



# Distributed Temperature Monitoring Biomedical

## using the PointScan™ Series

### Application Note #52

### Application Summary

Monitoring hundreds of temperature points in a biomedical test lab requires more than just reliable hardware and software. A data acquisition system purchased for the job must also meet stringent FDA requirements for accuracy in alarming out-of-tolerance temperatures within an extremely narrow bandwidth. High accuracy is necessary to ensure the successful outcome of all laboratory testing that has millions of dollars at stake.

A leading biomedical test lab, ViroMed Laboratories, located in Minnetonka, Minn., provides high-quality services to the pharmaceutical and biotechnology industries and requires such a data acquisition system; one that can connect easily and efficiently to more than 400 temperature points in a highly-distributed facility. The facility is currently being remodeled in two phases, and a major upgrade includes installing an Ethernet distribution network.

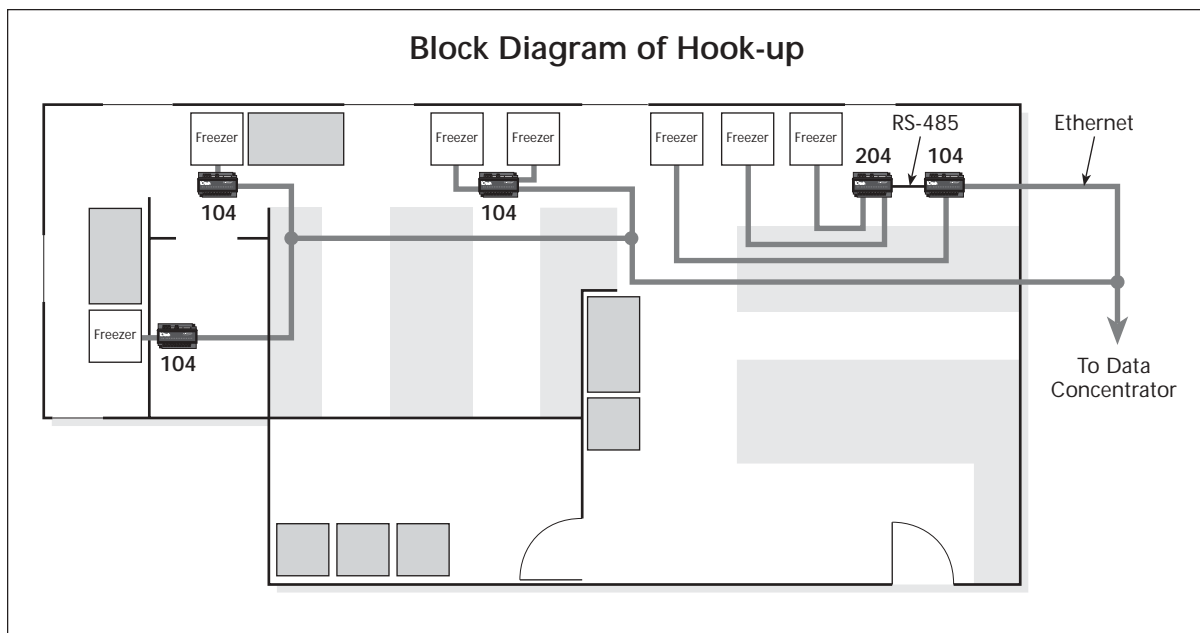
### Potential Solution

When Joe Estrem, Building Services Manager, looked into purchasing the needed data gathering and alarming equipment, he found that the hardware offered by several firms connected to the Ethernet bus, but their I/O modules provided only a single drop. Although

they could boast of a large capacity over the bus, the systems were virtually impossible to connect to the various individual devices widely spread around the test lab, which included freezers, coolers, incubators, dehydrogenation-sterilization ovens, and autoclaves. Making point-to-point connections through each single drop would have required a prohibitive amount of wiring.

### IOtech's Solution

Through his research and evaluation, Estrem found that IOtech's PointScan/104™ and PointScan/204™ modules were the best solution to his data acquisition and alarming requirements. PointScan modules connect to the Ethernet network and provide eight analog inputs that let Estrem connect thermocouples mounted to each device in the lab directly to the modules. This eliminates numerous wires while improving the signal-to-noise ratio, hence increasing system reliability. In addition, system accuracy requirements of less than 1°C for trending, reporting, and alarm set points are easily met. Such high accuracy ensures that ViroMed will continue to meet their goal of providing high-quality lab testing services to the healthcare, transplant medicine industries, and more recently, molecular diagnosis and clinical trials testing.



Four PointScan/104 and PointScan/204 modules presently connect to 32 thermocouples in the lab. Plans for completing the facility call for adding 50 more modules that can provide a capacity of up to 400 channels in a combination of thermocouples and sensors to measure room pressure and percent of CO<sub>2</sub>.



Estrem installed four modules during the first phase of the lab expansion, and plans to install additional PointScan modules in the second phase to measure more temperature points, plus room pressure and CO<sub>2</sub> concentrations. This will require an additional 50 modules that are planned to be running by the fourth quarter of 2003.

The PointScan modules connect to a central data-concentrator PC running Windows® NT at 500 to 700 MHz, but the main feature for the system is that of providing remote alarm signals over conventional phone lines. This was not a simple task to accomplish, but Estrem was able to devise a method of his own integrated with the supplied Citect™ software.

## Conclusion

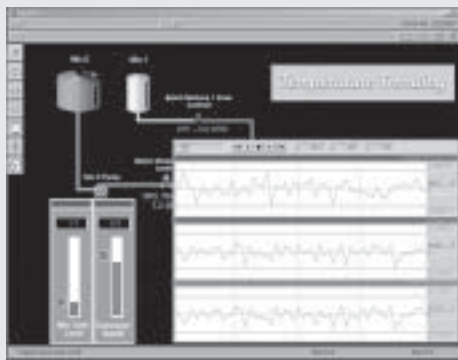
The problem of connecting a diverse array of laboratory equipment to a facility-wide Ethernet network was easily solved with a combination of IOtech PointScan/104 and PointScan/204 modules. The stringent requirements for accuracy were met while the wiring was kept to an absolute minimum. The only alternative solution offered was using Ethernet drops in 12 different locations and wiring to the laboratory equipment, but it was quickly deemed virtually impossible to interconnect a workable system. These turnkey systems also cost about ten times more and don't always offer the flexibility that IOtech equipment does. Other systems also had numerous inputs and a high price to reflect it. In comparison, IOtech modules offered a considerably lower price in the areas where only a few inputs were required, but have the ability to grow as the lab expands. That is, if only two inputs are needed at one time, IOtech modules with 8 inputs are much more economical than competing equipment that come with a minimum of 50 or 100 inputs.

## PointScan Series Distributed I/O

PointScan/104™ modules provide a single Ethernet 10BaseT port and a single RS-485 port, both isolated by 1,200 Vrms, while PointScan/204™ modules have an RS-485 port that communicates with the master controller PC using a two-wire, multi-drop party line. The 104 modules connect up to 8 differential-ended signal inputs and 4 to 20 mA inputs, with 16-bit Sigma-Delta A/D converters and programmable filter settings for noise rejection. The analog inputs are programmable to accept thermocouples, or mA, V, and mV signals. PointScan/104 module voltage inputs range from ±0.062 to ±10V with a 50 VDC maximum. The PointScan/204 modules also provide 8 differential-ended analog inputs that are used with strain gages, dc voltages, thermocouples, and 4 to 20 mA loops. Both the PointScan/104 and PointScan/204 modules have a full-scale accuracy of ±0.02% at 20°C, easily meeting most trending and alarming requirements.

### PointScan

- Over 40 I/O modules for measuring and controlling a wide variety of signals
- Cost-saving integrated terminal base for direct field wiring
- 4-, 8-, & 16-channel analog input module; up to 16-bit resolution
- 4- or 8-channel analog output modules; up to 14-bit resolution
- NIST-traceability for all analog I/O modules
- 8- or 16-channel isolated industrial digital I/O modules
- Economical combination analog/digital I/O modules
- 1200 Vrms isolation (module-to-communication port)
- Direct Ethernet connection (/100 series) 10BaseT @ 10 Mbps
- Direct RS-485 connection (/200 series)
- RS-232 or Ethernet gateway-based connection (/300 series)
- Hot-swap function for module substitution under power
- On-board diagnostics and status LEDs
- -30° to +70°C extended operating range
- Class I, Div 2 (hazardous location) compliance
- Space and cost saving compact form factor



### Included Software

Citect™ Windows®-based software features sophisticated graphics, trending/alarming, SPC/SQC, networking, web-connectivity, database management, and more. Unlike other "component-based" software offerings with costly add-on modules, Citect provides a complete solution in a single, tightly-integrated package. Citect software features a highly efficient, task-based client-server architecture tailored to meet the performance requirements for real-time monitoring and control.

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