Installation Guide

Avigilon™ ACM Embedded Controller™

Avigilon Corporation
http://www.avigilon.com

PDF-ACMEC-INSTALL

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Regulatory

All National and local Electrical codes apply.

- This equipment is intended to be powered from a limited power source output of a previously certified power supply.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Class A Digital Devices

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

Canada Class A

CE Mark - Europe (EU)

C-Tick - Australia and New Zealand

VCCI - Japan

NCC – Taiwan

SRRC– China

IDA – Singapore

KCC – Korea

UL Recognized Component (UL294 and UL1076)

RoHS compliant

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Introduction

The Avigilon ACM Embedded Controller is a controller embedded with the Avigilon™ ACM Embedded Controller application to provide a flexible and scalable platform for an economic and high performance access control system.

The controller uses a standard TCP/IP network to connect downstream controllers and door hardware together. While the ACM Embedded Controller application allows you to effectively control access at each entry point.

Package Contents

- ACM Embedded Controller
- 4 x Mounting screws
- 8 x 2.2K Ohm EOL resistors

NOTE: One or more HID VertX V100 interface panels are required when installing a ACM Embedded Controller controller.

Specifications

Product Specification

Feature	Specification
Power Supply	12-24 VDC
Maximum current at 12-24 VDC per unit	1 Amp
Average operating current at 12 VDC	210 mA
Operating temperature range	0 - 49°C (32 - 120°F)
Humidity	5 - 85% non-condensing
SD card slot	Reserved for future use
USB port	Reserved for future use

Max. Cable Length

Cable Type	Length	Recommended Cable
RS-485 *	1 220 m (4 000 feet) to host	Using Belden 3105A, 22AWG twisted pair, shielded 100 Ohm cable, or equivalent.
Input Circuits	150 m (500 feet)	2-conductor, shielded, using ALPHA 1292C (22AWG) or Alpha 2421C (18AWG), or equivalent.
Output Circuits	150 m (500 feet)	2-conductor, using ALPHA 1172C (22AWG) or Alpha 1897C (18AWG), or equivalent.
* Wiegand	150 m (500 feet) to reader	ALPHA 1299C, 22AWG, 9-conductor, stranded, overall shield. Fewer conductors needed if all control lines are not used.
Ethernet	100 m (328 feet)	Cat5, Cat5E, and Cat6
Power Supply 12-24 VDC IN		Refer to the power supply installation guide

* Minimum wire gauge depends on cable length and current requirements.

Max. Cable Length

Installation

Before you install the ACM Embedded Controller, read through this entire document.

Refer to the checklist at the end of this document and gather the required information before proceeding with these instructions.

⚠️ **CAUTION –** The controllers and interface panels are sensitive to Electrostatic Discharges (ESD). Observe precautions while handling the circuit board assembly by using proper grounding straps and handling precautions at all times.

Preparing for the Installation

1. On the ACM Embedded Controller, verify the battery jumper is installed in the **ON** position, P10 connector.
2. Verify the RS-485 termination jumper is in the **Out** position when there are no panels attached to the port.

   If there are downstream interface panels attached, place the termination jumper in the **In** position. The is shipped with jumpers in the **Out** positions.

   - The P6 termination jumper controls RS-485 Port 1
   - P5 controls RS-485 Port 2
   - P13 controls RS-485 Port 3
   - P8 controls RS-495 Port 4

Mounting the Controller

NOTE: Always mount the controllers and interface panels in a secure area.

1. Insert the provided mounting screws into the mounting holes at each corner of the controller.
2. Tighten the screws to secure the controller to the mounting location.
3. If you are installing more than one controller, position the device so that there is enough space for the wiring, airflow and cable runs.

   Do not remove the plastic base.

NOTE: Use spacers if you are stacking ACM Embedded Controller devices without the cover or the LEDs on the device may break.

Wiring the Controller

NOTE: ACM Embedded Controller is a non-PoE device. Do not connect J1 (Ethernet port) to a PoE capable port. This applies to both direct PoE Power Sourcing Equipment (Endspan PSE) and PoE injector (Midspan PSE) equipment. Not all PSE's correctly detect non-PoE-capable devices.

Tip: Keep the warning label at the bottom of the unit for future reference.

⚠️ **CAUTION —** Connectors on the ACM Embedded Controller devices are positioned to be mirror images and are not interchangeable once the installation is complete. You cannot unplug a connector from one side and plug it into the corresponding connector on the other side.

1. Connect the controller to the network using a standard Ethernet cable. Connect one end of the Ethernet cable to the J1 (RJ-45) connector on the controller and the other end to one of the following:
   - If you have a local area network, connect the other end to the network connection point (network port, hub, switch, or router).
   - If you do not have a local network, connect the other end to a computer with a web browser installed.

   NOTE: Two LED lights exist on the RJ-45 connector. The green LED denotes Ethernet Activity and the yellow LED denotes speed. When the yellow LED is on, it indicates 100 Mbits per second. Another LED in-board is a Duplex LED, indicating duplex communications are available.

2. Connect power by providing appropriate DC input to the P7 connector. The appropriate DC input goes to the positive Power pin and ground to the negative Power pin. The P7 connector is wired as follows from left to right:

Inputs	P7
Input 5	Tamper +
	Tamper -
Input 6	AC Fail +
	AC Fail -
Input 7	Batt Fail +
	Batt fail -
Power	(-) Ground
	(+) 12-24 VDC

3. The controller supports these alarm inputs: tamper, AC fail, and battery fail. The alarm inputs are wired to the P7 connector as follows:
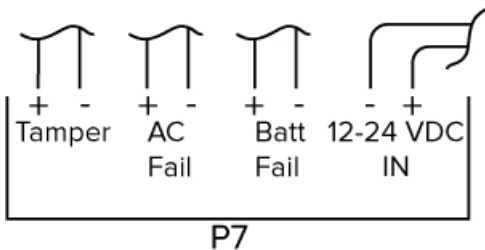
Connect the Bat Fail and AC Fail inputs to the battery low/failure contact and the AC failure contacts on the power supply.

Connect the Tamper input to a tamper switch on the enclosure.

4. Connect the downstream HID VertX interface panels (either V100, V200, or V300) to the controller through a RS-485 bus.

The controller has two RS-485 connectors and uses the 10-pin connector on **P3** and **P4**. Each RS-485 bus can support a maximum of eight interface panels - any combination of HID VertX interface panels (either V100, V200, or V300) using one or two ports. Having two ports on each bus provides the option of splitting each RS-485 bus into two physical connections, and allow for a total of four physical connections for the two busses.

The RS-485 busses can only be connected in a daisy chain topology and not a star topology. The RS-485 termination jumper should be in the **Out** position if there are no panels attached to the port. If there are downstream panels attached, the termination jumper should be in the **In** position.

RS-485 Port #	P3	RS-485 Port #	P4
Port 1	A	Port 3	A
	B		B
	Shield		Shield
	Not in use		Not in use
	Not in use		Not in use
Port 2	A	Port 4	A
	B		B
	Shield		Shield
	Not in use		Not in use
	Not in use		Not in use

⚠️ The RS-485 Ports 1 & 2 (P3) are a common bus and therefore cannot have panels with duplicate Interface Addresses assigned. The same is true of the RS-485, Ports 3 & 4 (P4). For example, two panels, both with Interface Address 0 (factory default), cannot be connected to Ports 1 and/or 2 (P3).

On the HID VertX interface panels (either V100, V200, or V300), only wire the RS-485 on the P9 terminal block to the **In** position. This is especially important when the RS-485 communication is in a daisy chain configuration. If the RS-485 is wired In and Out, or the P9 terminal block is unplugged on the interface panel, RS-485 communications will be lost to subsequent downstream interface panels.

5. Make door connections to the V100 interface panels.

Connect one door to each side of the V100 interface panel. Do not cross connections to the opposing side of the V100 interface panel or the door will not function correctly.

6. Make the output connections.

All Output connections are used for general purpose controls. The following table shows where the various outputs are located. Pin numbers shown use the convention "NO/C/NC". For example, Output 1, V200: P3 Pin 1 is NO (Normally Open), Pin 2 is C (Common), and Pin 3 is NC (Normally Closed).

NOTE: Relays are dry contact rated for 2 Amps @ 30VDC.

Output number	V100	V200	V300
1	P3 Pins 1/2/3 *Strike (lock) Relay 1*	P3 Pins 2/3/4	P1 Pins 1/2/3
2	Relay 1 P3 Pins 4/5/6 *Aux Relay 1*	P6 Pins 3/2/1	P1 Pins 4/5/6
3	P6 Pins 6/5/4 *Strike (lock) Relay 2*		P1 Pins 7/8/9
4	P6 Pins 3/2/1 *Aux Relay 2*		P2 Pins 1/2/3
5			P2 Pins 4/5/6
6			P2 Pins 7/8/9
7			P4 Pins 9/8/7
8			P4 Pins 6/5/4
9			P4 Pins 3/2/1
10			P5 Pins 9/8/7
11			P5 Pins 6/5/4
12			P5 Pins 3/2/1

⚠ Some magnetic locks exhibit both high inrush current when activated and a high instantaneous break voltage when de-energized due to magnetic field collapse. It is recommended you use of a snubber circuit across the controlling relay terminals to protect the controlling relay contacts.

7. Make the input connections.

   Input connections are analog inputs used for a combination of specific functions such as Request-to-Exit (REX), Door monitor, etc. They can also be used as general purpose monitoring. Connect one side of the switch or contact to the + (plus) lead and the other to the - (minus) lead. The following table shows where the inputs are located. Pin numbers shown on the cover use the convention +/-. The default REX input configuration is normally open (NO) unsupervised (no EOL resistors).

Input number	ACM Embedded Controller
Aux Input 1	P14 + / -
Aux Input 2	P11 + / -
Input 5	P7 Tamper + / -
Input 6	P7 AC Fail + / -
Input 7	P7 Batt Fail + / -

However, the default door switch (DS) configuration is Normally Closed (NC), unsupervised (no EOL resistors).

The following inputs do not support supervision:

- Tamper (Input 5 on the V100/V200; Input 3 on the V300)
- AC Fail (Input 6 on the V100/V200; Input 4 on the V300)
- Batt Fail (Input 7 on the V100/V200; Input 5 on the V300)

All other input points are defaulted for NO switches and are unsupervised (no EOL resistors).

Any input can be configured as NO or NC. Inputs except Battery Fail, AC Fail and Tamper can be unsupervised or supervised. They can be configured for supervisory resistors of 2.2K Ohm.
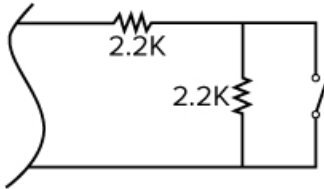
The setup of supervised inputs should be completed in the ACM Embedded Controller application. For more information, see the *Access Control Manager Embedded Controller User Guide*.

Input number	V100	V200	V300
1	P2 Pins 1/2 *Door Monitor*	P1 Pins 1/2	P6 Pins 2/1
2	P2 Pins 3/4 *REX input*	P1 Pins 3/4	P3 Pins 1/2
3	P5 Pins 4/3 *Door Monitor*	P1 Pins 5/6	P7 Pins 8/7 *Tamper*
4	P5 Pins 2/1 *Rex Input*	P1 Pins 7/8	P7 Pins 6/5 *AC Fail*
5	P7 Pins 8/7 *Tamper*	P1 Pins 9/10	P7 Pins 4/3 *Batt Fail*
6	P7 Pins 6/5 *AC Fail*	P2 Pins 1/2	
7	P7 Pins 4/3 *Batt Fail*	P2 Pins 3/4	
8		P2 Pins 5/6	
9		P4 Pins 10/9	
10		P4 Pins 8/7	
11		P4 Pins 6/5	
12		P4 Pins 4/3	
13		P4 Pins 2/1	
14		P5 Pins 6/5	
15		P5 Pins 4/3	
16		P5 Pins 2/1	
17		P7 Pins 8/7 *Tamper*	
18		P7 Pins 6/5 *AC Fail*	
19		P7 Pins 4/3 *Batt Fail*	

Accessing ACM Embedded ControllerApplication for the First Time

After the controller has been installed, you need to access the ACM Embedded Controller application to complete the system configuration.

You can access the application by using the controller hostname or virtual port.

By Virtual Port

By default, every controller can be accessed from this IP address: `169.254.242.121`

To perform this procedure, you must use a Windows computer with a web browser and a network port.

1. Disconnect the computer from the network.
2. Connect the computer to the controller using an Ethernet cable.
3. On your computer, open command prompt.
4. Enter `ipconfig/renew`

   Wait for DHCP to timeout (approximately 60 seconds). The computer will acquire a 169.254.x.x address.

5. Open a web browser and enter this address: `169.254.242.121`

   The controller is now accessible through this virtual port.

6. Enter your login for the application.

   The default username and password is `admin`.

By Host Name

To access the ACM Embedded Controller application by this method, your DHCP server must support hostname access and only have one controller in the local area network (LAN).

1. Make sure the controller has a LAN connection.
2. Power the controller and wait 60 seconds for the controller to start up.
3. In a web browser, enter this address: `https://acm-ec.`*`<network domain>`*

   For example: `https://acm-ec.example.lan`

   The controller is now accessible through this URL.

4. Enter your login for the application.

   The default username and password is `admin`.

Changing the IP Address or Hostname

If you have more than one ACM Embedded Controller system in your network, you must set an IP address or unique hostname for each controller so that there are no communication conflicts.

If you only have one controller in your system, you can skip this procedure.

1. Login to the ACM Embedded Controller application.
2. In the top-right Setup links area, click **System**.
3. On the Port screen, click **eth0** in the Network Interfaces table.

   The Port Edit page is displayed.

4. Select one of the following options:
   - **DHCP** — Select this option to change the hostname. Enter a DNS setting if your DHCP server does not provide one.
   - **Static** — Select this option to use a specific IP address. Refer to the *Configuration Checklist* on page 14 for the required details.

5. Click ✔ to save your changes.

Configuring ACM Embedded Controller

After the ACM Embedded Controller system has been completely installed, you can customize the system to fit your needs.

For more information about the available features, see the *Access Control Manager Embedded Controller User Guide*.

Troubleshooting

If the following troubleshooting solutions do not resolve your issue, contact Avigilon Technical Support – **http://avigilon.com/support-and-downloads/**.

Replacing the Controller Battery

NOTE: Do not replace the battery while the ACM Embedded Controller is powered.
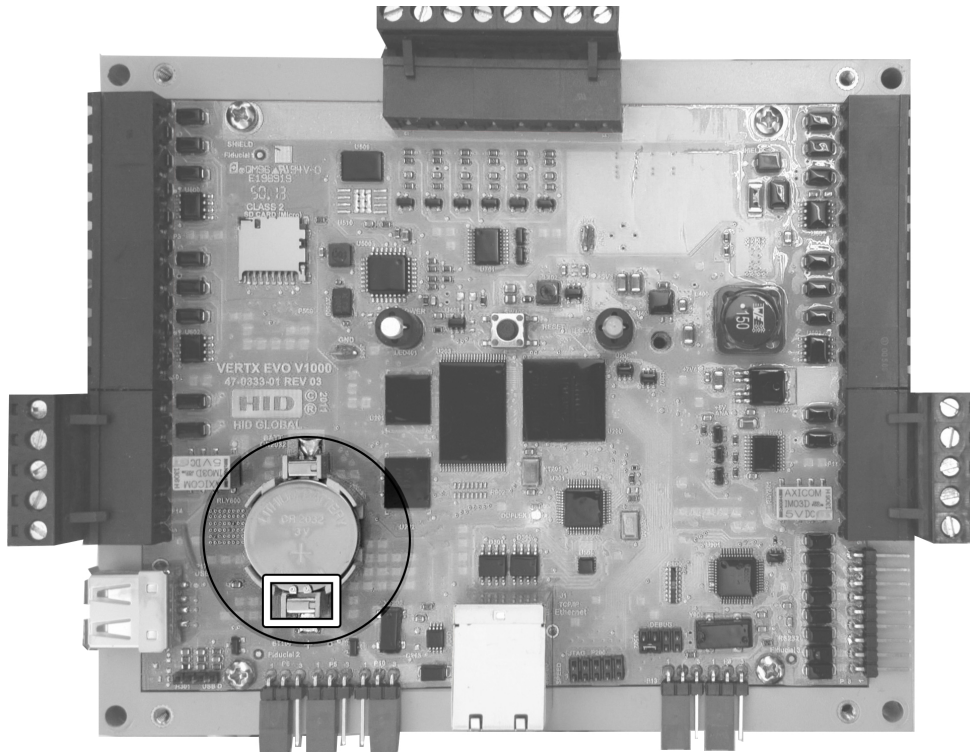
1. Remove the cover on the controller.

Figure 1: The controller battery. The prongs are highlighted on the lower end of the battery.

2. Lift the battery from the opposite side of the prongs then slide the battery up and away from the prongs.
3. With the **+** (positive) side facing upwards, insert the new battery under the prongs then press the opposite side into place.
4. Reinstall the cover.

Restoring the Factory Default Network Settings

If the ACM Embedded Controller displays potential errors in the network configuration, you may need to restore the controller to the factory default settings to resolve the issue.
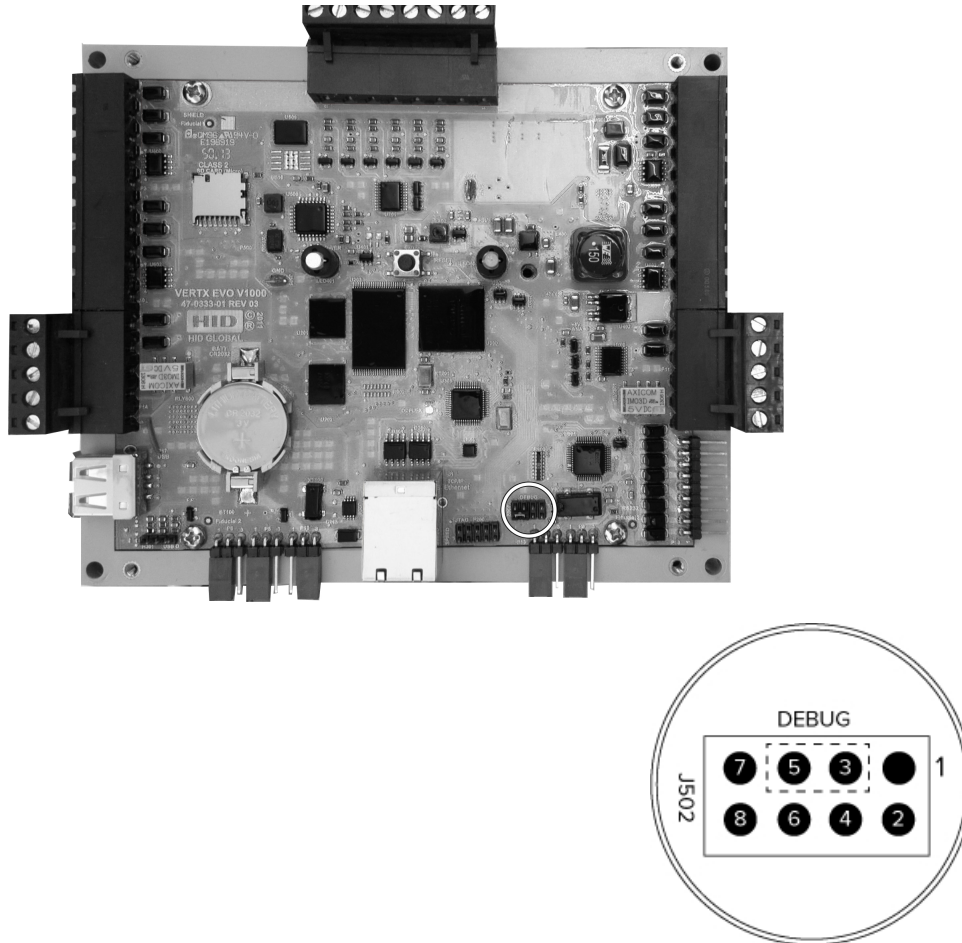
1. Remove the cover on the controller.

Figure 2: The Debug port on the controller.

2. Reboot the controller by pressing the **Reset** button at the center of the controller.

3. While the power LED is green, place the supplied jumper over pins 3 and 5 of the Debug port.

   NOTE: The network reset opportunity occurs for 30 seconds while rebooting the controller.

   After 30 seconds, the power LED flashes **green** five times, indicating success.

   When an error occurs, the LED flashes **red** five times. In both instances, the LED turns off to show that the controller has shut down.

4. Remove the jumper, return it to pins 6 and 8 of the Debug port and reboot the controller.

   The controller resets in approximately 60 seconds.

   Once the reset is complete, the LED returns to green. After the 30 second window, the LED returns to normal Red state. The controller is fully functional during this time.

   ⚠️ **CAUTION —** During the controller rebooting process, all network configuration information is overwritten and returned to the factory default settings.

5. Reinstall the cover.

6. Log in to the ACM Embedded Controller application and configure the controller network settings again.

Configuring Firewall Access

If you need to access the Access Control Manager application from outside the local area network, you may need to configure your firewall to allow TCP data transfer on the following port numbers:

- HTTPS incoming – 443
- HTTP incoming and updates – 80

If you are not familiar with configuring the network firewall, consult with your network or IT administrator.

Power LED Behavior

Outlined below is the Power LED behavior for the ACM Embedded Controller.

After bootup

The Power LED behavior (after boot up in a properly wired system) is as follows:

NOTE: The inputs are dry inputs - they do not have AC voltage or battery voltage applied. The power supply has outputs that trigger when it loses AC voltage and when battery voltage drops below a certain voltage.

Light color	Decscription
Green	- AC Fail terminal is closed - Batt Fail terminal is closed State of the inputs: The power supply has both AC and reserve Battery voltage.
Amber	- AC Fail terminal is closed - Batt Fail terminal is open State of the inputs: The power supply has AC power but does not have reserve battery voltage. There is no immediate need to worry but if there was a power outage the system will go offline.
Red	- AC Fail terminal is open - Batt Fail terminal is closed State of the inputs: The power supply does not have AC Power and is currently running on the reserve battery voltage. This is a very immediate concern. When the batteries run out, the system will go offline.
No light	- AC Fail terminal is open - Batt Fail terminal is open State of the inputs: The system is without power and the LED is off.

During bootup

The power LED during bootup for ACM Embedded Controller, adheres to the following sequence:

- Red (for about 40 seconds).
- Blinking Green (for about 6 seconds; it will blink 4 or 5 times).

- Green (for about 30 seconds).
- Off (for about 15 seconds).
- Red/Amber/Green depending on the fail terminals.

Comm LED Behavior

During bootup, the Comm LED activates around 40 seconds into the bootup.

The Comm LED behavior (after bootup in a properly wired system) for ACM Embedded Controller (1.6.2.0 or greater) should always be green indicating that the ACM Embedded Controller software is communicating with the on-board Controller firmware.

If the Comm LED is red then contact Avigilon Technical Support at support@avigilon.com (or see http://avigilon.com/contact-us/ for other contact details).

Configuration Checklist

Contact

	Name	Email	Phone Number
□	IT contact		
□	Sales / PM		

Hardware

	Name	Source	Part Number
□	Ethernet cable		
□	Computer with web browser		
□	Hub (optional)		
□	AC electrical outlet or surge protector (optional)		

Configuration Data

□	Connection type	Network (DHCP or Static)
□	ACM Embedded Controller IP address	
□	Netmask	
□	Gateway	
□	Primary DNS server	
□	Secondary DNS server	
□	Broadcast address	
□	Domain name	
□	Virtual port enabled	Yes □ No □
□	SSH Enabled	Yes □ No □
□	Login password	

Installation Worksheet

Complete this worksheet to maintain a record of your system settings.

Record if the input is wired:

1. **Normally Open** or **Normally Closed**
2. **Unsupervised** or **Supervised** (2.2K active or 4.4K active)
3. What type of device is attached

Record if output is wired:

1. **Normally Open** or **Normally Closed**
2. What type of device is attached

ACM Embedded Controller Information

Customer Number:		Contact:	
Installed Location:		MAC Address:	
Hostname:		IP Address:	
Tamper:		AC Fail:	BATT Fail:
Input 1:	Input 2:	Relay 1:	Relay 2:

HID VertX V100 Series Information

Interface Address: (0-31)		Interface Type: (V100, V200, V300)	
Tamper:	AC Fail:		BATT Fail:

V100 Door / Reader Interface

Reader 1:		Reader 2:	
Door Switch 1:	REX 1:	Door Switch 2:	REX 2:
Strike Relay 1:	Aux Relay 1:	Strike Relay 2:	Aux Relay 2:

V200 Input Monitor Interface

Input 1:	Input 2:	Input 3:	Input 4:
Input 5:	Input 6:	Input 7:	Input 8:
Input 9:	Input 10:	Input 11:	Input 12:
Input 13:	Input 14:	Input 15:	Input 16:
Relay 1:	Relay 2:		

V300 Output Control Interface

NOTE: Functionality may be limited depending on the version of the ACM Embedded Controller application.

Relay 1:	Relay 2:	Relay 3:	Relay 4:
Relay 5:	Relay 6:	Relay 7:	Relay 8:
Relay 9:	Relay 10:	Relay 11:	Relay 12:
Input 1:	Input 2:		