HID Aero™
Cyber Hardening Guide

PLT-05008, A.2
October 2021

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Contacts

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What's new

Date	Description	Revision
October 2021	Modified Network ports section and updated to latest new brand HID corporate template.	A.2

A complete list of revisions is available in **Revision history**.

Section **01**

Overview

This Hardening Guide covers how to maximize security with HID Aero controllers. This guide will identify critical information on features, suggest options that should be enabled, and include best practices for using the controller.

1.1 Intelligent controllers and interface modules

The following intelligent controllers and IO modules are covered in this hardening guide:

Intelligent Controllers	X1100
IO Modules	X100, X200, X300

1.2 Protection levels

Depending on the system size and needs, there are different protection levels. Each level assumes the previous level's recommendation.

Protection Level	Recommendation	Procedures
Basic	Minimum protection. Small businesses or office installations where the operator is also the administrator	1. Installation (see Installation). Place the product on a private network, in a secured enclosure, with updated firmware and normal DIP switch settings. 2. Web Interface (see Web interface). Enable HTTPS. 3. User Accounts (see User Accounts). Remove default user login, create a unique user account with a strong password. 4. Equipment Replacement (see Equipment replacement). Bulk erase controller and clear downstream module EEPROM.
Intermediate	Corporations that have a dedicated system administrator	5. Web Interface (see Web interface). Add authorized IP addresses. 6. Web service (see Web interface). Disable web service. 7. Information Services (see Information services). Disable discovery and SNMP services. 8. USB and SD Interfaces (see Information services). Disable USB and SD interfaces. 9. Encrypted and Authenticated Communications (see Encryption and authentication). Enable AES or TLS encryption.
Enterprise	Large networks with an IT/IS department. Intended for integration into an enterprise network infrastructure.	10. Information Services (see Information services). Enable SNMPv3. 11. Encrypted and Authenticated Communications (see Encryption and authentication). Generate and load customized peer certificates and enable TLS. 12. Port Based Network Access Control (see Port based network access control). Enable 802.1X. 13. Enable data encryption at rest (see 6.5 Data at rest encryption).

Section 02

Installation

Recommendations include private networks, securing the enclosure, ensuring the latest firmware, and normal operation.

2.1 Private network

Do not install any Ethernet products on the public Intranet.

2.2 Securing the enclosure

Install the hardware in a secure enclosure and use a cabinet tamper to generate notifications when the enclosure is opened.

2.3 Firmware

Check with the systems software provider for the latest firmware. Update all intelligent controller and IO module firmware to the latest version to ensure the latest changes and security improvements are installed.

2.4 Normal operation

Set all dip switches to **OFF** for normal operation.

Section 03

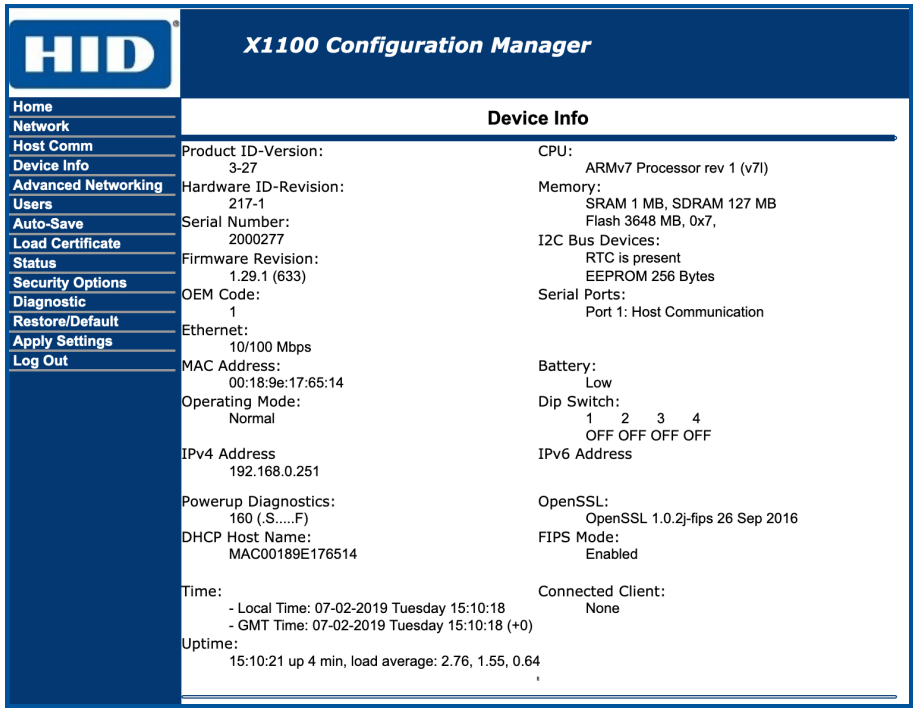
Web interface

Modify the HTTPS, Session Timer, and authorized IP addresses to reduce your risk.

3.1 HTTPS

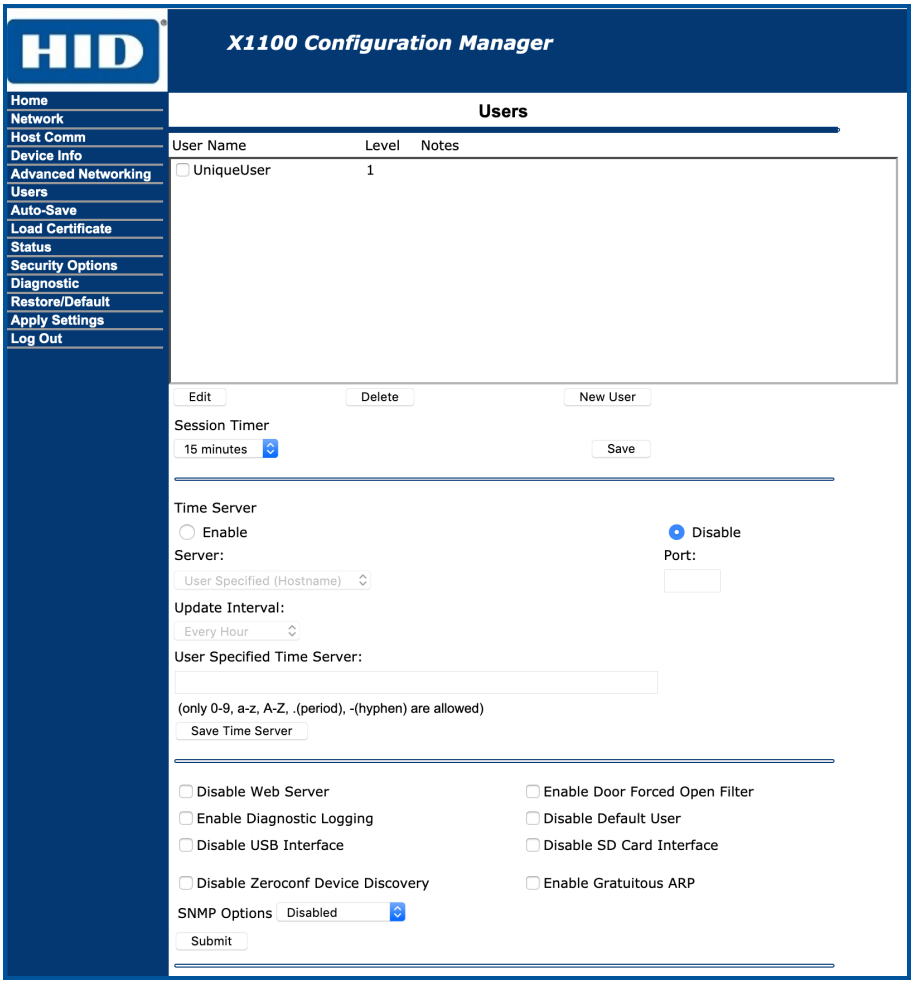
Hypertext Transfer Protocol Secure (HTTPS) is a protocol for securing communication over a network. HTTPS is a combination of HTTP and SSL/TLS protocols. It is used to provide encrypted communication with the web server. Always enable HTTPS as the default.

Ensure DIP SW3 is in the **OFF** position to enable HTTPS.



3.2 Session Timer

The session timer logs off a user after a certain period of time. A value of five minutes is recommended to minimize the risk of when an attacker can access active sessions. Values from five minutes to 60 minutes in five minute increments are allowed. Access the **Session Timer** configuration from the **Users** page of the web interface.

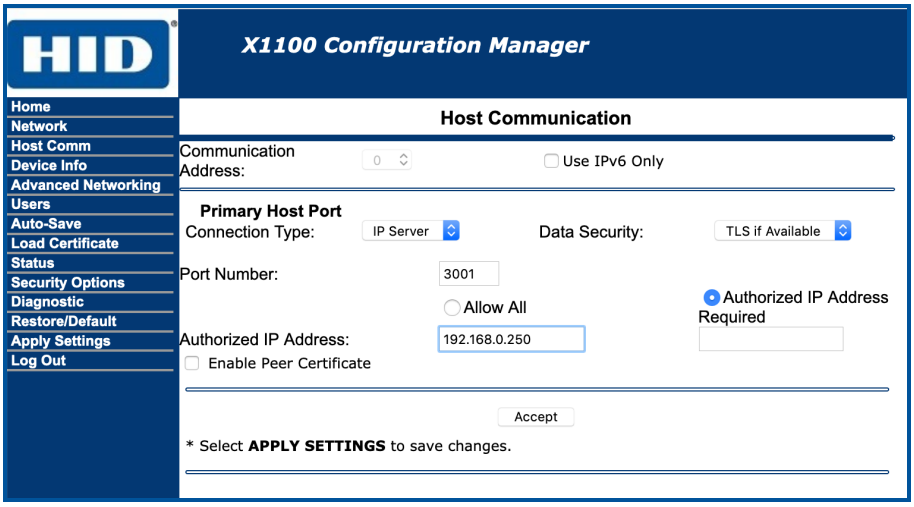


3.3 Authorized IP Addresses

Restrict accessing the controller's host communication port.

When there are only one or two IP addresses accessing the controller's host communication port, you can restrict where this connection originates. This filter applies to the communication port established by a host application configured in IP Server (host initiated connection) mode. In an IP Client (controller initiated connection) mode, the authorized IP addresses are programmed into the controller by the host application.

Select **Host Comm** > **Authorized IP Address Required** and specify the permitted one or two addresses.



3.4 Disable Web Service

The web service is used most frequently to perform initial configuration of the intelligent controller. Once the intelligent controller is configured and connected to the host, you can increase security by disabling the web service by checking the **Disable Web Service** check box at the bottom of the **Users** page. The web service can be re-enabled by the host application provided it has implemented this feature.

Section 04

User Accounts

Modifying user account information is paramount to the controller's security.

4.1 Default user login

The following is the default user login and password for out-of-the-box controllers:

- **Username:** admin
- **Password:** password

The default user credentials are the same for all intelligent controllers. To prevent unauthorized use, disable the default user.

Temporarily enable the default user account (only if the default user was not permanently disabled):

1. Enable the default user by switching DIP SW1 from **OFF** to **ON**.
2. Log in to the web interface within five minutes.

Note: A single login within the five minutes, or rebooting the board disables the ability to use the default login account until another DIP SW1 transition is performed.

4.2 Unique user accounts

Create at least one unique user the first time you login to the web interface. This user should use a unique username and password. Each person accessing the web interface should have their own unique account for audit purposes.

4.3 Password strengths

User accounts have three levels of password strengths (Low, Medium and High). Maximize password security by ensuring the password is a high level strength.

Note: To prevent against brute force attacks, three consecutive failed login attempts will lock the user out, preventing them from logging into the web interface for a period of time.

4.3.1 High strength passwords

- Eight character minimum
- Must not contain the username
- Meets all three criteria points (see **4.3.4 Password criteria**)

4.3.2 Medium strength passwords

- Six character minimum
- Meets two criteria points (see **4.3.4 Password criteria**)

4.3.3 Low strength passwords

1. Six character minimum

4.3.4 Password criteria

Passwords must contain three of the following categories:

- Uppercase alphabet characters (A-Z)
- Lowercase alphabet characters (a-z)
- Arabic numerals (0-9)
- Non-alphanumeric characters (!, $, #, or %)

Section **05**

Information services

Prevent discovery services by implementing the following guidelines.

5.1 Disable discovery

By default the controllers support device discovery on Windows and Linux through Zeroconf services such as Apple Bonjour and mDSResponder. Once the controller is installed and configured it is recommended to turn-off discovery by checking the **Disable Zeroconf Device Discovery** check box at the bottom of the **Users** page. This will to prevent someone with access to the same network from discovering the controllers.

5.2 Disable SNMP

By default, SNMP is disabled. If SNMP is not used, leave this setting disabled. Disable SNMP by selecting **Disabled** from the **SNMP Option** drop-down menu at the bottom of the **Users** page.

5.3 Disable USB and SD interfaces

By default, USB and SD interfaces are enabled. The SD interface can be used to collect log dumps if an intelligent controller is malfunctioning. Disable these interfaces if not used by checking the **Disable USB Interface** and **Disable SD Card Interface** check boxes toward the bottom of the **Users** page.

Section **06**

Encryption and authentication

Use the following settings to improve encryption and authentication methods.

6.1 Host/Controller encryption

The controller supports AES and TLS encryption for host communications. Use one of these methods to encrypt the data being transferred to and from the controller. TLS is recommended for data security over AES.

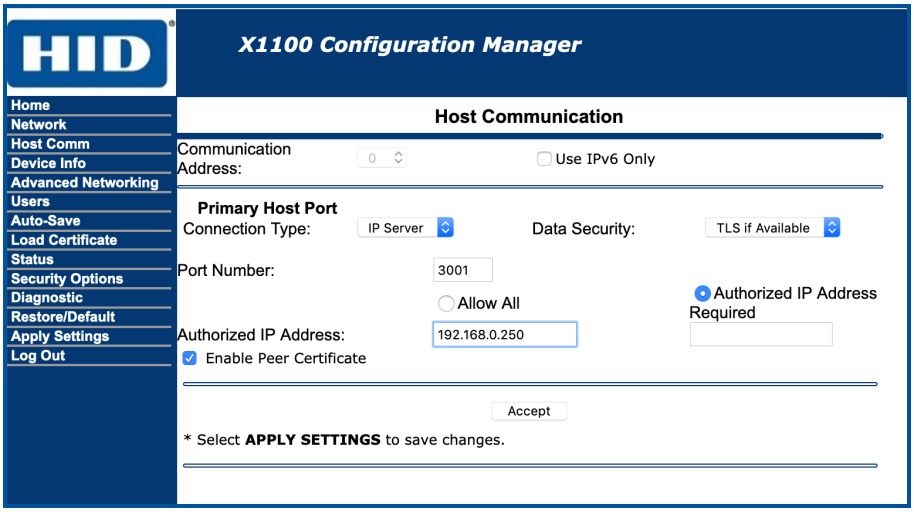
6.1.1 AES

Enable AES encryption by configuring both the host and controller.

6.1.2 TLS

By default, unique certificates are loaded into each controller at the time of manufacture. Use these certificates to encrypt communication between the host and controller. Enable TLS encryption by selecting the required level from the **Host Comm**> **Data Security** drop-down menu:

- **TLS Required:** Only encrypted connections are established. TLS configuration of the host software is also required. TLS Required is more secure.
- **TLS if Available:** Defaults to TLS locally at the controller (if available), with no host side changes required.



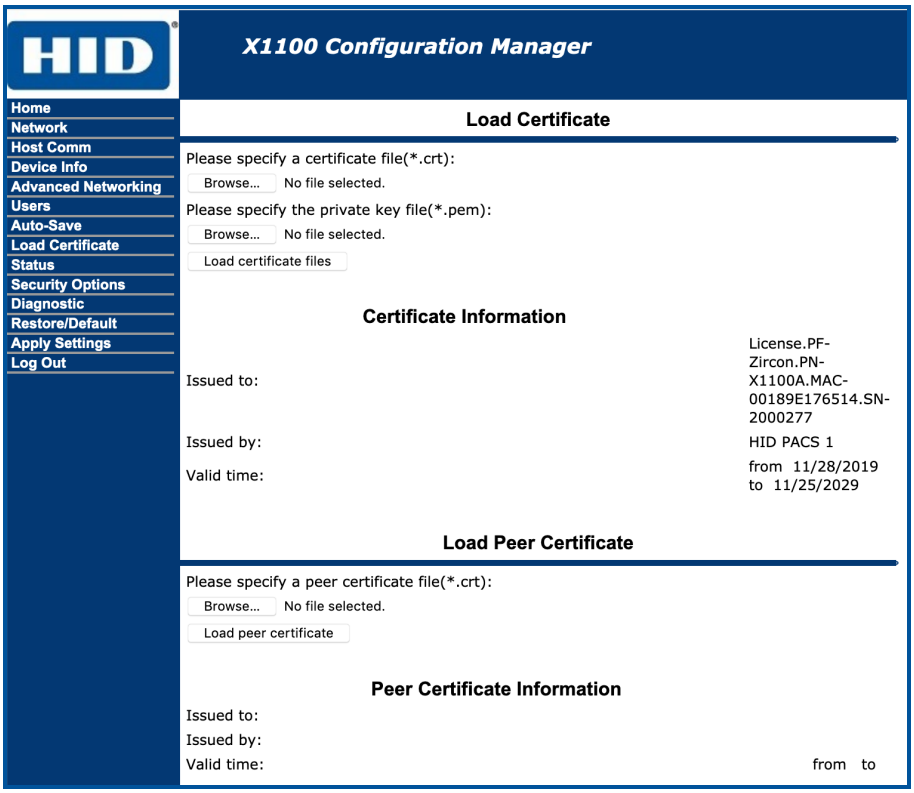
The HID Aero X1100 Intelligent Controller supports TLS 1.2.

6.2 Host/Controller authentication

It is recommended to also use certificates to authenticate the validity of the host and controller. One limitation of factory loaded certificates is they cannot be customized to the location where the controller is deployed. By loading customized peer certificates on the host and controller, a TLS connection proves the validity of host and controller.

For the controller, peer certificates are loaded through the **Load Certificate** page of the web interface or through the host application, if implemented.

Note: The peer certificate of the controller must also be loaded into the host's certificate store in order to mutually authenticate the validity of the controller.



HID Aero X1100 intelligent controllers support the following key and hash sizes.

- RSA Key Size: 3072-bit maximum.
- SHA Size: SHA-384 maximum (factory default is SHA-256).
- Host and IO Module Communication TLS Ciphers: FIPS 140 cipher suite.
- Web page HTTPS/TLS Ciphers:

- EECDH+AESGCM
- EDH+AESGCM

For more information on certificate verification (both server and controller), see the *HID Aero TLS Encryption Support Application Note (PLT-05030)*.

6.3 Controller to downstream module communications

Enable encryption between the controller and downstream devices.

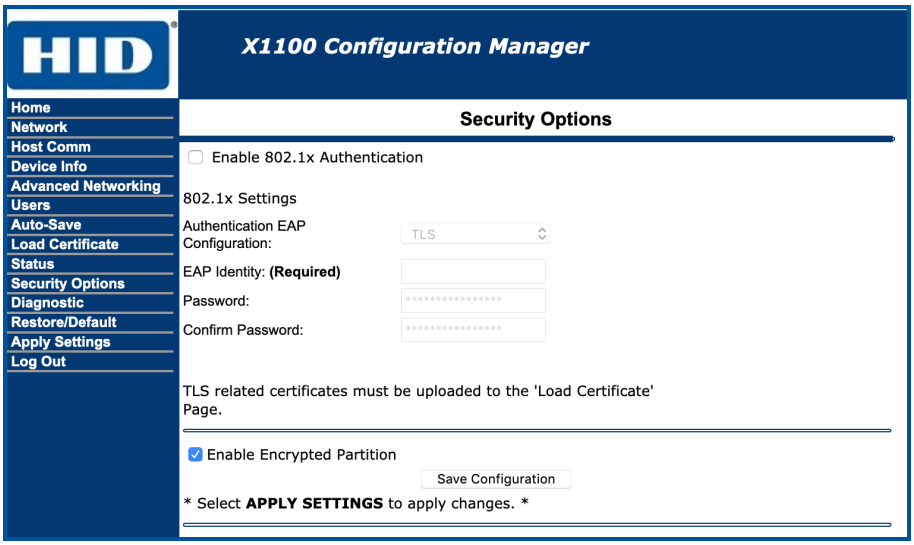
X1100	Supports AES256 encryption. AES256 is enabled by default.
X100, X200, X300 IO Modules	Supports AES256 encryption. AES256 is enabled by default.

6.4 Reader communications

Use OSDP secure channel (V2) for reader communications. This bidirectional protocol is secured using symmetric keys shared between the reader and controller, and is a more secure communication method.

6.5 Data at rest encryption

The ability to encrypt “data at rest” has been implemented to satisfy privacy concerns for end users in the field. The encryption allows the configuration and data files to be stored in an encrypted container, with the files remaining inaccessible unless the correct procedure and password are used. To enable “data at rest” encryption, select the **Security Options** > **Enable Encrypted Partition** check box within the web interface.



Section **07**

Port based network access control

7.1 802.1x

Add 802.1x authentication as an added layer of LAN security to prevent unwanted access to the network. A supplicant, or device intending to connect to the network must first agree on a type of Extensible Authentication Protocol (EAP) with the authentication server that is linked to the network. The supplicant is then required to pass a series of challenges passed from the middle-man authenticator in order to communicate with the network connected to the authentication server. EAPs range from anything simple as a combination of username/password, to requiring a certificate over Transport Layer Security (TLS), or requiring both username/password and certificate over TLS. This enables the authentication server to prevent access to any supplicant that does not properly authenticate.

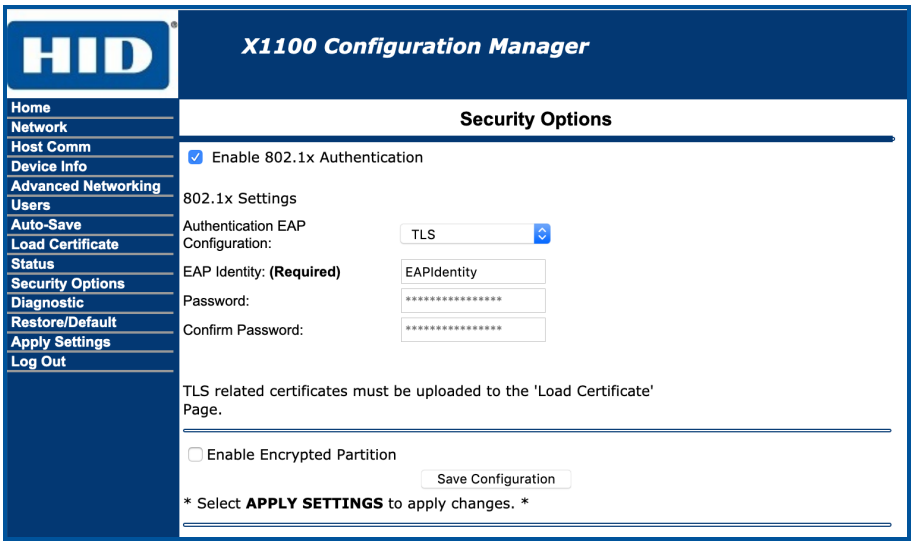
To activate, install the controller on an isolated network (or direct connect to host), configure with a static IP and connect through the web page.

If using TLS, ensure that the controller certificates are signed by the same root certificate used by the authentication server. See **6.5 Data at rest encryption** for details.

Once the controller is able to communicate using a browser,

1. Select **Security Options**.
2. Check the **Enable 802.1x Authentication** check box.
3. Enter the **Authentication EAP Configuration** and **EAP Identity** information, based on the authentication server configuration.
4. Enter the password in the **Password** and **Confirm Password** boxes.
5. Click **Save Configuration**.
6. Reboot the controller.
7. Connect to the desired network.

The controller is now authenticated using 802.1x.



Section **08**

Equipment replacement

Use the following settings to improve encryption and authentication methods.

8.1 Intelligent controller

8.1.1 Bulk erase

1. Disconnect power to the board.
2. Set S1 DIP switches 1 and 2 to **ON**.
3. Set S1 DIP switches 3 and 4 to **OFF**.
4. Reconnect power to the board. LEDs **ONLINE & HOST COMM** and **IO INTERNAL & IO MODULE PORT 1** should alternately flash at a 0.5 second rate.

IMPORTANT: DO NOT disconnect the power during the remainder of this procedure.

5. Within 10 seconds of powering up, change DIP switches 1 or 2 to **OFF**. Failure to do so results in the OEM default communication parameters being applied.

- LED HOST COMM flashes, indicating that the configuration memory is being erased. Full memory erase can take up to 60 seconds.
- When complete, LEDs **ONLINE & IO MODULE PORT1** will flash for eight seconds. The board will reboot eight seconds after LEDs **ONLINE & IO MODULE PORT1** stop flashing (LEDs are off during this time).

8.2 IO modules

8.2.1 Clearing the EEPROM

1. Set all DIP switches to **OFF** on the IO module.
2. Power cycle the IO module.
3. Within three seconds of reconnecting the power, set DIP switch 8 to **ON**.
4. Once the board completes the power up sequence, set the DIP switches to the required position.

Section **09**

Network ports

9.1 X1100 intelligent controller

Port	Port Type	Usage	Disable
67	UDP	DHCPS	Yes – Disabled by default.
68	UDP	DHCPC	Yes – Disabled when DHCP is not selected/used and "Static IP configuration" is set in the controller Network settings page.
161	UDP	SNMP	Yes (**Home** > **Users** > **Disable SNMP**).
443	TCP	HTTPS	Yes (**Home** > **Users** > **Disable Web Server**).
3001	TCP	Aero Host Protocol (MSP2)	Yes (**Home** > **Host Comm** > **Connection Type**).
5353	UDP	Zeroconf (discovery)	Yes (**Home** > **Users** > **Disable Zeroconf Device Discovery**).

Revision history

Date	Description	Revision
October 2021	Modified Network ports section and updated to latest new brand HID corporate template.	A.2
January 2021	Minor changes.	A.1
April 2020	Initial release.	A.0

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