INSTALLATION AND OPERATION MANUAL

RICi-16

Ethernet over Bonded PDH Network Termination Unit

Version 2.1

EtherAccess

RAD

data communications

The Access Company

RICi-16

Ethernet over Bonded PDH Network Termination Unit

Version 2.1

Installation and Operation Manual

Notice

For further information contact RAD at the address below or contact your local distributor.

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Limited Warranty

RAD warrants to DISTRIBUTOR that the hardware in the RICi-16 to be delivered hereunder shall be free of defects in material and workmanship under normal use and service for a period of twelve (12) months following the date of shipment to DISTRIBUTOR.

If, during the warranty period, any component part of the equipment becomes defective by reason of material or workmanship, and DISTRIBUTOR immediately notifies RAD of such defect, RAD shall have the option to choose the appropriate corrective action: a) supply a replacement part, or b) request return of equipment to its plant for repair, or c) perform necessary repair at the equipment's location. In the event that RAD requests the return of equipment, each party shall pay one-way shipping costs.

RAD shall be released from all obligations under its warranty in the event that the equipment has been subjected to misuse, neglect, accident or improper installation, or if repairs or modifications were made by persons other than RAD's own authorized service personnel, unless such repairs by others were made with the written consent of RAD.

The above warranty is in lieu of all other warranties, expressed or implied. There are no warranties which extend beyond the face hereof, including, but not limited to, warranties of merchantability and fitness for a particular purpose, and in no event shall RAD be liable for consequential damages.

RAD shall not be liable to any person for any special or indirect damages, including, but not limited to, lost profits from any cause whatsoever arising from or in any way connected with the manufacture, sale, handling, repair, maintenance or use of the RICi-16, and in no event shall RAD's liability exceed the purchase price of the RICi-16.

DISTRIBUTOR shall be responsible to its customers for any and all warranties which it makes relating to RICi-16 and for ensuring that replacements and other adjustments required in connection with the said warranties are satisfactory.

Software components in the RICi-16 are provided "as is" and without warranty of any kind. RAD disclaims all warranties including the implied warranties of merchantability and fitness for a particular purpose. RAD shall not be liable for any loss of use, interruption of business or indirect, special, incidental or consequential damages of any kind. In spite of the above RAD shall do its best to provide error-free software products and shall offer free Software updates during the warranty period under this Agreement.

RAD's cumulative liability to you or any other party for any loss or damages resulting from any claims, demands, or actions arising out of or relating to this Agreement and the RICi-16 shall not exceed the sum paid to RAD for the purchase of the RICi-16. In no event shall RAD be liable for any indirect, incidental, consequential, special, or exemplary damages or lost profits, even if RAD has been advised of the possibility of such damages.

This Agreement shall be construed and governed in accordance with the laws of the State of Israel.

Product Disposal

To facilitate the reuse, recycling and other forms of recovery of waste equipment in protecting the environment, the owner of this RAD product is required to refrain from disposing of this product as unsorted municipal waste at the end of its life cycle. Upon termination of the unit's use, customers should provide for its collection for reuse, recycling or other form of environmentally conscientious disposal.

General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

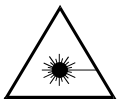
Safety Symbols

Warning

This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

Protective ground: the marked lug or terminal should be connected to the building protective ground bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.

Please observe the following precautions:

- Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.
- Do not attempt to adjust the laser drive current.
- Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.
- The use of optical devices with the equipment will increase eye hazard.
- Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective ground terminal. If a ground lug is provided on the product, it should be connected to the protective ground at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in grounded racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Some products may have panels secured by thumbscrews with a slotted head. These panels may cover hazardous circuits or parts, such as power supplies. These thumbscrews should therefore always be tightened securely with a screwdriver after both initial installation and subsequent access to the panels.

Connecting AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

Connecting DC Power

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC power systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC power supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC power supply is floating, the switch must disconnect both poles simultaneously.

Connecting Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1 Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2 Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3 Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The grounding and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk, there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention Pour réduire les risques s'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good ground connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the ground bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the 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 Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning	This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.
Avertissement	Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.
Achtung	Das vorliegende Gerät fällt unter die Funkstörgrenzwertklasse A. In Wohngebieten können beim Betrieb dieses Gerätes Rundfunkströrungen auftreten, für deren Behebung der Benutzer verantwortlich ist.

Mise au rebut du produit

Afin de faciliter la réutilisation, le recyclage ainsi que d'autres formes de récupération d'équipement mis au rebut dans le cadre de la protection de l'environnement, il est demandé au propriétaire de ce produit RAD de ne pas mettre ce dernier au rebut en tant que déchet municipal non trié, une fois que le produit est arrivé en fin de cycle de vie. Le client devrait proposer des solutions de réutilisation, de recyclage ou toute autre forme de mise au rebut de cette unité dans un esprit de protection de l'environnement, lorsqu'il aura fini de l'utiliser.

Instructions générales de sécurité

Les instructions suivantes servent de guide général d'installation et d'opération sécurisées des produits de télécommunications. Des instructions supplémentaires sont éventuellement indiquées dans le manuel.

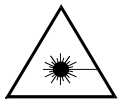
Symboles de sécurité

Avertissement

Ce symbole peut apparaitre sur l'équipement ou dans le texte. Il indique des risques potentiels de sécurité pour l'opérateur ou le personnel de service, quant à l'opération du produit ou à sa maintenance.

Danger de choc électrique ! Evitez tout contact avec la surface marquée tant que le produit est sous tension ou connecté à des lignes externes de télécommunications.

Mise à la terre de protection : la cosse ou la borne marquée devrait être connectée à la prise de terre de protection du bâtiment.



Avertissement

Certains produits peuvent être équipés d'une diode laser. Dans de tels cas, une étiquette indiquant la classe laser ainsi que d'autres avertissements, le cas échéant, sera jointe près du transmetteur optique. Le symbole d'avertissement laser peut aussi être joint.

Veuillez observer les précautions suivantes :

- Avant la mise en marche de l'équipement, assurez-vous que le câble de fibre optique est intact et qu'il est connecté au transmetteur.
- Ne tentez pas d'ajuster le courant de la commande laser.
- N'utilisez pas des câbles ou connecteurs de fibre optique cassés ou sans terminaison et n'observez pas directement un rayon laser.
- L'usage de périphériques optiques avec l'équipement augmentera le risque pour les yeux.
- L'usage de contrôles, ajustages ou procédures autres que celles spécifiées ici pourrait résulter en une dangereuse exposition aux radiations.

ATTENTION : Le rayon laser peut être invisible !

Les utilisateurs pourront, dans certains cas, insérer leurs propres émetteurs-récepteurs Laser SFP dans le produit. Les utilisateurs sont avertis que RAD ne pourra pas être tenue responsable de tout dommage pouvant résulter de l'utilisation d'émetteurs-récepteurs non conformes. Plus particulièrement, les utilisateurs sont avertis de n'utiliser que des produits approuvés par l'agence et conformes à la réglementation locale de sécurité laser pour les produits laser de classe 1.

Respectez toujours les précautions standards de sécurité durant l'installation, l'opération et la maintenance de ce produit. Seul le personnel de service qualifié et autorisé devrait effectuer l'ajustage, la maintenance ou les réparations de ce produit. Aucune opération d'installation, d'ajustage, de maintenance ou de réparation ne devrait être effectuée par l'opérateur ou l'utilisateur.

Manipuler des produits sous tension

Règles générales de sécurité

Ne pas toucher ou altérer l'alimentation en courant lorsque le câble d'alimentation est branché. Des tensions de lignes peuvent être présentes dans certains produits, même lorsque le commutateur (s'il est installé) est en position OFF ou si le fusible est rompu. Pour les produits alimentés par CC, les niveaux de tension ne sont généralement pas dangereux mais des risques de courant peuvent toujours exister.

Avant de travailler sur un équipement connecté aux lignes de tension ou de télécommunications, retirez vos bijoux ou tout autre objet métallique pouvant venir en contact avec les pièces sous tension.

Sauf s'il en est autrement indiqué, tous les produits sont destinés à être mis à la terre durant l'usage normal. La mise à la terre est fournie par la connexion de la fiche principale à une prise murale équipée d'une borne protectrice de mise à la terre. Si une cosse de mise à la terre est fournie avec le produit, elle devrait être connectée à tout moment à une mise à la terre de protection par un conducteur de diamètre 18 AWG ou plus. L'équipement monté en châssis ne devrait être monté que sur des châssis et dans des armoires mises à la terre.

Branchez toujours la mise à la terre en premier et débranchez-la en dernier. Ne branchez pas des câbles de télécommunications à un équipement qui n'est pas mis à la terre. Assurez-vous que tous les autres câbles sont débranchés avant de déconnecter la mise à la terre.

Connexion au courant du secteur

Assurez-vous que l'installation électrique est conforme à la réglementation locale.

Branchez toujours la fiche de secteur à une prise murale équipée d'une borne protectrice de mise à la terre.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A. Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A.

Branchez toujours le câble d'alimentation en premier à l'équipement puis à la prise murale. Si un commutateur est fourni avec l'équipement, fixez-le en position OFF. Si le câble d'alimentation ne peut pas être facilement débranché en cas d'urgence, assurez-vous qu'un coupe-circuit ou un disjoncteur d'urgence facilement accessible est installé dans l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si le système de distribution de courant est de type IT.

Connexion d'alimentation CC

Sauf s'il en est autrement spécifié dans le manuel, l'entrée CC de l'équipement est flottante par rapport à la mise à la terre. Tout pôle doit être mis à la terre en externe.

A cause de la capacité de courant des systèmes à alimentation CC, des précautions devraient être prises lors de la connexion de l'alimentation CC pour éviter des courts-circuits et des risques d'incendie.

Les unités CC devraient être installées dans une zone à accès restreint, une zone où l'accès n'est autorisé qu'au personnel qualifié de service et de maintenance.

Assurez-vous que l'alimentation CC est isolée de toute source de courant CA (secteur) et que l'installation est conforme à la réglementation locale.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A. Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A.

Avant la connexion des câbles d'alimentation en courant CC, assurez-vous que le circuit CC n'est pas sous tension. Localisez le coupe-circuit dans le tableau desservant l'équipement et fixez-le en position OFF. Lors de la connexion de câbles d'alimentation CC, connectez d'abord le conducteur de mise à la terre à la borne correspondante, puis le pôle positif et en dernier, le pôle négatif. Remettez le coupe-circuit en position ON.

Un disjoncteur facilement accessible, adapté et approuvé devrait être intégré à l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si l'alimentation en courant CC est flottante.

Declaration of Conformity

Manufacturer's Name:	RAD Data Communications Ltd.
Manufacturer's Address:	24 Raoul Wallenberg St. Tel Aviv 69719 Israel

Declares that the products:

Product Names:	**RICi-16E1, RICi-16T1**

Conform to the following standard(s) or other normative document(s):

EMC:	EN 55022:1998 + A1:2000, A2: 2003	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.
	EN 55024: 1998 + A1:2001, A2:2003	Information technology equipment – Immunity characteristics – Limits and methods of measurement.
	EN 61000-3-2:2000 + A2:2005	Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current up to and including 16A per phase).
	EN 61000-3-3:1995 + A1:2001	Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16A per phase and not subject to conditional connection.
Safety:	EN 60950-1:2001 + A11:2004	Information technology equipment – Safety – Part 1: General requirements

Supplementary Information:

The products herewith comply with the requirements of the EMC Directive 89/336/EC, the Low Voltage Directive 2006/95/EC and the R&TTE Directive 99/5/EC for wired equipment. The product was tested in a typical configuration.

Tel Aviv, 9 December 2007

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Otto-Hahn-Str. 28-30, 85521 Ottobrunn-Riemerling, Germany

Glossary

Address	A coded representation of the origin or destination of data.
Agent	In SNMP, this refers to the managed system.
Analog	A continuous wave or signal (such as human voice).
ANSI	American National Standards Institute.
Attenuation	Signal power loss through equipment, lines or other transmission devices. Measured in decibels.
AWG	The American Wire Gauge System, which specifies wire width.
Balanced	A transmission line in which voltages on the two conductors are equal in magnitude, but opposite in polarity, with respect to ground.
Bandwidth	The range of frequencies passing through a given circuit. The greater the bandwidth, the more information can be sent through the circuit in a given amount of time.
Baud	Unit of signaling speed equivalent to the number of discrete conditions or events per second. If each signal event represents only one bit condition, baud rate equals bps (bits per second).
Bipolar	Signaling method in E1/T1 representing a binary "1" by alternating positive and negative pulses, and a binary "0" by absence of pulses.
Bit	The smallest unit of information in a binary system. Represents either a one or zero ("1" or "0").
bps (Bits Per Second)	A measure of data transmission rate in serial transmission.
Bridge	A device interconnecting local area networks at the OSI data link layer, filtering and forwarding frames according to media access control (MAC) addresses.
Bus	A transmission path or channel. A bus is typically an electrical connection with one or more conductors, where all attached devices receive all transmissions at the same time.
Byte	A group of bits (normally 8 bits in length).
Carrier	A continuous signal at a fixed frequency that is capable of being modulated with a second (information carrying) signal.
Cell	The 53-byte basic information unit within an ATM network. The user traffic is segmented into cells at the source and reassembled

	at the destination. An ATM cell consists of a 5-byte ATM header and a 48-byte ATM payload, which contains the user data.
Channel	A path for electrical transmission between two or more points. Also called a link, line, circuit or facility.
Clock	A term for the source(s) of timing signals used in synchronous transmission.
Congestion	A state in which the network is overloaded and starts to discard user data (frames, cells or packets).
Data	Information represented in digital form, including voice, text, facsimile and video.
Data Link Layer	Layer 2 of the OSI model. The entity, which establishes, maintains, and releases data-link connections between elements in a network. Layer 2 is concerned with the transmission of units of information, or frames, and associated error checking.
Diagnostics	The detection and isolation of a malfunction or mistake in a communications device, network or system.
Differential Delay	Differential delay is caused when traffic is split over different lines that may traverse shorter and longer paths. Products like the RAD IMX-2T1/E1 inverse multiplexer compensate for any differential delay (up to 64 msec) between the T1 lines, to properly reconstruct the original stream.
Digital	The binary ("1" or "0") output of a computer or terminal. In data communications, an alternating, non-continuous (pulsating) signal.
E1 Line	A 2.048 Mbps line, common in Europe, that supports thirty-two 64 kbps channels, each of which can transmit and receive data or digitized voice. The line uses framing and signaling to achieve synchronous and reliable transmission. The most common configurations for E1 lines are E1 PRI, and unchannelized E1.
E3	The European standard for high speed digital transmission, operating at 34 Mbps.
Encapsulation	Encapsulating data is a technique used by layered protocols in which a low level protocol accepts a message from a higher level protocol, then places it in the data portion of the lower-level frame. The logistics of encapsulation require that packets traveling over a physical network contain a sequence of headers.
Ethernet	A local area network (LAN) technology which has extended into the wide area networks. Ethernet operates at many speeds, including data rates of 10 Mbps (Ethernet), 100 Mbps (Fast Ethernet), 1,000 Mbps (Gigabit Ethernet), 10 Gbps, 40 Gbps, and 100 Gbps.
Flow Control	A congestion control mechanism that results in an ATM system implementing flow control.
Frame	A logical grouping of information sent as a link-layer unit over a transmission medium. The terms packet, datagram, segment, and

	message are also used to describe logical information groupings.
Framing	At the physical and data link layers of the OSI model, bits are fit into units called frames. Frames contain source and destination information, flags to designate the start and end of the frame, plus information about the integrity of the frame. All other information, such as network protocols and the actual payload of data, is encapsulated in a packet, which is encapsulated in the frame.
Full Duplex	A circuit or device permitting transmission in two directions (sending and receiving) at the same time.
FXO (Foreign Exchange Office)	A voice interface, emulating a PBX extension, as it appears to the CO (Central Office) for connecting a PBX extension to a multiplexer.
FXS (Foreign Exchange Subscriber)	A voice interface, emulating the extension interface of a PBX (or subscriber interface of a CO) for connecting a regular telephone set to a multiplexer.
G.703	An ITU standard for the physical and electrical characteristics of various digital interfaces, including those at 64 kbps and 2.048 Mbps.
Gateway	Gateways are points of entrance and exit from a communications network. Viewed as a physical entity, a gateway is that node that translates between two otherwise incompatible networks or network segments. Gateways perform code and protocol conversion to facilitate traffic between data highways of differing architecture.
Half Duplex	A circuit or device capable of transmitting in two directions, but not at the same time.
Impedance	The combined effect of resistance, inductance and capacitance on a transmitted signal. Impedance varies at different frequencies.
Interface	A shared boundary, defined by common physical interconnection characteristics, signal characteristics, and meanings of exchanged signals.
IP Address	Also known as an Internet address. A unique string of numbers that identifies a computer or device on a TCP/IP network. The format of an IP address is a 32-bit numeric address written as four numbers from 0 to 255, separated by periods (for example, 1.0.255.123).
Laser	A device that transmits an extremely narrow and coherent beam of electromagnetic energy in the visible light spectrum. Used as a light source for fiber optic transmission (generally more expensive, shorter lived, single mode only, for greater distances than LED).
Latency	The time between initiating a request for data and the beginning of the actual data transfer. Network latency is the delay introduced when a packet is momentarily stored, analyzed and then forwarded.

Loopback	A type of diagnostic test in which the transmitted signal is returned to the sending device after passing through all or part of a communications link or network.
Manager	An application that receives Simple Network Management Protocol (SNMP) information from an agent. An agent and manager share a database of information, called the Management Information Base (MIB). An agent can use a message called a traps-PDU to send unsolicited information to the manager. A manager that uses the RADview MIB can query the RAD device, set parameters, sound alarms when certain conditions appear, and perform other administrative tasks.
Master Clock	The source of timing signals (or the signals themselves) that all network stations use for synchronization.
Multiplexer	At one end of a communications link, a device that combines several lower speed transmission channels into a single high speed channel. A multiplexer at the other end reverses the process. Sometimes called a mux. See **Bit Interleaving/Multiplexing**.
Network	(1) An interconnected group of nodes. (2) A series of points, nodes, or stations connected by communications channels; the collection of equipment through which connections are made between data stations.
Node	A point of interconnection to a network.
Packet	An ordered group of data and control signals transmitted through a network, as a subset of a larger message.
Payload	The 48-byte segment of the ATM cell containing user data. Any adaptation of user data via the AAL will take place within the payload.
Physical Layer	Layer 1 of the OSI model. The layer concerned with electrical, mechanical, and handshaking procedures over the interface connecting a device to the transmission medium.
Polling	See **Multidrop**.
Port	The physical interface to a computer or multiplexer, for connection of terminals and modems.
Protocol	A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.
Scalable	Able to be changed in size or configuration to suit changing conditions. For example, a scalable network can be expanded from a few nodes to thousands of nodes.
Serial Transmission	A common mode of transmission, where the character bits are sent sequentially one at a time instead of in parallel.
Single Mode	Describing an optical wave-guide or fiber that is designed to propagate light of only a single wavelength (typically 5-10 microns

	in diameter).
Space	In telecommunications, the absence of a signal. Equivalent to a binary 0.
Sync	See **Synchronous Transmission**.
Synchronous Transmission	Transmission in which data bits are sent at a fixed rate, with the transmitter and receiver synchronized.
T1	A digital transmission link with a capacity of 1.544 Mbps used in North America. Typically channelized into 24 DS0s, each capable of carrying a single voice conversation or data stream. Uses two pairs of twisted pair wires.
T3	A digital transmission link with a capacity of 45 Mbps, or 28 T1 lines.
Telnet	The virtual terminal protocol in the Internet suite of protocols. It lets users on one host access another host and work as terminal users of that remote host. Instead of dialing into the computer, the user connects to it over the Internet using Telnet. When issuing a Telnet session, it connects to the Telnet host and logs in. The connection enables the user to work with the remote machine as though a terminal was connected to it.
Throughput	The amount of information transferred through the network between two users in a given period, usually measured in the number of packets per second (pps).
Timeslot	A portion of a serial multiplex of timeslot information dedicated to a single channel. In E1 and T1, one timeslot typically represents one 64 kbps channel.
VLAN-Aware	A device that is doing the Layer 2 bridging according to the VLAN tag in addition to the standard bridging parameters. A VLAN-aware device will not strip or add any VLAN header.
VLAN Stacking	A technique that lets carriers offer multiple virtual LANs over a single circuit. In essence, the carrier creates an Ethernet virtual private network to tunnel customer VLANs across its WAN; this helps avoid name conflicts among customers of service providers who connect to the carrier. Stacking works by assigning two VLAN IDs to each frame header. One is a "backbone" VLAN ID used by the service provider; the other one has up to 4,096 unique 802.1Q VLAN tags.

Quick Start Guide

Only an experienced technician should install RICi-16. If you are familiar with RICi-16, use this guide to prepare the unit for operation.

1. Installing RICi-16

Connecting the Interfaces

1. Connect the network to the RJ-45 connectors designated **E1** or **T1**.
2. Connect the user LAN to the RJ-45 connectors designated **10/100 BaseT** (up to four connectors).
3. Connect the control terminal to the front panel **CONTROL** connector

   OR

   Connect a Telnet host, a PC running a Web browsing application, or an SNMP management station to the Ethernet port.

Connecting the Power

- Connect the power cable to the power socket on the RICi-16 front panel and the other end to the power outlet.

  The unit has no power switch. Operation starts when the power is applied to the power connector(s).

2. Configuring RICi-16

Configure RICi-16 to the desired operation mode via an ASCII terminal connected to the front panel **CONTROL** port. After configuring, you can manage the unit over Telnet, a PC that runs a Web browser, or SNMP via either Ethernet or an E1/T1 port.

Note *Remote management requires configuring an IP address.*

Starting a Terminal Session

➤ **To start a terminal session:**

1. Turn on the control terminal PC and set its default port parameters to the following:
   - **Baud rate**: 115,200 bps
   - **Data bits**: 8
   - **Stop bits**: 1
   - **Parity**: None
   - **Flow control**: None.
2. To optimize the view of the system menus, do the following:
   - Set the terminal emulator to **VT100**.
   - If you are using HyperTerminal, set the terminal mode to the 132-column mode.
3. Enter your user name and password and proceed with the management session.

Note *The RICi-16 default user name is **su** (lower case). The default password is **1234**.*

Configuring Basic Parameters

➤ **To configure RICi-16 for management:**

- From the Host menu (**Main** › **Configuration** › **System** › **Management** › **Host**), configure the following parameters:
  - **Host IP address**
  - **Host IP mask**
  - **Default gateway**
- From the Encapsulation menu (**Main** › **Configuration** › **System** › **Management** › **Host** › **Encapsulation**), configure **Host tagging** (untagged/tagged). If you select **Tagged**, additional parameters that need to be defined appear:
  - **Host VLAN ID**
  - **Host VLAN Priority**

Configuring RICi-16 Bridge Ports

The unit ships with a factory-set configuration, as defined below. To reconfigure, you have to delete and reconfigure every bridge port parameter. You cannot delete bridge port bindings to the host port and Ethernet ports.

Factory-Set Configuration

Bridge Port	Configured to
1	Reserved for management
2	Ethernet port 1
3	Ethernet port 2
4	Ethernet port 3
5	Ethernet port 4
6	GFP 1 (logical port 2)

If you reconfigure the unit for a minimum working configuration, define at least two bridge ports (BP) and bind them to either a physical or logical port.

- One BP bound to a GFP interface
- One BP bound to a Fast Ethernet interface.

Contents

Chapter 1
Introduction

1.1 Overview

RICi-16 is a Network Termination Unit (NTU) that connects Fast Ethernet LANs over 16 bonded E1 or T1 circuits, or over up to two bonded clear T3 circuits, or over a channelized T3 interface. The bonded circuits create a scalable, virtual pipe for transferring Ethernet traffic.

The unit enables service providers to supply high capacity Ethernet services to remote locations. The units can also transparently connect corporate LANs utilizing existing E1 or T1 lines.

RICi-16 uses the Ethernet over NG PDH standards and applies the Generic Framing Procedure (GFP) to encapsulate the packet data, thus enabling efficient bandwidth utilization and improving the latency for delay-sensitive applications. Virtual Concatenations (VCAT) are used to bond the required PDH connections for transmitting data, providing flexible bandwidth for different applications and using the Link Capacity Adjustment Scheme (LCAS) to ensure seamless PDH capacity changes without affecting traffic and error handling on individual E1/T1 links.

RICi-16 supports up to 16 GFP VCAT groups (VCG), allowing the connection of up to 16 different customers per site.

The following standard bonding and encapsulation protocols make RICi-16 interoperable with third-party devices:

- Generic Framing Procedure (GFP – G.8040)
- Virtual Concatenation (VCAT - G.7043)
- Link Capacity Adjustment Scheme (LCAS - G.7042).

RICi-16 supports Telnet, ConfiguRAD, and SNMP for inband configuration and management, as well as an ASCII terminal for out-of-band management.

Product Options

Uplink Options

RICi-16 is available with E1/T1/T3 interfaces as follows:

- E1/T1: 4, 8, or 16 ports, which can be balanced or unbalanced
- T3: Two bonded clear channel links or a single channelized link.

Ethernet Port Options

The Ethernet ports are available as four 10/100BaseTx interfaces or one SFP interface and two 10/100BaseTx interfaces.

Applications

Typical applications include Ethernet VPN services over E1 or T1 lines; aggregation of enterprise LANs over E1 or T1 circuits; and IP DSLAM, cellular IP, and WiMAX base station backhauling.

Figure 1-1 illustrates a typical application in which RICi-16 connects remote LANs to the packet-switched network over 16 E1/T1 circuits using an SDH/SONET connection.

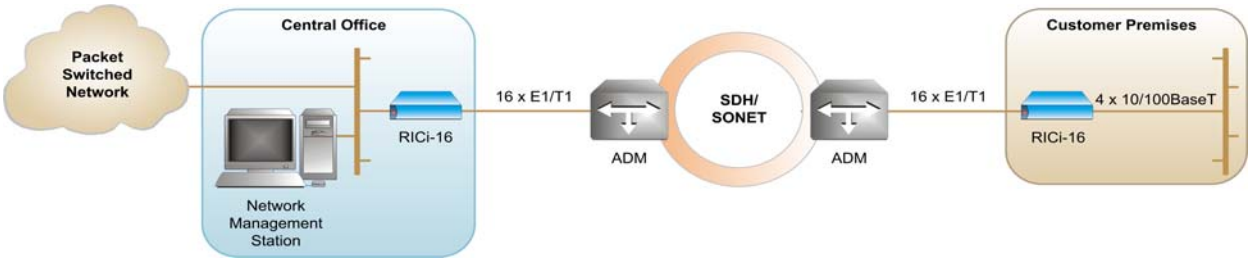


Figure 1-1. RICi-16 Extends Ethernet Services over Multiple E1/T1 Circuits

Features

The main features of RICi-16 are described below.

Ethernet Interfaces

The Fast Ethernet interfaces (10/100BaseT) operate in full or half duplex, with autonegotiation and flow control (PAUSE).

WAN Interfaces

The unit supports the following interfaces:

- Framed E1 circuits (G732N with CRC), up to 16. The E1 interfaces are G.704, G.703 compliant.
- Framed T1 (ESF) circuits, up to 16. The T1 interfaces are ANSI T1.403 compliant.
- Channelized or clear T3 circuits (T1oT3 {TDM} and ETHoT1oT3) to facilitate cellular backhauling. The T3 interfaces support M23 or C-bit parity framing. Up to 16 T1 circuits can be mapped over a channelized T3 interface, and the rest of the 28 channels or all of them can be mapped to up to 16 VCGs. Multi VCG enables supporting multiple service providers per site. Two clear T3 circuits facilitate up to 100 Mbps uplink.

GFP, VCAT, and LCAS

Using Generic Framing Procedure (GFP) for encapsulation, together with the virtual concatenation (VCAT) and Link Capacity Adjustment Scheme (LCAS)

protocols, the 16 E1/T1 or 2 T3 ports are bundled together producing a less rigid, more robust transfer method.

VCAT breaks the bundled payload into individual bytes that are transported over the E1/T1/T3 lines in the bundle. Since each byte may use a different physical route (different E1) through a network, VCAT supports the buffering of the information to account for delays.

LCAS is a signaling protocol for sizing virtually concatenated paths. LCAS provides a mechanism to remove links that are not carrying traffic, due to failures or user configuration. The link is detected and automatically removed from the VCG.

Bridge

RICi-16 provides a bridging function between its bridge ports:

- Fast Ethernet ports
- GFP logical ports (Ethernet over PDH)
- Internal host.

The internal bridge operates in VLAN-Unaware or VLAN-Aware modes.

The VLAN-aware bridge mode allows you to create a subgroup of bridge ports within the bridge. Each subgroup is associated with a unique VLAN Identifier (VID). Frames can be forwarded only between bridge ports that are members of the same VLAN, enabling a total separation between different VLAN users within the same bridge.

In VLAN-Unaware bridge mode, the bridge ignores VLAN tags and forwards frames only according to their source and destination MAC addresses.

Management

Setup, control, and monitoring of status and diagnostics information can be performed using the following methods:

- Inband management: Local and remote management via an Ethernet or GFP logical port.
- Local management via an ASCII terminal connected to the V.24 (RS-232) DCE control port.
- ConfiguRAD: A Web-based element management system for remote device configuration and maintenance. ConfiguRAD is embedded in the units and can be accessed from any standard Web browser.
- RADview: RAD's SNMP-based element management software, providing SNMP traps, status polling, and configuration download.

The following functionalities are supported by the internal management software:

- Viewing system information
- Modifying configuration and mode of operation, including setting system default values and resetting the unit
- Monitoring performance
- Initiating connectivity tests
- Defining ping and trace routes

- Downloading/uploading remote software and configuration files (TFTP)
- Upgrading software.

Timing

RICi-16 has a two-clock domain with master and fallback sources for timing, one clock for T3 timing and one for T1s mapped to VCGs. The clock source can be an internal oscillator or a recovered clock signal from one of the links.

Diagnostics

RICi-16 supports remote loopbacks for the E1/T1/T3 ports, and FDL Loopbacks for T1 diagnostics.

Statistics

RICi-16 provides statistics and counter capabilities for the physical Ethernet and E1/T1 levels, and logical GFP statistics.

Event Log File

The Log File includes entries at the system, Ethernet, GFP, VCG, and E1/T1/T3 levels.

Fault Propagation

In the event of error conditions on the first GFP port, the fault propagation mechanism shuts down the link integrity on the first three Fast Ethernet ports, indicating to the Ethernet network that there is an error condition on the TDM network. This enables routers and switches connected on both ends of the link to reroute traffic.

Power Supply Redundancy

Two redundant load-sharing power supply modules provide AC or DC power to the device. In case any one power supply module fails or looses its input power, the remaining power supply module continues to supply power to the chassis, without disruptions.

Temperature-hardened Version

A temperature-hardened version is available, significantly extending the permitted operating temperature range.

1.2 Physical Description

RICi-16 is a 1U high standalone or rack mountable device.

Figure 1-2 illustrates a three-dimensional view of RICi-16/T3 with T1 interfaces and Ethernet SFP port, over RICi-16/E1 with E1 interfaces.

Figure 1-2. RICi-16/E1 and RICi-16/T3 Front Views

LEDs, interfaces, and control connectors are located on the front panel. For additional information, refer to *Chapter 3*.

1.3 Functional Description

This section describes key features of RICi-16.

Bridge

RICi-16 has a multi-port bridging capability handling up to 6 bridge ports. The Bridge supports two modes of operation:

- VLAN-Aware
- VLAN-Unaware.

The mechanism of each mode can be described as five different processes:

- **Ingress**: Checks each frame entering the bridge to decide if and how this frame should be passed on to the forwarding process
- **Learning**: Learns new MAC table entries (MAC only or MAC VID pairs)
- **Aging**: Checks the forwarding MAC table periodically
- **Forwarding**: Decides to which bridge port/ports to forward the frame
- **Transmission (VLAN-Aware mode only)**: Selects the format of the transmitted frame at the output port: with VLAN ID (tagged) or without VLAN ID (untagged).

Bridge features and these five processes are described below for each mode.

VLAN-Aware Mode

This mode enables creating sub-groups of bridge ports within the bridge. Each sub-group is defined per VLAN and is associated with a unique VLAN ID (VID). Frames containing a VID can be forwarded only between bridge ports that are members of this specific VLAN, enabling a total separation between different VLAN users within the same bridge.

Bridge Features

- Full VLAN-aware bridge in accordance with 802.1q
- Learning and forwarding according to MAC address and VID
- Learning of up to 2,018 MAC table entries (MAC + VID pairs) and 30 static addresses
- Configuration of the aging time
- MAC table viewing (learned MACs).

Ingress Process

The ingress process is composed of the following three steps:

- **Frame Admission:** Has two modes of operation (configured per bridge port):

  - **Admit All Frames**: All frames arriving from the port are admitted and proceed to the ingress filtering process. PVID is assigned to untagged or priority-only tagged frames.
  - **Admit Only VLAN Tagged Frames**: Only VLAN tagged frames are admitted and allowed to proceed to the ingress filtering process. Untagged or priority-only tagged frames are discarded.
- **Ingress Filtering:** Available for one of the following modes (configured per bridge port):
  - **Enable**: Performs ingress filtering according to VIDs. Only frames that share a VID assigned to this bridge port are admitted
  - **Disable**: All frames are forwarded.
    Only admitted frames that pass filtering are submitted to learning and forwarding processes.
- **PVID Assignment:** Is per bridge port configuration:

  In VLAN-aware mode, every received frame entering the bridge is associated with a single VID. If the received frame does not contain a VLAN ID (untagged or priority only tagged frames), a specific PVID is assigned to these frames before they pass to the forwarding process. Accordingly, the untagged/priority tagged frames that have passed the admission/ingress filtering, are tagged with PVID and proceed to the forwarding process. Tagged frames will be double tagged with the PVID only if Tag Stacking is enabled.
  For untagged frames that were tagged during this process to VID=PVID, the priority tag is assigned at the VLAN priority field, according to the default priority configuration.

Table 1-1 summarizes the behavior of the ingress process:

Table 1-1. Ingress Process

Frame Admission Mode	Ingress Filtering Mode	Bridge Behavior
Admit all frames	Enable	VLAN tagged frames with a VID (or PVID for untagged/priority tagged frames) that do not include the bridge port in their VLAN member set are dropped.
	Disable	All frames pass.
Admit VLAN tagged frames	Enable	VLAN tagged frames with a VID that do not include the bridge port in their member set are dropped. Untagged/priority-only tagged frames are dropped.
	Disable	All VLAN tagged frames pass. Untagged/priority-only tagged frames are dropped.

Frames that pass this stage are submitted to the forwarding and learning processes.

Learning Process

The learning process observes the source MAC address (SA) and the VID of the received frame, and updates the database with the MAC VID pair and with the bridge port that the frame was received from. The Forwarding Data Base (FDB) is also referred to as a MAC table.

Entries in the MAC table can be dynamic (inserted by the learning process) or static (inserted by configuration). A dynamic entry has an aging time associated with it.

The RICi-16 VLAN–Aware bridge is an Independent VLAN Learning (IVL) bridge.

The learning process inserts a new dynamic entry into the MAC table. This entry consists of a MAC-VID pair and bridge port.

- If the MAC-VID pair already exists for the same port, the aging time is updated.
- If the MAC-VID pair already exists but for a different bridge port (dynamic entry), the new entry overrides the existing one.
- If the MAC-VID pair already exists for a different bridge port (static entry), the static entry prevails.

Aging Process

The aging process checks the forwarding MAC table periodically. Each dynamic entry-aging period that has exceeded the configured Aging Time Limit is deleted. The aging period represents the time passed since the last frame for this entry entered the bridge. The periodic check of the MAC table (aging time intervals) results in the actual aging time that can reach up to twice the value that was configured by the user.

Forwarding Process

The forwarding process is performed based on the frame destination MAC VID pair. The frame is forwarded to the bridge port that was specified in the MAC table for this MAC VID pair entry.

Untagged frames are forwarded according to the PVID that was attached to that frame during the ingress process.

Frames are forwarded, dropped, or flooded according to the following guidelines:

- Forwarded: If the bridge port of the pair entry (DA, VID) in the MAC table is both an active bridge port and a member of the VLAN, the frame is forwarded to that bridge port only.
- Dropped:
  - If the bridge port for the pair entry (DA, VID) in the MAC table is the port on which the frame was received, the frame is dropped.
  - If there are no active ports associated with the frame's VID, or if the VID is not defined at all, the frame is dropped.
- Flooded:

- If the pair (DA, VID) is not learned and does not exist in the MAC table, the frame is transmitted to all bridge ports that are associated with the frame's VLAN ID.
- Multicasts and broadcasts are flooded only through the bridge ports whose VLAN ID is identical to the frame's VLAN ID.

Frames that pass this stage are submitted to the forwarding and learning processes.

Transmission Process

After the forwarding process identifies the destination bridge port/ports to which the frames must be transmitted, the frames are transmitted in the appropriate format.

The frame format can be configured for each VLAN and port:

- VLAN-tagged: In this mode:
  - VLAN-tagged frames are transmitted unchanged
  - Untagged frames are transmitted tagged with VID=PVID of the port from which they entered.
  - Priority-tagged frames are transmitted tagged with original priority and VID = PVID.
- Untagged: In this mode, all frames are transmitted as untagged.

VLAN-Unaware Mode

In this mode the bridge forwarding ignores the VLAN ID of VLAN-tagged frames.

Each Ethernet packet received from each bridge port (Ethernet or E1s) is forwarded according to its destination MAC address.

Bridge Features

Bridge features include:

- Learning and forwarding according to MAC address only
- Learning of up to 2,018 MAC table entries and 30 static addresses
- Configuration of the aging time
- VLAN tagged frames transparency (forwarding according to MAC only)
- MAC table viewing (learned MACs).

Ingress Process

All frames are accepted in this mode: untagged, priority-tagged, or VLAN tagged.

Learning and forwarding is based on the MAC addresses, with no regard to the VLAN.

Learning Process

The learning process observes the source MAC address (SA) of the received frame and updates the forwarding database (FDB) with the MAC address and the bridge port that the frame was received from. (FDB is also referred to as MAC table).

The learning process inserts a new entry into the MAC table. This entry consists of the MAC and bridge port.

- If the MAC already exists for the same bridge port, the aging time will be updated.
- If the MAC already exists, but for a different bridge port, (dynamic entry) the new entry will override the existing one.

Aging Process

The aging process checks the forwarding MAC table periodically. Each dynamic entry aging time period that has exceeded the configured Aging Time Limit is deleted. The aging time period is the period of time since the last frame for this entry entered the bridge. The periodic check of the MAC table (aging time intervals), results in an actual aging time that can reach up to twice the user-configured value.

Forwarding Process

The forwarding process is performed based on the frame MAC Destination Address (MDA). The frame is forwarded to the bridge/port specified in the MAC table for this MAC.

Frames are forwarded, dropped, or flooded at this stage:

- Forwarded: The frame is forwarded according to DA, to the bridge port where the DA was learned.
- Dropped: If the port for the DA entry in the MAC table is the port for which the frame was received, the frame is dropped.
- Flooded:
  - If there is no information regarding the DA in the MAC table, the frame is flooded to all ports.
  - Frames with multicast or broadcast addresses are flooded to all ports.

Transmission Process

In this bridge mode (VLAN-Unaware), the frames are transmitted unchanged, that is no tags are added or removed.

VLAN Stacking

VLAN Stacking mode for a bridge port refers to the addition of a tag to a frame either at ingress or egress (regardless of whether it already has an existing VLAN tag), and removal of a tag at ingress or egress when the frame leaves through this port.

This setting is independent of the bridge activity.

Encapsulation

RICi-16 supports 16 GFP VCAT LCAS groups with up to 16 E1/T1s per group (VCG).

GFP VCAT LCAS

Ethernet over GFP VCAT encapsulation is supported as defined in ITU-T G.8040. The links are grouped using VCAT as defined in ITU T G.7043. The LCAS protocol is supported as defined in ITU T G.7042.

The RICi-16 GFP VCAT LCAS features are:

- Up to 16 Virtual Concatenation Groups (VCGs) are supported
- LCAS mechanisms:
  - Ensure that traffic flow recovers quickly from E1/T1 link failures
  - Allow on-the-fly addition/deletion of group members.
- Up to 250 ms differential delay for E1/T1
- Up to 217 ms differential delay for T3.

Note *GFP VCAT LCAS maps Ethernet over framed E1/T1/T3 links. For E1/T1 the LCAS information is aligned to the E1/T1 multiframe. Therefore for E1/T1, carrying Ethernet over GFP VCAT LCAS must be transported transparently over the PDH/SDH network, to avoid damaging the multiframe alignment.*

GFP Technical Overview

TX Traffic Path

In this direction, the ETHERNET packet with the CRC32 is encapsulated into GFP.

The encapsulation can be divided into two main sections: a Core Header and a Payload Area.

The Core Header contains the packet length and a CRC16 result of the length. It is used by the frame-delineation procedure (as explained in the RX path description below) to detect the boundaries of the frame. The Core Header is scrambled by xoring the 32 bits (length and CRC16) with the 32 bits B6AB31E0. The scrambling of the GFP Core Header improves the robustness of the frame-delineation procedure, and provides a sufficient number of 0 1 and 1 0 transitions during idle transmission periods.

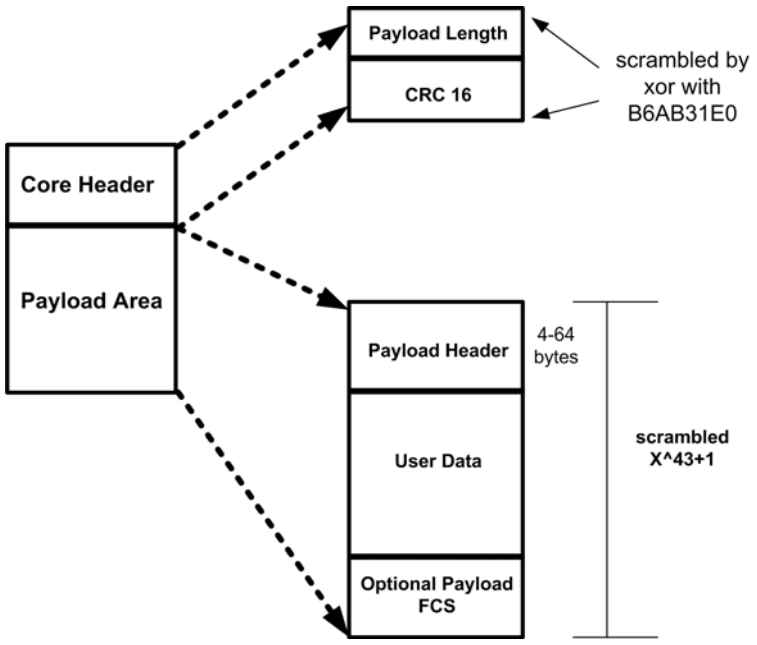


Figure 1-3. GFP Encapsulation

The Payload Area is divided into three subsections: the Payload header, the User data (Ethernet packet), and an optional FCS (CRC 32) that is calculated on all payload information filed. For encapsulation of Ethernet frames, this CRC appears to be unnecessary. The PFCS addition is user configurable.

All octets in the GFP Payload Area are scrambled using a 1 + x^43 scrambler; this scrambler is always activated.

The Payload Area contains between 4 and 64 bytes, according to the following:

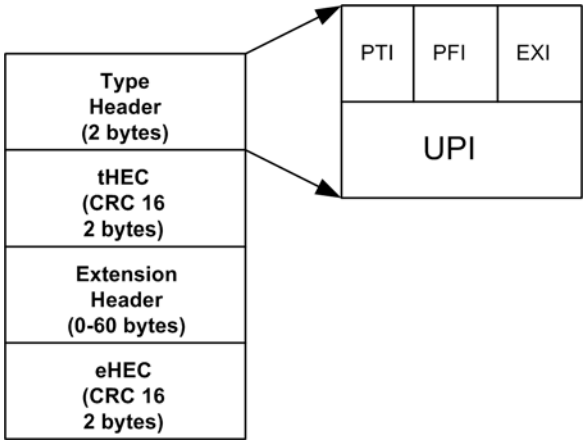


Figure 1-4. GFP Encapsulation – Payload Area

- PTI – Payload Type Identifier – indicates the content of the GFP frame: user frame or management frame (RICi-16 does not generate management frames in the TX direction)
- PFI – indicates whether the packet includes PFCS
- EXI – indicates the type of extension header encapsulated in the frame. RICi-16 supports transmission of a Null extension header (i.e., no extension header is added)

- UPI - indicates the type of user data encapsulated in the GFP format.

RICi-16 transmits an Ethernet-over-GFP payload identifier when the GFP frames are user frames. When there is no user packet to be transmitted over GFP, RICi-16 generates idle packets.

Idle packets - The GFP Idle frame is a special four-octet GFP control frame consisting of only a GFP Core Header with the PLI and cHEC fields set to 0. These frames are generated by the transmitter in order to keep the frame-delineation mechanism in the far-end receiver in a sync state.

The GFP signal is mapped into TDM according to the following. The procedure of mapping the GFP packets over the PDH signals is described in the G-8040 standard.

- The PDH signal works in multiframe mode: CRC-4 multiframe mode for E1 (31 timeslots) and ESF framing mode for T1 (24 timeslots) are supported
- The first timeslot in each multiframe is used for transferring the VCAT header information
- In all other timeslots there is user data after the encapsulation of GFP according to G.7041 (as described above).

The VCAT header information is the LCAS CONTROL packet, as described in the G.7043 standard. One control packet is transmitted in a period of 16 multiframes.

RICi-16 can work as a non-LCAS transmitter if all the fields such as MST, RSACK, SQ, GID, CONTROL & CRC & MFI2 MSB are set to zero. The MFI 1 parameter is incremented in a round-robin manner.

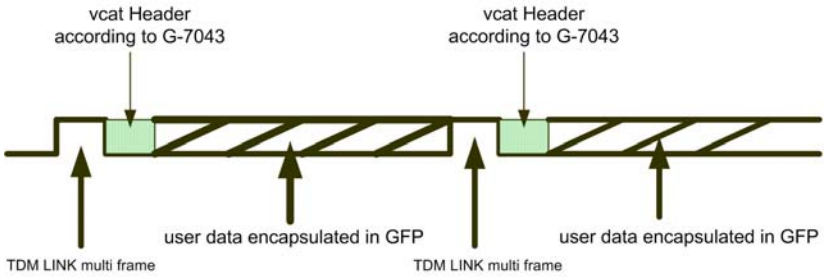


Figure 1-5. GFP Mapping over the PDH Signal

RX Traffic Path

The traffic received from TDM ports is assumed by RICi-16 to be traffic arriving from a non-LCAS GFP transmitter. RICi-16 hence treats the data according to the following:

- **VCAT header extraction:** The VCAT header is extracted from the first timeslot of each multiframe.
- **Frame Delineation:** The frame border is recognized by synchronization on the core header which contains the frame length & CRC16 on the length (see *Figure 1-6*). The GFP LINK is kept in sync state if the cHEC is correct per frame. To ensure that the GFP LINK is always synchronized, the transmitter in RICi-16 generates idle frames, with the Delta parameter equal to 2.

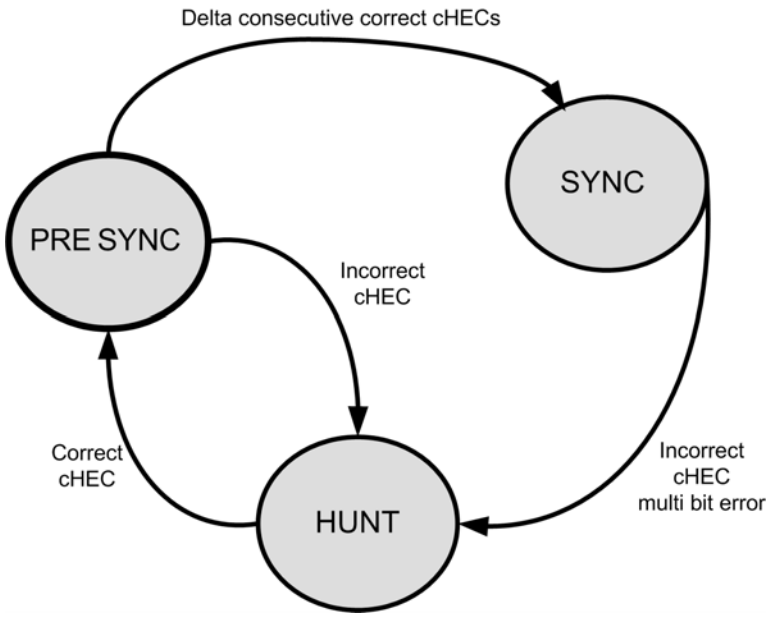


Figure 1-6. GFP Frame Delineation

- **Single-bit error correction:** The GFP receiver has the ability to correct a single-bit error in Thec or Chec or Ehec. This function is always active. The single-bit error correction on Chec is not active when the GFP signal is in Presync or hunt state.

The data is also descrambled (during sync state) before the packets are transferred to the bridge.

Payload FCS / CRC 32 of Ethernet packet check: The GFP receiver checks that the payload FCS (if enabled) or the CRC32 of Ethernet is correct. If incorrect, it discards the packet.

GFP over PDH actual bandwidth: GFP mapping over a PDH signal involves the following overhead:

- The PDH signal works in multiframe mode. For E1, TS0 is used for frame synchronization, and for T1, the F bit is used.
- Space is also reserved for a VCAT header every multiframe.

From this it can be determined that the actual PDH rate for GFP frames is as follows:

- for E1 links: (2.048Mbs –64Kbps – 64/16 k) = 1.98Mbs
- for T1 links: (1.544Mbs –8Kbps – 64/24 k) ~1.533Mbs. The overall calculation must also take into account the following overhead for GFP encapsulation:

- Chec_O (Core header encapsulation) – four bytes (always added to the packet)
- Thec_O (Type header encapsulation) – four bytes (always added to the packet)
- Ehec_O (Linear extension header encapsulation) – four bytes (optional; user-configurable)
- P_FCS (Payload FCS -CRC32) – four bytes (optional; user-configurable).

The maximum PPS (packets per second) that can be generated on the PDH is thus determined as follows (where P_SIZE is the packet size, and other parameters are as described above):

- for E1 links: PPS =1.98Mbs/ 8/ (P_SIZE + Chec_O + Thec_O + Ehec_O + P_FCS)
- for T1 links: PPS ~1.533Mbs / 8/ (P_SIZE + Chec_O + Thec_O + Ehec_O + P_FCS).

In RICi-16:

- Ehec_O is 0
- P_FCS is user-configurable.

Quality of Service

RICi-16 supports QoS mapping to four strict priority queues per VCG, according to one of the following:

- VLAN priority (802.1p)
- DSCP (ToS byte)
- Incoming port.

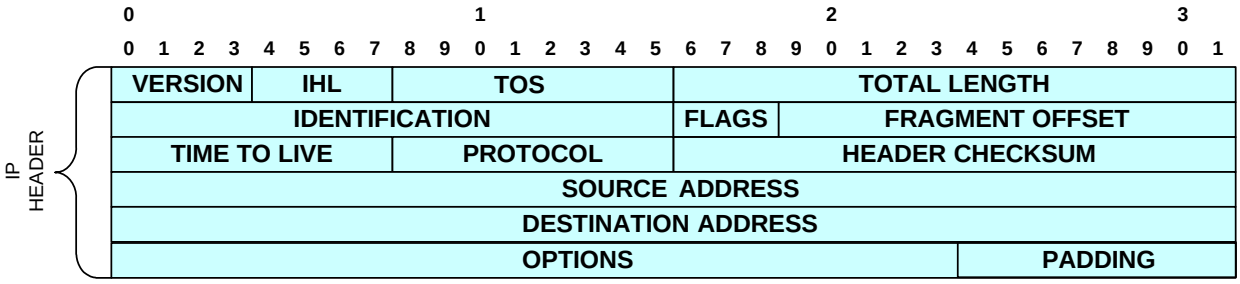


Figure 1-7. IP Header

Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
DS5	DS4	DS3	DS2	DS1	DS0	XX	XX

DSCP: six bits (DS5–DS0)

Figure 1-8. ToS Byte DSCP Field

Timing

E1/T1 Uplink

The Tx clock for the E1/T1 links is determined by the system clock, which can be derived from the internal oscillator or the recovered clock signal from one of the Rx links. You can configure the master and fallback source for the system clock.

The following figures show typical clock configurations for the E1/T1 links.

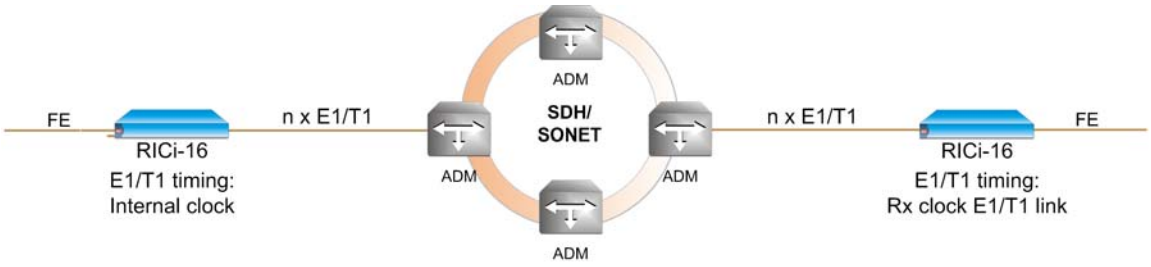


Figure 1-9. E1/T1 Clock Configuration for RICi-16 Working Opposite RICi-16

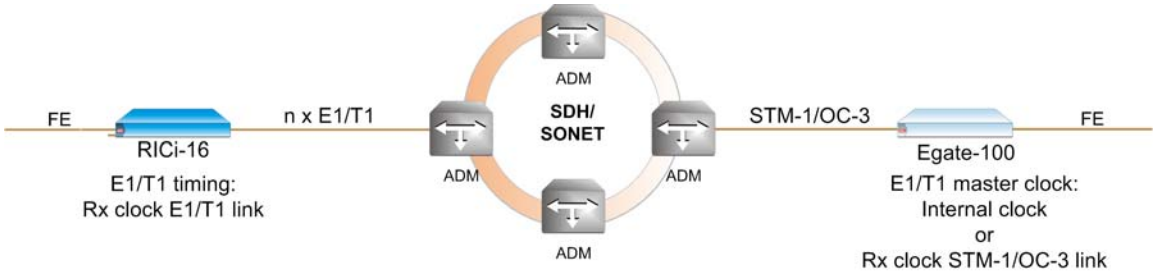


Figure 1-10. E1/T1 Clock Configuration for RICi-16 Working Opposite Egate-100

T3 Uplink

In T3 mode, RICi-16 supports two system clocks:

- E1/T1 clock, for E1/T1s mapped to VCGs, in the case of channelized T3. The E1/T1 clock source options are:
  - Internal oscillator
  - Recovered clock signal from one of the E1/T1 links.
- T3 clock. The T3 clock sources options are:
  - Internal oscillator
  - Recovered clock signal from one of the T3 links.

Note *Clock timing is not required for TDM T1s mapped over DS-3 (M13), as they are transparently mapped over DS-3.*

The following figures show typical clock configurations for the T3 links.

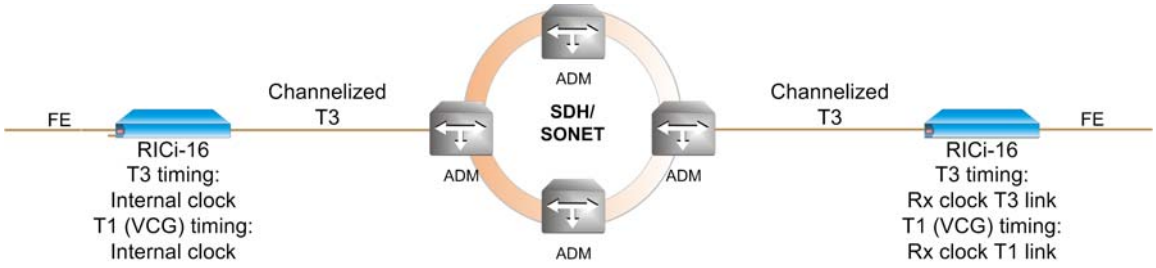


Figure 1-11. T3 Clock Configuration for RICi-16 Working Opposite RICi-16

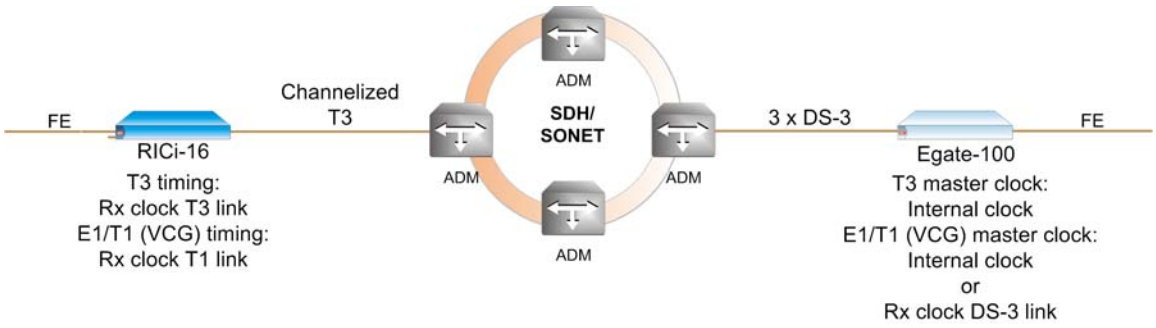


Figure 1-12. T3 Clock Configuration for RICi-16 Working Opposite Egate-100

Management

RICi-16's performance can be locally monitored from an ASCII terminal, or from a remote site using Telnet or the ConfiguRAD Web-based application. RAD's SNMP network management application RADview is supported as well.

Inband Management

RICi-16 supports inband management via Telnet, SNMP, and Web (ConfiguRAD). Configuration, monitoring, and statistics are available.

Out-of-Band Management

RICi-16 allows full configuration and diagnostics via an ASCII terminal. The ASCII terminal is connected to the control port on the front panel.

Chapter 3 explains how to activate the ASCII terminal and provides general instructions for navigating through the system menus and windows to view and modify data.

Security

ASCII terminal, Telnet, and Web access are password protected. After 15 minutes of inactivity, the system exits and you will have to log in again.

Telnet, Web, and SNMP access can be individually disabled or restricted to stations in the manager list.

RICi-16 supports the following access authorization levels:

- Superuser mode for configuration and monitoring
- User mode for monitoring and configuration view only.

Management Access

The unit's architecture allows access from every bridge port to the host devices. In certain configuration modes, a total separation of management traffic from user traffic can be achieved.

In VLAN-aware mode, RICi-16 forwards the management traffic to the management station in the Ethernet network. Because a different VLAN is used, total separation between user traffic and management traffic is maintained.

In the scenario illustrated by *Figure 1-13*, traffic coming from the remote CPE uses separate VLANs for user and management traffic. Each remote unit uses two VLANs, one for user traffic and one for management.

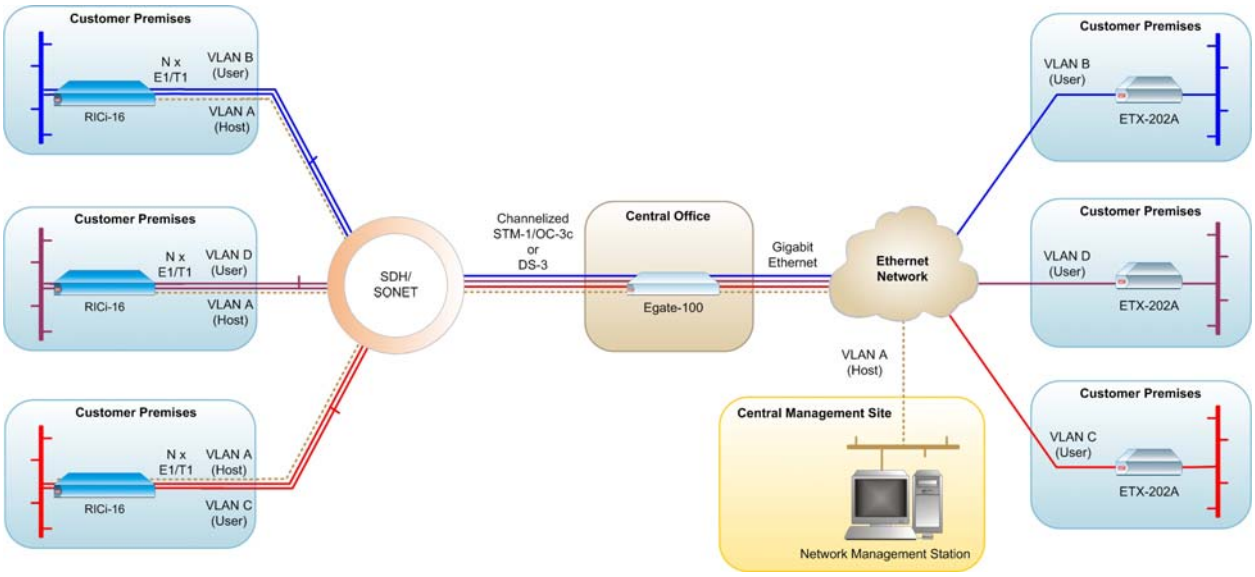


Figure 1-13. Management Traffic in a VLAN-Aware Application

Diagnostics

There are several types of diagnostics and troubleshooting procedures:

- Loop-based troubleshooting: E1/T1/T3 external loop, towards line.
- Ping tests
- Trace route
- Events/traps:
  - Events are stored and time-stamped in an event log file. Up to 1000 cyclic entries are maintained.
  - Traps can be masked per manager IP address, upon user configuration.

For additional information on diagnostics, refer to *Chapter 6*.

Statistics and Event Log

RICi-16 provides statistics at the physical Ethernet, the E1/T1, T3, and the GFP levels.

RICi-16 maintains a log file at the Ethernet, GFP, VCG, E1/T1, T3, and system levels.

For additional information, refer to *Chapter 6*.

1.4 Technical Specifications

E1 Interface	*Number of Ports*	4, 8, or 16
	Compliance	G.703, G.704
	Framing	Framed (G732N with CRC)
	Data Rate	2.048 Mbps
	Impedance	120Ω, balanced 75Ω, unbalanced (via adapter cable)
	Line Coding	HDB3, AMI
	Connector	Electrical, RJ-45
T1 Interface	*Number of Ports*	4, 8, or 16
	Compliance	ANSI T1.403
	Framing	ESF
	Data Rate	1.544 Mbps
	Impedance	100Ω, balanced
	Line Coding	B8ZS, AMI
	Connector	Electrical, RJ-45
T3 Interface	*Number of Ports*	1 (channelized) 2 (clear channel)
	Compliance	GR-499-CORE ANSI T1.107 ANSI T1.102
	Framing	C-bit parity, M23
	Data Rate	44.736 Mbps
	Impedance	75Ω, unbalanced
	Line Coding	B3ZS
	Connector	Coaxial BNC

Fast Ethernet 10/100BaseT Interfaces	*Number of Ports*	3 or 4
	Interface	4 10/100BaseTx interfaces or 2 10/100BaseTx interfaces and 1 SFP interface
	Standards	Ethernet, Relevant sections of IEEE 802.3, 802.3u
	Maximum Frame Size	1,700
	Data Rate	100 Mbps
	Interface type, connector	Electrical, RJ-45 SFP
	Range	100 meters/328 feet on UTP category 5 cables
	Autonegotiation	Supported
	Flow control	PAUSE
	Duplex modes	Full/half duplex
Encapsulation	*ETH over GFP VCAT LCAS*	• Compliance: G.7042, G.7043, G.8040 • Up to 16 E1/T1 links per VCG • Up to 16 VCGs • Differential delay: Up to 250 ms for E1/T1 Up to 217 ms for T3
Internal Bridge	*Ports*	• Fast Ethernet (up to 4) • For local host (1) • GFP
	LAN Table	Learning of up to 2,018 MAC table entries and 30 static addresses
	Operation Mode	VLAN–Aware, VLAN-Unaware
	Filtering and forwarding	Transparent or filter
Control Port	*Interface*	RS-232/V.24 (DTE asynchronous)
	Data Rate	9.6, 19.2, 115.2 kbps
	Connector	DB-9, female

Monitoring	*Statistics*	System and physical layer Alarms
		ETH o E1 frame counters
		Ethernet physical layer statistics and frame counters
Indicators	*PWR (green)*	On – RICi-16 is powered on
		Off – RICi-16 is off
	TST (yellow)	On – Loop is set on one of the interfaces
		Off – No loop is set on one of the interfaces
	ALM (red)	On – System or interface alarm is active
		Off – No Alarm
	LINK (green) for each Ethernet port	On – Ethernet link is active
		Off – Ethernet link is inactive
	ACT (blinking green) for each Ethernet port	Blinking – Ethernet frame received or sent within the last second
		Off – No frame received or sent within the last second
	LOC (red) for each port (E1 only)	On – Local sync loss for E1
		Off – No loss
	REM (red) for each port (E1 only)	On – Remote sync loss for E1
		Off – No loss
	RED (red) for each port (T1)	On – Local sync loss
		Off – No loss
Indicators (cont.)	*YEL (yellow) for each port (T1)*	On – Remote sync loss
		Off – No loss
Power	*Wide-range AC/DC*	100–240 VAC, 50/60 Hz or 48/60 VDC nominal (40–72 VDC)
	Power Consumption	13W
Physical	*Height*	43.7 mm (1.7 in) (1U)
	Width	440.0 mm (17.3 in)
	Depth	240.0 mm (9.4 in)
	Weight	2.2 kg (4.7 lb)

Environment	*Temperature*	Regular option: 0 to 50°C (32 to 122°F) Temperature-hardened option: -22° to 65°C (-7.6° to 149°F)
	Humidity	Up to 90%, non-condensing

Chapter 2

Installation and Setup

This chapter includes the following topics:

- Site Requirements and Prerequisites
- Package Contents
- Equipment Needed
- Installation and Setup.

The RICi-16 unit ships completely assembled with factory defaults set for basic operation. It is designed for installation as a desktop unit or mounting in a 19-inch rack. For rack installation instructions, refer to the *Rack Mounting Kit for 19-inch Racks* guide that comes with the RM kit.

After installing the unit, use an ASCII terminal connected to the CONTROL port to perform any configuration necessary. The configuration procedures are described in *Chapter 3* and *Chapter 4*.

If problems are encountered, refer to *Chapter 6*.

Warning

No internal settings, adjustment, maintenance and repairs should be performed by either the operator or the user. Such activities must be performed only by skilled personnel who are aware of the hazards involved.

Always observe standard safety precautions during installation, operation and maintenance of this product.

2.1 Site Requirements and Prerequisites

AC-powered units should be installed within 1.5 meters (5 feet) of an easily accessible grounded AC outlet capable of furnishing the required supply voltage, in the range of 100 to 240 VAC, 50/60 Hz. DC-powered units require a 48 VDC or 60 VDC nominal standard DC supply. Refer to the *Connecting DC Power* section at the front of the manual, and to *Section 2.9*.

Allow at least 90 cm (36 in) of frontal clearance for operator access. For continuous product operation allow at least 10 cm of frontal clearance and at least 15 cm at rear of the unit, for cable connections and ventilation. For proper ventilation, keep at least 2.5 cm clearance from the sides and top of the product.

The ambient operating temperature of RICi-16 is 0 to 50° C (32 to 122°F), at a relative humidity of up to 90%, non-condensing.

2.2 Package Contents

The package contains the following items:

- One RICi-16 with E1/T1/T3 ports
- AC power cord
- DC connector kit
- RM-34 kit for mounting in a 19″ rack
- CBL-RJ45/2BNC/E1 RJ-45 to BNC adapter cable, if an unbalanced E1 interface was ordered.

2.3 Required Equipment

RICi-16 needs no special tools for installation. You need a screwdriver for mounting the unit in a 19-inch rack.

RICi-16 ships with the appropriate country- or region-specific power cord equipped with a DC adapter to allow connecting DC power. The power cord connects RICi-16 to the mains using the power socket on the rear panel.

Refer to the following table to determine which cables and connectors are required for installation. *Appendix A* specifies all connector pinouts.

Table 2-1. Required Connection Media

Interface	Cable/Connector
Control port	Straight RS-232/V.24 cable with DB-9 female connector for ASCII terminal
Fast Ethernet interface	RJ-45, 8-pin connector SFP
E1/T1 interface	RJ-45, 8-pin connector For an unbalanced E1 interface, use the adapter cable provided
T3 Interface	BNC coax connector

2.4 Mounting the Unit

For rack installation instructions, refer to the *Rack Mounting Kit for 19-inch Racks* guide that comes with the RM kit. A wall-mounting (WM) kit is available upon request. For wall installations, refer to the *Wall Mounting Kit for Installation of 8.5-inch Units*.

2.5 Connecting to Ethernet Equipment

The RICi-16 Fast Ethernet interface terminates in an 8-pin RJ-45 connector.

Note *When connecting Ethernet and/or Gigabit Ethernet cables longer than 30m, it is recommended to use shielded cables.*

➤ **To connect the Fast Ethernet interface (1 to 4):**

- Connect the LAN to the RJ-45 connectors labeled 10/100BaseT.

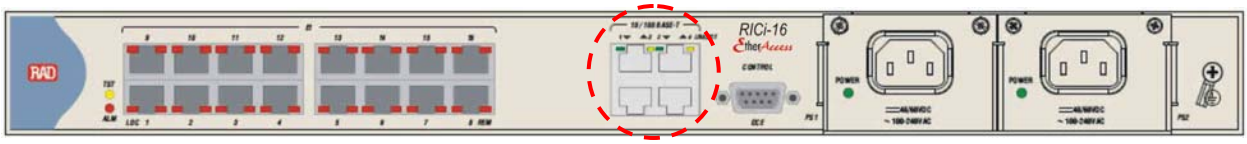


Figure 2-1. Ethernet Ports

2.6 Connecting to E1/T1 Equipment

The E1/T1 interfaces terminate in an 8-pin RJ-45 connector.

➤ **To connect the E1 or T1 interface:**

- Connect an E1 or T1 line to an RJ-45 connector designated E1 or T1 (1-16).
- For unbalanced E1 connections, use the RAD-supplied adaptor.

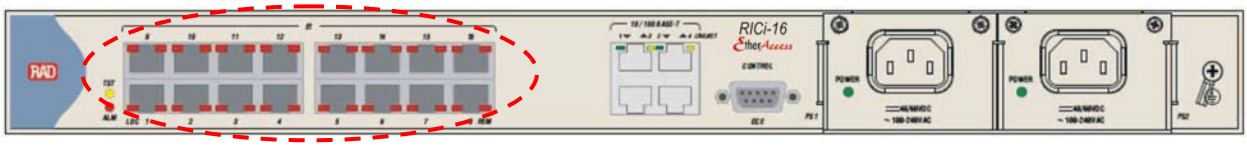


Figure 2-2. E1/T1 Ports

2.7 Connecting to T3 Equipment

The T3 interfaces terminate in BNC coax connectors.

➤ **To connect a T3 interface:**

1. Connect the Rx cable to the BNC labeled **Rx**.
2. Connect the Tx cable to the associated BNC labeled **Tx**.

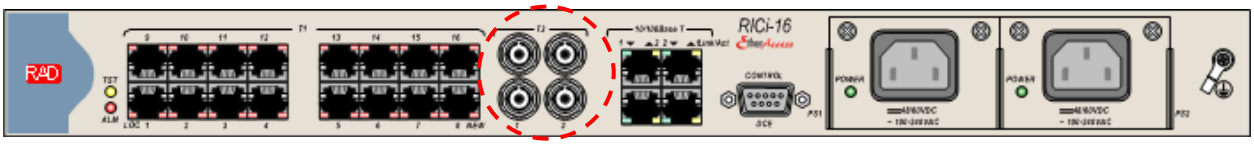


Figure 2-3. T3 Ports

2.8 Connecting to the Terminal

➤ **To connect the ASCII terminal:**

- Connect the unit's CONTROL port to an ASCII terminal or an out-of-band management station with a straight RS-232 cable.

Caution Terminal cables must have a frame ground connection. Use ungrounded cables when connecting a supervisory terminal to a DC-powered unit with floating ground. Using improper terminal cable may result in damage to supervisory terminal port.

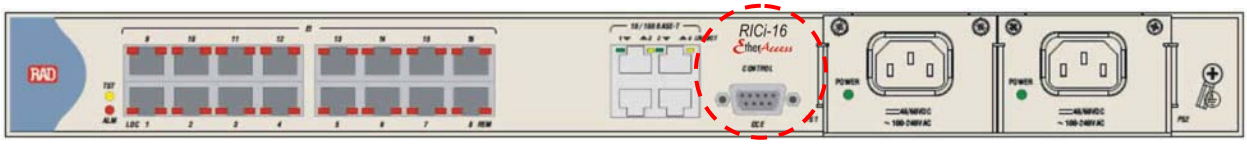


Figure 2-4. ASCII Terminal

2.9 Connecting to Power

RICi-16 can accept either AC power or DC power.

Warning

Before connecting or disconnecting any communication cable, the unit must be grounded by connecting its power cord to a power outlet with a ground terminal, and by connecting the ground terminal on the panel (if provided) to protective ground.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective ground terminal may render this unit dangerous. Intentional interruption is prohibited.

Connecting to AC Power

AC power is supplied via a standard 3-prong inlet with an integral fuse holder.

AC power should be supplied through the 1.5m (5 ft) standard power cable terminated by a 3-prong socket. The cable is provided with the unit.

➤ **To connect AC power:**

1. Connect the power cable to the power connector on the RICi-16 rear panel.
2. Connect the power cable to mains outlet.

   The unit turns on automatically upon connection to the mains.

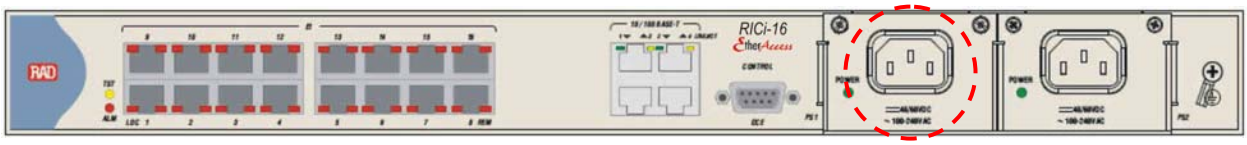


Figure 2-5. Power Connector

Connecting to DC Power

A special IEC 60320 adapter for 48/60 VDC power connection is supplied with the unit.

➤ **To connect to DC power:**

- For instructions on wiring the DC adapter, refer to the DC power supply connection supplement located at the end of this manual.
- For safety instructions, refer to the *Handling Energized Products* section at the beginning of this manual.

Removing/Installing the Hot-Swappable Power Supply Units

You can replace RICi-16's power supply units in the field whenever necessary.

➤ **To remove a hot-swappable power supply unit:**

Warning

To prevent electrocution, DISCONNECT THE POWER SUPPLY CABLE FROM THE POWER SUPPLY UNIT before removing the power supply unit.

1. Using a flathead screwdriver, unscrew the two tightening screws that secure the unit to the chassis.
2. Carefully pull and remove the power supply unit from the chassis.

➤ **To install a hot-swappable power supply unit:**

Warning

To prevent electrocution, KEEP THE POWER SUPPLY CABLE DISCONNECTED FROM THE POWER SUPPLY UNIT until it has been fully installed.

Caution

Do not install the RICi-16 power supply units in other products. The power supply units are intended solely for RICi-16.

1. Carefully slide the new power supply into its slot until the unit's rear connector engages the mating connector on the backplane, and the power supply unit fits into place.

2. Using a flathead screwdriver, secure the power supply unit with the two tightening screws.

Chapter 3

Operation

This chapter includes the following sections:

- Explains how to power RICi-16 up and down.
- Provides a detailed description of the front panel controls and indicators and their functions.
- Provides instructions for using a terminal connected to the RICi-16 control port.
- Describes how to navigate menus.
- Defines the configuration alternatives.

For a detailed explanation of parameters in the menus, see *Chapter 4*.

3.1 Turning On the Unit

➤ To turn on the unit:

- Connect the power cord to the mains.

  The PWR indicator turns on and remains on as long as RICi-16 receives power.

Once installed, RICi-16 requires no operator attention, except for occasionally monitoring the front panel indicators. Intervention is only required when the unit must be configured to its operational requirements, or when diagnostic tests are performed.

3.2 Indicators

The unit's LEDs are located on the front panel. *Table 3-1* lists the functions of the LED indicators.

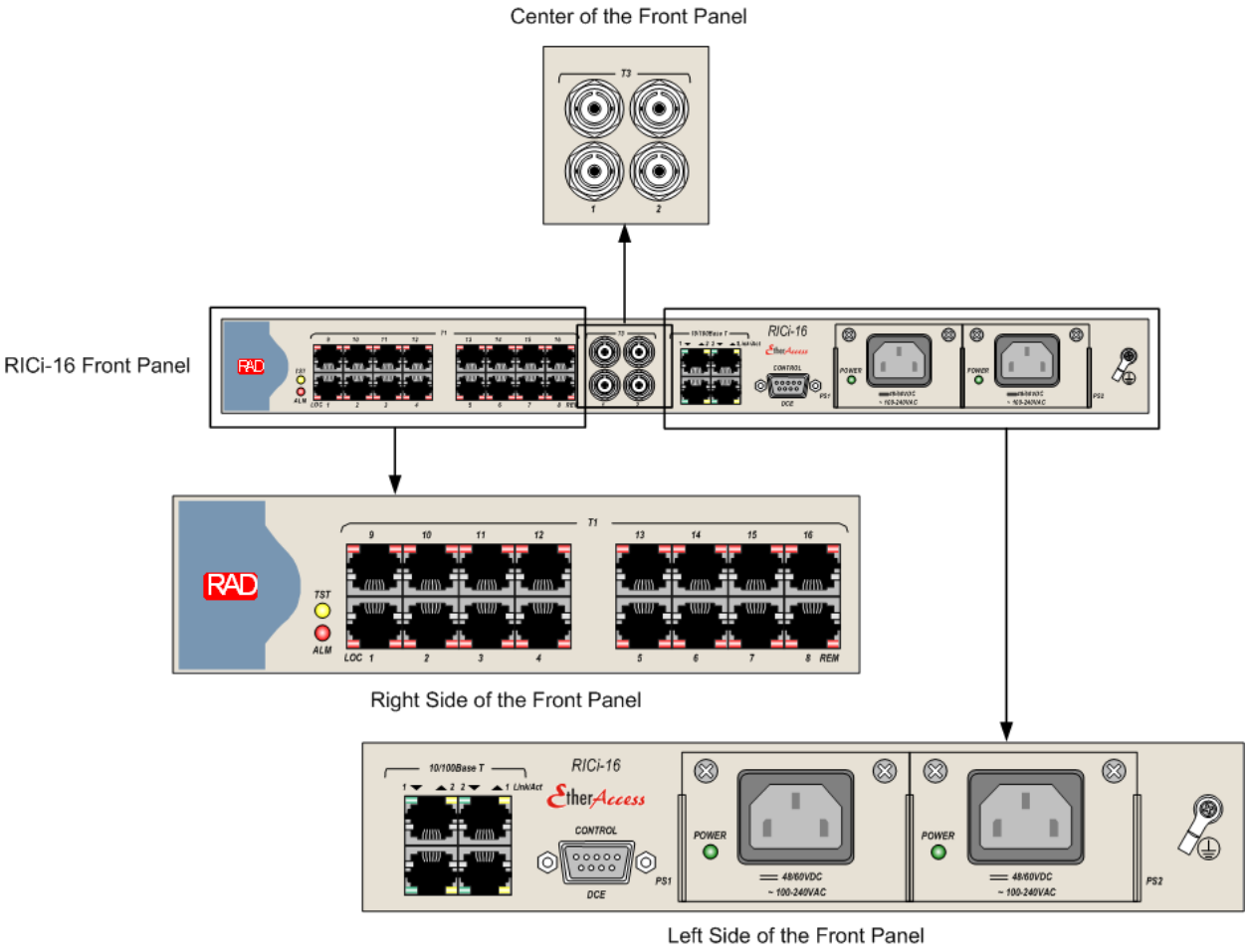


Figure 3-1. RICi-16 Front Panel with T3 Connectors – Magnified

Table 3-1. RICi-16 LEDs and Controls

Name	Color	Function
PWR	*Green*	On – Unit is powered Off – Unit is off
TST	*Yellow*	On – Self test or diagnostics underway Off – no test running
ALM	*Red*	On – interface alarm detected Off – no alarm currently detected
LOC for each **E1** port	*Red*	On – Local sync loss Off – No loss

Name	Color	Function
REM for each **E1** port	*Red*	On – Remote sync loss Off – No loss
RED for each **T1** port	*Red*	On – Local sync loss Off – No loss
YEL for each **T1** port	*Yellow*	On – Remote sync loss Off – No loss
LINK for each **Ethernet** port	*Green*	On – Ethernet link is up Off – Ethernet link is down
ACT for each **Ethernet** port	*Yellow*	Blinking – Ethernet frame received or sent within the last second Off – No frame received or sent within the last second

3.3 Default Settings

Configuration parameters in RICi-16 may or may not have default values. Configuration parameters that have default values fall into one of two categories:

- **Set/configured defaults** – For example, terminal bit rate, which is auto-detect and set on power up. These defaults are presented on the screen.
- **Not set/configured defaults** – These defaults are not visible when entering the screen and are presented by a blank field. They show up after a '**Save**' operation is done in the particular screen. For example, the ingress filtering parameter shows the default value after changes in the bridge configuration screen are saved.

Configuration parameters that do not have default values must have values entered in their respective fields, or the Save operation will fail.

Table 3-2 lists the default settings of the RICi-16 configuration parameters.

Table 3-2. Default System Settings

Type	Parameter	Default Value
System		
Host	IP address	0.0.0.0
	IP mask	255.255.255.0
	Default gateway	0.0.0.0
	Default IP	0.0.0.0
	DHCP	Disable
	Read community	Public

Type	Parameter	Default Value
	Write community	Private
	Trap community	Public
Device Info	Name	RICi-16
	Description	Fast Ethernet over 16 NTU HW Ver: 0.0, SW 2.10
	Location	The Location of the device
	Contact Person	Name of the contact person
Management Access	Telnet	Enable
	SNMP access	Enable
	Web access	Enable
User Access	User name for superuser	su (full control)
	User name for guest user	user (read-only)
Encapsulation	Host Tagging	Untagged
	Host VLAN ID	1
	Host VLAN Priority	0
Alarm Trap Mask	Alarm ID	1
	Trap Status	Active
Control Port	Baud Rate	115200 bps
	Set Scrolling Window Size	*4*
	Security Timeout	10
Network Interface	Network Operation Mode ***Note**: Applicable only for unit with T3 ports*	T3
Physical Ports		
Ethernet User	Administrative Status	Up
	Autonegotiation	Enable
	Max Capability Advertised	100base – TX Full Duplex
	Flow Control	Enable
	MDIX Auto Cross Over	Enable
E1	Administrative Status	Up
	Transmit Clock Source	System
	Receiver Sensitivity	Long haul
	Line Code	HDB3
	Line Type	G732N-CRC

Type	Parameter	Default Value
	Interface Type	Balanced
	Restoration Time	Immediate
T1	Administrative Status	Up
	Transmit Clock Source	System
	Line Type	ESF
	Line Interface	CSU
	Line BuildOut	0 dB
	Receiver Sensitivity	Long haul
	Line Code	B8ZS
	Restoration Time	1 Sec
T3	Administrative Status	Up
	Clock	System
	Structure	Channelized
	Line type	M23
	Line length	Up to 225ft
Application Layer		
Bridge	Aging Time	300
	Forwarding Mode	Filter
	VLAN Mode	Unaware
	Bridge Ports	1 = Reserved for management host 2 = Ethernet 1 3 = Ethernet 2 *4* = Ethernet 3 5 = Ethernet *4* 6 = GFP
Bridge Port	Activation	Enable
	Ingress Filtering	Disable
	Accept Frame Type	All
	Copy Original Priority	Disable
	Default Priority Tag	--
	Egress Tag Handling	None
	Ingress Tag Handling	
Bridge Port	VLAN Tag Stacking	Disable
	Port VID/Stacking VID	2

Type	Parameter	Default Value
	Copy Origin Priority	Disable
	Default Priority	0

3.4 Configuration and Management Alternatives

Configuration and monitoring operations are performed locally from an ASCII terminal connected to the control port or from a PC running a Web browser, using ConfiguRAD or RADview-Lite.

Working with Terminal

RICi-16 includes a V.24/RS-232 asynchronous DTE port designated CONTROL, which is terminated in a 9-pin D-type female connector. The control port continuously monitors the incoming data stream and immediately responds to any input string received through this port.

The control port can be configured to communicate at 9.6, 19.2 or 115.2 kbps.

➤ **To start a terminal control session:**

1. Make sure all RICi-16 cables and connectors are properly connected.
2. Connect RICi-16 to a PC equipped with an ASCII terminal emulation application such as HyperTerminal or Procomm.
3. Connect an ASCII terminal to the CONTROL port at the front panel. The default settings are as follows:
   - **Baud Rate**: 115,200 bps
   - **Data Bits**: 8
   - **Parity**: None
   - **Stop Bits**: 1
   - **Flow Control**: None.
4. To optimize the view of the system menus, do the following:
   - Set the terminal emulator to **VT100**.
   - If you are using HyperTerminal, set the terminal mode to the 132-column mode.
5. When the initialization and the self-test passed successfully, a menu appears displaying initialization and self-test results.

Logging In

➤ **To log in:**

1. Use **su** as user name with read/write permission.
2. Use **1234** as the (default) password for the first login.

Note *It is recommended to change default passwords to prevent unauthorized access to the unit.*

Choosing Options

This section explains how to select options and save changes.

➤ **To select an option:**

1. Type the number corresponding to the option and press ‹**Enter**›.
2. If you performed a change, **Save** appears as the last option in the menu.
3. Type the number corresponding to the **Save** option in the current menu, and press ‹**Enter**› to save your change.

   RICi-16 updates its database with the new value or displays a new menu for the selected option.
4. To exit the menu, press ‹**ESC**›.

   The following message appears:

   ```
   Do you want to save changes (Y/N/C)?
   ```

   Type the appropriate letter for **Y**es, **N**o, or **C**ancel.

Note *When a menu option has only two values, typing the option number and pressing ‹**Enter**› will toggle between the available values.*

Screen Example

Figure 3-2 illustrates a typical screen, displaying the main items.

```
                    Product Title (RICi-16)
Menu Path
1. Sub Menu>
2. Sub Menu>
3. Parameter X [Range] …… (value)
4. Parameter Y>           (Select value from the list)
5. Table Z []

prompt>

Help line message
Help line of keyboard shortcuts, such as “Esc-prev” for
returning to the previous menu
-----------Division screen line -----------------
Scroll messages
```

Figure 3-2. Sample Screen

Navigating Tables

Some of the management screens, such as the Inventory table and Manager table, exceed the size of regular menu screens and require scrolling to navigate between parameters. These screens are best viewed when your terminal screen is set to 132 character width.

Use the following keys (case-sensitive) for table navigation:

- ‹Ctrl+L› – scroll left, Left Arrow – move left
- ‹Ctrl+R› – scroll right, Right Arrow – move right
- ‹Ctrl+U› – scroll up, Up Arrow – move up
- ‹Ctrl+D› – scroll down, Down Arrow – move down
- ‹Tab› – select the next changeable cell
- G‹row number›, ‹col number› – go to the specified cell.

Note *You can display these navigation keys by typing ‹?› from a table.*

The following figure illustrates an empty VLAN table. VIDs and Names are the columns of the parameters to be defined.

```
                              RICi-16
                            VLAN Table
1. VID      | NAME    |

>

ESC-prev. menu; !-main menu; &-exit; ?-Help          1 user (s)
```

Figure 3-3. Sample Table Screen (VLAN)

Working with ConfiguRAD

ConfiguIRAD is a Web-based remote access terminal management software. It provides a user-friendly interface for configuring, collecting statistics and performing diagnostic tests on the unit.

Requirements for Web-based Management

- Internet Explorer 6.0 and up, running on Windows™
- Netscape Communicator 7.0 and up, running on Windows™, HPOV or Linux
- Firefox 1.0.4 and up, running on Windows™
- Mozilla 1.4.3 and up, running on Linux.

➤ **Before you start using a Web browser for remote management or monitoring:**

- Enable scripts.
- Configure the firewall that might be installed on your PC to allow access to the destination IP address.
- Disable pop-up blocking software, such as Google Popup Blocker. You may also have to configure spyware and adware protecting software to accept traffic from/to the destination IP address.
- To prevent configuration errors, you must flush the browser's cache whenever you return to the same screen.

Logging In

➤ To log in from a Web browser:

1. Connect the Ethernet port to the LAN.
2. Verify that an IP address has been assigned to the relevant unit, using an ASCII terminal.
3. Open the Web browser.
4. Disable any pop-up blocking software, such as Google Popup Blocker.
5. In the address field, enter the IP address of RICi-16 and then press ‹Enter›. The address line reads something like http://172.16.100.253.

   The Opening window appears.
6. Click LOGIN; you are asked for the user name and the password.
7. Enter your user name and the password. The default user name for read/write permission is su and the default password is 1234.

   The ConfiguRAD Main menu appears.

Notes

- *It is recommended to change default passwords to prevent unauthorized access to the unit.*
- *RICi-16 allows six management sessions to be active simultaneously: five network sessions (Telnet, ConfiguRAD, RADview-Lite) and one ASCII terminal session.*
- *If no user input is detected for 5 minutes during a ConfiguRAD session, RICi-16 automatically disconnects from the management station.*

Navigating the ConfiguRAD Menus

At the left-hand bottom corner, ConfiguRAD provides auxiliary management tools:

- Status – displays the number of users currently managing the unit.
- Trace – opens an additional pane for system messages, progress indicators (ping, software and configuration file downloads) and alarms.
- Refresh All – refreshes the data currently displayed.

➤ To choose an option:

1. Click a link in the ConfiguRAD screen to display the next menu.
2. Once the target screen is displayed, select a value from the drop-down box or enter it in a text box.

Working with RADview-EMS

RADview-EMS is a user-friendly and powerful SNMP-based element management system (EMS), used for planning, provisioning, and managing heterogeneous networks. RADview-EMS provides a graphical user interface for monitoring RAD products via their SNMP agents.

RADview-EMS for RICi-16 is bundled in the RADview-EMS/NGN package for PC (Windows-based) or UNIX.

For more details about this network management software, and for detailed instructions on how to install, set up, and use RADview, contact your local distributor or refer to the RADview-EMS User's Manual, located on the Technical Documentation CD or on the RAD Website.

Menu Map

Use the menu tree shown in *Figure 3-4* and *Figure 3-5* as a reference for configuring and managing RICi-16. *Chapter 4* illustrates menus and explains parameters.

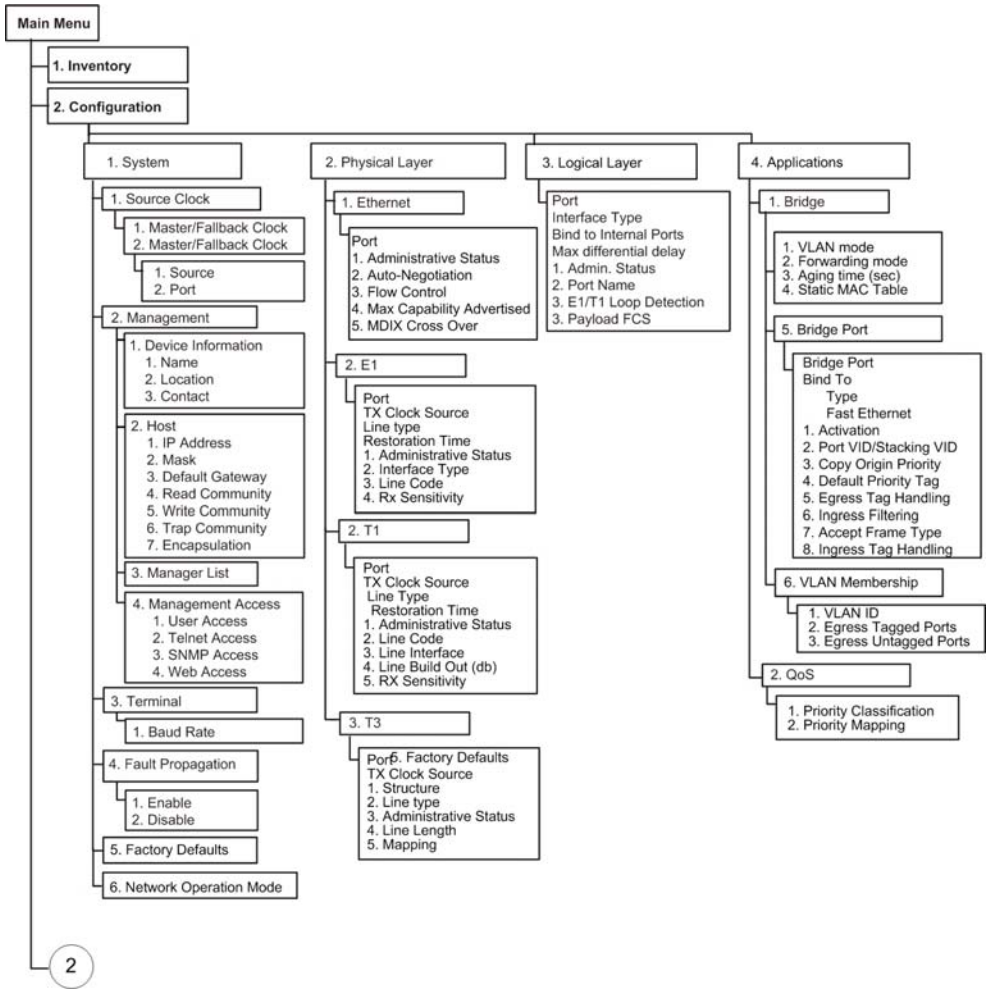


Figure 3-4. Menu Map

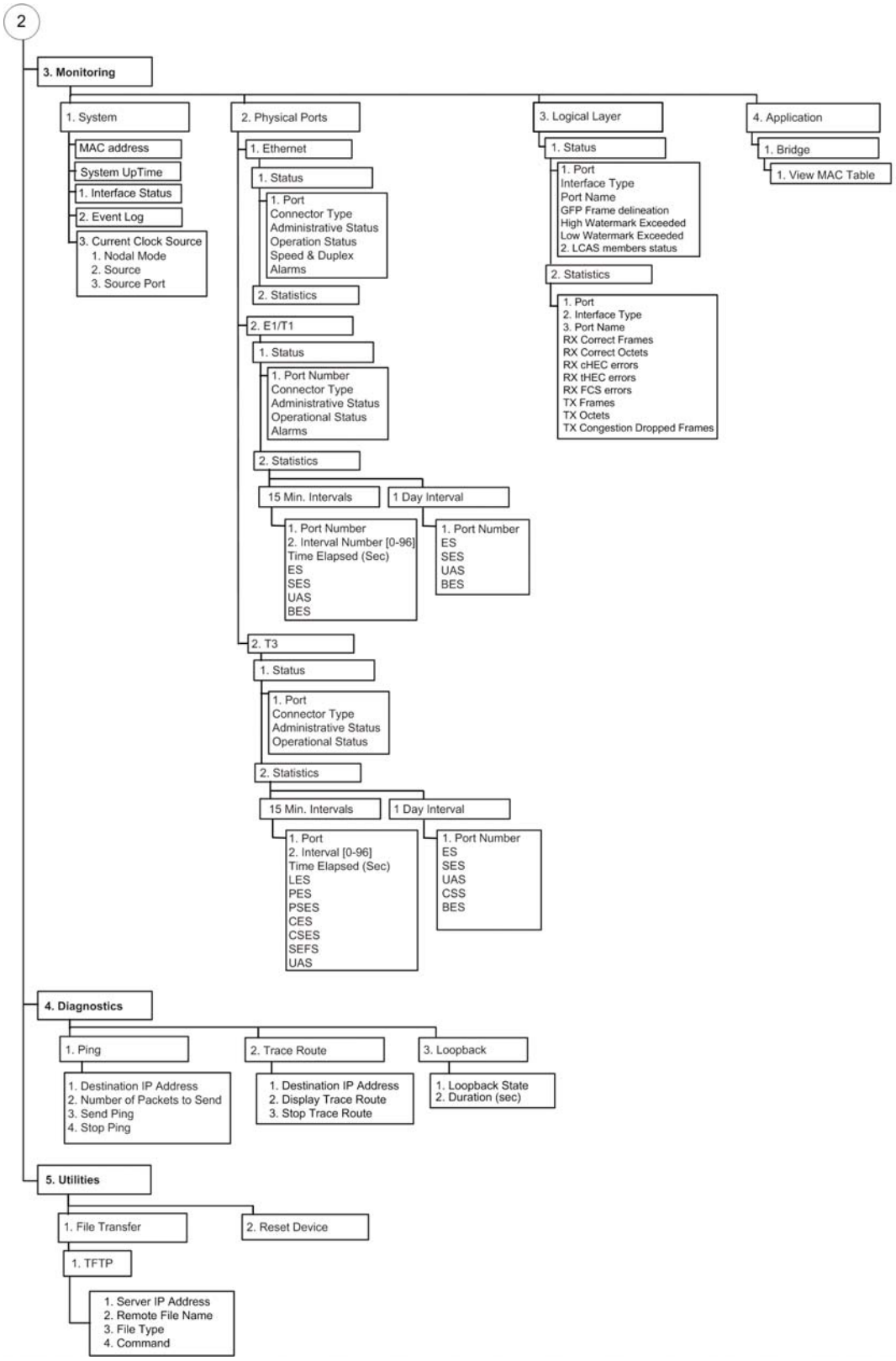


Figure 3-5. Menu Map, Continued

3.5 Turning Off the Unit

➤ To turn off the unit:

- Remove the power cord from the power source.

Chapter 4

Configuration

This chapter describes how to configure RICi-16 for management and operation. Configuration screens are illustrated and configuration parameters explained.

Note *The configuration screens illustrated in this chapter are taken from a terminal screen, but most of the menus are similar to those viewed in Telnet and ConfiguRAD.*

For instructions on accessing and navigating the screens, see *Chapter 3.*

This chapter includes the following sections:

- *Configuring RICi-16 for Management*
- *Configuring RICi-16 for Operation*
- *Additional Tasks*.

4.1 Configuring RICi-16 for Management

This section describes how to configure RICi-16 for management.

Configuring Host IP Parameters

You can manage the unit via a network management station connected to one of the unit's ports. To establish a proper connection, it is necessary to configure the Host parameters such as the IP address.

➤ To configure the Host parameters:

1. From the Main menu, navigate to Configuration › System › Management › Host.

   The Host menu appears as illustrated in *Figure 4-1*.

```
                          RICi-16
Configuration > System > Management > Host
1. IP Address                          ... (0.0.0.0)
2. IP Mask                             ... (255.255.255.0)
3. Default gateway                     ... (0.0.0.0)
4. Read community                      ... (public)
5. Write community                     ... (private)
6. Trap community                      ... (public)
7. Encapsulation                        >

 >
s - Save
ESC-Previous menu; !-Main menu; &-Exit;              1 user(s)
```

Figure 4-1. Host Menu

2. In the Host menu, do the following:
   - Select **IP Address** and assign an IP address.
   - Select **IP Mask** and enter the subnet mask.
   - Select **Default Gateway** and enter the default gateway IP address.
   - Select **Read Community** and type the name of a community with read-only authorization.
   - Select **Write Community** and type the name of a community with write authorization.
   - Select **Trap Community** and type the name of a community to which the unit should send traps.
3. Select **Encapsulation** to define VLAN tagging performed by the host.

   The Encapsulation menu appears as illustrated in *Figure 4-2*.

```
                              RICi-16
Configuration > System > Management > Host > Encapsulation
1. Host tagging                        (Tagged)
2. Host VLAN ID [1-4094]               ... (2)
3. Host Priority Tag [0-7]             ... (0)

s - Save

ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-2. Encapsulation Menu

4. From the Encapsulation menu, select **Host Tagging** to toggle between **Untagged** or **Tagged**.
   - **Untagged** – The host sends and receives frames with no VLAN tag to/from the bridge.
   - **Tagged** – The host receives frames only if they are tagged with the host's VLAN ID, and it sends frames to the bridge with this tag.

Note *When Host Tagging is set to **Tagged**, two parameters are added to the menu: **Host VLAN ID** and **Host Priority Tag**.*

5. Select **Host VLAN ID** to specify the host VLAN ID (1–4094).
6. Enter the number of the VLAN ID.
7. Select **Host Priority Tag** to specify the priority level for the host VLAN (0–7).
8. Select **Save**.
9. Return to the Host menu and select **Save** again.

Entering Device Information

The RICi-16 management software allows you to assign a name to the unit and specify its location to distinguish it from other units installed in your system. A contact person can also be assigned. Each of these fields can hold up to 50 characters.

➤ **To enter device information:**

1. From the Main menu, navigate to Configuration › System › Management › **Device Information**.

   The Device Information menu appears as illustrated in *Figure 4-3* for a typical example.
   The description of the unit is factory-set and cannot be changed.

```
                                RICi-16
Configuration > System > Management > Device Information
   Description        (Fast Ethernet over 16 E1 Intelligent Converter)

1. Device Name    ... (RICi-16)
2. Location       ... (The Location of the Device)
3. Contact        ... (Name of Contact Person)


>
s - Save
ESC-Previous menu; !-Main menu; &-Exit;
```

Figure 4-3. Typical Device Information Menu

2. Select **Device Name,** and type a name for the unit. The default name is RICi-16.
3. Select **Location**, and type a location name/description.
4. Select **Contact**, and type the name of a contact person for this unit.
5. Select **Save.**

Configuring Management Access

RICi-16 lets you enable or disable access via the Web, SNMP or Telnet for specific users.

➤ **To modify Telnet, SNMP, or WEB access permissions for a user:**

1. From the Main menu, navigate to Configuration › System › Management › **Management Access**.

   The Management Access menu appears as illustrated in *Figure 4-4*.

```
                              RICi-16
Configuration > System > Management > Management Access
1. User Access
2. Telnet Access                          (Enable)
3. SNMP Access                            (Enable)
4. WEB Access                             (Enable)

>
S – Save
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 1 C
```

Figure 4-4. Management Access Menu

2. Select the access level you wish to change. You may choose between **Telnet Access**, **SNMP Access**, or **WEB Access**.
3. Select the permission setting for this access level. You may choose between **Enable**, **Disable** or **Manage Only**.

   Manage Only allows access to only the stations that appear in the Manager List.

4. Select **Save**.

Configuring Network Managers

The network management stations to which the SNMP agent sends traps can be defined or modified. Up to ten managers can be defined. In addition, you can temporarily prevent a manager station from receiving traps by masking the network manager.

➤ **To edit the manager list:**

1. From the Main menu, navigate to Configuration › System › Management › **Managers List**.

   The Managers List menu appears as illustrated in *Figure 4-5*.

```
                              RICi-16
Configuration > System > Management > Managers List

Manager ID          Manager IP         Manager Trap Mask
    1.              1.1.1.1            Unmask
|   2.              2.2.2.2            Unmask
v   3.              3.3.3.3            Mask
    4.              4.4.4.4            Unmask
    5.              5.5.5.5            Unmask

1. Change cell                       … (1.1.1.1)
A - Add
ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 4-5. Manager List Menu

2. To add a new network manager, type **A**.

➤ **To edit an existing network manager:**

1. Move the cursor to the Manager IP cell you wish to modify by pressing the **Tab** key. The selected cell is highlighted and the value is displayed in the **Change cell** field.
2. Press ‹**1**›, and then press **Enter**.

   You may enter the IP address associated with the desired network manager.

3. Move the cursor to the Trap field and toggle between **Mask** and **Unmask** to mask or unmask traps for that manager.

```
                              RICi-16
Configuration > System > Management > Manager List
Manager ID                    (1)
1. Manager IP            ... (0.0.0.0)
2. Manager Trap Mask     ... (Enable)

>
s - Save
ESC-prev menu; !-main menu; &-exit;                        1 user(s)
```

Figure 4-6. Manager List Menu, Add Mode

Configuring Control Port Parameters

You can manage RICi-16 using an ASCII terminal connected to the Control Port. The management software allows you to configure the terminal baud rate.

Note *The Baud Rate parameter is masked during a Telnet session.*

➤ To change the terminal baud rate:

1. From the Main menu, navigate to Configuration › System › **Terminal**.

   The Terminal menu appears as illustrated in *Figure 4-7*.

```
                              RICi-16
Configuration > System > Terminal
1.      Baud Rate          > (115200 bps)

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-7. Control Port Menu

2. From the Terminal menu, select **Baud Rate.**
3. Select the desired baud rate (9600, 19200, 115200). The default baud rate is 115200.
4. Select **Save**.

4.2 Configuring RICi-16 for Operation

This section explains how to operate the unit.

Setting Device-Level Parameters

This section includes procedures for setting the clock source, configuring fault propagation options, and selecting the network operation mode.

Selecting the Clock Source

Transmitted data can be clocked either from an internal clock within the RICi-16 unit, or from an external clock via the E1/T1/T3 links.

In channelized T3 network mode the device has two system clocks, one for the T1 channels and one for the T3 ports. In unchannelized T3 mode, only the T3 clock is active. In T1 network mode, only the T1 clock is active.

The unit can be assigned two sources for timing:

- **Master Source** – main clock source
- **Fallback Source** – activated when the master source fails (for example, when the E1/T1 link supplying the timing fails).

It is recommended to assign different clock types for the master and fallback clock sources, for example: Rx Clock (external) for the master source and Internal for the fallback source.

If the fallback source fails, the internal source takes over.

➤ **To select the master clock source:**

1. Navigate to Configuration › System › Source Clock › **Master Clock.**

   The Master Clock menu appears (see *Figure 4-8* and *Figure 4-9*). If the unit has T3 network mode and channelized T3 structure, the menu indicates it is the T1 clock.

2. Select **Source** and choose the master clock source:
   - **Internal** – To set the internal clock as the master clock source.
   - **Rx Clock** – To set an external clock (from E1/T1/T3 link) for the master clock source.
3. If you chose **Rx Clock**, specify the port to be used:
   - **E1/T1 Port 1–16** if you are configuring the E1/T1 master clock source
   - **T3 Port 1–2** if you are configuring the T3 master clock source.
4. Select **Save** to save the clock source settings.
5. If the unit has T3 network mode and channelized T3 structure, type **f** to advance to the T3 master clock source, and repeat steps *2* through *4* to configure the T3 master clock source.

➤ **To select the fallback clock source:**

1. Navigate to Configuration › System › Source Clock › **Fallback Clock.**

   The Fallback Clock menu appears (see *Figure 4-10* and *Figure 4-11*). If the unit has T3 network mode and channelized T3 structure, the menu indicates it is the T1 clock.

2. Select **Source** and choose the fallback clock source:
   - **Internal** – To set the internal clock as the fallback clock source.
   - **Rx Clock** – To set an external clock (from E1/T1/T3 link) for the fallback clock source.
3. If you chose **Rx Clock**, specify the port to be used:
   - **E1/T1 Port 1–16** if you are configuring the E1/T1 fallback clock source
   - **T3 Port 1–2** if you are configuring the T3 fallback clock source.
4. Select **Save** to save the clock source settings.
5. If the unit has T3 network mode and channelized T3 structure, type **f** to advance to the T3 fallback clock source, and repeat steps *2* through *4* to configure the T3 fallback clock source.

```
                              RICi-16
Configuration > System > Source Clock > Master Clock

System Clock                        (T1)

1. Source                           (Internal)

>
f - Forward
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-8. Master Clock Menu, T3 Network Mode and Channelized T3 Structure

```
                              RICi-16
Configuration > System > Source Clock > Master Clock

1. Source                           (Internal)

>

ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-9. Master Clock Menu, E1 Interface or T1 Network Mode or Unchannelized T3 Structure

```
                                RICi-16
Configuration > System > Source Clock > Fallback Clock

System Clock                      (T1)

1. Source                         (Internal)

>
f - Forward
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-10. Fallback Clock Menu, T3 Network Mode and Channelized T3 Structure

```
                                RICi-16
Configuration > System > Source Clock > Fallback Clock

1. Source                         (Internal)

>

ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-11. Fallback Clock Menu, E1 Interface or T1 Network Mode or Unchannelized T3 Structure

Configuring Fault Propagation

When the fault propagation feature is enabled, LAN ports 1 through 3 are deactivated whenever the GFP uplink fails due to errors on the TDM link. LAN port 4 remains active for management traffic.

➤ To configure the fault propagation:

1. From the Main menu, navigate to Configuration › System › Fault Propagation.

   The Fault Propagation menu appears as illustrated in *Figure 4-12*.

```
                                RICi-16
Configuration > System > Fault Propagation

1. Network - >  User Fault Propagation      (Disable)

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-12. Fault Propagation Screen

2. From the Fault Propagation menu, select Network — › User Fault Propagation to toggle between Enable or Disable.
3. Select Save.

Selecting the Network Operation Mode

Note *This section is relevant only for RICi-16/T3.*

You can select the network operation mode to be T1 or T3, according to your application requirements.

➤ To set the network operation mode:

1. From the Main menu, navigate to Configuration › System.

   The System Configuration menu appears as illustrated in *Figure 4-13*.

2. Select Network Operation Mode and set it to T1 or T3.
3. Select Save.

Note *Changing the network operation mode is a time-consuming operation. It may take 10 to 30 seconds for RICi-16 to complete the transition.*

When you change the network operation mode, all VCG and VLAN configurations are lost. The device reverts to default VCG and VLAN configuration.

```
                          RICi-16
Configuration > System

1. Source Clock                >
2. Management                  >
3. Terminal                    >
4. Fault Propagation           >
5. Factory Defaults
6. Network Operation Mode      (T3)

>
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-13. System Configuration Menu

Setting Physical-Layer Port Parameters

RICi-16 is equipped with 16 E1/T1 ports and four fast Ethernet interfaces. The Ethernet and E1 or T1 (depending on your unit) configuration menus are available from the Physical Layer menu.

Configuring the Ethernet Ports

The following parameters can be configured for the Ethernet ports at the physical level:

- Auto Negotiation
- Flow Control
- Maximum advertised capability for the Auto Negotiation procedure
- Data rate and duplex mode (only when Auto Negotiation is disabled)
- MDIX Cross Over.

➤ To configure the Ethernet port:

1. From the Main menu, navigate to Configuration › Physical Layer › **Ethernet**.

   The Ethernet menu appears as illustrated in *Figure 4-14*.

```
                              RICi-16
Configuration > Physical Layer > Ethernet

   Port                            (1)
1. Administrative Status           (Up)
2. Auto-Negotiation                (Enable)
3. Flow Control                    (Enable)
4. Max Capability Advertised  >    (100base – TX Full Duplex)
5. MDIX Cross Over                 (Enable)

>
s – Save;  f – forward;  b – backward

ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 4-14. Ethernet Menu

2. Configure the Ethernet port parameters. Parameter descriptions and possible values are provided in *Table 4-1*.

Table 4-1. Ethernet Parameters

Parameter	Remarks	Possible Values
Port	Ethernet port number. This parameter is read-only.	1–4 The default is 1
Administrative Status	Specify the status of the associated port.	Up (default) Down
Auto-Negotiation	Enables auto negotiation signaling over the Ethernet.	Enable (default) Disable
Flow Control	The flow control parameter is used to configure the default administrative PAUSE mode for this interface.	Enable (default) Disable
Max Capability Advertised	The Max Capability Advertised parameter specifies the set of capabilities advertised by the local auto-negotiation entity.	10baseT Half Duplex 10baseT Full Duplex 100baseTX Half Duplex (default) 100base TX Full Duplex
MDIX Auto Cross Over	Enables and disables Auto Cross Over functionality.	Enable (default) Disable

3. Select **Save** to finish the port configuration.

Configuring the E1 Ports

Note *This section is relevant only for RICi-16 equipped with E1 ports.*

➤ To configure E1 ports:

1. From the Physical Layer menu, select **E1**.

   The E1 menu appears as illustrated in *Figure 4-15*.

```
                              RICi-16
Configuration > Physical Layer > E1

   Port [1 – 16]                (1)
   TX Clock Source              (System)
   Line type                    (G.732N-CRC)
   Restoration Time             (Immediate)


1. Administrative Status        (Up)
2. Interface Type               (Unbalanced)
3. Line Code                    (HDB3)
4. Rx Sensitivity               (Long Haul)


>
S – Save  f – forward  b – backward
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 4-15. E1 Port Configuration Menu

2. Configure E1 port parameters for each E1 port. Parameter descriptions and possible values are provided in *Table 4-2*.

   Press ‹**F**› to switch to a different E1 port.

Table 4-2. E1 Port Parameters

Parameter	Possible Values	Remarks
Port number	1 – Number of E1 ports (16)	Index of E1 ports. This parameter is read-only.
TX Clock Source	System	Transmit clock source of the E1 port
Line Type	G.732N-CRC	Indicates the variety of E1 line in this circuit. The type of circuit affects the number of bits per second that the circuit can reasonably carry, as well as the interpretation of the usage and error statistics. This parameter is read-only.
Restoration Time	Immediate	The restore time parameter is used to change the synchronization algorithms to reduce the time required for the port to return to normal operation after local loss of synchronization (LOF event). This parameter is read-only.

Parameter	Possible Values	Remarks
Administrative Status	Up (default) Down	Administrative status of E1 port
Interface Type	Balanced (default) Unbalanced	E1 interface type
Line Code	HDB3 (default) AMI	Indicates the transmission line code.
Rx Sensitivity	Short Haul Long Haul (default)	

3. Select **Save**.
4. Repeat this procedure for all E1 ports in use.

Note *If two CPEs such as RICi-16 communicate via VCG (VCAT) interfaces using a 16-frame multi-frame protocol (G.732N), network devices along the path must be set to forward E1 frames transparently.*

Configuring the T1 Ports

Note *This section is relevant only for RICi-16 with T1 network ports, or channelized T3 network interface.*

➤ To configure T1 ports:

1. From the Physical Layer menu, select **T1**.

   The T1 menu appears as illustrated in *Figure 4-16*.

```
                              RICi-16
Configuration > Physical Ports > T1
   Port [1 – 16]                        (1)
   TX clock Source                      (System)
   Line Type                         >  (ESF)

1. Administrative Status                (Up)
2. Line Code                         >  (B8ZS)
3. Restoration Time                     (Immediate)
4. Line Interface                    >  (DSU)
5. Line Length                          (0–133 ft)
6. Line Build Out (db)                  (0)
7. Rx Sensitivity                       (Long Haul)


>
f – forward  b – backward
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 4-16. T1 Port Configuration Menu

2. Configure the T1 port parameters for each T1 port. *Table 4-3* lists explanations and possible values for the listed parameters.

Press ‹F› to switch to a different T1 port.

Table 4-3. T1 Port Parameters

Parameter	Possible Values	Remarks
Port	1 – Number of T1 ports (16)	Index of T1 ports. This parameter is read-only.
Line Type	ESF	Indicates the variety of T1 Line implementing this circuit. The type of circuit affects the number of bits per second that the circuit can reasonably carry, as well as the interpretation of the usage and error statistics. This parameter is read-only.
Transmit clock source	System	Transmit clock source of the T1 port
Restoration Time	Immediate (default) 1 sec.	Reduces the time required for the T1 port to return to normal after loss of synchronization (LOF).
Administrative Status	Enable (default) Disable	Administrative status of the T1 port
Line Code	B8ZS (default) AMI	Indicates the transmission line code.
Line Interface	DSU (default) CSU	Line interface type of the T1 port: Digital Service Unit (DSU) or Channel Service Unit (CSU).
Line Length	0-133 ft (default) 134-266 ft 267-399 ft 400-533 ft 534-655 ft	The length of the DSL line
Line Build Out (dB)	0 dB (default) -7.5 dB -15 dB -22.5 dB	The TX gain of the DSL line
Rx Sensitivity	Short Haul Long Haul (default)	Determines the maximum attenuation of the receive signal that can be compensated for by the interface receive path.

3. Select **Save**.
4. Repeat this procedure for all T1 ports in use.

Note *If two CPEs such as RICi-16 communicate via VCG (VCAT) interfaces using a 24-frame multi-frame protocol (ESF), network devices along the path must be set to forward T1 frames transparently.*

Configuring the T3 Ports

Note *This section is relevant only for RICi-16/T3.*

This section describes the configuration of the T3 port parameters. To configure the T3 channel mapping, refer to *Configuring the T3 Channel Mapping*.

➤ **To configure the T3 port parameters:**

1. From the Physical Layer menu, select **T3**.

   The T3 menu appears as illustrated in *Figure 4-17*.

```
                              RICi-16
Configuration > Physical Layer > T3
   Port                                (1)
   TX Clock Source                     (System)

1. Structure                           (Channelized)
2. Line Type                           (M23)
3. Administrative Status               (Up)
4. Line Length                         (Up to 225ft)
3. Mapping                        >


>
s – Save;  f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-17. T3 Port Configuration Menu

2. Configure the T3 port parameters. *Table 4-4* lists explanations and possible values for the parameters.

Table 4-4. T3 Port Parameters

Parameter	Possible Values	Remarks
Port	1 – 2	Index of T3 port. This parameter is read-only.
TX Clock Source	System	Transmit clock source of the T3 port.
Structure	Channelized (default) Unchannelized	Channelized: Aggregated T3 up to 28 T1 channels. Unchannelized: Native T3 channel ***Note**: Changing the T3 structure is a time-consuming operation and may take as long as 30 seconds to complete. All VCG and VLAN configurations are lost when you change the T3 structure. The device reverts to default VCG and VLAN configurations.*
Line Type	M23 C-bit Parity	Indicates the variety of T3 Line implementing this circuit. The type of circuit affects the number of bits per second that the circuit can reasonably carry, as well as the interpretation of the usage and error statistics. ***Note**: The Line Type parameter changes if you change the T3 structure: M23 for channelized structure, C-bit Parity for unchannelized structure.*
Administrative Status	Up (default) Down	Administrative status of the T3 port

Parameter	Possible Values	Remarks
Line Length	Up to 225ft Over 225ft	The length of the DSL line.

3. Select **Save**.
4. Repeat this procedure for both T3 ports if T3 structure is unchannelized. Only the first T3 port is available to be configured if T3 structure is channelized.

Note *If two CPEs such as RICi-16 communicate via VCG (VCAT) interfaces using a 24-frame multi-frame protocol (ESF), network devices along the path must be set to forward T1 frames transparently.*

Configuring the T3 Channel Mapping

Note *This section is relevant only for RICi-16/T3.*

You can configure the T3 channel mapping in the case of channelized T3. To configure the T3 interface to channelized, refer to *Configuring the T3 Ports*.

You can map up to 28 T3 channels to up to 16 physical T1 ports and up to 16 VCGs. A physical T1 port can be mapped only once to a T3 channel. A VCG logical port can be mapped to up to 16 T3 channels. The default T3 channel mapping configuration is:

- T3 channels 1–16 mapped to T1 ports 1–16 respectively
- T3 channels 17–28 mapped to logical port 1 (VCG 1).

Note *If you want to map a T3 channel to a VCG other than VCG 1, you must first create the VCG logical port. Refer to* Configuring Logical Layer *for details.*

➤ To view the T3 channel mapping:

- From the T3 menu, select **Mapping**.

  The T3 Mapping menu appears as illustrated in *Figure 4-18*. The default mapping configuration is shown. When the mapping menu appears, the cursor is positioned at the connection for channel 1.

```
                                    RICi-16
Configuration > Physical Layer > T3 > Mapping
  Channel    Connection      Channel    Connection      Channel   Connection
  1          T1-1            11         T1-11           21        LP1
  2          T1-2            12         T1-12           22        LP1
  3          T1-3            13         T1-13           23        LP1
  4          T1-4            14         T1-14           24        LP1
  5          T1-5            15         T1-15           25        LP1
  6          T1-6            16         T1-16           26        LP1
  7          T1-7            17         LP1             27        LP1
  8          T1-8            18         LP1             28        LP1
  9          T1-9            19         LP1
  10         T1-10           20         LP1

 1. T1-1    4. T1-4      7. T1-7     10. T1-10    13. T1-13    16. T1-16
 2. T1-2    5. T1-5      8. T1-8     11. T1-11    14. T1-14    17. LP1
 3. T1-3    6. T1-6      9. T1-9     12. T1-12    15. T1-15    18. N/C

>

ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-18. T3 Mapping Menu, Default Configuration

The rows at the bottom of the screen show the values corresponding to potential connections, to use when changing the channel mapping. Use the **N/C** value to set a channel to unmapped. Setting a channel to unmapped causes an AIS signal to propagate over the T3 connection on that channel.

➤ **To change a T3 channel mapping:**

1. Use the arrow keys to position the cursor at the channel for which you want to change the mapping.
2. Type the value corresponding to the connection that you want to map to the channel, and click <**Enter**>. For example, type 1 to map to T1 port 1, or 16 to map to logical port 1. If the list of potential connections is too large to fit on the screen, type **n** to display the rest of the list, and **p** to display the first part of the list.

Configuring Logical Layer

You can map multiple E1/T1 ports or T3 clear channels to a VCAT VCG group, via the Logical Layer menu. If the RICi-16 unit has a T3 channelized interface, then you map the logical ports to T3 channels via the T3 mapping menu, not via the Logical Layer menu.

To ease configuration effort and save time, the RICi-16 unit is supplied with the logical ports preconfigured, according to the network interface (see *Table 4-5* through *Table 4-7*). When you change the network interface, the corresponding default configuration is automatically created.

A logical port in RICi-16 is either a VCG logical port bound to physical E1/T1/T3 ports or T1 channels, or a GFP logical port that is bound to a VCG logical port. When you create a VCG logical port, RICi-16 automatically creates a GFP logical port that is bound to the VCG logical port, and configures a bridge port bound to the GFP logical port. Therefore, you only need to add/delete VCG logical ports. You do not manually add/delete GFP logical ports.

You can create up to 16 VCG logical ports if the network interface is E1/T1 or channelized T3. You can create only two VCG logical ports if the network interface is unchannelized T3.

Note *A physical port can be bound to only one logical VCG port.*

Table 4-5. Default Logical Port Settings for T3 Network Interface, Channelized

Logical Port	Interface Type	Port Name	Bound to
1	VCG	VCG 1	Internal ports (T3 channels) 17–28
2	GFP	GFP 1	Logical port VCG 1

Table 4-6. Default Logical Port Settings for T3 Network Interface, Not Channelized

Logical Port	Interface Type	Port Name	Bound to
1	VCG	VCG 1	Physical (T3) ports 1–2
2	GFP	GFP 1	Logical port VCG 1

Table 4-7. Default Logical Port Settings for E1/T1 Network Interface

Logical Port	Interface Type	Port Name	Bound to
1	VCG	VCG 1	Physical (E1/T1) ports 1–16
2	GFP	GFP 1	Logical port VCG 1

➤ To configure the Logical Layer settings:

1. From the Main menu, navigate to Configuration › Logical Layer.

   The Logical Layer menu appears. Depending on the interface type and logical port type, the screen appears as shown in *Figure 4-19* through *Figure 4-21*.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Bind To Internal Ports                  (17-28)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-19. Logical Layer Menu (VCG) – T3 Interface, Channelized

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-2)
4. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-20. Logical Layer Menu (VCG) – E1/T1 or T3 Interface, Not Channelized

```
                              RICi-16
Configuration > Logical Layer
   Port[1-2]                                  (2)
   Interface Type                             (GFP)
1. Bind To                                    (VCG 1)
2. Administrative Status                      (Up)
3. Port Name                                  (GFP 1)
4. Payload FCS                                (Absent)

>
a – add; f – forward; b - backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-21. Logical Layer Menu (GFP)

2. Configure the logical parameters for each port. Parameter descriptions and possible values are provided in *Table 4-8*.

   Type ‹**F**› to scroll through the ports.

Table 4-8. Logical Layer Parameters

Parameter	Possible Values	Remarks
Port	1–16	The logical port being configured
Interface Type	VCG GFP	Interface Type
Bind to Internal Ports	Single number or range 1–28	VCAT VCG Logical Port: Links to T3 channels. This parameter is read-only and applies only when the T3 interface is configured as channelized.
Bind to Physical Ports	Single number or range E1/T1: 1–16 T3: 1–2	VCAT VCG Logical Port: E1/T1 links or T3 clear channels that are members of the VCG This parameter applies only when RICi-16 is configured for T1 network mode or T3 unchannelized interface.
Bind to	VCG ‹n›	GFP Logical Port: Links to VCG. This parameter is read-only.
Administrative Status	Up (default) down	Administrative state of the logical port
Port Name	VCG 1 / GFP 1 (default)	Free text to assign a name to the logical port
Max Differential Delay (msec)	256 (default)	Maximum allowed delay variation in milliseconds. This parameter is read-only.
Payload FCS	Present Absent (default)	GFP payload FCS

Parameter	Possible Values	Remarks
E1/T1 Loop Detection	Enable (default) Disable	**Enable**: Looped members are automatically detected and not added to the LCAS. **Disable**: Disabling **E1/T1 Loop Detection**. The VCG restarts after enabling or disabling the E1/T1 loop detection.

Configuring the Bridge

The internal bridge connects the unit's ports. Configure the bridge for it to properly process the VLAN tags to maintain priority of the data flows.

The bridge operates in transparent mode (learning is disabled) or filtered mode (learning and filtering are enabled).

➤ **To configure the internal bridge:**

1. From the Main menu, navigate to Configuration › Applications › **Bridge**.

   The Bridge menu appears as illustrated in *Figure 4-22*.

```
                              RICi-16
Configuration > Applications > Bridge
1. VLAN Mode                      >     (Aware)
2. Forwarding Mode                >     (Filter)
3. Aging Time (sec) [300 - 4080]  ... (300)
4. Static MAC Table               []>
5. Bridge Port                    >
6. VLAN Membership                >

>
s – Save
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-22. Bridge Menu

2. In the Bridge menu, configure the following:
   - **VLAN Mode** (forwarding based on MAC address only or on VLAN+MAC):
     - **Aware** –Bridge operates according to 802.1q, forwarding packets based on VLAN+MAC address
     - **Unaware** – Bridge operates according to 802.1d, forwarding packets based on MAC address only
   - **Forwarding Mode** (determines whether the bridge learns MAC addresses):
     - **Filter** – Learning and filtering are enabled
     - **Transparent** – No learning is performed. Each packet received is forwarded to all other ports automatically, unless static MAC is used.

- **Aging Time** (300 to 4080 seconds) – Aging time for entries in the MAC table. If the aging time elapses, and no frame has been received with the MAC address, it is erased from the MAC table.

3. To configure the Static MAC Table, refer to *Configuring the MAC Table.*
4. To configure the Bridge Port, refer to *Configuring the Bridge Ports.*
5. To configure the VLAN Membership (in Aware bridge only), refer to *Configuring VLAN Membership*.

Configuring the MAC Table

Static MAC addresses are stored in the MAC table.

➤ **To add a static MAC address:**

1. From the Main menu, navigate to Configuration › Applications › Bridge › **Static MAC Table**.

   The Static MAC Table appears as illustrated in *Figure 4-23*, with VLAN ID entries for a VLAN-aware bridge only.

```
                              RICi-16
Configuration > Applications > Bridge > Static MAC Table
             VLAN ID       MAC Address       Bridge Port
             1             111111111111       1
|            2             222222222222       2
v            3             333333333333       3
             4             444444444444       4
             5             555555555555       5

>
S – Save; A – Add; R – Remove; C - Clear
ESC-prev menu; !-main menu; &-exit; ?-help                1 M/ 2C
```

Figure 4-23. Static MAC Table

2. In the Static MAC Table, press ‹**A**› to add a static MAC address.

   The Static MAC Table switches to the MAC Table Handling mode as illustrated in *Figure 4-24*.

```
                              RICi-16
MAC Table Handling
1. VLAN ID                      (0)
2. MAC Address                … (00-00-00-00-00-00)
3. Bridge Port [1-6]            (6)

>
s - Save

ESC-Previous menu; !-Main menu; &-Exit; ?-Help          1 M/ 2 C
```

Figure 4-24. Static MAC Table, Add Mode

3. In the MAC Table Handling mode, perform the following:
   - Select **MAC Address**, and enter a new MAC address.

- Select **VLAN ID**, and choose a VLAN ID for the MAC address between 1 and 4094.
- Select **Bridge Port**, and choose the interface this MAC address should be attached to.
- Select **Save** to save the MAC address.
- Press <**ESC**> to return to the Static MAC Table screen.

➤ **To remove a static address from the table:**

- In the Static MAC Table (*Figure 4-23*), select the desired MAC address and press <**R**>.

  The MAC address is deleted from the table.

➤ **To clear the MAC table:**

1. In the Static MAC Table screen (*Figure 4-23*), press <**X**>.

   The following message appears:
   `Are you sure (Y/N)?`

2. To confirm your request, press <**Y**>.

   All MAC addresses are deleted from the table.

Configuring the Bridge Ports

You can use the Bridge Port menu for configuration of the bridge port parameters, other than binding to logical ports.

The unit ships with default bridge port bindings preconfigured for basic use. The factory defaults are listed in *Table 4-9*. You cannot delete bridge port bindings to the host port and Ethernet ports. You can create or delete bridge port bindings to GFP logical ports only indirectly, by adding or deleting the corresponding VCG logical port, via the Logical Layer menu.

Table 4-9. Default Bridge Port Bindings

Bridge Port	Bound to
1	Reserved for management host
2	Ethernet port 1
3	Ethernet port 2
4	Ethernet port 3
5	Ethernet port 4
6	GFP 1 (logical port 2)

➤ **To configure a bridge port:**

1. From the Main menu, navigate to Configuration › Applications › Bridge › **Bridge Ports**.

   The Bridge Port menu appears as illustrated in *Figure 4-25*.

2. In the Bridge Port menu, configure the bridge port parameters according to *Table 4-10*.
3. Select **Save**.

```
                              RICi-16
Configuration > Applications > Bridge > Bridge Ports
 1. Bridge port [1 – 16]                    (2)
 2. Bind To                                 (Fast Ethernet 1)
 3. Activation                              (Enable)
 4. Port VID\Stacking VID [1 – 4094]      …(3)
 5. Copy Origin Priority                    (Disable)
 6. Default Priority Tag [0-7]            …(4)
 7. Egress Tag Handling                     (Stacking)
 8. Ingress Filtering                       (Disable)
 9. Accept Frame Type                       (All)
10. Ingress Tag Handling                    (Stripping)

>
s - Save
f-Forward ; b-Backward; g-Go To ; d-Delete s–Save
ESC-Previous menu; !-Main menu; &-Exit; ?-Help        1 M/ 2 C
```

Figure 4-25. Bridge Port Menu

Table 4-10. Bridge Port Parameters

Parameter	Possible Values	Remarks
Bridge Port	1–120	Number that identifies the bridge port displayed. Bridge port 1 is reserved for the host bridge port. Press <**F**> to navigate between ports.
Activation	Enable (default) Disable	Specifies if this port is available.
Port VID \ Stacking VID	1–4094 The default is 2.	This is the PVID, the VLAN ID assigned to untagged frames or priority-tagged frames received on this port. If Stacking is enabled, this is the tag to be added.
Copy Origin Priority	Enable Disable (default)	Enable: The priority tag of the original VLAN is copied if a frame arrives with a stacked VLAN tag, otherwise the default priority is used. Disable: The default priority is used.
Default Priority Tag	0–7 The default is 0.	Default VLAN frame priority, applies to untagged frames.
Egress Tag Handling	Stacking Stripping None (default)	Stacking: Adds the PVID to every frame transmitted from the port (push). Stripping: Removes the first VLAN tag from every transmitted frame, on the egress of the port (pop).

Parameter	Possible Values	Remarks
Ingress Filtering	Enable Disable (default)	When enabled, the device discards incoming frames for VLANs of which the port is not a member. When disabled, the port accepts all incoming frame.
Accept Frame Type	All (default) Tag Only	Tag Only specifies that the device discards untagged frames. All specifies that untagged frames received on this port are accepted and assigned to the PVID for this port.
Ingress Tag Handling	Stacking Stripping None (default)	Stacking: Adds the PVID to every frame received on the ingress of the port (push). Stripping: Removes the first VLAN tag from every received frame, on the ingress of the port (pop).

Configuring VLAN Membership

➤ To configure VLAN membership:

1. From the Main menu, navigate to Configuration › Applications › Bridge › VLAN Membership.

   The VLAN Membership menu appears as illustrated in *Figure 4-26*.

```
                              RICi-16
Configuration > Applications > Bridge > VLAN Membership
1. VLAN ID                                    (1)
2. Egress Tagged Ports                      >      (1-10,12)
3. Egress UnTagged Ports                    >      (6,9,120)
                >


>
s – Save;  f – forward;  b – back;  g – go;  d – delete;
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 4-26. VLAN Membership Menu

2. Select VLAN ID, and type the VLAN ID you wish to configure.
3. Select Egress Tagged Ports. Define the set of ports to transmit packets for this VLAN as tagged.
4. Select Egress UnTagged Ports. Define the set of ports to transmit packets for this VLAN as untagged.
5. Select Save.

Configuring Quality of Service

Three methods of traffic classification are supported:

- 802.1 priority mapping
- DSCP priority mapping, using tag values
- Priority mapping per bridge port.

The classification method is chosen using the Priority Classification menu.

Four traffic queues are supported, which can be assigned priorities using the **Priority Mapping** menu.

➤ **To select the traffic classification method:**

1. From the Main menu, navigate to Configuration › Applications › QoS › **Priority Classification.**

   The Priority Classification menu appears as illustrated in *Figure 4-27*.

```
                              RICi-16
Configuration > Applications > QoS > Priority Classification
1. 802.1p
2. DSCP
3. Per Port

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit;                  1 M/ 2 C
```

Figure 4-27. QoS Priority Classification Menu

2. In the Priority Classification menu, select the desired traffic classification method. The following priority classification methods are available:
   - **802.1p**
   - **DSCP**
   - **Per Port**.
3. Select **Save**.

   The priority classification method is set and you are returned to the QoS menu.

➤ **To assign priorities to traffic queues for 802.1p:**

1. From the QoS menu, select **Priority Mapping**.

   The Priority Mapping (802.1p) menu appears as illustrated in *Figure 4-28*.

```
                                RICi-16
Configuration > Applications > QoS > Priority Mapping(802.1p)
1. User Priority 0  >  (Traffic Class 0)
2. User Priority 1  >  (Traffic Class 0)
3. User Priority 2  >  (Traffic Class 1)
4. User Priority 3  >  (Traffic Class 1)
5. User Priority 4  >  (Traffic Class 2)
6. User Priority 5  >  (Traffic Class 2)
7. User Priority 6  >  (Traffic Class 2)
8. User Priority 7  >  (Traffic Class 2)

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 4-28. Priority Mapping Menu (802.1p)

2. In the Priority Mapping menu, select the desired priority (0–7) and enter the assigned traffic queue number (0–3). Each traffic queue can be assigned to more than one priority.
3. Repeat the above step for all priorities.
4. Select **Save**.

➤ **To assign priorities to traffic queues, for DSCP:**

1. From the QoS menu, select **Priority Mapping**.

   The Priority Mapping (DSCP) menu appears as illustrated in *Figure 4-29*. The menu lists only values whose defaults have been modified.

```
                                RICi-16
Configuration > Applications > QoS > Priority Mapping(DSCP)

1. Tag Value  0   >      (Traffic Class 2)
2. Tag Value 63   >      (Traffic Class 2)

>
S – Save; a – add; d – Delete; c - Copy
ESC-prev menu; !-main menu; &-exit;                       1 M/ 2 C
```

Figure 4-29. Priority Mapping Menu (DSCP)

2. From the Priority Mapping menu, select the desired tag value (0–63) and enter the assigned traffic queue number (0–3). Each traffic queue can be assigned to more than one tag.
   - To add a new entry, press ‹**A**› and enter the tag value and the traffic queue number.
3. Repeat the above-mentioned step for all tag values that you wish to change.
4. Select **Save**.

➤ **To assign priorities to traffic queues per bridge port:**

1. From the QoS menu, select **Priority Mapping**.

The Priority Mapping (Per Port) menu appears as illustrated in *Figure 4-30*.

```
                              RICi-16
Configuration > Applications > QoS > Priority Mapping(Per Port)
   Bridge Port (1-6)          ... (5)
1. Traffic Class               >  (Traffic Class 0)

>
S – Save; f – Forward; b – Backward; g – Go To
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-30. Priority Mapping Menu (Per Port)

2. In the Priority Mapping menu, select the desired bridge port.
3. Select **Traffic Class** and enter the traffic queue number (0–2) to be assigned to the bridge port. Each traffic queue can be assigned to more than one port.
4. Repeat the above step for all active bridge ports.
5. Select **Save**.

4.3 Additional Tasks

This section provides procedures for miscellaneous tasks.

Viewing the Device Status

The software provides access to the following status information:

- System level – MAC address, connection status, log file and clock source
- Physical level – Ethernet, E1/T1, and T3 port status
- Logical level –VCG and GFP ports
- Application level – MAC table.

The status information is available via the Monitoring menu.

Displaying System Status Information

The System menu shows the Log file, and shows the interface connection status. For a description of system messages displayed in the Log file screen, refer to *Chapter 6*.

➤ **To display interface connection information:**

- Navigate to Main Menu › Monitoring › System › **Interface Status**.

  The Interface Status screen appears as illustrated in *Figure 4-31*.

  The Interface Status screen includes the following information:

  - **Interface description** – Fast Ethernet, E1/T1, or T3 ports.
  - **Type** – type of the interface according to the INF TYPE MIB.
  - **Activation** – whether the interface is enabled (Up) or disabled (Down), as user defined via the Ethernet menus.
  - **Operation** – actual operational status of the link (Up or Down)
  - **Speed** – the throughput of the port in bits per second.

```
                                    RICi-16
Monitoring > System > Interface Status
 Description       Type            Administrative    Operation     Speed
 T1 Port 1         T1              Up                Down          1544000
 T1 Port 2         T1              Up                Down          1544000
 T1 Port 3         T1              Up                Down          1544000
 T1 Port 4         T1              Up                Down          1544000
 T1 Port 5         T1              Up                Down          1544000
 T1 Port 6         T1              Up                Down          1544000
 T1 Port 7         T1              Up                Down          1544000
 T1 Port 8         T1              Up                Down          1544000
 T1 Port 9         T1              Up                Down          1544000
 T1 Port 10        T1              Up                Down          1544000
 T1 Port 11        T1              Up                Down          1544000
 T1 Port 12        T1              Up                Down          1544000
 T1 Port 13        T1              Up                Down          1544000
 T1 Port 14        T1              Up                Down          1544000
 T1 Port 15        T1              Up                Down          1544000
 T1 Port 16        T1              Up                Down          1544000
 VCG PORT          VCG             Up                Up            24704000
 GFP PORT          GFP             Up                Up            24704000
 Bridge Port 2     Bridge Port     Up                Down       100000000
 Bridge Port 3     Bridge Port     Up                Up         0
 Bridge Port 4     Bridge Port     Up                Down       100000000
 Bridge Port 5     Bridge Port     Up                Down       100000000
 Bridge Port 6     Bridge Port     Up                Down       100000000
 Bridge Port 7     Bridge Port     Up                Down       100000000

ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 4-31. Typical Interface Status Screen

Viewing Physical Layer Status

You can view the status of the unit's physical ports.

Viewing Ethernet Status

➤ To display the Ethernet port status:

- In the Main menu, navigate to Monitoring › Physical Ports › Ethernet › Status.

  The Ethernet Status screen appears as illustrated in *Figure 4-32*.

  The Ethernet Status screen includes the following information:

  - Connector Type – connector type
  - Administrative Status – whether the interface is enabled or disabled
  - Operational Status – actual operational status of the link (Up or Down)
  - Speed & Duplex – current data rate and duplex mode of the link
  - Flow Control – whether flow control is enabled or disabled

```
                              RICi-16
Monitoring > Physical Ports > Ethernet > Status

Port                              (1)


   Connector Type                 (RJ45)
   Administrative Status          (Enable)
   Operation Status               (Up)
   Speed & Duplex                 (100Mbps - Full Duplex)
   Flow Control                   (Enable)

F-Forwards; B-backwards
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-32. Ethernet Status Screen

Viewing E1/T1 Status

➤ To display the E1/T1 port status:

- In the Main menu, navigate to Monitoring > Physical Ports > E1/T1 > **Status**.

  The E1/T1 Status screen appears as illustrated in *Figure 4-33*.

  The E1/T1 Status screen includes the following information:

  - **Connector Type** – connector type
  - **Administrative Status**– whether the interface is enabled or disabled
  - **Operational Status** – actual operational status of the link (Up or Down).

```
                              RICi-16
Monitoring > Physical Ports > E1/T1 > Status

1. Port [1 – 16]            (1)
   Connector Type           (RJ45)
   Administrative Status    (Up)
   Operation Status         (Up)

f-Forward; b-backward
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-33. E1/T1 Status Screen

Viewing T3 Status

➤ To display the T3 port status:

- In the Main menu, navigate to Monitoring > Physical Ports > T3 > **Status**.

  The T3 Status screen appears as illustrated in *Figure 4-34*.

  The T3 Status screen includes the following information:

  - **Connector Type** – connector type
  - **Administrative Status** – whether the interface is enabled or disabled
  - **Operational Status** – actual operational status of the link (Up or Down).

```
                                RICi-16
Monitoring > Physical Ports > T3 > Status

1. Port [1 – 2]            (1)

   Connector Type          (BNC)
   Administrative Status   (Up)
   Operation Status        (Up)

F-Forward
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-34. T3 Status Screen

Viewing Logical Layer Status

You can view the status of the unit's logical ports.

➤ **To display the logical port status:**

- In the Main menu, navigate to Monitoring › Logical Layer › **Status**.

  The Logical Layer Status screen appears as illustrated in *Figure 4-35* or *Figure 4-36* (depending on whether interface type is VCAT or GFP).

  The Logical Layer Status screen includes the following information:

  - **Interface Type** – connector type
  - **GFP Frame Delineation** – GFP frame delineation status
  - **Differential Delay** – Detected differential delay.

```
                                RICi-16
Monitoring > Logical Layer > Status

   Port                    (1)


   Interface Type          (VCG)
   Port Name               (VCG 1)

1. LCAS members status      >

f-Forward; b-backward
ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-35. Logical Layer Status (VCG)

```
                              RICi-16
Monitoring > Logical Layer > Status

 Port                              (2)
 Interface Type                    (GFP)
 Port name                         (GFP 1)

 GFP Frame Delineation             (Not Delineated)

f-Forward; b-backward
ESC-Previous menu; !-Main menu; &-Exit; ?-Help       1 M/ 1 C
```

Figure 4-36. Logical Layer Status (GFP)

➤ To display the LCAS member status:

- In the Logical Layer Status menu for a VCG port, select **LCAS members status**.

  The LCAS member status screen appears as illustrated in *Figure 4-37*. *Table 4-11* describes the status parameters.

```
                              RICi-16
Monitoring > Logical Layer > Status > LCAS members status


     Link      Source Status      Sink Status
      1           (OK)               (OK)
      2           (FAIL)             (FAIL)

ESC-Previous menu; !-Main menu; &-Exit
```

Figure 4-37. LCAS Member Status Screen

Table 4-11. LCAS Members Status Parameters

Parameter	Description
Link	PDH link
Source Status	Status of source side of the link
Sink Status	Status of sink side of the link

Displaying Application-Level Status

At the application level, the unit provides information on the MAC addresses (static and learned) and their bridge port assignments; as well as VLAN IDs and their bridge port assignments.

➤ To display the MAC table:

- In the Main menu, navigate to Monitoring › Bridge › **MAC table**.

  The MAC Table screen appears as illustrated in *Figure 4-38*.

  The MAC Table screen includes the following information:

  - **VLAN ID** – the VLAN ID corresponding to the MAC address (VLAN-aware mode only)

- **MAC Address** – existing MAC address
- **Bridge Port** – bridge port number
- **Status** – status of MAC table entry.

```
                                RICi-16
Monitoring > Application > Bridge > View MAC Table

  VLAN ID       MAC Address          Bridge Port      Status
    1           111111111111         1
    2           222222222222         2
    3           333333333333         3
    4           444444444444         4


ESC-prev menu; !-main menu; &-exit; ?-help
```

Figure 4-38. Static MAC Table

Viewing Inventory

The inventory displays a description of the unit including its hardware revision and power supply type.

Note *The inventory is a wide table with 132 characters. It is best viewed by setting your terminal to 132 character wide display.*

➤ To display the inventory:

- From the Main menu, select **Inventory**.

  Hardware and software appear listed as illustrated in *Figure 4-39*.

- To navigate in the inventory list, use the arrow keys.

```
                                    RICi-16
Inventory

  ID      Description        Vendor type  Class     Entity name       HWRev
  1001    RICi-16   Device           Chassis          RICi-16           1.00
| 7001    Fast Eth Port 1            Port             FAST 1
v 7002    Fast Eth Port 2            Port             FAST 2
  7003    Fast Eth Port 3            Port             FAST 3
  7004    Fast Eth Port 4            Port             FAST 4
  7005    E1 Port 1                  Port             E 1
  7006    E1 Port 2                  Port             E 2
  7007    E1 Port 3                  Port             E 3
  7008    E1 Port 4                  Port             E 4
      - >  >

 >
```

Figure 4-39. Typical Inventory Screen

Note *Power supply can be PS 1 or PS 2.*

Configuring User Access

From the **User Access** menu you can change the current user name and password. RICi-16 supports two user names and passwords. The unit is supplied with the following default user settings:

User	User Name	Password
1	su	1234
2	user	1234

➤ **To change the current user name and password:**

1. From the Main menu, navigate to Configuration › System › Management › Management Access › **User Access**.

   The User Access menu appears.

```
                                  RICi-16
Configuration > System > Management > Management Access > User Access
   User Level:                    (User)

1. User Name                      ... (user)
2. Old Password                   ... (********)
3. New Password                   ... (********)
4. Confirm New Password           ... (********)

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit                          1 M/ 2 C
```

Figure 4-40. User Access Menu

2. In the User Access menu, select **User Name**, and enter a new user name. The user name can be up to twenty characters.
3. Select **Old Password**, and enter the current password (default is 1234).
4. Select **New password** and assign a new password of up to eight characters to the new or existing user name.

Note *The password is case sensitive.*

5. Select **Confirm New Password** to confirm the new password.

   If the new password is invalid, an error message appears indicating that the password is illegal. Assign a different password.

6. Select **Save**.

   The new password is saved.

Transferring Software and Configuration Files

This section instructs you on installing new software releases on RICi-16 units and transferring configuration files.

RICi-16 stores two software versions, each of them in one of the two partitions of its flash memory, which also contains a boot program. The software is stored in compressed format. The active version is decompressed and loaded into the RICi-16 RAM upon power-up. The passive software is kept for backup purposes. If the active software becomes corrupted, you can swap it with the backup. By default, RICi-16 ships active software only.

New software releases are distributed as image files (***.img**) downloaded to RICi-16. Once downloading starts, the current backup is erased and the new software release is placed in the backup partition instead. When downloading is completed, the unit checks the integrity of the new software file. If approved, the new software release becomes active and the previously active software becomes the backup. If a failure occurs while downloading, the new version is erased and only the previous version remains on the flash memory.

Configuration files can be uploaded for storage and backup.

Management software allows file transfer via TFTP only. You may also download the software files to RICi-16 using the Boot Manager, using XMODEM or TFTP, as explained in *Appendix B*.

➤ **To transfer files via TFTP:**

1. From the Main menu, select **Utilities › File Transfer**.

   The File Transfer menu appears as illustrated in *Figure 4-41*.

```
                          RICi-16
Utilities > File Transfer
1. Server IP Address …                  (0.0.0.0)
2. Remote File Name  …                  ()
3. File Type                            (Configuration)
4. Command            >

>
s - Save
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
```

Figure 4-41. TFTP Menu

2. From the File Transfer menu, perform the following:
   - Select **Server IP Address,** and enter the IP address of the TFTP server.
   - Select **Remote File Name**, and enter a file name as explained below.
     - For downloading, assign a name to the file that is about to be downloaded to RICi-16.
     - For uploading, assign a name to the file that will be saved on the remote server.
   - Select **File Type**, and choose whether you intend to transfer a software (**IMG**) or configuration (**Configuration**) file.
   - Select **Save** to save the changes.
   - Select **Command** to start the desired procedure:
     - **Upload** – saving software or a configuration file on a remote server.
     - **Download** – transferring software or a configuration file to RICi-16.

     RICi-16 starts the file transfer.

The TFTP file transfer process is logged by the system messages listed below, which are stored in the log file:

- TFTP – Starting Upload
- TFTP – Starting Download
- TFTP – Upload Failed
- TFTP – Download Failed.

Resetting RICi-16

RICi-16 lets you reset the unit while preserving customized parameters or resetting all customized parameters to the factory defaults.

Resetting to Factory Defaults

You can reset RICi-16 to the factory default settings.

➤ **To reset to the default settings:**

1. From the System menu, select **Factory Defaults**.

   You are asked to confirm your request:

   ```
   The device will restart. Do you want to proceed? (Y/N)
   ```

2. Press <**Y**> to confirm your request.

   RICi-16 resets all parameters to their default settings.

Resetting the Unit

You can restart RICi-16 while preserving the parameters you configured.

➤ **To reset RICi-16:**

1. From the Utilities menu, select **Reset Device**.

   You are asked to confirm your request:

   ```
   The device will restart. Do you want to proceed? (Y/N)
   ```

2. Press <**Y**> to confirm your request.

   RICi-16 resets, preserving the last-saved settings.

Chapter 5

Configuring Typical Applications

This chapter provides instructions for configuring RICi-16 for typical applications.

5.1 Application with Ethernet Cellular Backhauling over PDH/SONET/SDH

Figure 5-1 illustrates an application where three RICi-16 units provide Ethernet cellular backhauling, working opposite a third-party Ethernet device. Each unit has a different interface option: channelized DS-3, 16 E1 ports, and unchannelized T3.

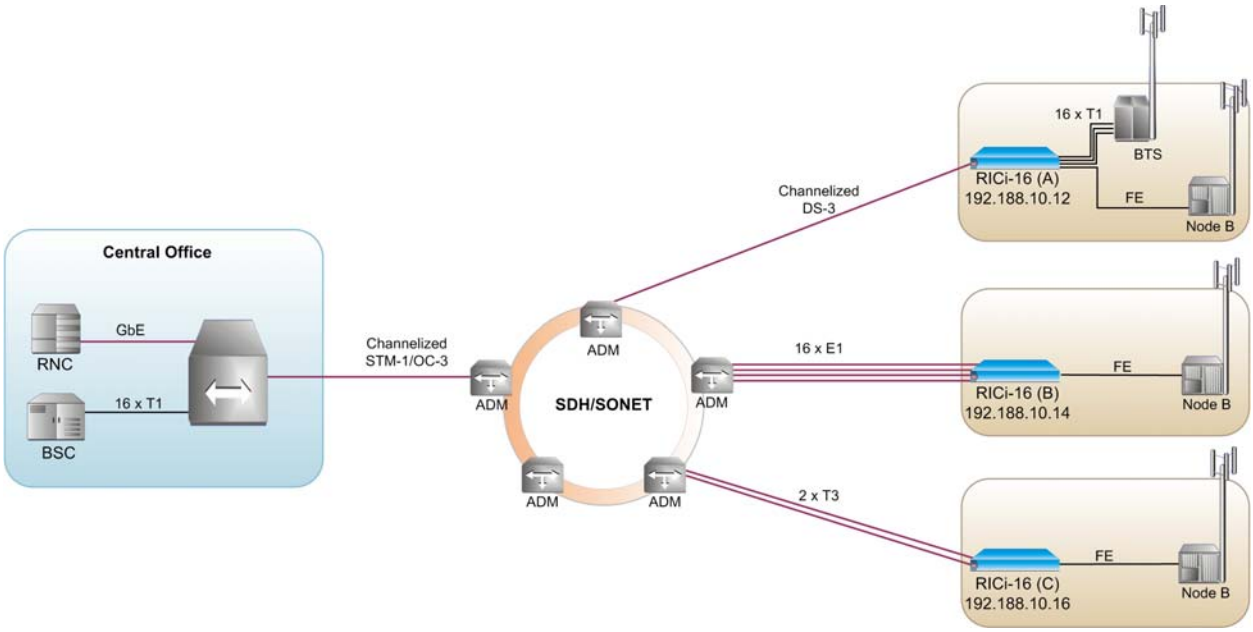


Figure 5-1. Ethernet Cellular Backhauling over PDH/SONET/SDH

This application has the following requirements:

- Channelized DS-3 links to the SDH/SONET network
- E1 links to the SDH/SONET network
- T3 links to the SDH/SONET network
- Third-party Ethernet device that can work opposite all the RICi-16 interface options.

The configuration procedure is divided into the following stages:

1. Configuring host IP parameters
2. Configuring physical port parameters
3. Configuring the logical layer.

Table 5-1. Host IP Parameters

Device	Host IP	IP mask	Default Gateway
RICi-16 (A)	192.188.10.12	255.255.255.0	192.188.10.1
RICi-16 (B)	192.188.10.14	255.255.255.0	192.188.10.1
RICi-16 (C)	192.188.10.16	255.255.255.0	192.188.10.1

Configuring System Parameters

The configuration procedure for system parameters is similar for all three RICi-16 units, except for defining different host IP addresses.

➤ **To define the host parameters:**

1. For RICi-16 (A), navigate to the Host menu (Configuration› System › Management› **Host**), and configure the host parameters as shown in *Table 5-1*.
2. For RICi-16 (B) and RICi-16 (C), perform the same procedure, using the host parameters as shown in *Table 5-1* for each respective unit.

```
                              RICi-16
Configuration > System > Management > Host
1. IP Address                              ... (192.188.10.12)
2. IP Mask                                 ... (255.255.255.0)
3. Default gateway                         ... (192.188.10.1)
4. Read community                          ... (public)
5. Write community                         ... (private)
6. Trap community                          ... (public)
7. Encapsulation                            >

 >
s - Save
ESC-Previous menu; !-Main menu; &-Exit;                  1 user(s)
```

Figure 5-2. Host Menu, RICi-16 (A

Configuring the Physical Layer

Configuring the Physical Layer for RICi-16 (A)

In the RICi-16 (A), you need to configure the T1 ports and the T3 channels.

Configuring the T1 Physical Layer

➤ To configure the T1 physical layer:

- For the RICi-16 (A) unit, you can use the default T1 port configurations. Use the T1 Physical Layer menu to check that the default configuration is in place for T1 ports 1–16.

```
                              RICi-16
Configuration > Physical Ports > T1
   Port [1 – 16]                        (1)
   TX clock Source                      (System)
   Line Type                         >  (ESF)

1. Administrative Status                (Up)
2. Line Code                         >  (B8ZS)
3. Restoration Time                     (Immediate)
4. Line Interface                    >  (DSU)
5. Line Length                          (0–133 ft)
6. Line Build Out (db)                  (0)
7. Rx Sensitivity                       (Long Haul)


>
f – forward  b – backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-3. T1 Port Configuration Menu

Configuring the T3 Interface

➤ To configure the T3 interface:

- Use the T3 Physical Layer menu to ensure that the T3 interface is channelized.

```
                              RICi-16
Configuration > Physical Layer > T3
   Port                                 (1)
   TX Clock Source                      (System)

1. Structure                            (Channelized)
2. Line Type                            (M23)
3. Administrative Status                (Up)
4. Line Length                          (Up to 225ft)
3. Mapping                           >


>
f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-4. T3 Channelized

Configuring the T3 Channel Mapping

You can use the default configuration T3 channel mapping (T3 channels 1–16 mapped to T1 ports 1–16). Use the T3 mapping menu to check that the default configuration is in place.

```
                                    RICi-16
Configuration > Physical Layer > T3 > Mapping
  Channel    Connection      Channel    Connection      Channel   Connection
  1          T1-1            11         T1-11           21        LP1
  2          T1-2            12         T1-12           22        LP1
  3          T1-3            13         T1-13           23        LP1
  4          T1-4            14         T1-14           24        LP1
  5          T1-5            15         T1-15           25        LP1
  6          T1-6            16         T1-16           26        LP1
  7          T1-7            17         LP1             27        LP1
  8          T1-8            18         LP1             28        LP1
  9          T1-9            19         LP1
  10         T1-10           20         LP1

 1. T1-1    4. T1-4      7. T1-7     10. T1-10    13. T1-13    16. T1-16
 2. T1-2    5. T1-5      8. T1-8     11. T1-11    14. T1-14    17. LP1
 3. T1-3    6. T1-6      9. T1-9     12. T1-12    15. T1-15    18. N/C

>

ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-5. T3 Mapping Menu, Default Configuration

Configuring the Physical Layer for RICi-16 (B)

➤ To configure the E1 physical layer:

- For the RICi-16 (B) unit, you can use the default E1 port configurations. Use the E1 Physical Layer menu to check that the default configuration is in place for E1 ports 1–16.

```
                              RICi-16
Configuration > Physical Layer > E1

   Port [1 – 16]              (1)
   TX Clock Source            (System)
   Line type                  (G.732N-CRC)
   Restoration Time           (Immediate)


1. Administrative Status      (Up)
2. Interface Type             (Balanced)
3. Line Code                  (HDB3)
4. Rx Sensitivity             (Long Haul)

>
s – Save;  f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-6. E1 Port Configuration Menu

Configuring the Physical Layer for RICi-16 (C)

Configuring the T3 Interface

➤ To configure the T3 interface:

- Use the T3 Physical Layer menu to ensure that the T3 interface is not channelized.

```
                              RICi-16
Configuration > Physical Layer > T3
   Port[1 - 2]                          (1)
   TX Clock Source                      (System)

1. Structure                            (Unchannelized)
2. Line Type                            (M23)
3. Administrative Status                (Up)
4. Line Length                          (Up to 225ft)


>
s – Save;  f – forward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-7. T3 Channelized

Configuring the Logical Layer

Configuring the Logical Layer for RICi-16 (B)

For the RICi-16 (B) unit, you can use the default logical layer configuration (logical port VCG 1 bound to E1 ports 1–16). Use the Logical Layer menu to check that the default configuration is in place.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-16)
4. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-8. Logical Layer Menu (VCG) – E1 Interface

Configuring the Logical Layer for RICi-16 (C)

For the RICi-16 (C) unit, you can use the default logical layer configuration (logical port VCG 1 bound to T3 ports 1–2). Use the Logical Layer menu to check that the default configuration is in place.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-2)
4. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-9. Logical Layer Menu (VCG) – T3 Interface, Not Channelized

5.2 Application with Ethernet Services over PDH/SONET/SDH

Figure 5-1 illustrates an application where two RICi-16 units, with eight and four E1 ports respectively, extend Ethernet services over PDH/SONET/SDH, working opposite RAD's Egate-100.

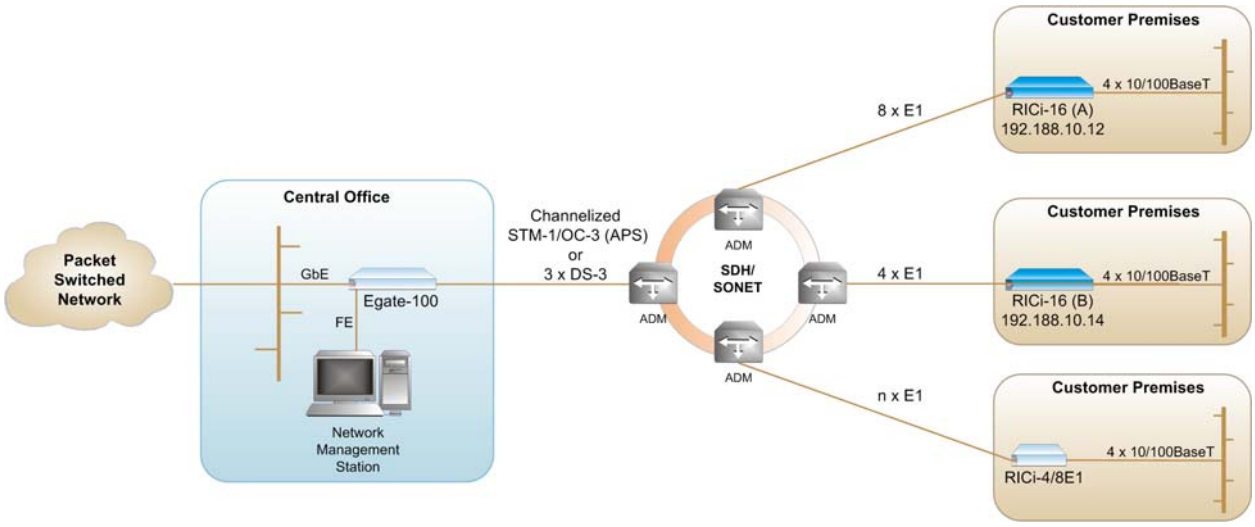


Figure 5-10. Ethernet Services over PDH/SONET/SDH

This application has the following requirements:

- E1 links to the SDH/SONET network

- Egate-100 with STM-1/OC-3 or channelized DS-3 links to the SDH/SONET network.

The configuration procedure is divided into the following stages:

1. Configuring host IP parameters
2. Configuring physical port parameters
3. Configuring the logical layer.

Table 5-2. Host IP Parameters

Device	Host IP	IP mask	Default Gateway
RICi-16 (A)	192.188.10.12	255.255.255.0	192.188.10.1
RICi-16 (B)	192.188.10.14	255.255.255.0	192.188.10.1

Configuring System Parameters

The configuration procedure for system parameters is similar for both RICi-16 units, except for defining different host IP addresses.

➤ **To define the host parameters:**

1. For RICi-16 (A), navigate to the Host menu (Configuration› System › Management› **Host**), and configure the host parameters as shown in *Table 5-2*.
2. For RICi-16 (B), perform the same procedure, using the host parameters as shown in *Table 5-2*.

```
                              RICi-16
Configuration > System > Management > Host
1. IP Address                              ... (192.188.10.12)
2. IP Mask                                 ... (255.255.255.0)
3. Default gateway                         ... (192.188.10.1)
4. Read community                          ... (public)
5. Write community                         ... (private)
6. Trap community                          ... (public)
7. Encapsulation                            >

 >
s - Save
ESC-Previous menu; !-Main menu; &-Exit;                  1 user(s)
```

Figure 5-11. Host Menu, RICi-16 (A

Configuring the Physical Layer

Configuring the Physical Layer for RICi-16 (A)

➤ To configure the E1 physical layer:

- For the RICi-16 (A) unit, you can use the default E1 port configurations. Use the E1 Physical Layer menu to check that the default configuration is in place for E1 ports 1–8.

```
                              RICi-16
Configuration > Physical Layer > E1

   Port [1 – 16]               (1)
   TX Clock Source             (System)
   Line type                   (G.732N-CRC)
   Restoration Time            (Immediate)


1. Administrative Status       (Up)
2. Interface Type              (Balanced)
3. Line Code                   (HDB3)
4. Rx Sensitivity              (Long Haul)

>
s – Save;  f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 5-12. E1 Port Configuration Menu, RICi-16 (A)

Configuring the Physical Layer for RICi-16 (B)

➤ To configure the E1 physical layer:

- For the RICi-16 (B) unit, you can use the default E1 port configurations. Use the E1 Physical Layer menu to check that the default configuration is in place for E1 ports 1–4.

```
                              RICi-16
Configuration > Physical Layer > E1

   Port [1 – 16]               (1)
   TX Clock Source             (System)
   Line type                   (G.732N-CRC)
   Restoration Time            (Immediate)


1. Administrative Status       (Up)
2. Interface Type              (Balanced)
3. Line Code                   (HDB3)
4. Rx Sensitivity              (Long Haul)

>
s – Save;  f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                    1 M/ 2 C
```

Figure 5-13. E1 Port Configuration Menu, RICi-16 (B)

Configuring the Logical Layer

Configuring the Logical Layer for RICi-16 (A)

For the RICi-16 (A) unit, you need a logical port bound to E1 ports 1-8. The instructions in this section describe how to change the default configuration of logical port VCG 1 from bound to E1 ports 1–16, to bound to E1 ports 1-8.

➤ To configure the logical port:

1. Navigate to Configuration › **Logical Layer**.

   The Logical Layer menu appears as illustrated in *Figure 5-14*.

2. Select **Bind to Physical Ports**

   The Bind to Physical Ports menu appears as illustrated in *Figure 5-15*.

3. Type **2** to delete range.

   You are prompted to provide a range of values to remove from the list.

4. Type **9–16.**

5. Type **s** to save your changes.

6. Click ‹**ESC**› to return to the previous menu. The logical port is now bound to to E1 ports 1-8, as illustrated in *Figure 5-16*.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-16)
4. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
```

Figure 5-14. Logical Layer Menu (VCG) – Bound to E1 Ports 1–16, RICi-16 (A)

```
                              RICi-16
Configuration > Logical Layer > Bind To Physical Ports (1–16)

1. [1-16]...(1–16)
2. Delete Range...


>


ESC-Previous menu; !-Main menu; &-Exit; A-add          1 M/ 2 C
```

Figure 5-15. Bind to Physical Ports, RICi-16 (A)

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-8)
4. E1/T1 Loop Detection                     Enable

>
s – Save; f – forward; b - backward
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
```

Figure 5-16. Logical Layer Menu (VCG) – Bound to E1 Ports 1–8, RICi-16 (A)

Configuring the Logical Layer for RICi-16 (B)

For the RICi-16 (B) unit, you need a logical port bound to E1 ports 1-4. The instructions in this section describe how to change the default configuration of logical port VCG 1 from bound to E1 ports 1–16, to bound to E1 ports 1-4.

➤ **To configure the logical port:**

1. Navigate to Configuration > **Logical Layer**.

   The Logical Layer menu appears as illustrated in *Figure 5-17*.

2. Select **Bind to Physical Ports**

   The Bind to Physical Ports menu appears as illustrated in *Figure 5-18*.

3. Type **2** to delete range.

   You are prompted to provide a range of values to remove from the list.

4. Type **5–16.**

5. Type **s** to save your changes.

6. Click <**ESC**> to return to the previous menu. The logical port is now bound to to E1 ports 1-4, as illustrated in *Figure 5-19*.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-16)
4. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                 1 M/ 2 C
```

Figure 5-17. Logical Layer Menu (VCG) – Bound to E1 Ports 1–16, RICi-16 (B)

```
                              RICi-16
Configuration > Logical Layer > Bind To Physical Ports (1–16)

1. [1-16]...(1–16)
2. Delete Range...

>


ESC-Previous menu; !-Main menu; &-Exit; A-add          1 M/ 2 C
```

Figure 5-18. Bind to Physical Ports, RICi-16 (B)

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. Bind to Physical Ports                   (1-4)
4. E1/T1 Loop Detection                     Enable

>
S – Save; f – forward; b - backward
ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-19. Logical Layer Menu (VCG) – Bound to E1 Ports 1–8, RICi-16 (B)

5.3 Application with Multiple Customer Premises Supported by Channelized DS-3

Figure 5-1 illustrates an application where a RICi-16 unit with channelized DS-3 interface supports five customer premises with RICi-4/8T1 units.

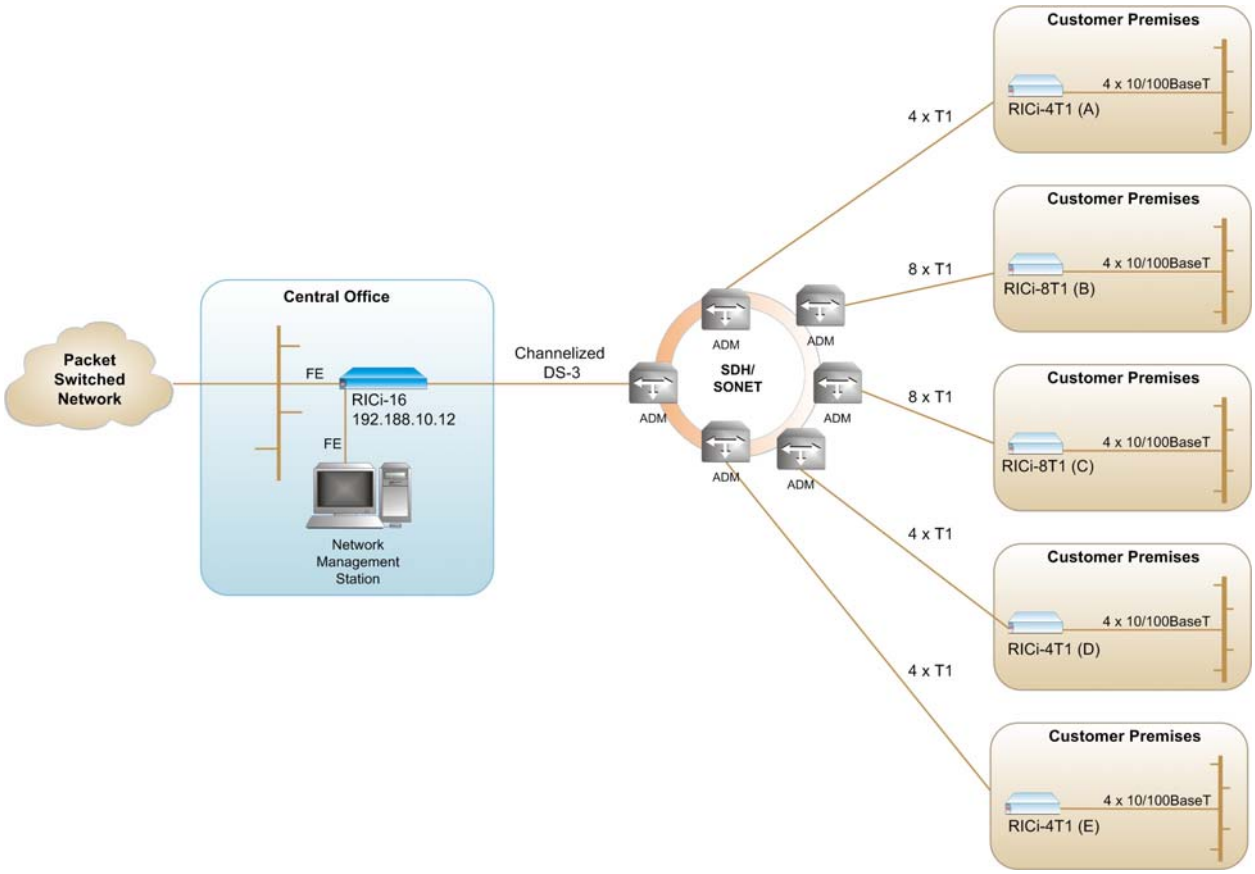


Figure 5-20. RICi-16 with Channelized DS-3 Supporting Multiple Customer Premises

This application has the following requirements:

- Channelized DS-3 links to the SDH/SONET network
- RICi-4/8T1 units with T1 links to the SDH/SONET network.

The configuration procedure is divided into the following stages:

1. Configuring host IP parameters
2. Configuring physical port parameters
3. Configuring logical layer
4. Configuring T3 channel mapping.

The required channel mapping and logical ports for this application are shown in the following table.

Table 5-3. Channel Mapping and Logical Ports

T3 channel	Logical port number	Logical port name	Corresponding Unit
1	1	VCG 1	RICi-4T1 (A)
2	1	VCG 1	RICi-4T1 (A)
3	1	VCG 1	RICi-4T1 (A)
4	1	VCG 1	RICi-4T1 (A)
5	3	VCG 2	RICi-8T1 (B)
6	3	VCG 2	RICi-8T1 (B)
7	3	VCG 2	RICi-8T1 (B)
8	3	VCG 2	RICi-8T1 (B)
9	3	VCG 2	RICi-8T1 (B)
10	3	VCG 2	RICi-8T1 (B)
11	3	VCG 2	RICi-8T1 (B)
12	3	VCG 2	RICi-8T1 (B)
13	5	VCG 3	RICi-8T1 (C)
14	5	VCG 3	RICi-8T1 (C)
15	5	VCG 3	RICi-8T1 (C)
16	5	VCG 3	RICi-8T1 (C)
17	5	VCG 3	RICi-8T1 (C)
18	5	VCG 3	RICi-8T1 (C)
19	5	VCG 3	RICi-8T1 (C)
20	5	VCG 3	RICi-8T1 (C)
21	7	VCG 4	RICi-8T1 (D)
22	7	VCG 4	RICi-8T1 (D)
23	7	VCG 4	RICi-8T1 (D)
24	7	VCG 4	RICi-8T1 (D)
25	9	VCG 5	RICi-8T1 (E)
26	9	VCG 5	RICi-8T1 (E)
27	9	VCG 5	RICi-8T1 (E)
28	9	VCG 5	RICi-8T1 (E)

Configuring System Parameters

➤ To define the host parameters:

- Navigate to the Host menu (Configuration› System › Management› **Host**), and configure the host parameters as illustrated in *Figure 5-21*.

```
                              RICi-16
Configuration > System > Management > Host
1. IP Address                              ... (192.188.10.12)
2. IP Mask                                 ... (255.255.255.0)
3. Default gateway                         ... (192.188.10.1)
4. Read community                          ... (public)
5. Write community                         ... (private)
6. Trap community                          ... (public)
7. Encapsulation                            >

 >
s - Save
ESC-Previous menu; !-Main menu; &-Exit;                  1 user(s)
```

Figure 5-21. Host Menu

Configuring the Physical Layer

➤ To configure the T3 interface:

- Use the T3 Physical Layer menu to ensure that the T3 interface is channelized.

```
                              RICi-16
Configuration > Physical Layer > T3
   Port                                (1)
   TX Clock Source                     (System)

1. Structure                           (Channelized)
2. Line Type                           (M23)
3. Administrative Status               (Up)
4. Line Length                         (Up to 225ft)
3. Mapping                          >


>
s – Save;  f – forward;  b – backward
ESC-Previous menu; !-Main menu; &-Exit                   1 M/ 2 C
```

Figure 5-22. T3 Channelized

Configuring the Logical Layer

You must create logical ports for VCGs 2–5 for this application, as illustrated in *Table 5-3*. You do not need to create VCG 1, which is automatically created by RICi-16.

➤ **To create the VCG logical ports:**

1. Navigate to Configuration > **Logical Layer**.

   The Logical Layer menu appears as illustrated in *Figure 5-23*.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (1)
   Interface Type                       >  (VCG)
   Bind To Internal Ports                  (17-28)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 1)
3. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
```

Figure 5-23. Logical Layer Menu (VCG), Logical Port 1

2. Type **a** to add a logical port.

   A screen appears showing the new logical port, with all parameters empty except the port number, and a message at the bottom prompting you to save the VCG.

```
                              RICi-16
Configuration > Logical Layer
   Port                                    (3)
   Interface Type                       >  ()
   Bind To Internal Ports                  (-)
   Max differential delay (msec)[0 - 256] ()
1. Administrative Status                   ()
2. Port Name                            ... ()
3. E1/T1 Loop Detection

>
s – save; a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
------------------------------------------------------------

Press ‘s’ to save new VCG
```

Figure 5-24. Logical Layer Menu (VCG), New Logical Port

3. Type **s** to save the logical port.

   The logical port is saved as VCG 2 (logical port 3).

```


                              RICi-16
Configuration > Logical Layer
   Port                                    (3)
   Interface Type                       >  (VCG 2)
   Bind To Internal Ports                  (-)
   Max differential delay (msec)[0 - 256] (256)
1. Administrative Status                   (Up)
2. Port Name                            ... (VCG 2)
3. E1/T1 Loop Detection                     Enable

>
a – add; f – forward; b – backward; d – delete
ESC-Previous menu; !-Main menu; &-Exit                1 M/ 2 C
```

Figure 5-25. Logical Layer Menu (VCG), Logical Port 3

4. Repeat the same procedure to create the following:
   - VCG 3 (logical port 5)
   - VCG 4 (logical port 7)

- VCG 5 (logical port 9).

Note *The corresponding GFP logical port is created automatically by RICi-16 for each new VCG logical port.*

Configuring the T3 Channel Mapping

You must set up the T3 channel mapping as specified in *Table 5-3*:

- Map channels 1–4 to logical port 1
- Map channels 5–12 to logical port 3
- Map channels 13–20 to logical port 5
- Map channels 21–24 to logical port 7
- Map channels 25–28 to logical port 9.

➤ **To configure the T3 channel mapping:**

1. Navigate to Configuration › Physical Layer › T3 › **Mapping**.

   The T3 Mapping menu appears as illustrated in *Figure 5-5*, with the cursor is positioned at the connection for channel 1. The list of connections at the bottom only shows the T1 ports.

2. Type n to see the next set of connection values.

   The T3 Mapping menu appears as illustrated in *Figure 5-27*, with the connection values shown for the logical ports.

```
                                RICi-16
Configuration > Physical Layer > T3 > Mapping
  Channel    Connection      Channel    Connection      Channel   Connection
  1          T1-1            11         T1-11           21        LP1
  2          T1-2            12         T1-12           22        LP1
  3          T1-3            13         T1-13           23        LP1
  4          T1-4            14         T1-14           24        LP1
  5          T1-5            15         T1-15           25        LP1
  6          T1-6            16         T1-16           26        LP1
  7          T1-7            17         LP1             27        LP1
  8          T1-8            18         LP1             28        LP1
  9          T1-9            19         LP1
  10         T1-10           20         LP1

 1. T1-1   3. T1-3   5. T1-5    7. T1-7   9. T1-9     11. T1-11   13. T1-13
 2. T1-2   4. T1-4   6. T1-6    8. T1-8   10. T1-10   12. T1-12   14. T1-14
...(N)
>

ESC-Previous menu; !-Main menu; &-Exit                 1 M/ 2 C
```

Figure 5-26. T3 Mapping Menu, First Set of Connections

```
                                    RICi-16
Configuration > Physical Layer > T3 > Mapping
  Channel     Connection      Channel     Connection      Channel    Connection
  1           T1-1            11          T1-11           21         LP1
  2           T1-2            12          T1-12           22         LP1
  3           T1-3            13          T1-13           23         LP1
  4           T1-4            14          T1-14           24         LP1
  5           T1-5            15          T1-15           25         LP1
  6           T1-6            16          T1-16           26         LP1
  7           T1-7            17          LP1             27         LP1
  8           T1-8            18          LP1             28         LP1
  9           T1-9            19          LP1
  10          T1-10           20          LP1

...(P)
 15. T1-15  17. LP1   19. LP5    21. LP9
 16. T1-16  18. LP3   20. LP7    22. N/C

>

ESC-Previous menu; !-Main menu; &-Exit                  1 M/ 2 C
```

Figure 5-27. T3 Mapping Menu, Second Set of Connections

3. Type **17** and then click ‹**Enter**›.

   T3 channel 1 is mapped to logical port 1.

4. Follow the same procedure for T3 channels 2–4, using the arrow keys to position the cursor.

   T3 channels 2–4 are mapped to logical port 1.

5. Position the cursor at T3 channel 5, and type **18** and then click ‹**Enter**›.

   T3 channel 5 is mapped to logical port 3.

6. Follow the same procedure for T3 channels 6–12, using the arrow keys to position the cursor.

   T3 channels 6–12 are mapped to logical port 3.

7. Position the cursor at T3 channel 13, and type **19** and then click ‹**Enter**.

   T3 channel 13 is mapped to logical port 5.

8. Follow the same procedure for T3 channels 14–20, using the arrow keys to position the cursor.

   T3 channels 14–20 are mapped to logical port 5.

9. Position the cursor at T3 channel 21, and type **20** and then click ‹**Enter**›.

   T3 channel 21 to is mapped logical port 7.

10. Follow the same procedure for T3 channels 21–24, using the arrow keys to position the cursor.

T3 channels 21–24 are mapped to logical port 7.

11. Position the cursor at T3 channel 25, and type 21 and then click <Enter>.

    T3 channel 25 is mapped to logical port 9.

12. Follow the same procedure for T3 channels 26–28, using the arrow keys to position the cursor.

    T3 channels 26–28 are mapped to logical port 9.

Figure 5-28 Illustrates the mapping after the above steps have been performed.

```
                                    RICi-16
Configuration > Physical Layer > T3 > Mapping
  Channel    Connection      Channel    Connection      Channel   Connection
  1          LP1             11         LP3             21        LP7
  2          LP1             12         LP3             22        LP7
  3          LP1             13         LP5             23        LP7
  4          LP1             14         LP5             24        LP7
  5          LP3             15         LP5             25        LP9
  6          LP3             16         LP5             26        LP9
  7          LP3             17         LP5             27        LP9
  8          LP3             18         LP5             28        LP9
  9          LP3             19         LP5
  10         LP3             20         LP5

 1. T1-1   3. T1-3   5. T1-5    7. T1-7   9. T1-9     11. T1-11   13. T1-13
 2. T1-2   4. T1-4   6. T1-6    8. T1-8   10. T1-10   12. T1-12   14. T1-14
...(N)
>

ESC-Previous menu; !-Main menu; &-Exit                 1 M/ 2 C
```

Figure 5-28. T3 Mapping Menu, First Set of Connections

Chapter 6

Diagnostics and Troubleshooting

This section describes how to:

- Monitor the system performance
- Display statistics
- Display system messages
- Detect errors
- Troubleshoot the device
- Perform connectivity tests.

6.1 Monitoring Performance

You can display statistical data for the Ethernet, E1/T1, T3 ports, and the logical layer.

Displaying Ethernet Statistics

➤ **To view Ethernet statistics:**

1. In the Main menu, navigate to Monitoring › Physical Ports › **Ethernet**.
2. Select **Statistics**.
3. Type **f** to navigate through port numbers.

   The Ethernet Statistics screen appears as illustrated in *Figure 6-1*.

➤ **To clear Ethernet statistics:**

- In the Ethernet Statistics menu, type **c** to clear port statistics.

```
                              RICi-16
Monitoring > Physical Ports > Ethernet > Statistics

   Port                                (1)

   Rx Correct Frames                   (709073132)
   Rx Correct Octets                   (533197630)
   Rx FCS Errors                       (0)
   Tx Correct Frames                   (21532)
   Tx Correct Octets                   (2139845)
   Tx Single Collision                 (0)
   Tx Collision                        (0)
   Tx Multiple Collision)              (0)
   Tx Deferred Transmissions           (0)
   Tx Late Collisions                  (0)
   Tx Congestion Dropped Frames        (0)

>

f-Forward; b-Backwards; c-Clear statistics
ESC-Previous menu; !-Main menu; &-Exit;                  1 M/ 1 C
```

Figure 6-1. Ethernet Statistics

Displaying E1/T1 Statistics

E1/T1 statistics can be displayed for 15-minute intervals or 1-day periods.

➤ To view E1/T1 port statistics:

1. In the Main menu, navigate to Monitoring › Physical Ports › E1/T1 › Statistics.
2. Select one of the following:
   - 15 Min. Intervals – To view statistics for current and previous 15-minute intervals.
   - 1 Day Interval – To view statistics for current and previous one-day intervals.

   The E1/T1 Statistics screen appears as illustrated in *Figure 6-2*. The statistics are described in *Table 6-1.*

➤ To clear statistics:

- In the Statistics menu, select Clear Statistics to clear all E1/T1 statistics.

```
                                RICi-16
Monitoring > Physical Ports > E1/T1 > Statistics>15 Min
Intervals

1.  Port [1 – 16]                (1)
2.  Interval [0-96]              (0)

    Time Elapsed                 (10)
    ES                           (0)
    SES                          (0)
    UAS                          (0)
    BES                          (0)

>

f-Forward; b-Backward; c-Clear Statistics; ^F-Frw (Int); ^B-Bkw
(Int)

ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 6-2. E1/T1 Statistics

Table 6-1. E1/T1 Statistics Parameters

Parameter	Description
Port number	Statistics regarding selected port number
Interval number	Selected interval (interval 0 displays the current interval)
Time elapsed	For interval 0 displays number of seconds passed from the start time of the interval
ES	Number of seconds where errored seconds (ES) are detected. For ESF and E1-CRC links an Errored Second is a second with: One or more Path Code Violation or, One or more Out of Frame defects or One or more Controlled Slip events or A detected AIS defect. For D4 and E1-noCRC links, the presence of Bipolar Violations also triggers an Errored Second. This is not incremented during an Unavailable Second.
SES	Number of seconds where SES is detected. A Severely Errored Second for ESF signals is a second with: 320 or more Path Code Violation Error Events or One or more Out of Frame defects or A detected AIS defect. For E1-CRC signals, a Severely Errored Second is a second

Parameter	Description
	with: 832 or more Path Code Violation error events or One or more Out of Frame defects. For E1-noCRC signals, a Severely Errored Second is a 2048 LCVs or more. For D4 signals, a Severely Errored Second is: A count of one- second intervals with Framing Error events or An OOF defect or 1544 LCVs or more. Controlled slips are not included in this parameter. This is not incremented during an Unavailable Second.
UAS	Number of seconds where SES is detected as Unavailable Seconds (UAS). Calculated by counting the number of seconds for which the interface is unavailable. The DS1 interface is said to be unavailable from the onset of 10 contiguous SESs, or the onset of the condition leading to a failure.
BES	Number of seconds where BES is detected. A Bursty Errored Second is a second with fewer than 320 and more than 1 Path Coding Violation error events, no Severely Errored Frame defects and no detected incoming AIS defects. Controlled slips are not included in this parameter. This is not incremented during an Unavailable Second. It applies to ESF signals only. Valid only for E1-CRCon and T1-ESF

Displaying T3 Statistics

T3 statistics can be displayed for 15-minute intervals or 1-day periods.

➤ **To view T3 port statistics:**

1. In the Main menu, navigate to Monitoring › Physical Ports › T3 › **Statistics**.
2. Select one of the following:
   - **15 Min. Intervals** – To view statistics for current and previous 15-minute intervals.
   - **1 Day Interval** – To view statistics for current and previous one-day intervals.

   The T3 Statistics screen appears as illustrated in *Figure 6-3*. The statistics are described in *Table 6-1.*

➤ **To clear statistics:**

- In the Statistics menu, select **Clear Statistics** to clear all E1/T1 statistics.

```
                              RICi-16
Monitoring > Physical Ports > T3> Statistics>15 Min Intervals

1.  Port [1 - 2]                  (1)
2.  Interval [0 - 96]             (0)

    Time Elapsed (sec)            (10)
    LES                           (0)
    PES                           (0)
    PSESS                         (0)
    CES                           (0)
    CSES                          (0)
    SEFS                          (0)
    UAS                           (0)

>

f-Forward; c-Clear Statistics; ^F-Frw (Int); ^B-Bkw (Int)
ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 6-3. T3 Statistics

Table 6-2. T3 Statistics Parameters

Parameter	Description
Port number	Statistics regarding selected port number
Interval number	Selected interval (interval 0 displays the current interval)
Time elapsed	For interval 0 displays number of seconds passed from the start time of the interval
LES	Number of seconds where Line Errored Seconds are detected. A Line Errored Second is a second with: One or more Code Violations or, One or more Loss of Signal defects
PES	Number of seconds where P-bit Errored Seconds are detected. A P-bit Errored Second is a second with: One or more Path Code Violation Error Events or One or more Out of Frame defects or A detected incoming AIS defect. This counter is not incremented when Unavailable Seconds (UAS) are counted.

Parameter	Description
PSES	Number of seconds where P-bit Severely Errored Seconds are detected. A P-bit Errored Second is a second with: 44 or more Path Code Violation Error Events or One or more Out of Frame defects or A detected incoming AIS defect. This counter is not incremented when Unavailable Seconds (UAS) are counted.
CES	Number of seconds where C-bit Errored Seconds are detected. A C-bit Errored Second is a second with: One or more CCV Error Events or One or more Out of Frame defects or A detected incoming AIS defect. This counter is not incremented when Unavailable Seconds (UAS) are counted. ***Note**: This count is only for the SYNTRAN and C-bit Parity DS3 applications.*
CSES	Number of seconds where C-bit Severely Errored Seconds are detected. A C-bit Severely Errored Second is a second with: 44 or more CCV Error Events or One or more Out of Frame defects or A detected incoming AIS defect. This counter is not incremented when Unavailable Seconds (UAS) are counted. ***Note**: This count is only for the SYNTRAN and C-bit Parity DS3 applications.*
SEFS	Number of seconds where Severely Errored Framing Seconds are detected. A Severely Errored Framing Second is a second with: One or more Out of Frame defects or A detected incoming AIS defect. This counter is not incremented during unavailable seconds
UAS	Number of seconds where the interface is unavailable. The DS3 interface is said to be unavailable from the onset of 10 contiguous LESs, or the onset of the condition leading to a failure.

Displaying Logical Layer Statistics

You can display the statistics for the GFP logical ports. There are no statistics for VCG logical ports.

➤ **To view the Logical Layer statistics:**

- In the Main menu, navigate to Monitoring > Logical Layer > **Statistics**.

  The Logical Layer Statistics screen appears as illustrated in *Figure 6-4*. The statistics are explained in *Table 6-3.*

➤ **To clear Logical Layer statistics:**

- In the Logical Layer Statistics menu, type **c** to clear port statistics.

```
                              RICi-16
Monitoring > Logical Layer > Statistics

 Port                              (2)
 Interface Type                    (GFP)
 Port name                         (GFP 1)

 Rx Correct Frames                 (0)
 Rx Correct Octets                 (0)
 Rx cHEC Errors                    (0)
 Rx tHEC Errors                    (0)
 Rx FCS Errors                     (0)
 TX Frames                         (453160)
 TX Octets                         (45609507)
 Tx congestion Dropped Frames      (0)

f-Forward; b-Backward; c-Clear Statistics
ESC-Previous menu; !-Main menu; &-Exit;                1 M/ 1 C
```

Figure 6-4. Logical Layer Statistics (GFP)

Table 6-3. Logical Layer Statistics

Parameter	Description
Port	Logical port being monitored
Interface Type	Interface type
Port Name	Given name to logical port
RX Correct Frames	Total number of frames received
RX Correct Octets	Total number of octets received
RX cHEC Errors	Total number of frames received with errors in the cHEC field of the header
RX tHEC Errors	Total number of frames received with errors in the tHEC field of the header
RX FCS Errors	Total number of frames received with frame checksum errors

Parameter	Description
TX Frames	Total number of frames transmitted
TX Octets	Total number of octets transmitted
TX Congestion Dropped Frames	Total number of frames dropped because of congestion

6.2 Handling Alarms and Traps

RICi-16 maintains a log file, which can hold up to 1000 system messages. All events are time-stamped.

Displaying Events

➤ To access the event log:

1. In the Main menu, navigate to Monitoring › System › Event Log.

   The Event Log screen appears as illustrated in *Figure 6-5*.

2. In the Event Log screen, use ‹Ctrl-u› to scroll up and ‹Ctrl-d› to scroll down in the Events list.

```
                                RICi-16E1
Monitoring > System > Event Log                        Current time: 0:07:59

    Source          Description     Information
1   E1 Port 2       LINK_DOWN       E1 port
2   E1 Port 6       LINK_UP         E1 port
3   Eth Port 1      LINK_DOWN       Eth port

x - Clear Table
ESC-Previous menu; !-Main menu; &-Exit;  ?-help
```

Figure 6-5. Typical Log File

Table 6-4 presents the event types that appear in the event log.

Table 6-4. Event List

Code	Event	Description
10	LINK_UP	Network Ethernet port has been connected
20	LINK_DOWN	Network Ethernet port has been disconnected
30	HW_FAILURE	Hardware failure has been detected
32	PS_FAILED_ON	(Dual power supply only) One of the power supplies has failed
33	PS_FAILED_OFF	(Dual power supply only) The power supply has been turned back on after a failure
40	SNMP_AUTH_FAIL	SNMP Authentication Failure trap has been received

50	WEB_START	ConfiguRAD session has been initiated
51	WEB_FINISH	ConfiguRAD session has been finished
52	WEB_FAILURE	ConfiguRAD session has failed
60	TELNET_START	Telnet session has been initiated
61	TELNET_FINISH	Telnet session has been finished
62	TELNET_FAILURE	Telnet session has failed
70	TFTP_START	TFTP session has been initiated
71	TFTP_FINISH	TFTP session has been finished
72	TFTP_FAILURE	TFTP session has failed
90	TELNET_ACCESS_DENIED	Access via Telnet was denied, either because the current IP address does not appear in the manager list, or because Telnet access was disabled via user configuration.
91	WEB_ACCESS_DENIED	Access via Web was denied, either because the current IP address does not appear in the manager list, or because web access was disabled via user configuration.
92	SNMP_ACCESS_DENIED	Access via SNMP was denied, either because the current IP address does not appear in the manager list, or because SNMP access was disabled via user configuration.

Clearing Events

➤ To clear the event log:

- In the Event Log screen, press ‹**X**›.

6.3 Testing RICi-16

RICi-16 checks network integrity by running ping, trace route, or loopback tests.

Running a Ping Test

You can ping the remote IP host to check the IP connectivity.

➤ **To ping an IP host:**

1. In the Main menu, navigate to Diagnostics › **Ping**.

   The Ping menu appears as illustrated in *Figure 6-6*.

2. In the Ping menu, configure the following:

   - **Destination IP Address.** This is the IP address of the host that you intend to ping. Use values between 0.0.0.0 and 255. 255. 255. 255.
   - **Number of Frames to Send.** Select 0 to send a continuous stream of frames, or 1-50 to send a specified number of frames.

3. To start sending pings, select **Send Ping**.

   The results are displayed in the lower scrolling message window.

4. To stop sending pings, select **Stop Ping**.

```
                          RICi-16
Diagnostics > Ping

1. Destination IP Address              …(0.0.0.0)
2. Number of Frames to Send [0 - 50]   …(10)
3. Send Ping
4. Stop Ping

Please select item from 1 to 4
ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 6-6. Ping Menu

Tracing the Route

This diagnostic utility traces the route through the network from RICi-16 to the destination host.

➤ **To trace a route:**

1. In the Main menu, navigate to Diagnostics › **Trace Route**.

   The Trace Route menu appears as illustrated in *Figure 6-7*.

2. In the Trace Route menu, select **Destination IP Address** and enter the IP address of the host to which you intend to trace the route.

3. To start tracing, select **Display Trace Route**.

RICi-16 starts tracing the route, displaying the IP addresses of all hop nodes.

4. To stop the tracing, select **Stop Trace Route**.

```
                              RICi-16
Diagnostics > Trace Route
1. Destination IP Address    …(0.0.0.0)
2. Display Trace Route
3. Stop Trace Route

>
ESC-Previous menu; !-Main menu; &-Exit; ?-Help
```

Figure 6-7. Trace Route Menu

Running Loopback Tests

Testing E1/T1 Links

This diagnostic utility performs remote loopback tests on the E1/T1 links in order to determine the source of a break in the data flow.

➤ **To execute a loopback test on an E1/T1 link:**

1. In the Main menu, navigate to Diagnostics › **E1/T1 Loopback**.

   The E1/T1 Loopback menu appears as illustrated in *Figure 6-8*.

2. Navigate to the E1/T1 link to test, by using **f** and **b**.
3. Select the **Loopback State** and specify **Remote** to perform remote loopback or **Disable** to disable loopback testing.
4. Select **Duration** and enter a value between 0 and 3600 to specify how many seconds to run the loopback test.

```
                          RICi-16E1
Diagnostics> E1/T1 Loopback
   Port [1 – 16]               (1)

1. Loopback State              (Disable)
2. Duration (sec) [0 – 3600]   (60)

F-Forwards; B-Backwards

ESC-Previous menu; !-Main menu; &-Exit; ?-Help       1 M/ 1 C
```

Figure 6-8. E1/T1 Loopback Menu

Testing T3 Links

This diagnostic utility performs remote loopback tests on the T3 links in order to determine the source of a break in the data flow.

➤ **To execute a loopback test on a T3 link:**

1. In the Main menu, navigate to Diagnostics › **T3 Loopback**.

The T3 Loopback menu appears as illustrated in *Figure 6-9*.

2. Navigate to the T3 link to test, by using **f** and **b**.
3. Select the **Loopback State** and specify **Remote** to perform remote loopback or **Disable** to disable loopback testing.
4. Select **Duration** and enter a value between 0 and 3600 to specify how many seconds to run the loopback test.

```
                              RICi-16E1
Diagnostics> T3 Loopback
   Port                    (1)

1. Loopback State               (Disable)
2. Duration (sec) [0 – 3600]    (60)

f-Forward;
ESC-Previous menu; !-Main menu; &-Exit; ?-Help       1 M/ 1 C
```

Figure 6-9. T3 Loopback Menu

6.4 Troubleshooting

Use the chart shown in *Table 6-5* to identify and remedy problems in unit operation.

Table 6-5. Troubleshooting Chart

Fault	Probable Cause	Remedial Action
Power LED off	No power supplied to unit.	• Check the power source. • Check whether the power cable is connected and correctly wired.
Ethernet Link LED off	• No Ethernet Link detected. • The rate or the duplex mode of the Ethernet ports on the switch and RICi-16 do not match.	• Check whether the cable is connected and correctly wired. • Check the switch and RICi-16's Ethernet port configuration (negotiation, rate, duplex mode). • Use the event log to check events.
E1/T1 local or remote Sync Loss LED on	No E1/T1 Link detected at the local or remote site.	• Check whether the cable is connected and correctly wired. • Check the E1/T1 physical connection (use loopbacks). • Check the configuration of the E1/T1 lines at local and remote sites. • Use the event log to check events.
No traffic flow between two units	Configuration or logical layer problems.	• Use the System Interface Status screen for assistance. All active

		ports that show Activation–Up, should show Operation–Up. • Use the log file to check events. • Check RICi-16's configuration and, if necessary, other RICi-16 parameters.
Partial Traffic Flow	Timing configuration is not properly set.	• Check timing settings.

6.5 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide. This information can be found at www.rad.com. (Offices – About RAD › Worldwide Offices; Distributors – Where to Buy › End Users).

Appendix A
Connector Wiring

A.1 Ethernet Connector

The 10/100BaseT Ethernet electrical interface is an 8-pin RJ-45 connector, wired according to *Table A-1*.

Table A-1. 10/100BaseT Ethernet Connector Pinouts

Pin	Function
1	Tx+
2	Tx–
3	Rx+
4, 5	–
6	Rx–
7, 8	–

A.2 E1/T1 Connector

The E1 or T1 electrical interface is an 8-pin RJ-45 connector, wired according to *Table A-2*.

Table A-2. E1 or T1 Connector Pinouts

Pin	Function
1	Rx+
2	Rx–
3	NC
4	Tx+
5	Tx–
6	NC
7	NC
8	NC

Note *Do not connect wires to the NC pins.*

A.3 Control Connector

The control terminal interface terminates in a V.24/RS-232 9-pin D-type female DCE connector. *Table A-3* lists the control connector pin assignments.

Table A-3. CONTROL Connector Pinout

Pin	Function
2	Txd (TD)
3	Rxd (RD)
5	Ground (GND)

Appendix B

Boot Sequence and Downloading Software

RICi-16 allows you to download software. In order to do so, you have to connect an ASCII terminal to the RICi-16 control port.

Software is stored in the in two separate sectors on the flash memory, in the boot sector and in the file system. The boot sector includes a boot program that calls the rest of the program from the file system.

The file system can hold two compressed copies of the RICi-16 code. One copy is called the operating file, and the other one is called the backup file. The operating file is the default-executable RICi-16 code. The backup file is used whenever the operating file is absent or corrupted.

B.1 Booting RICi-16

RICi-16 boots automatically. Once powered up, no further user intervention is required, except when the user wants to access the file system to modify or update the software or the RICi-16 configuration.

Accessing the Boot Manager

The Boot Manager menu is an option that allows the user to perform basic file transfer operations. These operations are all optional.

➤ To access the Boot Manager menu:

- Press <Enter> several times immediately after powering RICi-16 up.

  The Boot Manager menu appears as illustrated in *Figure* B-1.

```
RICi-16 Boot Version 1.00 (Jan 20 2005)
Boot manager version 10.07 (Jan 20 2005)

0 - Exit Boot-Manager
1 - Dir
2 - Set Active Software Copy
3 - Delete Software Copy
4 - Download an Application by XMODEM
5 - Format flash
6 - Show basic hardware information
7 - Reset board
8 - System Configuration.
9 - Download an Application by TFTP
Press the ESC key to return to the Main Menu.
Select:
```

Figure B-1. Typical Boot Manager Menu

From the Boot Manager menu, you can do the following:

- Listing all files stored in the flash memory
- Exchanging the operating and backup files
- Deleting the operating file; the backup file becomes the operating file
- Downloading a new operating file via XMODEM; the previous operating file is saved as the backup file
- Deleting all software and configuration files
- Displaying basic hardware information such as RAM, ROM size etc.
- Resetting RICi-16
- Configuring the IP address, the IP mask and the default gateway for the consecutively downloading via TFTP.

If you choose to exchange or delete a file, you are prompted for confirmation.

B.2 Transferring the Software and Configuration Files

New software releases are distributed as separate files, which are downloaded to RICi-16 using the XMODEM protocol or TFTP from the Boot Manager menu. Alternatively, you can download a new software release via TFTP, when the RICi-16 management software is already running (**Main menu** > **Utilities** > **File Transfer**).

The TFTP protocol can also be used for uploading configuration files that contain the RICi-16 database to the management station. When RICi-16 is running, administrators can use this capability to distribute verified configuration files to all other units that use the similar configuration.

Downloading Application Files via XMODEM

Use the XMODEM protocol to download applications from the Boot Manager menu.

➤ **To download application file via XMODEM:**

1. Configure your ASCII terminal or terminal emulation utility running on your PC to a data rate of 115.2 kbps.
2. Enter the Boot Manager menu.

   The Boot Manager menu appears as illustrated in *Figure B-1*.
3. From the Boot Manager menu, select **Download Files or an Application by XMODEM**.

   RICi-16 displays the following message:
   `Select Copy number for download (0)`
4. Enter the number associated with the backup partition, **0** or **1**.

   RICi-16 responds with the following string:
   `Please start the XMODEM download.`
5. Start sending the application file to RICi-16 using the XMODEM utility of your terminal application.

   Once completed, RICi-16 saves the new release as an active partition, the previously active partition becomes the backup partition and the boot sequence continues normally.

   In case downloading fails, the partially downloaded file is erased and only the active software file remains in the flash memory.

Downloading Application Files via TFTP

➤ **To download application file via TFTP**

1. From the Boot Manager menu, select **System Configuration**.
2. Configure the IIP address, the IP mask and the default gateway. These parameters are only valid for the TFTP file transfer via the Boot Manager.
3. Start a TFTP application and configure the TFTP communication parameters as follows:
   - Connection timeout – more than 30 seconds to prevent an automatic disconnection during the backup partition deletion (about 25 seconds)
   - Block size – 512 bytes
   - UDP port – 69.
4. Select a local software release file to download.
5. Enter the TFTP server IP address.
6. Start downloading.

   RICi-16 erases the backup partition. Once completed, RICi-16 saves the new release as an active partition. The previously active partition becomes the backup partition.

Index

Supplement

AC/DC Adapter (AD) Plug

for DC Power Supply Connection

Note *Ignore this supplement if the unit is AC-powered.*

Certain units are equipped with a wide-range AC/DC power supply. These units are equipped with a standard AC-type 3-prong power input connector located on the unit rear panel. This power input connector can be used for both AC and DC voltage inputs.

For DC operation, a compatible straight or 90-degree AC/DC Adapter (AD) plug for attaching to your DC power supply cable is supplied with your RAD product (see *Figure 1* and *Figure 2*).

Connect the wires of your DC power supply cable to the AD plug, according to the voltage polarity and assembly instructions provided on *page 2*.

Figure 1. Straight AD Plug

Figure 2. 90-Degree AD Plug

Caution

Prepare all connections to the AD plug **before** inserting it into the unit's power connector.

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➤ **To prepare the AD plug and connect it to the DC power supply cable:**

1. Loosen the cover screw on the bottom of the AD plug to open it (see *Figure 3*).
2. Run your DC power supply cable through the removable cable guard and through the open cable clamp.
3. Place each DC wire lead into the appropriate AD plug wire terminal according to the voltage polarity mapping shown. Afterwards, tighten the terminal screws closely.
4. Fit the cable guard in its slot and then close the clamp over the cable. Tighten the clamp screws to secure the cable.
5. Reassemble the two halves of the AD plug and tighten the cover screw.
6. Connect the assembled power supply cable to the unit.

***Note**: You have to flip over the non-90-degree AD plug type by 180 degrees to insert it into the unit. After inserting it, verify that the blue (negative) wire is connected to the POWER and the brown (positive) wire is connected to the RETURN.*

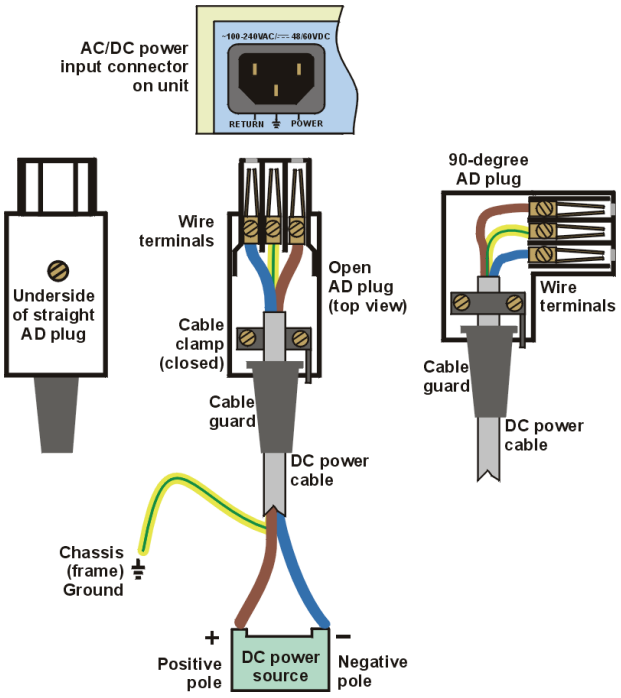

Figure 3. AD Plug Details

Warning

- **Reversing the wire voltage polarity will not cause damage to the unit, but the internal protection fuse will not function.**
- **Always connect a ground wire to the AD plug's chassis (frame) ground terminal. Connecting the unit without a protective ground, or interrupting the grounding (for example, by using an extension power cord without a grounding conductor) can damage the unit or the equipment connected to it!**
- **The AD adapter is not intended for field wiring.**

Supplement

Terminal Block Connector

for DC Power Supply Connection

Note *Ignore this supplement if the unit is AC-powered.*

Certain DC-powered units are equipped with a plastic 3-pin VDC-IN power input connector, located on the unit rear panel. Different variations of the connector are shown in *Figure 1*. All are functionally identical.

Supplied with such units is a kit including a mating Terminal Block (TB) type connector plug for attaching to your power supply cable.

Connect the wires of your power supply cable to the TB plug, according to the voltage polarity and assembly instructions provided on the following pages.

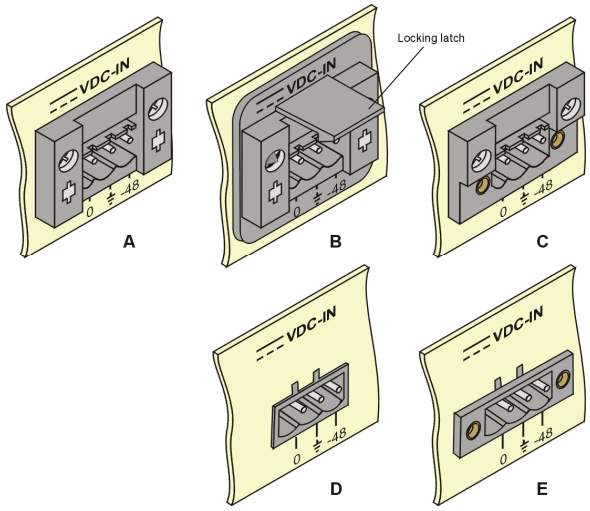

Figure 1. TB DC Input Connector Types Appearing on Unit Panels

Caution

Prepare all connections to the TB plug **before** inserting it into the unit's VDC-IN connector.

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➤ **To prepare and connect the power supply cable with the TB Plug:**

***Note**: Refer to Figure 2 for assistance.*

1. Strip the insulation of your power supply wires according to the dimensions shown.
2. Place each wire lead into the appropriate TB plug terminal according to the voltage polarity mapping shown in *Figure 3*. (If a terminal is not already open, loosen its screw.) Afterwards, tighten the three terminal screws to close them.
3. Pull a nylon cable tie (supplied) around the power supply cable to secure it firmly to the TB plug grip, passing the tie through the holes on the grip.
4. Isolate the exposed terminal screws/wire leads using a plastic sleeve or insulating tape to avoid a short-circuit.
5. Connect the assembled power supply cable to the unit by inserting the TB plug into the unit's VDC-IN connector until it snaps into place.

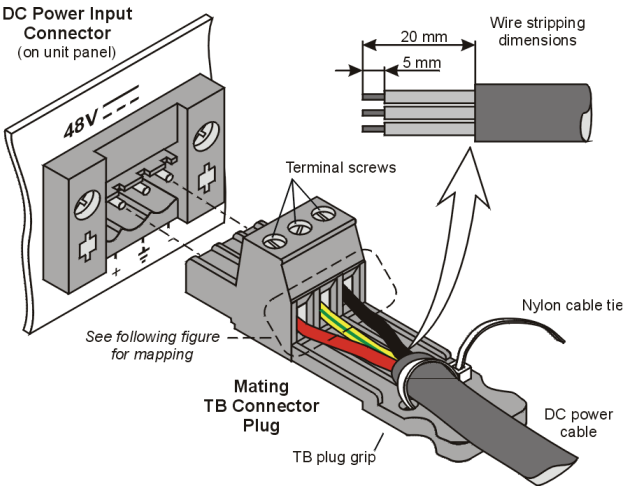

Figure 2. TB Plug Assembly

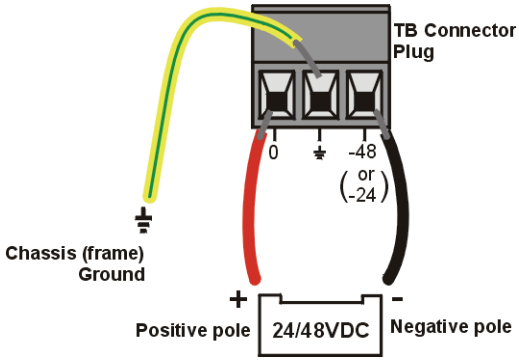

Figure 3. Mapping of the Power Supply Wire Leads to the TB Plug Terminals

Warning

- **Reversing the wire voltage polarity can cause damage to the unit!**
- **Always connect a ground wire to the TB plug's chassis (frame) ground terminal. Connecting the unit without a protective ground, or interruption of the grounding (for example, by using an extension power cord without a grounding conductor) can cause harm to the unit or to the equipment connected to it!**

***Note**: Certain TB plugs are equipped with captive screws for securing the assembled cable's TB plug to the unit's VDC-IN connector (C and E types only). To secure the plug, tighten the two screws on the plug into the corresponding holes on the sides of the input connector as shown in Figure 4.*

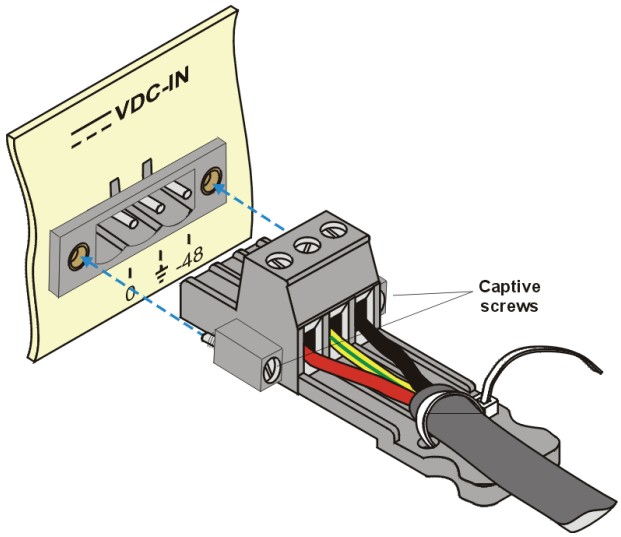

Figure 4. TB Plug with Captive Screws (optional)

➤ **To disconnect the TB plug:**

1. If the TB plug is equipped with captive screws, loosen the captive screws (see *Figure 4*).
2. If the unit's VDC-IN connector is type B, lift the locking latch (see *Figure 1*).
3. Pull out the TB plug carefully.

Caution Always lift the locking latch of type B connectors before disconnecting the TB plug, to avoid damaging the TB plug.

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Customer Response Form

RAD Data Communications would like your help in improving its product documentation. Please complete and return this form by mail or by fax or send us an e-mail with your comments.

Thank you for your assistance!

Manual Name: RICi-16 version 2.1

Publication Number: 506-200-08/08

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	Excellent	*Good*	*Fair*	*Poor*	*Very Poor*
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