



# **Dell EMC IPI Appliance**

## **User Manual**

**U-ZAEI-y**

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Dell EMC IPI Appliance User Manual

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## Introduction

The Dell EMC Intelligent Physical Infrastructure (IPI) Appliance is a compact device used to monitor and control up to 6 PDUs and 12 multifunction inputs (temperature, humidity, voltage, and digital inputs).

The unit comprises both an SNMP interface and a secure web-based interface for monitoring and management. Some of the main features of the unit are:



- Secure web management and configuration interface.
- SNMP enabled.
- 12 monitoring channels.
- Monitoring of up to 6 PDUs.
- Optional LCD Status module.

## Remote Temperature and Humidity Sensing

The IPI Appliance has the capability to monitor temperature and humidity and raise alarms or take action if a user-configured threshold is crossed.

## PDU Monitoring

The IPI Appliance, via intelligent PDUs, allows around-the-clock monitoring of the electrical power environment of the rack.

# Installation Requirements

- IPI Appliance unit.
- IEC mains lead (supplied localized).
- Ethernet or Fast Ethernet network connection.
- Network-connected computer system to setup the IPI Appliance Unit.

## Rack Mounting

This section covers the basic 19-inch rack-mounting of the IPI Appliance unit.

## Equipment Required

You need to supply a number-1 and a number-2 Phillips screwdriver to rack-mount the IPI Appliance unit.

## Before You Begin

When determining where to install the IPI Appliance unit, please verify that these guidelines are met:

- Airflow around the IPI Appliance is unrestricted.
- Clearance to the front and rear panels meet these conditions:
  - Front-panel LEDs can be easily read.
  - Access to ports is sufficient for unrestricted cabling.
- AC power cord from the power supply can reach the AC power outlet and the IPI Appliance .
- The 10/100 network cabling does not exceed 100 meters from the IPI Appliance to the Network switch.
- Temperature around the IPI Appliance does not exceed 40° C.
- Humidity around the IPI Appliance does not exceed 90%.

## Installation Warning Statements

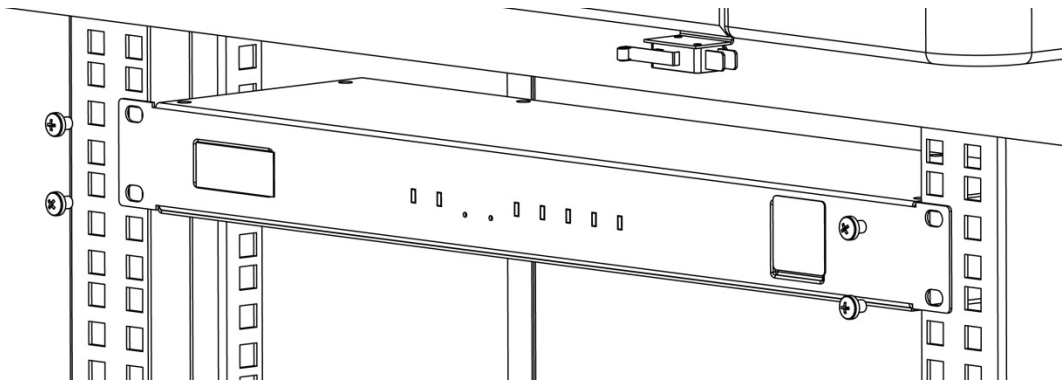
**Note:** Only trained and qualified personnel should be allowed to install, replace or service this equipment



- To prevent the unit from overheating, do not operate in an area that exceeds the maximum recommended ambient temperature of 40° C.
- Installation of the unit must comply with local and national electrical codes.
- To prevent personal injury when mounting or servicing the unit, ensure that the rack or cabinet is adequately secured so that the system remains stable.
- Circuit Overloading - Consult the equipment nameplate ratings when connecting the equipment to the supply circuit to avoid overloading of circuits. Overloading circuits can adversely affect current protection and supply wiring.
- Maintain reliable grounding of rack-mounted equipment. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, the use of PDUs).

## Rack-Mount the IPI Appliance

Hold the IPI Appliance and attach the bracket to rack using two 12-24 screws.



See the "IPI Appliance Installation Guide" for further instructions.

## The IPI Appliance Package

The standard IPI Appliance package contains supporting hardware, including a localized mains lead.

### Front of IPI Appliance

The following image shows the front panel of the IPI Appliance unit:



### LEDs

LEDs can be found on the front of the unit. Their purpose is described below.

#### Network

- **Link** (green): Embedded in RJ45 Ethernet connection. Illuminates when an Ethernet link is established. Flashes with network activity.
- **Speed**(amber): Illuminates when 100mbps connection is used.

## Status

- **CPU:** Indicates system activity.
- **Alarm:** Indicates any alarm condition.

## Power

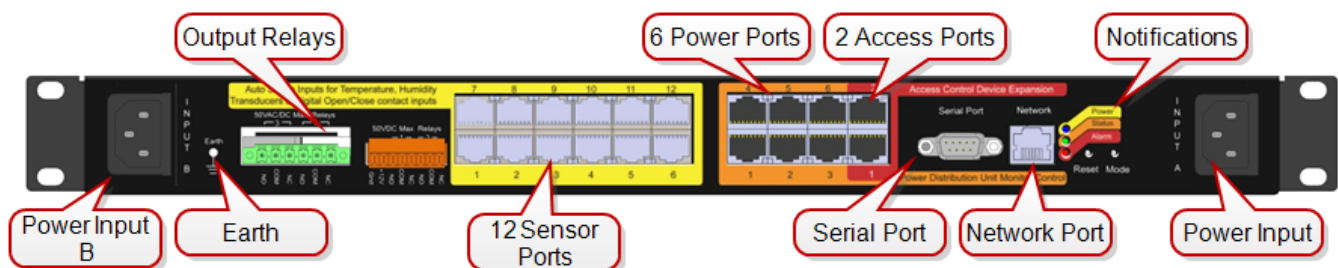
- **On:** Illuminates when unit is powered.
- **Feed B (amber):** Illuminates when mains power is present to input Feed B.
- **Feed A (amber):** Illuminates when mains power is present to input Feed A.

## Buttons

There are two buttons on the rear of the unit:

- **Reset:** Allows the user to reboot the unit.
- **Mode:** The mode select switch is used to reset the unit to factory defaults. See the section for details.

## Back of IPI Appliance



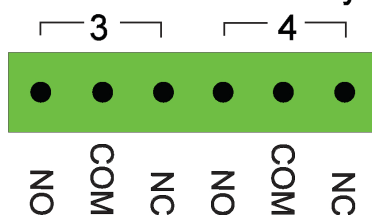
- **Power Input B:** Redundant mains or -48v DC voltage power feed.
- **Earth:** Grounding stud.
- **Output Relays:** Connect up to four output devices (such as Front and Back Electronic Swing Handles, and more).
- **Sensor Ports 1 through 12:** Connect up to 12 sensors (such as Temperature, Humidity, Water, Door Contacts, and more).

- **PDU Ports 1 through 6:** Connect up to six power devices (such as Appliance-Enabled Rack PDUs, Inline Meters, and Clamp Meters).
- **Access Ports:** Connect up to two access and control devices (such as Keypads or HID Card Readers).
- **Serial Port:** Attach optional devices (such as LCD Status Monitor Unit).
- **Network Port:** An RJ-45 port to connect Appliance to LAN/Network.
- **Notifications:** Reset/Mode/Power/Status/Alarm notifications duplicated from the Front Panel.
- **Power Input A:** Mains or -48v DC voltage.

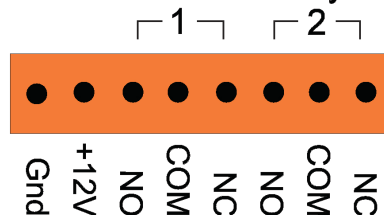
## Output Relays

Use the Output Relays to connect up to four output devices (such as Front and Back Electronic Swing Handles, and more). The following diagram shows the output relays of the IPI Appliance unit:

50VAC/DC Max. Relays



50VDC Max. Relays



# Initial Setup

## Default Settings

The Dell EMC IPI Appliance in factory default condition has the following network configuration. Advanced users may wish to make use of these settings to access the Appliance unit's Web Management Interface immediately and proceed with configuration.

Users who do not know how to do this should proceed through this section for information on how to configure the Appliance unit.

IP Address	192.168.0.253
Subnet Mask	255.255.255.0
Default Gateway	192.168.0.1
Web Management Address	http://192.168.0.253/
Default username	admin
Default password	admin

**Note:** Password entries are case-sensitive.

## Connecting to the Web Management Interface

The Dell EMC IPI Appliance monitoring solution can be configured entirely using the built-in Web Management Interface.

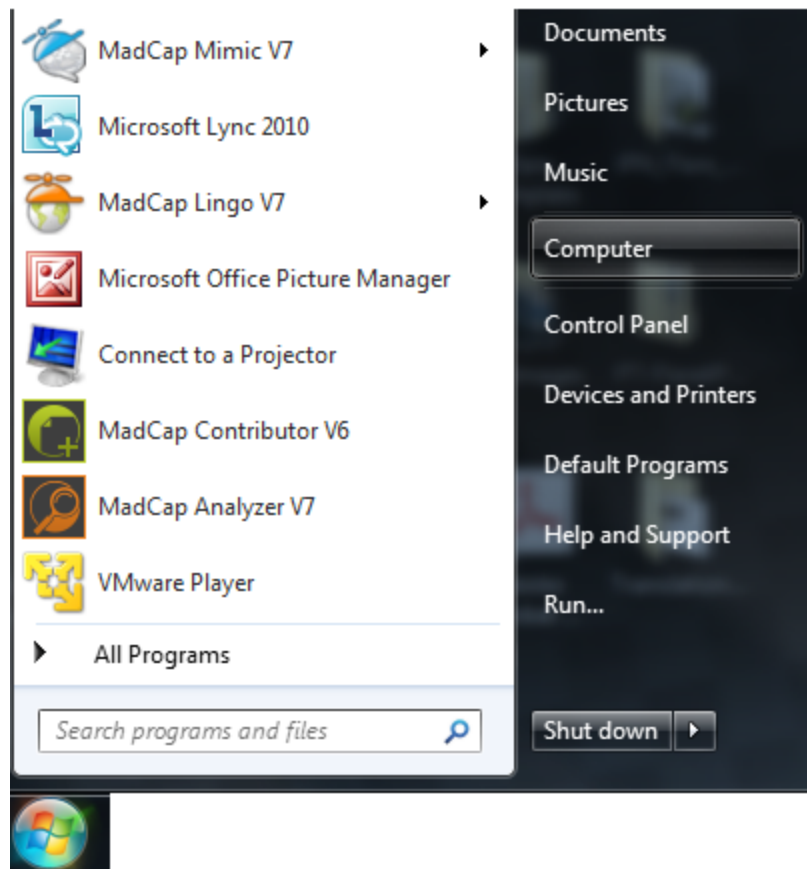
You may need to change the IP address of the PC to connect to the Web Management Interface for the first time. The following section details how to change the IP address and connect to the Web Management Interface.

## Changing your PC's IP Address

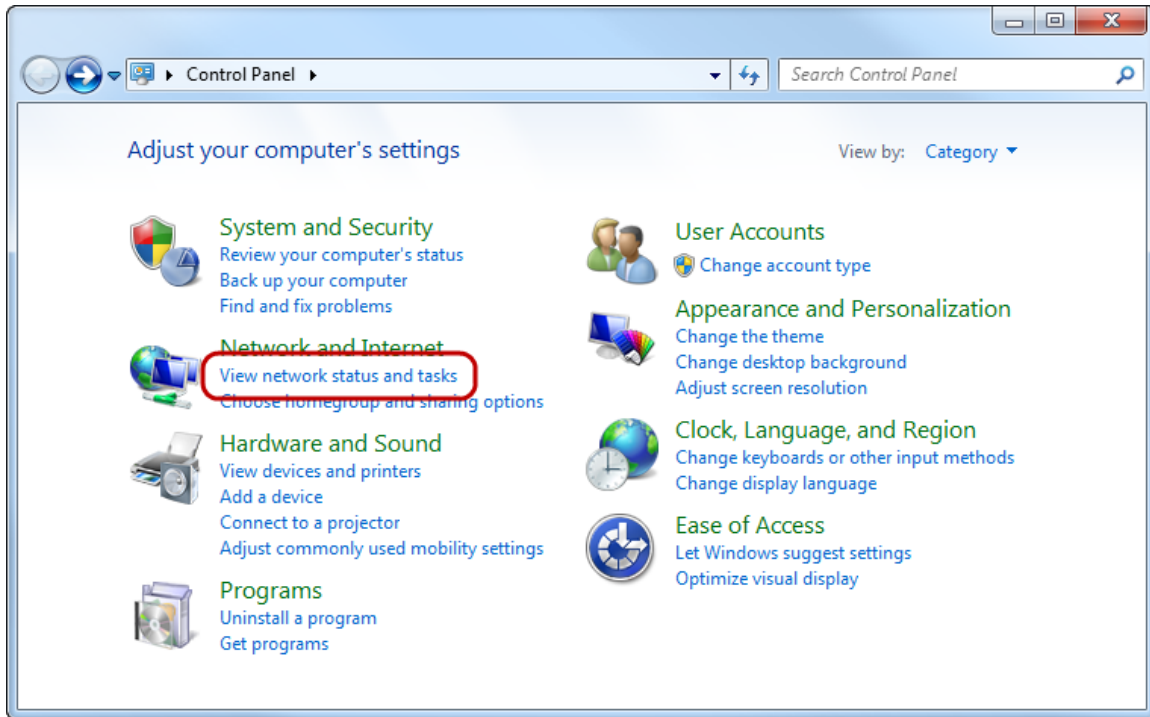
**Note:** Instructions refer specifically to Windows 7. Please refer to your operating system documentation if you are not using Windows 7.

1. Click the Windows button and select **Control Panel**.

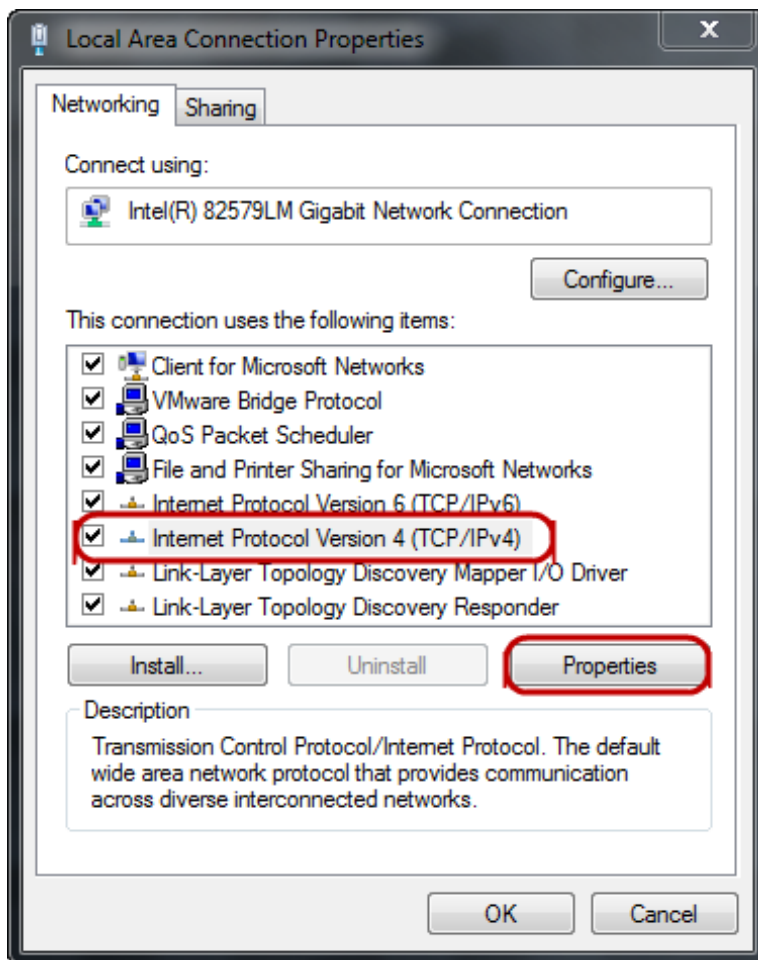
2. In the Control Panel window, select **View network status and tasks** under the Network and Internet heading.



3. Select **Change adapter settings** from the menu on the left.

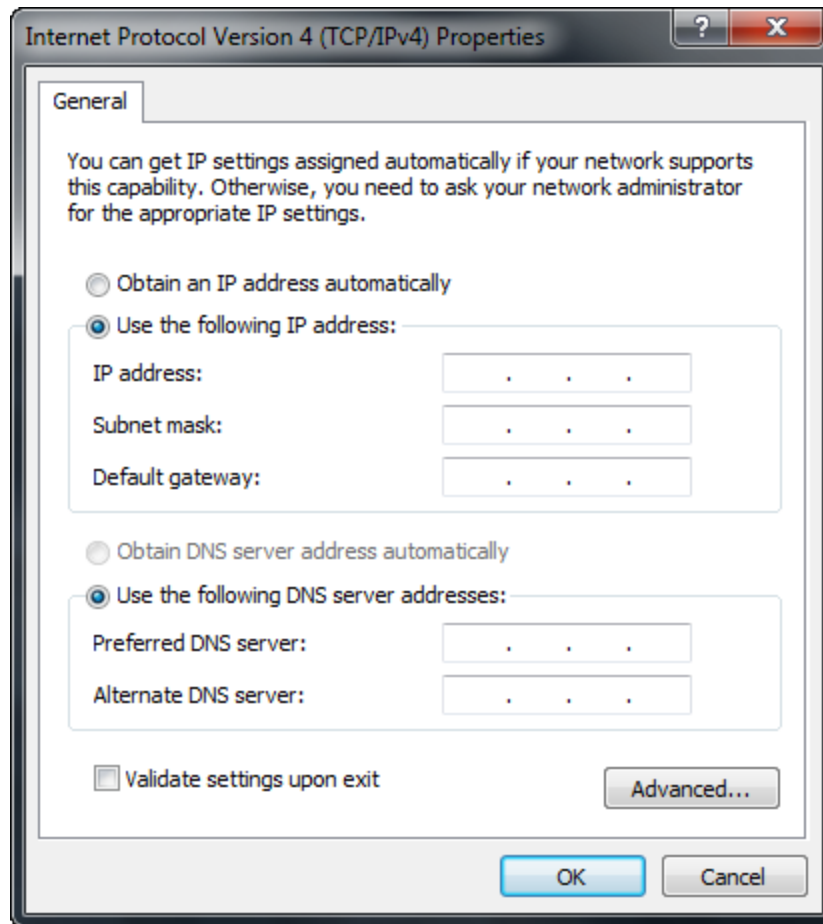


4. Select **Local Area Connection**.
5. Select **Internet Protocol (TCP/IP) Version 4** (you may need to scroll down). Then click the **Properties** button.



6. Select the **Use the following IP address** radio button. The **Use the following DNS server addresses** radio button then selects automatically.

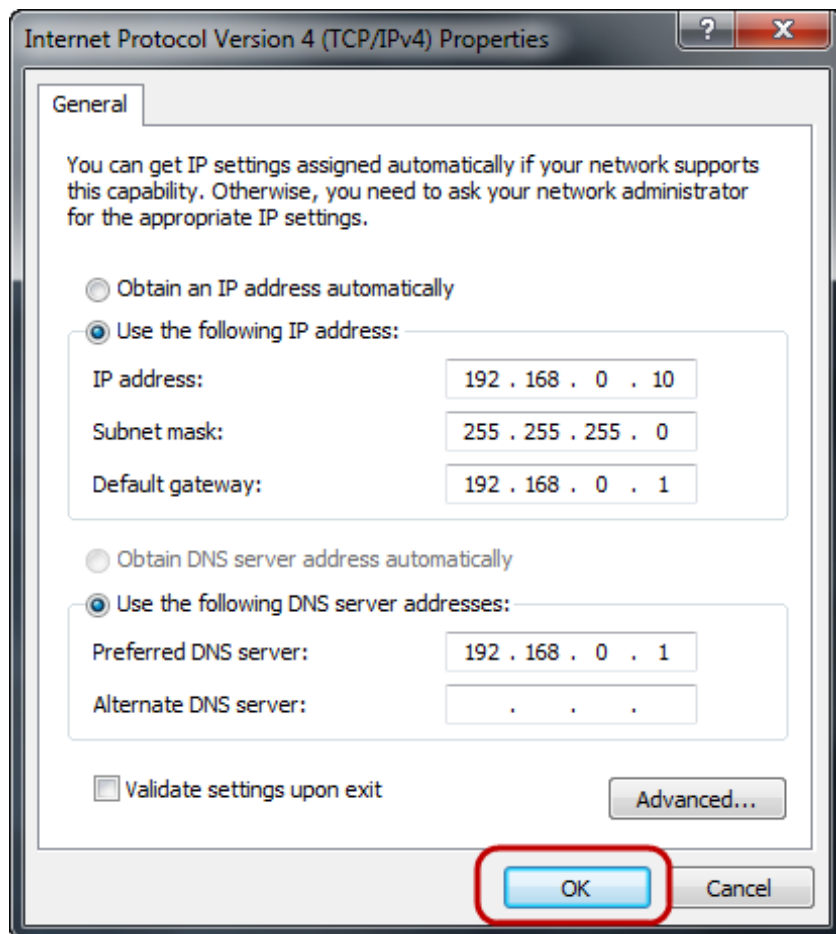




Enter the following details into the appropriate boxes.

- **IP address:** 192.168.0.10
- **Subnet mask:** 255.255.255.0
- **Default Gateway:** 192.168.0.1
- **Preferred DNS server:** 192.168.0.1

7. Click **OK** to accept the entries.



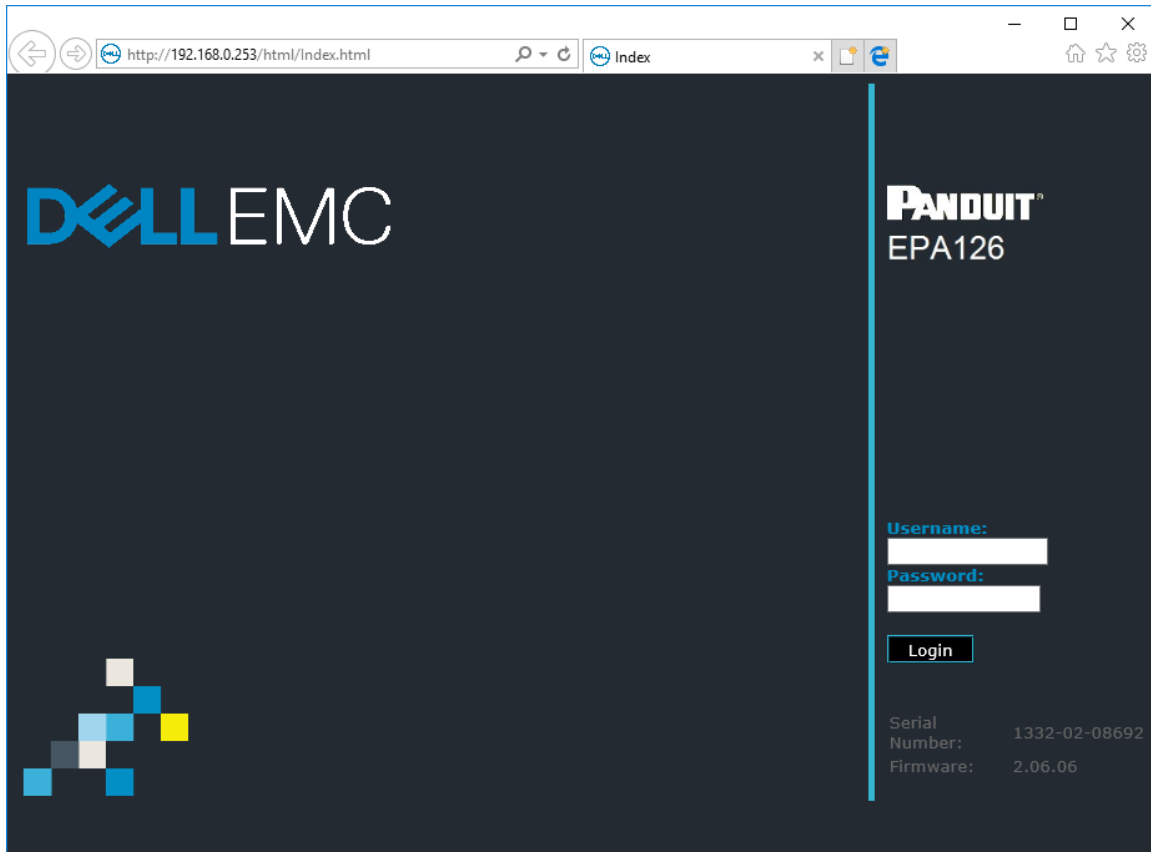
8. On the Local Area Connection Properties, click **OK** to return to the desktop.

## Connecting to the Dell EMC IPI Appliance Web Management Interface

1. Connect the Dell EMC IPI Appliance's network connection directly to a PC's Ethernet network card using a patch cable.

**Note:** A crossover cable must be used when directly connecting the unit to a PC's network card.

2. Power the unit.
3. Open a web browser.
4. Enter the following in the address field: `http://192.168.0.253`.
5. The Web Management Interface loads.



6. Click login and enter the username and password. The unit defaults are:

- **Login:** admin
- **Password:** admin

**Note:** Password entries are case sensitive.

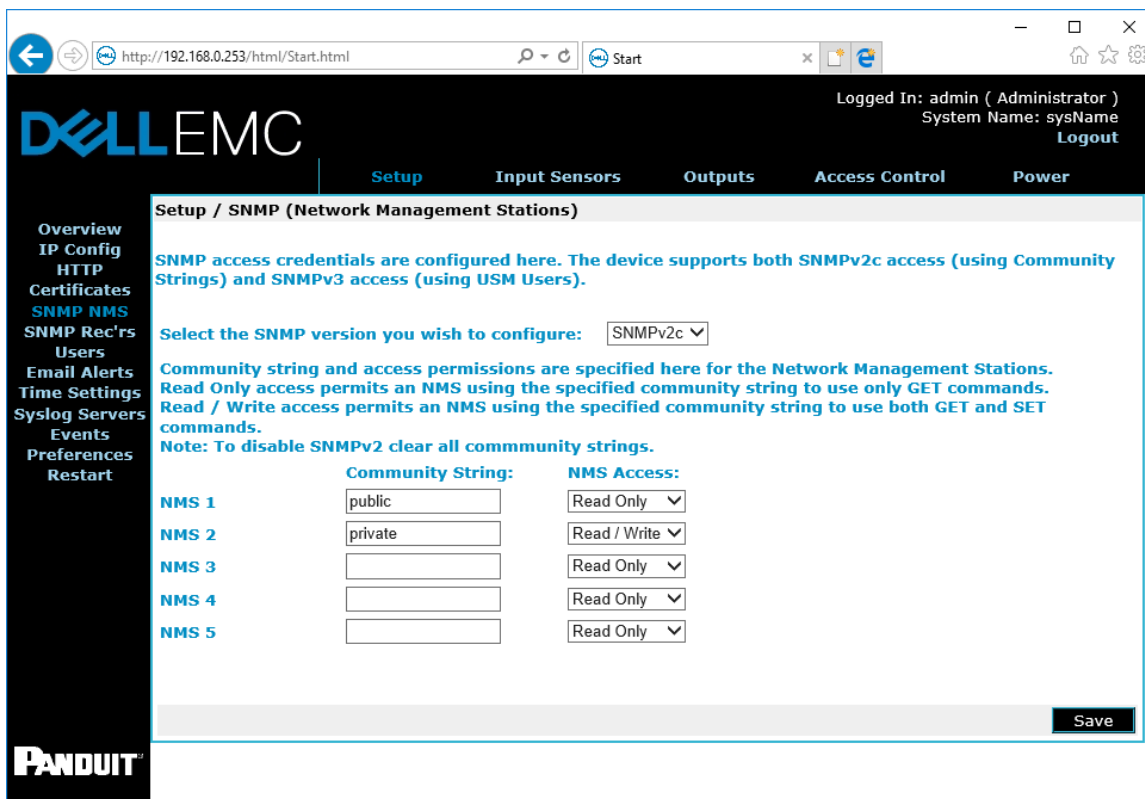
## Initial Network Setup

This section provides details on preparing the unit for network access and allowing Simple Network Management Protocol (SNMP) network management.

Connection to the Web Management Interface is required.

### Entering NMS Details

1. Click the **Setup** tab on the top menu bar, and then select the **SNMP NMS** link on the left menu bar.



2. Enter the IP address, chosen community string, and required Network Management Station (NMS) access permissions of the NMSs to be used.
3. Click **Save** to confirm the changes.
4. To disable an NMS, select the **Disabled** option from the **NMS Access** drop-down list.

## Entering Trap Receiver Details

1. Click the **Setup** tab on the top menu bar.
2. Select the **SNMP Rec'rs** link on the left menu bar.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup / SNMP (Receivers)

SNMP Trap Receivers are configured here.  
Any machine which will be required to receive SNMP traps sent from this unit must be entered here.

Notes:  
Authentication failure traps, when enabled, are generated if an attempt is made to access the unit with an invalid community string.  
v3 Traps are sent in a snmpv2-trap format contained within a SNMPv3 message. Authentication or Encryption is not supported.  
All Traps are generated to port 162.

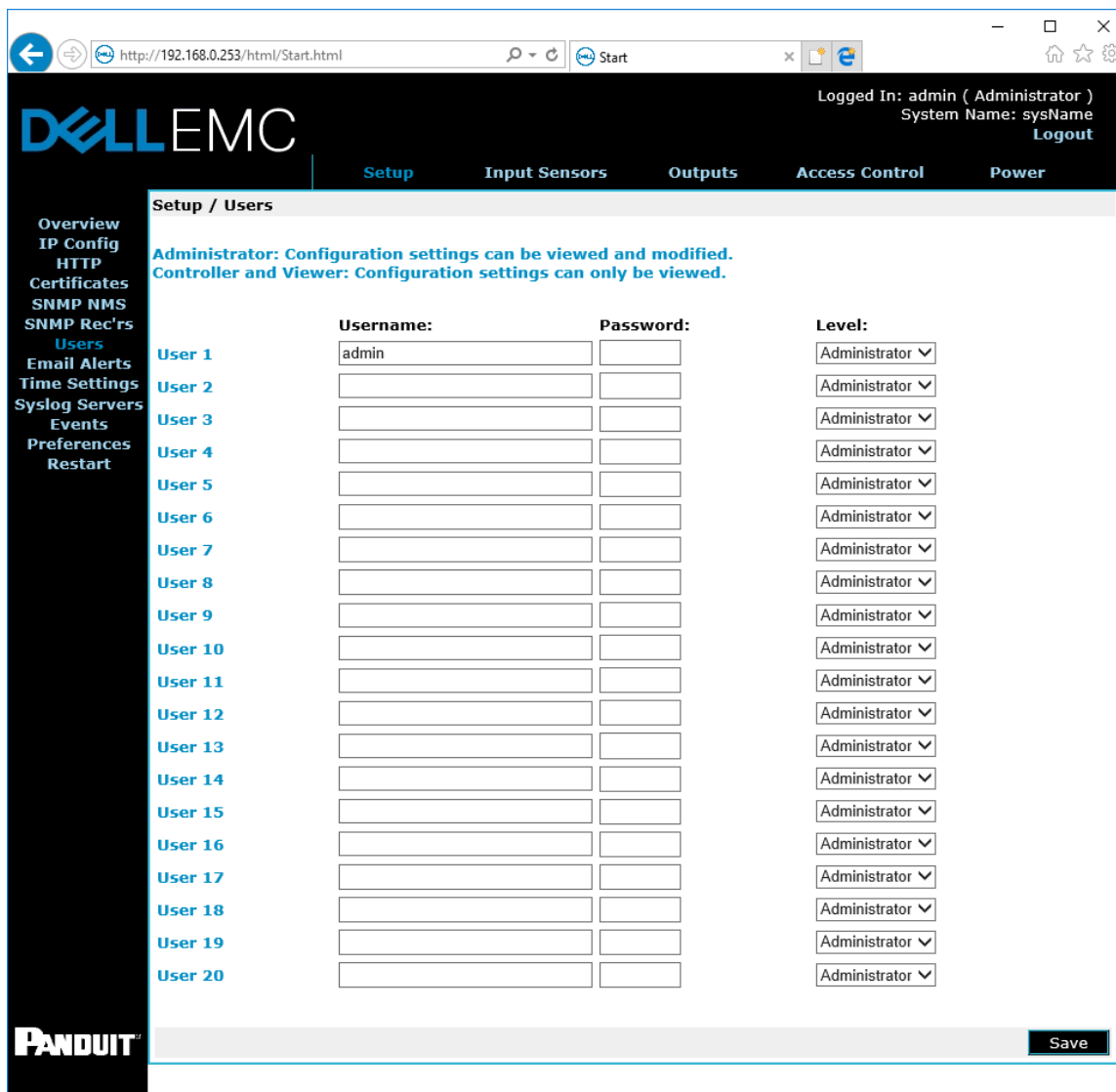
	Receiver IP Address:	Receive Traps:	Trap Version:
Receiver 1	<input type="text"/>	Disabled	v1
Receiver 2	<input type="text"/>	Disabled	v1
Receiver 3	<input type="text"/>	Disabled	v1
Receiver 4	<input type="text"/>	Disabled	v1
Receiver 5	<input type="text"/>	Disabled	v1
Receiver 6	<input type="text"/>	Disabled	v1
Receiver 7	<input type="text"/>	Disabled	v1
Receiver 8	<input type="text"/>	Disabled	v1
Receiver 9	<input type="text"/>	Disabled	v1
Receiver 10	<input type="text"/>	Disabled	v1

Test All Save

3. Enter the IP address.
4. Enter the chosen community string
5. Choose whether to enable traps, disable traps, or enable traps including authorization failures (meaning the unit will issue traps if an unauthorized IP address attempts to access the unit's SNMP functions) for each receiver.
6. Click **Save** to confirm the changes.

## Adding Users

1. Click the **Setup** tab on the top menu bar.
2. Select the **Users** link on the left menu bar.



3. You can set usernames, passwords, and access levels here. Unique usernames can be set for individuals who require web management access to the Appliance unit.
4. Click **Save** to confirm the changes.

## Changing the Unit IP Address

1. Click the **Setup** tab on the top menu bar.
2. Select the **IP Config** link on the left menu bar.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup / IP Configuration

Network settings for this unit are set here. This will be the IP address that is used to access the web management interface and by a Network Management Station.

System Name:   Include in Trap

System Location:

Contact Name:

IP Stack Selection:

IPv4  IPv6

Config. Protocol:

IP Address:

Subnet Mask:

Gateway:

If Domain Names are to be used, either here or on other forms, then the IP address of at least one Domain Name Server is required.

DNS Servers Enabled:

DNS Server 1 - IP Address:

DNS Server 2 - IP Address:

Upgrade Port [69]:

**Save**

3. Enter the **IP Address**, **Subnet Mask**, and the **Appliance** address that the IPI Appliance unit will use (required). Contact your network administrator if you do not know the values that you must enter here.
4. Select the **Config. Protocol** (Static, DHCP, or BootP).
5. Enter the SNMP **System Name**, **System Location**, and **Contact Name** if required. These fields will be added to all SNMP traps generated by the unit.
6. Click **Save** to confirm the changes.
7. Click **Restart**, and then select **Restart Now** to reboot the unit and implement the changes.

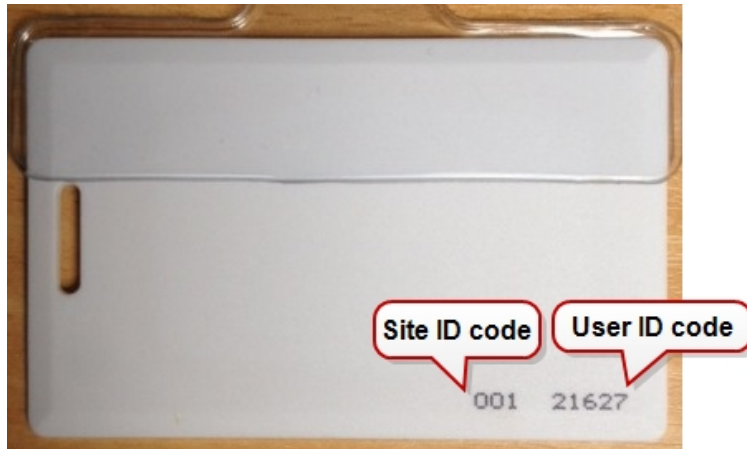
**Note:** Once the IP configuration has changed, the unit will no longer be accessible via the default IP address, because the new address will be operational.

The unit should now be connected to the main network and any further required configuration will be done via the unit's new IP address.

## HID Reader

The IPI Appliance include Smart Card readers that support HID 26 bit cards and HID Corporate 1000 cards.

### HID 26 Bit Cards



For 26 Bit cards, the IPI Appliance interface must be programmed for nine digits.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup    Input Sensors    Outputs    **Access Control**    Power

**Access Control / Configure**

ACU	Type	Name	Timeouts (Secs)		ACU in Use Trap Alarm Level
			Door Latch	Return to Standby	
1: ACU1	Disabled	ACU 1	10	0	Disabled
2: ACU2	Disabled	ACU 2	10	0	Disabled

Access Code Length: 5

Hide PIN Code:

In-Use Trap Text: in use

Remote Authentication Server:

Enable:

IP Address: 0.0.0.0

Port No.: 0

Save & Test RAS Connectivity

Save



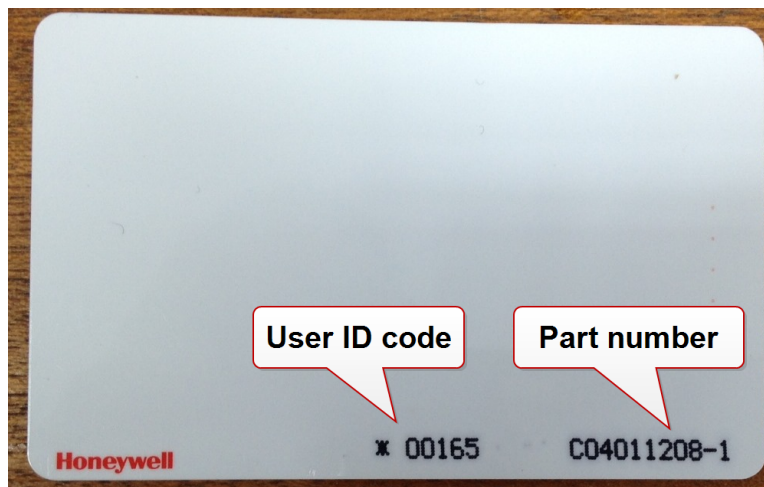
These nine digits consist of the following:

- 3-digit site code
- 1 hyphen
- 5-digit User ID code

Example: 001-21627

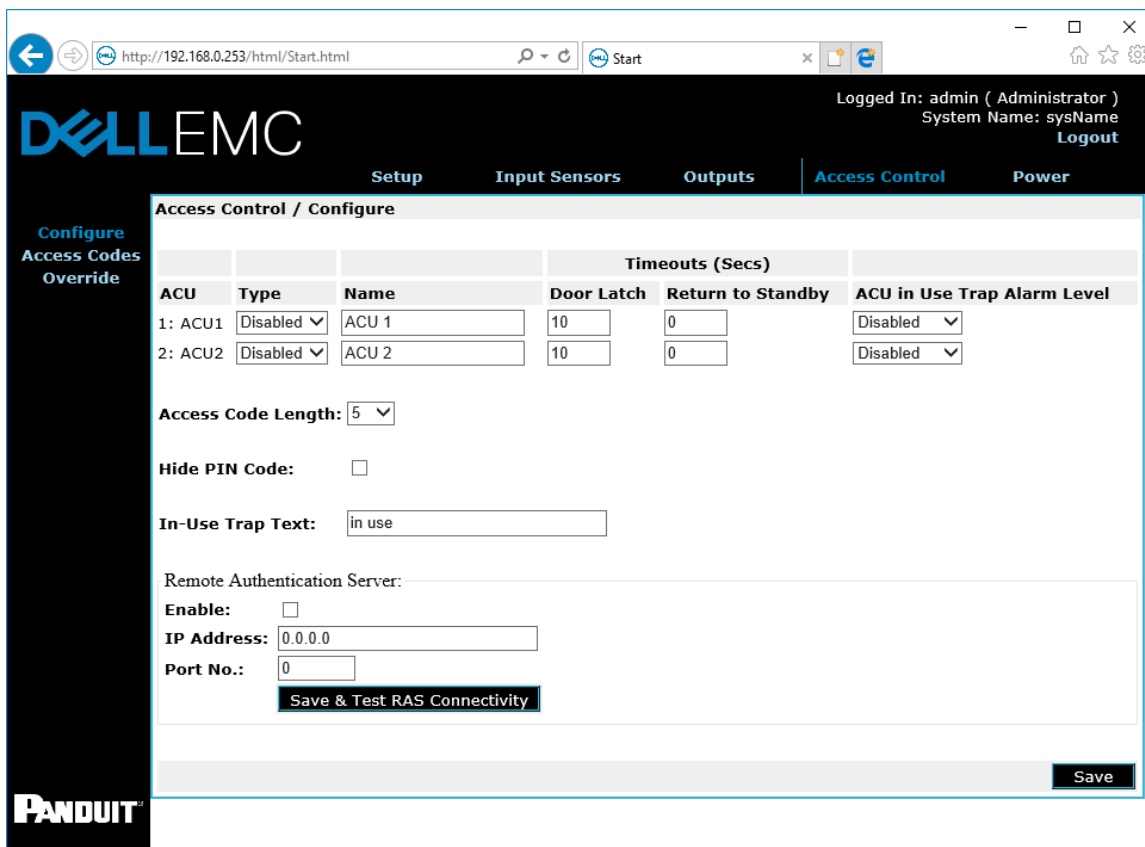
**Note:** The hyphen character must be input (it is included in the length).

## HID Corporate 1000 Cards



Corporate Site IDs are not normally printed on HID Corporate 1000 cards. This is confidential to each organization. You will need to ask the security office of the organization or supply company for the Site ID code, which is a four-digit number.

For 34 Bit Corporate 1000 cards, the Appliance interface must be programmed for 12 digits.



These 12 digits consist of the following:

- 4-digit site code
- 1 hyphen
- 7-digit User ID code

Example: 001-21627

**Note:** The hyphen character must be input (it is included in the length).

If the user ID code does not have seven digits, then the ID number must be padded out with leading zeros. Thus an ID code of "00165" becomes: "0000165".

Example for a card with a 2033 Site ID: 2033-0000165

## Web Management Interface

The IPI Appliance has a built-in Web Management Interface that can be accessed securely. The interface permits complete configuration and monitoring of the unit.

Windows where changes can be made have a **Save** button in the lower right-hand area. Click **Save** to activate and save any changes made.

## Network Setup - Overview

The Overview page is the first page displayed and provides the user with an overview of the unit's current status.

The screenshot shows the Dell EMC IPI Appliance Web Management Interface. The browser address bar displays `http://192.168.0.253/html/Start.html`. The user is logged in as `admin (Administrator)` with system name `sysName`. The interface includes a navigation menu on the left and a main content area titled `Network Setup / Overview`. The main content area displays the following system details:

<b>System Name:</b>	sysName		
<b>System Location:</b>	sysLocation		
<b>System Contact:</b>	sysContact		
<b>MAC Address:</b>	00:07:6e:02:21:f4		
<b>Serial Number:</b>	1332-02-08692		
<b>Firmware Version:</b>	2.06.06		
<b>Hardware Revision:</b>	ZBHIEIBB-01 v1.02.02 [DRAM:16MB Used:16MB]		
<b>System Uptime:</b>	0 days, 3 hours, 14 mins, 17 secs		
<b>IP Stack:</b>	Dual		
	<b>IPv4</b>	<b>IPv6 Auto Conf.</b>	<b>IPv6</b>
<b>IP Address:</b>	192.168.0.253	FE80::207:6EFF:FE02:21F4	
<b>Subnet Mask:</b>	255.255.255.0	/64	
<b>Gateway:</b>	192.168.0.1		
<b>Config. Protocol:</b>	Static	Auto Configured IPv6	
<b>Logged In User:</b>	admin		
<b>Access Level:</b>	Administrator		

System name, MAC address, serial number, firmware version, and other system details can be found here.

## Setup - IP Configuration

The IP Config page allows you to set the IPI Appliance unit's own management IP address.

The screenshot displays the 'Setup / IP Configuration' page in a web browser. The browser address bar shows 'http://192.168.0.253/html/Start.html'. The page header includes the Dell EMC logo and navigation tabs: Setup, Input Sensors, Outputs, Access Control, and Power. The user is logged in as 'admin (Administrator)' with system name 'sysName'. A sidebar on the left lists various configuration options like Overview, IP Config, HTTP, Certificates, etc. The main content area is titled 'Setup / IP Configuration' and contains the following fields and options:

- System Name:** Input field with 'sysName' entered. Includes an 'Include in Trap' checkbox.
- System Location:** Input field with 'sysLocation' entered. Includes an 'Include in Trap' checkbox.
- Contact Name:** Input field with 'sysContact' entered. Includes an 'Include in Trap' checkbox.
- IP Stack Selection:** Dropdown menu set to 'Dual'.
- IPv4 Configuration:**
  - Config. Protocol:** Dropdown menu set to 'Static'.
  - IP Address:** Input field with '192.168.0.253'.
  - Subnet Mask:** Input field with '255.255.255.0'.
  - Gateway:** Input field with '192.168.0.1'.
- IPv6 Configuration:**
  - Config. Protocol:** Dropdown menu set to 'AutoConfig Only'.
  - IP Address:** Empty input field.
  - Subnet Mask:** Empty input field.
  - Gateway:** Empty input field.
- DNS Servers:**
  - Enabled:** Dropdown menu set to 'Disabled'.
  - DNS Server 1 - IP Address:** Empty input field.
  - DNS Server 2 - IP Address:** Empty input field.
- Upgrade Port [69]:** Dropdown menu set to 'Enabled'.

A 'Save' button is located at the bottom right of the configuration area.

### System Name

You can specify the system name here. This is normally the Fully Qualified Domain Name (FQDN) of the device, but this is not enforced.

You can retrieve the value specified here by querying the sysName node via SNMP. This allows SNMP management platforms to obtain unique names for units where specified. This value has no effect on network communications, and the unit will function correctly with or without a value.

## System Location

You can specify the system location here.

You can retrieve the value specified here by querying the 'sysLocation' node via SNMP. This allows SNMP management platforms to obtain location names for units where specified. This value has no effect on network communications, and the unit will function correctly with or without a value.

## Contact Name

You can retrieve the unit support contact name by querying the 'sysContact' node via SNMP. This value has no effect on network communications and the unit will function correctly with or without a value.

## IP Address

You can enter a standard IP address here. The address is entered in decimal format (for example: 192.168.0.44 or 22.10.45.33). The address entered here will be the address by which the Appliance unit is accessed and managed.

## Subnet Mask

The subnet mask is used to determine what part of the IP address is the network portion and what part is the host portion.

It is often 255.255.0.0 or 255.255.255.0. The correct setting is essential for correct operation.

The subnet mask is entered in decimal format (for example: 255.255.255.0 or 255.255.224.0).

## Appliance

The Appliance setting specifies the IP address of the machine/router that the Appliance unit uses to communicate with different networks.

The Appliance address is entered in decimal format (for example: 192.168.0.1 or 11.2.24.103).

Most networks will have a Appliance. Correct setting is important for correct network communications.

## Config. Protocol

Select the configuration protocol. Choices include:

- Static
- DHCP
- BootP

**Note:** Once you enter the IP Configuration options and click **Save**, the changes take effect. If incorrect entries are made, this may result in loss of communication. If this happens, reset the unit's network configuration. Details of how to do this can be found in the [Troubleshooting](#) section.

## Setup - HTTP

Select the access method for the Web Management Interface here. Both HTTP and HTTPS access modes are available by default. Selecting the HTTPS radio button will allow only HTTPS configuration.

The screenshot shows a web browser window with the URL `http://192.168.0.253/html/Start.html`. The page is titled "Setup / HTTP" and is part of the Dell EMC management interface. The user is logged in as "admin (Administrator)" with the system name "sysName". The page has a navigation menu with options: Setup, Input Sensors, Outputs, Access Control, and Power. The "Setup / HTTP" page contains the following configuration options:

- Access method for the web management interface is selected here.**
  - HTTP and HTTPS - Accessible by either HTTP or HTTPS
  - HTTPS Only - Accessible by HTTPS only, recommended for security
- HTTP Port:**
- HTTPS Port:**
- HTTP and HTTPS
- HTTPS Only

**HTTP Strict Transport Security (HSTS) [ Help ]**

- HSTS: Disabled
- HSTS: Enabled
- HSTS Max Age (Seconds):**
- HSTS: Do not Include SubDomains
- HSTS: Include SubDomains

**HTTP Public Key Pinning (HPKP) [ Help ]**

- HPKP: Disabled
- HPKP: Enabled
- Max Age (Seconds):**
- Primary Hash (SHA256 - base64 encoded):**
- Backup Hash (SHA256 - base64 encoded):**
- HPKP: Do not Include SubDomains
- HPKP: Include SubDomains

A "Save" button is located at the bottom right of the configuration area.

Use of HTTPS is recommended for security, because the connections will be encrypted.

Additionally, you can specify the TCP port for connection to the Web Management Interface here. If you have specific requirements for default ports, these can be left at their default settings (for example, port 80 for HTTP and port 443 for HTTPS).

**Note:** Changing the selection to HTTP or HTTPS requires a reboot for the selection to take effect.

## HSTS

Enabling HSTS can help protect web browser clients against https downgrade attacks. Enable HSTS to make the web browser client always perform requests using https and cache this policy for Max Age seconds.

Max Age special cases:

- The default Max Age is approximately one half year. A "Max Age" of 0 will signal the UA to stop regarding the host as a known HSTS host.
- The "Include SubDomains" feature applies the policy to subdomains.

For further guidance on "Max Age" and "Include SubDomains", please read RFC 6797 <https://tools.ietf.org/html/rfc6797> and consult your web browser client documentation.

If HSTS was configured incorrectly or accidentally, reset the web browser client's HSTS and/or HPKP cache using the help documentation for the web browser. HSTS configuration takes effect after the next Restart.

## HPKP

Enabling HPKP can help protect web browser clients against impersonation attacks. Enable HPKP to make the web browser client expect certain public key hashes and cache this policy for Max Age seconds.

Max Age special cases:

- The default "Max Age" is approximately 60 days.
- The "Include SubDomains" feature applies the policy to subdomains.

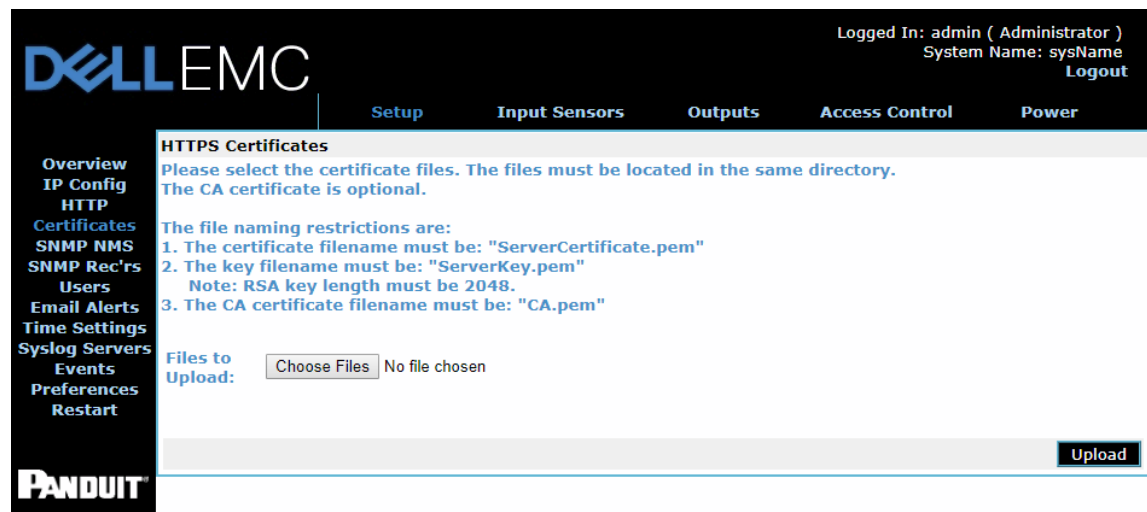
- The Primary and Backup Key Hashes are Base64 encoded Subject Public Key Information (SPKI) fingerprints.

For further guidance on HPKP key hashing, "Max Age" and "Include SubDomains", please read RFC 7469 <https://tools.ietf.org/html/rfc7469> and consult your web browser client documentation.

If HPKP was configured incorrectly or accidentally, reset the web browser client's HSTS and/or HPKP cache using the help documentation for the web browser. HPKP configuration takes effect after the next Restart.

## Setup - Certificates

Upload your certificate files here. The files must be located in the same directory.



The file naming restrictions are:

- The certificate filename must be: "ServerCertificate.pem"
- The key filename must be: "ServerKey.pem"

**Note:** RSA key length must be 2048.

- The CA certificate filename must be: "CA.pem"



## Setup - SNMP NMS

Specify the IP address, community string, and access permissions for up to five Network Management Stations here.

Any machine that needs to access the unit's SNMP functions must be entered here.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup / SNMP (Network Management Stations)

SNMP access credentials are configured here. The device supports both SNMPv2c access (using Community Strings) and SNMPv3 access (using USM Users).

Select the SNMP version you wish to configure:

Community string and access permissions are specified here for the Network Management Stations. Read Only access permits an NMS using the specified community string to use only GET commands. Read / Write access permits an NMS using the specified community string to use both GET and SET commands.  
**Note: To disable SNMPv2 clear all community strings.**

	Community String:	NMS Access:
NMS 1	<input type="text" value="public"/>	<input type="text" value="Read Only"/>
NMS 2	<input type="text" value="private"/>	<input type="text" value="Read / Write"/>
NMS 3	<input type="text"/>	<input type="text" value="Read Only"/>
NMS 4	<input type="text"/>	<input type="text" value="Read Only"/>
NMS 5	<input type="text"/>	<input type="text" value="Read Only"/>

Save

### NMS IP Address

Enter the IP address of the NMS machine here.

### Community String

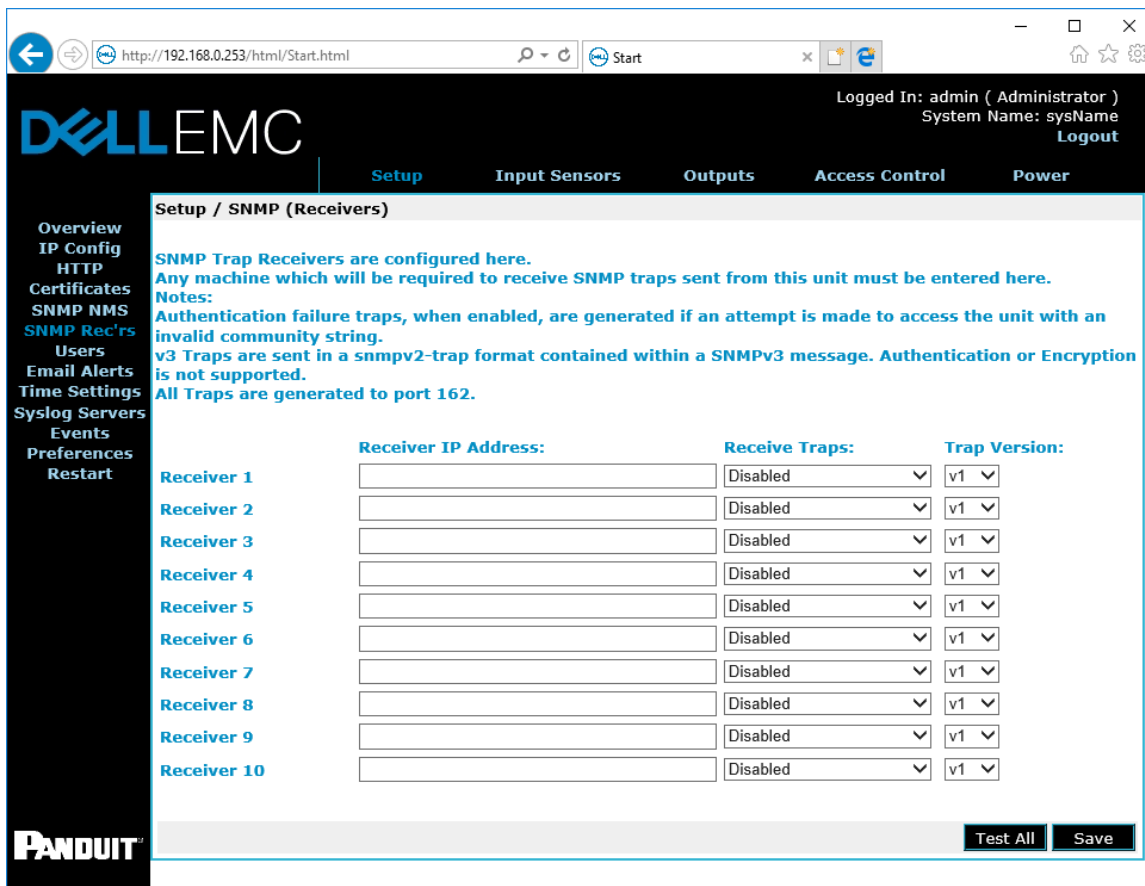
Enter the required community string here. The default for many devices is **public**. It is recommended that the community string be changed, because it serves as an access password.

### NMS Access

Read-only access permits the NMS to use only GET commands. Read/Write access permits the NMS to use both GET and SET commands.

## Setup - SNMP Receivers

Specify the IP address, community string, and access permissions for up to 10 Network Management Stations here.



### Receiver IP Address

You must enter any machine that is required to receive SNMP traps sent from this unit. Usually any SNMP NMS entries should also be entered.

### Community String

The required community string must be entered here. The default for many devices is **public**. The community string should be changed, because it serves as an access password.

## Receive Traps

The Receive Traps **Enabled** setting allows the specified NMS to receive the unit's standard range of traps. Receive Traps **Enabled (incl Auth fails)** will cause the unit to issue traps if an unauthorized IP address attempts to access the unit's SNMP functions.

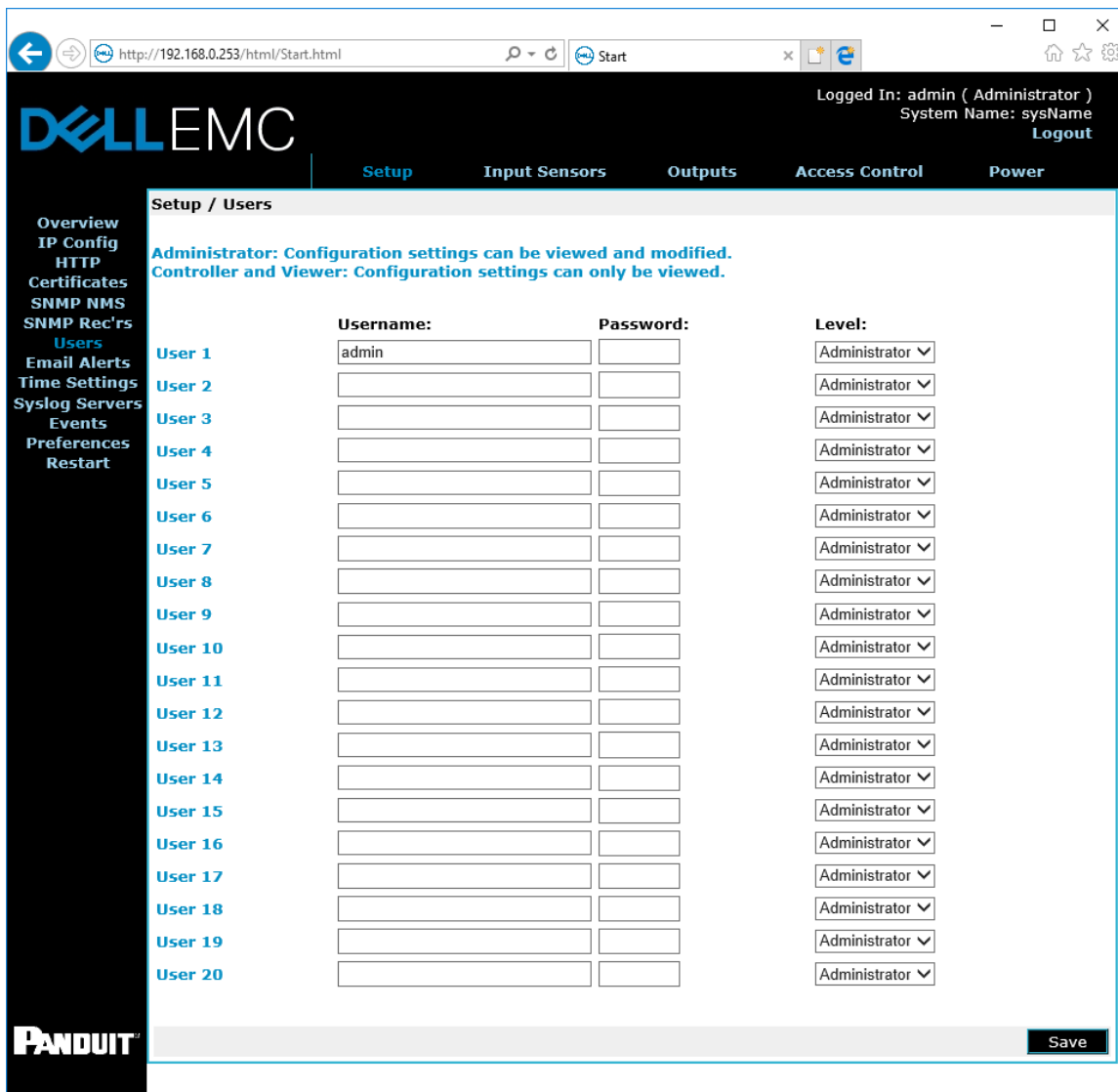
Receive Traps **Disabled** prevents traps from being sent to the specified NMS IP address.

## Setup - Modbus

To enable a Modbus communications protocol, specify the Modbus port number, and enable relays control.

## Setup - Users

You can add users with permission to access the Web Management Interface here. Access passwords are also specified along with users' access permissions.



### Username

Enter the required username. This is the username that will be required to login to the Web Management Interface.

### Password

Enter access passwords on a per-user basis.

## Level

Three user levels are available for assignment.

- **Administrator** : Administrators have full control of IPI Appliance configuration settings.
- **Controller** : Controllers can view configuration settings.
- **Viewer** : Viewers can view configuration settings.

**Warning:** User 1 / admin is the master administrator. It is possible to remove administrator rights from the admin user. Doing this is not recommended as it may result in no one having administrator access. In this situation, a reset to factory defaults is the only solution. Details on how to do this can be found in the [Troubleshooting](#) section.

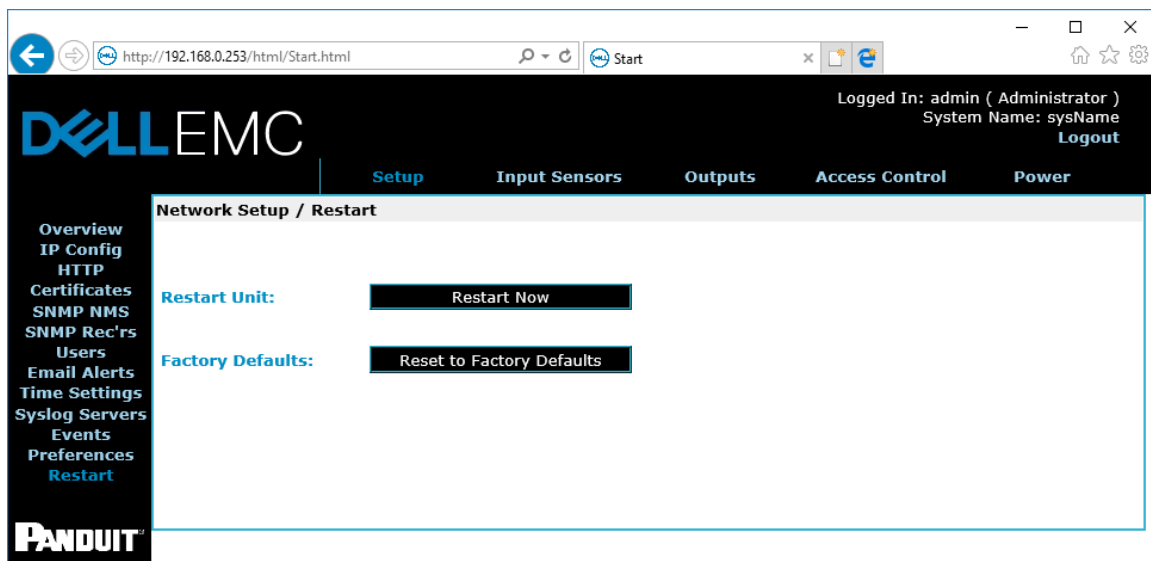
## Setup – Restart

A unit may be rebooted or reset to factory defaults here.

### Restart Unit

#### Restart Now

Selecting **Restart Now** commands the unit to reboot. Rebooting the unit will cause any outstanding configuration changes to take effect.



## Reset to Factory Defaults

See [Troubleshooting](#) for instructions on resetting the factory default settings for the unit.

## Setup - Email Alerts

On this page, you can edit email alert settings for traps. You may set up to 10 email receivers.

The screenshot shows the 'Setup / Email Alerts' configuration page in a web browser. The browser address bar shows 'http://192.168.0.253/html/Start.html'. The page header includes the Dell EMC logo and navigation tabs: Setup, Input Sensors, Outputs, Access Control, and Power. The user is logged in as 'admin (Administrator)' with system name 'sysName'. A 'Logout' link is visible. The left sidebar contains a navigation menu with options like Overview, IP Config, HTTP, Certificates, SNMP NMS, SNMP Rec'rs, Users, Email Alerts (selected), Time Settings, Syslog Servers, Events, Preferences, and Restart. The main content area has three input fields: 'SMTP Relay Server:', 'From Address:', and 'Reply-To Address:'. Below these is a table titled 'Email Receivers' with the following structure:

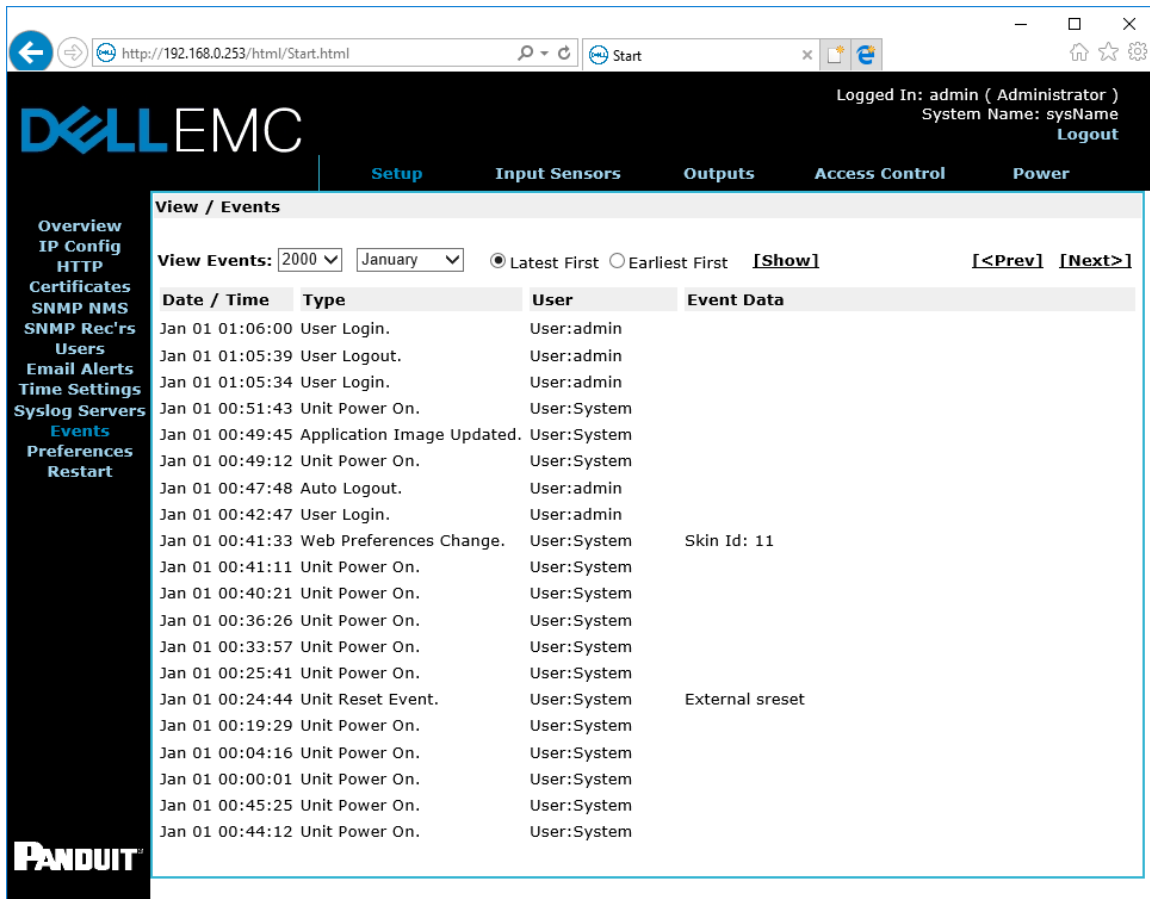
No.	Destination Address	Enabled	Repeat Timer
1	<input type="text"/>	<input type="checkbox"/>	0 mins.
2	<input type="text"/>	<input type="checkbox"/>	0 mins.
3	<input type="text"/>	<input type="checkbox"/>	0 mins.
4	<input type="text"/>	<input type="checkbox"/>	0 mins.
5	<input type="text"/>	<input type="checkbox"/>	0 mins.
6	<input type="text"/>	<input type="checkbox"/>	0 mins.
7	<input type="text"/>	<input type="checkbox"/>	0 mins.
8	<input type="text"/>	<input type="checkbox"/>	0 mins.
9	<input type="text"/>	<input type="checkbox"/>	0 mins.
10	<input type="text"/>	<input type="checkbox"/>	0 mins.

At the bottom right of the table area, there are two buttons: 'Test All' and 'Save'.

Email Alerts	
SMTP Relay Server	The IP Address of the SMTP Server
From Address	Address from which the alert emails are sent
Reply-To Address	Address to which the email receivers can reply
Destination Address	Address that will receive the email alerts
Enabled	Toggle the check box to enable or disable alerts to each address
Repeat Timer	Number of minutes after which the email alert will repeat

## Setup - Events

The **Events** page shows a history of events that have occurred, along with specific details about each event.



The screenshot shows the Dell EMC IPI Appliance Setup - Events page. The page is titled "View / Events" and includes a navigation menu with options like Overview, IP Config, HTTP, Certificates, SNMP NMS, SNMP Rec'rs, Users, Email Alerts, Time Settings, Syslog Servers, Events, Preferences, and Restart. The main content area displays a table of events with the following columns: Date / Time, Type, User, and Event Data. The table is filtered for the year 2000 and the month of January. The events are sorted by Latest First. The table contains 20 rows of event data.

Date / Time	Type	User	Event Data
Jan 01 01:06:00	User Login.	User:admin	
Jan 01 01:05:39	User Logout.	User:admin	
Jan 01 01:05:34	User Login.	User:admin	
Jan 01 00:51:43	Unit Power On.	User:System	
Jan 01 00:49:45	Application Image Updated.	User:System	
Jan 01 00:49:12	Unit Power On.	User:System	
Jan 01 00:47:48	Auto Logout.	User:admin	
Jan 01 00:42:47	User Login.	User:admin	
Jan 01 00:41:33	Web Preferences Change.	User:System	Skin Id: 11
Jan 01 00:41:11	Unit Power On.	User:System	
Jan 01 00:40:21	Unit Power On.	User:System	
Jan 01 00:36:26	Unit Power On.	User:System	
Jan 01 00:33:57	Unit Power On.	User:System	
Jan 01 00:25:41	Unit Power On.	User:System	
Jan 01 00:24:44	Unit Reset Event.	User:System	External sreset
Jan 01 00:19:29	Unit Power On.	User:System	
Jan 01 00:04:16	Unit Power On.	User:System	
Jan 01 00:00:01	Unit Power On.	User:System	
Jan 01 00:45:25	Unit Power On.	User:System	
Jan 01 00:44:12	Unit Power On.	User:System	

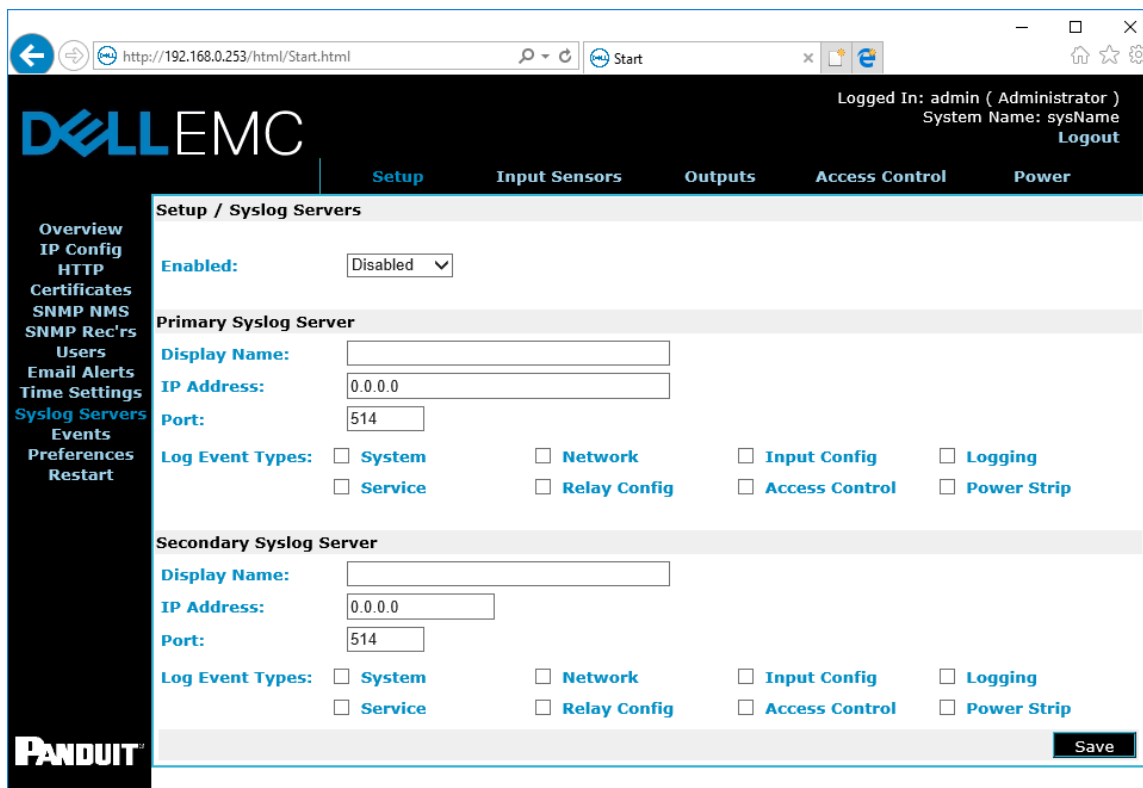
To specify a range of events to view, select the desired year and month from the drop-down menus, then click **Show**.

Date/Time, Type, User, and Event Data for each event are displayed.

Events can be ordered **Latest First** or **Earliest First** by clicking the corresponding radio button.

## Setup - Syslog Servers

This page allows you to view or edit information about the Syslog Servers currently being used.



From the Enabled drop-down menu, you can choose which syslog servers are enabled. Fill in the following fields for each Syslog server.

Syslog Server Setup	
Display Name	The name of the Syslog server
IP Address	The IP address of the Syslog server
Port	The number of the port being used
Log Event Types	Click the check boxes to choose which events to log

## Setup - Time Settings

The **Time Settings** page allows you to view or edit the current date and time.



Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup / Time Settings

**Date:** 1 January 2006

**Local Time:** 01 : 13 : 36  Update time

**Time Adjustments**

**Timezone:** (GMT) Dublin, Lisbon, London

**Daylight Saving:**  Enabled

**Start the** 4th **Sunday in** March

**Stop the** 4th **Sunday in** October

**Date Format:** dd/mm/yyyy

**SNTP Servers**

**Primary Server:** 0.0.0.0  Enabled

**Secondary Server:** 0.0.0.0  Enabled

**NTP Update Freq.:** 1 Hours

Save

Select the correct day, month, and year from the drop-down menus, and verify the local time. If you want to change the time, you must check the Update time check box.

## Time Adjustments

Select the correct time zone from the drop-down menu.

- **Daylight Saving** can be enabled or disabled by clicking the check box. If Daylight Saving is enabled, select start/stop dates from the subsequent drop-down menus.
- **Date Format** allows the administrator to choose whether the date is displayed with the day or month first. For example, the date August 20, 2013 can be displayed in one of two ways:

20/08/2013 (DD / MM / YYYY)

or

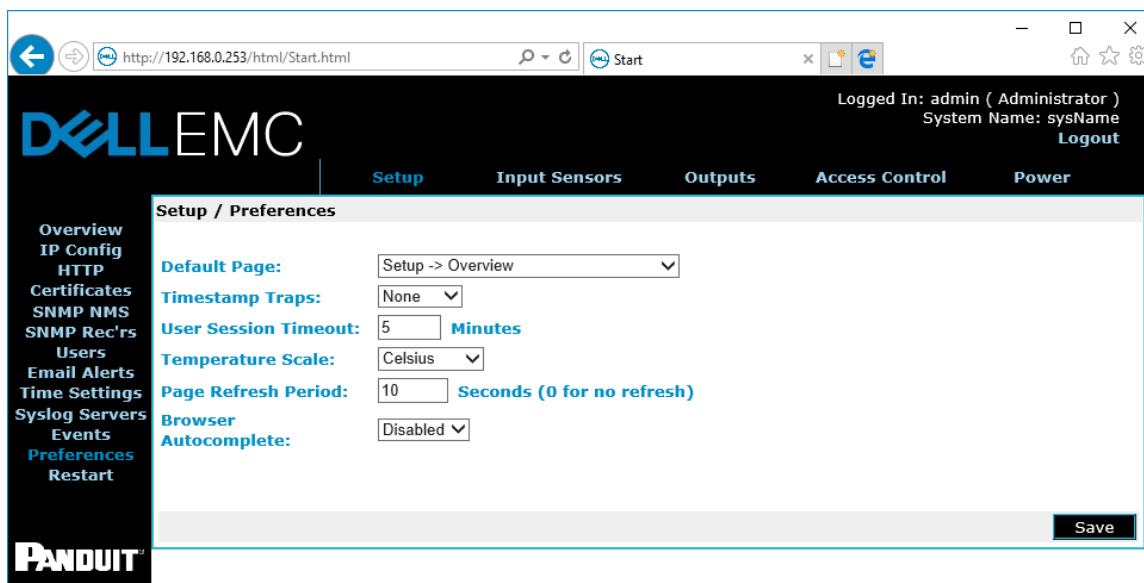
08/20/2013 (MM / DD / YYYY)

Select the desired format from the dropdown menu.

- **SNTP Servers - Simple Network Time Protocol** synchronizes the clocks of computer systems over a network. Enter the IP address of an SNTP server, and specify (in hours) how often the time should be updated.

## Setup - Preferences

The Preferences page allows you to edit system preferences.



Preferences	
Default Page	From the dropdown menu, select the first page you want to open when a user logs in. The preset default page is the Overview page.
Time stamp Traps	Choose from the drop-down menu where the timestamp will be found on traps. There are three options: <ul style="list-style-type: none"> <li>• Prefix – timestamp at the beginning</li> <li>• Append – timestamp at the end</li> <li>• None – no timestamp</li> </ul>
User Session Timeout	Enter a number of minutes, after which a session will be timed out if the user is inactive.
Temperature Scale	Select Celsius, Fahrenheit, or Kelvin from the drop-down menu.
Page Refresh Period	Enter a number of seconds, after which the page will automatically refresh. If 0 is entered, the page will not refresh automatically.

# Input Sensors – Configuration and Status

## Status




The Input Sensors status page presents an overview of the input ports. This page displays the input channel number, name, type of input sensor, status, current readings, and thresholds.

The screenshot shows the Dell EMC web interface for the Input Sensors Status page. The page title is "Input Sensors / Status". A message states: "Information from connected input sensors is presented here." Below this is a table with the following data:

Channel	Type	Detected	Status	Value	Limits			
					UC	UW	LW	LC
1: Input 01	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
2: Input 02	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
3: Input 03	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
4: Input 04	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
5: Input 05	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
6: Input 06	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
7: Input 07	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
8: Input 08	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
9: Input 09	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
10: Input 10	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
11: Input 11	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A
12: Input 12	Auto Detect	None	Fault	---	N/A	N/A	N/A	N/A

## Status Indicators

Three status indicators are displayed next to input channels to allow quick determination of normal, warning, and critical alarm statuses:

	Channel reading currently within threshold limits.
	Upper or lower Warning limit reached or exceeded.
	Upper or lower Critical limit reached or exceeded.

## Input Sensors – Defaults

This page allows you to choose default settings for **Temperature Sensors**, **Humidity Sensors**, **Analog Voltage**, and **Open/Close Contacts**.

Logged In: admin ( Administrator )  
System Name: sysName  
[Logout](#)

Setup
Input Sensors
Outputs
Access Control
Power

**Input Sensors / Defaults**

Defaults settings for Temperature, Humidity, Analogue Voltage and Open/Close Contacts are set here. Individual channels setups that differ from defaults can be configured via the Configure menu.

**Temperature Sensors**

Calibration Offset:  °C  
 Hysteresis Value:  °C

Limits & Traps:	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="35.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="30.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="15.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="10.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

[Apply To Temperature Sensors](#)

**Humidity Sensors**

Calibration Offset:  %RH  
 Hysteresis Value:  %RH

Limits & Traps:	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="65.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="60.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="20.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="10.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

[Apply To Humidity Sensors](#)

**Analogue Voltages**

Scaling Factor:  v  
 Calibration Offset:  v  
 Hysteresis Value:  v

Limits & Traps:	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="9.0"/> <span style="font-size: small;">v</span>	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="7.5"/> <span style="font-size: small;">v</span>	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="2.5"/> <span style="font-size: small;">v</span>	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="1.0"/> <span style="font-size: small;">v</span>	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

[Apply To Analogue Voltages](#)

**Open/Close Contacts**

Normal State:  v  
 Trigger Type:  v

Traps: Trap Alarm Level:  v      Repeat Timer:  Seconds

[Apply To Contacts](#)

[Save](#)

PANDUIT

Clicking the arrow opens a drop-down for each Sensor type. For **Temperature Sensors**, the defaults will display similar to the following:

**Temperature Sensors**

Calibration Offset:  °C

Hysteresis Value:  °C

Limits & Traps:

	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="35.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="30.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="15.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="10.0"/> °C	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

**Apply To Temperature Sensors**

The **Humidity Sensors** screen displays default information as shown below.

**Humidity Sensors**

Calibration Offset:  %RH

Hysteresis Value:  %RH

Limits & Traps:

	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="65.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="60.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="20.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="10.0"/> %RH	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

**Apply To Humidity Sensors**

The **Analogue Voltage** screen displays default information as shown below.

**Analogue Voltages**

Scaling Factor:  ▾

Calibration Offset:  V

Hysteresis Value:  V

Limits & Traps:

	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="9.0"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="7.5"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="2.5"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="1.0"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

**Apply To Analogue Voltages**

Explanations of the editable fields in the drop-down menus for Temperature, Humidity and Analog Voltage can be found in the table below.

Defaults- Temperature, Humidity, and Analog Voltage	
Scaling Factor (Analog Voltage only)	<p>The scaling factor is a value multiplied against the measured Analog Voltage to produce the Input Sensor measurement.</p> <p><i>Example:</i> Given a measurement of 10 Volts on the input sensor and a Scaling Factor of 100, the web UI and SNMP interface will report a value of <math>10 \times 100 = 1000</math> Volts as the sensor measured value.</p> <p><b>Note:</b> The <b>[Upper Lower] [Control Warning] Limit</b> fields apply to the post-scaled value.</p>
Calibration Offset	<p>Alters the actual reading of a sensor by the amount specified.</p> <p><i>Example:</i> If a Calibration offset of 6 was used and a sensor's true reading was 36, the indicated reading used for display and alarm purposes would be 42. This works in an identical way for both temperature and humidity sensors.</p>
Hysteresis Value	<p>The hysteresis default value to be applied to sensors is. The value specified is an offset from a sensor's threshold values.</p> <p><i>Example:</i> A hysteresis value of 5 would mean that in the case of an Upper Control Limits alarm, the alarm value would have to reduce to 5 below the threshold value before another alarm is issued.</p>
Upper Control Limit	The value at which an Upper Control alarm will be issued.
Upper Warning Limit	The value at which an Upper Warning alarm will be issued.
Lower Warning Limit	The value at which a Lower Warning alarm will be issued.
Lower Control Limit	The value at which a Lower Control alarm will be issued.

The **Open/Close Contacts** screen displays the following default information.

The screenshot shows a configuration window titled "Open/Close Contact" with a "PANDUIT" logo on the left. The settings are as follows:

- Normal State:** Normally Open (dropdown)
- Trigger Type:** Level (dropdown)
- Traps:**
  - Trap Alarm Level:** Disabled (dropdown)
  - Repeat Timer:** 0 Seconds (input field)
  - Normal Trap Text:** Normal 1 (input field)
  - Non-Normal Trap Text:** Non-Normal 1 (input field)

Buttons for "Back" and "Save" are located at the bottom right of the configuration area.

Defaults- Open/Close Contacts	
Normal State	<p>Normal state specifies the condition in which a contact is considered to be 'Normal', 'Non-alarmed' state. Devices such as smoke alarms and air conditioning units often have normally open contacts. In order to receive alarm indications from these types of units, setting normally open would cause alarms to be issued when the monitored contact closes. Setting normally closed, in the case of a rack cabinet door, would cause an alarm condition when the door was opened.</p>
Trap Alarm Level	<p>Rather than using <b>[Upper Lower] [Control Warning] Limit</b> settings, the <b>Open/Close Contact</b> sensors provide a Trap Alarm Level drop down menu with the following options:</p> <ul style="list-style-type: none"> <li>• Disabled</li> <li>• Critical</li> <li>• Warning</li> <li>• Information</li> </ul> <p>When the Trigger Type state occurs, if the <b>Trap Alarm Level</b> is not Disabled, a trap with the given Trap Alarm Level string content is generated.</p>
Trigger Types	<p>Trigger type defaults for Open/Close sensors are specified here. The three available options for trigger types are:</p> <p><b>Level</b></p> <p>Level triggering is the default mode. When an input physically transitions from a Normal to Non-Normal state an</p>

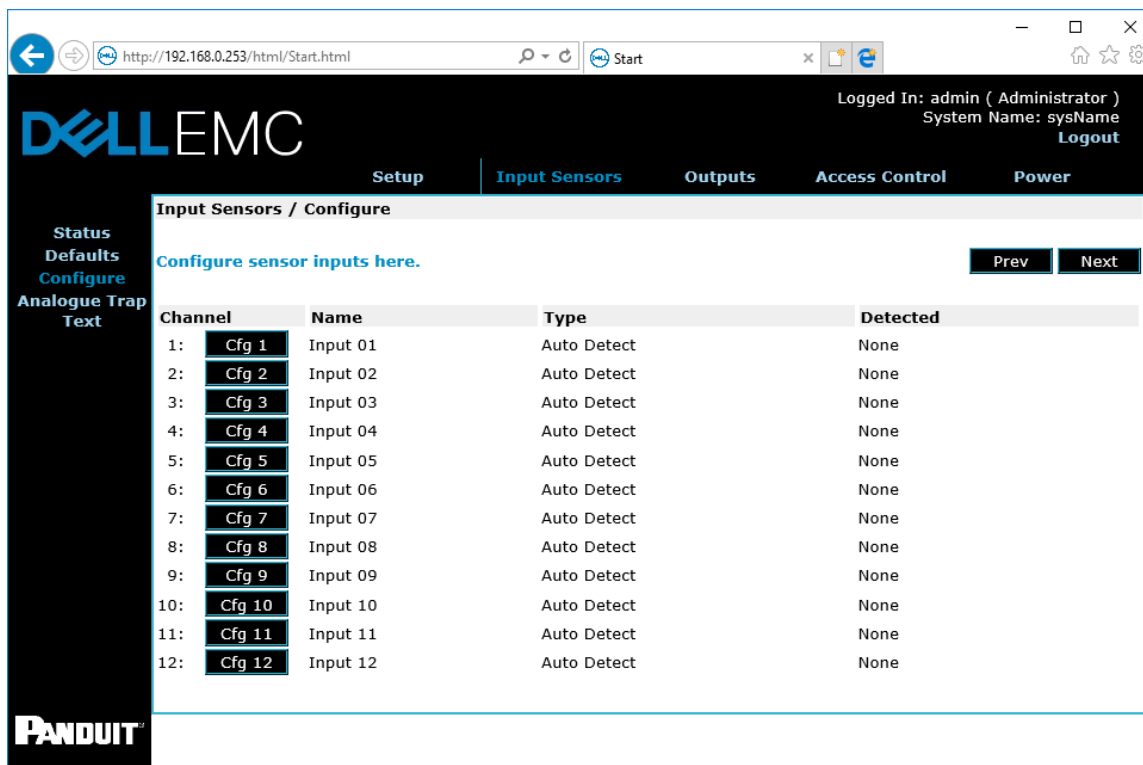


Defaults- Open/Close Contacts	
	<p>alarm will be triggered. However the alarm will only persist while the input remains in a Non-Normal state. When the input returns to a normal state the alarm will be cleared.</p> <p><b>Normal to Non-Normal (Positive Edge)</b> This type of triggering may be used in situations where a momentary type input (e.g. shock sensor, PIR etc.), is used. Since these types of inputs are momentary any alarm condition which occurs, no matter how short, will persist until manually cleared. Positive Edge triggering is used when an alarm is required to persist after an input changes from the Normal state to the Non-Normal state.</p> <p><b>Non-Normal to Normal (Negative Edge)</b> This type of triggering may be used in situations where a momentary type input (e.g. shock sensor, PIR etc.), is used. Since these types of inputs are momentary any alarm condition which occurs, no matter how short, will persist until manually cleared. Negative Edge triggering is used when an alarm is required to persist after an input changes from the Non-Normal state to the Normal state.</p>
Repeat Timer	Causes alarm traps to be reissued after a specified amount of time if the alarm condition is still present. Setting the timer to zero (0) disables repeat traps.

The drop-down menus can be closed by clicking on the corresponding arrows again.

## Input Sensors - Configure

You can configure the individual sensor channels in this window.



Select the **Config** option to open a detailed configuration page for the selected sensor.

The difference between the menus presented here and the menus presented on the Defaults page is that settings are applied to individual channels.

The submenus contain all the options in the Defaults menu, plus two additional options:

## Name

Sensor channels can be assigned names for ease of identification (for example, “Server Room Sensor” or “UPS Battery Fail”).

## Type

The type of connected sensor is specified here. The sensor channels can be set to auto detect, temperature, humidity, contact, or disabled.

**NOTE:** Auto Detect is the recommended Type setting for all sensors.

## Outputs – Status

The Outputs Status page provides an overview and direct control of the IPI Appliance's four output relays.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup Input Sensors **Outputs** Access Control Power

Status Configure

Outputs / Status

Information from outputs is presented here.

Output	Normal State	Logic Controlled	Current State	CONTROL		
1: Output_1	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
2: Output_2	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
3: Output_3	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
4: Output_4	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
5: Output_5 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
6: Output_6	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
7: Output_7 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
8: Output_8 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
9: Output_9 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
10: Output_10 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
11: Output_11 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
12: Output_12 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
13: Output_13 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
14: Output_14 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
15: Output_15 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
16: Output_16 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
17: Output_17 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]
18: Output_18 (L)	Not Active	-	Not Active	[Activate]	[DeActivate]	[Use Logic]

L = logical channel only, no physical device present

PANDUIT

## Control

- **Activate:** Commands the selected relay to energize.
- **Deactivate:** Commands the selected relay to de-energize.
- **Use Logic:** Commands the selected relay to enter logic-controlled mode. In logic-controlled mode, the activation and deactivation is governed by any configured and enabled logic.

## Outputs – Configure

Relay and logic configuration is performed via two pages.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup Input Sensors **Outputs** Access Control Power

Outputs / Configure

Output	Name	Normal State	SNMP Traps		Logic	
			Trap Alarm Level	Repeat Timer (Seconds)	Controlled	Configure
1	Output_1	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 1 &gt;</a>
2	Output_2	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 2 &gt;</a>
3	Output_3	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 3 &gt;</a>
4	Output_4	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 4 &gt;</a>
5 (L)	Output_5	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 5 &gt;</a>
6	Output_6	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 6 &gt;</a>
7 (L)	Output_7	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 7 &gt;</a>
8 (L)	Output_8	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 8 &gt;</a>
9 (L)	Output_9	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 9 &gt;</a>
10 (L)	Output_10	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 10 &gt;</a>
11 (L)	Output_11	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 11 &gt;</a>
12 (L)	Output_12	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 12 &gt;</a>
13 (L)	Output_13	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 13 &gt;</a>
14 (L)	Output_14	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 14 &gt;</a>
15 (L)	Output_15	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 15 &gt;</a>
16 (L)	Output_16	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 16 &gt;</a>
17 (L)	Output_17	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 17 &gt;</a>
18 (L)	Output_18	Not Active ▼	Disabled ▼	0	<input type="checkbox"/>	<a href="#">Config 18 &gt;</a>

L = logical channel only, no physical device present

**PANUIT** Save

- **Name:** The relay output name is specified here. (for example, Fan\_Tray or Door\_1).
- **Normal State:** Normal State specifies the 'normal' or 'non-alarm' state of a relay.
  - **Not Active:** Specifies that a output relay in a 'Not Active' ('not-energized) state is normal.
  - **Active:** Specifies that an output relay in an 'Active' ('Energized) state is normal.
- **Trap Alarm Enabled:** Toggles alarm trap generation. An alarm trap will be generated when the relay is in an alarm state with this enabled.
- **Repeat Timer (Seconds):** Specifies an interval in which a trap for an *existing* alarm condition will be regenerated. This will be a duplicate of the original trap. A

repeat timer is not necessary in NMS systems employing intelligent trap handling. Setting zero (0) disables repeat traps.

- **Controlled:** This toggle acts as a master control to any logic configured for a relay. When selected **Use Logic** may be enabled on the Status page.

It is only possible to select this option if logic has been specified in the **Relay Specific Configuration** page.

- **Configure:** Click on the **Config** link for the desired output to open the Outputs - Configure - Config window.

## Outputs - Configure - Config

Actual Digital Output Relay logic configurations are specified here.

The screenshot shows the Dell EMC IPI Appliance web interface. The browser address bar displays `http://192.168.0.253/html/Start.html`. The user is logged in as `admin ( Administrator )` with system name `sysName`. The navigation menu includes **Setup**, **Input Sensors**, **Outputs**, **Access Control**, and **Power**. The current page is **Outputs / Define Logic Control : Output 1 [Output\_1]**.

The configuration page features a logic diagram with the following components:

- Contact Input 24:** A list of 24 disabled inputs, each with a "Click To Enable" link and an "Invert" checkbox.
- Logic Operator:** A dropdown menu set to "Logical AND All Inputs".
- Delay Timer - ON:** A text input field containing "0" followed by "Seconds".
- Delay Timer - OFF:** A text input field containing "0" followed by "Seconds".
- Output Relay:** A final output stage with an "Invert" checkbox that is currently checked.

At the bottom of the configuration area, there are two text input fields:

- Normal Trap Text:** Contains the text "Normal 1".
- Non-Normal Trap Text:** Contains the text "Non-Normal 1".

Navigation buttons for **Back** and **Save** are located at the bottom right of the configuration area. The Panduit logo is visible in the bottom left corner of the interface.

## Input Selection

Select Inputs into the logic on the left hand side by clicking one of the **Click to Enable** boxes. Here you can choose a sensor type, sub-type, and name to feed into logic.

## Invert

The Invert check box allows the logic inversion of an input into the logic. For example, when an upper warning limit is breached, the following input logic is used.

	No Invert	Invert
Threshold breached	1 (Logic Triggering)	0 (Not Logic Triggering)
Threshold within limit	0 (Not Logic Triggering)	1 (Logic Triggering)

## Logic Operator

The Logic Operator provides options that control the evaluation of inputs to logic.

### Logical AND Inputs

Logical AND requires **ALL** of the selected inputs to the logic to be in a triggering state to activate the relay logic.

### Logical OR Inputs

Logical OR requires only **ONE** of the selected inputs to be in a triggering state to activate the relay logic.

## Delay Timer On

Delay Timer On specifies the time in seconds that must elapse before the logic activates in a situation where it would otherwise activate immediately.

This is useful in a situation where you want a delay to be added before a logic controlled relay is switched on.

If the logic triggering condition clears before the specified time has elapsed then the logic will not activate at all.

## Delay Timer Off

Delay Timer Off specifies the time in seconds which must elapse before the logic deactivates in a situation where it would otherwise deactivate immediately.

This is useful in a situation where you want a delay to be added before a logic controlled relay is switched off from a current on state. If the logic triggering condition returns before the specified time has elapsed then the logic will not deactivate at all.

## **Final Invert**

A final invert check box is provided. This allows the final output logical state to the relay to be inverted. Any conditions that produce a relay on output will produce the reverse.

## Access Control – Configure

Configure keypad devices physically attached to the unit at this screen.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup Input Sensors Outputs **Access Control** Power

Access Control / Configure

ACU	Type	Name	Timeouts (Secs)		ACU in Use Trap Alarm Level
			Door Latch	Return to Standby	
1: ACU1	Disabled	ACU 1	10	0	Disabled
2: ACU2	Disabled	ACU 2	10	0	Disabled

Access Code Length: 5

Hide PIN Code:

In-Use Trap Text: in use

Remote Authentication Server:

Enable:

IP Address: 0.0.0.0

Port No.: 0

Save & Test RAS Connectivity

Save

### ACU

ACU KP1 and KP2 refer to the two physical keypad connection ports found on the rear of the unit.

### Type

Two types of supplied keypads are supported by the unit: 2x5 and 3x4.

### Name

A keypad name can be specified here for alarm logging and notification reasons. Front\_Door or Rear\_Door are common choices.



## Timeouts - Door Latch

Since the most common use of the keypad is to activate a solenoid to provide rack access, a door latch timer is provided. The time in seconds specified here controls how long a valid keypad entry will provide a positive input to relay logic. In most situations, this controls how long a door solenoid remains activated after a valid keypad code is entered.

## Timeouts – Return to Standby

This parameter specifies the time in seconds that must elapse before the keypad returns to standby after an incomplete code is entered.

## ACU In Use Trap

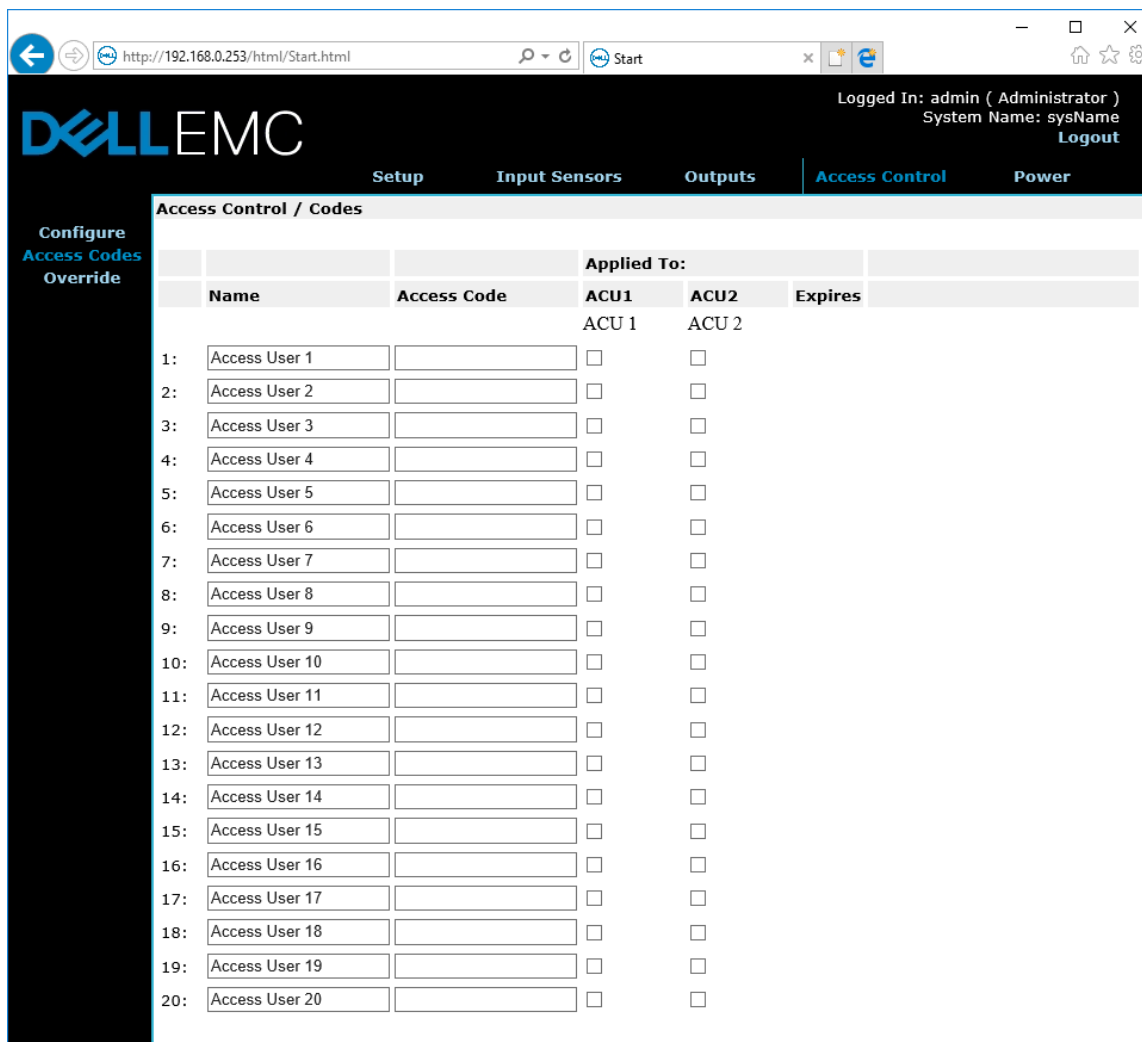
Selecting this option causes a keypad-in-use trap to be produced when any button is pressed on the keypad. This trap will be produced regardless of the entered code's validity.

## Access Code Length

An Access Code Length of between 1 and 15 digits can be selected here. This Access Code Length applies to all pin codes defined on the Access Control – Pin Codes screen. Any pin codes that do not match the length specified here will be unusable.

## Access Control – Codes

Access Codes are specified and applied to one or both keypads here.



## Name

A user or group name can be specified here for association with an Access Code.

## Access Code

Pin codes can be entered here. Pin code length can range from 1 to 15 digits.

Regardless of PIN length used here, only Pin codes of the length specified by the **Pin Code Length** setting on the Access Control – Configure page will be usable.

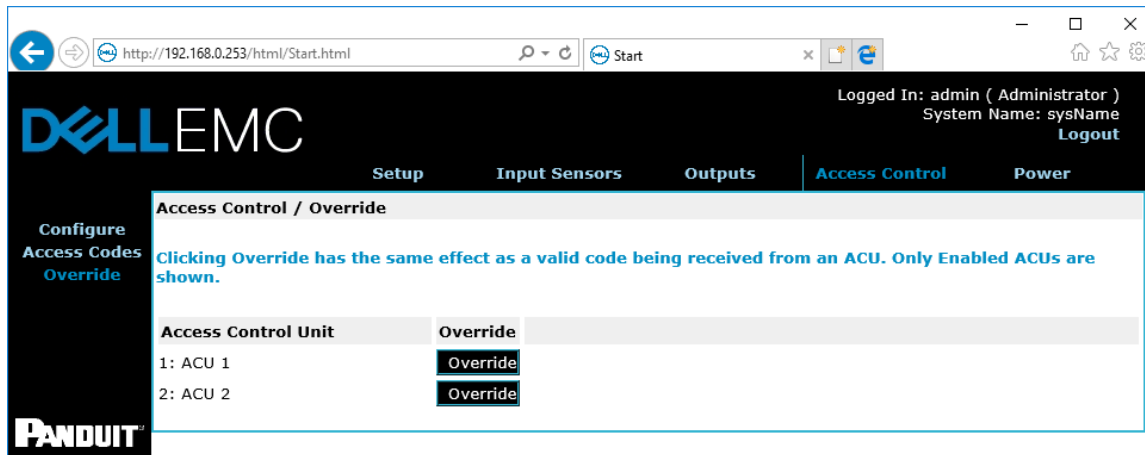
## Applied To

The check boxes allow PIN codes to be associated with a given keypad or both.

A PIN Code line must have a check box selected for a given keypad if the code is to be considered valid for that pad.

## Access Control – Override

This page allows a valid entry to be sent to a keypad remotely. This function is useful in a situation where it may be necessary to grant access to a rack remotely.



The screenshot shows a web browser window displaying the Dell EMC IPI Appliance management interface. The browser address bar shows the URL `http://192.168.0.253/html/Start.html`. The page is titled "Access Control / Override" and is part of a larger system configuration tool. The interface includes a navigation menu with options like "Setup", "Input Sensors", "Outputs", "Access Control", and "Power". The "Access Control" section is active, showing a table of Access Control Units (ACUs) with "Override" buttons for each. A note states: "Clicking Override has the same effect as a valid code being received from an ACU. Only Enabled ACUs are shown." The "PANDUIT" logo is visible in the bottom left corner of the interface.

Access Control Unit	Override
1: ACU 1	Override
2: ACU 2	Override

The Override buttons for each enabled keypad direct a 'valid PIN Code' command without the need to enter one physically at the keypad.

# Power – Configuration and Status

## Power - Status

The Power -Status page presents an overview of connected rack PDUs. The page displays the PDU channel number, name, voltage, and current thresholds.

The screenshot shows the Dell EMC web interface for Power Status. The page title is "Power / Status" and it contains a table of connected PDU devices. The table has columns for Circuit, Name, Outlets, Volts, Amps, kVA, PF, kW, Hz, and kWh. The "Amps" column includes status indicators: a green checkmark for normal, a yellow warning triangle for warning, and a red X for critical. An "Aggregate" row is shown at the bottom of the table.

Circuit	Name	Outlets	Volts	Amps	kVA	PF	kW	Hz	kWh
01	A1	N/A	?	✓ ??	??	??	??	??	??
02	B1	N/A	?	??	??	??	??	??	??
03	C1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
04	D1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
05	E1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
06	F1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aggregate				⚠ 0.0	✓ 0.0	✓ 0.0	0.0		0.0

## Status Indicators

Three status indicators are displayed next to PDU channels to allow quick determination of normal, warning, and critical alarm statuses:

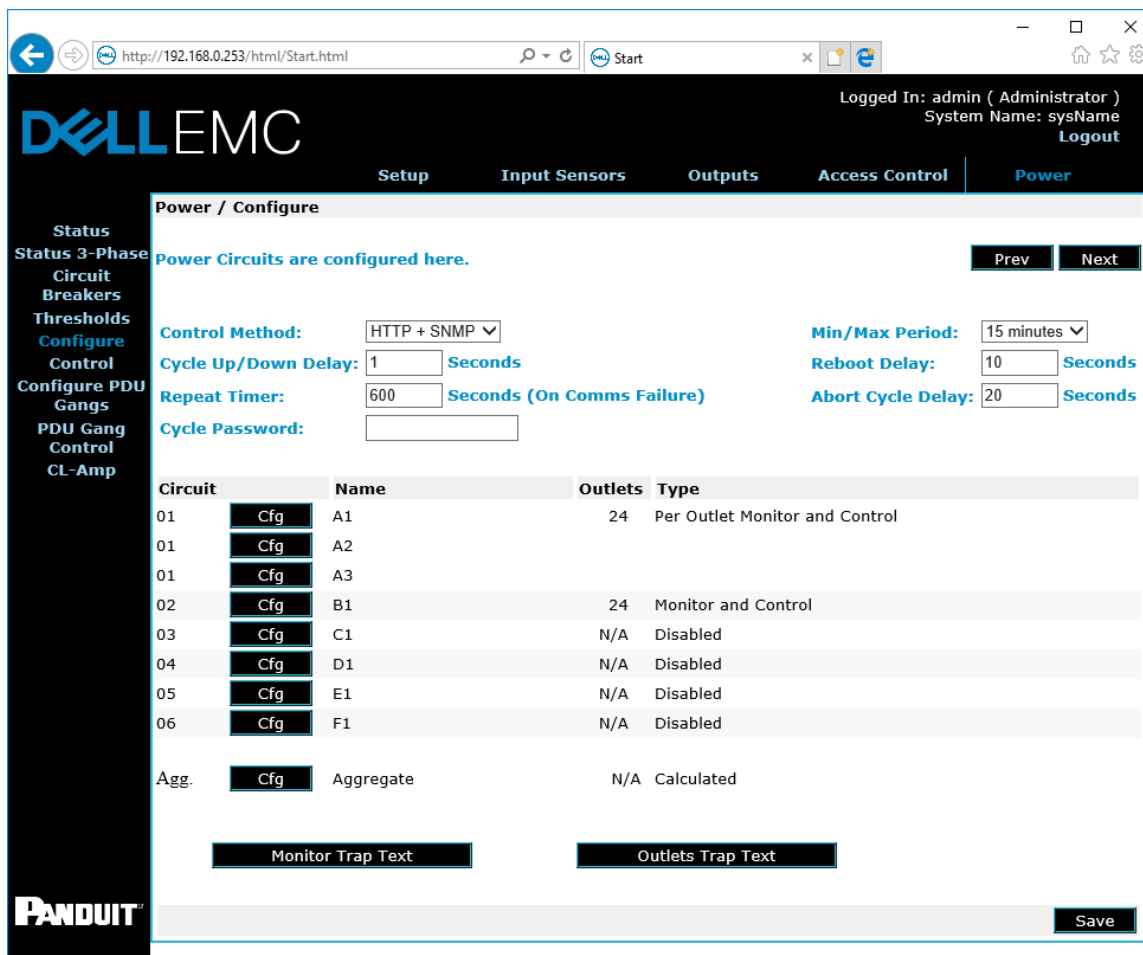
✓	Channel reading currently within threshold limits.
⚠	Upper or lower Warning limit reached or exceeded.
⚡	Upper or lower Critical limit reached or exceeded.

## Power - Configure

The Power - Configure menu provides the ability to configure individual PDU options. You can configure the two PDU channels individually by selecting the **Config** option

next to each channel.

A summary of several current configuration parameters is displayed on a per-PDU channel basis.



## Control Method

The Control Method parameter specifies which control methods are available to control the outlets on PDUs attached to the unit.

### HTTP + SNMP

The Web Management Interface and SNMP can be used to command PDU outlets.

### **HTTP Only**

This option allows only the Web Management Interface to command PDU outlets. This effectively disables SNMP PDU outlet control.

### **SNMP Only**

This option allows only SNMP to command PDU outlets. This effectively disables the Web Management Interface PDU outlet control.

### **RS232 Only**

This option allows PDU control commands to be issued directly to a unit via the onboard RS232 port. This option disables the Web Management Interface and SNMP control.

### **Cycle Up/Down Delay**

This parameter specifies the interval in seconds between switching on and switching off outlets when an entire PDU strip is cycled (all outlets commanded on or off).

### **Repeat Timer (on Comms Failure)**

This parameter specifies the interval in seconds between when an initial PDU comms failure trap is produced and a repeat trap is issued.

### **Reboot Delay**

This parameter specifies how long (in seconds) an outlet remains off after a reboot before switching back on.

### **Abort Cycle Delay**

This parameter specifies how many seconds must elapse before a commanded cycle begins on a PDU. This delay gives the user time to reverse the decision to cycle a PDU before any outlet states are changed.

If you do not want to use this functionality, set the delay to zero.

### **Power – Configure Menu for Individual Device**

By clicking the **Cfg** button on the Configure you can access a screen that allows all the available options for a specific Device to be specified.

Power / Configure : Device 1 [Power Device 01--A1]

Circuit Name:  Device Name:

Device Type:

No. Of Outlets:  Outlet Traps Repeat Timer:  Seconds

Cycle Password:

Power On Mode:

Circuit Breakers:

RMS Volts

Limits & Traps:	Value:	Trap Enabled:	Repeat Timer:
Upper Control Limit:	<input type="text" value="250"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Upper Warning Limit:	<input type="text" value="245"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Warning Limit:	<input type="text" value="220"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds
Lower Control Limit:	<input type="text" value="215"/> V	<input type="checkbox"/> Enabled	<input type="text" value="0"/> Seconds

## Circuit Name

Individual PDUs can be assigned names for ease of identification (for example, “Rack 5 PDU Sensor” or “Comm Room”).

## Device Type

Specify the type of PDU connected to channel here.

## Number of Outlets

This parameter specifies the number of controllable outlets present on a PDU. This is required when the **Control Only** or **Monitor and Control** options have been selected.

For example, if you have a PDU consisting of 24 Outlets, one of which is a permanent live (non-switching) outlet, 23 outlets would be specified.

**Warning:** Failure to specify the correct number of outlets can lead to the incorrect outlet being switched on or off.

During unit setup and deployment, you should select the **Control Only** or **Monitor and Control** options before critical loads are connected to outlets.

## Cycle Password

This field specifies the password required to set a power cycle of outlets on a controllable strip. This password is used when switching outlets using SNMP, not when switching via the web interface.

### Power on Mode

In the event that power to the PDU is lost, this parameter specifies how the outlets will be switched back on once power is restored.

## Additional Parameters

Below the Power On Mode selection is a series expandable settings. These settings are:

- RMS Volts
- RMS Current
- Total Energy (kWh)
- Apparent Power (kVA)
- True Power (kW)
- Power Factor
- Power Strip Outlets

For each of these setting types, click the small arrow on the right to show or hide the corresponding values. These values are identical for each setting, and are described below.

### Limits and Traps

You can specify values for voltage, current, and total power thresholds here. You also can enable or disable traps for each threshold. The following thresholds can be set:

- Upper Control Limit
- Upper Warning Limit
- Lower Warning Limit
- Lower Control Limit

**Note:** There are no lower limits for total power, because total power consumption can only go up, not down.

### Trap Enabled

Check the appropriate box to enable the trap.

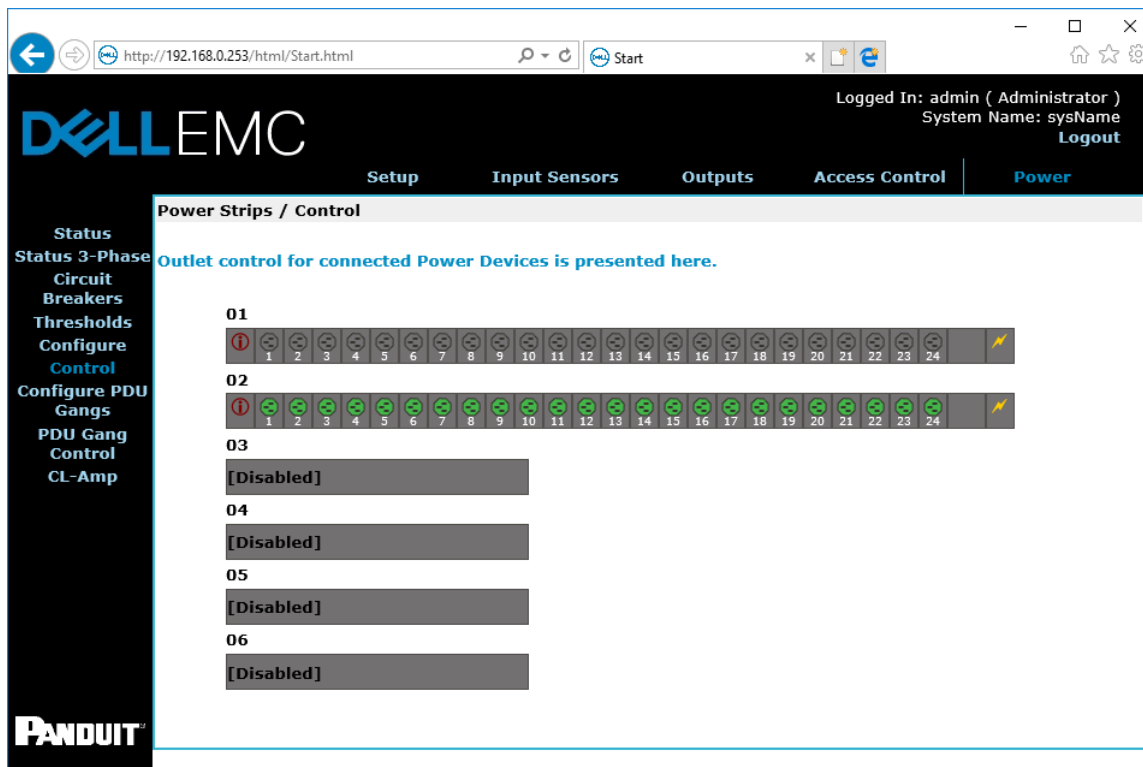
### Repeat Timer

In the event of a communications failure with a connected PDU, this entry specifies how often (in seconds) Comm Fail traps will be generated.



## Power – Control

Individual outlets or all outlets on a given PDU can be switched on and off using this screen.



The display consists of a visual representation of PDUs that have **Control** or **Monitor and Control** enabled on the Configure page.

PDUs that are **Disabled** or in **Monitor Only** status do not display any outlet graphics and are displayed with appropriate text.

PDU inputs are numbered 1 to 2 in ascending order. PDU numbers correspond to the physical input ports on the rear of the IPI Appliance unit.

### Switching Individual Sockets

When you click on a socket, a control menu above the socket displays further information. Three control options are also presented:

#### On

Selecting this option commands the selected outlet to switch On. If the outlet is already on this will have no effect.

### Off

Selecting this option commands the selected outlet to switch Off. If the outlet is already off this will have no effect.

### Reboot

The reboot option commands the selected outlet to switch off. After the time specified by the Reboot Delay timer has elapsed, the outlet will automatically switch itself back On.

**Note:** A PDU outlet may be in one of three states: "On", "Off", or "Unknown". When the user clicks on an outlet and chooses to change the outlet state, the outlet may be displayed as "Unknown" until the requested state matches the actual state. Note that when a PDU circuit breaker is in the "Off" (open circuit) position, the unit may report the outlet status of the breakers on that circuit as "Unknown".

## Switching an Entire Strip

You can switch all the outlets on any strip Off or On with a single command by clicking the **Lightning Bolt** symbol on the end of a PDU graphic.

A small dialog displays, offering the following options:

### On

This option commands all outlets on a selected PDU to switch on. Any outlets already on will remain on; any currently off will be switched on.

### Off

This option commands all outlets on a selected PDU to switch off. Any outlets already off will remain off; any currently on will be switched off.

### Abort!

Once a command has been issued to turn all outlets on a PDU on or off, you can click the **Abort!** button to abort the command.

The Abort Cycle delay option on the PDUs – Configure – Config menu specifies the time allowed in seconds for an abort to be issued.

## Power - Configure PDU Gangs

The **Configure PDU Gangs** screen allows you to configure individual outlets into logical groups.

Logged In: admin ( Administrator )  
System Name: sysName  
Logout

Setup Input Sensors Outputs Access Control **Power**

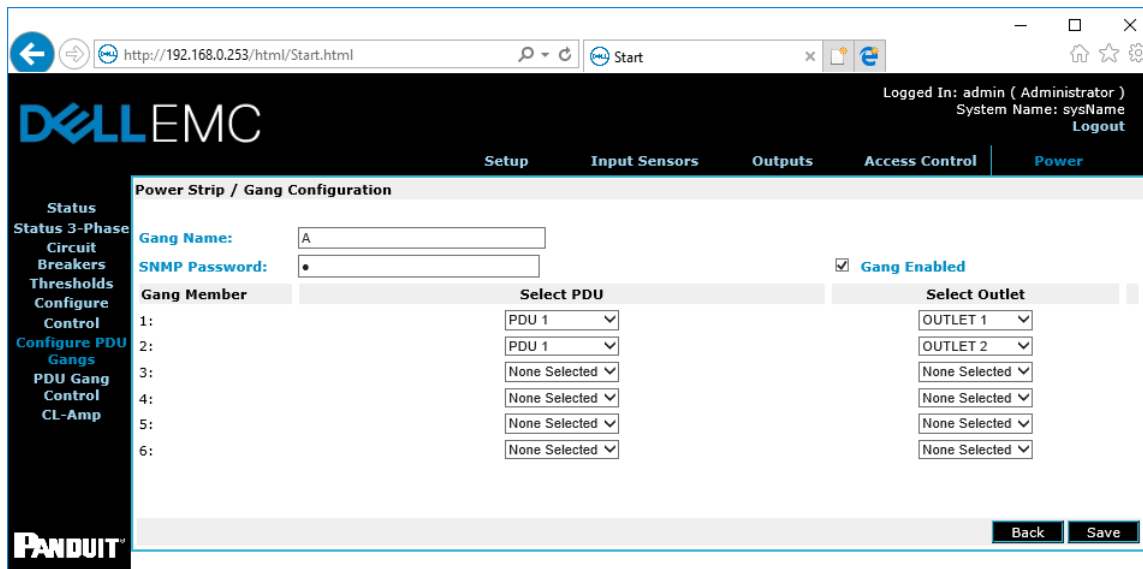
Power Strips / Configure

Gang	Gang Name	Gang String (PDU:OUTLET;)	Gang Size	Gang Enable
1 : <a href="#">Config &gt;</a>	A	1:1;1:2;	2 Members	Enabled
2 : <a href="#">Config &gt;</a>	B	2:1;2:2;2:3;2:4;2:5;2:6;	6 Members	Enabled
3 : <a href="#">Config &gt;</a>	C		0 Members	Disabled
4 : <a href="#">Config &gt;</a>	D		0 Members	Disabled
5 : <a href="#">Config &gt;</a>	E		0 Members	Disabled
6 : <a href="#">Config &gt;</a>	F		0 Members	Disabled
7 : <a href="#">Config &gt;</a>	G		0 Members	Disabled
8 : <a href="#">Config &gt;</a>	H		0 Members	Disabled
9 : <a href="#">Config &gt;</a>	I		0 Members	Disabled
10 : <a href="#">Config &gt;</a>	J		0 Members	Disabled
11 : <a href="#">Config &gt;</a>	K		0 Members	Disabled
12 : <a href="#">Config &gt;</a>	L		0 Members	Disabled
13 : <a href="#">Config &gt;</a>	M		0 Members	Disabled
14 : <a href="#">Config &gt;</a>	N		0 Members	Disabled
15 : <a href="#">Config &gt;</a>	O		0 Members	Disabled
16 : <a href="#">Config &gt;</a>	P		0 Members	Disabled
17 : <a href="#">Config &gt;</a>	Q		0 Members	Disabled
18 : <a href="#">Config &gt;</a>	R		0 Members	Disabled
19 : <a href="#">Config &gt;</a>	S		0 Members	Disabled
20 : <a href="#">Config &gt;</a>	T		0 Members	Disabled
21 : <a href="#">Config &gt;</a>	U		0 Members	Disabled
22 : <a href="#">Config &gt;</a>	V		0 Members	Disabled
23 : <a href="#">Config &gt;</a>	W		0 Members	Disabled
24 : <a href="#">Config &gt;</a>	X		0 Members	Disabled

PANUIT

To begin creating an PDU Gang, click **Config** next to the desired Gang Name. The Configuration screen appears, as shown below. Enter a **Gang Name** and **SNMP Password** and click the **Gang Enabled** box to enable the gang.

Select the members of the gang by selecting individual outlets from the drop down outlet list.



Click the **Save** button to create the PDU Gang.

## PDU Gang Control







































The PDU Gang Control screen is similar to the Control screen, except that logical groups are displayed rather than individual outlets. The screen below shows the display for a PDU Gang.

Browser window showing the Dell EMC IPI Appliance interface. The address bar displays `http://192.168.0.253/html/Start.html`. The user is logged in as `admin (Administrator)` with system name `sysName`. The interface includes a navigation menu on the left and a main content area titled `Power Strips / Gang Control`.

**Navigation Menu:**

- Status
- Status 3-Phase
- Circuit Breakers
- Thresholds
- Configure Control
- Configure PDU Gangs
- PDU Gang Control
- CL-Amp

**Power Strips / Gang Control:**

Strip	Status
1 : A	                                     

All of the functionality of the Power-Control screen is also available here. See the Power-Control section for details.

## **CL-Amp**

Not applicable.

# Temperature Sensor Adapter Installation

Follow the instructions below to install the ZAHTLADT-02 v1.01.01 temperature sensor adapter module. This adapter allows legacy sensors to provide more accurate temperature readings.

**Note:** This adapter does not work with the ZETHL-14 temperature sensor.

## New Installations

Follow these instructions when you are installing a standard temperature sensor, but the upgraded sensor input is required.

1. Plug the adapter directly into the back of the Appliance, at the sensor port to be used for temperature.
2. Plug the temperature sensor connector into the adapter.
3. Update the IPI Appliance firmware to the latest release.

## Existing Installations.

Follow these instructions when the sensor is already installed along with the IPI Appliance .

1. Unplug the current temperature sensor from the Appliance, noting the location where it resided.
2. Insert the adapter into that location.
3. Plug the sensor into the end of the adapter.
4. Perform these steps for all other temperature sensors to be changed.
5. The IPI Appliance firmware must be updated to the latest version.

## Fitting the Adapter In-line.

This procedure is not recommended, but it may be the only solution in some cases.

1. Using a patch lead from the Appliance and an RJ45 Jack to Jack through connector on its non-Appliance end, plug the adapter RJ45 Plug into the through connector.
2. Plug either the RJ45 plug of a temperature sensor into the jack on the adapter or a patch lead with the temperature sensor on the end.

## Troubleshooting

### Resetting the IPI Appliance to Factory Default Settings

To reset the Appliance unit to factory defaults, perform the following steps:

1. Press and release the **Reset** button on the front of the unit. The Alarm LED will flash twice (off/on, off/on).
2. Immediately press and hold the **Mode** button until the alarm LED goes off.
3. Immediately press and release the **Reset** button.

**NOTE:** The unit will now restart. The Status LED will start flashing after around 1 minute. The reset process is complete, and the IP address is set to the default 192.168.0.253.

### Problem: The NMS Cannot Poll the IPI Appliance

- **Solution:**Make sure the network is properly connected to the Appliance unit.
- **Solution:**Make sure the cable is in good condition.
- **Solution:**Try pinging the Appliance unit from another computer on the same network segment as the Appliance unit.
- **Solution:**Ensure that the NMS IP Address is in the NMS table of the Appliance unit.
- **Solution:**Ensure that the community string has been set for the NMS via the Web Management Interface.



# Technical Support

For technical support for the IPI Appliance system, please contact Panduit Technical Support using one of the following methods:

## **Panduit Technical Support**

### **Severity 1 & 2 Issues, Call 24/7:**

Americas: 1-866-721-5302

EMEA: 44-1291-674661

### **Severity 3 & 4 Issues, Email - normal business hours:**

[systemsupport@panduit.com](mailto:systemsupport@panduit.com)

## Appendix A: Technical Details

### Factory Default Settings

IP Address:	192.168.0.253
Subnet Mask:	255.255.255.0 (/24)
Default Appliance:	192.168.0.1
Web Management Address:	http://192.168.0.253/
Default username:	admin
Default password	admin

### Operating Information

Input Power:	100-240 VAC (45W) 50-60 Hz
Operating Temperature:	0°C to 40 °C
Storage Temperature:	-10 °C to 70 °C
Operating Humidity:	5% to 90% RH
Storage Humidity:	5% to 100% RH

**CAUTION:** There is a risk of explosion if the battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

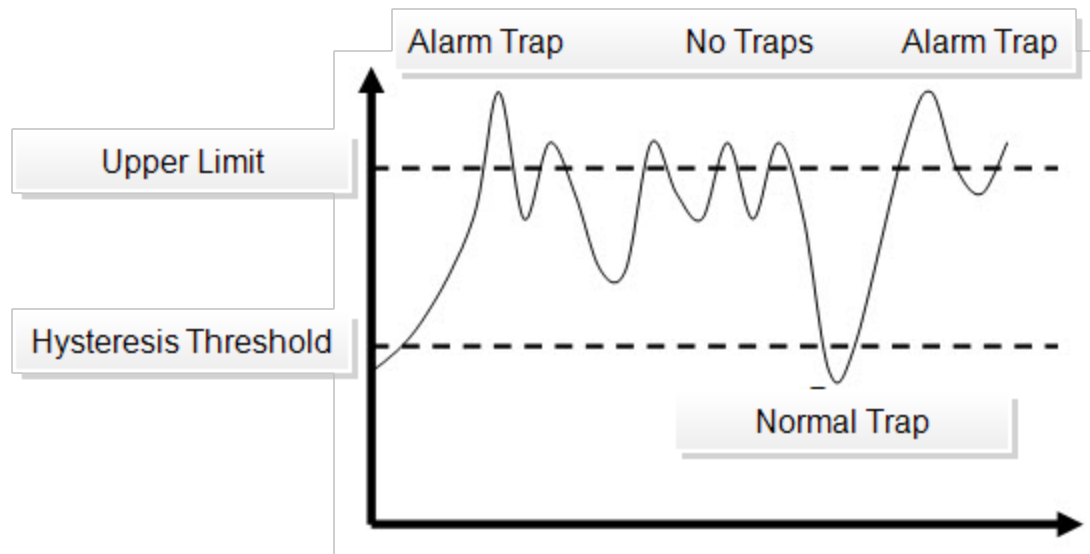
## Appendix B: Hysteresis Demystified

When a temperature or humidity limit is reached and the relevant limit has its OFF to ON Trap enabled, an alarm trap is issued by the IPI Appliance unit.

With a zero hysteresis setting, the traps will continue to be generated each time the limit is reached.

This may be undesirable in a situation where the temperature or humidity level measure has reduced by only a small amount before rising again and triggering further traps.

The hysteresis function is provided to prevent further alarm traps from being generated until the measured value has fallen to a satisfactory level.



As shown in image above, the humidity first rises past its upper warning threshold, which generates an alarm trap.

The humidity then reduces slightly but does not reduce to the hysteresis level, which is 1.5% relative humidity lower than the alarm setting (1.5% relative humidity lower as an absolute measured value, rather than 1.5% of currently measured value).

Humidity then increases and decreases again. However, on the second decrease of humidity the level drops below the hysteresis level. The Humidity falling below the hysteresis level re-enables alarm traps for the next alarm event. An upper limit of 25 and a hysteresis threshold of 1.5 yield a threshold limit of 23.5.

The humidity level again begins to rise and again exceeds the upper limit, however this time an alarm trap is generated again.

The Hysteresis feature acts on the following Temperature and Humidity thresholds:

- Upper Control Limit (UCL)
- Lower Control Limit (LCL)
- Upper Warning Limit (UWL)
- Lower Warning Limit (LWL)

The inverse of the above description is true when applied to Temperature and Humidity lower control and warning limits.

You can configure the hysteresis threshold by using the menu options.

# Appendix C: Networking Reference

## Reference

This section discusses SNMP communities, IP addressing, subnet masking, routers and gateways.

### Communities

A community is a string of printable ASCII characters that identifies a user group with the same access privileges. For example, a common community name is “public”. For security purposes, the SNMP agent validates requests before responding. The agent can be configured so that only managers that are members of a community can send requests and receive responses from a particular community. This prevents unauthorized managers from viewing or changing the configuration of a device.

### IP Addresses

Every device on an internetwork must be assigned a unique IP (Internet Protocol) address. An IP address is a 32-bit value comprised of a network ID and a host ID. The network ID identifies the logical network to which a particular device belongs. The host ID identifies the particular device within the logical network. IP addresses distinguish devices on an internetwork from one another so that IP packets are properly transmitted. IP addresses appear in dotted decimal (rather than in binary) notation. Dotted decimal notation divides the 32-bit value into four 8-bit groups, or octets, and separates each octet with a period. For example, 199.217.132.1 is an IP address in dotted decimal notation. To accommodate networks of different sizes, the IP address has three divisions - Classes A for large, B for medium, and C for small.

The difference among the network classes is the number of octets reserved for the network ID and the number of octets reserved for the host ID:

Class	Value of First Octet	Network ID	Host ID	Number of Hosts
A	1-126	first octet	last three octets	16,387,064
B	128-191	first two octets	last two octets	64,516
C	192-223	first three octets	last octet	254

Any value between 0 and 255 is valid as a host ID octet except for those values reserved by the IPv4 standard for other purposes:

Value	Purpose
0, 255	Network Number & Broadcast
127	Loopback testing and interprocess communication on local devices
224-254	IGMP multicast and other special protocols

## Subnetting and Subnet Masks

Subnetting divides a network address into subnetwork addresses to accommodate more than one physical network on a logical network.

For example: A Class B company has 100 LANs (Local Area Networks) with 100 to 200 nodes on each LAN.

To classify the nodes by its LANs on one main network, this company segments the network address into 100 subnetwork addresses (If the Class B network address is 150.1.x.x, the address can be segmented further from 150.1.1.x through 150.1.100.x.).

A subnet mask is a 32-bit value that distinguishes the network ID from the host ID for different subnetworks on the same logical network.

Like IP addresses, subnet masks consist of four octets in dotted decimal notation.

You can use subnet masks to route and filter the transmission of IP packets among your subnetworks.

The value "255" is assigned to octets that belong to the network ID, and the value "0" is assigned to octets that belong to the host ID.

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Network Mask	Routing and Filtering
255.0.0.0	Class A network. First octet defines network number. Final three octets define host address. Valid Class A network numbers are in the range 1 to 126.
255.255.0.0	Class B network. First 2 octets define network number. Final two octets define host address. Valid class B network numbers are in the range 128.0.x.x to 191.255.x.x
255.255.255.0	Class C network. First 3 octets define network number. Final octet defines host address Valid class C network numbers are in the range. 192.0.0.x 223.255.255.x

## Gateways

A gateway, also sometimes referred to as a router, is any device with two or more network adapters connecting to different physical networks.

Gateways allow for transmission of IP packets between different networks on an inter-network.