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ADAM-6000 Series

**Ethernet-based
Data Acquisition and
Control Modules**

User Manual

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June 2017 8th Edition

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- The exact wording of any error messages

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CHAPTER 1

Understanding Your System

Sections include:

- Introduction
- Major Features
- Specifications
- Dimensions
- LED Status

Chapter 1 Understanding Your System

1.1 Introduction

ADAM-6000 Ethernet-based data acquisition and control modules provide I/O, data acquisition, and networking in one module to build a cost-effective, distributed monitoring and control solution for a wide variety of applications. Through standard Ethernet networking, ADAM-6000 retrieves I/O values from sensors, and can publish them as a real-time I/O values to networking nodes via LAN, Intranet, or Internet. With Ethernet-enabled technology, ADAM-6000 series modules build up a cost-effective DA&C system for building automation, environmental monitoring, facility management and intelligent manufacturing applications. Please refer to Figure 1-1 for a brief overview of the ADAM-6000 system architecture.

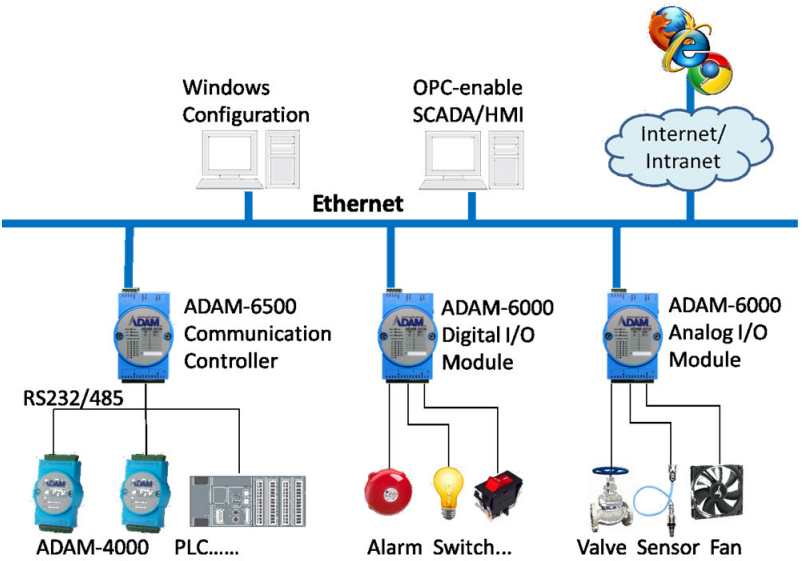


Figure 1.1: ADAM-6000 System Architecture

1.2 Major Features

1.2.1 Ethernet-enabled DA&C I/O Modules

ADAM-6000 is based on popular Ethernet networking standards used in most business environments. Users can easily add ADAM-6000 I/O modules to existing Ethernet networks, or use ADAM-6000 modules in new Ethernet-enabled manufacturing networks. ADAM-6000 modules feature a 10/100 Mbps Ethernet chip and support popular industrial Modbus/TCP protocols over TCP/IP for data connection. ADAM-6000 also supports UDP protocol over Ethernet networking. With UDP/IP, ADAM-6000 I/O modules can actively send I/O data streams to 8 Ethernet nodes. Through Ethernet networking, HMI/SCADA systems, and controllers, users can access or gather real-time data from ADAM-6000 Ethernet enabled DA&C modules. This data can then be integrated with business systems to compile valuable business information.

Note: Some intelligent functions are only provided by the ADAM-6000-CE version. See details in Appendix F.

1.2.2 Intelligent I/O Modules

ADAM-6000 series have pre-built intelligent math functions to empower system capacity. The Digital Input module provide counter, totalizer functions; the Digital Output module provide pulse output, delay output functions; the Analog Input module provide the max./min./average data values and the Analog Output module provide the PID loop control functions.

1.2.3 Mixed I/O to Fit All Applications

ADAM-6000 series mixed I/O design provides the most cost-effective I/O for applications. The most common used I/O type for single functions are collected in one module. This design concept not only saves I/O usage and costs, but also speeds up I/O relative operations. For small DA&C system or standalone control units from mid to large scales, ADAM-6000's mixed I/O design can easily adapt to application needs with one or two modules only. With additional embedded control modules, ADAM-6000 can easily create a localized, less complex, and more distributed I/O architecture.

1.2.4 Remote Monitoring & Diagnosis

Each ADAM-6000 module features a pre-built I/O module web page to display real-time I/O data values, alarms, and module status thru LAN or Internet. Through any Internet browser, users can monitor real-time I/O

data values and alarms at local or remote sites. The web-enabled monitoring system requires no programming.

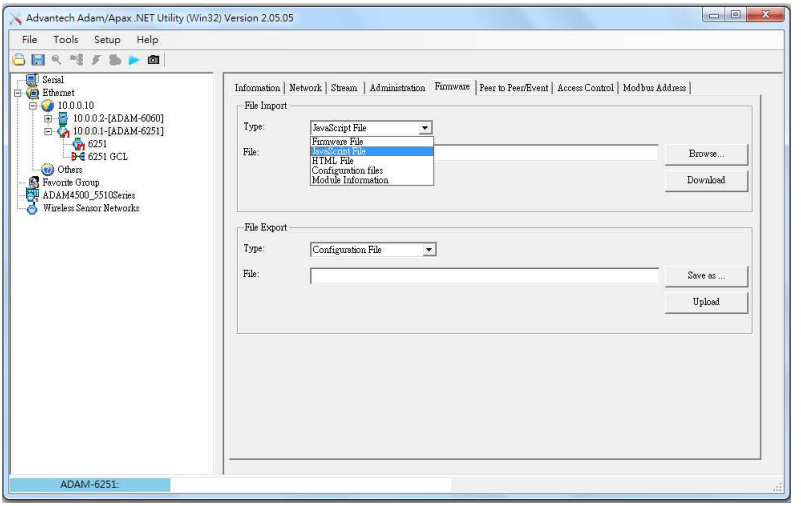
1.2.5 Industrial Standard Modbus/TCP Protocol

ADAM-6000 modules support the popular industrial standard, Modbus/TCP protocol, to connect with Ethernet Controller or HMI/SCADA software built with Modbus/TCP drivers. Advantech also provides an OPC server for Modbus/TCP to integrate ADAM-6000 I/O real-time data values with OPC client enabled software, freeing users from driver development.

1.2.6 Customized Web Page

Since ADAM-6000 modules have a built in default web page, users can monitor and control the I/O status from anywhere through a browser. Moreover, ADAM-6000 modules can download user-defined web pages for individual applications. Advantech has provided sample programs of Java Script* for users reference to design their own operator interface, then download it into the specific ADAM-6000 modules via Windows Utility.

*ADAM series support JavaScript libraries (*js files), users can import this file from the ADAM utility tool. Java Scripting language works with WWW and HTML documents and objects. ADAM provides basic libraries via jQuery v1.8.2 software on the CD package, users can update new versions online from http://jquery.com/download/



Note: Download the JavaScript file to the ADAM Module via the Adam/Apax Utility

1.2.7 Modbus/TCP Software Support

The ADAM-6000s firmware has a built-in Modbus/TCP server. Advantech provides the ADAM.NET class library and Windows ADAM.NET utility for users. Users can configure this DA&C system via Windows utility; integrate with HMI software package via Modbus/TCP driver. Users can also purchase an Advantech OPC server to operate Modbus/TCP.

1.3 Specifications

Ethernet:	10/100 Base-T
Wiring:	UTP, category 5 or greater
Bus Connection:	RJ45 modular jack
Comm. Protocol:	Modbus/TCP on TCP/IP and UDP
Data Transfer Rate:	Up to 100 Mbps
	Unregulated 10 to 30 VDC
Status Indicator:	Power, CPU, Communication
	(Link, Collide, 10/100 Mbps, Tx, Rx)
Case:	PC with captive mounting hardware
Screw Terminal Block:	Accepts wire size #14-28 AWG, stripped length:6.5 mm

NOTE: Equipment will operate below 30% humidity, however, static electricity problems occur much more frequently at lower humidity levels. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low humidity environments.

1.4 Dimensions

The following diagram shows the dimensions of the l/O modules. (mm)

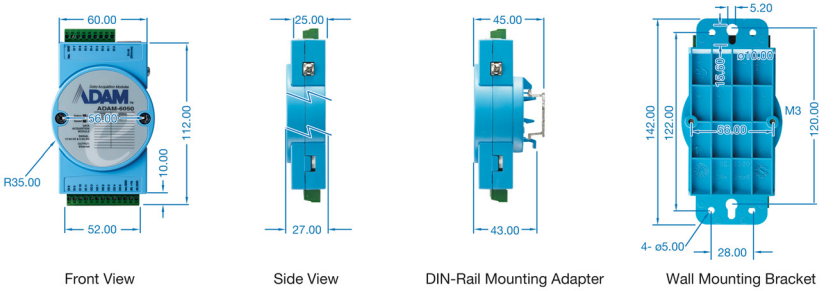


Figure 1.2: ADAM-6000 Module Dimension

1.5 LED Status

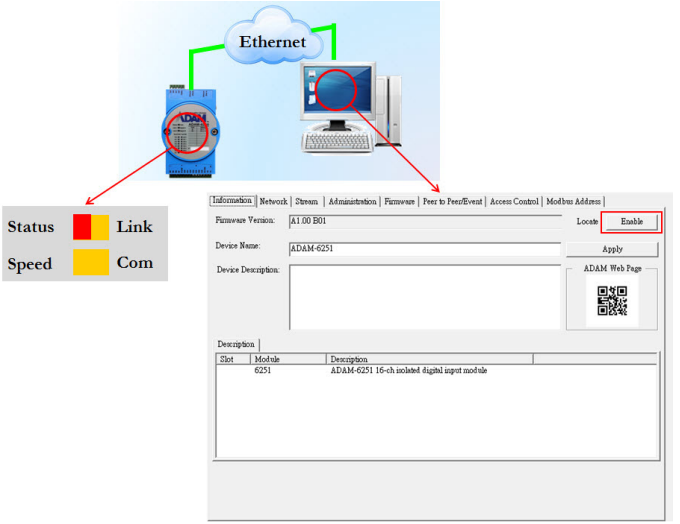
There are two LEDs on the ADAM-6000 I/O Series front panel. Each LED has two indicators to represent system status, as explained below:

Figure 1.3: LED Indicators

LED	Color		Indication	Behavior
Status	Orange (when status and Link are on at the same time)	Red	Blink	Module is normally running
			ON for 30s	When user enable LOCATE function.
Link		Green	ON	Ethernet is connected.
Speed	Orange (when speed and Com are on at the same time)	Red	ON	Ethernet speed is 100 Mbps
Com		Green	Blink	Module is transmitting or receiving data

1.5.1 Locate

This helps user get ADAM module status via LED lights. (Status LED will be constantly on RED or 30 seconds when enabled.)



CHAPTER 2

Selecting Your Hardware

Sections include:

- Selecting an I/O Module
- Selecting a Link Terminal & Cable
- Selecting an Operator Interface

Chapter 2 Selecting Your Hardware

2.1 Selecting an I/O Module

To organize an ADAM-6000 remote data acquisition & control system, you need to select I/O modules to interface the host PC with field devices or processes that you have previously determined. There are several things should be considered when you select the I/O modules.

- What type of I/O signal is applied in your system?
- How much I/O is required to your system?
- How will you place the modules to handle I/O points in individual areas of an entire field site?
- How many modules are required for distributed I/O point arrangement?
- How many hubs are required for the connection of these devices?
- What is the required voltage range for each I/O module?
- What isolation environment is required for each I/O module?
- What are the noise and distance limitations for each I/O module?

Refer to table 2-1 for I/O module selection guidelines

.

Table 2.1: I/O Selection Guidelines		
Type of I/O module:	**For these types of field devices or operations (examples):**	**Explanation:**
Discrete input module and block I/O module	Selector switches, push buttons, photoelectric eyes, limit switches, circuit breakers, proximity switches, level switches, motor starter contacts, relay contacts, thumb-wheel switches	Input modules sense ON/OFF or OPENED/CLOSED signals
Discrete output module and block I/O module	Alarms, control relays, fans, lights, horns, valves, motor starters, solenoids	Output module signals interface with ON/OFF or OPENED/CLOSED devices
Analog input module	Thermocouple signals, RTD signals, temperature transducers, pressure transducers, load cell transducers, humidity transducers, flow transducers, potentiometers.	Convert continuous analog signals into input values for host device
Analog output module	Analog valves, actuators, chart recorders, electric motor drives, analog meters	Interpret host device's output to analog signals (generally through transducers) for field devices.

2.2 Selecting a Link Terminal & Cable

Use the RJ-45 connector to connect the Ethernet port of the ADAM-6000 to the Hub. The cable for connection should be Category 3 (for 10Mbps data rate) or Category 5 (for 100Mbps data rate) UTP/STP cable, which is compliant with EIA/TIA 586 specifications. Maximum length between the Hub and any ADAM-6000 modules is up to 100 meters (approx. 300 ft).

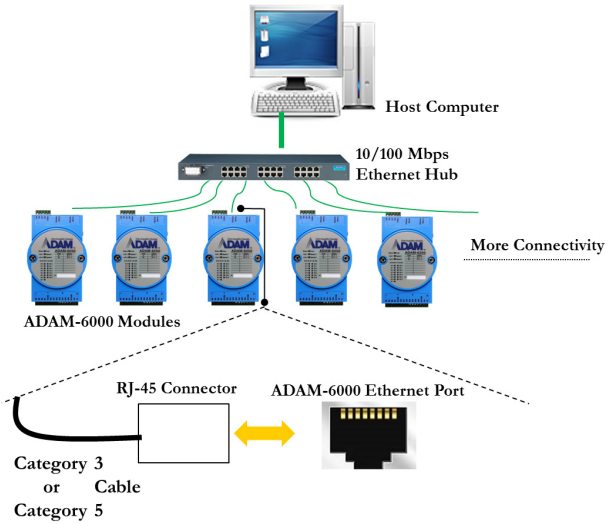


Figure 2.1: Ethernet Terminal and Cable Connection

Table 2.2: Ethernet RJ-45 port Pin Assignment		
PIN NUMBER	SIGNAL	FUNCTION
1	RD+	Receive (+)
2	RD-	Receive (-)
3	TD+	Transmit (+)
4	(Not Used)	-
5	(Not Used)	-
6	TD-	Transmit (-)
7	(Not Used)	-
8	(Not Used)	-

2.3 Selecting an Operator Interface

To complete your Data Acquisition and Control system, selecting the operator interface is necessary. Adopting the Modbus/TCP Protocol, ADAM-6000 I/O modules exhibit high ability in system integration for various applications.

You can read the real-time status of ADAM-6000 modules through the web page from the following browser.

•Microsoft Internet Explorer (version 9 or later)

•Google Chrome (version 30 or later)

•Safari (version 6 or later)

•Firefox (version 25 or later)

If you want to integrate ADAM-6000 I/O with HMI (Human Machine Interface) software in a SCADA (Supervisory Control and Data Acquisition) system, there are a lot of HMI software packages, which support Modbus/TCP driver.

- Advantech PM Designer
- Wonderware InTouch
- Any other software that supports the Modbus/TCP protocol

You can also purchase Advantech OPC Server, the easiest-to-use data exchange tool in the world. Any HMI software designed with OPC Client is able to access ADAM-6000 I/O modules.

- Modbus/TCP OPC Server

If you want to develop your own applications, the ADAM.NET Class Library will be the best tool to build up users' operator interface.

With these ready-to-go application software packages, tasks such as remote data acquisition, process control, historical trending and data analysis require only a few keystrokes.

CHAPTER 3

Hardware Installation Guide

Sections include:

- Determining the Proper Environment
- Mounting
- Wiring & Connections