



eMerge 50P
eMerge 5000P

Hardware Installation Guide

May 2013

Linear LLC
1950 Camino Vida Roble
Suite 150
Carlsbad, CA 92008
www.linearcorp.com

Copyright

© Linear LLC. All rights reserved.

This guide is protected by copyright and all rights are reserved by Linear LLC. It may not, in whole or in part, except insofar as herein directed, be copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form without prior written consent of Linear LLC.

eMerge™ is a registered trademark of Linear LLC.

Contents

- Introduction.....1**
 - Where to Go for More Information 1
 - Installation Notes..... 2
- Preparing to Install.....3**
 - eMerge System Overview 3
 - Topology Considerations..... 3
 - System Requirements 5
 - Network Requirements 5
 - Browser Requirements..... 5
 - Power Requirements 5
 - Environmental Requirements..... 6
 - Static Electricity Precautions 6
 - Installation Overview Checklist 7
 - eMerge Part Numbers..... 7
- Mounting the Cabinet.....8**
- Installing Additional Blades.....9**
 - How Slot and Position Numbers are Determined..... 9
- Connecting Readers, Inputs, Outputs, and Temperature Sensors12**
 - Wiring Readers..... 12
 - Connecting Readers..... 13
 - Wiring Inputs..... 14
 - Connecting Inputs..... 15
 - Input Supervision Types..... 16
 - Normally Closed Parallel Resistor Input Circuits..... 17
 - Normally Closed Series Resistor Input Circuits 17
 - Normally Closed Unsupervised Input Circuits 18
 - Normally Open Parallel Resistor Input Circuits 18
 - Normally Open Series Resistor Input Circuits..... 19
 - Normally Open Unsupervised Input Circuits..... 19
 - Wiring Outputs 20
 - Connecting Outputs 22
 - Wiring Temperature Sensors 23
 - Connecting Temperature Sensors..... 25
- Wiring the Network Connection.....26**
- Wiring Power27**
 - Wiring the PIP 27
 - Wiring a DC Power Source 27
- Adding a Backup Battery29**
- Setting Up a Small Configuration Network.....30**
- Testing and Troubleshooting32**
 - The Mini-ITX Network Controller..... 32
 - Interpreting the System Status LED on the Cabinet Door..... 33

- Interpreting Beeps33
- The Access Control Blade34
- Input, Output, and Temperature Blades34
 - Interpreting Access Control, Input, Output, and Temperature Blade LEDs35
- Removing Blades35
- Using the Power, Reset, and Revert Buttons on the eMerge50/5000P36
- Hardware and Third-Party Device Specifications.....39**
 - Environmental Requirements39
 - Power Requirements.....39
 - Reader Power Available from the eMerge System39
 - Wiring Requirements and Specifications39
 - Readers40
 - Cameras40
 - Temperature Sensors41
 - Software Protocols and Standards41
 - Single Facility Maximum Capacities41
 - Minimum System Configuration.....41
- Index.....42**

Introduction

This guide describes the hardware installation for a Linear eMerge system. It includes:

- A system overview and topology considerations (page 3), and system requirements (page 5).
- Instructions for mounting the cabinet (page 8).
- Instructions for adding any required additional blades (page 9).
- Instructions for connecting readers, inputs, outputs, and temperature sensors (page 12).
- Instructions for wiring the network connection (page 26).
- Instructions for wiring power (page 27).
- Instructions for adding a backup battery (page 29).
- Instructions for setting up a small network, if necessary, which can be used to complete the initial software setup before the system is connected to the corporate network (page 30).
- Testing and troubleshooting information (page 32).
- Information on interpreting the various system LED states and beeps (page 32).
- Hardware and third-party device specifications (page 39).

Note: Check the Linear web site (www.linearcorp.com) for updated specifications, lists of supported devices, and software updates.

Where to Go for More Information

When the hardware installation is complete, refer to the following publications:

- The “Initial Software Setup Guide” for information on setting initial IP values and logging into the security application.
- The “Network Node Hardware Installation Guide” for information on installing additional Network Nodes and application extension blades.

Installation Notes

Note to Installers

Install according to ANSI/NFPA70 and local codes and use only UL Listed equipment.

CAUTION

OBSERVE STATIC ELECTRICITY PRECAUTIONS WHEN HANDLING AND INSTALLING SYSTEM COMPONENTS. THESE COMPONENTS CAN BE DAMAGED BY STATIC DISCHARGE.

Disclaimer

Linear LLC provides this publication “as is,” without warranty of any kind, either expressed or implied. Linear LLC shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this guide.

Preparing to Install

eMerge System Overview

eMerge is a web-based system that does not require a computer to operate. A computer is required only for system setup, programming, and monitoring.

eMerge is provided in a controller cabinet containing the following:

- A Mini-ITX Network Controller running the controller application software.
- A SAM-E module providing network connectors and power buttons.
- A Network Node blade running the node application software.
- An access control blade that supports up to two card readers.

You can add up to three additional application extension blades to the cabinet. For more information, see “Connecting Readers, Inputs, Outputs, and Temperature Sensors” on page 12.

Note: The cabinet for the supported eMerge expansion node is the same except that it does not contain a Mini-ITX Network Controller.

Topology Considerations

Issues to consider when selecting a topology for the installation include simplicity, security, wiring requirements, bandwidth requirements, site distances, current network topology, and the number of security system resources to be wired.

The simplest topology, shown in Figure 1, will be the most common case for small systems. All users and network resources share the same LAN.

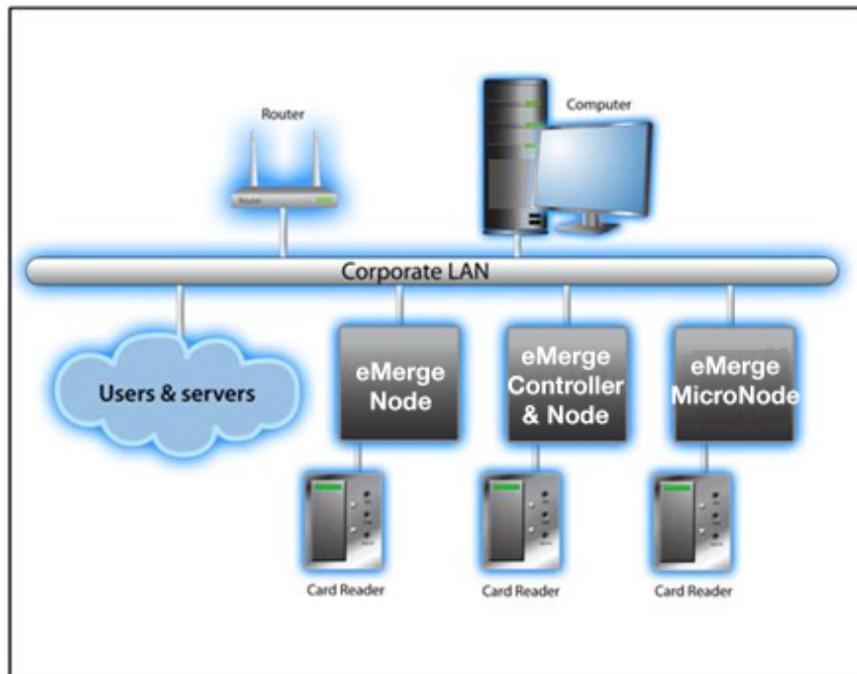


Figure 1. The simplest topology for a eMERGE installation. (Not Evaluated by UL)

This topology shown in Figure 2 is somewhat more complicated, but it is inherently more secure.

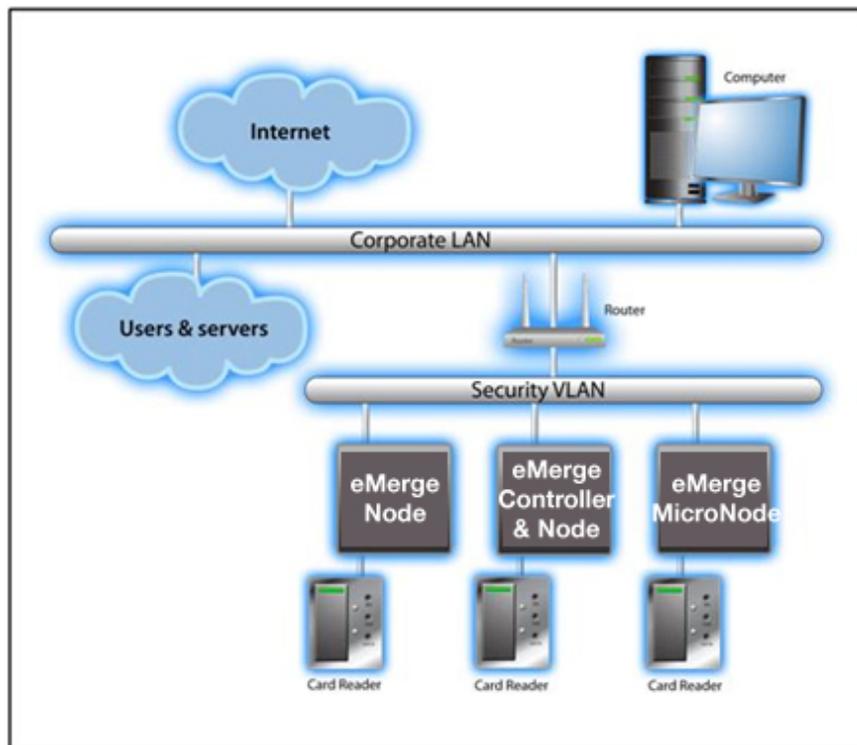


Figure 2. A more secure topology that includes a VLAN. (Not Evaluated by UL)

In this case, a security VLAN is used to create a subnet for the security system. As a result, the corporate LAN does not directly carry traffic between the Nodes and the Controller.

The advantages to this topology are increased network security and decreased bandwidth requirements. The disadvantages include potentially increased wiring, and greater complexity.

System Requirements

Network Requirements

The application is designed to work with Ethernet networks using TCP/IP. Although it will operate on 10baseT networks, 100baseT is preferred. A 100baseT network may be required for good performance if IP cameras and/or digital video are used.

Note: Networking is not evaluated by UL, only standalone systems.

Before beginning the installation, obtain the following information from the customer's network administrator.

- Static IP addresses for the blade running combination Controller application software, and for each blade running node-only application software.
- Subnet mask for the controller and nodes.
- Gateway IP address.
- DNS (Domain Name Server) IP address(es), if any.

Browser Requirements

The application is designed to work with the following web browsers:

- Microsoft Internet Explorer Versions 8 and 9 (recommended)
- Mozilla Firefox Versions 10 and 11
- Apple Safari Version 5

Power Requirements

- DC power is provided via a Listed UL 603 power-limited supply and must have $12V \pm 1\%$ DC at a minimum of 5 amps. Source power must come from a *separate circuit* with its own breaker and an isolated earth ground.

Environmental Requirements

- Operating temperature range: 32° F to 120° F (0° C to 49° C).
- Operating relative humidity range: Up to 85% non-condensing.

Static Electricity Precautions

The system components can be damaged by static discharge. Observe the following precautions when handling and installing these components:

- Discharge by touching a ground before handling components.
- Wear a grounded wrist strap or stand on a grounded mat.
- Limit movement to limit static buildup.

Installation Overview Checklist

The major steps required for installing an eMerge system are as follows:

- Review the information in this section to prepare for the installation.
- Mount the cabinet (page 8).
- Install any required additional blades (page 9).
- Connect readers, inputs, outputs, and temperature sensors (page 12).
- Wire the network connection (page 26).
- Connect the system to a power source (page 12).
- Add a backup battery (page 29).
- Set up a small configuration network, if necessary (page 30).

This checklist presents a logical sequence for completing the installation. Although it is not necessary to perform the steps in exactly this order, everything should be plugged in **BEFORE** powering the unit.

CAUTION: Observe static electricity precautions when handling and installing system components. These components can be damaged by static discharge.

eMerge Part Numbers

Network Node Blade	0-587009
Access Control Blade	0-580100-L
Input Blade	0-580110
Output Blade	0-580120
Temperature Blade	0-580130
eMerge50P	230219P
eMerge5000P	230220P
Expansion Node	0-587004

Mounting the Cabinet

There are three holes in the back of the eMerge cabinet for mounting it to the wall, as shown in Figure 3.

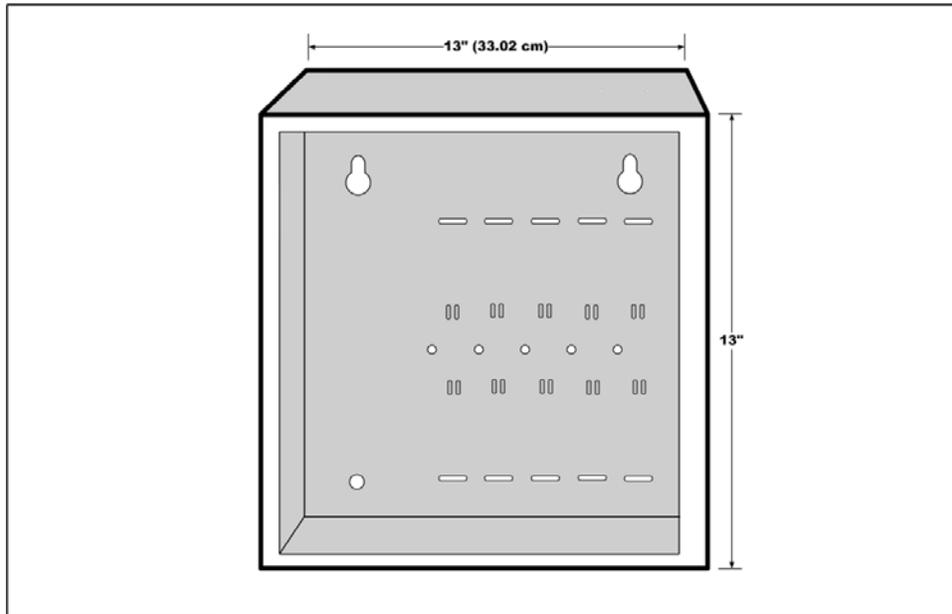


Figure 3. Wall mount eMerge cabinet.

The two mounting holes near the top of the cabinet are keyholes and should be mounted first. The lower hole can then be drilled using the cabinet as a template.

Mounting hardware should be sufficient to hang a 25 pound (11.34 kg) load. Wall space required to fully open the cabinet doors is twice the width of the cabinet. The door opens from right to left as you face the cabinet. It is recommended that the cabinet be mounted in a location where the door can be fully opened.

Installing Additional Blades

The eMerge cabinet has five slots in the aluminum chassis. The leftmost slot is reserved for the Network Node blade running the node application software. The access control blade provided is mounted to its right, in slot 1.

The remaining slots, numbered 2 through 4, can hold any combination of access control, input, output, and temperature application extension blades.

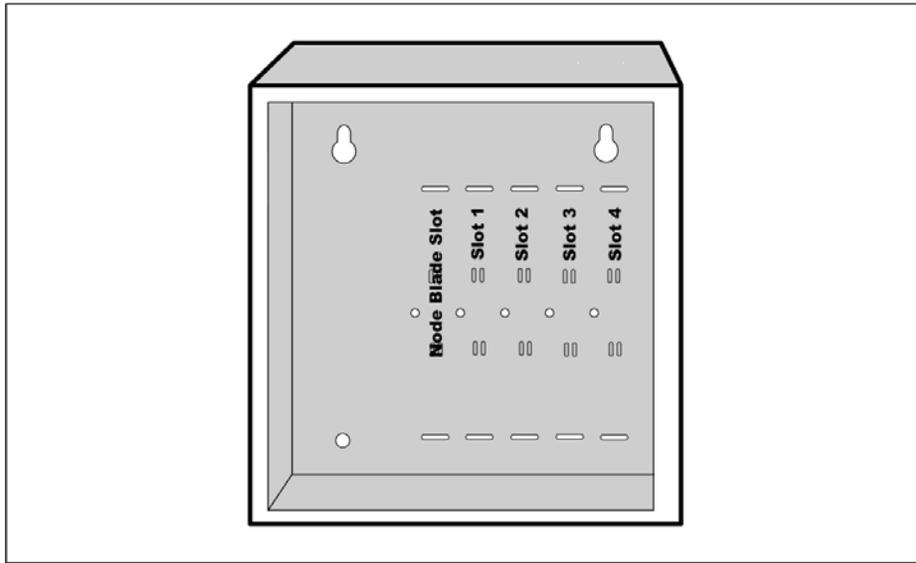


Figure 4. Slots for installing application extension blades.

You can use the slots in any sequence you choose. Note that the slots are physical mounting points only. The electrical connection is made through the ribbon cable, shown in Figure 5 on page 10.

How Slot and Position Numbers are Determined

Regardless of the physical slot in which a blade is mounted, its slot number is determined by the ribbon-cable connector you plug into the blade. This is because the ribbon cable (shown in Figure 5) is a bus, and a blade's position on the bus determines its slot number.

For example, even if a blade is mounted in physical slot 3, if it is attached to ribbon cable connector 4, the application will see it in slot 4 on the bus.

Important: The blade running the node application software must be attached to the leftmost connector on the ribbon cable.

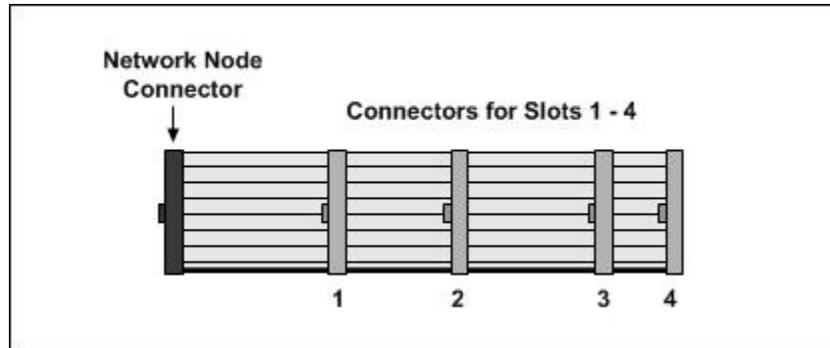


Figure 5. Ribbon cable bus viewed from above.

Position numbers are determined by the connector position on the blade itself. For more information, see the sections “Connecting Readers” (page 12), “Connecting Inputs” (page 14), and “Connecting Outputs” (page 20).

CAUTION: Blades are not hot-swappable. Before connecting or disconnecting blades in the cabinet, be sure to remove power from the system, after stopping all processes.

To install a slot-mounted blade in the cabinet:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, **remove power from the system**.
5. Thread the provided standoff tube down onto the threaded post on the chassis, next to the slot where you will insert the additional blade.
6. Be sure that you are grounded, and then insert the additional blade into the slot on the chassis with the ribbon cable connector toward the bottom of the cabinet. See the following diagram.
7. Place the provided lock washer over the top of the standoff, and thread the provided screw through the flange and down into the top of the standoff and snugly down onto the lock washer. See the following diagram.

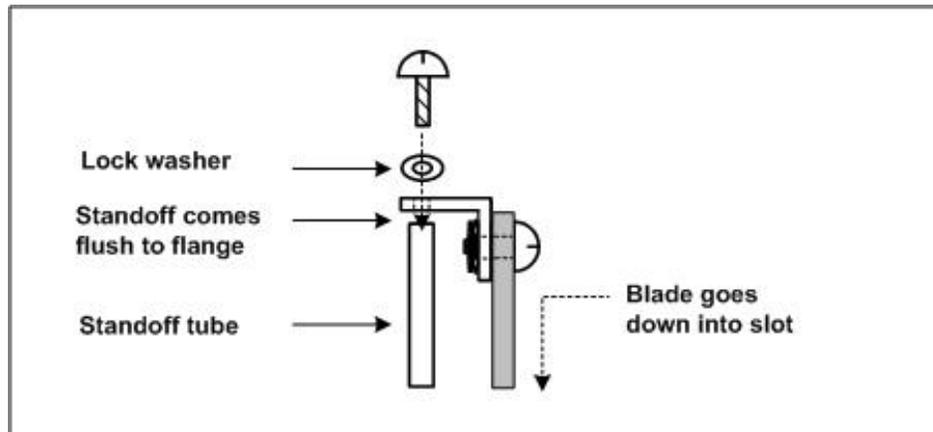


Figure 6. Installing a slot-mounted blade.

8. Connect the ribbon cable from the blade in the leftmost slot to the newly installed blade.

The connector is polarized. Make sure that the center bump fits into the opening for it on the connector located on the blade.
9. Press the connector firmly into place until you hear the click of the extraction levers snapping into vertical position. You may have to press the extraction levers into full vertical position before you will hear the click.

Connecting Readers, Inputs, Outputs, and Temperature Sensors

Each eMerge supports up to four application extension blades in any combination. There are four types of application extension blades:

- Access control blade: Includes two Wiegand reader interfaces, four supervised inputs, and four relay outputs. (6V / 70mA)
 - An access control blade is included in the cabinet.
 - An access control blade is compatible with UL listed 26 bit, 128 bit, and 200 bit Wiegand readers.
- Input blade: Includes eight supervised inputs. (6V / 60mA)
- Output blade: Includes eight relay outputs. (6V / 55mA)
- Temperature blade: Includes eight temperature input points. (Not UL listed.)

You can easily add application blades to your system in the future by following the steps on page 10.

This section describes how to connect readers, inputs, outputs, and temperature sensors.

Wiring Readers

CAUTION: Make sure all power is removed from the Network Node prior to wiring and/or connecting any reader to a blade.

To wire readers:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, **remove power from the system**.

Note: Steps 1-4 apply only to cabinets containing both a Mini-ITX Network Controller and a Network Node. Expansion Node cabinets simply require that you remove power before connecting any reader.

5. Be sure that you are grounded, and then pull the wiring through a knockout in the cabinet.

Wire specification: Twisted, shielded 22 AWG Belden #9536 (6 conductor) or equivalent. Maximum distance: 500 feet (152 meters).

- Connect the reader wires to the 7-pin reader connector provided, as shown in the following diagram.

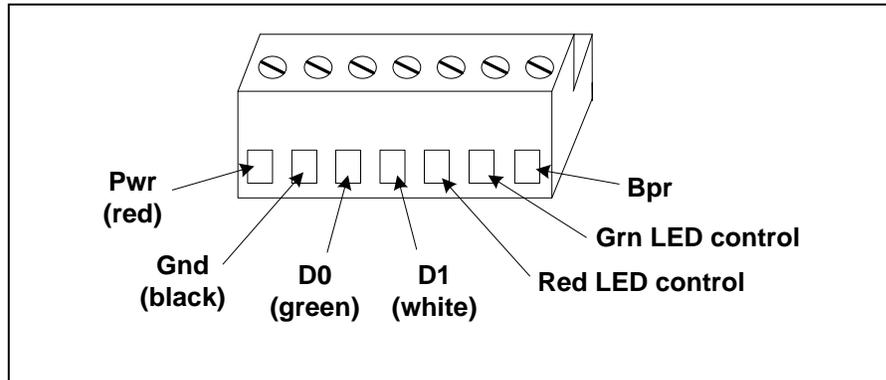


Figure 7. The 7-pin reader connector.

Note: Refer to the documentation provided by the reader manufacturer for LEDs and Bpr (Beeper) wire colors.

- Be sure there is no power to the system.
- Plug the connector into a reader position on the access control blade.

Connecting Readers

CAUTION: Make sure all power is off before connecting any reader to a blade.

Access control blades have two, 7-pin reader connectors mounted on the blade, as shown in the following figure.

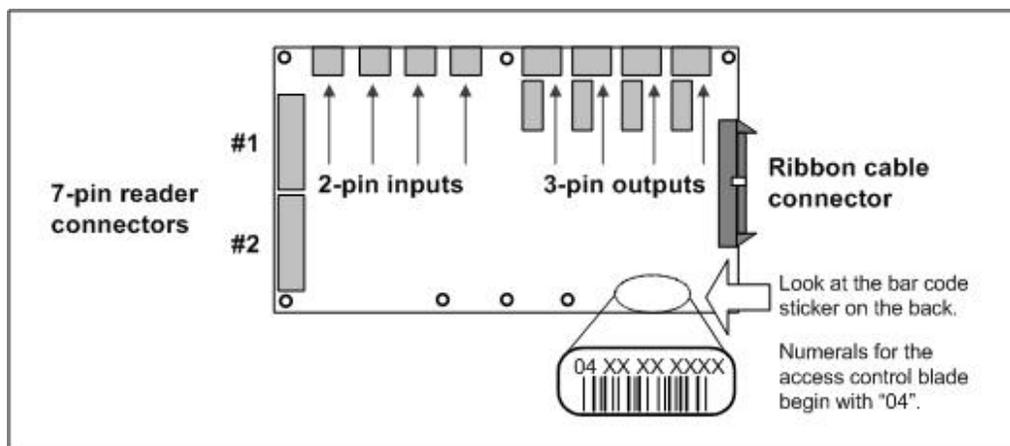


Figure 8. The two 7-pin reader connections on the access control blade.

Note: Each access control blade provides a maximum of 400mA peak power to the readers, 1 x 400mA or 2 x 200mA per board (1.6A maximum is supplied). If the reader(s) connected to the access control blade draw more than 400mA, external power must be supplied to these readers by a UL603 Power Limited Supply .

The access control blade will not function properly if the reader(s) draw more than 400mA peak.

The color-coded wires from the reader wiring harness must be connected to the 7-pin connector. The color-coding for Power (red), Ground (black), Data 0 (green), and Data 1 (white) is Security Industry Association (SIA) standard.

- **Reader Beeper control:** This varies by manufacturer and model. Refer to the documentation provided by the reader manufacturer for details on your particular reader. Typically, the reader will beep for the duration of a momentary unlock, or until the door is opened. This occurs whether the door is unlocked by a valid card read or from the application. If no beeper is desired, do not connect the beeper control wire.
- **Reader LED control:** This varies by manufacturer and model. Some use two-wire LED control and some use one-wire control. Refer to the documentation provided by the reader manufacturer for details on your particular reader. Control involving signal pulsing to change LED color is not supported.

The access control blade has both red and green LED control connections. The 7-pin reader connector wiring is shown in Figure 7 on page 13.

Note: LED display behavior for your particular reader may vary. Refer to the reader manufacturer documentation.

Wiring Inputs

Inputs are dry contact only. An input looks for a change in resistance, not a change in voltage.

CAUTION: Make sure all power is removed from the Network Node prior to wiring and/or connecting any input to a blade.

To wire inputs:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, **remove power from the system**.

Note: Steps 1-4 apply only to cabinets containing both a Mini-ITX Network Controller and a Network Node blade. Expansion Node cabinets simply require that you remove power before connecting any input.

5. Be sure that you are grounded, and then pull the wiring through a knockout in the cabinet.
Wire specification: Twisted, shielded 22 AWG Belden #9462 or equivalent. Maximum distance: 2000 feet (610 meters).
 6. Connect the input wires to the 2-pin input connector provided.
 7. **Be sure there is no power to the system.**
 8. Plug the connector into an input position on an access control blade or input blade. These connectors are polarized and can only be inserted one way.
 9. If you are connecting previously wired or previously installed inputs, determine the input supervision type: normally open (NO) or normally closed (NC); zero, one, or two resistors; or single resistors in parallel or series.
You will need this information for the software setup of the input. See the section, “Input Supervision Types” on page 16.
-

Note: The system supports the use of 1k Ohm resistors only.

10. If you are installing the input device, refer to the input device manual to determine if the device circuit is normally open (NO) or normally closed (NC).
11. Select the input supervision type you want, then install the supervision resistor(s) at the end of the input line.

Connecting Inputs

CAUTION: Make sure all power is off before connecting inputs to blades.

Inputs can be connected either to an access control blade or to an input blade. Access control blades have four male, 2-pin input connectors mounted on the blade as shown in Figure 9.

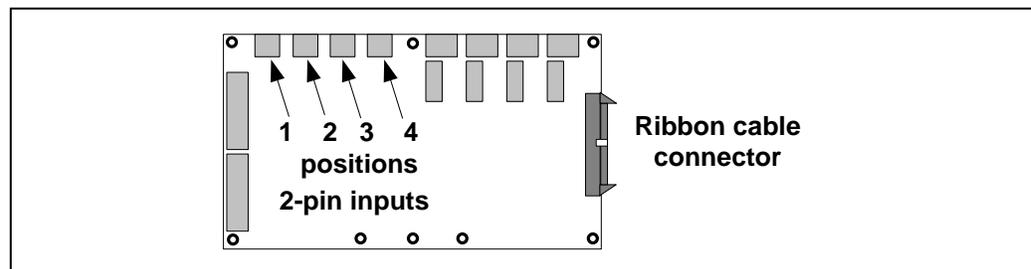


Figure 9. Input connectors mounted on the access control blade.

Input blades have eight male, 2-pin input connectors mounted on the blade, as shown in Figure 10.

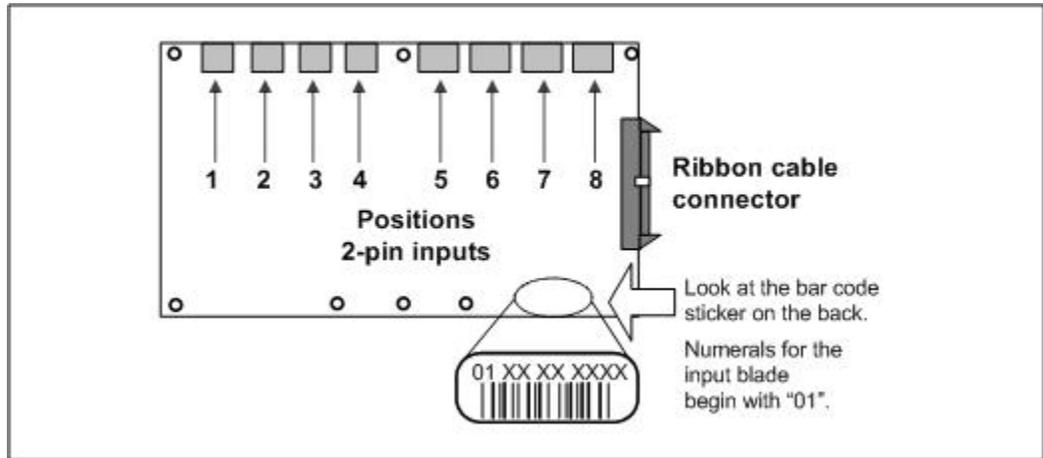


Figure 10. Input connectors mounted on the input blade.

Input blades and temperature blades look very much alike. To tell them apart, look at the bar code sticker on the back of the blade. The numerals on the bar code sticker for an input blade begin with “01,” as shown above. The numerals on the bar code sticker for a temperature blade begin with “08.”

If more inputs are required beyond the four provided on the access control blade or the eight provided on the input blade, additional access or input blades can be installed in the cabinet. For instructions, see “Installing Additional Blades” on page 9.

Input Supervision Types

Note: The system supports the use of 1k Ohm resistors only.

Dual Resistor Input Circuits

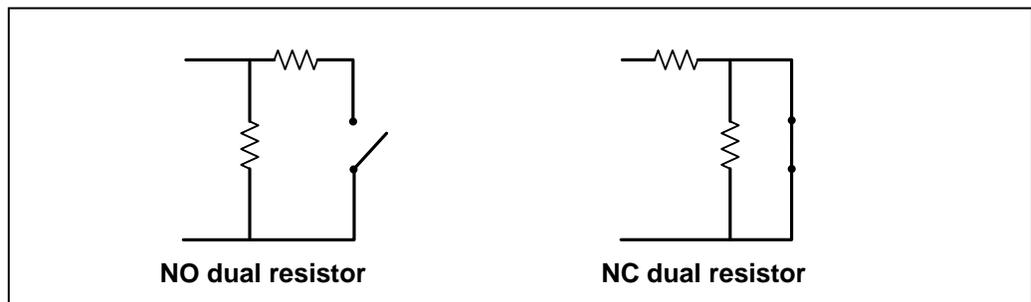


Figure 11. Normally open and normally closed dual resistor input circuit.

The configuration of resistors shown in Figure 11 must be installed for supervised input resistance values to be properly read by the system. The four states of the dual resistor input circuits are read according to the values in the following table.

Input State	Resistance Values
Normal	1k Ohms
Alarm	0.5k Ohms or 2k Ohms
Short	0k Ohms
Open	No current (∞ Ohms)

Normally Closed Parallel Resistor Input Circuits

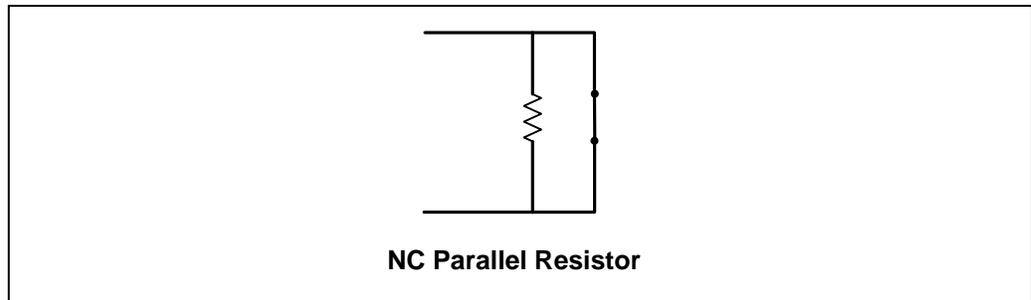


Figure 12. Normally closed parallel resistor input circuit.

The three states of the normally closed parallel resistor input circuit are read according to the values in the following table.

Input State	Resistance Values
Normal	0k Ohms
Alarm	1k Ohms
Open	No current (∞ Ohms)

Normally Closed Series Resistor Input Circuits

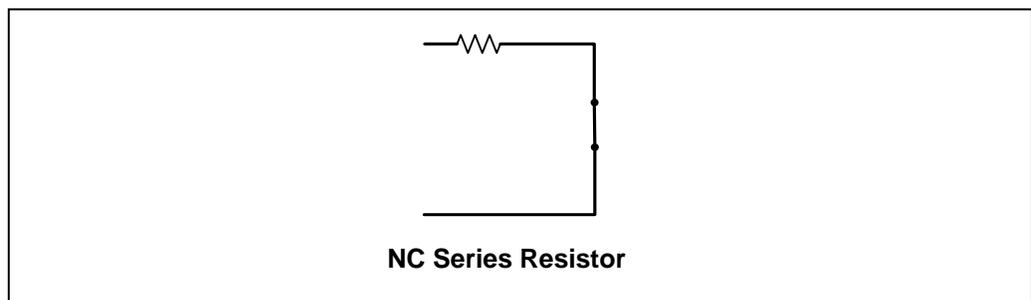


Figure 13. Normally closed series resistor input circuit.

The three states of the normally closed series resistor input circuit are read according to the values in the following table.

Input State	Resistance Values
Normal	1k Ohms
Alarm	No current (∞ Ohms)
Short	0k Ohms

Normally Closed Unsupervised Input Circuits

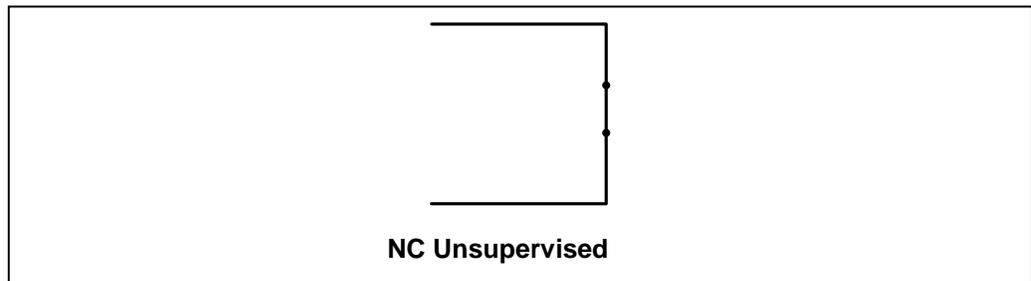


Figure 14. Normally closed unsupervised input circuit.

The two states of the normally closed unsupervised input circuit are read according to the values in the following table.

Input State	Resistance Values
Normal	0k Ohms
Alarm	No current (∞ Ohms)

Normally Open Parallel Resistor Input Circuits

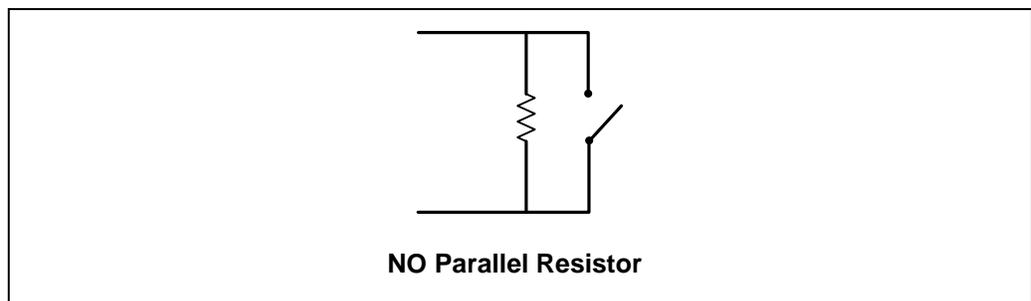


Figure 15. Normally open parallel resistor input circuit.

The three states of the normally open parallel resistor input circuit are read according to the values in the table below.

Input State	Resistance Values
Normal	1k Ohms
Alarm	0k Ohms
Open	No current (∞ Ohms)

Normally Open Series Resistor Input Circuits

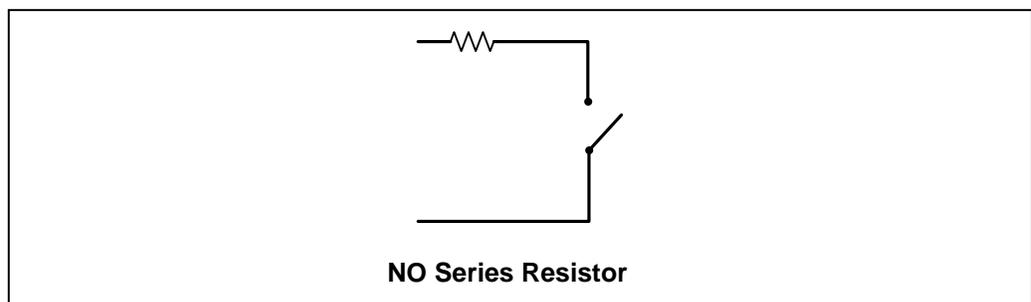


Figure 16. Normally open series resistor input circuit.

The three states of the normally open series resistor input circuit are read according to the values in the following table.

Input State	Resistance Values
Normal	No current (∞ Ohms)
Alarm	1k Ohms
Short	0k Ohms

Normally Open Unsupervised Input Circuits

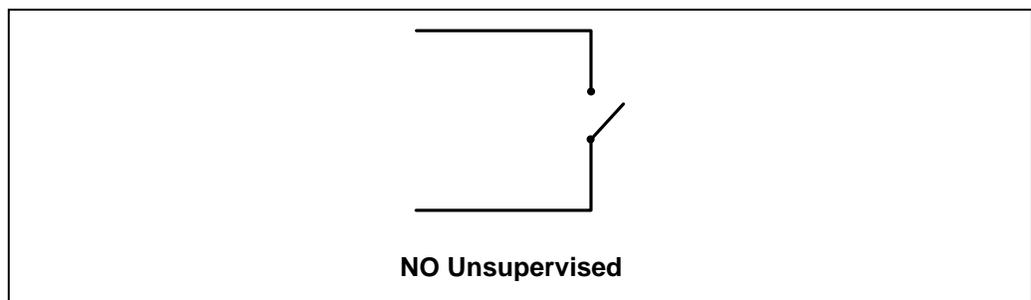


Figure 17. Normally open unsupervised input circuit.

The two states of the normally open unsupervised input circuit are read according to the values in the following table.

Input State	Resistance Values
Normal	No current (∞ Ohms)
Alarm	0k Ohms

Wiring Outputs

CAUTION: Make sure all power is off before wiring and connecting outputs.

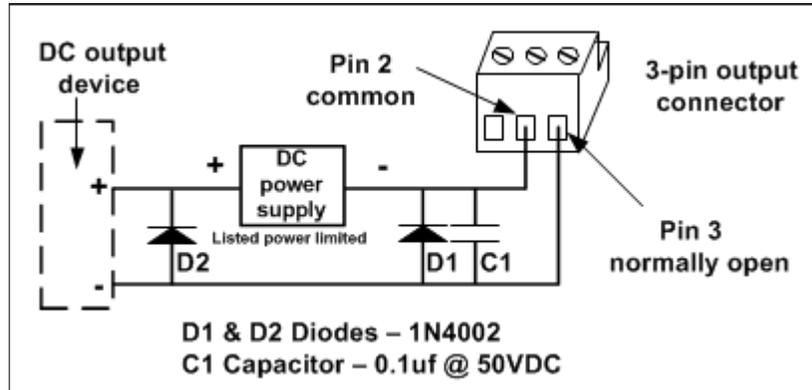
To wire outputs:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, **remove power from the system**.

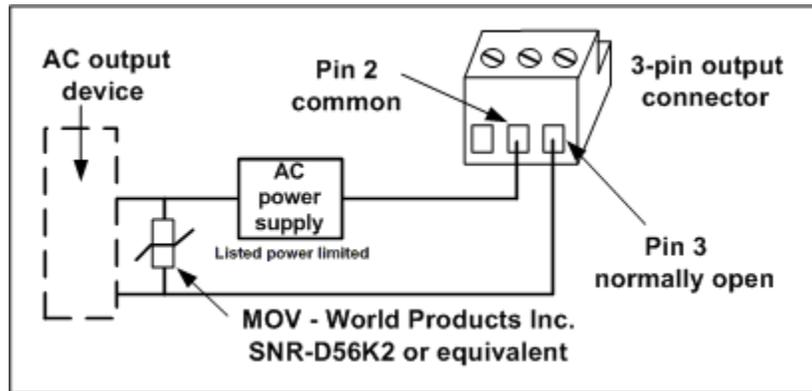
Note: Steps 1-4 apply only to cabinets containing both a Mini-ITX Network Controller and a Network Node blade. Expansion Node cabinets simply require that you remove power before connecting any output.

5. Be sure that you are grounded, and then pull the wiring through a knockout in the cabinet.
Wire specification: Twisted, shielded 22 AWG Belden #9462 or equivalent. Maximum distance: 2000 feet (610 meters).
6. Refer to the output device manual to determine if the device is normally energized or normally not energized, and if it is DC or AC powered.
7. Connect the output wiring to the 3-pin output connector Pin 1 is normally closed (NC). Pin 2 is common. Pin 3 is normally open (NO).
8. **Be sure there is no power to the system.**
9. Plug the connector into an output position on an access control blade or an output blade. These connectors are polarized and can only be inserted one way.

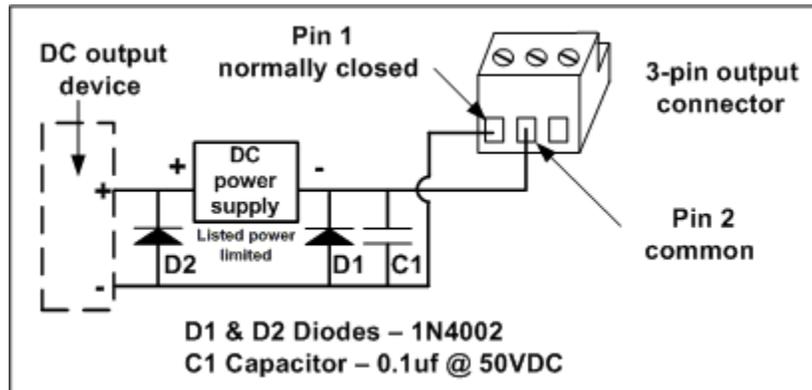
10. If the output device is **DC powered and normally not energized**, use the circuit shown in the following diagram.



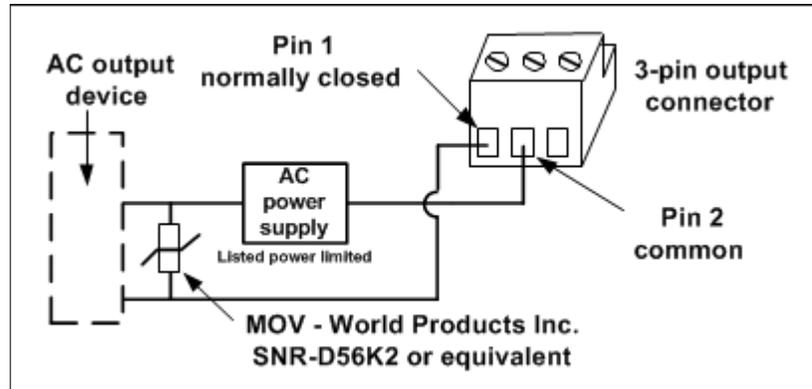
11. If the output device is **AC powered and normally not energized**, use the circuit shown in the following diagram.



12. If the output device is **DC powered and normally energized**, use the circuit shown in the following diagram.



13. If the output device is **AC powered and normally energized**, use the circuit shown in the following diagram.



Connecting Outputs

CAUTION: Make sure all power is off before connecting outputs to blades.

Outputs can be connected either to an access control blade or to an output blade.

Access control blades have four, 3-pin output connectors mounted on the blade as shown in Figure 18, dry contacts rated at 24V/2A.

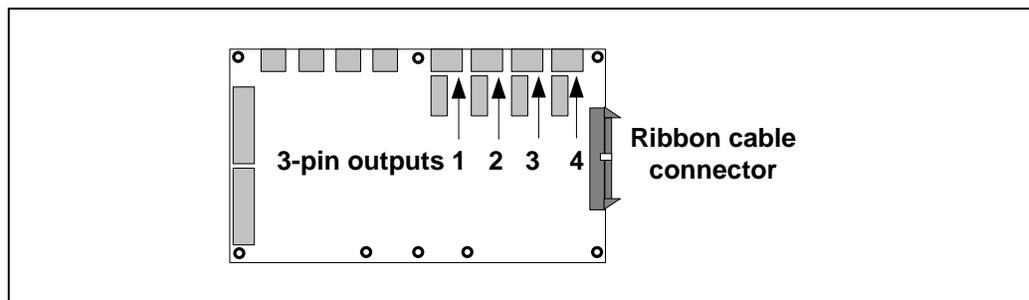


Figure 18. Output connectors mounted on the access control blade.

Note: Output positions on the access control blade are output numbers 1, 2, 3, and 4.

If more outputs are required beyond the four provided on the access control blade, additional access control blades or output blades can be installed in the node cabinet. For instructions, see “Installing Additional Blades” on page 9.

Output blades have eight male, 3-pin output connectors mounted on the blade, as shown in Figure 19. Outputs support any output devices that operate on the following maximum electrical ratings: 24V/2A.

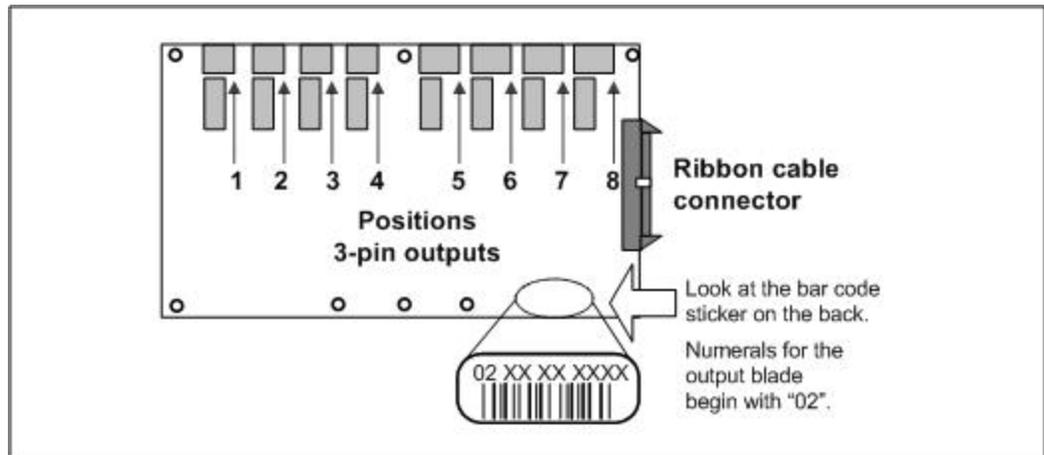


Figure 19. The output blade.

CAUTION: The diodes and varistors shown in the diagrams that follow must be installed as indicated. They are designed to protect the output circuits from induced voltage spikes, which can damage the output circuitry on the blade.

Wiring Temperature Sensors

CAUTION: Make sure all power is off before wiring and connecting temperature sensors.

Wiring temperature sensors are not investigated by UL.

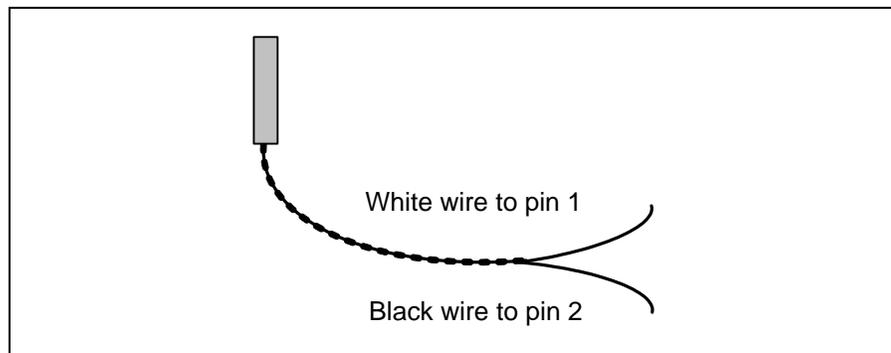
To wire temperature sensors:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, **remove power from the system**.

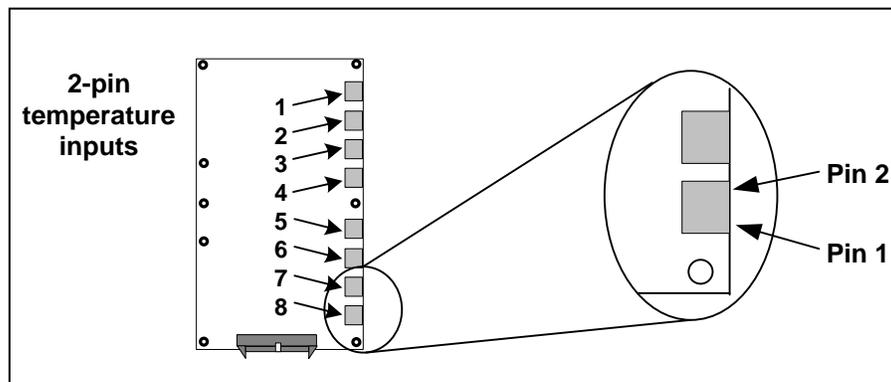
Note: Steps 1-4 apply only to cabinets containing both a Mini-ITX Network Controller board and a Network Node blade. Expansion Node cabinets simply require that you remove power before connecting any temperature sensor.

5. The cable lead from the white temperature sensor wire must connect to pin one, and the cable lead from the black temperature sensor wire must connect to pin two, of the temperature input connector. See the following diagram.

Note: For distances up to 500 feet (152.4 meters), use Category 3 cable. For distances over 500 feet up to 1000 feet (304.8 meters), use Category 5 cable.



6. **Be sure that you are grounded.**
7. Pull the cable through a knockout in the cabinet. Connect the 2-pin temperature input connector to the temperature blade.



Connecting Temperature Sensors

CAUTION: Make sure all power is off before connecting temperature sensors to blades.

A temperature sensor must be connected only to a temperature blade. Temperature blades and input blades look very much alike. The numerals on the bar code sticker on the back of the temperature blade begin with “08,” as shown in Figure 20.

Note: Temperature blades are not UL Listed.

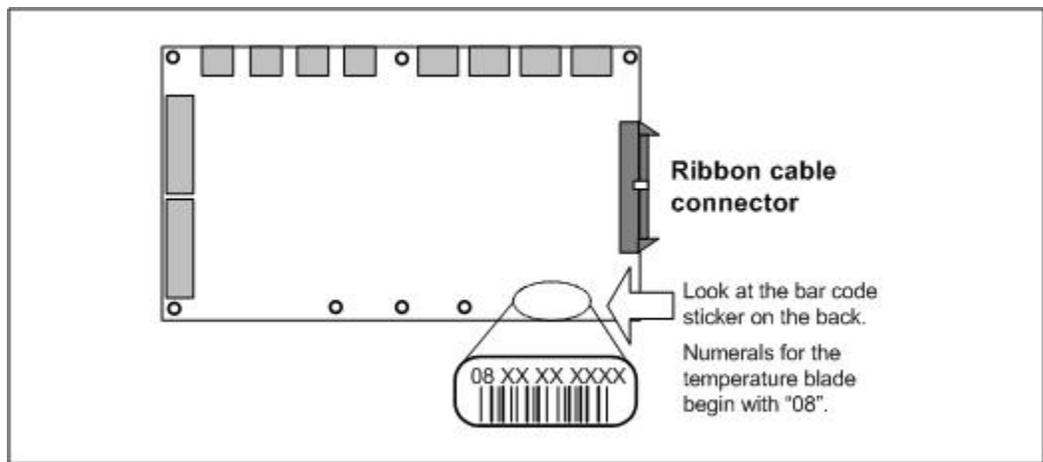


Figure 20. Identifying a temperature blade.

Wiring the Network Connection

To wire the network connection:

1. Pull the Ethernet cable through a knockout in the cabinet.

Cable specification: CAT 5 or better with an RJ-45 connector wired straight through connecting to a network hub, switch, or router.

2. Plug the RJ-45 connector into the network switch port on the SAM-E module mounted in the upper left side of the cabinet.

If the network connection is functioning properly, the Amber LED on the network switch will light.

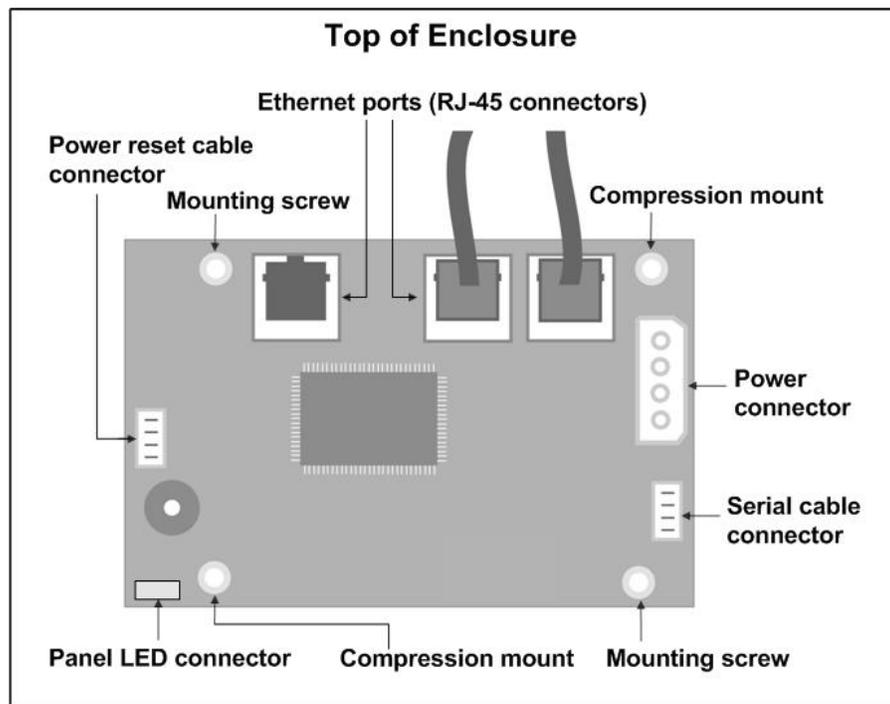


Figure 21. The SAM-E module

Wiring Power

This section describes how to wire the supplied PIP (Plug-in-Power supply) or a DC power source.

The PIP has not been investigated by UL, nor is it UL Listed.

WARNING: Do not apply power to the system until all connections have been made for readers, inputs, outputs, and temperature sensors.

Wiring the PIP

Wire specification: Twisted 16 AWG Belden (2 conductor) or equivalent.
Maximum distance: 10 feet (3.048 meters).

To wire the PIP:

1. Remove the supplied PIP from its packaging.
2. Attach the black, ground wire to the negative pin (pin 4) on the PIP.
3. Attach the red, positive wire to the positive pin (pin 1) on the PIP.
4. Prior to plugging in the PIP, pull the wiring through a knockout in the cabinet.
5. Connect the ground (black) wire to the left side of the terminal block.
6. Connect the positive (red) wire to the right side of the terminal block.
7. Plug in the PIP.

Wiring a DC Power Source

Source power must come from a Listed UL 603 power-limited supply with its own breaker and an isolated earth ground.

If DC power is provided directly to the terminal block via a Listed UL 603 power-limited supply it must have $12V \pm 1\%$ DC at a minimum of 5 Amps.

To wire DC power:

1. Ensure that the DC power source is off, and then and pull the wiring through a knockout in the cabinet.
2. Connect the ground (black) wire to the left side of the terminal block, as shown in the following figure.

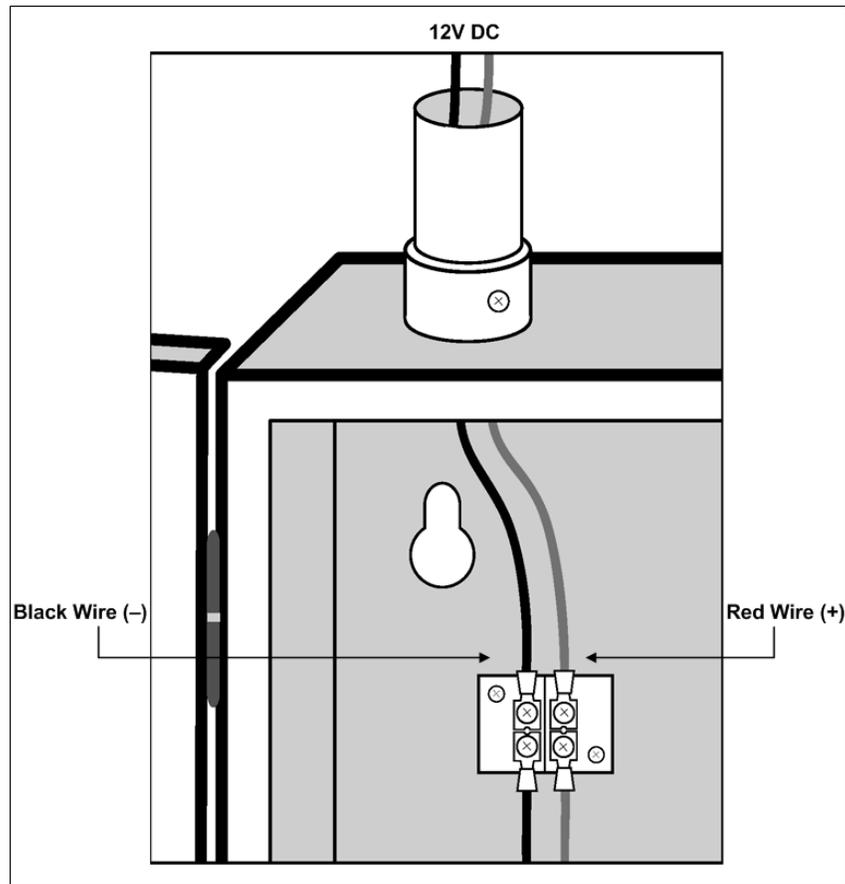


Figure 22. Wiring DC power.

3. Connect the positive (red) wire to the right side of the terminal block.

Adding a Backup Battery

To install a battery backup for node and additional blades:

Battery standby power has not been investigated by UL.

The network node does not include a battery, but one can be provided and mounted on the floor of the wall mount cabinet. The recommended battery is a 12 Volt Sealed or Valve Regulated Lead Acid type with a capacity of either 7AH or 12AH.

The battery cable is included but is not pre-installed. This cable has a 3-pin connector for the node (with the center position empty) and two quick connectors for the battery terminal tabs.

CAUTION: Do not connect the battery terminals and the node until power is supplied to the node.

The specified battery is not meant to function as a UPS, but rather to supply sufficient power for two to six hours of system function in case of power failure.

Do not connect a battery before external power is supplied. It will immediately power up the node and begin to drain the limited battery power. Once external power is supplied, you can connect the battery and it will charge at 12V via the connection with the node.

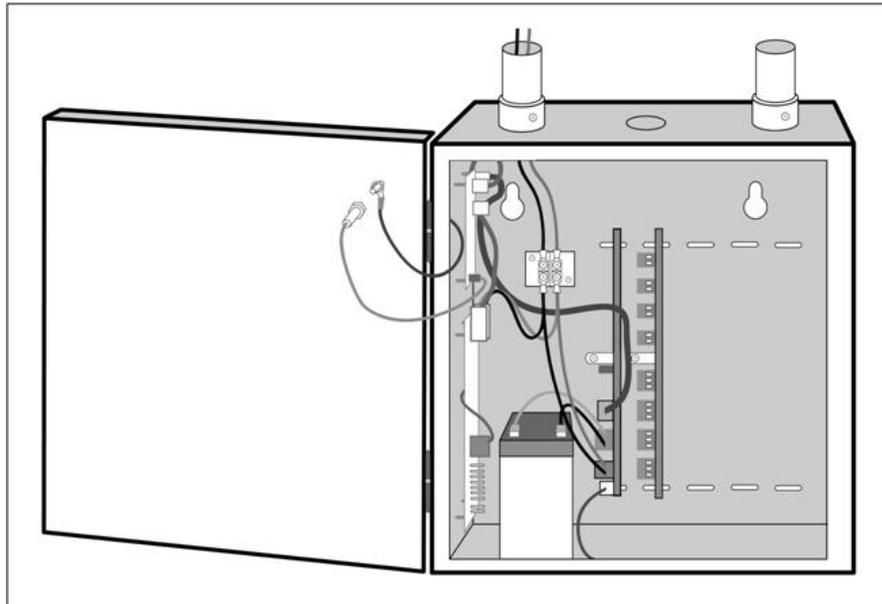


Figure 23. Network Node battery backup installed.

Setting Up a Small Configuration Network

Before connecting the controller to the corporate network, be sure to review the following information. You may need to set up a small network between the eMerge system and a PC that can be used to configure the system before it is connected to the corporate network.

Network Setup has not been evaluated by UL.

The system is configured with a factory default IP address of 192.168.0.250:

- If this is a valid address on a corporate network that is available for use, you can connect the system, in its factory default state, to the corporate network before configuring it. The corporate IT organization will be able to tell you if the default IP address is available on the corporate network.
- If the system's default IP address is not available on the network, it will need to be changed during the initial software setup, to an address provided by the corporate IT organization.

Important: Do not connect the system to the corporate network until its IP address has been changed to a valid address on that network.

To allow the person who will complete the initial software setup to change the system's IP address before connecting it to the network, you should create a small network between the eMerge system and the configuration PC.

To set up a configuration network:

1. Put an Ethernet switch between the eMerge system and the PC that will be used for the initial software setup, as shown in the following figure.

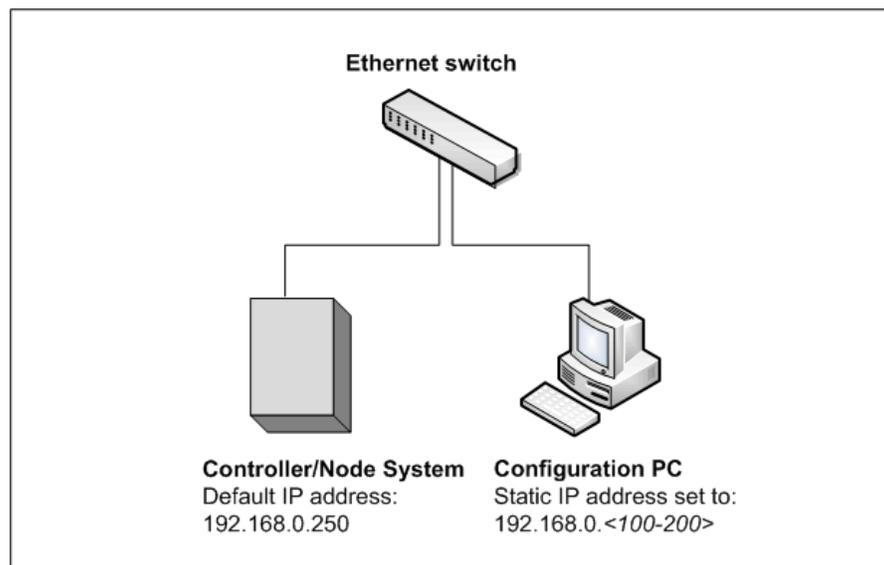


Figure 24. A configuration network.

The Ethernet switch can be of any size, but you should not use a switch that is already being used for another purpose.

2. Ensure that the person who will perform the initial software setup knows that the IP address of the configuration PC must be changed to a static value of 192.168.0.x (where x is a number between 100 and 200). For more information, refer to the “Initial Software Setup Guide.”

Testing and Troubleshooting

For testing and troubleshooting purposes, this section shows the layout of the DN2800MT board and the application extension blades. It also describes how to:

- Interpret various LEDs and beeps.
- Remove blades.
- Use buttons on the SAM-E module to start up, shut down, and reboot the system, and to reset the controller network and login factory defaults.

The Mini-ITX Network Controller

The Mini-ITX Network Controller is shown in the following figure.

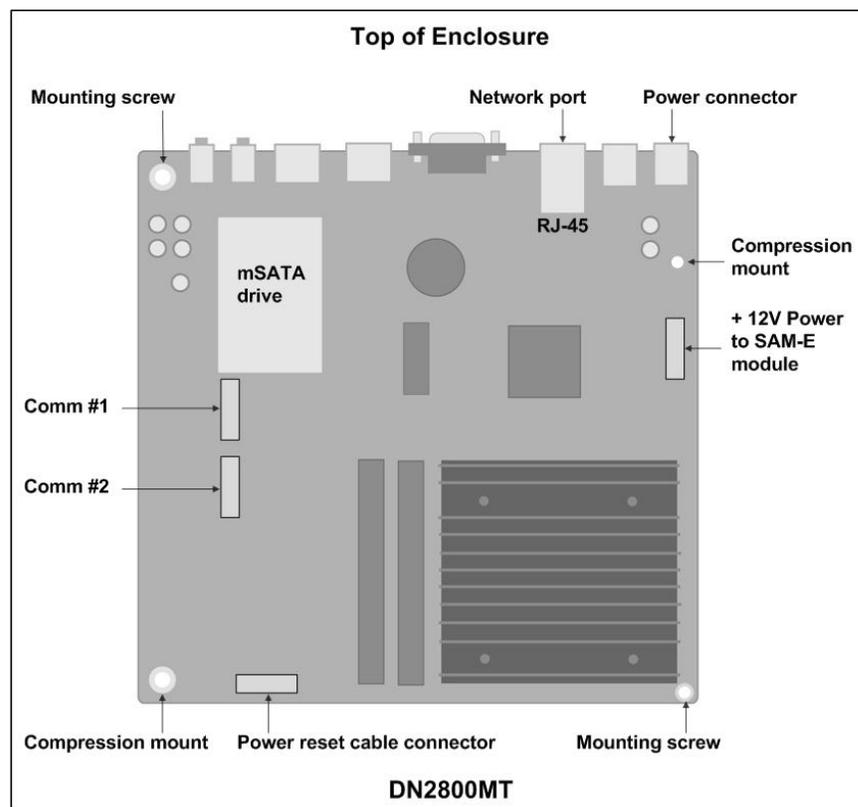


Figure 25. The Mini-ITX Network Controller.

Note: The single LED on the Mini-ITX Network Controller is green when the power is on and off when there is no power to the system.

Interpreting the System Status LED on the Cabinet Door

LED State	Meaning
OFF	System is down
BLINKING RED	System is starting up or shutting down, but the controller does not see a gateway to a network
ON RED	System is up, but the controller does not see a gateway to a network
BLINKING BLUE	System is starting up or shutting down and the controller sees a gateway to the network
ON BLUE	System is up and the controller sees a gateway to the network

Interpreting Beeps

# of Beeps	Meaning
Shutting Down:	
Two beeps	Most operating tasks have been completed and the file system is about to be un-mounted. After waiting a few seconds, you can remove power.
Powering Up:	
One beep	Startup is complete and you can log into the system. This may take several minutes.
Resetting System IP and Login Factory Defaults (via the hardware)	
Three beeps	The IP and login factory defaults have been reset via the REVERT button (see page 38).
Resetting System Configuration Factory Defaults (via the software)	
Three beeps	The system configuration factory defaults have been reset via the Initmode page in the UI, and the system is about to reboot.

Note: Unlike the controller, Network Nodes do not beep at any time. If readers are connected, you may hear beeps from the readers as they power up.

The Access Control Blade

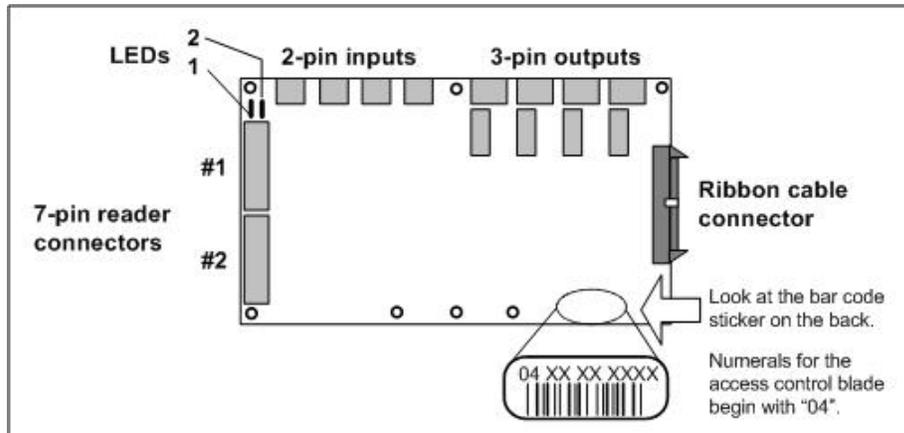


Figure 26. Access Control Blade.

Input, Output, and Temperature Blades

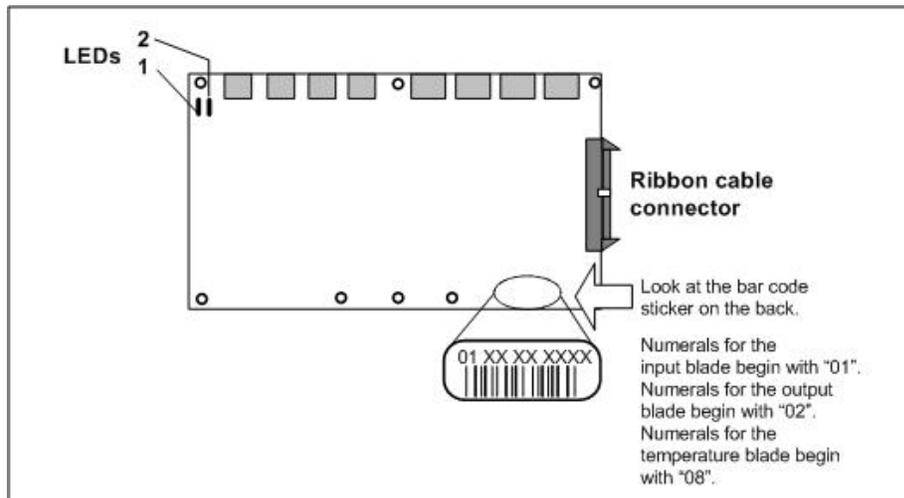


Figure 27. Input, output, and temperature blades.

Interpreting Access Control, Input, Output, and Temperature Blade LEDs

The two LEDs located on an access control, input, output, or temperature blade are described in the following table.

LED	Meaning
LED #1 RUN	ON GREEN means the blade is powered and has been initialized. OFF means either the blade is not powered (check the ribbon cable connection) or the board is not initialized (reboot the node).
LED #2 I2C	ON RED, BLINKS OFF indicates a state change on the input and/or output. This LED is normally OFF.

Removing Blades

The procedure for removing blades will be necessary only if you need to swap out a blade for service reasons.

CAUTION: Blades are not hot-swappable. Before connecting or disconnecting blades in the cabinet, be sure to remove power from the system, after shutting down the system.

To remove a blade from the unit:

1. Log into the application.
2. Select **Setup : System Maintenance : Utility**.
3. Click the **Shutdown now** button to perform an orderly shutdown of the system.
Using the Shutdown utility will ensure that the security database is saved.
4. Once you hear a double beep, remove power from the system.
5. Be sure that you are grounded and remove all reader, output, and input connectors attached to the blade and label each with their connector position.
6. Unplug the ribbon cable by pushing outward on the two extraction levers. This will release out the cable connector.
7. Unthread the screw from the top of the standoff and remove the screw and lock washer.
8. Remove the blade from the slot in the chassis.

Using the Power, Reset, and Revert Buttons on the eMerge 50P/5000P

This section describes how to use the Power, Reset, and Revert buttons to:

- Start and shut down the system.
- Reboot the system if the software is unavailable.
- Reset the controller network and login factory defaults if you are unable to log into the system.

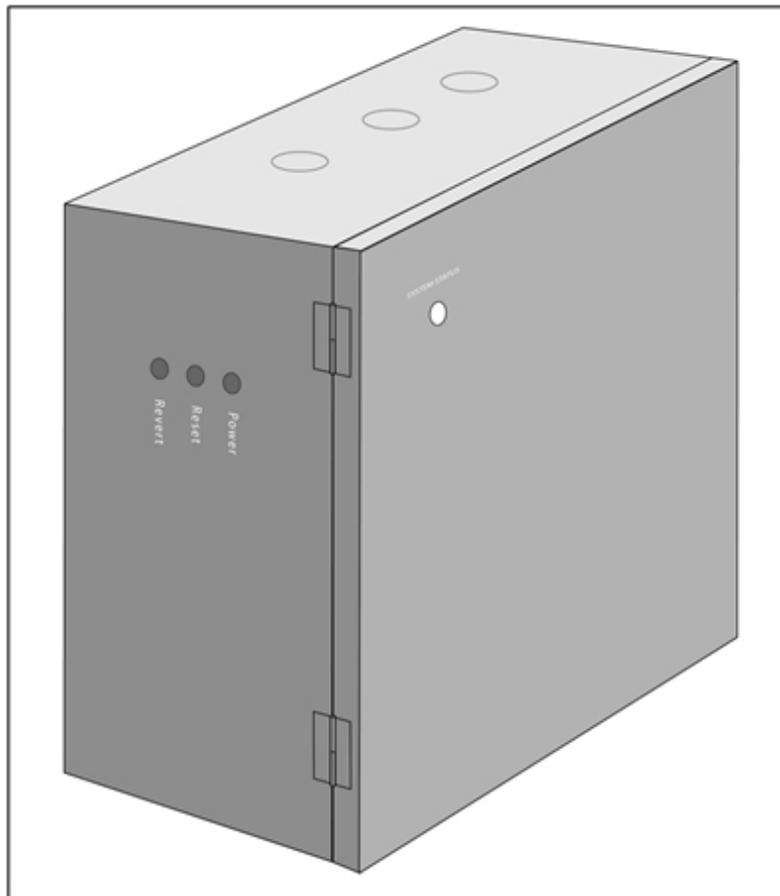


Figure 28. Power, Reset, and Revert buttons.

Using the Power Button

When the system is not running, pressing the Power button starts the system. The system status LED blinks while the system is starting up. You will hear a single beep when the startup process is complete.

When the system is running, you can use the Power button to perform an orderly or hard shutdown:

- Momentarily pressing the Power button performs the same function as an orderly shutdown performed through the software. The system status LED starts to blink, indicating a shutdown of services. You will hear a double beep once the shutdown process is complete.

To restart the controller after an orderly shutdown, momentarily press the Power button again.

- Holding down the Power button for longer than 5 seconds performs a hard shut down of the controller, killing all processes immediately. The system status LED blinks until the controller has shut down, at which point you can release the button. You will hear no beeps.

To restart the controller after a hard shutdown, press the Power button momentarily, or power cycle the controller by turning off power to the system and then turning it back on. The system status LED will blink while the system is starting up, just as for a normal startup.

Note: If after 30 seconds following a power cycle the system status LED does not start to blink, momentarily press the Power button to start the controller.

Using the Reset Button

Although you should use the software to reboot the system, you can use the Reset button if the software is unavailable. The results of the reboot operation will be slightly different, however, as described in the table below.

Pressing the Reset button performs the same function as a reboot performed through software, except that you will not hear a double beep indicating a reset. The system status LED goes out, and then starts blinking. Once the LED remains on and is not blinking, and you hear a single beep, the reset is complete.

Rebooting Using the Software	Rebooting Using the RESET Button
Performs an orderly shutdown of the database.	Stops all processes without shutting down the database.
Shuts down the system.	The database will recover on startup, but the system must NOT be powered down or reset again while it recovers.
Restarts the controller.	Restarts the controller.
Restarts communication between the controller and all the nodes.	Restarts communication between the controller and all the nodes.

Using the Revert Button

If you are unable to log in to the security application because the system IP address or login name and password are unknown, you will need to use the hardware to revert to the controller network and login factory defaults.

Pressing the Revert button causes the controller to begin the revert process, indicated by a blinking system status LED. You will hear the following beeps:

- A triple beep indicating the factory defaults listed below have been restored.
- A double beep indicating the controller is restarting.
- A single beep indicating the revert process is complete, and you can login using the default, out-of-box settings.

The revert process does the following:

- Resets all controller network settings to their factory defaults:
 - The IP address is reset to **192.168.0.250**.
 - The subnet mask is reset to **255.255.255.0**.
 - The gateway, DNS 1, and DNS 2 are each reset to **192.168.0.1**.
- Resets the web server port to port **80**.
- Resets the password for the default administrator account to **admin**.
- Re-enables the administrator account, if necessary.
- Reassigns full system administrator rights to the default administrator account.
- Resets the interface language to English.

Note: Once the controller network and login factory defaults have been reset, you can change them at any time by selecting **Setup : Site Settings : Network Controller**. Click the **Initmode** link to change the network settings and the web server port number. Click the **Localization** link to change the interface language.

Hardware and Third-Party Device Specifications

Check the Linear web site (www.linearcorp.com) for updated specifications, lists of supported devices, and software updates.

Environmental Requirements

- Operating temperature range: 32° F to 120° F (0° C to 49° C).
- Operating relative humidity range: Up to 85% non-condensing.

Power Requirements

- If DC power is provided directly to the node board, it must have 12V± 1% DC at a minimum of 5 amps. Source power must come from a *separate circuit* with its own breaker and an isolated earth ground via a UL 603 Power Limited supply.

Reader Power Available from the eMerge System

The total current that one eMerge system can provide to all readers is 1600 milliamps. Each access control blade can supply up to a total of 400 milliamps at 12VDC to readers. For example, an access control blade can supply 400 milliamps to one reader or 200 milliamps to each of two readers. If the readers require more current, or a different voltage, then power must be provided by a separate UL603 Limited-power supply.

For example, many Wiegand-compatible proximity readers from HID require 200 milliamps or less. The Node can power 8 readers, which is $8 \times 200\text{mA} = 1.6\text{A}$. Long range proximity readers may require more power. Refer to the reader manufacturer documentation for power specifications.

Other than readers, any other components in the system (such as magnetic locks) must have power provided separately.

Wiring Requirements and Specifications

- **Inputs and Outputs:** Twisted, shielded 22 AWG Belden #9462 or equivalent.

Maximum distance from input/output devices to the eMerge system: 2000 feet (610 meters).

- **Readers:** Twisted, shielded 22 AWG Belden #9536 (6 conductor) or equivalent.
Maximum distance from a reader to the eMerge system: 500 feet (152 meters).
- **Temperature Sensors (not evaluated by UL):** Up to 500 feet (152 meters) twisted Category 3; Over 500 feet up to 1000 feet (305 meters) twisted Category 5.
Maximum distance from a temperature sensor to the eMerge system: 1000 feet (305 meters).
- **Diodes** required for output devices that are DC powered: 1N4002- 1 A, 50 V, Fast Recovery Diode or equivalent.
- **Varistors** (MOV) required for output devices that are AC powered: 40 VAC, 56 VDC, 10 A Surge, Radial Leaded Varistor or equivalent, such as World Products Inc. SNR-D56K2.
- **Resistors** required for input devices: 1k Ohms.
- **Ethernet cable:** CAT 5 cable or better with RJ-45 connector.

Readers

The eMerge system's access control blade supports card readers that use the UL listed 26 bit, 126 bit, and 200 bit Wiegand Reader Interface.

Cameras

Cameras have not been evaluated by UL.

The controller supports up to 128 cameras. The exact number will depend on usage. IP video cameras may be connected directly to the network and driven by the controller. For UL application, IP cameras were not investigated.

At this release, the controller is tested to work with the following camera models:

- Axis: All VAPI-compliant cameras and models 2120, 232D
- IQinVision: Various IQeye models
- Panasonic: Models WV-NM100, WV-NS324
- Sony: Models SNC-DF40N/DF40P, SNC-P1, SNC-RZ30N
- Vivotek: Model IP2111

Temperature Sensors

Operating Range:	-55° C to 100° C (-67° F to 212° F)		
Accuracy:	-1°/+5° C	from -55° C to -30° C	(-2°/+9° F from -67° F to -22° F)
	-1°/+3° C	from -30° C to 0° C	(-2°/+5° F from -22° F to 32° F)
	±0.5° C	from 0° C to 70° C	(±1° F from 32° F to 158° F)
	±1° C	from 70° C to 85° C	(±2° F from 158° F to 185° F)
	-2°/+1° C	from 85° C to 100° C	(-4°/+2° F from 185° F to 212° F)

Note: Temperature blades are not UL listed.

Software Protocols and Standards

- DBMS compatibility: SQL
- Email support: POP, SMTP
- Encryption: SSL, SHA-1
- Network: NTP, TCP/IP
- Web: HTTP, HTTPS, XML

Single Facility Maximum Capacities

- Access control readers: 32 maximum
- Access cards: 20,000
- Alarm monitoring points: 500
- Control point outputs: 500
- Digital video cameras: 32
- Temperature monitoring points: 500
- Network Nodes (fully populated): 32

Minimum System Configuration

The minimum functional eMerge system would include one Mini-ITX Network Controller, one SAM-E module, one Network Node blade, and one application extension blade.

Index

A

access control blade
 available power for readers · 39
 connecting inputs · 15
 connecting outputs · 22
 LEDs · 34
additional blades, installing · 9
additional information, references to · 1
application extension blades
 connecting inputs and outputs · 12

B

battery backup
 for node and blades · 29
beeper control · 14
beeps, interpreting · 33
blades
 access control · 13, 34
 input · 16
 installing · 9
 removing · 35
 temperature · 25
browser requirements · 5
bus, ribbon cable · 10

C

cabinet door LED · 33
cabinet, mounting · 8
cable specifications, Ethernet · 40
cameras supported · 40
card readers supported · 40
configuration network, setting up · 30
connecting to the network · 26
connectors, ribbon cable · 10
controller · 32
current, total available for readers · 39

D

DC power supply, wiring · 5, 27, 39
device specifications · 39
diodes and varistors, specifications · 40
dual resistor input circuits · 16

E

encryption · 41
environmental requirements · 6
Ethernet cable specifications · 40

H

hard shutdown · 37
hardware specifications · 39

I

input blade
 connecting inputs to · 15
 LEDs · 34
input circuits
 dual resistor · 16
 normally closed parallel resistor · 17
 normally closed series resistor · 17
 normally closed unsupervised · 18
 normally open parallel resistor · 18
 normally open series resistor · 19
 normally open unsupervised · 19
inputs
 connecting · 15
 specifications · 39
 supervision types · 16
 wiring · 14
installation overview checklist · 7

L

LED control, reader · 14
LEDs
 on access control, input, output, and temperature
 blades · 35
 on cabinet door · 33

M

Mini-ITX Network Controller · 3, 7, 15, 24, 32, 41
minimum system configuration · 41
mounting the cabinet · 8

N

network

- connecting to · 26
- for configuring the system · 30
- requirements · 5

O

- orderly shutdown · 37
- output blade
 - connecting outputs to · 22
 - LEDs · 34
- outputs
 - connecting · 22
 - specifications · 39
 - wiring · 20
- overview
 - of the installation · 7

P

- panel LED · 33
- parallel resistor input circuits · 17, 18
- part numbers for eMerge 2 · 7
- position and slot numbers · 9
- power requirements · 39
- power source, wiring · 27
- precautions and installation notes · 2

R

readers

- available power for · 39
 - beeper control · 14
 - connecting · 13
 - LED control · 14
 - specifications · 40
 - supported · 40
 - wiring · 12
- rebooting the system · 37
 - requirements, system · 5
 - resetting network and login factory defaults · 37
 - resistor specifications · 40
 - restarting after a hard shutdown · 37
 - ribbon cable · 9, 11
 - ribbon cable connectors · 10
 - router, using to create a subnet · 4

S

- SAM-E module · 26, 41

- sensors, temperature · 25
- series resistor input circuits · 17, 19
- shutting down using the hardware · 37
- slot and position numbers · 9
- software protocols · 41
- specifications, hardware and third-party devices · 39
- static electricity precautions · 6
- subnet · 5
- system
 - requirements · 5
 - topology considerations · 3
- system status LED · 33

T

- temperature blade
 - identifying · 25
 - LEDs · 34
- temperature sensors
 - connecting · 25
 - operating range and accuracy · 41
 - specifications · 40
 - wiring · 23
- temperature, operating · 6, 39
- testing and troubleshooting · 32
- third-party device specifications · 39
- topology considerations · 3

U

- unsupervised input circuits · 18, 19
- UPS · 29

V

- varistors and diodes, specifications · 40

W

- where to go for more information · 1
- wiring
 - DC power source · 27
 - inputs · 14
 - outputs · 20
 - Plug-in-Power supply (PIP) · 27
 - readers · 12
 - requirements · 39
 - temperature sensors · 23
 - the network connection · 26