

The Sage Advisor

SCADA, SECURITY & AUTOMATION NEWSLETTER

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SECURITY ON A TIGHT BUDGET

Five years ago, if you went to the common Water or Wastewater Systems Owner and Operator and suggested that they visit all of their facilities and take a serious look at security, perform a vulnerability assessment, or create sections in their Emergency Response Plan for man-made intentional acts, they would have given the polite response of "No thanks," silently thinking how misdirected you were.

Now advance that thought in today's atmosphere in the water/wastewater industry. Due to federal mandates requiring them to acknowledge their vulnerabilities and address the need for security enhancements in physical, cyber, and operational security programs, the response would likely be, "If I had the budget you would have a contract because we need it!"

The good news is that there are ways of enhancing security in water or wastewater systems without spending hundreds of thousands of dollars. The first step is to break

down security enhancements by type and criticality, then concentrating on those items identified as the most critical in the vulnerability assessment. Security components that are relevant to the Water Industry are Physical, Operational, Technology, and Cyber.

For example, Joe Smith is the Water Systems Superintendent of Agency A Water. His vulnerability assessment identified Pump Station A as the most critical facility, and the need for a fence protection system for 1,000 linear feet of fence. Another recommendation was to erect a building around the outdoor pump monitored by security cameras. Joe Smith subsequently estimated the installed costs to be \$100,000 for the fence protection systems, another \$80,000 - \$100,000 for the building, \$25,000 for two cameras to be locally recorded, \$3,500 for an alarm system in the new building.

Next, Joe Smith looks at the \$40,000 budget he was able to scrape together, and scratches his head. Not only is



there a large discrepancy between his budget and the above estimate, but, lacking a 24/7 guard/operator at a single location, he has no idea of how or where to send the video.

Good news, Joe! Start by prioritizing what needs to be done and how you can do it in ways that won't cost as much. Physical components that will help mitigate vulnerabilities of the fence can include extra sets of razor ribbon on the inside of the fence, or building an expanded steel mesh enclosure around the pumps instead of a building. If Joe uses his own welders and mechanics to build these enclosures, this would only cost \$2,000 - \$3,000 in material costs.

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FREE SCADA/SECURITY SEMINARS

Sage Designs is hosting another round of seminars in May that will each feature a special guest speaker addressing topics of educational interest.

At the Sacramento seminar (May 17), Charlie Howell will discuss "How Do We Do Security Without a Budget?," a topic that is explored by him in this issue. Mr. Howell is the owner of Security Concepts and Planning, LLC, an independent security consulting firm specializing in the water and wastewater industries. Mr. Howell has performed a variety of security consulting, design and project management services over the last 3 years for State, Local, and Municipal water and wastewater systems, including vulnerability assessments (Both RAM-W © and non RAM-W ©), Emergency Response Plan creation, enhancement, training, and tabletop exercises to test them.

Joe Prevendar, P.E., V. P. of Engineering, Electrical Power Systems, Inc of Fresno, CA, will speak at the Bakersfield Seminar (May 18) about "Optimizing your SCADA

System Design." With an extensive background in SCADA engineering and specification of control systems, Mr. Prevendar will review the design questions to address to optimize a SCADA system for your application. Topics will include designing for reliability, lowest cost of ownership, ease of maintenance, and ensuring operational requirements are met.

In San Diego (May 19), M. Cyrus Moaveni, PE, will discuss "A Review of Current Radio Telemetry Technologies and a Checklist of How to Plan and Implement a SCADA System Radio Network so it WORKS!" Mr. Moaveni is President of CyberNet Consulting, Inc., and has been involved in the monitoring and controls systems planning, design and implementation in the water/wastewater industry for over 26 years. Nearly all of the SCADA systems Mr. Moaveni is involved with utilize a radio

network for data communications.

Tom Klein, Senior Engineer, CyberNet Consulting, will complement Mr. Moaveni's lecture in Bakersfield with details of some actual projects that use the concepts presented.

Additional presentations will be made by factory representatives from Control Microsystems and ProSoft Technology. For registration information and further details, see inside. The registration form can also be found on our website at www.sagedesignsinc.com/events/.

Inside This Issue

- SCADAPack Training Schedule
- Free Seminars
- Educational articles

The 10 Commandments of External Perimeter Security

Solving a facility's perimeter security problems can be a harrowing ordeal. Several factors can challenge even the most experienced security integrator or end-user. More and more emphasis has recently been given to exterior perimeter security for critical utility providers, so it is imperative to acquaint oneself with the basic ground rules before attempting to design such a system.

Experience has shown that most system designs lack a basic understanding of the inherent principles of sensor technology, which stems from installers not examining the real as opposed to perceived threats. This is further complicated by people not giving equal consideration to all four of the working parts of any security system: Detection, Delay, Assessment, and Response. The following "10 Commandments" of external perimeter security were created to provide straightforward guidelines for designing and installing an exterior Intrusion Detection System (IDS).

The 10 Commandments of External Perimeter Security

1. Give equal consideration to all aspects of exterior Intrusion Detection Systems: Detection, Delay Assessment and Response.
2. Know the real threat. What type of intruder are you trying to deter or capture?
3. Know the strengths and weaknesses of each sensor

continued on page 2

DNP3 PROTOCOL IMPLEMENTATION

THE APPLICATION

Situated in California's picturesque Eastern Sierra, the Bridgeport region is an unspoiled recreational playground of pristine lakes, rivers, streams and hot springs. The City of Bridgeport, a community of 5,000 people, provides a multitude of activities for the local tourist industry. In supplying water and wastewater treatment services, the city utilizes a network of two domestic water tanks, two well sites and three independently operating wet well sewer lift stations. Controlling and monitoring this system in a cost-effective and efficient manner would demand the use of powerful and flexible, yet easy-to-use programmable logic controllers.

THE SOLUTION

Sierra Controls of Carson City, Nevada, a systems integration firm with over 30 years experience in the SCADA industry, chose Control Microsystems equipment as an integral part of their solution. The hardware components included SCADAPack 32, SCADAPack and SCADAPack Light PLCs, each equipped with the powerful DNP3 communication protocol and programmed in the TelePACE ladder logic environment.

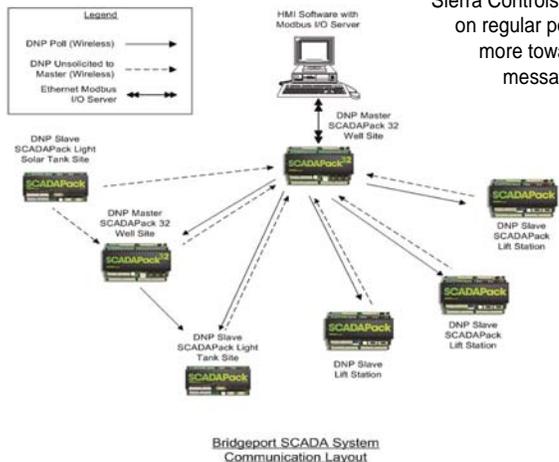
Features of the new SCADAPack-based system included versatile communication architecture utilizing the DNP3 communication protocol. DNP3 is a layered protocol that offers higher data-transfer integrity than most conventional communication protocols. Using TelePACE programming tools, complex communication algorithms, including unsolicited responses, prioritized data reporting and time-stamped events, are easily configured. Additional DNP3 functionality, mainly to trigger certain DNP events and access protocol-specific diagnostic information, is available through the use of custom function blocks.

The City of Bridgeport communication solution utilized two

well site SCADAPack 32 PLCs and several 16-bit SCADAPacks at tank and lift station sites, (See diagram). The main SCADAPack 32 is the link for all system data to the SCADA HMI computer. It also acts as the communication master that polls all sites, receives unsolicited messages and performs time synchronization for the system. The second SCADAPack 32 is a DNP master only to one of the Tank Site PLCs and receives unsolicited messages from a solar tank site. The 16-bit SCADAPacks are configured as DNP slaves. They are polled regularly and also send unsolicited messages back to the main SCADAPack 32.

In this solution, Sierra Controls used regular DNP polling mainly to verify the communication status with slave controllers. Communication integrity is extremely important due to the fact that in a typical water system, it is not unusual for long periods of time to pass between events. Therefore, when an event does occur, it is essential that the communication integrity be assured. Regular polling was also used to bring in accumulated values, such as runtimes or flow totals, in a simple manner without the need to formulate delta values; and to bring in analog values such as flow or tank levels at a satisfactory rate without the need for filtering or delta values. Although Sierra Controls found that unsolicited messaging worked best with discrete values, analog values were also configured. Delta points, designed to detect sudden abrupt changes to the system, were used to trigger unsolicited messages.

A final contributing factor in the development of the communication architecture was Sierra Controls' long history and comfort level with regular polling, typically Modbus-based. This first DNP-based project relies mainly on regular polling, yet they feel that as the capabilities of the DNP protocol become more familiar, Sierra Controls may rely less on regular polling and lean more towards unsolicited messaging.



THE RESULTS

From the City of Bridgeport's point of view, the updated control system was a definite hit! Initial concern that new computer-based technology would prove overwhelming to city personnel was quickly replaced by enthusiasm, as each new feature became apparent.

System operators were very pleased with the efficient and reliable method of information gathering, reporting and viewing. An SQL-based HMI software package, running on a main office computer, displayed, logged and trended system data in a timely manner. The DNP3 protocol's built-in unsolicited reporting functionality ensured that changed data was as "fresh" as possible; and the use of spread-spectrum radios greatly increased the reliability of the communication link. From a design engineer's perspective, the ease-of-configuration and the overall performance of the DNP3 protocol were the main keys to this successful installation.

Special thanks go to Mark Crossett and Seton Sibert of Sierra Control Systems, Carson City, NV, www.sierracontrolsystems.com, in the preparation of this article.

The 10 Commandments, cont.

type and complement with additional types if necessary.

4. Follow sensor manufacturer guidelines. Misapplication can be a disaster.
5. Make sure sensor zone lengths do not exceed Assessment and Response capabilities.
6. Inspect the perimeter routinely. Include appropriate reporting and responsibility assignments.
7. Check the sensor line routinely with a walk test.
8. Conduct appropriate service and maintenance to both sensors and their mounting platforms. Include adequate battery backup and UPS.
9. Ensure that limited security budgets do not cause a poor installation (If something is worth doing, it is worth doing right.)
10. Provide routine system training for those who operate and respond to the system.

For further information on perimeter security systems and solutions, visit www.southwestmicrowave.com

Sage Advice

INTEGRATION OF LOGGED DATA INTO A REAL-TIME DATABASE

With the advent of fully functioning PLCs with the memory and the capability to store data on board, users are faced with the daunting task of interleaving the historical data retrieved from the RTU into the real-time database at their HMI system. Since the real-time engine at the HMI expects to collect the data directly and not use historical data from other sources, it can be anywhere from difficult to impossible to deal with this data.

One reason for this problem is that many HMIs use a proprietary format for saving archived data due to the advantages of faster access times, smaller file sizes and data integrity. As a result, even though the files may be fully compatible with ODBC (Open Database Connectivity) and support SQL (Structured Query Language), you can't use a database program, such as Access, to write to these files.

Fortunately, many of the HMI programs have tools available to alleviate this problem. In Lookout for

example, there is a configured object, called a *Logger*, which allocates memory for the value you wish to add to the database. The *Logger* then takes the value along with time and date information and interleaves it with the archived data, allowing it to be displayed in trend charts, or be used with any of the data tools available for the real-time data in the system.

Other programs have scripting to perform a similar function, or use Access or other format database allowing you to add data to their archive files. The only problem here is the question of data integrity.

Another solution to the problem of collecting events and data from remotes is to use DNP3 protocol and a tightly integrated HIM. You may wish to read the DNP3 Protocol Implementation article on this page for further information. Stay tuned to *The Sage Advisor* for upcoming products that make these features automatic.



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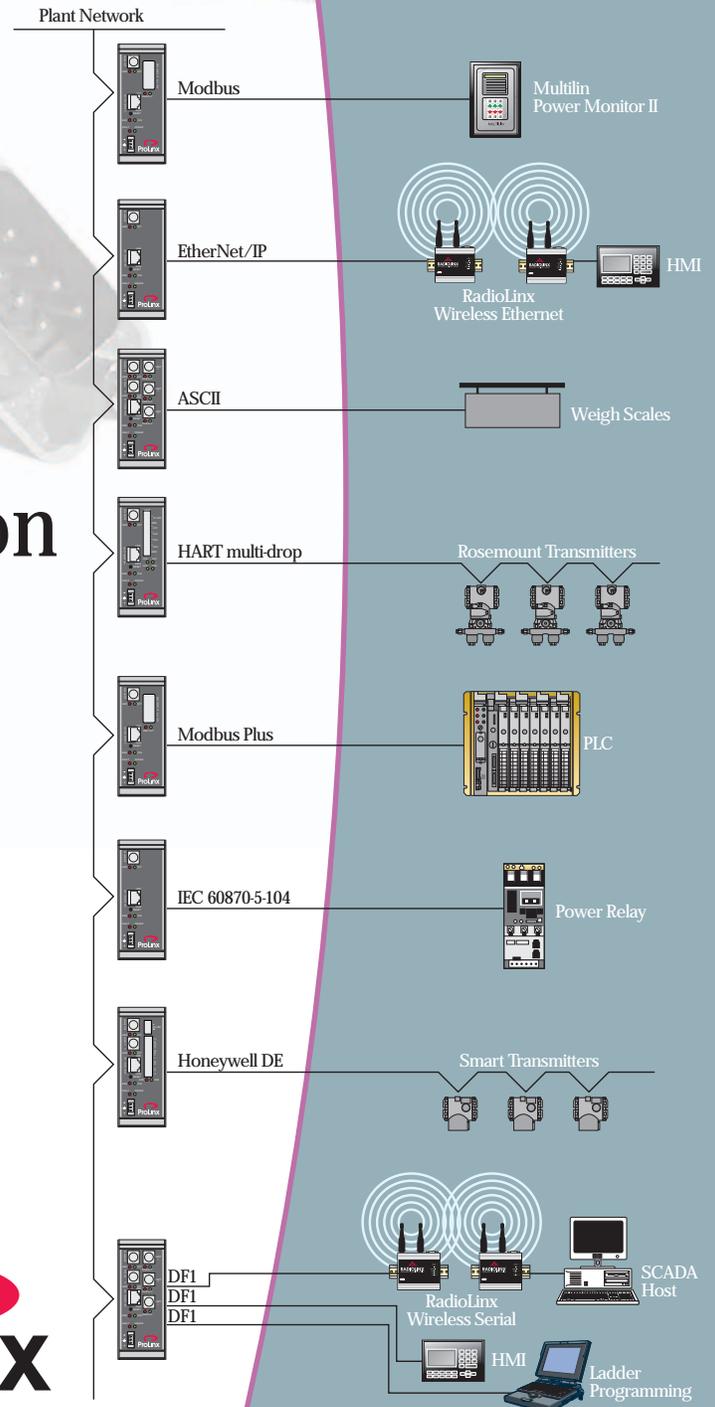


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- DH-485
- A-B Remote I/O
- EtherNet/IP
- HART Multi-drop
- Honeywell DE
- IEC60870-5-101
- IEC60870-5-103
- IEC60870-5-104





Free SCADA/Security Seminars

May 17, 2005

Courtyard Marriott Midtown Sacramento
4422 Y Street
Sacramento, CA
8:00 AM – Noon

May 18, 2005

Four Points Sheraton
5101 California Avenue
Bakersfield, CA
8:00 AM – Noon

May 19, 2005

Marriott San Diego Mission Hills
8757 Rio San Diego Drive
San Diego, CA
8:00 AM – Noon

These seminars are designed to educate utility managers and staff who are planning new, upgraded, or replacement SCADA systems. Guest speakers will be on hand to present and discuss issues and products for a modern, secure, open architecture system.

Guest Speakers

Charlie Howell, Principal, Security Concepts & Planning, Sacramento, CA [Sacramento Seminar](#)
How Do We Do Security Without a Budget? Mr. Howell is the owner of an independent security consulting firm specializing in addressing post-9/11 security issues in the water and wastewater industries, including vulnerability assessments and Emergency Response Plan creation, as well as projects involving Integrated Security Systems that incorporate Video, Access Control, Burglar Alarm, and Gate Control components.

Joe Prevendar, P.E., V.P. of Engineering, Electrical Power Systems, Inc of Fresno, CA. [Bakersfield Seminar](#)
Optimizing your SCADA System Design. With an extensive background in SCADA engineering and specification of control systems, Mr. Prevendar will review the design questions to address to optimize a SCADA system for your application. Topics will include designing for reliability, lowest cost of ownership, ease of maintenance, and ensuring operational requirements are met

M. Cyrus Moaveni, P.E., President, CyberNet Consulting, San Diego, CA [San Diego Seminar](#)
A Review of Current Radio Telemetry Technologies and a Checklist of How to Plan and Implement a SCADA System Radio Network so it WORKS! Mr. Moaveni has been involved in the monitoring and controls systems planning, design and implementation in the water/wastewater industry for over 26 years. He will review current offerings in radio communications technologies, and discuss how to select the one that is right for the project. **Tom Klein**, Senior Engineer, CyberNet Consulting, will complement Mr. Moaveni's lecture with details of some actual projects that use the concepts presented.

Other Presentations

- Learn about DNP Protocol and see the latest Control Microsystems products — the Wireless Series of SCADAPacks, from Jim Quist, Industry Director & Western Regional Manager for Control Microsystems. These products have been designed with open architecture and open protocols in mind, and have been ruggedized for severe environmental conditions. The Control Microsystems' SCADAPack line has been proven in SCADA systems throughout the west and the world.
- Learn about licensed and unlicensed radios and how they can provide reliable communications throughout your SCADA system. Scott Sibenac of ProSoft Technology will talk about the RadioLinx (formerly Locus) High-Speed Ethernet Spread Spectrum radio, with over-the-air data rates of up to 11 Mbps and range of up to 20+ miles.
- See a range of security and surveillance products, featuring IVC PTZ security camera and the Relay Server Camera Management Software.
- See a demonstration of the newest version of National Instruments' Lookout SCADA software, Version 6.0, which is powerful, yet easy to configure. Lookout provides all the flexibility and power of the other top HMI/SCADA products, without the complexity that generally accompanies this type of program.

Pre-registration Required

Registration Form

Please fax to 1-888-FAX-SAGE or call toll-free 1-888-ASK-SAGE.

- I would like to attend:**
- Sacramento SCADA Seminar on Tuesday, May 17, 2005, 8:00-Noon
 - Bakersfield SCADA Seminar on Wednesday, May 18, 2005, 8:00-Noon
 - San Diego SCADA Seminar on Thursday, May 19, 2005, 8:00-Noon

Name: _____ **Title:** _____
Company: _____
Address: _____
Phone: _____ **Fax:** _____
Email: _____

There is no charge for this event, but we would appreciate a call if you need to cancel your reservation. Seating is limited.



SCADAPack & Ladder Logic Training Class

May 24-26, 2005 North Lake Tahoe, CA



Sage Designs is hosting a 3-day training course for Control Microsystems' SCADAPack Controllers and TelePACE Ladder Logic programming. An optional SCADAPack or SCADAPack32 is available at a special price with the course — an excellent way to get started using Control Microsystems' Controllers.

May 24	9:00-5:00 PM	SCADAPack controller operation, Series 5000 I/O, TelePACE introduction.
May 25	9:00-5:00 PM	TelePACE advanced programming techniques and advanced functions.
May 26	9:00-3:00 PM	Controller communications, Modbus Master/Slave protocol, Diagnostics, Modems

Instructor: Tony Sannella, Sage Designs, a Control Microsystems' factory-certified instructor.

Location: North Tahoe Conference Center, 8318 North Lake Blvd. (Hwy. 28), King's Beach, CA 96143. *Those needing overnight accommodations will need to make their own reservations. Call our office or check our website for area hotels.*

Who should attend? Individuals interested in participating in a highly technical, in-depth course on Ladder Logic and how it applies to Control Microsystems' products. Prior Ladders experience is highly recommended.

What should I bring? It is a requirement of the course to bring a Laptop Computer – minimum of Win98 with 15mb free disk space, CD ROM and serial port. You also need to have software permissions/passwords to install software on your PC.

What is provided? Daily breakfast and lunch, coffee, soft drinks and snacks during the breaks.

To Register: Complete the information below and fax to us at 1-888-FAX-SAGE (888-329-7243)

Name (please print):	Title:
Company:	Phone:
Address:	Fax:
	Email:
City/State/Zip:	

Cost:	3-Day Training Class without a SCADAPack Demo	\$ 1,075
	3-Day Training Class with a SCADAPack SPT Demo*	\$ 1,845 + Sales Tax on \$770 @ your rate
	3-Day Training Class with a SCADAPack32 SPT32Demo*	\$ 1,995 + Sales Tax on \$920 @ your rate

* **SPT DEMO**, a \$3,180 value, consists of a SCADAPack Controller (#P1-130-01-0-0), TelePACE Ladders, Hardware Manual (on CD-ROM), 5699 I/O Simulator board, AC/2 Transformer, & programming cable. **SPT32 DEMO**, a \$3,960 value, consists of a SCADAPack32 Controller (P4-100-01-0-0), TelePACE Ladders, Hardware Manual (on CD-ROM), 5699 I/O Simulator board, AC/2 Transformer, & programming cable. Demos will be shipped N/C to training facility.

METHOD OF PAYMENT: Please check one of the following. Course fees are payable by the first day of class.

- Course only @ \$1,075 (not taxable)
- Course w/SPT Demo: @ \$1,845 + Sales Tax on \$770 @ your CA sales tax rate
- Course w/SPT32 Demo @ \$1,995 + Sales Tax on \$920 @ your CA sales tax rate
- A check is being mailed with a copy of this form. **Please include applicable sales taxes, as indicated above.**
- Bill my company on attached PO, #_____. PO must cover total cost of both course and optional demo, including applicable sales taxes.
- Charge to my credit card. Amount charged will include applicable sales taxes, as indicated above.

Visa Mastercard Card #: _____ Exp. Date (MO/YR): ____/____
 Cardholder Name (please print): _____
 Cardholder Authorization Signature: _____

***** Registration Deadline: Wednesday, May 4, 2005 — Seating is limited. *****

Sage Siting

INTEGRATOR FINDS EASY SOLUTION TO ALARMING CONDITION

FluidIQs, formerly CMC, is currently installing four Win-911™ Alarming software packages for two different customers. Win-911, a product of Specter Instruments, has proven to be a very reliable system and end-user friendly. The ease for operators to change the on-call personnel, bypass alarms, and to add alarms has made for a very positive experience.

Using OPC Servers, Win-911 has made the linking between SCADA applications or linking directly to a PLC a much more efficient activity. This ability saves time in configuration, and removes the indirect referencing used in the past, making it easier to debug.

The ease of connecting directly to PLCs has enabled a unique redundant implementation of the software. Putting Win-911 on an operator station reading directly from the PLCs, and an active back-up on the server also reading directly from the PLCs, has allowed us to meet customer needs for a "hot-backup" in dial-out alarming without the added expense of a back-up server. This configuration

has saved the end-user several thousands of dollars. The upcoming integrated "Factory-talk" Win-911 software package will provide an even easier solution when working with Rockwell PLCs and software. We at FluidIQs are looking forward for this upgrade, and are very excited to see that Specter Instruments has become an Encompass Partner with Rockwell Automation. The ability to pull the tags directly from the PLC in a Windows™ "point-and-click" environment will make the integration seamless and save money in the implementation.

FluidIQs, Inc. is the new name for Control Manufacturing Company, a full-service control system integrator headquartered in Napa, California, with offices in Southern California and the Pacific Northwest. An established industry leader with over twenty years of control system experience, cmcFluidIQs offers the resources and expertise necessary for today's sophisticated SCADA and industrial control applications.

— Jeffrey L. Childress, Regional Manager, FluidIQs, Inc., www.fluidiqs.com

SPECTER INSTRUMENTS INTRODUCES



WHAT IS WIN-911/LITE?

Think of it as a bridge between the low cost autodialer and a full-blown SCADA system. It is Alarm Notification Software for the small system.

"The price of an autodialer with the power of WIN-911."

Just look at the compromises you must accept with the typical autodialer:

- Cryptic phone messages and alarm codes
- No text messaging capability
- Only one phone number to call
- No shift or duty scheduling for users
- No ability to acknowledge alarms over the phone
- No historical log or record of alarms and acknowledgements
- No interface with other software, such as SCADA

With WIN-911/Lite, you have solutions for these limitations plus many more choices. It can be used with pagers, cell phones, landline phones and most any wireless communications. And if

you find yourself needing even more functionality, you can always upgrade to the full power of WIN-911 with just a phone call and a new unlock code.

How is Lite different from WIN-911? WIN-911/Lite is a limited feature-set of the popular WIN-911/TEP. In fact, it is installed from the same CD.

- Alarms can accommodate up to 24 digital inputs
- Users can select a single type of dial-out connection, such as: telephones, numeric or alphanumeric pagers, voice pagers or email
- Lite does not include WIN-411 reporting capability, but users can acknowledge alarms from the telephone connection
- The computer to telephone interface must be a TAPI Voice Modem

By using WIN-911/Lite and the WIN-911 OPC Client capability, low-cost remote alarm notification solutions are within easy reach of municipalities of any size.

SECURITY ON A TIGHT BUDGET, cont.

Operational components include putting security components, such as fence and gate checks, on a regular check list of tasks already being performed.

If, for example, there is currently a SCADA system in place, Technology components could send outputs to the SCADA system using a burglar alarm system; the alarm system, equipped with door contacts on each opening. Further, adding motion detection using photo electric beams, or specific outdoor rated motion detectors around the pumps inside the enclosure, would create a controlled atmosphere and reduce any false alarms that may occur. Since the SCADA system already pages the on-call technician, Joe has the ability to either use that process already in place and have the on-call technician call the Police or Sheriff before responding to a security breach. Alternately, he could install a phone line at the pump station and have a central station monitor the burglar alarm system. Total cost for the Burglar Alarm Systems shouldn't be more than \$3,500 in this case.

Cyber components in this case would mean interpreting data from the SCADA system to verify alarms. This

takes inputs into the SCADA systems from the pump station and waits for any operational alarm to happen at the pump station before dispatching the on call technician or central station monitoring center, minimizing false alarms caused by nature in remote areas. The cameras should be elevated beyond normal reach, with the recorder inside a locked cabinet within the enclosure around the pump. If Joe uses his own staff to run the conduit and wiring, he could save up to \$3,000 on the video portion of the project. His Operational component would retrieve the video and/or maintain the Digital Video Recorder.

At the end of securing Pump Station A, Joe has remained within his budget while greatly improving security at his critical Pump Station. By breaking down the problem and thinking outside of the box, anyone can cost-effectively make a difference in the security of their water/wastewater facility. For further discussion on this topic, consider attending Sage Designs' seminar on May 17th in Sacramento, CA.

— Charlie Howell, Principal, Security Concepts & Planning, LLC.



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Calendar of Events

- April 4-8 **AWWA 2005 Annual Spring Conference**, Industry Hills, CA.
- April 5-6 **Lookout 2-Day Basics Course***, Mill Valley, CA
- April 7-8 **Lookout 1 1/2-Day Advanced Course***, Mill Valley, CA
- April 12-15 **CWEA Annual Conference**, Palm Springs, CA.
- May 3-6 **ACWA Spring Conference and Exposition**, San Jose, CA.
- May 10-13 **California Rural Water User Association (CRWUA)**,
3rd Annual Operator Expo, Lake Tahoe, CA.
- May 17 **Free SCADA Seminar***, Sacramento, CA.
- May 18 **Free SCADA Seminar***, Bakersfield, CA.
- May 19 **Free SCADA Seminar***, San Diego, CA.
- May 24-26 **SCADAPack and Ladder Logic Training Course***, North Lake Tahoe, CA.
- June 12-16 **AWWA Annual Conference and Exposition**, San Francisco, CA.
- June 22 **Wine Country Water Works Trade Show**, Healdsburg, CA.
- Sept 20-22 **Lookout Training Course**, Mill Valley, CA
- Oct 9-12 **National Rural Water Leadership Forum & Technology Conference**,
Sacramento, CA.
- Oct 10-14 **AWWA Annual Fall Conference**, Reno, NV.
- Oct 18-20 **SCADAPack and Ladder Logic Training Course**, Mill Valley, CA
- Oct 26-29 **SCADA and Related Technologies for Irrigation District Modernization**,
Sponsored by USCID, Portland, OR.
- Nov 29-Dec 2 **ACWA Fall Conference and Exposition**, San Diego, CA.

* Download the [registration form](#) from the events page of our website,
or call for more information.

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Win-911 Alarm Notification Software
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