

## Remote Monitoring of Medical Incubators for Temperature and CO<sub>2</sub> Level Accsense Remote Monitoring System

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**CAS DataLoggers** recently provided the data logging solution for a hospital storing valuable life science samples in medical incubators. These incubators needed to hold samples under precisely controlled conditions for long periods of time—if a problem occurred while the samples were under incubation, the samples would be lost along with the time the materials were being incubated.

The hospital's incubators were typically operated at a constant 37°C (99°F) and a 5% CO<sub>2</sub> level. Often, regulators required recording of incubator conditions since any deviations from these levels could cause serious problems. Therefore the hospital needed a remote datalogging solution to monitor its incubators and alert personnel if conditions inside the incubator suddenly went out of range.

The hospital installed an **Accsense A1-01a Wireless Environmental Data Logger** on top of its incubators, connected to an **Accsense B1-06 Wireless Data Logger Gateway** supporting up to 16 A1-01a sensor pods. A single A1-01a pod monitored temperature and CO<sub>2</sub> levels for two incubators, providing simple and reliable online monitoring. The data logger ranges extended up to 250' outdoors, 90' indoors without obstructions, and could also act as a repeater for other logger signals, running on battery or AC power.

Three different monitoring methods could be used with incubators, including direct monitoring independent of the incubator itself. Monitoring the analog outputs of the incubator by using the incubator sensors could also be performed, as well as monitoring of the alarm state of the incubator via the incubator sensors. In the first case, independent temperature and CO<sub>2</sub> sensors would have to be installed within the incubator work space. In the second and third cases, the incubator would have to be equipped with the appropriate outputs (often an option card from the incubator manufacturer) and a cable from the incubator to the sensor pod would have to be used. The hospital's incubators were monitored using the first method described above using direct sensors, which were ordered alphabetically; changing their names allowed a consistent order to the readings.

Designed for general environmental measurements, the wireless A1-01a datalogger pods featured internal temperature, humidity, light and vibration sensors measuring every incubation parameter, as well as external 4-20mA and 0-5V inputs and 2 digital inputs. Screw terminal connectors allowed connection to a wide range of external analog sensors, and the data loggers also included a +5Vdc output to power external sensors. In the event the gateway couldn't be reached, individual pods stored up to 255 data points until a connection was restored. The B1-06 wireless gateway formed the connection between the hospital's data and the internet, featuring built-in 10/100BaseT Ethernet and supported DHCP and static IP addressing as well as SSL Encryption for secure communication. Diagnostic LEDs provided clear status indication while the gateway's 1900-point sample data buffer further ensured constant and effective monitoring.



Additionally, the Accsense wireless temperature monitoring and alarming system provided the hospital with cloud-based data storage and reporting for hassle-free monitoring. Once connected to the B1-06 Wireless Gateway, the pods monitored and logged data with the ability to view and remotely access data in real-time. The B1-06 Wireless Gateway could send all the data to the secure Rackspace cloud server or as a local ASCII stream, which staff could incorporate into their own custom software including LabView. Data online could easily be downloaded as a CSV file and loaded into most database applications. Hospital staff downloaded measurement data for offline analysis, signed in to access reports and graphs, and could modify the system configuration from anywhere an internet connection was available. Sophisticated alarms monitored incoming data and could send email, pager or phone warnings to multiple designees whenever an alarm went off. The sensor filters were powerful enough that when the CO<sub>2</sub> content dropped to near-zero during a loading operation, the alarm was not triggered due to correct filter settings. An Accsense online account gave instant access to charts showing all measurement history with ranges as narrow as 5 minutes or as wide as 90 days, and also offered a customizable interface featuring a dashboard showing the most recent measurements from all sensor pods.

The hospital benefitted immediately from installing the Accsense wireless monitoring system in its medical incubators. The data loggers were used as a convenient temperature alarm system with email, pager or phone alert capabilities. Using the wireless data loggers made it possible to check the incubators before the samples had been destroyed, saving the cost of the time running the test and saving the samples in the incubator. The remote monitoring system saved significant time and money while increasing confidence in all the incubation test results. Once the readings were taken, a monitor was used to display CO<sub>2</sub> level data by percentage for an incubator, as well as link quality, supply voltage, temperature, ambient temperature, and probe temperature. Multiple incubators were monitored from a single screen, along with freezers, refrigerators and cryogenic freezers. Further, the Accsense system's cloud capabilities put the hospital's incubation data online to offer management easy data accessibility and analysis. This, combined with the data loggers' high accuracy, made for an effective continual monitoring solution.

For further information on the Accsense A1-01a Wireless Environmental Data Logger, the B1-06 Wireless Data Logger Gateway, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Analyst at (800) 956-4437 or visit the website at [www.DataLoggerInc.com](http://www.DataLoggerInc.com).

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