Azure IC2 Hardware Manual

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IC2 Hardware Manual
2-Door Intelligent Network Controller

by IMRON Corporation
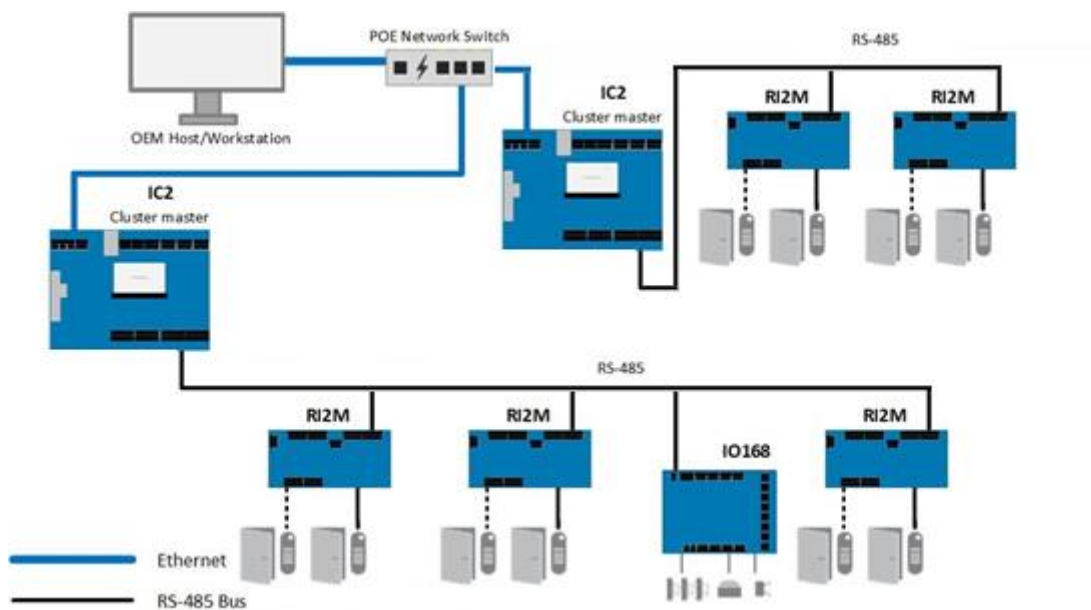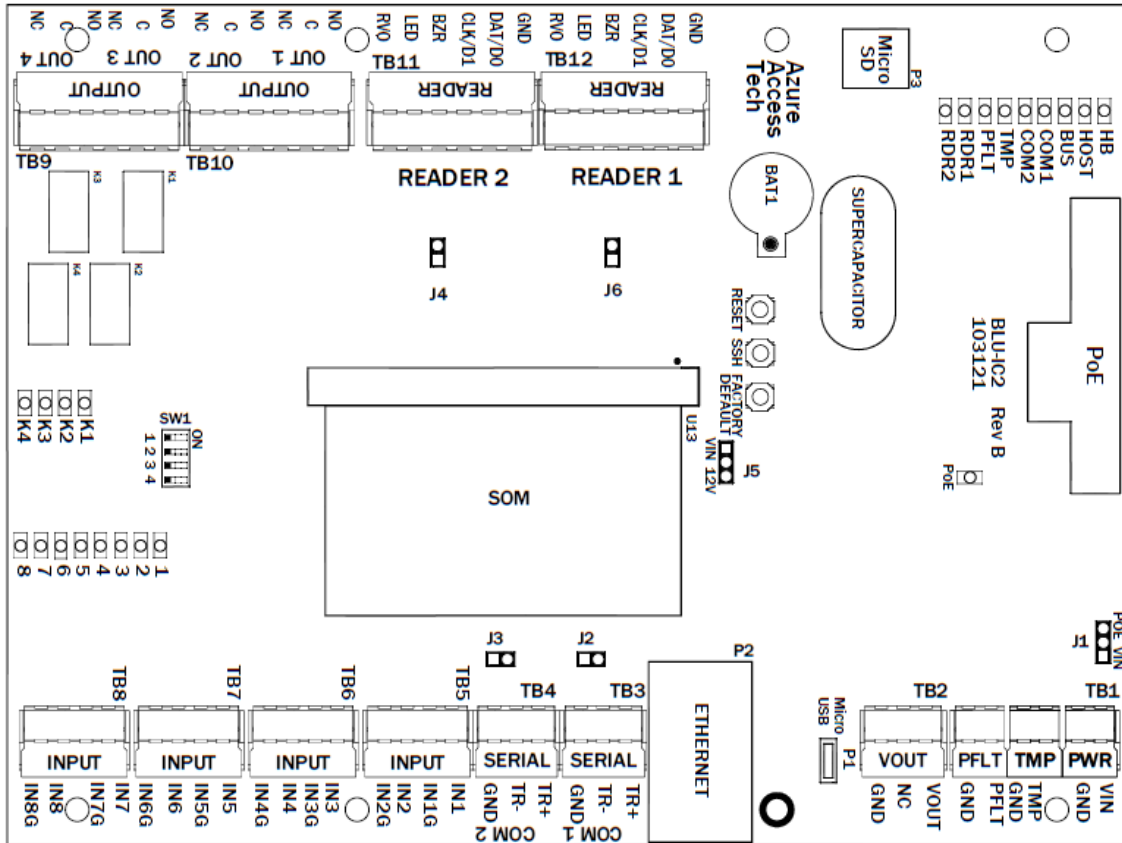
IMPORTANT INFORMATION

W A R N I N G
HIGH VOLTAGE, AC MAIN POWER SHOULD ONLY BE CONNECTED BY QUALIFIED, LICENSED ELECTRICIANS. ALL APPLICABLE LAWS AND CODES MUST BE FOLLOWED. IF THIS PRECAUTION IS NOT OBSERVED, PERSONAL INJURY OR DEATH COULD OCCUR

Power should not be applied to the system until after the installation has been completed. If this precaution is not observed, personal injury or death could occur, and the equipment could be damaged beyond repair.
-Verify that the external circuit breaker which supplies power to the device power supply is turned off prior to installation.
-Verify that the output voltage of the power supply is within specifications prior to connection to the device.

C A U T I O N
Several important procedures should be followed to prevent electro-static discharge (ESD) damage to sensitive CMOS integrated circuits and modules.

-All transport of electronic components, including completed reader assemblies, should be in static shield packaging and containers.
-Handle all ESD sensitive components at an approved static controlled workstation. These workstations consist of a desk mat, floor mat and an ESD wrist strap. Workstations are available from various vendors including the 3M company.

FCC Compliant
This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1.This device may not cause harmful interference, and
2.This device must accept any interference received, including interference that may cause undesired operation.

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 device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. The user is advised that any equipment changes, or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.

CE Compliant

UL & ULC Recognized
- UL294
- UL294B
- UL1076 & ULC/ORD 1076
- UL2610

Part I
Introduction

1 Introduction

The IC2 is a 2-door intelligent controller with 8 supervised inputs, 4 relay outputs. IO & Reader Interface panels can connect to the IC2 over RS485 serial ports.

1.1 General Features

- Two on-board reader ports for (2) Wiegand readers or up to (2) OSDP readers
- Full, Stand-Alone Operation with local database of up to 60,000 cards & 100,000 events
- One 10/100 Ethernet connection
    o Second Ethernet connection possible with USB-to-Ethernet adapter
- Up to 8 Card Formats
- 255 Access Levels Per Card
- Activation/Deactivation Time
- 8 Supervised Alarm Inputs
    o Configurable termination resistor values for supervised inputs
- 4 Relay Outputs
- Inputs & Outputs fully re-assignable
- Two, 2-wire RS-485 ports for downstream communication
    o Supports proprietary or OSDP protocol
- 1 Unsupervised Cabinet Tamper Input
- 1 Unsupervised Power Fault Input
- 1 LED Output per reader port (tri-state control)
    o 1 Buzzer Output (open collector) per reader port
- Buzzer output can be repurposed for 2-wire LED control

Part II
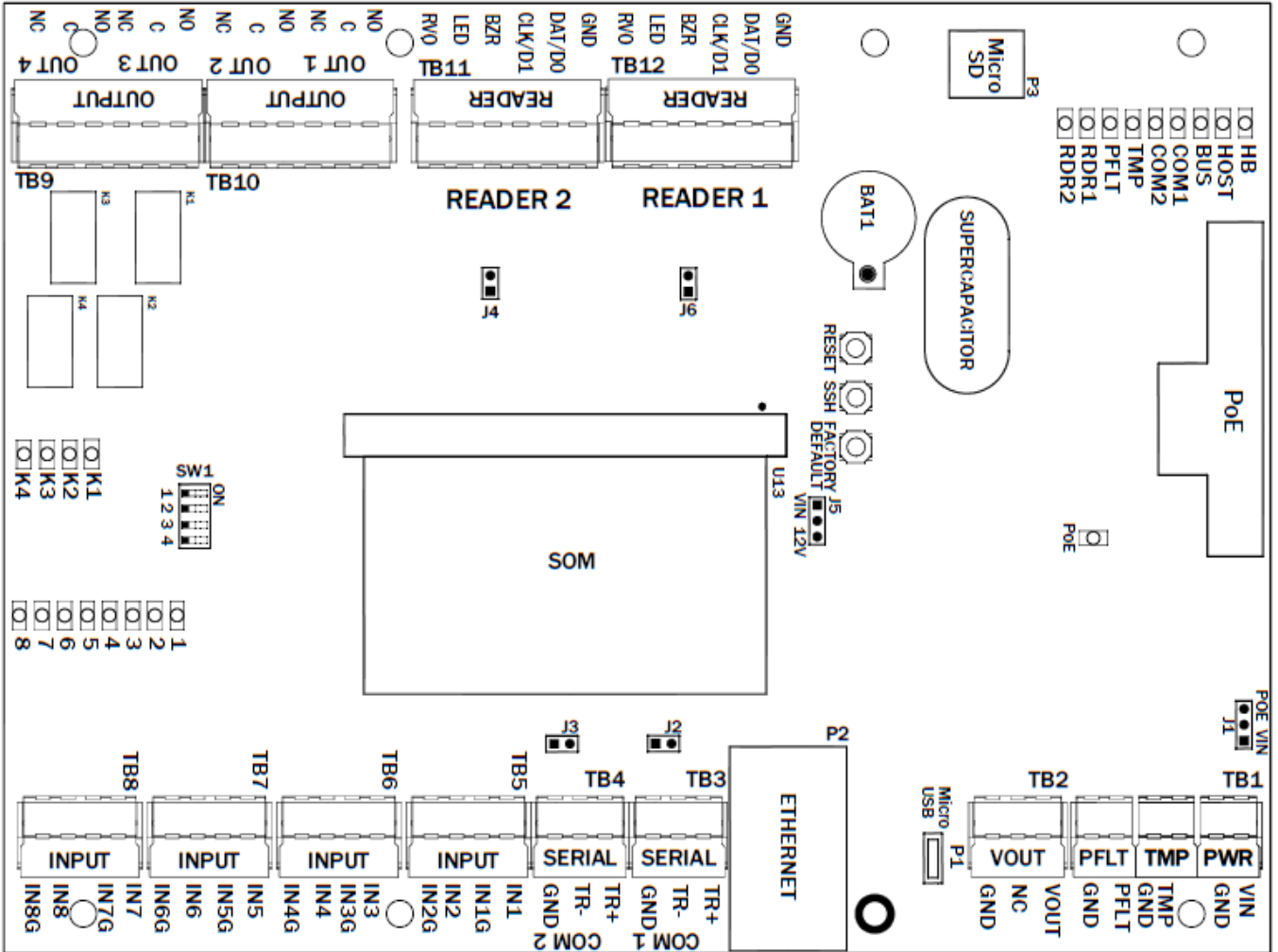# Hardware Layout

2   Hardware Layout

Figure 2.1: IC2 Diagram

2.1 Terminal Connectors

The IC2 uses terminal blocks for connecting power, readers & door control signals, supervised alarm inputs, and relay output connections. The connection terminals are factory equipped with removable screw-down quick connectors which are easily removed from the board by firmly grasping the connector and pulling away from the board. If pliers are used to remove the connectors, they should be of the rubber-tipped type. Be careful to not damage onboard components when using any tools near the board. The proper location of the quick connectors is outlined in white on the board.

IC2 Terminal Connections			
Power, Tamper, AC Fault Connections			
TB1-1	Power Fault Return	GND	AC Power Fault
TB1-2	Power Fault	PFLT	
TB1-3	Tamper Input Return	GND	Cabinet Tamper Input
TB1-4	Tamper Input	TMP	
TB1-5	Ground	GND	Power Input Connection 12 - 24 Vdc
TB1-6	Power Input	VIN	
TB2-1	Ground	GND	Vin or 12 Vdc if PoE is used
TB2-2	No Connection		
TB2-3	Voltage Output	VOUT	
Serial Connections			
TB3-1	Ground	GND	Serial 2-wire RS-485 Port 1
TB3-2	Transmit/Receive Data (-)	TR-	
TB3-3	Transmit/Receive Data (+)	TR+	
TB4-1	Ground	GND	Serial 2-wire RS-485 Port 2
TB4-2	Transmit/Receive Data (-)	TR-	
TB4-3	Transmit/Receive Data (+)	TR+	
Input Connections			
TB5-4	Input 1	IN1	Input 1
TB5-3	Input 1 Return	IN1G	
TB5-2	Input 2	IN2	Input 2
TB5-1	Input 2 Return	IN2G	
TB6-4	Input 3	IN3	Input 3
TB6-3	Input 3 Return	IN3G	

TB6-2	Input 4	IN4	Input 4
TB6-1	Input 4 Return	IN4G	
TB7-4	Input 5	IN5	Input 5
TB7-3	Input 5 Return	IN5G	
TB7-2	Input 6	IN6	Input 6
TB7-1	Input 6 Return	IN6G	
TB8-4	Input 7	IN7	Input 7
TB8-3	Input 7 Return	IN7G	
TB8-2	Input 8	IN8	Input 8
TB8-1	Input 8 Return	IN8G	

Relay Output Connections			
TB10-1	Normally Open	OUT 1 - NO	Relay K1 Connection
TB10-2	Common	OUT 1 - C	
TB10-3	Normally Closed	OUT 1 - NC	
TB10-4	Normally Open	OUT 2 - NO	Relay K2 Connection
TB10-5	Common	OUT 2 - C	
TB10-6	Normally Closed	OUT 2 - NC	
TB9-1	Normally Open	OUT 3 - NO	Relay K3 Connection
TB9-2	Common	OUT 3 - C	
TB9-3	Normally Closed	OUT 3 - NC	
TB9-4	Normally Open	OUT 4 - NO	Relay K4 Connection
TB9-5	Common	OUT 4 - C	
TB9-6	Normally Closed	OUT 4 - NC	

Reader Connections			
Location	Type	Label	Function
TB12-1	Ground (Reader Power)	GND	Reader 1 Device Connections
TB12-2	Data	DAT/D0	
TB12-3	Clock	CLK/D1	
TB12-4	Beeper (Buzzer) Control	BZR	
TB12-5	Green LED Control	LED	
TB12-6	VDC (Reader Power)	RVO	
TB11-1	Ground (Reader Power)	GND	Reader 2 Device Connections
TB11-2	Data	DAT/D0	
TB11-3	Clock	CLK/D1	
TB11-4	Beeper (Buzzer) Control	BZR	
TB11-5	Green LED Control	LED	
TB11-6	VDC (Reader Power)	RVO	

Table 2.1: IC2 Terminal Connections

2.2 Jumpers
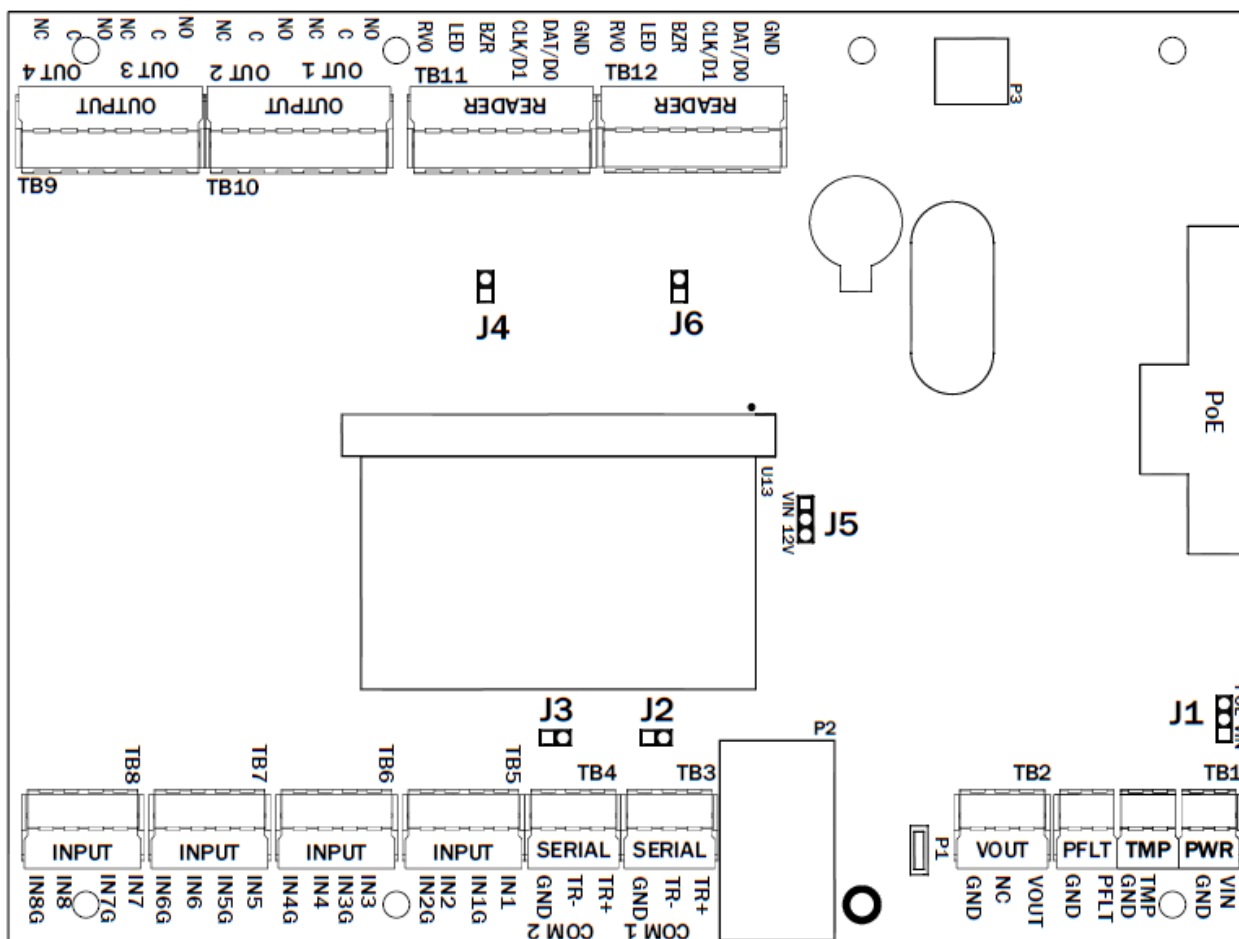
Figure 2.2: IC2 Jumpers

JUMPER	SETTING	DESCRIPTION
J1 Labeled PoE VIN	PoE VIN	12-24V DC/DC Power supply. **DEFAULT**
	PoE VIN	PoE (*Power over Ethernet) power source*
J2	ON/OFF	RS485 termination - Serial Port 1 (COM1)
J3	ON/OFF	RS485 termination - Serial Port 2 (COM2)
J4	ON/OFF	RS485 termination - Reader Port 2 (RDR2)
J5 Labeled VIN 12V	VIN 12V	12V regulated power for Reader Ports (RVO); Only use this setting when VIN >= 20VDC
	VIN 12V	VIN passthrough power for Reader Ports (RVO); Use VIN passthrough if using PoE power source
J6	ON/OFF	RS485 termination - Reader Port 1 (RDR1)

Note: RS485 termination jumpers (J2, J3, J4, & J6) are shipped from the factory in the OFF (termination disengaged) position. Only turn ON termination if the IC2 is at the end of the serial bus.

2.3 SOM (System on Module)

SOM Port: U1
The SOM (System On Module) should not be removed. In case a replacement is necessary, align the notch at the bottom of the SOM with the connector, slide the module in at a 45-degree angle until the contact pins are fully covered by the connector then gently press the SOM towards the board until it clicks into place. Make sure the SOM is properly installed before powering on the board.

2.4 Micro USB OTG Port

The USB connection port (P1) is reserved for future use and should not be connected to any device.

2.5 MicroSD Card

The micro-SD card socket (P3) is reserved for future use and should not be used.

2.6 LEDs

The IC2 has 24 LEDs for use in monitoring panel functions and diagnosing issues.

HB	Heartbeat & Offline / Online status Offline: 200ms ON, 800ms OFF Online: 800ms ON, 200ms OFF
HOST	Host COM Status – ON when online with Host software
BUS	Internal Bus Activity – Flashes repeatedly while data is being exchanged
COM1	RS-485 Serial Port 1 – Flashes when data is transmitted
COM2	RS-485 Serial Port 2 – Flashes when data is transmitted
TMP	Cabinet Tamper – ON when in ALARM, OFF when SECURE
PFLT	Power Fault – ON when in ALARM, OFF when SECURE
RDR1	Reader Port 1 – Wiegand Reader: Flashes ON when receiving data
RDR2	Reader Port 2 – Wiegand Reader: Flashes ON when receiving data
Alarm Zone Inputs LEDs	
1	Input IN1 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
2	Input IN2 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
3	Input IN3 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
4	Input IN4 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
5	Input IN5 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
6	Input IN6 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
7	Input IN7 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
8	Input IN8 Status: OFF = Secure, ON = Alarm, Flash = Fault. See Note 1
Output Relays	
K1	Relay OUT 1 (K1): ON = Energized
K2	Relay OUT 2 (K2): ON = Energized
K3	Relay OUT 3 (K3): ON = Energized
K4	Relay OUT 4 (K4): ON = Energized

Ethernet – P2	
Speed (left side)	Green: OFF = 10Mbps, ON = 100Mbps
Link (right side)	Yellow: flashing – network activity
PoE Power	
PoE_PWR	ON = PoE power available (Power over Ethernet)

Note 1: Every 4 seconds the LED is pulsed to its opposite state for 0.1 seconds

2.7 Function Buttons

The IC2 is equipped with three function buttons which allow for control of various functions.

RESET

This button will perform a hardware reboot which is like disconnecting and re-connecting power. To perform a reboot, press the button and immediately release. The status LEDs will light up and the device will reboot.

SSH

This button will enable connection to the device by SSH. This mode is only used for advanced troubleshooting. After pressing the button, SSH will be active for 30 seconds. If there is no connection within 30 seconds, SSH will be disabled.

Factory Default

Network Reset - This function will reset the network interface to the default configuration. All other configurations and saved information will be kept. This function can be used when the network configuration is unknown or if it's not possible to communicate with the device using the current configuration. To perform a network reset:

1. Make sure that the device is powered on and functioning normally.
2. Press and hold the FACTORY DEFAULT button for approximately 3 seconds until LED3 is lit.
3. Release the FACTORY DEFAULT button.
4. After a few seconds, the network will be reset to its default configuration (see the Communication Connection section for the default parameters).

2.8 Dip Switches

The IC2 has 4 DIP switches that are reserved for future use.

2.9 Memory & RTC Retention During Power Failure

The IC2 configuration and cardholder memory is stored in non-volatile memory which does not require constant power to retain information. In the case of sudden power failure, the IC2 has onboard backup power to retain volatile memory.

The RTC (Real Time Clock) is persevered through a power outage with a coin cell battery. See the "Specifications" section for more information. The coin cell battery power level is monitored and a low battery condition will generate an event message.

2.10 Mounting

Eight holes are provided for mounting the IC2. Mount at least 0.25 inches above the conductive surfaces. One mounting hole is plated for connecting to Chassis (Earth) ground.
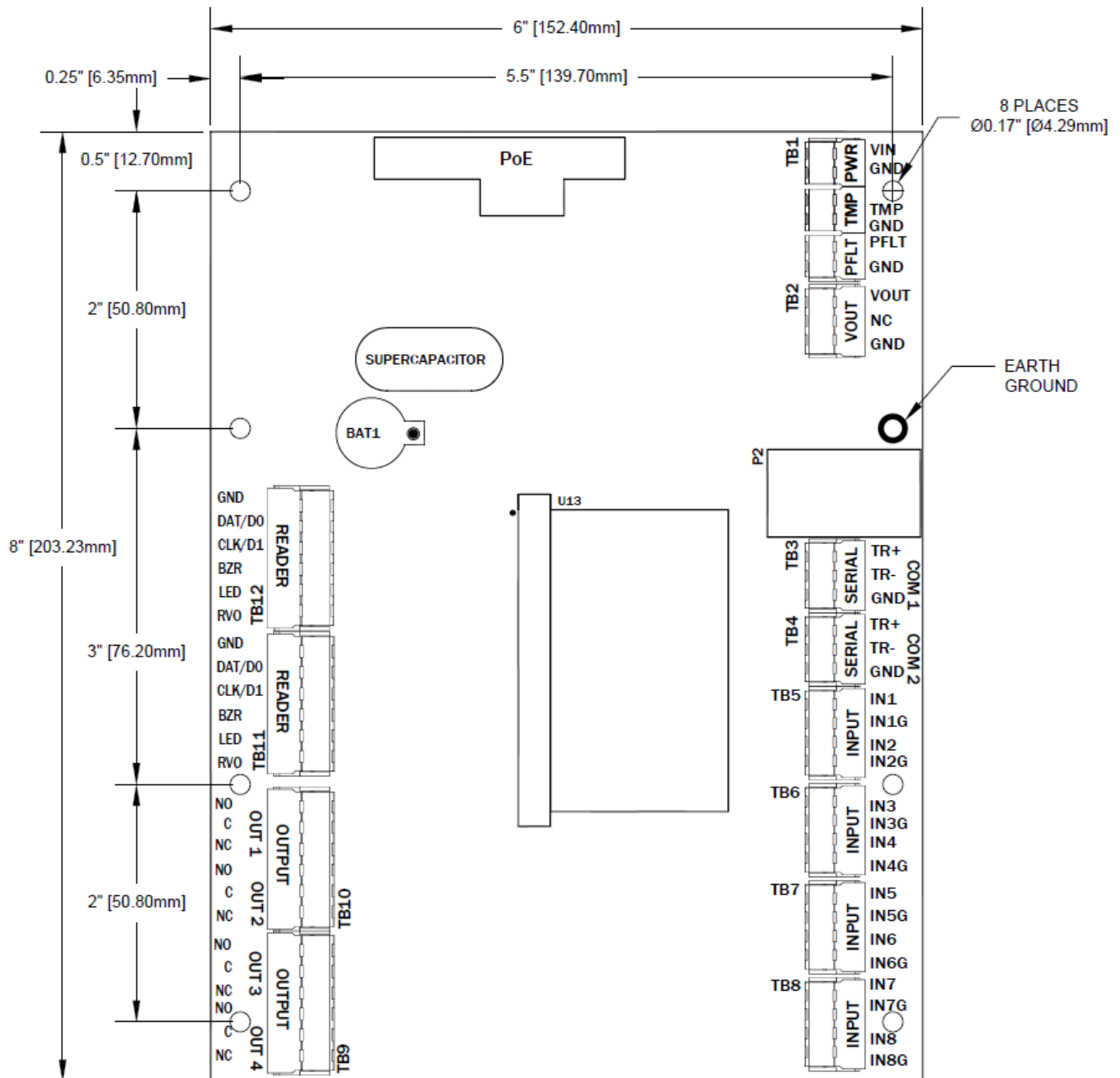

Figure 2.3: IC2 Mounting Holes [inches (mm)]

Part III
System Wiring & Setup

3   System Wiring & Setup

This section will provide installation and wiring instructions as well as hardware interface information as it applies to the access control system. To guard personal safety and avoid damaging equipment it is important to have a full understanding of electrical wiring best-practices and safety. The following sections provide general guidelines relating to the IC2 but are <u>not a substitute for formal training in safely handling electrical systems!</u>

3.1 Power

3.1.1 Primary Board Power

Connector: TB1

When operating on 12VDC, the IC2 has a peak current consumption of 700mA when charging a depleted super capacitor and a normal operating max of 320mA. Due to large inrush currents, it is recommended to use a power supply with a "soft-start" feature. See Section 6 "Specifications" for more details on power consumption.

Take care when selecting a power supply for use with the IC2. Most power supplies on the market today provide good input/output isolation, however those which do not provide isolation (or have high leakage capacitance), coupled with accidental AC power line interchange, presents serious ground fault problems for installers. With ground fault, the signal reference between subsystems may be 115 Vac (230 Vac) apart. If these subsystems are interconnected, the large potential difference will cause equipment damage or personal injury. IMRON Corporation recommends the use of isolated, continuous power supplies only.

In the case of over-current, solid-state fuses integrated on the IC2 panel will 'trip' to protect the components of the panel. In many cases, the solid-state fuses will reset automatically when normal current resumes, however it may be necessary to interrupt the supply of power to allow the fuses to reset.

3.1.2 Powering Peripherals

The IC2 has multiple output ports for distributing power to peripheral devices. Each port has its own voltage and current specs and have over-current protection.

The installer must adhere to overall current maximums of the power supply, whether PoE or DC/DC from the wall. Detailed electrical specs are in the "Specifications" section of this document (section 6).

To maximize longevity, it is not recommended to fully load all peripheral power ports when operating at the top of the operating temperature range.

Auxiliary Output Power "VOUT" (TB2)

The VOUT port can be used to power peripheral devices such as strikes, IO modules, readers, etc. This port is a direct passthrough from the primary power VIN (same voltage as VIN), whether using PoE or wall supply. This port has a 1 Amp current maximum.

Reader Port Power "RVO" (TB11 – pin 6) & (TB12 – pin 6)

Readers can be powered directly from the two reader ports. The RVO voltage is jumper selectable to be either passthrough from VIN or a regulated 12VDC. The regulated 12VDC setting is only to be used when VIN > 20VDC. Each port has a maximum of 500mA and the combined current maximum between <u>both</u> reader ports is 600mA.

USB (P1)

The USB port is 5V and has a current maximum of 500mA.

3.2 Grounding

DC Ground

This is typically the minus (-) side of the DC output of the power supply. This is never to be connected to Safety (Earth) Ground on the AC side. It is to be connected to the DC ground input of all devices being powered by one supply. All devices' ground connections must connect here if the device is powered by this supply.

AC Ground

Known as "Safety", "Earth", or "Chassis" ground. To avoid ground loop current, there must be only ONE point at which the safety ground connects to the DC ground (usually through the DC/DC power supply).

3.3 Communications

3.3.1 Network

Connector: P2

The IC2 communicates with UnityIS over the network. Network connectivity can be achieved using the dedicated 10/100 Ethernet port and/or the USB port when using an USB-to-Ethernet adapter. Connection to network switch should be made using standard CAT5e or CAT6 cable.

3.3.2 Downstream RS-485 Serial Ports

Connectors: TB3 & TB4

RS-485 is an electrical interface standard for multi-point communication on bus transmission lines. It allows high-speed data transfer over extended distance (4000 ft, 1219m). The IC2 can be configured to communicate with downstream IO or Reader Interface panels on two available RS-485 ports (COM1 & COM2). The IC2 supports a 2-wire bus setup. Both ports can be configured to communicate using different protocols.

Note: COM1 & Reader Port 1 share an internal serial bus and COM2 & Reader Port 2 share another internal serial bus. Therefore, COM 1 & Reader Port 1 must use the same baud rate and protocol and have unique addressing between them. COM 2 & Reader Port 2 must also share the same baud rate and protocol and have unique addressing between them.

Device Wiring

2-wire RS-485 consists of three wires: TR+, TR-, & SG (signal ground). Both TX and RX are done on the same pair of wires. Match the polarities; connect positive (+) to positive and negative (-) to negative. Wiring recommendation of 24 AWG, shielded twisted pair. Wiring requirements satisfied by Belden 9841 or equivalent.
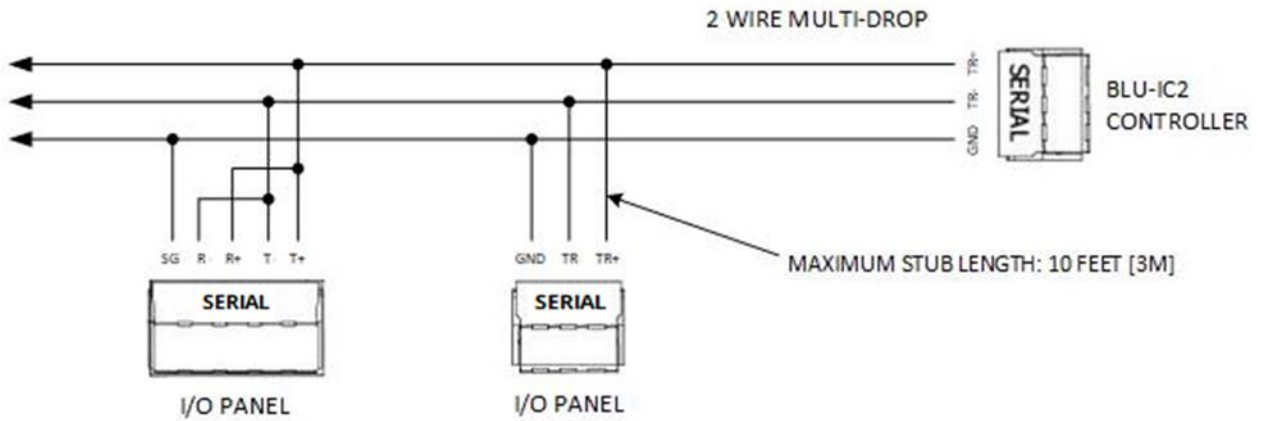
Figure 3.1: Device Wiring

Bus Configuration

The maximum number of field devices on one RS-485 bus is 32. Communication cables for RS-485 should be laid out in a "multi-drop topology". This means that there should only be two ends to the line and devices should be located directly along this line. The IC2 controller can be located at any point along the line. T-stubs longer than 10ft and Star wiring topology will cause communication problems and must be avoided. All the devices on the bus must communicate with the same protocol, use the same baud rate, and all the downstream devices connected to the IC must have a unique address (set with DIP switches on downstream devices).
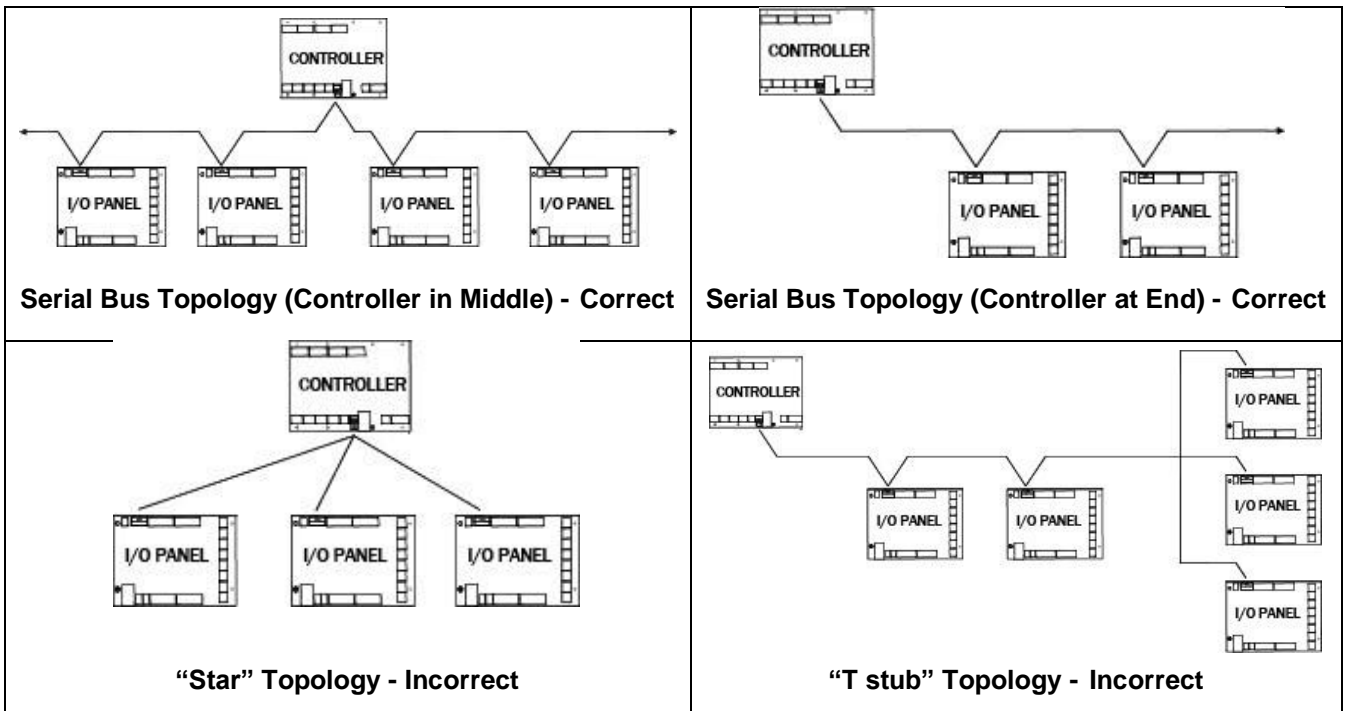

Figure 3.2: RS-485 Bus Topologies

Termination

For the most reliable communications, the RS-485 bus must be terminated at both ends. The terminators are integrated on the board and are engaged via user installed jumpers. Never engage termination of devices in the middle of the communication bus.

External termination modules (ATM-48) are not required but can be used. If using the ATM-48 termination module, DO NOT install the jumpers on the board. The wiring is as follows:
ATM-48 Pin 1 -> TR+
ATM-48 Pin 2 -> TR-

Signal Ground (SG)

When devices are powered from different power supplies, a common ground reference must be established on the RS-485 bus. This is the ground (GND) connection on the Serial port connector. Failure to have a common ground between devices may cause communication errors. If connecting the RS-485 bus with shielded wire, the shielding can be used as the signal ground connection. Or, if the environment is known to be electrically noisy, the wire's shield can be connected to safety/chassis/Earth ground and a separate wire can be used for signal ground.

Grounding Potential Difference Checks Before Connecting

Before a device is connected to an RS-485 subsystem, it must be checked for ground fault. Ground faults can damage all devices connected to the RS-485 communication line. To check if there is ground fault for a new unit, follow the steps below:

1. Apply power to all devices already successfully connected to the RS-485 line.
2. Power up the new unit, but DO NOT connect it to the RS-485 line.
3. Connect the signal ground (SG) of the RS-485 line through a 10k limiting resistor.
4. Measure the AC and DC voltage across the resistor. There should NOT be more than 1 volt across the resistor. Otherwise find and clear the fault.
5. Connect the new unit to the RS-485 line only if no ground fault is found.

3.4 Unsupervised Cabinet Tamper & Power Fault

Connector: TB1

The cabinet tamper (TMP) and power fault (PFLT) inputs only support unsupervised configurations. The cabinet tamper input is wired to the enclosure and detects when the enclosure door is opened and closed. The power fault input is wired to the power supply and detects when there is an issue with the power supply. Wire these inputs with 24 AWG minimum. See "Unsupervised" in Section 3.6.1 wiring diagram.
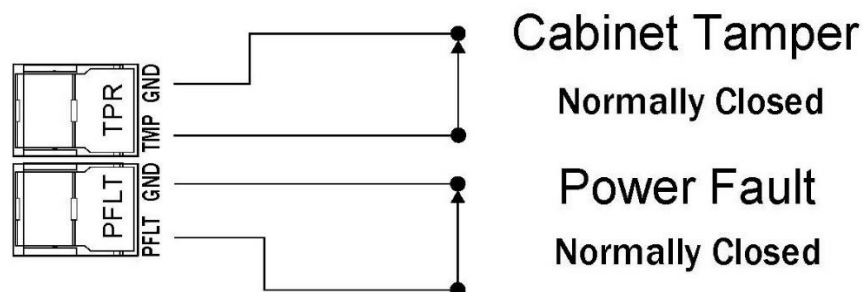

Figure 3.3: Cabinet Tamper & Power Fault Wiring

3.5 Reader Ports

Connector: TB11 & TB12

The IC2 has two onboard reader ports that support Wiegand readers. The RS-485 reader bus is a true RS-485 port, meeting all requirements of the electrical standard.

PIN	DESCRIPTION
GND	Ground connection for the reader
DAT/D0 & CLK/D1	Wiegand reader data connections (see 3.4.1 and 3.4.2 below).
BZR	Open-collector buzzer output. Can also be used for 2-wire LED control
LED	Tri-state LED signal
RVO	Reader power; jumper selectable to either be VIN passthrough or a regulated 12VDC

3.5.1 Wiegand Readers

Each reader port can support one Wiegand reader.

Wiegand readers usually utilize all pins on the reader port. The wiring to a Wiegand reader should be made using 24 AWG minimum, shielded cable with up to 6 conductors. Do not exceed 500 feet (152 m) between the IC2 and reader. 18 AWG cable may be required for long cable lengths or for large current requirements. If twisted pair cable is used, do not wire Data 1/Clock and Data 0/Data in the same pair. Connect the shield drain wire of the cable at the GND terminal of the appropriate reader connector on the IC2. Carefully insulate the drain wire with sleeving for a reliable installation.

Power for each reader port is provided through the "RVO" pins and is selected with a user-installed jumper. Power supplied on RVO is either a passthrough of VIN (12-24VDC) or a regulated 12VDC. The reader ports can supply a COMBINED maximum current of 600mA. If the readers have a greater total power requirement, or if there are other wiring concerns, external power supplies should be used to power the readers. In this case, only connect the reader power lines to the external power supply; do not connect the reader to two power supplies.

For basic operation of the reader, at a minimum the Data 1/Clock and Data 0/Data wires must be connected from the reader to the IC2 and power supplied to the reader. LED and buzzer control lines do not have to be connected, but in this case, the LED and buzzer may not function on the reader.
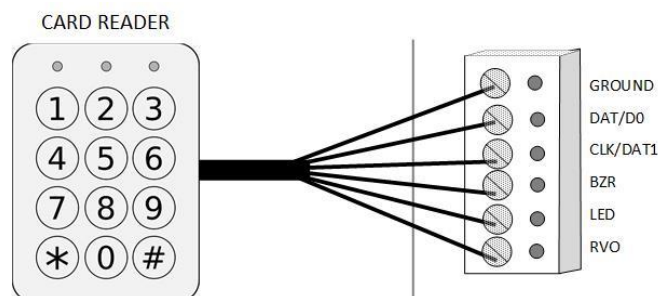

Figure 3.4: IC2 Wiegand Reader Wiring

3.5.2 RS-485 (OSDP) Readers

In this section, "OSDP reader" will be used to represent what is really any RS-485 reader. The OSDP protocol standard expands the functionality of readers by enabling a large (and growing) command set.

OSDP readers must be connected to the Serial Port #1 instead of the Reader Ports.

The IC2 supports 2 OSDP readers. OSDP uses a 2-wire interface (transmit and receive on same wires). Always observe polarity of the lines, connecting positive (+) to positive and negative (-) to negative terminals. The Signal Ground (GND) must be connected between the readers and the COM 1 port for reliable communications. "Star" wiring or "T stubs" longer than 10ft must never be used! For more information, see the Section 3.3.2 above.

Figure 3.5: OSDP Wiring

OSDP connections should be made observing polarity of the lines from the reader. Signal ground should always be connected.

3.6 Supervised Alarm Inputs

Connector: TB3 – TB8

The IC2 has 8 Supervised Alarm Inputs. These inputs are multi-purpose and are configured with the Host software. Any input can be assigned as a door contact, REX, or auxiliary alarm input (i.e., motion or glass-break sensors). With the use of end-of-line termination resistors, the alarms are monitored for not only secure and alarm states, but also the detection of fault conditions from tampering and accidental damage.

These alarm inputs can be configured as either "Normally Open" or "Normally Closed" and can also operate in an Unsupervised mode. Unsupervised configuration does not require any external, end of line resistors.

However, unsupervised mode is the least secure and damage or tampering of the line can go undetected, resulting in missed or false alarms. The unsupervised configuration should not be used in any situation that requires security. An example of unsupervised input wiring can be seen in Figure 3.9.

Input wiring requires minimum 22 AWG up to 1,000ft (304.8m) and a maximum of 30 Ohms of loop resistance.

3.6.1 End of Line (EOL) Termination Resistors

Using two End-of-Line (EOL) termination resistors, the Supervised mode can detect fault conditions resulting from accidental damage or tampering. The IC2 will not confuse this condition with a valid secure or alarm condition. For maximum security, the end-of-line termination resistors should be placed at the END of the cable, farthest away from the IC2. There are multiple EOL options, ranging from ready-made terminal block connectors to individual, hand-placed resistors. The following wiring diagram shows some of the pre-defined termination resistor configurations.
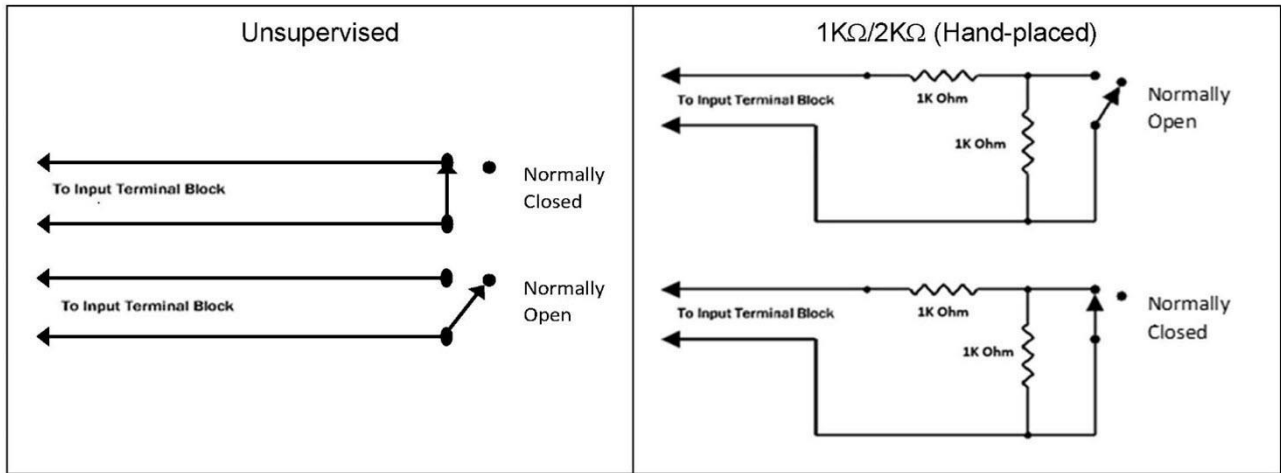
Figure 3.6: Input Supervision
Supervised inputs can be configured with Host Software to use different EOL resistor combinations.

3.7 Output Relays

Connector: TB9 & TB10

The IC2 has four output relays onboard. These relays can either control a door strike (lock) or other electrical device connections or other miscellaneous output control. Relay functions are defined in the Host software. The onboard relays can switch up to 2A @ 30VDC.

3.7.1 Door Strike Wiring
A typical electric door strike (lock) will require around 250mA (0.25 Amps) to operate. If the locking device requires more than 2 Amps to control, another external power-switching device/relay of adequate power rating must be used. Some strikes such as magnetic strikes are inductive loads, in which case is recommended to derate the relay's rated current by 50%.

Wiring between the strike power supply, strike relay (internal or external) and the electric lock should be of sufficient gauge (16 to 18 AWG recommended) to prevent excessive voltage drop under all circumstances.

3.7.2 Auxiliary Output Relay
Aside from controlling door strikes, relay outputs can be used for controlling other audible and visual devices. Auxiliary relay functionality is configured via the Host software.

3.7.3 Voltage Spike Suppression
Due to inductive nature of a door strike, energizing and deenergizing of the relay can cause voltage spikes across the relay contacts. If no suppression is used to defend against these voltage spikes, communication problems and permanent damage to the hardware may occur.

| Strike Type	Suppression Method
DC Strike	Reverse-biased DIODE with a continuous current rating of at least 1x the strike current and a breakdown voltage (Vbr) rating of at least 2x the strike voltage. Usually a 1N4001 – 1N4006 will work.
AC Strike	A Metal Oxide Varistor (MOV) will usually be included with the strike. If a MOV does not come with the strike, contact the strike manufacturer for the appropriate MOV ratings. Be sure to use a UL approved MOV.
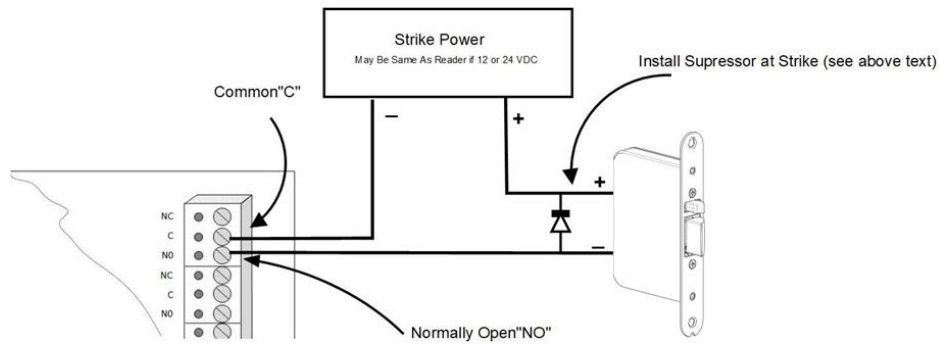
Figure 3.7: Strike Wiring Diagram (DC w/ Diode)

Both DC and AC suppression components are placed identically across the output device's electrical terminals.

3.8 Door / Access Point Setup

An Access Point (sometimes referred to simply as "Door") is the grouping of at least one reader, supervised inputs, and relay outputs to yield full control and monitoring of a door/entryway. The IC2 supports 2 complete Access Points by default. More Access Points are possible with the purchase of extra reader licenses allowing for multi-dropping more OSDP readers. A "complete" Access Point consists of at least one reader, two supervised inputs (for door contact and REX), and one relay output controlling the door strike. Configuration and assignment of the Access Point's interfaces is done through the Host software.
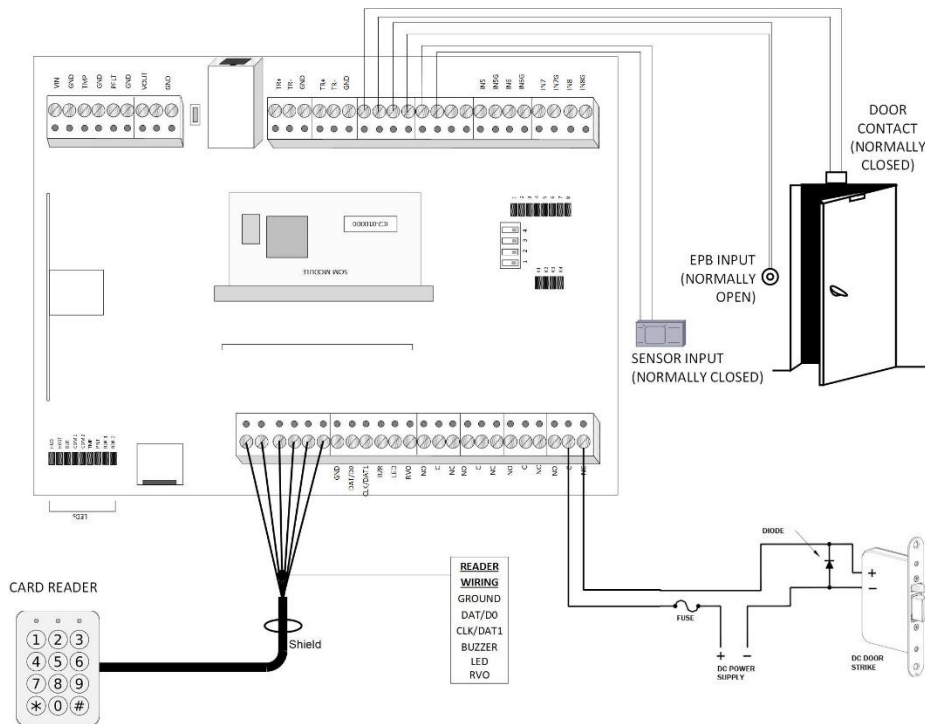

Figure 3.8: Door / Access Point Wiring

3.8.1 Reader

An Access Point needs at least one reader to receive credentials. The IC2 supports both Wiegand and RS-485 (OSDP readers). Access Points can also use two readers in a "paired" configuration.

3.8.2 Door Contact & Exit Pushbutton/REX Inputs

The door contact input is a normally closed input used to monitor the position of the door (open or closed). This will typically be connected to a magnetic sensor in the frame of the door that will provide a short circuit when the door is closed and an open circuit when the door is opened. Door Contact inputs are required for features that require knowledge of door usage, such as Anti-Passback, Door Forced / Held Open, and more precise strike timing.

The Exit Pushbutton, sometimes referred to as a REX (Request-to-Exit/Enter) input, is a Normally Open input that is used to inform the Access Point the door needs to or will be opening without an access request being made with a user's credential (card, pin, etc.). It is usually in the form of a pushbutton, but it could also be in the form of a motion sensor or other user-activated sensor. Note that different types of sensors will require different strike timing calibrations.

If input supervision is enabled (see Part 3.5.1 above), end of line (EOL) terminating resistors must be installed. The terminating resistors should be installed as close to sensor (away from the IC2) as possible.

3.8.3 Door Strike

Door strikes come in a variety of different styles. They can come in different voltages (both AC and DC) and can operate in a Fail-Secure or Fail-Safe manner. The most common voltages are 12 & 24 Volts. A Fail-Safe door uses electrical current to keep the strike locked; meaning in the case of power failure, the strike will default to an unlocked state. A Fail-Secure strike uses electrical current to unlock the door; meaning in a power failure situation, the door will default to a locked state.

PART V
Troubleshooting

4   Troubleshooting

When the IC2 encounters an unrecoverable state please perform a factory reset by pressing the reset button on board.

Please contact IMRON Corporation support for maintenance if the IC2 is not working properly.

PART VI
Specifications

5   Specifications

Specifications are subject to change without notice.

Primary Power (VIN)	**DC/DC:** 12 to 24 VDC ± 10%; Board current (no peripherals powered): • 12VDC: Operating Max 320mA, Peak 2A • 24VDC: Operating Max 170mA, Peak 1.54A "Peak" inrush current occurs immediately and then falls rapidly during super cap charging. It is recommended to use power supplies with a "soft-start" feature, otherwise the power supply must be rated to handle "Peak" inrush current. Some power supplies without "soft-start" feature still worked when rated at least x2 operating max but less than Peak inrush current rating. **PoE+** Source: 42.5-57V; 660mA Max with Full Load • 12VDC Output; Max Current: 2000mA (2 Amps)
Auxiliary Power (VOUT)	VIN Passthrough; 1000mA (1A) Max
Reader Power (RVO)	VIN Passthrough or 12VDC Regulated • 600mA Max between both ports (added directly to Primary Current if VIN Passthrough)
RTC Coin Cell Battery (BAT1)	CR1225; 3V; 48mAh capacity recommended
Micro USB OTG	5VDC, 500mA maximum (add 270mA to Primary Power current). Reserved for future use.
Micro SD Card	Not supported at this time.
Host Communication	• Network 10BaseT/100Base-TX • USB adapter can be used as a second network port for communications.
Downstream Serial Comm (x2)	RS-485; 2-wire (half-duplex), 9,600 to 115,200 baud
Tamper & Power Fault	Unsupervised digital inputs for cabinet tamper and power supply failure.
Alarm Inputs (x8)	Unsupervised or supervised, configurable End-Of-Line resistor values.1K/2K are supported by default. Custom values available. Use 1 %, ¼ W resistors.
Output Relays (x4)	Dry, Form-C contacts. 2A @ 30VDC Note: When connecting an inductive load like a magnetic strike, it is recommended to derate the relay's current rating by 50%.

Reader Ports (x2)	**Reader Power:** Jumper selectable; VIN or 12VDC Regulated. Only use Regulated 12VDC when VIN > 20VDC • 600mA Max between both ports. 500mA Max each port. **Data Input:** Supports Wiegand. **Buzzer Output:** Open collector, 18 Vdc maximum, sink 50mA maximum. **LED Output:** Tri-State LED output. Wiegand levels, high>3 V, low<0.5 V, Low=Active, 20 mA source or sink maximum
Cable Requirements	**DC Power:** 18 AWG minimum, 1 twisted pair **Ethernet/PoE+:** Cat 5 minimum **RS-485:** 24 AWG. 1 shielded twisted pair. 4000 ft. (1,219m) maximum. Belden 9841 or equivalent. **Reader Data (Wiegand):** 4 to 6 wires, 500 ft. (152 m) maximum. 22 to 18 AWG depending on cable length. Should be non-twisted pairs. For 6-conductor wiring, Belden 9536 or equivalent is recommended. **Inputs:** Unsupervised/supervised: 1 twisted pair, 22 AWG minimum, 1000 ft. (304.8 m) 30 Ω maximum loop resistance **Relay outputs:** 16 to 18 AWG. Should be of sufficient gauge to avoid voltage loss.
Environmental	**Temperature:** -40 to 85ºC operating and storage; Indoors **Humidity:** 5 to 95% RHNC.
Mechanical	**Dim:** 8 in. (203.2 mm) W x 6 in. (152.4 mm) L x .75 in. (19.05 mm) H **Weight:** 0.6 lbs. (272.2g)

Part VII
UL Compliance

6   UL Compliance as Recognized Product

- For UL installations using PoE, the following must be observed:
- Compliance with IEEE 802.3 (at or af) specifications was not verified as part of UL
    - 294.
- Locations and wiring methods which shall be in accordance with the National
    - Electrical Code, ANSI/NFPA 70.
- This product is not intended for outside wiring as covered by Article 800 in the
    - National Electrical Code, NFPA 70.
- Category 5e, cabling is the minimum performance category recommended.
- The minimum conductor gauge permitted to connect between the PSE or power
    - injector and the PD shall be 26 AWG (0.13 mm$_2$) for patch cords; 24 AWG (0.21
    - mm$_2$) for horizontal or riser cable.
- Connected through standard eight-pin RJ-45 connectors.
- Evaluated for Mode B only.
- PoE power is to be supplied by an Access Control System Unit (ALVY), Class 2 power
    - limited, PoE injector (PSE) providing 42.5-52VDC and 25.5W for maximum output."
- Power to be provided by a Listed UL 294, UL 603, or UL 2610 power limited/class 2, power
- supply or PoE injector with appropriate ratings and standby power.
- Wiegand, OSDP 26-bit card format tested by UL.
- 1K/2KEOL values verified.
- Supervised Inputs required for burglar applications.
- When used with a Listed system for burglar use, system is to be monitored by a Listed receiver for the standards used.
- 12V regulated reader-power setting is only for use with 24VDC input.
- Using the 12V regulated reader-power setting configures reader outputs for special application use only.
- 4-wire connection for half-duplex not evaluated.
- Battery on IC2 is assumed to be serviced by qualified technicians only.
- Product evaluated as a recognized component by UL and is not suitable to be used as a Listed subassembly. Products are for user with listed access control or proprietary burglar alarm control units/system.