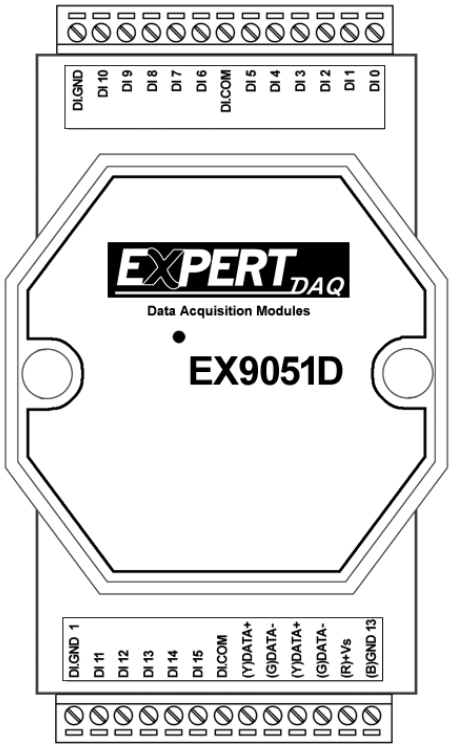
1. Introduction

EX-9051D-M provides 16 isolated digital input channels. All input channels are single ended with common source or common ground. (see sec. 1.2.1 Block diagram)

Specifications

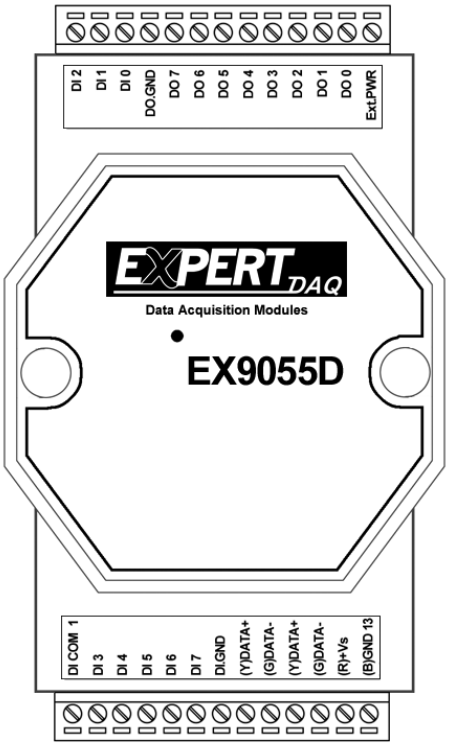
- Interface : RS-485, 2 wires
- Speed : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K,115.2K
- Input channels : 16 isolated input channels (sink).
- Input type: Isolated single ended with common source or common ground
- Logical level 0 : +1Vdc Max.
- Logical level 1 : +10V ~ +50Vdc
- Input impedance : 10K ohms
- Isolation Voltage: 3750Vrms
- LED: 16 digital input status LED
- Power input : +10V to +30Vdc
- Power Consumption : 1.2W



EX-9055D-M provides 8 isolated digital output(source)channels and 8 isolated digital input(sink)channels with common source . All output channels are open source (N-MOSFET). (see sec. 1.2.1 Block diagram)

Specifications

Interface : RS-485, 2 wires
Speed : 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K,115.2K
Output channels : 8 isolated output channels (source)
Output type: Open source (N-MOSFET)
Output load voltage: +10V~+40Vdc
Max. load current: 650mA
Short-circuit protection: Yes
Output isolation Voltage: 3750Vrms
Input channels: 8 isolated input channels (sink)
Input type: Isolated single ended with common source or common ground
Input impedance: 10K ohms
Logical level 0 : +4Vdc Max.
Logical level 1: +10V ~ +50Vdc
Input isolation Voltage: 3750Vrms
LED: 16 digital input/output status LED
Power input : +10V to +30VDC
Power Consumption : 3.5W



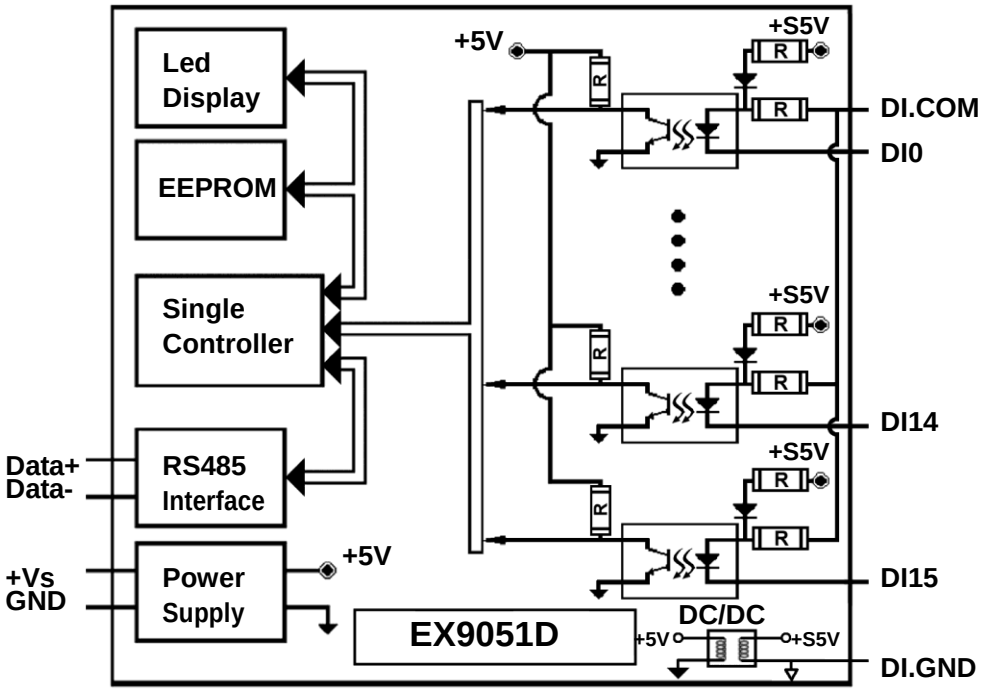
1.1 Specifications

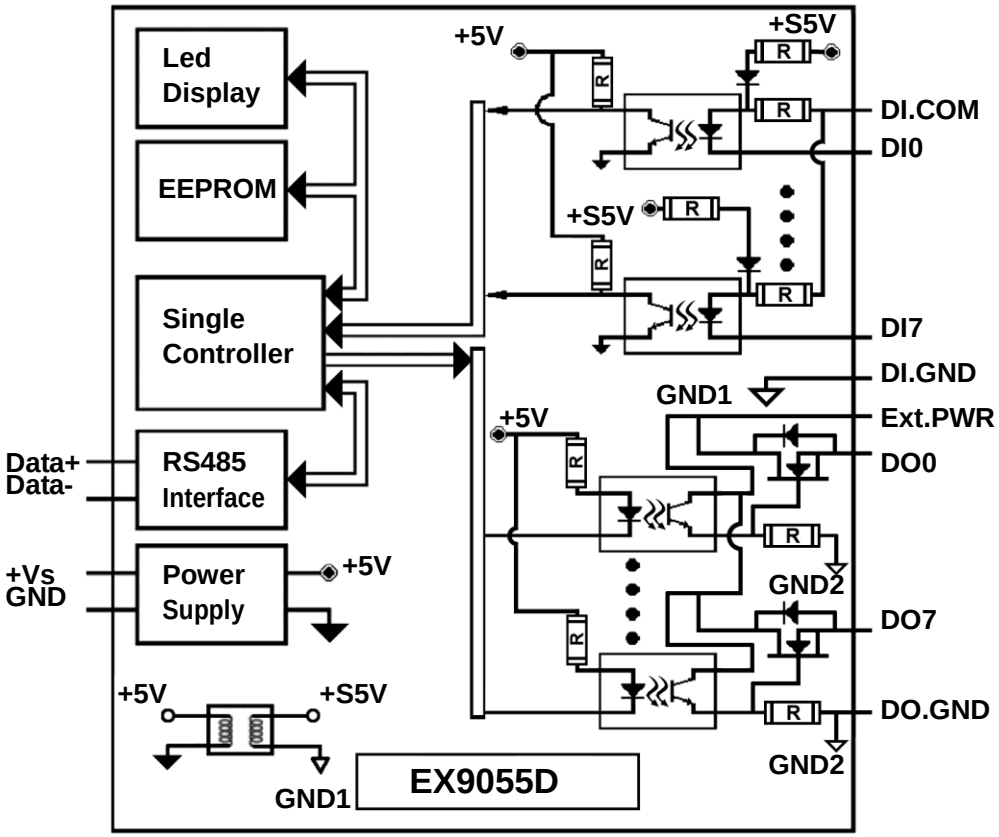
	EX-9051D-M	EX-9055D-M
Digital Output		
Output Channels		8 (Source)
Output Type		Open Source (N-MOSFET)
Load Voltage		+10 to +40V
Max Load Current		650mA
Short-Circuit Protection		Yes
Isolation Voltage		3750 Vrms
Digital Input		
Input Channels	16 (Sink)	8 (Sink)
Input Type	Isolated with Common Source	
ON Voltage Level	+10 to 50V	
OFF Voltage Level	+4V Max	
Input Impedance	10K Ohms	
Isolation Voltage	3750 Vrms	
Environment		
Modbus RTU	Support	
Power Requirement	+10 to +30 VDC	
Power Consumption	1.2 W	2.5W
Operating Temperature	-25℃ to +75℃	
Storage Temperature	-30℃ to +75℃	

Notes:
1. Warm-UP for 30 minutes is recommended!

1.2 Wire connection

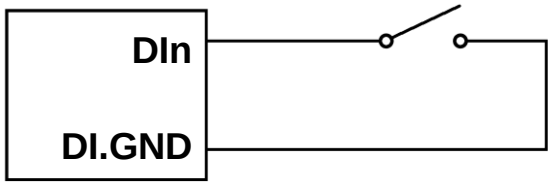
1.2.1 Block Diagrams



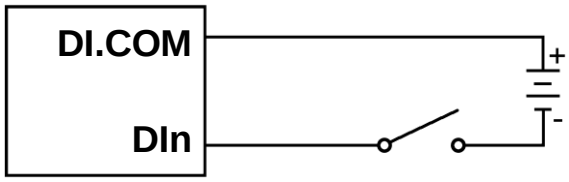


1.2.2 Wiring diagram for the EX-9051/9055

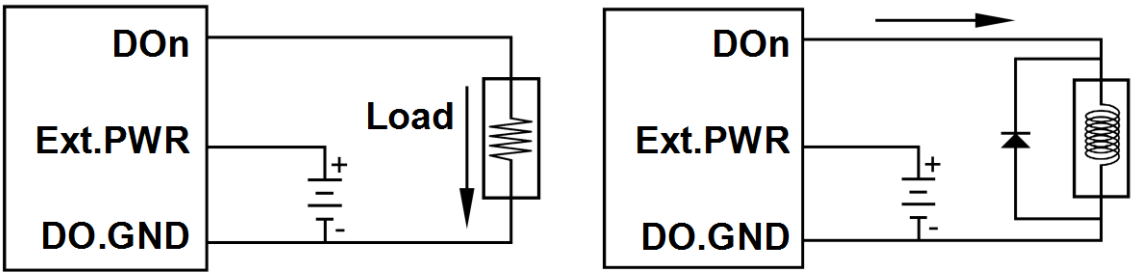
Dry Contact Input



Wet Contact Input



Digital Output



Note: The loading restriction is related by value of Ext.PWR

1.3 Default Settings

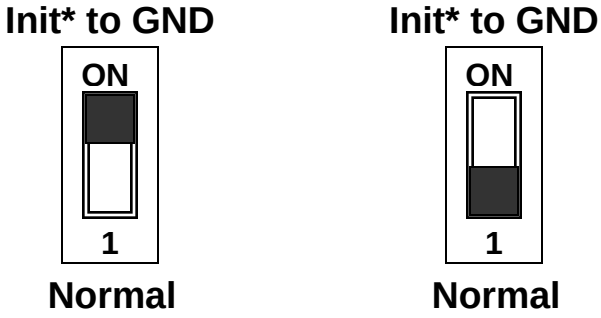
Default settings for the EX-9051D-M & EX-9055D-M modules are as follows:

. Protocol: Modbus RTU
. Module Address: 01
. DIO Type: 40
. Baud Rate: 9600 bps

1.4 INIT* Pin Operation

Each EX9000 module has a build-in EEPROM to store configuration information such as address, type, baudrate and other information. Sometimes, user may forget the configuration of the module. Therefore, the EX9000 have a special mode named "INIT mode" , to help user to resolve the problem. The "INIT mode" is setting as
Address=00, baudrate=9600bps, no checksum .
To enable INIT mode, please following these steps:
Step1. Power off the module
Step2. Connect the INIT* pin with the GND pin.
Step3. Power on
Step4. Send command $002 (cr) in 9600bps to read the Configuration stored in the module's EEPROM.

There are commands that require the module to be in INIT mode. They are:
1. %AANNTTCCFF when changing the Baud Rate and checksum settings. See Section 2.1 for details.
2. $AAPN, see Section 2.18 for details.
Originally, the INIT mode is accessed by connecting the INIT* terminal to the GND terminal. New EX-9000 and EX-9000-M modules have the INIT switch located on the rear side of the module to allow easier access to the INIT mode. For these modules, INIT mode is accessed by sliding the INIT switch to the Init position as shown below.



1.5 Configuration Tables

Baud Rate Setting (CC)

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

Data Format Setting (FF)

7	6	5	4	3	2	1	0
*1	*2	*3					

***1**: Counter Update Direction: 0 =Falling Edge,
1=Rising Edge.
***2**: Checksum Bit : 0=Disable, 1=Enable.
***3**: The reserved bits should be zero.

Read Digital Input/Output Data Format table

Data of $AA6,$AA4,$AALS:**(First Data)(Second Data)00**

Data of @AA:**(First Data)(Second Data)**

Note: Both the First Data and the Second Data are in two hexadecimal digitals format.

Module	The First data		The Second data	
EX9051M	DI8~DI15	00~FF	DI0~DI7	00~FF
EX9055M	DO0~DO7	00~FF	DI0~DI7	00~FF

2.1 %AANNTTCCFF

Description: Set Module Configuration.
Syntax: %AANNTTCCFF[CHK](cr)

%	a delimiter character
AA	address of setting/response module(00 to FF)
NN	new address for setting/response module(00 to FF)
TT	type 40 for DIO module
CC	new baudrate for setting module.
FF	new data format for setting module.

IF the configuration with new baudrate or new checksum setting, before using this command, the rear slide switch must be in the ON(INIT) position. The new setting is saved in the EEPROM and will be effective after the next power-on reset.

Response: Valid Command: !AA
Invalid Command: ?AA

Example:

Command: %0102240600 Receive: !02

Set module address 01 to 02, return Success.

2.2 #**

Description: Synchronized Sampling
Syntax: #[CHK](cr)**
delimiter character
** synchronized sampling command

Response: No response

Example:

Command: #** No response
Send synchronized sampling command to all modules.

Command: $014 Receive: !10F0000
Read synchronized data from address 01, return S=1, first read and data is 0F0000

Command: $014 Receive: !00F0000
Read synchronized data from address 01, return S=0, have readed and data is 0F0000

2.3 #AABBDD

Description: Digital Output

Syntax: #AABBDD[CHK](cr)

#	delimiter character
AA	address of reading/response module(00 to FF)
BBDD	Output command and parameter For output multi-channel, the BB=00, 0A or 0B the select which output group, and the DD is the output value

Parameter for Multi-Channel Output					
	Output Channels	DD for command #AABBDD			
		BB=00/0A		BB=0B	
EX9042D	13	00 to FF	DO(0~7)	00 to 1F	DO(8~12)
EX9043D	16	00 to FF	DO(0~7)	00 to 1F	DO(8~15)
EX9044D	8	00 to FF	DO(0~7)	NA	NA
EX9050D	8	00 to FF	DO(0~7)	NA	NA
EX9055D	8	00 to FF	DO(0~7)	NA	NA
EX9060D	4	00 to 0F	RL(1~4)	NA	NA
EX9063D	3	00 to 07	RL(1~3)	NA	NA
EX9065D	5	00 to 1F	RL(1~5)	NA	NA
EX9066D	7	00 to 7F	RL(1~7)	NA	NA
EX9067D	7	00 to 7F	RL(1~7)	NA	NA

For output single-channel, the BB=1c, Ac or Bc where c is the selected channel, and the DD must be 00 to clear output and 01 to set output.

Parameter for Single-Channel Output				
	Single channel output command #AABBDD			
	c for BB=1c/Ac		c for BB=Bc	
EX9042D	0 to 7	DO(0~7)	0 to 4	DO(8~12)
EX9043D	0 to 7	DO(0~7)	0 to 7	DO(8~15)
EX9044D	0 to 7	DO(0~7)	NA	NA
EX9050D	0 to 7	DO(0~7)	NA	NA
EX9055D	0 to 7	DO(0~7)	NA	NA
EX9060D	0 to 3	RL(1~4)	NA	NA
EX9063D	0 to 2	RL(1~3)	NA	NA
EX9065D	0 to 4	RL(1~5)	NA	NA
EX9066D	0 to 6	RL(1~7)	NA	NA
EX9067D	0 to 6	RL(1~7)	NA	NA

Response: Valid Command: >

Invalid Command: ?

Ignore Command: !

Delimiter for ignore the command. The module's host watchdog timeout status is set, and the output is set to Safe Value.

Example:

Command: #0100FF Receive: >

Assume module is EX9055M, set address 01 output value FF, return success.

Command: #021001 Receive: >

Assume module is EX9055M, set address 02 output channel 0 on, return success.

Command: #021001 Receive: >

Assume module is EX9055M, set address 02 output channel 0 on, return ignore, The module's host watchdog timeout status is set, and the output is set to Safe Value.

2.4 #AAN

Description: Read Digital Input Counter from channel N

Syntax : #AAN[CHK](cr)

#	delimiter character
AA	address of reading/response module (00 to FF)
N	channel to read

Response: Valid Command: >(Data)

Invalid Command: ?AA

(Data) digital input counter value in decimal, from 00000 to 99999

Example:

Command: #032 Receive: !0300103

Read address 03 digital input counter value of channel 2, return value 103.

Command: #025 Receive: ?02

Read address 02 digital input counter value of channel 5, return the channel is not available.

2.5 $AA2

Description: Read configuration.

Syntax: $AA2[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
2	command for read configuration

Response: Valid Command: **!AATTCCFF**

Invalid Command: **?AA**

TT	type code of module, it must be 40
CC	baudrate code of module
FF	data format of module

Example:

Command: $012 Receive: !01400600

Read the configuration of module 01, return DIO mode, baudrate 9600, no checksum.

Note: check configuration Tables

2.6 $AA4

Description: Reads the synchronized data

Syntax: $AA4[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
4	command to read the synchronized data

Response: Valid Command: **!S(Data)**

Invalid Command: **?AA**

S	status of synchronized data, 1=first read, 0=been readed
(Data)	synchronized DIO value. See section 1.5 for data format.

Example:

Command: $014 Receive: ?01

Read address 01 synchronized data, return no data available.

Command: #** no response

Send synchronized sampling to all modules.

Command: $014 Receive: !100F00

Read address 01 synchronized data, return S=1, first read, and synchronized data 0F00

2.7 $AA5

Description: Read Reset Status

Syntax: $AA5[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
5	command for read reset status

Response: Valid Command: **!AAS**

Invalid Command: **?AA**

S	reset status, 1=the module is been reset, 0=the module is not been rested

Example:

Command: $ 015 Receive: !011

Read address 01 reset status, return module is been reset

Command: $ 015 Receive: !010

Read address 01 reset status, return no reset occurred.

2.8 $AA6

Description: Read Digital I/O Status

Syntax: $AA6[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
6	command for read channel status

Response: Valid Command: **!(Data)**

Invalid Command: **?AA**

(Data) Digital input/output value.

Example:

Command: $016 Receive: !0F0000

Assume module is EX9055M, read address 01 DIO status, return 0F00, digital input channel 0~3 are on, digital output channel 0~7 are off.

2.9 $AAF

Description: Read Firmware Version

Syntax: $AAF[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
F	command for read firmware version

Response: Valid Command: **!AA(Data)**

Invalid Command: **?AA**

(Data) Firmware version of module

Example:

Command: $01F Receive: !01D02.07

Read address 01 firmware version, return version D02.07

2.10 $AAM

Description: Read Module Name

Syntax: $AAM[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
M	address of reading/response module(00 to FF)

Response: Valid Command: **!AA(Data)**

Invalid Command: **?AA**

(Data) Name of module

Example:

Command: $01M Receive: !019051M

Read address 01 module name, return name 9051M

Command: $03M Receive: !039055M

Read address 03 module name, return name 9055M

2.11 $AAC

Description: Clear Latched Digital Input

Syntax: $AAC[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
C	command for clear latched digital input

Response: Valid Command: **!AA**

Invalid Command: **?AA**

Example:

Command: $01L0 Receive: !01FFFF00

Read address 01 latch-low data, return FFFF.

Command: $01C Receive: !01

Clear address 01 Latched data, return success.

Command: $01L0 Receive: !000000

Read address 01 latch-low data, return 0000.

2.12 $AACN

Description: Clear Digital Input Counter

Syntax: $AAC[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
C	command for clear latched digital input
N	digital counter channel N to clear

Response: Valid Command: **!AA**

Invalid Command: **?AA**

Example:

Command: #010 Receive: !0100123

Read address 01 input channel 0 counter value, return 123.

Command: $01C0 Receive: !01

Clear address 01 input channel 0 counter value, return success.

Command: #010 Receive: !0100000

Read address 01 input channel 0 counter value, return 0.

2.13 $AALS

Description: Read Latched Digital Input

Syntax: $AAC[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
L	command for read latched digital input
S	1=select latch high status, 0=select latch low status

Response: Valid Command: **!(Data)**

Invalid Command: **?AA**

(Data) readed status 1=the input channel is latched, 0=the input channel is not latched.

Example:

Command: $01L1 Receive: !012300

Read address 01 latch-high data, return 0123.

Command: $01C Receive: !01

Clear address 01 Latched data, return success.

Command: $01L1 Receive: !000000

Read address 01 latch-high data, return 0000.

2.14 @AA

Description: Read Digital I/O Status

Syntax: @AA[CHK](cr)

@ delimiter character

AA address of reading/response module (00 to FF)

Response: Valid Command: **>(Data)**

Invalid Command: **?AA**

(Data) Digital input/output value.

Example:

Command: @01 Receive: >0F00

Assume module is EX9055M, read address 01 DIO status, return 0F00, digital input channel 0~3 are on, digital output channel 0~7 are off.

2.15 @AA(Data)

Description: Set Digital I/O Status

Syntax: @AA(Data)[CHK](cr)

@ delimiter character

AA address of reading/response module (00 to FF)

(Data) output value, the data format is following:

(Data) is one character for output channel less than 4

For EX9060D, from 0 to F

For EX9063D, from 0 to 7

(Data) is two characters for output channel less than 8

For EX9044D/50D/55M, from 00 to FF

For EX9065D, from 00 to 1F

For EX9066D/67D, from 00 to 7F

(Data) is four characters for output channel less than 16

For EX9042D, from 0000 to 1FFF

For EX9043D, from 0000 to FFFF

Response: Valid Command: >

Invalid Command: ?

Ignore Command: !

! delimiter for ignore command. The module is in Host Watchdog Timeout Mode, and the output is set to safe value.

Example:

Command: @0107 Receive: >

Output address 01 value 7, return success.(The example is suitable for EX9055M's digital output channel 0~3 are on)

2.16 ~AAO(Data)

Description: Set Module Name

Syntax: ~AAO(Data)[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
O	command for set module name
(Data)	new name for module, max 6 characters

Response: Valid Command: **!AA**

Invalid Command: **?AA**

Example:

Command: ~01O9055M Receive: !01

Set address 01 module name 9055M, return success.

Command: $01M Receive: !019055M

Read address 01 module name, return name 9055M.

2.17 $AAP

Description: Read protocol information of Module

Syntax: $AAP[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
P	command for read protocol information of module

Response: Valid Command: **!AAS**

Invalid Command: **?AA**

S	The protocol supported by the module 10: the protocol set in EEPROM is Normal mode 11: the protocol set in EEPROM is ModbusRTU mode

Example:

Command: $01P Receive: !0110

Reads the communication protocol of module 01 and returns a response of 10 meaning the protocol that will be used at the next power on reset is normal mode.

Command: $01P1 Receive: !01

Sets the communication protocol of module 01 to Modbus RTU and returns a valid response. And the next power on reset is in ModbusRTU mode.

2.18 $AAPN

Description: Set the protocol information of Module

Syntax: $AAPN[CHK](cr)

$	delimiter character
AA	address of reading/response module (00 to FF)
P	command for set protocol information of module
N	The protocol supported by the module 0: the protocol set in EEPROM is Normal mode 1: the protocol set in EEPROM is ModbusRTU mode Before using this command, the rear slide switch must be in the ON(INIT) position. The new protocol is saved in the EEPROM and will be effective after the next power-on reset.

Response: Valid Command: **!AA**

Invalid Command: **?AA**

Example:

Command: $01P1 Receive: !01

Sets the communication protocol of module 01 to Modbus RTU and returns a valid response. And the next power on reset is in ModbusRTU mode.

2.19 ~**

Description: Host OK

Host send this command to all modules for send the information “Host OK”

Syntax: ~[CHK](cr)**

~	delimiter character
**	command for all modules

Response: No response

Example:

Command: ~**	No response

2.20 ~AA0

Description: Read Module Status

Syntax: ~AA0[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
0	command for read module status

Response: Valid Command: **!AASS**

Invalid Command: **?AA**

SS module status, 00=host watchdog timeout status is clear,04=host watchdog timeout status is set. The status will store into EEPROM and only may reset by the command ~AA1.

2.21 ~AA1

Description: Reset Module Status

Syntax: ~AA1[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
1	command for reset module status

Response: Valid Command: **!AA**

Invalid Command: **?AA**

2.22 ~AA2

Description: Read the Host Watchdog Timeout Value
Syntax: ~AA2[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
2	command for read host watchdog timeout value

Response: Valid Command: **!AAEVV**
Invalid Command: **?AA**

E	host watchdog enable status, 1=Enable, 0=Disable
VV	timeout value in HEX format, each count is 0.1 second 01=0.1 second and FF=25.5 seconds

2.23 ~AA3EVV

Description: Set host Watchdog Timeout Value

Syntax: ~AA3EVV[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
3	command for set host watchdog timeout value
E	1=Enabled / 0=Disable host watchdog
VV	timeout value, from 01 to FF, each for 0.1 second

Response: Valid Command: **!AA**
Invalid Command: **?AA**

Example:

Command: ~010 Receive: !0100

Read address 01 modules status, return host watchdog timeout status is clear.

Command: ~013164 Receive: !01

Set address 01 host watchdog timeout value 10.0 seconds and enable host watchdog, return success.

Command: ~012 Receive: !01164

Read address 01 host watchdog timeout value, return that host watchdog is enabled, and time interval is 10.0 seconds.

Command: ~** No response

Reset the host watchdog timer. Wait for about 10 seconds and don't send command~**, the LED of module will go to flash. The flash LED indicates the host watchdog timeout status is set.

Command: ~010 Receive: !0104
Read address 01 module status, return host watchdog timeout status is set.

Command: ~012 Receive: !01064
Read address 01 host watchdog timeout value, return that host watchdog is disabled, and time interval is 10.0 seconds.

Command: ~011 Receive: !01
Reset address 01 host watchdog timeout status, return success And the LED of this module stop flash.

Command: ~010 Receive: !0100
Read address 01 module status, return host watchdog timeout status is clear.

2.24 ~AA4V

Description: Read Power On/Safe Value

Syntax: ~AA4V[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
4	command for read Power On/Safe value
V	P= read Power On Value, S= read Safe Value

Response: Valid Command: **!AA(Data)**

Invalid Command: **?AA**

(Data) Power On Value or Safe Value

For EX9042D/43D(Data) is **VVVV**,

where VVVV is the Power On Value (or Safe Value).

For other modules, (Data) is **VV00**,

where VV is the Power On Value(or Safe Value).

Example:

Command: @0100 Receive: >

Output address 01 Value 00, return success.

Command: ~015S Receive: !01

Set address 01 Safe Value, return success.

Command: @01FF Receive: >

Output address 01 Value FF, return success..

Command: ~015P Receive: !01

Set address 01 Power On Value, return success.

Command: ~014S Receive: !0100

Read address 01 Safe Value, return 00.

Command: ~014P Receive: !01FF

Read address 01 Power On Value, return FF.

2.25 ~AA5V

Description: Set Power On/Safe Value

Syntax: ~AA5V[CHK](cr)

~	delimiter character
AA	address of reading/response module (00 to FF)
5	command for set Power On/Safe value
V	P= set current output as Power On Value, S= set current output as Safe Value

Response: Valid Command: **!AA**
Invalid Command: **?AA**

Example:

Command: @01AA Receive: >
Output address 01 Value AA, return success.

Command: ~015P Receive: !01
Set address 01 Power On Value, return success.

Command: @0155 Receive: >
Output address 01 Value 55, return success.

Command: @015S Receive: !01
Set address 01 Safe Value, return success..

Command: ~014P Receive: !01AA00

Read address 01 Power On Value, return AA.

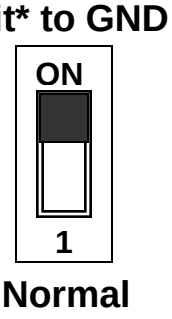
Command: ~014S Receive: !015500

Read address 01 Safe Value, return 55.

EX9051M/9055M Modbus Quick Start

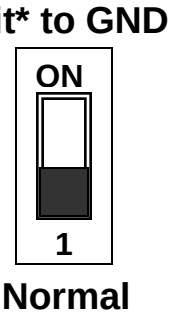
1. The default setting is MODBUS mode after Power On.

2. Sliding the INIT switch to the Init(ON) position of rear slide then Power On will enter INIT mode (use ASCII command).



3. On ASCII command mode, user can set other setting like address, Baudrate, …by use ASCII command or EX9000 utility (Please check the EX9000 user manual).

4. After change the setting finish, Sliding the INIT switch to the Normal(1) position of rear slide, the new setting will be effective after the next power-on reset.



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.orq to find more valuable information.

9000M 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 1stop bit. The following Modbus functions are supported.

01(0x01) Read Digital Input/Output Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x01
02~03	Starting channel	2 Bytes	**EX9051M:** 0x0020~0x002F for DI readback value 0x0040~0x004F for DI Latch high value 0x0060~0x006F for DI Latch low value **EX9055M:** 0x0000~0x0007 for DO readback value 0x0048~0x004F for DO Latch high value 0x0068~0x006F for DO Latch low value 0x0020~0x0027 for DI readback value 0x0040~0x0047 for DI Latch high value 0x0060~0x0067 for DI Latch low value
04~05	Input/Output channel numbers	2 Bytes	0x0001~0x0010

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x01
02	Byte count	1 Byte	1
03	Input/Output channel readback value	1 Byte	0x00~0x0F 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.

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.

02(0x02) Read Digital Input Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x02
02~03	Starting channel	2 Bytes	**EX9051M:** 0x0000~0x000F **EX9055M:** 0x0000~0x0007
04~05	Input channel numbers	2 Bytes	0x0001~0x0010

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x02
02	Byte count	1 Byte	1
03	Input channel readback value	1 Byte	0x00~0x0F A bit corresponds to a channel. When the bit is 1 it denotes that the value of the channel that was Input response. if the bit is 0 it denotes that the value of the channel that was no Input response .

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.

03(0x03) Read Digital Input Count Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x03
02~03	Starting channel	2 Bytes	**EX9051M:** 0x0000~0x000F **EX9055M:** 0x0000~0x0007
04~05	Input channel numbers	2 Bytes	0x0001~0x0010

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 Byte	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.

04(0x04) Read Digital Input Count Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x04
02~03	Starting channel	2 Bytes	**EX9051M:** 0x0000~0x000F **EX9055M:** 0x0000~0x0007
04~05	Input channel numbers	2 Bytes	0x0001~0x0004

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 Byte	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	0x84
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

05(0x05) Write Digital Output/Clear DI count Value (Single channel)

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x05
02~03	Output channel number	2 Bytes	**EX9051M:** 0x0100 to clear the latch value 0x0200~0x020F to clear the DI counter value **EX9055M:** 0x0000~0x0007 for output channel 0x0100 to clear the latch value 0x0200~0x0207 to clear the DI counter value
04~05	Output value	2 Bytes	A value of 0xFF00 sets the output to ON. A value of 0x0000 set it to OFF. All other values are illegal and won't 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.

15(0x0F) Write Digital Output/Clear DI count Value (Multi channel)

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x0F
02~03	Starting channel	2 Bytes	**EX9051M:** 0x0200~0x020F to clear the DI counter value **EX9055M:** 0x0000~0x0007 for output channel 0x0200~0x0207 to clear the DI counter value
04~05	Output channel numbers	2 Bytes	0x0001~0x0010
06	Byte count	1 Byte	2 for EX9051M, 1 for EX9055M
07	Output value/Clear DI count value	1 Byte	0x0000~0xFFFF for EX9051M 0x00~0xFF for EX9055M 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	2 Bytes	The value is the same as byte 02 and 03 of the Request
04~05	Output channel numbers	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 Mapping Table:

EX9051M (DI*16)

ADDR	Item	Attribute
00033~00048	Digital Input channel for DI0~15	R
00065~00080	DI Latch high value for DI0~15	R
00097~00112	DI Latch low value for DI0~15	R
00270	Clear the Latch value	W
30001~30015	Digital input counter for DI0~15	R
00513~00528	Clear the DI counter value for DI0~15	W

EX9055M (DI*8, DO*8)

ADDR	Item	Attribute
00033~00040	Digital Input channel for DI0~7	R
00065~00072	DI Latch high value for DI0~7	R
00097~00104	DI Latch low value for DI0~7	R
00270	Clear the Latch value	W
30001~30008	Digital input counter for DI0~7	R
00513~00520	Clear the DI counter value for DI0~7	W
00001~00008	Digital output channel for DO0~7	R/W