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RemoDAQ-8016 Series Modules

User's Manual

Beijing DSLC Technology Co.，Ltd

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Additional Information and Assistance

1. Visit the DSLC websites **www.DSLC.com.cn** at where you can find the latest information about the product.

2. Contact your distributor, sales representative, or DSLC's customer service center for technical support if you need additional assistance. Please have the following information ready before you call：

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version，application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

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1 Introduction

The RemoDAQ-8000 Series is a set of intelligent sensor to computer interface modules containing built in microprocessor. They are remotely controlled through a simple set of commands issued in ASCII format and transmitted in RS-485 protocol. They provide signal conditioning, isolation, ranging, A/D and D/A conversion, data comparison, digital communication, timer/counter, wireless communication, collection AC and other functions.

RemoDAQ-8016 Analog Input/Output Module

A strain gauge input module uses a microprocessor controlled integrating A/D converter to convert sensor voltage or current signals into digital data for load cell and stress measurement. The digital data is then translated into either engineering units, two's complement hexadecimal format or percentage of full scale range (FSR) according to the module's configuration. When prompted by the host computer, the data is sent through a standard RS-485 interface.

The strain gauge input module offers signal conditioning, A/D conversion, ranging, and RS-485 digital communication functions. They protect your equipment from ground loops and power surges by providing opto-isolation of the A/D input and transformer based isolation up to 3000 VDC.

Excitation Voltage Output

A strain gauge input module can supply single channel voltage output for excitation. The module receives digital input from the host computer. The format of the data is engineering units. It then uses its microprocessor-controlled D/A converter to convert the digital data into output signals.

Strain gauge input modules protect your equipment from ground loops and power surges by providing opto-isolation of the D/A output and transformer based isolation up to3000Vdc

Digital Outputs

A strain gauge input module also contains 4 digital outputs. Outputs are open-collector transistor switches that may be controlled by the host computer. They can control solid-state relays that in turn may control heaters, pumps, and other electrical equipment.

Alarm signaling

Strain Gauge input modules include High and Low alarm functions.High and Low alarm limits may be downloaded into the module's EEPROM by the host computer.

The alarm functions can be enabled or disabled remotely. When the alarm function is enabled, both Digital Output channels are used to indicate the High and Low alarm state. Digital Output channel 1 (DO1) equals High alarm state and Digital Output channel 0 (DO0) equals Low alarm state. The High and Low alarm states can be read at any time by the

host computer.

Every A/D conversion will be followed by a comparison with the High and Low limit. When the input value exceeds one of these limits, the High or Low alarm state is set to ON.

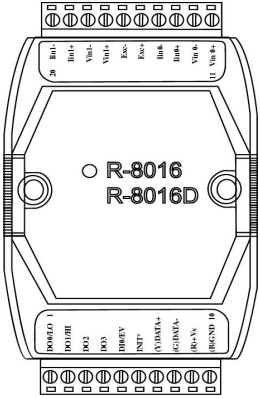
There are two alarm mode options: Momentary and Latching.

If the alarm is in Latching mode, the alarm will stay on even when the input value returns within limits. An alarm in Latching mode can be turned OFF by issuing a Clear Alarm command from the host computer. A Latching alarm is cleared by the module when the opposite alarm is set. For example: the alarm is in latching mode and the High alarm is turned ON.

When the module receives a value that is lower than the Low alarm limit, it will clear the High alarm and turn the Low alarm ON.

When the alarm is in Momentary mode, the alarm will be turned OFF as soon as the input value returns to within limits. The arrangement of coupling High and Low alarm states with DO lines may be utilized to build ON/OFF controllers that can operate without host computer involvement. .

1.1 Pin Assignment & Specifications



RemoDAQ-8016/8016D Specifications：

Input range	±15mV, ±50mV, ±100mV, ±500mV, ±1V, ±2.5V, ±20mA
Output Speed (in bps) Maximum distance	RS-485 (2-wire) 1200,2400,4800,9600,19.2K,38.4K,57.6K,115.2K 4000ft. (1200m.)
Accuracy	±0.05%(8012/12D)；±0.25% (8012F)；
Zero drift	20μV/° C
Span drift	25ppm/° C
Isolation voltage	3000VDC
CMR@50/60Hz	150dB
NMR@50/60Hz	100dB
Bandwidth	5.24Hz

Conversion rate	10samples/sec
Input impedance	20MΩ
Digital output Sink current Power dissipation	4 channels open collector to 30V 30mA max.load 300mW
Digital input Logic level 0 Logic level 1 Pull up current	1 channel +1Vmax +3.5V~30V 0.5mA
Event counter Max.input frequency Min.pulse width	 50Hz 1 m/sec
Watchdog timer	Yes
Displayed LED	4½ digits (for R-8012D)
Power supply	10~30VDC
Power consumption	2.4W(R-8016)；3.0W(R-8016D)
Environment	Operating Temperature：-20 ~ 70° C
	Humidity：5 ~ 95%, non-condensing

Excitation Voltage Output：

Output Channel：1

Output Range：0 ~ 10V

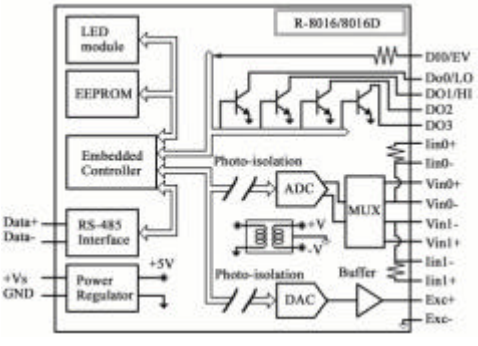
Max Output Load：40mA

Accuracy：± 0.05% of FSR

Drift：± 50ppm/° C

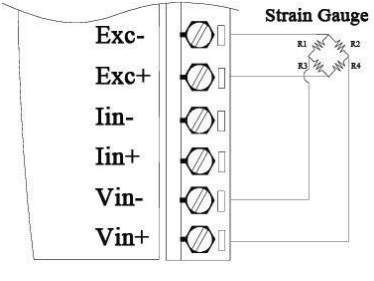
Output Impedance：12 Ohms

1.2 Block Diagram

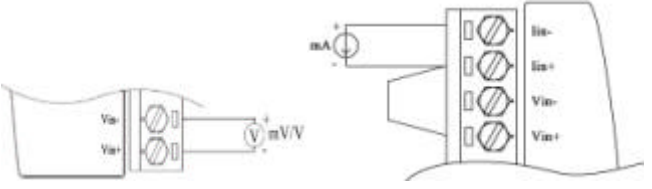


1.3 Application Wiring

Bridge Sensor/Load Cell/Strain Gauge Wire Connection

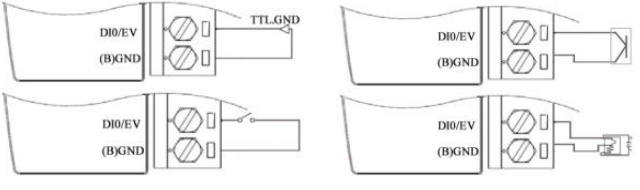


Analog Input Wire Connection

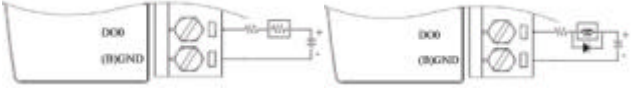


Analog Output Wire Connection

Digital Input Wire Connection



Digital Output Wire Connection



1.4 Default Setting

- Address：01
- Baudrate：9600 bps
- Analog output type：Type 05， -2.5 to +2.5 V
- 60Hz filter rejection,Checksum disable,engineering unit format

1.5 Calibration

What do you need to do calibration?

1. One 5 1/2 digital multimeter.
2. A voltage calibrator or very stable and noise free DC voltage generator.
3. A precision resistance decade box or discrete resistors.
4. RemoDAQ-8000 Utility

Calibration for RemoDAQ-8016/16D

Type	00	01	02	03	04	05	06
Min	0mV	0mV	0mV	0mV	0V	0V	0mA
Max	+15mV	+50mV	+100mV	+500mV	+1V	+2.5V	+20mA

Notes：

1. Apply power to the module and let it warm up for about 30 minutes
2. While calibrate type 06,need connect external resistor,125Ω,0.1%
3. Connect calibration voltage(or current) signal to module' s input.For RemoDAQ-8016 connects to channel 0.

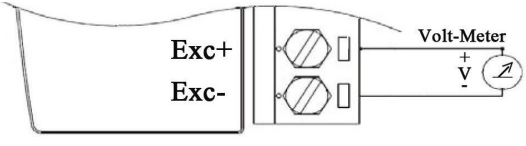
Calibrate Order：

1. Setting type to 00
2. Enable calibration
3. Apply zero calibration voltage

4. Perform zero calibration command
5. Apply span calibration voltage
6. Perform span calibration command
7. Repeat step 3 to step 6 three times.

The calibration order with other types is to it similar, but in first step installation type from time to time place difference.

Excitation Voltage Calibration Requirement for RemoDAQ–8016/8016D



Calibration Sequence：

1. Connect voltmeter to module's excitation output pin.
2. Warm-Up for 30 minutes.
3. Output 0V.
4. Trim the output until the value in voltmeter is closest to 0V.
5. Perform Excitation Voltage Zero Calibration.
6. Output 10V.
7. Trim the output until the value in voltmeter is closest to 10V.
8. Perform Excitation Voltage Span Calibration.

1.7 Install List

Baudrate Setting (CC)

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

Analog Input Type Setting (TT)

Type	00	01	02	03	04	05	06
Min	-15mV	-50mV	-100mV	-500mV	-1V	-2.5V	-200mA
Max	+15mV	+50mV	+100mV	+500mV	+1V	+2.5V	+200mA

Data format setting（FF）

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

*1：0=60Hz Restrain　　1=50Hz Restrain

*2：Checksum：0=Disabled　1=Enable

*3：00 = Engineering unit Format

01 = Percent Format

10 = 2's Complement HEX Format

Analog Input Type And Data Format Table

Code	**Input span**	**Data format**	**+F.S.**	**Zero**	**-F.S**
00	-15mV~+15mV	Project Unit	+15.000	+00.000	-15.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
01	-50mV~+50mV	Project Unit	+50.000	+00.000	-50.000
		%（FSR）	+100.000	+000.00	-100.00

		2's Complement HEX	7FFF	0000	8000
02	-100mV~100mV	Project Unit	+100.000	+000.000	-100.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
03	-500mV~+500mV	Project Unit	+500.000	+000.000	-500.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
04	-1V~+1V	Project Unit	+1.000	+0.000	-1.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
05	-2.5V~+2.5V	Project Unit	+2.5000	+0.000	-2.5.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
06	-20mA~+20mA	Project Unit	+20.000	+0.0000	-20.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000

2 Initialization & Installation

2.1 Installation Guideline

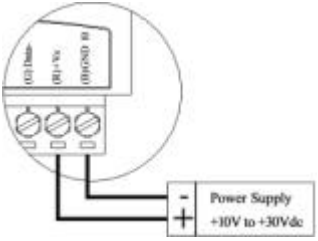


Figure 2-1 Power Supply Connections

We advise that the following standard colors (as indicated on the modules) be used for power lines：

+Vs (R) Red
GND (B) Black

We advice that the following standard colors (as indicated on the modules) be used for the communication lines：

DATA+ (Y) Yellow
DATA- (G) Green

2.2 Software Installation

1. If you have already installed "RemoDAQ-8000 Utility" then skip other steps.
2. Backup your software diskette.
3. Insert "RemoDAQ-8000 Utility" disc into CD-ROM：
4. Change drive to the path of CD-ROM. For example,

your drive of CD-ROM is F：then change the drive to F：

5. Find the setup of "RemoDAQ-8000 Utility" and run it.
6. Please follow the steps of setup program then you can successful to install the RemoDAQ-8000 Utility

2.3 Basic configuration and hook-up

Before placing a module in an existing network, the module should be configured. Though all modules are initially configured at the factory, it is recommended to check that the baud rate is set correctly.

Default Factory Settings

Baud rate： 9600 Bit/sec.

Address： 01 (hexadecimal)

Checksum：disable

The basic hook-up for module configuration is shown below.

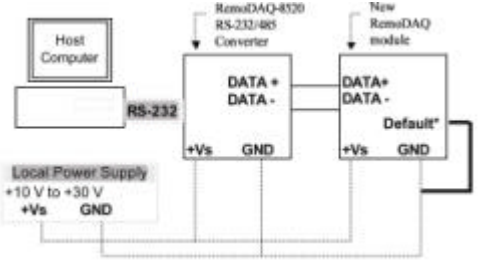


Figure 2-2 Layout for Initialization the RemoDAQ module

The following items are required to configure a module：a

RemoDAQ converter module, a personal computer with RS-232 port (baudrate set to 9600) and the RemoDAQ utility software.

Configuration with the RemoDAQ Utility Software

The easiest way to configure the RemoDAQ module is by using the RemoDAQ utility software：An easy-to-use menu-structured program will guide you through every step of the configuration.

Configuration with the RemoDAQ command set

RemoDAQ modules can also be configured by issuing direct commands within a terminal emulation program that is part of the RemoDAQ utility software.

The following example guides you through the setup of an analog input module. Assume that RemoDAQ-8016 still has its default settings (baud rate 9600 and address 01h). Before the module is reconfigured, it is first requested to send its default settings.

To change the configuration setting of the analog input module, the following command is issued：

%0107050600(cr)

% = change configuration

01 = target module at address 00 to：

07 = change address to 07 hexadecimal

05 = set input range to Type 05

06 = set baud rate to 9600

00 = set integration time to 50 ms (60 Hz)

disable checksum

set data format to engineering units

(See Chapter 3, Command Set for a full description of the syntax of the configuration command for module)
When the module received the configuration command it will respond with its new address：!07(cr)
NOTICE： *All reconfiguration except changing of baud rate and checksum values can be done dynamically, i.e. the modules need not to be reset. When changing the baud rate or checksum, these changes should be made for all connected devices. After reconfiguration, all modules should be powered down and powered up to force a reboot and let the changes take effect.*

2.4 Baudrate and Checksum

RemoDAQ modules contain EEPROMs to store configuration information and calibration constants. The EEPROM replaces the usual array of switches and ports required to specify baudrate, input/output range etc.

All of the RemoDAQ modules can be configured remotely through their communication ports, without having to physically alter port or switch settings.

Forcing the module in the INIT* state does not change any parameters in the module's EEPROM. When the module is in the INIT* state with its INIT* and GND terminals shorted, all configuration settings can be changed and the module will respond to all other commands normally.

Changing Baud rate and Checksum

Baud rate and checksum settings have several things in common：

- They should be the same for all modules and host computer.
- Their setting can only be changed by putting a module in the INIT* state.
- Changed settings can only take effect after a module is rebooted

To alter baudrate or checksum settings you must perform the following steps：

- Power on all components except the RemoDAQ Module.
- Power the RemoDAQ module on while shorting the INIT* and GND terminals
- Wait at least 7 seconds to let self calibration and ranging take effect.
- Configure the checksum status and/or the baud rate.
- Switch the power to the RemoDAQ Module OFF.
- Remove the grounding of the INIT* terminal and power the module on.
- Wait at least 7 seconds to let self calibration and ranging take effect.
- Check the settings (If the baud rate has changed, the settings on the host computer should be changed accordingly.)

3 Command Set

Introduction

To avoid communication conflicts when several devices try to send data at the same time, all actions are instigated by the host computer. The basic form is a command/response protocol with the host initiating the sequence.

When modules are not transmitting they are in listen mode. The host issues a command to a module with a specified address and waits a certain amount of time for the module to respond. If no response arrives, a timeout aborts the sequence and returns control to the host.

Changing RemoDAQ's configuration might require the module to perform auto calibration before changes can take effect. Especially when changing the range, the module has to perform all stages of auto calibration that it also performs when booted. When this process is under way, the module does not respond to any other commands.

The command set includes the exact delays that might occur when modules are reconfigured.

Syntax

[delimiter character][address][command][data][checksum][carriage return]

Every command begins with a delimiter character. There are four valid characters：a dollar sign $, a pound sign #, a percentage sign % and an at sign @.

The delimiter character is followed by a two-character address (hexadecimal) that specifies the target module. The actual two-character command follows the address. Depending on the command, an optional data segment follows the command string. An optional two character checksum may be appended to the total string. Every command is terminated by a carriage return (cr).

Calculate Checksum：

1. Calculate ASCII sum of all characters of command(or response) string except the character return(cr).
2. Mask the sum of string with 0ffh.

Example：

Command string：$012(cr)

Sum of string=‘$’+‘0’+‘1’+‘2’=24h+30h+31h+32h=B7h

The checksum is B7h，and [CHK] = “ B7”

Command string with checksum：$012B7(cr)

Response string：!01200600(cr)

Sum of string：‘!’+‘0’+‘1’+‘2’+‘0’+‘0’+‘6’+‘0’+‘0’

=1h+30h+31h+32h+30h+30h+36h+30h+30h=1AAh

The checksum is AAh，and [CHK] = “ AA”

Response string with checksum：!01200600AA(cr)

General Command Sets			
Command Syntax	**Command Name**	**Command Description**	**Notes**
%AANNTTCCFF	Configuration	Sets the address,input range, baudrate,dataformat,checksum status	3.1
#AA	Analog data in	Return the input value from the module in the currently configured data format	3.2
$AA0	Span calibration	Calibrates an AI module to correct for gain errors	3.3
$AA1	Zero Calibration	Calibrates an AI module to correct for gain errors	3.4
$AA2	Configuration status	Return the configuration parameters for the module	3.5
$AA3	Read channel select	Return the channel for the module	3.6
$AA3N	Set channel select	Return correct or error	3.7
$AA8	Read LED configuration	Read the LED configuration which determines whether LED will display data from the module or from the host computer	3.8
$AA8V	Set LED configuration	Set the LED configuration which determines whether LED will display data from the module or from the host computer	3.9
$AA9(data)	Send LED data	The computer sends data to the module to display on its LED	3.10
$AAF	Read firmware version	Return the firmware version code	3.11
$AAM	Read module name	Return the module name	3.12
~AAO(data)	Set module name	Return correct or error	3.13

~AAEV	Enable/Disable calibration	Return correct or error	3.14

Excitation Voltage Output Command Sets			
Command Syntax	**Command Name**	**Command Description**	**Notes**
$AA6	Get excitation voltage output value	Returns either last value sent to module by $AA7 command, or start up output voltage	3.15
$AA7(Data)	Excitation voltage output	Dired output excitation voltage data to the module	3.16
$AAS	Start-up voltage output configuration	Stores a default value in a module,The output value will take effect upon atartup	3.17
$AAEVV	Trim calibration	Trims module a number of units up or dowm	3.18
$AAA	Zero calibration	Tells the module to store parameters for zero calibration	3.19
$AAB	Span calibration	Tells the module to store parameters for span calibration	3.20

Digital I/O、Alarm and Event Counter Command Sets			
Command Syntax	**Command Name**	**Command Description**	**Notes**
@AADI	Read DI/O and alarm status	The addressed module returns the state of its DI channel,its two DO channels and the status of its alarm	3.21
@AADO(data)	Set digital output	Set the values of the module's two DO (On or Off)	3.22
@AAEAT	Enable alarm	Enables the alarm in either Momentary or Latching mode	3.23

@AAHI(data)	Set high alarm	Downloads the high alarm limit value	3.24
@AALO(data)	Set low alarm	Downloads the low alarm limit value	3.25
@AADA	Disable alarm	Disables all alarm functions	3.26
@AACA	Clear latch alarm	The latch alarm is reset	3.27
@AARH	Read high alarm	Return its high alarm value	3.28
@AARL	Read low alarm	Return its low alarm value	3.29
@AARE	Read event counter	Return its event counter value	3.30
@AACE	Clear event counter	The event counter is set to 0	3.31

Host Watchdog Related Command Sets			
Command Syntax	**Command Name**	**Command Description**	**Notes**
~**	Host OK	'Host ok' send to the module	3.29
~AA0	Read module status	Return module status	3.30
~AA1	Reset module status	Return success or error	3.31
~AA2	Read host watchdog timeout interval	Return timeout interval	3.32
~AA3EVV	Set host watchdog timeout interval	Return success or error	3.33
~AA4V	Read poweron value and safe value	Return poweron value and safe value	3.34
~AA5PPSS	Set poweron value and safe value	Return success or error	3.35

3.1 %AANNTTCCFF

Name： Configuration

Description： Sets address, type code, baudrate, data format

Syntax： %AANNTTCCFF(cr)

% delimiter character.

AA address of setting module (00-FF)

NN New address (00-FF)

TT New type

CC New baudrate

FF New data format

When changing baudrate or checksum, we should INIT* termination land.

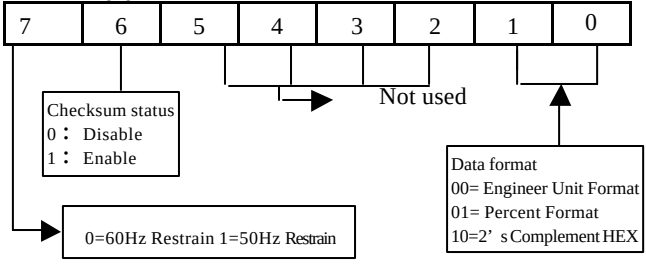


Figure 3-1 Data format setting of AI modules

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered. If the INIT* terminal was not grounded when attempting to change baud rate or checksum settings.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of setting module (00-FF)

(cr) is the terminating character, carriage return (0Dh)

Example：

Command：%0102050600(cr) Response：!02(cr)

Change address from 01 to 02,an input range ±2.5V, baud rate 9600, integration time 50 ms (60 Hz), engineering units data format and no checksum checking or generation.

The response indicates that the command was received.

Table 3-1 Input Rang Codes (Type Code)

Type	00	01	02	03	04	05	06
Min	0mV	0mV	0mV	0mV	0V	0V	0mA
Max	+15mV	+50mV	+100mV	+500mV	+1V	+2.5V	+200mA

Table 3-2 Baudrate Code

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

3.2 #AA

Name： Analog Data In

Description： Command will return the input value from module in the currently configured data format.

Syntax #AA(cr)

delimiter character.

AA address of reading module(00~FF)

(cr) is the terminating character, carriage return (0Dh).

Response： >(data)(cr)

Syntax error or communication error may get no response.

> delimiter character.

data AI input value,the data is the combination for each channel respectively

Example：

Command：#01 Response：>+02.505

Read analog input value at address 01, return with +02.505

3.3 $AA0

Name： Span Calibration

Description： Calibrates module to correct for gain errors.

Syntax： $AA0 (cr)

$ delimiter character.

AA address of the module that is to be calibrated(00~FF)

0 span calibration command.

(cr) the terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

In order to successfully calibrate an analog input module's input range, a proper calibration input signal should be connected to the analog input module before and during the calibration.

Example：

Command：$010 Response：!01

Span calibration of address 01,return success

Command：$020 Response：?02

Span calibration of address 02,return the calibration is not enable before span calibration command

3.4 $AA1

Name： Zero Calibration
Description： Calibrates module to correct for gain errors
Syntax： $AA1(cr)
$ delimiter character.
AA address of the module that is to be calibrated(00~FF)
1 zero calibration command.
(cr) the terminating character, carriage return (0Dh).
Response： !AA(cr) if the command was valid.
?AA(cr) if an invalid operation was entered.
Syntax error or communication error may get no response.
! command is valid.
? command is invalid.
AA address of the module (00~FF)
In order to successfully calibrate an analog input module's input range, a proper calibration input signal should be connected to the analog input module before and during the calibration.
Example：
Command：$011 Response：!01
Zero calibration of address 01,return success
Command：$021 Response：?02
Zero calibration of address 02,return the calibration is not enable before span calibration command

3.5 $AA2

Name： Configuration Status

Description： The command requests the return of the configuration data from the analog input module at address AA.

Syntax： $AA2(cr)

$ delimiter character.

AA address of reading module(00~FF)

2 the Configuration Status command.

(cr) the terminating character, carriage return (0Dh).

Response： !AATTCCFF(cr) if the command is valid.

?AA(cr)if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of module(00~FF)

TT represents the type code.

CC represents the baud rate code.

FF data format

(Also see the %AANNTTCCFF configuration command)

Example：

Command：$012 Response：!01050600

Read address 01 configuration,return success

3.6 $AA3

Name： Read Channle Select

Syntax： $AA3(cr)

$ delimiter character.

AA address of reading module(00~FF)

3 the read channel select command.

(cr) is the terminating character, carriage return (0Dh).

Response： !AAN(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

N channel selected. The analog input command is applied to the channel N.

Example：

Command：$013 Response：!01

Read address 01 channel select，return channel 0 is selected.

Notice： Command only for **RemoDAQ-8017R**

3.7 $AA3N

Name： Set channel select

Syntax： $AA3N(cr)

$ delimiter character.

AA address of setting module(00~FF)

3 the set channel select command.

N channel

(cr) is the terminating character, carriage return (0Dh).

Response： !AA(cr) if the command is valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$0131 Receive：!01

Set address 01 channel select 1，return success.

Command：$013 Receive：!011

Read address 01 channel select，return channel 1 is selected.

3.8 $AA8

Name： Read LED Data Origin

Description： Read the LED Data Origin status which determines whether LED will display data from the module directly or from the host computer

Syntax： $AA8(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

8 identifie the Read LED Data Origin commands.

(cr) is the terminating character, carriage return (0Dh)

Response： !AAV(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

V LED configuration. 1=module control，2=host control

Example：

Command：$018 Receive：!011

Read address 01 LED configuration，return module control.

3.9 $AA8V

Name： Select LED Data Origin

Description： Select whether LED will display data from the module directly or from the host computer.

Syntax： $AA8V(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

8 identifie the Select LED Data Origin commands.

V LED configuration. 1=module control，2=host control

(cr) is the terminating character, carriage return (0Dh)

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$0182 Receive：!01

Set address 01 LED to host control，return success.

Notice： Command only for **RemoDAQ-8016D**

3.10 $AA9(Data)

Name： Send Data to LED

Description： The host computer sends data to the addressed module to display on its LED.

Syntax： $AA9(data)(cr)

$ is a delimiter character.

AA address of setting module(00~FF)

9 identifies the Send LED Data command.

Data data for show on the LED，from -19999. to +19999. The data format is sign,5 numerical and decimal point.

(cr) is the terminating character, carriage return (0Dh)

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$019+123.45 Receive：!01

Send address 01 LED data +123.45，return success.

Command：$029+512.34 Receive：?02

Send address 02 LED data +512.34，return the LED is not setting in the host mode.

Notice： Command only for **RemoDAQ-8016D**

3.11 $AAF

Name： Read Firmware Version

Description： The command requests the module at address AA to return the version code of its firmware.

Syntax： $AAF (cr)

$ delimiter character.

AA address of reading module(00~FF)

F identifies the version command.

(cr) is the terminating character, carriage return (ODh)

Response： !AA(data)(cr) if the command is valid.

?AA (cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Data is the version code of the module's firmware.

Example：

Command：$01F Receive：!01040101

Read address 01 firmware version，return version 040101

Command：$02F Receive：!012050101

Read address 02 firmware version，return version 050101

3.12 $AAM

Name： Read Module Name

Description： The command requests the module at address AA to return its name.

Syntax： $AAM (cr)

$ delimiter character.

AA address of reading module(00~FF)

M the Read Module Name command.

(cr) is the terminating character, carriage return (ODh)

Response： !AA(data)(cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

data the name of the module

Example：

Command：$01M Receive：!018016

Read address 01 module name，return name 8016.

Command：$03M Receive：!038016

Read address 03 module name，return name 8016.

3.13 ~AAO(Data)

Name： Set Module Name

Description： Set the module name and return success or error.

Syntax： ~AAO(Data) (cr)

$ delimiter character.

AA address of setting module(00~FF)

O Set Module Name command.

Data new name for module，max 6 characters

(cr) is the terminating character, carriage return (ODh)

Response： !AA(cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：~01O8016 Receive：!01

Set address 01 module name to 8016，return success.

Command：$01M Receive：!018016

Read address 01 module name，return 8016.

3.14 ~AAEV

Name： Enable/Disable Calibration

Syntax： ~AAEV (cr)

$ delimiter character.

AA address of reading module(00~FF)

E Enable/Disable calibration command.

V 1=Enable 0=Disable

(cr) is the terminating character, carriage return (ODh)

Response： !AA(cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$010 Receive：?01

Perform address 01 span calibration，return the command is invalid before enable calibration.

Command：~01E1 Receive：!01

Set address 01 to enable calibration， return success.

Command：$010 Receive：!01

Perform address 01 span calibration， return success.

3.15 $AA6

Name： Get Excitation Voltage Output Value

Description： The addressed strain gauge input module is instructed to return the latest output value it received from Excitation Voltage Output command. If the module hasn't received an Excitation Voltage Output command since startup, it will return its Start-up Output value.

Syntax： $AA6(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

6 is the get excitation voltage output command.

(cr) is the terminating character, carriage return (0Dh)

Response： !AA(data)(cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

(Data) excitation voltage value，engineering unit format

Example：

Command：$0A6(cr) Response：!0A+03.000(cr)

The command tells the strain gauge input module at address 0Ah to return the last excitation voltage output value that it received from an Excitation Voltage Output command. The strain gauge input module returns the value +03.000V.

3.16 $AA7(Data)

Name： Excitation Voltage Output

Description：Send a value to the analog output channel of the addressed strain gauge input module. Upon receipt, the analog output channel will output this value.

Syntax： $AA7(data)(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

7 is the excitation voltage output command.

(Data) excitation voltage value，engineering unit format

(cr) is the terminating character, carriage return (0Dh)

Response： !AA (cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$337+05.000(cr) Response：!33(cr)

The command sends the value +05.000V to the analog output channel of the strain gauge input module at address 33h. The module responds that the command is valid. Its output data format is in engineering unit, the value is +05.000V.

3.17 $AAS

Name： Start-up Voltage Output Configuration

Description： Stores the present analog output value of the strain gauge input module with address AA in the module's non-volatile register. The output value will take effect upon start-up or after a brownout.

Syntax： $AAS(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

S is the start-up voltage output configuration command.

(cr) is the terminating character, carriage return (0Dh)

Response： !AA (cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$017+05.123 Receive：!01

Set address 01 exciataion 5.123V，return success.

Command：$01S Receive：!01

Set address 01 Start-Up Voltage，return success. The module's Start-Up Voltage is 5.123V now.

3.18 $AAEVV

Name： Trim Calibration

Description： Trims the output voltage of the strain gauge input module a specified number of units up or down.

Syntax： $AAEVV(cr)

$ is a delimiter character.

AA address of reading module(00~FF)

E is the trim calibration command.

VV trim value,01~7F is increase 1~127 counts,and FF~80 is decrease 1~128 counts.Each count is about 0.2mV

(cr) is the terminating character, carriage return (0Dh)

Response： !AA (cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$07E14(cr) Response：!07

The command tells the analog output of the strain gauge input module at address 07h to increase its output value by 20 (14h) counts what is approximately 20 mV.

The strain gauge input module confirms the increase.

3.19 $AAA

Name： Zero Calibration

Description： Stores the voltage output value of the addressed strain gauge input module as zero voltage reference.

Syntax： $AAA(cr)

$ is a delimiter character.

AA address of the module that is to be calibrated(00~FF)

A is the zero calibration command.

(cr) is the terminating character, carriage return (0Dh)

Response： !AA (cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$017+00.000 Receive：!01

Set address 01 excitation 0V，return success.

Command：$01A Receive：!01

Perform address 01 zero calibration，return success.

3.20 $AAB

Name：Span Calibration

Description：Stores the voltage output value of the addressed strain gauge input module as 10V reference.

Syntax：$AAB(cr)

$ is a delimiter character.

AA address of the module that is to be calibrated(00~FF)

B is the span calibration command.

(cr) is the terminating character, carriage return (0Dh)

Response：!AA (cr) if the command is valid.

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$017+10.000 Receive：!01

Set address 01 excitation 10V，return success.

Command：$01B Receive：!01

Perform address 01 span calibration，return success.

3.21 @AADI

Name： Read Digital I/O and Alarm State

Description：The addressed analog input module is instructed to return the value of its DI/O channels and the state of its alarm

Syntax： @AADI(cr)

@ delimiter character.

AA address of reading module(00~FF)

DI is the Read Digital I/O and Alarm Status command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AASOOII(cr) if the command was valid

?AA(cr) if an invalid command was issued.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

S alarm enable status,0=alarm disable,1=momentary alarm enabled,2=latch alarm enabled.

OO digital output status，

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DO0	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On
DO1	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On
DO2	Off	Off	Off	Off	On	On	On	On	Off	Off	Off	Off	On	On	On	On
DO3	Off	Off	Off	Off	Off	Off	Off	Off	On	On	On	On	On	On	On	On

II digital input status,00=input low level,01=input high level.

Example：

Command：@01DI Receive：!0100001

Read address 01 digital input，return alarm disable，DO all off， digital input high level.

3.22 @AADO(Data)

Name： Set Digital Output

Description： Sets the values of the module's digital outputs

Syntax： @AADO(data)(cr)

@ is a delimiter character.

AA address of reading module(00~FF)

DO is the Set Digital Output command

Data output value，

00=DO0,DO1 off	01=DO0 on，DO1 off
02=DO0 off，DO1 on	03=DO0，DO1 on
10=DO2，DO3off	11=DO2 on，DO3 off
12=DO2 off，DO3 on	13=DO2，DO3 on.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@01DO00 Receive：!01

Set address 01 digital output 00，return success.

3.23 @AAEAT

Name： Enable Alarm

Description：The addressed analog input module is instructed to enable its alarm in either Latching or Momentary mode.

Syntax： @AAEAT(cr)

@ delimiter character.

AA address of reading module(00~FF)

EA is the Enable Alarm command.

T alarm type M= Momentary alarm state,

L = Latching alarm state

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@01EAM Receive：!01

Set address 01 momentary alarm，return success.

3.24 @AAHI(Data)

Name： Set High Alarm Limit

Description： Downloads High alarm limit value into the addressed module.

Syntax： @AAHI(data)(cr)

@ delimiter character.

AA address of reading module(00~FF)

HI is the Set High Limit command.

data high alarm values,data format is in engineering unit format

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@04HI+10.000 Response：!04

Set address 04 high alarm +10.000，return success.

3.25 @AALO (Data)

Name： Set Low Alarm Limit

Description： Downloads Low alarm limit value into the addressed module.

Syntax： @AALO(data)(cr)

@ delimiter character.

AA address of setting module(00~FF)

LO is the Set Low Limit command.

(data) low alarm values,data format is in engineering unit format

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@04LO-10.000(cr) Response：!04(cr)

Set address 04 low alarm –10.000，return success.

3.26 @AADA

Name： Disable Alarm

Description： Disables all alarm functions of the addressed analog input module.

Syntax： @AADA(cr)

@ delimiter character.

AA address of setting module(00~FF)

DA is the Disable Alarm command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@01DA (cr) Response：!01(cr)

Disable address 01 alarm，return success.

3.27 @AACA

Name： Clear Latch Alarm

Description： Both alarm states (High and Low) of the addressed analog input module are set to OFF, no alarm.

Syntax： @AACA(cr)

@ delimiter character.

AA address of setting module(00~FF)

CA is the Clear Latch Alarm command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@01DI Receive：!0120101

Read address 01 digital input,return latch alarm mode,low alarm active.

Command：@01CA Receive：!01

Clear address 01 latch alarm，return success.

Command：@01DI Receive：!0120001

Read address 01 digital input,return latch alarm mode,no alarm active.

3.28 @AARH

Name： Read High Alarm Limit

Description： The addressed module is asked to return its High alarm limit value.

Syntax： @AARH(cr)

@ delimiter character.

AA address of reading module(00~FF)

RH is the Read High Alarm Limit command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(data)(cr) if the command was valid.

?AA (cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

(data) value of the High alarm limit in engineering units.

Example：

Command：@01RH(cr) Response：!01+10.000

Read address 01 high alarm，return +10.000.

3.29 @AARL

Name： Read Low Alarm Limit

Description： The addressed module is asked to return its low alarm limit value.

Syntax： @AARH(cr)

@ delimiter character.

AA address of reading module(00~FF)

RH is the Read Low Alarm Limit command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(data)(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

(data) value of the low alarm limit in engineering units.

Example：

Command：@01RL(cr) Response：!01-10.000

Read address 01 high alarm，return –10.000.

3.30 @AARE

Name： Read Event Counter

Description： The addressed module is instructed to return its event counter value.

Syntax： @AARE(cr)

@ delimiter character.

AA address of reading module(00~FF)

RE Read Event Counter command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(data)(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

(data) event counter value,from 00000~65535

Example：

Command：@08RE(cr) Response：!0832011(cr)

Read address 08 event counter, return 32011.

3.31 @AACE

Name： Clear Event Counter

Description： The addressed module is instructed to reset its event counter to zero.

Syntax： @AACE(cr)

@ delimiter character.

AA address of setting module(00~FF)

CE Clear Event Counter command.

(cr) represents terminating character, carriage return (0Dh).

Response： !AA(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：@01RE Receive：!0101234

Read address 01 event counter，return 1234.

Command：@01CE Receive：!01

Clear address 01 event counter，return success.

Command：@01RE Receive：!0100000

Read address 01 event counter，return 0.

3.32 ~**

Description： When host watchdog timer is enable, host computer must send this command to every module before timeout otherwise **" host watchdog timer enable"** module's output value will go to safety state output value.

Syntax： ~** (cr)

~ delimiter character

** command for all modules

Response： No response

Example：

Command：~** No respone

Send host OK to all modules

3.33 ~AA0

Name： Read Module Status

Description： Read command leading code setting and host watchdog status.

Syntax： ~AA0(cr)

~ delimiter character

AA address of setting module(00~FF)

0 command for reading module status

Response： !AASS(cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

SS Module Status. The status will store into EEPROM and only may reset by the command ~AA1.

00=host watchdog status is clear；

04=host watchdog status is set.

Example：

Command：~010 Receive：!0104

Read address 02 module status，return 04，host watchdog timeout flag is set.

3.34 ~AA1

Name： Reset Module Status
Description： Reset module status
Syntax： ~AA1(cr)
~ delimiter character
AA address of setting module(00~FF)
1 command for reset module status
Response： !AA(cr) if the command was valid.
?AA(cr) if an invalid parameter was entered.
Syntax error or communication error may get no response.
! command is valid.
? command is invalid.
AA address of response module(00~FF)
Example：
Command：~010 Receive：!0104
Read address 01 module status，return 04，host watchdog timeout status is set.

Command：~011 Receive：!01
Reset address 01 module status，return success.

Command：~010 Receive：!0100
Read address 01 module status，return 00，host watchdog timeout status is clear.

3.35 ~AA2

Name： Read Host Watchdog Timeout Interval
Description： Read Host Watchdog Timeout Interval
Syntax： ~AA2(cr)
~ delimiter character
AA address of setting module(00~FF)
2 command for read Host Watchdog Timeout Interval
Response： !AAEVV(cr) if the command was valid.
?AA(cr) if an invalid parameter was entered.
Syntax error or communication error may get no response.
! command is valid.
? command is invalid.
AA address of response module(00~FF)
E Host Watchdog status 1=enable,0=disable
VV timeout interval in HEX format，each count for 0.1 second; 0.1 = 0.1 second and FF = 25.5 second
Example：
Command：~012 Response：!01FF
Read address 01 host watchdog timeout interval，return FF，the host watchdog timeout interval is 25.5 second

3.36 ~AA3EVV

Name： Set Host Watchdog Timeout Interval

Description： Set host watchdog timer .

Syntax： ~AA3EVV(cr)

~ delimiter character

AA address of setting module(00~FF)

3 command for set Host Watchdog Timeout Interval

E 1=Enable;0=Disable host watchdog

VV time value,from 01 to FF,each for 0.1 second

Response： !AA (cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：~013164 Response：!01

Set address 01enable host watchdog and timeout interval is 64(10.0 second)，return success

Command：~012 Response：!0164

Read address 01 host watchdog timeout interval，return 64，the timeout interval is 10.0 second

3.37 ~AA4

Name： Read PowerOn Value and Safe Value

Description： Return PowerOn value and safe value

Syntax： ~AA4(cr)

~ delimiter character

AA address of setting module(00~FF)

4 command for read PowerOn/Safe value

Response： !AAPPSS (cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

PP PowerOn Value，

SS Safe Value，

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**0A**	**0B**	**0C**	**0D**	**0E**	**0F**
DO0	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On
DO1	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On
DO2	Off	Off	Off	Off	On	On	On	On	Off	Off	Off	Off	On	On	On	On
DO3	Off	Off	Off	Off	Off	Off	Off	Off	On	On	On	On	On	On	On	On

Example：

Command：~014 Receive：!010000

Read address 01 PowerOn/Safe Value，return PowerOn Value is DO0 off，DO1 off，Safe Value is DO0 off，DO1 off.

3.38 ~AA5PPSS

Name： Set PowerOn Value and Safe Value

Description： Return PowerOn value and safe value

Syntax： ~AA5PPSS(cr)

~ delimiter character

AA address of setting module(00~FF)

5 command for set PowerOn value and safe value

PP PowerOn Value，

SS Safe Value，

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DO0	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On
DO1	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On
DO2	Off	Off	Off	Off	On	On	On	On	Off	Off	Off	Off	On	On	On	On
DO3	Off	Off	Off	Off	Off	Off	Off	Off	On	On	On	On	On	On	On	On

Response： !AA (cr) if the command was valid.

?AA(cr) if an invalid parameter was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：~0150003 Receive：!01

Set address 01 PowerOn Value is DO0 off，DO1 off，Safe Value is DO0 on，DO1 on，return success.