Solution guide for SMS-based remote access control and intrusion detection system
SMS-based remote access control and intrusion detection system

This document outlines the use of the Phoenix Contact SMS Relay control cabinet (RAD-SYS-NEMA4X-SMS) as part of an access control and intrusion detection system that uses cellular text messages for remote monitoring and control.

Application: Remote access control and intrusion detection

The ANSI/AWWA G430-09 standard “Security Practices for Operations and Management” outlines key measures for water plant security. One of those security measures is access control and intrusion detection for critical assets. (Per the standard, Establish and maintain physical control of access to identified critical assets. Establish and maintain procedures to control personnel access to critical assets.)

The Phoenix Contact SMS Relay is a simple remote control and signaling system used to control access to remote, unmanned assets and to monitor status and alarm signals using text messages sent through any GSM mobile phone network. Additionally, the SMS Relay can initiate e-mail messages to expand monitoring and alarm capabilities. By adding the appropriate input and output devices, the SMS relay can be used to:

• Remotely unlock/lock doors and gates
• Remotely open/close doors and gates
• Remotely monitor status of access points
• Remotely control exterior lighting and auxiliary devices, such as sirens
• Remotely monitor alarms indicating unauthorized access
Solution: SMS Relay control cabinet

Short Message Service (SMS) messages, also known as text messages, are sent to and from devices that support SMS, such as cell phones. The SMS Relay is a device that can send and receive text messages or e-mails via a Global System for Mobile communications (GSM) network to monitor inputs and control outputs on the relay.

In Figure 1, a high-level input generates a text message that is sent to a mobile device. In response, a text message sent to an SMS Relay at a pump station turns on an output that starts a pump. The SMS Relay has six configurable analog/digital inputs and four SPDT relay outputs. Refer to Appendix A for more information on cellular communications and the use of SMS messaging for monitoring and control functions.

**Inputs**

As enabled, a change in the input status triggers a text message or e-mail that can be sent to a maximum of five recipients associated with that input. Normally the message is sent once to selected recipients simultaneously.

By enabling Confirmation, the message is sent in succession until an acknowledgement confirms that one of the intended recipients received the message. The Confirmation feature ensures receipt and allows for a prioritized notification procedure.
Outputs
A user-defined SMS message sent to the SMS Relay can enable or disable outputs. Integrated password protection prevents unauthorized changes of the outputs. For additional security, when the output is enabled with Caller Identification, only phone numbers in the integrated phonebook will have access to control functions. As an option, the relay outputs can be switched for a predefined period of time and then returned to their initial state to accomplish a time-based function.

System status
To monitor system operation remotely, user-defined messages can indicate that the system “is active,” “has been turned on” or “has been turned off.” The capability of sending a message indicating the system has been “turned off” can be useful when the message indicates a loss of power or other problem requiring a response by maintenance personnel. Additionally, the SMS Relay has multiple LEDs for local indication of relay operational status, cellular communications and the status of inputs and outputs.

System overview and operation
The SMS Relay panel (RAD-SYS-NEMA4X-SMS) is a prewired control cabinet that includes an SMS Relay, 24 V DC power supply and surge protection for line power mounted on DIN rail in a nonmetallic NEMA 4X enclosure. For easy installation, the panel includes terminal blocks for connecting input and output devices. Refer to Appendix B for information on technical data and reference information for SMS Relay and the SMS Relay panel.

Configuration
The SMS Relay uses simple configuration software to define the messages sent and received by the relay, as well as the phone numbers and e-mail addresses receiving messages from the relay. No programming is required. The software runs on a standard PC with Windows® 2000 to Windows® 7. The SMS Relay is connected to the PC via a serial (RS-232) cable. Refer to Appendix B for information on configuration of the SMS Relay.
Use of the SMS Relay requires a subscriber identification module (SIM) card and access to a GSM mobile phone network. Contact a cellular service provider to establish a call plan appropriate for the intended purpose of this system. Refer to Appendix A for more information on cellular call plans.

With additional components, the SMS Relay Panel can remotely control and monitor facility access points. Although these components are not available from Phoenix Contact, they are typically available from your authorized Phoenix Contact distributor.

Suggested components and their possible function when used with the SMS Relay:

- **Solenoid locks**: remote locking and unlocking of doors and gates with status messages to monitoring location
- **Motor starters and drives**: remote operation of motorized doors and gates with status messages to monitoring location
- **Keypad**: local control of doors and gates with status messages to monitoring location
- **Lighting contactors and relays**: remote control of lighting, audible alarms, warning lights and other auxiliary devices with status messages to monitoring location
- **Motion sensors**: detection of movement in a secure area with alarm message to monitoring location
- **Limit switches**: remote monitoring of doors and gates to determine if opened or closed

**Typical system for access control and intrusion detection**

The SMS Relay Control Cabinet can be used as the foundation of a flexible system for remote access control and intrusion detection. With the addition of inputs and outputs, such as solenoid locks and motion sensors, a system can be configured to meet the specific requirements for a municipal facility.

Figure 2 shows devices and components typically used for access control and intrusion detection.

![Figure 2: Typical components used with SMS Relay for access control and intrusion detection](image-url)
Machine-to-Machine communications

Machine-to-Machine (M2M) communications connects two or more devices over any type of communications medium. Cellular communications enables M2M communications between devices anywhere in the world with access to a GSM mobile phone network. Two or more SMS Relays can be used for M2M communications, which greatly expands the range of applications for their use.

Figure 3 shows an SMS Relay used to monitor tank levels. A low level alarm triggers a message to a relay, turning on a pump. In response, a message can be sent acknowledging that the pump has been started.

M2M communications can be useful in an access control application as well. As an example, two SMS Relays could be used together to simplify remote access control and eliminate the entry of text messages by an operator. One relay could be used for access control at a municipal facility. Another relay at a central monitoring location could have a push button wired to an input.

When the push button is pressed, a text message is sent to the remote facility which changes the state of an output and unlocks a door. In a similar manner, the relay at the remote facility could send a text message in response, confirming that the door was unlocked.

As an extension of this simple example, a relay at a central monitoring location could send text messages to multiple relays, resulting in a variety of actions with the press of one push button. Cellular communications greatly expands the range of M2M applications, and the SMS Relay provides a simple, cost-effective way to implement many applications that would be difficult or impossible to do otherwise.

SMS Relay as part of a SCADA system

The SMS Relay can be integrated into a Supervisory Control and Data Acquisition (SCADA) system as part of a more comprehensive system for access control and security. Some SCADA software packages have provisions for accepting SMS messages, extracting data and integrating the data into the SCADA software’s database. Once in the database, the data can be used in any fashion needed for control and reporting requirements.
Appendix A


The G430-09 standard is an AWWA standard that covers the minimum requirements for a protective security program for a water or wastewater utility. The purpose of this standard is to define the minimum requirements for a protective security program for a water or wastewater utility that will promote the protection of employee safety, public health, public safety and public confidence.

Cellular communications

There are two types of cellular communications: voice and data. Cellular communications over the voice network include both voice communication and SMS messaging, also known as text messages.

Cellular communications such as sending e-mails or surfing the web are handled on the data network. For voice network communications, the cellular carrier directs communications to a phone number on the Public Standard Telephone Network (PSTN). Data communications are directed from the cell base station to an IP address, typically via the Internet.

**WARNING:** Use of SMS-based systems is not suitable for monitoring sensitive systems or time-critical processes. GSM network failures or interruptions to the power supply may adversely affect monitoring and control functions.

Cellular call plans: Use of the SMS Relay requires a SIM card and calling plan from a GSM cellular service provider such as AT&T. There is a variety of call plans available; however, a “text-only” plan is the only plan needed to operate the SMS Relay. Unlike data calling plans that charge based on the amount of data transmitted, text-only plans charge by the text message and are usually only a few cents per message. E-mails generated by the SMS Relay are handled via a messaging center and do not require transmission of data. As a result, a text-only plan is all that is required for operation. Providers may offer options for text-only plans such as unlimited text messages for a monthly fee or a fixed number of text messages (buckets) for a monthly fee that reduces the per-message cost.

Additionally, the provider may allow the sharing of a bucket between multiple SMS devices to simplify account management and to optimize the calling plan for the user.

For additional information on cellular communications, refer to the following Phoenix Contact publications:

• Cellular Communications for SCADA Applications (L002899a:10.10)
• Mobile Communications: Data transmission in industry (105246_en_00)
Appendix B

Technical data, field terminations, SMS Relay configuration

Refer to product data sheets for technical data and installation instructions. For more information on Phoenix Contact components, go to www.phoenixcontact.com or contact Technical Support at 1-800-322-3225.

Product data sheets

SMS Relay Panel User Guide 2957_en_A
SMS Relay: PSI-MODEM-SMS-REL, Data Sheet 10389_en_03
RAD-SYS-NEMA4X-SMS, Data Sheet 2928_en_B

Figure 4: SMS Relay panel layout

Prewired terminal blocks are provided for easy termination of incoming power and field devices. Additional power for field devices or additional components may be required.
Our crucial water supply

Water is an essential natural resource that must be actively protected and preserved. To help accomplish this, Phoenix Contact is continually expanding our offering of innovative products specifically designed to be effective and sustainable solutions for managing water resources.

Phoenix Contact has developed a wide range of product and application solutions for secure, scalable industrial networks, remote connectivity and reliable power to ensure the availability and reliability of control and SCADA systems for water management.