Instruction manual
MTL Industrial Network Solutions

February 2022
INM 9476-ETG Rev 3

9476-ET(G)

Intrinsically Safe Gigabit Ethernet 6 Port Managed Switch

Powering Business Worldwide

DECLARATION OF CONFORMITY

A printed version of the Declaration of Conformity has been provided separately within the original shipment of goods. However, you can find a copy of the latest version at -

http://www.mtl-inst.com/certificates

CONTENTS

GENERAL SAFETY INFORMATION

Safety instructions for installation and operating personnel

The operating instructions provided here contain **essential safety instructions** for installation personnel and those engaged in the operation, maintenance and servicing of the equipment.

WARNING !

A 'WARNING' marked in this way is provided for operator and plant safety and MUST be followed.

CAUTION !

A Caution is provided to prevent damage to the instrument.

NOTE

These are used to guide the user in the operation of the instrument.

Before commencing installation or commissioning:

- Read and understand the contents of this manual
- Ensure installation and operating personnel have received adequate training for this task
- Ensure that any operating instructions are fully understood by the personnel responsible.
- Observe national and local installation and mounting regulations (e.g. IEC 60079-14).

WARNING !

These assemblies may not be used in explosion-hazard area applications if they have been used previously in general electrical installations.

WARNING !

The responsibility for planning, installation, commissioning, operation and maintenance, particularly with respect to applications in explosion-hazard areas, lies with the plant operator.

During operation:

- Make the relevant instructions available at all times to the operating personnel.
- Observe safety instructions.
- Observe national safety and accident prevention regulations.
- Operate the equipment within its published specification.
- Servicing, maintenance work or repairs not described in this manual must not be performed without prior agreement with the manufacturer.
- Any damage to this equipment may render its explosion protection null and void.
- No changes to any of the components that might impair their explosion protection are permitted.

If any information provided here is not clear:

Contact **Eaton's MTL product line** or an authorised distributor or sales office.

NOTE

Improper installation and operation of the enclosure can result in the invalidation of the guarantee.

1 FEATURE

- Intrinsically Safe ATEX / UKEX / IECEx Certification
- 6 Port Switch 10/100/1000Mb LAN
- Standard Versions

  6x Gigabit Ports

  2x Gigabit + 4x 10/100 PoEx* Ports
- CPU Management Feature via Web Pages
- Compact dimensions (W: 42 x H: 160 x D: 140 mm)
- Ex ia IIB T4 Ga, Ex ia [ia Da] IIIC T135°C Db (non-mining, Ex ia I Ma (mining) - ETG version
- Ex ia IIC T4 Ga, Ex ia [ia Da] IIIC T135°C Db (non-mining, Ex ia I Ma (mining) - ET version
- Ta -40ºC to 70ºC
- Zone 1 / Zone 21 mounting
- (Zone 0 / Zone 20 with a suitable Ex ia Power Supply)

**Note – PoEx is a simple adaptation of the IEEE 802.3af Power over Ethernet (PoE) standard to bring the benefits to the 9400 Range of Hazardous Area devices. This allows two spare pairs in the existing Cat5e cable to distribute the power supply from a 9476 Ethernet Switch (Power Sourcing Equipment – PSE) to each of the devices connected to its five ports (PD – Powered Device). This adaptation is necessary due to restrictions for Hazardous Area use. It is not implied that the device conforms to the 802.3af (PoE) standard.*

2 DESCRIPTION

The 9476-ET (G) is an Intrinsically Safe (IS) 6-Port Managed Ethernet Switch suitable for Zone 1 / Zone 21 mounting, (Zone 0 / Zone 20 with a suitable Ex ia Power Supply).

The 6x RJ45 (LAN) ports support 10/100/1000 IS Ethernet connections.
Available standards types

- 6 port Gigabit
- 4 port Gigabit and 2 ports 10/100+PoEx

These variants suit different applications.

Power (12V DC) is supplied to the module locally along with Power over Ethernet (PoEx) for the connected devices where required.
Note: PoEx not available on Gigabit ports.

The compact and cost effective design makes it the ideal choice for many applications:

Petrochem

Process Monitoring & Control...

Mining

Underground Communication Links, PLC and Machine Monitoring…

Electrical connections are via cage-clamp and/or screw type plug/socket terminals along with RJ45 type connectors for the Ethernet LAN ports.

3 CONNECTIONS

3.1 DATA & POWER TERMINALS

Power + External IP Rated LEDs (CON1)

Pin	Function	Pin	Function
1	Power +12V	**2**	Power 0V
3	Port 3 PoEx +12V	**4**	Port 3 PoEx 0V
5	Port 4 PoEx +12V	**6**	Port 4 PoEx 0V
7	Port 5 PoEx +12V	**8**	Port 5 PoEx 0V
9	Port 6 PoEx +12V	**10**	Port 6 PoEx 0V
11	0V	**12**	0V
13	LAN1 EXT LED	**14**	LAN2 EXT LED
15	LAN3 EXT LED	**16**	LAN4 EXT LED
17	LAN5 EXT LED	**18**	LAN6 EXT LED

External IP66 rated LEDs wire down to 0V
Power Ui = 15.4V

3.2 LAN (RJ45) 10/100/1000 BASE-T Ethernet

Pin	10/100 Function	Gigabit Function
1	Tx +	BI_DA+
2	Tx-	BI_DA-
3	Rx +	BI_DB+
4	PoEx +12V*	BI_DC+
5	PoEx +12V*	BI_DC-
6	Rx-	BI_DB-
7	PoEx 0V*	BI_DD+
8	PoEx 0V*	BI_DD-

*Note- PoEx only on LAN3-6 ports when 10/100
PoEx not available on Gigabit ports

3.3 LED indicators

	OFF	FLASH	ON
PWR (green)	Power Fail	N/A	Power OK
WDG (red/green)	Fault	Green- Healthy (10Hz)	Fault
STAT (red/green)	N/A	Green – Identify module mode	Red (fault) Green (healthy)
RJ45 ACT (yellow)	Ethernet link disconnected	Ethernet link activity	Ethernet link connected
RJ45 1000 (green)	10/100Mbps	N/A	1000Mbps
LAN1 – LAN6 EXT LED	Ethernet link Disconnected	Ethernet link activity	Ethernet link connected

4 ORDERING INFORMATION

Part Number	Description	Comments
9476-ETG	**6 Port Gigabit Ethernet Switch (6x Gigabit)**	**Standard**
9476-ET2G	**2+4 Port Gigabit Ethernet Switch (2x Gigabit + 4x 10/100 PoEx)**	**Standard**
9476-ET3G	3+3 Port Gigabit Ethernet Switch (3x Gigabit + 3x 10/100 PoEx)	Special Order
9476-ET4G	4+2 Port Gigabit Ethernet Switch (4x Gigabit + 2x 10/100 PoEx)	Special Order
9476-ET	6 Port Ethernet Switch (6x 10/100 4x PoEx)	Special Order

Note: Special order items may incur a minimum order quantity

5 DIMENSIONS

Width	42mm
Height	160mm
Depth	140mm
Weight	1500g
Mounting	Din Rail

6 ENVIRONMENTAL

Operating Temperature
-40°C…+70°C

Storage Temperature
-40°C…+70°C

Humidity
0…95% RH, non-condensing

Ingress Protection
Select enclosure to suit application, see certificates for information

7 WASTE REMOVAL INFORMATION

The electronic equipment within must not be treated as general waste. By ensuring that this product is disposed of correctly you will be helping to prevent potentially negative consequences for the environment and human health, which could otherwise be caused by incorrect waste handling of this product. For more detailed information about the take-back and recycling contact Controlled Systems Ltd

8 INSTALLATION

WARNING !

See Special Conditions of Safe Use in the folllowing section regarding ATEX, UKEX & IECEx Certification Information before installation

The 12V supply to the module connects via screw terminals 1 + 2 as shown above.

If Power over Ethernet (PoEx) is required to any of the connected devices, the RJ45 connection for that port requires that the 12V supply for that device be injected into the relevant screw terminals, see connections section.

As the 9476 Ethernet switch supports Auto MDI/MDI-X, a straight connected RJ45 Cat5e cable is used to connect to any device.

It is recommended that Cat5e cables for Hazardous Area Zone 1 use are 'Blue' in colour and are of good quality (see accessories section), the Safe Area cables being a colour other than blue to aid identification.

The operating parameters must not exceed those as detailed on the certificate.

This apparatus must only be installed or replaced by a competent person who must ensure that existing IS segregation is maintained.

9 ATEX, UKEX & IECEx CERTIFICATION INFORMATION

The following information is in accordance with the Essential Health and Safety Requirements (Annex II) of the EU Directive 2014/34/EU [the ATEX Directive- safety of apparatus] and SI 2016 No.1107 [UKEX Statutory Requirements] and is provided for those locations where the ATEX Directive and/or UKEX requirements are applicable.

General

a) This equipment must only be installed, operated and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis. [See clause 4.2 of EN 60079-17].

b) This equipment has been designed to provide protection against all the relevant additional hazards referred to in Annex II of the directive, such as those in clause 1.2.7. This equipment has been designed to meet the requirements of intrinsically safe electrical apparatus in accordance with EN 60079-0 and EN 60079-11.

Installation

a) Reference to the IEC code of practice IEC 60079-14. In addition particular industries or end users may have specific requirements relating to the safety of their installations and these requirements should also be met. For the majority of installations the Directive 1999/92/EC [the ATEX Directive- safety of installations] is also applicable.

b) Unless already protected by design this equipment must be protected by a suitable enclosure against

   i) mechanical and thermal stresses in excess of those noted in the certification documentation and the product specification.

   ii) aggressive substances excessive dust moisture and other contaminants

c) This apparatus is intrinsically safe electrical apparatus and is normally mounted in a hazardous area.

Inspection and maintenance

a) Inspection and maintenance should be carried out in accordance with European, national and local regulations which may refer to the IEC standard IEC 60079-17. In addition specific industries or end users may have specific requirements which should also be met.

b) Access to the internal circuitry must not be made during operation.

Repair

This product cannot be repaired by the user and must be replaced with an equivalent certified product.

Specific Conditions of Use (Special Conditions)

The following conditions relate to safe installation and/or use of the equipment.

8.1 For Group I, the modules shall each be mounted within an enclosure providing a degree of protection of at least IP54.
This shall be in accordance with EN 60529, and the modules installed in a manner that does not impair the existing creepage and clearance distances. The enclosure shall also comply with the appropriate requirements of Clauses 7.4.2 and 7.5, or 8.2 of EN 60079-0.

8.2 For Group II, the RJ45 connectors shall be fitted with either a plug or blanking plug.Alternatively, the module shall be mounted in an enclosure providing a degree of protection of at least IP20.
This shall be in accordance with EN 60529, and the modules installed in a manner that does not impair the existing creepage and clearance distances. The enclosure shall also comply with the appropriate requirements of Clauses 7.4.2 and 7.5, or 8.3 of EN 60079-0.

8.3 For Group III, the module shall be mounted inside a suitably certified enclosure which provides a minimum degree of protection of at least IP54. The module shall be installed in a manner that does not impair the existing creepage and clearance distances.

8.4 The supply to the modules must be derived from a suitably certified, intrinsically safe supply.

8.5 The values of Co and Lo shall apply when one of the two conditions below is given:

- The total Li of the external circuit (excluding the cable) is < 1% of the Lo value, or
- The total Ci of the external circuit (excluding the cable) is < 1% of the Co value.

The above parameters are reduced to 50% when both of the two conditions below are given:

- The total Li of the external circuit (excluding the cable) > 1% of the Lo, and
- The total Ci of the external circuit (excluding the cable) > 1% of the Co.

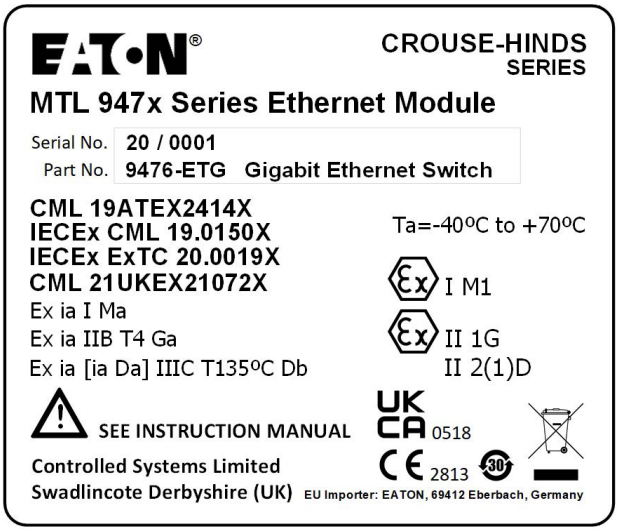
Note: the reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for Group I and IIB/III and 600 nF for IIC.

8.6 The equipment shall be mounted on an earthed metal bracket or housing.

Marking

Each device is marked in accordance with the Directive/Statutory Requirements and CE and UKCA marked with the Notified/Approved Body Identification Number.

9476-ETG Product Label



10 Specification

Power supplies

12VDC IS Power Supply Input
PoEx™ (Power over IS Ethernet)
Typically 12V @ 350mA (Inrush < 200mA)
Ui =15.4V
9492-PS-PLUS recommended

Ethernet

Intrinsically Safe 10/100/1000Base-T

Connector

RJ45 (x6)

Cable Length

Up to 100m Cat5e

PoEx

Power Source

11 APPROVALS

Location of Unit

Zone 1, IIB T4 hazardous area (9476-ETG)
Zone 1, IIC T4 hazardous area (9476-ET)

Certification Code

Ex ia IIB T4 Ga (9476-ETG)
Ex ia IIC T4 Ga (9476-ET)
Ex ia [ia Da] IIIC T135°C Db (non-mining)
Ex ia I Ma (M1 mining)
Ta =-40°C to +70°C

Certificate numbers

ATEX (CML 19ATEX2414X)
IECEx (IECEx CML 19.0150X)
QLD (IECEx ExTC 20.0019X)
UKEX (CML 21UKEX21072X)

See certificates for further information

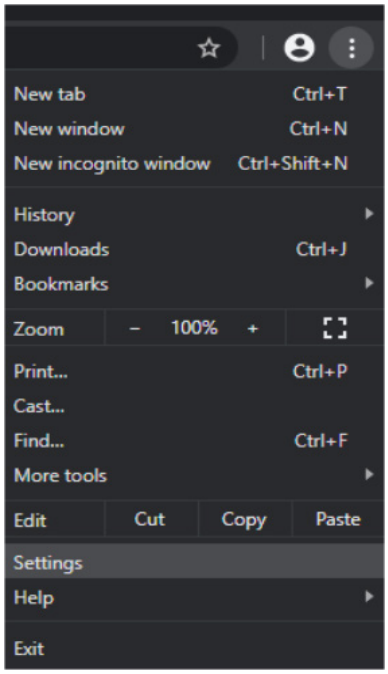
CE UK CA

12 CERTIFICATE INSTALLATION

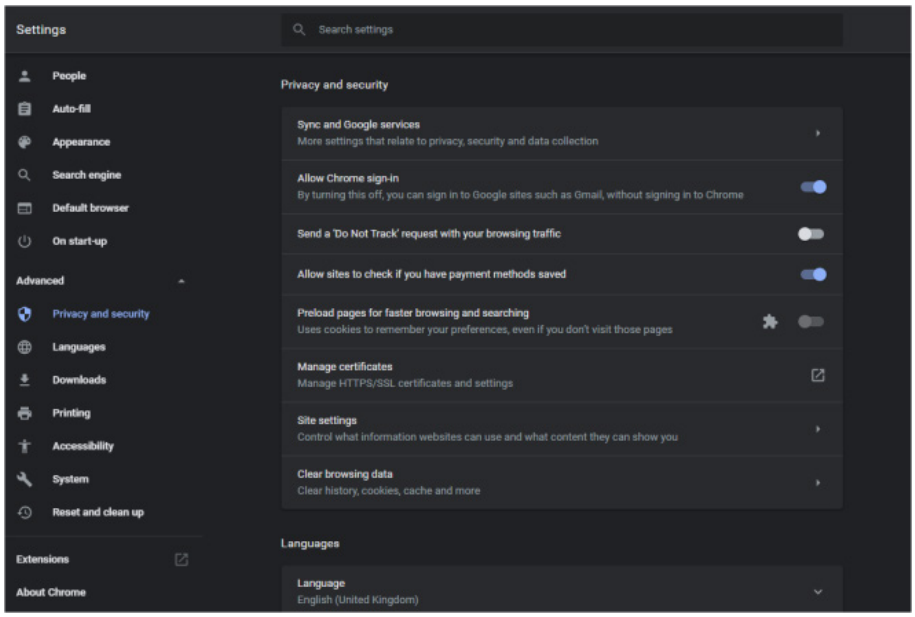
The certificate works on the Hostname of “9476-Switch”

To be able to view the HTTPS pages of the unit securely you are required to install a SSL certificate. Below are the steps required in the Google Chrome browser (other browser setups are similar).

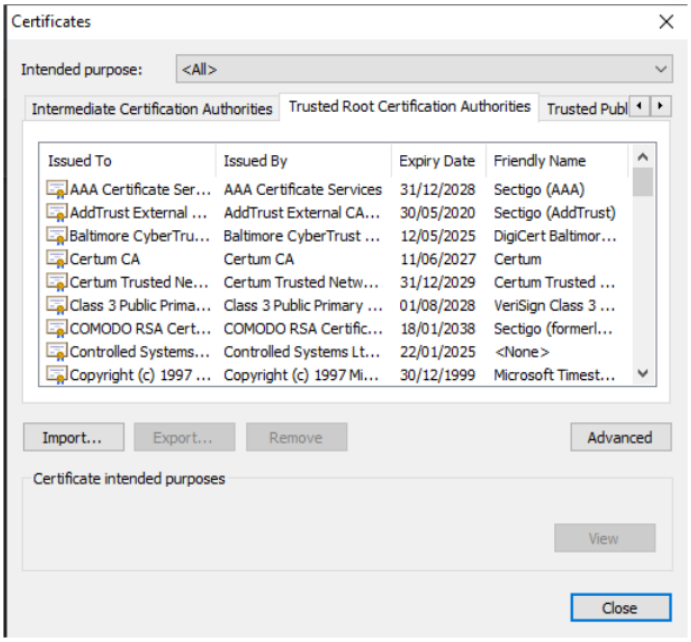
Click on the 3 dots in the top right corner of the browser



Click Advanced->Privacy and Security-> Manage certificates

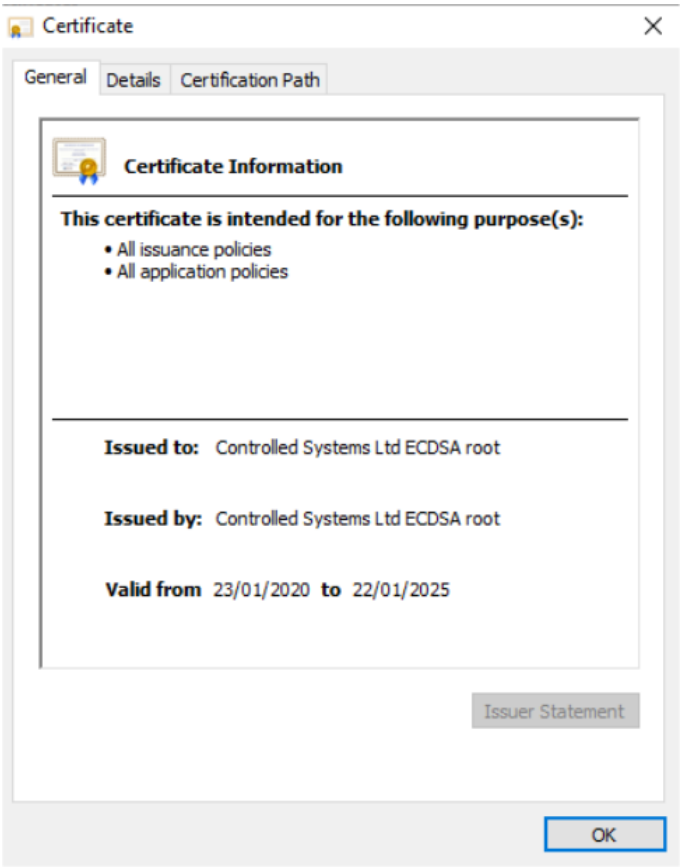


Click on the Trusted Root Certification Authorities Ab and click Insert



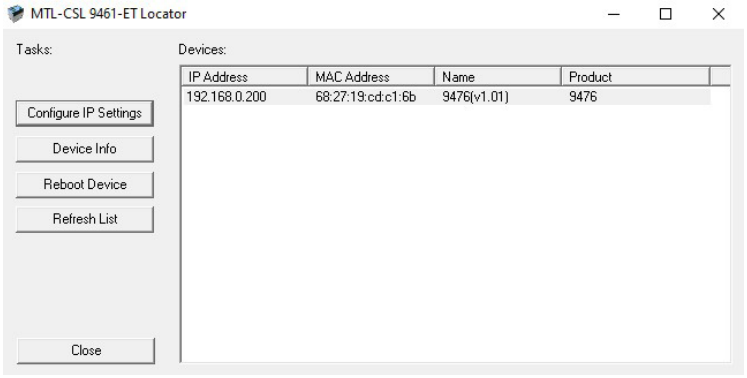
Browse for the “ca-cert.pem” file and install it.

You will now get and entry in the list of certificates called Controlled Systems Ltd ECDSA root

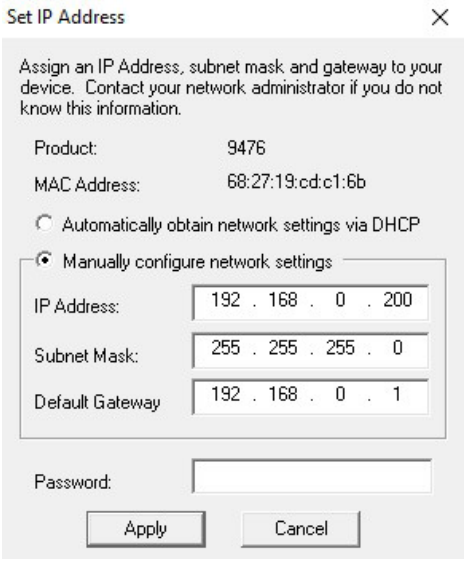


13 CONNECTING THE 9476-ET(G)TO A PC/NETWORK

- ☐ Ensure that the 9476 unit is powered by a suitable IS supply, such as the MTL 9492-PS-PLUS. PoEx can be used to power the unit via the LAN port if required.
- ☐ The 9476 unit should then be connected to an IS Ethernet Network/PC using a suitable CAT5/6 cable. Either LAN Port 1 or 2 can be used. The other LAN port can be used for daisy chaining units together.
- ☐ Run the 9461-ET Finder.exe program which can be found on the MTL website, this will automatically search for and locate any 9476 units connected to the network



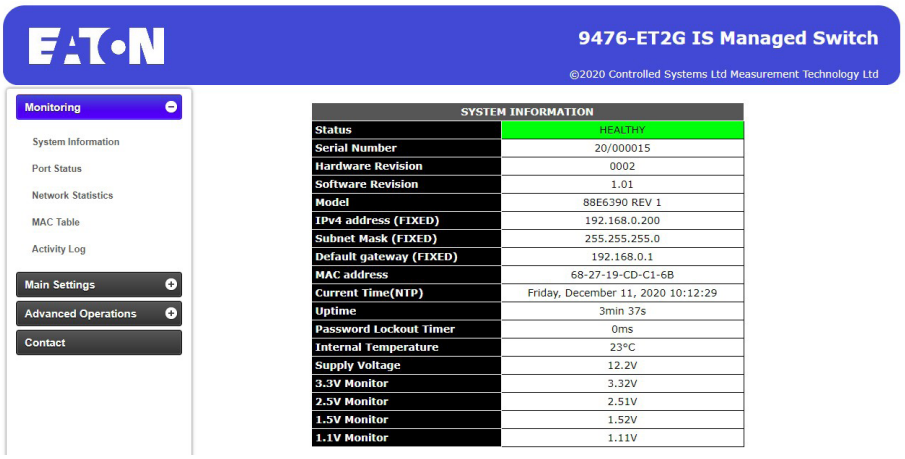
- ☐ Click on the device that you are looking to configure, then click the "configure IP settings" button and this will bring up the following screen



- ☐ Manually type in the settings that you require and then enter the password "CSL". Click the apply button to send the settings to the 9476.
- ☐ Reboot the device by either powering down or by clicking the "reboot" button in the above screen.
- ☐ Once the 9476 is up and running, navigate to the IP Address that has been programmed into the unit using a web browser

NOTE: The Factory Default IP Address is 192.168.0.200

14 SYSTEM INFORMATION



This is the main page of the 9476 and show the main information of the 9476 switch

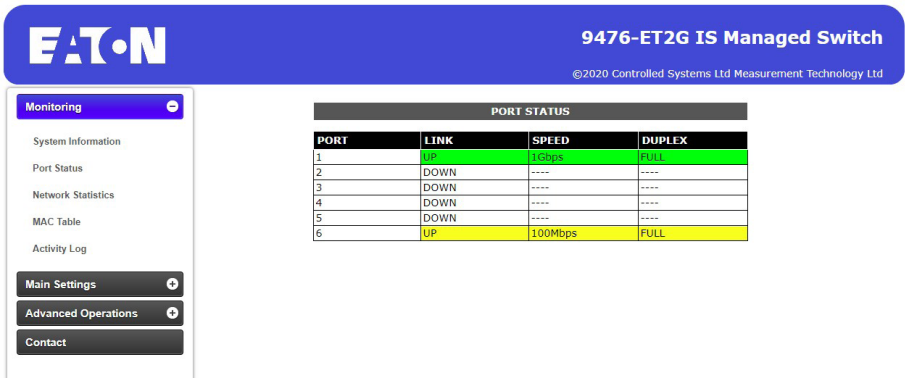
This page show the status of the switch to confirm everything is functioning correctly.

Hardware and Software version is shown here as well to ensure the latest firmware is being used.

The Password lockout timer indicates the time remaining if the configuration of the unit has been locked out due to the password being entered incorrect 3 or more times.

If intermittent problems exist check the Temperature and voltage settings as this may indicate what is wrong.

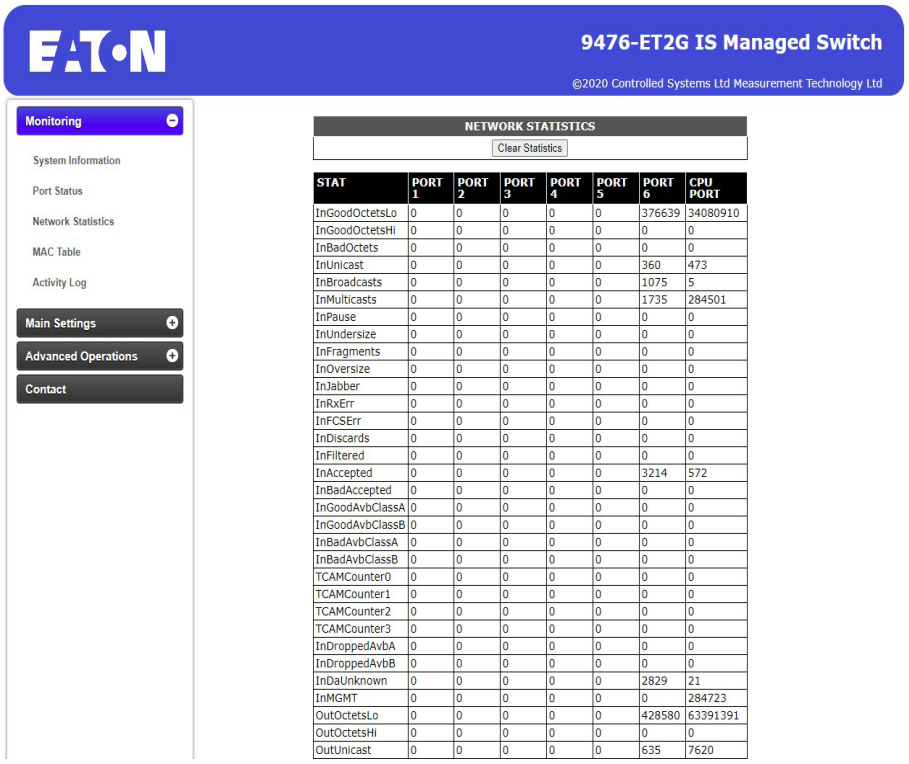
15 PORT STATUS



This page shows the current status of the 6 ports on the 9476,

The unit will display any connected Gigabit ports in green and any connected 10/100Mbps ports in Yellow.

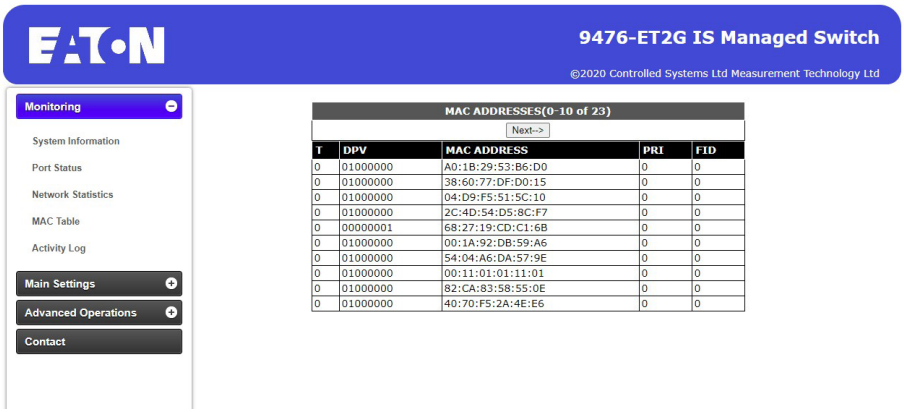
16 NETWORK STATISTICS



STAT	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	CPU PORT
InGoodOctetsLo	0	0	0	0	0	376639	34080910
InGoodOctetsHi	0	0	0	0	0	0	0
InBadOctets	0	0	0	0	0	0	0
InUnicast	0	0	0	0	0	360	473
InBroadcasts	0	0	0	0	0	1075	5
InMulticasts	0	0	0	0	0	1735	284501
InPause	0	0	0	0	0	0	0
InUndersize	0	0	0	0	0	0	0
InFragments	0	0	0	0	0	0	0
InOversize	0	0	0	0	0	0	0
InJabber	0	0	0	0	0	0	0
InRxErr	0	0	0	0	0	0	0
InFCSErr	0	0	0	0	0	0	0
InDiscards	0	0	0	0	0	0	0
InFiltered	0	0	0	0	0	0	0
InAccepted	0	0	0	0	0	3214	572
InBadAccepted	0	0	0	0	0	0	0
InGoodAvbClassA	0	0	0	0	0	0	0
InGoodAvbClassB	0	0	0	0	0	0	0
InBadAvbClassA	0	0	0	0	0	0	0
InBadAvbClassB	0	0	0	0	0	0	0
TCAMCounter0	0	0	0	0	0	0	0
TCAMCounter1	0	0	0	0	0	0	0
TCAMCounter2	0	0	0	0	0	0	0
TCAMCounter3	0	0	0	0	0	0	0
InDroppedAvbA	0	0	0	0	0	0	0
InDroppedAvbB	0	0	0	0	0	0	0
InDaUnknown	0	0	0	0	0	2829	21
InMGMT	0	0	0	0	0	0	284723
OutOctetsLo	0	0	0	0	0	428580	63391391
OutOctetsHi	0	0	0	0	0	0	0
OutUnicast	0	0	0	0	0	635	7620

On this page counters are shown to enable fault finding on your network infrastructure. There are 64 counters for the 4 external ports and the one internal port connected to the CPU. The counters can be cleared using the Clear Statistics button.

17 MAC TABLE



This page shows in blocks of 10 the relative location of network devices in relation to the unit

- **T**
  Trunk Specifies the DPV value is the trunk ID

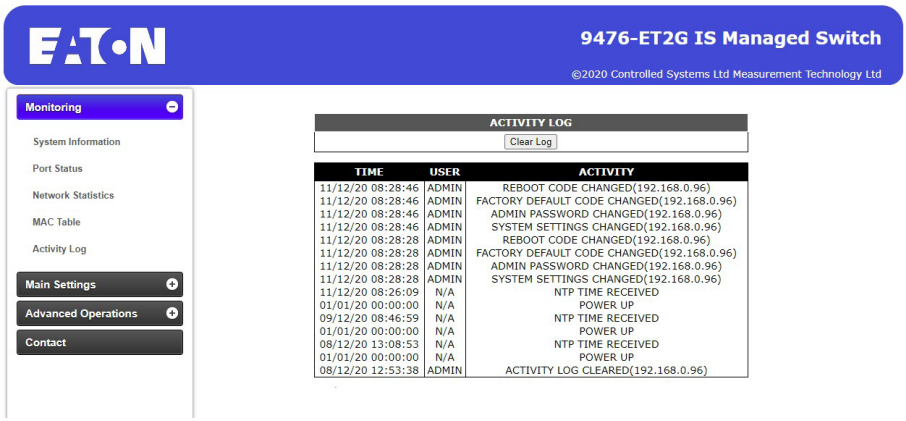
- **DPV**
  Destination Port Vector value is a bit pattern of the ports on the unit

- **MAC Address**
  The unique 48bit MAC address

- **PRI**
  The priority assigned to the MAC address

- **FID**
  Forwarding Information Database allows the same MAC Address on different ports

18 ACTIVITY LOG

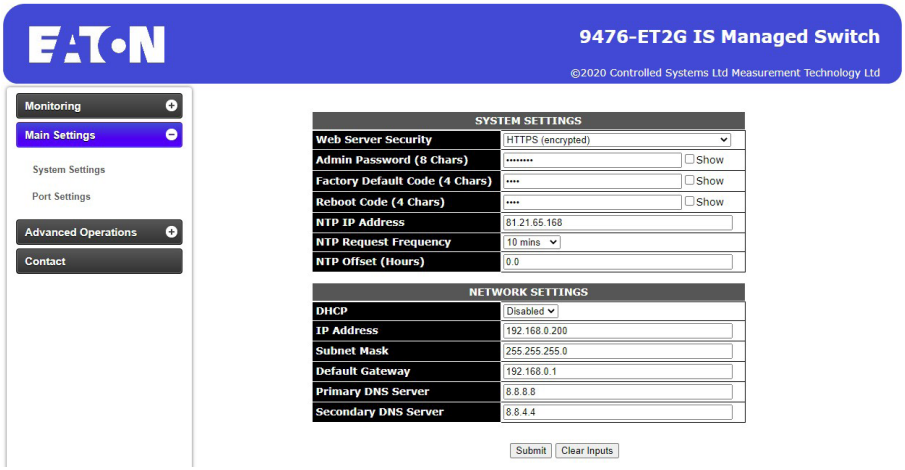


This page accessed via the password shows any changes that have occured to the unit. This includes configuration changes, password entered wrong and other useful information.

The Clear Log button will empty the existing log.

NOTE: The Factory Default Password is "Pa55w076" (without quotes)

19 SYSTEM SETTINGS



System Settings

Web Server Security

HTTP (clear text) HTTPS (encrypted)

We strongly recommend the use of HTTPS so that the data between browser and 9476 is encrypted

Admin Password

The admin password can be changed here

Factory Default Code

The code entered to allow the unit to factory default can be changed here

Reboot Code

The code entered to allow the unit to reboot can be changed here

NTP IP Address

Enter the IP Address of an NTP server to allow the unit to get the correct time

NTP Request Frequency

This is the frequency that the unit will request the time from an NTP server

NTP Offset

This value can be used to offset the time received from the NTP server. This value is the number of hours the local time is different from Greenwich Mean Time(GMT)

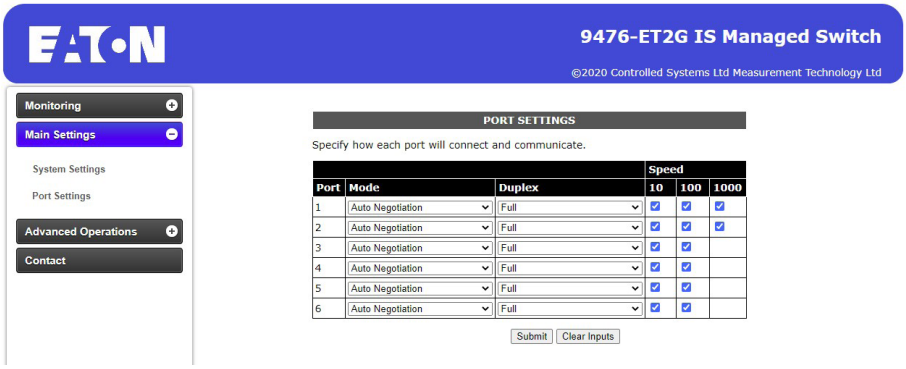
Network Settings

Enter the various settings to allow the 9475 to live on your network architecture. If required DHCP can be setup here and then the unit will be given an IP Address from the Networks DHCP server.

Click Submit to save the selection.

NOTE: The Factory Default Password is "Pa55w076" (without quotes)

20 PORT SETTINGS



This page accessible via password allows the changing of the 6 Ethernet ports.

- **Mode**
  Off, Auto or Fixed Negotiation
- **Duplex**
  Half or Full
- **Speed**
  10 Mbps, 100Mbps 1Gbps (1000)

Click Submit to save the selection.

NOTE: The Factory Default Password is "Pa55w076" (without quotes)

21 REBOOT MEDIA CONVERTER

This page allow the resetting of the unit back to Factory Defaults. To reset enter the factory reset code .

This page is only accessed via a password

The default factory reset code is “DEFA

22 REBOOT SWITCH

This page allow the rebooting of the unit. To reset enter the reboot device code.

This page is only accessed via a password.

The default reboot code is“4E5E”

NOTE: The Factory Default Password is "Pa55w076" (without quotes)

23 LOGOUT OF CURRENT WEB SESSION

This page logs the current user out of the web session.

It is highly recommended that once finished using the web interface that you log out enforcing that the password will have to be entered next time the unit is accessed.

24 RESET BUTTON

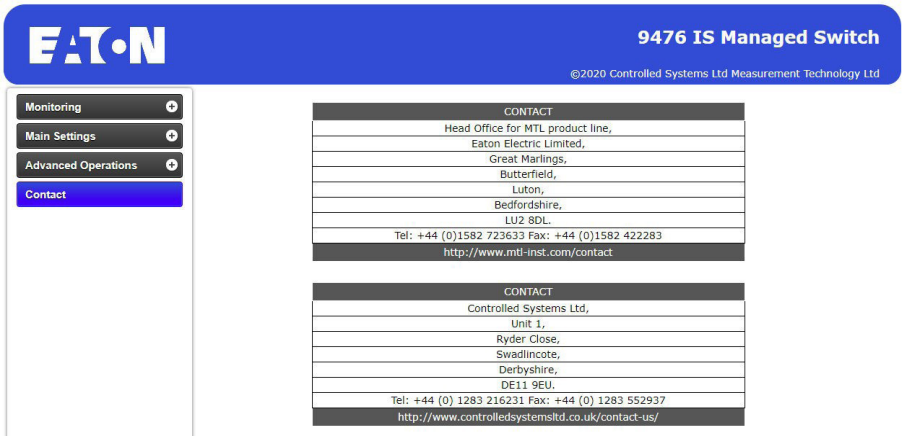
There is a hardware push button that is accessible through the small hole in the front panel, near to the LEDs. This may be needed for example if the password is unknown and you need to factory default the unit to again allow access to configure it.

The button has two functions depending on when it is pressed-

1. Press on power-up = This puts the unit into **Bootloader Mode**, ready for a firmware upgrade. The watchdog LED **flashes red** and the status LED turns **red** also. To exit this mode cycle the power to the unit.

2. Press 1-2 seconds after power-up = Factory Default Mode. This temporarily sets the unit to the defaults described in this manual (IP Address 192.168.0.200, HTTPS etc.). The watchdog LED **flashes green** and the status LED is **red**. The user can then access the webpage at the default IP address (https://192.168.0.200) make any changes to the configuration and save them. If the user cycles power before saving any settings then the unit reverts back to the previously saved settings.

25 CONTACT



This page list the contacts for support and offers a quick way to access our websites.

26 APPENDIX A END USER LICENSE AGREEMENT

Eaton

END-USER LICENSE AGREEMENT

Eaton 9476-ET(G) Intrinsically Safe Gigabit Ethernet 6 Port Managed Switch

Last Revised Date: 21July 2020

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Description of the Product Software. Configuration Utility Software for Eaton 9476-ET(G) Intrinsically Safe Gigabit Ethernet 6 Port Managed Switch. The software can be accessed through a web Graphical User Interface (GUI) through an IP Address by physically connecting to the switch.

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Eaton

Attn: IP Law Group

1000 Eaton Boulevard

Mail Code 4N

Cleveland, OH 44122

Eaton

Attn: Global Data Protection and Privacy Office

1000 Eaton Boulevard

Cleveland, OH 44122

Email: dataprotection@eaton.com

27 APPENDIX B CYBERSECURITY GUIDELINES

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The 9476 Gigabit Switch has been designed with cybersecurity as an important consideration. A number of features are offered in the product to address cybersecurity risks. These Cybersecurity Recommendations provide information to help users to deploy and maintain the product in a manner that minimizes the cybersecurity risks. These Cybersecurity Recommendations are not intended to provide a comprehensive guide to cybersecurity, but rather to complement customers' existing cybersecurity programs.

Eaton is committed to minimizing the cybersecurity risk in its products and deploying cybersecurity best practices in its products and solutions, making them more secure, reliable and competitive for customers.
The following Eaton whitepapers are available for more information on general cybersecurity best practices and guidelines:

Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):
http://www.eaton.com/ecm/groups/public/@pub/@eaton/@corp/documents/content/pct_1603172.pdf
Cybersecurity Best Practices Checklist Reminder (WP910003EN):
http://www.cooperindustries.com/content/dam/public/powersystems/resources/library/1100_EAS/WP910003EN.pdf

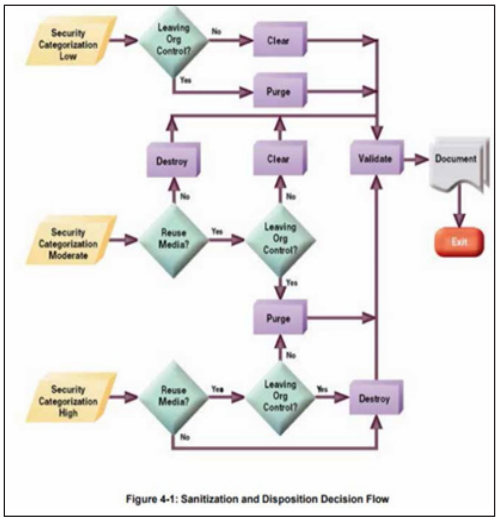
Category	Description
Asset Management	Keeping track of software and hardware assets in your environment is a pre-requisite for effectively managing cybersecurity. Eaton recommends that you maintain an asset inventory that uniquely identifies each important component. To facilitate this, The 9476 Gigabit Switch supports the following identifying information: <Include for hardware>- manufacturer, type, serial number, f/w version number, and location. <Include for software>- publisher, name, version, and version date.
Risk Assessment	Eaton recommends conducting a risk assessment to identify and assess reasonably foreseeable internal and external risks to the confidentiality, availability and integrity of the system | device and its environment. This exercise should be conducted in accordance with applicable technical and regulatory frameworks such as IEC 62443 and NERC-CIP. The risk assessment should be repeated periodically.
Physical Security	An attacker with unauthorized physical access can cause serious disruption to device functionality. Additionally, Industrial Control Protocols don't offer cryptographic protections, making ICS and SCADA communications especially vulnerable to threats to their confidentiality. Physical security is an important layer of defence in such cases The 9476 Gigabit Switch is designed to be deployed and operated in a physically secure location. Following are some best practices that Eaton recommends to physically secure your device: • Secure the facility and equipment rooms or closets with access control mechanisms such as • locks, entry card readers, guards, man traps, CCTV, etc. as appropriate. • Restrict physical access to cabinets and/or enclosures containing The 9476 Gigabit Switch and the associated system. Monitor and log the access at all times. • Physical access to the telecommunication lines and network cabling should be restricted to protect against attempts to intercept or sabotage communications • The 9476 Gigabit Switch supports the following physical access ports. • RJ45 Access to these ports should be restricted.

Category	Description
COTS Platform Security	Eaton recommends that customers harden third-party commercial off-the-shelf (COTS) operating systems or plat- forms that are used to run Eaton applications / products (e.g., third party hardware, operating systems and hyper- visors, such as those made available by Dell, Microsoft, VMware, Cisco, etc.).
	• Eaton recommends that customers refer to the COTS vendor's documentation for guidance on how to harden these components. • Vendor-neutral guidance is made available by the Center for Internet Security https://www.cisecurity.org/ Irrespective of the platform, customers should consider the following best practices: • Install all security updates made available by the COTS manufacturer. • Change default credentials upon first login. • Disable or lock unused built-in accounts. • Limit use of privileged generic accounts (e.g., disable interactive login). • Change default SNMP community strings. • Restrict SNMP access using access control lists. • Disable unneeded ports & services.
Account Management	Logical access to the system | device should be restricted to legitimate users, who should be assigned only the privileges necessary to complete their job roles/functions. Some of the following best practices may need to be implemented by incorporating them into the organization's written policies: • Ensure default credentials are changed upon first login. • The 9476 Gigabit Switch should not be deployed in production environments with default credentials, as default credentials are publicly known. • No account sharing – Each user should be provisioned a unique account instead of sharing accounts and passwords. Security monitoring/logging features in the product are designed based on each user having • A unique account. Allowing users to share credentials weakens security. • Restrict administrative privileges- Attackers seek to gain control of legitimate credentials, especially those for highly privileged accounts. Administrative privileges should be assigned only to accounts specifically designated for administrative duties and not for regular use.

Category	Description
Account Management (continued)	• Leverage the roles / access privileges to provide tiered access to the users as per the business /operational need. Follow the principle of least privilege (allocate the minimum authority level and access to system resources required for the role). • Perform periodic account maintenance (remove unused accounts). • Ensure password length, complexity and expiration requirements are appropriately set, particularly for all administrative accounts (e.g., minimum 10 characters, mix of upper- and lower-case and special characters, and expire every 90 days, or otherwise in accordance with your organization's policies). • Enforce session time-out after a period of inactivity.
Time Synchronization	Many operations in power grids and IT networks heavily depend on precise timing information. • Ensure the system clock is synchronized an authoritative time source (using manual configuration, NTP, SNTP, or IEEE 1588). Please refer to section 9.7.4 of this manual
Network Security	The 9476 Gigabit Switch supports network communication with other devices in the environment. This capability can present risks if it's not configured securely. Following are Eaton recommended best practices to help secure the network. Additional information about various network protection strategies is available in Eaton Cybersecurity Considerations for Electrical Distribution Systems [R1]. Eaton recommends segmentation of networks into logical enclaves, denying traffic between segments except that which is specifically allowed, and restricting communication to host-to-host paths (for example, using router ACLs and firewall rules). This helps to protect sensitive information and critical services and creates additional barriers in the event of a network perimeter breach. At a minimum, a utility Industrial Control Systems network should be segmented into a three-tiered architecture (as recommended by NIST SP 800-82[R3]) for better security control. Eaton recommends opening only those ports that are required for operations and protect the network communication using network protection systems like firewalls and intrusion detection systems / intrusion prevention systems. Use the information below to configure your firewall rules to allow access needed for The 9476 Gigabit Switch to operate smoothly The default ports used on The 9476 Gigabit Switch are:= 80 Web Port (HTTP) 443 Secure Web Port(HTTPS)

Category	Description
Remote Access	Remote access to devices/systems creates another entry point into the network. Strict management and validation of termination of such access is vital for maintaining control over overall ICS security. The 9476 Gigabit Switch requires additional hardware to allow Remote Access. This hardware will need securing correctly to ensure security
Logging and Event Management	• Eaton recommends logging all relevant system and application events, including all administrative and maintenance activities. • Logs should be protected from tampering and other risks to their integrity (for example, by restricting permissions to access and modify logs, transmitting logs to a security information and event management system, etc.). • Ensure that logs are retained for a reasonable and appropriate length of time. • Review the logs regularly. The frequency of review should be reasonable, taking into account the sensitivity and criticality of the system | device and any data it processes.
Vulnerability Scanning	Any known critical or high severity vulnerabilities on third party component/libraries used to run software /applications should be remediated before putting the device | system into production. • Eaton recommends running a vulnerability scan to identify known vulnerabilities for software used with the product. For COTS components (e.g., applications running on Windows), vulnerabilities can be tracked on the National Vulnerability Database (NVD), available at https://nvd.nist.gov/. • Keep software updated by monitoring security patches made available by COTS vendors and installing them as soon as possible. *Note: Many compliance frameworks and security best practices require a monthly vulnerability review. For many non-COTS products vulnerabilities will be communicated directly through the vendor site.*
Malware Defenses	Eaton recommends deploying adequate malware defenses to protect the product or the platforms used to run the Eaton product.

Category	Description
Secure Maintenance	Best Practices Update device firmware prior to putting the device into production. Thereafter, apply firmware updates and soft- ware patches regularly. Eaton publishes patches and updates for its products to protect them against vulnerabilities that are discovered. Eaton encourages customers to maintain a consistent process to promptly monitor for and install new firmware updates. Please check Eaton's cybersecurity website for information bulletins about available firmware and software updates. New firmware for The 9476 Gigabit Switch will be available on the products page on the Eaton website
Business Continuity / Cybersecurity Disaster Recovery	Plan for Business Continuity/Cybersecurity Disaster Recovery Eaton recommends incorporating The 9476 Gigabit Switch into the organization's business continuity and disaster recovery plans. Organizations should establish a Business Continuity Plan and a Disaster Recovery Plan and should periodically review and, where possible, exercise these plans. As part of the plan, important system | device data should be backed up and securely stored, including: Updated firmware for The 9476 Gigabit Switch. Make it a part of standard operating procedure to update the backup copy as soon as the latest firmware is updated. The current configuration. Documentation of the current permissions / access controls, if not backed up as part of the configuration. The following section describes the details of failures states and backup functions:
Sensitive Information Disclosure	Eaton recommends that sensitive information (i.e. connectivity, log data, personal information) that may be stored by The 9476 Gigabit Switch be adequately protected through the deployment of organizational security practices.

Category	Description
Decommissioning or Zeroisation	It is a best practice to purge data before disposing of any device containing data. Guidelines for decommissioning are provided in NIST SP 800-88. Eaton recommends that products containing embedded flash memory be securely destroyed to ensure data is unrecoverable.  Figure 4-1: Sanitization and Disposition Decision Flow *from NIST SP800-88* • **Embedded Flash Memory on Boards and Devices** Eaton recommends the following methods for disposing of motherboards, peripheral cards such as network adapters, or any other adapter containing non-volatile flash memory. • **Clear:** If supported by the device, reset the state to original factory settings. • **Purge:** If the flash memory can be easily identified and removed from the board, the flash memory may be destroyed independently of the board that contained the flash memory. Otherwise, the whole board should be destroyed. • **Destroy:** Shred, disintegrate, pulverize, or Incinerate by burning the device in a licensed incinerator.

28 APPENDIX C CYBERSECURITY REFERENCES

- **[R1] Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):**
  http://www.eaton.com/ecm/groups/public/@pub/@eaton/@corp/documents/content/pct_1603172.pdf
- **[R2] Cybersecurity Best Practices Checklist Reminder (WP910003EN):**
  http://www.cooperindustries.com/content/dam/public/powersystems/resources/library/1100_EAS/WP910003EN.pdf
- **[R3] NIST SP 800-82 Rev 2, Guide to Industrial Control Systems (ICS) Security, May 2015:**
  https://ics-cert.us-cert.gov/Standards-and-References
- **[R4] National Institute of Technology (NIST) Interagency "Guidelines on Firewalls and Firewall Policy, NIST special Publication 800-41", October 2009:**
  http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-41r1.pdf
- **[R5] NIST SP 800-88, Guidelines for Media Sanitization, September 2006:**
  http://ws680.nist.gov/publication/get_pdf.cfm?pub_id=50819

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