CYPRESS
INTEGRATION SOLUTIONS

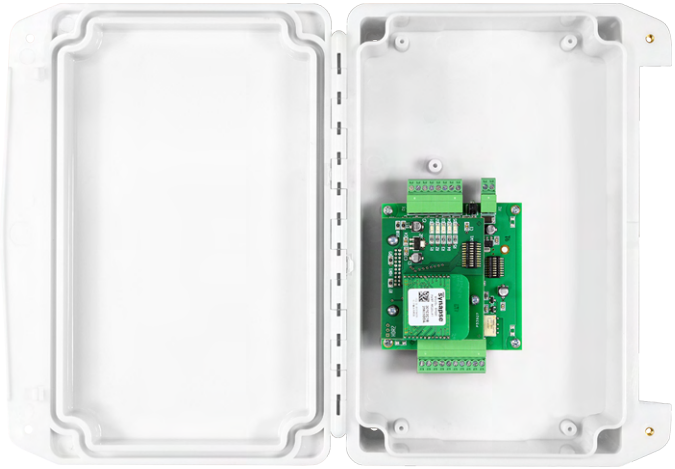
Suprex® RF

SPX-5631 & SPX-5641

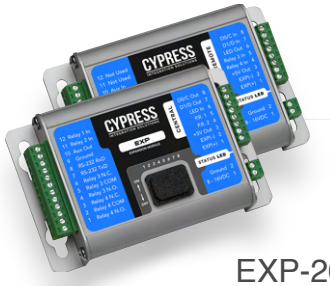
Wireless Reader-Extender
for OSDP or Wiegand systems

Product Manual

SPX-5631
2.4 GHz



RPT-5651



EXP-2000*

*NOTE: EXP-2000s are not supported in OSDP mode.

Use the Suprex RF series (SPX-5631 and SPX-5641) to install card readers more than 500 ft. from an access controller, through a point-to-point wireless link. The RF Suprex supports OSDP readers connected to OSDP controllers, Wiegand readers connected to Wiegand controllers, or a combined OSDP/Wiegand system. It is compatible with most manufacturers' devices.

OSDP Secure Channel is supported when used with OSDP systems. For systems with OSDP readers and Wiegand panels, Secure Channel is supported between the Suprex remote unit and the OSDP reader.

Note: OSDP capabilities were recently added to RF Suprex Reader Extenders (updates begin with firmware v5.0.0).

MADE IN USA

RoHS

SPX-5631_SPX-5641_MAN_250523

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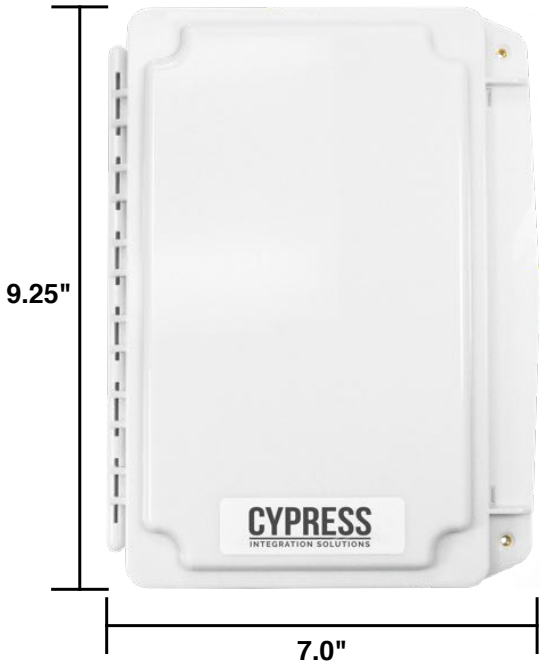
Cypress Suprex® RF Series - SPX-5631 & SPX-5641

Specifications			
Part Numbers	SPX-5631	816684008115	*Short-range wireless reader extender*
	SPX-5641	816684001352	*Long-range wireless reader extender*
	RPT-5651	816684003172	*Optional wireless repeater*
	EXP-2000	816684003233	*Optional expansion modules for additional readers (Wiegand systems)*
Physical	SPX-5631 / SPX-5641 Enclosure		9.25” x 7.0” x 2.25” / 1.3 lbs (diagram below)
	EXP-2000 Enclosure		4.5” x 2.9” x 0.94” / 0.3 lbs (diagram below)
Environmental	Storage Temperature		-40˚C to 100˚C
	Operating Temperature		-30˚C to 60˚C
	Enclosure Rating		Weatherproof Enclosure - ABS - IP65
Electrical	Central and Remote Supply Voltage		8-16Vdc Current 300mA
	Relays	Max Switching	220Vdc 30W (resistive) 1A / 250Vac 37.5VA 1A
		Running Spec with load	30Vdc 1A (resistive) / 125 Vac 0.3A (resistive), $1x10^5$ operations @ 20˚C
Radio	Frequency		2.4 GHz ISM band
	Type		Direct Sequence Spread Spectrum (DSSS)
	Transmit Power		15 dBm
	Receiver Sensitivity		-103 dBm (1% PER, 250Kbps)
	Modulation		O-QPSK
	Agency Approvals		FCC Part 15.247: FCC ID: U90-SM220
			Industry Canada (IC): 7084A-SM220
			CE Certified: Certified to EN300 328 Version 1.8.1
	Security Encryption		AES encryption.
Wireless Range	SPX-5631	Typical range of 1 mile (1609m) *	
	SPX-5641	Typical range of 2 miles (3218m)*	
	RPT-5651	Typical range of 1 mile (1609m) *	
	**Note: Distances are typical line-of-sight. Actual distance may vary depending upon terrain, RF environment, building materials, and height of antenna.*		
Additional Features	SPX-5631 and SPX-5641 include complete solution with Central (controller) and Remote (reader/gate/door) interface		
	“Quiet” bandwidth and power		
	Field configurable wireless channel, network ID, and pairing		
	Onboard relays to control door/gate		
	Auxiliary I/O available for LED signal and door/gate/panel status signal		
	Status LED and Supervision Relay (default off) monitor wireless connection status		

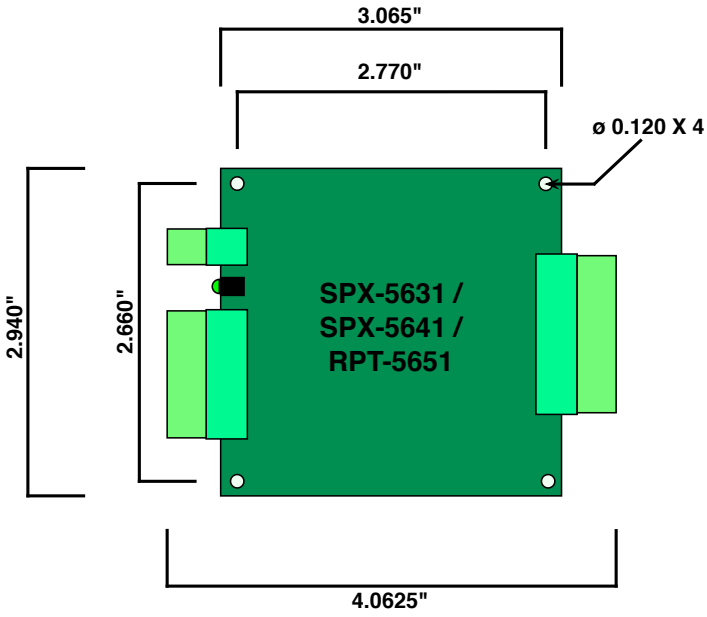
Table of Contents

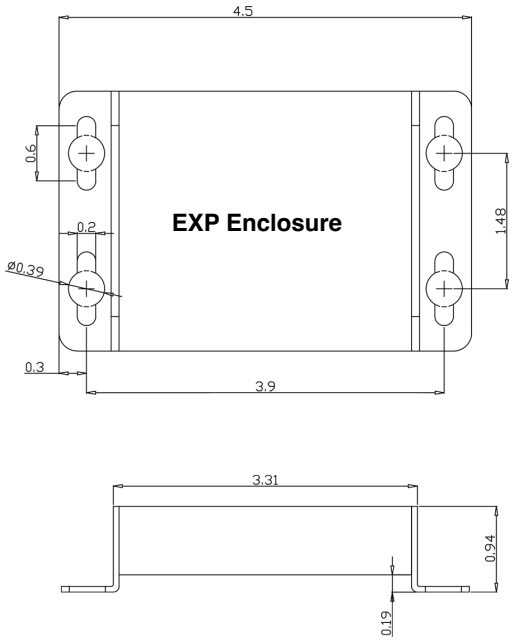
Topic		*Page*
Overview and Specifications		2
Physical Dimensions and Mounting Hole Locations		4
Central and Remote Pin Layout		5
Setup and Pre-Installation		6
Indicators and Operating Modes		7
Common Configuration and Run Mode Settings		8
DIP Switch Map		9
Using Remote Digital Relay Inputs		10
Quick Reference for Typical Connections		11
Repeater Installation		12
Troubleshooting		13
Accessory I/O	I/O Overview	14
	Central Relay Inputs	15
	Relay 1 & 2 I/O	16
	Remote Relay Inputs	17
	Relay 3 & 4 I/O	18
	LED I/O	19
	Aux I/O	20
	Application Note on Using Supervised Contacts	21
EXP-2000 Expansion Modules	Overview and Operation	22
	Central EXP Wiring Diagram	23
	Remote EXP Wiring Diagram	24
Radio Configuration		25
Radio Configuration (continued)		26
OSDP	OSDP Features	27
	OSDP Setup	28
	OSDP Secure Channel	29
	OSDP Wiring Diagram	30
	OSDP DIP Switches	31
	OSDP Device Report	32
	OSDP Terminology	33-34

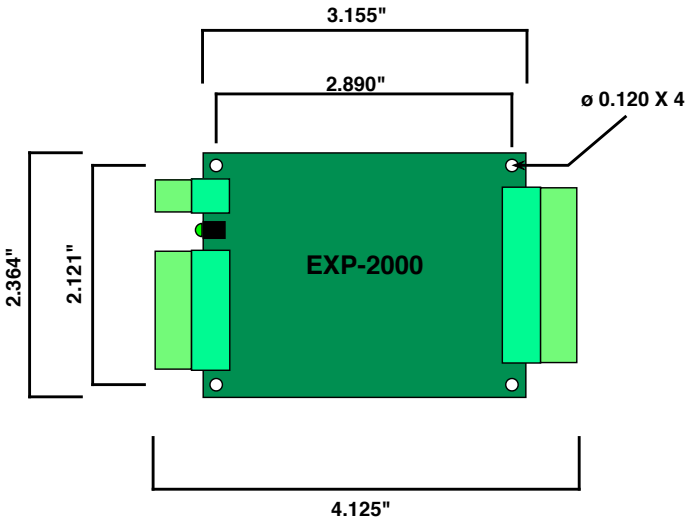
Cypress Suprex® RF Series - Physical Dimensions and Mounting Hole Locations



Thickness: 2.25"







All dimensions are listed in inches.

Cypress Suprex® RF Series - Central and Remote Pin Layout

SPX-5631 / SPX-5641 Central Unit

SPX-5631 / SPX-5641 Remote Unit

Cypress Suprex® RF Series - Setup and Pre-installation

Unpacking:
Remove covers from units and check interior for any shipping damage. Remove any packing material if present. Inventory any included parts (depending on model) such as antennas, coaxial cables etc.

Bench Testing:
Before installing the units in the field they should be assembled and tested at a convenient bench-top location. This will make it easier to verify / change settings and check operation when both units are visible.
This is also an opportunity to become familiar with the system if this is the first use of the Suprex system. It is much more difficult to set up and test the units when they are several thousand feet apart.
Both units will need to have the antenna and a suitable power supply connected. For testing purposes, the units can share the same power supply.

Basic Bench Test:
During initial setup, refer to the Run / Configuration mode settings (pgs 7-9).
1. Connect a suitable power supply to both units. Each unit should be provided with 8 - 16 Volts dc and approx 300mA. Units should be separated by a minimum of 24 inches.
2. Apply power. After about a 1-2 second delay, the Diagnostic LED on both units should flash green. The supervision relay (Relay 3) activates when the units are communicating. Note: Supervision relay is disabled by default (see pgs. 7-9).
3. Touch a jumper wire from the Ground connection to the Relay 1 input on the Central unit. Relay 1 on the Remote unit should activate with an audible click.
4. Units are shipped from the factory set for the Wiegand data format. If a different format is required, set the DIP switch to the required reader and panel format (see pgs. 7-9)
5. If a reader & panel are accessible, connect the reader to the Remote unit & the Central unit to the panel to verify card reads are accepted by the access control system. If troubleshooting is necessary, it is easier with units in close proximity.
6. Once these steps are completed, the units are ready for installation at their permanent locations.

Final Field Installation Checklist:
- The Central unit and access control panel should have a common ground.
- The Remote unit and card reader should have a common ground.
- The top of each unit (where antennas are located) should point up toward the sky.
- The Central and Remote units should be installed level relative to each other.
- There should be a direct line of sight between Central and Remote units (if there is no direct line of sight, a Repeater unit is recommended).
- Both the Central and Remote units should be mounted high enough to avoid interference from obstacles (vehicles, trains, buildings, trees, etc.).
- Metal mounting surfaces are not recommended. If use of a metal surface is unavoidable, space unit as far from metal surface as possible using non-metal spacer.
- Enclosure locking screws (6-32 x 3/8) max torque rating 8.5 inch-pounds.

Antenna orientation and field placement:
See examples below for Suprex® RF units with dipole antennas and “chip” antennas.The orientation of the dipole antenna is critical for performance. The antenna should always be oriented vertically. Orientation of Suprex® RF units with an internal “chip” antenna is not as critical.

Radio frequencies in the 2.4 GHz bands have characteristics that require a direct line of sight (LOS) between the transmitter and receiver. For best performance the antennas of the Central and Remote should “see” each other without obstructions.

There are limited exceptions in which the signal will still pass between the transmitter and receiver without line of sight placement. In some cases, the communication path will work but at a reduced distance.

For outdoor installations: When possible, place the units on the exterior of buildings to reduce interference. Repeaters/ Boosters are available if needed.

Dipole antenna example

Chip antenna example

Cypress Suprex® RF Series - Indicators and Operating Modes

LED DIAGNOSTIC INDICATOR

The LED Diagnostic indicator provides information on the operational status of the unit.

If the units are not communicating, viewing the diagnostic indicator LEDs may help to determine the nature of the problem. *See also Troubleshooting, page 13.*

- **If Central or Remote diagnostic LED is not illuminated:**
  If the LED(s) are not illuminated on the unit(s), the unit is not powered or there is an electrical problem. When power is properly applied, the Diagnostic LEDs will be illuminated to show a status below:

- **If the Central and Remote unit LEDs are flashing green:**
  When power is properly applied, and there is communication between the Central and the Remote, the Central and Remote unit LEDs will flash green after every polling cycle. The speed will depend on how many expansion units are connected (about 1 flash per second with 7 EXPs).

- **If the Central or Remote unit LED alternates between green/red:**
  There is no communication with the partner unit.

- **If the Central or Remote unit LEDs are solid green:**
  If the unit is in Configuration Mode, the settings have been successfully applied, it is safe to power cycle the unit and switch back to Run Mode. If the unit is in Run Mode, one of the EXPs is not communicating properly. Check that all connected EXPs are powered and properly connected. *(For details on setting Configuration Mode, see pgs. 7-9.)*

OPERATING MODES

Wireless Suprex products have 3 operating modes: Run Mode, Configuration Mode, and Test Mode.

- **Run Mode:** The units are factory-shipped in Run Mode. Run Mode is used during field operation of units. Run Mode allows changing of common settings without the need to power-cycle the units. Factory-set defaults can be changed. Default settings:
  - Units are set to operate as 1 Remote and 1 Central unit
  - Supervision relay is disabled
  - Pullup resistors are disabled
  - Number of EXP Expansion Modules is set to 0

- **Configuration Mode:** Switch to Configuration Mode to change the link type and interface type. Default settings:
  - Default interface type is Wiegand
  - Link type is pre-set based on the Suprex model

- **Test Mode:** Test Mode is used for troubleshooting the reader/panel connection to the Remote/Central unit. In Test Mode, DIP Switches 3-8 operate as if in Run Mode. Either a single unit or both units can be set to Test Mode; the Remote and Central units retain all their normal functionality in addition to the following functions:
  - In Test Mode, the Central unit outputs a test card read in the selected interface type every few seconds
  - In Test Mode, the Remote unit briefly triggers Relay 2 when detecting data of the selected interface type

Cypress Suprex® RF Series - Common Configuration and Run Mode Settings

Configuration Mode settings

Standard Wiegand interface is the default setting. To use with non-Wiegand interface:

a) Power off both Suprex units.

b) Turn on DIP switch 1 on both units.

c) Set DIP switches as described below for appropriate interface:

Default: Standard Wiegand	Turn on DIP switch 8 on both units
Keypad (Wiegand/No Filter)	Turn on DIP switch 7 on both units
OSDP	Turn off DIP switches 6, 7, and 8
F/2F (Unsupervised)	Turn on DIP switches 6, 7, 8 on both units
Strobed Rising Edge (MR-5)	Turn on DIP switches 7 and 8 on both units
Strobed Rising Edge (Dorado 644)	Turn on DIP switch 6 on both units
Strobed Rising (MagTek)	Turn on DIP switches 6 and 8 on both units
Strobed Falling Edge	Turn on DIP switches 6 and 7 on both units

d) Power on both Suprex units. Status LED should be solid green.

e) Power off both Suprex units; return DIP switch 1 to **off** position on both units to select Run Mode settings. ***When switching to Run Mode, always reselect Run Mode settings.***

Run Mode settings

Select Run Mode settings as described below, then power on both Suprex units to begin operating in Run Mode.

Central / Remote Select	Turn DIP switch 3 **on** for Central Mode / turn **off** for Remote Mode
Remote Digital/Analog Relay Select	Turn Remote Unit's DIP switch 2 **on** for digital input / **off** for analog input
Supervision Relay (Relay 3, Central Unit)	Turn Central Unit's DIP switch 4 on for supervision relay / off for normal relay
Supervision Relay (Relay 1, Remote Unit)	Turn Remote Unit's DIP switch 4 **on** for supervision relay / **off** for normal relay
Pullup Resistor Select	Turn **on** DIP switch 5 to enable pullup resistors / **off** to disable [applicable units)
EXP Select (for **no** EXP)	Turn **off** DIP switches, 6, 7, and 8 on both units
EXP Select (for **1** EXP)	Turn **on** DIP switch 8 on both units
EXP Select (for **2** EXPs)	Turn **on** DIP switch 7 on both units
EXP Select (for **3-7** EXPs)	See pg. 9

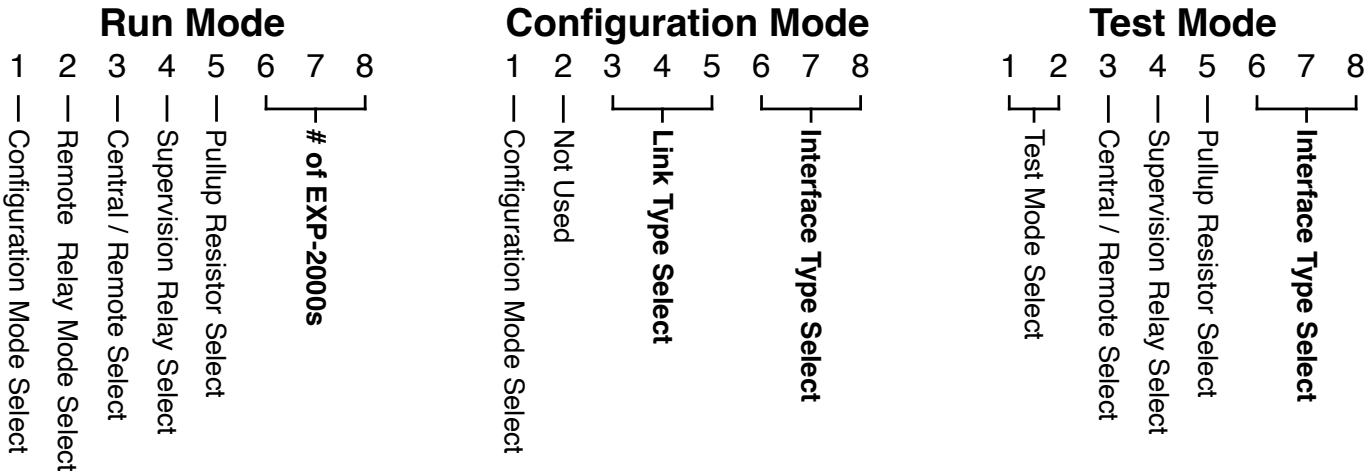
Note: EXP Select is disabled if using OSDP. See OSDP section for additional details on page 27.

Test Mode setting

See page 13 to troubleshoot using Test Mode.

Test Mode Select	Turn DIP switch 2 **on** for Remote &/or Central

Cypress Suprex® RF Series - SPX-5631 / SPX-5641 DIP Switch Map



Configuration Mode Select - ON = Configuration Mode - OFF = Run Mode

Remote Relay Mode Select - ON = Digital Input - OFF = Analog Input

Central / Remote Select - ON = Central - OFF = Remote

Supervision Relay Select - ON = Enable Supervision Relay - OFF = Disable Supervision Relay

Pullup Resistor Select - ON = Enable Pullup Resistor - OFF = Disable Pullup Resistor

Test Mode Select - DIP Switches 1 & 2 ON = Test Mode

# of EXP-2000 Pairs

6	7	8	- (Run Mode)
0	0	0	- None
0	0	1	- 1 Pair
0	1	0	- 2 Pairs
0	1	1	- 3 Pairs
1	0	0	- 4 Pairs
1	0	1	- 5 Pairs
1	1	0	- 6 Pairs
1	1	1	- 7 Pairs

Link Type Select

3	4	5	- (Config Mode)
0	0	0	- No Change
0	0	1	- Wireless

NOTE - 0 = OFF - 1 = ON

Interface Type Select

6	7	8	- (Config and Test Mode)
0	0	0	- OSDP
0	0	1	- Wiegand
0	1	0	- Wiegand No Filter
0	1	1	- Strobed Rising (MR5)
1	0	0	- Strobed Rising (Dorado 644)
1	0	1	- Strobed Rising (Mag-Tek)
1	1	0	- Strobed Falling
1	1	1	- Unsupervised F/2F

- The DIP Switch selections in Run Mode and Test Mode are ACTIVE, meaning that they can be changed on the fly without power cycling the unit.

- The DIP Switch selections in Configuration Mode are NOT ACTIVE. This means to set Configuration Mode setting the unit will need to be powered off, turn DIP 1 on and other Configuration DIP Switches as needed, power the unit on and the Status LED will be solid green. The solid green LED means the settings have been set. Power the unit off and return the DIP Switches to the Run Mode positions.

- When using the Remote unit with digital relay inputs the relays are controlled by the "not used" pins on the 10 pin header. Connect the outside "not used" pin to "Ground" to trigger Relay 3. Connect the inside "not used" pin to "Ground" to trigger Relay 4.

- When using the Remote unit with analog relay inputs the relays are controlled by the "Relay 3 in" and "Relay 4 in" pins. Connect "Relay 3 in" to "Ground" to trigger Relay 3. Connect "Relay 4 in" to "Ground" to trigger Relay4.

-The Remote Relay Mode Select (Dip Switch 2 in Run Mode) is only used on the Central unit, and has no functionality on the Remote unit.

This section applies only to the Remote unit, as the Central unit has only digital relay inputs. DIP switch 2 controls whether the Remote unit uses the analog relay inputs or the digital relay inputs. By default, DIP switch 2 is off and the Remote unit is set to use the analog relay inputs. When DIP switch 2 is in the ON position, the Remote unit is set to use the digital relay inputs. The digital relay inputs function in the same way the analog inputs on the Remote unit function. The digital relay inputs simply need to be connected to ground for the corresponding relay to be activated.

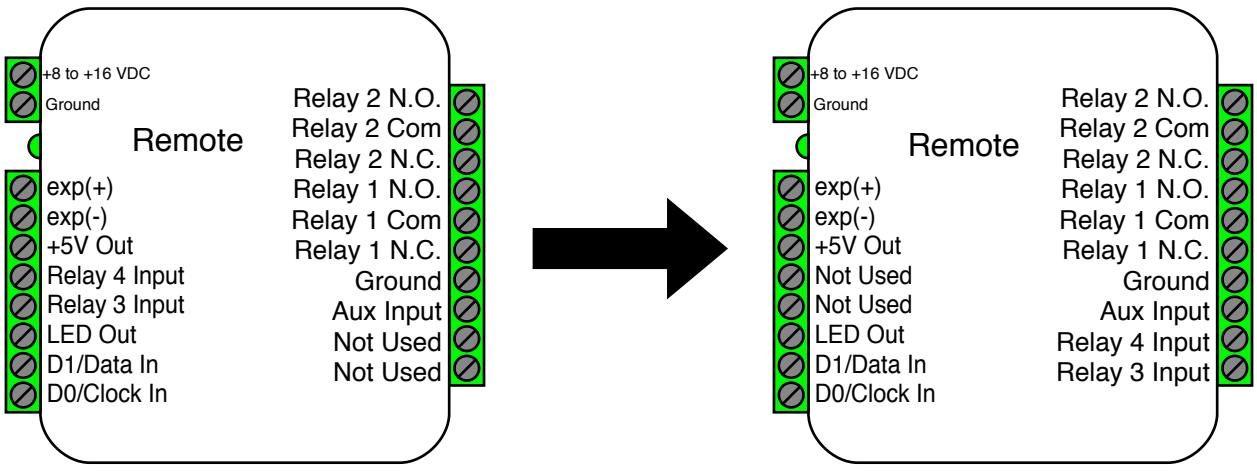
To active the digital relay inputs, only DIP switch 2 on the Central board needs to be enabled. DIP switch 2 on the Remote board has no function. It may be necessary to power-cycle the Central unit for the change to take effect.

Note: The digital relay input pins are not the same Relay 3 and Relay 4 input pins labeled on the Remote unit. Instead, the digital relay input pins use the two “Not Used” pins on the 10 pin header. The “Not Used” pin on the outside of the board is the new Relay 3 input pin, the other “Not Used” pin is the new Relay 4 input pin. Use the diagram below as a reference.

For most applications the analog relay inputs are sufficient. But for instances where a significant delay is noticed in the activation of Relay 3 and Relay 4, the end user should switch to using digital relay inputs. The digital relay input pins are able to detect a signal change faster than the analog inputs are, and this may eliminate the delay in the activation of the relay.

Note regarding EXP units: While DIP switch 2 is on and the digital relay input pins are enabled on the SPX-5631 / SPX-5641 units, the digital relay inputs are also enabled on any EXP-2000 Remote units that are connected. The digital relay input pins are on the 12 pin header and are the two “Not Used” pins. The outside “Not Used” pin is the Relay 3 Input pin and the other “Not Used” pin is the Relay 4 Input pin. EXP-2000s are not compatible with OSDP mode.

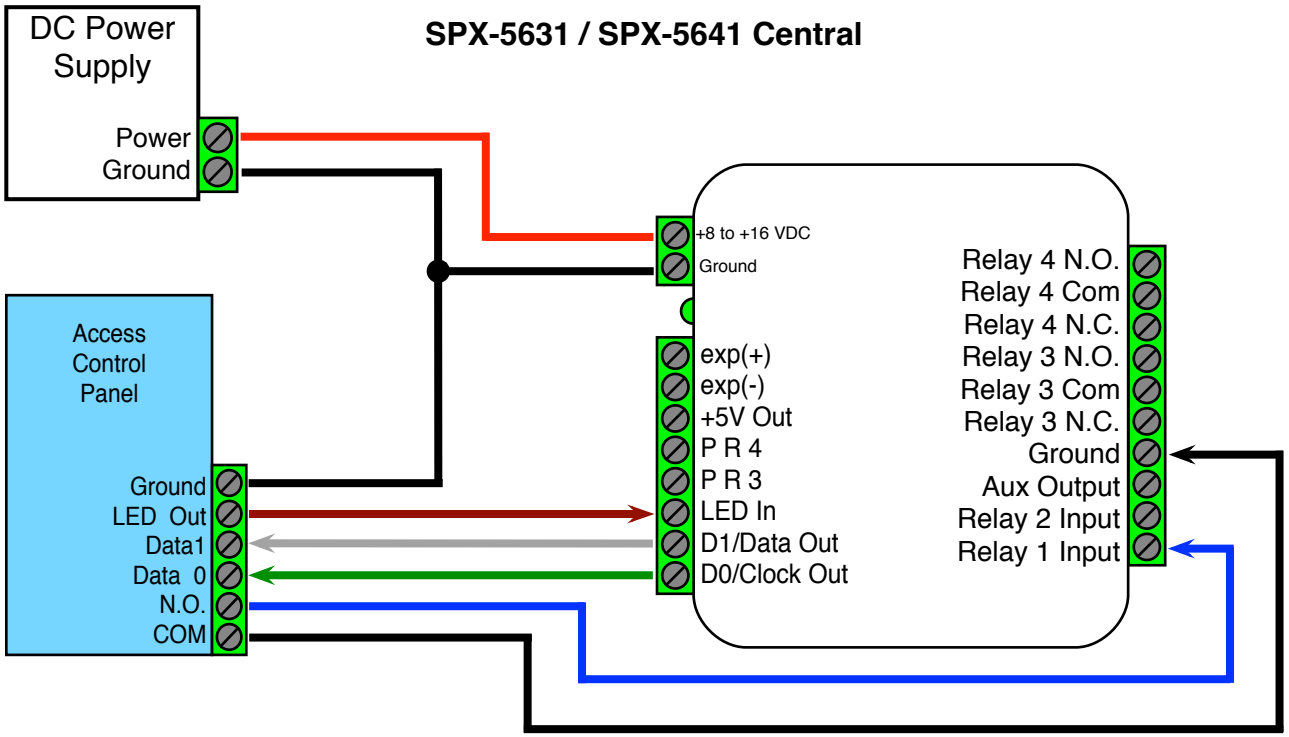
Analog and Digital Relay Input Pins



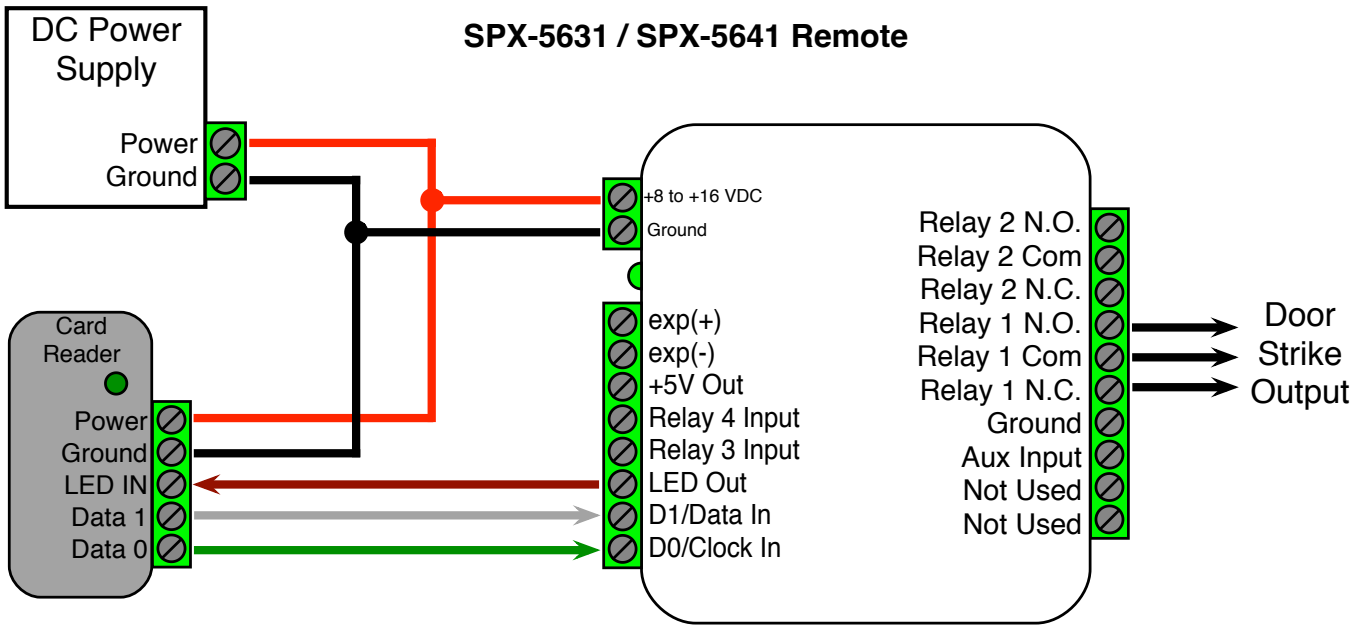
DIP Switch 2 Off
(Analog Inputs)

DIP Switch 2 On
(Digital Inputs)

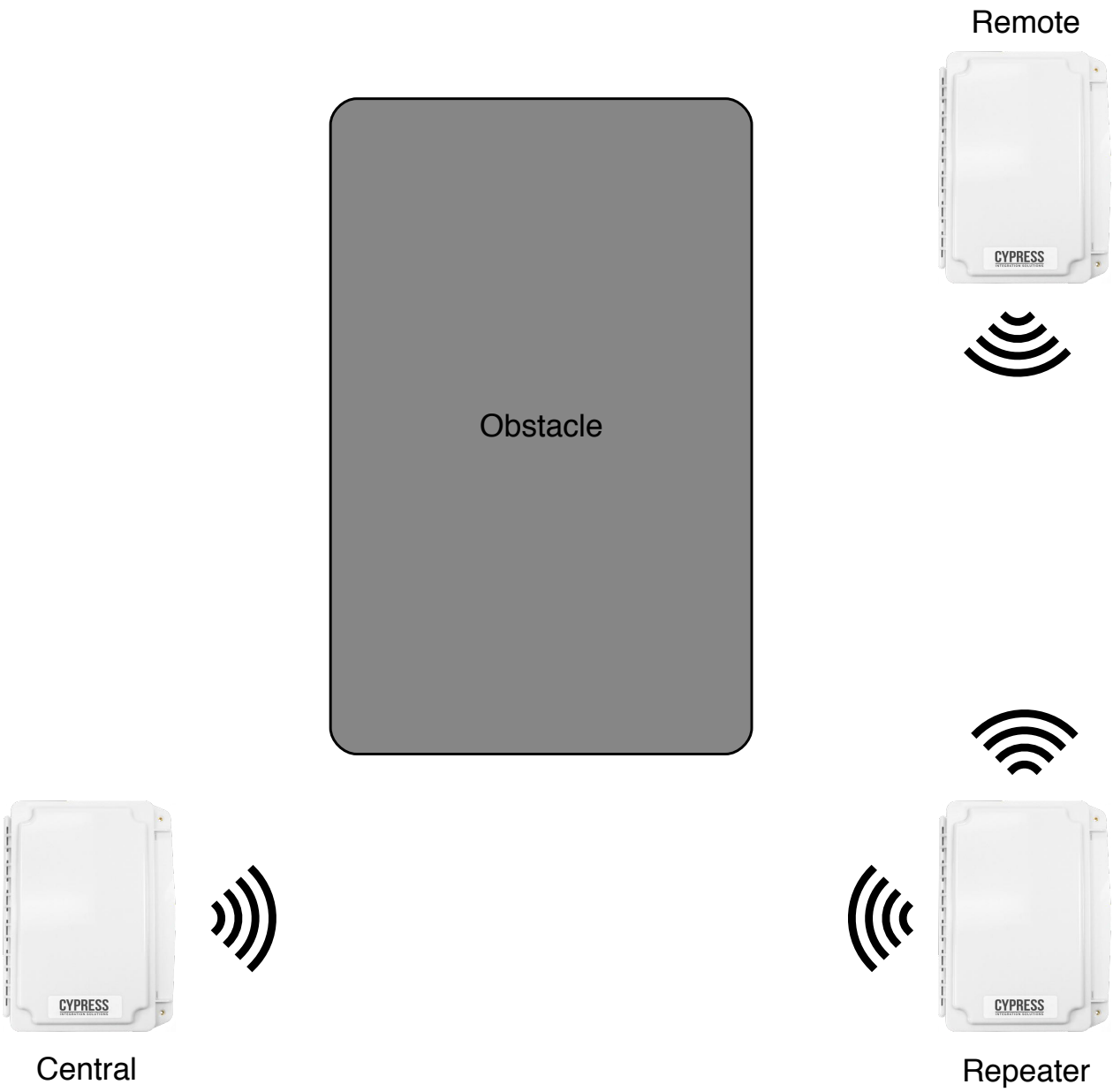
Cypress Suprex® RF Series - Quick Reference For Typical Connections



In this wiring example, the door strike follows a dry contact input from the access control panel. See page 15 for other strike control options.



Cypress Suprex® RF Series - Repeater Installation



For environments with obstacles that do not allow the Central and Remote units to have line of sight, or which need greater distances covered, a Repeater can be used. The diagram above shows the Repeater being used to get around an environmental obstacle. The Repeater needs to have line of sight with both the Central and Remote units. The Repeater needs only to be powered on; no other connections are necessary. The Repeater needs to be on the same channel and network ID as the Central and Remote units.

Cypress Suprex® RF Series - Troubleshooting

No Communication

When the Central and/or Remote unit is not communicating with its partner unit, the status LED will flash green/red. To troubleshoot communication issues, check the following:

- **Power:**
  - Both units must be powered.
  - Ensure proper power requirements are met: Unregulated Input 8 to 16Vdc @ 300mA max.
- **Installation:**
  - There should be a direct line of sight between Central and Remote units (if there is no direct line of sight, a Repeater unit is recommended).
  - The Central and Remote units should be installed level relative to each other.
  - Both the Central and Remote units should be mounted high enough to avoid interference from obstacles (vehicles, trains, buildings, trees, etc.).
  - Metal mounting surfaces can affect communication as well as range. If use of a metal surface is unavoidable, space unit as far from metal surface as possible using a non-metal spacer.
  - Antennas should both point up toward the sky (refer to Antenna Orientation, pg. 6).
  - In some cases an optimal mounting location can be selected by operating one of the units on a small 12V battery and moving the location while observing the diagnostic LED indicators.
- **Configuration:**
  - Ensure both Suprex units are set to the correct link type (see Configuration Mode, pgs. 7-9).
  - Ensure Suprex units are properly paired (see pgs. 25-26).
  - Ensure the Channel and Network ID settings on the Central and Remote units match (see Radio Configuration, pgs. 25-26).

No Data / Invalid Data

If the access control panel is not receiving valid data, check the following:

- **Basic Equipment Check:**
  - Ensure the reader and the access control panel data port are functional by directly connecting the reader to the data port and passing card data.
  - Check Suprex circuit boards for any signs of visual damage, such as burnt traces, burnt components, or browning of the PCB; these usually indicate misapplied power.
- **Wiring:**
  - Ensure there is a common ground between the Remote unit and the card reader.
  - Ensure there is a common ground between the Central unit and the access control panel.
  - Ensure Wiegand data wires are correctly connected and not reversed.
- **Configuration:**
  - Ensure both Suprex units are set to the correct interface type (see Configuration Mode, pgs. 7-9).
  - Ensure the access control panel is properly configured for the selected data format.
- **Data Voltage:** For a Wiegand connection, ensure Data 0 and Data 1 pins on Central and Remote units are at 5V relative to ground. The data pins can be as low as 4.4V before failing. If any Wiegand data pin is less than 4.4V, it is necessary to identify which device is pulling down the voltage.
  - Disconnect the Suprex from the reader/panel.
  - Maintain power on the Suprex and the reader/panel.
  - Independently measure the voltages of the Wiegand data pins of the Suprex, and of the reader/panel. If one or both devices have 4.3V or less, try enabling the pullup resistors on the Suprex by turning on DIP switch 5.
  - If internal pullup resistors do not work, try external pullup resistors (through-hole resistor 500 ohms - 2K ohms). To install external pullup resistors, place one end of the through-hole resistor into the +5Vdc pin on the Suprex unit; place the other end in the low-voltage Wiegand data pin (see pg. 5).

Cypress Suprex® RF Series - Accessory I/O - Overview

The Cypress SPX-5631 or SPX-5641 provides additional data channels to support access control hardware such as door strikes, tamper alarms, request to exit status, etc. These signals are sent to and from the Central and Remote units without the need to run additional wiring. We refer to these data channels as Accessory I/O. Accessory I/O data channels include Relay 1, Relay 2, Relay 3, Relay 4, LED, and AUX. Refer to the following pages (14-21) for details of each Accessory I/O operation and connection. Below is a table of the Accessory I/O pairs.

Relay I/O

The Relay I/O use active low inputs. When the Relay Inputs are floating (nothing connected) the inputs are set at 5V and the corresponding Relay Outputs will have continuity between COM and N.C. When the Relay Input is set to 0Volts (Ground) the input will activate the corresponding Relay Output. The Relay Outputs will have continuity between COM and N.O. when the relay is activated and will hold this state for as long as the Relay Input is set to 0Volts. The Relay Inputs can be tested by making a jumper connection to ground and monitoring the change in continuity of the Relay Outputs.

Relay 3 functions as an Supervision relay when DIP switch 4 is on in Run Mode; a Supervision relay monitors the condition of the communication link between the Central and Remote units. While in Supervision mode, Relay 3 is activated when the communication link between the Central and Remote is established and functioning. Relay 3 will deactivate (Alarm condition) when either the Relay 3 Input on the remote is active (pulled low) OR the Remote unit is unable to communicate with the Central unit. See APPLICATION NOTE FOR DETAILS.

LED and AUX I/O

The LED and AUX I/O use active low inputs. When the inputs are floating (nothing connected) the associated output will be set to a high level (5V). When the input is set to 0Volts (Ground) the input will activate its associated output. All Accessory outputs are Open Collector type and will switch to Ground when activated and will hold this state as long as the input is set to 0Volts. Each input will have an associated output. Inputs can be tested by making a jumper connection to ground and monitoring the associated output.

Accessory I/O Pairs

INPUT	OUTPUT
Relay 1 Input (C)	Relay 1 COM, Relay 1 N.C., Relay 1 N.O. (R)
Relay 2 Input (C)	Relay 2 COM, Relay 2 N.C., Relay 2 N.O. (R)
Relay 3 Input (R)	Relay 3 COM, Relay 3 N.C., Relay 3 N.O. (C)
Relay 4 Input (R)	Relay 4 COM, Relay 4 N.C., Relay 4 N.O. (C)
LED Input (C)	LED Output (R)
Aux Input (R)	Aux Output (C)

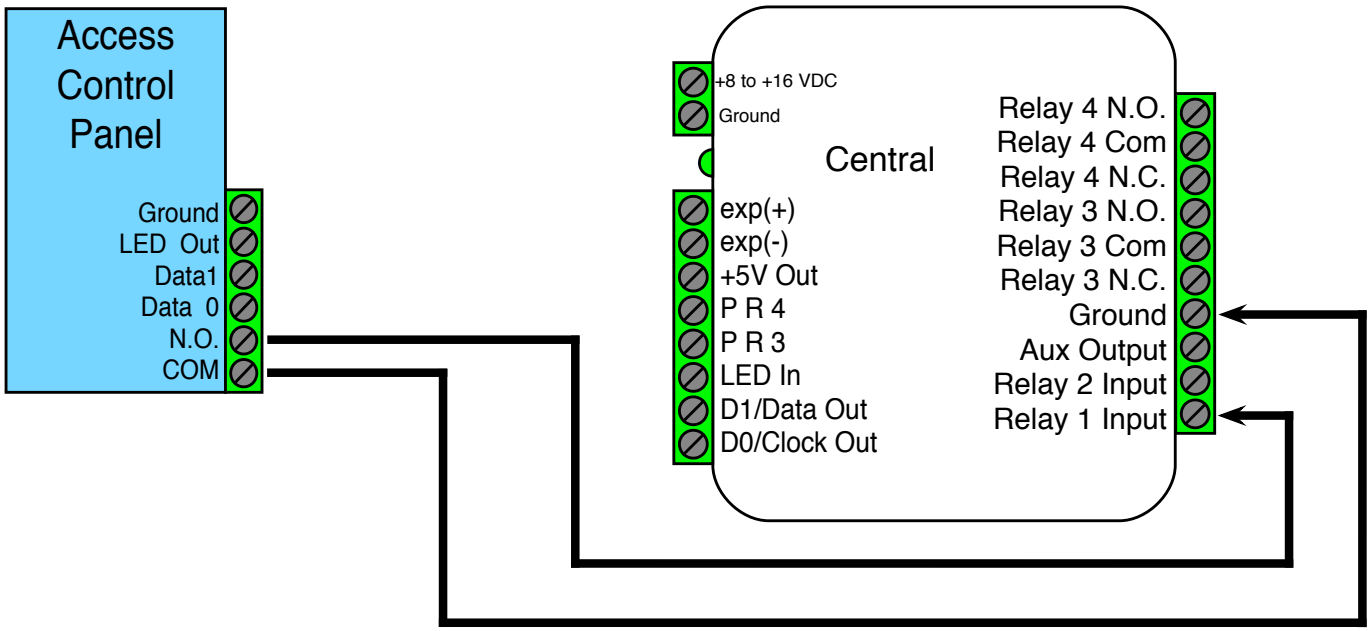
(C) or (R) denotes which board the pin is located on.

Cypress Suprex® RF Series - Accessory I/O - Central Relay Inputs

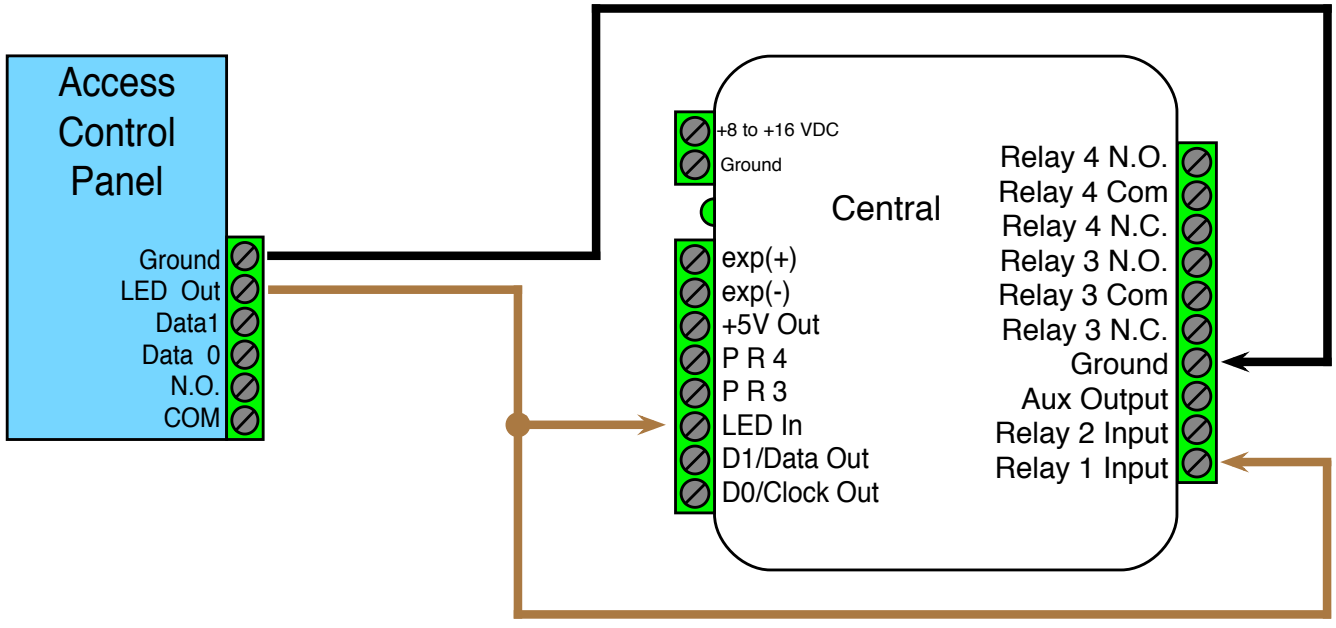
To activate the relay on the Remote unit, connect as shown below. These connections can be used to allow the Remote relay to operate a DOOR STRIKE, GATE, or other locking hardware. The diagram below shows two methods of triggering the relays. The first method uses a dry contact to trigger the relay. The second method shows the LED signal triggering the LEDS.

Relays 1 and 2 are available for accessory outputs at the Remote end. Either relay can be used to provide the Door Strike or Gate Activation function. This example uses Relay 1. The Relay Input pin is normally high (5V). When the Relay Input pin is pulled low (0V) the corresponding relay on the Remote unit will be activated. When the relay is activated, the Relay Output pins will change continuity from N.C. and COM to N.O. and COM (not shown in diagram).

Relay Input Wiring Example - Door Strike Follows Dry Contact



Relay Wiring Example - Door Strike Follows LED

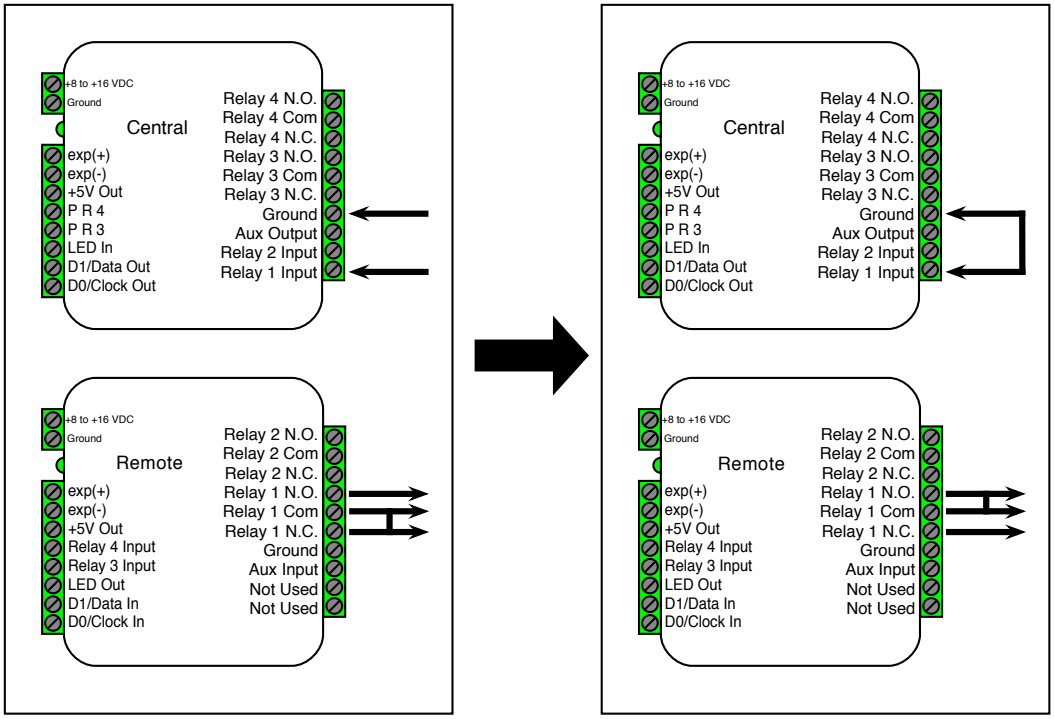


Cypress Suprex® RF Series - Accessory I/O - Relay 1 & 2 I/O

Relay 1 I/O Diagram

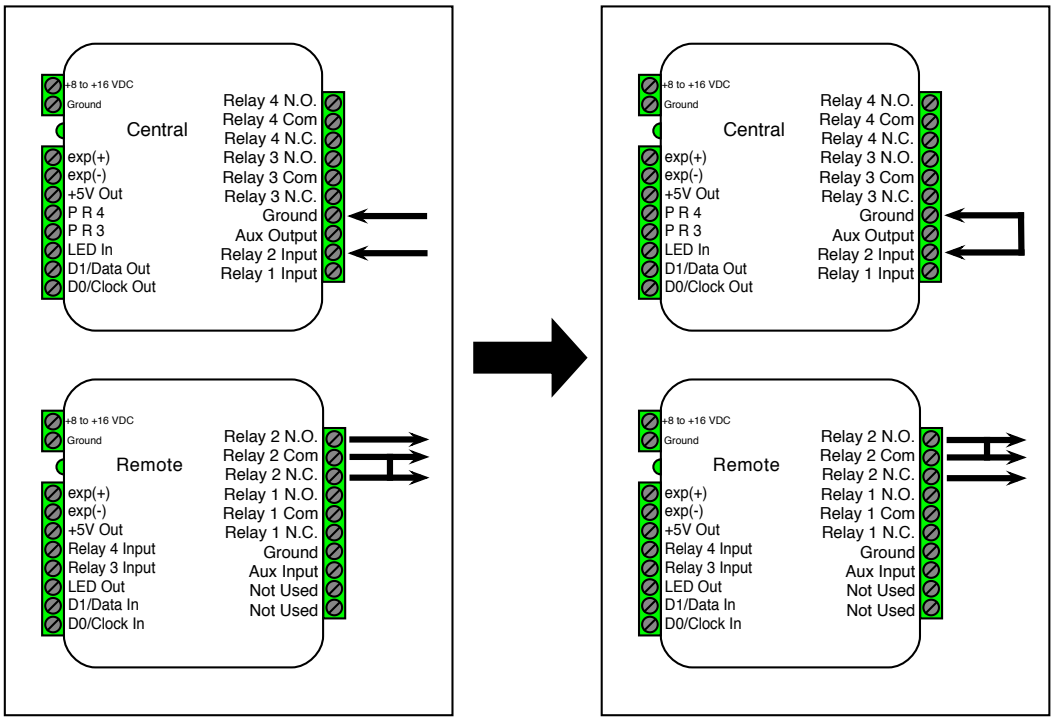
This diagram illustrates how the state of the Relay 1 Outputs change as Relay 1 Input is set to 0Volts (connected to Ground) using a jumper connection.

The left side illustrates that when Relay 1 Input is not set to 0Volts, Relay 1 COM and Relay 1 N.C have continuity. The right side shows that when Relay 1 Input is set to 0Volts, Relay 1 COM and Relay 1 N.O. have continuity.



Relay 2 I/O Diagram

This diagram shows how the state of the Relay 2 Outputs change as the Relay 2 Input is set to 0Volts (connected to Ground) using a jumper connection. The left side shows that when Relay 2 Input is not set to 0Volts, Relay 2 COM and Relay 2 N.C have continuity. The right side shows that when Relay 2 Input is set to 0Volts, Relay 2 COM and Relay 2 N.O. have continuity.



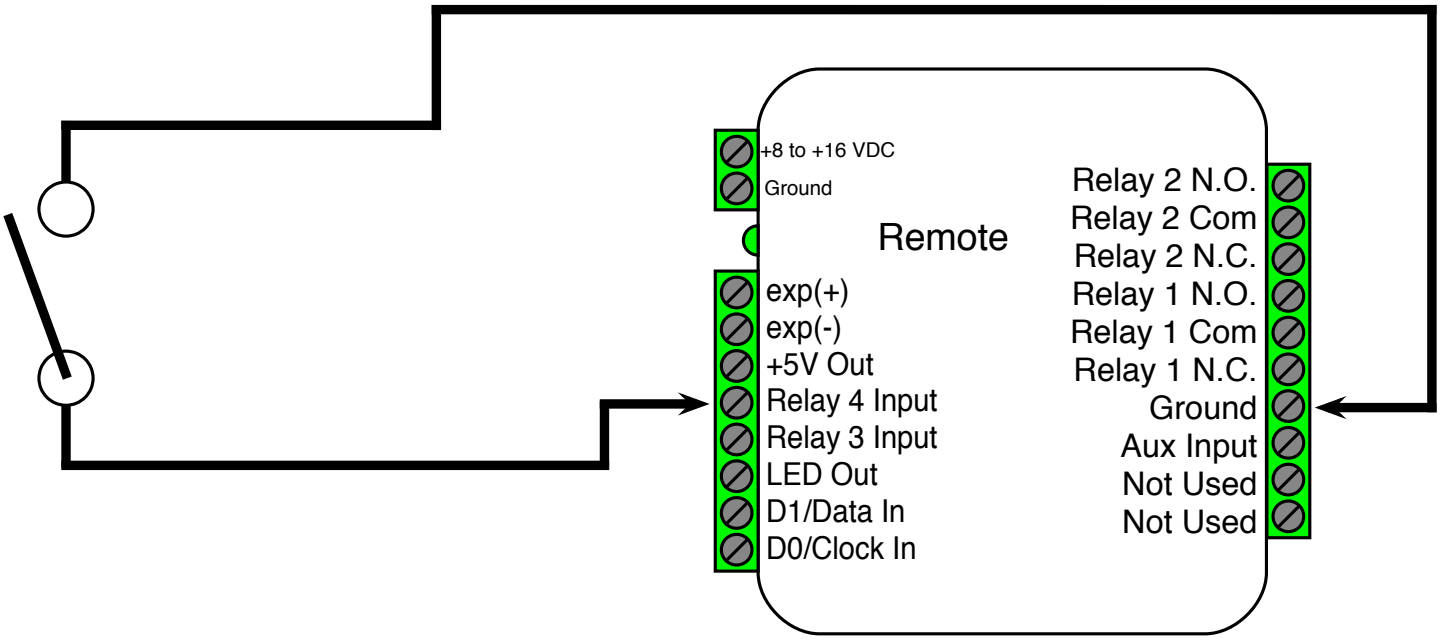
Cypress Suprex® RF Series - Accessory I/O - Remote Relay Inputs

To activate the relay on the Central unit, connect as shown below. These connections can be used to operate a REX switch or other signals that need to go to the access panel.

Relays 3 and 4 are available for accessory outputs at the Central end. Either Relay 3 or Relay 4 can be used. This example uses Relay 4. The Relay Input pin is normally high (5V). When the Relay Input pin is pulled low (0Volts) the corresponding relay on the Remote unit will be activated. When the relay is activated, the relay output pins will change continuity from N.C. and COM to N.O. and COM (not shown in diagram).

Relay 3 can used to send signals to the access panel while Supervision mode is active, but it is important to remember that the outputs will be reversed. When Supervision mode is active and the Relay 3 Input pin is normal (5V) the relay output pins will have continuity between N.O. and COM. When Supervision mode is active and the Relay 3 Input pin is active (0Volts) the relay output pins will have continuity between N.C. and COM.

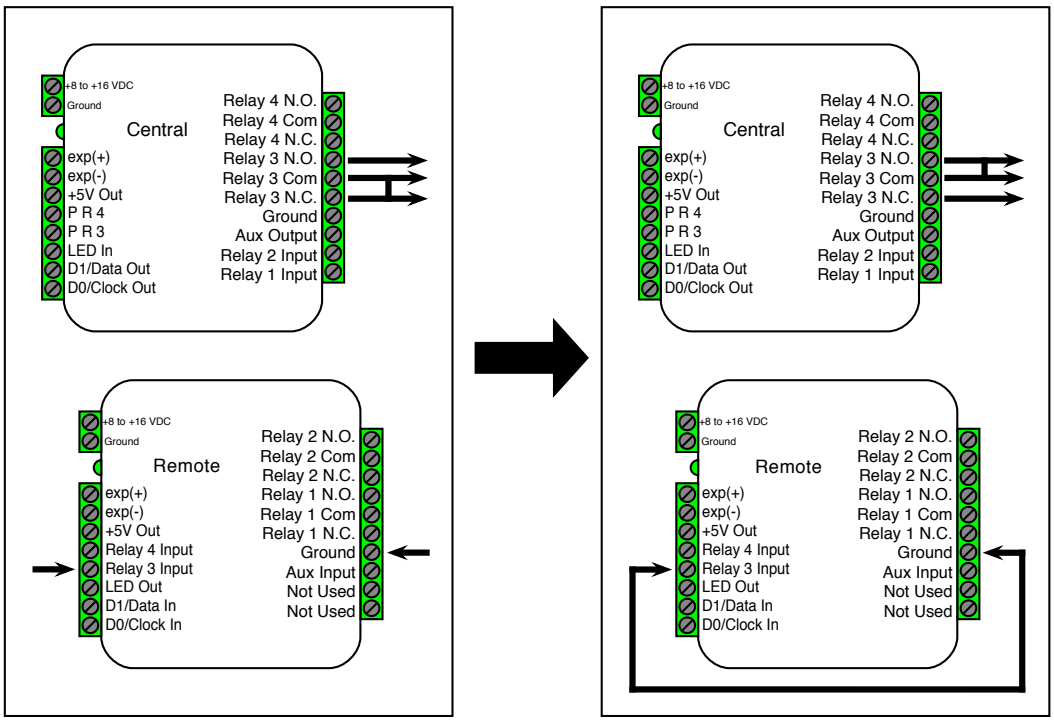
Relay Wiring Example - REX Switch



Cypress Suprex® RF Series - Accessory I/O - Relay 3 & 4 I/O

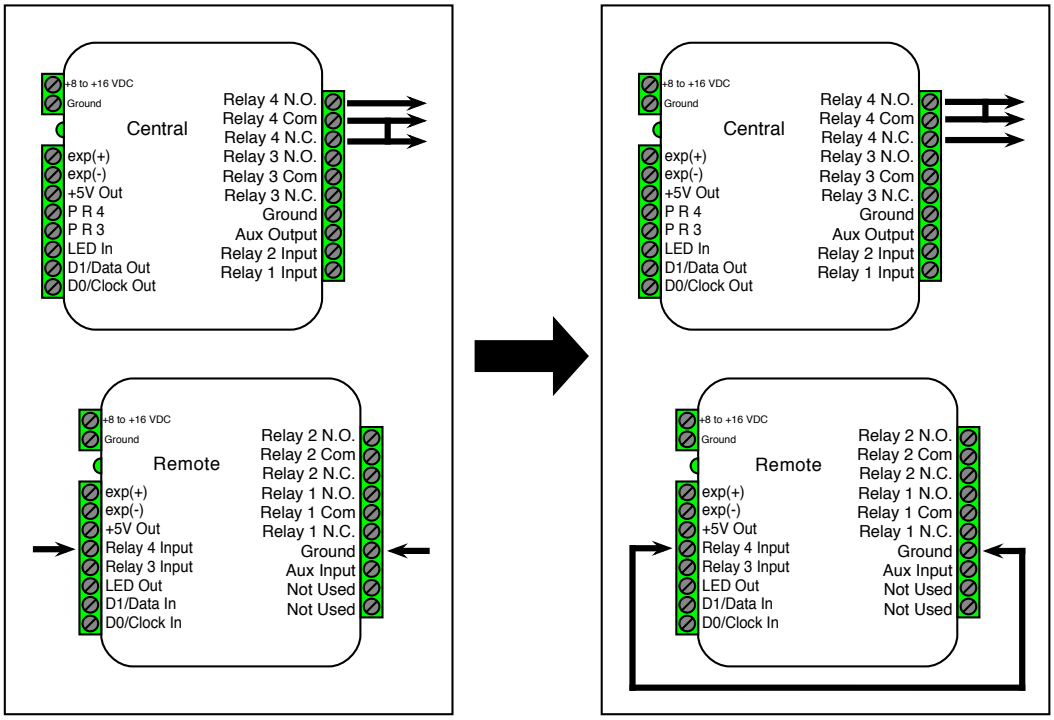
Relay 3 I/O Diagram

This diagram shows how the state of the the Relay 3 Outputs change the as Relay 3 Input is set to 0Volts (connected to Ground) using a jumper connection. The left side shows that when Relay 3 Input is not set to 0Volts, Relay 3 COM and Relay 3 N.C have continuity. The right side shows that when Relay 3 Input is set to 0Volts, Relay 3 COM and Relay 3 N.O. have continuity.



Relay 4 I/O Diagram

This diagram shows how the state of the the Relay 4 Outputs change the as Relay 4 Input is set to 0Volts (connected to Ground) using a jumper connection. The left side shows that when Relay 4 Input is not set to 0Volts, Relay 4 COM and Relay 1 N.C have continuity. The right side shows that when Relay 4 Input is set to 0Volts, Relay 4 COM and Relay 4 N.O. have continuity.

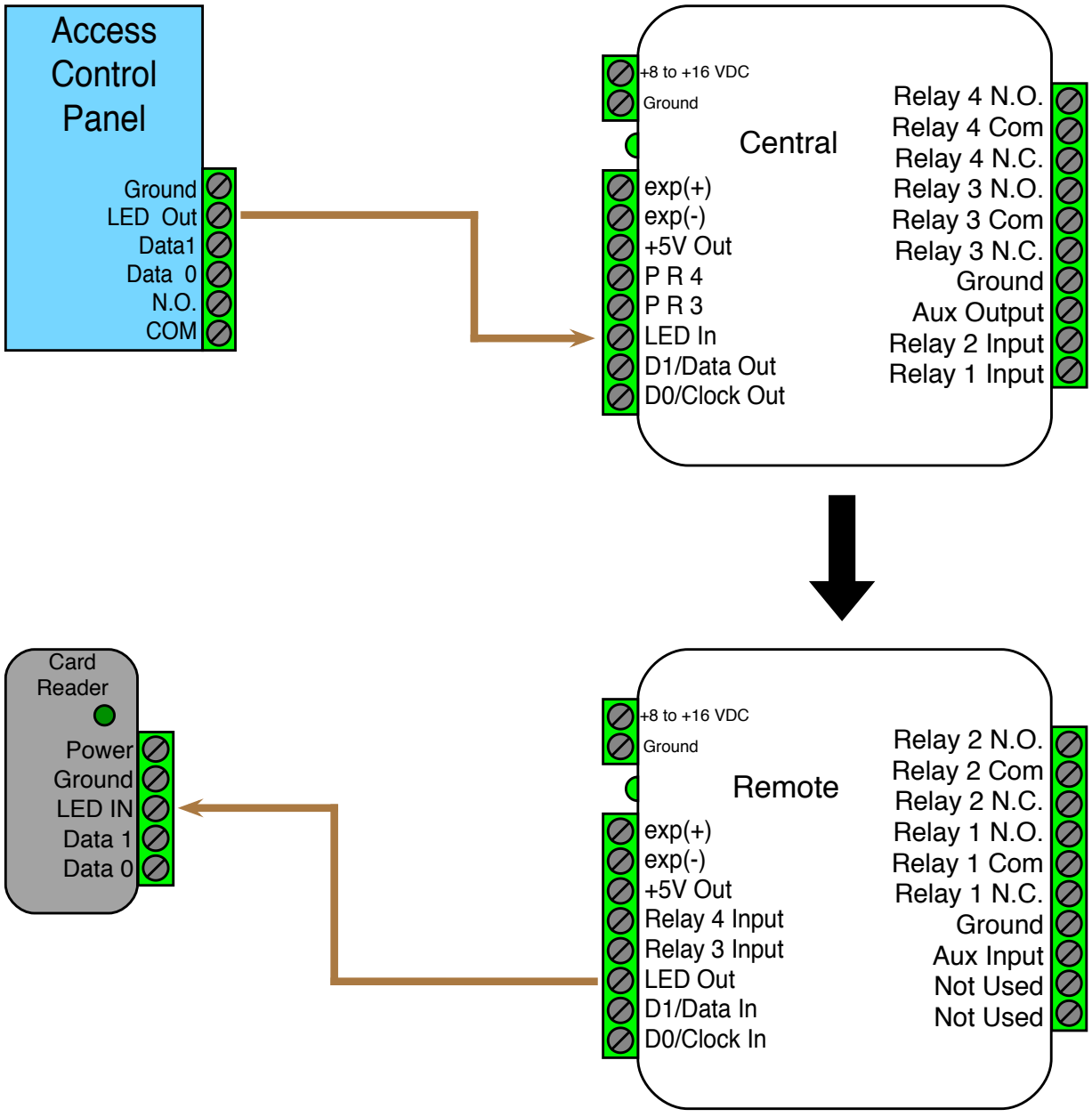


Cypress Suprex® RF Series - Accessory I/O - LED I/O

For access control panels with a LED Output signal, the SPX-5631 / SPX-5641 is able to transmit this signal to the reader with the LED Input and LED Output pins. The LED In pin is a digital input and the LED Out pin is a digital output. The LED In pin has two states, 5V (high or normal) and 0Volts (low or active). The LED Out pin will mirror the state of the LED In pin.

The LED I/O Signal Diagram below shows how this signal is passed through he SPX-5631 / SPX-5641.

LED I/O Signal Diagram

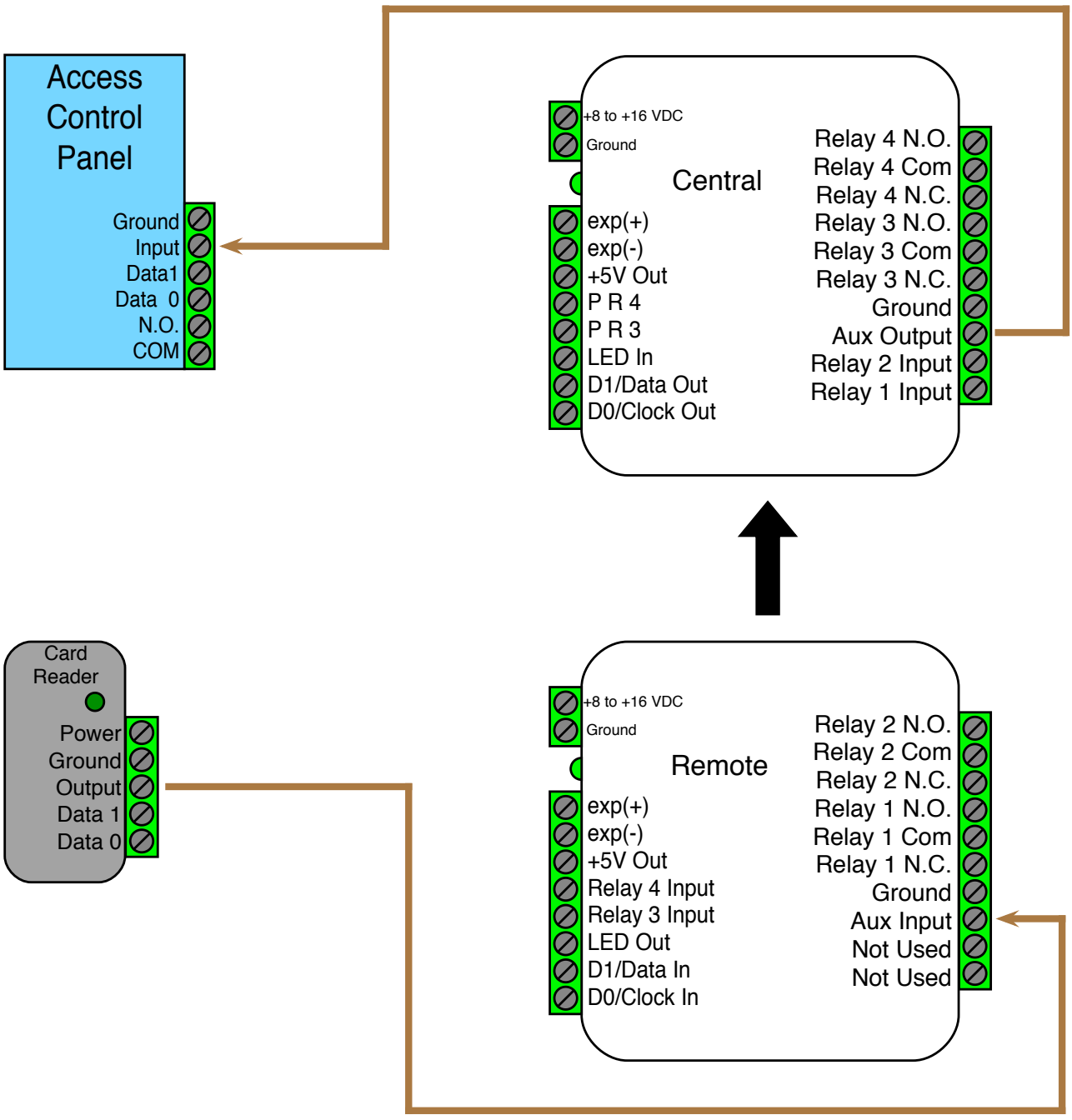


Cypress Suprex® RF Series - Accessory I/O - AUX I/O

The SPX-5631 / SPX-5641 has an auxiliary I/O signal going from the reader side to the panel side. The SPX-5631 / SPX-5641 is able to transmit this signal to the panel with the AUX Input and AUX Output pins. The AUX In pin is a digital input and the AUX Out pin is a digital output. The AUX In pin has two states, 5V (high or normal) and 0Volts (low or active). The AUX Out pin will mirror the state of the AUX In pin.

The AUX I/O Signal Diagram below shows how this signal is passed through the SPX-5631 / SPX-5641.

AUX I/O Signal Diagram



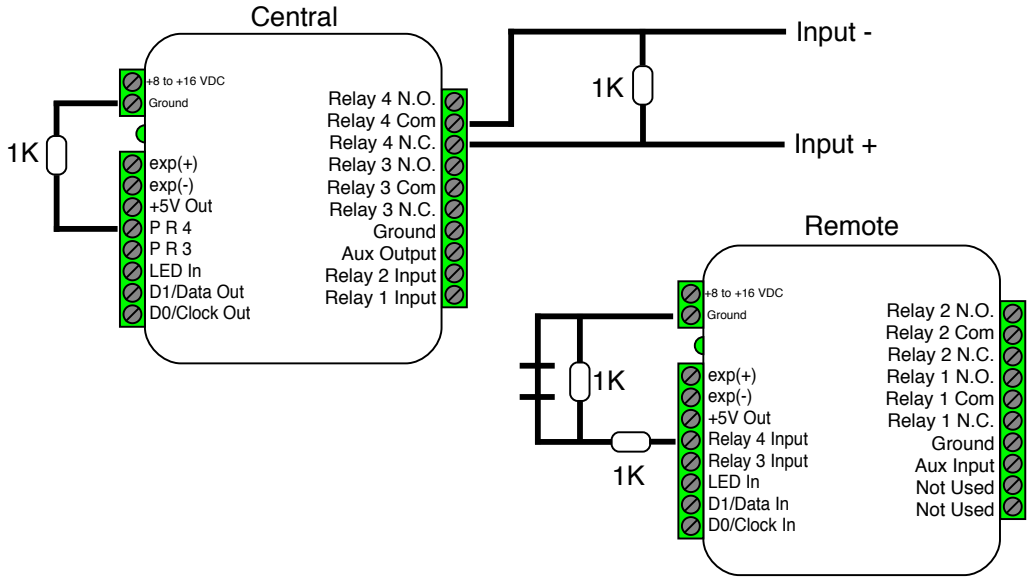
Application Note on using Supervised contacts with the Suprex® RF Series

The following applies to these products: SPX-5631 and SPX-5641.

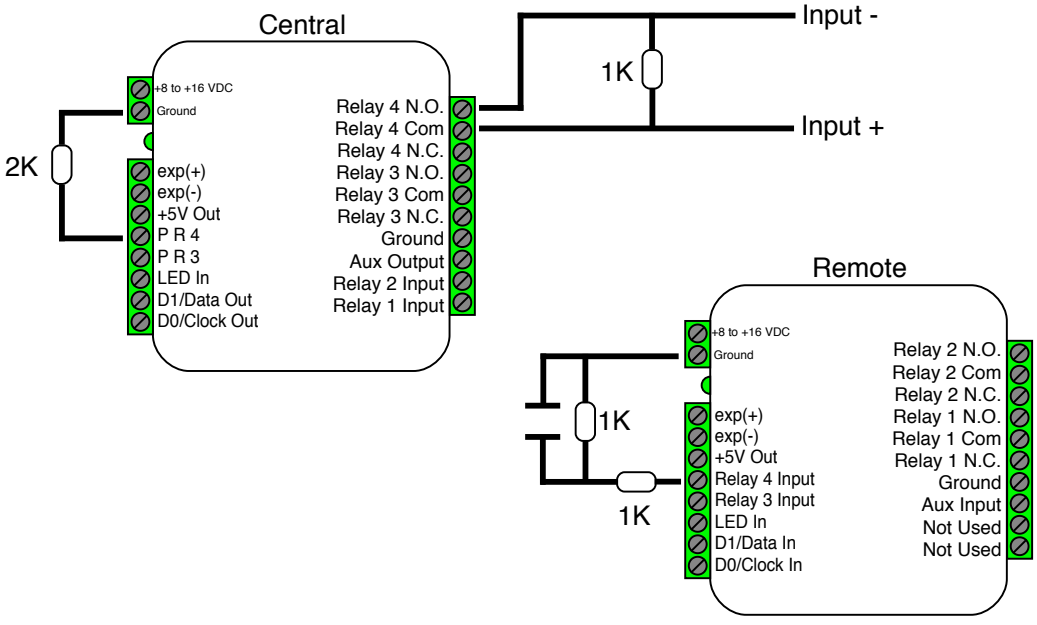
This application note describes the connections necessary to convey supervised contact status over a Suprex®. The configurations described in this application note should apply to most panels which utilize supervised contacts. When connected as described, the Suprex® provides a supervised signal to the panel interface by reading the supervised status of the contacts connected to the Suprex® Remote unit.

Theory of operation: The access control panel is looking for a certain value of resistance connected to the supervised contact terminals. The Suprex® Central unit will provide these resistance values locally at the panel so that the correct supervised status is maintained. At the same time, the Remote unit must maintain supervision of the wires connected to the relays and switches connected to the remote access point. The contact supervision is provided by the Remote unit. The Suprex® system does this by comparing the value of programming resistor at the Central unit with the resistance seen at the Remote interface terminals. When there is a difference in the two values, the Relay on the Central unit is activated. There are two different examples. One example is monitoring a normally closed contact at the Remote unit, and the other example is monitoring a normally open contact at the Remote unit. In the examples given, a normally closed contact will require a programming resistor of 1K and a normally open contact will require a programming resistor of 2K. Other resistor values can be used, but 1K resistors are the most common. Other resistance values will require different value(s) for the programming resistor(s).

Normally Closed Contact



Normally Open Contact



Cypress Suprex® RF Series - Using EXP-2000 Expansion Modules

EXP-2000 Expansion Modules allow additional readers to connect to the access control panel using a single Suprex® RF link. This is useful at door/gate locations with more than one card reader, such as in/out door readers or high/low gate readers. The Suprex® RF can accommodate a maximum of 8 readers with the use of 7 EXP-2000 Expansion Modules. Each reader requires its own data port on the access control panel.

Before using EXP-2000 Expansion modules with the Suprex® system, it will be necessary to perform a short configuration process. This process determines how many expansion modules will be used with the Suprex® system. Each Suprex® link can support up to 7 expansion modules.

Operation Overview:

The EXP-2000 pair of units is connected to the Suprex® pair of units via an RS-485 connection. The EXP Central units will be daisy-chained off the Suprex® Central RS-485 port (labeled **EXP+** and **EXP-**). The EXP Remote units will be daisy-chained off the Suprex® Remote unit RS-485 port (also labeled **EXP+** and **EXP-**). The only link between the reader/gate location and the panel will be the Suprex® link; in this case, the wireless link.

The Suprex® and EXP-2000 Expansion Modules operate on an addressing scheme. The Suprex® pair is always address 0. The first EXP pair will be address 1, the second EXP pair will be address 2, etc. (see pgs. 7-9). When configuring the Suprex® pair to work with the EXPs, the Central and Remote units must be told how many EXP pairs they will be working with. The Central and Remote units of each EXP pair must be configured with their address numbers.

Setup Process: By default, Suprex® units are not configured to accommodate EXP-2000 expansion modules. To reconfigure the Suprex® units, follow this process for both the Central and Remote units.

- The Suprex® Central and Remote units must be configured with the total number of EXP pairs being used.
  - This is configured in the Run Mode settings and is controlled by DIP switches 6, 7, and 8.
  - Change settings on both the Suprex® Central and Remote units, as shown on pgs 7-9.

- The EXP-2000 Expansion Module pairs need to be properly addressed with their address number.
  - The EXP address is configured by using DIP switches 6, 7, and 8 on the EXP-2000 Central and Remote units.
  - The first EXP pair will be address 1, the second EXP pair will be address 2, etc. (see pgs. 7-9).
  - Set DIP Switch 8 on the EXP Central and Remote units to set to address 1.
  - Set DIP Switch 7 on the EXP Central and Remote units to set to address 2.

- Connect the EXP Expansion Modules into the system as indicated in the wiring diagrams on pages 23 and 24.

Suprex® Operation with Expansion Modules: Using EXP Expansion Modules does not change the normal function of the Suprex®, with these exceptions:

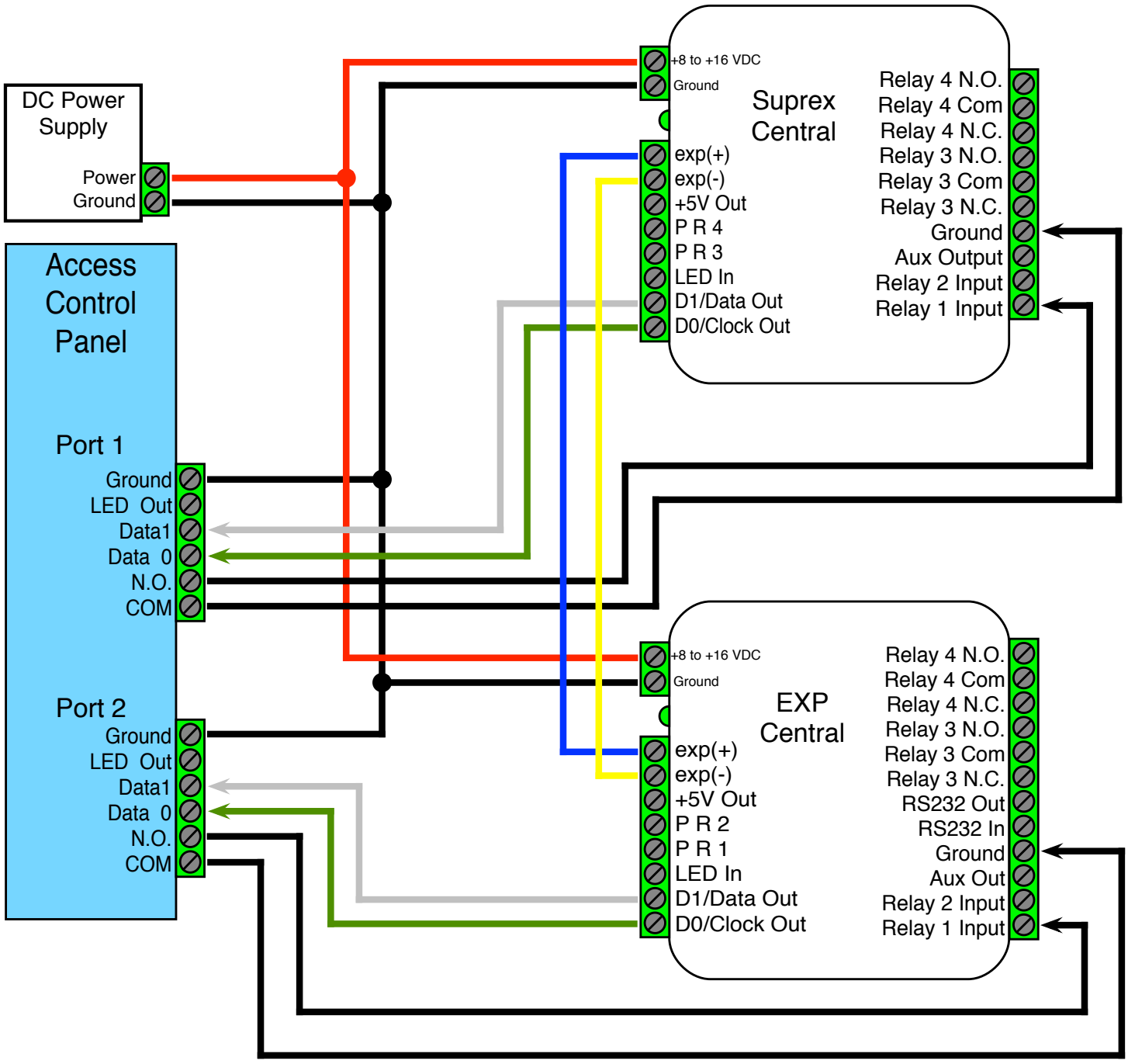
- EXP Expansion Modules are compatible only with the Wiegand interface type (does not apply to Wiegand No Filter)

- If the Suprex® Supervision relay is enabled, the Supervision relay will deactivate (indicate alarm state) if the communication link fails between the Suprex® pair or ANY of the the EXP pairs. *(To enable Supervision relay, see Run Mode settings, pgs. 7-9.)*

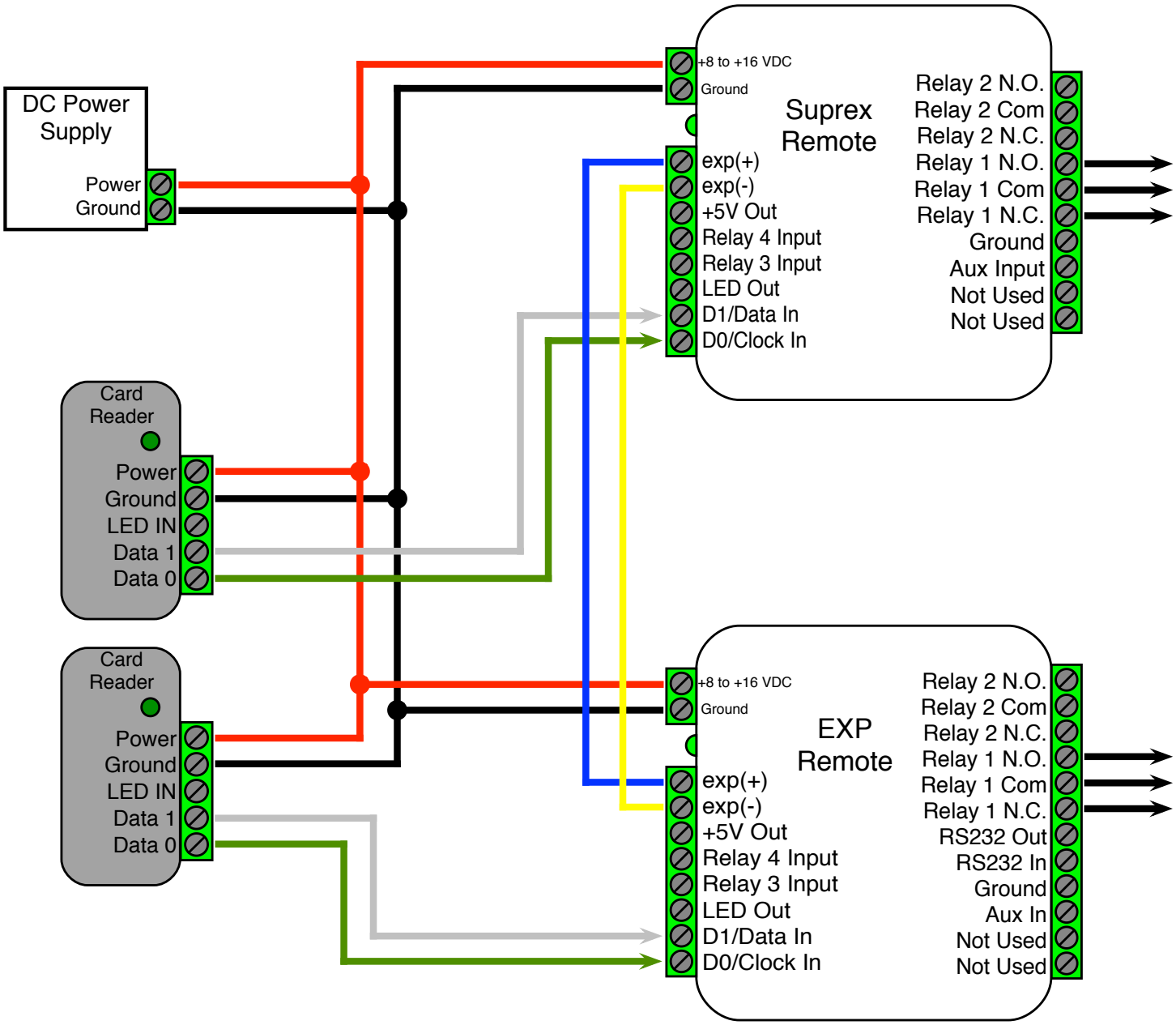
- LED Indicators with Suprex® Pair:
  - Suprex® Central or Remote status LED is solid green in Run Mode: one or more of the connected EXP units is not communicating properly. Ensure all EXP units are powered and correctly wired.
  - EXP status LED is solid red: EXP unit is not properly communicating with the Suprex® unit. Ensure the Suprex® unit is powered and wired correctly.
  - EXP status LED is flashing green: EXP unit is properly communicating with the Suprex®.

- The EXP-2000 Central and Remote pair will be functionally similar to the standard Cypress SPX-1300 Suprex® system. For more details, see the EXP-2000 manual.

Cypress Suprex® RF Series - Suprex Central and EXP Central Wiring Diagram

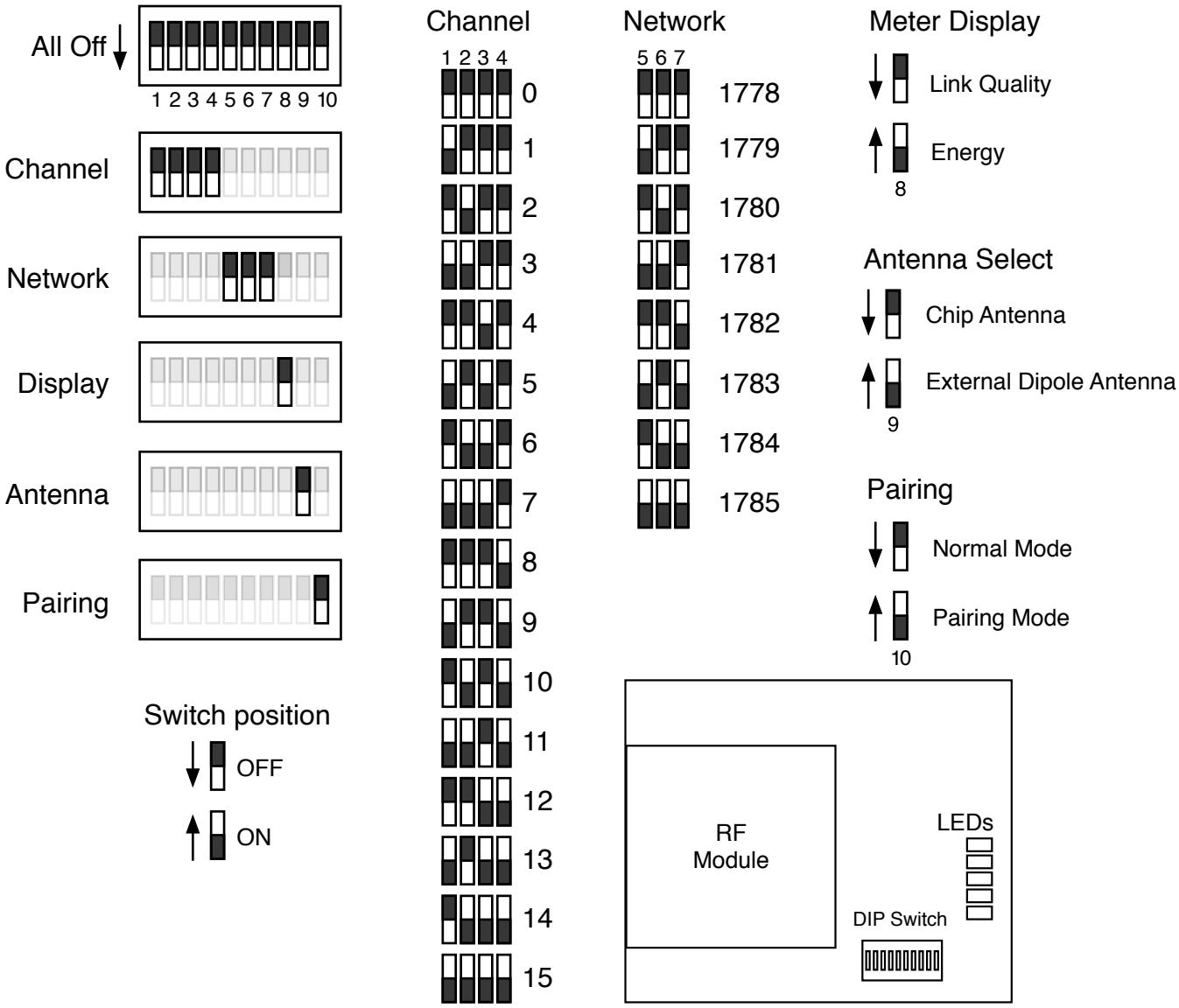


Cypress Suprex® RF Series - Suprex Remote and EXP Remote Wiring Diagram



See EXP-2000 Manual for further setup instructions.

Cypress Suprex® RF Series - Radio Configuration



The diagrams above show the 10 RF Daughter Board DIP switches and their functions. Using these DIP switches the user can change the wireless channel, network number, LED Display, Antenna Selection, and pair the Central and Remote units.

Wireless Channel Selection

DIP switches 1-4 control the wireless channel. Refer to the channel diagram above to set the DIP switches to the correct configuration for the desired channel. The Central and Remote units will be set to channel 4 by default. Both the Central and Remote unit need to be on the same channel and network in order to communicate. When a change is made to the channel selection, the unit will need to be power cycled for the change to take effect.

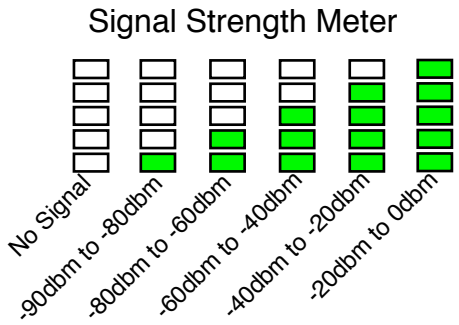
Note: Channels 0,1, and 15 are reserved and should not be used by the enduser, leaving channels 2-14 (13 channels) for user operation.

Wireless Network ID Selection

DIP switches 5-7 control the wireless network. Refer to the network diagram above to set the DIP switches to the correct configuration for the desired network ID. The Central and Remote units will be set to network ID 1778 by default. Both the Central and Remote unit need to be on the same channel and network ID in order to communicate. When a change is made to network ID selection, the unit will need to be power cycled for the change to take effect.

Meter Display

DIP switch 8 controls what the 5 LEDs on the daughter board display. The 5 LEDs can display Signal Strength or Ambient RF Energy. Refer to the diagram above (on page 25) in order set the unit to display Signal Strength or Ambient RF Energy.



Signal Strength Meter
When the unit is set to display signal strength, the LEDs will display the signal strength of the last received transmission from a device with the same network ID. Refer to the Signal Strength Meter diagram to see how the LEDs behave in this mode. The signal strength can be used to make the user aware of poor signal quality and determine a better location to mount the units.

Ambient RF Energy
When the unit is set to display ambient RF energy, the LEDs will display the ambient RF energy of the selected channel regardless of network ID. A greater number of illuminated LEDs indicates less ambient RF energy. A lesser number of LEDs illuminated indicates more ambient RF energy. Detecting the ambient RF energy can be used to find a channel most suitable for operation.

Antenna Select

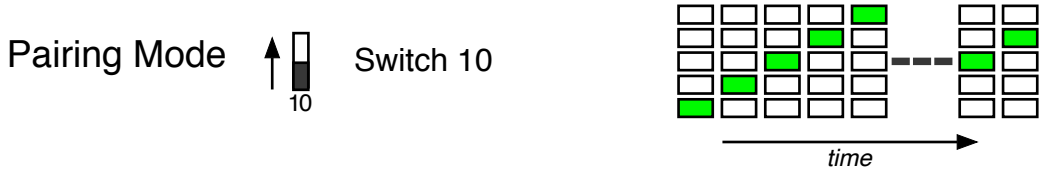
DIP switch 9 controls the antenna mode of the unit. Refer to the Antenna Select diagram (see page 25) to set the Antenna Select DIP switch to the appropriate setting. The mode the unit should set to depends on the part number. The SPX-5631 and SPX-5641 will have the antenna selection set correctly from the factory. When changing the Antenna Select DIP Switch, the unit will need to be power cycled twice for the change to take effect.

Chip Antenna
The SPX-5631 should be be set to Chip Antenna setting at all times. The SPX-5631 does not include a dipole antenna and will not function properly if the unit is set to the External Dipole Antenna setting.

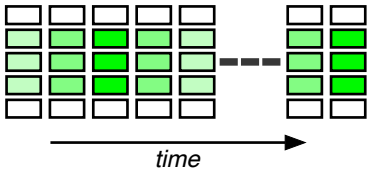
External Dipole Antenna
The SPX-5641 should be set to the External Dipole Antenna setting at all times. The SPX-5641 will not be able communicate over the full 10,000 foot range if the unit is set to the Chip Antenna setting.

Pairing

DIP switch 10 determines if the unit is in Pairing Mode. When DIP switch 10 is on, the unit will enter pairing mode (refer to Pairing diagram above on page 25). The Central and Remote units will come paired from the factory. After pairing mode is first entered, the radio will reboot. After one second, the LEDs display a “scanning” sequence (see diagram below) indicating the radio is “looking” for another radio also in pairing mode.



Put another unit into Pairing Mode to establish a pair. Both units must be set to the same channel and network ID to be paired. It is recommended that the two units be near each other when pairing. Once another unit is detected which is also in Pairing Mode, the LEDs will flicker, pause, reset, and finally the 3 center LEDs will settle into a dim-to-bright-to-dim pattern. This indicates pairing is successful. Pairing Mode can now be switched off on both units for normal operation.



The pairing function does not affect other units that have already been paired and are NOT in Pairing Mode. However, if more than two units are put into Pairing Mode at the same time, the results will be arbitrary. The first two radios to discover each other will be paired regardless of distance or signal strength.

Cypress Suprex® RF Series - OSDP Features

Features

- Supports 1 reader and door I/O.
- Each reader requires a pair of SUPREX units. However, Central units (in OSDP mode) can be multi-dropped. The number of supported Central units on a single port is determined by the ACU.
- OSDP Secure Channel (OSDP version 2.2) is supported when used with OSDP systems. For systems with OSDP readers and Wiegand panels, Secure Channel is supported between the Suprex remote unit and the OSDP reader.
- Mix and match data interfaces: OSDP can be used in combination with Wiegand and Strobed.

Interface Mode		Remote	
		OSDP	Wiegand, Strobbed
Central	OSDP	✅	✅
	Wiegand, Strobbed	✅	

- The following commands are passed through from panel to reader: osdp_LSTAT, osdp_ISTAT, osdp_OSTAT, osdp_OUT, osdp_LED, osdp_BUZ, osdp_TEXT, osdp_KEYSET, osdp_ID, osdp_CAP, and osdp_POLL.
- The following commands are not passed through from panel to reader: osdp_COMSET, osdp_CHLNG, and osdp_SCRYPT.
- The following replies are passed through from reader to panel: osdp_RAW, osdp_LSTATR, osdp_ISTATR, osdp_OSTATR, osdp_PDCAP, and osdp_PDID.

NOTE: EXP Expansion units are NOT supported in OSDP mode. Both OSDP and the EXP-2000 utilize the RS-485 connections. OSDP mode and EXP units are mutually exclusive.

OSDP Run Mode Status LED States

Solid RED: No communication between Central and Remote

Flashing RED/GREEN: Communication between Central and Remote, but no OSDP communication with panel and/or reader.

Flashing GREEN: Communication between Central and Remote, and OSDP communication with the panel and/or reader.

Find Reader Mode (Remote Initialization)

Find Reader Mode allows the Remote SPX-5631 to locate a new reader or peripheral device (PD), and set its address to 0. This only needs to be done once during installation. Please follow the steps below to perform this process:

1. Turn off the Central unit.
2. On the Remote unit, turn on dip switch 8.
3. Power on the Remote unit.
4. Verify the status LED is solid red (located between the 2-pin and 8-pin headers).
   - 4.1. The Remote finds the reader by broadcasting on osdp_ID command on address 127 at every baud rate.
   - 4.2. Then, the Remote sends an osdp_COMSET to change the address to 0. The baud rate remains the same.
   - 4.3. When complete, the status LED turns green.
5. Verify the status LED is solid green.
6. Power off the Remote unit.
7. Turn off dip switch 8.
8. Power the Remote unit back on.

Setup & General Initialization

Before beginning this process, be sure to go through Find Reader Mode in the section above! Every time the Central and/or Remote units are powered up, they perform this general initialization process:

1. Power on both the Central and Remote.
2. Both SUPREXs blink red/green or green when they are communicating (see LED section below for more information).
3. The Remote obtains info from the reader:
   - 3.1. Remote sends osdp_ID and osdp_CAP.
   - 3.2. This information is stored in non-volatile memory for future reference.
   - 3.3. The osdp_PDID and osdp_PDCAP replies are shared with the Central unit.
   - 3.4. If the Remote is not set to OSDP mode, the Central will share its osdp_PDID and osdp_PDCAP with the panel. See the Central OSDP Device Report section for more information (page 32).
4. Once the Central unit has the reader's info, the Central appears as a PD to the panel:
   - 4.1. Make sure the panel is configured with the appropriate com parameters.
   - 4.2. Central defaults to address 0 and 9600 baud.
   - 4.3. You may send an osdp_COMSET to modify these parameters in the Central (stored in NV). NOTE: Changing addresses is required for multi-drop installations.
   - 4.4. If the Central is not set to OSDP mode, disregard this step.
5. Finally, the SUPREX(s) check if they need to perform SC. Any of the following conditions will prompt SCS:
   - 5.1. A non-default key is set (see OSDP SC for more information).
   - 5.2. The OSDP session between either the panel and Central or the Remote and the reader is secure.
   - 5.3. DIP switch 6 is on (either unit).

Secure Channel (SC)

NOTE: OSDP Secure Channel is supported when used with OSDP systems. For systems with OSDP readers and Wiegand panels, Secure Channel is supported between the Suprex remote unit and the OSDP reader.

If the panel supports SC and the reader is OSDP, go to the OSDP Key Sharing section below.

Only turn on Remote DIP switch 6 if the panel does not support SC. The Remote will initialize a SC session; however, it will send a random key to the reader if the key is default.

Dip switch 6 enforces a SC session on the Central or Remote side. The Remote unit will establish a SC session after initialization. In this mode, any clear channel osdp_POLLs sent to the Central are replied to with a NAK code 6.

Permitted unencrypted commands (when Central is secured):
- osdp_ID
- osdp_PDID
- osdp_COMSET
- osdp_CHLNG

NOTE: If a non-default key has been set, the units will always initiate a SC session, even if DIP switch 6 is off.

OSDP Key Sharing

The OSDP Key Sharing process is designed to be run out-of-band on a bench. It is important:
- The panel and reader that are being installed are used.
- There is nothing else on the RS-485 bus (for security purposes).
- Central and Remote talk with the reader and panel hooked up.
- The panel is expecting a reader without a SCBK set.
- The reader is in install mode (if applicable).

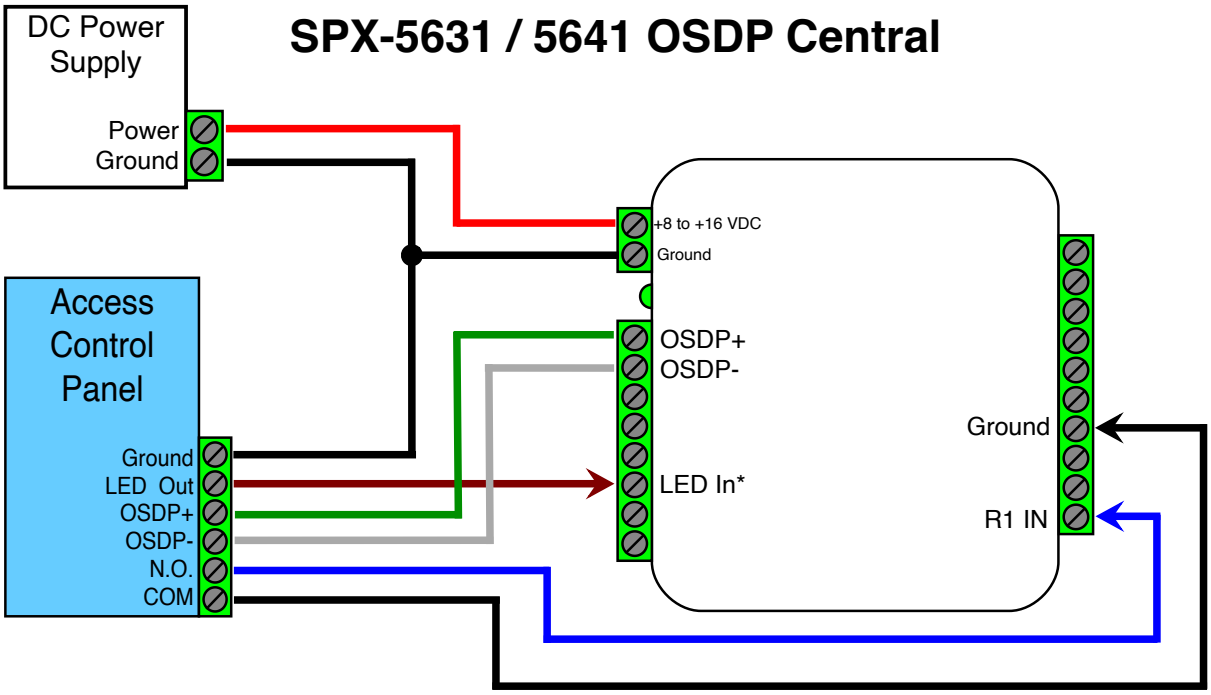
Once these conditions are met:
1. Connect Central to the panel, and Remote to the reader.
2. Power up everything (Central, Remote, panel, and reader).
3. Initiate a session with the Central unit.
4. Start SC from the panel.
5. From the panel, send a valid osdp_KEYSET command to the Central unit.

Doing these steps will result in a matching osdp_KEYSET being sent to the reader via the Remote unit. This will ensure that the reader can talk to the Remote unit OR the panel directly if needed!

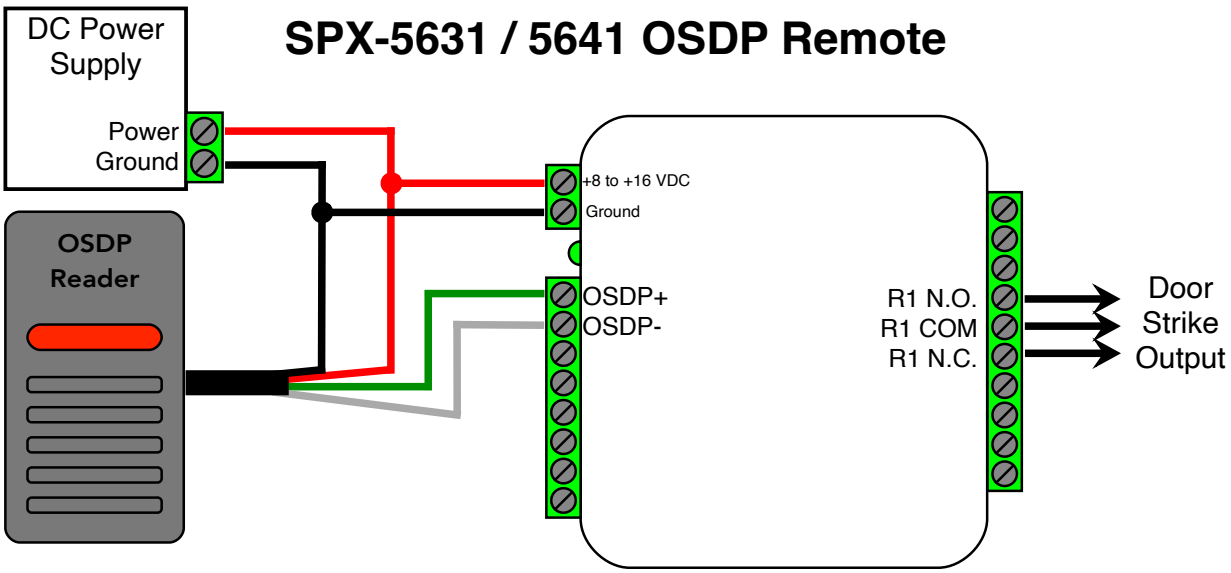
Default SCBK

If you need to clear the SCBK you will need to put both units in config mode (DIP switches 1 and 5 on). Then connect the units via RS-485. Turn on one unit. Wait until it is flashing green. Then turn on

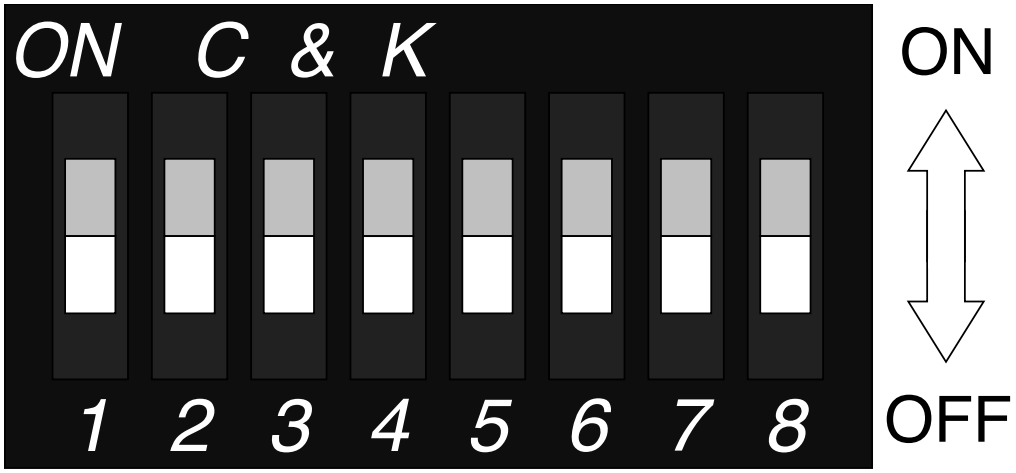
Typical OSDP SPX-5600 Series Central and Remote Connections



*NOTE: signal only required if Remote unit is not in OSDP mode.



Cypress Suprex® RF Series - OSDP DIP Switches



Run Mode

1 — Configuration Mode Select
2 — Remote Relay Mode Select
3 — Central / Remote Select
4 — Supervision Relay Select
5 — Pullup Resistor Select
6 — Require Secure Channel
7 — Not Used
8 — Find Reader Mode

Configuration Mode Select - ON = Configuration Mode - OFF = Run Mode

Remote Relay Mode Select - ON = Digital Input - OFF = Analog Input

Central / Remote Select - ON = Central - OFF = Remote

Supervision Relay Select - ON = Enable Supervision Relay - OFF = Disable Supervision Relay

Pullup Resistor Select - ON = Enable Pullup Resistor - OFF = Disable Pullup Resistor

Require Secure Channel - ON = Enforces SC Session - OFF = SC Not Required Unless SCBK Set

Find Reader Mode - ON = Enable Find Reader Mode - OFF = Normal OSDP Operation

- The DIP Switch selections in Run Mode and Test Mode are ACTIVE, meaning that they can be changed on the fly without power cycling the unit.

- When using the Remote unit with digital relay inputs the relays are controlled by the "not used" pins on the 10 pin header. Connect the outside "not used" pin to "Ground" to trigger Relay 3. Connect the inside "not used" pin to "Ground" to trigger Relay 4.

- When using the Remote unit with analog relay inputs the relays are controlled by the "Relay 3 in" and "Relay 4 in" pins. Connect "Relay 3 in" to "Ground" to trigger Relay 3. Connect "Relay 4 in" to "Ground" to trigger Relay4.

-The Remote Relay Mode Select (Dip Switch 2 in Run Mode) is only used on the Central unit, and has no functionality on the Remote unit.

-Find Reader Mode does not apply to Central units; it only functions on the Remote unit.

Cypress Suprex® RF Series - Central OSDP Device Report

This only applies if the Remote is NOT in OSDP mode. In this configuration, the Central unit will output this basic information. Otherwise, when the Remote is in OSDP mode, the reader's osdp_PDID and osdp_PDCAP are reported to the panel.

OUI: CA446C
Model: 05
Version: 01
Serial #: unique serial number for that Central unit

Field Value	Meaning
Function Code: 03	Card Data Format
Compliance: 01	Device Supports RAW Replies up to 1024 Bits
Number of: 00	N/A
Function Code: 08	Check Character Support
Compliance: 01	CRC-16 is Supported
Number of: 00	N/A
Function Code: 09	Communication Security
Compliance: 01	AES128
Number of: 01	Device Uses OSDP Default Key
Function Code: 0A	Maximum Single Message Size (for File Transfer Protocol)
Compliance: 00	The size capabilities are calculated by adding the values in the Compliance and Number Of fields. Device supports a maximum receive buffer size of 256 bytes.
Number of: 01	
Function Code: 0B	Maximum Multi-Part Message Size (for File Transfer Protocol)
Compliance: 00	The size capabilities are calculated by adding the values in the Compliance and Number Of fields. Device supports a maximum receive file size of 256 bytes.
Number of: 01	
Function Code: 10	OSDP Version
Compliance: 02	SIA OSDP 2.2
Number of: 00	N/A

This section lists and defines in general terms OSDP terminology used in this manual.

Access Control Unit (ACU): Typically the access controller, the ACU is the device on the OSDP bus that controls the PDs. The ACU only sends commands to the PDs and waits for replies.

Peripheral Device (PD): Typically a reader, but many other devices can be PDs, any device on the OSDP bus that is not the ACU. PDs receive commands from the ACU and send replies.

Device Address: OSDP Peripheral Devices are assigned an address, all PDs on the OSDP bus must have a unique address. This address is used in commands from the ACU and in replies from the PD to indicate which device the message is being sent to/from.

Baud Rate: Data transfer rate, expressed in bits per second. Communication speed between ACU and PD(s).

Secure Channel Base Key (SCBK): 16 byte key set by the user used to initiate Secure Channel communication sessions.

Secure Channel Base Key Default (SCBK-D): Default SCBK value. Default value set by the manufacturer or the default value defined in the OSDP specification.

Secure Channel Session: OSDP communication sessions using the Secure Channel Protocol, which, among other things, encrypts the data payload in OSDP messages.

Unencrypted Communication Session: OSDP communication sessions without data payload encryption.

Broadcast Address: An ACU can discover a PD with an unknown address by using the broadcast address. The broadcast address is 7F (or 127 in decimal).

osdp_NAK: Negative acknowledge reply from the PD. Indicates the PD had an error processing the previous command or is incapable of processing the previous command.

osdp_ACK: Positive acknowledge reply from the PD. The PD properly processed the previous command or nothing to report to ACU.

osdp_RAW: PD reply with card data payload. Card data is a raw string of bits.

osdp_ID: ACU command to request a device identification report.

osdp_PDID: PD reply with a device identification report.

osdp_CAP: ACU command to request a device capability report.

osdp_PDCAP: PD reply with a device capability report.

osdp_COMSET: ACU command to change a PD's Address and/or Baud Rate.

osdp_COM: PD reply to report its updated communication settings.

osdp_LED: ACU command to control LEDs on a PD.

osdp_BUZ: ACU command to control buzzers on a PD.

osdp_OUT: ACU command to control outputs on a PD.

osdp_LSTAT: ACU command to request a tamper input status.

osdp_LSTATR: PD reply to report its tamper input status.

osdp_ISTAT: ACU command to request a general input status.

osdp_ISTATR: PD reply to report its general input status.

osdp_OSTAT: ACU command to request output status.

osdp_OSTATR: PD reply to report its output status.

osdp_CHLNG: ACU command to begin the Secure Channel Session Connection Sequence.

osdp_CCRYPT: PD reply to begin the Secure Channel Session Connection Sequence.

osdp_SCRYPT: ACU command to finalize the Secure Channel Session Connection Sequence.

osdp_RMAC_I: PD reply to finalize the Secure Channel Session Connection Sequence.

osdp_KEYSET: ACU command to change a PD's SCBK. A PD only accepts this command while in a Secure Channel Session.