What is Data Acquisition?

By: Engr. Yogeswaran s/o Seleappan, Grad. IEM

Data acquisition is the processing of multiple electrical or electronic inputs from devices such as sensors, timers, relays, and solid-state circuits for the purpose of monitoring, analysing and/or controlling systems and processes. Data acquisition instrument types include computer boards, instruments or systems, dataloggers or recorders, chart recorders, input modules, output modules, and I/O modules. Computer boards are self-contained printed circuit board with full data acquisition functionality; typically plugs into a backplane or motherboard, or otherwise interfaces directly with a computer bus.

Instruments or systems are fully packaged with input and output, user interface, communications capability, etc. They may include integral sensors. Data loggers and data recorders are data acquisition units with instrument functionality with specific capability for data storage. May be for general purpose or application-specific data acquisition. Chart recorders generate real-time plots, graphs or other visualisations of data. Figure 1 below shows a sample of Data Acquisition software which is broadly used in the industry.

Input modules are devices (module or card) configured to accept input of sensors, timers, switches, amplifiers, transistors, etc. for use in the data acquisition system. Output modules are devices with specific functionality for output of amplified, conditioned, or digitied signal. I/O modules have both input and output functionality. Digital or discrete I/O includes on-off signals used in communication, user interface, or control.

Common form factor for data acquisition devices include IC or board mount, circuit board, panel or chassis mount, modular bay or slot system, rack mount, DIN rail, and stand-alone. Common device specifications to
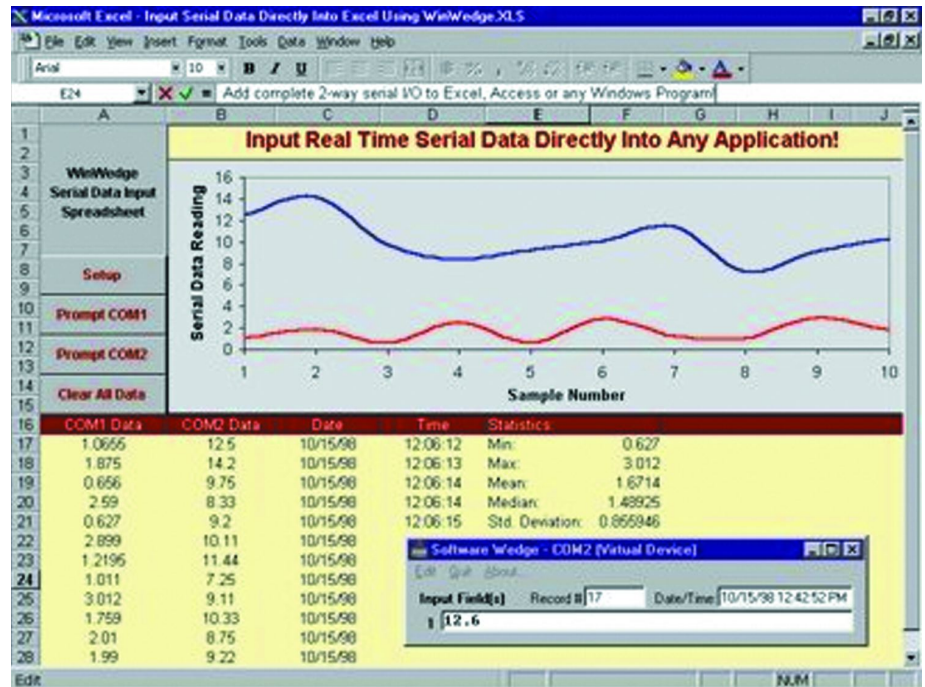

Figure 1: Sample of data acquisition software (source: Introduction on Data Acquisition Software)

consider when searching for data acquisition products include differential analog input channels, digital I/O channels, sampling frequency, resolution and accuracy. Common signal inputs available for data acquisition products include DC voltage, DC current, AC voltage, AC current, frequency, and charge. Sensor inputs include accelerometer, thermo-couple, thermistor, RTD, strain gauge or bridge, and LVDT or RVDT. Specialiced inputs include encoder, counter or tachometer, timer or clock, and relay or switch. Transducers and excitation are also important to consider when searching for data acquisition. Many products have integral sensors or transducers. These sensors can have voltage or current excitation. Common outputs for data acquisition products include voltage output, current output, frequency output, timer or counter output, relay output, and resistance or poten-tiometer output.

Considering the user interfaces available is important when searching for data acquisition products. User interfaces available include no display, front panel and display, touch screens, hand-held or remote programmers, and computer programmable. Host connection choices include direct backplane interface, RS232, RS422, ST485, USB, IEEE 1394, GPIB, SCSI, TTL, parallel, Ethernet, modem, and radio or telemetry. The transmission rate of data is important to consider. Many products are web enabled for web addressing. Common applications for data acquisition products include general lab or industrial, environmental, vehicular, marine, aerospace or military, seismic or geotechnical, weather or meteorology, and medical or biomedical. Additional specifications to consider when searching for data acquisition products include application software, memory and storage, network specifications, filter specifications, amplifier specifications, and environmental parameters. ■