INSTALLATION AND OPERATION MANUAL

ETX-203AX

Carrier Ethernet Demarcation Device

Version 4.01

EtherAccess

RAD

data communications

The Access Company

ETX-203AX

Carrier Ethernet Demarcation Device

Version 4.01

Installation and Operation Manual

Notice

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

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RAD Data Communications Ltd.

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
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 Publication No. 530-200-04/12

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Limited Warranty

RAD warrants to DISTRIBUTOR that the hardware in the ETX-203AX 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 ETX-203AX, and in no event shall RAD's liability exceed the purchase price of the ETX-203AX.

DISTRIBUTOR shall be responsible to its customers for any and all warranties which it makes relating to ETX-203AX and for ensuring that replacements and other adjustments required in connection with the said warranties are satisfactory.

Software components in the ETX-203AX 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 ETX-203AX shall not exceed the sum paid to RAD for the purchase of the ETX-203AX. 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.

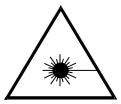
Safety Symbols

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 (20A for USA and Canada). The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A (40A for USA and Canada).

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.

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 (20A for USA and Canada). The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A (40A for USA and Canada).

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.

Français

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.

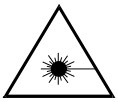
Symboles de sécurité

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.

Français

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 (20A aux Etats-Unis et Canada). 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 (40A aux Etats-Unis et Canada).

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.

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 (20A aux Etats-Unis et Canada). 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 (40A aux Etats-Unis et Canada).

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.

Glossary

Address	A coded representation of the origin or destination of data.
Agent	In SNMP, this refers to the managed system.
ANSI	American National Standards Institute.
APS (Automatic protection switching)	An automatic service restoration function by which a network senses a circuit or node failure and automatically switches traffic over an alternate path.
Attenuation	Signal power loss through equipment, lines or other transmission devices. Measured in decibels.
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).
Best Effort	A QoS class in which no specific traffic parameters and no absolute guarantees are provided.
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").
Bit Interleaving/Multiplexing	A process used in time division multiplexing where individual bits from different lower speed channel sources are combined (one bit from one channel at a time) into one continuous higher speed bit stream.
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.
Broadband	Wideband technology capable of supporting voice, video and data, possibly using multiple channels.
Buffer	A storage device. Commonly used to compensate for differences in data rates or event timing when transmitting from one device to another. Also used to remove jitter.
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.
CLI	Command Line Interface (CLI) is a mechanism for interacting with a RAD product by typing commands in response to a prompt.
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.
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.
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.
Ethernet OAM	Ethernet operation, administration and maintenance (OAM) are a set of standardized protocols for measuring and controlling network performance. There are two layers of Ethernet OAM: Service OAM (provides end-to-end connectivity fault management per customer service instance, even in multi-operator networks) and Link or Segment OAM (detailed monitoring and troubleshooting of an individual physical or emulated link).
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.
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.
GFP (Generic Framing Procedure)	Defined by ITU-T G.7041, generic framing procedure allows efficient mapping of variable length, higher-layer client signals, such as Ethernet, over a transport network like SDH/SONET. Recently, GFP has been extended to lower speed PDH networks.
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).
Jitter	The deviation of a transmission signal in time or phase. It can introduce errors and loss of synchronization in high speed synchronous communications.
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.
Loading	The addition of inductance to a line in order to minimize amplitude distortion. Used commonly on public telephone lines to improve voice quality, it can make the lines impassable to high speed data, and baseband modems.
Logical MAC	A concept used to describe and map the Ethernet traffic passing over different media (E1/T1, SDH/SONET, etc). Logical MAC represents the MAC layer of the entity. It should be bound to a GFP, HDLC or MLPPP port, which, in its turn, should be bound to the physical layer.
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.
MA (Maintenance Association)	See **MEG (Maintenance Entity Group)**.
ME (Maintenance Entity)	An ME is a maintenance entity as defined by ITU-T Y.1731 that requires management.
MEG (Maintenance Entity Group)	MEs are grouped into ME groups. For a point-to-point Ethernet connection/S-VLAN, a MEG contains a single ME. For a multipoint Ethernet connection, a MEG contains n*(n-1)/2 MEs, where n is the number of Ethernet connection end points. Each MEG is assigned a unique ID that is used in OAM messages. (MEGs are also referred to as Maintenance Associations or MAs in IEEE language.)
MEP (Maintenance Entity Group End Point)	MEPs are located at the ends of managed entities. MEPs generate and process OAM frames to monitor and maintain the ME.
MIP (Maintenance Entity Group Intermediate Point)	A MIP is located at an intermediate point along the end-to-end Ethernet path . It can respond to OAM messages, but cannot originate them.
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.
Mark	In telecommunications, this means the presence of a signal. A mark is equivalent to a binary 1. A mark is the opposite of a space (0).
Metering	This feature is intended for support of payphones, and therefore includes dedicated circuits for the detection of polarity and of 16 kHz or 12 kHz metering pulses.
Multidrop	A communications configuration in which multiple devices share a common transmission facility (or multipoint line), although generally only one may transmit at a time. Usually used with some kind of polling mechanism to address each connected terminal with a unique address code.
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.
Parameters	Parameters are often called arguments, and the two words are used interchangeably. However, some computer languages such as C define argument to mean actual parameter (i.e., the value), and parameter to mean formal parameter. In RAD CLI, parameter means formal parameter, not value.
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.
Policing	A method for verifying that the incoming VC complies with the user's service contract.
Polling	See **Multidrop**.
Port	The physical interface to a computer or multiplexer, for connection of terminals and modems.
Prioritization	Also called CoS (class of service), classifies traffic into categories such as high, medium, and low. The lower the priority, the more "drop eligible" is a packet. When the network gets busy, prioritization ensures critical or high-rated traffic is passed first, and packets from the lowest categories may be dropped.
prompt	One or more characters in a command line interface to indicate that the computer is ready to accept typed input.
Protocol	A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.
RADIUS (Remote Authentication Dial-In User Service)	An authentication, authorization and accounting protocol for applications such as network access or IP mobility. Many network services require the presentation of security credentials (such as a username and password or security certificate) in order to connect to the network. Before access to the network is granted, this information is passed to a network access server (NAS) device over the link-layer protocol, then to a RADIUS server over the RADIUS protocol. The RADIUS server checks that the information is correct using authentication schemes like PAP, CHAP or EAP.
Router	An interconnection device that connects individual LANs. Unlike bridges, which logically connect at OSI Layer 2, routers provide logical paths at OSI Layer 3. Like bridges, remote sites can be connected using routers over dedicated or switched lines to create WANs.
Routing	The process of selecting the most efficient circuit path for a message.
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).
SONET (Synchronous Optical Network)	A North American standard for using optical media as the physical transport for high speed long-haul networks. SONET basic speeds start at 51.84 Mbps and go up to 2.5 Gbps.
Space	In telecommunications, the absence of a signal. Equivalent to a binary 0.
SSH (Secure Shell)	A network protocol that allows data to be exchanged over a secure channel between two computers. Encryption provides confidentiality and integrity of data.
Sync	See **Synchronous Transmission**.
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.
Traffic Shaping	A method for smoothing the bursty traffic rate that might arrive on an access virtual circuit so as to present a more uniform traffic rate on the network.
Trunk	A single circuit between two points, both of which are switching centers or individual distribution points. A trunk usually handles many channels simultaneously.
Zero suppression	Technique used to ensure a minimum density of marks.

Quick Start Guide

This section describes the minimum configuration needed to prepare ETX-203AX for operation.

1. Installing the Unit

Perform the following steps to install the unit:

1. Determine the required configuration of ETX-203AX, according to your application.
2. Connect the user/network ports as required for the application.
3. Connect the ASCII terminal to the control port.
4. Connect power to the unit.

Connecting the Interfaces

➤ **To connect the interfaces:**

1. Insert the SFP modules (if applicable) into the relevant SFP-based Ethernet ports.
2. Connect the optical cables.
3. Connect the network port(s) to the service provider network equipment.
4. Connect the user port(s) to the customer network equipment.

Notes

- *The number of available Ethernet ports depends on the options you purchased.*
- *Lock the wire latch of each SFP module by lifting it up until it clicks into place. For additional information, refer to Chapter 2.*

Connecting to a Terminal

➤ **To connect the unit to a terminal:**

1. Connect the male RJ-45 connector of the cable supplied by RAD to the unit's 8-pin connector, designated CONTROL.
2. Connect the other side of the cable to the ASCII terminal equipment.

Connecting the Power

The unit can be connected to AC or DC power.

➤ **To connect to AC power:**

1. Connect the power cable to the AC power connector on the unit's front panel.
2. Connect the power cable to mains outlet.

   The unit turns on automatically upon connection to the mains, and the PWR indicator lights up.

➤ **To connect to DC power:**

- For instructions on wiring the DC adapters, refer to the DC Power Supply Terminal Block Connection supplement at the end of this manual.

2. Configuring the Unit for Management

Configure ETX-203AX for management, using a local ASCII-based terminal.

Starting a Terminal Session for the First Time

➤ **To start the terminal session:**

1. Connect an ASCII terminal to the CONTROL port.
2. Configure the ASCII terminal to the settings listed below and then set the terminal emulator to VT100 emulation for optimal view of system menus.
   - **Data Rate**: 9,600 bps
   - **Data bits**: 8
   - **Parity**: None
   - **Stop bits**: 1
   - **Flow control**: None.
3. If you are using HyperTerminal, set the terminal mode to 132-column mode for optimal view of system menus (**Properties› Settings› Terminal Setup› 132 column mode**).
4. Power-up ETX-203AX.
5. ETX-203AX boots up. When the startup process is completed, you are prompted to press ‹**ENTER**› to receive the login prompt.
6. Press ‹**ENTER**› until you receive the login prompt.
7. To log in, enter your user name (**su** for full configuration and monitoring access) and your password.
8. The device prompt appears:

   ETX-203AX#

You can now type the necessary CLI commands.

Configuring SVI

SVI 1 must be administratively enabled in order to be able to administratively enable the corresponding flows and router interface.

➤ To administratively enable SVI 1:

- Enter the following commands:

```
configure port svi 1
no shutdown
exit all
```

Configuring Management Flows

The following sections provide an example of configuring management flows for out-of-band management via the Ethernet management port. The management traffic is untagged. The management flows are set up between the Ethernet management port and SVI 1.

➤ To define the management flows:

- Enter the following commands:

```
configure flows
# Classifier profile to match untagged traffic
classifier-profile untagged match-any match untagged

# Flow from management Ethernet port to SVI 1
flow mng_in
classifier untagged
no policer
ingress-port ethernet 101
egress-port svi 1 queue 1
no shutdown
exit

# Flow from SVI 1 to management Ethernet port
flow mng_out
classifier untagged
ingress-port svi 1
egress-port ethernet 101 queue 0 block 0/1
no shutdown
exit all
```

Configuring Router

The router must be configured with a router interface that is bound to the SVI used for the management flows, and assigned an IP address. Also, a static route must be set up for the default gateway.

This section illustrates the following configuration:

- Router interface 1:
  - Bound to SVI 1
  - IP address 172.17.154.96 with mask 255.255.255.0
- Router: Static route associated with IP address 172.17.154.1 (default gateway).

➤ To define the router:

- Enter the following commands:

```
configure router 1
interface 1
bind svi 1
# IP address 172.17.154.96 with mask 255.255.255.0
address 172.17.154.96/24
no shutdown
exit
# Default gateway 172.17.154.1
static-route 0.0.0.0/0 address 172.17.154.1
exit all
```

3. Saving Management Configuration

Saving Configuration

Type **save** in any level to save your configuration in **startup-config**.

Copying User Configuration to Default Configuration

In addition to saving your configuration in **startup-config**, you may also wish to save your configuration as a user default configuration.

➤ To save user default configuration:

- Enter the following commands:

```
exit all
file copy startup-config user-default-config
y
```

4. Verifying Connectivity

At the ASCII terminal, ping the IP address assigned to ETX-203AX and verify that replies are received. If there is no reply to the ping, check your configuration and make the necessary corrections.

Contents

Chapter 4. Management and Security

Chapter 7. Resiliency

Chapter 8. Networking

Chapter 9. Timing and Synchronization

Chapter 10. Administration

Chapter 11. Monitoring and Diagnostics

Chapter 1
Introduction

1.1 Overview

ETX-203AX is a carrier Ethernet demarcation device owned and operated by the service provider and installed at the customer premises, delivering SLA-based Ethernet business services to the customer premises over native Ethernet access. It serves as a clear demarcation point between the user and operator networks. The device delivers Ethernet E-line services (EPL and EVPL) and is MEF 9 and MEF 14 certified.

Incoming customer traffic is classified and mapped according to port-based (all-in-one) bundling or by user port and CE VLAN-ID, VLAN priority, DSCP, IP precedence, MAC, IP address, and Ethertype. This offers operators the flexibility to differentiate services using different kinds of classification methods, police the traffic, and enforce SLA per service.

ETX-203AX supports powerful bandwidth profiles such as CIR/CBS and EIR/EBS for differentiated Ethernet services and includes comprehensive Ethernet OAM (Operation, Administration, and Maintenance) functionality together with SLA monitoring.

The SFP-based interfaces accommodate a wide range of Fast Ethernet and Gigabit Ethernet SFP transceivers, allowing service providers to seamlessly connect customers located at different distances from the device.

The network ports support 1:1 or LAG link aggregation. At the physical layer, ETX-203AX supports autonegotiation and fault propagation.

The unit can be managed via a local terminal port, via a dedicated out-of-band Ethernet port, or via a user or network port.

Product Options

Several versions of the unit are available, offering different combinations of Ethernet ports and enclosures. The basic port type is Fast Ethernet, which can be optionally increased to Gigabit Ethernet.

- Network ports – Up to two SFP-based fiber optic or electrical, depending on whether port 2 is configured as network or user port.
- User ports – Up to four SFP-based fiber optic or electrical, or five if port 2 is configured as user port.
- Enclosure –. Plastic, 8.4". For the allowed storage and operating temperature range, refer to *Technical Specifications*.

Applications

ETX-203AX delivers Ethernet services as defined by the MEF standards.

Figure 1-1. EPL Service

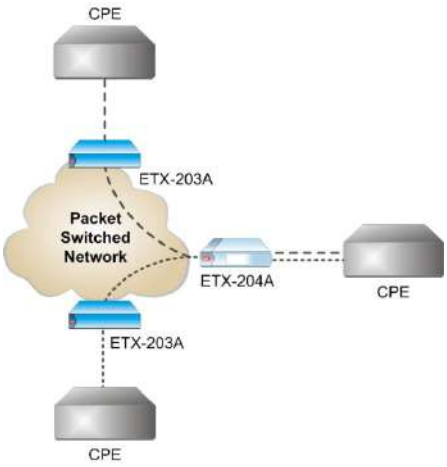


Figure 1-2. EVPL Service

Features

Service Types

ETX-203AX provides port- and flow-based services.

Port-Based Service

In a typical port-based (all-to-one bundling) application ETX-203AX receives different services via different user ports (*Figure 1-3*). This method achieves clearer service separation, it does not require any marking for CoS, and provides straightforward SLA measurement.

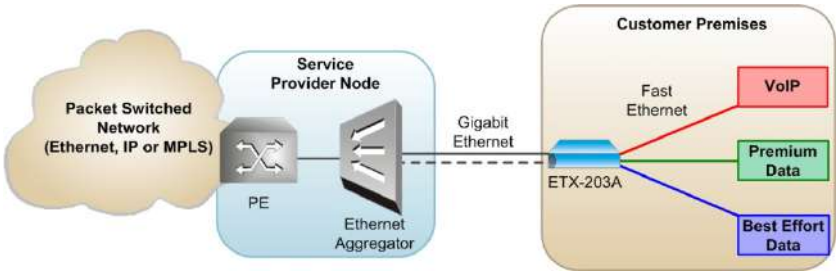


Figure 1-3. Port-Based Service

Flow-Based Service

In a typical flow-based application different services are assigned to different Ethernet flows received by the same user port (*Figure 1-4*). This provides a

cheaper, more scalable solution, with a possibility of mixing different service types.

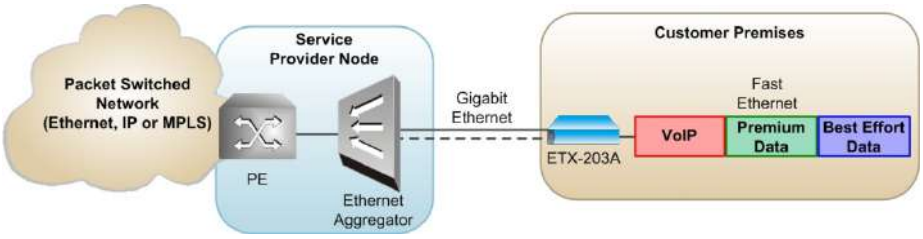


Figure 1-4. Flow-Based Service

Service Level Agreement (SLA) Monitoring

ETX-203AX is an effective tool for measuring the Service Level Agreement parameters, such as Frame Delay, Frame Delay Variance (jitter), Frame Loss and Availability.

Flow Classification

The ingress user traffic is mapped to the Ethernet flows using the following list of per-port classification criteria. In the classifications, VLAN refers to the service provider (outer) VLAN, previously referred to as SP-VLAN, while inner VLAN refers to the Customer Entity VLAN, previously referred to as CE-VLAN.

- Port-based (All to one bundling)
- VLAN
- VLAN + VLAN priority
- VLAN + IP precedence
- VLAN + DSCP
- VLAN + source/destination MAC
- VLAN + source/destination IP address
- VLAN + inner VLAN
- VLAN + VLAN priority + inner VLAN
- VLAN + non-IP
- VLAN + Ethertype
- VLAN priority
- IP precedence
- DSCP
- Source/destination MAC
- Source/destination IP address
- Non-IP
- Ether Type
- Untagged.

ETX-203AX supports up to 192 Ethernet flows. Flows are unidirectional.

Tagging and Marking

ETX-203AX supports several options for marking and tagging.

You can perform the following marking actions:

- Overwrite inner or outer VLAN with a new value
- Overwrite inner or outer VLAN p-bit with a new value.

You can perform the following tagging actions:

- Add (push) outer VLAN, with p-bit value that can be copied from the original value or set to a new value. When you add a new VLAN, the original outer VLAN becomes the inner VLAN.
- Remove (pop) outer VLAN and p-bit. When you remove a VLAN, the inner VLAN becomes the outer VLAN.
- Add (push) inner VLAN, with p-bit value that can be copied from the original value or set to a new value
- Remove (pop) inner VLAN and p-bit.

Only certain combinations of actions on the outer and inner VLAN are allowed. Refer to *Chapter 8* for details on the permitted combinations of actions.

Quality of Service (QoS)

Different service types require different levels of QoS to be provided end-to-end. QoS can be defined per subscriber as well as per flow. QoS has three aspects: rate limitation, traffic shaping, and traffic prioritization.

A single policer can be applied per flow, or a policer aggregate can be applied to a group of flows. The policers operate according to the dual token bucket mechanism (CIR+CBS, EIR+EBS). A special mechanism compensates for Layer 1 headers. Traffic can be limited to the line rate or the data rate.

In addition, ETX-203AX features unique p-bit re-marking capabilities that assign color-specific p-bit values to Ethernet frames at network ingress to ensure metering continuity across the Metro Ethernet network. User traffic that was marked “yellow” according to the CIR/EIR parameters by the device QoS engine is assigned a new p-bit value to signal its status and priority, so that it is dropped first by 802.1Q and 802.1ad network elements in the event of congestion. This is especially useful in color-blind as well as color-aware networks with no “discard eligible” (“yellow”) marking.

As well as assigning color-specific p-bit values, the Drop Eligible Indicator (DEI) bit in the Ethernet frames can be used to indicate that frames marked “yellow” are eligible for dropping, while frames marked “green” are not eligible for dropping.

Traffic Prioritization

Once traffic is classified to a flow, it can be mapped to Strict (Strict Priority) queues or WFQ (Weighted Fair Queues):

- **Strict**. The data flow set to the highest priority is transmitted first. If this data flow stops, all tasks at lower priorities move up by one priority level. For example, the data flow set to the second-highest priority is then transmitted at the highest priority.
- **WFQ**. Allows different scheduling priorities to statistically multiplex data flows with different shares on the service. Each data flow has a separate FIFO queue. A link transmitting at a data rate ***R***, all non-empty data flows ***N*** are served simultaneously according to the assigned share ***w***, each at an average rate of $R/(w_1 + w_2 + w_3 + ... + w_N)$. If one data flow stops, the remaining data flows each receive a larger share ***w***.

The WRED mechanism ensures that queues are not congested and high-priority traffic is maintained. Each queue is assigned a WRED profile for which you can configure the thresholds and probability to suit your needs.

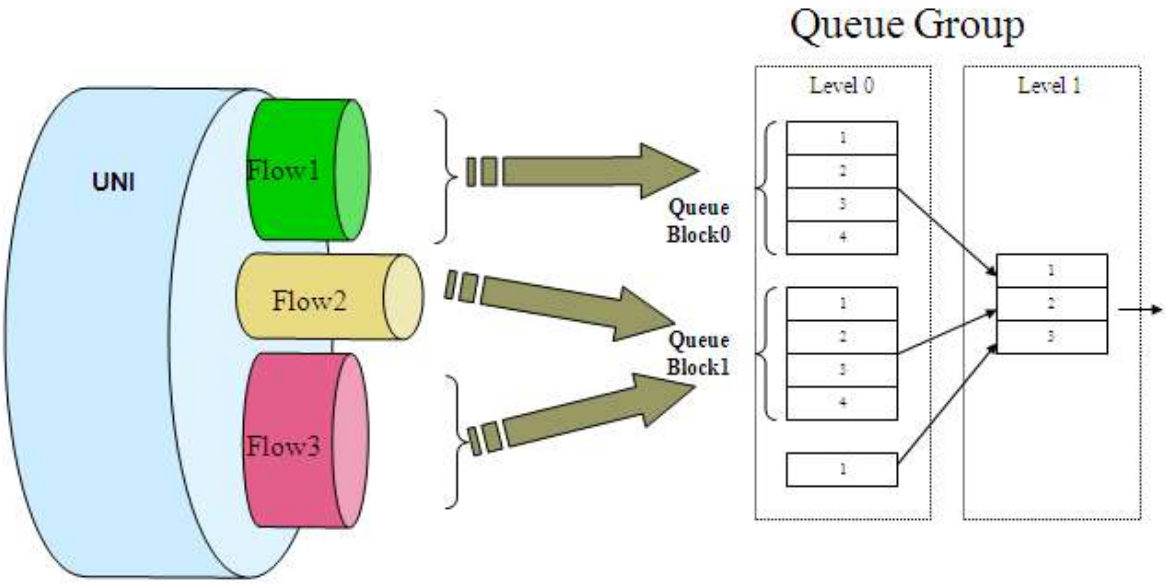


Figure 1-5. Queue Structure

Level 0 contains up to 31 queue blocks. Each block has eight queues and its own scheduling (Strict and WFQ). For each queue block in level 0, there is a queue in level 1 that represents the scheduling between the queue blocks in level 0. Flows can be bound to each queue block in level 0.

Queue Mapping and Marking

The queue mapping functionality associates the user priorities with queue numbers (CoS).

The marking functionality maps the user priority to the SP priority, according to p-bit/DSCP/IP precedence. The marking can also be done according to color (green and/or yellow) in addition to user priority.

The queue mapping and marking functionality is bound to each flow. For every port, a queue mapping can be done for one type of user priority classification.

Hierarchical Scheduling and Shaping Per Flow

Every flow has its own queues and scheduler. ETX-203AX supports up to 31 queue blocks per queue group. There are up to 31 available queues for the network ports and eight available queues for the user ports. Flows that are in the direction user port to network port can be bound to one of up to 31 queues, and flows that are in the direction network port to user port can be bound to one of eight queues.

Ethernet OAM

Featuring ultra-fast, hardware-based processing capabilities, ETX-203AX performs OAM and PM measurements in under 1 microsecond with maximum precision.

ETX-203AX provides OAM to monitor and troubleshoot an Ethernet network and quickly detect failures:

- CFM OAM (End-to-end OAM) based on IEEE 802.1ag-D8 and Y.1731 for continuity check, non-intrusive loopback, and performance management.
- EFM OAM (Link OAM) according to IEEE 802.3-2005 (formerly IEEE 802.3ah) for remote management and fault indication, including remote loopback, dying gasp, and MIB parameter retrieval.

RFC-2544 Testing and Analysis

ETX-203AX provides BERT testing based on RFC-2544:

- Throughput test – Until binary search convergence
- Packet loss rate – 10% steps
- Latency – Roundtrip frame latency.

Jumbo Frames and Egress MTU

ETX-203AX supports large frames of up to 12 Kbytes. The egress MTU can be defined per port.

Link Redundancy

The unit features network link redundancy in a LAG architecture that supports the LACP protocol according to 802.3-2005. Dual homing technology in a 1:1 architecture allows ETX-203AX to be connected to two different upstream devices. Link redundancy is available if two ports are configured as network ports.

Ethernet Linear Protection

The device offers protection switching in the following modes for network ports per ITU-T G.8031:

- 1:1
- Unidirectional
- Using APS messages.

The protection functions for the following topologies:

- EVC protection with one fiber — Both EVCs running on same fiber
- EVC protection with two fibers — Each path on different fiber (dual link)
- EVC protection with dual fiber working with MC-LACP to dual PE.

L2CP Handling

ETX-203AX can be configured to pass through Layer-2 control frames (including other vendors' L2CP frames) across the network, to peer-supported protocols (IEEE 802.3-2005), or to discard L2CP frames.

Fault Propagation

The unit provides the following types of fault propagation:

- Network-to-user fault propagation mechanism on the port and OAM CFM levels – When fault propagation is enabled, the user port shuts itself down or an OAM CFM indication of failure is sent when a link failure is detected at the network port or when an OAM CFM indication of failure is received.
- User-to-network fault propagation mechanism on the port and OAM CFM levels – When fault propagation is enabled, the network port shuts itself down or an OAM CFM indication of failure is sent when a link failure is detected at the user port or an OAM CFM indication of failure is received.

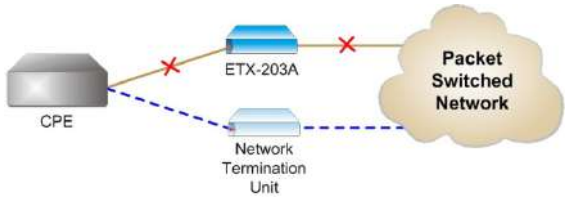


Figure 1-6. Fault Propagation

Smart SFPs

Smart SFPs can be used to provide a full duplex 100/1000 Ethernet remote bridge over E1/T1/E3/T3, or STM-1/OC-3. The following MiRICi devices are supported, with integrated configuration and management:

- MiRICi-E1
- MiRICi-T1
- MiRICi-E3
- MiRICi-T3
- MiRICi-155.

Management

ETX-203AX can be managed as follows:

- Local management via ASCII terminal connected to the V.24/RS-232 DCE control port.

- Local management via dedicated out of band (OOB) management port.
- Remote management via a network or user port using Telnet SSH or an SNMP-based management system. ETX-203AX supports the SNMP version 3 entity, providing secure access to the device by authenticating and encrypting packets transmitted over the network.

Management can be performed by creating a flow to/from the host port, thus enabling QoS on the management traffic. Management can be configured to use untagged or tagged frames.

Command Line Interface

You can create data bases and scripts of commonly used commands and easily apply them to multiple units in your infrastructure using RAD's new command line interface.

Security

To ensure client-server communication privacy and correct user authentication, ETX-203AX supports the security protocols listed below:

- SNMPv3
- RADIUS (client authentication)
- TACACS+ (client authentication)
- SSH for Secure Shell communication session.

Syslog

The syslog protocol is a client/server-type protocol, featuring a standard for forwarding log messages in an IP network and supports up to four syslog servers at present. A syslog sender sends a small text message of less than 1024 bytes to the syslog receiver. Syslog messages are sent via UDP in cleartext.

DHCP Client

When enabled, the DHCP client of ETX-203AX requests an IP address, IP mask, and default gateway from the DHCP server.

SFTP

SFTP (Secure File Transfer Protocol) is supported, to provide secure encrypted file transfer using SSH.

Statistics Collection

ETX-203AX collects performance statistics for the physical layers of the network/user ports, Ethernet flows, OAM CFM, and Radius.

In addition, ETX-203AX provides Rmon Statistics based on RFC 2819. In this scenario, ETX-203AX can send reports when one of the defined counters rises above or drops below specified thresholds within the sampling period of time. These reports can be sent as SNMP traps to defined network management stations and/or written to the event log.

Network Time Protocol

The Network Time Protocol (NTP) provides the means of synchronizing all managed elements across the network to a reliable clock source provided by multiple servers. ETX-203AX supports the client side of NTP v.3 (RFC 1305).

Diagnostic Tools

ETX-203AX offers several types of diagnostic procedures:

- Ping test – Check IP connectivity by pinging remote IP hosts.
- Trace route – Quickly trace a route from ETX-203AX to any other network device
- Loopback tests:
  - Layer-1 loopback performed at the PHY of the physical ports. When the loopback is active the data forwarded to a port is looped from the Tx path to the Rx path, disrupting the traffic. This loopback cannot pass through Ethernet bridges.
  - Layer-2/Layer-3 loopback on flows with optional MAC and/or IP address swapping. When the loopback is active, ETX-203AX can exchange the source and destination MAC/IP addresses of the incoming packets. This loopback passes through Ethernet bridges and routers, and does not disrupt traffic flows that are not being tested.

1.2 New in This Version

The following features have been added for Version 4.01:

- TACACS+ accounting
- Separate counters for dropped yellow and red frames
- Flow unidirectional hub configuration.

1.3 Physical Description

Figure 1-7 shows a 3D view of ETX-203AX.

The LEDs are located on the front panel, and the network and user Ethernet ports are located on the rear panel. The ETX-203AX interface connections are described in greater detail in *Chapter 2*.

Figure 1-7. 3D View of ETX-203AX

1.4 Functional Description

Figure 1-8 shows the data flow in the device. *Table 1-1* provides an overview of the traffic handling stages.

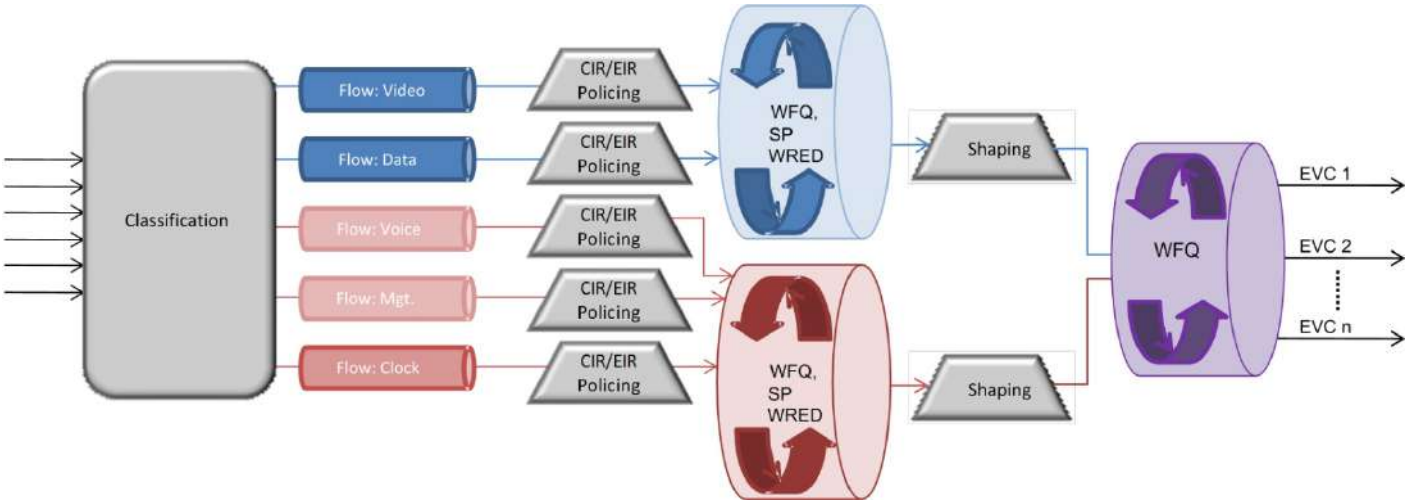


Figure 1-8. Data Flow

Table 1-1. Traffic Handling Stages

Processing Stage	Description
Classification	Classifying traffic such as email traffic, content streaming, large document transmission, etc.
Policer per Flow or Group of Flows	Policing the traffic within the flow or group of flows
CoS/Services	Dividing the services using a 3-bit field, specifying a priority value between 0 (signifying best-effort) and 7 (signifying priority real-time data)
Queues	'Storing' data that is transmitted according to the CoS level specified
Rate Limitation/ Shaping	Ensuring that traffic is shaped to the desired rate
Scheduling	Scheduling and 'regulating' traffic
Editing and Marking	Adding or removing VLAN IDs, as well as marking the priority on the outer VLAN header

1.5 Technical Specifications

Network Interface	*Number of Ports*	Up to 2 (RJ-45 or fiber optic SFPs). The second port can be configured as a network or user port.
	Type	Fast or Gigabit Ethernet
	Fiber Optic Specifications and Ranges	See SFP Transceivers data sheet
	Electrical Operation Mode	10/100 Mbps or 10/100/1000 Mbps, full duplex, autonegotiation, MDI/MDIX
User Interface	*Number of Ports*	Up to 4 (RJ-45 or fiber optic SFPs). If the second network port is configured as a user port, there are five user ports.
	Type	Fast or Gigabit Ethernet
	Fiber Optic Specifications and Ranges	See SFP Transceivers data sheet
	Electrical Operation Mode	10/100 Mbps or 10/100/1000 Mbps Full duplex, autonegotiation, MDI/MDIX
Standards Compliance	*IEEE*	802.3, 802.3u, 802.1q, 802.1p, 802.3-2005 (relevant parts), 802.1ag-D8, RFC-2544
	MEF	MEF 6 (E-Line – EPL and EVPL), MEF 9, MEF 10, MEF 14
	ITU-T	Y.1731, G.8031
Ethernet Flows	*Number of Flows*	192
Management	*Local*	Via dedicated terminal port; V.24/RS-232 DCE; 9.6, 19.2, 38.4, 57.6, 115.2 kbps; RJ-45 connector
	Inband	Via one of the Ethernet ports
	Out-of-band	Via dedicated management port
Indicators	*PWR (green)*	Power status
	TST/ALM (red)	Alarm and loopback status

	NET 1, NET 2, USER 3–4 (green)	Link/activity status of the network/user port
Power	*AC/DC*	AC/DC inlet connector with auto detection Wide-range AC: 100–240 VAC, 50/60 Hz DC: 8V (40–370 VDC)
	Power Consumption	15W max
Physical	*Height*	43.7 mm (1.7 in)
	Width	220 mm (8.6 in)
	Depth	170 mm (6.7 in)
	Weight	0.7 kg (1.54 lb)
Environment	*Temperature*	0°C to 50°C (32°F to 122°F)
	Humidity	Up to 90%, non-condensing

Chapter 2

Installation and Setup

This chapter describes installation and setup procedures for the ETX-203AX unit.

After installing the unit, refer to *Chapter 3* for operating instructions and *Chapter 4* for management instructions.

If a problem is encountered, refer to *Chapter 11* for test and diagnostic instructions.

Warning

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is 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 m (5 ft) of an easily-accessible grounded AC outlet capable of furnishing the voltage in accordance with the nominal supply voltage.

DC-powered units require a -48 VDC power source, which must be adequately isolated from the main supply.

Note

Refer also to the sections describing connections of AC and DC mains at the beginning of the manual.

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature of ETX-203AX is 0 to 50°C (32 to 122°F) at a relative humidity of up to 90%, non-condensing.

2.2 Package Contents

The ETX-203AX package includes the following items:

- One ETX-203AX unit
- Matching SFP module(s) (if ordered)
- CBL-RJ45/D9/F/6FT control port cable
- AC power cord

- Optional accessories included if ordered:
  - RM-33-2 rack-mount kit for mounting one or two ETX-203AX units in a 19" rack
  - DC connection kit.

2.3 Mounting the Unit

ETX-203AX is designed for installation as a desktop unit. It can also be mounted in a 19" rack or on a wall.

- For rack mounting instructions, refer to the associated installation kit manual
- For wall mounting instructions, refer to the drilling template at the end of this manual
- If ETX-203AX is to be used as a desktop unit, place and secure the unit on a stable, non-movable surface.

Refer to the clearance and temperature requirements in *Site Requirements and Prerequisites*.

2.4 Installing SFP Modules

ETX-203AX uses SFP modules with LC fiber optic connectors.

Warning

Third-party SFP optical transceivers must be agency-approved, complying with the local laser safety regulations for Class I laser equipment.

➤ **To install the SFP modules:**

- Lock the wire latch of each SFP module by lifting it up until it clicks into place, as illustrated in *Figure 2-1*.

Note

Some SFP models have a plastic door instead of a wire latch.

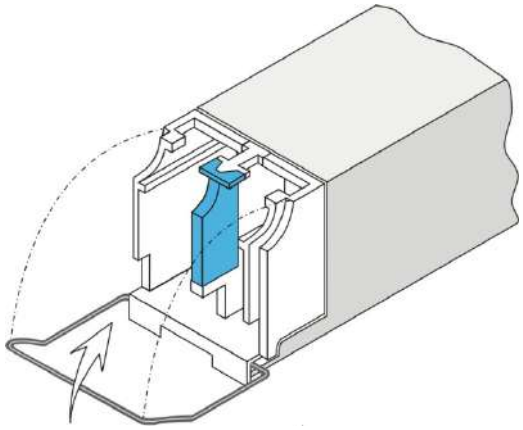


Figure 2-1. Locking the SFP Wire Latch

1. Carefully remove the dust covers from the SFP slot.
2. Insert the rear end of the SFP into the socket, and push slowly backwards to mate the connectors until the SFP clicks into place. If you feel resistance before the connectors are fully mated, retract the SFP using the wire latch as a pulling handle, and then repeat the procedure.

Caution Insert the SFP gently. Using force can damage the connecting pins.

3. Remove the protective rubber caps from the SFP modules.

➤ **To remove the SFP module:**

1. Disconnect the fiber optic cables from the SFP module.
2. Unlock the wire latch by lowering it downwards (as opposed to locking).
3. Hold the wire latch and pull the SFP module out of the Ethernet port.

Caution Do not remove the SFP while the fiber optic cables are still connected. This may result in physical damage (such as a chipped SFP module clip or socket), or cause malfunction (e.g., the network port redundancy switching may be interrupted)

2.5 Connecting to Ethernet Equipment

ETX-203AX can be connected to the Ethernet equipment via the following connectors, according to the relevant hardware configuration:

- Fiber optic LC designated ETH
- 8-pin RJ-45 electrical port designated ETH.

Refer to *Appendix A* for the RJ-45 connector pinout. The instructions below are illustrated using a sample configuration.

➤ **To connect to the Ethernet equipment with fiber optic interface:**

- Connect ETX-203AX to the Ethernet equipment using a standard fiber optic cable terminated with an LC connector.

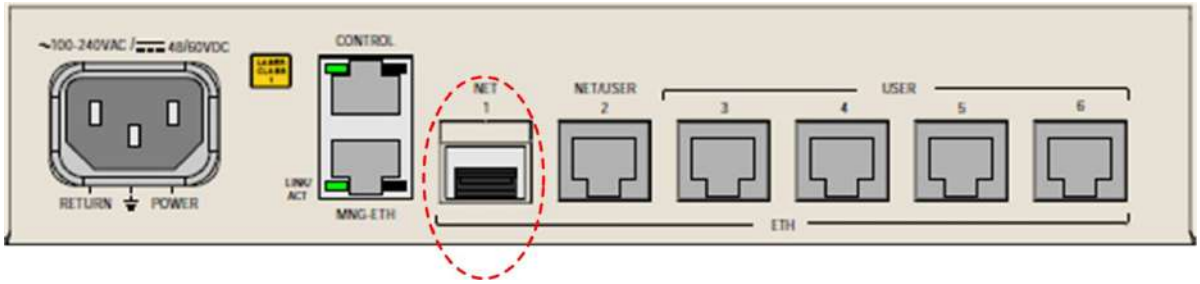


Figure 2-2. Fiber Optic Connectors

➤ **To connect to the Ethernet equipment with a copper interface:**

- Connect ETX-203AX to the Ethernet network equipment using a standard straight UTP cable terminated with an RJ-45 connector.

Note

In order to comply with electromagnetic compatibility requirements, it is recommended to use shielded cables when connecting to the RJ-45 port of the ETX-203AX electrical network or user interface.

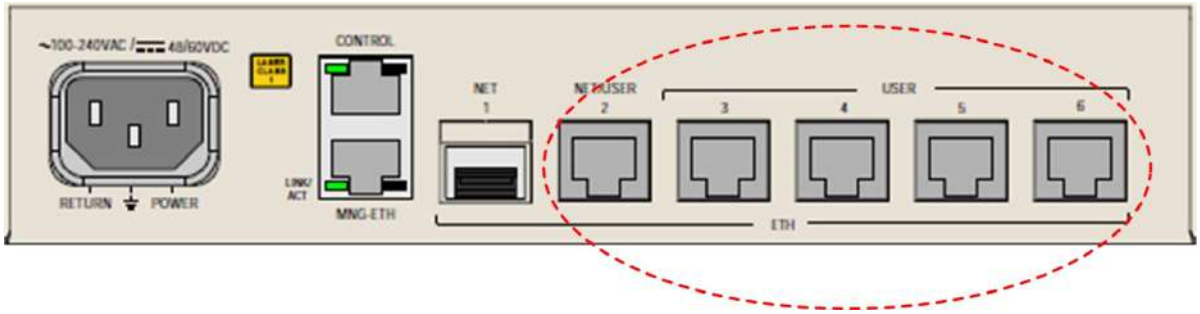


Figure 2-3. Electrical Connectors

2.6 Connecting to a Terminal

ETX-203AX is connected to a terminal/laptop via an 8-pin RJ-45 connector designated CONTROL. Refer to *Appendix A* for the connector pinout.

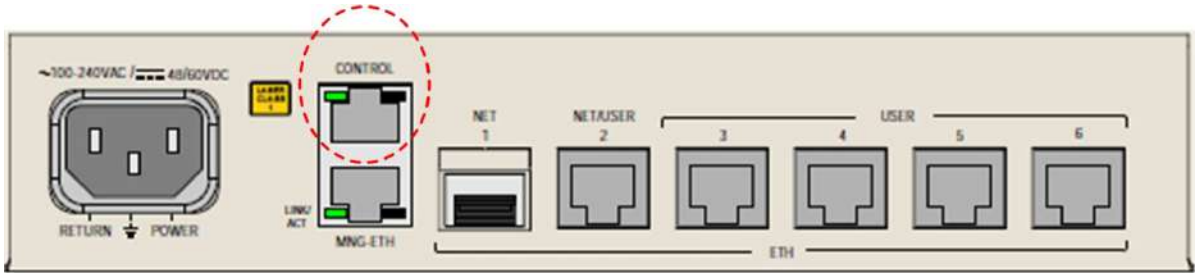


Figure 2-4. CONTROL Connector

➤ **To connect to an ASCII terminal:**

1. Connect the RJ-45 connector of CBL-RJ45/D9/F/6FT cable to the CONTROL connector.
2. Connect the other end of the CBL-RJ45/D9/F/6FT cable to an ASCII terminal.

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 the supervisory terminal port.

2.7 Connecting to Management Station

ETX-203AX is connected to remote network management stations via the dedicated Ethernet management port, an 8-pin RJ-45 connector designated MNG-ETH. Refer to *Appendix A* for the connector pinout.

➤ **To connect to an NMS:**

- Connect ETX-203AX to an Ethernet switch.

Note *In order to provide protection against surges, use shielded cables when connecting to the MNG-ETH port.*

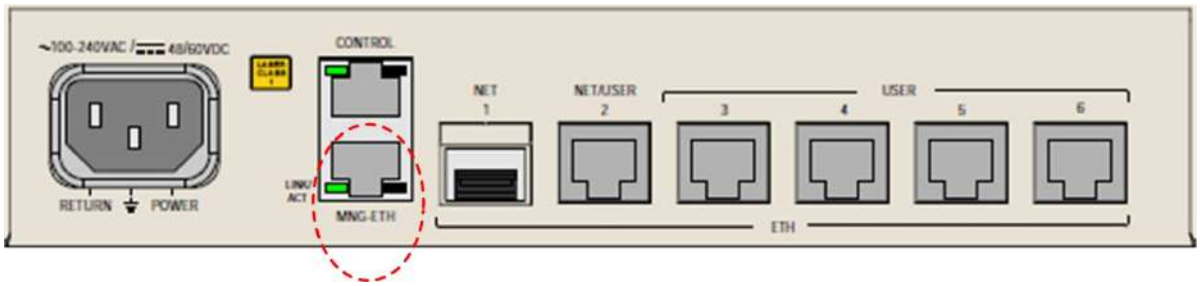


Figure 2-5: Ethernet Management Connector

2.8 Connecting to Power

Regular units are available with a universal AC/DC power supply. For the exact specs, refer to *Technical Specifications* in Chapter 1.

Warning **Before connecting or disconnecting any cable, the protective ground terminals of this unit must be connected to the protective ground conductor of the mains (AC or DC) power cord. If you are using an extension cord (power cable) make sure it is grounded as well.**

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

Note *Refer also to the sections describing connections of AC and DC power at the beginning of the manual.*

Connecting to AC Power

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

➤ To connect AC power:

1. Connect the power cable to the power connector on the ETX-203AX rear panel.
2. Connect the power cable to the mains outlet.

   The unit turns on automatically once connected to the mains.

Connecting to DC Power

Terminal block connectors with adapters are available for DC power supplies.

➤ To connect DC power:

- Refer to the Terminal Block Connector DC Power Supply Connection supplement for instructions on wiring the DC adapters. This supplement can be found at the end of this manual.

Chapter 3

Operation

This chapter:

- Explains power-on and power-off procedures
- Provides a detailed description of the front panel controls and indicators and their functions.

For a detailed explanation of parameters, refer to *Chapters 6–10*.

3.1 Turning On the Unit

➤ To turn on ETX-203AX:

- Connect the power cord to the mains.

  The PWR indicator lights up and remains lit as long as ETX-203AX receives power.

ETX-203AX requires no operator attention once installed, with the exception of occasional monitoring of front panel indicators. Intervention is only required when ETX-203AX must be configured to its operational requirements, or diagnostic tests are performed.

3.2 Indicators

The unit's LEDs are located on the front panel (see *Figure 3-1*). *Table 3-1* lists the functions of the ETX-203AX LED indicators.

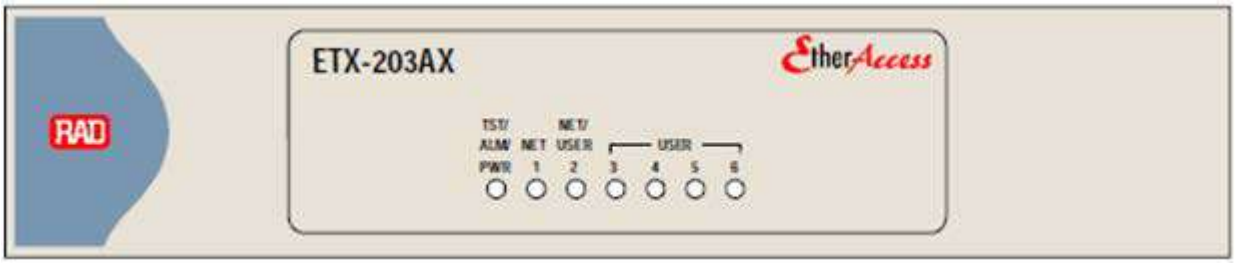


Figure 3-1. Device LEDs

Table 3-1. LEDs and Controls

Name	Color	Function
TST/ALM/PWR	Green/Red	ON (green) – Power is ON ON (red) – There is at least one active alarm Blinking – Diagnostic loopback is active
NET 1	Green	ON – Corresponding Ethernet link has been connected Blinking – Data is being transmitted or received on the corresponding Ethernet link
NET/ USER 2	Green	ON – Corresponding Ethernet link has been connected Blinking – Data is being transmitted or received on the corresponding Ethernet link
USER 3,4,5,6	Green	ON – Corresponding Ethernet link has been connected Blinking – Data is being transmitted or received on the corresponding Ethernet link

3.3 Startup

Configuration and Software Files

Software files are stored as **sw-pack-1** through **sw-pack-2**. One of the software packs is designated as active.

Note *The CLI allows **sw-pack-1** through **sw-pack-4**, but only **sw-pack-1** and **sw-pack-2** should be used.*

The following files contain configuration settings:

- **factory-default-config** – Contains the manufacturer default settings. At startup, **factory-default-config** is loaded if **startup-config**, **rollback-config**, and **user-default-config** are missing or invalid.
- **rollback-config** –Serves as a backup for **startup-config**. At startup, **rollback-config** is loaded if it exists and is valid, and if **startup-config** is missing or invalid.
- **restore-point-config** –Created by ETX-203AX when software is installed with restore point option. Refer to *Chapter 12* for more details.
- **running-config** – Contains the current configuration that the device is running
- **startup-config** – Contains saved non-default user configuration. This file is not automatically created. You can use the **save** or **copy** command to create it. At startup, **startup-config** is loaded if it exists and is valid.
- **user-default-config** – Contains default user configuration. This file is not automatically created. You can use the **copy** command to create it. At startup, **user-default-config** is loaded if **startup-config** and **rollback-config**, are missing or invalid.

Refer to *Chapter 10* for details on file operations.

Note *The **save** command is used to save the user configuration. Some commands that reset the device also erase the saved user configuration by copying another file to it before the reset. Refer to* Figure 3-2 *for details.*

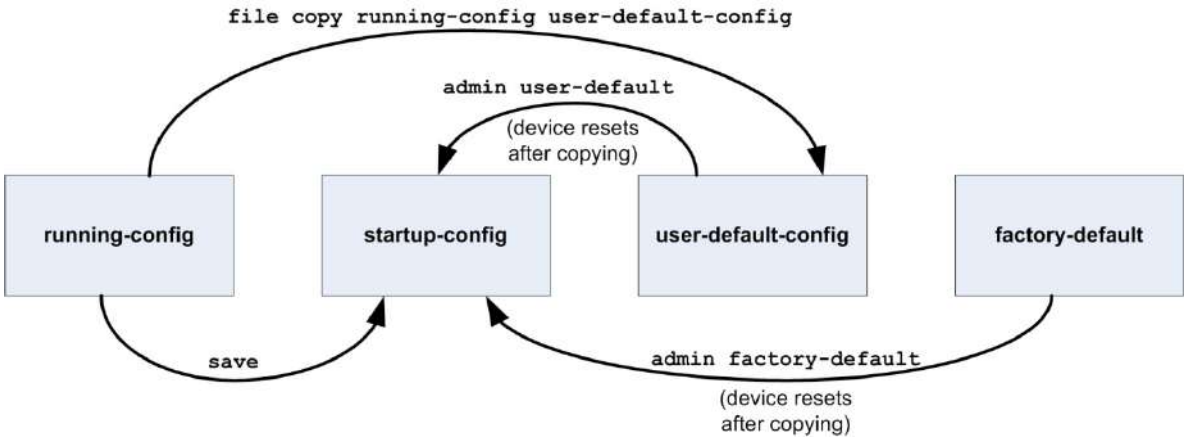


Figure 3-2. Commands That Reset Device/Copy Configuration Files

Loading Sequence

At startup, the device attempts to load configuration files in the following sequence until a valid one is found:

- **startup-config**
- **rollback-config**
- **user-default-config**
- **factory-default-config**.

If an error is encountered while loading a file, the default is to ignore the error and continue loading. You can use the **on-configuration-error** command to change this behavior, to either stop loading the file when the first error is encountered, or reject the file and reboot; after rebooting, the next file in the loading sequence is loaded).

To display the parameter values after startup, use the **`info [detail]`** command.

3.4 Using a Custom Configuration File

In large deployments, often a central network administrator sends configuration scripts to the remote locations and all that remains for the local technician to do is to replace the IP address in the script or other similar minor changes, and then download the file to the device. Alternatively, the technician can download the file as is to the device, log in to the device and make the required changes, then save the configuration.

To download the configuration file, use the copy command (refer to *Chapter 10*). After downloading the configuration file, the unit must be reset in order to execute the file. After the unit completes its startup, the custom configuration is complete.

You can use the zero touch feature to distribute software and configuration files automatically to units. Refer to *Zero Touch Configuration* for details.

3.5 Zero Touch Configuration

The Zero Touch feature allows ETX-203AX to receive software and configuration files via a DHCP server and TFTP server, eliminating the need to manually log into ETX-203AX in order to transfer the required files to it.

Prerequisites

- A Zero Touch configuration (ZTC) XML file, containing directives for the software and configuration files. To prepare this file, refer to *ZTC File Structure*.
- A DHCP server for providing the TFTP server address, in addition to the usual IP address, default gateway, etc.
- A TFTP server from which to download the following:
  - ZTC file
  - Software image file, if required by the directives
  - Configuration file, if required by the directives.

Sequence

1. At reboot, when ETX-203AX obtains a DHCP lease from the DHCP server, the lease provides the TFTP server address, either via option 150, or as a string ('xxx.xxx.xxx.xxx') via option 66. Optionally, the DHCP lease provides the path and/or the file name of the ZTC file via DHCP option 67.
2. ETX-203AX loads the ZTC file from the TFTP server, according to the information received in the lease. If not specified in the lease, the default path is **rad/**, and the default file name is **rad.xml**. After the ZTC file is loaded, it is saved in the file system as **zero-touch-config-xml**.
3. If **zero-touch-config-xml** contains directives for a software file, ETX-203AX does one of the following, according to the action specified in the directives:
   - Upgrade only – Load software file if it is newer than the active software image
   - Downgrade only – Load software file if it is older than the active software image
   - Replace – Load software file if different from the active software image.
4. If **zero-touch-config-xml** contains directives for a configuration file, then if the action specified in the directives is Replace, ETX-203AX loads the specified configuration file if it is different than the last configuration file loaded via the ZTC mechanism, and saves it as **startup-config**.
5. If a software file was downloaded, ETX-203AX installs it as the active software pack.
6. If a software file and/or configuration file was downloaded, ETX-203AX reboots. After startup, the sequence described in *Loading Sequence* is performed.
7. If no reboot was needed, ETX-203AX performs the sequence described in *Loading Sequence*.

If an error occurs in the ZTC process, ETX-203AX starts a 10-minute timer and then performs the sequence described in *Loading Sequence*. When the timer expires, ETX-203AX again attempts the ZTC process.

ZTC File Structure

This section describes the ZTC directives in the ZTC file, which is written in standard XML, based on the Netconf schema. The file can contain directives for one or more devices. This flexibility enables the use of one ZTC file per device, or one ZTC file for all devices. *ZTC File Example* shows a ZTC file containing directives for ETX-203AX, ETX-205A, and ETX-220A.

The directives are enclosed in the element pair **<zero-touch-configuration> </zero-touch-configuration>**. The ZTC directives for a particular device are enclosed by an element pair such as **<ETX-203AX> </ETX-203AX>**. The element contents are according to the chassis name displayed in the output of **show inventory-table** (refer to *Chapter 10*). The file can contain software-related directives and/or configuration-related directives for each device.

Software Directives

The following directives supply information about the software file to download:

- **sw-version** –Version of the software to download; must be formatted in the same way as the chassis software revision displayed in the output of **show inventory-table** (refer to *Chapter 10*).
- **sw-action** – Software installation to perform:
  - Upgrade only – Load software file if **sw-version** specifies a newer version than the chassis software revision
  - Downgrade only – Load software file if **sw-version** specifies an older version than the chassis software revision
  - Replace – Load software file if **sw-version** specifies a version that is different from the chassis software revision.
- **sw-src-**file –Path and name of the software to download
- **sw-dst-file** – The file name for saving the downloaded software:
  - **sw-pack-<n>** –File is saved as the specified name, if it is not the active software
  - **auto** – File is saved as follows:
    - If there is an unused software pack number, and there is enough space in the file system, then the file is saved as **sw-pack-<n>**, where **<n>**is the smallest unused software pack number.
    - If all software packs numbers are in use, or if there is not enough space to save the software, then the file is saved as **sw-pack-<n>**, where **<n>**is the software pack number of the oldest version.

Note *Verify that only **sw-pack-1** or **sw-pack-2** is used for the downloaded software, to ensure proper functioning.*

Configuration Directives

The following directives supply information about the configuration file to download:

- **cfg-version** – Version of configuration to download
- **cfg-action** – Action to take regarding configuration:
  - **replace-cfg** –Load configuration file if **cfg-version** is different than the last ZTC configuration version
- **cfg-src-file** –Path and name of the configuration file to download.
- **cfg-dst-file** – Specifies the name under which to save the downloaded configuration file; must contain **startup-config**.

ZTC File Example

The file shown below specifies the following:

- ETX-203AX:
  - If version 4.01.30.10 is newer or older than the active software version, download **/rad/etx/etx203AX.sw** and save it as specified for the auto option in *Software Directives*.
  - If the last downloaded ZTC configuration version was not **etx203AX 4.01.20**, download **/rad/etx/etx203AX.cfg** and save it as **startup-config**.
- ETX-205A:
  - If version 4.01.50 is newer than the active software version, download **/rad/etx/etx205A.sw** and save it as specified for the auto option in *Software Directives*.
  - If the last downloaded ZTC configuration version was not **etx205A 4.01.50**, download **/rad/etx/etx205A.cfg** and save it as **startup-config**.
- ETX-220A:
  - If version 4.01.10 is newer than the active software version, download **/rad/etx/etx220A.sw** and save it as specified for the auto option in *Software Directives*.
  - If the last downloaded ZTC configuration version was not **etx220A 4.01.10**, download **/rad/etx/etx220A.cfg** and save it as **startup-config**.

```
<rpc message-id="1"
xsi:schemaLocation="urn:ietf:params:xml:ns:netconf:base:1.0
netconf.xsd http://www.rad.com/schema/zero-touch-
configuration/1.0 ztc_netconf.xsd">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <zero-touch-configuration>
        <ETX-203AX>
          <sw-version>4.01.30.10</sw-version>
          <sw-action>replace</sw-action>
          <sw-src-file>/rad/etx/etx203AX.sw</sw-src-file>
          <sw-dst-file>auto</sw-dst-file>
          <cfg-version>etx203AX 4.01.20</cfg-version>
          <cfg-action>replace-cfg</cfg-action>
          <cfg-src-file>/rad/etx/etx203AX.cfg</cfg-src-file>
          <cfg-dst-file>startup-config</cfg-dst-file>
        </ETX-203AX>
        <ETX-205A>
          <sw-version>4.01.50</sw-version>
          <sw-action>upgrade-only</sw-action>
          <sw-src-file>/rad/etx/etx205A.sw</sw-src-file>
          <sw-dst-file>auto</sw-dst-file>
          <cfg-version>etx205A 4.01.50</cfg-version>
          <cfg-action>replace-cfg</cfg-action>
          <cfg-src-file>/rad/etx/etx205A.cfg</cfg-src-file>
          <cfg-dst-file>startup-config</cfg-dst-file>
        </ETX-205A>
        <ETX-220A>
          <sw-version>4.01.10</sw-version>
          <sw-action>downgrade-only</sw-action>
          <sw-src-file>/rad/etx/etx220A.sw</sw-src-file>
          <sw-dst-file>auto</sw-dst-file>
          <cfg-version>etx220A 4.01.10</cfg-version>
          <cfg-action>replace-cfg</cfg-action>
          <cfg-src-file>/rad/etx/etx220A.cfg</cfg-src-file>
          <cfg-dst-file>startup-config</cfg-dst-file>
        </ETX-220A>

      </zero-touch-configuration>
    </config>
  </edit-config>
</rpc>
```

3.6 Turning Off the Unit

➤ To power off the unit:

- Remove the power cord from the power source.

Chapter 4

Management and Security

This chapter describes the following:

- Management and configuration options
- Working with a terminal connected to the ETX-203AX control port
- Using the command line interface (CLI)
- CLI command tree
- Management-related features.

Usually, initial configuration of the management parameters is performed via ASCII terminal. Once the management flows and corresponding router interface have been configured, it is possible to access ETX-203AX via Telnet or SNMP for operation configuration. Refer to the *Quick Start Guide* for an example of management configuration. For details on configuring the router, refer to *Chapter 8*.

Table 4-1 summarizes management options for ETX-203AX.

Table 4-1. Management Alternatives

Port	Manager Location	Transport Method	Management Protocol	Application
CONTROL	Local	Out-of-band	RS-232	Terminal emulation applications such as HyperTerminal, Procomm, Putty, SecureCRT, Tera Term (see *Working with Terminal* below)
MNG-ETH	Local, remote	Out-of-band	Telnet, SSH	Terminal emulation application (see *Working with Telnet and SSH* below)
			SNMP	RADview (see *Working with RADview* below) Third-party NMS (see *Working with Third-Party Network Management Systems* below)
NET NET/USER USER	Local, remote	Inband	Telnet, SSH	RADview (see *Working with RADview* below) Terminal emulation application (see *Working with Telnet and SSH* below)
			SNMP	Third-party NMS (see *Working with Third-Party Network Management Systems* below)

Note *By default, the terminal, Telnet (SSH), and SNMP management access methods are enabled. Refer to* Controlling Management Access *for details on enabling/disabling a particular method.*

4.1 Working with Terminal

ETX-203AX has a V.24/RS-232 asynchronous DCE port, designated CONTROL and terminated in an RJ-45 connector. The control port continuously monitors the incoming data stream and immediately responds to any input string received through this port. You can use any terminal emulation program to manage ETX-203AX via the control port; the following procedure uses HyperTerminal.

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

1. Make sure all ETX-203AX cables and connectors are properly connected.
2. Connect ETX-203AX to a PC equipped with an ASCII terminal emulation application (for example, HyperTerminal). Refer to *Chapter 2* for details on connecting to the control port.
3. Start the PC terminal emulation (in Windows XP: Select **Start > All Programs > Accessories > Communications> HyperTerminal** to create a new terminal connection).

   The HyperTerminal application opens, and the Connection Description dialog box is displayed.

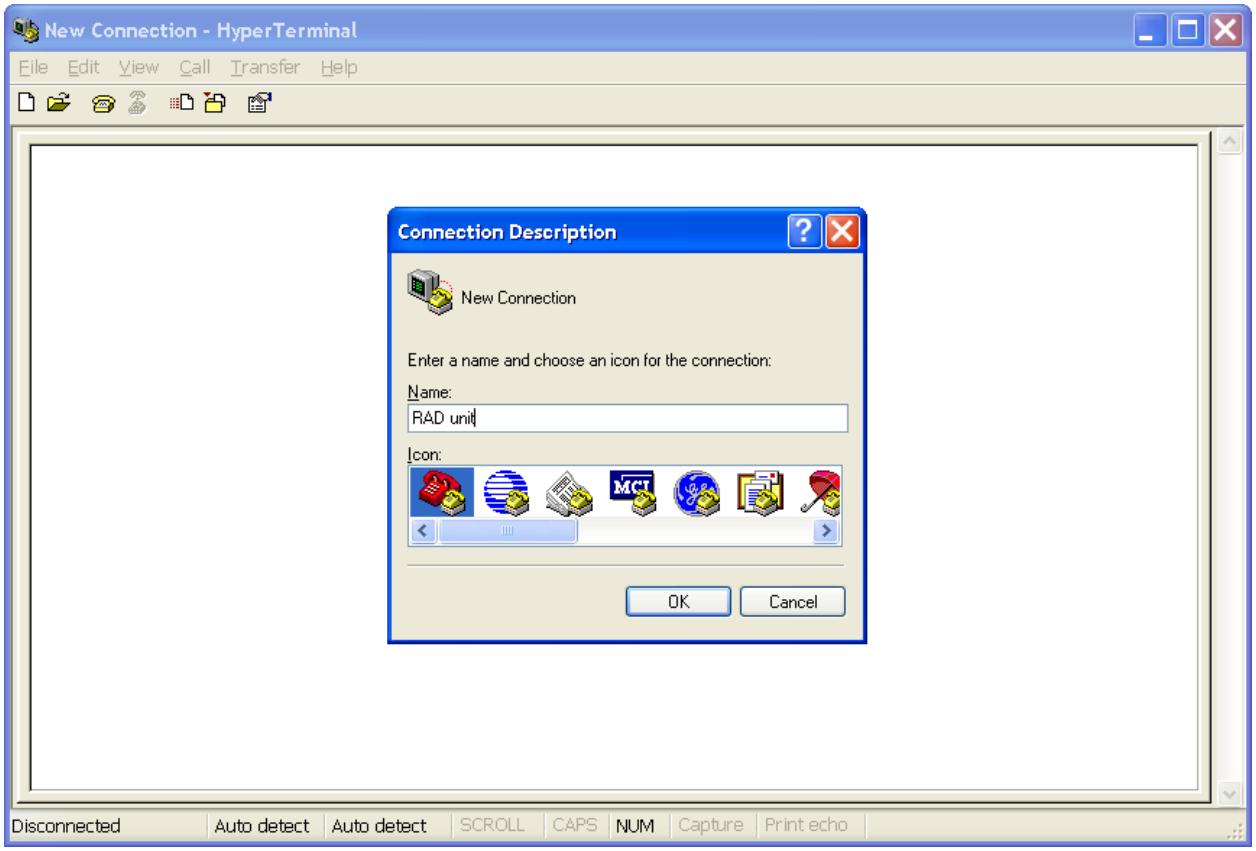


Figure 4-1. HyperTerminal with Connection Description Dialog Box

4. Enter a name for the connection.
5. Select an icon to represent the terminal connection, or leave the default icon selected.
6. Click ‹**OK**›.

   The Connect To dialog box is displayed.

Figure 4-2. Connect To Dialog Box

7. Select a PC COM port to be used to communicate with ETX-203AX, and click ‹OK›.

   The COM Properties dialog box is displayed.

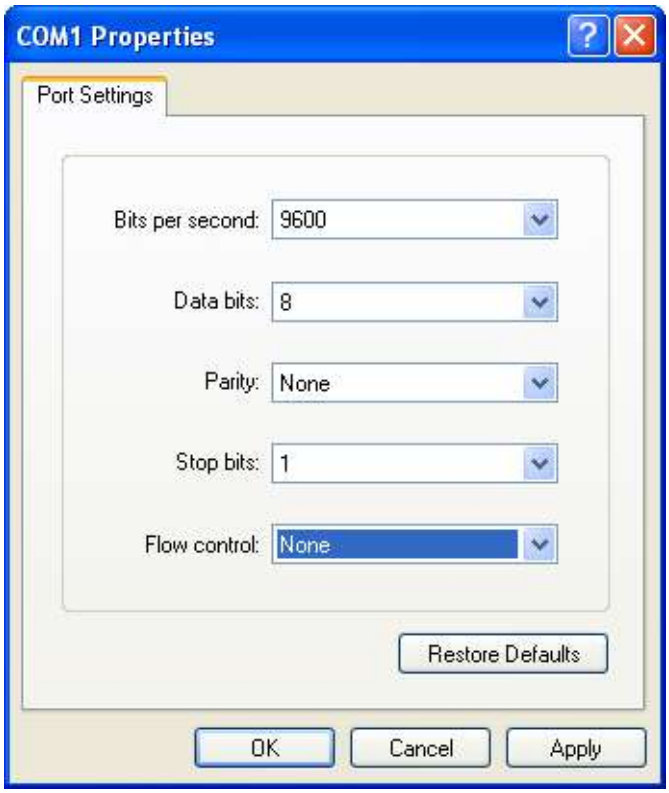


Figure 4-3. COM1 Properties Dialog Box

8. Configure the communication port parameters as follows:
   - Bits per second: 9,600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None.
9. Click ‹OK› to close the COM Properties dialog box.

   HyperTerminal is now ready for communication with the unit.

Note *It is not necessary to set the emulation type.*

10. Power-up ETX-203AX.

    The boot manager of ETX-203AX starts, and displays a message that you can stop the auto-boot and enter the boot manager by pressing any key. A running countdown of the number of seconds remaining until auto-boot is displayed. If it reaches 0 before you press a key, then after a few seconds a message is displayed showing that the active software pack is being loaded.

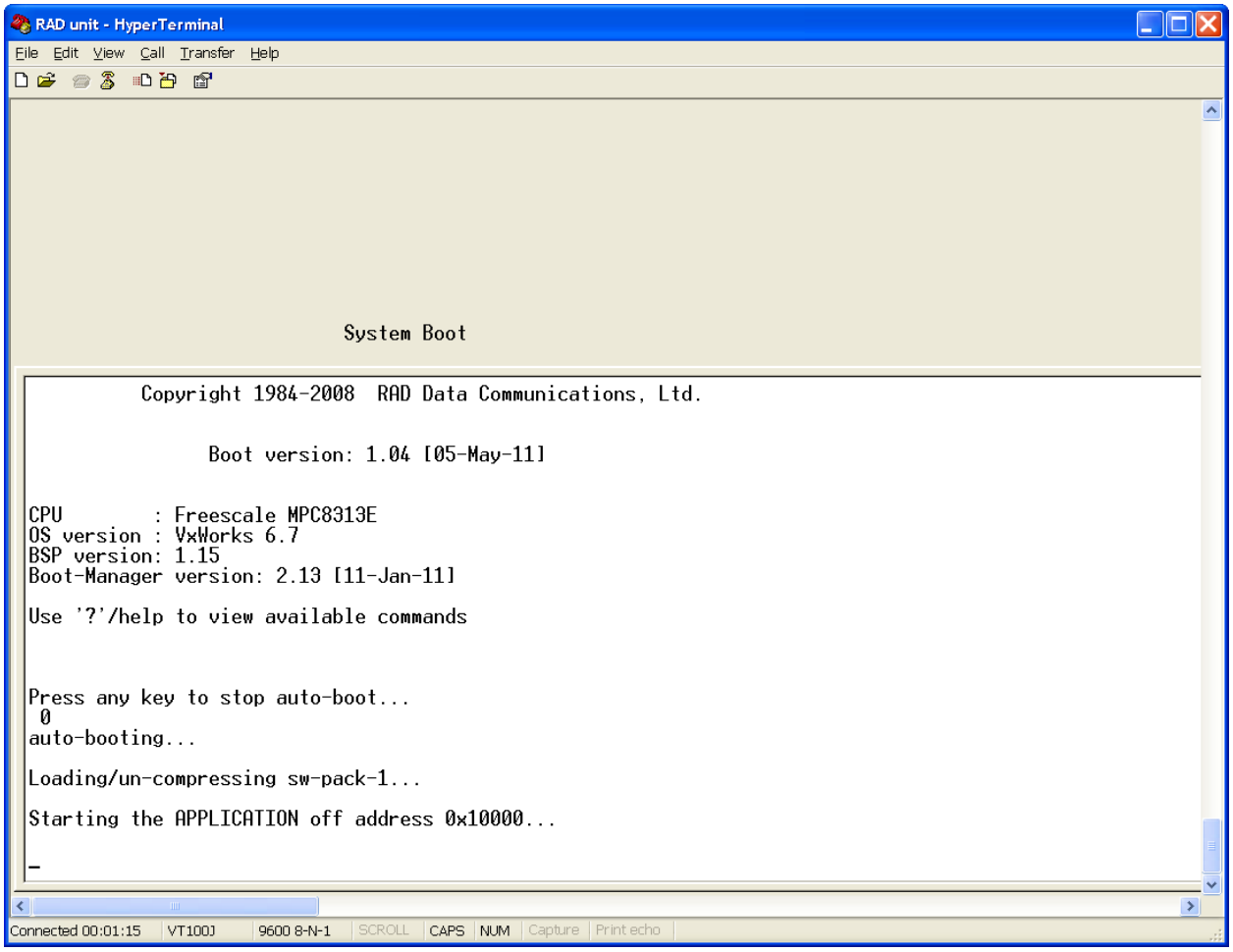


Figure 4-4. HyperTerminal Window after Startup

After a few more seconds, the login prompt is displayed. Refer to *Logging In* for details on logging in.

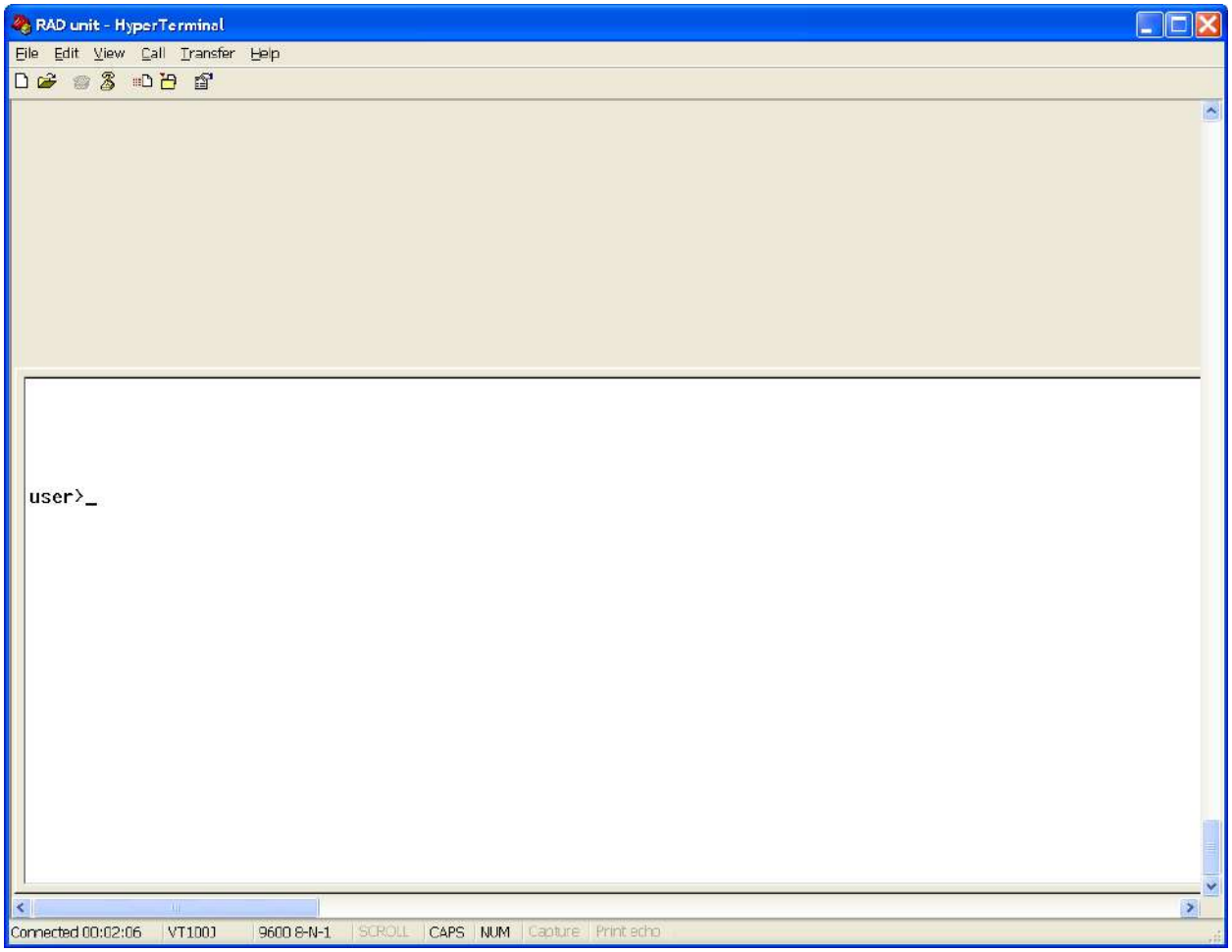


Figure 4-5. Login Prompt

Logging In

To prevent unauthorized modification of the operating parameters, ETX-203AX supports two access levels:

- **Superuser** can perform all the activities supported by the ETX-203AX management facility, including defining new users.
- **User** access rights (**full control** or **read only**) are defined by the superuser. Users are not allowed to create new users.

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

➤ **To enter as superuser:**

1. At the User prompt (**user>**), enter **su** and press ‹**Enter**›.

   The Password prompt (**password>**) appears.

2. Enter **1234** as password and press ‹**Enter**›.

   The base prompt **ETX-203AX#** appears.

Superuser allows you to configure all parameters of ETX-203AX and to change the **su** and **user** passwords.

➤ **To enter as User:**

1. Enter **user** as user name and press ‹**Enter**›.
2. Enter **1234** as password and press ‹**Enter**›.

   The base prompt **ETX-203AX#** appears.

Using the CLI

The CLI consists of commands organized in a tree structure, starting at the base prompt **ETX-203AX#**. The base prompt is the device name, which can be configured in the system level (refer to *Device Information* in Chapter 10). By default the device name is **ETX-203AX#**.

Commands that are not global are available only at their specific tree location. To find out what commands are available at the current location, type **?**. For a list of the commands and their levels, refer to *Command Tree*.

To navigate down the tree, type the name of the next level. The prompt then reflects the new location, followed by **#**. To navigate up, use the global command **exit**. To navigate all the way up to the root, type **exit all**.

At the prompt, one or more level names separated by a space can be typed, followed (or not) by a command. If only level names are typed, navigation is performed and the prompt changes to reflect the current location in the tree. If the level names are followed by a command, the command is executed, but no navigation is performed and the prompt remains unchanged.

Note *To use show commands without navigating, type **show** followed by the level name(s) followed by the rest of the show command.*

In the following example, the levels and command were typed together and therefore no navigation was performed, so the prompt has not changed.

```
ETX-203AX#
ETX-203AX# configure port ethernet 1 loopback local
ETX-203AX# show configure port ethernet 1 loopback
Loopback : Local                          Forever

ETX-203AX#
```

Figure 4-6. Commands Without Level Navigation

In the following example, the levels were typed separately and the navigation is reflected by the changing prompt.

```
ETX-203AX#
ETX-203AX# configure
ETX-203AX>config# port
ETX-203AX>config>port# ethernet 1
ETX-203AX>config>port>eth(1)# loopback local
ETX-203AX>config>port>eth(1)# show loopback
Loopback : Local                        Forever

ETX-203AX>config>port>eth(1)#
```

Figure 4-7. Commands With Level Navigation

Note *Level names are abbreviated in the prompt.*

You can type only as many letters of the level or command as required by the system to identify the level or command, for example you can enter **config manag** to navigate to the management level.

In addition to being the default prompt, the **#** symbol also indicates a static entity (such as a port) or already configured entity. The **$** symbol indicates a new dynamic entity (such as a flow) that takes several commands to configure. The dynamic entity is created as inactive. After the configuration is completed, it is activated by using the no shutdown command, as shown in the following example.

```
ETX-203AX#
ETX-203AX# configure flows flow flow1
ETX-203AX>config>flows>flow(flow1)$ ingress-port ethernet 3
ETX-203AX>config>flows>flow(flow1)$ egress-port ethernet 1 queue 1 block 0/1
ETX-203AX>config>flows>flow(flow1)$ classifier Classifier1
ETX-203AX>config>flows>flow(flow1)$ no shutdown
ETX-203AX>config>flows>flow(flow1)$exit
ETX-203AX>config>flows#
```

Figure 4-8. Creating and Activating Flow

The shutdown command is also used to deactivate/disable a hardware element (such as a port), while no shutdown enables/activates it.

Note *For the purposes of illustration, **#** rather than **$** is usually shown at the end of the prompts in the examples in this manual. Examples of dynamic entities include QoS profiles, flows, OAM CFM entities.*

CLI commands have the following basic format:
command [**parameter**]{ **value1** | **value2** | **…** | **valuen** }
[**optional parameter** <value>]
where:

{} Indicates that one of the values must be selected

[] Indicates an optional parameter

<> Indicates a value to be typed by user according to parameter requirements

The following keys are available at any time:

?	Lists all commands available at the current level
<Tab>	Command autocomplete
↑	Displays the previous command
↓	Displays the next command
<Backspace>	Deletes character
<Ctrl-C>	Interrupts current command
<Ctrl-Z>	Logs out

The commands shown in *Table 4-6* are available at any level.

CLI commands can be gathered into text files called scripts. They can be created using a text editor, by recording the user commands or by saving the current configuration. The scripts can be imported from and exported to RAD devices via file transfer protocols.

Command Tree

At the CLI root, the following categories are available:

- configure
- file
- admin
- root
- global-commands.

Each category is detailed in the tables below.

Table 4-2. Commands in the configure category

Command	Description
configure	Enter configure level
| chassis	Enter chassis level
| | show environment	Display hardware component statuses
| | temperature-threshold	Specify temperature thresholds
| etps	Enter EVC Termination Point (ETP) level
| | etp	Configure ETP
| | | clear-statistics	This command clears all statistics of ETP
| | | port	This command creates an ETP port
| | | | loopback	This command puts the ETP port in loopback mode
| | | | name	Assign name to ETP port
| | | | show status	Display ETP port status

Command	Description
| | | | show loopback	Display loopback status
| | | | shutdown	Activate or deactivate ETP port
| | | protection	Enter ETP protection level
| | | | aps-protocol	Define APS protocol
| | | | bind	Bind transport port id
| | | | clear	Clears the active near end lockout of Protection, Forced Switch, Manual Switch, WTR state, or Exercise command
| | | | force-switch	Forces normal traffic signal to be selected from the protection transport entity, meaning jump to next port even if it is down
| | | | lockout	This command prevents a working signal from being selected from the protection transport entity, effectively disabling the protection group
| | | | manual-switch	In the absence of failure of working or protection transport entity, forces normal traffic signal to be selected from the protection transport entity, meaning jump to next port only if it is not down
| | | | master-etp	Configure master ETP
| | | | mode	Configure protection mode
| | | | revertive	Indicates if mode is revertive
| | | | sf-trigger	Define signal failure trigger
| | | | wait-to-restore	Define time between recovery and resumption of transmission
| | | | show status	Display protection status
| | | | shutdown	Activate or deactivate ETP protection
| | | show status	Display ETP status
| | | show statistics running	Display ETP statistics
| | | show flows-summary	Display flows corresponding to ETP
| fault	Enter fault level
| | fault-propagation	Configure fault propagation
| | | action-on-group	Action(s) to perform in order to propagate a fault
| | | trigger	Trigger for propagating fault
| | | wait-to-restore	Define the time between recovery and resumption of transmission
| | cfm	Enter fault CFM level
| | | service	Configure event reporting for service

Command	Description
| | | | frames-report	Define event reporting type for service
| flows	Enter flows level
| | rate-sampling-window	Configure interval for rate sampling statistics
| | show summary	Display information for all flows
| | classifier-profile	Configure a classifier profile
| | | match	Specifies the criteria for the classifier profile
| | flow	Configure flow
| | | classifier	Associate the flow with a classifier profile
| | | drop	Discard traffic transmitted via the flow
| | | egress-port	Define the egress port of the flow
| | | ingress-port	Define the ingress port of the flow
| | | l2cp	Assign L2CP profile to flow
| | | mark	Enter marking level for overwriting VLAN or inner VLAN
| | | | marking-profile	Overwrite p-bit for VLAN as specified by marking profile
| | | | inner-marking-profile	Overwrite p-bit for inner VLAN as specified by marking profile
| | | | p-bit	Overwrite p-bit for VLAN
| | | | inner-p-bit	Overwrite p-bit for inner VLAN
| | | | vlan	Overwrite VLAN with a new value
| | | | inner-vlan	Overwrite inner VLAN
| | | policer	Associate the flow with a policer profile or aggregate
| | | test	This command puts the specified flow into a loopback mode. The no form of the command disables the specified type of loopback.
| | | vlan-tag	Perform push/pop of VLAN or inner VLAN, optionally with p-bits
| | | show statistics	Display statistics for the flow
| | | clear-statistics	Clear statistics for the flow
| | | show test	Display flow test status
| | | shutdown	Activate or deactivate the flow
| management	Configure management parameters
| | access	Configure access to device
| | | auth-policy	Configure policy of authentication

Command	Description
| | | snmp	Configure SNMP access
| | | ssh	Configure SSH access
| | | telnet	Configure telnet access
| | | tftp	Configure TFTP access
| | | sftp	Configure SFTP access
| | radius	RADIUS parameters
| | | clear-statistics	Clears the RADIUS statistics
| | | server	Create/delete RADIUS server
| | | | address	Configure address of RADIUS server
| | | | auth-port	Configure logical port to be used by the authentication protocol
| | | | key	Configure client and RADIUS server shared secret
| | | | retry	Configure number of request attempts from RADIUS server
| | | | timeout	Configure timeout for a response from RADIUS server
| | | | shutdown	Enable/disable RADIUS server
| | | show status	Display RADIUS status
| | | show statistics	Display RADIUS statistics
| | snmp	Configure SNMP parameters
| | | access-group	Configure SNMPv3 access group
| | | | shutdown	Activate or deactivate SNMPv3 access group
| | | | context-match	Configure context match
| | | | notify-view	Configure notify view
| | | | read-view	Configure read view
| | | | write-view	Configure write view
| | | community	Configure SNMPv3 community
| | | | shutdown	Activate or deactivate
| | | | name	Configure SNMPv3 community name
| | | | sec-name	Configure SNMPv3 community security name
| | | | tag	Configure SNMPv3 community tag
| | | notify	Configure SNMPv3 notification
| | | | bind	Configure SNMPv3 notification bind
| | | | tag	Configure SNMPv3 notification tag

Command	Description
| | | | shutdown	Activate or deactivate SNMPv3 notification
| | | notify-filter	Configure SNMPv3 notification filter
| | | | mask	Configure SNMPv3 notification filter mask
| | | | type	Configure SNMPv3 notification filter type
| | | | shutdown	Activate or deactivate SNMPv3 notification filter
| | | notify-filter-profile	Configure SNMPv3 notification filter profile
| | | | profile-name	Configure SNMPv3 notification filter profile name
| | | | shutdown	Activate or deactivate SNMPv3 notification filter profile
| | | security-to-group	Configure security for access group
| | | | group-name	Specify access group
| | | | shutdown	Activate or deactivate security for access group
| | | snmp-engine-id	Text, administratively assigned. Maximum remaining length 27
| | | target	Configure SNMPv3 target
| | | | address	Configure SNMPv3 target address
| | | | tag-list	Configure SNMPv3 target tag list
| | | | target-params	Configure SNMPv3 target parameters
| | | | trap-sync-group	Specify trap synchronization group for SNMPv3 target
| | | | shutdown	Activate or deactivate SNMPv3 target
| | | target-params	Configure SNMPv3 target parameters
| | | | message-processing-model	Configure SNMPv3 target parameters message processing model
| | | | security	Configure SNMPv3 target parameters security
| | | | version	Configure SNMPv3 target parameters version
| | | | shutdown	Activate or deactivate SNMPv3 target parameters
| | trap-sync-group	Configure trap synchronization group with SNMPv3 managers
| | | target-params	Configure target parameters for trap synchronization group with SNMPv3 managers
| | | tag-list	Configure tag list for trap synchronization group with SNMPv3 managers
| | show trap-sync	Display the trap synchronization information if SNMPv3 is enabled
| | | user	Configure SNMPv3 user

Command	Description
| | | | authentication	Configure authentication for SNMPv3 user
| | | | privacy	Configure privacy for SNMPv3 user
| | | | shutdown	Activate or deactivate SNMPv3 user
| | | view	Configure SNMPv3 view
| | | | shutdown	Activate or deactivate
| | | | mask	Configure SNMPv3 view mask
| | | | type	Configure SNMPv3 view type
| | | show snmpv3 information	Display SNMPv3 information
| | tacacsplus	TACACS+ parameters
| | | group	Creates a group for binding TACACS+ servers
| | | | accounting	Enables/disables TACACS+ accounting for the group.
| | | server	Configure TACACS+ server
| | | | accounting-port	Set accounting TCP port for a TACACS+ server
| | | | authentication-port	Set authentication TCP port for a TACACS+ server
| | | | clear-statistics	Clears the TACACS+ statistics
| | | | group	Bind \ unbinds TACACS+ server to \ from a group
| | | | key	Specifies the shared secret of Tacacs+ server
| | | | shutdown	Enable/disable TACACS+ server
| | | | retry	Configure number of request attempts from RADIUS server
| | | | timeout	Configure timeout for a response from RADIUS server
| | | | show statistics	Display TACACS+ server statistics
| | user	Create/delete user
| | show users	Display users
| oam	Enter OAM level
| | cfm	Enter OAM CFM level
| | | measurement-bin-profile	Define measurement bin profile
| | | | thresholds	Thresholds for bins delay measurement
| | | multicast-addr	Define the multicast address for OAM messages
| | | show mips	Display MIPs that currently exist
| | | show summary	Display OAM CFM information
| | | maintenance-domain	Configure a maintenance domain (MD)

Command	Description
| | | | md-level	Define the level of the MD
| | | | name	Define the name of the MD
| | | | proprietary-cc	Define whether the OAM protocol of the MD is standard or pre-standard
| | | | mip-policy	Define MIP policy
| | | | maintenance-association	Configure a maintenance association (MA)
| | | | | classification	Associate the MA with a VLAN
| | | | | mip-policy	Define MIP policy
| | | | | name	Define the name of the MA
| | | | | ccm-interval	Define the continuity check interval of the MA
| | | | | mep	Configure a maintenance endpoint (MEP)
| | | | | | ais	Define sending of AIS
| | | | | | bind	Bind MEP to Ethernet port or EVC Termination Point (ETP) port
| | | | | | ccm-initiate	Enable or disable continuity check messages
| | | | | | ccm-priority	Define the priority of the CC message
| | | | | | classification	Associate the MEP with a classifier profile or VLAN
| | | | | | client-md-level	Define client MD level
| | | | | | continuity-verification	Define continuity verification as CC-based or lb-based (only if OAM protocol is pre-standard and ccm-initiate is enabled)
| | | | | | dest-addr-type	Define MAC address types sent in OAM continuity check messages and in performance measurement messages, as standard multicast address or user-defined unicast address
| | | | | | dest-mac-addr	Define the unicast MAC address sent in OAM CCM messages if you defined unicast MAC address type for CCM messages
| | | | | | direction	Define direction
| | | | | | lbm	Configure OAM loopback
| | | | | | linktrace	Configure OAM link trace
| | | | | | queue	Define queue for the MEP
| | | | | | remote-mep	Define a remote MEP for the MEP
| | | | | | show remote-mep status	Display status of remote MEP (**show remote-mep** <**remote-mep-id**> **status**)
| | | | | | shutdown	Activate or deactivate the MEP
| | | | | | show status	Display status of MEP

Command	Description
| | | | | | show lbm-results	Display result of OAM loopback
| | | | | | show linktrace-results	Display result of OAM link trace
| | | | | | service	Configure MEP service
| | | | | | classification	Associate service with p-bit
| | | | | | | delay-threshold	Define delay threshold for the MEP service
| | | | | | | delay-var-threshold	Define delay variation threshold for the MEP service
| | | | | | | dmm-interval	Specify the interval for delay measurement messages
| | | | | | | lmm-interval	Specify the interval for loss measurement messages
| | | | | | | shutdown	Activate or deactivate the MEP service
| | | | | | | clear-statistics	Clear the OAM CFM statistics for service
| | | | | | | show statistics	Display the OAM CFM statistics for service
| | | | | | | dest-ne	Configure destination NE
| | | | | | | | remote	Define remote MAC address or remote MEP ID
| | | | | | | | delay	Enable two-way delay measurement method
| | | | | | | | delay-measurement-bin	Define the delay measurement bin profile to use as delay bin policy
| | | | | | | | delay-var-measurement-bin	Define the delay variation measurement bin profile to use as delay variation bin policy
| | | | | | | | loss	Enable single-ended loss measurement method
| | | | | | | | clear-statistics	Clear the OAM CFM statistics for destination NE
| | | | | | | | show delay-measurement-bins	Display the delay measurement bins
| | | | | | | | show statistics	Display the OAM CFM statistics for destination NE
| | efm	Enter OAM EFM level
| | | descriptor	Configure OAM EFM descriptor
| peer	Create/delete peer
| port	Enter configure port level
| | e1	Configure E1 port
| | | line-code	Specifies the line code and zero suppression method used by the port
| | | line-type	Specifies the E1 framing mode
| | | loopback	Enables/disables loopback mode for the specified port
| | | name	Assigns/removes a port name

Command	Description
| | | rx-sensitivity	Specifies the attenuation level of the receive signal that is compensated for by the interface receive path
| | | tx-clock-source	Specifies the source of the port's transmit clock
| | | shutdown	Administratively disables/enables the port
| | | show bind	Displays a list of interfaces bound to port
| | | show loopback	Displays loopback test results
| | | show status	Displays the port status
| | | show statistics	Displays the port statistics
| | | clear-statistics	Clears the statistics
| | e3	Configure E3 port
| | | loopback	Enables/disables loopback mode for the specified port
| | | name	Assigns/removes a port name
| | | tx-clock-source	Specifies the source of the port's transmit clock
| | | shutdown	Administratively disables/enables the port
| | | show bind	Displays a list of interfaces bound to port
| | | show loopback	Displays loopback test results
| | | show status	Displays the port status
| | | show statistics	Displays the port statistics
| | | clear-statistics	Clears the statistics
| | ethernet	Configure Ethernet port
| | | auto-negotiation	Configure auto negotiation ability
| | | efm	Enable or disable link OAM EFM for Ethernet port
| | | | loopback	Define loopback
| | | | snmp-tunneling	Define SNMP tunneling for OAM EFM
| | | egress-mtu	Define the maximum transmission unit (MTU)
| | | functional-mode	Determine if second network port works in user mode or network. If in network then redundancy is available
| | | l2cp	Assign L2CP profile to Ethernet port
| | | loopback	This command puts the specified port into a loopback mode. The no form of the command disables the specified type of lookback.
| | | max-capability	Configure maximum capability advertising
| | | name	Define port name

Command	Description
| | | policer	Associate the port with a policer profile
| | | queue-group	Define queue group profile for port
| | | speed-duplex	This command configures the speed and duplex of an Ethernet port when auto negotiation is disabled.
| | | tag-ethernet-type	This command specifies the Ethertype expected in Ethernet packet
| | | shutdown	This command administratively disables a port. The no form of this command administratively enables a port.
| | | clear-statistics	Clear Ethernet port statistics
| | | clear-l2cp-statistics	Clear L2CP statistics
| | | show status	Display Ethernet port status
| | | show statistics	Display Ethernet port statistics
| | | show oam-efm	Display OAM EFM status
| | | show oam-efm-statistics	Display OAM EFM statistics
| | | show loopback	Display loopback status
| | | show l2cp-statistics	Display L2CP statistics
| | gfp	Configure GFP port
| | | bind	Bind to lower-level port
| | | fcs-payload	Enable or disable FCS payload
| | | name	Assign name to port
| | | scrambler-payload	Enables/disables scrambling on the GFP packet payload
| | | vcat-header	Enables/disables VLI byte insertion on VCAT trunk or PDH
| | | shutdown	Administratively enable or disable port
| | | show bind	Displays a list of interfaces bound to the port
| | | show status	Display port status
| | l2cp-profile	Define L2CP profile
| | | mac	Define MAC address L2CP action
| | | default	Default action for undefined control protocols
| | | protocol	Choose specific protocol
| | lag	Configure LAG
| | | shutdown	Activate or deactivate the LAG
| | | admin-key	Define an admin key that indicates the port speed

Command	Description
| | | bind	Bind a port to the LAG
| | | lacp	Enable the LACP protocol on the LAG
| | | distribution-method	Define the distribution method
| | | show bind	Display bind status
| | | show lacp-statistics	Displays the LAG members statistics
| | | show lacp-status	Displays LAG members status
| | | show status	Display the status of the LAG
| | logical-mac	Configure logical MAC port
| | | bind	Bind to lower-level port
| | | clear-statistics	Clear port statistics
| | | efm	Enables/disables OAM (EFM) on the port
| | | | loopback	Enables/disables loopback operations
| | | | snmp-tunneling	Enable/disable tunneling SNMP messages to remote
| | | egress-mtu	Define the maximum transmission unit (MTU)
| | | l2cp	Assign L2CP profile to port
| | | loopback	This command puts the specified port into a loopback mode. The no form of the command disables the specified type of lookback.
| | | name	Define port name
| | | queue-group	Assigns/removes a queue group profile
| | | tag-ethernet-type	This command specifies the Ethertype expected in packets
| | | shutdown	Administratively disables/enables the port
| | | show bind	Displays a list of interfaces bound to the port
| | | show oam-efm	Displays EFM status
| | | show oam-efm-statistics	Displays EFM statistics
| | | show status	Displays the port status
| | | show statistics	Displays the port statistics
| | rate-sampling-window	Configure interval for rate sampling statistics
| | sdh-sonet	Configure SDH/SONET port
| | | frame-type	Specifies the cell frame type
| | | loopback	Enables/disables loopback mode for the port
| | | name	Assigns/removes a port name
| | | threshold	Bit error rate above which an alarm is triggered

Command	Description
| | | tx-clock-source	Specifies the source of the port's transmit clock
| | | show bind	Display the interfaces that are bound to the port
| | | show statistics	Display port statistics
| | | show status	Display port status
| | smart-sfp	Provision smart SFP
| | | type	Assign SFP type
| | | reset	Reset SFP
| | | show status	Display interface status
| | | shutdown	Administratively disable/enable interface
| | show summary	Display the status of all Ethernet ports
| | svi	Create/delete service virtual interface
| | | name	Assign name to the SVI port
| | | shutdown	Administratively enable/disable the SVI port
| | t1	Configure T1 port
| | | line-code	Specifies the variety of zero code suppression used for this port
| | | line-length	Specifies the length of the T1 line in DSU mode
| | | line-type	Specifies the T1 framing mode
| | | loopback	Enables/disables loopback mode for the specified port
| | | name	Assigns/removes a port name
| | | rx-sensitivity	Specifies the attenuation level of the receive signal that is compensated for by the interface receive path
| | | tx-clock-source	Specifies the source of the port's transmit clock
| | | shutdown	Administratively disables/enables the port
| | | show bind	Displays a list of interfaces bound to port
| | | show loopback	Displays loopback test results
| | | show status	Displays the port status
| | | show statistics	Displays the port statistics
| | | clear-statistics	Clears the statistics
| | t3	Configure T3 port
| | | line-length	Specifies the length of the T3 line
| | | line-type	Specifies type of T3 line

Command	Description
| | | loopback	Enables/disables loopback mode for the specified port
| | | name	Assigns/removes a port name
| | | tx-clock-source	Specifies the source of the port's transmit clock
| | | shutdown	Administratively disables/enables the port
| | | show bind	Displays a list of interfaces bound to port
| | | show loopback	Displays loopback test results
| | | show status	Displays the port status
| | | show statistics	Displays the port statistics
| | | clear-statistics	Clears the statistics
| protection	Configure link protection
| | ethernet-group	Define Ethernet group
| | | bind	Add/remove protection and working ports
| | | shutdown	Activate or deactivate Ethernet group
| | | oper-mode	Define protection mode as 1-to-1 or manual
| | | revertive	Define whether port recovery mode is revertive (traffic switched back to the primary port after it recovers)
| | | wait-to-restore	Define time between recovery and resumption of transmission
| | | tx-down-duration-upon-flip	Define period of time that failed link stops transmitting to report the failure
| | | force-active-port	Define if port is forced to be active
| | | show status	Display protection status
| qos	Enter quality of service level
| | cos-map-profile	Configure profile for mapping user priority to internal cos
| | | map	Define the mapping from user priority to internal cos
| | marking-profile	Configure a marking profile to map the P-bit, IP precedence, or DHCP classifications to the egress priority tags
| | | mark	Map the user priority to a priority marking value
| | policer-aggregate	Configure policer aggregate that specifies a policer profile to apply to a group of flows
| | | policer	Define policer profile for the policer aggregate
| | | show statistics	Display policer aggregate statistics

Command	Description
| | | show flows	Display the flows corresponding to policer aggregate
| | | clear-statistics	Clear policer aggregate statistics
| | | rate-sampling-window	Configure interval for rate sampling statistics
| | policer-profile	Configure a policer profile
| | | bandwidth	Define the bandwidth for the policer profile
| | | traffic-type	Define the policed traffic type
| | | compensation	Define how many bytes to compensate for layer 1 overhead
| | queue-block-profile	Configure queue block profile
| | | queue	Define queue
| | | | congestion-avoidance	Define WRED profile (fixed, cannot be changed)
| | | | depth	Define the queue length
| | | | scheduling	Define the queue scheduling method
| | queue-group-profile	Configure queue group profile
| | | queue-block	Configure queue block
| | | | name	Define the name of the queue block
| | | | profile	Define the queue block profile for the queue block
| | | | bind	Bind to next level block in specific queue
| | | | shaper	Define the shaper profile for the queue block
| | queue-map-profile	Define a queue map profile to map the P-bit, IP precedence, or DSCP classifications to internal priority queues (classes of service)
| | | map	Define the mapping between the user priority and the queue id
| | shaper-profile	Configure shaper profile
| | | bandwidth	Define the bandwidth for the shaper profile
| | | compensation	Define how many bytes to compensate for layer 1 overhead
| | wred-profile	Configure WRED profile
| | color	Configure the minimum and maximum queue usage threshold, and percentage of packets to drop when queue reaches maximum usage threshold
| reporting	Enter alarm/event/trap reporting level
| | acknowledge	Acknowledge alarms
| | active-alarm-rebuild	Rebuild active alarm database

Command	Description
| | alarm-input	Configure alarm input
| | alarm-source-attribute	Configure alarm severity and masking per source
| | alarm-source-type-attribute	Configure alarm severity and masking per source type
| | clear-alarm-log	Clear alarms from alarm and event history log
| | mask-minimum-severity	Configure alarm masking per severity
| | show active-alarms	Display active alarms
| | show active-alarms-details	Display active alarms with details
| | show alarm-information	Display information on specified alarm and source type
| | show alarm-input	Display information on alarm inputs
| | show alarm-list	Display list of supported alarms
| | show alarm-log	Display alarms in alarm and event history log
| | show brief-alarm-log	Display alarms in brief alarm and event history log
| show brief-log	Display alarms and events in brief alarm and event history log
| show event-information	Display information on specified event and source type
| | show event-list	Display list of supported events
| | show log	Display alarm and event history log
| router	Configures router parameters
| | clear-arp-table	Delete dynamic ARP entities
| | dhcp-client	Configures DHCP client for the router interface
| | | host-name	DHCP option 12 (host name)
| | | vendor-class-id	DHCP option 60 (vendor class identifier)
| interface	Create/delete router interface
| | address	Router interface IP and mask
| | bind	Binds router interface to physical/logical port
| | | dhcp	Enables/disables DHCP client
| | | dhcp-client	Configures DHCP client for the router interface
| | | | client-id	DHCP option 61 (client identifier) type and value
| | | management-access	Configure interface managment access.
| | | mtu	Maximum transmit unit allowed
| | name	Router interface name
| | vlan	Assign VLAN definition to the router interface

Command	Description
| | shutdown	Administratively enable/disable the router interface
| | show status	Router interface status
| | name	Router name
| static-route	Create/delete static route entities
| show arp-table	Displays the router ARP table
| | show interface-table	Displays the interface table
| show routing-table	Displays the routing table
| system	Configure system parameters
| | clear-cpu-utilization	Clear CPU utilization counters
| | show cpu-utilization	Shows the CPU utilization
| | contact	Configure contact person
| | date-and-time	Configure date & time parameters
| | | date-format	Configure system date format
| | | date	Configure system date
| | | time	Configure system time
| | | zone	Configure time zone and offset
| | | sntp	Configure Simple Network Time Protocol parameters
| | | | broadcast	Enable/disable broadcast client mode for SNTP
| | | | poll-interval	Configure SNTP polling interval
| | | | server	Configure SNTP server
| | | | | address	Configure SNTP server IP address
| | | | | prefer	Set/Reset the SNTP server preference
| | | | | query-server	Query the timestamp from the SNTP Server
| | | | | shutdown	Enable/Disable SNTP Server
| | | | | udp	UDP Port of SNTP Server
| | | | show status	Displays SNTP Servers Status
| | inventory	Configure inventory entity
| | | alias	Configure inventory entity alias
| | | asset-id	Configure inventory entity asset ID
| | | serial-number	Configure inventory entity serial number
| | | show status	Display inventory entity status
| | location	Configure location of device
| | name	Configure name of device

Command	Description
| | syslog	Configure syslog entities
| | | address	Configure target address of syslog server
| | | clear-statistics	Clears the Syslog statistics
| | | shutdown	Enable/disable logging of syslog entity
| | | facility	Configure facility of device
| | | severity-level	Configure severity level of device
| | | port	Configure UDP port number
| | | show statistics	Display syslog statistics
| | tftp	Configure TFTP parameters
| | show buffers	Display memory buffer usage
| | show date-and-time	Display date and time
| | show device-information	Display device information
| | show inventory	Display inventory information
| terminal	Configure control port parameters
| | baud-rate	Define control port data rate
| | timeout	Define security timeout
| | length	Define number of rows to display
| test	Enter test level
| | rfc2544	Enter RFC-2544 level
| | | profile-name	Configure RFC-2544 profile
| | | | frame-loss-tolerance	Configure frame loss tolerance
| | | | frame-size	Configure list of frame sizes for test
| | | | frames-number-in-attempt	Configure number of frames in attempt
| | | | learning-frames	Configure learning frames
| | | | number–of-trials	Configure number of repeats for test
| | | | pattern	Configure pattern of test frame payload
| | | | test-direction	Configure test direction
| | | | throughput-measurement-accuracy	Configure accuracy of throughput measurement
| | | | tlv-type	Configure TLV message type
| | | test	Configure RFC-2544 test
| | | | activate	Activate test
| | | | associated-flow	Associate flow with test
| | | | bind	Bind OAM CFM parameters

Command	Description
| | | | clear-reports	Clear test report
| | | | max-rate	Configure maximum theoretical PPS for test
| | | | max-test-duration	Configure maximum test duration
| | | | test-profile	Configure profile used for test
| | | | type	Configure type(s) of benchmark test to perform
| | | | show report	Display test report
| | | | show status	Show test status
| | | | show summary	Show test summary

Table 4-3. Commands in the file category

Command	Description
file	Enter file level
| delete	Delete file
| dir	Displays files in base directory
| show configuration-files	Displays configuration files properties
| show copy	Displays copy status
| show factory-default-config	Displays factory-default-config file content
| show rollback-config	Displays rollback-config file content
| show startup-config	Displays startup-config file content
| show sw-pack	Displays the existing sw-packs and their content
| show user-default-config	Displays user-default-config file content

Table 4-4. Commands in the admin category

Command	Description
admin	Administrative commands
| factory-default	Reset the device to factory defaults
| factory-default-all	Resets all configuration and counters
| reboot	Restart the device
| software	Software installed vectors
| | install	Instructs the device to run from another sw-pack (upgrade)
| | software-confirm-required	Requires user confirmation after reboot

Command	Description
| | show status	Status of upgrade process
| | undo-install	Abort the upgrade process the return to previous sw-pack (downgrade)
| startup-confirm-required	Requires user confirmation after reboot
| user-default	Reset the device to user defaults

Table 4-5. Commands in the root category

Command	Description
clear-statistics	Clear statistics for Ethernet ports, flows, and OAM services
on-configuration-error	Determines the device behavior when encountering an error in configuration file

Table 4-6. Commands in the global-commands category

Command	Description
global-commands	Global commands can be typed at any level
| exit	Return to previous level in the commands hierarchy
| tree	Displays all lower command levels and commands accessible from the current context level, optionally with parameter information
| help	Displays general help, or optionally just the hotkeys and/or global commands
| history	Displays the command history for the current session (by default the history contains the last 10 commands)
| echo	Echo the text that is typed in
| exec	Execute a file, optionally echoing the commands
| logout	Log out this system
| info	Displays information on the current configuration
| level-info	Displays the current device configuration – commands from the current level only
| ping	Verify the reachability of a remote host
| copy	Copy files
| save	Save user configuration

Command	Description
| trace-route	Determine the route to a destination address

4.2 Working with Telnet and SSH

Typically, the Telnet host is a PC or Unix station with the appropriate suite of TCP/IP protocols.

To enable the Telnet host to communicate with ETX-203AX, it is necessary to configure the ETX-203AX IP address settings (refer to the *Router* section in Chapter 8 for details). This is usually done via a terminal emulation program (see *Working with Terminal*). After this preliminary configuration, you can use a Telnet host connected directly or via a local area network.

➤ **To connect to ETX-203AX via Telnet:**

1. At the Telnet host, enter the necessary command (e.g. at a PC enter: **`telnet`** `<IP-address>`)

   The Telnet login window appears for the device as shown below.

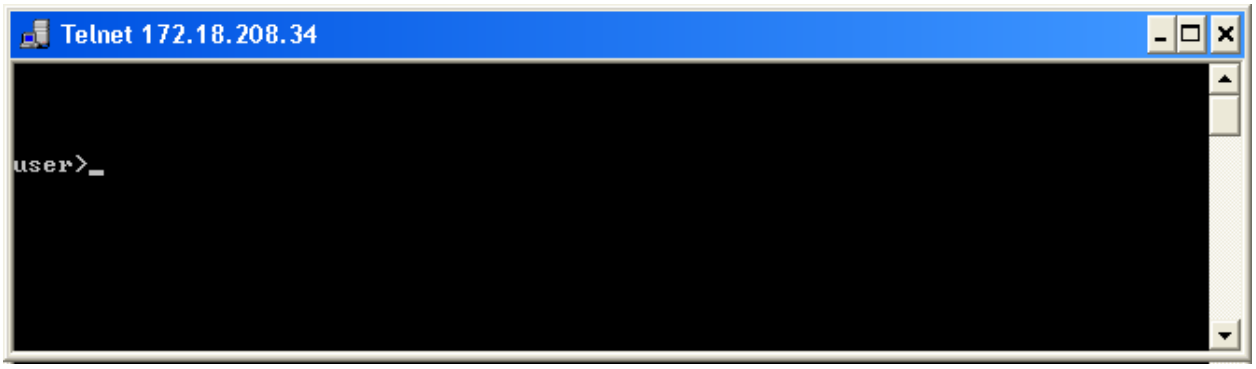


Figure 4-9. Telnet Connection to Unit

2. Log into the device as explained in *Logging In*. Refer to *Using the CLI* and *Command Tree* for details on using the CLI commands.

4.3 Working with RADview

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 dedicated graphical user interface (GUI) for monitoring RAD products via their SNMP agents. RADview-EMS for ETX-203AX is bundled in the RADview-EMS 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 RAD partner. Refer to the section *Working with Third-Party Network Management Systems* below for details on the SNMP MIBs used to manage ETX-203AX.

4.4 Working with Third-Party Network Management Systems

ETX-203AX can be integrated into third-party network management systems at the following levels:

- Viewing device inventory and receiving traps (refer to *Chapter 11* for trap list)
- Managing device, including configuration, statistics collection, and diagnostics, using the following standard and private MIBs:
  - CFM MIB (IEEE8021-CFM-MIB)
  - IANAifType-MIB
  - IETF Syslog Device MIB
  - IEEE8023-LAG-MIB
  - MEF-R MIB
  - RAD private MIB
  - RFC 2819 (RMON-MIB)
  - RFC 2863 (IF-MIB)
  - RFC 3273 (Remote Network Monitoring MIB)
  - RFC 3411 (SNMP-FRAMEWORK-MIB)
  - RFC 3413 (SNMP-TARGET-MIB)
  - RFC 3414 (SNMP-USER-BASED-SM-MIB)
  - RFC 3415 (SNMP-VIEW-BASED-ACM-MIB)
  - RFC 3418 (SNMPv2-MIB)
  - RFC 3433 (ENTITY-SENSOR-MIB)
  - RFC 3636 (MAU-MIB)
  - RFC 4133 (ENTITY-MIB)
  - RFC 4668 (RADIUS-AUTH-CLIENT-MIB)
  - RFC 4836.MIB (MAU-MIB)
  - RFC 4878.MIB (DOT3-OAM-MIB).

4.5 SNMP Management

SNMP stands for Simple Network Management Protocol and is an application layer protocol that provides a message format for communication between managers and agents.

ETX-203AX supports SNMPv3, the latest SNMP version to date. SNMPv3 provides secure access to devices in the network by using authentication and data encryption.

Standards

The supported SNMP versions are based on the following standards:

- RFC 1901, Introduction to Community-Based SNMPv2. SNMPv2 Working Group.
- RFC 1902, Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2). SNMPv2 Working Group.
- RFC 1903, Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2). SNMPv2 Working Group.
- RFC 1904, Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2). SNMPv2 Working Group.
- RFC 1905, Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2). SNMPv2 Working Group.
- RFC 1906, Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2).
- RFC 1907, Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2). SNMPv2 Working Group.
- RFC 1908, Coexistence between Version 1 and Version 2 of the Internet-standard Network Management Framework. SNMPv2 Working Group.
- RFC 2104, Keyed Hashing for Message Authentication.
- RFC 2271, Architecture for Describing SNMP Management Frameworks.
- RFC 2272, message processing and dispatching for the Simple Network Management Protocol (SNMP).
- RFC 2273, SNMPv3 Applications.
- RFC 2274, User-Based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3).
- RFC 2275, View-Based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP).
- RFC 3412, Version 3 Message Processing and Dispatching.
- RFC 3414, User-based Security Model for SNMPv3
- RFC 3416, Update for RFC 1904.

Benefits

The SNMP protocol allows you to remotely manage multiple units from a central workstation using a network management system.

The SNMPv3 protocol allows data to be collected securely from SNMP devices. Confidential information such as SNMP commands can thus be encrypted to prevent unauthorized parties from being able to access them.

Functional Description

In an SNMP configuration, one or more administrative computers manage a group of hosts or devices. Each managed system continuously executes a software component called agent, which reports information via SNMP back to the managing workstations.

Factory Defaults

The following is the default configuration of the SNMP parameters (refer to *Configuring SNMPv3 Parameters* for explanations of the parameters):

- SNMP engine ID set to device MAC address
- View named “internet” providing access to IETF MIBs and IEEE MIBs
- User named "initial", with security level no authentication and no privacy
- Group for SNMPv3 named "initial":
  - Security levels: no authentication and no privacy, authentication and no privacy, authentication and privacy
  - User: “initial”
  - Views for read/write/notify: "internet".
- Notifications with tag “unmasked” for the device traps.

Configuring SNMPv3 Parameters

ETX-203AX supports SNMP version 3, providing secure SNMP access to the device by authenticating and encrypting packets transmitted over the network.

The SNMPv3 manager application in RADview-EMS provides a user-friendly GUI interface to configure SNMPv3 parameters. If you intend to use it, you must first use the device CLI to create users with the required encryption method and security level, as the application can create users based only on existing users; the new user has the same encryption method, and the same security level or lower. The ETX-203AX default configuration provides one standard user named “initial” with no encryption and the lowest security level (refer to *Factory Defaults* for details).

Follow this procedure to configure SNMPv3:

1. Set SNMP engine ID if necessary
2. Add users, specifying authentication protocol and privacy protocol
3. Add groups, specifying security level, protocol, and views
4. Connect users to groups
5. Add notification entries with assigned traps and tags
6. Configure target parameter sets to be used for targets
7. Configure targets (SNMPv3 network management stations to which ETX-203AX should send trap notifications), specifying target parameter sets, notification tags, and trap synchronization groups if applicable

➤ **To configure SNMPv3 parameters:**

1. Navigate to **configure management snmp**.

   The **config>mngmnt>snmp#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Note *When you enter password parameters, they should contain at least eight characters.*

Task	Command	Level	Comments
Configuring group	**access-group** <group-name> { **snmpv2c** | **usm** } { **no-auth-no-priv** | **auth-no-priv** | **auth-priv** }	**snmp**	Using **no access-group** deletes the group
Defining how to match the context sent in frames by the NMS	**context-match** {**exact** | **prefix**}	**snmp>access-group**	**exact** – Match the entire context **prefix** – Match the first part of the context. ***Note**: ETX-203AX automatically identifies the NMS context, therefore you can configure exact match. Normally prefix is used for devices with multiple instances.*
Setting view for traps	**notify-view** <name>	**snmp>access-group**	Refer to the description of the **view** command for information on how to limit the parts of the MIB hierarchy that the view can access
Setting view with read-only access	**read-view** <name>	**snmp>access-group**	
Setting view with write access	**write-view** <name>	**snmp>access-group**	
Administratively enabling group	**no shutdown**	**snmp>access-group**	Using **shutdown** disables the group
Configuring community	**community** <community-index>	**snmp**	
Configuring name	**name** <community-string>	**snmp>community**	
Configuring security name	**sec-name** <security-name>	**snmp>community**	
Configuring transport tag	**tag** <transport-tag>	**snmp>community**	This should normally be left set to the default value
Administratively enabling community	**no shutdown**	**snmp>community**	Using **shutdown** disables community
Configuring notification	**notify** <notify-name>	**snmp>**	

Task	Command	Level	Comments
Assigning trap to notification	**bind** {**authenticationFailure** | **systemDeviceTemperatureOra** | **systemSoftwareInstallEnd** | **systemAlternateConfigLoaded** | **systemDyingGasp** | **systemDeviceStartup** | **systemSwUnconfirmed** | **fanFailure** | **systemSuccessfulLogin** | **systemFailedLogin** | **systemLogout** | **powerDeliveryFailure** | **systemTrapHardSyncStart** | **systemTrapHardSyncEnd** | **systemUserReset** | **smartSfpMismatch** | **systemRfc2544TestStart** | **systemRfc2544TestEnd** | **stationClockLos** | **epsConfigurationMismatch** | **epsPortSwitchover** | **sfpRemoved** | **ethLos** | **oamEfmRemoteLoopback** | **oamEfmRemoteLoopbackOff** | **oamEfmLinkFaultIndication** | **oamEfmFeLinkFaultIndication** | **oamEfmCriticalLinkIndication** | **oamEfmFeCriticalLinkIndication** | **oamEfmDyingGaspIndication** | **oamEfmFeDyingGaspIndication** | **sdhSonetLos** | **e3t3Los** | **e1t1Los** | **systemDownloadEnd** | **oamCfmMepAis** | **oamCfmMepLck** | **oamCfmMepMismatch** | **oamCfmRmepLoc** | **oamCfmRmepRdi** | **oamCfmDestNeDelayTca** | **oamCfmDestNeDelayTcaOff** | **oamCfmDestNeDelayVarTca** | **oamCfmDestNeDelayVarTcaOff** | **oamCfmDestNeLossRatioTca** | **oamCfmDestNeLossRatioTcaOff** | **oamCfmDestNeLossRatioTcaFe** | **oamCfmDestNeLossRatioTcaFeOff** | **oamCfmDestNeUnavailableRatioTca** | **oamCfmDestNeUnavailableRatioTcaOff** | **oamCfmDestNeUnavailableRatioTcaFe** | **oamCfmDestNeUnavailableRatioTcaFeOff**}	**snmp>notify**	You can assign more than one trap to a notification, in separate commands
Assigning tag to notification, to be used to identify the notification entry when configuring target	**tag** <tag-value>	**snmp>notify**	
Administratively enabling notification	**no shutdown**	**snmp>notify**	

Task	Command	Level	Comments
Configuring notification filter to define access to a particular part of the MIB hierarchy for trap variables	**notify-filter** <name> <sub-tree-oid>	**snmp**	• **name** – Name of filter • **sub-tree-oid** – OID that defines the MIB subtree
Specifying the part of the subtree OID to use in order to define the MIB subtree	**mask** [<mask>]	**snmp>notify-filter**	The mask is comprised of binary digits (for example, the mask 1.1.1 converts OID 1.3.6.7.8 to 1.3.6). It is not necessary to specify a mask if **sub-tree-oid** is the OID that should be used to define the MIB subtree
Defining whether traps with trap variables belonging to the MIB subtree are sent	**type** {**included** | **excluded**}	**snmp>notify-filter**	• **included** – Traps with trap variables belonging to the MIB subtree are sent • **excluded** – Traps with trap variables belonging to the MIB subtree are not sent
Administratively enabling notification filter	**no shutdown**	**snmp>notify-filter**	
Configuring notification filter profile	**notify-filter-profile** <params-name>	**snmp**	**params-name** – Specifies the target parameter set to associate with the profile
Configuring notification filter profile name	**profile-name** <argument>	**snmp>filter-profile**	**argument** – Specifies notification filter to associate with the profile
Administratively enabling notification filter profile	**no shutdown**	**snmp>filter-profile**	
Connecting security name to group (e.g. connecting user or community to group)	**security-to-group** { **snmpv2c** | **usm** } **sec-name** <security-name>	**snmp**	Using **no security-to-group** removes security-to-group entity
Specifying group to which to connect security name	**group-name** <group-name>	**snmp>security-to-group**	

Task	Command	Level	Comments
Administratively enabling security-to-group entity	**no shutdown**	**snmp>security-to-group**	Using **shutdown** disables the security-to-group entity
Setting SNMP engine ID, as MAC address or IP address or string	**snmp-engine-id mac** [<mac-address>] **snmp-engine-id ipv4** [<ip-address>] **snmp-engine-id text** <string>	**snmp**	If you use the **mac** option and don't specify the MAC address, the SNMP engine ID is set to the device MAC address If you use the **ipv4** option and don't specify the IP address, the SNMP engine ID is set to the device IP address
Configuring target (SNMPv3 network manager)	**target** <target-name>	**snmp**	Using **no target** removes target
Specifying target address as IP address or OAM port	**address udp-domain** <ip-address> **address oam-domain** <oam-port>	**snmp>target**	
Assigning tag(s) to target (the tag(s) must be defined in notification entries)	**tag-list** <tag> **tag-list** [<tag>] **tag-list** [<tag1>,<tag2>,...<tagn>]	**snmp>target**	If you specify more than one tag, you must enclose the list with square brackets, however if you are specifying just one tag the brackets are optional
Specifying set of target parameters for target	**target-params** <params-name>	**snmp>target**	
Specifying trap synchronization group	**trap-sync-group** <group-id> [**import-trap-masking**]	**snmp>target**	• If the group does not exist, it is created • If you specify the **import-trap-masking** parameter, the manager's trap masking is imported from the first manager in the group • Enter **no trap-sync-group** <group-id> to remove the manager from the group. If the manager was the last in the group, the group is deleted.

Task	Command	Level	Comments
Administratively enabling target	**no shutdown**	**snmp>target**	Using **shutdown** disables target
Configuring set of target parameters, to be assigned to target	**target-params** <target-param-name>	**snmp**	Using **no target-params** removes target parameters
Specifying message processing model (SNMP version) to be used when generating SNMP messages for the set of target parameters	**message-processing-model** { **snmpv2c** | **snmpv3** }	**snmp>target**	
Specifying user on whose behalf SNMP messages are to be generated for the set of target parameters	**security** [**name** <security-name>] [**level** { **no-auth-no-priv** | **auth-no-priv** | **auth-priv** }]	**snmp>target**	
Specifying SNMP version to be used when generating SNMP messages for the set of target parameters	**version** { **snmpv2c** | **usm** }	**snmp>target**	Use **usm** for SNMPv3 version
Administratively enabling target parameters	**no shutdown**	**snmp>target**	Using **shutdown** disables target parameters
Configuring target parameters and tags for trap synchronization group	**trap-sync-group** <group-id>	**snmp**	The trap synchronization group must be previously defined in the target level
Specifying tags	**tag-list** <list>	**snmp>trap-sync-group**	To remove the tag list, enter: **no tag-list**
Specifying set of target parameters	**target-params** <params-name>	**snmp>trap-sync-group**	To remove the set of target parameters, enter: **no target-params** <params-name>

Task	Command	Level	Comments
Configuring user	**user** <security-name> [**md5-auth** [{**des** | **none**}]] **user** <security-name> [**sha-auth** [{**des** | **none**}]] **user** <security-name> [**none-auth**]	**snmp**	If you don't specify the authentication method when creating a user, the default is MD5 with DES privacy protocol. To create a user with no authentication, specify **none-auth**. Typing **no user <security-name>** deletes the user
Setting user authentication password and optional key for changes	**authentication** [**password** <password>] [**key** <key-change>]	**snmp>user**	Using **no authentication** disables authentication protocol
Setting user privacy password and optional key for changes	**privacy** [**password** <password>] [**key** <key-change>]	**snmp>user**	Using **no privacy** disables privacy protocol
Administratively enabling user	**no shutdown**	**snmp>user**	• You must define the authentication and privacy method before you can enable the user, unless the user was defined with no authentication (**none-auth**) • Using **shutdown** disables the user.
Defining access to a particular part of the MIB hierarchy	**view** <view-name> <sub-tree-oid>	**snmp**	**view-name** –Name of view, which can be associated to a group as a notify, read, or write view **sub-tree-oid** – OID that defines the MIB subtree (for example 1.3.6.1 represents the Internet hierarchy)
Specifying the part of the subtree OID to use in order to define the MIB subtree	**mask** <mask>	**snmp>view**	The mask is comprised of binary digits (for example, the mask 1.1.1 converts OID 1.3.6.7.8 to 1.3.6). It is not necessary to specify a mask if **sub-tree-oid** is the OID that should be used to define the MIB subtree

Task	Command	Level	Comments
Defining whether access to the MIB subtree is allowed	**type** {included | excluded}	**snmp>view**	**included** – Allow access to the subtree **excluded** – Don't allow access to the subtree
Administratively enabling view	**no shutdown**	**snmp>view**	
Displaying trap synchronization groups and members for SNMPv3 manager groups	**show trap-sync**	**snmp**	
Displaying SNMPv3 information, such as the number of times the SNMPv3 engine has booted, and how long since the last boot	**show snmpv3 information**	**snmp**	

Example

➤ **To create SNMPv3 user and connect it to group:**

- User named "MD5_priv":
  - Security level – MD5 authentication, DES privacy
- Group named "MD5Group":
  - All security levels
  - Contains set of views named "internet" (from default configuration).

```
ETX-203AX# configure management snmp
ETX-203AX>config>mngmnt>snmp# user MD5_priv md5-auth des
ETX-203AX>config>mngmnt>snmp>user(MD5_priv)$ privacy password MD654321
ETX-203AX>config>mngmnt>snmp>user(MD5_priv)$ authentication password MD654321
ETX-203AX>config>mngmnt>snmp>user(MD5_priv)$ no shutdown
ETX-203AX>config>mngmnt>snmp>user(MD5_priv)$ exit
ETX-203AX>config>mngmnt>snmp# access-group MD5Group usm no-auth-no-priv
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ context-match exact
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ read-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ write-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ notify-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ no shutdown
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/no-auth-no-priv)$ exit
ETX-203AX>config>mngmnt>snmp# access-group MD5Group usm auth-no-priv
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ context-match exact
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ read-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ write-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ notify-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ no shutdown
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-no-priv)$ exit
ETX-203AX>config>mngmnt>snmp# access-group MD5Group usm auth-priv
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ context-match exact
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ read-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ write-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ notify-view internet
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ no shutdown
ETX-203AX>config>mngmnt>snmp>access-group(MD5Group/usm/auth-priv)$ exit
ETX-203AX>config>mngmnt>snmp# security-to-group usm sec-name MD5_priv
ETX-203AX>config>mngmnt>snmp>security-to-group(usm/MD5_priv)$ group-name MD5Group
ETX-203AX>config>mngmnt>snmp>security-to-group(usm/MD5_priv)$ no shutdown
ETX-203AX>config>mngmnt>snmp>security-to-group(usm/MD5_priv)$ exit
ETX-203AX>config>mngmnt>snmp#
```

➤ To create notifications:

- Notification named “TrapPort”:
  - Tag = “Port”
  - Bound to ethLos, sfpRemoved.
- Notification named “TrapPower”:
  - Tag = “Power”
  - Bound to powerDeliveryFailure, systemDeviceStartup.

```
ETX-203AX# configure management snmp
ETX-203AX>config>mngmnt>snmp# notify TrapPort
ETX-203AX>config>mngmnt>snmp>notify(TrapPort)$ tag Port
ETX-203AX>config>mngmnt>snmp>notify(TrapPort)$ bind ethLos
ETX-203AX>config>mngmnt>snmp>notify(TrapPort)$ bind sfpRemoved
ETX-203AX>config>mngmnt>snmp>notify(TrapPort)$ no shutdown
ETX-203AX>config>mngmnt>snmp>notify(TrapPort)$ exit
ETX-203AX>config>mngmnt>snmp# notify TrapPower
ETX-203AX>config>mngmnt>snmp>notify(TrapPower)$ tag Power
ETX-203AX>config>mngmnt>snmp>notify(TrapPower)$ bind powerDeliveryFailure
ETX-203AX>config>mngmnt>snmp>notify(TrapPower)$ bind systemDeviceStartup
ETX-203AX>config>mngmnt>snmp>notify(TrapPower)$ no shutdown
ETX-203AX>config>mngmnt>snmp>notify(TrapPower)$ exit
ETX-203AX>config>mngmnt>snmp#
```

➤ To create target parameters and target:

- Target parameters named "TargParam1":
  - Message processing model SNMPv3
  - version USM
  - User "MD5_priv"
  - Security level authentication and privacy
- Target named "TargNMS1":
  - Target parameters "TargParam1"
  - Tag list = "Port", "Power"
  - IP address 192.5.4.3.

```
ETX-203AX# configure management snmp
ETX-203AX>config>mngmnt>snmp# target-params TargParam1
ETX-203AX>config>mngmnt>snmp>target(TargParam1)$ message-processing-model snmpv3
ETX-203AX>config>mngmnt>snmp>target(TargParam1)$ version usm
ETX-203AX>config>mngmnt>snmp>target(TargParam1)$ security name MD5_priv level auth-
  priv
ETX-203AX>config>mngmnt>snmp>target(TargParam1)$ no shutdown
ETX-203AX>config>mngmnt>snmp>target(TargParam1)$ exit
ETX-203AX>config>mngmnt>snmp# target TargNMS1
ETX-203AX>config>mngmnt>snmp>target(TargNMS1)$ target-params TargParam1
ETX-203AX>config>mngmnt>snmp>target(TargNMS1)$ tag-list [Port,Power]
ETX-203AX>config>mngmnt>snmp>target(TargNMS1)$ address udp-domain 192.5.4.3
ETX-203AX>config>mngmnt>snmp>target(TargNMS1)$ no shutdown
ETX-203AX>config>mngmnt>snmp>target(TargNMS1)$ exit
ETX-203AX>config>mngmnt>snmp#
```

➤ To create communities, target parameters, and target for network devices that are working with SNMPv1 :

- Community "read":
  - Name: "public"
  - Security name: "v1_read" (defined in default configuration)

- Community “write”:
  - Name: “private”
  - Security name: “v1_write” (defined in default configuration)
- Community “trap”:
  - Name: “public”
  - Security name: “v1_trap” (defined in default configuration)
- Target parameters named “snv1”:
  - Message processing model SNMPv1
  - Version SNMPv1
  - Security name: “v1_trap”
  - Security: level no authentication and no privacy
- Target named “NMSsnmpv1”:
  - Target parameters “snv1”
  - Tag list = “unmasked”
  - IP address 192.5.6.7.

```
ETX-203AX# configure management snmp
ETX-203AX>config>mngmnt>snmp# snmpv3
ETX-203AX>config>mngmnt>snmp# community read
ETX-203AX>config>mngmnt>snmp>community(read)$ name public
ETX-203AX>config>mngmnt>snmp>community(read)$ sec-name v1_read
ETX-203AX>config>mngmnt>snmp>community(read)$ no shutdown
ETX-203AX>config>mngmnt>snmp>community(read)$ exit
ETX-203AX>config>mngmnt>snmp# community write
ETX-203AX>config>mngmnt>snmp>community(write)$ name private
ETX-203AX>config>mngmnt>snmp>community(write)$ sec-name v1_write
ETX-203AX>config>mngmnt>snmp>community(write)$ no shutdown
ETX-203AX>config>mngmnt>snmp>community(write)$ exit
ETX-203AX>config>mngmnt>snmp# community trap
ETX-203AX>config>mngmnt>snmp>community(trap)$ name public
ETX-203AX>config>mngmnt>snmp>community(trap)$ sec-name v1_trap
ETX-203AX>config>mngmnt>snmp>community(trap)$ no shutdown
ETX-203AX>config>mngmnt>snmp>community(trap)$ exit
ETX-203AX>config>mngmnt>snmp# target-params snv1
ETX-203AX>config>mngmnt>snmp>target(snv1)$ message-processing-model snmpv1
ETX-203AX>config>mngmnt>snmp>target(snv1)$ version snmpv1
ETX-203AX>config>mngmnt>snmp>target(snv1)$ security name v1_trap level no-auth-no-priv
ETX-203AX>config>mngmnt>snmp>target(snv1) no shutdown
ETX-203AX>config>mngmnt>snmp>target(snv1) exit
ETX-203AX>config>mngmnt>snmp# target NMSsnmpv1
ETX-203AX>config>mngmnt>snmp>target(NMSsnmpv1)$ target-params snv1
ETX-203AX>config>mngmnt>snmp>target(NMSsnmpv1)$ tag-list unmasked
ETX-203AX>config>mngmnt>snmp>target(NMSsnmpv1)$ address udp-domain  192.5.6.7
ETX-203AX>config>mngmnt>snmp>target(NMSsnmpv1)$ no shutdown
ETX-203AX>config>mngmnt>snmp>target(NMSsnmpv1)$ exit
ETX-203AX>config>mngmnt>snmp#
```

➤ To display SNMPv3 information:

```
ETX-203AX# configure management snmp
ETX-203AX> config>mngmnt>snmp# show snmpv3 information
SNMPv3           : enable
Boots            : 2
Boots Time (sec) : 102
EngineID         : 800000a4030020d2202416
ETX-203AX>config>mngmnt>snmp#
```

➤ To configure trap synchronization:

- Trap synchronization group 1:
  - Members NMS1 and NMS2
  - Target parameters "TargParam1" (from previous example)
  - Tag list = "Port", "Power" (from previous example)
- Trap synchronization group 2:
  - Members NMS3 and NMS4.

```
ETX-203AX# configure management snmp
ETX-203AX>config>mngmnt>snmp# target NMS1
ETX-203AX>config>mngmnt>snmp>target(NMS1)$ trap-sync-group 1
ETX-203AX>config>mngmnt>snmp>target(NMS1)$ exit
ETX-203AX>config>mngmnt>snmp# target NMS2
ETX-203AX>config>mngmnt>snmp>target(NMS2)$ trap-sync-group 1
ETX-203AX>config>mngmnt>snmp>target(NMS2)$ exit
ETX-203AX>config>mngmnt>snmp# target NMS3
ETX-203AX>config>mngmnt>snmp>target(NMS3)$ trap-sync-group 2
ETX-203AX>config>mngmnt>snmp>target(NMS3)$ exit
ETX-203AX>config>mngmnt>snmp# target NMS4
ETX-203AX>config>mngmnt>snmp>target(NMS4)$ trap-sync-group 2
ETX-203AX>config>mngmnt>snmp>target(NMS4)$ exit
ETX-203AX>config>mngmnt>snmp# trap-sync-group 1
ETX-203AX>config>mngmnt>snmp>trap-sync-group(1)# tag-list [Port,Power]
ETX-203AX>config>mngmnt>snmp>trap-sync-group(1)# target-params TargParam1
ETX-203AX>config>mngmnt>snmp>trap-sync-group(1)# exit
ETX-203AX>config>mngmnt>snmp# show trap-sync
Group ID  Member
------------------------------------------------------------------------------
1         NMS1
1         NMS2
2         NMS3
2         NMS4
ETX-203AX>config>mngmnt>snmp#
```

4.6 Controlling Management Access

You can enable or disable access to the ETX-203AX management system via Telnet, SSH, or SNMP applications. By disabling Telnet, SSH, or SNMP, you prevent unauthorized access to the system when security of the ETX-203AX IP address has been compromised. When Telnet, SSH, and SNMP are disabled, ETX-203AX can be managed via an ASCII terminal only. Additionally, you can enable or disable access via SFTP/TFTP.

Factory Defaults

By default, access is enabled for all the applications.

Configuring Management Access

➤ To configure management access:

- At the **configure management access** prompt enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Allowing SFTP access	**sftp**	Typing **no sftp** blocks access by SFTP
Allowing SSH (Secure Shell) access	**ssh**	Typing **no ssh** blocks access by SSH

Task	Command	Comments
Allowing SNMP access	**snmp**	Typing **no snmp** blocks access by SNMP
Allowing Telnet access	**telnet**	Typing **no telnet** blocks access by Telnet
Allowing TFTP access	**tftp**	Typing **no tftp** blocks access by TFTP

4.7 Access Policy

The access policy allows specifying up to three user authentication methods (local, RADIUS, TACACS+). If an authentication method is not available, the next method is used if applicable.

Factory Defaults

By default, authentication is via the locally stored database (**1st-level local**).

Configuring Access Policy

➤ To define the access policy:

- At the **config>mngmnt>access#** prompt, enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying authentication via locally stored database	**auth-policy 1st-level local**	
Specifying authentication method preferably via TACACS+, then optionally local	**auth-policy 1st-level tacacs+** [**2nd-level** { **local** | **none** }]	If **2nd-level** is set to **local**, authentication is performed via the TACACS server. If the TACACS server does not answer the authentication request, then ETX-203AX authenticates via the local database. If the TACACS server rejects the authentication request, ETX-203AX ends the authentication process. If **2nd-level** is set to **none**, authentication is performed via the TACACS server only

Task	Command	Comments
Specifying authentication method preferably via RADIUS/ TACACS+, then optionally TACACS+/ RADIUS, then optionally local	**auth-policy 1st-level radius** [**2nd-level tacacs+** [**3rd-level** {**local** | **none**}]] **auth-policy 1st-level tacacs+** [**2nd-level radius** [**3rd-level** {**local** | **none**}]]	ETX-203AX first attempts authentication via the server specified by **1st-level**. If the server does not answer the authentication request, then ETX-203AX attempts to authenticate via the server specified by **2nd-level**. If the server does not answer the authentication request, then ETX-203AX attempts to authenticate according to **3rd-level**: • **local** – ETX-203AX authenticates via the local database • **none** –No further authentication is done, and the authentication request is rejected. ***Note**: If at any time in this process, an authentication server rejects an authentication request, ETX-203AX ends the authentication process and does not attempt authentication at the next level.*

4.8 Authentication via RADIUS Server

RADIUS (Remote Authentication Dial-In User Service) is an AAA (authentication, authorization and accounting) client/server protocol that secures networks against unauthorized access. It is used to authenticate users and authorize their access to the requested system or service. The RADIUS client communicates with the RADIUS server using a defined authentication sequence.

Standards

RFC 2865, Remote Authentication Dial In User Service (RADIUS)

RFC 2618, RADIUS Authentication Client MIB

Benefits

The RADIUS protocol allows centralized authentication and access control, avoiding the need to maintain a local user data base on each device on the network.

Functional Description

When a login attempt occurs at ETX-203AX, it submits an authentication request to the RADIUS server. The RADIUS server checks the database and replies with either **Access Rejected** or **Access Accepted**.

Factory Defaults

By default, no RADIUS servers are defined. When the RADIUS server is first defined, it is configured as shown below.

Description	Default Value
IP address of server	0.0.0.0
Max number of authentication attempts	2
Time interval between two authentication attempts	2 seconds
UDP port used for authentication	1812

Configuring RADIUS Parameters

ETX-203AX provides connectivity to up to four RADIUS authentication servers. You have to specify access parameters such as assigning Radius server IDs, specifying the associated server IP addresses and the number of retries, etc.

➤ **To define RADIUS parameters:**

1. At the **config>mngmnt>radius#** prompt, type **server** <server-id> to specify which server to configure.

   The **config>mngmnt>radius>server**(<server-id>)**#** prompt is displayed.

2. Enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning an IP address to the server	**address** <ip-address>	Possible IP addresses range from 1.1.1.1 to 255.255.255.255
Defining a non-disclosed string (shared secret) used to encrypt the user password.	**key** <string> **[hash]**	The shared secret is a secret key consisting of free text known to the client and the server for encryption. It is hashed if specified.
Defining the number of authentication request attempts	**retry** <number-of-retries>	Range 0–10
Defining timeout (in seconds) for response from RADIUS server	**timeout** <seconds>	Range 1–5
Defining the UDP port to be used for authentication	**auth-port** <udp-port-number>	Range 1–65535
Administratively enabling server	**no shutdown**	Type **shutdown** to administratively disable the server
Displaying status	**show status**	

Displaying RADIUS Statistics

➤ To display RADIUS statistics:

- At the config>mngmnt>radius# prompt, enter:
  show statistics

RADIUS statistics appear as shown below.

```
ETX-203AX>config>mngmnt>radius# show statistics
                    Server1       Server2          Server3      Server4
-------------------------------------------------------------------------
Access Requests        :0            0                0            0
Access Retransmits     :0            0                0            0
Access Accepts         :0            0                0            0
Access Rejects         :0            0                0            0
Access Challenges      :0            0                0            0
Malformed Response     :0            0                0            0
Bad Authenticators     :0            0                0            0
Pending Requests       :0            0                0            0
Timeouts               :0            0                0            0
Unknown Types          :0            0                0            0
Packets Dropped        :0            0                0            0
```

➤ To clear the statistics for RADIUS:

- At the config>mngmnt>radius# prompt, enter:
  clear-statistics

The RADIUS statistics are cleared.

4.9 Authentication via TACACS+ Server

TACACS+ (Terminal Access Controller Access Control System Plus) is a security application that provides access control for routers, network access servers, and other networked computing devices via one or more centralized servers. TACACS+ provides separate authentication, authorization, and accounting services. It is used to communicate between the switch and an authentication database. As TACACS+ is based on TCP, implementations are typically resilient against packet loss.

Standards

RFC 1492, An Access Control Protocol, Sometimes Called TACACS

Benefits

The TACACS+ protocol allows centralized authentication and access control, avoiding the need to maintain a local user data base on each device on the network. The TACACS+ server encrypts the entire body of the packet but leaves a standard TACACS+ header.

Functional Description

TACACS+ is based on the AAA model:

- Authentication – The action of determining who a user is.
- Authorization – The action of determining what a user is allowed to do. It can be used to customize the service for the particular user.
- Accounting – The action of recording what a user is doing, and/or has done.

The activation of each of these three functionalities can be configured independently for the TACACS+ client.

Components

The TACACS+ remote access environment has three major components: access client, TACACS+ client, and TACACS+ server.

- The access client is an entity which seeks the services offered by the network
- TACACS+ client running on ETX-203AX, processes the requests from the access client and pass this data to TACACS+ server for authentication
- The TACACS+ server authenticates the request, and authorizes services over the connection. The TACACS+ server does this by matching data from the TACACS+ client`s request with entries in a trusted database.

The TACACS+ server decides whether to accept or reject the user's authentication or authorization. Based on this response from the TACACS+ server, the TACACS+ client decides whether to establish the user's connection or terminate the user's connection attempt. The TACACS+ client also sends accounting data to the TACACS+ server to record in a trusted database.

TACACS+ uses TCP for its transport and encrypts the body of each packet. TACACS+ client can use any port for authentication and accounting. TACACS+ supports authentication by using a user name and a fixed password, "one-time" password or a challenge response query.

Accounting

ETX-203AX supports up to five accounting groups, with up to five TACACS+ servers per group.

A group can be defined with its own accounting level:

- Shell accounting, which logs the following events:
  - Successful logon
  - Logon failure
  - Successful logoff
  - ETX-203AX terminated management session.
- System accounting, which records system events/alarms registered in local log file
- Command accounting, which logs the following events:

- Any shell command that was successfully executed by ETX-203AX
- Any level that was successfully changed in a shell.

Factory Defaults

By default, no TACACS+ servers are defined. When a TACACS+ server is first defined, it is configured as shown below.

Description	Default Value
The max number of authentication attempts.	1
Time interval between two authentication attempts.	5 seconds
TCP port for authentication	49
TCP port for accounting	49
Administratively enabled	Disabled (shutdown)

Configuring TACACS+ Servers

ETX-203AX provides connectivity to up to five TACACS+ authentication servers. You have to specify the associated server IP address, number of retries, etc.

Note *If you intend to use TACACS+ for authentication, verify that TACACS+ is selected as level-1 authentication method (see* Access Policy*).*

➤ **To define TACACS+ servers:**

1. At the **config>mngmnt>tacacsplus#** prompt, type **`server`** `<ip-address>` to specify the server IP address.

   The **config>mngmnt>tacacsplus>server**(<ip-address>)**#** prompt is displayed.

2. Enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Defining TCP port to be used for accounting	**accounting-port** <port-number>	Range 1–65535
Defining TCP port to be used for authentication	**authentication-port** <port-number>	Range 1–65535
Defining a non-disclosed string (shared secret) used to encrypt the user password	**key** <string> [**hash**]	The shared secret is a secret key consisting of free text known to the client and the server for encryption. It is hashed if specified.
Defining the number of authentication request attempts	**retry** <number-of-retries>	Range 1–10

Task	Command	Comments
Defining timeout (in seconds) for response from TACACS+ server	**timeout** ‹seconds›	Range 1–255
Administratively enabling server	**no shutdown**	Type **shutdown** to administratively disable the server
Clearing statistics	**clear-statistics**	
Displaying status	**show status**	
Displaying statistics	**show statistics**	

Example – Defining Server

The example below illustrates the procedure for defining a TACACS+ server.

- Server IP address: 175.18.172.150
- Key: TAC_server1.

```
ETX-203AX# configure management tacacsplus
ETX-203AX>config>mngmnt>tacacsplus# server 175.18.172.150
ETX-203AX>config>mngmnt>tacacsplus>server(175.18.172.150)$ key TAC_server1
ETX-203AX>config>mngmnt>tacacsplus>server(175.18.172.150)$ no shutdown
ETX-203AX>config>mngmnt>tacacsplus>server(175.18.172.150)$ information detail
    key "244055BF667B8F89225048C6571135EF" hash
    retry 1
    timeout 5
    authentication-port 49
    accounting-port 49
    no group
    no shutdown
```

Configuring Accounting Groups

➤ **To configure accounting groups:**

1. At the **config>mngmnt>tacacsplus#** prompt, type **group** ‹group-name› to configure an accounting group with the specified name.

   The **config>mngmnt>tacacsplus>group**(‹group-name›)**#** prompt is displayed.

2. To define the accounting for the group, enter:
   accounting [shell] [system] [commands]

Note *You can enter any combination of **shell**, **system**, and **commands**, but you must enter at least one of them.*

3. Type **exit** to return to the TACACS+ level.

   The **config>mngmnt>tacacsplus#** prompt is displayed.

4. Type **server** <ip-address> to select the TACACS+ server to which to bind the group.

   The **config>mngmnt>tacacsplus>server**(<ip-address>)**#** prompt is displayed.

5. At the **config>mngmnt>tacacsplus>server**(<ip-address>)**#** prompt, enter **group** < group-name> to bind the previously defined accounting group to the TACACS+ server.

Example – Defining Accounting Group

The example below illustrates the procedure for defining an accounting group.

- Group name: TAC1
- Accounting: Shell, system, and commands
- Bound to server defined in *Example – Defining Server*.

```
ETX-203AX# configure management tacacsplus
ETX-203AX>config>mngmnt>tacacsplus# group TAC1
ETX-203AX>config>mngmnt>tacacsplus>group(TAC1)$ accounting shell system
commands
ETX-203AX>config>mngmnt>tacacsplus>group(TAC1)$ info detail
    accounting shell system commands

ETX-203AX>config>mngmnt>tacacsplus>group(TAC1)$ exit
ETX-203AX>config>mngmnt>tacacsplus# server 175.18.172.150
ETX-203AX>config>mngmnt>tacacsplus>server(175.18.172.150)# group TAC1
ETX-203AX>config>mngmnt>tacacsplus>server(175.18.172.150)# info detail
    key "244055BF667B8F89829AB8AB0FE50885" hash
    retry 1
    timeout 5
    authentication-port 49
    accounting-port 49
    group "TAC1"
    no shutdown
```

4.10 Terminal Control Port

You can configure the serial port parameters, which include specifying the data rate, security timeout, and screen size from which you are accessing the device.

Factory Defaults

By default, data rate is set to 9,600 bps.

Configuring Control Port Parameters

➤ To define the control port parameters:

- At the **config>terminal#** prompt, enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the desired data rate	**baud-rate** { **9600bps** | **19200bps** | **38400bps** | **57800bps** | **115200bps**	The default data rate is 9,600 bps.
Defining whether in case of inactivity, device remains connected or disconnects after a specified time period	**timeout forever** **timeout limited** ‹ minutes ›	If you define a timeout, the timeout value can be 0–60. The default is 10 minutes.
Specifying the number of rows to display	**length** ‹ number-of-rows ›	The number of rows can be 0, to indicate no limit on the number of lines displayed, or 20.

4.11 User Access

ETX-203AX management software allows you to define new users, their management and access rights. Only superusers (su) can create new users, the regular users are limited to changing their current passwords, even if they were given full management and access rights.

You can specify a user's password as a text string or as a hashed value, that you obtain by using the **`info`** command to display user data.

Notes

- *User passwords are stored in a database so that the system can perform password verification when a user attempts to log in. To preserve confidentiality of system passwords stored in text configuration files, the password verification data is typically stored after a one-way hash function is applied to the password, in combination with other data. When a user attempts to log in by entering a password, the same function is applied to the entered value and the result is compared with the stored value.*
- *A cryptographic hash function is a deterministic procedure that takes an arbitrary block of data and returns a fixed-size bit string, the (cryptographic) hash value, such that any change to the data changes the hash value.*

The following table shows the different user access levels.

Table 4-7. User Access Levels

Access Level	Description
su	Unlimited read/write access to all device components and features, including administrator privileges such as adding/removing users and changing user passwords

Access Level	Description
oper	Unlimited read/write access like **su**; no administrator privileges except for changing its own password
tech	Unlimited read access; write access limited to running loopback tests and clearing alarms; no administrator provileges except for changing its own password
user	Unlimited read access; no write access; no administrator provileges except for changing its own password

Factory Defaults

By default, the following users exist in the device.

Table 4-8. Default Users

User Name	Access Level	Password
su	su	1234
oper	oper	1234
tech	tech	1234
user	user	1234

Configuring Users

➤ To add a new user:

1. Make sure that you are logged on as superuser (su).
2. Navigate to the Management context (config>mngmnt).
3. Define a new user:

```
user <name> [ level { su | oper | tech | user} ]
[password <password>  [hash]]
```

Example – Defining Users

➤ To define a new user:

- User name = staff
- User password = 1234.

```
ETX-203AX# configure management
ETX-203AX>config>mngmnt# user staff level su password 1234
# Password is encrypted successfully
ETX-203AX>config>mngmnt#
```

➤ To add a new user with a hashed password:

1. Define a new user with a text password.

2. Use **info detail** to display the password hash value.
3. Define another user with the hashed password from the **info** output.

   The second user can log in with the text password defined in *step 1*.

For example, to add the following users:

- User name = staff1
- User password = 4222
- User name = staff2
- User password = hash of 4222 (user staff2 can log in with password 4222).

```
ETX-203AX# configure management
ETX-203AX>config>mngmnt# user staff1 level user password 4222
# Password is encrypted successfully
ETX-203AX>config>mngmnt# info detail
    user  "staff1" level  user  password
"3fda26f8cff4123ddcad0c1bc89ed1e79977acef"  hash
    user  "su"
```

:

```
ETX-203AX>config>mngmnt# user staff2 level user password
3fda26f8cff4123ddcad0c1bc89ed1e79977acef hash
ETX-203AX>config>mngmnt# info detail
    user  "staff1" level  user  password
"3fda26f8cff4123ddcad0c1bc89ed1e79977acef"  hash
    user  "staff2" level  user  password
"3fda26f8cff4123ddcad0c1bc89ed1e79977acef"  hash
    user  "su"
```

:

```
ETX-203AX>config>mngmnt# logout
  exiting cli
ETX-203AX>config>mngmnt#


 CLI session is closed









user>staff2

password>****
```

➤ To delete an existing user:

- At the Management context (**config>mngmnt**), enter **no** <user-name>.

  The specified user is deleted.

➤ To view all connected users:

- At the Management context (**config>mngmnt**), enter **show user**s.

  A list of all connected users is displayed, showing their access level, the type of connection, and the IP address from which they are connected.

Example – Displaying Users

```
ETX-203AX# configure management
ETX-203AX>config>mngmnt# show users
User                          Access Level   Source         IP-address
-------------------------------------------------------------------------
su                            SU             Terminal       0.0.0.0

ETX-203AX>config>mngmnt#
```

Chapter 5
Services

This chapter shows the data flow and configuration steps for services.

Ethernet User Traffic

Network to User

In *Figure 5-1* the rectangles illustrate the data flow for Ethernet user traffic from a network port to a user port. The rounded rectangles indicate the features that need to be configured, numbered according to the order of configuration. *Table 5-1* shows the configuration steps corresponding to the numbers.

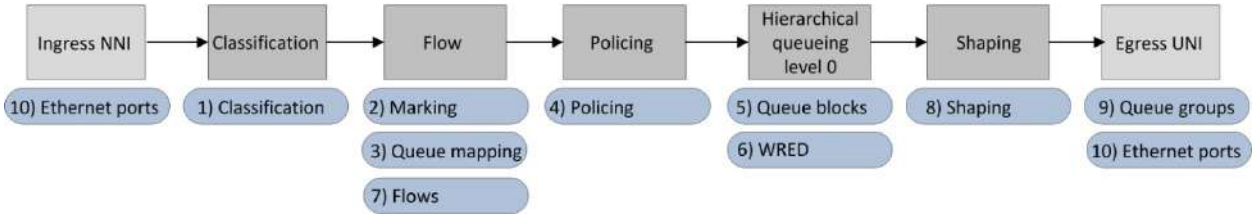


Figure 5-1. Ethernet User Traffic Data Flow – Network to User

Table 5-1. Ethernet User Traffic Configuration – Network to User

Sequence	Step	Commands	Comments
1	*Defining Classifier Profiles*	**classifier-profile** **match**	The classifier profile defines the criteria for the network-to-user flow
2	*Marking Profiles*	**marking-profile** **mark**	Necessary only if a profile is needed for non-default mapping of p-bit, IP precedence, DSCP, or CoS classifications to egress priority tags for the network-to-user flow
3	*Queue Mapping Profiles*	**queue-map-profile** **map**	Necessary only if a profile is needed for non-default mapping of user priorities to queues for the network-to-user flow
4	*Configuring Policer Profiles*	**policer-profile** **bandwidth** **compensation**	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the incoming traffic of the network-to-user flow

Sequence	Step	Commands	Comments
5	*Configuring Queue Block Profile Parameters*	queue-block-profile queue scheduling depth	Necessary only if you need to define non-default queue configuration for the network-to-user flow
6	*WRED Profiles*	wred-profile color	Necessary only if you need to define non-default WRED configuration for the queue blocks
7	*Configuring Flows*	classifier ingress-port egress-port policer mark vlan-tag shutdown	You must define the flow for the user traffic from the network port to the user port
8	*Configuring Shaper Profiles*	shaper-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the outgoing traffic of the network-to-user flow (via attaching shaper profile to queue group profile attached to egress port)
9	*Queue Group Profiles*	queue-group-profile queue-block name profile shaper	Necessary only if you need to define non-default queue group configuration for the egress port
10	*Ethernet Ports*	name auto-negotiation max-capability speed-duplex queue-group egress-mtu tag-ethernet-type shutdown	Necessary only if you need to define non-default configuration for the egress port

User to Network

In *Figure 5-2* the rectangles illustrate the data flow for Ethernet user traffic from a user port to a network port. The rounded rectangles indicate the features that need to be configured, numbered according to the order of configuration. *Table 5-2* shows the configuration steps corresponding to the numbers.

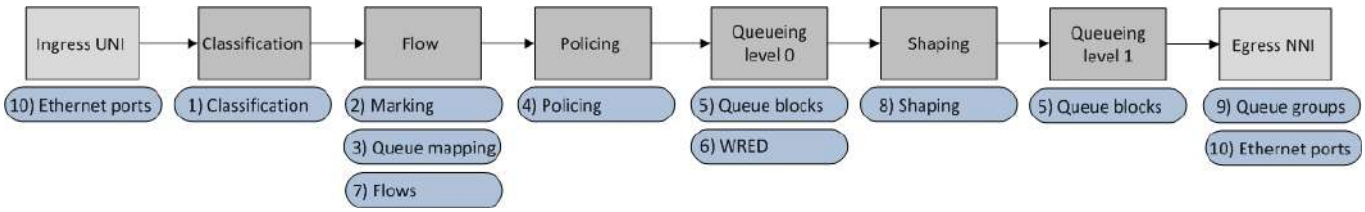


Figure 5-2. Ethernet User Traffic Data Flow – User to Network

Table 5-2. Ethernet User Traffic Configuration – User to Network

Sequence	Step	Commands	Comments
1	*Defining Classifier Profiles*	**classifier-profile** **match**	The classifier profile defines the criteria for the user-to-network flow
2	*Marking Profiles*	**marking-profile** **mark**	Necessary only if a profile is needed for non-default mapping of p-bit, IP precedence, DSCP, or CoS classifications to egress priority tags for the user-to-network flow
3	*Queue Mapping Profiles*	**queue-map-profile** **map**	Necessary only if a profile is needed for non-default mapping of user priorities to queues for the user-to-network flow
4	*Configuring Policer Profiles*	**policer-profile** **bandwidth** **compensation**	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the incoming traffic of the user-to-network flow
5	*Configuring Queue Block Profile Parameters*	**queue-block-profile** **queue** **scheduling** **depth**	Necessary only if you need to define non-default queue configuration for the user-to-network flow, or the egress port
6	*WRED Profiles*	**wred-profile** **color**	Necessary only if you need to define non-default WRED configuration for the queue blocks
7	*Configuring Flows*	**classifier** **ingress-port** **egress-port** **policer** **mark** **vlan-tag** **shutdown**	You must define the flow for the user traffic from the user port to the network port

Sequence	Step	Commands	Comments
8	*Configuring Shaper Profiles*	shaper-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the outgoing traffic of the user-to-network flow (via attaching shaper profile to queue group profile attached to egress port)
9	*Queue Group Profiles*	queue-group-profile queue-block name profile shaper	Necessary only if you need to define non-default queue group configuration for the egress port
10	*Ethernet Ports*	name auto-negotiation max-capability speed-duplex queue-group egress-mtu tag-ethernet-type shutdown	Necessary only if you need to define non-default configuration for the ingress or egress port

TDM User Traffic

TDM Network to Ethernet User

The following figure illustrates the data flow from a network port provisioned as a TDM port via a smart SFP, to an Ethernet user port. *Table 5-3* shows the configuration steps corresponding to the figure callouts.

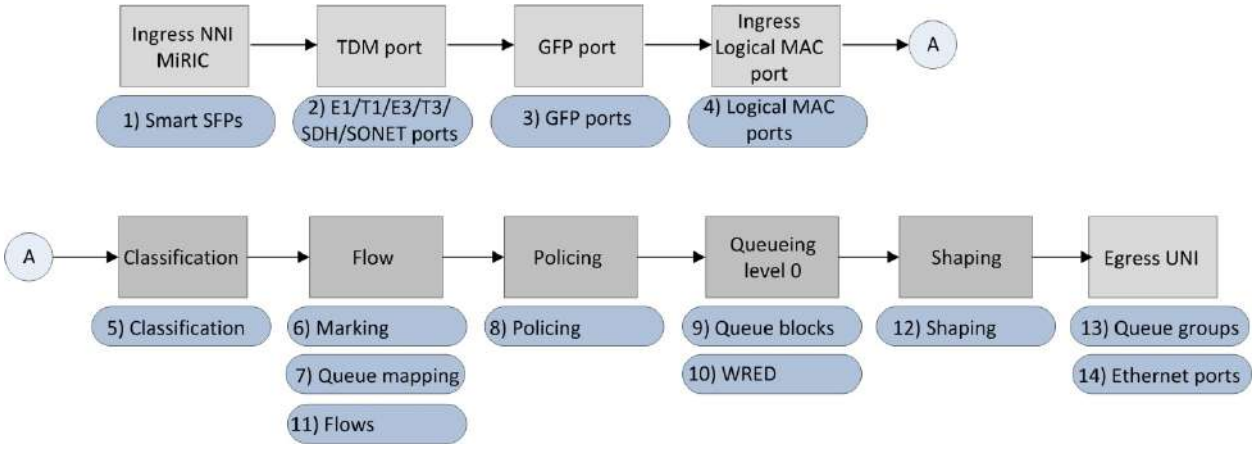


Figure 5-3. TDM User Traffic Data Flow – TDM Network to Ethernet User

Table 5-3. TDM User Traffic Configuration – TDM Network to Ethernet User

Sequence	Step	Commands	Comments
1	*Smart SFPs*	smart-sfp type shutdown	You must provision the smart SFP for the network port
2	*E1 Ports*	e1 name line-code line-type rx-sensitivity tx-clock-source shutdown	Necessary only if non-default configuration is needed for the TDM port ***Note**: The specific step is according to the TDM port type.*
	T1 Ports	t1 name line-code line-length line-type rx-sensitivity tx-clock-source shutdown	
	E3 Ports	e3 name tx-clock-source shutdown	
	T3 Ports	t3 name line-length line-type shutdown	
	SDH/SONET Ports	sdh-sonet name frame-type threshold tim-response tx-clock-source shutdown	
3	*GFP Ports*	gfp bind fcs-payload name	You must configure a GFP port, and bind the TDM port to it

Sequence	Step	Commands	Comments
4	*Logical MAC Ports*	logical-mac name bind egress-mtu queue-group tag-ethernet-type shutdown	You must configure a logical MAC port, and bind the GFP port to it. The logical MAC port is used as the ingress port of the flow
5	*Defining Classifier Profiles*	classifier-profile match	The classifier profile defines the criteria for the network-to-user flow
6	*Marking Profiles*	marking-profile mark	Necessary only if a profile is needed for non-default mapping of p-bit, IP precedence, DSCP, or CoS classifications to egress priority tags for the network-to-user flow
7	*Queue Mapping Profiles*	queue-map-profile map	Necessary only if a profile is needed for non-default mapping of user priorities to queues for the network-to-user flow
8	*Configuring Policer Profiles*	policer-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the incoming traffic of the network-to-user flow
9	*Configuring Queue Block Profile Parameters*	queue-block-profile queue scheduling depth	Necessary only if you need to define non-default queue configuration for the network-to-user flow
10	*WRED Profiles*	wred-profile color	Necessary only if you need to define non-default WRED configuration for the queue blocks
11	*Configuring Flows*	classifier ingress-port egress-port policer mark vlan-tag shutdown	You must define the flow for the user traffic from the network port (logical MAC port) to the user port

Sequence	Step	Commands	Comments
12	*Configuring Shaper Profiles*	shaper-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the outgoing traffic of the network-to-user flow (via attaching shaper profile to queue group profile attached to egress port)
13	*Queue Group Profiles*	queue-group-profile queue-block name profile shaper	Necessary only if you need to define non-default queue group configuration for the egress port
14	*Ethernet Ports*	name auto-negotiation max-capability speed-duplex queue-group egress-mtu tag-ethernet-type shutdown	Necessary only if you need to define non-default configuration for the egress port

TDM User to Network

The following figure illustrates the data flow from a user port provisioned as a TDM port via a smart SFP, to an Ethernet network port. *Table 5-2* shows the configuration steps corresponding to the figure callouts.

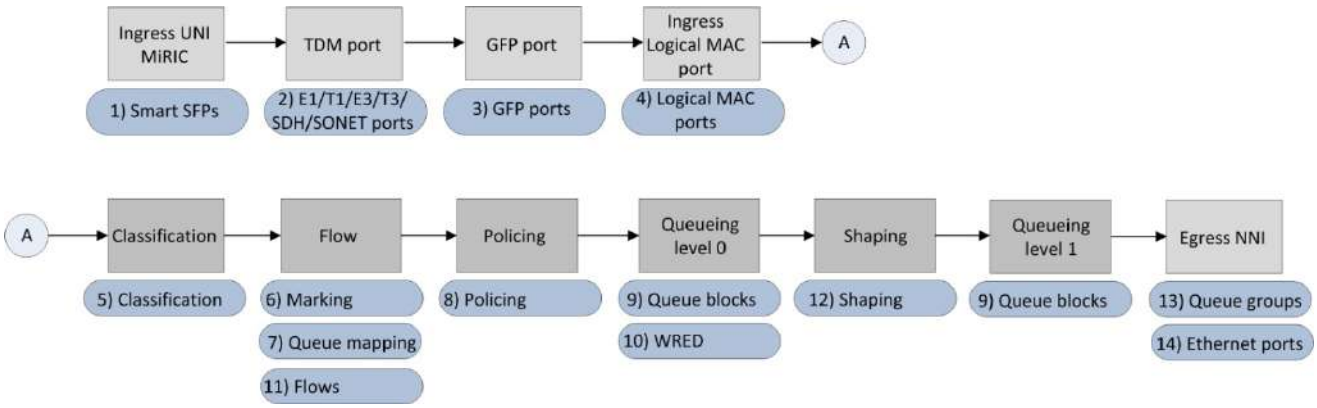


Figure 5-4. TDM User Traffic Data Flow – TDM User to Ethernet Network

Table 5-4. TDM User Traffic Configuration – TDM User to Ethernet Network User to Network

Sequence	Step	Commands	Comments
1	*Smart SFPs*	smart-sfp type shutdown	You must provision the smart SFP for the user port

Sequence	Step	Commands	Comments
2	*E1 Ports*	e1 name line-code line-type rx-sensitivity tx-clock-source shutdown	Necessary only if non-default configuration is needed for the TDM port ***Note**: The specific step is according to the TDM port type.*
	T1 Ports	t1 name line-code line-length line-type rx-sensitivity tx-clock-source shutdown	
	E3 Ports	e3 name tx-clock-source shutdown	
	T3 Ports	t3 name line-length line-type shutdown	
	SDH/SONET Ports	sdh-sonet name frame-type threshold tim-response tx-clock-source shutdown	
3	*GFP Ports*	gfp bind fcs-payload name	You must configure a GFP port, and bind the TDM port to it

Sequence	Step	Commands	Comments
4	*Logical MAC Ports*	logical-mac name bind egress-mtu queue-group tag-ethernet-type shutdown	You must configure a logical MAC port, and bind the GFP port to it. The logical MAC port is used as the ingress port of the flow
5	*Defining Classifier Profiles*	classifier-profile match	The classifier profile defines the criteria for the user-to-network flow
6	*Marking Profiles*	marking-profile mark	Necessary only if a profile is needed for non-default mapping of p-bit, IP precedence, DSCP, or CoS classifications to egress priority tags for the user-to-network flow
7	*Queue Mapping Profiles*	queue-map-profile map	Necessary only if a profile is needed for non-default mapping of user priorities to queues for the user-to-network flow
8	*Configuring Policer Profiles*	policer-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the incoming traffic of the user-to-network flow
9	*Configuring Queue Block Profile Parameters*	queue-block-profile queue scheduling depth	Necessary only if you need to define non-default queue configuration for the user-to-network flow, or the egress port
10	*WRED Profiles*	wred-profile color	Necessary only if you need to define non-default WRED configuration for the queue blocks
11	*Configuring Flows*	classifier ingress-port egress-port policer mark vlan-tag shutdown	You must define the flow for the user traffic from the user port to the network port

Sequence	Step	Commands	Comments
12	*Configuring Shaper Profiles*	shaper-profile bandwidth compensation	Necessary only if you need to define non-default bandwidth limits or overhead compensation for the outgoing traffic of the user-to-network flow (via attaching shaper profile to queue group profile attached to egress port)
13	*Queue Group Profiles*	queue-group-profile queue-block name profile shaper	Necessary only if you need to define non-default queue group configuration for the egress port
14	*Ethernet Ports*	name auto-negotiation max-capability speed-duplex queue-group egress-mtu tag-ethernet-type shutdown	Necessary only if you need to define non-default configuration for the egress port

Chapter 6

Ports

This chapter describes port-related features:

- *Ethernet Ports*
- *Smart SFPs*
- *E1 Ports*
- *T1 Ports*
- *E3 Ports*
- *T3 Ports*
- *SDH/SONET Ports*
- *GFP Ports*
- *Logical MAC Ports*
- *Service Virtual Interfaces*.

6.1 Ethernet Ports

ETX-203AX has two fiber optic or copper Fast or Gigabit Ethernet network ports and up to four fiber optic or copper Fast or Gigabit Ethernet user ports.

The second network port can be configured as a user port. The following table shows how to refer to the ports when configuring them with CLI commands.

Table 6-5. Ethernet Port Reference

Port	Unit	CLI
	Port Number	**Port Number**
Net	1	1
Net/User	2	2
User	3	3
User	4	4
User	5	5
User	6	6
MNG-ETH	-	101

The following parameters can be configured for the Ethernet ports for which no smart SFP has been provisioned:

- Port name
- Autonegotiation (electrical ports)
- Maximum advertised capability for autonegotiation procedure*
- Data rate (speed) and duplex mode, when autonegotiation is disabled
- Administrative status
- Network or user functional mode (second network interface only)
- Tag Ethernet Type*
- Egress MTU*
- Queue group profile*
- Policer profile*
- L2CP handling*
- Link OAM EFM (IEEE 802.3-2005)* – See *OAM EFM*
- Loopback* – See *Testing Ethernet Ports*.

Note ** = Not relevant for management Ethernet port.*

Factory Defaults

By default, the Ethernet non-management ports have the following configuration.

```
ETX-203AX>config>port# eth 1
ETX-203AX>config>port>eth(1)# inf d
    name  "ETH 1"
    tag-ethernet-type  0x8100
    no efm
    egress-mtu  1790
    queue-group profile  "DefaultQueueGroup"
    l2cp profile  "L2cpDefaultProfile"
    no tx-ssm
    auto-negotiation
    max-capability  1000-x-full-duplex  sfp
    max-capability  1000-full-duplex  rj45
    no policer
    no shutdown
ETX-203AX>config>port>eth(1)# exit
```

```
ETX-203AX>config>port# eth 2
ETX-203AX>config>port>eth(2)# inf d
    name  "ETH 2"
    functional-mode  network
    tag-ethernet-type  0x8100
    no efm
    egress-mtu  1790
    queue-group profile  "DefaultQueueGroup"
    l2cp profile  "L2cpDefaultProfile"
    no tx-ssm
    auto-negotiation
    max-capability  1000-x-full-duplex  sfp
    max-capability  1000-full-duplex  rj45
    no policer
    no shutdown
```

The rest of the Ethernet non-management ports have the same default configuration as Ethernet port 1, except for the port names.

Configuring Ethernet Port Parameters

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

1. Navigate to **configure port ethernet** ‹port-num› to select the Ethernet port to configure.

   The **config>port>eth**(‹port-num›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Enabling autonegotiation	**auto-negotiation**	Using **no** before **auto-negotiation** disables autonegotiation
Configuring OAM EFM descriptor	**efm descriptor** ‹efm-descriptor-index›	See *Configuring OAM EFM*
Setting maximum frame size (in bytes) to transmit (frames above the specified size are discarded)	**egress-mtu** ‹64–12288›	
Setting port to function as network or user	**functional-mode** {**network** | **user**}	• Applicable to second network interface only • See *Setting Second Network Interface as Network or User Port* for further information
Associating a Layer-2 control processing profile with the port	**l2cp profile** ‹l2cp-profile-name›	• If Ethernet port 2 is configured as a network port, then be sure to assign the same L2CP profile to both network ports • The associated L2CP profile must specify peer action for MAC 0x02 in the following cases: -LACP (LAG) is enabled for port -Link OAM (EFM) is enabled for port.

Task	Command	Comments
Setting maximum advertised capability (highest traffic handling capability to be advertised during the autonegotiation process)	**max-capability** {**10-full-duplex** | **100-full-duplex** | **1000-full-duplex** | **1000-x-full-duplex** }	**10-full-duplex** – 10baseT full duplex **100-full-duplex** – 100baseT full duplex **1000-full-duplex** – 1000base T full duplex **1000-x-full-duplex** – 1000 BaseX, 1000 BaseLX, 1000 BaseSX, or 1000 BaseCX full duplex The values **1000-full-duplex** and **1000-x-full-duplex** are relevant only for Gigabit Ethernet ports. ***Note**: This parameter applies only if autonegotiation is enabled.*
Assigning description to port	**name** ‹string›	Using **no** before **name** removes the name
Associating a policer profile for broadcast/multicast traffic with the port	**policer profile** ‹policer-profile-name›	Typing **no policer** removes any policer profile from the port.
Associating a queue group profile with the port	**queue-group profile** ‹queue-group-profile-name›	***Note**: You can associate a network port with a queue group profile containing up to 31 queue blocks, but a user port can be associated only with a queue group profile containing a single queue block.*
Setting data rate and duplex mode of the Ethernet port, when autonegotiation is disabled	**speed-duplex** {**10-full-duplex** | **100-full-duplex** | **1000-full-duplex** | **1000-x-full-duplex**}	**10-full-duplex** – 10baseT full duplex **100-full-duplex** – 100baseT full duplex **1000-full-duplex** – 1000base T full duplex **1000-x-full-duplex** – 1000baseX full duplex The values **1000-full-duplex** and **1000-x-full-duplex** are relevant only for Gigabit Ethernet ports
Setting the VLAN tagged frame ETH II frame Ethertype (tag protocol identifier)	**tag-ethernet-type** ‹**0x**0000-**0x**FFFF›	
Administratively enabling port	**no shutdown**	Using **shutdown** disables the port

Setting Second Network Interface as Network or User Port

You can change the functional mode of the second network interface from network to user port and vice versa. If it functions as a user port, then redundancy is not possible.

Notes

- *When you change the functional mode, all flows related to the port are deleted*
- *The port must be administratively disabled before you can change the functional mode.*

➤ To change the functional mode of the second network interface:

1. Navigate to configure **port ethernet 2**.

   The **config>port>eth(2)#** prompt is displayed.

2. Type **shutdown** to administratively disable the port.
3. Enter the command to change the functional mode:
   - To change to user port, enter:
     functional-mode user
   - To change to network port, enter:
     functional-mode network

     The functional mode of the port is changed.
4. Type **no shutdown** to administratively enable the port.

Example

➤ To change the second network interface functional mode to user port:

```
ETX-203AX# configure port ethernet 2
ETX-203AX>config>port>eth(2)# shutdown
ETX-203AX>config>port>eth(2)# functional-mode user
ETX-203AX>config>port>eth(2)# no shutdown
ETX-203AX#
```

Displaying Ethernet Port Status

You can display the following:

- Summary information showing the status and speed of all Ethernet ports
- Status and configuration of an individual Ethernet port.

➤ To display the status of all Ethernet ports:

- At the prompt **config>port#**, enter:
  show summary

  The statuses and speeds of the Ethernet ports are displayed. If a port is being tested via the **loopback** command, it is indicated in the operational status.

➤ To display status of an Ethernet port:

- At the prompt **config>port>eth**(<port-num>)**#**, enter:
  show status

  The Ethernet port status parameters are displayed.

Examples

➤ To display the status of all Ethernet ports:

```
ETX-203AX# configure port
ETX-203AX>config>port# show summary
Port       Number    Name      Admin     Oper                Speed
-------------------------------------------------------------------------
Ethernet   1         ETH 1     Up        Up                10000000
Ethernet   2         ETH 2     Up        Up                10000000
Ethernet   3         ETH 3     Up        Testing           10000000
Ethernet   4         ETH 4     Up        Up                10000000

Ethernet   5         ETH 5     Up        Up                10000000
Ethernet   6         ETH 6     Up        Up                10000000
Ethernet   101       MNG-ETH   Up        Up                100000000

ETX-203AX>config>port#
```

➤ To display the status of Ethernet port 3:

```
ETX-203AX# configure port ethernet 3
ETX-203AX>config>port>eth(3)# show status
Name                  : ETH 3
Administrative Status : Up
Operation Status      : Up
Connector Type        : RJ45
Auto Negotiation      : Other
Speed And Duplex      : 1000 Full Duplex
MAC Address           : 00-20-D2-30-CC-9D

EFM Status   : Disabled

ETX-203AX>config>port>eth(3)#
```

Testing Ethernet Ports

The physical layer runs at the PHY of the ports. When the loopback is active the data forwarded to a port is looped from the Tx path to the Rx path.

The loopback can be one of the following types:

- Local – Loopback is closed towards the user interface (*Figure 6-5*)
- Remote – Loopback is closed towards the network interface (*Figure 6-6*).

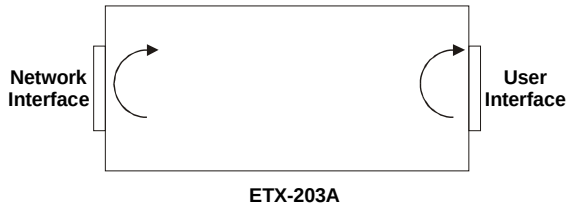


Figure 6-5. Local Loopback

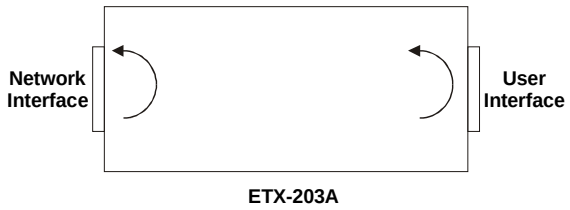


Figure 6-6. Remote Loopback

➤ **To run a physical layer loopback test:**

1. Navigate to **configure port ethernet** ‹port-num› to select the Ethernet port to test.

   The **config>port>eth**(‹port-num›)**#** prompt is displayed.

2. Enter:
   `loopback {local|remote} [duration <seconds>]`

   The duration is in seconds, with range `0–86400`. Entering 0 or not specifying the duration disables the timer, e.g. the loopback runs forever until you disable it.

   While the test is running, entering **show summary** at the **`port`** level displays the port's operational status as **Testing** (see *Displaying Ethernet Port Status*).

3. To end the loopback test, enter:
   `no loopback`

Example

➤ **To run loopback on Ethernet port 3:**

```
ETX-203AX# configure port ethernet 3
ETX-203AX>config>port>eth(3)# loopback remote duration 30
ETX-203AX>config>port>eth(3)# show loopback
Loopback : Remote         Remain (sec)  : 21
```

Displaying Ethernet Port Statistics

You can display statistics for the Ethernet ports, as well as L2CP statistics. The sampling interval for the Ethernet port statistics can be configured.

Setting Sampling Interval for Port Statistics

The sampling interval can be configured from one to 30 minutes. The default is 15 minutes.

➤ **To set the sampling interval:**

- At the prompt **config>port#**, enter:
  `rate-sampling-window <1–30>`

  The sampling interval is set to the specified number of minutes.

Displaying Port Statistics

➤ To display the Ethernet port statistics:

- At the prompt **config>port>eth(**<port-num>**)#**, enter:
  show statistics

  Ethernet port statistics are displayed. The counters are described in *Table 6-6*.

Example

➤ To display the statistics for Ethernet port 2:

```
ETX-203AX# configure port ethernet 2
ETX-203AX>config>port>eth(2)# show statistics
Rates Sampling Window
-------------------------------------------------------------
Window Size [Min.]        : 15
Window Remain Time [Min.] : 0

Running
-------------------------------------------------------------
                            Rx                  Tx
Total Frames              : 0                   5257039970304
Total Octets              : 0                   0
Total Frames/Sec          : 0                   0
Total Bits/Sec            : 0                   0
Min. Bits/Sec             : 0                   0
Max. Bits/Sec             : 0                   0
Unicast Frames            : 0                   0
Multicast Frames          : 0                   1224
Broadcast Frames          : 0                   0
Error Frames              : 0                   --
L2CP Discarded            : 0                   --
OAM Discarded             : 0                   --
Unknown Protocol Discarded : 0                  --
CRC Errors                : 0                   --
CRC Errors/Sec            : 0                   --
Jabber Errors             : 0                   --
Oversize Frames           : 0                   0
64 Octets                 : 0                   0
65-127 Octets             : 0                   0
128-255 Octets            : 0                   0
256-511 Octets            : 0                   0
512-1023 Octets           : 0                   0
1024-1528 Octets          : 0                   0
1519-2047 Octets          : 0                   0
2048-Max Octets           : 0                   0

ETX-203AX>config>port>eth(2)#
```

Table 6-6. Ethernet Statistics Counters

Parameter	Description
Window Size [Min.]	Interval for sampling statistics, user-configurable (see *Setting Sampling Interval for Port Statistics*)
Window Remain Time [Min.]	Amount of time remaining in statistics sampling window
Total Frames	Total number of frames received/transmitted
Total Octets	Total number of bytes received/transmitted
Total Frames/Sec	Number of frames received/transmitted per second
Total Bits/Sec	Number of bits received/transmitted per second
Min. Bits/Sec	Minimum number of bits received/transmitted per second
Max. Bits/Sec	Maximum number of bits received/transmitted per second
Unicast Frames	Total number of unicast frames received/transmitted
Multicast Frames	Total number of multicast frames received/transmitted
Broadcast Frames	Total number of broadcast frames received/transmitted
Error Frames	Total number of frames with errors received
L2CP Discarded	Total number of L2CP frames discarded
OAM Discarded	Total number of OAM frames discarded
Unknown Protocol Discarded	Total number of frames with unknown protocol discarded
CRC Errors	Total number of frames received that are an integral number of octets in length, but do not pass the Frame Check Sequence (FCS) check. This count does not include frames received with Frame-Too-Long or Frame-Too-Short error.
CRC Errors/Sec	Number of frames per second received that are an integral number of octets in length, but do not pass the Frame Check Sequence (FCS) check. This count does not include frames received with Frame-Too-Long or Frame-Too-Short error.
Jabber Errors	Total number of frames received with jabber errors
Oversize Frames	Total number of oversized frames received/transmitted
64 Octets	Total number of received/transmitted 64-byte packets
65–127 Octets	Total number of received/transmitted 65 to 127-byte packets
128–255 Octets	Total number of received/transmitted 128 to 255-byte packets
256–511 Octets	Total number of received/transmitted 256 to 511-byte packets
512–1023 Octets	Total number of received/transmitted 512 to 1023-byte packets
1024–1518 Octets	Total number of received/transmitted 1024 to 1518-byte packets
1519–2047 Octets	Total number of received/transmitted 1519 to 2047-byte packets
2048–Max Octets	Total number of received/transmitted packets with 2048 bytes and up to maximum

Displaying Layer-2 Control Processing Statistics

➤ To display the Layer-2 control processing statistics for an Ethernet port:

- At the prompt config>port>eth(<port-num>)#, enter:
  show l2cp-statistics

  L2CP statistics are displayed for the specified port, showing the number of encapsulated and decapsulated packets for each protocol.

Example

➤ To display the L2CP statistics for Ethernet port 3:

```
ETX-203AX# configure port ethernet 3
ETX-203AX>config>port>eth(3)# show l2cp-statistics
Protocol            Encapsulated   Decapsulated
-------------------------------------------------------
LACP                0              0
STP                 0              0
CDP                 0              0
VTP                 0              0
LLDP                0              0
PVSTP               0              0

Total                0               0
ETX-203AX>config>port>eth(3)#
```

Clearing Statistics

➤ To clear the statistics for an Ethernet port:

- At the prompt config>port>eth(<port-num>)#, enter:
  clear-statistics

  The statistics for the specified port are cleared.

➤ To clear the L2CP statistics for an Ethernet port:

- At the prompt config>port>eth(<port-num>)#, enter:
  clear-l2cp-statistics

  The L2CP statistics for the specified port are cleared.

6.2 Smart SFPs

ETX-203AX supports integrated configuration and management of smart SFPs (such as MiRICi devices) to provide TDM port functionality. The following are supported:

- MiRICi-E1
- MiRICi-T1
- MiRICi-E3
- MiRICi-T3

- MiRICi-155.

The smart SFP is provisioned in the specific Ethernet port where the SFP shall be inserted. After this provisioning, the Ethernet port is no longer available for normal Ethernet port functioning. The TDM port/s are automatically created when the smart SFP is provisioned, and can be configured.

After you provision a smart SFP, you can do the following:

- Define a logical GFP interface over the smart SFP port (see *GFP Ports*)
- Define a logical MAC interface over the GFP interface (see *Logical MAC Ports*)
- Create a flow over the logical MAC interface (see *Flows*).

Benefits

ETX-203AX offers the use of a wide variety of TDM E1/T1/E3/T3 OC-3/STM-1 ports via the smart SFP feature.

Factory Defaults

By default, no smart SFPs are provisioned.

Configuring Smart SFPs

To provision a smart SFP, you use the **smart-sfp** command to specify the Ethernet port, then you assign the type of smart SFP.

➤ **To configure smart SFPs:**

1. At the **config>port#** prompt, type **`smart-sfp`** `<port>`, where `<port>` indicates the Ethernet port where the SFP is (or shall be) inserted (see *Table 6-5* for the port numbers).

Note *You can provision the smart SFP before you insert it.*

The smart SFP interface is created if it does not already exist and the **`config>port>smart-sfp(`**`<port>`**`)$`** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning the type of smart SFP	**type** {**mirici-e1** | **mirici-t1** | **mirici-e3** | **mirici-t3** | **mirici-155** }	
Resetting smart SFP	**reset**	
Displaying interface status	**show status**	
Administratively enabling interface	**no shutdown**	Using **shutdown** disables the interface ***Note**: When the smart SFP interface is created, it is disabled by default.*

Example

This example shows how a smart SFP can be provisioned, and a flow created over the logical MAC port corresponding to a logical GFP port. The smart SFP can be inserted before or after the provisioning.

➤ To provision a smart SFP and corresponding flow:

- Ethernet port 1
- Smart SFP type = MiRICi-E1
- GFP port 1
- Logical MAC port 1
- Flow = flow1, with classification criterion VLAN 1.

Perform the following steps:

1. Provision the smart SFP.

```
ETX-203AX# configure port smart-sfp 1
ETX-203AX>config>port>smart-sfp(1)$ type mirici-e1
ETX-203AX>config>port>smart-sfp(1)$ info detail
    type  mirici-e1
    no shutdown
ETX-203AX>config>port>smart-sfp(1)$ exit
```

2. Create the GFP and bind it to the E1 port.

```
ETX-203AX>config>port# gfp 1
ETX-203AX>config>port>gfp(1)# bind e1 1
ETX-203AX>config>port>gfp(1)# info detail
    name  "GFP 1"
    bind  e1  1
    no fcs-payload
    scrambler-payload rx-tx
    no vcat-header
ETX-203AX>config>port>gfp(1)$ exit
```

3. Create the logical MAC port and bind it to GFP port 1.

```
ETX-203AX>config>port# logical-mac 1
ETX-203AX>config>port>log-mac(1)$ bind gfp 1
ETX-203AX>config>port>log-mac(1)$ no shutdown
ETX-203AX>config>port>log-mac(1)$ info detail
    name  "LOGICAL MAC 1"
    no shutdown
    bind  gfp  1
    tag-ethernet-type  0x8100
    egress-mtu  1790
    queue-group profile  "DefaultQueueGroup"
    l2cp profile  "L2cpDefaultProfile"
ETX-203AX>config>port>log-mac(1)$exit all
```

4. Create the flow and activate it.

```
ETX-203AX# configure flows
ETX-203AX>config>flows# classifier-profile v1 match-any match vlan 1
ETX-203AX>config>flows# flow flow1
ETX-203AX>config>flows>flow(flow1)$ classifier v1
ETX-203AX>config>flows>flow(flow1)$ ingress-port logical-mac 1
ETX-203AX>config>flows>flow(flow1)$ egress-port eth 3 queue 0 block 0/1
ETX-203AX>config>flows>flow(flow1)$ no shutdown
ETX-203AX>config>flows>flow(flow1)$ info detail
    classifier  "v1"
    no drop
    policer  profile  "Policer1"
    no mark  all
    no vlan-tag
    no l2cp
    ingress-port  logical-mac  1
    egress-port  ethernet  3  queue  0 block  0/1
    no shutdown
ETX-203AX>config>flows>flow(flow1)$
```

5. Insert the MiRICi-E1 device in Ethernet port 1.

6.3 E1 Ports

The European Conference of Postal and Telecommunications Administrations (CEPT) standardized the E-Carrier system, which was then adopted by the International Union Telecommunication Standardization sector (ITU-T), and is used in almost all countries outside the USA, Canada, and Japan.

The most commonly used versions are E1 and E3. E1 circuits are very common in most telephone exchanges and used to connect medium and large companies to remote exchanges. In many cases, E1 connects exchanges with each other.

E1 ports are available when smart SFPs such as MiRICi-E1 are provisioned (see *Smart SFPs*).

Standards and MIBs

ITU-T G.703

ITU-T G.704

ITU-T G.823

Benefits

E1 lines are high-speed dedicated lines that enable large volume usage.

Functional Description

An E1 link operates over a twisted pair of cables. A nominal 3-volt peak signal is encoded with pulses using a method that avoids long periods without polarity changes. The line data rate is 2.048 Mbps at full duplex, which means 2.048 Mbps downstream and 2.048 Mbps upstream. The E1 signal splits into 32 timeslots

each of which is allocated 8 bits. Each timeslot sends and receives an 8-bit sample 8000 times per second (8 x 8000 x 32 = 2,048,000), which is ideal for voice telephone calls where the voice is sampled into an 8-bit number at that data rate and restored at the other end. The timeslots are numbered from 0 to 31.

Factory Defaults

By default, no smart SFP E1 ports exist.

Configuring E1 Ports

➤ **To configure E1 ports:**

1. Provision a smart SFP such as MiRICi-E1 and insert it in an Ethernet port (see *Smart SFPs*).
2. At the **config>port#** prompt, type:
   e1 <port>

   The prompt **config>port>e1**(<port>)**#** is displayed.
3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Defining the transmission line code	**line-code** { **hdb3** | **ami** }	• **HDB3** – Referred to as High Density Bipolar of order 3 code, it is a telecommunication line code based on AMI and used in E1 lines. It is similar to B8ZS used in T1 lines • **AMI** – Referred to as Alternate Mark Inversion because a 1 is referred to as a mark and a 0 as a space
Specifying the framing mode of the port	**line-type** { **g732n** | **g732n-crc** }	• **g732n** – G.732N framing with CRC disabled • **g732n-crc** – G.732N framing with CRC enabled.

Task	Command	Comments
Running loopback test on E1 port	**loopback** {**local** | **remote** } [**start** ‹seconds›] [**duration** ‹seconds›]	• **local** – Returns the transmitted data at the physical layer to the receiving path • **remote** – Returns the received data at the physical layer to the transmitting path • **start** – Specifies the time (in seconds) until the loopback starts. Range is 1 to 3600. • **duration** – Specifies the duration of the loopback (in seconds). Range is 1 to 3600. If duration is not specified, the loopback test runs forever, until stopped Use **no loopback** to disable the loopback test.
Assigning a name to the port	**name** ‹string›	
Specifying the attenuation level of the received signal, compensated for by the interface receive path	**rx-sensitivity** {**short-haul** | **long-haul**}	• **short-haul** – Low sensitivity • **long-haul** – High sensitivity
Selecting the transmit clock source	**tx-clock-source** {**loopback** | **internal** }	• **loopback** –Clock retrieved from the port's incoming (Rx) data • **internal** – Clock provided by internal oscillator
Displaying list of interfaces bound to port	**show bind**	
Displaying loopback test status	**show loopback**	
Displaying the port status	**show status**	
Displaying the port statistics	**show statistics current** **show statistics interval** ‹interval-num› **show statistics all-intervals** **show statistics all**	
Clearing the statistics	**clear-statistics**	

6.4 T1 Ports

The T-carrier signaling scheme was devised by Bell Labs and is a widely used standard in telecommunications in the USA, Canada, and Japan to transmit voice and data between devices. T1, also referred to as DS-1, is a dedicated data line that transmits information at the speed of 1.544 megabits per second (mbps).

T1 ports are available when smart SFPs such as MiRICi-T1 are provisioned (see *Smart SFPs*).

Standards and MIBs

ITU-T G.703

ITU-T G.704

ITU-T G.823

Benefits

T1 lines are high-speed dedicated lines that enable large volume usage.

Functional Description

A T1 link operates over a twisted pair of cables. A nominal 3-volt peak signal is encoded with pulses using a method that avoids long periods without polarity changes. The line data rate is 1.544 Mbps at full duplex, which means 1.544 Mbps for downstream and 1.544 Mbps for upstream. The T1 signal splits into 24 timeslots each which is allocated 8 bits. Each timeslot sends and receives an 8-bit sample 8000 times per second (8 x 8000 x 24 = 1,544,000), which is ideal for voice telephone calls where the voice is sampled into an 8-bit number at that data rate and restored at the other end. The timeslots are numbered from 0 to 24.

Factory Defaults

By default, no T1 ports exist.

Configuring T1 Ports

➤ **To configure T1 ports:**

1. Provision a smart SFP such as MiRICi-T1 and insert it in an Ethernet port (see *Smart SFPs*).
2. At the **config>port#** prompt, type:
   t1 <port>

   The prompt **config>port>t1**(<port>)**#** is displayed.
3. Enter all necessary commands according to the tasks listed below.

Task	Command	Possible Values
Specifying the variety of zero code suppression used for this port	**line-code** { **ami** | **b8zs** }	• **AMI** – Referred to as Alternate Mark Inversion because a 1 is referred to as a mark and a 0 as a space • **B8ZS** –Bipolar 8-zero substitution, in which two successive ones (bipolar violations) are inserted whenever the stream of user data contains a string of eight or more consecutive zeros. This insertion is done in a way that allows each of the 24 channels to carry 64 kbsp of data.
Specifying the length of the T1 line in DSU mode (in feet)	**line-length** {**0-133** | **134-266** | **267-399** | **400-533** | **534-655**}	
Specifying the T1 line type.	**line-type** { **esf** | **sf** }	• **sf** –Super Frame (12 T1 frames) • **esf** – Extended Super Frame (24 T1 frames, with on-line performance monitoring and 4 Kbps control data link.)
Running loopback test on T1 port	**loopback** {**local** | **remote** } [**start** ‹seconds›] [**duration** ‹seconds›]	• **local** – Returns the transmitted data at the physical layer to the receiving path • **remote** – Returns the received data at the physical layer to the transmitting path • **start** – Specifies the time (in seconds) until the loopback starts. Range is 1 to 3600. • **duration** – Specifies the duration of the loopback (in seconds). Range is 1 to 3600. If duration is not specified, the loopback test runs forever, until stopped Use **no loopback** to disable the loopback test.
Assigning a name to the port	**name** ‹string›	
Specifying attenuation level of the receive signal that is compensated for by the interface receive path	**rx-sensitivity** { **short-haul** | **long-haul** }	
Selecting the transmit clock source	**tx-clock-source** {**loopback** | **internal** }	• **loopback** –Clock retrieved from the port's incoming (Rx) data • **internal** – Clock provided by internal oscillator
Displaying list of interfaces bound to port	**show bind**	

Task	Command	Possible Values
Displaying loopback test status	**show loopback**	
Displaying the port status	**show status**	
Displaying the port statistics	**show statistics current** **show statistics interval** ‹interval-num› **show statistics all-intervals** **show statistics all**	
Clearing the statistics	**clear-statistics**	

6.5 E3 Ports

Groups of E1 circuits are bundled into higher-capacity E3 links, which are mainly used between exchanges, operators, and/or countries, and have a transmission speed of 34.368 Mbps.

E3 ports are available when smart SFPs such as MiRICi-E3 are provisioned (see *Smart SFPs*).

Standards and MIBs

ITU-T G.703

ITU-T G.704

ITU-T G.823

Benefits

E3 lines provide high-capacity circuits.

Functional Description

Each E3 signal has 16 E1 channels, and each channel transmits at 2.048 Mbps. E3 links use all 8 bits of a channel.

Factory Defaults

By default, no E3 ports exist.

Configuring E3 Ports

➤ **To configure E3 ports:**

1. Provision a smart SFP such as MiRICi-E3 and insert it in an Ethernet port (see *Smart SFPs*).

2. At the **config>port#** prompt, type:
   e3 <port>

   The prompt **config>port>e3**(<port>)**#** is displayed.

3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Running loopback test on E3 port	**loopback** {**local** | **remote** } [**start** <seconds>] [**duration** <seconds>]	• **local** – Returns the transmitted data at the physical layer to the receiving path • **remote** – Returns the received data at the physical layer to the transmitting path • **start** – Specifies the time (in seconds) until the loopback starts. Range is 1 to 3600. • **duration** – Specifies the duration of the loopback (in seconds). Range is 1 to 3600. If duration is not specified, the loopback test runs forever, until stopped. Use **no loopback** to disable the loopback test.
Assigning a name to the port	**name** <string>	
Selecting the transmit clock source	**tx-clock-source** {**loopback** | **internal** }	• **loopback** –Clock retrieved from the port's incoming (Rx) data • **internal** – Clock provided by internal oscillator.
Displaying list of interfaces bound to port	**show bind**	
Displaying loopback test status	**show loopback**	
Displaying the port status	**show status**	
Displaying the port statistics	**show statistics current** **show statistics interval** <interval-num> **show statistics all-intervals** **show statistics all**	
Clearing the statistics	**clear-statistics**	

6.6 T3 Ports

T3, also referred to as DS-3 (Digital Signal Level 3), equates to 28 T-1 lines or 44.736 million bits per second (roughly 43-45 Mbps upstream/downstream speeds). DS-3s have enough bandwidth to allow very large database transfers over busy wide area networks.

T3 ports are available when smart SFPs such as MiRICi-T3 are provisioned (see *Smart SFPs*).

Standards and MIBs

ITU-T G.703

ITU-T G.704

ITU-T G.823

Benefits

T3 lines enable high-capacity Ethernet services in remote locations and transparently connect corporate LANs over existing PDH infrastructure.

Functional Description

In North America, DS-3 translates into T-3, which is the equivalent of 28 T-1 channels, each operating at 1.544 Mbps. Four T-1s are multiplexed to a T-2 frame, then seven T-2 frames are multiplexed, through an M23 ('Multiplex 2-to-3' multiplexer). As each frame is transmitted 8,000 times per second, the total T-3 signaling rate is 44.736 Mbps.

Factory Defaults

By default, no T3 ports exist.

Configuring T3 Ports

➤ **To configure T3 ports:**

1. Provision a smart SFP such as MiRICi-T3 and insert it in an Ethernet port (see *Smart SFPs*).
2. At the **config>port#** prompt, type:
   t3 <port>

   The prompt **config>port>t3**(<port>)**#** is displayed.
3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the length (in feet) of the T3 line	**line-length** { **up-to-225ft** | **over-225ft** }	

Task	Command	Comments
Specifying type of T3 line	**line-type** { **m23** | **c-bit-parity** }	• **m23** –Four DS1 signals are are multiplexed into one DS2 signal, then seven DS2 signals are multiplexed into one DS3 signal • **c-bit-parity** – The c-bit parity framing format is an enhancement of the M13 application, providing greater management and performance functions.
Running loopback test on T3 port	**loopback** {**local** | **remote** } [**start** ‹seconds›] [**duration** ‹seconds›]	• **local** – Returns the transmitted data at the physical layer to the receiving path • **remote** – Returns the received data at the physical layer to the transmitting path • **start** – Specifies the time (in seconds) until the loopback starts. Range is 1 to 3600. • **duration** – Specifies the duration of the loopback (in seconds). Range is 1 to 3600. If duration is not specified, the loopback test runs forever, until stopped. Use **no loopback** to disable the loopback test.
Assigning a name to the port	**name** ‹string›	
Selecting the transmit clock source	**tx-clock-source** {**loopback** | **internal** }	• **loopback** –Clock retrieved from the port's incoming (Rx) data • **internal** – Clock provided by internal oscillator.
Displaying list of interfaces bound to port	**show bind**	
Displaying loopback test status	**show loopback**	
Displaying the port status	**show status**	
Displaying the port statistics	**show statistics current** **show statistics interval** ‹interval-num› **show statistics all-intervals** **show statistics all**	
Clearing the statistics	**clear-statistics**	

6.7 SDH/SONET Ports

SDH/SONET ports are available when smart SFPs such as MiRICi-155 are provisioned (see *Smart SFPs*).

SDH (Synchronous Digital Hierarchy(and SONET (Synchronous Optical Network) are standardized transport protocols that transfer multiple digital bit streams over optical fiber using lasers or light-emitting diodes (LEDs). SONET is the United States version and SDH is the international version.

Standards and MIBs

SDH is defined by ITU-T G.707, G.781, G.782, G.783, and G.803. SONET is an ANSI standard defined in T1.105 and T1.119.

Benefits

SDH and SONET allow many different circuits from different sources to be transported simultaneously within one single framing protocol.

Functional Description

SDH is based on STM-1 which has a data rate of 155.52 Mbps, equivalent to STS-3. SONET is based on transmission at speeds of multiples of 51.840 Mbps, or STS-1.

Factory Defaults

By default, no SDH/SONET ports exist.

Configuring SDH/SONET Ports

➤ **To configure SDH/SONET ports:**

1. Provision a smart SFP such as MiRICi-155 and insert it in an Ethernet port (see *Smart SFPs*).
2. At the **config>port#** prompt, type:
   sdh-sonet <port>

   The prompt **config>port>sdh-sonet**(<port>)**#** is displayed.
3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the cell frame type	**frame-type** { **sdh** | **sonet** }	

Task	Command	Comments
Running loopback test on port	**loopback** {**local** | **remote** } [**start** <seconds>] [**duration** <seconds>]	• **local** – Returns the transmitted data at the physical layer to the receiving path • **remote** – Returns the received data at the physical layer to the transmitting path • **start** – Specifies the time (in seconds) until the loopback starts • **duration** – Specifies the duration of the loopback (in seconds). If duration is not specified, the loopback test runs forever, until stopped. Use **no loopback** to disable the loopback test.
Assigning a name to the port	**name** <string>	
Defining thresholds: • EED (Excessive Error Defect) – detected if the equivalent BER (bit error rate) exceeds the selected threshold parameters • SD (Degraded Signal Defect) – detected if the equivalent BER exceeds the selected threshold parameter.	**threshold** [**eed** { **1e-3** |**1e-4** | **1e-5** }] [**sd** { **1e-5** | **1e-6** | **1e-7** | **1e-8** | **1e-9** }]	
Selecting the transmit clock source	**tx-clock-source** {**internal** | **l oopback**}	• **internal** – Clock provided by internal oscillator • **loopback** –Clock retrieved from the port's incoming (Rx) data.
Displaying list of interfaces bound to port	**show bind**	
Displaying the port status	**show status**	

Task	Command	Comments
Displaying the port statistics	**show statistics current** **show statistics interval** ‹interval-num› **show statistics all-intervals** **show statistics all**	

6.8 GFP Ports

ETX-203AX uses GFP (Generic Framing Procedure) ports to provide a logical link to the TDM ports that become available when smart SFPs are inserted (see *Smart SFPs*).

ETX-203AX supports up to 16 GFP ports.

Factory Defaults

By default, no GFP ports exist. When a GFP port is created, it is configured as shown below.

Description	Default Value
Port name	GFP ‹n›
Enabling/disabling CRC-32 sequence of GFP packet payload	No FCS payload

Configuring GFP Logical Ports

➤ **To configure GFP logical ports:**

1. At the **config>port#** prompt, type:
   gfp <port>

   The port is created if it does not already exist, and the **config>port>gfp**(‹port›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Binding GFP port to E1 port	**bind e1** ‹port›	***Note**: Successful only if a smart SFP that provides the E1 port has been provisioned.*
Binding GFP port to T1 port	**bind t1** ‹port›	***Note**: Successful only if a smart SFP that provides the T1 port has been provisioned.*
Binding GFP port to E1 port	**bind e3** ‹port›	***Note**: Successful only if a smart SFP that provides the E3 port has been provisioned.*

Task	Command	Comments
Binding GFP port to T1 port	**bind t3** ‹port›	***Note**: Successful only if a smart SFP that provides the T3 port has been provisioned.*
Binding GFP port to SDH/SONET port	**bind sdh-sonet** ‹port›	***Note**: Successful only if a smart SFP that provides the SDH/SONET port has been provisioned.*
Enabling/disabling CRC-32 sequence of GFP packet payload	**fcs-payload**	Type **no fcs-payload** to disable
Assigning name to GFP port	**name** ‹string›	
Enabling/disabling scrambling on the GFP packet payload	**scrambler-payload**	***Note**: Not relevant for GFP port bound to SDH/SONET port*
Enabling/disabling VLI byte insertion on VCAT trunk or PDH	**vcat-header**	***Note**: Not relevant for GFP port bound to SDH/SONET port*
Displaying a list of interfaces bound to the port	**show bind**	
Displaying GFP port status	**show status**	

Example

➤ To configure GFP logical port 1:

- Bind to E1 port 1.

```
ETX-203AX>config>port$ gfp 1
ETX-203AX>config>port>gfp(1)$ bind e1 1
ETX-203AX>config>port>gfp(1)$ info detail
    name  "GFP 1"
    bind  e1  1
    no fcs-payload
    scrambler-payload rx-tx
    no vcat-header

ETX-203AX>config>port>gfp(1)$ show status
Name                 : GFP 1
Administrative Status : Up
Operation Status      : Up
ETX-203AX>config>port>gfp(1)$ exit
```

6.9 Logical MAC Ports

ETX-203AX uses logical MAC ports to connect flows to GFP (Generic Framing Procedure) ports that provide a logical link to the TDM ports that become available when smart SFPs are inserted (see *Smart SFPs*).

ETX-203AX supports up to 16 logical MAC ports.

Factory Defaults

By default, no logical MAC ports exist. When a logical MAC port is created, it is configured as shown below.

Description	Default Value
Port name	LOGICAL MAC ‹logical-mac-port-number›
Administrative status	Disabled
Port to which the logical MAC is bound	GFP 1
Ethernet tag protocol identifier	0×8100
Egress MTU	1790
Queue group profile	DefaultQueueGroup
L2CP profile	L2cpDefaultProfile

Configuring Logical MAC ports

➤ To configure logical MAC ports:

1. At the **config>port#** prompt, type **`logical-mac`** `<port>`

   The port is created if it does not already exist, and the **config>port>log-mac**(‹port›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Possible Values
Binding logical MAC port to GFP port	**bind gfp** ‹port›	• The GFP port must exist • Use the **no bind** form to remove the binding
Configuring OAM EFM descriptor	**efm descriptor** ‹efm-descriptor-index›	See *Configuring OAM EFM*
Setting maximum frame size to transmit (frames above the specified size are discarded)	**egress-mtu** ‹size›	Maximum size is 12,288
Associating a Layer-2 control processing profile with the port	**l2cp profile** ‹l2cp-profile-name›	
Running loopback test on port	**loopback** {**local**|**remote**} [**duration** ‹seconds›]	Use the **no loopback** command to stop the test
Assigning a name to the port	**name** ‹string›	
Associating a queue group profile with the port	**queue-group profile** ‹queue-profile-name›	
Setting the VLAN tagged frame ETH II frame Ethertype (tag protocol identifier)	**tag-ethernet-type** ‹**0x**0000-**0x**FFFF›	Ethernet type value: 0x0000–0xFFFF

Task	Command	Possible Values
Administratively enabling port	**no shutdown**	Using **shutdown** disables the port
Displaying the interfaces that are bound to the port	**show bind**	
Displaying link OAM (EFM) parameters	**show oam-efm**	
Displaying OAM EFM statistics	**show oam-efm-statistics**	
Displaying port status	**show status**	
Displaying port statistics	**show statistics**	
Clearing port statistics	**clear-statistics**	

Example

➤ To configure logical MAC port 1:

- Bind to GFP port 1.

```
ETX-203AX>config>port# logical-mac 1
ETX-203AX>config>port>log-mac(1)$ bind gfp 1
ETX-203AX>config>port>log-mac(1)$ no shutdown
ETX-203AX>config>port>log-mac(1)$ info detail
    name  "LOGICAL MAC 1"
    no shutdown
    bind  gfp  1
    tag-ethernet-type  0x8100
    egress-mtu  1790
    queue-group profile  "DefaultQueueGroup"
    l2cp profile  "L2cpDefaultProfile
ETX-203AX>config>port>log-mac(1)$ show status
Name                 : LOGICAL MAC 1
Administrative Status : Up
Operational Status    : Up
ETX-203AX>config>port>log-mac(1)$
```

6.10 Service Virtual Interfaces

Service virtual interfaces (SVIs) are logical ports used for flows. Service virtual interfaces (SVIs) are logical ports used to link router interfaces with Ethernet ports (via Layer-2 flows).

Note *ETX-203AX supports up to eight SVIs.*

Configuring Service Virtual Interfaces

You can enable and operate service virtual interfaces as explained below.

➤ **To configure the SVI parameters:**

1. Navigate to **configure port svi** ‹port-num› to select the SVI to configure.

   The **config›port›svi**(‹port-num›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Setting the port name	**name** ‹string›	
Administratively enabling SVI	**no shutdown**	Using **shutdown** disables the SVI

Chapter 7

Resiliency

This chapter describes features related to resiliency:

- *Ethernet Linear Protection*
- *Fault Propagation*
- *Network Interface Redundancy*.

7.1 Ethernet Linear Protection

ETX-203AX provides protection switching in the following modes for network ports per ITU-T G.8031:

- 1:1
- Unidirectional
- Using APS messages.

The triggers are:

- Port Signal loss
- CCM LOC
- ETH-AIS.

The protection time is as follows:

- One EVC pair — 50ms protection
- Four EVC pairs — 200ms protection.

Standards

ITU-T G.8031

Benefits

The Ethernet linear protection provides a way to protect the flows belonging to an EVC.

Functional Description

The protection is based on an EVC Termination Point (ETP). An ETP has one subscriber port and one or more transport ports. Multiple transport ports are used for protection only. There are two kinds of flows connected to the ETP ports, subscriber flows and transport flows.

- Subscriber flows run between UNIs and ETP subscriber port. You can define classification and policing on subscriber flows. You cannot define actions such as push and pop on subscriber flows, however you can define marking.
- Transport flows run between ETP transport ports and NNIs. You can define actions such as push, pop, and marking on transport flows.

Flows entering the ETP assign an internal CoS value to every frame using mapping profiles (priority-to-CoS) or by setting fixed CoS values.

Flows exiting the ETP perform queuing based on the internal CoS value using mapping profiles (CoS-to-queue).

ETP Flow Attributes

The following table shows which attributes you can configure for ETP flows.

Table 7-7. ETP Flow Attributes

Attribute	Subscriber (UNI to ETP)	Subscriber (ETP to UNI)	Transport (NNI to ETP)	Transport (ETP to NNI)
Ingress port	Required	Required	Required	Required
Egress port	Required	Required	Required	Required
Classifier profile	Required, with any type of criteria	Required, with criteria: Unclassified VLAN	Required, with criteria: SP VLAN	Required, with criteria: Unclassified
Policer profile	Optional	Optional	Not allowed	Not allowed
Queue / block	Not allowed	Required, with queue mapping profile classified by CoS	Not allowed	Required, with queue mapping profile classified by CoS
CoS	Required, with CoS mapping profile	Not allowed	Required, with CoS mapping profile	Not allowed
VLAN tag (push)	Optional	Not allowed	Not allowed	For at least one of the actions, marking profile classified by CoS
Mark	Required, with marking profile classified by CoS	Required, with CoS mapping profile	For at least one of the actions, CoS mapping profile	
VLAN tag (pop)	Not allowed	Optional		Not allowed
Drop	Optional	Optional	Optional	Optional

EVC Protection Switching

EVC protection (1:1) is based on the ETP model. One of the transport ports is the working transport entity and the other port serves as the protection transport entity.

Monitoring both working and protection transport entity is done via MEPs exchanging CCMs. In addition the protection transport optionally runs APS protocol.

Master and Slave ETPs

You can define one master ETP and several slave ETPs. The master ETP must have all the configuration of the protection, same as single ETP. The slave ETPs point to the master ETP via **master** command and bind each port ID to working/protection.

The master ETP index MUST be lower than the index of the slave ETPs. You must create the master ETP before creating the slave ETPs.

EVC and OAM

On each transport entity you must define a MEP in order to monitor the connection using CCM. The MEPs must be activated so that the protection switching mechanism can monitor both working and protection transport entities. The monitoring is accomplished by exchanging CCMs as defined in ITU-T Rec. Y.1731.

In addition the MEP can be defined to perform other Y.1731 services such as measuring delay and loss on the specific EVC.

EVC Fault Propagation

You can define fault propagation based on EVC failure detection (ETP operation status) to shut down the UNIs that connect to it. The fault trigger can be on of the following:

- In case of protection: the signal failure trigger MEP for ETP transport ports
- In other cases: the NNI operation status.

EVC Loopback

A loopback can be activated on any of the transport ports towards the network and on the subscriber port towards the user or network.

In most cases you would activate a loop on the subscriber port towards the network, thus you can loop the EVC traffic without affecting protection.

If you wish to run a loop on a specific EVC path when you activate the loop on the transport ports, you have two options:

- Loopback on a transport port affects OAM, as any traffic EVC path redundancy is triggered if present.
- Loopback only data without affecting redundancy.

Factory Defaults

By default, no ETPs are configured.

When you create an ETP port, by default it is configured as follows:

- Name = "ETP ‹etp-name› Subscriber Port ‹port-index›" or ""ETP ‹etp-name› Transport Port ‹port-index›", according to whether port is subscriber or transport
- Administratively enabled.

When you first enter the ETP protection level, by default the protection is configured as follows:

```
ETX-203AX#configure etps etp ETP1 protection
ETX-203AX>config>etps>etp(ETP1)>protection$ info detail
    shutdown
    no master-etp
    mode  bi-directional-1-to-1
    no aps-protocol
    revertive
    wait-to-restore  300

ETX-203AX>config>etps>etp(ETP1)>protection$
```

Configuring ETPs

This section describes how to configure ETPs.

➤ **To configure ETPs:**

1. Navigate to **configure etps etp** ‹name› to select the ETP to configure.

   The ETP is created if it does not already exist, and the **config›etps›etp**(‹name›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Configuring ETP port	**port** {**subscriber** | **transport**} ‹port-id›	Use the **no** form to remove the port The port-id range is 1–2 See *Configuring ETP Ports* for more information
Configuring ETP protection	**protection**	See *Configuring ETP Protection* for more information
Displaying ETP status	**show status**	
Displaying ETP statistics	**show statistics running**	
Displaying flows corresponding to ETP	**show flows-summary**	
Clearing ETP statistics	**clear-statistics**	

Configuring ETP Ports

This section describes how to configure ETP ports.

➤ **To configure ETP ports:**

1. Navigate to **configure etps etp** ‹name› to select the ETP to configure.

The **config>etps>etp**(<name>)**#** prompt is displayed.

2. Type the following command to configure a port, where **port-index** can be 1 for subscriber ports, or 1–2 for transport ports:
   port {**subscriber** | **transport**} <port-index>

   The prompt is displayed according to whether you typed **subscriber** or **transport**:
   config>etps>etp(<name>)**>port**(**subscriber**/<port-index>)**#**
   config>etps>etp(<name>)**>port**(**transport**/<port-index>)**#**

3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Activating loopback	**loopback** [**local** | **remote**] [**duration** <seconds>]	
Assigning name to ETP port	**name** <string>	
Displaying loopback status	**show loopback**	
Displaying status	**show status**	
Administratively enabling ETP port	**no shutdown**	Using **shutdown** disables the port ***Note**: When the port is created, it is enabled by default.*

Example

➤ **To configure an ETP:**

- Name = ETP1
- Port members = subscriber 1, transport 1, transport 2.

```
ETX-203AX# configure etps etp ETP1
ETX-203AX>config>etps>etp(ETP1)# port subscriber 1
ETX-203AX>config>etps>etp(ETP1)>port(subscriber/1)# exit
ETX-203AX>config>etps>etp(ETP1)# port transport 1
ETX-203AX>config>etps>etp(ETP1)>port(transport/1)# exit
ETX-203AX>config>etps>etp(ETP1)# port transport 2
ETX-203AX>config>etps>etp(ETP1)>port(transport/2)# exit
ETX-203AX>config>etps>etp(ETP1)#
```

Configuring ETP Protection

To configure ETP protection, you define the working and protection ports, as well as other protection parameters.

➤ **To configure ETP protection:**

1. Navigate to **configure etps etp** <name> **protection** to configure protection for the selected ETP.

   The **config>etps>etp**(<name>)**>protection#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Defining APS protocol for ETP	**aps-protocol**	
Defining transport port ID for protection or working port	**bind** {**protection** | **working**} **transport** ‹protection-port›	
Clearing the active near end lockout of Protection, Forced Switch, Manual Switch, WTR state, or Exercise command	**clear**	
Forcing normal traffic signal to be selected from the protection transport entity, meaning jump to next port even if it is down	**force-switch**	
Preventing a working signal from being selected from the protection transport entity, effectively disabling the protection group	**lockout**	
Forcing normal traffic signal to be selected from the protection transport entity in the absence of failure of working or protection transport entity, meaning jump to next port only if it is not down	**manual-switch**	
Defining master ETP	**master-etp** ‹etp-name›	
Configuring protection mode	**mode** {**uni-directional-1-plus-1** | **bi-directional-1-plus-1** | **bi-directional-1-to-1**}	
Indicating if mode is revertive	**revertive**	
Defining signal failure trigger	**sf-trigger** { **protection** | **working** } **mep** ‹md-id› ‹ma-id› ‹mep-id›	
Defining time between recovery and resumption of transmission	**wait-to-restore** ‹seconds›	
Displaying protection status	**show status**	
Administratively enabling ETP protection	**shutdown**	

Example

➤ To configure ETP protection:

- ETP name = ETP1, port members = subscriber 1, transport 1, transport2
- Protection mode = bidirectional 1:1

- APS protocol used for protection
- Working port = transport 1
- Protection port = transport 2
- Signal failure triggers = working MEP: MD 3 MA 2 MEP 1, protection MEP: MD 4 MA 2 MEP 1

Note *The MEPs must be active.*

- Revertive mode
- Time to wait before restoring transmission = 300 seconds.

```
ETX-203AX# configure etps etp ETP1 protection
ETX-203AX>config>etps>etp(ETP1)>protection# mode bi-directional-1-to-1
ETX-203AX>config>etps>etp(ETP1)>protection# aps-protocol
ETX-203AX>config>etps>etp(ETP1)>protection# bind working transport 1
ETX-203AX>config>etps>etp(ETP1)>protection# bind protection transport 2
ETX-203AX>config>etps>etp(ETP1)>protection# sf-trigger working mep 3 2 1
ETX-203AX>config>etps>etp(ETP1)>protection# sf-trigger protection mep 4 2 1
ETX-203AX>config>etps>etp(ETP1)>protection# revertive
ETX-203AX>config>etps>etp(ETP1)>protection# wait-to-restore 300
ETX-203AX>config>etps>etp(ETP1)>protection# no shutdown
ETX-203AX>config>etps>etp(ETP1)>protection#
```

7.2 Fault Propagation

Fault propagation enables you to specify which interfaces to shut down if link failure occurs.

Standards

IEEE 802.1ag-D8

ITU-T Y.1731

Benefits

You can ensure that you are sending packets via links that have not failed. Failures are propagated end-to-end via OAM CFM messages.

Functional Description

In the network-to-user or user-to-network direction, if a link fails for which fault propagation is enabled, the corresponding port shuts down or OAM CFM message indicating failure is sent, thus signaling the connected CPE to stop forwarding frames through the link.

You can enable fault propagation to be triggered by failure detection on a network/user interface, which causes a user-configurable action (such as deactivation or OAM CFM message indicating failure sent) to be performed on a

user/network interface. You can enable fault propagation in the network-to-user or user-to-network direction, for a pair of interfaces such as Ethernet ports, MEPs, and ETPs.

You can define the following when you enable fault propagation for a pair of interfaces:

- Trigger:
  - Failure detected on port or MEP:
    - LOS – Link down detected
  - Failure detected on MEP:
    - OAM CFM AIS – Alarm indication signal detected
    - OAM CFM LOC – Loss of continuity detected
    - OAM CFM RDI – Remote defect indication detected
    - OAM CFM Interface status TLV –Remote port failure detected.
- Action to take when fault propagation is triggered:
  - Action performed on port:
    - Interface-deactivation
  - Action performed on MEP:
    - Send OAM CFM alarm indication signal to indicate failure

    Or
    - Send OAM CFM interface status TLV to indicate failure.
- Wait-to-restore time – The time period before enabling the shut-down interface or ceasing to send OAM CFM interface status once the failed interface has been restored.

Factory Defaults

By default, no fault propagation is configured. When you configure fault propagation for a particular interface pair, the default configuration is as follows:

- No trigger defined for fault detection
- No action defined to be performed when fault is detected
- Wait-to-restore time = 0.

Configuring Fault Propagation

Follow this procedure to configure fault propagation:

1. Add a fault propagation entry for a pair of interfaces
2. Configure the fault propagation parameters for the entry:
   a. Specify the trigger(s)
   b. Specify the action
   c. Specify the wait-to-restore time if you do not want the default value 0.

Adding Fault Propagation Entry

➤ **To add fault propagation for a pair of interfaces:**

1. Navigate to **configure fault.**
2. Type the command:
   `fault-propagation` `<from-interface>` **`to`** `<to-interface>` and enter the desired interfaces, as shown in *Table 7-8*.

   A prompt is displayed:
   config>fault>fp(<from-interface>**/to/**<to-interface>**)$**
3. Configure the fault propagation parameters as needed (see *Configuring Fault Propagation Parameters*).

Table 7-8. Fault Propagation Command Options

From Interface	To Interface	Command
MEP	Ethernet port	**fault-propagation mep** <md-id> <ma-id> <mep-id> **to port ethernet** <port>
ETP	Ethernet port	**fault-propagation etp** <etp-name> **to port ethernet** <port>
Ethernet port	MEP	**fault-propagation port ethernet** port> **to mep** <to-mdid> <to-maid> <to-mepid>
Ethernet port	Ethernet port	**fault-propagation port ethernet** port> **to port ethernet** <port>
ETP	MEP	**fault-propagation etp** <etp-name> **to mep** <to-mdid> <to-maid> <to-mepid>
MEP	MEP	**fault-propagation mep** <md-id> <ma-id> <mep-id> **to mep** <to-mdid> <to-maid> <to-mepid>

Configuring Fault Propagation Parameters

➤ **To configure fault propagation parameters:**

1. Navigate to **configure fault fault-propagation** <from-interface> **to** <to-interface> to select the fault propagation entry to configure.

   A prompt is displayed:
   config>fault>fp(<from-interface>**/to/**<to-interface>**)#**
2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the trigger(s)	**trigger** { **los** | **oam-cfm-loc** | **oam-cfm-rdi** | **oam-cfm-if-status-tlv** | **oam-cfm-ais** }	Typing **no** before the command removes the specified trigger ***Note**: The **`los`** trigger is allowed only if the from-interface is an Ethernet port or ETP. The OAM CFM triggers are allowed only if the from-interface is a MEP.*

Task	Command	Comments
Specifying the action to take when fault propagation is triggered	**action-on-group** { **interface-deactivation** | **oam-cfm-if-status-tlv** | **oam-cfm-ais** }	Typing **no action-on-group** removes the action *Note: The action* **interface-deactivation** *is allowed only if the to-interface is an Ethernet port. The action* **oam-cfm-if-status-tlv** *or* **oam-cfm-ais** *is allowed only if the to-interface is a MEP.*
Specifying the wait-to-restore time	**wait-to-restore** ‹seconds›	The range is 0–3600

Example

➤ To enable fault propagation:

- From Ethernet port 3
- To MEP 3 in maintenance association 3 in maintenance domain 2 (this example assumes the MEP has been created)
- Trigger: LOS
- Action: Send OAM CFM interface status TLV
- Wait-to-restore time = 120 seconds.

```
ETX-203AX# config fault
ETX-203AX>config>fault# fault-propagation port ethernet 3 to mep 2 3 3
ETX-203AX>config>fault>fp(port/ethernet/3/to/mep/2/3/3)$ trigger los
ETX-203AX>config>fault>fp(port/ethernet/3/to/mep/2/3/3)$ action-on-g
oam-cfm-if-stat
ETX-203AX>config>fault>fp(port/ethernet/3/to/mep/2/3/3)$ wait-to-restore 120
ETX-203AX>config>fault>fp(port/ethernet/3/to/mep/2/3/3)$ info detail
    action-on-group  oam-cfm-if-status-tlv
    trigger  los
    no trigger  oam-cfm-loc
    no trigger  oam-cfm-if-status-tlv
    no trigger  oam-cfm-rdi
    wait-to-restore  120

ETX-203AX>config>fault>fp(port/ethernet/3/to/mep/2/3/3)$
```

➤ To enable fault propagation:

- From Ethernet port 1
- To Ethernet port 3
- Trigger: LOS
- Action: Shut down Ethernet port
- Wait-to-restore time = 90 seconds.

```
ETX-203AX# config fault
ETX-203AX>config>fault# fault-prop port ethernet 1 to port ethernet 3
ETX-203AX>config>fault>fp(port/ethernet/1/to/port/ethernet/3)$ trigger los
ETX-203AX>config>fault>fp(port/ethernet/1/to/port/ethernet/3)$ action
interface-deact
ETX-203AX>config>fault>fp(port/ethernet/1/to/port/ethernet/3)$
wait-to-restore 90
ETX-203AX>config>fault>fp(port/ethernet/1/to/port/ethernet/3)$ info detail
    action-on-group  interface-deactivation
    trigger  los
    no trigger  oam-cfm-loc
    no trigger  oam-cfm-if-status-tlv
    no trigger  oam-cfm-rdi
    wait-to-restore  90

ETX-203AX>config>fault>fp(port/ethernet/1/to/port/ethernet/3)$
```

➤ To enable fault propagation:

- From MEP 1 in maintenance association 1 in maintenance domain 1 (this example assumes the MEP has been created)
- To MEP 2 in maintenance association 2 in maintenance domain 1 (this example assumes the MEP has been created)
- Trigger: Any OAM CFM error
- Action: Send OAM CFM interface status TLV
- Wait-to-restore time = 300 seconds.

```
ETX-203AX# config fault
ETX-203AX>config>fault# fault-propagation mep 1 1 1 to mep 1 2 2
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ trigger oam-cfm-loc
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ trigger oam-cfm-rdi
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ trigger oam-cfm-if-status-
tl
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ action-on-g
oam-cfm-if-stat
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ wait-to-restore 300
ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$ info detail
    action-on-group  oam-cfm-if-status-tlv
    no trigger  los
    trigger  oam-cfm-loc
    trigger  oam-cfm-if-status-tlv
    trigger  oam-cfm-rdi
    wait-to-restore  300

ETX-203AX>config>fault>fp(mep/1/1/1/to/mep/1/2/2)$
```

Disabling Fault Propagation

➤ To disable fault propagation for a pair of interfaces:

1. Navigate to **configure fault.**
2. Type the command:
   no fault-propagation ‹from-interface› **to** ‹to-interface**>** to select the interfaces for which to disable fault propagation.

The specified fault propagation is disabled.

7.3 Network Interface Redundancy

Two network interfaces operate redundant to each other, either as a single logical link (LAG) or two separate links (1:1).

- **Link aggregation (LAG) mode according to IEEE 802.3-2005**. In this mode, both ports receive traffic at the same time and one port transmits. If the transmitting port fails, ETX-203AX switches to the standby link. Both network ports must be enabled. If activated, LACP control frames are periodically transmitted in order to locate failures as they occur.
- **1:1 bidirectional protection (redundancy) mode.** In this mode, only one port is active at a time to carry traffic. If it fails, the second port takes over. The recovery mode (revertive or non-revertive) and the restoration time in revertive mode can be selected according to the application requirements.

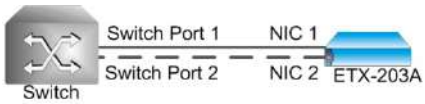


Figure 7-7. Link Aggregation between a Switch and ETX-203AX

When deciding whether to operate with LAG or protection, you can consider the following if protection without LACP is acceptable in your application:

- Protection – You can configure parameters such as revertive/non-revertive mode, the restoration time in revertive mode, forcing active link, etc., but the switchover time to the standby link is longer than for LAG
- LAG – The switchover time to the standby link is shorter than for protection, but you can't configure the parameters mentioned above.

Standards and MIBs

IEEE 802.3-2005

Benefits

ETX-203AX can continue to route traffic even if one of the network ports fails.

Functional Description

Link Aggregation

The two Gigabit Ethernet ports can be operated as a single logical interface, using link aggregation in accordance with IEEE 802.3-2005. The two ports must be connected to the same switch/router, as shown in *Figure 7-8*.

The equipment connected to the GbE ports must use compatible switching criteria for redundancy to be available:

- For networks using Layer 2 switching – The criterion is signal loss
- For networks using Layer 3 routing – The router must support IEEE 802.3-2005 or other link aggregation protocol that views the aggregated link as a single logical interface.

Figure 7-8. Network Link Aggregation Redundancy Mode

Using link aggregation inherently provides redundancy, because if one of the GbE ports fails, the other can continue transferring traffic. Failure of a link is detected by sensing the loss of valid signals, or receiving a failure report via Link Aggregation Control Protocol (LACP) if applicable, in which case all traffic is sent through the other link.

1:1 Bidirectional Redundancy

As an alternative to link aggregation, the two ETX-203AX network ports can be configured for 1:1 bidirectional mode. With this mode, two topologies can be used:

- Connection of both ports to the same switch/router, as shown in *Figure 7-8*.
- Connection of the ports to different switch/routers, as illustrated in *Figure 7-9*. The main advantage of this topology is its higher availability, because each port can be routed along a different path through the network. This topology is also referred to as dual homing.

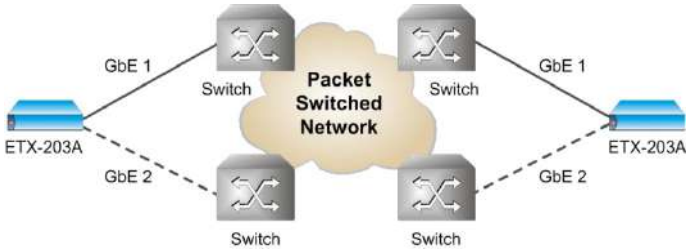


Figure 7-9. 1:1 Bidirectional Redundancy Mode (Dual Homing)

With 1:1 bidirectional redundancy mode, at any time only one of the ports is actively carrying traffic, and the other port serves as the backup port. A RAD proprietary redundancy algorithm, based on loss of GbE signal, is used to detect line failure. The protection switching (flipping) time is less than 1 second. It also depends on the network "relearning" time or aging.

The recovery mode after protection switching can be selected in accordance with the application requirements:

- Non-revertive mode –ETX-203AX does not automatically flip back after the failed port returns to normal operation, but only when the currently used port fails, or after a manual flip command.
- Revertive mode –ETX-203AX flips back to the original port when it returns to normal operation. Flipping back can be delayed by specifying a restoration time, during which alarms are ignored. As a result, ETX-203AX starts evaluating the criteria for protection switching (flipping) only after the restoration time expires, thereby ensuring that another flip cannot occur before the specified time expires.

Factory Defaults

By default, neither LAG nor bidirectional redundancy is enabled.

Configuring LAG

This section explains how to define a link aggregation group (LAG) and enable link aggregation control protocol (LACP). ETX-203AX supports one LAG.

Note *In order to enable LACP for the LAG, the ports bound to the LAG must be associated with an L2CP profile that specifies peer action for MAC 0x02.*

➤ To configure the LAG:

1. Navigate to **configure port lag 1**.

   The **config>port>lag(1)#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning an admin key to the LAG to indicate the port speed	**admin-key** {**giga-ethernet** | **fast-ethernet** }	You must define admin key before binding ports to the LAG
Adding a port to the LAG	**bind ethernet** ‹port-num›	Using **no** before **bind** removes a link from the LAG

Task	Command	Comments
Assigning method of distributing traffic within LAG	**distribution-method** {**src-mac** | **dest-mac** | **src-or-dest-mac** | **src-and-dest-mac** | **src-ip** | **dest-ip** | **src-dest-mac-ip** | **round-robin** | **source-port** | **one-to-one**}	**src-mac** – Packets are distrubuted according to their source MAC addresses **dest-mac** – Packets are distrubuted according to their destination MAC addresses **src-or-dest-mac** – Packets are distrubuted according to their source or destination MAC addresses **src-and-dest-mac** – Packets are distrubuted according to their source and destination MAC addresses **src-ip** – Packets are distrubuted according to their source IP addresses **dest-ip** – Packets are distrubuted according to their destination IP addresses **src-dest-mac-ip** – Packets are distrubuted according to their source and destination MAC an IP addresses **round-robin** – Packets are distrubuted evenly across all of the links **source-port** – Packets are distrubuted according to their source port

Task	Command	Comments
Enabling LACP and setting LACP parameters	**lacp** [**tx-activity** {**active** | **passive**}] [**tx-speed** { **slow** | **fast** }] [**sys-priority** ‹sys-priority›]	**tx-activity** – Defines operation mode: • **active** – LAG interface periodically transmits LACP frames (LACPDUs) to all links with LACP enabled • **passive** – LAG interface does not initiate the LACP exchange, but replies to received LACPDUs. **tx-speed** – Defines time to wait before sending LACP frames: • **fast** – Three seconds • **slow** – 90 seconds. **sys-priority** – Determines aggregation precedence. If there are two partner devices competing for the same LAG, LACP compares the priorities for each grouping of ports. The LAG with the lower priority is given precedence. Allowed values **0–65535** Defaults: • If you type **lacp** without specifying **tx-activity**, it is set to **active** • If you type **lacp** without specifying **tx-speed**, it is set to **fast**. Typing **no lacp** disables LACP protocol
Administratively enabling LAG	**no shutdown**	Using **shutdown** disables the LAG
Displaying bind status	**show bind**	
Displaying the LAG members statistics	**show lacp-statistics**	
Displaying LAG members status	**show lacp-status**	
Displaying LAG member status	**show members-status**	
Displaying LAG member statistics	**show members-statistics**	

Example

➤ To define LAG 1:

- L2CP profile mac2peer, with mac0x02 set to peer action

- LAG members – Ethernet ports 1 and 2, with assigned L2CP profile mac2peer
- LACP operation mode – Active
- LACP timeout – Fast
- Distribution method – Source port
- System priority – 40,000.

```
ETX-203AX#configure port l2cp-profile mac2peer
ETX-203AX>config>port>l2cp-profile(mac2peer)$ mac 0x02 peer
ETX-203AX>config>port>l2cp-profile(mac2peer)$ exit
ETX-203AX>config>port# eth 1 l2cp profile mac2peer
ETX-203AX>config>port# eth 2 l2cp profile mac2peer
ETX-203AX>config>port# lag 1
ETX-203AX>config>port>lag(1)$ bind ethernet 1
ETX-203AX>config>port>lag(1)$ bind ethernet 2
ETX-203AX>config>port>lag(1)$ lacp tx-activity active tx-speed fast
sys-priority 40000
ETX-203AX>config>port>lag(1)$ distribution-method source-port
ETX-203AX>config>port>lag(1)$ no shutdown
ETX-203AX>config>port>lag(1)$
```

➤ To display the LACP status of the LAG members:

```
ETX-203AX#configure port lag 1
ETX-203AX>config>port>lag(1)# show lacp-status eth 1
Ports
------------------------------------------------------------
                  Actor                Partner
Port Number     : 1                    0
Port Priority   : 32768                0
System ID       : 000000000000         000000000000
System Priority                        0
Operational Key : 0                    0
Activity        : Active               Passive
Timeout         : Long                 Long
Synchronized    : No                   No
Collecting      : No                   No
Distributing    : No                   No
ETX-203AX>config>port>lag(1)#
```

➤ To display the LACP statistics of the LAG members:

```
ETX-203AX#configure port lag 1
ETX-203AX>config>port>lag(1)# show lacp-statistics ethernet 1
LACP
-----------------------------------------------------------------
Port Number               : 1
Rx LACP Frames            : 0
Rx Marker Frames          : 0
Rx Marker response Frames : 0
Rx Unknown Frames         : 0
Rx Illegal Frames         : 0
Tx LACP Frames            : 1
Tx Marker Frames          : 0
Tx Marker response Frames : 0
Port Number               : 2
Rx LACP Frames            : 0
Rx Marker Frames          : 0
Rx Marker response Frames : 0
Rx Unknown Frames         : 0
Rx Illegal Frames         : 0
Tx LACP Frames            : 1
Tx Marker Frames          : 0
Tx Marker response Frames : 0
ETX-203AX>config>port>lag(1)#
```

Configuring Link Protection

Configuring a 1:1 protection requires defining an Ethernet group.

➤ To define an Ethernet group:

- At the Protection context (config>protection), enter:
  ethernet-group <group-id>

  The system switches to the context of the specified Ethernet group (config>protection>eth-group(<group-id>)).

➤ To add/remove protection and working ports – in manual mode:

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter
  bind ethernet primary <port>
- To remove protection and working ports, enter:
  no bind ethernet primary

➤ To add/remove protection and working ports – in 1–to–1 mode:

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter:
  bind ethernet [**primary** <port>] [**secondary** <port>]
- To remove protection and working ports, enter:
  no bind ethernet primary
  no bind ethernet secondary

➤ To define the operation mode:

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter:
  oper-mode { **1-to-1** | **manual** }

➤ To define the port recovery mode as revertive:

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter:
  revertive

  Traffic is switched back to the primary port after it recovers.

➤ To define the port recovery mode as non-revertive:

- At the Ethernet Group context config>protection>eth-group(<group id>)), enter:
  no revertive

  Traffic continues being transmitted over the secondary port after the primary port recovers.

➤ To define the time between recovery and resumption of transmission

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter
  wait-to-restore <seconds>

  The primary port resumes transmitting traffic once the specified time has been restored and the specified time has elapsed. You can choose between 1 and 720 seconds.

➤ To define the period of time that the failed link stops transmitting to report the failure:

- At the Ethernet Group context (config>protection>eth-group(<group id>)), enter
  tx-down-duration-upon-flip <seconds>

  The secondary port resumes transmitting after the specified 'reporting' time. You may specify a time in the range between 0 and 30 seconds. This function is useful if there is no autonegotiation between the link end points.

➤ To force a port to transmit:

- At the EthernetGroup context (config>protection>eth-group(<group id>)), enter:
  force-active-port ethernet <port>

  The specified port is set to be active. You can choose the primary port (1) or the secondary port (2).

  - Port 1. Port 1 is configured as a permanently active link. Even if port 1 fails, the traffic is not switched to the standby port.
  - Port 2. Port 2 is configured as a permanently active link. Even if port 2 fails, the traffic is not switched to the standby port.

To specify that neither of the ports is forced to remain active, enter:
no force-active-port

➤ To display the Ethernet group status:

- At the EthernetGroup context (**config>protection>eth-group**(<group id>)), enter:
  show status

  The Ethernet group status parameters are displayed.

Example

➤ To define link protection:

- Ethernet group 1
- Protection port – Ethernet port 1
- Working port – Ethernet port 2
- Operation mode –One-to-one.

```
ETX-203AX#configure protection
ETX-203AX>config>protection# ethernet-group 1
ETX-203AX>config>protection>eth-group(1)# bind eth primary 1 secondary 2
ETX-203AX>config>protection>eth-group(1)# oper-mode 1-to-1
ETX-203AX>config>protection>eth-group(1)#info detail
    bind  ethernet primary  1 secondary  2
    oper-mode  1-to-1
    revertive
    wait-to-restore  0
    tx-down-duration-upon-flip  0
    no shutdown
ETX-203AX> config>protection>eth-group(1)#
```

Chapter 8

Networking

This chapter describes networking features:

- *Flows*
- *Layer-2 Control Processing*
- *OAM*
- *Quality of Service (QoS)*
- *Router*.

8.1 Flows

ETX-203AX supports up to 192 unidirectional Ethernet flows, which can be used to provide E-line or E-LAN service delivery over Metro Ethernet networks. Each Ethernet flow is unidirectional and connects two ports.

This section explains how to define the flows according to specific criteria such as VLAN. You can use classifier profiles to specify the criteria for flows. The classification is per port and is applied to the ingress port of the flow.

You can configure a unidirectional hub (UDH) by defining up to five flows with the same ingress port, classifier profile, and policer aggregate, and different egress ports. Up to seven UDH groups can be defined per device. The egress ports must be physical Ethernet ports, not virtual ports such as SVI, ETP, etc. Only one queue-mapping profile and one marking profile can be used for the flows in a UDH group, however VLAN tag editing can be different in the different flows.

Standards

IEEE 802.3x

Benefits

The user traffic can be classified into different Ethernet flows (EVC.CoS) to provide services in a flexible manner.

Functional Description

Packets can be classified by means of their VLAN IDs and other criteria, fully specified in *Defining Classifier Profiles*.

Classifications that apply to the same port are allowed in the combinations shown in *Table 8-9*. The priority shown is used to determine which classification

is used if incoming packets for the port fit the criteria of more than one classification. Priority 4 is the lowest, priority 1 is the highest. NNI indicates ingress network port, UNI indicates ingress user port.

You can perform marking and tagging actions on the outer and inner VLAN such as adding, replacing, or removing, as well as marking with p-bit. Only certain combinations of actions on the outer and inner VLAN are allowed. If no action is performed for the outer VLAN, then for the inner VLAN there must be no action performed. *Table 8-10* shows valid action combinations on ingress frame tags and the resulting egress frame tags and p-bits, according to whether the ingress frame is untagged, contains one VLAN, or is double-tagged. Any combination not shown in the table is not supported.

In the descriptions, VLAN refers to the service provider (outer) VLAN, previously referred to as SP-VLAN, while inner VLAN refers to the Customer Entity VLAN, previously referred to as CE-VLAN.

Table 8-9. Classification Combinations

Classification	Other classifications allowed on same ingress port	Range	Max number ranges	Priority	NNI/UNI
Unclassified (all-to-one bundling)	VLAN VLAN + IP precedence VLAN + DSCP VLAN + VLAN priority VLAN + Non-IP VLAN priority IP precedence DSCP Source MAC address Destination MAC address Source IP address Destination IP address Non-IP Ethertype Untagged	–	1	4	Both
VLAN *See Note 1*	VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + source MAC address VLAN + destination MAC address VLAN + source IP address VLAN + destination IP address VLAN + inner VLAN VLAN + VLAN priority + inner VLAN VLAN + Ethertype Source MAC address Destination MAC address Source IP address Destination IP address Ethertype Unclassified Untagged	0–4094	10	3	Both

Classification	Other classifications allowed on same ingress port	Range	Max number ranges	Priority	NNI/UNI
VLAN + VLAN priority *See Note 1*	VLAN VLAN + source MAC address VLAN + destination MAC address VLAN + source IP address VLAN + destination IP address VLAN + inner VLAN VLAN + Ethertype Source MAC address Destination MAC address Source IP address Destination IP address Unclassified Ethertype Untagged	0–4094 + 0–7	10	2	Both
VLAN + IP precedence	VLAN Source MAC address Destination MAC address Source IP address Destination IP address Unclassified Ethertype Non-IP Untagged	0–4094 + 0–7	10	2	Both
VLAN + DSCP	VLAN Source MAC address Destination MAC address Source IP address Destination IP address Unclassified Ethertype Non-IP Untagged	0–4094 + 0–63	10	2	Both
VLAN + source MAC address	VLAN VLAN + VLAN priority VLAN + inner VLAN VLAN + VLAN priority + inner VLAN	0–4094 + MAC address	One VLAN value + one MAC address range	2	Both
VLAN + destination MAC address	VLAN VLAN + VLAN priority VLAN + inner VLAN VLAN + VLAN priority + inner VLAN	0–4094 + MAC address	One VLAN value + one MAC address range	2	Both
VLAN + source IP address	VLAN VLAN + VLAN priority VLAN + inner VLAN VLAN + inner VLAN + VLAN priority	0–4094 + IP address	One VLAN value + one IP address range	2	Both

Classification	Other classifications allowed on same ingress port	Range	Max number ranges	Priority	NNI/UNI
VLAN + destination IP address	VLAN VLAN + VLAN priority VLAN + inner VLAN VLAN + inner VLAN + VLAN priority	0–4094 + IP address	One VLAN value + one IP address range	2	Both
VLAN + inner VLAN	VLAN VLAN + VLAN priority VLAN + VLAN priority + inner VLAN VLAN + source MAC address VLAN + destination MAC address VLAN + source IP address VLAN + destination IP address VLAN + Ethertype	Single value for VLAN and range for inner VLAN	10 (for inner range)	3	Both
VLAN + VLAN priority + inner VLAN	VLAN VLAN + inner VLAN VLAN + source MAC address VLAN + destination MAC address VLAN + source IP address VLAN + destination IP address VLAN + Ethertype	Single value for VLAN and range for inner VLAN	10 (for inner range)	3	Both
VLAN + non-IP	Unclassified VLAN VLAN + IP precedence VLAN + DSCP Source MAC address Destination MAC address Source IP address Destination IP address Ethertype Untagged	0–4094	10	1	Both
VLAN + Ethertype	VLAN VLAN + VLAN priority VLAN +inner VLAN VLAN + inner VLAN + VLAN priority	Ethertype + 0–4094	One Ethertype value with one VLAN value	2	Both
VLAN priority	Unclassified Source MAC address Destination MAC address Source IP address Destination IP address Ethertype Untagged	0–7	10	2	Both
IP precedence	Unclassified Source MAC address Destination MAC address Source IP address Destination IP address Non-IP Ethertype	0–7	10	2	Both

Classification	Other classifications allowed on same ingress port	Range	Max number ranges	Priority	NNI/UNI
DSCP	Unclassified Source MAC address Destination MAC address Source IP address Destination IP address Non-IP Ethertype	0–63	10	2	Both
Source MAC address	VLAN VLAN priority VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + Non-IP IP precedence DSCP Unclassified Non-IP Untagged	MAC address	1	1	Both
Destination MAC address	VLAN VLAN priority VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + Non-IP IP precedence DSCP Unclassified Non-IP Untagged	MAC address	1	1	Both
Source IP address *See Note 2*	VLAN VLAN priority VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + Non-IP IP precedence DSCP Unclassified Non-IP Untagged	IP address	1	1	Both

Classification	Other classifications allowed on same ingress port	Range	Max number ranges	Priority	NNI/UNI
Destination IP address *See Note 2*	VLAN VLAN priority VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + Non-IP IP precedence DSCP Unclassified Non-IP Untagged	IP address	1	1	Both
Non-IP	Unclassified VLAN + IP precedence VLAN + DSCP Source MAC address Destination MAC address Source IP address Destination IP address Ethertype	–	1	1	Both
Ethertype	Unclassified VLAN VLAN priority VLAN + VLAN priority VLAN + IP precedence VLAN + DSCP VLAN + non-IP IP precedence DSCP Non-IP Untagged	1	1	1	Both
Untagged	Unclassified VLAN VLAN priority VLAN + VLAN priority VLAN + DSCP Source MAC address Destination MAC address Source IP address Destination IP address Ethertype	–	1	2	Both

Note 1 *If you combine the classifications VLAN and VLAN + VLAN priority, the VLANs must be different.*

For example, the following combination is not allowed:

- *VLAN 100*
- *VLAN 100 + p-bit 5.*

The following combination is allowed:

- *VLAN 100*
- *VLAN 200 + p-bit 5.*

You can achieve the combination VLAN 100 and VLAN 100 + p-bit 5 via the following:

- *VLAN 100 + p-bit 0–4, 6–7*
- *VLAN 100 + p-bit 5.*

Note 2 *If you apply two classification profiles with IP address ranges to a port, the profiles must have the same mask.*

For example:

The following is valid (mask1 equal to mask2):

Classification #1: 10.10.0.0 –10.10.0.255 -› mask1=255.255.255.0

Classification #2: 20.20.0.0 –20.20.0.255 -› mask2=255.255.255.0

The following is invalid (mask1 not equal to mask2):

Classification #1: 10.10.0.0–0.10.0.255 -› mask1=255.255.255.0

Classification #2: 20.20.0.0 –20.20.255.255 -› mask2=255.255.0.0

Table 8-10. Valid VLAN Action Combinations

Action on:		Egress VLAN(s) and P-bit(s) for Ingress Frame Types:		
Outer VLAN	Inner VLAN	Untagged	One VLAN (X)	Double VLANs (X and Y)
None	None	Untagged	X	X, Y
Pop	None	Not applicable – unsupported	Untagged	Y
Pop	Mark with VLAN A	Not applicable – unsupported	Not applicable – unsupported	A
Pop	Pop	Not applicable – unsupported	Not applicable – unsupported	Untagged
Push VLAN A	None	A	A, X	A, X, Y
Push VLAN A	Mark with VLAN B	A	A, B	A, B, Y
Push VLAN A	Mark with p-bit D	A	A X + p-bit D	A, X + p-bit D, Y

Action on:		Egress VLAN(s) and P-bit(s) for Ingress Frame Types:		
Outer VLAN	Inner VLAN	Untagged	One VLAN (X)	Double VLANs (X and Y)
Push VLAN A	Mark with profile F *See Note 1*	A	A, X + p-bit according to F	A, X + p-bit according to F, Y
Push VLAN A. mark with profile E	Push VLAN B, mark with p-bit D	A + p-bit 7 according to E, B + p-bit D	A + p-bit according to E, B + p-bit D, X	A + p-bit according to E, B + p-bit D, X, Y
Push VLAN A. mark with p-bit C	Push VLAN B, mark with p-bit D	A + p-bit C, B + p-bit D	A + p-bit C, B + p-bit D, X	A + p-bit C, B + p-bit D, X, Y
Push VLAN A. mark with profile E	Push VLAN B. mark with profile F *See Note 1*	A + p-bit 7 according to E, B + p-bit 7 according to F	A + p-bit according to E, B + p-bit according to F, X	A + p-bit according to E, B + p-bit according to F, X, Y
Push VLAN A. mark with p-bit C	Push VLAN B. mark with profile F	A + p-bit C, B + p-bit 7 according to F	A + p-bit C, B + p-bit according to F, X	A + p-bit C, B + p-bit according to F, X, Y
Mark with VLAN A	None	Untagged	A	A, Y
Mark with VLAN A	Mark with p-bit D	Not applicable – unsupported	Not applicable – unsupported	A, Y + p-bit D
Mark with p-bit C	Mark with p-bit D	Not applicable – unsupported	Not applicable – unsupported	X+ p-bit C, Y + p-bit D
Mark with VLAN A + p-bit	Mark with p-bit D	Not applicable – unsupported	Not applicable – unsupported	A + p-bit, Y + p-bit D
Mark with VLAN A + profile E	Mark with VLAN B +p-bit D	Not applicable – unsupported	Not applicable – unsupported	A + p-bit according to E, B +p-bit D

Factory Defaults

By default, no flows exist.

Defining Classifier Profiles

You can define up to 64 classifier profiles to apply to flows to ensure the desired flow classification.

➤ To define a classifier profile:

1. Navigate to the flows context (config>flows).
2. Define a classifier profile and assign a name to it:

   classifier-profile <profile-name> **match-any**

   The system switches to the context of the classifier profile (config>flows>classifier-profile(<profile-name>)).
3. Specify the criteria for the classifier profile:

```
[no] match [ vlan <vlan-range> ]
[ inner-vlan <inner-vlan-range> ] [ p-bit <p-bit-range> ]
[ inner-p-bit <inner-p-bit-range> ]
[ ip-precedence <ip-precedence-range> ]
[ ip-dscp <ip-dscp-range> ] [src-mac <src-mac-low>]
[to-src-mac <src-mac-high>] [dst-mac <dst-mac-low>]
[to-dst-mac <dst-mac-high>] [src-ip <src-ip-low>]
[to-src-ip <src-ip-high>] [dst-ip <dst-ip-low>]
[to-dst-ip <dst-ip-high>] [ether-type <ether-type>] [untagged]
[non-ip] [all]
```

4. When you have completed specifying the criteria, enter exit to exit the classifier profile context.

Examples

➤ To create classifier profile with criteria VLAN 100 to VLAN 150:

```
ETX-203AX# configure flows classifier-profile v100_150 match-any
ETX-203AX>config>flows>classifier-profile(v100_150)$ match vlan 100..150
ETX-203AX>config>flows>classifier-profile(v100_150)$ exit all
ETX-203AX#
```

➤ To create classifier profile with criteria VLAN 20 and inner VLAN 30:

```
ETX-203AX# configure flows classifier-profile v20_inner_30 match-any
ETX-203AX>config>flows>classifier-profile(v20_inner_30)$ match vlan 20
inner-vlan 30
ETX-203AX>config>flows>classifier-profile(v20_inner_30)$ exit all
ETX-203AX#
```

➤ To create classifier profile that matches all criteria:

```
ETX-203AX# configure flows classifier-profile all match-any
ETX-203AX>config>flows>classifier-profile(all)$ match all
ETX-203AX>config>flows>classifier-profile(all)$ exit all
ETX-203AX#
```

Configuring Flows

➤ To configure flows:

1. Navigate to **config>flows**.
2. Enter:
   flow <flow-name>

   If the flow already exists, the **config>flows>flow**(<flow-name>)# prompt is displayed, otherwise the flow is created and the **config>flows>flow**(<flow-name>)**$** prompt is displayed.
3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Associating the flow with a classifier profile	**classifier** <classifier-profile-name>	Up to three flows can be associated with one classifier profile
Discarding traffic transmitted via the flow	**drop**	
Specifying the ingress port	**ingress-port ethernet** <port> **ingress-port etp** <etp-name> {**subscriber** | **transport**} <port-number> **ingress-port logical-mac** <port> **ingress-port svi** <port>	
Specifying the egress port, and defining queue	**egress-port ethernet** <port> [**queue** <queue-id> **block** <level_id/queue_id>] **egress-port ethernet** <port> [**queue-map-profile** <queue-map-profile-name> **block** <level_id/queue_id>] **egress-port etp** <etp-name> {**subscriber** | **transport**} <port-number> [**cos** <cos-id>] **egress-port etp** <etp-name> {**subscriber** | **transport**} <port-number> [**cos-map-profile** <cos-map-profile-name>] **egress-port logical-mac** <port> [**queue** <queue-id> **block** <level_id/queue_id>] **egress-port logical-mac** <port> [**queue-map-profile** <queue-map-profile-name> **block** <level_id/queue_id>] **egress-port svi** <port>	If a queue mapping profile is used, it must be compatible with the classification criteria of the flow, e.g. if the classification is according to DSCP then the queue mapping should not be according to p-bit.
Associating a Layer-2 control processing profile with the flow	**l2cp profile** <l2cp-profile-name>	L2CP profile can be attached only to flows with the following classification types: • VLAN/VLAN+P-bit • Outer+Inner VLAN / Outer +P-bit + Inner VLAN • P-bits • VLAN+Non IP • Untagged.

Task	Command	Comments
Defining marking actions for the flow such as overwriting the VLAN ID or inner VLAN ID or setting the priority	**mark all**	See the following table for the marking actions
Associating the flow with a policer profile or policer aggregate	**policer profile** ‹policer-profile-name› **policer aggregate** ‹policer-aggregate-name›	Up to five flows can be associated with one policer aggregate
Adding VLAN ID with p-bit set to specific value, and optionally adding inner VLAN ID with p-bit set to specific value	**vlan-tag push vlan** ‹sp-vlan› **p-bit fixed** ‹fixed-p-bit› [**inner-vlan** ‹inner-sp-vlan› **p-bit fixed** ‹inner-fixed-p-bit›]	
Adding VLAN ID with p-bit set to specific value, and optionally adding inner VLAN ID with p-bit set via marking profile	**vlan-tag push vlan ‹sp-vlan› p-bit fixed ‹fixed-p-bit›** [**inner-vlan** ‹inner-sp-vlan› **p-bit profile** ‹inner-marking-profile-name›]	
Adding VLAN ID with p-bit set to specific value, and optionally adding inner VLAN ID with p-bit set by copying from the incoming frame	**vlan-tag push vlan** ‹sp-vlan› **p-bit fixed** ‹fixed-p-bit› [**inner-vlan** ‹inner-sp-vlan› **p-bit copy**]	
Adding VLAN ID with p-bit set via marking profile, and optionally adding inner VLAN ID with p-bit set to specific value	**vlan-tag push vlan** ‹sp-vlan› **p-bit profile** ‹marking-profile-name› [**inner-vlan** ‹inner-sp-vlan› **p-bit fixed** ‹inner-fixed-p-bit›]	
Adding VLAN ID with p-bit set via marking profile, and optionally adding inner VLAN ID with p-bit set via marking profile	**vlan-tag push vlan** ‹sp-vlan› **p-bit profile** ‹marking-profile-name› [**inner-vlan** ‹inner-sp-vlan› **p-bit profile** ‹inner-marking-profile-name›]	
Adding VLAN ID with p-bit set via marking profile, and optionally adding inner VLAN ID with p-bit set by copying from the incoming frame	**vlan-tag push vlan** ‹sp-vlan› **p-bit profile** ‹marking-profile-name› [**inner-vlan** ‹inner-sp-vlan› **p-bit copy]**	
Adding VLAN ID with p-bit set by copying from the incoming frame, and optionally adding inner VLAN ID with p-bit set to specific value:	**vlan-tag push vlan** ‹sp-vlan› **p-bit copy** [**inner-vlan** ‹inner-sp-vlan› **p-bit fixed** ‹inner-fixed-p-bit›]	
Adding VLAN ID with p-bit set by copying from the incoming frame, and optionally adding inner VLAN ID with p-bit set via marking profile	**vlan-tag push vlan** ‹sp-vlan› **p-bit copy** [**inner-vlan** ‹inner-sp-vlan› **p-bit profile** ‹inner-marking-profile-name›]	
Adding VLAN ID with p-bit set by copying from the incoming frame, and optionally adding inner VLAN ID with p-bit set by copying from the incoming frame	**vlan-tag push vlan** ‹sp-vlan› **p-bit copy** [**inner-vlan** ‹inner-sp-vlan› **p-bit copy]**	

Task	Command	Comments
Removing VLAN ID, and optionally removing inner VLAN ID	**vlan-tag pop vlan** [**inner-vlan**]	
Removing pushing of inner VLAN	**no vlan-tag** [**push inner-vlan**]	
Administratively enabling the flow	**no shutdown**	• You can activate a flow only if it is associated with at least a classifier profile, ingress port, and egress port • Flows are created as inactive by default • Type **shutdown** to disable the flow

The following marking actions can be performed in the **mark** level, at the **config>flows>flow**(<flow-name>)**>mark#** prompt.

Task	Command	Comments
Overwriting p-bit according to marking profile	**marking-profile <marking-profile-name>**	If a marking profile is used, it must be compatible with the classification criteria of the flow, e.g. if the flow classification is according to DSCP then the marking classification should not be according to p bit If a color-aware marking profile is applied for the outer VLAN of a flow, then if marking is applied to the inner VLAN, either the same color-aware marking profile must be used for the inner VLAN, or a non-color-aware marking profile must be used for the inner VLAN. Typing **no marking-profile** or **no inner-marking-profile** removes the overwriting of marking profile or inner marking profile respectively
Overwriting inner p-bit according to marking profile	**inner-marking-profile** <inner-marking-profile-name>	See comments for **marking-profile**
Overwriting p-bit with a new value	**p-bit** <p-bit-value>	Typing **no p-bit** removes the overwriting of p-bit
Overwriting inner p-bit with a new value	**inner-p-bit** <inner-p-bit-value >	Typing **no inner-p-bit** removes the overwriting of inner p-bit
Overwriting VLAN ID with a new value	**vlan** <vlan-value>	Typing **no vlan** removes the overwriting of VLAN ID
Overwriting inner VLAN ID with a new value	**inner-vlan** <inner-vlan-value>	Typing **no inner-vlan** removes the overwriting of inner VLAN ID

Task	Command	Comments
Exiting the marking context and returning to the flow context	exit	

Examples

Traffic Flows

This section provides an example of configuring the following flows:

- Outgoing traffic from user port ETH 3 to network port ETH 1:
  - Accept only traffic tagged with VLAN 10
  - Add VLAN 100 with p-bit 5 (this causes VLAN 100 to be the outer VLAN and VLAN 10 to be the inner VLAN).
- Incoming traffic from network port ETH 1 to user port ETH 3:
  - Accept only traffic tagged with VLAN 100 and inner VLAN 10
  - Remove the outer VLAN (VLAN 100).

➤ To configure the outgoing flow:

1. Set up a classifier profile to forward frames from VLAN 10:

```
ETX-203AX# configure flows
ETX-203AX>config>flows# classifier-profile v10 match-any
ETX-203AX>config>flows>classifier-profile(v10)$ match vlan 10
ETX-203AX>config>flows>classifier-profile(v10)$ exit all
ETX-203AX#
```

2. Set up a flow using the previously defined classifier profile, with ingress at ETH 3 and egress at ETH 1, and pushing VLAN 100 with p-bit 5:

```
ETX-203AX# configure flows
ETX-203AX>config>flows# flow f10_out
ETX-203AX>config>flows>flow(f10_out)$ classifier v10
ETX-203AX>config>flows>flow(f10_out)$ ingress-port eth 3
ETX-203AX>config>flows>flow(f10_out)$ egress-port eth 1 queue 0 block 0/1
ETX-203AX>config>flows>flow(f10_out)$ vlan-tag push vlan 100 p-bit fixed 5
ETX-203AX>config>flows>flow(f10_out)$ no shutdown
ETX-203AX>config>flows>flow(f10_out)$ exit all
ETX-203AX#
```

➤ To configure the incoming flow:

1. Set up a classifier profile to forward frames from VLAN 100 and inner VLAN 10:

```
ETX-203AX# configure flows
ETX-203AX>config>flows# classifier-profile v100_inner_v10 match-any
ETX-203AX>config>flows>classifier-profile(v100_inner_v10)$ match vlan 100
inner-vlan 10
ETX-203AX>config>flows>classifier-profile(v100_inner_v10)$ exit all
ETX-203AX#
```

2. Set up a flow using the previously defined classifier profile, with ingress at ETH 1 and egress at ETH 3, and popping the outer VLAN:

```
ETX-203AX# configure flows
ETX-203AX>config>flows# flow f100_in
ETX-203AX>config>flows>flow(f100_in)$ classifier v100_inner_v10
ETX-203AX>config>flows>flow(f100_in)$ ingress-port ethernet 1
ETX-203AX>config>flows>flow(f100_in)$ egress-port ethernet 3 queue 0 block
0/1
ETX-203AX>config>flows>flow(f100_in)$ vlan-tag pop vlan
ETX-203AX>config>flows>flow(f100_in)$ no shutdown
ETX-203AX>config>flows>flow(f100_in)$ exit all
ETX-203AX#
```

ETP Flows

➤ To configure ETP flows:

- Flow sub1:
  - Ingress = ethernet 3
  - Egress = etp ETP1 subscriber 1, CoS mapping profile my-p-bit (see *CoS Mapping Profiles* for details on CoS mapping profiles)
- Flow trans1:
  - Ingress = etp ETP1 transport 1
  - Egress = ethernet 1, queue 0, block 0/1.

```
ETX-203AX# configure flows
ETX-203AX>config>flows# flow sub1
ETX-203AX>config>flows>flow(sub1)# ingress-port eth 3
ETX-203AX>config>flows>flow(sub1)# egress-port etp ETP1 subscriber 1
cos-mapping my-p-bit
ETX-203AX>config>flows>flow(sub1)# exit
ETX-203AX>config>flows# flow trans1
ETX-203AX>config>flows>flow(trans1)# ingress-port etp ETP1 transport 1
ETX-203AX>config>flows>flow(trans1)# egress-port eth 1  queue 0 block 0/1
ETX-203AX>config>flows>flow(trans1)# exit
ETX-203AX>config>flows#
```

Unidirectional Hub

This section provides an example of configuring a unidirectional hub with five flows:

- Ingress port = ETH 1
- Egress ports:
  - ETH 3, queue 0, block 0/1
  - ETH 3, queue 0, block 0/2
  - ETH 4, queue 1, block 0/1
  - ETH 4, queue 1, block 0/2
  - ETH 5, queue 0, block 0/1.
  -

- Criteria = VLAN 100
- Policer profile bandwidth limits = CIR 10000, CBS 5000, EIR 0, EBS 0.

➤ To configure the hub:

- Enter the following commands:

```
exit all
configure qos

# Policer profile and aggregate for UDH
qos
policer-profile udh_pol bandwidth cir 10000 cbs 5000 eir 0 ebs 0
policer-aggregate udh_agg policer profile udh_pol
exit all

# Classifier profile for UDH
configure flows
classifier-profile udh_class match-any match vlan 100
exit

flow udh1
ingress-port ethernet 1
egress-port ethernet 3 queue 0 block 0/1
classifier udh_class
policer aggregate udh_agg
no shutdown
exit

flow udh2
classifier udh_class
ingress-port ethernet 1
egress-port ethernet 3 queue 0 block 0/2
policer aggregate udh_agg
no shutdown
exit

flow udh3
classifier udh_class
ingress-port ethernet 1
egress-port ethernet 4 queue 1 block 0/1

policer aggregate udh_agg
no shutdown
exit

flow udh4
classifier udh_class
ingress-port ethernet 1
egress-port ethernet 4 queue 1 block 0/2

policer aggregate udh_agg
no shutdown
exit
```

```
flow udh5
classifier udh_class
ingress-port ethernet 1
egress-port ethernet 5 queue 0 block 0/1

policer aggregate udh_agg
no shutdown
exit all
```

Testing Flows

You can run application layer loopbacks on a flow, with exchange of source and destination MAC addresses or IP addresses of incoming packets. This applies to all the data associated with the flow.

Note *MAC swap is not performed if the flow is part of a unidirectional hub.*

➤ **To run an application layer loopback test:**

1. Create a flow with the ingress port equal to the egress port.
2. Navigate to **configure flows flow** ‹flow-name› to select the above flow.

   The **config>flows>flow**(‹flow-name›)**#** prompt is displayed.
3. Enter:
   test [{mac-swap|ip-swap}] [duration <seconds>]
   [ttl-force <ttl>]

   The flow is activated, and the TEST LED is turned on. The test runs for the duration specified. If 0 is specified for the duration, the test runs until it is stopped manually.

Note *Regardless of whether the **mac-swap** or **ip-swap** option is specified, if there is an IP header in the frames, then both MAC and IP address are swapped, otherwise only the MAC is swapped.*

➤ **To end the test:**

1. Navigate to **configure flows flow** ‹flow-name› to select the flow being tested.

   The **config>flows>flow**(‹flow-name›)**#** prompt is displayed.
2. Enter:
   no test

Displaying Flow Statistics

You can display the number of forwarded and discarded packets and bytes for a flow.

Note *See* Configuring Policer Aggregate Parameters *for information on displaying statistics for flows associated with policer aggregates*

➤ To display the statistics for a flow:

- At the relevant flow context (config>flows>flow(<flow-id>)), enter:
  `show statistics running`

  Flow statistics are displayed.

➤ To clear the statistics for a flow:

- At the relevant flow context (config>flows>flow(<flow-id>)), enter:
  `clear-statistics`

  The statistics for the flow are cleared.

Example

Note *This example uses flow f10_out, created in the traffic flow example.*

➤ To display flow statistics:

```
ETX-203AX# configure flows flow f10_out
ETX-203AX>config>flows>flow(f10_out)# show statistics running
Rate Sampling Window
-------------------------------------------------------------------------------
Window Size [Min.]        : 15
Window Remain Time [Min.] : 12

Rx Statistics
-------------------------------------------------------------------------------
          Total
Packets : 0
Bytes   : 0

Drop Statistics
-------------------------------------------------------------------------------

               Packets              Bytes
Total        : 0                    0
Green        : 0                    0
Yellow       : 0                    0
Red          : 0                    0
Total(Rate)  : 0                    0

Green(Rate)  : 0                    0
Yellow(Rate) : 0                    0
Red(Rate)    : 0                    0

Tx Statistics
-------------------------------------------------------------------------------
             Total                Green                Yellow
Packets    : 0                    0                    0
Rate [pps] : 0                    0                    0
Bytes      : 0                    0                    0
Rate [bps] : 0                    0                    0

Pick Measurement
-------------------------------------------------------------------------------
                      Min.          Max.
Tx Bit Rate [bps]   : 0             0
Drop Bit Rate [bps] : 0             0

ETX-203AX>config>flows>flow(f10_out)#
```

8.2 Layer-2 Control Processing

ETX-203AX can be configured to pass through Layer-2 Control frames (including other vendors' L2CP frames) across the network, to peer supported protocols, or to discard the L2CP frames. You can perform protocol tunneling, with MAC address swap.

You can create profiles to define the handling of Layer-2 Control Protocol traffic. You then assign the required profile to an Ethernet port or to a flow (see *Configuring Ethernet Port Parameters* and *Configuring Flows*, respectively).

Standards

IEEE 802.3

Benefits

Layer 2 Control Protocol can be passed or filtered to Ethernet virtual connections.

Factory Defaults

ETX-203AX provides a default L2CP profile named L2cpDefaultProfile, configured as follows:

- For MAC hex byte 0x00 through 0x2f, action = tunnel
- Default action = tunnel.

When a new L2CP profile is created, it has the same configuration as L2cpDefaultProfile.

Adding Layer 2 Control Processing Profiles

➤ **To add an L2CP profile:**

1. Navigate to **configure port**.

   The **config>port#** prompt is displayed.

2. Type:
   `l2cp-profile` `<l2cp-profile-name>`

   An L2CP profile with the specified name is created and the **config>port>l2cp-profile**(<l2cp-profile-name>)**$** prompt is displayed. The new profile is configured by default as described in *Factory Defaults*.

3. Configure the L2CP profile as needed (see *Configuring Layer 2 Control Processing Profile Parameters*).

Deleting Layer 2 Control Processing Profiles

You can delete an L2CP profile only if it is not assigned to any port.

➤ **To delete an L2CP profile:**

1. Navigate to **configure port**.

   The **config>port#** prompt is displayed.

2. Type:
   `no l2cp-profile` `<l2cp-profile-name>`

   The L2CP profile with the specified name is deleted if it is not assigned to any port.

Configuring Layer 2 Control Processing Profile Parameters

➤ To configure an L2CP profile:

1. Navigate to **configure port l2cp-profile** <l2cp-profile-name> to select the L2CP profile to configure.

   The **config>port>l2cp-profile**(<l2cp-profile-name>)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the default action for undefined control protocols	**default** {**discard** | **tunnel**}	
Specifying the L2CP action for MAC addresses (discard, tunnel, or peer)	**mac** <mac-addr-last-byte-value-list> {**discard** | **tunnel** | **peer**}	**discard** – L2CP frames are discarded **tunnel** – L2CP frames are forwarded across the network as ordinary data **peer** –ETX-203AX peers with the user equipment to run the protocol. L2CP frames are forwarded to the ETX-203AX CPU. Unidentified L2CP frames are forwarded across the network as ordinary data. Typing **no mac** <mac-addr-last-byte-value-list> removes the action for the specified MAC address
Choosing a protocol for tunneling and specifying MAC swap if desired	**protocol** { **lacp** | **stp** | **vtp** | **cdp** | **lldp** | **pvstp** } **tunnel mac-change** [<mac-address>]	Typing **no protocol** { **lacp** | **stp** | **vtp** | **cdp** | **lldp** | **pvstp**| **pvstp** } removes the action for the specified protocol ***Note**: If the L2CP profile is associated with a flow, the MAC swap functions only if the flow uses network port 1, and not network port 2.*

Example

➤ To add L2CP profile named layer2ctrl1 with discard action for hex byte 0x01 and 0x03:

```
ETX-203AX# configure port
ETX-203AX>config>port# l2cp-profile layer2ctrl1
ETX-203AX>config>port>l2cp-profile(layer2ctrl1)$ mac 0x01 discard
ETX-203AX>config>port>l2cp-profile(layer2ctrl1)$ mac 0x03 discard
ETX-203AX>config>port>l2cp-profile(layer2ctrl1)$ info detail
    mac  0x00  tunnel
    mac  0x01  discard
    mac  0x02  tunnel
    mac  0x03  discard
    mac  0x04  tunnel
    mac  0x05  tunnel
    mac  0x06  tunnel
    mac  0x07  tunnel
    mac  0x08  tunnel
    mac  0x09  tunnel
    mac  0x0a  tunnel
    mac  0x0b  tunnel
    mac  0x0c  tunnel
    mac  0x0d  tunnel
    mac  0x0e  tunnel
    mac  0x0f  tunnel
    mac  0x10  tunnel
    mac  0x20  tunnel
    mac  0x21  tunnel
    mac  0x22  tunnel
    mac  0x23  tunnel
    mac  0x24  tunnel
    mac  0x25  tunnel
    mac  0x26  tunnel
    mac  0x27  tunnel
    mac  0x28  tunnel
    mac  0x29  tunnel
    mac  0x2a  tunnel
    mac  0x2b  tunnel
    mac  0x2c  tunnel
    mac  0x2d  tunnel
    mac  0x2e  tunnel
    mac  0x2f  tunnel
    default  tunnel

ETX-203AX>config>port>l2cp-profile(layer2ctrl1)$
```

➤ To delete L2CP profile named layer2ctrl1:

```
ETX-203AX# configure port
ETX-203AX>config>port# no l2cp-profile layer2ctrl1
ETX-203AX>config>port#
```

8.3 OAM

Ethernet OAM (operation, administration, and maintenance) functions provide end-to-end connectivity checks and performance monitoring.

OAM CFM (Connectivity Fault Management)

Ethernet Connectivity Fault Management (CFM) is a service-level OAM protocol that provides tools for monitoring and troubleshooting end-to-end Ethernet services. This includes proactive connectivity monitoring, fault verification, and fault isolation. CFM uses standard Ethernet frames and can be run on any physical media that can transport Ethernet service frames.

ETX-203AX can act as a Maintenance Entity Group Intermediate Point (MIP) or Maintenance Entity Group End Point (MEP). If ETX-203AX is acting as a MIP, it forwards OAM CFM messages transparently, responding only to OAM link trace (LTM) and unicast OAM loopback (LBM).

Standards

IEEE 802.1ag-D8

ITU-T Y.1731

Benefits

Ethernet service providers can monitor their services proactively and guarantee that customers receive the contracted SLA. Fault monitoring and end-to-end performance measurement provide tools for monitoring frame delay, frame delay variation, and frame loss and availability.

Functional Description

OAM enables detection of network faults and measurement of network performance, as well as distribution of fault-related information. OAM functionality ensures that network operators comply with QoS guarantees, detect anomalies before they escalate, and isolate and bypass network defects. As a result, the operators can offer binding service-level agreements.

ETX-203AX provides the OAM (CFM) functions listed below in packet-switched networks:

- End-to-end Connectivity Fault Management (CFM) per IEEE 802.1ag:
  - Continuity check (CC)
  - Non-intrusive loopback, used to detect loss of bidirectional continuity
  - Link Trace for fault localization
- End-to-end service and performance monitoring per ITU-T Y.1731:
  - Loss measurement
  - Delay measurement.

Note *OAM messages are always mapped to the queue with the lowest priority.*

The device supports:

- Up to 128 maintenance domains (MDs)
- Up to 128 maintenance associations (MAs)
- Up to 128 maintenance endpoints (MEPs). Up to eight MEPs can be configured for an MA (on EVC.cos configuration).
- Up to 512 remote MEPs.
- Up to 256 services. Up to eight services can be configured for a MEP.
- Up to 256 destination NEs.

Note *The above limits are subject to the limit of 300 received PPS (packets per second). This includes AIS, Linktrace, and other management packets. It does not include continuity check (CC), loopback (LB), delay measurement messages (DMM), or loss measurement messages (LMM). The LB rate is 200 PPS.*

➤ **To configure the service OAM:**

1. Configure general OAM parameters
2. Add and configure maintenance domain(s) (MD).
3. Configure maintenance associations for the added MDs.
4. If ETX-203AX is acting as a MIP:
   a. Configure the necessary flows from and to the unit(s) acting as MEP(s).
   b. Configure the MA classification to correspond to the flows.
   c. Configure the MIP policy (see *Configuring MIP* for an example of MIP configuration).
5. If ETX-203AX is acting as a MEP:
   a. Configure MA endpoints, referred as MEPs.
   b. Configure MEP services.
   c. Configure Destination NEs.

Factory Defaults

By default, there are no MDs, MAs, or MEPs.

The default OAM CFM multicast address is 01-80-C2-00-00-30.

When a maintenance domain is created, it has the following default configuration.

Parameter	Default	Remarks
proprietary-cc	**no proprietary-cc**	Standard OAM protocol
md-level	**3**	
name	**string "MD**<mdid>**"**	For example the default name for maintenance domain 1 is “MD1”.

When a maintenance association is created, it has the following default configuration.

Parameter	Default	Remarks
ccm-interval	**1s**	Continuity check interval is 1 second
classification	**vlan 0**	
mip-policy	**no mip-policy**	
name	**string "MA**<maid>**"**	For example the default name for maintenance association 1 is "MA1".

When a maintenance endpoint is created, it has the following default configuration.

Parameter	Default	Remarks
ais	**no ais**	
bind	**no bind**	
classification	**vlan 0**	
client-md-level	*4*	
dest-addr-type	**ccm multicast pm unicast**	• Destination address type for CCM messages – multicast • Destination address type for performance measurement messages – unicast
direction	**down**	
ccm-initiate	**ccm-initiate**	Initiate continuity check messages
ccm-priority	**0**	
queue	**fixed 0 block 0/0**	
shutdown	**shutdown**	Administratively disabled

When a service is created, it has the following default configuration.

Parameter	Default	Remarks
delay-threshold	**1000**	
delay-var-threshold	**1000**	
classification	**priority-bit 0**	
dmm-interval	**1s**	
lmm-interval	**1s**	
shutdown	**shutdown**	Administratively disabled

When a destination NE is created, it has the following default configuration.

Parameter	Default	Remarks
delay	**two-way data-tlv-length 0**	

Parameter	Default	Remarks
delay-measurement-bin	no delay-measurement-bin	
delay-var-measurement-bin	no delay-var-measurement-bin	
loss	single-ended user-data	
remote	mac-address 00-00-00-00-00-00	

Configuring OAM CFM General Parameters

If necessary you can define general OAM CFM parameters. You can also display OAM CFM information.

Configuring Multicast MAC Address

➤ To configure the OAM CFM multicast MAC address:

- Navigate to the CFM (Connectivity Fault Management) context (config>oam>cfm) and enter:

  multicast-addr <mac-address>

Configuring Measurement Bin Profiles

You can define measurement bin profiles to define sets of threshold ranges for displaying delay measurements in destination NEs. See *Configuring and Displaying Delay Measurement Bins* for a configuration example.

➤ To define measurement bin profiles:

1. Navigate to configure oam cfm.

   The config>oam>cfm prompt is displayed.

2. Enter the measurement bin profile level by typing the following:

   measurement-bin-profile <name>

   The prompt config>oam>cfm>measurement-bin-prof(<name>)# is displayed.

3. Specify the thresholds (single value, or values separated by commas).

   thresholds <thresholds-list>

   Each value is used as the upper range of a set of thresholds, up to 5,000,000. For instance, entering **thresholds 500,1000,15000** results in this set of threshold ranges:

   - 0–500
   - 501–1,000
   - 1,001–15,000
   - 15,001–5,000,000.

Displaying OAM CFM Information

You can display OAM CFM information by typing **show summary**, as shown in the following.

```
ETX-203AX# configure oam cfm
ETX-203AX# config>oam>cfm# show summary
                                        md   slot/  classifi  admin    mep  ok/total
md/ma/mepid     md/ma name              lvl  port   cation    status   def  r.meps

001/001/001     MD1/MA1                 3    eth1   100       enable   off  1/1
002/002/8191    123456789012345678901234567890/1234567801234  3    eth1   0         disable
002/005/123     12345678901234567890134567890/155             3    eth1   100/200   enable   off  0/2
002/006/101     12345678901234567890    3    eth3   untagged  enable   off  0/3
003/001/001     /iccname                4    eth1   100.1     enable   off  0/1
004/001/001     20-64-32-AB-CD-64 120/MA1  0    eth1   4000      enable   off  0/1
004/002/001     20-64-32-AB-CD-64 120/12345678901234567890123  0    eth1   3000/     enable   off  0/3
```

You can display information on MIPs by typing **show mips** (see *Configuring MIP* for an example).

Configuring Maintenance Domains

MDs are domains for which the connectivity faults are managed. Each MD is assigned a name that must be unique among all those used or available to an operator. The MD name facilitates easy identification of administrative responsibility for the maintenance domain.

➤ **To add a maintenance domain:**

- At the **config>oam>cfm#** prompt enter:

  maintenance-domain <mdid>

  where ‹mdid› is 1–128.

  The maintenance domain is created and the **config>oam>cfm>md**(‹mdid›)**$** prompt is displayed.

➤ **To delete a maintenance domain:**

- At the **config>oam>cfm#** prompt enter:

  no maintenance-domain <mdid>

  The maintenance domain is deleted.

➤ **To configure a maintenance domain:**

1. Navigate to **configure oam cfm maintenance-domain** ‹mdid› to select the maintenance domain to configure.

   The **config>oam>cfm>md**(‹mdid›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Configuring maintenance association for the MD	**maintenance -association** <maid>	See *Configuring Maintenance Associations*
Specifying the maintenance domain level	**md-level** <md-level>	The allowed range for **md-level** is 0–7 ***Note**: If prestandard OAM protocol is being used, the only allowed value for the maintenance domain level is 3.*
Defining MIP policy	**mip-policy** { **explicit** | **default**}	See the explanation of MIP policy in *Configuring Maintenance Associations* for a description of the parameters. You do not need to configure the MIP policy at the MD level, unless the MIP policy in the MA level is set to defer
Specifying the name format and name of the maintenance domain	**name string** <md-name-string> **name dns** <md-name-string> **name mac-and-uint** <md-name-mac> <md-name-uint> **no name**	• Maximum length of **md-name-string** is 43 characters • Maximum combined length of **md-name-string** and **ma-name-string** (maintenance association name) is 48 characters • Format **mac-and-uint** – Specify **md-name-mac** as **xx-xx-xx-xx-xx-xx**, and **md-name-uint** as an unsigned integer decimal number (0–65535) • If prestandard OAM protocol is being used, the maintenance domain must have no name (use command **no name**).
Specifying the OAM protocol type	**no proprietary-cc** **proprietary-cc**	• Use **no proprietary-cc** for standard OAM protocol • Use **proprietary-cc** for prestandard OAM protocol. ***Note**: The MD must have no name (via **no name**) and the level must be 3 before you can set the protocol to prestandard.*

Configuring Maintenance Associations

A maintenance domain contains maintenance associations.

➤ **To add a maintenance association (MA):**

- At the **config>oam>cfm>md**(<mdid>)**#** prompt enter:

  `maintenance- association <maid>`

  where <maid> is 1–128.

  The maintenance association is created and the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**$** prompt is displayed.

➤ **To delete a maintenance association:**

- At the **config>oam>cfm>md**(<mdid>)**#** prompt enter:

  no maintenance-association <maid>

  The maintenance association is deleted.

➤ **To configure a maintenance association:**

1. Navigate to **configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> to select the maintenance association to configure.

   The **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the interval between continuity check messages	**ccm-interval** {**3.33ms** | **10ms** | **100ms** | **1s** | **10s** | **1min** | **10min**}	
Associating the MA with a VLAN	**classification vlan** <vlan-id>	Verify that the VLAN is the same as the VLAN associated with the MEP **Note**: If a classifier profile is associated with the MEP, the VLAN should be set to 0.
Configuring MEP for the MA	**mep** <mepid>	See *Configuring Maintenance Endpoints*
Defining MIP policy	**mip-policy** { **explicit** | **default** | **defer** }	• Explicit – MIP is automatically created for ports corresponding to VLAN classification of MA, only if a corresponding MEP exists at a lower MD level • Default – MIP is automatically created for ports corresponding to VLAN classification of MA • Defer – MIP policy is inherited from the MD MIP policy.

Task	Command	Comments
Specifying the name format and name of the maintenance association	**name string** <ma-name-string> **name primary-vid** <ma-name-vid> **name uint** <ma-name-uint> **name icc** <ma-name-icc>	• Maximum length of **ma-name-string** is 45 characters • Maximum combined length of md name string and ma name string is 48 characters • Format **primary-vid** – Specify **ma-name-vid** as 1–4094 • Format **uint** – Specify **ma-name-uint** as an unsigned integer decimal number (0–65535) • Format **icc** – Specify **ma-name-icc** as the ITU carrier code that is assigned to the relevant network operator/service provider. The codes are maintained by ITU-T as defined in ITU-T Rec. M.1400. **Note**: If the **icc** option is selected or prestandard OAM protocol is being used, the maintenance domain must have no name (use command **no name**).

Configuring Maintenance Endpoints

Maintenance endpoints reside at the edge of a maintenance domain. They initiate and respond to CCMs, linktrace requests, and loopbacks to detect, localize, and diagnose connectivity problems.

➤ **To add a maintenance endpoint (MEP):**

- At the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**#** prompt, enter:

  mep <mepid>

  where <mepid> is 1–8191.

  The MEP is created and the prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**$** is displayed.

➤ **To delete a maintenance endpoint:**

- At the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**#** prompt, enter:

  no mep <mepid>

  The maintenance endpoint is deleted.

Note *You can remove a maintenance endpoint regardless of whether it contains services.*

➤ **To configure a maintenance endpoint:**

1. Navigate to **configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> **mep** <mepid>to select the maintenance endpoint to configure.

   The prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**#** is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Defining sending of AIS	**ais** [**interval** { **1s** | **1min** }] [**priority** <priority>]	
Binding the MEP to an Ethernet port	**bind ethernet** <port>	To unbind the MEP, enter **no bind**
Binding the MEP to an ETP port if ETP is used	**bind etp** <etp-name> {**subscriber** | **transport**} <port-id>	To unbind the MEP, enter **no bind**
Binding the MEP to a logical MAC port	**bind logical-mac** <port-number>	To unbind the MEP, enter **no bind**
Enabling initiation of continuity check messages (CCM)	**ccm-initiate**	To disable initiating continuity check messages, enter **no ccm-initiate**
Specifying the priority of CCMs and LTMs transmitted by the MEP	**ccm-priority** <priority>	The allowed range for <priority> is 0–7
Associating the MEP with a classifier profile or VLAN	**classification vlan** <vlan-id> **classification profile** <profile-name>	You can associate more than one MEP to the same VLAN if the MEPs belong to MDs with different levels Verify that the VLAN is the same as the VLAN associated with the MA
Defining client MD level	**client-md-level** <md-level>	
Specifying continuity verification method	**continuity-verification** <**cc-based** | **lb-based**>	This parameter is visible only in prestandard mode and can be configured only if **ccm-initiate** is enabled as explained above. Use **lb-based** only for RAD proprietary OAM functionality.
Defining the MAC address type sent in OAM continuity check messages (CCM) and performance measurement messages (PM)	**dest-addr-type** [**ccm** {**unicast**|**multicast**}] [**pm** {**unicast**|**multicast**}]	If more than one remote MEP ID has been defined for the MEP and you change the CCM destination address type from multicast to unicast, all remote MEP IDs are deleted except for the lowest remote MEP ID. If the MAC address type for PM messages is unicast, then the MAC address for the transmission of PM messages is determined by the configuration of the destination NE. If a remote MAC address is configured for the destination NE, that MAC is used. Otherwise if a remote MEP ID is configured for the destination NE, the remote MAC address is learned from CCM messages. See *Configuring Destination NEs* for details.

Task	Command	Comments
Defining a unicast MAC address if you defined unicast MAC address type for CCM messages with the **dest-addr-type** command	**dest-mac-addr** <mac-addr>	MAC address is in format **xx-xx-xx-xx-xx-xx**
Defining direction	**direction** { **up** | **down** }	
Defining the queue for the MEP	**queue fixed** <queue-id> [**block** <level-id>/<queue-id>] **queue queue-mapping** <queue-map-profile-name> [**block** <level-id>/<queue-id>]	
Defining remote MEP with which the MEP communicates	**remote-mep** <remote-mep-id>	Allowed range for remote MEP is 1–8191 The MEP ID and the remote MEP ID must be different. You can define up to 100 remote MEPs for the local MEP (up to 512 total remote MEPS in the device) if standard OAM protocol is being used for the MD and the destination address type is multicast, otherwise you can define only one remote MEP.
Configuring service for the MEP	**service** <serviceid>	See *Configuring Maintenance Endpoint Services*
Displaying MEP status	**show status**	
Displaying remote MEP status	**show remote-mep** <remote-mep-id> **status**	
Administratively enabling MEP	**no shutdown**	To deactivate the MEP, enter **shutdown**

Configuring Maintenance Intermediate Points

➤ To configure a MIP:

- Verify that you have flows configured between ETX-203AX and the device(s) acting as MEP(s) (see *Flows* for information on defining flows).
- Configure the MA classification to the same classification that is used by the flows.
- Configure MIP policy to default.

Examples

Configuring MD, MA, and MEP

➤ To configure MD, MA, and MEP:

- MD ID 1
- MA ID 1

- MEP ID 1:
  - Remote MEP ID 2
  - Classification VLAN 100.

```
ETX-203AX# configure oam cfm
ETX-203AX>config>oam>cfm# maintenance-domain 1
ETX-203AX>config>oam>cfm>md(1)$ maintenance-association 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)$ classification vlan 100
ETX-203AX>config>oam>cfm>md(1)>ma(1)$ mep 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)$ classification vlan 100
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)$ bind ethernet 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)$ queue fixed 1 block 0/1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)$ remote-mep 2
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)$ no shutdown
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)# exit
ETX-203AX>config>oam>cfm>md(1)>ma(1)# exit
ETX-203AX>config>oam>cfm>md(1)# info detail
    no proprietary-cc
    md-level  3
    name  string  "MD1"
    no mip-policy
    maintenance-association  1
        name  string  "MA1"
        ccm-interval  1s
        classification vlan  100
        no mip-policy
        mep  1
            bind  ethernet  1
            classification  vlan  100
            queue  fixed  0 block  0/1
            remote-mep  2
            dest-addr-type ccm  multicast pm  unicast
            ccm-initiate
            ccm-priority  0
            forwarding-method  e-line
            direction  down
            client-md-level  4
            no ais
            no shutdown
        exit
    exit
```

Displaying MEP Status and Remote MEP

The following illustrates displaying MEP status and remote MEP.

```
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)# show status
Port      : Ethernet      1
Direction : Down
VLAN      : 100       Priority  : 0

MD Name               : MD1
MA Name               : MA1
Administrative Status : Up

MEP Defect                                          Status
Rx LCK                                              Off
Rx AIS                                              Off
Cross Connected CCM (Mismatch; Unexpected MD Level) Off
Invalid CCM (Unexpected MEP; Unexpected CCM Period) Off

Remote MEP  Remote MEP Address  Operational Status
-------------------------------------------------------------------------------
4           00-00-00-00-00-00   Fail

ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)# show remote-mep 2 status
Remote MEP Address : 00-20-D2-2C-97-A9
Operational Status : OK
```

Configuring MIP

This example illustrates MIP configuration. The prerequisite for the example is that there are flows configured between ETX-203AX and the device(s) acting as MEP(s) (see *Flows* for information on defining flows).

```
ETX-203AX# configure oam cfm
ETX-203AX>config>oam>cfm# maintenance-domain 2
ETX-203AX>config>oam>cfm>md(2)$ maintenance-association 2
ETX-203AX>config>oam>cfm>md(2)>ma(2)$ classification vlan 100
ETX-203AX>config>oam>cfm>md(2)>ma(2)$ mip-policy default
ETX-203AX>config>oam>cfm>md(2)>ma(2)# exit
ETX-203AX>config>oam>cfm>md(2)# exit
ETX-203AX>config>oam>cfm# show mips
Port  VLAN  MD-level
-------------------------------------------------------------------------------
1     100   3
```

Configuring Maintenance Endpoint Services

You can configure up to eight services on a MEP, corresponding to each p-bit.

Note *Only one service is allowed if the classifier profile associated with the MEP is according to p-bit.*

Each service sets delay and delay variation thresholds. If the thresholds are exceeded, the service is declared as degraded. You can also define priority of OAM messages originating from this service.

➤ **To add a MEP service:**

- At the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**#** prompt, enter:

  service <serviceid>

  where <serviceid> is 1–8.

  The prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**$** is displayed.

➤ **To configure a MEP service:**

1. Navigate to **configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> **mep** <mepid> **service** <serviceid> to select the service to configure (<serviceid> is 1–8).

   The prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**#** is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Associating this service with a priority	**classification priority-bit** <p-bit>	The allowed range is 0–7 ***Note**: Only one service can be defined on each p-bit.*
Specifying delay threshold in microseconds	**delay-threshold** <delay-thresh>	The allowed range for delay threshold is: 1–5,000,000
Specifying delay variation threshold in microseconds	**delay-var-threshold** <delay-var-thresh>	The allowed range for delay variation threshold is: 1–5,000,000
Specifying the interval for delay measurement messages, to be used by all remote NEs defined for service	**dmm-interval** {**100ms** | **1s** | **10s**}	
Specifying the interval for loss measurement messages, to be used by all remote NEs defined for service	**lmm-interval** {**100ms** | **1s** | **10s**}	
Configuring destination NE for service	**dest-ne** <dest-ne-index>	The allowed range is 1–255
Activating the MEP service	**no shutdown**	You can activate a service only if the corresponding MEP is active and you have defined at least one destination NE

Configuring Destination NEs

For performance measurement it is necessary to know the exact address of the destination NE. You can configure the remote MAC address of the NE or ETX-203AX can learn it from the CCM messages.

If the remote MAC address is not configured and needs to be learned, performance measurement messages are sent only after the address is learned.

➤ **To add a destination NE:**

- At the prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**#**, enter:

  dest-ne <dest-ne-index>

  where <dest-ne-index> is 1–255.

  The prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**> dest-ne**(<dest-ne-index>)**$** is displayed.

➤ **To configure a destination NE:**

1. Navigate to **configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> **mep** <mepid> **service** <serviceid> **dest-ne** <dest-ne-index> to select the destination NE to configure.

   The prompt **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>) **>dest-ne**(<dest-ne-index>)**#** is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Enabling delay measurement method	**delay two-way** [**data-tlv-length** <length-val>]	
Assigning the delay measurement bin profile	**delay-measurement-bin profile** <name>	The delay measurement bin profiles are defined in the conf>oam>cfm level
Assigning the delay variation measurement bin profile	**delay-var-measurement-bin profile** <name>	The delay measurement bin profiles are defined in the **conf>oam>cfm** level
Defining single-ended loss measurement method	**loss single-ended** [{ **synthetic** | **user-data** | **lmm-synthetic** }]	• user-data – This method measures user data and CCM messages. • synthetic – This method measures DM frames. It is recommended when working with devices that do not count user data frames • lmm-synthetic – This method measures synthetic frames as well. It is recommended for working with ETX-201A/202A.

Task	Command	Comments
Defining the MAC address of the destination NE	**remote mac-address** ‹mac›	If the MAC address is 00-00-00-00-00-00, the statistic counters for the destination NE do not increment
Defining the remote MEP ID of the destination NE	**remote mep-id** ‹remote-mep-id›	
Displaying the delay measurement bins for delay measurements via DMRs	**show delay-measurement-bins** **show delay-measurement-bins** {**rt-delay** | **rt-delay-var**} **current** - **show delay-measurement-bins** {**rt-delay** | **rt-delay-var**} **interval** ‹interval-num› - **show delay-measurement-bins** {**rt-delay** | **rt-delay-var**} **all**	Relevant only if profiles were assigned via **delay-measurement-bin**, **delay-var-measurement-bin**
Clearing statistics	**clear-statistics**	

Example

➤ To configure service and destination NE:

- MD ID 1, MA ID 1, MEP ID 1 (from example in *Configuring MD, MA, and MEP*)
- Service 1
- Destination NE 3.

```
ETX-203AX# configure oam cfm ma 1 ma 1 mep 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)# service 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)$ dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)$ exit
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# no shutdown
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# exit
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# info detail
    delay-threshold  1000
    delay-var-threshold  1000
    classification priority-bit  0
    lmm-interval  1s
    dmm-interval  1s
    dest-ne  3
        remote  mac-address  00-00-00-00-00-00
        delay  two-way data-tlv-length  0
        loss  single-ended  user-data
        no delay-measurement-bin
        no delay-var-measurement-bin
    exit
    no shutdown
```

Configuring OAM CFM Service Event Reporting

You can define dedicated event reporting counters to track OAM SLA threshold crossing violations (for information on configuring the OAM service thresholds, see *Configuring Maintenance Endpoint Services*).

In addition to the regular OAM statistics collection, ETX-203AX supports proactive SLA measurements per OAM service, as per RMON-based RFC 2819. The device sends reports when one of the counters rises above or drops below the set thresholds within the specified sampling period of time. These reports can be sent as SNMP traps to the defined network management stations, or written to the event log. If an event is generated, this action also sends a syslog notification packet, if syslog reporting is active (see *Syslog* for more details)

The following counters can be monitored:

- Far End Frame Loss Ratio –Total number of OAM frames lost from local MEP to remote MEP, divided by total number of transmitted OAM frames since the service was activated
- Near End Frame Loss Ratio –Total number of OAM frames lost from remote MEP to local MEP, divided by total number of transmitted OAM frames since the service was activated
- Frames Above Delay – Number of frames that exceeded delay threshold
- Frames Above Delay Variation (jitter) – Number of frames below or equal delay variation threshold
- Far End Unavailability Ratio – Total number of far end unavailable seconds divided by elapsed time since service was activated
- Near End Unavailability Ratio – Total number of near end unavailable seconds divided by elapsed time since service was activated.

For non ratio-based counters (Frames Above Delay and Frames Above Delay Variation), you have to define a sampling interval in addition to the rising and falling thresholds. The purpose of the interval is to define a timeline, in seconds, in which the service OAM data is sampled and compared with the pre-defined service thresholds. For the ratio-based counters, defining a sampling interval is not required.

➤ **To configure the event reporting for a service:**

1. Navigate to **configure fault cfm**).
2. Specify the service and counter for which you wish to configure event reporting:

   service md <mdid> **ma** <maid> **mep** <mepid> **service** <serviceid> {**above-delay** | **above-delay-var** | **far-end-loss-ratio** | **near-end-loss-ratio** | **far-end-unavailability-ratio** | **near-end-unavailability-ratio**}

   The prompt **config>fault>cfm>service**(<mdid>/<maid>/<mepid>/<serviceid>)**#** is displayed.
3. Specify the type of event reporting for the counter (see *Table 8-11*):
   - For counters **above-delay** and **above-delay-var**:
     frames-report [**event** {**none** | **log** | **trap** | **logandtrap**}] [**rising-threshold** <rising-threshold>] [**falling-threshold** <falling-threshold>] [**sampling-interval** <value>]
   - For counters **near-end-loss-ratio** or **far-end-loss-ratio**:
     frames-report [**event** {**none** | **log** | **trap** | **logandtrap**}]

```
[rising-threshold {1e-3 | 1e-4 | 1e-5 | 1e-6 | 1e-7 |
1e-8 | 1e-9 | 1e-10}] [falling-threshold {1e-3 | 1e-4 |
1e-5 | 1e-6 | 1e-7 | 1e-8 | 1e-9 | 1e-10}]
```

- For counters **near-end-unavailability-ratio** or **far-end-unavailability-ratio**:

```
frames-report [event {none | log | trap | logandtrap}]
[rising-threshold <rising-threshold-thousandth>]
[falling-threshold <falling-threshold-thousandth>]
```

4. Type **no shutdown** to activate the event reporting for the counter.

Table 8-11. Service Event Reporting Parameters

Parameter	Description	Possible Values
event	Specifies the type of event reporting	**none** – The event is not reported **log** – The event is reported via the event log **trap** –An SNMP trap is sent to report the event **logandtrap** –The event is reported via the event log and an SNMP trap
rising-threshold falling-threshold	A value above **rising-threshold** within the sampling interval for the particular event is considered as rising event occurred A value below **falling-threshold** within the sampling interval for the particular event is considered as falling event occurred	• For counters **above-delay** or **above-delay-var** (measured in seconds): 1–60 • For counters **near-end-loss-ratio** or **far-end-loss-ratio**: 1e-3 1e-4 1e-5 1e-6 1e-7 1e-8 1e-9 1e-10 • For counters **near-end-unavailability-ratio** or **far-end-unavailability-ratio** (measured in milliseconds): 1–1000 ***Note**: Rising threshold must be greater than falling-threshold.*
sampling-interval	Specifies the interval in seconds over which the data is sampled and compared with the rising and falling thresholds	***Notes**:* • *Relevant only for counters **above-delay** or **above-delay-var*** • *Sampling interval value must be at least double rising threshold.*

Example

➤ To configure OAM CFM event reporting:

- Configure counters for the following service, as shown in the table below:
  - Maintenance domain 5
  - Maintenance association 8
  - MEP 3
  - Service 4.

The delay and delay variation (jitter) threshold for this service are set to 10 and 5 milliseconds respectively. The reporting counters for this service are set as shown in the table below.

Counter	Event Type	Rising Threshold	Falling Threshold	Sampling Interval
Frames Above Delay	Log and trap	4	2	8
Frames Above Delay Variation	Log	10	5	30
Far End Frame Loss Ratio	Trap	1e-4	1e-8	
Near End Frame Loss Ratio	Log and trap	1e-9	1e-10	
Far End Unavailability Ratio	Trap	40	20	
Near End Unavailability Ratio	Log	50	25	

In this example, an SNMP trap and an event are generated as notification of the rising threshold if during an 8-second sample interval, four DMM packets or more exceed the 10-milliseconds delay threshold of this service. The alarm is cleared (falling threshold) if ETX-203AX detects an 8-second sample interval in which two or fewer packets cross the thresholds.

A rising or falling threshold event is generated if a specific ratio is exceeded. For example, an SNMP trap is sent if the far end Frame Loss Ratio (from ETX-203AX to the network) exceed 10^-4, i.e. more than one frame out of 10,000 LMMs sent for this service are lost.

➤ To define the service delay thresholds:

```
ETX-203AX# configure oam cfm ma 5 ma 8 mep 3 service 4
ETX-203AX>config>oam>cfm>md(5)>ma(8)>mep(3)>service(4)delay-threshold 10
ETX-203AX>config>oam>cfm>md(5)>ma(8)>mep(3)>service(4) delay-var-threshold 5
```

➤ To define the service event reporting counters:

```
ETX-203AX# configure fault cfm
ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4 above-delay
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay)$ frames-report event logandtrap
rising-threshold 4 falling-threshold 2 sampling-interval 8
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay)$ exit
```

```
ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4 above-delay-var
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay-var)$ frames-report event log
rising-threshold 10 falling-threshold 5 sampling-interval 30
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay-var)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/above-delay-var)$ exit

ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4 far-end-loss-ratio
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-loss-ratio)$ frames-report event trap
rising-threshold 1e-4 falling-threshold 1e-8
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-loss-ratio)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-loss-ratio)$ exit

ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4 near-end-loss-ratio
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-loss-rati)$ frames-report event
logandtrap rising-threshold 1e-9 falling-threshold 1e-10
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-loss-rati)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-loss-rati)$ exit

ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4
far-end-unavailability-ratio
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-unavailabi)$ frames-report event trap
rising-threshold 40 falling-threshold 20
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-unavailabi)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/far-end-unavailabi)$ exit

ETX-203AX>config>fault>cfm# service md 5 ma 8 mep 3 service 4
near-end-unavailability-ratio
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-unavailab)$ frames-report event log
rising-threshold 50 falling-threshold 25
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-unavailab)$ no shutdown
ETX-203AX>config>fault>cfm>service(5/8/3/4/near-end-unavailab)$ exit
```

➤ To display the defined service event reporting counters:

```
ETX-203AX>config>fault>cfm# info detail
    service md  5 ma  8 mep  3 service  4  above-delay
        frames-report event  logandtrap rising-threshold  4 falling-threshold  2
sampling-interval  8
        no shutdown
    exit
    service md  5 ma  8 mep  3 service  4  above-delay-var
        frames-report event  log rising-threshold  10 falling-threshold  5 sampling-
interval  30
        no shutdown
    exit
    service md  5 ma  8 mep  3 service  4  far-end-loss-ratio
        frames-report event  trap rising-threshold  1e-4 falling-threshold  1e-8
        no shutdown
    exit
    service md  5 ma  8 mep  3 service  4  near-end-loss-ratio
        frames-report event  logandtrap rising-threshold  1e-9 falling-threshold  1e-10
        no shutdown
    exit
    service md  5 ma  8 mep  3 service  4  far-end-unavailability-ratio
        frames-report event  trap rising-threshold  40 falling-threshold  20
        no shutdown
    exit
    service md  5 ma  8 mep  3 service  4  near-end-unavailability-ratio
        frames-report event  log rising-threshold  50 falling-threshold  25
        no shutdown
    exit
```

Displaying OAM CFM Statistics

You can display end-to-end performance monitoring data for the OAM services and destination NEs. The statistics for a service are calculated from the statistics for its destination NEs.

ETX-203AX measures performance in fixed 15-minute intervals. It also stores performance data for the last 12 hours (48 intervals).

You can view the following types of statistics for services and destination NEs:

- Running –OAM statistics collected since the corresponding service was activated
- 12 hours – OAM statistics for the last 12 hours, or the amount of time since the service was activated, if less than 12 hours.
- Interval – OAM statistics for the current interval or a selected interval. You can select an interval only if it has already ended since the corresponding service was activated.

  When a service is first activated, you can view statistics for only the current interval. The statistics data is shown for the time elapsed since the beginning of the interval. When the current interval ends, it becomes interval 1 and you can select it for viewing interval statistics. After each interval ends, you can select it for viewing interval statistics.

➤ **To display the OAM CFM statistics for a service or destination NE:**

1. Navigate to the level corresponding to the OAM service or destination NE for which you wish to view the statistics (**configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> **mep** <mepid> **service** <serviceid> or **configure oam cfm maintenance-domain** <mdid> **maintenance-association** <maid> **mep** <mepid> **service** <serviceid> **dest-ne** <dest-ne-index>).

   The prompt for service or destination NE is displayed:

   config>oam>cfm>md(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**#**

   config>oam>cfm>md(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**>service**(<serviceid>)**> dest-ne**(<dest-ne-index>)**#**

2. Enter all necessary commands according to the tasks listed below.

Note *The service for which you wish to view the statistics must be active. If the service is not active, the commands to view statistics are not recognized.*

Task	Command	Comments
Viewing running statistics	**show statistics running**	The statistics are displayed as shown in *Displaying Running Statistics*; see *Table 8-12* and *Table 8-13*
Viewing statistics for the current interval	**show statistics current**	The statistics for the current interval are displayed as shown in *Displaying Current Statistics*; see *Table 8-12* and *Table 8-13*
Viewing the statistics for a selected interval	**show statistics interval** <interval-num>	• Allowed values for **interval-num**: 1–48 • The statistics for the selected interval are displayed as shown in *Displaying Interval Statistics*; see *Table 8-12* and *Table 8-13*. • If you specified an interval that has not yet ended since the service was activated, a message is displayed that the interval doesn't exist.
Viewing statistics for 12 hours	**show statistics 12-hours**	The statistics for the past 12 hours are displayed as shown in *Displaying 12-Hour Statistics*; see *Table 8-12* and *Table 8-13*

Task	Command	Comments
Viewing running statistics, statistics for the current interval, statistics for all intervals, and 12-hour statistics	**show statistics all**	The statistics are displayed as shown in *Displaying Running Statistics, Displaying Current Statistics, Displaying Interval Statistics, Displaying 12-Hour Statistics* see *Table 8-12* and *Table 8-13*
Viewing statistics for all intervals	**show statistics all-intervals**	The statistics for all intervals are displayed as shown in*Displaying Interval Statistics*; see *Table 8-12* and *Table 8-13*
Clearing the statistics for the service or destination NE	**clear-statistics**	All statistics data for the service or destination NE are cleared, including the stored interval data, except for the elapsed time since the start of the current interval

Table 8-12. OAM Statistic Counters

Parameter	Description
Far End Tx Frames	Total number of frames transmitted from local destination NE to remote destination NE since the service was activated (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Far End Rx Frames	Total number of frames received by remote destination NE since the service was activated (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Far End Lost Frames	Total number of frames lost from local destination NE to remote destination NE since the service was activated (Far End Tx Frames - Far End Rx Frames) (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Far End Frame Loss Ratio (%)	Far End Lost Frames divided by Far End Tx Frames

Parameter	Description
Far End Unavailable Seconds (Sec)	Number of seconds the remote destination NE is considered unavailable. The definition of unavailability differs according to user data or synthetic measurement mode, as configured by the **loss single-ended** command: • User data – The destination NE is considered unavailable after 10 consecutive seconds with SES (Severely Errored Second) events; the 10 seconds are part of the unavailable time. An SES is considered to have occurred if more than one frame out of 1000 is lost. The destination NE is considered available again after 10 consecutive non-SES events; the 10 seconds are part of the available time. • Synthetic mode – The destination NE is considered unavailable after 3.5 consecutive seconds with no reception of synthetic frames; the 3.5 seconds are part of the unavailable time. The destination NE is considered available again when a synthetic frame is received.
Near End Tx Frames	Total number of frames transmitted from remote destination NE to local destination NE since the service was activated (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Near End Rx Frames	Total number of frames received by local destination NE since the service was activated (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Near End Lost Frames	Total number of frames lost from remote destination NE to local destination NE since the service was activated (Near End Tx Frames - Near End Rx Frames) (the type of frames counted is either user data or synthetic, according to the method configured by the **loss single-ended** command)
Near End Frame Loss Ratio (%)	Near End Lost Frames divided by Near End Tx Frames
Near End Unavailable Seconds (Sec)	Number of seconds the local destination NE is considered unavailable. See the description of Far End Unavailable Seconds for the definition of unavailability.
Current Delay (uSec)	Current delay received in the last Delay Measurement Reply (DMR)
Current Delay Variation (uSec)	Difference between the current delay value and the previous current delay value
Average Two Way Delay (uSec)	Average of all frame delay values received in DM frames
Average Two Way Delay Var (uSec)	Average difference between the frame delay values received in DM frames
Frames Above Delay Threshold	Number of DM frames whose delay value exceeded the delay threshold configured for the service
Frames Above Delay Variation Threshold	Number of DM frames whose delay variation exceeded the delay variation threshold configured for the service
Elapsed Time (sec)	Time (in seconds) elapsed since the service was activated

Table 8-13. OAM Delay and Loss Measurement Counters

Parameter	Description
Transmitted LMMs	Number of transmitted loss measurement messages
Transmitted DMMs	Number of transmitted delay measurement messages
Received LMRs	Number of received loss measurement replies
Received DMRs	Number of received delay measurement replies

Examples

Displaying Running Statistics

```
ETX-203AX>config>oam>cfm# ma 1 ma 1 mep 1 serv 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# show statistics running
Running Counters
-------------------------------------------------------------------------------
Far End TX Frames                     : 3684
Far End RX Frames                     : 3684
Far End Lost Frames                   : 0

Near End TX Frames                    : 3684
Near End RX Frames                    : 3684
Near End Lost Frames                  : 0

Current Delay (uSec)                  : 0.001 mSec
Current Delay Variation (uSec)        : 0.000 mSec
Frames Above Delay Threshold          : 0
Frames Above Delay Variation Threshold : 0

Elapsed Time (sec)                    : 847

Loss and Delay Measurements Messages
-------------------------------------------------------------------------------
                    Transmitted
LMMs :              3561
DMMs :              3561
                    Received
LMRs :              3561
DMRs :              3561
```

```
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show statistics running
Running Counters
--------------------------------------------------------------------------------
Far End TX Frames                       : 3684
Far End RX Frames                       : 3684
Far End Lost Frames                     : 0
Far End Unavailable Seconds (Sec)       : 0

Near End TX Frames                      : 3684
Near End RX Frames                      : 3684
Near End Lost Frames                    : 0
Near End Unavailable Seconds (Sec)      : 0

Current Delay (uSec)                    : 0.001 mSec
Current Delay Variation (uSec)          : 0.000 mSec
Frames Above Delay Threshold            : 0
Frames Above Delay Variation Threshold : 0

Elapsed Time (sec)                      : 3647
Loss and Delay Measurements Messages
--------------------------------------------------------------------------------
                     Transmitted
LMMs :               3561
DMMs :               3561
                     Received
LMRs :               3561
DMRs :               3561
```

Displaying Current Statistics

```
ETX-203AX>config>oam>cfm# ma 1 ma 1 mep 1 serv 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# show statistics current
Current
-------------------------------------------------------------------------------
Far End Tx Frames                      : 854
Far End Rx Frames                      : 854
Far End Lost Frames                    : 0
Far End Frame Loss Ratio (%)           : 0.0000%

Near End Tx Frames                     : 855
Near End Rx Frames                     : 855
Near End Lost Frames                   : 0
Near End Frame Loss Ratio (%)          : 0.0000%

Average Two Way Delay (mSec)           : 0.001
Average Two Way Delay Var (mSec)       : 0.000
Frames Above Delay Threshold           : 0
Frames Above Delay Variation Threshold : 0

Elapsed Time (sec)                     : 847

Loss and Delay Measurements Messages
-------------------------------------------------------------------------------
                     Transmitted
LMMs :               826
DMMs :               826
                     Received
LMRs :               826
DMRs :               826
```

```
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show statistics current
Current
-------------------------------------------------------------------------
Far End Tx Frames                     : 854
Far End Rx Frames                     : 854
Far End Lost Frames                   : 0
Far End Frame Loss Ratio (%)          : 0.0000%
Far End Unavailable Seconds (Sec)     : 0

Near End Tx Frames                    : 855
Near End Rx Frames                    : 855
Near End Lost Frames                  : 0
Near End Frame Loss Ratio (%)         : 0.0000%
Near End Unavailable Seconds (Sec)    : 0

Average Two Way Delay (mSec)          : 0.001
Average Two Way Delay Var (mSec)      : 0.000
Frames Above Delay Threshold          : 0
Frames Above Delay Variation Threshold : 0

Elapsed Time (sec)                    : 847
Loss and Delay Measurements Messages
-------------------------------------------------------------------------
                    Transmitted
LMMs :              826
DMMs :              826
                    Received
LMRs :              826
DMRs :              826
```

Displaying Interval Statistics

```
ETX-203AX>config>oam>cfm# ma 1 ma 1 mep 1 serv 1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# show statist interval 1
Interval
-------------------------------------------------------------------------
Interval                              : 1
Far End Tx Frames                   : 910
Far End Rx Frames                   : 910
Far End Lost Frames                 : 0
Far End Frame Loss Ratio (%)        : 0.0000%

Near End Tx Frames                  : 909
Near End Rx Frames                  : 909
Near End Lost Frames                : 0
Near End Frame Loss Ratio (%)       : 0.0000%

Average Two Way Delay (mSec)        : 0.001
Average Two Way Delay Var (mSec)    : 0.000

Loss and Delay Measurements Messages
-------------------------------------------------------------------------
                    Transmitted
LMMs :              879
```

```
DMMs :              879
                    Received
LMRs :              879
DMRs :              879

ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show statist interval 1
Interval
-------------------------------------------------------------------------
Interval                            : 1
Far End Tx Frames                   : 910
Far End Rx Frames                   : 910
Far End Lost Frames                 : 0
Far End Frame Loss Ratio (%)        : 0.0000%
Far End Unavailable Seconds (Sec)   : 0

Near End Tx Frames                  : 909
Near End Rx Frames                  : 909
Near End Lost Frames                : 0
Near End Frame Loss Ratio (%)       : 0.0000%
Near End Unavailable Seconds (Sec) : 0

Average Two Way Delay (mSec)        : 0.001
Average Two Way Delay Var (mSec)    : 0.000

Loss and Delay Measurements Messages
-------------------------------------------------------------------------
                    Transmitted
LMMs :              879
DMMs :              879
                    Received
LMRs :              879
DMRs :              879
```

Displaying 12-Hour Statistics

```
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# show statistics 12-hours
12-Hours
-------------------------------------------------------------------------
Far End Tx Frames                   : 2830
Far End Rx Frames                   : 2830
Far End Lost Frames                 : 0

Near End Tx Frames                  : 2829
Near End Rx Frames                  : 2829
Near End Lost Frames                : 0

Average Two Way Delay (mSec)        : 0.000
Average Two Way Delay Var (mSec)    : 0.000
```

```
Loss and Delay Measurements Messages
--------------------------------------------------------------------------------
                    Transmitted
LMMs :              27350
DMMs :              2735
                    Received
LMRs :              2735
DMRs :              2735

ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)# dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show statistics 12-h
12-Hours
--------------------------------------------------------------------------------
Far End Tx Frames                  : 2830
Far End Rx Frames                  : 2830
Far End Lost Frames                : 0
Far End Unavailable Seconds (Sec)  : 0

Near End Tx Frames                 : 2829
Near End Rx Frames                 : 2829
Near End Lost Frames               : 0
Near End Unavailable Seconds (Sec) : 0

Average Two Way Delay (mSec)       : 0.000
Average Two Way Delay Var (mSec)   : 0.000

Loss and Delay Measurements Messages
--------------------------------------------------------------------------------
                    Transmitted
LMMs :              27350
DMMs :              2735
                    Received
LMRs :              2735
DMRs :              2735
```

Configuring and Displaying Delay Measurement Bins

➤ To configure and display delay measurement bins:

- Bin1 used for round trip delay measurements, with threshold ranges:
  - 0–15,000
  - 15,001– 49,000
  - 49,001–55,000
  - 55,001–250,000
  - 250,001–5,000,000.
- Bin2 used for round trip delay variation measurements, with threshold ranges:
  - 0–15,000
  - 15,001– 55,000
  - 55,001–105,000

- 105,001–205,000
- 205,001–5,000,000.

```
ETX-203AX>config>oam>cfm# measurement-bin-profile bin1
ETX-203AX>config>oam>cfm>measurement-bin-prof(bin1)# thresholds 15000,49000,55000,250000
ETX-203AX>config>oam>cfm>measurement-bin-prof(bin1)# exit
ETX-203AX>config>oam>cfm# measurement-bin-profile bin2
ETX-203AX>config>oam>cfm>measurement-bin-prof(bin2)# thresholds 15000,55000,105000,205000
ETX-203AX>config>oam>cfm>measurement-bin-prof(bin2)# exit
ETX-203AX>config>oam>cfm# ma 1 ma 1 mep 1 serv 1 dest-ne 3
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# delay-measurement-bin
profile bin1
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)#
delay-var-measurement-bin profile bin2
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show
delay-measurement-bins rt-delay all
Type : rt Delay

Current
-------------------------------------------------------------------------------
Bin  range                    Rx DMR
     (us)
-------------------------------------------------------------------------------
1    0..15000                 0
2    15001..49000             0
3    49001..55000             0
4    55001..250000            0
5    250001..5000000          0
```

```
Type : rt Delay

Interval  Bin  range                    Rx DMR
               (us)
-------------------------------------------------------------------------------
1         1    0..15000                 36
1         2    15001..49000             0
1         3    49001..55000             0
1         4    55001..250000            0
1         5    250001..5000000          0
2         1    0..15000                 753
2         2    15001..49000             0
2         3    49001..55000             0
2         4    55001..250000            0
2         5    250001..5000000          0
3         1    0..15000                 713
3         2    15001..49000             0
3         3    49001..55000             0
3         4    55001..250000            0
3         5    250001..5000000          0
```

```
ETX-203AX>config>oam>cfm>md(1)>ma(1)>mep(1)>service(1)>dest-ne(3)# show
delay-measurement-bins rt-delay-var all
Type : rt Delay Var

Current
-------------------------------------------------------------------------------
Bin  range                    Rx DMR
     (us)
-------------------------------------------------------------------------------
1    0..15000                 0
2    15001..55000             0
3    55001..105000            0
4    105001..205000           0
5    205001..5000000          0
```

```
Type : rt Delay Var

Interval  Bin  range                    Rx DMR
               (us)
-------------------------------------------------------------------------------
1         1    0..15000                 36
1         2    15001..55000             0
1         3    55001..105000            0
1         4    105001..205000           0
1         5    205001..5000000          0
2         1    0..15000                 753
2         2    15001..55000             0
2         3    55001..105000            0
2         4    105001..205000           0
2         5    205001..5000000          0
3         1    0..15000                 713
3         2    15001..55000             0
3         3    55001..105000            0
3         4    105001..205000           0
3         5    205001..5000000          0
```

Performing OAM Loopback

This diagnostic utility verifies OAM connectivity on Ethernet connections. You can execute the loopback according to the destination MAC address or the remote MEP number.

Note *The option for remote MEP ID is available only if ETX-203AX can resolve at least one remote MEP MAC address.*

➤ To run an OAM loopback:

- At the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**#** prompt, enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying remote MEP by MAC address	**lbm address** <mac-address> [**repeat** <repeat-num>] [**data-tlv-length** <length-val>]	• MAC address is in the format <xx-xx-xx-xx-xx-xx> • Allowed range of

Task	Command	Comments
Specifying remote MEP by MEP ID	**lbm remote-mep** <mep-id> [**repeat** <repeat-num>] [**data-tlv-length** <length-val>]	**repeat-num** is 1–500 • Allowed range of **data-tlv-length** is 0–1900
Sending LBM messages to default multicast MAC address	**lbm multicast** [**repeat** <repeat-num>]	
Checking OAM loopback results	**show lbm-results**	

Performing OAM Link Trace

This diagnostic utility traces the OAM route to the destination, specified either by the MAC address or the maintenance end point (MEP).

Note

The option to specify the destination MEP ID is available only if ETX-203AX can resolve at least one remote MEP MAC address.

➤ To run an OAM link trace:

- At the **config>oam>cfm>md**(<mdid>)**>ma**(<maid>)**>mep**(<mepid>)**#** prompt, enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying remote MEP by MAC address	**linktrace address** <mac-address> [**ttl** <ttl-value>]	• MAC address is in the format <xx-xx-xx-xx-xx-xx> • Allowed range for **ttl-value** is 1–64. This parameter specifies number of hops. Each unit in the link trace decrements the TTL until it reaches 0, which terminates the link trace.
Specifying remote MEP by ID	**linktrace remote-mep <mep-id>** [**ttl** <ttl-value>]	
Checking the OAM link trace results	**show linktrace-results**	

OAM EFM

This section covers the monitoring of the Ethernet links using OAM EFM (OAM Ethernet at the First Mile)

ETX-203AX can act as the active or passive side in an IEEE 802.3-2005 application.

When link OAM (EFM) is enabled for a port, you can view its status by displaying the port status (**show status**). You can also display the OAM (EFM) parameters and OAM (EFM) statistics. You can configure OAM EFM for Ethernet/logical MAC ports.

Standards

IEEE 802.3-2005

Benefits

Ethernet OAM (EFM) provides remote management and fault indication for the Ethernet links. Remote link failure can be detected via OAM (EFM).

Functional Description

The OAM (EFM) discovery process allows a local data terminating entity (DTE) to detect Ethernet OAM capabilities on a remote DTE. Once Ethernet OAM support is detected, both ends of the link exchange state and configuration information, such as mode, PDU size, loopback support, etc. If both DTEs are satisfied with the settings, OAM is enabled on the link. However, the loss of a link or a failure to receive OAMPDUs for five seconds may cause the discovery process to restart.

DTEs may either be in active or passive mode. DTEs in active mode initiate the ETH-OAM (EFM) communications and can issue queries and commands to a remote device. DTEs in passive mode generally wait for the peer device to initiate OAM communications and respond to commands and queries, but do not initiate them.

A flag in the OAMPDU allows an OAM entity to convey the failure condition Link Fault to its peer. Link Fault refers to the loss of signal detected by the receiver; A Link Fault report is sent once per second with the Information OAMPDU.

Factory Defaults

By default, OAM EFM is not enabled for Ethernet/logical MAC ports.

Configuring OAM EFM

There are two available OAM EFM descriptors. Each can be configured to indicate active or passive OAM EFM.

➤ **To configure OAM EFM descriptor:**

1. Navigate to **configure oam efm**.

   The **config>oam>efm#** prompt is displayed.

2. Enter:
   `descriptor` <number> {**`active`** | **`passive`**}

➤ **To configure link OAM (EFM) for Ethernet/logical MAC port:**

1. Navigate to **configure port ethernet** <port-num> or **configure port logical-mac** <port-num>, respectively.

   The prompt **config>port>eth**(<port-num>)**#** or **config>port>log-mac**(<port-num>)**#** is displayed, respectively.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Enabling link OAM (EFM)	**efm descriptor** ‹1–2›	The EFM descriptor must exist before you can assign it to a port ***Note**: In order for link OAM (EFM) to function properly, the relevant Ethernet port must be associated with an L2CP profile that specifies peer action for MAC 0x02.*
Disabling link OAM (EFM)	**no efm**	
Displaying link OAM (EFM) parameters	**show oam-efm**	***Note**: Relevant only for Ethernet ports, if link OAM (EFM) is enabled.*
Displaying link OAM (EFM) statistics	**show oam-efm-statistics**	***Note**: Relevant only for Ethernet ports, if link OAM (EFM) is enabled.*
Commands in level **efm**		
Enabling loopback	**loopback**	Type **no loopback t**o disable loopback
Enabling SNMP tunneling for OAM EFM	**snmp-tunneling**	Type **no snmp-tunneling t**o disable snmp tunneling

Example

➤ To enable active link OAM (EFM) for Ethernet port 1 and display the status:

```
ETX-203AX#configure port l2cp-profile mac2peer
ETX-203AX>config>port>l2cp-profile(mac2peer)$ mac 0x02 peer
ETX-203AX>config>port>l2cp-profile(mac2peer)$ exit all
ETX-203AX# configure oam efm
ETX-203AX>config>oam>efm# descriptor 2 active
ETX-203AX>config>oam>efm# exit all
ETX-203AX# configure port ethernet 1
ETX-203AX>config>port>eth(1)# l2cp profile mac2peer
ETX-203AX>config>port>eth(1)# efm descriptor 2
ETX-203AX>config>port>eth(1)>efm# exit
ETX-203AX>config>port>eth(1)# show oam-efm
Administrative Status : Enabled
Operational Status    : Link Fault
Loopback Status       : Off

Information
------------------------------------------------------------
                 Local                     Remote
Mode           : Active                    --
MAC Address    : 00-20-D2-30-CC-9D         --
Unidirectional : Not Supported             --
Vars Retrieval : Supported                 --
Link Events    : Supported                 --
Loopback       : Supported                 --
PDU Size       : 1518                      --
Vendor OUI     : 0x0020D2                  --

ETX-203AX>config>port>eth(1)#
```

8.4 Quality of Service (QoS)

The ETX-203AX Quality of Service (QoS) parameters include the following profiles:

- Queue map profiles
- CoS map profiles
- Marking profiles
- Bandwidth profiles
- Queue block profiles
- Queue group profiles.

These profiles can be applied to the traffic flows to ensure the desired flow prioritization.

Standards

The following standards are supported:

- IEEE 802.1p
- IEEE 802.1Q.

Benefits

QoS allows you to optimize bandwidth, avoiding the need to allocate excessive bandwidth to facilitate the necessary bandwidth for traffic at different requirements of speed and quality.

Factory Defaults

See the following sections for each QoS type's specific defaults.

Functional Description

To differentiate traffic, the IEEE 802.1p standard specifies eight classes of service per user-defined queue map profile. These classes of service are associated with priority values between 0 and 7, using the 3-bit user priority field in an IEEE 802.1Q header added to VLAN-tagged frames within an Ethernet frame header. The way traffic is treated when assigned to a specific priority value is only generally defined and left to implementation. The general definitions are as follows:

Table 8-14. User Priorities

User Priority	Traffic Type
0	Best effort
1	Background
2	Spare
3	Excellent effort
4	Controlled load
5	Video
6	Voice
7	Network control

Queue Mapping Profiles

Queue mapping profiles are used to convert the following user priorities into internal priority queues. ETX-203AX supports up to 12 queue mapping profiles.

- **p-bit**, when the ingress traffic is prioritized according to the 802.1p requirements
- **ip-dscp**, when the ingress traffic is prioritized according to DSCP

- ip-precedence, when the ingress traffic is prioritized according to IP precedence
- Class of Service (CoS), to queue ETP flow according to internal class of service.

For each profile, you have to define the queue mapping to map the user priority values to the internal queue values. The internal queues are combined into a queue profile, which can be assigned to a queue block.

Factory Defaults

Default Queue Mapping Profile

ETX-203AX provides a default queue mapping profile named CosProfile1, which can be used when the ingress traffic is prioritized according to the 802.1p requirements. It is defined with classification p-bit, and the following mappings:

- Map p-bit 0 to queue 7
- Map p-bit 1 to queue 6
- Map p-bit 2 to queue 5
- Map p-bit 3 to queue 4
- Map p-bit 4 to queue 3
- Map p-bit 5 to queue 2
- Map p-bit 6 to queue 1
- Map p-bit 7 to queue 0.

Default Configuration for IP Precedence Classification

When a new queue mapping profile is created with classification IP precedence, it contains the following mappings:

- Map p-bit 0 to queue 7
- Map p-bit 1 to queue 6
- Map p-bit 2 to queue 5
- Map p-bit 3 to queue 4
- Map p-bit 4 to queue 3
- Map p-bit 5 to queue 2
- Map p-bit 6 to queue 1
- Map p-bit 7 to queue 0.

Default Configuration for DSCP Classification

When a new queue mapping profile is created with classification DSCP, it contains the following mappings:

- Map p-bit 0 to queue 7
- Map p-bit 1 to queue 6
- Map p-bit 2 to queue 5

- Map p-bit 3 to queue 4
- Map p-bit 4 to queue 3
- Map p-bit 5 to queue 2
- Map p-bit 6 to queue 1
- Map p-bit 7 through 63 to queue 0.

Adding Queue Mapping Profiles

When you create a queue mapping profile, you specify the name and the classification method (p-bit, IP precedence, or DSCP).

➤ **To add a queue mapping profile:**

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   queue-map-profile <queue-map-profile-name> **classification** {p-bit|ip-precedence|ip-dscp|cos}

   A queue mapping profile with the specified name and classification method is created and the following prompt is displayed: **config>qos>queue-map-profile**(<queue-map-profile-name>)**$**. The mappings for the new profile are configured by default as described in *Factory Defaults*.

3. Configure the queue profile mappings as described in *Configuring Queue Mappings*.

Configuring Queue Mappings

1. Navigate to **config qos queue-map-profile** ‹queue-map-profile-name› to select the queue mapping profile to configure.

   The following prompt is displayed:
   config>qos>queue-map-profile(‹queue-map-profile-name›)**#**

2. Map the user priorities to queue IDs as necessary:

   - Classification p-bit or IP precedence:
     map <0-7> **to-queue** <0-7>
   - Classification DSCP:
     map <0-63> **to-queue** <0-7>
   - Classification CoS:
     map <0-7> **to-queue** <0-7>

Examples

➤ To create and configure a queue mapping profile named QMapPbit with classification p-bit:

- Map priority 0 to queue 3
- Map priority 4 and 6 to queue 2.

```
ETX-203AX# configure qos queue-map-profile QMapPbit classification p-bit
ETX-203AX>config>qos>queue-map-profile(QMapPbit)$ map 0 to 3
ETX-203AX>config>qos>queue-map-profile(QMapPbit)$ map 4 to 2
ETX-203AX>config>qos>queue-map-profile(QMapPbit)$ map 6 to 2
ETX-203AX>config>qos>queue-map-profile(QMapPbit)$ info detail
    map  0 to-queue  3
    map  1 to-queue  6
    map  2 to-queue  5
    map  3 to-queue  4
    map  4..6 to-queue  2
    map  7 to-queue  0
```

➤ To create and configure a queue mapping profile named QMapIPprec with classification IP precedence:

- Map priority 2 and 3 to queue 3.

```
ETX-203AX# configure qos queue-map-profile QMapIPprec classif ip-precedence
ETX-203AX>config>qos>queue-map-profile(QMapIPprec)$ map 2 to 3
ETX-203AX>config>qos>queue-map-profile(QMapIPprec)$ map 3 to 3
ETX-203AX>config>qos>queue-map-profile(QMapIPprec)$ info detail
    map  0 to-queue  7
    map  1 to-queue  6
    map  2..4 to-queue  3
    map  5 to-queue  2
    map  6 to-queue  1
    map  7 to-queue  0
```

➤ To create and configure a queue mapping profile named QMapDSCP with classification DSCP:

- Map priority 7 to queue 6
- Map priority 55 to queue 4
- Map priority 63 to queue 5.

```
ETX-203AX# configure qos queue-map-profile QMapDSCP classif ip-dscp
ETX-203AX>config>qos>queue-map-profile(QMapDSCP)$ map 7 to 6
ETX-203AX>config>qos>queue-map-profile(QMapDSCP)$ map 55 to 4
ETX-203AX>config>qos>queue-map-profile(QMapDSCP)$ map 63 to 5
ETX-203AX>config>qos>queue-map-profile(QMapDSCP)$ info detail
    map  0 to-queue  7
    map  1 to-queue  6
    map  2 to-queue  5
    map  3 to-queue  4
    map  4 to-queue  3
    map  5 to-queue  2
    map  6 to-queue  1
    map  7 to-queue  6
    map  8..54 to-queue  0
    map  55 to-queue  4
    map  56..62 to-queue  0
    map  63 to-queue  5
```

➤ To create and configure a queue mapping profile named QMapCoS with classification CoS:

- Map CoS 6–7 to-queue 0
- Map CoS 3–5 to-queue 1
- Map CoS 0–2 to-queue 2.

```
ETX-203AX# configure qos queue-map-profile QMapCoS classification cos
ETX-203AX>config>qos>queue-map-profile(QMapCoS)$ map 6..7 to-queue 0
ETX-203AX>config>qos>queue-map-profile(QMapCoS)$ map 3..5 to-queue 1
ETX-203AX>config>qos>queue-map-profile(QMapCoS)$ map 0..2 to-queue 2
ETX-203AX>config>qos>queue-map-profile(QMapCoS)$ exit
ETX-203AX>config>qos#
```

CoS Mapping Profiles

Class of Service (CoS) mapping profiles map the following user priorities to internal CoS values, for use in ETP flows.

- p-bit, when the ingress traffic is prioritized according to the 802.1p requirements
- ip-dscp, when the ingress traffic is prioritized according to DSCP
- ip-precedence, when the ingress traffic is prioritized according to IP precedence.

Factory Defaults

By default, there are no CoS mapping profiles. When you create a CoS mapping profile, it is configured as follows:

- Classification p-bit
- Mappings:
  - Map 0 to CoS 7
  - Map 1 to CoS 6
  - Map 2 to CoS 5
  - Map 3 to CoS 4
  - Map 4 to CoS 3
  - Map 5 to CoS 2
  - Map 6 to CoS 1
  - Map 7 to CoS 0.

Configuring CoS Mapping Profiles

➤ **To define a CoS profile:**

1. Navigate to the qos context (**config>qos**).
2. Define a CoS profile and assign a classification to it:

   cos-map-profile <cos-mapping-profile-name> [**classification** {**p-bit** | **ip-precedence** | **ip-dscp** }]

3. Map the user priority to a CoS value (user priority values 0–7 for p-bit and IP precedence, 0–63 for the other priority types; CoS values 0–7):

   map <0-7> **to** <0-7>
   map <0-63> **to** <0-7>

Example

➤ **To create and configure a CoS mapping profile named my-p-bit with classification p-bit:**

- Map priority 6–7 to CoS 0
- Map priority 3–5 to CoS 1
- Map priority 0–2 to CoS 2.

```
ETX-203AX# configure qos cos-map-profile my-p-bit classification p-bit
ETX-203AX>config>qos>cos-map-profile(my-p-bit)$ map 6..7 to-cos 0
ETX-203AX>config>qos>cos-mapping-profile(my-p-bit)# map 3..5 to-cos 1
ETX-203AX>config>qos>cos-mapping-profile(my-p-bit)# map 0..2 to-cos 2
ETX-203AX>config>qos>cos-mapping-profile(my-p-bit)# exit
ETX-203AX>config>qos#
```

Marking Profiles

Marking profiles map the P-bit, IP precedence, DSCP, or CoS classifications to the egress priority tags. The marking can also be done per color (green and/or yellow), to support color re-marking, optionally specifying the Drop Eligible Indicator (DEI) bit in the frame header. ETX-203AX supports up to 12 marking profiles.

Factory Defaults

ETX-203AX provides a default non color-aware marking profile named MarkingProfile1, which can be used when the ingress traffic is prioritized according to the 802.1p requirements. It is defined with classification p-bit and method p-bit, and the following markings:

- P-bit 0 =› priority 0
- P-bit 1 =›priority 1
- P-bit 2 =›priority 2
- P-bit 3 =›priority 3
- P-bit 4 =›priority 4
- P-bit 5 =›priority 5
- P-bit 6 =›priority 6
- P-bit 7 =›priority 7.

When a non color-aware marking profile is created, it has the same configuration as MarkingProfile1.

Configuring Marking Profiles

➤ To define a marking profile and assign a priority mark to it:

1. Navigate to the qos context (config>qos).
2. Define the marking profile and assign a classification and a method to it:

   marking-profile <marking-profile-name>
   [**classification** {**p-bit**|**ip-precedence**|**ip-dscp**} [**method p-bit**]
   [**color-aware** {**none** | **green-yellow**} [**dei-set**]

   To define a color-aware profile, specify color-aware green-yellow. In the case of a color-aware profile, if you specify dei-set, then yellow frames transmitted from ETX-203AX are marked via the Drop Eligible Indicator (DEI) bit as eligible to be dropped, and green frames transmitted from ETX-203AX are marked as not eligible to be dropped. If you do not specify dei-set, then green and yellow frames are marked as not eligible to be dropped.
3. Map the user priority (and packet color if applicable) to a priority marking value (user priority values 0–7 for p-bit, IP precedence, and CoS, 0–63 for DSCP; priority marking values 0–7), according to the profile parameters:

   - Non color-aware profile:

   mark <user-priority> **to** <priority-marking>

- Color-aware profile, and **dei-set** was not specified:

```
mark <user-priority> {all|green|yellow}to <priority-marking>
```

- Color-aware profile, and **dei-set** was specified:

```
mark <user-priority>{green|yellow}to <priority-marking> dei {green|yellow}
```

Bandwidth Profiles

ETX-203AX supports the following bandwidth profiles:

- Shaper profile – Applied to queue group blocks
- Policer profile – Applied to flows to limit flow traffic, or to Ethernet ports to limit broadcast/multicast traffic
- Policer aggregate – Specifies policer profile to apply to a group of up to traffic flows.

You can control the egress bandwidth utilization by defining the committed information rate and committed burst size in shaper and policer profiles. You can also define the excessive information rate and the excessive burst size in policer profiles.

CIR: Defines the Committed Information Rate (CIR) for the current profile. The CIR specifies a bandwidth with committed service guarantee ("green bucket" rate).

CBS: Defines the Committed Burst Size (CBS) for the current profile. The CBS specifies the maximum guaranteed burst size ("green bucket" size).

EIR: Defines the Excess Information Rate (EIR). The EIR specifies an extra bandwidth with no service guarantee ("yellow bucket" rate).

EBS: Defines the Excess Burst Size (EBS). The EBS specifies the extra burst with no service guarantee ("yellow bucket" size).

Compensation: You can specify the amount of bytes that the shaper or policer can compensate for the layer 1 overhead (preamble and IFG) and the overhead for the added VLAN header in case of stacking.

Factory Defaults

ETX-203AX provides default bandwidth profiles, as specified in the following table.

Table 8-15. Default Bandwidth Profiles

Profile Type	Shaper	Policer
Profile Name	Shaper1	Policer1
cir	1000000	0
cbs	32,767	0
eir	–	1000000
ebs	–	32767
compensation	0	0
traffic-type	–	all

Configuring Shaper Profiles

You can define up to 30 shaper profiles.

Adding Shaper Profiles

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   shaper-profile <shaper-profile-name>.

   A shaper profile with the specified name is created and the **config>qos>shaper-profile**(<shaper-profile-name>)**$** prompt is displayed. The new shaper profile parameters (except for name) are configured by default as described in *Factory Defaults*.

3. Configure the shaper profile as described in *Configuring Shaper Profile Parameters*.

Configuring Shaper Profile Parameters

➤ **To configure shaper profiles:**

1. Navigate to **configure qos shaper-profile** <shaper-profile-name> to select the shaper profile to configure.

   The **config>qos>shaper-profile**(<shaper-profile-name>)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the CIR (Kbps) and CBS (bytes) bandwidth limits	**bandwidth** [**cir** <cir-kbit-sec>] [**cbs** <cbs-bytes>]	***Notes:*** • *CIR allowed values: 0–1,000,000* • *CBS allowed values: 0, or 64–65535*
Specifying the compensation (bytes)	**compensation** <0–63>	

Example

➤ **To create and configure a shaper profile named Shap2:**

- CIR = 99,840 Kbps
- CBS = 32,000 bytes
- Compensation = 48.

```
ETX-203AX# configure qos shaper-profile Shap2
ETX-203AX>config>qos>shaper-profile(Shap2)$ bandwidth cir 99840 cbs 32000
ETX-203AX>config>qos>shaper-profile(Shap2)$ compensation 48
ETX-203AX>config>qos>shaper-profile(Shap2)$
```

Configuring Policer Profiles

You can define up to 60 policer profiles.

Adding Policer Profiles

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   policer-profile <policer-profile-name>

   A policer profile with the specified name is created and the following prompt is displayed:
   config>qos>policer-profile(<policer-profile-name>)**$**

   The new policer profile parameters (except for name) are configured by default as described in *Factory Defaults*.

3. Configure the policer profile as described in *Configuring Policer Profile Parameters*.

Configuring Policer Profile Parameters

1. Navigate to **configure qos policer-profile** ‹policer-profile-name› to select the policer profile to configure.

   The **config>qos>policer-profile**(‹policer-profile-name›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the CIR (Kbps), CBS (bytes), EIR (Kbps), and EBS (bytes) bandwidth limits	**bandwidth** [**cir** ‹cir-kbit-sec›] [**cbs** ‹cbs-bytes›] [**eir** ‹eir-kbit-sec›] [**ebs** ‹ebs-bytes›]	*Notes:* • *CIR & EIR allowed values: 0–1000000* • *CBS & EBS allowed values: 0, or 64–1048575* • *CIR can be set to zero only if CBS is set to zero* • *EIR can be set to zero only if EBS is set to zero* • *CIR + EIR must not exceed the maximum available bandwidth* • *CBS should be greater than the maximum frame size* • *For policer profiles that will be attached to Ethernet ports to limit broadcast/multicast traffic, only the CIR and CBS parameters are relevant (EIR and EBS should be set to 0)* • *The CIR and EIR granularity depend on the configured values, as described in Table 8-16* • *The CBS must be greater than or equal to the CIR divided by policer granularity.*
Specifying the compensation (bytes)	**compensation** ‹0–63›	
Specifying the traffic type	**traffic-type** {**all** | **broadcast** | **multicast** | **unknown-unicast** }	***Note**: Traffic types other than **all** are relevant only for policer profiles attached to ports.*

Table 8-16. Granularity Rounding Down of CIR/EIR

Policer Type	CBS/EBS <= 64,000 Bytes	64,000 Bytes < CBS/EBS <= 128,000 Bytes	128,000 Bytes < CBS/EBS <= 256,000 Bytes	256,000 Bytes < CBS/EBS <= 512,000 Bytes	512,000 Bytes < CBS/EBS <= 1,048,575 Bytes
Port policer, or flow policer with CIR and EIR < 100,000 Kbps	64 Kbps	128 Kbps	256 Kbps	512 Kbps	1 Mbps
Flow policer with CIR or EIR >= 100,000 Kbps	500 Kbps	1 Mbps	2 Mbps	4 Mbps	8 Mbps

Policer Type	CBS/EBS <= 64,000 Bytes	64,000 Bytes < CBS/EBS <= 128,000 Bytes	128,000 Bytes < CBS/EBS <= 256,000 Bytes	256,000 Bytes < CBS/EBS <= 512,000 Bytes	512,000 Bytes < CBS/EBS <= 1,048,575 Bytes

*Note: The **info** command displays the CIR/EIR value:*

- *Rounded down to 64 Kbps granularity for low-speed policers*
- *Rounded down to 500 Kbps granularity for high-speed policers.*

Examples

➤ To create and configure a policer profile named Policer4:

- CIR = 50,000 Kbps
- CBS = 28,000 bytes
- EIR = 30,000 Kbps
- EBS = 20,000 bytes
- Compensation = 56.

Note *CIR and EIR are rounded down to 64K granularity, as this is a low-speed policer with burst size < 64,000 bytes.*

```
ETX-203AX# configure qos policer-profile Policer4
ETX-203AX>config>qos>policer-profile(Policer4)$ bandwidth cir 50000 cbs 28000 eir 30000 ebs 20000
ETX-203AX>config>qos>policer-profile(Policer4)$ compensation 56
ETX-203AX>config>qos>policer-profile(Policer4)$ info detail
    bandwidth cir  49984 cbs  28000 eir  29952 ebs  20000
    traffic-type  all
    compensation  56
ETX-203AX>config>qos>policer-profile(Policer4)$
```

Configuring Policer Aggregates

You can define up to 30 policer aggregates that specify a policer profile to apply to a group of up to five flows. This is useful if you want to set bandwidth limits that are divided among more than one flow.

Factory Defaults

By default, no policer aggregates exist. When a policer aggregate is created, it has the following configuration:

- No assigned policer profile
- No assigned flows
- Rate sampling window (interval for sampling the associated flow statistics) set to 15 minutes.

Adding Policer Aggregates

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   policer-aggregate <policer-aggregate-name>

   A policer aggregate with the specified name is created and the **config>qos>policer-aggregate**(<policer-aggregate-name>)**$** prompt is displayed. The new policer aggregate parameters are configured by default as described in *Factory Default*.

3. Configure the policer aggregate as described in *Configuring Policer Aggregate Parameters*.

Configuring Policer Aggregate Parameters

1. Navigate to **configure qos policer-aggregate** <policer-aggregate-name> to select the policer aggregate to configure.

   The following prompt is displayed:
   config>qos>policer-aggregate(<policer-aggregate-name>)**#**

2. Enter all necessary commands according to the tasks listed below.

Note *You assign flows to the policer aggregate in the flow level (see* Configuring Flows *for details).*

Task	Command	Comments
Assigning policer profile	**policer profile** <policer-profile-name>	
Specifying rate sampling window (minutes)	**rate-sampling-window** <1–30>	
Displaying the associated flows	**show flows**	
Displaying statistics for the associated flows	**show statistics running**	
Clearing the statistics for the associated flows	**clear-statistics**	

Example

➤ **To create and configure a policer aggregate named Aggr1:**

- Policer profile: Policer4 (created in policer profile example).

```
ETX-203AX# configure qos
ETX-203AX>config>qos# policer-aggregate Aggr1
ETX-203AX>config>qos>policer-aggregate(Aggr1)$ policer profile Policer4
```

Queue Block Profiles

In order to facilitate congestion management, you can sort traffic by applying queue block profiles to queue block entities. A queue block profile contains entries for queues 0–7, with the following parameters:

- Scheduling method:

- Strict – High-priority queues that are always serviced first. If a lower-priority queue is being serviced and a packet enters a higher queue, that queue is serviced immediately.
- WFQ (weighted fair queuing) – If one port does not transmit, its unused bandwidth is shared by the 'transmitting' queues according to the assigned weight.

In configurations with Strict and WFQ queues, the WFQ frames are transmitted only after the transmission of frames associated with the Strict queues is completed.

Note *If one of the internal queues is configured to WFQ, queues with a higher queue ID cannot be configured to Strict.*

- Depth (queue size), in bytes.

Factory Defaults

ETX-203AX provides a default queue block profile named DefaultQueue1, which defines queues 0–7 as follows:

- Congestion avoidance: WRED profile corresponding to queue
- Scheduling method: WFQ, with weight set to 100
- Depth: 49,152.

Adding Queue Block Profiles

You can define up to 16 queue block profiles.The ETX-203AX device may create up to 16 additional queue block profiles for internal usage.

➤ **To add a queue block profile:**

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   queue-block-profile <queue-block-profile-name>

   A queue block profile with the specified name is created and the **config>qos>queue-block-profile**(<queue-block-profile-name>)**$** prompt is displayed. The queues for the new profile are configured by default as described in *Factory Defaults*.

3. Configure the queue block profile as described in *Configuring Queue Block Profile Parameters*.

Configuring Queue Block Profile Parameters

➤ **To configure a queue block profile:**

1. Navigate to **config qos queue-block-profile** <queue-block-profile-name> to select the queue block profile to configure.

   The **config>qos>queue-block-profile**(<queue-block-profile-name>)**#** prompt is displayed.

2. Perform the following for each queue that you wish to configure:

a. To configure a queue, enter:
queue <queue-ID>

The following prompt is displayed:
config>qos>queue-block-profile(<queue-block-profile-name>)**>queue(**<queue-ID>)**#**.

b. Enter all necessary commands according to the tasks listed below.

c. Type **exit** to return to the queue block profile context.

Task	Command	Comments
Setting scheduling method	**scheduling** { **strict** | **wfq** <weight>}	The weight range is 3–112
Specifying queue depth (in bytes)	**depth** <value>	Allowed range: 0–1048576 ***Notes**:* • *The queue depth that you configure might be changed by ETX-203AX due to granularity (see Table 8-17). After you configure the queue depth, it is recommended to use **info detail** to see the actual value* • *A queue contains 511 buffers, therefore it is possible for the queue to be full when every buffer is in use, even if the queue size has not reached the maximum depth. This is more likely to happen in the case of relatively small frame sizes.* • *A queue block has 1 MB available, therefore the sum of the depths of its eight queues must be no greater than 1,048,576*

Table 8-17. Queue Depth Granularity

Entered Via CLI	Granularity
0–1024	64
1025–16383	1024
16384–262143	16384
262144–1048576	262144

Example

➤ **To create and configure a queue block profile named QBlockProf1:**

- Queue 0 set to strict scheduling and depth 524,288
- Queue 1 set to strict scheduling and depth 212,992
- Queue 7 set to WFQ scheduling with weight 75.

```
ETX-203AX# configure qos queue-block-profile QBlockProf1
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)$ queue 0
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(0)$ scheduling
strict
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(0)$ depth 524288
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(0)$ exit
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)# queue 1
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(1)# scheduling
strict
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(1)# depth 212992
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(1)# exit
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)# queue 7
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(7)# scheduling wfq
75
ETX-203AX>config>qos>queue-block-profile(QBlockProf1)>queue(7)#
```

Queue Group Profiles

In order to facilitate congestion management, you can sort traffic by applying one queue group profile per network or user port. You can define up to eight queue group profiles per ETX-203AX unit.

Adding Queue Group Profiles

➤ **To add a queue group profile:**

1. Navigate to **configure qos**.

   The **config>qos#** prompt is displayed.

2. Type:
   queue-group-profile <queue-group-profile-name>.

   A queue group profile with the specified name is created and the following prompt is displayed:
   config>qos>queue-group-profile(<queue-group-profile-name>)**$**

3. Configure the queue group profile as described in *Configuring Queue Group* .

Configuring Queue Group Parameters

➤ **To configure a queue group profile:**

1. Navigate to **config qos queue-group-profile** <queue-group-profile-name> to select the queue group profile to configure.

   The **config>qos>queue-group-profile**(<queue-group-profile-name>)**#** prompt is displayed.

2. Select a queue block in level 0 or 1 to configure:
   queue-block 0/<1-31>
   queue-block 1/1

   The following prompt is displayed:
   config>qos>queue-group-profile(<q-grp-profile-name>)**>queue-block**(<level/ID>)**#**

3. Enter all necessary commands according to the tasks listed below.
4. If you wish to configure another queue block, type **exit** to return to the queue group profile context, and start again at *step 2*.

Task	Command	Comments
Assigning a name to the queue block	**name** ‹block-name›	
Assigning a queue block profile	**profile** ‹queue-block-profile-name›	
Assigning a shaper profile ***Note**: Only for queue blocks in level 0*	**shaper profile** ‹shaper-profile-name›	

Note *Normally there is no need for you to enter the bind command. When you add a queue block in level 0 to the profile, bind is done automatically.*

You cannot use the bind command if the queue group contains a single queue block in level 0.

Example

Note *This example uses the shaper profile and queue block profile created in the examples in the preceding sections.*

➤ To create and configure a queue group profile named QGroupProf1:

- Queue block 0/1:
  - Queue block profile: QBlockProf1
  - Shaper profile: Shap2.

Note *Queue blocks 1/1 and 0/2 are automatically created.*

```
ETX-203AX# configure qos queue-group-profile QGroupProf1
ETX-203AX>config>qos>queue-group-profile(QGroupProf1)$ queue-block 0/1
ETX-203AX>config>qos>queue-group-profile(QGroupProf1)>queue-block(0/1)$
profile QBlockProf1
ETX-203AX>config>qos>queue-group-profile(QGroupProf1)>queue-block(0/1)$
shaper profile Shap2
ETX-203AX>config>qos>queue-group-profile(QGroupProf1)>queue-block(0/1)$ exit
ETX-203AX>config>qos>queue-group-profile(QGroupProf1)$ info detail
    queue-block  1/1
        name  "Level1QueueBlock"
        profile  "Scheduling2"
    exit
    queue-block  0/1
        name  "Put your string here"
        profile  "QBlockProf1"
        bind queue  0 queue-block  1/1
        shaper profile  "Shap2"
    exit
    queue-block  0/2
        name  "Put your string here"
        profile  "DefaultQueue1"
        bind queue  1 queue-block  1/1
        shaper profile  "Shaper1"
    exit
```

WRED Profiles

The WRED mechanism defines the probability of dropping yellow packets depending on the current queue usage. This avoids traffic congestion and ensures the forwarding of green packets. You can configure the following:

- Minimum threshold – Defines the queue usage at which the WRED mechanism starts to drop yellow packets
- Maximum threshold – Defines the queue usage above which the WRED mechanism drops all yellow packets
- Probability –Determines the percentage of packets to be dropped when the queue usage reaches the maximum threshold

There are eight WRED profiles available, named WREDProfile0 through WREDProfile7. They are bound to the queues automatically: WREDProfile0 is bound to queue 0, WREDProfile1 is bound to queue 1, etc. You cannot delete the WRED profiles, and you cannot add more WRED profiles. The binding of the profiles to the queues is set and cannot be changed, but you can change the profile parameters. You can view the assignment of WRED profiles to queues via the **info** command in the queue block profile level.

Note *The WRED mechanism is activated only when you use a policer profile with EIR set to a nonzero value.*

Factory Defaults

There are eight WRED profiles available, named WREDProfile0 through WREDProfile7, bound to the corresponding queues.

Configuring WRED Profiles

➤ To configure WRED profiles:

1. Navigate to **configure qos** and type **wred-profile WREDProfile<n>** where **n** is 0 through 7.

   The **config>qos>wred-profile(WREDProfile<n>)#** prompt is displayed.

2. Enter:
   color yellow min <min-threshold> **max** <max-threshold> [**probability** <max-probability>]

   - min-threshold –Queue usage minimum threshold in percentage, 0–100
   - max-threshold –Queue usage maximum threshold in percentage, 0–100
   - max-probability – Percentage of packets to be dropped when the queue usage reaches the maximimum limit.

Note *You can configure the parameters for the color yellow only.*

Example

➤ To configure WRED profile *4*:

- Minimum threshold 64
- Maximum threshold 100
- Probability 50.

```
ETX-203AX# configure qos wred-profile WREDProfile4
ETX-203AX>config>qos>wred-profile(WREDProfile4)# color yellow min 64 max 100
probability 50
ETX-203AX>config>qos>wred-profile(WREDProfile4)# info detail
    color  yellow min  64 max  100 probability  50

ETX-203AX>config>qos>wred-profile(WREDProfile4)#
```

8.5 Router

The router in ETX-203AX is used to interconnect internal Layer 3 support modules such as management. Any flow related to management must be via an SVI that is bound to a router interface.

Notes

- *You can configure up to eight router interfaces*
- *In order to enable management, you must configure a router interface enabled for management access, assign it an IP address, and bind it to an SVI for which management flows have been defined. Refer to the* Quick Start Guide *for an example of management configuration.*

Benefits

The router provides Layer-3 (IP) connectivity.

Factory Default

By default, the router is configured as shown in the following.

```
ETX-203AX# conf router 1
ETX-203AX>config>router(1)# inf d
    name "Router#1"
    dhcp-client
        host-name sys-name
        vendor-class-id ent-physical-name
    exit
```

Functional Description

Any flow into/out of the device, that is related to management, must be via an SVI that is bound to a router interface. A router interface can be associated via binding to only one SVI. If a flow is used for management purposes, the router interface corresponding to the SVI should be enabled for management access.

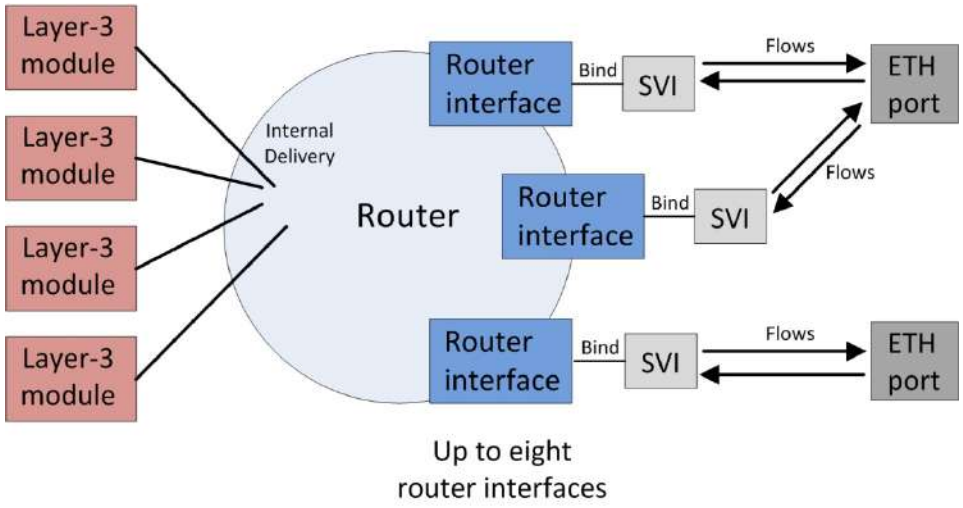


Figure 8-10. Router and SVIs

Configuring the Router

The router functionality allows ETX-203AX to establish links to Ethernet ports via SVIs.

➤ To configure the router:

1. At the **config#** prompt, enter:
   router 1

   The **config>router(1)#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Delete dynamic ARP entities	**clear-arp-table**	
Assigning name to router	**name** <string>	
Enabling the static route and the next gateway (next hop) using the next hop's IP address	**static-route** <IP-address/IP-mask-of-static-route> **address** <IP-address-of-next-hop> [**metric** <metric>]	The next hop must be a subnet of one of the router interfaces To set the default-gateway,configure static route of address 0.0.0.0/0 to next hop default gateway address
Enabling the static route and the router interface number towards which the destination subnet is to be routed	**static-route** <IP-address/IP-mask-of-static-route> **interface** <router-interface-num> [**metric** <metric>]	
Displaying the address resolution protocol (ARP) table, which lists the the original MAC addresses and the associated (resolved) IP addresses	**show arp-table** [**address** <ip-address>]	
Displaying the interface table	**show interface-table**	
Displaying the routing table	**show routing-table** [address <IP-address/IP-mask>] [**protocol** { **dynamic** | **static** }]	
Configuring DHCP client	**dhcp-client**	
Commands in level **dhcp-client**		
Providing host name to DHCP server	**host-name name** <string> **host-name sys-name**	You can specify a name, or specify **sys-name** to indicate that the system name should be used as the host name
Providing vendor ID to DHCP server	**vendor-class-id name** <string> **vendor-class-id ent-physical-name**	You can specify an ID, or specify **ent-physical-name** to indicate that the device name should be used as the vendor ID

➤ **To configure router interfaces:**

1. At the **config>router(1)#** prompt, enter:
   `interface` `<interface-num>`

   The **config>router(1)>interface**(<interface-num>)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning an IP address and a subnet mask to the router interface	**address** <IP-address/IP-mask>	

Task	Command	Comments
Binding router interface to logical port	**bind svi** ‹port-number›	You can bind one SVI to a router interface
Enabling/disabling DHCP client	**dhcp**	
Configuring interface management access	**management-access** {**allow-all** | **allow-ping**}	You can set management access to **allow-all** for up to two router interfaces.
Configuring maximum transmit unit allowed	**mtu** ‹bytes›	
Assigning a name to the router interface	**name** ‹interface-name›	
Enabling VLAN tagging and assigning VLAN ID and priority	**vlan** ‹1–4094› **priority** ‹0–7›	
Displaying interface status	**show status**	
Administratively enabling interface	**no shutdown**	You can administratively enable the router interface only if the following are true: • An IP address was assigned via the **address** command • The router interface is bound to an administratively enabled SVI • Flows have been defined to and from the SVI, and are administratively enabled. Using **shutdown** disables the interface
Configuring DHCP client	**dhcp-client**	
Commands in level **dhcp-client**		
Providing client ID to DHCP server	**client-id id** ‹string› **client-id mac**	You can specify an ID, or specify **mac** to indicate that the device MAC address should be used as the client ID

Chapter 9

Timing and Synchronization

This chapter describes timing features:

- *Date and Time*.

9.1 Date and Time

You can set the date and time for the ETX-203AX internal real-time clock or receive the NTP server clock signal.

Setting the Date and Time

➤ **To set the system date and time:**

1. Navigate to **configure system date-and-time**.

   The **config>system>date-time#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Specifying the desired date format	**date-format** {**yyyy-mm-dd** | **dd-mm-yyyy** | **mm-dd-yyyy** | **yyyy-dd-mm**}	
Defining the date	**date** <date>	Date is according to the configured date format
Defining the time zone relative to Universal Time Coordinated (UTC)	**zone utc** [<[{**+**|**-**}]**hh**[**:mm**]>]	Allowed range of values: -12:00 to +12:00, in 30-minute increments
Defining the time	**time** <hh:mm[:ss]>	

Example

➤ **To set the date and time:**

- Format = mm-dd-yyyy
- Date = May 17, 2011
- Time = 5:40pm
- Zone = UTC –4 hours and 30 minutes.

```
ETX-203AX#configure system date-and-time
ETX-203AX>config>system>date-time# date-format mm-dd-yyyy
ETX-203AX>config>system>date-time# date 05-17-2011
ETX-203AX>config>system>date-time# time 17:40
ETX-203AX>config>system>date-time# zone utc -04:30
ETX-203AX>config>system>date-time#
```

Displaying the Date and Time

➤ To display the date and time:

- From the system context (**config>system**), enter:
  show date-and-time

Working with SNTP

This section explains how to receive the clock signal from NTP servers in the network. ETX-203AX can synchronize with up to ten servers, sending NTP requests to the servers at user-defined intervals.

You can set one of the active SNTP servers as the preferred server, so that ETX-203AX sends NTP requests to the preferred server. If there is no preferred server or if the preferred server does not answer, then ETX-203AX sends NTP requests to any enabled servers.

Factory Defaults

The default configuration of the SNTP parameters is:

- No SNTP servers defined
- Polling interval set to 15 minutes.

When an SNTP server is defined, its default configuration is:

- IP address set to 0.0.0.0
- Not preferred
- Administratively disabled (shutdown).

Configuring SNTP Parameters

➤ To configure SNTP parameters:

1. Navigate to **configure system date-and-time sntp**.

   The **config>system>date-time>sntp#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Enabling ETX-203AX to listen to NTP broadcast messages to obtain accurate timestamps	**broadcast**	Type **no broadcast** to disable broadcast mode.
Setting polling interval (in minutes) for SNTP requests	**poll-interval interval** <minutes>	Allowed range is 1–1440

Task	Command	Comments
Defining and configuring SNTP servers (see *Defining SNTP Servers* and *Configuring SNTP Server Parameters*)	**server** <server-id>	
Displaying SNTP status	**show status**	

Defining SNTP Servers

➤ **To define an SNTP server:**

1. Navigate to **config system date-and-time sntp**.

   The **config>system>date-time>sntp#** prompt is displayed.

2. Type **server** <server-id> to define an SNTP server with ID <server-id>.

   The following prompt is displayed:
   config>system>date-time>sntp>server(<server-id>)**$**. The SNTP server parameters are configured by default as described in *Factory Default*.

3. Configure the SNTP server parameters as needed, as described in *Configuring SNTP Server Parameters*.

Configuring SNTP Server Parameters

➤ **To configure SNTP server parameters:**

1. Navigate to **config system date-and-time sntp**.

   The **config>system>date-time>sntp#** prompt is displayed.

2. Type **server** <server-id> to select the SNTP server to configure.

   The following prompt is displayed:
   config>system>date-time>sntp>server(<server-id>)**#**

3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Setting the IP address of the server	**address** <IP-address>	
Set SNTP server as preferred server.	**prefer**	Type **no prefer t**o remove preference ***Note**: Only one server can be preferred.*
Setting UDP port for NTP requests, to a specific UDP port or to default UDP port (123)	**udp port** <udp-port> **udp default**	Allowed range is 1–65535
Administratively enabling server	**no shutdown**	Using **shutdown** disables the server
Sending query to server and displaying result	**query-server**	

Example

➤ To define SNTP server:

- Server ID = 1
- IP address = 192.1.1.1
- Preferred
- Administratively enabled.

```
ETX-203AX# configure system date-and-time sntp
ETX-203AX>config>system>date-time>sntp# server 1
ETX-203AX>config>system>date-time>sntp>server(1)# address 192.1.1.1
ETX-203AX>config>system>date-time>sntp>server(1)# prefer
ETX-203AX>config>system>date-time>sntp>server(1)# no shutdown
ETX-203AX>config>system>date-time>sntp>server(1)# query-server
Query Server Replay
-------------------------------------------------------------------------
Server  : 192.1.1.1       UDP   : 123
Date    : 00-00-0000      Time  : 00:00:00
Stratum : 0
ETX-203AX>config>system>date-time>sntp>server(1)# exit
ETX-203AX>config>system>date-time>sntp# show status
System Uptime : 000 Days 00:19:55
System Time   : 2009-09-14                              13:01:09

Current Source : 1  127.0.0.1

NTP Server      Type       UDP Port Tstap Date Time     Strat Received


192.1.1.1       Prefer     123      00-00-0000 00:00:00 0     --
ETX-203AX>config>system>date-time>sntp#
```

Chapter 10

Administration

This chapter describes administrative features:

10.1 Confirming Startup Configuration

You can request that **startup-config** be confirmed after the next reboot. When you execute the request, then the next time the device reboots, if **startup-config** is loaded successfully, you must confirm **startup-config** within the configured timeout period. If the confirmation is not received before timeout, the device rejects **startup-config**, reboots, and attempts to load the next available configuration file (**rollback-config**, **user-default-config**, **factory-default-config**).

➤ **To request confirmation of startup-config after next reboot;**

- At the **admin#** prompt enter:
  `startup-confirm-required` [**`time-to-confirm`** <minutes>] [**`rollback`** {**`startup-config`** | **`user-default-config`** | **`factory-default-config`** | **`running-config`**}]

  The ‹minutes› parameter defines the confirmation timeout, range 1–65535 (default 5). If **rollback** ‹config-file› is specified, the specified configuration file is copied to **rollback-config**.

➤ **To confirm confirmation of startup-config after reboot;**

- In any level enter:
  `startup-config-confirm`

10.2 Device Information

You can assign a name to the unit, add its description, specify its location to distinguish it from the other devices installed in your system, and assign a contact person.

➤ To configure device information:

1. Navigate to **configure system**.

   The **config>system#** prompt is displayed.

2. Enter the necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning device name	**name** ‹device-name›	The device name has unlimited length, but if you enter a name with more than 20 characters, the prompt displays only the first 20 characters followed by 0. For example, this command that defines a 25-character device name: **ETX-203AX# config sys name ETXETXETXETXETX-203AX12345** results in this prompt that shows the first 20 characters, followed by 0: **ETXETXETXETXETX-203AX0#**
Specifying location	**location** ‹device-location›	
Specifying contact person	**contact** ‹contact-person›	
Displaying device information, MAC address, and amount of time device has been running	**show device-information**	

Example

➤ To configure device information:

- Device name – ETX-203AX-HAC
- Location – floor-8
- Contact –Engineer-1.

```
ETX-203AX# configure system
ETX-203AX>config>system# name ETX-203AX-HAC
ETX-203AX-HAC >config>system# location floor-8
ETX-203AX-HAC >config>system# contact Engineer-1
ETX-203AX-HAC >config>system# show device-information

Description : ETX-203AX-HAC
Name        : ETX-203AX-HAC
Location    : floor-8
Contact     : Engineer-1
MAC Address : 00-20-D2-30-CC-9D
Engine Time : 05:13:31
```

10.3 Environment

You can display information about the power supply.

➤ **To display the information:**

1. Navigate to **configure chassis**.

   The **config>chassis#** prompt is displayed.

2. Enter:
   show environment

   The information is displayed as shown in the example below.

   The power supply type is indicated as AC, DC, or **--** (if it has failed).

Example

```
ETX-203AX# configure chassis
ETX-203AX>config>chassis# show environment
Power Supply   Type      Status
---------------------------------------------------------------
1              AC-DC        OK

ETX-203AX>config>chassis#
```

10.4 CPU and Memory Utilization

You can view the CPU and memory buffer usage. See *Table 10-18* for a description of the memory buffers.

➤ **To display CPU usage:**

- From the system context (**config>system**), enter:
  show cpu-utilization

  The CPU usage is displayed.

```
ETX-203AX>config>system# show cpu-utilization
CPU Utilization
---------------------------------------------------------------
Min (%)     : 2
Cur (%)     : 2
Max (%)     : 65
Average (%) : 10

ETX-203AX>config>system#
```

Figure 10-11. CPU Usage

➤ **To display memory buffer usage:**

- From the system context (**config>system**), enter:
  show buffers

The memory buffer usage is displayed.

```
ETX-203AX>config>system# show buffers
Pool Name Buffer Size (Bytes) Total Buffers Free Buffers Alloc. Failures  Free Failures
-------------------------------------------------------------------------------------
VLAN             64                 100          99             0               0
Huge             8192               100          100            0               0
Large            2048               1000         796            0               0
Medium           512                4000         3975           0               0
Small            64                 4000         3979           0               0
Queue            16                 8000         8000           0               0
```

Figure 10-12. Memory Buffer Usage

Table 10-18. Memory Buffers

Buffer	Size	Total Buffers Available	Purpose
VLAN	64	100	Unused, except three of the buffers are used for internal functions
Huge	8192	100	Unused
Large	2048	1000	OAM CFM and OAM EFM
Medium	512	4000	Event log and traps
Small	64	4000	Management traffic
Queue	16	8000	Application task messages

10.5 File Operations

You can perform the following operations:

- Transfer files via SFTP/TFTP
- Copy files within the ETX-203AX unit
- Display files
- Delete files.

You can copy files via the **copy** command, or via the commands shown in *Table 10-19*. As shown in the table, some commands that reset the device also erase the saved user configuration by copying another file to it before the reset.

Table 10-19. Commands That Copy Files

Command	Level	Copies...	Additional Actions	Manual Section
save	**global**	**running-config** to **startup-config**	None	*Saving Configuration*
factory-default	**admin**	**factory-default** to **startup-config**	Unit resets after copying	*Resetting to Factory Defaults*

Command	Level	Copies...	Additional Actions	Manual Section
user-default	admin	user-default-config to startup-config	Unit resets after copying	*Resetting to User Defaults*

Downloading/Uploading Files

You can download or upload files to the ETX-203AX unit via SFTP/TFTP. Normally the types of files copied are configuration files and software files.

The software files can also be downloaded to ETX-203AX via the Boot Manager, using XMODEM, FTP, or TFTP. For details on upgrading the device software, see *Chapter 12*.

SFTP Application

The SFTP protocol is used to provide secure file transfers via the product's Ethernet interface. SFTP is a version of FTP that encrypts commands and data transfers, keeping your data secure and your session private. For SFTP file transfers, an SFTP server application must be installed on the local or remote computer.

A variety of third-party applications offer SFTP server software. For more information, refer to the documentation of these applications.

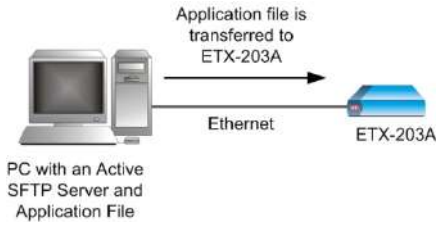


Figure 10-13. Downloading a Software Application File via SFTP

Setting up SFTP Server

If you use a local laptop and SFTP is the preferred transfer method, a SFTP server application must be installed on it.

As mentioned above, third-party applications are available and you should refer to their setup documentation.

Checking the Firewall Settings

SFTP file transfers are carried out through TCP port 22. You should check that the firewall you are using on the server computer allows communication through this port.

➤ **To allow communication through port 22 in Windows XP:**

1. Double-click the **My Network Places** icon, located on the desktop.

   The My Network Places window appears.

2. On the Network Tasks sidebar, click View network connections.

The available network connections are displayed.

Figure 10-14. Viewing Network Connections

3. On the Network Tasks sidebar, click **Change Windows Firewall settings**.

   The Windows Firewall dialog box appears.

Figure 10-15. Changing Firewall Settings

4. Click the **Exceptions** tab.

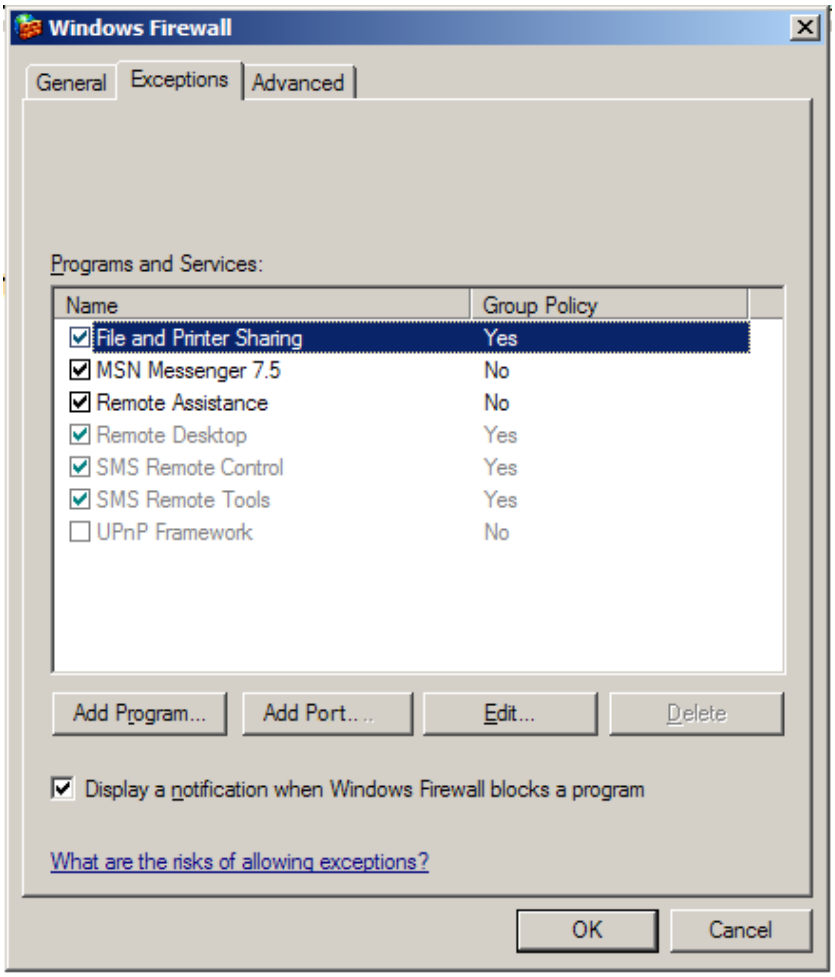


Figure 10-16. Windows Firewall Dialog Box – Exceptions Tab

5. Check whether port 22 appears on the exceptions list. If it does not, click **Add Port** and add it to the list of exceptions.

Note *Different firewall types require different configuration. Refer to your firewall's documentation to check how SFTP file transfers can be allowed to pass through it using TCP port 22.*

TFTP Application

The TFTP protocol is typically used for remote IP-to-IP file transfers via the product's Ethernet interface. It can be used, however, for local file transfer as well, as the transfer rate of the Ethernet interface is much faster than that of the RS-232 interface.

For TFTP file transfers, a TFTP server application must be installed on the local or remote computer. As it runs in the background, the TFTP server waits for any TFTP file transfer request originating from the product, and carries out the received request automatically.

A variety of third-party TFTP applications are available that allow the instant creation of a TFTP server on a client computer. For more information, refer to the documentation of these applications.

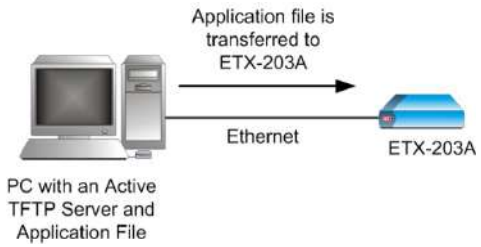


Figure 10-17. Downloading a Software Application File via TFTP

Setting up a TFTP Server

If you use a local laptop and TFTP is the preferred transfer method, a TFTP server application must be installed on it.

As mentioned above, third-party applications are available and you should refer to their setup documentation.

Checking the Firewall Settings

TFTP file transfers are carried out through port 69. You should check that the firewall you are using on the server computer allows communication through this port.

➤ **To allow communication through port 69 in Windows XP:**

1. Double-click the **My Network Places** icon, located on the desktop.

   The My Network Place window appears.

2. On the Network Tasks sidebar, click View network connections.

   The available network connections are displayed.

Figure 10-18. Viewing Network Connections

3. On the Network Tasks sidebar, click **Change Windows Firewall settings**.

   The Windows Firewall dialog box appears.

Figure 10-19. Changing Firewall Settings

4. Click the **Exceptions** tab.

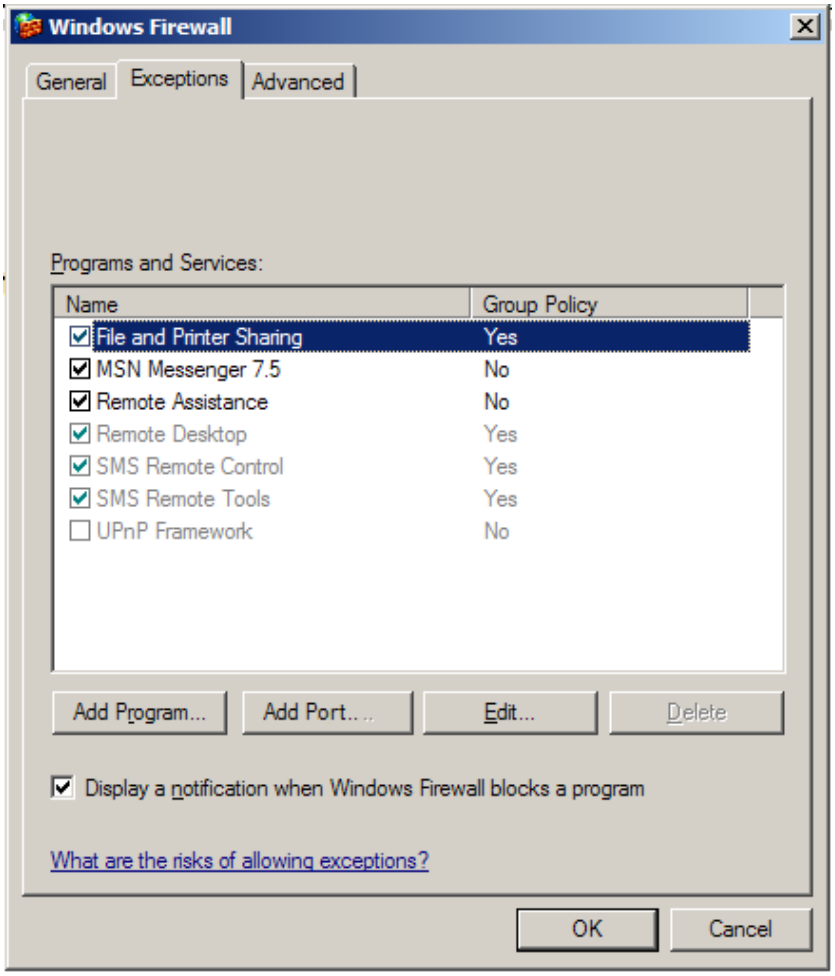


Figure 10-20. Windows Firewall Dialog Box – Exceptions Tab

5. Check whether port 69 appears on the exceptions list. If it does not, click **Add Port** and add it to the list of exceptions.

Note *Different firewall types require different configuration. Refer to your firewall's documentation to check how TFTP file transfers can be allowed to pass through it using a UDP-type port.*

Defining TFTP Timeout Values

You can specify the timeout values for TFTP.

➤ To set the TFTP timeouts:

1. Navigate to the System context (config>system).
2. Specify the number of seconds between attempts to reconnect (retry timeout), and the timeout (in seconds) at which the connection is considered as failed:
   tftp timeout <60–240> **retry-timeout** <5–60>

   Default: timeout = 60, retry-timeout = 15

Using CLI to Download/Upload Files

You use the **copy** command to download/upload files.

➤ To download a file via TFTP:

- At any prompt, enter:
  copy tftp://<TFTP-server-IP-address>/<source-file> <destination-file>

Example – Download via TFTP

- TFTP server address – 192.10.10.10
- Source file name – ETX-203AX.bin
- Destination file name – sw-pack-2.

```
ETX-203AX# copy tftp://192.10.10.10/ETX-203AX.img sw-pack-2
```

➤ To download a file via SFTP:

- At any prompt, enter:
  copy
  sftp://<user>:<password>@<sftp-server-ip-addr>/<source-file> <destination-file>

Example – Download via SFTP

- SFTP server address – 192.20.20.20
- SFTP user name – admin
- SFTP password – 1234
- Source file name – ETX-203AX.bin
- Destination file name – sw-pack-2.

```
ETX-203AX# copy sftp://admin:1234@192.20.20.20/ETX-203AX.img sw-pack-2
```

➤ To upload a file via TFTP:

- At any prompt, enter:
  copy <source-file>
  tftp://<TFTP-server-IP-address>/<destination-file>

Example – Upload via TFTP

- TFTP server address – 192.10.10.10
- Source file name – **startup-config**
- Destination file name – **db1conf.cfg**.

```
ETX-203AX# copy startup-config tftp://192.10.10.10/db1conf.cfg
```

➤ To upload a file via SFTP:

- At any prompt, enter:
  copy <source-file>
  sftp://<user>:<password>@<sftp-server-ip-addr>/<dest-file>

Example – Upload via SFTP

- SFTP server address – 192.20.20.20
- SFTP user name – admin
- SFTP password – 1234
- Source file name – **startup-config**
- Destination file name – **db1conf.cfg**.

```
ETX-203AX# copy startup-config sftp://admin:1234@192.20.20.20/db1conf.cfg
```

Copying Files Within Device

You can copy files within the ETX-203AX unit with the copy command.

➤ To copy files within the device:

- At any prompt, enter:
  copy <source-file> <dest-file>

Example

- Source file name – **running-config**
- Destination file name – **startup-config**.

```
ETX-203AX# copy running-config startup-config
```

Displaying Copy Status

You can display the status of current and past copy operations.

➤ To display copy status:

- At the **file#** prompt, enter:
  show copy [**summary**]

Displaying Information on Files

You can display the the following information:

- Files within the device
- Information on the configuration files
- Contents of configuration text files
- Information on the software files (software packs). For information on upgrading to a different software pack, refer to *Chapter 12*.

➤ To display the files within the device:

- At the **file#** prompt, enter:
  dir

  A list of the file names and types is displayed.

Example

```
ETX-203AX# file
ETX-203AX>file# dir
Codes    C – Configuration   S - Software   LO - Log  O - Other
Name                Type Size(Bytes) Creation Date Status

sw-pack-1             S    3366481    2011-04-10
                                      0:0:6
sw-pack-2             S    3366780    2011-07-18  File In Use
                                      20:53:12
startup-config        C    23269      2011-08-02
                                      18:19:7
factory-default-config C   12404      2011-08-13   Read Only
                                      17:18:7
running-config        C    --         2011-04-10   File In Use
                                      0:0:6
log                   LO   105840     2011-04-10   Read Only
                                      0:0:6
ltm_1                 LO   102400     2011-04-10   Read Only
                                      0:0:6

Total Bytes : 27359280 Free Bytes  : 13413376
```

➤ To display information on the configuration files:

- At the **file#** prompt, enter:
  show configuration-files

  Information on the configuration files is displayed.

Example

```
ETX-203AX# file
ETX-203AXshow configuration-files
Configuration          Last Modified       Valid
-------------------------------------------------------------------------
startup-config         2011-08-02 18:19:07 Yes
factory-default-config 2011-08-13 17:18:07 Yes
running-config         2011-04-10 00:00:06 Yes

Device loaded from : startup-config

running-config has been modified since last time it was equal to startup-config
```

➤ To display the contents of configuration text files:

- At the **file#** prompt, enter one of the following:
  - **show factory-default-config**
  - **show rollback-config**
  - **show startup-config**
  - **show user-default-config**

    The contents of the specified configuration file are displayed.

➤ To display information on the software files:

- At the **file#** prompt, enter:
  show sw-pack [**refresh** [<sec>]]
  where sec represents the refresh timeout, with range 3–100.

  Information on the software files (up to two, named **sw-pack-1** through **sw-pack-2**) is displayed.

Note *The license option is indicated in the software file name, as follows:*

- *For license option FE2, F2 is appended to the software file name*
- *For license option GE2, G2 is appended to the software file name*
- *For the license option of all enabled, nothing is appended to the software file name.*

Example

```
ETX-203AX# file
ETX-203AX>file# show sw-pack
Name      Version   Creation Time          Actual
-------------------------------------------------------------------------
sw-pack-1 4.01D26F2   2011-04-11   18:59:47  ready
sw-pack-2 4.01D28     2011-07-19   11:39:27  active


sw-pack-1 Size (Bytes)  : 3366481

Type      Name           Version   H/W Ver   Size
                                             (Bytes)
-------------------------------------------------------------------------
main      main.bin       4.01D26F2  0.0       3366241


sw-pack-2 Size (Bytes)  : 3366780

Type      Name           Version   H/W Ver   Size
                                             (Bytes)
-------------------------------------------------------------------------
main      main.bin       4.01D28   0.0       3366540
```

Deleting Files

You can delete the following files:

- restore-point-config
- rollback-config
- startup-config
- sw-pack-<n>
- zero-touch-config-xml.

Note *Use caution in deleting files.*

➤ To delete a file:

1. At the **file#** prompt, enter:
   delete <file-name>

   You are prompted to confirm the deletion.

2. Confirm the deletion.

Example

```
ETX-203AX# file
ETX-203AX>file# delete startup-config
File will be erased. Are you sure?? [yes/no] _yes
```

10.6 Inventory

The ETX-203AX inventory table displays the unit's components, hardware and software revisions, and power supply types. You can display an inventory table that shows all installed components, and you can display more detailed information for each component. You can configure an alias name, asset ID, and serial number for inventory components.

Standards and MIBs

The inventory feature is implemented according to RFC 4133 – Entity MIB (RFC 2737 was made obsolete by RFC 4133 version 3).

Benefits

You can monitor the installed components and hardware/software revisions.

Displaying Inventory Information

➤ **To display the inventory table:**

- At the **config>system#** prompt, enter:
  `show inventory-table`

  The inventory table is displayed (see *Example* for a typical inventory table output).

You can display more information for each installed inventory component. To do so, you need to enter the **inventory** level with the corresponding inventory component index, which is determined by the position of the corresponding row in the output of **show inventory-table**, therefore it changes according to what is installed in the unit.

➤ **To display the inventory component information:**

1. Navigate to **configure system inventory** <index>.
2. Enter:
   `show status`

   Information for the corresponding inventory component is displayed (see *Table 10-20* for information on the parameters).

Table 10-20. Inventory Parameters

Parameter	Description
Description	Description of component type, in the form: **RAD.<device-name>.< Physical Class>**, e.g. **RAD.ETX-203AX.Port**
Contained In	Index of the component that contains the component for which information is being displayed. This is 0 for the chassis, as it is not contained in any component, and 1 for all other components, as they are all contained in the chassis.

Parameter	Description
Physical Class	Class of component Possible values: **Chassis**, **CPU**, **Power Supply**, **Port**
Relative Position	Contains the relative position of this component among other similar components (with the exception of the relative positions for the chassis, management Ethernet port). Possible values for the various component types: Chassis –**4294967295** CPU –**1** Power Supply – **1** Network Port – **1**, **2** User Port –**1**, **2**, **3**, **4** Management Ethernet – **101**
Name	Name of component Possible values (according to component type): **<device-name> –Chassis** **CPU** **Power Supply <n>** **Network Port <n>** **User Port <n>** **Management Ethernet**
HW Rev	Hardware version (relevant only for chassis)
SW Rev	Software version (relevant only for chassis) **Note**: The license option is indicated in this parameter, as follows: • For license option FE2, F2 is appended to the software version • For license option GE2, G2 is appended to the software version • For the license option of all enabled, nothing is appended to the software version.
FW Rev	Firmware version (relevant only for chassis)
Serial No.	Serial number (blank if unknown for component)
MFG Name	Manufacturer name (blank if unknown for component)
Model Name	Model name (blank if unknown for component)
Alias	Alias name for component
Asset ID	Identification information for component
FRU	Indicates whether this component is a field replaceable unit that can be replaced on site. For ETX-203AX this is normally true only for the chassis .

Setting Administrative Inventory Information

If necessary, you can configure the alias, asset ID, and serial number for inventory components. To configure the information, you need to enter the **`inventory`** level with the corresponding inventory component index as determined by the position of the corresponding row in the output of **show-inventory-table**.

➤ **To set inventory component information:**

1. Navigate to **configure system inventory** ‹index›.

   The **config>system>inventor**(‹index›)**#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Assigning user-defined alias to component	**alias** ‹string›	Using **no** before **alias** removes the alias. ***Note:*** *Configuring the alias is meaningful only for the chassis component. It can be used by a network manager as a non-volatile identifier for the device.*
Assigning user-specific asset identifier to the component (usually for removable physical components)	**asset-id** ‹id›	Using **no** before **asset-id** removes the asset ID.
Assigning vendor-specific serial number to the component	**serial-number** ‹string›	Using **no** before **serial-number** removes the serial number.

Example

➤ **To display the following inventory information:**

- Inventory table
- Inventory information for the following components:
  - Chassis
  - Power Supply
  - User Port 1.

```
ETX-203AX# configure system
ETX-203AX# config>system# show inventory
Physical Class Name                    HW Rev SW Rev   FW Rev
-------------------------------------------------------------------------
Chassis        ETX-203AX – Chassis     0.00   4.01     1.5.1.0.0.0.0.8
CPU            CPU
Power Supply   Power Supply
Port           Network Port 1
Port           Network Port 2
Port           User Port 1
Port           User Port 2
Port           User Port 3
Port           User Port 4
Port           Management Ethernet
```

```
ETX-203AX>config>system# inventory 1
ETX-203AX>config>system>inventor(1)# show status
Description       : RAD.ETX-203AX.Chassis
Contained In      : 0
Physical Class    : Chassis
Relative Position : 1
Name              : ETX-203AX - Chassis
HW Rev            : 0.00
SW Rev            : 4.01
FW Rev            : 1.5.1.0.0.0.0.8
Serial Number     : 00-20-D2-30-CC-9D
MFG Name          : RAD
Model Name        :
Alias             :
Asset ID          :
FRU               : True

ETX-203AX>config>system>inventor(1)# exit
ETX-203AX >config>system# inventory 3
ETX-203AX>config>system>inventor(3)# show status
Description       : RAD.ETX-203AX.Power Supply
Contained In      : 1
Physical Class    : Power Supply
Relative Position : 1
Name              : Power Supply
HW Rev        :
SW Rev            :
FW Rev            :
Serial Number     :
MFG Name          : RAD
Model Name        :
Alias             :
Asset ID          :
FRU               : False

ETX-203AX>config>system>inventor(3)# exit
ETX-203AX>config>system# inventory 6
ETX-203AX>config>system>inventor(6)# show status
Description       : RAD.ETX-203AX.Port
Contained In      : 1
Physical Class    : Port
Relative Position : 3
Name              : User Port 1
HW Rev            :
SW Rev            :
FW Rev            :
Serial Number     :
MFG Name          :
Model Name        :
Alias             :
Asset ID          :
FRU               : False

ETX-203AX>config>system>inventor(6)# exit
```

➤ To set the chassis alias to "ETX-test-unit":

```
ETX-203AX# configure system
ETX-203AX>config>system# inventory 1
ETX-203AX>config>system>inventor(1)# alias ETX-test-unit
ETX-203AX>config>system>inventor(1) show status
Description       : RAD.ETX-203AX.Chassis
Contained In      : 0
Physical Class    : Chassis
Relative Position : 4294967295
Name              : ETX-203AX - Chassis
HW Rev            : 0.00
SW Rev            : 4.01
FW Rev            : 1.5.1.0.0.0.0.8
Serial Number     : 00-20-D2-30-CC-9D
MFG Name          : RAD
Model Name        :
Alias             : ETX-test-unit
Asset ID          :
FRU               : True

ETX-203AX>config>system>inventor(1)# exit
```

10.7 Licensing

The following license options control the port capacity and number of shaped EVCs:

- FE2 – Two shaped EVCs up to 100 Mbps each; 100 Mbps per port if copper, whether built-in or SFP; 1000 Mbps per port if SFP (fiber)
- GE2 – Two shaped EVCs up to 1000 Mbps each; 1000 Mbps per port
- All enabled – Thirty shaped EVCs up to 1000 Mbps each; 1000 Mbps per port.

You can see an indication of which license option is enabled for the installed software pack by displaying the inventory information; you can see an indication of which license option is enabled for the existing software packs by displaying the software file information.

10.8 Reset

ETX-203AX supports the following types of reset:

- Reset to factory defaults (optionally with configuration and counter reset)
- Reset to user defaults
- Overall reset (restart) of the device.

Note *You can request that the active software pack be confirmed after the next reboot of ETX-203AX. Refer to the description of installing software in Chapter 12 for details.*

Resetting to Factory Defaults

You can reset to factory defaults, or to factory defaults with configuration and counter reset.

The configuration and counter reset comprises the following:

- All files removed except **factory-default-config**, **user-default-config**, and the device software
- Parameter snmpEngineBoots initialized to 1.

➤ **To reset ETX-203AX to factory defaults:**

1. At the **admin#** prompt enter:
   `factory-default`

   A confirmation message is displayed:
   `Current configuration will be erased and device will reboot with factory default configuration. Are you sure?? [yes/no]`

2. Enter **yes** to confirm the reset to factory defaults.

   The **factory-default-config** file is copied to the **startup-config** file. The unit resets, and after it completes its startup the factory defaults are loaded. If a **startup-config** confirm request was active, it is canceled.

➤ **To reset ETX-203AX to factory defaults, with configuration and counter reset:**

1. At the admin# prompt enter:
   `factory-default-all`

   A confirmation message is displayed:
   `The device will delete its entire database and reboot. Are you sure? [yes/no]`

2. Enter **yes** to confirm the reset to factory defaults with configuration and counter reset.

   The configuration and counter reset explained above is performed, the unit resets, and after it completes its startup the factory defaults are loaded. If a **startup-config** confirm request was active, it is canceled.

Resetting to User Defaults

➤ **To reset ETX-203AX to user defaults:**

1. At the **admin#** prompt enter:
   `user-default`

   A confirmation message is displayed:
   `Current configuration will be erased and device will reboot with user default configuration. Are you sure?? [yes/no]`

2. Enter **yes** to confirm the reset to user defaults.

The **user-default-config** file is copied to the **startup-config** file. The unit resets, and after it completes its startup the user defaults are loaded. If a **startup-config** confirm request was active, it is canceled.

Restarting the Unit

If necessary, you can restart ETX-203AX without interrupting the power supply.

➤ **To restart ETX-203AX:**

1. At the **admin#** prompt enter:
   `reboot`

   A confirmation message is displayed:
   `Device will reboot. Are you sure?? [yes/no]`

2. Enter **yes** to confirm the reset.

   The unit restarts.

10.9 Saving Configuration

You must save your configuration if you wish to have it available, as it is not saved automatically. You can save your configuration as follows:

- To save the user configuration in **startup-config**:
  - In any level enter:
    `save`
  - At the **file#** prompt enter:
    `copy running-config startup-config`
- To save the user default configuration in **user-default-config**, at the **file#** prompt enter:
  `copy running-config user-default-config`

10.10 Statistics Clearing

You can clear the statistics for Ethernet ports, flows, and OAM services.

➤ **To clear the statistics:**

- At the device prompt, enter:
  `clear-statistics`

  The statistics for Ethernet ports, flows, and OAM services are cleared.

10.11 Syslog

ETX-203AX uses the Syslog protocol to generate and transport event notification messages over IP networks to Syslog servers. The Syslog operation is compliant with the RFC 3164 requirements.

Configuring Syslog Parameters

➤ To configure syslog parameters:

1. Navigate to the system context (config>system).
2. Define syslog device parameters:
   a. Enter:
      syslog device

      The system switches to the syslog device context (**config>system>syslog**(device))
   b. Specify the module, task, or function from which syslog messages are sent:

      facility {**local1** | **local2** | **local3** | **local4** | **local5** | **local6** | **local7**}

      Default: local1
   c. Specify the UDP port that transmits syslog messages (allowed only if syslog message transmitting is administratively disabled):

      port <udp-port-number>

      Allowed values: 1–65535
      Default: 514
   d. Specify the severity level. The log messages that contain severity level up to the specified level are transmitted:

      severity-level {**critical** | **major** | **minor** | **warning** | **event** | **info** | **debug**}
   e. Administratively enable the transmitting of syslog messages:

      no shutdown
3. Define syslog server parameters:
   a. Specify the syslog server to receive syslog messages, from 1 to 5:
      syslog server <server-id>

      The system switches to the context of the specified syslog server (config>system>syslog(server <server-ID>**)**).
   b. Specify the IP address of the server (allowed only if the server is administratively disabled):

      address <0.0.0.0–255.255.255.255>
   c. Specify the UDP port on the server that receives syslog messages (allowed only if the server is administratively disabled):

      port <udp-port-number>

Allowed values: 1–65535

d. Administratively enable the server (allowed only if IP address is not 0.0.0.0):

no shutdown

e. Enter **exit** to exit the server context.

The system switches to the system context (**config>system**).

Displaying Syslog Statistics

➤ To display syslog statistics:

1. At the system context (config>system), enter:
syslog device

The system switches to the syslog device context (config>system>syslog(device))

2. Enter:
show statistics

3. Syslog statistics appear as shown below. The counters are described in *Table 10-21*.

```
ETX-203AX>config>system>syslog(device)# show statistics
Total Tx Messages                                : 356
Non-queued Dropped Messages              : 265
```

4. To clear the statistics, enter:
clear-statistics

Table 10-21. Syslog Statistic Parameters

Parameter	Description
Total Tx Messages	The total number of syslog messages transmitted
Non-queued Dropped Messages	The total number of syslog messages that were dropped before being queued

Chapter 11

Monitoring and Diagnostics

The following are described in this chapter:

- Detecting problems
- Alarms and traps
- Performing diagnostic tests.

11.1 Detecting Problems

The LED indicators indicate errors on the hardware level.

LEDs

If an LED is red, that usually indicates there is a problem. Check the port that is associated with the LED to further investigate the problem. Refer to *Chapter 3* for a description of the unit LEDs.

Alarms and Traps

Alarms serve as notification of a fault in the device, and are indicated by an entry in the alarm and event history log, and/or an SNMP trap to a management station. Refer to *Handling Alarms and Events* for further details on alarms, events, and traps.

Statistic Counters

Statistic counters provide information on possible abnormal behavior and failures. You can collect statistics on the following:

- Ethernet ports
- Flows
- RADIUS server
- OAM CFM.

For further information, refer to the relevant sections in *Chapter 6 –10* and the relevant sections in the troubleshooting chart.

11.2 Handling Alarms and Events

An alarm is an indication of a fault in the device. An event is an occurrence in the device that may be a fault or may be a user login, change in port status, etc. Alarms and events can be written in the alarm and event history log. In addition to the history log containing alarms and events, the device maintains statistics for alarms and events in a brief log. Alarms can also be written in the active alarm table. An SNMP trap can be sent to management stations as the result of an alarm/event.

Alarms and events have the following properties:

- Source –An entity for which alarms and events can be generated. The source consists of a source ID, source type (e.g. system, fan, ethernet), and source name.
- ID – Unique numeric identification of the alarm/event
- Name – Unique alphanumeric identification of the alarm/event, up to 32 characters
- Description –Alphanumeric description that provides details on the alarm/event
- Severity (alarms only) – Critical, Major, or Minor.

Alarms and events can be masked per source type, source ID, or minimum severity. When an alarm/event is masked, it is not written to the history log, and any corresponding traps are not sent to management stations, regardless of masking in the SNMP manager configuration. When an alarm/event is not masked, any corresponding traps are sent only to management station for which the traps are not masked in the SNMP manager configuration.

Configuring Alarm and Event Properties

This section explains how to configure alarm/event properties.

➤ **To configure alarm/event properties:**

1. Navigate to configure reporting.

   The **config›reporting#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Configuring alarm input	**alarm-input** ‹**port-number**› [**active** {**high** | **low** | **off**}] [**description** ‹**description**›]	

Task	Command	Comments
Configuring alarm/event severity and masking per source ***Note**: Severity applies only to alarms.*	**alarm-source-attribute** ,<source-name> [<source-id>] **alarm** <alarm-list> [**severity** {**critical** | **major** | **minor**}] [**log**] [**snmp-trap**] [**led**] **alarm-source-attribute** ,<source-name> [<source-id>] **event** <alarm-list> [**log**] [**snmp-trap**]	Use the **no** form to mask alarms/events. The following apply: • If a trap is masked according to alarm/event attribute, it is not sent to any management station, regardless of whether it is masked in the SNMP manager configuration • If a trap is unmasked according to alarm/event attribute, it is sent only to management station for which it is not masked in the SNMP manager configuration.
Configuring alarm/event severity and masking per source type ***Note**: Severity applies only to alarms.*	**alarm-source-type-attribute** ,<source-type> [<source-id>] **alarm** <alarm-list> [**severity** {**critical** | **major** | **minor**}] [**log**] [**snmp-trap**] [**led**] **alarm-source-type-attribute** ,<source-type> [<source-id>] **event** <alarm-list> [**log**] [**snmp-trap**]	Use the **no** form to mask alarms/events. The following apply: • If a trap is masked according to alarm/event attribute, it is not sent to any management station, regardless of whether it is masked in the SNMP manager configuration • If a trap is unmasked according to alarm/event attribute, it is sent only to management station for which it is not masked in the SNMP manager configuration.
Configuring alarm masking per severity	**mask-minimum-severity** [**log** {**critical** | **major** | **minor**}] [**snmp-trap** {**critical** | **major** | **minor**}] [**led** {**critical** | **major** | **minor**}]	
Displaying information on specified alarm and source type	**show alarm-information** <source-type> <alarm-list>	
Displaying information on alarm inputs	**show alarm-input**	
Displaying list of supported alarms, optionally for specified source/severity	**show alarm-list** **show alarm-list** [<source-type> [<source-id>] [**severity** {**critical** | **major** | **minor**}]]	
Displaying information on specified event and source type	**show event-information** <source-type> [<event-list>]	

Task	Command	Comments
Displaying list of supported events	**show event-list** **show event-list** ‹source-type› [‹event-list›]	

Working with Alarm and Event Logs

This section explains how to work with the log files to display or acknowledge alarm/events,

➤ **To work with alarm/event log files:**

1. Navigate to configure reporting.

   The **config›reporting#** prompt is displayed.

2. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Acknowledging alarms	**acknowledge** {**log** | **brief-log** | **activity-log** | **all-logs**}	
Rebuilding active alarm database	**active-alarm-rebuild** [**send-traps**]	
Clearing alarms from log file(s)	**clear-alarm-log** {**log** | **brief-log** | **activity-log** | **all-logs**}	
Displaying active alarms, optionally according to specified criteria	**show active-alarms** **show active-alarms** {‹source-type› [‹source-id›] | all} [**minimum-severity** {**critical** | **major** | **minor**}] [**masked-included**] [**instance** ‹**instance-number**›]]	
Displaying active alarms with details, optionally according to specified criteria	**show active-alarms-details** **show active-alarms-details** {‹source-type› [‹source-id›] | all} [**minimum-severity** {**critical** | **major** | **minor**}] [**time-zone-utc**] [**masked-included**] [**instance** ‹**instance-number**›]]	
Displaying alarms in alarm and event history log, optionally according to specified criteria	**show alarm-log** **show alarm-log** {‹source-type› [‹source-id›] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] [**start** ‹**yyyy-mm-dd**› [‹**hh:mm**[**:ss**]›] [**end** ‹**yyyy-mm-dd**› [‹**hh:mm**[**:ss**]›]] **show alarm-log** {‹source-type› [‹source-id›] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] {[**last-seconds** ‹seconds›] | [**last-entries** ‹entries›]}	

Task	Command	Comments
Displaying alarms in brief alarm and event history log, optionally according to specified criteria	**show brief-alarm-log** **show brief-alarm-log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] [**start** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] [**end** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] **show brief-alarm-log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] {[**last-seconds** <seconds>] | [**last-entries** <entries>]}	
Displaying brief alarm and event history log, optionally according to specified criteria	**show brief-log** **show brief-log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] [**start** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] [**end** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] **show brief-log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] {[**last-seconds** <seconds>] | [**last-entries** <entries>]}	
Displaying alarm and event history log, optionally according to specified criteria	**show log** **show log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] [**start** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] [**end** <**yyyy-mm-dd**> [<**hh:mm**[:**ss**]>]] **show log** {<source-type> [<source-id>] | all} [**minimum-severity** {**critical** | **major** | **minor** | **cleared**}] [**order-ascending**] [**time-zone-utc**] [**acknowledged-included**] {[**last-seconds** <seconds>] | [**last-entries** <entries>]}	

Alarms and Events Supported by Device

The following table shows the alarms and events supported by ETX-203AX, along with the traps corresponding to each alarm/event. For more information on the traps, refer to *Table 11-2*.

Table 11-1. Alarms and Events

Name	Description	A=Alarm E=Event	ID	Source	Trap
device_startup	Device startup due to cold start	E	1020018	system	coldStart systemDeviceStartup
user_reset	System user reset	E	1020004	system	systemUserReset
alternate_configuration_loaded	{startup-config | user-default-config | factory-default-config | rollback-config} loaded as running-config	E	1020005	system	systemAlternateConfigLoaded
successful_login	Successful login	E	1020022	system	systemSuccessfulLogin
failed_login	Failed login	E	1020023	system	systemFailedLogin
logout	Logout due to inactivity	E	1020024	system	systemLogout
fan_failure	Fan failure start or end	A	20009	fan	fanFailure
power_delivery_failure	Power supply ‹n› failure start or end	A	20201	power-supply	powerDeliveryFailure
device_temperature_ora	Device temperature has crossed threshold	A	20002	system	systemDeviceTemperatureOra
dying_gasp	Dying gasp	E	1020012	system	systemDyingGasp
configuration_sanity	Configuration sanity in ‹configuration file›: configuration ‹loaded/rejected/ loaded till first error›	E	1020007	system	systemConfigurationSanity
trap_hard_sync_start	Trap synchronization hard sync process started	E	1020008	system	systemTrapHardSyncStart
trap_hard_sync_end	Trap synchronization hard sync process ended	E	1020009	system	systemTrapHardSyncEnd
download_end	End download	E	1020003	system	systemDownloadEnd
sw_install_end	End software install	E	1020002	system	systemSoftwareInstallEnd
sw_unconfirmed	SW pack not confirmed before timeout	E	1020027	system	systemSwUnconfirmed
startup_config_unconfirmed	Startup configuration not confirmed before timeout	E	1020028	system	systemStartupConfig Unconfirmed
los	Loss of signal (LOS)	A	50003	eth	linkUp/linkDown ethLos

Name	Description	A=Alarm E=Event	ID	Source	Trap
los	Loss of signal (LOS)	A	110110	e1t1	linkUp/linkDown e1t1Los
los	Loss of signal (LOS)	A	120104	e3t3	linkUp/linkDown e3t3Los
los	Loss of signal (LOS)	A	100005	stm1	linkUp/linkDown sdhSonetLos
los	Loss of signal (LOS)	A	30104	station clock	linkUp/linkDown stationClockLos
smart_sfp_mismatch	Smart SFP not supported or misconfigured	A	40101	smart-sfp	smartSfpMismatch
sfp_removed	SFP not installed	A	50004	eth	sfpRemoved
dying_gasp_indication_fe	Dying gasp indication at far-end	A	270107	oam-efm	oamEfmFeDyingGaspIndication
link_fault_indication	Link fault indication	A	270102	oam-efm	oamEfmLinkFaultIndication
link_fault_indication_fe	Link fault indication at far-end	A	270103	oam-efm	oamEfmFeLinkFaultIndication
critical_link_indication_fe	Critical link indication at far-end	A	270105	oam-efm	oamEfmFeCriticalLinkIndication
remote_loopback	Loopback started	E	1270101	oam-efm	oamEfmRemoteLoopback
remote_loopback_off	Loopback ended	E	1270102	oam-efm	oamEfmRemoteLoopbackOff
loc	Loss of continuity (LOC) <mep>	A	270601	oam-cfm-rmep	oamCfmRmepLoc
rdi	Remote defect indication (RDI) <mep>	A	270602	oam-cfm-rmep	oamCfmRmepRdi
lck	Lock (LCK) <mep>	A	270202	oam-cfm-mep	oamCfmMepLck
ais	Alarm indication signal (AIS) <mep>	A	270201	oam-cfm-mep	oamCfmMepAis

Name	Description	A=Alarm E=Event	ID	Source	Trap
mismatch	Mismatch due to ‹mismerge/ unexpected MEP/ unexpected MEG level/ unexpected period›	A	270203	oam-cfm-mep	oamCfmMepMismatch
loss_ratio_tca	Loss ratio threshold crossing alert	E	1270405	oam-cfm-dest-ne	oamCfmDestNeLossRatioTca
loss_ratio_tca_off	Loss ratio in permitted range	E	1270406	oam-cfm-dest-ne	oamCfmDestNeLossRatioTcaOff
loss_ratio_tca_fe	Loss ratio threshold crossing alert at far-end	E	1270407	oam-cfm-dest-ne	oamCfmDestNeLossRatioTcaFe
loss_ratio_tca_fe_off	Loss ratio in permitted range at far-end	E	1270408	oam-cfm-dest-ne	oamCfmDestNeLossRatioTcaFeOff
delay_tca	Delay threshold crossing alert	E	1270401	oam-cfm-dest-ne	oamCfmDestNeDelayTca
delay_tca_off	Delay in permitted range	E	1270402	oam-cfm-dest-ne	oamCfmDestNeDelayTcaOff
delay_var_tca	Delay variance threshold crossing alert	E	1270403	oam-cfm-dest-ne	oamCfmDestNeDelayVarTca
delay_var_tca_off	Delay variance in permitted range	E	1270404	oam-cfm-dest-ne	oamCfmDestNeDelayVarTcaOff
unavailable_ratio_tca	Unavailable ratio threshold crossing alert	E	1270409	oam-cfm-dest-ne	oamCfmDestNeUnavailRatioTca

Name	Description	A=Alarm E=Event	ID	Source	Trap
unavailable_ratio_tca_off	Unavailable ratio in permitted range	E	1270410	oam-cfm-dest-ne	oamCfmDestNeUnavailRatioTcaOff
unavailable_ratio_tca_fe	Unavailable ratio threshold crossing alert at far-end	E	1270411	oam-cfm-dest-ne	oamCfmDestNeUnavailRatioTcaFe
unavailable_ratio_tca_fe_off	Unavailable ratio in permitted range at far-end	E	1270412	oam-cfm-dest-ne	oamCfmDestNeUnavailRatioTcaFeOff
port_switchover	Port switchover	E	1290201	eps	epsPortSwitchover
configuration_mismatch	Configuration mismatch	A	290201	eps	epsConfigurationMismatch
rfc2544_test_start	RFC-2544 test started	E	1020025	system	systemRfc2544TestStart
rfc2544_test_end	RFC-2544 test ended	E	1020026	system	systemRfc2544TestEnd

Traps Supported by Device

The following table shows the traps supported by ETX-203AX, along with the alarm/event corresponding to each trap. For more information on the alarm/event, refer to *Table 11-1*.

Note *All traps are maskable, by masking the corresponding alarm/event via the **alarm-source-attribute** / **alarm-source-type—attribute** commands, or by masking the corresponding alarm per severity via the **mask-minimum-severity** command. For details, refer to* Configuring Alarm and Event Properties*.*

Table 11-2. Traps

Trap Name	Trap OID	Alarm/Event Name	A=Alarm E=Event	Alarm/ Event ID	Alarm/ Event Source
authenticationFailure	1.3.6.1.6.3.1.1.5.5	Not applicable –sent in case of incorrect access via SNMP (e.g. invalid SNMPv2 community)			system
systemAlternateConfigLoaded	1.3.6.1.4.1.164.6.1.0.45	alternate_configuration_loaded	E	1020005	system
coldStart	1.3.6.1.6.3.1.1.5.1	device_startup	E	1020018	system
systemDeviceStartup	1.3.6.1.4.1.164.6.1.0.55	device_startup	E	1020018	system
systemDownloadEnd	1.3.6.1.4.1.164.6.2.12.18.0.2	download_end	E	1020003	system

Trap Name	Trap OID	Alarm/Event Name	A=Alarm E=Event	Alarm/ Event ID	Alarm/ Event Source
systemFailedLogin	1.3.6.1.4.1.164.6.1.0.71	failed_login	E	1020023	system
systemLogout	1.3.6.1.4.1.164.6.1.0.72	logout	E	1020005	system
systemRfc2544TestStart	1.3.6.1.4.1.164.6.1.15.0.2	rfc2544_test_start	E	1020025	system
systemRfc2544TestEnd	1.3.6.1.4.1.164.6.1.15.0.3	rfc2544_test_end	E	1020026	system
systemSoftwareInstallEnd	1.3.6.1.4.1.164.6.1.0.43	sw_install_end	E	1020002	system
systemStartupConfig Unconfirmed	1.3.6.1.4.1.164.6.1.0.63	startup_config_ unconfirmed	E	1020028	system
systemSuccessfulLogin	1.3.6.1.4.1.164.6.1.0.70	successful_login	E	1020022	system
systemSwUnconfirmed	1.3.6.1.4.1.164.6.1.0.62	sw_unconfirmed	E	1020027	system
systemTrapHardSync Start	1.3.6.1.4.1.164.6.1.0.77	trap_hard_sync_start	E	1020008	system
systemTrapHardSync End	1.3.6.1.4.1.164.6.1.0.78	trap_hard_sync_end	E	1020009	system
systemUserReset	1.3.6.1.4.1.164.6.1.0.82	user_reset	E	1020004	system
fanFailure	1.3.6.1.4.1.164.6.1.0.64	fan_failure	A	20009	fan
powerDeliveryFailure	1.3.6.1.4.1.164.6.1.0.73	power_delivery_failure	A	20201	power supply
systemDeviceTemperature Ora	1.3.6.1.4.1.164.6.1.0.41	device_temperature_ora	A	20002	system
systemDyingGasp	1.3.6.1.4.1.164.6.1.0.49	dying_gasp	E	1020012	system
systemConfiguration Sanity	1.3.6.1.4.1.164.6.1.0.47	configuration_ sanity	E	1020007	system
linkDown	1.3.6.1.6.3.1.1.5.4	los	A	50003	eth
linkUp	1.3.6.1.6.3.1.1.5.3			110110	e1t1
				120104	e3t3
				100005	sdh-sonet
ethLos	1.3.6.1.4.1.164.3.1.6.1.0.1	los	A	50003	eth
e1t1Los	1.3.6.1.4.1.164.3.1.6.4.0.30	los	A	110110	e1t1
e3t3Los	1.3.6.1.4.1.164.3.1.6.3.0.4	los	A	120104	e3t3
sdhSonetLos	1.3.6.1.4.1.164.3.1.6.2.0.24	los	A	100005	sdh-sonet
smartSfpMismatch	1.3.6.1.4.1.164.40.2.0.1	smart_sfp_ mismatch	A	40101	smart-sfp
sfpRemoved	1.3.6.1.4.1.164.40.3.4.0.3	sfp_removed	A	50004	eth
oamEfmFeDyingGasp Indication	1.3.6.1.4.1.164.3.1.6.1.0.25	dying_gasp_indication_fe	A	270107	oam-efm

Trap Name	Trap OID	Alarm/Event Name	A=Alarm E=Event	Alarm/ Event ID	Alarm/ Event Source
oamEfmFeCriticalLink Indication	1.3.6.1.4.1.164.3.1.6.1.0.23	critical_link_indication_fe	A	270105	oam-efm
oamEfmRemoteLoopback	1.3.6.1.4.1.164.3.1.6.1.0.17	remote_loopback	E	1270101	oam-efm
oamEfmRemoteLoopback Off	1.3.6.1.4.1.164.3.1.6.1.0.19	remote_loopback_off	E	1270102	oam-efm
oamCfmRmepLoc	1.3.6.1.4.1.164.3.1.6.1.3.0.7	loc	A	270601	oam-cfm-rmep
oamCfmRmepRdi	1.3.6.1.4.1.164.3.1.6.1.3.0.8	rdi	A	270602	oam-cfm-rmep
oamCfmMepLck	1.3.6.1.4.1.164.3.1.6.1.3.0.5	lck	A	270202	oam-cfm-mep
oamCfmMepAis	1.3.6.1.4.1.164.3.1.6.1.3.0.4	ais	A	270201	oam-cfm-mep
oamCfmMepMismatch	1.3.6.1.4.1.164.3.1.6.1.3.0.6	mismatch	A	270203	oam-cfm-mep
oamCfmDestNeLossRatio Tca	1.3.6.1.4.1.164.3.1.6.1.3.0.13	loss_ratio_tca	E	1270405	oam-cfm-dest-ne
oamCfmDestNeLossRatio TcaOff	1.3.6.1.4.1.164.3.1.6.1.3.0.14	loss_ratio_tca_off	E	1270406	oam-cfm-dest-ne
oamCfmDestNeLossRatio TcaFe	1.3.6.1.4.1.164.3.1.6.1.3.0.15	loss_ratio_tca_fe	E	1270407	oam-cfm-dest-ne
oamCfmDestNeLossRatio TcaFeOff	1.3.6.1.4.1.164.3.1.6.1.3.0.16	loss_ratio_tca_fe_off	E	1270408	oam-cfm-dest-ne
oamCfmDestNeDelayTca	1.3.6.1.4.1.164.3.1.6.1.3.0.9	delay_tca	E	1270401	oam-cfm-dest-ne
oamCfmDestNeDelayTca Off	1.3.6.1.4.1.164.3.1.6.1.3.0.10	delay_tca_off	E	1270402	oam-cfm-dest-ne
oamCfmDestNeDelayVar Tca	1.3.6.1.4.1.164.3.1.6.1.3.0.11	delay_var_tca	E	1270403	oam-cfm-dest-ne
oamCfmDestNeDelayVar TcaOff	1.3.6.1.4.1.164.3.1.6.1.3.0.12	delay_var_tca_off	E	1270404	oam-cfm-dest-ne
oamCfmDestNeUnavailable RatioTca	1.3.6.1.4.1.164.3.1.6.1.3.0.17	unavailable_ratio_tca	E	1270409	oam-cfm-dest-ne
oamCfmDestNeUnavailable RatioTcaOff	1.3.6.1.4.1.164.3.1.6.1.3.0.18	unavailable_ratio_tca_off	E	1270410	oam-cfm-dest-ne
oamCfmDestNeUnavailable RatioTcaFe	1.3.6.1.4.1.164.3.1.6.1.3.0.19	unavailable_ratio_tca_fe	E	1270411	oam-cfm-dest-ne

Trap Name	Trap OID	Alarm/Event Name	A=Alarm E=Event	Alarm/ Event ID	Alarm/ Event Source
oamCfmDestNeUnavailable RatioTcaFeOff	1.3.6.1.4.1.164.3.1.6.1.3.0.20	unavailable_ratio_tca_fe_off	E	1270412	oam-cfm-dest-ne
epsPortSwitchover	1.3.6.1.4.1.164.6.2.72.0.4	port_switchover	E	1290201	eps
epsConfigurationMismatch	1.3.6.1.4.1.164.6.2.72.0.3	configuration_mismatch	A	290201	eps

11.3 Troubleshooting

This section contains a general troubleshooting chart that lists possible failures and provides workarounds.

Troubleshooting Chart

Use this chart to identify the cause of a problem that may arise during operation. For detailed description of the LED indicators functions, refer to *Chapter 3*.

To correct the reported problem, perform the suggested corrective actions. If a problem cannot be resolved by performing the suggested action, please contact your RAD distributor.

Table 11-3. Troubleshooting Chart

Fault/Problem	Probable Cause	Corrective Action
The unit is "dead" (POWER LED is off)	No power	• Verify that both ends of the power cable are properly connected.
	Blown fuse	• Disconnect the power cable from both ends and replace the fuse with another fuse of proper rating.
The event log reports a fan or power supply error.		• View the inventory file by entering **show inventory** at the **config›system** prompt. • Restart the unit. • In case of failure, replace the entire unit.

Fault/Problem	Probable Cause	Corrective Action
The unit is unreachable	Incorrect management settings	• Using a local serial connection, enable the relevant management access type by entering **telnet**, **snmp**, and/or **ssh** at the **config›mngmnt›access** prompt. • View the list of enabled management access types and settings by entering **info detail** at the **config›mngmnt** prompt • Verify that a router interface has been configured with management access set to allow all, assigned an IP address, and bound to an administratively enabled SVI. • Verify that management flows have been set up to/from the SVI, and that the flows are enabled • Verify that the default gateway is configured in the router.
	Management path disconnected	• In case of remote management, analyze this issue using a local serial connection • At the current prompt, check whether the desired unit responds by entering **ping** ‹IP address› • Check network connectivity issues and firewall settings • Verify that the management flows have been configured correctly.
Physical link fails to respond	Link may be administratively disabled.	• Administratively enable the link • In case of Ethernet links, make sure that the autonegotiation, speed, and duplex modes match the configured values on the access switch/router.
Ethernet LINK LED is off	Ethernet cable problem	• Check the Ethernet cable to see whether a cross or straight cable is needed • Check/replace Ethernet cable • Verify that the range is within the limits • Check the port by connecting the remote end of the cable to a different switch • Send the unit for repair.

11.4 Performing Diagnostic Tests

This section describes general diagnostic tests and RFC-2544 testing. For information on testing ports, refer to *Chapter 6*. For information on testing flows and OAM CFM, refer to *Chapter 8*.

RFC-2544 Testing

You can perform BERT testing based on RFC-2544:

- Throughput test – Detect the maximum frame rate without lost frames
- Packet loss – Detect the point at which frame loss does not occur
- Latency – Determine average frame roundtrip time.

Note *You can run the RFC-2544 tests up to 1 GbE at a time.*

Standards

RFC-2544, Benchmarking Methodology for Carrier Ethernet Networks

Benefits

You can evaluate the performance of network devices to provide performance metrics of the Ethernet network and validate the SLA.

Functional Description

RFC-2544 testing uses OAM CFM messages such as Loopback (LB), Loss Measurements (LM), and Delay Measurements (DM) frames. Therefore, end-to-end OAM CFM is necessary for the testing. User data can't be transmitted via associated OAM service data/flows while an RFC-2544 test is running.

In a bidirectional throughput test, the local ETX-203AX generates LBM + data TLV messages towards the far-end device, which responds with LBR messages. The local ETX-203AX calculates the round trip throughput.

In a unidirectional throughput test, the local ETX-203AX generates 1DM messages towards the far-end device, which verifies the frames and calculates unidirectional throughput. The convergence algorithm is based on a binary search using LMM and LMR messages.

The packet loss test is performed as follows for all selected frame sizes:

- Transmit x frames at a rate of 100% throughput
- Calculate frame loss with the formula: (tx - rx) / 100 * tx
- Decrease rate by 10% and repeat the test until two trials result in no frame loss.

The latency test is performed as follows:

- Transmit DMM frames at a rate of throughput for 10 seconds
- Calculate the latency using DMM and DMR frames that are transmitted after 5 seconds

- The test result is the average of the number of iterations per frame size (up to 5 minutes per frame size)
- Applicable for round-trip mode.

Factory Defaults

By default, no profiles or tests are defined.

When you create a test profile, it is configured by default as shown below.

```
ETX-203AX# config test rfc2544
ETX-203AX>config>test>rfc2544# profile-name Testprf
ETX-203AX>config>test>rfc2544>profile-nam(Testprf)$ inf d
    frame-size  64
    pattern  all-ones
    tlv-type  data
    test-direction  bidirectional
    frames-number-in-attempt 200000
    frame-loss-tolerance  20
    throughput-measurement-accuracy 100000
    number-of-trials  1
    no learning-frames

ETX-203AX>config>test>rfc2544>profile-nam(Testprf)$
```

When you create a test, it is configured by default as shown below.

```
ETX-203AX# config test rfc2544
ETX-203AX>config>test>rfc2544# test 1
ETX-203AX>config>test>rfc2544>test(1)$ inf d
    no bind
    max-rate  0 convention data-rate compensation 0
    type  throughput
    no max-test-duration
    no associated-flow

ETX-203AX>config>test>rfc2544>test(1)$
```

Performing Tests

In order to perform RFC-2544 tests, you must configure:

- Bidirectional data flows that are administratively enabled. If one of the flows is associated with the test, its egress port and queue block must be identical to the associated port and queue block of the MEP to which the test is bound
- MEP and Destination NE
- RFC-2544 profile – Template to create test runs. You can configure up to eight test profiles.
- RFC-2544 test – Associated with RFC-2544 profile. Up to eight tests can use the same test profile. In one RFC-2544 test, you can perform one or more of the three test types.

Note *Up to eight RFC-2544 tests can run concurrently.*

If you are performing more than one type of test, they are performed in the following order:

- Throughput
- Packet loss
- Latency – Up to 20 latency test iterations are performed in the remaining time, according to the configured maximum test duration (each iteration requires 15 seconds).

➤ **To configure RFC-2544 test profiles:**

1. Navigate to **configure test rfc2544**.

   The **config›test›rfc2544#** prompt is displayed.

2. Type:
   `profile-name` <name>

   A test profile with the specified name is created if it does not already exist, and the **config›test›RFC2544› profile-nam**(‹name›)**#** prompt is displayed.

3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Configuring frame loss tolerance in 1/1000 units	**frame-loss-tolerance** ‹frames›	If the test reaches that value, the test is considered as completed successfully.
Configuring frame sizes for the test	**frame-size** [**64**] [**128**] [**256**] [**512**] [**1024**] [**1280**] [**1518**] [**1700**] [**1900**] [**2000**] [**custom** ‹custom›]	You can specify one or more standard frame sizes, as well as a custom frame size (64–2000)
Configuring how many frames in attempt	**frames-number-in-attempt**	
Configuring amount and frequency of learning frames	**learning-frames number** ‹value› **frequency** { **once** | **once-per-trial** }	
Configuring the number of trials for the test	**number-of-trials** ‹value›	Allowed range: 1–3
Configuring pattern of test frame payload	**pattern** { **all-ones** | **all-zeros-without-crc** | **all-zeros-with-crc** | **alternate** | **prbs-with-crc** | **prbs-without-crc** }	
Configuring direction of test (unidirectional or bidirectional)	**test-direction** { **unidirectional** | **bidirectional** }	
Configuring accuracy of throughput measurement	**throughput-measurement-accuracy** ‹bps›	
Configuring TLV type as test or data	**tlv-type** { **test** | **data** }	

➤ **To configure RFC-2544 tests:**

1. Navigate to **configure test rfc2544**.

   The **config›test›rfc2544#** prompt is displayed.

2. Type:
   test <id>

   The **config**›**test**›**rfc2544**› **test**(‹id›)**#** prompt is displayed.

3. Enter all necessary commands according to the tasks listed below.

Task	Command	Comments
Activating the test	**activate date** ‹dd-mm-yyyy› ‹hh:mm:ss› **activate recurring** ‹hours›	Type **no activate** to stop the test
Associating test with flow in order to retrieve bandwidth profile and QoS information.	**associated-flow** ‹name›	Flow must be active and its egress port and queue block must be identical to the associated port and queue block of the MEP to which the test is bound
Binding to destination NE	**bind oam-cfm md** ‹md-id› **ma** ‹ma-id› **mep** ‹mep-id› **service** ‹service-id› **dest-ne** ‹dest-ne-id›	There must be bidirectional flows using the same classification and port associated with the MEP
Configuring maximum rate for test	**max-rate** ‹bps› [**convention** {**line-rate** | **data-rate**}] [**compensation** ‹compensation›]	**max-rate** – The maximum rate applies to throughput and loss tests. **convention** – Determines whether the interpacket gap is included in test result calculations: **line-rate** – Interpacket gap is included **data-rate** – Interpacket gap is not included **compensation** – Allowed range is 0–63. The compensation value is added to frame size, to allow for Layer-1 overhead in the network ***Note**: It is not necessary to configure the maximum rate if **associated-flow** is used to associate the test with a flow that has a policer profile, as in that case the maximum rate is derived from the flow policer profile.*

Task	Command	Comments
Configuring maximum duration of test	**max-test-duration** ‹minutes›	Allowed values: 0, or 2–60 The value 0 indicates no limit; the test runs until it completes. If a value from 2–60 is configured, the test is stopped when the configured maximum duration has elapsed, whether or not all the configured test types have completed.
Associating a test profile with the test	**test-profile** ‹name›	
Defining the type(s) of benchmark test to perform on this run	**type** [**throughput**] [**latency**] [**frame-loss**]	
Clearing test report	**clear-reports**	
Displaying test report	**show report all** **show report iteration** ‹iteration-number›	
Displaying test status	**show status**	
Displaying test summary	**show summary**	

Example

➤ To run RFC-2544 test:

- Test direction – bidirectional
- Number of trials – 2
- Frame sizes – 64, 256, 1400 [custom]
- Test types –throughput, frame loss, latency
- Bound to MD 1 MA 1 service 1 MEP 1 Destination NE 1
- Associated to flow test_flow1, that has associated policer profile test_policer with CIR=9984, EIR = 0, and is associated with classification, port, and queue block as the above MEP
- Maximum test duration – 1 hour.

```
ETX-203AX# configure test rfc2544
ETX-203AX>config>test>rfc2544# profile-name p1
ETX-203AX>config>test>rfc2544>profile-nam(p1)$
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ frame-size 64 256 custom 1400
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ pattern all-ones
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ tlv-type data
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ test-direction bidirectional
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ frames-number-in-attempt 5000
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ frame-loss-tolerance 10
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ number-of-trials 2
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ no learning-frames
ETX-203AX>config>test>rfc2544>profile-nam(p1)$ exit
ETX-203AX>config>test>rfc2544# test 1
ETX-203AX>config>test>rfc2544>test(1)$ test-profile p1
ETX-203AX>config>test>rfc2544>test(1)$ type throughput latency frame-loss
ETX-203AX>config>test>rfc2544>test(1)$ bind oam-cfm md 1 ma 1 mep 1 service 1
dest-ne 1
ETX-203AX>config>test>rfc2544>test(1)$ associated-flow test_flow1
ETX-203AX>config>test>rfc2544>test(1)$ max-test-duration 60
ETX-203AX>config>test>rfc2544>test(1)$ activate
ETX-203AX>config>test>rfc2544>test(1)$ show status
Activity Status            : In Progress
Elapsed Time <dd:hh:mm:ss> : <00:00:15:24>
ETX-203AX>config>test>rfc2544>test(1)$ show status
Activity Status            : Completed

ETX-203AX>config>test>rfc2544>test(1)$ show summary
Iteration Start       Start     Duration Duration
          Date        Time      Days     Time
--------------------------------------------------------------------------------
1         08-01-2012  11:31:43  0        <00:38:25>

ETX-203AX>config>test>rfc2544>test(1)$ show report all
Test ID                : 1
Iteration Number       : 1
Date & Time            : 08-01-2012                      11:31:43
Profile Name           : p1
Number of Trials       : 2
Duration <dd:hh:mm:ss> : <00:00:38:25>

Test Parameters
--------------------------------------------------------------------------------
Bind: MD                       : 1             MA         : 1
MEP         : 1
P-Bit                          : 0             VLAN       : 200
Max Rate (bps)    : 1000000000
Convention         : Data Rate           Compensation  : 0
Frames in Burst    : 200000
Pattern            : All Ones
Frame Type  : Data
Search Resolution              : 1         Tolerance  : 5
Learning Frames:               : 0         Frequency  :
Direction                      : Bidirectional
```

```
Flow Parameters
-------------------------------------------------------------------------------
Flow Name    : test_flow1
Fixed Queue  : 0                              Mapping Profile  :
Policer Name : test_policer
CIR (Kbps)   : 9984                           EIR (Kbps)       : 0

Throughput Report
-------------------------------------------------------------------------------
Trial  : 1
Status : Success                 Duration  : <00:00:00:49>
Frame Size     Theoretical Max     Throughput Throughput Success
               (FPS)               (FPS)      (Mbps)    (%)
-------------------------------------------------------------------------------
64             1953125             1490312     763.040    76
256            488281              453309      928.379    92
1400           97656               96173       984.812    98

Throughput Report
-------------------------------------------------------------------------------
Trial  : 2
Status : Success                 Duration  : <00:00:00:52>
Frame Size     Theoretical Max     Throughput Throughput Success
               (FPS)               (FPS)      (Mbps)    (%)
-------------------------------------------------------------------------------
64             1953125             1490312     763.040    76
256            488281              453309      928.379    92
1400           97656               96173       984.812    98

Loss Report
-------------------------------------------------------------------------------
Trial  : 1

Status : Success                 Duration  : <00:00:02:21>

Frame Size            : 64
Theoretical Max (FPS) : 1953125

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------------
100                  76
90                   84
80                   95
70                   100
60                   100
```

```
Frame Size            : 256
Theoretical Max (FPS) : 488281

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------------
100                  92
90                   100
80                   100

Frame Size            : 1400
Theoretical Max (FPS) : 97656

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------------
100                  98
90                   100
80                   100

Loss Report
-------------------------------------------------------------------------------
Trial  : 2

Status : Success                Duration  : <00:00:02:21>


Frame Size            : 64
Theoretical Max (FPS) : 1953125

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------------
100                  76
90                   84
80                   95
70                   100
60                   100

Frame Size            : 256

Theoretical Max (FPS) : 488281

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------------
100                  92
90                   100
80                   100
```

```
Frame Size            : 1400
Theoretical Max (FPS) : 97656

Throughput of Max    Success
(%)                  (%)
-------------------------------------------------------------------------
100                  98
90                   100
80                   100

Latency Report
-------------------------------------------------------------------------
Trial  : 1

Status : Success                Duration  : <00:00:15:15>
Num of Iterations : 20

Frame Size     Latency
               (micro-sec)
-------------------------------------------------------------------------
64             1
256            1
1400           1

Latency Report
-------------------------------------------------------------------------
Trial  : 2

Status : Success                Duration  : <00:00:15:14>
Num of Iterations : 20

Frame Size     Latency
               (micro-sec)
-------------------------------------------------------------------------
64             0
256            0
1400           0

ETX-203AX>config>test>rfc2544>test(1)$
```

Running a Ping Test

You can ping a remote IP host to check the ETX-203AX IP connectivity with that host.

➤ To ping an IP host:

1. In any level, start pinging the desired host specifying its IP address and optionally the number of packets to send:
   ping <1.1.1.1–255.255.255.255> [number-of-packets <0–50>]
2. To stop the ping test, enter:
   no ping

Tracing the Route

This diagnostic utility traces the route through the network from ETX-203AX to the destination host. The trace route utility supports up to 30 hops.

➤ To trace a route:

- In any level, start the trace route and specify the IP address of the host to which you intend to trace route:
  `trace-route` `<1.1.1.1–255.255.255.255>`

11.5 Frequently Asked Questions

Q How should ETX-203AX be configured for management?

A You need to configure a router interface for management by assigning it an IP address, and binding it to an SVI for which management flows have been configured. Additionally, you need to configure the default gateway address in the router. Refer to the *Quick Start Guide* for an example of configuring ETX-203AX for management.

Q If I change the second Ethernet port from network to user, what happens to the associated flows?

A When you change the functional mode, all flows related to the port are deleted.

11.6 Technical Support

Technical support for this product can be obtained from the local partner from whom it was purchased.

RADcare Global Professional Services offers a wide variety of service, support and training options, including expert consulting and troubleshooting assistance, online tools, regular training programs, and various equipment coverage options.

For further information, please contact the RAD partner nearest you or one of RAD's offices worldwide.

RAD Data Communications would like your help in improving its product documentation. Please send us an e-mail with your comments.

Thank you for your assistance!

Chapter 12

Software Upgrade

This chapter explains how to upgrade ETX-203AX for software version 4.01.

Software upgrade is required to fix product limitations, enable new features, or to make the unit compatible with other devices that are already running the new software version.

The device can store up to two software images, referred to as software packs and named **sw-pack-1** through **sw-pack-2**. You can designate any of the software packs as active. The non-active software packs serve as backups that can be used if the active software becomes corrupted.

Note *The CLI allows **sw-pack-1** through s**w-pack-4**, but only **sw-pack-1** and **sw-pack-2** should be used.*

The information in this chapter includes the following:

- Detailed conditions required for the upgrade
- Any impact the upgrade may have on the system
- Description of downloading options.

12.1 Software Upgrade Options

Application software can be downloaded to ETX-203AX via SFTP/TFTP with the **copy** command, or via XMODEM, FTP, or TFTP, using the boot menu.

The downloaded software pack can be installed as the active software via the **admin software install** command, or by using the boot menu.

12.2 Prerequisites

Before starting the upgrade, verify that you have the following:

- For upgrade via SFTP/FTP/TFTP:
  - Operational ETX-203AX unit with valid IP parameters configured
  - Connection to a PC with an SFTP/FTP/TFTP server application and a valid IP address
  - Software image file stored on the PC. The image file (and exact name) can be obtained from the local RAD business partner from whom the device was purchased.

- For upgrade via XMODEM:
  - Operational ETX-203AX unit
  - Connection to a PC via a terminal emulation program
  - Software image file stored on the PC. The image file (and exact name) can be obtained from the local RAD business partner from whom the device was purchased.

12.3 Upgrading the Device Software via CLI

The recommended software downloading method is to use the **copy** command.

Network administrators can use this procedure to distribute new software releases to all the managed ETX-203AX units in the network from a central location.

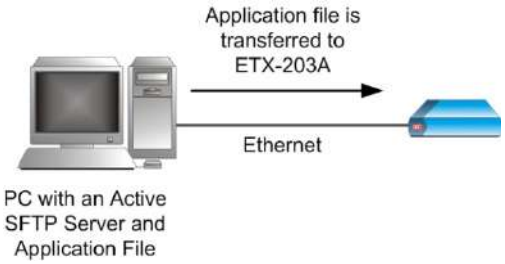


Figure 12-1. Downloading a Software Application File

Use the following procedure to download software release 4.01 to ETX-203AX via CLI.

1. Verify that the image file is stored on the PC with the SFTP/TFTP server application.
2. Verify that the ETX-203AX router has been configured with valid IP parameters.
3. Ping the PC to verify the connection.
4. Activate the SFTP/TFTP server application.
5. Download the image file from the PC to ETX-203AX.

Note *Configuration values shown in this chapter are examples only.*

Verifying the IP Parameters

In order to be able to establish communication with the SFTP/TFTP server, the ETX-203AX router must have IP parameters configured according to your network requirements. Refer to the following manual sections for additional information:

- *Connecting to ASCII Terminal* in Chapter 2
- *Working with Terminal* in Chapter 4
- *Configuring the Router* in Chapter 8.

Pinging the PC

Check the integrity of the communication link between ETX-203AX and the PC by pinging the PC from ETX-203AX.

➤ **To ping the PC:**

1. In any level, start pinging the PC specifying its IP address and optionally the number of packets to send:

   ping <ip-address> [**number-of-packets** <num-packets>]

   A reply from the PC indicates a proper communication link.

2. If the ping request times out, check the link between ETX-203AX and the PC (physical path, configuration parameters, etc.)

Activating the SFTP Server

Once the SFTP server is activated on the PC, it waits for any SFTP file transfer request originating from the product, and carries out the received request automatically.

SFTP file transfers are carried out through TCP port 22. Make sure that the firewall you are using on the server allows communication through this port (refer to *Chapter 10* for details).

Activating the TFTP Server

Once the TFTP server is activated on the PC, it waits for any TFTP file transfer request originating from the product, and carries out the received request automatically.

TFTP file transfers are carried out through port 69. Make sure that the firewall you are using on the server allows communication through this port (refer to *Chapter 10* for details).

Note *Configure the connection timeout of the TFTP server to be more than 30 seconds to prevent an automatic disconnection during the backup partition deletion (about 25 seconds).*

Downloading the Software

This procedure is used to download the new software release.

➤ **To copy the image file to the ETX-203AX unit:**

- In any level, enter:

  copy
  sftp://<username>:<password>@<ip-address>/<image-file-name>
  <sw-pack-n>

  Where <ip-address> is the IP address of the PC where the SFTP server is installed, and <n> is the index of the desired software pack.

Or

copy tftp://<tftp-ip-address>/<image-file-name> <sw-pack-n>

Where **tftp-ip-address** is the IP address of the PC where the TFTP server is installed, and <n> is the index of the desired software pack.

Note *Choose an index that is not being used by the active software, or by a software pack that you do not want to overwrite.*

The software download is performed. See *Installing Software* for instructions on installing the downloaded software as the active software.

Installing Software

After software is downloaded to ETX-203AX, it has to be installed via the **install** command as the active software. When you install software, by default ETX-203AX creates a restore point, so that if there is a problem with the new software pack, you can perform a rollback to the previous software pack.

Note *The file **startup-config** must exist before you can install software with creation of a restore point.*

You can request (via command **software-confirm-required**) that the next installed software be confirmed after the next reboot. When you execute the request, then the next time ETX-203AX reboots and loads the new software, you must confirm the software (via command **software-confirm**) within the configured timeout period. If the confirmation is not received before timeout, ETX-203AX automatically falls back to its previous software.

➤ **To request software confirmation:**

- At the **admin>software#** prompt, enter:
  software-confirm-required [**time-to-confirm** <minutes>]
  The confirmation timeout can be from five minutes to 24 hours. If you do not specify it, the default is five minutes.

Note *You can cancel the software confirmation request by entering **no software-confirm-required**.*

Next time ETX-203AX reboots and loads new software, it starts a confirmation timer. See the following procedure for more details on the confirmation.

➤ **To install a software pack as active:**

Note *If **startup-config** does not exist, you must install the software pack without creating a restore point.*

1. At the **admin>software#** prompt, enter:
   install <filename> [**no-restore-point**]
   The parameter <filename> can be any of the non-active software packs (**sw-pack-1** through **sw-pack-2**). If you specify **no-restore-point**, then after

the software is installed, it is not possible to rollback to the previous software.

You are prompted to confirm the operation.

```
!Device will install file and reboot. Are you sure? [yes/no] _
```

2. Type **yes** to confirm.

   If a restore point is being created, then **startup-config** is copied to **restore-point-config**. ETX-203AX designates the specified software pack as active, then reboots.

3. If a software confirmation request is active, ETX-203AX starts a timer with the specified timeout period.

Note *While the confirmation timer is running, ETX-203AX does not allow any commands that change its configuration.*

4. If the **software-confirm** command is entered before the timer expires, the software is considered to be confirmed.
5. If the **software-confirm** command is not entered before the timer expires, then **restore-point-config** is deleted, ETX-203AX designates the previously active software pack as active, then reboots.

Restoring Previous Active Software

If the installed software malfunctions and was installed with a restore point, you can perform rollback to the previous active software.

➤ **To rollback to the previous active software pack:**

1. At the admin›software# prompt, enter:
   undo-install

   You are prompted to confirm the operation.

```
! Falling back to restore point ! Are you sure? [yes/no] _
```

2. Type **yes** to confirm.

   The file **restore-point-config** is renamed to **startup-config**. ETX-203AX designates the previously active software pack as active, then reboots.

12.4 Upgrading the Device Software via the Boot Menu

Software downloading can also be performed using the Boot menu. The Boot menu can be reached while ETX-203AX performs initialization, for example, after power-up.

You may need to start the loading from the Boot menu if you are unable to use the **copy** command (for example, because the ETX-203AX software has not yet been downloaded or is corrupted).

Caution The Boot menu procedures are recommended only for use by authorized personnel, because this menu provides many additional options that are intended for use only by technical support personnel.

The following software downloading options are available from the Boot menu:

- Downloading using the XMODEM protocol. This is usually performed by downloading from a PC directly connected to the CONTROL DCE port of the unit.

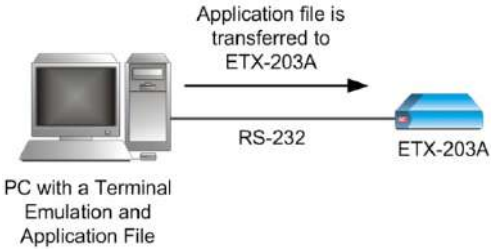


Figure 12-2. Downloading a Software Application File via XMODEM

- Downloading using FTP/TFTP. This is usually performed by downloading from a remote location that provides an IP communication path to an Ethernet port of ETX-203AX.

Accessing the Boot Menu

The boot menu can be accessed when the device is powered up, before logging in.

➤ **To access the Boot menu:**

1. Configure the communication parameters of the selected PC serial port for asynchronous communication with 9,600 bps, no parity, one start bit, eight data bits and one stop bit. Turn all types of flow control off.
2. Turn off ETX-203AX.
3. Activate the terminal application.
4. Turn on ETX-203AX and immediately start pressing the **<Enter>** key several times in sequence until you see the prompt to press any key to stop the autoboot.
5. Press any key.

   The boot screen appears. A typical boot screen is shown below (the exact version and date displayed by your ETX-203AX unit may be different). You can type ? to display the available commands.

Note *If you miss the timing, ETX-203AX performs a regular reboot process (this process starts with* ***Loading*** *and ends with the login screen).*

```
                          System Boot

          Copyright 1984-2008  RAD Data Communications, Ltd.


               Boot version: 1.04 [05-May-11]


CPU        : Freescale MPC8313E
OS version : VxWorks 6.7
BSP version: 1.15
Boot-Manager version: 2.13 [11-Jan-11]

Use '?'/help to view available commands




Press any key to stop auto-boot...
 7
[boot]:
```

Figure 12-3. Boot Menu

```
[boot]: ?

Commands:
 ?/help                          - print this list
 p                               - print boot parameters
 c [param]                       - change boot parameter(s)
 v                               - print boot logo with versions information
 run                             - load active sw pack and execute
 delete <FileName>               - delete a file
 dir                             - show list of files
 show <index>                    - show sw pack info
 download <index> [,<FileName|x>] - download a sw pack to specific index (x -
by Xmodem)
 set-active <index>              - Set a sw pack index to be the active
application
 control-x/reset                 - reboot/reset
```

Figure 12-4. Displaying Boot Commands

Using the XMODEM Protocol

Use the following procedure to download software release 4.01 to ETX-203AX via XMODEM.

➤ To download software release via XMODEM:

1. Verify that the image file is stored on the PC with the terminal application.
2. At the boot prompt, enter:
   download <index>**, x**

Where <index> can be 1–4 and corresponds to the desired software pack number.

Note *Choose an index that is not being used by the active software, or by a software pack that you do not want to overwrite.*

The process starts, and the following is displayed:

```
The terminal will become disabled !!!
Please send the file in XMODEM
```

3. Start the transfer in accordance with the program you are using. For example, if you are using the Windows HyperTerminal utility:
   - Select **Transfer** in the HyperTerminal menu bar, and then select **Send File** on the **Transfer** menu.

     The **Send File** window is displayed:
     - Select the prescribed ETX-203AX software file name (you may use the **Browse** function to find it).
     - In the **Protocol** field, select **Xmodem.**
   - When ready, press **Send** in the **Send File** window.

     You can now monitor the progress of the downloading in the **Send File** window.

Note *If downloading fails, repeat the whole procedure.*

When the downloading process has successfully completed, a sequence of messages similar to the following is displayed:

```
File writing to flash: - 4030KB
File downloaded successfully to :2
```

4. See *Activating Software* for instructions on activating the downloaded software.

Using FTP

Use the following procedure to download software release 4.01 to ETX-203AX via FTP.

➤ **To download software release via FTP:**

1. At the boot prompt, use the **c** command to configure the FTP parameters as needed.
2. At the boot prompt, enter:
   download <index>**,sw-pack-**<index>
   Where <index> corresponds to the desired software pack number.

Note *Choose an index that is not being used by a software pack that you do not want to overwrite.*

If no errors are detected, the downloading process starts, and the file is downloaded via FTP.

3. See *Activating Software* for instructions on activating the downloaded software.

Using TFTP

Use the following procedure to download software release 4.01 to ETX-203AX via TFTP.

➤ **To download software release via TFTP:**

1. At the boot prompt, use the **c** command to configure the TFTP parameters as needed.
2. At the boot prompt, enter:
   download <index>**,sw-pack-**<index>
   Where <index> corresponds to the desired software pack number.

Note *Choose an index that is not being used by a software pack that you do not want to overwrite.*

If no errors are detected, the downloading process starts, and the file is downloaded via TFTP.

3. See *Activating Software* for instructions on activating the downloaded software.

Activating Software

To activate a software pack, you need to designate it as active and load it.

➤ **To activate a software pack:**

1. To set the software as active, enter:
   set-active <index>.

   A confirmation similar to the following is displayed:

```
SW set active 2 completed successfully.
```

2. To load the active software, type: **run**.

   A sequence of messages similar to the following is displayed:

```
Loading/un-compressing sw-pack-2...
Starting the APPLICATION off address 0x10000...
```

After a few more seconds, the login prompt is displayed.

12.5 Verifying Upgrade Results

To verify that the upgrade was successful, log on to ETX-203AX via a terminal emulation program to view the Inventory table (**show inventory-table** at prompt **config>system#**), and verify the active software version in the SW Rev column.

Appendix A
Connection Data

A.1 Ethernet Connector

The Ethernet electrical interface terminates in 8-pin RJ-45 connectors, of type 10/100BaseT or 10/100/1000BaseT, wired in accordance with *Table A-1*. The connector supports both MDI and MDIX modes.

Table A-1. 10/100/1000BaseT Connector Pinout

Pin	MDI	MDIX
1	A+	B+
2	A-	B-
3	B+	A+
4	C+	D+
5	C-	D-
6	B-	A-
7	D+	C+
8	D-	C-

A.2 MNG Connector

The ETX-203AX Ethernet management port uses an electrical interface that terminates in an RJ-45, 8-pin connector. The port supports MDI and MDIX modes. *Table A-2* lists the pin assignments.

Table A-2. MNG Pinout

Pin	Designation	Function
1	RxD+	Receive Data output, + wire
2	RxD–	Receive Data output, – wire
3	TxD+	Transmit Data input, + wire
4,5	–	Not connected

Pin	Designation	Function
6	TxD-	Transmit Data input, – wire
7,8	–	Not connected

A.3 CONTROL Connector

The control terminal interface terminates in an 8-pin RJ-45 connector. The following table lists the CONTROL connector pin assignments.

Table A-3. CONTROL Connector Pinout

Pin	Function
1, 2, 3, 4	–
5	Transmit Data (output)
6	Receive Data (input)
7, 8	–

Appendix B

Operation, Administration, and Maintenance (OAM)

B.1 Introduction

ETX-203AX supports standard implementation of Ethernet OAM based on ITU-T Y.1731 and IEEE 802.1ag-D8. Pre-standard implementation based on Y.1731 is supported for backward compatibility, for instance when working opposite a device with an older version of Ethernet OAM software. This appendix describes the pre-standard implementation. The standard implementation can be found in the ITU-T Y.1731 and IEEE 802.1ag-D8 documentation.

The pre-standard OAM implementation provides the following:

- Continuity check
- Non-intrusive loopback which used to detect loss of bidirectional continuity
- Performance measurements (per service).

Table B-1 lists the Ethernet OAM-related terms used in the appendix.

Table B-1. Ethernet OAM Terminology

Term	Description
UNI	User Network Interface. The physical demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber
UNI_C	Customer side of a UNI link
UNI_N	Network side of a UNI link
Service frame	An Ethernet frame transmitted across the UNI toward the Service Provider or an Ethernet frame transmitted across the UNI toward the Subscriber.
Flow	Ethernet Virtual Connection : An association of two or more UNIs that limits the exchange of Service Frames to UNIs in the Ethernet Virtual Connection
Point-to-point Flow	Flow connecting exactly two UNIs

Term	Description
Multipoint-to-Multipoint Flow	Flow connecting two or more UNIs
Service Instance / Class of service (CoS)	A set of Service Frames that have a commitment from the Service Provider to receive a particular level of performance
Service Instance Identifier (CoS ID)	Service Frame delivery performance is specified for all Service Frames transported within a flow with a particular Class of Service instance. The Class of Service instance is identified by a Class of Service Identifier associated with each Service Frame (Class of service can be identified by more than one parameter/frame attribute)
MEP	Proactive OAM reference point which is capable to initiate and terminate proactive OAM frames. MEP is also capable to initiate and react to diagnostics OAM frames.
MIP	A provisioned OAM reference point which is capable to respond to diagnostics OAM frames initiated by the MEP.
MEP Service Instance Source	The receiver of OAM frames in each Service Instance
MEP Service Instance Destination	The transmitter of OAM frames in each Service Instance

B.2 Reference Architecture

Figure B-1 illustrates two OAM flows:

- OAM flow originating from the CPE

  The CPE-to-CPE OAM flow is transferred transparently by ETX-203AX and treated as data.

- OAM flow originating from the ETX-203AX devices.

  The ETX-203AX OAM flow runs on a data flow on the same VLAN.
  The ETX-203AX units terminate the OAM flow and can be referred as a Maintenance Entity (ME). Each device supports up to 8 such MEs. In this case, the ETX-203AX units act as MEPs (Maintenance End-Points) and not as a MIP (Maintenance Intermediate Points) and all measurements are performed on the UNI_N to UNI_N segment.

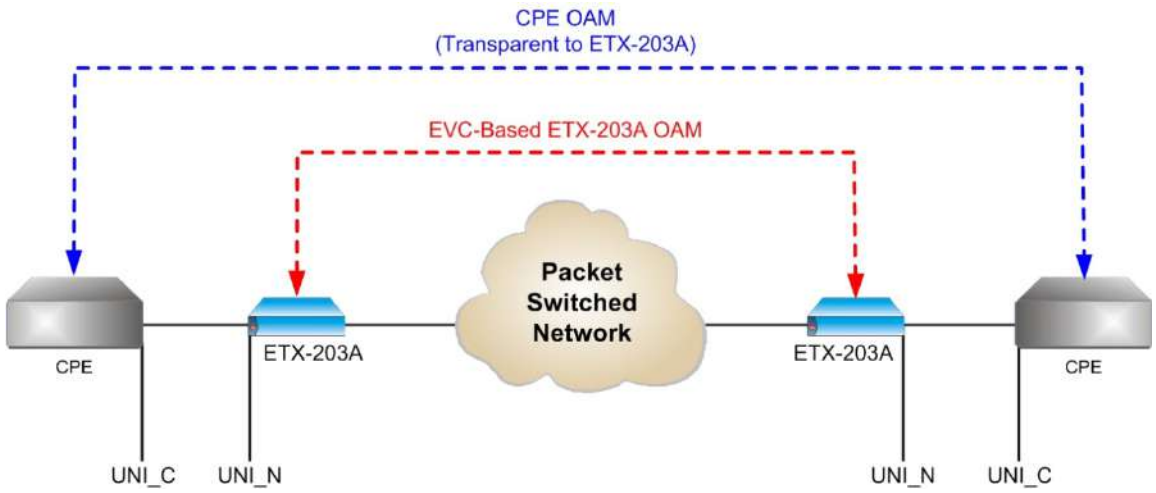


Figure B-1. OAM Architecture

Handling of OAM Levels

UNI_C to UNI_N Direction

In the UNI_C to UNI_N direction ETX-203AX blocks all OAM messages with OAM level greater than 2. Messages with other OAM levels are passed transparently.

Network Ingress to UNI_N Direction

All OAM messages coming from the network ingress with the device MAC address or with the special OAM multicast address are sent to the CPU. All other OAM messages are passed transparently to the user ports as per the respective flow definition.

B.3 OAM Entities

This section describes the OAM entities hierarchy. *Figure B-2* illustrates the relationship between UNI, flow and Service Instance (COS ID), when one or more service instances belong to one flow and one or more flow belong to a UNI. From the OAM perspective, the continuity messages and defects are activated per flow, and the PM is activated per service instance.

Note *A flow can belong only to one UNI in the same ETX-203AX.*

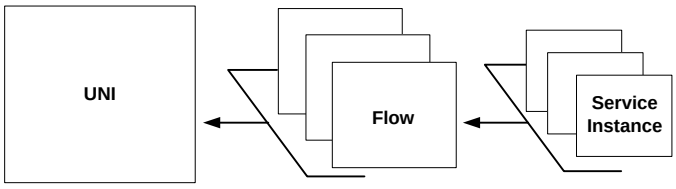


Figure B-2. UNI, Flow and Service Instance (COS ID)

Figure B-3, *Figure B-4* and *Figure B-5* illustrate different combinations of UNIs, flows and service instances. Each UNI contains at least one flow, which contain at least one service instance.

- In the one flow per UNI case (*Figure B-3*), the PM and CC are transmitted once.

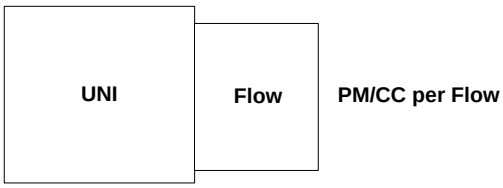


Figure B-3. One Flow per UNI

- In case of multiple flows per UNI (*Figure B-4*), PM and CC are transmitted three times.

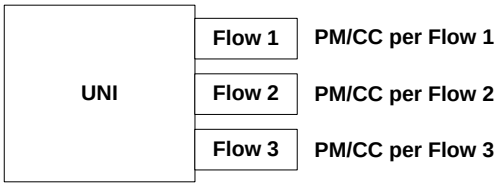


Figure B-4. Multiple Flows per UNI

- In case of one flow and multiple CoS (Service Instances) per UNI (*Figure B-5*), the PM is transmitted three times and the CC – once.

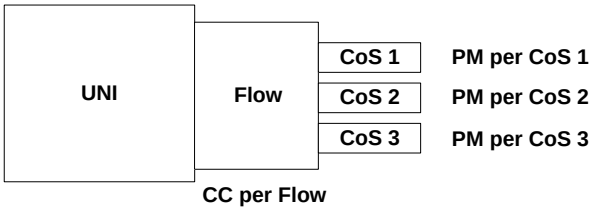


Figure B-5. One Flow and Multiple CoS (Service Instances) per UNI

B.4 OAM Flows

Figure B-6 illustrates a typical OAM traffic flow. The OAM message is transmitted from the source MEP 1 to the destination MEP 2 and the reply is transmitted back The source is also a destination for messages from the other direction.

The OAM interval is one second, so each NTU transmits one request and one reply and receive one request and one reply. Total of four messages are transmitted per second per service instance.

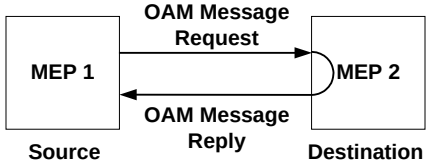


Figure B-6. OAM Flow

OAM Message Addressing

The OAM defines two modes of addressing, unicast and multicast. Unicast addressing is used for point-to-point connections, while multicast addressing is used in cases where the MAC address of the destination MEP is not known. Currently ETX-203AX supports point-to-point flows in proprietary mode.

OAM Message Association

On the receiver side the OAM frame is associated with a flow and a service.

Flow Association

When an OAM frame is associated with a flow, the following steps are performed:

- Request message reception

  When a request message is received, the VLAN is extracted to find the Flow ID. The Flow ID found at the receiver is compared against the Flow ID in the frame. If the IDs are equal, further service association is made. If it is not found, the "Flow ID no match" notification is returned in the reply message.

- Reply message reception

  When a reply message is received, the VLAN is extracted to find the Flow ID. The Flow ID found at the receiver is compared against the Flow ID in the frame. If the IDs are equal, further service association is made. If it is not found, the frame is discarded and connectivity alarm is issued.

Service Association

When an OAM frame is associated with a service, the following steps are performed:

- Request message reception

  The class of service characteristics are extracted from the frame and must be matched to an entry in the flows <-> services table at the receiver. If they are matched, the frame is processed. If not, the service ID is returned with the "Not Found" notification.

- Reply message reception

  The class of service characteristics are extracted from the frame and must be matched to an entry in the flow <-> services table at the receiver. If they are matched, the frame is processed. If not, the frame is discarded.

Ethernet Loopback (ETH-LB)

The ETH-LB can be used to verify connectivity. The ETH-LB is performed by sending a request ETH-LB message to the remote unit and expecting an ETH-LB reply message back to verify connectivity. When the insertion rate of ETH-LB messages is much slower compared to data rate between the flow points.

Unicast ETH-LB request message is sent from a MEP to a specific MEP (remote device). The DA of the request message is a unicast MAC address of destination device. Upon receipt of the request message, the MEP responds with unicast ETH-

LB reply message. The DA of the reply message is a unicast MAC address of requesting device, learned from request message.

Continuity Check (ETH-CC)

Ethernet Continuity Check (ETH-CC) can be used to detect continuity failures across flows between a given pair of edge service point on a flow. Continuity failures are caused by:

- Major failures (link failure, device failure, network path failure etc)
- Minor failures (software failure, memory corruption, incorrect configuration etc).

The ETH-CC signal is generated by one MEP. Upon receipt of the first ETH-CC signal from a sending MEP, the receiving MEP detects continuity with sending MEP and expects to receive further periodic ETH-CC signals. Once the receiving MEP stops receiving periodic ETH-CC signals from sending MEP, it declares continuity failure.

OAM Procedures

This section discusses the continuity check (CC) and the performance measurement (PM) procedures.

Continuity Check Procedure

The loopback message and the ETH-CC messages are used for continuity check. In case the services are defined and PM collection is enabled, they are also used to carry PM messages. If PM collection is disabled, the messages are used for continuity check only.

If the RX CC mode of the receiver is configured to CC-based, the continuity detection is based on ETH-CC. If the mode is set to LB-based, the continuity detection is based on ETH-LB. If the mode is disabled, the continuity detection is not performed.

ETH-LB Method

The ETH-LB method includes the following elements:

- Unicast ETH-LB transmission

  Unicast ETH-LB request message is transmitted by a MEP (ETX-203AX) every 1 second. The transmitted Transaction Identifier is retained for at least 5 seconds after the unicast ETH-LB signal is transmitted. The Transaction Identifier must be changed for every unicast ETH-LB message, and no Transaction Identifier from the same MEP is allowed to be repeated within 1 minute.

- Unicast ETH-LB reception and reply transmission

  Whenever a valid unicast ETH-LB request message is received by MEP (ETX-203AX), a unicast ETH-LB reply message is generated and transmitted to the requesting MEP. Every field in the unicast ETH-LB request message is copied to the unicast ETH-LB reply message with the following exceptions:

- The source and destination MAC addresses are swapped.
- The OpCode field is vendor-specific 0xFE.
- The Flow and MEP ID are processed as follows: if the Flow/MEP ID do not exist in the device, it changes them to "No Match" otherwise they are left intact.

- Unicast ETH-LB reply receipt

  When a unicast ETH-LB reply message is received by a MEP (ETX-203AX) diagnostic flow termination function, it examines the TLVs returned in the unicast ETH-LB reply message. The signal is declared invalid if the TLVs do not match those sent in the corresponding unicast ETH-LB request signal, including MEP ID and Flow ID.

- Continuity declarations

  Loss of Continuity and Connectivity Mismatch states are declared by the ETH-LB mechanism.

  - Loss of continuity declaration

    After the source device sends an ETH-LB message a timer is set with a 3.52 second timeout. If the destination device does send reply within the timeout, the source enters the loss of continuity state. Upon reply from the destination, the source resets the timer to 3.52 seconds. Regarding the continuity check message, the source checks only the Flow ID with the MEP ID. When the source enters the loss of continuity state, it adds 24 to Unavailable Seconds counter. The 3.52 second period is calculated as a sliding window.

    Loss of continuity state is cleared after 3.52 seconds with at least 21 reply messages from the destination. In this case the Unavailable Seconds counter decreased by 24.

  - Connectivity mismatch declaration

    If the source Flow ID is not equal to the destination Flow ID as recorded in the reply message for 10 consecutive times, the source enters in to misconnection state.

    Misconnection state is cleared after 10 consecutive reply messages with the correct flow name from the destination.

    The Unavailable counter is maintained by the service according to the number of PM messages that did not receive replies. If a mismatch notification is received to the LB request, the frame is dropped and reply message is not sent. This is why the service becomes unavailable (no reply) in case of mismatch and the unavailable counter is raised.

ETH-CC Method

The ETH-CC method includes the following elements:

- ETH-CC transmission

  Unicast ETH-CC request message is transmitted by a MEP (ETX-203AX) every 1 second. The transmitted Transaction Identifier is retained for at least 5 seconds after the unicast ETH-CC signal is transmitted. The Transaction Identifier must be changed for every Unicast ETH-CC message, and no

Transaction Identifier from the same MEP is allowed to be repeated within 1 minute.

- Unicast ETH-CC reply receipt

  When a unicast ETH-CC message is received by a MEP (ETX-203AX) diagnostic flow termination function, it examines the TLVs returned in the unicast ETH-CC message, and declares the signal invalid if the TLVs do not match those sent in the corresponding exiting MEP ID and Flow ID.

- Continuity declarations

  Loss of Continuity and Connectivity Mismatch states are declared by the ETH-CC mechanism.

  - Loss of continuity declaration

    When the MEP receives the ETH-CC message a timer is set with a 3.5 seconds timeout. If the source does send another message during this period, the destination enters the loss of continuity state. Upon receipt of the ETH-CC message, the destination resets the timer to 3.5 seconds. Regarding the continuity check message, the destination check the Flow ID and the MEP ID. When the destination enters the loss of continuity state, it adds 4 to the Unavailable Seconds counter. The 3.5 second period is calculated as a sliding window.

    Loss of continuity state is cleared after 3.5 seconds with at least 2 messages from the source. In this case the Unavailable Seconds counter is decreased by 4.

  - Connectivity mismatch declaration

    If the source Flow ID is not equal to the destination Flow ID for 10 consecutive times, the destination enters in to misconnection state.

    Misconnection state is cleared after 10 consecutive reply messages with the correct flow name from the source.

    The Unavailable counter is maintained by the service according to the number of PM messages that did not receive replies. If a mismatch notification is received to the LB request, the frame is dropped and reply message is not sent. This is why the service becomes unavailable (no reply) in case of mismatch and the unavailable counter is raised.

Performance Measurement

For details on OAM statistic counters, refer to *Chapter 8*.

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.

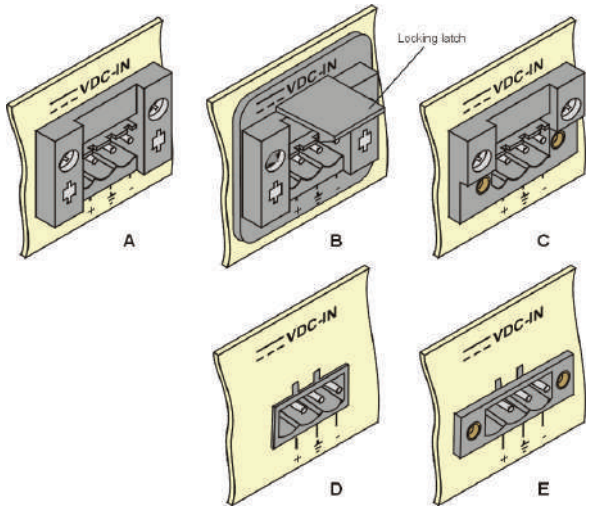


Figure 1. TB DC Input Connector Types Appearing on Unit Panels

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.

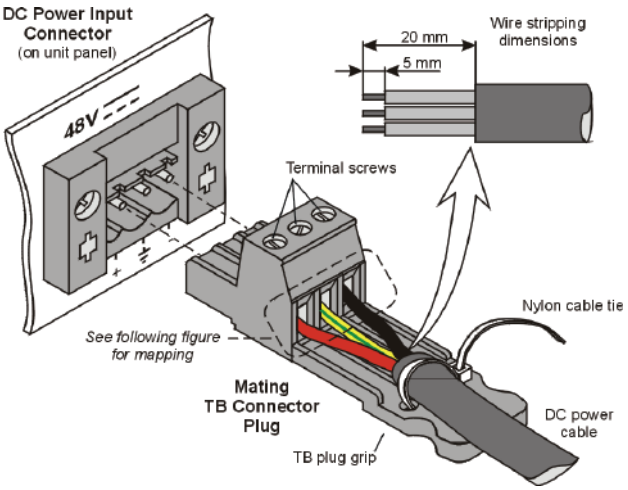

Figure 2. TB Plug Assembly

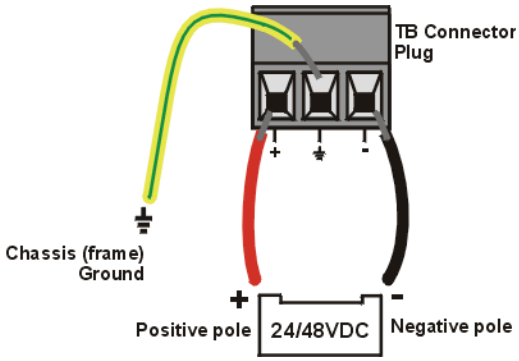

Figure 3. Mapping of the Power Supply Wire Leads to the TB Plug Terminals

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, and can be a safety hazard to personnel operating 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.*

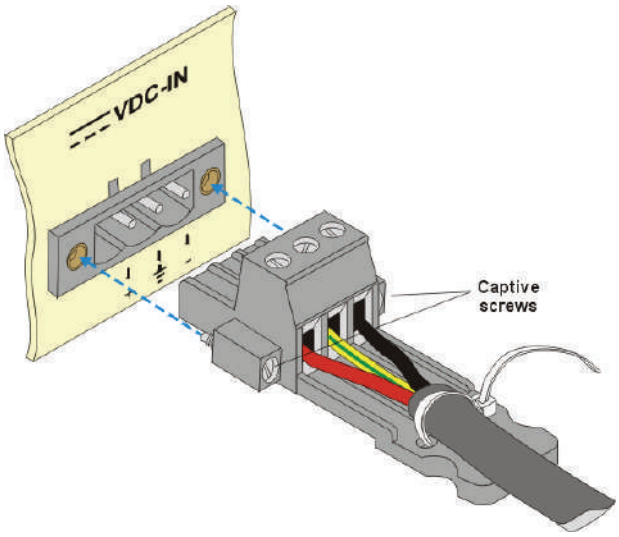

Figure 4. TB Plug with Captive Screws (optional)

➤ **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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