

### ACU-1

#### Application

The ACU-1 is a self-contained controller for single door access control. Use the ACU-1 to electrically control passage through a physical barrier such as a door or gate.

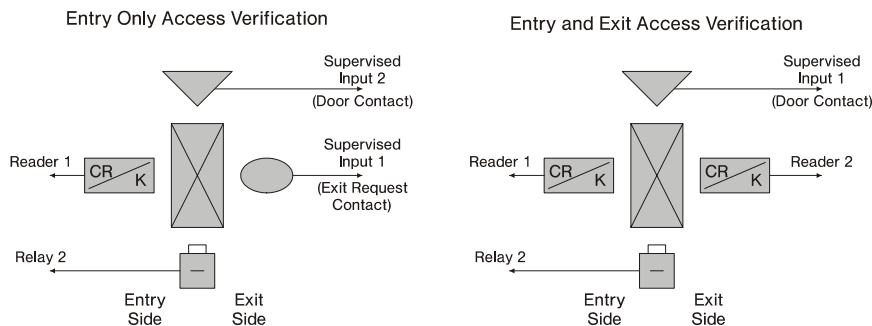
The controller monitors contacts and controls actuators via its 2 card reader/keypad interfaces, 4 digital outputs, 4 supervised inputs, and 1 relay output. LED indicators and field wiring terminal blocks are other features of this controller. Once configured by an LCI, it functions in standalone mode or as part of an Echelon LONWORKS® Network using the integral FTT-10 Free Topology communications transceiver.

A Local Database Module (LDM) allows the controller to locally validate access attempts in the case of a loss of network communication.

#### Applicable Documentation

Description	Audience	Purpose
iWorX LCI User's Guide	<ul style="list-style-type: none"> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> <li>– End user</li> </ul>	Provides instructions for setting up and using the iWorX Local Control Interface.
iWorX ACU-1 Application Manual	<ul style="list-style-type: none"> <li>– Application Engineers</li> <li>– Wholesalers</li> <li>– Contractors</li> </ul>	Provides specific application information about the ACU-1, including sequence of operation and SNVT information.
Additional Documentation	<i>LonWorks FTT-10A Free Topology Transceiver User's Guide</i> , published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.	

#### Typical Use



Innovex Technologies  
511 Braddock Avenue  
Turtle Creek, PA 15145  
[www.innovextechnologies.com](http://www.innovextechnologies.com)

iWorX is a trademark of Innovex Technologies  
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## Precautions

### General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



**Warning:** Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167 °F (75 °C).

### Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any static charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The wrist strap must be secured to earth ground.

### Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is intended for indoor use only. Operate where ambient temperatures do not exceed 104 °F (40 °C) or fall below 32 °F (0 °C) and relative humidity does not exceed 90%, non-condensing.

### For Installation in the United States

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a power source different from that to which the receiver is connected.
- Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment.

### For Installation in the European Community

This equipment meets the requirements of the European Community Directives for Electromagnetic Compatibility (EMC Directive 89/336/EE).

## Before Installing

### About this Document

The instructions in this document are for the ACU-1 controller which can monitor and control access through one physical barrier.

### Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

### What is Not Included with this Equipment

- A power source for the equipment electronics and peripheral devices.
- Tools necessary to install, troubleshoot and service the equipment.
- The screws or DIN rail needed to mount the device.
- Peripheral devices, such as card readers, sensors, and actuators.
- Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source, FTT-10A network, and peripheral devices.

### Equipment Location



Abide by all warnings regarding equipment location provided earlier in this document.

The equipment should be installed in a secure area or within a secure enclosure. The enclosure supplied is not tamper proof and includes no factory installed tamper detection device.

The equipment must be installed indoors unless contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

The equipment must be installed within 500 feet of all input peripherals (card readers and sensors) that will be connected to the equipment.

### Selecting a Power Source

This equipment requires a UL recognized or CE marked (as appropriate) external power source (not supplied) to operate. The controller power input requires a voltage of 12 to 24 VAC or 12 to 24 VDC.

To calculate power source current requirements, add the power consumption of all peripheral devices to that of the controller.

Most card readers require a 5 VDC power source, which is available from the controller.

The power source used for the controller can be used to power the barrier locking device. The locking device must provide back EMF protection or external protection must be installed in the circuit when the controller power source is used to power the locking device.



The controller connects one of the power supply leads (TB7-41) to earth ground. A power source must be capable of operating properly with the Common (TB7-41) connected to earth ground. For more information, see “Power (PWR In, RET)” on page 9.

## Installation

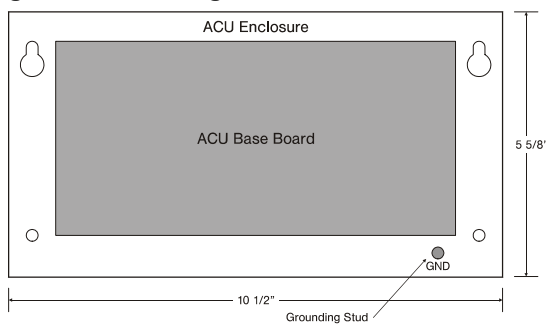


**Warning:** Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

## Mounting the Device

1. Remove the enclosure cover to mount the enclosure base, which contains the base board. The four mounting holes on the enclosure base are accessible as illustrated below. The enclosure base is mounted using four #8 (4.5mm) screws. The screw shanks must fit through the mounting holes and the screw heads must fit through the bottom (larger) portion of the teardrop shaped upper two mounting holes.
2. Place the enclosure base against the mounting surface and mark the outline of the upper two mounting holes.
3. With the enclosure set aside, drill the two holes on the mounting surface in the upper portion of the teardrop shaped markings.
4. Start the screws until they are firmly anchored but not tight.
5. Place the two upper holes of the enclosure base over the two screw heads and pull down to secure the enclosure onto the mounting surface. Mark the location of the bottom two mounting holes and remove the enclosure.
6. Drill the bottom two holes. Set the enclosure back onto the two upper mounting screw heads. Insert the bottom two screws and tighten all four mounting screws.

**Figure 1: Mounting Dimensions**



## Routing Cabling into the Enclosure

The enclosure base provides twelve  $\frac{1}{2}$ " and  $\frac{3}{4}$ " combination conduit knockouts for cabling entry.



Power supply cabling and FTT-10A network cabling must enter the enclosure base through separate knockouts and must remain separated within the enclosure.

To prevent the power source and FTT-10A network cables from coming into contact within the enclosure, route the power source cabling through a knockout close to the controller input power terminations (right side of the enclosure). Route the FTT-10A network cabling through a knockout close to the controller FTT-10A network wiring terminations (left side of the enclosure).

## Grounding the Enclosure



The enclosure base must be securely connected to earth ground. Failure to properly ground this equipment may increase the risk of electrical shock and may increase the possibility of interference to radio/TV reception.

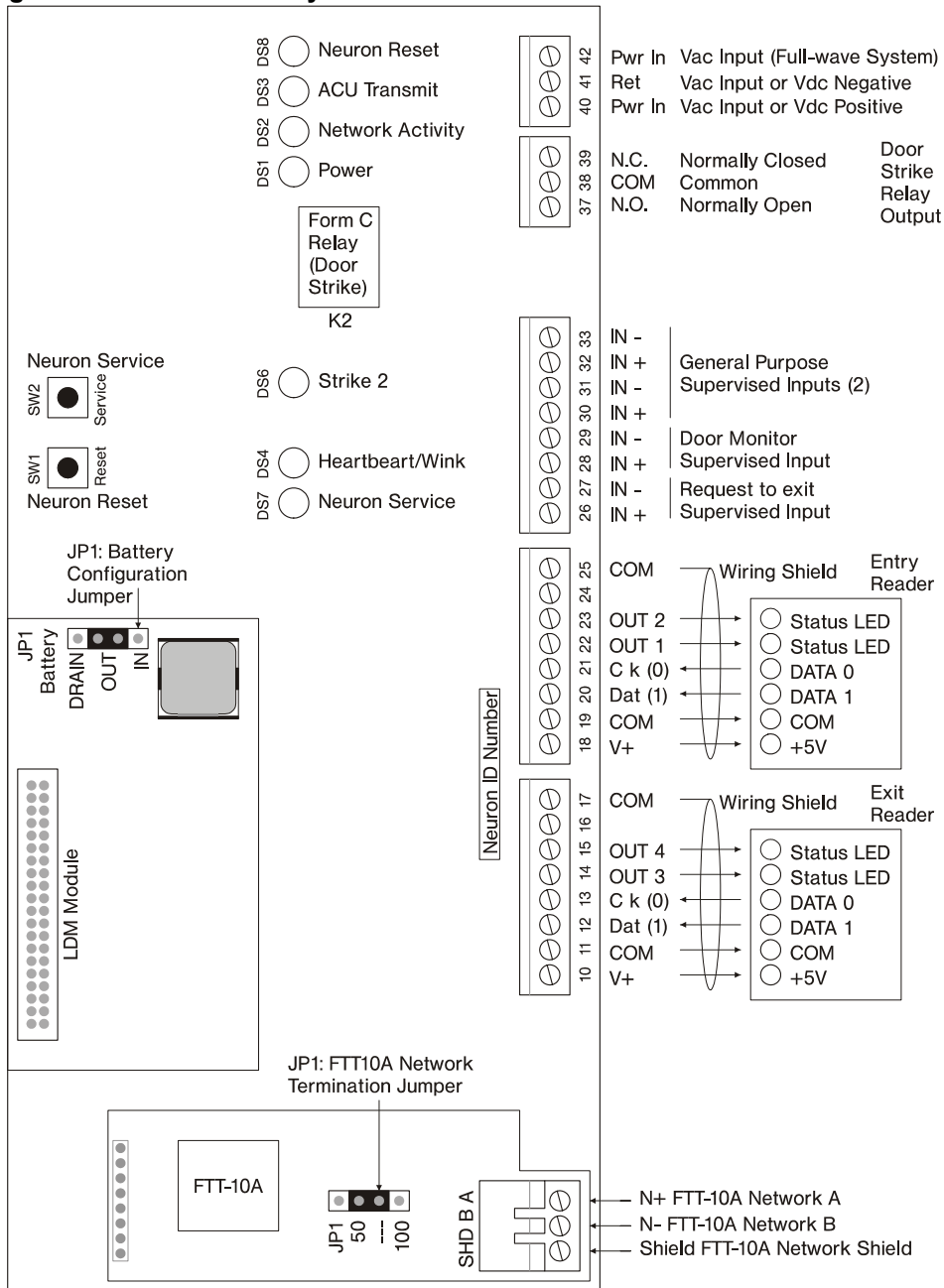


Connecting the enclosure to earth ground will also connect the power source (TB7-41) to earth ground.

Connect the ground wire to the grounding stud on the bottom right of the enclosure base, using the nut installed onto the stud at the factory. Be sure to scrape away any paint in the area where the ground wire will touch the enclosure.

# Wiring Information

Figure 2: ACU-1 Board Layout



## Configuration Jumper Positions

### FTT-10A Network Resistor Termination Configuration Jumper

A four pin header, designated JP1 on the FTT-10A Daughter Board, is used to resistor terminate the FTT-10A network. A jumper is installed across the two center pins at the factory.

Position the jumper across the center two pins (designated OUT on the board) if network termination is not to be provided by the controller. Position the jumper across the left two pins (designated 50 on the board) to provide 50 ohms termination. Position the jumper across the right two pins (designated 100 on the board) to provide 100 ohms termination.

**Figure 3: Network Termination Jumper Positions**



## Battery Maintenance

### Battery

The database memory in your ACU-1 is backed up by a BR1/3N primary lithium battery (widely available). Change the battery every five years if the controller is not subjected to many power outages, and more often if it is.

### LDM Battery Configuration Jumper

A four pin header, designated JP1 on the LDM, is used to control battery operation. A jumper is installed across the center two pins (OUT) at the factory.

Position the jumper across the right two pins to put the battery in-circuit (IN) for normal operation. Position the jumper across the center two pins to disable the battery (OUT). Position the jumper across the left two pins to clear (drain) the LDM memory.



Position the jumper across the center two pins (battery OUT) while replacing the LDM battery.

**Figure 4: Battery Jumper Positions**



### Battery Replacement Procedure

1. Remove the enclosure cover from the ACU-1.
2. If the power source has a switch, turn off the power; otherwise, remove power from the ACU-1 by pulling the power terminal block.
3. Move the battery jumper from the IN position to the OUT position
4. Remove the battery from the socket.
5. Insert the BR1/3N, 3 volt replacement battery, BEING SURE TO OBSERVE POLARITY. The positive terminal of the battery should be facing towards the top (the LDM is marked + near the positive side of the battery socket). The tab on the battery is the negative (-) terminal.
6. Move the battery jumper to the IN position.
7. If the power source has a switch, turn on the power; otherwise, restore power to the ACU-1 by plugging in the power terminal block.
8. Reinstall the enclosure cover on the ACU-1.

## Connecting Card Readers

Card reader wiring is terminated at TB3 (for the exit reader) and TB4 (for the entry reader) on the base board. TB3 and TB4 provide identical electrical interfaces.

### **V+** (TB3-10 and TB4-18)

Positive DC power output to supply power to the reader. The output provides +5 VDC.

### **COM** (TB3-11 and TB4-19)

DC common for the card reader power outputs. Always tie the reader's common to the corresponding common pin on the ACU-1 even if the reader is being powered externally.

### **1** (TB3-12 and TB4-20)

Connect the "1's" output signal of a 26-bit Wiegand card reader to this terminal.

### **0** (TB3-13 and TB4-21)

Connect the "0's" output of a 26-bit Wiegand card reader to this terminal.

### **COM** (TB3-17 and TB4-25)

The DC common of the controller's power supply. Connect cable shields here.

### **OUT 1, OUT 2, OUT 3, and OUT 4** (TB3-14, TB3-15, TB4-22, and TB4-23)

The controller supports four digital outputs which are used as control signals for card readers with LED indicators, audible sounders, and other such devices. When the controller is used in an iWorX system, OUT 1 and OUT 3 provide a "ready" signal and will turn on when the controller is ready to accept a card read. OUT 2 and OUT 4 provide an "access granted" signal and will turn on when the controller grants access.

If a card reader is powered by an external supply of a higher potential than the supply powering the ACU-1, the digital outputs may conduct current to the ACU-1 power supply if the respective loads are powered within the card reader from the external supply. It is recommended that the ACU-1 be powered by a supply of equal or greater potential as the external card reader supply.

## Connecting Input Devices

### Supervised Inputs

Four supervised inputs (TB5-26 through TB5-33) are used to monitor contact type devices such as switches, pushbuttons and relay contacts. You can monitor normally open and normally closed contacts. They are designated SUPER 1, SUPER 2, SUPER 3, and SUPER 4 on the base board.

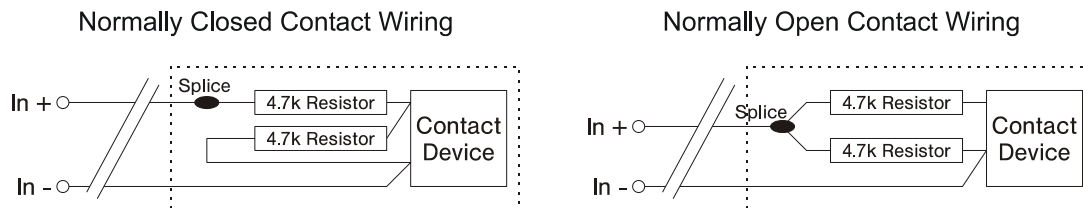
SUPER 1 is dedicated for an exit pushbutton (request to exit), and SUPER 2 is dedicated for a door open/closed contact monitor. SUPER 3 and SUPER 4 are general purpose inputs.

Supervised inputs detect the difference between a short or open circuit and the contact change of state. A circuit short or open indicates a wiring fault, which may also indicate an attempt to tamper with the circuit. Two 4.7k ohm, 5% tolerance resistors (not supplied) must be installed on each input circuit, as illustrated.



Place the resistors as close as possible to the contact device. Wiring faults can only be detected between the resistors and the controller's wiring terminations.

**Figure 5:**



With the resistors in place and the contact in its normal position, approximately 4.7k ohms of resistance should be present across the input circuit, with the circuit disconnected from the base board. To avoid nuisance alarms at the LCI, 4.7k ohm resistors should be installed across SUPER3 and SUPER4 if they are not being used in the system.

## Connecting Output Devices

### Relay Outputs



A relay output is used to switch on and off power that is not supplied by the controller and may not be on the same disconnect switch as the controller's power source. The voltage and current at these terminals (TB6-37 through TB6-39) is not regulated by the controller's electronics. Power at these terminals can represent an electrical shock hazard. Always disconnect all power sources when servicing this equipment.

The relay output is designated RELAY OUT 2 on the base board.

The relay output is available to switch on and off power to an electrically controlled barrier locking device, such as a door strike or magnetic lock. The relay output is a single pole, double throw (SPDT) contact. It provides a normally open and normally closed contact to accommodate devices that lock while power is applied and devices that lock with power off. Be sure to install an EMF protection device (MOV) across the coil, especially if it is powered from the same supply as the ACU-1.

## Other Connections

### Network (N+, N-, Shield)

FTT-10A network wiring is terminated on TB1 of the FTT-10A Daughter Board. The two wires are terminated on TB1-2 and TB1-3 (designated B and A on the base board). Polarity does not matter.



A ferrite bead (supplied with the controller) must be installed onto the FTT-10A network cable to suppress radio frequency energy generated by the controller. The bead must be installed within the enclosure or within a few inches of the enclosure. The bead is hinged so that it can be installed while the cable is terminated. The cable must loop through the center hole of the bead.

### Power (PWR In, RET)

Input power is terminated on TB7 of the base board. For DC power, connect the positive voltage lead to TB7-40 (designated PWR IN on the board) and connect the negative or common lead to TB7-41 (designated COM on the board). For AC power, connect one of the power supply leads to TB7-40 and the other lead to TB7-41.



TB7-41 (COM) is electrically connected to the enclosure base while the base board is mounted to the base. When the enclosure base is properly connected to earth ground, the power source DC negative or common lead is connected to earth ground when terminated on TB7-41 of the controller.

If you are powering the controller from the same transformer as other types of controllers that full-wave rectify the 24 VAC power input, you must connect one lead of the 24 VAC to TB7-40 and the other to TB7-42. It is recommended that each ACU-1 have its own 24 VAC transformer.

# Specifications

## Electrical

### Inputs

- Cabling: twisted shielded pair (use multi-core for Card Reader Data Inputs), 18 AWG recommended—500 feet max.(152 meters)

### Supervised Inputs (TB5-26 through TB5-33)

- 0-5 Volt
- Resolution: 8 bit

### Card Reader Data Inputs (TB3-12, TB3-13, TB4-20, and TB4-21)

- Compatible with Wiegand 26-bit electrical interface standards

### Outputs

#### Digital Outputs (TB3-14, TB3-15, TB4-22, and TB4-23)

- 50 mA maximum load
- Current sinking to DC common when on

#### Relay Output (TB6-37 through TB6-39)

- 2 amps @ 30 VDC or VAC
- SPDT, form-C contact

#### Power Outputs (TB3-10 and TB4-18)

- 5 VDC, 100 mA maximum load
- Individually short-circuit protected using a PTC.

### FTT10-A Network

- Speed: 78KBPS
- Cabling: Maximum node-to-node distance: 1312 feet (400 meters)
- Maximum total distance: 1640 feet (500 meters)

**Table 1: Network Wire Specifications**

Cable Type	Pairs	Details	Connect Air Catalog No.
Level 4 22AWG (0.65mm)	1	Unshielded, Plenum, U.L. Type CMP	W221P-2001
Level 4 22AWG (0.65mm)	1	Unshielded, Non-Plenum, U.L. Type CM	W221P-1002

For detailed specifications, refer to the FTT-10A Free-Topology Transceiver User's Guide published by Echelon Corporation. For information on ordering Connect Air items, contact Connect Air International; 4240 B Street; Auburn, WA 98001 <[www.connect-air.com](http://www.connect-air.com)>.

### Power Requirements

- 12 to 24 VAC or 12 to 24 VDC power (requires an external supply)

### Power Consumption

- With no external loads: 6 VA

## Mechanical

### Enclosure

- Dimensions: 10.5" (267mm) wide, 5.64" (143mm) high, 2.52" (64mm) deep
- Material: 0.063" thick Aluminum
- Surface preparation: black, semi-gloss paint

### LDM Battery

- Battery Life: 5 years
- Memory retention: 1440 hours (60 days) of accumulated power off
- Battery type: BR1/3N primary lithium (removable)

### Electronics

- Base board dimensions: 9.0" wide, 4.0" high
- Terminals: Removable screw terminal blocks. Rated for 12 to 24 AWG wire

### Environmental

- Temperature: 32 to 104 degrees F (0 to 40 degrees C)
- Humidity: 0 to 90 percent, non-condensing
- Altitude: 0 to 10,000 feet (3048m)

### Agency Listings

- UL916 PAZX
- CSA 22.2 No. 205-M1983 P PAZX7

### Agency Compliances

- (CE) EMC Directive
- EN5022
- EN50082-1
- FCC Part 15 Class B

## Troubleshooting

### Diagnostic LEDs

The base board contains 7 LED indicators designated DS1 through DS4, and DS6 through DS8. These indicators can aid in troubleshooting problems with equipment operation. Note that the indicators are designated from left to right, DS7, DS4, DS6, DS1, DS2 DS3, and DS8.

**Table 2: Diagnostic LEDs**

LED	Indication
DS1 (green)	Illuminated while 5VDC power is present on the base board
DS2 (yellow)	Illuminated while a signal is detected from the FTT-10A network (receive data)
DS3 (yellow)	Illuminated while the controller is transmitting data onto the FTT-10A network (transmit data).
DS4 (yellow)	Illuminates briefly when the controller receives a LonTalk “wink” message from a device on the FTT-10A network
DS6 (red)	Illuminated while Relay 2 is on
DS7 (yellow)	Illuminates briefly when the controller sends a LonTalk “service pin” message. The controller sends a service pin message when momentary switch SW2 on the base board is pressed
DS8 (yellow)	Illuminates briefly when the microprocessor is reset. The microprocessor can be reset by pressing momentary switch SW1 on the base board



Resetting the controller will cause it to unlatch any active outputs. These outputs will return to their appropriate state once the controller completes its reset sequence.

### Troubleshooting Tips

#### **Controller is not running and DS1 LED is not illuminated.**

No power to controller. Verify the voltage on the controller’s power connector.

#### **How do I reset the controller?**

The controller can be reset by the LCI, or you can depress the reset button on the ACU-1 base module. Refer to the LCI documentation for more information on resetting the controller using the LCI.

#### **The door strike relay will not come on.**

Ensure that the relay has been wired correctly.

#### **When a valid card is swiped, access is not granted.**

Verify the following at the LCI:

1. Is the card permitted at this door?
2. Is this still a valid card?

#### **Every card swiped is granted to the door, even cards that have never been added to the system.**

The ACU-1 is in Auto Add Card mode. Change the Auto Add feature to “No”.

#### **An externally powered card reader is wired correctly but not working properly.**

Be sure that your external power supply common is tied to the common (-) on the card reader terminal block of the ACU-1.