In:xtnd™

User Manual

In:xtnd™ | Control | MA2.5 | 4

INCOAX

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Read This First

Always make sure to connect all coaxial cables and network cables before connecting the power cable. This must be done to avoid electrical shock and to avoid damage to the unit. Ground loops might build up enough electrical charge to give an electrical shock if not properly connected before connecting the power cord. Make sure to connect the Cable TV (CATV) amplifier's ground connection to the *Controller* unit if both the CATV amplifier and *Controller* are installed in the same physical location. If the CATV-amplifier is located far away on the coaxial network, the *Controller* unit must not be grounded because this will create a ground loop.

When Using the Controller

The *Controller* is designed to operate on 48 VDC. If the unit is **not** powered using the power supply delivered with the *Controller*, but in any other way directly or indirectly with 48 VDC, a 3 A fuse **must be** fitted to the power cable.

Please observe the following:

- Do not stick any foreign objects, like metal or flammable objects into the *Controller* or its ventilation holes, as this can cause fire or electric shock.
- Do not remove the cover or modify it in any way.
  - High voltages which can cause severe electric shocks are present inside the *Controller*. For any inspection, adjustment, and repair work please contact your local InCoax dealer. The warranty is void if the cover is opened.
  - Never attempt to repair this product yourself. Improper repair work can be dangerous. Never disassemble or modify this product. Tampering with this product may result in injury or fire.
- Do not handle the power supply plug with wet hands as this may cause electric shocks.
- Do not use in locations subject to high humidity or dust levels, as this may cause damage to the equipment or start a fire.
- Do not do anything that may damage the power cable. When disconnecting the power cable, pull on the plug body, not the cable.
- Do not damage a power cable, make any modifications to it, place heavy objects on top of it, heat it, place it near any hot objects, twist it, bend it excessively or pull it. To do so may cause fire and electric shock. You should discard the power cable if it is damaged in any way.
- The power cable shall also be discarded if the plug is damaged.
- Do not place heavy objects on top of the *Controller*.
- Securely insert the power supply plug as far as it will go.
- Before moving the *Controller* unplug all cables connected to it.

It is recommended to unplug the power supply from the wall outlet or the unit if the *Controller* is not going to be used for any prolonged length of time.

Network Requirements

Please consider the following during the installation of the *Controller*.

The risk of potential differences and the spread of voltage from faulty equipment are largely linked to the design of the power installation in the building. If the coax connections are not galvanically separated according to the standard EN60728 then a galvanic separator, e.g. Soontai Isolator IS9 SG, shall be used between the coax connection and the *Controller*.

In terms of potential equalization, the EN 50083-1 and EN60728 shall be followed. Cable distribution systems shall be designed and constructed so that no dangerous voltages can occur in the external conductors of any cables or in metal cases on passive parts.

Warning

If the *Controller* is installed in an environment where the surrounding temperature is at least 50 °C (degrees Celsius), the coax connectors can reach a temperature of at least 85 °C. In this case the coax connectors must not be covered with or in contact with combustible materials due to the risk of fire.

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Installation Environment

Install the *Controller* in a site free from strong electromagnetic field generators (such as motors), vibration, dust, and direct exposure to sunlight.

Install the *Controller* in a fairly cool and dry place for the acceptable temperature and humidity operating ranges. See ***section*** 4 for the actual temperature ranges.

Install the *Controller* on a sturdy, level surface that can support at least 5 kg (11 lbs) of weight. Leave at least 10 cm (4 inches) of space at the front for the coax cables.

Connect a 75-ohm terminator (F-connector) in all coax ports that are not used on the *Controller*.

Storage Environment

The ideal storage location is a dry and well ventilated location, e.g. in a space with climate-control. Please refer to ***section*** 4 on page 36 for more details about the specified environmental conditions.

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Definitions and Abbreviations

The following definitions are used in this document:

Definition	Description
Access Modem	In:xtnd™ | Access | MA2.5 | 2Eth – is a coax to Ethernet network terminal providing 2×1 Gbps Ethernet interfaces. In:xtnd Access 2 Ethernet communicates with the In:xtnd *Controller* 4-port and is based on the MoCA Access™ 2.5 standard. The In:xtnd *Access Modem* is installed in the subscribers' premises. This device will be referred to as the *Access Modem* or just the *Modem* in the document.
Controller	In:xtnd™ | Control | MA2.5 | 4 – is a 4-channel broadband over coax access node, capable of 2.5 Gbps per RF-port, or a total of 10 Gbps, supporting up to 124 In:xtnd *Access Modems*. It communicates with In:xtnd Access using the MoCA Access 2.5 standard.
Customer	End user.
Diplexer	In:xtnd™ | Combine I MA 2.5 is a high-performance frequency combiner. The combiner is designed to be used for connecting one or two MoCA Access Channels for an In:xtnd *Controller* and FM/VHF into a single coaxial cable combining FM/VHF and broadband access in a single coax cable.
Management System	In:xtnd™ | Manage | MA 2.5 – is a, cloud-based, advanced element manager with features for In:xtnd *Controller* deployment, control, and supervision of the coax link conditions. It includes essential functions for service provisioning and network management.
MoCA Access	In:xtnd MoCA Access is point-to-multipoint access network solution serving up to 31 *Modems* (clients) per coax cable loop. It is designed to coexist with legacy services such as TV, DOCSIS, and cellular (4G/5G) technologies. The operating frequency range is 400 MHz – 1675 MHz.

The following abbreviations are used in this document:

Abbreviation	Description
CAM	*Coax Access Modem* - This device will be referred to as the *Access Modem* or just the *Modem* in this document.
CATV	Cable TV.
CLC	Coax Link *Controller*. It will be referred to as the *Controller* in this document.
C-VLAN	Customer VLAN - is the VLAN that the customer uses, or sees (the inner tag). CVLAN is the VLAN tag the customer is using on their own devices. (See QinQ.)
DHCP	Dynamic Host Configuration Protocol – an automatic configuration protocol used to automatically assign IP addresses to devices on a TCP/IP network.
IaaS	Infrastructure as a Service – a form of cloud computing that provides virtualized computing resources over the internet.
IGMP	Internet Group Management Protocol – a protocol used to establish multicast group membership.
IPTV	Internet Protocol TeleVision – the delivery of television content over Internet Protocol (IP) networks. IPTV is a technology for watching television using Internet Protocol over LAN or the Internet, instead of watching TV over cable or satellite.
MAC Address	Media Access Control address – a unique identifier assigned to a Network Interface Controller (NIC) for communications at the data link layer of a network segment. MAC addresses are used as a network address for most IEEE 802 network technologies, including Ethernet, WiFi, and Bluetooth.
MGT	Denotes the Management port on the *Controller*.
MVR	Multicast VLAN Registration
Nmap	Network Mapper – a free and open-source network scanner. Nmap is used to discover hosts and services on a computer network by sending packets and analyzing the responses.
PPPoE	Point-to-Point Protocol over Ethernet is a network protocol for encapsulating PPP frames inside Ethernet frames.
QinQ	The 802.1Q-in-802.1Q (QinQ) technology improves the utilization of VLANs by adding another 802.1Q tag to tagged packets. (See C-VLAN and S-VLAN.)
QoS	Quality of Service - is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow.

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Abbreviation	Description
RX	Receive signal.
SaaS	Software as a Service – a software licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted.
SFP/SFP+	Small Form factor Pluggable transceiver. SFP ≤ 1 Gbps and SFP+/Enhanced ≤ 10 Gbps.
SOAP	Simple Object Access Protocol – protocol for exchanging structured information.
SSL	Secure Sockets Layer is a standard technology for keeping an internet connection secure and safeguarding any sensitive data that is being sent between two systems, including potential personal details.
S-VLAN	Service VLAN - is the VLAN that the service provider network sees (the outer Q-tag). SVLAN is the VLAN the service provider puts all the customer traffic in. (See QinQ.)
TCP/IP	Transmission Control Protocol/Internet Protocol – architecture for data communication over networks.
ToS	Type of Service.
Trunk	The Trunk is the uplink port from the *Controller*. It uses SFP modules.
TX	Transmit signal.
URL	Uniform Resource Locator - the address of a resource on the Internet.
UTP	Unshielded Twisted Pair.
Web GUI	Web Graphical User Interface – a user interface that allows users to interact with In:xtnd electronic devices through a web page.
XML	eXtensible Markup Language – languages which describes the information.

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Package Content

Check that you have the accessories and items as shown in ***Table 1***.

(The images are illustrations and may differ from the real items.)

Table 1 *- Contents of the package.*

Product	Item Description	Item picture
Controller	Broadband over coax access node, capable of 2.5 Gbps per RF-port, a total of 10 Gbps.	
Mounting handles	Mounting handles for wall mount (4 pcs).	
Quick Guide	Quick Guide	

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1 Introduction

1.1 The In:xtnd™ System

InCoax™ is a provider of broadband access solutions leveraging existing in-building coaxial cable networks. The In:xtnd System consists of a Management System (In:xtnd™ | Manage) which manages *Controllers* (In:xtnd™ | Control) installed in, or near, buildings and *Modems* (In:xtnd™ | Access) installed in customers' homes. An illustration of the management system can be seen in ***Figure 1***. The *Modem* is easily installed by the customers without any requirements for configuration. This architecture makes the system very flexible. Once the *Controller* has been installed in, or near, the building the only required operation to connect new customers is to provide them with a *Modem*. As soon as the *Modem* has been connected to the coax network, it will automatically be detected and properly configured by the *Controller* through the Management System.

The typical In:xtnd System consists of one Management System which handles hundreds of *Controllers* and thousands of *Modems*. If there is a legacy cable-TV service in the building the TV signal can be multiplexed with the broadband signal using the Diplexer (In:xtnd™ | Combine). The Management System is used as a customer configuration, monitoring, and provisioning tool through a web interface. In larger networks the *Controller* functions used by the Management System can be accessed by any other provisioning system or Operating Support System through a SOAP/XML interface.

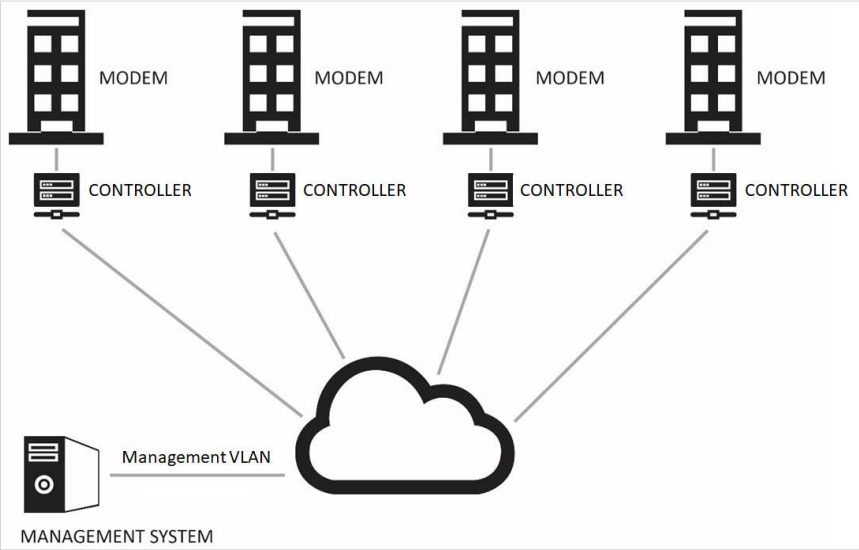

Figure 1 *— Overview of the Management System.*

1.2 The In:xtnd™ | Manage | MA2.5

The Management System is a software package installed in a Linux environment. It manages the *Controllers* and *Modems*. The Management System automatically detects new *Modems* and manages the mapping of subscriber data. It also collects and presents communication statistics parameters and priorities. Furthermore, it measures and presents the RF link quality in real time and handles various alarms to the operator.

1.3 The In:xtnd™ | Control | MA2.5 | 4

The *Controller* acts as a bridge between the Ethernet access network and customers' local area Ethernet, using the in-building coaxial network as transport for data traffic to the *Modems*. The *Controller* communicates with all *Modems*, over dedicated RF channels, in the coaxial network to manage their individual configuration, enforces traffic, and security policies. It also collects and stores traffic statistics data from the network.

1.4 The In:xtnd™ | Access | MA2.5 | 2

The *Access Modem* is an Ethernet network terminal. It connects to any antenna outlet in the subscribers' homes for easy self-installation. It communicates with the *Controller* to get configuration parameters and connects to the subscribers' local area Ethernet (e.g. usually a residential gateway) using Ethernet CAT cables with RJ45 plug. (InCoax recommends using CAT5e cable type as a minimum for best performance.) The firmware of the Modem can be upgraded from the *Controller*.

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1.5 The In:xtnd™ Quality of Service

The In:xtnd *Controller* support up to four queues, broadcast, and multicast Quality of Service (QoS), prioritization between unicast and broadcast/multicast and classification. Unicast QoS can be set individually for each *Modem*.

1.6 The In:xtnd™ | Basic Product Connection

Figure 2 shows an example of the in-building connections for the basic products.

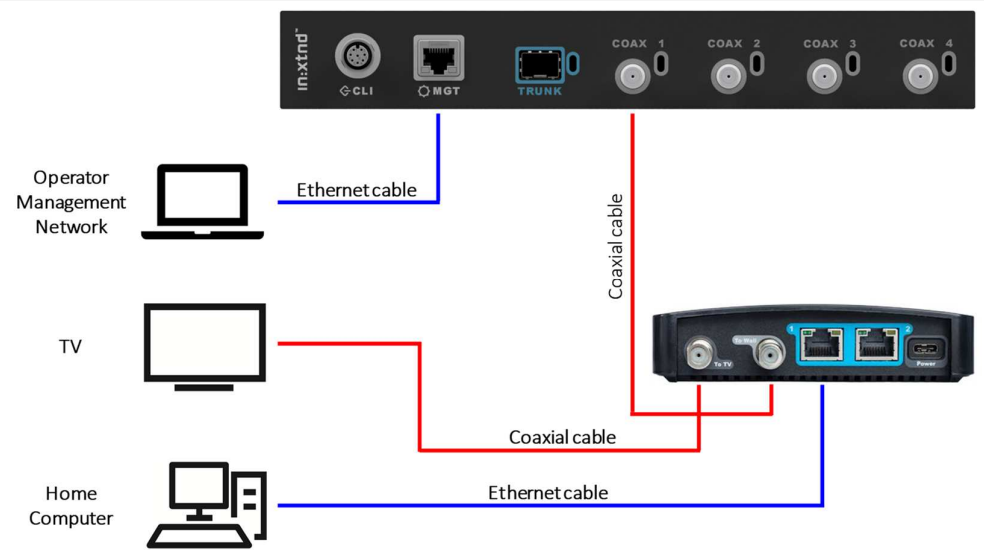

Figure 2 *— Overview of the in-building connections.*

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2 Getting Started – Controller Web Interface

The *Controller* can be managed via the management port ⚙**MGT**. Please refer to ***Figure 3*** where the front of the *Controller* can be seen.

2.1 Accessing the Controller Web Interface

1. Connect a computer with an Ethernet cable to the Management port on the *Controller*, marked ⚙ **MGT**. (InCoax recommends using the cable type CAT5e as a minimum for best performance.)
2. Set a static IP for your computer connection, for example 192.168.144.100 (or any IP between 192.168.144.1 and 192.168.144.254 but not the same as the default IP address) and Subnet Mask 255.255.255.0.
3. Open your web browser and go to the URL https://192.168.144.20. The web page in ***Figure 4*** will be displayed. Input the following to log in:
   a. Default Username: **incoax**
   b. Default Password: **incoax**

Figure 3 *— The front of the Controller.*

Figure 4 *— The login page.*

2.2 User Levels and Permissions

There are two different user levels with different purposes and permissions:

- **View Only**: Demonstration and supervision. The *View Only* users can view some managed objects and settings, but cannot add or change anything.
- **Admin**: *Controller* and *Modem* management. The *Admin* users can add and change managed objects and settings. This is the standard user level.

Table 2 gives a detailed view of what the two user levels are allowed to do.

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Table 2 *— User level permissions.*

Operation	View Only	Admin
View Controller	●	♦
View Modem	●	♦
View Service	●	♦
View Controller Statistics	●	♦
Use port Spectrum	●	♦
View Modem Statistics	●	♦
View Alarms	●	♦
View Modem Default Configurations	●	♦
View Users	●	♦
View SOAP Configurations	●	♦
Add/edit/delete Modem		♦
Add/edit/delete Service		♦
Upgrade Modem Firmware		♦
Add/edit/delete Multicast Groups		♦
Edit Coax Ports		♦
Add/edit/delete Service VLAN		♦
Edit Service and QoS		♦
Edit Priorities		♦
Edit Advance Settings		♦
Use Ping and Traceroute Tools	●	♦
View Hardware	●	♦
Download Logs	●	♦
View Settings	●	♦
Add/edit/delete Settings		♦
Add/edit/delete Network Settings		♦
Modify Users		♦
Modify Own Account Settings	●	♦
Modify SOAP Configuration		♦
Manage Controller Firmware		♦
Reboot Controller		♦

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3 Web Interface

This section gives a detailed description on how to use the *Controller Web Interface*.

3.1 Overview

The web interface provides the possibility to configure and manage settings, and inspect performance and statistics. Each of the tabs **HOME**, **MODEMS**, **MANAGEMENT**, **SUPPORT**, **STATISTICS**, **SETTINGS**, and **LOGOUT** are described ~~below~~ in the following sections. All web pages have their name displayed just below the menu bar. This is to make it easier to locate where you are in the web interface.

3.2 Home

The **HOME** tab in ***Figure 5*** is shown after the login is completed. It displays the basic configuration parameters (***LAN Settings*** and ***Management VLAN Settings***), some status information, and some statistics.

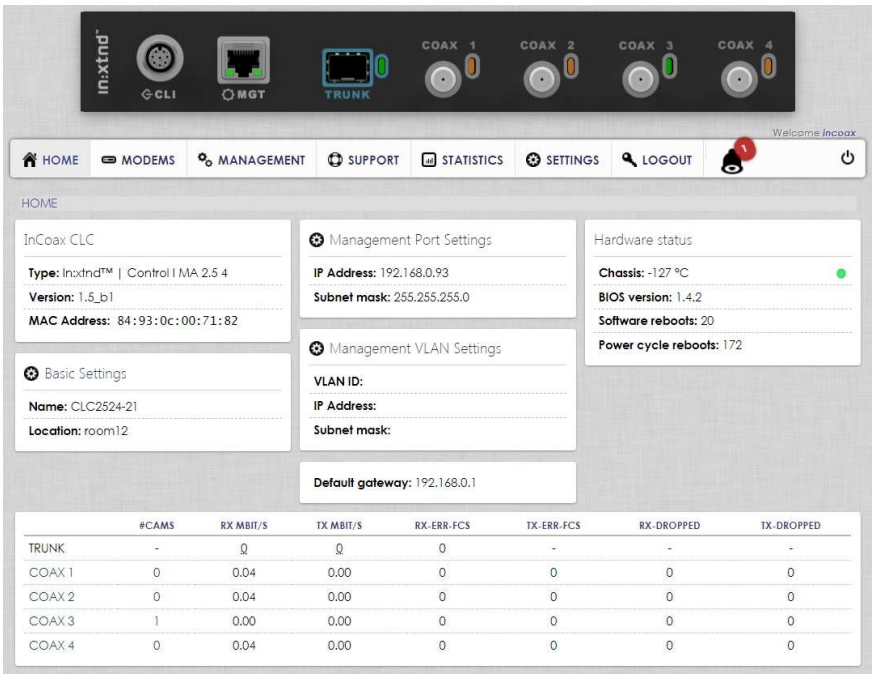
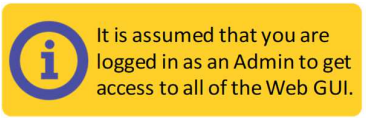


Figure 5 *— Web page Home for the Controller.*

The settings can only be edited by a user with *Admin* permissions, as was stated in ***section 2.2***.

1. Click on **HOME** to see the Home tab.
2. To edit the ***Basic Settings*,** click on the symbol ⚙ in the same box.
3. To edit the ***LAN Settings***, click on the symbol ⚙ in the same box.
4. To edit the ***Management VLAN Settings***, click on the symbol ⚙ in the same box.



The following information can be found on the **HOME** tab:

- The box ***InCoax CLC*** contains information about the hardware type, software version, and MAC address that are valid for the specific *Controller*. (Please note that CLC stands for *Coax Link Controller*, i.e. the *Controller*.)
- The box ***Basic Settings*** contains information about the hardware version and its location.
- The box ***LAN Settings*** contains information of which IP address that is used to manage the *Controller* and the Subnet for the network.
- The box ***Management VLAN Settings*** contains information about the VLAN ID that is used for management, IP address for the management VLAN, Subnet for the network, and Default Gateway.
- The box ***Hardware status*** contains information about the hardware; Chassis temperatures, BIOS version, number of Software reboots, and Power cycle reboots.
- The table in the lower part of ***Figure 5*** provides a quick performance overview of the *Controller*.

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Chassis: This gives an indication of the temperature inside the chassis. There are four possible colors:

- Good (green) - Status OK.
- Warning (yellow) - Status warning. Small margin to Critical status.
- Critical (orange) - Maintenance might be required. Contact your local sales representative.
- Failure (red) - Maintenance or replacement might be required. Contact your local sales representative.

3.3 Modems

3.3.1 Overview

The **MODEMS** tab displays all *Access Modems* that have been added to the specific *Controller* unit. All of these *Modems* can be managed from this tab.

Hover over **MODEMS** ~~in~~ and click on **OVERVIEW.** This displays a table with information, as shown in ***Figure 6***, about ***MAC, COAX, STAT, LOCATION, VLAN, STATUS, MHz, SET,*** and ***SERVICE*** for every *Modem* that is connected with the *Controller*. ***Table 3*** has more information about some of the different parameters.

- ***MAC*** - displays the *Modem* MAC address. By clicking once on the header ***MAC*** the *Modems* will be sorted alphanumerically in accordance with their MAC addresses. If you click once more the sorting will be reversed.
- ***COAX*** - displays which coax port on the *Controller* a *Modem* is connected to.
- ***STAT*** - press the symbol to be directed to the specific *Modem's* statistics. (See ***section 3.6*** for more information.)
- ***LOCATION*** - displays the location set in the *Modem*.
- ***VLAN*** - display Service VLAN setting.
- ***STATUS*** - green or red means link or no link, respectively, between the *Controller* and the *Modem*. By clicking once on the header *STATUS* the *Modems* will be sorted according to their status green/red. If you click once more the sorting will be reversed. If the status is green you can click on the status indicator and some useful information will be displayed (e.g. configuration parameters and uptime).
- ***MHz*** - displays the frequency set during the configuration of the *Modem*. (See ***Figure 8*** and ***Table 3*** for more information.)
- ***SET*** - please note that clicking on the will set the *Active Service* to *Default* for the specific *Modem*. See ***section 3.3.3.2*** and ***Table 4*** for more information.
- ***SERVICE*** - displays the name for the Service that is set.
- ***DELETE*** - click on the ⊗ symbol and the specific *Modem* will be deleted.

3.3.2 General Data Protection Regulation

In the field Location you can enter the real location of the *Modem* in the building. (See ***Figure 7*** and ***Table 3***.) Please note that this can be in conflict with General Data Protection Regulation (GDPR). Before you enter any information about the location make sure that it is in agreement with GDPR and/or any local legal aspects. Also note that there may be security aspects that can affect what kind of information could be in the database.

3.3.3 Adding and Configuring Modems

At the far right in ***Figure 6*** there is an **Options** menu. Here it is possible to add a new *Modem* or to send a new configuration to update the *Modems*. When a *Modem* is added manually to the *Controller* it will get all configuration parameters from the "default" service. All parameters can manually be reconfigured, or a new service can be assigned to each *Modem*. The parameters are described in ***Table 3***.

Please note that you **must first** add a Service VLAN as described in ***section 3.4.4.1*** on page 21.

Add Service VLAN before adding Modems.

MODEMS / OVERVIEW

MAC	COAX	STAT	LOCATION	VLAN	STATUS	MHZ	SET	SERVICE	DELETE
55:55:55:55:55:55			office	666		1150			
84:93:0c:00:52:ed	1					1150			
84:93:0c:10:27:48	3			666		1150			

Figure 6 *– Overview of the connected Modems.*

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3.3.3.1 Adding Modems Manually

1. Make sure that the *Modem* is **switched off**.
2. In the main menu, hover over **MODEMS** and click on **OVERVIEW.**
3. Click on **ADD MODEM** in the **Options** menu to the right. (See ***Figure 7***.)
4. Enter the MAC address of the *Modem* in the field **MAC**. The MAC address can be found on the product label placed on the *Modem*.
5. In the ***Service & QoS***, as seen in ***Figure 8***, set the MoCA band and frequency to the same values as the coax port. This is to ensure that the *Modem* can establish a link to the intended coax port.
6. Configure other relevant parameters like VLAN, priorities, etc.
7. Click on the button ***Add modem*** to add this *Modem*.
8. Connect the *Modem* to the coaxial network and connect the power adapter.

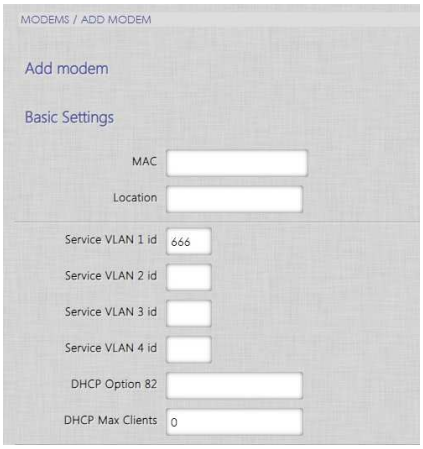

Figure 7 *— Add Modem - Basic Settings.*

Figure 8 *— Add Modem - Service and QoS; Switch Configuration*

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Table 3 *— Description of the Add Modem parameters.*

Term	Value [Default Setting]	Definition
	Basic Settings	
MAC	*MAC*	MAC address for the *Modem*.
Location	*User defined location*	Text string describing the location of the *Modem*. Set to Auto discover when the *Modem* has been automatically detected and added by the *Controller*. This can be changed when the *Modem* has been added.
Service VLAN n id **n = 1 - 4**	*User added VLAN*	Defines which of the VLAN's available on the *Controller* that could be available in the *Modem*. If there is a Service Default VLAN it will show up as a suggestion.
DHCP Option 82	*User defined*	DHCP Relay Agent Information Option parameters
DHCP Max Clients	*User defined*	Defines max. concurrent clients that are allowed to connect to this *Modem*. 0 (zero) means unlimited.
Admission Allowed	*On/Off [On]*	Defines whether the *Modem* is allowed to be associated with the *Controller* or not. Check the checkbox to allow admission.
Automatic Power Control	*On/Off [On]*	Enable or disable automatic power control. The benefit with automatic power control is that the risk of interfering with other analogue devices is reduced due to overall lower transmit power levels. External interference problems can be reduced / avoided by disabling the power control mechanism. Power control is enabled when the checkbox is checked.
Power	*0 - 10 [10]*	This parameter sets the transmit power level when automatic power control is disabled and sets the max. power level when automatic power control is enabled. Each reduction in the index is a 3dB reduction in the transmit power level. When using the Power Amplifier (PA, "PA On") in the *Controller*, the MoCA chip needs to back off to avoid saturation of the PA, so the max. TX Power should be set to 8 or less to avoid saturation of the PA. When NOT using the Power Amplifier (PA, "PA Off") in the *Controller*, max. TX Power should be set to 10.
Power Control Rate	*0 - 680 Mbps [680]*	This parameter is the required physical bit rate that will be targeted in the automatic power control mode and is the speed per 100 MHz channel. If the target MAC rate is 2500 Mbps MAC rate, the Power Control Rate should be set to 680 Mbps (5 × 680 Mbps = 3400 Mbps PHY rate), as a lot of the PHY rate capacity will be used for the MoCA Access 2.5 based MAC.
PA/Attenuation	*[Off/Off]*	Amplified output and/or attenuated input. (Default Off/Off). Observe that "PA On" requires the user to modify the Power parameter described above.
US Speed limit	*[0]*	Max. upstream traffic from the *Modem*. The default value of zero, 0, means that no upstream limit is applied in the *Modem* and all policing is done in the *Controller*.
MoCA Band	*[A-D]*	Choose frequency range. Options A-A/A-B/A-C/A-D or A-E.
Frequency (1 of)	*450 - 1625 MHz [1150]*	The centre frequency the *Modem* is to operate on.
	QoS (Q0 - Q3)	
Upstream peak	*0 - 2000 Mbps [2000]*	Max. unicast upstream traffic per queue.
Upstream guaranteed	*0 - 2000 Mbps [100]*	Guaranteed unicast upstream traffic per queue.
Downstream peak	*0 - 2000 Mbps [2000]*	Max. unicast downstream traffic per queue.
Downstream guaranteed	*0 - 2000 Mbps [100]*	Guaranteed unicast downstream traffic per queue.
Burst peak	*0 - 131071 bytes [80000]*	Burst traffic peak value, also called peak burst size – PBS.

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Term	Value [Default Setting]	Definition
Burst guaranteed	*0 - 131071 bytes [4096]*	Burst traffic guaranteed value, also called committed burst size, CBS.
Switch Configuration		
VLAN passthrough	*[On]*	If it is marked it means that each port allows packets with tagged VLAN (defined in each *Modem*) to pass through the *Modem* switch. If it is not marked, then packets with VLAN tag (other than defined in native) are dropped.
Enable port	*On/Off [On]*	Activate/disable switchport.
Native VLAN (U)	*Service VLAN 1 - 4 id*	Packets belonging to the VLAN specified here will leave the switch port untagged and packets received on this port will leave the switch tagged with this VLAN.
Tagged VLAN	*Service VLAN 1 - 4 id*	A max. of 3 Tagged VLANs can be supported, packets belonging to the VLAN specified here will leave the switch port tagged and tagged packets (with this VLAN) received on this port will leave the *Controller* tagged.

3.3.3.2 Adding Modems Automatically

When a Modem is added automatically it always gets the **default Service settings**.

Before starting to add *Modems* automatically, it is good to check how they are going to be configured. Adding *Modems* automatically can save a lot of time, but the opposite can also be true if the default settings for the *Modems* are wrong.

1. Set ***Service default*** in the *Controller*.
2. In the main menu, hover over **MODEMS** and click on **SERVICES.**
3. Click on the name ***default*** in the column ***SERVICE*** in the displayed table. (See ***Figure 9.***)
4. Set the desired default settings.
5. Connect the power to the *Modem*(s).
6. The *Modem*(s) will soon be found by the *Controller* and will be correctly associated.

Figure 9 *— Overview of the Modem Services.*

3.3.3.3 Service

A service is a configuration template for *Modems*. A "default service" always exists on a *Controller*. This service can be edited but it cannot be deleted. The service on the *Controller* should not be used if you are using the InCoax Management System (Manage). Please see ***section 3.7.6*** on page *32* and the Manage User Manual for more information.

3.3.3.3.1 Adding a New Service to a Modem

1. In main menu, hover over **MODEMS** and click on **SERVICES.**
2. Click on **ADD SERVICE** in the Options panel to the far right in ***Figure 9***.
3. Configure the parameters and make sure the checkbox *Service active* is marked. See ***Figure 10***, ***Figure 11***, and ***Table 4***.
4. Click on the button ***Add*** at the bottom of the web page.
5. In the main menu, hover over **MODEMS** and click on **OVERVIEW**. You will then come to the page seen in ***Figure 6***.
6. Assign the new service to one of the *Modems* by clicking the symbol ⓓ (**SET**) on the selected *Modem*.
7. Click on **SEND UPDATES** to save the changes.

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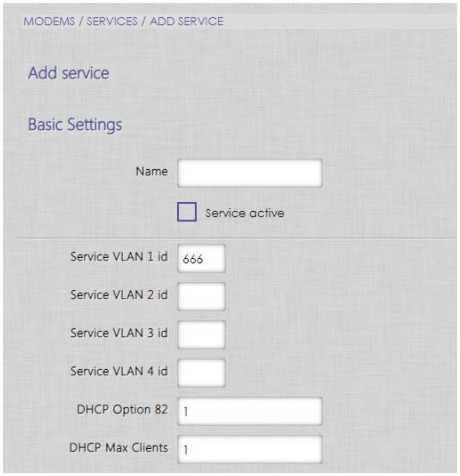

Figure 10 *— Add Service - Basic Settings.*

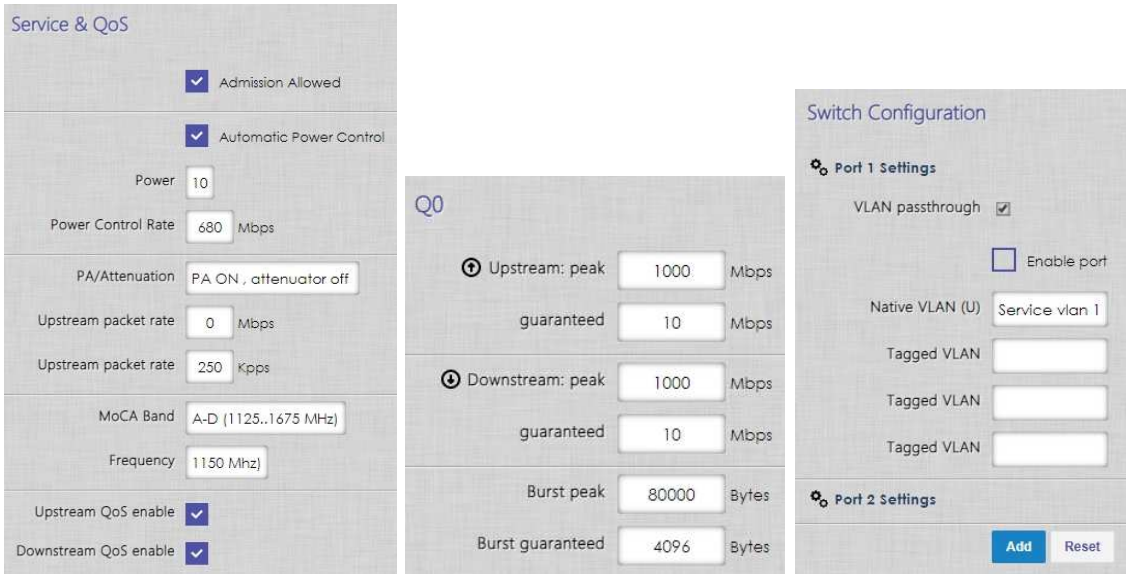

Figure 11 *— Add Service - Service and QoS; Switch Configuration.*

3.3.3.4 Modem Details

To get access to more details about the *Modem* go to the main menu, hover over **MODEMS** and click on **DETAILS.**

A web page as shown in ***Figure 12*** will be displayed. This contains some statistical data from the *Modems*. See ***Table 5*** for more details. Sorting of the listed *Modems* can be done for the headers *MAC*, *COAX*, *LOCATION*, *S*, *CAM UPTIME*, and *VERSION*.

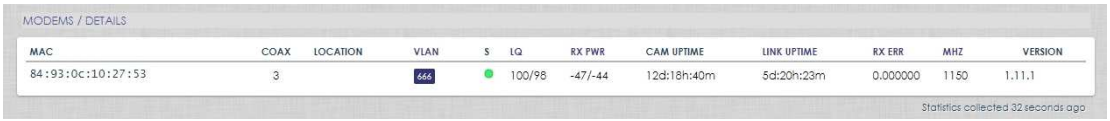

Figure 12 *— Modem - Details.*

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Table 4 *— Description of the Add Service parameters.*

Term	Value [Default Setting]	Definition
	Basic Settings	
Name	*User defined Name [Blank]*	Text string describing the Service. This can be changed when the *Modem* has been added.
Service active	*On/Off [Off]*	Defines which service that is active via ***SET*** function in the **MODEM** - **OVERVIEW** tab. (See ***Figure 6***.)
Service VLAN n id n= 1 - 4	*User added VLAN*	Defines which of the VLANs are available on the *Controller* that could be available for the *Modem*.
DHCP Option 82	*User defined*	DHCP Relay Agent Information Option parameters.
DHCP Max Clients	*User defined*	Defines max. concurrent clients that are allowed to connect to this *Modem*.
Admission Allowed	*On/Off [On]*	Defines whether the *Modem* is allowed to be associated with the *Controller* or not. Check the checkbox to allow admission.
Automatic Power Control	*On/Off [On]*	Enable or disable automatic power control. The benefit with automatic power control is that the risk of interfering with other analogue devices is reduced due to overall lower transmit power levels. External interference problems can be reduced / avoided by disabling the power control mechanism. Power control is enabled when the checkbox is checked.
Power	*0 - 10 [10]*	This parameter sets the transmit power level when automatic power control is disabled and sets the max. power level when automatic power control is enabled. Each reduction in the index is a 3 dB reduction in the transmit power level.
Power Control Rate	*0 - 2048 Mbps [680]*	This parameter is the required physical bit rate that will be targeted in the automatic power control mode.
PA/Attenuation	*[Off/Off]*	Amplified output and/or attenuated input. (Default Off/Off).
US Speed limit	*0*	Max. upstream traffic from *Modem*.
MoCA Band	*[A - D]*	Choose frequency range. Options A - A/A - B/A - C/A - D or A - E.
Frequency (1 of]	*450 - 1625 MHz [1150]*	The centre frequency the *Modem* is to operate on.
	QoS (Q0 - Q3)	
Upstream peak	*0 - 2000 Mbps [2000]*	Max. unicast upstream traffic per queue.
Upstream guaranteed	*0 - 2000 Mbps [100]*	Guaranteed unicast upstream traffic per queue.
Downstream peak	*0 - 2000 Mbps [2000]*	Max. unicast downstream traffic per queue.
Downstream guaranteed	*0 - 2000 Mbps [100]*	Guaranteed unicast downstream traffic per queue.
Burst peak	*0 - 131071 [80000]*	Burst traffic peak value.
Burst guaranteed	*0 - 131071 [4096]*	Burst traffic guaranteed value.
	Switch Configuration	
VLAN passthrough	*[On]*	If it is marked it means that each port allows packets with tagged VLAN (defined in each *Modem*) to pass through the *Modem* switch. If it is not marked, then packets with VLAN tag (other than defined in native) are dropped.
Enable port	*On/Off [On]*	Activate/disable switchport.
Native VLAN (U)	*Service VLAN 1 - 4 id*	Packets belonging to the VLAN specified here will leave the switch port untagged and packets received on this port will leave the switch tagged with this VLAN.
Tagged VLAN	*Service VLAN 1 - 4 id*	Packets belonging to the VLAN specified here will leave the switch port tagged and tagged packets (with this VLAN) received on this port will leave the *Controller* tagged.

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Table 5 *— Description of parameters for Modem - Details.*

Term	Value	Definition
MAC		Displays the *Modem's* MAC address.
COAX	*1 to 4*	Displays which coax port the *Modem* is connected to.
LOCATION		Displays the text (string) entered under Location earlier. See ***Table 3*** and ***Figure 7***.
VLAN	*1 - 4095*	Displays which VLAN the *Modem* is connected to.
S	*Green/Red*	S = Status. **Green** means that there is a coax link connection. **Red** means no coax link connection.
LQ	*0 - 100%/0 - 100%*	Link quality (RX at *Modem* / RX at *Controller*) shows how much of the optimal link symbol encoding that can be achieved between the *Modem* and the *Controller*.
RX PWR		RX Power dBm (RX PWR at *Controller* / RX PWR at *Modem*).
CAM UPTIME		*Coax Access Modem* (CAM) uptime in days:hours:minutes.
LINK UPTIME		Link uptime in days:hours:minutes.
RX ERR		Share of erroneous Ethernet frames that has been dropped in percent.
MHz		The centre frequency the *Access Modem* is to operate on.
VERSION		Software version.

3.3.3.5 Firmware

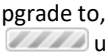
The *Modems* can be upgraded with the firmware that is included in the *Controller* software package. In the main menu, hover over **MODEMS** and click on **FIRMWARE**. The displayed web page is shown in ***Figure 13***. Choose the firmware version to upgrade to, then choose any online *Modem*(s) that shall be upgraded and click on the button ***Apply***. The symbol  under **PENDING** will appear as long as the update is progressing. It will disappear when the update has finished for each *Modem*.

Figure 13 *— Modem firmware.*

3.3.3.6 Modem Statistics

Modem statistics will show the number of packets per second (RX/TX) on both ethernet ports and the coax port. Data can also be downloaded in ***csv*** format by clicking on the "csv-link" just above the first diagram. See ***Figure 14***.

- Hover over **MODEMS** in the main menu and click on **OVERVIEW.** Then click on the **STAT** symbol for the *Modem* that is of interest.
- Or, hover over **STATISTICS** in the main menu and click on **CAM STATISTICS** or click on the ***CAM MAC*** (address). See ***Figure 33***. (Please note that CAM is an abbreviation of *Coax Access Modem*.)

3.3.4 Edit the Configuration of a Modem

If you click on the MAC address for one of the *Modems* on the web page **MODEMS - OVERVIEW** (see ***Figure 6***) you will be redirected to the web page **MODEMS - EDIT MODEM**. All of the settings in ***section*** **3.3.2** and its subsections, can be edited, except for the MAC address.

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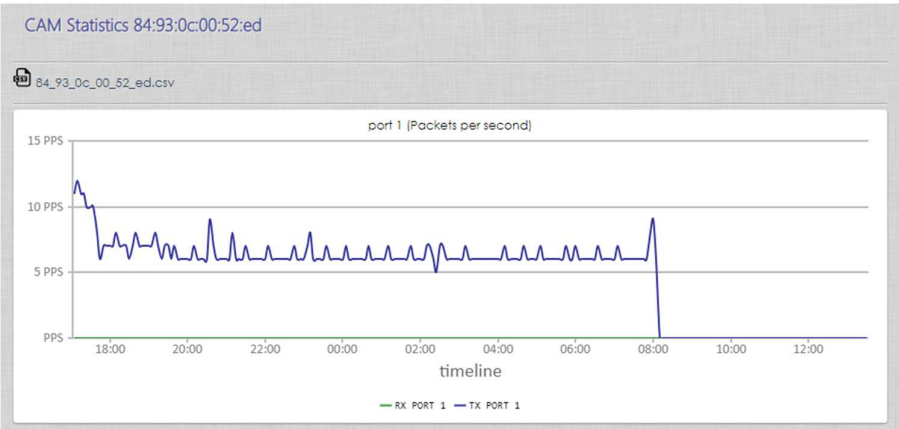

Figure 14 *— Modem statistics graph and csv file download page.*

3.4 Management

The **MANAGEMENT** tab contains all MoCA Access 2.5 based Network Controller parameters, i.e. RF signal and MAC configuration, and Ethernet Access Node parameters (i.e. the VLAN and QoS) that can be configured.

3.4.1 Overview

In the main menu, hover over **MANAGEMENT** and click on **OVERVIEW.** The parameters Multicast groups and Service VLAN are displayed, as is seen in ***Figure 15***.

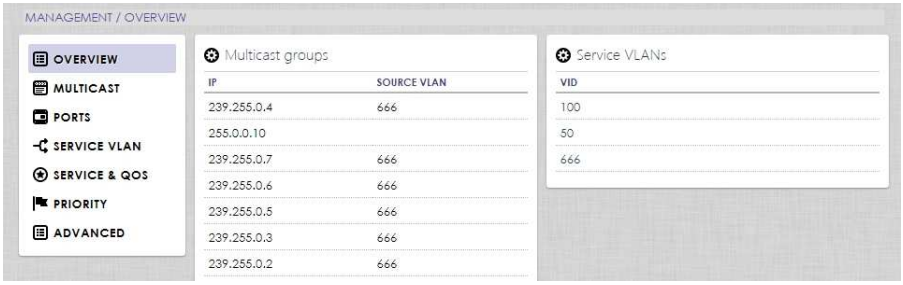

Figure 15 *— Management - Overview.*

3.4.2 Multicast

Each multicast group that is distributed to one or more *Modems* over the coaxial network will consume an amount of traffic equal to sending the traffic to a single *Modem*. Each multicast group can also be configured to reserve bandwidth.

In the main menu, hover over **MANAGEMENT** and click on **MULTICAST**. The web page is shown in ***Figure 16***.

On this web page you can delete an IP address by clicking on the symbol ⊗ for that address. In the menu to the far right there is the option to add a new multicast group. This will be described in ***section 3.4.2.1***.

If you need to edit one of the groups you can click on the IP address in the column ***IP***. A page as seen in ***Figure* 18** will then be displayed.

Figure 16 *— Management - Multicast Overview.*

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3.4.2.1 Add Multicast

Click on the **ADD MC GROUP** to add a new multicast group.

1. Configure the relevant parameters Multicast group IP, Name, Source VLAN, and Reserved bandwidth, as seen in ***Figure 17*** and ***Table 6***.
2. Click on **Add multicast group** to save the settings and add the new Multicast Group.

Figure 17 *— Add Multicast.*

Table 6 *— Description of the Multicast parameters.*

Term	Value	Definition
Multicast group IP		Multicast IP address.
Name		User defined name.
Source VLAN	*1 - 4095*	Enter the Source VLAN for the multicast group, if multicast VLAN registration is used. See also Multicast VLAN in ***section* 3.4.4**.
Reserved bandwidth		The reserved bandwidth on the link for this group. The reserved bandwidth for the multicast group is deducted from the unicast capacity of each *Modem*, i.e. each *Modem* that gets the distributed multicast traffic.
Add multicast group		Click to add the new multicast group.
Reset		Click to discard the settings.

3.4.2.2 Edit a Multicast Group

To edit one of the Multicast groups you can click on the IP address and you will be redirected to a page similar to the one in ***Figure 18***. Here you can edit all of the parameters found in ***Table 6*** except the IP address. Click on the button ***Apply*** to save the settings.

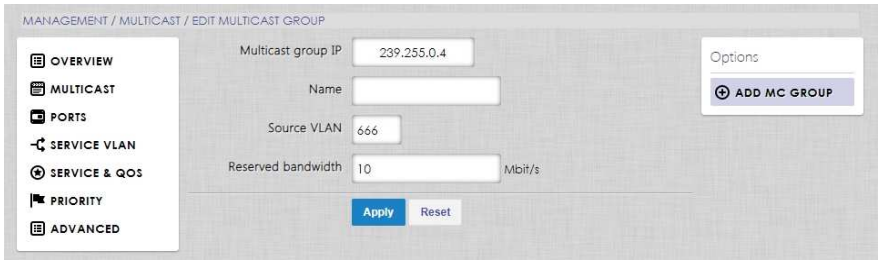

Figure 18 *– Edit Multicast Group.*

3.4.3 Port Settings

The *Controller* has four coaxial ports and one SFP/SFP+ Trunk port for a connection to an Ethernet aggregation network, as shown in ***Figure 5***. The SFP/SFP+ Trunk port can support 1 Gbps and 10 Gbps speeds and must be configured manually to either 1 Gbps or 10 Gbps. All coaxial links are by default activated on the band A - D at 1150 MHz by default. See ***Table 7*** and ***Table 8*** for more details.

1. In the main menu, hover over **MANAGEMENT** and click on **PORTS**. ***Figure 19*** shows the corresponding web page.
2. Click on one of the ***Settings*** to change the settings for the specific port. See ***Figure 20*** and ***Table 7*** for more details about the Trunk port and ***Figure 21*** and ***Table 8*** for more details about the coax ports.
3. Click on the button ***Apply*** to save the settings.

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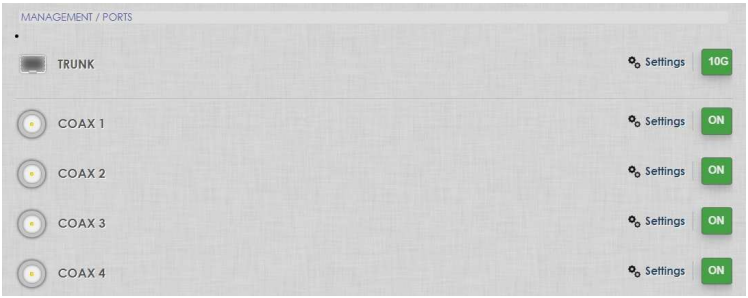

Figure 19 *— Trunk and Coax ports.*

Figure 20 *— The default settings for the Trunk port.*

Table 7 *— Description of the Trunk port parameters.*

Term	Value [Default Value]	Definition
Port Speed	*TRUNK 10G, COAX 4×2.5G /* *TRUNK 1G, COAX 4×1G* *[TRUNK 10G, COAX 4×2.5G]*	”TRUNK 10G, COAX 4×2.5G” sets the Trunk port to work in 10 Gbps mode and the Coax ports to run in 2.5 Gbps mode. The setting is intended to be used with 10 Gbps Ethernet SFP+ modules and 10 Gbps XG(S) - PON ONT/ONU that support 10 Gbps Ethernet. ”TRUNK 1G, COAX 4×1G” sets the Trunk port to work in 1 Gbps mode and the Coax ports to run in 1 Gbps mode. The setting is intended to be used with 1 Gbps Ethernet SFP modules and 1 Gbps GPON ONT/ONU that support 1 Gbps Ethernet. The reason for setting the Coax ports to 1 Gbps is that there is no reason to support higher speeds than the Trunk port supports.
Apply		Click to apply the settings.
Reset		Click to discard the settings.

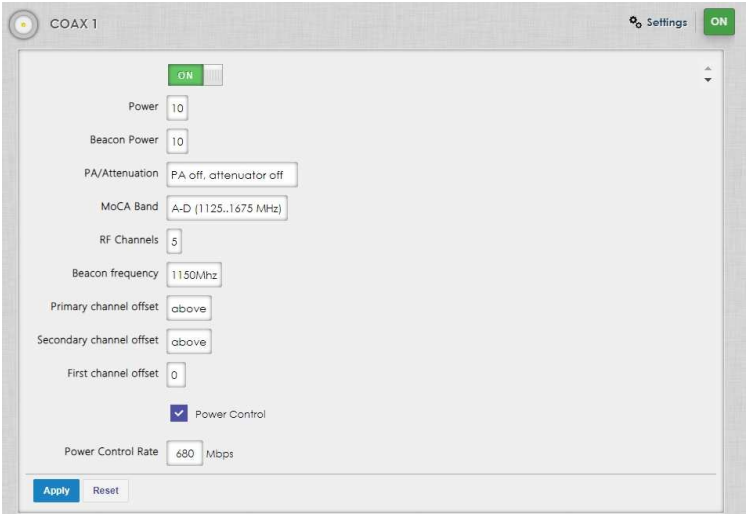

Figure 21 *— The default settings for the Coax ports.*

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***Table 8** — Description of the Coax ports parameters.*

Term	Value [Default Value]	Definition
On/Off	*On/Off [On]*	On (Green) indicates that the coaxial port is active. Off (Red) indicates that the coaxial port is inactive.
Power	*0 - 10 [10]*	This parameter sets the transmit power level when automatic power control is disabled and sets the max. power level when "Power Control" is enabled. Each reduction in the index is a 3 dB reduction in the transmitted power level.
PA/Attenuation	*[Off/Off]*	Amplified output and/or attenuated input.
MoCA Band	*[A - D, 1125 - 1625 MHz]*	Choose the frequency range.
RF Channels	*[5]*	Define the number of 100 MHz Channels to be used for each port.
Beacon frequency	*500 - 1600 MHz depending on MoCA band [1150]*	Frequency used by the *Controller* to broadcast beacon messages.
Primary channel offset	*[above]*	Centre frequency in the primary channel relative to the beacon frequency.
Secondary channel offset	*[above]*	Centre frequency in the secondary channel relative to the primary frequency.
First channel offset	*[0]*	Define start of first channel relative to the primary channel.
Power Control	*On/Off [On]*	Enable or disable automatic power control. If On the output power is set up to the configured Power (0 - 10). The benefit with automatic power control is that the risk of interfering with other analogue devices is reduced due to overall lower transmit power levels. Power control is enabled when the checkbox is checked.
Power Control Rate	*0 - 2048 Mbps [680]*	This parameter is the required physical bit rate that will be targeted in the automatic power control mode. The max. output power is still regulated by the *Power* parameter. The default value is 680.
Apply		Click to apply the settings.
Reset		Click to discard the settings.

3.4.4 Service VLAN

A service VLAN is a configuration template for VLANs. A "default VLAN" always exists on the *Controller*. This VLAN can be edited but it cannot be deleted. The *Controller* can handle up to 200 different 802.1q VLANs.

Hover over **MANAGEMENT** in the main menu and click on **SERVICE VLAN.**

All configured VLANs will be displayed. One example is shown in ***Figure 22***. Click on the ⊗ symbol if you want to delete one of the VLANs.

***Figure 22** — Service VLAN.*

3.4.4.1 Adding VLAN

Add a new VLAN by clicking on **ADD VLAN** in the Options menu on the right-hand side in ***Figure 22***. A web page will appear as seen in ***Figure 23***. The description of the parameters is found in ***Table* 9**. Enter the desired settings and click on the button ***ADD VLAN***.

3.4.4.2 Configure Multicast Groups for VLAN

Configure the multicast groups that shall be allowed on the VLAN by clicking on the **MC** symbol in the **SERVICE VLAN** listing of the VLANs. See ***Figure 22***. The **MC** configuration page can be seen in ***Figure 24*** and the description of the parameters is found in ***Table 10***. Click on the button ***Update VLAN*** to save the settings.

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Figure 23 *— The Add VLAN page.*

Table 9 *— Description of the Add VLAN parameters.*

Term	Value [Default Setting]	Definition
S-VLAN	*1 - 4095*	802.1q VLAN ID.
C-VLAN	*1 - 4095*	C-VLAN is the VLAN tag the customer is using on their own devices.
Prio	*[0] - 7*	The VLAN priority between 0 and 7.
OPT82 ID	*1 - 4095*	If the DHCP snooping is activated the VLAN ID information uses the value in this field.
DHCP Snooping	*[Inactive]* *Active untrusted* *Active trusted*	- DHCP Snooping is inactive. - Uses OPT82 and rewrites the value. - Uses OPT82 and keeps the value.
OPT82 Circuit ID	*Modem mac* *Controller mac* *Controller vlan* *Modem id* *Controller id* *[Blank]*	Choose the source for the value to set CID field in DHCP option 82.
OPT82 Remote ID	*Modem mac* *Controller mac* *Controller vlan* *Modem id* *Controller id* *[Blank]*	Choose the source for the value to set RID field in DHCP option 82.
PPPoE Enabled	*Yes/[No]*	If PPPoE is enabled all upstream PPPoE-frames will have the Vendor specific option 0x105 added with Remote ID set to the value that is configured in the field "DHCP OPT82/PPPoE ID" of the *Access Modem* configuration.
Multicast VLAN	*Yes/[No]*	Broadcasts the IGMP queries to all configured VLANS, i.e. Multicast VLAN Registration (MVR) MVLAN is configured on this VLAN. Then the other VLANs intended to be MVR receiver VLANs can be configured by adding multicast groups to the MVR receiver VLAN multicast configuration. Please note that the Source VLAN has to be set to the MVLAN. When an MVLAN is configured, the VLAN will carry traffic for the configured multicast groups. It is possible to configure multiple MVLANs on a switch, but they must have disjoint multicast groups. An MVR receiver VLAN can be associated with more than one MVLAN, by configuring multicast groups for the MVR receiver VLAN.
Internal VLAN	*Yes/[No]*	The *Controller* tags untagged traffic with this VLAN ID.
Add VLAN		Click to add the new VLAN.
Reset		Click to discard the settings.

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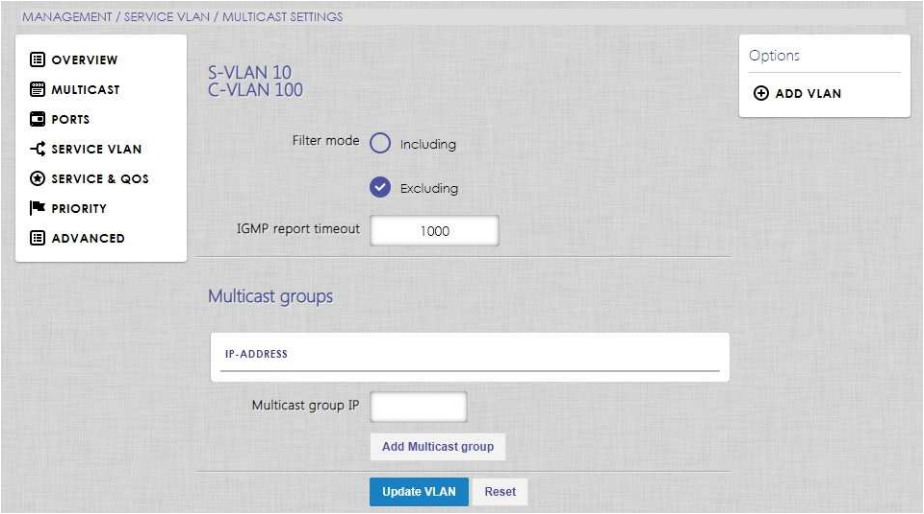

Figure 24 *— The VLAN Multicast Group configuration page.*

Table 10 *— Description of the Add Multicast Group parameters.*

Term	Value [Default Setting]	Definition
S-VLAN 10 / C-VLAN 100		
Filter mode Including/Excluding	*Including/Excluding [Excluding]*	If Including, the configured Multicast Groups for this VLAN will only allow multicast traffic for the configured multicast groups. If Excluding, the configured Multicast Groups for this VLAN will be blocked and all other multicast traffic will be allowed on this VLAN.
IGMP report timeout		Set IGMP report timeout in correspondence to the IGMP query interval.
Multicast groups		
IP address		
Multicast group IP		Multicast IP address from the list of Multicast Groups existing in ***section 3.4.2***.
Add Multicast group		Click to add the new Multicast Group.
Update VLAN		Click to update the VLAN.
Reset		Click to discard the settings.

3.4.5 Service & QoS

Every *Modem* can have up to four queues for unicast traffic. The *Controller* has a bit rate up to 2.5 Gbps per coaxial port (500 Mbps per 100 MHz channel). The sum of the guaranteed bit rate for all queues and all *Modems* on one channel cannot exceed the link's bit rate. One *Modem* can have a higher guaranteed bit rate in one or more queues than other *Modems* on the same link. The peak and guaranteed bit rate for each queue can be configured both upstream and downstream.

If a VLAN-tagged frame, with the P-bits set, is received on the WAN-side in the *Controller* and the VLAN ID is mapped against one or more *Modems*, the frame will be mapped against one of the queues depending on the P-bits. Read about Type of Service (ToS) and DHCP in ***section 3.4.6***.

In the main menu, hover over **MANAGEMENT** and click on **SERVICE & QoS**.

Figure 25 and ***Figure 26*** shows the displayed information. (The Q1 and Q2 have the same parameters as Q0 and Q3.) More details about the settings for the Service and QoS are found in ***Table 11***. Click on the button ***Apply*** to save the settings or click on ***Reset*** to discard the settings.

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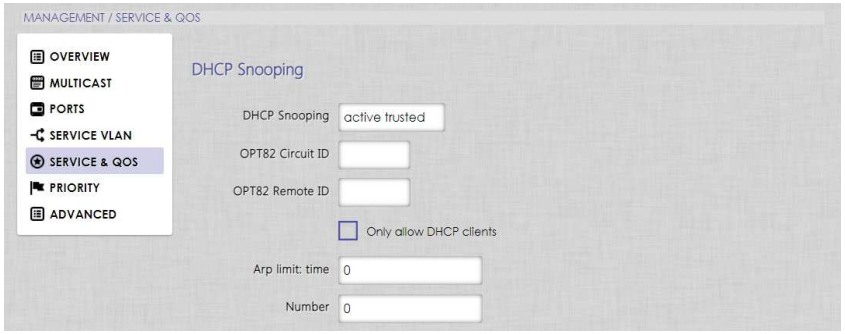

Figure 25 *— Service and QoS settings, DHCP snooping and Access Modem default.*

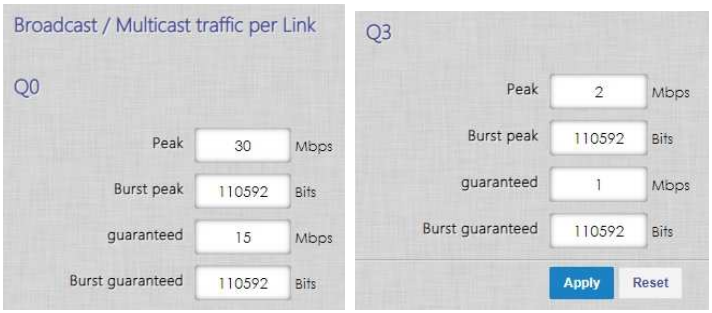

Figure 26 *— Service and QoS settings, Broadcast / Multicast traffic per Link.*

Table 11 *— Service and QoS settings.*

Term	Value [Default Setting]	Definition
	DHCP Snooping	
DHCP Snooping	*Inactive* *[Active untrusted]* *Active trusted*	- DHCP Snooping is inactivated - Uses OPT82 and rewrites the value - Uses OPT82 and keeps the value
OPT82 Circuit ID	*Modem mac* *Controller mac* *Controller vlan* *Modem id* *Controller id* *[Blank]*	The information the OPT82 Circuit ID field shall contain.
OPT82 Remote ID	*Modem mac* *Controller mac* *Controller vlan* *Modem id* *Controller id* *[Blank]*	Same as for the OPT82 Circuit ID above.
Only allow DHCP clients	*On/[Off]*	Allow only clients with DHCP obtained IP addresses. Clients with fixed IP addresses will be blocked.
Arp limit: time	*[0]*	The time limit in seconds for ARP, DHCP, and IGMP packets. In conjunction with the “Number” parameter below. The default is 0 and it means unlimited.
Number	*[0]*	Number of ARP, DHCP, and IGMP packets allowed during the time period specified in “Arp limit:time” parameter above. The default is 0 and it means unlimited.
	Broadcast / Multicast traffic per Link Q0 - Q3	
Peak Rate	*[30]*	Max. bandwidth allowed for this queue (EIR).
Peak Burst	*0 - 1 048 575* *[110 592]*	Max. burst size allowed for this queue for peak bandwidth (EBS) (Step size 2048)
Guaranteed Rate	*[15]*	Min. guaranteed bandwidth for this queue (CIR).
Guaranteed Burst	*0 - 1 048 575* *[110 592]*	Max. burst size allowed for this queue for guaranteed bandwidth (CBS) (Step size 2048).

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3.4.6 Priority Settings

The In:xtnd System can handle up to four queues; Q0 to Q3. They are intended for different types of traffic with different priorities. Traffic from the queues is dispatched with frames from the Q3 queue first, then from the Q2 queue, and so on with the Q0 queue last.

If a VLAN-tagged frame has the P-bits set, the frame can be mapped against one of the queues depending on the P-bits. This mapping can be done in any way under the Inbound Traffic Class Mapping. VLAN Priority in VLAN-tagged frames can be remarked with a new priority under the Inbound P-bit mapping heading.

IP-packets with ToS field value can be mapped and remarked with a VLAN Priority according to the settings under Enable ToS - Priority 0 to 7.

In the main menu, hover over **MANAGEMENT** and click on **PRIORITY**. More information can be found in ***Figure 27*** and ***Table 12***. Click on the button ***Apply*** to save the settings.

This configuration operation will require a *Controller* reboot. A web page as shown in ***Figure 29*** will appear. Click on the button ***Reboot*** to proceed with the reboot **only** if you are absolutely sure that this is the correct thing to do.

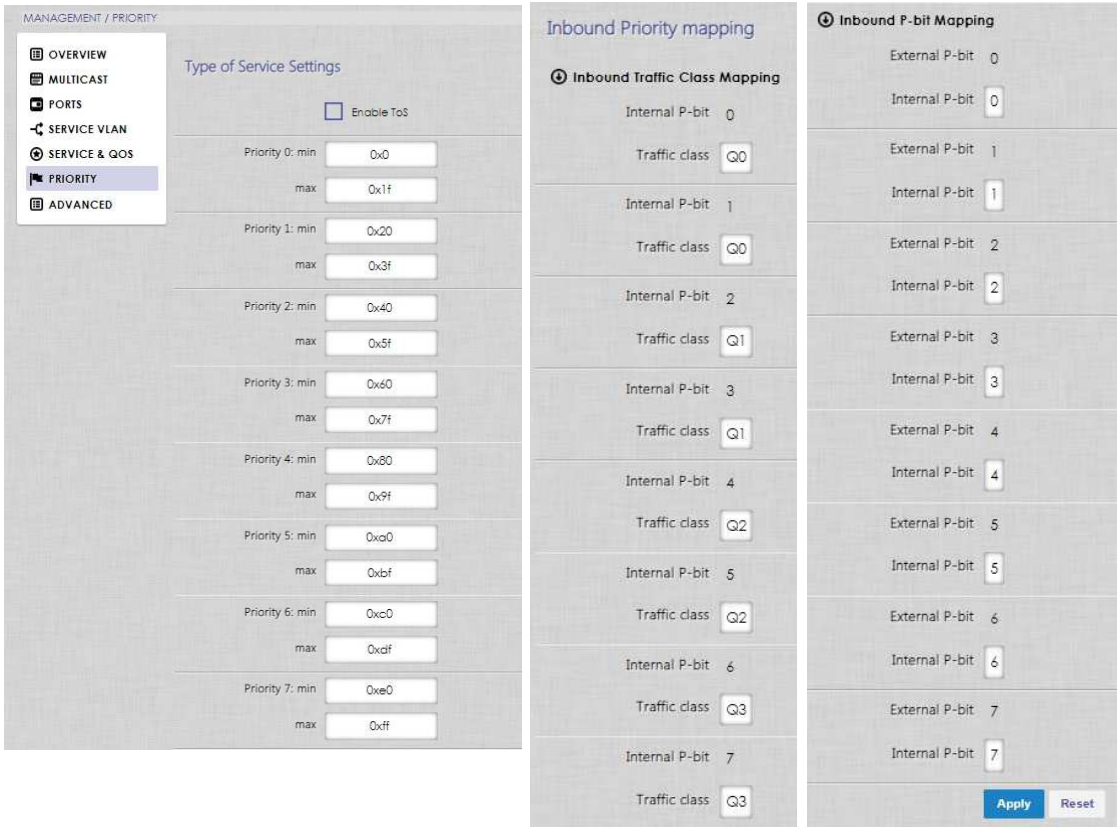

Figure 27 *— Priority - Type of Service settings - Inbound Priority Mapping.*

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***Table 12** — Description of the Priority parameters.*

Term	Value [Default Setting]	Definition
Type of Service Settings		
Enable ToS	*On/Off [Off]*	Enable/Disable if the Type of Service (ToS) field in IP-header shall be used to control priority of the traffic. If ToS is activated the priority of VLAN Pri-field (802.1p) is overridden by the ToS settings.
Priority n: min / max **n = 0 - 7**	*Prio n / Min / Max.* *0 / 0x0 / 0x1f* *1 / 0x20 / 0x3f* *2 / 0x40 / 0x5f* *3 / 0x60 / 0x7f* *4 / 0x80 / 0x9f* *5 / 0xa0 / 0xbf* *6 / 0xo0 / 0xdf* *7 / 0xe0 / 0xff*	The lower value of the ToS field is mapped according to the priority in the VLAN Prio field. E.g. if the value in "Priority 0: min" is 0 and "Priority 0: max" is 0x1f, all packets with a ToS value between 0x0 and 0x1f will be remarked with VLAN Prio 0 regardless of the initial VLAN Prio value. The default values are written in the column to the left.
Priority n: max **n = 0 - 7**	*0x0 – 0xff*	The higher limit of the ToS field, see above for Priority n.
Inbound Priority Mapping		
Inbound Traffic class mapping		
Internal P-bit N = 0 – 7 **Traffic class**	*Q0 – Q3*	The VLAN Prio value is mapped to the queue to which the packet shall be transferred.
Inbound P-bit mapping		
External P-bit N = 0 – 7 **Internal P-bit**	*0 – 7*	Remarking of incoming packets VLAN Prio value.
Apply		Click to apply the settings.
Reset		Click to discard the settings.

3.4.7 Advanced Settings

In Advanced settings it is possible to define the maximum Link speed on coax ports, setting of maximum unicast (UC) capacity per *Modem*, and to decrease (UC Adjustment) the maximum unicast capacity per *Modem* for each multicast group that is joined on the *Modem*.

1. In the main menu, hover over **MANAGEMENT** and click on **ADVANCED**. The web page is shown in ***Figure* 28**.
2. Default values
   a. *UC Adjustment*: 0
   b. *UC Capacity*: 1000 Mpbs
   c. *Link speed*: 2500 Mpbs
   d. *Downstream BW*: 2200 Mpbs
3. Change the default values and click on Update Advanced settings to save the new values.

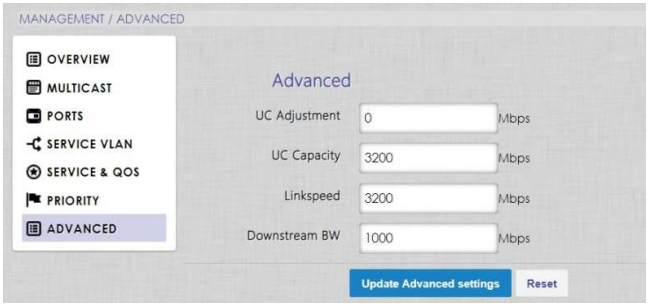

***Figure 28** — Advanced settings.*

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It is possible to define reserved bandwidth for multicast groups. If a multicast group is joined on one *Modem* the unicast peak bandwidth can be limited with a value on that *Modem* to avoid unicast traffic to disturb the multicast stream. This setting is "global" for the *Controller*, i.e. the value is valid for all multicast groups. When a new multicast group is joined the bandwidth will be limited with the value that is input in the field *UC Adjustment*. The value is subtracted from the value in the field *UC Capacity*. An example:

- *UC Adjustment* = 20 Mbps
- *UC Capacity* = 1000 Mbps
- *Link speed* = 2500 Mbps
- When a client joins a multicast group the maximum available unicast capacity for that *Modem* will be 1000 - 20 = 980 Mbps.
- If another client on the same *Modem* joins another multicast group, the maximum available unicast capacity for that *Modem* will be 1000 - 20 - 20 = 960 Mbps.
- No other *Modems* are affected, only the ones that have clients that have joined multicast groups.

This configuration operation will require a ***reboot*** of the *Controller*.

3.4.8 Reboot (Controller)

In the menu bar, on the right-hand side, click on the symbol ⏻ to ***Reboot***. Click on the button ***Reboot*** on the displayed web page, as shown in **Figure 29** only if you are absolutely sure that this is correct.

The *Controller* software reboots and the *Modems* drops the links.

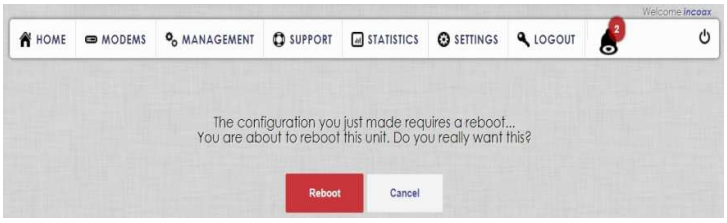

Figure 29 *- Web page Controller Reboot.*

3.5 Support

3.5.1 Support - Ping

On this web page, you can run the Ping and Traceroute network tools.

1. Hover over **SUPPORT** and click on **PING**.
2. Enter the IP address of the device in the **IP address** field shown in ***Figure 30***.
3. Click on one of the buttons ***Ping*** or ***Traceroute*** to run the corresponding command.

Note that it may take some seconds before any result is displayed.

Figure 30 *— Ping web page.*

Table 13 *— Description of the Ping parameters.*

Term	Value	Definition
IP address		User defined, IP.
Ping		Click to initiate Ping.
Traceroute		Click to initiate TCP Traceroute.

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3.5.2 Support - Hardware

To view the hardware information hover over **SUPPORT** and click on **HARDWARE**. The displayed information will be similar to the one shown in ***Figure 31***.

Figure 31 *— Hardware information.*

3.6 Statistics

The *Controller* maintains a database for various key data regarding link quality and error indications. The data is presented in different graphs to show changes over time, which is useful for troubleshooting and quality supervision. The *Controller* needs to collect some data before the statistics can be displayed. It may take about 20 minutes before any data will be shown.

1. In the main menu, hover over **STATISTICS** and click on:
   a. **CLC STATISTICS** for the *Controller* - see ***Figure 32***.
      i. Displays the traffic per coax port as RX/TX in Mbps.
      ii. Hover over graph, click-hold-drag-release to zoom in on a selected area.
      iii. The Guaranteed Rate Down/Up is total guaranteed speed for the *Modem*.
   b. **CAM STATISTICS** for the *Modem* - see ***Figure 33***.
      i. RX/TX traffic per *Modem* port in number of packets and packets per second as seen in ***Figure 34***.
      ii. Click on the **CAM MAC** (address) to see the graphs or click on the **STAT** symbol in the page **MODEMS** - **OVERVIEW**.
   c. **CLC STATUS** - see ***Figure 35***.
      i. Live statistics from the chipset in the *Controller*.
   d. **PORT SPECTRUM** - see ***Figure 36***.
      i. Spectrum analysis for a specific coax port.

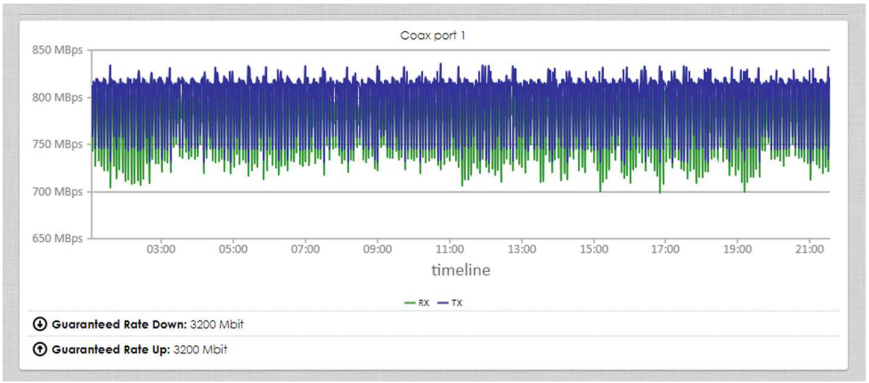

Figure 32 *— Controller Statistics per coax port, RX/TX in Mbps.*
The picture illustrates a case with heavy traffic.

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ALL | coax1 | coax2 | coax3 | coax4

CAM MAC	COAX	SWITCH PORT	RX-PACKETS	TX-PACKETS	RX-PPS	TX-PPS
84:93:0c:00:6f:91	1	Port 1	0	0	0	0
		Port 2	2441848	2441833	8449	8449
		COAX	2441833	2441867	8449	8449
84:93:0c:00:6f:8a	1	Port 1	0	0	0	0
		Port 2	2441832	2441815	8449	8449
		COAX	2441815	2441829	8449	8449
84:93:0c:00:6f:8e	1	Port 1	2442271	2442274	8450	8450
		Port 2	0	0	0	0
		COAX	2442274	2442266	8450	8450
84:93:0c:00:6f:90	1	Port 1	0	0	0	0
		Port 2	2443318	2443306	8454	8454
		COAX	2443306	2443330	8454	8454

Figure 33 *— Modem Statistics - RX/TX traffic per Modem port, number of packets, and packets per second.*

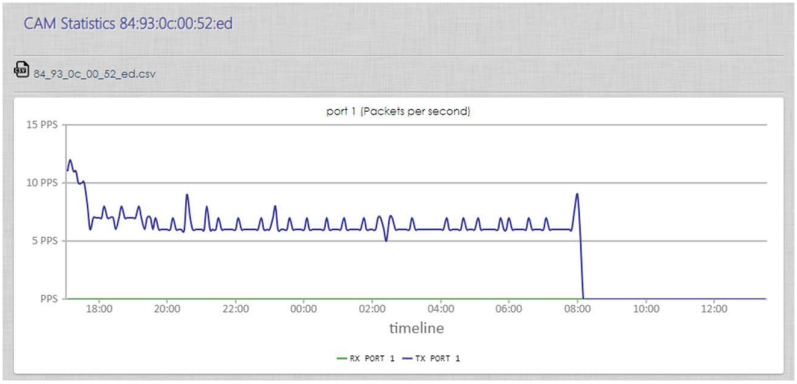
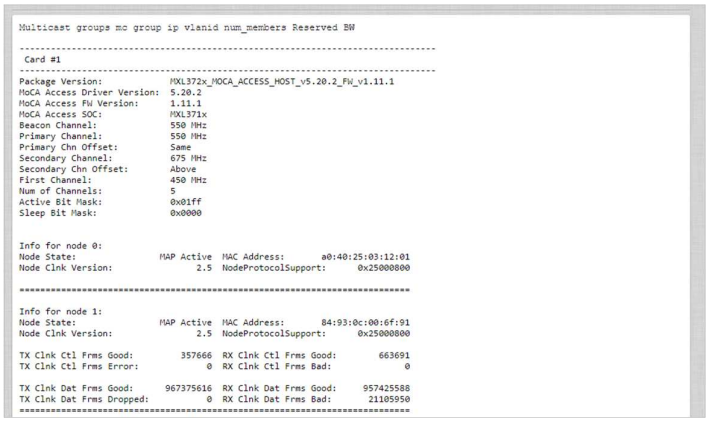


Figure 34 *— Modem statistics graph - RX/TX packets per second.*



```
Multicast groups mc group ip vlanid num_members Reserved BW

-------------------------------------------------------------------------------
 Card #1
-------------------------------------------------------------------------------
Package Version:          MXL372x_MOCA_ACCESS_HOST_v5.20.2_FW_v1.11.1
MoCA Access Driver Version:  5.20.2
MoCA Access FW Version:      1.11.1
MoCA Access SOC:             MXL371x
Beacon Channel:              550 MHz
Primary Channel:             550 MHz
Primary Chn Offset:          Same
Secondary Channel:           675 MHz
Secondary Chn Offset:        Above
First Channel:               450 MHz
Num of Channels:             5
Active Bit Mask:             0x01ff
Sleep Bit Mask:              0x0000


Info for node 0:
Node State:              MAP Active  MAC Address:       a0:40:25:03:12:01
Node Clnk Version:              2.5  NodeProtocolSupport:      0x25000800

================================================================================

Info for node 1:
Node State:              MAP Active  MAC Address:       84:93:0c:00:6f:91
Node Clnk Version:              2.5  NodeProtocolSupport:      0x25000800

TX Clnk Ctl Frms Good:        357666  RX Clnk Ctl Frms Good:       663691
TX Clnk Ctl Frms Error:            0  RX Clnk Ctl Frms Bad:             0

TX Clnk Dat Frms Good:      967375616  RX Clnk Dat Frms Good:     957425588
TX Clnk Dat Frms Dropped:          0  RX Clnk Dat Frms Bad:       21105950
================================================================================
```

Figure 35 *— Controller Status - Live statistics from the chipsets in the Controller.*

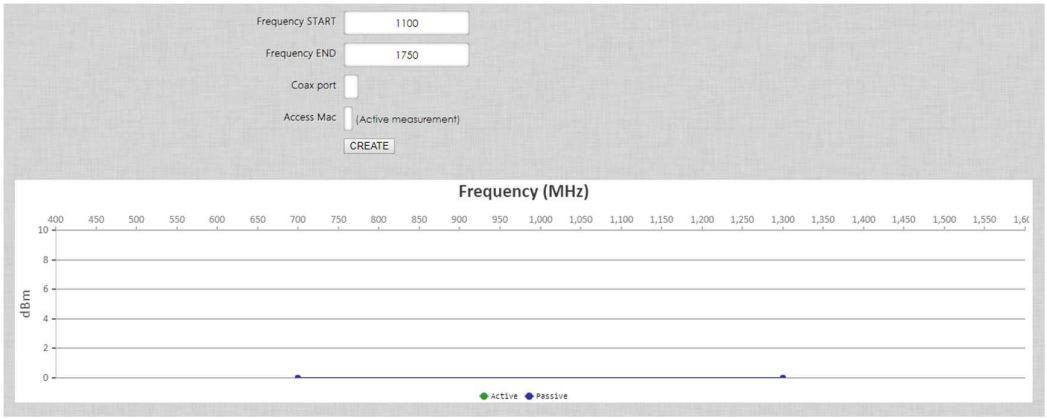


Figure 36 *— Port spectrum analysis for a coax port.*

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3.7 Settings

In the **SETTINGS** menu you can change the general settings, edit the account, manage users, and edit the time settings.

3.7.1 My Account

In the main menu hover over **SETTINGS** and click on **MY ACCOUNT** -side. The web page is shown in ***Figure 37***.

Figure 37 *— My Account.*

3.7.2 Users

On this page it is possible to manage the users that will have the login access to the *Controller*. Log in as an Admin to be able to add or edit accounts.

3.7.2.1 Creating New Users

Hover over **SETTINGS** in the main menu and click on **USERS** in the drop down list. Click on **ADD USER** at the right side in the ***Options*** menu. See ***Figure 38*** and the description of the parameters is found in ***Table 14***.

Fill in the ***Username*** and ***Password***, which is mandatory and select the correct ***User level*** for the user. The **Company** field is optional. Click on the button ***Add user*** to add the user.

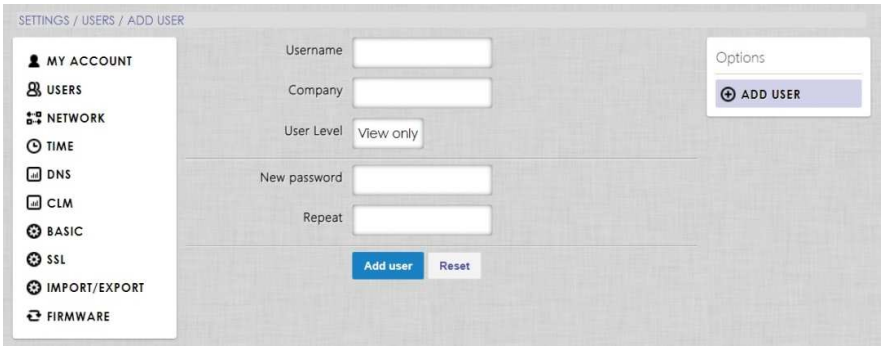

Figure 38 *— Add user.*

Table 14 *— Description of the parameters for Add User.*

Term	Value	Definition
Username	*User defined*	The username used to log in.
Company	*User defined*	Not mandatory, only for information.
User Level	*View only* *Admin*	- Can only view selected pages. - Can view all pages and edit all settings.
Password	*User defined*	Password used to log in.
Repeat	*User defined*	Repeat the password, for safety.
Add user		Click to add the new user.
Reset		Click to discard the settings.

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3.7.3 Network

The settings for the Network are one of the most important settings that allow management of the *Controller*. The *Controller* can be managed by using a Management System via SOAP or simply to log in to the web managing interface IP defined in the LAN settings. To enter this configuration:

In the main menu, hover over **MANAGEMENT** and click on **NETWORK**. The web page is shown in ***Figure 39*** and the parameters are described in ***Table 15***.

In the *LAN settings* there are the *IP address* and *Subnet mask*. The IP address is the main IP address which allows to directly managing the *Controller*. Please refer to **Getting started** on ***page 8*** before the *Controller* is powered on.

The Management VLAN needs to be configured to be able to manage the *Controller* on the Trunk port.

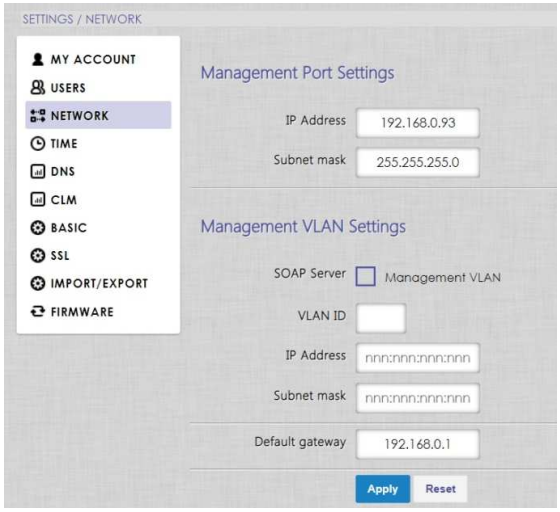

Figure 39 *— Network Settings.*

Table 15 *— Description of the Network settings Parameters.*

Term	Value	Definition
	Management Port Settings	
IP address	*User defined network IP*	The IP address of the node (if static). Used in conjunction with the network mask and gateway fields as described below.
Subnet mask	*User defined network mask*	The network mask used in conjunction with the node's IP address.
	Management VLAN Settings	
SOAP Server / Management VLAN	*On/Off*	Enable or disable access to the *Controller* through a tagged VLAN. Check the checkbox to enable.
VLAN ID	*1 - 4095*	VLAN ID used in combination with Management VLAN.
IP address	*User defined network IP*	IP address of the tagged VLAN interface. Used in conjunction with the network mask described below.
Subnet mask	*User defined network mask*	The network mask used in conjunction with the management VLAN interface's IP address.
Default gateway	*User defined gateway address*	The gateway routing address used in conjunction with the node's IP address and network mask.
Apply		Click to apply the settings.
Reset		Click to discard the settings.

3.7.4 Time Settings

The date and time are mainly used for logs and may be important for proper event logging while troubleshooting. There is an option to enter the time manually or automatically by an NTP-Server. The *Controller* has to be able to connect to an NTP-server to update the time automatically.

In the main menu, hover over **SETTINGS** and click on **TIME**.

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Figure 40 shows the Date and Time web page. Select ***Manual time*** (radio button) to set the time manually. Enter the *Date* and *Time* and then click on the button ***Update***.

Click on ***NTP Server*** (radio button) if you prefer that the time shall be set automatically and updated regularly. Enter an *NTP address* for a server that you prefer to use. Use the parameters **UTC Sign** and **UTC Offset** to compensate for an eventual time difference between the NTP server and the local time where the Controller is located. Click in the field **UTC Offset** and select the number of hours from the list. Click on either of the radio buttons for the **UTC Sign** if the offset shall be added or subtracted from the UTC time. (If the selected offset is zero (0) then it does not matter if the sign is + or -.) Click on the button ***Update*** to save the settings.

The time is displayed in the footer of every page of the web GUI.

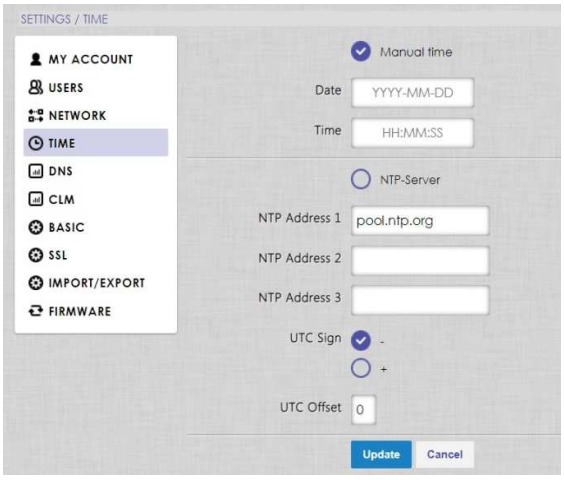

Figure 40 *— Date and Time settings.*

3.7.5 DNS Settings

Go to the *DNS settings* by hover over **SETTINGS** and click on **DNS**. ***Figure 41*** shows the web page and the descriptions of the parameters are found in ***Table 16***.

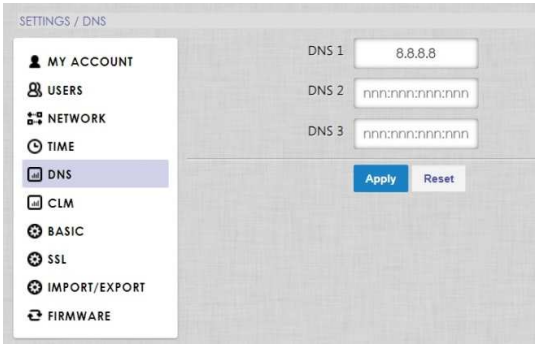

Figure 41 *— DNS settings.*

Table 16 *— Description of the parameters for the DNS settings.*

Term	Value [Default Settings]	Definition
DNS 1	*IP address [8.8.8.8]*	Domain name server 1
DNS 2	*IP address*	Domain name server 2
DNS 3	*IP address*	Domain name server 3
Apply		Click to apply the settings.
Reset		Click to discard the settings.

3.7.6 Management System Settings

The *Controller* can communicate with the Management System via a SOAP interface. The *Controller* needs three parameters to achieve this. The *IP address* to Management System, Management System SOAP *Username*, and Management System SOAP *Password*.

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In the main menu click on **SETTINGS** and then click on **MANAGEMENT SYSTEM** in the menu to the right. See ***Figure 42*** and ***Table 17***.

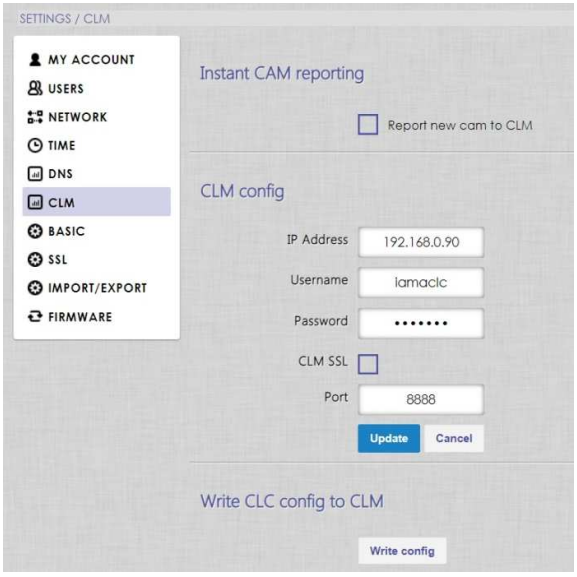

Figure 42 *— Settings for the Management System.*

Table 17 *— Description of the parameters for the Management system.*

Term	Value	Definition
	Instant CAM reporting	
Report new CAM to CLM	*On/Off*	*Controller* reports new *Modem* immediately to Management System.
	CLM config	
IP address	*IP address*	IP address of Management System.
Username	*Text string*	Management System SOAP username.
Password	*Text string*	Management System SOAP password.
CLM SSL		Mark to enable SSL.
Port		Specify the port on the computer.
Update		Click to save the new configuration.
Cancel		Click to cancel the changes, and revert back to the previously saved configuration.
	Write CLC config to CLM	
Write config		Click to send the new *Controller* configuration to the CLM.

3.7.7 Basic

Identification of the *Controller* is mainly used when the *Controller* is imported into the Management System. Hover over **SETTINGS** and click on **BASIC**. The web page is shown in ***Figure 43*** and the descriptions of the parameters are found in ***Table 18***.

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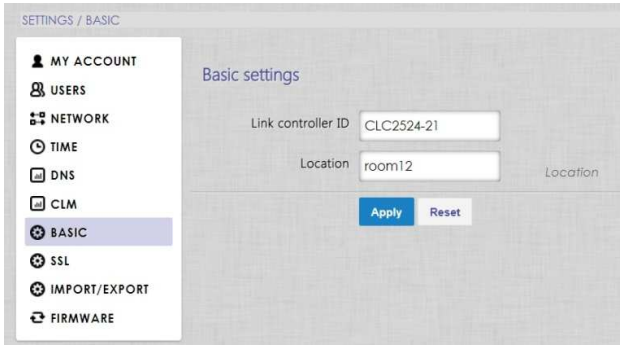

Figure 43 *— Basic settings.*

Table 18 *— Description of the parameters of the Basic settings.*

Term	Value	Definition
Link Controller ID	*Text string*	ID of the *Controller*. This is a mandatory field for the Management System
Location	*Text string*	Physical location of the *Controller*
Apply		Click to apply the new settings.
Reset		Click to revert back to the previously saved configuration.

3.7.8 SSL

Secure Sockets Layer is a standard technology for keeping an internet connection secure and safeguarding any sensitive data that is being sent between two systems, including potential personal details. Hover over **SETTINGS** and click on **SSL** to show the web page in ***Figure* 44**. The description of the parameters is found in ***Table 19***.

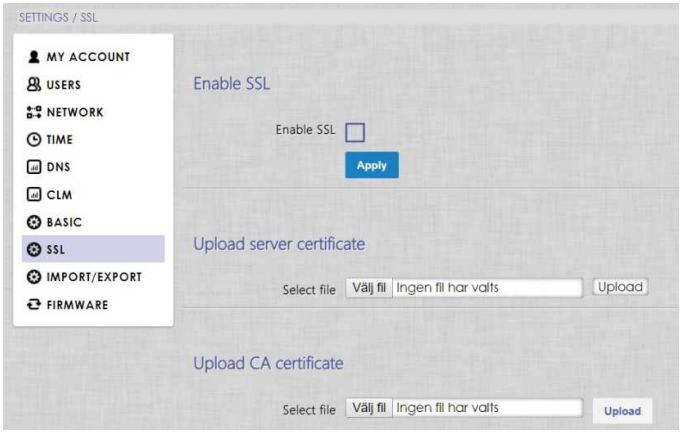

Figure 44 *– Settings – SSL.*

Table 19 *— Description of the parameters of the SSL settings.*

Term	Value	Definition
Enable SSL		
Enable SSL		Mark the checkbox to activate SSL.
Apply		Click to confirm.
Upload server certificate		
Select file		Select the file containing the desired information.
Upload		Click to confirm.
Upload CA certificate		
Select file		Select the file containing the desired information.
Upload		Click to confirm.

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3.7.9 Import/Export

This section is used to import and export *Controller* settings from local saved files, and to reset the *Controller* to the factory defaults. To show the web page hover over **SETTINGS** and click on **IMPORT/EXPORT**. The web page in ***Figure 45*** will be shown and the description of the parameters is found in ***Table 20***.

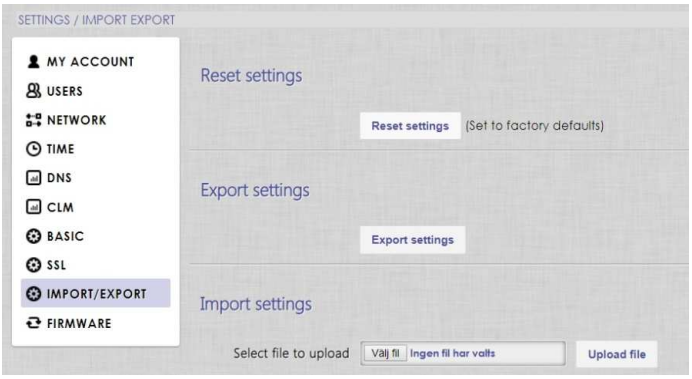

Figure 45 *– Import/Export*

Table 20 *— Description of the parameters of the Import/Export settings.*

Term	Value	Definition
Reset settings		Click to reset the *Controller* to the factory defaults.
Export settings		Click to save current *Controller* settings to a backup file.
Import settings		
Select file		Select the file containing the desired information.
Upload file		Click to confirm.

3.7.10 Firmware

This is used to roll back to a previous firmware version or to upload a new firmware. To show the web page hover over **SETTINGS** and click on **IMPORT/EXPORT**. The web page in ***Figure 46*** will be shown and the description of the parameters is found in ***Table 21***.

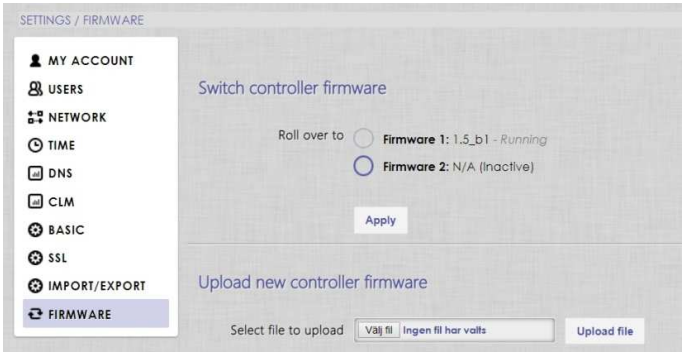

Figure 46 *– Settings – Firmware.*

Table 21 *— Description of the parameters for the settings of the Firmware.*

Term	Value	Definition
Switch controller firmware		
Roll over to		Select the firmware by clicking on one of the radio buttons.
Apply		Click to confirm
Upload new controller firmware		
Select file for upload		Select a verified and functioning firmware file, and upload the firmware to the *Controller*.
Upload file		Click to confirm.

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4 Specifications

The electrical, physical and functional specifications for the In:xtnd Control | MA2.5 | 4. Please note that the specifications will be subjected to changes.

Performance

- Based on MoCA Access 2.5 Profile D.
- 10 Gbps WAN interface.
- 2.5 Gbps throughput per MoCA port.
- 31 Modems per port.
- MoCA Bands: A - A, A - B, A - C, A - D, A - E.
- Frequency range: 400 - 1675 MHz.
- RF-channel bandwidth: 100 MHz.
- Bonded operation supporting 3, 4 or 5 RF-channels.
- MAC Rate typically 1.5 / 2.0 / 2.5 Gbps (up to 3.0 Gbps).
- PHY/MAC rate: up to 730 / 600 Mbps per 100 MHz RF channel.
- Attenuation 100% link quality up to 55 dB.
- 15 dBm ± 3 dBm max. output power; automatically adjusted per Modem.
- Configurable beacon frequency.
- Modulation: OFDM, QAM 1024 /512 / 256 / 128 / 64 / 32 / 16 / 8, QPSK, and BPSK.
- Multiplexing methods: TDMA/TDD.

Physical:

- 4× MoCA Access ports, individually enabled/disabled.
- 1× SFP+ port: Multi Source Agreement (MSA) compliant, SERDES – 10 Gbps data rate, SFF8472 – Diagnostics interface.[a]
- 1 × Management Ethernet port: 10 / 100 Mbps, configuration and statistics port.
- RJ-45 connector supports type CAT5 UTP (as a minimum).
- F-female connector - 3/8-UNEF32, 75 Ω.

Indicators

- Power on, Management, Trunk, Coax Link traffic, and alerts.

Dimensions

- 278 × 61 × 224 mm (W × H × D).
- Prepared for 19” rack chassis installation.
- Handles can be rotated +90° for mounting directly to the wall.
- Vertical, horizontal, or angled installation.

Weight

- 3.7 kg

Environmental

- Operating temperature: -25 °C to +50 °C.
- Relative humidity: 20% - 80%.
- Altitude: max. 2000 m.
- Dynamic temperature control with cooling redundancy.
- Abnormal operation conditions alarms.
- Storage (non-condensing): -40 °C to +70 °C and 5% to 90% relative humidity.
- RoHS, RoHS2, UL94-V0.

Power

- 48 VDC nominal.
- Power consumption: normally 32 W.
- Automatic power on after power grid failure.

[a] InCoax recommends to use the SFP+ module MikroTik 10G S+RJ10.
Other approved SFP+ modules are: Ubiquiti 10G UDC-2; **Fiber MM**: Ubiquiti 10G UF-CoaxMM-10G; **Fiber SM**: Ubiquiti 10G UF-SM-10G, In 10G OS-SP96-3110D, Ubiquiti Bi-Di UF-SM-10G-S.

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Technical Specifications

IEEE Standards

- IEEE 802.1p - QoS.
- IEEE 802.1q - with full VLAN-ID range up to 200 VLAN. Configurable internal VLAN for policing, shaping, and prioritization for ingress untagged frames.
- IEEE 802.3ac - Q-tag.
- IEEE 802.3u - Fast Ethernet.

Approvals

- CE (see ***section 5.1.3***)
- ETSI EN 300386 V2.1.1, EN 55032:2015, EN 55035:2017, EN 60950-1:2006/A11/A1/A12/A2, EN 50581:2012.
- FCC Class A (see ***section 5.1.1***).

Security

- DHCP snooping, Option 82 rewrite and trusted/untrusted clients, limit setting, configurable options per VLAN.
- Blocking of unknown CPE.
- Broadcast storm protection from clients.
- Support for PPPoE IA option 0x105 Remote ID.

Multicast

- IGMP snooping (v1, v2, and v3 (partially)).
- IGMP filtering per VLAN.
- Configurable IGMP timeout.
- Multicast VLAN Registration.
- Bandwidth reservation per multicast group.

QoS

- Traffic classification.
- Mapping and remarking.
- Congestion management.
- Strict priority, four separate queues for broadcast, multicast, and unicast.
- Configurable rate limitation per queue.
- Configurable upstream/downstream ratio.

Management

- WEB GUI via https.
- SOAP/XML interface via https.
- Statistics and system/version information.
- Configuration.
- Define and assign service profiles.
- Built in spectrum analyzer.
- Access through management VLAN or separate management ethernet port.
- Remotely upgradable.

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5 Legal Information

5.1 Regulatory Notice and Statement (Class A)

Model List: In:xtnd™ | Control | MA2.5 | 4

5.1.1 United States of America

The following information applies if you use the product within the USA area.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

5.1.2 Canada

The following information applies if you use the product within the Canada area.

Industry Canada ICES statement

CAN ICES-3(A)/NMB-3(A)

5.1.3 European Union

The following information applies if you use the product within the European Union.

CE EMC statement

Warning: This equipment is compliant with Class A of EN55032. In a residential environment this equipment may cause radio interference.

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6 Disposal of Equipment

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community Directive 2002/96/EC on waste electrical and electronic equipment which, together with the Restriction of Hazardous Substances Directive (RoHS Directive) 2002/95/EC (also known as RoHS 1) became European Law in February 2003. The WEEE Directive was amended into the Directive 2012/19/EU and the RoHS 1 has been evolved into the RoHS 2 Directive 2011/65/EU.

The symbol adopted by the European Council to represent WEEE comprises of a crossed-out wheelie bin. The black rectangle below the wheelie bin indicates that the product has been placed on the market after 2005, when the WEEE Directive came into force. The symbol shall be placed on the products, packaging, and/or accompanying documents. It means that used electrical and electronic products and batteries should not be mixed with general household waste but taken to a designated collection site as indicated by the local authorities. In accordance with national legislation and the WEEE Directives 2002/96/EC and 2012/19/EU, and the Battery Directive 2006/66/EC amended by 2013/56/EU.

For more information about collection and recycling of old products and batteries, please contact your local municipality, your waste disposal service or the point of sale where you purchased the items. Penalties may be applicable for incorrect disposal of this waste, in accordance with national legislation.

6.1 For Business Users in the European Union

If you wish to discard electrical and electronic equipment, please contact your dealer or supplier for further information.

6.2 Disposal in Countries Outside the European Union

The symbol has only validity in the European Union. If you wish to discard these items, please contact your local authorities or dealer and ask for the correct method of disposal.

6.3 Battery Symbol

The WEEE symbol can be supplemented with one or more chemical symbols to indicate what kind of battery is used in the product. The chemical symbols will then be placed under the black rectangle.

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