ISONAS™

PURE IP ACCESS CONTROL

How to Install an ISONAS Pure IP Reader-Controller™

ISONAS Inc.

FCC ID: OCZRC-04M, OCZRC-04SK
IC: 8431A-RC04M, 8431A-RC04SK

This device complies with **Part 15 of the 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 in a residential installation. This equipment generates, uses, and 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: 1) Reorient or relocate the receiving antenna. 2) Increase the separation between the equipment and receiver. 3) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected. 4) Consult the dealer or an experienced radio/TV technician for help.

This device complies with **RSS-210 of Industry Canada**.
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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

For RF Safety and per FCC and Industry Canada regulations, the product should never be installed within 8-inches (20cm) of typical people locations.

Table of Contents

Document Version

Date of Revision	Revision	Author	Description
11/03/2016	**1.00**	**Shirl Jones**	**Initial Release**
12/14/2016	**1.01**	**Shirl Jones**	**General Updates**
12/20/2016	**1.02**	**Shirl Jones**	**Updated Cabling Guidelines**
1/25/2018	**1.03**	**David Tamarchenko**	**Listing Updates**
11/13/2020	**1.04**	**Nick Baker**	**UL 294 7th Edition & General Updates**

1: BEFORE YOU BEGIN

This guide discusses each wiring process separately. Understanding all these processes makes a project much simpler and helps guarantee success. To install an ISONAS Reader-Controller unit, you must complete three key wiring tasks:

1.1. Mount the Pure IP Reader-Controller reader in the appropriate location. Recommended locations and wiring methods shall be in accordance with 1) the National Electrical Code, {ANSI/NFPA 70}; 2) International Building Code {IBC}, and 3) Americans with Disabilities Act {ADA}.

1.2. Wire the unit to the door's locks and other components for physical access control.

1.3. Supply power to the Pure IP Reader-Controller reader. This may be accomplished with power being provided on the Ethernet data cable (Power over Ethernet [POE / POE+]) or through an external DC power source (12VDC). When powering from POE or POE+, the Power Sourcing Equipment (PSE) injector or end point must either be compliant to UL294B or UL294 7th Edition standards.

1.4. Connect the unit to the data network for communication with the Host access control system. The Host access control system typically is one of the following: PureAccess-Cloud, PureAccess-Manager, or a 3rd party ACS software package.

1.5. The Pure IP Reader-Controller reader complies with UL 294 V7 and is rated for the following performance levels:

Feature	Level
Destructive Level Attack	**IV (ASM required)**
Line Security	**I**
Endurance	**IV**
Standby Power	**I**

1.1: GENERAL INFORMATION & REQUIREMENTS:

- If PoE is not being used, then use only UL-listed, access control, power-limited power supplies with an 'AC on' indicator light clearly visible on the enclosure. Power supplies should provide at least four hours of standby power.
- *If POE is being used,* the PoE Power Source needs to comply with National Electric Code, ANSI/NFPA 70, Article 725.121, Power Sources for Class 2 and Class 3 circuits.
- Never connect power supplies to a switch-controlled receptacle.
- Install the ISONAS system in accordance with the National Electrical Code NFPA 70, IBC, and ADA requirements. (Local authority has jurisdiction.)
- Use only UL-listed wire or cabling recognized suitable for ISONAS power supply and data communications, in accordance with the National Electrical Code.
- Category 5e cabling is the minimum performance category recommended. The performance category utilized should match the transmission speed required at the installation site.
- The minimum conductor gauge permitted to connect between the PSE or power injector and the PD (powered device) shall be 26 AWG (0.13mm^2) for patch cords; 24 AWG (0.21mm^2) for horizontal or riser cable.
- Compatible with UL 294 compliant PoE Network Switches and Midspan PoE Injectors.
- Where possible, separate ISONAS equipment and cabling from sources of electromagnetic interference (EMI). Where this is not possible, take other steps to reduce the effect of EMI on cabling or equipment.
- Protect input and output terminals adequately from transient signals. Also, connect these terminals to power-limited circuitry.
- Compliance with IEEE 802.3 (af or at) specifications are not verified.

1.2: Pure IP Reader-Controller SPECIFICATIONS:

Input Voltage	12 VDC @ Orange Pigtail Wire Note: 8.0V - 14.5V absolute min/max PoE per IEEE 802.3af @ RJ45 Connector Note: PoE+ (802.3at) will auto-negotiate to standard PoE (802.3af)	
Input Current Draw (Without external loads)	PoE: 2.3 watts 12VDC: 150 mA	
Supplied Power for External Devices (when PoE power is being used)	0.60 AMPS @ 12VDC	
Read Range	2 to 5 inches typically	
Read Speed	<250msec (Prox)	
Exciter Field Frequency	Proximity - 125 kHz Multi-Tech - 13.56 MHz	
Modulation Schemes	Proximity: FSK Multi-Tech: ISO 14443 type A and type B	
Communication Interface	TCP/IP Over Ethernet 10 Mbps Auto-Negotiation Half-duplex / Full-duplex	
Inputs	1 Door Sensor / 1 REX/AUX	
Outputs	1 Lock Power Output / 1 EDK control output	
Standalone Memory Capacity	64000 Cards / 5000 Events / 32 Time zones	
Visual Indicators	LED for Normal Operations	
Environmental Operating Conditions	-40° To 57° Celsius (-40° To 135° Fahrenheit)	
	IP56 rated for outdoor use	
Weight	Mullion	6.5 Oz
	WallMount	8.0 Oz
	WallMount w/Keypad	9.5 Oz
Size	Mullion	5.10 x 1.70 x 0.71
	WallMount	5.10 x 3.25 x 0.71
	WallMount w/Keypad	5.10 x 3.25 x 0.75

1.3: INSTALLATION LOCATION GUIDELINES

When selecting the location where you are going to mount the ISONAS Reader-Controller, a few guidelines should be observed.

1) The Reader-Controller should be kept at least 2 feet from another ISONAS Reader-Controller, and 6 feet from any other RF emitting device.

2) In an exterior location, the Reader-Controller's mounting should be sealed to prevent water from running down between the mounting surface and the back of the Reader-Controller.

3) For the Pure IP Reader-Controller, a dielectric insulating compound (Dow Corning DC-4 or equivalent) should be used in humid environments to obtain extra water protection of the Reader-Controller's cable connections.

4) In humid environments, it is recommended that a drip-loop be formed in the Pure IP Reader-Controller's cables, before the cables enter the Reader-Controller.

5) The Reader-Controller should be protected from extreme heat and sunlight. It is rated for conditions up to 135 F. A direct southern exposure, in the Southwest area of the United States may exceed these ratings.

6) The cables extending from the back of the Pure IP Reader-Controller's Pigtail cable is available in two standard lengths (10 foot or 25 foot). Plan for the termination of the door wiring within that distance of the Reader-Controller.

7) The wall mounting features required for the Reader-Controller are shown in the next figure. It is recommended to use the RC04's detachable metal bracket as a drill template for locating the mounting screws.

8) Assure the selected location meets ADA requirements. This typically requires unobstructed access, less than 48 inches from the floor

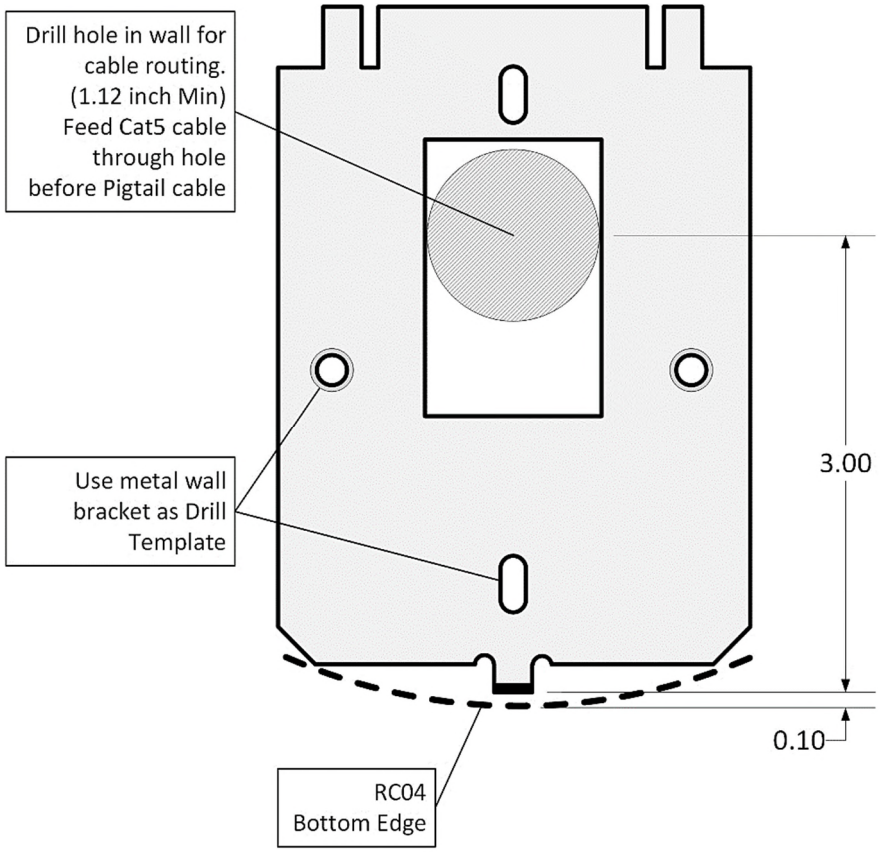


Figure 1

Pure IP Reader-Controller Wallplate
Mounting Diagram

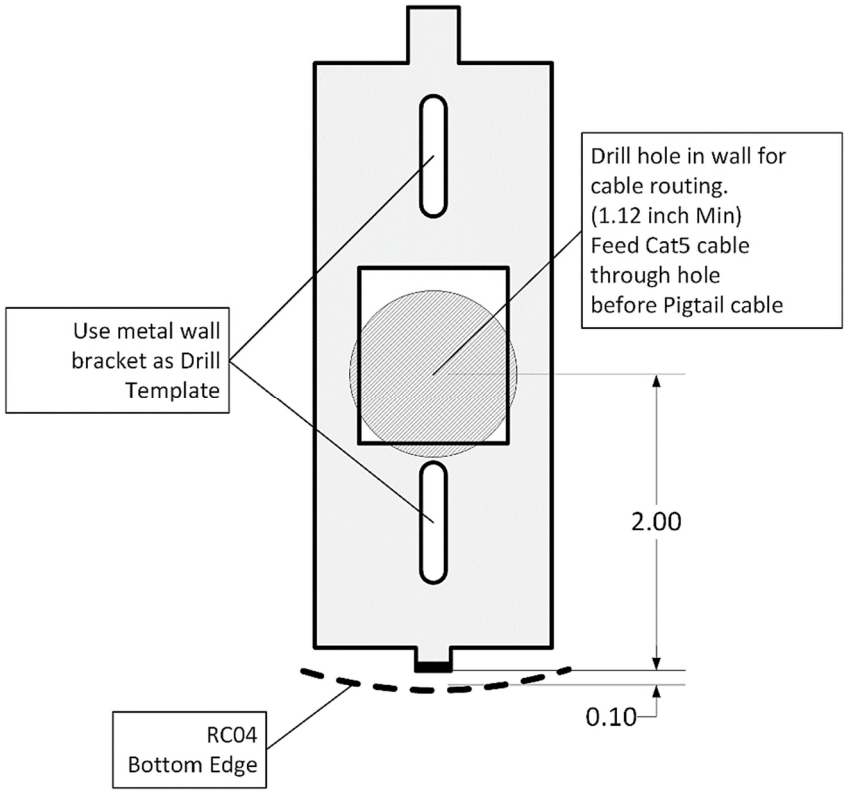


Figure 2

Pure IP Reader-Controller Mullion
Mounting Diagram

1.4: INSTALLER TOOLKIT COMPONENTS

Before an installer goes to a customer site, they need to put together their supplies and toolkit. The ISONAS solution is simpler to install than other Access Control Systems, but to be successful, other materials are still needed. And some of these items may be different than what you are used to carrying. The list below identifies some important items that you should make sure to bring with you, to the customer's site.

A prepared installer will have:

- **Completed the on-line reseller training program.**
- **Determined the reader's required network configuration, based on the customer's networking topology.**
- **Pre-configured the reader's network configuration.**

An installer's Tool Kit should include the following:

1. **A copy of the Pure IP Reader-Controller Installation and Wiring Guide**
2. **A Volt-Ohm Meter**
3. **Pin-in-Torx Screwdriver**
    - **T-8 (Tamper Resistant)**
4. **1 1/8-inch hole-saw (If mounting is done without a J-box)**
5. **A PoE Injector**
6. **A Cross-over Cat5/6 cable**
7. **A straight-thru Cat5/6 patch cable.**
8. **Basic Ethernet network cable tester (Tests for: Opens, Shorts, Split Pairs, Mis-wires & Reversals)**
9. **A spare Pure IP Reader-Controller**
10. **An extra Pure IP Reader-Controller Pigtail**
11. **Silicon Caulking for sealing the Pure IP Reader-Controller to exterior walls**
12. **Dielectric Silicon Grease (Dow DC-4) for protecting cable connections.**
13. **The ISONAS Pure IP Reader-Controller As-Built forms, which is used to record the details of the door's installation.**
14. **Credentials that match the customer system's technology**
    - **ISONAS Proximity**
    - **HID Proximity**
    - **DESFire EV2 Smart Cards**

1.5: PURE IP READER-CONTROLLER RESET BUTTON

The Pure IP Reader-Controller has a Reset Button located on the back. It can be used for two different types of resets.

It is helpful if the Pure IP Reader-Controller's Ethernet cable is connected, and functioning (the network status LED is lit). Monitoring the RC04's main status LED allows you to determine the status of the reset operation.

- **Reset CPU:** Press, hold (approx. 2 seconds) and release the Reset button. Once the Reset Button is released, the reader should reboot. The main Status LED should turn AMBER, and then return to the normal RED state. If the LED does not turn AMBER, then the reset did not occur.

- **Reset Configuration:** Press and hold the Reset button (approx. 10 seconds), until the RC04's Main Status LED turns AMBER. Selected Reader-Controller configuration settings are reset to factory defaults. Setting that are changed include:

Setting	Default Value
DHCP	On
IP Address	192.168.254.119
IP Port	10001
Subnet Mask	255.255.0.0
Gateway	0.0.0.0
ACS Alias	{blank}
ACS Server IP	0.0.0.0
Communication Type	Client
Remote Host Name	{blank}
Remote Host IP	0.0.0.0
Remote Host IP Port	55533
Remote Host DNS	8.8.8.8
HID Prox Enabled	On
HID Bit Mask	"FFFFFF"
Clears AES Encryption Configuration	
Resets Pure IP Reader-Controller's Passwords	

2: WIRING AT THE DOOR AND READER-CONTROLLER

2.1: POWERING THE READER-CONTROLLERS

All ISONAS Reader-Controller models require a direct connection to a power source.

Warning: The Reader-Controller should *not* be powered on until all connections have been made and tested. To avoid a potential Reader-Controller failure due to Back-EMF, Inrush Currents, Electrostatic Discharge (ESD), etc., remove power prior to changing any connections.

The Pure IP Reader-Controllers can be powered with 12 volts DC or PoE (IEEE 802.3af) power and the supply must be regulated. Many brands of power sources work well with ISONAS equipment. Please note that you should **never connect 24VDC to the Reader-Controller**. This will void the unit's warranty.

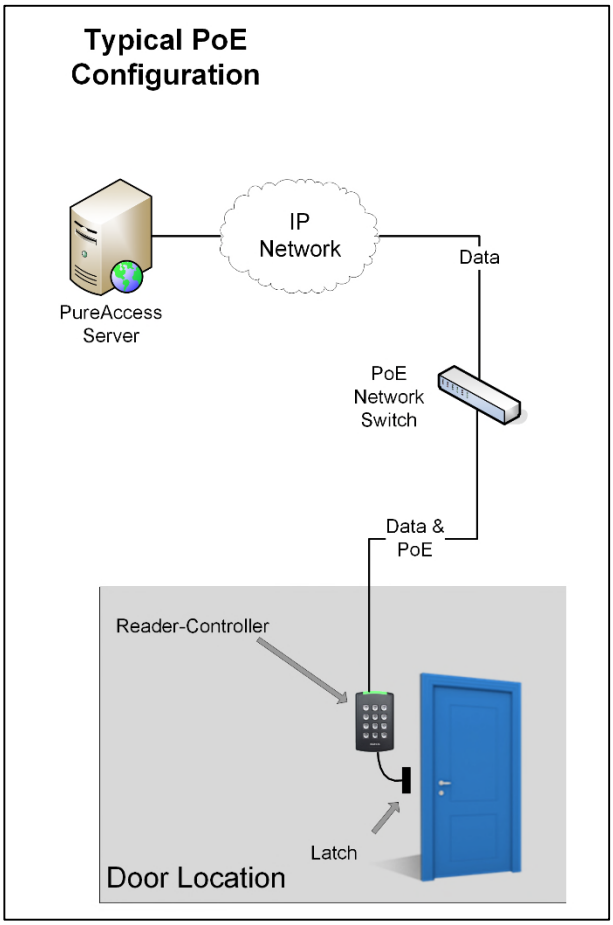
All connections, cable, and wiring methods used during installation need to be in conformance with National Electrical Code and ANSI/NFPA 70.

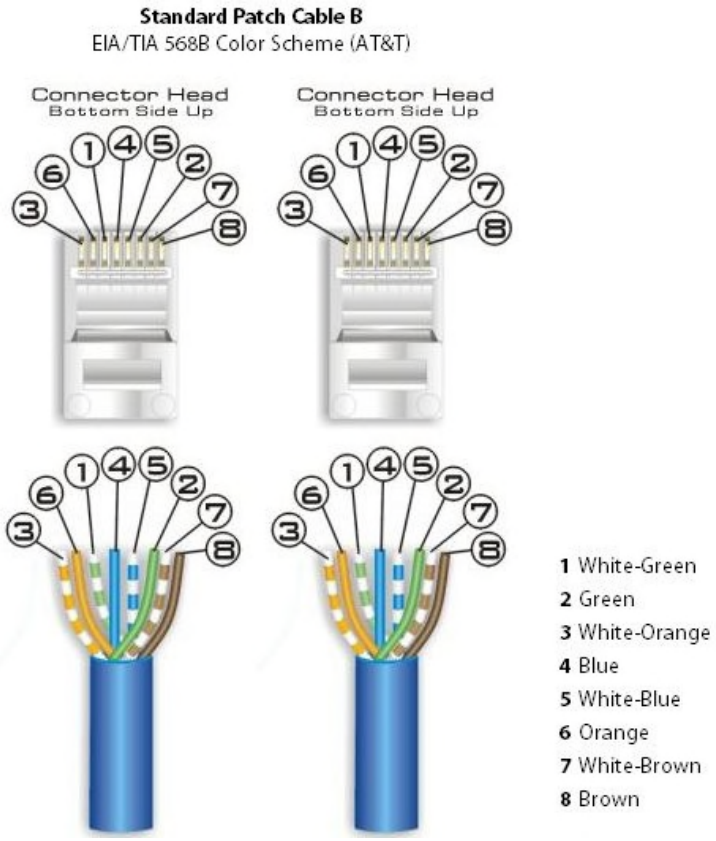
2.1.1: POWER OVER ETHERNET (PoE) OPTION

If you are installing ISONAS Pure IP Reader-Controllers, then you can use the Power Over Ethernet (PoE) option. PoE allows one cable to supply data and power to the Reader-Controller, which in turn, can then supply 12VDC to the door's Electronic lock. The obvious savings here is that you only need to run a single Cat5e/6 cable to the door which will provide enough power to run both the ISONAS Reader-Controller and an electronic lock.

If your network switches do not support PoE, then a PoE Injector can be used to augment the switch's output with PoE power. A PoE injector is normally located close to your existing network hub/switch, and the PoE Injector itself is plugged directly into a standard AC outlet, or for extra reliability, a UPS with battery backup.

Figure 3 is an overview of how to use PoE to power both the ISONAS Pure IP Reader-Controller and an electronic locking mechanism.





A standard Cat5e/6 cable is then run between the PoE source (Injector or switch) and the Pure IP Reader-Controller which will be located right next to the door. The Cat5e/6 cable can be up to 100 Meters (328 feet) long, including all patch cables and patch panels.

Supplying 12 VDC to Door Components from the PoE powered Pure IP Reader-Controller

When the Pure IP Reader-Controller is powered by PoE, the reader can supply 0.6 amps @12 VDC power for external components. This DC power is available via two pigtail wires.

The Red pigtail wire is typically used to control the door's lock. The Red wire's 12VDC output will be activated /deactivated when the reader is operating the door's lock. This connection has a built-in current limiting feature, to prevent the lock from consuming too much electrical power.

The Orange pigtail wire provides a source of continuously available 12 VDC power. You might use this 12VDC source to power a PIR Motion Detector located at the door location.

PoE Power Budget Calculations

When planning an installation using PoE, you need to validate that the PoE source (PoE Injector or PoE equipped Network Switch) supplying the PoE power is sized properly for all the attached PoE devices. To do this, you total up the power draw (in watts) of the PoE connections and compare that total power draw to the rated capacity of the PoE source.

Below is a chart of expected PoE power draws of the ISONAS Reader-Controllers.

Door Location Configuration	PoE Power Requirement ** (Watts)
Pure IP Reader-Controller	2.3 Watts
Pure IP Reader-Controller with Electronic Lock (300 mA @ 12V)	6.2 Watts
Pure IP Reader-Controller with Electronic Lock (600 mA @ 12V)	10.4 Watts

*** Ethernet cabling power losses not included. Losses range from being negligible for short Cat5e/6 cables, up to about 16% for 100 meter Cat5e/6 cables.

To meet the Pure IP Reader-Controller's variable PoE power requirements, the Pure IP Reader-Controller will classify itself with the PoE source as a "Class 0" PoE device. The power usage of a Class 0 device can range between 0.4 to 13.0 watts at the device (up to 15.4 watts from the PoE source).

Some network PoE equipment will budget and allocate its distribution of PoE power based upon the maximum power usage of each attached device's classification. If your network equipment uses this power provisioning technique, then you should budget 15.4 watts for each Pure IP Reader-Controller. Such network PoE Equipment may allow you to manually configure the amount of power that should be allocated to each device. Configuring the PoE equipment for an allocation of 3.0 watts or 11.0 watts per connection would be appropriate. Remember, when powering from POE or POE+, the Power Sourcing Equipment (PSE) injector or end point must be compliant to UL294B or UL294 7th Edition standards.

Using PoE over longer cable distances:

The ISONAS RC04 can be powered via PoE on cable runs up to 100 meters long (the standard Ethernet cable limit).

For RC04 locations that have longer cable runs (> 50 meters), extra care should be given to the planning and installation of the network cabling. The PoE power delivery system will running at about 80% of the allowable capacity, when powering a 0.6A lock over a 100-meter cable run.

For long cable run installations, here are some items to focus on:

- **Cabling:**
  - Use high-quality Ethernet cabling (Cat5e / Cat6). Please note that the power loss over a Cat6 cable is about 30% less than the power loss on a Cat5e cable
  - Cable Length. The 100 meter limit needs to include any patch cords and patch panels.
  - Follow IEEE/TIA installation best practices, including:
    - Cabling is properly terminated and tested.
    - The cabling loop resistance must be less than 20 ohms.

- **PoE Source:**
  - The PoE Source (PoE Network switch or PoE Injector) meets the IEEE 802.3af standard.
  - The PoE Source is properly sized to supply 15.4 watts/port. (Cabling power loses can be up to 2.5 watts/cable.

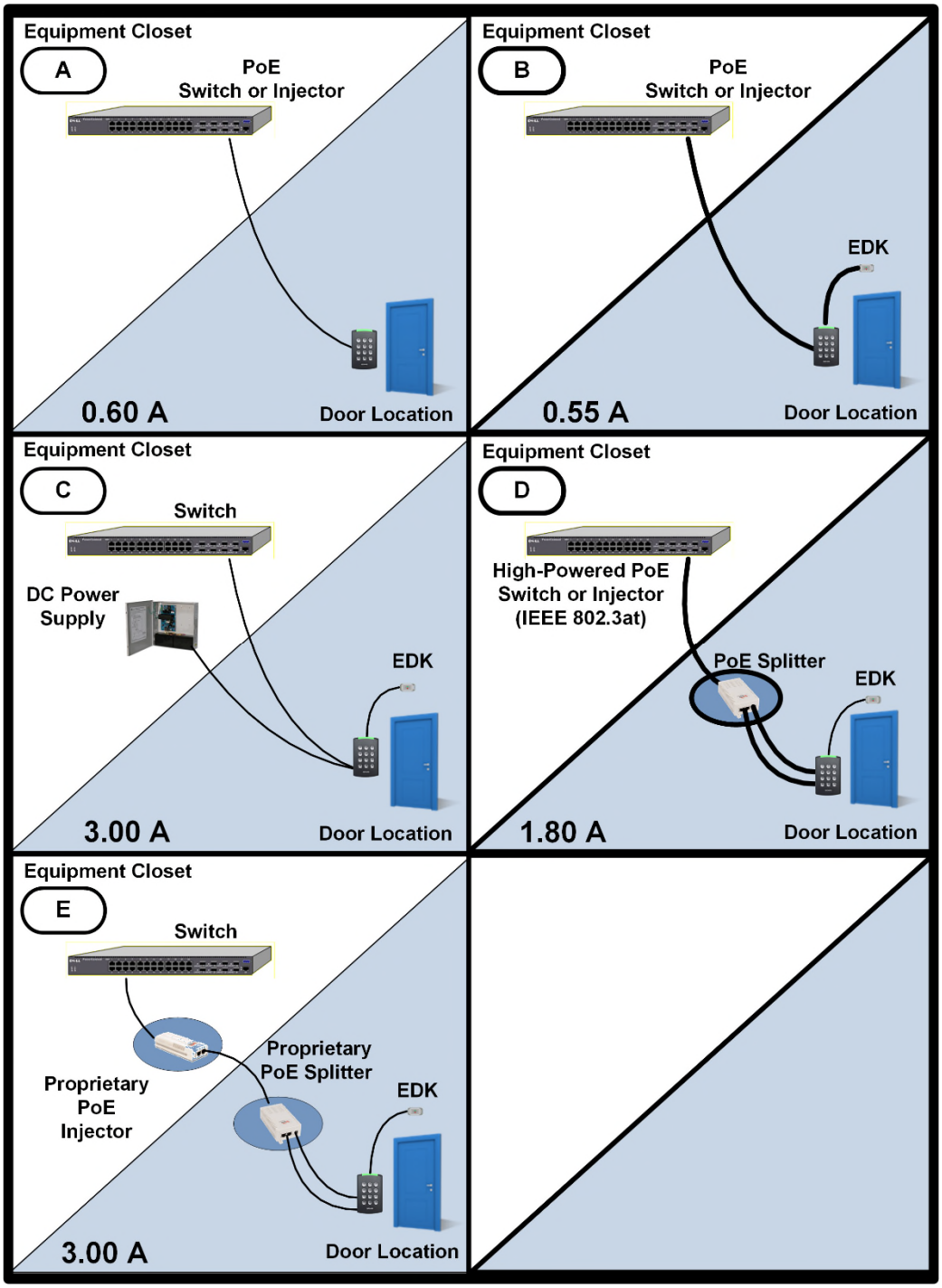
2.1.2: ADDITIONAL POWER OPTIONS

Most installations will use PoE for the Pure IP Reader-Controller and door locks.
That is a clean way to control a door using a single, standard network cable.

There are many additional options available, that can be used, if the door location requires more power than a standard PoE-powered Pure IP Reader-Controller can provide.

The different options require different configurations of the supporting equipment and /or building wiring. The following chart and **Figure 4** describe some of these power options.

Power Source	Switchable Power (Max)	Equipment at the Door	Limiting Factor	Topology Diagram
PoE (802.3af)	0.60 amps (12VDC)	Pure IP Reader-Controller	Pure IP Reader-Controller's available PoE Output	A
PoE (802.3af)	0.55 amps (12VDC)	Pure IP Reader-Controller EDK	Pure IP Reader-Controller's available PoE Output {minus} the power required by the EDK	B
DC Power Supply 12 VDC	3.0 amps (12VDC)	Pure IP Reader-Controller EDK	Rating of EDK's lock relay (12VDC required by EDK's internal circuitry)	C
PoE + (802.3at)	1.8 amps (Approx.) (12VDC)	Pure IP Reader-Controller EDK PoE Splitter Example PoE Splitter PowerDsine PD-AS-701/12	Rating of PoE Splitter {minus} power required to operate Pure IP Reader-Controller & EDK	D
High-Powered PoE (non-standard) Example PoE Injector PowerDsine PD-9501G	3.00 amps (12VDC)	Pure IP Reader-Controller EDK PoE Splitter Example PoE Splitter PowerDsine PD-AS-951/12-24	Rating of EDK's lock relay	E



Power Options
Figure 4

2.2: WIRING THE DOORS

Wiring a door may involve connecting:

- An electronic door latch:
  - Optional door position sensor
  - External power for latch/maglock over 0.6mA
  - Diode or In-Rush Suppressor between latch/maglock and Reader-Controller
    PNs: ACC-BackEMF-DIODE and ACC-IRS-4700
- Optional request to exit (REX) such as:
  - Motion sensors
  - REX buttons
- Optional Door sensors
- Optional Exterior Door Kit (PN: ACC-EDK-3A)

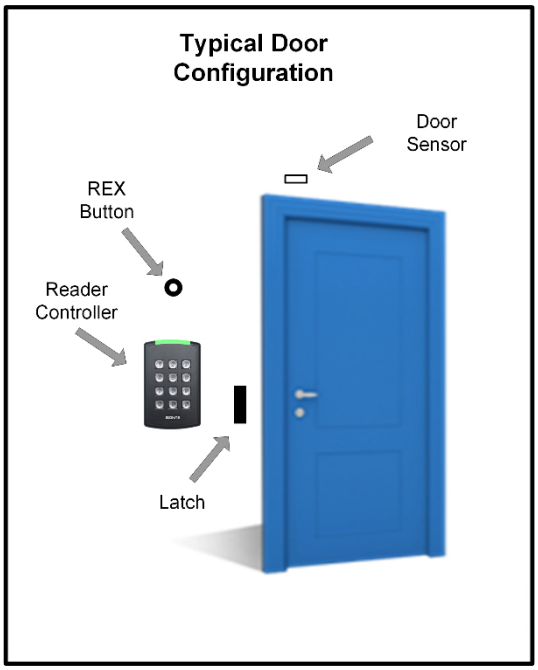


Figure 5

Figure 5 shows a typical installation configuration at the door.

Warning: The Reader-Controller should *not* be powered on until all connections have been made and tested. To avoid a potential Reader-Controller failure due to Back-EMF, Inrush Currents, Electrostatic Discharge (ESD), etc., remove power prior to changing any connections.

2.2.1: READER-CONTROLLER CONTROL-LEADS DESCRIPTION

Resources: Visit the ISONAS website and use our Wire App Designer to build your wiring diagram - https://www.isonas.com/application/wiring-app/index.php

The Reader-Controller has a cable extending from its back plate that is referred to as "the pigtail". The pigtail consists of 8 wire leads (22 AWG) which are used to connect to the various components at the door location. *Wiring lead connections must be at least 6" long, no more than 98.5' (30m) and 22 AWG or less.* Most installations do not require the use of all the leads. The typical usage of each available lead is shown in **Figure 6**.

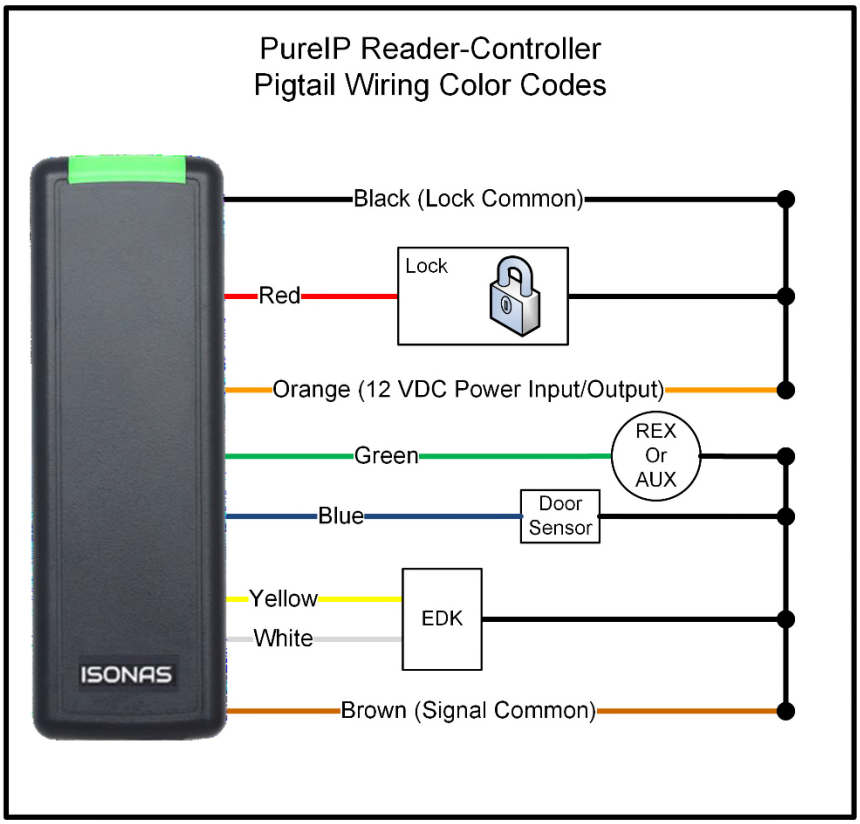


Figure 6

The Blue wire is for a door sense switch. The Green wire is for a REX (Request for Exit) signal coming from a switch, motion sensor or other REX device.

The controllers have a lock-control circuit. This circuit provides conditioned 12VDC power and can be directly connected to the electronic lock to unlock the door when a valid credential is presented.

The usage of each lead will be detailed in the next few pages.

2.2.2: LOCK WIRING -- BASIC

Electronic door lock Overview:

If the door does not already have an electronic lock, first install the lock hardware according to the manufacturer's instructions. Examine the lock to determine whether applying power will lock or unlock the door.

- **Fail Safe:** Applying power *locks* the door (usually magnetic locks).
- **Fail Secure:** Applying power *unlocks* the door (usually electric strike locks).

Most locking mechanisms have **two leads for the power coil**. On an electric strike, the leads power a solenoid. On a Mag Lock, the leads power an electromagnet.

The Pure IP Reader-Controller's lock control circuit can control either a fail-safe or fail-secure lock. This selection is typically configured within the host access control system's door settings.

Installation Tip

For non-PoE installations:

Before you start wiring an electronic door lock, verify that the lock's power source is separate from the power source for the Reader-Controller.

Otherwise, supply voltage fluctuations induced by the lock's operation may cause the reader to malfunction.

Lock Wiring, using PoE:

The Pure IP Reader-Controller supports a simplified configuration when PoE is being used to supply the lock's power.

1. Connect the **Red** wire on the ISONAS Reader-Controller to the positive lead of the electric lock. See **Figure 7**

2. Connect the negative lead of the lock to the **black** wire on the ISONAS Reader-Controller.

3. See this manual's "Managing Inductive Load Challenges" section for more info regarding the use of the Back-EMF diode.

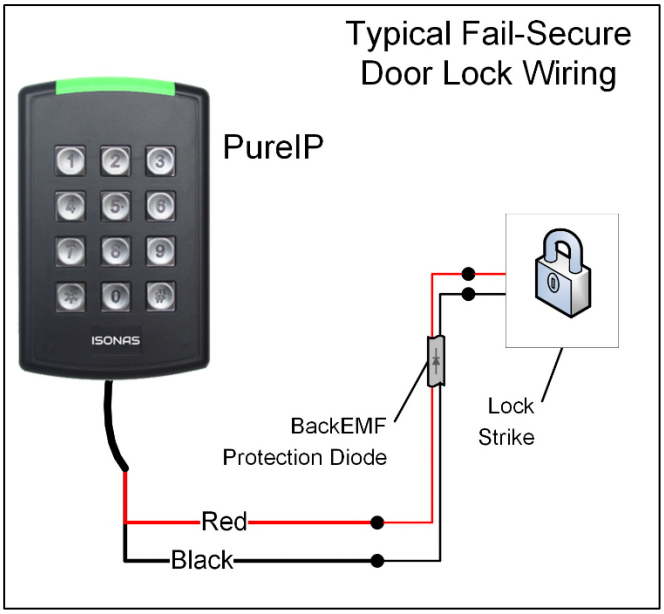


Figure 7

2.2.3: WIRING THE REX/AUX INPUT

The Pure IP Reader-Controller's REX / AUX input expects a **momentary closure**. You can generate this signal with a pushbutton, infrared motion detector, or other simple device.

The host access control system configures the reader to know if the input's action is treated as a REX event or an AUX event.

About REX / AUX

REX / AUX is a normally open input. No action is taken until the input is closed.

Typically, the REX is placed adjacent to the door so that people can press the button and let themselves out the door without setting off the alarm. When pressed, this button tells the ISONAS Reader-Controller that that someone wishes to pass through the door. The latch releases and/or the door open alarm is suppressed.

The reader could be configured to create an AUX event. An example usage of the AUX input is having it connected to a phone intercom. Someone within the facility could use the intercom system to release the door.

You must wire the switch through the ISONAS Reader-Controller.
(See **Figure 8**) First, connect one terminal of the momentary switch to the Reader's **green wire**. Then, connect the switch's other terminal to the Reader's common **ground wire (brown)**.

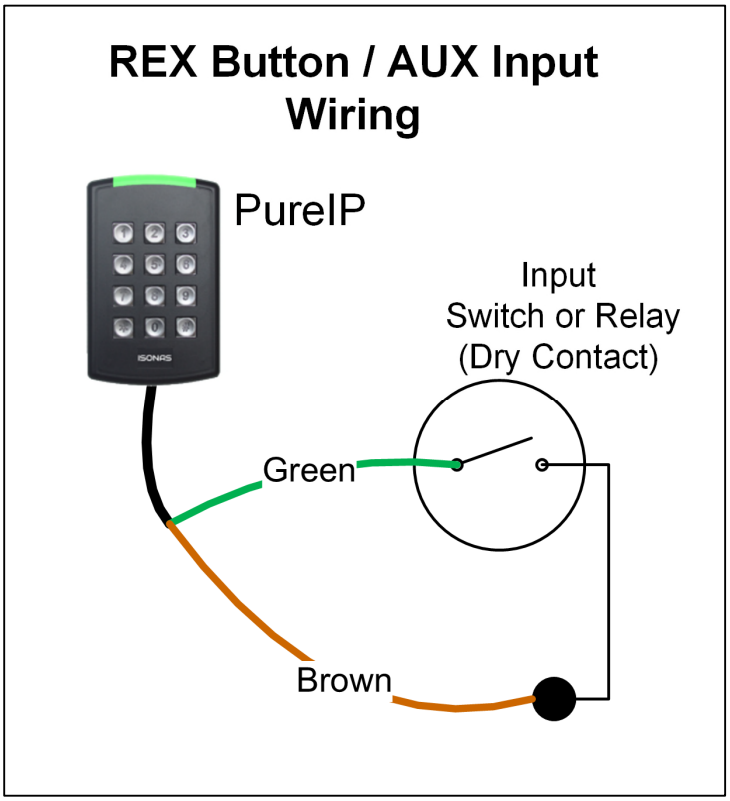


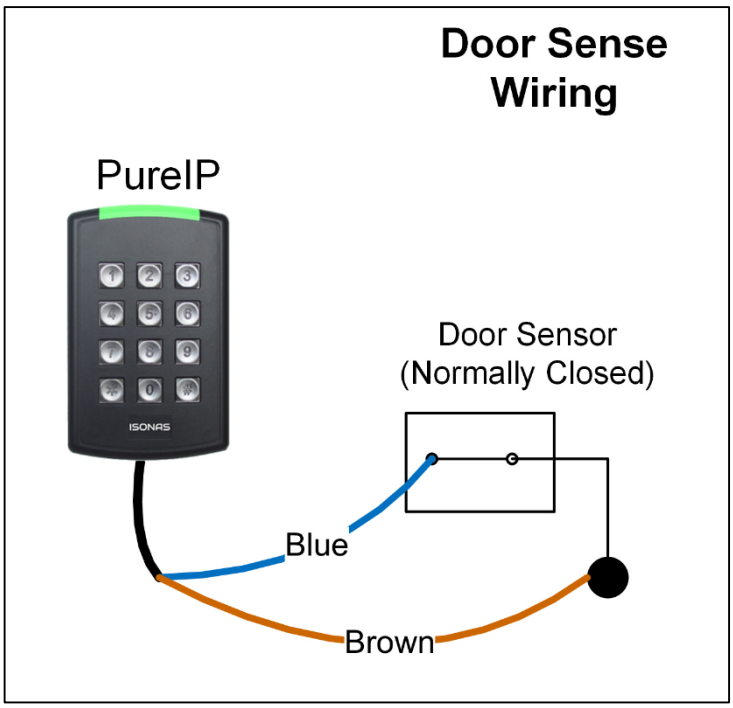
Figure 8

2.2.5: WIRING THE DOOR SENSE

Connecting the ISONAS Reader-Controller to a door sensor allows the host access control system to detect if the door is ajar. Then the host access control system can create alarms based on the door's state. This wiring task is like wiring the REX / AUX input.

First, connect one terminal of the door sensor to the Reader's **blue wire**. Then connect the door sensor's other terminal to the Reader's common **ground wire (brown)**.

Figure 9 shows how to wire the door sensor.



About the Door Sense

The door sense is a normally closed input. No action is taken until the input is opened.

Figure 9

2.2.7: LOCK WIRING -- EXTERIOR DOOR KIT (EDK/ASM)

The Pure IP Reader-Controller has an optional Exterior Door Kit (EDK) or Advanced Security Module (ASM) (ISONAS part number ACC-EDK-3A), which allows you to isolate the door's lock control circuitry on the secure side of the building.

The EDK/ASM contains a form-C relay with dry-contacts that are rated for 3 amps of current @ 30 Volts.
It can also be used in cases where the Reader-Controller is switching an externally supplied voltage or an external control signal. Examples of such usages include operating a 24VDC lock or switching a logic signal for a garage door opener.

Two methods of connecting the EDK/ASM are shown in Figures 10 and 11

The 1st example shows powering both the lock and the EDK/ASM with the Reader-Controller's PoE power See **Figure 10**

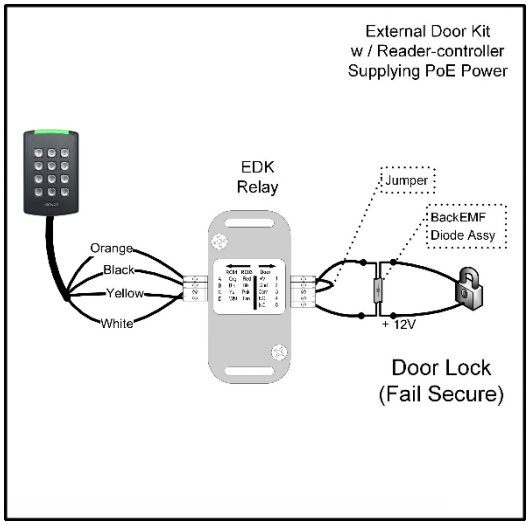


Figure 10

Label	Reader Side Connection	Label	Lock Side Connection
A	Pigtail's Orange wire (12 V Input Power)	1	12V Output Power
B	Pigtail's Black wire (Ground)	2	Power Ground
C	Pigtail's Yellow wire	3	EDK/ASM Relay's Common Contact
D	Pigtail's White wire	4	EDK/ASM Relay's Normally Closed (NC) contact (Fail-Safe Lock)
	N/A	5	EDK/ASM Relay's Normally Open (NO) contact (Fail-Secure Lock)

EDK/ASM Wire Conductor Preparation:
Strip back the wire insulation: .25 to .275 (1/4 to 9/32) inches

Acceptable single conductor sizes: 26 gauge to 15 gauge
Acceptable two conductor sizes: 26 gauge to 15 gauge
Note for multi-stranded conductors:

- Avoid allowing any stray wire strands from contacting the adjacent terminal block connection.
- Twist the multi-strands together prior to insertion.
- Lightly solder-tinning the exposed wire can help prevent stray strands.

The 2nd example shows powering the EDK/ASM with the Reader-Controller's PoE power output, and the lock with an external 24-volt power supply. See **Figure 11**

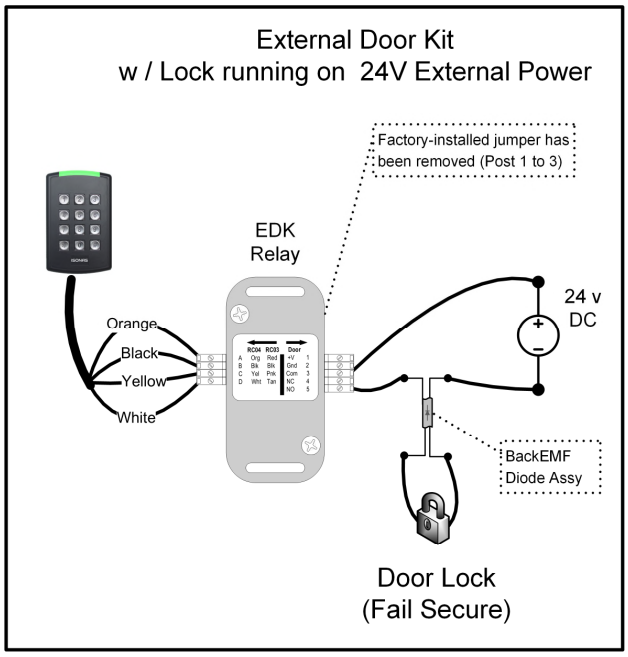


Figure 11

Label	Reader Side Connection	Label	Lock Side Connection
A	Pigtail's Orange wire (12 V Input Power)	1	Not Used (Factory-installed Jumper removed)
B	Pigtail's Black wire (Ground)	2	Not Used
C	Pigtail's Yellow wire	3	EDK Relay's Common Contact
D	Pigtail's White wire	4	EDK Relay's Normally Closed (NC) contact (Fail-Safe Lock)
	N/A	5	EDK Relay's Normally Open (NO) contact (Fail-Secure Lock)

2.2.8: EDK/ASM LED STATUS INDEX

The EDK/ASM has two status LEDs

Power LED:

Located on the side towards the Pure IP Reader-Controller's pigtail.
A Red LED indicates 12VDC power is being supplied to the EDK/ASM.

Communication Status LED:

Located on the side towards the Lock wiring.
LED status meaning are described in the table below.

Pure IP Reader-Controller Locked	Pure IP Reader-Controller Unlocked	Lock State when Pure IP Reader-Controller is unlocked	Description or Item to Check
Off	Green	Normal Operation	
Flash Amber	Flash Amber	No Operation	Yellow wire may be disconnected
Off	Flash Amber	No Operation	White wire may be disconnected
Off	Flash Amber	No Operation	Invalid encryption key received from Pure IP Reader-Controller
Off	Off	No Operation	If Power Cycle of Pure IP Reader-Controller allows for one or more lock operations, and then the lock stops operating, then the BackEMF diode may not be installed correctly.

2.2.9: LOCK WIRING -- 2 READERS TO 1 LOCK

If you are wiring both sides of the door to control IN and OUT access, then you will have the special condition of wiring 2 Reader-Controllers to a single locking mechanism.

The "Inside" Reader controls the door, and is wired to the door's components, such as the lock and Door-sense switch. Use the following steps to cause the "outside" Reader to activate the REX input on the "Inside" Reader.

Two Readers & One Lock Wiring Steps:
See **Figure 12**

1. Wire the "Inside" reader normally
2. Connect an EDK/ASM to the "Outside" reader
3. Connect the "Inside" reader's REX input to the "NO" terminal of the EDK/ASM.
4. Connect the "Inside" reader's Brown wire to the Common terminal of the EDK/ASM.
5. If the door also has a REX device, wire the REX device "in parallel" to the EDK/ASM

Programming

"Inside" Reader must be programmed to activate the lock upon a REX input event.

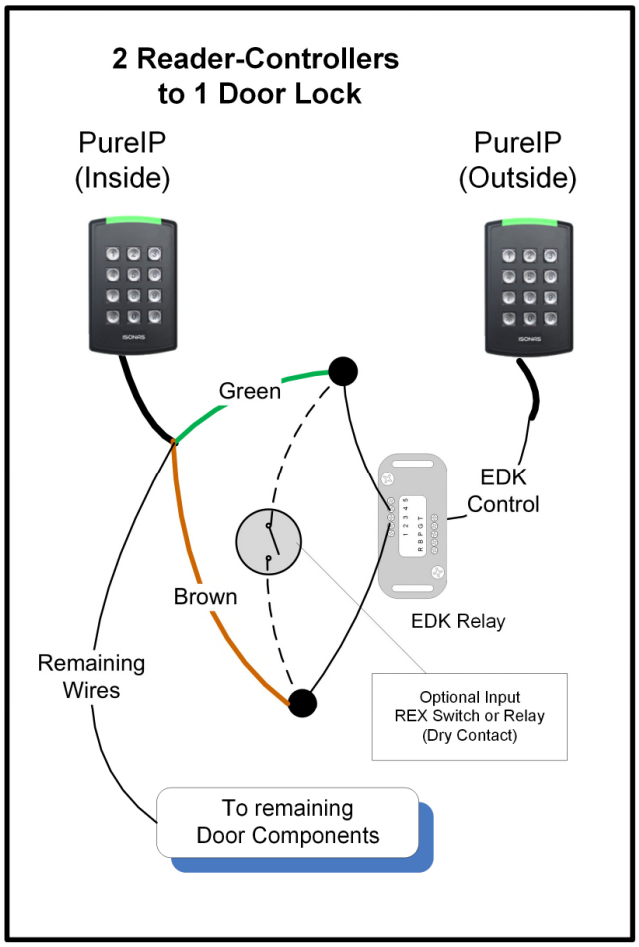


Figure 12

2.2.15: MANAGING INDUCTIVE LOAD CHALLENGES

Most door latches use a **relay coil** that powers up and down, when the door is unlocked and locked. When this happens, a pulse of electrical energy is produced by the lock's coil. This pulse is called **back-EMF and** can interfere with the reader's operation.

Switching off a typical 12 VDC relay coil can produce a back EMF pulse of 300 volts or more. If this voltage pulse can flow back into the reader, it can cause the reader to "brown out" and the reader will reboot.

Figure 13 shows a solution. You can virtually eliminate back EMF by installing a **transient suppression device (diode).** Each Pure IP Reader-Controller is supplied with a diode assembly (ACC-BackEMF-DIODE), which simplifies the installation process. A standard diode, from any electronic supply store, can also be used (1N4007 or better). Always check that the diode is correctly rated for the circuit voltage. For optimum performance, the diode should be installed at the lock or close to the lock. Standard diodes have a stripe-band marking on one side. That side of the diode should be connected to the "+" wire of the lock circuit.

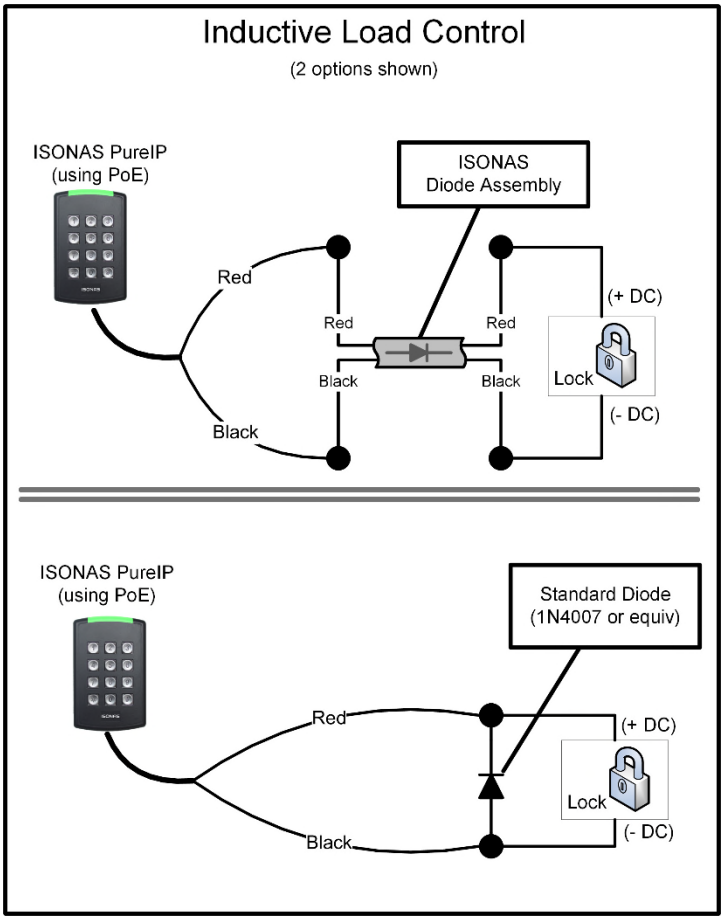


Figure 13

Protect the Digital Output

Which type of transient suppressor should you install? This depends mainly on the type of inductive load being switched. Some locks have Back EMF protection built into the lock itself.

For Back EMF in low-voltage DC applications, a 1N4007 diode will suffice (ISONAS PN ACC-BackEMF-DIODE).

However, for protection against other transient voltages (i.e. lightening), we recommend using a fast-switching transient voltage suppressor, such as a transient-voltage-suppression (TVS) diode (or bipolar TransZorb).

2.3: CONFIGUATION EXAMPLES

2.3.1: PoE --- ELECTRIC STRIKE

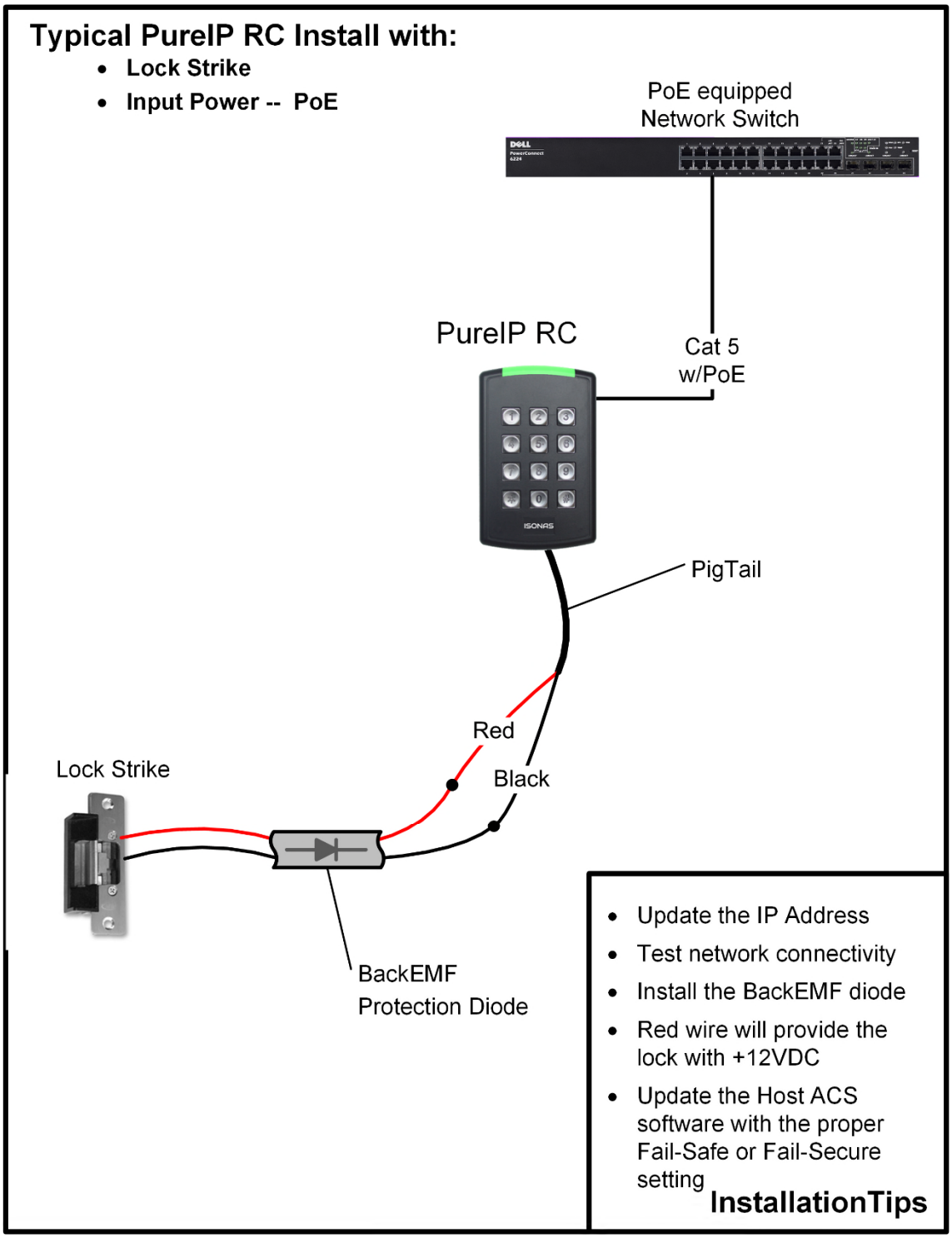


Figure 14

2.3.2: PoE --- MAGNETIC LOCK, EDK & PIR

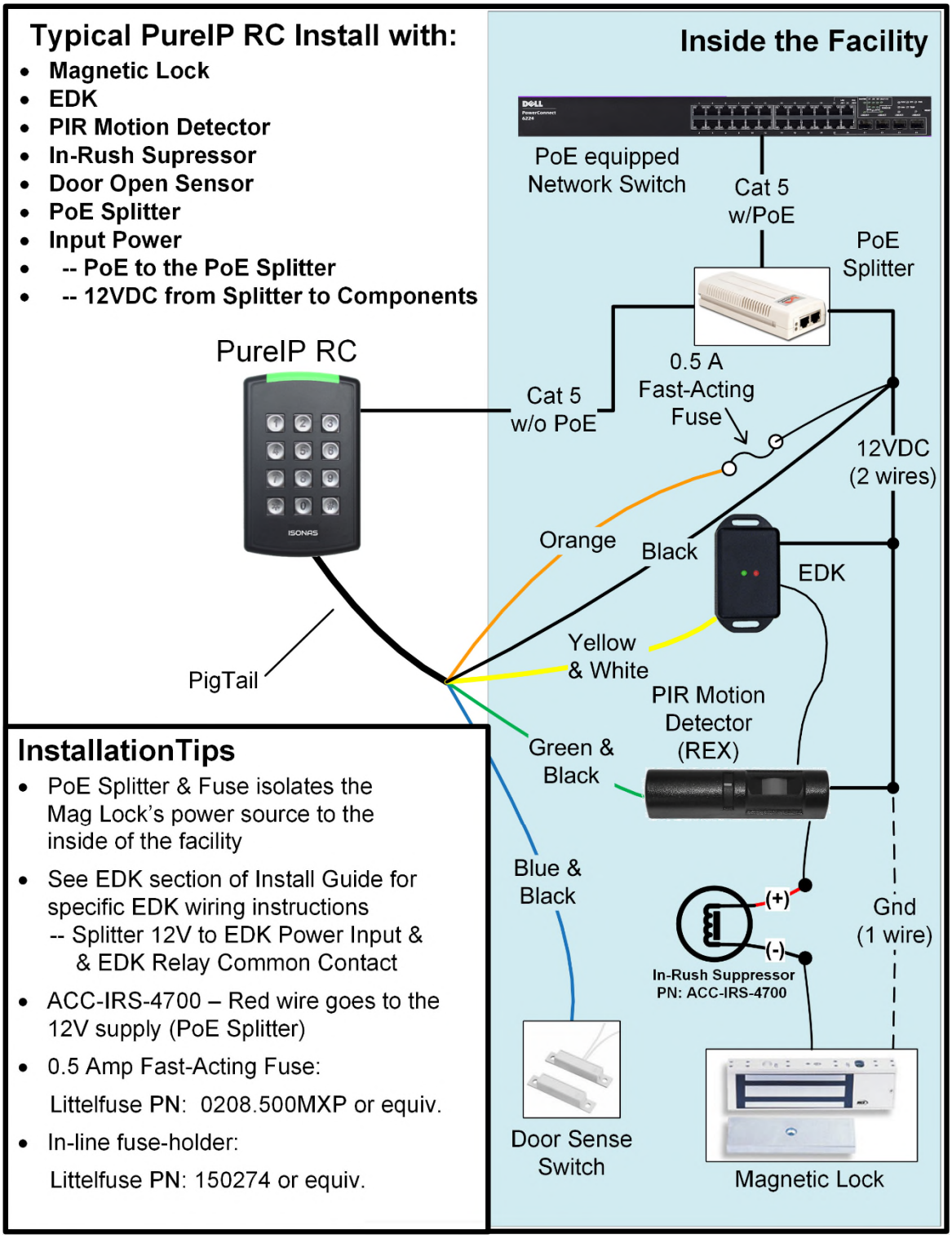


Figure 15

2.3.3: DUAL POWER SOURCES

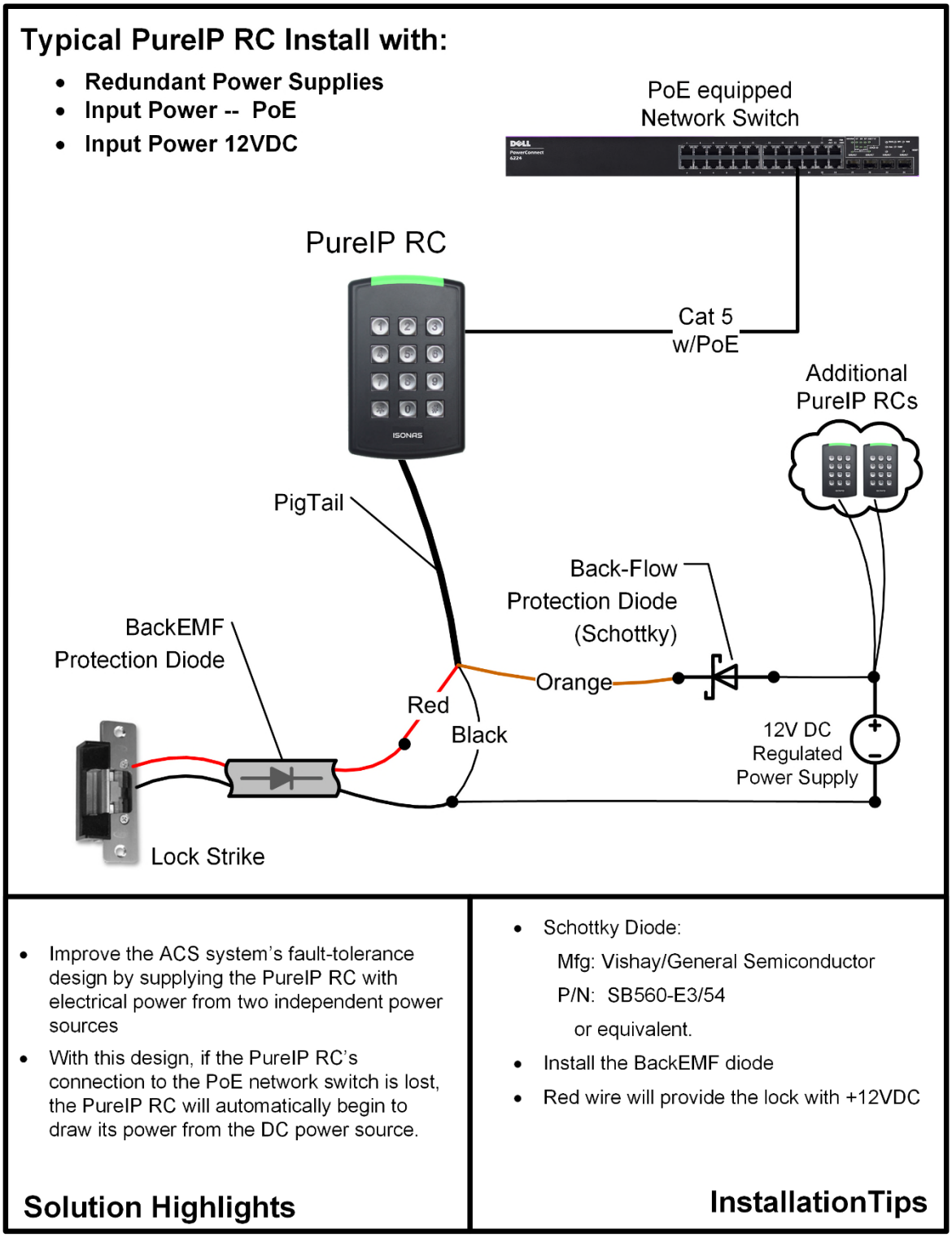


Figure 16

3: CONFIGURING THE READER-CONTROLLER'S COMMUNICATIONS

The ISONAS Pure IP Reader-Controller can communicate with a variety of access control software platforms, contact a salesperson for a complete list. ISONAS provides a complete solution by offering the Pure Access software platform, which is available in the cloud or on premise. For both options, the Reader-Controllers communicate over the network to Pure Access, below are best practices on this configuration. For a more in-depth, step by step process, visit our website at www.isonas.com/support/installFAQ.

3.1: ETHERNET-BASED TCP/IP READER-CONTROLLERS

There are many Ethernet network topology permutations, too many topologies to cover in this guide. Here are two common Ethernet configurations used by ISONAS customers:

- **Pure IP Reader-Controllers to Pure Access-Cloud Software**:

  This is the simplest type of network connection. The ISONAS Reader-Controller is an IOT style device that requires minimal network configuration to function.

  ISONAS provides a cloud instance of the Pure Access software. The readers are configured to automatically connect to hosted Pure Access software.

Addressing:
The recommended best-practice is to let the local network's DHCP service assign the IP Address to each reader.

As an alternative, you can manually assign the reader's IP Address. To allow the reader to successfully reach the host software, the following setting are typically required:

- Static IP Address that is valid on the local subnetwork
- Proper Subnet Mask
- IP Address of the local subnetwork's gateway
- DNS server's IP Address

Here are a few guidelines to follow to assure that your network's configuration will support the ISONAS access system:

- The ISONAS Reader-Controller is a standard "network appliance". Standard TCP/IP networking rules apply.
- ISONAS can provide a simple utility, that will redirect any currently installed Reader-Controllers to the cloud instance of Pure Access. This utility can be downloaded from the ISONAS website
- When using the Reader-Controller in conjunction with Pure Access Cloud the Reader-Controller must have a clear path to the internet on port 55533. No other ports are required.

- Firewall Configuration Recommendations
    - The reader controllers communicate on port 55533.
    - If Intrusion Detection and Prevention is enabled, double check the firewall logs for dropped packets with a source IP that matches a Reader-Controller and create bypass rules as needed.
    - A firewall egress rule allowing the IP's of the Reader-Controllers is required.
        - Note: the devices do not proxy.
    - Recommendation: Create a group for the Reader-Controller IPs and apply the group to a rule to allow 55533 to communicate with isonaspureaccesscloud.com (IP 52.40.147.42). Both UPD and TCP should be allowed to pass.
- DHCP Configuration
    - If the Reader-Controllers are to be left on DHCP it is strongly recommended to use reservations, so the IP address does not need to be renewed.
- Network Configuration
    - A common best-practice is to place the Reader-Controllers in a dedicated subnet
    - The POE switch should have enough power to run all ports and account for in rush. (IE. A switch restart which would cause all readers to restart).

- **Pure IP Reader-Controllers to Pure Access-Manager Software (PA-M)**:

  Some locations may have a version of Pure Access installed on a local server. The software package that is designed for such on-site installation is named: Pure Access Manager.

  These installations will require that the Reader-Controller's configuration be modified to direct the reader to connect to the local server's location.

  ISONAS can provide a simple utility, that can be used to redirect the Reader-Controllers to the local instance of PureAccess-Manager.

  Addressing:
  The recommended best-practice is to let the local network's DHCP service assign the IP Address to each reader.

  As an alternative, you can manually assign the reader's IP Address. To allow the reader to successfully reach the host software, the following setting are typically required:
    - Static IP Address that is valid on the local subnetwork
    - Proper Subnet Mask
    - IP Address of the local subnetwork's gateway
    - DNS server's IP Address

3.2: SECURING MESSAGES ON YOUR NETWORK

You can configure ISONAS Readers and software to *secure every message* to and from the Reader using **Advanced Encryption Standard (AES).**

When you enable AES in both an ISONAS Reader-Controller and the PureAccess software, every message to and from that Reader-Controller is encrypted. Therefore, anyone who manages to hack into your data network would still face a daunting task to decrypt the actual messages to the Reader-Controllers. This is a significant strength of the ISONAS solution in protecting the customer's Reader-Controllers from hackers.

4.1: OPERATION, TESTING, AND MAINTENANCE

- *Operation: When a credential is presented to the reader the decision to accept the credential is done locally at the device and then the solid-state lock output or ASM/EDK to the lock will unlock the door allowing entry.*
- *Testing: Verify function of lock output and all ancillary equipment monthly.*
- *Verify firmware updates quarterly at Isonas.com/support*

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