

3

ADAM-5000/485 System

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3.1 Overview

The ADAM-5000/485 series is a data acquisition and control system which can control, monitor and acquire data through multichannel I/O modules. Encased in rugged industrial grade plastic bases, the systems provide intelligent signal conditioning, analog I/O, digital I/O, RS-232 and RS-485 communication. Each system can handle up to any 4 combinations of I/O modules (64 I/O points). The systems communicate with their controlling host over a multi-drop RS-485 network.

3.2 Major Features of the ADAM-5000/485 System

The ADAM-5000/485 system consists of two major parts: the system kernel and I/O modules. The system kernel includes a CPU card, a power regulator, a 4-slot base, a built-in RS-232 communication port and a pair of built-in RS-485 ports. It also offers the following major features:

The CPU's Basic Functions

The CPU is the heart of the system and has the following basic functions:

- Data acquisition and control for all I/O modules in the system
- Linearization of T/C (Thermocouple)
- Communication software and command set
- Calibration software and command set
- Alarm monitoring
- Management of the EEPROM device that holds the system parameters
- Data transformation
- Diagnosis

Diagnosis

There are 4 LEDs (indicated as PWR, RUN, TX and RX) to provide visual information on the general operation of the ADAM-5000 system. The LEDs also indicate the error status when the ADAM-5000 system performs the self test. Besides the LED indicators, the system also offers software diagnosis via the RS-232 port. For details, refer to Chapter 7.

3-Way Isolation and Watchdog Timer

Electrical noise can enter a system in many different ways. It may enter through an I/O module, a power supply connection or the communication ground connection. The ADAM-5000 system provides isolation for I/O modules ($3000\text{ V}_{\text{DC}}$), communication ($2500\text{ V}_{\text{DC}}$) and power ($3000\text{ V}_{\text{DC}}$). The 3-way isolation design prevents ground loops and reduces the effect of electrical noise to the system. It also offers better surge protection to prevent dangerous voltages or spikes from harming your system. The system also provides a Watchdog timer to monitor the microprocessor. It will automatically reset the microprocessor in ADAM-5000 system if the system fails.

Remote Software Configuration and Calibration

The ADAM-5000 system merely issues a command from the host computer, you can change an analog input module to accept several ranges of voltage input, current input, thermocouple input or RTD input. With the exception of system node address, all the parameters including speed, parity, HI and LO alarm, and calibration parameters setting may be set remotely. Remote configuration can be done by using either the provided menu-based software or the command set's configuration and calibration commands. By storing configuration and calibration parameters in a nonvolatile EEPROM, the systems are able to retain these parameters in case of power failure.

Flexible Alarm Setting

The ADAM-5000 system provides a flexible alarm setting method via an utility software (ADAM.EXE) between analog input modules and digital output modules. The user may configure a point of any digital output module plugged into any slot as the High alarm or Low alarm output of a channel of an analog input module. The relation-

ADAM-5000/485 System

ship and their High/Low alarm limits may be downloaded into the system's EEPROM by the host computer.

The alarm functions can be enabled or disabled remotely. When the alarm function is enabled, the user may select whether the digital output is triggered. If the digital outputs are enabled, they are used to indicate the High and Low Alarm state. The High and Low alarm states can be read at any time by the host computer.

Every A/D conversion will be followed by a comparison with the High and Low limit. When the input value is over the High limit or below the Low limit, the High or Low alarm state is set to ON.

There are two alarm mode options: Momentary and Latching.

If the alarm is in Latching mode, the alarm will stay on even when the input value returns within limits. An alarm in Latching mode can be turned OFF by issuing a Clear Alarm command from the host computer. A Latching alarm is cleared by the microprocessor when the opposite alarm is set

For example, the alarm is in latching mode and the High alarm is turned ON. When the module receives a value that is lower than the Low alarm limit, the microprocessor will clear the High alarm and turn the Low alarm ON.

When the alarm is in Momentary mode, the alarm will be turned ON when the input value is outside of alarm limits and OFF while the input value remains within alarm limits. The arrangement of coupling High and Low alarm states with digital outputs may be utilized to build ON/OFF controllers that can operate without host computer involvement.

Connectivity and Programming

ADAM-5000/485 systems can connect to and communicate with all computers and terminals. They use either RS-232 or RS-485 transmission standards and communicate with ASCII format commands. However, users can only select and use one communication port at any time. All communications to and from the system are performed in ASCII, which means that ADAM-5000 systems can be programmed in virtually any high-level language. The details of all

commands will be covered in Chapter 6.

3.3 System Setup

A Single System Setup thru the RS-232 Port

If users would like to use a PC to locally control and monitor a simple application, the ADAM-5000 system provides up to 64 points and front-end wiring through the RS-232 port to the host computer.

A Distributed I/O Setup thru the RS-485 Network

The RS-485 network provides lower-noise sensor readings as the systems can be placed much closer to the source. Up to 256 ADAM-5000 systems may be connected to an RS-485 multi-drop network by using the ADAM RS-485 repeaters, extending the maximum communication distance to 4,000 ft. The host computer is connected to the RS-485 network from one of its COM ports through the ADAM RS-232/RS-485 converter.

To boost the network's throughput, the ADAM RS-485 repeaters use a logical RTS signal to manage the repeater's direction. Only two wires are needed for the RS-485 network: DATA+ and DATA-. Inexpensive, shielded twisted-pair wiring is employed.

3.4 Technical Specifications of the ADAM-5000/485

Processor

CPU	80188, 16-bit microprocessor
RAM	32KB
ROM (Flash)	128KB
I/O Capacity	4 slots
Watchdog Timer	Yes
Power Consumption	1.0W

ADAM-5000/485 System

Communication

RS-485 Ports	2, 1 each for input and output
Extended RS-232 Ports	1
Wiring	RS-485, twisted pair
Speed	1200 Kbps to 115.2 Kbps
Max. Communication Distance	4000 ft. (1.2 Km)
Network Expansion	Up to 256 ADAM-5000 systems per host serial port over twisted pair wires
Protection	Transient suppression on RS-485 communication lines
Protocol	ASCII command/response
Asynchronous Data Format	1 start bit, 8 data bits, 1 stop bit, no parity (1 start, 8-N-1)
Communication Error Check	With checksum

Isolation

Power	3000 Vdc
Input/Output	3000 Vdc
Communication	2500 Vdc

Diagnosis

Status Indicators	<ul style="list-style-type: none">- Power- CPU- Communication- I/O modules
Self-Test	Yes, while on
Software Diagnosis	Yes

Basic Function Block Diagram

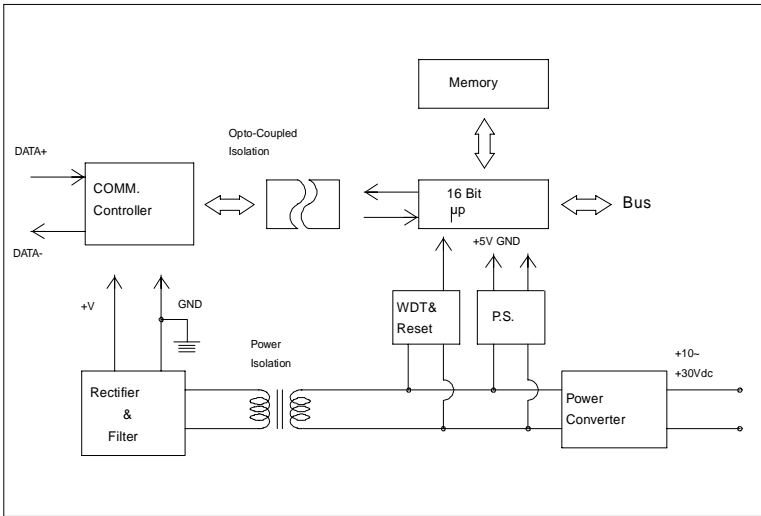


Figure 3-1 Function block diagram

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