Implementing Data Historian Functionality with LabVIEW

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The Challenge: Monitoring, displaying, recording, and reporting data previously plotted on a multipen Chessell strip-chart recorder.

The Solution: Developing a LabVIEW-based SCADA system that uses the NI Modbus server to acquire data from the recorder serial port.

Introduction
Union Carbide Corporation identified the need to improve a critical temperature and relative humidity (RH) monitoring system in a production QA Lab at the Bound Brook, NJ plant during September 1997. The existing system consisted of a Eurotherm Chessell paper strip-chart recorder, which received the data from RTD probes in several ovens, a density column bath, and room air temperature and RH sensors and plotted it with a three-color ink cartridge.

Paper jams, which had become a regular occurrence because of variations in paper consistency and the age of the Chessell instrument, made it difficult to monitor the inputs without interruption and loss of data.

We purchased the National Instruments Modicon Modbus RTU industrial automation (IA) server software for communicating with the serial port link to the Chessell recorder so that all the sensor data was available to LabVIEW.

When a critical variable went out of tolerance, a significant amount of time could pass before an operator discovered and corrected the error. Then the operator had to conduct an investigation and write a lengthy corrective-action report. Archiving the paper also presented a problem because the ink faded over time; the archived charts were difficult or impossible to read. Of course, operators could never extract data off the strip-chart recorder to plot on a computer or incorporate in printed reports.

System Overview
Union Carbide hired Process Automation to replace the data presentation functions of the strip-chart recorder with a PC-based SCADA system using LabVIEW from National Instruments. Goals for the new system were to:

- Bypass the paper charting system
- Reduce the number of corrective action reports through improved monitoring
- Make the storage and retrieval of data an easier task

To achieve these objectives, we decided to continue to use the Chessell chart recorder (which had a built-in Modbus serial port) as the sensor conditioning and digitizing component of the system. We purchased the National Instruments Modicon Modbus RTU industrial automation (IA) server software for communicating with the serial port link to the Chessell recorder so that all the sensor data was available to LabVIEW. We installed LabVIEW on a 100 MHz, 16 MB, 2.0 GB desktop PC in the laboratory and adapted Process Automation Corporation’s SCADA Tool Kit for LabVIEW to perform the following tasks:

- Data retrieval from the IA server into its real-time database
- Alarm monitoring and reporting
- Automatic data/time spreadsheet report generation
- Historical data compression and archiving
- Data trend plotting and printing

The operator can select several variables, either individually or in groups, for viewing in a multicolor graphical trend plot. The greatest benefit comes from the ability to view one or more data trends - in spans from minutes up to one year - on screen in a clear and concise manner. The system captures out-of-tolerance readings and stores them in a separate alarm table that the system can import to Excel or Word. In addition, the operator can automatically generate a tabular report covering a user-defined time span for all or some of the variables as necessary. The operator can archive data either within the program or by using the Windows file manager. The system automatically compresses data into 24-hour files (indexed by date) and archives the data in directories named after the variable. The SCADA Tool Kit can retrieve the...
Because of the ease of development and the flexibility of LabVIEW, along with the “jump start” provided by the SCADA Tool Kit, we implemented the new system in only eight days.

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