Contents

Section 5
SmartSensor Address Programming 5-1

Section 6
Diagnostics and Troubleshooting 6-1

Section 1
Introduction

The 4815 Serial Zone Expander is a UL listed zone expansion system for the 4821/4820 Control/Communicator. This manual describes installation, address programming, and troubleshooting for the 4815.

The 4815 is a flexible, cost-effective zone expansion solution for many—but not all—installations. In this manual, we have attempted to describe installations for which SmartSensors may **not** be the optimum choice. Read Section 3 thoroughly if you are unsure whether SmartSensors are appropriate for your application.

1.1   Model 4815 SmartSensorController

The 4815 controller is used in conjunction with SmartSensors to provide serial point ID monitoring. The 4815 controller provides two 2-wire serial buses, or loops, that interface the point ID SmartSensors to the control panel. (Note that throughout this manual the serial buses will be referred to as loops.) The 4111 is available for use with the 4815.

Each 4815 supports up to 128 SmartSensors (64 per loop).

1.2   SmartSensor Models

The 4111 SmartSensor models are small enough to be connected inside or close to sensing devices such as motion detectors or magnetic contacts. Each SmartSensor must be programmed with an address that uniquely identifies it to the 4815. See Section 5 for information on programming SmartSensor addresses. The 4111 does not have a built-in end-of-line resistor. The model 4114 EOL resistor is available for the 4111. See Section 3.3 for details about EOL resistor requirements.

1.2.1 Models 4111

SmartSensors are used to interface Normally Open or Normally Closed contacts to the 4815. The 4111 requires an 1.43K Ω 1% external end-of-line resistor for non-UL applications.
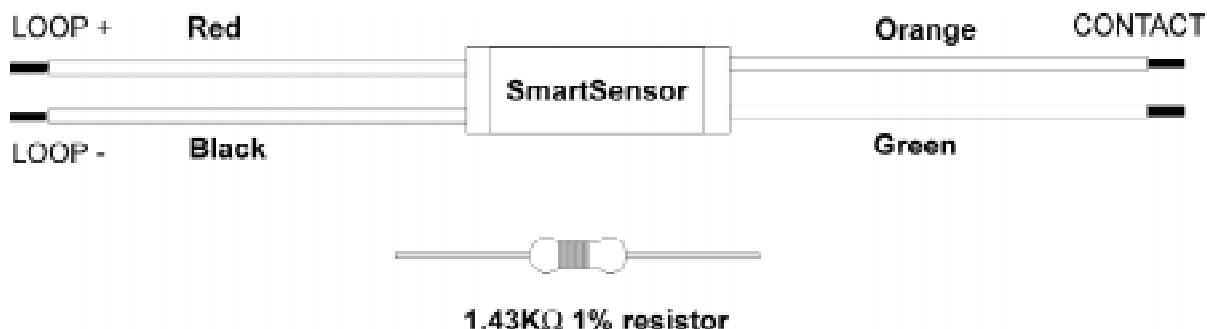

Figure 1-1 Model 4111 SmartSensor

1.2.2 UL Requirements for 4111 with Model 4114

Use the Model 4111 with the Model 4114 EOL Assembly for UL installations. Discard the resistor which is supplied with the 4111 and use the 4114 (ordered separately) in its place.
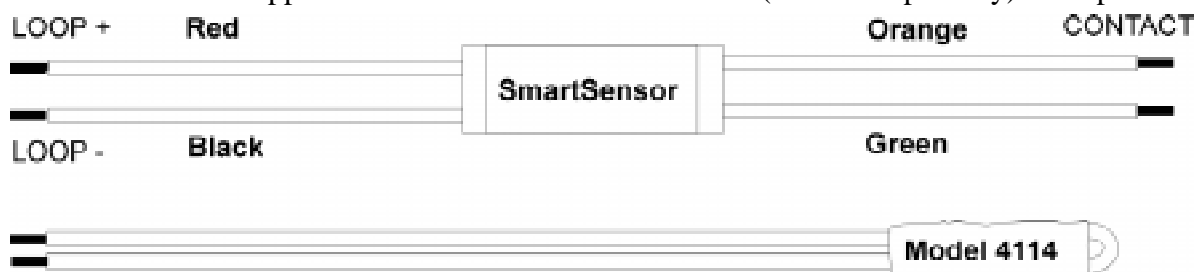

Figure 1-2 SmartSensor with UL EOL (4114)

Section 2
UL Requirements

If you are installing the 4815 in a UL listed application, follow the requirements shown below.

1. 22-gauge or larger wire must be used for Burglary loops. 18-gauge wire or larger must be used for Fire loops.

2. Four-wire smoke detectors require UL listed power supervision devices. Use Air Products Model PAM-2 (Silent Knight P/N 160150).

3. Fire and Burglary zones cannot exist on the same loop.

4. Program zones per Table 2-1. See Section 6 of the *4821/4820 Installation Manual* (P/N 150966) for complete zone programming instructions.

Table 2-1: UL Zone Programming Requirements

Zone Type	Disarmed Response		Armed Response	
Normally Open Fire	Open	Trouble	Open	Trouble
	EOL	Ready	EOL	Ready
	Closed	Alarm	Closed	Alarm
Normally Open Burglary	Open	Trouble	Open	Alarm
	EOL	Ready	EOL	Ready
	Closed	Not Ready	Closed	Alarm
Normally Closed Burglary	Open	Trouble	Open	Alarm
	EOL	Not Ready	EOL	Alarm
	Closed	Ready	Closed	Ready

Section 3
Specifications and System Planning

SmartSensors have unique design features that make them an excellent choice for many—but not all—types of applications. This section describes the requirements and the ideal conditions for optimum SmartSensor operation.

3.1   Electrical Specifications

The 4815 requires 10 to 14 VDC and will draw no more than 100 mA from the 4821/4820 SBUS over the voltage range 10 to 14 VDC.

3.2   Maximum Number of SmartSensor Zones

Each 4815 provides up to 128 SmartSensor zones. Each loop will support up to 64 SmartSensors.

3.3   EOL Resistor Requirements

The 4111 SmartSensor is the only SmartSensor model that requires an external end-of-line (EOL) resistor. The EOL resistor must be connected in *parallel* with the green and orange leads of the SmartSensor regardless of whether the zone is configured as Normally Open or Normally Closed. UL installations must use the 4114 EOL resistor. (Non-UL installations could use any 1.43K, 1%, 1/4W resistor.) Figure 3-1 shows the possible contact and EOL resistor configurations for the model 4111.
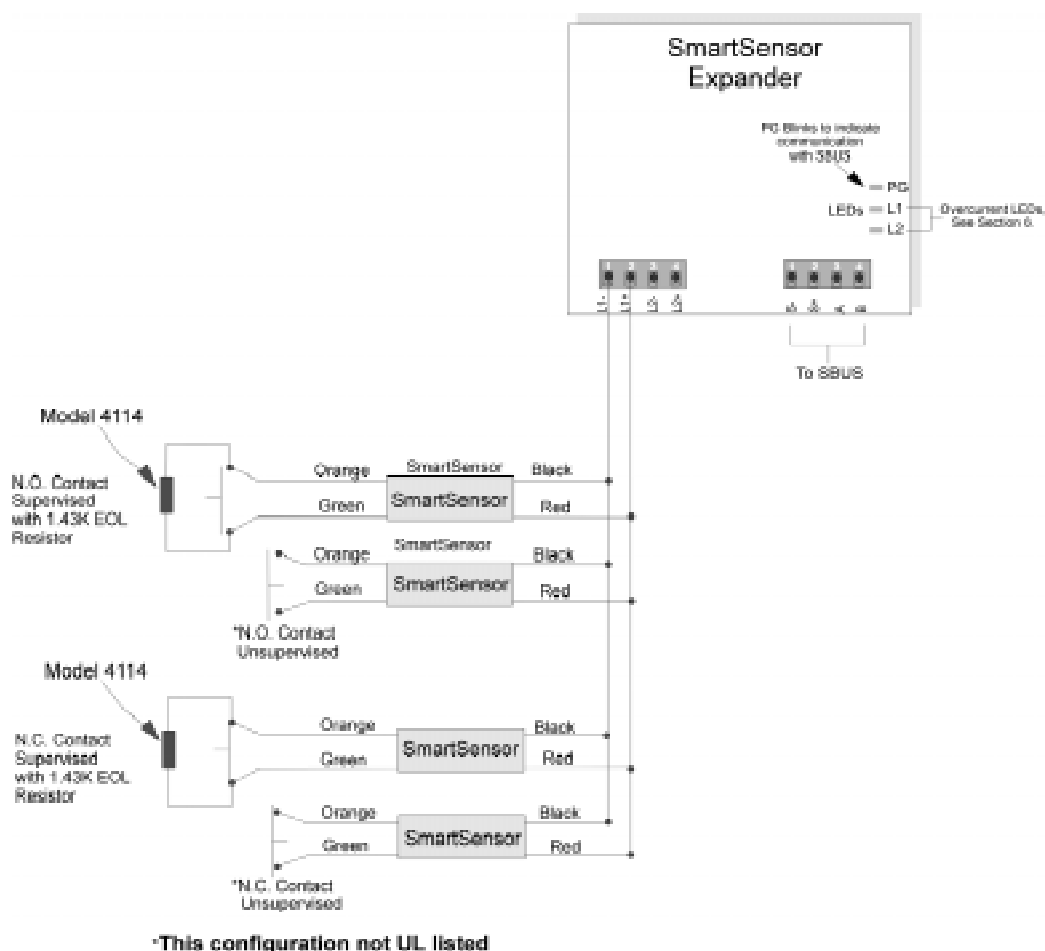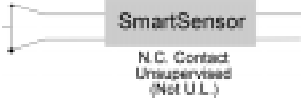
Figure 3-1 Possible contact configurations using the 4111

3.3.1 Zone Configuration Examples

The chart below shows some commonly used zone hardware configurations and provides examples of how you might want to program the zone for the disarmed and armed

	State of Zone	Disarmed Response	Armed Response
SmartSensor N.O. Contact Unsupervised (Not U.L.)	**Open Circuit** Contact open or open hardware fault.	Ready	Ready
	EOL Circuit (This state is not possible for this example, but you still must program a system response for this configuration.)	Not Ready	Alarm
	Short Circuit Contact closed or shorted hardware fault.	Not Ready	Alarm
SmartSensor N.C. Contact Unsupervised (Not U.L.)	**Open Circuit** Contact open or open hardware fault.	Not Ready	Alarm
	EOL Circuit (This state is not possible for this example, but you still must program a system response for this configuration.)	Not Ready	Alarm
	Short Circuit Contact closed or shorted hardware fault.	Ready	Ready

	State of Zone	Disarmed Response	Armed Response
N.O. Contact with EOL (U.L Fire, N.O. Supervised)	**Open Circuit** Open circuit hardware fault.	Trouble	Trouble
	EOL Circuit The contact is open and supervised.	Ready	Ready
	Short Circuit The contact is closed or there is a short circuit hardware fault.	Alarm	Alarm
N.C. Contact with EOL (U.L Burglary, N.C. Supervised)	**Open Circuit** The contact is open or there is an open circuit hardware fault.	Trouble	Alarm
	EOL Circuit The contact is closed and supervised.	Not Ready	Alarm
	Short Circuit Short circuit hardware fault.	Ready	Ready

3.4   Environmental Specifications

Model	Operating Temperature	Available Humidity Conditions
4815	0° C to 49° C (32° F to 120°F)	10% to 85%, noncondensing
SmartSensors	0° C to 49° C (32° F to 120°F)	10% to 85%, noncondensing

3.5   Sensing Devices

The SmartSensors are not compatible with two-wire smoke detectors. Four-wire smoke detectors and PIRs must be powered from a separate loop that originates at the 4820 smoke power or auxiliary power terminals.

3.6   Single Building Coverage Only

All SmartSensor loop wiring must be contained within a single building. The system is not intended for multiple building facilities or for outdoor use.

3.7   SBUS Wiring

As a protection against transients, maintain a physical separation of one-half inch or more between all field wires and the SBUS cable.

3.8   SmartSensor Loop Wiring

SmartSensor wire runs can be constructed from two-wire twisted pair or two-wire parallel conductor cable. However, if shielded cable is used, make sure that the shield is connected to earth ground in only one location. The conductor cross-section can be solid or stranded.

Do not run two loops in a 4-conductor cable.

In UL installations, 22-gauge or larger must be used for burglary loops. 18-gauge or larger wire must be used for fire loops.

3.9   Maximum SmartSensor Wire Run Length

Using 18-gauge wire: The maximum wire run length is one mile (5,280 feet).

Using 22-gauge wire: The maximum wire run length is 3,000 feet.

The wire run length for each SmartSensor is defined as the distance along the wire run between the 4815 and the SmartSensor. It is possible to homerun each SmartSensor in a star pattern from the 4815 to the maximum wire run length.
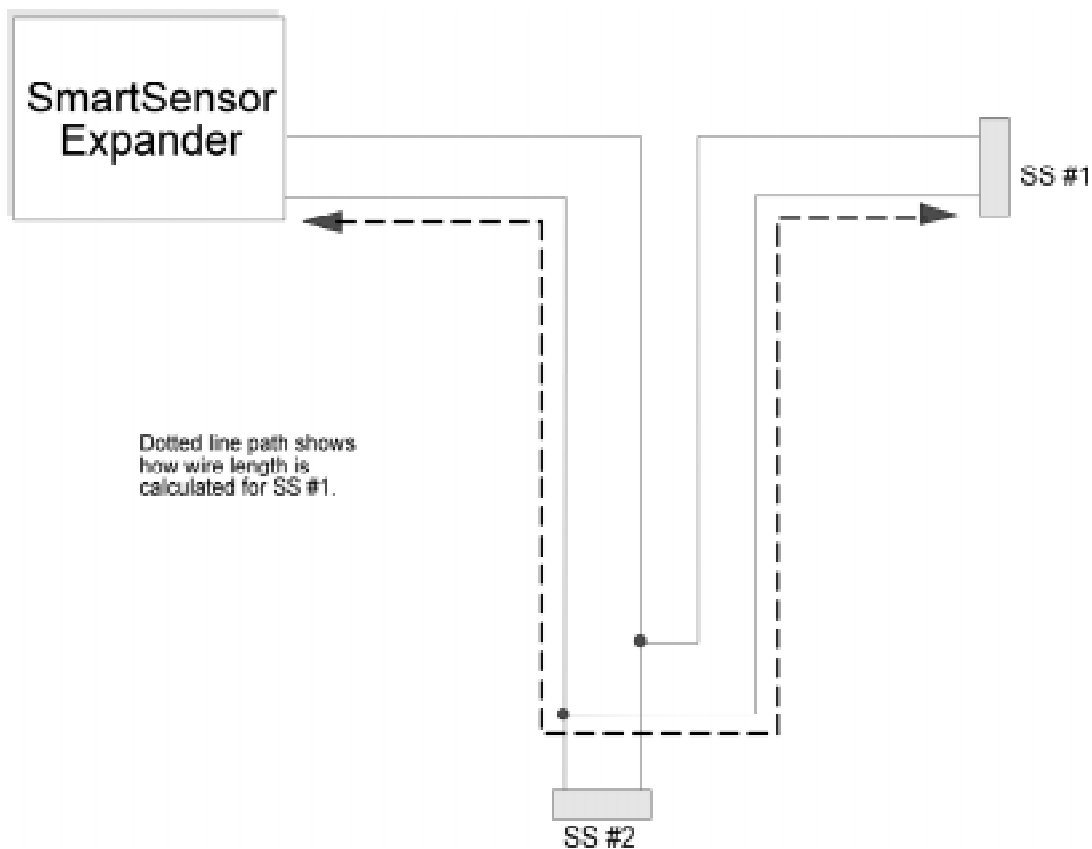
Figure 3-2 Calculating wire run length for an out and back tap
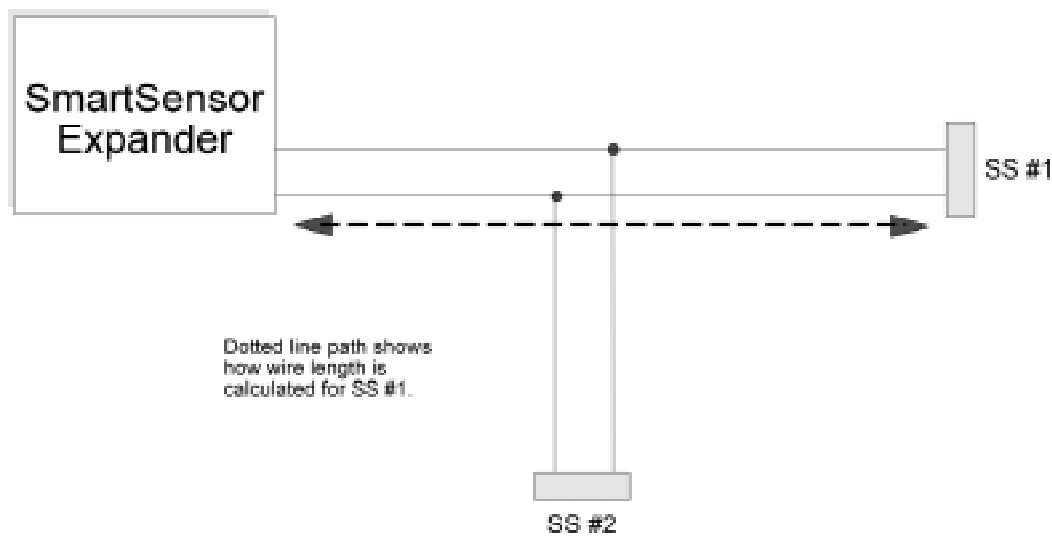
Figure 3-3 Calculating wire run length for a "T" tap

3.10   Contact Distance From the SmartSensor

The distance between a 4111 SmartSensor and the contacts it monitors can be up to 200 feet. The resistance between the orange and green wires at the SmartSensor with the contact closed must not exceed 50 ohms. However, for best security performance, it is recommended that the SmartSensor be located as close as possible to the contact. This ensures that as much wiring as possible is supervised and provides true point ID monitoring.

Figure 3-4 Distance from 4111 to Contact

3.11   Electrical Noise Level

The 4815 makes use of technology to minimize the effects of electrical noise on SmartSensor operation while remaining a low-cost device. Nevertheless, the 4815 may be unsuitable for applications that must be installed in environments with high electrical noise. A heavy industrial setting, such as a welding shop, or an environment prone to transients, such as a transmit tower, are examples of locations that are likely to be too electrically noisy for optimum SmartSensor operation. The wiring techniques described below are ways to help reduce electrical noise. (See Section 6.6 of this manual for instructions for determining if electrical noise exists in an installed 4815 system.)

• When routing wire, remember that the best system performance will be obtained when the SmartSensor loops are physically separated from other electrical cabling by at least several inches.

• Loops from different expanders, or Loop1 and Loop2 from the same expander, must be run in separate 2-wire cables. Do not run two separate loops in a 4-conductor cable harness.

• Do not use a spare pair of wires in cable structures that are used for phone or intercom wiring.

• Do not run SmartSensor loops along telephone wiring.

• When using existing wiring, check for splices and know exactly where the wire is routed.

• Because SmartSensor loop's may induce electrical noise on other wire runs (such as phone or intercom wiring) an eighteen inch spacing should be maintained between SmartSensor and other devices' wire runs.

• Shielded cable is not required for SmartSensor loops. However, if you want to use it as an additional protection from potential electrical noise problems, be sure to connect the shield to earth ground at only one location, preferably at the "EARTH" terminal at the 4821/4820 panel.

Section 4
Installation

> **IMPORTANT:**
>
> Power must always be OFF at the panel when you work on the SmartSensor loops (for example, when you connect, disconnect, or troubleshoot SmartSensors). Leave power ON at the panel when you program SmartSensor addresses.

4.1 Handling the SmartSensors

When stripping SmartSensor wires, hold the SmartSensor by its wires, not its case. Improper handling can cause internal damage leading to immediate or future failure of the unit.

4.2 Installation Steps

The general procedures for installing a 4815 SmartSensor system are outlined below. You do not have to perform all steps in the order they are listed here, but you must add the 4815 to the system devices list before you begin (see Step 1). You must also program SmartSensor addresses before permanently connecting them to the loops (see Step 3). The 4815 will not attempt to program SmartSensor addresses if any sensors are attached to the loop at the time you are programming. See Section 5 of this manual for more information.

1. Make sure the 4815 you are installing has been added to the installation through 4821/4820 system programming (System Devices Menu). (See Section 5 of the 4821/4820 Installation Manual, P/N 150960.)

2. Mount the 4815 in the cabinet as described in Section.

3. Program the SmartSensor addresses using the Fast Address method. (See Section 5.1.)

4. Connect the previously programmed SmartSensors to the loops and connect the loops to the 4815. (See Section 4.4.)

5. Program options for the zones. (See Section 6 of the 4821/4820 *Installation Manual* P/N 150960.)

4.3   Mounting the 4815

1. Make sure power is off at the panel.

2. Place the 4815 in the panel cabinet's snap-track so that the loop screw terminals are at the bottom left.

3. Wire the 4815 SBUS connections to the SBUS1 or SBUS2 terminals on the 4820 board.

4.4   Connecting the SmartSensors and the Loops

The wiring example in Figure 4-1 shows the simplest configuration for wiring SmartSensors to the 4815. The SmartSensors can be located anywhere on the wire run. They do **not** have to be configured as shown in Figure 4-1 where SmartSensor address #1 is physically closest to the 4815 and SmartSensor #64 is physically farthest. A more typical configuration using "T" taps and multiple branches is shown in Figure 4-2.
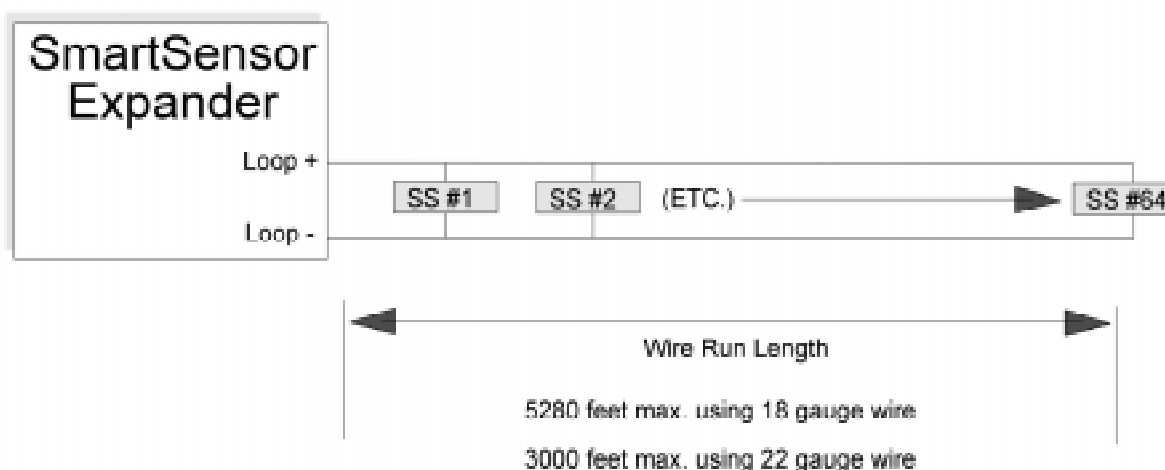
Figure 4-1 Simple wiring configuration
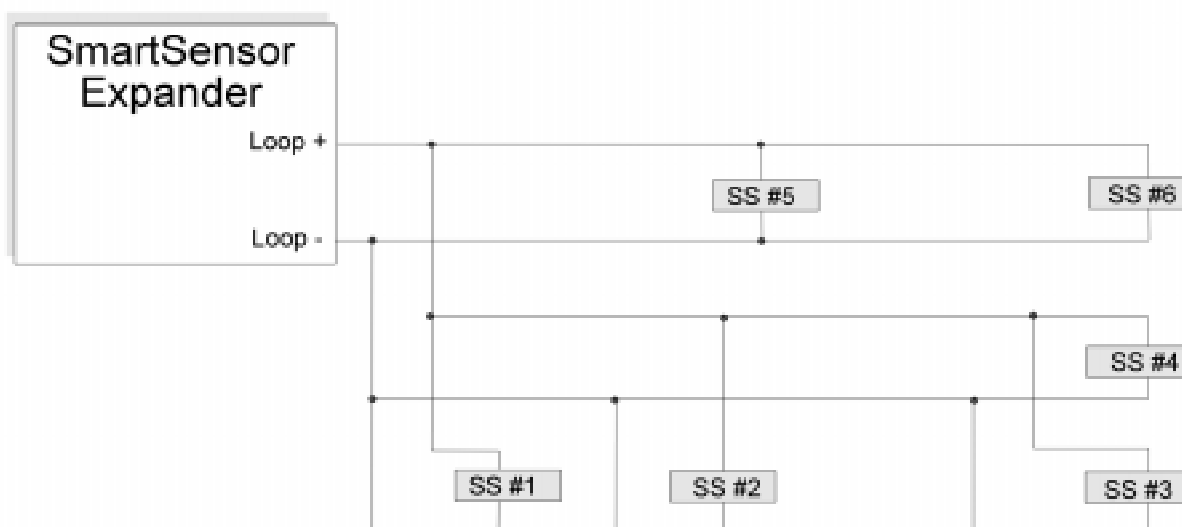
Figure 4-2 Typical wiring configuration

The four screw terminals at the 4815 are for connecting two SmartSensor loops to the 4815. The loop screw terminals are numbered 1 through 4 from left to right (see Table 4-1). To connect SmartSensors to the loop, attach the SmartSensor's red lead to the 4815's loop positive terminal and the SmartSensor's black lead to the 4815's loop negative terminal. Make sure the positive and negative wires of the loop are electrically isolated from each other and from ground. It is recommended that all loop connections be soldered to ensure long term reliability. Crimp connections are acceptable, but twisted connections with electrical tape should not be used.

Table 4-1: Connecting the Loops to the 4815

Terminal Number	4815 Terminal Label	Function	Wire Color
1	L1-	Loop1 (-)	Black
2	L1+	Loop1 (+)	Red
3	L2-	Loop2 (-)	Black
4	L2+	Loop2 (+)	Red

4111 SmartSensors

If you are using the model 4111 in a UL installation, you must attach a model 4114, 1.43K, 1% end-of-line resistor across the 4111's green and orange wires. Always connect the EOL resistor in *parallel* with the contact for both normally open and normally closed contacts.

Very Important: After installing approximately 10 SmartSensors, power up the loop and enter the 4815 diagnostics mode to make sure that the answer back level for each SmartSensor is what you expect based on the status of the contact it is monitoring. See Section 6 for details on entering and viewing the loop in 4815 diagnostics mode. It is recommended that this procedure be repeated for every 10 sensors that are added. Troubleshooting address programming or wiring mistakes you have made will be much easier if only a few sensors are installed on the loop at a time. When you finish viewing the loop in the 4815 diagnostics mode, be sure to turn off the power before continuing the installation.

4.5   Zone Response (Debounce) Speeds

Zone response (debounce) speeds for the 4815 are programmed through 4821/4820 zone programming. The number of SmartSensors connected to the loop does not affect zone response speed. The available speeds are: 250 milliseconds, 1 second, or 10 seconds. See Section 4 of the 4821/4820 *Installation* Manual (P/N 150960) for more information.

Section 5
SmartSensor Address Programming

Each SmartSensor has a unique address (or hardware point) that is used by the 4815 for identification. The address is field-programmable. The factory default for all SmartSensors is address 127. At installation the installer must change the factory address of the SmartSensor to be within the range 1-64. Installers may reprogram SmartSensors at any time when the system configuration changes. You will need access to a system touchpad and a 4815 to program SmartSensors.

The 4815 supports up to 128 SmartSensors, 64 maximum per loop. The range of valid addresses is 1-64. Addresses do not need to be sequential (as long as there are fewer than 64 sensors on a loop). Section 5.1 describes the procedure for programming SmartSensors using the Fast Address technique. Section 5.2 describes the procedure for programming SmartSensors using the Change Address technique.

5.1   Fast Address Programming

The fast address programming option is used for pre-programming large numbers of SmartSensors before they are installed on the loops. Note the following:

* All sensors being programmed must have their factory-programmed address of 127.

* The range of valid addresses is 1-64.

* The loop you are addressing must be disconnected. The opposite loop, the one you are currently *not* working with, can remain connected.

* Power must be ON at the panel.

1. Press 9 ENTR [Unlimited Access Code] to enter the 4815 programming menu.

2. A scrolling menu displays all 4815s in the installation. Select the 4815 you will be working with.

3. Choose Fast Address at the next prompt.

4. Select Loop1 or Loop2 at the prompt that follows.

5. Enter the address for the first SmartSensor followed by ENTR . For example, if you want to begin at address 1, press 1 ENTR . Press CLR to re-enter the address if you make a mistake. Press MUTE to exit Fast Address program mode.

6. *Step 6 applies to Model 4111 SmartSensors only. Skip this step for all other SmartSensor models.* If you are programming Model 4111 SmartSensors, connect a 4114 EOL resistor between the orange and green wires or connect the orange and green wires together. Leave the orange and green wires in this state until you are finished with Step 7. This procedure allows the 4815 to see the 4111 on the loop.

7. A message like the one shown below will display.
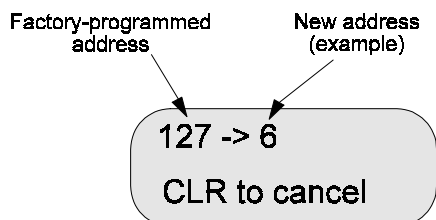
Factory-programmed address → 127 -> 6 ← New address (example)

CLR to cancel

Temporarily connect (see note below) the SmartSensor's black wire to 4815 screw terminal 1. Then, connect the SmartSensor's red wire to terminal 2 until "SUCCESS" or "FAILED" displays on the LCD. The touchpad will beep every two seconds until a sensor with address 127 is connected. (Use terminals 3 and 4 instead of 1 and 2 if you are programming from Loop 2.) Once the sensor is recognized, the touchpad will beep every half second until a "SUCCESS" or "FAILED" message appears on the LCD. Remove the black and red wires after you have seen the SUCCESS or FAILED message. It takes approximately two seconds to program each SmartSensor address once it is attached to the programming loop.

If you receive a "FAILED" message and are not sure what caused it, use the View Loop Troubleshooting menu (described in Section 6) to see if the system can recognize the failed Smart-Sensor. Leave the failed sensor connected and select Option 1, View All. If the address displayed is 127, the sensor did not accept its new address. Try to program it again. If the address is still not correct and you cannot determine what is causing the problem, the Smart-Sensor may be bad. Contact Technical Support at 800-328-0103 to arrange for an exchange.

Note: "Temporarily connect" means touch the SmartSensor wire to the 4815 screw terminal long enough for the SmartSensor to be recognized by the 4815 (that is, until you receive the "SUCCESS" or "FAILED" message). It is not necessary to screw each sensor to the terminal block.

8. After each SmartSensor has been programmed, write its address and zone number on the label.

5.2 Change Address Method

Change Address program mode is used primarily as a way to quick fix an address problem. For example, you may have a SmartSensor with an address outside the valid range of 1-64 and you need to temporarily exchange an address in an emergency situation (because there are no other sensors available to replace the suspect sensors). Change Address allows you to correct the address so that it is within the valid address range of 1-64.

Before you begin, make sure that:

• The loop you are addressing is disconnected. The opposite loop, the one you are currently *not* working with, can remain connected.

• Power is ON at the panel.

1. Press ⑨ ENTR [Unlimited Access Code] to enter the 4815 programming menu.

2. A scrolling menu displays all 4815s in the installation. Select the 4815 you will be working with.

3. Choose Change Address at the next prompt.

4. Select Loop1 or Loop2 at the next prompt.

5. You will be prompted for the current address of the sensor you want to change. The valid range for the old address is 1-255. Enter the address followed by ENTR.

6. Now enter the new address for the sensor followed by ENTR. The valid range for new addresses is 1-64.

7. *Step 7 applies to Model 4111 SmartSensors only. Skip this step for all other SmartSensor models.* If you are programming Model 4111 SmartSensors, connect a 4114 EOL resistor between the orange and green wires or connect the orange and green wires together. Leave the orange and green wires in this state until you are finished with Step 8. This procedure allows the 4815 to see the 4111 on the loop.

8. A message like the one shown below will display.
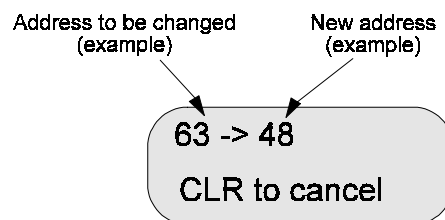
Address to be changed
(example)

New address
(example)

63 -> 48

CLR to cancel

Temporarily connect (see note below) the SmartSensor's black wire to 4815 screw terminal 1. Then, connect the SmartSensor's red wire to terminal 2 until "SUCCESS" or "FAILED" displays on the LCD. The PZT on the touchpad will beep every two seconds until a sensor with the "old" address is connected. When the sensor is recognized, the PZT will beep every half second until a SUCCESS or FAILED message appears on the LCD. Remove the black and red wires after you have seen the SUCCESS or FAILED message. It takes approximately two seconds to program the sensor once it is attached to the programming loop.

Note: Note: It is not necessary to screw each sensor to the terminal block for programming. It is much faster to momentarily hold each sensor while watching the touchpad for feedback on the programming status.

If you received a "FAILED" message and are not sure what caused it, use the View Loop Troubleshooting menu (described in Section 6), to see if the system can recognize the failed SmartSensor. Leave the failed sensor connected and select Option 6, List All. If the address displayed is the "old" address you entered, the sensor did not accept its new address. Try to program it again. If the address is still not correct and you cannot determine what is causing the problem, the SmartSensor may be bad. Contact Technical Support at 800-328-0103 to arrange for an exchange.

Note: "Temporarily connect" means touch the SmartSensor wire to the 4815 screw terminal long enough for the SmartSensor to be recognized by the 4815 (that is, until you receive the "SUCCESS" or "FAILED" message). It is not necessary to screw each sensor to the terminal block.

9. After the sensor address has been changed, be sure to update the address and zone number on the SmartSensor label.

Section 6
Diagnostics and Troubleshooting

IMPORTANT:

Power must always be OFF at the panel when you work on the SmartSensor loops (for example, when you connect, disconnect, or troubleshoot SmartSensors). Leave power ON at the panel when you program SmartSensor addresses.

6.1 View Loop

View Loop allows you to look at the SmartSensors more directly than you can through the 4821/4820 status mode. It is the main troubleshooting tool for the 4815. You will want to use View Loop almost any time you encounter a problem with the 4815.

View Loop shows you the signal level of each SmartSensor and the open or closed status (see Table 6-1).

1. Enter diagnostics mode. Press ⑥ ENTR [Unlimited Access Code], then select the 4815 you want to work with.

2. Choose Loop1 or Loop2 in response to the next prompt.

3. Select items you want to view from the scrolling menu. Table 6-1 describes the menu items.

Table 6-1: View Loop Troubleshooting Menu

Press	Menu Option	To Display	Scanned Address Range	Signal Levels Returned (See Table 6-2 for significance of signal levels.)
0	View Levels	View A/D levels for all SmartSensor addresses on the loop.	1 - 64	0-127
1	Open Circuit	All SmartSensor addresses which are reporting back an open circuit.	1 - 64	0-9
2	EOL Circuit	All SmartSensor addresses which are reporting back an EOL.	1 - 64	10-26
3	Short Circuit	All SmartSensor addresses which are reporting back a short circuit.	1 - 64	27-51
4	Duplicate Address	All SmartSensor addresses which are reporting back a duplicate address.	1 - 64	52 - 127
5	View One	A/D count and status of the specified SmartSensor displays on the LCD. (Displays the same information as Option 0, but for one SmartSensor only.) This option continually updates the display with new levels.	Not applicable.	0 - 127
6	List All	Lists all sensors with A/D values greater than 9.	1 - 255	Not applicable.
7	Adjust Scroll	Option for temporarily changing the scroll rate for speeding up or slowing down the rate at which options 0-6 display. When you choose "Adjust Scroll," a secondary menu displays: Options are: 1 = 1 second 2 = 1.5 seconds 3 = 2 seconds 4 = 3 seconds 5 = 5 seconds	Not applicable.	Not applicable.

Table 6-2: Significance of Signal Levels

Level	Circuit State	Possible Meaning	Suggested Action
0 - 9	OPEN	No SmartSensor with this address on the loop. This is a valid reading for a 4111 with no EOL.	Determine if a sensor on the loop has the wrong address and/or connect a Smart-Sensor with the correct address.
		A 4111 SmartSensor is missing its EOL resistor.	Install a 4114 EOL resistor between the orange and green leads.
		The SmartSensor at the particular address is wired to the loop backwards.	Make sure the SmartSensor's red lead is connected to the loop (+) and its black lead is connected to loop (-).
		If the LED labeled L1 or L2 is on, Loop1 or Loop2 is drawing too much current. (L+ to L- is probably shorted.)	Open the loop at its mid-point. If it is still shorted, open it at its new mid-point. Continue until you locate the short.
10-26 (Typically 18)	EOL	Valid levels for a 4111 with an EOL in parallel with the open contact. Be suspicious of readings 1 or 2 counts from the boundaries. Double-check EOL connections for correct EOL value.	
27-51 (Typically 43)	SHORT	Valid levels for a closed contact with or without an EOL in parallel with the contact. Be suspicious of readings 1 or 2 counts from the boundaries. Double-check EOL connections for correct EOL value.	
		If you know the contact is open, then another SmartSensor is probably drawing current from the loop.	Disconnect the known open sensor at the red or black lead. Look for other devices or other SmartSensors on the loop.
		If the contact is open, it can also indicate that there are two SmartSensors with the same address and both contacts are open.	Close the contact at the known SmartSensor and select option 5 (View One) from the View Loop menu. If the level is greater than 52, there are two SmartSensors on the loop with this address. Remove the known SmartSensor and select View Loop again. You should see a level of 10-26. This means there is a second SmartSensor with an open contact with this address.
52-127	Duplicate Address	There may be two SmartSensors with the same address on the loop.	Remove SmartSensors you suspect of having this address, viewing levels after you remove each one.

6.2 Significance of LEDs

The 4815 board has 3 red LEDs. See Figure 3-1 in Section 3 for location of LEDs.

LED	Meaning
PG	Flashes to indicate it is communicating to the panel through the SBUS (same as all SBUS devices.) Normal condition. Very rapid flashing indicates that the 4815 has not been selected in programming.
L1 and L2	Overcurrent on Loop1 (L1) or Loop2 (L2) (if on in normal operation mode). You cannot always tell exactly what the problem is from the status of the LED. It is always a good idea to use the View Loop troubleshooting menu to look directly at a loop when the L1 or L2 LED indicates a problem.

6.3 Earth Ground Shorts

• If only one of the loop terminals is shorted to earth ground, the corresponding LED will not turn on and the short will have no effect on performance. Both L1 and L2 will be on if both terminals are shorted.

• If the green or orange lead of a single 4111 is shorted to earth ground, there will be no change to the sensor or the loop.

• If the green or orange lead of more than one 4111 is shorted to earth ground, sensor levels will change unpredictably.

6.4 Missing SmartSensors

The model 4111 SmartSensor must have a 1.43k 1% end-of-line resistor between its orange and green leads. If the orange and green leads are shorted together, the sensors will look closed to the 4815. Using the incorrect EOL value will cause unpredictable results.

A common cause for a missing SmartSensor is when the red and black leads are wired backwards on the loop. The red lead must be connected to the positive (+) terminal (either L1+ or L2+ on the 4815) and the black lead must be connected to the negative (-) terminal (either L1- or L2- on the 4815).

If you observe reporting that is not what you expect, use the View Loop menu to look directly at the loops (see section 6.1 if you need more information).

6.5 Loop Voltage

If you have access to a voltmeter, you can apply it between the loop terminals to verify that the 4815 power supply is operating properly. If there is at least one SmartSensor on the loop and if the system is in normal operating mode, the loop voltage between the positive (+) and negative
(-) terminals should read between 8.0 - 10.5 volts on the DC function.

6.6 Troubleshooting Electrical Noise in an Installed System

If you suspect that electrical noise is a problem in your installation, use either of the techniques described below to check for electrical noise. (See section 3.11 for more information about electrical noise.)

Use option 5 (View One) of the View Loop troubleshooting menu to specify the address of a SmartSensor on a loop in the noisy area. The SmartSensor's level should remain fairly stable. If it bounces among three, four, or more numbers, the environment has too much electrical noise.

<div align="center">—OR—</div>

Look at the loop with an oscilloscope. Noise with frequency content less than approximately 3 kHz could affect the SmartSensor's signal.