J1000/J5000 Installation Manual

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10003496.00 Rev.5

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Product Code **MAN-J1000INS/MAN-J5000INS**

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This document describes the J1000/J5000 product family.

In this manual, any reference to J1000 refers to all models in the J1000 series of products except the J1200 Terminal Adaptor. J5000 refers to all models in the J5000 series of products, unless specified differently.

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An Australian company

Service Requirements

In the event of equipment malfunction, all repairs should be performed by Jtec or an authorised agent. It is the responsibility of users requiring service to report the need for service to Jtec or to one of our authorised agents. Please refer to the contact information sheet included in this manual for the nearest Jtec office or authorised agent.

Comments

Jtec welcomes questions, comments and suggestions regarding this document. Please contact:

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Contents

Introduction

About this manual

This manual provides the information you need to install a member of the J1000/J5000 product family.

This Installation Manual is part of the J1000/J5000 product documentation, along with:

- J1000/J5000 Reference Manual
- OmniVision User Manual
- OmniVision Help.

Refer to this *Installation Manual* for J1000/J5000 installation, operation, maintenance and troubleshooting information.

The *J1000/J5000 Reference Manual* defines the parameters available to you when configuring a J1000/J5000 and provides configuration instructions.

The *OmniVision User Manual* and *OmniVision Help* describe the Jtec Network Management System (NMS) and provide detailed instructions for its use. The help system also provides a brief guide to configuring all the Jtec product modules.

Audience

This manual is designed to meet the needs of installation and maintenance personnel and network managers who are responsible for the installation of a J1000/J5000.

Experience in the use of PCs running Microsoft Windows 95 and communications equipment is assumed, as is a high level of technical knowledge.

Using this manual

Refer to the appropriate section of this manual for the information you require.

This *Introduction* section provides an overview of the product family as well as the approvals, compliances, and standard safety precautions that are applicable to this equipment. Module applicability for particular markets and regions is also included.

Overall installation and pre-installation information is provided in the *Installation* section. It is important that the pre-installation considerations are read **before** installation as failure to comply with the conditions may render your warranty invalid.

The individual modules are dealt with in the *System Modules, ISDN Interface Modules, Analog Line Modules, Digital Line Modules* and *Utility Modules* sections. Each module is described, and installation, troubleshooting and other information specific to the module is provided.

The *Troubleshooting* section provides troubleshooting information.

The *Appendices* provide further technical details.

Conventions

Except where otherwise indicated, the information provided in this manual is valid for operation in all countries.

Certain modules and features detailed in this manual can only operate when your chassis is fitted with a Resource Manager (RM). The following markers are used throughout the manual to indicate the features and modules supported by the Control Module, the Resource Manager or both:

RM Feature or module supported by Resource Manager.

CM Feature or module supported by Control Module.

J1000/J5000 product family overview

The J1000/J5000 product family provides access from your terminal equipment to various telecommunications exchanges and fixed networks.

Access Controller

Each member of the J1000 series is available as an Access Controller (AC). The AC performs all the normal Access Controller functions as well as providing the J1000 optional facilities. All modules supported by the Control Module can be used in an Access Controller.

Virtual eXchange

Each member the J1000/J5000 product family are available as a Virtual eXchange (VX). The VX provides a private networking facility. This enables calls to be routed to another device via a private link, thus avoiding the use of the ISDN. This makes a more cost effective use of your private link. The VX also provides call charging and service tones within the private network.

Switched digital connections are provided for voice and data information originating from equipment such as:

- Telephones
- Facsimile machines
- Modems
- Private Automatic Branch eXchanges (PABXs)
- Public Switched Telephone Network (PSTN) exchanges
- ISDN exchanges
- Local Area Networks (LAN)
- Computer terminals and systems
- Video conferencing equipment
- Semipermanent connections (where applicable).

A J1000/J5000 provides the function of a Network Termination type 2 (NT2).

Voice and data information is processed by the J1000/J5000, including conversion into a digital format if necessary, and integrated onto digital carriers. By this description, the capabilities of the J1000/J5000 are technically defined as those of an intelligent digital multiplexer.

Terminal equipment connects to the J1000/J5000 family using communications cabling and interface protocols, just as if it's connected directly to an exchange network. The equipment provides the interface appropriate to the exchange network you select.

Members of the J1000/J5000 product family can provide a national network access solution for voice and data communications requirements. The equipment can interwork with new and old terminal equipment and exchange networks. Likewise, they can interwork with other network access equipment.

OmniVision is an SNMP-based network management system that gives you control over a single member of the J1000/J5000 product family and other Jtec products from either a central site or multiple points on a network. OmniVision is available for the Windows 95, 98 and NT operating systems , as well as for the HP OpenView platform. See your *OmniVision User Manual* for further information.

The J1000/J5000 product family is designed to have very high reliability and is suitable either for use within an exchange or within customer premises.

The J1000/J5000 product family is the interface between customer terminal equipment and a network, usually an ISDN. Its capabilities include:

- Voice compression
- IP Routing and Bridging
- Line status reporting (busy, idle, failed and so on)
- Call logging
- Loopback number for diagnostic purposes
- Non-volatile storage of line configurations
- Connection of network and terminal equipment channels.

The J1000/J5000 can provide access to networks such as the ISDN, Frame Relay and leased line services using the Basic Rate or DTM trunk ports. Private networks can be created using any combination of ISDN, or frame switching, on leased or public services.

The J1000/J5000 provides access to voice systems via Analog ports. Advanced low bit rate voice compression techniques are used to further optimise the bandwidth used by voice on the network.

J5000 series

As well as the common features described above, the J5000 series supports the following major features:

- TimeFrame technology
- Remote software download to RM
- Bridging and Routing
- HDLC handling
- Frame Switching
- Data compression.

The J5000 delivers bandwidth efficiency, flexibility and quality of service via Jtec's TimeFrame technology. TimeFrame provides the ability to dynamically allocate bandwidth to applications by supporting three modes of trunk operation:

- **Time Mode**
- **Frame Mode** (Future release)
- **TimeFrame Mode**.

These are explained in more detail below.

Time Mode

In Time Mode, both voice and data are carried in separate Time Division Multiplexing (TDM) time slots. Time slots are allocated to applications on a per call basis. Time Mode is a commonly used access method. Its strength lies in delay-sensitive applications such as voice. This mode is fully compatible with the Jtec J1000 series of products.

Frame Mode

In Frame Mode, both voice and data are carried in frames over Frame Relay. For voice, silence suppression ensures that only frames containing information are transmitted. Advanced voice compression techniques are used to reduce the amount of bandwidth occupied by voice calls. Data, management information, and signalling are also transmitted as frames, but only when needed.

Frame Mode provides high efficiency as trunk bandwidth is only used when an application has information to transfer. However, frame technologies are subject to congestion and hence are not very good for delay-sensitive applications such as voice. This mode of operation is intended for cost-conscious applications or where there is only a small amount of voice traffic and its transmission quality is not a concern.

TimeFrame Mode

This mode offers the best elements of the Time and Frame Modes of operation. Voice is carried in TDM time slots, ensuring high quality and predictable delivery. These time slots are allocated on a per call basis. Data, management information and signalling are carried in the remaining trunk bandwidth over Frame Relay, taking advantage of the bandwidth efficiency this technology has to offer.

As soon as bandwidth is released by a voice application, it is reclaimed by the data applications. Thus bandwidth is not only dynamically allocated by Frame Relay to data applications, but also between TDM time slots for voice, and Frame Relay for data.

Other features

Each product in the J5000 series is equipped with a 10BaseT Ethernet interface. This enables the J5000 to bridge or route LAN traffic, eliminating the requirement for an external router.

An HDLC handler is provided to service equipment that is Frame Relay ’unaware’. This may include some types of routers, hosts, cluster controllers, front end processors, X.25 switches and statistical multiplexers. The handler transparently transports all HDLC-based protocols over Frame Relay, providing a complete networking strategy for legacy equipment. Data devices are connected to this handler by the data ports on the J5000.

The J5000 also provides a data compression capability to further reduce the bandwidth requirements of data from the LAN router and HDLC handler travelling across the network.

J1000/J5000 base systems

The J1000/J5000 product family has three base systems. This section details the relationship between the models and base systems, the system capacities of each model, and the modules supported by the RM and CM.

A base system includes a chassis, backplane and a Control Module or Resource Manager.

Base systems

The relationship between models and base systems is summarised in the following table.

Series	Models	Description	Control processor
J1000	J1700/J1800	15 slot base system	Control Module
	J1500/J1600	6 slot base system	Control Module
	J1400	4 slot base system	Control Module
J5000	J5015	15 slot base system	Resource Manager
	J5006	6 slot base system	Resource Manager
	J5004	4 slot base system	Resource Manager

The control processor fitted to the base system chassis determines the particular model. For example, a Resource Manager fitted to a 6 slot chassis makes a J5006. A Control Module fitted to a four slot chassis makes a J1400.

System capacities

Each model in the J1000/J5000 product family has a maximum capacity to handle Primary Rate and/or Basic rate ports.

The table below summarises the capacity of each model in the J1000/J5000 product family:

Model	Capacity (up to)
J1800	8 x 2 Mbit/s Primary Rate modules
J1700	4 x 2 Mbit/s Primary Rate modules
J1600	4 x 2 Mbit/s Primary Rate modules
J1500	Basic Rate only (capacity dependent on slot usage)
J1400	8 x 64 kbit/s Basic Rate B-channels
J5015	8 x 2 Mbit/s Primary Rate modules
J5006	4 x 2 Mbit/s Primary Rate modules
J5004-8B	8 x 64 kbit/s Basic Rate B-channels
J5004-2E	2 x 2 Mbit/s Primary Rate modules

Supported modules

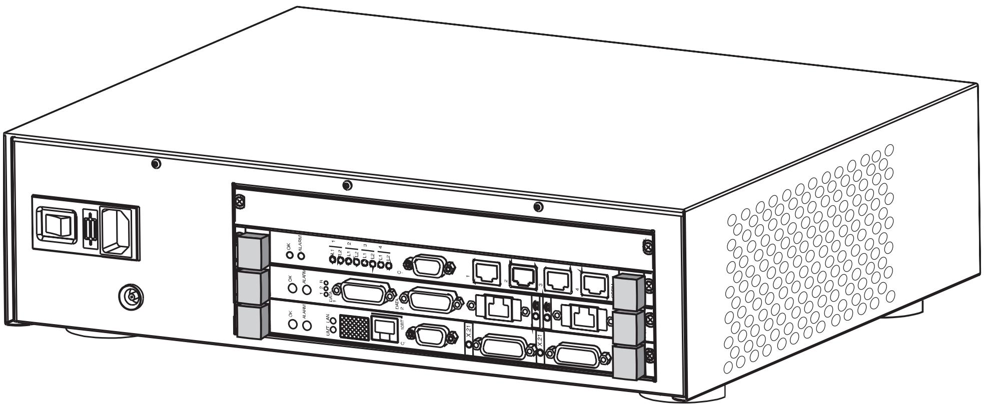
The following table shows the modules that are supported by the Control Module and the Resource Manager:

Modules	CM	RM
ISDN Interface Modules		
IPMN/IPMN-2/IPMN-T1	Yes	Yes
IPMT/IPMT-2/IPMT-T1	Yes	Yes
IPMN-GT	No	Yes
BRMT	Yes	Yes
BRMN	Yes	Yes
DBRM	Yes	Yes
QBRM	Yes	Yes
DBRM-U	No	Yes
QBRM-U	No	Yes
Digital Modules		
ADLM V.24	Yes	Yes
SDLM X.21	Yes	Yes
SDLM V.24	Yes	Yes
SDLM V.35	Yes	Yes
QDLM X.21	Yes	Yes
QDLM V.24	Yes	Yes
QDLM V.35	Yes	Yes
HSDM	No	Yes
E1M	Yes	Yes
T1M	Yes	Yes
E1M DPNSS	Yes	Yes
E1M QSIG	No	Yes
DTM	Yes	Yes
Analog Modules		
ALEM (Australia only)	Yes	Yes
ALPM (Australia only)	Yes	Yes
ALEM-2	Yes	Yes
ALPM-2	Yes	Yes
EMM	Yes	Yes
EMM-2	Yes	Yes

Modules	CM	RM
Utility Modules		
Combo[1]	No	Yes
SRMM	Yes	Yes
SAM	Yes	No
LDCM	Yes	Yes
MFCM	Yes	Yes
HD-VCM submodule	No	Yes
IRM	Yes	Yes
BCAM	Yes	Yes
FSM	Yes	Yes
DMM	Yes	Yes
DMM-56K	Yes	Yes
VCM	Yes	Yes

1 The Combo module can only be fitted to the J5004.

J1400/J5004

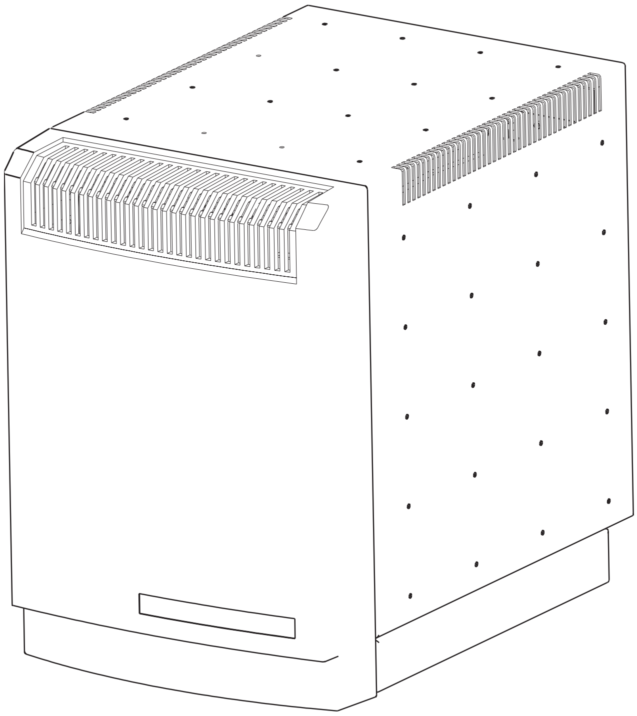


This is a four slot chassis and is intended for remote sites with low volume access requirements. The chassis is packaged as a desktop or shelf-mounted unit. It has four physical slots per chassis. One slot contains the Control Module or Resource Manager, leaving three slots available for other modules. Some limitations exist in the mix and placement of modules. These are described in the *Reference Manual.*

The chassis requires mains power (AC 240V or AC110V) for its built in power supply. The power supply auto-detects the voltage applied. The unit incorporates two fans with a fan alarm system that reports failures to the Network Management System.

Note *The J1400 does not support the fan alarm feature.*

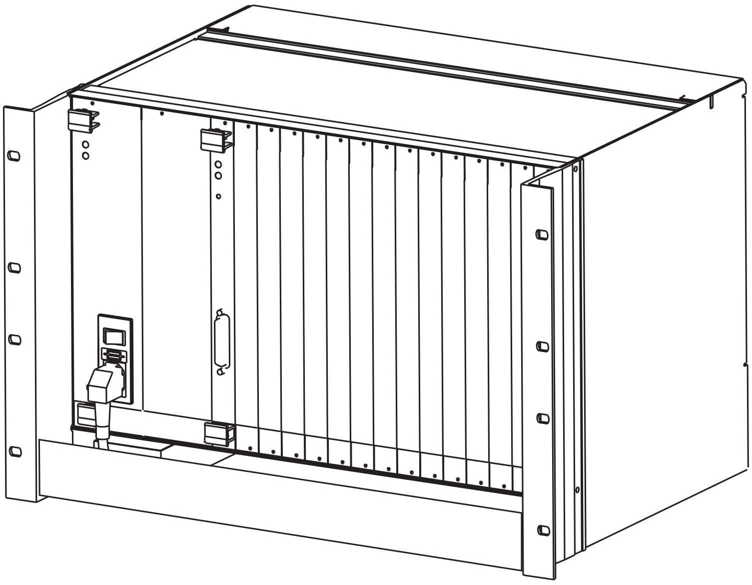
J1500/J1600/J5006



This is a six slot chassis and is intended for sites with low to medium volume network access requirements. The chassis is packaged as a cabinet which can be desktop-mounted, shelf-mounted, or wall-mounted. It has six physical slots per chassis. One slot contains a Control Module or Resource Manager, leaving five slots for other modules. Some limitations exist in the mix and placement of modules. These are described in the *Reference Manual*.

The chassis requires mains power (AC 240V or AC110V). Only one Power Supply Module (PSM) can be installed.

J1700/J1800/J5015



This is a fifteen slot chassis and is intended for sites with medium to high volume network access requirements. The chassis has 15 slots for network access, terminal equipment and utility modules. It can either be installed in a standard 19" rack, or mounted on the wall.

Four types of Power Supply Module (PSM) are available for the chassis. One is for connection to mains supply (AC240V or AC110V), the other for connection to a telecommunications power supply (DC-48V).

Note *A customer-supplied, local authority-approved power source is assumed for the DC-48V module.*

The chassis is typically configured with one PSM. However, two PSMs can be installed for redundancy purposes. In such a case the two PSMs must be of the same type.

Once a Control Module (CM) or Resource Manager (RM) has been installed, the chassis has fourteen slots available for line modules. Some limitations exist in the mix and placement of modules. These are described in the *Reference Manual*.

System features

The J1000/J5000 product family features plug-in modules which provide flexibility in configuration and expansion. They also make maintenance easier as most problems can be rectified by replacing a module, thus reducing the down time involved.

All modules are locked in position by two screws on the front panel of the module. One is located above the top (left on the4 slot chassis) handle and the other below the bottom (right on the 4 slot chassis) handle.

When you pull the top handle out a short distance, a mechanical latch releases and turns the module's power off. This allows you to remove or replace a module without turning off the chassis power supply.

In general, modules can be placed in any order at any location within a subrack, however, there are some guidelines and restrictions to be considered during installation. These issues are covered in the *Reference Manual* and in the sections for each module. Modules are inserted from the front of the subrack and are positioned by pre-mounted locators.

Each module has at least two light-emitting diodes (LEDs) on its front panel. One of these indicates normal active operation and the other indicates error conditions. These LEDs and error conditions are explained in detail as part of individual module descriptions.

The module type is printed on the front panel of the module above the bottom handle. The version number of the firmware installed on a module can be obtained through the NMS.

All the modules are optional and unused card slots are to be covered with blanking panels.

The chassis needs to be installed close to your network access and terminal equipment cabling termination points. See *Installation* section for cable length limitations.

On all but the four slot chassis, cabling to a module is routed through a cable access duct at the bottom of the subrack. Connectors for terminal equipment and network access are located on the front panel of a module.

The J1000/J5000 requires external power from either your local mains supply (AC240 V or AC110V) or your telecommunications power supply (DC-48 V).

J1000/J5000 hardware configuration

Module recognition

When a module starts up, it is recognised by the CM or RM on an internal control bus. It informs the CM or RM of its lines and their types, and an appropriate number of entries are made and initialised in the line database. If an NMS session is currently active, the CM or RM then informs the PC of the appearance of the lines.

J1000 software

All requisite operational software is resident within the modules at delivery.

Configuration data is stored in non-volatile RAM on the CM. This ensures that the configuration is not lost in the event of temporary power failure. This data is preserved for a minimum of four hours.

J5000 software

All requisite operational software is resident within the modules at delivery. The Resource Manager software can be downloaded remotely.

Control Module non-volatile configuration

The configuration information in the CM is stored in non-volatile RAM (NVRAM). Its integrity is monitored through the use of a number of checksums and through a cessation of processor activity when a power down condition is detected. The integrity of the NVRAM can never be guaranteed, however the likelihood of configuration loss is minimised by always powering the CM down with the power supply switch, rather than the switch on the CM itself. In the case of power failure, the CM will resume its normal operating state if power is returned within four hours.

Although there are a number of checksums, each applying to different parts of the database (for example, one for linesets, one for each line record), if any of these checksums fail, the entire configuration database is initialised to its default values. Consequently, a partial loss of configuration scenario is highly improbable, if not impossible. Note that the checksums are maintained whenever any part of the database is written, but they are only validated at CM startup. This is, therefore, the only time at which the database can be set to its default.

Resource Manager non-volatile configuration

Resource Managers below Version 2.00

If your chassis contains an RM which is lower than Version 2.00, the configuration information is stored on the RM in a combination of non-volatile RAM (NVRAM) and Flash Memory. Its integrity is monitored through the use of a number of checksums and through a cessation of processor activity when a power down condition is detected. The integrity of the NVRAM can never be guaranteed, however the likelihood of configuration loss is minimised by always powering the RM down with the power supply switch, rather than the switch on the RM itself. In the case of power failure, the RM will return to its normal operating state if power is returned within two hours.

Resource Managers Version 2.00 and above

For Resource Managers Version 2.00 and above, all of the configuration information is stored in Flash Memory. Checksums are used to check its integrity. The NVRAM is used for Call and Alarm logging. This means that, without power, these logs are valid for up to two hours, as would be the Time and Date for the chassis. However, because the OmniVision configuration information for the RM is stored permanently in flash, it will not be lost even during a power failure. The OmniVision configuration file is stored in the RM's file system as CM.CFG.

To delete the configuration from an RM (Version 2.00 and above) the following methods can be used:

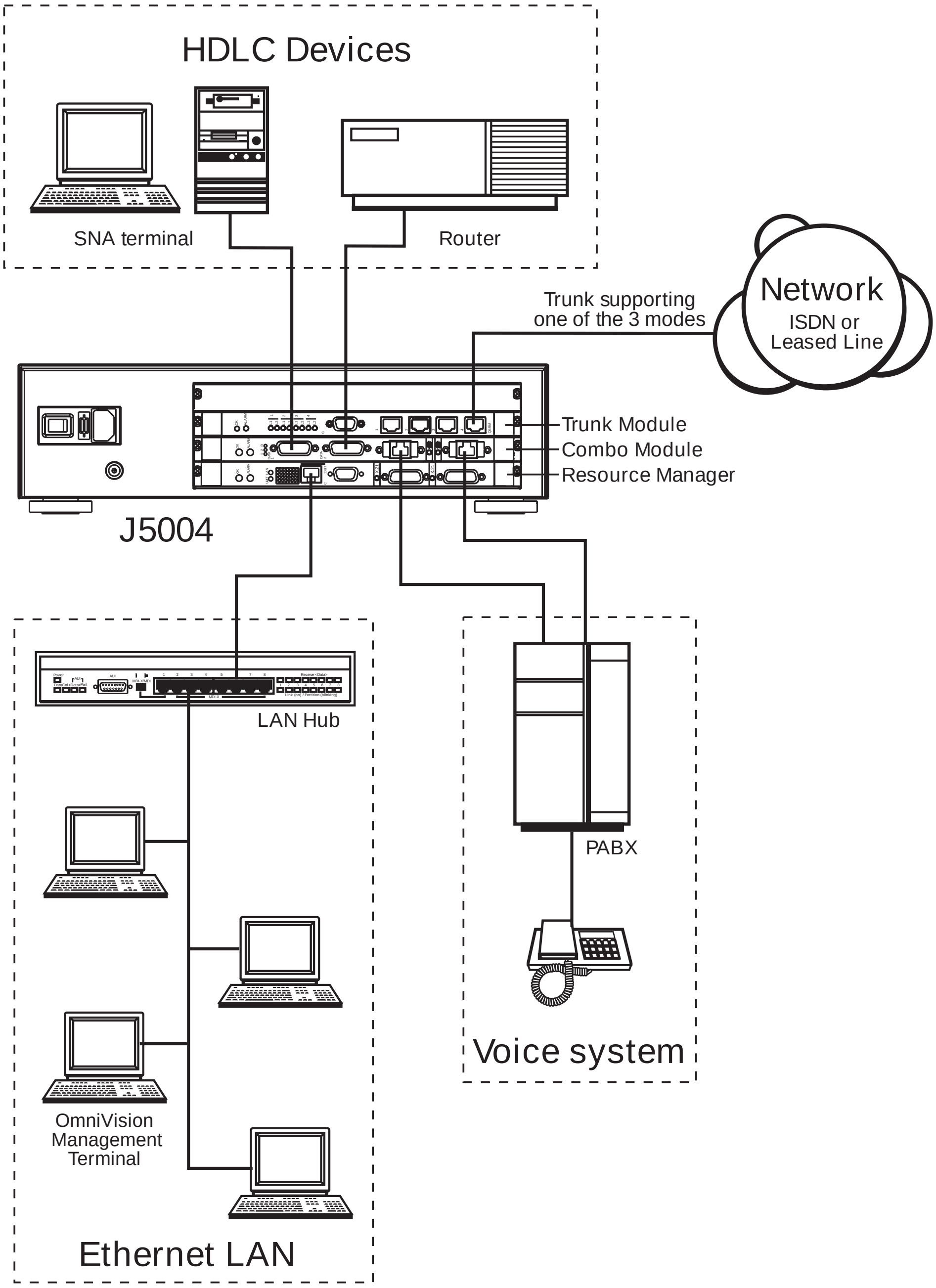
- Use OmniVision to default the configuration (see your *Omnivision User Manual*)
- Use Telnet or OmniVision's Virtual Terminal to delete the file CM.CFG from flash. For the change to be effective, you must restart the RM after deleting the file.
- Connect pins 2 and 3 on link X21, install the RM and apply power. Once the RM is started, it deletes the CM.CFG file and resets. The process repeats continually until you remove the link.

Checksums

Although there are a number of checksums, each applying to different parts of the database (for example, one for linesets, one for each line record), if any of these checksums fail, the entire configuration database is initialised to its default values. Consequently, a partial loss of configuration scenario is highly improbable, if not impossible. Note that the checksums are maintained whenever any part of the database is written, but they are only validated at RM startup. This is, therefore, the only time at which the database can be set to its default.

Typical Network

The diagram below summarises some typical uses for a J1000/J5000. In this example, a J5004 is shown operating in a mixed network of Voice, Ethernet and HDLC.



A typical network scenario

Refer to the *J1000/J5000 Reference Manua*l and the respective module information in this manual for detail on connecting the devices shown in the above diagram.

Network management of J1000/J5000

Jtec's OmniVision application is used for monitoring and configuring the J1000/J5000 family of products. This Network Management System (NMS) supports SNMP management and is available for Windows 95, Windows 98, Windows NT and HP OpenView platforms. OmniVision manages the following parameters:

- Trunk Ports, Data Ports, Line Ports
- Time, TimeFrame and Frame Virtual Lines (RM only)
- Call routing information
- LAN Routing (IP/Bridging)
- Data Port services (X.25/SNA).

OmniVision provides a graphical representation of the front panel of the subrack. When the PC is connected to a chassis, changes such as module insertion and removal are reflected in the display as they take place.

When a module is removed while a session is active, the module status changes to reflect this, but the module is not deleted from the configuration held in the Control Module or Resource Manager, and the PC. This allows the module, or another module of the same type, to be re-inserted in the slot without requiring reconfiguration.

Management of the devices is performed either locally or remotely.

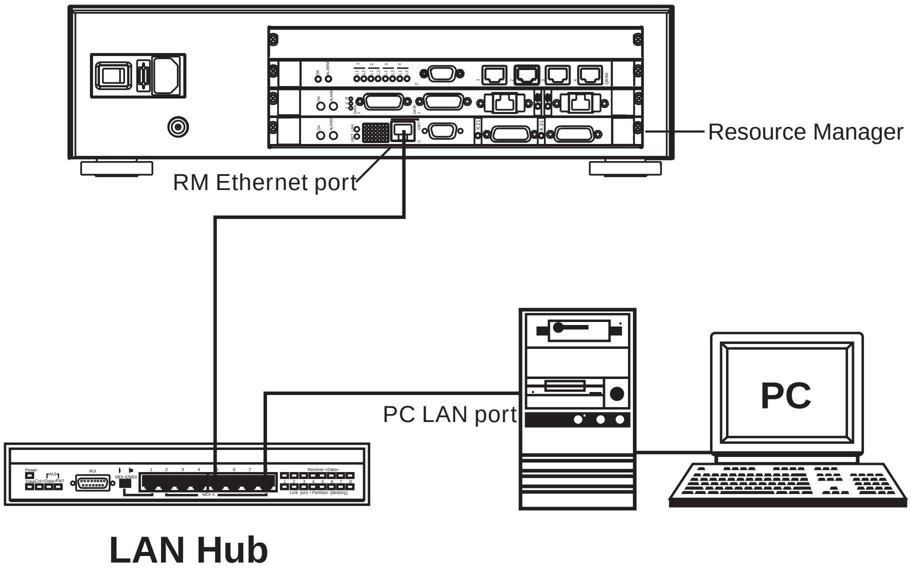
Call logging

When using OmniVision it is possible to run a call-logging program called Call Log. This monitors all calls and records details such as duration and cost, for a named node. It is particularly useful for billing purposes.

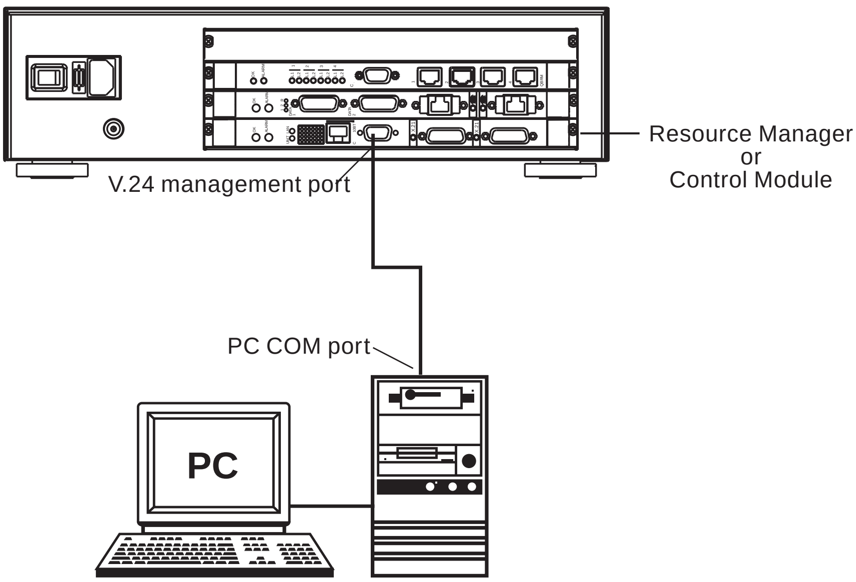
Call log information may be collected from local and remote nodes and displayed in a variety of ways and formats. See your *OmniVision User Manual* for further information.

Local management

You can locally manage the products by connecting a PC running Omnivision to either the LAN port or the V.24 management port of the RM, or to the V.24 management port of the CM. The figures below show typical connections to an RM. The connection of a PC to a Control Module can only be made through the CM's V.24 port. The cables used for this purpose are detailed in the relevant module section.



Using a PC on a LAN to locally manage a J5000



Using a PC to directly manage a J1000 or J5000

Remote management

Remote configuration may be performed by establishing a user session with a given device through a signalling channel. Since a phone number must be entered whenever a session is initiated, the fact that the signalling channel is used to access a remote device is transparent to the user. When the CM or RM realises that the phone number passed to establish the session is not its own, it automatically attempts to establish a B-channel call to the remote device and set up a signalling connection between the two.

In some markets, remote configuration may be also performed by establishing a user session with a given device through the ISDN D-channel. Since a phone number must be entered whenever a session is initiated, the fact that the D-channel is used to access a remote device is transparent to the user. When the CM or RM realises that the phone number passed to establish the session is not its own, it automatically attempts to establish a D-channel call with a device with the given phone number.

Refer to the *OmniVision User Manual* for details on installing and operating OmniVision.

First user connection

An attempt may be made to connect to a previously unconfigured J1000/J5000, even though the destination phone number has not yet been programmed into the device. You can use any phone number within the range assigned to the device to make the first connection. This number will be accepted (if the default password *Jtec* is used).

If the number is not in the allocated number range, the B- or D-channel call will never reach the device. Until the Manager number is set in OmniVision, or if this number is ever deleted, the device will always accept incoming B- or D-channel calls as if they are NMS calls. It is therefore essential to set this number if D-channel End-to-End signalling is to be used.

Warning

Although the D-channel call setup in a remote user session is transparent to you, the uploading process may appear to pause during the session. Neither the PC nor the device has ceased to operate in this situation. To guard against excessive processor loading in the ISDN exchange, a simple congestion control mechanism prevents the flow of user messages if a count of 103 user information messages is received within any 3 minute period. The flow may not resume for up to 2 minutes. In this instance a congestion message will appear on the OmniVision screen. Packets are queued within the device while congestion control is being asserted, so no data is lost as a result of this mechanism. Once the upload has concluded, it is highly unlikely that the flow control mechanism will be triggered again during the session as the traffic volume is at its peak during the uploading process. However, to ensure that the configuration session is successful, and all information is transferred, you should wait 5 minutes after performing the last action before terminating a remote session.

Approvals

This section contains information relating to approvals applicable to the J1000/J5000 family of products.

Key

The following key is used in the tables in this section:

AUS — Australia

NZ — New Zealand

CE — CE Countries (see current countries below)

Current CE Countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. This list is current at the time of publication.

USA/CAN — United States of America/Canada

UK — United Kingdom

Approved systems

The following table details the agency approvals and references for the J1000/J5000 systems:

	Model		
Agency	**J1700/J1800/J5015**	**J1500/J1600/J5006**	**J1400/J5004**
Austel	A90/76/0161	A90/76/0161	A90/76/0161
ACA Compliance	Yes	Yes	Yes
Telecom NZ	PTC/217/95/005 PTC/217/95/006	PTC/217/95/004	
BABT	AA604177 AA604179	AA604178	AA607653
FCC	6BKAUS-24811-PF-T	6BKAUS-24811-PF-T	6BKAUS-24811-PF-T
Industry Canada	2858 8368AB	2858 8368AB	2858 8368AB
UL/CUL	E177972(S)	E177972(S)	E177972(S)

Approved power supplies

The following table details the power supplies that are approved for use in a particular country or region.

Power Supply Module	Country/Region		
	AUS/NZ	CE	USA/CAN
PSM-240 AC	✔	✔	
PSM-110 AC			✔
PSM-HC	✔		
PSM-HC-AC	✔	✔	✔
PSM-48 DC	✔	✔	

Approved network interface modules

The following table provides a summary of the network interface modules that are approved for connection to public networks in a particular country or region, and those that apply only to specific countries. For information about countries included in the CE region, see page 1-19.

Module	Country or Regional approvals				Specific approvals
	AUS	NZ	CE[1]	USA/ CAN	UK[2]
BRMT TS013	✔				
BRMT ETSI[3]					✔
QBRM/DBRM	✔	✔	✔	✔	
QBRM-U/DBRM-U				✔	
IPMT-2 ETSI	✔	✔	✔		
IPMT-2 TS014	✔				
IPMT-2 B190					✔
IPMT-T1				✔	
ALPM	✔				
ALPM-2	✔				✔
E1M-2	✔				
T1M				✔	

1 CE approval applies to modules where Common Technical Requirements (CTR) exist. Modules that are not ticked in this column may or may not need country specific approval. Contact Jtec Customer Service and Support for further advice.

2 The modules that are ticked in this column are those that have specific UK approvals. Modules approved under the CE column are also approved for the UK.

3 The BRMT-ETSI is approved for use in the J1500/J1600/J5006 and the J1700/J1800/J5015.

Approved leased line interface modules

The following table provides a summary of the leased line interface modules that are approved for use in a particular country or region, and those that apply only to specific countries. For information about countries included in the CE region, see the key on page 1-19. Modules that are not ticked in this table may or may not need country specific approval. Contact Jtec Customer Service and Support for advice.

Module	Country or Regional approvals				Specific approvals
	AUS	NZ	CE[1]	USA/ CAN	UK[2]
E1M/E1M-2	✔				✔
IPMN-2	✔		✔		
ALEM	✔				
ALPM	✔				
ALEM-2	✔			✔	✔
ALPM-2	✔			✔	✔
EMM/EMM-2	✔				✔
QDLM X.21TE			✔		
QDLM V.35TE					✔
QDLM V.24TE					✔
QDLM X.21LLB			✔		
QDLM V.35 LLB					✔
QDLM V.24 LLB					✔
DTM X.21			✔		
DTM V.35					✔
COMBO[3]	✔			✔	✔

1 CE approval applies to modules where Common Technical Requirements (CTR) exist.

2 The modules that are ticked in this column are those that have specific UK approvals. Modules approved under the CE column are also approved for the UK.

Note *In many countries, there are no specific approval requirements for connecting to Digital Data Services (DDS).*

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3 Combo fitted with ALIM-EXCH daughter board.

User interface, utility and system modules

The following user interface, utility and system modules do not require specific approval for connection to CPE. They can be used in all approved systems. The network interface and leased line interface modules can also be used as user interface modules.

Modules
E1M
E1M-2
IPMN
IPMN-2
BRMN
IPMN-T1
IPMN-GT
ADLM V.24
SDLM X.21
SDLM V.24
SDLM V.35
VCM
BCAM with interfaces: X.21 V.35
IRM
SRMM
SAM with interfaces: V.24 V.35 X.21
LDCM
MFCM
FSM
DMM
DMM-56K
CM
RM

Compliances

Safety compliance

This equipment meets the following safety compliance requirements:

- AS/NZ 3260 — Australian/New Zealand Safety Requirements
- TS001 — Australia Telecom Safety
- EN60950 — European Safety Requirements
- EN41003 — European Telecom Safety
- UL1950 — UL Safety Requirements.

The following table shows which modules and systems meet a particular compliance requirement.

	Safety Compliance		
System/ Module	**AS/NZ 3260 TS001**	**EN60950/ EN41003**	**UL1950**
J1700/1800/5015	✔	✔	✔
J1500/1600/5006	✔	✔	✔
J1400/5004	✔	✔	✔
PSM 240V AC	✔	✔	
PSM 110V AC			✔
PSM-HC	✔		
PSM-HC-AC	✔	✔	✔
PSM 48V DC	✔	✔	
CM	✔	✔	✔
RM, RM-04	✔	✔	✔
BRMN	✔	✔	
BRMT	✔	✔	
QBRM, DBRM	✔	✔	✔
QBRM-U, DBRM-U			✔
IPMN, IPMT, E1M	✔	✔	
IPMT-2	✔	✔	
IPMN-2, E1M-2	✔	✔	✔
IPMN-T1, IPMT-T1, T1M, IPMN-GT			✔
ALEM	✔		
ALPM	✔		
ALEM-2	✔	✔	✔
ALPM-2	✔	✔	✔
EMM, EMM-2	✔	✔	✔
ADLM V.24	✔	✔	✔
SDLM V.24	✔	✔	✔
SDLM V.35	✔	✔	✔
SDLM X.21	✔	✔	✔
QDLM	✔	✔	✔
HSDM	✔	✔	✔
DTM-1, DTM-4	✔	✔	✔
VCM	✔	✔	✔

	Safety Compliance		
System/ Module	AS/NZ 3260 TS001	EN60950/ EN41003	UL1950
BCAM, SAM	✔	✔	✔
IRM	✔	✔	✔
SRMM	✔	✔	✔
LDCM	✔	✔	
MFCM	✔	✔	✔
FSM	✔	✔	✔
DMM-8, DMM-15	✔	✔	✔
DMM-56K-16, DMM-56K-8	✔	✔	✔
COMBO	✔	✔	✔

Note *The conditions of IEC 950 — International Electrotechnical Safety Requirements, are met by EN60950 and UL1950.*

Safety status of interface ports

The following table indicates the safety status of the interface ports (Refer to EN410003/EN60950).

Module	Interface port	
	D type	RJ type
CM	SELV	N/A
RM, RM-04	SELV	SELV
BRMN	SELV	SELV
BRMT	SELV	SELV
QBRM, DBRM	SELV	SELV
QBRM-U, DBRM-U	SELV	SELV
IPMN, IPMT, E1M	SELV	SELV
IPMT-2	SELV	SELV
IPMN-2, E1M-2	SELV	SELV
IPMN-T1, IPMT-T1, T1M, IPMN-GT	SELV	SELV
ALEM	N/A	TNV
ALPM	N/A	TNV
ALEM-2	N/A	TNV
ALPM-2	N/A	TNV
EMM, EMM-2	N/A	TNV
ADLM V.24	SELV	N/A
SDLM V.24	SELV	N/A
SDLM V.35	SELV	N/A
SDLM X.21	SELV	N/A
QDLM	SELV	N/A
HSDM	SELV	N/A
DTM-1, DTM-4	SELV	N/A
BCAM, SAM	SELV	N/A

Module	Interface port	
	D type	RJ type
VCM	SELV	N/A
IRM	SELV	N/A
SRMM	SELV	N/A
LDCM	SELV	N/A
MFCM	SELV	N/A
DMM-8, DMM-15	SELV	N/A
DMM-56K-16, DMM-56K-8	SELV	N/A
Combo Digital ports	SELV	N/A
Combo ALIM ports	N/A	TNV

To maintain safety compliance when connecting the equipment electrically to other equipment, the interconnecting circuits shall be selected to provide continued conformance with the following standards after making connections between equipment:

- For SELV CIRCUITS - Clause 2.3 of AS/NZS3260-1993 and EN 60950
- For TNV CIRCUITS - Clause 6 of AS/NZS3260-1993 and EN 60950.

Notes

Compliance with the above standards is normally achieved by connecting SELV CIRCUITS to SELV CIRCUITS, and TNV CIRCUITS to TNV CIRCUITS.

It is permitted for an Interconnecting Cable to carry more than one type of Circuit (SELV, LIMITED CURRENT, TNV, ELV and HAZARDOUS VOLTAGE) provided that they are separated as requiredby these standards.

Note *Use only line cords approved to an applicable national standard when connecting a module to other equipment.*

Safety Precautions

The following information provides safety precautions to follow when using this equipment.

This equipment is to be installed and maintained by qualified service personnel only.

Caution. This equipment must be connected to earthed mains socket-outlets.

Caution. To protect against fire hazard replace fuses with the same type and rating as originally installed.

Sicherheitsvorkehrungen

Nachstehend werden Sicherheitsvorkehrungen aufgeführt, denen bei der Verwendung dieses Geräts entsprochen werden muß.

Dieses Gerät darf nur von qualifiziertem Servicepersonal installiert und gewartet werden.

Vorsicht. Dieses Gerät muß an geerdete Netzsteckdosen angeschlossen sein.

Sikkerhedsforanstaltninger

Følgende oplysninger giver sikkerhedsforanstaltninger, som bør følges, når dette udstyr bruges.

Dette udstyr skal udelukkende installeres og vedligeholdes af kvalificeret servicepersonale.

Forsigtig. Dette udstyr skal være tilsluttet en strømforsyning, der er jordforbundet.

Sikkerhetsforanstaltninger

Informasjonen nedenfor inneholder sikkerhetsforanstaltninger som skal følges ved bruk av dette utstyret.

Dette utstyret skal kun installeres og vedlikeholdes av kvalifisert servicepersonale.

Forsiktig. Dette utstyret må koples til hovedledningen via en jordet kontakt.

Säkerhetsföreskrifter

Vid användning av denna utrustning skall följande säkerhetsföreskrifter iakttas.

Utrustningen måste installeras och underhållas av behörig servicepersonal.

Viktigt! Utrustningen måste anslutas till jordat nätströmsuttag.

EMC compliance

This equipment meets the following EMC compliance requirements:

- AS/NZ 3548.
- EN55022 Level A
- EN50082-1 (Immunity)
- FCC Part 15 Class A

The following table specifies which systems and modules meet the requirements of the particular EMC compliance:

	EMC Compliance		
System/ Module	**AS/NZ 3548**	**EN55022 EN50082-1**	**FCC Part 15**
J1700/J1800/J5015	✔	✔	✔
J1500/J1600/J5006	✔	✔	✔
J1400/J5004	✔	✔	✔
PSM 240V AC	✔	✔	
PSM 110V AC			✔
PSM-HC	✔		
PSM HC AC	✔	✔	✔
PSM 48V DC	✔	✔	
CM	✔	✔	✔
RM	✔	✔	✔
BRMN	✔	✔	
BRMT	✔	✔	
QBRM, DBRM	✔	✔	✔
QBRM-U, DBRM-U			✔
IPMN, IPMT, E1M			
IPMN-2, IPMT-2, E1M2	✔	✔	✔
IPMN-T1, IPMT-T1, T1M, IPMN-GT			✔
ALEM			
ALPM			
ALEM-2	✔	✔	✔
ALPM-2	✔	✔	✔
EMM	✔	✔	✔
ADLM V.24	✔	✔	✔
SDLM V.24	✔	✔	✔
SDLM V.35	✔	✔	✔
SDLM X.21	✔	✔	✔
QDLM	✔	✔	✔
HSDM	✔	✔	✔
DTM	✔	✔	✔
VCM	✔	✔	
BCAM, SAM	✔	✔	✔
IRM	✔	✔	✔
SRMM	✔	✔	✔

	EMC Compliance		
System/ Module	**AS/NZ 3548**	**EN55022 EN50082-1**	**FCC Part 15**
LDCM	✔	✔	
MFCM	✔	✔	✔
FSM	✔	✔	✔
DMM (all models)	✔	✔	✔
Combo	✔	✔	✔

Note *The requirements of CISPR 22 Level A are met by EN55022 Level A.*

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 and used in accordance with the instruction document, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY JTEC PTY LIMITED COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of Industry Canada.

Cet appareil numérique n'émet pas de bruits radioélectriques depassant les limites applicables aux appareils numériques de la Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Warning. 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.

Where specified, shielded cabling must be used to maintain compliance with emission standards. It is the responsibility of the user to use the shielded cables to maintain compliance.

Warnung. Dieses Produkt ist ein Produkt der Klasse A und kann in einem Wohngebiet zu Funkstörungen führen. In diesem Fall ist es erforderlich, daß der Benutzer geeignete Maßnahmen trifft.

Falls angegeben, müssen abgeschirmte Kabel verwendet werden, um Emissionsnormen zu entsprechen. Es gehört zur Verantwortung des Benutzers, die zur Übereinstimmung mit den Emissionsnormen erforderlichen abgeschirmten Kabel zu benutzen.

Advarsel. Dette produkt er et Klasse A produkt. I private hjem kan dette produkt forårsage radiointerferens, som muligvis vil kræve, at der tages visse forholdsregler.

Der hvor det er påkrævet, skal der benyttes afskærmet kabelføring for at overholde emissionsnormer. Det er brugerens ansvar at benytte afskærmede kabler for at overholde emissionsnormer.

Advarsel. Dette er et produkt i klasse A. Ved bruk i hjemmet kan produktet forårsake radioforstyrrelser, som kan medføre at brukeren må treffe visse foranstaltninger.

Der det spesifiseres, må skjermede kabler brukes for å overholde eventuelle standarder som er satt for emisjon. Det er brukerens ansvar å bruke de skjermede kablene til å overholde forskriftene.

Varning! Denna produkt tillhör Klass A. Produkten kan orsaka radiostörningar i en hemmiljö. Skulle detta inträffa, kan användaren vara tvungen att vidta lämpliga åtgärder.

När så anges måste skärmkablar användas för att produkten skall överensstämma med gällande störningsnormer. Det åligger användaren att använda skärmkablar för att uppfylla dessa normer.

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FCC Part 68

This equipment complies with Part 68 of the FCC rules. On the side or bottom panel of this equipment is a label that contains, among other information, the FCC registration number.

The ringer equivalence number (REN) is used to determine the quality of devices which 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. In most, but not all areas, 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. The REN assigned to this equipment is 0.7B. If required, this information must be provided to the telephone company.

The FCC has established Rules which permit this device to be directly connected to the telephone network. Standardised jacks are used for these connections.

Facility Interface Information for Loop-start/Ground-start services

Manufacturer Port Identifier	Facility Interface Code (FIC)	REN	Network Jack
ALPM-2 Analog Line Phone Module	02LS2	0.7B	RJ11C

Facility Interface Information for Analog Private Line Services

Manufacturer Port Identifier	Facility Interface Code (FIC)	Service Order Code (SOC)	Network Jack
ALEM-2 Analog Line Exchange Module	0L13C	9.0F	RJ11C
COMBO Analog Line Exchange Module	0L13C	9.0F	RJ11C

Facility Interface Information for Digital Services

Manufacturer Port Identifier	Facility Interface Code (FIC)	Service Order Code (SOC)	Network Jack
T1M-T1 Module	O4DU9-BN/DN/1KN /1SN	6.0Y	RJ48C
IPMT PRI Module	O4DU9-BN/DN/1KN /1SN	6.0Y	RJ48C
QBRM - 4 Port BRI Module S	02IS5	6.0P	N/A*
DBRM - 2 Port BRI Module S	02IS5	6.0P	N/A*
QBRM-U - 4 Port BRI Module	02IS5	6.0Y	RJ49C
DBRM-U - 2 Port BRI Module	02IS5	6.0Y	RJ49C

*Connected through an FCC registered NT1.

If this equipment is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and until repair has been made. If this is not done, the telephone company may temporarily disconnect service.

The telephone company may make changes in its technical operations and procedures; if such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the change.

Canadian Notice to Users

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the user's 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. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorised Canadian maintenance facility designated by the supplier. 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 to each other. 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.

The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminal connections allowed 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 RENs of all the devices does not exceed 5.

The REN assigned to this equipment is 0.6.

EC Declaration

This product bears the **CE 168X** mark. The mark signifies that the product conforms to the following EC directives:

- **72/23/EEC** (Low Voltage Directive)
- **91/263/EEC** (Telecommunications Terminal Equipment Directive)
- **89/336/EEC** (EMC Directive).

Market variants

This section details the market variants for the Control Module option module and tone ROM, and the mains power cords used with the Power Supply Modules.

Control Module option module variants

The CM option module is programmed according to the market in which it is used. The following table details the market segment code for each variant of the option module and indicates the appropriate default country code.

Market segment	Default country code
CK-STD-AUS	61
CK-STD-USA	1
CK-STD-UKS	44
CK-STD-WEU	49
CK-STD-ITA	39
CK-STD-MEX	61

Control Module tone ROM variants

The CM tone ROM (Programmable Logic Device D12) is programmed according to the market in which it is used. The following table shows the tone option and the ROM label for each market variant:

Market segment	Tone ROM option	ROM D12 Label
CK-STD-AUS	-13 dBm 425 Hz A-law encoded	10000501.00 V1 D12-13A
CK-STD-USA	-15dBm 425 Hz µ-law encoded	10000501.00 V1 D12-15U
CK-STD-UKS	-13 dBm 425 Hz A-law encoded	10000501.00 V1 D12-13A
CK-STD-WEU	-3 dBm 425 Hz A-law encoded	10000501.00 V1 D12-3A
CK-STD-ITA	-13 dBm 425 Hz A-law encoded	10000501.00 V1 D12-13A
CK-STD-MEX	-13 dBm 425 Hz A-law encoded	10000501.00 V1 D12-13A

Power Cord

Each market uses a particular type of power cord. The following table details the market segment codes and part numbers applicable to each type of power cord.

Market segment	Part number
CK-STD-AUS	10001114.00
CK-STD-USA	C090-03253
CK-STD-UKS	10003051.00
CK-STD-WEU	C090-02419
CK-STD-ITA	C090-02456
CK-STD-MEX	C090-03253

Installation

Pre-installation considerations

This section describes conditions, external to the J1000/J5000, that must be met for successful installation.

Jtec's Terms and Conditions of Sale detail the warranty provided for this equipment under normal operating conditions. Please note that the warranty may be rendered invalid if any of the following conditions concerning installation are not met:

- protective earthing must be connected as specified in this chapter;
- adequate ventilation must be provided as specified in this chapter;
- anti-static handling procedures must be followed as specified in this chapter;
- all procedures specified in documentation supplied with this equipment must be followed;
- all equipment connected to the J1000/J5000 must meet the safety requirements of the relevant standard (appropriate to the country in which the equipment is to be used), for example, AS/NZS3260, EN60950.

Warning	This equipment must be installed and maintained by qualified service personnel only.

EMC requirements

To maintain EMC compliance you must ensure the following:

- All vacant module positions must be covered by blank panels.
- All digital network interface modules using RJ45 type connectors must be installed using shielded cables fitted with shielded RJ45 compatible plugs.
- All digital interfaces using D-type or M34 type connectors must be installed using shielded cables fitted with metal shielded connectors. The cable shield should be a good quality braid/foil combination. The cable shield must have secure, continuous contact around the circumference of the cable with the connector shield using a conductive ferrule or clamp.

Operating environment

The operating environment of this equipment must meet the following requirements:

- Ambient temperature of: 0°C to 45°C
- Ambient humidity 10% to 95% (non-condensing)
- Low dust environment
- Altitude 2500m maximum.

Maximum recommended ambient temperature (Tmra)

We recommend that the maximum ambient temperature does not exceed 45°C.

Power source

The following table details the power source and power module requirements for the J1000/J5000 product family.

Model	Power source	Power module
J1400/J5004	100-240V AC	In-built (auto detect)
J1500/J1600/J5006	100-120V AC	PSM-110V
	200-240V AC	PSM-240V
	100-240V AC	PSM-HC
	100-240V AC	PSM-HC-AC
J1700/J1800/J5015	100-120V AC	PSM-110V
	200-240V AC	PSM 240V
	100-240V AC	PSM-HC
	100-240V AC	PSM-HC-AC
	-40 to -60V DC	PSM-48V

All of this equipment uses a pluggable power cord. For this equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.

Warning Before you remove the AC mains cable from the power supply unit, you must switch the unit off using the front panel switch and isolate the mains supply at the wall socket.

The following table details the power input and output requirements for each type of power supply module and the built-in power supply for the J1400/J5004.

Module	Supply		Output			Approved Standards
	Voltage	Maximum Current	5V (A)	12V (A) + and -	-48V	
PSM-HC	100-240V AC	4.5-2.0A RMS	25A	2A	2.4A	TS001, AS3260,
PSM-HC-AC	100-240V AC	4.5-2.0A RMS	30A	2A	2.4A	UL 1950, TS001, AS3260, EN41003, EN60950
PSM-240V	200-240V AC	4A RMS	20A	2A	2A	TS001, AS3260 EN41003, EN60950
PSM-110V	100-120V AC	5A RMS	10A	1A	1.5A	UL 1950
PSM-48V	-40 to -60V DC	5A	20A	2A	2A	TS001, AS3260 EN41003, EN60950
Built -in for J1400/J5004	90-240V AC	3.15A RMS	15A	1.6A (+12V) 0.6A (-12V)	0.35A	TS001, AS3260 EN41003, EN60950

Circuit overloading

You should give consideration to the connection of the equipment to the supply circuit and the effect that overloading of circuits might have on overcurrent protection and supply wiring. You should give appropriate consideration to equipment name plate ratings when addressing this concern.

Current consumption

The current consumption of all the modules is detailed in the table below. You should ensure that the total current consumption of the installed modules does not exceed the output ratings specified in the table on the previous page.

Module	5V (A)	12V (A) + and -	-48V (A)
RM, RM-04	2.20	0.01	
CM	0.65	0.09	
T1M/IPMT-T1/IPMN/T1	0.82	0.01	
IPMN-GT	0.82	0.01	
IPM/E1M	0.55	0.01	
BRM	0.55	0.01	
QBRM	0.50	0.01	
DBRM	0.40	0.01	
QBRM-U	0.40	0.01	
DBRM-U	0.30	0.01	
ALEM	0.26	0.04	
ALPM	0.23	0.03	
ALEM-2	0.40	0.01	0.20
ALPM-2	0.35	0.03	
EMM/EMM-2	0.24	0.04	0.02
ADLM V.24	1.45	0.06	
SDLM V.35	1.79	0.06	
SDLM X.21	1.59	0.01	
QDLM V.24	0.45	0.12	
QDLM V.35	1.25	0.08	
QDLM X.21	1.25	0.01	
QDLM LLB V.24	0.65	0.13	
QDLM LLB V.35	1.40	0.08	
QDLM LLB X.21	1.49	0.01	
HSDM	0.55	0.03	
E1M-2, IPMN-2	0.55	0.01	
DTM-1 X.21	1.20	0.03	
DTM-1 V.35	1.20	0.04	
DTM-4 X.21	1.80	0.03	
DTM-4 V.35	1.80	0.08	
BCAM/SAM V.24	1.27	0.01	

Module	5V (A)	12V (A) + and -	-48V (A)
BCAM/SAM V.35	1.27	0.13	
BCAM/SAM X.21	1.27	0.01	
IRM	3.94	0.03	
SRMM	0.40	0.01	
LDCM-CELP 1/2	1.50	0.00	
LDCM-CELP 3/4	2.30	0.00	
LDCM-CELP 5/6	3.10	0.00	
LDCM-CELP 7/8	3.90	0.00	
LDCM-1/VF2	2.10	0.00	
LDCM-1/VF4	2.70	0.00	
LDCM-1/VF6	3.30	0.00	
MFCM-4	1.45	0.01	
MFCM-8	2.56	0.01	
MFCM Base Board (MFCM-BS) MLQ-CMP HD-VCM	0.36 0.55 0.45	0.01 0.00 0.00	
DMM-15	3.26	0.07	
DMM-8	1.92	0.07	
DMM-56K-16	3.0	0.01	
DMM-56K-8	2.0	0.01	
FSM	2.20	0.01	
COMBO	0.86	0.03	0.12

Maximum power input for chassis

The following table details the maximum power input for each chassis:

Chassis	Input Power (maximum)
15 slot	200 Watts
6 slot	100 Watts
4 slot	75 Watts

Protective earth

When a PSM-240V, PSM-110V, PSM-HC or a PSM-HC-AC is used, the external AC source must include a mains earth which is connected to the power supply.

When a PSM-48V is used a protective earth must be connected to the earth stud on the chassis.

All power supplies must be screwed into position in the chassis.

Important

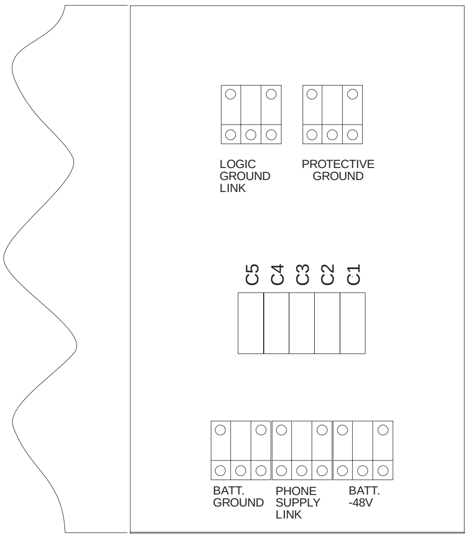
This equipment is intended to be installed by service personnel and requires connection to a mains socket-outlet with a protective earthing connection.

Before disconnecting the mains cable from the PSM or the mains power outlet, ensure that all network cables are disconnected from the equipment.

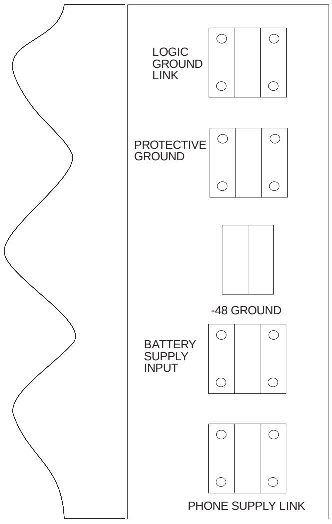
Warning	Failure to connect this equipment in accordance with the above can result in non-compliance with the equipment specification, equipment damage, injury or loss of life.

Chassis backplane

This section describes the chassis backplane and the grounding/earthing requirements.



Fifteen slot chassis backplane, issue 3



Six slot chassis backplane

PROTECTIVE GROUND

The protective ground terminal block provides a means for connecting the chassis to the Protective Earthing system associated with a site.

Installations that use a PSM-48 must connect an external protective earth to the chassis earthing stud (located on the inside of the right-hand side-panel when viewing from the back). Additionally, a PE conductor should be installed between the second protective ground terminal and the chassis earthing stud.

Installations that use a mains earthed PSM do not require an external protective earth to be connected to the chassis earthing stud or the protective ground; however, a cable must be installed between the protective ground terminal and the chassis earthing stud.

Note *In accordance with Austel Technical Standard TS009, the Telecommunications Reference Conductor (TRC) should not be connected to XF1 or to the PE conductors (Australia only).*

BATT GROUND and BATT -48V

The battery ground terminal block represents the connection point for a -48 V DC supply from which the DC to DC Power Supply Module operates. The two terminals of BATT GROUND represent connection points for Battery Ground, and the two terminals of BATT -48V represent connection points for -48 V battery.

The positive side of a DC supply should be connected to one of the terminals of BATT GROUND, while the negative side of the supply should be connected to one of the terminals of BATT -48V.

Note *If an installation involves the use of E1Ms, ALEMs, Combo Modules or EMMs, then in accordance with Austel TS003 Clause 5.1.6, TS016 Clause 5.7.4 and TS009, a Telecommunications Reference Conductor (TRC) should be terminated on one of the Battery Ground terminals (Australia only).*

Reliable earthing for rack mounting

You should maintain reliable earthing of rack-mounted equipment. You should pay particular attention to supply connections other than direct connections to the branch circuit, for example, the use of power strips.

Anti-static handling procedures

All J1000/J5000 modules are static sensitive devices (SSDs). To avoid damage to components you must be grounded whenever you handle SSDs.

Personal grounding can be achieved in a number of ways. The most common method is to wear a grounding wrist or ankle strap (connected to a suitable earthing point). Typically the straps are flexible bands with a minimum of a 1MΩ resistor in the ground cords, and they must be in contact with the skin to be effective. Standing on an anti-static mat and wearing conductive footwear is an alternative, however these can only be used when standing.

Any inspection operations or work performed on SSDs must be carried out on a grounded conductive surface.

Warning Failure to comply with the above procedures may result in the destruction or degradation of the SSD.

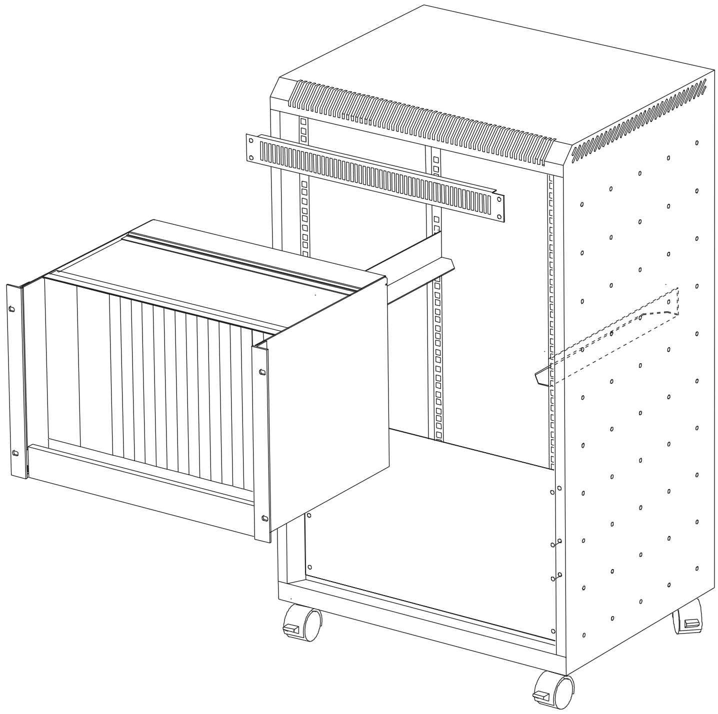
Weight

The J1700/J1800/J5015, including packaging, can weigh up to 22.5kg, depending upon the configuration supplied.

The J1500/J1600/J5006, including packaging, can weigh up to 11.5kg, depending on the configuration supplied.

The J1400/J5004 can weigh up to 7.1kg depending on the configuration supplied.

It is recommended that mounting angles or a mounting shelf are used when installing the J1700/J1800/J5015 into the cabinet. The following diagram illustrates this.

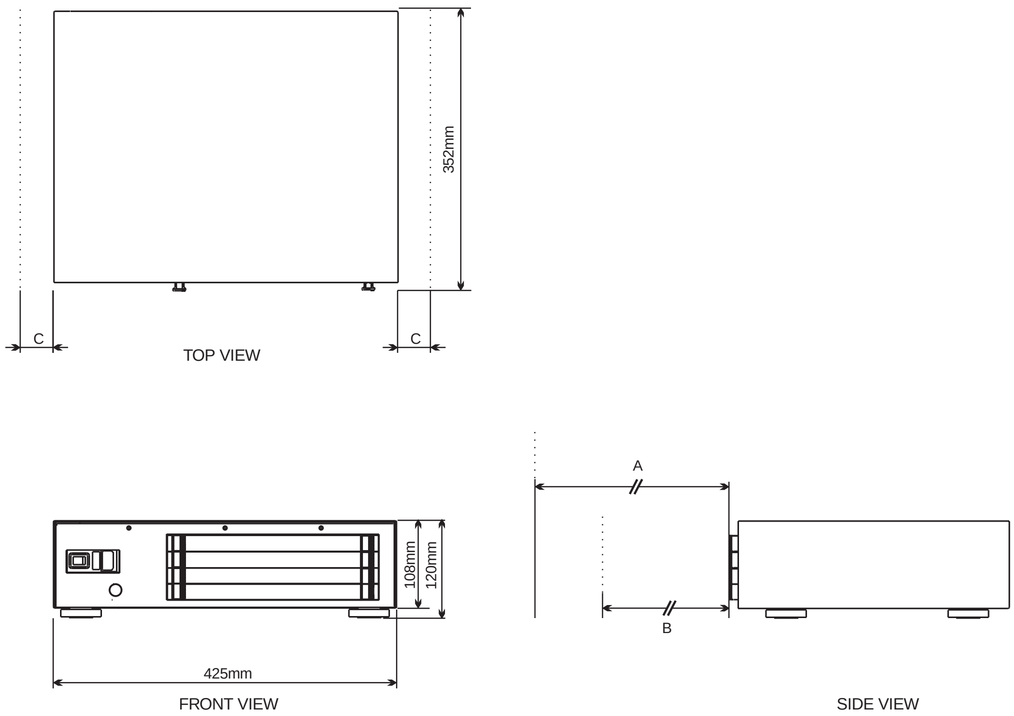


Note *It is recommended that you refer to the safety standards on lifting requirements specific to your country.*

Space

J1400/J5004

The diagram and table below shows the clearance requirements that apply when positioning your J1400/J5004 on its mounting surface.



A	Minimum distance of 750mm in front of unit is required for maintenance personnel.
B	A distance of 250mm in front of unit is required for module replacement.
C	A minimum distance of 50mm is required for ventilation.

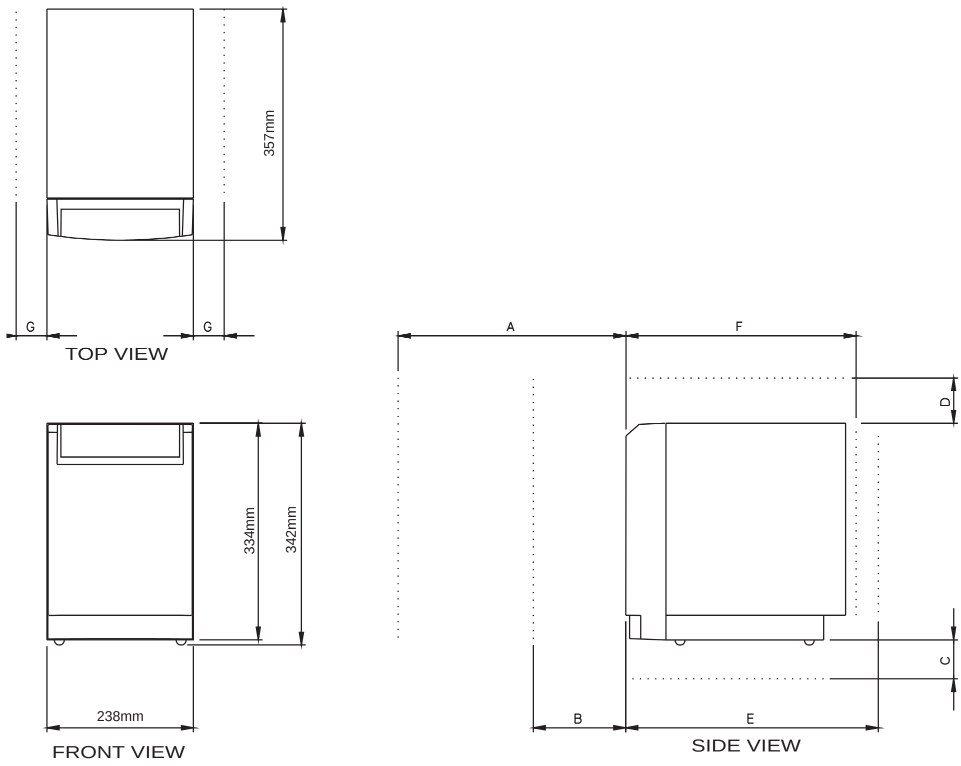
Stacking J1400/J5004 units

You may stack up to four units. The feet of the unit provide an adequate gap for ventilation.

Note *Please do not remove the feet from the chassis, as this will restrict ventilation.*

J1500/J1600/J5006

The following diagram and table show the clearance constraints that you must adhere to when installing the J1500/J1600/J5006.

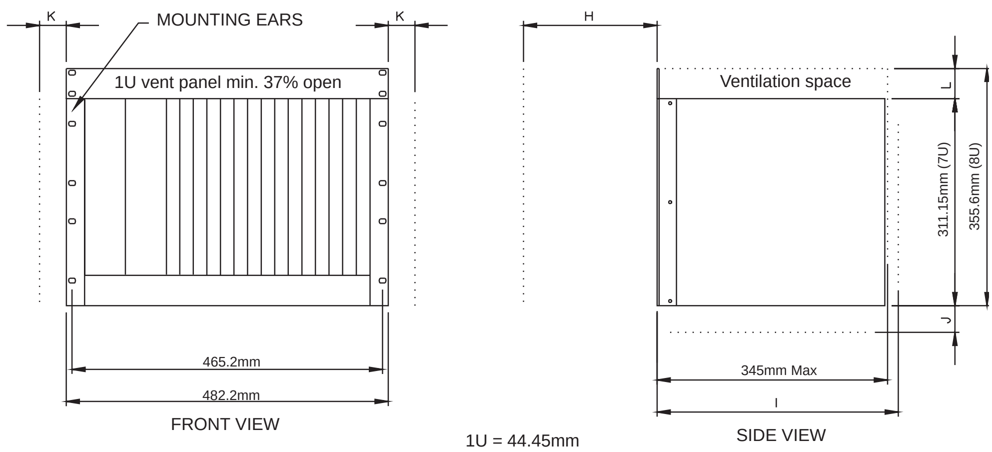


A	Minimum distance of 750mm in front of unit is required for maintenance personnel.
B	A distance of 250mm in front of unit is required for module replacement.
C	Minimum distance of 200mm is required for maintenance. Wall mount only.
D	Minimum distance of 70mm is required for ventilation.
E	Minimum distance of 410mm is required for desktop installation.
F	Physical size of 374mm. Wall mounted.
G	Minimum distance of 50mm is required for ventilation.

J1700/J1800/J5015

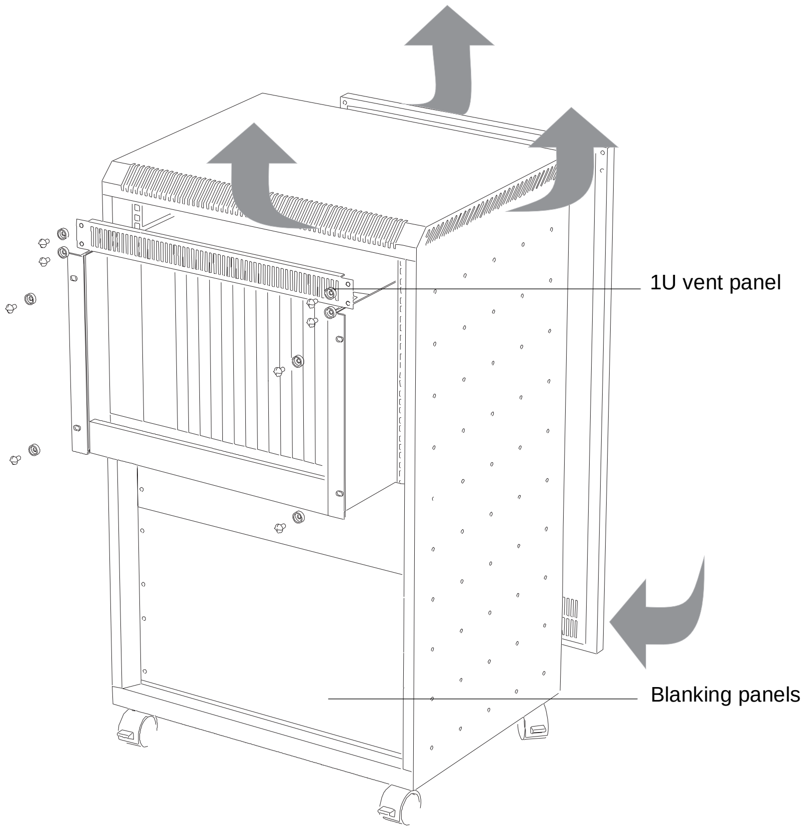
It is recommended that the J1700/J1800/J5015 is mounted in a standard 19" rack (IEC 297-2; DIN 41494) to ensure correct operation and ventilation.

The following diagram and table show the clearance constraints that you must adhere to when installing the chassis.



H	Minimum distance of 750mm in front of unit is required for maintenance personnel.
I	Physical size 372mm (wall mounted).
J	Minimum distance of 100mm is required for ventilation (wall mounted).
K	Minimum distance of 50mm is required for ventilation (wall mounted).
L	Minimum distance of 45mm is required for ventilation (wall mounted).

Ventilation



The J1700/J1800/J5015 requires at least 1U (approximately 45mm) of ventilation space above the subrack. If a vent panel is fitted it must have an open area of at least 37%.

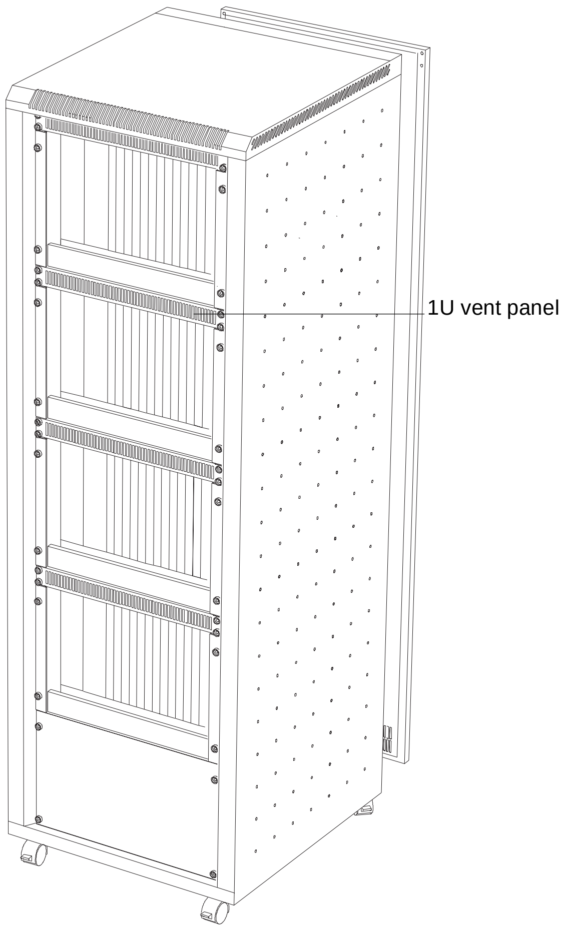
Blanking panels must be fitted to empty rack positions to allow efficient cooling of the unit.

If the chassis is fitted into a cabinet with a close-fitting door, it is essential that these minimum requirements are adhered to.

Elevated operating ambient temperature

When the equipment is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient. You should install the equipment in an environment compatible with our recommended maximum rated ambient temperature (Tmra), given on page 2-3.

If more than one chassis is stacked in a rack, there must be a 1U vent panel above each unit. The following diagram illustrates this.



Rack mounting

When rack mounting this equipment you should also consider the following:

- Circuit overloading—see page 2-5 for information on power supplies and circuit overloading.
- Earthing — see page 2-9 for information on earthing rack-mounted equipment.

J1700/J1800/J5015

When fitting the chassis to a rack you should ensure that you do not create a hazardous condition due to uneven mechanical loading. We recommend that the mounting ears of the chassis are secured to the rack using at least six securing screws, suitable for the type of rack. The position of the screws depends on the type and model of rack being used, but they should be placed near the top, centre and bottom of each mounting ear. The screws should be tightened to the rack manufacturer's recommended settings. You can use more than six screws, but additional fasteners must be fitted in pairs.

To provide additional support when fitting the chassis, we recommend the use of mounting angles or a mounting shelf.

Refer to your rack manufacturer's documentation for rack limitations and further information.

J1400/J5004

The J1400/J5004 chassis can be fitted into a rack using a Jtec-supplied mounting shelf (5004-RACK-MT).

Wall mounting

Wall mounting kits are available for 6 and 15 slot chassis (WMB-15/16 and WMB-17/18 respectively).

Network termination (NT)

The J1000/J5000 connects to an NT. Ensure that the NT is installed and operational.

Cabling

The following table shows the cabling specifications for external connections to the J1000/J5000.

	Distance limitation	Cable type	Cable connector
PSM-48V	as short as possible	2.5mm single- or multi-core	screw terminals on backplane
PSM 240VAC	as supplied	cable supplied	as supplied
PSM 110V AC	as supplied	cable supplied	as supplied
PSM-HC	as supplied	cable supplied	as supplied
PSM-HC-AC	as supplied	cable supplied	as supplied
Protective earth	as short as possible	2.5mm single- or multi-core	screw terminals on backplane
BRMT BRMN QBRM DBRM	1000m max. 1000m max (point to point) 500m max (point to multipoint)	0.5mm dual twisted-pair solid conductor shielded (Telecom Serial 323/Item 5191)	RJ45 male (FCC RJ49)
QBRM-U DBRM-U	5000m max (point to point)	0.5mm dual twisted-pair solid conductor shielded (Telecom Serial 323/Item 5191)	RJ45 male (FCC RJ49C)
E1M 120 Ω E1M-2 120Ω IPMN 120Ω IPMN-2 120Ω IPMT 120Ω IPMT-2 120Ω IPMN-GT 120Ω	75m max.	0.5mm dual twisted-pair solid conductor shielded (Telecom Serial 323/Item 5191)	RJ45 male (FCC RJ48)
IPMN-T1 100Ω IPMT-T1 100Ω T1M	Up to 1.6 kms (6000 ft)	0.63mm (22 AWG) dual twisted pair solid conductor shielded	RJ45 Male (FCC RJ48C)
E1M 75Ω E1M-2 75Ω	100m max.	75Ω coaxial	1.6/5.6 coaxial
IPMN 75Ω IPMN-2 75Ω IPMT 75Ω IPMT-2 75Ω IPMN-GT 75Ω	75m max	75Ω coaxial	1.6/5.6 coaxial
CM	15m max.	data cable 3-core minimum shielded	DB25 female
RM V.24 LAN	 15m max. 100m max	 3 core plus shield 8 core shielded	 DB9 RJ45 male
ALEM ALPM ALIM-EXCH	Up to 4 kms	0.5mm 2-wire solid conductor (Telecom Serial 323/Item 6591)	FCC Part 68 compatible jack
ALEM-2 ALPM-2	Up to 10 kms	0.5mm 2-wire solid conductor (Telecom Serial 323/Item 6591)	FCC Part 68 compatible jack
EMM/EMM-2	100m max.	0.5mm 8-wire solid conductor	RJ45 male (FCC RJ49)

	Distance limitation	Cable type	Cable connector
Combo V.24 DTE V.24 DCE V.35 DTE V.35 DCE X.21 DTE X.21 DCE	As supplied	multicore shielded multicore shielded twisted pair multi-core shielded twisted pair multi-core shielded twisted pair multi-core shielded twisted pair multi-core shielded	HD26 male HD26 male HD26 male HD26 male HD26 male HD26 male
HSDM V.24 DTE V.24 DCE V.35 DTE V.35 DCE X.21 DTE X.21 DCE	As supplied	multicore shielded multicore shielded twisted pair multi-core shielded twisted pair multi-core shielded twisted pair multi-core shielded twisted pair multi-core shielded	HD26 male HD26 male HD26 male HD26 male HD26 male HD26 male
SDLM X.21 BCAM X.21 QDLM X.21 SAM X.21 LLB X.21	100m max.	twisted-pair multi-core shielded	DB15 male
SDLM V.24 ADLM V.24 SAM V.24 QDLM V.24 LLB V.24	15m max.	multi-core shielded	DB25 male HD26 male HD26 male
SDLM V.35 BCAM V.35 SAM V.35 QDLM V.35 LLB V.35	100m max.	twisted-pair multi-core shielded	DB25 male HD26 male HD26 male
DTM X.21 DTM V.35	Refer ITU-T recommendation V.11.1984, Appendix B, Clause I.2	twisted-pair multi-core shielded	DB15 HD26
IRM	Refer to the *IRM Router Configuration Manual*		
FSM	15m max	3 core plus shield	DB9

All D-type connectors should have a right-angle backshell (as opposed to straight exit).

CAUTION To reduce the risk of fire use only No.26 AWG (0.4mm) or larger telecommunication line cord

Warning Before removing a module from the subrack, it is recommended that you unplug all cables attached to it.

J1400/J5004 TRC (Australia only)

The J1400/J5004 Telecommunications Reference Conductor (TRC) socket is located on the front panel of the unit. Connect an authorised grounded connector to the socket in accordance with Austel Technical Standard TS009.

Module installation and removal

Module installation

If your chassis did not arrive with the modules installed, you will have to fit the modules required for your network. We recommend that you start with the Control Module or Resource Manager, turn the power on, then insert the other modules one by one. This will assist you in detecting any problems that may arise. This safe hot-swapping feature can be used for replacing and adding modules at any time.

1 Insert each module fully into the chassis using the card guides to ensure that the module connector correctly aligns with the backplane pins.

Note *We recommend that the module is gently eased into position during the mating of the module connector with the backplane to ensure that the pins remain aligned.*

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2 Secure with the top and bottom fastening screws. Ensure that the top switch mechanism operates correctly, so that power is supplied to the module.

3 Observe the LEDs and proceed with the next module when the modules's green OK LED illuminates. This indicates that the module has completed its self test and is operational. The modules may take a few minutes to complete their power up checks.

4 Check that no error condition has arisen. This is indicated by the LEDs on the front panels of the modules. If an error occurs, see the *Troubleshooting* section of the module concerned.

5 Fit blanking panels to any unused slots.

This ends the physical installation phase. See the respective chapters for specific information on each module.

Module removal

Warning	Some modules connect to external networks that may employ telecommunications network voltages. In such cases, the telecommunications line connection must be disconnected before removing the module from its chassis.

To remove a module:

1. Disconnect all cables from the module connectors.
2. Loosen the fastening screws in the top and bottom handles and pull the top handle to switch off the power to the module.
3. Using the top and bottom handles, withdraw the module, ensuring that the module circuit board is not twisted. Place the module in a suitable anti-static container or place it on a suitably prepared work surface.
4. If you are not replacing the module, fit a blanking panel to the slot.

System and module configuration

Once your system is installed you need to configure it.

You require a Personal Computer (PC) or workstation to configure the J1000/J5000. See your *OmniVision User Manual* for details. Configuration can be carried out either on-site using a local PC/workstation, or over the network from a remote site using a PC/workstation connected to another member of the J1000/J5000 product family.

Refer to the *Reference Manual* for module and system configuration information.

Power Supply Modules (PSMs)

Introduction

All chassis, except the 4 slot chassis, must be fitted with a Power Supply Module (PSM) that generates all of the internal voltages needed by the modules. The 4 slot chassis has a built-in power supply.

The PSM also provides the ring signal for the modules. There are five PSMs available:

- Power Supply Module -High Capacity (PSM-HC), a 25A unit that connects to a mains supply (available in Australia only)
- Power Supply Module - High Capacity - AC (PSM-HC-AC), a 30A unit that connects to a mains power supply
- Power Supply Module AC 240V (PSM-240V) connects to a mains supply
- Power Supply Module AC 110V (PSM-110V) connects to a mains supply
- Power Supply Module DC -48V (PSM-48V) connects to a 48V telecommunications power supply.

The characteristics of the ring signal are produced by the ring generator in the PSM. These are:

- Open circuit voltage between 78 ± 1V r.m.s.
- Nominal frequency between 27 ± 10Hz.

System compatibility

The following table details where each type of power supply can be used:

Power Supply	Chassis		
	15 slot[1]	6 slot	4 slot[2]
PSM-HC	✔	✔	✘
PSM-HC-AC	✔	✔	✘
PSM-240V	✔	✔	✘
PSM-110V	✔	✔	✘
PSM-48V	✔	✘	✘

Notes

1 *Dual mode operation with the same type of power supply is available for the 15 slot chassis. You must not, however, combine different types of power supply in the same chassis.*

2 *The 4 slot chassis has a built-in power supply.*

Power requirements

The following table details the input and output figures for each type of power supply.

Module	Supply Input		Output		
	Voltage	Maximum Current	5V (A)	12V (A) + and -	-48V
PSM-HC	100V-240V	4.5A-2.0A RMS	25A	2A	2.4A
PSM-HC-AC	100V-240V	4.5A-2.0A RMS	30A	2A	2.4A
PSM-240V	200-240V AC	4A RMS	20A	2A	2A
PSM-110V	100-120V AC	5A RMS	10A	1A	1.5A
PSM-48V	-40 to -60V DC	5A	20A	2A	2A
Built -in for 1400/5004	90-240V AC	3.15A RMS	15A	1.6A (+12V) 0.6A (-12V)	0.35A

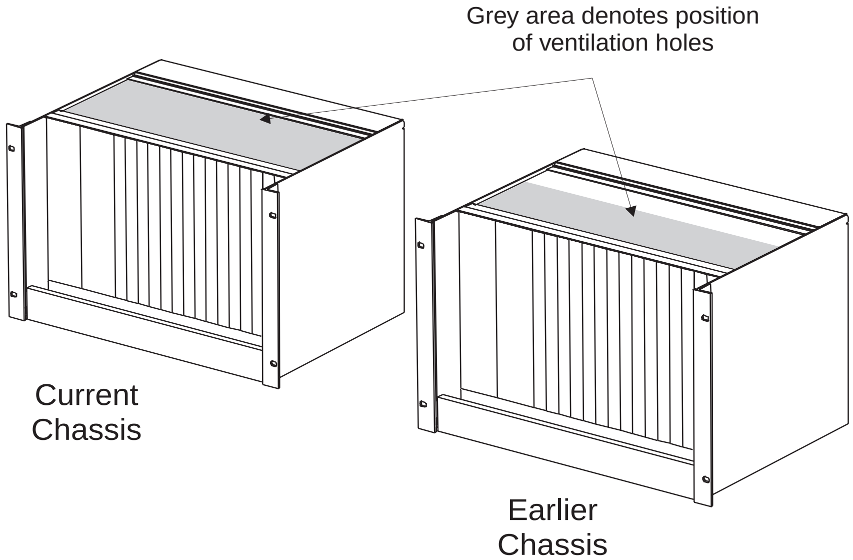
Power input

The following table details the maximum power input for each chassis:

Chassis	Input Power (maximum)
15 slot	200 Watts
6 slot	100 Watts
4 slot	75 Watts

Operation of High Capacity PSMs

The PSM-HC-AC and PSM-HC have a higher output rating than previous models of PSM, and consequently, there are some limitations when using them in an earlier model of the 15 slot chassis — earlier models have less upper ventilation than current models. The diagram below shows the approximate ventilation areas of the earlier and current chassis. Refer to the diagram to determine which type of chassis you have.



The following table shows the 5V Output Rating limits for each type of PSM when fitted to a particular chassis.

Power Supply Module	Maximum Output Rating (A)	
	Earlier Chassis	Current Chassis
PSM-HC-AC	20A	30A
PSM-HC	20A	25A

Note *Do not exceed the output rating indicated above, particularly when using a High Capacity PSM in an earlier model chassis.*

Dual mode operation

The power supplies can be operated in pairs in a 15 slot chassis to provide redundancy. The following matrix details the 5V output limits for each allowable pair of PSMs. A cross (✘) indicates that the PSMs cannot be operated together in the same chassis.

	PSM-HC-AC	PSM-HC	PSM-240	PSM-110	PSM-48
PSM-HC-AC	30A	25A	20A	10A	✘
PSM-HC	25A	25A	20A	✘	✘
PSM-240	20A	20A	20A	✘	✘
PSM-110	10A	✘	✘	10A	✘
PSM-48	✘	✘	✘	✘	20A

Troubleshooting

The troubleshooting instructions for all five PSMs apply to a chassis with a single PSM. If your chassis contains two PSMs and the error condition occurs on both PSMs, you must establish which PSM is faulty before you can determine what the problem is.

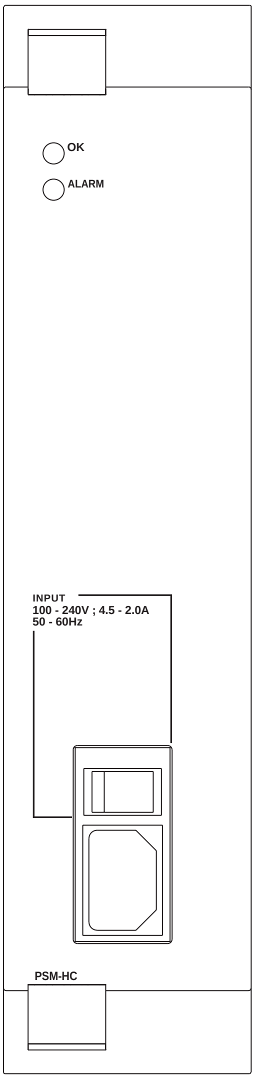
To find out which PSM is faulty, turn off the power to one of the PSMs and note whether the PSM which still has power operates normally.

Then, power off the first PSM and power on the second. Note whether the PSM which now has power operates normally.

If it appears that both PSMs operate normally, or are both faulty, then the fault is probably not in the PSMs. Nominate either one of the PSMs as faulty and continue as for single PSM operation.

Otherwise, turn off the power to the faulty PSM and turn on the power to the PSM that operates normally. Continue as for single PSM operation.

Power Supply Module AC High Capacity (PSM-HC)



Note *The PSM-HC is only available in Australia.*

Specifications

Ports	IEC 3-pin male on front panel
Input Voltage	100V–240V rms ± 10%, 50-60Hz
Input current	4.5A -2.0A rms, 40A pk surge
Module width	1 power supply slot (one of the first two positions in the rack).

Installation

Connecting the PSM-HC to the AC source:

1 Mount the chassis in its operational position.

Note *Step 1 may be performed after step 4 if the rear panel is more easily removed and replaced while the subrack is not mounted in the 19" rack.*

2 Unscrew and remove the rear panel of the subrack.

3 Run a cable from the protective earth stud to the XF1 protective ground terminal block on the backplane. Remove any protective earth cable fitted between the chassis and an external protective earth.

4 Connect the Reference Ground to the XF5 Batt Ground terminal block on the backplane. See *page 2-7* for further information.

Note *In Australia, Reference Ground refers to the Telecommunications Reference Conductor (TRC).*

5 Replace the rear panel of the subrack.

6 Screw the PSM-HC into position.

7 Re-connect the power cable.

Note *The AC power source must provide an earth and the power cable must connect this earth to the power supply.*

8 Wait until the modules complete their initialisation routines.

9 Check that each module has ALARM LED off and OK LED on. Ignore any other LEDs at this stage.

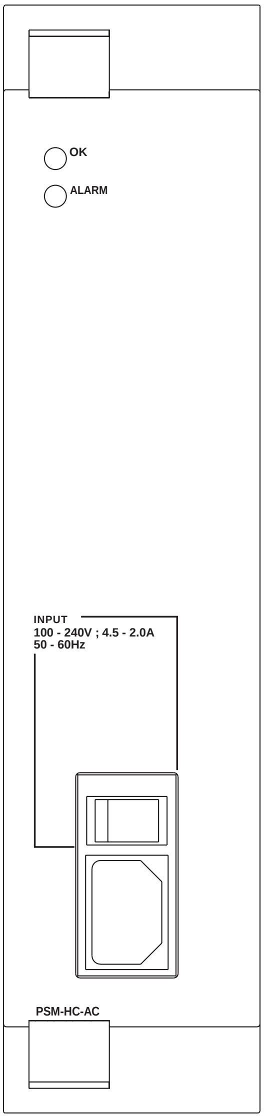
LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check that the AC source is present
	Check that the power cables are terminated correctly
	Check that the module is properly located in the subrack
	Check that the front panel switch of the PSM is ON.
	Notify service personnel
ALARM LED is On	Notify service personnel

Power Supply Module High Capacity AC (PSM-HC-AC)



Specifications

Ports	IEC 3-pin male on front panel
Input Voltage	100V–240V rms ± 10%, 50-60Hz
Input current	4.5A -2.0A rms, 40A pk surge
Module width	1 power supply slot (one of the first two positions in the rack).

Installation

Connecting the PSM-HC-AC to the AC source:

1 Mount the chassis in its operational position.

Note *Step 1 may be performed after step 4 if the rear panel is more easily removed and replaced while the subrack is not mounted in the 19" rack.*

2 Unscrew and remove the rear panel of the subrack.

3 Run a cable from the protective earth stud to the XF1 protective ground terminal block on the backplane. Remove any protective earth cable fitted between the chassis and an external protective earth.

4 Connect the Reference Ground to the XF5 Batt Ground terminal block on the backplane. See *page 2-7* for further information.

Note *In Australia, Reference Ground refers to the Telecommunications Reference Conductor (TRC).*

5 Replace the rear panel of the subrack.

6 Screw the PSM-HC-AC into position.

7 Re-connect the power cable.

Note *The AC power source must provide an earth and the power cable must connect this earth to the power supply.*

8 Wait until the modules complete their initialisation routines.

9 Check that each module has ALARM LED off and OK LED on. Ignore any other LEDs at this stage.

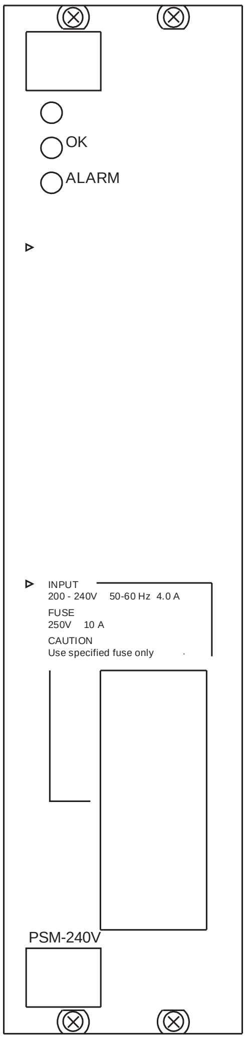
LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check that the AC source is present
	Check that the power cables are terminated correctly
	Check that the module is properly located in the subrack
	Check that the front panel switch of the PSM is ON.
	Notify service personnel
ALARM LED is On	Notify service personnel

Power Supply Module AC 240 V (PSM-240V)



Specifications

Ports	IEC 3-pin male on front panel	
Power source	240 V AC [+10% to -15%] 50 Hz Input current 4 A maximum normal, 40 A surge	
Fuse	Dimensions	1.25" x 0.25"
	Capsule	glass, cylindrical
	Rating	10 A
	Type	slow blow
Module width	1 power supply slot (one of the first two positions in the rack).	

Installation

Connecting the PSM-240V to the AC 240 V source

1 Mount the chassis into a 19" rack, or in its operational position.

Note *Step 1 may be performed after step 4 if the rear panel is more easily removed and replaced while the chassis is not mounted in the 19" rack.*

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2 Unscrew and remove the rear panel of the chassis.

3 Run a cable from the protective earth stud to the XF1 protective ground terminal block on the backplane. Remove any protective earth cable fitted between your chassis and an external protective earth.

4 Connect the Reference Ground to the XF5 Batt Ground terminal block on the backplane. See *page 2-7* for further information.

Note *In Australia, Reference Ground refers to the Telecommunications Reference Conductor (TRC).*

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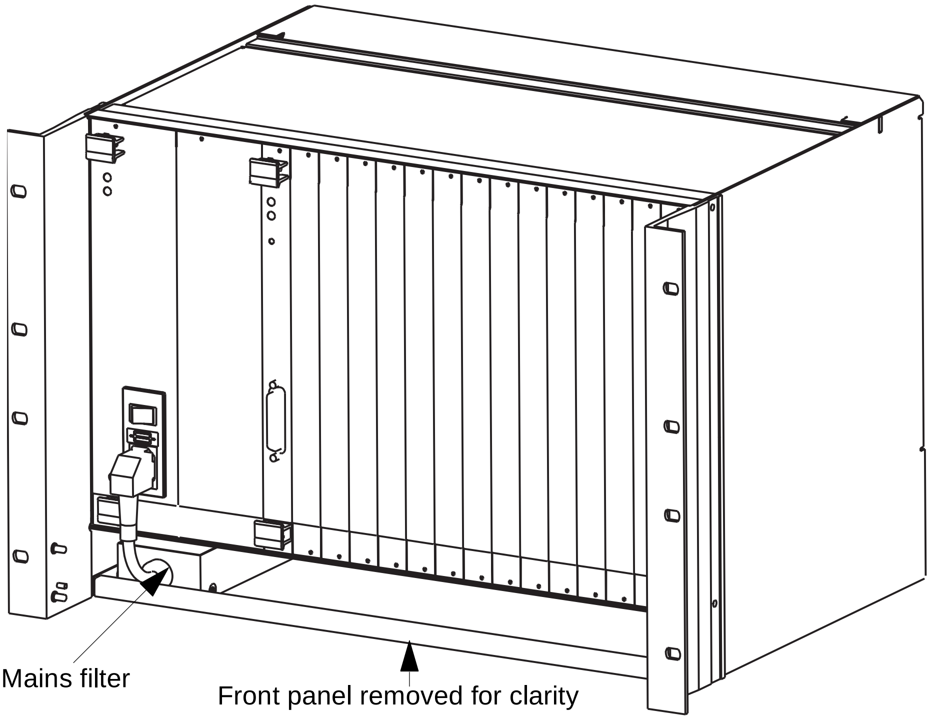
5 Replace the rear panel of the chassis.

6 Screw the PSM-240V into position.

7 Connect the mains filter to the PSM-240V

8 Connect the mains power cord to the mains filter.

9 Position the mains filter in the cable tray immediately under the PSM as shown in the diagram below.



10 Connect and switch on the mains power supply.

11 Switch on the PSM-240V power switch.

Note *The AC power source must provide an earth and the power cable must connect this earth to the power supply.*

---

12 Wait until the modules complete their initialization routines.

13 Check that each module has ALARM LED off and OK LED on. Ignore any other LEDs at this stage.

LEDs

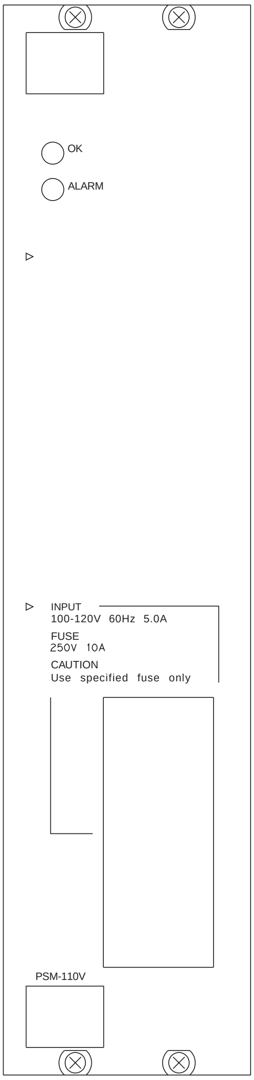
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check that the AC 240V source is present
	Check that the power cables are terminated correctly
	Check that the module is properly located in the chassis
	Check that the front panel switch of the PSM is ON.
	Notify service personnel
ALARM LED is On	Notify service personnel

If you are operating dual PSMs, see page 3-4 for further information.

Power Supply Module AC 110V (PSM-110V)



Specifications

Ports	IEC 3-pin male on front panel	
Power source	110V AC [+10% to -15%] 60Hz Input current 5A maximum normal, 40A surge	
Fuse	Dimensions	1.25" x 0.25"
	Capsule	glass, cylindrical
	Rating	10A
	Type	slow blow
Module width	1 power supply slot (one of the first two positions in the rack).	

Installation

Connecting the PSM-110V to the AC 110V source

1 Mount the chassis into a 19" rack, or in its operational position.

Note *Step 1 may be performed after step 4 if the rear panel is more easily removed and replaced while the chassis is not mounted in the 19" rack.*

2 Unscrew and remove the rear panel of the chassis.

3 Run a cable from the protective earth stud to the XF1 protective ground terminal block on the backplane. Remove any protective earth cable fitted between your chassis and an external protective earth.

4 Connect the Reference Ground to the XF5 Batt Ground terminal block on the backplane. See *page* 2-7 for further information.

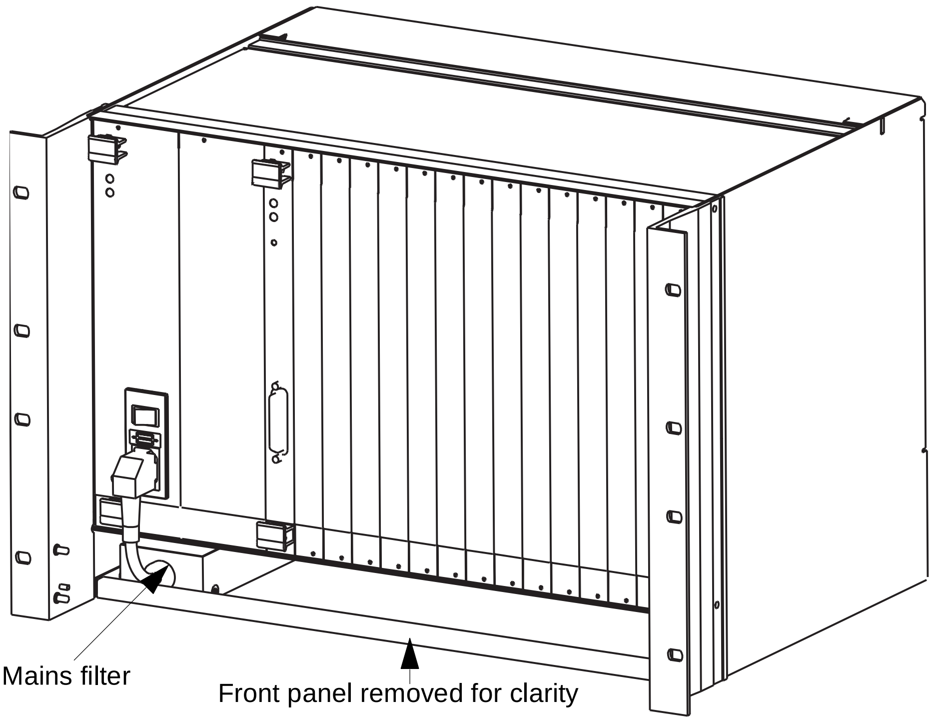
5 Replace the rear panel of the chassis.

6 Screw the PSM-110V into position.

7 Connect the mains filter to the PSM-110V.

8 Connect the mains power cord to the mains filter.

9 Position the mains filter in the cable tray immediately under the PSM as shown in the diagram below.



10 Connect and switch on the mains power supply.

11 Switch on the PSM-110V power switch.

Note *The AC power source must provide an earth and the power cable must connect this earth to the power supply.*

---

12 Wait until the modules complete their initialization routines.

13 Check that each module has ALARM LED off and OK LED on. Ignore any other LEDs at this stage.

LEDs

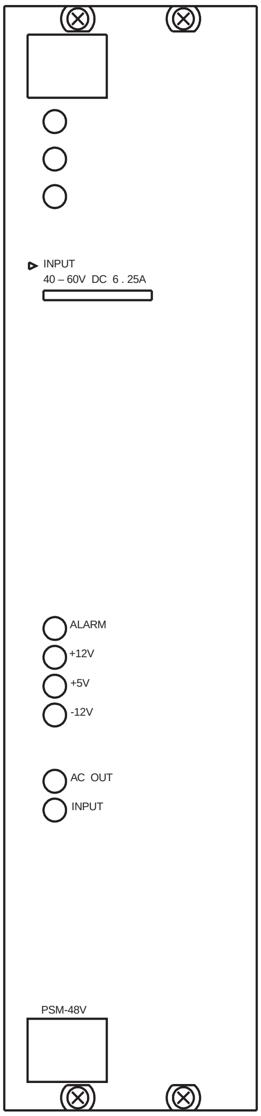
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check that the AC 110V source is present
	Check that the power cables are terminated correctly
	Check that the module is properly located in the chassis
	Check that the front panel switch of the PSM is ON.
	Notify service personnel
ALARM LED is On	Notify service personnel

If you are operating dual PSMs, see page 3-4 for further information.

Power Supply Module DC -48V (PSM-48V)



Specifications

Ports	Terminals on backplane
Power source	-48V DC (-40V DC to -60 VDC) Input current 5A normal, 15A surge
Module width	1 power supply slot (one of the first two positions in the rack).

Installation

Connecting the PSM-48V to the external power supply

The following table describes the cable needed to connect the PSM-48V to the DC -48V source:

Cable type	2.5mm single- or multi-core
Cable length	as short as possible
Connector	none (screw terminals on backplane)

See *page 2-7* for a diagram of the connectors on the backplane.

Connecting the PSM-48V to the DC -48V source

1 Mount the chassis in the 19" rack or in its operational position.

Note *Step 1 may be performed after step 7 if the rear panel is more easily removed and replaced while the chassis is not mounted in the 19" rack.*

---

2 Remove the four screws from the front panel of the PSM-48V.

3 Partially remove the PSM-48V to disconnect it from the backplane.

4 Unscrew and remove the rear panel of the chassis.

5 Connect the protective earth (provided by the mains supply authority) to the stud protruding from the chassis. Use the nut, washer, and crimp connector that are provided.

Note *The protective earth should be the green-yellow wire.*

---

6 Run a cable from the protective earth stud to the XF1 protective ground terminal block on the backplane.

7 Connect the Reference Ground to the XF5 Batt Ground terminal block on the backplane.

Note *In Australia, Reference Ground refers to the Telecommunications Reference Conductor (TRC).*

8 Connect the -48Volt source directly to the Batt -48V terminal block on the backplane.

9 Replace the PSM-48V in the chassis and screw the four screws into position.

10 Wait until the modules finish their initialization routines.

11 Check that each module has ALARM LED off and OK LED on. Ignore any other LEDs at this stage.

Note *See page 2-7 for further information.*

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
+12V[1]	Green	On*
+5V[2]	Green	On*
-12V[3]	Green	On*
INPUT[4]	Green	On
AC OUT[5]	Green	On

***** If LED flashes Off and On, treat it as Off.

1 The +12V LED indicates that the PSM can supply +12V.

2 The +5V LED indicates that the PSM can supply +5V.

3 The -12V LED indicates that the PSM can supply -12V.

4 INPUT indicates that the PSM is receiving acceptable voltage from the DC -48Volt source.

5 AC OUT indicates that the PSM is generating ring current for use on ALEMs.

Troubleshooting

The most likely causes of an error condition on the PSM-48V are:

- the power source is absent or under voltage
- the PSM-48V cannot generate ring current
- the PSM-48V cannot generate one or more of the DC outputs.

Symptom	Action
All LEDs are Off	Check that the external power source is operational
	Check that the power cables are terminated correctly
	Check that the module is properly located in the chassis
	Notify service personnel
ALARM LED is On	Notify service personnel
ALARM On and AC OUT Off (ring current supply fault)	Notify service personnel.
+12V LED Off	Notify service personnel.
+5V LED Off	Notify service personnel.
-12V LED Off	Notify service personnel.
INPUT LED Off	Treat as if all LEDs are Off.
AC OUT LED Off	Notify service personnel.

If you are operating dual PSMs, see page 3-4 for further information.

System modules

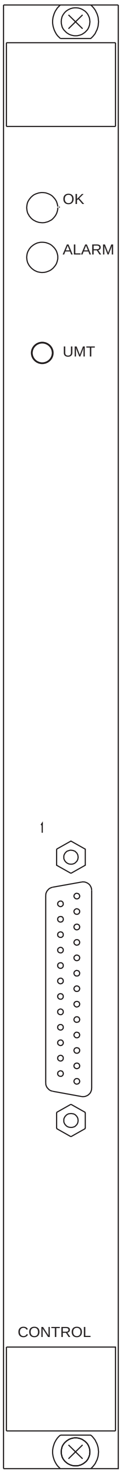
Overview

This section describes the following system modules:

- Control Module (CM)
- Resource Manager (RM).

The Control Module is used in all J1000 models. The Resource Manager is used in all J5000 models.

Control Module (CM)



The Control Module is a plug-in module with a 16-bit microprocessor that is the central processing unit of the J1000. It switches data between the line modules and the network bearers to allow calls from any line. It also validates and accepts incoming calls, routing them to the appropriate destination line. These functions are termed Call Control.

The CM maintains a database which stores the characteristics of the lines installed in the J1000. These include phone numbers, line capabilities, etc. The configuration information is stored in Non Volatile RAM (NVRAM).

The CM provides line status reporting (for example, busy, idle, failed) and call logging. It also provides a loopback number for diagnostic purposes and other features such as power supply monitoring.

The CM maintains logs of the following information:

- calls made and received
- changes in the status of modules
- errors detected.

This information is transferred from the J1000 to a PC when you establish an NMS session.

The CM can store log information for up to 155 calls. When an NMS session is in progress and logging is enabled, log information is passed directly to the PC.

An optional facilities submodule is installed on the CM. This enables any optional features you may have purchased to suit your individual needs.

Specifications

Compatibility	A single CM must be fitted to every J1000.
Port	Asynchronous V.24 DTE on front panel DB25 male connector.
Port protocol	JASYNC, a proprietary protocol.
Data rates	Autobaud 2400bit/s or 9600bit/s.
Module width	1 slot.

Installation

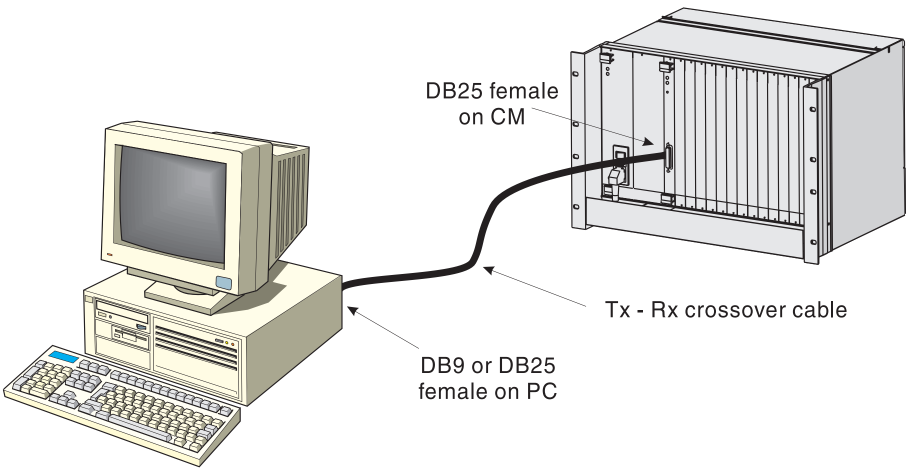
Cabling

The following describes the cable needed to connect the CM to a local PC:

Cable type	Data cable 3-core minimum plus shield.
Cable length	15m max.
Connector	DB25 female.

Note *This port must not be connected to any public telecommunications network.*

Connecting the CM to a local PC



If you want to run an NMS session on a local PC to configure the J1000, connect the CM to the PC as follows:

1 Run a cable from a serial port on the PC through the front cable access duct.

2 Terminate the cable at the PC with either a 25-pin female or a 9-pin female connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.

3 Terminate the cable at the CM port with a female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *This CM connector must have jack screws and preferably a right-angle backshell.*

To ensure correct operation of the connection, unused pins must ***not*** *be connected. We advise that third-party cables should not be used if all the pins are connected to the cable.*

Cable connector pinouts for PC port (DB9 female) to CM (DB25 female)

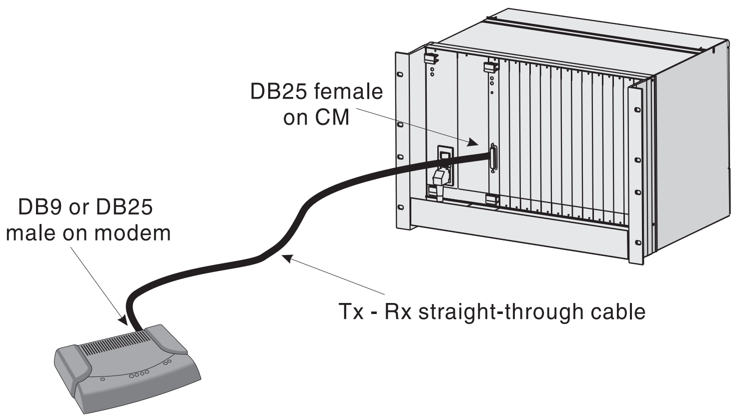
PC signal (DTE)	DB9 pin	DB25 pin	CM Signal (DTE)
RxD (receive data)	2	2	TxD (transmit data)
TxD (transmit data)	3	3	RxD (receive data)
SG (signal ground)	5	7	SG (signal ground)

Cable connector pinouts for PC port (DB25 female) to CM (DB25 female)

PC signal (DTE)	DB25 pin	DB25 pin	CM Signal (DTE)
RxD (receive data)	3	2	TxD (transmit data)
TxD (transmit data)	2	3	RxD (receive data)
SG (signal ground)	7	7	SG (signal ground)

Connecting the CM to a remote PC using modems

Local modem to CM port



If you want to run an NMS session on a remote PC to configure the J1000, connect the CM to the modem as follows:

1 Run a cable from a serial port on the modem through the front cable access duct.

2 Terminate the cable at the modem with either a 25-pin male or a 9-pin male connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.

3 Terminate the cable at the CM port with a female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *The CM port connector must have jack screws and preferably a right-angle backshell.*

To ensure correct operation of the connection, unused pins must ***not*** *be connected. We advise that third-party cables should not be used if all the pins are connected to the cable.*

When operating, the CM polls the modem every 10 minutes using the command `ATS0=2` to instruct the modem to answer after 2 rings.

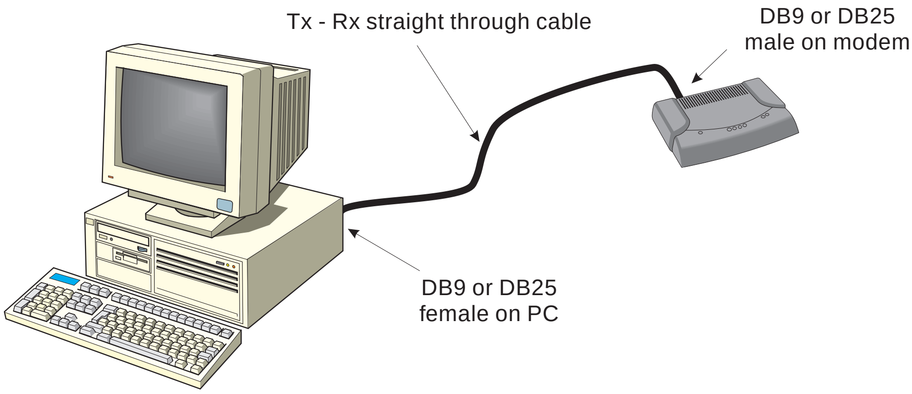
Cable connector pinouts for modem (DB9 male) to CM (DB25 female)

Modem signal (DCE)	DB9 pin	DB25 pin	CM Signal (DTE)
RxD (receive data)	2	3	RxD (receive data)
TxD (transmit data)	3	2	TxD (transmit data)
SG (signal ground)	5	7	SG (signal ground)
DTR (optional)	4	20	DTR (optional)

Cable connector pinouts for modem (DB25 male) to CM (DB25 female)

Modem signal (DCE)	DB25 pin	DB25 pin	CM Signal (DTE)
RxD (receive data)	3	3	RxD (receive data)
TxD (transmit data)	2	2	TxD (transmit data)
SG (signal ground)	7	7	SG (signal ground)
DTR (optional)	20	20	DTR (optional)

Remote modem to PC Port



1. Run a cable from a serial port on the modem to the serial port on the PC.
2. Terminate the cable at the modem with either a 25-pin male or a 9-pin male connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.
3. Terminate the cable at the PC serial port with either a 25-pin female or a 9-pin female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *To ensure correct operation of the connection, unused pins must* ***not*** *be connected. We advise that third-party cables should not be used if all the pins are connected to the cable.*

Cable connector pinouts for modem (DB9 male) to PC (DB9 female)

Modem signal (DCE)	DB9 pin	DB9 pin	PC signal (DTE)
RxD (receive data)	2	2	RxD (receive data)
TxD (transmit data)	3	3	TxD (transmit data)
SG (signal ground)	5	5	SG (signal ground)
DTR (optional)	4	4	DTR (optional)

Cable connector pinouts for modem (DB9 male) to PC (DB25 female)

Modem signal (DCE)	DB9 pin	DB25 pin	PC Signal (DTE)
RxD (receive data)	2	3	RxD (receive data)
TxD (transmit data)	3	2	TxD (transmit data)
SG (signal ground)	5	7	SG (signal ground)
DTR (optional)	4	20	DTR (optional)

Cable connector pinouts for modem (DB25 male) to PC (DB9 female)

Modem signal (DCE)	DB25 pin	DB9 pin	PC Signal (DTE)
RxD (receive data)	3	2	RxD (receive data)
TxD (transmit data)	2	3	TxD (transmit data)
SG (signal ground)	7	5	SG (signal ground)
DTR (optional)	20	4	DTR (optional)

Cable connector pinouts for modem (DB25 male) to PC (DB25 female)

Modem signal (DCE)	DB25 pin	DB25 pin	PC Signal (DTE)
RxD (receive data)	3	3	RxD (receive data)
TxD (transmit data)	2	2	TxD (transmit data)
SG (signal ground)	7	7	SG (signal ground)
DTR (optional)	20	20	DTR (optional)

The options submodule

An options submodule is inserted into the Control Module on shipment. This is programmed to enable the optional features you require, for example, CLIVE, ISDN Interworking, etc. If you upgrade your system at any time you may need to install a new submodule yourself. The instructions are detailed below.

Installing the options submodule

1 Remove the Control Module to an anti-static environment.

2 Insert the options submodule in position D68, as shown in Figure 1.

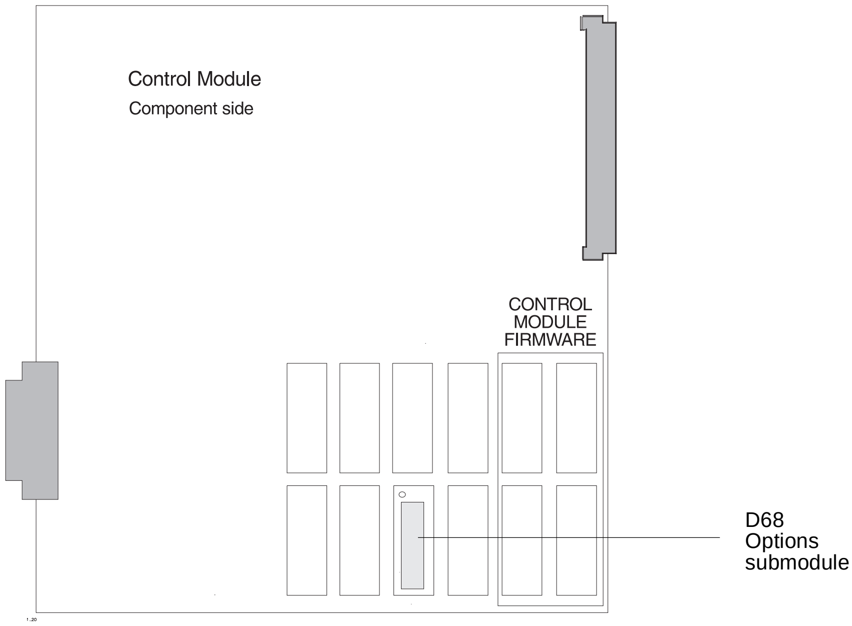


Figure 1: Position of option module

3 Insert the Control Module back in the J1000 in its original slot.

Link settings

Figure 2 below shows the position of the links on the Control Module 10000225.00 issue 2.

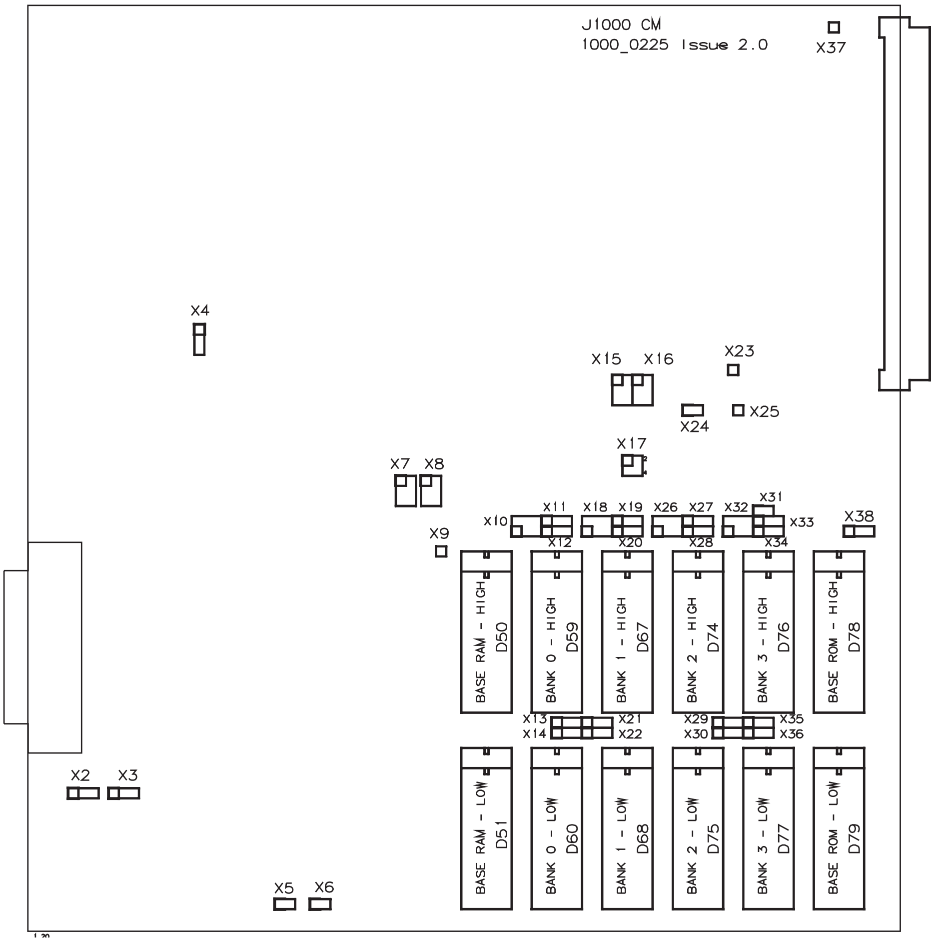


Figure 2: CM circuit board, 10000225.00 issue 2

Normal link settings for the Control Module 10000225.00 issue 2

The following table shows the CM link settings.

Ref	Normal setting	Ref	Normal setting
X2	1-2	X21	1-2
X3	2-3	X22	2-3
X4	1-2	X23	–
X5	1-2	X24	1-2
X6	–	X25	–
X7	Link X7/1 to X8/2	X26	5-6
X8	3-4	X27	1-2
X9	–	X28	2-3
X10	5-6	X29	1-2
X11	1-2	X30	2-3
X12	1-2	X31	–
X13	1-2	X32	3-4
X14	2-3	X33	2-3
X15	1-2, 3-4	X34	2-3
X16	3-4, 5-6	X35	2-3
X17	–	X36	1-2
X18	5-6	X37	–
X19	1-2	X38	2-3
X20	2-3		

Figure 3 shows the position of the links on Control Module 10000225.01 Rev.1.

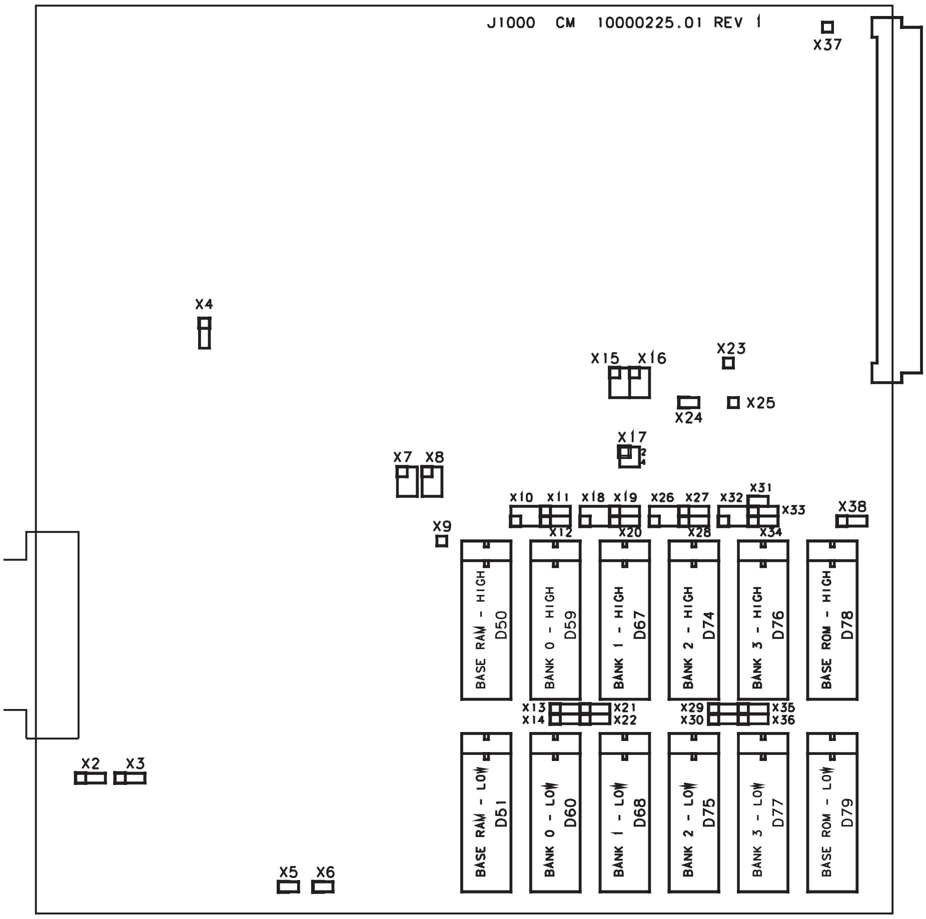


Figure 3: CM circuit board 10000225.01 Rev.1

Normal link settings for the Control Module 10000225.01 Rev.1

The following table shows the Control Module link settings:

Ref	Normal setting	Ref	Normal setting
X2	1-2	X21	1-2
X3	2-3	X22	2-3
X4	1-2	X23	–
X5	1-2	X24	1-2
X6	–	X25	–
X7	3-4	X26	5-6
X8	3-4	X27	1-2
X9	–	X28	2-3
X10	5-6	X29	1-2
X11	1-2	X30	2-3
X12	1-2	X31	–
X13	1-2	X32	3-4
X14	2-3	X33	2-3
X15	1-2, 3-4	X34	2-3
X16	3-4, 5-6	X35	2-3
X17	–	X36	1-2
X18	5-6	X37	–
X19	1-2	X38	2-3
X20	2-3		

Configurable Memory Links

The tables above reflect the current build standards. For previous build standards refer to the following tables.

There are four sets of these:

X10 to X14, X18 to X22, X26 to X30 and X32 to X36

for IC pairs D59/60, D67/68, D74/75, and D76/77 respectively.

The table below shows the possible configurations (using D59/60 as an example).

Configurable Memory Links - RAM fitted

Ref	32K RAM	32K RAM Backup	128K RAM	128K RAM Backup
X10	5 - 6	5 - 6	5 - 6	5 - 6
X11	1 - 2	1 - 2	1 - 2	1 - 2
X12	2 - 3	1 - 2	2 - 3	1 - 2
X13	1 - 2	1 - 2	1 - 2	1 - 2
X14	any	any	2 - 3	2 - 3

Configurable Memory links - ROM fitted

Ref	32K ROM	64K ROM	128K ROM
X10	any	3 - 4	3 - 4
X11	2 - 3	2 - 3	2 - 3
X12	2 - 3	2 - 3	2 - 3
X13	2 - 3	2 - 3	2 - 3
X14	1 - 2	1 - 2	1 - 2

Specifying the Split of Configurable ROM/RAM and its Type

The hardware must know what types of devices are fitted and the number of pairs of RAMs (the hardware assumes that the maximum number of ROMs = 4 - number of RAMs).

RAM Type

X15 1 - 2	RAM size
OUT	32K RAMs
IN	128K RAMs

ROM Type

X15 3 - 4	5 - 6	ROM size
OUT	OUT	32K ROMs
OUT	IN	64K ROMs
IN	OUT	128K ROMs

Number of Configurable RAMs

X16 1 - 2	3 - 4	5 - 6	RAM configuration
OUT	OUT	OUT	No RAMs
OUT	OUT	IN	1 RAM (pair)
OUT	IN	OUT	2 RAM (pair)
OUT	IN	IN	3 RAM (pair)
IN	OUT	OUT	4 RAM (pair)

Specifying the Boot ROM

Depending on the type of ROMs fitted X38 must be fitted.

32K	64K	128K
1 - 2	2 - 3	2 - 3

LEDs

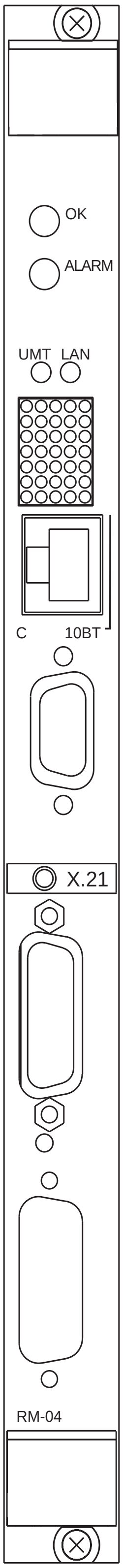
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
UMT	Green	On[1]

1 The UMT LED indicates that an NMS session is in progress.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If either a RAM or a ROM has just been fitted, check their orientation, location within the socket and size allocations in the link setting tables
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Notify service personnel

Resource Manager (RM)



The Resource Manager is a plug-in module with a 32-bit microprocessor that is the central processing unit of the J5000. It switches data between the line modules and the network bearers to allow calls from any line. It also validates and accepts incoming calls, routing them to the appropriate destination line. These functions are termed Call Control.

The RM has two variants:

- RM-04 — used only in the J5004 chassis
- RM — used in the J5006 and J5015 chassis.

Note *The RM-04 will not function in a J5006 or J5015 chassis.*

The RM performs data processing functions such as LAN IP routing and bridging, TimeFrame Virtual Line management, data compression, and packet switching for TimeFrame lines.

The RM maintains a database which stores the characteristics of the lines installed in the J5000. These include phone numbers, line capabilities, and so on. The configuration information is stored in non volatile memory. It also contains databases of information on the LAN router, packet switching and TimeFrame management.

The RM provides line status reporting (for example, busy, idle, failed) and call logging. It also provides a loopback number for diagnostic purposes and other features such as power supply monitoring.

The RM maintains logs of the following information:

- calls made and received
- changes in the status of modules
- errors detected.

This information is transferred from the J5000 to a PC or workstation when you establish an OmniVision session.

An option ROM is installed on the RM. This enables any optional features you may have purchased to suit your individual needs.

The RM supports one further optional DCE or DTE port which can be either asynchronousV.24 or synchronous V.24, V.35 and X.21 interfaces. The RM shown on this page is fitted with an X.21 port.

Specifications

Compatibility	A single RM must be fitted to every J5000 chassis.
V.24 Ports	Asynchronous V.24 DTE on front panel DB9.
V.24 Port protocol	JASYNC (Proprietary) or ASCII text.
Data rates	9600 bit/s.
LAN Port	Ethernet 10BT RJ45 Female.
LAN Data rates	10 Mbit/s.
Module width	1 slot.

Installation

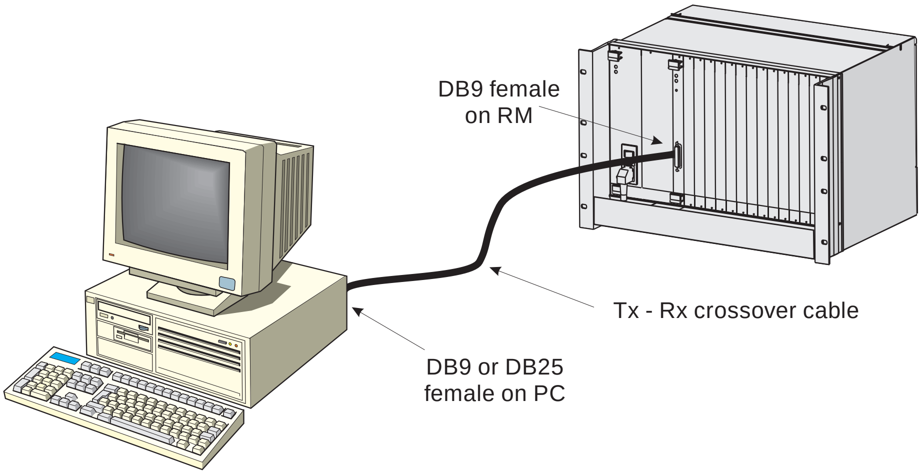
Cabling

The following table describes the cable needed to connect the RM to a local PC:

V.24 cable type	Data cable 3-core minimum plus shield
V.24 cable length	15m max
V.24 connector	DB9
LAN cable	8 core plus shield
LAN cable length	100m max
LAN connector	RJ45 male

Note *The V.24 port must not be connected to any public telecommunications network.*

Connecting the RM to a local PC using the V.24 port



If you want to run an NMS session on a local PC to configure the J5000, connect the RM to the PC as follows:

1 Run a cable from a serial port on the PC through the front cable access duct.

2 Terminate the cable at the PC with either a 25-pin female or a 9-pin female connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.

3 Terminate the cable at the RM port with a female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *This RM connector must have jack screws and preferably a right-angle backshell.*

*To ensure correct operation of the connection, unused pins must **not** be connected. We advise that third-party cables should not be used if all the pins are connected to the cable.*

Cable connector pinouts for PC port (DB9 female) to RM (DB9 female)

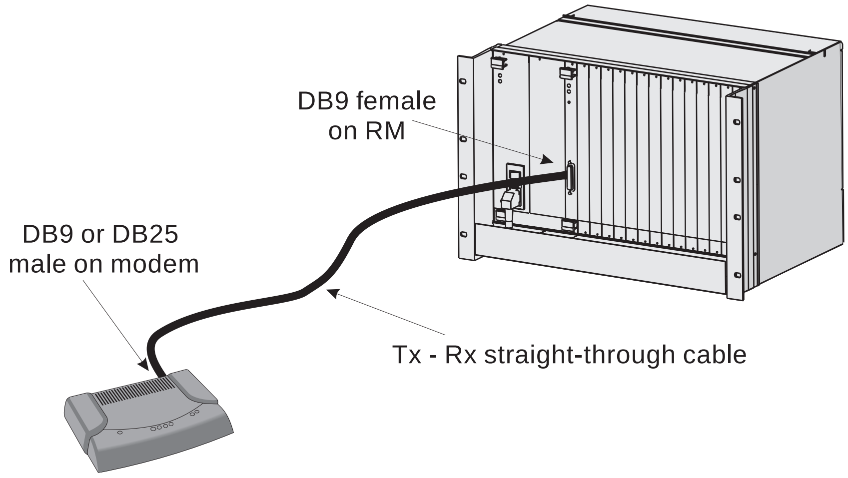
PC signal (DTE)	DB9 pin	DB9 pin	RM Signal (DTE)
RxD (receive data)	2	3	TxD (transmit data)
TxD (transmit data)	3	2	RxD (receive data)
SG (signal ground)	5	5	SG (signal ground)

Cable connector pinouts for PC port (DB25 female) to RM (DB9 female)

PC signal (DTE)	DB25 pin	DB9 pin	RM Signal (DTE)
RxD (receive data)	3	3	TxD (transmit data)
TxD (transmit data)	2	2	RxD (receive data)
SG (signal ground)	7	5	SG (signal ground)

Connecting the RM to a remote PC using modems

Local modem to RM port



If you want to run an NMS session on a remote PC to configure the J5000, connect the RM to the modem as follows:

1 Run a cable from a serial port on the modem through the front cable access duct.

2 Terminate the cable at the modem with either a 25-pin male or a 9-pin male connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.

3 Terminate the cable at the RM port with a female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *The RM port connector must have jack screws and preferably a right-angle backshell.*

*To ensure correct operation of the connection, unused pins must **not** be connected We advise that third-party cables should not be used if all the pins are connected to the cable.*

When operating, the RM polls the modem every 10 minutes using the command `ATS0=2` to instruct the modem to answer after 2 rings.

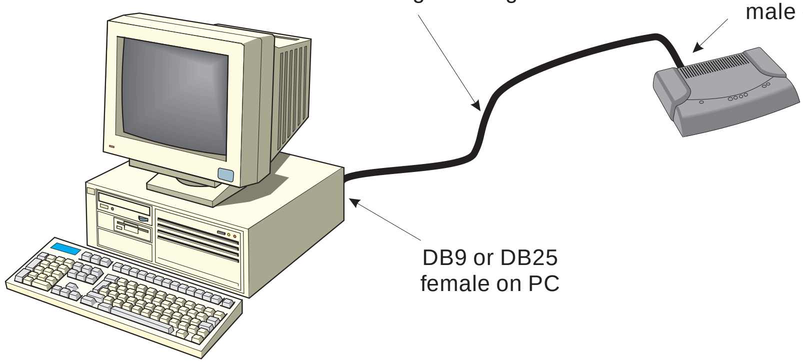
Cable connector pinouts for modem (DB9 male) to RM (DB9 female)

Modem signal (DCE)	DB9 pin	DB9 pin	RM Signal (DTE)
RxD (receive data)	2	2	RxD (receive data)
TxD (transmit data)	3	3	TxD (transmit data)
SG (signal ground)	5	5	SG (signal ground)
DTR (optional)	4	4	DTR (optional)

Cable connector pinouts for modem (DB25 male) to RM (DB9 female)

Modem signal (DCE)	DB25 pin	DB9 pin	RM Signal (DTE)
RxD (receive data)	3	2	RxD (receive data)
TxD (transmit data)	2	3	TxD (transmit data)
SG (signal ground)	7	5	SG (signal ground)
DTR (optional)	20	4	DTR (optional)

Remote modem to PC Port



1 Run a cable from a serial port on the modem to the serial port on the PC.

2 Terminate the cable at the modem with either a 25-pin male or a 9-pin male connector wired as shown in the tables below. See *Appendix A* for a diagram of the connectors.

3 Terminate the cable at the PC serial port with either a 25-pin female or a 9-pin female connector wired as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

Note *To ensure correct operation of the connection, unused pins must **not** be connected. We advise that third-party cables should not be used if all the pins are connected to the cable.*

Cable connector pinouts for modem (DB9 male) to PC (DB9 female)

Modem signal (DCE)	DB9 pin	DB9 pin	PC signal (DTE)
RxD (receive data)	2	2	RxD (receive data)
TxD (transmit data)	3	3	TxD (transmit data)
SG (signal ground)	5	5	SG (signal ground)
DTR (optional)	4	4	DTR (optional)

Cable connector pinouts for modem (DB9 male) to PC (DB25 female)

Modem signal (DCE)	DB9 pin	DB25 pin	PC Signal (DTE)
RxD (receive data)	2	3	RxD (receive data)
TxD (transmit data)	3	2	TxD (transmit data)
SG (signal ground)	5	7	SG (signal ground)
DTR (optional)	4	20	DTR (optional)

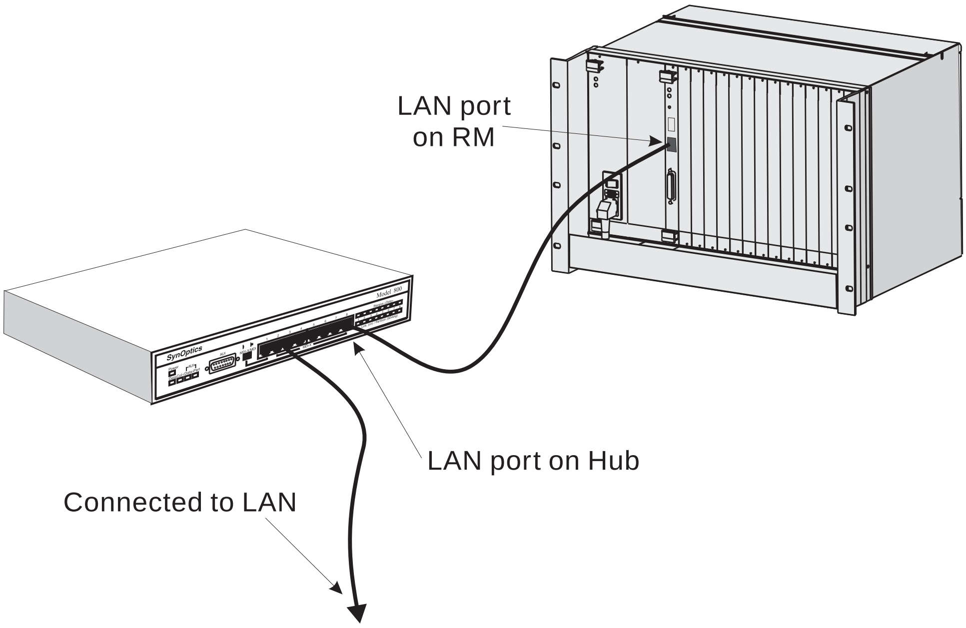
Cable connector pinouts for modem (DB25 male) to PC (DB9 female)

Modem signal (DCE)	DB25 pin	DB9 pin	PC Signal (DTE)
RxD (receive data)	3	2	RxD (receive data)
TxD (transmit data)	2	3	TxD (transmit data)
SG (signal ground)	7	5	SG (signal ground)
DTR (optional)	20	4	DTR (optional)

Cable connector pinouts for modem (DB25 male) to PC (DB25 female)

Modem signal (DCE)	DB25 pin	DB25 pin	PC Signal (DTE)
RxD (receive data)	3	3	RxD (receive data)
TxD (transmit data)	2	2	TxD (transmit data)
SG (signal ground)	7	7	SG (signal ground)
DTR (optional)	20	20	DTR (optional)

Connecting a LAN to the RM port



1 Connect the LAN port on the RM to a free port of a hub on your LAN using a suitable LAN cable.

The following table shows the pinouts for the RM Ethernet connector:

Line	Pin
Output (Transmit) Data (+)	1
Output (Transmit) Data (-)	2
Input (Receive) Data (+)	3
Input (Receive) Data (-)	6

Link settings

Figure 4 below shows the position of the links on the Resource Manager 10002631.00 Rev.3.

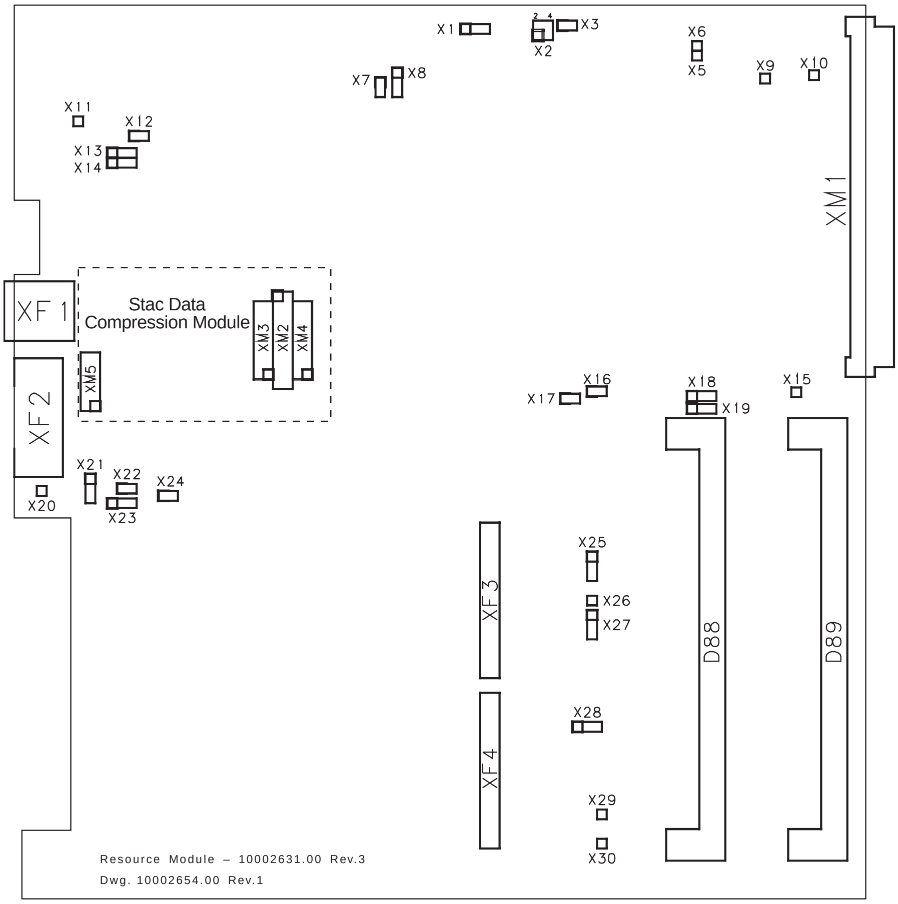


Figure 4: RM circuit board, 10002631.00 Rev.3

Normal link settings for the Resource Manager 10002631.00 Rev.3

The following table shows the RM link settings.

Ref	Normal setting	Ref	Normal setting
X1	1-2	X16	Not fitted
X2	Not fitted	X17	Not fitted
X3	Not fitted	X18	See table below
X4	—	X19	See table below
X5	—	X20	—
X6	—	X21	Not fitted[3]
X7	Not fitted[1]	X22	Not fitted
X8	Not fitted[2]	X23	2-3
X9	—	X24	Not fitted
X10	—	X25	2-3
X11	—	X26	—
X12	1-2	X27	—
X13	2-3	X28	See table below
X14	1-2	X29	—
X15	—	X30	—

1 Fit link X7 to disable the loading of the software image from Flash Memory.

2 Fit link X8 to pins 2-3 to erase the contents of the NVRAM that contains the RM configuration (only available on RMs prior to software version 2.00). This must be carried out with the power to the module turned off, and the link must be fitted for 30 seconds.

3 Fit link X21 pins 2-3 to erase the contents of the RM configuration stored in Flash Memory. The link must be fitted and the module powered on. Let the RM start and when it resets, remove the RM from the rack. Remove the link X21 and reinstall the RM in the rack.

Configurable Memory links - DRAM SIMMS

X18	X19	X28	SIMM 0 size (D88)	SIMM 1 size (D89)	Total (MB)
2-3	2-3	2-3	4 Mbyte	—	4
2-3	2-3	1-2	4 Mbyte	4 Mbyte	8
1-2	2-3	2-3	8 Mbyte	—	8
1-2	2-3	1-2	8 Mbyte	8 Mbyte	16
2-3	1-2	2-3	16 Mbyte	—	16
2-3	1-2	1-2	16 Mbyte	16 Mbyte	32
1-2	1-2	2-3	32 Mbyte	—	32
1-2	1-2	1-2	32 Mbyte	32 Mbyte	64

LEDs

LED	Colour	Normal status
OK	Green	On[1]
ALARM	Red	Off
UMT	Green	On[2]
LAN	Green	See Note 3
Dot Matrix display	Green	See Note 4

1 From RM software Version 2.00 onwards, the OK LED is used as a visual indication that the configuration is being written to Flash. It flickers on and off for approximately 10 to 15 seconds to indicate the writing process. Notify service personnel if the LED does not return to a permanently on status.

2 The UMT LED indicates that an OmniVision session is in progress.

3 The LED is **On** if the LAN is connected, **flashing** when transmitting data, and **Off** when no LAN is connected.

4 The Dot Matrix display is used to display status information of the RM. See the *Reference Manual* for more information.

Troubleshooting

Symptom	Action
All LEDs are Off	Check Power Supply is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If a RAM has just been fitted, check its orientation, location within the socket, and size allocations in the link setting table.
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s interval	Notify service personnel
OK LED and ALARM LED on, LAN LED flashing at 0.5 s interval	No software image present in flash. Notify service personnel

Note *The RM always provides bus clock in a J5000 chassis.*

ISDN Interface Modules

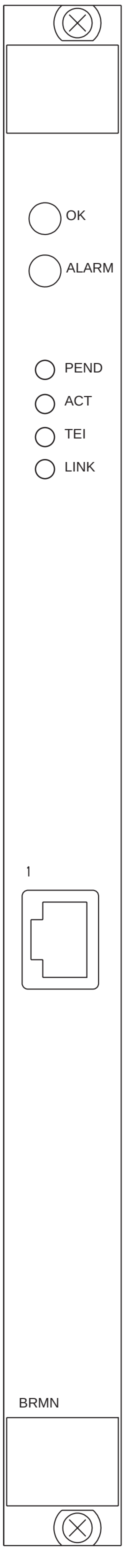
Overview

This section describes the following ISDN Interface modules:

- Basic Rate Module NT (BRMN)
- Basic Rate Module TE (BRMT)
- Dual Basic Rate Module (DBRM)
- Quad Basic Rate Module (QBRM)
- Dual Basic Rate Module - U Interface (DBRM-U)
- Quad Basic Rate Module - U Interface (QBRM-U)
- ISDN Primary Rate Module NT (IPMN)
- ISDN Primary Rate Module TE (IPMT)
- ISDN Primary Rate Module NT-2 (IPMN-2)
- ISDN Primary Rate Module TE-2 (IPMT-2)
- ISDN Primary Rate Module NT-T1 (IPMN-T1)
- ISDN Primary Rate Module TE -T1 (IPMT-T1)
- ISDN Gateway Module (IPMN-GT).

RM CM

Basic Rate Module NT (BRMN)



This section describes the Basic Rate Module NT (BRMN).

The BRMN is a network interface emulation module. It provides one ISDN Basic Rate NT port that allows you to connect up to eight ISDN terminals to the network through the device. This ISDN Basic Rate port provides two 64 kbit/s B-channels and one 16 kbit/s D-channel.

Specifications

Compatibility	The BRMN can be fitted to any chassis.
Ports	RJ45 (8 way) modular jack female connector on front panel.
Port protocol	ITU-T (CCITT) recommendations Q.920, Q.921, Q.930, Q.931. Australian Telstra standards TPH1962, TPH2001 Austel TS013. British Telecom standard BTNR 191.
Data rates supported	192 kbit/s. This supports two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the BRMN:

Cable type	0.5 mm dual twisted-pair solid conductor with metallic shield.
Cable length	1000 m max.
Connector	RJ45 male.
S Bus Termination	The BRMN normally provides S Bus termination with 100 Ω resistors. If the S Bus is to be terminated externally, remove the links fitted. See the links tables in this section.

Connecting the BRMN to terminal equipment

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a BRMN to terminal equipment that is compatible with a Basic Rate NT1.

1 Route the cable through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

BRMN signal code	RJ45 connector pin
Receive +	3
Transmit +	4
Transmit -	5
Receive -	6
not used	1, 2, 7 and 8

All pins not used are not connected (open circuit).

Link settings

Figure 5 below shows the location of the links on the BRMN, issue 2 (Applicable to Australia only).

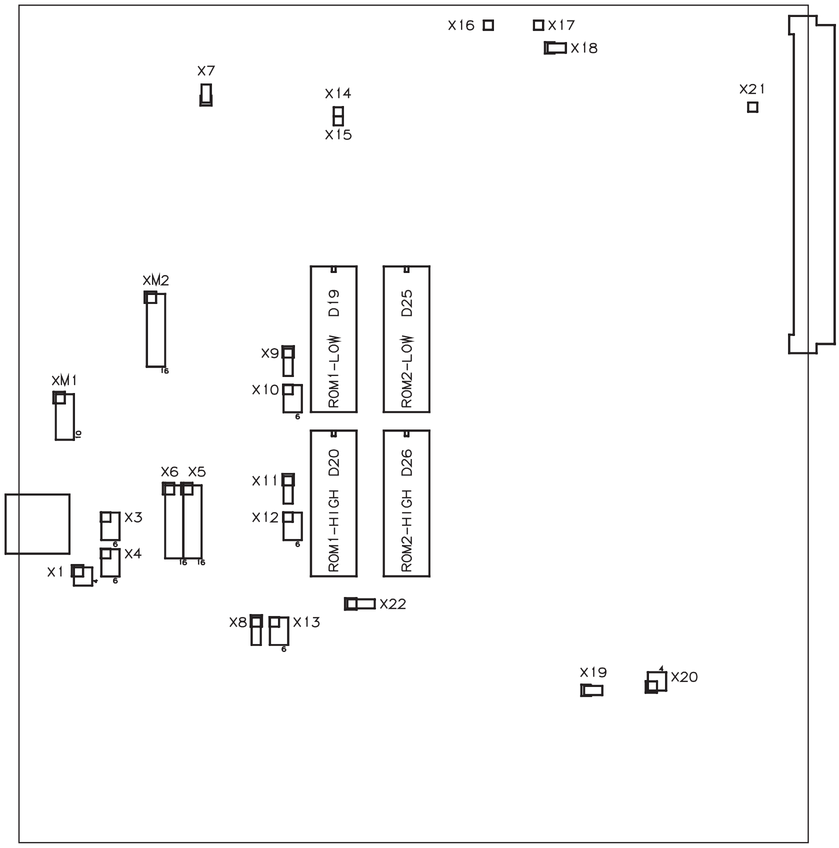


Figure 5: BRMN circuit board, issue 2

Normal link settings for the BRMN

The following table shows the normal link settings for the BRMN, issue 2.

Ref	Normal setting	Ref	Normal setting
X1	1-2, 3-4*	X14	Not Applicable
X2	Not Applicable	X15	Not Applicable
X3	2-4, 3-5	X16	Not Applicable
X4	2-4, 3-5	X17	Not Applicable
X5	Not fitted	X18	Not fitted
X6	1-2	X19	Not fitted
X7	1-2	X20	Not fitted
X8	1-2	X21	Not Applicable
X9	2-3	X22	2-3
X10	5-6	XM1	-
X11	Not fitted		
X12	Not fitted	XM2	13-14
X13	Not fitted		

* 100 Ω termination

Figure 6 below shows the location of the links on the BRMN, issue 3 (applicable in UK only).

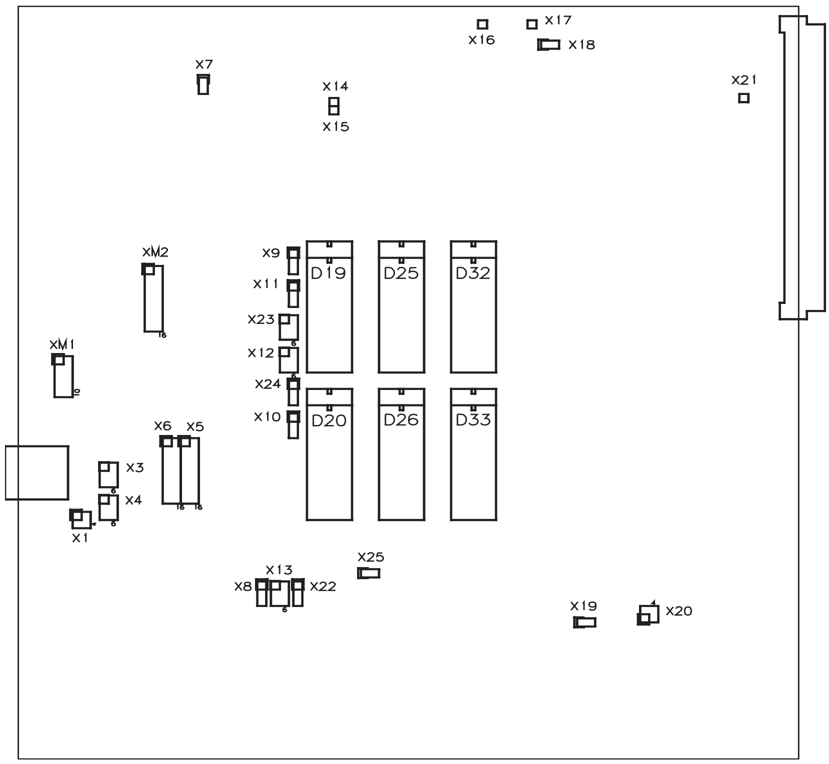


Figure 6: BRMN circuit board, issue 3

Normal link settings for the BRMN issue 3

The following table shows the normal link settings for the BRMN, issue 3.

Ref	Normal setting	Ref	Normal setting
X1	1-2, 3-4*	X14	Not Applicable
X2	Not Applicable	X15	Not Applicable
X3	2-4, 3-5	X16	Not Applicable
X4	2-4, 3-5	X17	Not Applicable
X5	Not fitted	X18	Not fitted
X6	1-2	X19	Not fitted
X7	1-2	X20	Not fitted
X8	1-2	X21	Not Applicable
X9	2-3	X22	2-3
X10	Not fitted	X23	Not fitted
X11	Not fitted	X24	Not fitted
X12	Not fitted	X25	Not fitted
X13	Not fitted	XM1	-
		XM2	13-14

* 100 Ω termination

Figure 7 below shows the location of the links on the BRMN, issue 4.

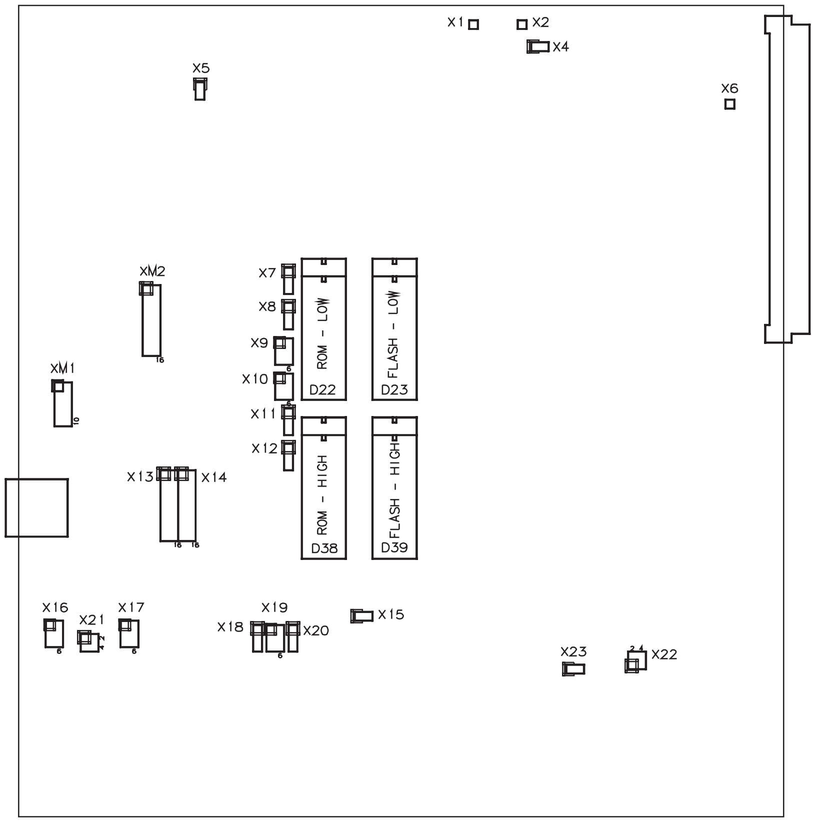


Figure 7: BRMN circuit board, issue 4

Normal link settings for the BRMN, issue 4

The following table shows the normal link settings for the BRMN, issue 4.

Ref	Normal setting	Ref	Normal setting
X1	Not Applicable	X14	Not fitted
X2	Not Applicable	X15	Not fitted
X3	Not Applicable	X16	2-4, 3-5
X4	Not fitted	X17	2-4, 3-5
X5	1-2	X18	1-2
X6	Not Applicable	X19	Not fitted
X7	2-3	X20	2-3
X8	Not fitted	X21	1-2, 3-4*
X9	Not fitted	X22	Not fitted
X10	Not fitted	X23	Not fitted
X11	Not fitted	XM1	-
X12	Not fitted	XM2	13-14
X13	1-2		

* 100 Ω termination

Figure 8 below shows the location of the links on the BRMN, 10000309.03 Rev.2.

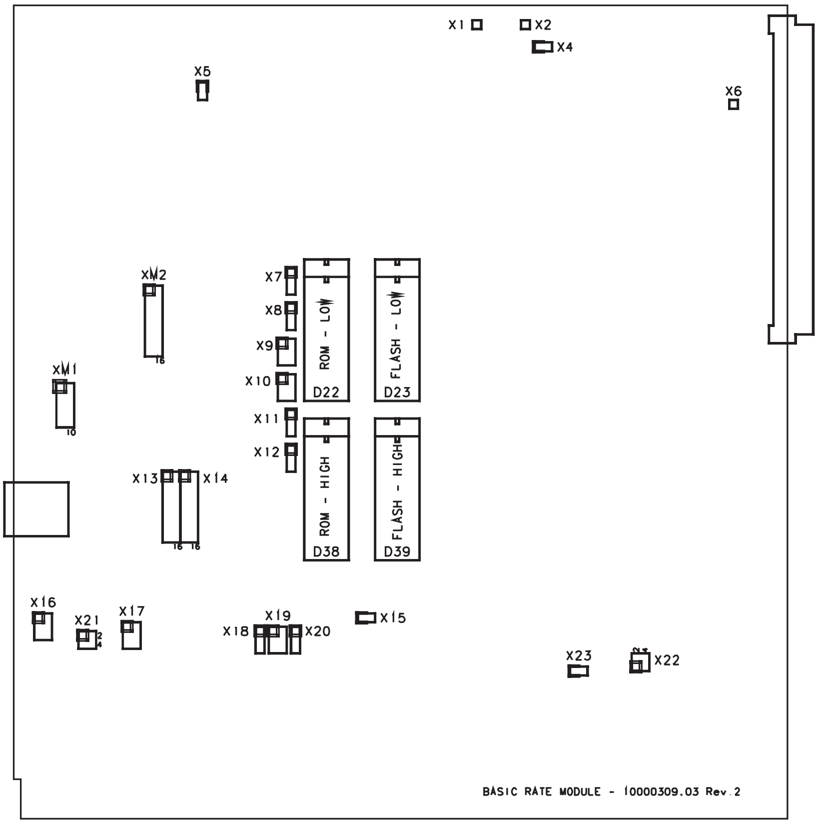


Figure 8: BRMN circuit board, 10000309.03 Rev.2

Normal link settings for the BRMN, 10000309.03 Rev.2

The following table shows the normal link settings for the BRMN, 10000309.03 Rev.2.

Ref	Normal setting	Ref	Normal setting
X1	Not Applicable	X14	Not fitted
X2	Not Applicable	X15	Not fitted
X3	Not Applicable	X16	2-4, 3-5
X4	Not fitted	X17	2-4, 3-5
X5	1-2	X18	1-2
X6	Not Applicable	X19	Not fitted
X7	2-3	X20	2-3
X8	Not fitted	X21	1-2, 3-4*
X9	Not fitted	X22	Not fitted
X10	Not fitted	X23	Not fitted
X11	Not fitted	XM1	-
X12	Not fitted	XM2	13-14
X13	1-2		

* 100 Ω termination

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
PEND [1]	Red	Off
ACT [2]	Green	On*
TEI [3]	Green	On*
LINK [4]	Green	On*

***** These LEDs are On when calls are present. The LED may be Off or On when no call is present. If the LED is On when no call is present, it is not necessarily a fault.

1 PEND (Layer 1 Pending activation) indicates that the BRMN is attempting a physical connection to the terminal equipment. This LED goes Off when the attempt is successful or aborted.

2 ACT (Layer 1 Activated) indicates that the physical connection to the terminal equipment is operational.

3 TEI indicates that the BRMN Layer 2 knows about the terminal equipment and has assigned a TEI to it. If the terminal equipment is removed, the LED may go Off after some time.

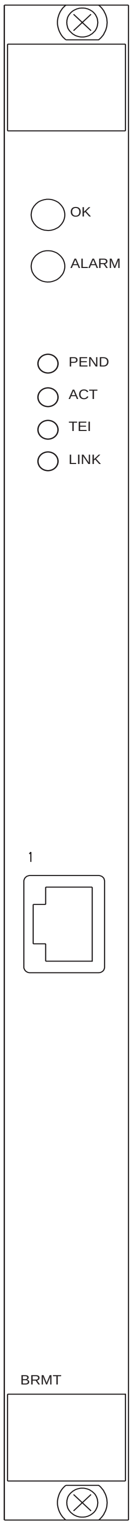
4 LINK indicates that the Layer 2 (link) is active. The state is entered when a call is initiated (in or out) and may clear some time after the call clears.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 second rate	Check CM or RM is operational
	Check that a clock source (e.g. IPMT BRMT) is operational
	Notify service personnel
PEND LED Off and doesn’t go On when outgoing calls are attempted	Check connections and cable to TE(s)
	Notify service personnel
PEND and ACT LEDs are Off and don’t go On when outgoing calls are attempted	Check connections and cable to TE(s)
	Check NT
	Notify service personnel
LINK LED remains Off when calls are attempted	Check TEs
	Ensure TEs sharing the S bus have uniform polarity connections
	Notify service personnel

RM CM

Basic Rate Module TE (BRMT)



This section describes the Basic Rate Module TE (BRMT).

The BRMT provides one ISDN Basic Rate TE port for connection to an ISDN Basic Rate Network Termination (NT). The BRMT connects to an ISDN at the S/T reference point.

The BRMT is a network interface module that provides two 64 kbit/s channels for transmitting digitised information and one 16 kbit/s channel for signalling information.

You can use a BRMT where you need small to medium amounts of network access. You can use more than one BRMT in a chassis, each providing two B-channels for connection to an ISDN Basic Rate NT1.

You can install up to 14 BRMTs in a 15 slot chassis, five in a six slot chassis and one in a four slot chassis.

Specifications

Compatibility	The BRMT can be fitted to any chassis. However, as the BRMT can only operate in point-to-point mode, each BRMT requires a separate Basic Rate connection to the network.
Port	RJ45 (8-way) modular jack female connector on the front panel.
Port protocol	ITU-T (CCITT) recommendations Q.920, Q.921, Q.930, Q.931 Telstra standards TPH1962, TPH2001 Austel TS013 British Telecom standard BTNR 191.
Data rates	192 kbit/s supporting two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot.

Installation

Cabling

The following table describes the cable needed to connect the BRMT to the Basic Rate NT1:

Cable type	0.5 mm dual twisted-pair solid conductor with metallic shield.
Cable length	1000 m max.
Connector	RJ45 male. The pinouts of the RJ45 connector are assigned such that a straight-through cable connects the BRMT to a Basic Rate NT1.
S Bus termination	The BRMT normally provides S Bus termination with 100 Ω resistors. If the S Bus is to be terminated externally, remove the links fitted. See the links table in this section.

Note *The port may be subjected to over-voltages when connected to an ISDN network. This is caused by atmospheric discharges and power supply disturbances.*

Connecting the BRMT to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a BRMT to a Basic Rate NT1.

1 Route the cable through the front cable access duct.

2 Fit the cable with an RJ45 connector that is wired according to the table overleaf, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

BRMT signal code	RJ45 connector pin
Transmit +	3
Receive +	4
Receive -	5
Transmit -	6
not used	1, 2, 7 and 8

All pins not defined above are not connected (open circuit).

Link settings

Figure 9 below shows the position of the links on the BRMT, issue 2 (applicable in Australia only).

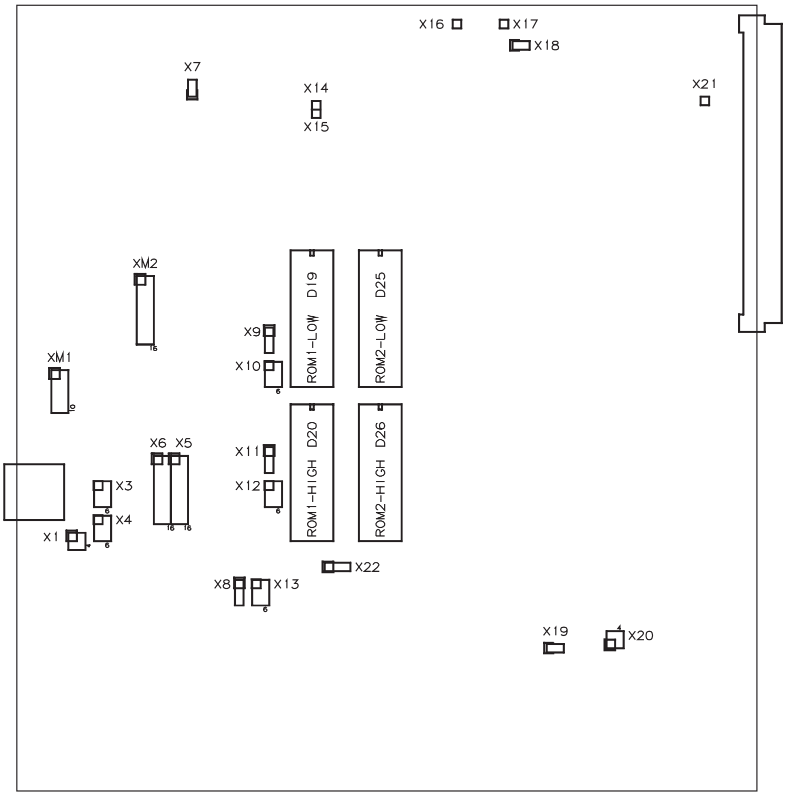


Figure 9: BRMT circuit board, issue 2

Normal link settings for the BRMT, issue 2

The following table shows the normal link settings for the BRMT, issue 2.

<table>
<tr><th>Ref</th><th colspan="2">Normal setting</th><th>Ref</th><th>Normal setting</th></tr>
<tr><td>X1</td><td colspan="2">1-2, 3-4*</td><td>X14</td><td>Not Applicable</td></tr>
<tr><td>X2</td><td colspan="2">Not applicable</td><td>X15</td><td>Not Applicable</td></tr>
<tr><td>X3</td><td colspan="2">1-3, 4-6</td><td>X16</td><td>Not Applicable</td></tr>
<tr><td>X4</td><td colspan="2">1-3, 4-6</td><td>X17</td><td>Not Applicable</td></tr>
<tr><td>X5</td><td colspan="2">Not fitted</td><td>X18</td><td>Not fitted</td></tr>
<tr><td>X6</td><td colspan="2">1-2</td><td>X19</td><td>Not fitted</td></tr>
<tr><td>X7</td><td colspan="2">1-2</td><td>X20</td><td>Not fitted</td></tr>
<tr><td>X8</td><td colspan="2">1-2</td><td>X21</td><td>Not Applicable</td></tr>
<tr><td>X9</td><td colspan="2">2-3</td><td rowspan="2">X22</td><td rowspan="2">2-3</td></tr>
<tr><td>X10</td><td colspan="2">5-6</td></tr>
<tr><td>X11</td><td colspan="2">Not fitted</td><td rowspan="2">XM1</td><td rowspan="2">-</td></tr>
<tr><td>X12</td><td colspan="2">Not fitted</td></tr>
<tr><td rowspan="2">X13</td><td>3-4</td><td>TP3420 installed</td><td rowspan="2">XM2</td><td rowspan="2">Not fitted</td></tr>
<tr><td>1-2, 5-6</td><td>TP3420A installed</td></tr>
</table>

* 100 Ω termination

Note *This issue is capable of supporting TE multidrop operation if a TP3420A ISDN S BUS interface chip is installed at D23, the X13 link settings are set as described in the above table, and the software version is greater than V3.40.*

Figure 10 below shows the position of the links on the BRMT, issue 3 (applicable to Australia only).

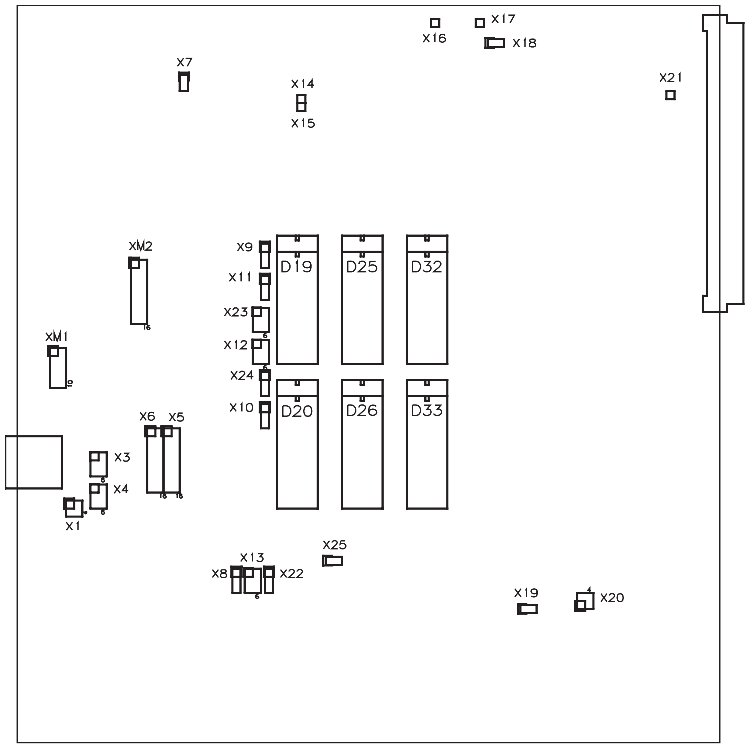


Figure 10: BRMT circuit board, issue 3

Normal link settings for the BRMT, issue 3

The following table shows the normal link settings for the BRMT, issue 3.

<table>
<tr><th>Ref</th><th colspan="2">Normal setting</th><th>Ref</th><th>Normal setting</th></tr>
<tr><td>X1</td><td colspan="2">1-2, 3-4</td><td>X14</td><td>Not Applicable</td></tr>
<tr><td>X2</td><td colspan="2">Not Applicable</td><td>X15</td><td>Not Applicable</td></tr>
<tr><td>X3</td><td colspan="2">1-3, 4-6</td><td>X16</td><td>Not Applicable</td></tr>
<tr><td>X4</td><td colspan="2">1-3, 4-6</td><td>X17</td><td>Not Applicable</td></tr>
<tr><td>X5</td><td colspan="2">Not fitted</td><td>X18</td><td>Not fitted</td></tr>
<tr><td>X6</td><td colspan="2">1-2</td><td>X19</td><td>Not fitted</td></tr>
<tr><td>X7</td><td colspan="2">1-2</td><td>X20</td><td>Not fitted</td></tr>
<tr><td>X8</td><td colspan="2">1-2</td><td>X21</td><td>Not Applicable</td></tr>
<tr><td>X9</td><td colspan="2">2-3</td><td>X22</td><td>2-3</td></tr>
<tr><td>X10</td><td colspan="2">Not fitted</td><td>X23</td><td>Not fitted</td></tr>
<tr><td>X11</td><td colspan="2">Not fitted</td><td>X24</td><td>Not fitted</td></tr>
<tr><td>X12</td><td colspan="2">Not fitted</td><td>X25</td><td>Not fitted</td></tr>
<tr><td rowspan="2">X13</td><td>3-4</td><td>TP3420 installed</td><td>XM1</td><td>-</td></tr>
<tr><td>1-2, 5-6</td><td>TP3420A installed</td><td>XM2</td><td>Not fitted</td></tr>
</table>

* 100 Ω termination

Note *This issue is capable of supporting TE multidrop operation if a TP3420A ISDN S BUS interface chip is installed at D23, the X13 link settings are set as described in the above table, and the software version is greater than V3.40.*

Figure 11 below shows the position of the links on the BRMT, issue 4.

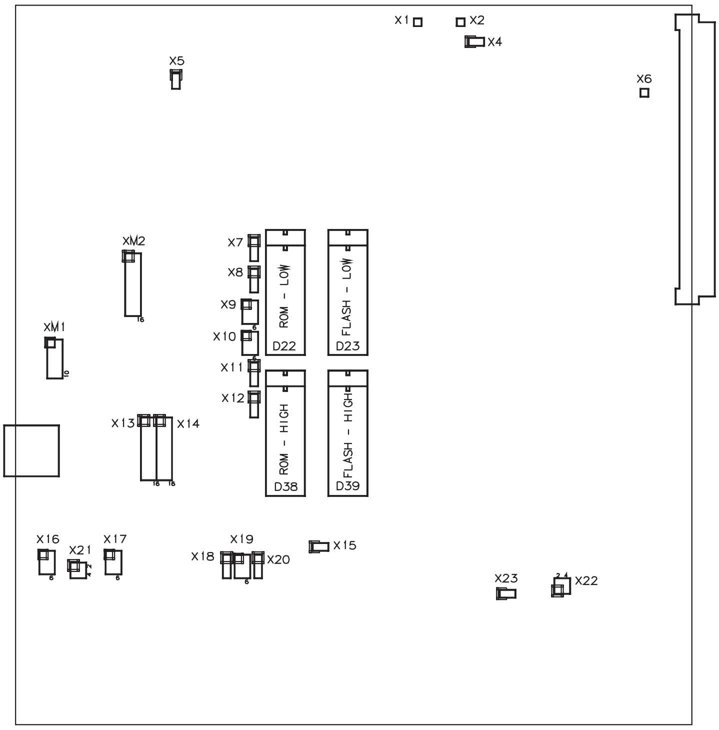


Figure 11: BRMT circuit board, issue 4

Normal link settings for the BRMT, issue 4

The following table shows the normal link settings for the BRMT, issue 4.

Ref	Normal setting	Ref	Normal setting
X1	Not Applicable	X14	Not fitted
X2	Not Applicable	X15	Not fitted
X3	Not Applicable	X16	1-3, 4-6
X4	Not fitted	X17	1-3, 4-6
X5	1-2	X18	1-2
X6	Not Applicable	X19	1-2, 5-6
X7	2-3	X20	2-3
X8	Not fitted	X21	1-2, 3-4*
X9	Not fitted	X22	Not fitted
X10	Not fitted	X23	Not fitted
X11	Not fitted	XM1	-
X12	Not fitted	XM2	See below
X13	1-2		

* 100 Ω termination

Note *This issue is capable of supporting TE multidrop if the software version is greater than Ver 3.40.*

XM2 link settings

The links on header XM2 provide some functions which are for *TEST* and fixed configuration purposes only.

The following table shows the configuration of these links.

Link	Function of link
1-2	
3-4	Loopback
5-6	Bus clock
7-8	
9-10	Poll LED
11-12	
13-14	
15-16	Test enable

Figure 12 below shows the position of the links on the BRMT, 10000309.03 Rev.2.

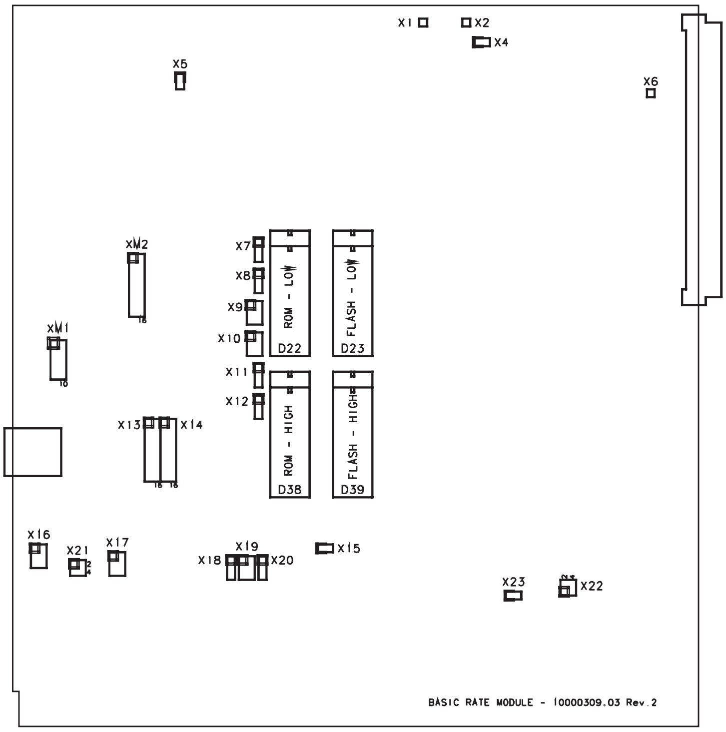


Figure 12: BRMT circuit board, 10000309.03 Rev.2

Normal link settings for the BRMT

The following table shows the normal link settings for the BRMT, 10000309.03 Rev.2.

Ref	Normal setting	Ref	Normal setting
X1	Not Applicable	X14	Not fitted
X2	Not Applicable	X15	Not fitted
X3	Not Applicable	X16	1-3, 4-6
X4	Not fitted	X17	1-3, 4-6
X5	1-2	X18	1-2
X6	Not Applicable	X19	1-2, 5-6
X7	2-3	X20	2-3
X8	Not fitted	X21	1-2, 3-4*
X9	Not fitted	X22	Not fitted
X10	Not fitted	X23	Not fitted
X11	Not fitted	XM1	-
X12	Not fitted	XM2	Not fitted (see below)
X13	1-2		

* 100 Ω termination

Note *This issue is capable of supporting TE multidrop if the software version is greater than Ver 3.40.*

XM2 link settings

The links on header XM2 provide some functions which are for *TEST* and fixed configuration purposes only. Normally no links are fitted.

The following table shows the configuration of these links.

Link	Function of link
1-2	
3-4	Loopback
5-6	Bus clock
7-8	
9-10	Poll LED
11-12	
13-14	
15-16	Test enable

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
PEND [1]	Red	On*
ACT [2]	Green	On*
TEI [3]	Green	On*
LINK [4]	Green	On*

***** These LEDs are On when calls are present. The LED may be Off or On when no call is present. If the LED is On when no call is present, it is not necessarily a fault state.

1 PEND (Layer 1 Pending activation) indicates that the BRMT is attempting a physical connection to the NT1. This LED goes Off when the attempt is successful or aborted.

2 ACT (Layer 1 Activated) indicates that the physical connection to the NT1 is completely operational.

3 TEI indicates that the exchange (or BRMN) Layer 2 knows about the terminal equipment and has assigned a TEI to it.

4 LINK indicates that the Layer 2 (link) is in the active state. This state is initiated when a call is started (in or out) and may clear some time after the call clears.

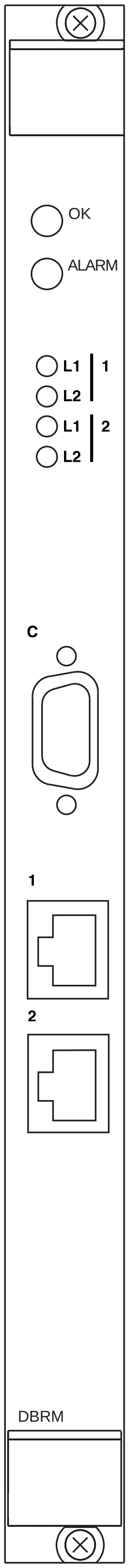
Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s interval	Check CM or RM is operational
	Check that a clock source (e.g. IPMT BRMT) is operational[1]
	Notify service personnel
PEND LED Off and doesn’t go on when outgoing calls are attempted	Check connections and cable to NT
	Notify service personnel
PEND and ACT LEDs are Off and don’t go On when outgoing calls are attempted	Check connections and cable to NT
	Check NT
	Ensure no other TE is sharing the S bus
	Notify service personnel
LINK LED remains Off when calls are attempted	Check NT
	Notify service personnel

1 BRMT is a valid reference clock provider.

RM CM

Dual Basic Rate Module (DBRM)



The Dual Basic Rate Module (DBRM) provides two ISDN Basic Rate ports that can be configured to provide either the Network Termination (NT) function or the Terminal Equipment (TE) function. Any combination of NTs and TEs can be configured.

The ports can be used for point-to-point and multidrop S-bus connections.

In addition to the two ISDN Basic Rate ports, the DBRM has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP). For DBRM-NI, this port is also used to enter the default Service Profile Identification (SPID).

There are two protocol variants of the DBRM:

- DBRM-ETSI — supports the European ETSI protocol
- DBRM-NI — supports the US National ISDN (NI-1) protocol. Currently provides only TE function.

Specifications

Compatibility	The DBRM can be fitted to any chassis.
Ports	2x RJ45 (8-way) modular jack female connectors on the front panel. 1 x DB9 female connector on the front panel.
Port Protocol	**DBRM-ETSI** European Standard TBR3 ITU-T recommendation I.430 **DBRM-NI** US National ISDN (NI-1)
Data rates	Each port supports two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot.

Installation

Cabling

The following shows the cabling specifications for external connections to the DBRM:

Cable type	DBRM port: 0.5 mm dual twisted-pair solid conductor with metallic shield PAP port: shielded multi-core
Cable length	Point-to-point connection: 1000 m max. Point-to-multipoint connection: 500 m max.
Connector	DBRM port: RJ45 male PAP port: DB9 male
S-bus termination	A 100 Ω termination is required at the NT end of the S-bus and also at the far end. Where the DBRM is operating as NT, links will have to be fitted to enable the DBRM's on-board terminating resistors. If the DBRM port is operating as a TE, and the S-bus is not externally terminated at the TE end, the links that enable the on-board terminating resistors must be fitted. See the links tables on page 5-24.

Connecting the DBRM to terminal equipment

Warning Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a DBRM to terminal equipment that is compatible with a Basic Rate NT1.

1 Route the cable through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

DBRM signal code	RJ45 connector pin: NT mode	RJ45 connector pin: TE mode
Receive +	3	4
Transmit +	4	3
Transmit -	5	6
Receive -	6	5
not used	1, 2, 7 and 8	1, 2, 7 and 8

PAP connector pinouts

PAP signal code	DB9 connector pin
Transmit +	2
Receive -	3
Ground	5
not used	1, 4, 6, 7, 8 and 9

Configuring the default SPID (DBRM-NI only)

The V.24 serial port can be used to enter the default SPID. This is necessary if remote NMS access of an unconfigured device is required.

To configure the default SPID:

1 Connect a serial terminal to the DBRM-NI at 19200, no parity, 8 data bits and 1 stop.

2 Hold down the **Enter** key until the terminal displays the DBRM prompt.

3 Enter the following:
`e <port> 0 400 <SPID>`
where
`<port>` is 0, 1, 2, or 3 corresponding to the DBRM ports 1, 2, 3 and 4 respectively,
`0 400` denotes the NI1 protocol (this should not change), and
`<SPID>` is the 9 to 20 digit SPID number provided by the NI1 service provider.

4 Press **Enter.**

5 When the entries are complete, check the values by entering the following at the prompt:
d Enter
n Enter
x Enter

6 When the values have been checked press **x** Enter.

Link settings

Figure 13 below shows the position of the links on the DBRM 10000975.02 Rev.2.

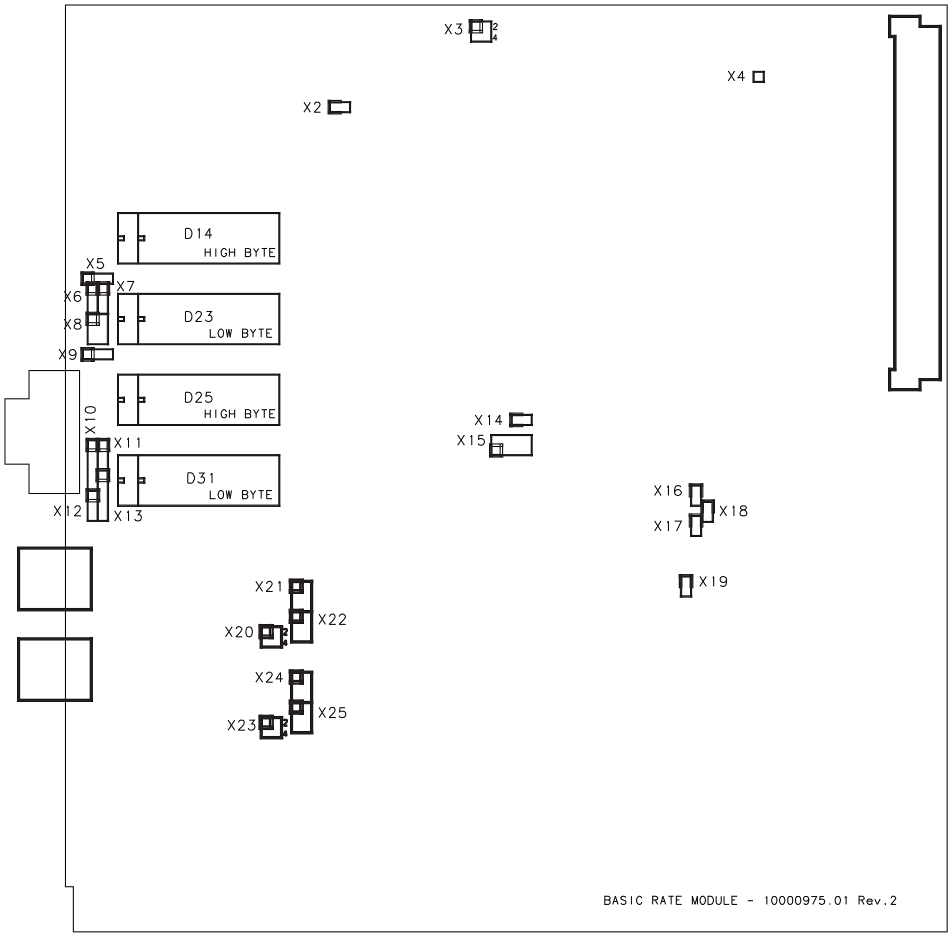


Figure 13: DBRM circuit board, 10000975.02 Rev.2

Normal link settings for the DBRM 10000975.02 Rev.2

The following table shows the normal link settings for the DBRM, 10000975.02 Rev.2.

Ref	Normal setting: NT mode	Normal setting: TE mode
X1	—	—
X2	Not fitted	Not fitted
X3	3-4	3-4
X4	—	—
X5	1-2	1-2
X6	1-2	1-2
X7	2-3	2-3
X8	5-6	5-6
X9	1-2	1-2
X10	2-3, 4-5	2-3, 4-5
X11	1-2	1-2
X12	2-3	2-3
X13	2-3, 4-5	2-3, 4-5
X14	Not fitted	Not fitted
X15	5-6	5-6
X16	1-2	Not fitted
X17	1-2	Not fitted
X20	1-2, 3-4	1-2, 3-4
X21	2-4, 3-5	1-3, 4-6
X22	2-4, 3-5	1-3, 4-6
X23	1-2, 3-4	1-2, 3-4
X24	2-4, 3-5	1-3, 4-6
X25	2-4, 3-5	1-3, 4-6

S-bus termination

If you want the DBRM to provide the 100 Ω S-bus termination resistors, links must be fitted as shown in the following table:

Port	Ref	Position
1	X20	1-2, 3-4
2	X23	1-2, 3-4

Note *The links should be fitted for a port operating in either NT mode or TE mode on a point-to-point connection.*

LEDS

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
L1	Green	Not applicable[1]
L2	Green	Not applicable[2]

Note *There are two status LEDs for each S-bus port.*

1 L1 indicates the status of the S-bus at Layer 1 as follows:

- If the LED is Off, there are no active calls and the clock is not being extracted.
- If the LED is flashing, the port is attempting to activate the S-bus.
- If the LED is On, the S-bus is active. Clock can be extracted and calls can be made.

2 L2 indicates the status of the S-bus at Layer 2 as follows:

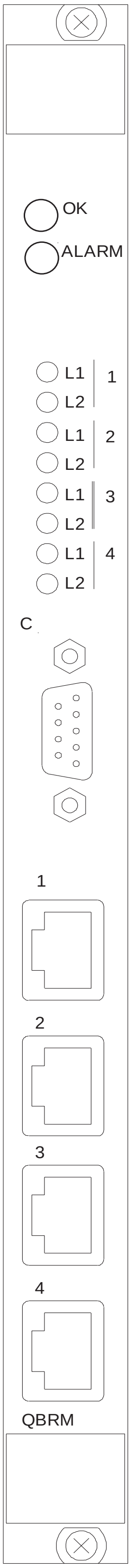
- If the LED is Off the D-channel is inactive and no TEI is assigned. On a TE port this occurs after deactivation. On an NT port this occurs if there are no TEs connected to the S-bus. When a TE has a fixed TEI this state does not occur.
- If the LED is flashing a TEI has been assigned, however there are no active calls and no calls in the process of being established.
- If the LED is On the LAPD data link is established and calls can be processed.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	Hardware fault
	Notify service personnel
ALARM LED flashing at 2s intervals	Check that the module providing the backplane clocks is operating
	Notify service personnel
ALARM LED and On LED flashing together	Hardware failure
	Notify service personnel
OK LED flashing at 2s intervals	A diagnostic loopback is active. No action required.

RM CM

Quad Basic Rate Module (QBRM)



The Quad Basic Rate Module (QBRM) provides four ISDN Basic Rate ports that can be configured to provide either the Network Termination (NT) function or the Terminal Equipment (TE) function. Any combination of NTs and TEs can be configured.

The ports can be used for point-to-point and multidrop S-bus connections.

In addition to the four ISDN Basic Rate ports, the QBRM has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP). For QBRM-NI, this port is also used to enter the default Service Profile Identification (SPID).

There are three protocol variants of the QBRM:

- QBRM-T013 — supports Australian ACA TS013 protocol
- QBRM-ETSI — supports the European ETSI protocol
- QBRM-NI — supports the US National ISDN (NI-1) protocol. Currently provides only TE function.

Specifications

Compatibility	The QBRM can be fitted to any chassis.
Ports	4 x RJ45 (8-way) modular jack female connectors on the front panel. 1 x DB9 female connector on the front panel.
Port Protocol	**QBRM-T013** Australian ACA TS013 Telstra TPH1962, TPH2001 **QBRM-ETSI** European Standard TBR3 ITU-T recommendation I.430 **QBRM-NI** US National ISDN (NI-1)
Data rates	Each port supports two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the QBRM:

Cable type	QBRM port: 0.5 mm dual twisted-pair solid conductor with metallic shield PAP port: shielded multi-core
Cable length	Point-to-point connection: 1000 m max. Point-to-multipoint connection: 500 m max.
Connector	QBRM port: RJ45 male PAP port: DB9 male
S-bus termination	A 100 Ω termination is required at the NT end of the S-bus and also at the far end. Links will have to be fitted to enable the terminating resistors. Similarly, if the QBRM port is operating as a TE, the links will need to be removed to disable the terminating resistors. See the link tables below.

Connecting the QBRM to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a BRMN to terminal equipment that is compatible with a Basic Rate NT1.

1 Route the cable through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

QBRM signal code	RJ45 connector pin: NT mode	RJ45 connector pin: TE mode
Receive +	3	4
Transmit +	4	3
Transmit -	5	6
Receive -	6	5
not used	1, 2, 7 and 8	1, 2, 7 and 8

PAP connector pinouts

PAP signal code	DB9 connector pin
Transmit +	2
Receive -	3
Ground	5
not used	1, 4, 6, 7, 8 and 9

Configuring the default SPID (QBRM-NI only)

The V.24 serial port can be used to enter the default SPID. This is necessary if remote NMS access of an unconfigured device is required.

To configure the default SPID:

1 Connect a serial terminal to the QBRM-NI at 19200, no parity, 8 data bits and 1 stop.

2 Hold down the **Enter** key until the terminal displays the QBRM prompt.

3 Enter the following:

```
e <port> 0 400 <SPID>
```

where
`<port>` is 0, 1, 2, or 3 corresponding to the QBRM ports 1, 2, 3 and 4 respectively,
`0 400` denotes the NI1 protocol (this should not change), and
`<SPID>` is the 9 to 20 digit SPID number provided by the NI1 service provider.

4 Press **Enter.**

5 When the entries are complete, check the values by entering the following at the prompt:
d Enter
n Enter
x Enter

6 When the values have been checked press **x** Enter.

Link settings

Figure 14 below shows the position of the links on the QBRM issue 1.1.

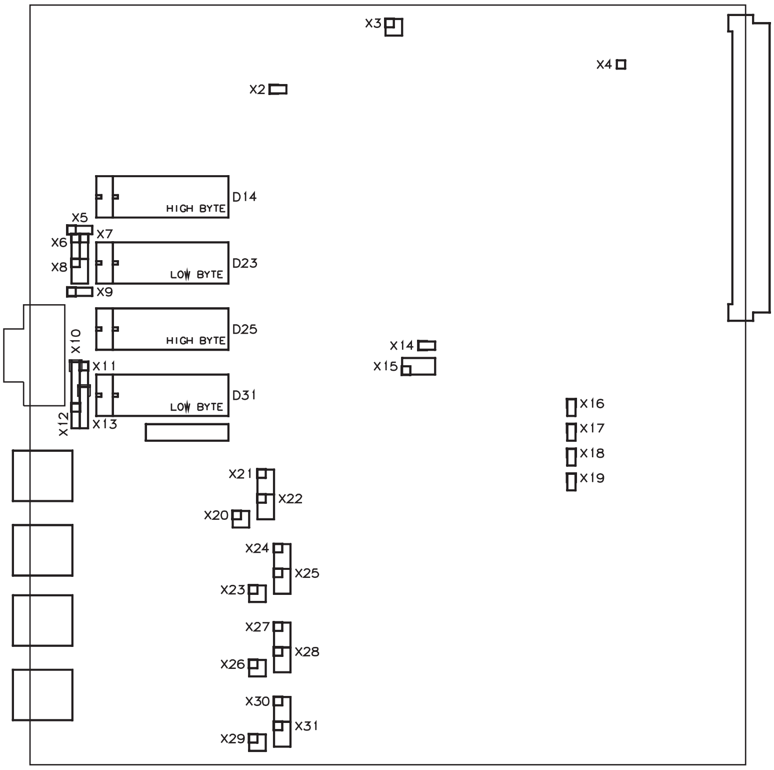


Figure 14: QBRM circuit board, issue 1.1

Normal link settings for the QBRM issue 1.1

The following table shows the normal link settings for the QBRM issue 1.1.

Ref	Normal setting: NT mode	Normal setting: TE mode
X1	—	—
X2	Not fitted	Not fitted
X3	3-4	3-4
X4	—	—
X5	1-2	1-2
X6	1-2	1-2
X7	2-3	2-3
X8	5-6	5-6
X9	1-2	1-2
X10	2-3, 4-5	2-3, 4-5
X11	1-2	1-2
X12	2-3	2-3
X13	2-3, 4-5	2-3, 4-5
X14	Not fitted	Not fitted
X15	Not fitted	Not fitted
X16	1-2	Not fitted
X17	1-2	Not fitted
X18	1-2	Not fitted
X19	1-2	Not fitted
X20	1-2, 3-4	1-2, 3-4
X21	2-4, 3-5	1-3, 4-6
X22	2-4, 3-5	1-3, 4-6
X23	1-2, 3-4	1-2, 3-4
X24	2-4, 3-5	1-3, 4-6
X25	2-4, 3-5	1-3, 4-6
X26	1-2, 3-4	1-2, 3-4
X27	2-4, 3-5	1-3, 4-6
X28	2-4, 3-5	1-3, 4-6
X29	1-2, 3-4	1-2, 3-4
X30	2-4, 3-5	1-3, 4-6
X31	2-4, 3-5	1-3, 4-6

S-bus termination

If you want the QBRM to provide the 100 Ω S-bus termination resistors, links must be fitted as shown in the following table:

Port	Ref	Position
1	X20	1-2, 3-4
2	X23	1-2, 3-4
3	X26	1-2, 3-4
4	X29	1-2, 3-4

Note *The links should be fitted for a port operating in either NT mode or TE mode on a point-to-point connection.*

Figure 15 below shows the position of the links on the QBRM 10000975.01 Rev.2.

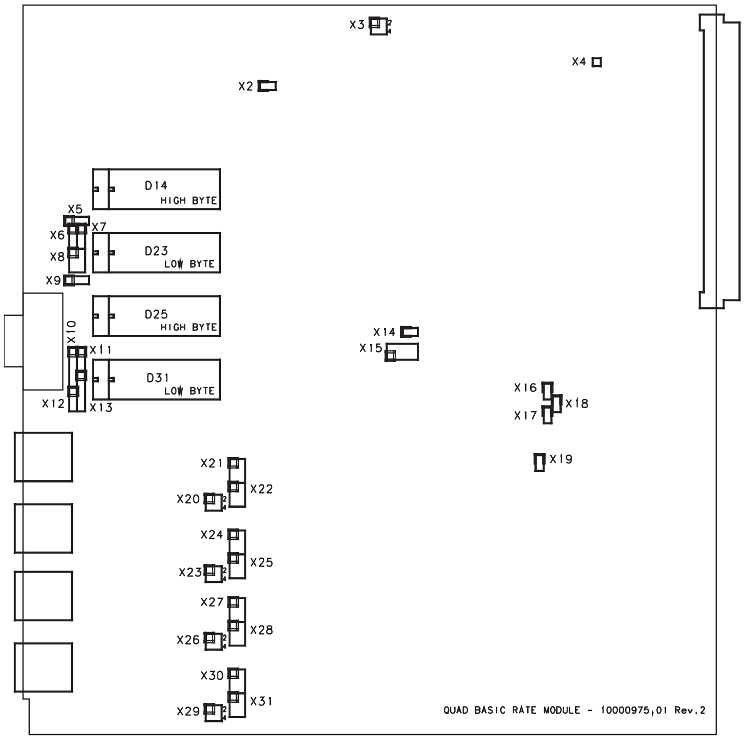


Figure 15: QBRM circuit board, 10000975.01 Rev.2

Normal link settings for the QBRM 10000975.01 Rev.2

The following table shows the normal link settings for the QBRM, 10000975.01 Rev.2.

Ref	Normal setting: NT mode	Normal setting: TE mode
X1	—	—
X2	Not fitted	Not fitted
X3	3-4	3-4
X4	—	—
X5	1-2	1-2
X6	1-2	1-2
X7	2-3	2-3
X8	5-6	5-6
X9	1-2	1-2
X10	2-3, 4-5	2-3, 4-5
X11	1-2	1-2
X12	2-3	2-3
X13	2-3, 4-5	2-3, 4-5
X14	Not fitted	Not fitted
X15	5-6	5-6
X16	1-2	Not fitted
X17	1-2	Not fitted
X18	1-2	Not fitted
X19	1-2	Not fitted
X20	1-2, 3-4	1-2, 3-4
X21	2-4, 3-5	1-3, 4-6
X22	2-4, 3-5	1-3, 4-6
X23	1-2, 3-4	1-2, 3-4
X24	2-4, 3-5	1-3, 4-6
X25	2-4, 3-5	1-3, 4-6
X26	1-2, 3-4	1-2, 3-4
X27	2-4, 3-5	1-3, 4-6
X28	2-4, 3-5	1-3, 4-6
X29	1-2, 3-4	1-2, 3-4
X30	2-4, 3-5	1-3, 4-6
X31	2-4, 3-5	1-3, 4-6

S-bus termination

If you want the QBRM to provide the 100 Ω S-bus termination resistors, links must be fitted as shown in the following table:

Port	Ref	Position
1	X20	1-2, 3-4
2	X23	1-2, 3-4
3	X26	1-2, 3-4
4	X29	1-2, 3-4

Note *The links should be fitted for a port operating in either NT mode or TE mode on a point-to-point connection.*

LEDS

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
L1	Green	Not applicable[1]
L2	Green	Not applicable[2]

Note *There are two status LEDs for each S-bus port.*

---

1 L1 indicates the status of the S-bus at Layer 1 as follows:

- If the LED is Off, there are no active calls and the clock is not being extracted.
- If the LED is flashing, the port is attempting to activate the S-bus.
- If the LED is On, the S-bus is active. Clock can be extracted and calls can be made.

2 L2 indicates the status of the S-bus at Layer 2 as follows:

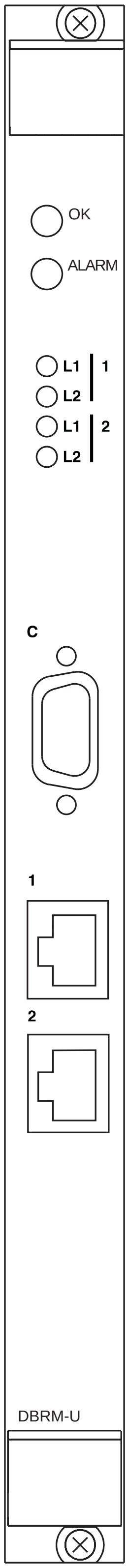
- If the LED is Off the D-channel is inactive and no TEI is assigned. On a TE port this occurs after deactivation. On an NT port this occurs if there are no TEs connected to the S-bus. When a TE has a fixed TEI this state does not occur.
- If the LED is flashing a TEI has been assigned, however there are no active calls and no calls in the process of being established.
- If the LED is On the LAPD data link is established and calls can be processed.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	Hardware fault
	Notify service personnel
ALARM LED flashing at 2s intervals	Check that the module providing the backplane clocks is operating
	Notify service personnel
ALARM LED and On LED flashing together	Hardware failure
	Notify service personnel
OK LED flashing at 2s intervals	A diagnostic loopback is active. No action required.

RM

Dual Basic Rate Module-U Interface (DBRM-U)



The Dual Basic Rate Module-U Interface (DBRM-U) provides two ISDN Basic Rate U interface ports that can be configured to provide either the Termination Equipment (TE) function or the Network Termination (NT) function. Any combination of TEs and NTs can be configured.

Note *The NT and TE functions referred to in this section are consistent with other NT and TE functions described in this manual. The functions do **not** define the physical NT and LT interfaces.*

The ports are used for point-to-point connection.

In addition to the two ISDN Basic Rate ports, the DBRM-U has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP).

The DBRM-U supports the US National ISDN-1 (NI-1) protocol.

Specifications

Compatibility	The DBRM-U can be fitted to any chassis.
Ports	2 x RJ45 (conforming to FCC RJ49C) modular jack female connectors on the front panel . 1 x DB9 female connector on the front panel.
Port Protocol	US National ISDN-1 (NI-1)
Data rates	Each port supports two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the DBRM-U:

Cable type	DBRM-U port: 0.5 mm dual twisted-pair solid conductor with metallic shield PAP port: shielded multi-core
Cable length	Point-to-point connection: 5000 m max.
Connector	DBRM-U port: RJ45 male (conforming to FCC RJ49C) PAP port: DB9 male

Connecting the DBRM-U to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a DBRM-U to terminal equipment that is compatible with a Basic Rate U-interface.

1 Route the cable through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below and plug it in. See *Appendix AAppendix AAppendix A* for a diagram of the connector.

RJ45 connector pinouts

DBRM-U signal code	RJ45 connector pin: TE mode
Signal (Tip/Ring)	4
Signal (Tip/Ring)	5
not used	1, 2, 3, 6, 7 and 8

PAP connector pinouts

PAP signal code	DB9 connector pin
Transmit +	2
Receive -	3
Ground	5
not used	1, 4, 6, 7, 8 and 9

Link settings

Figure 16 below shows the position of the links on the DBRM-U 10003284.00 Rev.2.

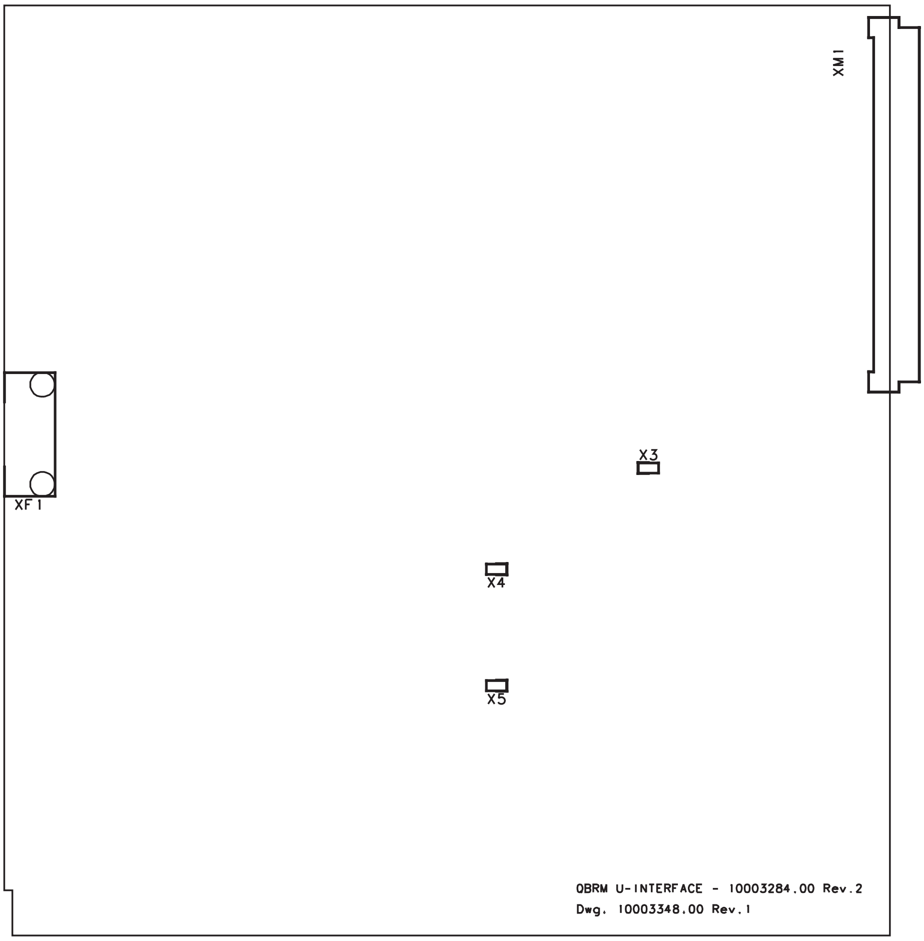


Figure 16: DBRM-U circuit board, 10003284.00 Rev.2

Normal link settings for the DBRM-U 10003284.00 Rev.2

The following table shows the normal link settings for the DBRM-U, 10003284.00 Rev.2.

Ref	Description	Normal setting: TE mode	Normal setting: NT mode
X2	Test link	Not fitted	Not fitted
X3	Watchdog link	1-2	1-2
X4	Port 1 TE/NT setting	Not fitted[1]	1-2
X5	Port 2 TE/NT setting	Not fitted[1]	1-2

1 Links X4 and X5 are normally fitted to a single pin of the respective link when in the TE mode. This ensures that they are available for fitting when changing a port to NT

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
L1	Green	See Note 1
L2	Green	See Note 2

Note *There are two status LEDs for each port.*

1 L1 indicates the status of the port at Layer 1 as follows:

- If the LED is Off, there are no active calls.
- If the LED is flashing, the port is attempting to activate the Layer 1 link.
- If the LED is On, the Layer 1 is active, clock can be extracted by the TEs and calls can be made.

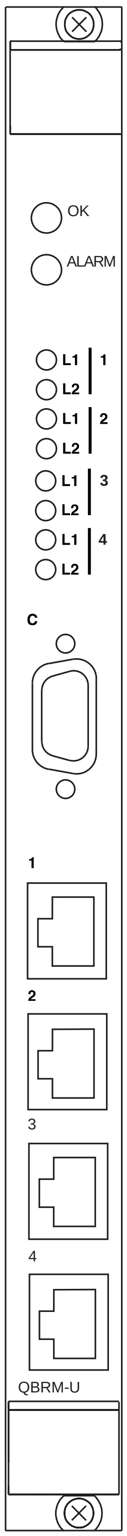
2 L2 indicates the status of the port at Layer 2 as follows:

- If the LED is Off the D-channel is inactive and no TEI is assigned. On an NT port this occurs after deactivation. On an TE port this occurs if there are no NTs connected to the port. When an NT has a fixed TEI this state does not occur.
- If the LED is flashing a TEI has been assigned, however the LAPD data link is not established and so there are no active calls.
- If the LED is On the LAPD data link is established and calls can be processed.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	Hardware fault
	Notify service personnel
ALARM LED flashing at 2s intervals	Check that the module providing the backplane clocks is operating
	Notify service personnel
ALARM LED and On LED flashing together	Hardware failure
	Notify service personnel
OK LED flashing at 2s intervals	A diagnostic loopback is active. No action required.

Quad Basic Rate Module-U Interface (QBRM-U)



The Quad Basic Rate Module-U Interface (QBRM-U) provides four ISDN Basic Rate U interface ports that can be configured to provide either the Termination Equipment (TE) function or the Network Termination (NT) function. Any combination of TEs and NTs can be configured.

Note *The NT and TE functions referred to in this section are consistent with other NT and TE functions described in this manual. The functions do **not** define the physical NT and LT interfaces.*

The ports are used for point-to-point connection.

In addition to the four ISDN Basic Rate ports, the QBRM-U has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP).

The QBRM-U supports the US National ISDN-1 (NI-1) protocol.

Specifications

Compatibility	The QBRM-U can be fitted to any chassis.
Ports	4 x RJ45 (conforming to FCC RJ49C) modular jack female connectors on the front panel. 1 x DB9 female connector on the front panel.
Port Protocol	US National ISDN-1 (NI-1)
Data rates	Each port supports two B-channels at 64 kbit/s and one D-channel at 16 kbit/s.
Module width	1 slot

Installation

Cabling

The following table shows the cabling specifications for external connections to the QBRM-U:

Cable type	QBRM-U port: 0.5 mm dual twisted-pair solid conductor with metallic shield PAP port: shielded multi-core
Cable length	Point-to-point connection: 5000 m max.
Connector	QBRM-U port: RJ45 male (conforming to FCC RJ49C) PAP port: DB9 male

Connecting the QBRM-U to terminal equipment

Warning Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The pinouts of the RJ45 connector are assigned so that you can use a straight-through cable to connect a QBRM-U to terminal equipment that is compatible with a Basic Rate U-interface.

1 Route the cable through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

QBRM-U signal code	RJ45 connector pin: TE mode
Signal (Tip/Ring)	4
Signal (Tip/Ring)	5
not used	1, 2, 3, 6, 7 and 8

PAP connector pinouts

PAP signal code	DB9 connector pin
Transmit +	2
Receive -	3
Ground	5
not used	1, 4, 6, 7, 8 and 9

Link settings

Figure 17 below shows the position of the links on the QBRM-U 10003284.00 Rev.2.

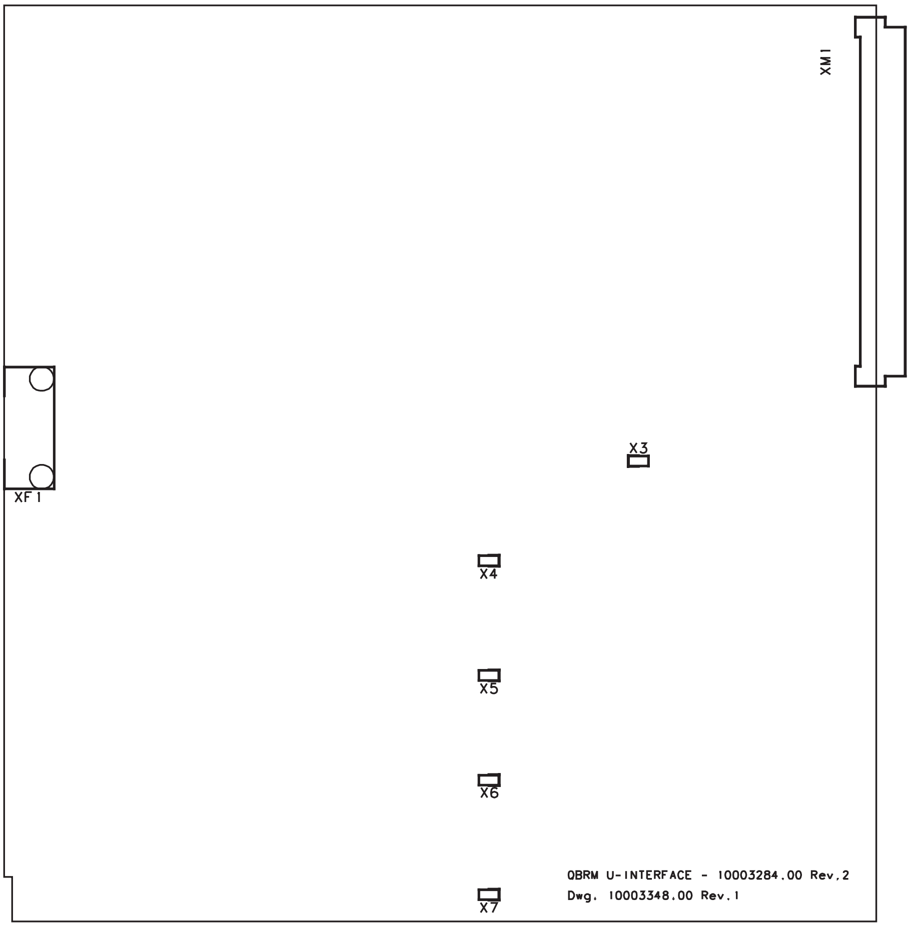


Figure 17: QBRM-U circuit board, 10003284.00 Rev.2

Normal link settings for the QBRM-U 10003284.00 Rev.2

The following table shows the normal link settings for the QBRM-U, 10003284.00 Rev.2.

Ref	Description	Normal setting: TE mode	Normal setting: NT mode
X2	Test link	Not fitted	Not fitted
X3	Watchdog link	1-2	1-2
X4	Port 1 TE/NT setting	Not fitted[1]	1-2
X5	Port 2 TE/NT setting	Not fitted[1]	1-2
X6	Port 3 TE/NT setting	Not fitted[1]	1-2
X7	Port 4 TE/NT setting	Not fitted[1]	1-2

1 Links X4 to X7 are normally fitted to a single pin of the respective link when in the TE mode. This ensures that they are available for fitting when changing a port to NT

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
L1	Green	See Note 1
L2	Green	See Note 2

Note *There are two status LEDs for each port.*

1 L1 indicates the status of the port at Layer 1 as follows:

- If the LED is Off, there are no active calls.
- If the LED is flashing, the port is attempting to activate the Layer 1 link.
- If the LED is On, the Layer 1 is active, clock can be extracted by the TEs and calls can be made.

2 L2 indicates the status of the port at Layer 2 as follows:

- If the LED is Off the D-channel is inactive and no TEI is assigned. On an NT port this occurs after deactivation. On an TE port this occurs if there are no NTs connected to the port. When an NT has a fixed TEI this state does not occur.
- If the LED is flashing a TEI has been assigned, however the LAPD data link is not established and so there are no active calls.
- If the LED is On the LAPD data link is established and calls can be processed.

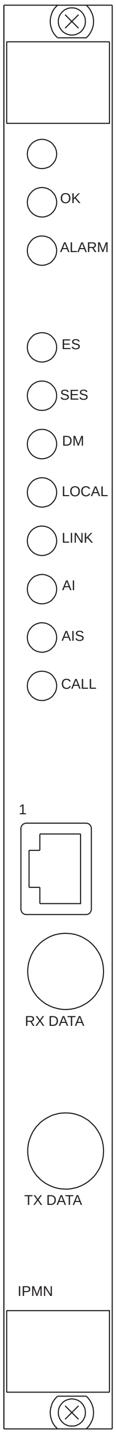
Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	Hardware fault
	Notify service personnel
ALARM LED flashing at 2s intervals	Check that the module providing the backplane clocks is operating
	Notify service personnel
ALARM LED and On LED flashing together	Hardware failure
	Notify service personnel
OK LED flashing at 2s intervals	A diagnostic loopback is active. No action required.

RM CM

ISDN Primary Rate Module NT (IPMN)

PCB 1000-0294



This section describes the ISDN Primary Rate Module NT (IPMN), PCB 1000-0294.

The IPMN is a network interface module that emulates an ISDN NT at the T reference point. It allows for Primary Rate *drop and insert* applications. For example, you could connect an ISDN PABX to the IPMN and the non-ISDN DTEs to SDLM V.24 cards. The PABX and the DTEs could then share a single Primary Rate network connection.

Specifications

Compatibility The IPMN can be fitted to any chassis.

Ports RJ45 (8-way) modular jack female connector on front panel. This is a 120 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive. The pinouts of this connector are assigned such that you need a crossover cable to connect the IPMN to a Jtec IPMT.

75 Ω 1.6/5.6 coaxial threaded female connectors on the front panel. These are labelled as follows:
Tx Data for data transmitted from the device.
Rx Data for data received from the ISDN TE.

Port protocol Telstra standards: TPH1856, TPH2001 Austel TS014.
IPMN-B190. A 30 B+D interface that complies with British Telecom BTNR190 DASS2
IPMN-ETSI: A 30 B+D interface that complies with ETSI ETS-300.

Data rates 2.048 Mbit/s supporting thirty 64 kbit/s B-channels and one 64 kbit/s D-channel.

Layer 1 Point-to-point configuration.
Bit rate is 2.048 Mbit/s ± 50 ppm.
Signal is high density bipolar 3 (HDB3) encoded.

In-service monitoring of the bit stream can be carried out using the four bit cyclic redundancy check (CRC-4) procedure.

Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitoring scheme).

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704. Time slot usage is shown in the following table.

Slot	Usage
0	Frame alignment
1 to 15	B-channels 1 to 15
16	D-channel
17 to 31	B-channels 16 to 30

Layer 2 Protocol is link access procedure on the D-channel (LAPD) (Australia only).

Protocol is DASS2 Layer 2 (IPMN-LAPD).

Protocol is ETS-300 (IPMN-ETSI).

Call types Switched.
D-channel (packet mode) (Australia only).

Module width 1 slot.

Installation

Cabling

The cable needed to connect the IPMN to an ISDN TE using the 120 Ω connectors is detailed below:

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Cable length 75 m max.

Connector RJ45 male. The pinouts of the RJ45 connector are assigned such that you need a crossover cable to connect the IPMN to TE compatible with a Primary Rate NT1.

The cable needed to connect the IPMN to an ISDN TE using the 75Ω connectors is detailed below:

Cable type 75 Ω coaxial.

Cable length 75 m max.

Connector 1.6/5.6 coaxial female.

Notes

The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 kHz.

The frequency/attenuation characteristics of the cabling shall follow a root f law.

If either link X9/1-8 or X9/4-5 is fitted the safety status of the associated front panel port is TNV. European Standard EN60950 applies.

Connecting the IPMN to terminal equipment

1 Run a cable from the ISDN TE through the front cable access duct.

2 Terminate the cable with either an RJ45 connector or a 1.6/5.6 coaxial connector, as shown in the table below, and plug it in. See *Appendix A* for a diagram of the connectors.

RJ45 connector pinouts 120 Ω balanced

IPMN signal code	RJ45 connector
Transmit +	3
Receive +	4
Receive -	5
Transmit -	6
not used	1, 2, 7 and 8

All pins not defined above are not connected (open circuit).

Note *When using the ETSI standard, ETS 300 012:1992, the RJ45 connector is wired differently.*

Coaxial socket pinouts 75 Ω unbalanced

Signal code	Coaxial connector
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

Link settings

Figure 18 below shows the position of the links on the IPMN.

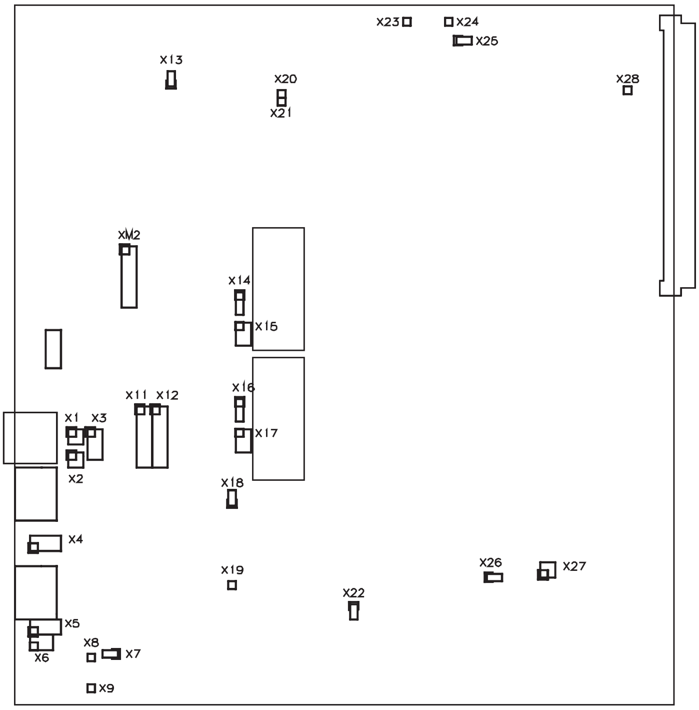


Figure 18: IPMN circuit board, 1000-0294

Normal link settings for the IPMN

The following table shows the normal link settings for the IPMN.

Ref	Normal Setting	Ref	Normal Setting
X1	See below	X16	Not fitted
X2	Not fitted	X17	Not fitted
X3	See below	X18	Not fitted
X4	See below	X19	Not fitted
X5	Not fitted	X20	Not fitted
X6	Not fitted	X21	Not fitted
X7	Not fitted	X22	-
X8	Not fitted	X23	Not fitted
X9	Not fitted	X24	Not fitted
X10		X25	Not fitted
X11	1-2	X26	Not fitted
X12	Not fitted	X27	Not fitted
X13	Not fitted	X28	Not fitted
X14	2-3	XM2	13-14
X15	5-6		

Links X1, X3 and X4 indicate which external connector is used by the IPMN. This can be either the 120 Ω connection via RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following table shows the links for each terminal impedance:

	X1	X3	X4
120 Ω	1-2, 3-4	1-2, 5-6	1-2, 3-4
75 Ω	-	3-4, 7-8	5-6, 7-8

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
DM [3]	Red	Off
LOCAL [4]	Red	Off
LINK [5]	Green	On
AI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821). Only used when CRC-4 is available.

4 LOCAL indicates that the IPMN is not receiving the ISDN synchronising clock reliably and is using the internal clock.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 AI (Alarm Indication) indicates that the IPMN has received a remote alarm from the network, in TS0.

7 AIS (all 1s) indicates an Alarm Indication Signal has been received from the network.

8 CALL indicates one or more calls are present on the IPMN.

Troubleshooting

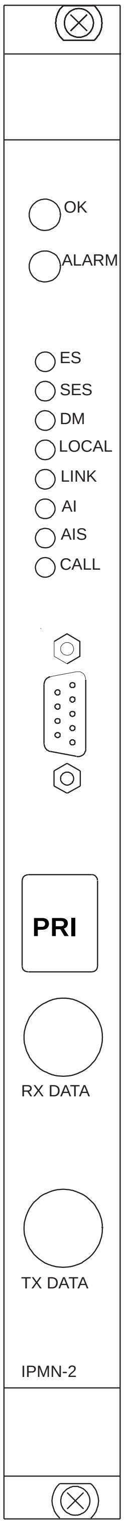
Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s interval	Check CM or RM is operational
	Check that a clock source (e.g. BRMT) is operational[1]
	Notify service personnel
DM ES or SES On intermittently	Check the cable to TE
	Notify service personnel
SES and LOCAL LEDs On continuously	Notify service personnel
AI LED is On for more than 1 minute	Notify service personnel
AIS LED is On	Notify service personnel
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

1 IPMN is a valid reference clock provider.

RM **CM**

ISDN Primary Rate Module NT (IPMN-2)

PCB 1000-1624



This section describes the ISDN Primary Rate Module NT (IPMN-2), PCB 1000-1624.

The IPMN-2 is a network interface module that emulates an ISDN NT at the T reference point. It allows for Primary Rate *drop and insert* applications. For example, you could connect an ISDN PABX to the IPMN-2 and the non-ISDN DTEs to SDLM V.24 cards. The PABX and the DTEs could then share a single Primary Rate network connection.

In addition, the IPMN-2 has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP).

There are three variants of the IPMN-2:

- IPMN-ETSI (Provides NT services for TE that supports European standards: I-CTR4, TBR4 and ETS 300 102)
- IPMN-T014 (Provides NT services for TE that supports Australian standard TS 014)
- IPMN-B190 (Provides NT services for TE that supports BT specification BTNR 190).

Note *The IPMN-2 ETSI must* ***not*** *be connected to the public network ISDN. It may, however, be connected to 2 Mbit/s leased lines, both structured and unstructured.*

Specifications

Compatibility	The IPMN-2 can be fitted to any chassis.
Ports	RJ45 (8-way) modular jack female connector on front panel. This is a 120 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive. 75 Ω 1.6/5.6 coaxial threaded female connectors on the front panel. These are labelled as follows: **Tx Data** for data transmitted from the device. **Rx Data** for data received from the ISDN TE.
Port protocol	This module can be connected to equipment that is compliant with the following standards: Telstra standards: TPH1856, TPH2001 Austel TS014 European standards I-CTR4, TBR4, ETS 300 102 German Delta BAPT 223 ZV25 French Delta CSE P 10-20 A. IPMN-B190. A 30 B+D interface that complies with British Telecom BTNR190 DASS2.
Data rates	2.048Mbit/s supporting thirty 64kbit/s B-channels and one 64kbit/s D-channel.
Layer 1	Point-to-point configuration. Bit rate is 2.048Mbit/s ± 50 ppm. CTR12 Input Jitter Profile: 1.3 UI 20Hz to 2400Hz 0.2 UI 18kHz to 100kHz. Signal is high density bipolar 3 (HDB3) encoded. In-service monitoring of the bit stream can be carried out using the four bit cyclic redundancy check (CRC-4) procedure. Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitoring scheme).

CRC must be disabled for France.

Layer 1 conforms to the following:

- CTR12 (120 Ω balanced unstructured)
- TBR13 (120 Ω balanced, structured)
- BAPT 221 ZV MV9a/b (120 Ω balanced, structured).

Layer 2 Protocol is Link Access Procedure on the D-channel (LAPD).

Protocol is DASS2 Layer 2

Call types Switched.
D-channel (packet mode).

Module width 1 slot.

Installation

Cabling

The cable needed to connect the IPMN-2 to an ISDN TE using the 120 Ω connectors is detailed below:

Cable type 0.5mm dual twisted-pair solid conductor with metallic shield.

Cable length 75m max.

Connector RJ45 male.

The cable needed to connect the IPMN-2 to an ISDN TE using the 75Ω connectors is detailed below:

Cable type 75Ω coaxial.

Cable length 75m max.

Connector 1.6/5.6 coaxial female.

The following table shows the cabling specifications for external connections to the PAP port.

Cable type shielded multi-core.

Connector DB9 male.

Notes

The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 kHz.

The frequency/attenuation characteristics of the cabling shall follow a root f law.

If either link X11/1-8 or X11/4-5 is fitted the safety status of the associated front panel port is TNV. European Standard EN60950 applies.

Connecting the IPMN-2 to terminal equipment

1. Run a cable from the ISDN TE through the front cable access duct.
2. Terminate the cable with either an RJ45 connector or a 1.6/5.6 coaxial connector, as shown in the table below, and plug it in. See *Appendix A* for a diagram of the connectors.

RJ45 connector pinouts 120 Ω balanced

The following tables show the four possible transmit/receive pinouts for the 120Ω RJ45 socket. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'physical data input'. The links relevant to the 120Ω pinout are X6, X7 and X8. Links X7 and X8 should be considered as a mutually exclusive pair.

The first table shows the recommended link settings for both ISO and proprietary (non-ISO) pin outs. The shaded areas define the ISO pinouts. The second table shows the acceptable alternative pinouts and the link settings required to achieve them.

		Link X6		
		1-2, 3-4	5-6, 7-8	
X7	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Transmit +
		Pin 2	Pin 6	Transmit –
X8	Not fitted	Pin 4	Pin 4	Receive +
		Pin 5	Pin 5	Receive –
		ISO	Non-ISO	

		Link X6		
		1-2, 3-4	5-6, 7-8	
X7	Not fitted	Pin 4	Pin 4	Transmit +
		Pin 5	Pin 5	Transmit –
X8	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Receive +
		Pin 2	Pin 6	Receive –

All pins not used are not connected (open circuit).

Coaxial socket pinouts 75 Ω unbalanced

Signal code	Coaxial connector
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

PAP connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

All pins not used are not connected (open circuit).

Link settings

Figure 19 below shows the position of the links on the IPMN-2, 10001624.00, issue 2 and 10001624.02, issue 2.

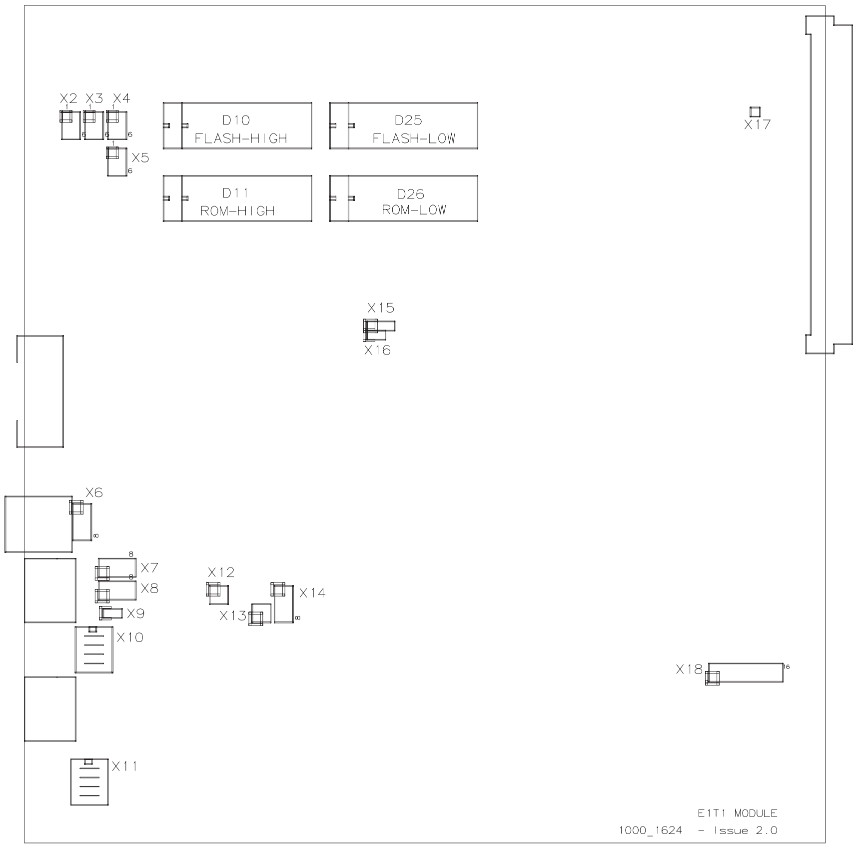


Figure 19: IPMN-2 circuit board, 10001624.00, issue 2 and 10001624.02, issue 2

Normal link settings for the IPMN-2, 10001624.00, issue 2 and 10001624.02, issue 2

The following table shows the normal link settings for the IPMN-B190/UKS.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X10	1-8, 2-7, 3-6, 4-5
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	Not fitted	X16	Not fitted
X8	1-2, 3-4, 5-6, 7-8	X17	-
X9	Not fitted	X18	13-14

The following table shows the normal link settings for the IPMN-ETSI/UKS.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X10	Not fitted
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	1-2, 3-4	X15	2-3
X7	1-2, 3-4, 5-6, 7-8	X16	Not fitted
X8	Not fitted	X17	-
X9	Not fitted	X18	13-14

The following table shows the normal link settings for the IPMN-T014/AUS and IPMN-T014/BTA.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X10	Not fitted
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	1-2, 3-4, 5-6, 7-8	X16	Not fitted
X8	Not fitted	X17	-
X9	Not fitted	X18	13-14

Links X6, X7, X8 and X10 indicate which external connector is used by the IPMN-2. This can be either the 120 Ω connection via RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following tables show the link settings for each connector interface type:

	X6	X7	X8	X10
120 Ω	1-2, 3-4	1-2, 3-4, 5-6, 7-8	Not fitted	Not fitted
75 Ω	1-2, 3-4	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7, 3-6, 4-5

UK termination

	X6	X7	X8	X10
120 Ω	5-6, 7-8	1-2, 3-4 5-6, 7-8	Not fitted	Not fitted
75 Ω	5-6, 7-8	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7, 3-6, 4-5

Australian termination

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Diagnostic test links

Loopbacks If you want to perform diagnostic test links you must install link 18 in position 3-4. The link must be removed for normal operation.

AIS If you want to generate an Alarm Indication Signal (AIS) to the line you must install link X18 in position 1-2.

Free run If you want the board to present AIS to the line if the device is not synchronised to an external source, you must install link X18 in position 7-8.

Figure 20 below shows the position of the links on the IPMN-2, 10001624.03 Rev.1.

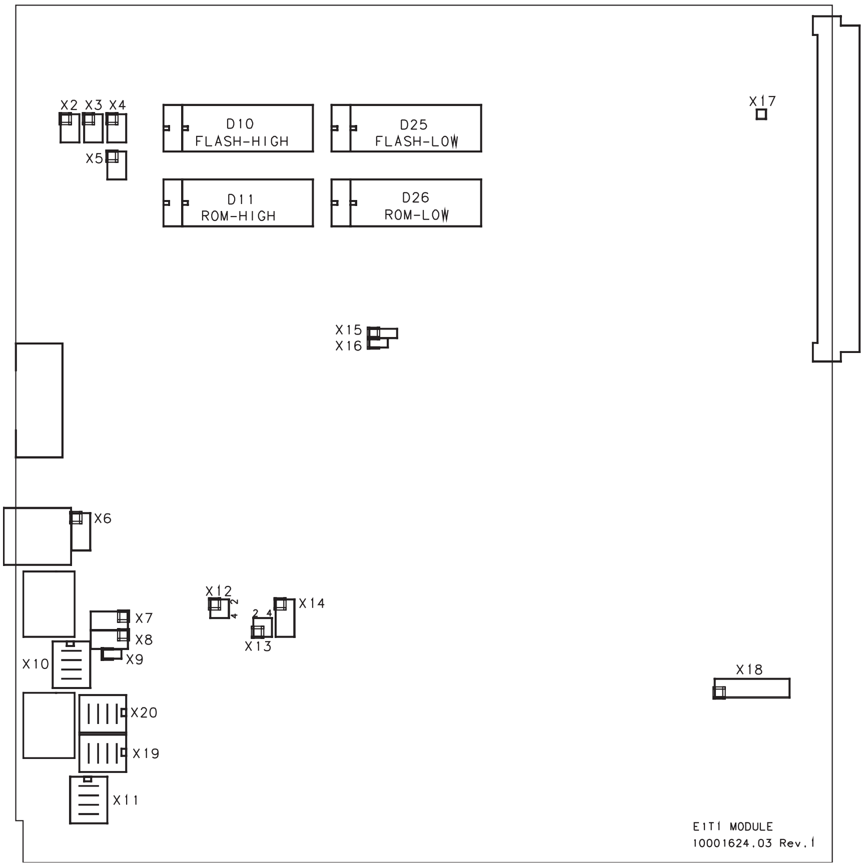


Figure 20: IPMN-2 circuit board, 10001624.03 Rev.1

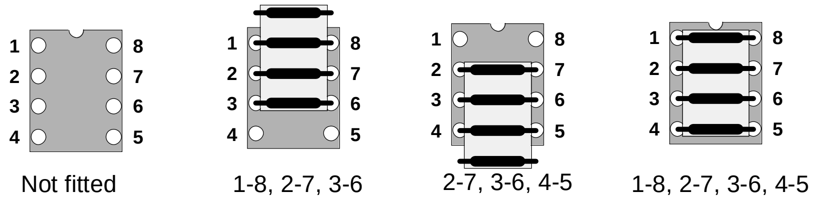
Normal link settings for the IPMN-2, 10001624.03 Rev.1

The following table shows the normal link settings for the IPMN-B190/UKS and IPMN-ETSI.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X11	Not fitted
X2	Not fitted	X12	Not fitted
X3	Not fitted	X13	Not fitted
X4	Not fitted	X14	1-2, 3-4
X5	3-5	X15	2-3
X6	1-2, 3-4	X16	Not fitted
X7	1-2, 3-4, 5-6, 7-8	X17	-
X8	Not fitted	X18	13-14
X9	Not fitted	X19	1-8, 2-7, 3-6, 4-5
X10	Not fitted	X20	1-8, 2-7, 3-6, 4-5

Links X6, X7, X8 and X10 indicate which external connector is used by the IPMN-2. This can be either a 120 Ω connection via an RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following diagram shows the relationship of the pins for links X10, X11, X19 and X20.



The following tables show the factory-fitted link settings for each connector interface type:

Ref	*X6	*X7	X8	X10	X19
120 Ω	1-2, 3-4	1-2, 3-4, 5-6, 7-8	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5
75 Ω	Don't care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

* See page 5-58 for valid alternative positions for Links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Diagnostic test links

Loopbacks If you want to perform diagnostic test links you must install link 18 in position 3-4. The link must be removed for normal operation.

AIS If you want to generate an Alarm Indication Signal (AIS) to the line you must install link X18 in position 1-2.

Free run If you want the board to present AIS to the line if the device is not synchronised to an external source, you must install link X18 in position 7-8.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
DM [3]	Red	Off
LOCAL [4]	Red	Off
LINK [5]	Green	On
AI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821). Only used when CRC-4 is available.

4 LOCAL indicates that the IPMN-2 is not receiving the ISDN synchronising clock reliably and is using the internal clock.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 AI (Alarm Indication) indicates that the IPMN-2 has received a remote alarm from the network, in TS0.

7 AIS (all 1s) indicates an Alarm Indication Signal has been received from the network.

8 CALL indicates one or more calls are present on the IPMN-2.

Troubleshooting

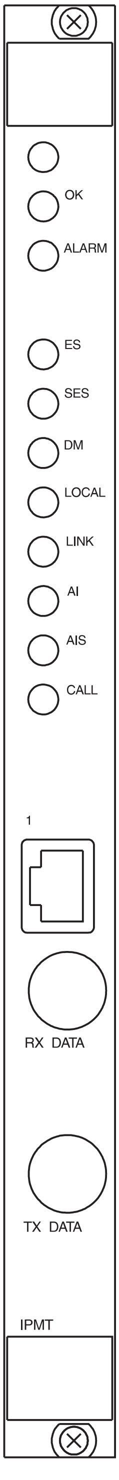
Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel.
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a clock source (e.g. BRMT) is operational[1]
	Notify service personnel
DM ES or SES On intermittently	Check the cable to TE
	Notify service personnel
SES and LOCAL LEDs On continuously	Notify service personnel
AI LED is On for more than 1 minute	Notify service personnel
AIS LED is On	Notify service personnel
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

1 IPMN-2 is a valid reference clock provider.

RM CM

ISDN Primary Rate Module TE (IPMT)

PCB 1000-0294



This section describes the ISDN Primary Rate Module TE (IPMT), PCB 1000-0294.

The IPMT is an ISDN Primary Rate module that connects to ISDN at the T reference point.The IPMT provides medium-to-large capacity for network access. One or more IPMTs can be used in a chassis, each providing 30 B-channels for connection to an ISDN Primary Rate NT1.

Specifications

Compatibility The IPMT is a 2.048 Mbit/s network access module and can be fitted to any chassis.

Ports RJ45 (8-way) modular jack female connector on front panel. This is a 120 Ω balanced connection which requires two pairs of wires, one to transmit and one to receive.

75 Ω 1.6/5.6 coaxial threaded female connectors on the front panel. These are labelled as follows:
Tx Data for data transmitted from the device.
Rx Data for data received from the ISDN NT1.

Port protocol Telstra standards TPH1856, TPH2001
Austel TS014.
British Telecom standard BTNR190 DASS2.

Data rates 2.048 Mbit/s supporting thirty 64 kbit/s B-channels and one 64 kbit/s D-channel.

Layer 1 Point-to-point configuration.
Bit rate is 2.048 Mbit/s ± 50 ppm.
Signal is high density bipolar 3 (HDB3) encoded.

In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure.

Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitor scheme). The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704. Time slot usage is shown in the table below.

Time Slot	Usage
0	Frame alignment
1 to 15	B-channels 1 to 15
16	D-channel
17 to 31	B-channels 16 to 30

Layer 2 Protocol is link access procedure on the D-channel (LAPD).

Protocol is DASS2 Layer 2.

Call types Switched
Semipermanent
D-channel (packet mode) (Australia only)

Module width 1 slot.

Installation

Cabling

The cable needed to connect the IPMT to an ISDN NT1 using the 120 Ω connectors is detailed below.

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Cable length 75 m max.

Connector RJ45 male.

The cable needed to connect the IPMT to an ISDN NT1 using the 75 Ω connectors is detailed below.

Cable type 75 Ω coaxial.

Cable length 75 m max.

Connector 1.6/5.6 coaxial female.

Notes

The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 kHz.

The frequency/attenuation characteristics of the cabling shall follow a root f law.

The ports may be subjected to overvoltages when connected to an ISDN network. This is caused by atmospheric discharges and power supply disturbances.

Connecting the IPMT to an ISDN Primary Rate service

Warning Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

1 Run a cable from the ISDN NT1 through the front cable access duct of the subrack.

2 Terminate the cable with either an RJ45 connector or a 1.6/5.6 coaxial connector, as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts - 120 Ω balanced

IPMT signal code	RJ45 connector TE pin
Transmit +	4
Receive +	3
Receive -	6
Transmit -	5
not used	1, 2, 7 and 8

All pins not used are not connected (open circuit).

Coaxial socket pinouts - 75 Ω unbalanced

Signal code	Coaxial connector
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

Link settings

Figure 21 below shows the position of the links on the IPMT.

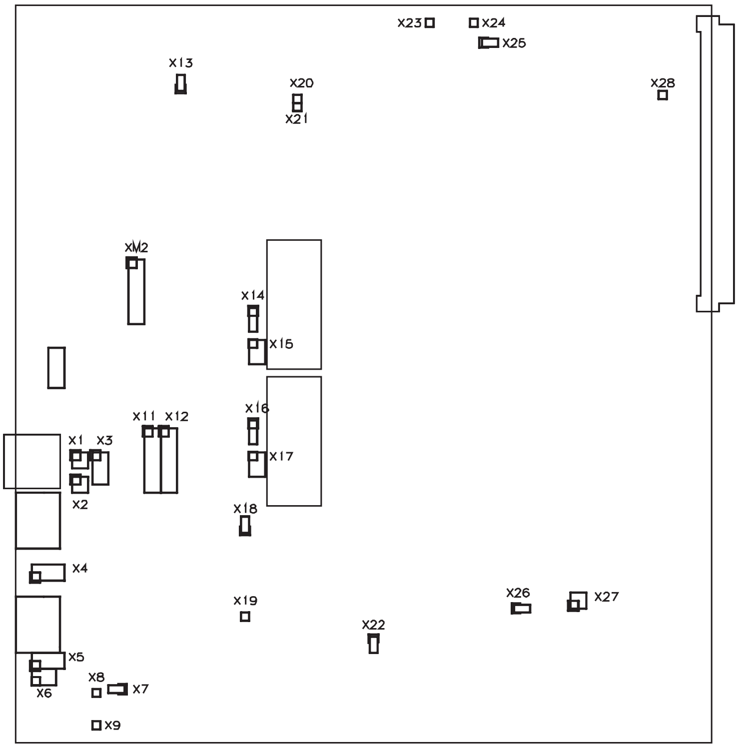


Figure 21: IPMT circuit board, 1000-0294

Note *The orientation of X1 is different between issue 1.0 and issue 1.1 of the circuit board.*

Normal link settings for the IPMT

The following table lists the normal link settings for the IPMT.

Ref	Normal Setting	Ref	Normal Setting
X1	See below	X15	5-6
X2	Not fitted	X16	Not fitted
X3	See below	X17	Not fitted
X4	See below	X18	Not fitted
X5	Not fitted	X19	Not fitted
X6	Not fitted	X20	Not fitted
X7	Not fitted	X21	Not fitted
X8	Not fitted	X22	Not fitted
X9	Not fitted	X23	Not fitted
X10	Not fitted	X24	Not fitted
X11	1-2	X25	Not fitted
X12	Not fitted	X26	Not fitted
X13	Not fitted	X27	Not fitted
X14	2-3	X28	Not fitted
XM1	Not fitted	XM2	Not fitted

Links X1, X3 and X4 indicate which external connector is used by the IPMT. This can be either the 120 Ω connection via RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following table shows the links for each terminal impedance:

	X1	X3	X4
120 Ω	1-2, 3-4	1-2, 5-6	1-2. 3-4
75 Ω	Not fitted	3-4, 7-8	5-6, 7-8

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
DM [3]	Red	Off
LOCAL [4]	Red	Off
LINK [5]	Green	On
AI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of 1×10^{-3} (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of 1×10^{-6} (ITU-T G.821). Applies to CRC0 only.

4 LOCAL indicates that the IPMT is not receiving the ISDN synchronising clock reliably and is using the internal clock.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 AI (Alarm Indication) indicates that the IPMT has received a remote alarm from the network in TS0.

7 AIS (all 1s) indicates an Alarm Indication Signal has been received from the network.

8 CALL indicates one or more calls are present on the IPMT.

Troubleshooting

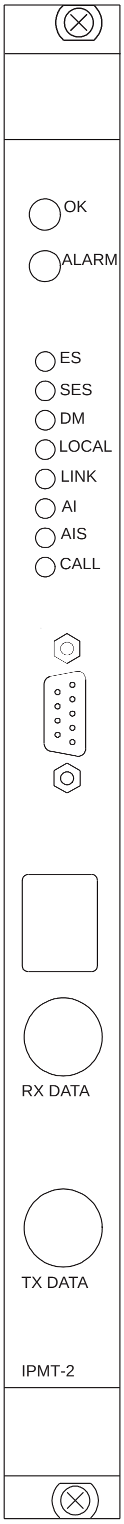
Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s interval	Check CM or RM is operational
	Check that a clock source (e.g. IPMT or BRMT) is operational[1]
	Notify service personnel
DM ES or SES On intermittently	Check cable to NT1
	Notify service personnel
SES and LOCAL LEDs On continuously	Notify service personnel
AI LED is On for more than 1 minute	Notify service personnel
AIS LED is On	Notify service personnel
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

1 IPMT is a valid reference clock provider.

RM CM

ISDN Primary Rate Module TE (IPMT-2)

PCB 1000-1624



This section describes the ISDN Primary Rate Module TE (IPMT-2), PCB 1000-1624.

There are three variants of the IPMT-2:

- IPMT-T014 (Australian standard TS 014 implementation)
- IPMT-B190 (BT specification BTNR 190 implementation)
- IPMT-ETSI (European specification I-CTR4).

The IPMT-2 is an ISDN Primary Rate module that connects to ISDN at the T reference point. The IPMT-2 provides medium-to-large capacity for network access. One or more IPMTs can be used in a 15 slot chassis, each providing 30 B-channels for connection to an ISDN Primary Rate NT1.

Specifications

Compatibility The IPMT-2 is a 2.048Mbit/s network access module and can be fitted to any chassis.

Ports RJ45 (8-way) modular jack female connector on front panel. This is a 120 Ω balanced connection which requires two pairs of wires, one to transmit and one to receive.

75 Ω 1.6/5.6 coaxial threaded female connectors on the front panel. These are labelled as follows:
Tx Data for data transmitted from the device
Rx Data for data received from the ISDN NT1.

Port protocol Telstra standards TPH1856, TPH2001
Austel TS014.
European standards I-CTR4, TBR4, ETS 300 102.
German Delta BAPT 223 ZV25.
French Delta CSE P 110-20 A.
British Telecom standard BTNR190 DASS2.

Data rates 2.048Mbit/s supporting thirty 64kbit/s B-channels and one 64kbit/s D-channel.

Layer 1 Point-to-point configuration.
Bit rate is 2.048Mbit/s ± 50 ppm.
Signal is high density bipolar 3 (HDB3) encoded.

In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure.

Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count (DM is below the resolution of this monitor scheme).

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704. Time slot 0 is used for frame alignment and timeslot 16 is used for signalling.

CRC must be disabled for France.

In addition to the relevant parts of the protocol specifications above, Layer 1 conforms to the following:

- CTR12 (120 Ω balanced, unstructured)
- TBR13 (120 Ω balanced, structured)
- BAPT 221 ZV MV9a/b (120 Ω balanced, structured).

Layer 2 Protocol is Link Access Procedure on the D-channel (LAPD).

Protocol is DASS2 Layer 2.

Call types Switched.
Semipermanent.
D-channel (packet mode) (Australia only)

Module width 1 slot.

Installation

Cabling

The cable needed to connect the IPMT-2 to an ISDN NT1 using the 120 Ω connectors is detailed below:

Cable type 0.5mm dual twisted-pair solid conductor with metallic shield.

Cable length 75m max.

Connector RJ45 male.

The cable needed to connect the IPMT-2 to an ISDN NT1 using the 75 Ω connectors is detailed below:

Cable type 75Ω coaxial.

Cable length 75m max.

Connector 1.6/5.6 coaxial female.

The following table shows the cabling specifications for external connections to the PAP port.

Cable type shielded multi-core.

Connector DB9 male.

Notes

The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 kHz.

The frequency/attenuation characteristics of the cabling shall follow a root f law.

If either link X11/1-8 or X11/4-5 is fitted the safety status of the front panel port associated with the link is TNV. European Standard EN60950 applies.

The ports may be subjected to overvoltages when connected to an ISDN network. These may be caused by such rare incidents as atmospheric discharges or power surges.

Connecting the IPMT-2 to an ISDN Primary Rate service

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

1 Run a cable from the ISDN NT1 through the front cable access duct of the subrack.

2 Terminate the cable with either an RJ45 connector or a 1.6/5.6 coaxial connector, as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts - 120 Ω balanced

The following tables show the four possible transmit/receive pinouts for the 120Ω RJ45 socket. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'physical data input'. The links relevant to the 120Ω pinout are X6, X7 and X8. Links X7 and X8 should be considered as a mutually exclusive pair.

The first table shows the recommended link settings for both ISO and proprietary (non-ISO) pin outs. The shaded areas define the ISO pinouts. The second table shows the acceptable alternative pinouts and the link settings required to achieve them.

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	Not fitted	Pin 4	Pin 4	Transmit +
		Pin 5	Pin 5	Transmit –
X8	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Receive +
		Pin 2	Pin 6	Receive –
		ISO	**Non-ISO**	

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Transmit +
		Pin 2	Pin 6	Transmit –
X8	Not fitted	Pin 4	Pin 4	Receive +
		Pin 5	Pin 5	Receive –

All pins not used are not connected (open circuit).

Coaxial socket pinouts - 75 Ω unbalanced

Signal code	Coaxial connector
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

PAP connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

All pins not used are not connected (open circuit).

Link settings

Figure 22 below shows the position of the links on the IPMT-2, 10001624.00, issue 2 and 10001624.02, issue 2.

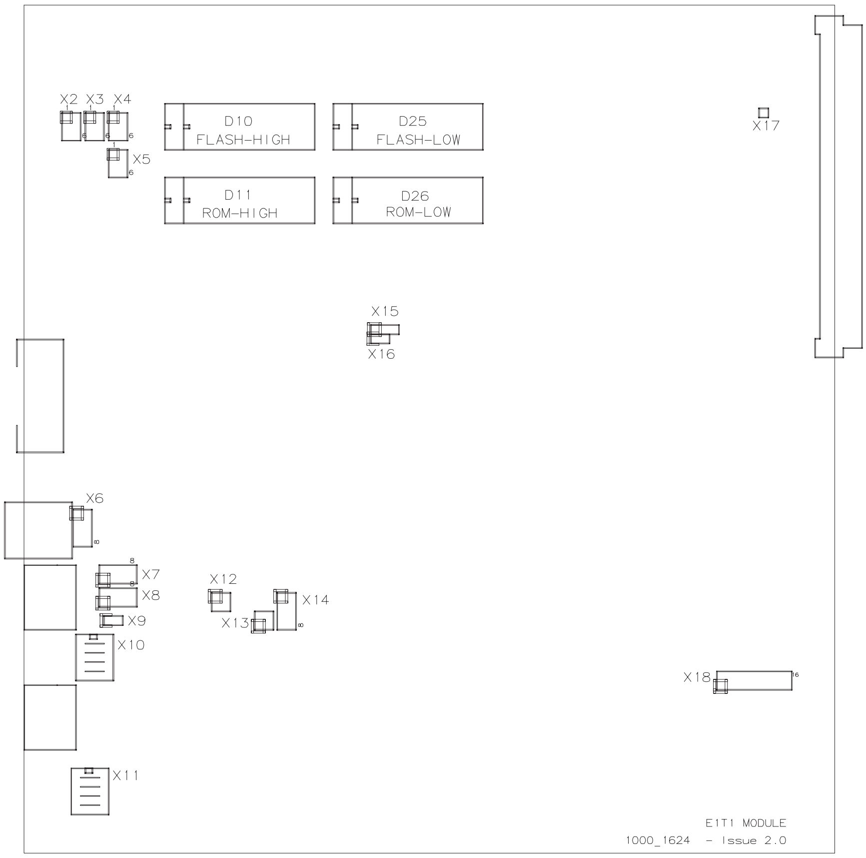


Figure 22: IPMT circuit board, 10001624.00, issue 2 and 10001624.02, issue 2

Normal link settings for the IPMT-2, 10001624.00, issue 2 and 10001624.02, issue 2

The following table lists the normal link settings for the IPMT-B190.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X10	1-8, 2-7, 3-6, 4-5
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	Not fitted	X16	Not fitted
X8	1-2, 3-4, 5-6, 7-8	X17	-
X9	Not fitted	X18	Not fitted

The following table lists the normal link settings for the IPMT-T014.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X10	Not fitted
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	Not fitted	X16	Not fitted
X8	1-2, 3-4, 5-6, 7-8	X17	-
X9	Not fitted	X18	Not fitted

Links X6, X7, X8 and X10 indicate which external connector is used by the IPMT-2. This can be either the 120 Ω connection via RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following tables show the link settings for each connector interface type:

	X6	X7	X8	X10
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

UK termination

	X6	X7	X8	X10
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

Australian termination

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Diagnostic test links

Loopbacks If you want to perform diagnostic test links you must install link 18 in position 3-4. The link must be removed for normal operation.

AIS If you want to generate an Alarm Indication Signal (AIS) to the line you must install link X18 in position 1-2.

Free run If you want the board to present AIS to the line and if the device is not synchronised to an external source, you must install link 18 in position 7-8.

Figure 23 below shows the position of the links on the IPMT-2, 10001624.03 Rev.1.

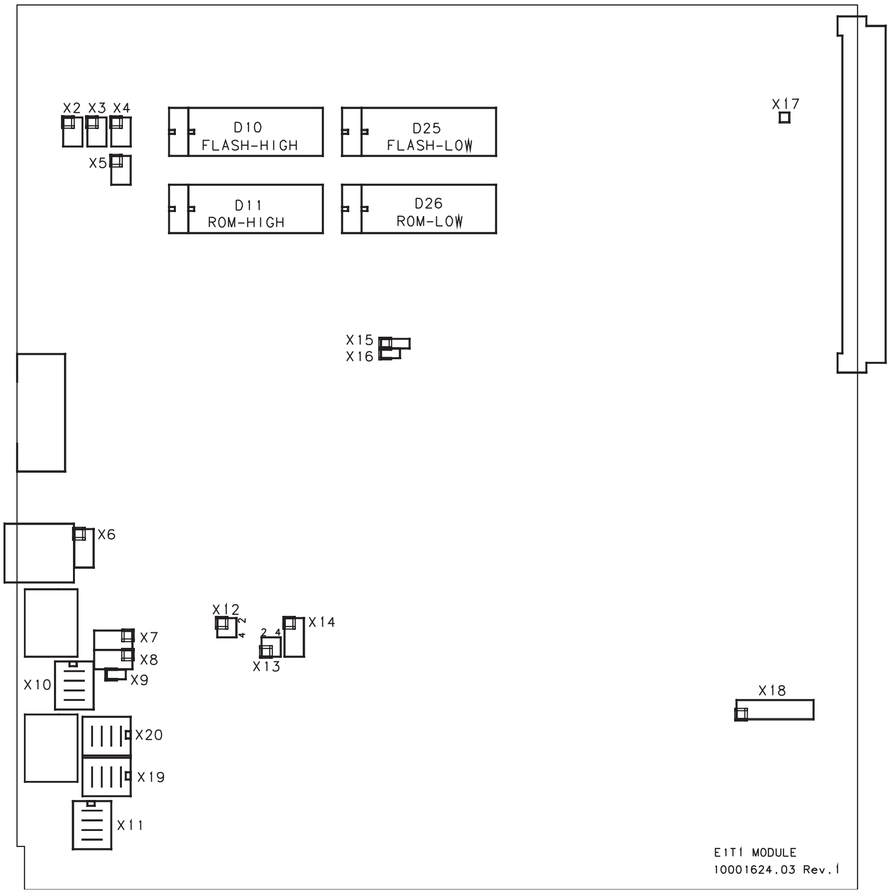


Figure 23: IPMT-2 circuit board, 10001624.03 Rev.1

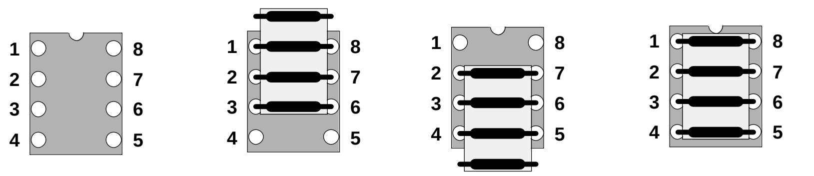
Normal link settings for the IPMT-2, 10001624.03 Rev.1

The following table lists the normal link settings for the IPMT-B190 and IPMT-ETSI.

Ref	Normal Setting	Ref	Normal Setting
X1	-	X11	Not fitted
X2	Not fitted	X12	Not fitted
X3	Not fitted	X13	Not fitted
X4	Not fitted	X14	1-2, 3-4
X5	3-5	X15	2-3
X6	1-2, 3-4	X16	Not fitted
X7	Not fitted	X17	-
X8	1-2, 3-4, 5-6, 7-8	X18	Not fitted
X9	Not fitted	X19	1-8, 2-7, 3-6, 4-5
X10	Not fitted	X20	1-8, 2-7, 3-6, 4-5

Links X6, X7, X8 and X10 indicate which external connector is used by the IPMT-2. This can be either the 120 Ω connection via RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following diagrams show the relationship of the pins for links X10, X11, X19 and X20.



Not fitted   1-8, 2-7, 3-6   2-7, 3-6, 4-5   1-8, 2-7, 3-6, 4-5

The following table shows the factory-fitted link settings for each connector interface type:

Ref	*X6	*X7	X8	X10	X19
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don’t care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

*Refer to page 5-78 for valid alternative positions for links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11	Link X20
Tx shield to Ground	1-8, 2-7, 3-6 fitted 4-5 not fitted	Not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted 1-8 not fitted	Not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted	Not fitted
Tx and Rx shields not Grounded	Not fitted	1-8, 2-7, 3-6, 4-5

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Diagnostic test links

Loopbacks If you want to perform diagnostic test links you must install link 18 in position 3-4. The link must be removed for normal operation.

AIS If you want to generate an Alarm Indication Signal (AIS) to the line you must install link X18 in position 1-2.

Free run If you want the board to present AIS to the line and the device is not synchronised to an external source, you must install link 18 in position 7-8.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
DM [3]	Red	Off
LOCAL [4]	Red	Off
LINK [5]	Green	On
AI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821). Applies to CRC0 only.

4 LOCAL indicates that the IPMT-2 is not receiving the ISDN synchronising clock reliably and is using the internal clock.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 AI (Alarm Indication) indicates that the IPMT-2 has received a remote alarm from the network in TS0.

7 AIS (all 1s) indicates an Alarm Indication Signal has been received from the network.

8 CALL indicates one or more calls are present on the IPMT-2.

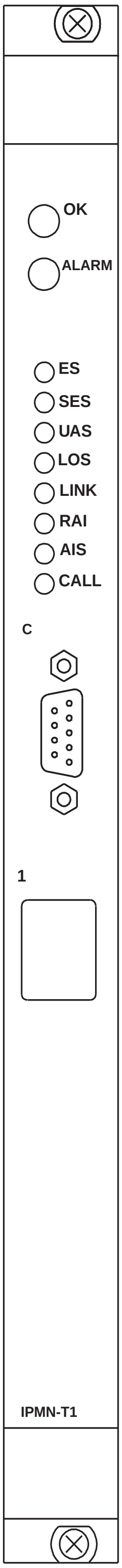
Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a clock source (e.g. IPMT-2 or BRMT) is operational[1]
	Notify service personnel
DM ES or SES On intermittently	Check cable to NT1
	Notify service personnel
SES and LOCAL LEDs On continuously	Notify service personnel
AI LED is On for more than 1 minute	Notify service personnel
AIS LED is On	Notify service personnel
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

1 IPMT-2 is a valid reference clock provider.

RM CM

ISDN Primary Rate Module NT–T1 (IPMN-T1)



This section describes the T1 ISDN Interface Module, the IPMN-T1.

The IPMN-T1 is a user interface (NT) module that emulates an ISDN network. It allows for Primary Rate *drop and insert* applications. For example, you could connect an ISDN PABX to the IPMN-T1 and the non-ISDN DTEs to SDLM V.24 cards. The PABX and the DTEs could then share a single Primary Rate network connection.

The IPMN-T1 has a V.24 serial port which can be used in conjunction with the ISDN Protocol Analyser Package (PAP).

The IPMN-T1 (ESS) provides NT services for a TE that supports AT&T standard TR41459.

Specifications

Compatibility	The IPMN-T1 can be fitted to all models.
Ports	RJ45 (8-way) modular jack female connector on front panel. This is a 100 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive.
Port protocol	This module can be connected to equipment that is compliant with AT&T standard TR41459 – 4ESS/5ESS.
Data rates	1.544 Mbit/s supporting twenty-three 64kbit/s B-channels and one 64kbit/s D-channel.
Layer 1	Conforms to FCC Part 68 Network Compliance requirements.

Point-to-point configuration.
Bit rate is 1.544Mbit/s +/- 50 bit/s.
Signal is Bipolar 8, Zero Substitution (B8ZS) encoded.

Line Framing is ESF.

Long Haul CSU.

Receiver sensitivity: 0 to -36db.

In-service monitoring of the bit stream is carried out using the six bit cyclic redundancy check (CRC-6) procedure. CRC-6 is used to monitor the received signal (ES, SES, and UAS).

In addition to the relevant parts of the protocol specifications above, Layer 1 conforms to the following:

- ANSI T1.403
- AT&T TR62411
- ITU-T G.704
- Layer 2

Protocol is Link Access Procedure on the D-channel (LAPD)

Call types	Switched
	D-channel (packet mode) (where available).
Module width	1 slot.

Installation

Cabling

The cable needed to connect the IPMN-T1 to an ISDN TE using the 100 Ω connectors is detailed below:

Cable type	0.63mm dual twisted-pair solid conductor with metallic shield.
Connector	RJ45 male conforming to FCC RJ48C standard.

The cabling specifications for external connections to the PAP port are as follows:

Cable type	shielded multi-core
Connector	DB9 male

Connecting the IPMN-T1 to terminal equipment

1 Run a cable from the ISDN TE through the front cable access duct.

2 Terminate the cable with an RJ45 connector as shown in the table below, and plug it in. See *Appendix A* for a diagram of the connectors.

RJ45 connector pinouts

The first table below shows the default pinouts for the RJ45 socket to the FCC RJ48C standard. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'Physical data input'. The second table shows valid link settings to achieve alternative pinouts.

	FCC RJ48C		
Link X6	1-2, 6-7		
Link X7	1-2, 6-7		
	Pin 1	(R)	Transmit +
	Pin 2	(T)	Transmit -
	Pin 4	(R1)	Receive +
	Pin 5	(T1)	Receive -

	Alternative 1	Alternative 2	Alternative 3	
Link X6	4-5, 6-7	2-3, 5-6	3-4, 5-6	
Link X7	4-5, 6-7	2-3, 5-6	3-4, 5-6	
	Pin 3	Pin 4	Pin 4	Transmit +
	Pin 6	Pin 5	Pin 5	Transmit -
	Pin 4	Pin 1	Pin 3	Receive +
	Pin 5	Pin 2	Pin 6	Receive -

Unused pins are not connected (open circuit).

PAP (Protocol Analyser Package) connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

Unused pins are not connected (open circuit).

Link settings

Figure 24 below shows the position of the links on the IPMN-T1, 10003088.00 Rev.2.

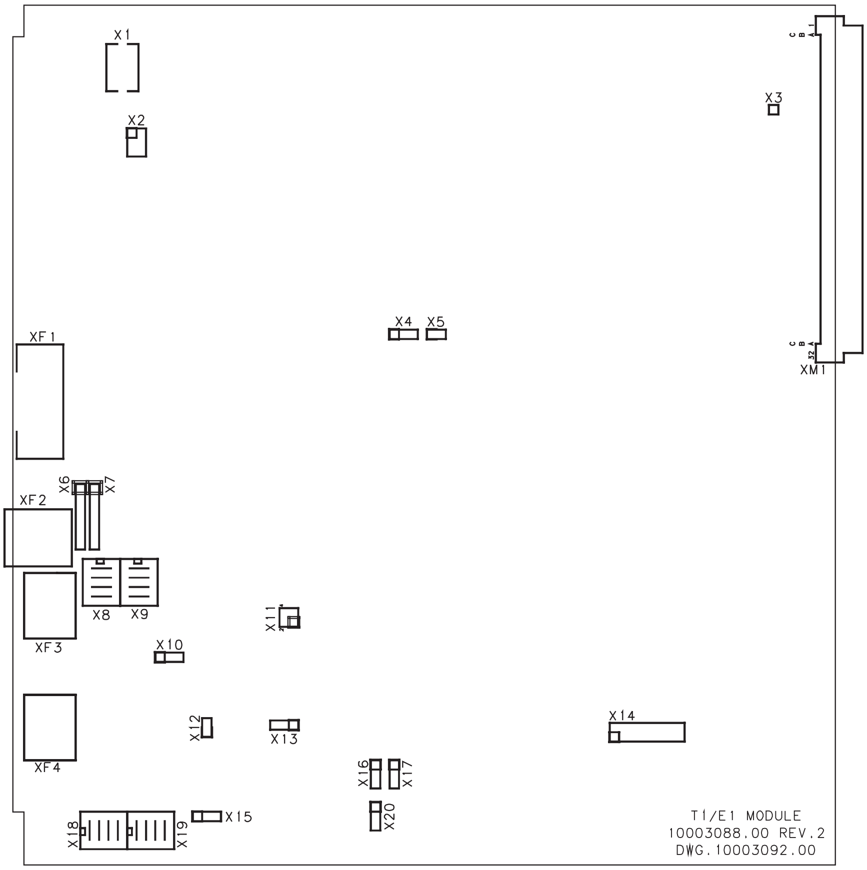


Figure 24: IPMN-T1 circuit board, 10003088.00 Rev.2

Normal link settings for the IPMN-T1, 10003088.00 Rev.2

The following table shows the normal link settings for the IPMN-T1 10003088.00 Rev.2.

Ref	Normal Setting	Ref	Normal Setting
X1	—	X11	Not fitted
X2	3-5	X12	Not fitted
X3	—	X13	1-2
X4	2-3	X14	13-14
X5	Not fitted	X15	Not fitted
X6	1-2, 6-7[1]	X16	1-2
X7	1-2, 6-7[1]	X17	1-2
X8	Not fitted	X18	Not fitted
X9	1-8, 2-7, 3-6, 4-5	X19	Not fitted
X10	Not fitted	X20	1-2

1 Links X6 and X7 are used to determine RJ45 connector pinouts. See page 5-89 for information on alternate settings for these links.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
UAS [3]	Red	Off
LOS [4]	Red	Off
LINK [5]	Green	On
RAI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES indicates Errored Seconds (in accordance with AT&T TR62411).

2 SES indicates Severely Errored Seconds (AT&T TR62411).

3 UAS indicates UnAvailable Signal (AT&T TR62411).

4 LOS indicates that the IPMN-T1 is not receiving the T1 signal reliably and is using the internal clock. This also indicates a Red Alarm.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 RAI (Remote Alarm Indication) indicates that the IPMN-T1 is receiving a remote alarm from the PABX. This is also known as a Yellow Alarm.

7 AIS (Alarm Indication Signal) indicates that the IPMN-T1 is receiving an all 1s signal from the PABX. This is also known as a Blue Alarm.

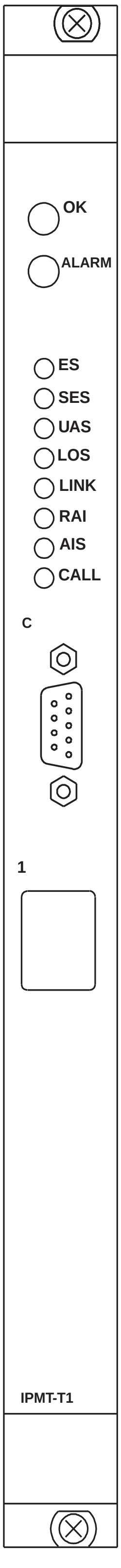
8 CALL indicates one or more calls are present on the IPMN-T1.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings.
	Notify service personnel.
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Notify service personnel
UAS, ES or SES On intermittently	Check the interface cable
	Notify service personnel
SES or LOS LEDs On continuously	Check the interface cable
	Notify service personnel
RAI LED is On for more than 1 minute	Check the interface cable
	Notify service personnel
AIS LED is On	Indicates that the link has been placed in maintenance mode by the PABX
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation.
	Notify service personnel

RM CM

ISDN Primary Rate Module TE -T1 (IPMT-T1)



This section describes the T1 ISDN interface module.

The IPMT-T1 is a network interface TE module. It has built-in CSU components that enable direct connection to a public network.

The IPMT-T1 has a V.24 serial port that can be used in conjunction with the ISDN Protocol Analyser Package (PAP).

The IPMT-T1 (ESS) provides TE services for an NT that supports AT&T Standard TR41459.

Specifications

Compatibility The IPMT-T1 can be fitted to all models.

Ports RJ45 (8-way) modular jack female connector on front panel. This is a 100 Ω balanced connection which requires two pairs of wires, one to transmit and one to receive.

Port protocol AT&T standard TR41459 – 4ESS/5ESS.

Data rates 1.544 Mbit/s supporting twenty-three 64kbit/s B-channels and one 64kbit/s D-channel

Layer 1 Conforms to FCC Part 68 Network Compliance requirements.

Point-to-point configuration.
Bit rate is 1.544Mbit/s +/- 50 bit/s.
Signal is Bipolar 8, Zero Substitution (B8ZS) encoded.

Line Framing is ESF.

Long Haul CSU.

Receiver sensitivity: 0 to -36db.

In-service monitoring of the bit stream is carried out using the six bit cyclic redundancy check (CRC-6) procedure. CRC-6 is used to monitor the received signal (ES, SES, and UAS)

In addition to the relevant parts of the protocol specifications above, Layer 1 conforms to the following:

- ANSI T1.403
- AT&T TR62411
- ITU-T G.704.

Layer 2 Protocol is Link Access Procedure on the D-channel (LAPD).

Call types Switched

D-channel (packet mode) (where available).

Module width 1 slot.

Installation

Cabling

The cable needed to connect the IPMT-T1 to a network interface using the 100 Ω connectors is detailed below.

Cable type 0.63mm dual twisted-pair solid conductor with metallic shield.

Connector RJ45 male conforming to FCC RJ48C standard.

The cabling specifications for external connections to the PAP port are as follows:

Cable type shielded multi-core

Connector DB9 male

Connecting the IPMT-T1 to an ISDN Primary Rate service

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

1 Run a cable from the ISDN NT1 through the front cable access duct of the subrack.

2 Terminate the cable with an RJ45 connector as shown in the tables below, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts

The first table below shows the default pinouts for the RJ45 socket to the FCC RJ48C standard. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'Physical data input'. The second table shows valid link settings to achieve alternative pinouts.

	FCC RJ48C	
Link X6	2-3, 5-6	
Link X7	2-3, 5-6	
	Pin 4 (R)	Transmit +
	Pin 5 (T)	Transmit -
	Pin 1 (R1)	Receive +
	Pin 2 (T1)	Receive -

	Alternative 1	Alternative 2	Alternative 3	
Link X6	3-4, 5-6	1-2, 6-7	4-5, 6-7	
Link X7	3-4, 5-6	1-2, 6-7	4-5, 6-7	
	Pin 4	Pin 1	Pin 3	Transmit +
	Pin 5	Pin 2	Pin 6	Transmit -
	Pin 3	Pin 4	Pin 4	Receive +
	Pin 6	Pin 5	Pin 5	Receive -

Unused pins are not connected (open circuit).

PAP (Protocol Analyser Package) connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

Unused pins are not connected (open circuit).

Link settings

Figure 25 below shows the position of the links on the IPMT-T1, 10003088.00 Rev.2.

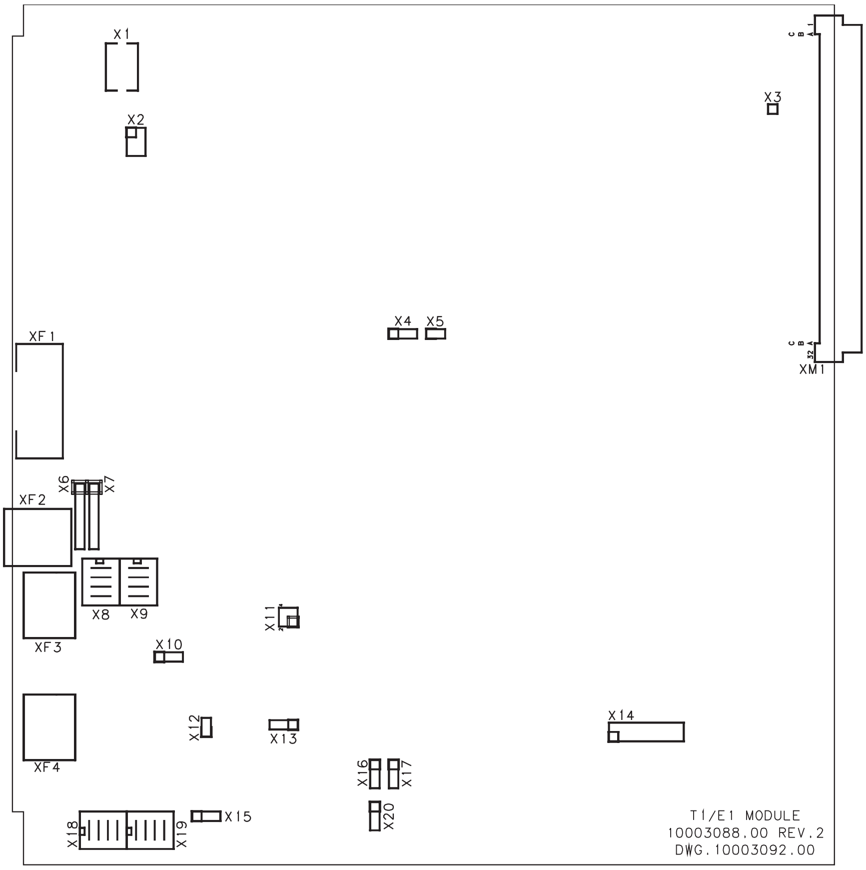


Figure 25: IPMT-T1 circuit board, 10003088.00 Rev.2

Normal link settings for the IPMT-T1, 10003088.00 Rev.2

The following table lists the normal link settings for the IPMT-T1.

Ref	Normal Setting	Ref	Normal Setting
X1	—	X11	Not fitted
X2	3-5	X12	Not fitted
X3	—	X13	1-2
X4	2-3	X14	Not fitted
X5	Not fitted	X15	Not fitted
X6	2-3, 5-6[1]	X16	1-2
X7	2-3, 5-6[1]	X17	1-2
X8	Not fitted	X18	Not fitted
X9	1-8, 2-7, 3-6, 4-5	X19	Not fitted
X10	Not fitted	X20	1-2

1 Links X6 and X7 are used to determine RJ45 connector pinouts. See page 5-97 for information on alternate settings for these links.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
UAS[3]	Red	Off
LOS [4]	Red	Off
LINK [5]	Green	On
RAI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES indicates Errored Seconds (in accordance with AT&T TR62411).

2 SES indicates Severely Errored Seconds (AT&T TR62411).

3 UAS indicates UnAvailable Signal (AT&T TR62411).

4 LOS indicates that the IPMT-T1 is not receiving the T1 signal reliably and is using the internal clock. This also indicates a Red Alarm.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 RAI (Remote Alarm Indication) indicates that the IPMT-T1 is receiving a remote alarm from the network. This is also known as a Yellow Alarm.

7 AIS (Alarm Indication Signal) indicates that the IPMT-T1 is receiving an all 1s signal from the network. This is also known as a Blue Alarm.

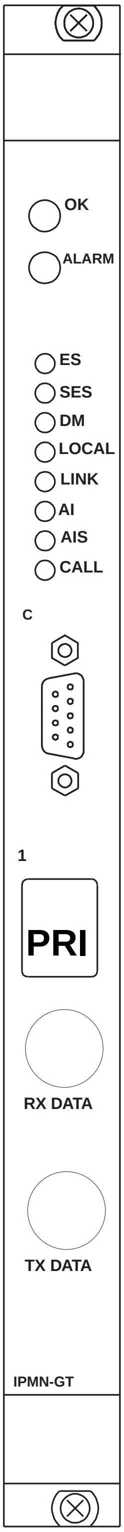
8 CALL indicates one or more calls are present on the IPMT-T1.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Notify service personnel
UAS, ES or SES On intermittently	Check the interface cable
	Notify service personnel
SES or LOS LEDs On continuously	Check the interface cable
	Notify service personnel
RAI LED is On for more than 1 minute	Check the interface cable
	Notify service personnel
AIS LED is On	Indicates that the link has been placed in maintenance mode by the network
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

RM

ISDN Gateway Module (IPMN-GT)



The IPMN-GT is an E1 ISDN module with the ability to convert A-law to µ-law. Apart from this extra feature, the IPMN-GT is functionally identical to the IPMN-2.

The primary application for the module is to allow the connection of international E1/A-law links to devices operating in µ-law environments. The IPMN-GT runs the ETSI ISDN protocol.

Note *The IPMN-GT must **not** be connected to the public network ISDN. It may, however, be connected to 2 Mbit/s leased lines, both structured and unstructured.*

Specifications

Compatibility	The IPMN-GT can be fitted all models.
Ports	RJ45 (8-way) modular jack female connector on front panel. This is a 120 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive. 75 Ω 1.6/5.6 coaxial threaded female connectors on the front panel. These are labelled as follows: **Tx Data** for data transmitted from the device **Rx Data** for data received from the ISDN TE.
Port protocol	This module can be connected to equipment that is compliant with the following standards: European standards I-CTR4, TBR4, ETS 300 102
Data rates	2.048 Mbit/s supporting thirty 64 kbit/s B-channels and one 64 kbit/s D-channel.
Layer 1	Point-to-point configuration. Bit rate is 2.048 Mbit/s +/- 50 ppm. CTR12 Input Jitter Profile: 1.3 UI 20Hz to 2400Hz 0.2 UI 18kHz to 100 kHz. Signal is high density bipolar 3 (HDB3) encoded. In-service monitoring of the bit stream can be carried out using the four bit cyclic redundancy check (CRC-4) procedure. Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES). If CRC is disabled the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitoring scheme.) CRC must be disabled for France. Layer 1 conforms to the following: • CTR12 (120 Ω balanced unstructured) • TBR13 (120 Ω balanced, structured) • BAPT 221 ZV MV9a/b (120 Ω balanced, structured).
Layer 2	Protocol is Link Access Procedure on the D-channel (LAPD).
Call types	Switched.
Module width	1 slot.
A/μ–law conversion	Compliant with ITU G.711.

Installation

Cabling

The cable needed to connect the IPMN-GT to an ISDN TE and NT using the 120 Ω connectors is detailed below:

Cable type	0.5 mm dual twisted-pair solid conductor with metallic shield.
Cable length	75 m max.
Connector	RJ45 male conforming to FCC RJ48C standard.

The cable needed to connect the IPMN-GT to an ISDN TE and NT using the 75Ω connectors is detailed below:

Cable type	75 Ω coaxial.
Cable length	75 m max.
Connector	1.6/5.6 coaxial female.

The cabling specifications for external connections to the PAP port are detailed below:

Cable type	shielded multi-core.
Connector	DB9 male.

Notes *The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 kHz. The frequency/attenuation characteristics of the cabling shall follow a root f law.*

If either link X11/1-8 or X11/4-5 is fitted the safety status of the associated front panel port is TNV. European Standard EN60950 refers.

Connecting the IPMN-GT to equipment

The IPMN-GT can be connected to your equipment using the 120Ω RJ45 connector or the 75Ω coaxial connectors. The module is supplied configured for 120 Ω operation out of the RJ45 socket.

The following table shows the required link settings for each connector interface type:

Ref	X8	X9
120 Ω	Not fitted	1-8, 2-7, 3-6, 4-5
75 Ω	1-8, 2-7, 3-6, 4-5	Not fitted

To connect the module:

1 Run the required cable(s) through the front connector cable access duct of the subrack.

2 Terminate the cable(s) with an appropriate connector, as shown below, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts - 120Ω balanced

The first table below shows the default pinouts for the RJ45 socket to the FCC RJ48C standard for Network mode (NT) mode and User mode (TE). Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'Physical data input'. The second table shows valid link settings to achieve alternative pinouts.

	FCC RJ48C				
	Network Mode (NT)		User Mode (TE)		
Link X6	1-2, 6-7		2-3, 5-6		
Link X7	1-2, 6-7		2-3, 5-6		
	Pin 1	(R)	Pin 4	(R1)	Transmit +
	Pin 2	(T)	Pin 5	(T1)	Transmit -
	Pin 4	(R1)	Pin 1	(R)	Receive +
	Pin 5	(T1)	Pin 2	(T)	Receive -

	Alternative 1	Alternative 2	
Link X6	4-5, 6-7	3-4, 5-6	
Link X7	4-5, 6-7	3-4, 5-6	
	Pin 3	Pin 4	Transmit +
	Pin 6	Pin 5	Transmit -
	Pin 4	Pin 3	Receive +
	Pin 5	Pin 6	Receive -

Unused pins are not connected (open circuit).

Coaxial socket pinouts 75 Ω unbalanced

The following table details the signal codes and the corresponding coaxial connectors.

Signal code	Coaxial connector
Receive (Rx) Ground	Rx Shield
Receive (RX) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

PAP (Protocol Analyser Package) connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

Unused pins are not connected (open circuit).

Link settings

Figure 26 below shows the position of the links on the IPMN-GT, 10003088.00 Rev.2.

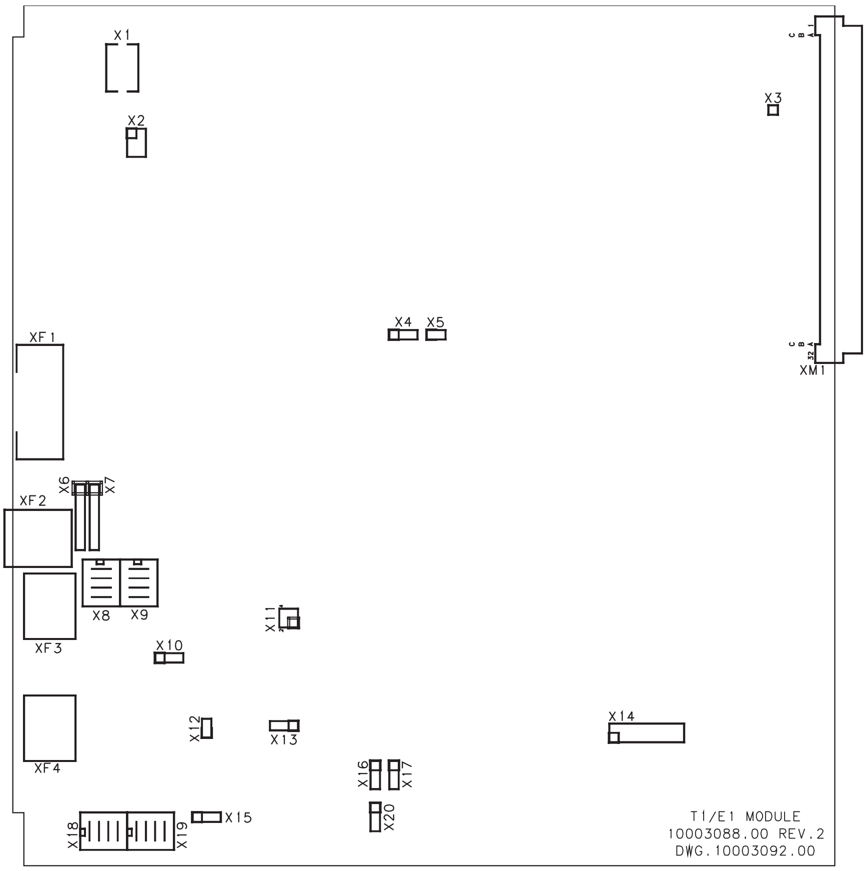


Figure 26: IPMN-GT circuit board, 10003088.00 Rev.2

Normal link settings for the IPMN-GT, 10003088.00 Rev.2

The following tables show the normal link settings for the IPMN-GT, 10003088.00 Rev.2.

Ref	Normal Setting	Ref	Normal Setting
X1	—	X11	Not fitted
X2	3-5	X12	Not fitted
X3	—	X13	1-2
X4	2-3	X14	13-14[2]
X5	Not fitted	X15	Not fitted
X6	1-2, 6-7[1]	X16	1-2
X7	1-2, 6-7[1]	X17	1-2
X8	Not fitted[1]	X18	Not fitted
X9	1-8, 2-7, 3-6, 4-5[1]	X19	Not fitted
X10	Not fitted	X20	1-2

1 Links X6, X7, X8 and X9 are used to determine RJ45 connector pinouts. See page 5-104 for information on alternate settings for these links.

2 Link X14 pins 13-14 controls the TE/NT operation of the IPMN-GT. Fit a link to pins 13-14 for NT operation and remove the link for TE operation.

* See page 5-104 for valid alternatives positions for Links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X18	Link X19
Tx shield to Ground	1-8 fitted, 2-7 not fitted	4-5 fitted
Rx shield to Ground	2-7 fitted, 1-8 not fitted	Not fitted
Tx and Rx shields to Ground	1-8, 2-7 fitted	4-5 fitted
Tx and Rx shields not Grounded	Not fitted	18, 2-7, 3-6, 4-5

Note *When the RJ45 interface option is used, X11 must* ***not*** *be fitted.*

Diagnostic test links

AIS If you want to generate an Alarm Indication Signal (AIS) to the line you must install link X18 in position 1-2.

Free run If you want the board to present AIS to the line when the device is not synchronized to an external source, you must install link X18 in position 7-8.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES [1]	Red	Off
SES [2]	Red	Off
DM [3]	Red	Off
LOCAL [4]	Red	Off
LINK [5]	Green	On
AI [6]	Red	Off
AIS [7]	Red	Off
CALL [8]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821). Only used when CRC-4 is available.

4 LOCAL indicates that the IPMN-GT is not receiving a signal from the line.

5 LINK indicates that Layer 2 is active (in multiframe or timer expiry state).

6 AI (Alarm Indication) indicates that the IPMN-GT has received a remote alarm from the network, in TSO.

7 AIS (all 1s) indicates an Alarm Indication Signal has been received from the network.

8 CALL indicates one or more calls are present on the IPMN-GT.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel.
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check RM is operational
	Check that a clock source (e.g. BRMT) is operational[1]
	Notify service personnel
DM ES or SES On intermittently	Check the cable to TE
	Notify service personnel
SES and LOCAL LEDs On continuously	Notify service personnel
AI LED is On for more than 1 minute	Notify service personnel
AIS LED is On	Notify service personnel
LINK LED is Off	Notify service personnel
CALL LED flashes when a call is attempted	Check configuration if it is a new installation
	Notify service personnel

1 IPMN-GT is a valid reference clock provider.

Analog Line Modules (ALMs)

Introduction

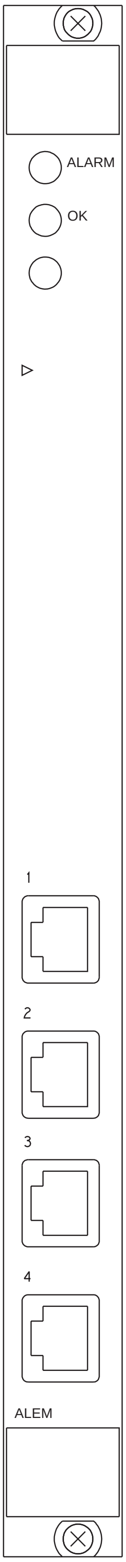
This section describes the following line modules:

- Analog Line Exchange Module (ALEM)
- Analog Line Exchange Module-2 (ALEM-2)
- Analog Line Phone Module (ALPM)
- Analog Line Phone Module-2 (ALPM-2)
- E&M Line Module (EMM)
- E&M Line Module-2 (EMM-2).

Note *The ALEM and ALPM are not available in the United Kingdom.*

RM **CM**

Analog Line Exchange Module (ALEM)



The ALEM is an analog voice-frequency line module that can connect 2-wire analog systems to an ISDN. An ALEM contains four ports which digitally encode the voice signals onto a single 64 kbit/s B-channel. These ports are loop-in, ring-out interfaces which emulate some of the features of 2-wire PSTN connections. Each port provides:

- 48 V battery feed
- On-hook and off-hook detection
- Ring signal, with programmable duration and duty cycle
- Dual tone multi-frequency (DTMF) or pulse (decadic) dialling detection.

Note *The ALEM is only available in Australia.*

You can use the ALEM for switched calls or for semipermanent connections. You can also simulate a tie line by connecting an ALEM to an ALPM, EMM or E1M across the ISDN.

You can select one of three signalling modes for each ALEM port, and each can be configured differently.

Specifications

Compatibility	The ALEM can be fitted to any chassis.
Ports	Four RJ11 female modular jack connectors on the front panel.
Port protocol	Loop-in, ring-out. Tone (DTMF) or pulse (decadic) dialling. See Austel TS 002-1990 and TS 003-1992.
Signalling	Normal dialling. Hotline dialling. Semipermanent operation. Switched (NMS-established hotline).
Module width	1 slot.

Installation

Cabling

The following table describes the cable needed to connect the ALEM to terminal equipment:

Cable length	up to 4 km.
Cable type	0.5mm 2-wire solid conductor.
Connector	FCC Part 68 compatible modular jack.

Connecting the ALEM to terminal equipment

For each line:

1 Run a cable from the terminal equipment (TE) through the front cable access duct.

2 Terminate the cable with an FCC Part 68 compatible modular jack connector that is wired as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

Signal code	FCC Part 68 connector pin
Tip	3
Ring	4
not used	1, 2, 5, 6

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

Link settings

Figure 27 below shows the position of the links on the ALEM, issue 3.

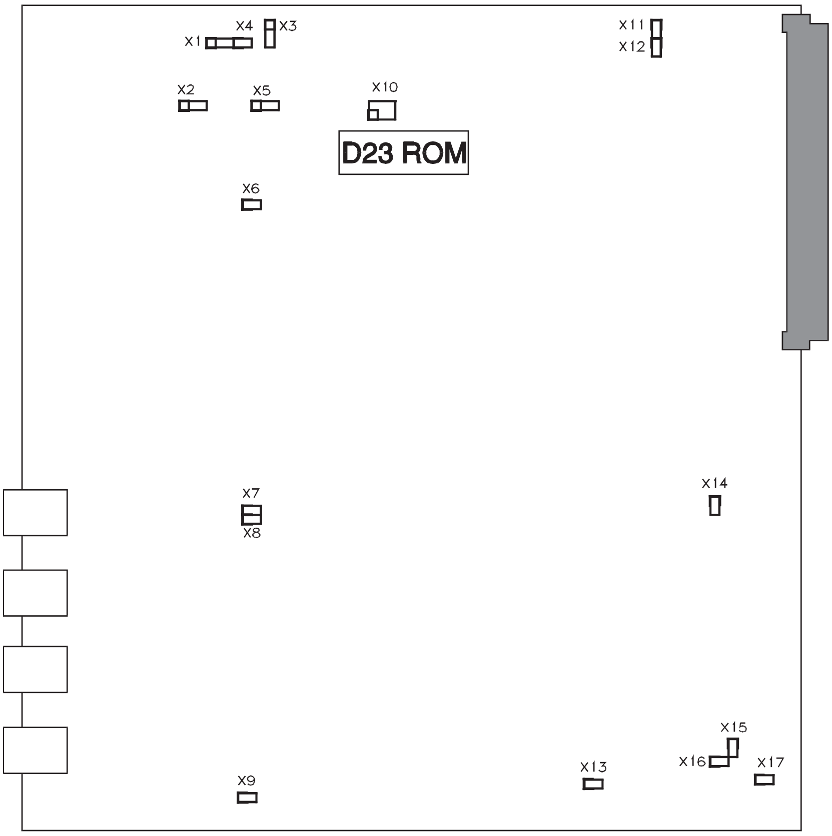


Figure 27: ALEM circuit board, issue 3

Normal link settings for the ALEM

The following table shows the normal link settings for the ALEM, issue 3.

Ref	Normal setting	Ref	Normal setting
X1	1-2	X10	3-4
X2	2-3	X11	Not fitted
X3	2-3	X12	Not fitted
X4	1-2	X13	Not fitted
X5	1-2	X14	Not fitted
X6	Not fitted	X15	Not fitted
X7	Not fitted	X16	Not fitted
X8	Not fitted	X17	Not fitted
X9	Not fitted		

Figure 28 below shows the position of the links on the ALEM, issue 4.

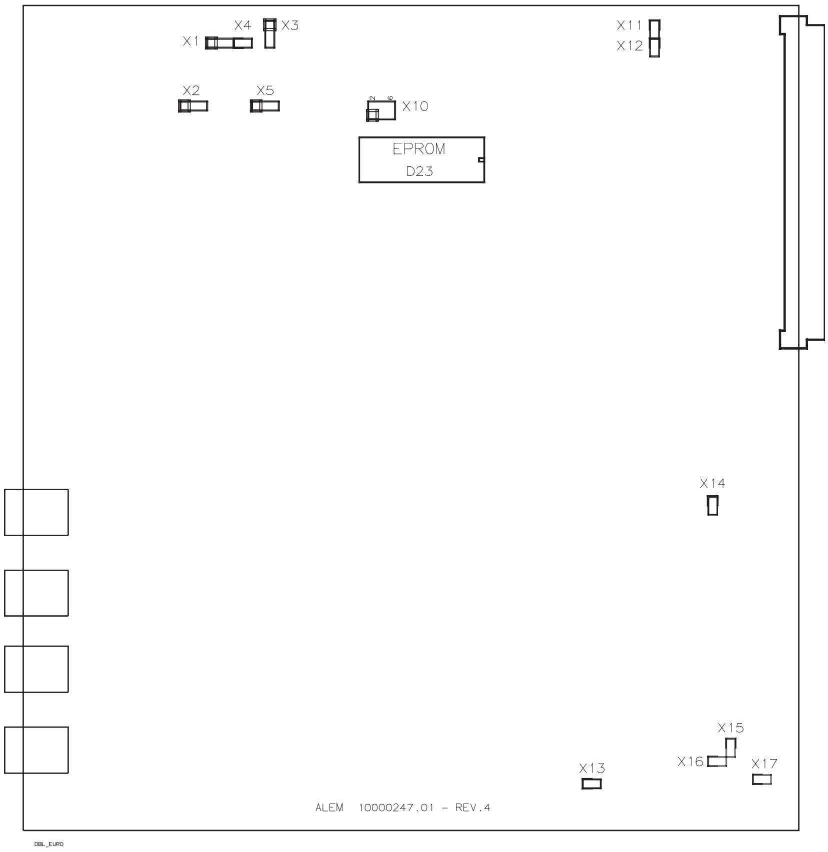


Figure 28: ALEM circuit board, issue 4

The following table shows the normal link settings for the ALEM, issue 4.

Ref	Normal setting	Ref	Normal setting
X1	1-2	X12	Not fitted
X2	2-3	X13	Not fitted
X3	2-3	X14	Not fitted
X4	1-2	X15	Not fitted
X5	1-2	X16	Not fitted
X10	3-4	X17	Not fitted
X11	Not fitted		

Configurable links

CPU ROM size selection

Link X5 determines the CPU ROM size. The following table lists the settings of X5 for the available ROM sizes.

ROM size	Link X5
64 k bit	2-3
256 k bit	1-2

CPU RAM size selection

Links X2 and X10 determine the CPU RAM size. The following table lists the settings of X2 and X10 for each RAM size.

RAM size	Link X2	Link X10
16 k bit	1-2	5-6
64 k bit	2-3	3-4
256 k bit	2-3	1-2

LEDs

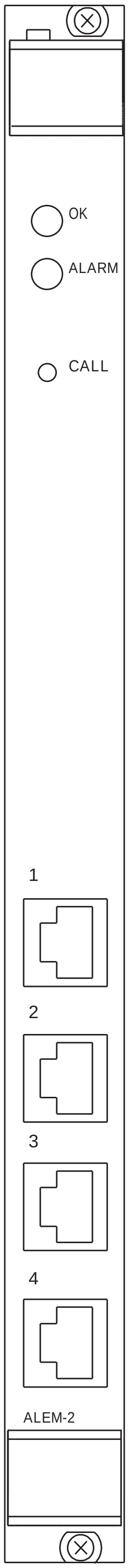
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check CM or RM is operational
	Check that the module is properly located in the subrack
	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
ALARM indicator is On or continuously flashing	Notify service personnel

RM CM

Analog Line Exchange Module-2 (ALEM-2)



The ALEM-2 is an analog voice-frequency line module that can connect 2-wire analog systems to an ISDN. An ALEM-2 contains four ports which digitally encode the voice signals onto a μ–law or A-law 64 kbit/s signal according to G.711. These ports are loop-in, ring-out interfaces that provide the following features:

- Reverse or normal polarity 48V battery feed
- On-hook and off-hook detection
- Ring signal, with programmable duration and duty cycle, and reverse or normal battery feed
- Dual tone multi-frequency (DTMF) or pulse (decadic) dialling detection
- Hookflash detection with programmable duration limit
- Line force release on failure to establish an ISDN connection
- Field selectable termination impedances
- Adjustable input/output relative levels and hybrid balance
- Programmable two-wire signal protocols
- Back busy signal generation
- Programmable A-law or μ-law PCM voice encoding.

Simple attachment connection — advice (UK only)

The following information is applicable to this equipment installed in the UK.

These devices are approved for connection to public switched networks as a 'Simple Attachment'.

Warning

Any form of connection of this device to Public Switched Telephone Networks which would cause the Multiplexer to be classified as 'Call Routing Apparatus (CRA)' invalidates the Approval of the equipment and renders the user liable to prosecution under the UK Telecommunications Act 1984.

Call Routing Apparatus is defined as telecommunications apparatus capable of switching messages consisting of two-way live speech telephone calls between two or more items of Extension Apparatus* and two or more circuits forming part of one or more Public Switched Networks.

*Extension Apparatus is defined as equipment approved for direct connection to 2 or 3-wire analog speechband PSTN or private network interfaces or PBX extension apparatus ports.

What this means...

This means that:

- It is **not** permitted to connect a telephone directly to a 2-wire analog port on this device if the telephone is to be used to make switched calls to the public network
- It is permitted to connect a telephone directly to a 2-wire analog port on this device if the telephone forms one end of a tie line
- It is permitted to connect a PABX or Key System to a 2-wire analog port on this device with telephones connected to the PABX or Key System
- It is permitted to connect a modem directly or via a Private Circuit (Leased Line) or via PSTN to a 2-wire analog port on this device.

Please contact your supplier if it is unclear whether a specific connection would cause the equipment to be classified as 'Call Routing Apparatus' or 'Simple Attachment'.

USA/Canada

In the USA and Canada the ALEM-2 is approved for connection to an FCC Part 68/CS-03 registered analog line/FXS interface. This includes the leased line services provided by the Public Network Carriers.

Termination impedances

The ALEM-2 supports a range of termination impedances:

- 220 Ω + 820 Ω // 220 nF
- 370 Ω + 620 Ω // 310 nF
- 300 Ω + 1000 Ω // 220 nF

For each termination impedance, a choice of balance impedance is available. The balance impedance is selected to match the impedance presented to the ALEM-2 port by the attached equipment and influences the amount of echo suppression that occurs at the port interface in the direction of the digital backplane of the multiplexer.

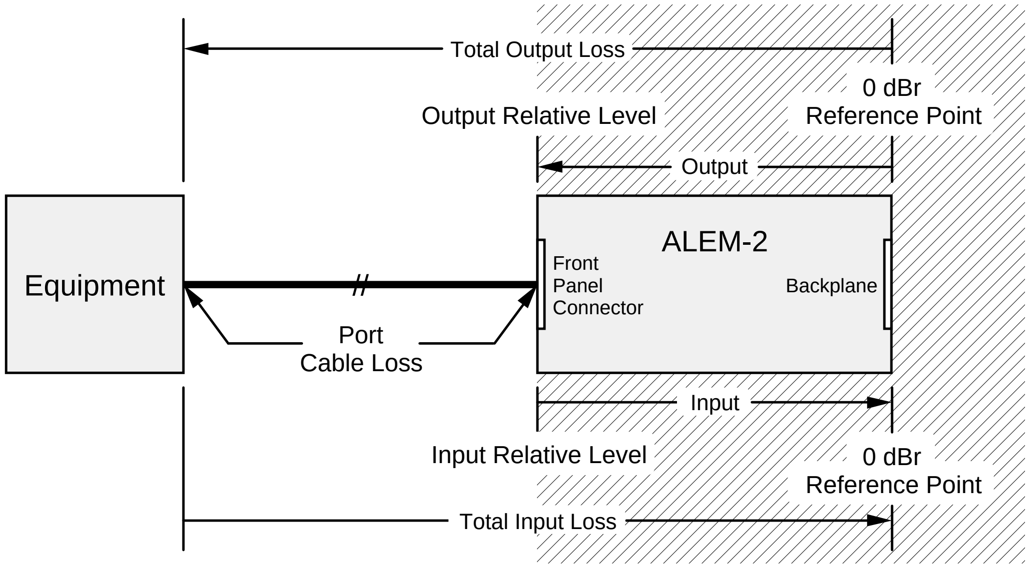
For the 220 Ω + 820 Ω // 220 nF termination impedance option, balance impedances of 220 Ω + 820 Ω // 220 nF and 600 Ω are provided.

For the 370 Ω + 620 Ω // 310 nF and 300 Ω + 1000 Ω // 220 nF impedance options, the same impedances are provided as balance impedance options.

See page 6-19, page 6-20 and page 6-22 for details on setting the termination impedances for each type of board.

Relative level settings

This section provides information for determining relative level settings on ALEM-2 ports to suit installation conditions. The figure below shows the relationship between the Input and Output Relative Levels, the Total Input and Output Loss, and the Port Cable Loss.



Settings for extension ports for UK installations

The input and output relative levels on extension ports should be set to a value determined from the table below depending on the loss of the cable connected to the port.

Port Cable Loss (dB)	Relative Level (dBr)	
	Input	Output
0 - 2	+3	-4
2 - 4	+1	-2
4 - 6	-1	0
6 - 8	-3	+2
8 - 9	-5	+3

Settings for extension ports for Australian installations

The input relative level should be set to 0dBr.
The output relative level should be set to -6.5dBr.

Settings for extension ports for USA/Canada installations

The input relative level should be set to 0dBr.
The output relative level should be set to -3dBr.

Warning	The ALEM-2 is not permitted to be connected to PSTN lines in the UK and Australia.

Note *Refer to Appendix C for information regarding overall Call Path Losses within a system.*

Applications

Each ALEM-2 port can be independently configured to provide any of the following signalling schemes:

- Austel's Ring In/Loop Out (See Note 1)
- Austel's Loop In (INDIAL) exchange line (See Note 2)
- Austel's extension line
- BABT's Loop Calling/Unguarded Clearing (See Note 1)
- BABT's Loop Calling/Guarded Clearing (See Note 1)
- BABT's Loop Calling/Disconnect Clearing (See Note 1)
- BABT's Earth Calling (See Note 1)
- BABT's Loop In (DDI) exchange line (See Note 2)

Note 1 *Connects as exchange equipment.*

Note 2 *Connects as terminal equipment.*

These signalling schemes can be used to provide either dialled-up voice circuits or permanent voice circuits.

Specifications

Compatibility The ALEM-2 can be fitted to any chassis.

Ports Four FCC Part 68 compatible sockets on the front panel.

Port protocol Loop-in, ring-out.
Tone (DTMF) or pulse (decadic) dialling.

Regulatory Specifications Conforms to BS 6450, Part 4, 1993 for 1BS and NWH port type classifications.

Signalling See *Applications* section above.

Module width 1 slot.

Power consumption The table below summarises the power consumption of the ALEM-2:

Supply Voltage	Supply Current (mA)	Notes
+5 Volts	590	
+12V	10.3	
-12V	3.9	
-48 Volts	5.7	All ports idle
	200	All ports active

Input (analog) Relative Level Range -9 to +3dBr (selectable in 1dB steps).

Output (analog) Relative Level Range +3 to -9dBr (selectable in 1dB steps).

Allowable extension port cable loss range 0 to 9dB.

Allowable PSTN line loss range 3dB, 6dB, 8dB.

Battery feed voltage 44 to 50 Volts dc.

Ring signal voltage 75 to 100 Volts (ac rms) at 27 Hz.

Note *Ring signal is superimposed onto -48 V battery feed.*

Ring signal current 45mA (ac rms max).

Ring Signal Drive Capability 4 standard ringers.

Note *One standard ringer is 55H + 7KΩs. Ring Signal Drive Capability (RSDC) is specified over the maximum cable length that may be connected to ALEM-2 port.*

The following table details the transmission performance:

Parameter	Specification	Notes
Variation of Loss with Frequency	0.35 to - 0.3dB	1, 2
	0.6 to -0.3dB	1, 3
Quantisation Distortion Units	0.5QDU	1, 4

Notes

1 *Specified between ALEM-2 port and digital reference point of this equipment.*

2 *Frequency range 600 to 2400 Hz.*

3 *Frequency range 300 to 3200 Hz.*

4 *Additional Quantization distortion units may be introduced into the transmission path depending on whether voice compression features in this equipment are used.*

Call Path Loss See *Appendix C*.

Call Path Delay See *Appendix D*.

Installation

Cabling

The following table describes the cable needed to connect the ALEM-2 to terminal equipment:

Cable length	up to 10 km
Cable type	0.5mm 2-wire solid conductor
Connector	FCC Part 68 compatible modular jack

Insulation displacement connectors and adapter cabling

Some installations may require the provision of insulation displacement type connectors to complete cabling between ALEM-2 ports and attached equipment. This is the case where it is required to connect the ALEM-2 to cabling maintained by a Public Telecommunications Operator.

If insulation displacement type connectors are required, then an insulation displacement connector block and adapter cable(s) may be ordered from Jtec.

A choice of two types of connector blocks is provided depending on the installation conditions. For installations where cabling is to be made between an ALEM-2 and an existing distribution frame located at the site, a 20 pair connector block type may be ordered by the following market code:

ABLK - 20

The connector block comes complete with a wall mountable enclosure.

If an installation requires more than 20 wire pairs to be terminated on insulation displacement connectors, then additional 20 pair connector blocks must be ordered.

For installations where cabling is to be made directly between an ALEM-2 and incoming building cabling, then a 10 pair connector block type should be ordered by the following market code:

ABLK - 10

This connector block comes complete with a wall mountable enclosure and overvoltage suppression devices on each wire pair.

If an installation includes more than 10 wire pairs, then additional 10 pair connector blocks must be ordered.

Adapter cables must also be ordered to connect between the connector block and the FCC Part 68 compatible modular sockets on the ALEM-2. The market code for the adapter cables is:

ACBL - ADP

One adapter cable is required for each ALEM-2 port to be wired to a connector block.

Connecting the ALEM-2 to terminal equipment

For each line:

1 Run a cable from the terminal equipment (TE) through the front cable access duct.

2 Terminate the cable with an FCC Part 68 compatible jack connector that is wired as shown in the table below and plug it in.

Signal code	FCC Part 68 connector pin
Tip or A-wire	4
Ring or B-wire	3
not used	1, 2, 5, 6

Note *Pin 1 on the FCC Part 68 compatible jack connector is the left most pin when the connector is viewed from contact end, with the latch tab facing down.*

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

Link settings

Figure 29 below shows the position of the links on the ALEM-2, issue 3.

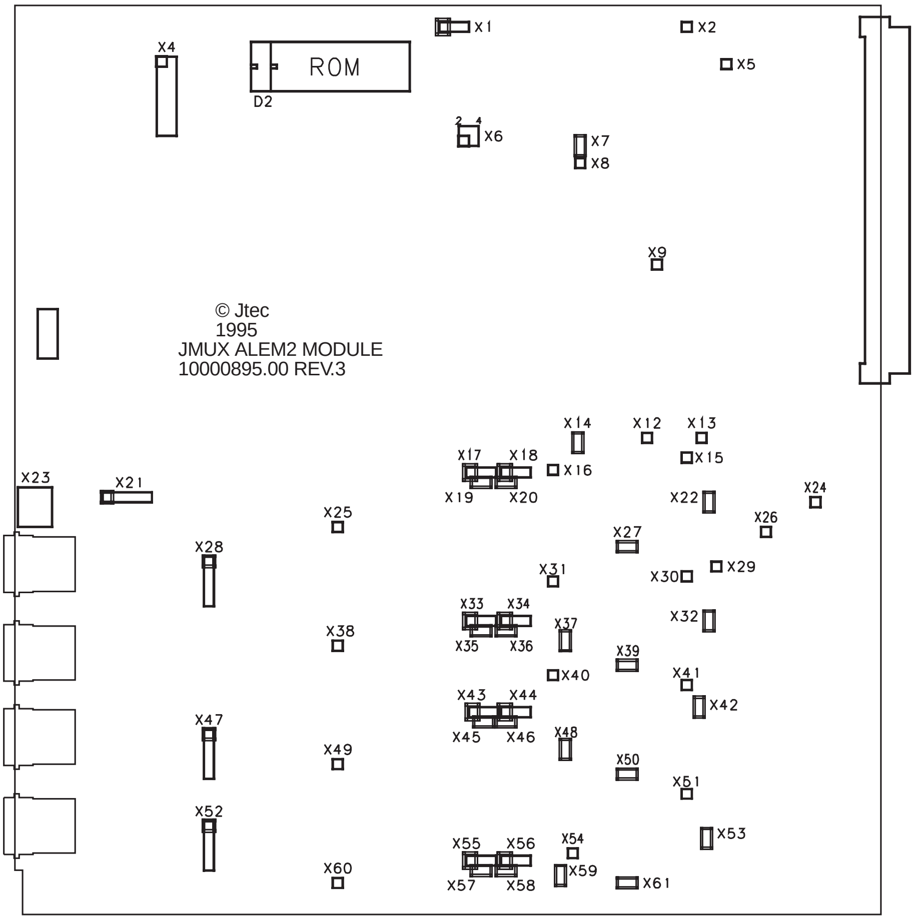


Figure 29: ALEM-2 circuit board, issue 3

Normal link settings for the ALEM-2 (Australia)

The following table shows the normal link settings for the ALEM-2 (Australia):

Ref	Normal setting	Ref	Normal setting
X1	2-3	X37	Not fitted[2]
X4	Not fitted[1]	X39	Not fitted[2]
X6	Not fitted	X42	1-2[1]
X7	Not fitted	X43	Not fitted[1]
X14	Not fitted[2]	X44	Not fitted[1]
X17	Not fitted[1]	X45	1-2[1]
X18	Not fitted[1]	X46	1-2[1]
X19	1-2[1]	X47	1-2, 3-4
X20	1-2[1]	X48	Not fitted[2]
X21	1-2, 3-4	X50	Not fitted[2]
X22	1-2[1]	X52	1-2, 3-4
X27	Not fitted[2]	X53	1-2[1]
X28	1-2, 3-4	X55	Not fitted[1]
X32	1-2[1]	X56	Not fitted[1]
X33	Not fitted[1]	X57	1-2[1]
X34	Not fitted[1]	X58	1-2[1]
X35	1-2[1]	X59	Not fitted[2]
X36	1-2[1]	X61	Not fitted[2]

Note 1 — Termination links

Links X4 and X22, X32, X42, X53 are used to indicate the type of termination impedance being selected for the associated ALEM-2 port. These links setting are cross-referenced, by software, with the allowable termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port. For Australian operation, use the default settings to set up the ports as Australian complex termination (220Ω + 820Ω ll 120nF).

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X14 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X37, X48, and X59 have the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X27, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms. Links X39, X50 and X61 do this for ports 2, 3, and 4 respectively.

The following table shows the link settings for the termination impedance types:

Port Number	Termination Types	Link settings
1	Australian complex (220W + 820Ω ll 120nF)	X4 1-2 (not fitted), X22 (Fitted), X17 (Not fitted), X19 (Fitted), X18 (Not fitted), X20 (Fitted)
2	Australian complex (220Ω + 820Ω ll 120nF)	X4 3-4 (Not fitted), X32 (Fitted), X35 (Fitted) X33 (Not fitted), X36 (Fitted), X34 (Not fitted)
3	Australian complex (220Ω + 820Ω ll 120nF)	X4 5-6(Not fitted), X42 (Fitted), X45 (Fitted) X43 2-3 (Not fitted), X46 (Fitted), X44 (Not fitted)
4	Australian complex (220Ω + 820Ω ll 120nF)	X4 7-8 (Not fitted), X53 (Fitted), X57 (Fitted) X55 (Not fitted), X58 (Not fitted), X56 2-3 (Not fitted)

Normal link settings for the ALEM-2 (UK)

The following table shows the normal link settings for the ALEM-2 (UK):

Ref	Normal setting	Ref	Normal setting
X1	2-3	X37	Not fitted[2]
X4	1-2, 3-4, 5-6, 7-8[1]	X39	Not fitted[2]
X6	Not fitted	X42	1-2[1]
X7	Not fitted	X43	2-3[1]
X14	Not fitted[2]	X44	2-3[1]
X17	2-3[1]	X45	Not fitted[1]
X18	2-3[1]	X46	Not fitted[1]
X19	Not fitted[1]	X47	1-2, 3-4
X20	Not fitted[1]	X48	Not fitted[2]
X21	1-2, 3-4	X50	Not fitted[2]
X22	1-2[1]	X52	1-2, 3-4
X27	Not fitted[2]	X53	1-2[1]
X28	1-2, 3-4	X55	2-3[1]
X32	1-2[1]	X56	2-3[1]
X33	2-3[1]	X57	Not fitted[1]
X34	2-3[1]	X58	Not fitted[1]
X35	Not fitted[1]	X59	Not fitted[2]
X36	Not fitted[1]	X61	Not fitted[2]

Note 1 — Termination links

Links X4 and X22, X32, X42, X53 are used to indicate the type of termination impedance being selected for the associated ALEM-2 port. These links setting are cross-referenced, by software, with the allowable termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port.

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X14 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X37, X48, and X59 have the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X27, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms. Links X39, X50 and X61 do this for ports 2, 3, and 4 respectively.

The following table shows the link settings for the termination impedance types:

Port Number	Termination Types	Link settings
1	UK1 Termination (370Ω + 620Ω ll 310nF)	X4 1-2 (Fitted), X22 (Fitted), X19 (Not fitted), X17 2-3 (Fitted), X20 (Not fitted), X18 2-3 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X4 1-2(Not fitted), X22 (Not fitted), X19 (Not fitted) X17 1-2 (Fitted), X20 (Not fitted), X18 1-2 (Fitted)
2	UK1 Termination (370Ω + 620Ω ll 310nF)	X4 3-4 (Fitted), X32 (Fitted), X35 (Not fitted) X33 2-3 (Fitted), X36 (Not fitted), X34 2-3 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X4 3-4 (Not fitted), X32 (Not fitted), X35 (Not fitted) X33 1-2 (Fitted), X36 (Not fitted), X34 1-2 (Fitted)
3	UK1 Termination (370Ω + 620Ω ll 310nF)	X4 5-6(Fitted), X42 (Fitted), X45 (Not fitted) X43 2-3 (Fitted), X46 (Not fitted), X44 2-3 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X4 5-6(Not fitted), X42 (Not fitted), X45 (Not fitted) X43 1-2 (Fitted), X46 (Not fitted), X44 1-2 (Fitted)
4	UK1 Termination (370Ω + 620Ω ll 310nF)	X4 7-8 (Fitted), X53 (Fitted), X57 (Not fitted) X55 2-3 (Fitted), X58 (Not fitted), X56 2-3 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X4 7-8 (Not fitted), X53 (Not fitted), X57 (Not fitted) X55 1-2 (Fitted), X58 (Not fitted), X56 1-2 (Fitted)

Note *UK2 Termination is not supported from Network Release A onwards.*

Normal link settings for the ALEM-2 (USA/Canada)

The following table shows the normal link settings for the ALEM-2 (USA/Canada):

Ref	Normal setting	Ref	Normal setting
X1	2-3	X37	Not fitted[2]
X4	Not fitted[1]	X39	Not fitted[2]
X6	Not fitted	X42	Not fitted[1]
X7	Not fitted	X43	1-2[1]
X14	Not fitted[2]	X44	1-2[1]
X17	1-2[1]	X45	Not fitted[1]
X18	1-2[1]	X46	Not fitted[1]
X19	Not fitted[1]	X47	1-2, 3-4
X20	Not fitted[1]	X48	Not fitted[2]
X21	1-2, 3-4	X50	Not fitted[2]
X22	Not fitted[1]	X52	1-2, 3-4
X27	Not fitted[2]	X53	Not fitted[1]
X28	1-2, 3-4	X55	1-2[1]
X32	Not fitted[1]	X56	1-2[1]
X33	1-2[1]	X57	Not fitted[1]
X34	1-2[1]	X58	Not fitted[1]
X35	Not fitted[1]	X59	Not fitted[2]
X36	Not fitted[1]	X61	Not fitted[2]

Note 1 — Termination links

Links X4 and X22, X32, X42, X53 are used to indicate the type of termination impedance being selected for the associated ALEM-2 port. These links setting are cross-referenced, by software, with the allowable termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port.

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X14 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X37, X48, and X59 have the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X27, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms. Links X39, X50 and X61 do this for ports 2, 3, and 4 respectively.

The following table shows the link settings for the termination impedance types:

Port Number	Termination Types	Link settings
1	General Termination (600Ω)	X4 1-2 (Not fitted), X22 (Not fitted), X19 (Not fitted), X17 1-2 (Fitted), X20 (Not fitted), X18 1-2 (Fitted)
2	General Termination (600Ω)	X4 3-4 (Not fitted), X32 (Not fitted), X35 (Not fitted) X33 1-2 (Fitted), X36 (Not fitted), X34 1-2 (Fitted)
3	General Termination (600Ω)	X4 5-6 (Not fitted), X42 (Not fitted), X45 (Not fitted) X43 1-2 (Fitted), X46 (Not fitted), X44 1-2 (Fitted)
4	General Termination (600Ω)	X4 7-8 (Not fitted), X53 (Not fitted), X57 (Not fitted) X55 1-2 (Fitted), X58 (Not fitted), X56 1-2 (Fitted)

LEDs

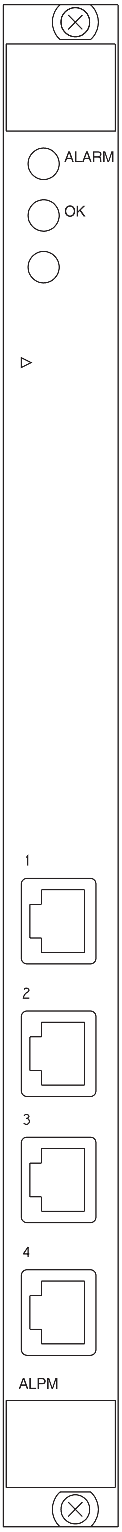
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
CALL	Green	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check CM or RM is operational
	Check that the module is properly located in the subrack
	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM indicator is On or continuously flashing	Notify service personnel
OK indicator is flashing On and Off	A diagnostic loopback has been applied to one or more ports

RM **CM**

Analog Line Phone Module (ALPM)



The ALPM is an analog voice-frequency line module that can connect 2-wire analog systems to an ISDN. An ALPM contains four ports which digitally encode voice signals onto a single 64 kbit/s B-channel. These ports are loop-out, ring-in interfaces which emulate some of the features of 2-wire telephones. The ALPM provides:

- On-hook and off-hook generation
- Ring tone detection
- Busy tone detection
- Tone (DTMF) or pulse (decadic) dialling
- Ring-back tone detection
- Battery reversal detection
- Back busy to network upon indial line fault detection.

Terminal equipment that you want to connect to an ALPM port must provide the battery feed (24 to 48 V).

Three different signalling modes can be configured with an ALPM interface, and each interface on a module can be configured differently. The three signalling modes provide either dialled-up voice circuits or permanent voice tie lines. In each case, translation to the appropriate ISDN signalling is performed by this equipment.

Specifications

Compatibility	The ALPM can be fitted to any chassis.
Ports	Four RJ11 female modular jack connectors on front panel.
Port protocol	Ring-in, Loop-out. Tone (DTMF) and pulse (decadic) dialling. See Austel TS 002-1990 and TS 003-1992.
Signalling	Normal dialling (indial). Hotline dialling. Semipermanent operation. Switched (OmniVision-established hotline).
Module width	1 slot.

Installation

Cabling

The following table describes the cable needed to connect the ALPM to terminal equipment.

Cable length	up to 4 km.
Cable type	0.5mm 2-wire solid conductor.
Connector	FCC Part 68 compatible modular jack.

Connecting the ALPM to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

For each line:

1 Run a cable from the terminal equipment (TE) through the front cable access duct.

2 Terminate the cable with an FCC Part 68 compatible modular jack connector that is wired as shown in the table below and plug it in. See *Appendix AAppendix A* for a diagram of the connector.

Signal code	FCC Part 68 connector pin
Tip or A wire	3
Ring or B wire	4
not used	1, 2, 5, 6

Link settings

Figure 30 below shows the position of the links on the ALPM.

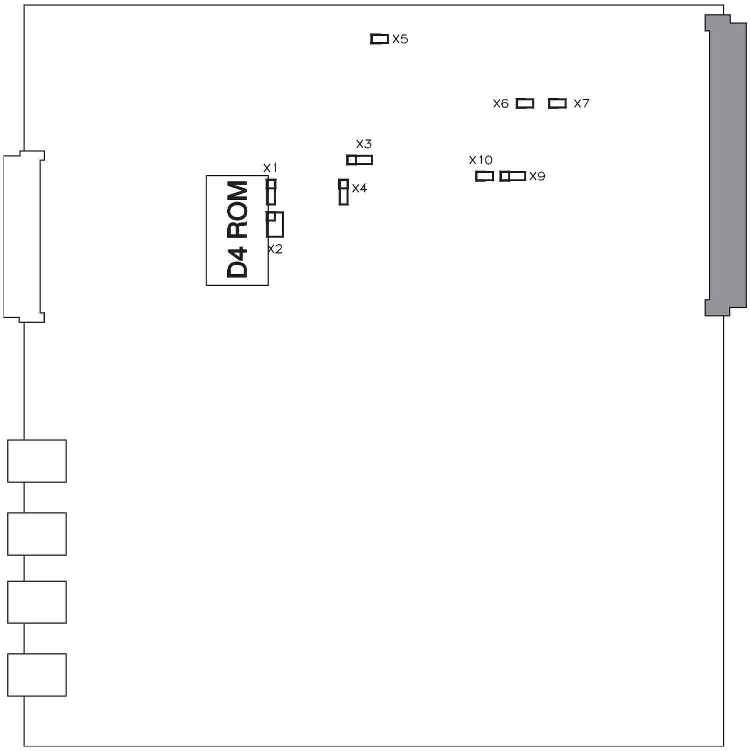


Figure 30: ALPM circuit board, issue 1

Normal link settings for the ALPM

The following table shows the normal link settings for the ALPM.

Ref	Normal setting
X1	1-2
X2	3-4
X3	2-3
X4	2-3
X5	Not fitted
X6	See below
X7	Not fitted
X9	2-3
X10	1-2

X6 link settings

Link X6	Operating mode
On	Back busy to network if line battery is reversed or not present upon line seizure.
Off	Ignore line battery conditions on seizure.

CPU ROM size selection

Link X1 describes the CPU ROM size.

The following table lists the settings for the different ROM sizes that can be fitted to the ALPM.

ROM size	Link X1
64K bit	2-3
256K bit	1-2

CPU RAM size selection

Links X2 and X4 determine the CPU RAM size. The following table lists the settings of X2 and X4 for each RAM size.

RAM size	Link X2	Link X4
16K bit	Link on 5-6	Link on 1-2
64K bit	Link on 3-4	Link on 2-3
256K bit	Link on 1-2	Link on 2-3

LEDs

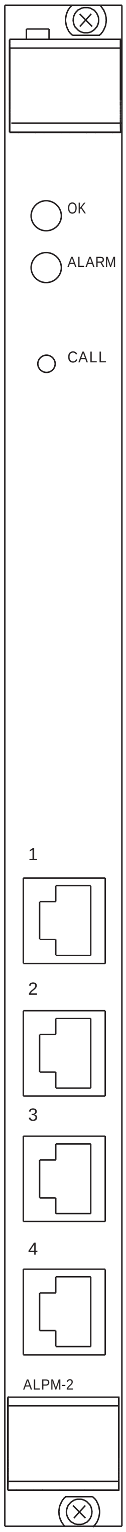
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check CM or RM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel

RM CM

Analog Line Phone Module -2 (ALPM-2)



The ALPM-2 is an analog voice-frequency line module that can connect 2-wire analog systems to an ISDN. An ALPM-2 contains four ports which digitally encode voice signals onto a µ–law or A-law 64 kbit/s signal according to G.711. These ports are polarity-independent loop-out, ring-in interfaces that provide the following features:

- On-hook and off-hook generation
- Dial tone detection
- Busy and ring service tone detection
- Tone (DTMF) or pulse (decadic) dialling
- Ring-back tone detection
- Bidirectional polarity battery feed detection
- Field selectable termination impedances
- Adjustable input/output relative levels and hybrid balance
- Basic insulation from earth and other ALPM-2 ports
- Programmable A-law or µ-law PCM voice encoding
- Optional battery feed voltage monitoring.

Simple attachment connection — advice (UK only)

The following information is applicable to this equipment installed in the UK.

This equipment approved for connection to public switched networks as a 'Simple Attachment'.

Warning

Any form of connection of this equipment to Public Switched Telephone Networks which would cause the Multiplexer to be classified as 'Call Routing Apparatus (CRA)' invalidates the Approval of the equipment and renders the user liable to prosecution under the UK Telecommunications Act 1984.

Call Routing Apparatus is defined as telecommunication apparatus capable of switching messages consisting of two-way live speech telephone calls between two or more items of Extension Apparatus* and two or more circuits forming part of one or more Public Switched Telephone Networks.

*Extension Apparatus is defined as equipment approved for direct connection to 2 or 3-wire analog speechband PSTN or private network interfaces or PBX extension apparatus ports.

What this means...

This means that:

- It is **not** permitted to connect a telephone directly to a 2-wire analog port in this equipment if the telephone is to be used to make switched calls to the public network
- It is permitted to connect a telephone directly to a 2-wire analog port in this equipment if the telephone forms one end of a tie line
- It is permitted to connect a PABX or Key System to a 2-wire analog port in this equipment with telephones connected to the PABX or Key System
- It is permitted to connect a modem directly or via a Private Circuit (Leased Line) or via PSTN to a 2-wire analog port in this equipment.

Please contact your supplier if it is unclear whether a specific connection would cause the equipment to be classified as 'Call Routing Apparatus' or 'Simple Attachment'.

USA/Canada

In the USA and Canada the ALPM-2 is approved for connection to an FCC Part 68/CS-03 registered analog line/FXO interface. This includes the leased line services provided by the Public Network Carriers.

Termination impedances

The ALPM-2 supports the following termination impedances:

- 600 Ω
- 220 Ω + 820 Ω // 120 nF
- 370 Ω + 620 Ω // 310 nF
- 300 Ω + 1000 Ω // 220 nF.

Each termination impedance has a choice of two balance impedances. The balance impedance is selected to match the impedance of the attached CPE and influences the amount of echo suppression that occurs.

For the 600 Ω termination impedance you can select:

- 220 Ω + 820 Ω // 120 nF, or;
- 600 Ω balance impedances.

For the 220 Ω + 820 Ω // 120 nF termination impedance you can select:

- 220 Ω + 820 Ω // 120 nF, or;
- 600 Ω balance impedances.

For the 370 Ω + 620 Ω// 310 nF termination impedance you can select:

- 300 Ω + 1000 Ω // 220 nF, or;
- 370 Ω + 620 Ω // 310 nF balance impedances.

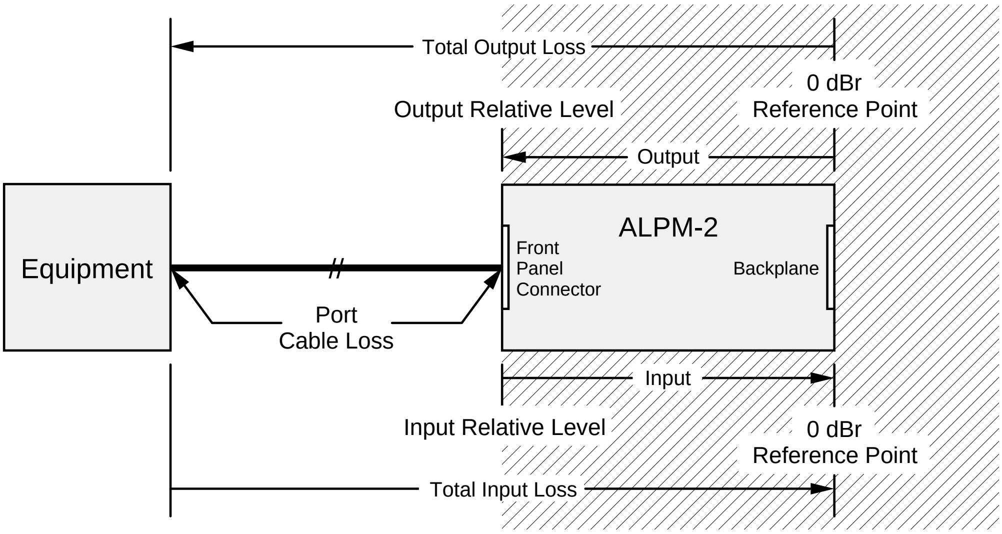
For the 300 Ω + 1000 Ω // 220 nF termination impedance you can select:

- 300 Ω + 1000 Ω // 220 nF, or;
- 370 Ω + 620 Ω // 310 nF balance impedances.

See page 6-38, page 6-40 and page 6-42 for details of setting the termination impedances for each type of board.

Relative level settings

This section provides information for determining relative level settings on ALPM-2 ports to suit installation conditions. The figure below shows the relationship between the Input and Output Relative Levels, the Total Input and Output Loss, and the Port Cable Loss.



Settings for UK installations

Extension Ports

The input and output relative levels on extension ports should be set to a value determined from the table below depending on the loss of the cable connected to the port.

Port Cable Loss (dB)	Relative Level (dBr)	
	Input	Output
0 - 2	+3	-4
2 - 4	+1	-2
4 - 6	-1	0
6 - 8	-3	+2
8 - 9	-5	+3

PSTN Ports

The input relative level on ports connected to a PSTN should be set to -6dBr.
The output relative level on ports connected to a PSTN should be set to +3dBr.

Settings for Australian installations

Extension ports

The input relative level should be set to 0dBr.
The output relative level should be set to -6.5dBr.

PSTN ports

The input relative level should be set to -6dBr.
The output relative level should be set to -0.5dBr.

Settings for USA/Canada installations

The input relative level should be set to 0dBr.
The output relative level should be set to -3dBr.

Note *Refer to Appendix C for information regarding overall Call Path Losses within a system.*

Applications

Each ALPM-2 port can be independently configured to provide any of the following signalling schemes:

- Austel's Ring In/Loop Out (See Note 1)
- Austel's Loop In (INDIAL) exchange line (See Note 2)
- BABT's Loop Calling/Unguarded Clearing (See Note 1)
- BABT's Loop Calling/Guarded Clearing (See Note 1)
- BABT's Loop Calling/Disconnect Clearing (See Note 1)
- BABT's PSTN Direct Dial In (DDI) (See Note 2).

Note 1 *Connects as terminal equipment.*

Note 2 *Connects as exchange equipment.*

These signalling schemes can be used to provide either dialled-up voice circuits or permanent voice circuits.

Specifications

Compatibility The ALPM-2 can be fitted to any chassis.

Ports Four FCC Part 68 compatible sockets on front panel.
(The safety status of these ports is TNV. EN60950 refers).

Port protocol Ring-in, Loop-out
Tone (DTMF) and pulse (decadic) dialling

Regulatory Specifications Conforms to BS 6450, Part 4, 1993 for PA1 and NWS port type classifications.

Signalling See *Applications* section above.

Module width 1 slot.

Power consumption The table below summarises the power consumption of the ALPM-2:

Input Voltage	Supply Current
+5 V	1.5A
+12 V	150mA
-12 V	150mA
-48 V	150mA

Input (analog) Relative Level Range -9 to +3dBr (selectable in 1dB steps).

Output (analog) Relative Level Range +3 to -9dBr (selectable in 1dB steps).

Allowable extension port cable loss range 0 to 9dB.

Ringer Equivalence Number (REN) 2 (Australia)
1 (UK)
0.7B (USA)
0.6 (Canada)

Battery feed voltage monitor fault threshold 40V

Transmission Performance: The following table details the transmission performance:

Parameter	Specification	Notes
Variation of Loss with Frequency	0.35 to - 0.3dB	1, 2
	0.6 to -0.3dB	1, 3
Quantisation Distortion Units	0.5QDU	1, 4

Notes

1 *Specified between ALPM-2 port and digital reference point of this equipment.*

2 *Frequency range 600 to 2400 Hz.*

3 *Frequency range 300 to 3200 Hz.*

4 *Additional quantization distortion units may be introduced into the transmission path depending on whether voice compression features in the this equipment are used.*

Call Path Loss: See *Appendix C*.

Call Path Delay: See *Appendix D*.

Installation

Cabling

The following table describes the cable needed to connect the ALPM-2 to terminal equipment.

Cable length	up to 10 km
Cable type	0.5mm 2-wire solid conductor
Connector	FCC Part 68 compatible modular jack

Insulation displacement connectors and adapter cabling

Some installations may require the provision of insulation displacement type connectors to complete cabling between ALPM-2 ports and attached equipment. This is the case where it is required to connect the ALPM-2 to cabling maintained by a Public Telecommunications Operator.

If insulation displacement type connectors are required, then an insulation displacement connector block and adapter cable(s) may be ordered from Jtec.

A choice of two types of connector blocks is provided depending on the installation conditions. For installations where cabling is to be made between an ALPM-2 and an existing distribution frame located at the site, a 20 pair connector block type may be ordered by the following market code:

ABLK - 20

The connector block comes complete with a wall mountable enclosure.

If an installation requires more than 20 wire pairs to be terminated on insulation displacement connectors, then additional 20 pair connector blocks must be ordered.

For installations where cabling is to be made directly between an ALPM-2 and incoming building cabling, then a 10 pair connector block type should be ordered by the following market code:

ABLK - 10

This connector block comes complete with a wall mountable enclosure and overvoltage suppression devices on each wire pair.

If an installation includes more than 10 wire pairs, then additional 10 pair connector blocks must be ordered.

Adapter cables must also be ordered to connect between the connector block and the FCC Part 68 compatible sockets on the ALPM-2. The market code for the adapter cables is:

ACBL - ADP

One adapter cable is required for each ALPM-2 port to be wired to a connector block.

Connecting the ALPM-2 to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

For each line:

1 Run a cable from the terminal equipment (TE) through the front cable access duct.

2 Terminate the cable with an FCC Part 68 compatible modular jack connector that is wired as shown in the table below and plug it in.

Signal code	FCC Part 68 connector pin
Tip or A-wire	4
Ring or B-wire	3
not used	1, 2, 5, 6

Note *Pin 1 on the FCC Part 68 compatible jack connector is the left most pin when the connector is viewed from contact end, with latch tab facing down.*

Link settings

Figure 31 below shows the position of the links on the ALPM-2, issue 3.

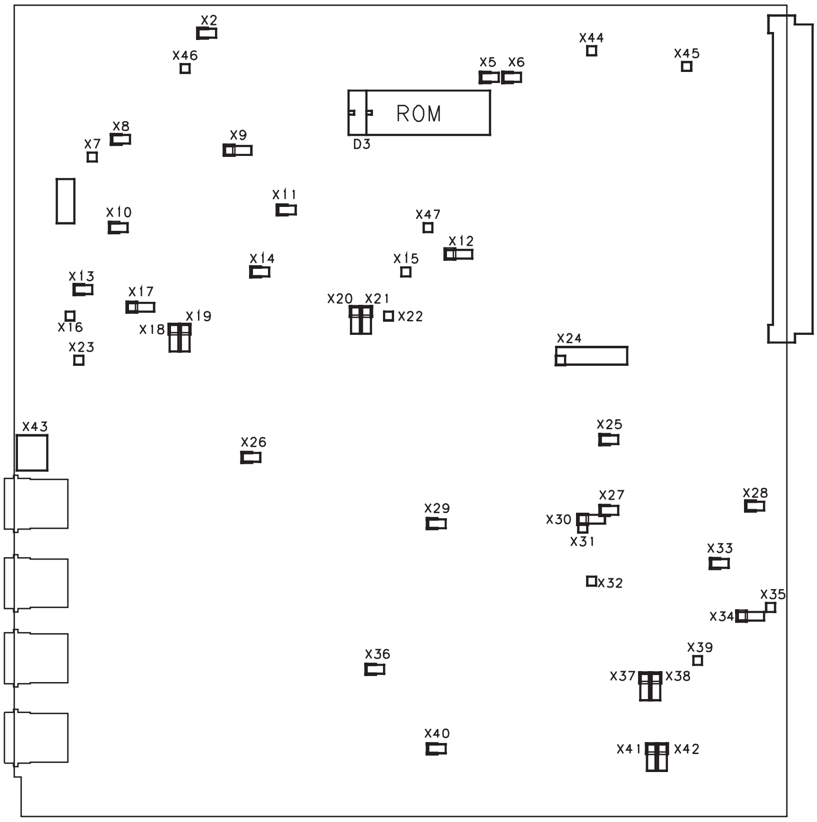


Figure 31: ALPM-2 circuit board, issue 3

Normal link settings for the ALPM-2 (Australia)

The following table shows the normal link settings for the ALPM-2 (Australia):

Ref	Normal setting	Ref	Normal setting
X2	Not fitted	X25[2]	Not fitted
X5	Not fitted	X26[3]	Not fitted
X6	Not fitted	X27[2]	Not fitted
X9	2-3	X28[2]	Not fitted
X10[2]	Not fitted	X29[3]	Not fitted
X11[2]	Not fitted	X30[1]	Not fitted
X12[1]	Not fitted	X33[2]	Not fitted
X13[2]	Not fitted	X34[1]	Not fitted
X14[2]	Not fitted	X36[3]	Not fitted
X17[1]	Not fitted	X37[1]	2-3
X18[1]	2-3	X38[1]	Not fitted
X19[1]	Not fitted	X40[3]	Not fitted
X20[1]	Not fitted	X41[1]	2-3
X21[1]	2-3	X42[1]	Not fitted
X24[1]	1-2, 5-6, 9-10, 13-14		

Note 1 — Termination links

The links needed to set the termination types for the ALPM-2 ports are shown in the following table. The link block X24 is used to indicate the type of termination impedance being selected for the associated ALPM-2 port.

Link positions 1, 2, 3 and 4 are associated with port 1, the next four positions (5 to 8) with port 2 and so on. These links are cross-referenced, by software, with the actual termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port.

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X13 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X14, X27, and X33 do the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X10, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms.Links X11, X25 and X28 do this for ports 2, 3, and 4 respectively.

Note 3 — Low Current Loop Links

When a link is fitted to positions 1-2 of X26, the nominal value of the low current loop applied by port 1 is increased from 1.1 mA to 2.4 mA. The low current loop is used when monitoring the 2 wire line for line blocking / line failure and also in certain guarded loop signalling schemes. Links X29, X36 and X40 have the same function for ports 2, 3 and 4 respectively.

The following table shows the link settings for the two termination impedance types:

Port Number	Termination types	Link settings
1	Australian complex (220Ω + 820Ω ll 120nF)	X24 1-2 (Fitted), 3-4 (Not Fitted) X17 (Not fitted), X18 2-3 (Fitted), X19 (Not fitted)
	General Termination (600Ω)	X24 1-2 (Not fitted), 3-4 (Not Fitted) X17 1-2 (Fitted), X18 (Not fitted), X19 2-3 (Fitted)
2	Australian complex (220Ω + 820Ω ll 120nF)	X24 5-6 (Fitted), 7-8 (Not fitted) X12 1-2 (Not fitted), X20 2-3 (Not fitted), X21 (Fitted)
	General Termination (600Ω)	X24 5-6 (Not fitted), 7-8 (Not fitted) X12 1-2 (Fitted), X20 2-3 (Fitted), X21 (Not fitted)
3	Australian complex (220Ω + 820Ω ll 120nF)	X24 9-10 (Fitted), 11-12 (Not fitted) X30 (Not fitted), X37 2-3 (Fitted), X38 (Not fitted)
	General Termination (600Ω)	X24 9-10 (Not fitted), 11-12 (Not fitted) X30 1-2 (Fitted), X37(Not fitted), X38 2-3 (Fitted)
4	Australian complex (220Ω + 820Ω ll 120nF)	X24 13-14 (Fitted), 15-16 (Not fitted) X34 (Not fitted), X41 2-3 (Fitted), X42 (Not fitted)
	General Termination (600Ω)	X24 13-14 (Not fitted), 15-16 (Not fitted) X34 1-2 (Fitted), X41 (Not fitted), X42 2-3 (Fitted)

Normal link settings for the ALPM-2 (UK)

The following table shows the normal link settings for the ALPM-2 (UK):

Ref	Normal setting	Ref	Normal setting
X2	Not fitted	X25[2]	Not fitted
X5	Not fitted	X26[3]	1-2
X6	Not fitted	X27[2]	Not fitted
X9	2-3	X28[2]	Not fitted
X10[2]	Not fitted	X29[3]	1-2
X11[2]	Not fitted	X30[1]	2-3
X12[1]	2-3	X33[2]	Not fitted
X13[2]	Not fitted	X34[1]	2-3
X14[2]	Not fitted	X36[3]	1-2
X17[1]	2-3	X37[1]	Not fitted
X18[1]	Not fitted	X38[1]	1-2
X19[1]	1-2	X40[3]	1-2
X20[1]	1-2	X41[1]	Not fitted
X21[1]	Not fitted	X42[1]	1-2
X24[1]	3-4, 7-8, 11-12, 15-16		

Note 1 — Termination links

The links needed to set the termination types for the ALPM-2 ports are shown in the following table. The link block X24 is used to indicate the type of termination impedance being selected for the associated ALPM-2 port.

Link positions 1, 2, 3 and 4 are associated with port 1, the next four positions (5 to 8) with port 2 and so on. These links are cross-referenced, by software, with the actual termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port.

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X13 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X14, X27, and X33 carry out the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X10, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms. Links X11, X25 and X28 do this for ports 2, 3, and 4 respectively.

Note 3 — Low Current Loop Links

When a link is fitted to positions 1-2 of X26, the nominal value of the low current loop applied by port 1 is increased from 1.1 mA to 2.4 mA. The low current loop is used when monitoring the 2 wire line for line blocking / line failure and also in certain guarded loop signalling schemes. Links X29, X36 and X40 have the same function for ports 2, 3 and 4 respectively.

The following table shows the link settings for the two termination impedance types:

Port Number	Termination types	Link settings
1	UK1 Termination (370Ω + 620Ω ll 310nF)	X24 1-2 (Not fitted), 3-4 (Fitted) X17 2-3 (Fitted), X18 (Not fitted), X19 1-2 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X24 1-2 (Fitted), 3-4 (Fitted) X17 2-3 (Fitted), X18 1-2 (Fitted), X19 (Not fitted)
2	UK1 Termination (370Ω + 620Ω ll 310nF)	X24 5-6 (Not fitted), 7-8 (Fitted) X12 2-3 (Fitted), X20 1-2(Fitted), X21 (Not fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X24 5-6 (Fitted), 7-8 (Fitted) X12 2-3 (Fitted), X20 (Not fitted), X21 1-2 (Fitted)
3	UK1 Termination (370Ω + 620Ω ll 310nF)	X24 9-10 (Not fitted), 11-12 (Fitted) X30 2-3 (Fitted), X37 (Not fitted), X38 1-2 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X24 9-10 (Fitted), 11-12 (Fitted) X30 2-3 (Fitted), X37 1-2 (Fitted), X38 (Not fitted)
4	UK1 Termination (370Ω + 620Ω ll 310nF)	X24 13-14 (Not fitted), 15-16 (Fitted) X34 2-3 (Fitted), X41 (Not fitted), X42 1-2 (Fitted)
	UK2 Termination (300Ω + 1000Ω ll 220nF)	X24 13-14 (Fitted), 15-16 (Fitted) X34 2-3 (Fitted), X41 1-2 (Fitted), X42 (Not fitted)

Normal link settings for ALPM-2 (USA/Canada)

The following table shows the normal link settings for the ALPM-2 (USA/Canada):

Ref	Normal setting	Ref	Normal setting
X2	Not fitted	X25[2]	Not fitted
X5	Not fitted	X26[3]	Not fitted
X6	Not fitted	X27[2]	Not fitted
X9	2-3	X28[2]	Not fitted
X10[2]	Not fitted	X29[3]	Not fitted
X11[2]	Not fitted	X30[1]	1-2
X12[1]	1-2	X33[2]	Not fitted
X13[2]	Not fitted	X34[1]	1-2
X14[2]	Not fitted	X36[3]	Not fitted
X17[1]	1-2	X37[1]	Not fitted
X18[1]	Not fitted	X38[1]	2-3
X19[1]	2-3	X40[3]	Not fitted
X20[1]	2-3	X41[1]	Not fitted
X21[1]	Not fitted	X42[1]	2-3
X24[1]	Not fitted		

Note 1 — Termination links

The links needed to set the termination types for the ALPM-2 ports are shown in the following table. The link block X24 is used to indicate the type of termination impedance being selected for the associated ALPM-2 port.

Link positions 1, 2, 3 and 4 are associated with port 1, the next four positions (5 to 8) with port 2 and so on. These links are cross-referenced, by software, with the actual termination type(s) stored in the EEPROM before sign on to the Control Module or Resource Manager. The port sign-on type determines the configuration setting of the port.

Note 2 — Tone detection links

The effect of fitting a link to positions 1-2 of X13 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X14, X27, and X33 do the same function for ports 2, 3 and 4 respectively.

When a link is fitted to positions 1-2 of X10, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms.Links X11, X25 and X28 do this for ports 2, 3, and 4 respectively.

Note 3 — Low Current Loop Links

When a link is fitted to positions 1-2 of X26, the nominal value of the low current loop applied by port 1 is increased from 1.1 mA to 2.4 mA. The low current loop is used when monitoring the 2 wire line for line blocking / line failure and also in certain guarded loop signalling schemes. Links X29, X36 and X40 have the same function for ports 2, 3 and 4 respectively.

The following table shows the link settings for the two termination impedance types:

Port Number	Termination types	Link settings
1	General Termination (600Ω)	X24 1-2 (Not fitted), 3-4 (Not Fitted) X17 1-2 (Fitted), X18 (Not fitted), X19 2-3 (Fitted)
2	General Termination (600Ω)	X24 5-6 (Not fitted), 7-8 (Not fitted) X12 1-2 (Fitted), X20 2-3 (Fitted), X21 (Not fitted)
3	General Termination (600Ω)	X24 9-10 (Not fitted), 11-12 (Not fitted) X30 1-2 (Fitted), X37(Not fitted), X38 2-3 (Fitted)
4	General Termination (600Ω)	X24 13-14 (Not fitted), 15-16 (Not fitted) X34 1-2 (Fitted), X41 (Not fitted), X42 2-3 (Fitted)

LEDs

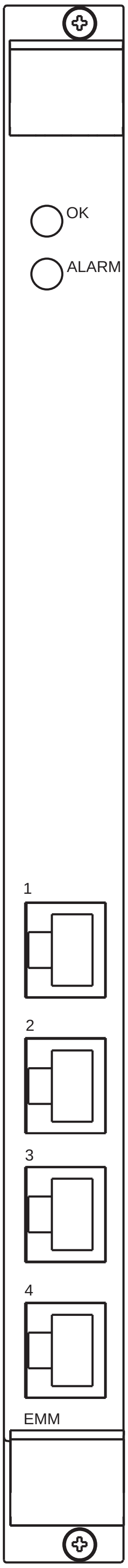
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
CALL	Green	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check CM or RM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
OK indicator is flashing On and Off	A diagnostic loopback has been applied to one or more ports

RM CM

E&M Line Module (EMM)



The E&M Line Module (EMM) is an analog voice-frequency line module that can connect 4 wire, single E&M analog systems to an ISDN. An EMM contains four ports which digitally encode voice signals onto a 64 kbit/s B-channel. Each port comprises two signalling leads and a 4-wire audio circuit.

The signalling leads connect to the E&M leads of the attached equipment (typically a PABX tie line interface). The EMM receives call control signals from the attached equipment's M lead and sends call control signals to the attached equipment's E lead.

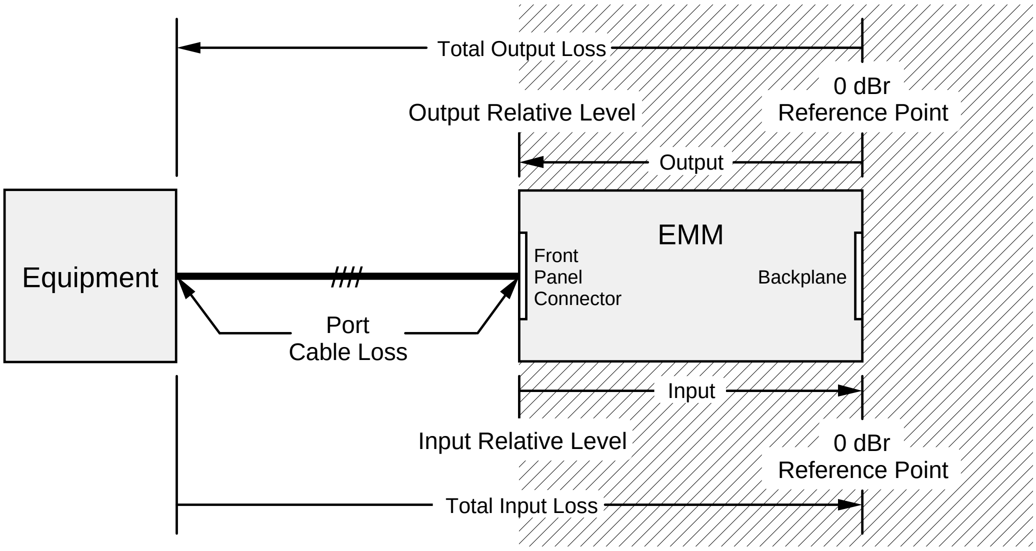
The 4-wire audio circuit connects to the 600 Ω terminated transmit (send) and receive (paired) audio circuits of the attached equipment.

The EMM supports C2 signalling in both earth on idle and earth off idle modes.

Back busy is supported as an NMS configurable option for tie line applications (SPC or Switched Semipermanent Connection XSPC).

Relative level settings

This section provides information for determining relative level settings on EMM ports to suit installation conditions. The figure below shows the relationship between the Input and Output Relative Levels, the Total Input and Output Loss, and the Port Cable Loss.



Settings for UK installations

The input relative level should be set to 0dBr.
The output relative level should be set to 0dBr.

Settings for Australian installations

The input relative level should be set to 0dBr.
The output relative level should be set to 0dBr.

Settings for USA/Canadian installations

The input relative level should be set to 0dBr.
The output relative level should be set to -3dBr.

Note *Refer to Appendix C for information regarding overall Call Path Losses within a system.*

Specifications

Compatibility The EMM can be fitted to any chassis.

Ports RJ45 female connector on front panel.

Port protocol C2 Signalling Code.

Australian standard Austel TS003.

Idle mode Earth on idle, earth off idle (link-selectable).

Call establishment modes Switched, using C2 signalling.
Manual call control (NMS operator initiated).

In Australia, a tie line (ISDN Semipermanent connection) is available.

Earthing There must be a common (low resistance) earth between the battery of the terminal equipment (TE) and the chassis.

Module width 1 slot.

Power consumption The table below summarizes the power consumption of the EMM:

Supply Voltage	Supply Current (mA)
+5 V	240
+12V	30
-12V	30
-48 V	40

Transmission Performance: The following table details the transmission performance:

Parameter	Specification	Notes
Variation of Loss with Frequency	0.35 to - 0.3dB	1, 2
	0.6 to -0.3dB	1, 3
Quantization Distortion Units	0.5QDU	1, 4

Notes

1 *Specified between EMM port and digital reference point of this equipment.*

2 *Frequency range 600 to 2400 Hz.*

3 *Frequency range 300 to 3200 Hz.*

4 *Additional quantization distortion units may be introduced into the transmission path depending on whether voice compression features in this equipment are used.*

Call Path Loss: See *Appendix C*.

Call Path Delay See *Appendix D*.

Installation

Cabling

The following table describes the cable needed to connect the EMM to terminal equipment:

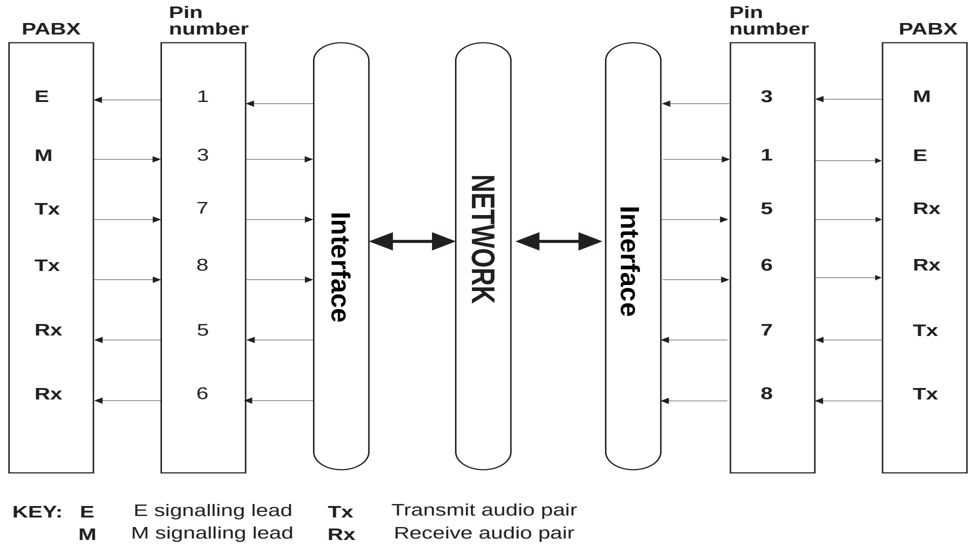
Cable length	100m max.
Cable type	0.5mm 8-wire solid conductor.
Connector	RJ45 male.

Connecting the EMM to terminal equipment

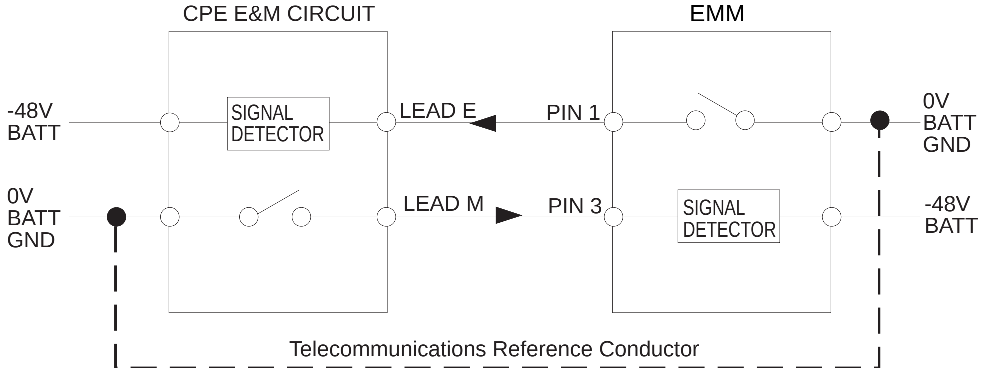
Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

For each user line:

1. Run a cable from the TE to the EMM through the front cable access duct.
2. Terminate the cable with an RJ45 male connector as shown below. See *Appendix A* for a diagram of the connectors.



You must connect the battery 0V of the chassis and the 0V reference of the attached terminal equipment as shown in the following diagram. This occurs automatically when the attached equipment and the chassis are both connected to reference ground.



Link settings

EMM circuit board

Figure 32 below shows the position of the links on the EMM, issue 1.

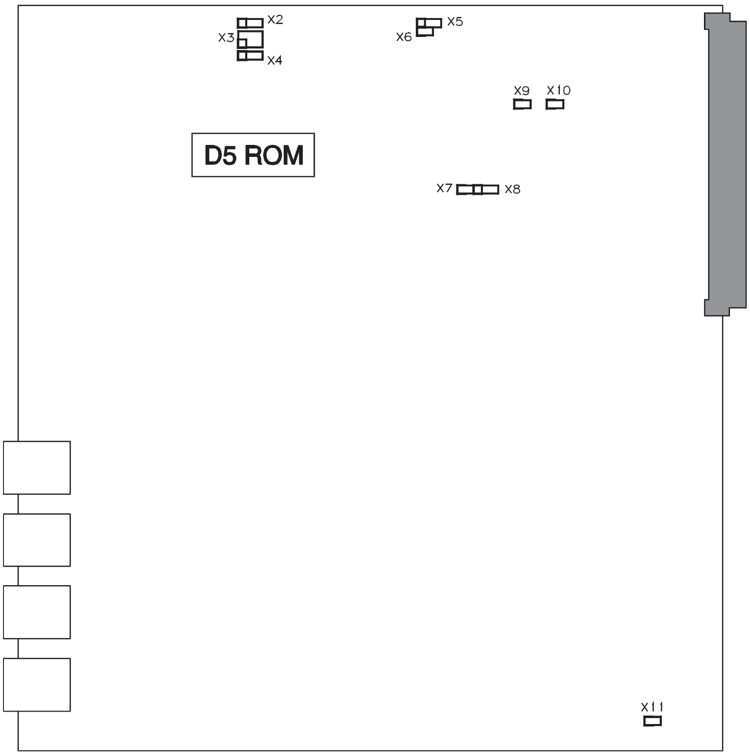


Figure 32: EMM circuit board, issue 1

Normal link settings for the EMM, issue 1

The following table shows the normal link settings for the EMM, issue 1.

Ref	Normal setting	Ref	Normal setting
X2	2-3	X7	1-2
X3	3-4	X8	1-2
X4	2-3	X9	see below
X5	1-2	X10	no link
X6	no link	X11	no link

The following table shows the operating modes that result from the various settings of X9.

X9	Operating Mode
Link Off	Earth Off Idle mode
Link On	Earth On Idle mode

LEDs

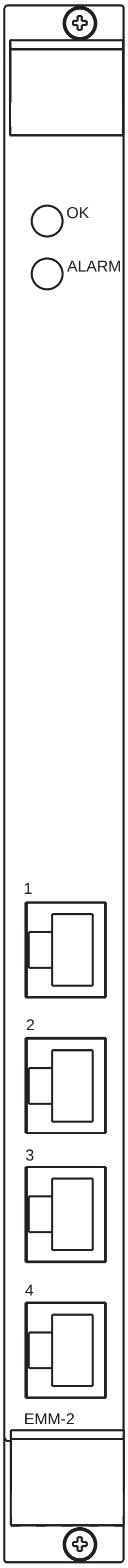
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check CM or RM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM indicator is On	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
Signalling is not transmitted or received	Check cabling to Customer Premises Equipment (CPE)
	Check that CPE and device share the common (low-resistance) earth
	Check that the module port is correctly configured
	Check that CPE at each end is operating correctly
	Check that other calls are present or can be made from this device
	Check that the EMM links for Idle mode have been correctly configured
	Notify service personnel
Voice is not transmitted or received	Check voice pairs to CPE
	Check that CPE at each end is operating correctly
	Notify service personnel
OK indicator is flashing On and Off	A diagnostic loopback has been applied to one or more ports

RM CM

E&M Line Module-2 (EMM-2)



The E&M Line Module-2 (EMM-2) is an analog voice-frequency line module that can connect 4 wire, single E&M analog systems to an ISDN. An EMM-2 contains four ports which digitally encode voice signals onto a 64kbit/s B-channel. Each port comprises two signalling leads and a 4-wire audio circuit.

The signalling leads connect to the E&M leads of the attached equipment (typically a PABX tie line interface). The EMM-2 receives call control signals from the attached equipment's M lead and sends call control signals to the attached equipment's E lead.

The 4-wire audio circuit connects to the 600 Ω terminated transmit (send) and receive (paired) audio circuits of the attached equipment.

The EMM-2 supports the following signalling schemes in both earth on idle and earth off idle modes:

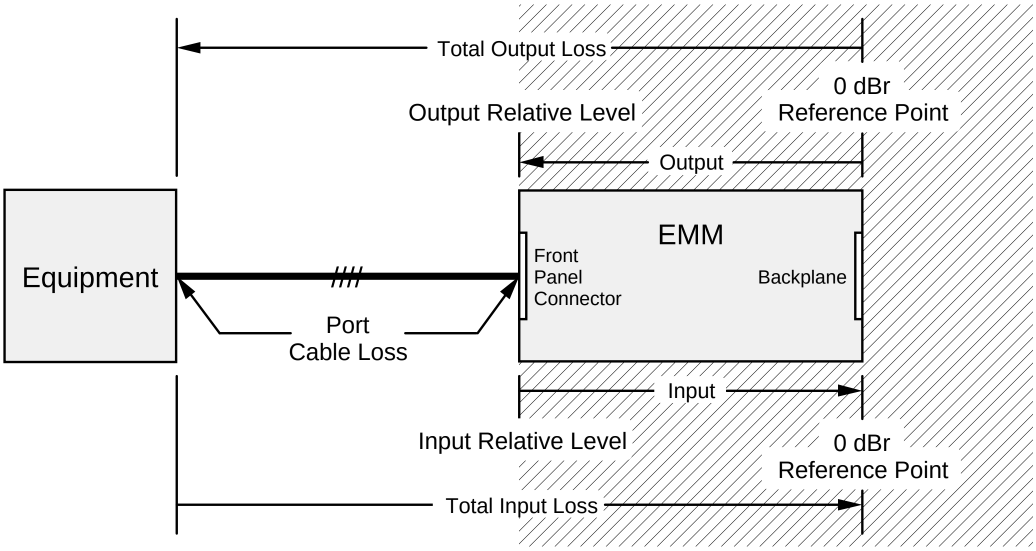
- Type 1
- Type 2
- Type 3
- Type 5 (C2).

The EMM-2 also supports DTMF tone dialling.

Back busy is supported as an NMS configurable option for tie line applications (SPC or Switched Semipermanent Connection XSPC).

Relative level settings

This section provides information for determining relative level settings on EMM-2 ports to suit installation conditions. The figure below shows the relationship between the Input and Output Relative Levels, the Total Input and Output Loss, and the Port Cable Loss.



Settings for UK installations

The input relative level should be set to 0dBr.
The output relative level should be set to 0dBr.

Settings for Australian installations

The input relative level should be set to 0dBr.
The output relative level should be set to 0dBr.

Settings for USA/Canadian installations

The input relative level should be set to 0dBr.
The output relative level should be set to -3dBr.

Note *Refer to Appendix C for information regarding overall Call Path Losses within a system.*

Specifications

Compatibility The EMM-2 can be fitted to any chassis.

Ports RJ45 female connector on front panel.

Port protocol E&M types 1, 2, 3 and 5.

Type 1 and 2: Bellcore (GR-506-CORE)
Type 5: Australian standard Austel TS003 (C2).

Idle mode Earth on idle, earth off idle (link-selectable).

Call establishment modes Switched, using E&M or DTMF signalling.
Manual call control (NMS operator initiated).

In Australia, a tie line (ISDN Semipermanent connection) is available.

Earthing There must be a common (low resistance) earth between the battery of the terminal equipment (TE) and the chassis.

Module width 1 slot.

Power consumption The table below summarises the power consumption of the EMM-2:

Supply Voltage	Supply Current (mA)
+5 V	240
+12V	30
-12V	30
-48 V	40

Transmission Performance: The following table details the transmission performance:

Parameter	Specification	Notes
Variation of Loss with Frequency	0.35 to - 0.3dB	1, 2
	0.6 to -0.3dB	1, 3
Quantization Distortion Units	0.5QDU	1, 4

Notes

1 *Specified between EMM-2 port and digital reference point of this equipment.*

2 *Frequency range 600 to 2400 Hz.*

3 *Frequency range 300 to 3200 Hz.*

4 *Additional quantization distortion units may be introduced into the transmission path depending on whether voice compression features in this equipment are used.*

Call Path Loss: See *Appendix C*.

Call Path Delay See *Appendix D*.

Installation

Cabling

The following table describes the cable needed to connect the EMM-2 to terminal equipment:

Cable length	100m max.
Cable type	0.5mm 8-wire solid conductor.
Connector	RJ45 male.

Connecting the EMM-2 to terminal equipment

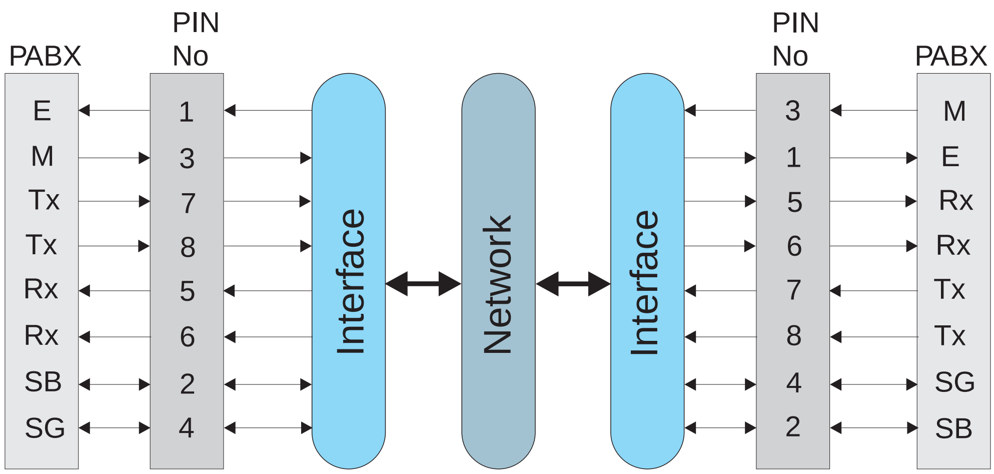
Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

For each user line:

1 Run a cable from the TE to the EMM-2 through the front cable access duct.

2 Terminate the cable with an RJ45 male connector as shown below for each connector type. See *Appendix A* for a diagram of the connectors.

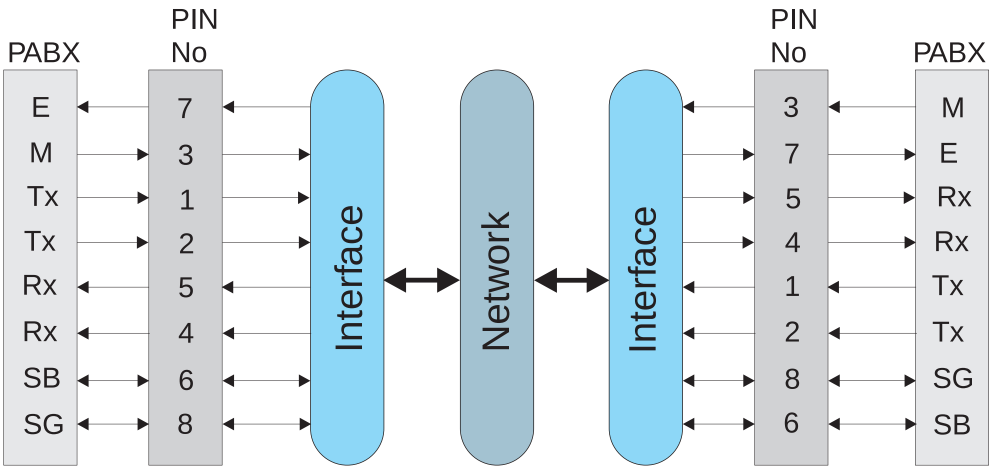
Connector Type A



KEY: **E** E Signal lead **Tx** Transmit audio pair
M M Signal lead **Rx** Receive audio pair

Note: SB and SG are not used with Type 5 signalling

Connector Type B

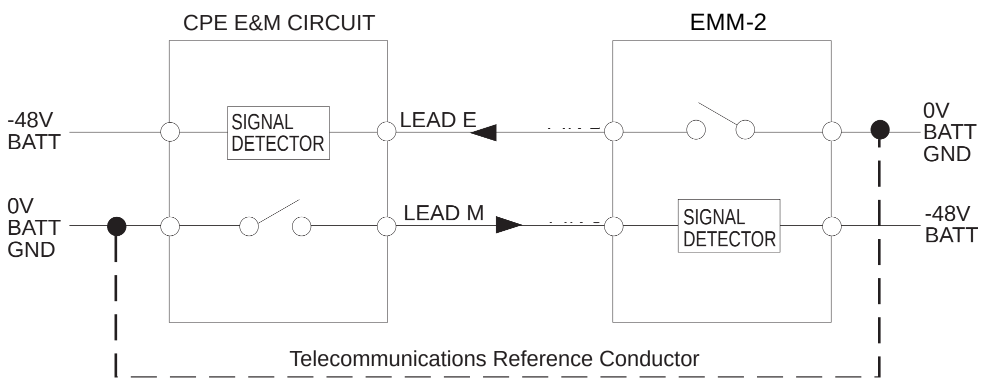


KEY: E E Signal lead **Tx** Transmit audio pair
M M Signal lead **Rx** Receive audio pair

Note: SB and SG are not used with Type 5 signalling

Refer to the front panel pin allocation link table on page 6-63 for information on setting up each type of connector

You must connect the battery 0V of the chassis and the 0V reference of the attached terminal equipment as shown in the following diagram.



Link settings

EMM-2 circuit board 10003298.00 Rev.1

The following diagram shows the position of the links on EMM-2 circuit board 10003298.00 Rev.1.

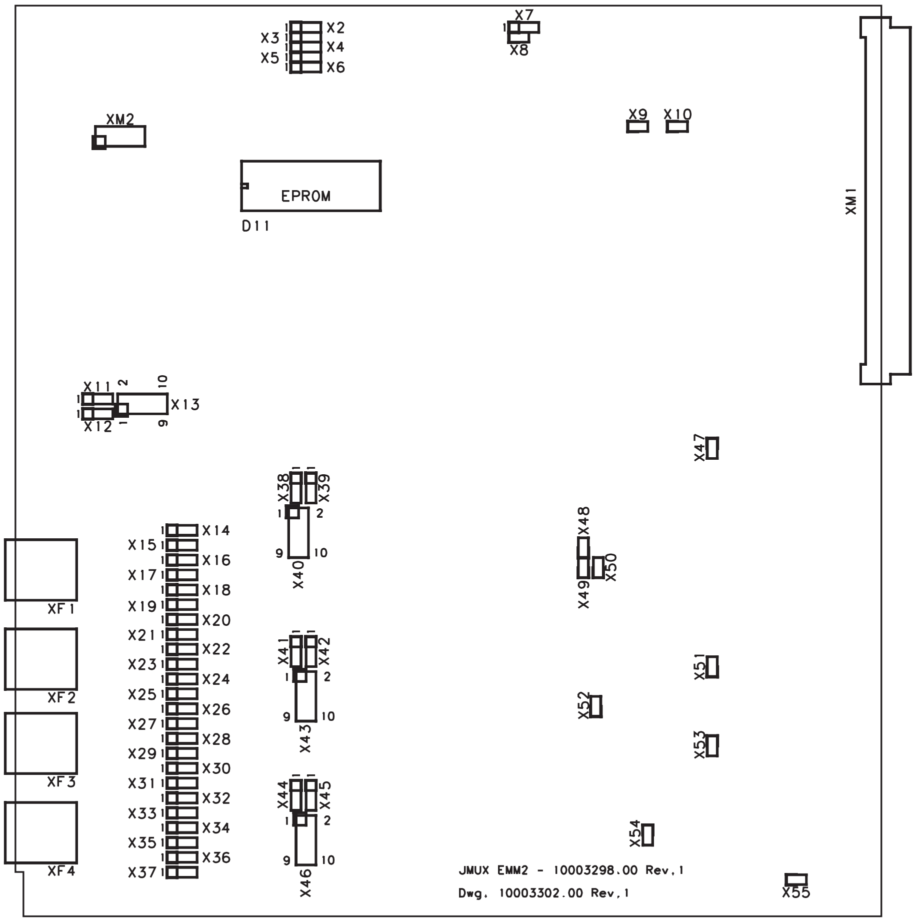


Figure 33: EMM-2 circuit board, 10003298.00 Rev.1

Link settings for the EMM-2, 10003298.00 Rev.1

The EMM-2 10003298.00 Rev.1 can be configured for use in different markets. The link settings for your particular market are set during manufacture. The following tables show the link settings for the different signalling types. The first table specifies the common link settings for all markets. The link settings for each signal variant are covered by the successive tables.

Further links enable you to change the pin allocation of the EMM-2 front panel connector to suit your requirements. These are detailed in the *Front panel connector pin allocation* table on page 6-63.

Common Links

The following table shows the common link settings for the EMM-2, 10003298.00 Rev.1 for all markets.

Ref	Normal setting	Ref	Normal setting
X2	1-2	X47	Not fitted[1]
X3	1-2	X48	Not fitted[1]
X4	1-2	X49	Not fitted[1]
X5	1-2	X50	Not fitted[1]
X6	1-2	X51	Not fitted[1]
X7	1-2	X52	Not fitted[1]
X8	Not fitted	X53	Not fitted[1]
X9	Not fitted	X54	Not fitted[1]
X10	Not fitted	X55	Not fitted

Note 1 — Tone detection links

The effect of fitting a link to positions 1-2 of X48 is to provide an optional 3 dB loss for receiving tones from the line for port 1. X49, X52, and X54 do the same function for ports 2, 3 and 4 respectively

When a link is fitted to positions 1-2 of X47, the tone absent detection threshold of the receiver circuitry is lowered to below 30 ms.Links X50, X51 and X53 do this for ports 2, 3, and 4 respectively.

Earth operating mode

The following table shows the operating modes that result from the various settings of X9 and X10.

X9	X10	Operating Mode
Link off	Link off	Earth Off Idle mode
Link on	Link off	Earth On Idle mode

Signalling specific links

The following tables show the link settings for each market and its respective E&M signalling type. Only the pins relevant to the particular setting are shown. Refer to the table above for the common link settings for all markets.

In the following tables the CPE and NE link settings refer to the type of equipment the EMM interface is set up to be. When set to CPE, the EMM behaves as 'Customer Premises Equipment'. When set to NE, the EMM behaves as 'Network Equipment' and therefore connects to a CPE device.

Caution *When configuring X13, X40, X43 and X46, ensure that you remove all links from the pins* ***BEFORE*** *changing the jumpers. The incorrect setting of the jumpers could result in a short circuit across the power leads.*

Type 5 signalling

Note *Type 5 signalling is symmetrical for CPE and NE.*

Ref	CPE	NE	Description
X11	1-2	1-2	Channel 1 E Lead
X12	1-2	1-2	Channel 1 E Lead
X13	3-4, 5-x, 6-x[1]	3-4	Channel 1 Type configuration
X38	1-2	1-2	Channel 2 E Lead
X39	1-2	1-2	Channel 2 E Lead
X40	3-4, 5-x, 6-x[1]	3-4	Channel 2 Type configuration
X41	1-2	1-2	Channel 3 E Lead
X42	1-2	1-2	Channel 3 E Lead
X43	3-4, 5-x, 6-x[1]	3-4	Channel 3 Type configuration
X44	1-2	1-2	Channel 4 E Lead
X45	1-2	1-2	Channel 4 E Lead
X46	3-4, 5-x, 6-x[1]	3-4	Channel 4 Type configuration
X47	Not fitted	Not fitted	Tone detection link (See note on page 6-59)

Type 1 signalling

Ref	CPE	NE	Description
X11	1-2	2-3	Channel 1 E Lead
X12	1-2	2-3	Channel 1 E Lead
X13	1-2, 8-10, 4-x[1]	2-4	Channel 1 Type configuration
X38	1-2	2-3	Channel 2 E Lead
X39	1-2	2-3	Channel 2 E Lead
X40	1-2, 8-10, 4-x[1]	2-4	Channel 2 Type configuration
X41	1-2	2-3	Channel 3 E Lead
X42	1-2	2-3	Channel 3 E Lead
X43	1-2, 8-10, 4-x[1]	2-4	Channel 3 Type configuration
X44	1-2	2-3	Channel 4 E Lead
X45	1-2	2-3	Channel 4 E Lead
X46	1-2, 8-10, 4-x[1]	2-4	Channel 4 Type configuration
X47	Not fitted	Not fitted	Tone detection link (See note on page 6-59)

Type 2 signalling

Ref	CPE	NE	Description
X11	1-2	2-3	Channel 1 E Lead
X12	1-2	2-3	Channel 1 E Lead
X13	6-8, 5-7, 2-x[1]	6-8, 7-9	Channel 1 Type configuration
X38	1-2	2-3	Channel 2 E Lead
X39	1-2	2-3	Channel 2 E Lead
X40	6-8, 5-7, 2-x[1]	6-8, 7-9	Channel 2 Type configuration
X41	1-2	2-3	Channel 3 E Lead
X42	1-2	2-3	Channel 3 E Lead
X43	6-8, 5-7, 2-x[1]	6-8, 7-9	Channel 3 Type configuration
X44	1-2	2-3	Channel 4 E Lead
X45	1-2	2-3	Channel 4 E Lead
X46	6-8, 5-7, 2-x[1]	6-8, 7-9	Channel 4 Type configuration
X47	Not fitted	Not fitted	Tone detection link (See note on page 6-59)

Note

1 *Where a setting is shown as* 'n-x', *the jumper is placed only on one pin. This provides storage for the unused link.*

Type 3 signalling

Ref	CPE	NE	Description
X11	1-2	2-3	Channel 1 E Lead
X12	1-2	2-3	Channel 1 E Lead
X13	1-2, 5-7, 6-8	3-4, 5-6, 7-9	Channel 1 Type configuration
X38	1-2	2-3	Channel 2 E Lead
X39	1-2	2-3	Channel 2 E Lead
X40	1-2, 5-7, 6-8	3-4, 5-6, 7-9	Channel 2 Type configuration
X41	1-2	2-3	Channel 3 E Lead
X42	1-2	2-3	Channel 3 E Lead
X43	1-2, 5-7, 6-8	3-4, 5-6, 7-9	Channel 3 Type configuration
X44	1-2	2-3	Channel 4 E Lead
X45	1-2	2-3	Channel 4 E Lead
X46	1-2, 5-7, 6-8	3-4, 5-6, 7-9	Channel 4 Type configuration
X47	Not fitted	Not fitted	Tone detection link (See note on page 6-59)

Front panel connector pin allocation links

The following table shows the link settings required to enable the pin allocation for each type of connector. Type A is the default setting. Type B is the setting for an FCC compliant connector See page 6-56 for details of the pin-to-lead allocation for each type of connector..

Link ref	Connector type		Lead description
	Setting for Type A (Factory default)	Setting for Type B (FCC compliant)	
X14	1-2	2-3	Channel 1 M lead
X15	1-2	2-3	Channel 1 RX1 lead
X16	1-2	2-3	Channel 1 SB lead
X17	1-2	2-3	Channel 1 RX2 lead
X18	1-2	2-3	Channel 1TX2 lead
X19	1-2	2-3	Channel 1 SG lead
X20	1-2	2-3	Channel 2 M lead
X21	1-2	2-3	Channel 2 RX1 lead
X22	1-2	2-3	Channel 2 SB lead
X23	1-2	2-3	Channel 2 RX2 lead
X24	1-2	2-3	Channel 2 TX2 lead
X25	1-2	2-3	Channel 2 SG lead
X26	1-2	2-3	Channel 3 M lead
X27	1-2	2-3	Channel 3 RX1 lead
X28	1-2	2-3	Channel 3 SB lead
X29	1-2	2-3	Channel 3 RX2 lead
X30	1-2	2-3	Channel 3 TX2 lead
X31	1-2	2-3	Channel 3 SG lead
X32	1-2	2-3	Channel 4 M lead
X33	1-2	2-3	Channel 4 RX1 lead
X34	1-2	2-3	Channel 4 SB lead
X35	1-2	2-3	Channel 4 RX2 lead
X36	1-2	2-3	Channel 4 TX2 lead
X37	1-2	2-3	Channel 4 SG lead

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check RM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM indicator is On	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
Signalling is not transmitted or received	Check cabling to Customer Premises Equipment (CPE) or Networking Equipment (NE) as applicable to your configuration
	Check that CPE and device share the common (low-resistance) earth
	Check that the module port is correctly configured
	Check that CPE at each end is operating correctly
	Check that other calls are present or can be made from this device
	Check that the EMM-2 links for Idle mode have been correctly configured
	Notify service personnel
Voice is not transmitted or received	Check voice pairs to CPE
	Check that CPE at each end is operating correctly
	Notify service personnel
OK indicator is flashing On and Off	A diagnostic loopback has been applied to one or more ports

Digital Line Modules (DLMs)

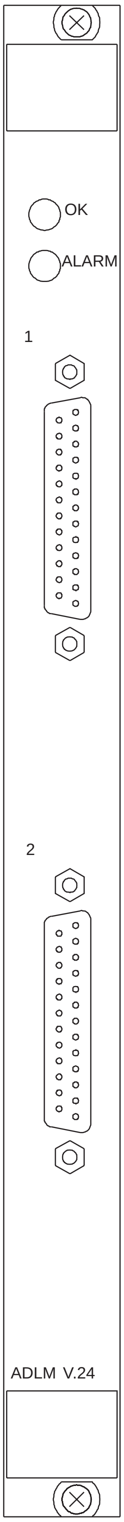
Introduction

This section describes the following digital line modules:

- Asynchronous Digital Line Module V.24 (ADLM V.24)
- Synchronous Digital Line Module V.24 (SDLM V.24)
- Synchronous Digital Line Module V.35 (SDLM V.35)
- Synchronous Digital Line Module X.21 (SDLM X.21)
- Quad Digital Line Module (QDLM)
- High Speed Digital Module (HSDM)
- Leased Line Backup (LLB)
- E1 Digital Module (E1M)
- E1 Digital Module-2 (E1M-2)
- T1 Digital Module (T1M)
- E1 Digital Module DPNSS (E1M DPNSS)
- E1 Digital Module QSIG (E1M-QSIG)
- Digital Trunk Module (DTM).

RM CM

Asynchronous Digital Line Module V.24 (ADLM V.24)



The ADLM V.24 is a V.24 DCE as defined in the recommendations of ITU-T (CCITT). It can connect two asynchronous V.24 DTEs to the ISDN. The DTEs can be computers, modems, or other devices which communicate using asynchronous V.24 (or RS-232) data formats.

The ADLM V.24 simulates the operation of an AT compatible data modem by providing a subset of the AT command set which is translated to the ISDN D-channel protocol.

The ADLM V.24 provides data rate adaption of user data to the 64kbit/s ISDN B-channel using I.463 (V.110) and ECMA 102 compatible data rate adaption.

In the UK, the data word size can be 8-bit or 7-bit. Parity is not supported in the United Kingdom.

In Australia, the data word size can be either 7-bit with parity, 7-bit without parity, or 8 bit without parity. Parity is only allowed for 7-bit data (in accordance with ECMA 102). The parity bit can be odd, even, forced to 0, or forced to 1.

The number of stop bits can be either 1 or 2.

Three different signalling modes can be configured for an ADLM V.24 interface, and each interface on a module can be configured differently. In each case, translation to the appropriate ISDN signalling is performed by this device. These signalling modes provide dialled-up data calls or permanent leased line applications.

Specifications

Compatibility	The ADLM can be fitted to any chassis.
Ports	DB25 female connector on front panel, conforms to ISO2110 standard.
Port protocol	ITU-T (CCITT) recommendation V.24 (asynchronous) and RS-232.
Data rates supported (bit/s)	600, 1200, 2400, 4800, 9600, 19200 (ITU-T V.110).
Data Rate Adaption Techniques	ITU-T (CCITT) recommendations I.463 (V.110) and ECMA 102 compatible protocols.
Call Establishment Modes	Control signal (DTR signal) initiated Hotline. Manual call control (NMS operator initiated). AT commands. In Australia leased lines (ISDN semipermanent connection) are available.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the ADLM V.24:

Cable length	15m max.
Cable type	multi-core shielded.
Connector	DB25 male.

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the ADLM V.24 to terminal equipment

For each user line:

1 Run a cable from the asynchronous V.24 DTE (personal computer, modem or other device) through the front connector cable access duct of the subrack.

2 Terminate the cable with a DB25 male connector wired as shown below, and plug it in to the ADLM V.24. See *Appendix A* for a diagram of the connector.

V.24 signal	DCE	
	DB25 pin	Circuit type
TXD (Transmit data)	2	L
RXD (Receive data)	3	G
RTS (Request to send)	4	L
CTS (Clear to send)	5	G
DSR (Data set ready)	6	G
DCD (Data carrier detect)	8	G
DTR (Data terminal ready)	20	L
RI (Ring indicator)	22	G
FG (Frame ground)	1	CR
SG (Signal ground)	7	CR

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Link settings

Figure 34 below shows the position of the links on the ADLM V.24, issue 4.1.

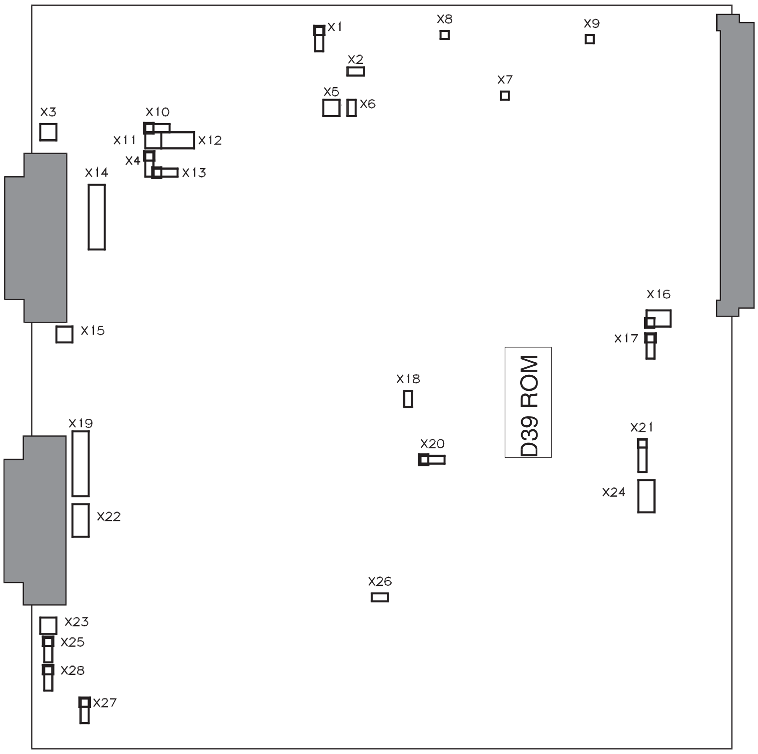


Figure 34: ADLM V.24 circuit board, issue 4.1

Normal link settings for the ADLM V.24

The following table shows the normal link settings for the ADLM V.24.

Ref	Normal setting	Ref	Normal setting
X1	2-3	X15	Not fitted
X2	Not fitted	X16	Not fitted
X3	Not fitted	X17	Not fitted
X4	1-2	X18	1-2
X5	Not fitted	X19	1-2, 3-4, 7-8, 11-12, 13-14
X6	Not fitted	X20	Not fitted
X7	Not Applicable	X21	Not fitted
X8	Not Applicable	X22	1-2
X9	Not Applicable	X23	3-4
X10	2-3	X24	3-4
X11	3-4	X25	2-3
X12	1-2	X26	Not fitted
X13	2-3	X27	2-3
X14	1-2, 3-4, 7-8, 11-12, 13-14	X28	1-2

LEDs

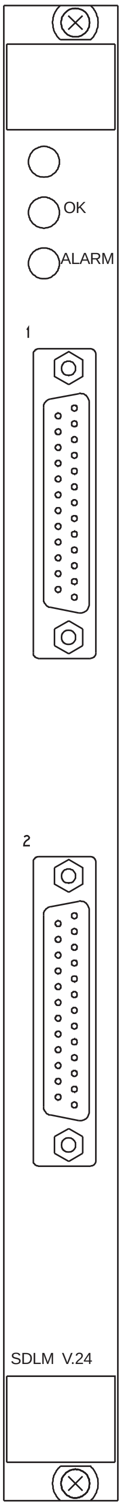
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM indicator is On	Notify service personnel
Data is not being transmitted or received	Check cabling to DTE
	Check cabling termination
	Check that a call is present - NMS action required
	Check that the module port is correctly configured - NMS action required
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check that other calls are present or can be made from this device
	Notify service personnel

RM CM

Synchronous Digital Line Module (SDLM V.24)



The SDLM V.24 is a V.24 DCE as defined in the recommendations of ITU-T. It provides interfaces for two synchronous V.24 DTEs to ISDN. The DTEs can be computers, terminals, or other devices which communicate using synchronous V.24 (or RS-232) data formats.

The SDLM V.24 provides data rate adaption of user data to the 64 kbit/s ISDN B-channel using ITU-T X.30 and I.463 (V.110) and ECMA 102 compatible data rate adaption.

Two different signalling modes can be configured for an SDLM V.24 interface, and each interface on a module can be configured differently. In each case, translation to the appropriate ISDN signalling is performed by the device. These signalling modes provide dialled-up data calls or permanent leased line applications.

Specifications

Compatibility	The SDLM V.24 can be fitted to any chassis.
Ports	DB25 female connector on front panel, conforms to ISO2110 standard.
Port protocol	ITU-T recommendation V.24 (synchronous) and RS-232.
Data rates supported (bit/s)	600, 1200, 2400, 4800, 9600, 19200, 48000, 56000, 64000 (ITU-T X.30, V.110; ECMA 102). 8000, 16000, 32000 (ITU-T I.460). 24000, 48000 (proprietary).

Note *You can configure this module for data rates up to 64kbit/s even though the V.24 interface is defined only for data rates up to 19.2kbit/s.*

Data Rate Adaption Techniques	ITU-T recommendation X.30 I.463 (V.110). ECMA 102 compatible protocols.
Call Establishment Modes	Control signal (DTR signal) initiated Hotline. Manual call control (NMS operator initiated). In Australia leased lines (ISDN semipermanent connection) are available.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the SDLM V.24:

Cable length	15m max.
Cable type	multi-core shielded.
Connector	DB25 male.

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the SDLM V.24 to terminal equipment

For each user line:

1 Run a cable from the synchronous DTE (personal computer, terminal or other device) through the front connector cable access duct of the subrack.

2 Terminate the cable with a DB25 male connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

V.24 signal	DCE	
	DB25 pin	Circuit type
TXD (transmit data)	2	L
RXD (receive data)	3	G
RTS (request to send)	4	L
CTS (clear to send)	5	G
DSR (data set ready)	6	G
DCD (data carrier detect)	8	G
TC (transmit clock)	15	G
RC (receive clock)	17	G
DTR (data terminal ready)	20	L
RI (ring indicator)	22	G
SG (signal ground)	7	CR

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Link settings

Figure 35 below shows the position of the links on the SDLM V.24, issue 4.1.

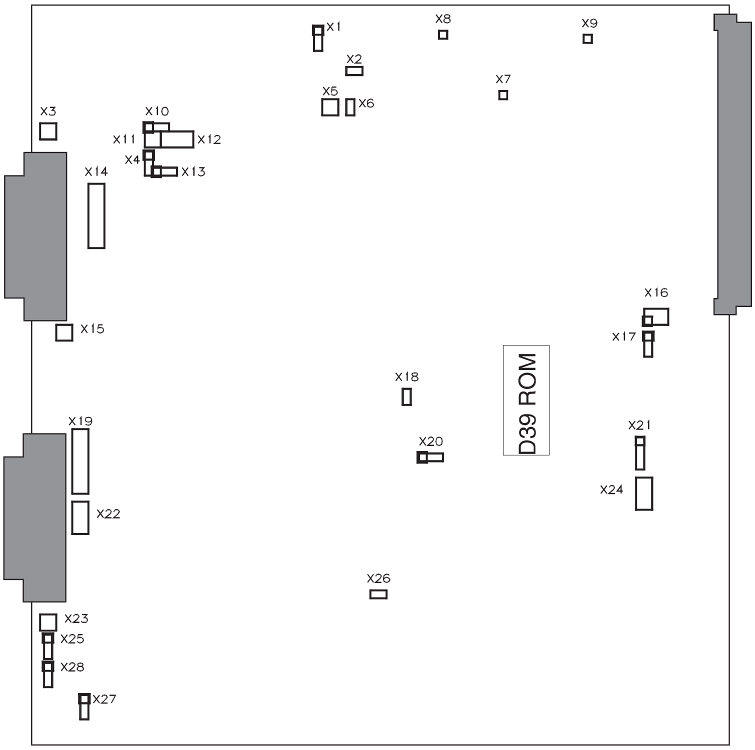


Figure 35: SDLM V.24 circuit board, issue 4.1

Normal link settings for the SDLM V.24

The following table shows normal settings on the SDLM V.24.

Ref	Normal setting	Ref	Normal setting
X1	2-3	X15	Not fitted
X2	Not fitted	X16	Not fitted
X3	Not fitted	X17	Not fitted
X4	2-3	X18	1-2
X5	Not fitted	X19	1-2, 3-4, 7-8, 11-12, 13-14
X6	Not fitted	X20	Not fitted
X7	Not Applicable	X21	Not fitted
X8	Not Applicable	X22	3-4
X9	Not Applicable	X23	3-4
X10	2-3	X24	3-4
X11	3-4	X25	2-3
X12	3-4	X26	Not fitted
X13	2-3	X27	2-3
X14	1-2, 3-4, 7-8, 11-12, 13-14	X28	2-3

LEDs

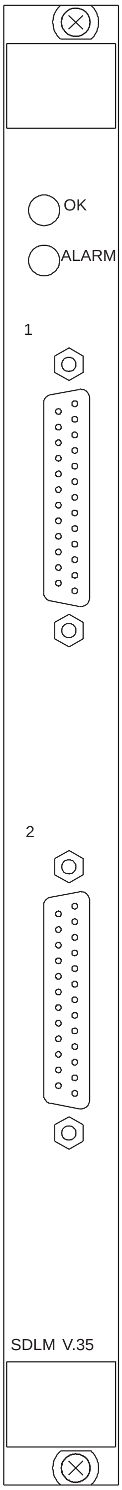
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
ALARM indicator is On	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
Data is not being transmitted or received	Check cabling to DTE
	Check cabling termination
	Check that a call is present - NMS action required
	Check that the module port is correctly configured - NMS action required
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check that other calls are present or can be made from this device
	Notify service personnel

RM CM

Synchronous Digital Line Module V.35 (SDLM V.35)



The SDLM V.35 provides two data circuit terminating equipment (DCE) ports for data terminating equipment (DTE) connection. Equipment connecting to its ports must comply with ITU-T V.35 recommendations and be configured to synchronise with the clocking signal supplied from the module's DCE ports.

Each port allows a DTE to communicate at data rates from 600bit/s to 64kbit/s for connection onto a digital network. Bit rate adaption of the DTE data onto the 64kbit/s digital network channel is performed using ITU-T recommendations X.30 and I.463 (V.110), and ECMA 102 compatible protocols.

The ports can be configured independently and used for switched (NMS operator or Control signal initiated) calls.

The SDLM V.35 can be used where data is required to be transmitted between two items of terminal equipment which require a V.35 DCE connection for data rates between 600bit/s and 64kbit/s.

The terminal equipment will normally be required to connect to one or more destinations. This will be achieved by using either a fixed (leased line) or a switched connection between them.

SDLM V.35s are typically used in applications such as terminal to computer links, computer to computer links or video conference links.

Two different signalling modes can be configured for an SDLM V.35 interface, and each interface on a module can be configured differently. In each case, translation to the appropriate ISDN signalling is performed by this device. These signalling modes provide dialled-up data calls or permanent leased line applications.

Specifications

Compatibility	The SDLM V.35 can be fitted to any chassis.
Ports	DB25 female connector on front panel, conforms mechanically to ISO2110 standard.
Port protocol	ITU-T recommendation V.35.
Data rates supported (bit/s)	600, 1200, 2400, 4800, 9600, 19200, 48000, 56000, 64000 (ITU-T X.30, V.110; ECMA 102). 8000, 16000, 32000 (ITU-T I.460). 24000, 48000 (Jtec proprietary).
Data Rate Adaption Techniques	ITU-T recommendations X.30 and I.463 (V.110) and ECMA 102 compatible protocols.
Call Establishment Modes	Control signal (RS signal) initiated Hotline. Manual call control (NMS operator initiated). In Australia, leased lines (ISDN semipermanent connection) are available.
Adaptor cables (one pair)	DB25 male connector to M34 female connector. Conforms to ISO2593 standard, 1 metre long.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the SDLM V.35:

Cable length	100m max.
Cable type	twisted-pair multi-core.
Connector	DB25 male (cable assembly available for conversion to standard M34 connectors).

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the SDLM V.35 to terminal equipment

The SDLM V.35 has a DB25 female connector. To interface with a V.35 DTE, an M34 connector might be required. A pair of DB25 to M34 adaptor cables are available as an option. See *Appendix A* for further details.

The table shows the V.35 connector assignments.

V.35 signal	DCE		
	DB25 pin	M34 pin	Circuit type
SG signal ground	1	B	CR
RTS request to send	4	C	L
CTS clear to send	5	D	G
DSR data set ready	6	E	G
DTR data terminal ready	20	H	L
RLSD Rx'd line signal	18	F	G
RDa Rx'd data (sig. a)	9	R	G
RDb Rx'd data (sig. b)	21	T	G
SCRa ser. clk Rx (sig. a)	12	V	G
SCRb ser. clk Rx (sig. a)	24	X	G
SDa send data (sig. a)	7	P	L
SDb send data (sig. b)	19	S	L
SCTa ser. clk Tx (sig. a)	11	Y	G
SCTb ser. clk Tx (sig. b)	23	AA	G
RI (ring indicator)	22	J	G

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Link settings

Figure 36 below shows the position of the links on the SDLM V.35., issue 4.1.

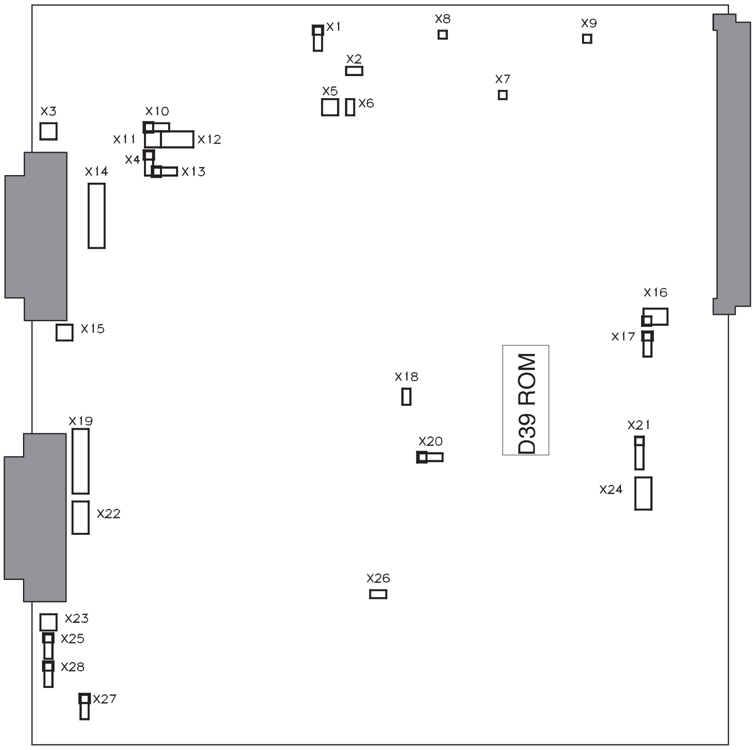


Figure 36: SDLM V.35, issue 4.1

Normal link settings for the SDLM V.35

The table below shows the normal link settings for the SDLM V.35.

Ref	Normal setting	Ref	Normal setting
X1	2-3	X15	3-4
X2	Not fitted	X16	Not fitted
X3	3-4	X17	Not fitted
X4	1-2	X18	1-2
X5	Not fitted	X19	3-4, 9-10
X6	Not fitted	X20	Not fitted
X7	Not Applicable	X21	Not fitted
X8	Not Applicable	X22	3-4
X9	Not Applicable	X23	1-2
X10	2-3	X24	3-4
X11	1-2	X25	Not fitted
X12	3-4	X26	Not fitted
X13	Not fitted	X27	2-3
X14	3-4, 9-10	X28	1-2

LEDs

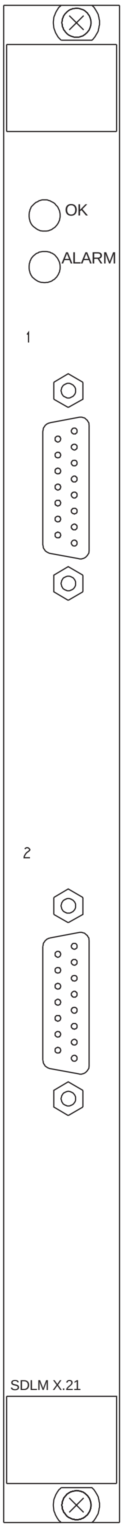
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM indicator is On	Notify service personnel
Data is not being transmitted or received	Check cabling to DTE
	Check cabling termination
	Check that a call is present - NMS action required
	Check that the module port is correctly configured - NMS action required
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check that other calls are present or can be made from this device
	Notify service personnel

RM CM

Synchronous Digital Line Module X.21 (SDLM X.21)



The SDLM X.21 is an X.21 DCE (data circuit terminating equipment) as defined in the recommendations of ITU-T. It provides interfaces for two X.21 DTEs (data terminal equipment) to the ISDN.

The functions provided by the SDLM X.21 include:

- conversion of the X.21 call establishment and call clearing protocol to the ISDN protocol;
- bit rate adaption of the user rate to the 64kbit/s ISDN B-channel rate.

Before making a data call, the DTE must be connected to one of the SDLM X.21 ports and the port must be configured using OmniVision.

The SDLM X.21 supports X.21 circuit-switched and leased line call establishment procedures.

Three different signalling modes can be configured for an SDLM X.21 interface, and each interface on a module can be configured differently. In each case, translation to the appropriate ISDN signalling is performed by this device. These signalling modes provide dialled-up data calls or permanent leased line applications.

Specifications

Compatibility	The SDLM X.21 can be fitted to any chassis.
Ports	DB15 female connector on front panel, conforms to ISO4903 standard.
Port protocol	ITU-T recommendation X.21.
Data rates supported (bit/s)	600, 1200, 2400, 4800, 9600, 19200, 48000, 56000, 64000 (ITU-T X.30, V.110; ECMA 102). 8000, 16000, 32000 (ITU-T I.460). 24000, 48000 (proprietary).
Data Rate Adaption Techniques	ITU-T recommendations X.30 and I.463 (V.110). ECMA 102 compatible protocols.
Call Establishment Modes	X.21 dialling. Control signal (C signal) initiated Hotline. Manual call control (NMS operator initiated). In Australia leased lines (ISDN semipermanent connection) are available.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the SDLM X.21.

Cable length	100m max.
Cable type	twisted-pair multi-core shielded.
Connector	DB15 male.

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the SDLM X.21 to terminal equipment

For each user line:

1 Run a cable from the X.21 data terminal equipment (DTE) through the front connector cable access duct of the subrack.

2 Terminate the cable with a DB15 male connector as shown and plug it in. See *Appendix A* for a diagram of the connector.

X.21 signal	DCE	
	DB15 pin	Circuit type
T(A) (transmit)	2	L
T(B) (transmit)	9	L
C(A) (control)	3	L
C(B) (control)	10	L
R(A) (receive)	4	G
R(B) (receive)	11	G
I(A) (indication)	5	G
I(B) (indication)	12	G
S(A) (signal timing element)	6	G
S(B) (signal timing element)	13	G
B(A) (byte timing element)	7	G
B(B) (byte timing element)	14	G
G (signal ground)	8	CR

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Connecting X.21 to RS-449 compatible DCE

For each user line to be connected to RS-449 compatible DCE:

1 Run a cable from the RS-449 DCE through the front cable access duct of the subrack.

2 Terminate the cable with a DB15 male connector as shown below and plug it in.

The following table details the pinouts of the X.21 to RS-449 adaptor cable

X.21 signal	DCE cable		
	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD
T(B) Transmit	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST
S(B) Signal Timing Element	13	26 23	RT ST
C(A) Control	3	7 9	RS CS
C(B) Control	10	25 27	RS CS
R(A) Control	4	6	RD
R(B) Control	11	24	RD
I(A) Indication	5	13	RR
I(B) Indication	12	31	RR
SG Signal Ground	8	19	SG
X(A) Signal Timing Element	7	17	TT
X(B) Signal Timing Element	14	35	TT

Link settings

Figure 37 below shows the position of the links on the SDLM X.21, issue 4.1.

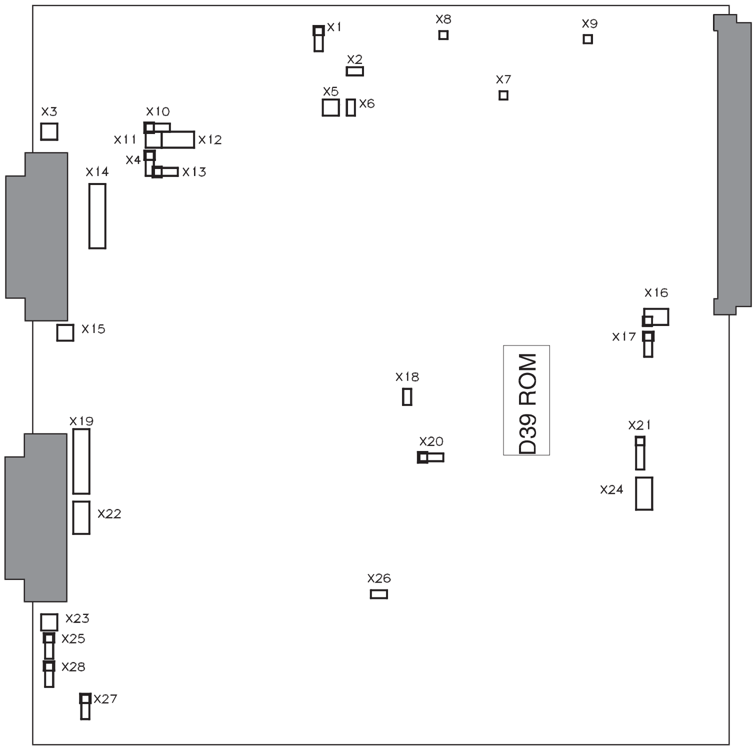


Figure 37: SDLM X.21 circuit board, issue 4.1

Normal link settings for the SDLM X.21

The following table shows the normal link settings for the SDLM X.21.

Ref	Normal setting	Ref	Normal setting
X1	2-3	X15	1-2
X2	Not fitted	X16	Not fitted
X3	1-2	X17	Not fitted
X4	1-2	X18	1-2
X5	Not fitted	X19	Not fitted
X6	Not fitted	X20	Not fitted
X7	Not Applicable	X21	Not fitted
X8	Not Applicable	X22	3-4
X9	Not Applicable	X23	Not fitted
X10	2-3	X24	3-4
X11	Not fitted	X25	Not fitted
X12	3-4	X26	Not fitted
X13	Not fitted	X27	2-3
X14	Not fitted	X28	1-2
D94	1-2, 3-4, 5-6, 8-9, 10-11, 12-13	D95	1-2, 3-4, 5-6, 8-9, 10-11, 12-13

LEDs

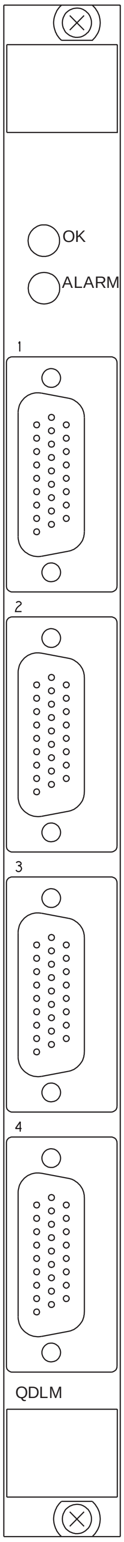
LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM indicator is On	Notify service personnel
Data is not being transmitted or received	Check cabling to DTE
	Check cabling termination
	Check that a call is present - NMS action required
	Check that the module port is correctly configured - NMS action required
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check that other calls are present or can be made from this device
	Notify service personnel

RM CM

Quad Digital Line Module (QDLM)



The Quad Digital Line Module (QDLM) provides either four data circuit terminating equipment (DCE) ports or four data terminal equipment (DTE) ports which comply with the ITU-T (CCITT) standards:

- X.21
- V.35
- V.24 asynchronous
- V.24 synchronous.

DTEs connecting to the DCE ports are required to synchronise with the clocking signal supplied by the QDLM.

Each port allows a DTE to communicate at data rates from 300 bit/s to 64 kbit/s, depending on the configuration. Bit rate adaption onto the 64 kbit/s ISDN channel is performed under ITU-T (recommendations X.30, V.110 and ECMA 102 compatible protocols.

The module is supplied fitted with four connectors for the type of interface required at each port.

The QDLM supports all data rates specified by recommendations V.110 and X.30. It inter-operates with SDLM V.24, SDLM V.35, SDLM X.21, COMBO Module and Jtec Terminal Adaptors.

The QDLM is available in two versions:

- DCE only operation
- DCE-DTE operation.

Applications

The QDLM provides a means of obtaining a high density of Digital Line Module ports within a single slot in a chassis. The operation of each port is independent of the others.

Each port offers similar facilities as the equivalent port in an SDLM. The standard interfaces typically provide low data rate terminal links to computers, inter-computer links and video conferencing links. Refer to the sections on SDLM V.24, SDLM V.35 and SDLM X.21 in this manual for further information.

Connection to the Kilostream (UK only)

The QDLM is approved for direct connection to the UK digital service, Kilostream.

If any other apparatus, cable or wiring is connected between the chassis and Kilostream it must conform to the following:

1. The overall transmission characteristics of all the other apparatus shall be such as to introduce no material effect upon the electrical conditions presented to one another by the chassis and Kilostream;
2. All the other apparatus must comprise only:
   - apparatus, cable or wiring approved for the purpose of connection to Kilostream; and
   - cable or wiring complying with a code of practice for the installation of apparatus covered by BS 6328: Part 7 or such other requirements as may be applicable.

Specifications

Compatibility	The QDLM can be fitted to any chassis.
Ports	X.21: DB15 female connectors on the front panel conform to ISO 4903 standard. V.24 and V.35: Proprietary HD26 female connectors on the front panel. Refer to *Appendix A* for further information about connectors.
Port protocols	ITU-T recommendations for V.24, V.35 and X.21.
Data Rates supported (bit/s)	X.21, V.35, V.24 synchronous and asynchronous: V.24 asynchronous only - 300. synchronous & asynchronous - 600, 1200, 2400, 4800, 9600, 19200, 38400 (ITU-T X.30, V.110, ECMA 102). synchronous only - 48000, 56000, 64000 (ITU-T X.30, V.110, ECMA 102).
Data Rate Adaption Techniques	ITU-T recommendations X.30 and I.463 (V.110). ECMA 102 compatible protocols. Asynchronous mode uses data bits 7,8 and stop bits 1,2.

Call Establishment Modes	Control signal (C/DTR signal) initiated Hotline. Manual Call Control (NMS operator initiated). X.21 Call Control. In Australia leased lines (ISDN semipermanent connection) are available.
Adapter cables	V.24: HD26 male to DB25 female (QCBL-V24C) HD26 male to DB25 male (QCBL-V24T) V.35: HD26 male to M34 female (QCBL-V35C) HD26 male to M34 male (QCBL-V35T) X.21: DB15 male to DB15 male (QCBL-X21T) All adapter cables are 600mm in length.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the DLM ports.

Cable length	100 m max. for X.21 and V.35. 15 m max. for V.24 synchronous and asynchronous.
Cable type	twisted-pair multi-core.
Connectors	V.24 and V.35: HD26 female. X.21: DB15 female.

Notes *When connecting the QDLM to Kilostream you must use the appropriate Jtec DTE adapter cable (QCBL-V24T, QCBL-V35T or QCBL-X21T) according to the interface being connected.*

All ports, except X.21, are provided with High Density 26 pin connectors.

Adapter cables are available to convert M34 or DB25 connectors to High Density 26 pin connectors. The adapter cable is 600mm in length.

All D-type connectors for direct connection to a QDLM front panel must have a right-angle backshell (as opposed to a straight exit).

Connecting the QDLM to terminal equipment

The QDLM can be fitted with DB15 female connectors and high density 26 pin female connectors. The following tables show the pin assignments and interconnections.

Connector pin assignments for X.21

X.21 signal	DB15 pin	Circuit type	
		DCE	DTE
T(A) (transmit)	2	L	G
C(A) (control)	3	L	G
R(A) (receive)	4	G	L
I(A) (indication)	5	G	L
S(A) (signal timing element)	6	G	L
G (signal ground)	8	CR	CR
T(B) (transmit)	9	L	G
C(B) (control)	10	L	G
R(B) (receive)	11	G	L
I(B) (indication)	12	G	L
S(B) (signal timing element)	13	G	L

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Connecting the QDLM to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

V.24 connector pin assignments and interconnections to DB25

V.24 signal	DCE			DTE		
	HD26 pin	DB25 pin	Circuit type	HD26 pin	DB25 pin	Circuit type
FG (Frame ground)	1	1		1	1	
TxD (Transmit data)	2	2	L	3	2	G
RxD (Receive data)	3	3	G	2	3	L
RTS (Request to send)	4	4	L	8	4	G
CTS (Clear to send)	5	5	G	18	5	L
DSR (Data set ready)	6	6	G	20	6	L
SG (Signal ground)	7	7	CR	7	7	CR
CD (Carrier detect)	8	8	G	4	8	L
TxC (Transmit clock)	15	15	G	23	15	L
RxC (Receive clock)	17	17	G	24	17	L
LLB (Local loop back)	18	18	L	5	18	G
DTR (Data terminal ready)	20	20	L	6	20	G
RLB (Remote loop back)	21	21	L	25	21	G
RI (Ring indicator)	22	22	G	10	22	L
ETxC (DTE transmit clock)	24	24	L	17	24	G
TI (Test indicator)	25	25	G	21	25	L

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

V.35 connector pin assignments and interconnections to M34

V.35 signal	DCE			DTE		
	HD26 pin	M34 pin	Circuit type	HD26 pin	M34 pin	Circuit type
SG (Signal ground)	1	B	CR	1	B	CR
RTS (Request to send)	4	C	L	18	C	G
CTS (Clear to send)	5	D	G	2	D	L
DSR (Data set ready)	6	E	G	20	E	L
CD (Carrier detect)	18	F	G	4	F	L
DTR (Data terminal ready)	20	H	L	6	H	G
LLB (Local loopback)	2	L	L	5	L	G
RLB (Remote loopback)	14	N	L	25	N	G
RI (Ring indicator)	22	J	G	8	J	L
TI (Test indicator)	25	NN	G	14	NN	L
RxDa (Receive data a)	9	R	G	7	R	L
RxDb (Receive data b)	21	T	G	19	T	L
TxDa (Transmit data a)	7	P	L	9	P	G
TxDb (Transmit data b)	19	S	L	21	S	G
RxCa (Receive clock a)	12	V	G	10	V	L
RxCb (Receive clock b)	24	X	G	17	X	L
ETxCa (DTE transmit clock a)	10	U	L	12	U	G
ETxCb (transmit clock b)	17	W	L	24	W	G
TxCa (Transmit clock a)	11	Y	G	15	Y	L
TxCb (Transmit clock b)	23	AA	G	16	AA	L

L = Load (or input)   G = Generator (or output)   CR = Common Return
All pins not used are not connected (open circuit).

Link settings

QDLM

Figure 38 below shows the position of the links on the QDLM, issue 3.

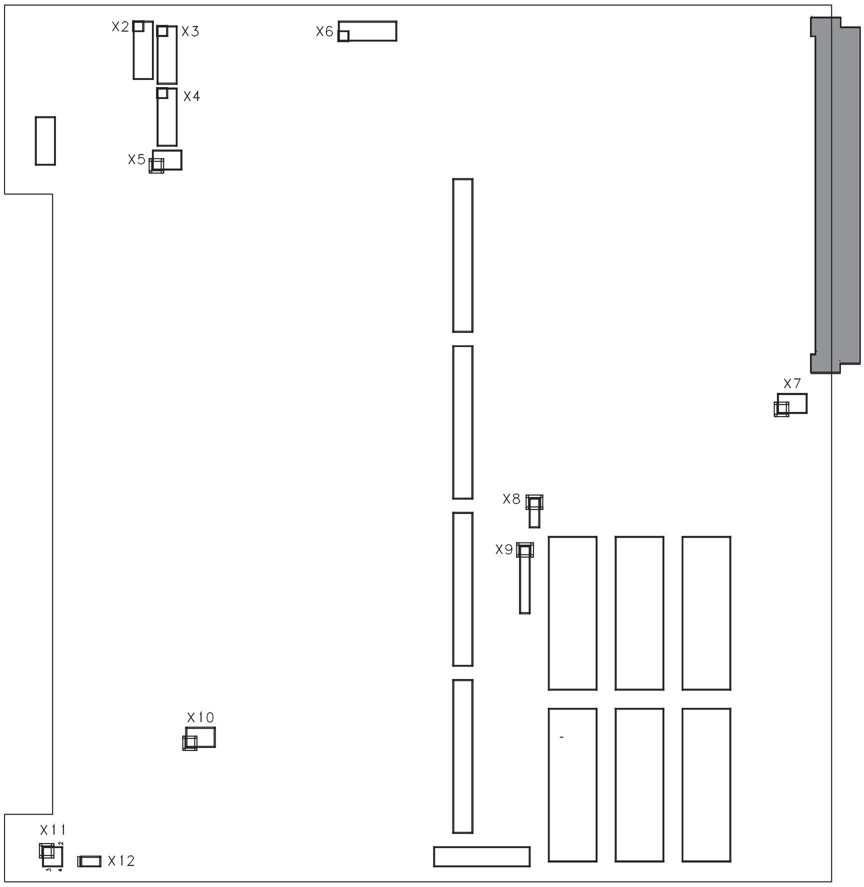


Figure 38: QDLM circuit board, issue 3

The table on the following page shows the normal link settings for all QDLM configurations. The type of Interface provided by the module is determined by the EEPROMs fitted to the line card.

Normal link settings for all QDLM configurations (DCE-DTE operation)

The following table shows the normal link settings for all QDLM configurations.

Ref	Normal setting	Ref	Normal setting
X2	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	X8	2-3
X3	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	X9	1-2, 3-4, 5-6
X4	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	X10	Not fitted
X5	Not fitted	X11	1-2
X6	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	X12	Not fitted
X7	1-2, 3-4, 5-6		

Note *Links X2, X3, X4 and X6 are removed if the DTE feature is supported.*

QDLM Line Interface Submodule (QLIM-V.24)

Figure 39 shows the position of the links on the QLIM-V.24 interface, issue 2.

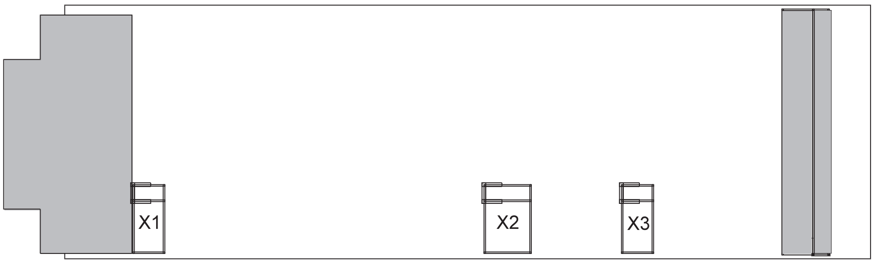


Figure 39: QLIM-V.24 circuit board, issue 2

Link settings for QLIM-V.24 Interface

The following table shows the normal link settings for the QLIM-V.24.

Ref	Normal setting	Function of link
X1	Not fitted	To connect frame ground to logic ground
X2	Not fitted	Not to be used
X3	Not fitted	Not to be used

QDLM Line Interface Submodule (QLIM-V.35)

Figure 40 shows the position of the links on the QLIM-V.35 interface, issue 2.

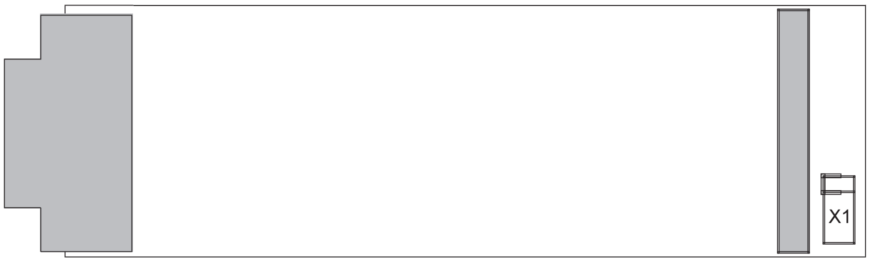


Figure 40: QLIM-V.35 circuit board, issue 2

Link settings for QLIM-V.35 Interface

The following table shows the normal link settings for the QLIM-V.35.

Ref	Normal setting	Function of link
X1	Not fitted	Not to be used

QDLM Line Interface Submodule (QLIM-X.21)

Figure 41 shows the position of the links on the QLIM-X.21 interface, issue 1.

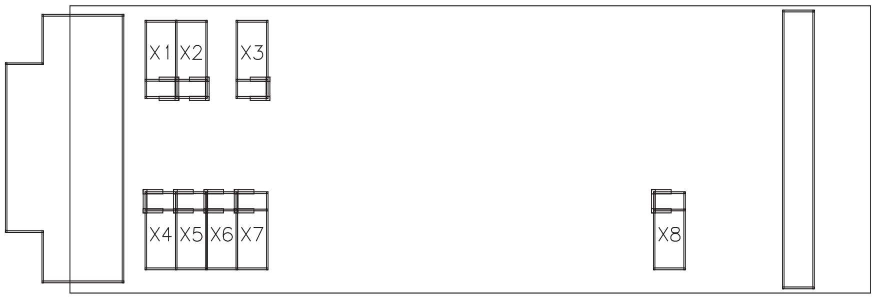


Figure 41: QLIM-X.21 circuit board, issue 1

Normal link settings for QLIM-X.21 Interface, Issue 1

The following table shows the normal link settings for the QLIM-X.21, issue 1.

Ref	Normal setting	Function of link
X1	Not fitted	120 Ω termination for C signal
X2	Not fitted	120 Ω termination for T signal
X3	Not fitted	To connect frame ground to logic ground
X4	Not fitted	120 Ω termination for R signal
X5	Not fitted	120 Ω termination for I signal
X6	Not fitted	120 Ω termination for S signal
X7	Not fitted	120 Ω termination for B signal
X8	Not fitted	Not to be used

Notes

- *Normally you do not need to fit these links; however, you may need to fit them in an electrically noisy environment to ensure correct operation.*
- *To terminate DCE mode of operation, fit links to X1 and X2.*
- *To terminate DTE mode of operation, fit links to X4, X5, X6 and X7.*

Figure 42 shows the position of the links on the QLIM-X.21 interface, Issue 2:

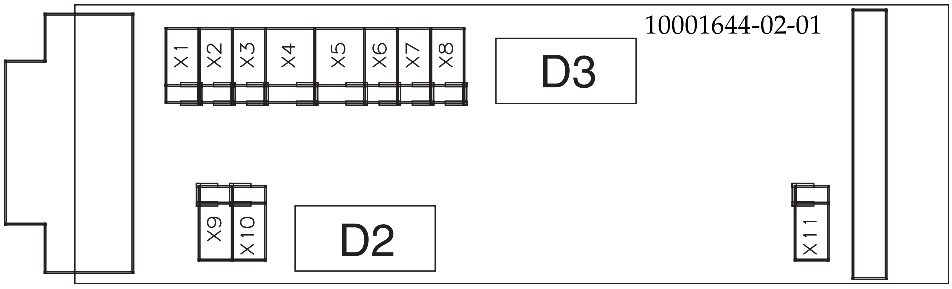


Figure 42: QLIM-X.21 circuit board, issue 2

Normal link settings for QLIM-X.21 Interface, Issue 2

The following table shows the normal link settings for the QLIM-X.21 interface, issue 2:

Ref	Normal setting	Function of link
X1	Not fitted	Shield - connects pin 1 (shield) of front panel connector to signal ground
X2	Not fitted	Termination DTE mode
X3	Not fitted	Termination DTE mode
X4	Fitted pin 2-3	B or X signal selection
X5	Fitted pin 2-3	B or X signal selection
X6	Not fitted	Termination DTE mode
X7	Not fitted	Termination DCE mode
X8	Not fitted	Termination DTE mode
X9	Not fitted	Termination DCE mode
X10	Not fitted	Termination DCE mode
X11	Not fitted	Not to be used

Note *Ensure that chips D2 and D3 are present on each issue of board. If they are missing, the board is intended for use in a different system, and you should contact Jtec Customer Service and Support for a replacement.*

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicator is On	If new ROMs have been fitted, check their orientation, location within the socket and link settings
	Notify service personnel
ALARM indicator is On	Notify service personnel
Data is not being transmitted or received	Check cable to DTE
	Check cable termination
	Check (through NMS) that a call is present
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check whether other calls are present or can be made from the device
	Check that the correct PROM was installed for the interface and links are correctly set
	Perform BERT tests through NMS diagnostics
	Notify service personnel

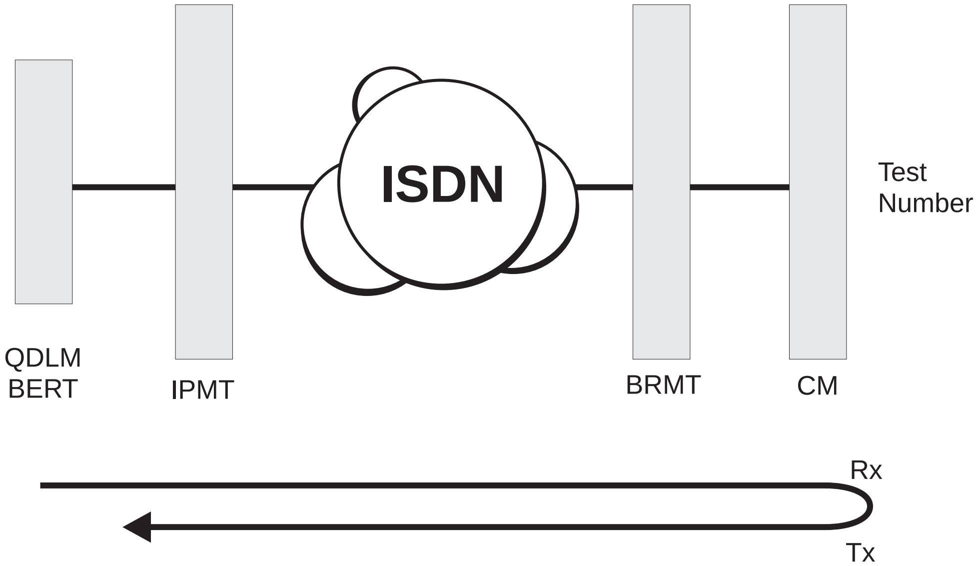
QDLM Bit Error Rate Testing (BERT)

Bit Error Rate Testing (BERT) is a QDLM diagnostic facility which enables you to check the integrity of a data circuit. It uses a pattern specified in ITU-T O.153 to test either a switched or permanent ISDN B-channel connection for errors.

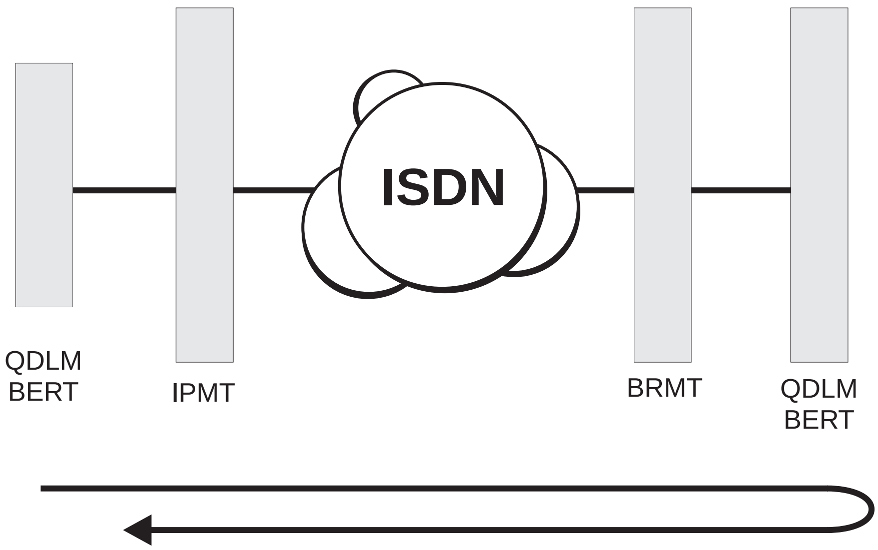
Applications

You can use BERT to:

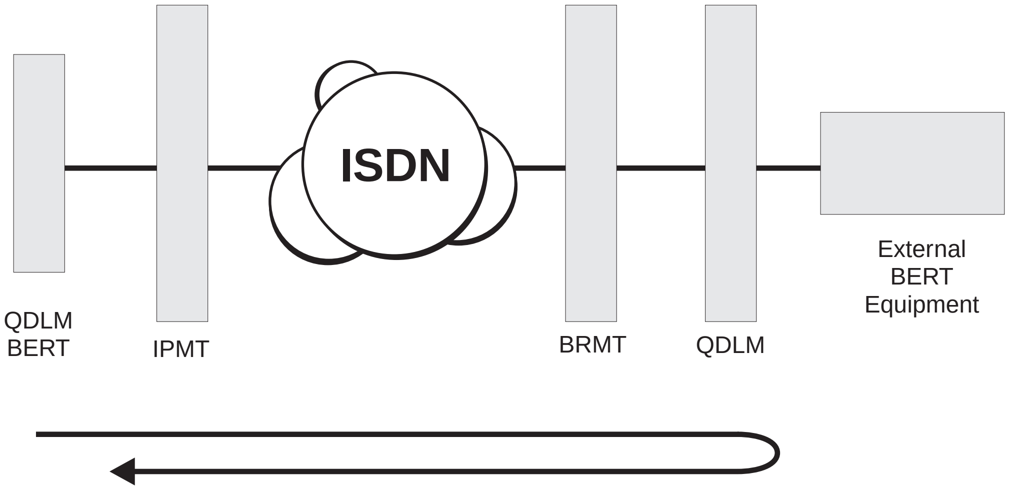
Send a test pattern from QDLM BERT to a loopback in a remote device and examine the data which is sent back, as shown in the following diagram.



Send a test pattern from QDLM BERT to another QDLM BERT in a remote device and examine the data received, as shown in the following diagram.



Send a test pattern to another tester (which sends its own test pattern) connected to the front panel of a QDLM or DLM in a remote device and examine the data received, as shown in the following diagram.



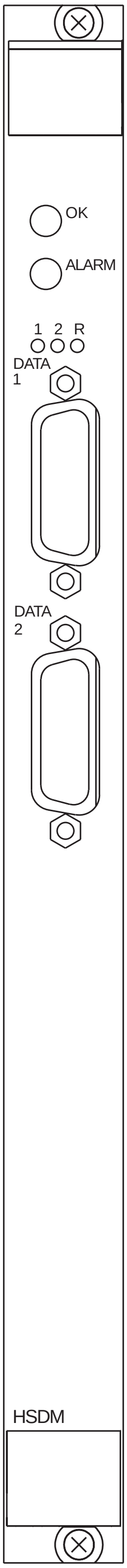
BERT displays the:

- elapsed seconds
- errored seconds
- % error free seconds
- bit count
- bit error count
- block count
- block error count.

Installation

No physical installation is required for BERT. Use OmniVision to access BERT. Refer to *OmniVision Help* for instructions on how to use BERT.

High Speed Data Module (HSDM)



The High Speed Digital Module (HSDM) combines two DTE/DCE, high speed, digital data ports and a Subrate Switch port. The HSDM provides a means of connecting up to two devices to high speed data networks. The data interfaces on the HSDM typically provide high data rate links to routers and Frame Relay networks.

The HSDM can be configured as a member of a Subrate Virtual Line or a Wideband Virtual Line.

Data ports

The digital data ports support the following ITU-T compliant features:

- Synchronous V.24 (up to 64kbit/s)
- V.35
- X.21
- BERT test.

DTEs connecting to the DCE ports are required to synchronise with the clocking signal supplied by the HSDM. When connecting to DCE ports, the HSDM is capable of synchronising its clock with the DCE-supplied clock.

The HSDM data ports interoperate with the following:

- COMBO Module
- SDLM
- QDLM
- DTM
- All ISDN Basic and Primary Rate modules via a BCAM-ISO if required
- J1200 Terminal Adaptor.

Subrate Switch Port

The Subrate Switch Port is an internal resource and has 28 unidirectional Subrate switches. These are used by the RM to switch fractional Narrowband and Wideband data channels, as well as compressed voice from other modules, onto a single line.

Specifications

Compatibility	The HSDM can be fitted to all chassis.
Module width	1 slot.
Ports	Two data ports supporting a proprietary HD26 female connector. Conversion to the appropriate physical interface is achieved with a converter cable (see *Adapter cables* below).
Data Port protocols	ITU-T recommendations for V.24, V.35 and X.21.
Data Rates supported (bit/s)	X.21, V.35, V.24 synchronous. Synchronous - 600, 1200, 2400, 4800, 9600, 19200, 38400 48000, 56000, 64000 (ITU-T X.30, V.110, ECMA 102). n x 8 kbit/s from 8 kbit/s up to 256 kbit/s (superset of I.460). n x 64 kbit/s from 256 kbit/s up to 2048 kbit/s.
Data Rate Adaption Techniques	ITU-T recommendations X.30 and I.463 (V.110). ECMA 102 compatible protocols.
Call Establishment Modes	Control signal (C/DTR signal) initiated Hotline. Manual Call Control (NMS operator initiated). X.21 Call Control.
Adapter cables	V.24: HD26 male to DB25 female (UDT-CBL-V24C) HD26 male to DB25 male (UDT-CBL-V24T) V.35: HD26 male to M34 female (UDT-CBL-V35C) HD26 male to M34 male (UDT-CBL-V35T) X.21: HD26 male to DB15 female (UDT-CBL-X21C) HD26 male to DB15 male (UDT-CBL-X21T) All adapter cables are 600mm in length.

Installation

Data port cabling

The following table shows the cabling specifications for external connections to the data ports.

Cable length	100 m max. for X.21 and V.35. 15 m max. for V.24 synchronous.
Cable type	twisted-pair multi-core.
Connectors	HD26 female.

Note *All ports are provided with High Density 26 pin connectors.*

Adapter cables are available to convert M34, DB15 or DB25 connectors to High Density 26 pin connectors. The adapter cable is 600mm in length.

All D-type connectors for direct connection to a HSDM front panel must have a 45 degree angle backshell (as opposed to a straight exit).

HSDM converter cables

The tables below show the pin configuration for the HSDM converter cables for the following interfaces:

- V.24 DTE (UDT-CBL-V24T)
- V.24 DCE (UDT-CBL-V24C)
- V.35 DTE (UDT-CBL-V35T)
- V.35 DCE (UDT-CBL-V35C)
- X.21 DTE (UDT-CBL-X21T)
- X.21 DCE (UDT-CBL-X21C).

HSDM V.24 DTE

DB25 connector		HD26 connector	
Function	**Pin**	**Function**	**Pin**
Drain wire	1		
TXD	2	TXD	8
RXD	3	RXD	9
RTS	4	RTS	3
CTS	5	CTS	21
DSR	6	DSR	2
GND	7	GND	19*
		S2	10*
DCD	8	DCD	25
TXC (DCE)	15	TXC (DCE)	5
RXC	17	RXC	6
LLB	18	LLB	24
DTR	20	DTR	22
RI	22	RI	23
TXC (DTE)	24	TXC (DTE)	7

* Pins 19 and 10 in the HD26 connector are linked together.

HSDM V.24 DCE

DB25 connector		HD26 connector	
Function	**Pin**	**Function**	**Pin**
Drain wire	1		
TXD	2	TXD	9
RXD	3	RXD	8
RTS	4	RTS	25
CTS	5	CTS	24
DSR	6	DSR	22
GND	7	GND	19*
		S1	1*
		S2	10*
DCD	8	DCD	3
TXC (DCE)	15	TXC (DCE)	4
RXC	17	RXC	7
LLB	18	LLB	21
DTR	20	DTR	2
RI	22	RI	20
TXC (DTE)	24	TXC (DTE)	6

*Pins 19, 1 and 10 on the HD26 connector are linked together.

HSDM V.35 DTE

Twisted Pairs	M34 socket		HD26 connector	
	Function	Pin	Function	Pin
Pair	DCD	F	DCD	25
	DTR	H	DTR	22
Pair	LLB	L	LLB	24
	RI	J	RI	23
Pair	CTS	D	CTS	21
	DSR	E	DSR	2
Pair	RXC (A)	V	RXC (A)	15
	RXC (B)	X	RXC (B)	6
Pair	RXD (A)	R	RXD (A)	13
	RXD (B)	T	RXD (B)	9
Pair	TXC (A) (DTE)	U	TXC (A) (DTE)	16
	TXC (B) (DTE)	W	TXC (B) (DTE)	7
Pair	TXC (A) (DCE)	Y	TXC (A) (DCE)	14
	TXC (B) (DCE)	AA	TXC (B) (DCE)	5
Pair	TXD (A)	P	TXD (A)	17
	TXD (B)	S	TXD (B)	8
Pair	RTS	C	RTS	3
	GND	B	GND	19
			S2	10*
			VDD	26*
	Drain wire	A		

* Pins 10 and 26 of the HD26 connector are linked together.

HSDM V.35 DCE

Twisted Pairs	M34 socket		HD26 connector	
	Function	Pin	Function	Pin
Pair	CTS	DF	CTS	24
	RI	J	RI	20
Pair	LLB	L	LLB	21
	DTR	H	DTR	2
Pair	RTS	C	RTS	25
	DSR	E	DSR	22
Pair	RXC (A)	V	RXC (A)	16
	RXC (B)	X	RXC (B)	7
Pair	RXD (A)	R	RXD (A)	17
	RXD (B)	T	RXD (B)	8
Pair	TXC (A) (DTE)	U	TXC (A) (DTE)	15
	TXC (B) (DTE)	W	TXC (B) (DTE)	6
Pair	TXC (A) (DCE)	Y	TXC (A) (DCE)	13
	TXC (B) (DCE)	AA	TXC (B) (DCE)	4
Pair	TXD (A)	P	TXD (A)	18
	TXD (B)	S	TXD (B)	9
Pair	DCD	F	DCD	3
	GND	B	GND	19*
			S1	1*
			S2	10**
			VDD	26**
	Drain wire	A		

* Pins 19 and 1 of the HD26 connector are linked together.
** Pins 10 and 26 of the HD26 connector are linked together.

HSDM X.21 DTE

Twisted Pairs	DB15 connector		HD26 connector	
	Function	Pin	Function	Pin
Pair	T (A) Transmit	2	T (A)	17
	T (B) Transmit	9	T (B)	8
Pair	C (A) Control	3	C (A)	12
	C (B) Control	10	C (B)	3
Pair	R (A) Control	4	R (A)	18
	R (B) Receive	11	R (B)	9
Pair	I (A) Indication	5	I (A)	11
	I (B) Indication	12	I (B)	2
Pair	S (A) Signal timing	6	S (A)	15
	S (B) Signal timing	13	S (B)	6
Pair	X (A) Ext. Sig. timing	7	X (A)	16
	X (B) Ext. Sig. timing	14	X (B)	7
	Signal Ground	8	GND	19
				26*
				1*
	Drain Wire	1		

* Pins 26 and 1 on the HD26 connector are linked together.

HSDM X.21 DCE

Twisted Pairs	DB15 connector		HD26 connector	
	Function	Pin	Function	Pin
Pair	T (A) Transmit	2	T (A)	18
	T (B) Transmit	9	T (B)	9
Pair	C (A) Control	3	C (A)	11
	C (B) Control	10	C (B)	2
Pair	R (A) Control	4	R (A)	17
	R (B) Receive	11	R (B)	8
Pair	I (A) Indication	5	I (A)	12
	I (B) Indication	12	I (B)	3
Pair	S (A) Signal timing	6	S (A)	16
	S (B) Signal timing	13	S (B)	7
Pair	X (A) Ext. Sig. timing	7	X (A)	15
	X (B) Ext. Sig. timing	14	X (B)	6
	Signal Ground	8	GND	19
			S1	1*
	Drain Wire	1		

* Pins 19 and 1 of the HD26 connector are linked together.

Connecting the HSDM X.21 to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

Link settings

HSDM

Figure 43 below shows the location of the links on the HSDM, 10002935.00 Rev.2.

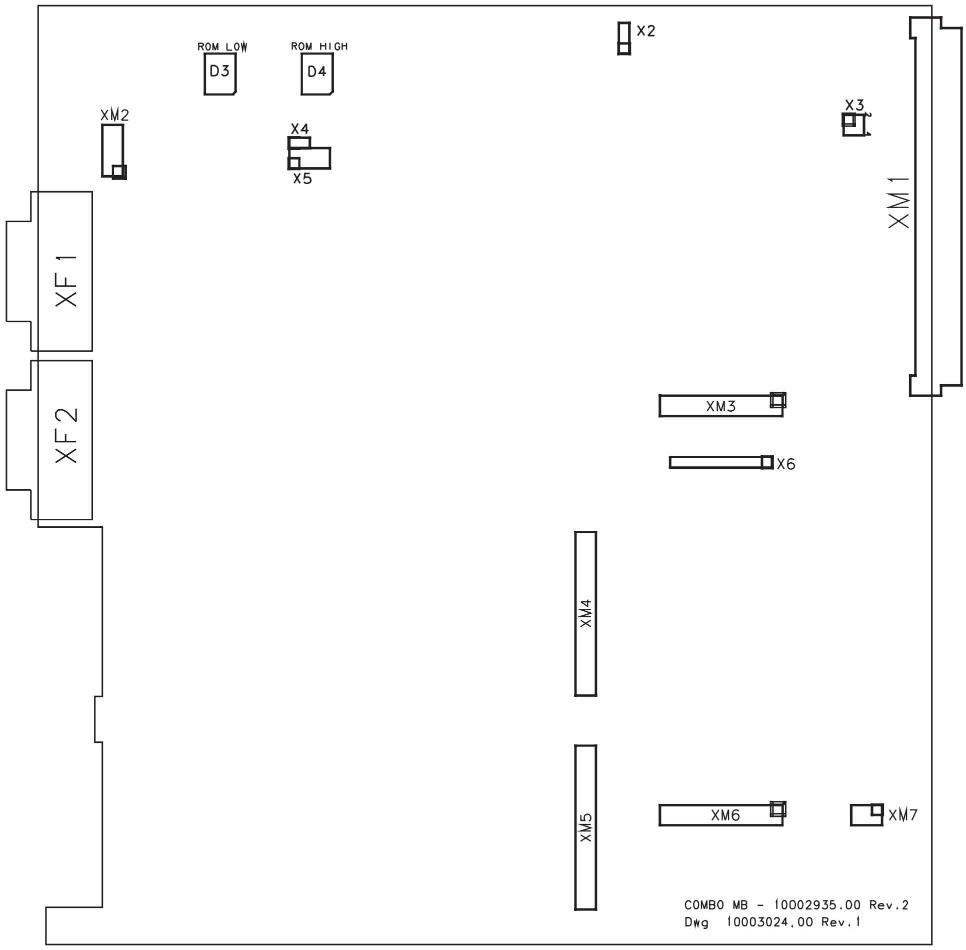


Figure 43: HSDM circuit board, 10002935.00 Rev.2

Normal link settings for the HSDM

The following table shows the normal link settings for the HSDM 10002935.00 Rev.2:

Ref	Normal setting	Ref	Normal setting
X1	—	X4	—
X2	1-2	X5	—
X3	—	X6	—

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
Data 1	Green	See Note 1
Data 2	Green	See Note 1
R (Resource)	Green	See Note 2

Note 1 The Data LED is off when no call is connected to the data port and on when a call is connected or is the process of being connected.

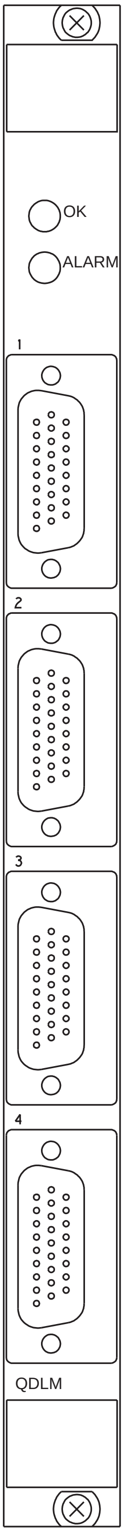
Note 2 The R (Resource) LED is on when the HSDM is subrate switching. It is off when none of these resources is being used.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
ALARM indicator is On or continuously flashing	Notify service personnel
	Check that the RM is operational
OK and ALARM indicators are On	Notify service personnel
OK indicator is always On and ALARM indicator is always flashing	No backplane clocks can be detected. Ensure that both a Resource Manager and a Clock Card (for example, IPM, BRM, DTM, DLM) are fitted somewhere in the rack.
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
OK and ALARM indicators are continuously flashing	A hardware fault has been detected. Notify service personnel
Data is not being transmitted or received	Check cable to DTE
	Check cable termination
	Check (through NMS) that a call is present
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check whether other calls are present or can be made from the device
	Check that the correct PROM was installed for the interface and links are correctly set
	Perform BERT tests through NMS diagnostics
	Notify service personnel

RM CM

Leased Line Backup (LLB)



Leased Line Backup (LLB) is provided by a factory-fitted dual-port submodule on the QDLM.

LLBs can be fitted to any QDLM where there are two adjacent ports. Up to two LLB submodules can be installed in each QDLM. Additional leased lines can be protected by fitting more LLB submodules to a chassis and providing either a Basic Rate or Primary Rate connection to the ISDN, depending on the number of backup links that are required.

The top port of the submodule operates in Data Terminal Equipment (DTE) mode and must be connected to the Network Termination Unit (NTU). The bottom port operates in Data Circuit-terminating Equipment (DCE) mode and must be connected to the DTE.

Note *NTU is the device which provides access to the leased data link and is the point at which a customer connects a DTE, for example, a PC, multiplexer, front-end-processor, and so on.*

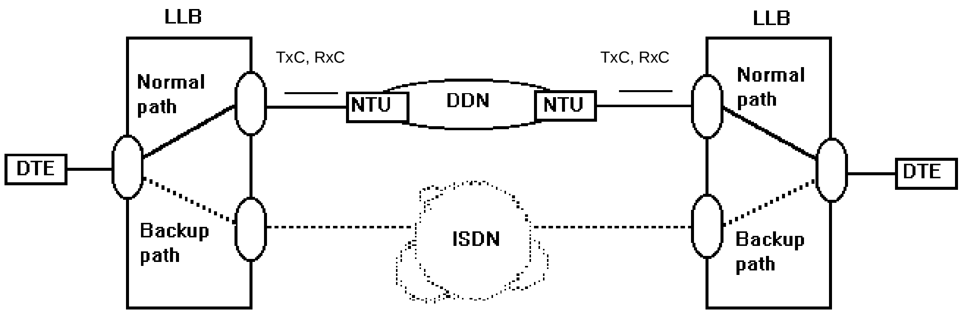
The NTU/DTE interface can be:

- V.24
- V.35, or
- X.21.

Any combination can be used in the QDLM, however both ports in the LLB submodule must be the same type.

Applications

LLB allows a switched ISDN B-channel to be used as a backup link for a leased data link. Signals are monitored at the DCE/DTE interface to detect failure of the leased data link. When this occurs, an alarm is sent to the network management system and a backup link is automatically established. The following diagram displays this.



When the leased data link recovers, the QDLM reconnects the normal path. You can choose to disconnect the backup link either manually or automatically using OmniVision. See your *OmniVision User Manual*.

Connection to the Kilostream (UK only)

The LLB is approved for direct connection to the digital service, Kilostream.

If any other apparatus, cable or wiring is connected between the chassis and Kilostream it must conform to the following:

1 The overall transmission characteristics of all the other apparatus shall be such as to introduce no material effect upon the electrical conditions presented to one another by the chassis and Kilostream;

2 All the other apparatus must comprise only:

- apparatus, cable or wiring approved for the purpose of connection to Kilostream; and
- cable or wiring complying with a code of practice for the installation of apparatus covered by BS 6328: Part 7 or such other requirements as may be applicable.

Connection to DDS Flexnet (Australia only)

The Telstra service, DDS Flexnet, is suitable for connection to the LLB facility.

Specifications

Compatibility	LLBs can be fitted to any QDLM where there are two adjacent port positions.
Ports	V.24 and V.35: HD26 female connector on the front panel. X.21: DB15 female connector on the front panel that conforms to ISO 4903 standard.
Port protocol	ITU-T recommendations V.24, V.35 and X.21.
Data rates supported	V.24 (Sync), V.35 and X.21: Up to 64 kbit/s. V.24 (Async.): Up to 38.4 kbit/s.
Adapter cables	V.24: HD26 male to DB25 female HD26 male to DB25 male V.35: HD26 male to M34 female HD26 male to M34 male X.21: DB15 male to DB15 male
Data rate adaption techniques	ITU-T recommendations X.30 and I.463 (V.110). ECMA 102 compatible protocols. Asynchronous mode uses data bits 7, 8 and stop bits 1, 2.
Call types	Manual call control (NMS operator initiated). Hotline (based on LLB criteria).
Module width	1 slot.

Installation

Cabling

V.24

The following table shows the cabling specifications for external connections to the QLLB V.24.

Cable length	15 m max.
Cable type	twisted-pair multi-core.
Connector	HD26 male (cable is available to convert to standard DB25 connectors).

Note *You must use a Jtec QDLM V.24 DTE converter cable to connect to the Kilostream service.*

Connecting the QLLB V.24 to terminal equipment

For each user line:

1 Run a cable from the V.24 DTE through the front cable access duct of the subrack.

2 Terminate the cable with an HD26 male connector as shown below and plug it in. See *Appendix A* for a diagram of the connector.

Note *The table also shows the DB25 pin appearances when an adapter cable is used.*

Note *See Appendix B for instructions on connecting the QLLB V.24 to Kilostream.*

V.24 signal	Cable from top port to DCE			Cable from bottom port to DTE		
	HD26 pin	DB25 pin	Circuit type	HD26 pin	DB25 pin	Circuit type
FG (frame ground)	1	1		1	1	
TxD (transmit data)	3	2	G	2	2	L
RxD (receive data)	2	3	L	3	3	G
RTS (request to send)	8	4	G	4	4	L
CTS(clear to send)	18	5	L	5	5	G
DSR (data set ready)	20	6	L	6	6	G
SG (signal ground)	7	7	CR	7	7	CR
CD (carrier detect)	4	8	L	8	8	G
TxC (transmit clock)	23	15	L	15	15	G
RxC (receive clock)	24	17	L	17	17	G
DTR (data terminal ready)	6	20	G	20	20	L
LLB (local line loopback)	5	18	G	18	18	L
RLB (remote loopback)	25	21	G	21	21	L
TI (test indicator)	21	25	L	25	25	G
ETxC (transmit clock, DTE sourced)	17	24	G	24	24	L

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

V.35

The following table shows the cabling specifications for external connections to the QLLB V.35.

Cable length 100 m max.

Cable type twisted-pair multi-core.

Connector HD26 male (cable is available to convert to standard M34 connectors).

Note *You must use a Jtec QDLM V.35 DTE converter cable to connect to the Kilostream service.*

Connecting the QLLB V.35 to terminal equipment

For each user line:

1 Run a cable from the V.35 DTE through the front cable access duct of the subrack.

2 Terminate the cable with an HD26 male connector as shown below and plug it in. See *Appendix A* for a diagram of the connector.

Note *The table also shows the M34 pin appearances when an adapter cable is used.*

Note *See Appendix B for instructions on connecting the QLLB V.35 to Kilostream.*

L = Load (or input)   G = Generator (or output)   CR = Common Return

V.35 signal	Cable from top port to DCE			Cable from bottom port to DTE		
	HD26 pin	M34 pin	Circuit type	HD26 pin	M34 pin	Circuit type
SG (signal ground)	1	B	CR	1	B	CR
RTS (request to send)	18	C	G	4	C	L
CTS (clear to send)	2	D	L	5	D	G
DSR (data set ready)	20	E	L	6	E	G
CD (carrier detect)	4	F	L	18	F	G
DTR (data terminal ready)	6	H	G	20	H	L
LLB (local loopback)	5	L	G	2	L	L
RLB (remote loopback)	25	N	G	14	N	L
TI (test indicator)	14	NN	L	25	NN	G
RxDa (receive data a)	7	R	L	9	R	G
RxDb (receive data b)	19	T	L	21	T	G
RxCa (receive clock a)	10	V	L	12	V	G
RxCb (receive clock b)	17	X	L	24	X	G
TxDa (send data a)	9	P	G	7	P	L
TxDb (send data b)	21	S	G	19	S	L
TxCa (transmit clock a)	15	Y	L	11	Y	G
TxCb (transmit clock b)	16	AA	L	23	AA	G
ETxCa (transmit clock a, DTE source)	12	U	G	10	U	L
ETxCb (transmit clock b, DTE source)	24	W	G	17	W	L

All pins not used are not connected (open circuit).

X.21

The following table shows the cabling specifications for external connections to the QLLB X.21.

Cable length 100 m max.

Cable type twisted-pair multi-core.

Connector DB15 male.

Note *You must use a QDLM X.21 DTE converter cable to connect to Kilostream Service.*

Connecting the QLLB X.21 to terminal equipment

For each user line:

1. Run a cable from the X.21 DTE through the front cable access duct of the subrack.
2. Terminate the cable with a DB15 male connector as shown below and plug it in. See *Appendix A* for a diagram of the connector.

Note *Byte timing element, B, is connected transparently from the NTU to the DTE during normal operation but is not provided by the QDLM while a backup call is active.*

X.21 signal	DB15 pin	Circuit type	
		DCE	DTE
T(A) (transmit)	2	L	G
T(B) (transmit)	9	L	G
C(A) (control)	3	L	G
C(B) (control)	10	L	G
R(A) (receive)	4	G	L
R(B) (receive)	11	G	L
I(A) (indication)	5	G	L
I(B) (indication)	12	G	L
S(A) (signal timing element)	6	G	L
S(B) (signal timing element)	13	G	L
B(A) (byte timing element internal)	7	G	L
B(B) (byte timing element internal)	14	G	L
B(A) (byte timing element external)	7	L	G
B(B) (byte timing element external)	14	L	G
G (signal ground)	8	CR	CR

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Connecting the QLLB X.21 to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

Link settings

QLLB V.24 Module

Figure 44 below shows the position of the links on the Leased Line Backup module QLLB V.24, issue 2.

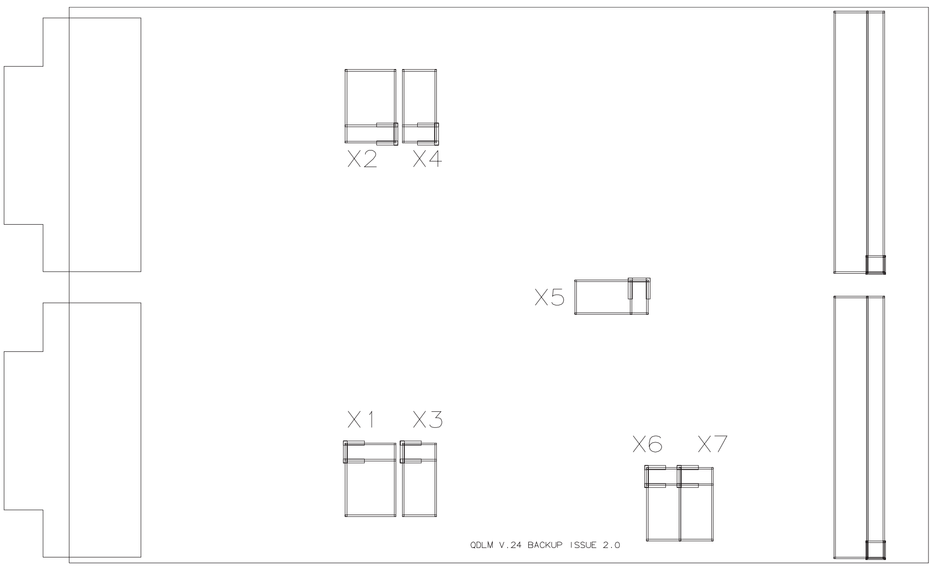


Figure 44: QLLB V.24 circuit board, issue 2

Normal link settings for the QLLB V.24

The following table shows the normal link settings for the QLLB V.24.

Ref	Normal setting	Function of link
X1	No links	Not to be used
X2	No links	Not to be used
X3	No links	To connect frame ground of port 1 to logic ground
X4	No links	To connect frame ground of port 2 to logic ground
X5	Not fitted	Not to be used
X6	1-2	To enable backup
X7	1-2	To enable backup

QLLB V.35 Module

Figure 45 below shows the position of the links on the QLLB V.35, issue 3.

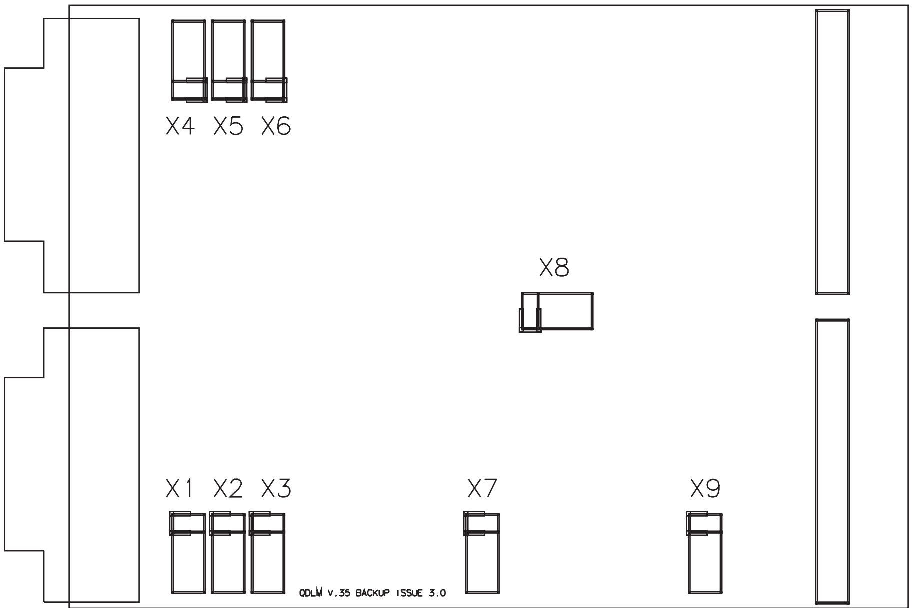


Figure 45: QLLB V.35 circuit board, issue 3

Normal link settings for the QLLB V.35

The following table shows the normal link settings for the QLLB V.35.

Ref	Normal setting	Function of link
X1	1-2	DCE mode: to terminate TxD signal on port 1 DTE mode: to terminate RxD signal on port 1
X2	1-2	DCE mode: to terminate ETxC signal on port 1 DTE mode: to terminate RxC signal on port 1
X3	1-2	DTE mode: to terminate TxC signal on port 1
X4	1-2	DCE mode: to terminate TxD signal on port 2 DTE mode: to terminate RxD signal on port 2
X5	1-2	DCE mode: to terminate ETxC signal on port 2 DTE mode: to terminate RxC signal on port 2
X6	1-2	DTE mode: to terminate TxC signal on port 2
X7	1-2	To enable backup
X8	-	Not to be used
X9	1-2	To enable backup

QLLB X.21 Module

Figure 46 below shows the position of the links on the QLLB X.21, issue 3.

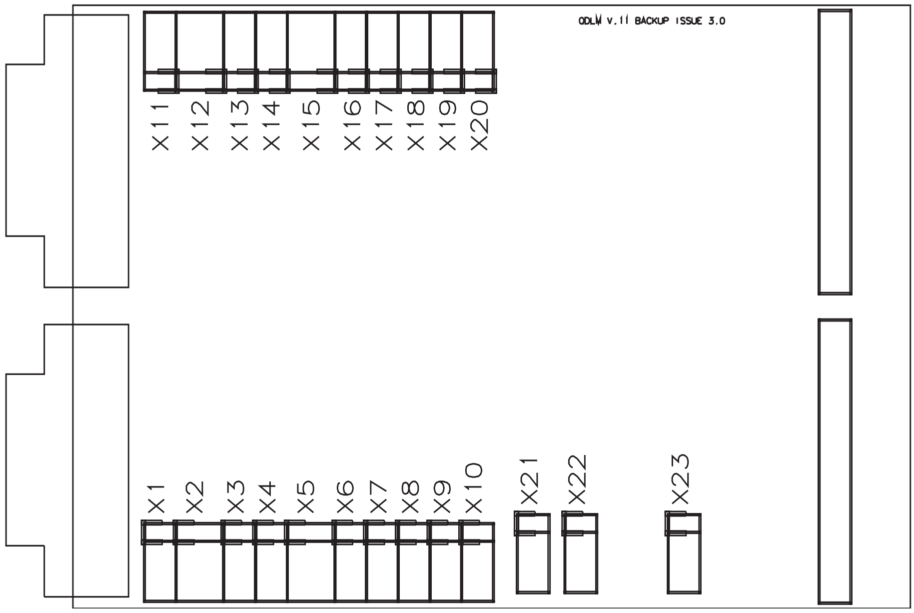


Figure 46: QLLB X.21 circuit board, issue 3

Normal link settings for the QLLB X.21

The following table shows the normal link settings for the QLLB X.21.

Ref	Normal setting	Function of link
X1	-	To connect frame ground 1 to logic ground
X2	-	1-2: Byte timing (B1) received or transmitted on pins 7 and 14 2-3: DTE sourced clock (X1) received or transmitted on pins 7 and 14
X3	1-2	To terminate X signal on port 1
X4	-	To terminate B signal on port 1
X5	-	1-2: Byte timing (B1) received or transmitted on pins 7 and 14 2-3: DTE sourced clock (X1) received or transmitted on pins 7 and 14
X6	1-2	To terminate C signal on port 1
X7	1-2	To terminate T signal on port 1
X8	-	To terminate S signal on port 1
X9	-	To terminate I signal on port 1
X10	-	To terminate R signal on port 1
X11	-	To connect frame ground 2 to logic ground
X12	-	1-2: Byte timing (B2) received or transmitted on pins 7 and 14 2-3: DTE sourced clock (X2) received or transmitted on pins 7 and 14
X13	-	To terminate X signal on port 2
X14	1-2	To terminate B signal on port 2
X15	-	1-2: Byte timing (B2) received or transmitted on pins 7 and 14 2-3: DTE sourced clock (X2) received or transmitted on pins 7 and 14
X16	-	To terminate C signal on port 2
X17	-	To terminate T signal on port 2
X18	1-2	To terminate S signal on port 2
X19	1-2	To terminate I signal on port 2
X20	1-2	To terminate R signal on port 2
X21	1-2	To enable backup
X22	1-2	To enable backup
X23	-	Not to be used

LEDs

There are no LEDs on the LLB submodules.

The front panel indicators of the QDLM do not display any conditions relating to the function of the LLB.

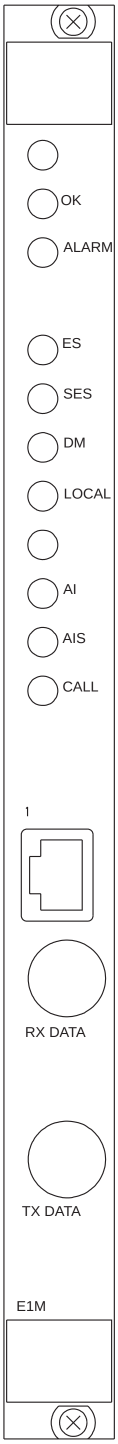
Troubleshooting

Symptom	Action
NMS call connect button fails to initiate ISDN call to remote DTE.	Notify service personnel
DDN-DTE data is not transmitted, or received transparently	Check cable termination
	Check cable to DTE
	Notify service personnel

RM CM

E1 Digital Module (E1M)

PCB 1000-0294



This section describes the E1 Digital Module (E1M), PCB 1000-0294.

The E1 Digital Module (E1M) provides a 2.048 Mbit/s NT port. It supports the use of both fixed (leased line) and switched calls.

The E1M can also be configured in two mutually exclusive modes:

- 31 channel transparent
- Channel Associated Signalling (CAS).

Applications

Overview

The E1M can be used where there is need for multiple digital channels to one or more destinations. One or more E1Ms can be used in a chassis when a site requires greater than thirty 64 kbit/s channels access from the terminal equipment. The E1Ms can then access the ISDN network via an ISDN Primary Rate network access module (IPMT) in the chassis.

An E1M can be accessed by terminal equipment such as third generation PABXs which support 2.048 Mbit/s modules, video conferencing codec equipment and Local Area Network (LAN) bridges.

Any terminal equipment connected to the chassis normally requires either a fixed or switched connection to equipment at other locations. Both of these types of connections are supported by the E1M.

The E1M operates as a digital network termination, connecting directly to E1 terminal equipment. The Resource Manager or Control Module treats the E1M as an NT module.

Clock reference

The E1M provides reference clock to synchronise connected terminal equipment to the chassis. It can also be configured to extract the chassis reference clock from the line.

Specifications

Compatibility	The E1M can be fitted to any chassis.
Ports	RJ45 (8 way) modular jack female connector and a pair of 1.6/5.6 coaxial threaded female connectors on front panel.
Port impedances	RJ45: 120 Ω balanced Coax: 75 Ω unbalanced (Impedance is set at installation by service personnel).
Port protocol	ITU-T recommendation Q.422 (out-of-band sections) Telstra (Australia) signalling standard T6 (TPH00091 TSP).
Data rates supported	2.048 Mbit/s supporting 31 64 kbit/s channels (timeslots 1 to 31) and one 64 kbit/s framing channel (timeslot 0). Optionally, one channel (timeslot 16) can be used for signalling
Layer 1	Point-to-point configuration. Bit rate is 2.048/Mbit/s ± 50 ppm Signal is high density bipolar 3 (HDB3) encoded. In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure. Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (SES, ES and DM is below the resolution of this monitor scheme.)

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704. Time slot usage is shown in the following table.

Slot	Usage
0	Frame alignment
1 to 15	Data channels 1 to 15
16	Signalling channel (optional)
17 to 31	Data channels 16 to 30

Call Establishment Modes

Switched, using CAS signalling.
Manual call control (NMS operator initiated).
In Australia, fixed connections using ISDN semipermanent connections are available.

Indial

Signalling.
Number of digits dialled is programmable.

Module width 1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the E1M via the 120 Ω (balanced) connection.

Cable length 75 m max.

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Connector RJ45 male.

The following table shows the cabling specifications for external connections to the E1M via the 75 Ω (unbalanced) connection.

Cable length 100 m max.

Cable type 75 Ω coaxial.

Connector 1.6/5.6 coaxial female.

Notes

The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 KHz.

The frequency/attenuation characteristics of the cabling shall follow a root f law.

Connecting the E1M to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The E1M is supplied configured for 120 Ω operation out of the RJ45 socket.

The module can be reconfigured for 75 Ω operation. This requires a link change on the module. Refer to the link tables below.

1 Run a cable through the front connector cable access duct of the subrack.

2 Terminate the cable with either 1.6/5.6 coaxial male connectors or an RJ45 male connector as shown and plug it in. See *Appendix A* for a diagram of the connectors.

Coaxial socket pinouts - 75 Ω unbalanced

E1M signal code	Coaxial connection
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

RJ45 connector pinouts - 120 Ω balanced

E1M signal code	RJ45 connector pin
Receive +	3
Transmit +	4
Transmit +	5
Receive +	6
not used	1, 2, 7 and 8

All pins not used are not connected (open circuit).

Link settings

Figure 47 below shows the position of the links on the E1M.

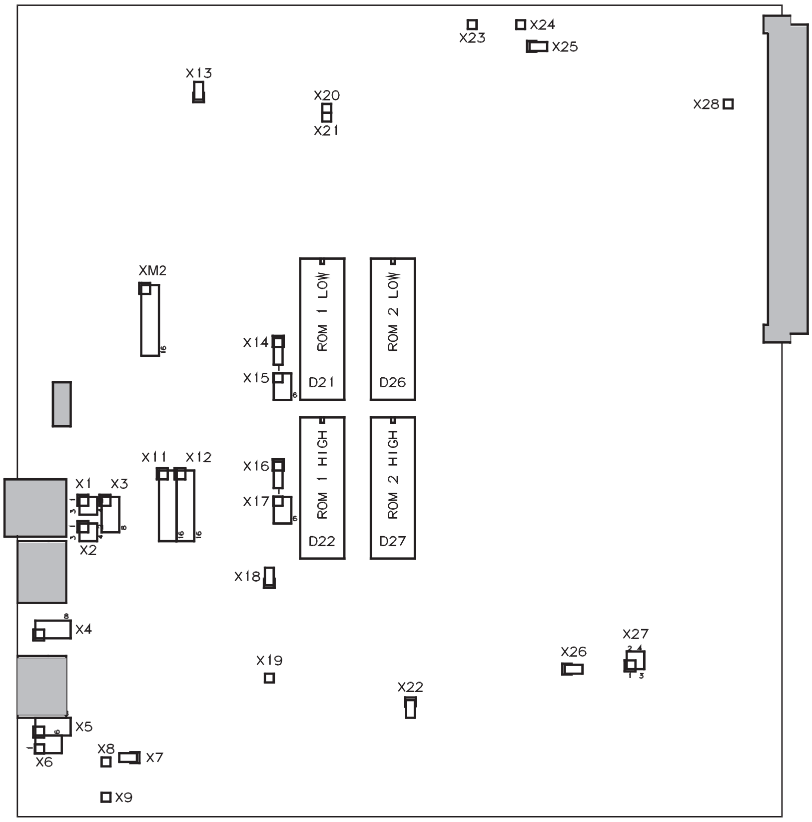


Figure 47: : E1M circuit board, 1000-0294

Normal link settings for the E1M

The following tables show the normal link settings for the E1M.

Ref	Normal setting	Ref	Normal setting
X1	See below	X15	5-6
X2	Not fitted	X16	Not fitted
X3	See below	X17	Not fitted
X4	See below	X18	Not fitted
X5	Not fitted	X19	Not fitted
X6	Not fitted	X20	Not fitted
X7	Not fitted	X21	Not fitted
X8	Not fitted	X22	Not fitted
X9	Not fitted	X23	Not fitted
X10	Not fitted	X24	Not fitted
X11	1-2	X25	Not fitted
X12	Not fitted	X26	Not fitted
X13	Not fitted	X27	Not fitted
X14	2-3	X28	Not fitted
		XM2	13-14

Links for termination impedance

	X1	X3	X4
120 Ω	1-2, 3-4	1-2, 5-6	1-2, 3-4
75 Ω	Not fitted	3-4, 7-8	5-6, 7-8

XM2 link settings

The links on header XM2 provide some functions which are for *TEST* and fixed configuration purposes only.

The following table shows the configuration of these links.

Link	Function of link
1-2	AIS
3-4	Loopback
5-6	Not used
7-8	Enable FREE RUN
9-10	Poll LED
11-12	Busy block
15-16	Test enable

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES[1]	Red	Off
SES[2]	Red	Off
DM[3]	Red	Off
LOCAL[4]	Red	Off
MFS[5]	Green	On[6]
AI[7]	Red	Off
AIS[8]	Red	Off
CALL[9]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821).

4 LOCAL indicates ISDN synchronising clock is not being received reliably and the E1M is using its internal clock source.

5 The MFS (Multi Frame Signalling) LED indicates that the signalling channel is synchronised to the terminal equipment signalling channel. (That is, T6 signalling is active). It should be On shortly after the CAS Enable is selected when configuring the E1M with OmniVision.

6 When the module is used for leased line applications the MFS LED will normally be Off.

7 The AI (remote Alarm Indication) LED indicates that the TE has received line errors (or other failures) and has set the alarm bit in timeslot zero. This alarm is transmitted from the TE to the E1M and causes the AI LED to be lit.

8 The AIS (Alarm Indication Signal) LED generally indicates that the line between the E1M and the TE has been set out-of-service by the TE.

9 The CALL LED indicates that one or more calls are present between the E1M and the terminal equipment.

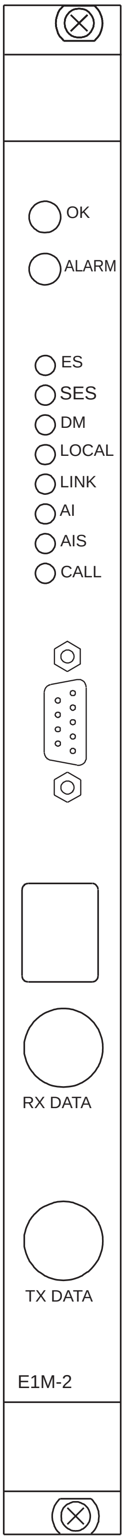
Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM and OK LEDs flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a network TE interface (e.g. IPMT BRMT) is operational
	Notify service personnel
DM ES or SES On intermittently	Check cable to PABX
	Notify service personnel
SES and LOCAL LEDs On continuously	Check cable to PABX
	Notify service personnel
AI LED On continuously	Check cable to PABX
	Check network TE interface (e.g. IPMT)
AIS LED On	Indicates that PABX is being serviced
MFS LED Off (CAS enabled)	Notify service personnel

RM CM

E1 Digital Module-2 (E1M-2)

PCB 1000-1624



This section describes the E1 Digital Module (E1M-2), 1000-1634.

The E1 Digital Module (E1M-2) provides a 2.048 Mbit/s NT port. It supports the use of both fixed (leased line) and switched calls.

The E1M-2 can also be configured in two mutually exclusive modes:

- 31 channel transparent
- Channel Associated Signalling (CAS).

Applications

Overview

The E1M-2 can be used where there is need for multiple digital channels to one or more destinations. One or more E1M-2s can be used in a chassis when a site requires greater than thirty 64 kbit/s channels access from the terminal equipment. The E1M-2s can then access the ISDN network via an ISDN Primary Rate network access module (IPMT) in the chassis.

An E1M-2 can be accessed by terminal equipment such as third generation PABXs which support 2.048 Mbit/s modules, video conferencing codec equipment and Local Area Network (LAN) bridges.

Any terminal equipment connected to the chassis normally requires either a fixed or switched connection to equipment at other locations. Both of these types of connections are supported by the E1M-2.

The E1M-2 operates as a digital network termination, connecting directly to E1 terminal equipment. The Resource Manager or Control Module treats the E1MN as an NT module.

Clock reference

The E1M-2 provides reference clock to synchronise connected terminal equipment to the chassis. It can also be configured to extract the chassis reference clock from the line.

Specifications

Compatibility	The E1M-2 can be fitted to any chassis.
Ports	RJ45 (8 way) modular jack female connector and a pair of 1.6/5.6 coaxial threaded female connectors on front panel.
Port impedances	RJ45: 120 Ω balanced Coax: 75 Ω unbalanced (Impedance is set at installation by service personnel).
Port protocol	ITU-T recommendation Q.422 (out-of-band sections). Telstra signalling standard T6 (TPH0091 TSP).
Data rates supported	2.048 Mbit/s supporting 31 64 kbit/s channels (timeslots 1 to 31) and one 64 kbit/s framing channel (timeslot 0). Optionally, one channel (timeslot 16) can be used for signalling.
Layer 1	Point-to-point configuration. Bit rate is 2.048/Mbit/s ± 50 ppm. Signal is high density bipolar 3 (HDB3) encoded. In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure. Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (SES, ES and DM is below the resolution of this monitor scheme).

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704. Time slot usage is shown in the following table:

Slot	Usage
0	Frame alignment
1 to 15	Data channels 1 to 15
16	Signalling channel (optional)
17 to 31	Data channels 16 to 30

Call Establishment Modes
Switched, using CAS signalling.
Manual call control (NMS operator initiated).
In Australia, fixed connections using ISDN semipermanent connections are available.

Indial
CAS signalling.
Number of digits dialled is programmable.

Module width 1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the E1M-2 via the 120 Ω (balanced) connection.

Cable length 75 m max.

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Connector RJ45 male.

The following table shows the cabling specifications for external connections to the E1M-2 via the 75 Ω (unbalanced) connection.

Cable length 100 m max.

Cable type 75 Ω coaxial.

Connector 1.6/5.6 coaxial female.

The following table shows the cabling specifications for external connections to the PAP port.

Cable type shielded multi-core.

Connector DB9 male.

PAP connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

All pins not used are not connected (open circuit).

Notes *The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 KHz.*

The frequency/attenuation characteristics of the cabling shall follow a root f law.

Connecting the E1M-2 to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The E1M-2 is supplied configured for 120 Ω operation out of the RJ45 socket.

The module can be reconfigured for 75 Ω operation. This requires a link change on the module. Refer to the link tables below.

1 Run a cable through the front connector cable access duct of the subrack.

2 Terminate the cable with either 1.6/5.6 coaxial male connectors or an RJ45 male connector, as shown, and plug it in. See *Appendix A* for a diagram of the connectors.

Coaxial socket pinouts - 75 Ω unbalanced

E1M-2 signal code	Coaxial connection
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

RJ45 connector pinouts - 120 Ω balanced

The following tables show the four possible transmit/receive pinouts for the 120Ω RJ45 socket. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'physical data input'. The links relevant to the 120Ω pinout are X6, X7 and X8. Links X7 and X8 should be considered as a mutually exclusive pair.

The first table shows the recommended link settings for both ISO and proprietary (non-ISO) pin outs. The shaded areas define the ISO pin outs. The second table shows the acceptable alternative pin outs and the link settings required to achieve them.

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Transmit +
		Pin 2	Pin 6	Transmit –
X8	Not fitted	Pin 4	Pin 4	Receive +
		Pin 5	Pin 5	Receive –
		ISO	**Non-ISO**	

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	Not fitted	Pin 4	Pin 4	Transmit +
		Pin 5	Pin 5	Transmit –
X8	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Receive +
		Pin 2	Pin 6	Receive –

All pins not used are not connected (open circuit).

Link settings

Figure 48 below shows the position of the links on the E1M-2, 1000-1624, issue 2.

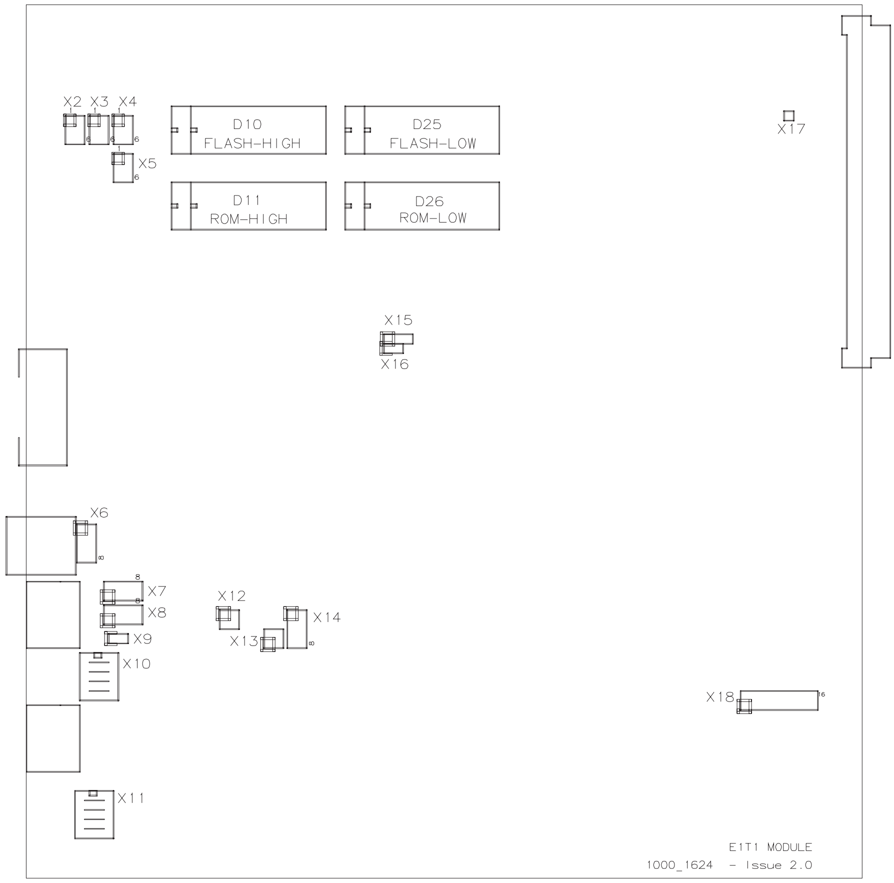


Figure 48: E1M circuit board, 1000-1624, issue 2

Normal link settings for the E1M-2, 1000-1624, issue 2

The following tables show the normal link settings for the E1M-2.

Ref	Normal setting	Ref	Normal setting
X1	-	X10	1-8, 2-7, 3-6, 4-5
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	Not fitted	X16	Not fitted
X8	1-2, 3-4, 5-6, 7-8	X17	Not fitted
X9	Not fitted	X18	13-14

Links for connector interface types

The following tables show the link settings for each connector interface type:

	X6	X7	X8	X10
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

UK termination

	X6	X7	X8	X10
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

Australian termination

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted, 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted, 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Figure 49 below shows the position of the links on the E1M-2, 10001624.03 Rev.1.

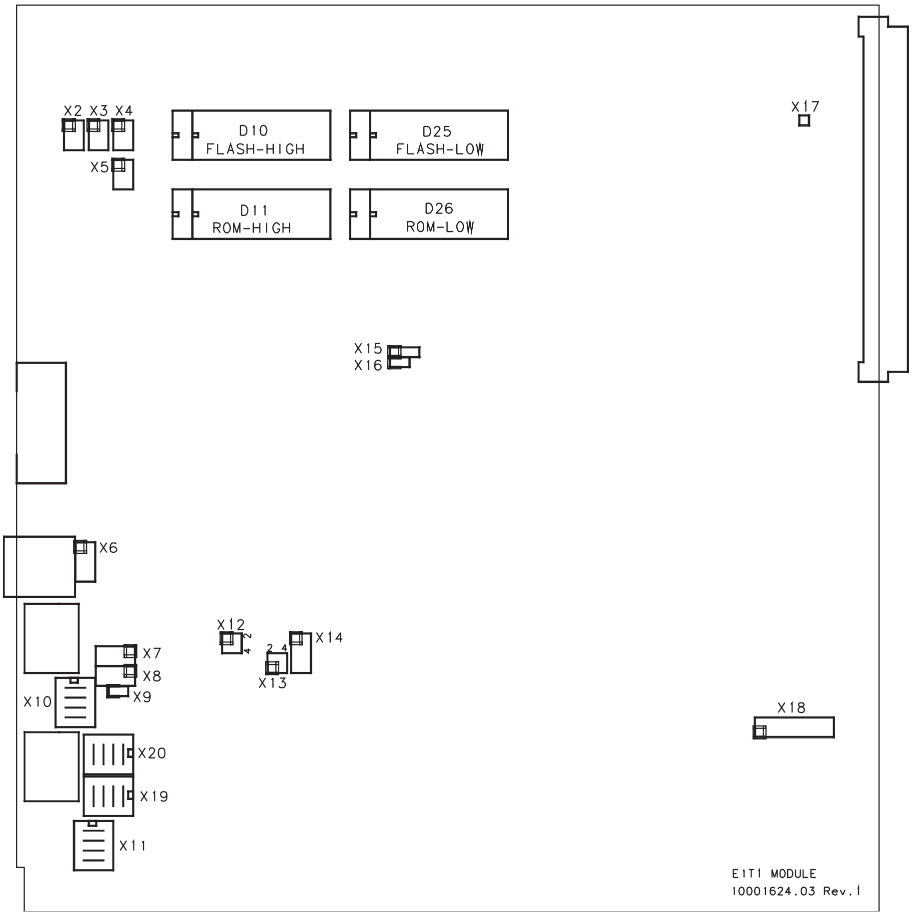


Figure 49: E1M-2 circuit board, 10001624.03 Rev.1

Normal link settings for the E1M-2, 10001624.03 Rev.1

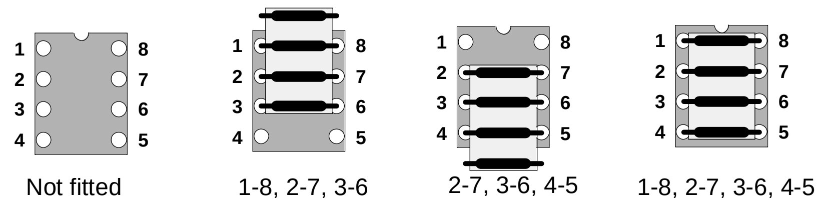
The following tables show the normal link settings for the E1M-2.

Ref	Normal setting	Ref	Normal setting
X1	-	X11	Not fitted
X2	Not fitted	X12	Not fitted
X3	Not fitted	X13	Not fitted
X4	Not fitted	X14	1-2, 3-4
X5	3-5	X15	2-3
X6	1-2, 3-4	X16	Not fitted
X7	Not fitted	X17	-
X8	1-2, 3-4, 5-6, 7-8	X18	13-14
X9	Not fitted	X19	1-8, 2-7, 3-6, 4-5
X10	Not fitted	X20	1-8, 2-7, 3-6, 4-5

Links for connector interface types

Links X6, X7, X8 and X10 and X19 indicate which external connector is used by the E1M-2. This can be either a 120 Ω connection via an RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following diagram shows the relationship of the pins for links X10, X11, X19 and X20:



The following tables show the factory-fitted link settings for each connector interface type:

Ref	*X6	*X7	X8	X10	X19
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don’t care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for countries other than Australia

Ref	*X6	*X7	X8	X10	X19
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don’t care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for Australia

*Refer to page 7-79 for valid alternative positions for links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted, 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted, 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must* ***not*** *be fitted.*

X18 link settings

The links on header X18 provide some functions which are for *TEST* and fixed configuration purposes only.

The following table shows the configuration of these links.

Link	Function of link
1-2	AIS
3-4	Loopback
5-6	Not used
7-8	Enable FREE RUN
9-10	Poll LED
11-12	Busy block
15-16	Test enable

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES[1]	Red	Off
SES[2]	Red	Off
DM[3]	Red	Off
LOCAL[4]	Red	Off
LINK[5]	Green	On[6]
AI[7]	Red	Off
AIS[8]	Red	Off
CALL[9]	Green	On

1 ES (Errored Seconds) indicates a CRC-4 error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821).

4 LOCAL indicates ISDN synchronising clock is not being received reliably and the E1M-2 is using its internal clock source.

5 The LINK LED indicates that MFS (Multi Frame Signalling) is occurring. This means that the signalling channel is synchronised to the terminal equipment signalling channel. (That is, T6 signalling is active). It should be On shortly after the CAS Enable is selected when configuring the E1M-2 with OmniVision.

6 When the module is used for leased line applications the MFS LED will normally be Off.

7 The AI (remote Alarm Indication) LED indicates that the TE has received line errors (or other failures) and has set the alarm bit in timeslot zero. This alarm is transmitted from the TE to the E1M-2 and causes the AI LED to be lit.

8 The AIS (Alarm Indication Signal) LED generally indicates that the line between the E1M-2 and the TE has been set out-of-service by the TE.

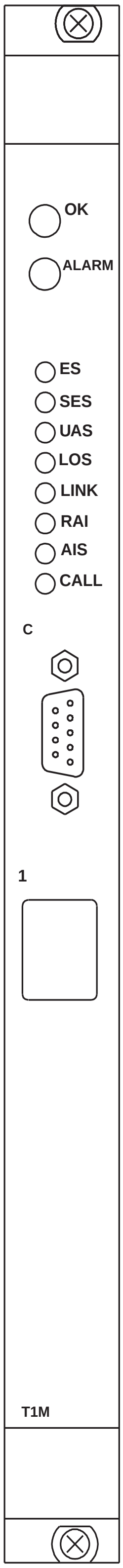
9 The CALL LED indicates that one or more calls are present between the E1M-2 and the terminal equipment.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM and OK LEDs flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a network TE interface (e.g. IPMT or BRMT) is operational
	Notify service personnel
DM ES or SES On intermittently	Check cable to PABX
	Notify service personnel
SES and LOCAL LEDs On continuously	Check cable to PABX
	Notify service personnel
AI LED On continuously	Check cable to PABX
	Check network TE interface (e.g. IPMT)
AIS LED On	Indicates that PABX is being serviced
MFS LED Off (CAS enabled)	Notify service personnel

RM CM

T1 Digital Module (T1M)



This section describes the T1 Digital Module (T1M).

The T1 Digital Module provides a 1.544 Mbit/s port. It supports the use of both fixed (leased line) and switched calls.

Specifications

Compatibility	The T1M can be fitted to all models.
Ports	RJ45 (8-way) modular jack female connector on front panel. This is a 100 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive.
Port protocol	E&M Wink Start E&M Immediate Start FXO Ground Start FXS Ground Start FXO Loop Start FXS Loop Start PLAR.
Data rates supported	1.544 Mbit/s supporting 24 x 64 or 56 kbit/s channels.
Layer 1	Conforms to FCC Part 68 Network Compliance requirements. Point-to-point configuration. Bit rate is 1.544/Mbit/s +/- 50 bps Signal is AMI encoded. Zero code suppression options are B8ZS, ZCS or none. Line can be set to either ESF or SF (D4) framing. Setting ESF framing enables line monitoring through CRC-6 errors, framing errors and bipolar violations. It also enables the Facility Data Link (FDL) for Layer 1. The FDL supports performance reporting and is also used to control line and payload loopbacks. Setting SF framing allows line monitoring through framing errors and bipolar variations only. Performance reporting is not available. Line loopbacks are available. In addition to the relevant parts of the Protocol specifications above, Layer 1 conforms to the following: • ANSI T1.403 • AT&T TR62411.
Module width	1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the T1M via the 100 Ω (balanced) connection.

Cable type	0.63 mm dual twisted-pair solid conductor with metallic shield.
Connector	RJ45 male conforming to FCC RJ48C standard.

Connecting the T1M to equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The T1M is supplied configured for 100 Ω operation out of the RJ45 socket.

1 Run a cable through the front connector cable access duct of the subrack.

2 Terminate the cable with an RJ45 male connector, as shown, and plug it in. See *Appendix A* for a diagram of the connector.

RJ45 connector pinouts - 100Ω balanced

The first table below shows the default pinouts for the RJ45 socket to the FCC RJ48C standard for Network mode (NT) mode and User mode (TE). Transmit and receive are with respect to the module, such that Transmit means 'Physical data output' and Receive means 'Physical data input'.

	FCC RJ48C				
	Network Mode (NT)		User Mode (TE)		
Link X6	1-2, 6-7		2-3, 5-6		
Link X7	1-2, 6-7		2-3, 5-6		
	Pin 1	(R)	Pin 4	(R1)	Transmit +
	Pin 2	(T)	Pin 5	(T1)	Transmit -
	Pin 4	(R1)	Pin 1	(R)	Receive +
	Pin 5	(T1)	Pin 2	(T)	Receive -

Unused pins are not connected (open circuit).

Link settings

Figure 50 below shows the position of the links on the T1M, 10003088.00 Rev.2 and 10003088.03 Rev.1.

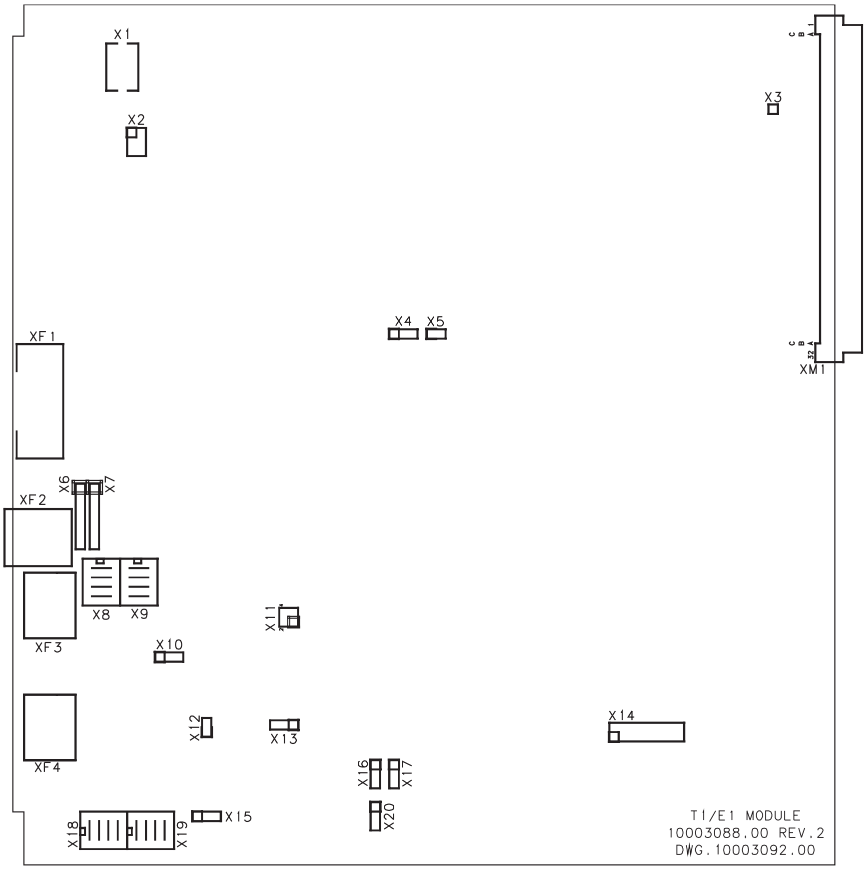


Figure 50: T1M circuit board, 10003088.00 Rev.2 and 10003088.03 Rev.1

Normal link settings for the T1M, 10003088.00 Rev.2 and 10003088.03 Rev.1

The following tables show the normal link settings for the T1M, 10003088.00 Rev.2 and 10003088.03 Rev.1.

Ref	Normal Setting	Ref	Normal Setting
X1	—	X11	Not fitted
X2	3-5	X12	Not fitted
X3	—	X13	1-2
X4	2-3	X14	13-14[2,]
X5	Not fitted	X15	2-3
X6	1-2, 6-7[1]	X16	1-2
X7	1-2, 6-7[1]	X17	1-2
X8	Not fitted	X18	Not fitted
X9	1-8, 2-7, 3-6, 4-5	X19	Not fitted
X10	2-3	X20	1-2

1 Links X6 and X7 are used to determine RJ45 connector pinouts. See page 7-89 for information on alternate settings for these links.

2 Link X14 pins 13-14 controls the TE/NT operation of the T1M. Fit a link to pins 13-14 for NT operation and remove the link for TE operation.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES[1]	Red	Off
SES[2]	Red	Off
UAS[3]	Red	Off
LOS[4]	Red	Off
LINK[5]	Green	On[6]
RAI[7]	Red	Off
AIS[8]	Red	Off
CALL[9]	Green	On

1 ES indicates Errored Seconds (in accordance with AT&T TR62411).

2 SES indicates Severely Errored Seconds (AT&T TR62411).

3 UAS indicates UnAvailable Signal (AT&T TR62411).

4 LOS indicates that the module is not receiving the T1 signal reliably and is using the internal clock. This also indicates a Red Alarm.

5 LINK indicates that T1 framing is synchronised.

6 RAI (Remote Alarm Indication) indicates that the T1M is receiving a remote alarm from the connected equipment. This is also known as a Yellow Alarm.

7 AIS (Alarm Indication Signal) indicates that the T1M is receiving an all 1s signal from the connected equipment. This is also known as a Blue Alarm.

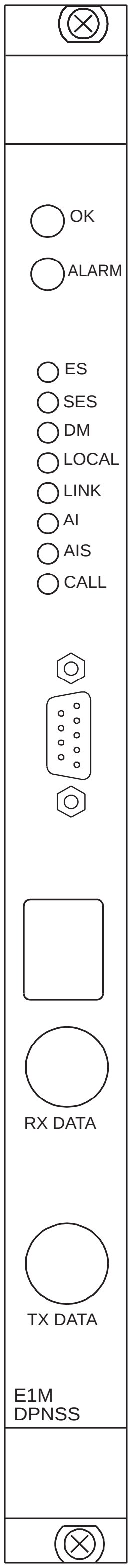
8 CALL indicates one or more calls are present on the T1M.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM and OK LEDs flashing in repeating sequence	Check Link settings Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Notify service personnel
UAS, ES or SES LEDs On intermittently	Check the interface cable
	Notify service personnel
UAS or LOS LEDs On continuously	Check Link settings Check the interface cable
	Notify service personnel
RAI LED On continuously	Check Link settings Check the interface cable Notify service personnel
AIS LED On	Check the state of the equipment at the other end of the link Check the interface cable
LINK LED Off	Check Link settings Check the interface cable

RM CM

E1 Digital Module DPNSS (E1M DPNSS)



This section describes the E1M DPNSS (Digital Private Network Signalling System) module.

DPNSS is a symmetrical protocol and does not differentiate between TE (User) and NT (Network) protocols. Ends of a DPNSS link are configured to be A-side or B-side from OmniVision.

The E1M DPNSS module can be used to provide a transparent DPNSS connection between DPNSS equipment using ISDN or other non-DPNSS network services.

The E1M DPNSS module facilitates communication between DPNSS and non-DPNSS equipment.

Applications

Overview

E1M DPNSS can be used where there is need for multiple digital channels to one or more destinations. One or more E1M DPNSS modules can be used in a chassis when a site requires greater than thirty 64 kbit/s channels access from the PBXs. The E1M DPNSS modules can then access the ISDN network via an ISDN Primary Rate network access module (IPMT) in the chassis.

The Resource Manager or Control Module treats the E1M DPNSS as an NT module.

Clock reference

The E1M DPNSS normally provides reference clock to synchronise the connected PBX to the chassis. It can also be configured to extract the chassis reference clock from the PBX.

Call types

The E1M DPNSS supports both Real (channel associated) and Virtual DPNSS calls.

Specifications

Compatibility	The E1M DPNSS can be fitted to all chassis.
Ports	RJ45 (8 way) modular jack female connector and a pair of 1.6/5.6 coaxial threaded female connectors on front panel. The E1M DPNSS port should be selected to match the PBX installation. The RJ45 (8-way) modular jack female connector on front panel is a 120 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive. The 1.6/5.6 coaxial threaded female connectors on the front panel are 75 Ω unbalanced. These are labelled as follows: **Tx Data** for data transmitted from the device **Rx Data** for data received from the PABX. (Impedance is set at installation by service personnel).
Port protocol	BTNR 188.
Data rates supported	2.048 Mbit/s supporting 30 64 kbit/s channels (timeslots 1 to 15 and 17 to 31), one 64 kbit/s framing channel (timeslot 0) and a signalling channel (timeslot 16).

Layer 1

Point-to-point configuration.
Bit rate is 2.048/Mbit/s ± 50 ppm.
Signal is high density bipolar 3 (HDB3) encoded.

In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure.

Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitoring scheme).

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704.

DPNSS protocol splits the signal into laps. This allows the device to send a virtual call with each real call as a call identification mechanism. Time slot usage is shown in the following table:

Slot	Laps		E1M DPNSS channel
1-15	1-15	Real	1-15
17-31	17-31		16-30
-	33-47	Virtual	-
-	49-63		-

Call Establishment Modes

Switched.

Module width

1 slot.

Installation

Cabling

The following table shows the cabling specifications for external connections to the E1M DPNSS via the 120 Ω (balanced) connection.

Cable length 75 m max.

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Connector RJ45 male.

The following table shows the cabling specifications for external connections to the E1M DPNSS via the 75 Ω (unbalanced) connection.

Cable length 100 m max.

Cable type 75 Ω coaxial.

Connector 1.6/5.6 coaxial female.

The following table shows the cabling specifications for external connections to the PAP (Protocol Analyser Package) port.

Cable type shielded multi-core.

Connector DB9 male.

PAP connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

All pins not used are not connected (open circuit).

Note *The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 KHz.*

The frequency/attenuation characteristics of the cabling shall follow a root f law.

Connecting the E1M DPNSS to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The E1M DPNSS is supplied configured for 120 Ω operation out of the RJ45 socket.

The module can be reconfigured for 75Ω operation. Refer to the link tables below.

1 Run a cable through the front connector cable access duct of the subrack.

2 Terminate the cable with either 1.6/5.6 coaxial male connectors or an RJ45 male connector, as shown, and plug it in. See *Appendix A* for a diagram of the connectors.

Coaxial socket pinouts - 75 Ω unbalanced

E1M DPNSS signal	Coaxial connection
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

RJ45 connector pinouts - 120 Ω balanced

The following tables show the four possible transmit/receive pinouts for the 120Ω RJ45 socket. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'physical data input'. The links relevant to the 120Ω pinout are X6, X7 and X8. Links X7 and X8 should be considered as a mutually exclusive pair.

The first table shows the recommended link settings for both ISO and proprietary (non-ISO) pin outs. The shaded areas define the ISO pin outs. The second table shows the acceptable alternative pin outs and the link settings required to achieve them.

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Transmit +
		Pin 2	Pin 6	Transmit –
X8	Not fitted	Pin 4	Pin 4	Receive +
		Pin 5	Pin 5	Receive –
		ISO	**Non-ISO**	

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	Not fitted	Pin 4	Pin 4	Transmit +
		Pin 5	Pin 5	Transmit –
X8	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Receive +
		Pin 2	Pin 6	Receive –

All pins not used are not connected (open circuit).

Link settings

Figure 51 below shows the position of the links on the E1M DPNSS, 1000-1624, issue 2.

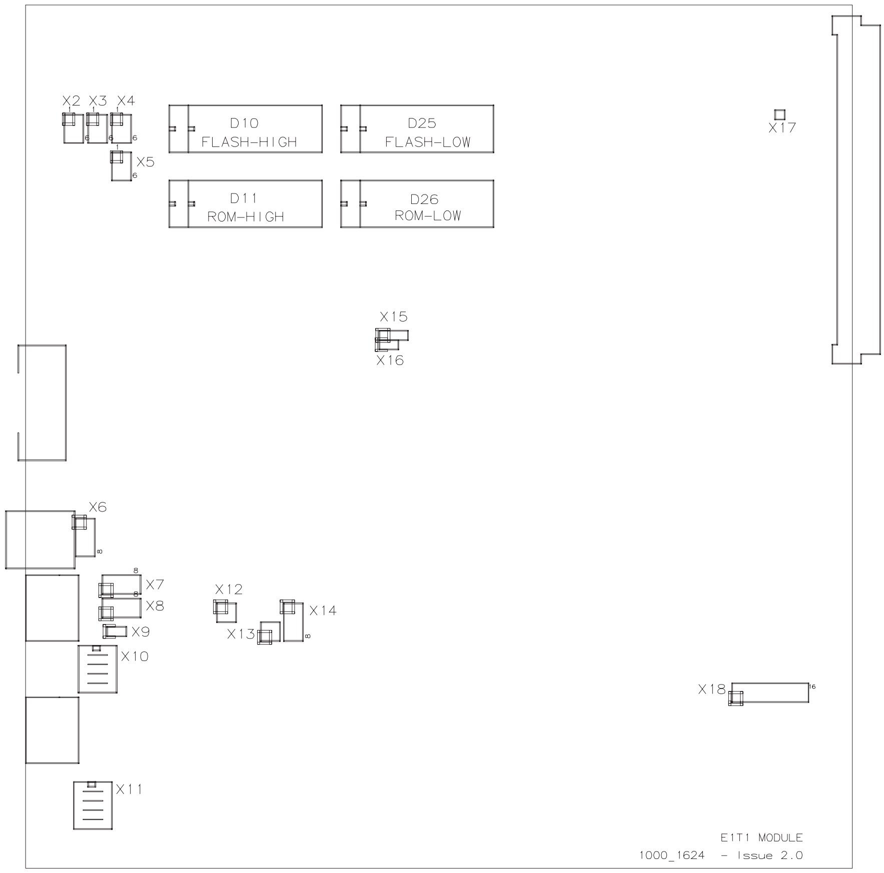


Figure 51: E1M DPNSS circuit board, 1000-1624, issue 2

Normal link settings for the E1M DPNSS, 1000-1624, issue 2

The following tables show the normal link settings for the E1M DPNSS.

Ref	Normal setting	Ref	Normal setting
X1	-	X10	1-8, 2-7, 3-6, 4-5
X2	Not fitted	X11	Not fitted
X3	Not fitted	X12	Not fitted
X4	Not fitted	X13	Not fitted
X5	3-5	X14	1-2, 3-4
X6	5-6, 7-8	X15	2-3
X7	Not fitted	X16	Not fitted
X8	1-2, 3-4, 5-6, 7-8	X17	Not fitted
X9	Not fitted	X18	13-14

Links for connector interface types

The following tables show the link settings for each connector interface type:

	X6	X7	X8	X10
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

Link settings for countries other than Australia

	X6	X7	X8	X10
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted
75 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	1-8, 2-7, 3-6, 4-5

Link settings for Australia

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted, 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted, 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

Figure 52 below shows the position of the links on the E1M DPNSS, 10001624.03 Rev.1.

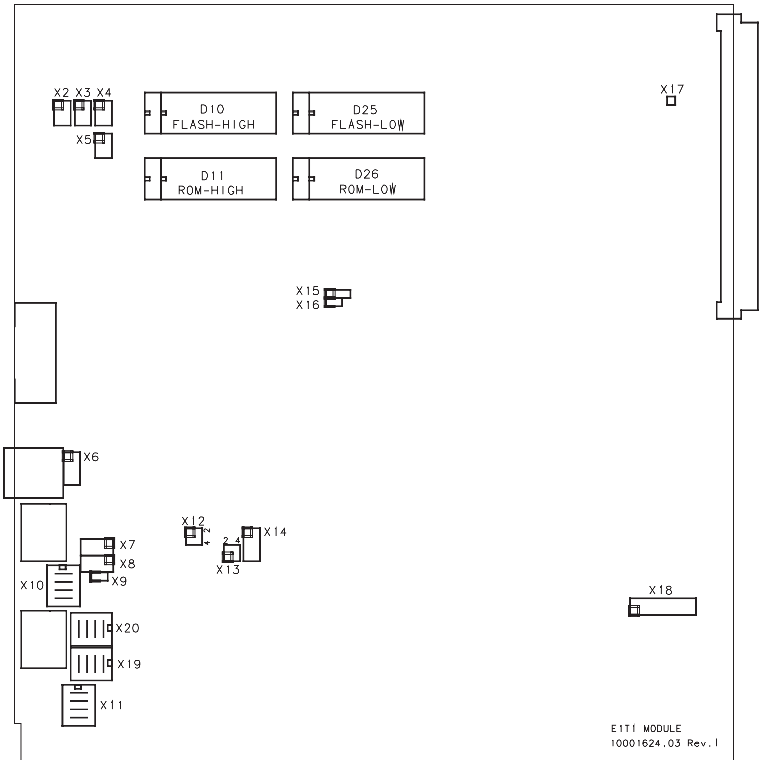


Figure 52: E1M DPNSS circuit board, 10001624.03 Rev.1

Normal link settings for the E1M DPNSS, 10001624.03 Rev.1

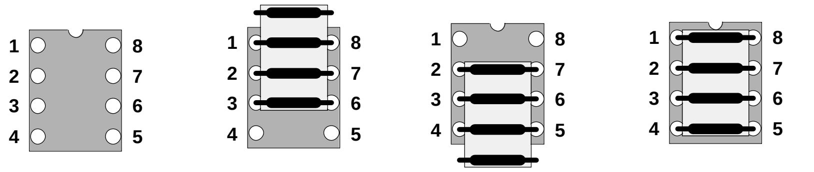
The following tables show the normal link settings for the E1M DPNSS.

Ref	Normal setting	Ref	Normal setting
X1	-	X11	Not fitted
X2	Not fitted	X12	Not fitted
X3	Not fitted	X13	Not fitted
X4	Not fitted	X14	1-2, 3-4
X5	3-5	X15	2-3
X6	1-2, 3-4	X16	Not fitted
X7	Not fitted	X17	-
X8	1-2, 3-4, 5-6, 7-8	X18	13-14
X9	Not fitted	X19	1-8, 2-7, 3-6, 4-5
X10	Not fitted	X20	1-8, 2-7, 3-6, 4-5

Links for connector interface types

Links X6, X7, X8 and X10 and X19 indicate which external connector is used by the E1M-DPNSS. This can be either a 120 Ω connection via an RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following diagram shows the relationship of the pins for links X10, X11, X19 and X20.



The following tables show the factory-fitted link settings for each connector interface type:

Ref	*X6	*X7	X8	X10	X19
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don't care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for countries other than Australia

Ref	*X6	*X7	X8	X10	X19
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don't care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for Australia

*Refer to page 7-100 for viable alternatives for Links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted, 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted, 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must **not** be fitted.*

X18 link settings

The links on header X18 provide some functions which are for *TEST* and fixed configuration purposes only.

The following table shows the configuration of these links.

Link	Function of link
1-2	AIS
3-4	Loopback
5-6	Not used
7-8	Not used
9-10	Not used
11-12	Not used
13-14	NT selection (must be fitted)
15-16	Test enable

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES[1]	Red	Off
SES[2]	Red	Off
DM[3]	Red	Off
LOCAL[4]	Red	Off
LINK[5]	Green	On[6]
AI[6]	Red	Off
AIS[7]	Red	Off
CALL[8]	Green	On

1 ES (Errored Seconds) indicates an error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821).

4 LOCAL indicates synchronising clock is not being received reliably and the E1M DPNSS is using its internal clock source.

5 The LINK LED is On when LAP 16 is established.

6 The AI (remote Alarm Indication) LED indicates that the PABX has received line errors (or other failures) and has set the alarm bit in timeslot zero. This alarm is transmitted from the PABX to the E1MDPNSS and causes the AI LED to be lit.

7 The AIS (Alarm Indication Signal) LED generally indicates that the line between the E1M DPNSS and the PABX has been set out-of-service by the PABX.

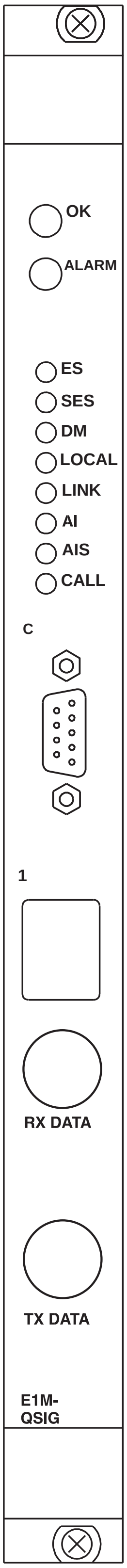
8 The CALL LED indicates that one or more calls are present between the E1M DPNSS and the terminal equipment.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM and OK LEDs flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a network TE interface (e.g. IPMT or BRMT) is operational
	Notify service personnel
DM ES or SES On intermittently	Check cable to PABX
	Notify service personnel
SES and LOCAL LEDs On continuously	Check cable to PABX
	Notify service personnel
AI LED On continuously	Check cable to PABX
	Check PABX interface (e.g. IPMT)
AIS LED On	Indicates that PABX is being serviced

RM

E1 Digital Module-QSIG (E1M-QSIG)



This section describes the E1M-QSIG module.

QSIG is a symmetrical protocol and does not differentiate between TE (User) and NT (Network) protocols. Ends of a QSIG link are configured to be A-side or B-side using the Network Management System (NMS).

The E1M-QSIG module can be used to provide a transparent QSIG connection between QSIG equipment using ISDN or other non-QSIG network services.

The E1M-QSIG module facilitates communication between QSIG and non-QSIG equipment.

Applications

Overview

E1M-QSIG can be used where there is need for multiple digital channels to one or more destinations. One or more E1M-QSIG modules can be used in a chassis when a site requires greater than thirty 64 kbit/s channels access from the PBXs. The E1M-QSIG modules can then access the ISDN network via an ISDN Primary Rate network access module (IPMN) in the chassis.

Note *The E1M-QSIG is compatible only with the IPMN-2, and not with the IPMN.*

The Resource Manager treats the E1M-QSIG as an NT module.

Clock reference

The E1M-QSIG normally provides reference clock to synchronise the connected PBX to the chassis. It can also be configured to extract the reference clock from the PBX.

Specifications

Compatibility	The E1M-QSIG can be fitted to any chassis.
Ports	RJ45 (8 way) modular jack female connector and a pair of 1.6/5.6 coaxial threaded female connectors on front panel. The E1M-QSIG port should be selected to match the PBX installation. The RJ45 (8-way) modular jack female connector on front panel is a 120 Ω balanced connection which requires two pairs of wires in one cable, one to transmit and one to receive. The 1.6/5.6 coaxial threaded female connectors on the front panel are 75 Ω unbalanced. These are labelled as follows: **Tx Data** for data transmitted from the device **Rx Data** for data received from the PABX. (Impedance is set at installation by service personnel).
Port protocol	BTNR 188.
Data rates supported	2.048 Mbit/s supporting 30 64 kbit/s channels (timeslots 1 to 15 and 17 to 31), one 64 kbit/s framing channel (timeslot 0) and a signalling channel (timeslot 16).
Layer 1	Point-to-point configuration Bit rate is 2.048/Mbit/s ± 50 ppm Signal is high density bipolar 3 (HDB3) encoded. In-service monitoring of the bit stream is carried out using the four bit cyclic redundancy check (CRC-4) procedure. Enabling CRC causes CRC-4 multiframing to be transmitted in timeslot 0 (TS0). It also causes the received TS0 to have CRC-4 multiframing applied, and the CRC-4 to be used to monitor the received signal (ES, DM and SES).

If CRC is disabled, the CRC-4 multiframe bits of the transmitted TS0 are set to the internationally accepted unused values. The received signal is not checked for CRC-4 but instead monitored by using a less accurate frame (TS0) error count. (DM is below the resolution of this monitoring scheme).

The signal is framed into 32 time slots in compliance with ITU-T recommendation G.704.

QSIG protocol splits the signal into laps. This allows the device to send a virtual call with each real call as a call identification mechanism. Time slot usage is shown in the following table.

Slot	Laps		E1M-QSIG channel
1-15	1-15	Real	1-15
17-31	17-31		16-30
-	33-47	Virtual	-
-	49-63		-

Layer 3

Supports Segmentation and Reassembly (SAR) in accordance with ETS 300 172.

Call Establishment Modes

Switched.

Module width

1 slot.

Installation

Cabling

The following shows the cabling specifications for external connections to the E1M-QSIG via the 120 Ω (balanced) connection.

Cable length 75 m max.

Cable type 0.5 mm dual twisted-pair solid conductor with metallic shield.

Connector RJ45 male.

The following shows the cabling specifications for external connections to the E1M-QSIG via the 75 Ω (unbalanced) connection.

Cable length 100 m max.

Cable type 75 Ω coaxial.

Connector 1.6/5.6 coaxial female.

The following shows the cabling specifications for external connections to the PAP (Protocol Analyser Package) port.

Cable type shielded multi-core.

Connector DB9 male.

PAP connector pinouts

Signal code	DB9 connector pin
Transmit	2
Receive	3
Ground	5

All pins not used are not connected (open circuit).

Notes *The maximum attenuation of the cabling shall not exceed 6dB when measured at 1024 KHz.*

The frequency/attenuation characteristics of the cabling shall follow a root f law.

Connecting the E1M-QSIG to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

The E1M-QSIG is supplied configured for 120 Ω operation out of the RJ45 socket.

The module can be reconfigured for 75Ω operation. Refer to the link tables below.

1. Run a cable through the front connector cable access duct of the subrack.
2. Terminate the cable with either 1.6/5.6 coaxial male connectors or an RJ45 male connector, as shown, and plug it in. See *Appendix A* for a diagram of the connectors.

Coaxial socket pinouts - 75 Ω unbalanced

E1M-QSIG signal	Coaxial connection
Receive (Rx) Ground	Rx Shield
Receive (Rx) Signal	Rx Centre
Transmit (Tx) Ground	Tx Shield
Transmit (Tx) Signal	Tx Centre

RJ45 connector pinouts - 120 Ω balanced

The following tables show the four possible transmit/receive pinouts for the 120Ω RJ45 socket. Transmit and receive are with respect to the module, such that Transmit means 'physical data output' and Receive means 'physical data input'. The links relevant to the 120Ω pinout are X6, X7 and X8. Links X7 and X8 should be considered as a mutually exclusive pair.

The first table shows the recommended link settings for both ISO and proprietary (non-ISO) pin outs. The shaded areas define the ISO pin outs. The second table shows the acceptable alternatives pin outs and the link settings required to achieve them.

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Transmit +
		Pin 2	Pin 6	Transmit –
X8	Not fitted	Pin 4	Pin 4	Receive +
		Pin 5	Pin 5	Receive –
		ISO	**Non-ISO**	

		Link X6		
		1-2, 3-4	**5-6, 7-8**	
X7	Not fitted	Pin 4	Pin 4	Transmit +
		Pin 5	Pin 5	Transmit –
X8	1-2, 3-4 5-6, 7-8	Pin 1	Pin 3	Receive +
		Pin 2	Pin 6	Receive –

All pins not used are not connected (open circuit).

Link settings

Figure 53 below shows the position of the links on the E1M-QSIG, 10001624.03 Rev.1.

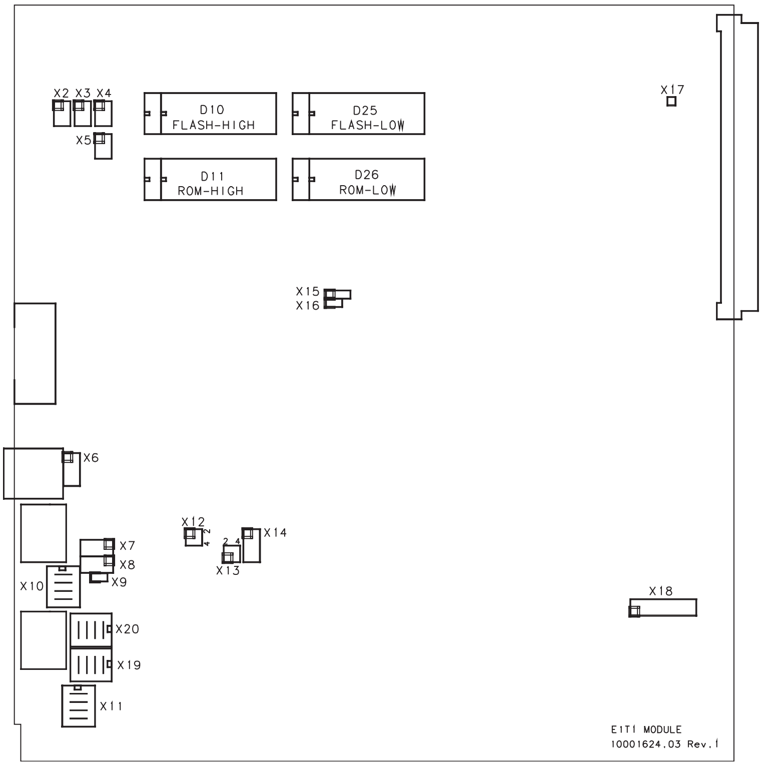


Figure 53: E1M-QSIG circuit board, 10001624.03 Rev.1

Normal link settings for the E1M-QSIG, 10001624.03 Rev.1

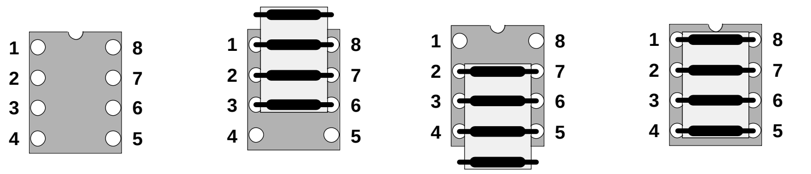
The following tables show the normal link settings for the E1M-QSIG.

Ref	Normal setting	Ref	Normal setting
X1	-	X11	Not fitted
X2	Not fitted	X12	Not fitted
X3	Not fitted	X13	Not fitted
X4	Not fitted	X14	1-2, 3-4
X5	3-5	X15	2-3
X6	1-2, 3-4	X16	Not fitted
X7	Not fitted	X17	-
X8	1-2, 3-4, 5-6, 7-8	X18	13-14
X9	Not fitted	X19	1-8, 2-7, 3-6, 4-5
X10	Not fitted	X20	1-8, 2-7, 3-6, 4-5

Links for connector interface types

Links X6, X7, X8 and X10 and X19 indicate which external connector is used by the E1M-QSIG. This can be either a 120 Ω connection via an RJ45 connector, or a 75 Ω connection via 1.6/5.6 co-axial connectors.

The following diagram shows the relationship of the pins for links X10, X11, X19 and X20



Not fitted | 1-8, 2-7, 3-6 | 2-7, 3-6, 4-5 | 1-8, 2-7, 3-6, 4-5

The following tables show the factory-fitted link settings for each connector interface type:

Ref	*X6	*X7	X8	X10	X19
120 Ω	1-2, 3-4	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don’t care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for countries other than Australia

Ref	*X6	*X7	X8	X10	X19
120 Ω	5-6, 7-8	Not fitted	1-2, 3-4, 5-6, 7-8	Not fitted	1-8, 2-7 3-6, 4-5
75 Ω	Don’t care	Not fitted	Not fitted	1-8, 2-7, 3-6, 4-5	Not fitted

Link settings for Australia

*Refer to page 7-114 for valid alternative positions for links X6 and X7.

Co-axial connector grounding options

When the co-axial interface is used, the following grounding options are available:

- Tx shield to ground
- Rx shield to ground
- Tx **and** Rx shield to ground
- Tx and Rx shield **not** grounded.

The following table shows the link settings applicable to each option:

Grounding option	Link X11
Tx shield to Ground	1-8, 2-7, 3-6 fitted 4-5 not fitted
Rx shield to Ground	2-7, 3-6, 4-5 fitted 1-8 not fitted
Tx and Rx shields to Ground	1-8, 2-7, 3-6, 4-5 fitted
Tx and Rx shields not Grounded	Not fitted

Note *When the RJ45 interface option is used, X11 must* ***not*** *be fitted.*

X18 link settings

The links on header X18 provide some functions which are for *TEST* and fixed configuration purposes only.

The following table shows the configuration of these links.

Link	Function of link
1-2	AIS
3-4	Loopback
5-6	Not used
7-8	Not used
9-10	Not used
11-12	Not used
13-14	NT selection (must be fitted)
15-16	Test enable

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
ES[1]	Red	Off
SES[2]	Red	Off
DM[3]	Red	Off
LOCAL[4]	Red	Off
LINK[5]	Green	On[6]
AI[6]	Red	Off
AIS[7]	Red	Off
CALL[8]	Green	On

1 ES (Errored Seconds) indicates an error in the previous second (in accordance with ITU-T recommendation G.821).

2 SES (Severely Errored Seconds) indicates an error rate of $1x10^{-3}$ (ITU-T G.821).

3 DM (Degraded Minutes) indicates an error rate of $1x10^{-6}$ (ITU-T G.821).

4 LOCAL indicates synchronising clock is not being received reliably and the E1M-QSIG is using its internal clock source.

5 The LINK LED is On when LAP 16 is established.

6 The AI (remote Alarm Indication) LED indicates that the PABX has received line errors (or other failures) and has set the alarm bit in timeslot zero. This alarm is transmitted from the PABX to the E1M-QSIG and causes the AI LED to be lit.

7 The AIS (Alarm Indication Signal) LED generally indicates that the line between the E1M-QSIG and the PABX has been set out-of-service by the PABX.

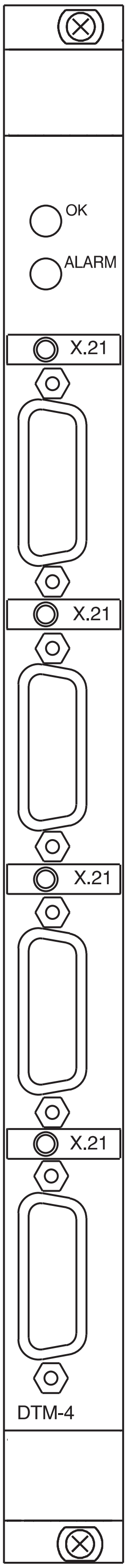
8 The CALL LED indicates that one or more calls are present between the E1M-QSIG and the terminal equipment.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
ALARM and OK LEDs flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check RM is operational
	Check that a network TE interface (e.g. IPMT BRMT) is operational
	Notify service personnel
DM ES or SES On intermittently	Check cable to PABX
	Notify service personnel
SES and LOCAL LEDs On continuously	Check cable to PABX
	Notify service personnel
AI LED On continuously	Check cable to PABX
	Check PABX interface (e.g. IPMT)
AIS LED On	Indicates that PABX is being serviced

RM CM

Digital Trunk Module (DTM)



The Digital Trunk Module (DTM) is available in two models, the DTM-1 and the DTM-4. The DTM-1 provides one trunk port and the DTM-4 provides four independent trunk ports. Each port can operate in either DTE (data terminal equipment) or DCE (data circuit terminating equipment) mode. Sub-modules allow each port to be either X.21 or V.35. Each port of the DTM is hardware link configured to operate in either NT or TE (call signalling protocol) mode.

The DTM module enables the setup of a private network with DDN (Digital Data Network) service links.

Specifications

Compatibility The DTM module can be fitted to any chassis.

Ports X.21: DB15 female connector.

V.35: HD26 female connector.

Data rates DCE & DTE mode: 48kbit/s 56kbit/s and Nx64kbit/s up to 2.048 Mbit/s.

Trunk Speed (kbit/s) [T]	Framing bandwidth (kbit/s)	D channel bandwidth (kbit/s) [D]	Number of B channels	Sub-B channel bandwidth (kbit/s)
48	4	4, 12, 20, 28, 36, 44	0	[T]-4-[D]
56	4	4, 12, 20, 28, 36, 44, 52	0	[T]-4-[D]
64	4	4, 12, 20, 28, 36, 44, 52, 60	0	60-[D]
Nx64	4	4, 12, 20, 28, 36, 44, 52, 60	N-1	60-[D]

Module width 1 slot.

Installation

Cabling

The cabling specifications for external connections to the DTM ports are as follows:

Cable length in accordance with ITU-T Recommendation V11:1984 (Refer Appendix B, clause I.2).

Cable type twisted-pair multi-core.

Adaptor cables

The following table specifies the adaptor cable requirements for X.21 and V.35 submodules in DTE and DCE modes. An X.21 submodule operating in DCE mode does not require an adaptor cable.

Connector on port	Operating mode	Connector on cable into port	Connector on cable into TE or NT
X21 interface DB15 female connector	DTE	DB15 male	DB15 male
	DCE	N/A	N/A
V35 interface HD26 female connector	DTE	HD26 male	M34 male
	DCE	HD26 male	M34 female

V.35 connector pin assignments and interconnections to M34

V.35 signal	DCE			DTE		
	HD26 way pin	M34 socket	Circuit type	HD26 way pin	M34 pin	Circuit type
TXC (B) (DCE)	23	AA	G	16	AA	L
GND	1	B	CR	1	B	CR
RTS	4	C	L	18	C	G
CTS	5	D	G	2	D	L
DS	6	E	G	20	E	L
DCD	18	F	G	4	F	L
DTR	20	H	L	6	H	G
RI	22	J	G	8	J	L
LLB	2	L	L	5	L	G
RLB	14	N	L	25	N	G
TI	25	NN	G	14	NN	L
TXD (A)	7	P	L	9	P	G
RXD (A)	9	R	G	7	R	L
TXD (B)	19	S	L	21	S	G
RXD (B)	21	T	G	19	T	L
TXC (A) (DTE)	10	U	L	12	U	G
RXC (A)	12	V	G	10	V	L
TXC (B) (DTE)	17	W	L	24	W	G
RXC (B)	24	X	G	17	X	L
TXC (A) (DCE)	11	Y	G	15	Y	L

L = Load (or input)   G = Generator (or output)   CR = Common Return

Connecting the DTM to terminal equipment

A DTM port can be fitted with an HD26 female connector when the interface is V.35 and a DB15 female connector when the interface is X.21.

For easy reference, the following two tables list the pin assignments for the V.35 and X.21 connectors.

Connector pin assignments for V.35

Module face HD 26 way pin no.	V.35 signal when operated as DCE	V.35 signal when operated as DTE
1	GND	GND
2	LLB	CTS
3	-	-
4	RTS	DCD
5	CTS	LLB
6	DSR	DTR
7	TXD (A)	RXD (A)
8	-	RI
9	RXD (A)	TXD (A)
10	TXC (A) (DTE)	RXC (A)
11	TXC (A) (DCE)	-
12	RXC (A)	TXC (A) (DTE)
13	-	-
14	RLB	TI
15	-	TXC (A) (DCE)
16	-	TXC (B) (DCE)
17	TXC (B) (DTE)	RXC (B)
18	DCD	RTS
19	TXD (B)	RXD (B)
20	DTR	DSR
21	RXD (B)	TXD (B)
22	RI	-
23	TXC (B) (DCE)	-
24	RXC (B)	TXC (B) (DTE)
25	TI	RLB

Connector pin assignments for X.21

Front panel DB15 pin no.	X.21 signals when operated as DCE	X.21 signals when operated as DTE
1	Shield	Shield
2	T(A) (transmit) from DTE	T(A) (transmit) to DCE
3	C(A) (control) from DTE	C(A) (control) to DCE
4	R(A) (receive) to DTE	R(A) (receive) from DCE
5	I(A) (indication) to DTE	I(A) (indication) from DCE
6	S(A) (signal timing element) to DTE	S(A) (signal timing element) from DCE
7	B(A) (byte timing element) from DTE	B(A) (byte timing element) to DCE
8	G (signal ground)	G (signal ground)
9	T(B) (transmit) from DTE	T(B) (transmit) to DCE
10	C(B) (control) from DTE	C(B) (control) to DCE
11	R(B) (receive) to DTE	R(B) (receive) from DCE
12	I(B) (indication) to DTE	I(B) (indication) from DCE
13	S(B) (signal timing element) to DTE	S(B) (signal timing element) from DCE
14	B(B) (byte timing element) from DTE	B(B) (byte timing element) to DCE
15	not used	not used

Connecting the DTM X.21 to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

Link settings

Figure 54 below shows the positions of the links on the DTM, issue 1.0.

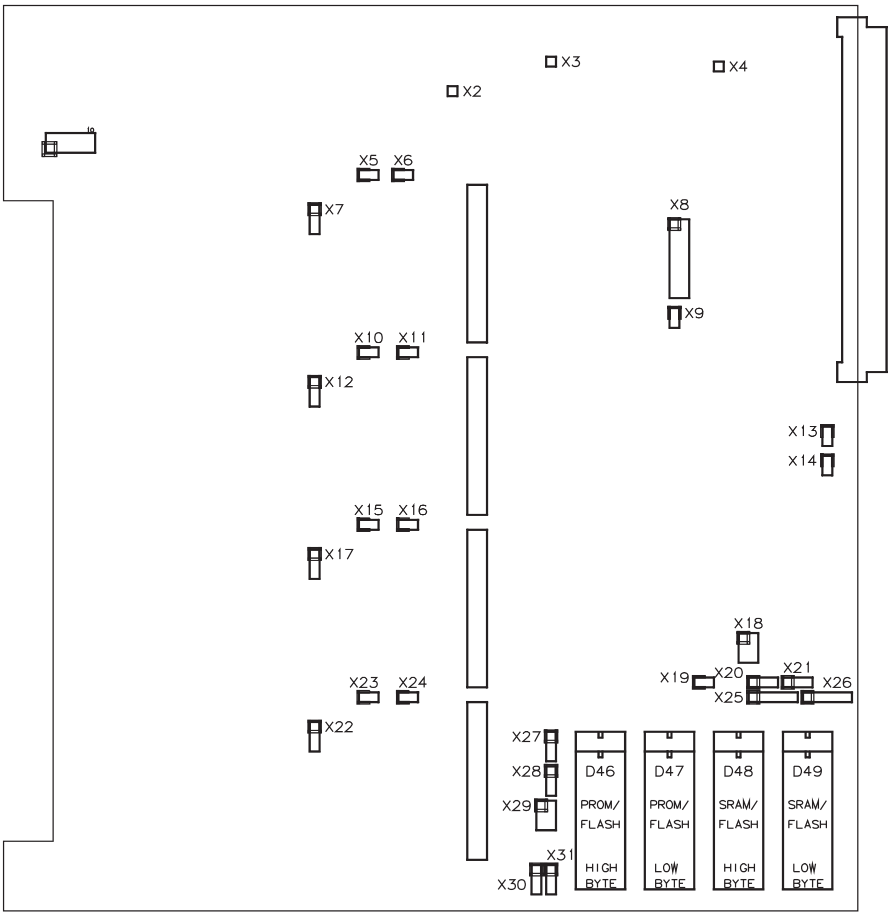


Figure 54: DTM circuit board, issue 1.0

Normal link settings for the DTM

The following table shows the normal link settings for DTM configuration.

Ref	Normal setting	Ref	Normal setting
X1	NA	X17	Not fitted
X2	NA	X18	3-4
X3	NA	X19	Not fitted
X4	NA	X20	2-3
X5	Not fitted	X21	1-2
X6	Not fitted	X22	Not fitted
X7	Not fitted	X23	Not fitted
X8	See Note	X24	Not fitted
X9	Not fitted	X25	2-3,4-5
X10	Not fitted	X26	2-3, 4-5
X11	Not fitted	X27	1-2
X12	Not fitted	X28	1-2
X13	Not fitted	X29	5-6
X14	Not fitted	X30	2-3
X15	Not fitted	X31	1-2
X16	Not fitted	XM1	Not fitted

Note *The links used for NT/TE configuration are at X8. Each port can be individually set up as an NT or TE, as shown in the table below.*

Port	X8 pin position	
	NT	TE
Port 1	9-10	Not fitted
Port 2	11-12	Not fitted
Port 3	13-14	Not fitted
Port 4	15-16	Not fitted

LEDs

The front panel has the standard green OK LED and the red ALARM LED.

Each port has a green LED recessed behind it which, when illuminated, indicates that the port has achieved frame synchronisation with no CRC errors. Any other condition will cause the LED to turn off.

LED	Colour	Normal Status
OK	Green	On
ALARM	Red	Off
PORT	Green	On

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM LEDs are On	If new ROMs have been fitted, check their orientation, location within the socket and link settings
	Notify service personnel
ALARM LED is On	Notify service personnel
ALARM LED flashes OK LED is On	Check network clock provider for this device
	Notify service personnel
OK LED flashes ALARM LED is Off	Check if loopbacks are set on any port
	Notify service personnel
PORT LED is Off	Check cable
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check that the equipment at the other end is operating correctly
	Check trunk provider, if applicable
	Notify service personnel

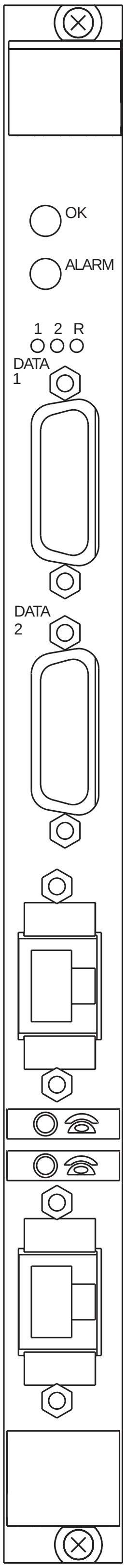
Utility modules

Introduction

This section describes the following utility modules:

- COMBO Module (COMBO)
- B-Channel Aggregation Module (BCAM) including the BCAM-ISO
- Voice Compression Module (VCM)
- Sub-rate Multiplexing Module (SRMM)
- Signalling Access Module (SAM)
- Integrated Router Module (IRM)
- Low Delay CELP Module (LDCM) including the CELP and VF-CMP submodules
- Multi Function Compression Module (MFCM) including the MLQ-CMP and HD-VCM submodules
- Digital Modem Modules (DMM and DMM-56K)
- Frame Switch Module (FSM).

COMBO Module



The COMBO Module combines two DTE/DCE digital data ports with up to two optionally fitted Analog Line Interfaces Modules (ALIM) and a Voice Compression submodule. The module is designed for use in the J5004, to provide low-cost multiple ports.

Data ports

The digital data ports support the following ITU-T compliant features:

- Synchronous V.24
- V.35
- X.21
- Data Rates up to 64 kbit/s using bit rate adaption (in accordance with ITU-T X.30, V.110 and ECMA 102)
- n x 8 kbit/s rates up to 256 kbit/s
- 4800 bit/s BERT test.

DTEs connecting to the DCE ports are required to synchronise with the clocking signal supplied by the COMBO Module.

The COMBO data ports interoperate with the following:

- HSDM
- SDLM
- QDLM
- DTM
- All ISDN Basic and Primary Rate modules via a BCAM-ISO if required
- J1200 Terminal Adaptor.

Analog ports

The ALIMs are analog voice-frequency line submodules that can connect 2- or 4-wire analog systems to the ISDN or leased lines. The COMBO currently supports the following ALIMs in the two plug-in slots on the main board:

Exchange (ALIM-EXCH)

This is a loop-in, ring-out interface that provides the following features:

- Reverse or normal polarity 48V battery feed
- On-hook and off-hook detection
- Ring signal, with programmable duration and duty cycle, and reverse or normal battery feed
- Dual tone multi-frequency (DTMF) or pulse (decadic) dialling detection
- Hookflash detection with programmable duration limit
- Line force release on failure to establish an ISDN connection

- Field selectable termination impedances
- Adjustable input/output relative levels and hybrid balance
- Programmable two-wire signal protocols
- Back busy signal generation
- Programmable A-law or µ-law PCM voice encoding.

Simple attachment connection of analog ports — advice (UK only)

The following information is applicable to this equipment installed in the UK.

This equipment is approved for connection to public switched networks as a 'Simple Attachment'.

Warning	Any form of connection of this equipment to Public Switched Telephone Networks which would cause the Multiplexer to be classified as 'Call Routing Apparatus '(CRA) invalidates the Approval of the equipment and renders the user liable to prosecution under the UK Telecommunications Act 1984.

Call Routing Apparatus is defined as telecommunication apparatus capable of switching messages consisting of two-way live speech telephone calls between two or more items of Extension Apparatus* and two or more circuits forming part of one or more Public Switched Telephone Networks.

*Extension Apparatus is defined as equipment approved for direct connection to 2 or 3-wire analog speechband PSTN or private network interfaces or PBX extension apparatus ports.

What this means...

This means that:

- It is **not** permitted to connect a telephone directly to a 2-wire analog port in this equipment if the telephone is to be used to make switched calls to the public network
- It is permitted to connect a telephone directly to a 2-wire analog port in this equipment if the telephone forms one end of a tie line
- It is permitted to connect a PABX or Key System to a 2-wire analog port in this equipment with telephones connected to the PABX or Key System
- It is permitted to connect a modem directly or via a Private Circuit (Leased Line) or via PSTN to a 2-wire analog port in this equipment.

Please contact your supplier if it is unclear whether a specific connection would cause the equipment to be classified as 'Call Routing Apparatus' or 'Simple Attachment'.

Voice compression submodule

The COMBO supports a single Voice Compression submodule on the main board. The COMBO currently supports the Dual Channel G.7231.1 Compressor (VC-G7231-2) and the High Density Voice Compression Module (HD-VCM).

These submodules use the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique. They both provide a G3 fax detection/relay capability in addition to enhanced voice compression at the following rates:

- 8kbit/s MP-MLQ
- 16 kbit/s MP-MLQ.

The HD-VCM also provides a Modem detection/relay function.

The voice compression submodules compress 64 kbit/s A-law or µ-law voice signals to either 8 or 16 kbit/s for transmission over a common channel. The receiving end expands the voice subchannels back to 64 kbit/s. A combination of voice and data subchannels can be transmitted over a common channel via the subrate data switch on the COMBO.

Applications

The COMBO Module provides a means of connecting both analog and digital devices to a single card within a four slot chassis, and multiplexing them across a digital link to other devices. The voice compression capability is used to compress the analog voice signals into digital signals. These signals are then multiplexed with any data onto a common channel, thus providing tie lines between members of this equipment product family.

The data interfaces on the COMBO typically provide low data rate terminal links to computers and inter-computer links.

Each ALIM port can be independently configured to provide any of the following signalling schemes:

- Austel's Ring In/Loop Out (See Note 1)
- Austel's Loop In (INDIAL) exchange line (See Note 2)
- Austel's extension line.
- BABT's Loop Calling/Unguarded Clearing (See Note 1)
- BABT's Loop Calling/Guarded Clearing (See Note 1)
- BABT's Loop Calling/Disconnect Clearing (See Note 1)
- BABT's Earth Calling (See Note 1)
- BABT's Loop In (DDI) exchange line. (See Note 2)

Note 1 *Connects as exchange equipment.*

Note 2 *Connects as terminal equipment.*

Warning The ALIM-EXCH is not permitted to be connected to PSTN lines in the UK and Australia.

These signalling schemes can be used to provide either dialled-up voice circuits or permanent voice circuits.

The COMBO can be used for providing Time, TimeFrame and Frame Virtual Lines between like nodes in a network.

Specifications

Compatibility	The COMBO Module can only be fitted to a J5004.
Module width	1 slot.
Ports	Two data ports supporting a proprietary HD26 female connector. Conversion to the appropriate physical interface is achieved with a converter cable (see *Adapter cables* below). Up to two RJ11 (FCC Part 68) female modular jack connectors on the front panel for the ALIM analog ports.
Data Port protocols	ITU-T recommendations for V.24, V.35 and X.21.
Data Rates supported (bit/s)	X.21, V.35, V.24 synchronous. Synchronous - 600, 1200, 2400, 4800, 9600, 19200, 38400 48000, 56000, 64000 (ITU-T X.30, V.110, ECMA 102). n x 8 kbit/s from 8kbit/s to 256 kbit/s (I.460).
Data Rate Adaption Techniques	ITU-T recommendations X.30 and I.463 (V.110). ECMA 102 compatible protocols.
Call Establishment Modes	Control signal (C/DTR signal) initiated Hotline. Manual Call Control (NMS operator initiated). X.21 Call Control. In Australia leased lines (ISDN semipermanent connection) are available.
Adapter cables	V.24: HD26 male to DB25 female (UDT-CBL-V24C) HD26 male to DB25 male (UDT-CBL-V24T) V.35: HD26 male to M34 female (UDT-CBL-V35C) HD26 male to M34 male (UDT-CBL-V35T) X.21: HD26 male to DB15 female (UDT-CBL-X21C) HD26 male to DB15 male (UDT-CBL-X21T) All adapter cables are 600mm in length.

Compression modes and compander options

VC-G7231-2 submodule

8 kbit/s and 16 kbit/s voice compression using 6.3 kbit/s MP-MLQ algorithm that complies with ITU-T G.723.1. A-law or µ-law encoded input signals can be compressed.

The following fax speeds are supported by the VC-7321-2 sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Fax speed (kbit/s)
8	6.3	2.4, 4.8, 7.2
16	6.3	2.4, 4.8, 7.2, 9.6

HD-VCM submodule

6.3 kbit/s MP-MLQ algorithm that complies with ITU-T G.723.1.

A-law or µ-law encoded input signals can be compressed.

Automatic V.32bis Modem Relay is supported from 4800 kbit/s up to 14,400 bit/s.

The following fax speeds are supported by the HD-VCM sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Fax speed (kbit/s)
8	6.3	2.4, 4.8
16	6.3	2.4, 4.8, 7.2, 9.6, 14.4

The following modem speeds are supported by the HD-VCM sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Modem speed (kbit/s)
8	6.3	4.8
16	6.3	4.8, 7.2, 9.6, 12, 14.4

Subrate Switches

Up to 28 with a VC- G7231-2 sub-module fitted
Up to 16 with a HD-VCM sub-module fitted.

Subrate data multiplexing

The table below provides multiplexing details.

User data rate	Sub-channel rate
64 kbit/s	64 kbit/s
56 kbit/s with V.110 framing	64 kbit/s
56 kbit/s without V.110 framing	56 kbit/s
48 kbit/s with V.110 framing	64 kbit/s
48 kbit/s without V.110 framing	48 kbit/s
32 kbit/s	32 kbit/s
24 kbit/s	24 kbit/s
19.2 kbit/s	32 kbit/s
16 kbit/s	16 kbit/s
9.6 kbit/s	16 kbit/s
8 kbit/s	8 kbit/s
4.8 kbit/s	8 kbit/s
2.4 kbit/s	8 kbit/s
1.2 kbit/s	8 kbit/s
0.6 kbit/s	8 kbit/s
0.3 kbit/s	8 kbit/s

Analog Port protocols

Loop-in, Ring-out.
Tone (DTMF) or pulse (decadic) dialling.

Analog Signalling

See *Applications* on page 8-5.

Input (analog) Relative Level range

-9 to+3dBr (selectable in 1dB steps).

Output (analog) Relative Level Range

+3 to -9dBr (selectable in 1dB steps).

Allowable extension port cable loss range

0 to 9dB.

Allowable PSTN line loss range

3dB, 6dB, 8dB.

Battery feed voltage

44 to 50 V dc.

Ring signal voltage

75 to 100 V (ac rms) at 27 Hz.

Note *Ring signal is superimposed onto -48 V battery feed.*

Ring signal current

45mA (ac rms max).

Ring Signal Drive Capability 4 standard ringers.

Note *One standard ringer is 55Hz + 7KΩ. Ring signal drive capability is specified over maximum cable length that may be connected to an ALIM port.*

Transmission Performance: The following table details the transmission performance:

Parameter	Specification	Notes
Variation of Loss with Frequency	0.35 to - 0.3dB	1, 2
	0.6 to -0.3dB	1, 3
Quantisation Distortion Units	0.5QDU	1, 4

Notes

1 *Specified between ALIM port and digital reference point of this equipment.*

2 *Frequency range 600 to 2400 Hz.*

3 *Frequency range 300 to 3200 Hz.*

4 *Additional Quantization distortion units may be introduced into the transmission path depending on whether voice compression features in this equipment are used.*

Call Path Loss: See *Appendix C*.

Call Path Delay: See *Appendix D*.

Installation

ALIM-EXCH Cabling

The following table describes the cable needed to connect the ALIM-EXCH to terminal equipment:

Cable length up to 10 km.

Cable type 0.5mm 2-wire solid conductor.

Connector FCC Part 68 compatible modular jack.

Insulation displacement connectors and adapter cabling

Some installations may require the provision of insulation displacement type connectors to complete cabling between ALIM-EXCH ports and attached equipment. This is the case where it is required to connect the ALIM-EXCH to cabling maintained by a Public Telecommunications Operator.

If insulation displacement type connectors are required, then an insulation displacement connector block and adapter cable(s) may be ordered from Jtec.

A choice of two types of connector blocks is provided depending on the installation conditions. For installations where cabling is to be made between an ALIM-EXCH and an existing distribution frame located at the site, a 20 pair connector block type may be ordered by the following market code:

ABLK - 20

The connector block comes complete with a wall mountable enclosure.

If an installation requires more than 20 wire pairs to be terminated on insulation displacement connectors, then additional 20 pair connector blocks must be ordered.

For installations where cabling is to be made directly between an ALIM-EXCH and incoming building cabling, then a 10 pair connector block type should be ordered by the following market code:

ABLK - 10

This connector block comes complete with a wall mountable enclosure and overvoltage suppression devices on each wire pair.

If an installation includes more than 10 wire pairs, then additional 10 pair connector blocks must be ordered.

Adapter cables must also be ordered to connect between the connector block and the FCC Part 68 compatible modular sockets on the ALIM-EXCH. The market code for the adapter cables is:

ACBL - ADP

One adapter cable is required for each ALIM-EXCH port to be wired to a connector block.

Connecting the ALIM-EXCH to terminal equipment

Warning	Telecommunications network voltages may exist on the module. The telecommunications line connection must be disconnected before removing the module from its chassis.

For each line:

1 Run a cable from the terminal equipment (TE).

2 Terminate the cable with an FCC Part 68 compatible jack connector that is wired as shown in the table below and plug it in.

Signal code	FCC Part 68 connector pin
Tip or A-wire	4
Ring or B-wire	3
not used	1, 2, 5, 6

Note *Pin 1 on the FCC Part 68 compatible jack connector is the left most pin when the connector is viewed from contact end, with the latch tab facing down.*

Termination impedances

The ALIM-EXCH supports a range of termination impedances:

- 220 Ω + 820 Ω // 220 nF
- 370 Ω + 620 Ω // 310 nF
- 300 Ω + 1000 Ω // 220 nF.

For each termination impedance, a choice of balance impedance is available. The balance impedance is selected to match the impedance presented to the ALIM-EXCH port by the attached equipment. This influences the amount of echo suppression that occurs at the port interface in the direction of the digital backplane of the multiplexer.

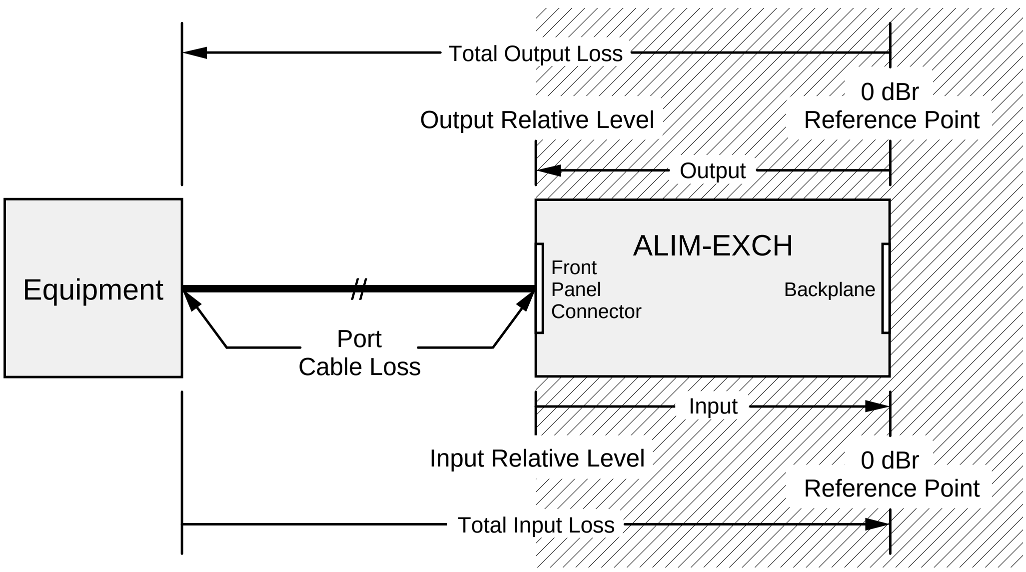
For the 220 Ω + 820 Ω // 220 nF termination impedance option, balance impedances of 220 Ω + 820 Ω // 220 nF and 600 Ω are provided.

For the 370 Ω + 620 Ω // 310 nF and 300 Ω + 1000 Ω // 220 nF impedance options, the same impedances are provided as balance impedance options.

See page 8-20 for details on setting the termination impedances.

Relative level settings

This section provides information for determining relative level settings on ALIM-EXCH ports to suit installation conditions. The figure below shows the relationship between the Input and Output Relative Levels, the Total Input and Output Loss, and the Port Cable Loss.



Settings for extension ports for UK installations

The input and output relative levels on extension ports should be set to a value determined from the table below depending on the loss of the cable connected to the port.

Port Cable Loss (dB)	Relative Level (dBr)	
	Input	Output
0 - 2	+3	-4
2 - 4	+1	-2
4 - 6	-1	0
6 - 8	-3	+2
8 - 9	-5	+3

Settings for extension ports for Australian installations

The input relative level should be set to 0dBr.
The output relative level should be set to -6.5dBr.

Settings for extension ports for USA/Canada installations

The input relative level should be set to 0dBr.
The output relative level should be set to -3dBr.

Warning The ALEM-2 is not permitted to be connected to PSTN lines in the UK and Australia.

Note *Refer to Appendix C for information regarding overall Call Path Losses within a system.*

Data port cabling

The following table shows the cabling specifications for external connections to the data ports.

Cable length	100 m max. for X.21 and V.35. 15 m max. for V.24 synchronous.
Cable type	twisted-pair multi-core.
Connectors	HD26 female.

Note *All ports are provided with High Density 26 pin connectors.*

Adapter cables are available to convert M34, DB15 or DB25 connectors to High Density 26 pin connectors. The adapter cable is 600mm in length.

All D-type connectors for direct connection to a COMBO front panel must have a 45 degree angle backshell (as opposed to a straight exit).

COMBO converter cables

The tables below show the pin configuration for the COMBO converter cables for the following interfaces:

- V.24 DTE (UDT-CBL-V24T)
- V.24 DCE (UDT-CBL-V24C)
- V.35 DTE (UDT-CBL-V35T)
- V.35 DCE (UDT-CBL-V35C)
- X.21 DTE (UDT-CBL-X21T)
- X.21 DCE (UDT-CBL-X21C).

COMBO V.24 DTE

DB25 connector		HD26 connector	
Function	Pin	Function	Pin
Drain wire	1		
TXD	2	TXD	8
RXD	3	RXD	9
RTS	4	RTS	3
CTS	5	CTS	21
DSR	6	DSR	2
GND	7	GND	19*
		S2	10*
DCD	8	DCD	25
TXC (DCE)	15	TXC (DCE)	5
RXC	17	RXC	6
LLB	18	LLB	24
DTR	20	DTR	22
RI	22	RI	23
TXC (DTE)	24	TXC (DTE)	7

* Pins 19 and 10 in the HD26 connector are linked.

COMBO V.24 DCE

DB25 connector		HD26 connector	
Function	Pin	Function	Pin
Drain wire	1		
TXD	2	TXD	9
RXD	3	RXD	8
RTS	4	RTS	25
CTS	5	CTS	24
DSR	6	DSR	22
GND	7	GND	19*
		S1	1*
		S2	10*
DCD	8	DCD	3
TXC (DCE)	15	TXC (DCE)	4
RXC	17	RXC	7
LLB	18	LLB	21
DTR	20	DTR	2
RI	22	RI	20
TXC (DTE)	24	TXC (DTE)	6

*Pins 19, 1 and 10 on the HD26 connector are linked together.

COMBO V.35 DTE

Twisted Pairs	M34 socket		HD26 connector	
	Function	Pin	Function	Pin
Pair	DCD	F	DCD	25
	DTR	H	DTR	22
Pair	LLB	L	LLB	24
	RI	J	RI	23
Pair	CTS	D	CTS	21
	DSR	E	DSR	2
Pair	RXC (A)	V	RXC (A)	15
	RXC (B)	X	RXC (B)	6
Pair	RXD (A)	R	RXD (A)	13
	RXD (B)	T	RXD (B)	9
Pair	TXC (A) (DTE)	U	TXC (A) (DTE)	16
	TXC (B) (DTE)	W	TXC (B) (DTE)	7
Pair	TXC (A) (DCE)	Y	TXC (A) (DCE)	14
	TXC (B) (DCE)	AA	TXC (B) (DCE)	5
Pair	TXD (A)	P	TXD (A)	17
	TXD (B)	S	TXD (B)	8
Pair	RTS	C	RTS	3
	GND	B	GND	19
			S2	10*
			VDD	26*
	Drain wire	A		

* Pins 10 and 26 of the HD26 connector are linked together.

COMBO V.35 DCE

Twisted Pairs	M34 socket		HD26 connector	
	Function	Pin	Function	Pin
Pair	CTS	DF	CTS	24
	RI	J	RI	20
Pair	LLB	L	LLB	21
	DTR	H	DTR	2
Pair	RTS	C	RTS	25
	DSR	E	DSR	22
Pair	RXC (A)	V	RXC (A)	16
	RXC (B)	X	RXC (B)	7
Pair	RXD (A)	R	RXD (A)	17
	RXD (B)	T	RXD (B)	8
Pair	TXC (A) (DTE)	U	TXC (A) (DTE)	15
	TXC (B) (DTE)	W	TXC (B) (DTE)	6
Pair	TXC (A) (DCE)	Y	TXC (A) (DCE)	13
	TXC (B) (DCE)	AA	TXC (B) (DCE)	4
Pair	TXD (A)	P	TXD (A)	18
	TXD (B)	S	TXD (B)	9
Pair	DCD	F	DCD	3
	GND	B	GND	19*
			S1	1*
			S2	10**
			VDD	26**
	Drain wire	A		

* Pins 19 and 1 of the HD26 connector are linked together.
** Pins 10 and 26 of the HD26 connector are linked together.

COMBO X.21 DTE

Twisted Pairs	DB15 connector		HD26 connector	
	Function	Pin	Function	Pin
Pair	T (A) Transmit	2	T (A)	17
	T (B) Transmit	9	T (B)	8
Pair	C (A) Control	3	C (A)	12
	C (B) Control	10	C (B)	3
Pair	R (A) Control	4	R (A)	18
	R (B) Receive	11	R (B)	9
Pair	I (A) Indication	5	I (A)	11
	I (B) Indication	12	I (B)	2
Pair	S (A) Signal timing	6	S (A)	15
	S (B) Signal timing	13	S (B)	6
Pair	X (A) Ext. Sig. timing	7	X (A)	16
	X (B) Ext. Sig. timing	14	X (B)	7
	Signal Ground	8	GND	19
				26*
				1*
	Drain Wire	1		

* Pins 26 and 1 on the HD26 connector are linked together.

COMBO X.21 DCE

Twisted Pairs	DB15 connector		HD26 connector	
	Function	Pin	Function	Pin
Pair	T (A) Transmit	2	T (A)	18
	T (B) Transmit	9	T (B)	9
Pair	C (A) Control	3	C (A)	11
	C (B) Control	10	C (B)	2
Pair	R (A) Control	4	R (A)	17
	R (B) Receive	11	R (B)	8
Pair	I (A) Indication	5	I (A)	12
	I (B) Indication	12	I (B)	3
Pair	S (A) Signal timing	6	S (A)	16
	S (B) Signal timing	13	S (B)	7
Pair	X (A) Ext. Sig. timing	7	X (A)	15
	X (B) Ext. Sig. timing	14	X (B)	6
	Signal Ground	8	GND	19
			S1	1*
	Drain Wire	1		

* Pins 19 and 1 of the HD26 connector are linked together.

Connecting the COMBO X.21 to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

Link settings

COMBO module

Figure 55 below shows the location of the links on the COMBO Module, 10002935.00 Rev.2.

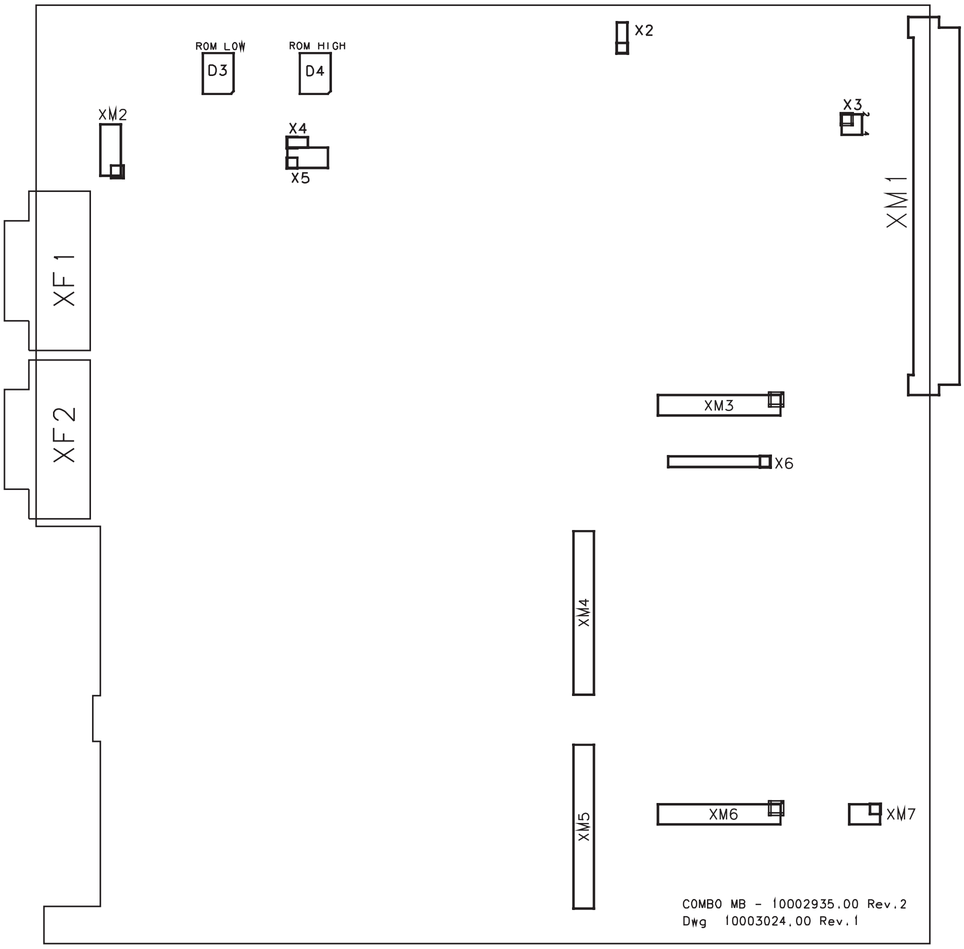


Figure 55: COMBO Module circuit board, 10002935.00 Rev.2

Normal link settings for the COMBO Module

The following table shows the normal link settings for the COMBO Module 10002935.00 Rev.2:

Ref	Normal setting	Ref	Normal setting
X1	—	X4	—
X2	1-2	X5	—
X3	—	X6	—

ALIM-EXCH submodule

Figure 56 shows the position of links on the COMBO ALIM-EXCH submodule 10002907.00 Rev.2.

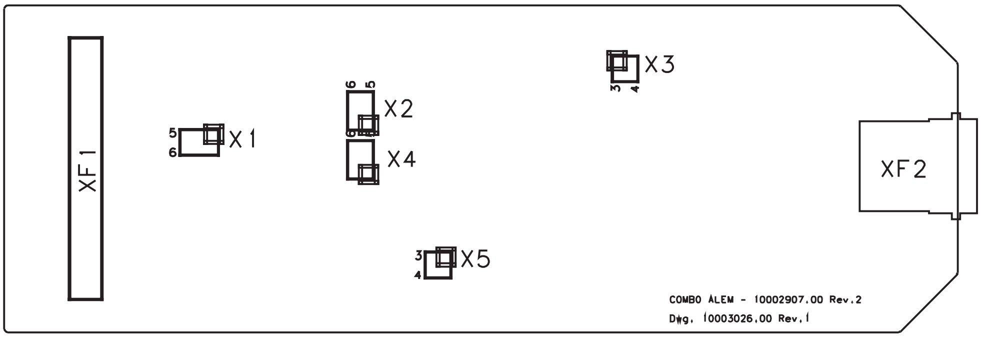


Figure 56: ALIM-EXCH submodule 10002907.00 Rev.2

Normal link settings for the COMBO ALIM-EXCH submodule

The following table shows the normal link settings for the COMBO ALIM-EXCH submodule:.

Ref	Normal setting	Description
X1	Note 1	Termination indication
X2	Note 1	Termination setting
X3	1-2, 3-4	Ring Battery Polarity link
X4	Note1	Termination setting
X5	Not fitted	Tone dialling link (see Note 2)

Note 1 — Termination links

Links X1, X2 and X4 are used to indicate the type of termination impedance being selected for the associated ALEM-2 port. These links settings are cross-referenced, by software, with the allowable termination type(s) stored in the eeprom before sign on to the Resource Manager. The port sign-on type determines the configuration setting of the port.

The following table shows the link settings for the three types of termination impedance:

Termination types	Links fitted		
	X1	X2	X4
Australian complex (220Ω + 820Ω || 120nF)	1-2, 5-6	5-6	1-2
UK1 Termination (370Ω +620Ω || 310nF)	3-4, 5-6	1-2	5-6
UK2 Termination (300Ω + 1000Ω || 220nF)	1-2, 3-4	3-4	3-4

Note 2 — Tone detection links

The effect of fitting a link to positions 3-4 of X5 is to provide an optional 3dB loss for receiving tones from the line.

When a link is fitted to positions 1-2 of X5, the tone absent detection threshold of the receiver circuitry is lowered to below 30ms.

VC-G7231-2 submodule

The VC-G7231-2 submodule uses the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique. It provides a G3 fax detection/relay capability in addition to enhanced voice compression.

Each compander submodule supports compression/Fax relaying of two 64 kbit/s A-law or µ-law encoded channels.

Figure 57 shows the layout of the VC-G7231-2 circuit board

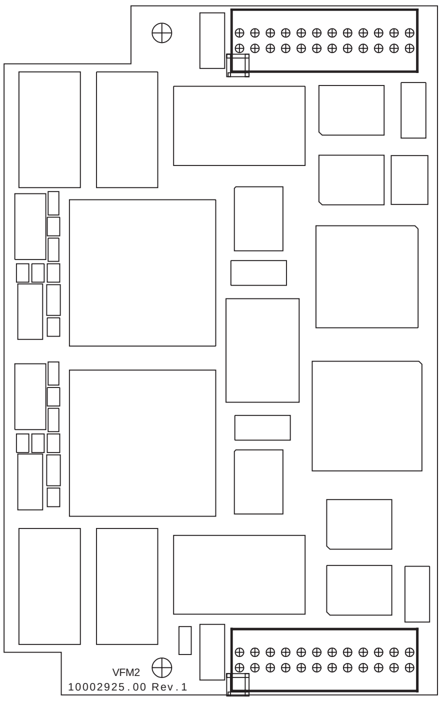


Figure 57: VC-G7231-2 circuit board

There are no link settings for the VC-G7231-2 submodule.

HD-VCM submodule

The HD-VCM is similar to the MLQ-CMP, but provides a higher capacity. It uses the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique, and supports both G3 fax detection/relay and Modem Relay.

Each HD-VCM compander submodule can support compression/Fax relaying of up to fifteen 64 kbit/s A-law or µ-law encoded signals. The following models of the HD-VCM are available:

- HD-VCM-5 – has one compander providing up to 5 voice channels
- HD-VCM-10 – has two companders, providing up to 10 voice channels
- HD-VCM-15 – has three companders, providing up to 15 voice channels.

Links

Figure 58 shows the position of the link on the HD-VCM submodule.

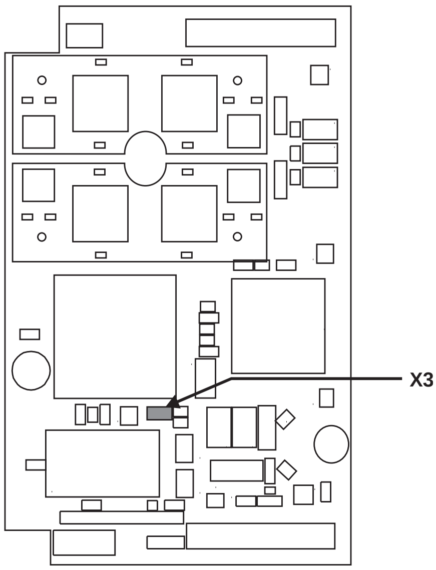


Figure 58: HD-VCM link position

Normal link settings for the HD-VCM

The following table shows the normal link settings for the HD-VCM submodule.

Ref	Normal setting
X3	1-2

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
Data 1	Green	See Note 1
Data 2	Green	See Note 1
R (Resource)	Green	See Note 2
Analog Port 1	Green	See Note 3
Analog Port 2	Green	See Note 3

Note 1 The Data LED is off when no device is connected to the data port and on when a device is connected. The LED flashes when data is transmitted.

Note 2 The R (Resource) LED is on when the COMBO is compressing or expanding at least one voice channel, or the subrate switching system is in use. It is off when none of these resources is being used.

Note 3 The Analog Port LED is on when the port is in use and off when the port is not being used.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	If new ROMs have been fitted, check their orientation, location within the socket, and the appropriate link settings
	Notify service personnel
ALARM indicator is On or continuously flashing	Notify service personnel
	Check that the RM is operational
OK and ALARM indicators are On	Notify service personnel
OK indicator is always On and ALARM indicator is always flashing	No backplane clocks can be detected. Ensure that both a Resource Manager and a Clock Card (for example, IPM, BRM, DTM, DLM) are fitted somewhere in the rack.
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
OK and ALARM indicators are continuously flashing	A hardware fault has been detected. Notify service personnel
Data is not being transmitted or received	Check cable to DTE
	Check cable termination
	Check (through NMS) that a call is present
	Check that the equipment at the other end is operating correctly
	Check that both DTEs are operating at the same data rate and are using the same rate adaption technique
	Check whether other calls are present or can be made from the device
	Check that the correct PROM was installed for the interface and links are correctly set
	Perform BERT tests through NMS diagnostics
	Notify service personnel

Submodule installation

This section describes the installation and removal of Line Interface and Voice compression submodules.

Requirements

Before you can install the submodule(s), you must ensure that you have all of the following:

1. The submodule(s) to be installed.
2. An anti-static bench mat.
3. An anti-static wrist band.
4. A Posi-driv 0 point screwdriver.

Installing a COMBO submodule

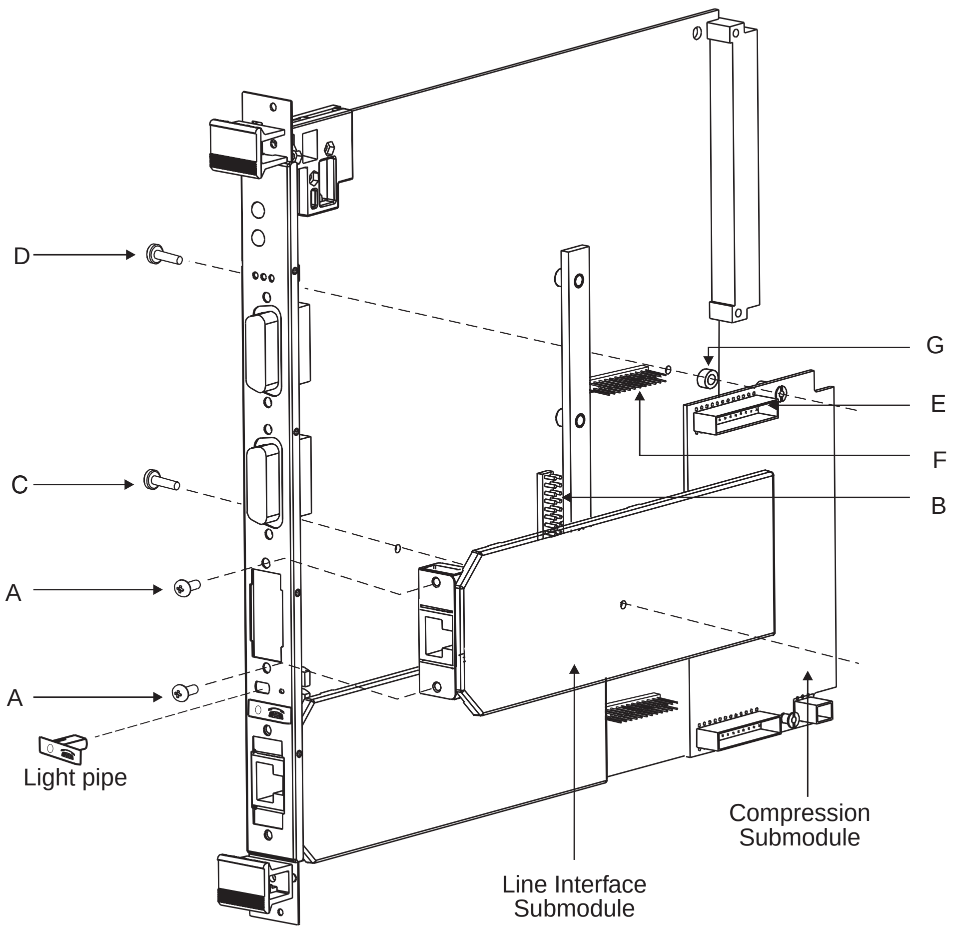


Figure 59: Fitting submodules to the COMBO

General

These instructions apply to each task. They must be carried out before any installation or removal of submodules takes place.

1 Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.

2 Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.

3 Remove the COMBO board from the rack and place it on the anti-static mat components side up.

Installing a line interface submodule

1 Referring to Figure 59, remove the blanking plate from the front panel connector cutout and retain the screws (A).

Note *During step 2, you must ensure that the sockets of the submodule are correctly aligned with the main board connector pins before inserting the submodule. Failure to do this may result in damage to the connector pins.*

---

2 Align the submodule socket with the main board connector pins (B). Press the submodule into position, ensuring that the submodule connector aligns with the cutout in the front panel, and the submodule screw holes align with the holes in the front panel and main board.

3 Insert the fastening screw (C) into the back of the submodule. Insert connector fastening screws (A) through the front panel. Tighten the screws to secure the submodule into position.

4 Remove the Light pipe blank from the front panel by releasing the securing clip from the back. Replace the blank with the appropriate light pipe for the interface. Retain the blank for future use.

Note *Two types of light pipe are supplied with each interface submodule. The type with the engraved text or symbol in a grey colour is used with the milled aluminium front panels, the other, with printed green text or symbols is used with the thinner stainless steel front panels.*

---

5 Replace the COMBO module in the rack.

6 Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

Removing a line interface submodule

1. Referring to Figure 59, remove the module fastening screws (A and C) from the submodule and front panel connector.
2. Gently remove the submodule from the connector pins (B), ensuring that they remain aligned until the submodule is clear of the board.
3. Fit a blanking plate to the front panel connector cutout and secure with screws (A).
4. Remove the light pipe from the front panel by releasing the securing clip from the back. Replace the light pipe with a blank.
5. Replace the module in the rack.
6. Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

If the module fails to power up correctly, contact Jtec Customer Service and Support for assistance.

Installing the Voice Compression submodule

Note *For clarity, only the top fastening screw and spacer are shown in Figure 59. The lower screw and spacer must also be fitted when installing the submodule.*

---

1. Referring to Figure 59, remove the two module fastening screws (D) from the submodule.
2. Align the two submodule mating sockets (E) with the COMBO board connectors (F) and press the submodule into position. Ensure that the two nylon spacers (G) are positioned correctly on the mating holes.
3. Insert the module fastening screws (D) into the back of the module and screw the submodule into position.
4. Replace the COMBO module in the rack.
5. Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

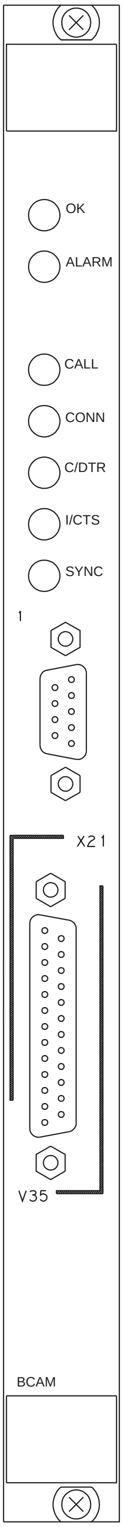
Removing a Voice Compression submodule

1. Place the COMBO module component side down.
2. Referring to Figure 59, remove the submodule fastening screws (D) from the module.
3. Turn the COMBO module over so that the components side is face up.
4. Gently remove the submodule from the COMBO connector pins (F) and refit the module fastening screws (D) to the submodule.
5. Replace the COMBO module in the rack.
6. Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

RM CM

B-Channel Aggregation Module (BCAM)



The BCAM supports user speeds higher than 64kbits/s across an ISDN, performing all of the channel synchronisation and sequence alignment necessary to aggregate the required B-channels.

The BCAM is fitted with either an X.21 or a V.35 connector on the front panel, and is a DCE (data circuit terminating equipment) as defined in the recommendations of ITU-T. (The module shown on this page is fitted with a V.35 interface).

The BCAM may also be used by an E1M or an IRM as a utility module.

BCAM functions include:

- time slot differential delay compensation
- time slot sequencing.

Two versions of the BCAM are available:

- BCAM (uses aggregation to AS 4064)
- BCAM-ISO (uses ISO 13871 Digital Channel Aggregation).

All information in this section applies to both types of BCAM, except where indicated.

The BCAM supports N x 64kbit/s connections across an ISDN. We call this Channel Aggregation. Elsewhere it may be called Inverse Multiplexing, ISDN Super Rate Adaption or Reverse Multiplexing.

Specifications

Compatibility The BCAM can be fitted to any chassis.

Ports For the V.35 option, a DB25 female connector on the front panel that conforms mechanically to ISO 2110 Standard.

For the X.21 option, a DB15 female connector on the front panel that conforms to ISO 4903 Standard.

Data rates **BCAM (AS 4064)**

The BCAM (AS 4064) can operate at user speeds of either N x 64kbit/s or N x 63kbit/s.

The N x 63kbit/s mode provides a higher user speed for a given number of B-channels, as the following table shows:

B-channels	N x 64kbit/s mode	N x 63kbit/s mode
1	not supported	63
2	64	126
3	128	189
4	192	252
5	256	315
6	320	378
7	384	441
8	not supported	504

BCAM-ISO

The BCAM-ISO module supports ISO 13871 aggregation modes 1 and 2, and a subset of mode 3. Mode 3 aggregations only support N x 64k rates (not N x 8k). The E1M interface does not support Mode 2 aggregation. Transparent mode is supported on all interfaces.

The following table shows the data rates and aggregation modes supported:

ISO 13871 Mode	User Data Rate kbit/s (*p*)				Channels
X.21/V.35 user data interface					
Transparent (*p* x 64)	64 (1)	128 (2)	192 (3)	256 (4)	p
Mode 0 (*p* x 64)	320 (5)	384 (6)	448 (7)	512 (8)	
Mode 1 (*p* x 64)	576 (9)*	640 (10)	704 (11)*	768 (12)*	
	832 (13)*	896 (14)*	960 (15)*	1024 (16)	
Mode 2 (*p* x 63)	63 (1)	126 (2)	189 (3)	252 (4)	p
	315 (5)	378 (6)	441 (7)	504 (8)	
	567 (9)*	630 (10)	693 (11)*	756 (12)*	
	819 (13)*	882 (14)*	945 (15)*	1008 (16)	
Mode 3 (*p* x 64)	64 (1)	128 (2)	192 (3)	256 (4)	*p* + 1
	320 (5)	384 (6)	448 (7)	512 (8)	
	576 (9)*	640 (10)	704 (11)*	768 (12)*	
	832 (13)*	896 (14)*	960 (15)*		
E1M user data interface					
Transparent (*p* x 64)	64 (1)	128 (2)	192 (3)	256 (4)	p
Mode 0 (*p* x 64)	320 (5)	384 (6)	448 (7)	512 (8)	
Mode 1 (*p* x 64)	576 (9)	640 (10)	704 (11)	768 (12)	
	832 (13)	896 (14)	960 (15)	1024 (16)	
Mode 3 (*p* x 64)	64 (1)	128 (2)	192 (3)	256 (4)	*p* + 1
	320 (5)	384 (6)	448 (7)	512 (8)	
	576 (9)	640 (10)	704 (11)	768 (12)	
	832 (13)	896 (14)	960 (15)		

* These rates require a front panel clock upgrade circuit. Please contact Jtec Customer Service and Support for further information.

Call types Switched.
Semipermanent connections are available in Australia.

Adapter cables Jtec can supply an adapter cable for the V.35 interface. This cable is a DB25 male (mates with the BCAM V.35 connector) to M34 series female connector that conforms to ISO2593 standard.

Module width 1 slot.

Installation

Cabling

X.21

The cabling specifications for external connections to the BCAM via the X.21 port are as follows:

Cable length 100m max.

Cable type twisted-pair multi-core shielded.

Connector DB15 male.

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the BCAM X.21 to terminal equipment

For each user line:

1. Run a cable from the X.21 data terminal equipment (DTE) through the front cable access duct of the subrack.

2. Terminate the cable with a DB15 male connector as shown below and plug it in. See *Appendix A* for a diagram of the connector.

BCAM X.21 signal	DCE	
	DB15 pin	Circuit type
T(A) (transmit)	2	L
T(B) (transmit)	9	L
C(A) (control)	3	L
C(B) (control)	10	L
R(A) (receive)	4	G
R(B) (receive)	11	G
I(A) (indication)	5	G
I(B) (indication)	12	G
S(A) (signal timing element)	6	G
S(B) (signal timing element)	13	G
G (signal ground)	8	CR

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Connecting the BCAM X.21 to RS-449 compatible DTE

For each user line to be connected to RS-449 compatible DTE:

1 Run a cable from the RS-449 DTE through the front cable access duct of the subrack.

2 Terminate the cable with a DB15 male connector as shown below and plug it in.

The following table details the pinouts of the X.21to RS-449 adaptor cable

X.21 signal	DCE cable		
	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD
T(B) Transmit	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST
S(B) Signal Timing Element	13	26 23	RT ST
C(A) Control	3	7 9	RS CS
C(B) Control	10	25 27	RS CS
R(A) Control	4	6	RD
R(B) Control	11	24	RD
I(A) Indication	5	13	RR
I(B) Indication	12	31	RR
SG Signal Ground	8	19	SG
X(A) Signal Timing Element	7	17	TT
X(B) Signal Timing Element	14	35	TT

V.35

The cabling specifications for external connections to the BCAM via the V.35 port are as follows:

Cable length 100m max.

Cable type twisted-pair multi-core.

Connector DB25 male (cable available to convert to standard M34 connectors).

Note *All D-type connectors should have a right-angle backshell (as opposed to straight exit).*

Connecting the BCAM V.35 to terminal equipment

For each user line:

1 Run a cable from the V.35 data terminal equipment (DTE) through the front cable access duct of the subrack.

2 Terminate the cable with a DB25 male connector as shown below and plug it in. See *Appendix A* for a diagram of the connector.

BCAM V.35 signal	DCE		
	M34 pin	DB25 pin	Circuit type
SG signal ground	B	1	CR
RTS request to send	C	4	L
CTS clear to send	D	5	G
DSR data set ready	E	6	G
DTR data terminal ready	H	20	L
RLSD Rx'd line signal	F	18	G
RDa Rx'd data (sig. a)	R	9	G
RDb Rx'd data (sig. b)	T	21	G
SCRa ser. clk Rx (sig. a)	V	12	G
SCRb ser. clk Rx (sig. b)	X	24	G
SDa send data (sig. a)	P	7	L
SDb send data (sig. b)	S	19	L
SCTa ser. clk Tx (sig. a)	Y	11	G
SCTb ser. clk Tx (sig. b)	AA	23	G

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Note *To interface with a V.35 DTE, an M34 connector may be required. A DB25-to-M34 adapter cable is available. See Appendix A for a diagram of the connector.*

Link settings

Figure 60 below shows the position of the links on the BCAM, issue 1.1.

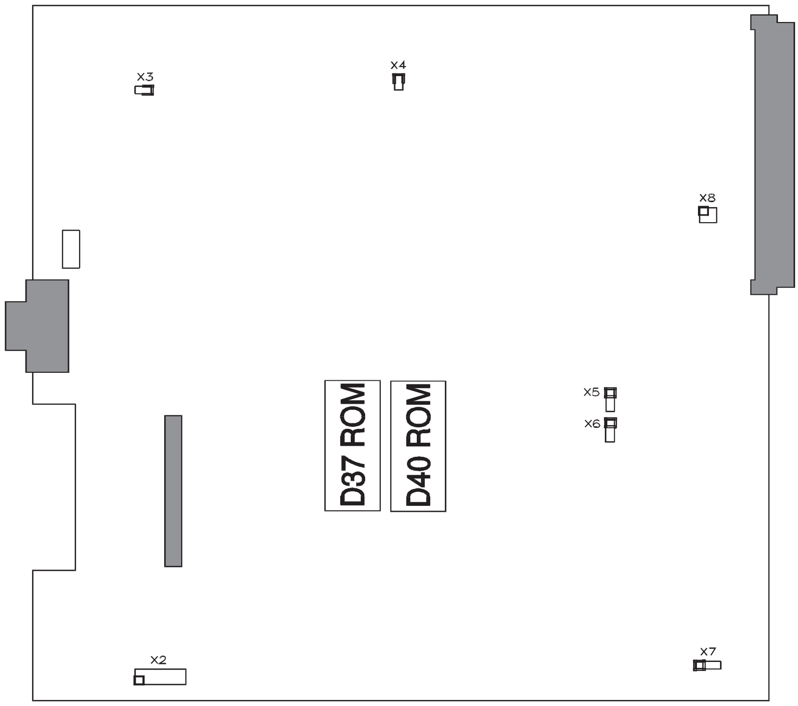


Figure 60: BCAM circuit board, issue 1.1

Normal link settings for the BCAM

The following table shows the normal link settings for the BCAM.

Ref	Normal setting
X1	Not applicable
X2	Not used
X3	Not applicable
X4	Not used
X5	Not fitted
X6	2-3
X7	1-2
X8	Not applicable

BCAM X.21 interface

Figure 61 below shows the position of links on the BCAM X.21 interface, issue 1.2.

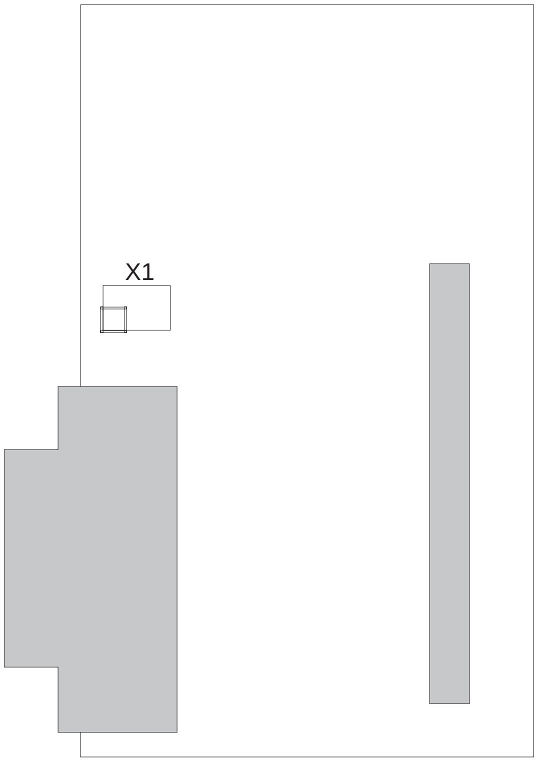


Figure 61: BCAM X.21 circuit board, issue 1.2

Normal link settings for the BCAM X.21

The following table shows the normal link settings for the X.21 module.

Ref	Normal setting
X1	1-2, 3-4

BCAM V.35 interface

Figure 62 below shows the position of the links on the BCAM V.35 interface, issue 1.1.

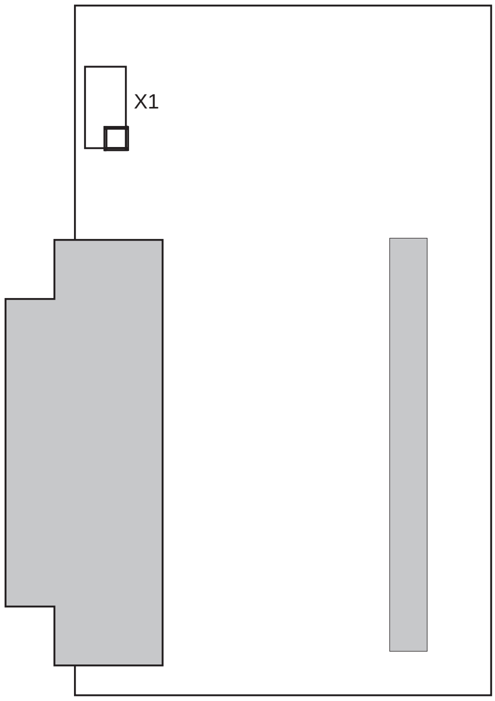


Figure 62: BCAM V.35 circuit board, issue 1.1

Normal link settings for the BCAM V.35

The following table shows the normal link settings for the V35 interface.

Ref	Normal setting
X1	5-6, 7-8

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
CALL[1]	Green	On
CONN[2]	Green	On
C/DTR[3]	Green	On
I/CTS[4]	Green	On
SYNC[5]	Green	On

1 CALL indicates that a call is in progress.

2 CONN indicates that all of the B-channels required for the pre-set user rate are connected.

3 C/DTR monitors the front panel input from the DTE of the control signals C (X.21) or DTR (V.35).

4 I/CTS monitors the front panel output to the DTE of the control signals I (X.21) or CTS (V.35).

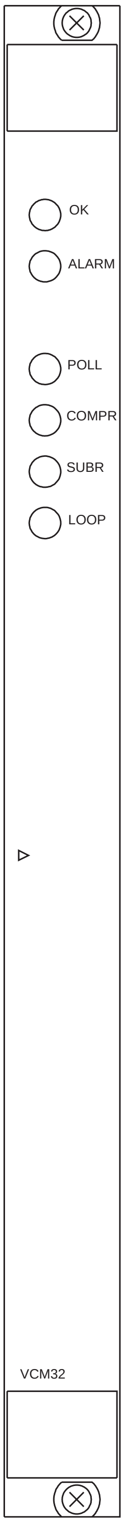
5 SYNC indicates that aggregation has synchronised.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings.
	Notify service personnel
ALARM LED and OK LED flashing in sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM or RM is operational
	Check that a network TE (e.g. IPMN or BRMT) is operational
	Notify service personnel

RM CM

Voice Compression Modules (VCM)



A Voice Compression Module (VCM) compresses digitised voice signals from different sources and switches them onto a common channel or channels. There are four VCMs available:

- Voice Compression Module 4 Channel (VCM4)
- Voice Compression Module 8 Channel (VCM8)
- Voice Compression Module 16 Channel (VCM16)
- Voice Compression Module 32 Channel (VCM32).

The following voice compression rates are supported on all VCMs:

- 16 kbit/s
- 24 kbit/s
- 32 kbit/s.

Where a fixed voice channel (tie line) normally uses one 64 kbit/s network access channel, voice compression allows multiple tie lines to be directed to their destination via one or more 64 kbit/s network access channels. It can also combine voice and data via a subrate data switch onto a common channel.

Each compressed voice signal occupies a subchannel which can be multiplexed with other subchannels onto a common network access channel.

The numeric suffix in the module name indicates the number of uncompressed voice subchannels that the module can accept as input. For example, using a VCM4, four digitised voice signals can each be compressed to 16 kbit/s and transported over one 64 kbit/s network channel, then expanded at destination.

A VCM32 can compand (compress and expand) 32 digitised voice signals and these can be transported over as few as eight 64 kbit/s network channels.

Voice signals access the VCM using the standard interface modules used for voice applications such as the Analog Line Exchange Module (ALEM), Analog Line Phone Module (ALPM), E & M line Module (EMM) or the 2.048 Mbit/s Digital Module NT (E1MN). The voice signals are digitised and directed via the internal buses in the chassis to the VCM.

The different compression rates for voice enable you to select the appropriate balance between economic benefits and the quality of voice reproduction. All rates used for voice compression provide high quality reproduction of the original voice signal but the user environment and terminal equipment might need to be considered when selecting rates.

The subrate switching function of the VCM enables transit node switching of subchannels and multiplexing of voice and data subchannels.

All VCMs are compatible and can be used throughout a network of these products in appropriate quantities and model sizes.The VCM can be used where there is a need for voice tie lines between members of this series of equipment. Where members are far apart it is more economical to compress the voice signals and thus use fewer network access channels.

As the number of voice tie lines increase between the sites, or to other sites, more VCMs (or higher capacity VCMs) can be added to the chassis.

Where data leased lines are required between members of the same device as used for voice tie lines, these can be combined with the voice subchannels.

VCMs also provide the functions of an SRMM.

Specifications

Channels supported	VCM4 supports four uncompressed voice subchannels, 32 data channels. VCM8 supports eight uncompressed voice subchannels, 32 data channels. VCM16 supports sixteen uncompressed voice subchannels, 32 data channels. VCM32 supports thirty-two uncompressed voice subchannels, 32 data channels.
Compression Techniques	32kbit/s ADPCM complies with ITU-T recommendation G.726 - 1990 and ANSI standard T1.301. 24kbit/s ADPCM complies with ITU-T recommendation G.726 - 1990 and ANSI standard T1.303. 16kbit/s ADPCM complies with ITU-T recommendation G.726 - 1990.

Subrate data multiplexing see following table.

User data rate	Sync	Async	Subchannel rate with V.110	Subchannel rate without V.110
64 kbit/s	yes	no		64 kbit/s
56 kbit/s	yes	no	64 kbit/s	56 kbit/s
48 kbit/s	yes	no	64 kbit/s	48 kbit/s
38.4 kbit/s	yes	yes	64 kbit/s	
32 kbit/s	yes	no		32 kbit/s
24 kbit/s	yes	no		24 kbit/s
19.2 kbit/s	yes	yes	32 kbit/s	
16 kbit/s	yes	no		16 kbit/s
9.6 kbit/s	yes	yes	16 kbit/s	
8 kbit/s	yes	no		8 kbit/s
4.8 kbit/s	yes	yes	8 kbit/s	
2.4 kbit/s	yes	yes	8 kbit/s	
1.2 kbit/s	yes	yes	8 kbit/s	
0.6 kbit/s	yes	yes	8 kbit/s	
0.3 kbit/s	no	yes	8 kbit/s	

Module width 1 slot.

Installation

The module is located in any suitable slot position. When fully inserted, the front plate of the module is level with the rack. No other configuration actions are necessary. The internal connections to the VCM from the analog and data modules are performed during configuration.

Link settings

Figure 63 below shows the position of the links on the VCM, issue 4.0.

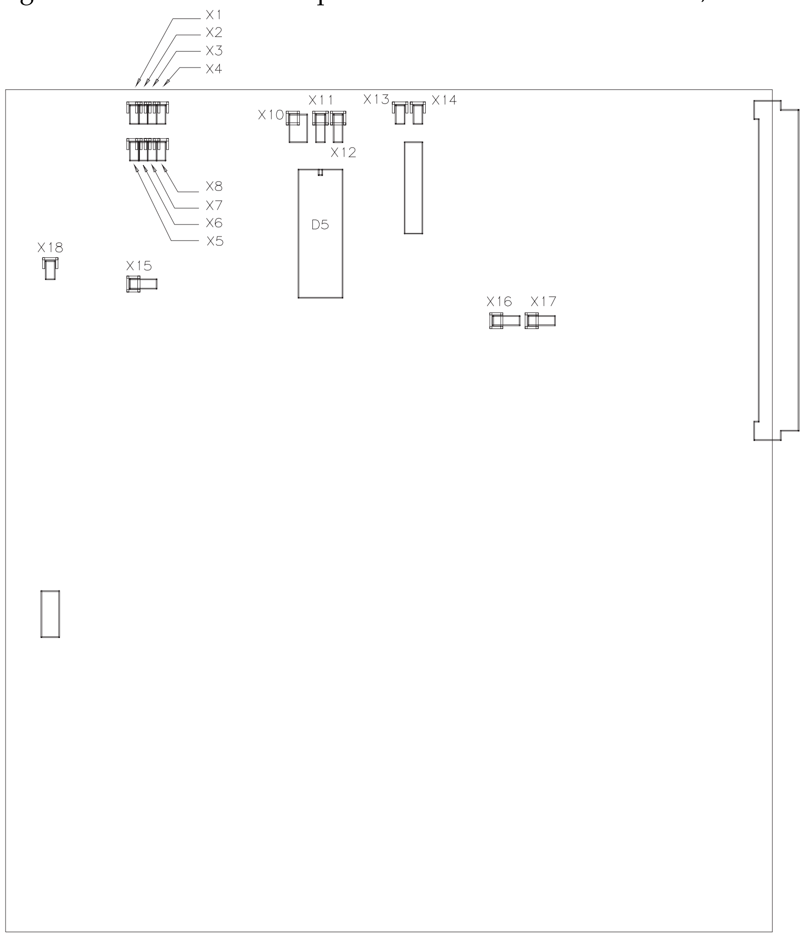


Figure 63: VCM circuit board, issue 4.0

The same diagram applies to the VCM4, VCM8, VCM16 and VCM32 models.

VCM 4

Normal link settings on the VCM4

The following table shows the normal link settings for the VCM 4.

Ref	Normal setting	Ref	Normal setting
X1	Out	X10	3-4
X2	In	X11	2-3
X3	Out	X12	2-3
X4	Out	X13	Out
X5	Out	X14	Out
X6	Out	X15	1-2
X7	Out	X16	1-2
X8	Out	X17	1-2
		X18	Out

VCM 8

Normal link settings on the VCM8

The table below shows the normal link settings for the VCM 8.

Ref	Normal setting	Ref	Normal setting
X1	Out	X10	3-4
X2	In	X11	2-3
X3	In	X12	2-3
X4	Out	X13	Out
X5	Out	X14	Out
X6	Out	X15	1-2
X7	Out	X16	1-2
X8	Out	X17	1-2
		X18	Out

VCM 16

Normal link settings on the VCM16

The following table shows the normal link settings for the VCM 16.

Ref	Normal setting	Ref	Normal setting
X1	In	X10	3-4
X2	Out	X11	2-3
X3	In	X12	2-3
X4	Out	X13	Out
X5	Out	X14	Out
X6	Out	X15	1-2
X7	Out	X16	1-2
X8	Out	X17	1-2
		X18	Out

VCM 32

Normal link settings on the VCM32

The following table shows the normal link settings for the VCM 32.

Ref	Normal setting	Ref	Normal setting
X1	In	X10	3-4
X2	In	X11	2-3
X3	Out	X12	2-3
X4	Out	X13	Out
X5	Out	X14	Out
X6	Out	X15	1-2
X7	Out	X16	1-2
X8	Out	X17	1-2
		X18	Out

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
POLL[1]	Green	Flashing
COMPR[2]	Green	On
SUBR[3]	Green	On
LOOP[4]	Green	Off

1 The POLL (Polling of VCM by Control Module or Resource Manager) LED flashes to indicate that the device has recognised the presence of the VCM and that it is capable of normal operation.

2 The COMPR (Compressing) LED indicates that the VCM is compressing and/or decompressing subchannels. The LED will be Off before the VCM has been configured and if no compression/decompression is taking place.

3 The SUBR (Subrate switching) LED indicates that switching is occurring. The LED will be Off before the VCM has been configured and if no subrate switching is taking place.

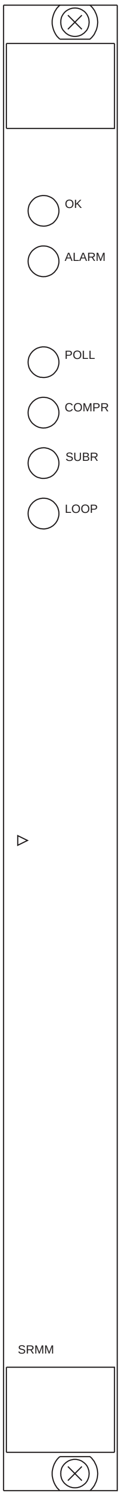
4 The LOOP (Loopback) LED is On only during diagnostic testing by service personnel.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel
POLL LED is not FLASHING	Check that the device is operational
	Notify service personnel
COMPR and SUBR LEDs are Off when expected to be On	Check that POLL LED is FLASHING
	Check that a call is present - NMS action required
	Notify service personnel
LOOP LED is On when expected to be Off	Notify service personnel
Information is not being transmitted or received from terminal equipment when a call is believed to be active	Check cabling to DTE
	Check DTE and module cabling termination
	Check that a call is present - NMS action required
	Check that the equipment at the other end is operating correctly
	Notify service personnel

RM CM

Subrate Multiplexing Module (SRMM)



The SRMM provides subrate switching of a source subchannel and switches it to another subchannel or to a network access channel. Subchannels can originate from a data interface or network modules.

A fixed data channel (leased line) with a user rate of less than 64kbit/s normally uses one 64kbit/s network access channel. Subrate switching enables multiple leased lines to be directed to their destination via a single 64kbit/s network access channel.

Each subchannel can be multiplexed onto a common network access channel. Up to 32 subchannels can be switched using an SRMM.

Data subchannels access the SRMM via the standard interface modules used for data applications.

Where data leased lines are required between members of this series of equipment, SRMMs can be used to subrate multiplex subchannels, thus using fewer network access channels. This uses a Virtual line that is supported by the Time and TimeFrame modes.

SRMMs can also be used where a device is used as a transit node between other members of this equipment series.

Specifications

Compatibility The SRMM can be fitted to any chassis.

Channels supported SRMM supports 32 bi-directional data channels.

Subchannel data multiplexing Subchannel rates: 8 kbit/s, 16 kbit/s, 24kbit/s, 32 kbit/s, 40 kbit/s, 48 kbit/s, 56 kbit/s, 64 kbit/s.

Subrate data multiplexing The table below provides multiplexing details.

User data rate	Sync	Async	Subchannel rate with V.110	Subchannel rate without V.110
64 kbit/s	yes	no		64 kbit/s
56 kbit/s	yes	no	64 kbit/s	56 kbit/s
48 kbit/s	yes	no	64 kbit/s	48 kbit/s
38.4 kbit/s	yes	yes	64 kbit/s	
32 kbit/s	yes	no		32 kbit/s
24 kbit/s	yes	no		24 kbit/s
19.2 kbit/s	yes	yes	32 kbit/s	
16 kbit/s	yes	no		16 kbit/s
9.6 kbit/s	yes	yes	16 kbit/s	
8 kbit/s	yes	no		8 kbit/s
4.8 kbit/s	yes	yes	8 kbit/s	
2.4 kbit/s	yes	yes	8 kbit/s	
1.2 kbit/s	yes	yes	8 kbit/s	
0.6 kbit/s	yes	yes	8 kbit/s	
0.3 kbit/s	no	yes	8 kbit/s	

Module width 1 slot.

Installation

The module can be located in any available slot position and slid into place. Insert until the module’s front plate is level with the housing. No other configuration is required.

Link settings

Figure 64 below shows the position of the links on the SRMM, issue 4.0.

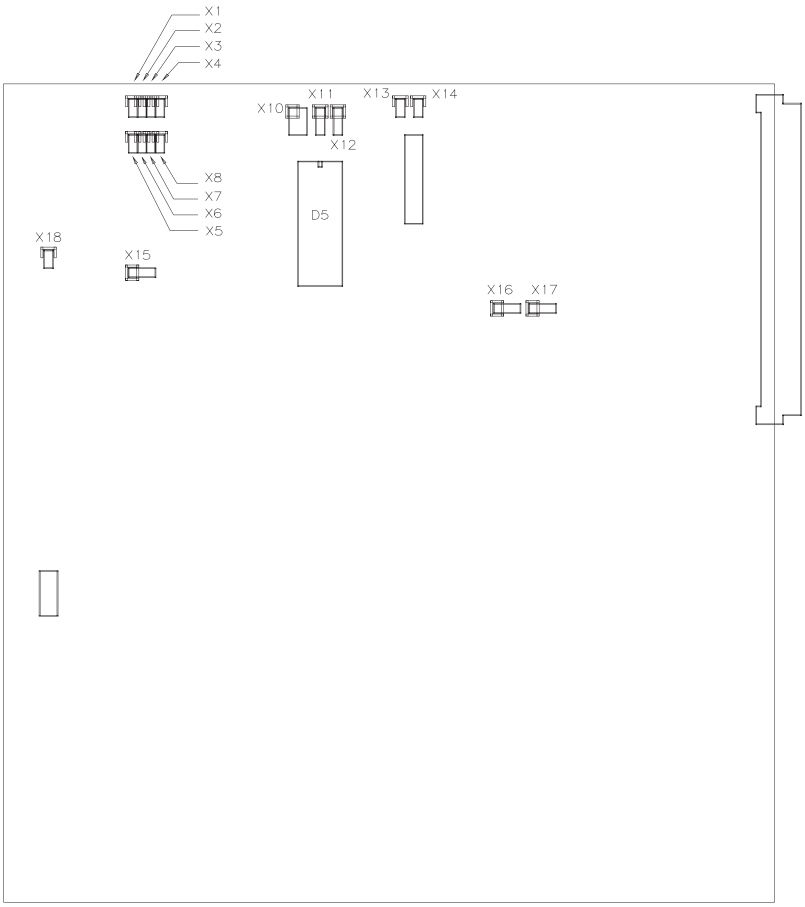


Figure 64: SRMM circuit board, issue 4.0

Normal link settings for the SRMM

The following table shows the normal link settings for the SRMM.

Ref	Normal setting	Ref	Normal setting
X1	In	X10	3-4
X2	In	X11	2-3
X3	In	X12	2-3
X4	Out	X13	Out
X5	Out	X14	Out
X6	Out	X15	1-2
X7	Out	X16	1-2
X8	Out	X17	1-2
		X18	Out

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
POLL[1]	Green	Flashing
COMPR[2]	Green	Off
SUBR[3]	Green	On
LOOP[4]	Green	Off

1 POLL (Polling of SRMM by Resource Manager or Control Module) flashes to indicate that the device has recognised the presence of the SRMM, and that the SRMM is capable of normal operation.

2 COMPR should never be On. The SRMM is not capable of performing compression or decompression of subchannels.

3 SUBR (Subrate switching of subchannels) indicates that the SRMM is switching subchannels. It will be Off if no subrate switching is occurring and before the SRMM has been configured.

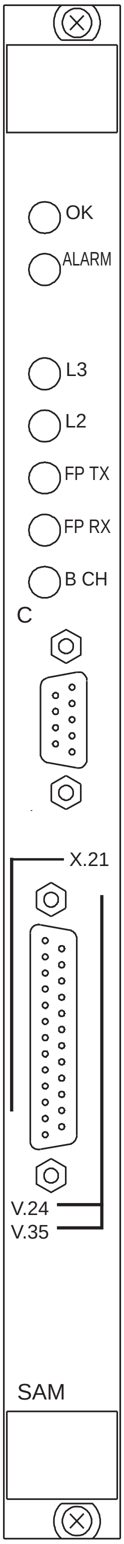
4 The LOOP (Loopback) LED will only be On if diagnostic testing is being performed by service personnel.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings.
	Notify service personnel
POLL LED is not FLASHING	Check that the device is operational
	Notify service personnel
COMPR LED is On	Check the SRMM configuration
	Notify service personnel
SUBR LED is Off when it should be On	Check that POLL LED is FLASHING
	Check that a call is present
	Notify service personnel
LOOP LED is On when it should be Off	Notify service personnel
Information is not transmitted or received from DTE when a call is active	Check cabling to DTE

CM

Signalling Access Module (SAM)



The SAM provides an inband signalling facility using a router and a set of communications links. This facility allows network management information and end-to-end signalling tie line information to be transported over:

- part or all of an ISDN B-channel using a suitable reliable protocol
- an ISDN D-channel using end-to-end packets
- V.24, V.35 or X.21 cables.

The Signalling Access Module (SAM) front panel can be fitted with either:

- an X.21 or V.35 connector with a data rate of up to 64 kbit/s, or
- a V.24 synchronous connector with a data rate of up to 38.4 kbit/s.

The SAM backplane is equipped with the following communications links options:

- 8 ports at 8 kbit/s,
- 4 ports at 8 kbit/s, plus 1 backplane port at 64 kbit/s, or
- 2 ports at 64 kbit/s.

All ports can be configured as a Data Terminal Equipment (DTE) or Data Circuit-terminating Equipment (DCE).

The 8 kbit/s backplane ports can be subrate multiplexed with compressed voice channels or other low speed data channels by using the VCM or SRMM in conjunction with the SAM.

Specifications

Compatibility The SAM can be fitted to any chassis.

Ports V.24 and V.35 options — a DB25 female connector on the front panel that conforms to ISO 2110 Standard.

X.21 option — a DB15 female connector on the front panel that conforms to ISO 4903 Standard.

A maintenance access port (not for general use).

Data rates Backplane

Up to eight backplane ports at 8 kbit/s, or

up to four backplane ports at 8 kbit/s plus one backplane port at 64 kbit/s, or

two backplane ports at 64 kbit/s.

The backplane port combination is configured using the NMS.

Front panel

One front panel port, whose options are shown below.

	V.24	V.35	X.21
DCE	19.2 or 38.4 kbit/s	19.2 or 38.4 kbit/s	19.2 , 38.4 or 64 kbit/s
DTE	up to 38.4 kbit/s	up to 64 kbit/s	up to 64 kbit/s

Call types Fixed (using semipermanent connections).
Switched.
Manual call control (NMS operator initiated).

Adapter cables V.24 DTE: DB25 male connector to DB25 male.

X.21 DTE: DB15 male connector to DB15 male.

V.35 DTE: DB25 male connector to M34 male.

V.35 DCE: DB25 male connector to M34 female.

Module width 1 slot.

Installation

Cabling

V.24

The following table shows the cabling specifications for external connections to the SAM via the V.24 port:

Cable length 15 m max.

Cable type multi-core.

Connector DB25 male.

Note *All D-type connectors should have a right-angle backshell (as opposed to straight exit).*

Connecting the SAM V.24 to terminal equipment

1 Run a cable from the V.24 equipment through the front connector cable access duct of the subrack.

2 Terminate the cable with a DB25 male connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

SAM V.24 signal	DCE		DTE	
	DB25 pin	Circuit type	DB25 pin	Circuit type
TxD (Transmit data)	2	L	3	G
RxD (Receive data)	3	G	2	L
RTS (Request to send)	4	L	5	G
CTS (Clear to send)	5	G	4	L
DSR (Data set ready)	6	G	Not used	
DCD (Data carrier detect)	8	G	20	L
DTR (Data terminal ready)	20	L	8	G
RI (Ring indicator)	22	G	Not used	
SG (Signal ground)	7	CR	7	CR
TxC (Transmit clock)	15	G	Not used	
RxC (Receive clock)	17	G	24	L

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Note *The clock input on pin 24 is used to clock both TxD and RxD when configured as a DTE port.*

V.35

The following table shows the cabling specifications for external connections to the SAM via the V.35 port:

Cable length 100 m max.

Cable type twisted-pair multi-core.

Connector DB25 male (cable available to convert to standard M34 connectors).

Note *All D-type connectors should have a right-angle backshell (as opposed to straight exit).*

Connecting the SAM V.35 to terminal equipment

1 Run a cable from the V.35 equipment through the front cable access duct of the subrack.

2 Terminate the cable with a DB25 male connector as shown in the table below and plug it in.

SAM V.35 signal	DCE		DTE	
	DB25 pin	Circuit type	DB25	Circuit type
SG signal ground	1	CR	1	CR
RTS request to send	4	L	5	G
CTS clear to send	5	G	4	L
DSR data set ready	6	G	Not used	
DTR data terminal ready	20	L	6	G
RLSD Rx'd line signal	18	G	20	L
RDa Rx'd data (sig. a)	9	G	7	L
RDb Rx'd data (sig. b)	21	G	19	L
SCRa ser. clk Rx (sig. a)	12	G	12	L
SCRb ser. clk Rx (sig. a)	24	G	24	L
SDa send data (sig. a)	7	L	9	G
SDb send data (sig. b)	19	L	21	G
SCTa ser. clk Tx (sig. a)	11	G	Not used	
SCTb ser. clk Tx (sig. b)	23	G	Not used	

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Note *In DTE mode the SCRa and SCRb signal clocks both send and receive data.*

X.21

The following table shows the cabling specifications for external connections to the SAM via the X.21 port.

Cable length 100m max.

Cable type twisted-pair multi-core.

Connector DB15 male.

Note *All D-type connectors must have a right-angle backshell (as opposed to straight exit).*

Connecting the SAM X.21 to terminal equipment

1 Run a cable from the X.21 equipment through the front cable access duct of the subrack.

2 Terminate the cable with a DB15 male connector as shown in the table below and plug it in. See *Appendix A* for a diagram of the connector.

SAM X.21 signal	DCE		DTE	
	DB15 pin	Circuit type	DB15 pin	Circuit type
T(A) (transmit)	2	L	4	G
T(B) (transmit)	9	L	11	G
C(A) (control)	3	L	5	G
C(B) (control)	10	L	12	G
R(A) (receive)	4	G	2	L
R(B) (receive)	11	G	9	L
I(A) (indication)	5	G	3	L
I(B) (indication)	12	G	10	L
S(A) (signal timing element)	6	G	6	L
S(B) (signal timing element)	13	G	13	L
G (signal ground)	8	CR	8	CR

L = Load (or input) G = Generator (or output) CR = Common Return
All pins not used are not connected (open circuit).

Connecting the SAM X.21 to RS-449 compatible equipment

The following table details the pin assignments of the X.21 to RS-449 adaptor cables:

SAM X.21 signal	DCE cable			DTE cable		
	DB15 pin	D37 pin	RS-449 signal	DB15 pin	D37 pin	RS-449 signal
T(A) Transmit	2	4	TD	2	4	TD
T(B) Transmit	9	22	TD	9	22	TD
S(A) Signal Timing Element	6	8 5	RT ST	6	8	RT
S(B) Signal Timing Element	13	26 23	RT ST	13	26	RT
C(A) Control	3	7 9	RS CS	3	7 12	RS TR
C(B) Control	10	25 27	RS CS	10	25 30	RS TR
R(A) Control	4	6	RD	4	6	RD
R(B) Control	11	24	RD	11	24	RD
I(A) Indication	5	13	RR	5	13	RR
I(B) Indication	12	31	RR	12	31	RR
SG Signal Ground	8	19	SG	8	19	SG
X(A) Signal Timing Element	7	17	TT	7	17	TT
X(B) Signal Timing Element	14	35	TT	14	35	TT

Link settings

Figure 65 below shows the position of the links on the SAM, issue 1.1.

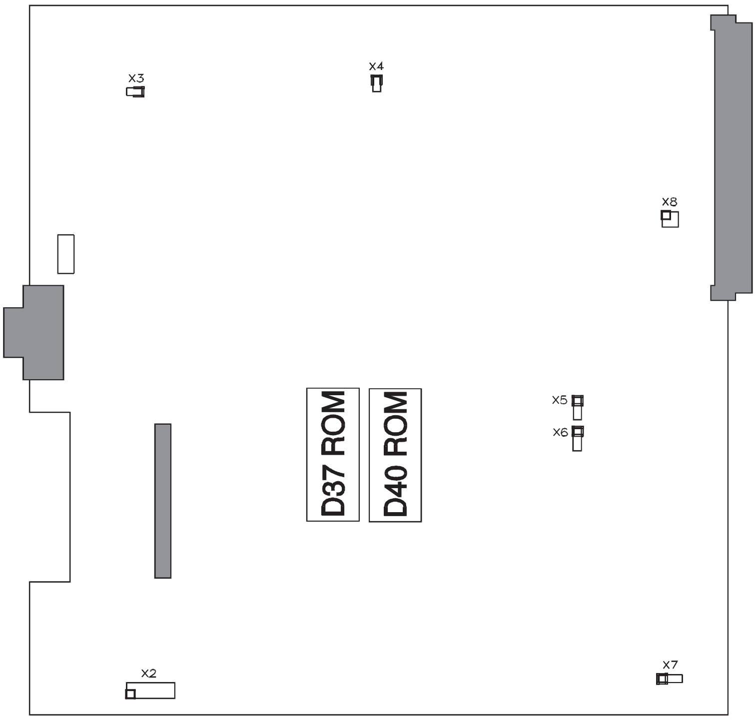


Figure 65: SAM circuit board, issue 1.1

Normal link settings for the SAM

The following table shows the normal link settings for the SAM.

Ref	Normal setting
X1	Not applicable
X2	Not used
X3	Not applicable
X4	Not used
X5	Not fitted
X6	2-3
X7	1-2
X8	Not applicable

SAM V.24 interface

Figure 66 below shows an outline of the SAM V.24 submodule, issue 1.3.

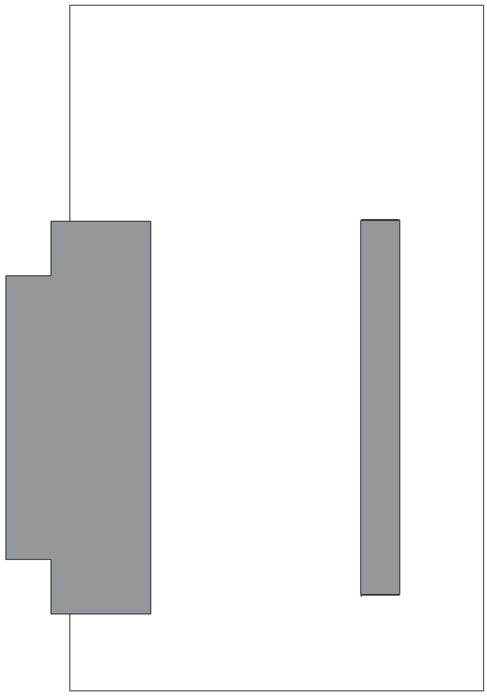


Figure 66: SAM V.24 circuit board, issue 1.3

There are no link settings for the SAM V.24 submodule.

SAM V.35 interface

Figure 67 below shows the position of the links on the SAM V.35 submodule, issue 1.1.

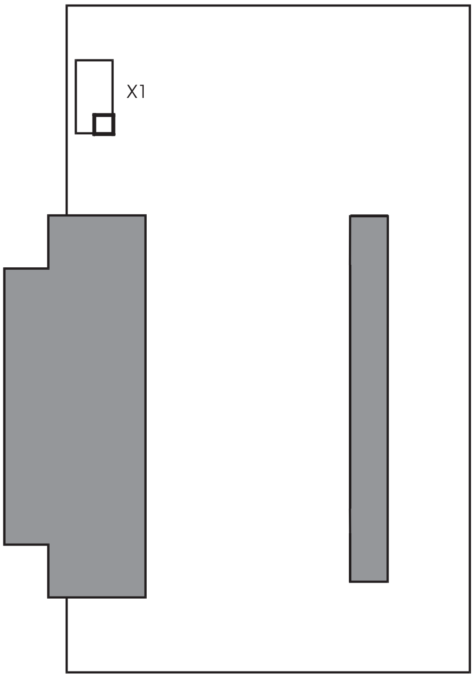


Figure 67: SAM V.35 circuit board, issue 1.1

Normal link settings for the SAM V.35

The following table shows the normal link settings for the SAM V.35 submodule.

Ref	DCE port setting	DTE port setting
X1	5-6, 7-8	1-2, 3-4

SAM X.21 interface

Figure 68 below shows the position of the links on the SAM X.21 submodule, issue 1.2.

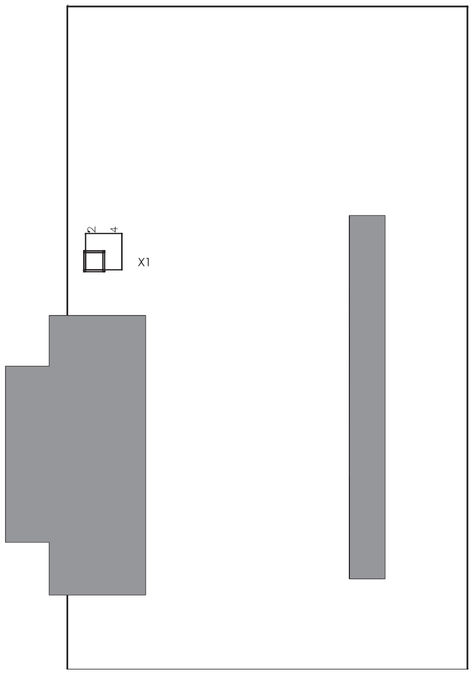


Figure 68: SAM X.21 circuit board, issue 1.2

Normal link settings for the SAM X.21

The following table shows the normal link settings for the SAM X.21 submodule.

Ref	DCE port setting	DTE port setting
X1	1-2, 3-4	No links

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
L3[1]	Green	Not applicable
L2[2]	Green	Not applicable
FP Tx[3]	Green	Not applicable
FP Rx[4]	Green	Not applicable
B CH[5]	Green	Not applicable

1 L3 indicates that Layer 3 data is either being sent or being received.

2 L2 indicates that Layer 2 data is either being sent or being received.

3 FP Tx indicates that data is being transmitted from the front panel.

4 FP Rx indicates that data is being received by the front panel.

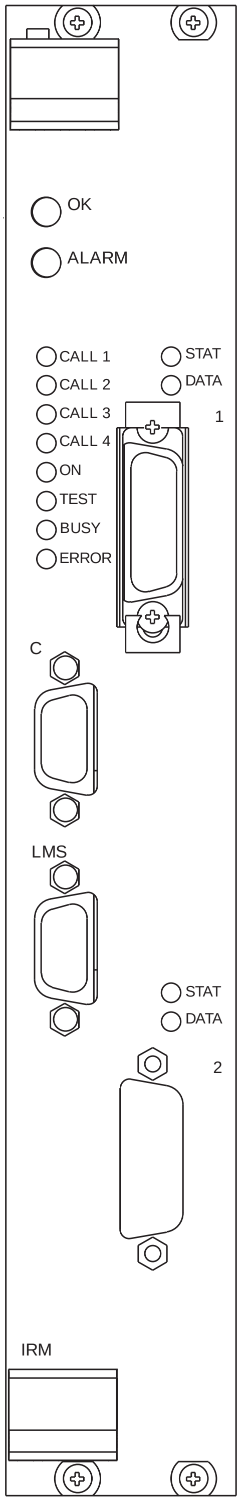
5 B CH indicates that data is being transmitted from the backplane using a B-channel.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings.
	Notify service personnel
ALARM LED and OK LED flashing in sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s rate	Check CM is operational
	Check that a network TE (e.g. IPMN or BRMT) is operational
	Notify service personnel
B-channel LED is Off	Check that any of the IPM, BRM, G.703 cards are correctly plugged in and supplying clock
	Notify service personnel
Data is not being transmitted point-to-point via the ISDN B-channel	Check cabling between IPMT and SAM modules
	Notify service personnel
Data is not being transmitted between devices via the front panel interconnection	Check cabling
	Notify service personnel

RM CM

Integrated Router Module (IRM)



The Integrated Router Module (IRM) is a multiport, multiprotocol router designed to add Local Area Network (LAN) interconnection functionality to this equipment. The IRM connects LANs to other remote networks via the Wide Area Network (WAN) facilities provided by this device.

The IRM architecture is based on a high performance, multiport, multiprotocol router engine. This allows for the interconnection of four backplane WAN ports and up to two external LAN ports. The WAN ports can use the device to connect to remote routers.

The IRM has the following main features:

- Two Backplane WAN ports (group A), with configurable bandwidth (up to 1984 kbit/s)
- Two Backplane WAN ports (group B), with configurable bandwidth (up to 64 kbit/s)
- Up to two Ethernet AUI LANs (10Base5, 10Base2 or 10BaseT)
- High speed multiprotocol routing and concurrent bridging
- Filtering at full Ethernet wire speeds
- Bridging techniques: Transparent, Spanning Tree (STP) and Source Routing (SR)
- Concurrent routing protocols: IP, IPX, DECnet Phase IV
- Routing algorithms: RIP, OSPF, IPX RIP
- WAN encapsulation: PPP and MultiWAN (proprietary multilinking)
- STAC[2] WAN compression algorithm on all WAN ports
- Fixed WAN bandwidth supporting manual, XSPC and SPC call setup
- Local and remote management.

Specifications

Compatibility	The IRM can be used in all chassis.
Module width	2 slots.
Modules per system	Maximum of two in a six and 15 slot chassis. One in a four slot chassis.
Data ports	Up to two pluggable LAN interface modules. Standard AUI - 15 pin female D-type connector.
Router LMS port	9 pin female D-type.

Installation

The IRM is installed in any two adjacent slot positions. When fully inserted, the front plate of the module should be flush with the rack.

Cabling

Connector types	Media Attachment Unit (MAU) 10Base2 or 10BaseT, or; Attachment Unit Interface (AUI) — max 50 metres.

Refer to *Installing IRM Hardware* in the *IRM Router Configuration Manual* for further details of cabling requirements.

Link settings

IRM

Figure 69 below shows the position of the links on the IRM 10002440.00 Rev.2 and 10002440.01 Rev.1.

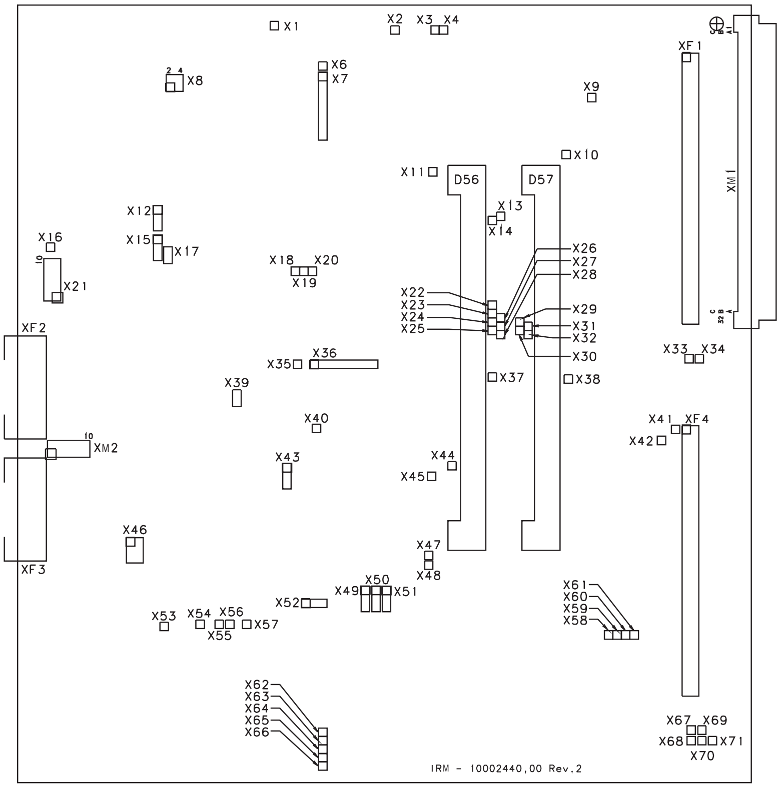


Figure 69: IRM link locations for IRM 10002440.00 Rev.2 and 10002440.01 Rev.1

Normal link settings for the IRM

The following table shows the normal link settings for the IRM 10002440.00 Rev.2 and 10002440.01 Rev.1.

Ref	Normal setting	Ref	Normal setting
X8	1-2 not fitted 3-4 not fitted	X46	3-5
X12	2-3	X49	2-3
X15	2-3	X50	2-3
X17	Not fitted	X51	2-3
X39	Not fitted	X52	2-3
X43	1-2		

Ethernet submodule

Figure 70 shows the position of the links on the Ethernet submodule.

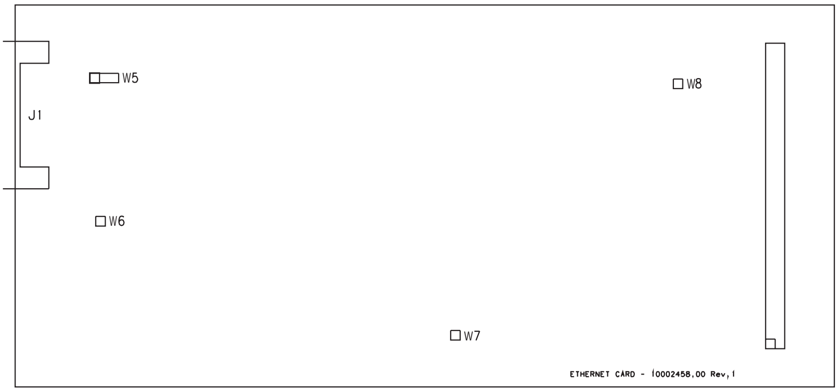


Figure 70: Ethernet submodule link locations

Normal link settings for the Ethernet submodule

The following table shows the normal link settings for the Ethernet submodule.

Ref	Normal setting
W5	2-3

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
CALL 1	Green	On if connection is established on WAN port 1
CALL 2	Green	On if connection is established on WAN port 2
CALL 3	Green	On if connection is established on WAN port 3
CALL 4	Green	On if connection is established on WAN port 4
ON	Green	On
TEST	Amber	Off except during diagnostics
BUSY	Amber	Off except during config upload/download and software upgrade
ERROR	Red	Off
PORT 1 STAT	Green	On when interface is active
PORT 1 DATA	Green	On when interface is transmitting or receiving data
PORT 2 STAT	Green	On when interface is active
PORT 2 DATA	Green	On when interface is transmitting or receiving data

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the submodule is properly located in the rack
	Notify service personnel
ALARM LED On continuously	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
Error LED On	Notify service personnel
Port STAT LED Flashing	Check AUI connector
	Notify service personnel

When you have completed the installation, you should refer to the following documents:

- The *Reference Manual* for basic configuration details
- *IRM Router Configuration Manual* for in-depth configuration of the IRM's router facilities.

Submodule installation

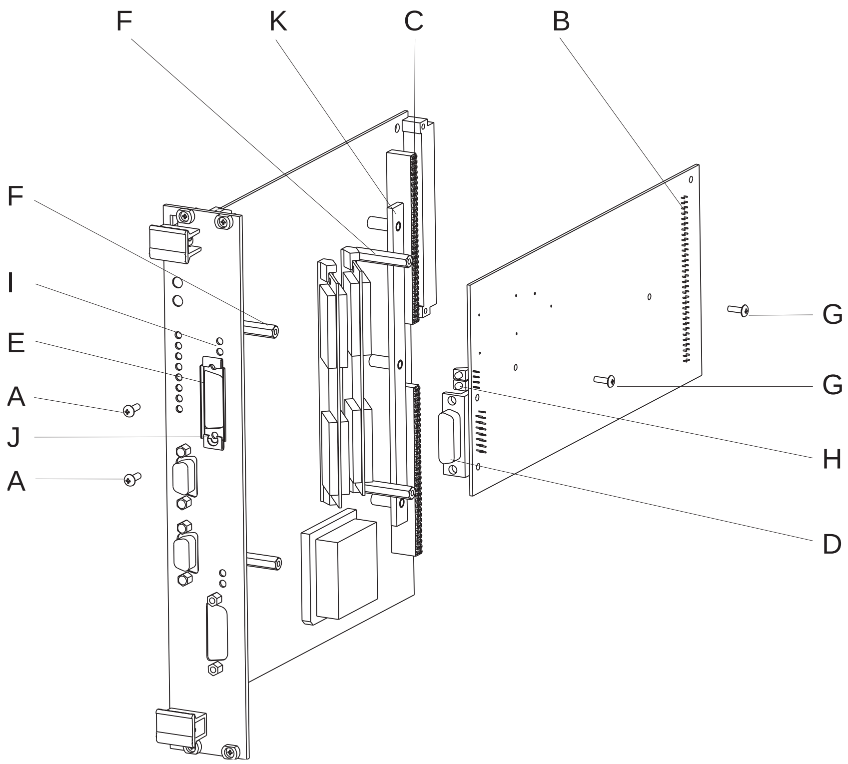
It is possible to install additional submodules, to a maximum of two submodules per IRM. The following procedure describes how to fit an additional submodule.

Requirements

Before you can install the submodule, you must ensure that you have all of the following:

- The submodule to be installed
- An anti-static bench mat
- An anti-static wrist band
- A Posi-driv 0 point screwdriver.

Installing a submodule



1 Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.

2 Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.

3 Remove the IRM board from the rack and place it on the anti-static mat components side up.

4 Place the submodule on the anti-static mat.

5 Remove the blanking plate from the front panel connector cutout (E) and retain the screws (A).

Note *During step 6, you must ensure that the connector pins of the submodule are correctly aligned with the IRM socket before inserting the submodule. Failure to do this may result in damage to the IRM connector pins.*

---

6 Align the submodule connector pins (B) with the IRM socket (C). Press the submodule into position, ensuring that the submodule connector (D) aligns with the cutout (E) in the IRM front panel, the submodule LEDs (H) align with cutouts (I) on the front panel, and the submodule screw holes align with the spacers (F).

7 Insert the module fastening screws (G) into the back of the submodule. Insert connector fastening screws (A) through the front panel, together with the slide latch (J), ensuring that the latch locks in the bottom position. Tighten the screws to secure the submodule into position.

8 Replace the IRM in the rack.

9 Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

If the module fails to power up correctly, contact Jtec Customer Service and Support for assistance.

Removing an IRM submodule

1 Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.

2 Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.

3 Remove the IRM from the rack and place it on the anti-static mat wiring side up.

4 Remove the module fastening screws (A and G) and the slide latch (J) from the submodule and front panel connector.

5 Gently remove the submodule from the IRM socket (C), ensuring that the connector pins remain aligned until the submodule is clear of the IRM board.

Hint *While removing the submodule, rest your hand on the stiffener bar (K) or on the other submodule, if installed.*

---

6 Fit a blanking plate to the front panel connector cutout and secure with screws (A).

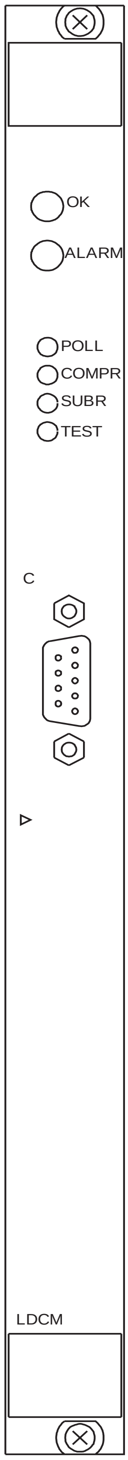
7 Replace the IRM in the rack.

8 Observe the result of the self-test. Check that the module has ALARM LED off and OK LED on.

If the module fails to power up correctly, contact Jtec Customer Service and Support for assistance.

RM **CM**

Low Delay CELP Module (LDCM)



The Low Delay CELP Module (LDCM) compresses standard 64 kbit/s A-law encoded voice/fax signals and switches them onto a common channel. The LDCM can have up to eight DSPs (Digital Signal Processors). Two CELP DSPs are resident on the LDCM board and up to six can be added by fitting submodules (two DSPs per submodule). There are two types of submodule available:

CELP (Code Excited Linear Prediction) DSP submodule. This supports the following voice compression rates:

- 8 kbit/s CELP
- 16 kbit/s CELP
- 16 kbit/s Low Delay CELP

LDCM-VF-CMP submodule. This uses the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique. It provides a G3 fax detection/relay capability in addition to enhanced voice compression at the following rates:

- 8kbit/s MP-MLQ
- 16 kbit/s MP-MLQ.

Note *The LDCM does not support the MLQ-CMP submodule.*

The number of DSPs required for call processing depends on the encoding algorithm selected, for example, 8kbit/s and 16 kbit/s CELP, and 8kbit/s and 16kbit/s MP-MLQ require one DSP for each end of a call; 16 kbit/s Low Delay CELP requires two DSPs for each end of a call.

The LDCM allows multiple voice subchannels to be transmitted over a single 64 kbit/s channel. The receiving end then expands the voice subchannels back to 64 kbit/s A-law. A combination of voice and data subchannels can also be transmitted over a common channel via the subrate data switch. The LDCM always combines subchannels to produce a total of 64 kbit/s.

Voice and/or Fax signals access the LDCM through the standard interface modules used for voice applications, such as the Analog Line Exchange Module (ALEM), Analog Line Phone Module (ALPM), E&M Module (EMM) or the 2.048 Mbit/s Digital Module NT (E1MN). The signals are directed via the internal buses in the chassis to the LDCM.

The LDCM is dynamically allocated on a per call basis. This combined with the ability to choose between different voice compression rates provides greater flexibility in the management of your network.

The LDCM can be used for both Time and TimeFrame Virtual Lines when operating with MP-MLQ voice compression submodules.

Specifications

Compatibility

The LDCM can be fitted to any chassis.

Compression modes and compander options

CELP DSP submodule
8 kbit/s CELP is a proprietary algorithm.
16 kbit/s CELP is a proprietary algorithm.
16 kbit/s Low Delay CELP complies with ITU-T recommendation G.728.

The table below shows the number of DSPs (Digital Signal Processors) required for call processing with each algorithm.

Algorithm type	DSPs per call (each end)
8 kbit/s CELP	1
16 kbit/s CELP	1
16 kbit/s LDCELP	2

2, 4, 6 or 8 CELP companders can be fitted to an LDCM. These products are referred to as LDCM1/2, LDCM2/4, LDCM3/6 and LDCM4/8.

LDCM-VF-CMP submodule
8 kbit/s and 16 kbit/s voice compression using 6.3 kbit/s MP-MLQ algorithm that complies with ITU-T G.723.1.

Algorithm type	DSPs per call (each end)
8 kbit/s MP-MLQ	1
16 kbit/s MP-MLQ	1

In addition to the two on-board CELP companders, 2, 4 or 6 companders can be fitted. These products are referred to as LDCM1/VF2, LDCM1/VF4 and LDCM1/VF6.

The following fax speeds are supported by the module:

TDM channel (kbit/s)	Fax speed (kbit/s)
8	2.4, 4.8, 7.2
16	2.4, 4.8, 7.2, 9.6

Debug port

The port is for factory testing and not customer use.

Subrate data multiplexing The table below provides multiplexing details.

User data rate	Subchannel rate
64 kbit/s	64 kbit/s
56 kbit/s with V.110 framing	64 kbit/s
56 kbit/s without V.110 framing	56 kbit/s
48 kbit/s with V.110 framing	64 kbit/s
48 kbit/s without V.110 framing	48 kbit/s
32 kbit/s	32 kbit/s
24 kbit/s	24 kbit/s
19.2 kbit/s	32 kbit/s
16 kbit/s	16 kbit/s
9.6 kbit/s	16 kbit/s
8 kbit/s	8 kbit/s
4.8 kbit/s	8 kbit/s
2.4 kbit/s	8 kbit/s
1.2 kbit/s	8 kbit/s
0.6 kbit/s	8 kbit/s
0.3 kbit/s	8 kbit/s

Module width 1 slot.

Installation

The LDCM module is located in any suitable slot position. When fully inserted, the front plate of the module is level with the rack.

Note *It is possible for externally-generated, fax-like audio tones, such as an error beep from a computer, to be detected by the telephone apparatus using the MP-MLQ compression circuit. This may cause the MP-MLQ to switch from voice to fax detection mode. Ensure that equipment capable of producing these sorts of tones is installed well away from telephone apparatus that is using the LDCM as a resource.*

Link settings

Figure 71 below shows the position of the links on the LDCM, issue 4.0.

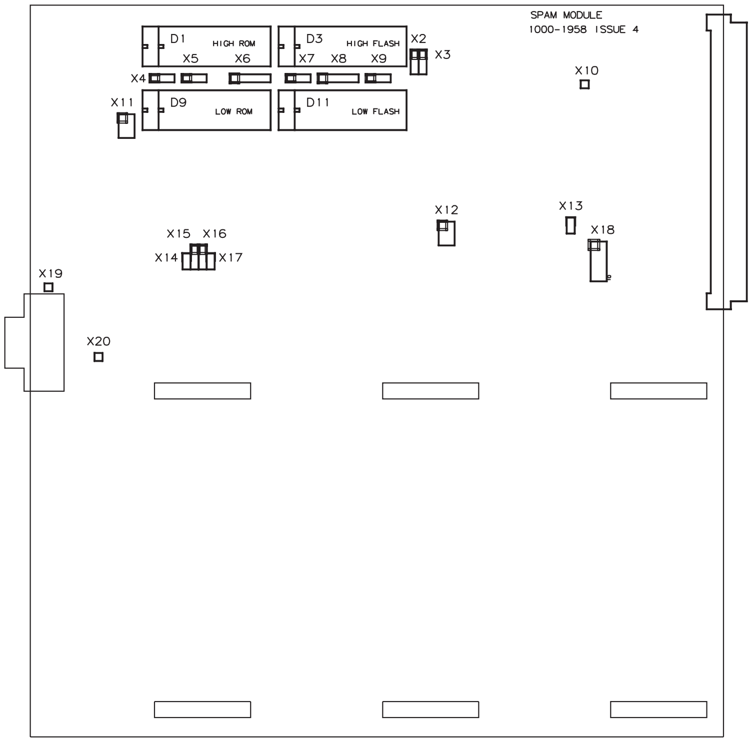


Figure 71: LDCM circuit board, issue 4.0

Normal link settings for the LDCM

The following table shows the normal link settings for the LDCM.

Ref	Normal setting	Ref	Normal setting
X1	Not applicable	X11	5-6
X2	2-3	X12	3-4
X3	Not fitted	X13	Not fitted
X4	1-2	X14	1-2
X5	1-2	X15	2-3
X6	Not fitted	X16	2-3
X7	1-2	X17	1-2
X8	Not fitted	X18	Not fitted
X9	Not fitted	X19	Not applicable
X10	Not applicable	X20	Not applicable

CELP DSP submodule

Figure 72 below shows the position of the links on the CELP DSP submodule, issue 4.

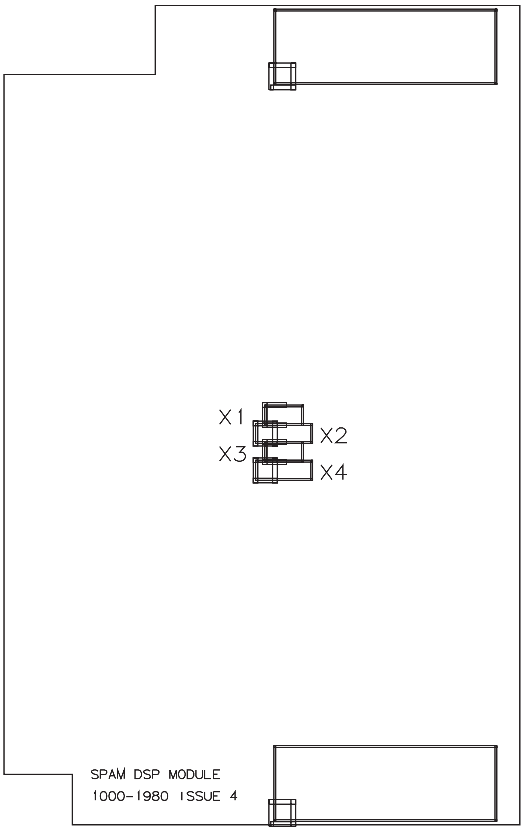


Figure 72: CELP DSP submodule, issue 4

Normal link settings for the CELP DSP submodule

The following table shows the normal link settings for the CELP DSP submodule.

Ref	Normal setting
X1	1-2
X2	2-3
X3	1-2
X4	2-3

LDCM-VF-CMP submodule

Figure 73 shows the layout of the LDCM-VF-CMP submodule.

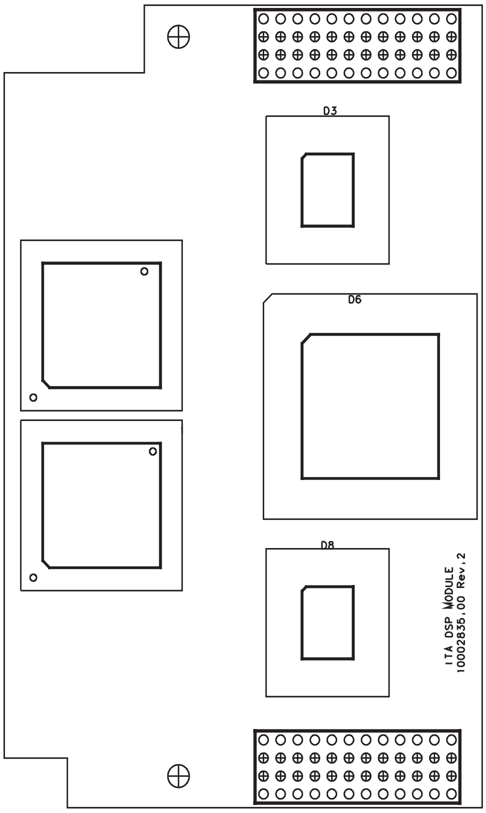


Figure 73: LDCM-VF-CMP submodule layout

There are no configurable links on the LDCM-VF-CMP submodule.

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
POLL[1]	Green	Flashing
COMP[2]	Green	On
SUBR[3]	Green	On
TEST[4]	Green	Off

1 The POLL (Polling of LDCM by Control Module or Resource Manager) LED flashes to indicate that the device has recognised the presence of the LDCM, and that the LDCM is capable of normal operation.

2 The COMP (Companding) LED indicates that the LDCM card is compressing/expanding at least one A-law channel. The LED will be Off before the LDCM has been configured and if no compression/expansion is taking place.

3 The SUBR (Subrate switching) LED indicates that the LDCM card is subrate switching external data. The LED will be Off before the LDCM has been configured and if no subrate switching is taking place.

4 The TEST LED indicates that a test is in process on the LDCM card. The LED flashes continuously during start-up while the LDCM runs its internal tests.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
OK indicator is always On and ALARM indicator is always flashing	No backplane clocks can be detected. Ensure that both a Control Module or Resource Manager, and a Clock Card (for example, IPM, BRM, DTM, DLM) are fitted somewhere in the rack
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
OK and ALARM indicators are continuously flashing	A hardware fault has been detected. Notify service personnel
POLL indicator is not flashing	Check that there is a CM or RM in the rack
	Notify service personnel

Submodule installation

The number of submodules fitted on the LDCM depends on the model of the LDCM purchased. The following describes how to fit an additional submodule.

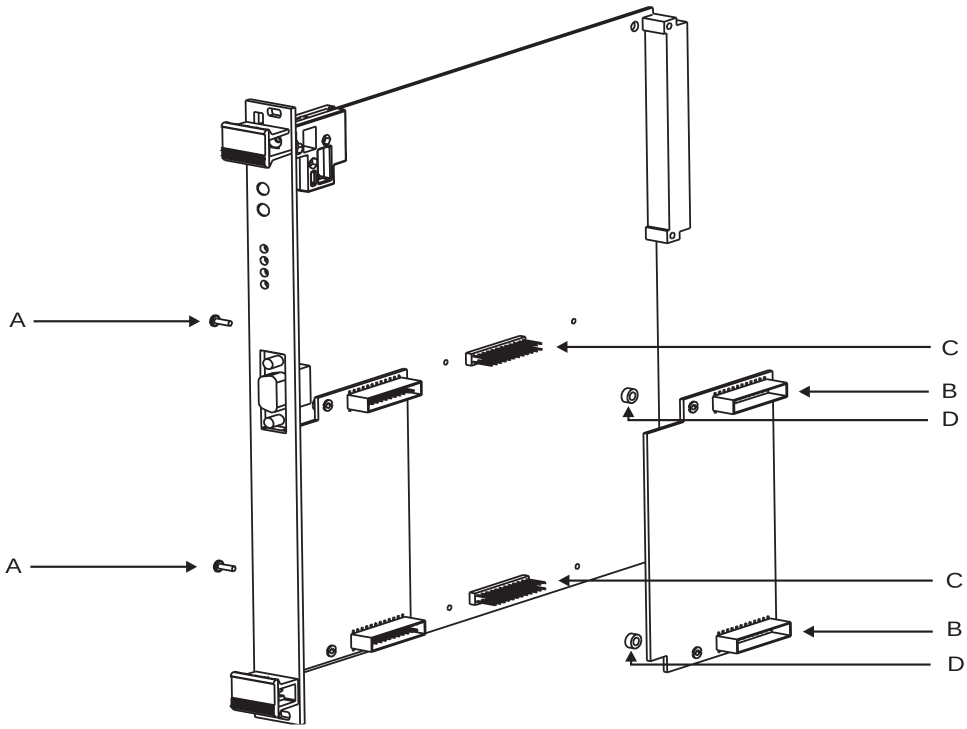
Note *Refer to the general information for module upgrading in the* ***J1000/J5000 Upgrade User Note****.*

Requirements

Before you can install the LDCM submodule(s), you must ensure that you have all of the following:

1. The LDCM submodule(s) to be installed
2. An anti-static bench mat
3. An anti-static wrist band
4. A Posi-driv 0 point screwdriver.

Installing an LDCM submodule



1 Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.

2 Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.

3 Remove the LDCM board from the rack and place it on the anti-static mat components side up.

4 Place the LDCM submodule on the anti-static mat wiring side up.

5 Remove the module fastening screws (A) from the LDCM submodule.

6 Align the LDCM submodule mating sockets (B) with the LDCM connectors (C) and press the submodule into position. Ensure that the nylon spacers (D) are positioned correctly on the mating holes.

Note *The submodules must be fitted sequentially from the front of the LDCM towards the backplane.*

---

7 Insert the module fastening screws (A) into the back of the LDCM and screw the submodule into position.

8 Replace the LDCM in the rack.

9 Observe the result of the self-test. Check that the module has ALARM LED off, OK LED on and POLL LED flashing.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

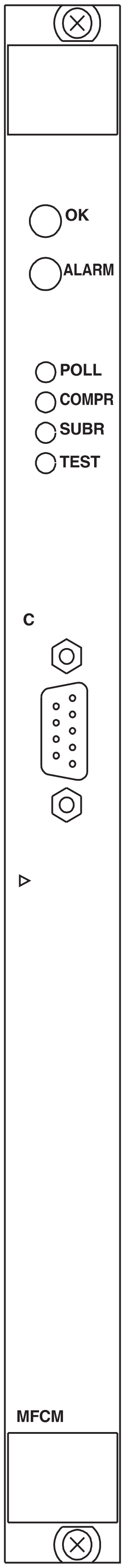
Removing an LDCM submodule

1. Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.
2. Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.
3. Remove the LDCM board from the rack and place it on the anti-static mat wiring side up.
4. Remove the module fastening screws (A) from the LDCM.
5. Turn the LDCM over so that the components side is face up.
6. Gently remove the submodule from the LDCM connectors (C) and refit the module fastening screws (A) to the submodule.
7. Replace the LDCM in the rack.
8. Observe the result of the self-test. Check that the module has ALARM LED off, OK LED on and POLL LED flashing.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

RM CM

Multi Function Compression Module (MFCM)



The Multi Function Compression Module is designed to compress standard 64 kbit/s A-law or µ-law encoded voice channels. A number of compressed voice channels can then be switched onto a single common channel for onward transmission across a network. The MFCM achieves the compression by the use of companders mounted on sub-modules. The MFCM can have up to four sub-modules fitted. These can be either:

- MP-MLQ Compander sub-modules (MLQ-CMP), or,
- High Density Voice Compression Modules (HD-VCM)

Note *A mixture of MLQ-CMP and HD-VCM sub-modules cannot be supported on the same MFCM.*

An MFCM populated with four MLQ-CMP compander sub-modules can provide compression for up to 8 voice channels. An MFCM fitted with four HD-VCM-15 compander sub-modules provides compression for up to 60 voice channels.

The MFCM at one end of a network compresses multiple voice subchannels. An MFCM at the receiving end then expands the voice subchannels back to 64 kbit/s A-law or µ-law. A combination of voice and data subchannels can also be compressed by the on-board subrate data switches. The MFCM typically combines subchannels to produce a channel of 64 kbit/s.

Voice and/or Fax signals (and Modem signals with HD-VCM) access the MFCM through the standard interface modules used for voice applications, such as the Analog Line Exchange Module (ALEM), Analog Line Phone Module (ALPM), E&M Module (EMM) or the 2.048 Mbit/s Digital Module NT (E1MN). The signals are directed via the internal buses in the chassis to the MFCM.

The MFCM can be used for both Time and TimeFrame Virtual Lines when operating with MP-MLQ and HD-VCM voice compression sub-modules.

Specifications

MFCM main board

Compatibility The MFCM can be fitted to all chassis.

Debug port The port is for factory testing and not customer use.

Subrate Switches Up to 12 with MLQ-CMP sub-modules
Up to 16 with HD-VCM sub-modules

Subrate data multiplexing The table below provides multiplexing details.

User data rate	Sub-channel rate
64 kbit/s	64 kbit/s
56 kbit/s with V.110 framing	64 kbit/s
56 kbit/s without V.110 framing	56 kbit/s
48 kbit/s with V.110 framing	64 kbit/s
48 kbit/s without V.110 framing	48 kbit/s
32 kbit/s	32 kbit/s
24 kbit/s	24 kbit/s
19.2 kbit/s	32 kbit/s
16 kbit/s	16 kbit/s
9.6 kbit/s	16 kbit/s
8 kbit/s	8 kbit/s
4.8 kbit/s	8 kbit/s
2.4 kbit/s	8 kbit/s
1.2 kbit/s	8 kbit/s
0.6 kbit/s	8 kbit/s
0.3 kbit/s	8 kbit/s

Module width 1 slot.

Installation

The MFCM can be located in any suitable slot position. When fully inserted, the front plate of the module is level with the rack.

Note *It is possible for externally-generated, fax-like audio tones, such as an error beep from a computer, to be detected by the telephone apparatus using the MP-MLQ compression circuit. This may cause the MP-MLQ to switch from voice to fax detection mode. Ensure that equipment capable of producing these sorts of tones is installed well away from telephone apparatus that is using the MFCM as a resource.*

Link settings

Figure 74 below shows the position of the links on the MFCM, 10002954.00 Rev.2.

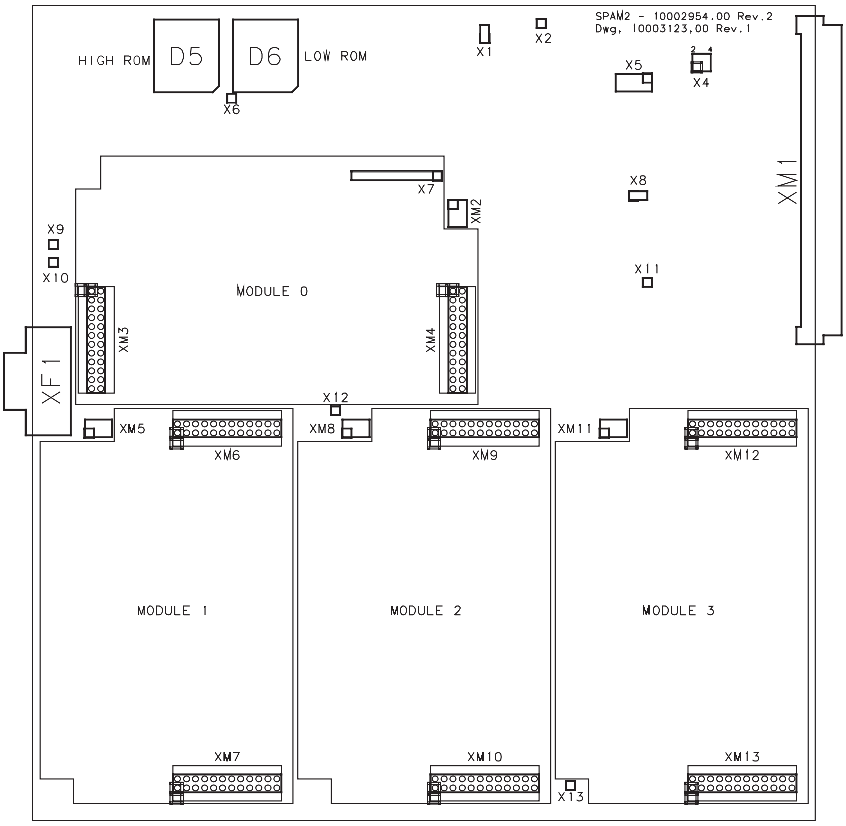


Figure 74: MFCM *circuit board, 10002954.00 Rev.2*

Normal link settings for the MFCM

The following table shows the normal link settings for the MFCM, 10002954.00 Rev.2.

Ref	Normal setting	Ref	Normal setting
X1	1-2	X5	Not fitted
X4	Not fitted	X8	Not fitted

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
POLL[1]	Green	Flashing
COMP[2]	Green	On
SUBR[3]	Green	On
TEST[4]	Green	Off

1 The POLL (Polling of MFCM by the Control Module or Resource Manager) LED flashes to indicate that the device has recognised the presence of the MFCM.

2 The COMP (Companding) LED indicates that the MFCM card is compressing/expanding at least one channel. The LED will be Off before the MFCM has been configured and if no compression/expansion is taking place.

3 The SUBR (Subrate switching) LED indicates that the MFCM card is subrate switching external data. The LED will be Off before the MFCM has been configured and if no subrate switching is taking place.

4 The TEST LED indicates that a test is in process on the MFCM card. The LED flashes continuously during start-up while the MFCM runs its internal tests.

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
OK indicator is always On and ALARM indicator is always flashing	No backplane clocks can be detected. Ensure that both a Control Module or a Resource Manager, and a Clock Card (for example, IPM, BRM, DTM, DLM) are fitted somewhere in the chassis
	Notify service personnel
ALARM indicator is On continuously	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
OK and ALARM indicators are continuously flashing	A hardware fault has been detected. Notify service personnel
POLL indicator is not flashing	Check there is a CM or RM in the chassis
	Notify service personnel

RM CM

MLQ-CMP sub-module

The MLQ-CMP sub-module uses the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique. It provides a G3 fax detection/relay capability in addition to enhanced voice compression.

Each MLQ-CMP compander sub-module supports compression/Fax relaying of two 64 kbit/s A-law or μ-law encoded channels. The companders are progressively fitted to the main board by the use of sub-modules (two companders per sub-module).

The sub-modules can be ordered separately under the code MLQ-CMP, or are already fitted to the MFCM under the following codes:

- MFCM-2 – MFCM fitted with one sub-module (two companders)
- MFCM-4 – MFCM fitted with two sub-modules (four companders)
- MFCM-6 – MFCM fitted with three sub-modules (six companders)
- MFCM-8 – MFCM fitted with four sub-modules (eight companders).

Specifications

Compression modes

6.3 kbit/s MP-MLQ algorithm that complies with ITU-T G.723.1.

A-law or μ-law encoded input signals can be compressed.

Fax speeds

The following fax speeds are supported by the MLQ-CMP sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Fax speed (kbit/s)
8	6.3	2.4, 4.8, 7.2
16	6.3	2.4, 4.8, 7.2, 9.6

Figure 75 shows the layout of the MLQ-CMP sub-module.

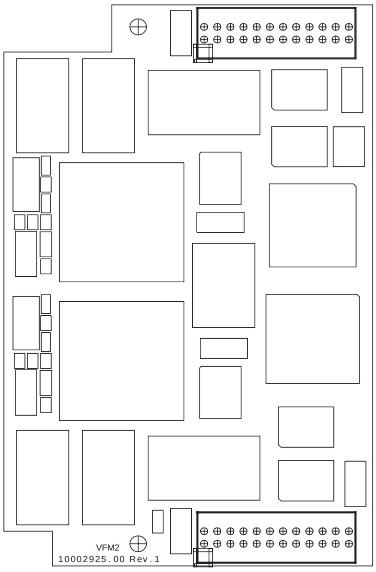


Figure 75: MLQ-CMP layout

There are no configurable links on the MLQ-CMP submodule.

RM

HD-VCM sub-module

The HD-VCM is similar to the MLQ-CMP, but provides a higher capacity. It uses the MP-MLQ (Multi-Pulse Maximum Likelihood Quantization) speech compression technique, and supports both G3 fax detection/relay and Modem Relay.

Each HD-VCM compander sub-module can support compression/Fax relaying of up to fifteen 64 kbit/s A-law or μ-law encoded signals. The following models of the HD-VCM are available and should be ordered together with an MFCM base board (MFCM-BS):

- HD-VCM-5 – has one compander providing up to 5 voice channels
- HD-VCM-10 – has two companders, providing up to 10 voice channels
- HD-VCM-15 – has three companders, providing up to 15 voice channels.

Specifications

Compression modes

6.3 kbit/s MP-MLQ algorithm that complies with ITU-T G.723.1.

A-law or μ-law encoded input signals can be compressed.

V.32bis Modem Relay

Automatic V.32bis Modem Relay is supported from 4800 bit/s up to 14,400 bit/s.

Fax speeds

The following fax speeds are supported by the HD-VCM sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Fax speed (kbit/s)
8	6.3	2.4, 4.8
16	6.3	2.4, 4.8, 7.2, 9.6, 14.4

Modem speeds

The following modem speeds are supported by the HD-VCM sub-module:

TDM channel (kbit/s)	Voice bit rate (kbit/s)	Modem speed (kbit/s)
8	6.3	4.8
16	6.3	4.8, 7.2, 9.6, 12, 14.4

Links

Figure 76 shows the position of the link on the HD-VCM sub-module.

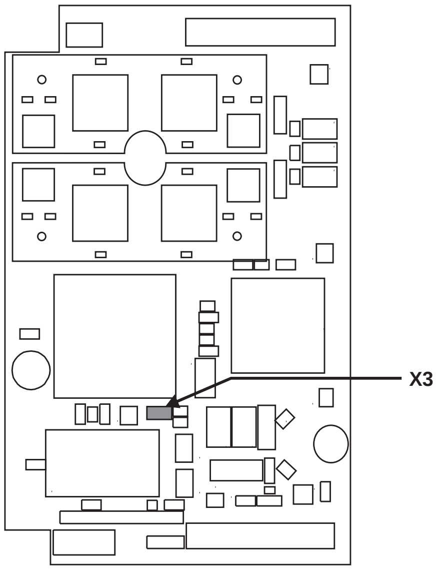


Figure 76: HD-VCM link position

Normal link settings for the HD-VCM

The following table shows the normal link settings for the HD-VCM submodule.

Ref	Normal setting
X3	1-2

Sub-module installation

MFCMs purchased with MLQ-CMP companders have a number of sub-modules factory-fitted. The number is dependent on the model ordered. For example, an MFCM-4 has two sub-modules providing four voice channels.

When ordering an MFCM for HD-VCM applications, the board is shipped with the ordered sub-modules fitted.

You may want to add or remove sub-modules according to the requirements of your network. The following describes how to fit and remove both types of sub-module. The diagram below shows the fitment of a third sub-module.

Note *If you want to upgrade your MLQ-CMP submodules to HD-VCM, follow the instructions for removing and fitting submodules given below.*

Additionally, for HD-VCM operation, the MFCM baseboard must have software at Version 8.xx or above. HD-VCMs are not compatible with MFCMs below Version 8.xx.

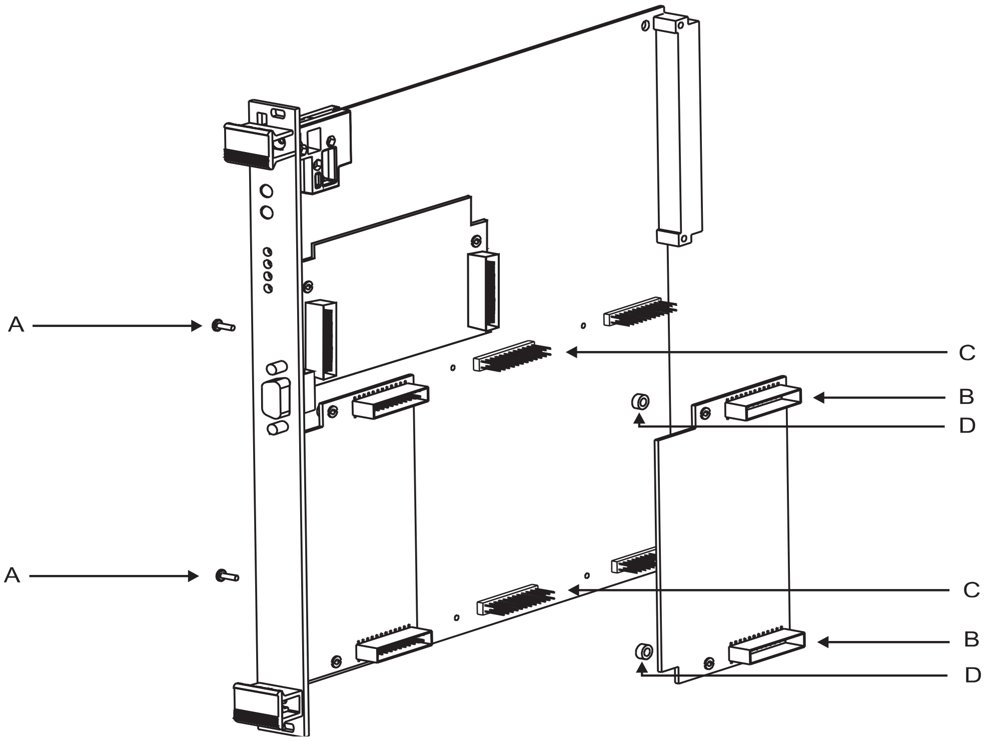
*Once an MFCM is upgraded to Version 8.xx or above, you can remotely download later versions of the HD-VCM software. For more information, refer to the **J1000/J5000 Upgrade User Note**.*

Requirements

Before you can install the MFCM sub-module(s), you must ensure that you have all of the following:

1. The MFCM sub-module(s) to be installed.
2. An anti-static bench mat.
3. An anti-static wrist band.
4. A Posi-driv 0 point screwdriver.

Installing an MFCM sub-module



1 Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.

2 Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.

3 Remove the MFCM board from the rack and place it on the anti-static mat components side up.

4 Place the MFCM sub-module on the anti-static mat wiring side up.

5 Remove the module fastening screws (A) from the MFCM sub-module.

6 Align the MFCM sub-module mating sockets (B) with the MFCM connectors (C) and press the sub-module into position. Ensure that the nylon spacers (D) are positioned correctly on the mating holes.

Note *The sub-modules must be fitted sequentially, upper module (Module 0) first, then from the front of the MFCM towards the backplane connector (Modules 1 to 3). The labels 'Module 0' to 'Module 3' indicate the position of the sub-modules.*

---

7 Insert the module fastening screws (A) into the back of the MFCM and screw the sub-module into position.

8 Replace the MFCM in the rack.

9 Observe the result of the self-test. Check that the module has ALARM LED off, OK LED on and POLL LED flashing.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

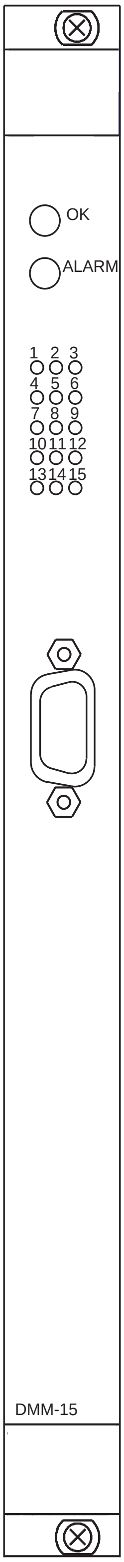
Removing an MFCM sub-module

1. Place the anti-static bench mat on a flat hard surface and connect it to an external protective earth.
2. Put the anti-static wrist strap on and connect it to either the earthing stud on the bench mat, or an external protective earth.
3. Remove the MFCM board from the rack and place it on the anti-static mat, wiring side up.
4. Remove the module fastening screws (A) from the MFCM.
5. Turn the MFCM over so that the components side is face up.
6. Gently remove the sub-module from the MFCM connectors (C). Remove the nylon spacers (D) and refit them to the sub-module using the module fastening screws (A). Place the sub-module in a suitable anti-static bag.
7. Replace the MFCM in the rack.
8. Observe the result of the self-test. Check that the module has ALARM LED off, OK LED on and POLL LED flashing.

If any error codes are displayed, note the code(s) and contact Jtec Customer Service and Support for assistance.

RM CM

Digital Modem Module (DMM)



The Digital Modem Module functions as a multi-channel, central site modem. The DMM-15 contains 15 modem channels, the DMM-8, eight modem channels.

The DMM accepts an input from an ISDN B-channel in the form of A-law or μ–law encoded PCM data. This input originates from a remote user terminal connected to the modem. Incoming data is decoded and demodulated back to the original digital signal as an asynchronous serial stream at 57.6 kbit/s. The serial stream is then rate-adapted into a 64 kbit/s timeslot and connected to a Frame Switch Module (FSM).

In the opposite direction, the DMM receives data from the Frame Switch Module in a 64 kbit/s timeslot. The input signal is converted into a 57.6 kbit/s asynchronous stream and is then modulated and encoded into A-law or μ-law PCM data.

The module provides a remote access capability for this equipment only when used in conjunction with the Frame Switch Module (FSM). See page 8-99 for details of the FSM.

Specifications

Compatibility	The DMM can be fitted to any chassis.
Module width	1 slot.
Debug port	The port is for factory testing only.
Modem data standards	V.34bis, V34, V32bis, V.32, V.22bis, V.22, V22A/B, V.23, V.21, Bell 212A, Bell 103.

Note *V.Fast Modems are not supported.*

Speed	V.34 at 33.6, 31.2 and 28.8 kbit/s V.32bis at 14.4 and 12.0 kbit/s V.32 at 9.6, 7.2 and 4.8 kbit/s V.22bis at 2400 bps V.22 at 1200 bps.
Error correction	V.42 LAPM, MNP 2-4, MNP 10.
Data compression	V.42bis, MNP 5.
Cellular	MNP 10EC.

Installation

The module can be located in any available slot position and slid into place. Insert until the module's front plate is level with the housing. No other configuration is required.

Link settings

Figure 77 below shows the position of the links on the DMM board, 10002995.00 Rev.2.

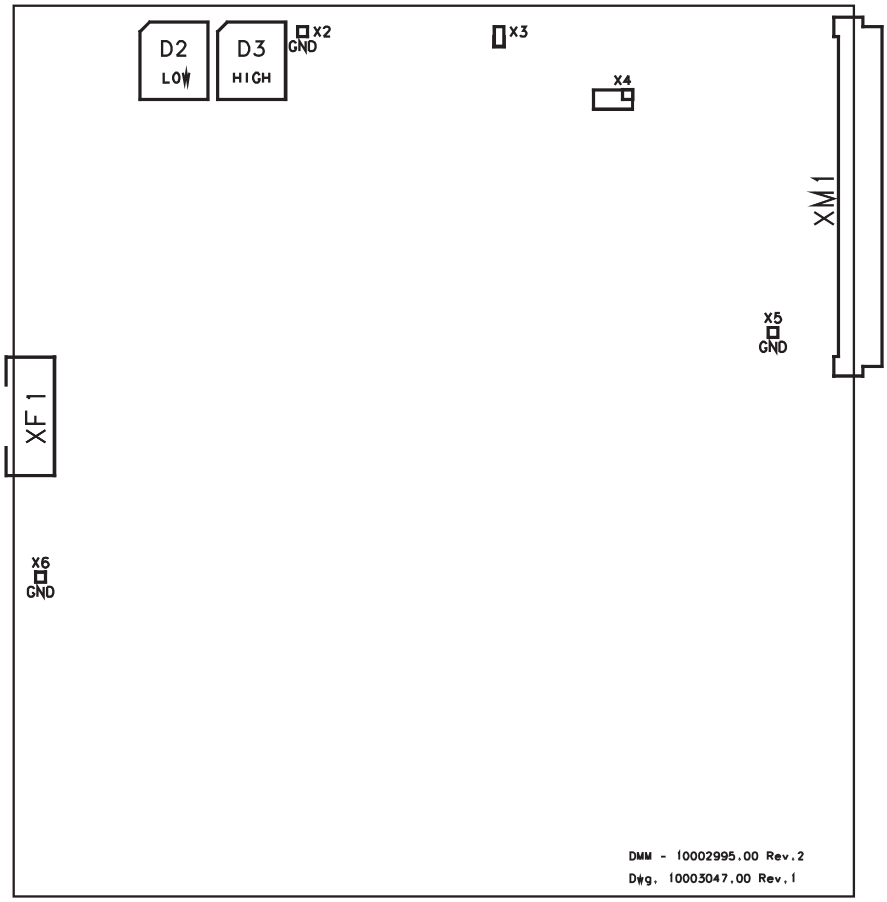


Figure 77: Digital Modem Module circuit board 10002995.00 Rev.2

Normal link settings for the DMM

The following table shows the normal link settings for the DMM 10002995.00 Rev.2.

Ref	Normal setting	Ref	Normal setting
X2	—	X5	—
X3	Fitted	X6	—
X4	Not fitted		

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
Modem 1-15 (DMM-15)[1] Modem 1-8 (DMM-8)	Green	Off -Modem idle Flashing - Call in progress On steady - Call established

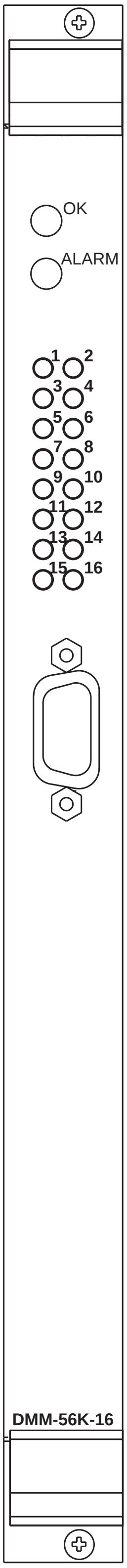
1 The Modem LED indicates an active channel. Channels are numbered 1-15 or 1-8, from left to right/top to bottom (Channel 1 is top left)

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
OK and ALARM indicators are On	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Notify service personnel

RM CM

Digital Modem Module - 56K (DMM-56K)



The DMM-56K is a multi-channel, central-site modem module. The module is similar to the DMM but adds support for V.90 56 kbit/s modem standards. The DMM-56K is available in two models:

- DMM-56K-16 providing 16 modem channels (shown here)
- DMM-56K-8 providing 8 modem channels.

The DMM-56K module supports V.90 (56 kbit/s) modem standards and legacy modulations such as K56Flex and V.34. Refer to *Specifications* on page 8-96 for a complete list of the supported modem standards.

When used in conjunction with Frame Switch Module (FSM, versions 1.48 or higher) the DMM-56K module provides remote access capability for up to 16 remote modem users. See page 8-99 for details of the FSM.

The DMM accepts an input from an ISDN B-channel in the form of A-law or µ–law encoded PCM data. This input originates from a remote user terminal connected to the modem. Incoming data is decoded and demodulated back to the original digital signal as an asynchronous serial stream at 57.6 kbit/s. The serial stream is then rate-adapted into a 64 kbit/s timeslot and connected to a Frame Switch Module (FSM).

In the opposite direction, the DMM receives data from the Frame Switch Module in a 64 kbit/s timeslot. The input signal is converted into a 57.6 kbit/s asynchronous stream and is then modulated and encoded into A-law or µ-law PCM data over an ISDN B-channel.

Specifications

Compatibility	The DMM-56K can be fitted to any chassis.
Module width	1 slot.
Debug port	The port is for factory testing only.
Modem data standards	V.90, K56Flex, V34, V32bis, V.32, V.22bis, V.22, V.21, Bell 212A, Bell 103.

Note *V.Fast Modems are not supported.*

Speed	V.90 at 56 kbit/s V.34 at 33.6, 31.2 and 28.8 kbit/s V.32bis at 14.4 and 12.0 kbit/s V.32 at 9.6, 7.2 and 4.8 kbit/s V.22bis at 2400 bps V.22 at 1200 bps.
Error correction	V.42 LAPM, MNP 2-4, MNP 10.
Data compression	V.42bis, MNP 5, Cellular MNP 10EC.
Transmission Signal Level	Limited to -12dBm in accordance with US FCC regulations.

Installation

The module can be located in any available slot position and slid into place. Insert until the module's front plate is level with the housing. No other configuration is required.

Note *When installing the DMM-56K in place of a standard DMM module, first remove the DMM module and then delete it from the device configuration database using OmniVision. Upload the device using OmniVision before inserting the DMM-56K in the vacant slot.*

Link settings

Figure 78 below shows the position of the links on the DMM board, 1000330.00 Rev.2.

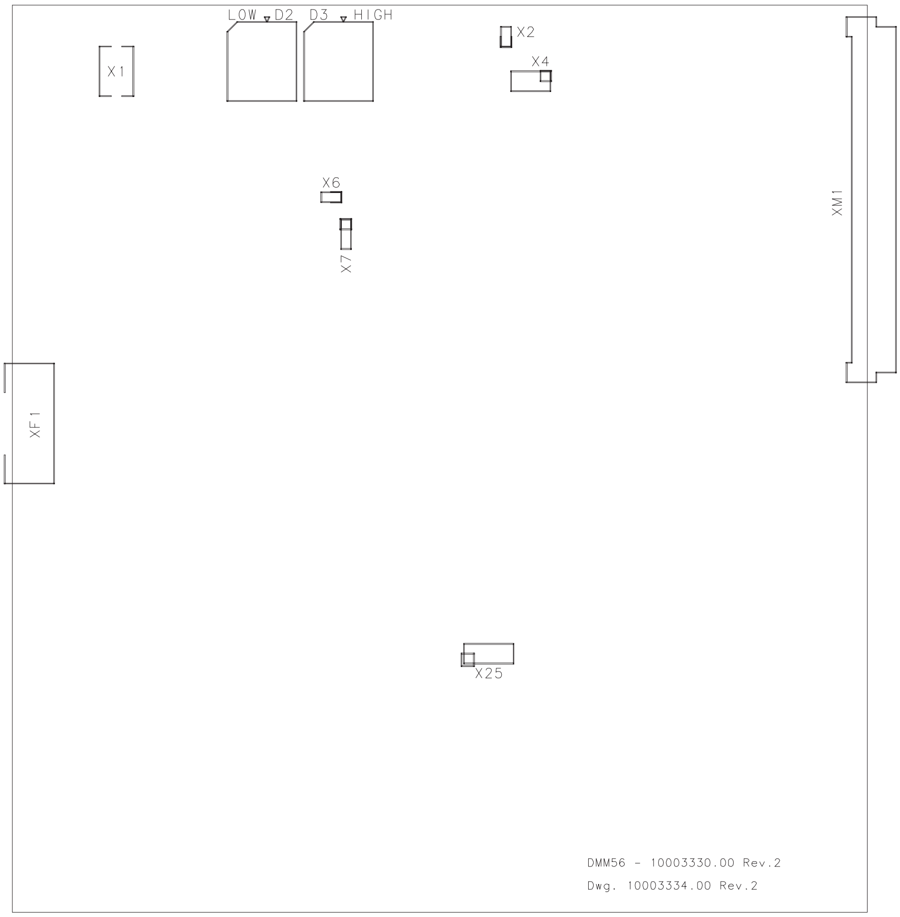


Figure 78: DMM-56K circuit board 10003330.00 Rev.2

Normal link settings for the DMM-56K

The following table shows the normal link settings for the DMM 10003330.00 Rev.2.

Ref	Normal setting	Ref	Normal setting
X2	1-2	X6	1-2
X4	Not fitted	X7	1-2

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
Modem 1-16 (DMM-56K-16)[1] Modem 1-8 (DMM-56K-8)	Green	Off -Modem idle Flashing - Call in progress On steady - Call established

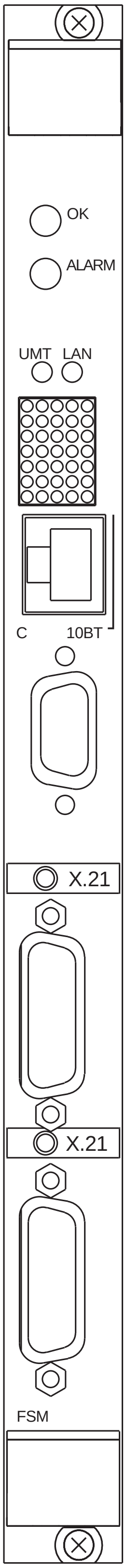
1 The Modem LED indicates an active channel. Channels are numbered 1-16 or 1-8, from left to right/top to bottom (Channel 1 is top left)

Troubleshooting

Symptom	Action
All LEDs are Off	Check PSM is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM and OK LED flashing in sequence	Check RM or CM is operational
	Check that at least one network TE (IPMT or BRMT) is present in the chassis, and that this TE module is active and properly configured, and is providing backplane clocks
	Notify service personnel
ALARM indicator is On or continuously flashing	If new ROMs have been fitted, check their orientation, location within the socket and the appropriate link settings
	Check hardware revision and link settings
	Notify service personnel

RM CM

Frame Switch Module (FSM)



The Frame Switch Module (FSM) is a Frame Relay switch with a built-in access router. It is available in two variants:

- FSM-15 — supports up to fifteen remote connections
- FSM-30 — supports up to thirty remote connections.

The FSM terminates remote devices on a LAN using the PPP protocol. It does this via an Ethernet 10baseT port or to an external router via a Frame Relay port using X.21 or V.35 access. The Frame Relay port supports access through public networks or direct connection.

The FSM supports an external RADIUS Server for access control and accounting purposes. PAP and CHAP access control protocols are also supported.

Remote access devices can be:

- 64k ISDN service
- Analog modems when used with a Digital Modem Module (DMM or DMM-56K)
- 9600 GSM data.

The FSM is NMS-configurable using OmniVision.

Specifications

Compatibility	The FSM can be fitted to any chassis.
V.24 Port	Asynchronous V.24 DTE on front panel DB9.
V.24 Port protocol	Debug port for factory use only.
V.24 data rates	19200 bit/s.
X.21 or V.35 port	X.21: DB15 female connectors on the front panel conform to ISO 4903 standard. V.35: Proprietary HD26 female connectors on the front panel. Refer to *Appendix A* for further information about connectors.
X.21 or V.35 port protocol	Frame Relay.
X.21/V.35 data rates	n x 64 kbit/s up to 2Mbit/s.
V.110 data rates	4800, 9600, 19200 or 57600 bit/s Asynchronous 4800, 7200, 9600, 14400, 19200 or 56000 bit/s Synchronous.
LAN Port	Ethernet 10BT RJ45 female.
LAN Data rates	10 Mbit/s.
Remote connection types	Modem over Async PPP. V.110 over Async PPP up to 57.6 kbit/s. Sync PPP up to 64 kbit/s.
Module width	1 slot.

Installation

Cabling

The following table describes the cable needed to connect the FSM to a local PC:

V.24 cable type	Data cable 3-core minimum plus shield.
V.24 cable length	15m max.
V.24 connector	DB9.
LAN cable	8 core plus shield.
V.35/X.21 Cable length	100 m max.
V.35/X.21 Cable type	twisted-pair multi-core.
Connectors	V.35: HD26 female. X.21: DB15 female.

Note *This port must not be directly connected to any public telecommunications network.*

Link settings

Figure 79 below shows the position of the links on the Frame Switch Module 10002631.00 Rev.3.

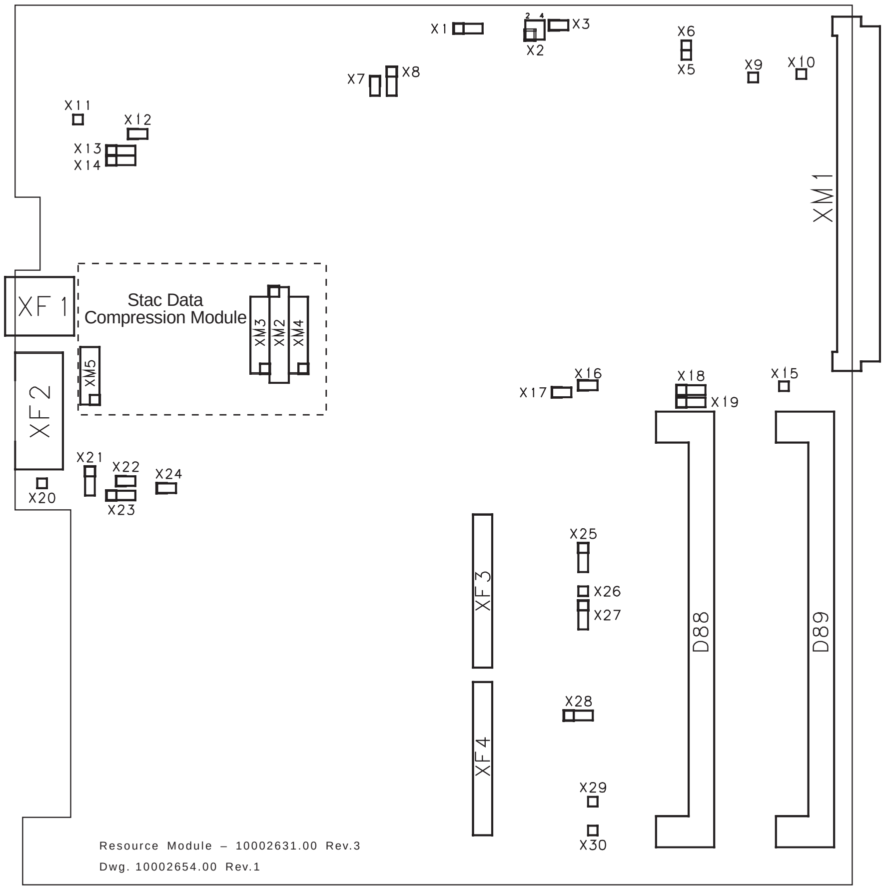


Figure 79: FSM circuit board, 10002631.00 Rev.3

Normal link settings for the FSM 10002631.00 Rev.3

The following table shows the FSM link settings.

Ref	Normal setting	Ref	Normal setting
X1	1-2	X16	Not fitted
X2	Not fitted	X17	Not fitted
X3	Not fitted	X18	See table below
X4	—	X19	See table below
X5	—	X20	—
X6	—	X21	—
X7	Not fitted [1]	X22	Not fitted
X8	Not fitted	X23	2-3
X9	—	X24	Not fitted
X10	—	X25	2-3
X11	—	X26	—
X12	1-2	X27	—
X13	2-3	X28	See table below
X14	1-2	X29	—
X15	—	X30	—

1 Fit Link X7 to disable the loading of the software image from flash memory.

Configurable Memory links - DRAM SIMMS

X18	X19	X28	SIMM 0 size (D88)	SIMM 1 size (D89)	Total (Mb)
2-3	2-3	2-3	4 Mbyte	—	4
2-3	2-3	1-2	4 Mbyte	4 Mbyte	8
1-2	2-3	2-3	8 Mbyte	—	8
1-2	2-3	1-2	8 Mbyte	8 Mbyte	16
2-3	1-2	2-3	16 Mbyte	—	16
2-3	1-2	1-2	16 Mbyte	16 Mbyte	32
1-2	1-2	2-3	32 Mbyte	—	32
1-2	1-2	1-2	32 Mbyte	32 Mbyte	64

LEDs

LED	Colour	Normal status
OK	Green	On
ALARM	Red	Off
UMT	Green	On
LAN	Green	See Note 1
LED Matrix display	Green	See Note 2

1 The LAN LED is **On** if the LAN is connected, **flashing** when transmitting data, and **Off** when no LAN is connected.

2 Indicates the active channels. Channel LEDs are positioned is left to right/top to bottom (i.e. Channel 1 is top left). The bottom row is not used. The LED is on when the Link Control Protocol (LCP) has reached the Open State. The LED flashes during LCP negotiation.

Troubleshooting

Symptom	Action
All LEDs are Off	Check Power Supply is operational
	Check that the module is properly located in the subrack
	Notify service personnel
ALARM LED On continuously	If a RAM has just been fitted, check its orientation, location within the socket, and size allocations in the link setting tables.
	Notify service personnel
ALARM LED and OK LED flashing in repeating sequence	Notify service personnel
OK LED On and ALARM LED flashing at 1 s interval	Notify service personnel
OK LED and ALARM LED on, LAN LED flashing at 0.5 sec interval	No software image present in flash. Notify service personnel
Line LED flashing	The line has not yet reached the PPP Link Control Protocol (LCP) Opened state. LCP Opened state is indicated by a steady illumination. Check that the Low Layer Compatibility and Bearer Capability are correctly configured for the WAN line.

Troubleshooting

Overview

This section outlines some of the facilities available to you for troubleshooting. However, if you encounter a problem that you are unable to solve, please contact your support agent.

Hardware faults

When a hardware failure is detected, the fault is traced, if possible, to a particular module within the device. Any module can be replaced without removing power from the rest of the system. This ensures that normal operation can be restored with minimum disruption to other functions.

Module failure monitoring

If a module fails to respond on the Contention Bus (CBUS) on the device for any reason (for example, power down, module removal or module failure), the Resource Manager (RM) or Control Module (CM) marks it as dead and reports its failure to the NMS PC or workstation terminal. The entries for the lines on the module remain in the line database and may only be removed by user intervention via OmniVision. This is so that valuable information such as telephone numbers will not be lost if module replacement is performed or the module has simply been powered down.

Power supply monitoring (six and fifteen slot models)

Although the Power Supply Modules (PSMs) in this equipment are not capable of communicating with the RM or CM in the same way as the line modules, the RM or CM is able to detect their existence and monitor their status. The RM or CM reports the existence of any PSMs it detects to the NMS PC or workstation terminal and, if a failure occurs, reports the failure status of the PSM concerned. Obviously, if only one PSM is fitted, if both PSMs fail or if the power supply to the PSMs fails, the RM or CM cannot report anything to the PC/workstation. However, in this event it uses its knowledge of the PSM status to cease any processor activity and secure the integrity of the Non-Volatile Configuration.

Fan monitoring (J5004)

The J5004 chassis incorporate two cooling fans. The status of these fans is monitored by the NMS. If a fan stops operating, the NMS is notified. You should replace an inoperative fan as soon as possible.

Status reporting

The RM or CM is responsible for reporting both line and module status to the PC or workstation terminal. For lines, call status (busy/idle/connected/failed) is reported. For modules, overall module health (module alive, module dead) is reported. Both line and module status are indicated on the NMS screen. Line status is indicated by the colour of the line’s icon, and module status is indicated through the representation of the module’s LEDs on the NMS screen.

Test number

The test number is a diagnostic loopback facility provided by the equipment. A call can be made to the test number and any signal on the B-channel will be looped back to the originating end of the call. The test number accepts incoming calls with any combination of Bearer Capability, Low Layer Compatibility, and High Layer Compatibility. A maximum of 30 simultaneous calls can be made to the test number.

Any D-channel user-to-user data associated with the call will be sent back to the originator of the call on the D-channel.

Call logging

The RM or CM is fitted with a real time clock which may be set from the PC. This is used to time-stamp information logged about calls to and from the device. A call is logged when it is terminated. The information is then sent to the PC if logging is enabled. The RM or CM call log entries can be passed to the PC when a session is established with the device. The log includes the following information:

- Called Party Number
- Called Party Subaddress
- Calling Party Number
- Call direction
- Call type
- B-channel used
- Call start time
- Call finish time
- Reason for call termination
- Source of call termination
- Qualifier included in Disconnect message.
- Advice of charge information (where available).

Module failures and alarm conditions are also logged.

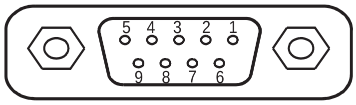
Alarms

OmniVision provides a number of alarm facilities to help you manage your network. Conditions that generate an alarm can be defined; if the alarm signalling option is enabled, the device will report the alarm condition as it occurs. A serial alarm interface option is also available whereby alarms are converted into a format that can be recognized by an external network management system. See your *OmniVision User Manual* for further information.

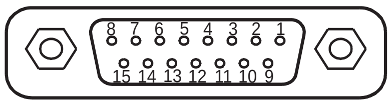
Appendices

Appendix A

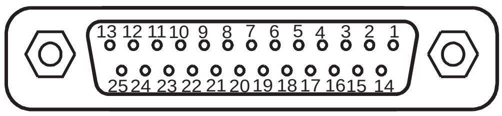
Connector pinouts



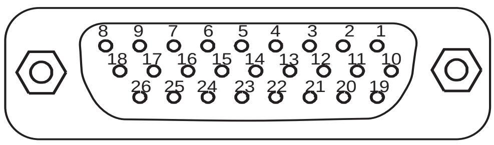
DB9 connector



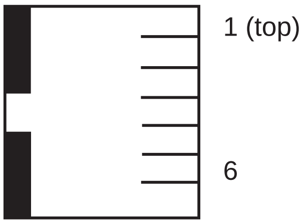
DB15 connector



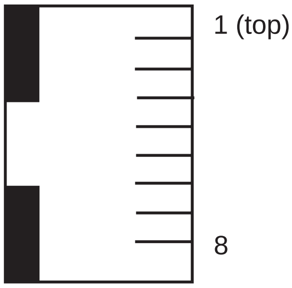
DB25 connector



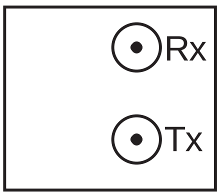
HD26 connector



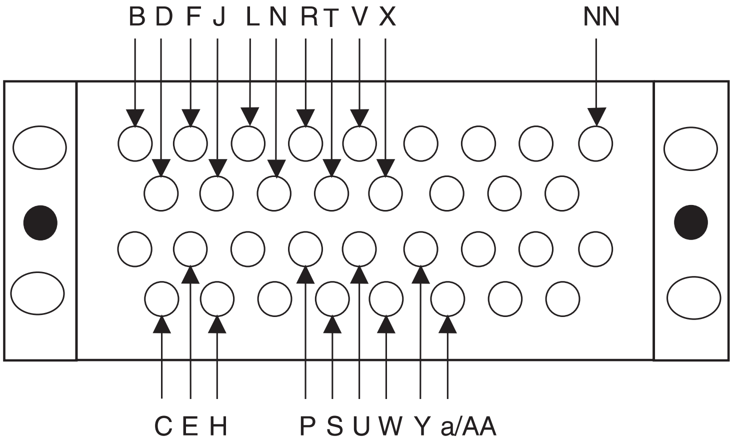
RJ11 connector (female socket)



RJ45 connector (female socket)



1.6/5.6 coaxial sockets



M34 connector

Appendix B

Connecting the QLLB V.24 and QLLB V.35 to Kilostream

Note *Appendix B applies to the UK only.*

Service Category	Interface type[1]	Data rate	Service requirements		PTO		
	ITU-T recommendation		Physical	Electrical	BT[2]	Hull[3]	MCL[4]
1	X.21 bis (V.24)	2400 4800 9600 19200	Connection via a 25-way D-type connector. Method of retention via 2 x 4-40 UNC internally threaded bushes.	See pin assignment table on page 7-56.	yes yes yes	yes yes yes	yes yes yes yes
2	X.21 bis (V.35)	48000 56000 64000	Connection via an M34-type connector. Method of retention via 2 x 6-32 UNC internally threaded bushes.	See pin assignment table on page 7-57	yes yes	yes	yes yes yes

1 It should not be assumed that all PTOs will choose the same set of options available within the recommendations.

2 British Telecommunications plc.

3 Kingston Communications (Hull) plc.

4 Mercury Communications Ltd.

Appendix C

Call path loss

The following tables detail the call path loss for installations in the nominated countries.

The port type indicated in the tables relate to modules as follows:

- Analog Tie Line — an EMM port
- Analog Extension — an ALEM-2, ALPM-2 port or COMBO ALIM-EXCH port
- PSTN — an ALPM-2 port
- Digital — any digital port
- N/A — not applicable.

Note *Each table entry represents the loss range for transmission in direction from port type in the left hand column of the table to port type in the top row of the table.*

Warning	The ALEM-2 is not permitted to be connected to PSTN in the UK and Australia.

UK installations

The following table details the call path losses for UK installations:

		To			
	Port type	**Analog Tie Line**	**Analog Extension**	**PSTN**	**Digital**
From	**Analog Tie Line**	0dB	4 to 6dB	-3dB	0dB
	Analog Extension	3 to 5dB	7 to 11dB	0 to 2dB	3 to 5dB
	PSTN	-6dB	-2 to 0dB	N/A	-6dB
	Digital	0dB	4 to 6dB	-3dB	0dB

Note *Call path loss includes the relative loss associated with ports and cabling that may be attached to the extension port, provided that port input and output relative levels have been set in accordance those specified in the relevant module specification.*

Australian installations

The following table details the call path losses for Australian installations:

	Port type	To: Analog Tie Line	To: Analog Extension	To: PSTN	To: Digital
From	**Analog Tie Line**	0dB	6.5dB	0.5dB	0dB
	Analog Extension	0dB	6.5dB	0.5dB	0dB
	PSTN	-6dB	0.5dB	N/A	-6dB
	Digital	0dB	6.5dB	0.5dB	0dB

USA/Canadian installations

The following table details the call path losses for USA/Canadian installations:

	Port type	To: Analog Tie Line	To: Analog Extension	To: PSTN	To: Digital
From	**Analog Tie Line**	3dB	3dB	N/A	0dB
	Analog Extension	3dB	3dB	N/A	0dB
	PSTN	N/A	N/A	N/A	N/A
	Digital	3dB	3dB	N/A	0dB

Appendix D

Call path delays

The following table specifies the call path delays for installations.

The port type indicated in the table relates to the modules as follows:

- Analog Tie Line — an EMM port
- Analog Extension — an ALEM-2, ALPM-2 port or COMBO ALIM-EXCH port
- PSTN — an ALPM-2 port
- Digital — any digital port.

Port type	Analog Extension	Analog PSTN	Analog Tie Line	Digital
Analog Extension	500µsec	500µsec	500µsec	1 msec
Analog PSTN	500µsec	N/A	500µsec	1 msec
Digital	1 msec	1 msec	1 msec	1.5msec

Note *Additional call path delays may be incurred if the voice compression and sub-channel switching features of the equipment are used.*

Glossary

ALEM Analog Line Exchange Module.

ALIM Analog Line Interface Module. Used on the Combo Module.

ALM Analog Line Module. Includes ALEM, ALPM and EMM.

ALPM Analog Line Phone Module.

analog An analog (analogue) signal is electrical and varies constantly in voltage. This is unlike a digital signal which varies between two constant values, usually denoted as 0 and 1.
The value of the analog signal varies continually during transmission, whereas a digital signal only ever changes between two set values without any intermediate variations. See *Digital*.

AOC (Advice Of Charge) A supplementary service which provides the cost of nominated outgoing calls. The service can be subscribed to from the ISDN provider. Charging information is provided in the form of units, $ per unit and packet charges on a per call basis.

application A general term for any program or software package such as a word processing, database, spreadsheet or graphics package.

area code telephone number prefix representing a geographic area.

asynchronous A way of transmitting data whereby each information character, or sometimes each word or small block, is individually synchronised. This is usually achieved by labelling the beginning and end of each character with additional bits, known as start and stop bits.
Also known as start/stop transmission. See *synchronous*.

Auto Answer Used when the called DTE is not using X.21 circuit switched call establishment and clearing procedures. An incoming call will be automatically answered.

B-channel An ISDN 64kbit/s channel that carries customer information such as encoded voice, circuit-switched or packet-switched data. Known as the bearer channel.

base number Can be defined when you configure IPMTs and BRMTs. It is subtracted from an incoming called party number and the call is directed to the line with the resulting number,
for example, 4507020 (incoming) - 4507000 (base) = 20 (line called).
The base number is also added to the area code and line number to generate the 8 digit national significant number which is sent as the calling party number on outgoing calls,
for example, 20 (line calling) + 4507000 (base) + 2 (area) = 24507020.

Basic Rate ISDN transmission type comprising of two 64kbit/s B-channels for user transmission and one 16kbit/s D-channel for common channel signalling.

baud (Bd) A unit of signalling speed of a data transmission device. The speed expressed in bauds (Bd) reflects the number of discrete conditions or signal events per second.

BCAM B-Channel Aggregation Module.

bearer service The communication link of a service that provides for the transmission of digital information (for example, digitised voice and data) between user devices.

BERT Bit Error Rate Testing.

bi-directional A link whereby it is possible to transfer information simultaneously in both directions between two points.

bit A binary unit of information that can have one of two values - 0 or 1. The word comes from the contraction of binary digit.

bit/s Bits per second. Used to describe data transmission rate. Also called bps and bits/s.

BRMN Basic Rate Module Network.

BRMT Basic Rate Module Terminal.

broadcast A unidirectional transmission to multiple receiving locations simultaneously.

byte A small group of bits, usually 8, that combine to represent a character or measurement of memory capacity.

call The temporary connection (or apparent connection, as perceived by the caller) of one terminal to another, for example, a telephone call.

call control A function performed by the network layer (layer 3) of communications. It provides call routing, number analysis, and call setup and clearance services.

Call Log OmniVision logging facility, which records details of sessions, module function and errors.

CAS Channel Associated Signalling. A signalling method in which traffic signals carried by a single channel are transmitted in the channel itself or in a signalling channel permanently dedicated to it.
E1 modules incorporate a CAS option.
Timeslot 16 is used as the dedicated signalling channel for timeslots 1 – 15 and 17 – 31.

channel A conceptual pipe, that represents a specific portion of the information carrying capability of an interface, through which information (for example, control signals, voice, data) may be transported.

CLI Called/Calling Line Identification. A supplementary service which can be subscribed to from the ISDN provider. It controls the identification of the number of the calling party (A) to the called party (B).

CLIVE Calling Line Identification Verification Enhancement.

clipboard A temporary storage location within Windows ™. You can use the clipboard to transfer data between applications, and within applications.

Configuration Set of values which control the operation of the device.

COT Central Office Trunk. A ring in/loop out analog trunk line that connects to PABXs. Calls to the PABX are directed to pre-determined answering points. Calls from the PABX contain destination routing information, that is a telephone number.

CSS Customer Switching System. Any switching system that can switch voice, digital data, images, video or any other information signals, and operates beyond the network service provider's telecommunications network boundaries.

D-channel An ISDN 64kbit/s (Primary Rate) or 16kbit/s (Basic Rate) channel that carries common channel signalling and user-to-user information. Known as the delta channel.

Data Terminal Equipment (DTE) Equipment which converts user information into data signals for transmission, and vice-versa, for example, a PC.

database file A file in the OmniVision directory of the PC containing configuration information. An equivalent file is also stored in the Resource Manager or Control Module.

DCE Data Circuit-terminating Equipment. Equipment that provides signal conversion and coding between data terminal equipment and a line, for example, a modem.

DDI Direct Dial In. A loop in analog trunk line that connects to a PABX. Calls to the PABX contain destination routing information, that is an extension number. DDI allows incoming PABX calls to be directed to an extension without attendant supervision. Also known as DID trunk (Direct Inward Dialling) and Indial trunk.

default A value which is automatically selected after system start-up. This value can be altered by the user.

digital A digital signal is a signal that takes only one of two values, normally denoted as 0 or 1, during transmission. This is in contrast to an analog signal which can take any value between a minimum and maximum at any particular time during transmission. See *analog*.

DLM Digital Line Module.

DOS Disk Operating System.

Drop and Insert A procedure whereby a connection is broken and another device is inserted in series, without affecting the original application.

DTE Data Terminal Equipment. Equipment which converts user information into data signals for transmission, and vice-versa.

DTMF Dual Tone Multiple Frequency. Signalling scheme that uses two audio tones to pass dialled numbers to the network.

DTR Data Terminal Ready. Control lead on V.24 and V.35 digital line cards. Defined as Interchange Circuit No.108.

duplex transmission Data transmission in both directions, either simultaneously (full duplex) or alternately (half duplex).

E1M E1 Module.

end-to-end signalling Signalling between parties at either end of a link, independently of the link signalling.

error A discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.

extension (Extn, Xtn). A locally provided terminal equipment service, for example, a telephone which is connected to a PABX.

facsimile (Fax). The process of scanning a document, converting the image into electrical signals for transmission to a remote receiver, and the conversion of the received signals into a copy of the original document.
A machine that performs the facsimile process.
The copy document that is produced by the facsimile process.

G.703 The ITU-T standard for the physical traits of transmissions over digital circuits.

gain Increased signal power, usually after the signal passes through an amplifier, repeater or antenna. Normally expressed in decibels (dB).
The opposite of gain is loss (or attenuation), which is often described as negative gain.

group number Allocated main directory number within the range allocated by ISDN provider. It is written on the label of the NT1.

group number (basic rate) Where a BRMT is connected to a basic rate with a Multiple Subscriber Number (MSN) numbering scheme, the group number is the full number without the last digit (UK only).

hotline dialling Provides rapid call connection to one number. The called number is sent in the setup message.

icon A symbol used by an operating system or application to represent an event, object, tool, command, etc.

IDD International Direct Dial. The facility whereby network service provider customers can place unassisted international calls to other customers.

input/output (I/O) A general term for the equipment used to communicate with a computer; also the data involved in such communication.

interface A boundary between two systems, or two parts of one system, across which all of the signals that pass are carefully defined.
The definition includes the connector signal levels, impedance, timing, sequence of operation, and the meaning of signals.

IPMN ISDN Primary Rate Module Network.

IPMT ISDN Primary Rate Module Terminal.

ISDN Integrated Services Digital Network. A ITU-T standardised telecommunications service that provides for the transmission of voice, data and image, and a common channel digital signalling system. End-to-end digitised voice and data traffic is handled simultaneously on the same links via the same exchanges. Network access includes Basic Rate (2B+D ~ 144kbit/s) and Primary Rate (30B+D ~ 2.048Mbit/s)
ISDN is defined in the ITU-T I.400 series.

ITU-T InternationalTelecommunications Union - Telecommunications. Formerly the Comité Consultatif International de Télégraphie et de Téléfonie (CCITT). The ITU-T belongs to the International Telecommunications Union, which itself is a part of the United Nations. It publishes a set of recommendations, which are voluntarily adhered to by equipment providers and service providers worldwide. Examples of ITU-T recommendations are X.25, V.24 and G.703.

ITU-T Recommendations These are listed in *Appendix B* of the *Reference Manual*.

kbit/s Kilobits per second (thousand bits per second). Used to describe data transmission rate. Also called kbps and kbits/s.

LAN Local Area Network.

layer A collection of related network-processing functions that together comprise one step of a hierarchy of functions, for example, the OSI reference model has seven layers.

LED Light Emitting Diode. A semiconductor junction diode that emits light in either the visible or non-visible range. Uses include alphanumeric displays, status indicators (for example, power on/off, alarm reported, etc.) and light sources for fibre optic communications.

line A concept. Not necessarily a physical port, and not necessarily on the user or network side. An ALEM has four lines and an E1MN has 31. We use a physical line number (for example, ALEM lines 1 top to 4 bottom), and a Line Number entered in the Line Configuration dialog box which is used to match the phone number of the line.

lineset A range of ISDN numbers associated with a group of ports. Called numbers in the range are directed to one of the ports. One or many numbers can be associated with one or many ports.

LLB Leased Line Backup.

local device One to which the computer running an NMS session is connected via the serial port on the Resource module, not over the ISDN.

local number Telephone number without area code, for example, 450 7000.

loopback A diagnostic facility to assist in the determination of data transfer faults. The transmit and receive channels of a device are effectively connected, such that all received information is immediately re-transmitted to the source. Often used in conjunction with BERT (Bit Error Rate Testing) in digital systems.

Management number A number defined in RM or CM configuration which is matched to the device in order to receive D-channel calls. If absent, all incoming D-channel calls are assumed to be for establishing a session between OmniVision and the device, to allow configuration of an unconfigured device. Must be numbered like other lines within the allocated ISDN range.

Mbit/s Megabits per second (million bits per second). Used to describe data transmission rate. Also called Mbps and Mbits/s.

Microsoft Windows An operating system which provides a graphical interface for PCs.

mode A type of operation, for example, configure, monitor, etc.

modem (modulator/demodulator) Device which transforms (modulates) a digital bit stream into an analog signal, and vice-versa.

MS-DOS Microsoft Disk Operating System.

ms (millisecond) One thousandth of a second.

multiplex The process of transmitting multiple signals from different sources over a common cable, transmission line, or channel.

national (significant) number Telephone number including the area code without the first leading zero. The AOTC definition has 8 digits.
for example, (02) 123 7000 – 21237000 (006) 992 000 – 06992000.

network A series of points, or nodes, connected by communications channels.

Network Independent Clock (NIC) The clock of a digital synchronous device is carried over a synchronous network and reproduced at the other end. The digital device clock is independent of the network clock. The ISDN low layer compatibility information element (LLC) allows this to be configured. Jtec does not provide this feature, but provides access to the LLC to allow external devices to provide clock buffering.

node A point on a network that demands or supplies services, or where transmission paths are interconnected, typically by means of switching.

NMS Network Management System. For example, Jtec’s JUMP or OmniVision.

NT1 (Network Termination 1) Device which terminates the ISDN on the user's premises. The ISDN equivalent of a telephone socket.

NT2 (Network Termination 2) Device which lies between terminal equipment (TE) and the network termination 1 (NT1), providing switching and/or multiplexing facilities, for example, an IPMT, a digital PABX.

online and offline A device is online if a session is established with the PC running an NMS session. If the NMS is offline, it is accessing the device’s database file stored on the PC. There are no active sessions.

OSI Open Systems Interconnection. A model devised by the International Standards Organisation (ISO) to describe and categorise the different functions that need to be performed by systems to ensure effective communication between devices. The model consists of seven hierarchical layers representing a network and its supported services. Each layer from the lowest to the highest uses the services of the lower layers to create and make available new services to higher layers.

PABX Private Automatic Branch Exchange. A type of CSS that connects to voice services via trunk lines (for example, COT and DDI) that are provided by the network service provider. Allows optionally unattended incoming, outgoing and internal extension calls. Also called PBX.

password The password required to leave *monitor* mode, and to establish a session with an unconfigured device is Jtec (case sensitive). These passwords can be changed via OmniVision.

PC (Personal Computer) An IBM or compatible PC is needed to run the NMS software. Windows ™ system requirements should be adhered to.

port The physical entry and exit point (termination point) for information going into and out of a module, that is, the User Interface.

Primary Rate (also PRA and 30B+D) An ISDN term that describes the 30B+D interface, that is thirty 64kbit/s transmission links and one 64kbit/s signalling channel. These are known as bearer links and the delta channel. Also PRA (Access), PRI (Interface).
The primary rate interface implemented by Jtec for connection to the AOTC ISDN is defined in AOTC TPH.1856 and Austel TS.14. The ITU-T recommendation is the I.430 series.

Primary Rate (Australia) The primary rate interface implemented by Jtec for connection to the AOTC ISDN is defined in AOTC TPH.1856 and Austel TS.14. The ITU-T recommendation is the I.430 series.

Primary Rate (UK) The primary rate interface implemented by Jtec for the U.K. is defined in BT NR 190.

protocol A set of rules governing the information flow within a communications infrastructure, otherwise known as data link control.
Protocols control format, timing, error correction and running order. Suites of protocols are often used in networks, with each protocol responsible for one part of a communications function. See *OSI*.

PSM Power Supply Module.

PSTN Public Switched Telephone Network. The complete public telephone system, including telephones, local and trunk lines, and exchanges.
Links are only held as long as a call is in progress. Local lines to telephones are usually analog in nature.

QDLM Quad Digital Line Module.

QLLB Quad Leased Line Backup.

RAM Random Access Memory. A storage location where information can be entered, stored and removed (written, held and overwritten), as required. A power source is required to maintain the contents of the memory.

re-boot To restart your PC, forcing DOS to be re-loaded.
Press the Ctrl, Alt and delete keys simultaneously.

relative level (dBr) The relative (power) level of a point in a transmission system is the nominal power gain at the reference frequency, from a reference point to the point considered.
Relative levels can be used to compare two or more points of a network with respect to power. One point of a network is usually defined as the reference point at 0dBr, from which other measurement points are derived.

remote device One to which the computer running an NMS session is connected over the ISDN.

retry To try again.

ring back tone The signal heard by the user of a telephone when the called telephone is being rung.

RM Resource Manager.

ROM Read Only Memory.

SAM Signalling Access Module.

scroll bar For viewing more of a window or list box. Click on either arrow to scroll one line, click on the bar to scroll one window, or move the box to scroll any distance.

SELV Safety Extra Low Voltage.

semipermanent (or SPC) (Australia only) The equivalent of a tie line or leased line between two parties through the ISDN, set up by the ISDN provider. Can be deactivated to free the B-channel for other traffic.

semipermanent backup (Australia only) Attempts one hotline connection if the semipermanent drops out for more than 3 seconds. The NMS gives no indication whether a semipermanent or more expensive switched call is operating. If a hotline call is established, it must be manually cleared. Backup should therefore be used with care.

session status An indication of the relationship between the PC running the NMS and the device, displayed in the device's window title bar:

Online	Session established between the NMS and the device.
Offline	No session established between the NMS and the device.
Uploading	Configuration being sent from the device to the NMS.
Downloading	Database file being sent from the NMS to the device.
Connecting	Making connection between the NMS and the device.

signal A physical phenomenon whose characteristics may vary to represent information.

SPC (semipermanent connection) (Australia only) ISDN equivalent of a data leased line or voice tie line.

SRMM Subrate Multiplexer Module.

subaddress A suffix to a line or hotline number which is not interpreted by the network. If a called party subaddress number Information Element (IE) is received on an incoming call, the subaddress is checked against the configured line subaddress. The line subaddress is sent, if configured, as the calling party subaddress IE on outgoing calls.

subrack The chassis which functions as the equipment housing. The J15 slot subrack is designed to fit into standard 19 inch equipment racks. It measures 7 IU (that is, 7 x 44.5 mm) in height. Installation of a 1 IU vent panel above each subrack is recommended to allow for adequate airflow.

subrate and subchannel A rate or channel of less than 64 kbit/s, in multiples of 8 kbit/s, for example, 8, 32 and 56 kbit/s.

supplementary service A type of telecommunication service that can only be used in conjunction with one or more bearer or teleservices. May be subscribed to from the ISDN provider.

synchronous A way of transmitting data whereby there is a constant interval between the transmitted bits, obviating the need for start and stop bits that are necessary for asynchronous transmission. This increased sophistication allows for faster transmission rates. The method does, however, demand that the two devices involved in the interchange must be synchronised. This is achieved by one device providing the clock (generally DCE) and the other synchronising to that clock. The ISDN is a synchronous network. See *asynchronous*.

T309 An ISDN layer 3 timer. If T309 is enabled, calls are automatically cleared after a certain time following a layer 2 failure. Primary Rate calls are cleared after 15 seconds. Basic Rate calls are cleared after 2 seconds.
The T309 disable option in OmniVision is only available for IPMTs and BRMTs with a version number greater than 3.0.

TA (Terminal Adaptor) Device that adapts non-ISDN equipment to a standard ISDN interface, for example, a device that converts RS-232 to ISDN.

TE (Terminal Equipment) Equipment that makes use of the ISDN.
TE1 has a standard ISDN interface (for example, a digital telephone).
TE2 does not have a standard ISDN interface (for example, an analog telephone), and requires a terminal adaptor (TA).

telecommunications Any transmission and/or emission, and reception of signals that represent signs, writing, images and sounds, or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

telephony A form of telecommunication that allows the transfer of speech, bidirectionally and in realtime.

telex Teleprinter exchange network. System of text communication between text-only teleprinters at 50 bit/s (6 characters per second).

test number A number, defined in RM configuration, for diagnostic loopback testing of B-channel connections to and from the device.

tie line Also leased line. A private-line type communications channel that is used to link two CSSs. Provides interworking and/or traffic transfer capabilities. Also known as Tie Trunk and Leased Line.

TNV Telecommunications Network Voltage.

toolbar A collection of icons that you can use to access OmniVision commands.

transmission The transfer of information from one point to another point, or points, by means of signals.

U Unit Height. 1U=44.45mm.

unidirectional Pertaining to a link where the transfer of information is possible in one pre-assigned direction only.

virtual line A named group of lines which can be treated as one for call control purposes. It has no physical attributes itself, but is defined by its members. The three types of virtual line are subrate multiplexed, non-subrate multiplexed, and broadcast.

VX Virtual eXchange.

XSPC (TM) Switched Semipermanent Connection. A facility which attempts to automatically re-establish a failed hotline call at timed intervals.

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