

Introduction to Monitoring with SNAP-IT

Part 1: Connecting to Real-World Assets and Equipment



Why should I monitor equipment?

To gain real-time business data without disturbing systems and processes.

Business data includes:

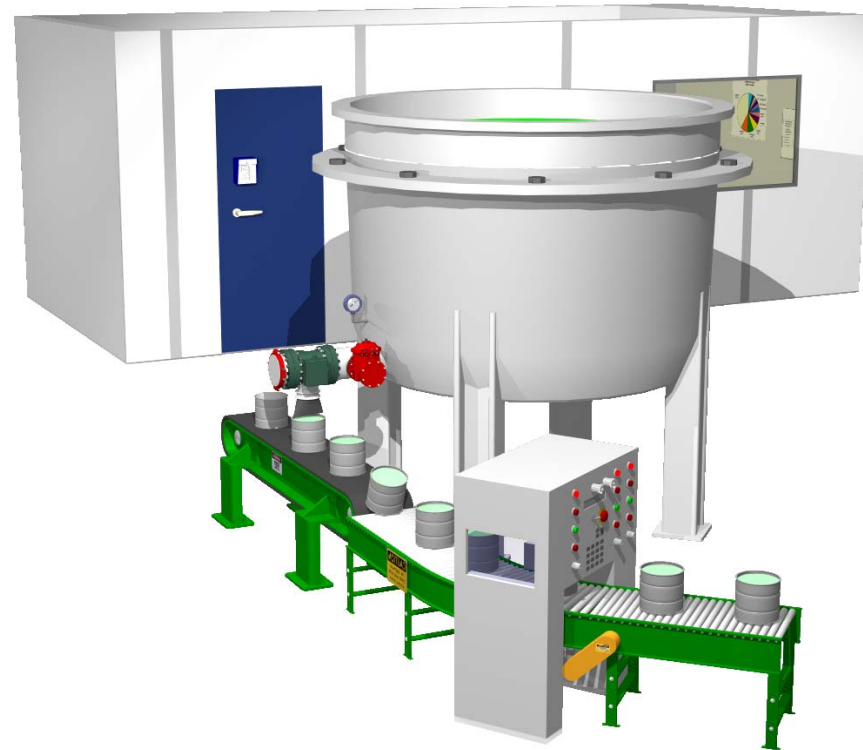
- Levels of raw materials
- Status of equipment and machines
- Temperatures, pressures, voltages, etc.
- Security access information
- Production counts
- Inventory
- Alarm status
- More

The purpose of a monitoring system is to extract data from a system or process without disturbing that process. An Opto 22 SNAP-IT™ system allows data to be gathered and shared without having any effect on the process being monitored. Monitoring offers several benefits, including:

- capturing real-time performance data
- providing critical maintenance information
- immediately detecting alarm conditions and equipment failures.

Making Connections

To gather the data, connections must be made between the SNAP-IT system and the equipment being monitored. While a qualified electrical installation or maintenance engineer should make the actual electrical connections, Information Technology (IT) staff need to understand how the connected equipment sends information to the monitoring system without affecting the equipment's normal operation.



To understand how to make the connections, you need to know two things: first, whether you will be monitoring *digital data* or *analog data* (or both), and second, whether you will be monitoring *voltage* or *current*.

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What types of data can I monitor?

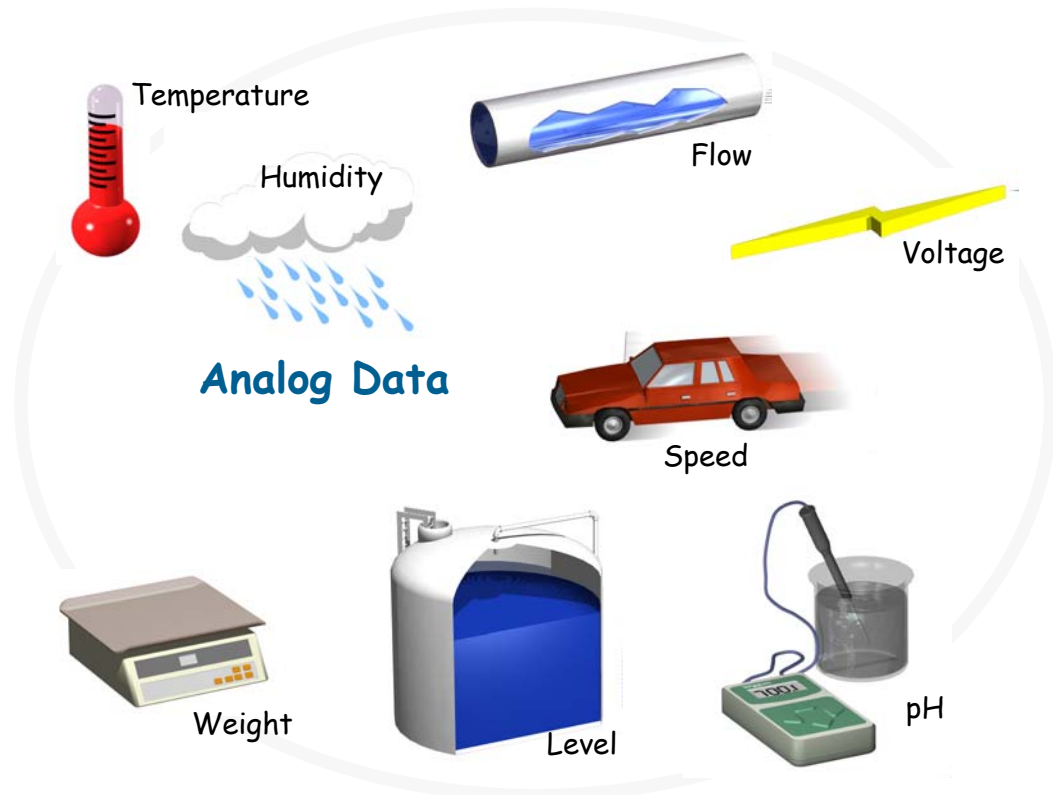
Digital Data

Digital data is data that can be in only one of two states: on or off. All digital data monitoring is accomplished by measuring voltage. The presence or absence of voltage is used to represent on/off, open/closed, alarm/OK, running/stopped, and so on.



Analog Data

Analog data is data whose value changes, so all analog data monitoring requires a measurement over a specified range of values. Temperature, level, pressure, flow, and voltage are all examples of analog data that can be monitored in computer control and monitoring systems. Other parameters frequently measured by monitoring systems include humidity, weight, pH, conductivity, speed, altitude, barometric pressure, and vibration.



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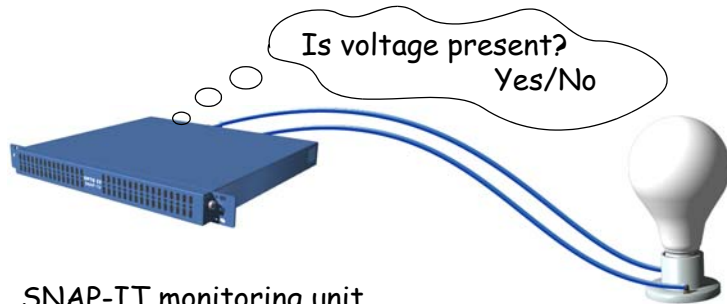
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How can the data be measured?

Digital Data

In the same way that you can manually use a voltmeter to test for voltage, a SNAP-IT unit containing a *digital input module* checks whether voltage is present in a circuit and converts this information to a data format that computers can understand. No modification to the circuit is needed, no relays are required, and no rewiring is required.

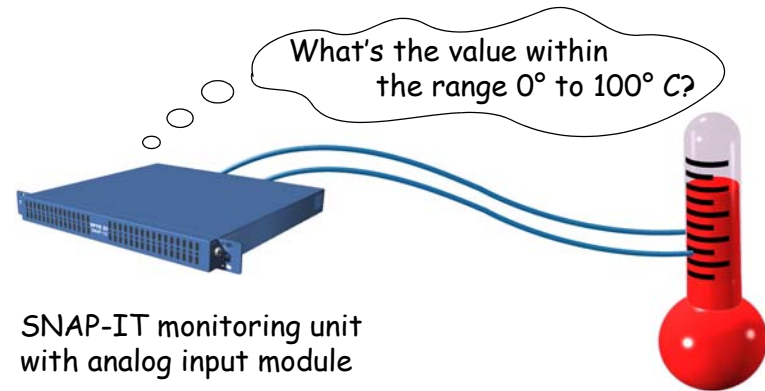


SNAP-IT monitoring unit with digital input module

Opto 22 SNAP digital input modules are available in a variety of voltages; the voltage to be measured determines the appropriate module to use.

Analog Data

The type of electrical signal used to measure the variety of analog data is chosen by instrument manufacturers, usually based upon industry standards and preferences. Many devices use small electrical currents between 4 milliamps (representing a minimum reading) and 20 milliamps (a maximum reading) to transfer analog values between instruments and control systems. Small voltages in the range from -10 volts to +10 volts are also used to represent analog values.



SNAP-IT monitoring unit with analog input module

A SNAP-IT unit containing an *analog input module* can measure the value of analog data and convert it to a format computers can use. Opto 22 offers a variety of SNAP analog input modules to interface easily with most standard instruments.



What's the difference between voltage and current?

Voltage and Current Compared

Think of voltage as the pressure of water against the sides of a hose or pipe, and think of current as the flow of water within the hose. For a given hose, more pressure results in more flow; similarly, more voltage results in more current.

Water in a hose



More pressure results in more flow.

Electricity



More voltage results in more current.

Measuring Voltage and Current

To measure the flow in the hose, we put a measuring device in line with the flow. To measure the water pressure, we determine how hard the water is pressing out on the sides of the hose.

Electrical parameters are monitored in the same way.

- To measure current, we place a measuring device *in line* with the current flow.
- To measure voltage, we connect *across* the device.

Whether current or voltage is being measured, the measuring device (the SNAP-IT unit) is designed so that it does not affect the operation of the device or circuit being monitored.

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How do I monitor voltage and current?

Suppose you have a light bulb and a power source: either DC (a battery) or AC (a plug in a wall outlet). You can monitor the power source's voltage and current using SNAP-IT.

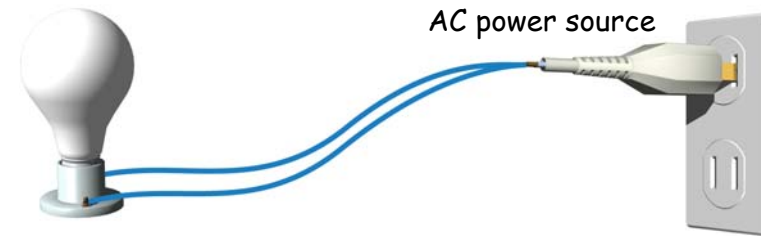
To monitor the voltage, you connect a module within the monitoring unit to the battery terminals.

To measure current, you connect a module within the monitoring unit to a current transformer (CT) placed around the wire through which the current flows. The CT senses the current and transmits a proportional current to the monitoring unit through the module.

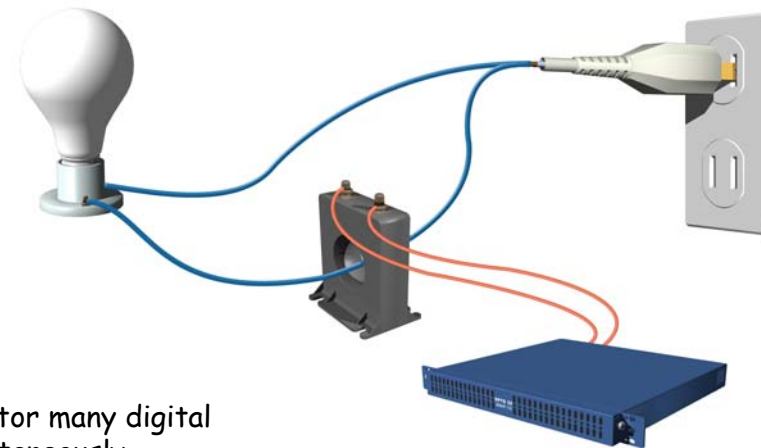
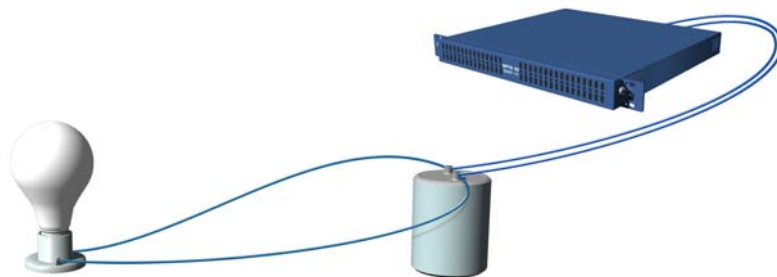
One Opto 22 SNAP-IT unit can monitor many digital and analog data points simultaneously.



Monitoring the Power Source's Voltage



Monitoring the Power Source's Current



CAUTION: Illustrations are simplified for example. Consult a trained electrician before designing actual systems.

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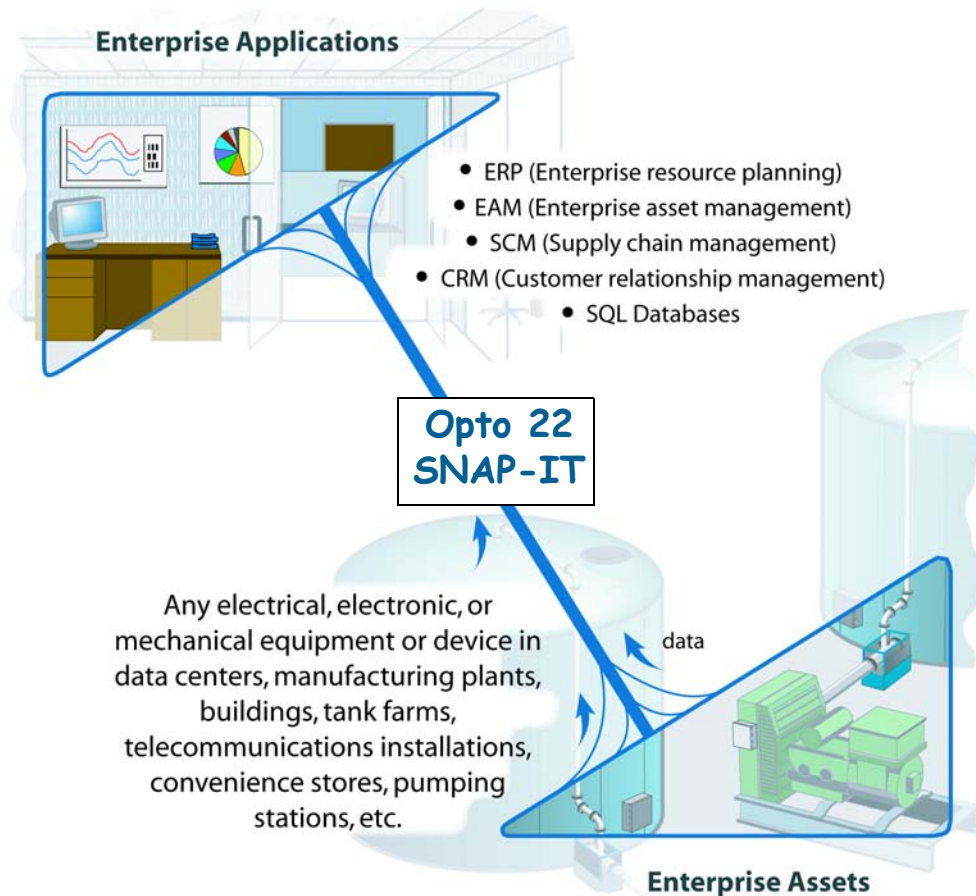
How does SNAP-IT connect to the Ethernet network?

Once electrically wired to the equipment, a standard Ethernet cable connects the Opto 22 SNAP-IT unit to the nearest Ethernet switch or hub,

automatically integrating into the IT installation. Each SNAP-IT unit has its own IP address and can serve data to any authorized computer on the network.

Using included software, the IT Department can configure additional functionality such as alarm messages, SNMP traps, and e-mail alerts or pages, and easily integrate the data into corporate applications using today's IT standards.

The Opto 22 SNAP-IT system can operate in parallel with existing control systems or PLCs without affecting the existing installation. While existing systems concentrate on the automation or operation of processes and equipment, SNAP-IT efficiently and effectively integrates real-time data into the IT network, directly delivering business-critical data to the corporate level of the organization.



Questions?

Opto 22's broad line of Ethernet-based SNAP-IT units and modules is optimized for acquiring and distributing data throughout your enterprise. Please feel free to contact your local Opto 22 representative or engineers at Opto 22 for product information and system recommendations.

Products

Opto 22 produces a broad array of reliable, flexible hardware and software products for industrial automation, remote monitoring, enterprise data acquisition, and machine-to-machine (M2M) applications.

SNAP Ethernet Systems

Based on the Internet Protocol (IP), SNAP Ethernet systems offer flexibility in their network connectivity and in the software applications they work with. The physical network may be a wired Ethernet network, a cellular wireless network, or a modem. A wide variety of software applications can exchange data with SNAP Ethernet systems, including:

- Opto 22's own ioProject™ suite of control and HMI software
- Manufacturing resource planning (MRP), enterprise management, and other enterprise systems
- Human-machine interfaces (HMIs)
- Databases
- Email systems
- OPC client software
- Custom applications
- Modbus/TCP software and hardware.



SNAP Ethernet system hardware consists of controllers and I/O units. Controllers provide central control and data distribution. I/O units provide local connection to sensors and equipment.

SNAP OEM Systems

Opto 22 SNAP OEM I/O systems are highly configurable, programmable processors intended for OEMs, IT professionals, and others who need to use custom software with Opto 22 SNAP I/O modules.



Linux® applications running on these systems can read and write to analog, simple digital, and serial I/O points

on SNAP I/O modules using easily implemented file-based operations. Applications can be developed using several common development tools and environments, including C or C++, Java, and shell scripts.

M2M Systems

Machine-to-machine (M2M) systems connect your business computer systems to the machines, devices, and environments you want to monitor, control, or collect data from. M2M systems often use wireless cellular communications to link remote facilities to central systems over the Internet, or to provide monitoring and control capability via a cellular phone.

Opto 22's Nvio™ systems include everything you need for M2M—interface and communications hardware, data service plan, and Web portal—in one easy-to-use package. Visit nvio.opto22.com for more information.

Opto 22 Software

Opto 22's ioProject and FactoryFloor® software suites provide full-featured and cost-effective control, HMI, and OPC software to power your Opto 22 hardware. These software applications help you develop control automation solutions, build easy-to-use operator interfaces, and expand your manufacturing systems' connectivity.



Quality

In delivering hardware and software solutions for worldwide device management and control, Opto 22 retains the highest commitment to quality. We do no statistical testing; each product is made in the U.S.A. and is tested twice before leaving our 160,000 square-foot manufacturing facility in Temecula, California. That's why we can guarantee solid-state relays and optically-isolated I/O modules *for life*.

Product Support

Opto 22's Product Support Group offers comprehensive technical support for Opto 22 products. The staff of support engineers represents years of training and experience, and can assist with a variety of project implementation questions. Product support is available in English and Spanish from Monday through Friday, 7 a.m. to 5 p.m. PST.

Opto 22 Web Sites

- www.opto22.com
- nvio.opto22.com
- www.internetio.com (live Internet I/O demo)

Other Resources

- OptoInfo CDs
- Custom integration and development
- Hands-on customer training classes.

Opto 22 manufactures and develops hardware and software products for industrial automation, remote monitoring, enterprise data acquisition, and machine-to-machine (M2M) applications. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's input/output and control systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, and electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel.

Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for quality and reliability.



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