FibeAir 70

PRODUCT DESCRIPTION

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CERAGON

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This document was originally written in English. Please refer to the English language version for a full and accurate description of all products and services described herein.

Safety and Regulatory Notices

The following are mandatory notices for installation and operation of FibeAir 70, 70GHz Wireless Backhaul Link. Indications appearing here are required by the designated government and regulatory agencies for purposes of safety and compliance.

General

Do not install or operate this System in the presence of flammable gases or fumes. Operating any electrical instrument in such an environment is a safety hazard.

European Commission

This product has been designed to comply with CE markings in accordance with the requirements of European Directive 1995/5/EC.

This product has been designed to comply with the requirements of European Directives.

This equipment must be permanently earthed for protection and functional purposes. To make a protective earth connection, use the grounding point located on the System ODU.

For safe operation and servicing, install the ac socket-outlet near the equipment so that it is readily accessible. Use the appropriate ac power cord and plug, as required by national standards.

This apparatus is intended to be accessible only to authorized personnel. Failure to prevent access by unauthorized personnel will invalidate any approval given to this apparatus.

This product is in full compliance with the following standards:

- RF EN 302 217-3 1.3.1
- EMC EN 301 489-4
- Safety IEC 60950
- Operation EN 300 019-1-4 Class 4.1E
- Storage EN 300 019-1-1 Class 1.2
- Transportation EN 300 019-1-2 Class 2.2

About this Document

This document is the Installation and User Manual for the FibeAir 70, 70GHz Wireless Links.

Audience

This document assumes a working knowledge of wireless backhaul platforms and their operating environments.

This document is intended for use by all persons who are involved in planning, installing, configuring and using the FibeAir 70 system.

Conventions

The following conventions are used in this document in order to make locating, reading, and using information easier.

Special Attention

Hint:

Informs you of a helpful optional activity that may be performed at the current operating stage.

Note:

Provides important and useful information.

Caution:

Describes an activity or situation that may or will interrupt normal operation of the FibeAir 70 system, one of its components, or the network.

Text Conventions

Document References	Italicized text is used to reference sections or chapters in this document. In many cases, references use clickable hypertext links that enable immediate access to referenced objects.
`Command Input`	Monospace text is used to help delineate command line User input or text displayed in a command window.

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1 Introduction to the FibeAir 70 System

The FibeAir 70 is member of Ceragon FibeAir family of wireless products, featuring carrier grade, high capacity Ethernet with flexible support of the 71-76 GHz regulated E-Band. The FibeAir 70 radio supports up to 1.2 Gbps aggregated traffic.

Designed with strenuous carrier wireless backhaul demands in mind, FibeAir 70 solutions are equally at home in the mobile backhaul, in the enterprise, or in Ethernet service provider networks.

This chapter provides a brief overview of the FibeAir 70 system, its features and specifications.

Figure 1-1 FibeAir 70 System

1.1 System Applications

For Mobile Operators

To meet growing subscriber demand, providers are constantly seeking additional network capacity to enable delivery of bandwidth-intensive data services. Nowhere are these challenges felt more acutely than in the backhaul network. Ceragon offers easily-deployed, Gigabit wireless solutions for mobile operators seeking to dramatically raise backhaul capacity.

Leveraging the advantages of the 71-76 GHz E-Band spectrum, Ceragon's high-throughput FibeAir 70 solutions deliver the reliable, carrier-grade bandwidth that clients need. FibeAir 70 not only allows providers to avoid the expense of new fiber deployments, but also helps future-proof the backhaul – enabling the transition to Ethernet, providing the high capacity required by HSPA, LTE and WiMAX, and incorporating networking capabilities to support future network topologies such as flat-IP, mesh and ring architectures.

For Ethernet Business Service Providers

Ethernet business service providers and triple-play providers have traditionally used copper in the last mile – migrating to fiber only when necessary, owing to the time and expense required. In today's competitive environment, FibeAir 70 offers integrated, high-speed data, video and voice transport over a highly cost-effective, point-to-point bearer. FibeAir 70 enables rapid, wireless last-mile backhaul bridging and fiber extension, eliminating the need for additional fiber connections, and enabling operators to build a converged network infrastructure.

For the Enterprise

Ceragon solutions are an ideal alternative to expensive leased lines or new privately-owned fiber links for Enterprises or large organizations looking to quickly extend high speed Ethernet services from wireline-connected locations. FibeAir 70 products improve service delivery while lowering CapEx & OpEx, while offering greater flexibility for network growth.

1.2 Main Features

Ceragon's FibeAir 70 wireless backhaul radio link operates in the E-band spectrum. Taking advantage of the new spectrum, the FibeAir 70 enables easy migration to support Gigabit throughput – allowing operators to enhance bandwidth capacity on a "pay as you grow" basis. Supporting point-to-point, daisy-chain, ring and mesh configurations, and the FibeAir 70 system offers carrier class availability and services.

Among key features of the FibeAir 70 systems is:

- Provides aggregated Gigabit-per-second data rates utilizing the newly allocated E-band spectrum, while being spectral efficient.
- Integrates easily into existing networks, enabling operators to quickly and seamlessly scale and boost their network capacity and as they grow and introduce future technologies and services.
- Provides advanced carrier Ethernet features including cutting-edge, integrated Layer 2 switching and Ethernet operation, administration and management (OAM) capabilities. FibeAir 70 outdoor units (ODUs) are highly-scalable and software-upgradable to support future Layer 2.5/3 networking and routing capabilities as networks evolve.
- Provides advanced adaptive modulation, bandwidth and coding capabilities allowing operators to maintain, prioritize, and verify quality of service (QoS) in all weather conditions, and achieve maximum (up to 99.999%) link availability.
- All-outdoor, small form factor, with a small antenna footprint and especially low power consumption results in an environmentally friendly design and easier installation, deployment and adoption.

1.3 Functional Description

The FibeAir 70 system comprises:

- The FibeAir 70 outdoor unit (radio link unit and antenna)
- The FibeAir 70 system host software and command line interface for complete and flexible system configuration, administration and management.

1.4 Management

The FibeAir 70 system can be managed using Ceragon's NMS – PolyView and with a built-in command line interface (CLI) while supporting Simple Network Management Protocol (SNMP).

The FibeAir 70 system features a wide range of built-in indicators and diagnostic tools for advanced OAM functionality. The system is designed to allow quick evaluation, identification and resolution of operating faults.

1.5 Technical Specifications

FibeAir 70 – Product Highlights		
Operational	Data throughput	Up to 70 Mbps
	Frequency Band	71-76 GHz According to ETSI EN 302 217-3 V1.3.1 (2009-07)
	Air Interface	TDD, OFDM
	Channel Size	250 MHz or 500 MHz (Typical) Additional: n*62.5 MHz; n=1…8 Software selectable
	Channel Arrangement	71+n*250, n=1…19
	Modulation Scheme	QPSK, QAM 16
	FEC	Convolutional Turbo Coding (CTC)
	Adaptive Bandwidth, Coding and Modulation	Dynamic gain of up to 20 dB in link budget
Antenna	RPE	Class 2 (According to ETSI EN 302 217-4-2 V1.4.1 (2009-03))
	Diameter	26 cm
	Gain	42 dBi
	Transmit Power	Nominal +5 dBm
Carrier Ethernet	Networking	Integrated Layer 2 switch Provider Bridge (802.1ad)
	QoS	Quality of Service (QoS), policing and prioritization capabilities (802.1Q)
	OAM	Service OAM (802.1ag / Y.1731) Link OAM (802.3ah)
	Resiliency	Ethernet Ring Protection (G.8032) Ethernet Linear Protection (G.8031) Link Aggregation (802.3ad)
Synchronization		G.8262 Synchronous Ethernet IEEE 1588v.2
Data Interfaces	Copper	10/100/1000BaseX
	Optical (SFP)	MMF - 1000BaseSX SMF - 1000BaseLX
Management		CLI, SNMP
Power	Voltage	-48 VDC
	Consumption	20 W

2 Installing the FibeAir 70

This chapter describes how to install and perform the basic setup for FibeAir 70 antenna outdoor units (ODUs) in a FibeAir 70 wireless network.

Topics covered here include:

- Preparing the installation site
- Unpacking and examining the ODU
- Installing the ODU
- Powering the ODU
- Aligning the ODU
- Initializing network connection

2.1 Site Preparation

Carefully select and prepare each FibeAir 70 ODU site to make device installation and configuration as simple and trouble-free as possible. During selection and preparation, always consider the long-term needs of both your network and your applications.

Physical Requirements

Each FibeAir 70 ODU site should adhere to the following requirements:

- Install the FibeAir 70 ODU only at a site where environmental conditions conform to the equipment operational requirements specified in *Section 1.5*.
- A clear, unobstructed line-of-sight between FibeAir 70 ODU nodes.
- Mount the FibeAir 70 ODU on a fixed, stable, permanent structure. A reinforced steel mounting pole is required, with a diameter measuring from 2-4 inches (5-10 centimeters).

Caution:

Do not mount the FibeAir 70 device on a structure that is temporary or easily moved. Doing say may result in poor service or equipment damage.

- Install the FibeAir 70 ODU where it is easily accessed after mounting.

Cabling Requirements

- Ensure that your power connection cable matches the FibeAir 70 power connector pin-outs. See *Figure 2-2* for the DC power connector pin-out diagram.

- Install the FibeAir 70 ODU where network connections and optional power cabling are ready for operation and are easily accessed.
- Install the FibeAir 70 ODU where proper electrical outdoor grounding is readily available. Typically, the grounding connection attached directly to the mounting pole. If not already present, then suitable structure-to-earth grounding connections must be created before installation.

Note: 

Improper electrical grounding can result in excessive electromagnetic interference or electrical discharge.

2.2 FibeAir 70 Package Content

Each FibeAir 70 package comprises the following components:

Part No.	Description	Quantity
	FibeAir 70 ODU (including antenna and radome)	2
	FibeAir 70 Mounting Assembly	2
	Connecting Cable All-Weather Shells	8
	Unit Grounding Cable (90 cm)	2
	DC Cable Terminal Block Connector	2

Please examine all FibeAir 70 package contents carefully upon arrival. If a package component is missing or damaged, please contact your FibeAir 70 distributor before attempting equipment installation.

2.3 System Installation

2.3.1 Required Tools

Ensure that you have the following tools with you when performing the FibeAir 70 installation:

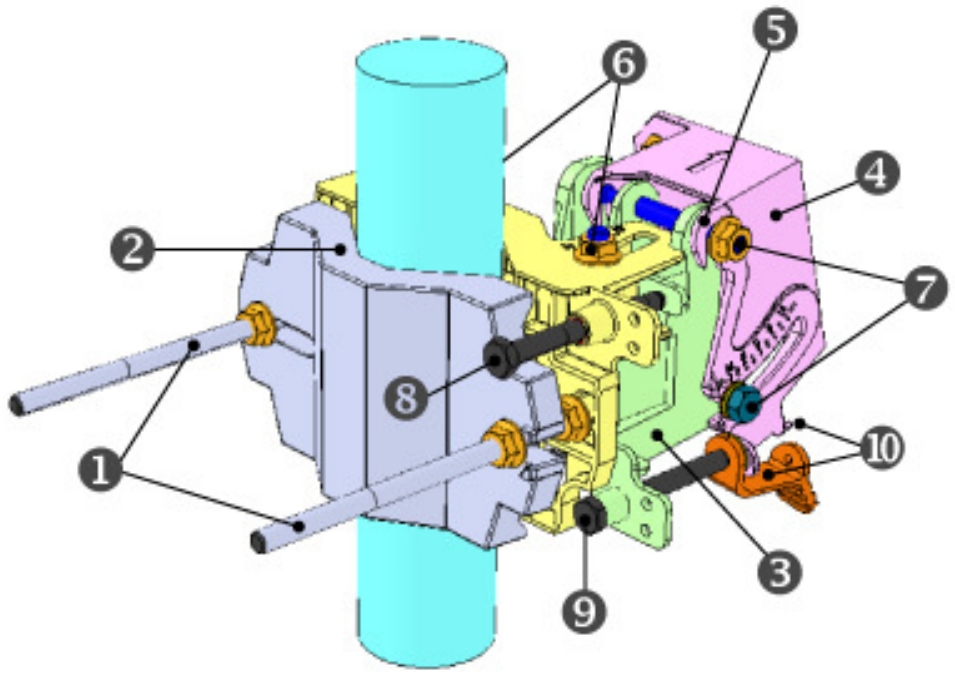
- Standard handheld digital voltage meter (DVM) with probes
- Standard open-end wrench, 1/2- inch (13 millimeter)
- Hexagonal wrench, (13millimeter)
- Philips screwdriver (medium size head for grounding connection)
- Cable ties (for securing network and optional power cables)
- Cutter

2.3.2 Activities Prior to Installation

- FibeAir 70 units must be installed in pairs, working with two technicians. One technician is located at each node, in order to align and calibrate each antenna ODU with its remote node pair for best performance.
- The expected receive signal strength for each antenna ODU (read from the DVM) must be calculated prior to the installation procedure, based on the network link budget.

2.3.3 Mounting the FibeAir 70

Figure 2-1 shows details of the FibeAir 70 Mounting Assembly.



1. Unit Mounting Bolts
2. Back Mounting Bracket
3. Front Mounting Bracket
4. Quick Release Plate (Attached to ODU)
5. Quick Release Hook
6. Azimuth Adjustment Lock Bolts
7. Elevation Adjustment Lock Bolts
8. Azimuth Fine Adjustment Screw (± 8°)
9. Elevation Fine Adjustment Screw (± 16°)
10. Elevation Screw Tension Band and Pin

Figure 2-1 FibeAir 70 Mounting Assembly Details

Prior to mounting, loosen the Unit Mounting Bolts (❶), and remove one of the Bolts. Separate and rotate the Front (❷) and Back (❸) Mounting Brackets by about 120 degrees so that the Assembly can to be attached to the mounting pole.

Place the Assembly on the mounting pole and rotate the Front and Back Mounting Brackets to close the Assembly on the pole. Replace the Unit Mounting Bolt that was removed.

Ensure that both Front and Back Mounting Brackets are attached evenly to the pole, and are completely level.

Use the 1/2-inch open wrench to tighten the nuts on both Unit Mounting Bolts. Temporarily tighten the Unit Mounting Bolts at this stage to keep the Unit from moving freely.

The ODU is delivered with the Quick Release Plate (❹) securely attached in a vertical polarity position, by default.

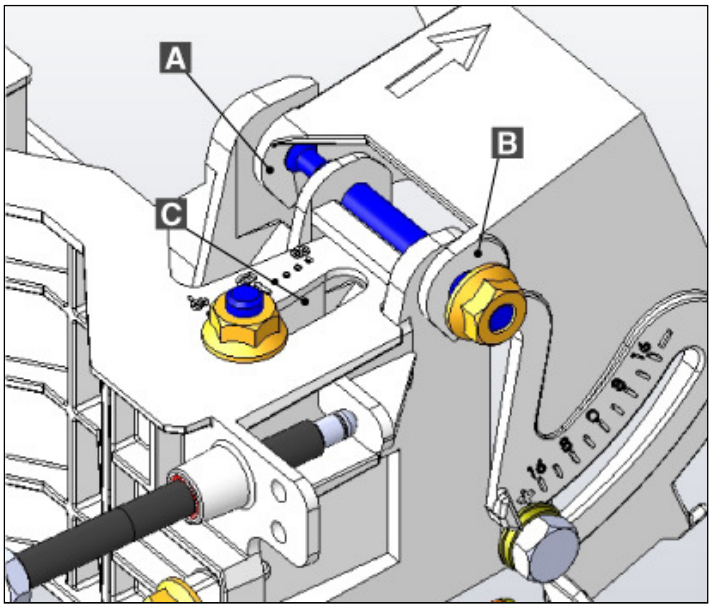
If needed, change the ODU polarity position to match the orientation of the remote pair ODU by removing the Quick Release Plate, changing its orientation, and reattaching. For ease of reference, the markings “V” (vertical) and “H” (horizontal) are engraved on the back side of the ODU.

Examine the position scales of both the Azimuth Adjustment Lock Bolts (❻) and the Elevation Adjustment Lock Bolts (❼), found on the Front Mounting Bracket, and ensure that they are positioned at 0 degrees (in the middle of the scale).

Position the Quick Release Hooks (❺) onto the top Elevation Adjustment Lock Bolt (❼) and carefully set the ODU in place on the Front Mounting Bracket.

Mount the ODU by attaching the Interior Quick Release Hook (A) in place **before** attaching the Exterior Hook (B). The Interior Hook is the one located farthest from the tightening nut, as shown below.

Hint:



A. Interior Quick Release Hook **B**. Exterior Quick Release Hook **C**. Elevation Position Slot

Finger-tighten the Azimuth Adjustment Lock Bolts (❻) and the Elevation Adjustment Lock Bolts (❼).

Stretch the Elevation Screw Tension Band (❿) slightly and connect it to its mating Tension Pin, located on the Quick Release Plate.

2.3.4 Ground Connection

The location of Grounding Outlet on the ODU is shown in *Figure 2-2*.

Connect one end of the Grounding Cable to the Ground Outlet on the left side of the ODU using the Grounding Cable Lug. Tighten the lug securely in place.

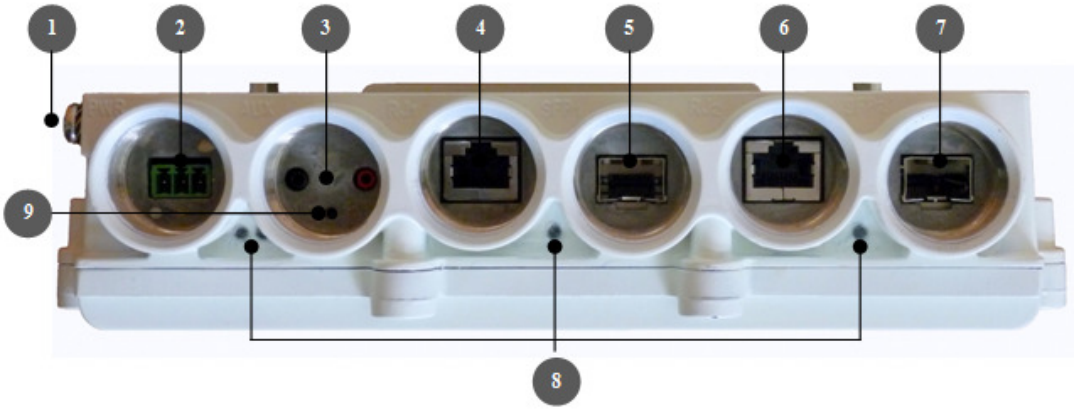
Connect the opposite end of the Grounding Cable to the earth connection, typically located on the mounting pole. In case earth connection is out of reach of the Grounding cable, install alternative cable.

2.3.5 Cabling Connections

Cable connection panel details are shown in *Figure 2-2*.

Network connections are made according to port availability on the ODU. Before mapping ODU connections, consider the following cabling restrictions:

- A power over Ethernet (PoE) connection can only be made via ODU port ETH1.
- Note that for each Ethernet port (ETH1 and ETH2) only one connection type can be made on the ODU, either Ethernet (RJ45) or fiber optic (SFP).



1. Electrical Ground Outlet
2. Power Connector Interface (PWR)
3. DVM Probe Interface (AUX)
4. Ethernet Cable RJ45 Interface (RJ1)
5. Fiber Cable SFP Interface (SFP1)
6. Ethernet Cable RJ45 Interface (RJ2)
7. Fiber Cable SFP Interface (SFP2)
8. Reset Button (press for 5 seconds for restoring factory defaults)

Figure 2-2 FibeAir 70 Connection Panel Details

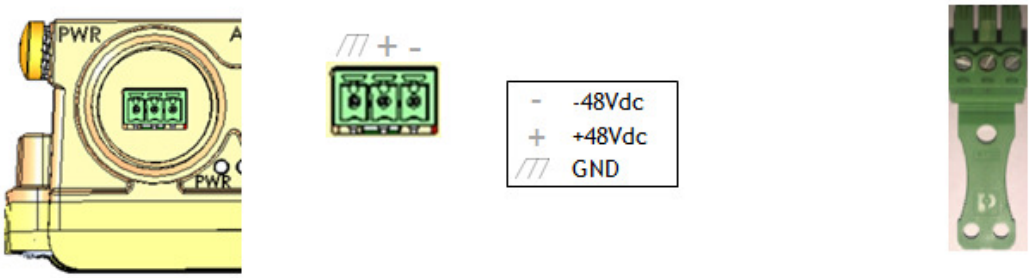


Figure 2-3 FibeAir 70 DC Power Connector Pin-Out Diagram

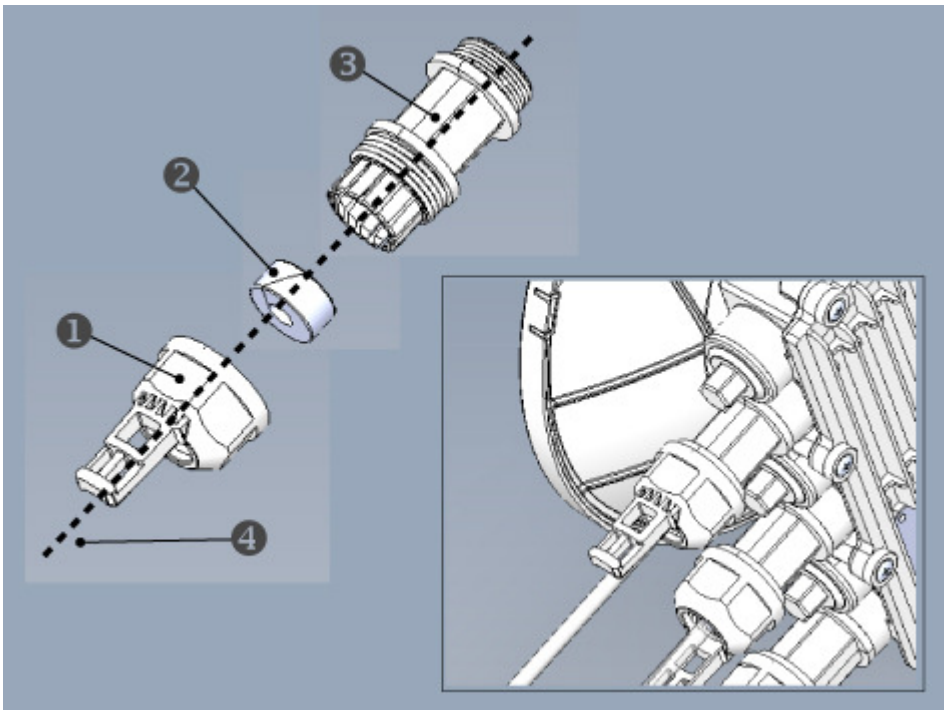
Cable Preparation

Before inserting a cable connector into the ODU, it must first be enclosed in a protective All-Weather Shell, supplied with the FibeAir 70 unit.

The protective All-Weather Shell assembly is shown in *Figure 2-4*.

An identical All-Weather Shell is provided for each ODU connector: power supply, data interface, and management interface.

Unscrew and remove the protective seals from each ODU cable interface opening that will be used in the configuration.



1. Cable Inlet Portion
2. Rubber Gasket Insert
3. Connector Outlet Portion
4. Ethernet Cable

Figure 2-4 All-Weather Connecting Cable Shell Assembly

For each ODU cable connection, perform the following procedure:

a. Disassemble a protective shell by unscrewing its parts and carefully removing the Rubber Gasket Insert (❷) from the Cable Inlet Portion (❶)of the shell.

b. Thread the Ethernet Cable connector through the Cable Inlet Portion of the shell, as shown in *Figure 2-4*.

c. Thread the cable connector completely through the Rubber Gasket (❷), as shown.

d. Replace the Rubber Gasket Insert snugly into the Cable Inlet Portion of the shell, gently pulling the cable connector and cable through the shell.

The cable is now prepared for insertion to the ODU.

Removing Connectors from the FibeAir 70 ODU

Caution:

To avoid accidental damage to the connector, always use the following order to remove cable connections from the ODU (Refer to *Figure 2-4*):

1. Unscrew the Cable Inlet Portion (❶) of the All-Weather Shell **first** to release the gasket seal and remove tension from the cable connector.
2. Unscrew the Connector Outlet Portion (❸)of the All-Weather Shell from its ODU port.
3. Remove the cable connector from its port.

Power Connection

Carefully screw the Connector Outlet Portion (❸) of the All-Weather Shell into the PWR port or alternatively, if a PoE connection is being used, the ETH1 port. Tighten the Connector Outlet Portion securely by hand. **Do not use a wrench**.

Insert the power or PoE data connector into the port. The PWR LED color indicator will turn green.

Screw the Cable Inlet Portion (❶) of the All-Weather Shell onto the secured Connector Outlet Portion, taking care not to twist the connecting cable. Tighten the Cable Inlet Portion securely by hand. The Rubber Gasket Insert (❷) will tighten to create a moisture-proof seal. **Do not use a wrench**.

Secure the power supply cable into place using a cable tie.

Ensure that there is sufficient play in the cabling to allow movement of the ODU during final alignment.

Wait for the FibeAir 70 ODU to boot up (about 5 seconds).). The RF LED color indicator will turn green when the boot is completed.

Other Connections

For each network connection, perform the following steps:

Carefully screw the Connector Outlet Portion (❸) of the All-Weather Shell into the appropriate port. Tighten the Connector Outlet Portion securely by hand. **Do not use a wrench**.

Insert the RJ45 or SFP connector into the port.

Screw the Cable Inlet Portion (❶) of the All-Weather Shell onto the secured top portion, taking care not to twist the connecting cable. Tighten the bottom portion securely by hand. The Rubber Gasket Insert (❷) will tighten to create a moisture-proof seal. **Do not use a wrench**.

Secure the network connection cable into place using a cable tie.

Ensure that there is sufficient play in the cabling to allow movement of the ODU during final alignment.

2.3.6 Antenna ODU Alignment

Two alignment stages (that is, course and fine alignments) are required during installation on both local and remote FibeAir 70 Antenna ODUs. Accurate alignment of the ODU is critical for achieving the strongest receive signal possible.

Verify the ODU is in **Alignment Mode** by checking the RF LED color – **orange** indicated **Alignment Mode**.

Note:

The FibeAir 70 ODU is shipped from the factory configured for **Alignment Mode**. In case RF LED is not orange, configure the ODU to **Alignment Mode** using the Web-EMS or CLI (See *Section 3.2 and 3.3*).

Course Alignment (Azimuth Only)

Loosen the Unit Mounting Bolts (❶) slightly in order to allow the ODU some freedom of movement.

Perform a course ODU alignment using a line-of-sight visual check with the remote FibeAir 70 ODU.

Ideally, this ODU alignment should be accurate within 10° of the final alignment position.

Lock the Unit Mounting Bolts (❶).

Repeat Steps 0 to 0 above on the remote FibeAir 70 ODU.

Fine Alignment

Note:

When aligning one of FibeAir 70 ODU nodes, its remote node pair must remain completely stationary. Fine alignment is performed first on the local ODU node, and only afterwards on the remote node.

The optimum alignment may require several adjustment iterations between the ODU nodes.

Connect the DVM to the FibeAir 70 ODU by inserting both red and black probes into their appropriate positions in the AUX port.

Throughout the alignment procedure, you will compare the actual receive signal strength indication (RSSI) to the expected RSSI that was calculated during network link budget preparation (See *Section 2.3.2*).

Before using the DVM, set its output to **millivolts**. Dividing the RSSI millivolt output by 10 will provide the actual receive signal strength calculation. For example, a DVM millivolt reading of 450 mV is equivalent to -45 dBm.

Align the fine azimuth axis. Use the hexagonal wrench to adjust the Azimuth Fine Adjustment Screw (❽). Be sure to sweep the complete range of the azimuth in order to determine the maximum received signal strength position.

When the optimum axis is achieved, tighten both Azimuth Adjustment Lock Bolts (❻).

Align the fine elevation axis. Use the hexagonal wrench to adjust the Elevation Fine Adjustment Screw (❾). Be sure to sweep the complete range of the elevation in order to determine the maximum received signal strength position.

When the optimum axis is achieved, tighten both Elevation Adjustment Lock Bolts (❼).

Perform Steps 0 and 0 for the remote paired ODU.

Repeat Steps 0 and 0 once again for the local paired ODU.

Use the DVM to verify maximum received signal strength on both local and remote ODUs. For best performance, measured RSSI should be within ±4 dB of the calculated value.

Once the optimum position has been achieved for the ODU node pair, tighten the azimuth and elevation adjustment lock bolts (❻, ❼) on both ODUs, being very careful not to move the FibeAir 70 ODU when tightening.

Use the DVM to verify that the received signal strength has not changed on either local or remote ODUs after final tightening of the brackets.

Figure 2-5 shows the FibeAir 70 appearance after it has been completely installed.

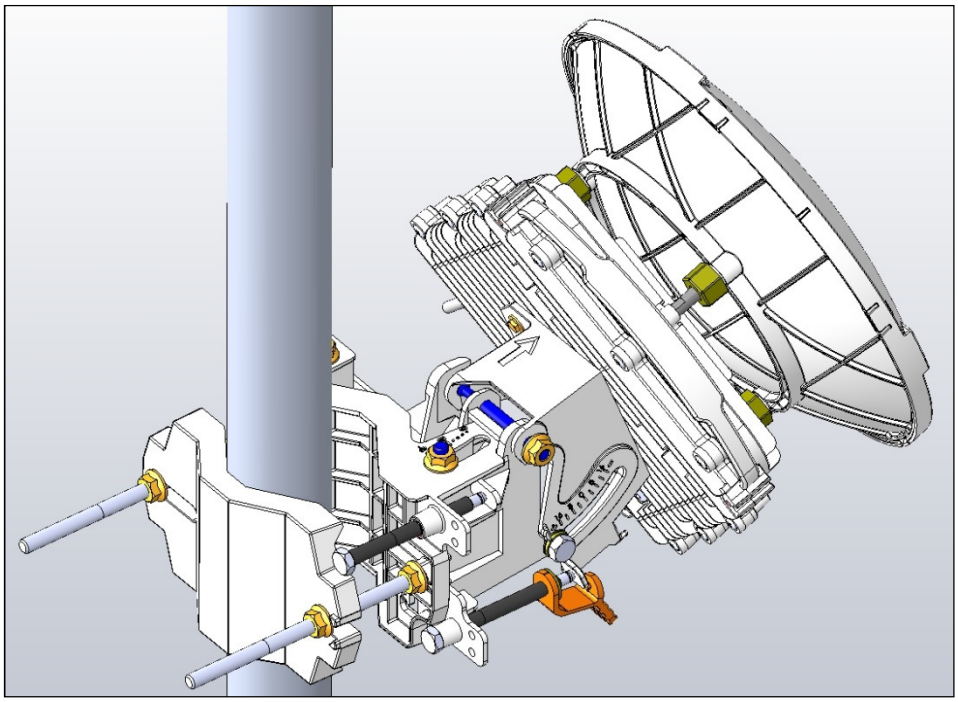


Figure 2-5 Installed FibeAir 70 Unit

2.3.7 Initial System Setup

Disconnect the DVM from the FibeAir 70 ODU by removing the probes from the AUX port.

Carefully reinsert and tighten replace the AUX port protective seal.

Using the web-EMS or CLI configure the ODU to **Adaptive Mode** (See *Section 5.14.1.1*) on both local and remote units. Configure one unit to **Role=Master** and the second to **Role=Slave**.

Save configuration and reset the ODU.

Following this action, and after ODU completed its reboot, the RF LED color indicator on will change its color to **green,** indicating that the radio link is Up (operative).

Each FibeAir 70 ODU will now perform automatic pairing.

The FibeAir 70 pair is now ready to be configured on the network.

3 FibeAir 70 Configuration

This chapter presents the FibeAir 70 ODU configuration steps for link setup. It describes the initial configuration procedures to be carried out after antennas alignment.

Topics covered here include:

- Default configuration information
- ODU configuration using web-EMS
- ODU configuration using CLI

Networking configuration, including bridge management model, VLANs setup and configuration examples, is presented in chapter 4 “FibeAir 70 Network Configuration”.

3.1 Default Configuration Information

This section provides information on the factory default values of the main ODU settings.

3.1.1 Default Provider Bridge License

Provider Bridge mode, set by license, determines the networking configuration method of the ODU.

- Provider Bridge license = Disable: VLANs configuration and monitoring available in web-EMS only
- Provider Bridge license = Enable: VLANs configuration and monitoring available in CLI only (Bridge section will be grayed out in web-EMS). All advanced networking options require Provider Bridge license = Enable.

The default Provider Bridge license is **`disable`**.

3.1.2 Default User Name and Password

The FibeAir 70 ODU uses the following default parameters for full R/W access:

User name: **`admin`**

Password: **`admin`**

3.1.3 Default IP Address

The FibeAir 70 ODU supports up to four IP addresses that can be on different subnets and associated to different VLANs. Static route can be assigned to each IP.

By default, two IP addresses (IPs 1 and 4) are defined:

Index	**1**	**4**
IP Address	192.168.0.1	172.16.100.1
IP Mask	255.255.255.0	255.255.255.0
Route	0.0.0.0	0.0.0.0
Destination	0.0.0.0	0.0.0.0
Destination Mask	255.255.255.0	255.255.255.0
Default IP Gateway	0.0.0.0	0.0.0.0
VLAN	0 (not defined)	4094

3.1.4 Default RF Configuration

The following FibeAir 70 RF configuration items are configurable and their default values provided here:

Configuration Item	**Default Value**
Channel-width	500
Operational Frequency	74000
Role	Master
Mode	Alignment
Transmit Asymmetry	50tx-50rx
Tx Link ID	0
Rx Link ID	0
RSSI-Interval	0

3.1.5 Default Ethernet Interface Configuration

Many FibeAir 70 interface configuration items are hardcoded. However, the following items are configurable and their default values provided here:

Configuration Item	Default Value
Admin Status	Up (enabled)
Interface Alias	None (empty string)
Ethernet Type	1000fd (Electrical RJ45, 1000 Full-Duplex)
Auto-Negotiation	Enabled

3.2 ODU Setup using the web-EMS

This section provides information on the configuration steps of the ODU be carried out after antennas alignment.

3.2.1 Connecting to the ODU

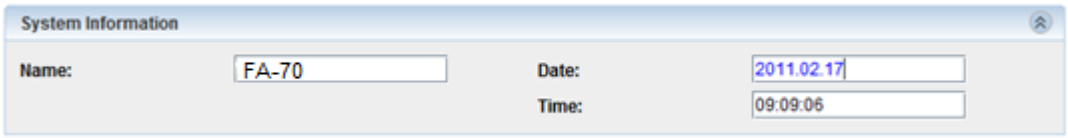
1. Launch Internet Browser and enter the ODU's IP address on the address bar (https://192.168.0.1).
2. Wait for the Java Applet to load and enter the username and password (**admin**, **admin**).

The web-EMS screen will be displayed:

You may use the "Quick Configuration" section to configure the basic common parameters needed in order to establish the link or use the dedicated section for that purpose.

3.2.2 Quick Configuration

3.2.2.1 System Information

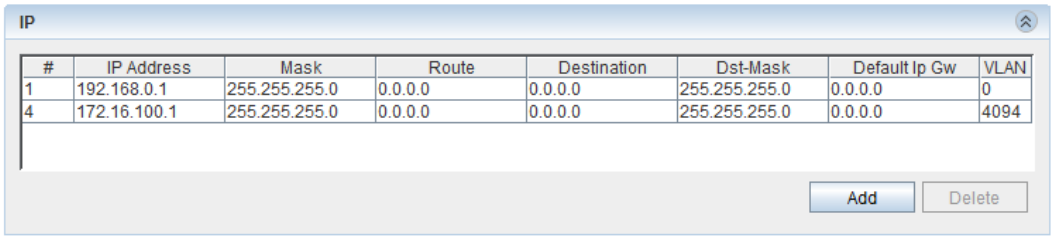


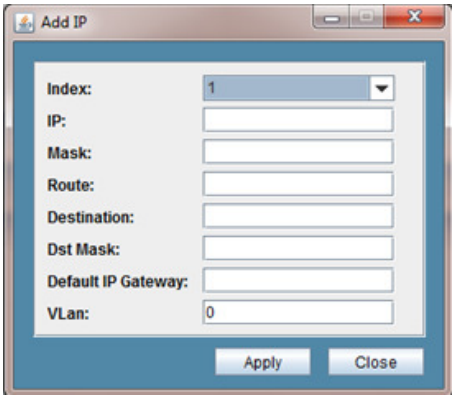
Set ODU's system information parameters:

- Name
- Date
- Time

Click "Apply" to apply changes.

3.2.2.2 IP





Set ODU's IP attributes for one of the 4 available IPs:

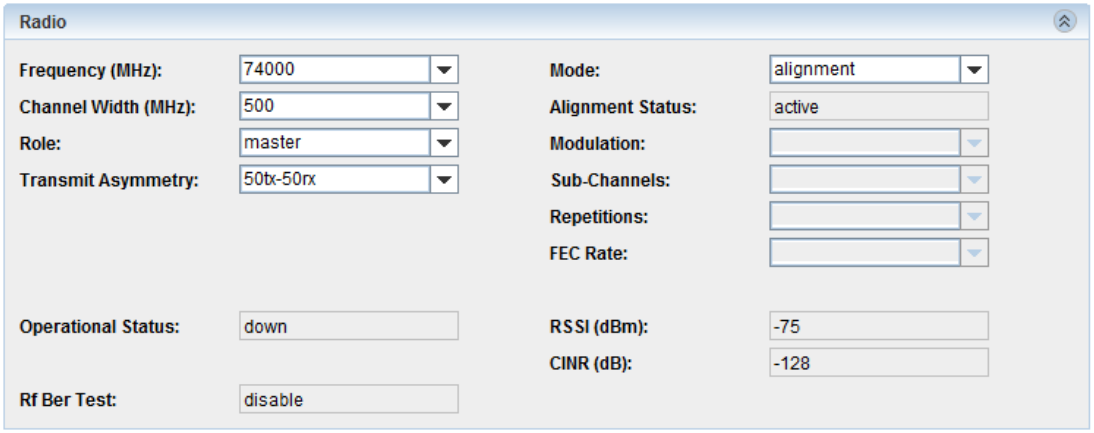
- IP Address
- IP Mask
- Route (static route)
- Destination (static route)
- Destination Mask (static route)
- Default IP Gateway
- VLAN

In order to change the default IP (IP #1, 192.168.0.1) click "Add" and enter the required values under IP index 1).

Click "Apply" to apply changes.

Note: once IP address changed you will lose the connection to the ODU. Launch the Internet Browser and connect using the new IP address to re-establish connection.

3.2.2.3 Radio



Set ODU's radio parameters and check radio status:

- Frequency [MHz]
- Channel-width [MHz]
- Role -

  `Master` or **`Slave`**. In a link one side should be configured as Master and the second as Slave.

- Transmit Asymmetry

  For symmetric configuration (50% for Tx and Rx) use **`50tx-50rx`**.

  You may set the link to asymmetric configuration (75%/25%). In such case, set **`75tx-25rx`** for the Master unit and **`25tx-75rx`** for the Slave unit.

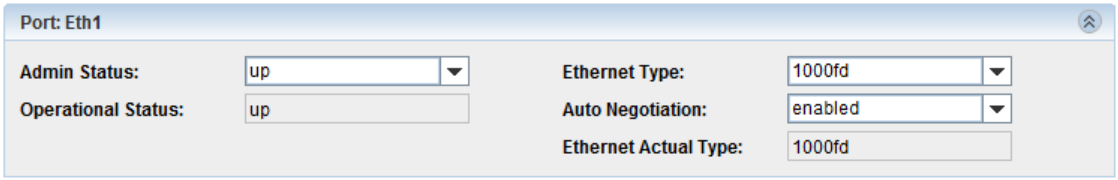
- Mode

  The ODU supports 3 operation modes: **`Alignment`** (Carrier Wave transmission for antenna alignment), **`Adaptive`** (adaptive bandwidth, code & modulation) and **`Static`** (fixed modulation profile. Should be set to one of the available modulation profiles available, see sec 3.2.5.2).

  After antenna alignment, set the ODU to **`adaptive`** to bring the link up.

Click "Apply" to apply changes.

3.2.2.4 Ethernet Ports



Set Eth1 and Eth2 ports configuration:

- Admin (port enable)

  `Up` or **`Down`**
- Auto-negotiation

  `Enable` or **`Disable`**
- Speed

  Manually set the port's speed (10/100/1000, HF/FD) when auto-negotiation disabled.

  Set speed to **`1000xfd`** when SFP is used.

Click "Apply" to apply changes.

Default port configuration: RJ45, Auto-negotiation enabled.

3.2.2.5 Save and Reset

Click "Save Configuration" on the main screen to save the configuration into the startup configuration so the ODU will keep the configuration after reset.

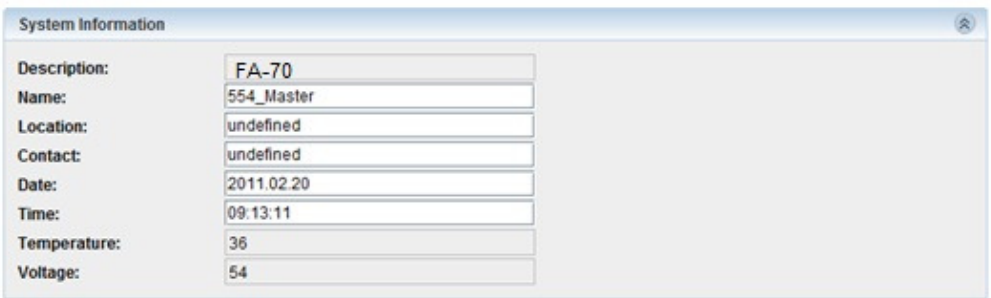
Click "Reset System" to reset the ODU (required after changing the Radio parameters).

3.2.3 System

Use the System section to set and check the following items:

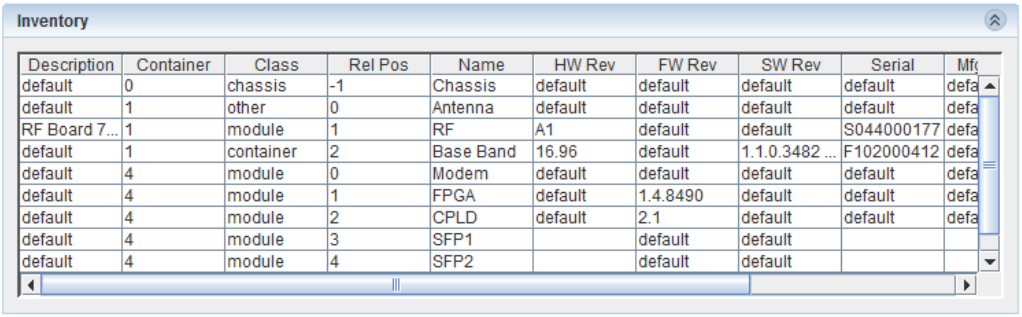
3.2.3.1 System Information

Check and set the Description, Name, location, Contact, Date, Time, Temperature and Voltage.



3.2.3.2 Inventory

Check the Inventory list of the ODU, including the sub-parts and their information.



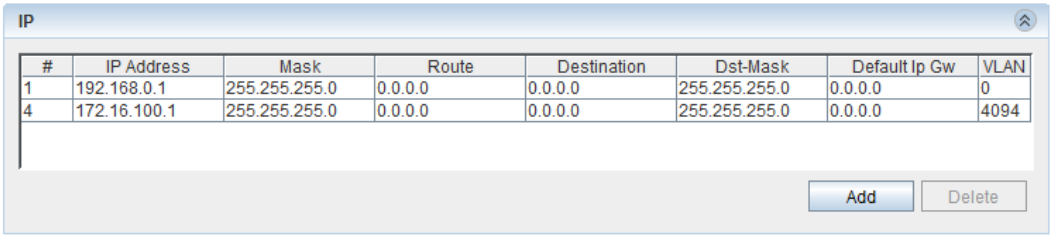
Description	Container	Class	Rel Pos	Name	HW Rev	FW Rev	SW Rev	Serial	Mf
default	0	chassis	-1	Chassis	default	default	default	default	defa
default	1	other	0	Antenna	default	default	default	default	defa
RF Board 7...	1	module	1	RF	A1	default	default	S044000177	defa
default	1	container	2	Base Band	16.96	default	1.1.0.3482 ...	F102000412	defa
default	4	module	0	Modem	default	default	default	default	defa
default	4	module	1	FPGA	default	1.4.8490	default	default	defa
default	4	module	2	CPLD	default	2.1	default	default	defa
default	4	module	3	SFP1		default	default		
default	4	module	4	SFP2		default	default		

3.2.3.3 IP

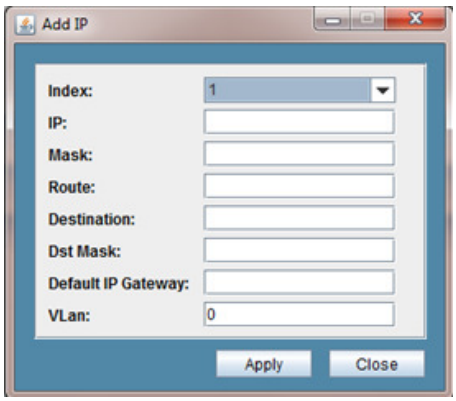
Set ODU's IP attributes for one of the 4 available IPs: IP Address, IP Mask, Route (static route), Destination (static route), Destination Mask (static route), Default IP Gateway, and VLAN.

In order to change or add an IP, click "Add" and enter the required values under the appropriate IP index).

Click "Apply" to apply changes.



#	IP Address	Mask	Route	Destination	Dst-Mask	Default Ip Gw	VLAN
1	192.168.0.1	255.255.255.0	0.0.0.0	0.0.0.0	255.255.255.0	0.0.0.0	0
4	172.16.100.1	255.255.255.0	0.0.0.0	0.0.0.0	255.255.255.0	0.0.0.0	4094

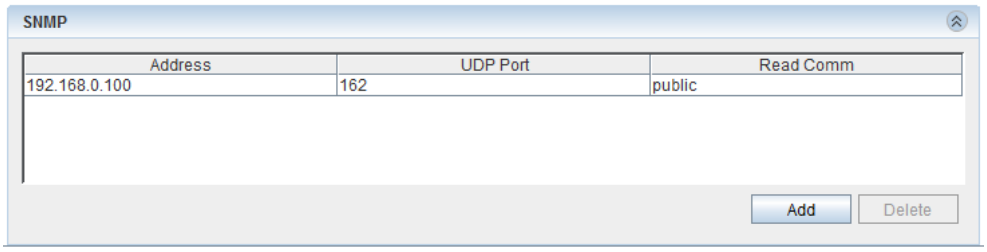


3.2.3.4 SNMP

Set SNMP managers trap destination: destination IP address, port number and community.

Up to 5 managers can be defined.

Click “Apply” to apply changes.



3.2.4 Bridge

Use the Bridge section to set VLANs and ports configuration.

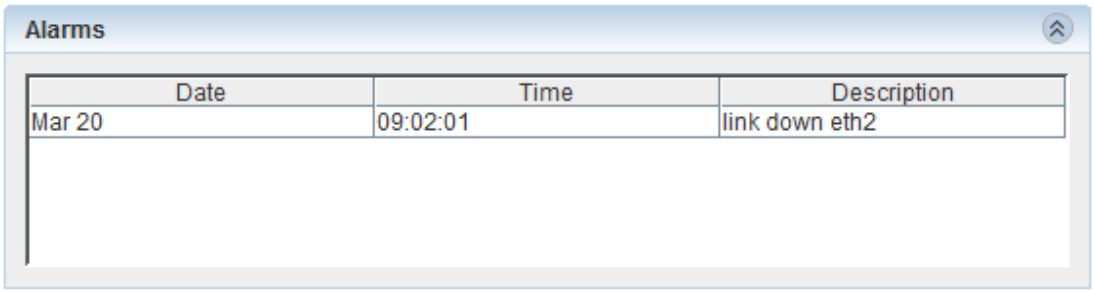
Networking configuration, including bridge management model, VLANs setup and configuration examples, is presented in chapter 4 “FibeAir 70 Network Configuration”.

3.2.5 Events

Check current alarms and alarm log:

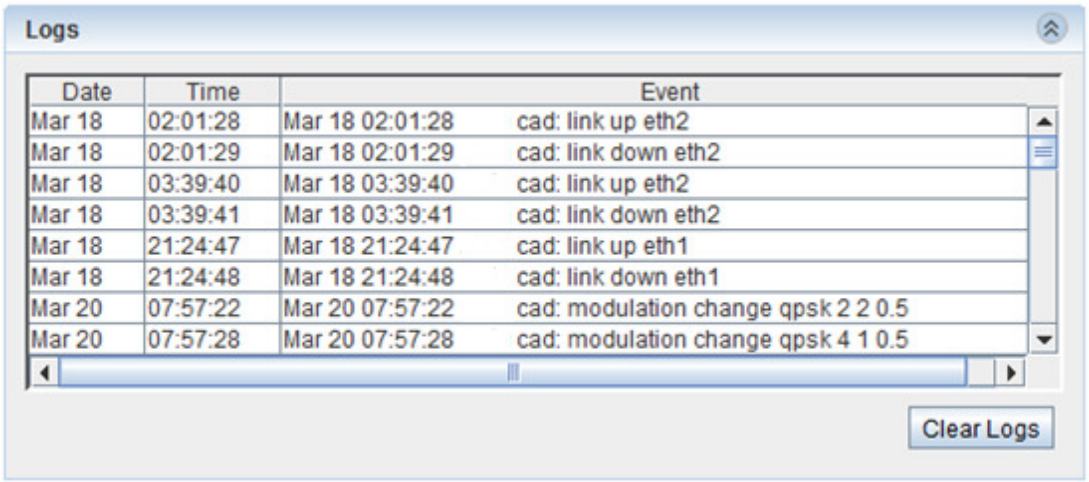
3.2.5.1 Alarms

Currently active alarms.



3.2.5.2 Logs

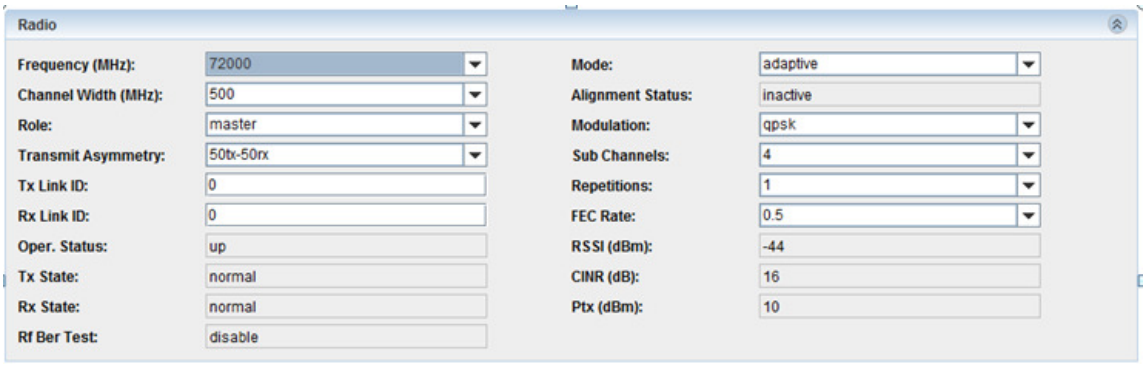
Alarm history log.



3.2.6 Radio

Use the Radio section to set and check radio parameters and statistics:

3.2.6.1 Radio



Set ODU's radio parameters:

- Frequency [MHz]
- Channel-width [MHz]
- Role – **`Master`** or **`Slave`**

  In a link one side should be configured as Master and the second as Slave.
- Transmit Asymmetry

  For symmetric configuration (50% for Tx and Rx) use **`50tx-50rx`**.

  You may set the link to asymmetric configuration (75%/25%). In such case, set **`75tx-25rx`** for the Master unit and **`25tx-75rx`** for the Slave unit.
- Tx and Rx Link ID

  You may set unique Link ID for links installed on same site to avoid locking on the wrong transmitter.
- Mode

  The ODU supports 3 operation modes: **`Alignment`** (Carrier Wave transmission for antenna alignment), **`Adaptive`** (adaptive bandwidth, code & modulation) and **`Static`** (fixed modulation profile. Should be set to one of the available modulation profiles available, see next section).

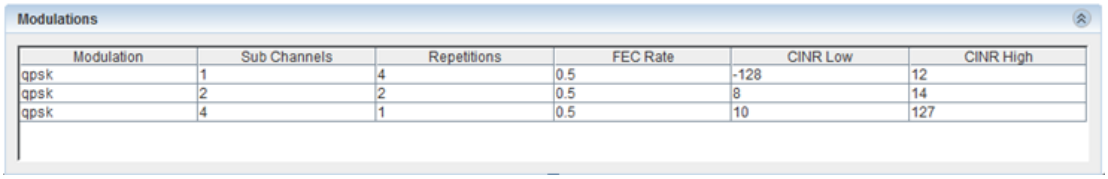
  After antenna alignment, set the ODU to **`adaptive`** to bring the link up.

Click "Apply" to apply changes.

Check ODU's status:

- Operational Status – Up or Down (radio link status)
- Tx and Rx State – indicates Tx and Rx chains status
- RSSI [dBm] – Receiver Signal Strengh Indicator
- CINR [dB] – Carrier to Interference + Noise ratio. Radio link's signal quality indication. For normal conditions CINR>13 indicates good signal level.
- Ptx [dBm] – ODU's monitored Tx power

3.2.6.2 Modulations


Modulations

Modulation	Sub Channels	Repetitions	FEC Rate	CINR Low	CINR High
qpsk	1	4	0.5	-128	12
qpsk	2	2	0.5	8	14
qpsk	4	1	0.5	10	127

Check ODU's supported modulation profiles (loaded in factory. Note not all options supported):

- Modulation – qpsk or 16QAM
- Sub Channels – 1 to 4
- Repetitions – 1,2 or 4
- FEC Rate – 0.5, 0.67
- CINR Low – lower threshold for stepping down in modulation profile (Adaptive Mode)
- CINR High – upper threshold for stepping up in modulation profile (Adaptive Mode)

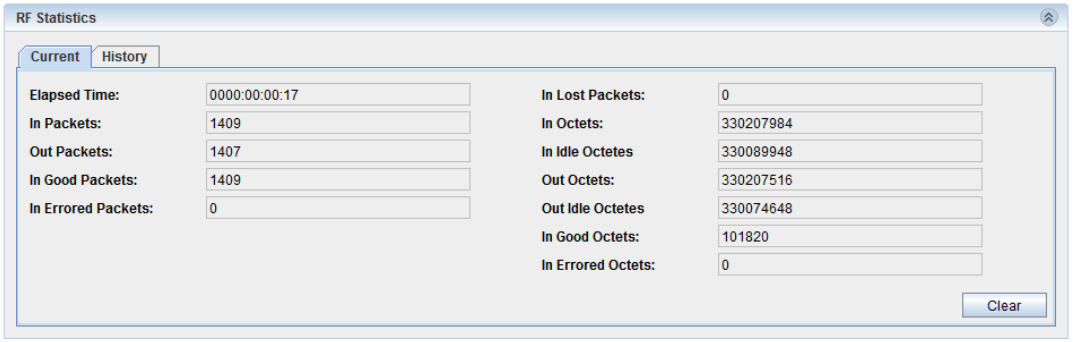
3.2.6.3 RF Statistics

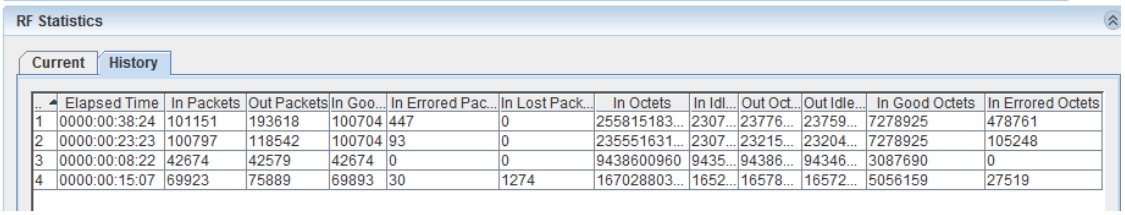
Check RF statistics counters to identify radio errors:

- Current – real time statistics counters since last clear.

  No errors on In Errored Octets, In Errored Packets and In Lost Packets indicate error-free operation of the radio link.

- History –96 intervals of 15 minutes (total 24 hours) of the statistics counters.



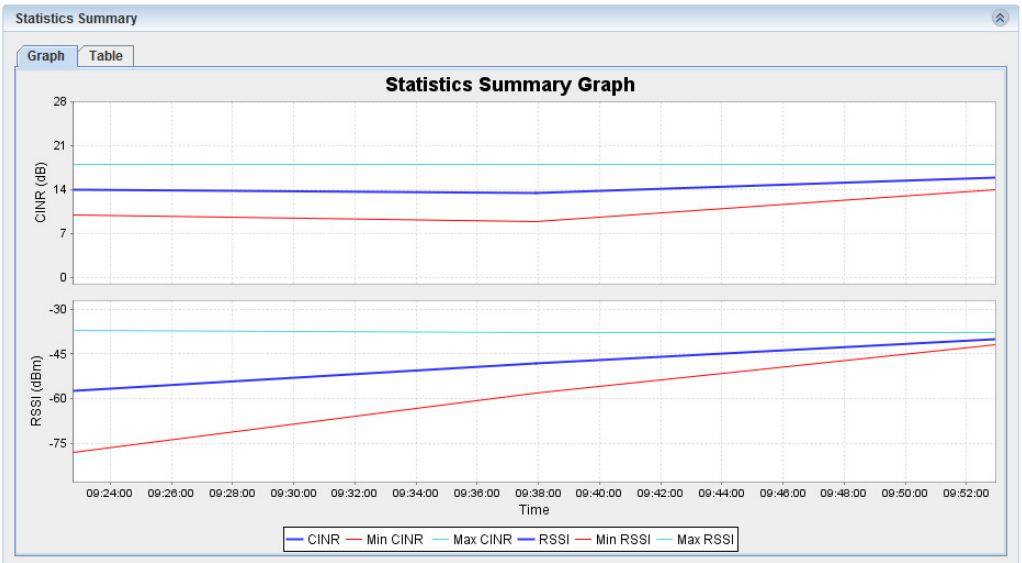


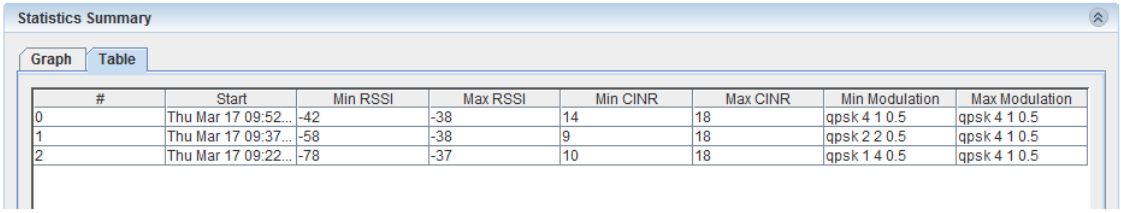
	Elapsed Time	In Packets	Out Packets	In Goo...	In Errored Pac...	In Lost Pack...	In Octets	In Idl...	Out Oct...	Out Idle...	In Good Octets	In Errored Octets
1	0000:00:38:24	101151	193618	100704	447	0	255815183...	2307...	23776...	23759...	7278925	478761
2	0000:00:23:23	100797	118542	100704	93	0	235551631...	2307...	23215...	23204...	7278925	105248
3	0000:00:08:22	42674	42579	42674	0	0	9438600960	9435...	94386...	94346...	3087690	0
4	0000:00:15:07	69923	75889	69893	30	1274	167028803...	1652...	16578...	16572...	5056159	27519

3.2.6.4 Statistics Summary

Check RSSI, CINR and Modulation history (graph and table).

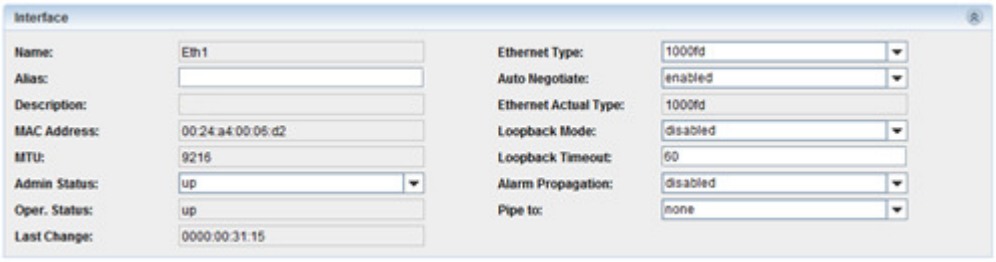
Statistics gathered for 96 intervals of 15 minutes (total 24 hours), recording and min and max values per interval.





3.2.7 Ethernet Interface Configuration

Click the ODU's Ethernet interfaces to configure and monitor the status of the Ethernet line interfaces (Eth1 and Eth2):



3.2.7.1 Admin Status

Interface enable/disable: **`Up`** or **`Down`**.

3.2.7.2 Ethernet Type

Interface type (RJ45 or SFP) and speed/duplex (when Auto Negotiation disabled):

`10hd, 10fd, 100hd, 100fd, 1000hd, 1000fd, 1000xhd, 1000xfd.`

Set speed to **`1000xfd`** when SFP is used.

3.2.7.3 Auto Negotiation

Interface Auto Negotiation: **`Enabled`** or **`Disabled`**.

3.2.7.4 Loopback

Set loopback timeout (in seconds) and loopback mode:

`Disabled,Internal,Internal-mac-swap,External,External-mac-swap.`

3.2.7.5 Alarm Propagation

Enable Alarm Propagation for radio and line faults (port shutdown).

3.2.7.6 Pipe To

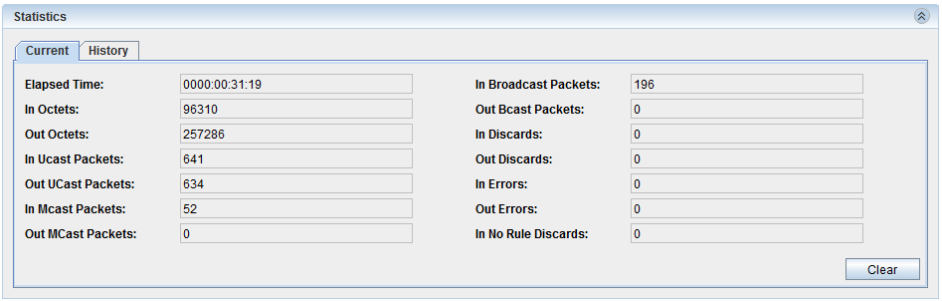
Set interface pipe mode, connecting one of the line interfaces (Eth1 or Eth2) to another interface (host, Eth0, Eth1, Eth2).

Click “Apply” to apply changes.

3.2.7.7 Ethernet Statistics

Check Ethernet interface statistics counters:

- Current – real time statistics counters since last clear.
- History –96 intervals of 15 minutes (total 24 hours) of the statistics counters.



3.2.8 Advanced Settings

The Advanced Settings section covers advanced and non-routine configurations:

3.2.8.1 File System

The ODU supports file system for Flash and EPROM, with copying files support.

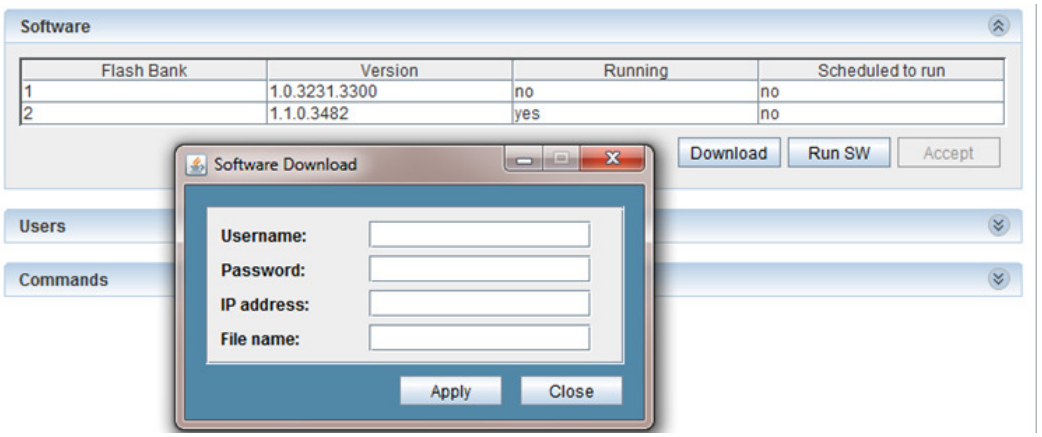
3.2.8.2 Scripts

The ODU supports running scripts. A script is a list of commands that runs locally on the ODU. Script output is displayed on a script output screen and its output can be copied and saved.

3.2.8.3 Software

The FibeAir 70 system supports switching in real time between two distinct software versions. Because the System simultaneously maintains both an Active, running software version and a Standby, passive software version, an upgrade can be performed with minimal interruption of service.

An external FTP server is required for software download. Downloaded SW replaces the standby SW.

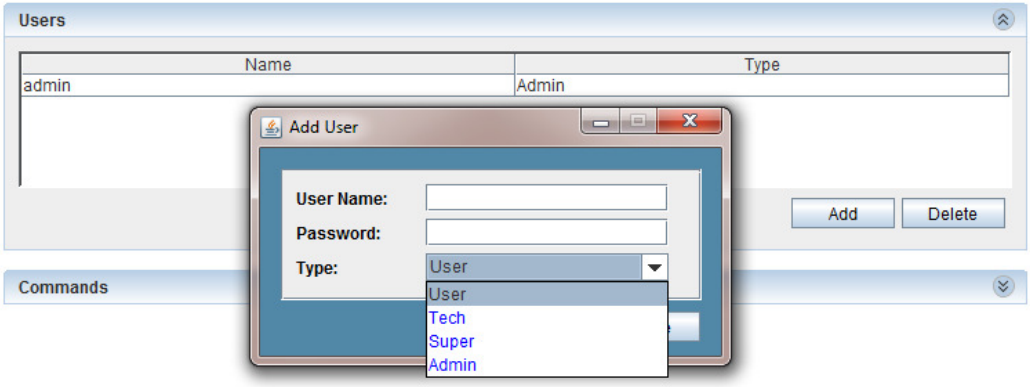


In order to download SW, click “Download” and enter the FTP details: username, password, IP address of the FTP server that the SW is stored at its home directory and file name.

In order to activate the downloaded SW, click “Run SW”.

3.2.8.4 Users

The FibeAir 70 system supports multiple user’s access and users management for different user profiles.



Click “Add” to add a user and assign it to one of the user types:

Type	Default Password	Access Rights
user	N/A	Read only access, excluding the ability of viewing the user names, passwords and other security settings.
tech	N/A	Read only access to configuration settings, Ability to clear statistics, alarm and log lists, run diagnostics.
super	N/A	Read-write access, except from the user names, passwords and other security settings.
admin	admin	The same as super type plus ability to configure the user names, passwords and other security settings. It does not allow access to debug tools.

3.2.8.5 Commands

Use “Restore Settings” to clear current running configuration and restore factory default settings. Reset the ODU to load the factory default settings.

3.3 ODU Setup using the CLI

This section provides information on the configuration steps of the ODU be carried out after antennas alignment using the Command Line Interface (CLI).

Initial configuration for each ODU is performed as follows:

- Invoke the CLI using a standard SSH client.
- Access the ODU using its default IP address.
- Assign a network IP Address, Name and RF value for the ODU.
- Verify ODU performance.

Note: Before starting the network configuration process, be sure that all FibeAir 70 ODUs are set to **Adaptive or Static** mode. The RF LED color indicator on a network-ready ODU will be **green**. For more information, see *Section 2.3.7*.

3.3.1 Connecting to the ODU

Invoking the CLI

Run standard SSH client. You can use a common, open source SSH client programs such as PuTTY available for download from the web.

Enter the ODU's **default** IP address: **`192.168.0.1 (Mask 255.255.255.0)`** and open the connection.

Login as user **`admin`**.

Enter the password **`admin`**.

When a successful connection is established, the ODU responds as follows:

```
                                                                <
```

3.3.2 System

Set ODU's system information parameters:

- Name
- Date

- Time

```
FA-70> set system name Local_Site

Local_Site> system date 2011.01.18 time 15:08:00
```

To check the System settings:

```
Local_Site>show system

system description           : FA-70
system snmpid                : 1.3.6.1.4.1.31926
system uptime                : 0000:00:05:10
system contact               : undefined
system name                  : Local_Site
system location              : undefined
system voltage               : 55
system temperature           : 39
system date                  : 2011.01.18
system time                  : 15:08:06
system cli-timeout           : 15
```

3.3.3 IP

Set ODU's IP attributes for one of the 4 available IPs:

- IP Address
- IP Mask
- Route (static route)
- Destination (static route)
- Destination Mask (static route)
- Default IP Gateway
- VLAN

In order to change the default IP (IP #1, 192.168.0.1) configure IP #1.

```
Local_Site>set ip 1 ip-addr 192.168.0.11 mask 255.255.255.0
default-ipgw 192.168.0.254
```

Note: once IP address changed you will lose the connection to the ODU. Launch the Internet Browser and connect using the new IP address to re-establish connection.

To check the IP settings:

```
Local_Site>show ip

ip 1 ip-addr                : 192.168.0.11
ip 1 mask                   : 255.255.255.0
ip 1 route                  : 0.0.0.0
ip 1 destination            : 0.0.0.0
ip 1 dst-mask               : 255.255.255.0
ip 1 default-ipgw           : 192.168.0.254
ip 1 vlan                   : 0

ip 4 ip-addr                : 172.16.100.1
ip 4 mask                   : 255.255.255.0
ip 1 route                  : 0.0.0.0
ip 1 destination            : 0.0.0.0
ip 1 dst-mask               : 255.255.255.0
ip 1 default-ipgw           : 0.0.0.0
ip 1 vlan                   : 4094
```

3.3.4 RF

Set ODU's RF parameters:

- Frequency [MHz]
- Channel-width [MHz]
- Role – **`Master`** or **`Slave`**

  In a link one side should be configured as Master and the second as Slave.
- Transmit Asymmetry

  For symmetric configuration (50% for Tx and Rx) use **`50tx-50rx`**.

  You may set the link to asymmetric configuration (75%/25%). In such case, set **`75tx-25rx`** for the Master unit and **`25tx-75rx`** for the Slave unit.
- Mode

  The ODU supports 3 operation modes: **`Alignment`** (Carrier Wave transmission for antenna alignment), **`Adaptive`** (adaptive bandwidth, code & modulation) and **`Static`** (fixed modulation profile. Should be set to one of the available modulation profiles supported).

  After antenna alignment, set the ODU to **`adaptive`** to bring the link up.

```
Local_Site>set rf frequency 72000
Local_Site>set rf role slave
Local_Site>set rf mode adaptive
```

To check the available supported modulations:

```
Local_Site>show modulation

Modulation subchannels repetitions fec-rate cinr-low cinr-high
qpsk        1           4           0.5      -128     12
qpsk        2           2           0.5      8        14
qpsk        4           1           0.5      10       127
```

Check ODU's status:

```
Local_Site>show rf

rf operational          : up
rf tx-state             : normal
rf rx-state             : normal
rf cinr                 : 18
rf rssi                 : -41
rf ptx                  : 6
rf channel-width        : 500
rf frequency            : 72000
rf role                 : slave
rf mode                 : adaptive qpsk 4 1 0.5
rf alignment-status     : inactive
rf lowest-modulation    : qpsk 1 4 0.5
rf tx-asymmetry         : 50tx-50rx
rf encryption           : disabled
rf static-key           : 92E3C28020570998E74B41C06A58BB40
rf rx-link-id           : 0
rf tx-link-id           : 0
rf temperature          : 57
rf rf-ber-test          : disable
```

Check RF statistics counters to identify radio errors and check the radio status history.

The RF statistics consists of real time statistics counters since last clear.

No errors on In Errored Octets, In Errored Packets and In Lost Packets indicate error-free operation of the radio link.

Check RF statistics-summary for RSSI, CINR and Modulation history.

Statistics gathered for 96 intervals of 15 minutes (total 24 hours), recording and min and max values per interval.

```
Local_Site>show rf statistics

rf in-octets              : 32535265564
rf in-idle-octets         : 29775780985
rf in-good-octets         : 9370230
rf in-errored-octets      : 0
rf out-octets             : 30552267600
rf out-idle-octets        : 30531707551
rf in-pkts                : 129957
rf in-good-pkts           : 129452
rf in-errored-pkts        : 0
rf in-lost-pkts           : 0
rf out-pkts               : 231519
rf min-cinr               : 13
rf max-cinr               : 18
rf min-rssi               : -56
rf max-rssi               : -33
rf min-modulation         : qpsk 2 2 0.5
rf max-modulation         : qpsk 4 1 0.5
rf elapsed-time           : 0000:00:45:51
```

```
Local_Site>show rf statistics-summary 0 95

  start                min-  max-  min-  max-  min-            max-            valid
                       rssi  rssi  cinr  cinr  modulation      modulation

  2011.03.17  10:22:58 -76   -33   15    18    qpsk 1 4 0.5    qpsk 4 1 0.5    unknown
  2011.03.17  10:07:57 -76   -24   -128  -128  qpsk 1 4 0.5    qpsk 1 4 0.5    unknown
  2011.03.17  09:52:56 -76   -10   -128  -128  qpsk 1 4 0.5    qpsk 1 4 0.5    unknown
  2011.03.17  09:37:55 -58   -38   9     18    qpsk 2 2 0.5    qpsk 4 1 0.5    unknown
  2011.03.17  09:22:48 -78   -37   10    18    qpsk 1 4 0.5    qpsk 4 1 0.5    unknown
```

3.3.5 Ethernet Interfaces

The FibeAir 70 system consists of 4 Ethernet interfaces:

- Host – management interface
- Eth0 – radio interface
- Eth1 – ODU interface, port 1
- Eth2 – ODU interface, port 2

Set Eth1 and Eth2 ports configuration, if desired configuration is different from default:

- Admin (port enable) – **`Enable`** by default
- Auto-negotiation – **`Enable`** by default
- Speed

  Manually set the port's speed (10/100/1000, HF/FD) when auto-negotiation disabled.

  Set speed to **`1000xfd`** when SFP is used.

To check Ethernet port status for specific interface:

```
Local_Site> show eth eth1

eth eth1 description           : Ceragon
eth eth1 mtu                   : 9216
eth eth1 mac-addr              : 00:24:a4:00:06:d2
eth eth1 admin                 : up
eth eth1 operational           : up
eth eth1 last-change           : 0000:00:12:11
eth eth1 name                  : Eth1
eth eth1 alias                 :
eth eth1 eth-type              : 1000fd
eth eth1 eth-act-type          : 1000fd
eth eth1 auto-neg              : enabled
eth eth1 loopback-mode         : disabled
eth eth1 loopback-timeout      : 60
eth eth1 alarm-propagation     : disabled
eth eth1 pipe-to               : none
```

3.3.6 Save and Reset

Save the new configuration using the copy command:

```
Local_Site> copy running-configuration startup-configuration
```

Saving the running (currently active) configuration will make it the default configuration that is available after a reset and upon startup.

To exit the RF Alignment Mode, and after each change in the RF settings, perform a System Reset:

```
Local_Site> reset system
```

This command resets the ODU's and readies the ODU for operation.

4 FibeAir 70 Network Configuration

This chapter presents the FibeAir 70 bridge management model and describes the initial procedures for configuring the FibeAir 70 network.

Topics covered here include:

- FibeAir 70 bridging model
- VLANs and ports settings
- FibeAir 70 network configuration examples

4.1 FibeAir 70 Bridging Model

Figure 4-1 shows the default bridge model when Provider Bridge Feature is enabled (by license). When the Provider Bridge Feature is not enabled, multiple C-components and S-components are replaced with a single bridge configuration.

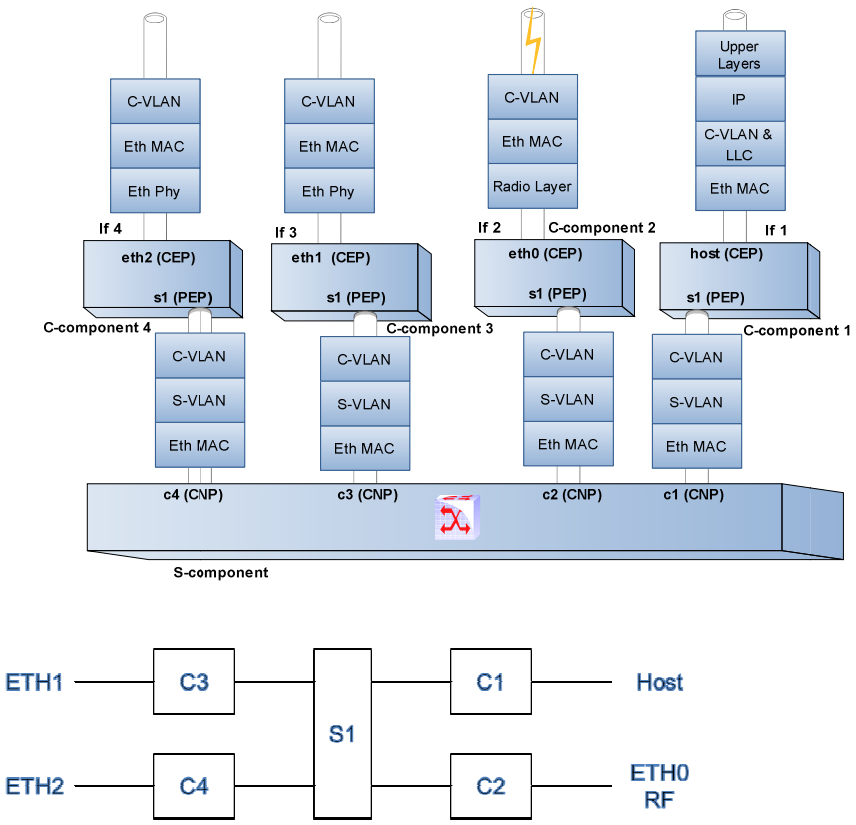


Figure 4-1 Generic Model of the FibeAir 70 Bridge

Each component acts as a virtual bridge. A component can have both external and internal ports. An external port name is identical to its interface name. An internal port name uses the name of its peer component.

For example, as shown in

Figure 4-1, when C-component 1 is connected to the S-component, the corresponding internal port in the C-component will be called **s1** and in the S-component will be called **c1**.

The bridge configuration may be changed to suit your network. This is done by removing or adding the desired bridge components. All components are created, managed and removed using the FibeAir 70 command line interface (CLI).

4.2 Default Bridge Configuration

The default bridge configuration (by license) is Provider Bridge disabled.

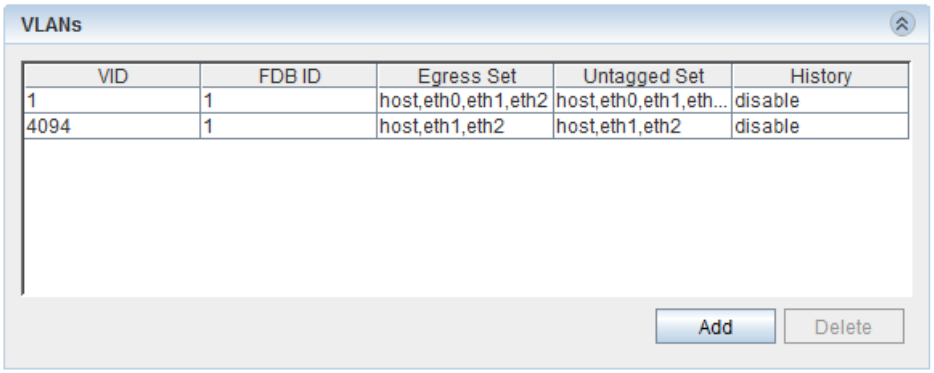
This configuration allows configuration and monitoring of VLANs in the web-EMS only.

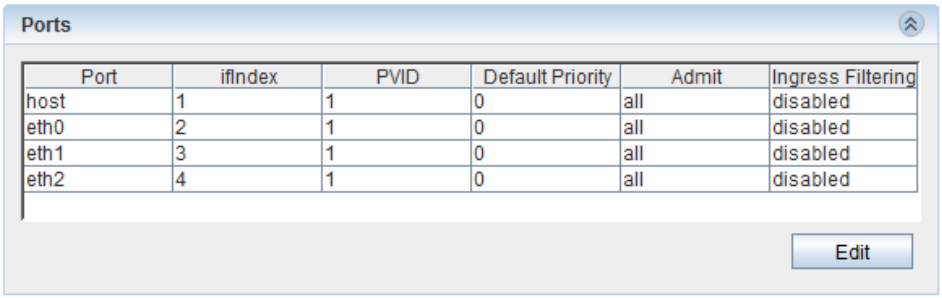
When Provider Bridge license = Enable: VLANs configuration and monitoring available in CLI only (Bridge section will be grayed out in web-EMS). All advanced networking options require Provider Bridge license = Enable.

4.3 Bridge Configuration using the Web-EMS

4.3.1 Default VLAN and Port Configuration

Following system startup, the ODU comes up with the following default configuration:





Note that in this default configuration:

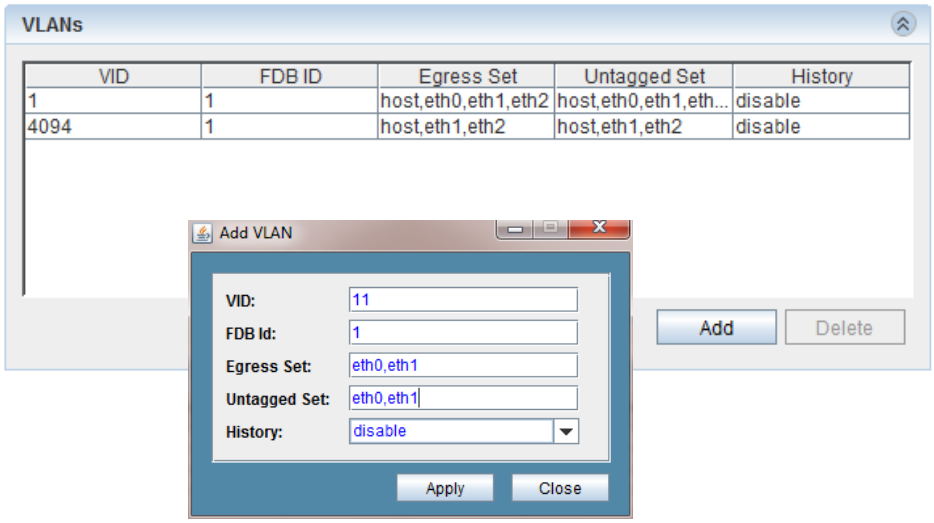
- VID (VLAN ID) 1 is defined on all ports (management, radio and Eth ports 1 and 2).
- All ports are assigned with PVID 1.

- When a packet is transmitted out of the port, VID=1 is removed (untagged on all ports).
- All traffic (and management data) is transmitted to all ports (over VID 1).

In addition, VID 4094 for IP address 4 (see 3.2.3.3) is defined on all ports but Eth0 (radio) – local management only (and not in-band over the radio).

4.3.2 Configuring VLAN and Port

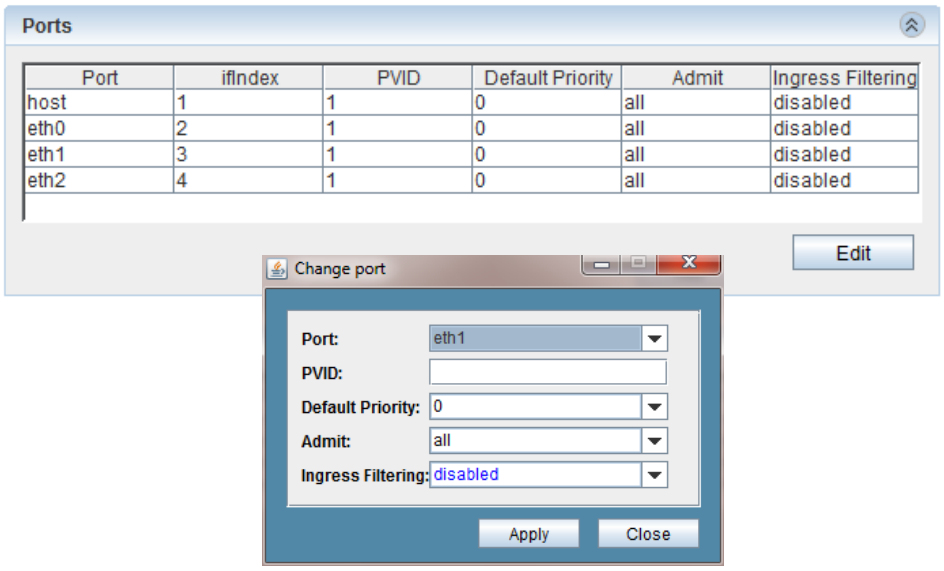
Click “Add” to add or edit VLANs:



Configure the following VLAN attributes:

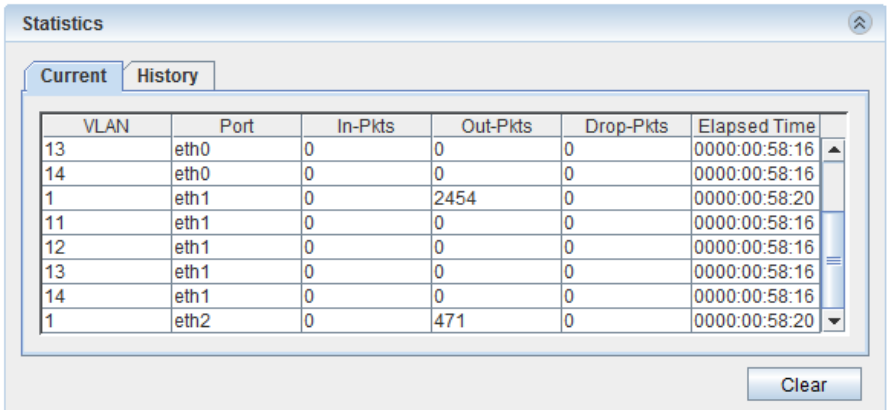
- VID – VLAN ID (or IDs)
- FDB ID – enter 1 (in Provider Bridge configuration, up to 64 FDBs are available for different S-VLANs)
- Egress Set – the ports this VLAN will be set to (Host – management, Eth0 – radio, Eth1 – ODU port 1, Eth2 – ODU port 2)
- Untagged Set – set on what ports (subset of the ports defined in Egress Set) the packet will transmitted out untagged (VLAN removed). Set **none** to leave the VLAN tagged when packet is transmitted out of the port
- History – enable for VLANs you want to ODU to collect statistics for

Click “Edit” to edit the port and to change the PVID:



4.3.3 VLAN Statistics

To check the VLAN statistics:



4.4 Bridge Configuration using the CLI

In order to configure and monitor VLANs using the CLI, Provider Bridge license should be set to **`disable`** (CLI: set license provider-bridge disable).

4.4.1 Default VLAN Configuration

Following system startup, the ODU comes up with the following default configuration:

```
Local_Site> show vlan

component-id  vid  fdb-id  egress         untagged      history
s1            1    1       c1,c2,c3,c4    c1,c2,c3,c4   disable
s1            4094 1       c1,c3,c4       c1,c3,c4      disable
c1            1    1       host,s1        host          disable
c1            4094 1       host,s1        none          disable
c2            1    1       eth0,s1        eth0          disable
c2            4094 1       s1             none          disable
c3            1    1       eth1,s1        eth1          disable
c3            4094 1       eth1,s1        none          disable
c4            1    1       eth2,s1        eth2          disable
c4            4094 1       eth2,s1        none          disable
```

Note that in this default configuration:

- VID (VLAN ID) 1 is defined on all components.
- The connection between all C bridges and the S bridge is defined.
- All ports are assigned with PVID 1.
- When a packet is transmitted out of the port, VID=1 is removed (untagged on all ports).
- All traffic (and management data) is transmitted to all ports (over VID 1).

In addition, VID 4094 for IP address 4 (see 3.2.3.3) is defined on all components but C2 (radio) – local management only (and not in-band over the radio).

4.5 FibeAir 70 Network Configuration Examples

This section provides examples of basic FibeAir-7 network configurations which can be useful when creating your local FibeAir 70 configuration.

Note: The following configuration example details the configuration settings when the Provider Bridge Feature is enabled (by license). For details, refer to *Section* 4.5.2.

4.5.1 Creating a Basic VLAN Configuration (Provider Bridge Enabled)

This basic VLAN configuration example is for FibeAir 70 sites serving a single customer or service provider. It comprises:

- Two paired FibeAir 70 RF units using local and remote in-band management VLAN (VID = 100) over port ETH0
- Three customer Ethernet VLANs (VIDs =110, 120 and 130) using ports ETH1 and ETH2
- Two network Hosts
- Management data from port ETH0 is sent to Host untagged

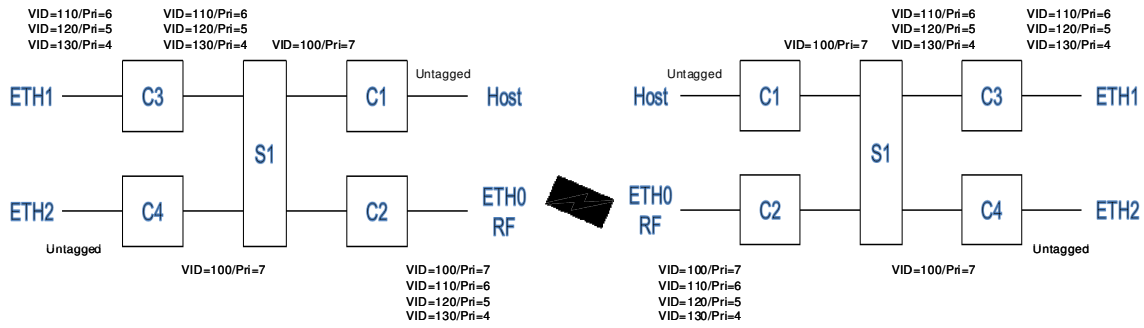


Figure 4-2 Basic FibeAir 70 VLAN Configuration

Configuring In-Band Management

Connect port ETH2 to Host via S1 using VID=100 (both untagged on port):

```
set vlan c1 100 egress host,s1 untagged host
```

Connect the RF port ETH0 to ETH2 and Host via S1 using VID=100 (tag will not be removed on the radio as management should be separated on RF as well):

```
set vlan c4 100 egress eth2,s1 untagged eth2
set vlan c2 100 egress eth0,s1 untagged none
```

Assign VID=100 to port ETH2 and Host towards S1 (with Priority=7):

```
set bridge-port c1 host pvid 100 prio 7
set bridge-port c4 eth2 pvid 100 prio 7
```

Disable port ETH1 capability to send untagged traffic on VID=1:

```
set vlan c3 1  egress none untagged none
```

Configuring Customer Ethernet Services and In-Band Management

Connect ETH2, ETH0 (RF) and Host ports via S1 using VID=100. ETH2 and Host data will be untagged; ETH0 (RF) tags will be preserved:

```
set vlan c1 100  egress host,s1 untagged host
set vlan c4 100  egress eth2,s1 untagged eth2
set vlan c2 100  egress eth0,s1 untagged none
set vlan c3 1  egress none untagged none
```

Assign VID=100 to ETH2 and Host pots towards S1 (with Priority=7):

```
set bridge-port c1 host pvid 100 prio 7
set bridge-port c4 eth2 pvid 100 prio 7
```

Connect port ETH1 and ETH0 (RF) via S1 using customer's VIDs:

```
set vlan c2 110  egress eth0,s1 untagged none
set vlan c2 120  egress eth0,s1 untagged none
set vlan c2 130  egress eth0,s1 untagged none

set vlan c3 110  egress eth1,s1 untagged none
set vlan c3 120  egress eth1,s1 untagged none
set vlan c3 130  egress eth1,s1 untagged none
```

Note that customer Ethernet services from port ETH1 that arrive with different VLAN IDs will be discarded.

Confirming the VLAN Configuration

Enter the following command to confirm the new VLAN configuration:

```
FA-70>show vlan all all

component-id  vid  fdb-id  egress              untagged
s1            1    1       c1,c2,c3,c4         c1,c2,c3,c4
c1            1    1       host,s1             host,s1
c1            100  1       host,s1             host
c2            1    1       eth0,s1             eth0,s1
c2            100  1       eth0,s1             none
c2            110  1       eth0,s1             none
c2            120  1       eth0,s1             none
c2            130  1       eth0,s1             none
c3            1    1       none                none
c3            110  1       eth1,s1             none
c3            120  1       eth1,s1             none
c3            130  1       eth1,s1             none
c4            1    1       eth2,s1             eth2,s1
c4            100  1       eth2,s1             eth2
```

Enter the following command to confirm the new Bridge-Port configuration:

```
FA-70>show bridge-port all all

bridge-port c1 host interface             : 1
bridge-port c1 host pvid                  : 100
bridge-port c1 host prio                  : 7
bridge-port c1 host admit                 : all
bridge-port c1 host filter                : disabled
bridge-port c1 host gvrp                  : disabled
bridge-port c1 host vlan-restricted       : disabled
bridge-port c1 host last-pdu-origin       : 00:00:00:00:00:00
bridge-port c1 host component             : c1

bridge-port c4 eth2 interface             : 4
bridge-port c4 eth2 pvid                  : 100
bridge-port c4 eth2 prio                  : 7
bridge-port c4 eth2 admit                 : all
bridge-port c4 eth2 filter                : disabled
bridge-port c4 eth2 gvrp                  : disabled
bridge-port c4 eth2 vlan-restricted       : disabled
bridge-port c4 eth2 last-pdu-origin       : 00:00:00:00:00:00
bridge-port c4 eth2 component             : c4
```

Examining VLAN Statistics

In the event of VLAN performance problems, ODU transmission can be monitored using the **`show vlan statistics`** command:

```
FA-70>show vlan all all statistics

component  vlan  port  in-pkts       out-pkts      drop-pkts     elapsed-time
c1         1     host  0             0             0             0000:00:00:32
c1         100   host  96            0             0             0000:00:00:32
c2         1     eth0  0             0             0             0000:00:00:32
c2         100   eth0  100           127           0             0000:00:00:32
c2         110   eth0  0             28601         0             0000:00:00:32
c2         120   eth0  0             28601         0             0000:00:00:32
c2         130   eth0  0             57180         0             0000:00:00:32
c3         1     eth1  0             0             0             0000:00:00:32
c3         110   eth1  28601         0             0             0000:00:00:32
c3         120   eth1  28601         0             0             0000:00:00:32
c3         130   eth1  71518         0             0             0000:00:00:32
c4         1     eth2  0             0             0             0000:00:00:32
c4         100   eth2  224           196           0             0000:00:00:32
```

4.5.2 Creating a Basic VLAN Configuration (Provider Bridge *Disabled*)

The previous configuration can also be implemented using the basic configuration available when the Provider Bridge Feature is disabled.

This basic VLAN configuration example is for FibeAir 70 sites serving a single customer or service provider. It comprises:

- Two paired FibeAir 70 RF units using local and remote in-band management VLAN (VID 100) over port ETH0
- Three customer Ethernet VLANs (VIDs110, 120 and 130) using ports ETH1 and ETH2
- Two network Hosts
- Management data from port ETH0 is sent to Host untagged

Configuring In-Band Management

Connect port ETH2 to Host and ETH0 using VID=100 (ETH2 and Host - untagged on port):

```
set vlan 100 egress eth2,host,eth0 untagged eth2,host
```

Assign VID=100 to port ETH2 and Host (with Priority=7):

```
set bridge-port host pvid 100 prio 7
set bridge-port eth2 pvid 100 prio 7
```

Allow customer's VLANs on the link. Connect port ETH1 and ETH0 (RF) via S1 using customer's VIDs:

```
set vlan 110,120,130 egress eth1,eth0 untagged none
```

Note that customer Ethernet services from port ETH1 that arrive with different VLAN IDs and priorities will be transferred as-is.

4.5.3 Creating a Multiple Customer VLAN Configuration

This VLAN configuration example is for FibeAir 70 sites serving multiple customers or service providers. It comprises:

- Ten paired FibeAir 70 RF units (EH1 through EH10) using local and remote in-band management VLAN (VID = 111).
- Two separate, unique customer Ethernet VLANs (VIDs = 200-203).
- Customer 1 traffic is encapsulated into the S-VLAN with VID = 1000; Customer 2 traffic encapsulated into the S-VLAN with VID = 2000.

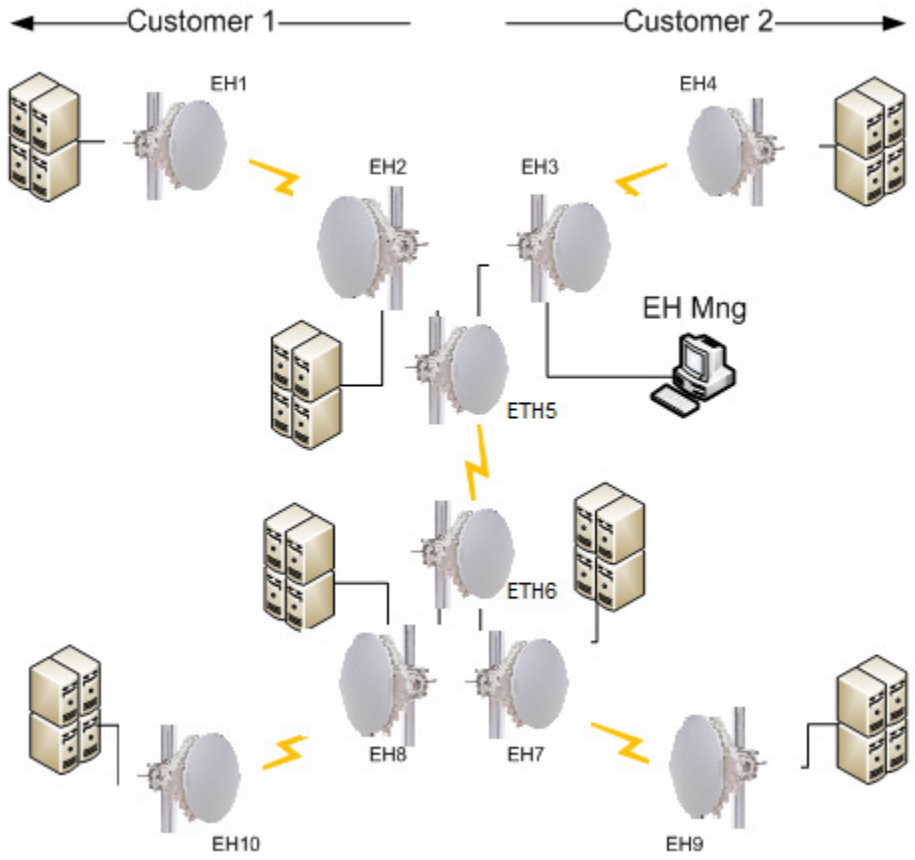


Figure 4-3 FibeAir 70 Multiple Customer VLAN Configuration

EH 1 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.51 route 10.0.0.1
```

Remove the default C-component c2 and attach the interface ETH0 to the S-component:

```
clear bridge c2
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, c3, eth0
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map the management C-VLAN to the management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c4 200-203 egress eth2, s1
```

Configure Service VLAN:

```
set vlan s1 1000 fdb-id 10 egress c4, eth0
```

Map the Customer VLANs to the Service VLAN:

```
set cvlan-reg c4 eth2 200 svid 1000

set cvlan-reg c4 eth2 201 svid 1000

set cvlan-reg c4 eth2 202 svid 1000

set cvlan-reg c4 eth2 203 svid 1000
```

EH 2 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.52 route 10.0.0.1
```

Remove C-components C2 and C4 and attach the interfaces ETH0 and ETH2 to the S-component:

```
clear bridge c2, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host
```

```
set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, eth0, eth2
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map the Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c3 200-203 egress eth1, s1
```

Configure Service VLAN:

```
set vlan s1 1000 fdb-id 10 egress c3, eth2, eth0
```

Map the Customer VLANs to the Service VLANs:

```
set cvlan-reg c3 eth1 200 svid 1000

set cvlan-reg c3 eth1 201 svid 1000

set cvlan-reg c3 eth1 202 svid 1000

set cvlan-reg c3 eth1 203 svid 1000
```

EH 3 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.53 route 10.0.0.1
```

Remove C-components C2 and C4 and attach the interfaces ETH0 and ETH2 to the S-component:

```
clear bridge c2, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, c3, eth0, eth2
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged
```

```
set bridge-port s1 c1 pvid 111 prio 6
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Service VLAN:

```
set vlan s1 2000 fdb-id 10 egress eth2, eth0
```

EH 4 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.54 route 10.0.0.1
```

Remove C-component C2 and attach the interface ETH0 to the S-component:

```
clear bridge c2
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, c3, eth0
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c4 200-203 egress eth2, s1
```

Configure Service VLAN:

```
set vlan s1 2000 fdb-id 10 egress c4, eth0
```

Map the Customer VLANs to the Service VLAN:

```
set cvlan-reg c4 eth2 200 svid 2000

set cvlan-reg c4 eth2 201 svid 2000

set cvlan-reg c4 eth2 202 svid 2000

set cvlan-reg c4 eth2 203 svid 2000
```

EH 5 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.55 route 10.0.0.1
```

Remove C-components C2, C3 and C4 and attach all the external interfaces to the S-component:

```
clear bridge c2, c3, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan s1 111 fdb-id 5 egress c1, eth0, eth1, eth2
```

Configure bridge port management

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Configure Service VLANs

```
set vlan s1 2000 fdb-id 11 egress eth2, eth0

set vlan s1 1000 fdb-id 10 egress eth1, eth0
```

EH 6 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.56 route 10.0.0.1
```

Remove C-components C2, C3 and C4 and attach all the external interfaces to the S-component:

```
clear bridge c2, c3, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan s1 111 fdb-id 5 egress c1, eth0, eth1, eth2
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Configure Service VLANs:

```
set vlan s1 2000 fdb-id 11 egress eth2, eth0

set vlan s1 1000 fdb-id 10 egress eth1, eth0
```

EH 7 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.57 route 10.0.0.1
```

Remove C-components C2 and C4 and attach the interface ETH0 and ETH2 to the S-component:

```
clear bridge c2, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, c3, eth0, eth2
```

Configure bridge port:management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c3 200-203 egress eth1, s1
```

Configure Service VLAN:

```
set vlan s1 2000 fdb-id 10 egress c3, eth2, eth0
```

Map the Customer VLANs to the Service VLAN:

```
set cvlan-reg c3 eth1 200 svid 2000

set cvlan-reg c3 eth1 201 svid 2000

set cvlan-reg c3 eth1 202 svid 2000

set cvlan-reg c3 eth1 203 svid 2000
```

EH 8 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.58 route 10.0.0.1
```

Remove C-components C2 and C4 and attach the interface ETH0 and ETH2 to the S-component:

```
clear bridge c2, c4
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, eth0, eth2
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c3 200-203 egress eth1, s1
```

Configure Service VLAN:

```
set vlan s1 1000 fdb-id 10 egress c3, eth2, eth0
```

Map the Customer VLANs onto the Service VLAN:

```
set cvlan-reg c3 eth1 200 svid 1000

set cvlan-reg c3 eth1 201 svid 1000

set cvlan-reg c3 eth1 202 svid 1000

set cvlan-reg c3 eth1 203 svid 1000
```

EH 9 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.59 route 10.0.0.1
```

Remove C-component C2 and attach the interface ETH0 to the S-component:

```
clear bridge c2
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host
```

```
set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, c3, eth0
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Configure Customer VLANs:

```
set vlan c4 200-203 egress eth2, s1
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Service VLAN:

```
set vlan s1 2000 fdb-id 10 egress c4, eth0
```

Map the Customer VLANs to the Service VLAN:

```
set cvlan-reg c4 eth2 200 svid 2000

set cvlan-reg c4 eth2 201 svid 2000

set cvlan-reg c4 eth2 202 svid 2000

set cvlan-reg c4 eth2 203 svid 2000
```

EH 10 Configuration

Configure RF:

```
set rf role master frequency 74000 mode adaptive
```

Configure the IP address:

```
set ip ip-addr 10.0.0.60 route 10.0.0.1
```

Remove C-component C2 and attaching the interface ETH0 to the S-component:

```
clear bridge c2
```

Configure management for the VLAN:

```
set vlan c1 111 egress host, s1 untagged host

set vlan c3 111 egress eth1, s1

set vlan s1 111 fdb-id 5 egress c1, eth0
```

Configure bridge port management:

```
set bridge-port c1 s1 admit tagged filter enabled

set bridge-port c1 host pvid 111 prio 6 admit untagged

set bridge-port s1 c1 pvid 111 prio 6
```

Map Management C-VLAN to the Management S-VLAN:

```
set cvlan-reg c3 eth1 111 svid 111
```

Configure Customer VLANs:

```
set vlan c4 200-203 egress eth2, s1
```

Configure Service VLAN:

```
set vlan s1 1000 fdb-id 10 egress c4, eth0
```

Map the Customer VLANs onto the Service VLAN:

```
set cvlan-reg c4 eth2 200 svid 1000

set cvlan-reg c4 eth2 201 svid 1000

set cvlan-reg c4 eth2 202 svid 1000

set cvlan-reg c4 eth2 203 svid 1000
```

The commissioning and acceptance procedure verifies the correct installation and the proper, safe, and robust operation of the FibeAir 70 RF link.

Topics covered here include:

- ODU installation verification and testing
- Operational status of the link
- Acceptance tests to be performed on the link
- FibeAir 70 Commissioning and Acceptance Form

4.6 Installation Verification and Testing

Inspect the following components and confirm their adherence to requirements that are detailed in the accompanying checklist, ***FibeAir 70 Commissioning and Acceptance Form*** (*Section 4.7*).

Hint:

Make copies of the **FibeAir 70 Commissioning and Acceptance Form** and use it as a comprehensive guide to RF link commissioning and acceptance.

4.6.1 Physical Installation Verification

This inspection verifies the physical installation of the ODU, in accordance with *Chapter 2* of this manual.

- Pole mount installation
- ODU installation
- Connectors' sealing
- Cables installation
- Grounding

4.6.2 RF Link Test

This inspection verifies the RF link status, in accordance with *Chapters 2* and *3* of this manual.

- RF LED is green
- Management/CLI indication: "RF Operational – Up"
- Receive Signal Strength Indication (RSSI) achieved in Alignment Mode is within +/-4dB of the expected value
- Carrier to Interference + Noise Ratio (CINR) is 15 or higher
- Link configuration (modulation, mode) is in accordance with plan requirements

4.6.3 Link Errors Test

This inspection verifies error-free operation of the radio link.

- No radio errors on the RF Statistics counters

4.6.4 Ethernet Services Test

This inspection verifies correct Ethernet services flow and error-free operation.

- Connect PCs on both ends of the link and use software-based utilities to test for packet-loss
- If available, connect a packet analyzer to the GbE port and verify that no packets are lost

4.6.5 Management Verification

This inspection verifies proper management of the link.

- Verify correct management/CLI connection to both local and remote ODUs
- Verify management access from remote NMS stations

4.6.6 Recording ODU Configuration

Perform the following steps after the FibeAir 70 ODU is commissioned and accepted:

- Copy the Running Configuration (currently active) to Startup Configuration.
- Save the configuration file for future records and backup.

4.7 FibeAir 70 Commissioning and Acceptance Form

Customer Details		
Customer		
Project/link name		
Physical Installation Verification	**Local Site**	**Remote Site**
Site name & address		
Mount type	☐Roof-top ☐Mast/Tower	☐Roof-top ☐Mast/Tower
ODU mount above ground	meters	meters
Clear line-of-site	☐ Yes ☐ No	☐ Yes ☐ No
ODU safely mounted	☐ Yes ☐ No	☐ Yes ☐ No
Bracket's mounting bolts securely tightened	☐ Yes ☐ No	☐ Yes ☐ No
ODU grounding	☐ Yes ☐ No	☐ Yes ☐ No
Cables / Fibers Connections (mark all cables connected)	☐Eth1 Cat5 ☐Eth1 Fiber ☐Eth2 Cat5 ☐Eth2 Fiber ☐DC	☐Eth1 Cat5 ☐Eth1 Fiber ☐Eth2 Cat5 ☐Eth2 Fiber ☐DC
Overall Cables / Fibers length	meters	meters
Cables / Fibers securely routed and fixed properly using cable ties	☐ Yes ☐ No	☐ Yes ☐ No
Cables / Fibers are properly weatherproofed using the appropriate glands	☐ Yes ☐ No	☐ Yes ☐ No
ODU DC source	☐PoE ☐External DC	☐PoE ☐External DC
Measured DC power	Volts DC	Volts DC
RF Link Parameters		
ODU Model		
ODU P/N		
ODU S/N		
ODU running SW version		
Tx / Rx Frequency	MHz	MHz
Tx / Rx Link ID		
Modulation / Mode Mode: modulation / sub-channel / repetitions / FEC	☐Adaptive_____ ☐Static _____	☐Adaptive_____ ☐Static _____
ODU Polarization	☐V ☐H	☐V ☐H
Link distance	Kilometers	Kilometers

RF Link Tests		
Expected RSSI	dBm	dBm
Measured RSSI	dBm	dBm
Measured CINR	dB	dB
Green “RF” led	☐ Yes ☐ No	☐ Yes ☐ No
RF operational status Up	☐ Yes ☐ No	☐ Yes ☐ No
BER test	☐No errors ☐BER_____ Test duration _____ hours	☐No errors ☐BER_____ Test duration _____ hours
RF Statistics error counters clear	☐ Yes ☐ No	☐ Yes ☐ No
Ethernet Services Tests		
Packet-Loss test ☐Packet Analyzer ☐SW-based	☐No Packet-Loss Test duration _____ hours	☐No Packet-Loss Test duration _____ hours
VLAN Statistics dropped-packets counters clear	☐ Yes ☐ No	☐ Yes ☐ No
Management		
IP address / Mask bits		
IP route		
In-band management enabled	☐ Yes ☐ No VLAN ID _____	☐ Yes ☐ No VLAN ID _____
Management of local and remote	☐ OK ☐ NOK	☐ OK ☐ NOK
NMS management access	☐ OK ☐ NOK ☐ N/A	☐ OK ☐ NOK ☐ N/A
Final Configuration Verification		
Copy running configuration to startup	☐ Done	☐ Done
Configuration file saved and stored	☐ Done	☐ Done
Additional Info / Remarks		
I&C Details		
Installation team details:		
Commissioning team details:		

This chapter describes how to use the FibeAir 70 Command Line Interface (CLI) client to configure and maintain FibeAir 70 devices on your network.

Topics covered here include:

- Invoking the CLI
- CLI command syntax
- Referring to FibeAir 70 objects
- Managing FibeAir 70 objects
- Displaying FibeAir 70 objects
- CLI help and auto completion
- CLI error messages

Hint:

This chapter provides information and procedures on **basic** FibeAir 70 CLI operations. For more **advanced** operations, see *Chapter 6*.

4.8 Invoking the CLI

Run your standard Telnet/SSH client. A secured connection is recommended. You can use a common, open source SSH client programs such as PuTTY.

Enter the ODU's **default** IP address: **`192.168.0.1 / 24`** and open the connection.

Login as user **`admin`**.

Enter the password **`admin`**.

At the SSH client prompt, enter **`cli`**.

When a successful connection is established, the ODU responds as follows:

```
Ceragon-OS

FA-70>
```

FibeAir 70 CLI commands should be entered only at the above prompt.

4.9 CLI Command Syntax

After invoking the CLI, the User inputs commands to the CLI. Each CLI command is submitted to the FibeAir 70 device for execution, after which a response is typically returned.

Each command line submitted to the CLI is comprised of:

a unique command that specifies the action(s) to be performed;

the object type on which action(s) will be performed;

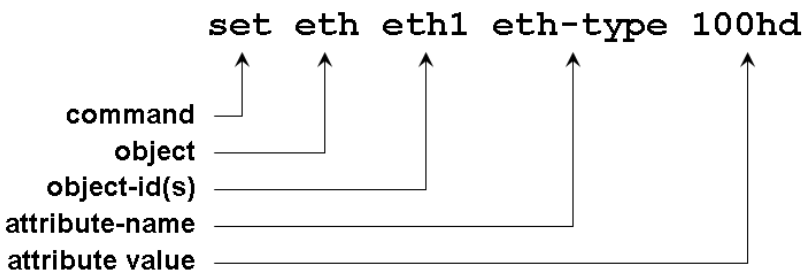
the identifier(s) for the object(s) on which action(s) will be performed; and

zero or more object attributes, that typically specify the value or characteristics for each action.

A CLI command line typically uses the following basic form:

```
command object <object-id(s)> [attribute-name <attribute-value>]
```

For example:



4.9.1 Basic Conventions

- CLI commands are not case sensitive.
- A User can abbreviate commands and parameters as long as they contain enough letters to be distinguished from any other currently available commands or parameters.
- The commands entered from the CLI can apply to the entire system, to a specific port, or to a VLAN.

4.9.2 Common Syntax Rules

This document uses the following notation conventions when presenting CLI usage examples. These syntax conventions are found in commands, index names, objects and attributes.

Syntax	Meaning
{a | b | c}	One of the specified values must be entered on the command line
<name>	The name of a required attribute, explained in an accompanying or referenced section.
[name]	The name of an optional attribute, explained in an accompanying or referenced section.
n…m	Represents a number or integer series from n to m.

4.9.3 Repeatedly Used Identifiers

This document uses the following identifying conventions when presenting CLI usage examples. These syntax conventions are used primarily to represent various types of objects and lists that are to be specified on the command line.

For more information on using identifiers in the FibeAir 70 CLI, see *Section 0*.

Convention	Meaning
<comp-id>	A single component ID (one of c1, c2, c3, c4, c4, s1)
<bridge-port>	A single port name (one of host, eth0, eth1, eth2, c1, c2, c3, c4, c4, s1)
<fdb-id>	A single FID (number from 1 to 64)
<vid>	A single VID (number from 1 to 4094)
<mac-addr>	A MAC address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (*e.g.*, 00-AF-DD-1E-2D-A3).
<ip-addr>	A standard dotted notation IP address (*e.g.*, 10.0.15.74)
<ip-mask>	The IP address mask, *i.e.*, the number of bits that constitute the IP network address prefix.
<comp-id-list>	A comma-separated list of the component IDs, *e.g.*, c1, c2, c3, c4, c4, s1. Any combination of the component IDs can be included in the list. (For details, see *Section 4.9.6*.)
<c-comp-id-list>	A comma-separated list of the C-component IDs, *e.g.,* c1, c2, c3, c4, c4. Any combination of the component IDs can be included in the list. (For details, see *Section 4.9.6*.)
<bridge-port-list>	A comma-separated list of port names, *e.g.*, host, eth0, eth1, eth2, c1, c2, c3, c4, c4, s1. Any combination of the names can be included in the list. (For details, see *Section 4.9.6*.)
<eth-list>	A comma-separated list of external port names, *e.g.*, host, eth0, eth1, eth2. Any combination of the names can be included in the list. (For details, see *Section 4.9.6*.)

Convention	Meaning
<ext-bridge-port-list>	A comma-separated list of external port names, *e.g.*, host, eth0, eth1, eth2. Any combination of the names can be included in the list. (For details, see *Section 4.9.6*.)
<vid-list>	A list of ranges of VIDs from 1 to 4094. The notation covers comma-separated lists of the numbers within the specified range, as well a range of numbers separated by a hyphen, *e.g.*, 5-25. (For details, see *Section 0*.)
<fdb-id-list>	A list of ranges of FIDs from 1 to 64. The notation covers comma-separated lists of the numbers within the specified range, as well as a range of numbers separated by a hyphen, *e.g.*, 5-25. (For details, see *Section 0*.)
<comp-id>	A single component ID (one of c1, c2, c3, c4, c4, s1)
<bridge-port>	A single port name (one of host, eth0, eth1, eth2, c1, c2, c3, c4, c4, s1)
<fdb-id>	A single FID (number from 1 to 64)
<vid>	A single VID (number from 1 to 4094)
<mac-addr>	A MAC address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (*e.g.*, 00-AF-DD-1E-2D-A3).
<ip-addr>	A standard dotted notation IP address (*e.g.*, 10.0.15.74)
<ip-mask>	The IP address mask, *i.e.*, the number of bits that constitute the IP network address prefix.
<qid-list>	A range of numbers from 1 to 8.
<hist-range>	A list of ranges of history interval numbers from 0 to 95. The notation covers comma-separated lists of the numbers within the specified range, as well as a range of numbers separated by a hyphen, *e.g.*, 5-25. (For details, see *Section 0*.)

4.9.4 CLI Command Types

The CLI uses a limited number of commands to create, maintain and monitor a FibeAir 70 configuration.

To perform this operation…	…use this CLI Command:
Create, update or modify an object	Set
Display the characteristics or values of an object	Show
Reset or delete specified characteristics or values of an object	Clear
Reset the RF or System	Reset

The following sections describe the generic use of these routine CLI commands.

When performing non-routine activities, some additional commands are used, including **`copy`**, **`run`**, and **`accept`**. For information on these advanced commands, see *Chapter 6*.

Hint:

CLI command syntax changes to fit the FibeAir 70 object being managed or displayed. For specific command syntax and execution details, see the information that accompanies a particular object, starting in *Chapter 55*.

4.9.4.1 Set Commands

The Set command is used to create, update and modify the characteristics of dynamic objects in the FibeAir 70 configuration and values for a chosen object. Examples of dynamic objects are: VLANs, MEPs and Static MAC Addresses.

The generic form the Set command is:

```
set object-name <object-ids> [attribute-name <value>] … [attribute-name <value>]
```

If a dynamic object does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that an attribute is not explicitly specified, the entry is created with the default value for that attribute.

If the dynamic object already exists, then the Set command will replace the attributes that are currently defined for the entry with those specified in the command.

If a **`set`** command is entered in an incomplete or invalid form, when possible, the CLI will respond with an execution error message that specifies the reason for the error. For more information on error handling in the CLI, see *Section 4.12*.

4.9.4.2 Show Commands

The Show command is used to display the current characteristics and other values for a chosen object.

The generic form the Show command is:

show object-name <object-ids> [attribute-name]

If a **show** command is entered in an incomplete form, when possible, the CLI will automatically complete missing object-ids with the keyword **all**, and missing attributes with the keyword **info**.

For example:

When this Command is entered…	…the CLI interprets the Command as:
show system	**show system info.**
show eth	**show eth all info.**
show bridge-port	**show bridge-port all all info**
show bridge-port c2	**show bridge-port c2 all info**
show bridge-port c2 eth0	**show bridge-port c2 eth0 info**
show vlan	**show vlan all all info**
show vlan s1	**show vlan s1 all info**
show vlan s1 123-170	**show vlan s1 123-170 info**

For more information on the FibeAir 70 CLI auto completion feature, see *Section* ***Error! Reference source not found.***.

Note: The auto completion mechanism does not enable the omission of object-ids or attributes which are required for correct command interpretation.

For example, **show vlan 123-170** will not be correctly auto completed because it lacks a required reference to the object **s1**.

When a **show** command is entered with the names or ids of an object that does not exist, the reference to the non-existing object is silently ignored. However, the information requested for all existing objects will be displayed.

Display Formats

Both line-by-line and table methods are available for displaying attributes. The method used depends upon the object being displayed.

Line-by-line per attribute displays the objects in the form:

```
<object-name> <object-id> <attribute-name>: <value>
```

Note that multiple **<object-ids>** may be displayed using this form.

The Table display method presents the information in blocks and omits the object name and IDs, as in the form:

```
<attribute-name>          <attribute-name>          <attribute-name>

<value>                   <value>                   <value>
```

4.9.4.3 Clear Commands

The Clear command is used to reset or delete the specified values for a chosen object.

The generic form the Clear command is:

```
clear object-name <object-ids> [attribute-name]
```

Nearly all **clear** commands require that at least one object identifier follow the object name on the command line. Alternatively, an object identifier may be replaced on the command line with the word **all**, which typically will be interpreted as "the whole range" (or "the whole set") of identifiers for the specified object.

4.9.4.4 Reset Commands

There are two Reset commands used in the FibeAir 70 system. Reset commands used exclusively during initialization or reboot activities.

Reset RF

Resetting the RF returns the radio and modem hardware to its default settings. The command does not change a system configuration.

```
FA-70>reset rf
```

Reset RF is required whenever a RF Mode change is made from Alignment to Adaptive/Static.

Note: 

Resetting the RF causes a service disruption of approximately **2 seconds** in duration.

Reset System

Resetting the System reboots and reloads the currently saved System startup configuration.

```
FA-70>reset system
```

Reset System is used for power up and is required after software upgrades.

Note: 

Resetting the System causes a service disruption of approximately **90 seconds** in duration.

4.9.5 Designating Objects in CLI Commands

The CLI requires explicit identifiers to perform operations on the objects in an FibeAir 70 configuration. The User designates a specific object (*e.g.*, a bridge) by using its unique identifier.

Two types of object identifiers are used in the CLI:

- Object Names
- Object Indexes

4.9.6 Designating Named Objects

Certain FibeAir 70 CLI objects are identified by symbolic names. These names are static and always are assigned to the same FibeAir 70 object type. Using static names generally makes system configuration much easier and more consistent from network to network.

For example, the designation:

```
eth eth0
```

Refers to the *Wireless Port*, while the designation:

```
bridge-port s1 c3
```

Refers to *Port c3* on *Component s1*

The following lists all named objects used in the CLI, together with the FibeAir 70 objects that they reference:

CLI Name	Referenced Object
eth0	The wireless port
eth1	Wired Ethernet port
eth2	Wired Ethernet port
host	Internal CPU
s1	S-component 1
c1	C-component 1
c2	C-component 2
c3	C-component 3
c4	C-component 4

The CLI supports specifying a list of named objects by entering multiple comma-separated names.

For example:

```
eth eth0, host, eth1
```

Specifies to three **eth** objects: *eth0, host* and *eth1*;

```
bridge c1, c2, s1
```

Specifies three bridge components: *c1, c2* and *s1*; and

```
egress host, s1
```

Specifies two egress ports: *host* and *s1*.

Hint:

When using the **show** and **clear** commands, the keyword **all** may be substituted for a list of object names. In this context, "all" means all of the objects.

For example: **eth all** is identical to **eth host, eth0, eth1, eth2**.

Multi-Dimensional Object Lists

To specify objects in a multi-dimensional object list, the symbol names (or comma-separated lists of names) are entered one after another and are separated by spaces. The generic syntax is as follows:

```
object {<name1>}  {<name2>}  {<name3>}
```

For example:

```
bridge-port c1 host, s1
```

Specifies the bridge ports *c1 host* and *c1 s1*.

Note that not every combination of keywords is valid. For example, the command **`bridge-port c1, c2 host`** is invalid, because two different C-components cannot be associated with the same port.

4.9.6.1 Designating Indexed Objects

Countable FibeAir 70 CLI objects are specified by their unique identifying keyword, followed by the object's index number. A VLAN is a typical, countable object. For example:

```
vlan 230
```

refers to the VLAN that indexed to number 230.

A complete list of indexed objects is specified in a command using a comma-separated series. For example:

```
vlan 230, 330, 430
```

refers to VLANs that are indexed to numbers 230, 330 and 430.

It is also possible to specify a range of indexed objects in a command. For example:

```
vlan 230-270
```

refers to VLANs from indexed number 230 to 270, inclusive.

Finally, a mixed method may be used for specifying indexed objects in a command, enabling references to both a range of objects and to individual objects. For example:

```
vlan 230-270, 300, 401-410
```

refers to VLANs from indexed number 230 to 270, VLAN number 300 and VLANs 401 to 410.

Designating indexed objects is valid in all **`set`**, **`show`** and **`clear`** commands. If the **`show`** command is executed for indexed objects which don't exist, the non-existing objects are silently ignored and the command executes only for existing objects.

Hint:

When using the **`show`** and **`clear`** commands, the keyword **`all`** may be substituted for an indexed numerical range. In this context, "all" means the entire object range.

For example: **`vlan all`** is identical to **`vlan 1-4094`**.

Multi-Dimensional Objects with Indexes

The CLI supports multi-dimensional objects with numerical indexes. If they appear then their indexes (or lists of ranges of indexes) are placed one after another and are separated by spaces. The generic syntax is as follows: *object {<idx1>} {<idx2>} {<idx3>}*.

More specifically: *object 2, 9, 23-25* means the collection of double indexed objects: {2, 23}, {2, 24}, {2, 25}, {9, 23}, {9, 24}, {9, 25}.

For **show** and **clear** commands it is possible to put the word **all** instead of either of indexes. For example: *object 2, 9 all* or *object all 23-25* or *object all all*.

For specific per-command definitions see 4.9.4

4.10 Viewing the CLI Command History

The FibeAir 70 CLI maintains a history of the 100 most recent commands that were entered by the User. This is especially useful when recalling long, complex or repetitive entries.

To recall commands from the history buffer, the User can press the following keys:

Keypress	Result
Up Arrow	Recall commands in the history buffer, beginning with the most recent command. Press the key repeatedly to recall successively older commands.
Down Arrow	Return to more recent commands in the history buffer, after recalling one or more commands with the Up Arrow key. Press the key repeatedly to recall successively more recent commands.

4.11 Invoking CLI Help and Auto completion

The FibeAir 70 CLI assists the User both actively and passively, using the following means:

- The User can explicitly request syntax help on the command line.
- The User can explicitly request auto completion assistance on the command line.
- The CLI command interpreter always checks the validity and completeness of a string that is entered on the command line.
  - When a command is determined to be invalid, the CLI responds with a help message to assist the User. If possible, the command interpreter will derive the intended command from the User's initial entry and will explain the syntax of the command and the range of allowed values.
  - When a command is determined to be incomplete (for example, if a required object or attribute is missing), the CLI responds with a choice of variants that represent the possible values, based on the User's initial entry.

The following summarizes the ways to invoke CLI help and auto completion features:

Feature	Description
Help <*string*>	Returns a help line for the requested command and object. For example: **FA-70> help set vlan xxx** *Will return:* **FA-70> set vlan <comp-id-list> <vid-list> [fdb-id <fdbid>] [egress <bridge-ports>] [untagged <bridge-ports>] where <bridge-ports> are port names or none fdbid in range 1..64 and relevant for s-vlans only**
<*string*> ?	Returns a detailed list of commands that begin with a particular character string. For example: **FA-70> set vlan?** *Will return:* **FA-70> set vlan <comp-id-list> <vid-list> [fdb-id <fdbid>] [egress <bridge ports>] [untagged <bridge ports>] where <bridge ports> are port names or none fdbid in range 1..64 and relevant for s-vlans only** Following printout, the CLI will prompt the User with the command that was input: **FA-70> set vlan xxx**

<*string*> <tab>	Automatically completes a specific command name. For example: **FA-70> set vl <tab>** **FA-70> set vlan** **FA-70> se vl 33 e** **FA-70> set vlan 33 egress** If more than one command matches the string that was entered by the User, the CLI indicates that an ambiguous command has been entered. Note that the autocompletion feature does not function for indexes, MAC addresses or IP addresses.
? or Help (without a string)	Returns a list of top-level CLI commands only.

4.12 CLI Error Messages

FibeAir 70 CLI issues three types of error messages:

- **%Ambiguous command**. This error occurs when the command entered can only be partially interpreted. If possible, following the error message, a help syntax line is returned to assist the User in correcting the command, as described in *Section 4.10*.

  For example:

  ```
  FA-70> sh i

  %Ambiguous command: sh i

  show system, show bridge, show bridge-port, show eth,
  show vlan-common, show vlan, show fdb, show fdb-table,
  show ip, show rf, show arp, show cvlan-reg, show pep-vp,
  show svid-xlat, show cfm-md, show crm-ma, show cfm-mep,
  show cfm-ccm, show cfm-peer-mep-db

  FA-70> sh i
  ```

- **%Invalid input**. This error occurs when the command entered includes an attribute value that is outside of the range allowed. To assist the User, the CLI will return the entered command with a question mark (?) added, immediately following the erroneous parameter, as well as the entire command syntax.

  For example:

  ```
  FA-70> set vlan c1 5000 egress 1, 3

  %Invalid input: set vlan c1 5000 (?) egress 1, 3

  set vlan <comp-id-list> <vid-list> [fdb-id <fdbid>]
  [egress <bridge-ports>] [untagged <bridge-ports>] where
  <bridge-ports> are port names  or none fdbid in range
  1..64 and relevant for s-vlans only
  ```

- **General Execution Errors**. This error occurs when the command entered has correct syntax but cannot be executed for some reason. Such error messages are often application or object dependant. For more information, see the explanation that accompanies the object that is specified on the command line, in *Chapter 5*.

4.13 Viewing the FibeAir 70 Statistics History

The FibeAir 70 CLI enables viewing of standard operational and performance statistics for various objects in the System.

View the statistics history using the **show** command:

```
show  <object> <comp-id> statistics
            [{<hist-range> | all}]
```

For example:

```
show  RF statistics
```

Hint:

For a complete description of the statistics that are available for a specific FibeAir 70 object, see the statistics information that accompanies the object in *Chapter 55*.

4.13.1 Using Statistics Intervals

It is possible to specify a range of history intervals for the requested object statistics.

When a statistics interval is requested, the CLI returns information in the following format:

```
Interval            Start         End
<num>               <time>        <time>
```

Where:

<num> = is the interval number, from 0 to 95. Interval 0 is the current interval, while intervals 1 to 95 hold statistics collected from 15 to 1425 minutes ago. The duration time for each interval is 15 minutes.

<time> = is the interval time, displayed in a format that is identical to the System Up Time (See Section 5.1.2.3).

When a history interval is not specified on the command line, the CLI will display the ordinary accumulative counters associated with the object.

Note:

Using the **clear statistics** command will erase all accumulative counters as well as the counters for Interval 0.

5 CLI Managed Object Reference

This chapter describes all FibeAir 70 System objects that can be created, modified, displayed or deleted using the command line interface.

Use Figure 5-1 to quickly identify and locate a specific FibeAir 70 object according to its logical function in the FibeAir 70 System.

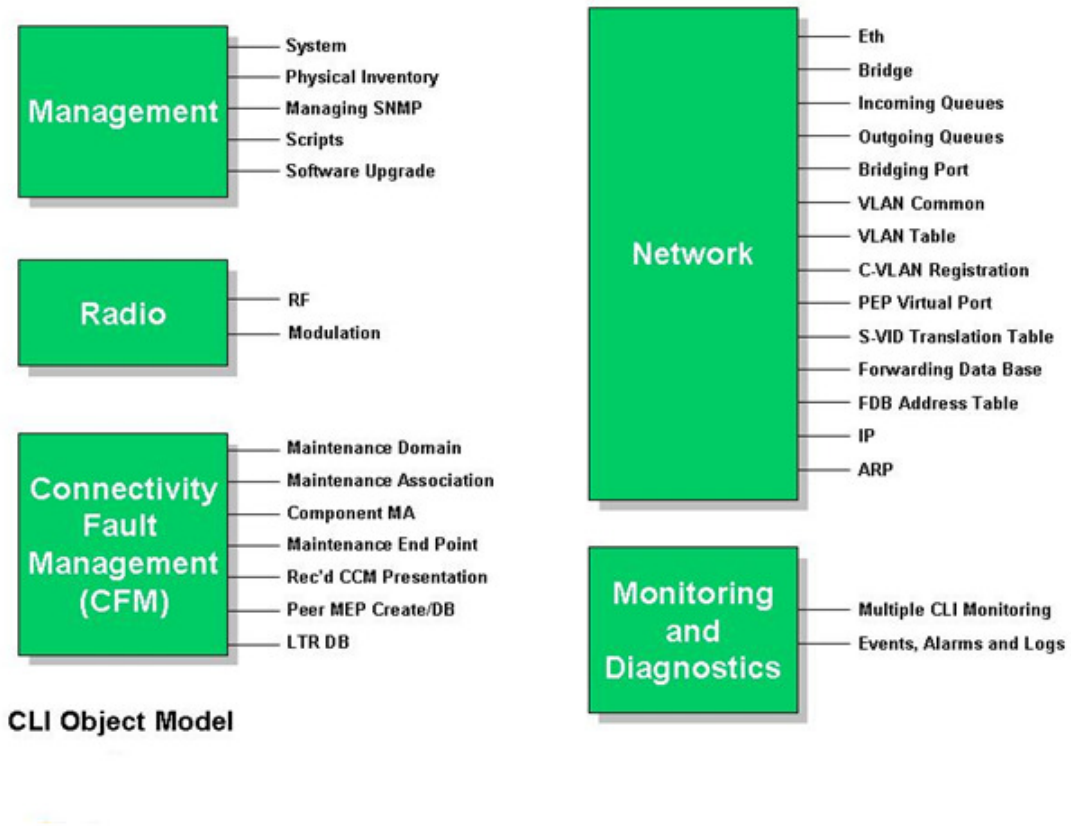


Figure 5-1 The FibeAir 70 CLI Object Model

5.1 System

The System object provides access to general operating parameters of the device.

The System object corresponds to the System Group MIB2 described in RFC-3418.

5.1.1 System Commands

5.1.1.1 Set

Assign and modify device parameters using the Set command:

```
set   system
              [contact <string>]
              [name <string>]
              [location <string>]
              [date <yyyy.mm.dd>]
              [time <hh:mm:ss>]
```

5.1.1.2 Show

Display device parameters using the Show command:

```
show system [{info | description | snmpid | uptime | contact |
 name | location | voltage | temperature | date | time}]
```

5.1.1.3 Reset

Reboot the device using the Reset command:

```
reset system
```

All device parameters will be set to their default values.

When using this command, the CLI prompts for an explicit **[y/n]** confirmation prior to its execution.

5.1.2 System Attributes

5.1.2.1 System Description

Description	A text string describing the entity. This value generally includes the full name and version identification of the system's hardware type, operating-system, and networking software.
CLI Attribute Name	Description
SNMP Object ID	sysDescr (1.3.6.1.2.1.1.1)
Value	Variable text
Access	RO
Default	EH-70 HW W.X SW Y.Z Where: W.X is the HW version and Y.Z is the SW version
Dependencies	This string must comprise only printable American Standard Code for Information Interchange (ASCII) characters.

5.1.2.2 System Object ID

Description	The vendor's authoritative identification of the network management subsystem contained in the entity. This value is allocated within the SMI enterprises subtree (1.3.6.1.4.1) and provides an easy and unambiguous means for determining `what kind of box' is being managed.
CLI Attribute Name	snmp-id
SNMP Object ID	sysObiectID (1.3.6.1.2.1.1.2)
Value	1.3.6.1.4.1.31926
Access	RO
Default	1.3.6.1.4.1.31926
Dependencies	None

5.1.2.3 System Up Time

Description	The length of time that has passed since the network management portion of the system was last re-initialized.
CLI Attribute Name	up-time
SNMP Object ID	sysUpTime (1.3.6.1.2.1.1.3)
Value	ddd:hh:mm:ss *Where*: **ddd** = decimal integer representing days (it can be an arbitrary number of digits) **hh** = two-digit decimal integer representing the hours of a day [0..23] **mm** = two-digit decimal integer representing minutes of an hour [0..59] **ss** = two-digit decimal integer representing seconds of a minute [0..59]
Access	RO
Default	N/A
Dependencies	None

5.1.2.4 System Contact

Description	A text string identifying the contact person responsible for this managed node, together with information on how to contact this person.
CLI Attribute Name	contact
SNMP Object ID	sysContact (1.3.6.1.2.1.1.4)
Value	Up to 256 characters. If no contact information exists, the value returns a zero-length string.
Access	RW
Default	"sysContact undefined"
Dependencies	None

5.1.2.5 System Name

Description	A name assigned by the administrator for this managed node. Generally, by convention, this is the node's fully-qualified domain name.
CLI Attribute Name	name
SNMP Object ID	sysName (1.3.6.1.2.1.1.5)
Value	Up to 256 characters. If no system name exists, the value returns a zero-length string.
Access	RW
Default	"EH-70"
Dependencies	This value is also used as the system prompt string. If no System Name is assigned the system prompt will read “Console”

5.1.2.6 System Location

Description	The physical location of this node (*e.g.*, 'telephone closet, 3rd floor'
CLI Attribute Name	location
SNMP Object ID	sysLocation (1.3.6.1.2.1.1.6)
Value	Up to 256 characters. If no system location exists, the value returns a zero-length string.
Access	RW
Default	"sysLocation undefined"
Dependencies	None

5.1.2.7 Input Voltage

Description	The system input voltage.
CLI Attribute Name	voltage
SNMP Object ID	CeragonSysVoltage (1.3.6.1.4.1.31926.1.1)
Value	Integer
Access	RO
Default	N/A
Dependencies	None

5.1.2.8 Enclosure Temperature

Description	The system enclosure temperature.
CLI Attribute Name	temperature
SNMP Object ID	CeragonSysTemperature (1.3.6.1.4.1.31926.1.2)
Value	Integer
Access	RO
Default	N/A
Dependencies	None

5.1.2.9 System Date and Time

Description	The host's local date and time of day.
CLI Attribute Name	date, time
SNMP Object ID	hrSystemDate (1.3.6.1.2.1.25.1.2) As defined in RFC 2790
Value	yyyy-mm-dd hh:mm:ss *Where*: **yyyy** = year (0 – 9999) **hh** = hour (0 – 24) **mm** = month (1 – 12) **mm** = minute (0 – 60) **dd** = day (1 – 31) **ss** = second (0 – 60)
Access	RW
Default	None
Dependencies	None

5.2 Eth

The Eth object provides access to Ethernet network-related device parameters.

The Eth object corresponds to the Interface MIB2 described in RFC-2863.

5.2.1 Eth Commands

Note:

The Eth object is always followed by one or more name strings that correspond to ports or devices to be acted upon.

In the commands below, this string is represented as `<eth-list>`.

For more details on this convention, see ***Section 4.9.6., Designating Named Objects***.

5.2.1.1 Set

Assign and modify device parameters using the Set command:

```
set   eth <eth-list>
            [admin up | down]
            [alias <string>]
            [eth-type <eth-type-set>]
            [auto-neg {enabled | disabled}]
            [loopback-mode { disabled | external | internal}]
            [loopback-timeout <integer>]
            [alarm-propagation {disabled | backward | forward | both directions}
```

5.2.1.2 Show

Display device parameters using the Show command:

```
show  eth [{<eth-list> | all}
            [{info | description | mtu | mac-addr | admin | operational
            | last-change | name | alias | eth-type | eth-act-type
            | auto-neg | loopback-mode | loopback-timeout | statistics
            | alarm-propagation}]]
```

5.2.1.3 Clear

Reset selected attributes of the device using the Clear command:

```
clear  eth {<eth-list> | all}

              [{info | description | mtu |  mac-addr | admin | operational

              | last-change | name | alias | eth-type | eth-act-type

              | auto-neg | statistics}]
```

5.2.2 Eth Attributes

5.2.2.1 Description

Description	A text string describing the interface. This value generally includes the manufacturer's name, the product name and the interface hardware and software versions.
CLI Attribute Name	description
SNMP Object ID	ifDescr (1.3.6.1.2.1.2.2.1.2)
Value	Variable text
Access	RO
Default	{"Ceragon EH-70 Host"; " Ceragon EH-70 Eth 0"; "Ceragon EH-70 Eth 1"; "Ceragon EH-70 Eth 2"}
Dependencies	None

5.2.2.2 MTU Size

Description	The size of the largest packet which can be sent/received on the interface, specified in octets. For interfaces that are used for transmitting network datagrams, this is the size of the largest network datagram that can be sent on the interface.
CLI Attribute Name	mtu
SNMP Object ID	ifMtu (1.3.6.1.2.1.2.2.1.4)
Value	9216
Access	RO
Default	9216
Dependencies	None

5.2.2.3 MAC Address

Description	The address of the interface at its protocol sub-layer.
CLI Attribute Name	mac-addr
SNMP Object ID	ifPhysAddress (1.3.6.1.2.1.2.2.1.6)
Value	host0 = <mac_base_address> (read from hardware) rf0 = <mac_base_address> + 1 eth1 = <mac_base_address> + 2 eth2 = <mac_base_address> + 3
Access	RO
Default	NN-NN-NN-NN-NN-NN *where* NN is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Dependencies	None

5.2.2.4 Administrative Status

Description	The desired operational state of the interface, expressed as an integer.
CLI Attribute Name	admin
SNMP Object ID	ifAdminStatus (1.3.6.1.2.1.2.2.1.7)
Value	1 = Up (operational) 2 = Down (not operational) When the **set** command is used together with the **admin** attribute, the device will report the administrative status of the device immediately after command execution. For example: **`Interface eth7 admin set down`**
Access	RW
Default	1 (Up)
Dependencies	There are no restrictions for adding an interface in the Down state to VLAN egress and untagged lists, or to FDP.

5.2.2.5 Operational Status

Description	The current operational state of the interface, expressed as an integer. When this attribute is in the Down state, but the Administrative Status attribute (**`admin`**) is in the Up state, then a fault condition is presumed to exist on the interface.
CLI Attribute Name	operational
SNMP Object ID	ifOperStatus (1.3.6.1.2.1.2.2.1.8)
Value	1 = Up (Ready to pass packets) 2 = Down (Not available for host0)
Access	RO

Default	N/A
Dependencies	If the Administrative Status attribute (**admin**) is in the Down state, then the **operational** attribute should also be in the Down state. If the Administrative Status attribute (**admin**) changes to the Up state, then the **operational** attribute should also change to the Up state if the interface is ready to transmit and receive network traffic. it should remain in the Down state if and only if there is a fault condition that prevents the interface from going to the Up state.

5.2.2.6 Last Change Time

Description	The value of sysUpTime at the time the interface entered its current operational state.
CLI Attribute Name	lastChange
SNMP Object ID	ifLastChange (1.3.6.1.2.1.2.2.1.9)
Value	ddd:hh:mm:ss *Where*: **ddd** = decimal integer representing days (it can be an arbitrary number of digits) **hh** = two-digit decimal integer representing the hours of a day [0..23] **mm** = two-digit decimal integer representing minutes of an hour [0..59] **ss** = two-digit decimal integer representing seconds of a minute [0..59]
Access	RO
Default	N/A
Dependencies	If the current operational state was entered prior to the last reinitialization of the local network management subsystem, then the value of this attribute is 0.

5.2.2.7 Name

Description	The text string name of the interface.
CLI Attribute Name	name
SNMP Object ID	ifName (1.3.6.1.2.1.31.1.1.1.1)
Value	host, eth0, eth1, eth2
Access	RO
Default	None
Dependencies	None

5.2.2.8 State Trap

Description	An integer that indicates whether linkUp/linkDown traps should be generated for this interface.
CLI Attribute Name	trap
SNMP Object ID	ifLinkDownTrapEnable (1.3.6.1.2.1.31.1.1.1.14)
Value	1 = Enabled 2 = Disabled
Access	RW
Default	1 = Enabled
Dependencies	None

5.2.2.9 Connector

Description	An integer that indicates whether the interface sublayer has a physical connector.
CLI Attribute Name	connector
SNMP Object ID	ifConnectorPresent (1.3.6.1.2.1.31.1.1.1.17)
Value	1 = True (Connector is present) 2 = False True (Connector is absent)
Access	RO
Default	N/A
Dependencies	None

5.2.2.10 Alias

Description	A text string containing an 'alias' name for the interface, as assigned by a network manager. This value provides a non-volatile 'handle' for the interface.
CLI Attribute Name	alias
SNMP Object ID	ifAlias (1.3.6.1.2.1.31.1.1.1.18)
Value	Up to 256 characters. When the **set** command is used together with the **alias** attribute, only one interface can be addressed per invocation.
Access	RW
Default	0 length string
Dependencies	The value of this attribute must be unique with respect to other interface aliases.

5.2.2.11 Ethernet Type

Description	This object identifier represents the operational type of MAU that the administrator has assigned. As described below, the use of this attribute is limited when auto-negotiation is enabled for the MAU.
CLI Attribute Name	eth-type
SNMP Object ID	ifMauDefaultType (1.3.6.1.2.1.26.2.1.1.11) Part of ifMauTable (1.3.6.1.2.1.26.2.1)
Value	The possible values are:

10hd	dot3MauType10BaseTHD (1.3.6.1.2.1.26.4.10)
10fd	dot3MauType10BaseTFD (1.3.6.1.2.1.26.4.11)
100hd	dot3MauType100BaseTXHD (1.3.6.1.2.1.26.4.15)
100fd	dot3MauType100BaseTXFD (1.3.6.1.2.1.26.4.16)
1000hd	dot3MauType1000BaseTHD (1.3.6.1.2.1.26.4.29)
1000fd	dot3MauType1000BaseTFD (1.3.6.1.2.1.26.4.30)
1000sxhd	dot3MauType1000BaseXHD (1.3.6.1.2.1.26.4.21)
1000sxfd	dot3MauType1000BaseXFD (1.3.6.1.2.1.26.4.22)
1000lxhd	dot3MauType1000BaseXHD (1.3.6.1.2.1.26.4.21)
1000lxfd	dot3MauType1000BaseXFD (1.3.6.1.2.1.26.4.22)

Access	RW
Default	1000fd
Dependencies	If auto-negotiation is not enabled or is not implemented for this MAU, the value of this attribute is used to determine the operational type of the MAU. In such a case, a set command is used to force the MAU into the specified operating mode. If auto-negotiation is implemented and enabled for this MAU, the operational type of the MAU is determined by auto-negotiation, and the value of this attribute denotes the type to which the MAU will automatically revert if/when auto-negotiation is later disabled.

5.2.2.12 Actual Ethernet Type

Description	This object identifier represents the operational type of the MAU, as determined by either: 1. the result of the auto-negotiation process, or 2. if auto-negotiation is not enabled or is not implemented for this MAU, then the value that has been assigned in the **`eth-type`** attribute is used (See *Section 0*).
CLI Attribute Name	eth-act-type
SNMP Object ID	ifMauType (1.3.6.1.2.1.26.2.1.1.3) Part of ifMauTable (1.3.6.1.2.1.26.2.1)
Value	The possible values are:

	10hd	dot3MauType10BaseTHD (1.3.6.1.2.1.26.4.10)
	10fd	dot3MauType10BaseTFD (1.3.6.1.2.1.26.4.11)
	100hd	dot3MauType100BaseTXHD (1.3.6.1.2.1.26.4.15)
	100fd	dot3MauType100BaseTXFD (1.3.6.1.2.1.26.4.16)
	1000hd	dot3MauType1000BaseTHD (1.3.6.1.2.1.26.4.29)
	1000fd	dot3MauType1000BaseTFD (1.3.6.1.2.1.26.4.30)
	1000xhd	dot3MauType1000BaseXHD (1.3.6.1.2.1.26.4.21)
	1000xfd	dot3MauType1000BaseXFD (1.3.6.1.2.1.26.4.22)
Access	RO	
Default	1000fd	
Dependencies	None	

5.2.2.13 Auto Negotiation Admin Status

Description	An integer representing the administrative state of auto-negotiation signaling for the interface. Setting this attribute to Enabled causes the auto-negotiation signaling ability of the interface to be operational. Setting this attribute to Disabled causes the auto-negotiation signaling ability of the interface to be non-operational, and no auto-negotiation signaling will be performed. In such a case, the MAU type is forced to the value that has been assigned in the **`eth-type`** attribute (See *Section 0*).
CLI Attribute Name	auto-neg
SNMP Object ID	ifMauAutoNegAdminStatus (1.3.6.1.2.1.26.5.1.1.1) Part of ifMauAutoNegTable (1.3.6.1.2.1.26.5.1)
Value	1 = Enabled 2 = Disabled
Access	RW
Default	Enabled
Dependencies	None

5.2.2.14 Loopback Mode

Description	Loopback mode operation.
CLI Attribute Name	loopback-mode
SNMP Object ID	N/A
Value	{disabled | external | internal}
Access	RW
Default	Disabled
Dependencies	None

5.2.2.15 Loopback Timeout

Description	Loopback timeout, expressed in seconds
CLI Attribute Name	loopback-timeout
SNMP Object ID	N/A
Value	Integer
Access	RW
Default	Disabled
Dependencies	None

5.2.2.16 Alarm Propagation Mode

Description	Alarm propagation mode is used to define System behavior in case of a link failure	
CLI Attribute Name	alarm-propagation	
SNMP Object ID	N/A	
Value	The possible alarm propagation values are:	
	Disabled	No propagation is performed.
	Backward	The Ethernet link is set to down if the radio link is down or if a “Peer Eth Down” notification has been received at the radio interface.
	Forward	A “Peer Eth Down” notification is sent to the other end of the radio link if the Ethernet link is down.
	Both Directions	Both Backward and Forward alarm propagation is performed.
Access	RW (ETH1 and ETH2 only)	
Default	Disabled	
Dependencies	None	

5.2.2.17 Statistics

The current CLI version displays all Eth object statistics together in response to the following command:

```
show  eth <ext-bridge-port-list> statistics
```

Table 5-1 summarizes and describes all Eth object statistics:

Table 5-1 Statistics for the Eth Object

	CLI Name	***Description***	***SNMP Object ID***
Incoming Octets	in-octets	The total number of octets received on the interface, including framing characters.	ifInOctets 1.3.6.1.2.1.2.2.1.10
Incoming Unicast Packets	in-ucast-pkts	The number of unicast packets received on the interface.	ifInUcastPkts 1.3.6.1.2.1.2.2.1.11
Discarded Incoming Packets	in-discards	The number of packets which were chosen to be discarded due to RX FIFO full	ifInDiscards 1.3.6.1.2.1.2.2.1.13
Erroneous Incoming Packets	in-errors	The number of received erred packets.	ifInErrors 1.3.6.1.2.1.2.2.1.14
Outgoing Octets	out-octets	The total number of octets transmitted out of the interface, including framing characters.	ifOutOctets 1.3.6.1.2.1.2.2.1.16
Outgoing Unicast Packets	out-ucast-pkts	The number of unicast packets transmitted out of the interface.	ifOutUcastPkts 1.3.6.1.2.1.2.2.1.17
Discarded Outgoing Packets	out-discards	The number of outbound packets which were chosen to be discarded due to excessive collision or excessive deferral.	ifOutDisacrds 1.3.6.1.2.1.2.2.1.19
Erroneous Outgoing Packets	out-errors	The number of outbound packets that could not be transmitted because of errors.	ifOutErrors 1.3.6.1.2.1.2.2.1.20
Incoming Multicast Packets	in-mcast-pkts	The number of multicast packets received on the interface.	ifInMulticastPkts 1.3.6.1.2.1.31.1.1.1.2
Incoming Broadcast Packets	in-bcast-pkts	The number of broadcast packets received on the interface.	ifInBroadcastPkts 1.3.6.1.2.1.31.1.1.1.3
Outgoing Multicast Packets	out-mcast-pkts	The number of multicast packets transmitted out of the interface.	ifOutMulticastPkts 1.3.6.1.2.1.31.1.1.1.4
Outgoing Broadcast Packets	out-bcast-pkts	The number of broadcast packets transmitted out of the interface.	ifOutBroadcastPkts 1.3.6.1.2.1.31.1.1.1.5

5.3 Bridge

The Bridge object provides access to the Bridge parameters.

The Bridge object corresponds to the Bridge MIB described in IEEE8021-BRIDGE-MIB.

5.3.1 Bridge Commands

Note:

The Bridge object is always followed by one or more name strings that correspond to ports or devices to be acted upon.

In the commands below, this string is represented as **<comp-id-list>**.

For more details on this convention, see ***Section 4.9.6., Designating Named Objects***.

5.3.1.1 Set

Assign the bridge device using the Set command:

```
set   bridge <comp-id-list>
```

5.3.1.2 Show

Display bridge parameters using the Show command:

```
show   bridge {[<comp-id-list> | all}
               [{info | mac-addr | num-ports}]]
```

5.3.1.3 Clear

Reset all bridge attributes using the Clear command:

```
clear  bridge {<comp-id-list> | all}
```

5.3.2 Bridge Attributes

5.3.2.1 Component ID

Description	The component identifier is used to distinguish between the multiple virtual bridge instances within a PBB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021BridgeBaseComponentId (1.3.111.2.802.1.1.2.1.1.1.1.1).
Value	1
Access	Not Accessible This attribute is used as the index key to ieee8021BridgeBaseTable (1.3.111.2.802.1.1.2.1.1)
Default	s1
Dependencies	The component id = s1 cannot be supplied as argument when using the **`clear`** command.

5.3.2.2 Bridge Address

Description	The MAC address to be used by this bridge when it must be referred to in a unique fashion. It is the address of the Host interface (interface 1).
CLI Attribute Name	addr
SNMP Object ID	ieee8021BridgeBaseBridgeAddress (1.3.111.2.802.1.1.2.1.1.1.1.2)
Value	Octet string
Access	RO
Default	NN-NN-NN-NN-NN-NN *where* NN is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Dependencies	The MAC base address is the same as the address of the Host interface 1 (See *Section 0*)

5.3.2.3 Component Number of Ports

Description	The number of ports controlled by this bridging entity.
CLI Attribute Name	num-ports
SNMP Object ID	ieee8021BridgeBaseNumPorts (1.3.111.2.802.1.1.2.1.1.1.1.3)
Value	Integer (32 bit)
Access	RO
Default	Always 2 for C-components Always 4 for S-components
Dependencies	None

5.4 Bridging Port

The Bridging Port object provides access to port-wide definitions from the Bridge.

The Bridging Port object corresponds to the Bridge MIB (RFC-4188) and the Bridge MIB Extensions (RFC-4363).

5.4.1 Bridging Port Commands

When using the **bridge-port** commands, any combination of components and ports may be specified. However, only certain combinations will produce a result.

In the current product version, the following usage restrictions exist:

- Component *c1* is strictly associated with the Ports *host* and *s1*
- Component *c2* is strictly associated with the Ports *eth0* and *s1*
- Component *c3* is strictly associated with the Ports *eth1* and *s1*
- Component *c4* is strictly associated with the Ports *eth2* and *s1*
- The Ports associated with the Component *s1* are dependent on the *c* components that currently exist (See more information in *Section 5.3*).

  For example, if the components *c1* and *c4* already exist, then the Component *s1* is associated with the Ports *eth0, eth1, c1* and *c4*.

The validity of a specified combination should be tested before command execution.

Note:

The use of **<comp-id-list>** in Bridging Port CLI commands changes, depending on whether the FibeAir 70 Provider Bridge feature is enabled or disabled.

Also, when the Provider Bridge feature is disabled **<bridge-port-list>** can only include the external ports eth1, eth2, eth0 and Host.

5.4.1.1 Set

Assign the bridging port parameters using the Set command.

When the Provider Bridge feature is **enabled**, use the following syntax:

```
set   bridge-port <comp-id-list> <bridge-port-list>
              [pvid <vlan>]
              [prio {0..7}]
```

```
              [admit untagged | tagged | all]
              [filter enabled | disabled]
```

When the Provider Bridge feature is **disabled**, use the following syntax:

```
set   bridge-port <bridge-port-list>
              [<comp-id-list>]
              [pvid <vlan>]
              [prio {0..7}]
              [admit untagged | tagged | all]
              [filter enabled | disabled]
```

When the Provider Bridge feature is disabled **<bridge-port-list>** can only include the external ports eth1, eth2, eth0 and Host.

5.4.1.2 Show

Display bridging port attributes using the Show command.

When the Provider Bridge feature is **enabled**, use the following syntax:

```
show   bridge-port [[{<comp-id-list> | all}] {<bridge-port-list> | all}
              [{ info | mac-addr | num-ports | interface | pvid | prio
              | admit | filter | gvrp | vlan-restricted | last-pdu-origin
              | statistics}]]
```

When the Provider Bridge feature is **disabled**, use the following syntax:

```
show   bridge-port [{<bridge-port-list> | all}
              [{ info | mac-addr | num-ports | interface | pvid | prio
              | admit | filter | gvrp | vlan-restricted | last-pdu-origin
              | statistics}]]
```

When the Provider Bridge feature is disabled **<bridge-port-list>** can only include the external ports eth1, eth2, eth0 and Host.

5.4.2 Bridging Port Attributes

5.4.2.1 Component ID

Description	The component identifier is used to distinguish between the multiple virtual bridge instances within a PB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021BridgeBasePortComponentId (1.3.111.2.802.1.1.2.1.1.4.1.1)
Value	<comp-id-list>
Access	N/A
Default	N/A
Dependencies	Component identifiers must be defined in the Bridge Component table (See *Section* 5.3).

5.4.2.1.1 Bridge Base Port

Description	The number of the port for which this entry contains bridge management information. In the CLI port name is used instead of number.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021BridgeBasePort (1.3.111.2.802.1.1.2.1.1.4.1.2)
Value	host, eth0, eth1, eth2, s1, c2, c3, c4
Access	N/A
Default	N/A
Dependencies	None

5.4.2.1.2 Bridge Port Interface Index

Description	The interface that corresponds to this port.
CLI Attribute Name	interface
SNMP Object ID	ieee8021BridgeBasePortIfIndex (1.3.111.2.802.1.1.2.1.1.4.1.3)
Value	host, eth0, eth1, eth2 In the current version, when a port is bound to an internal interface (s1, c1, c2, c3, c4) then the value for this attribute is 0.
Access	RO
Default	N/A
Dependencies	None

5.4.2.1.3 Bridge Port PVID

Description	The port-level VLAN ID that is assigned to untagged frames or Priority-Tagged frames received on the port.
CLI Attribute Name	pvid
SNMP Object ID	ieee8021QBridgePvid (1.3.111.2.802.1.1.4.1.4.5.1.1)
Value	1..4094
Access	RW
Default	1
Dependencies	Each PVID must correspond to a valid VLAN on the corresponding component. In practice, this means that the VLAN must already be configured in the VLAN Table for the component before its VID can be assigned as the PVID for a port.

5.4.2.2 Bridge Port Default Priority

Description	An integer indicating the default ingress User Priority for this port. This attribute is relevant for protocols that do not support native User Priority, such as Ethernet.
CLI Attribute Name	Prio
SNMP Object ID	ieee8021BridgePortDefaultUserPriority (1.3.111.2.802.1.1.2.1.3.1.1.1)
Value	0..7
Access	RW
Default	0
Dependencies	None

5.4.2.3 Bridge Port Acceptable Frame Types

Description	The frame types that will be accepted on the port and assigned to a VID. VID assignment is based on the PVID and VID Set for the port. When this is admitTagged(3), the device will discard untagged frames or Priority-Tagged frames received on this port. When admitAll(1), untagged frames or Priority-Tagged frames received on this port will be accepted. This attribute does not affect VLAN-independent Bridge Protocol Data Unit (BPDU) frames, such as MVRP or Spanning Tree Protocol (STP). However, it does affect VLAN-dependent BPDU frames, such as MMRP.
CLI Attribute Name	admit
SNMP Object ID	ieee8021QBridgePortAcceptableFrameTypes (1.3.111.2.802.1.1.4.1.4.5.1.2)
Value	**All** Admit all untagged and priority-tagged frames. **Untagged** Admit untagged frames only. **Tagged** Admit tagged frames only.
Access	RW
Default	All

Dependencies	If ingress filtering is enabled on the same port, then accepting untagged frames only is not compatible, since the combination effectively leads to discarding all frames on the port. (See *Section 5.4.2.4*.)

5.4.2.4 Bridge Port Ingress Filtering

Description	The ingress filtering state of the port. When Enabled, the device discards incoming frames for VLANs that do not include the port in its Member Set. When Disabled, the device accepts all incoming frames to the port.
CLI Attribute Name	filter
SNMP Object ID	ieee8021QBridgePortIngressFiltering (1.3.111.2.802.1.1.2.1.4.5.3)
Value	Enabled Disabled
Access	RW
Default	Disabled
Dependencies	If untagged frames are admitted on the port, then ingress filtering is not compatible, since the combination effectively leads to discarding all frames on the port. (See *Section 5.4.2.3*.)

5.5 VLAN Common

The VLAN Common object provides general information about VLAN bridges that are active in the network.

Use this object to query general attributes which are common to multiple VLANs.

5.5.1 VLAN Common Commands

5.5.1.1 Show

Display VLANs using the Show command:

```
show   vlan-common [{<comp-id-list> | all}
                   [{ info | version | max-vid | max-num | curr-num}]]
```

5.5.2 VLAN Common Attributes

5.5.2.1 Component ID

Description	The component identifier is used to distinguish between the multiple virtual bridge instances within a PB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021QBridgeComponentId 1.3.111.2.802.1.1.4.1.1.1.1.1
Value	<comp-id-list>
Access	N/A
Default	s1
Dependencies	Component identifiers must be defined in the Bridge Component table (See *Section* 5.3).

5.5.2.2 VLAN Version Number

Description	The version number of IEEE 802.1Q that this device supports.
CLI Attribute Name	version
SNMP Object ID	ieee8021QBridgeVlanVersionNumber (1.3.111.2.802.1.1.4.1.1.1.1.2)
Value	Varies
Access	RO
Default	version1
Dependencies	None

5.5.2.3 Maximum VLAN ID

Description	The maximum IEEE 802.1Q VLAN-ID that this device supports.
CLI Attribute Name	max-vid
SNMP Object ID	ieee8021QBridgeMaxVlanId (1.3.111.2.802.1.1.4.1.1.1.1.3)
Value	1..4094
Access	RO
Default	N/A
Dependencies	None

5.5.2.4 Maximum Number of VLANs

Description	The maximum number of IEEE 802.1Q VLANs that this device supports.
CLI Attribute Name	max-num
SNMP Object ID	ieee8021QBridgeMaxSupportedVlans (1.3.111.2.802.1.1.4.1.1.1.1.4)
Value	1..4094
Access	RO
Default	N/A
Dependencies	None

5.5.2.5 Current Number of VLANs

Description	The number of IEEE 802.1Q VLANs currently active on the network. This attribute is updated each time a VLAN is added or deleted from the network.
CLI Attribute Name	curr-num
SNMP Object ID	ieee8021QBridgeNumVlans (1.3.111.2.802.1.1.4.1.1.1.1.5)
Value	1..4094
Access	RO
Default	N/A
Dependencies	None

5.6 VLAN Table

The VLAN Table object enables the management of VLANs by the CLI. VLAN definitions are stored in a table containing static configuration information for each VLAN that is configured into the device by local or network management.

All VLAN Table entries are permanent and will be restored when the device is reset.

This object corresponds to SNMP object qBridgeVlanStaticGroup dot1qVlanStaticTable.

5.6.1 VLAN Table Commands

Note: The use of **<comp-id-list>** in VLAN Table CLI commands changes, depending on whether the FibeAir 70 Provider Bridge feature is enabled or disabled.

5.6.1.1 Set

Create and modify VLANs using the Set command.

When the Provider Bridge feature is **enabled**, use the following syntax:

```
set   vlan <comp-id-list> <vid-list>
            [fdb-id <fdb-id>]
            [egress <bridge-port-list>]
            [untagged <bridge-port-list>]
```

When the Provider Bridge feature is **disabled**, use the following syntax:

```
set   vlan <vid-list>
            [<comp-id-list>]
            [fdb-id <fdb-id>]
            [egress <bridge-port-list>]
            [untagged <bridge-port-list>]
```

5.6.1.2 Clear

Delete VLANs and clear their associated statistics using the Clear command.

When the Provider Bridge feature is **enabled**, use the following syntax:

```
clear vlan {<comp-id-list> | all} {<vid-list> | all}
                    [statistics]
```

When the Provider Bridge feature is **disabled**, use the following syntax:

```
clear vlan {<vid-list> | all}
                    [statistics]
```

- Before deleting a **C-VLAN**, verify that it is not being used as a key to the C-VLAN Registration Table. Do not delete the C-VLAN if such an entry exists.
- Before deleting an **S-VLAN**, verify that:
  - the S-VLAN is not being used as the key in the PEP Virtual Port Table (See *Section 5.8*) and S-VID Translation Table (See *Section 5.9*);
  - the S-VLAN is not being used as Relay S-VID in the S-VID Translation Table (See *Section 5.9*);
  - the S-VLAN is not defined in any entry of the C-VLAN Registration Table.

5.6.1.3 Show

Display VLANs using the Show command.

When the Provider Bridge feature is **enabled**, use the following syntax:

```
show vlan [{all | <component-id>}
           [{all | <vids>}
           [{info | statistics | fdb-id | egress | untagged}]]]]
```

When the Provider Bridge feature is **enabled**, use the following syntax:

```
show vlan
           [{all | <vids>}
           [{info | statistics | fdb-id | egress | untagged}]]]]
```

5.6.2 VLAN Table Attributes

5.6.2.1 Component Identifier

Description	The component identifier is used to distinguish between multiple virtual bridge instances within a PB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021QBridgeVlanStaticComponentId (1.3.111.2.802.1.1.4.1.4.3.1.1)
Value	<comp-id-list>
Access	N/A
Default	s1
Dependencies	Component identifiers must be defined in the Bridge Component table (See *Section* 5.3).

5.6.2.2 VLAN ID

Description	The VLAN-ID referring to this VLAN.
CLI Attribute Name	N/A
SNMP Object ID	Ieee8021QBridgeVlanStaticVlanIndex (1.3.111.2.802.1.1.4.1.4.3.1.2)
Value	<vid-list>
Access	N/A
Default	1
Dependencies	None.

5.6.2.3 Egress Ports Set

Description	The set of ports that are permanently assigned by management to the egress list for this VLAN.
CLI Attribute Name	egress
SNMP Object ID	ieee8021QBridgeVlanStaticEgressPorts (1.3.111.2.802.1.1.4.1.4.3.1.4)
Value	<bridge-port-list>
Access	RC
Default	Empty
Dependencies	Only those ports that belong to the corresponding component can be included in the set.

5.6.2.4 Untagged Ports Set

Description	The set of ports that should transmit egress packets for this VLAN as untagged. This set is allowed only for S-VLANs.
CLI Attribute Name	Untagged
SNMP Object ID	ieee8021QBridgeVlanStaticUntaggedPorts (1.3.111.2.802.1.1.4.1.4.3.1.4)
Value	<bridge-port-list>
Access	RC
Default	Empty
Dependencies	This set must be subset of the egress ports set (See *Section* 5.6.2.3).

5.6.2.5 FDB ID

Description	The ID of the filtering database used for this VLAN.
CLI Attribute Name	fdb-id
SNMP Object ID	ieee8021QBridgeVlanFdbId (1.3.111.2.802.1.1.4.1.4.2.1.4)
Value	1..64
Access	RC
Default	1
Dependencies	None

5.6.2.6 Per-VLAN Incoming Packets

Description	The number of valid frames received by this port from its segment that were classified as belonging to this VLAN. Note: A frame received on this port is counted by this object only if it is for a protocol being processed by the local forwarding process for this VLAN. This object includes received bridge management frames that are classified as belonging to this VLAN (*e.g.*, MMRP, but not MVRP or STP).
CLI Attribute Name	in-pkts
SNMP Object ID	ieee8021QBridgeTpVlanPortInFrames (1.3.111.2.802.1.1.4.1.4.6.1.1)
Value	0..264
Access	RO
Default	N/A
Dependencies	N/A

5.6.2.7 Per-VLAN Outgoing Packets

Description	The number of valid frames transmitted by this port to its segment from the local forwarding process for this VLAN. This object includes bridge management frames originated by this device that are classified as belonging to this VLAN (*e.g.*, MMRP, but not MVRP or STP).
CLI Attribute Name	out-pkts
SNMP Object ID	ieee8021QBridgeTpVlanPortOutFrames (1.3.111.2.802.1.1.4.1.4.6.1.2)
Value	0..264
Access	RO
Default	N/A
Dependencies	N/A

5.6.2.8 Per-VLAN Dropped Packets

Description	The number of valid frames received by this port from its segment that were classified as belonging to this VLAN and that were discarded due to VLAN-related reasons. This object refers specifically to the IEEE 802.1Q counters for Discard Inbound and Discard on Ingress Filtering.
CLI Attribute Name	drop-pkts
SNMP Object ID	ieee8021QBridgeTpVlanPortInDiscards (1.3.111.2.802.1.1.4.1.4.6.1.3)
Value	0..264
Access	RO
Default	N/A
Dependencies	N/A

5.6.3 VLAN-to-SNMP ifTable Attributes

Whenever a VLAN is associated with Component c1, an entry in the SNMP ifTable is automatically created for that VLAN. When the VLAN is deleted, the corresponding ifTable entry is also deleted.

The following attributes are contained in the SNMP ifTable.

5.6.3.1 Description

Description	A textual string containing information about the interface. This string should include the name of the manufacturer, the product name and the version of the interface hardware/software.
CLI Attribute Name	N/A
SNMP Object ID	ifDescr (1.3.6.1.2.1.2.2.1.2)
Value	ASCII representation of the VLAN ID
SNMP Access	RO

5.6.3.2 Type

Description	The type of interface. Additional values for ifType are assigned by the Internet Assigned Numbers Authority (IANA), through updating the syntax of the IANA ifType textual convention.
CLI Attribute Name	N/A
SNMP Object ID	ifType (1.3.6.1.2.1.2.2.1.3)
Value	l2vlan (135)
SNMP Access	RO

5.6.3.3 MTU Size

Description	The size of the largest packet which can be sent/received on the interface, specified in octets. For interfaces that are used for transmitting network datagrams, this is the size of the largest network datagram that can be sent on the interface.
CLI Attribute Name	N/A
SNMP Object ID	ifMtu (1.3.6.1.2.1.2.2.1.4)
Value	9216
SNMP Access	RO

5.6.3.4 MAC Address

Description	The interface's address at its protocol sub-layer.
CLI Attribute Name	N/A
SNMP Object ID	ifPhysAddress (1.3.6.1.2.1.2.2.1.6)
Value	The MAC address of the corresponding Eth.
SNMP Access	RO

5.6.3.5 Administrative Status

Description	The desired state of the interface.
CLI Attribute Name	N/A
SNMP Object ID	ifAdminStatus (1.3.6.1.2.1.2.2.1.7)
Value	Up (1)
SNMP Access	RW (Only a single value is allowed.)

5.6.3.6 Operational Status

Description	The current operational state of the interface. The Down state of ifOperStatus has two meanings, depending on the value of ifAdminStatus: • If ifAdminStatus is not Down and ifOperStatus is Down then a fault condition is presumed to exist on the interface. • If ifAdminStatus is Down, then ifOperStatus will normally also be Down *i.e.*, there is not (necessarily) a fault condition on the interface.
CLI Attribute Name	N/A
SNMP Object ID	ifOperStatus (1.3.6.1.2.1.2.2.1.8)
Value	Up (1) = Ready to pass packets
SNMP Access	RO

5.6.3.7 Last Change Time

Description	The value of sysUpTime at the time the interface entered its current operational state. If the current state was entered prior to the last reinitialization of the local network management subsystem, then this object contains a zero value. Note:
CLI Attribute Name	lastchange
SNMP Object ID	ifLastChange (1.3.6.1.2.1.2.2.1.9)
Value	0
SNMP Access	RO

5.6.3.8 Name

Description	The textual name of the interface.
CLI Attribute Name	N/A
SNMP Object ID	ifName (1.3.6.1.2.1.31.1.1.1.1)
Value	ASCII representation of the VLAN ID
SNMP Access	RO

5.6.3.9 State Trap

Description	Indicates whether linkUp/linkDown traps should be generated for this interface.
CLI Attribute Name	N/A
SNMP Object ID	ifLinkDownTrapEnable (1.3.6.1.2.1.31.1.1.1.14)
Value	Disabled (2)
SNMP Access	RW (Only a single value is allowed.)

5.6.3.10 High Speed Indication

Description	An estimate of the interface's current bandwidth in units of 1,000,000 bits per second.
CLI Attribute Name	N/A
SNMP Object ID	ifHighSpeed (1.3.6.1.2.1.31.1.1.1.15)
Value	1000
SNMP Access	RO

5.6.3.11 Promiscuous Mode

Description	This object has a value of False (2) if this interface only accepts packets/frames that are addressed to this station. This object has a value of True (1) when the station accepts all packets/frames transmitted on the media.
CLI Attribute Name	N/A
SNMP Object ID	ifPromiscuousMode (1.3.6.1.2.1.31.1.1.1.16)
Value	False (0)
SNMP Access	RO

5.6.3.12 Connector

Description	This object has the value True (1) if the interface sublayer has a physical connector. Otherwise, this object has the value False(2).
CLI Attribute Name	N/A
SNMP Object ID	ifConnectorPresent (1.3.6.1.2.1.31.1.1.1.17)
Value	False (2)
SNMP Access	RO

5.6.3.13 Alias

Description	This object is an 'alias' name for the interface as specified by a network manager, and provides a non-volatile 'handle' for the interface.
CLI Attribute Name	N/A
SNMP Object ID	ifAlias (1.3.6.1.2.1.31.1.1.1.18)
Value	Zero-length string
SNMP Access	RW

5.7 C-VLAN Registration

An element of the C-VID registration table accessed by PB C-VLAN component, Customer Edge Port bridge port number, and C-VID. Each element contains the mapping between a C-VID and the S-VID which carries the service and booleans for handling untagged frames at the PEP and CEP.

5.7.1 C-VLAN Registration Commands

5.7.1.1 Set

Create and modify C-VLAN Registration entries using the Set command:

```
set   cvlan-reg <c-comp-id-list> <ext-bridge-port-list> <vid-list>
              [svlan <vid>]
              [untag-cep yes | no]
              [untag-pep yes | no]
```

If the C-VLAN Registration entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that an attribute is not explicitly specified, the entry is created with the default value for that attribute.

If the C-VLAN Registration entry already exists, then the Set command will replace the attributes that are currently defined for the entry with those specified in the command.

Note the following conditions for execution:

- The Set command is valid only for bridge ports that are external C-component ports: host, eth0, eth1 and eth2.
- Creating a new C-VLAN Registration entry fails if the port specified belongs to a S-component and not a C-component.
- The Set command operation also fails if the C-VID specified is not yet defined in the VLAN Table.

5.7.1.2 Show

Display C-VLAN Registration entries using the Show command:

```
show   cvlan-reg [{<c-comp-id-list> | all}
              [{<ext-bridge-port-list> | all}
              [{<vid-list> | all} [{info | svlan | untag-cep
              | untag-pep}]]]]
```

5.7.1.3 Clear

Delete C-VLAN Registration entries using the Clear command:

```
clear  cvlan-reg {<c-comp-id-list> | all} {<ext-bridge-port-list>
              | all} {<vid-list> | all}
```

5.7.2 C-VLAN Registration Attributes

5.7.2.1 Bridge Port

Description	The bridge port for the C-VLAN Registration entry.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021BridgeBasePort (1.3.111.2.802.1.1.2.1.1.4.1.2)
Value	<ext-bridge-port-list>
Access	N/A
Default	N/A
Dependencies	The bridge port specified in the command must match the Component ID in the VLAN Table (See *Section 5.6*). For example, if the Component ID is c4 then the port must be external port 4).

5.7.2.2 C-VID

Description	The C-VID of this C-VLAN Registration entry.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021PbCVidRegistrationCVid (1.3.111.2.802.1.1.5.1.2.1.1)
Value	1..4094
Access	N/A
Default	N/A
Dependencies	The VID must be defined in the VLAN Table (See *Section 5.6*). The bridge component port specified in the command must match the Component ID in the VLAN Table. For example, if the Component ID is c4 then the port must be external4.

5.7.2.3 S-VID

Description	The S-VID of this C-VLAN Registration entry. This value will be added to the C-tagged frames of the C-VID. (See *Section 5.7.2.2*.)
CLI Attribute Name	svlan
SNMP Object ID	ieee8021PbCVidRegistrationSVid (1.3.111.2.802.1.1.5.1.2.1.2)
Value	1..4094
Access	RC
Default	N/A
Dependencies	The VID must be defined in the VLAN Table for an S-component (See *Section 5.6*).

5.7.2.4 Untagged CEP

Description	A flag indicating whether this C-VID should be carried untagged at the CEP.
CLI Attribute Name	untag-cep
SNMP Object ID	ieee8021PbCVidRegistrationUntaggedCep (1.3.111.2.802.1.1.5.1.2.1.4)
Value	Yes = The C-VID will be untagged No = The C-VID will be tagged
Access	RC
Default	No
Dependencies	None

5.7.2.5 Untagged PEP

Description	A flag indicating if this C-VID should be carried untagged at the PEP.
CLI Attribute Name	untag-pep
SNMP Object ID	ieee8021PbCVidRegistrationUntaggedPep (1.3.111.2.802.1.1.5.1.2.1.3)
Value	Yes = The C-VID will be untagged No = The C-VID will be tagged
Access	RC
Default	No
Dependencies	None

5.8 PEP Virtual Port

The PEP Virtual Port object specifies components of the PEP Table, which is used to configure ingress port filtering. PEP Table entries define traffic flows from the provider network to the customer edge port.

The table is indexed by ComponentID and S-VID.

The columns allow the default C-VID value and default User Priority to be specified and PEP's ingress filtering operation to be controlled.

5.8.1 PEP Virtual Port Commands

5.8.1.1 Set

Create and modify PEP Virtual Port elements using the Set command:

```
Set   pep-vp <c-comp-id-list> s1 <vid-list>
              [cpvid <vid>]
              [prio 0..7]
              [admit all | tagged | untagged]
              [filter enabled | disabled]
```

If the PEP Virtual Port entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that an attribute is not explicitly specified, the entry is created with the default value for that attribute.

If the PEP Virtual Port entry already exists, then the Set command will replace the attributes that are currently defined for the entry with those specified in the command.

Note the following conditions for execution:

- The Set command is valid only for those bridge ports which are S-component ports.
- Creating a new PEP Virtual Port entry fails if the port specified belongs to a S-component and not a C-component.
- The Set command operation also fails if the S-VID specified is not yet defined in the VLAN Table.

5.8.1.2 Show

Display PEP Virtual Port entries using the Show command:

```
show   pep-vp [{<c-comp-id-list> | all}
```

```
[{all | <bridge-port-list>}
[{all | <s-vid>}
[{info | cpvid | prio | admit | filter}]]]].
```

5.8.1.3 Clear

Delete PEP Virtual Port entries using the Clear command:

```
clear  pep-vp {<c-comp-id-list> | all} {s1 | all} {<vid-list>
| all}.
```

5.8.2 PEP Virtual Port Attributes

5.8.2.1 Bridge Port

Description	The bridge port for the PEP Virtual Port entry.
CLI Attribute Name	bridge-port
SNMP Object ID	ieee8021BridgeBasePort (1.3.111.2.802.1.1.2.1.1.4.1.2)
Value	s1
Access	N/A
Default	N/A
Dependencies	The Bridge Port specified in the command must be an internal port (PEP) that belongs to the corresponding C-component.

5.8.2.2 PEP S-VID

Description	The 12-bit S-VID that is associated with the PEP.
CLI Attribute Name	s-vid
SNMP Object ID	ieee8021PbEdgePortSVid (1.3.111.2.802.1.1.5.1.3.1.1)
Value	1..4094
Access	N/A
Default	N/A
Dependencies	The VID must be defined in the VLAN Table for an S-component (See *Section 5.6*).

5.8.2.3 PEP C-PVID

Description	The 12-bit C-VID that will be used for untagged frames received at the PEP
CLI Attribute Name	cpvid
SNMP Object ID	ieee8021PbEdgePortPVID (1.3.111.2.802.1.1.5.1.3.1.2)
Value	1..4094
Access	RC
Default	N/A
Dependencies	The VID must be defined in the VLAN Table for the port's C-component (See *Section 5.6*).

5.8.2.4 PEP Default User Priority

Description	An integer range 0-7 to be used for untagged frames received at the Provider Edge Port.
CLI Attribute Name	prio
SNMP Object ID	ieee8021PbEdgePortDefaultUserPriority (1.3.111.2.802.1.1.5.1.3.1.3)
Value	0..7
Access	RC
Default	None
Dependencies	None

5.8.2.5 PEP Acceptable Frame Types

Description	The frame types that will be accepted upon receipt at the PEP.
CLI Attribute Name	admit
SNMP Object ID	ieee8021PbEdgePortAcceptableFrameTypes (1.3.111.2.802.1.1.5.1.3.1.4)
Value	**All** Admit all untagged and priority-tagged frames. **Untagged** Admit untagged frames only. **Tagged** Admit tagged frames only.
Access	RC
Default	All
Dependencies	None

5.8.2.6 PEP Ingress Filtering

Description	The ingress filtering state of the PEP. When Enabled, the device discards incoming frames for VLANs that do not include the port in its Member Set. When Disabled, the device accepts all incoming frames to the port.
CLI Attribute Name	filter
SNMP Object ID	ieee8021PbEdgePortEnableIngressFiltering (1.3.111.2.802.1.1.5.1.3.1.5)
Value	Enabled Disabled
Access	RC
Default	Disabled
Dependencies	None

5.9 S-VID Translation Table

The S-VID Translation Table object is used to configure the VID Translation Table, which maintains a bi-directional mapping between a Local S-VID (used in data and protocol frames transmitted and received through a CNP or PNP) and a Relay S-VID (used by the filtering and forwarding process).

Each VID Translation Table definition contains Component, Port, Local S-VID values and the Relay S-VID values for each specified S-VID. If no entry exists in this table for a specified Component, Port and Local S-VID, then a substitute value will be used by looking at the Relay S-VID that is specified in a frame received on a Local S-VID Port.

All S-VID Translation Table entries are permanent and will be restored when the device is reset.

5.9.1 S-VID Translation Table Commands

5.9.1.1 Set

Create and modify S-VID Translation Table entries using the Set command:

```
set  svid-xlat s1 <ext-bridge-port-list> <vid> relay-svid <vid>
```

If the S-VID Translation Table entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that an attribute is not explicitly specified, the entry is created with the default value for that attribute.

If the S-VID Translation Table entry already exists, then the Set command will replace the attributes that are currently defined for the entry with those specified in the command.

Note the following conditions for execution:

- The Set command is valid only for bridge ports that are S-component ports.
- Creating a new S-VID Translation Table entry fails if the port specified belongs to a C-component and not a S-component.
- The Set command operation also fails if the S-VID specified is not yet defined in the VLAN Table.

5.9.1.2 Clear

Delete S-VID Translation Table entries and clear their associated statistics using the Clear command:

```
clear  svid-xlat {s1 | all} {<ext-bridge-port-list> | all} {<vid-list> |
all}
```

5.9.1.3 Show

Display S-VID Translation Table entries using the Show command:

```
show   svid-xlat [{s1 | all}

               [{<ext-bridge-port-list> | all}

               [{<vid-list> | all}

               [info]]]]
```

5.9.2 VID Translation Table Attributes

5.9.2.1 Bridge Port

Description	The bridge port for the VID Translation Table entry.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021BridgeBasePort (1.3.111.2.802.1.1.2.1.1.4.1.2)
Value	host, eth0, eth1, eth2
Access	N/A
Default	N/A
Dependencies	The Bridge Port specified in the command must belong to a corresponding S-component.

5.9.2.2 Local S-VID

Description	The internal S-VID on received (transmitted) at the ISS of a CNP or PNP.
CLI Attribute Name	local-svid
SNMP Object ID	ieee8021PbVidTranslationLocalVid (1.3.111.2.802.1.1.5.1.1.1.1)
Value	1..4094
Access	N/A
Default	N/A
Dependencies	The VID must be defined in the VLAN Table (See *Section 5.6*) and the Bridge Port specified in the command must belong to the S-component. Because VID translation is bidirectional, two entries cannot use the same Local S-VID for the same port. Figure 5-2 shows the bidirectional relationships for Local S-VID.

5.9.2.3 Relay S-VID

Description	The translated S-VID delivered (received) over the EISS from a CNP or PNP.
CLI Attribute Name	relay-svid
SNMP Object ID	ieee8021PbVidTranslationRelayVid (1.3.111.2.802.1.1.5.1.1.1.2)
Value	1..4094
Access	RC
Default	N/A
Dependencies	The VID must be defined in the VLAN Table (See *Section 5.6*) and the Bridge Port specified in the command must belong to the S-component. Because VID translation is bidirectional, two entries cannot use the same Relay S-VID for the same port. Figure 5-2 shows the bidirectional relationships for Relay S-VID.

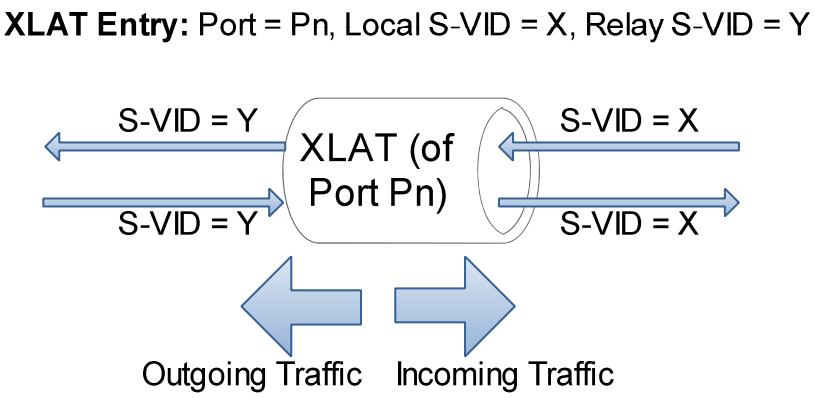


Figure 5-2 Bidirectional Definitions of S-VID Translation

5.10 Forwarding Data Base (FDB)

The FDB object enables access to general parameters of the FDB Address Table, which specifies configuration and control information for each Filtering Database currently operating on the device.

Entries in the FDB Address Table appear automatically when VLANs are assigned FDB IDs in the VLAN Table (See *Section 5.6*).

The system maintains 64 permanent instances of the FDB object.

This object corresponds to SNMP ieee8021QBridgeFdbTable object.

5.10.1 FDB Commands

5.10.1.1 Set

Create and modify FDB entries using the Set command:

```
set fdb s1 <fdb-id-list> [aging <aging-time>]
```

5.10.1.2 Show

Display FDB entries using the Show command:

```
show fdb     [s1
                              [<fdb-id-list>
                              [{aging | full-table-counter | num-of-dynamic}]]]
```

5.10.2 FDB Attributes

5.10.2.1 Bridge Component ID

Description	The component identifier is used to distinguish between the multiple virtual bridge instances within a PBB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021QBridgeFdbComponentId (1.3.111.2.802.1.1.2.1.2.1.1.1). It is an index to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	s1 (forced)
Access	N/A
Default	s1
Dependencies	In the current product version, the value of this object is equal to s1.

5.10.2.2 FDB ID

Description	The identity of this Forwarding Database. The system maintains 64 permanent instances of the FDB object.
CLI Attribute Name	fdb-id
SNMP Object ID	ieee8021QBridgeFdbId (1.3.111.2.802.1.1.2.1.2.1.1.2) It is an index to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	1..64
Access	N/A
Default	1
Dependencies	None

5.10.2.3 Aging Time

Description	The timeout period in seconds for aging out dynamically-learned forwarding information.
CLI Attribute Name	aging
SNMP Object ID	ieee8021QBridgeFdbAgingTime (1.3.111.2.802.1.1.2.1.2.1.1.5) It belongs to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	10..1000000
Access	RW
Default	172800
Dependencies	None

5.10.2.4 Learned Entry Discards

Description	The total number of Forwarding Database entries that have been or would have been learned, but have been discarded due to a lack of storage space in the Forwarding Database. When this counter is increasing, it indicates that the FDB is regularly becoming full, a condition which generally has adverse performance effects on the sub network. When this counter has a large value but is not currently increasing, it indicates that entry discards have been occurring but are not persistent. View the value of this object using the show command together with the **`statistics`** qualifier
CLI Attribute Name	full-table-counter
SNMP Object ID	ieee8021QBridgeFdbLearnedEntryDiscards (1.3.111.2.802.1.1.2.1.2.1.1.4) It belongs to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	Varies
Access	RO
Default	N/A
Dependencies	None

5.10.2.5 Dynamic Count

Description	The current number of dynamic entries in this Forwarding Database. The value of this object is incremented each time an entry is created or deleted View the value of this object using the show command together with the **`statistics`** qualifier
CLI Attribute Name	num-of-dynamic
SNMP Object ID	ieee8021QBridgeFdbDynamicCount (1.3.111.2.802.1.1.2.1.2.1.1.3) It belongs to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	Varies
Access	RO
Default	N/A
Dependencies	None

5.11 FDB Address Table

The FDB Address Table object contains information about unicast entries for which the device has forwarding and/or filtering information. This information is used by the transparent bridging function when determining how to propagate a received frame.

Entries in the FDB Address Table appear automatically when VLANs are assigned FDB IDs in the VLAN Table (See *Section 5.6*).

This object corresponds to SNMP ieee8021QBridgeTpFdbTable object.

5.11.1 FDB Address Table Commands

5.11.1.1 Set

Create and modify VLANs using the Set command:

```
set  fdb-table s1 <fdb-id-list> <mac-addr> port <bridge-port>
```

If the FDB Address Table entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that an attribute is not explicitly specified, the entry is created with the default value for that attribute.

If the FDB Address Table entry already exists, then the Set command will replace the attributes that are currently defined for the entry with those specified in the command.

Note that modifying an FDB Address Table entry will fail if its port already exists in the FDB with “self” as the assigned status.

5.11.1.2 Show

Display FDB Address Table entries using the Show command:

```
show  fdb-table
              [{s1 | all}
              [{<fdb-id-list> | all}
              [{<mac-addr> | all}
              [{info | port | status}]]]
```

5.11.1.3 Clear

Delete FDB Address Table entries and clear their associated statistics using the Clear command:

```
clear  fdb-table {s1 | all} {<fdb-id-list> | all} {<mac-addr>
              | all}
```

Note that deleting an FDB Address Table entry will fail if its port exists in the FDB with “self” as the assigned status.

5.11.2 FDB Address Table Attributes

5.11.2.1 Bridge Component ID

Description	The component identifier is used to distinguish between the multiple virtual bridge instances within a PBB.
CLI Attribute Name	N/A
SNMP Object ID	ieee8021QBridgeFdbComponentId (1.3.111.2.802.1.1.2.1.2.1.1.1) It is an index to ieee8021QBridgeTpFdbTable (1.3.111.2.802.1.1.4.1.2.2) and also to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	s1 (forced)
Access	N/A
Default	s1
Dependencies	In the current product version, the value of this object is equal to s1.

5.11.2.2 FDB ID

Description	The identity of this Forwarding Database. The system maintains 64 permanent instances of the FDB Address Table object.
CLI Attribute Name	fdb-id-list
SNMP Object ID	ieee8021QBridgeFdbId (1.3.111.2.802.1.1.2.1.2.1.1.2) It is an index to ieee8021QBridgeTpFdbTable (1.3.111.2.802.1.1.4.1.2.2) and also to ieee8021QBridgeFdbTable (1.3.111.2.802.1.1.2.1.2.1)
Value	1..64
Access	N/A
Default	1
Dependencies	None

5.11.2.3 FDB MAC Address

Description	The unicast MAC address for which the device has forwarding and/or filtering information.
CLI Attribute Name	addr
SNMP Object ID	ieee8021QBridgeTpFdbAddress (1.3.111.2.802.1.1.4.1.2.2.1.1) It is an index to ieee8021QBridgeTpFdbTable (1.3.111.2.802.1.1.4.1.2.2)
Value	NN-NN-NN-NN-NN-NN *where* NN is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	N/A
Default	N/A
Dependencies	None

5.11.2.4 FDB Port

Description	The bridge port from which the MAC address has been learned.
CLI Attribute Name	port
SNMP Object ID	ieee8021QBridgeTpFdbPort (1.3.111.2.802.1.1.4.1.2.2.1.2) It belongs to ieee8021QBridgeTpFdbTable (1.3.111.2.802.1.1.4.1.2.2)
Value	host, eth0, eth1, eth2, c1, c2, c3, c4, s1
Access	RC
Default	N/A
Dependencies	None

5.11.2.5 Address Entry Status

Description	The status of this FDB Address Table entry.	
CLI Attribute Name	status	
SNMP Object ID	ieee8021QBridgeTpFdbStatus (1.3.111.2.802.1.1.4.1.2.2.1.3) It belongs to ieee8021QBridgeTpFdbTable (1.3.111.2.802.1.1.4.1.2.2)	
Value	**Learned**	The port was learned and is being used.
	Self	The port indicates which of the device's ports has this address.
	Mgmt	The entry has been assigned by management.
Access	RO	
Default	N/A	
Dependencies	None	

5.12 IP

The IP object is a table that maintains addressing information relevant to an entity's interfaces. This table is used to describe the default routers known to the entity.

Currently, only one default route is supported.

This object corresponds to SNMP MIB object ipAddressGroup ipAddressTable (RFC-4293).

5.12.1 IP Commands

Note:

When DHCP is enabled, the configuration received from the network will override all manually-configured parameters.

5.12.1.1 Set

Create and modify VLANs using the Set command:

```
set  ip <ip-addr>
            [mask <mask>]
            [route <ip-addr>]
            [vlan <vid>]
            [dhcp {enable | disable}]
            [dhcp-client-id <host>]
            [dhcp-lease <time>]
            [dhcp-hostname <name>]
```

Up to four IP addresses can be specified on the command line.

If the IP entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that the interface address or the default router address is not explicitly specified, the entry is created with the default value that has been defined for the VLAN.

If the IP entry already exists, then the Set command will replace the attributes that are currently defined for the entry with the value that has been specified in the command.

A **`set`** operation will fail if the route specified is not within the subnet that has been defined by mask.

5.12.1.2 Show

Display IP entries using the Show command:

```
show   ip [<ip-addr> [{route | mask | vlan}]]
```

5.12.1.3 Clear

Delete IP entries and clear their associated statistics using the Clear command:

```
clear  ip <ip-mask>
```

5.12.2 IP Attributes

5.12.2.1 IP Index

CLI Only object

Description	The index to the IP addres table
SNMP Object ID	N/A
SNMP Syntax	N/A
Access	N/A
CLI Name	none
Value	1..4
CLI Commands	set ip <idx> ip-addr <ip address>

5.12.2.2 IP Address

Description	The IP address to which this entry's addressing information pertains. The address type of this object is specified in ipAddressAddrType.
SNMP Object ID	1.3.6.1.2.1.4.34.1.2 (ipAddressAddr)
SNMP Syntax	InetAddress
CLI Name	ip-addr
Value	ip address in the form X.X.X.X where X is a decimal number from 0 to 255 (for example 10.0.15.74)
Default	0.0.0.0
Access	RC
CLI Commands	set ip ip-addr <ip address>
Dependencies	All IP addresses in the table must be different.

5.12.2.3 IP Address Mask

Description	The subnet IP belongs to.
SNMP Object ID	N/A – not part of the MIB
CLI name	mask
Value	ip mask in the form X.X.X.X where X is a decimal number from 0 to 255 (for example 255.255.255.0)
Access	RC
Default	255.255.255.0
CLI Commands	set ip <idx> ip-addrd <ip-address> mask 255.255.255.0

5.12.2.4 IP Default Router Address

Description	The IP address of the default router represented by this row.
SNMP Object ID	1.3.6.1.2.1.4.37.1.2 (ipDefaultRouterAddress)
SNMP Syntax	InetAddress

CLI Syntax	ip address in the form X.X.X.X where X is a decimal number from 0 to 255 (for example 10.0.15.74)
Access	NA
Default	0.0.0.0
CLI Commands	set ip <idx> route <ip address>

5.12.2.5 VLAN

CLI Only object

Description	VLAN assigned to the IP.
SNMP Object ID	N/A
SNMP Name	N/A
Access	RC
CLI Name	vlan
Value	0..4094
Default	0
CLI Commands	set ip <idx> vlan <vlan>
Dependencies	Two different IP addresses can not be assigned the same VLAN (therefore all VIDs in the table must be different).

5.13 ARP

The ARP object is a translation table that is used for mapping between IP addresses and physical addresses.

This object corresponds to SNMP MIB object ipNetToPhysicalTable (RFC-4293).

5.13.1 ARP Commands

5.13.1.1 Set

Create and modify ARP entries using the Set command:

```
set  arp
            [ip-address <mac-address>]
```

If the ARP entry does not already exist, the Set command creates it and assigns the attributes specified. Upon creation, in the event that the interface address or the default router address is not explicitly specified, the entry is created with the default value that has been defined for the VLAN.

If the ARP entry already exists, then the Set command will replace the attributes that are currently defined for the entry with the value that has been specified in the command.

5.13.1.2 Show

Display ARP entries using the Show command:

```
show  arp [<ip-address>]
```

5.13.1.3 Clear

Delete ARP entries and clear their associated statistics using the Clear command:

```
clear  arp [<ip-address>]
```

5.13.2 ARP Attributes

5.13.2.1 ARP Interface

Description	The index value that uniquely identifies the interface for this entry. The interface identified here is identical to that of the MIB's ifIndex.
CLI Attribute Name	interface
SNMP Object ID	ipNetToPhysicalIfIndex (1.3.6.1.2.1.4.35.1.1)
Value	1..4
Access	NA
Default	1
Dependencies	None

5.13.2.2 ARP IP Address

Description	The IP Address that corresponds to the media-dependent physical address.
CLI Attribute Name	
SNMP Object ID	ipNetToPhysicalNetAddress (1.3.6.1.2.1.4.35.1.3)
Value	X.X.X.X *where* X is a decimal number from 0 to 255 (for example 10.0.15.74)
Access	RC
Default	None
Dependencies	None

5.13.2.3 ARP MAC Address

Description	The media-dependent physical address.
CLI Attribute Name	mac-addr
SNMP Object ID	ipNetToPhysicalPhysAddress (1.3.6.1.2.1.4.35.1.4)
Value	NN-NN-NN-NN-NN-NN *where* NN is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	RC
Default	None
Dependencies	None

5.14 RF

The RF object corresponds to definitions in the private Ceragon SNMP MIB (1.3.6.1.4.1.31926.1).

5.14.1 RF Commands

5.14.1.1 Set

Create and modify RF device characteristics using the Set command:

```
set  rf
             [num-of-channels 1..2]
             [frequency 0 | 50000..80000]
             [role master | slave]
             [mode adaptive | static <mod> <scnum> <rep> <fec> | alignment]
             [rx-ber-test  disable | enable]
             [tx-ber-test  disable | enable]
             [rx-link-id <int>]
             [tx-link-id <int>]
             [cinr-low -127..127]
             [cinr-interval 0..2000]
             [rssi-interval 0..2000]
```

5.14.1.2 Show

Display RF device characteristics using the Show command:

```
show   rf {info | operational | tx-state | rx-state | cinr | rssi
             | num-of-channels | channel-width | frequency | role | mode
             | rx-ber-test | tx-ber-test | rx-link-id | tx-link-id | cinr-low
             | cinr-interval | rssi-interval | rf-temperature | statistics}
```

5.14.1.3 Clear

Delete RF device statistics using the Clear command:

```
clear  rf statistics
```

5.14.2 RF Attributes

5.14.2.1 Number of Channels

Description	The maximum allowed bandwidth, expressed in MHz.
CLI Attribute Name	num-of-channels
SNMP Object ID	rfNumOfChannels (1.3.6.1.4.1.31926.2.1.1.2)
Value	1..2
Access	RW
Default	2
Dependencies	None

5.14.2.2 Channel Width

Description	The channel width, expressed in MHz.
CLI Attribute Name	channel-width
SNMP Object ID	rfChannelWidth (1.3.6.1.4.1.31926.2.1.1.3)
Value	250
Access	RO
Default	N/A
Dependencies	None

5.14.2.3 Operational Frequency

Description	The frequency at which the RF operates, expressed in MHz.
CLI Attribute Name	frequency
SNMP Object ID	rfOperationalFrequency (1.3.6.1.4.1.31926.2.1.1.4)
Value	50000..80000
Access	RW
Default	74000
Dependencies	None

5.14.2.4 Role

Description	The current role of the RF device.
CLI Attribute Name	role
SNMP Object ID	rfRole (1.3.6.1.4.1.31926.2.1.1.5)
Value	master, slave
Access	RW
Default	master

Dependencies	None

5.14.2.5 Mode Selector

Description	Specifies the current RF device operating mode. The available modes are: adaptive, static or alignment.
CLI Attribute Name	mode
SNMP Object ID	rfModeSelector (1.3.6.1.4.1.31926.2.1.1.6)
Value	adaptive, static, alignment

When **`static`** mode is specified, the following sub-parameters are used to define additional relevant operating characteristics:

Argument	Description	Values	SNMP Reference
modu	Modulation	QPSK, QAM16, QAM64	rfModulationType (1.3.6.1.4.1.31926.2.1.1.7)
num-subch	Number of subchannels	1..4	rfNumOfSubchannels (1.3.6.1.4.1.31926.2.1.1.8)
repete	Repetitions	1, 2, 4	rfNumOfRepetitions (1.3.6.1.4.1.31926.2.1.1.9)
fec	FEC rate	0.5, 0.67, 0.8	rfFecRate (1.3.6.1.4.1.31926.2.1.1.10)

Access	RW
Default	Adaptive
Dependencies	When **`static`** mode is specified, only certain sub-parameter combinations will produce a valid result. When an invalid combination is specified on the command line, the CLI will respond with: 'the modulation does not exist in the modulation table'.

5.14.2.6 CINR Low

Description	The lowest acceptable value for CINR, expressed in decibels (dB).
CLI Attribute Name	cinr-low
SNMP Object ID	rfCinrLow (1.3.6.1.4.1.31926.2.1.1.13)
Value	-128..127
Access	RW
Default	0
Dependencies	None

5.14.2.7 CINR Interval

Description	The interval used to determine the value for CINR, expressed in milliseconds.
CLI Attribute Name	cinr-interval
SNMP Object ID	rfCinrInterval (1.3.6.1.4.1.31926.2.1.1.15)
Value	0..2000
Access	RW
Default	0
Dependencies	None

5.14.2.8 RSSI Interval

Description	The interval used to determine the value for RSSI, expressed in milliseconds.
CLI Attribute Name	rssi-interval
SNMP Object ID	rfRssiInterval(1.3.6.1.4.1.31926.2.1.1.16)
Value	0..2000
Access	RW
Default	0
Dependencies	None

5.14.2.9 RX Link ID

Description	An integer that specifies the RF receive link ID.
CLI Attribute Name	rx-link-id
SNMP Object ID	rfRxLinkId (1.3.6.1.4.1.31926.2.1.1.22)
Value	Varies
Access	RW
Default	0
Dependencies	None

5.14.2.10 TX Link ID

Description	An integer that specifies the RF transmit link ID.
CLI Attribute Name	tx-link-id
SNMP Object ID	rfTxLinkId (1.3.6.1.4.1.31926.2.1.1.23)
Value	Varies
Access	RW
Default	0

Dependencies	None

5.14.2.11 RX State

Description	An integer that specifies the current state of the RF receive link.
CLI Attribute Name	rx-state
SNMP Object ID	rfRxState (1.3.6.1.4.1.31926.2.1.1.25)
Value	1 = Sync
	2 = Search countdown
	3 = Found countdown
	4 = Normal
Access	RO
Default	N/A
Dependencies	None

5.14.2.12 TX State

Description	An integer that specifies the current state of the RF transmit link.
CLI Attribute Name	tx-state
SNMP Object ID	rfTxState (1.3.6.1.4.1.31926.2.1.1.24)
Value	1 = Sync
	2 = Search countdown
	3 = Found countdown
	4 = Normal
Access	RO
Default	N/A
Dependencies	None

5.14.2.13 Operational State

Description	The current operating state of the RF device.
CLI Attribute Name	operational
SNMP Object ID	rfOperationalState (1.3.6.1.4.1.31926.2.1.1.17)
Value	up, down
Access	RO
Default	N/A
Dependencies	None

5.14.2.14 Average CINR

This object is accessible via SNMP Only

Description	Average carrier to interference noise ratio [-6..30]
SNMP Object ID	rfAverageCinr (1.3.6.1.4.1.31926.2.1.1.18)
SNMP Syntax	integer
Access	RO

5.14.2.15 Average RSSI

This object is accessible via SNMP Only

Description	Average received signal strength indication, measured in DB. [-100..-60]
SNMP Object ID	rfAverageRssi (1.3.6.1.4.1.31926.2.1.1.19)
SNMP Syntax	integer
Access	RO

5.14.2.16 RF Temperature

Description	The current temperature of the RF device.
CLI Attribute Name	rf-temperature
SNMP Object ID	rfTemperature (1.3.6.1.4.1.31926.2.1.1.26)
Value	Varies
Access	RO
Default	N/A
Dependencies	None

5.14.2.17 Transmit Asymmetry

Description	Percentage of the TX part in the airframe.
SNMP Object ID	TBD
CLI Attribute Name	tx-asymmetry
SNMP Syntax	integer
CLI Syntax	{25tx-75rx | 50tx-50rx | 75tx-25rx}
Access	RW
Default Value	50tx-50rx

5.14.2.18 Lowest Modulation

Dropping below the Lowest Mode causes RF link failure.

Wherein:

mod	Modulation type. {QPSK, QAM16, QAM64}
scnum	The number of subchannels [1..4]
rep	Repetition {1, 2, 4}
fec	FEC {0.5, 0.67, 0.8}
frame	The frame number to be used for the execution of the new modulation (only in static mode)

The mode must be present in the Modulation Table

5.14.2.19 Encryption

Description	RF Encryption Mode.
SNMP Object ID	TBD
Syntax	{disabled | static-key}
Access	RW
Default	disabled
Dependencies	Visible only to admin user (?).

5.14.2.20 Static Key

Description	Static Key. This is the only key (this is to say the current key and next key are always the same and equal to this configured key.
SNMP Object ID	TBD
Syntax	string of 32 hexadecimal digits
Access	RW
Default	92E3C28020570998E74B 41C06A58BB40
Dependencies	Takes effect only if the encryption attribute is set to *static-key*. Visible only to admin user (?).

5.14.2.21 RF Statistics

The RF Statistics object correspond to the RF Statistics Table (1.3.6.1.4.1.31926.2.2).

The current CLI version displays all RF object statistics together in response to the following command:

```
show  rf statistics
```

Table 5-2 summarizes and describes all RF object statistics.

Table 5-2 Statistics for the RF Object

	CLI Name	***Description***	***SNMP Object ID***
Incoming Octets	in-octets	The total number of octets received from the RF link.	rfInOctets (1.3.6.1.4.1.31926.2.2.1.1)
Incoming Idle Octets	in-idle-octets	The total number of octets received from the RF link while idle.	rfInIdleOctets (1.3.6.1.4.1.31926.2.2.1.2)
Incoming Good Octets	in-good-octets	The number of good octets received from the RF link.	rfInGoodOctets (1.3.6.1.4.1.31926.2.2.1.3)
Incoming Erroneous Octets	in-errored-octets	The number of received erred octets from the RF link.	rfInErroredOctets (1.3.6.1.4.1.31926.2.2.1.4)
Outgoing Octets	out-octets	The total number of octets transmitted to the RF link.	rfOutOctets (1.3.6.1.4.1.31926.2.2.1.5)
Outgoing Idle Octets	out-idle-octets	The total number of octets transmitted to the RF link while idle.	rfOutIdleOctets (1.3.6.1.4.1.31926.2.2.1.6)
Incoming Packets	in-pkts	The total number of packets received from the RF link.	rfInPkts (1.3.6.1.4.1.31926.2.2.1.7)
Incoming Good Packets	in-good-pkts	The total number of good packets received from the RF link.	rfInGoodPkts (1.3.6.1.4.1.31926.2.2.1.8)
Incoming Erroneous Packets	in-errored-pkts	The total number of erred packets received from the RF link.	rfInErroredPkts (1.3.6.1.4.1.31926.2.2.1.9)
Incoming Lost Packets	in-lost-pkts	The total number of lost packets received from the RF link.	rfInLostPkts (1.3.6.1.4.1.31926.2.2.1.10)
Outgoing Packets	out-pkts	The total number of packets transmitted to the RF link.	rfOutPkts (1.3.6.1.4.1.31926.2.2.1.11)

5.14.2.22 RF Statistics History

Table 5-3 lists the index pointers to the statistics history of the RF object.

Table 5-3 Statistics History for the RF Object

usrHistoryObjectIndex	usrHistoryObjectVariable
1	rfInOctets (1.3.6.1.4.1.31926.2.2.1.1)
2	rfInIdleOctets (1.3.6.1.4.1.31926.2.2.1.2)
3	rfInGoodOctets (1.3.6.1.4.1.31926.2.2.1.3)
4	rfInErroredOctets (1.3.6.1.4.1.31926.2.2.1.4)
5	rfOutOctets (1.3.6.1.4.1.31926.2.2.1.5)
6	rfOutIdleOctets (1.3.6.1.4.1.31926.2.2.1.6)
7	rfInPkts (1.3.6.1.4.1.31926.2.2.1.7)
8	rfInGoodPkts (1.3.6.1.4.1.31926.2.2.1.8)
9	rfInErroredPkts (1.3.6.1.4.1.31926.2.2.1.9)
10	rfInLostPkts (1.3.6.1.4.1.31926.2.2.1.10)
11	rfOutPkts (1.3.6.1.4.1.31926.2.2.1.11)

6 Performing Advanced CLI Operations

This chapter describes the advanced use of the FibeAir 70 Command Line Interface (CLI) client. Prior to performing operations that are described here, it is recommended that the User be completely familiar with basic FibeAir 70 CLI commands and object operations.

Topics covered here include:

- Using Configuration Files
- Performing Software Upgrades
- Using Scripts
- Performing System Rollbacks
- Performing SNMP Operations
- Setting Modulation
- Viewing Events and Logs

Hint:

This chapter provides information and procedures on **advanced** FibeAir 70 CLI operations. For more **basic** operations, see *Chapter* **Error! Reference source not found.**.

6.1 Configuration Files

The FibeAir 70 System supports the use of stored network configurations. Generally, a stored configuration is automatically loaded on System startup or following a System reset.

6.1.1 Saving Configurations

A stored configuration is created by saving the currently active (running) configuration as the default configuration.

Note:

The running configuration FibeAir 70 is not automatically saved in non-volatile RAM.

Should a System reset occur before a particular configuration is saved, the FibeAir 70 will perform a startup using the current stored configuration, or if none exists, the factory default configuration.

To save the running configuration, a specific, privileged command is issued:

```
FA-70>copy running-configuration startup-configuration

running-configuration copied to startup-configuration
```

6.1.2 Viewing Configurations

It is possible to display either the running or the default FibeAir 70 network configuration with the following command:

```
FA-70>copy running-configuration display

FA-70>copy startup-configuration display
```

6.1.3 Removing the Startup Configuration

A startup configuration can be cleared by issuing the **`clear startup-configuration`** privileged command:

```
FA-70>clear startup-configuration

running-configuration cleared
```

After this command is executed, on the subsequent startup the FibeAir 70 System will revert to the hard-coded factory default parameters.

6.2 Rollback Operations

The FibeAir 70 system supports rolling back of network configurations.

A rollback is a safety measure to prevent unwanted System changes in the event that a loss of communication occurs while performing configuration activities. The Rollback timeout function reloads the saved startup configuration in the event that no command is entered within a predefined timeout period.

A Rollback timeout is especially recommended when configuring remote elements that are being managed over the link.

6.2.1 Rollback Commands

6.2.1.1 Setting Rollback Timeout

To specify the System rollback timeout period, use the following command:

```
set rollback timeout <duration-in-seconds>
```

When Rollback is used, a timer will run (and will restart) whenever a CLI command is entered. In the event that no CLI command is entered within the timeout period (*i.e.,* the timeout duration is reached), the System automatically resets and wakes up with the saved startup configuration.

Note that the rollback timer resets to zero after each new CLI command. The rollback timer expires when it reaches the value specified by **`<duration-in-seconds>`**.

To cancel a rollback, use the **`clear rollback`** command.

6.2.1.2 Clearing Rollback Timeout

To remove the System rollback timeout period, use the following command:

```
clear rollback
```

Issuing this command cancels the rollback function. This means that the System will not automatically roll back to any previous configuration.

The **`clear rollback`** command may be entered at any time before the end of a rollback timeout period in order to cancel a rollback timeout.

6.2.1.3 Showing Rollback Timeout

Display the System rollback timeout period using the Show command:

```
show rollback [{info | timeout}]
```

In response, the System will display the requested rollback values.

6.3 Software Upgrade

The FibeAir 70 system supports switching in real time between two distinct software versions. Because the System simultaneously maintains both an Active, running software version and a Standby, passive software version, an upgrade can be performed with minimal interruption of service.

Flash Banks and Software Images

Figure 6-1 shows the relationship between flash banks and software images in the FibeAir 70 system.

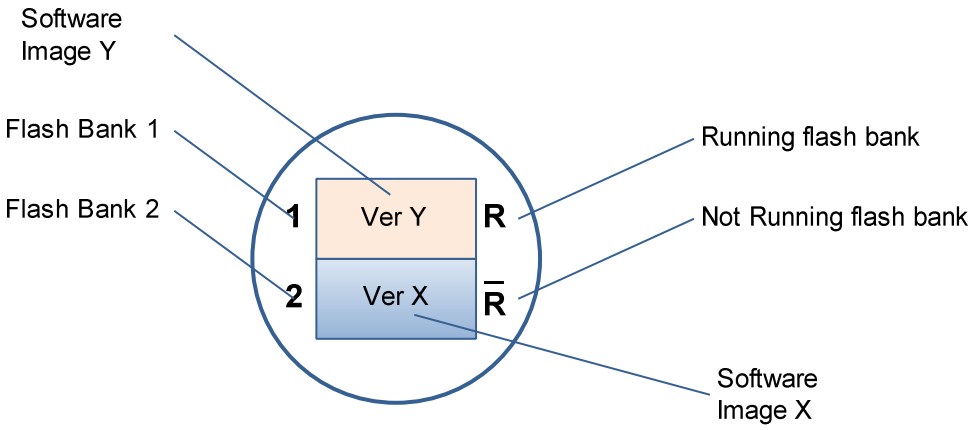


Figure 6-1 Flash Banks and Software Images

6.3.1 Software Upgrade Commands

6.3.1.1 Show Software Versions

Display the software versions using the Show command:

```
show sw
```

The command shows both Active and Standby software versions stored in the flash banks, as in the following example:

```
Flash Bank    Version                          Running     Scheduled to run

1             0.2.1.0 2010-05-18 15:58:13      yes         no

2             0.2.0.1865 2010-05-20 14:59:57   no          no
```

The software version is followed by the creation date and time of the version. The first digit of the version number represents the major version number, the second digit represents the minor version number, the third digit represents the SVN revision, and the fourth digit represents the version build number.

6.3.1.2 Copy a Software Version to the System

Copy a specified software version to the FibeAir 70 system using the Copy command:

```
copy  sw <from-url>
```

The command downloads the software version image from the specified URL and copies it to the Standby (not running) flash bank.

6.3.1.3 Activating a Software Version

Run a specified software version on the FibeAir 70 system using the Run command:

```
run sw      {immediate | next-rst}

                  {<accept-timeout-sec> | no-timeout}
```

Upon execution, the command causes the System to be reset and then wake up with the software version image that is stored on the Standby flash bank.

- If **immediate** is specified as the first parameter on the command line, then a Reset is performed immediately. This is the default value.
- If **next-rst** is specified as the first parameter on the command line, then the next System Reset that occurs (for whatever reason) will cause the System to wake up with the software version stored in the Standby flash bank.
- If **<accept-timeout-sec>** is specified as the second parameter on the command line, then this duration in seconds is used as the safety timeout period in order to manually enter the command **accept sw**. If **no-timeout** is specified as the second parameter on the command line, then the command **accept sw** is not expected and the Standby software version automatically becomes the Active software version.

6.3.1.4 Accepting the Software Image

Running a new software version can be controlled using the Accept command:

```
accept sw
```

If the System wakes up with a software version stored in the Standby flash bank, then this command turns the Standby (not running) version into the Active (running) version.

If no **`accept sw`** is entered before the **`accept-timeout-sec`** period ends (See *Section 6.3.1.3*), then the System will Reset and wake up with software version image that is stored in the Active flash bank. Effectively, this means that the software version rolls back. Note that such a rollback will also be performed if a Reset occurs (for whatever reason) before the **`accept sw`** command is entered.

6.4 Ceragon File System (CFS)

FibeAir 70 supports the use of pre-composed, multiple-line command scripts. A script is simply a list of CLI commands saved in a text file.

6.4.1 Understanding CFS

With CFS, all files can be listed and classified (binary, text file, and so on), including files on remote servers.

CFS minimizes the required prompting for many commands, such as the copy CLI command. A user can enter all of the required information in the command line, rather than needing to provide information when the system prompts the user for it. For example, if the user wants to copy a file to an FTP server, on a single line she can specify the specific location on the device of the source file, the specific location of the destination file on the FTP server, and the username and password to use when connecting to the FTP server. However, the user can still enter the minimal form of the command.

With CFS, a user can navigate to different directories and list the files in a directory.

6.4.2 Specifying Files Using URLs

6.4.2.1 Specifying Files on Network Servers

To specify a file on a network server, use one of the following forms:

ftp://username:password@Location/subdirectory/filename

The *location* can be an IP address or a host name.

The file path (directory and filename) is specified relative to the directory used for file transfers. For example, on UNIX file servers, FTP paths start in the home directory associated with the username.

The following example specifies the file named mill-config on the server named enterprise.Ceragon.com. The device uses the username liberty and the password secret to access this server via FTP.

Since, currently there is no DNS; the location is specified as IP Address in the dotted notation.

ftp://liberty:secret@127.23.46.17/mill-config

6.4.2.2 Specifying Local Files

Use the ***[prefix:[directory/]]filename*** syntax to specify a file located on the device specified by prefix. For example, ***flash:backup-config*** specifies the file named backup-config in the configs directory of Flash memory. Some devices do not support directories.

6.4.2.3 Supported Storage Devices

The list of currently supported file storage devices appear below.

Device identification	**Description**
ftp:	FTP server (external server)
flash:	Local flash memory (linux shell /var/Ceragon/etc).
eprom	RF module ROM. No directories.

/scripts directory resides under flash (flash:scripts).

6.4.3 File System Commands

6.4.3.1 Command List

Command	**Purpose**
dir <device:>	lists files stored at the device; works only for flash and eprom; available to all types of users.
copy <from-url> <to-url>	copy file; root, admin and super are allowed to copy from any device to any device; tech and user are allowed to copy files from the local devices (namely: flash, ram, eprom) to the network devices (namely ftp) but not vice versa; they are not allowed to copy files between the local devices;

Command	Purpose
del <url>	works only for flash; available only for root, admin and super;

6.4.3.2 Displaying the List of Stored Files

The command dir displays the list of the stored files in the form of table:

<Num> <Size> <date> < time> <name>

Wherein:

Mnemonic	Description
Num	The sequential number
size	File size in bytes
date	Storage date
time	Storage time
name	File name

6.4.4 Examples

Copying file demo.txt from ftp server (server's IP address – 192.168.0.100, username – srv; password – admin):

```
FA-70>copy ftp://srv:admin@192.168.0.100/demo.txt flash:demo.txt

…

finished
```

Copying file demo.txt from flash to server (home directory):

```
FA-70>copy flash:demo.txt ftp://srv:admin@192.168.0.100/demo.txt

…

finished
```

Viewing the files at the flash:

```
FA-70>dir flash:


Num      Size  Date       Time      Name

----------------------------------------

 1         2  02.03.2011 14:59:32  demo.txt

 2      1035  23.02.2011 09:35:11  finallog

 3      6122  24.02.2011 11:06:32  rf.ini

 4         8  12.02.2011 21:20:43  rftype_cfg

 5      5613  02.03.2011 08:51:19  startup-configuration.txt

 6       566  02.03.2011 08:51:19  startup-debug-configuration.txt

 7      5688  02.03.2011 16:51:45  scripts/clear_statistics

 8      2121  25.02.2011 08:50:24  scripts/qos-dscp

 9      2117  24.02.2011 21:07:14  scripts/qos-pcp

 10      2078  13.03.2011 09:42:39  scripts/qos-vid

 11      5688  02.03.2011 16:51:45  scripts/clear_statistics

 12       373  21.03.2011 17:29:05  scripts/system_info
```

6.5 Command Line Scripts

FibeAir 70 supports the use of pre-composed, multiple-line command scripts. A script is simply a list of CLI commands saved in a text file.

6.5.1 Showing Scripts

Display scripts using the Show command. In response, the names of all script files stored in the local directory are displayed.

```
FA-70>show script

Clear_statistics

qos-dscp

qos-pcp

qos-vid

system_info
```

To view script content – refer to 8.5.4.

6.5.2 Running Scripts

Execute scripts using the Run command:

```
run script <script-filename>
```

In response, the System will execute the script filename that is specified.

The System can use an auto completion mechanism to search in the local directory for script files. Entering a search string, followed by a <tab> after the **`run script`** command invokes auto complete.

6.5.3 Adding Scripts

To add a script to the ODU, edit it in a text file. The script should consist valid CLI commands. Use # at the beginning of a remark line.

For example (DemoScript.txt):

 # Demo Script

 # This script sets the ODU to static mode, saves the configuration and reset the system.

set rf mode static qpsk 4 1 0.5

copy running-configuration startup-configuration

reset system

To add the script text file to the ODU use ftp server and transfer the file to the scripts directory under flash (flash:scripts) using the Ceragon File System commands:

```
FA-70>copy ftp://srv:admin@192.168.0.100/DemoScript.txt flash:scripts/DemoScript.txt

…

finished
```

6.5.4 Viewing Scripts Content

Scripts content cannot be viewed directly from the CLI. To view the content of a script, transfer it to the server and view it with text editor.

```
FA-70>copy flash:scripts/DemoScript.txt ftp://srv:admin@192.168.0.100/ DemoScript.txt

…

finished
```

6.5.5 Deleting Scripts

Delete scripts from *flash:scripts* using the Del command:

```
FA-70>del flash:scripts/DemoScript.txt
```

6.6 System Event and Alarm Handling

The FibeAir 70 system supports logging history of standard network events and alarms.

Hint:

For detailed definitions of System Events and Alarms, and instructions on how to use them in diagnosing FibeAir 70 system problems, see *Section 7.4.*

6.6.1 Event and Alarm Commands

6.6.1.1 Showing Alarms

Display all active System alarms using the Show command:

```
show alarms
```

In response, all logged active alarms are displayed, along with the date and time of their occurrence:

```
2010.7.10      9:45:21 temperature high

2010.7.10      9:50:13 link down eth0
```

6.6.1.2 Showing Logs

Display all System logs using the Show command:

```
show log
```

In response, all log strings are displayed, along with the date and time of their generation. System logs include alarms as well as routing changes in System operating status.

```
2010.7.10      9:35:11 temperature high

2010.7.10      9:36:13 link down eth0

2010.7.10      9:36:49 link up eth0

2010.7.10      9:40:04 temperature normal

2010.7.10      9:45:21 temperature high

2010.7.10      9:50:13 link down eth0
```

Clear all System logs using the Clear command:

```
clear log
```

In response, all active System logs are cleared.

6.7 Physical Inventory

The FibeAir 70 objects described here correspond to the Entity MIB defined in RFC 4133.
The tables implemented are: entPhysicalTable (1.3.6.1.2.1.47.1.1.1)

6.7.1 Physical Inventory Commands

6.7.1.1 Show

Display the System physical inventory using the Show command:

```
show   inventory [{<ph-idx-range> | all}
               [{desc | cont-in | class | rel-pos | name | hw-rev
               | fw-rev | sw-rev | serial | mfg-name | model-name | fru
               | last-change | info}]]
```

In response, the System will display the requested inventory values.

6.7.2 Physical Inventory Attributes

6.7.2.1 Inventory Index

Description	The index for the table entry.
CLI Attribute Name	none.
SNMP Object ID	entPhysicalIndex (1.3.6.1.2.1.47.1.1.1.1.1)
SNMP Syntax	integer32 (1..2147483647)
CLI Syntax	integer
Access	N/A (index)
CLI Commands	show inventory <ph-idx-range> <any parameter> set inventory <ph-idx> <any parameter>

6.7.2.2 Physical Descriptor

Description	A textual description of physical entity. This object should contain a string that identifies the manufacturer's name for the physical entity, and should be set to a distinct value for each version or model of the physical entity.
CLI Attribute Name	desc.
SNMP Object ID	entPhysicalDescr (1.3.6.1.2.1.47.1.1.1.1.2)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> desc

6.7.2.3 Contained In

Description	The value of entPhysicalIndex for the physical entity which 'contains' this physical entity. A value of zero indicates this physical entity is not contained in any other physical entity. Note that the set of 'containment' relationships define a strict hierarchy; that is, recursion is not allowed. In the event that a physical entity is contained by more than one physical entity (e.g., double-wide modules), this object should identify the containing entity with the lowest value of entPhysicalIndex.
CLI Attribute Name	cont-in
SNMP Object ID	entPhysicalContainedIn (1.3.6.1.2.1.47.1.1.1.1.4)
SNMP Syntax	integer32 (0..2147483647)
CLI Syntax	integer
Access	RO
CLI Commands	show inventory <ph-idx-range> cont-in

6.7.2.4 Class

Description	An indication of the general hardware type of the physical entity. If no appropriate standard registration identifier exists for this physical entity, then the value 'other(1)' is returned. If the value is unknown by this agent, then the value 'unknown(2)' is returned.
CLI Attribute Name	class
SNMP Object ID	entPhysicalClass (1.3.6.1.2.1.47.1.1.1.1.5)

SNMP Syntax	INTEGER {
	other(1),
	unknown(2),
	chassis(3),
	backplane(4),
	container(5), -- e.g., chassis slot or daughter-card holder
	powerSupply(6),
	fan(7),
	sensor(8),
	module(9), -- e.g., plug-in card or daughter-card
	port(10),
	stack(11), -- e.g., stack of multiple chassis entities
	cpu(12)
	}

CLI Syntax	{other, unknown, chassis, backplane, container, power-supply, fan, sensor, module, port, stack, cpu}
Access	RO
CLI Commands	show inventory <ph-idx-range> class

6.7.2.5 Parent Relative Position

Description	An indication of the relative position of this 'child' component among all its 'sibling' components. Sibling components are defined as entPhysicalEntries that share the same instance values of each of the entPhysicalContainedIn and entPhysicalClass objects. An NMS can use this object to identify the relative ordering for all sibling components of a particular parent (identified by the entPhysicalContainedIn instance in each sibling entry).
CLI Attribute Name	rel-pos
SNMP Object ID	entPhysicalParentRelPos (1.3.6.1.2.1.47.1.1.1.1.6)
SNMP Syntax	integer32 (-1..2147483647)
CLI Syntax	integer
Access	RO
CLI Commands	show inventory <ph-idx-range> rel-pos

6.7.2.6 Physical Name

Description	The textual name of the physical entity. The value of this object should be the name of the component as assigned by the local device and should be suitable for use in commands entered at the device's `console'. This might be a text name (e.g., `console') or a simple component number (e.g., port or module number, such as `1'), depending on the physical component naming syntax of the device. If there is no local name, or if this object is otherwise not applicable, then this object contains a zero-length string.
CLI Attribute Name	name
SNMP Object ID	entPhysicalName (1.3.6.1.2.1.47.1.1.1.1.7)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> name

6.7.2.7 Physical Hardware Revision

Description	The vendor-specific hardware revision string for the physical entity. The preferred value is the hardware revision identifier actually printed on the component itself (if present). Note that if revision information is stored internally in a non-printable (e.g., binary) format, then the agent must convert such information to a printable format, in an implementation-specific manner. If no specific hardware revision string is associated with the physical component, or if this information is unknown to the agent, then this object will contain a zero-length string.
CLI Attribute Name	hw-rev
SNMP Object ID	entPhysicalHardwareRev (1.3.6.1.2.1.47.1.1.1.1.8)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> hw-rev

6.7.2.8 Physical Firmware Revision

Description	The vendor-specific firmware revision string for the physical entity. Note that if revision information is stored internally in a non-printable (e.g., binary) format, then the agent must convert such information to a printable format, in an implementation-specific manner. If no specific firmware revision string is associated with the physical component, or if this information is unknown to the agent, then this object will contain a zero-length string.
CLI Attribute Name	fw-rev
SNMP Object ID	entPhysicalFirmwareRev (1.3.6.1.2.1.47.1.1.1.1.9)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> fw-rev

6.7.2.9 Physical Software Revision

Description	The vendor-specific software revision string for the physical entity. Note that if revision information is stored internally in a non-printable (e.g., binary) format, then the agent must convert such information to a printable format, in an implementation-specific manner. If no specific software revision string is associated with the physical component, or if this information is unknown to the agent, then this object will contain a zero-length string.
CLI Attribute Name	sw-rev
SNMP Object ID	entPhysicalSoftwareRev (1.3.6.1.2.1.47.1.1.1.1.10)
SNMP Syntax	character string

CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> sw-rev

6.7.2.10 Physical Serial Number

Description	The vendor-specific serial number string for the physical entity. The preferred value is the serial number string actually printed on the component itself (if present). Not every physical component will have a serial number, or even need one. Physical entities for which the associated value of the entPhysicalIsFRU object is equal to 'false(2)' (e.g., the repeater ports within a repeater module), do not need their own unique serial number. An agent does not have to provide write access for such entities, and may return a zero-length string.
CLI Attribute Name	serial
SNMP Object ID	entPhysicalSerialNum (1.3.6.1.2.1.47.1.1.1.1.11)
SNMP Syntax	character string (up to 32 chars)
CLI Syntax	character string (up to 32 chars)
Access	RO (discuss if RW is necessary)
CLI Commands	show inventory <ph-idx-range> serial

6.7.2.11 Physical Manufacturer Name

Description	The name of the manufacturer of this physical component. The preferred value is the manufacturer name string actually printed on the component itself (if present). If the manufacturer name string associated with the physical component is unknown to the agent, then this object will contain a zero-length string.
CLI Attribute Name	mfg-name
SNMP Object ID	entPhysicalMfgName (1.3.6.1.2.1.47.1.1.1.1.12)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> mfg-name

6.7.2.12 Physical Model Name

Description	The vendor-specific model name identifier string associated with this physical component. The preferred value is the customer-visible part number, which may be printed on the component itself. If the model name string associated with the physical component is unknown to the agent, then this object will contain a zero-length string.
CLI Attribute Name	model-name
SNMP Object ID	entPhysicalModelName (1.3.6.1.2.1.47.1.1.1.1.13)
SNMP Syntax	character string
CLI Syntax	character string
Access	RO
CLI Commands	show inventory <ph-idx-range> model-name

6.7.2.13 Field Replaceable Unit Indicator

Description	This object indicates whether or not this physical entity is considered a 'field replaceable unit' by the vendor. If this object contains the value 'true(1)' then this entPhysicalEntry identifies a field replaceable unit. For all entPhysicalEntries that represent components permanently contained within a field replaceable unit, the value 'false(2)' should be returned for this object.
CLI Attribute Name	fru
SNMP Object ID	entPhysicalIsFRU (1.3.6.1.2.1.47.1.1.1.1.16)
SNMP Syntax	{true (1), false(2)}
CLI Syntax	{replaceable | not-replaceable}
Access	RO
CLI Commands	show inventory <ph-idx-range> fru

6.7.2.14 Last Change Time

Description	The value of sysUpTime at the time the configuration of the entity has changed.
SNMP Object ID	1.3.6.1.2.1.47.1.4.1 (entLastChangeTime)
CLI Attribute Name	last-change
SNMP Syntax	TimeTicks
CLI Syntax	ddd:hh:mm:ss, wherein ddd – decimal integer representing days (it may include arbitrary number of digits), hh – two-digit decimal integer representing hours of day [0..23], mm – two-digit decimal integer representing minutes of hour [0..59], ss – two-digit decimal integer representing seconds of minute [0..59].
Access	RO
Value	N/A
CLI Commands	show inventory <ph-idx-range> last-change

6.7.3 Physical Inventory Assignments

Hierarchy

Figure 6-2 shows all physical inventory entities and their relationship.

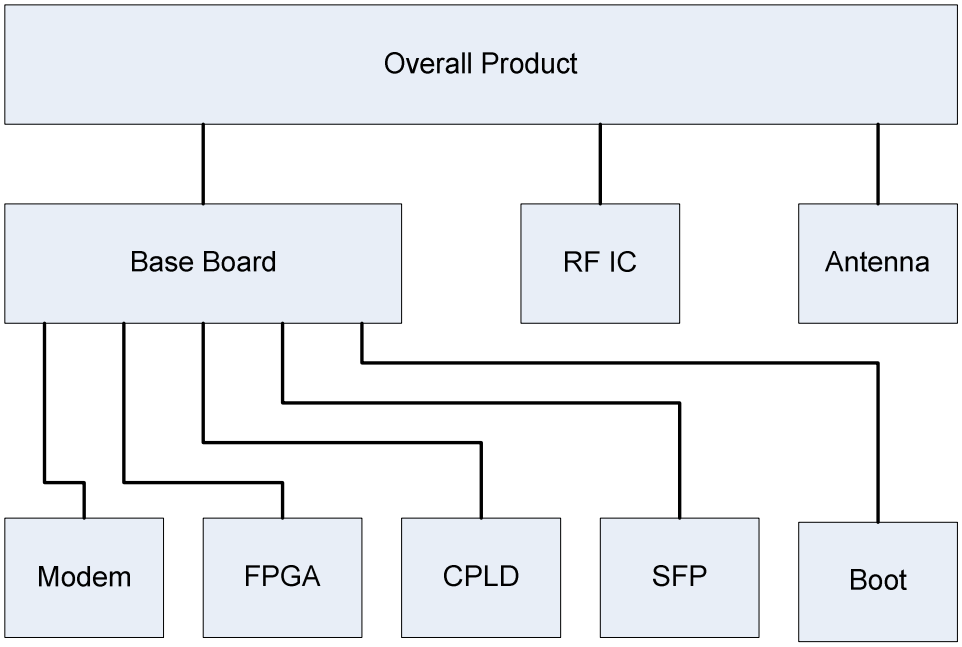


Figure 6-2 Physical Inventory Hierarchy Scheme

6.7.3.1 Overall Product

Attribute	Value
Inventory Index	1
Descriptor	“Ceragon FA-70”
Contained In	0
Class	chassis
Parent Relative Position	-1
Name	“EH-70”
Hardware Revision	*empty*
Firmware Revision	*empty*
Software Revision	*empty*
Serial Number	*<to be read in runtime>*
Manufacturer Name	“Ceragon”
Model Name	“FA-70”
Field Replaceable Unit Indicator	replaceable

6.7.3.2 Antenna

Attribute	Value
Inventory Index	2
Descriptor	“Ceragon Antenna”
Contained In	1
Class	other
Parent Relative Position	0
Name	“Antenna”
Hardware Revision	empty
Firmware Revision	empty
Software Revision	empty
Serial Number	empty
Manufacturer Name	“Ceragon”
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.3 RF IC

Attribute	Value
Inventory Index	3
Descriptor	“Ceragon FA-70 RF IC”
Contained In	1
Class	module
Parent Relative Position	1
Name	“RF IC”
Hardware Revision	<to be read in runtime>
Firmware Revision	empty
Software Revision	empty
Serial Number	<to be read in runtime>
Manufacturer Name	“Ceragon”

Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.4 Base Band Board

Attribute	Value
Inventory Index	4
Descriptor	“Ceragon FA-70 Base Band Board”
Contained In	1
Class	container
Parent Relative Position	2
Name	“Base Band Board”
Hardware Revision	<to be read in runtime>
Firmware Revision	empty
Software Revision	empty
Serial Number	<to be read in runtime>
Manufacturer Name	“Ceragon”
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.5 Modem

Attribute	Value
Inventory Index	5
Descriptor	“Ceragon FA-70 Modem”
Contained In	4
Class	module
Parent Relative Position	0
Name	“Modem”
Hardware Revision	<to be read in runtime>
Firmware Revision	empty

Software Revision	empty
Serial Number	empty
Manufacturer Name	“Ceragon”
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.6 FPGA

Attribute	Value
Inventory Index	6
Descriptor	“Ceragon FA-70 FPGA”
Contained In	4
Class	module
Parent Relative Position	1
Name	“FPGA”
Hardware Revision	empty
Firmware Revision	<to be read in runtime>
Software Revision	empty
Serial Number	empty
Manufacturer Name	empty
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.7 CPLD

Attribute	Value
Inventory Index	7
Descriptor	“Ceragon FA-70 CPLD”
Contained In	4
Class	module
Parent Relative Position	2

Name	“CPLD”
Hardware Revision	empty
Firmware Revision	<to be read in runtime>
Software Revision	empty
Serial Number	empty
Manufacturer Name	“Ceragon”
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.7.3.8 SFP

Attribute	Value
Inventory Index	7
Descriptor	“Ceragon FA-70 SFP”
Contained In	4
Class	module
Parent Relative Position	3
Name	“SFP”
Hardware Revision	<to be read in runtime>
Firmware Revision	empty
Software Revision	empty
Serial Number	empty
Manufacturer Name	<to be read in runtime>
Model Name	empty
Field Replaceable Unit Indicator	replaceable

6.7.3.9 Boot

Attribute	Value
Inventory Index	8
Descriptor	“Ceragon FA-70 Boot”

Contained In	4
Class	module
Parent Relative Position	5
Name	“Boot”
Hardware Revision	empty
Firmware Revision	empty
Software Revision	<to be read in runtime>
Serial Number	empty
Manufacturer Name	“Ceragon”
Model Name	empty
Field Replaceable Unit Indicator	not-replaceable

6.8 Maintenance Domain

6.8.1 MD Commands

Note:

MD CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.8.1.1 Set

```
set    cfm-md <md-idx> [format <md-name-format>] [name <md-name>] [level <md
level>] [mhf-creation <mhf creation>] [mhfid-permission <mhf permission>]
```

Note that **md-name** must be unique in the system.

6.8.1.2 Show

```
show cfm-md {<md-idx-list> | all} {format | name | level |  mhf-creation |
mhfid-permission | info}
```

6.8.1.3 Clear

```
clear cfm-md {<md-idx-list> | all}
```

6.8.2 MD Attributes

6.8.2.1 MD Index

Description	Value to be used as the index of the Maintenance Association table entries for this Maintenance Domain when the management entity wants to create a new entry in that table.
CLI Attribute Name	None.
SNMP Object ID	dot1agCfmMdIndex (1.3.111.2.802.1.1.8.1.5.2.1.1)
CLI Syntax	Integer
Access	N/A
Dependencies	A MD Index entry cannot be deleted if it is used as the key in MA, MEP, Received CCM Presentation, Peer MEP or LTR DB.
CLI Commands	**show cfm-md <md-idx> <any parameter>** **set cfm-md <md-idx> <any parameter>**

6.8.2.2 Name

Description	Each Maintenance Domain has a unique name. This facilitates easy identification of administrative responsibility for each Maintenance Domain.
SNMP Object ID	dot1agCfmMdName (1.3.111.2.802.1.1.8.1.5.2.1.1)
CLI Attribute Name	name
CLI Syntax	According to the format as described in Section 6.8.2.3
Access	RC
Default	Empty
CLI Commands	**show cfm-md <md-idx> name** **set cfm-md <md-idx> name**

6.8.2.3 Format

Description	A value that represents a type (and the resulting format) of the Maintenance Domain Name.
SNMP Object ID	dot1agCfmMdFormat (1.3.111.2.802.1.1.8.1.5.2.1.2)
CLI Attribute Name	format
CLI Syntax	{dns-like | mac-and-unit | string} “<name according to format>”
Access	RC
Value	256 characters
Default	String
CLI Commands	**show cfm-md <md-idx> format** **set cfm-md <md-idx> name <format> “name”**

6.8.2.4 Level

Description	A value that represents the Maintenance Domain Level.
SNMP Object ID	dot1agCfmMdMdLevel (1.3.111.2.802.1.1.8.1.5.2.1.4)
CLI Attribute Name	level
CLI Syntax	0..7
Access	RC
Default	0
CLI Commands	**show cfm-md <md-idx> level** **set cfm-md <md-idx> level 6**

6.8.2.5 MHF Creation

Description	Enumerated value indicating whether the management entity can create MHFs (MIP Half Function) for this Maintenance Domain.
SNMP Object ID	dot1agCfmMdMhfCreation (1.3.111.2.802.1.1.8.1.5.2.1.5)
CLI Attribute Name	mhf-creation
CLI Syntax	{none | default | explicit}
Access	RC
Default	None
CLI Commands	**show cfm-md <md-idx> mhf-creation** **set cfm-md <md-idx> mhf-creation none**

6.8.2.6 MHF ID Permission

Description	Enumerated value indicating what, if anything, is to be included in the Sender ID TLV (21.5.3) transmitted by MPs configured in this Maintenance Domain.
SNMP Object ID	dot1agCfmMdMhfIdPermission (1.3.111.2.802.1.1.8.1.5.2.1.6)
CLI Attribute Name	mhf-permission
CLI Syntax	{none | chassis | mgmg | chassis-mgmg}
Access	RC
Default	None
CLI Commands	**show cfm-md <md-idx> mhf-permission** **set cfm-md <md-idx> mhf-permission none**

6.9 Maintenance Association

6.9.1 MA Commands

Note:

MA CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.9.1.1 Set

```
set cfm-ma <md-idx> <ma-idx> [format <ma-name-format>] [name <ma-name>]
[interval <ccm-interval>]
```

Note that **ma-name** is mandatory in the Set command. The name must be unique in the system.

6.9.1.2 Show

```
show cfm-ma {<md-idx-list> | all} {<ma-idx-list> | all} {name | component |
interval | info}
```

6.9.1.3 Clear

```
clear cfm-ma {<md-idx-list> | all} {<ma-idx-list> | all}
```

6.9.2 MA Attributes

6.9.2.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. Entering the MD Name enables use of the common command structure.

6.9.2.2 MA Index

Description	Index of the Maintenance Association table (dot1agCfmMdMaNextIndex) needs to be inspected to find an available index for row-creation.
SNMP Object ID	dot1agCfmMaIndex (1.3.111.2.802.1.1.8.1.6.1.1.1)
Access	N/A
Dependencies	An MA Index entry cannot be deleted if it is used as the key in MA, MEP, Received CCM Presentation, Peer MEP Create or LTR DB.

6.9.2.3 MA Format

Description	A value that represents a type (and the resulting format) of the Maintenance Domain Name.
SNMP Object ID	dot1agCfmMaNetFormat(1.3.111.2.802.1.1.8.1.6.1.1.2)
CLI Attribute Name	format
CLI Syntax	{vid | string | vpnid}
Access	RW
Default	vid
CLI Commands	**show cfm-ma <md-idx> <ma_idx> format** **set cfm-ma <md-idx> <ma_idx> format string**

6.9.2.4 MA Name

Description	The short Maintenance Association name. The type/format of this object is determined by the value of the dot1agCfmMaNetNameType object. This name must be unique within a Maintenance Domain.
SNMP Object ID	dot1agCfmMaNetName (1.3.111.2.802.1.1.8.1.6.1.1.3)
CLI Attribute Name	name
CLI Syntax	{vid | string | vpnid} “<name according to format>”
Access	RC
Default	1
CLI Commands	**set cfm-ma <md-idx> <ma_idx> name <format> "<name>"** **show cfm-ma <md-idx> <ma_idx> name**

6.9.2.5 Interval

Description	The interval to be used between CCM transmissions by all MEPs in the MA.
SNMP Object ID	1.3.111.2.802.1.1.8.1.6.1.1.4 (dot1agCfmMaNetCcmInterval)
CLI Attribute Name	interval
CLI Syntax	{3.3ms | 10ms | 100ms | 1s | 10s | 1min | 10min}
Access	RC
Default	1s
CLI Commands	**show cfm-ma <md-idx> <ma_idx> interval** **set cfm-ma <md-idx> <ma_idx> interval 10ms**

6.10 Component Maintenance Association

6.10.1 MA-COMP Commands

Note:

MA-COMP CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.10.1.1 Set

```
set cfm-ma-comp <comp-id> <md-idx> <ma-idx> [vlan <vid>] [mhf-creation <mhf-creation>] [mhfid-permission <mhf-permission>]
```

6.10.1.2 Show

```
show cfm-ma-comp {<comp-id-list | all} {<md-idx-list> | all} {<ma-idx-list> | all} {vlan | mhf-creation | mhfid-permission | info}
```

6.10.1.3 Clear

```
clear cfm-ma-comp {<comp-id-list | all} {<md-idx-list> | all} {<ma-idx-list> | all}
```

6.10.2 MA-COMP Attributes

6.10.2.1 Component

Description	The bridge component within the system to which the information in this dot1agCfmMaCompEntry applies.
SNMP Object ID	ieee8021CfmMaComponentId (1.3.111.2.802.1.1.8.1.6.4.1.1)
CLI Syntax	component <comp-id-list>
Access	N/A
CLI Commands	**show cfm-ma <comp-id> <md-idx> <ma_idx> any parameter** **set cfm-ma <comp-id> <md-idx> <ma_idx> component c1**
Dependancies	The component must be defined in the Bridge component table (See *Section 5.3*).

6.10.2.2 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. Entering the MD Name enables use of the common command structure.

6.10.2.3 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*.

6.10.2.4 Service Selector

Description	Service Selector identifier to which the MP is attached, or 0, if none. The type of the Service Selector is defined by the value of ieee8021CfmMaCompPrimarySelectorType. In the current implementation the type is always VLAN ID. Thus the Service Selector is the Primary VLAN ID with which the Maintenance Association is associated, or 0 if the MA is not attached to any VID.
SNMP Object ID	ieee8021CfmMaCompPrimarySelectorOrNone (1.3.111.2.802.1.1.8.1.6.4.1.3)
CLI Attribute Name	vlan
CLI Syntax	{none | 1..4094}
Access	RC
Default	None
CLI Commands	**show cfm-ma <md-idx> <ma_idx> vlan** **set cfm-ma <md-idx> <ma_idx> vlan 102**
Dependencies	The VLAN must be defined in the VLAN Table.

6.10.2.5 MHF Creation

Description	Enumerated value indicating whether the management entity can create MHFs (MIP Half Function) for this Maintenance Association.
SNMP Object ID	ieee8021CfmMaCompMhfCreation (1.3.111.2.802.1.1.8.1.6.4.1.4)
CLI Attribute Name	mhf-creation
CLI Syntax	{mhf-creation none | default | explicit | defer}
Access	RC
Default	defer
CLI Commands	**show cfm-ma <md-idx> <ma_idx> mhf-creation** **set cfm-ma <md-idx> <ma_idx> mhf-creation *none***

6.10.2.6 MHF ID Permission

Description	Enumerated value indicating what, if anything, is to be included in the Sender ID TLV (21.5.3) transmitted by MPs configured in this Maintenance Association.
SNMP Object ID	ieee8021CfmMaCompIdPermission (1.3.111.2.802.1.1.8.1.6.4.1.5)
CLI Attribute Name	mhf-permission
CLI Syntax	{mhf-permission none | chassis | mgmg | chassis-mgmg}
Access	RC
Default	None
CLI Commands	**show cfm-ma <md-idx> <ma_idx> mhf-permission** **set cfm-ma <md-idx> <ma_idx> mhf-permission *none***

6.11 Maintenance End Point

6.11.1 MEP Commands

Note:

MEP CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.11.1.1 Set

```
set cfm-mep <md-idx> <ma-idx> <mepid> [interface <ext-bridge-port-list>]
[dir {down | up}] [vlan {1..4094}] [admin-state {active | inactive}] [cci
{enabled | disabled}] [msg-prio {0..7}] [low-defect <low-defect>] [alarm-
time {250..1000}] [reset-time {250..1000}] [lbm-dst-type {mac | mepid}]
[lbm-dst-mac <mac addr>] [lbm-dst-mepid <mepid>] [lbm-tx-num {1..1024}]
[lbm-tx-data <hex string>] [lbm-tx-prio {0..7}] [lbm-tx-drop {enable |
disable}] [ltm-dst-type {mac | mepid}] [ltm-dst-mac <mac addr>] [ltm-dst-
mepid <mepid>] [ltm-tx-ttl {0..250}] }] [lbm-tx-status  {tx-pending | tx-
idle}] [ltm-tx-status  {tx-pending | tx-idle}]
```

6.11.1.2 Show

```
show cfm-mep [{<md-idx-list> | all} [{<ma-idx-list> | all} [{<mepid-list> |
all}]]] {interface | dir | vlan | admin-state | cci | msg-prio | low-defect
| alarm-time | reset-time | lbm-dst-mac | lbm-dst-mepid | lbm-dst-type |
lbm-tx-num | lbm-tx-data |  lbm-tx-prio |  lbm-tx-drop | ltm-dst-mac | ltm-
dst-mepid | ltm-dst-type | ltm-tx-ttl | lbm-tx-status | ltm-tx-status | fng-
state | mac | high-defect | defects | ccm-seq-errors | ccm-tx | lbm-tx-
result | lbm-tx-sn | lbm-next-sn | lbr-in-order | lbr-out-of-order | lbr-tx
| ltm-next-sn | ltr-unexpected | ltm-tx-result | ltm-tx-sn | last-error-ccm
| last-xcon-ccm | info}
```

6.11.1.3 CLI Clear Command Structure

```
clear cfm-mep {<md-idx-list> | all} {<ma-idx-list> | all} {<mepid-list> |
all}
```

6.11.2 Definitions of Writable MEP Attributes

6.11.2.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. Entering the MD Name enables use of the common command structure.

6.11.2.2 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*.

6.11.2.3 MEPID

Description	An integer that is unique for all the Maintenance End Points (MEPs) in the same Maintenance Association that identifies a specific Maintenance Association End Point.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.1 (dot1agCfmMepIdentifier)
CLI Attribute Name	N/A
CLI Syntax	integer
Access	RC
Default	1
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> <any parameter>** **show cfm-mep <md-idx> <ma_idx> <mepid> <any parameter>** **clear cfm-mep <md-idx> <ma_idx> <mepid>**
Dependencies	Adding an entry with a specific MEPID creates associated entries in the Peer MEP DB. Similarly, deleting a specific MEPID entry causes deletion of association entries in the Peer MEP DB.

6.11.2.4 Interface

Description	The index of the interface either of a Bridge Port, or an aggregated IEEE 802.1 link within a Bridge Port, to which the MEP is attached.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.2 (dot1agCfmMepIfIndex)
CLI Attribute Name	interface
CLI Syntax	{eth0 | eth1 | eth2 | host}
Access	RC
Default	eth1
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> interface <eth>** **show cfm-mep <md-idx> <ma_idx> <mepid> interface**
Dependencies	The component associated with the MEP interface must exist in the Component MA Table. In addition, only one MEP can be defined for the same combination of Interface, Direction and Primary VLAN.

6.11.2.5 Direction

Description	The direction in which the MEP is facing on the Bridge Port.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.3 (dot1agCfmMepDirection)
CLI Attribute Name	dir
CLI Syntax	{up | down}
Access	RC
Default	down
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> dir up | down** **show cfm-mep <md-idx> <ma_idx> <mepid> dir**
Dependencies	Only one MEP can be defined for the same combination of Interface, Direction and Primary VLAN.

6.11.2.6 Primary VLAN

Description	An integer indicating the Primary VID of the MEP. A value of 0 indicates that either the Primary VID is that of the MEP's MA, or that the MEP's MA is not associated with any VID.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.4 (dot1agCfmMepPrimaryVid)
CLI Attribute Name	vlan
CLI Syntax	0..4094
Access	RC
Default	0
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> vlan <vlan id>** **show cfm-mep <md-idx> <ma_idx> <mepid> vlan**
Dependencies	The associated VLAN must be defined in the VLAN Table. In addition, only one MEP can be defined for the same combination of Interface, Direction and Primary VLAN.

6.11.2.7 Administrative State

Description	The administrative state of the MEP. True (active) indicates that the MEP is to function normally; False (inactive) indicates that the MEP is to cease functioning.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.5 (dot1agCfmMepActive)
CLI Attribute Name	admin-state
CLI Syntax	{active | inactive}
Access	RC
Default	Inactive
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> admin-state active** **show cfm-mep <md-idx> <ma_idx> <mepid> admin-state**

6.11.2.8 CCI

Description	If set to True, the MEP will generate CCM messages.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.7 (dot1agCfmMepCciEnabled)
CLI Attribute Name	cci
CLI Syntax	{enabled | disabled}
Access	RC
Default	disabled
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> cci enabled** **show cfm-mep <md-idx> <ma_idx> <mepid> cci**

6.11.2.9 Message Priority

Description	The priority value for CCMs and LTMs transmitted by the MEP. The default value is the highest priority value allowed passing through the Bridge Port for any of the MEP VIDs. The Management Entity can obtain the default value for this variable from the priority regeneration table by extracting the highest priority value in this table on this MEP's Bridge Port. (1 is lowest, followed by 2, then 0, then 3-7)
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.8 (dot1agCfmMepCcmLtmPriority)
CLI Attribute Name	msg-prio
CLI Syntax	0..7
Access	RC
Default	0
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> msg-prio <prio>** **show cfm-mep <md-idx> <ma_idx> <mepid> msg-prio**

6.11.2.10 Lowest Primary Defect

Description	An integer specifying the lowest priority defect that is allowed to generate a fault alarm.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.10 (dot1agCfmMepLowPrDef)
CLI Attribute Name	low-defect
CLI Syntax	{all-def | mac-rem-err-xcon | rem-err-xcon | err-xcon | xcon | no-xcon}
Access	RC
Default	mac-rem-err-xcon
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> low-defect <defect>** **show cfm-mep <md-idx> <ma_idx> <mepid> low-defect**

6.11.2.11 Alarm Time

Description	The time that a defect must be present before a fault alarm is issued
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.11 (dot1agCfmMepFngAlarmTime)
CLI Attribute Name	alarm-time
CLI Syntax	250..000
Access	RC
Default	250
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> alarm-time <time>** **show cfm-mep <md-idx> <ma_idx> <mepid> alarm-time**

6.11.2.12 Reset Time

Description	The time that a defect must be absent before resetting a fault alarm.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.12 (dot1agCfmMepFngResetTime)
CLI Attribute Name	reset-time
CLI Syntax	250..1000
Access	RC
Default	1000
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> reset-time <time>** **show cfm-mep <md-idx> <ma_idx> <mepid> reset-time**

6.11.2.13 LBM Destination MAC Address

Description	A unicast destination MAC address specifying the target MAC address field to be transmitted. This address will be used if the value for the column dot1agCfmMepTransmitLbmDestIsMepId is False.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.27 (dot1agCfmMepTransmitLbmDestMacAddress)
CLI Attribute Name	lbm-dst-mac
CLI Syntax	Mac address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	RC
Default	00-00-00-00-00-00
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-mac <adr>** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-mac**

6.11.2.14 LBM Destination MEPID

Description	The Maintenance Association End Point Identifier of another MEP in the same Maintenance Association to which the LBM is to be sent. This address will be used if the value of the column dot1agCfmMepTransmitLbmDestIsMepId is True.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.28 (dot1agCfmMepTransmitLbmDestMepId)
CLI Attribute Name	lbm-dst-mepid
CLI Syntax	Integer
Access	RC
Default	0
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-mepid <mepid>** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-mepid**

6.11.2.15 LBM Destination Type

Description	The destination type indicator for purposes of Loopback transmission, either the the unicast destination MAC address of the target MEP or the MEPID of the target MEP.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.29 (dot1agCfmMepTransmitLbmDestIsMepId)
CLI Attribute Name	lbm-dst-type
CLI Syntax	{mac | mepid}
Access	RC
Default	mac
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-type mepid** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-dst-type**

6.11.2.16 Number of LBMs to Transmit

Description	The number of Loopback messages to be transmitted.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.30 (dot1agCfmMepTransmitLbmMessages)
CLI Attribute Name	lbm-tx-num
CLI Syntax	1..1024
Access	RC
Default	1
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-num <num>** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-num**

6.11.2.17 LBM Data TLV

Description	An arbitrary amount of data to be included in the Data TLV, if the Data TLV is selected to be sent.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.31 (dot1agCfmMepTransmitLbmDataTlv)
CLI Attribute Name	lbm-tx-data
CLI Syntax	String of hexadecimal digits. Two digits constitute an octet thus the length must be even.
Access	RC
Default	Empty String
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-data <hexadecimal digit string>** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-data**

6.11.2.18 LBM Transmit VLAN Priority

Description	Priority. 3-bit value to be used in the VLAN tag, if present in the transmitted frame.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.32 (dot1agCfmMepTransmitLbmVlanPriority)
CLI Attribute Name	lbm-tx-prio
CLI Syntax	0..7
Access	RC
Default	0
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-prio <prio>** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-prio**

6.11.2.19 LBM Transmit VLAN Drop Eligibility

Description	Drop Enable bit value to be used in the VLAN tag, if present in the transmitted frame. For more information about VLAN Drop Enable, see IEEE 802.1ad.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.33 (dot1agCfmMepTransmitLbmVlanDropEnable)
CLI Attribute Name	lbm-tx-drop
CLI Syntax	{enable | disable}
Access	RC
Default	Enable
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-drop enable** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-drop**

6.11.2.20 LTM Destination MAC Address

Description	A unicast destination MAC address specifying the target MAC Address Field to be transmitted. This address will be used if the value of the column dot1agCfmMepTransmitLtmTargetIsMepId is False.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.38 (dot1agCfmMepTransmitLtmTargetMacAddress)
CLI Attribute Name	ltm-dst-mac
CLI Syntax	MAC address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	RC
Default	00-00-00-00-00-00
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-mac <adr>** **show cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-mac**

6.11.2.21 LTM Destination MEPID

Description	The Maintenance Association End Point Identifier of another MEP in the same Maintenance Association to which the LTM is to be sent. This address will be used if the value of the column dot1agCfmMepTransmitLtmTargetIsMepId is True.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.39 (dot1agCfmMepTransmitLtmTargetIsMepId)
CLI Attribute Name	ltm-dst-mepid
CLI Syntax	0..8191
Access	RC
Default	0
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-mepid <mepid>** **show cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-mepid**

6.11.2.22 LTM Destination Type

Description	The destination type indicator for purposes of LTM transmission, either the the unicast destination MAC address of the target MEP or the MEPID of the target MEP.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.40 dot1agCfmMepTransmitLtmTargetIsMepId
CLI Attribute Name	ltm-dst-type
CLI Syntax	{mac | mepid}
Access	RC
Default	mac
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-type mac** **show cfm-mep <md-idx> <ma_idx> <mepid> ltm-dst-type**

6.11.2.23 LTM Transmit TTL

Description	The TTL field indicates the number of hops remaining to the LTM. Decremented by 1 by each Linktrace Responder that handles the LTM. The value returned in the LTR is one less than that received in the LTM. If the LTM TTL is 0 or 1, the LTM is not forwarded to the next hop, and if 0, no LTR is generated
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.41 (dot1agCfmMepTransmitLtmTtl)
CLI Attribute Name	ltm-tx-ttl
CLI Syntax	0..250
Access	RC
Default	64
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> ltm-tx-ttl <ttl>** **show cfm-mep <md-idx> <ma_idx> <mepid> ltm-tx-ttl**

6.11.2.24 Transmit LBM Status

Description	A Boolean flag set to True by the Bridge Port to indicate that another LBM may be transmitted. Reset to False by the MEP Loopback Initiator State Machine. Setting the status to True (tx-pending) will initiate LBM sending. The number of LBM sent is defined by the Number of LBM to Transmit (see **Error! Reference source not found.**). After transmitting the specified number of LBM the value automatically changes to False (tx-idle). Note that if the Number of LBM to Transmit is zero the status turns to False (tx-idle) immediately.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.26 (dot1agCfmMepTransmitLbmStatus)
CLI Attribute Name	lbm-tx-status
CLI Syntax	{tx-pending, tx-idle}
Default	tx-idle
Access	RC
CLI Commands	**set cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-status tx-pending** **show cfm-mep <md-idx> <ma_idx> <mepid> lbm-tx-status**

6.11.2.25 Transmit LTM Status

Description	A Boolean flag set to True by the Bridge Port to indicate that another LTM may be transmitted. Reset to False by the MEP Linktrace Initiator State Machine. Setting the status to True (tx-pending) will initiate LTM sending. Only one message is sent, after which the value automatically changes to False (tx-idle). Note that if the Number of LTM to Transmit is zero the status turns to False (tx-idle) immediately.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.36 (dot1agCfmMepTransmitLtmStatus)
CLI Attribute Name	ltm-tx-status
CLI Syntax	{tx-pending, tx-idle}
Default	tx-idle
Access	RC
CLI Commands	Accessed with show info command

6.11.3 Definitions of Read-Only MEP Attributes

Hint:

Read-only MEP parameters may be accessed using the CLI **`show info`** command.

6.11.3.1 Fault Notification Generator State

Description	The current state of the MEP Fault Notification Generator state machine. See 802.1ag clauses 12.14.7.1.3:f and 20.35
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.6 (dot1agCfmMepFngState)
CLI Attribute Name	fng-state
CLI Syntax	{reset | defect | report-defect | defect-reported | defect-clearing}
SNMP Access	RO

6.11.3.2 MEP MAC Address

Description	MAC address of the MEP.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.9 (dot1agCfmMepMacAddress)
CLI Attribute Name	mac
CLI Syntax	MAC address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	RO

6.11.3.3 Highest Priority Defect

Description	The highest priority defect that has been present since the MEPs Fault notification Generator State Machine was last in the reset state.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.13 (dot1agCfmMepHighestPrDefect)
CLI Attribute Name	high-defect
CLI Syntax	{none | rdi-ccm | mac-status | remote-ccm | error-ccm | xcon-ccm}
Access	RO

6.11.3.4 MEP Defects

Description	A vector of Boolean error conditions from IEEE 802.1ag Table 20-1, any of which may be true. A MEP can detect and report a number of defects, and multiple defects can be present at the same time.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.14 (dot1agCfmMepDefects)
CLI Attribute Name	defects
CLI Syntax	Any combination of: {rdi-ccm, mac-status, remote-ccm, error-ccm, xcon-ccm}
Access	RO

6.11.3.5 CCM Sequence Errors

Description	The total number of out-of-sequence CCMs that have been received from all remote MEPs.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.17 (dot1agCfmMepCcmSequenceErrors)
CLI Attribute Name	ccm-seq-errors
CLI Syntax	Integer
Access	RO

6.11.3.6 CCM Transmit Counter

Description	Total number of Continuity Check messages transmitted.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.18 (dot1agCfmMepCciSentCcms)
CLI Attribute Name	ccm-tx
CLI Syntax	Integer
Access	RO

6.11.3.7 LBM Transmit Result

Description	Indicates the result of the operation.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.34 (dot1agCfmMepTransmitLbmResultOK)
CLI Attribute Name	lbm-tx-result
CLI Syntax	{ok | not-ok}
Access	RO

6.11.3.8 LBM Transmit Sequence Number

Description	The Loopback Transaction Identifier (dot1agCfmMepNextLbmTransId) of the first LBM sent. The value returned is undefined if dot1agCfmMepTransmitLbmResultOK is False.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.35 (dot1agCfmMepTransmitLbmSeqNumber)
CLI Attribute Name	lbm-tx-sn
CLI Syntax	Integer
Access	RO

6.11.3.9 LBM Next Sequence Number

Description	Next sequence number/transaction identifier to be sent in a Loopback message. This sequence number can be zero when it wraps around.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.19 (dot1agCfmMepNextLbmTransId)
CLI Attribute Name	lbm-next-sn
CLI Syntax	Integer
Access	RO

6.11.3.10 Incoming In Order LBR Counter

Description	Total number of valid, in-order Loopback Replies received.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.20 (dot1agCfmMepLbrIn)
CLI Attribute Name	lbr-in-order
CLI Syntax	Integer
Access	RO

6.11.3.11 Incoming Out of Order LBR Counter

Description	The total number of valid, out-of-order Loopback Replies received.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.21 (dot1agCfmMepLbrInOutOfOrder)
CLI Attribute Name	lbr-out-of-order
CLI Syntax	Integer

Access	RO

6.11.3.12 Transmit LBR Counter

Description	Total number of Loopback Replies transmitted.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.25 (dot1agCfmMepLbrOut)
CLI Attribute Name	lbr-tx
CLI Syntax	Integer
Access	RO

6.11.3.13 LTM Next Sequence Number

Description	Next transaction identifier/sequence number to be sent in a Linktrace message. This sequence number can be zero when it wraps around.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.23 (dot1agCfmMepLtmNextSeqNumber)
CLI Attribute Name	ltm-next-sn
CLI Syntax	Integer
Access	RO

6.11.3.14 Unexpected Incoming LTR

Description	The total number of unexpected LTRs received.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.24 (dot1agCfmMepUnexpLtrIn)
CLI Attribute Name	ltr-unexpected
CLI Syntax	Integer
Access	RO

6.11.3.15 LTM Transmit Result

Description	Indicates the result of the operation.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.42 (dot1agCfmMepTransmitLtmResult)
CLI Attribute Name	ltm-tx-result
CLI Syntax	{ok | not-ok}
Access	RO

6.11.3.16 LTM Transmit Sequence Number

Description	The LTM Transaction Identifier (dot1agCfmMepLtmNextSeqNumber) of the LTM sent. The value returned is undefined if dot1agCfmMepTransmitLtmResult is False
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.43 (dot1agCfmMepTransmitLtmSeqNumber)

CLI Attribute Name	ltm-tx-sn
CLI Syntax	Integer
Access	RO

6.12 Received CCM Presentation

6.12.1 Parsing and Displaying CCM Messages

The following information is displayed per CCM message stored:

Eth Source Address
VLAN Priority (PCP)
Drop Eligibility
VLAN ID
MD Level
Version
RDI
CCM Interval
Sequence Number
Counters: TxFCf, RxFCb, TxFCb
If present:
Sender Chassis Subtype and ID
Management Address Domain
Management Address
Port Status -- {blocked | up} (according to IEEE 802.1ag Table 21-10
Interface Status -- {up | down | testing | unknown | dormant | not-present | lower-layer-down} according to IEEE 802.1ag Table 21-1
Other TLVs: Type, Data as hexadecimal string

The above information is displayed using the following Show commands:

```
show cfm-ccm  [{<md-idx-list> | all} [{<ma-idx-list> | all} [{<mepid-list> | all}]]] last-error-ccm
```

and

```
show cfm-ccm [{<md-idx-list> | all} [{<ma-idx-list> | all} [{<mepid-list> | all}]]] last-xcon-ccm
```

6.12.2 CCM Parameter Definitions

6.12.2.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. An entry cannot be created if a corresponding MD Index does not exist.

6.12.2.2 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*. An entry cannot be created if a corresponding MA Index does not exist.

6.12.2.3 MEPID

This is the same attribute as the one described in *Section 6.11.2.3.* An entry cannot be created if a corresponding MEPID does not exist.

6.12.2.4 Last Error Condition CCM

Description	The last-received CCM that triggered an DefErrorCCM fault.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.15 (dot1agCfmMepErrorCcmLastFailure)
CLI Attribute Name	last-error-ccm
CLI Syntax	According to Section 6.12.1
Access	RO
CLI Commands	**show cfm-ccm last-error-ccm <ma name> <mepid>**

6.12.2.5 Last Xcon Condition CCM

Description	The last-received CCM that triggered an DefErrorCCM fault.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.1.1.16 (dot1agCfmMepXconCcmLastFailure)
CLI Attribute Name	last-xcon-ccm
CLI Syntax	According to Section 6.12.1
Access	RO
CLI Commands	**show last-xcon-ccm**

6.13 Peer MEP Create

6.13.1 Peer MEP Create Commands

Note:

Peer MEP Create CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.13.1.1 Set

A Peer MEP entry is created with the Set command:

```
set cfm-peer-mep-create <md-idx-list> <ma-idx-list> <peer-mepid-list>
```

The Set command causes automatic creation of entries in the Peer MEP DB for all MEPIDs that have entries in MEP Table and this Peer MEP ID.

6.13.1.2 Show

Peer MEP information is displayed with the Show command:

```
show cfm-peer-mep-create [{<md-idx-list> | all} [{<ma-idx-list> | all}
[{<peer-mepid-list> | all}]]]
```

6.13.1.3 Clear

A Peer MEP entry is deleted with the Clear command:

```
clear cfm-peer-mep-create {<md-idx-list> | all} {<ma-idx-list> | all}
{<peer-mepid-list> | all}
```

The Clear command causes automatic deletion of entries in the Peer MEP DB for all MEPIDs that have entries in MEP Table and this Peer MEP ID.

6.13.2 Peer MEP Create Attributes

6.13.2.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. An entry cannot be created if a corresponding MD Index does not exist.

6.13.2.2 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*. An entry cannot be created if a corresponding MA Index does not exist.

6.13.2.3 Peer MEPID

Description	Integer identifying a specific Peer Maintenance Association End Point.
SNMP Object ID	dot1agCfmMaMepListIdentifier (1.3.111.2.802.1.1.8.1.6.3.1.1)
CLI Syntax	1..8191
Access	N/A
CLI Commands	**set cfm-peer-mep-create <md-idx> <ma_idx> <mepid> <peer mepid> <any parameter>** **show cfm-peer-mep-create <md-idx> <ma_idx> <mepid> <peer mepid> <any parameter>** **clear cfm-peer-mep-create <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14 Peer MEP DB

6.14.1 Peer MEP DB Commands

Note:

Peer MEP DB CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.14.1.1 Show

Peer MEP DB information is displayed using the following Show command:

```
show cfm-peer-mep-db [{<md-idx-list> | all} [{<ma-idx-list> | all} [{<mepid-list> | all} [{<peer-mepid-list> | all}]]]]
```

The information displayed is only for Peer MEPs which have been reported. For those that do not report, the Show command will display the message “unreachable”.

6.14.2 Peer MEP DB Parameter Definitions

6.14.2.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. An entry cannot be created if a corresponding MD Index does not exist.

6.14.2.2 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*. An entry cannot be created if a corresponding MA Index does not exist.

6.14.2.3 MEPID

This is the same attribute as the one described in *Section 6.11.2.3.* An entry cannot be created if a corresponding MEPID does not exist.

6.14.2.4 Peer MEPID

Description	Integer identifying a specific Peer Maintenance Association End Point.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.1 (dot1agCfmMepDbRMepIdentifier)
CLI Syntax	1..8191
Access	N/A
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.5 Peer MEP State

Description	The operational state of the remote MEP IFF State machines. This state machine monitors the reception of valid CCMs from a remote MEP with a specific MEPID. It uses a timer that expires in 3.5 times the length of time indicated by the dot1agCfmMaNetCcmInterval object.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.2 (dot1agCfmMepDbRMepState)
CLI Attribute Name	state
CLI Syntax	{idle | start | failed | ok}
Access	RO
CLI Commands	**show cfm-peer-mep <md-idx> <ma_idx><mepid> <peer mepid>**

6.14.2.6 Peer MEP Failed OK Time

Description	The time (SysUpTime) at which the peer MEP state machine last entered either the Failed or OK state.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.3 (dot1agCfmMepDbRMepFailedOkTime)
CLI Attribute Name	failed-ok-time
CLI Syntax	ddd:hh:mm:ss, wherein ddd – decimal integer representing days (it may include arbitrary number of digits), hh – two-digit decimal integer representing hours of day [0..23], mm – two-digit decimal integer representing minutes of hour [0..59], ss – two-digit decimal integer representing seconds of minute [0..59].
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.7 Peer MEP MAC Address

Description	The MAC address of the remote MEP
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.4 (dot1agCfmMepDbMacAddress)
CLI Attribute Name	mac
CLI Syntax	MAC address in the form NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3)
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx><mepid> <peer mepid>**

6.14.2.8 Remote Defect Indication

Description	State of the RDI bit in the last received CCM. On corresponds to True.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.5 (dot1agCfmMepDbRdi)
CLI Attribute Name	rdi
CLI Syntax	{on | off}
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.9 Peer Port Status

Description	An enumerated value of the Port status TLV received in the last CCM from the remote MEP or the default value psNoPortStateTLV indicating either no CCM has been received, or that no port status TLV was received in the last CCM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.6 (dot1agCfmMepDbPortStatusTlv)
CLI Attribute Name	port-status
CLI Syntax	{none | blocked | up}
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.10 Peer Interface Status

Description	An enumerated value of the Interface status TLV received in the last CCM from the remote MEP or the default value isNoInterfaceStatus TLV indicating either no CCM has been received, or that no interface status TLV was received in the last CCM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.7 (dot1agCfmMepDbInterfaceStatusTlv)
CLI Attribute Name	if-status
CLI Syntax	{none | up | down | testing | unknown | dormant | not-present | lower-layer-down}
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.11 Peer Chassis ID Subtype

Description	This object specifies the format of the Chassis ID received in the last CCM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.8 (dot1agCfmMepDbChassisIdSubtype)
CLI Attribute Name	chassis-id-subtype
CLI Syntax	{chassis-comp | if-alias | port-comp | mac | net-addr | if-name}
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.12 Peer Chassis ID

Description	The Chassis ID. The format of this object is determined by the value of the dot1agCfmLtrChassisIdSubtype object.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.9 (dot1agCfmMepDbChassisId)
CLI Attribute Name	chassis-id
CLI Syntax	Hexadecimal string
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.13 Management Address Domain

Description	The TDomain that identifies the type and format of the related dot1agCfmMepDbManAddress object, used to access the SNMP agent of the system transmitting the CCM. Received in the CCM Sender ID TLV from that system.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.10 (dot1agCfmMepDbManAddressDomain)
CLI Attribute Name	mng-addr-domain
CLI Syntax	{snmp-udp, snmp-ieee802}
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.14.2.14 Management Address

Description	The TAddress that can be used to access the SNMP agent of the system transmitting the CCM, received in the CCM Sender ID TLV from that system. If the related object dot1agCfmMepDbManAddressDomain contains the value 'zeroDotZero', this object dot1agCfmMepDbManAddress must have a zero-length OCTET STRING as a value.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.3.1.11 (dot1agCfmMepDbManAddress)
CLI Attribute Name	mng-addr
CLI Syntax	IP Address – dotted notation. MAC Address - NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3), the rest – hexadecimal string
Access	RO
CLI Commands	**show cfm-peer-mep-db <md-idx> <ma_idx> <mepid> <peer mepid>**

6.15 LTR DB

6.15.1.1 LTR Storage Overview

The LTRs that arrive are stored on per-MEP basis in the LTR database, as shown in *Figure 6-3*.

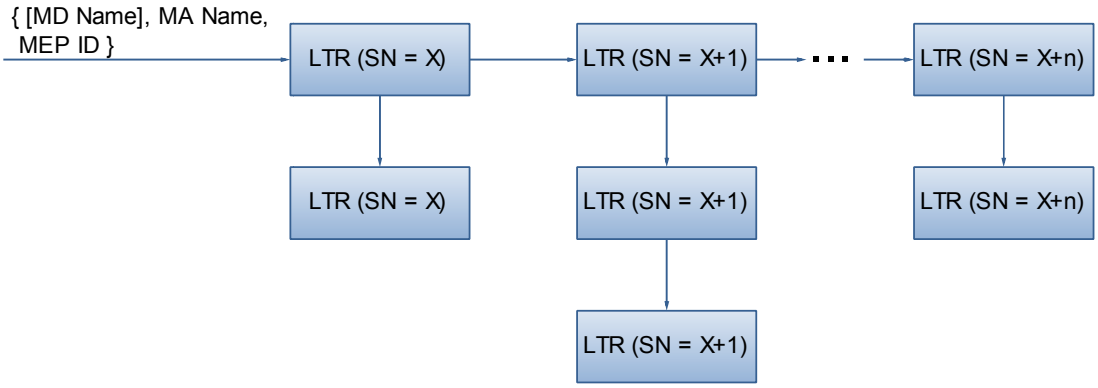


Figure 6-3. Per-MEP LTR Storage Structure

The LTRs are stored in the ascending sequence number order and the LTRs with the same sequence number (i.e. replies to the same LTM) are grouped together.

Since storage is limited, arrival of a new message results in discarding older messages. Entire groups that use the same sequence number are discarded.

6.15.2 LTR DB Commands

Note:

LTR DB CLI commands are available only when the FibeAir 70 Provider Bridge feature is enabled.

6.15.2.1 Show

LTR database information is displayed using the Show command:

```
show cfm ltr-db [{<md-idx-list> | all} [{<ma-idx-list> | all} [{<mepid-list>
| all} [{SN-list | all}]]]]
```

The SN stands for Sequence Number of the LTR message stored. (This refers not to the real sequence number stored in the LTR header, but to the relative SN which is equal to Real SN modulo Maximum Allowed Number of SNs.

For example, if the maximum allowed number of stored LTRs (with different SNs) is 20 then the Real SN = 807 is translated into the Relative SN = 7.

It is possible to specify more than one SN in the command by designating indexed objects (See *Section 04.9.6.1*).

6.15.3 LTR DB Attributes

6.15.3.1 MD Index

This is the same attribute as the one described in *Section 6.8.2.1*. An entry cannot be created if a corresponding MD Index does not exist.

6.15.3.2 MA Index

This is the same attribute as the one described in *Section 6.9.2.2*. An entry cannot be created if a corresponding MA Index does not exist.

6.15.3.3 MEPID

This is the same attribute as the one described in *Section 6.11.2.3.* An entry cannot be created if a corresponding MEPID does not exist.

6.15.3.4 LTR SN

Description	Transaction identifier/sequence number returned by a previous transmit linktrace message command, indicating which LTM's response is going to be returned.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.1 (dot1agCfmLtrSeqNumber)
CLI Attribute Name	None
CLI Syntax	Integer
Access	N/A
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.5 LTR Received TTL

Description	TTL field value for a returned LTR
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.3 (dot1agCfmLtrTtl)
CLI Attribute Name	rx-ttl
CLI Syntax	0..250
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.6 LTR Forwarded Indicator

Description	Indicates if a LTM was forwarded by the responding MP, as returned in the 'FwdYes' flag of the flags field.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.4 (dot1agCfmLtrForwarded)
CLI Attribute Name	ltr-forward
CLI Syntax	{forwarded | not-forwarded}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.7 LTR Relay Indicator

Description	Possible values the Relay action field can take.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.8 (dot1agCfmLtrRelay)
CLI Attribute Name	relay-action
CLI Syntax	{hit | fdb | mpdb}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.8 LTR Chassis ID Subtype

Description	This object specifies the format of the Chassis ID returned in the Sender ID TLV of the LTR, if any.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.9 (dot1agCfmLtrChassisIdSubtype)
CLI Attribute Name	chassis-id-subtype
CLI Syntax	{chassis-comp | if-alias | port-comp | mac | net-addr | if-name}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.9 LTR Chassis ID

Description	The Chassis ID returned in the Sender ID TLV of the LTR, if any. The format of this object is determined by the value of the dot1agCfmLtrChassisIdSubtype object.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.10 (dot1agCfmLtrChassisId)
CLI Attribute Name	chassis-id
CLI Syntax	Format in accordance with the definitions in 6.15.3.8. Hexadecimal string if no format is known.
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.10 LTR Management Address Domain

Description	The TDomain that identifies the type and format of the related dot1agCfmMepDbManAddress object, used to access the SNMP agent of the system transmitting the LTR.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.11 (dot1agCfmLtrManAddressDomain)
CLI Attribute Name	mng-addr-domain
CLI Syntax	{snmp-udp, snmp-ieee802}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.11 LTR Management Address

Description	The TAddress that can be used to access the SNMP agent of the system transmitting the LTR, received in the LTR Sender ID TLV from that system.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.12 (dot1agCfmLtrManAddress)
CLI Attribute Name	mng-addr
CLI Syntax	IP Address – dotted notation. MAC Address - NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3), the rest – hexadecimal string
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.12 LTR Ingress Action

Description	The value returned in the Ingress Action Field of the LTM. The value ingNoTlv(0) indicates that no Reply Ingress TLV was returned in the LTM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.13 (dot1agCfmLtrIngress)
CLI Attribute Name	ingr-action
CLI Syntax	{none | ok | down | blocked | vid}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.13 LTR Ingress MAC Address

Description	MAC address returned in the ingress MAC address field. If the dot1agCfmLtrIngress object contains the value ingNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.14 (dot1agCfmLtrIngressMac)
CLI Attribute Name	ingr-mac
CLI Syntax	MAC Address - NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3), the rest – hexadecimal string
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.14 LTR Ingress Port ID Subtype

Description	Format of the Ingress Port ID. If the dot1agCfmLtrIngress object contains the value ingNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.15 (dot1agCfmLtrIngressPortIdSubtype)
CLI Attribute Name	ingr-port-id-subtype
CLI Syntax	{if-alias | port-comp | mac | net-addr | if-name | agent-circuit-id | local}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.15 LTR Ingress Port ID

Description	Ingress Port ID. The format of this object is determined by the value of the dot1agCfmLtrIngressPortIdSubtype object. If the dot1agCfmLtrIngress object contains the value ingNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.16 (dot1agCfmLtrIngressPortId)
CLI Attribute Name	ingr-port-id
CLI Syntax	Format in accordance with the definitions in *Section 6.15.3.8.* A hexadecimal string is used if no format is known.
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.16 LTR Egress Action

Description	The value returned in the Egress Action Field of the LTM. The value egrNoTlv(0) indicates that no Reply Egress TLV was returned in the LTM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.17 (dot1agCfmLtrEgress)
CLI Attribute Name	egr-action
CLI Syntax	{none | ok | down | blocked | vid}
Access	RO

CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.17 LTR Egress MAC Address

Description	MAC address returned in the ingress MAC address field. If the dot1agCfmLtrIngress object contains the value ergNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.18 (dot1agCfmLtrEgressMac)
CLI Attribute Name	egr-mac
CLI Syntax	MAC Address - NN-NN-NN-NN-NN-NN, where N is a hexadecimal number (for example 00-AF-DD-1E-2D-A3), the rest – hexadecimal string
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.18 LTR Egress Port ID Subtype

Description	Format of the Egress Port ID. If the dot1agCfmLtrEgress object contains the value ergNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.19 (dot1agCfmLtrEgressPortIdSubtype)
CLI Attribute Name	egr-port-id-subtype
CLI Syntax	{if-alias | port-comp | mac | net-addr | if-name | agent-circuit-id | local}
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.19 LTR Ingress Port ID

Description	Egress Port ID. The format of this object is determined by the value of the dot1agCfmLtrEgressPortIdSubtype object. If the dot1agCfmLtrEgress object contains the value ergNoTlv(0), then the contents of this object are meaningless.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.20 (dot1agCfmLtrEgressPortId)
CLI Attribute Name	egr-port-id
CLI Syntax	Format in accordance with the definitions in 6.15.3.18. Hexadecimal string if no format is known.
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.20 LTR Terminal MEP

Description	A boolean value stating whether the forwarded LTM reached a MEP enclosing its MA, as returned in the Terminal MEP flag of the Flags field.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.5 (dot1agCfmLtrTerminalMep)
CLI Attribute Name	trm-mep

CLI Syntax	{on | off}
Access	RO
CLI Commands	**show ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.21 LTR Last Egress Identifier

Description	An octet field holding the Last Egress Identifier returned in the LTR Egress Identifier TLV of the LTR. The Last Egress Identifier identifies the MEP Linktrace Initiator that originated, or the Linktrace Responder that forwarded, the LTM to which this LTR is the response. This is the same value as the Egress Identifier TLV of that LTM.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.6 (dot1agCfmLtrLastEgressIdentifier)
CLI Attribute Name	last-egr-id
CLI Syntax	8 pairs hexadecimal digits, each pair separated by dashes: NN-NN-NN-NN-NN-NN-NN-NN, for example: 00-00-00-AF-DD-1E-2D-A3
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.15.3.22 LTR Next Egress Identifier

Description	An octet field holding the Next Egress Identifier returned in the LTR Egress Identifier TLV of the LTR. The Next Egress Identifier Identifies the Linktrace Responder that transmitted this LTR, and can forward the LTM to the next hop. This is the same value as the Egress Identifier TLV of the forwarded LTM, if any. If the FwdYes bit of the Flags field is false, the contents of this field are undefined, i.e., any value can be transmitted, and the field is ignored by the receiver.
SNMP Object ID	1.3.111.2.802.1.1.8.1.7.2.1.7 (dot1agCfmLtrNextEgressIdentifier)
CLI Attribute Name	next-egr-id
CLI Syntax	8 pairs hexadecimal digits, each pair separated by dashes: NN-NN-NN-NN-NN-NN-NN-NN, for example: 00-00-00-AF-DD-1E-2D-A3
Access	RO
CLI Commands	**show cfm ltr-db <md-idx> <ma_idx> <mepid> {<SN>} | all**

6.16 Outgoing Queues

6.16.1 Outgoing Queues Commands

6.16.1.1 Show

Display the Queue statistics using Show command:

```
show out-queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics
```

In response the software displays counters of all queues. The output is displayed in the table as follows:

```
FA-70> show out-queue eth1 all statistics

interface   qid   tx          drop  elapsed-time
eth1              1           1321  3           0001:02:15:09
eth1              2           1543  1           0001:02:15:09
eth1              3           1435  0           0001:02:15:09
eth1              4           2345  0           0001:02:15:09
eth1              5           4563  0           0001:02:15:09
eth1              6           4563  0           0001:02:15:09
eth1              7           6547  9           0001:02:15:09
eth1              8           1256  0           0001:02:15:09
```

Note that for **rf** there are only four queues, thus only the number from 1 to 4 (or **all**) is valid for the second ID. If **all** is specified then only four queuses are displayed.

6.16.1.2 Clear

Clear the Queue statistics using the Clear command:

```
clear out-queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics
```

Note that for **rf** there are only four queues, thus only the number from 1 to 4 (or **all**) is valid for the second ID.

6.16.2 Outgoing Queue Attributes

6.16.2.1 Interface Name

Description	Interface name
SNMP Object ID	TBD
CLI Syntax	{eth0 | eth1 | eth2 | rf} | all
Access	N/A
CLI Commands	**show out-queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics**

6.16.2.2 Queue ID

Description	Queue ID
SNMP Object ID	TBD
CLI Syntax	Range from 1 to 8
Access	N/A
CLI Commands	**show queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics**

6.16.2.3 Tx Frame Counter

Description	The counter of the per-Q transmitted frames
SNMP Object ID	TBD
CLI Syntax	tx 0..264
Access	RO
CLI Commands	**show queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics**

6.16.2.4 Drop Frame Counter

Description	The counter of the per-Q dropped frames
SNMP Object ID	TBD
CLI Syntax	drop 0..264
Access	RO
CLI Commands	**show queue {{eth0, eth1, eth2, rf} | all} {1..8 | all} statistics**

6.17 Incoming Queues

Currently Incoming Queues are defined only for rf. However, the design should take into account the possibility that the other interfaces will also have incoming queues and their statistics may be different from rf's

6.17.1 Incoming Queues Commands

6.17.1.1 Show

Display the Queue statistics using the Show command:

```
show in-queue {rf | all} {1..4 | all} statistics
```

In response the software displays counters of all queues. The output is displayed in the table as follows:

```
Interface           qid    good   error  lost   elapsed-time
```

Note that for **rf** there are only four queues, thus only the number from 1 to 4 (or **all**) is valid for the second ID. If **all** is specified then only four queuses are displayed.

6.17.1.2 Clear

Clear the Queue statistics using the Clear command:

```
clear in-queue {rf | all} {1..4 | all} statistics
```

Note that for **rf** there are only four queues, thus only the number from 1 to 4 (or **all**) is valid for the second ID.

6.17.2 Incoming Queues Attributes

6.17.2.1 Interface Name

Description	Interface name
SNMP Object ID	TBD
CLI Syntax	rf (currently only one, but may be extended in the future)
Access	N/A
CLI Commands	**show in-queue {rf | all} {1..4 | all} statistics**

6.17.2.2 Queue ID

Description	Queue ID
SNMP Object ID	TBD
CLI Syntax	Range from 1 to 4
Access	N/A
CLI Commands	**show in-queue {rf | all} {1..4 | all} statistics**

6.17.2.3 Good Frame Counter

Description	The counter of the per-Q received good frames
SNMP Object ID	TBD
CLI Syntax	good 0..264
Access	RO
CLI Commands	**show in-queue {rf | all} {1..4 | all} statistics**

6.17.2.4 Erroneous Frame Counter

Description	The counter of the per-Q received erroneous frames
SNMP Object ID	TBD
CLI Syntax	error 0..264
Access	RO
CLI Commands	**show queue {rf | all} {1..4 | all} statistics**

6.17.2.5 Lost Frame Counter

Description	The counter of the per-Q lost rx frames
SNMP Object ID	TBD
CLI Syntax	lost 0..264
Access	RO
CLI Commands	**show queue {rf | all} {1..4 | all} statistics**

6.18 Multiple CLI Monitoring

Display active CLI sessions using the Show command:

```
show loginsession [{my | all}]
```

In response, the software displays:

```
Session ID        Session Time

xx                          dddd:hh:mm:ss

yy                          dddd:hh:mm:ss
```

Where:

xx or **yy** is a two-digit integer from 00 to 99, and

dddd:hh:mm:ss – days(0000 – 9999):hours(00 – 24):minutes(00 – 60):seconds(00 – 60)

If a **show loginsession my** command is issued (the default value), then the software displays only the session ID of the User that has issued the command.

If a **show loginsession all** command is issued, then the software displays all active sessions.

7 FibeAir 70 Diagnostics

The FibeAir 70 System's highly reliable and easy-to-use radio link features a wide range of built-in indicators and diagnostic tools designed to allow a User to quickly evaluate a link's performance identify operating faults and resolve them.

The general diagnostics process for a FibeAir 70 link is to identify whether there is a problem that needs to be addressed, to isolate the root cause of the problem, and to implement the steps that are required to solve the problem.

In a radio link system like the FibeAir 70, some possible problem causes can be:

- End equipment problems (such as connection or device configuration issues)
- External hardware faults
- System level configuration issues
- Hardware faults that require radio link replacement

This chapter describes the FibeAir 70 diagnostics features, and offers basic instructions on how to use these features to isolate and resolve operating faults in the ODUs or in the FibeAir 70 network.

7.1 Diagnostics Tools

The following diagnostics tools are available using the FibeAir 70 system:

ODU LEDs
System alarms
Statistics (RF and Ethernet)
Loopbacks

7.2 The Troubleshooting and Diagnostics Process

The following step-by-step process should be followed whenever a problem with the link is encountered.

Define the Problem

Isolating a problem's symptoms is the first step in corrective maintenance. It is important to define the problem clearly and fully.

Define the problem as either a **customer-impact type** (for example, loss of element management, or no Ethernet services over the link) or a **product-related type** (for example, a link is down or an ODU does not power up).

Check and Gather Relevant Information

Examining the link's status indications will provide both current and historical information regarding the link's performance and alarms.

Indications include ODU LEDs, System Alarms and System Statistics.

Use these indications to further refine the problem and help to assess possible causes, both physical and logical, in the FibeAir 70 system.

Isolate the Fault

Further isolate and characterize the problem using all available link indications.

Ascertain if the problem is related to:

- End-equipment configuration or an interconnection
- A hardware fault in the link's accessories (such as a cable)
- Configuration settings (this can be verified using the CLI)
- A hardware fault in one of the ODUs
- A result of larger network propagation problem

Note that Loopback indications are especially useful when isolating the fault's component and network location.

Correct the Fault

Once the fault is isolated, implement the needed corrective actions until the problem resolution can be confirmed.

Whenever possible, it is recommended that commissioning tests be repeated in order to verify that the problem link is now operating correctly.

7.3 FibeAir 70 ODU LEDs

The following table lists the possible status of all LEDs, together with a description for purposes of diagnostics.

LED	*Color*	*Description*
PWR (Power)	Green – Power OK Red – Power Failure Off – No Alarms	Blink Green – Device boot Blink Red – Other alarm
RF	Green – Link Up Yellow – Alignment Mode Off – Link Down	Blink Green – RF activity
ETH1/2:	Green – Link 1G Yellow – Link 10/100 Off – No Link (Carrier)	Blink Green – 1G activity Blink Yellow – 10/100 activity

7.4 FibeAir 70 System Alarms and Events

The following table lists all System Alarms and Events, together with their severity, possible cause and corrective actions.

Indication	*Classification and Severity*	*Explanation*	*Probable Cause*	*Corrective Actions*
Link Down	Alarm High	The communication link (either the RF or one of the Ethernet ports) is not operational.	**Ethernet:** 1) A cable is disconnected. 2) Configuration mismatch between the ODU and end-equipment. **RF Link:** 1) Configuration mismatch between sides (frequency, modulation, RF role, etc.) 2) Line-of-Sight disruption or antennas not aligned. 3) Faulty ODU	**Ethernet:** 1) Check the cable connection. 2) Check the CLI configuration and end-equipment configuration. **RF Link:** 1) Check the configuration. 2) Isolate the problem using loopbacks. 3) Check cable connections and antenna alignment. 4)Replace ODU
Temperature High	Alarm Medium	The ODU temperature has exceeded a predefined threshold.	1) The ODU is installed in extreme temperature conditions. 2) Wrong temperature reading made in the ODU	1) Check the ODU installation and verify that it is installed in accordance with environmental specifications. 2) Replace ODU
CFM Fault Alarm	Alarm Varies	A maintenance end-point (MEP) has a persistent defect condition.	Varies	1) Use the reported OID to determine the source of the fault.

Indication	*Classification and Severity*	*Explanation*	*Probable Cause*	*Corrective Actions*
Cold Start	Event	The ODU is re-initializating due to a Power-Up or Reset action.	N/A	N/A
Link Up	Event	The communication link (either the RF or one of the Ethernet ports) is operational.	N/A	N/A
Modulation Change	Event	The modulation setting for the RF link (currently in Adaptive mode) has changed.	N/A	N/A
Synthesizer Locked	Event	The synthesizer has been locked.	N/A	N/A
Synthesizer Unlocked	Event	The synthesizer has been unlocked.	N/A	N/A
POE Status Low	Event	The power level being drawn by the ODU from the Ethernet is low.	N/A	N/A
POE Status Normal	Event	The power level being drawn by the ODU from the Ethernet is normal.	N/A	N/A
Temperature Normal	Event	The temperature of the device has returned to the normal range. This event clears a Temperature High alarm.	N/A	N/A
SFP In	Event	SFP inserted	N/A	N/A
SFP Out	Event	SFP extracted	N/A	N/A
Inventory change	Event	An entConfigChange notification is generated when the value of entLastChangeTime changes. This can be utilized by an NMS to trigger logical or physical entity table maintenance polls.	N/A	N/A
Reference Clock Source	Event	The reference clock source for the	N/A	N/A

Indication	*Classification and Severity*	*Explanation*	*Probable Cause*	*Corrective Actions*
Change		FibeAir 70 system has changed.		

7.5 FibeAir 70 System Statistics

The FibeAir 70 system uses advanced RF and Ethernet counters to provide real-time performance statistics for radio transmission activities, Ethernet ports and VLAN traffic.

The following statistics enable quick analysis of system and component performance in support of troubleshooting and diagnostics.

Hint:

For general details on the objects and attributes appearing below, see their explanations in *Chapter 5.*

7.5.1 RF Statistics

Use the RF Lost/Error indicators to confirm error-free operation:

```
Local_Site>show rf statistics

rf in-octets              : 32535265564
rf in-idle-octets         : 29775780985
rf in-good-octets         : 9370230
rf in-errored-octets      : 0
rf out-octets             : 30552267600
rf out-idle-octets        : 30531707551
rf in-pkts                : 129957
rf in-good-pkts           : 129452
rf in-errored-pkts        : 0
rf in-lost-pkts           : 0
rf out-pkts               : 231519
rf min-cinr               : 13
rf max-cinr               : 18
rf min-rssi               : -56
rf max-rssi               : -33
rf min-modulation         : qpsk 2 2 0.5
rf max-modulation         : qpsk 4 1 0.5
rf elapsed-time           : 0000:00:45:51
```

The RF transmission quality indicators are **`rf in-errored-pkts`** and **`rf in-lost-pkts`**. The advancement of these statistics indicates that there are error/lost packets in the network and that radio transmission is not error-free (i.e., there is a problem).

For detailed explanations of all RF statistics, see *Table 5-2.*

7.5.2 VLAN Statistics

Statistics counters of each FibeAir 70 component are displayed per VLAN:

```
FA-70>>show vlan all all statistics

component  vlan  port  in-pkts       out-pkts      drop-pkts     elapsed-time

c1         1     host  0             0             0             0000:00:00:32
c1         100   host  96            0             0             0000:00:00:32
c2         1     eth0  0             0             0             0000:00:00:32
c2         100   eth0  100           127           0             0000:00:00:32
c2         110   eth0  0             28601         0             0000:00:00:32
c2         120   eth0  0             28601         0             0000:00:00:32
c2         130   eth0  0             57180         0             0000:00:00:32
c3         1     eth1  0             0             0             0000:00:00:32
c3         110   eth1  28601         0             0             0000:00:00:32
c3         120   eth1  28601         0             0             0000:00:00:32
c3         130   eth1  71518         0             0             0000:00:00:32
c4         1     eth2  0             0             0             0000:00:00:32
c4         100   eth2  224           196           0             0000:00:00:32
```

Observe the **in-pkts**, **out-pkts** and **dropped-pkts** for each VLAN.

Note that packets may be dropped due to traffic exceeding the radio link's maximum bandwidth.

For detailed explanations of all VLAN statistics, see *Section 5.6.2.*

7.5.3 Ethernet Statistics

Statistics counters are displayed per Ethernet port.

```
FA-70>show eth all statistics

eth eth0 elapsed-time          : 0000:00:41:17
eth eth0 in-octets             : 18835233
eth eth0 in-ucast-pkts         : 4294967357
eth eth0 in-discards           : 0
eth eth0 in-errors             : 0
eth eth0 out-octets            : 19839102
eth eth0 out-ucast-pkts        : 63
eth eth0 out-errors            : 0
eth eth0 in-mcast-pkts         : 44
eth eth0 in-bcast-pkts         : 247622
eth eth0 out-mcast-pkts        : 247737
eth eth0 out-bcast-pkts        : 0
eth eth0 out-discards          : 0
eth eth0 in-no-rule-discards   : 0
```

Observe the **discard** and **error** counters to evaluate the performance of the Ethernet transmission.

For detailed explanations of all Ethernet statistics, see *Table 5-1.*

7.6 FibeAir 70 System Loopbacks

The FibeAir 70 radio uses Ethernet and RF loopbacks designed to enable fault isolation and Ethernet service performance testing.

- **Ethernet Loopback.** Internal and external loops are performed on the interface, testing the local ODU, the radio link and the remote ODU.
- **RF Loopback**. External loopb is performed on the RF interface of the switch.

Note:

After activating Loopback, it is important to **clear all RF and Ethernet statistics** in order to receive the most accurate results for analysis.

Use System Alarms as well as Statistics displays to determine if Loopback testing has passed or failed.

7.6.1 Loopback Diagrams

7.6.1.1 System Loopback Points

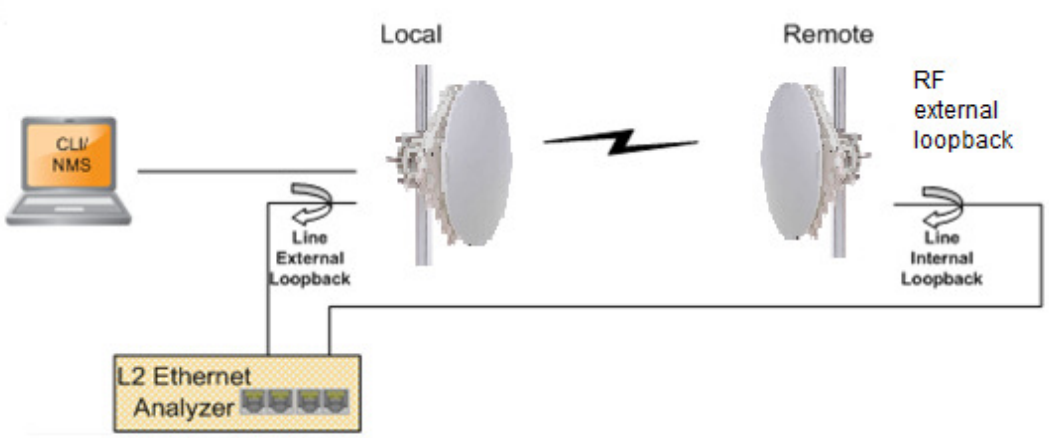


Figure 7-1 FibeAir 70 System Loopback Points

7.6.1.2 Ethernet External Line Loopback Points

The Ethernet traffic from customer's end-equipment or Ethernet analyzer is looped on the Ethernet interface (Eth1 or Eth2), enabling testing of the connection (cable/Fiber) and the interface between end-equipment and the ODU.

When testing a link from one side (Local), External Line loopback should be applied on the Local unit.

Loopback can be applied separately for ETH1 and ETH2.

To set Ethernet External Loopback

Loopback can be set with or without MAC Address swap.

Set the loopback mode to external for the desired Ethernet port and set the loopback-timeout in seconds:

```
set eth eth1 loopback-timeout 300

set eth eth1 loopback-mode external-mac-swap
```

To clear the Loopback

```
set eth eth1 loopback-mode disable
```

7.6.1.3 RF (Eth0) External Loopback Points

The Ethernet traffic from customer's end-equipment or Ethernet analyzer is looped in the Ethernet Bridge RF output (Eth0) towards the modem's input, enabling testing of the connection (cable/Fiber), the interface between end-equipment and the ODU, the Local ODU, the radio link and the Remote ODU.

To set RF Loopback

Loopback can be set with or without MAC Address swap.

Set the loopback mode to external for the RF (Eth0) port and set the loopback-timeout in seconds:

```
set eth eth0 loopback-timeout 300

set eth eth0 loopback-mode external-mac-swap
```

To clear the Loopback

```
set eth eth1 loopback-mode disable
```

7.6.1.4 Ethernet Internal Line Loopback Points

Internal External loop returns the received frames to the radio side, thus allowing testing Ethernet traffic across the link.

The Ethernet traffic from the Customer's end-equipment or Ethernet analyzer is looped at the Ethernet interface of the remote ODU, enabling testing of the connection (cable/Fiber), the interface between end-equipment and the ODU, both local and remote ODUs, and the radio transmission.

Loopback can be applied separately for ETH1 and ETH2.

To set Ethernet Internal Line Loopback

Loopback can be set with or without MAC Address swap.

Set the loopback mode to internal for the desired Ethernet port and set the loopback-timeout in seconds:

```
set eth eth1 loopback-timeout 300

set eth eth1 loopback-mode internal-mac-swap
```

To clear the Loopback

```
set eth eth1 loopback-mode disable
```