



Model: ADAM-6017
**8-channel Analog Input
with Digital Output Module**

Overview

The ADAM-6017 is designed with 8-channel analog inputs and 2 digital outputs to satisfy all plant needs. Each analog channel is allowed to configure an individual range for variety of applications. Provides math functions: Max., Min., Avg.

This Ethernet-enabled data acquisition and control module features I/O, data acquisition, web browser and networking capabilities all in one module. 10/100 Mbps communication rate and 2000 VRMS surge protection.

Features

Communication rate:	10/100 Mbps
I/O type:	8 AI / 2 DO
Input type:	mV, V, mA
Surge protection:	2000VRMS
Provides math functions:	Max., Min., Avg.
Provides default/customized web page	

Analog Input

Effective resolution:	16-bit
Channels:	8 differential
Input type:	mV, V, mA
Input range:	±150 mV, ±500 mV, 0-5 V, ±10 V, 0-20 mA, 4-20 mA
Isolation voltage:	2000 V DC
Fault and overvoltage protection:	Withstands up to ±35 V
Sampling rate:	10 samples/sec.
Input impedance:	20 W
Bandwidth:	13.1 Hz @ 50 Hz, 15.72 @ 60 Hz
Accuracy:	±0.1% or better
Zero drift:	±6 µV/ °C
Span drift:	±25 ppm/ °C
CMR @ 50/60:	92 dB min.

Digital Output

Channels:	2
	Open collector to 30 V
	200 mA max. load
Optical isolation:	5000 VRMS

Power

Requirements:	Unregulated +10 ~ +30 V DC
Consumption:	2 W

Built-in Watchdog Timer

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4-1 Analog Input Module

Analog input modules use an A/D converter to convert sensor voltage, current, thermocouple or RTD signals into digital data. The digital data is then translated into engineering units. When prompted by the host computer, the data is sent through a standard 10/100 based-T Ethernet interface. Users would be able to read the current status via pre-built web page or any HMI software package supported Modbus/TCP protocol. The analog input modules protect your equipment from ground loops and power surges by providing opto-isolation of the A/D input and transformer based isolation up to 3,000 V_{DC}.

ADAM-6017 8-channel Analog Input with 2/DO Module

The ADAM-6017 is a 16-bit, 8-channel analog differential input module that provides programmable input ranges on all channels. It accepts millivoltage inputs ($\pm 100\text{mV}$, $\pm 500\text{mV}$), voltage inputs ($\pm 1\text{V}$, $\pm 5\text{V}$ and $\pm 10\text{V}$) and current input ($\pm 20\text{ mA}$, $4\text{--}20\text{ mA}$) and provides data to the host computer in engineering units (mV, V or mA). In order to satisfy all plant needs in one module, ADAM-6017 has been designed with 8 analog inputs and 2 digital outputs. Each analog channel is allowed to configure an individual range for a variety of applications.

ADAM-6017

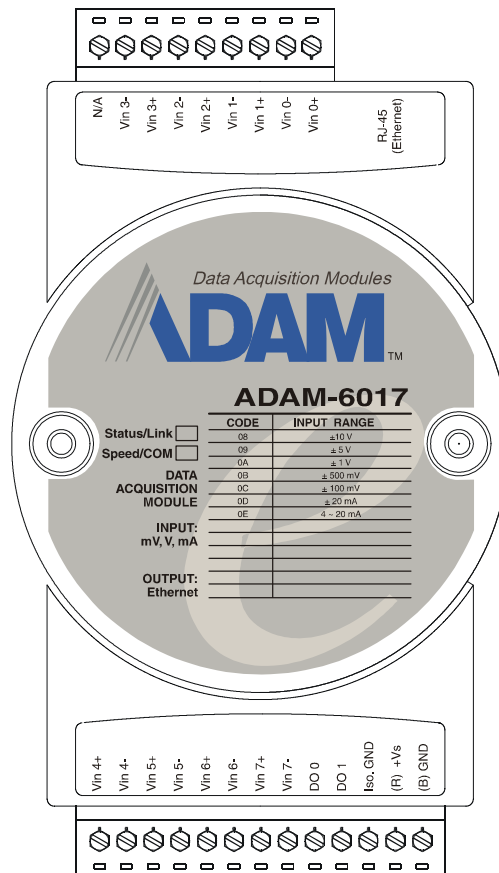


Figure 4-1: ADAM-6017 8-channel Analog Input w/2DO Module

ADAM-6017 Specification

Analog Input:

- **Effective resolution:** 16-bit
- **Channels:** 8 differential
- **Input type:** mV, V, mA
- **Input range:** ± 150 mV, ± 500 mV, ± 1 V, ± 5 V, ± 10 V, 0-20 mA, 4-20 mA
- **Isolation voltage:** $3000 V_{DC}$
- **Fault and overvoltage protection:** Withstands overvoltage up to ± 35 V
- **Sampling rate:** 10 samples/sec.
- **Input impedance:** 20 M ohm
- **Bandwidth:** 13.1 Hz @ 50 Hz, 15.72 Hz @ 60 Hz
- **Accuracy:** $\pm 0.1\%$ or better
- **Zero drift:** $\pm 6 \mu V/^{\circ} C$
- **Span drift:** ± 25 ppm/ $^{\circ} C$
- **CMR @ 50/60 Hz:** 92 dB min.

Digital Output:

- **Channel:** 2
 - Open Collector to 30 V
 - 200 mA max. load
- **Optical Isolation:** 5000VRMS

Built-in Watchdog Timer

Power

- **Power requirements:** Unregulated +10 ~ +30 VDC
- **Power consumption:** 2 W

Application Wiring

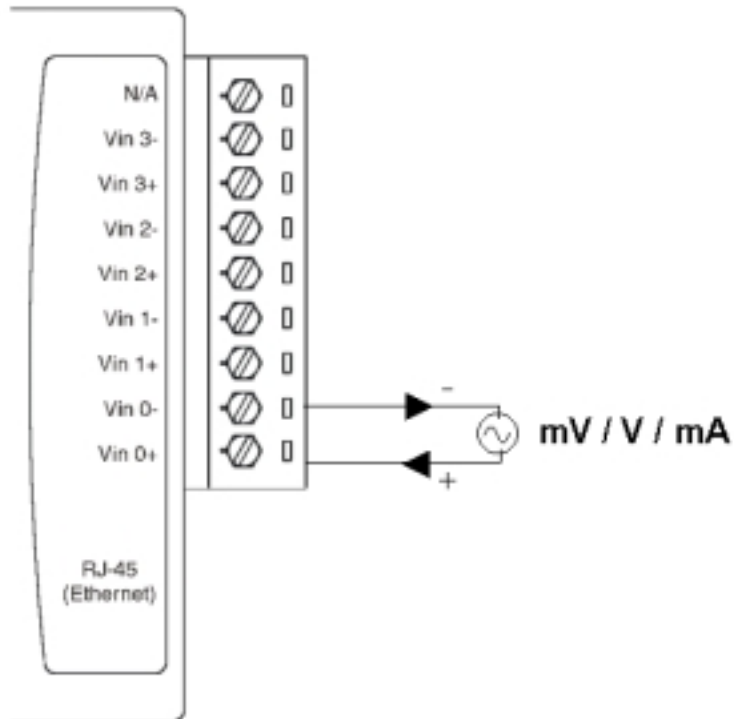


Figure 4-2: ADAM-6017 millivoltage, voltage, and current Input Wiring

ADAM-6017 has built with a 120 ohms resistor in each channel, users do not have to add any resistors in addition for current input measurement. Just adjust the jumper setting to choose the specific input type you need. Refer to Figure 4-3, each analog input channel has built-in a jumper on the PCB for users to set as a voltage mode or current mode.

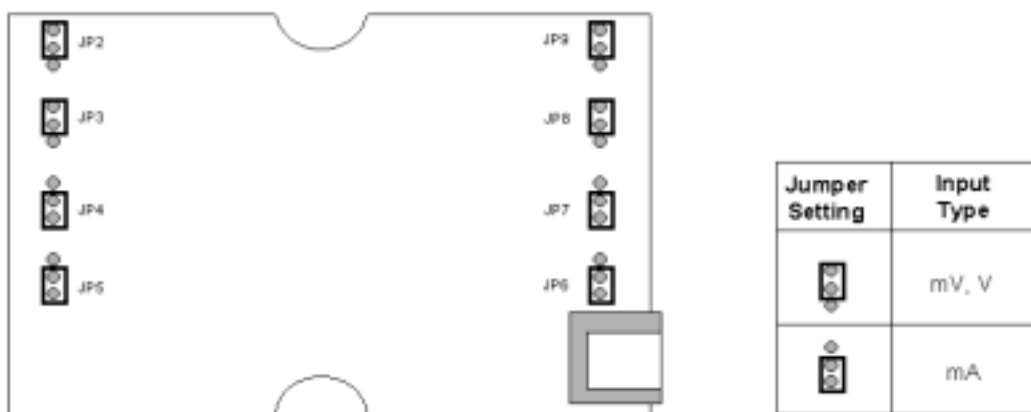


Figure 4-3: ADAM-6017 Analog Input Type Setting

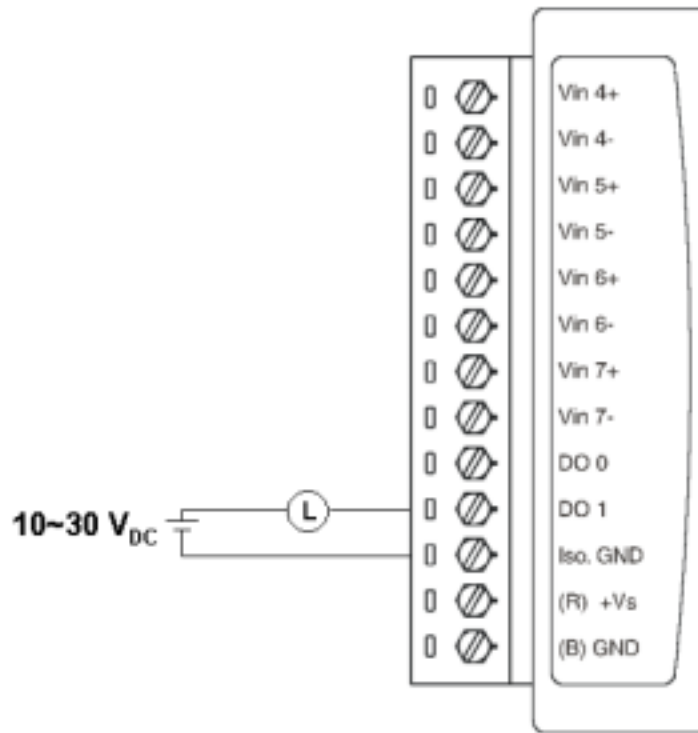


Figure 4-4: ADAM-6017 Digital Output wiring

Assigning address for ADAM-6017 Modules

Basing on Modbus/TCP standard, the addresses of the I/O channels in ADAM-6000 modules you place in the system are defined by a simple rule. Please refer the Figures 4-5 to map the I/O address.

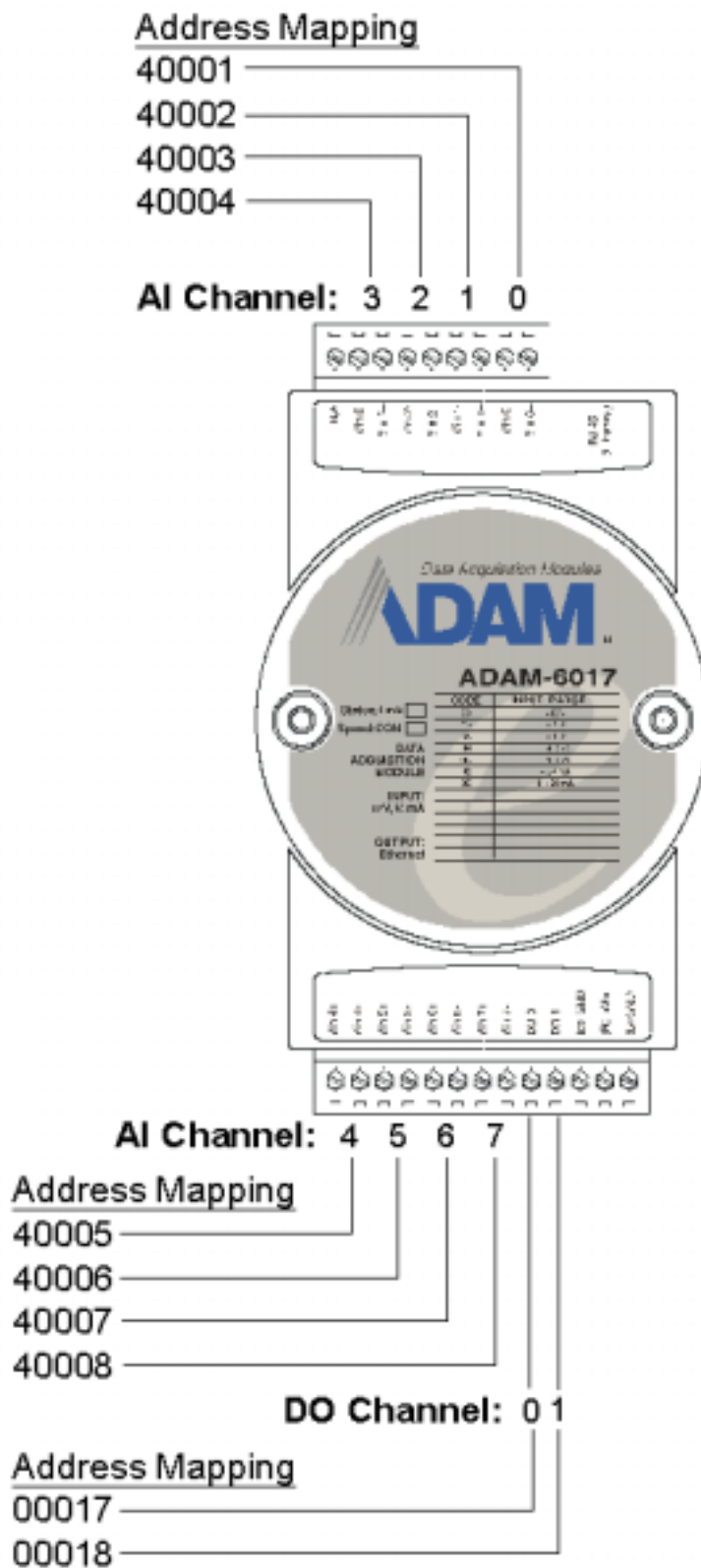


Figure 4-5: ADAM-6017 I/O Address Mapping

6-3 ADAM-6000 Commands

ADAM-6000 and ADAM-5000/TCP system accept a command/response form with the host computer. When systems are not transmitting they are in listen mode. The host issues a command to a system with a specified address and waits a certain amount of time for the system to respond. If no response arrives, a time-out aborts the sequence and returns control to the host. This chapter explains the structure of the commands with Modbus/TCP protocol, and guides to use these command sets to implement user's programs.

6-3-1 Command Structure

It is important to understand the encapsulation of a Modbus request or response carried on the Modbus/TCP network. A complete command is consisted of command head and command body. The command head is prefixed by six bytes and responded to pack Modbus format; the command body defines target device and requested action. Following example will help you to realize this structure quickly.

Example:

If you want to read the first two values of ADAM-6017 (address: 40001~40002), the request command should be:

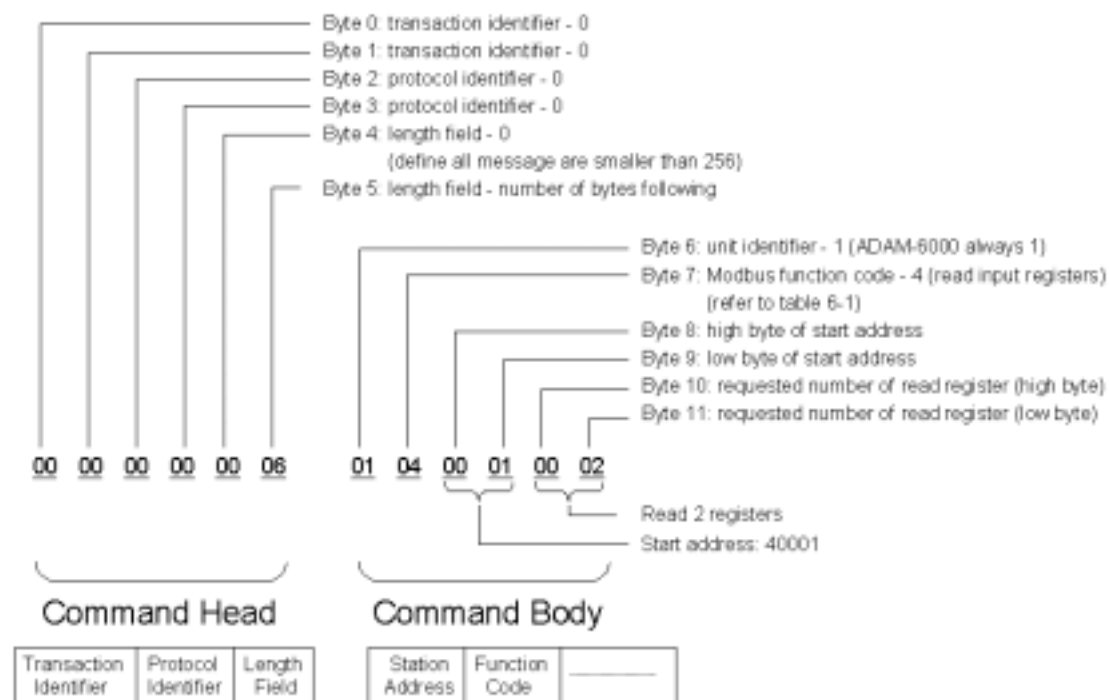


Figure 6-1 Request Command Structure

And the response should be:

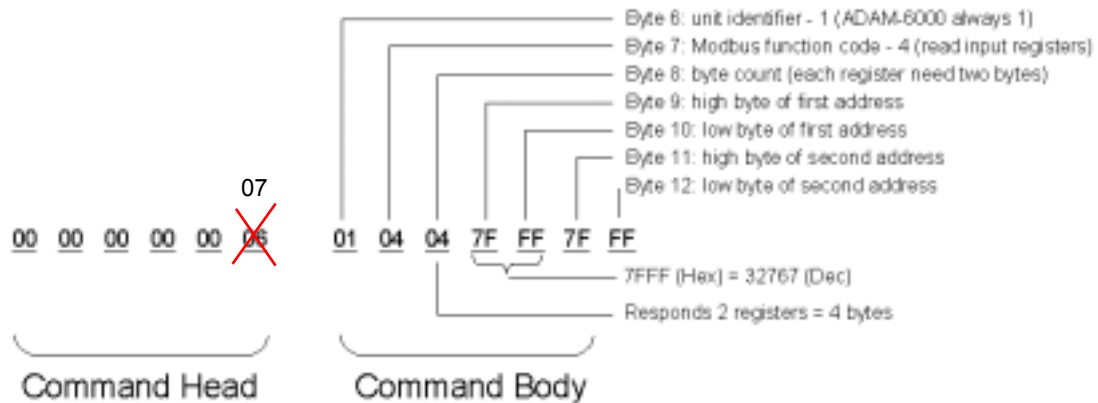


Figure 6-2 Response Comment Structure

6-3-2 Modbus Function Code Introductions

To full-fill the programming requirement, there is a series of function code standard for user's reference...

Code (Hex)	Name	Usage
01	Read Coil Status	Read Discrete Output Bit
02	Read Input Status	Read Discrete Input Bit
03	Read Holding Registers	Read 16-bit register. Used to read integer or floating point process data.
04	Read Input Registers	
05	Force Single Coil	Write data to force coil ON/OFF
06	Preset Single Register	Write data in 16-bit integer format
08	Loopback Diagnosis	Diagnostic testing of the communication port
15	Force Multiple Coils	Write multiple data to force coil ON/OFF
16	Preset Multiple Registers	Write multiple data in 16-bit integer format

Table 6-1 Response Comment Structure

Function Code 01

The function code 01 is used to read the discrete output's ON/OFF status of ADAM-6000 modules in a binary data format.

Request message format for function code 01:

Command Body					
Station Address	Function Code	Start Address High Byte	Start Address Low Byte	Requested Number of Coil High Byte	Requested Number of Coil Low Byte

Example: Read coil number 1 to 8 (address number 00017 to 00024) from ADAM-6000 Modules

01 01 00 17 00 08

Response message format for function code 01:

Command Body					
Station Address	Function Code	Byte Count	Data	Data	...

Example: Coils number 2 and 7 are on, all others are off.

01 01 01 42

In the response the status of coils 1 to 8 is shown as the byte value 42 hex, equal to 0100 0010 binary.

Function Code 02

The function code 02 is used to read the discrete input's ON/OFF status of ADAM-6000 in a binary data format.

Request message format for function code 02:

Command Body					
Station Address	Function Code	Start Address High Byte	Start Address Low Byte	Requested Number of Input High Byte	Requested Number of Input Low Byte

Example: Read coil number 1 to 8 (address number 00001 to 00008) from ADAM-6000 modules

01 01 00 01 00 08

Response message format for function code 02:

Command Body					
Station Address	Function Code	Byte Count	Data	Data	...

Example: input number 2 and 3 are on, all others are off.

01 01 01 60

In the response the status of input 1 to 8 is shown as the byte value 60 hex, equal to 0110 0000 binary.

Function Code 03/04

The function code 03 or 04 is used to read the binary contents of input registers

Request message format for function code 03 or 04:

Command Body					
Station Address	Function Code	Start Address High Byte	Start Address Low Byte	Requested Number of Register High Byte	Requested Number of Register Low Byte

Example: Read Analog inputs #1 and #2 in addresses 40001 to 40002 as floating point value from

ADAM-6017 module

01 04 00 01 00 02

Response message format for function code 03 or 04:

Command Body					
Station Address	Function Code	Byte Count	Data	Data	...

Example: Analog input #1 and #2 as floating point values where AI#1=100.0 and AI#2=55.32

01 04 08 42 C8 00 00 47 AE 42 5D

Function Code 05

Force a single coil to either ON or OFF. The requested ON/OFF state is specified by a constant in the query data field. A value of FF 00 hex requests it to be ON. A value of 00 00 hex requests it to be OFF. And a value of FF FF hex requests it to release the force.

Request message format for function code 05:

Command Body					
Station Address	Function Code	Coil Address High Byte	Coil Address Low Byte	Force Data High Byte	Force Data Low Byte

Example: Force coil 3 (address 00003) ON in ADAM-6000 module

01 05 00 03 FF 00

Response message format for function code 05:

The normal response is an echo of the query, returned after the coil state has been forced.

Command Body					
Station Address	Function Code	Coil Address High Byte	Coil Address Low Byte	Force Data High Byte	Force Data Low Byte

Function Code 06

Presets integer value into a single register.

Request message format for function code 06:

Command Body					
Station Address	Function Code	Register Address High Byte	Register Address Low Byte	Preset Data High Byte	Preset Data Low Byte

Example: Preset register 40002 to 00 04 hex in ADAM-6000 module

01 06 00 02 00 04

Response message format for function code 06:

The normal response is an echo of the query, returned after the coil state has been preset.

Command Body					
Station Address	Function Code	Register Address High Byte	Register Address Low Byte	Preset Data High Byte	Preset Data Low Byte