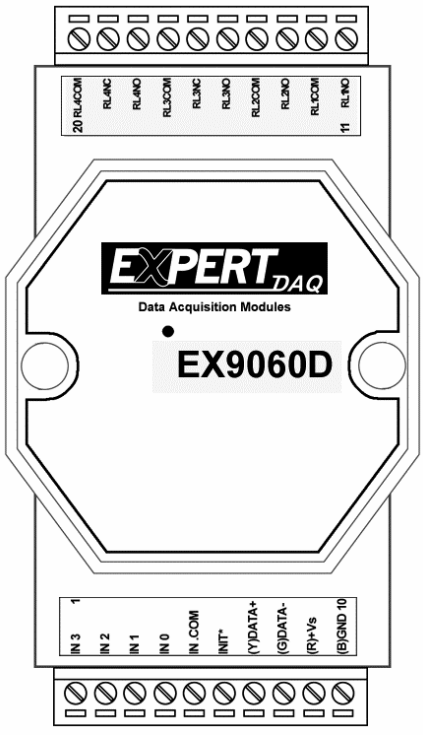
1. Introduction

EX-9060D/9060D-M provides 4 relay output channels and 4 isolated digital input channels. all relay output channels are differential with individually common . (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: 4 relay output channels
(RL1,RL2: Form A, RL3,RL4 Form C)
Relay contact rating : 0.6A/125VAC, 2A/30VDC
Surge strength: 500V
Operate Time: 3mS max.
Release Time: 2mS max.
Min Life: $5*10^5$ops.
Input channels : 4 isolated input channels with common source
Isolation Voltage: 3750Vrms.
Input impedance: 3K ohms
Input logical level 0 : +1V Max.
Input logical level 1: +4.0V ~ +30V
LED: 8 digital input/output status LED
Power input : +10V to +30VDC
Power Consumption : 1.9W/1.8W

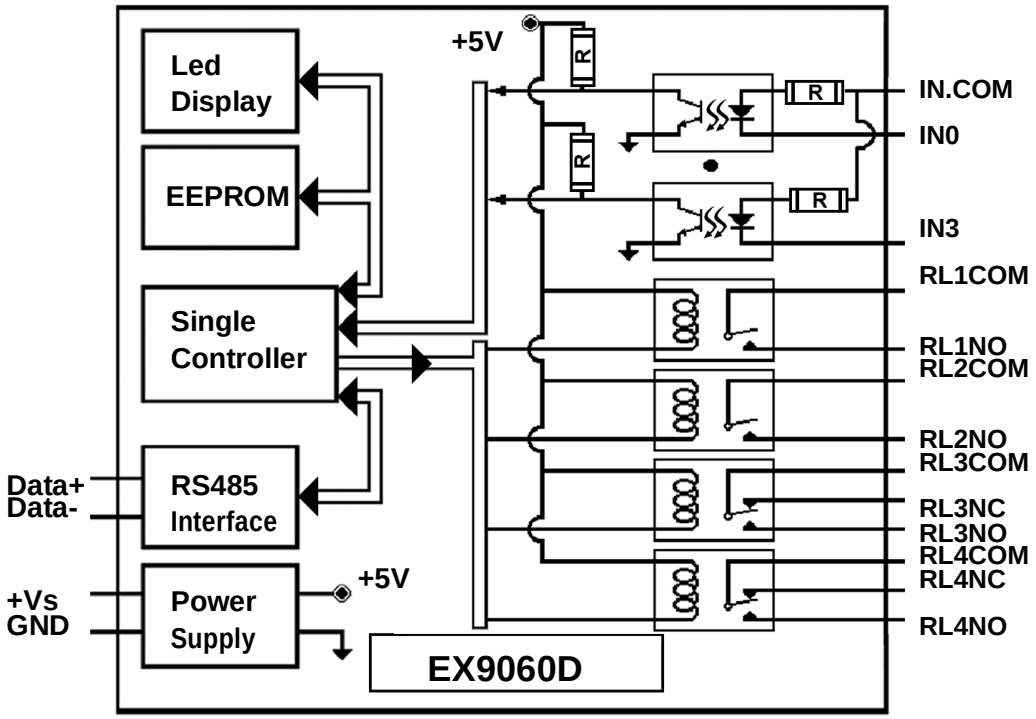


1.1 Specifications

	EX-9060D	EX-9060D-M
Digital Output		
Output Channels	4 Relay Output Channels	
Output mode	Dry Contact Output	
Relay Type	RL1, RL2: Form A RL3, RL4: Form C	
AC Contact Rating	AC: 125V @0.6A	
DC Contact Rating	DC: 30V @2A	
Relay On Time(Typical)	3 msec	
Relay Off Time(Typical)	2 msec	
Insulation Resistance	1000M ohms at 500 VDC	
Digital Input		
Input Channels	4 isolated input channels with common source	
Logical Level 1	+4V to +30V	
Logical Level 0	+1V Max	
Input Impedance	3K Ohms	
Isolation Voltage	3750 Vrms	
Environment		
Modbus RTU	Not support	Support
Power Requirement	+10 to +30 VDC	
Power Consumption	1.9W	1.8W
Operating Temperature	-25°C to +75°C	
Storage Temperature	-30°C to +75°C	

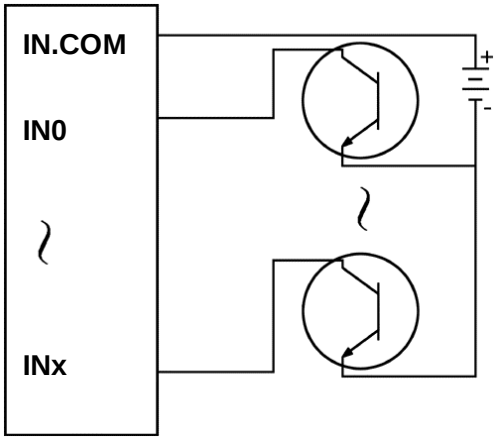
1.2 Wire connection

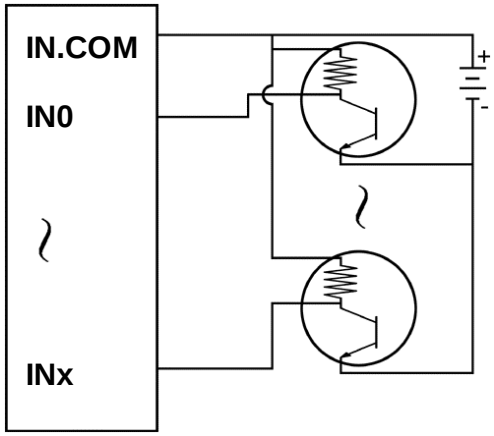
1.2.1 Block Diagrams



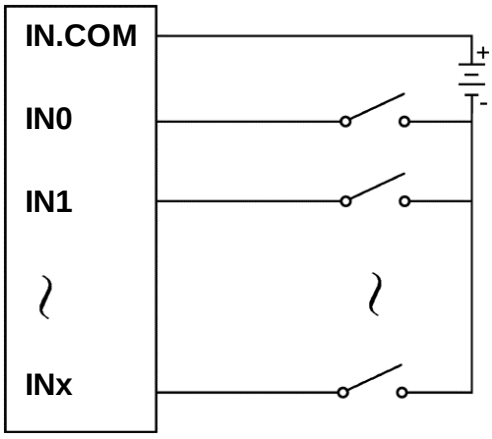
1.2.2 Wiring diagram for the EX-9060D

Open Collector signal Input

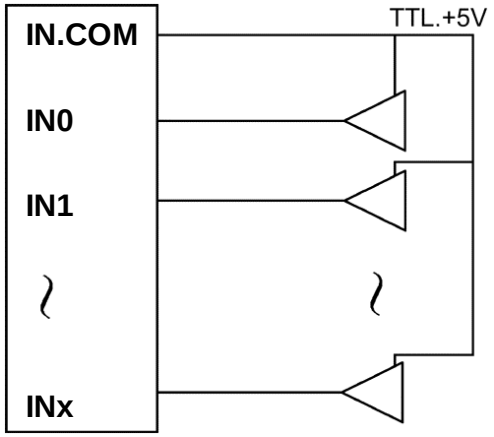




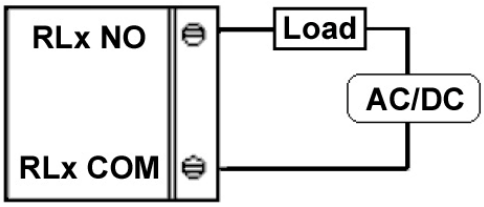
Dry Contact signal Input



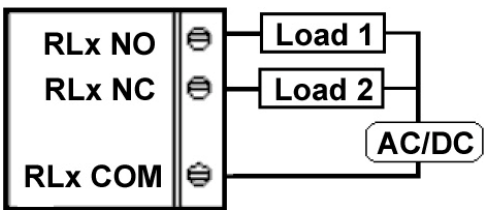
TTL/CMOS signal Input



Relay output in RL1/RL2



Relay output in RL3/RL4



1.3 Default Settings

Default settings for the EX-9060D modules are as follows:

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

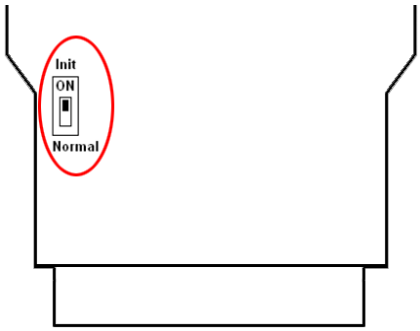
Default settings for the EX-9060D-M modules are as follows:

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

1.4 INIT* Mode 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 .

Originally, the INIT* mode is accessed by connecting the INIT* terminal to the GND terminal. New EX9000 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.



To enable INIT* mode, please following these steps:
Step1. Power off the module
Step2. Connect the INIT* pin with the GND pin.
(or sliding the INIT* switch to the Init* ON position)
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.

1.5 Module Status for DIO, AIO

Power On Reset or **Module Watchdog Reset** will let all output goto **Power On Value**. And the module may accept the host's command to change the output value.

Host Watchdog Timeout will let all output goto **Safe Value**. The module's status(read by command~AA0) will be 04, and the output command will be ignored.

1.6 Dual Watchdog Operation for DIO, AIO

Dual Watchdog=Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit to monitor the module's operating status. While working in harsh or noisy environment, the module may be down by the external signal. The circuit may let the module to work continues and never halt.

The Host Watchdog is a software function to monitor the host's operating status. Its purpose is to prevent the network from communication problem or host halt. When the timeout interval expired, the module will turn all outputs to predefined Safe Value. This can prevent the controlled target from unexpected situation.

The EX9000 module with Dual Watchdog may let the control system more reliable and stable.

1.7 Reset Status

The Reset Status is set while the module power on or reset by module watchdog and is cleared while the command read Reset Status ($AA5) applied. This is useful for user to check the module's working status. When the Reset Status is set means the module is reset and the output may be changed to the PowerOn Value. When the Reset Status is clear means the module is not resetted and the output is not changed.

1.8 Digital O/P

The module's output have 3 different situation :

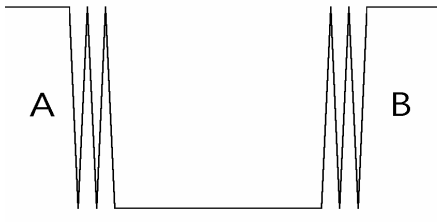
<1>**Safe Value**. If the host watchdog timeout status is set, the output is set to Safe Value. While the module receive the output command like @AA(Date) or #AABBDD, the module will ignore the command and return "!". And will not change the output to the output command value. **The host watchdog timeout status is set and store into EEPROM while the host watchdog timeout interval expired and only can be cleared by command ~AA1**. If user want to change the output it need to clear the host watchdog timeout status firstly and send output command to change the output into desired value.

<2>**PowerOn Value**. Only the module reset and the host watchdog timeout status is clear, the module's output is set to predefined Power On Value.

<3> **Output Command Value**. If the host watchdog timeout status is clear and user issue a digital output command like @AA (Data) or #AABBDD to module for changing the output value. The module will response success (receive>).

1.9 Latch Digital I/P

For example, use connect the key switch to Digital input channel of a digital input/output module and want to read the key stoke. The Key input is a pulse digital input and user will lost the strike. While reading by command $AA6 in A and B position, the response is that no key stroke and it will lose the key stroke information. Respectely, the read latch low digital input command $AAL0 will solve this problem. When issue $AAL0 command in A and B position, the response denote that there is a low pulse between A and B position for a key stroke.



1.10 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	
EX9060	DO1~DO4	00~0F	DI0~DI3	00~0F

2.0 Command Sets
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, it is needed to short the INIT* to ground (or sliding the INIT* switch to the Init ON position of rear side). 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: #021001 Receive: >

Assume module is EX9060D, set address 02 output channel 0 on, return success.

Command: #021001 Receive: >

Assume module is EX9060D, 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 1.10 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: !10F0000

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) **(First Data)(Second Data)00**

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

Module	The First data		The Second data	
EX9060	DO1~DO4	00~0F	DI0~DI3	00~0F

Example:

Command: $016 Receive: !0F0000

Assume module is EX9060, read address 01 DIO status, return 0F00, digital output channel 1~4 are on, digital input channel 0~3 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: !01D03.11

Read address 01 firmware version, return version D03.11

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: !019060M

Read address 01 module name, return name 9060M

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: !010F0F00

Read address 01 latch-low data, return 0F0F.

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: $AACN[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: $AALS[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) **(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	
EX9060	DO1~DO4	00~0F	DI0~DI3	00~0F

Example:

Command: @01 Receive: >0F00

Assume module is EX9060M, read address 01 DIO status, return 0F00, digital output channel 1~4 are on, digital input channel 0~3 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/55D, 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: @01F Receive: >

Output address 01 value F, return success.(The example is suitable for EX9060's digital output channel 1~4 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: ~01O9060M Receive: !01

Set address 01 module name 9060M, return success.

Command: $01M Receive: !019060M

Read address 01 module name, return name 9060M.

2.17 $AAP(Only for EX9060M)

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(Only for EX9060M)

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, it is needed to short the INIT* to ground (or sliding the INIT* switch to the Init ON position of rear side). 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.

EX9060-M Quick Start

1. **The default setting is MODBUS mode after Power On.**
2. **Using INIT* pin to contact with GND pin then Power On will enter Normal mode.**
3. **Command: $00P0 is set EX9060-M to Normal mode after Repower On. On normal mode, user can set other setting like Address, Baudrate, ….. (Please check the EX9000 user manual).**
4. **Command: $AAP1 is set to MODBUS mode after Repower On.**
5. **Under Normal mode that Command: $AAP can check which mode it is after Repower On.**

   Response:

   !AA10=Normal

   !AA11=MODBUS

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	0x0000~0x0003 for DO readback value 0x0020~0x0023 for DI readback value 0x0040~0x0043 for DI Latch high value 0x0060~0x0063 for DI Latch low value **0x0080~0x0083 for DO safe value** **0x00A0~0x00A3 for DO power-on value**
04~05	Input/Output channel numbers	2 Bytes	Input: 0x0001~0x0004 Output: 0x0001~0x0004

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	0x0000~0x0003
04~05	Input channel numbers	2 Bytes	0x0001~0x0004

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	0x0000~0x0003
04~05	Input channel numbers	2 Bytes	0x0001~0x0004

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x03
02	Byte count	1 Byte	**N*** x 2
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	0x0000~0x0003
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	**N*** x 2
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	0x0000~0x0003 for output channel 0x0107 to clear the latch value 0x0200~0x0203 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	0x0000~0x0003 for output channel 0x0200~0x0203 to clear the DI counter value 0x0080~0x0083 for **Safe value** 0x00A0~0x00A3 for **Power-on value**
04~05	Input/Output channel numbers	2 Bytes	Input: 0x0001~0x0004 Output: 0x0001~0x0004
06	Byte count	1 Byte	1
07	Output value/Clear DI count value	1 Byte	0x00~0xFF **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.

01(0x01) Read WDT timeout status

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x01
02~03	Starting channel	2 Bytes	0x010D
04~05	Read WDT timeout status	2 Bytes	0x0001

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x01
02	Byte count	1 Byte	1
03	Read WDT timeout status	1 Byte	0x00 The WDT timeout status is clear 0x01 The WDT timeout status is enable

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.

03(0x03) Read WDT timeout Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x03
02~03	Starting channel	2 Bytes	0x01E8
04~05	Read WDT timeout value	2 Bytes	0x0001

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x03
02	Byte count	1 Byte	2
03~	Read WDT timeout value	**1** Byte	0x0000~0x00FF WDT timeout value, 0~255, in 0.1 second

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.

03(0x03) Send Host OK

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x03
02~03	Starting channel	2 Bytes	0x3038
04~05	Send Host OK	2 Bytes	0x0000

No Response

04(0x04) Send Host OK

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x04
02~03	Starting channel	2 Bytes	0x3038
04~05	Send Host OK	2 Bytes	0x0000

No Response

05(0x05) Set WDT timeout /Clear WDT timeout status

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x05
02~03	WDT timeout	2 Bytes	0x0104 Set WDT timeout enable/disable 0x010D Clear WDT timeout status
04~05	WDT timeout	2 Bytes	0xFF00 for WDT timeout enable 0x0000 for WDT timeout disable 0xFF00 for Clear WDT timeout status

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x05
02~03	WDT timeout	2 Bytes	The value is the same as byte 02 and 03 of the Request
04~05	WDT timeout	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.

06(0x06) Set WDT timeout Value

Request

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x06
02~03	Starting channel	2 Bytes	0x01E8
04~05	WDT timeout value	2 Bytes	0x0000~0x00FF WDT timeout value, 0~255, in 0.1 second

Response

00	Address	1 Byte	1-247
01	Function code	1 Byte	0x06
02~03	WDT timeout value	2 Bytes	The value is the same as byte 02 and 03 of the Request
04~05	WDT timeout 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	0x86
02	Exception code	1 Byte	Refer to the Modbus standard for more details.

9060-M Modbus mapping:

General			
Protocol of Module	00257	R/W	0x00(0x0000): ASCII command, 0x01(0xFF00): ModbusRTU new protocol is effective after module reboot.
Module name	40483~40484	R	0x0090 0x6000
Module address	40485	R/W	0x0000~0x00F7(1~247) new address is effective after module reboot.
Module baudrate	40486	R/W	0x0003~0x000A (the table please check the user manual) new baudrate is effective after module reboot.
DIO function			
DO channel	00001~00004	R/W	0x00(0x0000): off, 0x01(0xFF00): on
DI channel	00033~00036 10001~10004	R	0x00: level low, 0x01: level high
DI latch high value	00065~00068	R	0x00: level never high, 0x01: level already high
DI latch low value	00097~00100	R	0x00: level never low, 0x01: level already low
Clear the latch value	00264	W	0xFF00
DI channel's counter	30001~30004	R	0x0000~0xFFFF
Clear DI channel's counter	00513~00516	W	0xFF00
DI count edge	02251	R/W	0x00(0x0000): falling edge, 0x01(0xFF00): rising edge
DO channel's safe value	00129~00132	R/W	0x00(0x0000): not set, 0x01(0xFF00): set on to safe value The DO status will be change after change the safe value
DO channel's power-on value	00161~00164	R/W	0x00(0x0000): not set, 0x01(0xFF00): set on to power-on value The DO status will be change after change the power-on value
WDT			
Informs module host is OK	312345 412345	R	No response
WDT timeout value	40489	R/W	0x0000~0x00FF, 0~255 in 0.1 second
WDT enable/disable	00261	R/W	0x00(0x0000):disable, 0x01(0xFF00):enable
WDT timeout status	00270	R/W	0x00: not timeout, 0x01:WDT timeout (write 0xFF00 to clear WDT timeout status)

Sub-function (0x46)			
Module name	AA 46 00	R	01 46 00 **00 90 60 00**
Set module's address	AA 46 04 NN 00 00 00	W	NN: new address, 01~F7(1~247) new address is effective after module reboot.