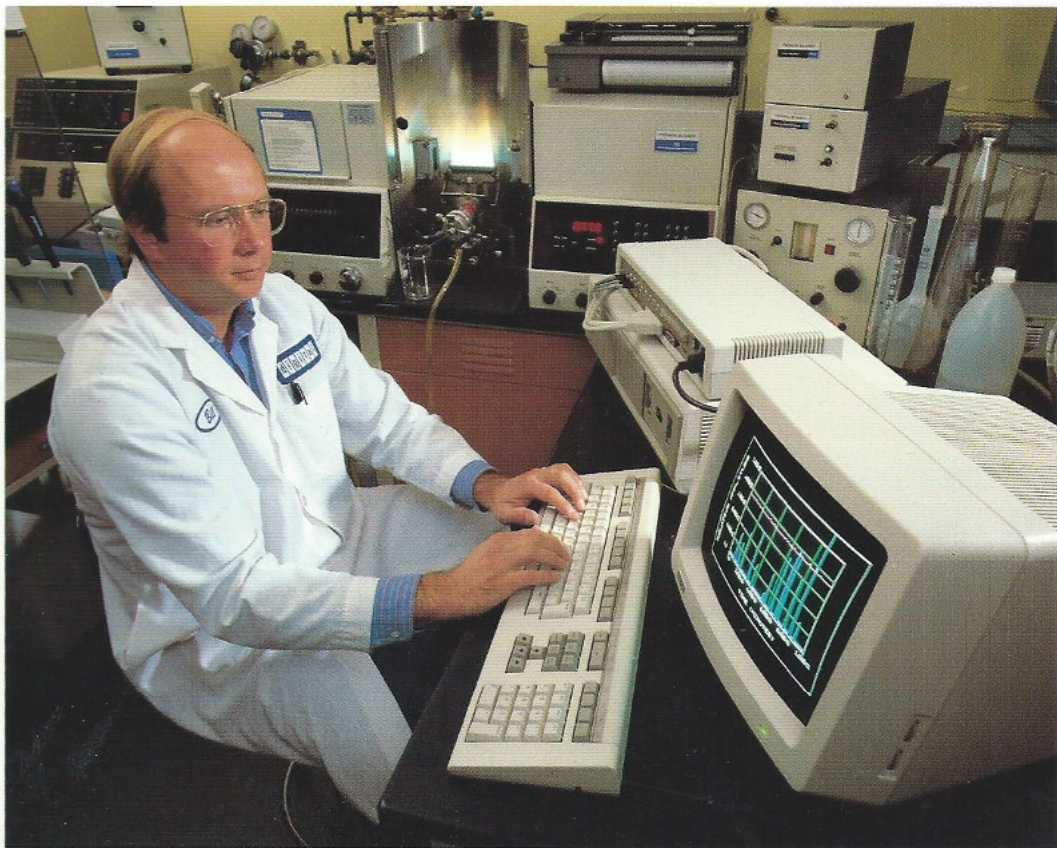# Professional™ Series

ANALOG DATA MODULE FOR THE PROFESSIONAL 300 SERIES

digital™

BENEFITS

The Analog Data Module (ADM) for the Professional 300 Series offers these advantages:

- Allows you to control experiments and automate data acquisition from instruments with analog outputs.
- Enhances the accuracy and resolution of collected data.
- Helps prevent loss of data if signals leave expected voltage ranges.
- Increases convenience and power for application development.
- Calibrates itself with precise on-board voltage sources.
- Installs easily and quickly.
- Comes with 90-day warranty and option for long-term Digital hardware and software service.

PRODUCT DESCRIPTION

The Analog Data Module adds high accuracy analog data acquisition to the Professional 350 and Professional 380 real time I/O capabilities. Specially designed for interfacing to analytical instruments, the ADM can precisely acquire voltage values that vary in magnitude from a few microvolts to 5 volts. Digital input and output capabilities facilitate control of experimental devices and allow recording of sample numbers and related information for automated testing. Sampling can be triggered by an external signal or synchronized with the on-board real time clock.

The ADM connects to a Professional via the Real Time Interface (RTI) parallel digital port. The RTI's two serial asynchronous ports and IEEE-488 bus interface can be used concurrently with the ADM; the ADM package includes connectors for these ports as well as its own.

The ADM enables you to monitor and control your research instruments. With the Professional and its powerful library of software packages you can

- analyze the resulting data
- graphically display findings
- generate reports
- communicate with a host computer or network.

ANALOG INPUTS

The ADM's eight true differential analog input channels are multiplexed to a 16-bit analog-to-digital converter for high accuracy data conversion. Prior to conversion, the signal can be amplified by a Programmable Gain Amplifier with gain settings of 1, 4, 16, and 64 to enhance precision in measuring low-level signals. The amplifier can be programmed for gain or set to autoranging mode, in which the optimum gain setting is automatically selected before each sample is acquired. With autoranging, the ADM's dynamic range is 132dB.

The ADM's analog front end also includes an auto-zero circuit to reduce the effects of system offset errors. It also includes circuits that enable calibration under program control to maintain accuracy over temperature range. The system will accept bipolar inputs from -5 volts to +5 volts full scale.

DIGITAL I/O

In addition to analog input channels, the ADM includes an 8-bit parallel digital input port and an 8-bit output port to facilitate handshaking with instruments and allow digital data transfers. Each bit on the input port can be used to independently trigger one of the analog input channels. In addition, the value of each input bit is associated with an analog input channel and is stored with the analog sample value for subsequent use. These bit values can indicate start/end events for sampling on a channel, the status of the channel, or any other user-defined condition. Pulses on the digital input port can be used instead of the ADM real time clock to synchronize data acquisition.

The digital output port uses TTL logic levels. The input port not only will accept TTL voltage representations, but also will accept inputs over a broader voltage range to allow switch closure and other user-defined signals to be acquired. The digital I/O ports on the ADM can be used to transfer 8-bit data values as well as for instrument control. Inputs can be synchronized with the ADM real time clock.

REAL TIME CLOCK

An on-board programmable real time clock provides a precise internal source of trigger signals for analog and digital inputs. The user specifies in software the desired frequency at which samples should be acquired. One rate is used for all analog and digital inputs at a time.

BUFFER MEMORY

An on-board First-In, First-Out (FIFO) memory provides buffer space for more than 40 analog sample values. The FIFO allows data acquisition to continue without lost sample values while the host Professional performs other required operations such as managing buffers of acquired data or displaying results. The FIFO automatically fills when data are acquired faster than they can be transferred to the host system; if the FIFO is overrun, an error message is returned.

REAL TIME INTERFACE PORTS

The host Professional 300 system communicates with the ADM over the parallel digital port of the Professional Real Time Interface (PC3XX-AA). When the ADM is in use, the RTI's parallel port cannot be used for other tasks. The RTI's two serial asynchronous ports and IEEE-488 bus port can be used concurrently with the ADM. The ADM package includes connectors for these ports.

SOFTWARE

High level software support for the ADM and RTI is provided in the Professional Real Time Interface Library (PRTIL), a set of subroutines that can be called from user-written FORTRAN, BASIC-PLUS-2, or PASCAL programs. ADM support routines allow you to:

- acquire analog data and store values in memory or directly on disk
- set data acquisition parameters such as sampling frequency, type of trigger signal, data format
- acquire or send digital values over the ADM parallel ports
- plot data
- check acquisition status
- perform utility operations, such as converting from voltage to other physical units, checking, setting, and clearing bits in data values, changing the method of representation from integer to floating point or from BCD to integer and the reverse, and others.

PRTIL also includes an example program designed for interactive analog data acquisition applications. Programming is not required; you can request all parameter settings interactively.
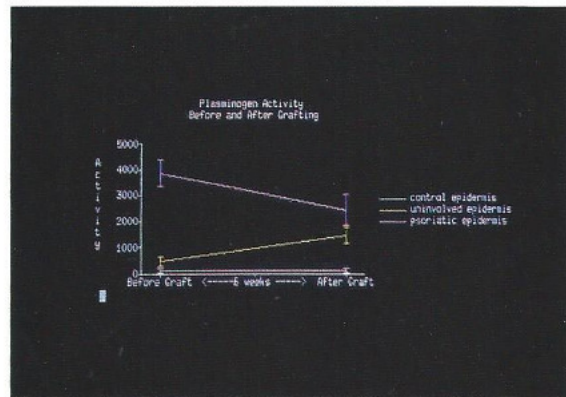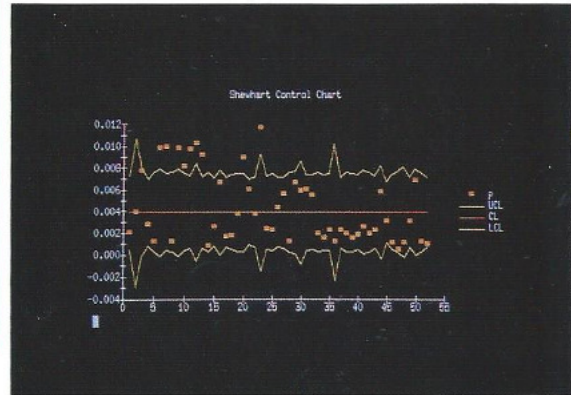
PRTIL includes procedures to move data from files created by the ADM data acquisition routines to RS/1™ tables. RS/1 then provides integrated data management, analysis, and display capabilities.

PRTIL supports I/O operations that are synchronous or asynchronous with the calling task. PRTIL allows the user to signal when I/O operations are complete with event flags so that other tasks can be synchronized with real time tasks. All ADM and RTI functions (except the RTI parallel port when the ADM is used) can operate concurrently.

SYSTEM REQUIREMENTS

The ADM requires a Real Time Interface for its host Professional. The RTI hardware is compatible with any Professional 300 system and requires one option slot.

Programming the RTI requires a Professional Host Tool Kit or PRO/Tool Kit. The RTI and ADM can be programmed with Tool Kit MACRO-11, or with PRTIL, which requires a Tool Kit and all its prerequisites. PRTIL subroutines can be called from Tool Kit FORTRAN-77, Tool Kit BASIC-PLUS-2, or Tool Kit PASCAL. PRTIL requires P/OS Hard Disk for program development and execution.

PACKAGING AND CONNECTIONS

The ADM is packaged separately from the Professional and RTI. It comes complete with its own power supply, and includes a 6-foot cable that interfaces to the RTI I/O connector on the Professional.

The ADM front panel provides 4-position mate-and-lock connectors for analog inputs. These connectors include positions for positive, negative, return, and guard signals. Also packaged with the ADM are eight mating connectors and 32-feet of shielded signal cable.

ADM digital I/O connections are implemented with a push-pin terminal strip. Two 25-pin subminiature D male connectors and a standard IEEE-488 connector provide serial and IEEE-488 I/O capabilities.

The ADM cable inserts into the RTI connector on the back panel of the PRO. With the ADM, no RTI external cabling or connection options are required.

SUPPORT

Digital Equipment Corporation supports the ADM and RTI with a complete range of hardware, software, and training services.

ORDERING INFORMATION

The Real Time Interface is a prerequisite for the ADM. Only the PC3XX-AA option is required. RTI external cables and connectors are NOT required. RTI includes a module with internal cable, back panel connector, installation manual, and English-language owners manual.
ORDER: PC3XX-AA

OPTION
Analog Data Module with interface cable to RTI, installation and English-language owners manuals, 120 volts line cord, and analog connectors and cable.
ORDER: ADMPC-AA

OPTION
Professional Real Time Interface Library (PRTIL) including subroutine library for ADM and RTI, device driver for RTI, example programs, and English-language programmers reference manual.
For Professional 300 Series system running P/OS Hard Disk V1.7 or later and the PRO/Tool Kit, use PRO/Tool Kit Real Time Interface Library.
ORDER: QBA58-A3
For PDP-11 or VAX/VMS host systems running Host Tool Kit, use Professional Real Time Interface Library for development.
ORDER: QJ076-AM or -AH for RSX-11M/M+
ORDER: QE355-AY for VAX-11/780
       QD355-AG for VAX-11/750
       QC355-AG for VAX-11/730

SPECIFICATIONS

Analog Inputs
- 8 true differential channels
- Programmable Gain Amplifier
- Software Selectable gains of 1, 4, 16, 64
- Gain accuracy: 0.020% @ x1
                 0.035% @ x4
                 0.050% @ x16
                 0.080% @ x64
- CMRR (min): 74dB
- Input Impedance: 1×10 (7) ohms

Analog-to-Digital Converter (including sample & hold):
- Full Scale Input Ranges:
     Bipolar: -5 to +5VDC
- Monotonicity: 14 bits
- Differential nonlinearity: 65525 states <1LSB
- Resolution: 16 bits
- Relative Accuracy Error: ± 8 LSB
- Offset Error adjustable to: ± 2 LSB
- FS Gain Error adjustable to: ± 4 LSB
- Temperature Coefficients:
     Differential Linearity: ±0.07 LSB/deg C
     Bipolar offset: ±0.63 LSB/deg C
     Gain: ±0.82 LSB/deg C
- RMS Noise (Max):   1.0 LSB
- Peak Noise (Max):   3.0 LSB
- Conversion Time (Max.):
     Gains 1, 4:   200 microsec
     Gains 16, 64:   400 microsec
- Autoranging enabled: 400 microsec

Digital Inputs
- 8 bits total
- Min voltage to set logic level 1: 1.6VDC
- Max voltage to reset logic 0: 0.8VDC
- Max voltage range: 115VDC
- Min input impedance: 12K ohms
- Min trigger pulse width: 200nsec
- Trigger polarity: negative going

Digital Outputs
- 8 bits total
- Min voltage for logic level: 2.40VDC
                               @ 15MA

Real Time Clock
- Software selectable sampling intervals
  Max sampling interval: 16.32 sec
  Min sampling interval: 8 microsec

Connections
- Analog: Switchcraft TA4F 4-pin Connector
- Digital: Push pin terminal strip
- Serial: two 25-pin subminiature D (male)
- IEEE-488: IEEE-488 standard connector
- Host Connection: 6-foot cable to Professional 300 back panel

Environmental
Operating Temperature: ±10 to ±40 °C
Humidity: 10% to 80%
FCC Classification: Class A qualified

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