

Diablo's GC-AED Development Lab

Diablo Analytical has been a Hewlett-Packard Channel Partner since 1993, providing general analytical application and system integration services. We



recently expanded our relationship to include both pre- and post sales application support for the Atomic Emission Detector for Gas Chromatography. As part of this relationship, we have designed and started up a GC-AED development and demonstration laboratory in our facility in Concord California. A photograph of our development lab showing the GC-AED system is shown in Figure 1.



Figure 1: Diablo Analytical's new GC-AED development laboratory

See the article on page 3 for a discussion of how we solved our high-purity gas distribution needs in our development lab.

Customers interested in evaluating the suitability of the GC-AED for their own applications should contact Diablo Analytical for pre-sales assistance. We will discuss your application with you and if it shows promise, we are equipped to run evaluation samples. In addition, potential GC-AED customers can also visit our facility to evaluate the GC-AED system for themselves.

Diablo continues to provide a variety of post-sales application support services

GC-AED Application Services

for the GC-AED.

- *AED Method Development and Method Optimization*
- *Macro Programming and Instrument Automation*
- *Customized AED training*
- *Assistance in making the transition from Pascal to the DOS/Windows ChemStation*

Recent Additions to Diablo's Web Page

If you haven't visited our web page lately, you might want to stop by the next time you are "online". We frequently update the content so that our customers can easily access the most up to date information about our company. Some of the items you will find on our web page are listed below.

- Application notes and highlights
- Presentations given by Diablo personnel at professional meetings
- Back issues of our newsletters
- The GC-AED home page

inside...

Analytical Application Focus: System Integration for Custom Applications
High Purity Laboratory Gas Distribution Issues
Recent Diablo Application Highlights

Page 2
Page 3
Page 4

Analytical Application Focus: System Integration for Custom Applications

The term “System Integration” has been used widely in the computer industry for many years. However, this term may not be familiar to people outside that industry. System Integration involves the combination of both off-the-shelf and custom hardware and software components in order to produce a complete “solution” for the end-user. The best way to describe the function of a System Integrator is to give an actual example.

A client had a time-critical need to analyze a large number of compressed-gas SO₂ standards using a Thermo Pulsed-Fluorescence SO₂ analyzer. Unfortunately, no commercial systems were available that could automatically sample multiple gas cylinders and interface with the SO₂ analyzer. Diablo Analytical integrated off-the-shelf hardware components with a custom software application to produce the solution for the customer. A block diagram of the system is shown in Figure 2.

Hardware Components

The gas-cylinder autosampler system was built using a Valco 16-port sampling valve with a microelectronic actuator (VICI In-

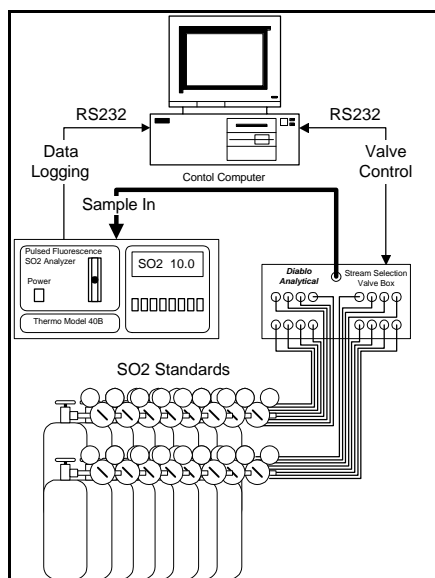


Figure 2: Block Diagram of the Automated SO₂ Analyzer System

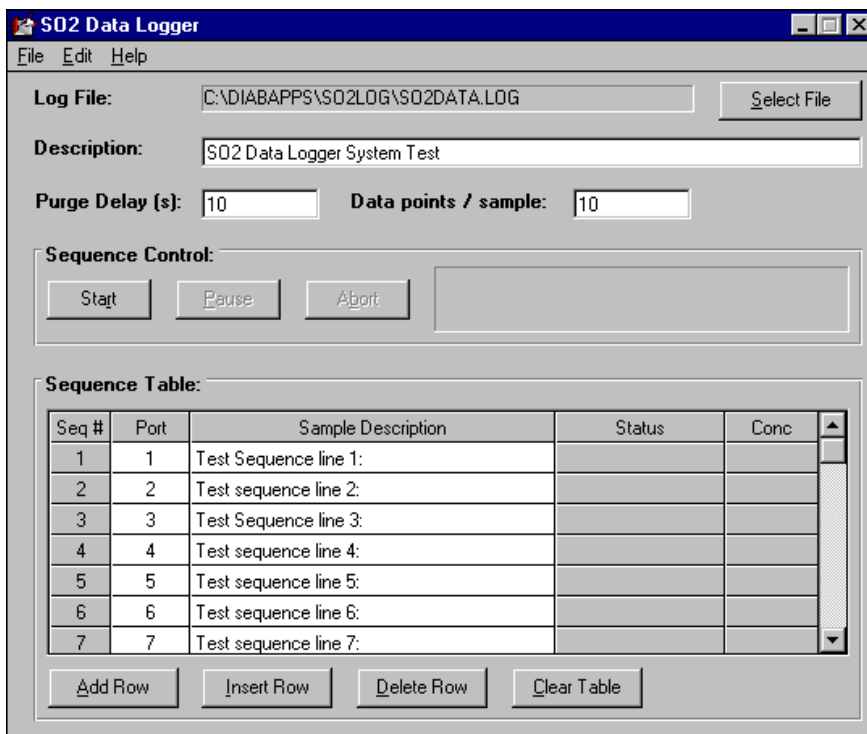


Figure 3: Screen shot of the data logging and sample sequencing custom software application

struments, Houston TX). The valve, actuator, and actuator control module were placed in an off-the-shelf enclosure. The valve’s 16 inlet and 1 outlet ports were connected to bulkhead fittings on the front of the enclosure for easy access. Power and RS-232 cable connectors were installed on the rear of the enclosure. The Thermo Model 40B Pulsed-Fluorescence SO₂ analyzer (Thermo Instruments) was unmodified for this application.

Software Components

A custom software application had to be written that could control the multiport sampling valve and log data from the SO₂ analyzer. The application was written using Visual Basic 4.0 (Microsoft, Redmond WA). A screen shot of the sequencing/data logging portion of the application is shown in Figure 3. The multiposition valve control software is shown in Figure 4. The application communicates with the valve controller and the SO₂ analyzer over two separate RS-

232 ports. The sequencing portion of the program allows the gas cylinders to be sampled in any order with a user-settable purge time. SO₂ concentration data is logged to a text file that can easily be imported into a spreadsheet for data analysis.

This custom system was developed, integrated, and delivered to the customer

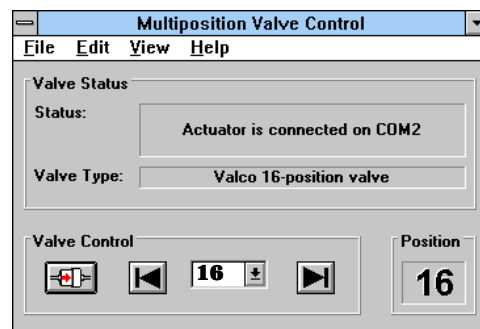


Figure 4: Screen shot of valve control software

within three weeks to meet their deadline.

High Purity Laboratory Gas Distribution Issues

The GC-AED requires a consistent supply of high-purity gases for optimal performance. Helium is used as both the GC carrier gas and as the AED's microwave plasma gas. Hydrogen, oxygen, and methane or 10% methane in nitrogen are used as plasma reagent gases. In addition, the AED spectrometer requires a continuous nitrogen purge. When common impurities such as N₂, O₂, CO, CO₂, or hydrocarbons contaminate the gas system through leaks, AED sensitivity for C, O, and N will obviously be reduced. Unfortunately, typical laboratory gas systems are usually far from leak-free and are often contaminated due to improper installation or materials of construction. These pre-

existing gas systems are adequate for many GC applications, but the GC-AED demands a cleaner gas system. When new laboratory gas systems are put in place they are often re-engineered at a substantial cost, with no guarantee of proper installation. We have personally experienced this in several previous labs. Consequently, we tried to address these issues during the design of our own development lab

Diablo worked closely with Matheson Gas Products to specify and install a Matheson LabGas System tailored specifically for the GC-AED. A diagram of this system is shown in Figure 5. In addition, the LabGas panels can be

seen on the wall in Figure 1. The LabGas System includes an automatic cylinder switchover for the helium supply and an ultra-high purity nitrogen generator for continuous AED spectrometer purge. All regulators are stainless steel and distribution tubing is constructed of semiconductor-grade electropolished or micro-cleaned stainless steel. Matheson leak checks all regulators and gas panels with a Helium mass spectrometer prior to on-site installation. A Valco Helium Purifier ("Getter") was also installed on the helium line to increase the purity of helium from "five 9's" to "six 9's". We are willing to share our gas distribution system experience with other AED customers.

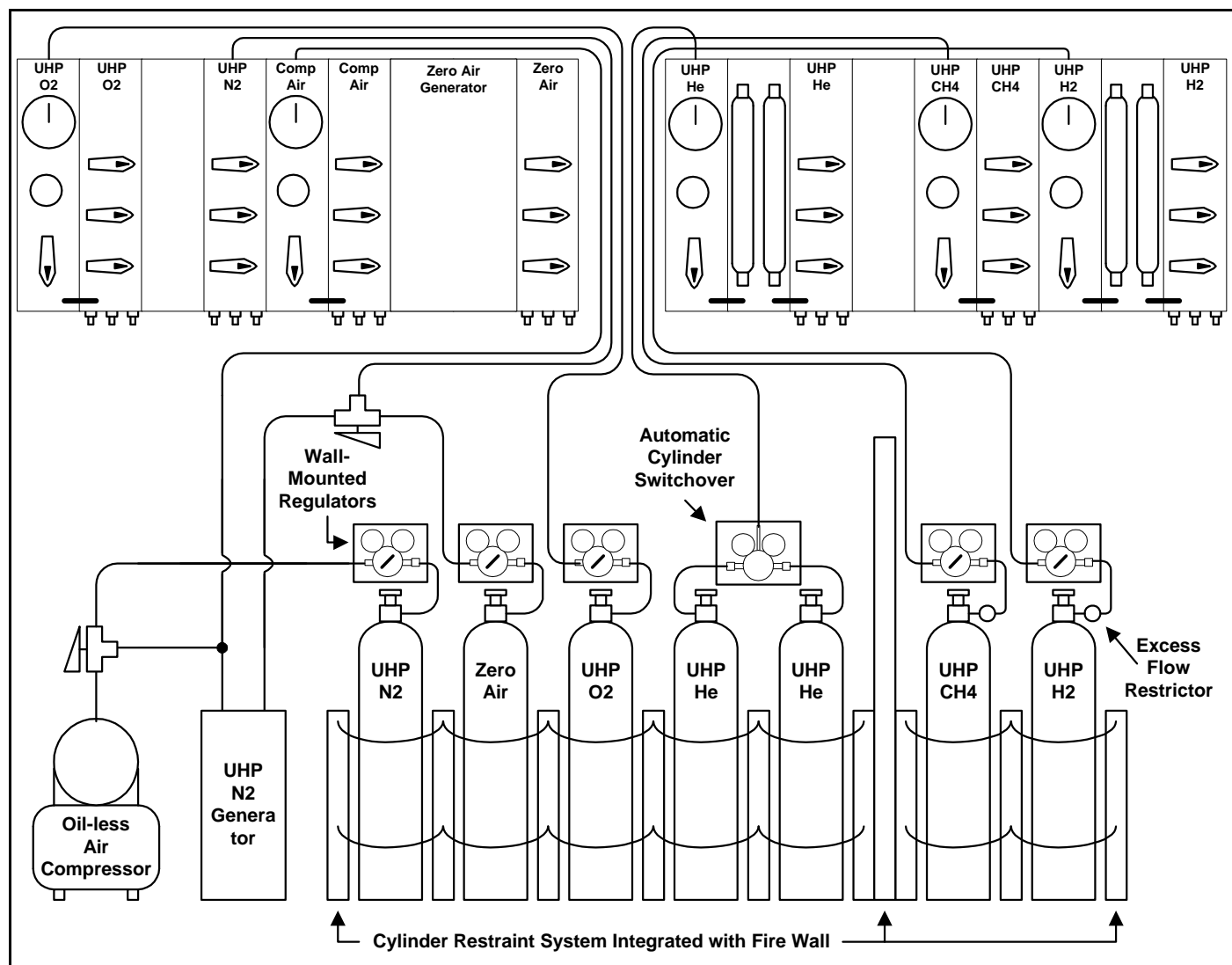


Figure 5: Diagram of a custom LabGas system designed by Matheson Gas Products and Diablo for the GC-AED.



Diablo Analytical, Inc.
1110 Burnett Ave, Suite C
P.O. Box 5889
Concord, CA 94524

Bulk Rate
U.S. Postage
PAID
Concord, CA
Permit No. 131

Recent Diablo Application Highlights

Bottle-Cap Leak Rate Measurement System. Diablo developed a chemical sensor based system to detect and monitor leaks from the bottle caps of semiconductor process reagent containers. The new system provided our client with leak rate information in minutes rather than the hours or days required by their existing method. The new system also produces improved quantitative results

Start-up and Performance Validation of an On-line Ammonia Analyzer. Diablo worked with a petroleum refinery and an instrument company to implement successfully an on-line ammonia analyzer. Diablo worked with site engineering, manufacturing and maintenance personnel to optimize the installation. The sampling system, auto-calibration, routine maintenance, data lines, and alarms were all considered

during the project. The analyzer performance was validated after instrument start-up, and personnel were trained to perform routine tasks.

In-Situ MS System for Gas System Purge Monitoring. Diablo developed a system to monitor the purging cycles of a semiconductor gas cabinet purge system. This in-situ MS system is based on a Hewlett-Packard Mass-Selective Detector with custom data acquisition macros.

FTIR Data System Macro Translation. Diablo translated a number of critical "legacy" Nicolet DX quantitation macros into versions that run under OMNIC, Nicolet's Windows-based FTIR data system. The OMNIC macros were created using Visual Basic and the Nicolet Macros/Pro routines.

Evaluation of Commercial Oxygen Analyzers for an "On-Tool" Semiconductor Application. Diablo evaluated commercial oxygen analyzer technology for a semiconductor process analysis application. Laboratory experiments were performed on the top analyzer candidates in order to determine critical performance characteristics.

On-Site GC-AED Training and Custom Macro Development. Diablo developed a custom training course for the GC-AED. The customer's environment and applications were considered during the course design and delivery. The training course was performed on the customer's site. We were also able to identify critical bottlenecks in our customer's data analysis processes, and we wrote custom GC-AED Pascal Macros to enhance productivity.