TECHDOCS

Manual

WAGO ETHERNET Accessories 852

852-1305

8/4-Port 1000BASE-T/1000BASE-SX/LX

Industrial-Managed-Switch, 8 Ports 1000BASE-T,4 Slots 1000BASE-SX/LX

Version 1.2.0

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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

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1 Notes about this Documentation

Note

Always retain this documentation!
This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user. In addition, ensure that any supplement to this documentation is included, if necessary.

1.1 Validity of this Documentation

This documentation is only applicable to WAGO ETHERNET accessory products “8/4-Port 1000BASE-T/1000BASE-SX/LX” (852-1305).

1.2 Copyright

1.3 Symbols

DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 1: Number Notation

Number Code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.5 Font Conventions

Table 2: Font Conventions

Font Type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Program Files\WAGO Software*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualification

All sequences implemented on Series 852 devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

All changes to the controller should always be carried out by qualified personnel with sufficient sufficient skills in PLC programming.

2.1.3 Proper Use of the Industrial Switches

The device is designed for the IP30 protection class. It is protected against the insertion of solid items and solid impurities up to 2.5 mm in diameter, but not against water penetration. Unless otherwise specified, the device must not be operated in wet and dusty environments.

2.1.4 Technical Condition of Specified Devices

The devices to be supplied ex works are equipped with hardware and software configurations, which meet the individual application requirements. These modules contain no parts that can be serviced or repaired by the user. The following actions will result in the exclusion of liability on the part of WAGO Kontakttechnik GmbH & Co. KG:

- Repairs,
- Changes to the hardware or software that are not described in the operating instructions,
- Improper use of the components.

Further details are given in the contractual agreements. Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

2.1.5 Standards and Regulations for Operating the Industrial Switches

Please observe the standards and regulations that are relevant to installation:

- The data and power lines must be connected and installed in compliance with the standards to avoid failures on your installation and eliminate any danger to personnel.

- For installation, startup, maintenance and repair, please observe the accident prevention regulations of your machine (e.g., DGUV Regulation “Electrical Installations and Equipment”).

- Emergency stop functions and equipment must not be deactivated or otherwise made ineffective. See relevant standards (e.g., DIN EN 418).

- Your installation must be equipped in accordance to the EMC guidelines so electromagnetic interferences can be eliminated.

- Please observe the safety measures against electrostatic discharge according to DIN EN 61340-5-1/-3. When handling the modules, ensure that environmental factors (persons, workplace and packing) are well grounded.

- The relevant valid and applicable standards and guidelines regarding the installation of switch cabinets must be observed.

2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:

DANGER

Do not work on devices while energized!
All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.

DANGER

Only install in appropriate housings, cabinets or electrical operation rooms!
WAGO's 852 Series ETHERNET Switches are considered exposed operating components. Therefore, only install these switches in lockable housings, cabinets or electrical operation rooms. Access must be limited to authorized, qualified staff having the appropriate key or tool.

DANGER

Ensure a standard connection!
To minimize any hazardous situations resulting in personal injury or to avoid failures in your system, the data and power supply lines shall be installed according to standards, with careful attention given to ensuring the correct terminal assignment. Always adhere to the EMC directives applicable to your application.

NOTICE

Do not use in telecommunication circuits!
Only use devices equipped with ETHERNET or RJ-45 connectors in LANs. Never connect these devices with telecommunication networks.

NOTICE

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts), since the long-term functionality of device/module involved can no longer be ensured.

NOTICE

Protect the components against materials having seeping and insulating properties!

The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

NOTICE

Clean only with permitted materials!

Clean housing and soiled contacts with propanol.

NOTICE

Do not use any contact spray!

Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

NOTICE

Do not reverse the polarity of connection lines!

Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

NOTICE

Avoid electrostatic discharge!

The devices are equipped with electronic components that may be destroyed by electrostatic discharge when touched. Please observe the safety precautions against electrostatic discharge per DIN EN 61340-5-1/-3. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly grounded.

⚠ CAUTION

Laser radiation warning!

Do not stare into openings of the connections when no cable is connected, so as not to expose the radiation.
It can emit invisible radiation.
It concerns here a laser class 1 according EN 60825-1.

Note

Radio interference in residential areas

This is a Class A device. This device can cause radio interference in residential areas; in this case, the operator can be required to take appropriate measures to prevent such interference.

2.3 Special Use Conditions for ETHERNET Devices

If not otherwise specified, ETHERNET devices are intended for use on local networks. Please note the following when using ETHERNET devices in your system:

- Do not connect control components and control networks to an open network such as the Internet or an office network. WAGO recommends putting control components and control networks behind a firewall.
- Limit physical and electronic access to all automation components to authorized personnel only.
- Change the default passwords before first use! This will reduce the risk of unauthorized access to your system.
- Regularly change the passwords used! This will reduce the risk of unauthorized access to your system.
- If remote access to control components and control networks is required, use a Virtual Private Network (VPN).
- Regularly perform threat analyses. You can check whether the measures taken meet your security requirements.
- Use “defense-in-depth” mechanisms in your system's security configuration to restrict the access to and control of individual products and networks.

3 General

3.1 Scope of Supply

- 1 Industrial managed switch with multipoint connector
- Protective covers for unused ports
- Data cable RS-232 for CLI

3.2 Industrial ETHERNET Technology

The range of WAGO switches ensures scalability of your network infrastructure with outstanding electrical and mechanical characteristics. These robust devices are designed for industrial use and they are fully compliant with IEEE 802.3, 802.3u, 802.3w, 802.3z, 802.3x, 802.3ab, 802.3ad, 802.1d, 802.1q, 802.1p and 802.1x standards.
They have voltage supply with a supply voltage range of 12 … 60 V.
Characteristics such as auto-negotiation and auto-MDI/MDIX (crossover) on all 10/100/1000BASE-T ports are also realized.

3.3 Switching Technology

Industrial ETHERNET primarily uses switching technology. This technology allows any network subscriber to send at any time because the subscriber always has an open peer-to-peer connection to the next switch. The connection is bidirectional, i.e., the subscriber can send and receive at the same time (full duplex).
The targeted use of switching technology can increase real-time capability because the peer-to-peer connection prevents collisions in network communication.

The Industrial Managed Switch was developed for easy installation in a manufacturing environment where vibration, shock, heat and radio frequency interference are common.

Due to its compact size, the Industrial Managed Switch makes mounting on the DIN rail particularly simple and installation possible in environments with limited space.

Two or more switches can be added in series to the Industrial Managed Switch. Since all ports support 100 Mbit/, this series connection is possible for the industrial managed switch from every port and with any number of switches.

The Industrial Managed Switch is also equipped with a variety of management functions that let you configure communication parameters as you desire to monitor network behavior in different ways. In addition, the Industrial Managed Switch is built with dual redundant power inputs for maximum reliability and network availability. Other integrated features of the switch such as Auto-negotiation, Rate limitation, Port isolation, etc. optimize your network performance and provide a secure network, offering a cost-effective solution in a small but powerful package.

The 1000BASE SX/LX ports are designed to connect Gigabit SFP modules that support network speeds of 100/1000 Mbit/s.

Other key features are:

- Eight (8) 10/100/1000BASE-T, four (4) 1000BASE-SX/LX (SFP type fiber transceivers) and one (1) Console port (RJ-45)
- Diagnostic LEDs on the front
- Web-based/SNMP Management
- Redundant DC power supply
- Large voltage range: 12 … 60 V
- DIP switches to set alarm functions
- Full compliance with IEEE 802.3, 802.3u, 802.3z, 802.3x, 802.3ad, 802.3ab, 802.1d, 802.1q, 802.1p, 802.1w, 802.1x standards
- Implemented functions:
  - Dual ring
  - ERPS
  - Jet ring
  - Xpress Ring (redundant ring) with less than 50 ms recovery time
- Non-blocking, store-and-forward switching, rapid spanning tree protocol (RSTP)
- Auto-negotiation on all 10/100/1000Base-T ports
- Auto-MDI/MDIX (crossover) on all 10/100/1000BASE-T ports
- VLAN (802.1q) VID
- IGMP snooping for multicast filtering
- Port configuration status and statistics
- Port trunking
- SNMP v1/v2 and RMON
- Rugged IP30 metal housing
- Operable in vibration / shock

4 Device Description

The 852-1305 is an industrial ETHERNET switch with 8 10/100/1000BASE-T ports, with autonegotiation and auto-MDI-/MDI-X detection at every port.
Using the Industrial Managed Switch's 8 ports, several segments can be set up for reducing network load and a dedicated bandwidth assigned to each user node.

In addition, the 852-1305 Industrial Managed Switch has 4 ports with SFP 1000BASE-SX/LX to connect multi-mode or single-mode fiber optic cables for wave lengths of 850 nm (SX), 1310 nm (LX) and 1550 nm (ZX).
The 852-1305 is a cost-effect solution to keep up with the constant demands of IP-based, industrial communication needs.
The Industrial Managed Switch is easy to configure and install and is best suited for small to medium-sized networks.

4.1 View

4.1.1 Front View

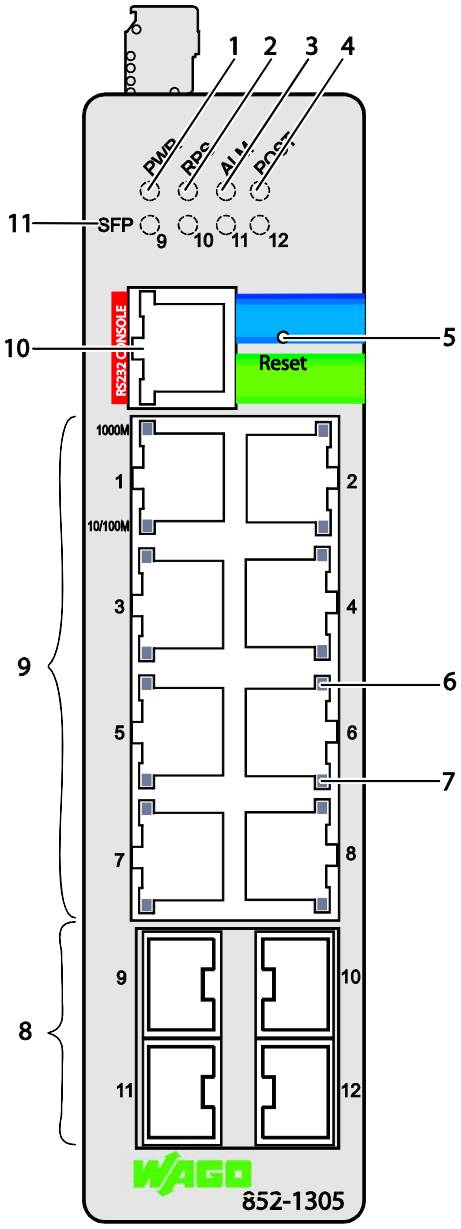


Figure 1: Front View of the Industrial Managed Switch

Table 3: Legend for the Figure “Front View of the Industrial Managed Switch”

No.	Descrip-tion	Meaning	For Details see Section
1	PWR	Status LED, supply voltage	“Device Description” > “Display Elements”
2	RPS	Status LED, redundant, supply voltage	“Device Description” > “Display Elements”
3	ALM	Status LED, alarm	“Device Description” > “Display Elements”
4	POST	Status LED, POST	“Device Description” > “Display Elements”

Table 3: Legend for the Figure “Front View of the Industrial Managed Switch”

No.	Descrip-tion	Meaning	For Details see Section
5	Reset	Reset button	"Device Description" > "Operating Elements"
6	-	Status LED TX Port 1000 Mbit/s (1 LED for each port)	“Device Description” > “Display Elements”
7	-	Status LED TX Port 10/100 Mbit/s (1 LED for each port)	“Device Description” > “Display Elements”
8	-	Port 4 x SFP (1000BASE-SX/LX, fiber optic)	"Device Description" > "Connections"
9	-	Port 8 x RJ-45 (10/100/1000BASE-T ports)	"Device Description" > "Connections"
10	-	Port 1 x RJ-45 (RS-232 port switch)	"Device Description" > "Connections"
11	SFP	Status LED SFP port LNK/ACT (4)	“Device Description” > “Display Elements”

4.1.2 Top View

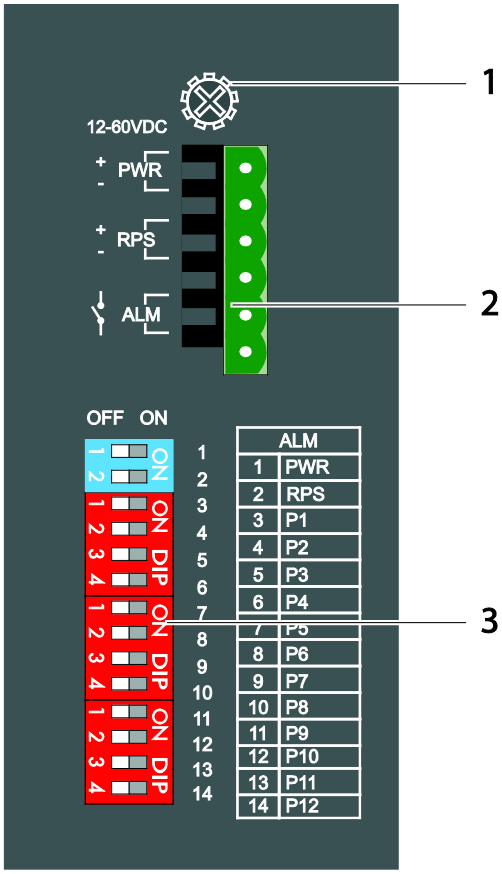


Figure 2: Top View of the industrial ECO switch

Table 4: Legend for the Figure “Front View of the Industrial Managed Switch”

No.	Descrip-tion	Meaning	For Details see Section
1	-	Grounding lug	-
2	-	Connector (male) for power consumption (PWR/RPS/ALM) and potential-free alarm contact	"Device Description" > "Connections"
3	-	DIP Switches	"Device Description" > "Operating Elements"

4.2 Connectors

4.2.1 Power Supply (PWR/RPS)

The female connector (Item No. 2231-106/026-000) can easily be connected to the 6-pole male connector located on the top of the switch.

The male connector shows the following pin assignment:

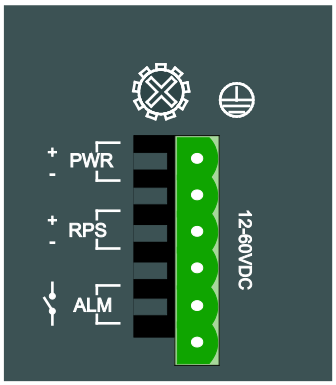


Figure 3: Power Supply (PWR/RPS)

Table 5: Legend for Figure “Power Supply (PWR/RPS)”

Connection	Description	Description
+	PWR	Primary DC input
-	PWR	Primary DC input
+	RPS	Secondary DC input
-	RPS	Secondary DC input
	ALM	Contact for external alarm
	ALM	Contact for external alarm

NOTICE

Warning: Damage to property caused by electrostatic discharge (ESD)!
DC Powered Switch: Power is supplied through an external DC power source. Since the switch does not include a power switch, plugging its power adapter into a power outlet will immediately power it on.

4.2.2 Network Connectors

This Industrial Managed Switch utilizes ports with fiber or copper port connectors functioning under ETHERNET and/or Fast ETHERNET protocols.

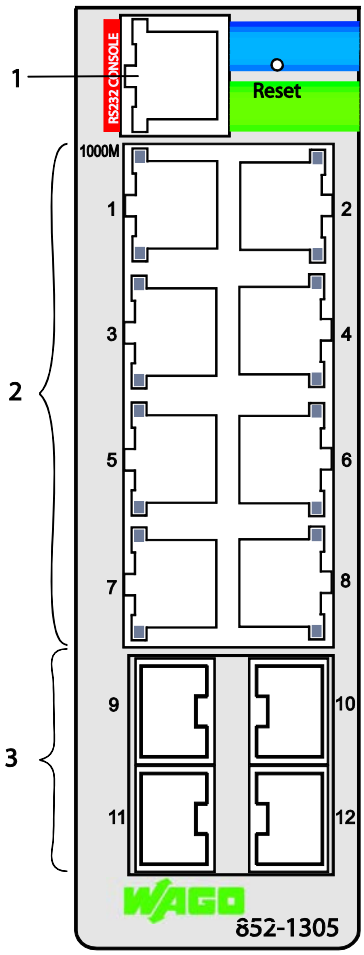


Figure 4: Network connectors

Table 6: Legend for Figure “Network Connections”

No.	Description	Meaning	For Details see Section
1	-	Connection 1 x RJ-45 (RS-232 port)	“Device Description” > … > “RJ-45 Port”
3	-	Connection 4 x SFP (1000Base-SX/LX, fiber optic)	“Device Description” > … > “1000BASE SX/LX Ports”
2	-	Connections 8 x RJ-45 (10/100Base-T ports)	“Device Description ”> … > “10/100BASE T Ports”

4.2.2.1 RJ-45 Port

The connection to ETHERNET-based fieldbuses is made via the RJ-45 connector (also called “Western plugs”), which are connected to the fieldbus controller via an integrated switch.
The integrated switch works in store-and-forward mode and for each port, supports transmission speeds 10/100 Mbit/s as well as the full and half-duplex transmission modes.
The RJ-45 socket is wired in accordance with 100Base TX requirements.
It is mandatory to use a Category 5e twisted-pair cable from the ETHERNET standard as a connecting cable. Cable types S-UTP (Screened Unshielded Twisted Pair) and STP (Shielded Twisted Pair) with a maximum segment length of 100 m can be used.
The connection point is designed for mounting into an 80 mm-high switchgear cabinet after connector attachment.

4.2.2.2 1000BASE SX/LX Ports

The 1000BASE SX/LX ports are designed to connect Fast ETHERNET or gigabit SFP modules that support network speeds of 1000 Mbit/s.

4.2.2.3 10/100/1000BASE T Ports

The 10/100/1000BASE T ports support network speeds of 10 Mbit/s and 1000 Mbit/s and can be operated in half and full-duplex transmission modes. These ports also provide automatic crossover detection (Auto-MDI/MDI-X) with plug&play capabilities. Simply plug the network cables into the ports; they then adapt to the end node devices. We recommend the following cables for the RJ-45 ports.

- 10 m – Cat 3 or higher / 100 m – Cat 5e or higher

4.3 Display Elements

The industrial managed switch is equipped with device LEDs and port LEDs. You can see the status of the switch at a quick glance of the device LEDs, while the port LEDs provide information about connection actions.

4.3.1 Device LEDs

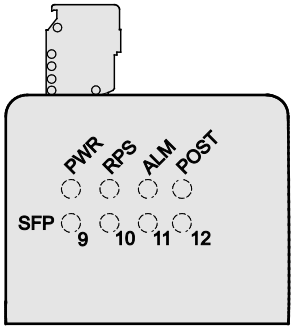


Figure 5: Device LEDs

Table 7: Legend for Figure “Device LEDs”

LED	Name	Status	Description
PWR	Primary Power LED	Green	The industrial managed switch uses the primary power supply.
		OFF	The primary power supply has been switched off or a fault has occurred.
RPS	Redundant Power System LED	Green	The industrial managed switch uses the redundant power supply.
		OFF	The redundant power supply has been switched off or a fault has occurred.
ALM	Alarm LED	Red	Lights up in the event of network, connection or ring errors (for Arbiter nodes).
		OFF	No alarm to report.
POST	Power On Self Test LED	Flashes	The Self Test is running.
		Green	The Switch is operational.
		OFF	The Switch is not operational.

Table 7: Legend for Figure “Device LEDs”

LED		Name	Status	Description
SFP	9	SFP Port LNK/ACT LED	Green	Lights up when the port is linked.
			Flashes	Data traffic being routed via the port.
			Off	No proper link established at the port.
	10	SFP Port LNK/ACT LED	Green	Lights up when the port is linked.
			Flashes	Data traffic being routed via the port.
			Off	No proper link established at the port.
	11	SFP Port LNK/ACT LED	Green	Lights up when the port is linked.
			Flashes	Data traffic being routed via the port.
			Off	No proper link established at the port.
	12	SFP Port LNK/ACT LED	Green	Lights up when the port is linked.
			Flashes	Data traffic being routed via the port.
			Off	No proper link established at the port.

4.3.2 Port LEDs

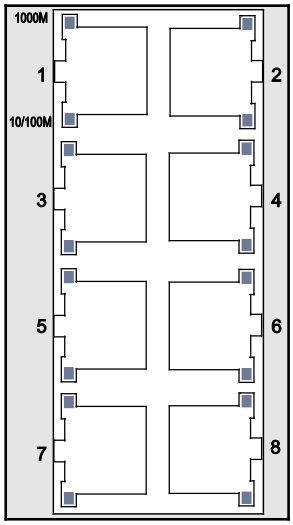


Figure 6: Port LEDs

Table 8: Legend for Figure “Port LEDs”

LED	Name	Status	Description
1000M	1000BASE T Ports LED (1 LED for each port)	Green	Port in operation at 1000 Mbit/s.
		Flashes	Data traffic being routed over the port.
		OFF	Connection in operation at less than 100 Mbit/s.
10/100	10/100BASE T Ports LED (1 LED for each port)	Green	Lights up when the ports are linked.
		Flashes	Data traffic being routed over the port.
		OFF	No proper link established at the port.

4.4 Operating elements

4.4.1 DIP Switches

On the top side of the industrial switch there are DIP switches to configure the alarm and arbiter configurations.

The meaning of the DIP switch settings are described below:

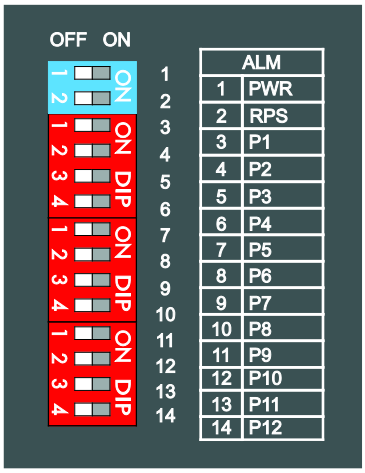


Figure 7: DIP Switches

Table 9: Legend for Figure “DIP Switches

No.	Name	Status	Description
1	PWR	ON	The alarm reporting function for the primary power supply is activated.
		OFF	The alarm reporting function for the primary power supply is deactivated.
2	RPS	ON	The alarm reporting function for the secondary power supply is activated.
		OFF	The alarm reporting function for the secondary power supply is deactivated.
3 … 14	P1 … P12	ON	The alarm reporting function for the port x connection is activated.
		OFF	The alarm reporting function for the port x connection is deactivated.

DIP switches let the user manually turn ON/OFF any port, the external alarm, or the redundant power supply.

The DIP switch must be “ON” to activate the port alarm function. The default setting is “OFF”.

The following is the recommended procedure for configuring and setting DIP switches during initial installation:

1 Turn all DIP switches to “OFF”.

2 Install the industrial managed switch in your network.

3 Select the port(s) to be monitored or the alarm to be activated.

4 Set the DIP switch of the corresponding port to “ON”.

5 Turn the industrial managed switch ON.

4.4.2 Reset Button

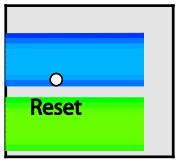


Figure 8: Reset Button

Table 10: Legend for Figure “Reset Button”

Name	Status	Description
Reset	Press the Reset button for 2 seconds and release.	The system is restarted.

Note

Important Note!
Use a suitable object, e.g., ballpoint pen or straightened paper clip, to press the Reset button.

4.5 Label

4.5.1 Hardware and Software Version

There is a label with the “MAC Address” and “Serial NO” on the back of the industrial managed switch.

Figure 9: Label (Example)

Table 11: Legend for Figure “Label”

No.	“Serial NO” Description
02	Firmware version
01	Hardware version

4.6 Technical Data

4.6.1 Device Data

Table 12: Technical Data – Device Data

Width	Carrier rail mounting	50 mm
Height	Carrier rail mounting	120 mm (from the top edge of the carrier rail)
Depth	Carrier rail mounting	162 mm
Weight		910 g
Degree of protection		IP30

4.6.2 System Data

Table 13: Technical Data – System Data

MAC table	Up to 16000 addresses
VLAN	Port based and tag based (4094 VIDs)
Jumbo Frame Size	10240 bytes
Wavelength optical fibers	Depends on SFP module
Maximum lengths	10/100/ 1000BASE-TX: 100 m; Fiber optic: 2 km to 80 km RS-232: 15 m

4.6.3 Power Supply

Table 14: Technical Data – Power Supply

Supply voltage	12 … 60 VDC
Power consumption, max.	18 W

4.6.4 Communication

Table 15: Technical Data – Communication

Ports	8 x 10/100/1000BASE-T (RJ-45); 4 x SFP 1000BASE-SX/LX, fiber optic; 1 x RS-232 (RJ-45)
Standards	IEEE 802.3u 100BASE-TX/FX; IEEE 802.3ad Link Aggregation; IEEE 802.3 10BASE-T; IEEE 802.1d Spanning Tree Protocol; IEEE 802.3x Flow Control; IEEE 802.1p CoS Prioritization; IEEE 802.1q VLAN Tagging; IEEE 802.3ab LLDP; IEEE 802.3ab 1000BASE-T; IEEE 802.3w RSTP; IEEE 802.3z 1000BASE-SX/LX; IEEE 802.1x Port Authentication
Topology	Ring and star

4.6.5 Environmental Conditions

Table 16: Technical Data – Environmental Conditions

Surrounding air temperature, operation	-40 °C … +70 °C
Surrounding air temperature, operation, DNV GL (Temperature class D)	-25 °C … +70 °C
Surrounding air temperature, storage	-40 °C … +80 °C
Relative humidity (without condensation)	95 %
Vibration resistance	Acc. IEC 60068-2-6
Shock resistance	Acc. IEC 60068-2-27
EMC-1 immunity to interference	Acc. EN 61000-6-2
EMC-1 Emission of interference	Acc. EN 61000-6-4
Standard Compass Safe Distance 0.3 Degree deflection	750 mm
Steering, Standby, Emergency Compass Safe Distance 1.0 Degree deflection	500 mm

4.7 Approvals

The following approvals have been granted for the WAGO ETHERNET accessory product “8/4-Port 1000BASE-T/1000BASE-SX/LX” (852-1305):

CE Conformity Marking

The following approvals are pending for WAGO ETHERNET accessory products “8/4-Port 1000BASE-T/1000BASE-SX/LX” (852-1305):

c UL us Ordinary Locations UL61010-2-201

The following ship approvals have been granted for the WAGO ETHERNET accessory product “8/4-Port 1000BASE-T/1000BASE-SX/LX” (852-1305):

DNV GL
[Temperature: D, Humidity: B, Vibration: C, EMC: B, Enclosure: A]

5 Mounting

5.1 Installation Site

The location selected to install the industrial managed switch may greatly affect its performance. When selecting a site, we recommend considering the following rules:

- Install the industrial managed switch at an appropriate place. See section “Device Description” > … > “Technical Data“ for the acceptable temperature and humidity operating ranges.

Make sure that the heat output from the industrial managed switch and ventilation around it is adequate. Do not place any heavy objects on the industrial managed switch.

5.2 Installation on a Carrier Rail

The carrier rail must optimally support the EMC measures integrated into the system and the shielding of the internal data bus connections.

Place the industrial managed switch onto the DIN rail from the top and snap it into position.

5.3 Removal from Carrier ail

To remove the industrial managed switch from the carrier rail, insert a suitable tool into the metal tab under the switch and deflect the metal tab downward.

You can then release the switch down from the carrier rail and remove it upwards.

6 Connect Devices

6.1 Power Supply

The industrial managed switch uses direct current power supply for 12 … 60 V.

The primary and secondary network link is established via a 6-pin plug-in connection located on the top of the industrial managed switch.

The female connector is composed of six connecting terminals and can be inserted and removed easily by hand to connect to the 6-pin plug connector located on the top of the switch.

The power supply for the industrial managed switch automatically adjusts to the local power source and can also be switched On if no or not all patch cables are connected.

1 Check whether the power LED on the front lights up when the device is switched ON. If not, check that the power cable is correctly and securely plugged in.

2 If a secondary power supply is connected, the RPS LED lights up.

3 PWR +/- conductors:
To connect or disconnect the conductors, actuate the spring in the female connector directly using a screwdriver or an operating tool and insert or remove the conductor.

4 For the backup DC connection, follow the same procedure as above. Attach power wires to the female connector (in the position marked “RPS +/-”).

5 Plug the female connector into the male connector of the switch if it has not already been plugged in.

6 Check whether the power LED on the top of the device lights up when power is supplied to the device. If not, check to ensure that the power cable is plugged in correctly and fits securely.

6.2 External Alarm Contact Port

The industrial managed switch has an alarm contact connection on the top panel. For detailed instructions on how to connect the alarm contact power wires to the two ALM contacts of the 6-pin female connector, please refer to section “Power Supply (PWR/RPS)” (it is the same procedure).

You can connect the alarm circuit to any warning device already installed in the user's control room or factory floor. When a fault occurs, the industrial switch sends a signal through the alarm contact to activate the external alarm. The alarm contact has two ports that form a fault circuit for connecting to alarm systems.

An alarm is signaled in the following cases:

1 Link failure (e.g., cable disconnected, device breakdown, etc.)

2 PWR/RPS:
   a Power failure (power cord is disconnected, power supply malfunction, etc.)
   b Input power falls outside specification (12 … 60 V)

3 Failure in jet ring or ERPS ring (Enhancement mode).

6.3 Console Port Cable Connection

The console port (RJ-45) provides the local management facility.

1. Insert the RJ-45 side of the (8 pin RJ-45 to DB9) cable into the RJ-45 console port on the Industrial Managed Switch and the other end into the COM port of the computer.

2. Configure the Hyper Terminal settings as mentioned in chapter “Configuration“ > … > “Console Port”.

For console port (8 pin RJ-45) pin assignment, please see in the chapter “Appendix“ > …> “Console Port (RJ-45 to DB9)”.

6.4 1000Base-SX/LX Port, Fiber Optic

When connecting a fiber optic cable to a 1000Base-SX/LX port on the industrial managed switch, make sure to use the right connector type (LC) and SFP module.
There are various types of multi-mode, single mode or WDM SFP modules.
Follow the steps below to connect the fiber optic cable properly:

Note

Rubber covers
Remove and safely store the rubber covers of the fiber optic port (LC).
If no fiber optic cable is connected, the rubber cover should be installed to protect the fiber optics.

1 Insert the respective SFP modules.

2 Ensure that the fiber optic ports are clean. You can clean the cable connectors by wiping them with a clean cloth or a cotton ball soaked with a little ethanol. Dirty fiber optic cables affect the quality of the light transmitted via the cable and leads to reduced performance at the port.

3 Connect one end of the fiber optic cable to the LC port of the industrial managed switch and the other end to the fiber optic port of the other device.

Note

Proper connection of the fiber optic cable to the SFP module
For a proper connection, snap the connector of the fiber optic cable into the SFP module audibly.

4 Check the respective port LED on the industrial managed switch that the connection is established (see section “Device Description” > … > “Display Elements”).

6.5 10/100/1000BASE-T Ports

The 10/100BASE-T ports (RJ-45 ETHERNET ports) of the industrial managed switch support both autosensing and autonegotiation.

1 Connect one end of the twisted pair cable of the type Category 3/4/5/5e to an available RJ-45 port on the industrial managed switch and the other end to the port of the selected network node.

2 Check the respective port LED on the industrial managed switch that the connection is established.
(see section “Display Elements” > … > “Port LEDs”).

7 Enhanced Features

7.1 Default Settings

7.1.1 Jumbo Frame

“Jumbo Frames” are ETHERNET frames with a size of more than 1500 bytes. Jumbo frames can increase data transmission efficiency in a network. The bigger the “Jumbo Frame”, the better the network performance.

Note

“Jumbo Frame” settings
The “Jumbo Frame” settings apply to all ports.

If the size of a packet exceeds the size of the “Jumbo Frame”, the packet is dropped.

7.1.2 SNTP

SNTP (“**S**imple **N**etwork **T**ime **P**rotocol”) is a protocol for synchronizing clocks in computer systems. It is a less complex implementation of an NTP (“**N**etwork **T**ime **P**rotocol”).

SNTP uses “**C**oordinated **U**niversal **T**ime” (French: “**T**emps **U**niversel **C**oordonné”). No information on time zones or daylight savings time is transmitted. This information falls outside the protocol range and must be obtained separately.

The SNTP port is 123.

Note

1. The SNTP server always replies the current UTC time.
2. If the switch receives the SNTP reply time, it adjusts the time to the time zone configuration and configures the time for the switch accordingly.
3. If the time server's IP address is not configured, the switch does not send an SNTP request packet.
4. If the switch does not receive an SNTP reply packet, it repeats the challenge indefinitely every ten seconds.
5. If the switch receives an SNTP reply, it repeats the time request from the NTP server every hour.
6. If the time zone and NTP server changes, the switch repeats the request process.
7. No default SNTP server.

7.1.3 Management Host

The management host limits the number of hosts that the switch can manage. There is no “Management Host” in the default settings. Any host can manage the switch via Telnet or web browser. If a user has configured one or more hosts, only those hosts can manage the switch. The function allows users to configure up to three entries for the management IPs.

7.1.4 MAC Management

The MAC address (“**M**edia **A**ccess **C**ontrol”) is the unique hardware number in a network.

Dynamic Address

When receiving frames, the switch records the source MAC address, receiving port, VLAN and an “Age Time” in the address table. When the “Age Time” is expired, the address entry is deleted from the address table.

Static Address

A static address set by the user does not include the “age time” and is not deleted by the switch. The static address can only be deleted by a user. The switch supports an address table at up to 16 K.

Static and dynamic addresses share the same address table.

MAC Table

The “MAC Table” (MAC address table, also known as a filter database) shows which frames are forwarded to the switch's ports or which frames are filtered out. If a device that belongs to a VLAN group sends a data packet that is forwarded to a port on the switch, the MAC address of the device is read from the switch's MAC address table.
It also shows whether the MAC address is dynamic (assigned by the switch) or static (set manually).

MAC Address Table

The switch uses the MAC address table to determine how to forward frames (see figure below).

1. The switch checks a received frame and detects the port from which the MAC source address originates.

2. The switch checks if the frame's destination MAC address matches a source MAC address already detected in the MAC address table.

   - If the switch already knows the port for this MAC address, the it forwards the frame to that port.

- If the switch does not already know the port for this MAC address, it forwards the frame to all ports. “Port Flooding” (forwarded too often to all ports) can lead to network congestion.

- If the switch already knows the port for this MAC address and the destination port is the same as the input port, the frame is filtered.

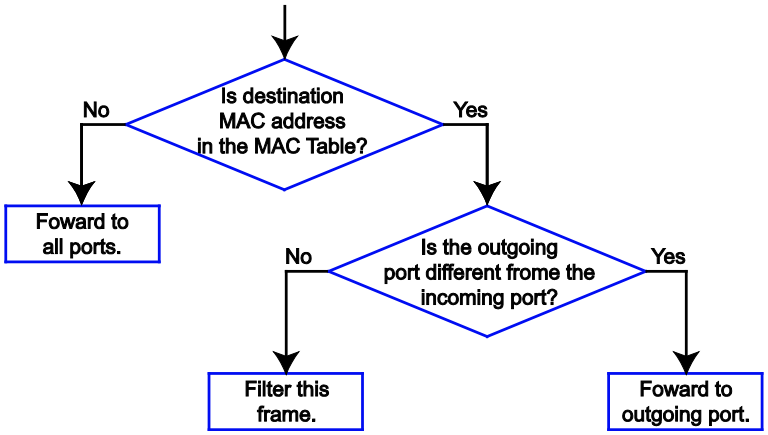


Figure 10: MAC Address Table Flowchart

7.1.4.1 Static MAC Settings

Static MAC Addresses

A static MAC address is an address that has been manually entered in the MAC address table. Static MAC addresses have no “Age Time”. When you set up rules for static MAC addresses, you are setting static MAC addresses for a port. This may reduce data transmission needs.

7.1.4.2 Refusal MAC Settings

This type of MAC address entries is configured manually. The switch ignores packets that have such MAC addresses as the source or destination contained in “Blackhole” MAC address entries. “Blackhole” entries are configured to filter frames with specific source or destination MAC addresses.

7.1.5 Port Mirroring

Port mirroring is used on switches to copy sent/received network packets from one or more areas of network monitoring or to send them to another switch port (monitor port).
Port mirroring is used in network systems that require monitoring of network traffic as in an IDS (“**I**ntrusion **D**etection **S**ystem”).

Port mirroring, together with an NTA (“**N**etwork **T**raffic **A**nalyzer”) can help to monitor network traffic. Users can monitor incoming and/or outgoing data packets on selected ports (“Source Ports”).

Source Mode

- “Ingress”: The incoming data packets are copied and forwarded to the monitor port.
- “Egress”: The outgoing data packets are copied and forwarded to the monitor port.
- Both: Both incoming and outgoing data packets are copied and forwarded to the monitor port.

Note

1. The monitor port cannot be a member of a “Truck Port” group.
2. The monitor port cannot be an ingress or egress port.
3. If a port has been configured as a source port and a user then configures it as a destination port, the port is automatically deleted from the source ports.

7.1.6 Port Settings

Duplex Mode

A duplex communication system is a system composed of two connected devices that can communicate with each other in both directions.

Half-Duplex

A half-duplex system provides for communication in both directions, but only one direction at a time (not simultaneously).
One device receives a signal and must wait for the other device to stop transmitting before replying.

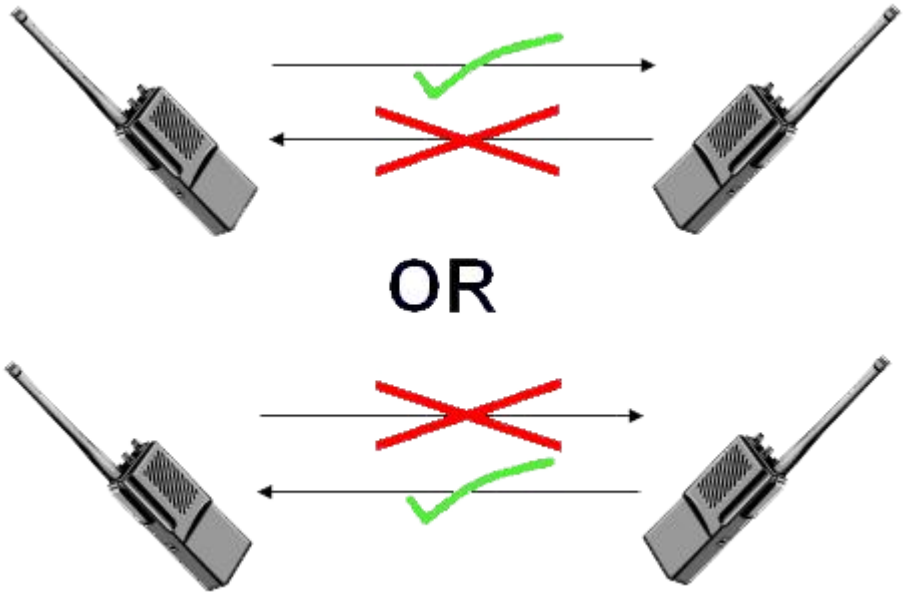


Figure 11: Half-Duplex Mode

Full-Duplex

A full-duplex system (also known as a double-duplex system) can communicate simultaneously in both directions.
Fixed-line telephone networks, for example, are full-duplex since both callers can talk and listen at the same time.

Figure 12: Full-Duplex Mode

Loopback Test

In a “Loopback” test, a signal is sent from and then returned to a communication device (“looped back”).
The test checks the proper function of the device and looks for faulty nodes in the network.
For one type of “Loopback” test, a special plug (so-called “wrap plug”) is plugged into a communications device. The plug causes transmitted (output) data to be returned as received (input) data, simulating a closed communication circuit using a single computer.

Auto MDI/MDIX

MDI (“**M**edium-**D**ependent **I**nterface”) is part of the transmitter/receiver unit (transceiver) of a network device.

Auto-MDIX (“**Aut**omatic **M**edium-**D**ependent **I**nterface **C**rossover”) is a network technology integrated in the port that automatically detects the required network cable type (“Straight-Through” or “Crossover” cable) and configures the connection accordingly.
“Crossover” cables are then unnecessary for connecting devices.
The interface corrects incorrect cabling automatically.
For Auto-MDIX to work properly, the speed of the interface and in the duplex settings must be set to “Auto”.

Auto-Negotiation

Auto-negotiation is a method in which two interconnected ETHERNET network ports (e.g., the network port of a PC and a port of a router, hub or switch that is connected to it) that independently negotiate and configure the maximum transmission speed and the duplex process.
Auto-negotiation only applies to twisted-pair cables, but not to WLAN, fiber optic or coaxial cable connections.

If the port does not support auto-negotiation or the function is disabled, the switch determines the connection speed by detecting the signal on the cable and using half-duplex mode.
If auto-negotiation is enabled on the switch, a port uses its pre-configured settings for speed and duplex mode when establishing the connection.
This should ensure that the same settings have been made on the port, allowing the connection to be established.

Flow Control

“Flow Control” regulates the transmission of signals by adjusting them to the bandwidth on the input port.
Higher data traffic on the port decreases the bandwidth and can overflow the buffer memory, which can lead to packet and frame loss.

According to IEEE802.3x, the switch uses “Flow Control” in full-duplex mode and “Backpressure Flow Control” in half-duplex mode.

For “Flow Control”, the switch sends a pause signal in full-duplex mode to the sending port, causing it to temporarily stop sending signals when the buffer memory of the receiving port is full.
For “Backpressure Flow Control”, the switch sends a collision signal to the sending port in half-duplex mode (mimicking a state of packet collision), causing the sending port to temporarily stop sending signals and to resend the signals later.

Note

Support for “Force Mode”
1000 Base-T does not support “Force Mode”.

7.2 Advanced Settings

7.2.1 Bandwidth Limitation

7.2.1.1 QoS

Each egress port supports up to eight “Transmit Queues”. Each “Transmit Queue” contains a list specifying the packet transmission order. Each incoming frame is forwarded to one of the eight “Transmit Queues” of the assigned egress port based on its priority. The egress port transmits packets from each of the eight “Transmit Queues” according to a configurable sequence algorithm, which can be a combination of SP (“**S**trict **P**riority”) and/or WRR (“**W**eighted **R**ound **R**obin”).

Normally, networks operate on a best-effort delivery basis, i.e., all data traffic has equal priority and an equal chance of being transmitted in a timely manner.
If congestion occurs, all data traffic has an equal chance of being dropped.

When configuring the QoS (“**Q**uality of **S**ervice”) function, you can select a specific data traffic, prioritize it according to its relative importance and use congestion management and congestion-avoidance techniques to give preferential treatment.
Implementing QoS in a network improves network predictability and increases bandwidth utilization.

The industrial managed switch supports “802.1p Priority Queuing”.
The switch has eight “Priority Queues”. These priority queues are numbered, where Class 7 is the highest and Class 0 the lowest priority queue. The eight priority classes specified in IEEE 802.1p (p0 to p7) are mapped to the switches priority queues as follows:

Priority	0	1	2	3	4	5	6	7
Queue	2	0	1	3	4	5	6	7

The “Priority Scheduling” is implemented in “Priority Queues”. The switch operates the four “Hardware Priority Queues” sequentially, where it starts with the highest “Priority Queue” (3) and ends with the lowest (0). Each “Hardware Queue” transmits all packets in its buffer before the next lower priority is allowed to transmit its packets. If the lowest “Hardware Priority Queue” transmits all its packets, the highest starts to transmit its packets again that it received in the meantime.

QoS Enhancement

You can configure the switch to prioritize data traffic even if the incoming packets are not marked with “IEEE 802.1p Priority Tags” or change the existing “Priority Tags” based on the criteria you select. The switch allows you to choose one of the following methods for assigning priority to incoming packets:

- 802.1p Tag Priority
  - Assign priority to packets based on the packet's “802.1p Tag Priority”.
- Port-based QoS
  - Assign priority to packets based on the incoming port on the switch.
- DSCP-based QoS
  - Assign priority to packets based on their DSCP (“**D**ifferentiated **S**ervices **C**ode **P**oints”).

Note

Advanced QoS Methods
Advanced QoS methods only affect the internal “Priority Queue” mapping for the switch. The switch does not modify the IEEE 802.1p value for the egress frames.

You can choose one of these options above to alter the way incoming packets are prioritized or you can choose not to use any QoS extension setting on the switch.

802.1p Priority

When using the 802.1p priority mechanism, the packet is examined for the presence of a valid “802.1p Priority Tag”. If it has a tag, the packet is designated to a configurable “Egress Queue” based on its priority value. The “Tag Priority” can be designated to any of the available “Queues”.

ETHERNET Packet

6	6	2	42-1496	4
DA	SA	Type / Length	Data	FCS

6	6	4	2	42-1496	4
DA	SA	802.1Q Tag	Type / Length	Data	FCS

802.1Q Tag:

2 bytes	2 bytes		
Tag Protocol Identifier (TPID)	Tag Control Information (TCI)		
16 bits	3 bits	1 bits	12 bits
TPID (0x8100)	Priority	CFI	VID

- TPID (“**T**ag **P**rotocol **Id**entifier”)
  A 16-bit field is set to the value of 0x8100 to identify the frame as an “IEEE 802.1Q Tag Frame”.

- TCI (“**T**ag **C**ontrol **I**nformation”)
  - PCP (“**P**riority **C**ode **P**oint”)
    A 3-bit field that refers to the IEEE 802.1p priority. It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc.).

  - CFI (“**C**anonical **F**ormat **I**ndicator”)
    A 1-bit field. If the value of this field is 1, the MAC address is in non-canonical format. If the value is 0, the MAC address is in canonical format. It is always set to 0 for ETHERNET switches. CFI is used for compatibility between ETHERNET and “Token Ring” networks. If a frame received at an ETHERNET port has a CFI of 1, the frame should not be output to an untagged port.

  - VID (“**V**LAN **Id**entifier”)
    A 12-bit field specifying the VLAN to which the frame belongs. A value of 0 means that the frame does not belong to any VLAN; in this case, the “802.1Q Tag” specifies only a priority and is referred to as a “Priority Tag”. A hexadecimal value of 0xFFF is reserved for implementation purposes. All other values may be used as “VLAN Identifiers”, allowing support for up to 4094 VLANs. On “Bridges”, VLAN 1 is often reserved for management.

Priority Levels

PCP (“**P**riority **C**ode **P**oint”):

Table 17: Priority Levels

PCP	Network Priority	Traffic Characteristics
1	0 (lowest)	“Background”
0	1	“Best Effort”
2	2	“Excellent Effort”
3	3	“Critical Applications”
4	4	Video, < 100 ms latency
5	5	Video, < 10 ms latency
6	6	Internetwork Control
7	7 (highest)	Network Control

DiffServ (DSCP)

DiffServ (“**Diff**erentiated **Serv**ices”) is a computer networking architecture that specifies a simple, scalable and coarse-grained mechanism, managing network traffic and providing (“**Q**uality **o**f **S**ervice”) guarantees in modern IP networks. DiffServ can, for example, be used to provide low-latency, guaranteed service (“**G**uaranteed **S**ervice”) to critical network traffic such as voice or video data while providing simple “Best Effort” traffic guarantees to non-critical services such as web traffic or file transfers.

DSCP (“**D**ifferentiated **S**ervices **C**ode **P**oint”) is a 6-bit field in the header of IP packets for packet classification purposes. DSCP replaces the outdated IP precedence, a 3-bit field in the “Type of Service” byte of the IP header originally used to classify and prioritize types of traffic.

When using the DiffServ priority mechanism, a packet is classified based on the DSCP field in the IP header. If the tag is present, the packet is assigned to a programmable “Egress Queue” based on the value of the “Tagged Priority”. The “Tagged Priority” can be designated to any available “Queue”.

<table>
<tr><th>Version</th><th>IHL</th><th>Type of Service</th><th colspan="2">Total Length</th></tr>
<tr><td colspan="3">Marking</td><td>Flags</td><td>Fragment Offset</td></tr>
<tr><td colspan="2">Time to Live</td><td>Protocol</td><td colspan="2">Header Checksum</td></tr>
<tr><td colspan="5">Source Address</td></tr>
<tr><td colspan="5">Destination Address</td></tr>
<tr><td colspan="4">Options</td><td>Padding</td></tr>
</table>

Example Internet Data Packet Header

“Type of Service” in the IP header: 8-bit

The “Type of Service” field provides an indication of the abstract parameters of the “Quality of Service” desired. These parameters are to be used to guide the

manual selection of the actual service parameters when transmitting a data packet through a particular network. Several networks offer service precedence, which treats high precedence traffic as more important than other traffic (generally by accepting only traffic above certain precedence at time of high load). The most favorable choice is a compromise between low delay, high reliability and high throughput.

Bit 0 … 2	Precedence.	
Bit 3	0 = Normal delay,	1 = Low delay.
Bit 4	0 = Normal throughput,	1 = High throughput.
Bit 5	0 = Normal reliability,	1 = High reliability.
Bit 6 … 7	Reserve for future use.	

Precedence

111 – Network Control
110 – Internetwork Control
101 – CRITIC/ECP
100 – Flash Override
011 – Flash
010 – Immediate
001 – Priority
000 – Routine

Specifying the Delay, Throughput and Reliability parameters can increase the service cost. In many networks, preference for one parameter means a disadvantage for another. Except for very unusual cases, two of three parameters should be specified at most.

The “Type of Service” is used to specify the type of processing of the data packet while it is transmitted through a network. Example mappings of the “Internet Type of Service” to the actual service provided in networks, such as AUTODIN II, ARPANET, SATNET and PRNET are specified in “Service Mappings”.

The Network Control precedence designation should only be used within a network. The actual use and control of that designation depends on the respective network. The Internetwork Control designation should only be changed by the initiators of the gateway control.

If these precedence designations apply to a specific network, it is the responsibility of that network to control access to and the use of those designations.

DSCP	Priority	DSCP	Priority	DSCP	Priority
0	0	1	0	2	0
…					
60	0	61	0	62	0
62	0				

Example:

IP Header

DSCP=50 -> 45 C8 …

Queuing Algorithms

"Queuing Algorithms" can be used to maintain separate "Queues" for packets that can be derived from any single source or any data flow, thus preventing a source from monopolizing the bandwidth.

SPQ

With SPQ ("**S**trict **P**riority **Q**ueuing"), the four "Hardware Priority Queues" are processed sequentially – the highest priority (3) first and the lowest (0) last. Each "Hardware Queue" transmits all packets in the buffer before the next lower priority is allowed to transmit its packets. If the lowest "Hardware Priority Queue" transmits all its packets, the highest starts to transmit its packets again that it received in the meantime.

WRR

RR ("Round Robin") is a scheduling service that queues packets on a rotating basis and is only activated when a port has more traffic than it can handle. A "Queue" is given an amount of bandwidth irrespective of the incoming traffic on that port. This "Queue" then moves to the back of the list. The next "Queue" is given an equal amount of bandwidth and then moves to the end of the list and so on until all "Queues" are processed. The entire process works in a looping fashion until a "Queue" is empty.

WRR ("Weighted Round Robin") scheduling uses the same algorithm as "Round Robin" scheduling, but services "Queues" based on their priority and queue weight (the number you configure in the "Weight Value" field) rather than a fixed amount of bandwidth. WRR is activated only when a port has more traffic than it can handle. "Queues" with larger weights get more service than those with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different "Traffic Queues" and returns to queues that have not yet emptied.

Note

DiffServ Function
DiffServ is disabled on the industrial managed switch.
If the DiffServ is disabled, the "802.1p Tag Priority" is used.

7.2.1.2 Rate Limitation

7.2.1.2.1 Storm Control

A broadcast storm means that the network is overwhelmed with constant broadcast or multicast traffic. Broadcast storms can eventually lead to a complete loss of network connectivity as the packets proliferate.

“Storm Control” protects the switch bandwidth from packet flooding, including broadcast packets, multicast packets and DLF (“**D**estination **L**ookup **F**ailure”). The Rate is a threshold that limits the total number of specific packet types. For example, if the broadcast and multicast options are selected, the total number of packets transmitted per second for those two types is not exceed.

“Broadcast Storm Control” limits the number of broadcast, multicast and unknown unicast (also referred to as “Destination Lookup Failure” or DLF) packets the switch receives per second on the ports. If the maximum number of packets per second is reached, all subsequent packets are discarded. Enable this function to reduce the number of these packets in the network.

The “Storm Control” unit is 625 pps (packets per second).

7.2.1.2.2 Rate Limitation

The “Rate Limitation” is used to control the rate of traffic sent or received on a network interface.

7.2.2 IGMP Snooping

“IGMP Snooping” (“**I**nternet **G**roup **M**anagement **P**rotocol **Snooping**”) is used for multicast data traffic. The switch can passively “snoop” on IGMP packets transmitted between IP multicast routers/switches and IP multicast hosts to learn the IP multicast group membership. “IGMP Snooping” allows a switch to detect multicast groups without a user having to manually configure them.

It checks IGMP packets passing through it, reads the group registration information and configures multicasting accordingly.

The switch forwards multicast traffic to its multicast destination groups (that it has detected from “IGMP Snooping” or that you have manually configured) to ports that are members of those groups. “IGMP Snooping” generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through the switch.

The switch can perform “IGMP Snooping” on up to 4094 VLANs. You can configure the switch to automatically detect multicast group membership in all VLANs. The switch then performs “IGMP Snooping” on the first VLANs that send IGMP packets.

This is referred to as “Auto Mode”. Alternatively, you can specify the VLANs that “IGMP Snooping” should be performed on. This is referred to as “Fixed Mode”. In “Fixed Mode”, the switch does not detect multicast group membership of any VLANs other than those explicitly added as an “IGMP Snooping” VLAN.

Immediate Leave

If you enable the “IGMP Immediate Leave” function, the switch immediately deletes a port when it receives a “Leave message” with IGMP Version 2 on that port. You should use the “Immediate Leave” function only when there is a single receiver present on every port in the VLAN (“Immediate Leave” is only supported on IGMP Version 2 hosts).

The switch uses the “Immediate Leave” function with “IGMP Snooping” to remove an interface from the forwarding table that sends a “Leave Message” without the switch sending group-specific queries to the interface. The VLAN interface is deleted from the multicast tree for the multicast group specified in the original “Leave Message”. “Immediate Leave” ensures optimal bandwidth management for all hosts in a switched network, even when multiple multicast groups are simultaneously in use.

Fast Leave

The switch allows you to configure a delay time. When the delay time is expired, the switch deletes the interface from the multicast group.

Last Member Query Interval

The “Last Member Query Interval” is the maximum response time in group-specific queries sent in response to “Leave Group” messages, and also shows the time between group-specific query messages.

If the switch receives an “IGMP Leave Message” from a subscriber on a receiver port without the “Immediate Leave” function being enabled, the switch sends an IGMP-specific query on this port and waits for IGMP group membership reports. If the switch receives no messages within a configured period, the receiver port is removed from the multicast group.

IGMP Querier

There is normally only one “Querier” per physical network. All multicast routers start up as a “Querier” on each attached network. If a multicast router receives a “Query Message” from a router with a lower IP address, it MUST become a non-“Querier” in that network. If a router does not receive any “Query Messages” from another router over a certain period of time [“Other Querier Present Interval”], it assumes the role of “Querier”. Routers periodically [“Query Interval”] send a “General Query” in all attached networks for which the router is the “Querier” to solicit membership information. At startup, a router SHOULD send [“Startup Query Count”] “General Queries” spaced closely together [“Startup Query Interval”] to quickly and reliably determine membership information. A “General Query” is addressed to an all-systems multicast group (224.0.0.1), has a group address field of 0 and has a maximum response time of [“Query Response Interval”].

Port IGMP Querier Mode

- Auto
  - The switch uses the port as an “IGMP Query Port” if the port receives “IGMP Query” packets.

- Fixed
  - The switch always uses the port(s) as “IGMP Query Port(s)”. This mode is used when connecting an IGMP multicast server to the port(s).
  - The switch always forwards the clients “Report/Leave” packets to the port. Normally, the port is connected to an IGMP server.
- Edge
  - The switch does not use the port as an “IGMP Query Port”.
  - The “IGMP Query” packets received on this port are dropped. Normally, the port is connected to an IGMP client.

Note

Forwarding “IGMP Join/Leave” packets
The industrial managed switch will forward the “IGMP Join/Leave” packets to the query port.

IGMP Proxy Snooping

The “IGMP Proxy Snooping” can reduce the number of “Reports” and “Leaves” sent through an IGMP router.

Configurations

Users can enable/disable “IGMP Snooping” on the switch. This also applies to specific VLANs. If “IGMP Snooping” on the switch is disabled, it is disabled on all VLANs even when enabled on some VLANs.

Note

VLAN States
There is a global state and individual VLAN states.
If the global state is disabled, “IGMP Snooping” on the switch is disabled even if individual VLAN states have been enabled.
If the global state is enabled for “IGMP Snooping”, the function must be individually enabled by the user for specific VLANs.

7.2.2.1 MVR

MVR (“**M**ulticast **V**LAN **R**egistration”) through which a media server can transmit a multicast stream in an individual multicast VLAN and in which the clients receiving the VLAN stream can be located in different VLANs. Clients in different VLANs can join or leave the multicast group simply by sending an “IGMP Join Message” or “IGMP Leave Message” to a receiver port. The receiver port belonging to a multicast groups can receive the multicast stream from the media server. Without MVR support, the multicast stream from the media server and subscriber would have to be in the same VLAN.

- Source ports : The source ports of the stream.
- Receiver ports: The reports of the clients.
- Ports with tag: Configure ports with tags to designate them as source ports or receiver ports.

MVR Mode

- **Dynamic Mode**
  If dynamic mode is enabled in the MVR settings, the “IGMP Report Message” is transmitted from the receiver port to the source ports of the multicast router. The multicast router can detect dynamically which multicast groups are on which interface.

- **Compatibility Mode**
  If compatibility mode is enabled in the MVR settings, the “IGMP Report Message” send by the receiver port is not transmitted to the source ports of the multicast router. The multicast router must be statically configured.

- **Operating Mode**
  Join Operation
  A subscriber sends an “IGMP Report Message” to the switch to join a respective multicast. The next step depends on whether the “IGMP Report Message” matches the multicast MAC address configured on the switch. If it matches, the switch CPU modifies the hardware address table to include the receiver port and the VLAN as a forwarding destination for the MVLAN.

- **Leave Operation**
  A subscriber sends an “IGMP Leave Message” to the switch to leave the multicast. The switch CPU sends a group-specific “IGMP Query” to the receiver port of the VLAN. If there is another subscriber in the VLAN, the subscriber must respond within the maximum response time. If there is no subscriber, the switch deletes the receiver port.

- **Immediate Leave Operation**
  A subscriber sends an “IGMP Leave Message” to the switch to leave the multicast. The subscribers do not need to wait for the switch CPU to send a group-specific “IGMP Query” to the receiver port of the VLAN. The switch immediately deletes the receiver port.

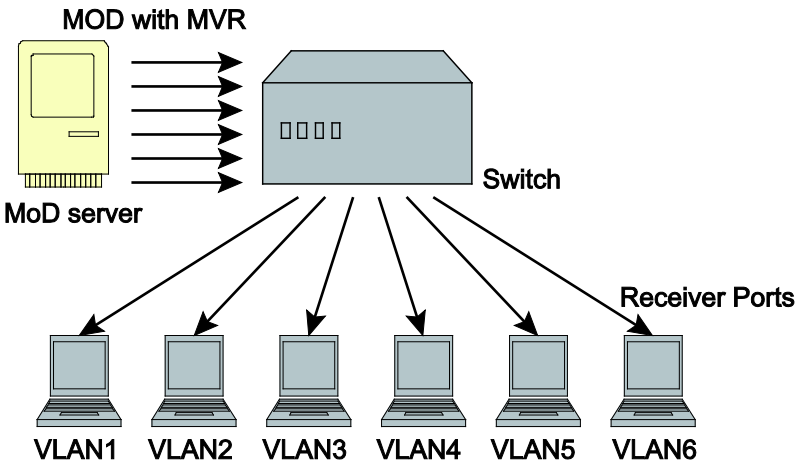


Figure 13: MOD without MVR

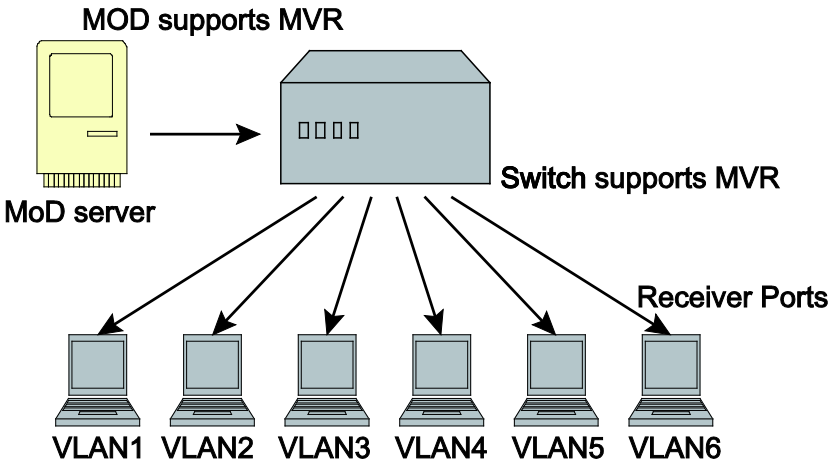


Figure 14: MOD supports MVR

Default configuration for a new MVR:

MVR VLAN information

VLAN ID:	2
Name:	MVR2
Active:	Enabled
Mode:	Dynamic
Source port(s):	None
Receiver port(s):	None
Port(s) with tag:	None

The switch allows the user to create up to 250 groups.
The switch allows the user to create up to 16 MVRs.

Note

- “IGMP Snooping” and MVR can be enabled independently.
- “IGMP Snooping” and MVR use the same IGMP timer.
- MVR can recognize IGMPv3 reports.
- The switch as wells as the following group record types do not treat group entries such as an IGMPv3 report as membership reports. The group record types are “MODE_IS_INCLUDE”, “CHANGE_TO_INCLUDE_MODE”, “ALLOW_NEW_SOURCES” and “BLOCK_OLD_SOURCES”.
- Do not use group address X.0.0.1 for your multicast stream. The system detects and logs the address 224.0.0.1 for the dynamic “Querier Port”. The group address X.0.0.1 could cause a conflict with 224.0.0.1.
- The lower 23 bits of the 28-bit multicast IP address are mapped to the 23 bits of the available ETHERNET address space.
  When configuring the group address, the switch only compares the lower 23 bits.
- The CLI command “group 1 start-address 224.1.1.1 6” creates 6 groups. That is, one IP, one group.
- The MVR name should be a combination of numbers and letters.
- The group name should be a combination of numbers and letters.

7.2.2.2 Multicast Address

A multicast address is associated with a group of interested receivers. According to RFC 3171, addresses 224.0.0.0 to 239.255.255.255 (formerly Class D addresses) are reserved as multicast addresses in IPv4.

The first octet (01) includes the broadcast/multicast bit. The lower 23 bits of the 28-bit multicast IP address are mapped to the 23 bits of the available ETHERNET address space. This means that there is ambiguity in delivering packets. If two hosts on the same subnet each subscribe to different multicast groups whose addresses differ only in the first 5 bits, ETHERNET packets for both multicast groups are sent to both hosts, requiring the network software in the hosts to discard the unnecessary packets.

Table 18: Multicast Classes and Address Ranges

Class	Address Range	Support
Class A	1.0.0.1 to 126.255.255.254	Supports 16 million hosts on each of 127 networks.
Class B	128.1.0.1 to 191.255.255.254	Supports 65,000 hosts on each of 16,000 networks.
Class C	192.0.1.1 to 223.255.254.254	Supports 254 hosts on each of 2 million networks.
Class D	224.0.0.0 to 239.255.255.255	Reserved for multicast groups.
Class E	240.0.0.0 to 254.255.255.254	Reserved for future use or research and development purposes.

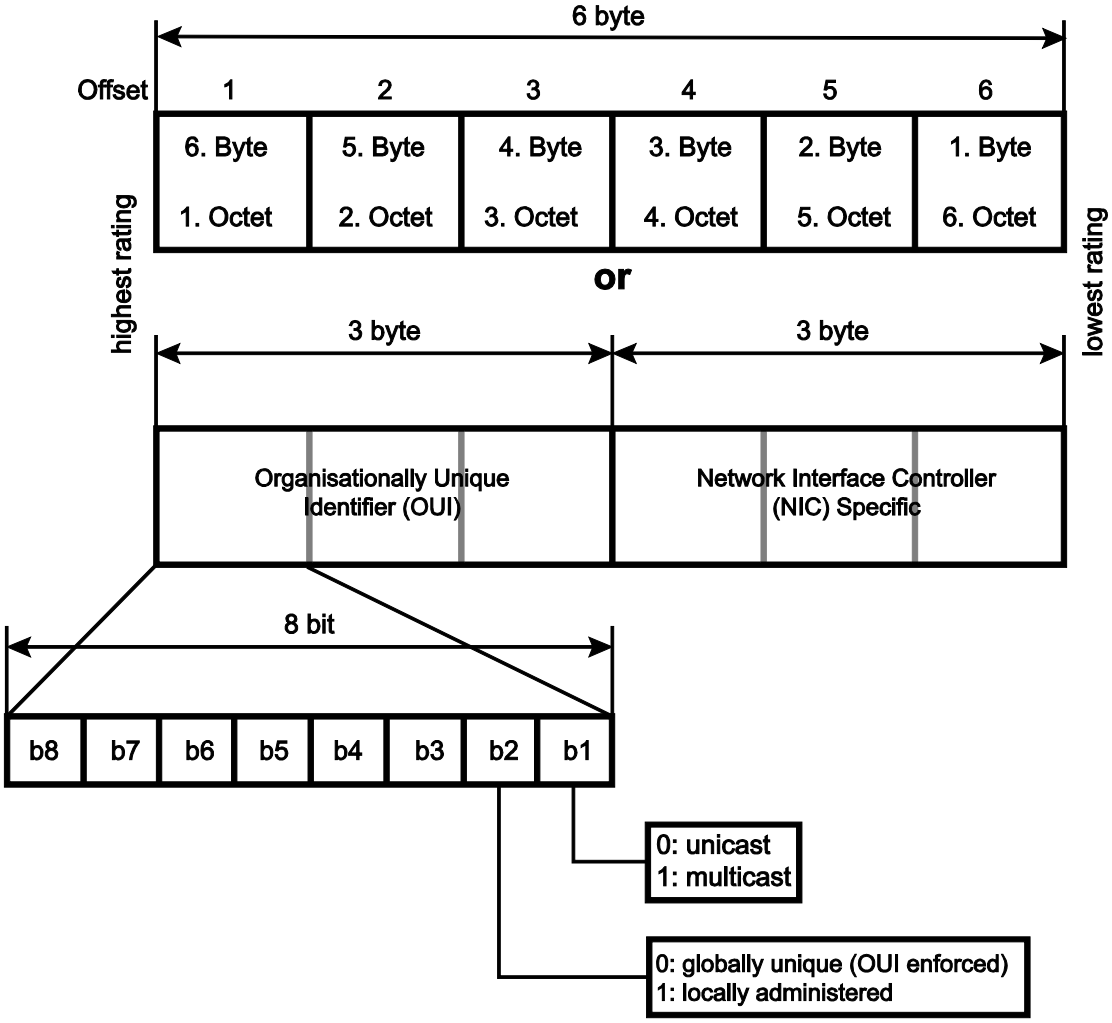


Figure 15: Multicast Address

Table 19: IP Multicast Addresses

IP multicast address	Description
224.0.0.0	Base address (reserved)
224.0.0.1	“All Hosts Multicast” group that contains all systems on the same network segment.
224.0.0.2	“All Routers Multicast” group that contains all routers on the same network segment.
224.0.0.5	The “Open Shortest Path First” (OSPF protocol), the “AllSPFRouters” address. Used to send “Hello Packets” to all OSPF routers on a network segment
224.0.0.6	The “OSPF AllDRouters” address. Used to send OSPF routing information to “OSPF Designated Routers” on a network segment
224.0.0.9	The RIP (“Routing Information Protocol”) Version 2 of the group address. Used to send routing information to all RIPv2-compatible routers on a network segment.
224.0.0.10	The EIGRP group address. Used to send EIGRP routing information to all EIGRP routers on a network segment.
224.0.0.13	PIM Version 2 (“Protocol Independent Multicast”)

Table 19: IP Multicast Addresses

IP multicast address	Description
224.0.0.18	Virtual Router Redundancy Protocol
224.0.0.19 - 21	IS-IS over IP
224.0.0.22	IGMP Version 3 (“Internet Group Management Protocol”)
224.0.0.102	Hot Standby Router Protocol Version 2
224.0.0.251	Multicast DNS address
224.0.0.252	“Link-local Multicast Name Resolution”-address
224.0.1.1	“Network Time Protocol” address
224.0.1.39	“Cisco Auto-RP-Announce” address
224.0.1.40	“Cisco Auto-RP-Discovery” address
224.0.1.41	“H.323 Gatekeeper Discovery” address

7.2.3 VLAN

A VLAN (“**V**irtual **LAN**”) is a group of hosts with a common set of requirements that communicate as if they were attached to a broadcast domain, regardless of their physical location. A VLAN has the same attributes as a physical LAN, but it allows for end stations to be grouped together even if they are not located on the same network switch. Networks can be reconfigured through software instead of spatially offset devices.

VID (“**V**LAN-**ID**”) is the identification of a VLAN that is generally used by the 802.1Q standard. It has 12 bits and allows the identification of 4096 (2^12) VLANs. Of the 4096 possible VIDs, VID 0 is used to identify “Priority Frames” and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4094.

A “Tagged VLAN” uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across “Bridges” - they are not confined to the switch on which they were created. VLANs can be created statically (manually by users) or dynamically via the GVRP (“GARP VLAN Registration Protocol”). The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is four bytes longer than an untagged frame and contains two bytes of TPID (“Tag Protocol Identifier”, residing within the type/length field of the “ETHERNET Frame”) and two bytes of TCI (“Tag Control Information”, starts after the source address field of the “ETHERNET Frame”).

The CFI (“Canonical Format Indicator”) is a single-bit flag, always set to zero for ETHERNET switches. If a frame received at an ETHERNET port has a CFI of 1, the frame should not be output to an untagged port. The remaining 12 bits define the VLAN ID, giving a possible maximum number of 4096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a “Priority Frame”, i.e., only the priority level is relevant and the default VID of the ingress port is used as the VID of the frame. Of the 4096 possible VIDs, a VID of 0 is used to identify “Priority Frames” and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4094.

TPID	User Priority	CFI	VLAN ID
2 bytes	3 Bit	1 bits	12 bits

- **Forwarded Tagged and Untagged Frames**

Each port on the switch is capable of forwarding tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the switch first decides where to forward the frame and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is “VLAN 1” for all ports, but this can be changed.

A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are subscribers of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

- **Port-Based 802.1Q VLAN**

As a subscriber of a port-based VLAN, the port is assigned to a specific VLAN independent of the user or system attached to the port. This means all users attached to the port should be subscribers of the same VLAN. The network administrator typically performs the VLAN assignment. The port configuration is static and cannot be automatically changed to another VLAN without manual reconfiguration.

As with other VLAN approaches, the packets forwarded using this method are not transmitted to other VLAN domains or networks. After a port has been assigned to a VLAN, the port cannot send to or receive from devices in another VLAN without the intervention of a Layer 3 device.

The device that is attached to the port likely has no understanding that a VLAN exists. The device simply knows that it is part of a subnet and that the device should be able to talk to all other network subscribers by simply sending information via the cable connection. The switch is responsible for identifying that the information came from a specific VLAN and for ensuring that the information gets to all other subscribers of the VLAN. The switch is also responsible for ensuring that ports in a different VLAN do not receive the information.

This approach is quite simple, fast and easy to manage in that there are no complex lookup tables required for VLAN segmentation. If the “Port-to-VLAN” connection is designed with an application-specific integrated circuit (ASIC), performance is very good. An ASIC allows “Port-to-VLAN” mapping at the hardware level.

7.2.3.1 Port Isolation

“Port Isolation” is a port-based virtual LAN function. It partitions the switching ports into virtual private domains designated on a per port basis. Data switching outside of the switch's private domain is not allowed. VLAN tag information of the packets is ignored.

This function can be used to configure one or more egress ports that allow the data received by the specific port to forward it. If the CPU port (port 0) is not an egress port for a specific port, the host connected to the specific port cannot manage the switch.

If you want to allow communication between two subscriber ports, you must define the egress port for both ports. CPU refers to the switch management port. By default, it forms a VLAN with all ETHERNET ports. If it does not form a VLAN with a specific port, then the switch cannot be managed from that port.

7.2.3.2 GARP/GVRP

GARP (“**G**eneric **A**ttribute **R**egistration **P**rotocol“) and GVRP (“**G**ARP **V**LAN **R**egistration **P**rotocol“ or “**G**eneric **V**LAN **R**egistration **P**rotocol”) are industry-standard protocols described in IEEE 802.1p. GVRP is a GARP application that provides 802.1Q-compliant “VLAN Pruning” and dynamic VLAN creation on “802.1Q Trunk Ports”.

With GVRP, the switch can exchange VLAN configuration information with other GVRP switches, prune unnecessary broadcast and unknown unicast traffic, and dynamically create and manage VLANs on switches that are connected through “802.1Q Trunk Ports”.

GVRP makes use of GID (“**G**roup **Id**entification”) and GIP, which provide the common “State Machine Descriptions” and the common information propagation mechanisms defined for use in GARP-based applications. GVRP runs only on “802.1Q Trunk Links”. GVRP prunes “Trunk Links” so that only active VLANs are transmitted across trunk connections. GVRP expects to hear join messages from the switches before it will add a VLAN to the trunk. GVRP updates and hold timers can be altered. GVRP ports run in various modes to control how they will prune VLANs. GVRP can be configured to dynamically add and manage VLANS in the VLAN database for “Trunking” purposes.

In other words, GVRP allows the propagation of VLAN information from device to device. With GVRP, a single switch is manually configured for all VLANs required for the network and all other switches on the network learn detect the VLANs dynamically. End nodes can be plugged into any switch and connected to the required VLAN. For end nodes to make use of GVRP, they need GVRP-aware network interface cards (NICs). The GVRP-aware NIC is configured with the desired VLAN or VLANs, then connected to a GVRP-enabled switch. The NIC communicates with the switch once connectivity is established between the NIC and switch.

Registration Mode:

- **Normal**
  The “normal” registration mode allows dynamic creation (if dynamic VLAN creation is enabled), registration and deregistration of VLANs on the trunk port. “Normal” mode is the default setting.

- **Forbidden**
  The “forbidden” registration mode deregisters all VLANs (except VLAN 1) and prevents further creation or registration of VLANs on the trunk port.

- **Fixed**
  The “fixed” registration mode allows manual creation and registration of VLANs, prevents VLAN deregistration and registers all known VLANs on other ports on the trunk port. (Same applies to the static VLAN)

GVRP Timer:

- **Join Timer**
  The “Join Timer” specifies the maximum time in milliseconds that interface waits before sending VLAN messages.

- **Leave Timer**
  The “Leave Timer” specifies the number maximum time in milliseconds an interface waits after receiving a “Leave Message” before the interface leaves the VLAN specified in the message.

- **Leaveall Timer**
  The “Leaveall Timer” specifies the interval in milliseconds at which “Leaveall Messages” are sent on interfaces. “Leaveall Messages” help to maintain current GVRP VLAN subscriber information in the network.

7.2.3.3 Q-in-Q

“Q-in-Q Tunneling” is also known as “VLAN Stacking”. Both of them use 802.1Q double tagging technology. Q-in-Q is used by ISPs (Internet Service Providers) that need TLS (“**T**ransparent **L**AN **Se**rvices”) and that have their own set of VLAN, independent of customer VLANs. Normally, each service provider VLAN interconnects a group of sites belonging to a customer. However, a service provider VLAN could also be shared by a set of customers sharing the same end points and QoS requirements of the VLAN. “Double Tagging” is considered to be a relatively simpler way of implementing a transparent LAN. This is accomplished by encapsulating “ETHERNET Frames”. A second or outer VLAN tag is inserted in “ETHERNET Frames” sent over the ingress PE (“**P**rovider **E**dge”). This VLAN tag corresponds to the VLAN of the service provider. If the frame reaches the destination PE, the service provider VLAN opens. The destination address of the encapsulated frame and VLAN ID are used for other L2 decisions, similar to an “ETHERNET Frame” that arrives from a physical ETHERNET port. The service provider VLAN tag determines the membership in the VPLS (“**V**irtual **P**rivate **L**AN **S**ervice”). Double tagging aggregates multiple VLANs within another VLAN and allows a private dedicated ETHERNET connection between customers who want to reach their subnet transparently across multiple networks. Service providers can create their own VLANs without coming in contact with customer VLANs via “Double Tagging”. This allows customers to connect to ISPs and ASPs (“**A**pplication **S**ervice **P**roviders”).

The ports that are connected to the service provider VLANs are called “Tunnel Ports” and the ports that are connected to the customer VLANs are called “Access Ports”. If a port is configured as “Tunnel Port”, all outgoing packets on this port are transmitted with an SPVLAN tag (SPVID and 1p priority) tag. The incoming packet can have two tags (SPVLAN + CVLAN), one tag (SPVLAN or CVLAN), or no tag. In all cases, the packet is sent out with a SPVLAN tag. If a port is configured as an “Access Port”, the incoming traffic can have only a CVLAN tag (CVID and 1p priority) or no tag. Hence, all the packets that are being sent from “Access Ports” are untagged or single tagged (CVLAN). If a port is configured as a normal port, it ignores “Double Tagging Frames”.

Double Tagging Format

A VLAN tag (service provider “VLAN Stacking” or customer IEEE 802.1Q) consists of the following three fields:

TPID	Priority	VID

TPID

TPID (“**T**ag **P**rotocol **I**dentifier”) is a standard ETHERNET code identifying the frame and indicating whether the frame contains IEEE 802.1Q tag information. The value of this field is 0x8100 as described in IEEE 802.1Q. Other providers may use a different value, such as 0x9100.

“Tunnel TPID” is the “VLAN Stacking” tag type the switch adds to the outgoing frames sent through a “Tunnel Port” of the service provider's PE devices

Priority

Priority refers to the IEEE 802.1p standard that allows the service provider to prioritize traffic based on the class of service (CoS) the customer has paid for. "0" is the lowest priority level and "7" is the highest.

VID

VID (“**V**LAN **ID**”). SP VID is the VID for the second or outer VLAN tag (of the service provider). CVID is the VID for the first or inner VLAN tag (of the customer).

The frame formats for an untagged “ETHERNET Frame” a single-tagged 802.1Q frame (customer) and a double-tagged 802.1Q frame (service provider) are shown as follows.

Untagged frame	DA		Len or Etype	Data	FCS						
Single-tagged frame	DA	SA	TPID	P	VID	Len or Etype	Data	FCS			
Double-tagged frame	DA	SA	Tunnel TPID	P	VID	TPID	P	VID	Len or Etype	Data	FCS

DA	Destination Address
SA	Source Address
Tunnel TPID	“Tag Protocol Identifier” added to a “Tunnel Port”
VID	VLAN ID
Len or Etype	Length or ETHERNET frame type
Data	Frame data
FCS	Frame Check Sequence

VLAN Stacking Port Roles

For “VLAN Stacking”, each port can have one of three “roles”: Normal, “Access Port” or “Tunnel Port”.

- Select “normal” for normal (no “VLAN Stacking”) IEEE 802.1Q frame switching.
- Select “Access Port” for ingress ports on PE devices of the service provider. The incoming frame is treated as "untagged", so a second VLAN tag (outer VLAN tag) can be added.
- Select “Tunnel Port” for egress ports in the PE range of the provider's network. All VLANs belonging to a customer can be aggregated into a single service provider's VLAN (using the outer VLAN tag defined by SP VID).

Note

Q-in-Q Configuration
For the double-tagged frames to switch correctly, users have to configure a service provider’s VLAN (SPVLAN) on the Q-in-Q switch. Then, the double-tagged frames can be switched according to the SP VID. The SPVLAN should include all related “Tunnels” and “Access Ports”. In addition, the “Tunnel Ports” must be configured as tagged ports and the “Access Ports” as untagged ports.

7.2.3.3.1 Port-Based Q-in-Q

Q-in-Q encapsulation can be used to convert a single-tagged 802.1Q packet into a double-tagged Q-in-Q packet. The Q-in-Q encapsulation can be based on port or traffic. Port-based Q-in-Q can be used to encapsulate all incoming packets to a port with the same SPVID outer tag. This mode is less flexible.

In the following example figure, both X and Y are Service Provider’s Network (SPN) customers with VPN tunnels between their head offices and branch offices respectively. Both have an identical VLAN tag for their VLAN group. The service provider can separate these two VLANs within its network by adding tag 100 to distinguish customer X and tag 200 to distinguish customer Y at PE device A and then stripping those tags at PE device B as the data frames leave the network.

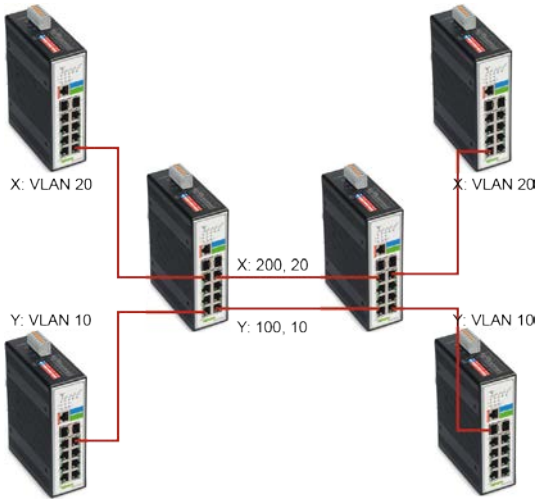


Figure 16: Port-Based Q-in-Q

This example shows how to configure switch A with port 1 on the switch to tag incoming frames with the service provider's VID of 200 (ports are connected to customer X network) and configure port 7 to the service provider's VID of 100 (ports are connected to customer Y network). This example also shows how to set the priority for port 1 to 3 and port 7 to 4.

7.2.3.3.2 Selective Q-in-Q

The traffic-based Q-in-Q is also called selective Q-in-Q. Selective Q-in-Q allows the switch to add different outer VLAN tags to the incoming frames received on one port according to their inner VLAN tags. In Selective Q-in-Q mode, the switch performs traffic classifies the incoming traffic on a port based on the VLAN ID. When a user uses different VLAN IDs for different services, traffic can be classified according to the VLAN ID. Example: VLAN ID 100 for surfing on the Internet on a PC, VLAN ID 200 for IPTV and VLAN ID 300 for VIP customers. After receiving user data, the switch labels the traffic for surfing on the Internet on a PC with 500 as a SPVID outer tag, IPTV with 600 and VIP customers with 700.

This following example shows how to configure port 3 on the switch to tag incoming frames with the different service provider's VID and priority.

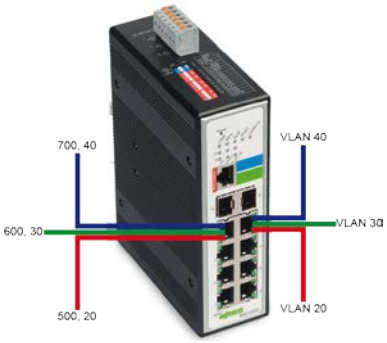


Figure 17: Configuration Example

7.2.4 DHCP Relay

Because the “DHCPDISCOVER” message is a broadcast message and broadcasts only cross other segments when they are explicitly routed, you might have to configure a “DHCP Relay Agent” on the router interface so that all “DHCPDISCOVER” messages can be forwarded to your DHCP server. Alternatively, you can configure the router to forward DHCP messages and BOOTP message. In a routed network, you would need “DHCP Relay Agents” if you plan to implement only one DHCP server.

The “DHCP Relay” that is either a host or an IP router waits for DHCP client messages being broadcast on a subnet and then forwards those DHCP messages directly to a configured DHCP server. The DHCP server sends DHCP response messages directly back to the “DHCP Relay Agent”, which then forwards them to the DHCP client. The DHCP administrator uses “DHCP Relay Agents” to centralize DHCP servers, avoiding the need for a DHCP server on each subnet.

Most of the time in small networks, DHCP uses broadcasts, but there are some circumstances where unicast addresses are used. This can be the case when networks have a single DHCP server that provides IP addresses for multiple subnets. A router for such a subnet receives the DHCP broadcasts, converts them to unicast (with a MAC/IP destination address of the configured DHCP server, MAC/IP source address of the router itself). The GIADDR field on the main DHCP page contains the IP address of the interface on the router it received the DHCP request on. The DHCP server uses the GIADDR field to identify the subnet the device and selects an IP address from the correct pool. The DHCP server then sends the “DHCP OFFER” back to the router via unicast, which then converts it back to a broadcast and out to the correct subnet containing the device requesting an address.

Configurations

A user can enable/disable the “DHCP Relay” on the switch. It can also be enabled/disabled on a specific VLAN. If the “DHCP Relay” on the switch is disabled, it is disabled on all VLANs, even if enabled for individual VLANs.

Applications

- **Application 1 (via a router**)
  DHCP client 1 and DHCP client 2 are in different IP segments. However, they receive IP address from the same DHCP server.

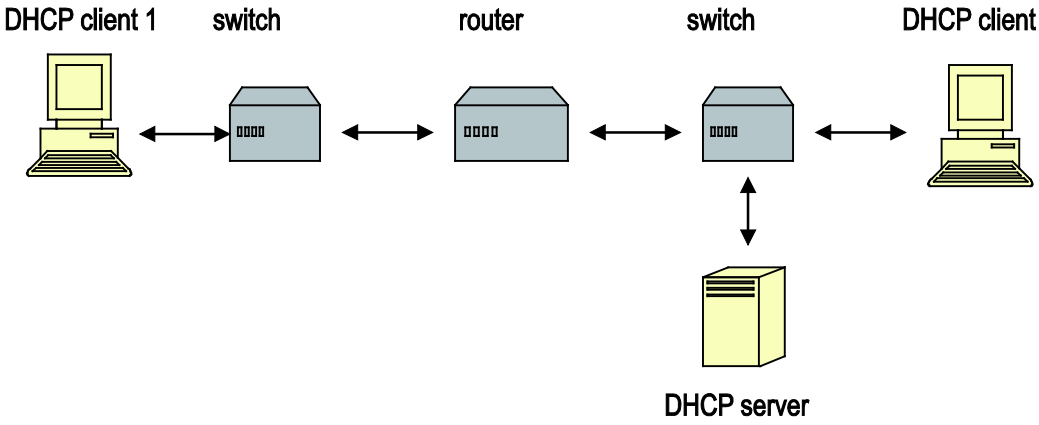


Figure 18: Application 1 (via a Router)

- **Application 2 (local in different VLANs)**
  DHCP client 1 and DHCP client 2 are in different VLANs. However, they receive IP address from the same DHCP server.

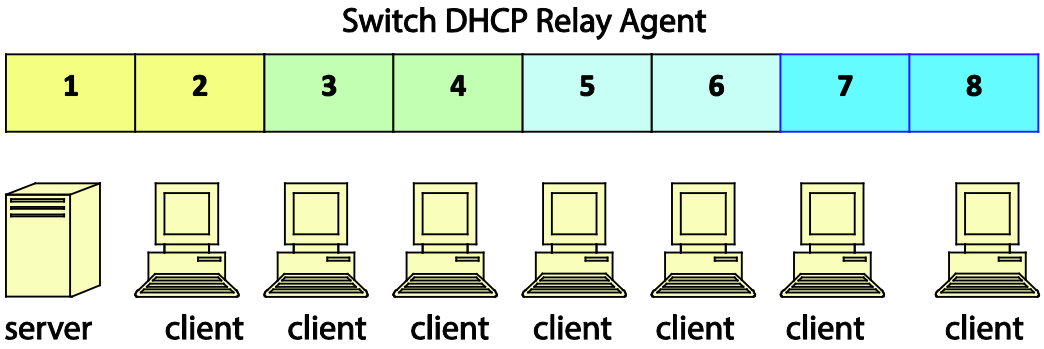


Figure 19: Application 2 (Local in Different VLANs)

VLAN 1: Port 1, 2 (Management VLAN)
VLAN 2: Port 3, 4
VLAN 3: Port 5, 6
VLAN 4: Port 7, 8

DHCP Server -> Port 1.
DHCP Client -> Port 2, 3, 4, 5, 6, 7, 8.

Result: Hosts connected to port 2, 3, 4, 5, 6, 7 and 8 receive an IP from the DHCP server.

Note

DHCP Server Connection
The DHCP server must be connected to the subscriber ports of the management VLAN.
The “DHCP Relay” in the management VLAN must be enabled.

7.2.5 DHCP Relay Option 82

“DHCP Option 82” (“**DHCP** Relay Agent Information **Option**”). Option 82 was designed to allow a “DHCP Relay Agent” to insert circuit-specific information into a request that is being forwarded to a DHCP server. Specifically, the option works by setting two sub-options: “Circuit ID” and “Remote ID”.

“DHCP Option 82” operates on the basis of “DHCP Snooping” or/and “DHCP Relay”.

The switch monitors the DHCP packets and append some information under “DHCPDISCOVER” and “DHCPREQUEST” packets. The switch deletes “DHCP Option 82” from the “DHCPOFFER” and “DHCPACK” packets. The DHCP server then assigns an IP domain to the client based on this information.

The maximum length of the information is 32 characters.

In residential, metropolitan ETHERNET-access environments, DHCP can centrally manage the IP address assignments for a large number of subscribers. If the “DHCP Option 82” function is enabled on the switch, a subscriber device is identified by the switch port through which it connects to the network (in addition to its MAC address). Multiple hosts on the subscriber LAN can be connected to the same port on the switch and are uniquely identified.

If you enable “DHCP Snooping Information Option 82” on the switch, the sequence of events is:

- The host (DHCP Client) generates a DCHP request and broadcasts it on the network.
- If the switch receives the DHCP request, it adds the “Option 82” information in the packet. The information contains the switch MAC address (the “Remote ID” sub-option), “Port Identifier” and “VLAN-Mod-PORT”, from which the packet is received (the “Circuit ID” sub-option).
- If the IP address of the “Relay Agent” has been configured, the switch adds the IP address in the DHCP packet.
- The switch forwards the DHCP request that includes the Option 82 field to the DHCP server.
- The DHCP server receives the packet. If the server is Option 82 capable, it can use the “Remote ID”, “Circuit ID” or both to assign IP addresses and implement policies, such as restricting the number of IP addresses that can be assigned to a single “Remote ID” or “Circuit ID”. The DHCP server then echoes the Option 82 field in the DHCP reply.
- The DHCP server forwards the reply to the switch as a unicast if the request was relayed to the server by the switch. If the client and server are on the same subnet, the server broadcasts the reply. The switch verifies the Option 82 data originally entered by checking the “Remote ID” and “Circuit ID” fields. The switch deletes the Option 82 field and forwards the packet to the switch port that connects to the DHCP client that sent the DHCP request.

Option Frame Format

Table 20: Option Frame Format

Code	Len	Agent Information Field					
82	N	i1	i2	i3	i4	…	iN

The “Agent Information Field” consists of a sequence of SubOpt/Length/Value tuples for each sub-option, encoded in the following manner:

Table 21: Option Frame Format

Sub-Option	Len	Sub-Option Value					
1	N	s1	s2	s3	s4	…	sN

DHCP Agent Sub-Option Code	Sub-Option Description
1	“Agent Circuit ID” sub-option
2	“Agent Remote ID” sub-option

Table 22: Frame Format of the “Circuit ID” Sub-Option

Sub-Option Type	Length	“Circuit ID” Type	Length	VLAN	Module	Port
1	6	0	4	2	1	1

Table 23: Frame Format of the “Remote ID” Sub-Option

Sub-Option Type	Length	“Circuit ID” Type	Length	MAC address
2	8	0	6	6

Table 24: Format of the “Circuit ID” Sub-Option

Code	Len	Sub-Option Type	Length	Slot ID	Port ID	VLAN ID	Information
0x52	0x0c	0x01	0x0a	0x01	0x01	0x0002	justin

7.2.6 Dual Ring

The “Dual Ring” function can be used to connect 2 neighboring rings to each other on a switch without needing additional ports or cables. This configuration reduces the total number of required ports and wiring costs are saved because no additional wiring is required.

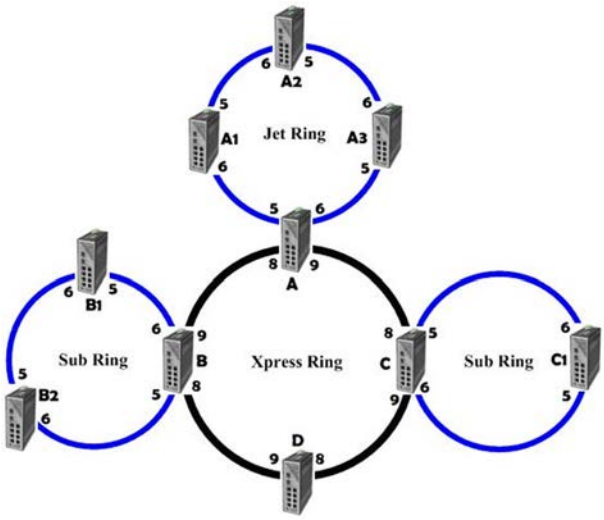


Figure 20: Dual Ring Switch ABC

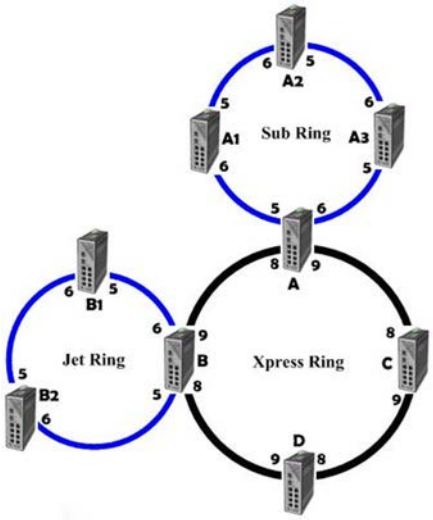


Figure 21: Dual Ring Switch AB

7.2.7 ERPS

The ERPS (“**E**THERNET **R**ing **P**rotection **S**witching”) function implements a protection switching mechanism for ETHERNET layer ring topologies according to ITU-T standard G.8032. The ERP (“**E**THERNET **R**ing **P**rotection”) protects ETHERNET traffic in a ring topology and ensures that no loops are within the ring in the ETHERNET later. Looping is prevented by blocking traffic on either a predetermined link or a failed link.

The ETHERNET ring protection functionality includes the following:

- Loop avoidance
- Use of learning, forwarding and filter database (FDB) mechanisms

Loop avoidance in an ETHERNET ring is achieved by guaranteeing that, at any time, traffic may flow on all but one of the ring links. This particular ring link serves as a reserve connection and is called an RPL (“**R**ing **P**rotection **L**ink”). In normal operation, it is blocked and not used for service traffic. A specific ETHERNET ring node, the “RPL Owner” node, is responsible for blocking traffic at one end of the RPL. Under an ETHERNET ring failure condition, the “RPL Owner” node is responsible for unblocking its end of the RPL, unless the RPL has failed, allowing the RPL to be used for traffic. The ETHERNET ring node adjacent to the RPL, the “RPL Neighbor” node, may also participate in blocking or unblocking its end of the RPL.

The ETHERNET rings can support a multi-ring/ladder network that consists of conjoined ETHERNET rings by one or more interconnection points. The protection switching mechanisms and protocol defined in this recommendation can be used for a multi-ring/ladder network under the following conditions:

- R-APS channels are not shared across ETHERNET ring connections;
- On each ring port, each traffic channel and each R-APS channel is controlled (e.g., for blocking or flushing) by the ETHERNET ring protection control process (“ERP Control Process”) of only one ETHERNET ring.
- Each main ring or sub-ring has its own RPL.

In an ETHERNET ring without congestion with all ETHERNET ring nodes in the idle state (i.e., no detected failure, no active automatic or external command and receiving only R-APS (NR, RB) messages) with less than 1,200 km of ring fiber circumference and fewer than 16 ETHERNET ring nodes, the switch completion time (transfer time as defined in [ITU-T G.808.1]) for a failure on a ring link shall be less than 50 ms.

The ring protection architecture relies on the existence of an APS protocol to coordinate ring protection actions in an ETHERNET ring.

The switch supports up to six rings.

Guard Timer

All ring subscribers use a “Guard Timer”. It prevents the possibility of forming a closed loop and prevents ring subscribers from using outdated R-APS messages. The “Guard Timer” is enabled if a ring subscriber received information on a local switching request, such as after SF (“**S**witch **F**ail”), MS (“**M**anual **S**witch”) or FS (“**F**orced **S**witch”) commands. When the timer expires, the ring subscriber begins executing actions it received from the R-APS. This timer cannot be manually stopped.

WTR Timer

The “WTR Timer” (“**W**ait **T**o **R**estore **Timer**”) is used by the “RPL Owner”. The “WTR Timer” applies to the reset mode to prevent frequent triggering of the protection switching due to port flapping or intermittent signal failure defects. When the timer expires, the “RPL Owner” sends an R-APS (NR, RB) message through the ring.

WTB Timer

The “WTB Timer” (“**W**ait **T**o **B**lock **Timer**”) is enabled on the “RPL Owner”. The “RPL Owner” uses “WTB Timers” before initiating an RPL block and then reverting to the idle state after operator-initiated commands, such as for FS or MS conditions, are entered. Because multiple FS commands are allowed to co-exist in a ring, the “WTB Timer” ensures that clearing a single FS command does not trigger the re-blocking of the RPL. The “WTB Timer” should be 5 seconds longer than the “Guard Timer”, enough time to allow a reporting ring subscriber to receive two R-APS messages and to allow the ring to identify the latent state. When clearing a MS command, the “WTB Timer” prevents the formation of a closed loop because the “RPL Owner” node does not respond to an outdated remote MS request during the recovery process.

Hold-off Timer

Each ring subscriber uses a “Hold-off Timer” to delay reporting a port failure. When the timer expires, the ring subscriber checks the port status. If the problem persists, a failure is reported. If the issue does not persist, nothing is reported.

ERPS revertive and non-revertive switching

ERPS uses revertive and non-revertive operation. In revertive operation after the conditions causing a switch have cleared, the traffic channel is restored to the working transport entity, i.e., blocked on the RPL. Once an error condition is cleared, the traffic channel is switched back only after expiration of a “WTR Timer” to prevent protecting states from toggling due to intermittent errors. without revertive operation, the traffic channel continues to use RPL after a switch condition is cleared if the RPL has not failed.

Control VLAN

The “Control VLAN” is a domain in which only ERPS control packets are transmitted. Because no other packets are transmitted in the VLAN, there are no delays for the ERPS. Therefore, when configuring a control VLAN for a ring, make sure it is a new VLAN. The ERPS creates the control VLAN and its subscriber ports automatically. A subscriber port should have a right and left port only.

In ERPS, control packets and data packets are separated in different VLANs. The control packets are transmitted in a control VLAN.

Instance

For ERPS Version 2, an instance is a profile that specifies a control VLAN and one or more data VLANS for the ERPS. The control and data packets in ERPS are separated in different VLANs. The control packets are transmitted in the control VLAN and the data packets in one or more data VLANs. In this way, a user can easily assign an instance to an ERPS ring.

If a port is blocked by ERPS in ERPS Version 1, all packets are blocked.

If a port is blocked by an ERPS ring in ERPS Version 2, only the packets belonging to the VLANs in this instance are blocked.

Note

Control VLAN and Instance

In CLI or Web configurations, there are settings for the control VLAN or instance. If the control VLAN is configured for a ring and an instance should be configured for the ring, the control VLAN must be the same for the instance as that of the ring. Otherwise, an error is displayed. If you still want to use this instance, you can first change the control VLAN so that it is the same as that of the instance. You can the configure the instance.

7.2.8 Dual Homing

“Dual Homing” is a network topology in which a device is connected to the network by way of two independent access points (“Points of Attachment”). One access point establishes the primary connection, and the other is a reserve if the primary connection fails.

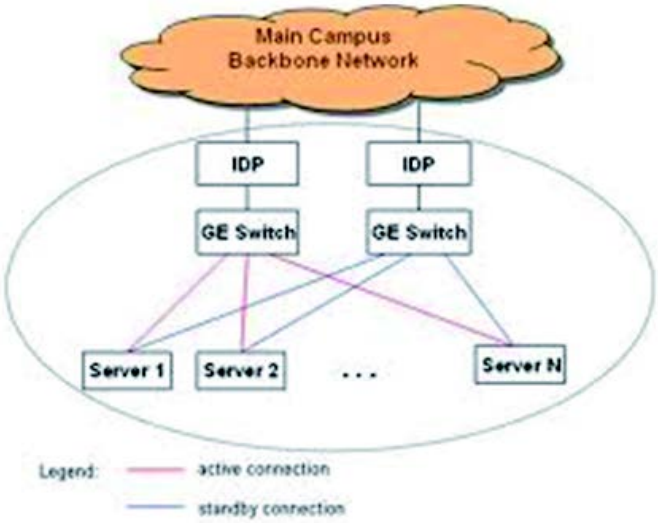


Figure 22: Dual Homing

Primary and secondary connections, for example, can be connected to the Internet in different ways. The primary connection could be connected to a physical network and the secondary to a wireless network. If the “Dual Homing” function is enabled, a device connects via the primary connection be default, while the secondary connection remains suspended. If the port or all ports of the primary connection fail, the devices switches to the secondary connection. If the secondary connection also fails, the device remains inactive. The secondary connection only works if the primary connection is interrupted.

7.2.9 Link Aggregation

7.2.9.1 Static Trunk

“Ling Aggregation” (also called “Trunking”), parallel link bundling) is the grouping of physical ports into one logical ling with higher capacity. When bundling ports, it can be more cost effective to use multiple lower-speed links than to underutilize a high-speed, but expensive “Port Link”.

However, the more ports you aggregate, the fewer available ports you have. A “Trunk Group” is one logical link containing multiple ports. The switch supports both static and dynamic “Link Aggregation”.

Note

“Link Aggregation”
In a well-planned network, only static “Link Aggregation” is recommended. This ensures increased network stability and control over “Trunk Groups” on your switch.

7.2.9.2 LACP

The switch supports static and dynamic (LACP) “Port Trunking” according to IEEE 802.3ad. The IEEE 802.3ad standard describes LACP (“**L**ink **A**ggregation **C**ontrol **P**rotocol”) for dynamic creation and management of “Trunk Groups”.

When you enable “LACP Link Aggregation” on a port, the port can automatically negotiate with the ports at the remote end of a link to establish “Trunk Groups”. LACP also allows port redundancy, i.e., if an operational port fails, then one of the “standby” ports becomes operational without user intervention
The following should be noted:

- All ports must be connected peer-to-peer to the same ETHERNET switch and configured for “LACP Trunking”.
- LACP only works on full-duplex links.
- All ports in the same “Trunk Group” must have the same media type, speed, duplex mode and settings for “Flow Control”.
- Configure the “Trunk Groups” or LACPs before you connect to the ETHERNET switch to prevent looping in the network topology.

System Priority

LACP system priority is used to determine membership in an LAG (“**L**ink **A**ggregation **G**roup”) and identifies the device for other switches during LAG negotiations.
The switch with the lowest system priority (and lowest port number if system priority is the same) becomes the LACP “Server”. The server controls the operation of the LACP settings. The smaller the number, the higher the priority level.

System ID

The “LACP System ID” is a combination of the LACP system priority value and the MAC address of the router.

Administrative Key

The “Administrative Key” defines the ability of a port to aggregate with other ports. This ability is determined by the following factors:

- The physical properties of the port, e.g., data rate, duplex capability and peer-to-peer or shared transmission medium.
- The configuration restrictions that you establish.

Port Priority

Port priority determines which ports should go into standby mode if there is a hardware limitation that prevents all compatible ports from bundling.

7.2.10 LLDP

The LLDP (“**L**ink **L**ayer **D**iscovery **P**rotocol”) described in this standard allows stations connected to a LAN acc. IEEE 802® to send information to other stations connected to the same LAN. The information includes essential system functions, including the management address or addresses of an entity or entities that provide management of these functions, as well as identification of the station's access point to the IEEE802 LAN required by the management entity or entities.

The information distributed via this protocol is stored by the recipients in a normal MIB (“**M**anagement **I**nformation **B**ase”). That allows an NMS (“**N**etwork **M**anagement **S**ystem”) to access the information using a management protocol such as SNTP (“**S**imple **N**etwork **M**anagement **P**rotocol”).

7.2.11 Loop Detection

“Loop Detection” handles problems with loops in the network periphery. These problems can occur if a port is connected to a switch that is in a loop state. A loop state occurs as a result of user error. It happens when two ports on a switch are connected with the same cable. When a switch in loop state sends out broadcast messages, the messages loop back to the switch and are re-broadcast again and again causing a “Broadcast Storm”.

The “Loop Detection” function sends probe packets periodically to detect if the port is connected to a network in loop state. The switch shuts down a port if the switch detects that probe packets loop back to the same port.

Loop Recovery

When “Loop Detection” is enabled, the switch sends a probe packet every two seconds and waits to receive the packet. If it receives the packet at the same port, the switch disables the port. After the time period (“Recovery Time”), the switch enables the port and executes “Loop Detection” again.

The switch generates a “Syslog” (system log), internal log messages and “SNMP Traps” if it disables a port after “Loop Detection”.

7.2.12 Jet Ring

Setting up the Jet Ring function (redundant connection) in a network better protects critical connections against errors and network loops. In addition, network downtime is reduced to less than 300 ms.

The Jet Ring function can be used to set up a secondary path to the network. A data transmission safety route is then provided in case there is an abrupt interruption in a connection. This function is extremely important for industrial applications because connection errors without safeguards for network downtime can last several minutes and result in heavy losses.

The Jet Ring protocol is used to optimize secondary communication links and to ensure very short connection recovery time. The Jet Ring function is used to automatically identify a switch as the network “Master” and to automatically block connections. This prevents packets from being broadcast to all secondary loop segments of a network. If a ring segment is separated from the rest of the network due to a connection error, the Jet Ring protocol automatically adjust the ring again to restore the connection between the part of the network that was separated with the rest of the network.

Step 1

The Jet Ring function in the graphic below is applicable to connecting industrial managed switches.

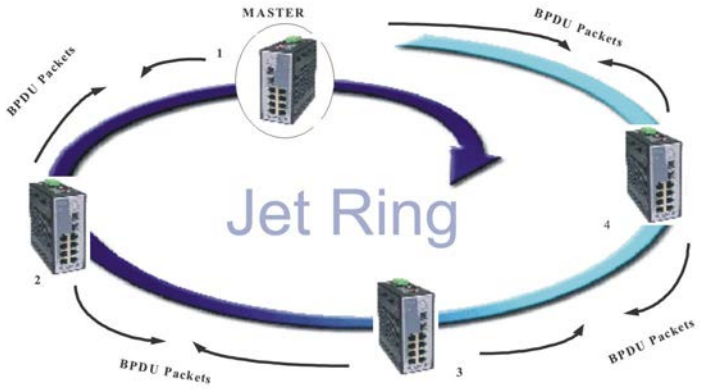


Figure 23: Jet Ring

Step 2

The Jet Ring function is used to automatically select the Arbiter switch. The network then ready for operation.

7.2.13 STP

The (R)STP (“(**R**apid) **S**panning **T**ree **P**rotocol)”) can detect and stop network loops, as well as provide “Backup Links” between switches, bridges or routers. It allows a switch to interact with other (R)STP-compliant switches in the network to ensure that only one path exists between any two stations on the network.

The switch supports both STP and RSTP as defined in the following standards:

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Spanning Tree Protocol

The switch uses IEEE 802.1w RSTP that allows faster convergence of the “Spanning Tree” than STP (the switch is also backwards compatible with STP-only aware bridges). In RSTP, topology change information is directly propagated throughout the network from the device that generates the topology change. In STP, there are longer delays because the device that causes a topology change first notifies the “Root Bridge” and then the network. Both RSTP and STP remove unwanted learned addresses from the filtering database.

- STP has the port states “Blocking”, “Listening”, “Learning” and “Forwarding”.
- RSTP has the port states in RSTP “Discarding”, “Learning” and “Forwarding”.

STP Switch Port States

- **“Blocking”**
  If a port causes a “Switching Loop” (looping connection between two ports), user data can no longer be sent or received. However, the port can go into the “Forwarding” state if the other active connections fail and the “Spanning Tree” algorithm determines that the port may transition to that state. BPDU data is still received and sent in the “Blocking” state.
- **“Listening”**
  The switch processes BPDUs and waits for possible new information that would cause it to return to the “Blocking” state.
- **“Learning”**
  Even if the port does not yet forward any frames (packets), it can learn source addresses from frames received and add them to the filter database (“Switching Database”).

- **“Forwarding”**
  The port is in normal operating mode and receives and sends data. STP still monitors incoming BPDUs that would indicate that the port should return to the “Blocking” state to prevent a loop.
- **“Disabled”**
  It is not strictly part of the STP because a network administrator can manually disable a port.

RSTP Bridge Port Roles

- **“Root”**
  The “Root Port” is a forwarding port that can best transmit data from the “Non-Root Bridge” to the “Root Bridge”.
- **“Designated”**
  This is a forwarding port for every LAN segment.
- **“Alternate”**
  This port represents an alternate path to the “Root Bridge”. However, the path is different than the “Root Port”.
- **“Backup”**
  This port is used as a backup/redundant path to a segment to which another “Bridge Port” is already connected.
- **“Disabled”**
  This is not actually part of STP because a network administrator can manually disable a port.

Note

STP/RSTP
In this document, “STP” refers to both STP and RSTP.

STP Terminology

Root Bridge

The “Root Bridge” is the “Base” of the spanning tree.

Path Cost

The path costs are the costs for transmitting a frame through the port in the LAN. This value should be adjusted to the transmission speed.
The valid range is 1 to 200000000. A path with higher costs is more likely to be blocked by SSTP if a network look is detected.

- “**Path Cost Short”** is the original size with a 16-bit value.
  Only speeds up to 10 GBit can be considered.
- “**Path Cost Long”** stands for a 32-bit value.
  Speeds up to 10 TBit are supported.

Table 25: STP Path Costs

Transmission Speed	Recommended Value	Recommended Range	Permissible Range
4 Mbps	250	100 … 1000	1 … 65535
10 Mbps	100	50 … 600	1 … 65535
16 Mbps	62	40 … 400	1 … 65535
100 Mbps	19	10 … 60	1 … 65535
1 Gbps	4	3 … 10	1 … 65535
10 Gbps	2	1 … 5	1 … 65535

- Each “Bridge” communicates with the “Root Bridge” via the “Root Port”. The “Root Port” is the port on the switch with the lowest path costs to the “Root Bridge” (the “Root Path Cost”). If there is no “Root Port”, then the switch becomes the “Root Bridge” for the “Spanning Tree” network
- A “Designated Bridge” is selected for each LAN segment. This bridge has the lowest cost to the “Root Bridge” among the bridges connected to the LAN.

Forward Time (Forward Delay)

The “Forward Time” is the maximum time (in seconds) that the switch wats before it changes states. This delay is required because every switch must first receive information on topology changes before it forwards frames. In addition, each port needs time to receive information on conflicts that would make it return to the blocking state. Otherwise, temporary data loops might result. The valid range is 4 to 30 seconds.

Max Age

The “Max Age” is the maximum time (in seconds) that the switch can wait without receiving a BPDU (“**B**ridge **P**rotocol **D**ata **U**nit”, configuration message) before attempting to reconfigure. All switch ports (except for “Designated Ports”) receive BPDUs at regular intervals. Each port that ages out STP information (from the last BPDU) becomes the “Designated Port” for the attached LAN. If it is a “Root Port”, a new “Root Port” is selected from among the switch ports attached to the network.

Hello Time

The “Hello Time” is the time interval in seconds between configuration messages (BDPU “Bridge Protocol Data Unit”) sent from the root switch.

STP

After a bridge determines the lowest cost “Spanning Tree” with STP, it enables the “Root Port” and “Designated Ports” for connected LANs, and disables all other ports that participate in STP. Network packets are therefore only forwarded between enabled ports, eliminating any possible network loops.

STP-aware switches exchange BPDUs periodically. If the topology changes in a LAN coupled via bridge, a new tree is spanned. Once a stable network topology has been established, all bridges listen for “Hello BPDUs” transmitted from the “Root Bridge”. If a bridge does not get a “Hello BPDU” after a predefined interval (“Max Age”), the bridge assumes that the link to the “Root Bridge” is down. This bridge then initiates negotiations with other bridges to reconfigure the network to re-establish a valid network topology.

Edge Port

“Edge Ports” are attached to a LAN that has no other bridges attached. These ports can transition directly to the “Forwarding” state. RSTP still continues to monitor the port for BPDUs in case a bridge is connected. RSTP can also be configured to automatically detect “Edge Ports”. As soon as the bridge detects a BPDU coming to an “Edge Port”, the port loses its status as an “Edge Port”.

Forward Delay

The “Forward Delay” is the maximum time (in seconds) that the root devices waits before changing states (e.g., from “Listening” to “Learning” to “Forwarding”). The valid range is from 4 to 30 seconds.

Transmission Limit

The “Transmission Limit” is used to configure the minimum interval between the transmission of consecutive RSTP BPDUs. This function can only be enabled in RSTP mode. The valid range is from 1 to 10 seconds.

Bridge Priority

“Bridge Priority” is used in selecting the root switch, root port and “Designated Port”. The switch with the highest priority becomes the STA root switch. If all switches have the same priority, however, the switch with the lowest MAC address becomes the root switch.

Port Priority

The port priority is configured on the switch. A low numeric value indicates a high priority. A port with lower priority is more likely to be blocked by STP if a network loop is detected. The valid range is from 0 to 240.

BPDU Guard

This setting is configured individual for each port. If the port is enabled in “BDU Guard” and receives a BPDU, the port is switched to the “Disabled” state to prevent a faulty environment. The user must manually enable the port.

BPDU Filter

This function is used to set up a filter for sending or receiving BPDUs on a switch port. If the port receives BPDUs, the BPDUs are dropped. If both of the “BPDU Filter” and “BPDU Guard” are enabled, the “BPDU Filter” has the higher priority.

Note

BPDU Filter and BPDU Guard
If both of the “BPDU Filter” and “BPDU Guard” are enabled, the “BPDU Filter” has the higher priority.

Root Guard

The “Root Guard” function forces an interface to become a “Designated Port” to prevent neighboring switches from becoming a root switch. This function provides a way to specify the selection of a “Root Bridge” in a network. It prevents a “Designated Port” from becoming the “Root Port”. If a port with the “Root Guard” function receives a superior BPDU, the port moves to a root-inconsistent state (effectively equal to the “Listening” state) to maintain the status of the current “Root Bridge”. The port can be moved to the “Forwarding” state if no superior BPDU received over the period of three “Hello Times”.

MSTP

The MSTP (“**M**ultiple **S**panning **T**ree **P**rotocol”) is an RSTP extension. It allows different spanning tree instances in conjunction with VLANs (“Virtual Local Area Networks”).
For a VLAN or group of VLANs, STP instances can be created independently that user their own different spanning trees within a LAN.
With the MSTP approach, a root bridge and the lowest path costs between the root bridge and the root ports offered of the individual bridges are determined.
The root bridge sends Bridge Protocol Data Units (BPDU) to all bridges and determines the network configuration from the configuration data contained in the BPDU data packets.

7.2.14 Xpress Ring

The Xpress Ring is a fast-acting, self-healing ring recovery technology that enables networks to recover from link failure within 50 ms.

Fast Link Recovery and Ring Redundancy are important functions for increasing the reliability of non-stop systems.

A well-planned network with an Arbiter switch and ring ports can recover from segment failure within a very short time.

A switch in the Xpress Ring has only two roles: either “Forwarder” or “Arbiter”. There can be only one Arbiter switch while all other switches are “Forwarders”.

One of the ring ports of an Arbiter switch is set to the blocking state. If one of the ring connections fails, the blocked port is set to the forwarding state.

7.3 Security

7.3.1 IP Source Guard

“IP Source Guard” is a security function that restricts IP traffic on untrusted Layer2 ports by filtering traffic based on a “DHCP Snooping” database connection or a manually configured IP source connection. This function helps prevent access such as “IP Snooping” (sending IP packets with a spoofed sender IP address) if a host attempts to spoof the IP address of another host. Any IP traffic coming into the interface with a source IP address other than that assigned (via DHCP or static configuration) is filtered out on untrusted Layer2 ports.

This function is used on untrusted Layer2 interfaces in combination with “DHCP Snooping”. An IP source binding table is manually configured (static IP source binding) or created from information from the “DHCP Snooping” function and used. Each entry in this table contains the IP address and associated MAC and VLAN addresses. The “IP Source Guard” only supports Layer2 ports, including “Access Ports” and “Trunk Ports”.

The “IP Source Guard” includes the following functions:

1. DHCP Snooping
2. DHCP Binding Table
3. ARP Inspection
4. Blacklist Filter (ARP inspection with MAC address filter table)

7.3.1.1 DHCP Snooping

“DHCP Snooping” is a DHCP security function that increases network security by filtering untrusted DHCP messages and creating and using a “DHCP Snooping” database connection (also called “DHCP Snooping” binding table).

“DHCP Snooping” acts like a firewall between untrusted hosts and DHCP servers. It can be used to differentiate between untrusted interfaces connected to end users and trusted interfaces connected to a DHCP server or another switch.

The “DHCP Snooping” binding table contains the MAC address, IP address, “Lease Time”, mount type, VLAN number and information on the local untrusted interfaces of a switch.

If a switch receives a packet from an untrusted interface and the interface belongs to a VLAN in which “DHCP Snooping” is enabled, the switch compares the MAC source address to the hardware address of the DHCP client. If the addresses match (as is normal), the switch forwards the packet. If the addresses do not match, the switch drops the packet.

The switch drops a DHCP packet when one of the following situations occur:

- A packet from a DHCP server, such as a DHCPOFFER, DHCPACK, DHCPNAK, or DHCPLEASEQUERY packet, is received from the untrusted port.
- A packet is received on an untrusted interface, and the source MAC address and the DHCP client hardware address do not match any of the current bindings.

“DHCP Snooping” can be used to filter unauthorized DHCP packets on the network and to dynamically create a binding table. This can prevent clients from getting IP addresses from unauthorized DHCP servers.

Trusted vs. Untrusted Ports

Every port is either a “Trusted Port” or an “Untrusted Port” for “DHCP Snooping”. This setting is independent of the “Trusted/Untrusted” setting for ARP inspection. You can also specify the maximum number for DHCP packets that each port (“trusted” or “untrusted”) can receive each second.

“Trusted Ports” are connected to DHCP servers or switches. The switch only drops DHCP packets from “Trusted Ports” if the transmission rate of the DHCP packets received is too high. The switch learns the dynamic bindings from the “Trusted Ports”.

Note

DHCP Requests

The switch drops all DHCP requests if “DHCP Snooping” is enabled, but there are no “Trusted Ports”.

“Untrusted Ports” are connected to subscribers. The switch discards DHCP packets from untrusted ports in the following situations:

- The packet is a DHCP server packet (e.g., “OFFER”, “ACK” or “NACK”).
- The source MAC address and source IP address in a packet do not match any of the current bindings.
- The source MAC address and source port in a “RELEASE” or “DECLINE” packet do not match any of the current bindings.
- The transmission rate of the DHCP packets received are too high.

DHCP Snooping Database

The switch stores the binding table in volatile memory. If the switch restarts, it loads the static bindings from non-volatile memory, but loses the dynamic bindings, so that the devices in the network have to send DHCP requests again.

Configuring DHCP Snooping

Follow the steps below to configure “DHCP Snooping” on the switch:

1. Enable “DHCP Snooping” on the switch.
2. Enable “DHCP Snooping” for each VLAN.
3. Configure “Trusted Ports” and “Untrusted Ports”.
4. Configure the static bindings.

Note

DHCP Snooping

The switch drops all DHCP requests if “DHCP Snooping” is enabled, but there are no “Trusted Ports”.

If the port link fails, the entries from this port are deleted from the “DHCP Snooping” binding table.

You must first enable global “DHCP Snooping” and “DHCP Snooping” for VLANs.

The main purposes of the “DHCP Snooping” are:

1 To create and maintain a binding table for the ARP Inspection function.
2 To filter packets from DHCP servers that are connected to an “Untrusted Port”.

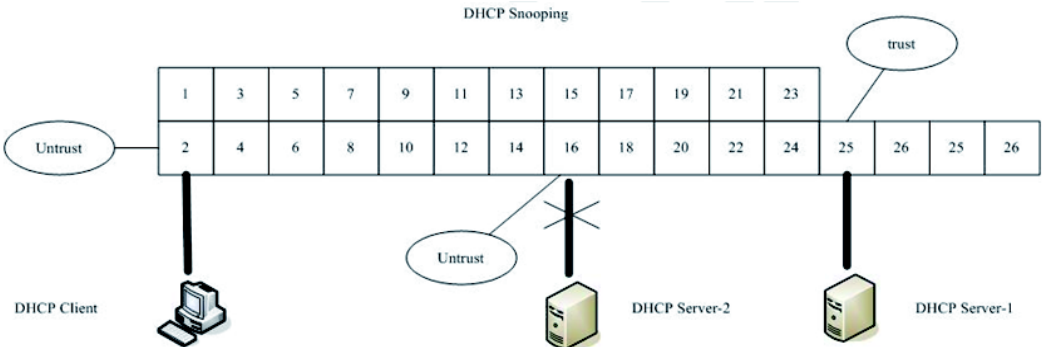


Figure 24: DHCP Snooping

The packets from DHCP servers connected to an “Untrusted Port” are filtered.

7.3.1.1.1 Server Screening

The switch supports “Server Screening”, a function that denies access to “Rogue DHCP Servers” (unauthorized, invalid DHCP servers). That is, when one or more DHCP servers are present on the network and both provide DHCP services to different distinct groups of clients, the valid DHCP server’s packets are passed to the client.

If this function is enabled, the “DHCP Snooping” function must also be enabled beforehand. The switch allows users to configure up to three valid DHCP servers.

If no DHCP servers are configured, it means all DHCP server are valid.

7.3.1.2 Binding Table

The “DHCP Snooping” binding table records the host information learned from “DHCP Snooping” (dynamic) or set by user (static). The ARP inspection uses this table to decide if to forward or drop ARP packets. ARP packets sent from by invalid hosts are dropped. Once the “Lease Time” expires, the entry is deleted from the table.

Static bindings are uniquely identified by the MAC address and VLAN ID. Each MAC address and VLAN ID can only be in one static binding. If you create a static binding with the MAC address and VLAN ID of an existing binding, the new static binding replaces the original on.

Bindings are used by “DHCP Snooping” and ARP inspection to distinguish between authorized and unauthorized packets in the network. The switch detects the dynamic bindings by “snooping” DHCP packets and from static information from the manual entries in the “Static Entry Settings” menu.

7.3.1.3 ARP Inspection

The dynamic “ARP Inspection” (“**A**ddress **R**esolution **P**rotocol **Inspection**”) is a security function in which ARP packets are inspected in a network. Dynamic ARP inspections validates the packet by performing IP-to-MAC address binding inspection stored in a trusted database (the “DHCP Snooping” database) before forwarding the packet. Dynamic ARP intercepts, logs, and discards ARP packets with invalid IP-to-MAC address bindings. This function protects the network from certain “Man-in-the-Middle” attacks.

Dynamic ARP inspection ensures that only valid ARP requests and responses are relayed.

The switch executes the following processes:

- Interception of all ARP requests and responses on untrusted ports.
- Inspection of all intercepted packets for valid IP-to-MAC address binding before updating the local ARP cache or forwarding a packet to the respective destination.

Trusted Port and Untrusted Port

- This setting is independent of the “Trusted/Untrusted” setting for “DHCP Snooping”.
- The switch does not drop ARP packets from “Trusted Ports” for any reason.
- The switch drops ARP packets from “Untrusted Ports” if the information from the sender in the ARP packets does not match any current bindings.
- Normally, the “Trusted Ports” are the “Uplink Ports” and the “Untrusted Ports” are connected to subscribers.

Configurations

Users can enable/disable the ARP Inspection on the switch. It can also be enabled/disabled on a specific VLAN. If ARP Inspection is disabled on the switch, ARP Inspection is disabled on all VLANs, even if enabled for individual VLAN.

Note

Global State/VLAN State
There is a global state and individual VLAN states.

If the global state is disabled, ARP Inspection is disabled on the switch, even if individual VLAN states are enabled.

If the global state for ARP Inspection is enabled, this function must be enabled by the user for specific VLANs.

7.3.1.3.1 Filter Table

Dynamic ARP inspections validates the packet by performing IP-to-MAC address binding inspection stored in a trusted database (the “DHCP Snooping” database) before forwarding the packet. If the switch detects an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and the source VLAN ID of the packet. In addition, the switch regularly deletes entries whose “Age Time” has expired.

- If ARP Inspection is enabled and the system detects invalid hosts, the system creates a filtered entry in the MAC address table.
- If a port link fails and ARP Inspection is disabled, the switch deletes the MAC filter entries for this port.
- If a port link fails and ARP Inspection is enabled, the switch deletes the MAC filter entries for this port.
- The maximum number of entries in the MAC address filter table is 256.
- If the MAC address filter table for ARP inspection is full and the switch receives an unauthorized ARP packet, it automatically creates a “SYSLOG” and the ARP packet is dropped. The SYSLOG is created only once.

7.3.2 Access Control List (ACL)

The ACL (“**A**ccess **C**ontrol **L**ist”) is a list of permissions attached to an object. The list specifies who or what is allowed to access an object and what operations are allowed to be performed on the object.

The ACL function allows users to configure some rules to reject packets received from specific ingress ports or all ports. These rules check the source and destination MAC addresses of packets. If packets match these rules, the system does not deny the action, i.e., the packets are not rejected.

The “Action Resolution Engine” collects the information (action and metering results) from the hit entries: if more than one rule matches, the actions and meter/counters are taken from the policy associated with the matched rule with highest priority.

7.3.3 802.1x

IEEE 802.1X is an IEEE Standard for port-based Network Access Control (“port” meaning a single point of attachment to the LAN infrastructure). It is part of the IEEE 802.1 group of networking protocols. It provides an authentication mechanism to devices wishing to attach to a LAN, either establishing a point-to-point connection or preventing it if authentication fails. It is used for most wireless 802.11 access points and is based on EAP (“**E**xtensible **A**uthentication **P**rotocol”)

802.1X provides port-based authentication, which involves communications between a supplicant, authenticator, and authentication server. The supplicant is often software on a client device, such as a laptop, the authenticator is a wired ETHERNET switch or wireless access point, and an authentication server is generally a RADIUS (“**R**emote **A**uthentication **D**ial-**I**n **U**ser **S**ervice”) database.

The authenticator acts like a security guard to a protected network. The supplicant (i.e., client device) is not allowed access through the authenticator to the protected side of the network until the supplicant’s identity is authorized. With 802.1X port-based authentication, the supplicant provides credentials, such as user name/password or digital certificate, to the authenticator, and the authenticator forwards the credentials to the authentication server for verification. If the credentials are valid (in the authentication server database), the supplicant (client device) is allowed to access resources located on the protected side of the network.

Upon detection of a new client (“Supplicant”), the port on the switch (“Authenticator”) is enabled and set to the "unauthorized" state. In this state, only 802.1X traffic is allowed; other traffic, such as DHCP and HTTP, is blocked at the network layer (Layer 3). The authenticator sends out the EAP identify request to the supplicant, the supplicant responds with the EAP response packet that the authenticator forwards to the authenticating server. If the authenticating server accepts the request, the authenticator sets the port to the "authorized" mode and normal traffic is allowed. If the supplicant logs off, it sends an EAP logoff message to the authenticator. The authenticator then sets the port to the "unauthorized" state, once again blocking all non-EAP traffic.

RADIUS Server

The RADIUS server (“**R**emote **A**uthentication **D**ial-**I**n **U**ser **S**ervice”) is a client-server-based security protocol for authentication and to control network access permissions.
The RADIUS server operates using the Challenge/Response process and supports central administration of user data, such as user ID, passwords, phone, access rights and account data, and consists of an accounting and authentication protocol.
In combination with DHCP and PPP, configuration of dial-in system can be automatic with RADIUS.

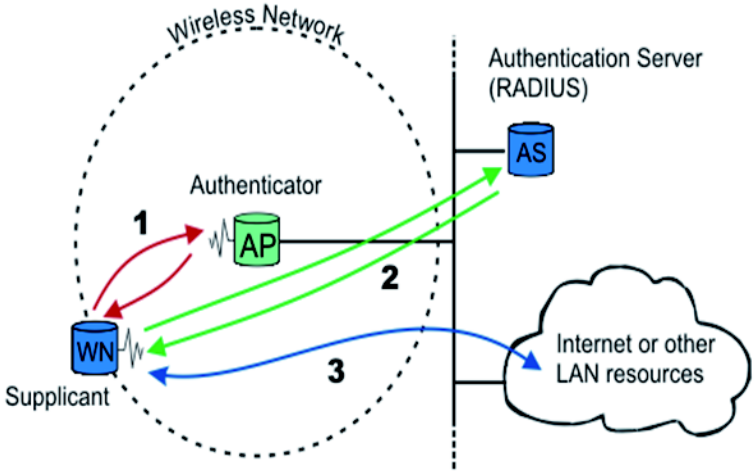


Figure 25: 802.1x

The following figure illustrates how a client connecting to a IEEE 802.1x authentication enabled port goes through a validation process. The switch prompts the client for login information in the form of a user name and password.

Once the client provides the login credentials, the switch sends an authentication request to the RADIUS server. The RADIUS server validates whether this client is allowed access to the port.

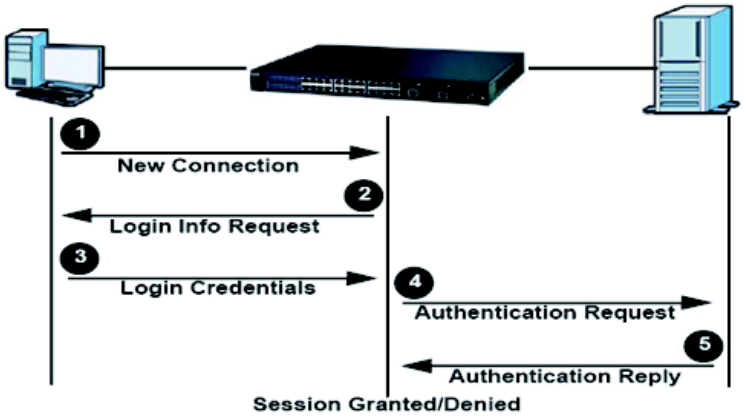


Figure 26: RADIUS Server

Local User Accounts

By storing user profiles locally on the switch, it can authenticate users without interacting with the network authentication server. However, there is a limit of 6 users that can be authenticated in this way.

Guest VLAN

The Guest VLAN function in IEEE 802.1x port-based authentication on the switch provides limited services to clients, such as downloading the IEEE 802.1x client. These clients can update their system for IEEE 802.1x authentication.

If you enable a guest VLAN on an IEEE 802.1x port, the switch assigns clients to a guest VLAN when the switch does not receive a response to its EAP request/identity frame or when EAPOL packets are not sent by the client.

Port Parameters

- **Admin Control Direction**
  Both - If 802.1x port authentication for a user has failed, incoming and outgoing packets on the port are dropped.
  Incoming - If 802.1x port authentication for a user has failed, only incoming packets on the port are dropped.

- **Re-Authentication**
  This function specifies if a subscriber must periodically re-enter his or her user name and password to stay connected to the port.

- **Reauth-Period**
  The “Reauth-Period” function is used to specify how often a client has to re-enter his or her username and password to stay connected to the port. The acceptable range for this field is 0 to 65535 seconds.

- **Port Control Mode**
  “Auto” Users can access the network after authenticating.
  “Force-authorized” Users can access the network without authentication.
  “force-unauthorized” Users cannot access the network.

- **Quiet Period**
  The “Quiet Period” function is used to specify the time a client has to wait before the next authentication attempt. This prevents the switch from becoming overloaded with continuous authentication attempts from the client. The acceptable range for this field is 0 to 65535 seconds.

- **Server-Timeout**
  The “Server-Timeout” value is used for timing out the authentication server.

- **Supp-Timeout**
  The “Supp-Timeout” value is the initialization value used for timing out a supplicant.

- **Max-req Time**
  The “Max-req Time” specifies how often the switch attempts to connect to the authentication server before determining the server is down. The acceptable range for this field is 1 to 10 attempts.

7.3.4 Port Security

The switch receives the MAC address of a device that is connected to a specific port direction and allows data forwarding. The functions of the switch allow control over which and how many devices may be connected to a switch port.

The “Port Security” functions can specify the maximum number of MAC addresses per interface. If the number is exceeded, incoming packets with new MAC addresses are dropped. A MAC address table can be used to check that number. The static MAC addresses are included for the limit.

Note

State Change of a Port on the Switch
If the state of a port on the switch is changed from disabled to enabled, all MAC addresses captured by this port are dropped.

7.4 Monitor

7.4.1 Alarm Information

This function alerts the network administrator to any abnormal network situations.

Note

Alarm DIP Switches
The alarm DIP switches allow users to configure if an alarm message should be sent when a corresponding event occurs.

Example

P1:	ON (AN)	– The switch sends an alarm message if the connection on Port 1 fails.
PWR:	ON	– The switch sends an alarm message if the primary power supply is interrupted.
RPS:	ON	– The switch sends an alarm message if the redundant power supply is interrupted.

7.4.2 Monitor Information

This function displays some hardware information to monitor the system and to guarantee proper network operation.

7.4.3 RMON Statistics

This function is used to monitor or delete RMON statistics.

Jabber

Subscribers whose data packets are longer than the allowable MTU (“**M**aximum **T**ransmission **U**nit”) on a network (e.g., ETHERNET) are referred to as Jabbers.

7.4.4 SFP

SFP (“**S**mall **F**orm-factor **P**luggable”) are small standardized modules for network connections.
SFP refers to a modular interface to support various transmission media and is used in network technology for interface flexibility.

7.4.4.1 DDM

DDM (“**D**ynamic **D**evice **M**apping”) is a technology for KVM switches with USB ports that are sometimes used as an alternative to standard USB keyboard and mouse emulation.

7.4.5 Traffic Monitor

The “Traffic Monitor” function can be used to enable or disable a specific port or the switch globally. The function can monitor the data rate of broadcast, multicast or broadcast and multicast packets. If the packet rate exceeds the specification for a user, the port is blocked. If the “Recovery” function is enabled, the port is enabled again after the “Recovery Time” has expired.

7.5 Management

7.5.1 SNMP

The SNMP (“**S**imple **N**etwork **M**anagement **P**rotocol”) is used in network management systems to monitor the state of attached devices that require the attention of an administrator. SNMP is a component of the “Internet Protocol Suite” defined by the IETF (“**I**nternet **E**ngineering **T**ask **F**orce”). It consists of a set of standards for network management, including an application layer protocol, a database schema and a set of data objects.

SNMP provides management data in the form of variables on the managed systems, which describe the system configuration. These variables can then be queried (and sometimes changed) by managing applications.

Support for MIBs

- RFC 1157 A Simple Network Management Protocol
- RFC 1213 MIB-II
- RFC 1493 Bridge MIB
- RFC 1643 ETHERNET Interface MIB
- RFC 1757 RMON Group 1,2,3,9

An “SNMP Community String” is a text string that acts as a password. It is used to authenticate messages that are sent between the management station (the SNMP manager) and the device (the SNMP agent). The string is included in every packet transmitted between the SNMP manager and the SNMP agent.

The “SNMP Community” acts like a password and is used to define the security parameters of SNMP clients in an SNMP v1 and SNMP v2c environments. The default “SNMP Community” is “public” for both SNMPv1 and SNMPv2c before SNMPv3 is enabled. Once SNMPv3 is enabled, the “Communities” of SNMPv1 and v2c have to be unique and cannot be shared.

Network ID of “Trusted Host”:

The IP address is a combination of the network ID and host ID.

- Network ID = (Host IP and mask).
- A user must enter the network ID only and leave the host ID at “0”. If a user enters a host ID such as 192.168.1.102, the system resets the host ID to 192.168.1.0.

Note

Community String

It should allow users to configure the “Community String” and rights only.

A user configures the “Community String” and rights and the network ID of the “Trusted Host” = 0.0.0.0, subnet mask = 0.0.0.0, i.e., all hosts with this “Community String” can access the switch.

7.5.2 SNMP Trap

A trap is an unsolicited message from an agent to the manager that an event has occurred. The SNMP Manager that receives the tap can ask for more information.

7.5.3 Auto Provision

The “Auto Provision” is a service that service providers can use to quickly, easily and automatically configure remote devices or update firmware from a remote location.

1. If the function is enabled, the switch first downloads an information file from the server of the service provider.

   The file name is formed according to the following naming convention:
   Model_Name_Autoprovision.txt

   Example: MEN-**5210_Autoprovision.t**xt

   The contents of the file are:
   AUTO_PROVISION_VER=1
   Firmware_Upgrade_State=1
   Firmware_Version=5228-000-1.0.0.b1
   Firmware_Image_File=5228-000-1.0.0.b1.fw
   Firmware_Reboot=1
   Global_Configuration_State=0
   Global_Configuration_File=5228-000-1.0.0.b1.save
   Global_Configuration_Reboot=0
   Specific_Configuration_State=0
   Specific_Configuration_Reboot=0

2. If the “AUTO_PROVISION_VER” value is higher than the current version of the “Auto Provision”, continue to Step 3. If not, please wait 24 hours and start again with Step 1.

3. If “Firmware_Upgrade_State =1”, continue to Step 4. If not, continue to Step 6.

4. If the “Firmware_Version” differs from the current firmware version, please download the “Firmware_Image_File” and update the firmware.

5. If the firmware is updated successfully and “Firmware_Reboot=1”, “reboot_flag=1” is executed.

6. If “Global_Configuration_State =1”, please download the “Global_Configuration_File” and update the configuration. If not, continue to Step 8.

7. If the configuration is updated successfully and “Global_Configuration_Reboot =1”, “reboot_flag=1” is executed.

8. If “Global_Configuration_State =1”, please download the specific configuration file and update the configuration. If not, continue to Step 10. The name is: “Model_Name _” with 12-bit MAC digits, e.g., “MEN-5210_00e04c8196b9.txt”.

9. If the configuration is updated successfully and “Specific_Configuration_Reboot =1”, “reboot_flag=1” is executed.

10. If “reboot_flag=1”, save the executed configuration and reboot the switch. If not, please wait 24 hours and start again at Step 1.

7.5.4 Mail Alarm

The “Mail Alarm” function sends an e-mail trap to a previously defined administrator when certain events occur. The events are listed below:

System Reboot:	The system performs a warm or cold start.
Port Link Change:	A port connection is established or fails.
Configuration Change:	The system configurations in the NV-RAM have been updated.
Firmware Upgrade:	The system firmware has been updated.
User Login:	A user has logged into the system.
Port Blocked:	A port is blocked by “Loop Detection” or “BPDU Guard”.

8 Configuration

8.1 Overview of Configuration Options

The industrial managed switch provides two options for advanced management features:

Telnet/SSH Port
A menu-driven user interface can be called up from the WBM ("**W**eb **B**ased **M**anagement") via the Telnet port.

Note

Additional Information
Please refer to the section "Configuring in the Web-Based Management System (WBM)" for a detailed description.

Console Port
The CLI ("**C**ommand **L**ine **I**nterface") can be called up from the Console port on the front of the industrial managed switch (local) via an integrated management agent.

The management agent is based on SNMP (Simple Network Management Protocol). Using this SNMP agent, management software can be used to manage the industrial managed switch from any PC in the network.

The management agent includes an embedded HTTP Web agent. A standard Web browser can be used on any PC connected to the network to access the Web agent.

Note

Additional Information
Please refer to the section "Appendix" > … > "Configuring in the Command Line Interface (CLI)" for a detailed description.

8.1.1 Telnet Port

1. Connect the computer to one of the ETHERNET ports.

2. Open a Telnet session to the switch's IP address. If this is your first login, use the default values.

Table 26: Default Settings for the Telnet Port

Setting	Default Value	
	FW Version 01	FW Version 02 or higher
IP Address	192.168.1.254	
Subnet Mask	255.255.255.0	
Default Gateway	0.0.0.0	
Management VLAN	1	
Default Username	admin	admin
Default Password	Wago1951	wago

3. Make sure your computer IP address is in the same subnet, unless you are accessing the switch through one or more routers.

8.2 Console Port

Before accessing the integrated management agent of the industrial managed switch via a network connection, you first have to configure it via a local connection or the BOOTP protocol with the default IP address, a subnet mask and a standard gateway.

After configuring the IP parameters of the industrial managed switch, you can access the integrated configuration utility from any point in the connected network or via the Internet. The integrated configuration utility can be called up via Telnet from any computer connected to the network. In addition, it can be managed from any computer via a Web browser.

1. Connect the computer to the console port on the switch using the appropriate cable.

2. Use Telnet with the following settings:

Table 27: Default Settings for the Console Port

Setting	Default Value
Baud Rate	38400
Parity	None
Number of Data Bits	8
Number of Stop Bits	1
Flow Control	None

3. Press [ENTER] to open the login screen.

Table 28: Login Screen

Setting	Default Value	
	FW Version 01	FW Version 02 or higher
Default Username	admin	admin
Default Password	Wago1951	wago

Note

Requirement to establish the connection
Make sure that the terminal or PC is configured for the connection with the above settings. Otherwise, no connection can be established.

Please refer to the section “Appendix” > … > “RJ-45 Cable” for details on the cable terminal assignment.

9 Configuring in the Web-Based Management System

An internal file system and integrated Webserver can be used for configuration and administration of the system. Together, they are referred to as the Web-Based Management System (WBM).

The HTML pages saved internally provide you with information about the configuration and status of the fieldbus node. In addition, you can also change the configuration of the device here.
You can also save HTML pages created yourself via the implemented file system.

Note

Always restart after making changes to the configuration!
The system must always be restarted for the changed configuration settings to take effect.

1. To open the WBM, launch a Web browser (e.g., Microsoft Internet Explorer or Mozilla Firefox).
2. Enter the IP address of the fieldbus coupler/ controller.
3. Click **[Enter]** to confirm.
4. Enter your user name and password in the query dialog:
   Firmware version 01: User = “admin”, password = “Wago1951”
   Firmware version 02: User = “admin”, password = “wago”
5. The start page of WBM loads.
6. Make the wanted settings.
7. Press **[Apply]** or **[Update]** or press **[Delete]** or **[Discard]** to discard your changes.
8. To apply the settings, press the **[Save configuration]** button to confirm your changes.

You can access the respective WBM pages via the links in the navigation bar:

Table 29: Overview - Navigation Links and WBM Pages

Navigation Links and WBM Pages
▶ **[System Status]**
• System Information
▶ **[Basic Settings]**
• General Settings • MAC Management • Port Mirroring • Port Settings
▶ **[Advanced Settings]**
▶ **[Bandwidth Control]** • QoS • Rate Limitation ▶ **[IMGP Snooping]** ▶ • IGMP Snooping • IGMP Filtering • MVR • Multicast Addr. • Multicast IP Statistics ▶ **[VLAN]** ▶ • Port Isolation • VLAN • GVRP • MAC VLAN • Protocol VLAN • Q-in-Q • DHCP Relay • DHCP Options • Dual Homing • Dual Ring • ERPS • Link Aggregation • LLDP • Loop Detection • Jet Ring • Modbus • STP • Xpress Ring

▶ **[Security]**

[IP Source Guard] ▶

- DHCP Snooping
- Binding Table
- ARP Inspection

- Access Control List
- 802.1x
- Port Security

▶ **[Monitor]**

- Alarm
- Monitor Information
- Port Statistics
- Port Utilization
- RMON Statistics
- SFP Information
- Traffic Monitor

▶ **[Management]**

[SNMP] ▶

- SNMP
- SNMP Trap

- Auto Provision
- Mail Alarm
- Maintenance
- System Log
- User Account

The settings/configuration of the industrial managed switch can be made on these WBM pages.
There are tab pages on some WBM pages for the settings/configuration.

The default values are displayed in **bold**.

9.1 System Status

9.1.1 System Informationen

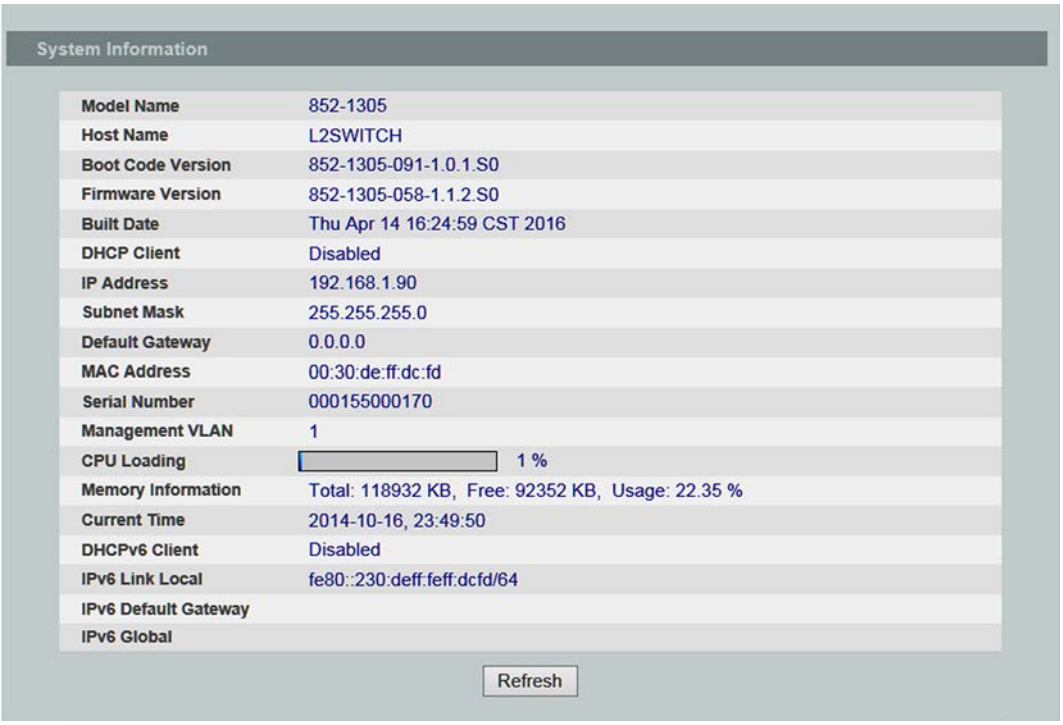


Figure 27: WBM “System Information” Page

Table 30: WBM “System Information” Page

Parameters	Description
Model Name	This display field shows the model name of the switch.
Host Name	This display field shows the host name of the switch.
Boot Code Version	This display field shows the boot code version.
Firmware Version	This display field shows the version number of the firmware currently installed.
Built Date	This display field shows the create date of the firmware currently installed.
DHCP Client	This display field shows if the DHCP client function is enabled.
IP Address	This display field shows the IP address of the switch.
Subnet mask	This display field shows the subnet mask of the switch.
Default Gateway	This display field shows the default gateway of the switch.
MAC Address	This display field shows the MAC (Media Access Control) address of the switch.
Serial Number	This display field shows the serial number.
Management VLAN	This display field shows the VLAN ID required for the switch management process.
CPU Loading	This display field shows the percentage system load of the switch.
Memory Informationen	This display field shows the switch's total memory, available memory (“Free”) and used memory (“Used”).
Current Time	This display field shows the current date (yyyy-mm-dd) and current time (hh:mm:ss).
DHCPv6 Client	This display field shows if the DHCPv6 client is ON or OFF.
IPv6 Link Local	This display field shows the IPv6 Link-local address.
IPv6 Default Gateway	This display field shows if the global IPv6 Link address has also been entered.
IPv6 Global	This display field shows if the global IPv6 Link address.
Refresh	Click this button to update the information on this page.

9.2 Basic Settings

9.2.1 General Settings

9.2.1.1 System

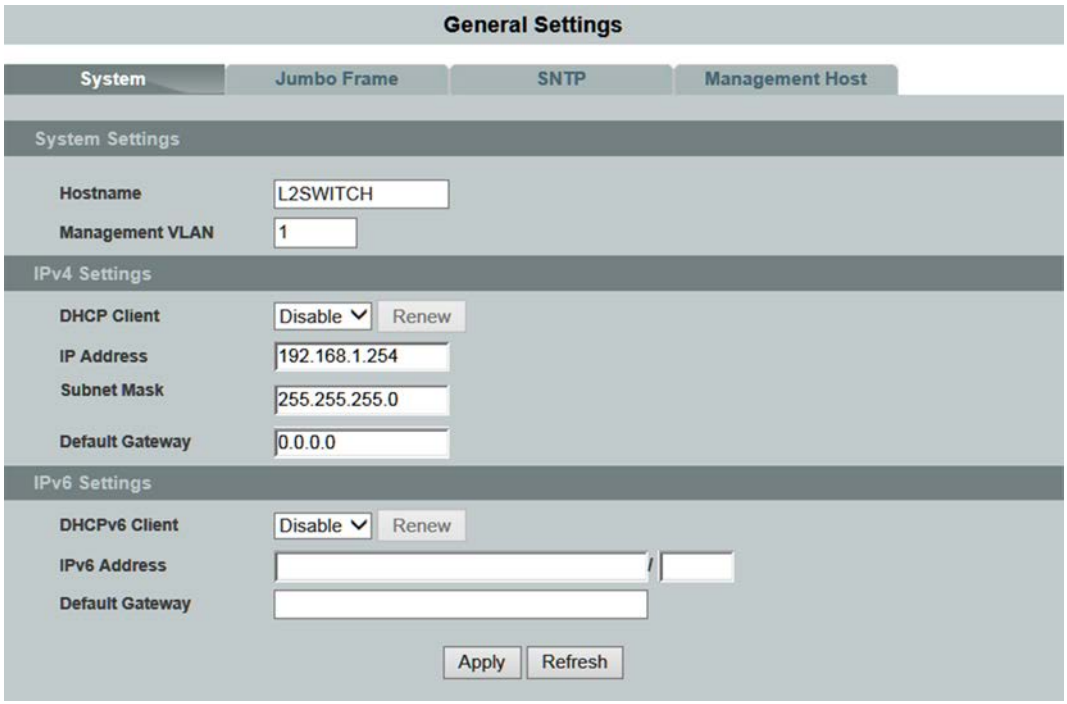


Figure 28: WBM Page, “General Settings” – “System” Tab

Table 31: WBM Page, “General Settings” – “System” Tab

System Settings			
Parameters	**Default**	**Description**	
Hostname	**L2SWITCH**	Enter up to 64 alphanumeric characters for the name of your switch. The hostname should be a combination of numbers, letters, hyphens (-) or underscores (_).	
Management VLAN	**1**	Specify a VLAN group to have access to the switch. Valid VLAN range: 1 … 4094.	
		Note	***Note*** **Configuring a Management VLAN** Before configuring a management VLAN, you must first create a management VLAN and assign it at least one subscriber port.

Table 31: WBM Page, “General Settings” – “System” Tab

IPv6 Settings		
Parameters	**Default**	**Description**
DHCP Client	**Disable**	Select “Disable” in the selection box if you want to manually configure the IP address of the switch. Click **[Renew]** to allow the switch to get an IP address from the DHCP server.
	Enable	Select “Enable” in the selection box to allow the switch to get its IP address from a DHCP server automatically. Click **[Renew]** to allow the switch to get an IP address from the DHCP server.
IP Address	**192.168.0.254**	Enter the IP address of the switch in decimal-point notation.
Subnet Mask	**255.255.255.0**	Enter the IP subnet mask of the switch in decimal-point notation.
Default Gateway	0.0.0.0	Enter the IP address of the default outgoing gateway in decimal-point notation.
IPv6 Settings		
Parameters	**Default**	**Description**
DHCPv6 Client	**Disable**	Select “Disable” in the selection box if you want to manually configure the IP address of the switch.
	Enable	Select “Enable” in the selection box to allow the switch to get its IP address by DHCP automatically. Click **[Renew]** for the switch to update the values.
Static IPv6 Address		This field displays the static IPv6 address.
Default Gateway		Enter the IP address of the default outgoing gateway in decimal-point notation.

9.2.1.2 Jumbo Frame

Note

Additional Information

Please refer to the section “Function Description” for more information on “Jumbo Frame”.

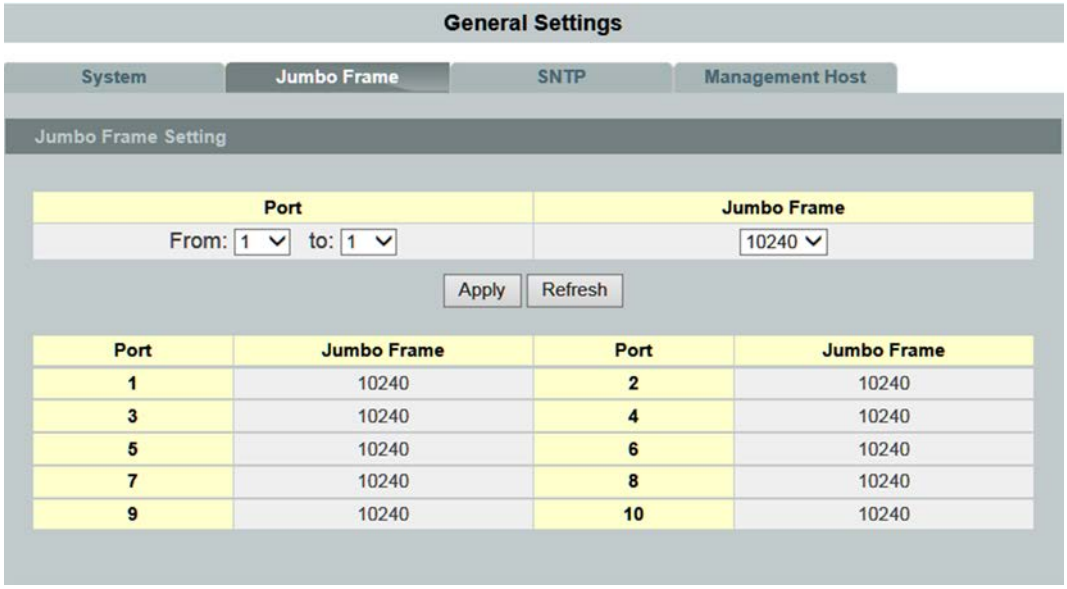


Figure 29: WBM Page, “General” – “Jumbo Frame” Tab

Table 32: WBM Page, “General” – “Jumbo Frame” Tab

Jumbo Frame Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the jumbo frame.
	to:	**1**	Select a port or port range in the selection box to configure the jumbo frame.
Jumbo Frame		**10240**	Select the maximum number of bytes of a jumbo frame for all ports. The bigger the frame size, the better the network performance.
		1522	
		1536	
		1552	
		9010	
		9216	
Port		1 … 10	This column displays the port numbers.
Jumbo Frame		1522	This column displays the maximum number of bytes for a jumbo frame.
		1536	
		1552	
		9010	
		9216	
		10240	

9.2.1.3 SNTP

Note

Additional Information

Please refer to the section “Function Description” for more information on “SNTP” (**S**imple **N**etwork **T**ime **P**rotocol).

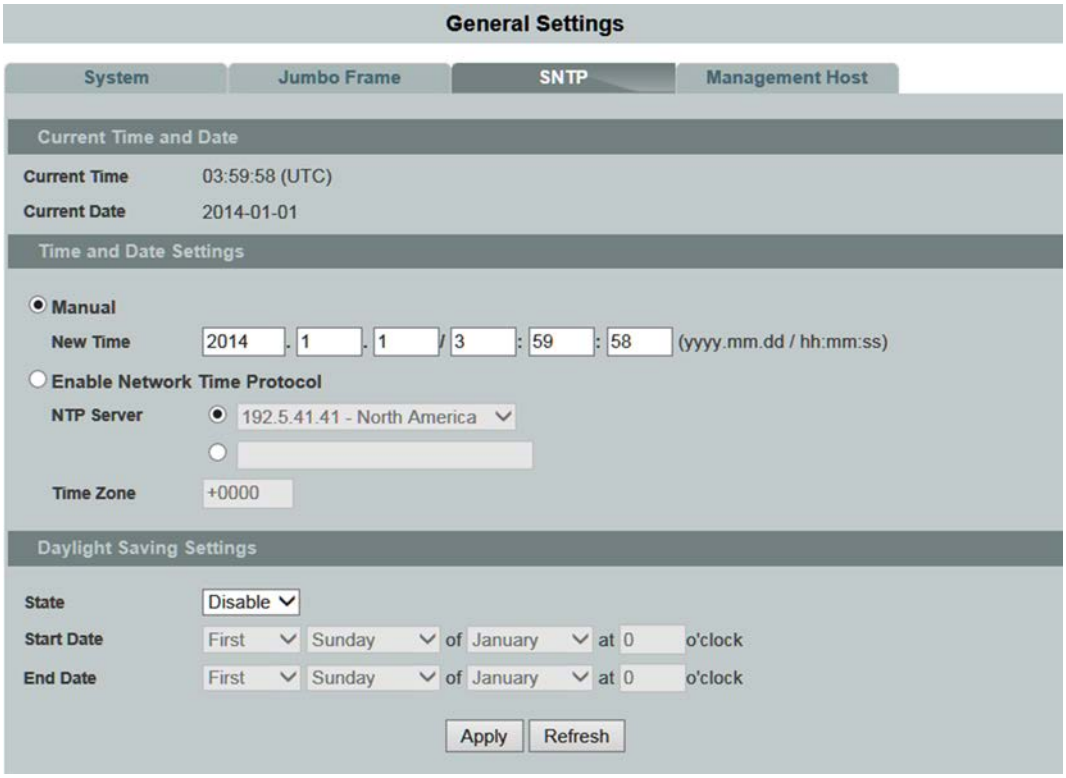


Figure 30: WBM Page, “General” – “SNTP” Tab

Table 33: WBM Page, “General” – “SNTP” Tab

Current Time and Date				
Parameters	**Default**	**Description**		
Current Time		This field displays the current time if you open or refresh the menu.		
Current Date		The field displays the current date if you open or refresh the menu.		
Time and Date Settings				
Parameters	**Default**	**Description**		
Manual	New Time ○	Select this option if you want to manually set the time and date for the system. Enter the new date in the format year/month/day format and time in the format hour/minute/second. Click **[Apply]** to display the “Current Time” and “Current Date”.		
Enable Network Time Protocol		Select this option to use NTP (“Network Time Protocol”) for the time service.		
	NTP Server ◉	◉	Select this option if you want to use a predefined time server. The switch searches for a time server for 60 seconds.	
		○	Select this option if you enter the IP address of a time server. The switch searches for a time server for 60 seconds.	
	0.0.0.0	◉	IP	Enter the IP address of the NTP server in decimal-point notation.
		○	Domain Name	Enter the domain address of the switch.
	Time Zone **+0000**	Enter the time difference between UTC (“Universal Time Coordinated”, formally GMT “Greenwich Mean Time”) and the time zone in hh.mm.		

Table 33: WBM Page, “General” – “SNTP” Tab

Daylight Saving Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” if you do not want to use daylight savings time.
	Enable	Select “Enable” if you want to use daylight savings time.
Start Date[1)]		Enter the date and time for the start of daylight savings if you have enabled this option. The time is displayed in 24-hour format.
End Date[2)]		Enter the date and time for the end of daylight savings if you have enabled this option. The time is displayed in 24-hour format.

1)	Daylight savings starts on the second Sunday of March in most places in the USA. Daylight savings starts at 2 A.M local time in each time zone in the USA. Correspondingly, you would select “Second, Sunday, March” and “2:00”. In the EU, daylight savings starts on the last Sunday in March. It starts at the same time (1:00 A.M GMT or UTC) in all EU time zones. Correspondingly, you would select “Last, Sunday, March”) and in the last field, enter the time based on your time zone. In Germany, for instance, you would select “2:00” because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
2)	In the USA, daylight savings ends on the last Sunday in October. It ends at 2:00 A.M. local time in each time zone in the USA. Correspondingly, you would select “First, Sunday, November” and “2:00”. In the EU, daylight savings ends on the last Sunday in October. Daylight savings ends at the same time (1:00 AM GMT or UTC) in all EU times zones. Correspondingly, you would select “Last, Sunday, October”) and in the last field, enter the time based on your time zone. In Germany, for instance, you would select “2:00” because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).

9.2.1.4 Management Host

Note

Additional Information

Please refer to the section “Function Description” for more information on “Management Host”.

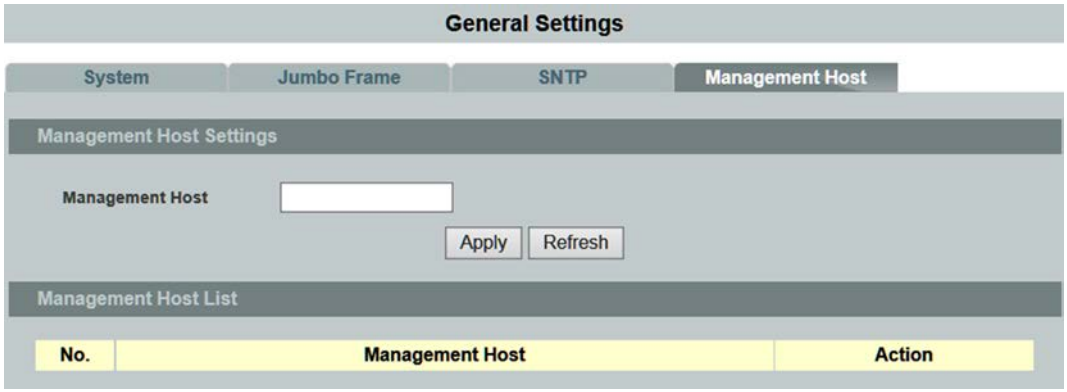


Figure 31: WBM Page, “General” – “Management Host” Tab

Table 34: WBM Page, “General” – “Management Host” Tab

Management Host Settings		
Parameters	**Default**	**Description**
Management Host		Enter the IP address of the “Management Host” in decimal-point notation.
Management Host List		
Parameters	**Default**	**Description**
No.	1 … 3	This column displays the sequential numbers of each “Management Host”.
Management Host		This column displays the “Management Hosts”.
Action		Click **[Delete]** to delete a specific entry.

9.2.2 MAC Management

Note

Additional Information
Please refer to the section “Function Description” for more information on “MAC Management”.

9.2.2.1 Static MAC Settings

Note

Additional Information
Please refer to the section “Function Description” for more information on “Static MAC Settings” (static MAC address).

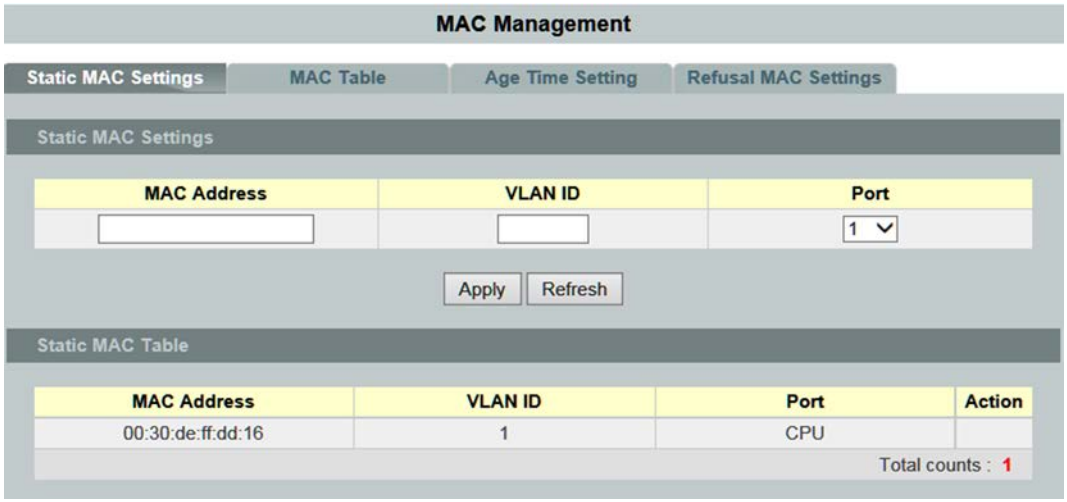


Figure 32: WBM Page, “MAC Management” – “Static MAC Settings” Tab

Table 35: WBM Page, “MAC Management” – “Static MAC Settings” Tab

Static MAC Settings		
Parameters	**Default**	**Description**
MAC Address		In this input field, enter the MAC address of a computer or device that you want to add to the MAC address table. The valid format is: hh:hh:hh:hh:hh:hh.
VLAN ID		In this input field, enter the VLAN ID to apply to the computer or device.
Port	**1** … 10	In this selection box, select the port number to which the computer or device is connected.

Table 35: WBM Page, “MAC Management” – “Static MAC Settings” Tab

Static MAC Table		
Parameters	**Default**	**Description**
MAC Address		This column displays the manually entered MAC address entries.
VLAN ID		This column displays the VLAN ID of the manually entered MAC address entries.
Port	1 … 10	This column displays the port numbers of the manually entered MAC address entries. The MAC address “CPU” is the MAC address of the switch.
Action		Click **[Delete]** to delete the manually entered MAC address from the MAC address table. You cannot delete the MAC address of the switch from the static MAC address table.
Total counts		This display field displays the total number of entries in the static MAC address table.

9.2.2.2 MAC Table

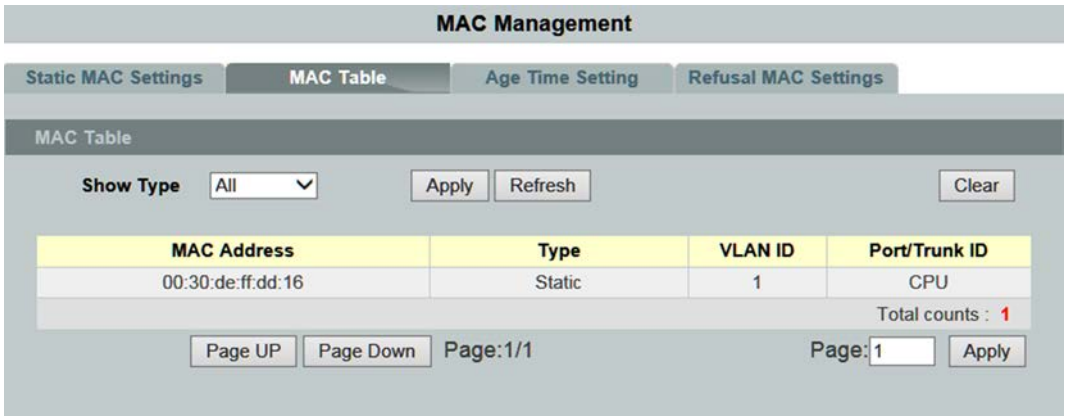


Figure 33: WBM Page, “MAC Management” – “MAC Table” Tab

Table 36: WBM Page, “MAC Management” – “MAC Table” Tab

MAC Table		
Parameters	**Default**	**Description**
Show Type	**[All]**	Select “All” to display all MAC address entries.
	Static	Select “Static” to display the static MAC address entries.
	Dynamic	Select “Dynamic” to display the dynamic MAC address entries.
	Port	Select “Port” to display the corresponding MAC address entries.
	MAC	Select “MAC” to display the corresponding MAC address entries.
MAC Address		This column displays the MAC addresses.
Type		This column displays whether the entry was entered manually (static) or pulled by the switch (dynamic).
VLAN ID		This column displays the VLAN ID of the MAC address entry.
Port/Trunk ID		This column displays the port numbers to which the MAC address entry is connected. “CPU” is the MAC address entry of the switch.
Total counts		This display field displays the total number of entries in the MAC address table.
Page UP		This button can be used to scroll up for many MAC address entries.
Page Down		This button can be used to scroll down for many MAC address entries.

9.2.2.3 Age Time Setting

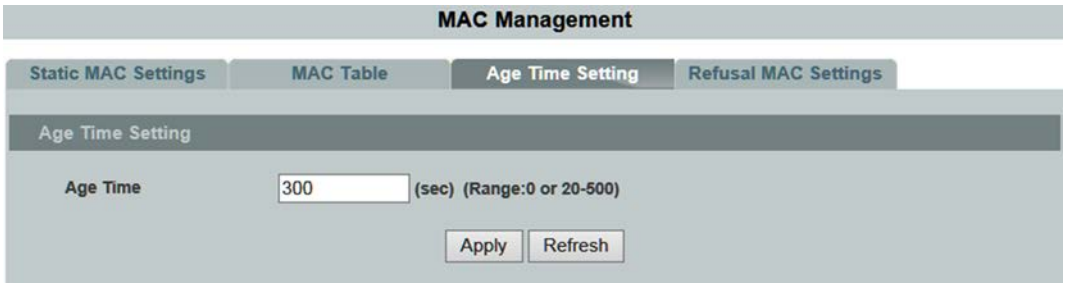


Figure 34: WBM Page, “MAC Management” – “Age Time Setting” Tab

Table 37: WBM Page, “MAC Management” – “Age Time Setting” Tab

Age Time Setting		
Parameters	**Default**	**Description**
Age Time (sec) (Range:0 or 20-500)	**300**	Enter the “Age Time” in this input field. Valid range: 20 … 500 s.

9.2.2.4 Refusal MAC Settings

Note

Additional Information
Please refer to the section “Function Description” for more information on “Refusal MAC Settings”.

Note

Maximum number of MAC blacklist entries
Up to 20 entries can be configured.

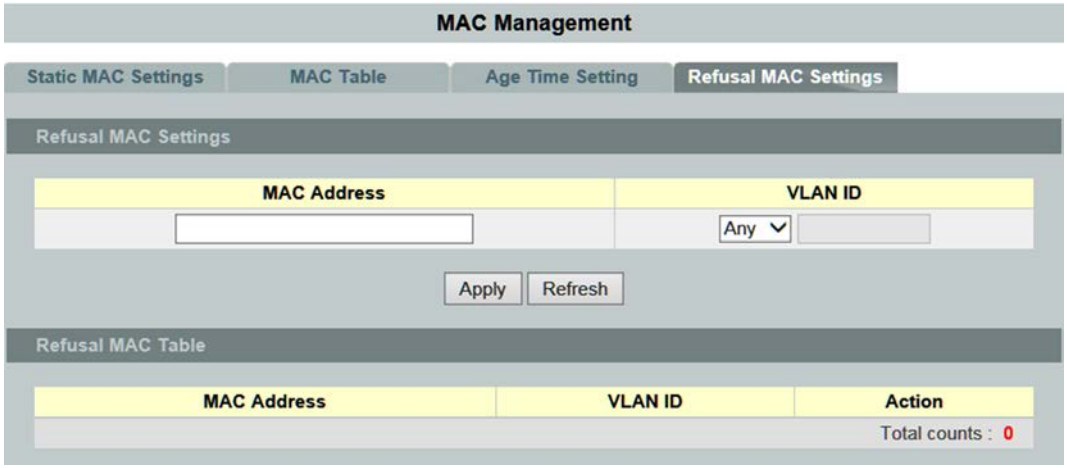


Figure 35: WBM Page, “MAC Management” – “Refusal MAC Settings” Tab

Table 38: WBM Page, “MAC Management” – “Refusal MAC Settings” Tab

Refusal MAC Settings		
Parameters	**Default**	**Description**
MAC Address		Enter the MAC address of a computer or device that you want to reject. The valid format is: hh:hh:hh:hh:hh:hh.
VLAN ID	**Any**	The switch receives any VLAN ID.
	Vlan	Enter the VLAN ID that you want to assign to the computer or device.
Refusal MAC Settings		
Parameters	**Default**	**Description**
MAC Address		This column displays the MAC addresses.
VLAN ID		This field displays the VLAN ID of the MAC address entry.
Action		Click **[Delete]**, to delete a MAC address entry manually entered from the blacklist table.
Total counts		This field displays the total number of entries in the blacklist table.

9.2.3 Port Mirroring

Note

Additional Information

Please refer to the section “Function Description” for more information on “Port Mirroring”.

Note

Monitor Port

The monitor port cannot be a member of any “Truck Port” group.
The monitor port cannot be an ingress or egress port.
If a port has been configured as a source port and a user then configures it as a destination port, the port is automatically deleted from the source ports.

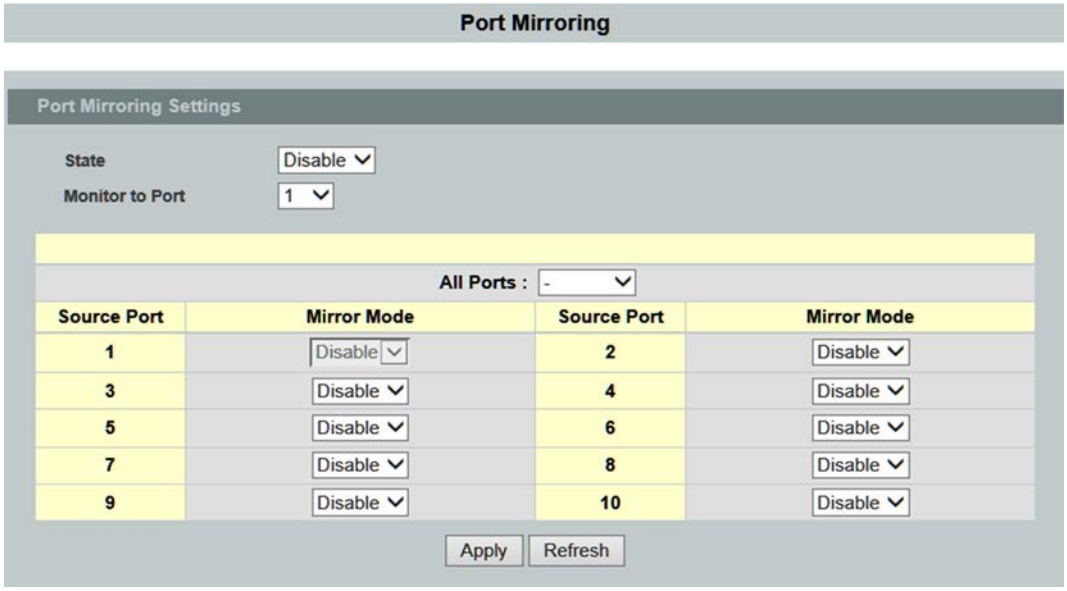


Figure 36: WBM “Port Mirroring” Page

Table 39: WBM “Port Mirroring” Page

Port Mirroring Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” to disable the “Port Mirroring”.
	Enable	Select “Enable” to enable the “Port Mirroring”.
Monitor to Port	**1**	Select a port to be connected to a “Network Traffic Analyzer”.
All Ports	-	Settings in this select box apply to all ports. Make settings here to be applied to all ports. Start here with general settings and then change the settings for individual ports.
	Disable	
	Ingress	
	Egress	
	Both	
Source Port	1 … 10	This column displays the number of individual source ports.
Mirror Mode	Disable	Select “Disable” to prevent traffic being copied from the specified source port to the monitor port.
	Ingress	Select “Ingress” to only copy the input data (incoming) from the specified source ports to the monitor port.
	Egress	Select “Egress” to only copy the output data (outgoing) from the specified source ports to the monitor port.
	Both	Select “Both” to copy both incoming and outgoing data from the specified source ports to the monitor port.

9.2.4 Port Settings

9.2.4.1 General Settings

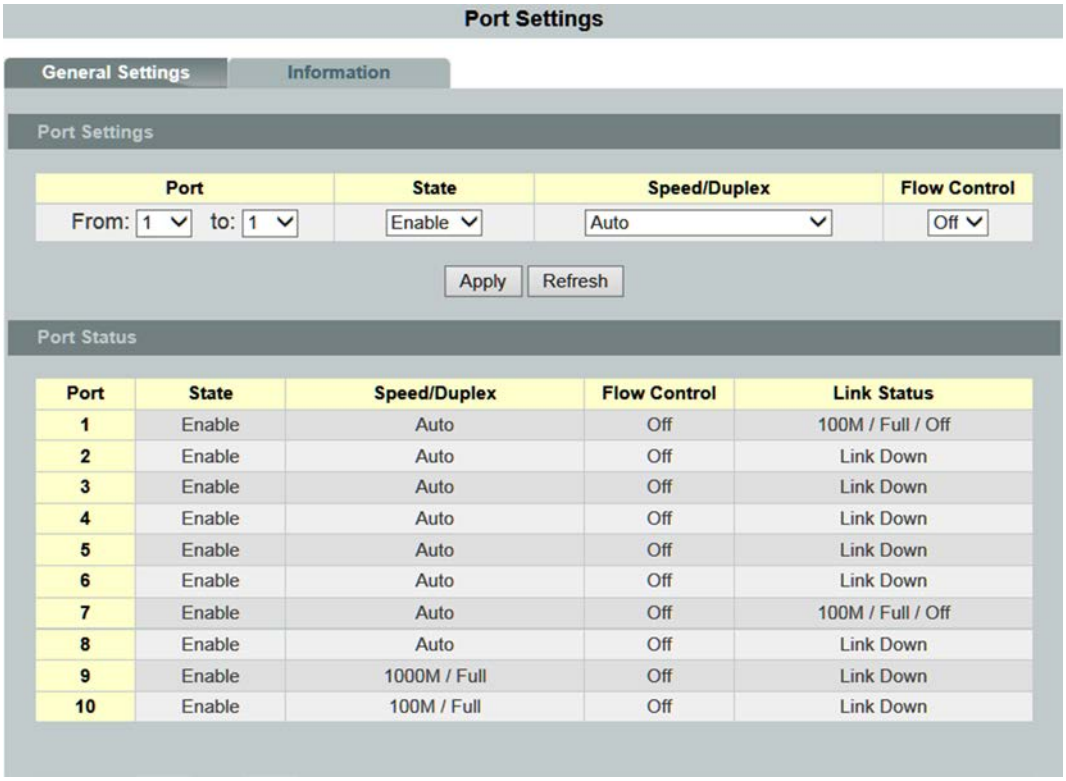


Figure 37: WBM Page, “Port Settings” – “General Settings” Tab

Table 40: WBM Page, “Port Settings” – “General Settings” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range that you want to configure.
	to:	**1**	Select a port or port range that you want to configure.
State		**Disable**	Select “Disable” to disable the port.
		Enable	Select “Enable” to enable the port.
Speed/Duplex		**Auto**	Select the speed and duplex mode of the port.
		10 Mbit/s / Full Duplex	
		10 Mbit/s / Half Duplex	
		100 Mbit/s / Full Duplex	
		100 Mbit/s / Half Duplex	
		1000 Mbit/s / Full Duplex	
Flow Control		**Off**	Select “Off” to disable access to the port's buffer resources and to interrupt operation of the switches in the network.
		On	Select “On” to maintain access to the port's buffer resources and to ensure lossless operation of the switches in the network.
Port State			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
State			This column displays if the port is enabled or disabled.
Speed/Duplex			This column displays the configured speed (10 Mbit/s, 100 Mbit/s or 1000 Mbit/s) and duplex mode (full or half-duplex) for a port.
Flow Control			This column displays whether the port's “Flow Control” is set to “On” or “Off”.
Link State			This column displays the link status of a port. If the port is up, the speed, duplex mode and “Flow Control” settings are displayed. “Link Up” displays that the port is either disabled or no device is connected.

9.2.4.2 Information

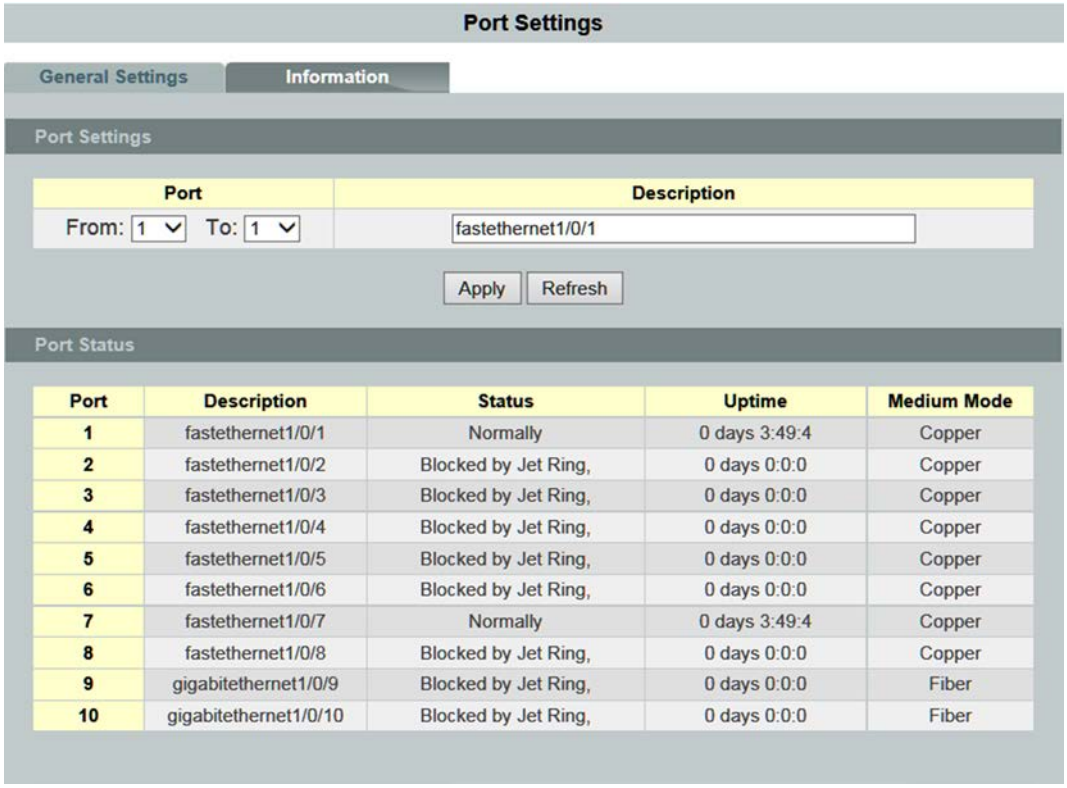


Figure 38: WBM Page, “Port Settings” – “Information” Tab

Table 41: WBM Page, “Port Settings” – “Information” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range that you want to display.
	To:	**1**	Select a port or port range that you want to display.
Description			
Port Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Description			This column displays the name of the port.
Status			This column displays the status of the port.
Uptime			This column displays the operating mode of the port.
Medium Mode			This column displays the connection type.
		Copper	Copper wire
		Fiber	Fiber optic cable

9.3 Advanced Settings

9.3.1 Bandwidth Control

9.3.1.1 QoS

Note

Additional Information

More information about “QoS” (Quality of Service) is available in the section “Function Description”.

9.3.1.1.1 Port Priority

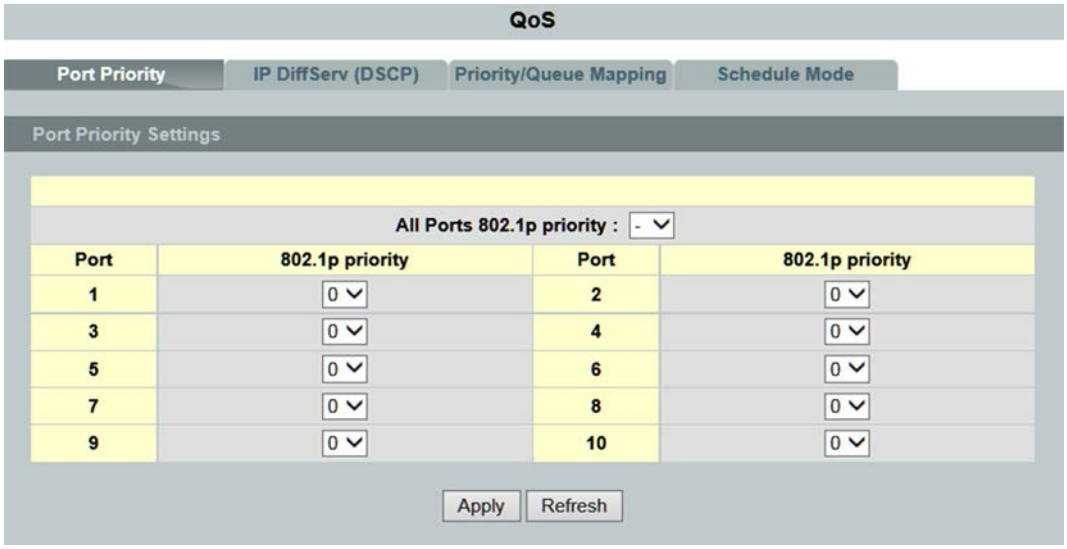


Figure 39: WBM “QoS” Page – “Port Priority” Tab

Table 42: WBM “QoS” Page – “Port Priority” Tab

Port Priority Settings		
Parameters	**Default**	**Description**
All Ports 802.1p priority	-	In the selection box, enter the priority vale for all ports. The value indicates the packet priority and is added to the “Priority Tag” field of the incoming packets.
	0 … 7	0 = Lowest priority 7 = Highest priority
Port	1 … 10	This column displays the port numbers.
802.1p priority	**0** … 7	In the selection box, select a priority for packets received on this port. Only packets without an “802.1p Tag Priority” are assigned the specified priority.

9.3.1.1.2 IP DiffServ (DSCP)

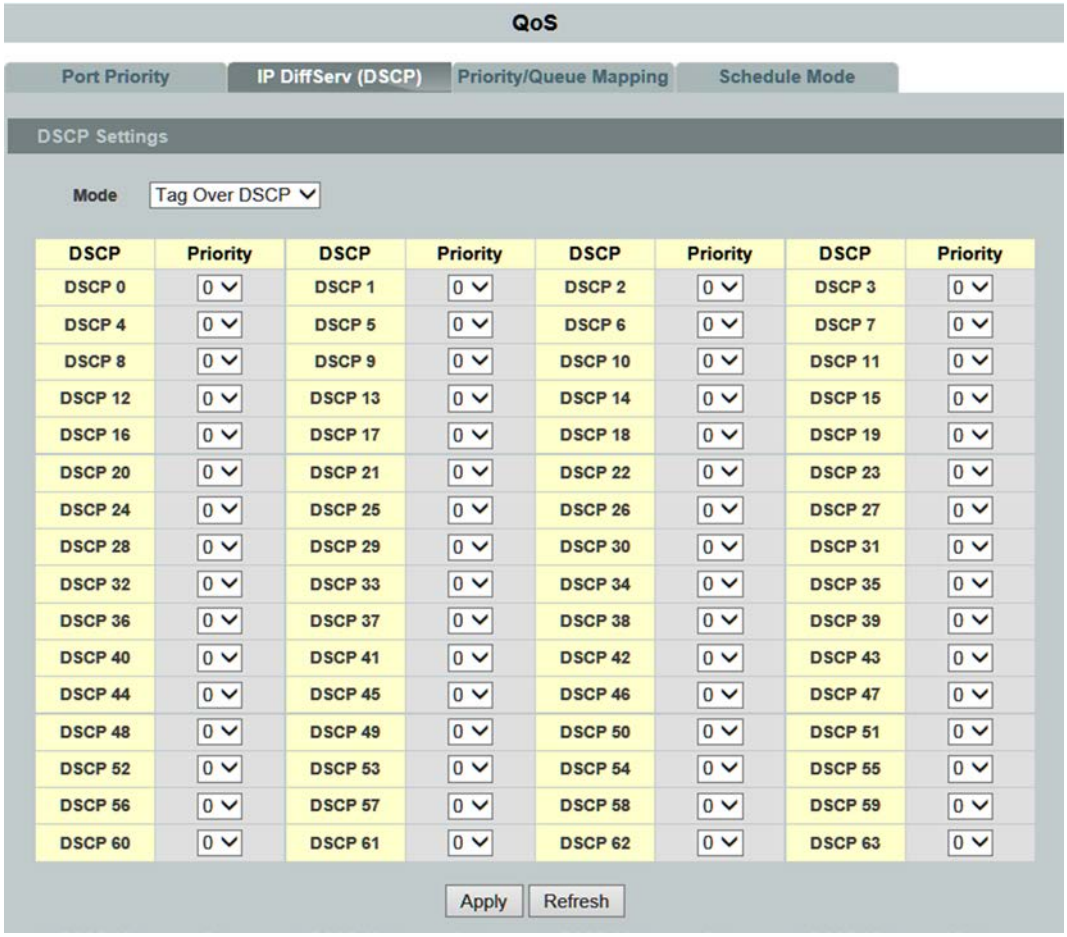


Figure 40: WBM “QoS” Page – “IP DiffServ (DSCP)” Tab

Table 43: WBM “QoS” Page – “IP DiffServ (DSCP)” Tab

DSCP Settings		
Parameters	**Default**	**Description**
Mode	**Tag Over DSCP**	In the selection box, select “Tag Over DSCP” if the 802.1p tag has a higher priority than DSCP.
	DSCP Over Tag	In the selection box, select “DSCP Over Tag” if the 802.1p tag has a lower priority than DSCP.
DSCP	DSCP 0 … DSCP 63	This column displays the DSCP fields.
Priority	**0** … 7	Select the respective priority level in the selection box. 0 = Lowest priority 7 = Highest priority

9.3.1.1.3 Priority/Queue Mapping

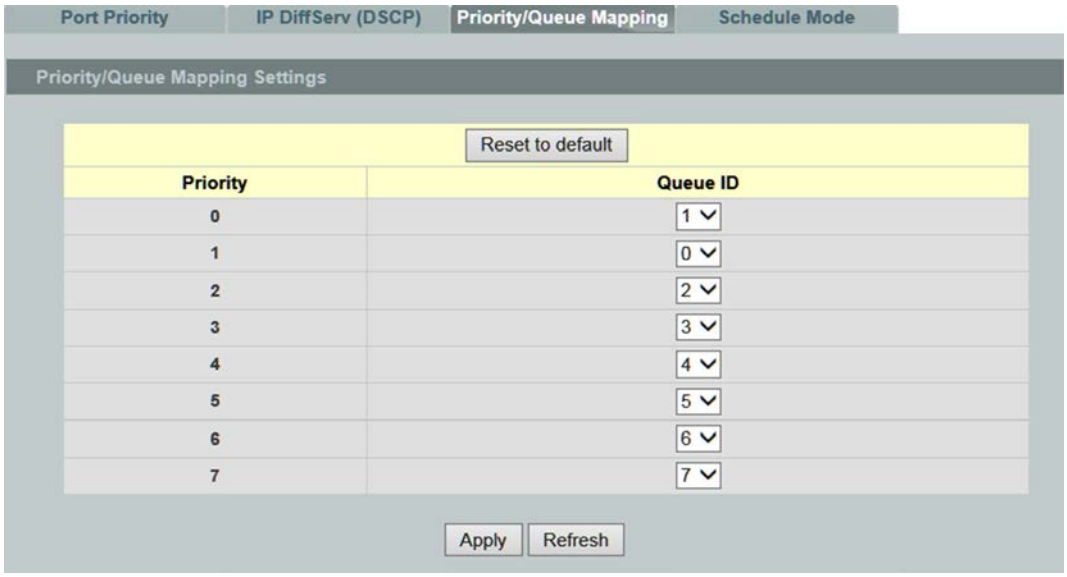


Figure 41: WBM “QoS” Page – “Priority/Queue Mapping” Tab

Table 44: WBM “QoS” Page – “Priority/Queue Mapping” Tab

Priority/Queue Mapping Settings		
Parameters	**Default**	**Description**
Reset to default		Click this button to reset the priority of the “Queue” to the default values.
Priority	0 … 7	This column displays the respective priority level. 0 = Lowest priority 7 = Highest priority
Queue ID	0 … 7	In the selection box, select the number of a “Queue” for packets with the priority level.

Table 45: Default Settings

Priority	Queue ID
0	2
1	0
2	1
3	3
4	4
5	5
6	6
7	7

9.3.1.1.4 Schedule Mode

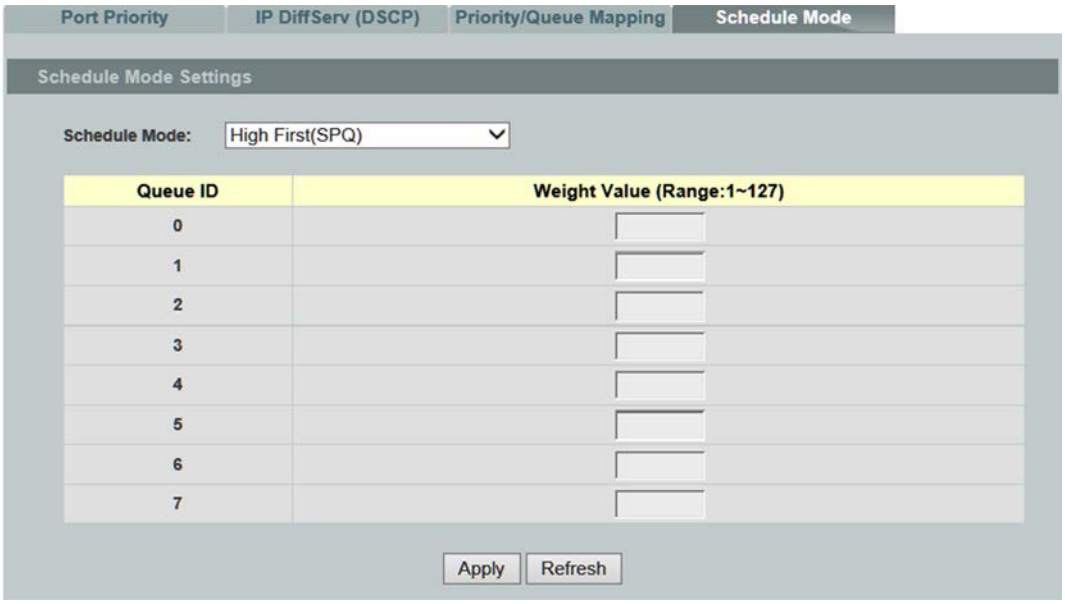


Figure 42: WBM “QoS” Page – “Schedule Mode” Tab

Table 46: WBM “QoS” Page – “Schedule Mode” Tab

Schedule Mode Settings		
Parameters	**Default**	**Description**
Schedule Mode	**High First (SPQ)**	In the selection box, select “Strict Priority Queuing (SPQ)” if you want to process the hardware priority queues sequentially.
	Weighted Round Robin (WRR)	In the selection box, select “Weighted Round Robin (WRR)” if you want to use the algorithm based on queue weighting (the value entered in the “**Weight Value (range: 1~127)**” field. Queues with higher weighting get more service than those with lower weighting.
Queue ID	0 … 7	This column displays which “Queue” is being configured. 0 = Lowest priority 7 = Highest priority
Weight Value (Range: 1~127)	**1** … 127	The “Weight Value” can only be configured if the “Weighted Round Robin (WRR)” is selected. The bandwidth is divided among the different “Traffic Queues” according to their weighting. 0 = Lowest priority 127 = Highest priority
		Note  ***Note*** **Changing the “Weight Value (range: 1~127)”** If you have selected “Strict Priority Queuing (SPQ)”, you cannot change the “Weight Value”. You must first select “Weighted Round Robin (WRR)”. You can then change “Strict Priority Queuing (SPQ)”.

9.3.1.2 Rate Limitation

9.3.1.2.1 Storm Control

Note

Additional Information

Please refer to the section “Function Description” for more information on “Storm Control”.

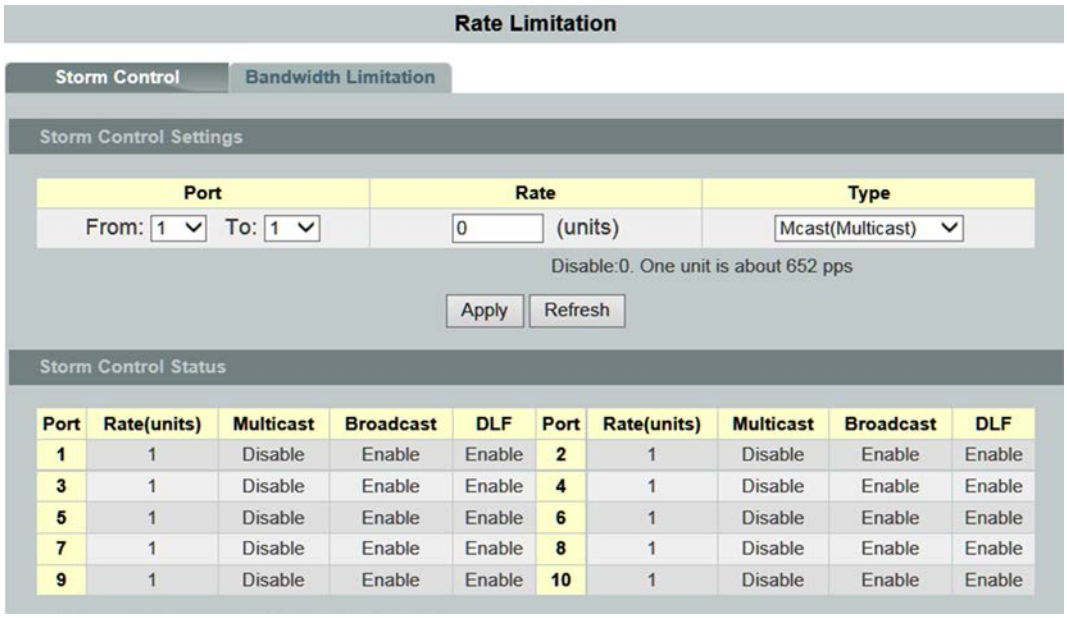


Figure 43: WBM “Rate Limitation” Page – “Storm Control” Tab

Table 47: WBM “Rate Limitation” Page – “Storm Control” Tab

Storm Control Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “Storm Control” settings.
	to:	**1**	Select a port or port range in the selection box to configure the “Storm Control” settings.
Rate (units)		**0**	
Type		Bcast (Broadcast)	Choose “Bcast (Broadcast)” in the selection box to specify a limit for the number of broadcast packets received per second.
		Mcast (Multicast)	Choose “Mcast (Multicast)” in the selection box to specify a limit for the number of multicast packets received per second.
		DLF	Choose “DLF” in the selection box to specify a limit for the number of DLF packets received per second.
		Mcast+Bcast	Choose “Mcast+Bcast” in the selection box to specify a limit for the number of multicast and broadcast packets received per second.
		Mcast+DLF	Choose “Mcast+DLF” in the selection box to specify a limit for the number of multicast and DLF packets received per second.
		Bcast+DLF	Choose “Bcast+DLF” in the selection box to specify a limit for the number of broadcast and DLF packets received per second.
		Mcast+Bcast+ DLF	Choose “Mcat+Bcast+DLF” in the selection box to specify a limit for the number of multicast, broadcast and DLF packets received per second.
Storm Control Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Rate (units)			This column displays the number of packets the switch can receive per second.
Multicast		Enable Disable	This column indicates if the rate setting applies to multicast.
Broadcast		Enable Disable	This column indicates if the rate setting applies to broadcast.
DLF		Enable Disable	This column indicates if the rate setting applies to DLF.

9.3.1.2.2 Bandwidth Limitation

Note

Additional Information

Please refer to the section “Function Description” for more information on “Bandwidth Limitation”.

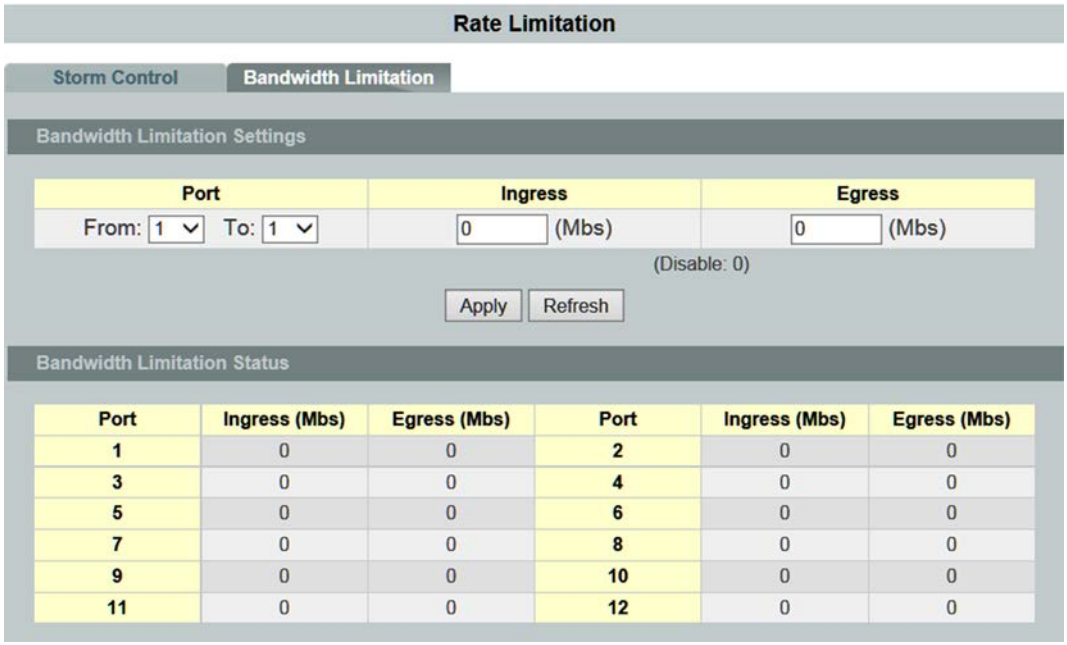


Figure 44: WBM “Rate Limitation” Page – “Bandwidth Limitation” Tab

Table 48: WBM “Rate Limitation” Page – “Bandwidth Limitation” Tab

Bandwidth Limitation Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “Rate Limitation Settings”.
	to:	**1**	Select a port or port range in the selection box to configure the “Rate Limitation Settings”.
Ingress (Mbs)		**0**	Enter the “Rate Limitation” for incoming packets in the input field. Port 1 … 8 0 … 100 Port 9 … 10 0 … 1000
Egress (Mbs)		**0**	Enter the “Rate Limitation” for outgoing packets in the input field.
Bandwidth Limitation Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Ingress (Mbs)			This column displays the bandwidth set for “Ingress”.
Egress (Mbs)			This column displays the bandwidth set for “Egress”.

9.3.2 IGMP Snooping

Note

Additional Information

Please refer to the section “Function Description” for more information on “IGMP Snooping” (**I**nternet **G**roup **M**anagement **P**rotocol Snooping).

9.3.2.1 IGMP Snooping

9.3.2.1.1 General Settings

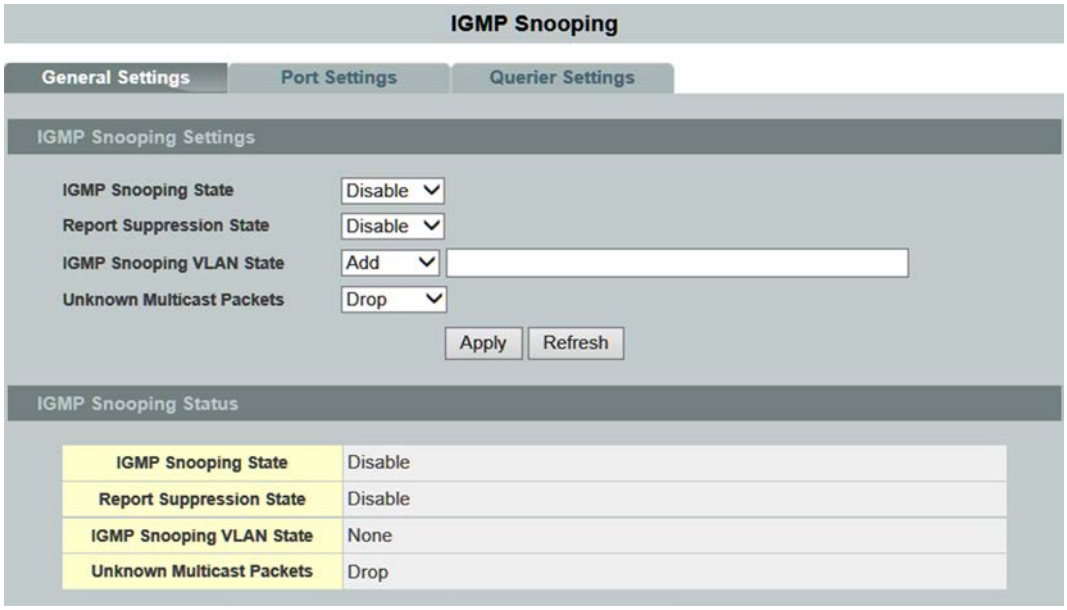


Figure 45: WBM “IGMP Snooping” Page – “General Settings” Tab

Table 49: WBM “IGMP Snooping” Page – “General Settings” Tab

IGMP Snooping Settings		
Parameters	**Default**	**Description**
IGMP Snooping State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable “IGMP Snooping” and to forward multicast group data only to ports that are members of this group.
Report Suppression State	**Disable**	Select “Disable” to disable the “Report Suppression” function for “IGMP Snooping”.
	Enable	Select “Enable” to enable the “Report Suppression” function for “IGMP Snooping”.
IGMP Snooping VLAN State	**Add**	Select “Add” in the selection box and enter the VLANs on which the switch should run “IGMP Snooping”. Valid range of VLAN IDs: 1 … 4094. Use a comma (,) or hyphen (-) to specify individual VLANs or VLAN ranges.
	Delete	Select “Delete” in the selection box and enter the VLANs on which the switch should not run “IGMP Snooping”.
Unknown Multicast Packets		In this selection box, specify the action to perform when the switch receives unknown multicast frames.
	Drop	Select “Discard” in the selection box to discard the frames.
	Flooding	Select “Flooding” in the selection box to forward the frames to all ports.
IGMP Snooping Status		
Parameters	**Default**	**Description**
IGMP Snooping State	Disable Enable	This display field indicates if “IGMP Snooping” is enabled or disabled globally.
Report Suppression State	Disable Enable	This display field indicates if the “Reporting Suppression Function” is enabled or disabled for “IGMP Snooping”.
IGMP Snooping VLAN State	None 1 … 4094	This display field indicates the VLANs on which the switch runs “IGMP Snooping”. “None” is displayed if “IGMP Snooping” is not enabled for any port.
Unknown Multicast Packets	Drop Flooding	This display field indicates if the switch discards unknown multicast packets or forwards them to all ports.

9.3.2.1.2 Port Settings

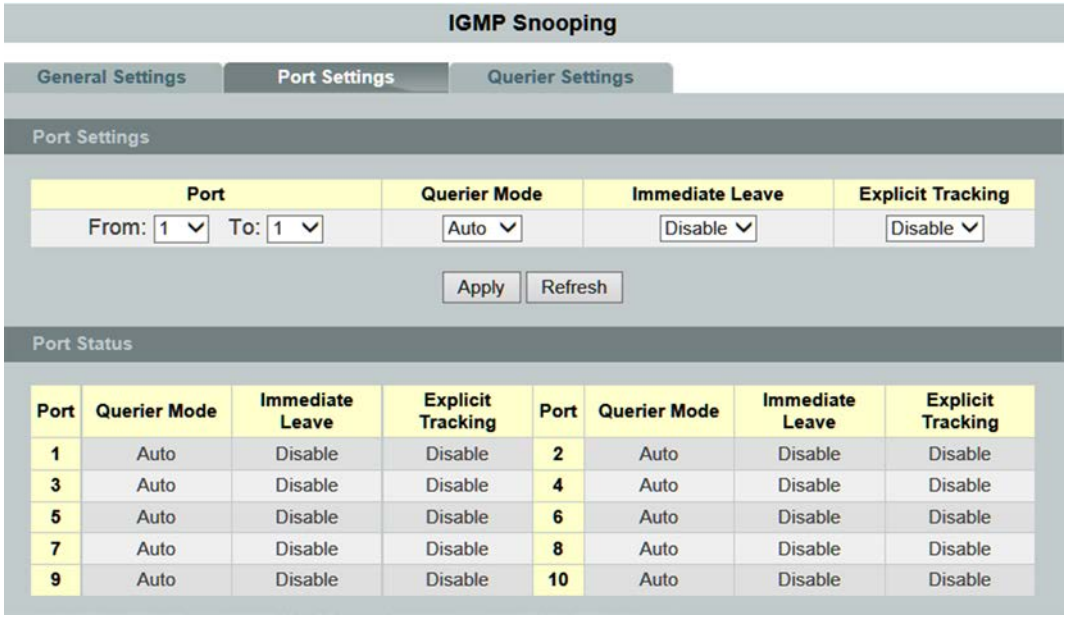


Figure 46: WBM “IGMP Snooping” Page – “Port Settings” Tab

Table 50: WBM “IGMP Snooping” Page – “Port Settings” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	In this selection box, select a port or port range to configure the “Port Settings”.
	to:	**1**	In this selection box, select a port or port range to configure the “Port Settings”.
Querier Mode		**Auto**	In this selection box, select the “Auto” setting if the switch should use the port as an “IGMP Query Port” if it receives “IGMP Query” packet.
		Fix	In this selection box, select the “Fix” setting if the switch should always use the port or ports as “IGMP Query Ports”. This setting is used if an IGMP multicast server is connected to the port(s).
		Edge	In this selection box, select the “Edge” setting if the switch should not use the port as an “IGMP Query Port”. In this case, the switch does not log that an IGMP router is connected to this port and does not forward the “IGMP Join/Leave” packets to this port.
Immediate Leave		**Disable**	In this selection box, select “Disable” to disable the “Immediate Leave” function on individual ports.
		Enable	In this selection box, select “Enable” to enable the “Immediate Leave” function on individual ports.
Port Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Querier Mode		Auto Fix Edge	This column displays the “Querier” mode for the specific port.
Immediate Leave		Disable Enable	This column displays the “Immediate Leave” setting for the specific port.

9.3.2.1.3 Querier Settings

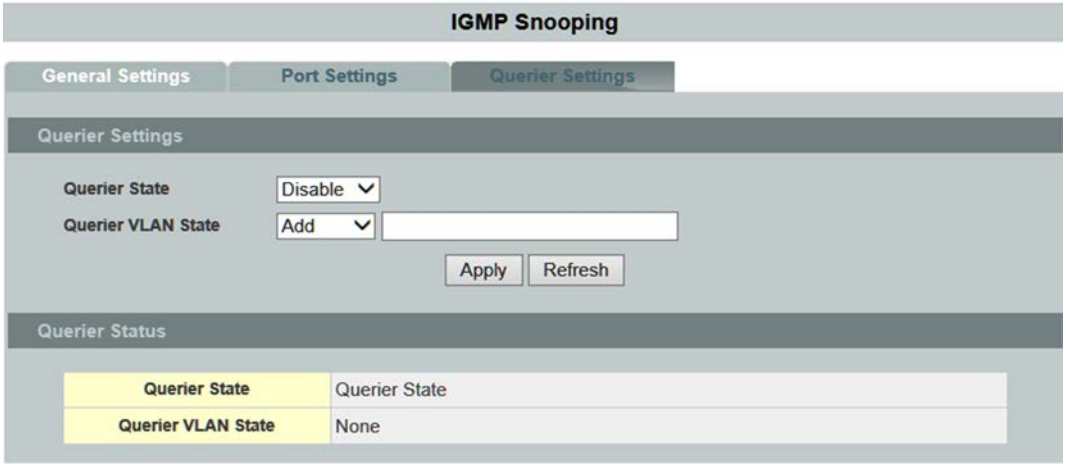


Figure 47: WBM “IGMP Snooping” Page – “Querier Settings” Tab

Table 51: WBM “IGMP Snooping” Page – “Querier Settings” Tab

Querier Settings		
Parameters	**Default**	**Description**
Querier State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable this function.
Querier VLAN State	**Add**	Select “Add” in the selection box to enter the VLAN ID.
	Delete	Select “Delete” in the selection box to delete the VLAN ID.
Querier Status		
Parameters	**Default**	**Description**
Querier State	Querier State	This field displays the Querier State.
Querier VLAN State	None 0 … 4094	This field displays the VLAN ID.

9.3.2.2 IGMP Filtering

9.3.2.2.1 General Settings

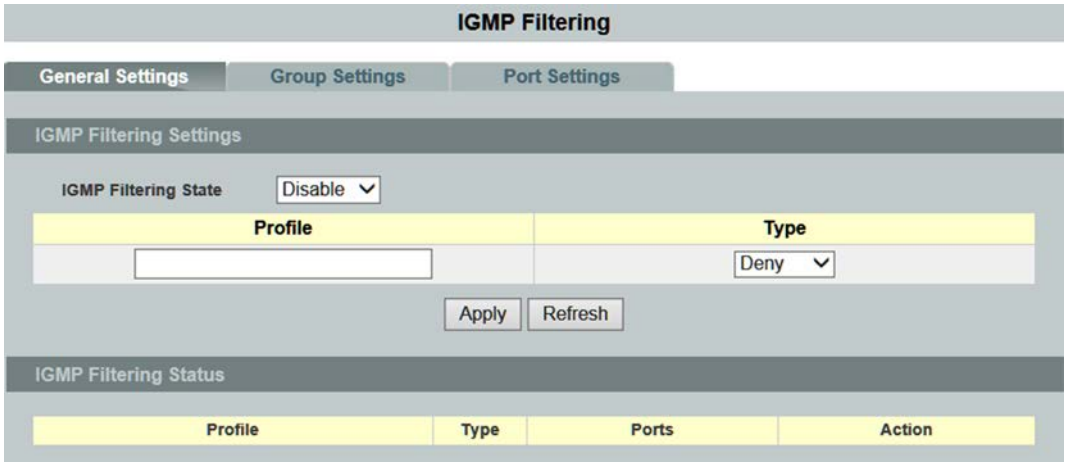


Figure 48: WBM “IGMP Filtering” Page – “General Settings” Tab

Table 52: WBM “IGMP Filtering” Page – “General Settings” Tab

IGMP Filtering Settings		
Parameters	**Default**	**Description**
IGMP Filtering State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable this function.
Profile		Enter the name for the IGMP filter in the input field.
Type	**Deny**	In the selection box, select “Deny” to deny access to the group.
	Permit	In the selection box, select “Permit” to ensure access to the group.
IGMP Filtering Status		
Parameters	**Default**	**Description**
Profile		This column displays the name of the profile. Click the name to modify the profile.
Type	Deny Permit	This column displays the type of action.
Ports	1 … 10	This column displays the ports on which the profile of the IGMP filter is enabled.
Action	Delete	Click **[Delete]** to delete the multicast addresses.

9.3.2.2.2 Group Settings

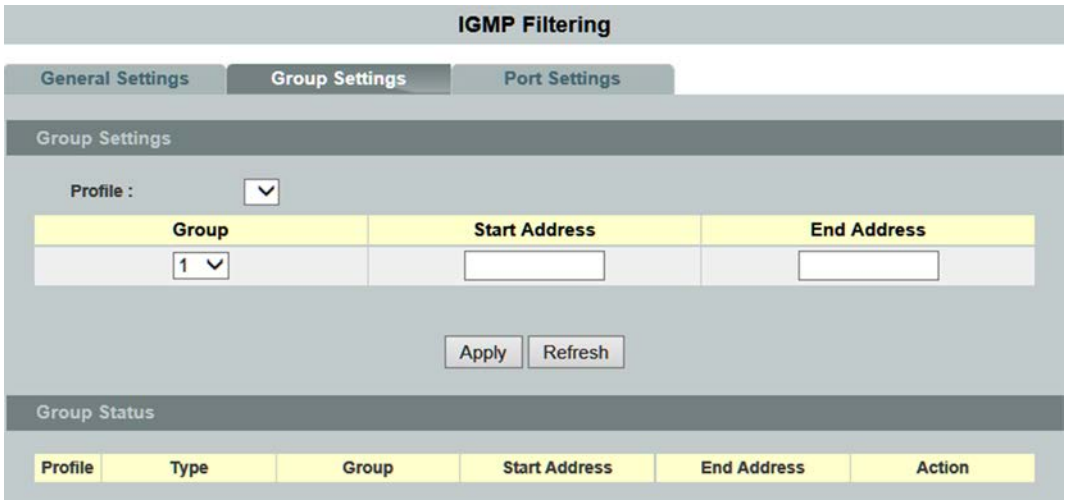


Figure 49: WBM “IGMP Filtering” Page – “Group Settings” Tab

Table 53: WBM “IGMP Filtering” Page – “Group Settings” Tab

Group Settings		
Parameters	**Default**	**Description**
Profile		Select the profile in the selection box that you want to configure for a group.
Group	**1** … 10	You can select a group in this selection box.
Start Address		In the input field, enter the first multicast address of the group that you want to configure.
End Address		In the input field, enter the last multicast address of the group that you want to configure.
Group Status		
Parameters	**Default**	**Description**
Profile		This column displays the name of the profile.
Type		This column displays the type of action.
Group	1 … 10	This column displays the group.
Start Address		This column displays the first multicast address.
End Address		This column displays the last multicast address.
Action	Delete	Click **[Delete]** to delete the multicast addresses.

9.3.2.2.3 Port Settings

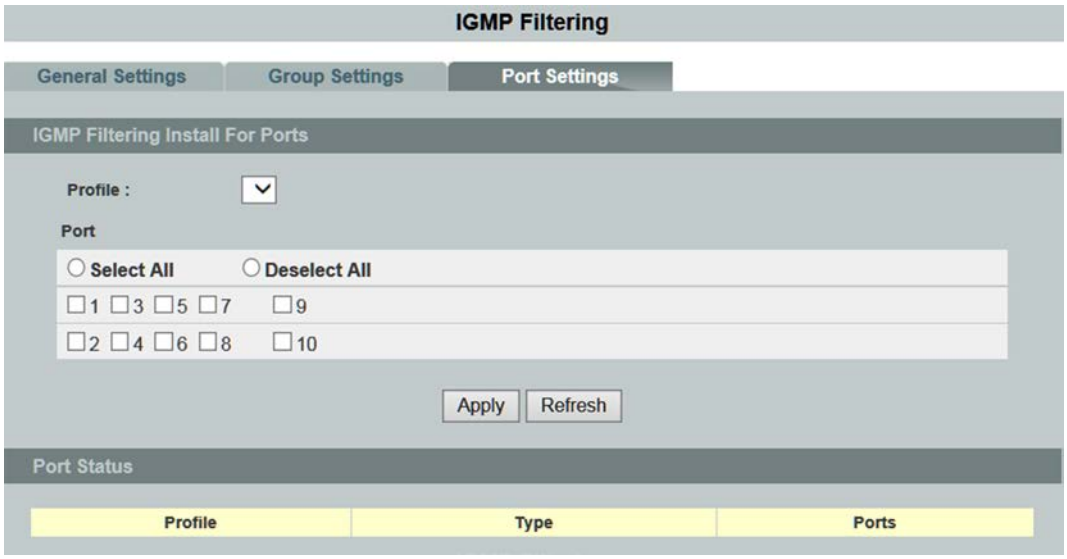


Figure 50: WBM “IGMP Filtering” Page – “Port Settings” Tab

Table 54: WBM “IGMP Filtering” Page – “Port Settings” Tab

IGMP Filtering Install For Ports				
Parameters		**Default**	**Description**	
Profile			Select the profile in the selection box that you want to configure for a group.	
Port	Select All	○	○	No port is selected.
			◉	All ports are selected.
	Deselect All	○	○	No port is disabled.
			◉	All ports are disabled.
	☐ 1 … ☐ 10	☐	☐	The port is not enabled.
			☑	The port is enabled.
Port Status				
Parameters		**Default**	**Description**	
Profile			This column displays the name of the profile.	
Type		Deny Permit	This column displays the type of action.	
Ports		1 … 10	This column displays the ports on which the profile of the IGMP filter is enabled.	

9.3.2.3 MVR

Note

Additional Information

Please refer to the section “Function Description” for more information on “MVR (**M**ulticast **V**LAN **R**egistration).

9.3.2.3.1 MVR Settings

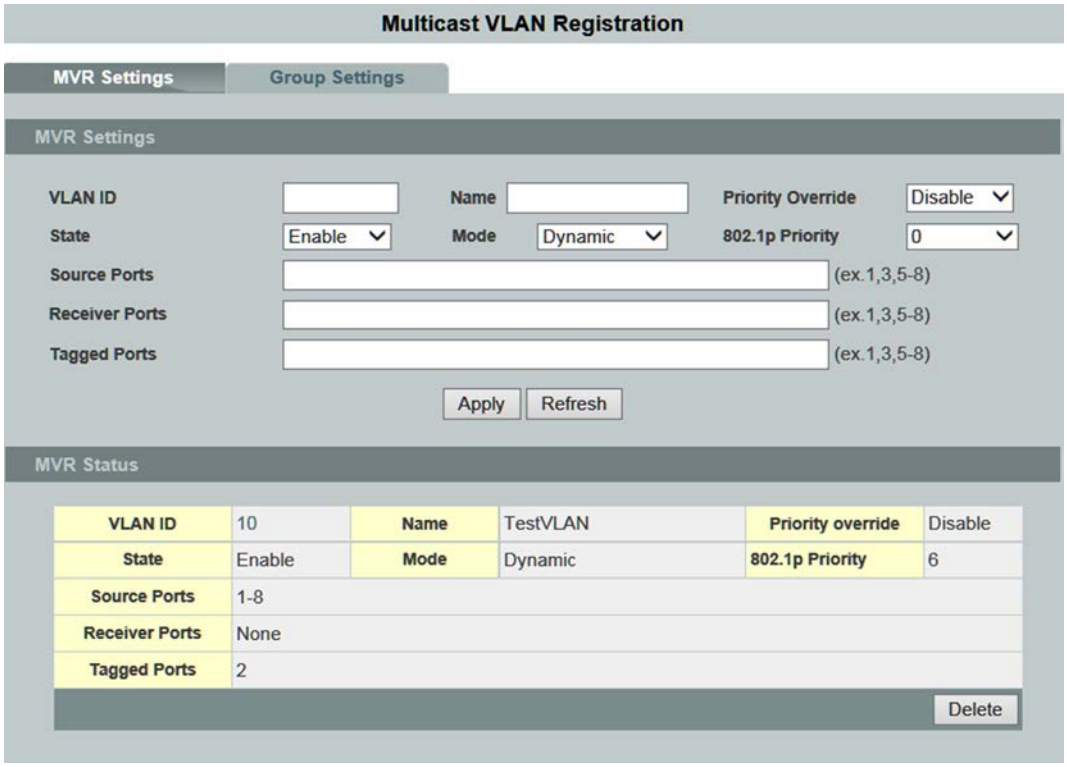


Figure 51: WBM “MVR” Page – “MVR Settings” Tab

Table 55: WBM “MVR” Page – “MVR Settings” Tab

MVR Settings		
Parameters	**Default**	**Description**
VLAN ID		Enter the VLAN ID in the input field.
Name		Enter the name for the MVR in the input field.
Priority Override	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable this function.
State	**Enable**	Select “Enable” in the selection box to enable the MVR.
	Disable	Select “Disable” in the selection box to disable the MVR.
Mode	**Dynamic**	Select “Dynamic” in the selection box to configure the dynamic mode for the MVR.
	Compatible	Select “Compatible” in the selection box to configure the compatible mode for the MVR.
802.1p Priority	**0** … 7	In the selection box, select a priority for packets received on this port. Only packets without an “802.1p Tag Priority” are assigned the specified priority.
Source Ports	1 … 8	Enter the source port or source port range for the MVR in the input field. Normally, the source ports are connected to the “Streaming Server”.
Receiver Ports	1 … 8	Enter the receiver port or receiver port range for the MVR in the input field. Normally, the source ports are connected to the “Streaming Client”.
Tagged Ports	1 … 8	Enter the tagged port or port range for the MVR in the input field. The same applies to VLAN tagged ports.
MVR Status		
Parameters	**Default**	**Description**
VLAN ID		This field displays the VLAN ID.
Name		This field displays the name you choose.
Priority Override	Disable Enable	This field displays the status.
State	Disable Enable	This field displays the status of the MVR.
Mode	Dynamic Compatible	This field displays the mode of the MVR.
802.1p Priority	0 … 7	This field displays the packet priority you choose.
Source Ports	1 … 8	This field displays the source port or source port range for the MVR.
Receiver Ports	1 … 8	This field displays the receiver port or receiver port range for the MVR.
Tagged Ports	1 … 8	This field displays the tagged port or port range for the MVR.

9.3.2.3.2 Group Settings

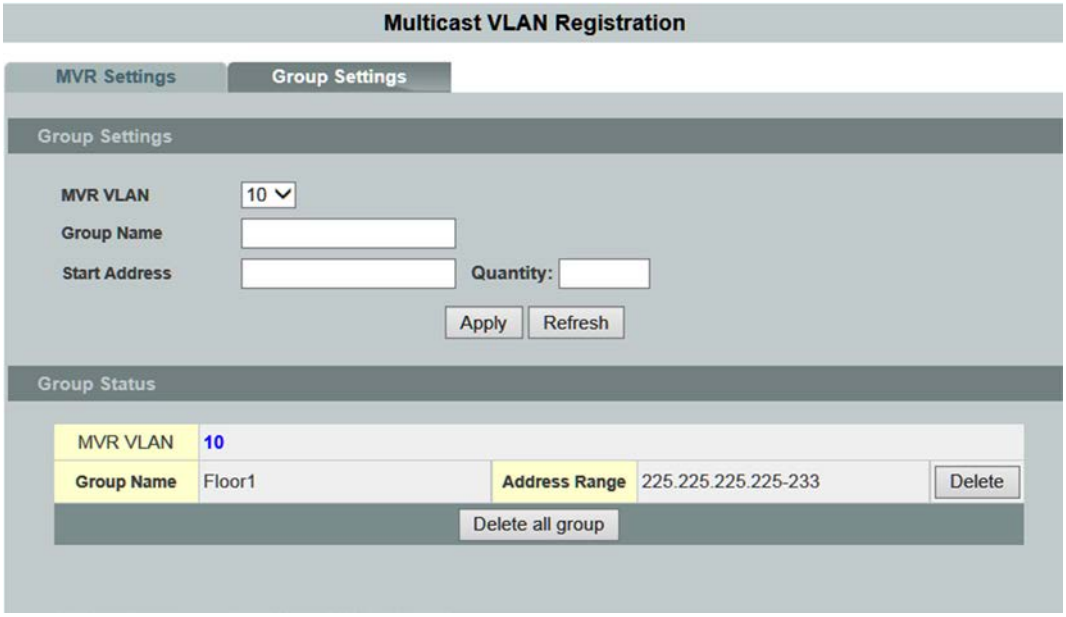


Figure 52: WBM “MVR” Page – “Group Settings” Tab

Table 56: WBM “MVR” Page – “Group Settings” Tab

Group Settings		
Parameters	**Default**	**Description**
MRV VLAN	1 … 10	Select the number of MVR VLANs in the selection box.
Group Name		Enter the group name for the MVR in the input field.
Start Address		Enter the multicast start address in the input field.
Quantity		Enter the number of multicast addresses in the input field.
Group Status		
Parameters	**Default**	**Description**
MRV VLAN	1 … 10	This field displays the number of MVR VLANs.
Group Name		This field displays the group name you choose.
Address range		This display fields shows the multicast start address.
Delete		Click **[Delete]** to delete this setting.
Delete All Group		Click **[Delete All Group]** to delete the settings for the entire group.

9.3.2.4 Multicast Address

Note

Additional Information

Please refer to the section “Function Description” for more information on “Multicast Address”.

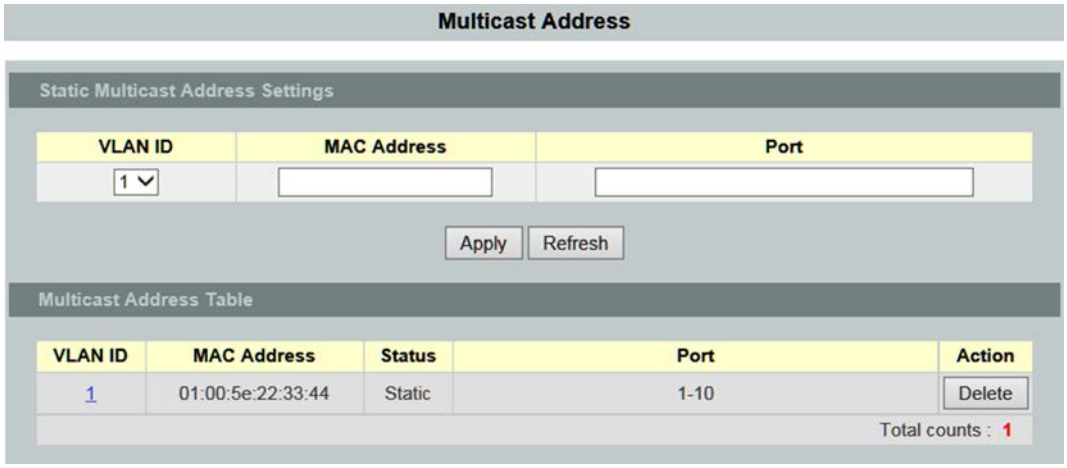


Figure 53: WBM “Multicast Address” Page

Table 57: WBM “Multicast Address” Page

Static Multicast Address Settings		
Parameters	**Default**	**Description**
VLAN ID	**1**	Select the VLAN ID in the selection box that you want to configure.
MAC Address		Enter the multicast MAC address of the respective ring in the input field. Configure a multicast MAC that does not receive an “Age Time.” The valid format is: 0x:0x:0x:0x:0x:0x.
Port		Enter the subscriber port for the multicast address in the input field.
Multicast Address Table		
Parameters	**Default**	**Description**
VLAN ID	0 … 4094	This column displays the selected VLAN IDs.
MAC Address		This column displays the multicast addresses.
Status		This column displays the status of the multicast addresses.
Port	1 - 10	This column displays the port numbers.
Action		Click **[Delete]** to delete the multicast addresses.
Total count		This field displays the total number of entries in the multicast address table.

9.3.2.5 Multicast IP Statistics

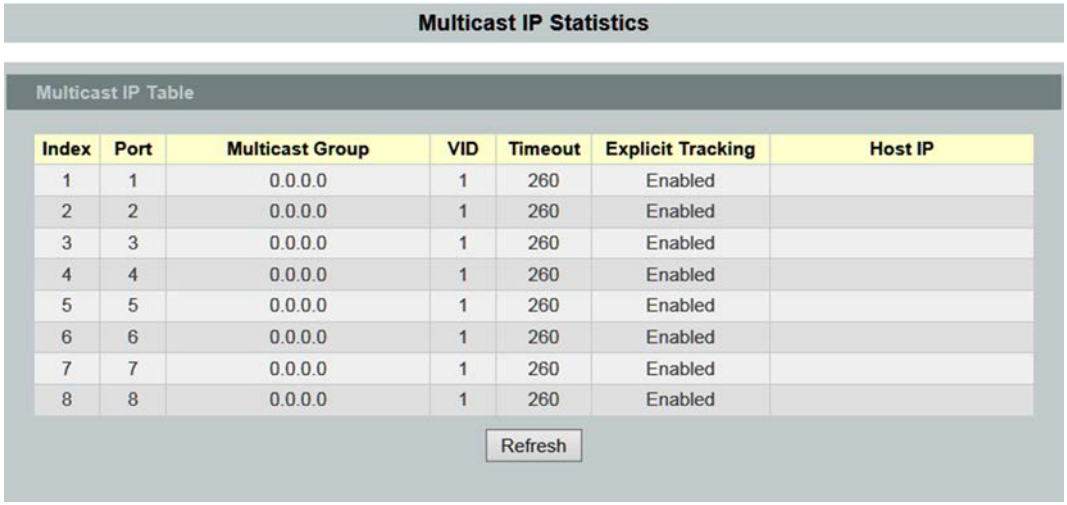


Figure 54: WBM “Multicast IP Statistics” Page

Table 58: WBM “Multicast IP Statistics” Page

Multicast IP Table		
Parameters	**Default**	**Description**
Index	1 … 10	This column displays the number of entries.
Port	1 … 10	This column displays the port number.
Multicast Group		This column displays the IP address of the multicast group.
VID		This column displays the VLAN ID.
Timeout		This column displays the timeout time.
Explicit Tracking		This column displays if “Explicit Tracking” is set.
Host IP		This column displays the host IP.

9.3.3 VLAN

Note

Additional Information

Please refer to the section “Function Description” for more information on “VLAN” (**V**irtual **L**ocal **A**rea **N**etwork).

9.3.3.1 Port Isolation

Note

Additional Information

Please refer to the section “Function Description” for more information on “Port Isolation”.

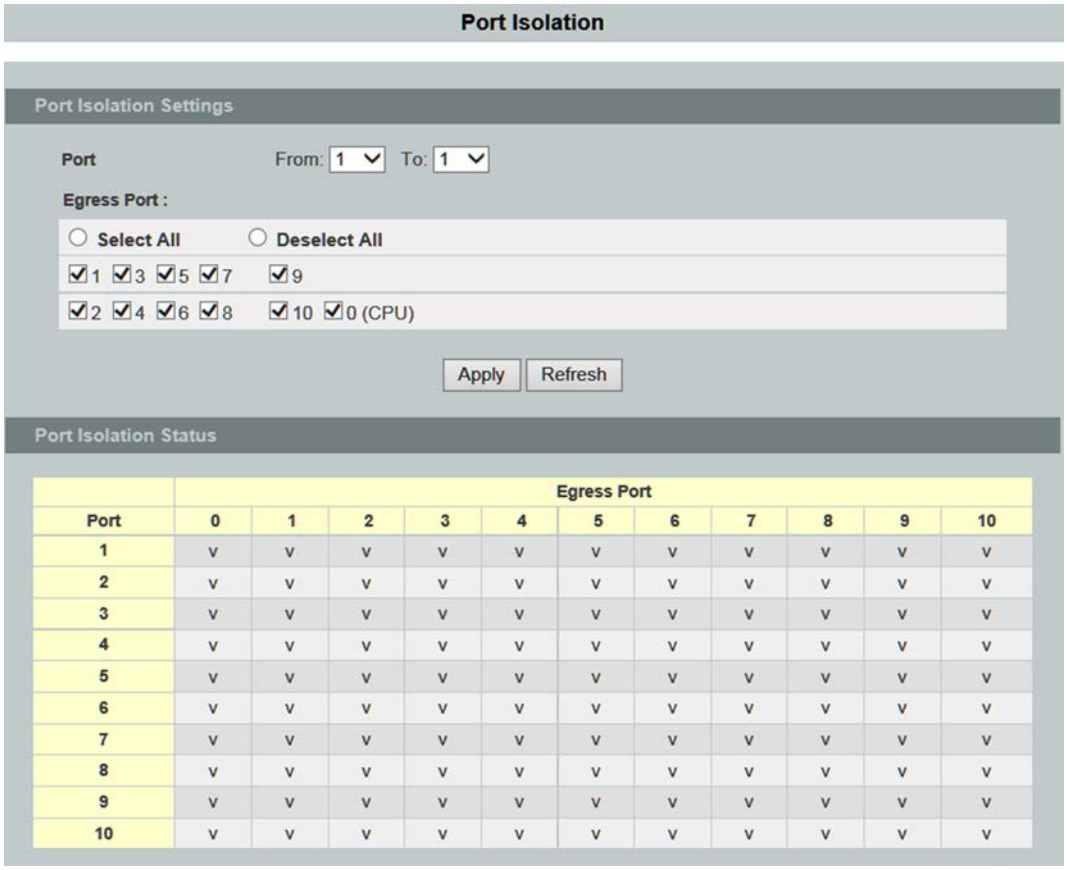


Figure 55: WBM “Port Isolation” Page

Table 59: WBM “Port Isolation” Page

Port Isolation Settings				
Parameters		**Default**	**Description**	
Port	From:	**1**	Select a port or port range in the selection box for which you want to configure the “Port Isolation” setting.	
	to:	**1**	Select a port or port range in the selection box for which you want to configure the “Port Isolation” setting.	
Egress Port			An egress port is an outgoing port through which a data packet is sent. The selection of a port as an egress port means that it can communicate with the port being configured.	
	Select All	○	○	No egress port is selected.
			◉	All egress ports are selected.
	Deselect All	○	○	No egress port is disabled.
			◉	All egress ports are disabled.
	☐ 0 (CPU) … ☐ 10	☐	☐	The egress port is not enabled.
			☑	The egress port is enabled.
Port Isolation Status				
Parameters		**Default**	**Description**	
Port		**V**	V	“V” indicates that the port's packets can be sent to this port.
Egress Port			-	“-” indicates the port’s packets cannot be sent to this port.

9.3.3.2 VLAN

9.3.3.2.1 VLAN Settings

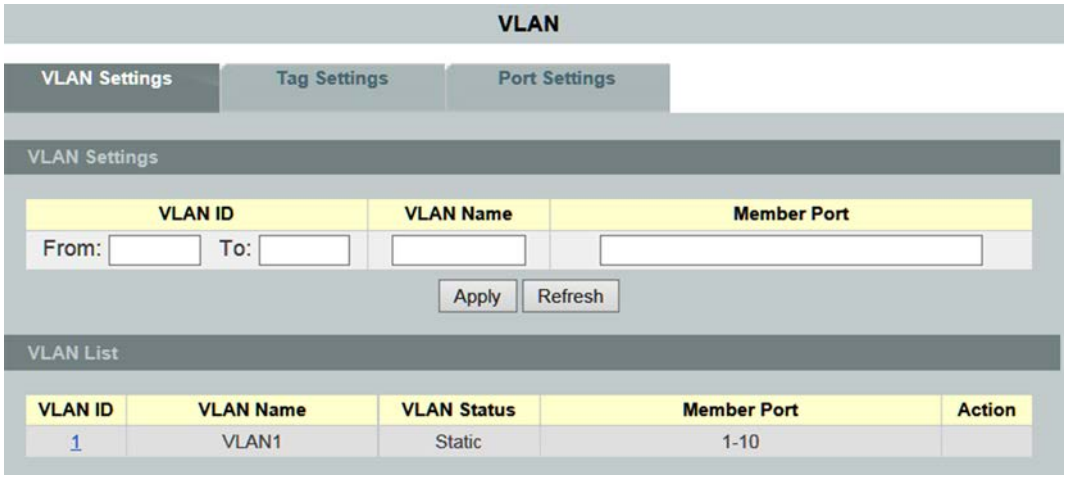


Figure 56: WBM “VLAN” Page – “VLAN Settings” Tab

Table 60: WBM “VLAN” Page – “VLAN Settings” Tab

VLAN Settings			
Parameters		**Default**	**Description**
VLAN ID	From:		Enter the VLAN ID for this entry in the input field. Valid range: 1 … 4094
	To:		Enter the VLAN ID for this entry in the input field. Valid range: 1 … 4094
VLAN Name			Enter a descriptive name for the VLAN for identification purposes. The VLAN name should be a combination of numbers, letters, hyphens (-) or underscores (_).
Member Port			Enter the port numbers that the switch should assign to the VLAN as subscribers. You can specify multiple individual port numbers or ranges by using a comma (,) to separate individual ports or using a hyphen (-) for port ranges.

Table 60: WBM “VLAN” Page – “VLAN Settings” Tab

VLAN List		
Parameters	**Default**	**Description**
VLAN ID	1 … 4094	This column displays the index number of the VLAN entry. Click the number to modify the VLAN entry.
VLAN Name		This field displays the name of the VLAN.
VLAN Status	Static Dynamic 802.1Q-VLAN	This field displays the status of the VLAN.
Member Port	1-10	This column displays which ports are assigned to the VLAN as subscribers.
Action		Click **[Delete]** to delete the VLAN.
		Note  **Note** **Deleting VLAN1** VLAN1 cannot be deleted.

9.3.3.2.2 Tag Settings

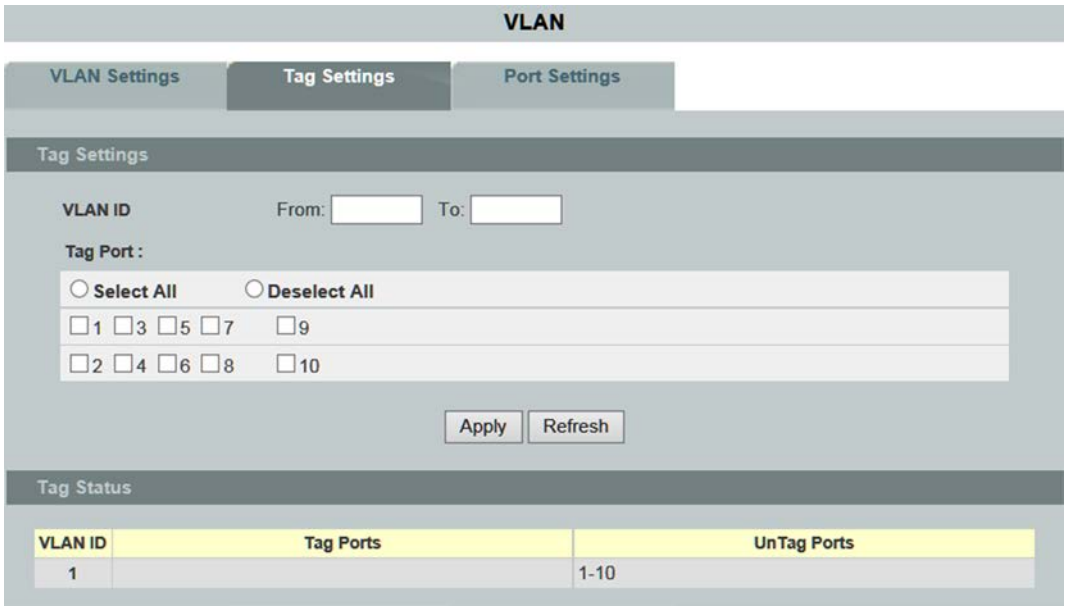


Figure 57: WBM “VLAN” Page – “Tag Settings” Tab

Table 61: WBM “VLAN” Page – “TAG Settings” Tab

Tag Settings				
Parameters		**Default**	**Description**	
VLAN-ID	From:		Enter the VLAN ID for this entry in the input field. Valid range: 1 … 4094	
	to:		Enter the VLAN ID for this entry in the input field. Valid range: 1 … 4094	
Tag Port	Select All	○	○	No port is selected as a tagged port.
			◉	All ports are selected as tagged ports.
	Deselect All	○	○	No tagged port is disabled.
			◉	All tagged ports are disabled.
	☐ 1 … ☐ 10	☐	☐	The port is not enabled.
			☑	The port is enabled.
Tag Status				
Parameters		**Default**	**Description**	
VLAN ID		1 … 4094	This column displays the VLAN ID.	
Tag Ports		1 … 7	This field displays the ports that have been assigned as tag ports.	
Un Tag Ports		1 … 7	This field displays the ports that have been assigned as untagged ports.	

9.3.3.2.3 Port Settings

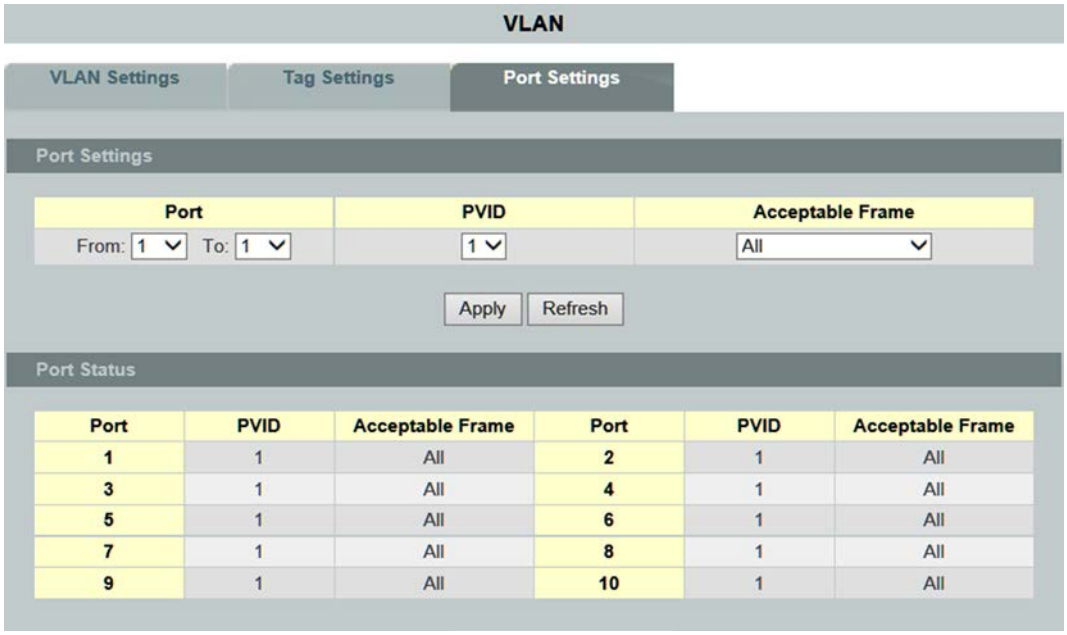


Figure 58: WBM “VLAN” Page – “Port Settings” Tab

Table 62: WBM “VLAN” Page – “Port Settings” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “Port Settings”.
	To:	**1**	Select a port or port range in the selection box to configure the “Port Settings”.
PVID		**1**	Select the PVID (Port VLAN ID) in the selection box.
Acceptable Frame			You can specify the frame types allowed for a port in this selection box.
		All	Select “All” in the selection box if all frames (tagged and untagged) should be accepted on this port.
		VLAN untagged only	Select “VLAN Untagged Only” in the selection box if only untagged frames should be accepted on this port. All tagged frames are dropped.
		VLAN tagged only	Select “VLAN Tagged Only” in the selection box if only tagged frames should be accepted on this port. All untagged frames are dropped.
Port Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
PVID			This column displays the VLAN ID numbers.
Acceptable Frame		All VLAN untagged only VLAN tagged only	This field displays the type of frames allowed on the port.

9.3.3.3 GARP/GVRP

Note

Additional Information

Please refer to the section “Function Description” for more information on “GARP/GVRP” (**G**eneric **A**ttribute **R**egistration **P**rotocol/**G**ARP **V**LAN **R**egistration **P**rotocol or **G**eneric **V**LAN **R**egistration **P**rotocol).

9.3.3.3.1 GVRP

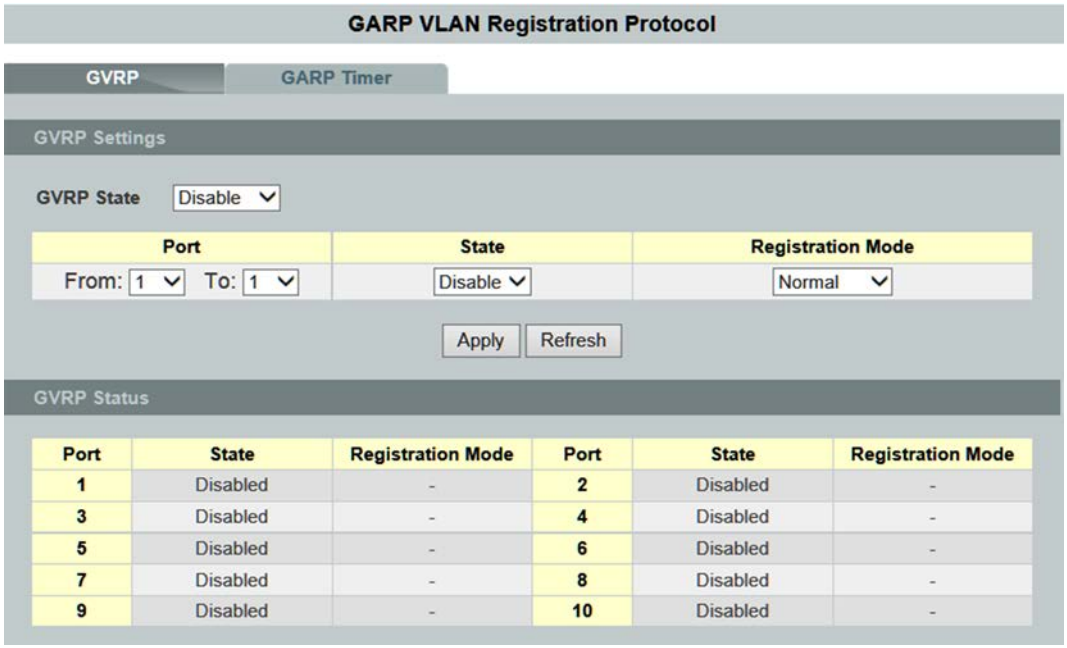


Figure 59: WBM “GARP VLAN Registration Protocol” Page – “GVRP” Tab

Table 63: WBM “GARP VLAN Registration Protocol” Page – “GVRP” Tab

GVRP Settings			
Parameters		**Default**	**Description**
GVRP State		**Disable**	Select “Disable” in the selection box to disable the GVRP function.
		Enable	Select “Enable” in the selection box to enable the GVRP function and to exchange the VLAN configuration information with other GVRP switches.
Port	From:	**1**	Select a port or port range in the selection box to configure the GVRP settings.
	To:	**1**	Select a port or port range in the selection box to configure the GVRP settings.
State		**Disable**	Select “Disable” in the selection box to disable the GVRP function for the port.
		Enable	Select “Enable” in the selection box to enable the GVRP function for the port.
Registration Mode		**Normal**	Select “Normal” in the selection box to allow dynamic creation (if dynamic VLAN creation is enabled), registration and deregistration of VLANs on the trunk port.
		Forbidden	Select “Forbidden” in the selection box to deregister all VLANs (except VLAN 1) and to prevent any further creation or deregistration of VLANs on the “Trunk Port”.
GVRP Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
State		Disable Enable	This column displays the set status.
Registration Mode		Normal Forbidden	This column displays the selected registration mode.

9.3.3.3.2 GARP Timer

Note

Size of the “leave”, “join”, “leave” and “leaveall” values
The value for “leave” must be three times the value for “join” (leave >= join x 3).
The value for “leaveall” must be greater than the value for “leave” (leaveall > leave).

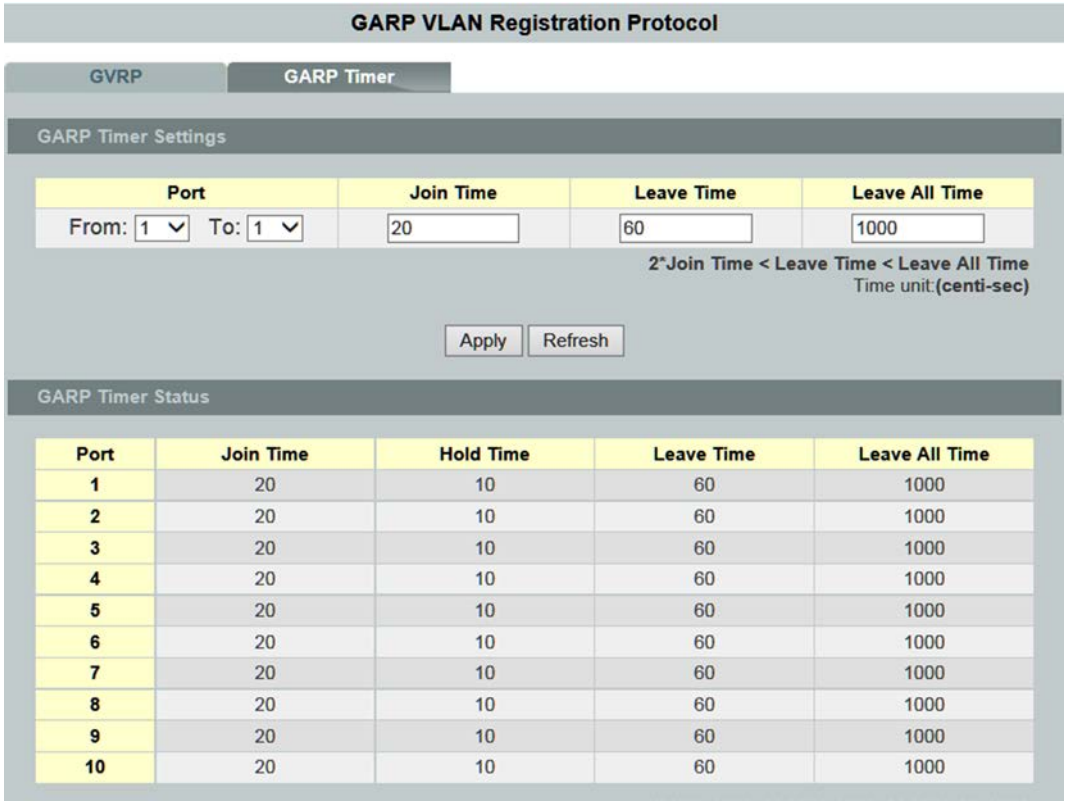


Figure 60: WBM “GARP VLAN Registration Protocol” Page – “GVRP Timer” Tab

Table 64: WBM “GARP VLAN Registration Protocol” Page – “GVRP Timer” Tab

GARP Timer Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the GARP timer.
	To:	**1**	Select a port or port range in the selection box to configure the GARP timer.
Join Time		**20**	Enter the maximum time in milliseconds that the interface waits before sending VLAN messages.
Leave Time		**60**	Enter the maximum time in milliseconds that the interface waits after receiving a “Leave Message” before the interface leaves the VLAN specified in the message.
Leave All Time		**1000**	Enter the time interval in milliseconds after which the Leave All messages are sent to interfaces. Leave All messages can help to update information about current GVRP VLAN subscriber information in the network.
GARP Timer Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Join Time			This column displays the Join Time.
Hold Time		**10**	This column displays the Hold Time.
Leave Time			This column displays the Leave Time.
Leave All Time			This column displays the Leave All Time.

9.3.3.4 IP-Subnet-VLAN

Note

Additional information

Please refer to the section “Function Description” for more information on “IP Subnet VLAN.”

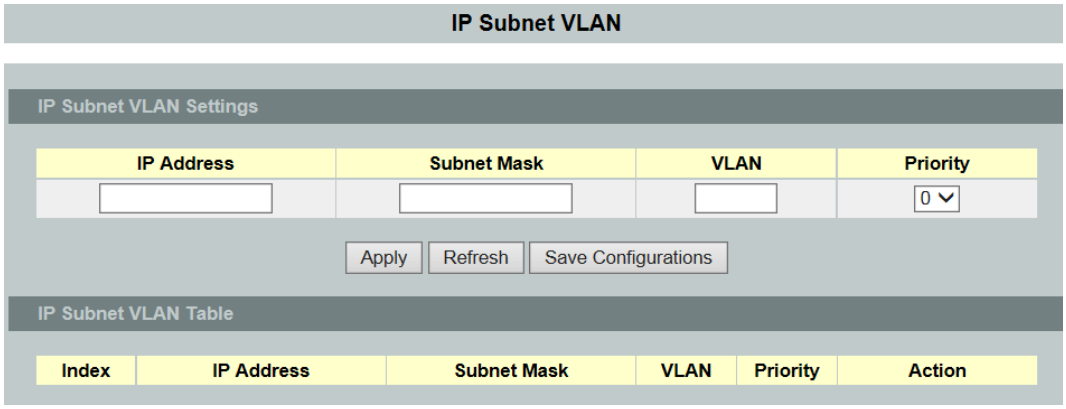


Figure 61: WBM„IP-Subnet-VLAN“

Table 65: WBM “IP Subnet VLAN” Page

IP Subnet VLAN Settings		
Parameter	**Default**	**Description**
IP Address		Enter the IP address of the IP subnet VLAN in the input field.
Subnet Mask		Enter the subnet mask of the switch in the input field in decimal-point notation.
VLAN (1–4094)		Enter the value for the IP subnet VLAN for the instance in the input field. Valid range: 1 … 4094 One or more data VLANs can be configured.
Priority	**0** … 7	Select the respective priority for the specific port in the selection box. 0 = Lowest priority 7 = Highest priority
IP Subnet VLAN Table		
Parameter	**Default**	**Description**
Index	1 … 10	This column displays the number of entries.
IP Address		This column displays the IP address of the IP subnet VLAN.
Subnet Mask		This column shows the subnet mask of the switch.
VLAN		This column displays the IP subnet VLAN ID for the specific port.
Priority	0 … 7	This column displays the priority for the specific port.
Action		Click **[Delete]** to delete the IP subnet VLAN addresses.
Number of Entries		This field displays the total number of entries in the IP subnet VLAN table.

9.3.3.5 MAC VLAN

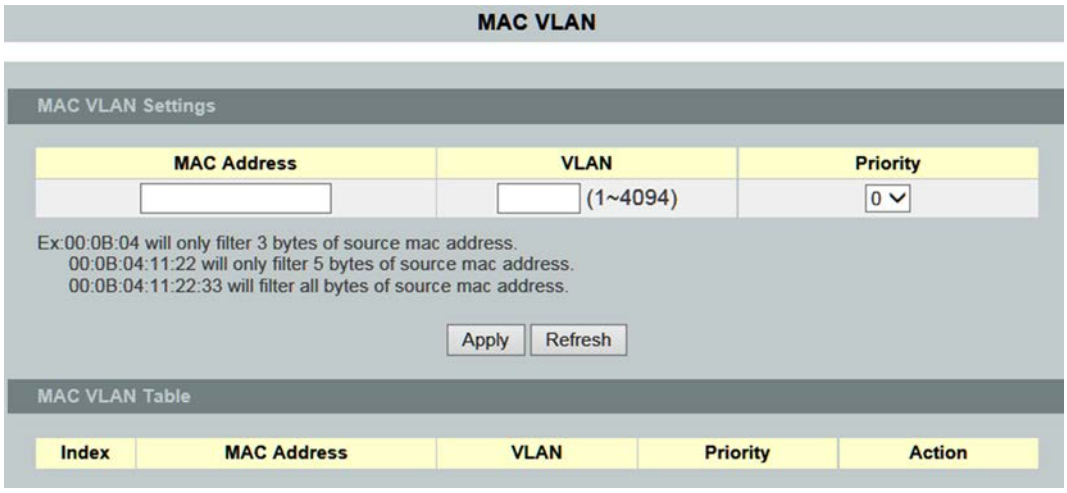


Figure 62: WBM “MAC VLAN” Page

Table 66: WBM “MAC VLAN” Page

MAC VLAN Settings		
Parameters	**Default**	**Description**
MAC Address		Enter the first three or more bytes of the MAC address in the input field.
VLAN		Enter the value for the MAC VLAN for the instance in the input field. Valid range: 1 … 4094 One or more data VLANs can be configured.
Priority	**0** … 7	Select the respective priority for the specific port in the selection box. 0 = Lowest priority 7 = Highest priority
MAC VLAN Table		
Parameters	**Default**	**Description**
Index	1 … 10	This column displays the number of entries.
MAC Address		This column displays the MAC address.
VLAN		This column displays the VLAN ID for the specific port.
Priority	0 … 7	This column displays the priority for the specific port.
Action		Click **[Delete]** to delete the multicast addresses.

9.3.3.6 Protocol VLAN

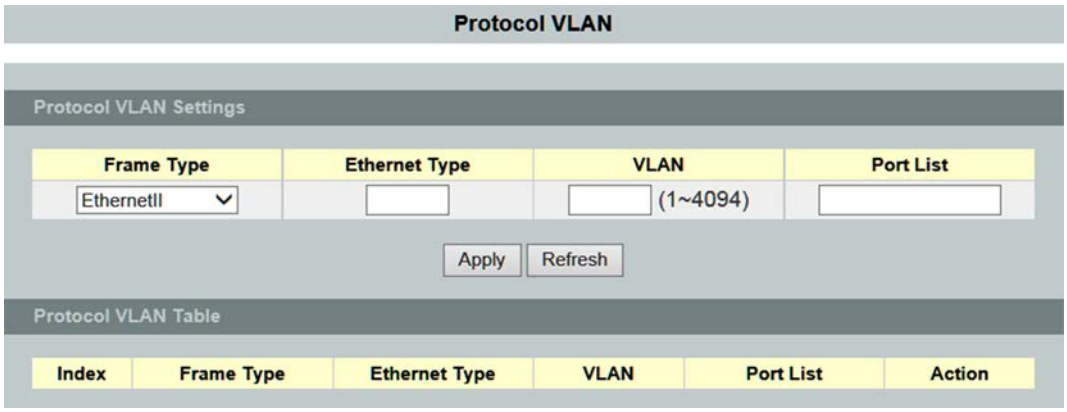


Figure 63: WBM “Protocol VLAN” Page

Table 67: WBM “Protocol VLAN” Page

Protocol VLAN Settings		
Parameters	**Default**	**Description**
Frame Type	**EthertnetII**	Select “EthernetII” in the selection box if you want to configure this frame type.
	NonLLC-SNAP	Select “NonLLC-SNAP” in the selection box if you want to configure this frame type.
	LLC-SNAP	Select “LLC-SNAP” in the selection box if you want to configure this frame type.
Ethernet Type		Enter the ETHERNET type in the input field. (e.g., 0800)
VLAN (1~4094)	1 … 4094	Enter the VLAN ID in the input field.
Port List	1 … 10	Enter the port or port group (e.g., 1 – 3) for the protocol VLAN in the input field.
Protocol VLAN Table		
Parameters	**Default**	**Description**
Index		This column displays the number of entries.
Frame Type		This column displays the frame type.
Ethernet Type		This column displays the ETHERNET type.
VLAN		This column displays the VLAN ID.
Port List		This column displays the port list.
Action		Click **[Delete]** to delete the multicast addresses.

9.3.3.7 Q-in-Q

Note

Additional Information

Please refer to the section “Function Description” for more information on “Q-in-Q”.

9.3.3.7.1 VLAN Stacking

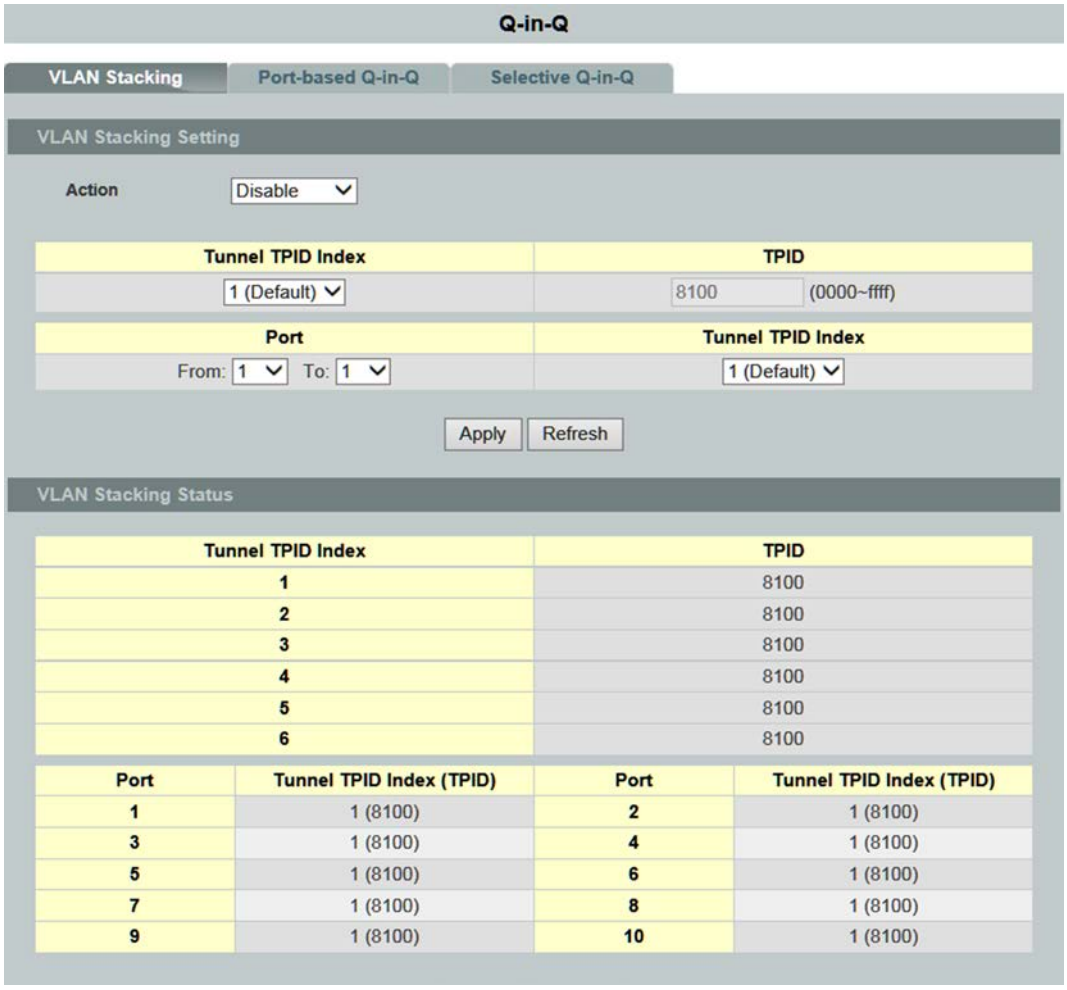


Figure 64: WBM “Q-in-Q” Page – “VLAN Stacking” Tab

Table 68: WBM “Q-in-Q” Page – “VLAN Stacking” Tab

VLAN Stacking Setting			
Parameters		**Default**	**Description**
Action		**Disable**	Select “Disable” in the selection box to disable the VLAN Stacking function.
		Port-based	Select “Port-Based” in the selection box to execute the VLAN Stacking function port-based.
		Selective	Select “Selective” in the selection box to execute the VLAN Stacking function selectively.
Tunnel TPID Index		**1 (Default)** … 6	Select a table index number in the selection box.
TPID (0000~ffff)			Enter a value for the TPID in the input field.
Port	From:	**1**	Select a port or port range in the selection box to configure the “VLAN Stacking”.
	To:	**1**	Select a port or port range in the selection box to configure the “VLAN Stacking”.
Tunnel TPID Index		**1 (Default)** … 6	Select a “Tunnel TPID Index” in the selection box.
VLAN Stacking Status			
Parameters		**Default**	**Description**
Tunnel TPID Index		1 … 6	This column displays the table index number.
TPID		0000 … ffff	This column displays the TPID.
Port		1 … 10	This column displays the port number.
Tunnel TPID Index (TPID)			This column displays the index number for the specific port.

9.3.3.7.2 Port-based Q-in-Q

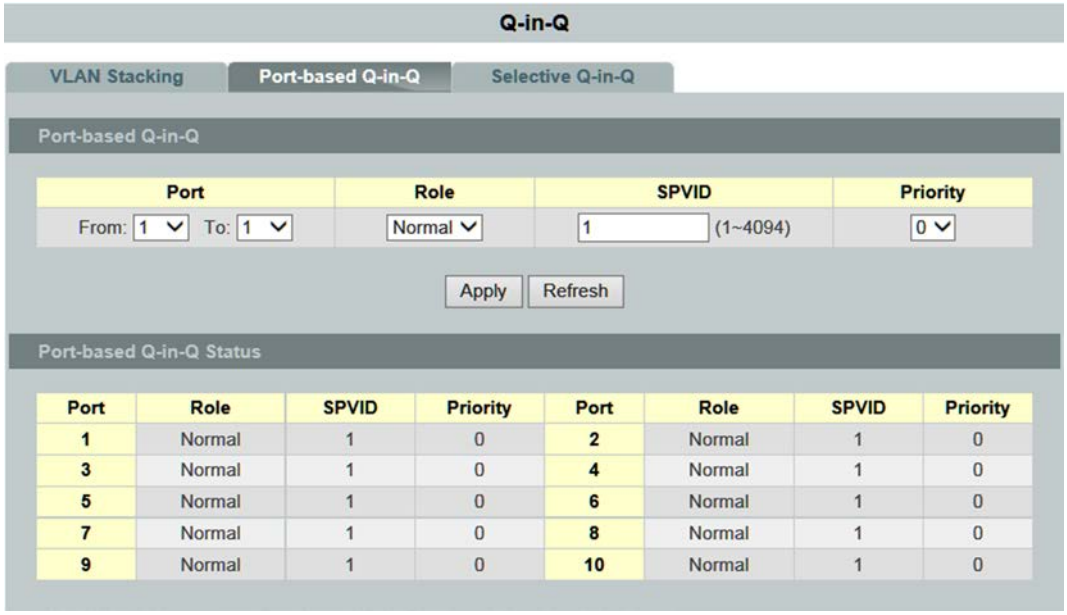


Figure 65: WBM “Q-in-Q” Page – “Port-based Q-in-Q” Tab

Table 69: WBM “Q-in-Q” Page – “Port-based Q-in-Q” Tab

Port-based Q-in-Q			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “Q-in-Q”.
	To:	**1**	Select a port or port range in the selection box to configure the “Q-in-Q”.
Role		**Normal**	Select “Normal” in the selection box to select this role for the specific port.
		Access	Select “Access” in the selection box to select this role for the specific port.
		Tunnel	Select “Tunnel” in the selection box to select this role for the specific port.
SPVID (1~4094)		**1**	Enter the service provider VLAN “SPVID” in the input field.
Priority		**0**	Select the respective priority for the specific port in the selection box. 0 = Lowest priority 7 = Highest priority
Port-based Q-in-Q Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port number.
Role			This column displays the role of the specific port.
SPVID		1 … 10	This column displays the SPVID.
Priority			This column displays the priority for the specific port.

9.3.3.7.3 Selective Q-in-Q

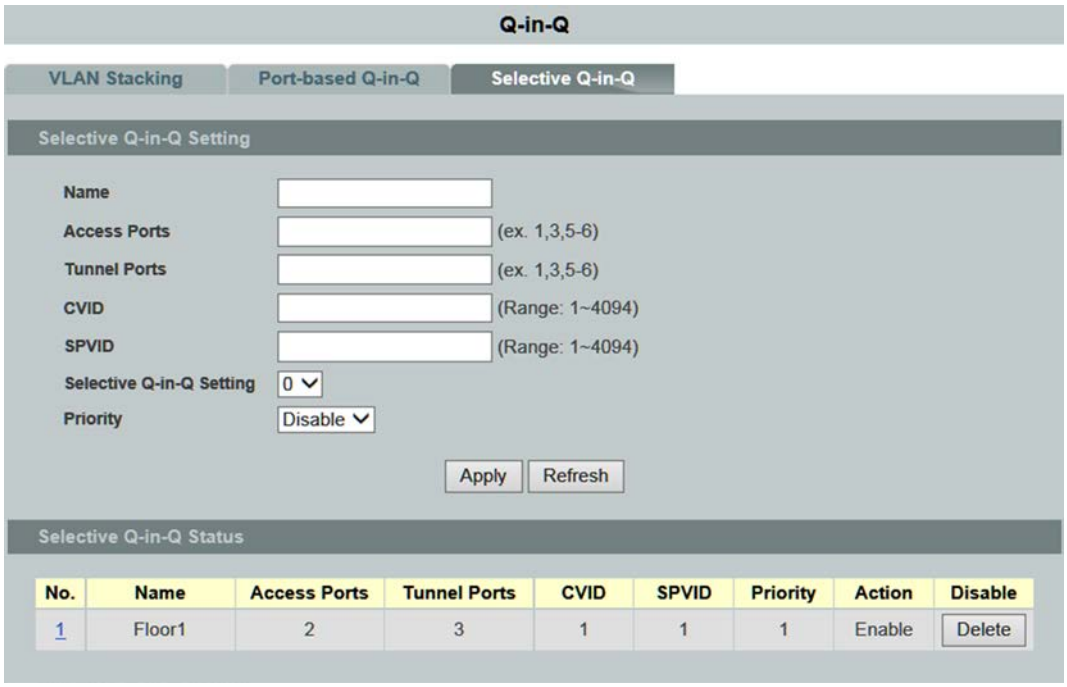


Figure 66: WBM “Q-in-Q” Page – “Selective Q-in-Q” Tab

Table 70: WBM “Q-in-Q” Page – “Selective Q-in-Q” Tab

Selective Q-in-Q Setting		
Parameters	**Default**	**Description**
Name		Enter the name for the selective Q-in-Q profile in the input field.
Access Ports (ex. 1,3,5-6)		Enter the Access port or port range in the input field.
Tunnel Ports (ex. 1,3,5-6)		Enter the tunnel port or port range in the input field.
CVID (Range: 1~4094)		Enter a customer VLAN “CVID” in the input field.
SPVID (Range: 1~4094)		Enter a service provider VLAN “SPVID” in the input field.
Selective Q-in-Q Setting	**0** … 7	Select the respective priority level in the selection box. 0 = Lowest priority 7 = Highest priority
Priority	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable this function.
Selective Q-in-Q Status		
Parameters	**Default**	**Description**
No.		This column displays the index No.
Name		This column displays the name of the selective Q-in-Q profile.
Access Ports		This column displays the Access port.
Tunnel Ports		This column displays the Tunnel port.
CVID		This column displays the customer VLAN “CVID”.
SPVID		This column displays the service provider VLAN “SPVID”.
Priority	0 … 7	This column displays the respective priority level. 0 = Lowest priority 7 = Highest priority
Action	Disable Enable	This column displays the selected action.
Disable		Click **[Delete]** to delete the selective Q-in-Q settings.

9.3.4 DHCP Relay

Note

Additional Information

Please refer to the section “Function Description” for more information on “DHCP Relay” (**D**ynamic **H**ost **C**onfiguration **P**rotocol **Relay**).

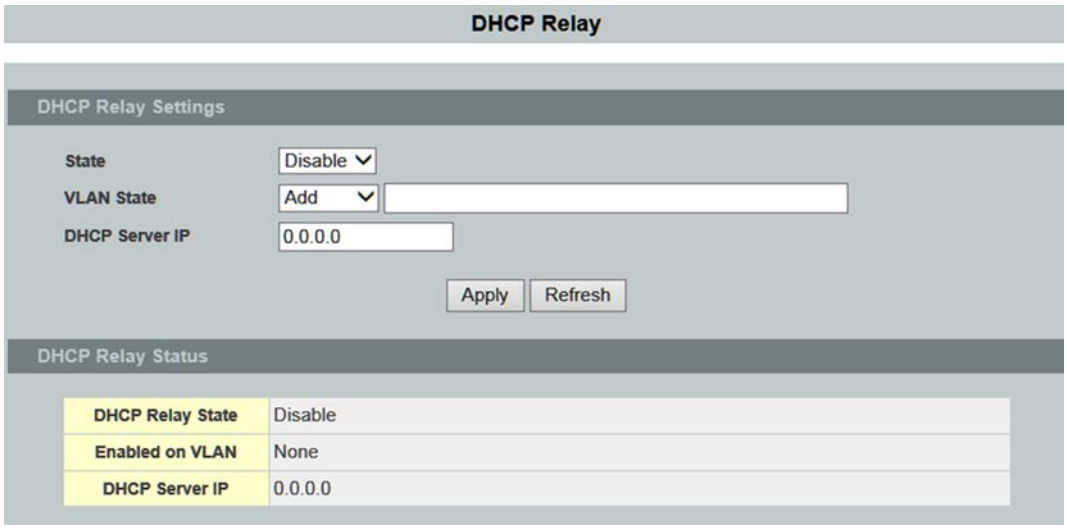


Figure 67: WBM “DHCP Relay” Page

Table 71: WBM “DHCP Relay” Page

DHCP Relay Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable the “DHCP Relay”.
VLAN State	**Add**	Select “Add” in the selection box and enter the VLANs on which the switch should run “DHCP Relay”. Valid range of VLAN IDs: 1 … 4094. Use a comma (,) or hyphen (-) to specify individual VLANs or VLAN ranges.
	Delete	Select “Delete” in the selection box and enter the VLANs on which the switch should not run “DHCP Relay”.
DHCP Server IP	**0.0.0.0**	Enter the IP address of the DHCP server in the input field.
DHCP Relay Status		
Parameters	**Default**	**Description**
DHCP Relay State	Disable Enable	This display field indicates if “DHCP Relay” is enabled or disabled.
Enabled on VLAN	None 0 … 4094	This field displays if a VLAN is used.
DHCP Server IP		This field displays the IP address of the DHCP server.

9.3.5 DHCP Options

9.3.5.1 Option 82

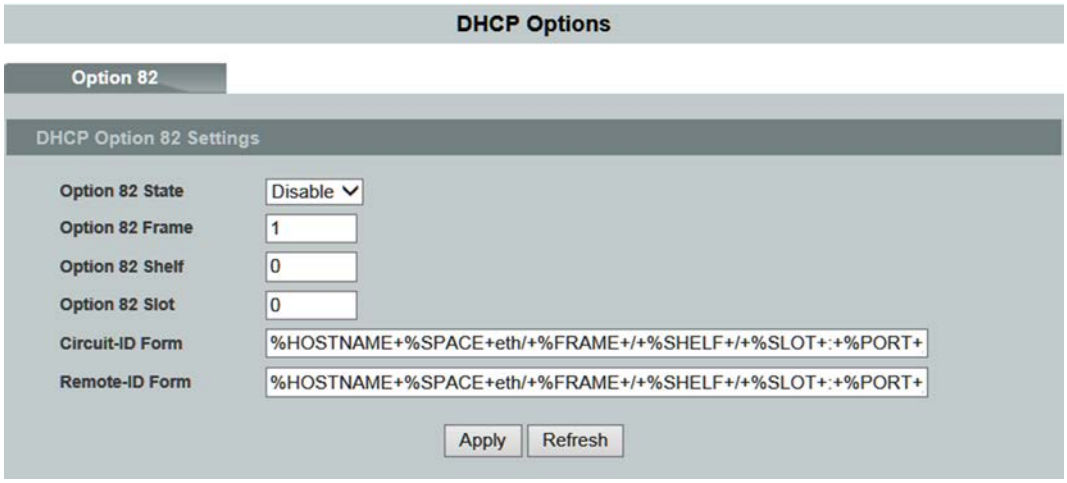


Figure 68: WBM “DHCP Options” Page – “Option 82” Tab

Table 72: WBM “DHCP Options” Page – “Option 82” Tab

DHCP Option 82 Settings		
Parameters	**Default**	**Description**
Option 82 State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable “DHCP Relay Option 82” on the switch.
Option 82 Frame	**1**	Enter the required frame number in the input field.
Option 82 Shelf	**0**	Enter the required shelf number in the input field to uniquely identify the switch.
Option 82 Slot	**0**	Enter the required slot number in the input field to uniquely identify the switch.
Circuit-ID Form	**%HOSTNAME+%SPACE+eth/+%FRAME+/+%SHELF+/+%SLOT+:+%PORT+_+%SVLAN+:+%CVLAN**	This input field gives you the option to adapt the appended string.
Remote-ID Form	**%HOSTNAME+%SPACE+eth/+%FRAME+/+%SHELF+/+%SLOT+:+%PORT+_+%SVLAN+:+%CVLAN**	This input field gives you the option to adapt the appended string.

9.3.6 Dual Homing

Note

Additional Information

Please refer to the section “Function Description” for more information on “Dual Homing”.

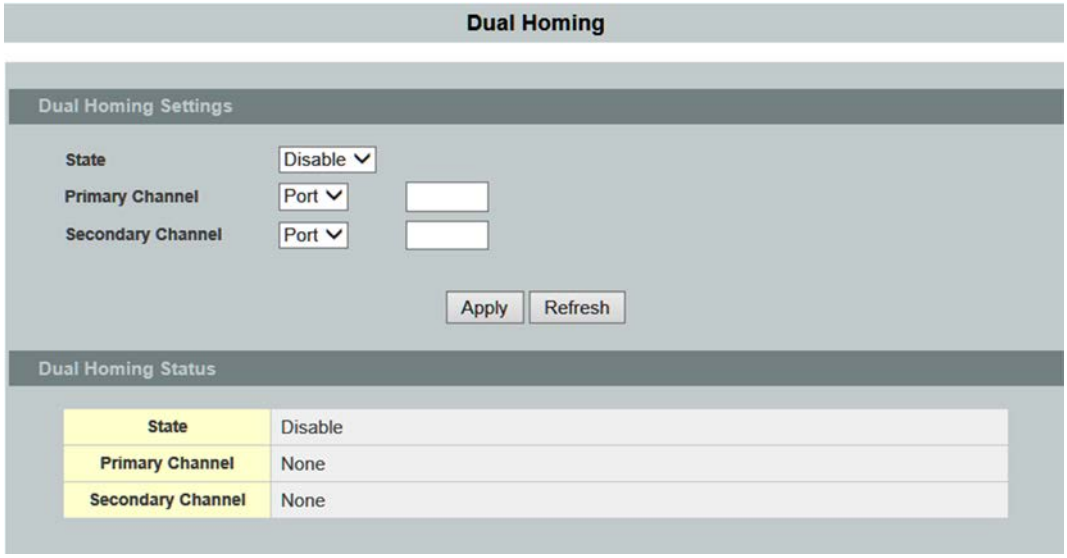


Figure 69: WBM “Dual Homing” Page

Table 73: WBM “Dual Homing” Page

Dual Homing Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to enable “Dual Homing”.
Primary Channel	**Port**	This field configures the primary channel. Select only one individual port or a “Trunk Group” in the selection box.
Secondary Channel	**Port**	This field configures the secondary channel. Select only one individual port or a “Trunk Group” in the selection box.
Dual Homing Status		
Parameters	**Default**	**Description**
State	Disable Enable	This field displays what status “Dual Homing” has.
Primary Channel	None Port 1 … 10	This field displays the selected primary channel.
Secondary Channel	None Port 1 … 10	This field displays the selected secondary channel.

9.3.7 Dual Ring

Note

Additional Information

Please refer to the section “Function Description” for more information on “Dual Ring”.

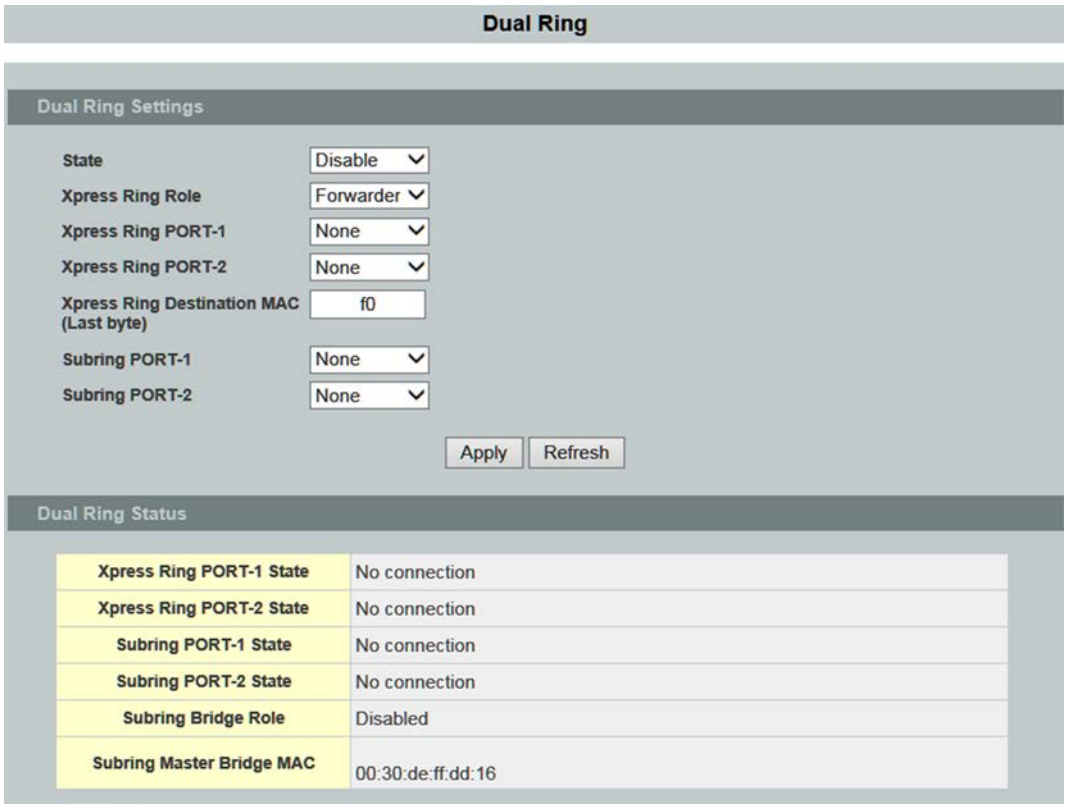


Figure 70: WBM “Dual Ring” Page

Table 74: WBM “Dual Ring” Page

Dual Ring Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” to enable “Dual ring”.
Xpress Ring Role	**Forwarder**	Select “Forwarder” in the selection box if the switch should operate in the Xpress Ring as a forwarder.
	Arbiter	Select “Arbiter” in the selection box if the switch should operate in the Xpress Ring as an Arbiter.
Xpress Ring PORT-1	**None**	Select “None” in the selection box if you do not want to select any port.
	1 … 10	Select Port 1 in the Xpress Ring in the selection box.
Xpress Ring PORT-2	**None**	Select “None” in the selection box if you do not want to select any port.
	1 … 10	Select Port 2 in the Xpress Ring in the selection box.
Xpress Ring Destination MAC (last byte)	**f0**	Enter the Xpress Ring ID in the input field.
Subring PORT-1	**None**	Select “None” in the selection box if you do not want to select any port.
	1 … 10	Select Port 1 in the Jet Ring in the selection box.
Subring PORT-2	**None**	Select “None” if you do not want to select any port.
	1 … 10	Select Port 2 in the Jet Ring.
Dual Ring Status		
Parameters	**Default**	**Description**
Xpress Ring PORT-1 State	Forwarding Blocking	This field displays what status Xpress Ring Port 1 has.
Xpress Ring PORT-2 State	Forwarding Blocking	This field displays what status Xpress Ring Port 2 has.
Subring PORT-1 State	Forwarding Blocking	This field displays what status Jet Ring Port 1 has.
Subring PORT-2 State	Forwarding Blocking	This field displays what status Jet Ring Port 2 has.
Subring Bridge Role	Forwarder Master	This field displays the role of the switch in the Xpress Ring.
Subring Master Bridge MAC		This field displays the MAD ID of the Jet Ring.

9.3.8 ERPS

Note

Additional Information

Please refer to the section “Function Description” for more information on “ERPS” (**E**THERNET **R**ing **P**rotection **S**witching).

9.3.8.1 Ring Settings

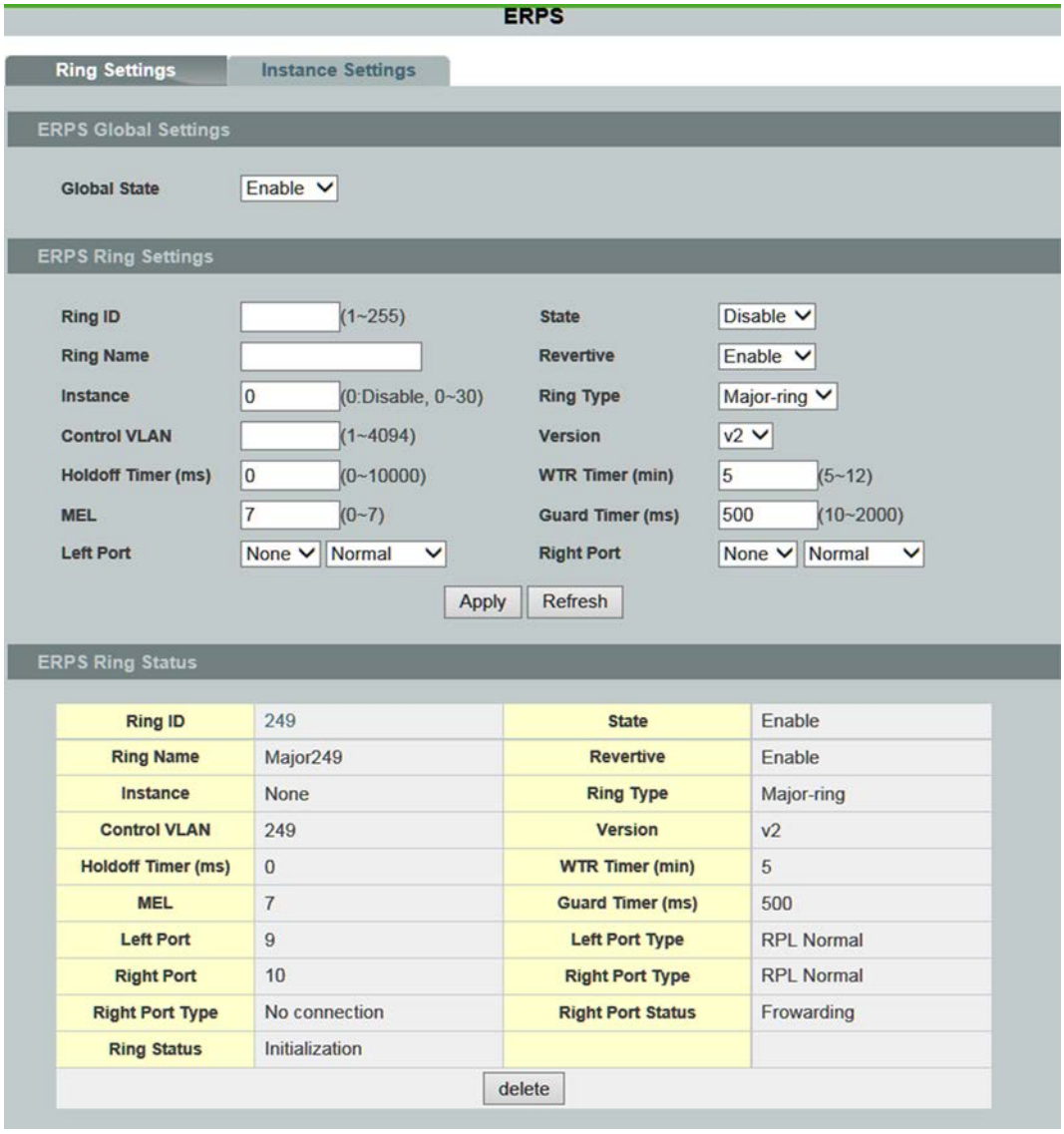


Figure 71: WBM “ERPS” Page – “Ring Settings” Tab

Table 75: WBM “ERPS” Page – “Ring Settings” Tab

ERPS Global Settings		
Parameters	**Default**	**Description**
Global State	**Disable**	Select “Disable” in the selection box to disable the ERPS function.
	Enable	Select “Enable” in the selection box to enable the ERPS function.
ERPS Ring Settings		
Parameters	**Default**	**Description**
Ring ID (1~255)		Enter the Ring ID in the input field.
State	**Disable**	Select “Disable” in the selection box to disable the state of the ring.
	Enable	Select “Enable” in the selection box to enable the state of the ring.
Ring Name		Enter the name of the ring (max. 32 characters) in the input field. (e.g., Major-Ring ID255)
Revertive	**Enable**	Select “Enable” to enable revertive mode.
	Disable	Select “Disable” in the selection box to disable the revertive mode.
Instance (0:Disable, 0~30)		Enter the instance for the ring in the input field. Valid range: 0 … 30. 0 (“Disable”) means that the ERPS is running in version 1. The control VLAN of the instance should be the same as the control VLAN below it.
Ring Type	**Major-ring**	Select “Major-Ring” in the selection box if the switch should operate in the Major-Ring.
	Sub-ring	Select “Sub-Ring” in the selection box if the switch should operate in the Sub-Ring.
Control VLAN (1~4084)	1 … 4094	Enter the VLAN ID in the input field that should serve as the domain for the ERPS control packets.
Version	**v2**	Select “v2” in the selection box if you want to use ERPS Version v2.
	v1	Select “v1” in the selection box if you want to use ERPS Version v1.
Holdoff Timer (ms) (0~10000)	**0** … 10000	Enter the value for the “Hold-off Timer” for the ring in the input field. Valid range: 0 … 10000 ms.
WTR Timer (min) (5~12)	**5** … 12	Enter the value for the “WTR Timer” for the ring in the input field.
MEL (0~7)	0 … **7**	Enter the value for the “Control MEL” (**M**aintenance **E**ntity Group **L**evel) for the ring in the input field. The MEL specifies the priority. 0 = Lowest priority 7 = Highest priority

Table 75: WBM “ERPS” Page – “Ring Settings” Tab

Guard Timer (ms) (10~2000)	**500**	Enter the value for the “Guard Timer” for the ring in this input field. Valid range: 10 … 2000 ms.
Left Port		The selection box is used to configure the left port and its type for the ring.
	None	Select “None” in the selection box if you do not want to select any port.
	1 … 10	Select the respective port in the selection box.
	Normal	Select “Normal” in the selection box if the port is not assigned any specific function in the ERPS ring.
	Neighbour	Select “Neighbor” in the selection box if the neighboring port has the Neighbor function.
	Owner	Select “Owner” in the selection box if the port should take the Owner function in the ERPS ring.
Right Port		The selection box is used to configure the right port and its type for the ring.
	None	Select “None” in the selection box if you do not want to select any port.
	1 … 10	Select the respective port in the selection box.
	Normal	Select “Normal” in the selection box if the port is not assigned any specific function in the ERPS ring.
	Neighbour	Select “Neighbor” in the selection box if the neighboring port has the Neighbor function.
	Owner	Select “Owner” in the selection box if the port should take the Owner function in the ERPS ring.
Left Port Enhance Mode	**Disable**	Select “Disable” in the selection box if a device that supports ERPS is connected to this port.
	Enable	Select “Enable” in the selection box if a device that does not support ERPS is connected to this port. Please note the Aging Time of the connected device.
Right Port Enhance Mode	**Disable**	Select “Disable” in the selection box if a device that supports ERPS is connected to this port.
	Enable	Select “Enable” in the selection box if a device that does not support ERPS is connected to this port. Please note the Aging Time of the connected device.
Alarm Relay	**Disable**	Select "Disable" in the selection box if you do not want the alarm relay to switch when the ERPS (Enhancement Mode) is open.
	Enable	Select "Enable" in the selection box if you want the alarm relay to switch when the ERPS (Enhancement Mode) is open.
ERPS Ring Status		
Parameters	**Default**	**Description**
Ring ID	1 … 255	This field displays the Ring ID.
State	Disable Enable	This field displays the ring status.
Ring Name		This field displays the ring name.
Revertive	Enable Disable	This field displays the status of the revertive mode.
Instance		This field displays the instance for the ring.
Ring Type	Major-ring Sub-ring	This field displays the ring type.
Control VLAN	1 … 4084	This field displays the VLAN of the controller.
Version	v2 v1	This field displays the version of the ERPS function.

Table 75: WBM “ERPS” Page – “Ring Settings” Tab

Holdoff Timer (ms)	0 … 10000	This field displays the time for the “Hold-off Timer”.
WTR Timer (min)	5 … 12	This field displays the time for the “WTR Timer”.
MEL	0 … 7	This field displays the value for the “Control MEL”.
Guard Timer (ms)	10 …2000	This field displays the time for the “Guard Timer”.
Left Port	None 1 … 10	This field displays the port number of the left port.
Right Port	None 1 … 10	This field displays the port number of the right port.
Left Port Type	RPL Normal Neighbour Owner	This field displays the type of the left port.
Right Port Type	RPL Normal Neighbour Owner	This field displays the type of the right port.
Left Port Enhance Mode	Enable Disable	This field displays the status of the left port.
Right Port Enhance Mode	Enable Disable	This field displays the status of the right port.
Left Port Status	Forwarding Blocking	This field displays the current status of the left port.
Right Port Status	Forwarding Blocking	This field displays the current status of the right port.
Ring Status	Protection Idle	This field displays the ring status.
Delete		Click **[Delete]** to delete this setting.

9.3.8.2 Instance Settings

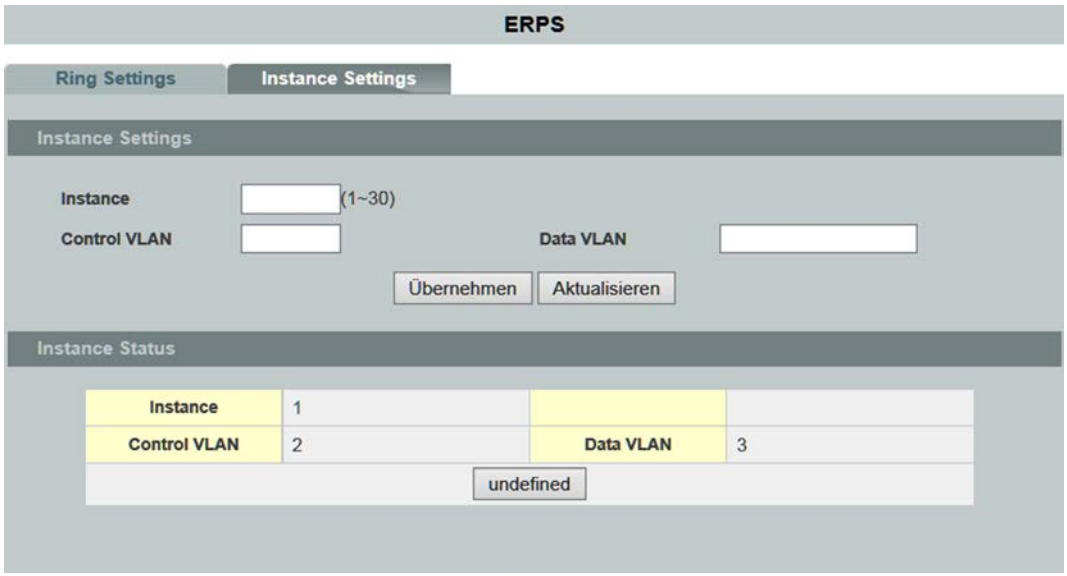


Figure 72: WBM “ERPS” Page – “Instance Settings” Tab

Table 76: WBM “ERPS” Page – “Instance Settings” Tab

Instance Settings		
Parameters	**Default**	**Description**
Instance (1~30)		Enter the instance ID in the input field. Valid range: 1 … 31
Control VLAN		Enter the VLAN of the controller for the instance in the input field. Valid range: 1 … 4094
Data VLAN		Enter the value for the data VLAN for the instance in the input field. Valid range: 1 … 4094 One or more data VLANs can be configured.
Instance Status		
Parameters	**Default**	**Description**
Instance	1 … 31	This field displays the instance ID.
Control VLAN	1 … 4094	This field displays the controller VLAN of the instance.
Data VLAN	1 … 4094	This field displays the data VLAN of the instance.
Delete		Click [Delete] to delete this setting.

9.3.9 Link Aggregation

9.3.9.1 Static Trunk

Note

Additional Information

Please refer to the section “Function Description” for more information on “Static Trunk”.

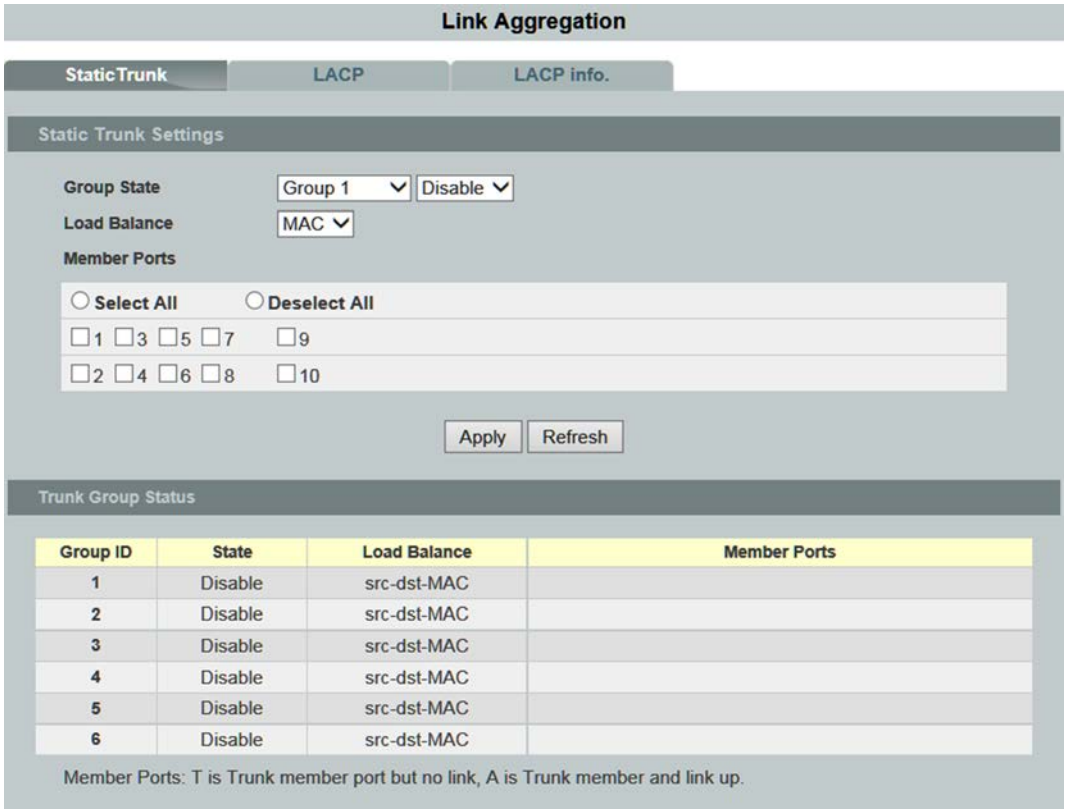


Figure 73: WBM “Link Aggregation” Page – “Static Trunk” Tab

Table 77: WBM “Link Aggregation” Page – “Static Trunk” Tab

Static Trunk Settings				
Parameters		**Default**	**Description**	
Group State		**Group 1** … Group 6	Select a group ID for the “Trunk Group” (a logical ling containing multiple ports) in the selection box.	
		Disable	Select “Disable” in the selection box to disable a static “Trunk Group”.	
		Enable	Select “Enable” in the selection box to use a static “Trunk Group”.	
Load Balance		**MAC**	Select “MAC” in the selection box to configure the algorithm for load balancing of a specific “Trunk Group”.	
		IP	Select “IP” in the selection box to configure the algorithm for load balancing of a specific “Trunk Group”.	
Member Ports	Select All	○	○	No port is selected to be added to the static “Trunk Port”.
			◉	All ports are selected to be added to the status “Trunk Group”.
	Deselect All	○	○	No port is disabled.
			◉	All ports are disabled.
	☐ 1 … ☐ 10	☐	☐	The port is not enabled.
			☑	The port is enabled.
Trunk Group Status				
Parameters		**Default**	**Description**	
Group ID		1 … 6	This column displays the group ID for a “Trunk Group” (a logical link containing multiple ports).	
State		Disable Enable	This column displays if a “Trunk Group” is enabled or disabled.	
Load Balance		1 … 6	This column displays the policy for load balancing of the “Trunk Group”.	
Member Ports			This column displays the ports assigned to the “Trunk Group”.	

9.3.9.2 LACP

Note

Additional Information

Please refer to the section “Function Description” for more information on “LACP” (**L**ink **A**ggregation **C**ontrol **P**rotocol).

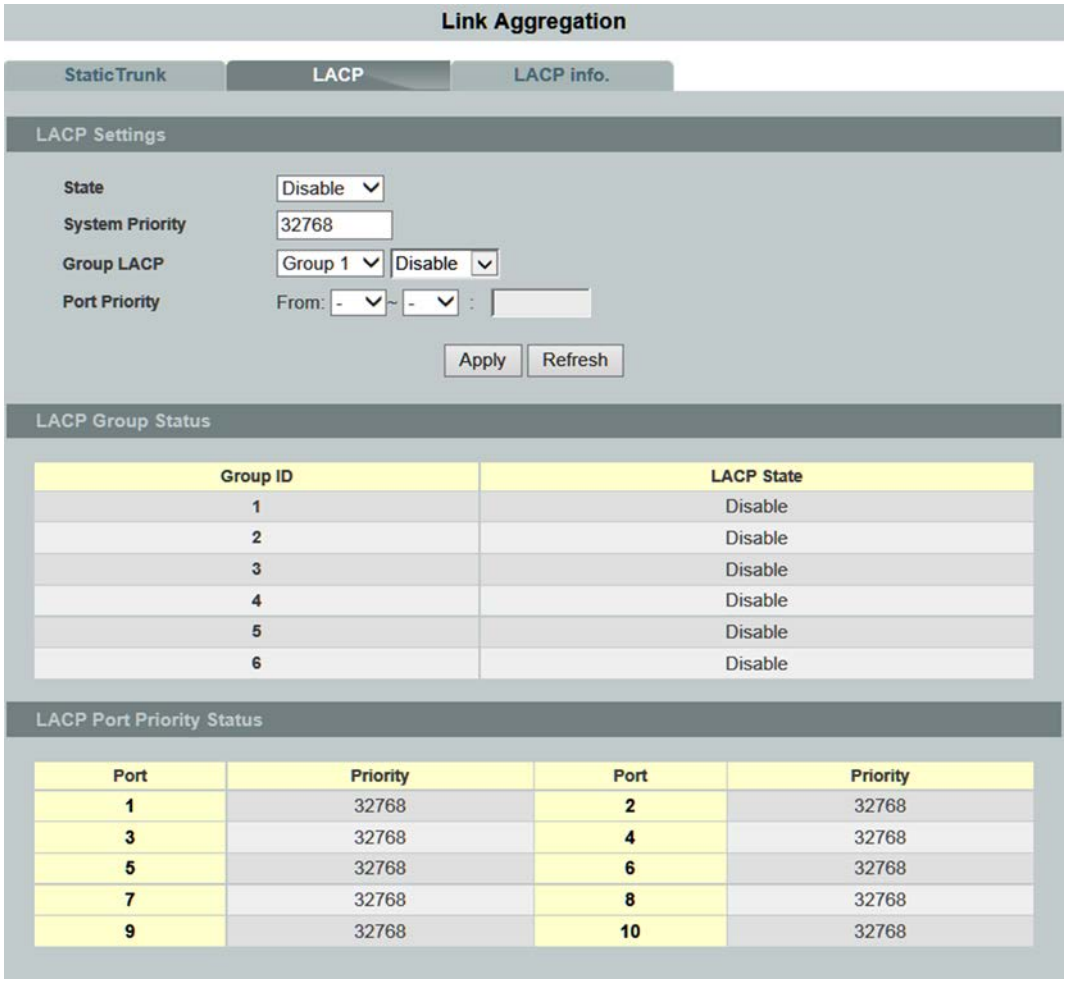


Figure 74: WBM “Link Aggregation” Page – “LACP” Tab

Table 78: WBM “Link Aggregation” Page – “LACP” Tab

LACP Settings			
Parameters		**Default**	**Description**
State		**Disable**	Select “Disable” in the selection box if you do not want to use LACP.
		Enable	Select “Enable” in the selection box to enable the “Link Aggregation Control Protocol” (LACP).
System Priority		1 … 65535	Select the LACP system priority in the selection box. Enter a number to set the priority of an active port with “Link Aggregation Control Protocol” (LACP). The smaller the number, the higher the priority level.
Group LACP		**Group 1** … Group 6	Select a “Trunk Group ID” in the selection box.
		Disable	Select “Disable” in the selection box to disable LACP for this “Trunk Group”.
		Enable	Select “Enable” in the selection box to enable LACP for this “Trunk Group”.
Port Priority	From:	-	Select a port or port range in the selection box for which you want to configure the LACP priority.
	To:	-	Select a port or port range in the selection box for which you want to configure the LACP priority.
		32768	The default System Priority is 32768.
LACP Group Status			
Parameters		**Default**	**Description**
Group ID		1 … 6	This column displays the LACP group ID.
LACP State		Enable Disable	This column displays if LACP is enabled or disabled for a group.
LACP Port Priority Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port ID.
Priority		1 … 65535	This column displays the LACP priority of the port.

9.3.9.3 LACP Info.

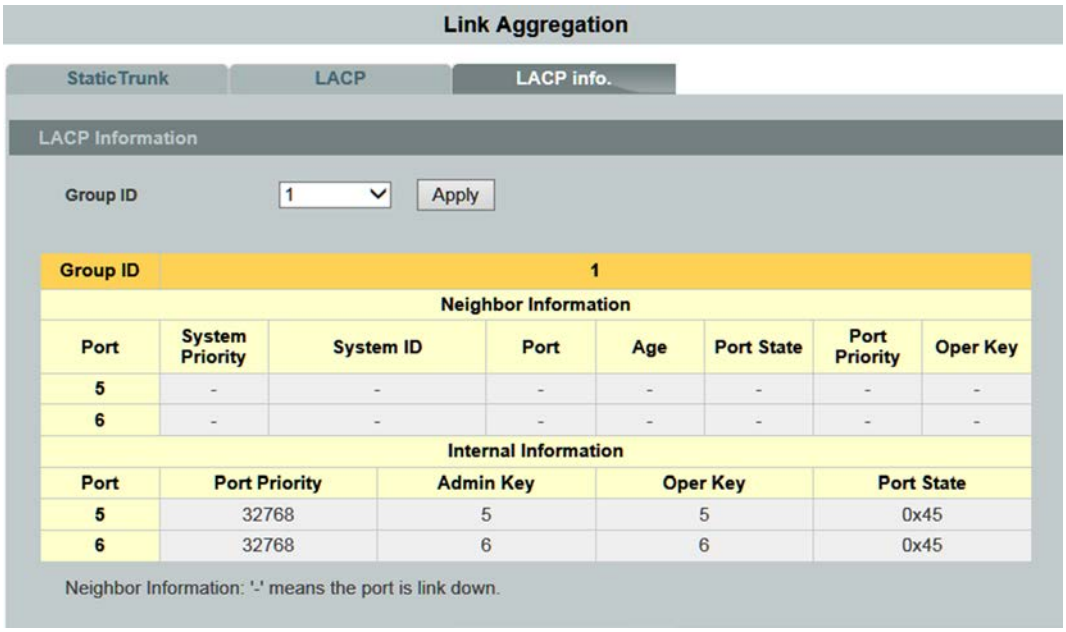


Figure 75: WBM “Link Aggregation” Page – “LACP Info.” Tab

Table 79: WBM “Link Aggregation” Page – “LACP Info.” Tab

LACP Information		
Parameters	**Default**	**Description**
Group ID	-	Select an LACP group that you want to view.
Neighbor Informationen		
Parameters	**Default**	**Description**
Port	1 … 10	This column displays the LACP ID of the subscriber port.
System Priority	0 … 65535	This column displays the LACP system priority.
System ID		This column displays the system ID of the neighboring switch.
Port	1 … 10	This column displays the ID of the directly connected port of the neighboring switch.
Age		This column displays the available time period for the LACP information of the neighboring switch.
Port State		This column displays the status of the port connected directly to the neighboring switch.
Port Priority		This column displays the priority of the port connected directly to the neighboring switch.
Oper Key		This column displays the “Oper Key” of the neighboring switch.
Internal Information		
Parameters	**Default**	**Description**
Port		This column displays the LACP ID of the subscriber port.
Port Priority		This column displays the port priority of the LACP subscriber port.
Admin Key		This column displays the “Admin Key” of the LACP subscriber port.
Oper Key		This column displays the “Oper Key” of the LACP subscriber port.
Port State		This column displays the port status of the LACP subscriber port.

9.3.10 LLDP

Note

Additional Information

Please refer to the section “Function Description” for more information on “LLDP” (**L**ink **L**ayer **D**iscovery **P**rotocol).

9.3.10.1 Settings

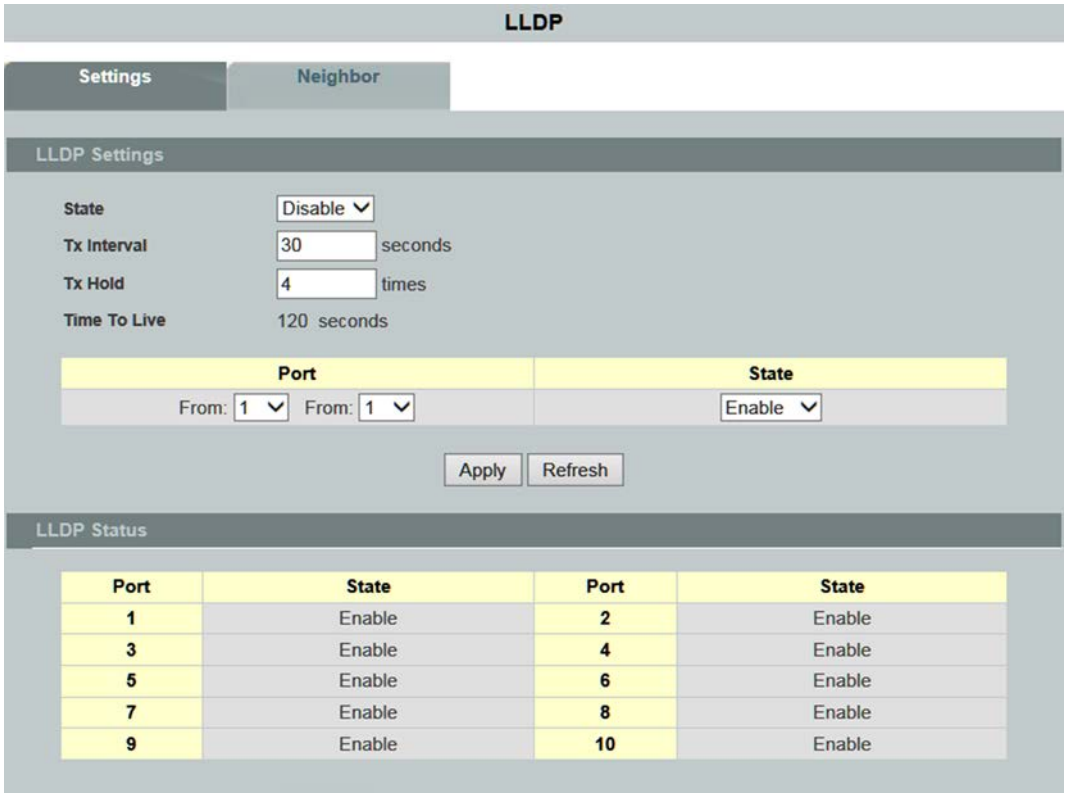


Figure 76: WBM “LLDP” Page – “Settings” Tab

Table 80: WBM “LLDP” Page – “Settings” Tab

LLDP Settings			
Parameters		**Default**	**Description**
State		**Disable**	Select “Disable” in the selection box to disable this function.
		Enable	Select “Enable” in the selection box to enable the LLDP function. for the switch globally.
Tx Interval		**30**	Enter the value for the “Tx Interval” (transmission interval) for the LLDP packets in the input field.
TX Hold		**4**	Enter the value for the “tx-Hold Time” in the input field that determines the TTL of the switch's message. (TTL = tx-hold * tx-interval)
Time To Live		**120**	This field displays the lifetime for the switch's information.
Port	From:	**1**	Select a port or port range in the selection box for which you want to configure the “LLDP” setting.
	To:	**1**	Select a port or port range in the selection box for which you want to configure the “LLDP” setting.
State		**Enable**	In this selection box, select “Enable” to enable the LLDP function on individual ports.
		Rx Only	Select the “Rx Only” setting in the selection box if “Rx Interval” is always used as the transmission interval for the switch or ports.
		Tx Only	Select the “Tx Only” setting in the selection box if “Tx Interval” is always used as the transmission interval for the switch or ports.
		Disable	In this selection box, select “Disable” to disable the LLDP function on individual ports.
LLDP Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
State		Disable Enable	This column displays if “LLDP” is enabled or disabled.

9.3.10.2 Neighbor

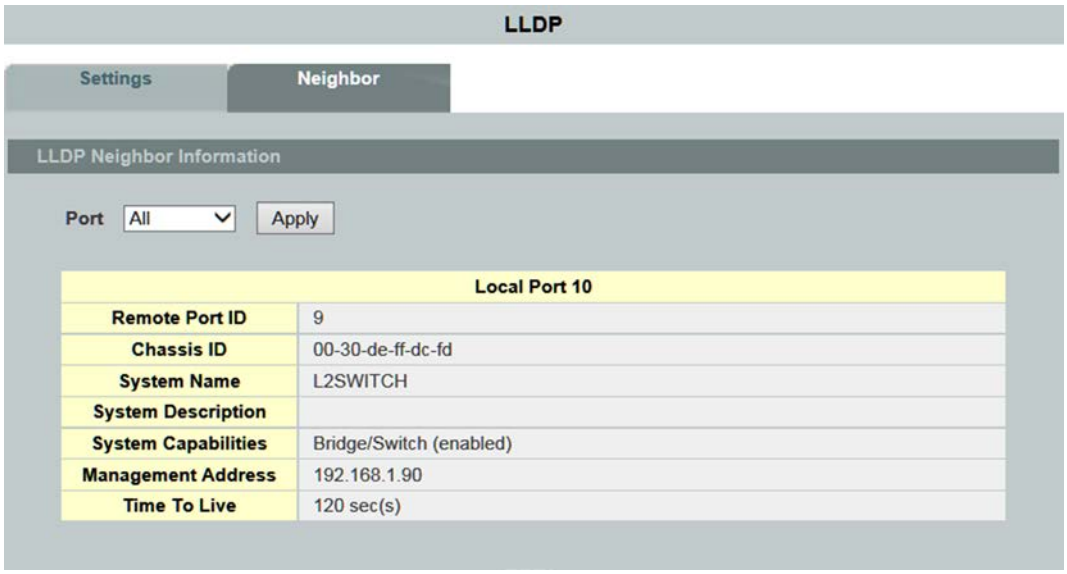


Figure 77: WBM “LLDP” Page – “Neighbor” Tab

Table 81: WBM “LLDP” Page – “Neighbor” Tab

LLDP Neighbor Information		
Parameters	**Default**	**Description**
Port	**All**	Select “All” in the selection box if you want to display information from all neighboring ports.
	1 … 10	Select a port in the selection box for which you want to display the information for its neighboring port.
Local Port	1 … 10	This field displays the port number.
Remote Port ID		This field displays the ID of the connected port.
Chassis ID		This field displays the chassis ID of the neighboring port.
System Name		This field displays the system name of the neighboring port.
System Description		This field displays the system description of the neighboring port.
System Capabilities		This field displays the system capabilities of the neighboring port.
Management Address		This field displays the management address of the neighboring port.
Time To Live		This field displays the validity period of the information of the neighboring port.

9.3.11 Loop Detection

Note

Additional Information

Please refer to the section “Function Description” for more information on “Loop Detection”.

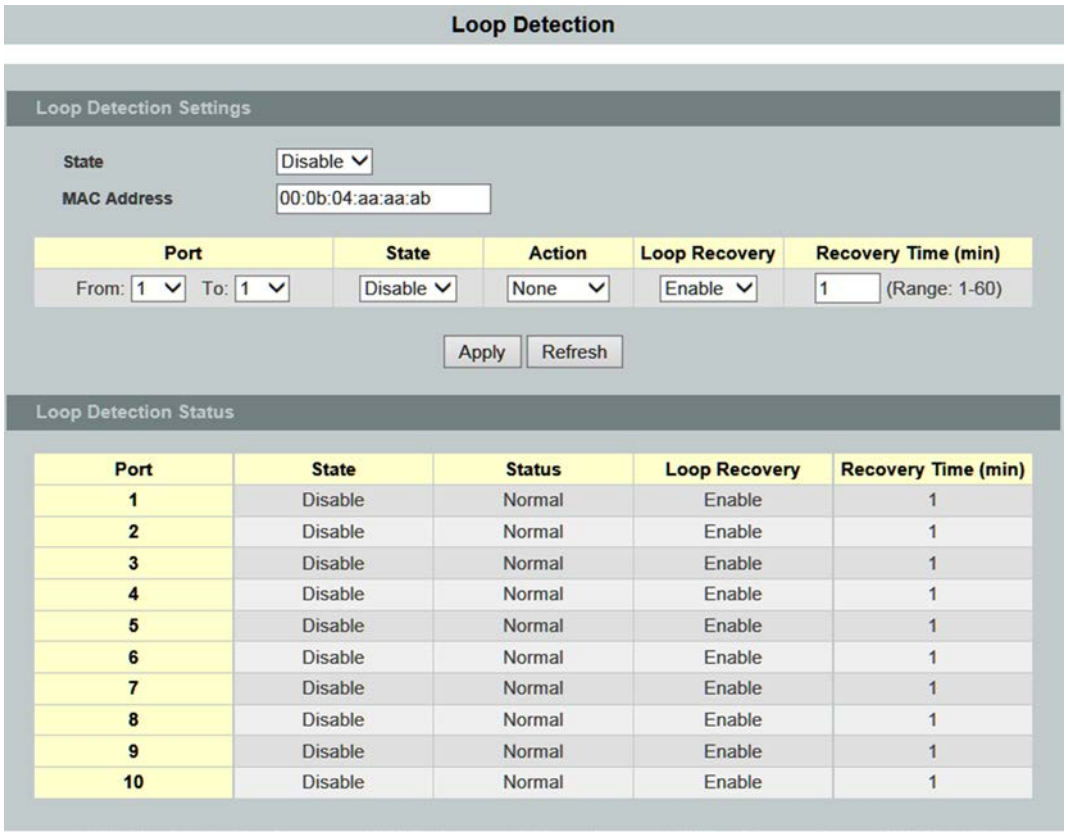


Figure 78: WBM “Loop Detection” Page

Table 82: WBM “Loop Detection” Page

Loop Detection Settings			
Parameters		**Default**	**Description**
Status		**Disable**	Select “Disable” in the selection box to disable this function.
		Enable	Select “Enable” in the selection box to enable this function.
MAC Address			Enter the destination MAC address in the input field to which the probe packets should be sent. If the port receives the same packets, it is shut down.
Port	From:	**1**	Select a port or port range in the selection box for which you want to configure the “Loop Guard Protection” settings.
	To:	**1**	Select a port or port range in the selection box for which you want to configure the “Loop Guard Protection” settings.
State		**Disable**	Select “Disable” in the selection box to disable this function.
		Enable	Select “Enable” in the selection box to enable the “Loop Guard” function for the switch.
Action		**None**	Select “None” in the selection box if you disable loop detection on the port.
		Unblock	Select “Unblock” in the selection box if you do not want to change the “Status” and “Loop Correction” functions.
Loop Recovery		**Enable**	Select “Enable” in the selection box to automatically enable the port again after the designated “Recovery Time” has elapsed.
		Disable	Select “Disable” in the selection box to disable this function.
Recovery Time (min) (Range: 1~60)		**1**	Enter the value for the “Recovery Time” (in minutes) in the input field that the switch waits before enabling the port again. Time: 1 … 60 min
Loop Detection Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Status		Enable Disable	This column displays if the “Loop Guard” function is enabled or disabled.
Status		None Normal	This column displays if a port is blocked.
Loop Recovery		Enable Disable	This column displays if the “Loop Recovery” function is enabled or disabled.
Recovery Time (min)		1 … 50	This column displays the “Recovery Time” for the “Loop Recovery” function.

9.3.12 Jet Ring

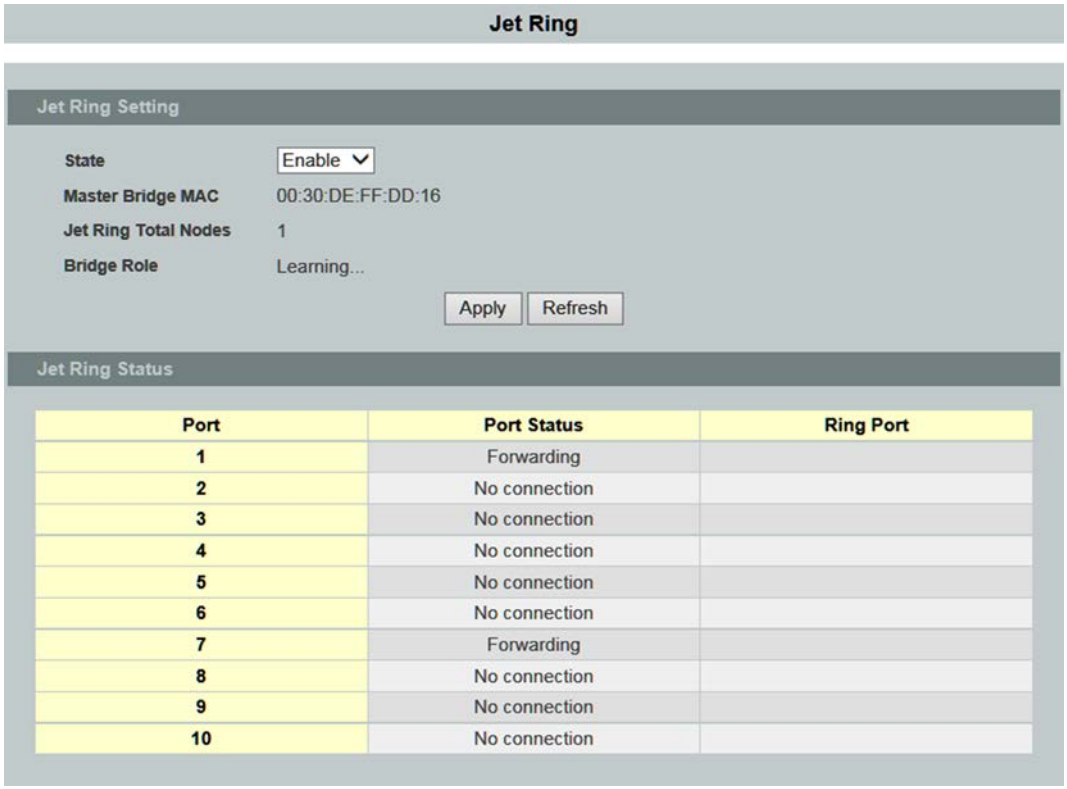


Figure 79: WBM “Jet Ring” Page

Table 83: WBM “Jet Ring” Page

Jet Ring Setting		
Parameters	**Default**	**Description**
State	**Disable**	In this selection box, select “Disable” to disable the “Jet Ring” function on individual ports.
	Enable	In this selection box, select “Enable” to enable the “Jet Ring” function on individual ports.
Master Bridge MAC		This field displays the IP address of the Jet Ring Master.
Jet Ring Total Nodes		This field displays the number of switches in the Jet Ring.
Bridge Role		This field displays the function of the switch in the Jet Ring.
Jet Ring Status		
Parameters	**Default**	**Description**
Port	1 … 10	This column displays the port numbers.
Port Status	No connection Forwarding Blocking	This column displays the port status.
Ring Port	Yes	This column displays if the port operates in a ring.

9.3.13 MODBUS

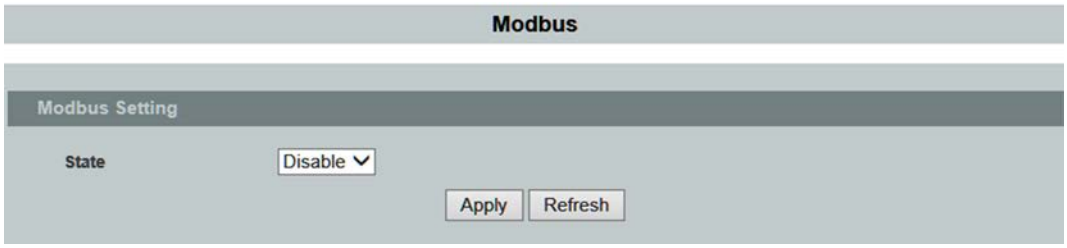


Figure 80: WBM “MODBUS” Page

Table 84: WBM “MODBUS” Page

MODBUS Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable the “MODBUS” function on individual ports.
	Enable	Select “Enable” in the selection box to enable the “MODBUS” function on individual ports.

9.3.14 STP

Note

Additional Information

Please refer to the section “Function Description” for more information on “STP” (**S**panning **T**ree **P**rotocol).

9.3.14.1 General Settings

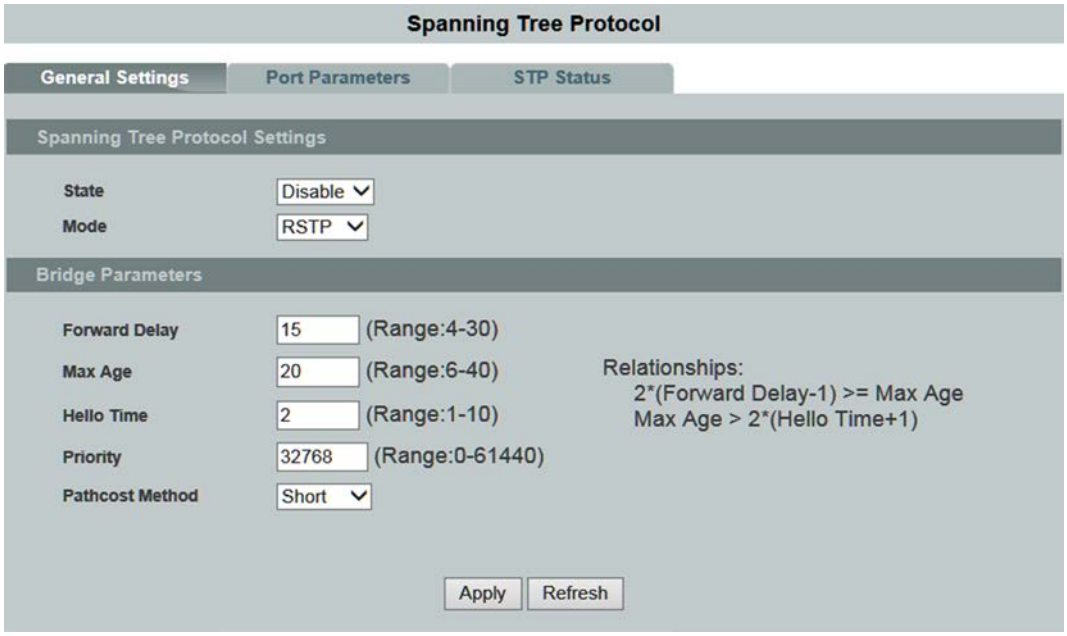


Figure 81: WBM “STP” Page – “General Settings” Tab

Table 85: WBM “STP” Page – “General Settings” Tab

Spanning Tree Protocol Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable this function.
	Enable	Select “Enable” in the selection box to use the “Spanning Tree Protocol” (STP) or “Rapid Spanning Tree Protocol” (RSTP).
Mode	**RSTP**	Select “RSTP” in the selection box if you want to use the faster “Rapid Spanning Tree Protocol”.
	MSTP	Select “MSTP” in the selection box if you want to use the “Multiple Spanning Tree Protocol”.
	STP	Select “STP” in the selection box if you want to use the “Spanning Tree Protocol”.
Bridge Parameters		
Parameters	**Default**	**Description**
Forward Delay	**15**	Enter the “Forward Delay” time in the input field. Valid range: 4 … 30 s
Max Age	**20**	Enter the “Max Age” time in the input field. Valid range: 6 … 40 s
Hello Time	**2**	Enter the “Hello Time” in the input field. Valid range: 1 … 10 s
Priority	**32768**	Enter a value for the priority in the input field. The lower the numerical value you assign, the higher the priority of this bridge. Valid range: 0 … 61440
Pathcost Method	**Short**	Select “Short” in the selection box if you want to select a size of 16 bits and a transmission rate of up to 10 Gbit. 10 MBit = 100 100 MBit = 19 1 GBit = 4 10 GBit = 2
	Long	Select “Long” in the selection box if you want to select a size of 32 bits and a transmission rate of up to 10 TBit. 10 MBit = 2000000 100MBit = 200000 1 GBit = 20000 10 GBit = 2000 100 GBit = 200 1 TBit = 20

9.3.14.2 Port Parameters

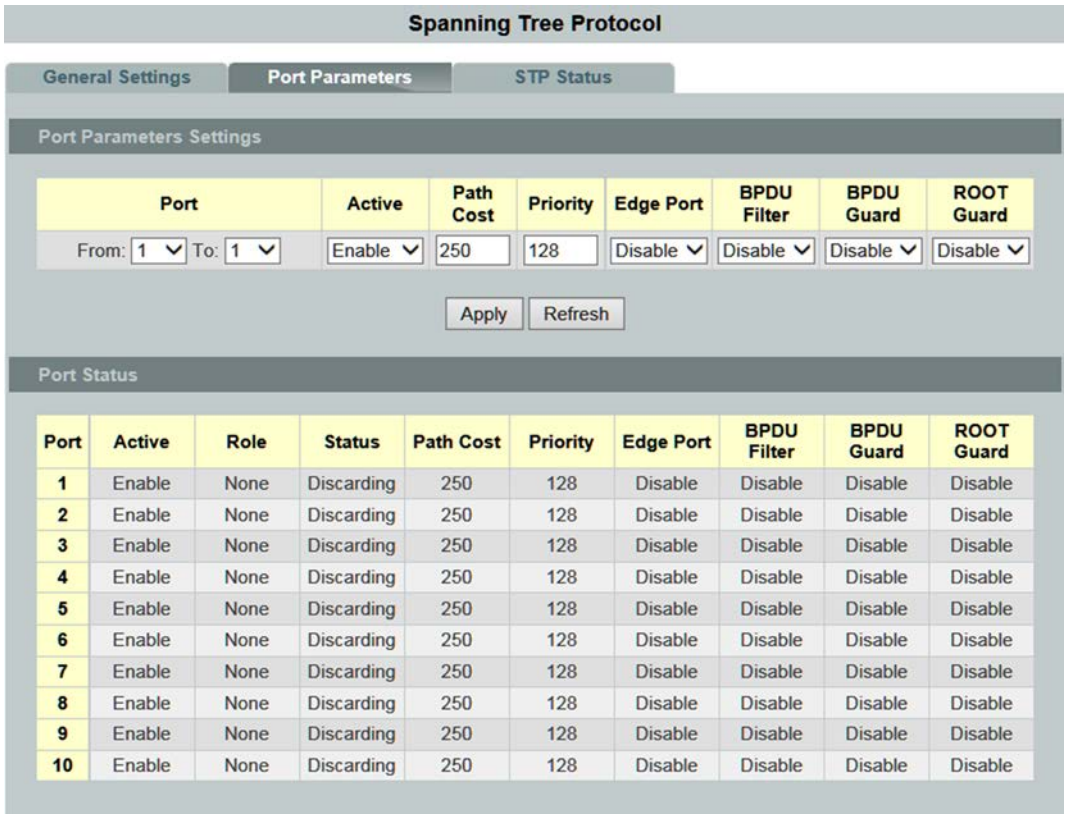


Figure 82: WBM “STP” Page – “Port Parameters” Tab

Table 86: WBM “STP” Page – “Port Parameters” Tab

Port Parameters Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “STP Function”.
	To:	**1**	Select a port or port range in the selection box to configure the “STP Function”.
Active		**Enable**	Select “Enable” in the selection box if you want to enable the STP function for the specific port.
		Disable	Select “Disable” in the selection box if you want to disable the STP function for the specific port.
Path Cost		250	Enter the value for the path costs for the specific port in the input field.
Priority		128	Enter the value for the priority for the specific port in the input field.
Edge Port		**Disable**	Select “Disable” in the selection box to disable the “Edge Port” port type for the specific port.
		Enable	Select “Enable” in the selection box to enable the “Edge Port” port type for the specific port.
BPDU Filter		**Disable**	Select “Disable” in the selection box to disable the BPDU filter function for the specific port.
		Enable	Select “Enable” in the selection box to enable the BPDU filter function for the specific port.
BPDU Guard		**Disable**	Select “Disable” in the selection box to disable the “BPDU Guard” function for the specific port.
		Enable	Select “Enable” in the selection box to enable the “BPDU Guard” function for the specific port.
ROOT Guard		**Disable**	Select “Disable” in the selection box to disable the “ROOT Guard” function for the specific port.
		Enable	Select “Enable” in the selection box to enable the “ROOT Guard” function for the specific port.
Port Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Active		**Enable** Disable	This column displays the status of the STP function.
Role		Alternated Designated Root Backup None	This column displays the role of the port.
Status		Discarding Blocking Listening Learning Forwarding Disabled	This column displays the port status.
Path Cost		0 … 65535	This column displays the path cost of the port.
Priority		0 … 61440	This column displays the port priority.
Edge Port		Disable Enable	This column displays the status of the “Edge Port” function.
BPDU Filter		Disable Enable	This column displays the status of the BPDU filter function.
BPDU Guard		Disable Enable	This column displays the status of the “BPDU Guard” function.

Table 86: WBM “STP” Page – “Port Parameters” Tab

ROOT Guard	Disable Enable	This column displays the status of the “Root Guard” function.

9.3.14.3 STP Status

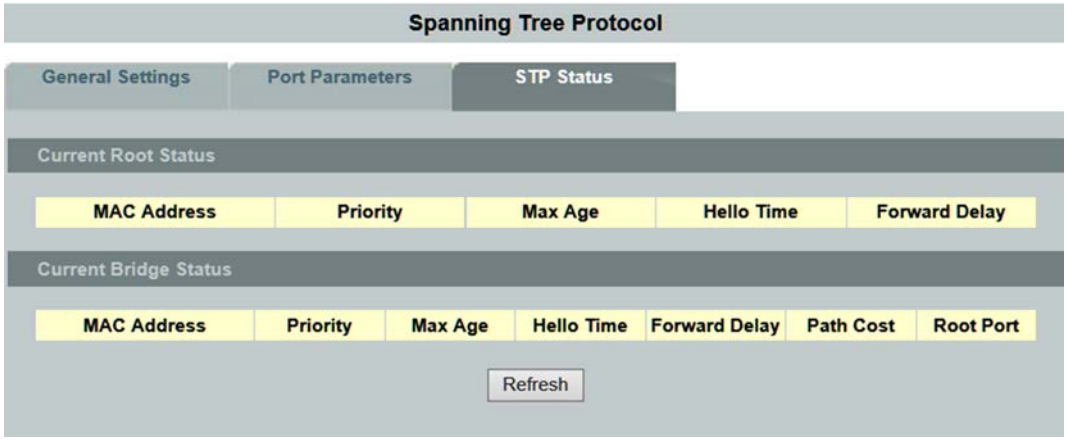


Figure 83: WBM “STP” Page – “STP Status” Tab

Table 87: WBM “STP” Page – “STP Status” Tab

Current Root Status		
Parameters	**Default**	**Description**
MAC Address		This field displays the MAC address of the “Root Bridge”.
Priority		This field displays the priority of the “Root Bridge”. This switch can also be the “Root Bridge”.
Max Age		This field displays the “Max Age” of the “Root Bridge”.
Hello Time		This field displays the “Hello Time” of the “Root Bridge”. The “Root Bridge” determines the “Hello Time”, “Max Age and “Forwarding Delay”.
Forward Delay		This field displays the maximum time (in seconds) that the root switch waits before changing states.
Current Bridge Status		
Parameters	**Default**	**Description**
MAC Address		This field displays the MAC address of the current bridge.
Priority		This field displays the priority.
Max Age		This field displays the “Max Age”.
Hello Time		This field displays the “Hello Time”.
Forward Delay		This field displays the “Forward Time”.
Path Cost		This field displays the path cost.
ROOT Port		This field displays the port number on the switch by which the switch has to communicate with the root of the “Spanning Tree”.

9.3.15 Xpress Ring

Note

Additional Information

Please refer to the section “Function Description” for more information on “Xpress Ring”.

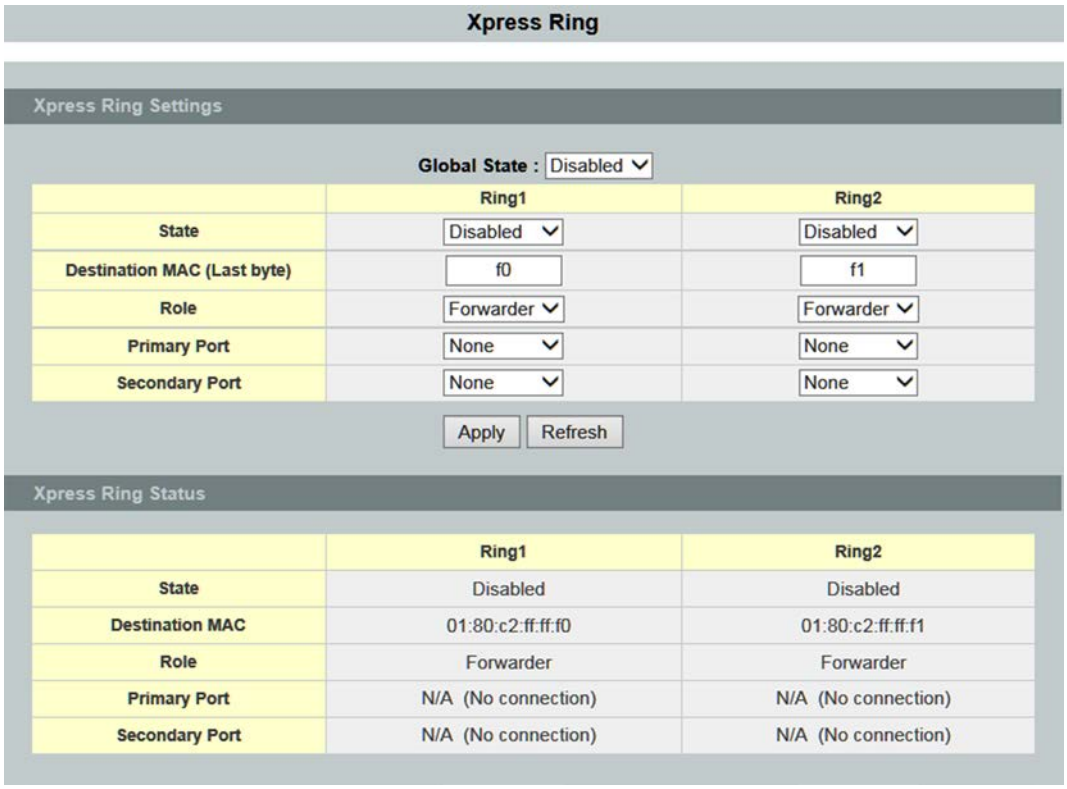


Figure 84: WBM “Xpress Ring” Page

Table 88: WBM “Xpress Ring” Page

Xpress Ring Settings		
Parameters	**Default**	**Description**
Global State	**Disabled**	Select “Disable” in the selection box to disable the “Xpress Ring” function.
	Enabled	Select “Enable” in the selection box to enable the “Xpress Ring” function.
Ring 1		This column can be used to configure Ring 1.
Ring 2		This column can be used to configure Ring 2.
Status	**Disabled**	Select “Disable” in the selection box to disable the “Xpress Ring” function for the respective ring.
	Enabled	Select “Enable” in the selection box to enable the “Xpress Ring” function for the respective ring.
Destination MAC (Last byte)		Enter the MAC address of the respective ring in the input field.
Role	**Forwarder**	Select the “Forwarder” role for the switch in the selection box.
	Arbiter	Select the “Arbiter” role for the switch in the selection box.
Primary Port	**None**	Select “None” in the selection box if you do not want to enable a primary port in the ring.
	1 … 10	Select the respective primary port in the selection box.
Secondary Port	**None**	Select “None” in the selection box if you do not want to enable a secondary port in the ring.
	1 … 10	Select the respective secondary port in the selection box.
Xpress Ring Status		
Parameters	**Default**	**Description**
Status	Disabled Enabled	This field displays the current status of the Xpress Ring.
Ring 1		This column displays the configurations for Ring 1.
Ring 2		This column displays the configurations for Ring 2.
Destination MAC (Last byte)		This field displays the last byte of the respective MAC address of the Xpress Ring.
Role	Forwarder Arbiter	This field displays the role of switch.
Primary Port	N/A (No connection) 0 … 10 (Forwarding, Blocking)	This field displays the status of the primary port.
Secondary Port	N/A (No connection) 0 … 10 (Forwarding, Blocking)	This field displays the status of the secondary port.

9.4 Security

9.4.1 IP Source Guard

Note

Additional Information
Please refer to the section “Function Description” for more information on “IP Source Guard”.

9.4.1.1 DHCP Snooping

Note

Additional Information
Please refer to the section “Function Description” for more information on “DHCP Snooping” (**D**ynamic **H**ost **C**onfiguration **P**rotocol).

9.4.1.1.1 DHCP Snooping

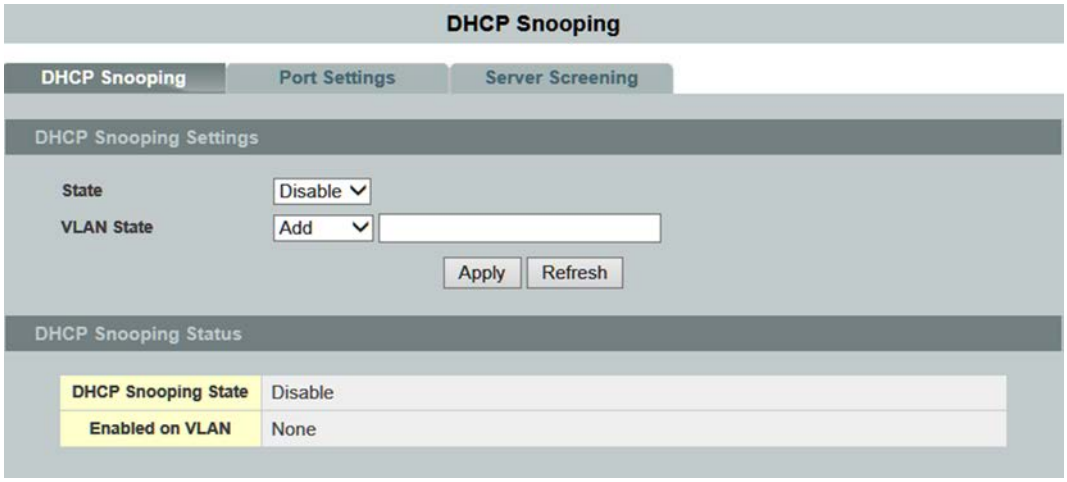


Figure 85: WBM “DHCP Snooping” Page – “DHCP Snooping” Tab

Table 89: WBM “DHCP Snooping” Page – “DHCP Snooping” Tab

DHCP Snooping Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box if you do not want to use this function.
	Enable	Select “Enable” in the selection box to enable the “DHCP Snooping”. You must then enable this function for specific VLANs and configure “Trusted Ports”.
		Note ***Note*** **Configuring DHCP requests** The switch drops all DHCP requests when “DHCP Snooping” is enabled and there are no “Trusted Ports”. Select “Disable” if you do not want to use this function.
VLAN State	**Add**	Select “Add” in the selection box and enter the VLANs for which “DHCP Snooping” should be enabled. Valid range of VLAN IDs: 1 … 4094. Use a comma (,) or hyphen (-) to specify individual VLANs or VLAN ranges.
	Delete	Select “Delete” in the selection box and enter the VLANs for which “DHCP Snooping” should be disabled.
DHCP Snooping Status		
Parameters	**Default**	**Description**
DHCP Snooping Status	Disable Enable	This field displays if “DHCP Snooping” is enabled or disabled.
Enabled on VLAN	None 1 … 4094	This field displays the VLANs in which the “DHCP Snooping” function is enabled. “None” is displayed if no VLANs have been specified.

9.4.1.1.2 Port Settings

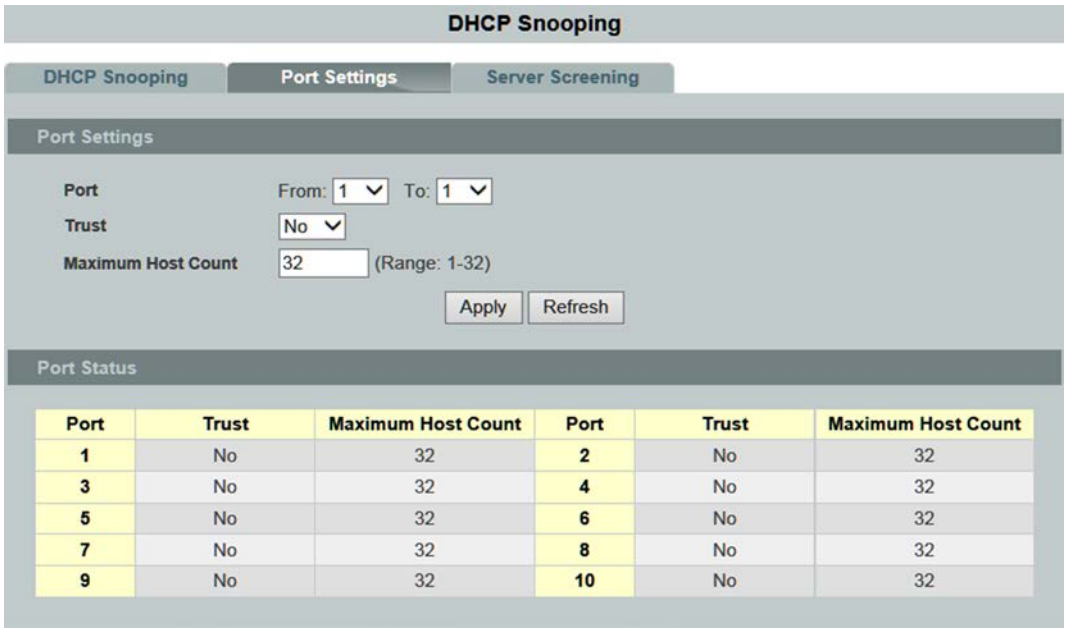


Figure 86: WBM “DHCP Snooping” Page – “Port Settings” Tab

Table 90: WBM “DHCP Snooping” Page – “Port Settings” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box for which you want to specify the maximum number of hosts.
	To:	**1**	Select a port or port range in the selection box for which you want to specify the maximum number of hosts.
Trust		**No**	Select “No” in the selection box if the specific port should not be a “Trusted Port”.
		Yes	Select “Yes” in the selection box if the specific port should be a “Trusted Port”.
Maximum Host Count (Range: 1~32)		**32**	Enter the maximum number of hosts in the input field that can be connected to a port at the same time. Valid range: 1 … 32
Port Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
Trust		No Yes	This column displays the status of the “Trusted Ports”.
Maximum Host Count			This column displays the maximum number of hosts that can be connected to a port at the same time.

9.4.1.1.3 Server Screening

Note

Additional Information

Please refer to the section “Function Description” for more information on “Server Screening”.

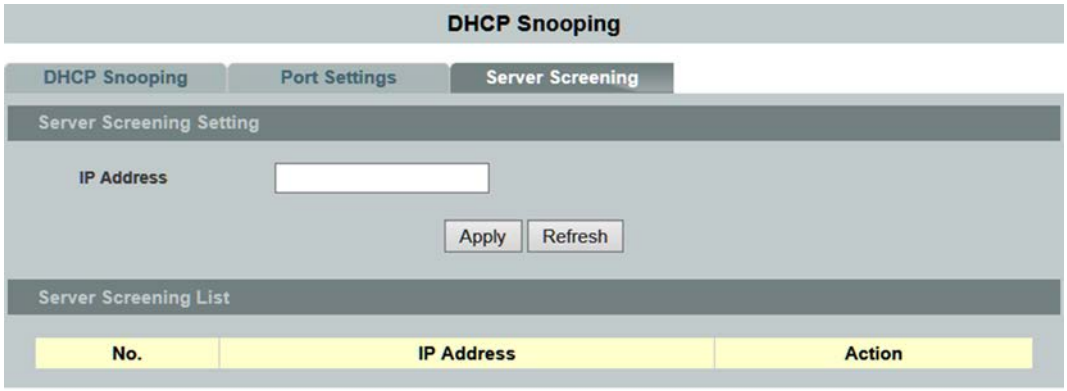


Figure 87: WBM “DHCP Snooping” Page – “Server Screening” Tab

Table 91: WBM “DHCP Snooping” Page – “Server Screening” Tab

Server Screening Setting		
Parameters	**Default**	**Description**
IP Address		Enter the IP address of a valid DHCP server in this input field.
Server Screening List		
Parameters	**Default**	**Description**
No.		This column displays the index number of the DHCP server entry. Click the number to modify the entry.
IP Address		This column displays the IP address of the DHCP server.
Action		Click **[Delete]** to delete a specific entry.

9.4.1.2 Binding Table

Note

Additional Information

Please refer to the section “Function Description” for more information on “Binding Table”.

9.4.1.2.1 Static Entry

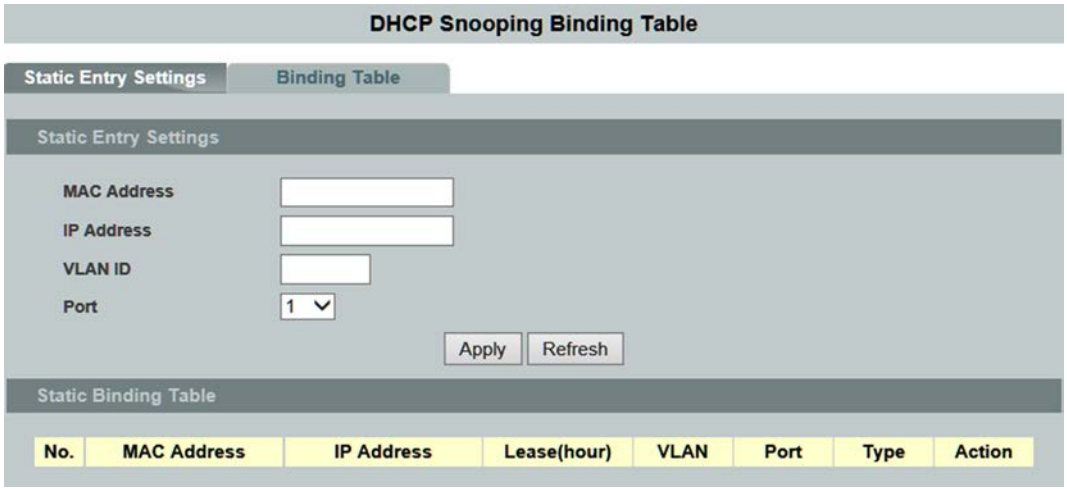


Figure 88: WBM “Binding Table” Page – “Static Entry” Tab

Table 92: WBM “Binding Table” Page – “Static Entry” Tab

Static Entry Settings		
Parameters	**Default**	**Description**
MAC Address		Enter the source MAC address for the binding in this input field.
IP Address		Enter the IP address assigned to the source MAC address for the binding.
VLAN ID		Enter the source VLAN ID for the binding in this input field.
Port	**1** … 10	Select the physical port of the binding in the selection box.
Static Binding Table		
Parameters	**Default**	**Description**
No.	1 … 10	This column displays the sequential numbers for each binding. Click to update the existing entries.
MAC Address		This column displays the MAC address for the binding.
IP Address		This column displays the IP address assigned to the source MAC address for the binding.
Lease (hour)		This column displays how long the binding is valid.
VLAN		This column displays the source VLAN ID for the binding.
Port	1 … 10	This column displays the port number for the binding.
Type	Static Dynamic	This column displays how the binding was communicated to the switch. “Static”: This binding was manually entered by an administrator. “Dynamic”: This binding was entered by information from “DHCP Snooping”.
Action		Click **[Delete]** to delete a specific entry.

9.4.1.2.2 Binding Table

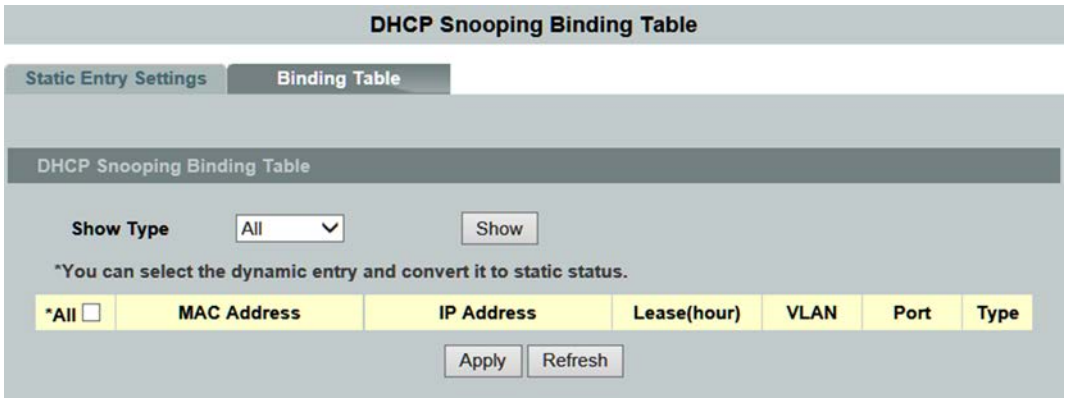


Figure 89: WBM “Binding Table” Page – “Binding Table” Tab

Table 93: WBM “Binding Table” Page – “Binding Table” Tab

DHCP Snooping Binding Table		
Parameters	**Default**	**Description**
Show Type	**All**	Select “All” in the selection box if you want to display all binding table entries.
	Dynamic	Select “Dynamic” in the selection box if you want to display the dynamic binding table entries.
	Static	Select “Static” in the selection box if you want to display the static binding table entries.
Parameters	**Default**	**Description**
All	1 … 10	This column displays the sequential numbers for each binding. Click to update the existing entries.
MAC Address		This column displays the MAC address for the binding.
IP Address		This column displays the IP address assigned to the source MAC address for the binding.
Lease (hour)		This column displays how long the binding is valid.
VLAN		This column displays the source VLAN ID for the binding.
Port		This column displays the port number for the binding. If this field is empty, the binding applied to all ports.
Type	Static Dynamic	This column displays how the binding is communicated to the switch. “Static”: This binding was manually entered by an administrator. “Dynamic”: This binding was entered by information from “DHCP Snooping”.

9.4.1.3 ARP Inspection

Note

Additional Information

Please refer to the section “Function Description” for more information on “ARP Inspection” (“**A**ddress **R**esolution **P**rotocol **Inspection**”).

9.4.1.3.1 ARP Inspection

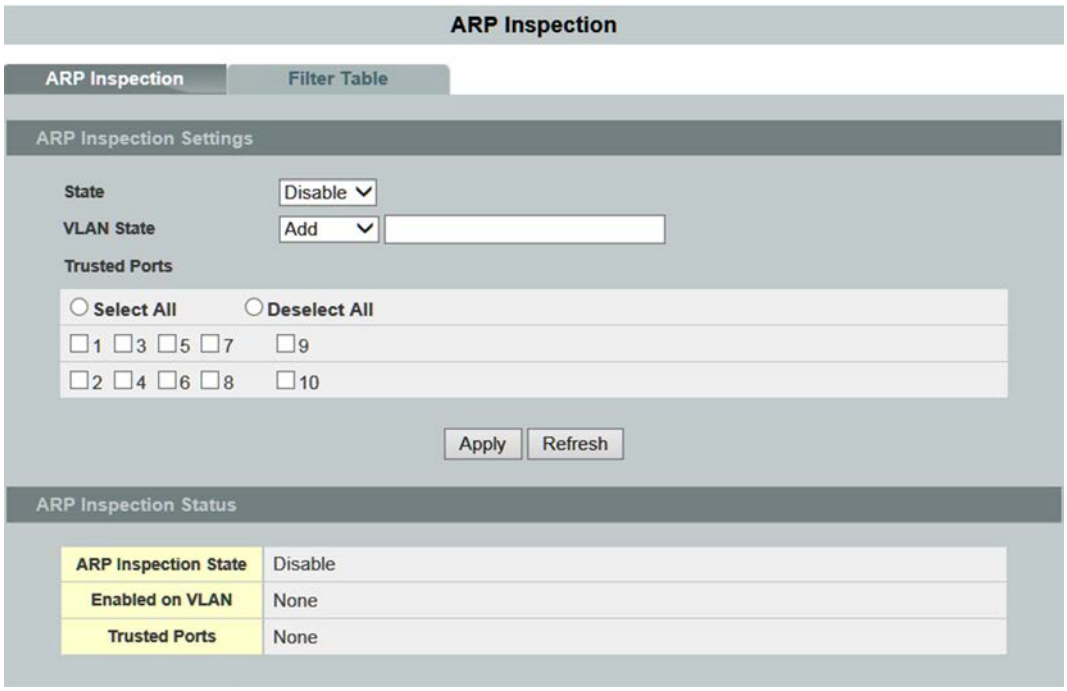


Figure 90: WBM “ARP Inspection” Page – “ARP Inspection” Tab

Table 94: WBM “ARP Inspection” Page – “ARP Inspection” Tab

ARP Inspection Settings				
Parameters		**Default**	**Description**	
State		**Disable**	Select “Disable” in the selection box if you want to disable ARP inspection on the switch.	
		Enable	Select “Enable” in the selection box if you want to enable ARP inspection on the switch.	
VLAN State		**Add**	Select “Add” in the selection box and enter the VLANs for which “ARP Inspection” should be enabled on the switch. Valid range of VLAN IDs: 1 … 4094. Use a comma (,) or hyphen (-) to specify individual VLANs or VLAN ranges.	
		Delete	Select “Delete” in the selection box and enter the VLANs on which the switch should not run “ARP Inspection”.	
Trusted Ports			Select the ports that you want to select or deselect as “Trusted Ports”. The switch does not drop ARP packets from “Trusted Ports” for any reason. The switch discards DHCP packets from “Untrusted Ports” in the following situations: • The sender information in an ARP packet does not match any current bindings. • The transmission rate of the DHCP packets received are too high. You can specify the maximum rate for receiving packets on “Untrusted Ports”.	
	Select All	○	○	No port is selected as “Trusted”.
			◉	All ports are selected as “Trusted”.
	Deselect All	○	○	No port is disabled as “Trusted”.
			◉	All ports are disabled as “Trusted”.
	☐ 1 … ☐ 10	☐	☐	The port is not enabled.
			☑	The port is enabled.
ARP Inspection Status				
Parameters		**Default**	**Description**	
ARP Inspection State		Disable Enable	This field displays the current status of the ARP inspection.	
Enabled on VLAN		None 1 … 10	This field displays the VLAN IDs for which ARP Inspection is enabled.	
Trusted Ports		Nonr 1 … 10	This field displays the ports specified as “Trusted Ports”.	

9.4.1.3.2 Filter Table

Note

Additional Information

Please refer to the section “Function Description” for more information on “Filter Table”.

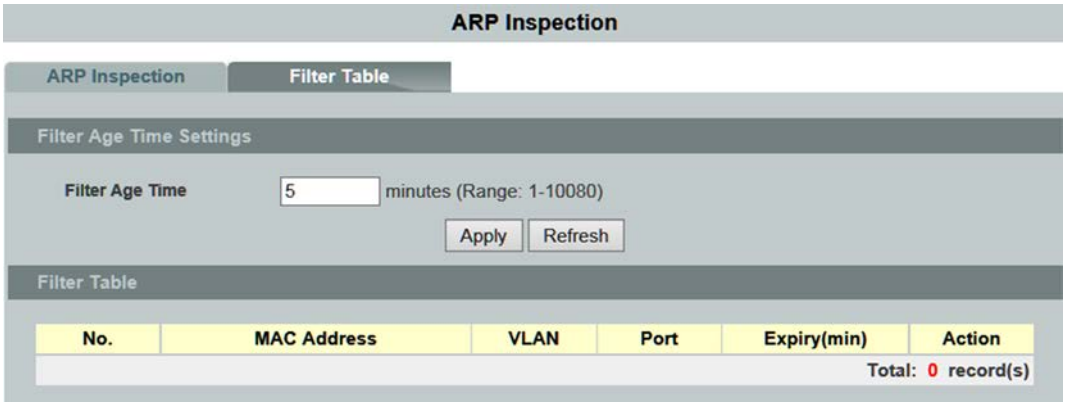


Figure 91: WBM “ARP Inspection” Page – “Filter Table” Tab

Table 95: WBM “ARP Inspection” Page – “Filter Table” Tab

Filter Age Time Settings		
Parameters	**Default**	**Description**
Filter Age Time min (Range: 1~10080)	**5**	Enter a time (1 to 10,080 minutes) in the input field for how long a MAC address filter entry should remain in the switch after the switch has received an unauthorized ARP packet. Once the time has elapsed, the switch deletes the entry automatically. This setting has no effect on existing MAC address filters.
Filter Table		
Parameters	**Default**	**Description**
No.		This column displays the sequential number of each MAC address filter entry.
MAC Address		This column displays the source MAC address in the MAC address filter.
VLAN		This column displays the source VLAN IDs in the MAC address filter.
Port		This column displays the source ports of the dropped ARP packets.
Expiry (min)		This column displays how long (in minutes) a MAC address filter entry remains in the switch.
Action		Click **[Delete]** to delete a specific entry.
Total		This field displays the total number of current MAC address filter entries that the switch created due to identified unauthorized ARP packets.

9.4.2 Access Control List

Note

Additional Information

Please refer to the section “Function Description” for more information on “Access Control”.

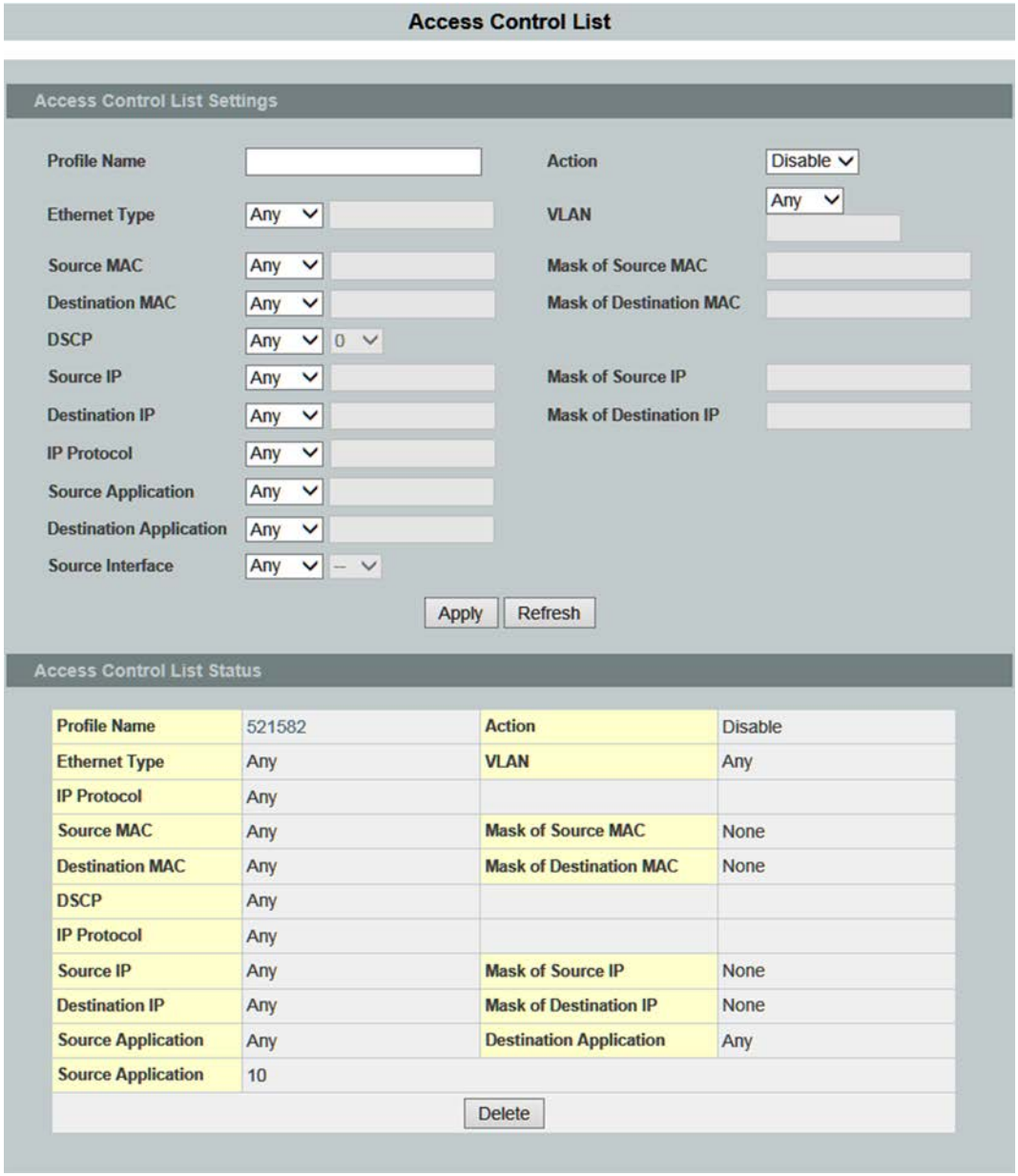


Figure 92: WBM “Access Control List” Page

Table 96: WBM “Access Control List” Page

Access Control List Settings		
Parameters	**Default**	**Description**
Profile Name		Enter the name of the profile in the input field.
Action	**Disable**	Select “Disable” in the selection box to disable access control.
	Permit	Select “Permission” in the selection box to forward data packet that match the information.
	Drop	Select “Drop” in the selection box to drop data packet that match the information.
	DSCP	Select “DSCP” to give data packet a new priority that match the information (only IPv4).
ETHERNET Type (only IPv4)	**Any**	Select “any” in the selection box, so every ETHERNET type is valid.
	Other	Select “Other” in the selection box to specify an ETHERNET type for which access control is valid.
VLAN	**Any**	Select “any” in the selection box, so every VLAN ID is valid.
	Other	Select “Other” in the selection box to enter a specific VLAN ID in the access control list.
Source MAC (only IPv4)	**Any**	Select “any” in the selection box, so every MAC address is valid.
	Other	Select “Other” in the selection box to enter the MAC address for the source in the access control list.
Mask of Source MAC (only IPv4)		In the input field, enter the source MAC ID of the bitmap mask for source MAC addresses of packets to be filtered. If you selected “any” in the “Source MAC Address” selection box, the field remains empty. The profile then only filters the MAC address entered in the source MAC address field.
Destination MAC (only IPv4)	**Any**	Select “any” in the selection box, so every MAC address is valid.
	Other	Select “Other” in the selection box to enter the destination MAC address in the access control list.
Mask of De4stination MAC (only IPv4)		In the input field, enter the destination MAC address of the bitmap mask for designation MAC addresses of packets to be filtered. If you selected “Destination MAC Address” in the selection box, the field remains empty. The profile then only filters the MAC address entered in the designation MAC address field.
DSCP (only IPv4)	**Any**	Select “any” in the selection box, so every DSCP priority for the access control list is valid.
	Other	**0** … 63 — Select the DSCP priority in the selection box.
Source IP	**Any**	Select “any” in the selection box, so every IP address is valid.
	Other	Select “Other” in the selection box to enter the source IP address in the access control list.
Mask of Source IP		In the input field, enter the source IP address of the bitmap mask for source IP addresses of packets to be filtered. If you selected “Source IP” in the selection box, the field remains empty. The profile then only filters the IP address entered in the source IP address field.

Table 96: WBM “Access Control List” Page

Destination IP	**Any**		Select “any” in the selection box, so every IP address is valid.
	Other		Select “Other” in the selection box to enter the destination IP address in the access control list.
Mask of Destination IP			In the input field, enter the destination IP address of the bitmap mask for designation IP addresses of packets to be filtered. If you selected “Destination IP Address” in the selection box, the field remains empty. The profile then only filters the IP address entered in the destination IP address field.
IP Protocol	**Any**		Select “any” in the selection box, so every IP protocol for the access control list is valid.
	Other		Enter “Other” in the selection box to enter the protocol.
Source Application	**Any**		Select “any” in the selection box, so every application is valid.
	Other		Select “Other” in the selection box to enter the source port (e.g., 2234).
Destination Application	**Any**		Select “any” in the selection box, so every target application is valid.
	Other		Select “Other” in the selection box to enter the destination port (e.g., 502) in the access control list.
Source Interface	**Any**		Select “any” in the selection box, if every physical port is valid.
	Other	1 … 10	Enter the physical port in the input field for which this entry is valid in the access control list.
Access Control List Status			
Parameters	**Default**		**Description**
IP-Type	IPv4 IPv6		This field displays the selected IP Type.
Profile Name			This field displays the selected name of the profile.
Action	Disable Permit Drop DSCP		This field displays the status of the access control. (DSCP only at IPv4).
ETHERNET Type (only IPv4)	Any Other		This field displays the ETHERNET type.
VLAN	Any Other		This field displays the VLAN ID.
IP Protocol	Any Other		This field displays the IP protocol.
Source MAC (only IPv4)	Any Other		This field displays the source MAC address.
Mask of Source MAC (only IPv4)			This field displays the source MAC ID of the bitmap mask.
Destination MAC (only IPv4)	Any Other		This field displays the destination MAC address.
Mask of Destination MAC (only IPv4)			This field displays the destination MAC ID of the bitmap mask.
DSCP (only IPv4)	Any Other		This field displays the DSCP priority.
IP Protocol	Any Other		This field displays the IP protocol.

Table 96: WBM “Access Control List” Page

Source IP	Any Other	This field displays the source IP.
Mask of Source IP		This field displays the source MAC ID of the bitmap mask.
Destination IP	Any Other	This field displays the destination IP address.
Mask of Destination IP		This field display the destination IP ID of the bitmap mask.
Source Application	Any Other	This field display the source application.
Destination Application	Any Other	This field displays the target application.
Source Application	1 … 10	This field display the source application.

9.4.3 802.1x

Note

Additional Information

Please refer to the section “Function Description” for more information on the “IEEE 802.1x” standard.

9.4.3.1 Global Settings

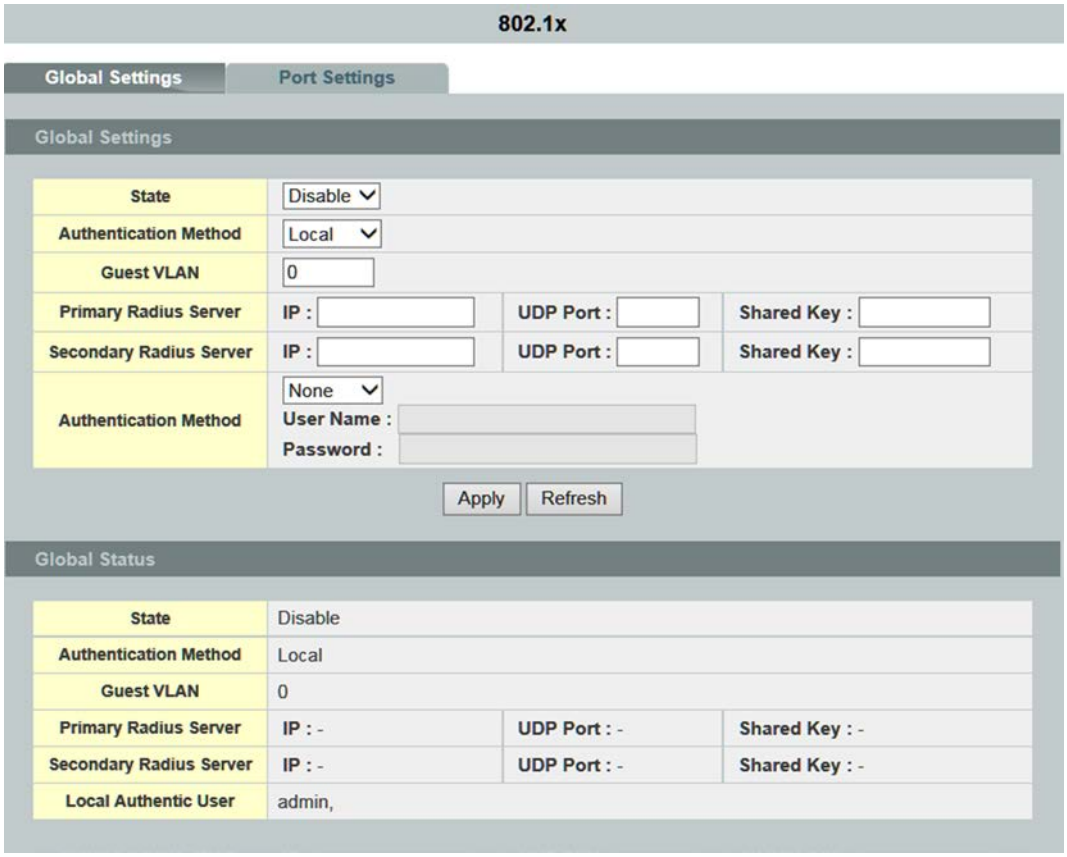


Figure 93: WBM “802.1x” Page – “Global Settings” Tab

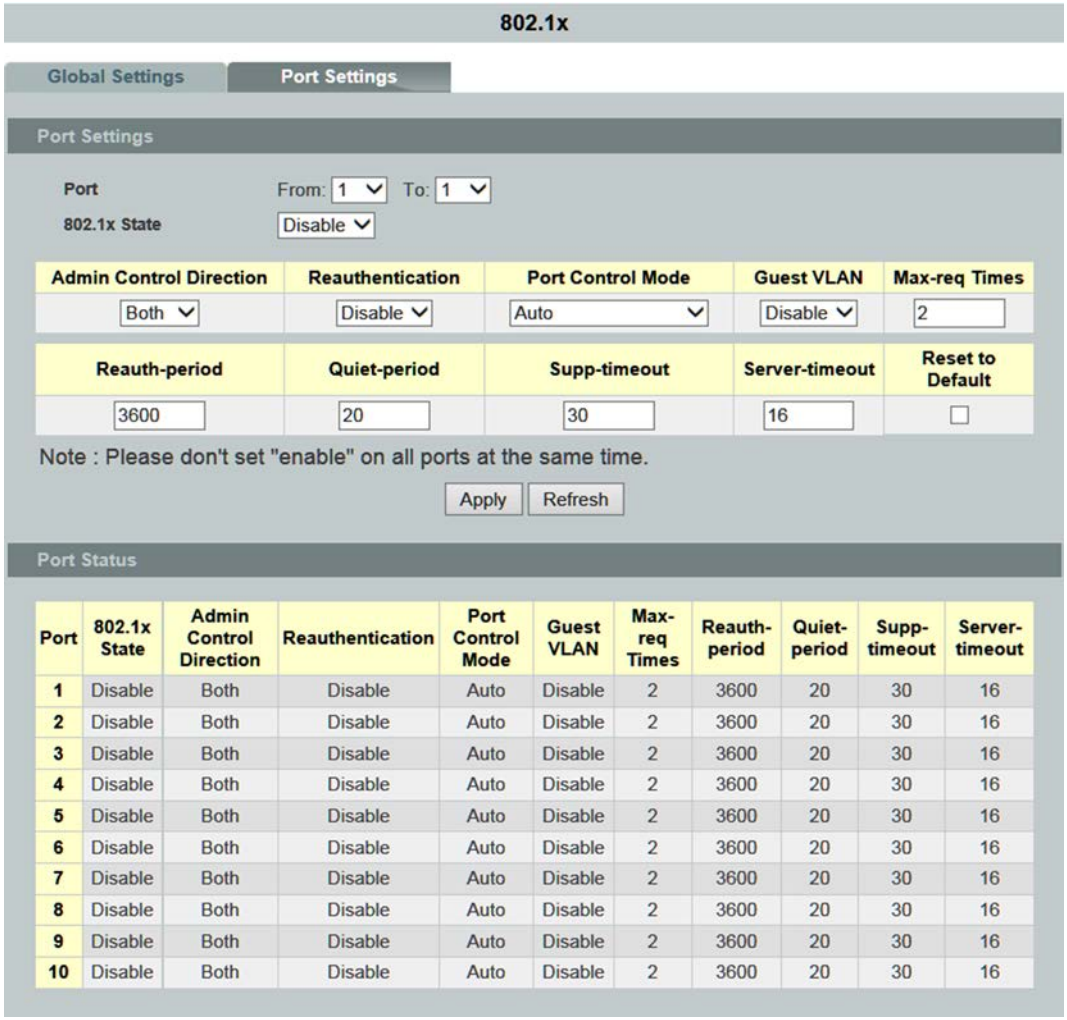
Table 97: WBM “802.1x” Page – “Global Settings” Tab

Global Settings			
Parameters		**Default**	**Description**
State		**Disable**	Select “Disable” in the selection box to disable 802.1x authentication on the switch.
		Enable	Select “Enable” in the selection box to enable 802.1x authentication on the switch.
			Note **Note** **802.1x Authentication** You must first enable 802.1x authentication on the switch before you can configure this function for individual ports.
Authentication Method		**Local**	Select “Local” in the selection box to use the “Guest” and “User” user groups from the user account database on the switch for authentication. However, the number of node that can exist at the same time is limited.
		Radius	Select “Radius” in the selection box to enable the security protocol that uses an external server for user authentication in contrast to the internal user database in devices with limited storage. In general, “Radius” allows validation of an unlimited number of users from a central location.
Guest VLAN			This field is used to configure the VLAN ID.
Primary Radius Server			If you select “Radius” for the authentication method, the primary RADIUS server is used for all authentication requests.
	IP:		In the input field, enter the IP address of the external RADIUS server in decimal-point notation.
	UDP Port:		Enter the UDP port in the input field.
	Shared Key:		Enter a password (up to 32 alphanumeric characters) in the input field to use as the common key for the connection between the external RADIUS server and the switch. This key may not be sent over the network. The key must be identical on the external RADIUS server and the switch.

Table 97: WBM “802.1x” Page – “Global Settings” Tab

Secondary Radius Server			This is the back-up server that is only used if the primary RADIUS server fails.	
	IP:		In the input field, enter the IP address of the external RADIUS server in decimal-point notation.	
	UDP Port:	**0 … 65535**	Enter the port number of the RADIUS server in the input field.	
	Shared Key:		Enter a password (up to 32 alphanumeric characters) in the input field to use as the common key for the connection between the external RADIUS server and the switch. This key may not be sent over the network. The key must be identical on the external RADIUS server and the switch.	
Authentication Method			The user name and password are displayed, added or deleted in these input fields.	
		None	If you selected “None” in the selection box, you then cannot change the user name and password.	
		Delete	User Name:	If you selected “Delete” in the selection box, you can change the user name.
		Add	Password:	If you selected “Add” in the selection box, you can change the user name and password.
Global Status				
Parameters		**Default**	**Description**	
State		Disable Enable	This field indicates if 802.1x authentication is enabled or disabled.	
Authentication Method		Local Radius	This field displays the authentication method.	
Guest VLAN			This field displays the guest VLAN.	
Primary Radius Server	IP:		This field displays the IP address, UDP port and common key for the primary RADIUS server. The fields are empty if no configuration is executed.	
	UDP Port:			
	Shared Key:			
Secondary Radius Server	IP:		This field displays the IP address, UDP port and common key for the secondary RADIUS server. The fields are empty if no configuration is executed.	
	UDP Port:			
	Shared Key:			
Local Authentic User		admin,	This field displays the list of users logged in.	

9.4.3.2 Port Settings



Port	802.1x State	Admin Control Direction	Reauthentication	Port Control Mode	Guest VLAN	Max-req Times	Reauth-period	Quiet-period	Supp-timeout	Server-timeout
1	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
2	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
3	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
4	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
5	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
6	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
7	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
8	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
9	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16
10	Disable	Both	Disable	Auto	Disable	2	3600	20	30	16

Figure 94: WBM “802.1x” Page – “Port Settings” Tab

Table 98: WBM “802.1x” Page – “Port Settings” Tab

Port Settings			
Parameters		**Default**	**Description**
Port	From:	**1**	Select a port or port range in the selection box to configure the “Port Settings”.
	To:	**1**	Select a port or port range in the selection box to configure the “Port Settings”.
802.1x State		**Disable**	Select “Disable” in the selection box to disable this function.
		Enable	Select “Enable” in the selection box to enable 802.1x authentication for the port. You must first enable 802.1x authentication on the switch before you can configure this function for individual ports.
Admin Control Direction		**Both**	Select “Both” in the selection box if both incoming and outgoing packets should be dropped if 802.1x port authentication of a user fails.
		In	Select “Input” in the selection box if only incoming packets should be dropped if 802.1x port authentication of a user fails.
Reauthentication		**Disable**	Select “Disable” in the selection box if a subscriber does not regularly enter the user name and password to remain connected to the port.
		Enable	Select “Enable” in the selection box if a subscriber regularly enters the user name and password to remain connected to the port.
Port Control Mode		**Auto**	Select “Auto” in the selection box to enable authentication for the port.
		Force Authorized	Select “Force Authorized,” in the selection box to enable permanent authentication for the port.
		Force Unauthorized	Select “Force Unauthorized, in the selection box to enable permanent denial of authentication for the port. No packets can pass through this port.
Guest VLAN		**Ausschalten**	Select “Disable” in the selection box to disable the guest VLAN on the port.
		Einschalten	Select “Enable” in the selection box to enable the guest VLAN on the port.
Max-req Times		**2**	Enter a value for the maximum required time in the input field that the switch should attempt to connect to the authentication server before it sees the server as not connected.
Reauth-period		**3600**	Enter a value for the time in the input field during which a subscriber has to enter the user name and password to remain connected to the port.
Quiet-period		**60**	Enter a value for the time in the input field that the client must wait before it can request authentication again. This prevents the switch from becoming overloaded with continuous authentication attempts from the client.
Supp-timeout		**30**	Enter a value for the time in the input field that the switch must wait before it can communicate with the server.
Server-timeout		**30**	Enter a value for the time in the input field that the switch should wait for a response from the authentication server.

Table 98: WBM “802.1x” Page – “Port Settings” Tab

Reset to Default	☐	☐	No custom settings for 802.1x port authentication are reset to the default values.
		☑	The custom settings for 802.1x port authentication are reset to the default values.
Port Status			
Parameters	**Default**	**Description**	
Port	1 **...** 10	This column displays the port numbers.	
802.1x State	Disable Enable	This column displays if 802.1x authentication for a port is enabled or disabled.	
Admin Control Direction	Both In	This column displays the “Admin Control Direction”.	
Reauthentication	Disable Enable	This column displays if the subscriber has to enter the user name and password regularly to remain connected to the port.	
Port Control Mode	Auto, Force Authorized, Force Unauthorized	This column displays the port control mode.	
Guest VLAN	Disable Enable	This column displays the guest VLAN setting for hosts where authentication failed.	
Max-req Times	1 … 10	This column displays how often the switch attempts to connect to the authentication server before it sees the server as not connected.	
Reauth-period	0 … 65535	This column displays at what interval a subscriber must enter the user name and password to remain connected to the port.	
Quiet-period	0 … 65535	This column displays the time that a client must wait before it can request authentication again.	
Supp-timeout	0 … 65535	This column displays how long the switch should wait before communicating with the switch.	
Server-timeout	0 … 65535	This column displays how long the switch should wait before communicating with the client.	

9.4.4 Port Security

Note

Additional Information

Please refer to the section “Function Description” for more information on “Port Security”.

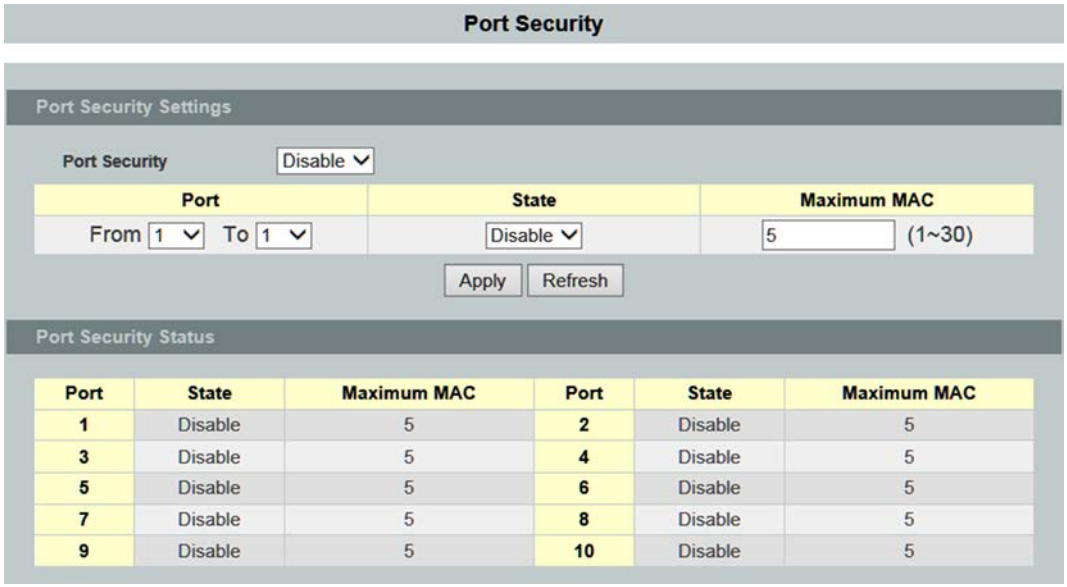


Figure 95: WBM “Port Security” Page

Table 99: WBM “Port Security” Page

Port Security Settings			
Parameters		**Default**	**Description**
Port Security		**Disable**	Select “Disable” in the selection box to disable port security on the switch.
		Enable	Select “Enable” in the selection box to enable port security on the switch.
Port	From:	**1**	Select a port or port range in the selection box to configure the “Port Security”.
	To:	**1**	Select a port or port range in the selection box to configure the “Port Security”.
State		**Disable**	Select “Disable” in the selection box to disable port security for a port or port range.
		Enable	Select “Enable” in the selection box to enable port security for a port or port range.
Maximum MAC (1~30)		**5**	Enter the maximum number of MAC addresses per interface in the input field.
Port Security Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
State		Enable Disable	This column displays if port security is enabled or disabled.
Maximum MAC		0 … 30	This column displays the maximum number of MAC addresses.

9.5 Monitor

9.5.1 Alarm Information

Note

Additional Information

Please refer to the section “Function Description” for more information on the “Alarm”.

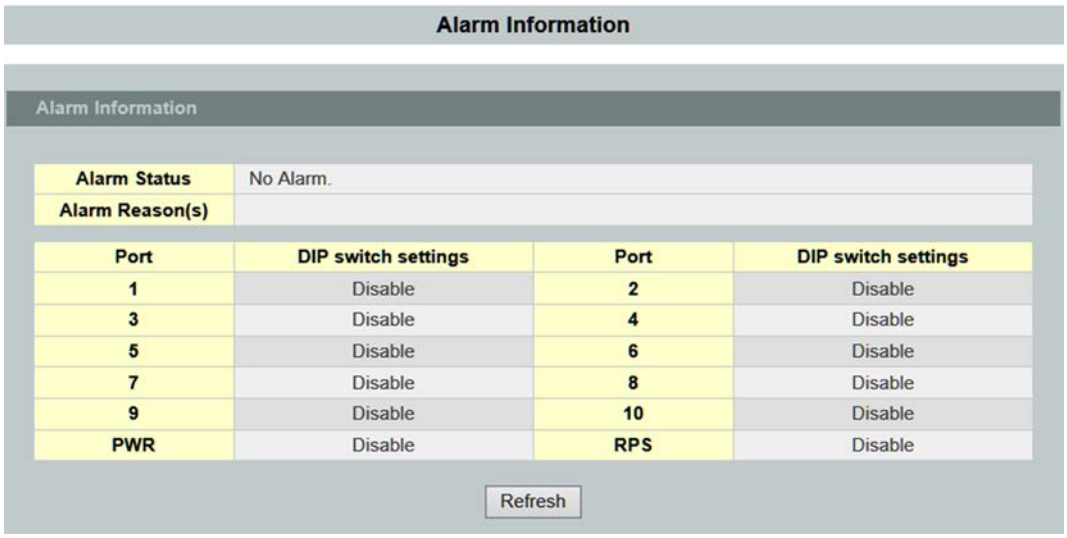


Figure 96: WBM “Alarm Information” Page

Table 100: WBM “Alarm Information” Page

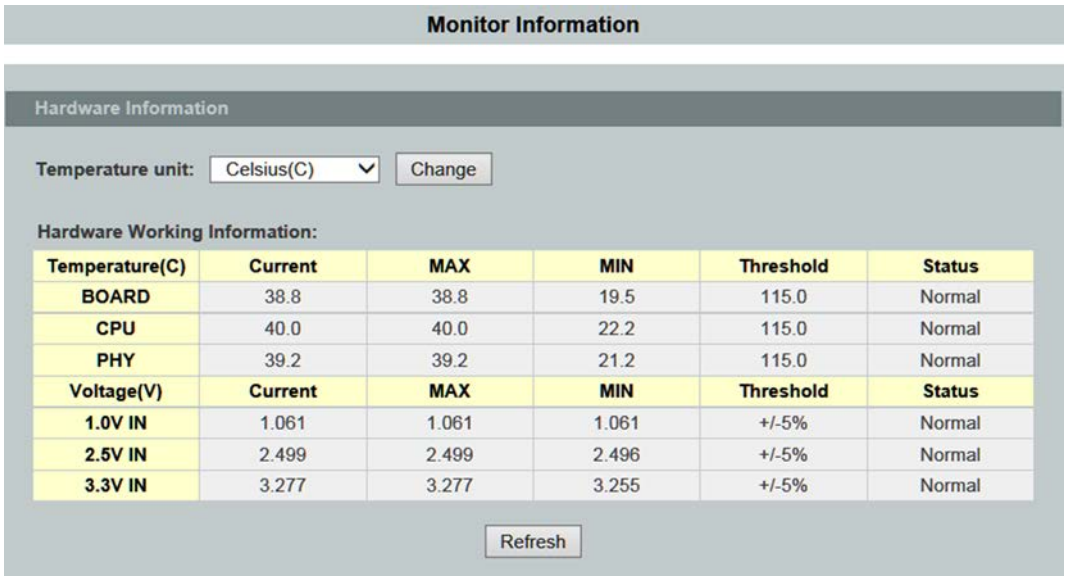
Alarm Information		
Parameters	**Default**	**Description**
Alarm Status		This display field shows if there are any alarm events.
Alarm Reason(s)		This display field shows details about the alarm events.
Port	0 … 10 PWR RPS	This column displays the DIP switch name.
DIP switch settings	Enable Disable	This column displays the current status of the DIP switch.

9.5.2 Monitor Information

Note

Additional Information

Please refer to the section “Function Description” for more information on the “Monitor Information”.



Temperature(C)	Current	MAX	MIN	Threshold	Status
BOARD	38.8	38.8	19.5	115.0	Normal
CPU	40.0	40.0	22.2	115.0	Normal
PHY	39.2	39.2	21.2	115.0	Normal
Voltage(V)	**Current**	**MAX**	**MIN**	**Threshold**	**Status**
1.0V IN	1.061	1.061	1.061	+/-5%	Normal
2.5V IN	2.499	2.499	2.496	+/-5%	Normal
3.3V IN	3.277	3.277	3.255	+/-5%	Normal

Figure 97: WBM “Monitor Information” Page

Table 101: WBM “Monitor Information” Page

Hardware Information		
Parameters	**Default**	**Description**
Temperature unit	**Celsius (C)**	Select “Celsius (C)” in the selection box if you want to display the temperature in Celsius.
	Fahrenheit (F)	Select “Fahrenheit (F)” in the selection box if you want to display the temperature in Fahrenheit.
Hardware Working Information		
Parameters	**Default**	**Description**
Temperature (C)		
Current		This column displays the current temperature of the “BOARD”, “CPU” and “PHY” MAC chip.
MAX		This column displays the maximum temperature of the “BOARD”, “CPU” and “PHY” MAC chip.
MIN		This column displays the minimum temperature of the “BOARD”, “CPU” and “PHY” MAC chip.
Threshold		This column displays the threshold set.
Status		This column displays the status.
Voltage (V)		
Current		This column displays the current voltage of the “1.0 V IN”, “2.5 V IN” and “3.3 V IN” inputs.
MAX		This column displays the maximum voltage of the “1.0 V IN”, “2.5 V IN” and “3.3 V IN” inputs.
MIN		This column displays the minimum voltage of the “1.0 V IN”, “2.5 V IN” and “3.3 V IN” inputs.
Threshold		This column displays the threshold set.
Status		This column displays the status.

9.5.3 Port Statistics

Note

Additional Information

Please refer to the section “Function Description” for more information on the “Port Statistics”.

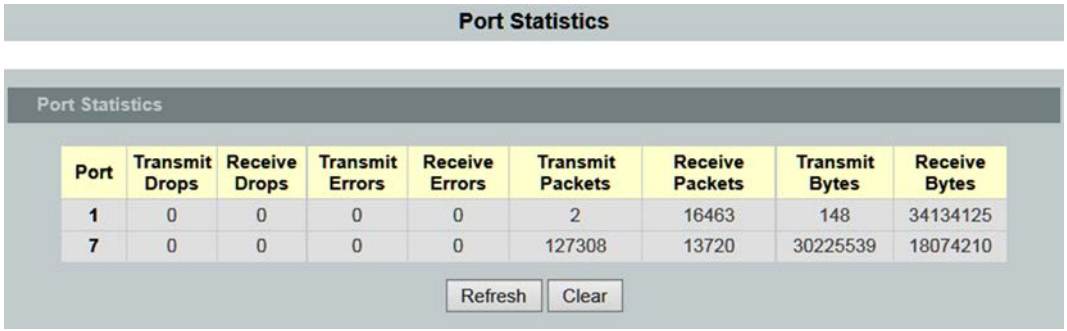


Figure 98: WBM “Port Statistics” Page

Table 102: WBM “Port Statistics” Page

Port Statistics		
Parameters	**Default**	**Description**
Port		This column displays the port numbers.
Transmit Drops		This column displays the number of dropped data packets on the transmission line.
Receive Drops		This column displays the number of dropped data packets on the receiving line.
Transmit Errors		This column displays the errors on the transmission line.
Receive Errors		This column displays the errors on the receiving line.
Transmit Packets		This column displays the number of data packets transmitted since power ON.
Receive Packets		This column displays the number of data packets received since power ON.
Transmit Byte		This column displays the number of bytes sent on the port since power ON.
Receive Bytes		This column displays the number of bytes received on the port since power ON.

9.5.4 Port Utilization

Note

Additional Information

Please refer to the section “Function Description” for more information on the “Port Utilization”.

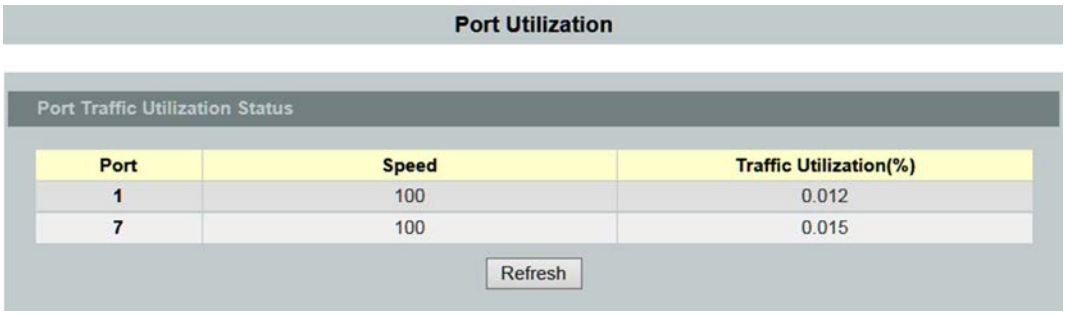


Figure 99: WBM “Port Utilization” Page

Table 103: WBM “Port Utilization” Page

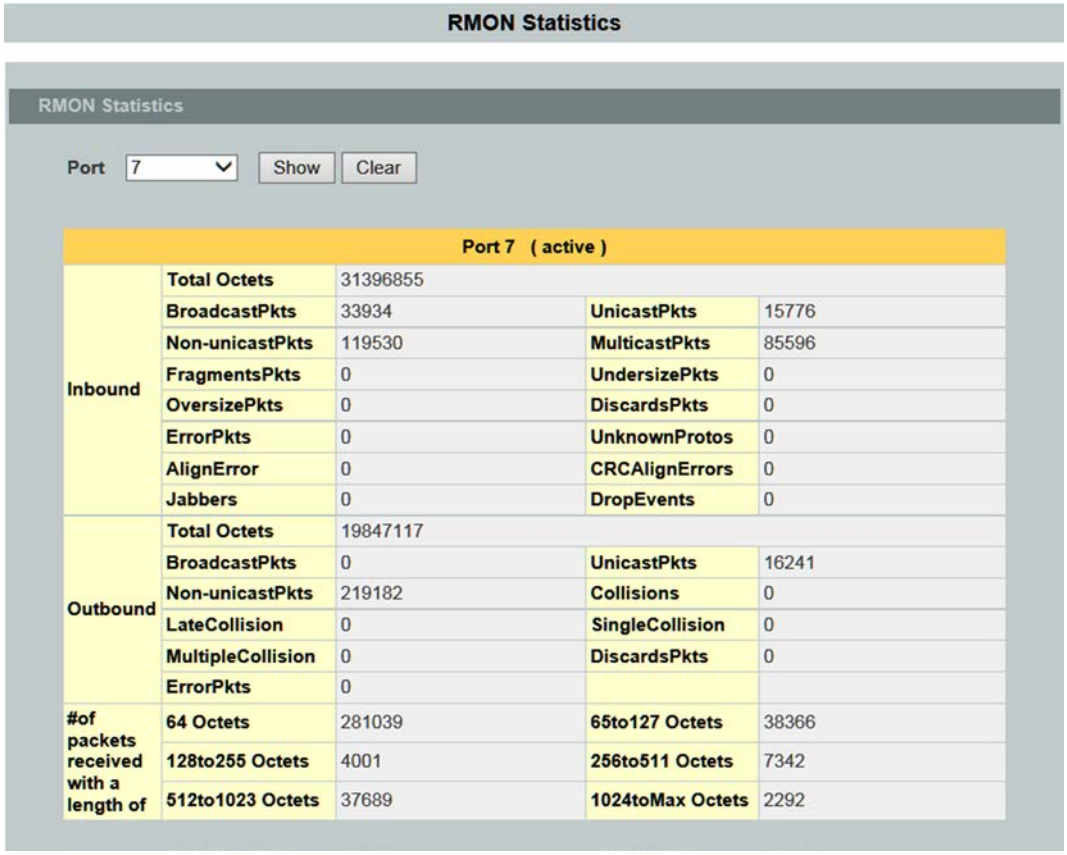
Port Traffic Utilization Status		
Parameters	**Default**	**Description**
Port		This column displays the port numbers.
Speed		This column displays the transfer rate.
Traffic Utilization (%)		This column displays the percentage utilization of the bandwidth.

9.5.5 RMON Statistics

Note

Additional Information

Please refer to the section “Function Description” for more information on the “RMON Statistics”.



Port 7 (active)				
Inbound	Total Octets	31396855		
	BroadcastPkts	33934	UnicastPkts	15776
	Non-unicastPkts	119530	MulticastPkts	85596
	FragmentsPkts	0	UndersizePkts	0
	OversizePkts	0	DiscardsPkts	0
	ErrorPkts	0	UnknownProtos	0
	AlignError	0	CRCAlignErrors	0
	Jabbers	0	DropEvents	0
Outbound	Total Octets	19847117		
	BroadcastPkts	0	UnicastPkts	16241
	Non-unicastPkts	219182	Collisions	0
	LateCollision	0	SingleCollision	0
	MultipleCollision	0	DiscardsPkts	0
	ErrorPkts	0		
#of packets received with a length of	64 Octets	281039	65to127 Octets	38366
	128to255 Octets	4001	256to511 Octets	7342
	512to1023 Octets	37689	1024toMax Octets	2292

Figure 100: WBM “RMON Statistics” Page

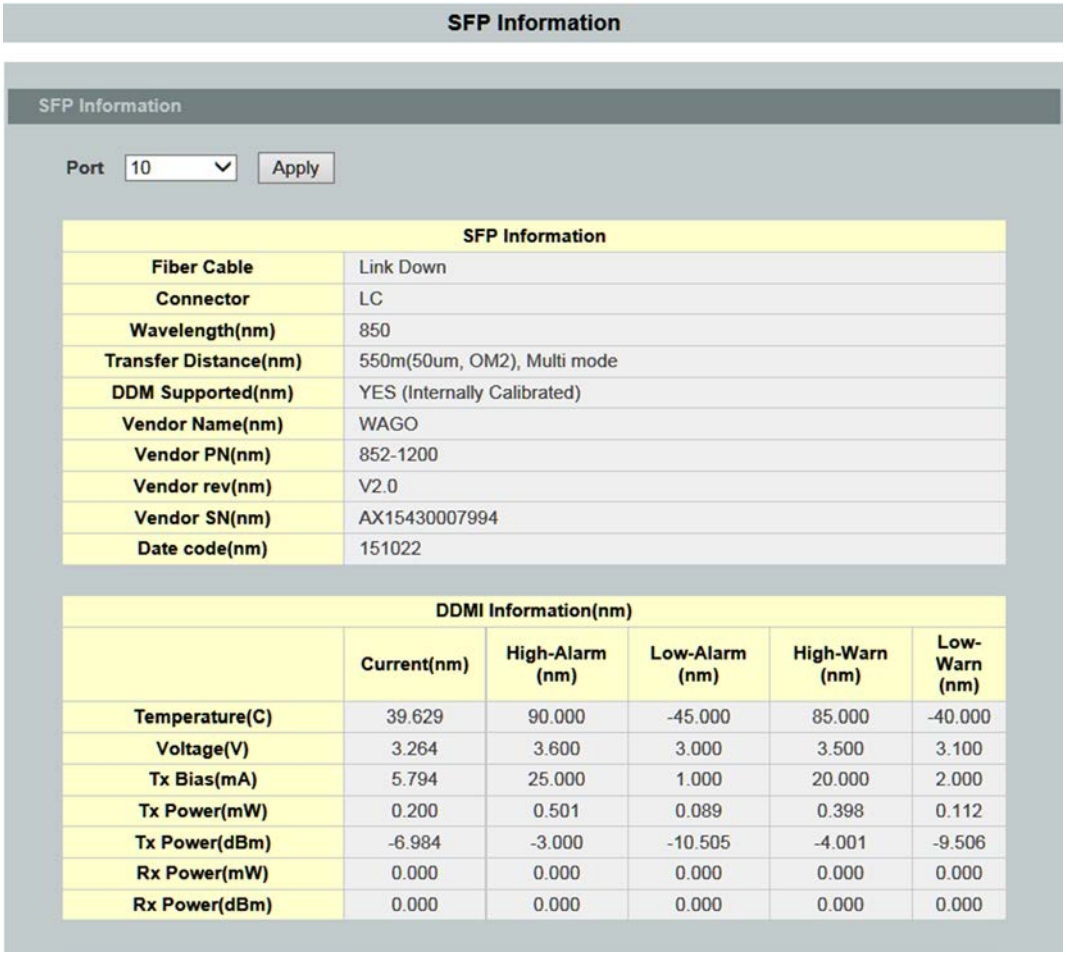
Table 104: WBM “RMON Statistics” Page

RMON Statistics			
Parameters		**Default**	**Description**
Port		**-**	Select “-” in the selection box, if you do not want to view any statistics.
		1 … 10 All	In the selection box, select a port or all ports to display their RMON statistics.
Select Port (s) (active)			
Parameters		**Default**	**Description**
Inbound	Total Octets		This display field shows the number of data packets received on the port.
	Broadcast Pkts		This display field shows the number of broadcast packets received on the port.
	Unicast Pkts		This display field shows the number of unicast packets received on the port.
	Non-unicast Pkts		This display field shows the total number of broadcast and multicast packets received on the port.
	Multicast Pkts		This display field shows the number of multicast packets received on the port.
	Fragments Pkts		This display field shows the number of fragmented data packets received on the port.
	Undersize Pkts		This display field shows the number of data packets received on the port that are too small.
	Oversize Pkts		This display field shows the number of data packets received on the port that are too large.
	Discards Pkts		This display field shows the number of data packets received on the port that were dropped.
	Error Pkts		This display field shows the number of data packets received on the port that were faulty.
	Unknown Protos		This display field shows the number of packets received by this port that contain an unknown or unsupported protocol as the target.
	Align Error		This display field shows the number of data packets received where the total number of bits of a received frame is not divisible by eight.
	CRC Align Errors		This display field shows the number of data packets received with a checksum error.
	Jabbers		This display field shows the number of jabbers received by this port.
	Drop Events		This display field shows the number of discarded data packets.

Table 104: WBM “RMON Statistics” Page

Outbound	Total Octets		This display field shows the number of data packets sent from the port.
	Broadcast Pkts		This display field shows the number of broadcast packets sent from the port.
	Unicast Pkts		This display field shows the number of unicast packets sent from the port.
	Non Unicast Pkts		This display field shows the number of unicast packets sent from the port.
	Collisions		This display field shows the number of data packets to be sent, have collided and were discarded.
	Late Collisions		This display field shows the number of data packets to be sent, have collided and were discarded.
	Single Collisions		This display field shows the number of single collisions of the data packets sent.
	Multiple Collisions		This display field shows the number of multiple collisions of the data packets sent.
	Discards Pkts		This display field shows the number of data packets sent from the port that were discarded.
	Error Pkts		This display field shows the number of data packets sent from the port that were faulty.
# of packets received with a length of	64 Octets		This display field shows the number of data packets received that had a length of 64 octets.
	65 to 127 Octets		This display field shows the number of data packets received that had a length of 65 to 127 octets.
	128 to 255 Octets		This display field shows the number of data packets received that had a length of 128 to 255 octets.
	256 to 511 Octets		This display field shows the number of data packets received that had a length of 256 to 511 octets.
	512 to 1023 Octets		This display field shows the number of data packets received that had a length of 512 to 1023 octets.
	1024 to Max. Octets		This display field shows the number of data packets received that had a length of more than 1024 octets.

9.5.6 SFP Information



SFP Information	
Fiber Cable	Link Down
Connector	LC
Wavelength(nm)	850
Transfer Distance(nm)	550m(50um, OM2), Multi mode
DDM Supported(nm)	YES (Internally Calibrated)
Vendor Name(nm)	WAGO
Vendor PN(nm)	852-1200
Vendor rev(nm)	V2.0
Vendor SN(nm)	AX15430007994
Date code(nm)	151022

DDMI Information(nm)					
	Current(nm)	High-Alarm (nm)	Low-Alarm (nm)	High-Warn (nm)	Low-Warn (nm)
Temperature(C)	39.629	90.000	-45.000	85.000	-40.000
Voltage(V)	3.264	3.600	3.000	3.500	3.100
Tx Bias(mA)	5.794	25.000	1.000	20.000	2.000
Tx Power(mW)	0.200	0.501	0.089	0.398	0.112
Tx Power(dBm)	-6.984	-3.000	-10.505	-4.001	-9.506
Rx Power(mW)	0.000	0.000	0.000	0.000	0.000
Rx Power(dBm)	0.000	0.000	0.000	0.000	0.000

Figure 101: WBM “SFP Information” Page

Table 105: WBM “SFP Information” Page

SFP Information		
Parameters	**Default**	**Description**
Port	-, 9, 10	Select a port number to configure.
SFP Information		
Parameters	**Default**	**Description**
Fiber Cable		This display field shows if the fiber optic cable is connected.
Connector		This display field shows the code for the optical connector type.
Wavelength (nm)		This display field shows the wave length.
Transfer Distance (nm)		This display field shows the wave length.
DDM Supported (nm)		This display field shows if the SFP module supports DDM (“Dynamic Device Mapping”).
Vendor Name (nm)		This display field shows the name of the SFP provider.
Vendor PN (nm)		This display field shows the part number.
Vendor rev (nm)		This display shows the revision status of the part number.
Vendor SN (nm)		This display field shows the serial number (ASCII).
Date code (nm)		This display field shows the date code of the manufacturer.
DDMI Information (nm)		
Parameters	**Default**	**Description**
Current (nm)		This column displays the “Current” values of temperature, voltage, Tx Bias, Tx Power and Rx Power.
High Alarm (nm)		This column displays the "High Alarm" values of temperature, voltage, Tx Bias, Tx Power and Rx Power.
Low Alarm (nm)		This column displays the "Low Alarm" values of temperature, voltage, Tx Bias, Tx Power and Rx Power.
High Warn (nm)		This column displays the "High Warning" values of temperature, voltage, Tx Bias, Tx Power and Rx Power.
Low Warn (nm)		This column displays the "Low Warning" values of temperature, voltage, Tx Bias, Tx Power and Rx Power.

9.5.7 Traffic Monitor

Note

Additional Information

Please refer to the section “Function Description” for more information on the “Traffic Monitor”.

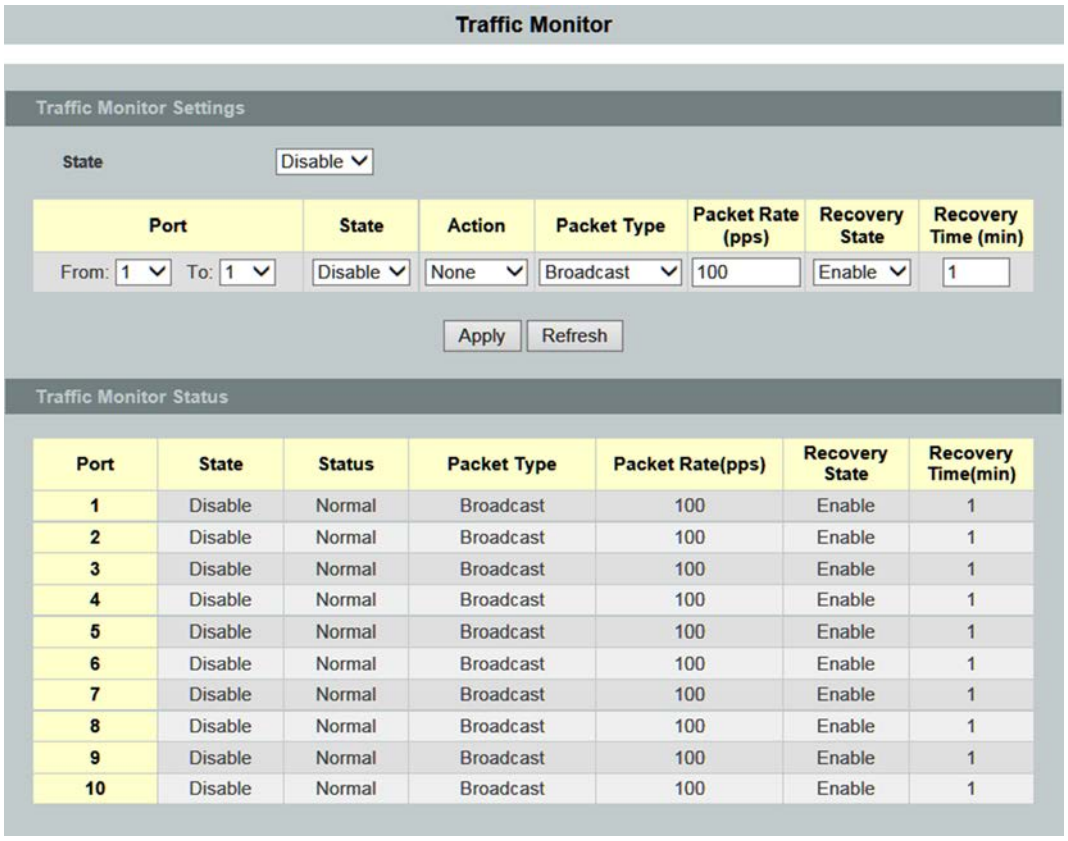


Figure 102: WBM “Traffic Monitor” Page

Table 106: WBM “Traffic Monitor” Page

Traffic Monitor Settings			
Parameters		**Default**	**Description**
Status		**Disable**	Select “Switch OFF” in the selection box to disable the “Traffic Monitor” function globally.
		Enable	Select “Switch ON” in the selection box to enable the “Traffic Monitor” function globally.
Port	From:	**1**	Select a port or port range in the selection box that you want to configure.
	To:	**1**	Select a port or port range in the selection box that you want to configure.
State		**Disable**	Select “Switch OFF” in the selection box if you want to disable the “Traffic Monitor” function for the port or port range.
		Enable	Select “Switch ON” in the selection box if you want to enable the “Traffic Monitor” function for the port or port range.
Action		**None**	Select “None” in the selection box if you do not want to cancel port blocking.
		Unblock	Select “Unblock” in the selection box if you want to cancel port blocking.
Packet Type		**Broadcast**	Select “Broadcast” in the selection box, if you want to monitor this as the packet type.
		Multicast	Select “Multicast” in the selection box, if you want to monitor this as the packet type.
		Bcast+Mcast	Select “Bcast+Mcast” in the selection box, if you want to monitor both as the packet types.
Packet Rate (pps)			In the input field, enter the packet rate that you want to monitor.
Recovery State		**Enable**	Select “Switch ON” in the selection box if you want to enable the “Recover” function in the “Traffic Monitor” for the port or port range.
		Disable	Select “Switch OFF” in the selection box if you want to disable the “Recovery” function in the “Traffic Monitor” for the port or port range.
Recovery Time (min)		**1** … 60	Enter a value in the input field for the “Recovery Time” for the “Traffic Monitor” function.
Traffic Monitor Status			
Parameters		**Default**	**Description**
Port		1 … 10	This column displays the port numbers.
State		Disable Enable	This column displays the status of the specific port.
Status		Normal	This column displays the status of the operational state.
Packet Type		Broadcast Multicast Bcast+Mcast	This column displays the type of data packet.
Packet Rate (pps)			This column displays the selected packet rate.
Recovery State		Enable Disable	This column displays the status of the selection Recover function.
Recovery Time (min)		1 … 60	This column displays the selected Recovery time.

9.6 Management

9.6.1 SNMP

9.6.1.1 SNMP

9.6.1.1.1 SNMP Settings

Note

Additional Information

Please refer to the section “Function Description” for more information on “SNMP” (**S**imple **N**etwork **M**anagement **P**rotocol).

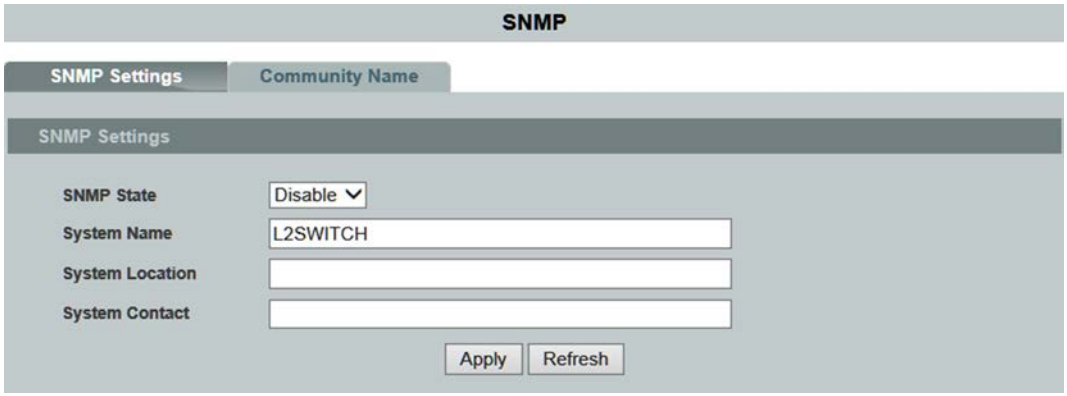


Figure 103: WBM Page, “SNMP” – “SNMP Settings” Tab

Table 107: WBM Page, “SNMP” – “SNMP Settings” Tab

SNMP Setting		
Parameters	**Default**	**Description**
SNMP State	**Disable**	Select “Disable” in the selection box to disable SNMP on the switch.
	Enable	Select “Enable” in the selection box to enable SNMP on the switch.
System Name	**L2SWITCH**	Enter the system name for the switch in the input field. (System name and host name are identical.)
System Location	**192.168.0.254**	Enter the IP address (location information) of the switch in decimal-point notation.
System Contact	**255.255.255.0**	Enter the IP subnet mask of the switch in decimal-point notation.

9.6.1.1.2 Community Name

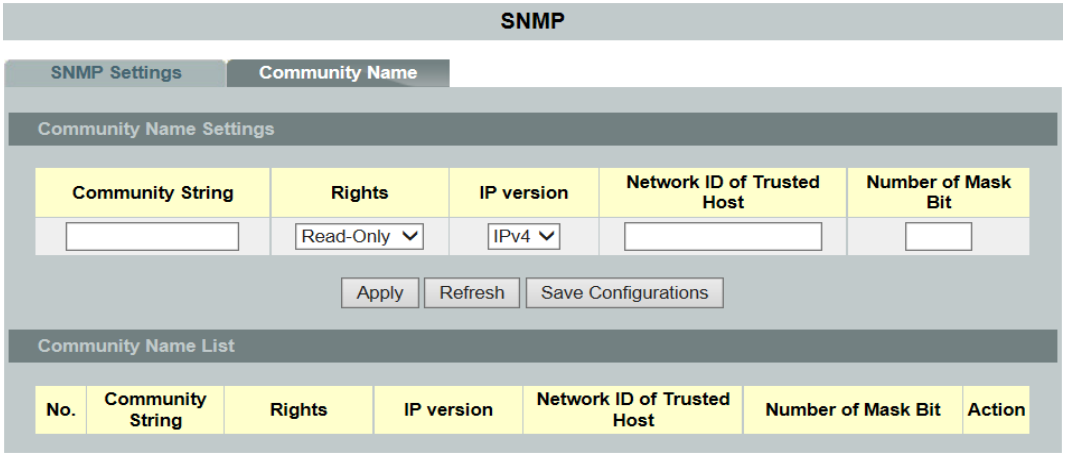


Figure 104: WBM Page, “SNMP” – “Community Name” Tab

Table 108: WBM Page, “SNMP” – “Community Name” Tab

Community Name Settings		
Parameters	**Default**	**Description**
Community String		Enter the “Community String” to act as a password for requests from the management station.
Rights	**Read-Only**	Select ""“Read Only” in the selection box so that the SNMP manager can use this string to receive information from the switch.
	Read/ Write	Select ""“Read/Write” in the selection box so that the SNMP manager can use this string to configure settings on the switch.
IP Version	**IPv4**	Select “IPv4” in the selection box if you want to choose this version of the internet protocol.
	IPv6	Select “IPv6” in the selection box if you want to choose this version of the internet protocol.
Network ID of Trusted Host		Enter the IP address of the remote SNMP management station in decimal-point notation (e.g., 192.168.1.0).
Mask		Enter the IP address of the subnet mask for the remote SNMP management station in decimal-point notation (e.g., 255.255.255.0).

Table 108: WBM Page, “SNMP” – “Community Name” Tab

Community Name List		
Parameters	**Default**	**Description**
No.		This column displays the “Community” number. It is used for identification only. Click a number to modify the setting for a specific “Community”.
Community String		This column displays the “SNMP Community String”. This is a text element that acts as a password.
Rights		This column displays the rights for the “SNMP Community String”.
IP Version	IPv4 IPv6	This column displays the selected IP Version.
Network ID of Trusted Host		This column displays the IP address of the remote SNMP management station after it has been modified by the subnet mask.
Mask		This column displays the subnet mask for the IP address of the remote SNMP management station.
Action		Click **[Delete]** to delete a specific “Community String”.

9.6.1.2 SNMP Trap

9.6.1.2.1 Trap Receiver Settings

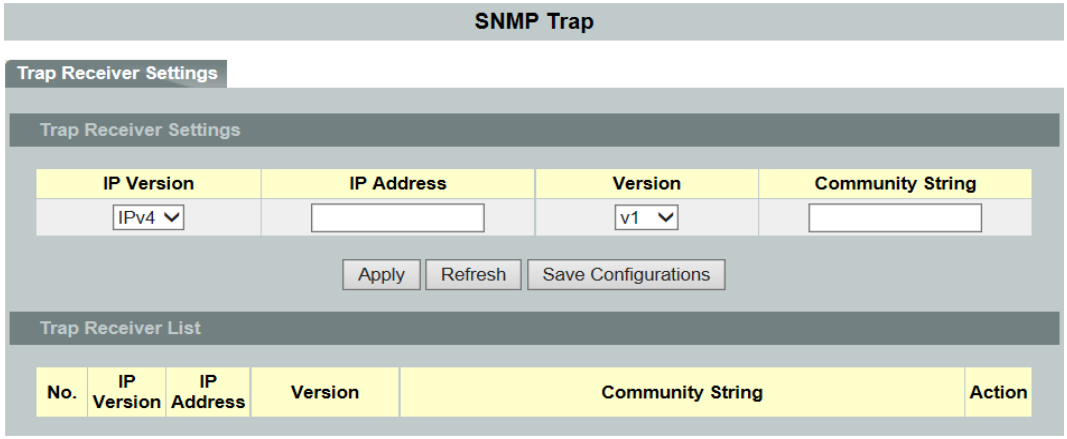


Figure 105: WBM Page, “SNMP Trap” – “Trap Receiver Settings” Tab

Table 109: WBM Page, “SNMP Trap” – “Trap Receiver Settings” Tab

Trap Receiver Settings		
Parameters	**Default**	**Description**
IP Version	**IPv4**	Select “IPv4” in the selection box if you want to choose this version of the internet protocol.
	IPv6	Select “IPv6” in the selection box if you want to choose this version of the internet protocol.
IP Address		Enter the IP address of the remote trap station in decimal-point notation.
Version	**v1**	Select “v1” in the selection box if you want to use SNMP Version v1.
	v2c	Select “v2c” in the selection box if you want to use SNMP Version v2c.
Community String		Enter the IP address of the remote SNMP management station in decimal-point notation (e.g., 192.168.1.0).
Trap Receiver List		
Parameters	**Default**	**Description**
No.		This column displays the “Community” number. It is used for identification only. Click a number to modify the setting for a specific “Community”.
IP Version	IPv4 IPv6	This column displays the selected IP Version.
IP Address		This column displays the IP address of the remote trap station.
Version	v1 v2c	This column displays the SNMP version in use.
Community String		This column displays the “Community String” used by the remote trap station.
Action		Click the **[Delete]** button to delete a configured trap receiver station.

9.6.1.3 Auto Provision

Note

Additional Information

Please refer to the section “Function Description” for more information on “Auto Provision”.

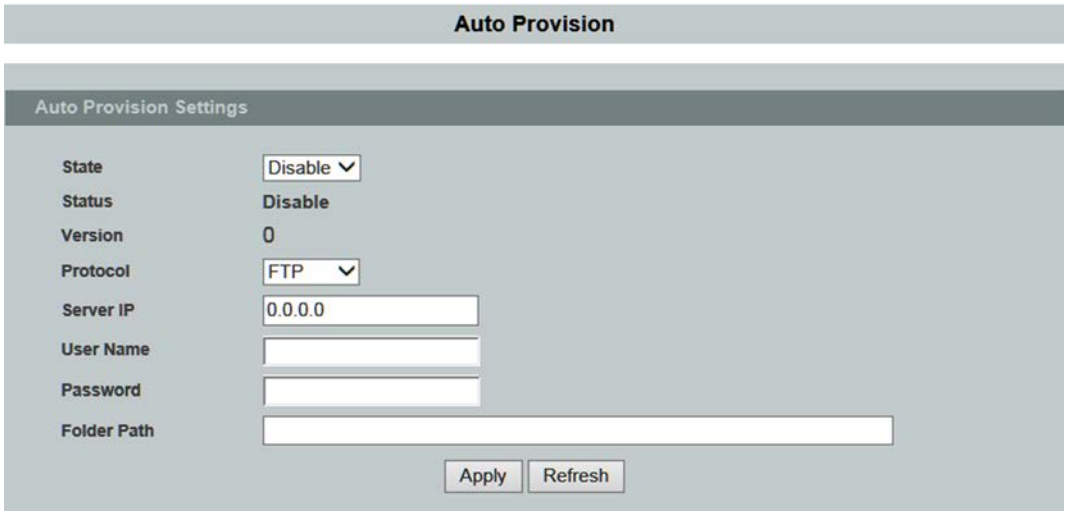


Figure 106: WBM “Auto Provision” Page

Table 110: WBM “Auto Provision” Page

Auto Provision Settings		
Parameters	**Default**	**Description**
State	**Disable**	Select “Disable” in the selection box to disable “Auto Provision” function on the switch.
	Enable	Select “Enable” in the selection box to enable the “Auto Provision” function on the switch.
Status	**Disable**	This field displays the “Auto Provision” status.
Version	**0**	This field displays the version.
Protocol	**FTP**	Select “FTP” (“**F**ile **T**ransfer **P**rotocol”) in the selection box if you want to select this type as the Auto Provision server.
	TFTP	Select “TFTP” (“**T**rivial **F**ile **T**ransfer **P**rotocol”) in the selection box if you want to select this type as the Auto Provision server.
	HTTP	Select “HTTP” (“**H**yper**t**ext **T**ransfer **P**rotocol”) in the selection box if you want to select this type as the Auto Provision server.
Server IP		Enter the ID for the IP subnet mask of the server in decimal-point notation.
User Name		Enter the name for the FTP server in the input field.
Password		Enter the password for the FTP server in the input field.
Folder Path		Select the folder structure of the FTP server in this input field.

9.6.1.3.1 Mail Alarm

Note

Additional Information

Please refer to the section “Function Description” for more information on “Mail Alarm”.

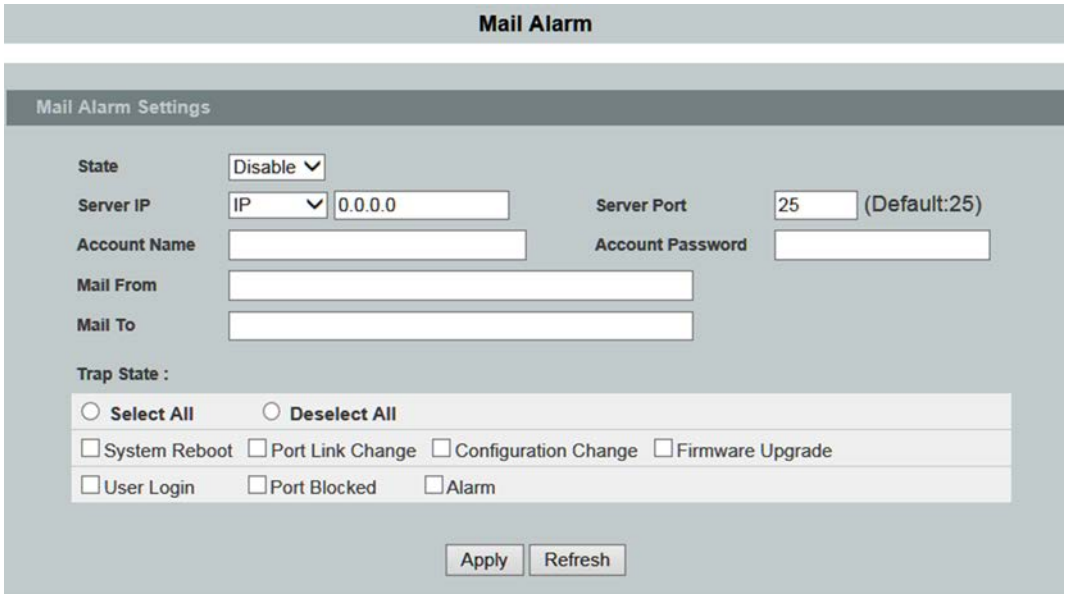


Figure 107: WBM “Mail Alarm” Page

Table 111: WBM “Mail Alarm” Page

Mail Alarm Settings				
Parameters		**Default**	**Description**	
State		**Disable**	Select “Disable” in the selection box to disable the “Mail Alarm” function.	
		Enable	Select “Enable” in the selection box to enable the “Mail Alarm” function.	
Server IP		**IP**	Select “IP” in the selection box if you want to use the server IP of the mail server.	
		IPv6	Select “IPv6” in the selection box if you want to use the server IP of the IPv6 server.	
		Domain	Select “Domain” in the selection box if you want to use the domain address of the mail server.	
		0.0.0.0	Enter the IP address in the input field.	
Server Port (Default:25)		**25**	Enter the TCP port for SMTP in the input field.	
Account Name			Enter the name of the e-mail account in the input field.	
Account Password			Enter the password for the e-mail account in the input field.	
Mail From			Enter the name of the e-mail sender in the input field.	
Mail To			Enter the name of the e-mail recipient in the input field.	
Trap State	Select All	○	○	No port has been selected for sending event traps.
			◉	All ports are selected for sending event traps.
	Deselect All	○	○	No port has been disabled for sending event traps.
			◉	All ports are disabled for sending event traps.
	System Reboot	☐	☐	The port is not enabled.
			☑	The port is enabled.
	Port Link Change	☐	☐	The “Port Link Change” state is disabled.
			☑	The “Port Link Change” state is enabled.
	Configuration Change	☐	☐	The “Configuration Change” state is disabled.
			☑	The “Configuration Change” state is enabled.
	Firmware Upgrade	☐	☐	The “Firmware Upgrade” state is disabled.
			☑	The “Firmware Upgrade” state is enabled.
	User Login	☐	☐	The “User Login” state is disabled.
			☑	The “User Login” state is enabled.
	Port Blocked	☐	☐	The “Port Blocked” state is disabled.
			☑	The “Port Blocked” state is enabled.
	Alarm	☐	☐	The “Alert” state is disabled.
			☑	The “Alert” state is enabled.

9.6.1.3.2 Maintenance

9.6.1.3.3 Configuration

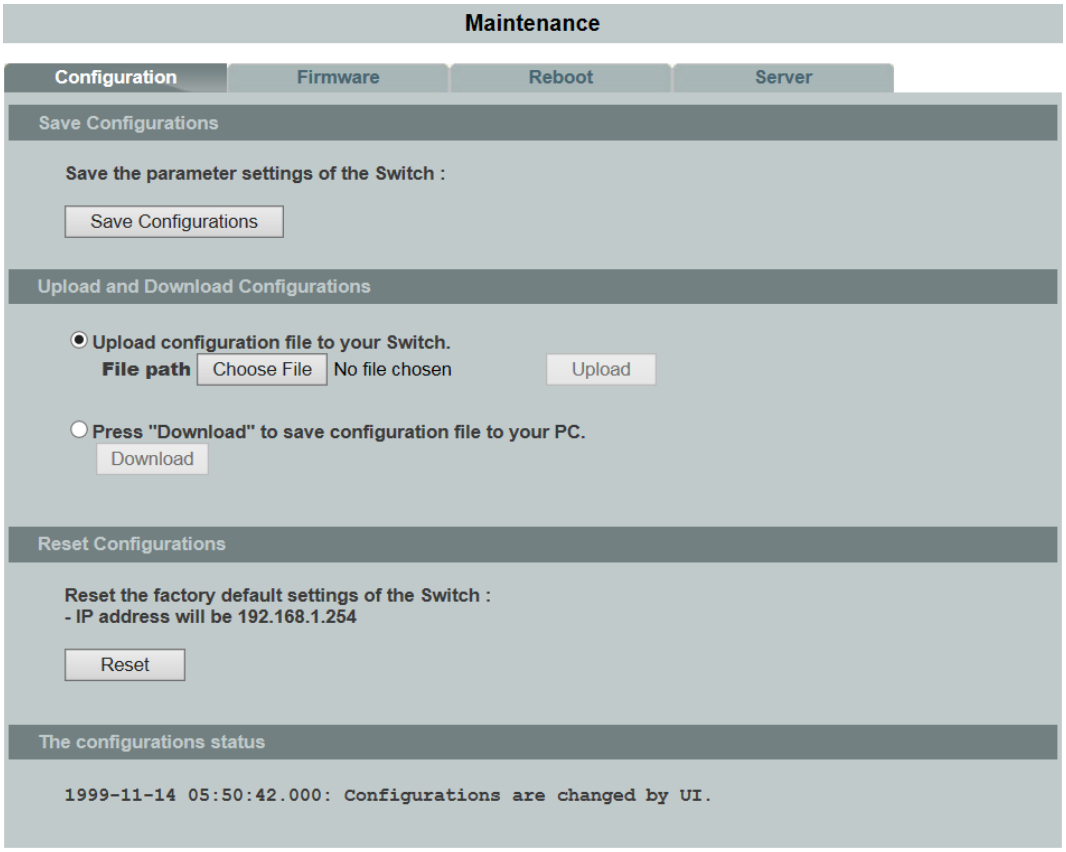


Figure 108: WBM Page, “Maintenance” – “Configuration” Tab

Save Configuration

- Click the **[Save]** button to save the current settings in NV-RAM (Flash).

Upload and Download the Configuration

Execute the following steps to save the configuration file to your PC.

1. Select “Press Download to save the configuration file to your PC”.
2. Click the **[Download]** button to start the download.

Execute the following steps to upload the configuration file from your PC to the switch.

1. Select “Upload the configuration file to the switch”.
2. Click the **[Select file]** button.
   Select the configuration file by specifying the full path.
3. Click the **[Upload]** button to begin uploading the file.

Reset Configuration

- Click the **[Reset]** button to reset the switch configuration to the factory default.

Configuration Status

“The configurations have been changed” indicates that changes have been made to the configurations.

“The user configuration file is the default. The configurations are default values.” indicates that no changes have been made to the configurations.

9.6.2 Firmware

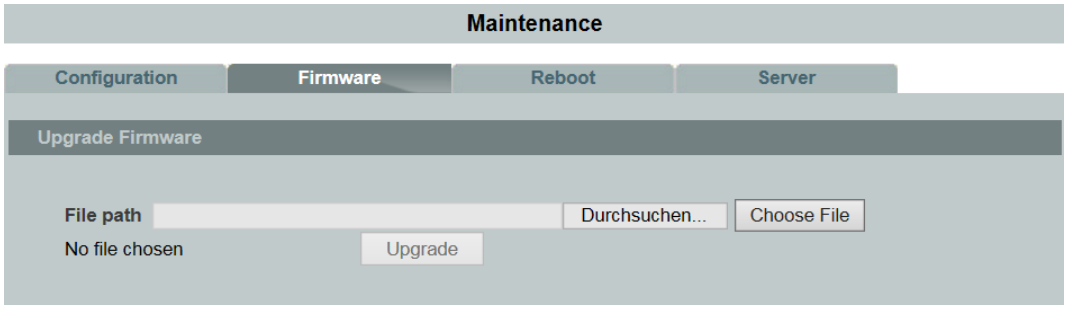


Figure 109: WBM Page, “Maintenance” – “Firmware” Tab

Firmware Update

Execute the following steps to update the switch's firmware.

1. Click the **[Select file]** button.
   The file selection dialog opens. Select the respective firmware file.

2. Click the **[Update]** button to load the new firmware.

9.6.3 Reboot

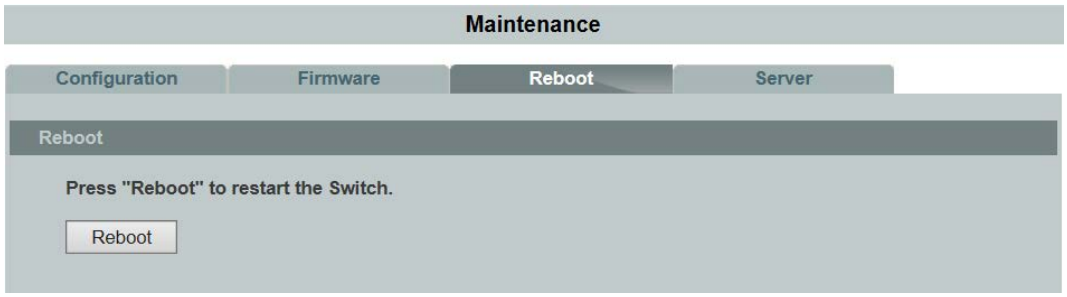


Figure 110: WBM Page, “Maintenance” – “Reboot” Tab

Reboot

The “Reboot” function allows you to restart the switch without physically turning the power off.

Follow the steps below to reboot the switch.

1. Click the **[Reboot]** button in the “Reboot” menu. The following windows open:

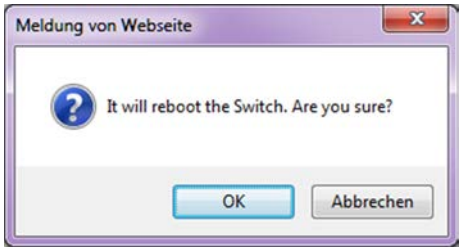


Figure 111: WBM Page, “Maintenance” – “Reboot” Tab – Message

2. Click **[OK]** and wait for the switch to restart. The process can take up to two minutes. The process does not change the switch configuration.

9.6.4 Server

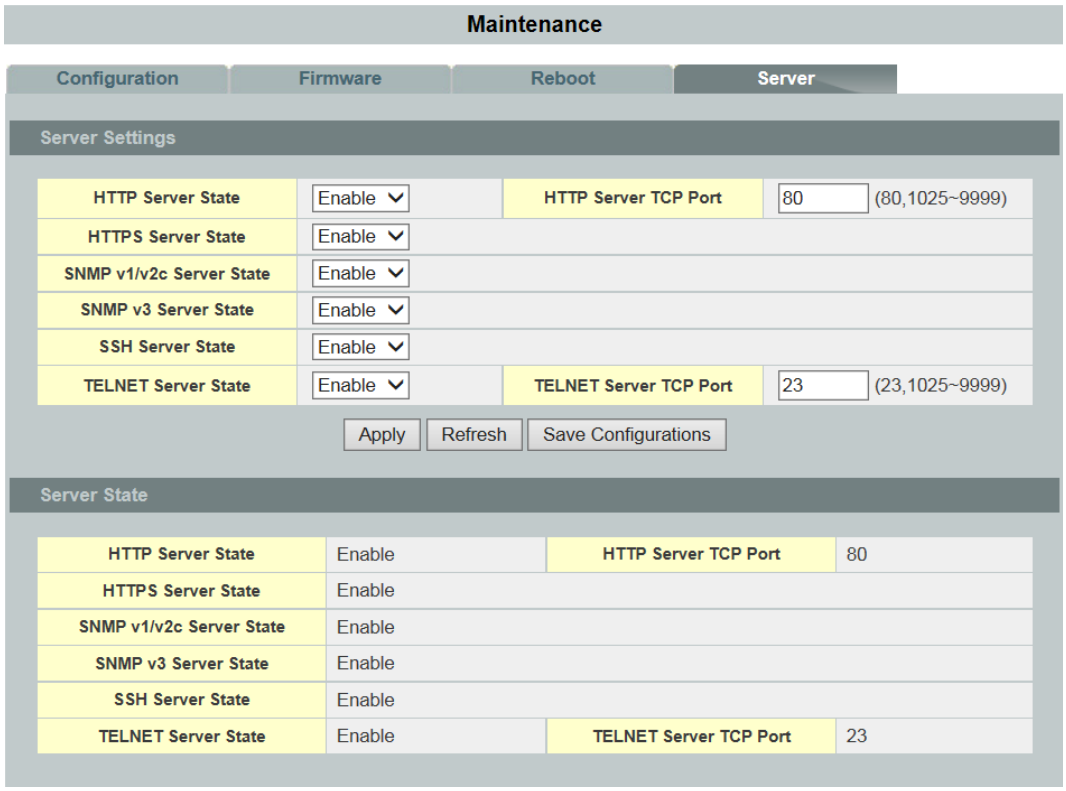


Figure 112: WBM “Maintenance” Page – “Server” Tab

Table 112: WBM “Maintenance” Page – “Protocols” Tab

Server Settings		
Parameter	**Default**	**Description**
HTTP Server Status	**Enable**	Select “Enable” to enable the HTTP server.
	Disable	Select “Disable” to disable the HTTP server.
HTTP Server TCP Port (80, 1025–9999)	**80** 1025 … 9999	Enter the “HTTP Server TCP Port” in the input field.
HTTP Server Status	**Enable**	Select “Enable” to enable the HTTPS server.
	Disable	Select “Disable” to disable the HTTPS server.
SNMP v1/v2c Server Status	**Enable**	Select “Enable” to enable the SNMP v1/v2c server.
	Disable	Select “Disable” to disable the SNMP v1/v2c server.
SNMP v3 Server Status	**Enable**	Select “Enable” to enable the SNMP v3 server.
	Disable	Select “Disable” to disable the SNMP v3 server.
SSH Server Status	**Enable**	Select “Enable” to enable the SSH server.
	Disable	Select “Disable” to disable the SSH server.
Telnet Server Status	**Enable**	Select “Enable” to enable the Telnet server.
	Disable	Select “Disable” to disable the Telnet server.
Telnet Server TCP Port (23, 1025–9999)	**23** 1025 … 9999	Enter the “Telnet Server TCP Port” in the input field.
Server Status		
Parameter	**Default**	**Description**
HTTP Server Status	Enable Disable	This field displays the status of the HTTP server.
HTTP Server TCP Port	80 1025 … 9999	This field displays the status of the HTTP server TCP port.
HTTP Server Status	Enable Disable	This field displays the status of the HTTPS server.
SNMP v1/v2c Server Status	Enable Disable	This field displays the status of the SNMP v1/v2c server.
SNMP v3 Server Status	Enable Disable	This field displays the status of the SNMP v3 server.
SSH Server Status	Enable Disable	This field displays the status of the SSH server.
Telnet Server Status	Enable Disable	This field displays the status of the Telnet server.
Telnet Server TCP Port	23 1025 … 9999	This field displays the status of the Telnet server TCP port.

9.6.4.1 System Log

The “syslog” function records various system information for “Debugging”.
Each log entry records one of the following levels:
- Alert
- Critical
- Error
- Warning
- Notice
- Information

The Syslog function can be enabled or disabled. The default setting is “disabled”.
The log message is recorded in the switch file system. If the IP address of the Syslog server has been configured, the switch sends a copy to it.

Note

Size of the Log Message File
The size of the log message file is limited to 4 KB. If the file is full, the oldest message is replaced.

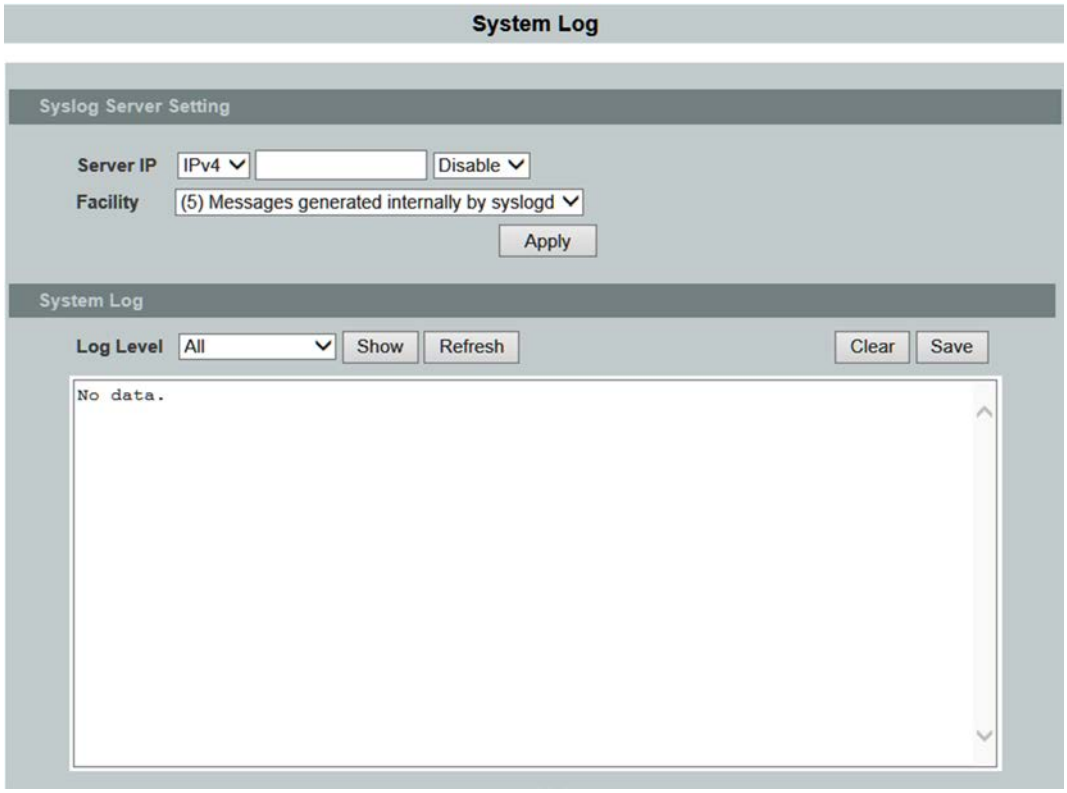


Figure 113: WBM “System Log” Page

Table 113: WBM “System Log” Page

Syslog Server Settings		
Parameters	**Default**	**Description**
Server IP	**IPv4**	In the “IPv4” selection box, choose if you want to select this version of the Internet protocol.
	IPv6	In the “IPv6” selection box, choose if you want to select this version of the Internet protocol.
		Enter the IP address in decimal-point notation. (e.g., 192.168.1.1).
	Disable	Select “Disable” in the selection box to prevent the switch from sending all new log messages to the Syslog server.
	Enable	Select “Enable” in the selection box to allow the switch to send all new log messages to the Syslog server.
Facility	(1) User-level messages	Select “(1) User-level messages” in the selection box if you want to display user-specific messages.
	(5) Messages generated internally by syslogd	Select “(5) Messages generated internally by syslogd” in the selection box if you want to display messages generated by syslog internally.
	(14) Log alert	
	(16) Local use 0	
	(17) Local use 1	
	(18) Local use 2	
	(19) Local use 3	
	(20) Local use 4	
	(21) Local use 5	
	(22) Local use 6	
	(23) Local use 7	
System Log		
Parameters	**Default**	**Description**
Log Level	**All**	Select “All” in the selection box if you want to display all log messages.
	1:Alert	Select “Log alert” in the selection box if you want to display the log messages.
	2:Critical	Select “Critical” in the selection box if you want to display critical log messages.
	3:Error	Select “Error” in the selection box if you want to display the errors.
	4:Warning	Select “Warning” in the selection box if you want to display the warnings.
	5:Notice	Select “Notice” in the selection box if you want to display the notices.
	6:Informational	Select “Informational” in the selection box if you want to display all information.

9.6.4.2 User Account

The switch allows users to create up to six user accounts. The user name and password must be a combination of numbers or letters. The last admin account cannot be deleted. To use the CLI or Web-Based Management, a user has to be logged into a valid user account.

User Permissions

The switch supports two types of user accounts:

The default user accounts have the following credentials:
Firmware version 01: User Name = „admin“
User Password = „Wago1951“
Firmware version 02: User Name = „admin“
User Password = „wago“

1.	Admin account	Read/Write permissions
2.	Normal user account	Read permission only - Cannot enter privileged mode in the CLI. - Configurations cannot be changed in the Web-Based Management.

The switch also supports a “Backdoor” user account. If a user has forgotten his user name or password, the switch can create a “backdoor” account with the MAC address of the system. A user can then log into the switch and create a new account.

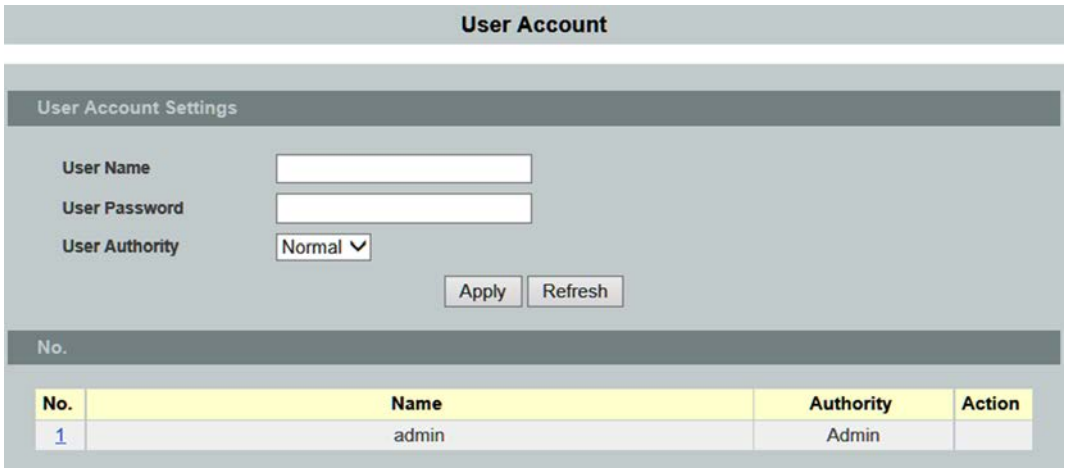


Figure 114: WBM “User Account” Page

Table 114: WBM “User Account” Page

User Account Settings		
Parameters	**Default**	**Description**
User Name		Enter a new or modify the existing user name in the input field.
User Password		Enter a new or modify an existing password in the input field. You can enter up to 32 alphanumeric characters.
User Authority		In this box, select the type of user account.
	Normal	Select “Normal” in the selection box if you need only read permission for this user account.
	Admin	Select “Admin” in the selection box if you need read and write permission for this user account.
No.		
Parameters	**Default**	**Description**
No.		This column displays the index number of an entry.
Name		This column displays the name of the user account.
Authority		This column displays the type of user account.
Action		Click the **[Delete]** button to delete the user account.
		Note  **Note** **Deleting an administrator account** The last admin account cannot be deleted.

10 Appendix

10.1 Console Port (RJ-45 to DB9)

Use the included console cable to connect the console port of the industrial managed switch to the COM port. The connector pin assignment is:

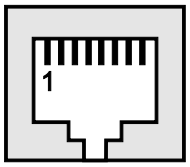


Figure 115: RJ-45 Connector Pin Assignment

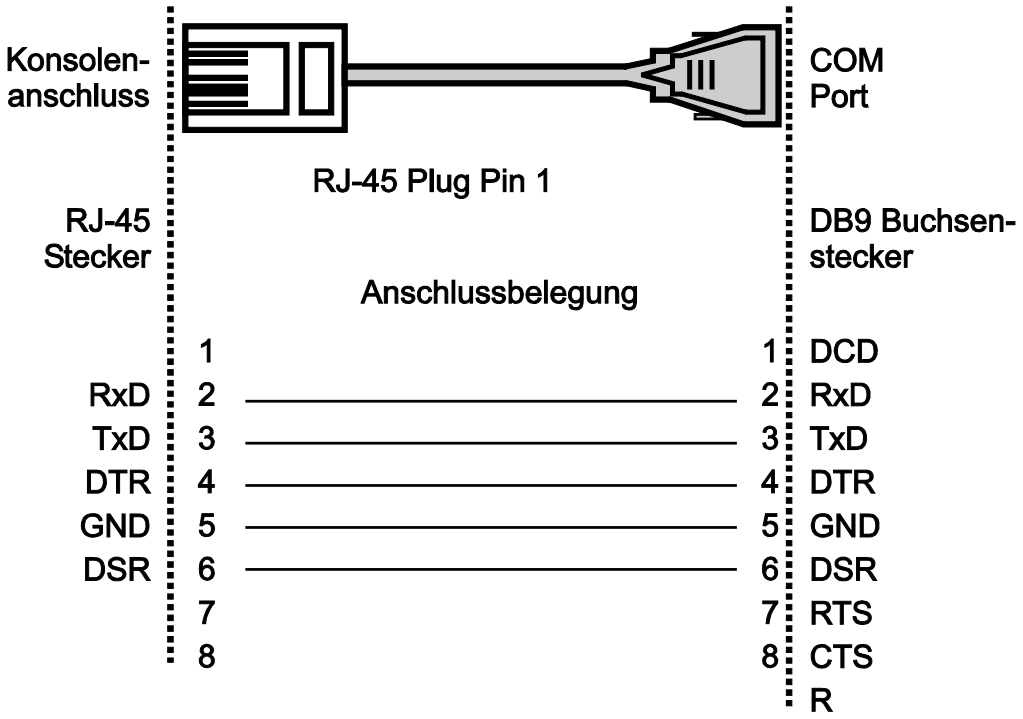


Figure 116: Connector Pin Assignment RJ-45 to DB9

10.2 RJ-45 Cable

Always use category 5e cables to connect your network devices. The pin assignment is given below:

Table 115: RJ-45 Cable

Contact	Description		Pair	Color (acc. EIA/TIA 568B)
	4-wire	8-wire		
1	TD	D1+	2	White/Orange
2	TD-	D1-	2	Orange
3	RX+	D2+	3	White/Green
4	Not assigned	D3+	1	Blue
5	Not assigned	D3-	1	White/Blue
6	RX-	D2-	3	Green
7	Not assigned	D4+	4	White/Brown
8	Not assigned	D4-	4	Brown

Note

Functions on the RJ45 connector
The industrial managed switch offers the functions autocrossing und autonegotiation to the RJ-45 connection.

10.3 Configuring in the Command Line Interface (CLI)

10.3.1 System Status

10.3.1.1 System Information

Table 116: CLI “System Information” Configuration

Node	Command	Description
enable	show hostname	This command displays the system’s network name.
enable	show interface eth0	This command displays the current Eth0 configurations.
enable	show model	This command displays the system information.
enable	show running-config	This command displays the current operating configurations.
enable	show system-info	This command displays the system’s CPU utilization and memory information.
enable	show uptime	This command displays the system up time.

10.3.2 Default Settings

10.3.2.1 System

Table 117: CLI “System” Configuration

Node	Command	Description
configure	reboot	This command reboots the system.
configure	hostname STRINGS	This command sets the system's network name.
configure	interface eth0	This command enters the eth0 interface node to configure the system IP.
eth0	ip address A.B.C.D/M	This command configures a static IP and subnet mask for the system.
eth0	ip address default-gateway A.B.C.D	This command configures the system default gateway.
eth0	ip dhcp client (disable|enable|renew)	This command configures a DHCP client function for the system. Disable: Use a static IP address for the switch. Enable & Renew: Use the DHCP client to get an IP address from the DHCP server.
eth0	management vlan VLAN_ID	This command configures the management VLAN.

10.3.2.2 Jumbo Frame

Table 118: CLI “Jumbo Frame” Configuration

Node	Command	Description
enable	show jumboframe	This command displays the current jumbo frame settings.
configure	jumboframe (10240|1522|1536|1552|9216)	This command configures the maximum number of bytes of frame size.

10.3.2.3 SNTP

Table 119: CLI “SNTP” Configuration

Node	Command	Description
enable	show time	This command displays the current time and date configurations.
configure	time HOUR:MINUTE:SECOND	This command sets the current time of the switch. hour: 0-23 min: 0-59 sec: 0-59 Note: If you configure daylight savings time after you configure the date and time, the switch uses daylight savings time.
configure	time date YEAR/MONTH/DAY	This command sets the current date of the switch. year: 1970- month: 1-12 day: 1-31
configure	time daylight-saving-time	This command enables the daylight saving time.
configure	time daylight-saving-time start-date <month> <day> <hour>	This command sets the start date of daylight savings time.
configure	time daylight-saving-time end-date <month> <day> <hour>	This command sets the end date of daylight saving time.
configure	no time daylight-saving-time	This command disables daylight saving time on the switch.
configure	time ntp-server IP_ADDRESS	This command sets the IP address of the time server.
configure	no time ntp-server	This command disables the NTP server settings.
configure	time timezone operator (+|-) hour (VALUE 0~14) min (VALUE 00 or 30)	This command sets the time difference between UTC (formerly GMT) and the time zone.

Example

L2SWITCH(config)#*time ntp-server 192.5.41.41*

L2SWITCH(config)#*time timezone operator + hour 8 min 0*

10.3.2.4 Management Host

Table 120: CLI “Management Host” Configuration

Node	Command	Description
enable	show interface eth0	The command displays the all eth0 interface configurations.
eth0	show	The command displays the all eth0 interface configurations.
eth0	management host A.B.C.D	The command adds a management host address.
eth0	no management host A.B.C.D	The command deletes a management host address.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*interface eth0*

L2SWITCH(config-if)#*management host 192.168.200.106*

10.3.2.5 MAC Management

Table 121: CLI “MAC Management” Configuration

Node	Command	Description
enable	show mac-address-table aging-time	This command displays the current “Age Time” for the MAC address table.
enable	show mac-address-table (static|dynamic)	This command displays the current static/dynamic unicast address entries.
enable	show mac-address-table port PORT_ID	This command displays the current unicast address entries recognized by the specific port.
configure	mac-address-table static MACADDR vlan VLANID port PORT_ID	This command configures a static unicast entry.
configure	no mac-address-table static MACADDR vlan VLANID	This command deletes a static unicast entry from the address table.

Example

L2SWITCH(config)#*mac-address-table static 00:11:22:33:44:55 vlan 1 port 1*

10.3.2.6 Blackhole MAC

Table 122: CLI “Blackhole MAC” Configuration

Node	Command	Description
enable	show mac-address-table refusal	This command displays the current rejected MAC address only.
configure	mac-address-table refusal MACADDR vlan VLANID	This command configures the rejection of a MAC address in a specific VLAN.
configure	mac-address-table refusal MACADDR	This command configures the rejection of a MAC address.

10.3.2.7 Port Mirroring

Table 123: CLI “Port Mirroring” Configuration

Node	Command	Description
enable	show mirror	This command displays the current “Port Mirroring” configurations.
configure	mirror (disable|enable)	This command disables / enables the “Port Mirroring” on the switch.
configure	mirror destination port PORT_ID	This command specifies the monitor port for the “Port Mirroring”.
configure	mirror source ports PORT_LIST mode (both|ingress|egress)	This command adds a port or port range as the source port(s) for the “Port Mirroring”.
configure	no mirror source ports PORT_LIST	This command removes a port or port range as the source port(s) for the “Port Mirroring”.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*mirror enable*

L2SWITCH(config)#*mirror destination port 2*

L2SWITCH(config)#*mirror source ports 3-10 mode both*

10.3.2.8 Port Settings

Table 124: CLI “Port Settings” Configuration

Node	Command	Description
enable	show interface IFNAME	This command displays the current port configurations.
interface	show	This command displays the current port configurations.
interface	loopback (none | phy)	This command specifies the “Loopback” mode for a specific port.
interface	flowcontrol (off | on)	This command disables / enables the “Flow Control” for a port.
interface	speed (auto|10-full||10-half100-full|100-half)	This command configures the speed and duplex mode for a port.
interface	shutdown	This command disables a specific port.
interface	no shutdown	This command enables a specific port.
interface	loopback (none|mac)	This command tests the transmission or data transport infrastructure.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*interface fa1/0/1*

L2SWITCH(config-if)#*speed auto*

L2SWITCH#*show interface fastethernet1/0/1*

10.3.3 Advanced Settings

10.3.3.1 Bandwidth Control

10.3.3.2 QoS

Table 125: CLI “QoS” Configuration

Node	Command	Description
enable	show queue cos-map	This command displays the current 802.1p priority mapping to the “Service Queue”.
enable	show qos mode	This command displays the current IEEE 802.1p QoS mode.
configure	queue cos-map PRIORITY QUEUE_ID	This command configures the 802.1p priority mapping of the “Service Queue”.
configure	no queue cos-map	This command configures the default settings for the 802.1p priority mapping of the “Service Queue”.
configure	qos mode high-first	This command configures the QoS mode to “high_first”, so that “Hardware Queue” transmits all packets in its buffer before permitting the next lower priority to transmit its packets.
configure	qos mode wrr-queue weights VALUE VALUE VALUE VALUE VALUE VALUE VALUE VALUE	This command configures the QoS mode to “Weighted Round Robin”.
interface	default-priority	This command allows the user to specify which priority is assigned by default to the packets received by the switch without any tag. The priority value entered with this command is used to determine which of the “Hardware Priority Queues” the packet is forwarded to. Default: 0.
interface	no default-priority	This command configures the default priority for the specific port to 0.

10.3.3.3 Rate Limitation

Table 126: CLI “Rate Limitation” Configuration

Node	Command	Description
enable	show bandwidth-limit	This command displays the current “Rate Limitation” configurations.
configure	bandwidth-limit egress RATE_LIMIT ports PORTLISTS	This command enables the bandwidth limit for outgoing packets and sets the limit.
configure	no bandwidth-limit egress ports PORTLISTS	This command disables the bandwidth limit for outgoing packets.
configure	bandwidth-limit ingress RATE_LIMIT ports PORTLISTS	This command enables the bandwidth limit for incoming packets and set the limit.
configure	no bandwidth-limit ingress ports PORTLISTS	This command disables the bandwidth limit for incoming packets.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*bandwidth-limit egress 1 ports 1-8*

L2SWITCH(config)#*bandwidth-limit ingress 1 ports 1-8*

10.3.3.4 Storm Control

Table 127: CLI “Storm Control” Configuration

Node	Command	Description
enable	show storm-control	This command displays the current “Storm Control” configurations.
configure	storm-control rate RATE_LIMIT type (bcast | mcast | DLF | bcast+mcast | bcast+DLF | mcast+DLF | bcast+mcast+DLF) ports PORTLISTS	This command enables the bandwidth limit for broadcast, multicast or DLF packets and sets the bandwidth limit of a specified type.
configure	no storm-control type (bcast | mcast | DLF | bcast+mcast | bcast+DLF | mcast+DLF | bcast+mcast+DLF) ports PORTLISTS	This command disables the bandwidth limit for broadcast, multicast or DLF packets.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*storm-control rate 1 type broadcast ports 1-6*

L2SWITCH(config)#*storm-control rate 1 type multicast ports 1-6*

L2SWITCH(config)#*storm-control rate 1 type DLF ports 1-6*

10.3.3.5 IGMP Snooping

Table 128: CLI “IGMP Snooping” Configuration

Node	Command	Description
enable	show igmp-snooping	This command displays the current “IGMP Snooping” configurations.
configure	igmp-snooping (disable | enable)	This command disables / enables “IGMP Snooping” on the switch.
configure	igmp-snooping vlan VLAN_ID	This command enables “IGMP Snooping” on a VLAN or VLAN range.
configure	no igmp-snooping vlan VLAN_ID	This command disables “IGMP Snooping” on a VLAN or VLAN range.
configure	igmp-snooping querier (disable | enable)	This command disables / enables “IGMP Snooping Querier” on the switch.
configure	igmp-snooping querier vlan VLAN_ID	This command enables the “IGMP Snooping Querier” function on a VLAN or VLAN range.
configure	no igmp-snooping querier vlan VLAN_ID	This command disables the “IGMP Snooping Querier” function on a VLAN or VLAN range.
configure	igmp-snooping unknown-multicast (drop|flooding)	This command configures the process for unknown multicast packets when the “IGMP Snooping” function is enabled. drop: All unknown multicast packets are dropped.
configure	igmp-snooping report-suppression (disable|enable)	This command disables / enables the “IGMP Snooping Report Suppression” function on the switch.
interface	igmp-querier-mode (auto | fixed | edge)	This command specifies if and under what conditions the port(s) are “IGMP Query Ports”. The switch forwards the “IGMP Join/Leave” packets to an “IGMP Query Port”, treating the port as if it were connected to an IGMP multicast router (or server). “IGMP Snooping” must also be enabled (default: “Auto”).
interface	igmp-immediate-leave	The command enables the “Immediate Leave” function for “IGMP Snooping” for a specific interface.
interface	no igmp-immediate-leave	The command disables the “Immediate Leave” function for “IGMP Snooping” for a specific interface.

Example

L2SWITCH(config)#*igmp-snooping enable*

L2SWITCH(config)#*igmp-snooping vlan 1*

L2SWITCH(config)#*igmp-snooping querier enable*

L2SWITCH(config)#*igmp-snooping querier vlan 1*

L2SWITCH(config)#*interface 1/0/1*

L2SWITCH(config-if)#*igmp-immediate-leave*

L2SWITCH(config-if)# *igmp-querier-mode fixed*

10.3.3.6 MVR

Table 129: CLI “MVR” Configuration

Node	Command	Description
enable	show mvr	This command displays the current MVR configurations.
enable	show mvr vlan VLANID	This command displays the current MVR configurations of the specific VLAN.
enable	show igmp-snooping	This command displays the current “IGMP Snooping” configurations.
configure	mvr VLANID	This command creates the MVR configurations for the specific VLAN.
configure	no mvr VLANID	This command disables the MVR configurations for the specific VLAN.
MVR	group NAME	This command creates a group configuration for the MVR.
MVR	no group NAME	This command deletes the group configurations from the MVR.
MVR	inactive	This command disables the MVR settings.
MVR	no inactive	This command enables the MVR settings.
MVR	mode (dynamic | compatible)	This command configures the mode for the MVR. - Dynamic: Sends “IGMP Reports” to all MVR source ports in the multicast VLAN. - Compatibility: The switch does not send any “IGMP Reports”.
MVR	name STRING	This command configures the name for the MVR.
MVR	no name	This command configures the default name for the MVR.
MVR	receiver-port PORTLIST	This command assigns a receiver port or receiver port range. Normally, the source ports are connected to the “Streaming Client”.
MVR	no receiver-port PORTLIST	This command deletes a port or port range from the list of receiver ports.
MVR	source-port PORTLIST	This command assigns a source port or source port range. Normally, the source ports are connected to the “Streaming Server”.
MVR	no source-port PORTLIST	This command deletes a port or port range from the list of source ports.
MVR	tagged PORTLIST	This command assigns a tagged port or port range. The same applies to VLAN tagged ports.
MVR	no tagged PORTLIST	

10.3.3.7 Multicast Address

Table 130: CLI “Multicast Address” Configuration

Node	Command	Description
enable	show mac-address-table multicast	This command displays the current static/dynamic multicast address entries.
configure	mac-address-table multicast MACADDR vlan VLAN_ID ports PORTLIST	This command configures a static multicast entry.
configure	no mac-address-table multicast MACADDR	This command deletes a static multicast entry from the address table.

10.3.3.8 VLAN

10.3.3.8.1 Port Isolation

Table 131: CLI “Port Isolation” Configuration

Node	Command	Description
enable	show port-isolation	This command displays the current “Port Isolation” configurations. “V” indicates that the port's packets can be sent to that port. “-” indicates that the port's packets cannot be sent to that port.
interface	port-isolation ports PORTLISTS	This command configures a port or port range to forward data packets from a specific port.
interface	no port-isolation	This command configures all ports to forward data packets from a specific port.

Example

L2SWITCH(config)#*interface 1/0/2*

L2SWITCH(config-if)#*port-isolation ports 3-10*

10.3.3.8.2 VLAN Settings

Table 132: CLI “VLAN Settings” Configuration

Node	Command	Description
enable	show vlan VLANID	This command displays the VLAN configurations.
configure	vlan <1~4094>	This command enables a VLAN and enters the VLAN node.
configure	no vlan <1~4094>	This command deletes a VLAN.
vlan	show	This command displays the current VLAN configurations.
vlan	name STRING	This command assigns a name for the specific VLAN. The VLAN name should be a combination of numbers, letters, hyphens (-) or underscores (_). The maximum length of the name is 16 characters.
vlan	no name	This command resets the VLAN name to the default setting. Note: The default VLAN name is comprised as follows: “VLAN”+VLAN_ID, VLAN1, VLAN2, …
vlan	fixed PORT_LIST	This command assigns ports to a VLAN group as fixed subscribers.
vlan	no fixed	This command deletes all fixed ports from a VLAN.
vlan	tagged PORT_LIST	This command assigns fixed ports to a VLAN group as tagged subscribers. The port(s) should be a fixed subscriber of the VLAN group.
vlan	no tagged	This command deletes all tagged member from a VLAN.
vlan	untagged PORT_LIST	This command assigns fixed ports to a VLAN group as untagged subscribers. The port(s) should be a fixed subscriber of the VLAN group.
vlan	no untagged	This command deletes all untagged ports from a VLAN.
vlan	acceptable frame type (all | tagged | untagged)	This command configures the acceptable frame type.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*vlan 2*

L2SWITCH(config-vlan)#*fixed 1*-6

L2SWITCH(config-vlan)#*untagged 1-3*

10.3.3.9 GARP/GVRP

Table 133: CLI “GARP/GVRP” Configuration

Node	Command	Description
enable	show gvrp configuration	This command displays the GVRP configurations.
enable	show gvrp statistics	This command displays the GVRP configurations for one port or all ports.
enable	show garp timer	This command displays the timers for GARP.
configure	gvrp (disable | enable)	This command disables / enables GVRP on the switch.
configure	no gvrp configuration	This command resets the GVRP configuration to the default setting.
interface	gvrp (disable | enable)	This command disables / enables GVRP on a specific port.
interface	gvrp registration (normal | forbidden)	This command configures the registration mode for GVRP on a specific port.
interface	no gvrp configuration	This command resets the GVRP configuration for a specific port to the default setting.
interface	garp join-time VALUE leave-time VALUE leaveall-time VALUE	This command configures the “Join Time”, “Leave Time” and “Leaveall Time” for GVRP on a specific port.
interface	no garp time	This command resets the Join, Leave and Leaveall times for GVRP on a specific port to the default settings.

10.3.3.10 Q-in-Q

10.3.3.10.1 VLAN Stacking

Table 134: CLI “VLAN Stacking” Configuration

Node	Command	Description
enable	show vlan-stacking	This command displays the current “VLAN Stacking” type.
enable	show vlan-stacking selective-qinq	This command displays the selective Q-in-Q configurations.
enable	show vlan-stacking portbased-qinq	This command displays the port-based q-in-Q configurations.
enable	show vlan-stacking tpid-inform	This command displays the TPID configurations.
config	vlan-stacking (disable | port-based | selective)	This command disables “VLAN Stacking” or enables port-based or selective “VLAN Stacking” on the switch.
config	vlan-stacking selective-qinq STRINGS	This command creates a selective Q-in-Q profile with name.
config	no vlan-stacking selective-qinq STRINGS	This command deletes a selective Q-in-Q profile with name.
config	vlan-stacking tpid-table index <2-6> value STRINGS	This command configures the TPID table.
interface	vlan-stacking port-based priority <0~7>	This command sets the priority in the port based Q-in-Q.
interface	vlan-stacking port-based role (tunnel | access | normal)	This command sets the “VLAN Stacking” port role.
interface	vlan-stacking port-based spvid <1~4096>	This command sets the service provider VID of the specified port.
interface	vlan-stacking tunnel-tpid index <1-6>	This command sets the TPID for a “Q-in-Q Tunnel Port”.
qinq	active	This command enables the selective Q-in-Q profile.
qinq	inactive	This command disables the selective Q-in-Q profile.
qinq	cvid VLANID	This command specifies the service provider's VLAN range for incoming packets.
qinq	spvid VLANID	This command specifies the service provider's VLAN range for outgoing packets in the selective Q-in-Q.
qinq	priority <0-7>	This command sets the priority in the selective Q-in-Q.
qinq	access-ports PORTLISTS	This command specifies the “Access Ports” to apply the rules.
qinq	tunnel-ports PORTLISTS	This command specifies the “Tunnel Ports” to apply the rules.
qinq	end	The command exits the “CLI Q-in-Q” node and enables the “CLI enable” node.
qinq	exit	The command exits the “CLI Q-in-Q” node and enables the “CLI configure” node.
qinq	show	The command displays the current configurations of the Q-in-Q profile.

10.3.3.11 DHCP Relay

Table 135: CLI “DHCP Relay” Configuration

Node	Command	Description
enable	show dhcp relay	This command displays the current configurations for the “DHCP Relay”.
configure	dhcp relay (disable | enable)	This command disables / enables the “DHCP Relay” on the switch.
configure	dhcp relay vlan VLAN_RANGE	This command enables the “DHCP Relay” function for a VLAN or a VLAN range.
configure	no dhcp relay vlan VLAN_RANGE	This command disables the “DHCP Relay” function for a VLAN or a VLAN range.
configure	dhcp helper-address IP_ADDRESS	This command configures IP address of the DHCP server.
configure	no dhcp helper-address	This command deletes the IP address of the DHCP server.
configure	dhcp option82 (disable | enable)	This command disables / enables the “DHCP Relay Option 82” function on the switch.
configure	dhcp option82 information STRING	This command configures the information for the “DHCP Relay Option 82” function.
configure	no dhcp option82 information	This command deletes the information for the “DHCP Relay Option 82” function.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)# *interface eth0*

L2SWITCH(config-if)# *ip address 172.20.1.101/24*

L2SWITCH(config-if)# *ip address default-gateway 172.20.1.1*

L2SWITCH(config)#*dhcp relay enable*

L2SWITCH(config)# *dhcp relay vlan 1*

L2SWITCH(config)# *dhcp helper-address 172.20.1.1*

L2SWITCH(config)#*dhcp option82 enable*

L2SWITCH(config)#*dhcp option82 information Justin*

10.3.3.12 Dual Homing

Table 136: CLI “Dual Homing” Configuration

Node	Command	Description
enable	show dual-homing	This command displays the “Dual Homing” information.
configure	dual-homing (disable | enable)	This command disables / enables the “Dual Homing” function in the system.
configure	no dual-homing primary-channel	This command deletes the primary channel for “Dual Homing” from the system.
configure	no dual-homing primary-channel	This command deletes the primary channel for “Dual Homing” from the system.
configure	dual-homing secondary-channel (port | trunk) VALUE	This command configures the secondary channel for “Dual Homing” in the system. The channel can be a single port or a “Trunk Group”.
configure	no dual-homing secondary-channel	This command deletes the secondary channel for “Dual Homing” from the system.

Example

L2SWITCH(config)# *link-aggregation 1 ports 5-6*

L2SWITCH(config)# *link-aggregation 1 enable*

L2SWITCH(config)# *dual-homing primary-channel port 2*

L2SWITCH(config)# *dual-homing secondary -channel trunk 1*

L2SWITCH(config)# *dual-homing enable*

10.3.3.13 Link Aggregation

Table 137: CLI “Link Aggregation” Configuration

Node	Command	Description
enable	show link-aggregation	The command displays the current configuration for “Trunking”.
configure	link-aggregation [GROUP_ID] (disable | enable)	The command disables / enables “Trunking” for the specific “Trunk Group”.
configure	link-aggregation [GROUP_ID] interface PORTLISTS	The command adds ports to a specific “Trunk Group”.
configure	no link-aggregation [GROUP_ID] interface PORTLISTS	The command deletes ports from a specific “Trunk Group”.

10.3.3.14 LACP

Table 138: CLI “LACP” Configuration

Node	Command	Description
enable	show trunk	The command displays the current configuration for “Trunking”.
enable	show lacp counters [GROUP_ID]	This command displays the LACP counters for the specific group or all groups.
enable	show lacp internal [GROUP_ID]	This command displays internal LACP information for the specific group or all groups.
enable	show lacp neighbor [GROUP_ID]	This command displays the LACP neighbor information for the specific group or all groups.
enable	show lacp port_priority	This command displays the port priority for LACP.
enable	show lacp sys_id	This command displays the system ID for the “LACP Actor” and “LACP Partner”.
configure	Lacp (disable | enable)	This command disables / enables LACP on the switch.
configure	Lacp GROUP_ID (disable | enable)	This command disables / enables LACP for a specific “Trunk Group”.
configure	clear lacp counters [PORT_ID]	This command clears the LACP statistics for a specific port or all ports.
configure	lacp system-priority <1-65535>	This command configures the system priority for LACP. Note: The default value is 32768.
configure	no lacp system-priority	This command configures the default setting for system priority for LACP.
interface	lacp port_priority <1-65535>	This command configures the priority for the specific port.
interface	no lacp port_priority	Note: The default value is 32768.

10.3.3.15 LLDP

Table 139: CLI “LLDP” Configuration

Node	Command	Description
enable	show lldp	This command displays the LLDP configurations.
enable	show lldp neighbor	This command displays all information of port neighbors.
configure	lldp (disable | enable)	This command globally enables / disables the LLDP function on the switch.
configure	lldp tx-interval	This command configures the transmission interval for LLDP packets.
configure	lldp tx-hold	This command configures the “tx-Hold Time” that determines the TTL of the switch message. (TTL = tx-hold * tx-interval)
interface	lldp-agent (disable | enable | rx-only | tx-only)	This command configures the Agent function for LLDP. “disable”: LLDP is enabled for a specific port. “enable”: The LLDP packet is transmitted on a specific port and received. “tx-only”: The LLDP packet is only transmitted on a specific port. “rx-only”: The LLDP packet is only received on a specific port.

10.3.3.16 Loop Detection

Table 140: CLI “Loop Detection” Configuration

Node	Command	Description
enable	show loop-detection	This command displays the current configuration for “Loop Detection”.
configure	loop-detection (disable | enable)	This command disables / enables “Loop Detection” on the switch.
configure	loop-detection address MACADDR	This command configures the target MAC address for special “Loop Detection” packets.
configure	no loop-detection address	This command resets the target MAC address to the default setting (00:0b:04:AA:AA:AB).
interface	loop-detection (disable | enable)	This command disables / enables “Loop Detection” for a specific port.
interface	no shutdown	This command enables a specific port. It can enable a port blocked by “Loop Detection”.
interface	loop-detection recovery (disable | enable)	This command enables / disables the “Recovery” function on a port.
interface	loop-detection recovery time VALUE	This command configures the “Recovery Time” period.

Example

L2SWITCH(config)#*loop-detection enable*

L2SWITCH(config)#*interface 1/0/1*

L2SWITCH(config-if)#*loop-detection enable*

L2SWITCH(config-if)#*loop-detection recovery enable*

L2SWITCH(config-if)#*loop-detection recovery time 10*

10.3.3.17 STP

Table 141: CLI “STP” Configuration

Node	Command	Description
enable	show spanning-tree active	This command only displays STP information for active ports.
enable	show spanning-tree blockedports	This command only displays STP information for blocked ports.
enable	show spanning-tree port detail PORT_ID	This command displays STP information for the interface port.
enable	show spanning-tree statistics PORT_ID	This command displays STP information for the interface port.
enable	show spanning-tree summary	This command displays a summary of port states and configurations.
enable	clear spanning-tree counters	This command clears the STP statistics for all ports.
enable	clear spanning-tree counters PORT_ID	This command clears the STP statistics for a specific port.
configure	spanning-tree (disable | enable)	This command disables / enables the STP function in the system.
configure	spanning-tree algorithm-timer forward-time TIME max-age TIME hello-time TIME	This command configures the bridge times (“Forward Delay”, “Max Age”, “Hello Time”).
configure	no spanning-tree algorithm-timer	This command configures the default values for “Forward Delay”, “Max Age” and “Hello Time”.
configure	spanning-tree forward-time <4-30>	This command configures the “Forward Delay” period (in seconds) for the bridge.
configure	no spanning-tree forward-time	This command configures the default values for “Forward Delay”.
configure	spanning-tree hello-time <1-10>	This command configures the “Hello Time” period (in seconds) for the bridge.
configure	no spanning-tree hello-time	This command configures the default values for the “Hello Time”.
configure	spanning-tree max-age <6-40>	This command configures the “Max Age” period (in seconds) for bridge messages.
configure	no spanning-tree max-age	This command configures the default values for the “Max Age”.
configure	spanning-tree mode (rstp | stp)	This command configures the STP mode.
configure	spanning-tree pathcost method (short | long)	This command configures the pathcost method.
configure	spanning-tree priority <0-61440>	This command configures the priority for the system.
configure	no spanning-tree priority	This command configures the default values for the system priority.
interface	spanning-tree bpdufilter (disable | enable)	This command configures enables / disables the “BPDU Filter” function.
interface	spanning-tree bpduguard (disable | enable)	This command configures enables / disables the “BPDU Guard” function.
interface	spanning-tree edge-port (disable | enable)	This command enables / disables the “Edge Port” setting.

Table 141: CLI “STP” Configuration

Node	Command	Description
interface	spanning-tree cost VALUE	This command configures the costs for the specific port. Cost range: 16-bit-based value range of 1 to 65,535, 32-bit-based value range of 1 to 200,000,000.
interface	no spanning-tree cost	This command configures the path cost of the specific port to the default value.
interface	spanning-tree port-priority <0-240>	This command configures the priority for the specific port. Default value: 128.
interface	no spanning-tree port-priority	This command configures the priority to of the specific port to the default value.

10.3.3.18 Xpress Ring

Table 142: CLI “Xpress Ring” Configuration

Node	Command	Description
enable	show xpress-ring	This command displays the current status of the Xpress ring.
config	xpress-ring (disable | enable)	This command enables / disables the Xpress ring function on the switch.
config	xpress-ring role (forwarder | arbiter)	This command configures the role (“Forwarder” or “Arbiter”) on the switch.
config	xpress-ring ring-port1	This command configures one port of the ring.
config	xpress-ring ring-port2	This command configures the other port of the ring.

10.3.4 Security

10.3.4.1 DHCP Snooping

Table 143: CLI “DHCP Snooping” Configuration

Node	Command	Description
enable	show dhcp-snooping	This command displays the current “DHCP Snooping” configurations.
configure	dhcp-snooping (disable | enable)	This command disables / enables the “DHCP Snooping” on the switch.
configure	dhcp-snooping vlan VLANID	This command enables the “DHCP Snooping” function on a VLAN or VLAN range.
configure	no dhcp-snooping vlan VLANID	This command disables the “DHCP Snooping” function on a VLAN or VLAN range.
configure	dhcp option82 (disable | enable)	This command disables / enables the “DHCP Relay Option 82” function.
configure	dhcp option82 information STRING	This command configures the information for the “DHCP Relay Option 82” function.
configure	no dhcp option82 information	This command deletes the information for the “DHCP Relay Option 82” function.
interface	dhcp-snooping host	This command configures the maximum host count for the specific port.
interface	no dhcp-snooping host	This command configures the maximum host count for the specific port to the default value.
interface	dhcp-snooping trust	This command configures the “Trusted Port” for the specific port.
interface	no dhcp-snooping trust	This command configures the “Untrusted Port” for the specific port.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*dhcp-snooping enable*

L2SWITCH(config)#*dhcp-snooping vlan 1*

L2SWITCH(config)#*interface 1/0/1*

L2SWITCH(config-if)#*dhcp-snooping trust*

L2SWITCH(config)#*dhcp option82 enable*

L2SWITCH(config)#*dhcp option82 information Test01*

10.3.4.2 Server Screening

Table 144: CLI “Server Screening” Configuration

Node	Command	Description
enable	show dhcp-snooping server	This command displays the IP address of the valid DHCP server.
configure	dhcp-snooping server IPADDR	This command configures the IP address of a valid DHCP server.
configure	no dhcp-snooping server IPADDR	This command deletes the IP address of a valid DHCP server.

10.3.4.3 Binding Table

Table 145: CLI “Binding Table” Configuration

Node	Command	Description
enable	show dhcp-snooping binding	This command displays the current “DHCP Snooping” binding table.
configure	dhcp-snooping binding mac MAC_ADDR ip IP_ADDR vlan VLANID port PORT_NO	This command configures a static host into the “DHCP Snooping” binding table.
configure	no dhcp-snooping binding mac MACADDR	This command deletes a static host from the “DHCP Snooping” binding table.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*dhcp-snooping binding mac 00:11:22:33:44:55 ip 1.1.1.1 vlan 1 port 2*

L2SWITCH(config)#*no dhcp-snooping binding mac 00:11:22:33:44:55*

L2SWITCH#*show dhcp-snooping binding*

10.3.4.4 ARP Inspection

Table 146: CLI “ARP Inspection” Configuration

Node	Command	Description
enable	show arp-inspection	This command displays the current configurations for the ARP Inspection.
configure	arp-inspection (disable | enable)	This command disables / enables the ARP Inspection function on the switch.
configure	arp-inspection vlan VLANID	This command enables the ARP Inspection function on a VLAN or VLAN range.
configure	no arp-inspection vlan VLANID	This command disables the ARP Inspection function on a VLAN or VLAN range.
interface	arp-inspection trust	This command configures the “Trusted Port” for the specific port.
interface	no arp-inspection trust	This command configures the “Untrusted Port” for the specific port.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*arp-inspection enable*

L2SWITCH(config)#*arp-inspection vlan 1*

L2SWITCH(config)#*interface 1/0/1*

L2SWITCH(config-if)#*arp-inspection trust*

10.3.4.5 Filter Table

Table 147: CLI “Filter Table” Configuration

Node	Command	Description
enable	show arp-inspection mac-filter	This command displays the current MAC address filter for the ARP Inspection.
configure	arp-inspection mac-filter age VALUE	This command configures the “Age Time” for the MAP address filter entries of the ARP Inspection.
configure	no arp-inspection mac-filter mac MACADDR	This command deletes a MAC address filter entry from the MAC filter table of the ARP Inspection.

10.3.4.6 Access Control List

Table 148: CLI “Access Control List” Configuration

Node	Command	Description
enable	show access-list	This command displays all access control profiles.
configure	access-list STRING	This command creates a new access control profile. Where “STRING” is the profile name.
configure	no access-list STRING	This command deletes an access control profile.
acl	show	This command displays the current access control profile.
acl	action (disable | drop | permit)	This command activates this profile. “disable”: The profile is disabled. “drop”: If packets match the profile, the packets are dropped. “permit”: If packets match the profile, the packets are forwarded.
acl	destination mac host MACADDR	This command configures the destination MAC address and the mask for the profile.
acl	destination mac MACADDR MACADDR	This command configures the destination MAC address and the mask for the profile.
acl	destination mac MACADDR MACADDR	This command configures the destination MAC address and the mask for the profile. The second “MACADDR” parameter is the mask (e.g., ffff.ffff.0000) for the profile.
acl	no destination mac	This command deletes the destination MAC address from the profile.
acl	ethertype STRING	This command configures the ETHERNET type for the profile. Where the “STRING” is a hexadecimal value. e.g.: 08AA.
acl	no ethertype	This command deletes the ETHERNET type limit from the profile.
acl	source mac host MACADDR	This command configures the source MAC address and mask for the profile.
acl	source mac MACADDR MACADDR	This command configures the source MAC address and mask for the profile.
acl	no source mac	This command deletes the source MAC and mask from the profile.
acl	source ip host IPADDR	This command configures the source IP address for the profile.
acl	source ip IPADDR IPMASK	This command configures the source IP address and mask for the profile.
acl	no source ip	This command deletes the source IP address from the profile.
acl	destination ip host IPADDR	This command configures a specific destination IP address for the profile.
acl	destination ip IPADDR IPMASK	This command configures the destination IP address and mask for the profile.
acl	no destination ip	This command deletes the destination IP address from the profile.
acl	l4-source-port IPADDR	This command configures the UDP/TCP source port for the profile.
acl	no l4-source-port IPADDR	This command deletes the UDP/TCP source port from the profile.
acl	L4-destination-port PORT	This command configures the UDP/TCP destination port for the profile.

Table 148: CLI “Access Control List” Configuration

Node	Command	Description
acl	no l4-destination-port	This command deletes the UDP/TCP destination port from the profile.
acl	vlan VLANID	This command configures the VLAN for the profile.
acl	no vlan	This command deletes the VLAN limit from the profile.
acl	source interface PORT_ID	This command configures the source interface for the profile.
acl	no source interface PORT_ID	This command deletes the source interface from the profile.

10.3.4.7 802.1x

Table 149: CLI “802.1x” Configuration

Node	Command	Description
enable	show dot1x	This command displays the current 802.1x configurations.
enable	show dot1x username	This command displays the current user accounts for local authentication.
enable	show dot1x accounting-record	This command displays the local accounting records.
configure	dot1x authentication (disable | enable)	This command enables / disables 802.1x authentication on the switch.
configure	dot1x authentic-method (local | radius)	This command configures the 802.1x authentication method.
configure	no dot1x authentic-method	This command sets the 802.1x authentication method to the default setting.
configure	dot1x radius primary-server-ip <IP> port PORTID	This command configures the primary radius server.
configure	dot1x radius primary-server-ip <IP> port PORTID key KEY	This command configures the primary radius server.
configure	dot1x radius secondary-server-ip <IP> port PORTID	This command configures the secondary radius server.
configure	dot1x radius secondary-server-ip <IP> port PORTID key KEY	This command configures the secondary radius server.
configure	no dot1x radius secondary-server-ip	This command deletes the secondary radius server.
configure	dot1x username <STRING> passwd <STRING>	This command configures the user account for local authentication.
configure	no dot1x username <STRING>	This command deletes the user account for local authentication.
configure	dot1x accounting (disable|enable)	This command enables / disables the local .1x accounting records.
configure	dot1x guest-vlan VLANID	This command configures the guest VLAN.
configure	no dot1x guest-vlan	This command deletes the guest VLAN.
interface	dot1x admin-control-direction (both|in)	This command configures the control direction for blocking packets.
interface	dot1x default	This command resets the port configuration to the default settings.
interface	dot1x max-req <1-10>	This command sets the “Max-req Times” of a port. (1 to 10).
interface	dot1x port-control (auto | force-authorized | force-unauthorized)	This command configures the port control mode on the port.
interface	dot1x authentication (disable | enable)	This command enables / disables 802.1x authentication on the port.
interface	dot1x reauthentication (disable | enable)	This command enables / disables the authentication interval on the port.
interface	dot1x timeout quiet-period	This command configures the “Quiet Period” value on the port.
interface	dot1x timeout server-timeout	This command configures the server timeout value on the port.

Table 149: CLI “802.1x” Configuration

Node	Command	Description
interface	dot1x timeout reauth-period	This command configures the authentication interval value on the port.
interface	dot1x timeout supp-timeout	This command configures the supp-timeout value on the port.
interface	dot1x guest-vlan (disable | enable)	This command configures the 802.1x state on the port.

10.3.4.8 Port Security

Table 150: CLI “Port Security” Configuration

Node	Command	Description
enable	show port-security	This command displays the current configurations for port security.
config	port-security (disable | enable)	This command enables / disables the Port Security function globally.
interface	port-security (disable | enable)	This command enables / disables the Port Security function for the specific port.
interface	port-security limit VALUE	This command configures the maximum number of MAC address entries for the specific port.

10.3.5 Monitor

10.3.5.1 Alarm

Table 151: CLI “Alarm” Configuration

Node	Command	Description
enable	show alarm-info	This command displays alarm information.

10.3.5.2 Monitor Information

Table 152: CLI “Monitor Information” Configuration

Node	Command	Description
enable	show hardware-monitor (C|F)	This command displays hardware operation information.

10.3.5.3 RMON Statistics

Table 153: CLI “RMON Statistics” Configuration

Node	Command	Description
enable	show rmon statistics	This command displays the RMON statistics.
configure	clear rmon statistics [IFNAME]	This command clears the RMON statistics for one or all ports.

10.3.5.4 SFP Information

Table 154: CLI “SFP Information” Configuration

Node	Command	Description
enable	show sfp info port PORT_ID	This command displays the SFP information.
enable	show sfp ddmi port PORT_ID	This command displays the SFP DDMI status.

10.3.5.5 Traffic Monitor

Table 155: CLI “Traffic Monitor” Configuration

Node	Command	Description
enable	show traffic-monitor	This command displays the “Traffic Monitor” configurations and current status.
configure	traffic-monitor (disable | enable)	This command enables / disables the “Traffic Monitor” on the switch.
interface	traffic-monitor rate RATE_LIMIT type (bcast | mcast | bcast+mcast)	This command configures the packet rate and type for the “Traffic Monitor” on a specific port. mcast: broadcast packet mcast: multicast packet The rate should be greater than 50 pps.
interface	traffic-monitor (disable | enable)	This command enables / disables the “Traffic Monitor” on a specific port.
interface	traffic-monitor recovery (disable | enable)	This command enables / disables the “Recover” function for the “Traffic Monitor” on a specific port.
interface	traffic-monitor recovery time VALUE	This command configures the “Recovery Time” for the “Traffic Monitor” on a specific port.

10.3.6 Management

10.3.6.1 SNMP

Table 156: CLI “SNMP” Configuration

Node	Command	Description
enable	show snmp	This command displays the SNMP configurations.
configure	snmp community STRING (ro | rw) trusted-host IPADDR	This command configures the “SNMP Community” name.
configure	snmp (disable | enable)	This command disables / enables SNMP on the switch.
configure	snmp system-contact STRING	This command configures contact information for the system.
configure	snmp system-location STRING	This command configures the location information for the system.
configure	snmp system-name STRING	This command assigns a name to the system.
configure	snmp trap-receiver IPADDR VERSION COMMUNITY	This command configures the trap receiver’s configurations, including the IP address, version (v1 or v2c) and “Community”.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*snmp enable*

L2SWITCH(config)#*snmp community public rw trusted-host 192.168.200.106/24*

L2SWITCH(config)#*snmp trap-receiver 192.168.200.106 v2c public*

L2SWITCH(config)#*snmp system-contact IT engineer*

L2SWITCH(config)#*snmp system-location Wago*

10.3.6.2 Auto Provision

Table 157: CLI “Auto Provision” Configuration

Node	Command	Description
auto-provision	show	This command displays the current configurations for the “Auto Provision”.
auto-provision	active (enable | disable)	This command enables / disables the “Auto Provision” function.
auto-provision	server-address IPADDR	This command sets the IP address of the server for the “Auto Provision”.
auto-provision	protocol (tftp | http | ftp)	The command configures the update protocol.
auto-provision	FTP-user username STRING password STRING	The command configures the username and password for the FTP server.
auto-provision	folder STRING	The command sets the folder for the “Auto Provision” server.
auto-provision	version <0-65535>	The command configures the version for “Auto Provision” on the switch.
auto-provision	no folder	The command resets the folder to the default setting.
auto-provision	no FTP-user	The command resets the username and password to default setting.

10.3.6.3 Mail Alarm

Table 158: CLI “Mail Alarm” Configuration

Node	Command	Description
enable	show mail-alarm	This command displays the “Mail Alarm” configurations.
configure	mail-alarm (disable | enable)	This command disables / enables the “Mail Alarm” function.
configure	mail-alarm mail-from	This command configures the e-mail sender.
configure	mail-alarm mail-to	This command configures the e-mail receiver.
configure	mail-alarm server-ip IPADDR server-port VALUE	This command configures IP address and TCP port for the mail server.
configure	mail-alarm server-ip IPADDR server-port Default	This command configures the IP address of the mail server and sets its TCP port to 25.
configure	mail-alarm trap-event (reboot | link-change | config. | firmware | login | port-blocked) (disable|enable)	This command disables / enables mail trap events.

10.3.6.4 Maintenance

Table 159: CLI “Maintenance” Configuration

Node	Command	Description
configure	reboot	This command reboots the system.
configure	reload default-config	This command resets the system configuration to the default settings. Note: The system automatically reboots to apply the configurations.
configure	write memory	This command writes the current operating configurations to the configuration file.
configure	archive download-config <URL PATH>	This command downloads an updated configuration file from TFTP server. Where <URL PATH> can be: ftp://user:pass@192.168.1.1/file http://192.168.1.1/file tftp://192.168.1.1/file
configure	archive upload-config <URL PATH>	This command uploads the current configurations file to the TFTP server.
configure	archive download-fw <URL PATH>	This command downloads an updated firmware file from the TFTP / FTP / HTTP server. Where <URL PATH> can be: ftp://user:pass@192.168.1.1/file http://192.168.1.1/file tftp://192.168.1.1/file

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*interface eth0*

L2SWITCH(config-if)#*ip address 172.20.1.101/24*

L2SWITCH(config-if)#*ip address default-gateway 172.20.1.1*

L2SWITCH(config-if)#*management vlan 1*

10.3.6.5 System Log

Table 160: CLI “System Log” Configuration

Node	Command	Description
enable	show syslog	The command displays all log messages recorded in the switch.
enable	show syslog level LEVEL	This command displays the log messages with the “LEVEL” recorded in the switch.
enable	show syslog server	The command displays the syslog server configurations.
configure	syslog (disable | enable)	The command disables / enables the System Log function.
configure	syslog ip IPADDR	The command configures the IP address of the syslog server.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*syslog-server ip 192.168.200.106*

L2SWITCH(config)#*syslog-server enable*

10.3.6.6 User Account

Table 161: CLI “System Log” Configuration

Node	Command	Description
enable	show user account	This command displays the current user accounts.
configure	add user USER_ACCOUNT PASSWORD (normal | admin)	This command adds a new user account.
configure	delete user USER_ACCOUNT	The command deletes an existing user account.

Example

L2SWITCH#*configure terminal*

L2SWITCH(config)#*add user q q admin*

L2SWITCH(config)#*add user 1 1 normal*

10.4 MODBUS/TCP Tables

10.4.1 Data Format and Function Code

MODBUS TCP supports different types of data formats for reading. The most important 4 types are:

Table 162: Data Format and Function Code

Data access type		Function code	Function name	Note
Bit access	Physical Discrete Inputs	2	Read Discrete Inputs	Not supported.
	Internal Bits or Physical	1	Read Coils	Not supported.
Word access (16-bit access)	Physical Input Registers	4	Read Input Registers	
	Physical Output	3	Read Holding Registers	Not supported.

10.4.2 MODBUS Registers

The MODBUS base address of the industrial managed switch is 1001 (decimal) for function code 4.

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
System Information			
0x0000	1 word	HEX	Vendor ID = 0x0b04
0x0001	16 words	ASCII	Vendor Name = “WAGO”
			Word 0 Hi byte = ‘W’
			Word 0 Lo byte = ‘A’
			Word 1 Hi byte = ‘G’
			Word 1 Lo byte = ‘O’
			Word 2 Hi byte = ‘\0’
0x1020	16 words	ASCII	Product Name = “INS-8528”
			Word 0 Hi byte = ‘I’
			Word 0 Lo byte = ‘N’
			Word 1 Hi byte = ‘S’
			Word 1 Lo byte = ‘-’
			Word 2 Hi byte = ‘8’
			Word 2 Lo byte = ‘5’
			Word 3 Hi byte = ‘2’
			Word 3 Lo byte = ‘8’
			Word 4 Hi byte = ‘\0’
			Word 4 Lo byte = ‘\0’
0x0040	7 words		Product Serial Number
			Ex: Serial No=A000000000001

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0050	12 words	ASCII	Firmware Version=" 8528-000-1.1.0.b1"
			Word 0 Hi byte = '8'
			Word 0 Lo byte = '5'
			Word 1 Hi byte = '2'
			Word 1 Lo byte = '8'
			Word 2 Hi byte = '-'
			Word 2 Lo byte = '0'
			Word 3 Hi byte = '0'
			Word 3 Lo byte = '0'
			Word 4 Hi byte = '-'
			Word 4 Lo byte = '1'
			Word 5 Hi byte = '.'
			Word 5 Lo byte = '1'
			Word 6 Hi byte = '.'
			Word 6 Lo byte = '0'
			Word 7 Hi byte = '.'
			Word 7 Lo byte = 'b'
			Word 8 Hi byte = '1'
			Word 8 Lo byte = '\0'
0x0060	16 words	ASCII	Firmware Release Date = "Mon Sep 30 18:51:45 2013"
0x0070	3 words	HEX	**ETHERNET MAC Address**
			Ex: MAC = 00-01-02-03-04-05
			Word 0 Hi byte = 0 x 00
			Word 0 Lo byte = 0 x 01
			Word 1 Hi byte = 0 x 02
			Word 1 Lo byte = 0 x 03
			Word 2 Hi byte = 0 x 04
			Word 2 Lo byte = 0 x 05
0x0080	1 word	HEX	**Power 1 (PWR) Alarm, DIP switch 1 need ON**
			0x0000: no alarm
			0x0001: input voltage < 11.7V
			0x0002: input voltage > 57V
			0x0003: No PWR input
0x0081	1 word	HEX	**Power 2(RPS) Alarm, DIP switch 1 need ON**
			0x0000: no alarm
			0x0001: input voltage < 11.7V
			0x0002: input voltage > 57V
			0x0003: No RPSinput
0x0090	1 word	HEX	**Fault LED Status**
			0x0000: No
			0x0001: Yes

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
Port Information			
0x0100 to 0x0109	1 word	HEX	Port 1 to 10 Link Status
			0x0000: Link down
			0x0001: 10M-Full-FC_ON (FC: Flow Control)
			0x0002: 10M-Full-FC_OFF
			0x0003: 10M-Half-FC_ON
			0x0004: 10M-Half-FC_OFF
			0x0005: 100M-Full-FC_ON
			0x0006: 100M-Full-FC_OFF
			0x0007: 100M-Half-FC_ON
			0x0008: 100M-Half-FC_OFF
			0x0009: 1000M-Full-FC_ON
			0x000A: 1000M-Full-FC_OFF
			0x000B: 1000M-Half-FC_ON
			0x000C: 1000M-Half-FC_OFF
			0xFFFF: No port
0x0200 to 0x021f (port 1) 0x0220 to 0x023f (port 2) … 0x0320 to 0x033f (port 10)	20 words	ASCII	Port 1 to 10 Medium
			Port Description = “100TX,RJ45.” Or
			“1000TX,SFP.”
			Word 0 Hi byte = ‘1’
			Word 0 Lo byte = ‘0’
			Word 1 Hi byte = ‘0’
			Word 1 Lo byte = ‘T’
			…
			Word 4 Hi byte = ‘4’
			Word 4 Lo byte = ‘5’
			Word 5 Hi byte = ‘.’
			Word 5 Lo byte = ‘\0’
0x0400 to 0x0413 (port 1 to 10)	2 words	HEX	Port 1 to 10 Tx Packets
			Ex: port 1 Tx Packet Amount = 0x87654321
			Word 0 = 8765
			Word 1 = 4321
0x0440 to 0x0453 (port 1 to 10)	2 words	HEX	Port 1 to 10 Rx Packets
			Ex: port 1 Rx Packet Amount = 0x123456
			Word 0 = 0012
			Word 1 = 3456
0x0480 to 0x0493 (port 1 to 10)	2 words	HEX	Port 1 to 10 Tx Error Packets
			Ex: port 1 Tx Error Packet Amount = 0x87654321
			Word 0 = 8765
			Word 1 = 4321
0x04C0 to 0x04D3 (port 1 to 10)	2 words	HEX	Port 1 to 10 Rx Error Packets
			Ex: port 1 Rx Error Packet Amount = 0x123456
			Word 0 = 0012
			Word 1 = 3456

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
Redundancy & Ring Information			
0x0500	2 word	HEX	**Spanning Tree Status**
			0x0000: none
			0x0001: STP
			0x0002: RSTP
			0x0003: MSTP
0x0501	1 word	HEX	**Xpress-ring Status**
			0x0000: Disabled
			0x0001: Enabled
0x0502	1 word	HEX	**Jet-ring Status**
			0x0000: Disabled
			0x0001: Enabled
0x0503	1 word	HEX	**Dual-ring Status**
			0x0000: Disabled
			0x0001: Enabled
0x0504	1 word	HEX	**ERPS Status**
			0x0000: Disabled
			0x0001: Enabled
0x0510	2 word	HEX	**Xpress-ring Status**
			Ring 1
			0x0000: **Disabled**
			0x0001: **Enabled**
0x0511			***Ring 2***
			0x0000: **Disabled**
			0x0001: **Enabled**
0x0512	6 word	HEX	**Xpress-ring MAC**
			Ring 1
			Word 0 Hi byte = 0 x 00
			Word 0 Lo byte = 0 x 01
			Word 1 Hi byte = 0 x 02
			Word 1 Lo byte = 0 x 03
			Word 2 Hi byte = 0 x 04
			Word 2 Lo byte = 0 x 05
0x0515			***Ring 2***
			Word 0 Hi byte = 0 x 00
			Word 0 Lo byte = 0 x 01
			Word 1 Hi byte = 0 x 02
			Word 1 Lo byte = 0 x 03
			Word 2 Hi byte = 0 x 04
			Word 2 Lo byte = 0 x 05
0x0518	2 word	HEX	**Xpress-ring Role**
			Ring 1
			0x0000: **Forwarder**
			0x0001: **Arbiter**
0x0519			***Ring 2***
			0x0000: **Forwarder**
			0x0001: **Arbiter**

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0520	2 word	HEX	**Xpress-ring Current status for Ring 1**
			Ring 1 – Primary Port
			0x0000: No connection
			0x0001: Forwarding
			0x0002: Blocking
0x0521			***Ring 1 – Secondary Port***
			0x0000: No connection
			0x0001: Forwarding
			0x0002: Blocking
0x0522	2 word	HEX	**Xpress-ring Current status for Ring 2**
			Ring 2 – Primary Port
			0x0000: No connection
			0x0001: Forwarding
			0x0002: Blocking
0x0523			***Ring 2 – Secondary Port***
			0x0000: No connection
			0x0001: Forwarding
			0x0002: Blocking
Jet-Ring Information			
0x0600	1 word	Hex	Jet Ring State
			0x0000: Disabled.
			0x0001: Enabled.
0x0601	3 word	Hex	Master Bridge MAC:
			Ex: MAC=00:01:02:03:04:05
			Word 0, high byte=0x00.
			Word 0, low byte=0x01.
			Word 1, high byte=0x02.
			Word 1, low byte=0x03.
			Word 2, high byte=0x04.
			Word 2, low byte=0x05.
0x0604	1 word	Hex	Jet Ring Total Nodes.
			Ex: When total nodes is 255(0xff).
			Word 0, high byte=0x00.
			Word 0, low byte=0xff.
0x0605	1 word	Hex	Bridge Role:
			0x0000: Learning.
			0x0001: Master.
			0x0002: Arbiter.
			0x0003: Forwarder.
			0x0004: Pre-Forwarder.
0x0610 to 0x062F	1 word	Hex	Port Role:
			0x0000: Disabled.
			0x0001: Listening.
			0x0002: Learning.
			0x0003: Forwarding.
			0x0004: Blocking.
			0x0005: No connection.

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0630 to 0x064F	1 word	Hex	Ring Port:
			0x0000: No
			0x0001: Yes
Dual-Ring Information			
0x0700	1 word	Hex	**Dual- Ring State:**
			0x0000: Disabled.
			0x0001: Enabled.
0x0701	3 word	Hex	**Xpress-ring MAC for Dual-Ring:**
			Ex: MAC=00:01:02:03:04:05
			Word 0, high byte=0x00.
			Word 0, low byte=0x01.
			Word 1, high byte=0x02.
			Word 1, low byte=0x03.
			Word 2, high byte=0x04.
			Word 2, low byte=0x05.
0x0704	1 word	Hex	**Xpress-ring Role for Dual-Ring:**
			0x0000: **Forwarder**
			0x0001: **Arbiter**
0x0705	2 word	Hex	**Xpress-ring Current status for Dual-Ring**
			Port-1 – (Primary Port)
			High byte – Port No.
			0x01~ 0x0a: Port 1~Port 10
			Low byte – Port Status
			0x00: No connection
			0x01: Forwarding
			0x02: Blocking
			Ex: 0x0501– Port 5 Forwarding
			0x0b02 – Port 12 Blocking
0x0706			***Port-2 – (Secondary Port)***
			High byte – Port No.
			0x01~ 0x0a: Port 1~Port 10
			Low byte – Port Status
			0x00: No connection
			0x01: Forwarding
			0x02: Blocking
			Ex: 0x0501– Port 5 Forwarding
			0x0b02 – Port 12 Blocking
0x0707	3 word	Hex	**Sub-Ring Master Bridge MAC :**
			Ex: MAC=00:01:02:03:04:05
			Word 0, high byte=0x00.
			Word 0, low byte=0x01.
			Word 1, high byte=0x02.
			Word 1, low byte=0x03.
			Word 2, high byte=0x04.
			Word 2, low byte=0x05.
0x070a	1 word	Hex	**Jet Ring Total Nodes for Sub-Ring.**
			Ex: When total nodes is 255(0xff).
			Word 0, high byte=0x00.
			Word 0, low byte=0xff.

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x070b	1 word	Hex	**Bridge Role for Sub-Ring:**
			0x0000: Learning.
			0x0001: Master.
			0x0002: Arbiter.
			0x0003: Forwarder.
			0x0004: Pre-Forwarder.
0x070c	2 Word	Hex	**Sub-ring Current status for Dual-Ring**
			Subport-1 – (Primary Port)
			High byte – Port No.
			0x01~ 0x0a: Port 1~Port 10
			Low byte – Port Status
			0x00: No connection
			0x01: Forwarding
			0x02: Blocking
			Ex: 0x0501– Port 5 Forwarding
			0x0b02 – Port 12 Blocking
0x070d			***Subport-2 – (Secondary Port)***
			High byte – Port No.
			0x01~ 0x0a: Port 1~Port 10
			Low byte – Port Status
			0x00: No connection
			0x01: Forwarding
			0x02: Blocking
			Ex: 0x0501– Port 5 Forwarding
			0x0b02 – Port 12 Blocking
ERPS Information (Active Ring Only)			
0x0800	1 word	Hex	**Ring ID for ERPSn (n=1)**
			Ex: 0x001 Ring ID=1
0x0801	1 word	Hex	**State for ring of ERPS**
			0x0000: Disabled.
			0x0001: Enabled.
0x0802	33 words	Hex	**Name of Ring**
			Ring Name = “Ring1”
			Word 1 Lo byte = ‘R’
			Word 2 Lo byte = ‘i’
			Word 3 Lo byte = ‘n’
			Word 4 Lo byte = ‘g’
			Word 5 Lo byte = ‘1’
			Word 6 Lo byte = ‘\0’
0x0823	1 word	Hex	**Version & Ring Type**
			High byte – Version.
			Low byte – Ring Type.
			0x01:Major-ring
			0x02:Sub-ring
			Ex: 0x0201– Version2, Type:Major-ring
0x0824	1 word	Hex	**Instance of Ring**
			Ex: 0x0001 Instance ID=1

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0825	1 word	Hex	**Control VLAN of Ring**
			E:0x000b Control VLAN=11
0x0826	1 word	Hex	**Right Port of Ring**
			High byte –Port No.
			Low byte – Port Type.
			0x01:Normal
			0x02:RPL Owner
			0x03:RPL Neighbour
			Ex: 0x0502– Port 5, RPL Owner
0x0827	1 word	Hex	**Left Port of Ring**
			High byte –Port No.
			Low byte – Port Type.
			0x01:Normal
			0x02:RPL Owner
			0x03:RPL Neighbour
			Ex: 0x0303– Port 3, RPL Neighbour
0x0828	1 word	Hex	**Ring port state**
			High byte –Left port state.
			Low byte – Right port state.
			0x00: No connection
			0x01: Forwarding
			0x02: Blocking
			Ex: 0x0001– Left Port No connection
			Right Port Forwarding
0x0829	1 word	Hex	**Ring ID for ERPSn (n=2)**
0x082a	1 word	Hex	**State for ring of ERPS**
0x082b	33 words	Hex	**Name of Ring**
0x084c	1 word	Hex	**Version & Ring Type**
0x084d	1 word	Hex	**Instance of Ring**
0x084e	1 word	Hex	**Control VLAN of Ring**
0x084f	1 word	Hex	**Right Port of Ring**
0x0850	1 word	Hex	**Left Port of Ring**
0x0851	1 word	Hex	**Ring port state**
0x0852	1 word	Hex	**Ring ID for ERPSn (n=3)**
0x0853	1 word	Hex	**State for ring of ERPS**
0x0854	33 words	Hex	**Name of Ring**
0x0875	1 word	Hex	**Version & Ring Type**
0x0876	1 word	Hex	**Instance of Ring**
0x0877	1 word	Hex	**Control VLAN of Ring**
0x0878	1 word	Hex	**Right Port of Ring**
0x0879	1 word	Hex	**Left Port of Ring**
0x087a	1 word	Hex	**Ring port state**

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x087b	1 word	Hex	**Ring ID for ERPSn (n=4)**
0x087c	1 word	Hex	**State for ring of ERPS**
0x087d	33 words	Hex	**Name of Ring**
0x089e	1 word	Hex	**Version & Ring Type**
0x089f	1 word	Hex	**Instance of Ring**
0x08a0	1 word	Hex	**Control VLAN of Ring**
0x08a1	1 word	Hex	**Right Port of Ring**
0x08a2	1 word	Hex	**Left Port of Ring**
0x08a3	1 word	Hex	**Ring port state**
0x08a4	1 word	Hex	**Ring ID for ERPSn (n=5)**
0x08a5	1 word	Hex	**State for ring of ERPS**
0x08a6	33 words	Hex	**Name of Ring**
0x08c7	1 word	Hex	**Version & Ring Type**
0x08c8	1 word	Hex	**Instance of Ring**
0x08c9	1 word	Hex	**Control VLAN of Ring**
0x08ca	1 word	Hex	**Right Port of Ring**
0x08cb	1 word	Hex	**Left Port of Ring**
0x08cc	1 word	Hex	**Ring port state**
0x08cd	1 word	Hex	**Ring ID for ERPSn (n=6)**
0x08ce	1 word	Hex	**State for ring of ERPS**
0x08cf	33 words	Hex	**Name of Ring**
0x08f0	1 word	Hex	**Version & Ring Type**
0x08f1	1 word	Hex	**Instance of Ring**
0x08f2	1 word	Hex	**Control VLAN of Ring**
0x08f3	1 word	Hex	**Right Port of Ring**
0x08f4	1 word	Hex	**Left Port of Ring**
0x08f5	1 word	Hex	**Ring port state**
MSTP Information			
0x0900	1 word	Hex	**Instance ID (Fixed 0x00, 0)**
			High byte –Instance ID.
			Low byte –Used State.
			0x01: used
			0x00: non used
0x0901	3 word	Hex	**Root bridge MAC**
			Ex: MAC=00:01:02:03:04:05
			Word 0, high byte=0x00.
			Word 0, low byte=0x01.
			Word 1, high byte=0x02.
			Word 1, low byte=0x03.
			Word 2, high byte=0x04.
			Word 2, low byte=0x05.

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0904	1 word	Hex	**Port 1 status**
			High byte –Port No.
			Low byte –Port Status.
			b'0:1 Type
			00: Bound(STP)
			01: Bound(RSTP)
			10: Bound(MSTP)
			11: Internal(MSTP)
			b'2 P2P
			0: non P2P
			1: P2P
			b'3:4 State
			00: Blocking
			01: Learning
			10: Forwarding
			b'5:7 Role
			000: Master
			001:Alternate
			010: Root
			011: Designated
			100: Backup
			101: Disabled
			110: Boundary
			111: Unknown
0x0905	1 word	Hex	**Port 2 status**
0x0906	1 word	Hex	**Port 3 status**
0x0907	1 word	Hex	**Port 4 status**
0x0908	1 word	Hex	**Port 5 status**
0x0909	1 word	Hex	**Port 6 status**
0x090a	1 word	Hex	**Port 7 status**
0x090b	1 word	Hex	**Port 8 status**
0x090c	1 word	Hex	**Port 9 status**
0x090d	1 word	Hex	**Port 10 status**
0x090e	1 word	Hex	**Port 11 status**
0x090f	1 word	Hex	**Port 12 status**
0x0920	1 word	Hex	**Instance ID (Fixed 0x01, 1)**
0x0940	1 word	Hex	**Instance ID (Fixed 0x02, 2)**
0x0960	1 word	Hex	**Instance ID (Fixed 0x03, 3)**
0x0980	1 word	Hex	**Instance ID (Fixed 0x04, 4)**
0x09a0	1 word	Hex	**Instance ID (Fixed 0x05, 5)**
0x09c0	1 word	Hex	**Instance ID (Fixed 0x06, 6)**
0x09e0	1 word	Hex	**Instance ID (Fixed 0x07, 7)**
0x0a00	1 word	Hex	**Instance ID (Fixed 0x08, 8)**
0x0a20	1 word	Hex	**Instance ID (Fixed 0x09, 9)**
0x0a40	1 word	Hex	**Instance ID (Fixed 0x0a, 10)**
0x0a60	1 word	Hex	**Instance ID (Fixed 0x0b, 11)**
0x0a80	1 word	Hex	**Instance ID (Fixed 0x0c, 12)**
0x0aa0	1 word	Hex	**Instance ID (Fixed 0x0d, 13)**

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x0ac0	1 word	Hex	**Instance ID (Fixed 0x0e, 14)**
0x0ae0	1 word	Hex	**Instance ID (Fixed 0x0f, 15)**
0x0b00	1 word	Hex	**Instance ID (Fixed 0x10, 16)**
0x0b20	1 word	Hex	**Instance ID (Fixed 0x11, 17)**
0x0b40	1 word	Hex	**Instance ID (Fixed 0x12, 18)**
0x0b60	1 word	Hex	**Instance ID (Fixed 0x13, 19)**
0x0b80	1 word	Hex	**Instance ID (Fixed 0x14, 20)**
0x0ba0	1 word	Hex	**Instance ID (Fixed 0x15, 21)**
0x0bc0	1 word	Hex	**Instance ID (Fixed 0x16, 22)**
0x0be0	1 word	Hex	**Instance ID (Fixed 0x17, 23)**
0x0c00	1 word	Hex	**Instance ID (Fixed 0x18, 24)**
0x0c20	1 word	Hex	**Instance ID (Fixed 0x19, 25)**
0x0c40	1 word	Hex	**Instance ID (Fixed 0x1a, 26)**
0x0c60	1 word	Hex	**Instance ID (Fixed 0x1b, 27)**
0x0c80	1 word	Hex	**Instance ID (Fixed 0x1c, 28)**
0x0ca0	1 word	Hex	**Instance ID (Fixed 0x1d, 29)**
0x0cc0	1 word	Hex	**Instance ID (Fixed 0x1e,30)**
0x0ce0	1 word	Hex	**Instance ID (Fixed 0x1f, 31)**
0x0d00	1 word	Hex	**Instance ID (Fixed 0x20, 32)**
0x0d20	1 word	Hex	**Instance ID (Fixed 0x21, 33)**
0x0d40	1 word	Hex	**Instance ID (Fixed 0x22, 34)**
0x0d60	1 word	Hex	**Instance ID (Fixed 0x23, 36)**
0x0d80	1 word	Hex	**Instance ID (Fixed 0x24, 36)**
0x0da0	1 word	Hex	**Instance ID (Fixed 0x25, 37)**
0x0dc0	1 word	Hex	**Instance ID (Fixed 0x26, 38)**
0x0de0	1 word	Hex	**Instance ID (Fixed 0x27, 39)**
0x0e00	1 word	Hex	**Instance ID (Fixed 0x28, 40)**
0x0e20	1 word	Hex	**Instance ID (Fixed 0x29, 41)**
0x0e40	1 word	Hex	**Instance ID (Fixed 0x2a, 42)**
0x0e60	1 word	Hex	**Instance ID (Fixed 0x2b, 43)**
0x0e80	1 word	Hex	**Instance ID (Fixed 0x2c, 44)**
0x0ea0	1 word	Hex	**Instance ID (Fixed 0x2d, 45)**
0x0ec0	1 word	Hex	**Instance ID (Fixed 0x2e, 46)**
0x0ee0	1 word	Hex	**Instance ID (Fixed 0x2f, 47)**
0x0f00	1 word	Hex	**Instance ID (Fixed 0x30, 48)**
0x0f20	1 word	Hex	**Instance ID (Fixed 0x31, 49)**
0x0f40	1 word	Hex	**Instance ID (Fixed 0x32, 50)**
0x0f60	1 word	Hex	**Instance ID (Fixed 0x33, 51)**
0x0f80	1 word	Hex	**Instance ID (Fixed 0x34, 52)**
0x0fa0	1 word	Hex	**Instance ID (Fixed 0x35, 53)**
0x0fc0	1 word	Hex	**Instance ID (Fixed 0x36, 54)**
0x0fe0	1 word	Hex	**Instance ID (Fixed 0x37, 55)**

Table 163: MODBUS Registers

Register Address	Data Type	Rep.	Description
0x1000	1 word	Hex	**Instance ID (Fixed 0x38, 56)**
0x1020	1 word	Hex	**Instance ID (Fixed 0x39, 57)**
0x1040	1 word	Hex	**Instance ID (Fixed 0x3a, 58)**
0x1060	1 word	Hex	**Instance ID (Fixed 0x3b, 59)**
0x1080	1 word	Hex	**Instance ID (Fixed 0x3c, 60)**
0x10a0	1 word	Hex	**Instance ID (Fixed 0x3d, 61)**
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