The Sage Advisor

A Publication of Sage Designs, Inc., Mill Valley, CA **Spring 2002**

☐ ☐ ☐ **SCADA & Industrial Automation Specialists serving California & Nevada since 1991** ☐ ☐ ☐

Introducing the SCADAPack LP & SCADAPack 100

Following closely on the heels of the release of the SCADAPack 32 and Micro 32 controllers, Control Microsystems has just released two new products to take advantage of the latest innovations in SCADA technology.

Free SCADA Seminars

May 22	May 23	May 29	May 30
Buena Park	Pasadena	Concord	Fresno

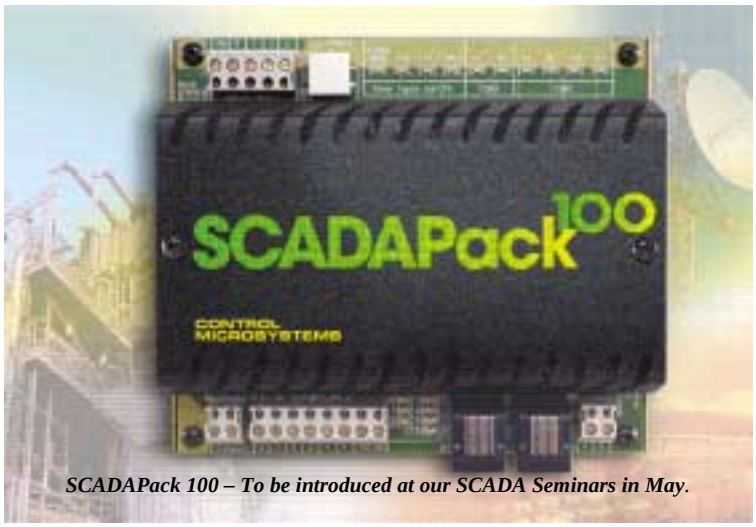
Sage Designs and Control Microsystems are teaming up again to provide a forum to introduce new SCADA products and to educate our customer base on the advantages of open-architecture SCADA systems. Although Sage Designs does not provide systems integration services directly, we can provide you with on-site training to assist you in managing your own SCADA system or refer you to integrators who can meet your needs. *See the enclosed flyer for dates, locations and registration information.*

SCADAPack LP — A Breakthrough in Power Consumption

The SCADAPack LP has been engineered for Low Power applications, delivering the full range of SCADAPack capabilities while saving money with its low rate of power consumption. This new controller operates with smaller solar panels, batteries and enclosures. Plus, the LP includes a 12 to 24 volt DC-DC converter and two turbine meter preamplifiers, lowering the number of parts, increasing reliability and reducing the footprint. SCADAPack LP is well suited for water, wastewater, oil and gas, and pipeline applications needing a mix of analog and digital I/O, and multiple communication ports. This new controller supports several standard protocols: Modbus ASCII/RTU master/slave with store-and-forward; DF-1 full and half-duplex; and DNP 3.0.

SCADAPack 100 — Compact & Affordable PLC

Control Microsystems is now shipping the SCADAPack 100, a new PLC/RTU engineered specifically for Water and Wastewater applications. Being very compact and low cost, the SCADAPack 100 provides universal 6 digital I/O, 3 analog inputs plus DC power monitor, 2 RS-232/485 serial ports, and 1 high speed counter input. The SCADAPack 100 is ideal for lift stations, reservoirs, and water distribution controls. In addition to being a full-featured PLC with ladder logic, floating point math, PID, IEC 611131-3 and C programmability, the SCADAPack 100 also provides SCADA features such as multiple protocols, conformal coating to resist corrosion, and a very wide temperature range. Best of all, it features a full 3-year warranty and is backed by Control Microsystems' commitment to Total Customer Care.



SCADAPack 100 – To be introduced at our SCADA Seminars in May.

Now Serving Southern California

Sage Designs has expanded to provide its complete line of SCADA & Telemetry products to all of California, including: Control Microsystems PLCs/RTUs, National Instruments' Lookout HMI software, Data-Linc Group spread spectrum radios, and Teledesign Systems licensed narrow-band radios. If you are located in Southern California, chances are this is your first *Sage Advisor*. Come to a seminar, call, or return our fax form to learn more about our products and services.

For more information, sign up for the May SCADA Seminar closest to you.

What's New in Lookout?

Lookout 5.0 now ships with Measurement & Automation Explorer (MAX), a program that allows you to access to your entire Lookout database in an interactive browser-like interface. Simply select the archived traces (tags) you want displayed and the time span you want to view, and MAX will trend or easily export the data for use in Excel or other programs. MAX also includes an integrated data, alarms and events viewer with multiple filters, allowing you quick and easy access to archived alarm and event data. MAX has a set of historical management tools to archive, export, merge, compact, rename, and delete traces.

Lookout 5.0 has new ActiveX Controls including: List Box object, Combo Box object, Internet Explorer object, and an Alarm & Event Browser. The web browser object allows you to embed a web site with or without links within a Lookout application. This object is also handy for displaying images from a Web-Cam in your SCADA system. Also, Lookout 5.0 also runs as an NT Service, allowing you to run an application without being logged on for automatic startup. Lookout 5.0 is a seamless upgrade from your 4.x version, and only costs $395 for the development system upgrade. *Call Sage Designs to order your upgrade today.*

Open Protocols…or, Spreken ze Español, oui?

The key to an open system is in its ability to interface with other systems. The hardware compatibility issue can be equated to a telephone system in that you can pick up your telephone and dial a series of numbers and another phone somewhere in the world will ring. This other phone system to which you are connected may use different ringing voltages, different dial tone frequencies, and have a host of other differences that could present problems; however phone companies worldwide can work together just like RS-232 ports and Bell 202 modems can because of interface devices that make all of these disparate systems work together. The problem is when this phone is answered and the person at the other end of the line says "*Bueno*." Unless you also speak Spanish, the conversation is as good as over. This is where a common language is important.

A protocol is the language spoken by an RTU. Devices that speak different languages cannot communicate with each other without an interpreter, and since an interpreter (otherwise known as a Protocol Bridge or Protocol Converter) can often cost as much as the RTU, you can see how important it can be to get devices that speak a common language.

There are literally hundreds of protocols on the market, with only a handful covering about 99% of the systems being installed today. Most of the protocols work in one of three ways: polled systems, poll-for-exception systems and report-by-exception systems.

Most telemetry systems use a polling protocol that works on the principal that there is one master in a system which controls the flow of information by polling (querying) one or more slaves. Modbus, the most common of these, is a truly open protocol in that Modicon made it public domain several years ago. As it is a fairly efficient protocol with more than adequate error detection, hundreds of vendors of all types of controllers, PLCs, RTUs and automation software products have offered it for years. It will be helpful to your understanding of SCADA systems to have at least a basic understanding of how a protocol works, so below is a description of the basics of Modbus as it is used in a large majority of the SCADA systems being installed today.

In general, protocols have several things in common. They transfer information from the memory of one device to another following a set of rules that make up the protocol. In Modbus, the information to be transferred between devices is stored in registers which resemble cells in a spreadsheet.

Some registers can hold an analog value such as the current input from a level motor, the set point for the pump start signal to control the level, or the calculated average flow for the last fortnight. Discrete registers may contain the status of a pump, the status for a level switch or the output to start a motor. Both the analog and the discrete registers come in two varieties: read/write and read only.

All Modbus registers are numbered within the device according to a set of rules that is an important part of the protocol definition. Discrete output (D/O) registers are numbered from 1 to 9999, and are called *coils* as they generally represent real outputs; however, they can also represent a pseudo or memory-only output as well. Your Modbus master can read the value of these registers to see if outputs are on or not, or it can write a value (turn on or off) the output when it polls the slave RTU. Discrete input (D/I) registers are numbered from 10001 through 19999 and contain information about the status of an external switch such as a level alarm, or can represent the result of a logical value (true or false). Your Modbus master can only read the values in these registers. Analog input (A/I) registers are numbered between 30001 and 39999, and represent real inputs to the RTU such as flow or level. A/I registers cannot be written to from your Modbus master. Analog output (A/O) registers, otherwise called *User* or *Holding* registers, are the most versatile of the registers and are used for setpoints, data storage, counters, timers, analog output values, variables or results of calculations and, of course, analog outputs. Holding registers are by far the most useful register type.

The Modbus master message contains several elements. First, it has the address of the slave RTU with which it wishes to communicate (a number between 1 and 254), followed by the type of data transfer it wishes to perform (a function such as read or write, one piece of data or several) and the starting number of the first register in the data packet, the packet size and, of course, the data. Finally the message contains a mathematical summation of the message called a checksum value which is used by the receiving device to determine message validity.

While Modbus is adequate for the vast majority of SCADA applications, other more powerful protocols such as the IEEE Standard DNP 3.0 may offer more options for larger SCADA Systems. Whichever protocol you choose, be sure that it is not only *"open,"* but also supported by multiple vendors.

Add Surveillance Cameras to your SCADA System

With the advent of web-based net cameras, it has become a simple task to install security cameras and integrate these with a SCADA system without relying on a traditional security company's proprietary system. After looking at a wide variety of options, Sage Designs is pleased offer security cameras, which can become a part of an open architecture SCADA system. Depending on the radios and software used, our cameras can simply be positioned and powered up, needing no further programming. Of course, each SCADA system is unique, and depending on the circumstances, additional equipment may be required.

Our cameras have excellent digital image quality with outdoor enclosures available. Images are viewable with **a** web browser or HMI software. The net cam connects to wireless Ethernet radio modem, LAN, Cable, DSL, and its TCP/IP Addressable (static or DHCP). It is powered by Linux, runs a web server internally, and has a built-in Ethernet port (10Mbit), a digital I/O port and 2 serial ports**.** This rugged digital camera automatically captures an image every few seconds or can be activated by an alarm, such as a motion detector. When an alarm event is generated, an HMI such as Lookout can poll the NetCam and acquire the JPEG image produced by the camera, display it on a screen and embed it in an HTML report that is saved with time and date information. This report can then be attached to an e-mail and sent to assigned personnel, browsed over the network or printed out for review. Lookout will also send a pager message, if required, to alert personnel to the alarm event.

As an option, Lookout can act as a web server and generate the security screen with images and manual controls for capturing additional images by operator command. This web page is viewable and controllable using Internet Explorer™. Lookout allows you to monitor multiple locations from one panel. With this approach, an operator can supervise a control process, and be informed of any security alerts at the same station.

We recommend a quality industrial Ethernet radio to ensure image quality and connection reliability. For Ethernet links up to twenty miles the Data-Linc SMR 6210E provides a reliable high-speed network connection for efficient transfer of image data. Depending on client needs the camera can be configured to transmit high or low-resolution images. Call Sage Designs for a demonstration on how to install SCADA Security today.

☐ Phone: 415-331-8826 or 1-888-ASK-SAGE ☐ Fax: 415-331-8969 or 1-888-FAX-SAGE ☐ Internet: http://www.sagedesignsinc.com ☐

WAS Control with Lookout

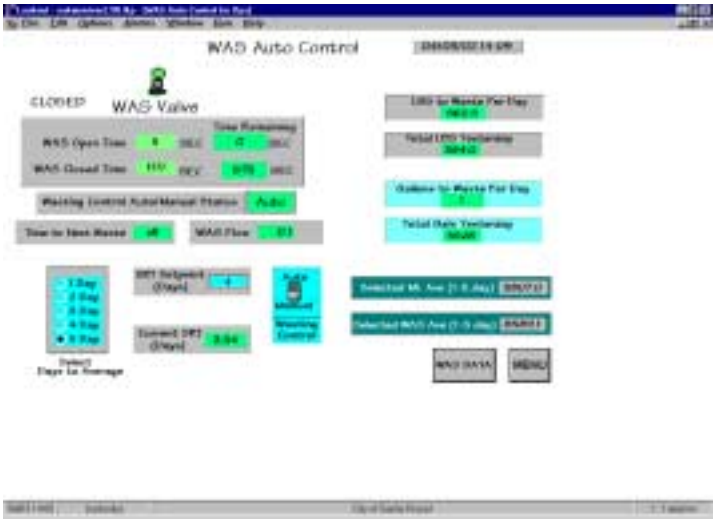
The task, simply put, was to automate the control of the Waste Activated Sludge (WAS) at the City of Santa Rosa's Oakmont Wastewater Treatment Plant. At that time, the wasting-valve cycles were being calculated once daily using data manually entered into a spreadsheet. The operators then entered the results of the calculations into Lookout HMI software via an operator interface which then set the timers in the PLC to control the modulation of the wasting valve.

The automation task involved the following steps:

- Monitor the Mixed Liquor Suspended Solids (MLSS), Waste Activated Sludge Suspended Solids (WASSS), and the Waste Activated Sludge (WAS) flow via signals sent to a PLC
- Determine the total pounds of solids needed to waste per day, to meet a target (setpoint) Sludge Retention Time (SRT)
- Calculate the current SRT, average WAS flow, and total pounds of solids needed to waste every 30 minutes to meet the daily requirement.
- Calculate a 5 day average SRT, WASSS running total, previous 30 min LBS. wasted, WAS totalized flow, and previous day's totals.
- By converting the calculated pounds-to-waste for 30 minutes to WAS flow for 30 minutes, open the modulating valve, totalize the was flow, and then close the valve until the next 30 minute period.
- Allow an Auto (new) or Manual (old) control of the wasting process.

It was decided it would be more efficient to perform all calculations in Lookout, not the PLC. Sage Designs was called in for some on-site Lookout training, at which point we discussed how best to design the application. After a training session with Tony Sannella of Sage Designs, a few phone calls, and some long days, the application was up and running. Upon seeing the application working, the operations staff requested a few changes. After another training session with Sage Designs and some more phone calls, the changes were implemented.

The finished product was on-line for about one month when the plant shut down for the season. During that time, automation of the process proved successful and more accurate than manual entry of the SRT. Plans are now underway to replace the 4-year-old operator workstation with a new unit, and to upgrade the 3.18 version of Lookout to version 5.0.



New from Data-Linc Group

License-Free, Wireless Ethernet Modems

Data-Linc Group is pleased to announce the addition of the new, next generation wireless, license-free Ethernet modems to the current Data-Linc Group product line—the SRM6210E and SRM6310E. The SRM6210E was specifically designed to operate in the license-free 900 MHz ISM band, while the SRM6310E operates in the 2.4 GHz ISM band. The SRM6210E and SRM6310E provide unsurpassed data integrity in high EMI/RF environments with a range of up to 35 miles—or farther with repeaters.

These new Ethernet modems are compact in design, offering maximum mounting flexibility with easy to customize mounting brackets or by utilizing the optional DIN rail mount. The SRM6210E and SRM6310E modems offer extended temperature ranges and are ideal for systems where cable installation is difficult or cost prohibitive. Without expensive Ethernet cabling, these highly reliable wireless alternatives use MAC layer bridging for true protocol transparency and fully support TCP/IP-based protocols. The SRM6210E and SRM6310E excel in SCADA and remote security applications.

An optional diagnostics management software tool, LincView offers complete network monitoring and maintenance from one master location. Technicians can track the actual data path to the master, view every network link in miles or kilometers and monitor key parameters such as signal or noise levels, voltage and much more. Even visual trend analysis can be performed for frequency, PPM and radio temperatures.

About Data-Linc Group
Founded in 1988, Data-Linc Group is the leading provider of industrial data communication solutions. Data-Linc designs and manufactures high performance, superior quality modems for a broad range of industrial applications. Their complete line of industrial grade modems and networking products consistently provide reliable, robust data communications—even in the most demanding environments.

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Your #1 Source
for
SCADA

Control Microsystems' TeleSAFE SCADAPack PLCs & RTUs
National Instruments' Lookout HMI/SCADA Software
Teledesign Systems' UHF/VHF/Microwave Radio Modems
Data-Linc Spread Spectrum Radios
Remote I/O Systems
Security Web Cams with Alarm Paging
Operator Interface Panels & Industrial PCs
Leased-Line & Dial-up SCADA Modems

…Everything to meet your SCADA system needs

Seminars & Events

April 22	California Rural Water Association Training Worship & Exhibit *Plus SCADA Workshop by Tony Sannella, Sage Designs*
May 11	ISA NorCal Section Course: SCADA Basics taught by Tony Sannella
May 22	Free SCADA Seminar, Buena Park, CA
May 23	Free SCADA Seminar, Pasadena, CA
May 29	Free SCADA Seminar, Concord, CA
May 30	Free SCADA Seminar, Fresno, CA
June 26	Wine Country Water Works Association Trade Show, Healdsburg, CA

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