

Modbus DIO User's Manual

Warranty

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Date: 2005/7/1

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1. Introduction

The I-7000 series is a family of network data acquisition and control modules, providing analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. The modules can be remotely controlled using a set of commands, which we call the DCON protocol. Communication between the module and the host is in ASCII format via an RS-485 bi-directional serial bus standard. Baud Rates are software programmable and transmission speeds of up to 115.2K baud can be selected. The functionality of the M-7000 series is the same as the I-7000 series, with the exception that the M-7000 series offers extended support for the Modbus RTU protocol.

1.1 More Information

Refer to chapter 1 of the “I-7000 Bus Converter User’s Manual” as shown below, or visit the ICP DAS website <http://www.icpdas.com> for more information regarding the I-7000 series.

- 1.1 The I-7000 Series Overview
- 1.2 Related Documentation for the I-7000 Series
- 1.3 Common Features of the I-7000 Series
- 1.4 The I-7000 Series System Network Configuration
- 1.5 I-7000 Dimensions

2. Modbus RTU Protocol

The Modbus protocol was originally developed for Modicon controllers by Modicon Inc. Detailed information can be found at <http://www.modicon.com/techpubs/toc7.html>. Visit <http://www.modbus.org> to find more valuable information.

M-7000 series modules support the Modbus RTU protocol. The communication Baud Rates range from 1200bps to 115200bps. The parity, data bits and stop bits are fixed as no parity, 8 data bits and 1 stop bit. The following Modbus functions are supported.

Function code	Description	Section
0x01	Read coils	2.1
0x02	Read discrete inputs	2.2
0x03	Read multiple registers	2.3
0x04	Read multiple input registers	2.4
0x05	Write single coils	2.5
0x0F	Write multiple coils	2.6
0x46	Read/write module settings	2.7

If the function specified in the message is not supported, then the module responds as follows.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	Function code + 0x80
02	Exception code	1 Byte	01

If a CRC mismatch occurs, the module will not respond.

Modbus DIO

2.1 01 (0x01) Read coils

This function code is used to read the current digital output readback value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02 ~ 03	Starting channel numbers	2 Bytes	0x0000~0x001F for DO readback value 0x0020~0x003F for DI value 0x0040~0x005F for DIO Latch high value 0x0060~0x007F for DIO Latch low value
04 ~ 05	Output channel number	2 Bytes	0x0001 ~ 0x001F

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02	Byte count	1 Byte	1
03	Output channel readback value	1 Byte	Refer to page 6 for the details of the value

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x81
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Modbus DIO

Supported modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DO readback value
	0x0020~0x0023 for DI value
	0x0040~0x0043 for DI Latch high value
	0x0044~0x0047 for DO Latch high value
	0x0060~0x0063 for DI Latch low value 0x0064~0x0067 for DO Latch low value

M-7067/M-7067D:

Valid starting channel	0x0000~0x 0006 for DO readback value
	0x0040~0x0046 for DO Latch high value
	0x0060~0x0066 for DO Latch low value

M-7055/M-7055D:

Valid starting channel	0x0000~0x 0007 for DO readback value
	0x0020~0x0027 for DI value
	0x0040~0x0047 for DI Latch high value
	0x0048~0x004F for DO Latch high value
	0x0060~0x0067 for DI Latch low value 0x0068~0x006F for DO Latch low value

M-7052/M-7052D:

Valid starting channel	0x0020~0x0027 for DI value
	0x0040~0x0047 for DI Latch high value
	0x0060~0x0067 for DI Latch low value

M-7053/M-7053D:

Valid starting channel	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value
	0x0060~0x006F for DI Latch low value

M-7041/M-7041D:

Valid starting channel	0x0020~0x002D for DI value
	0x0040~0x004D for DI Latch high value
	0x0060~0x006D for DI Latch low value

Modbus DIO

M-7051/M-7051D:

Valid starting channel	0x0020~0x002F for DI value
	0x0040~0x004F for DI Latch high value
	0x0060~0x006F for DI Latch low value

Modbus DIO

2.2 02 (0x02) Read discrete inputs

This function code is used to read the current digital input value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02 ~ 03	Starting channel	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02	Byte count	1 Byte	1
03	Input channel data	1 Byte	Refer to the page 8 for details of the value.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x82
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI value
------------------------	-----------------------------

M-7055/M-7055D:

Valid starting channel	0x0000~0x 0007 for DI value
------------------------	-----------------------------

Modbus DIO

M-7052/M-7052D:

Valid starting channel	0x0000~0x0007 for DI value
------------------------	----------------------------

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI value
------------------------	----------------------------

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

Modbus DIO

2.3 03 (0x03) Read multiple registers

This function code is used to read the current digital input count value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02	Byte count	1 Byte	1
03~	Input channel count value	*N x 2 Bytes	Each channel can record a maximum count value up to 65535 (0xFFFF).

*N = Number of input channels

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x83
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI count value
------------------------	-----------------------------------

Modbus DIO

M-7055/M-7055D:

Valid starting channel	0x0000~0x 0007 for DI count value
------------------------	-----------------------------------

M-7052/M-7052D:

Valid starting channel	0x0000~0x 0007 for DI count value
------------------------	-----------------------------------

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI value
------------------------	----------------------------

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

Modbus DIO

2.4 04 (0x04) Read multiple input registers

This function code is used to read the current digital input count value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x001F
04 ~ 05	Input channel number	2 Bytes	0x0001 ~ 0x0020

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02	Byte count	1 Byte	1
03~	Input channel count value	*N x 2 Bytes	Each channel can record the maximum count value up to 65535 (0xFFFF).

*N = Number of input channels

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x84
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x 0003 for DI count value
------------------------	-----------------------------------

Modbus DIO

M-7055/M-7055D:

Valid starting channel	0x0000~0x 0007 for DI count value
------------------------	-----------------------------------

M-7052/M-7052D:

Valid starting channel	0x0000~0x 0007 for DI count value
------------------------	-----------------------------------

M-7053/M-7053D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

M-7041/M-7041D:

Valid starting channel	0x0000~0x000D for DI value
------------------------	----------------------------

M-7051/M-7051D:

Valid starting channel	0x0000~0x000F for DI value
------------------------	----------------------------

Modbus DIO

2.5 05 (0x05) Write single coils

This function code is used to write the digital output value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel numbers	2 Bytes	0x0000 ~ 0x001F 0x0100 to clear the latch value 0x0200~0x0220 to clear the DI count value
04 ~ 05	Output value	2 Bytes	A value of 0xFF00 sets the output to ON. A value of 0x0000 sets it to OFF. All other values are illegal and will not affect the coil.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel numbers	2 Bytes	The value is the same as byte 02 and 03 of the Request
04 ~ 05	Output value	2 Bytes	The value is the same as byte 04 and 05 of the Request

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x85
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Modbus DIO

Supported modules

M-7060/M-7060D:

Valid output channel	0x0000~0x0003 for DO output
	0x0100 to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0203 to clear the DI count value

M-7067/M-7067D:

Valid starting channel	0x0000~0x 0006 for DO output
	0x0100 to clear the DO latch value. If setting this channel to ON, the latch value will become 0.

M-7055/M-7055D:

Valid output channel	0x0000~0x 0007 for DO output
	0x0100 to clear the DIO latch value. If setting this channel to ON, the latch value will become 0. 0x0200~0x0207 to clear the DI count value

M-7052/M-7052D:

Valid output channel	0x0100 to clear the DI latch value. If setting this channel to ON, the latch value will become 0.
	0x0200~0x0207 to clear the DI count value

M-7053/M-7053D:

Valid output channel	0x0100 to clear the DI latch value. If setting this channel to ON, the latch value will become 0.
	0x0200~0x020F to clear the DI count value

M-7041/M-7041D:

Valid output channel	0x0100 to clear the DI latch value. If setting this channel to ON, the latch value will become 0.
	0x0200~0x020D to clear the DI count value

M-7051/M-7051D:

Valid output channel	0x0100 to clear the DI latch value. If setting this channel to ON, the latch value will become 0.
	0x0200~0x020F to clear the DI count value

Modbus DIO

2.6 15 (0x0F) Write multiple coils

This function code is used to write the digital output value of the M-7000 DIO module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x001F for DO output 0x0200~0x0220 to clear the DI count value
04 ~ 05	Output channel number	2 Bytes	0x0001 ~ 0x0020
06	Byte count	1 Byte	1
07	Output value	1 Byte	A bit corresponds to a channel. When the bit is 1 it denotes that the value of the channel that was set is ON. If the bit is 0 it denotes that the value of the channel that was set is OFF.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel numbers	2 Bytes	The value is the same as byte 02 and 03 of the Request
04 ~ 05	Input channel number	2 Bytes	The value is the same as byte 04 and 05 of the Request

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x8F
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Modbus DIO

Supported modules

M-7060/M-7060D:

Valid starting channel	0x0000~0x0003 for DO output
	0x0200~0x0203 to clear the DI count value

M-7067/M-7067D:

Valid starting channel	0x0000~0x0006 for DO output
------------------------	-----------------------------

M-7055/M-7055D:

Valid starting channel	0x0000~0x0007 for DO output
	0x0200~0x0207 to clear the DI count value

M-7052/M-7052D:

Valid starting channel	0x0200~0x0207 to clear the DI count value
------------------------	---

M-7053/M-7053D:

Valid starting channel	0x0200~0x020F to clear the DI count value
------------------------	---

M-7041/M-7041D:

Valid starting channel	0x0200~0x020D to clear the DI count value
------------------------	---

M-7051/M-7051D:

Valid starting channel	0x0200~0x020F to clear the DI count value
------------------------	---

Modbus DIO

2.7 70 (0x46) Read/Write Module Settings

This function code is used to read the settings of the module or change the settings of the module. The following sub-function codes are supported.

Sub-function Code	Description	Section
00 (0x00)	Read the module name	2.6.1
04 (0x04)	Set the module address	2.6.2
05 (0x05)	Read the communication settings	2.6.3
06 (0x06)	Set the communication settings	2.6.4
32 (0x20)	Read the firmware version	2.6.5
33 (0x21)	Set the DI count edge	2.6.6
34 (0x22)	Read the DI count edge setting value	2.6.7
39 (0x27)	Set the DO power-on value	2.6.8
40 (0x28)	Read the DO power-on value	2.6.9
41 (0x29)	Set the DI/O active status	2.6.10
42 (0x2A)	Read the DI/O active status	2.6.11

If the module does not support the sub-function code specified in the message, then it responds as follows:

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Modbus DIO

2.6.1 Sub-function 00 (0x00) Read Module Name

This sub-function code is used to read the name of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x00
03 ~ 06	Module name	4 Bytes	0x00 0x70 0x60 0x00 for M-7060/M-7060D modules 0x00 0x70 0x67 0x00 for M-7067/M-7060D modules

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7052/M-7052D

Modbus DIO

2.6.2 Sub-function 04 (0x04) Set Module Address

This sub-function code is used to set the address of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x04
03	Address	1 Byte	1 ~ 247
04~ 06	Reserved	3 Bytes	0x00 0x00 0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x04
03	Set address result	1 Byte	0: OK Others: error
04~ 06	Reserved	3 Bytes	0x00 0x00 0x00

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.3 Sub-function 05 (0x05) Read Communication Settings

This sub-function code is used to read the communication protocol settings of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x05
03	Reserved	1 Byte	0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x05
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	Refer to Table 1. below
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: DCON protocol 1: Modbus RTU protocol
09~10	Reserved	2 Bytes	0x00 0x00

Note: This information is the data saved in the EEPROM and will be used for the next power-on reset. It is not the currently used settings.

Baud Rate settings:

Value	03	04	05	06	07	08	09	0A
Baud Rate	1200	2400	4800	9600	19200	38400	57600	115200

Table 1.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Modbus DIO

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.4 Sub-function 06 (0x06) Set Communication Settings

This sub-function code is used to set the communication protocol of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x06
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	Refer to Table 1. on page 17
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: DCON protocol 1: Modbus RTU protocol
09~10	Reserved	2 Bytes	0x00 0x00

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x06
03	Reserved	1 Byte	0x00
04	Baud Rate	1 Byte	0: OK, others: error
05~ 07	Reserved	3 Bytes	0x00 0x00 0x00
08	Mode	1 Byte	0: OK, others: error
09~10	Reserved	2 Bytes	0x00 0x00

Note: The new Baud Rate and protocol will be effective after the next power-on reset.

Modbus DIO

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported module

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.5 Sub-function 32 (0x20) Read Firmware Version

This sub-function code is used to read the firmware version information of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x20

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x20
03	Major version	1 Byte	0x00~0xFF
04	Minor version	1 Byte	0x00~0xFF
05	Build version	1 Byte	0x00~0xFF

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.6 Sub-function 33 (0x21) Set Digital Input Count Edge

This sub-function code is used to set the digital input count edge value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x21
03	Edge setting value	1 Byte	*0x00~0x0F

*1 = rising edge, 0 = falling edge. For example 0x03 denotes that channels 0~1 are set as rising edge and channels 2~3 are set as falling edge.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x21
03	Edge setting value	1 Byte	0: OK others: error

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.7 Sub-function 34 (0x22) Read Digital Input Count Edge

This sub-function code is used to read the digital input count edge value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x22

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x22
03	Edge setting value	1 Byte	*0x00~0x0F

*1 = rising edge, 0 = falling edge. For example 0x03 denotes that channels 0~1 are set as rising edge and channels 2~3 are set as falling edge.

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

2.6.8 Sub-function 39 (0x27) Set Power-on Value

This sub-function code is used to set the power-on value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x27
03	Power-on Value	1 Byte	*0x00~0xFF

*0x00~0x0F for M-7060/M-7060D

0x00~0x7F for M-7067/M-7067D

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28
03	Power-on value	1 Byte	0: OK, others: error

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D

Modbus DIO

2.6.9 Sub-function 40 (0x28) Read Power-on Value

This sub-function code is used to read the power-on value of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x28
03	Power-on value	1 Byte	*0x00~0xFF

*0x00~0x0F for M-7060/M-7060D

0x00~0x7F for M-7067/M-7067D

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/

Modbus DIO

2.6.10 Sub-function 41 (0x29) Set DI/O active status

This sub-function code is used to set the DI/O active status of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x29
03	DI/O active status	1 Byte	*0x00~0x03 Refer to Table 2.

*0x00~0x03 for M-7060/M-7060D
0x00 and 0x02 for M-7067/M-7067D

DI/O active status:

7	6	5	4	3	2	1	0
Reserved						OAS	IAS

Key	Description
OAS	DO active status 0: output value 1 for relay active output value 0 for relay inactive 1: output value 0 for relay active output value 1 for relay inactive
IAS	DI active status 0: input value 1 for non-signal or the low voltage; input value 0 for high voltage 1: input value 0 for non-signal or the low voltage; input value 1 for high voltage

Table 2.

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x29
03	Power-on value	1 Byte	0: OK others: error

Modbus DIO

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Note: After using the command, the DIO active status will immediately change and will simultaneously clear the DI count and latch values.

Modbus DIO

2.6.11 Sub-function 42 (0x2A) Read DI/O active status

This sub-function code is used to read the DI/O active status of a module.

Request

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x2A

Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x46
02	Sub-function code	1 Byte	0x2A
03	DI/O active status	1 Byte	*0x00~0x03

*0x00~0x03 for M-7060/M-7060D

0x00 and 0x02 for M-7067/M-7067D

Error Response

00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0xC6
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

3. Recently-added DCON commands

General command set			
Command	Response	Description	Section
\$AAP	!AA(Data)	Reads the communication protocol information	3.1
\$AAPN	~AA	Sets the communication protocol	3.2
~AAD	!AA(Data)	Reads the DI/O active status of the module	3.3
~AADVV	!AA	Sets the DI/O active status of the module	3.4
~AAI	!AA	Soft INIT	3.5
~AATnn	!AA	Sets the Soft INIT Timeout	3.6

Modbus DIO

3.1 \$AAP

Description:

Reads the communication protocol information.

Syntax:

\$AAP[CHKSUM](CR)

\$ Delimiter character

AA Address of the module to be read (00 to FF)

P Command to read the communication protocol

Response:

Valid Response: !AASC[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

S The protocols supported by the module

0: only DCON protocol is supported

1: both the DCON and Modbus RTU protocols are supported

C The current protocol that is saved in the EEPROM that will be used at the next power-on reset

0: the protocol set in the EEPROM is DCON

1: the protocol set in the EEPROM is Modbus RTU

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Modbus DIO

Examples:

Command: \$01P

Response: !0110

Reads the communication protocol of module 01 and returns a response of 10 meaning that it supports both the DCON and Modbus RTU protocols and the protocol that will be used at the next power-on reset is DCON.

Related Commands:

Section 3.2 \$AAPN

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

3.2 \$AAPN

Description:

Sets the communication protocol.

Syntax:

\$AAPN[CHKSUM](CR)

\$ Delimiter character

AA Address of the module to be read (00 to FF)

P Command to read the communication protocol

N 0: DCON protocol

1: Modbus RTU protocols

Before using this command, the rear slide switch must be in the INIT position. The new protocol is saved in the EEPROM and will be effective after the next power-on reset.

Response:

Valid Response: !AASC[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Modbus DIO

Examples:

Command: \$01P1 Response: ?01
Sets the communication protocol of module 01 to Modbus RTU and returns an invalid response because the module is not in INIT mode.

Command: \$01P1 Response: !01
Sets the communication protocol of module 01 to Modbus RTU and returns a valid response.

Related Commands:

Section 3.1 \$AAP

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

3.3 ~AAD

Description:

Reads the DI/O active status.

Syntax:

~AAD[CHKSUM](CR)

~ Delimiter character

AA Address of the module to be read (00 to FF)

D Command to read the DI/O active status

Response:

Valid Response: !AAFL[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

VV A two-digit hexadecimal value indicating the DI/O active status.

Please refer to Table 2 on page 26 for more details about of DI/O active status values.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Modbus DIO

Examples:

Command: ~01D

Response: !0100

Reads the communication protocol of module 01 and returns a response of 00. Please refer to Table 2 on page 23 for more details regarding DI/O active status values.

Related Commands:

Section 3.2 ~AADVV

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

3.4 ~AADVV

Description:

Sets the DI/O active status.

Syntax:

~AADVV[CHKSUM](CR)

~ Delimiter character

AA Address of the module to be read (00 to FF)

D Command to set the DI/O active status.

VV A two-digit hexadecimal value indicating the DI/O active status.

Please refer to Table 2 on page 26 for more details regarding DI/O active status values.

Response:

Valid Response: !AA[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Modbus DIO

Examples:

Command: ~01D00

Response: !01

Sets the DI/O active value of module 01 as 00 and returns a valid response.

Related Commands:

Section 3.3 ~AAD

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Note: After using this command, the DIO active status will immediately change and will clear the DI count and latch values simultaneously.

Modbus DIO

3.5 ~AAI

Description:

The Soft INIT command is used to enable modification of the Baud Rate and checksum settings using software only.

Syntax:

~AAI[CHKSUM](CR)

~ Delimiter character

AA Address of the module to be read (00 to FF)

I Command to set the Soft INIT

Response:

Valid Response: !AA[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~01I

Response: !01

 Sets the soft INIT of module 01 and returns a valid response.

Related Commands:

Section 3.6 of the “7000 DIO Manual” ~AATnn,

Section 2.1 of the “7000 DIO Manual” %AANNTTCCFF

Modbus DIO

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Note: The ~AATnn command should be sent prior to Using this command, see Section 2.6 of the “7000 DIO Manual” for details.

Modbus DIO

3.6 ~AATnn

Description:

Sets the soft INIT timeout value.

Syntax:

~AATnn[CHKSUM](CR)

~ Delimiter character
T Command to set the soft INIT timeout value
nn Two hexadecimal digits representing the time out value in seconds. The maximum timeout value is 60 seconds. When changing the Baud Rate or checksum settings without adjusting the INIT* pin, the ~AAI and %AANNTTCCFF commands should be sent consecutively and the time interval between the two commands should be less than the soft INIT timeout. If the soft INIT timeout is 0, then the Baud Rate and checksum settings cannot be changed using software only. The power-on reset value of the soft INIT timeout is 0.

Response:

Valid Response: !AA[CHKSUM](CR)

Invalid Response: ?AA[CHKSUM](CR)

! Delimiter character for a valid response

? Delimiter character for an invalid response

AA Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Modbus DIO

Examples:

Command: ~01I Response: !01
Sets the soft INIT of module 01 and returns a valid response.

Command: %0101400700 Response: ?01
Attempts to change the Baud Rate of module 01 to 19200 without first adjusting the INIT * pin. The module returns an invalid response because the soft INIT timeout value is 0.

Command: ~01T10 Response: !01
Sets the soft INIT time out value of module 01 to 16 seconds and returns a valid response.

Command: ~01I Response: !01
Sets the soft INIT of module 01 and returns a valid response.

Command: %0101400700 Response: !01
Attempts to change the Baud Rate of module 01 to 19200 without first adjusting the INIT * pin. The module returns an invalid response because the soft INIT time out value is 0.

Related Commands:

Section 3.5 of the "7000 DIO Manual" ~AAI,
Section 2.1 of the "7000 DIO Manual" %AANNTTCCFF

Supported modules

M-7060/M-7060D/M-7067/M-7067D/M-7055/M-7055D/M-7051/M-7051D/M-7052/M-7052D/M-7053/M-7053D/M-7041/M-7041D

Modbus DIO

Note: It is recommended that soft INIT timeout value is reset to 0 once any changes to the Baud Rate and checksum setting have been completed.

4. Hardware information and DCON Protocol

The “7000 DIO manual” can be downloaded from
<http://www.icpdas.com/download/7000/manual/7000dio.pdf>