I-7016/16D/16P/16PD
User's Manual

Warranty

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1. Introduction

I-7000 is a family of network data acquisition and control modules. They provide analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. These modules can be remote controlled by a set of commands. The basic features of I-7016/16D/16P/16PD are given as following :

- 3000 VDC isolatied analog input.
- 24-bits sigma-delta ADC to provide excellent accuracy.
- 16-bit DAC supply excitation voltage for strain gauge.
- Software calibration.
- Linear Mapping.
- The I-7016D/16PD is the I-7016/16P with a 4½ digit LED display.

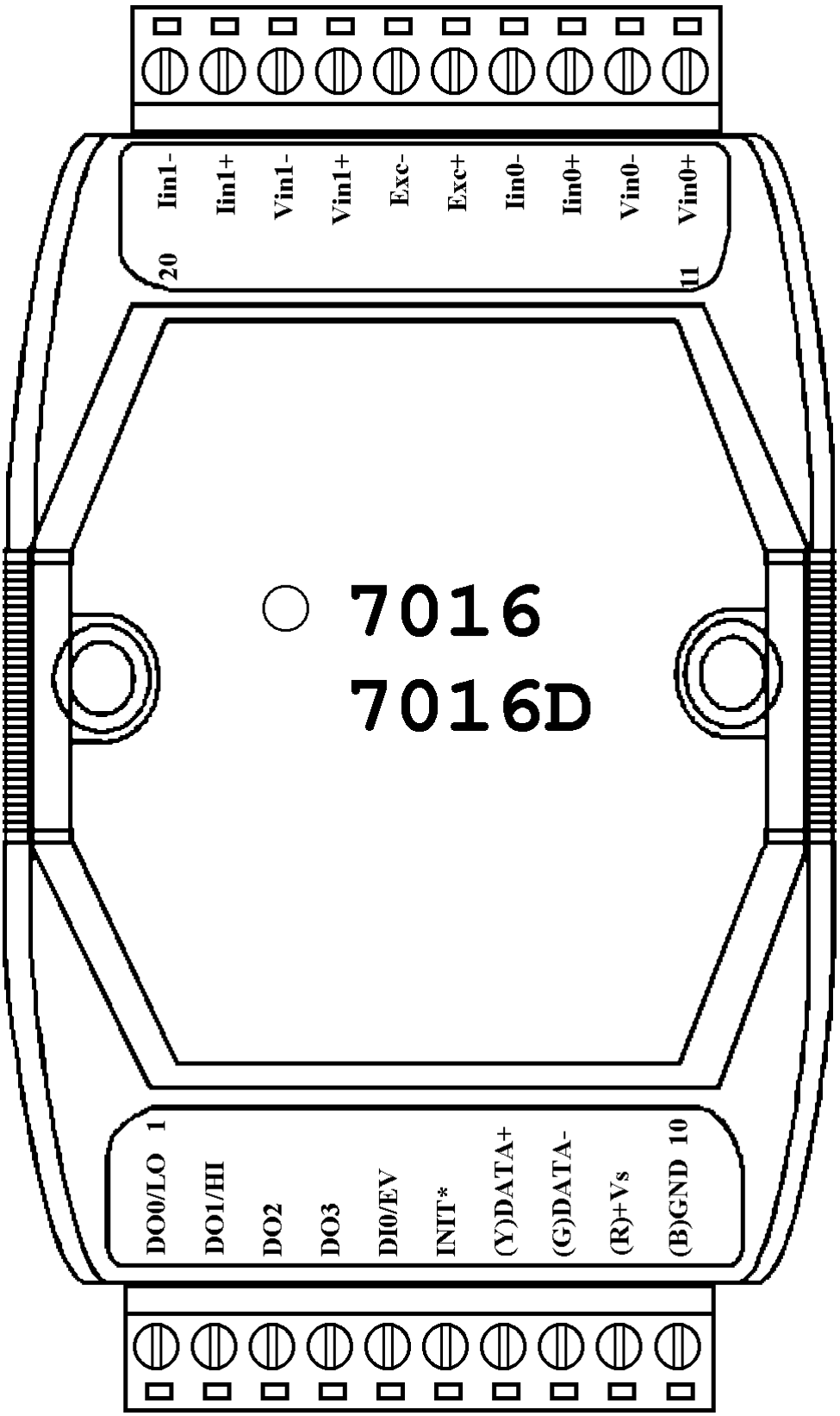
1.1 More Information

Refer to "**I-7000 Bus Converter User Manual**" chapter 1 for more information as following:

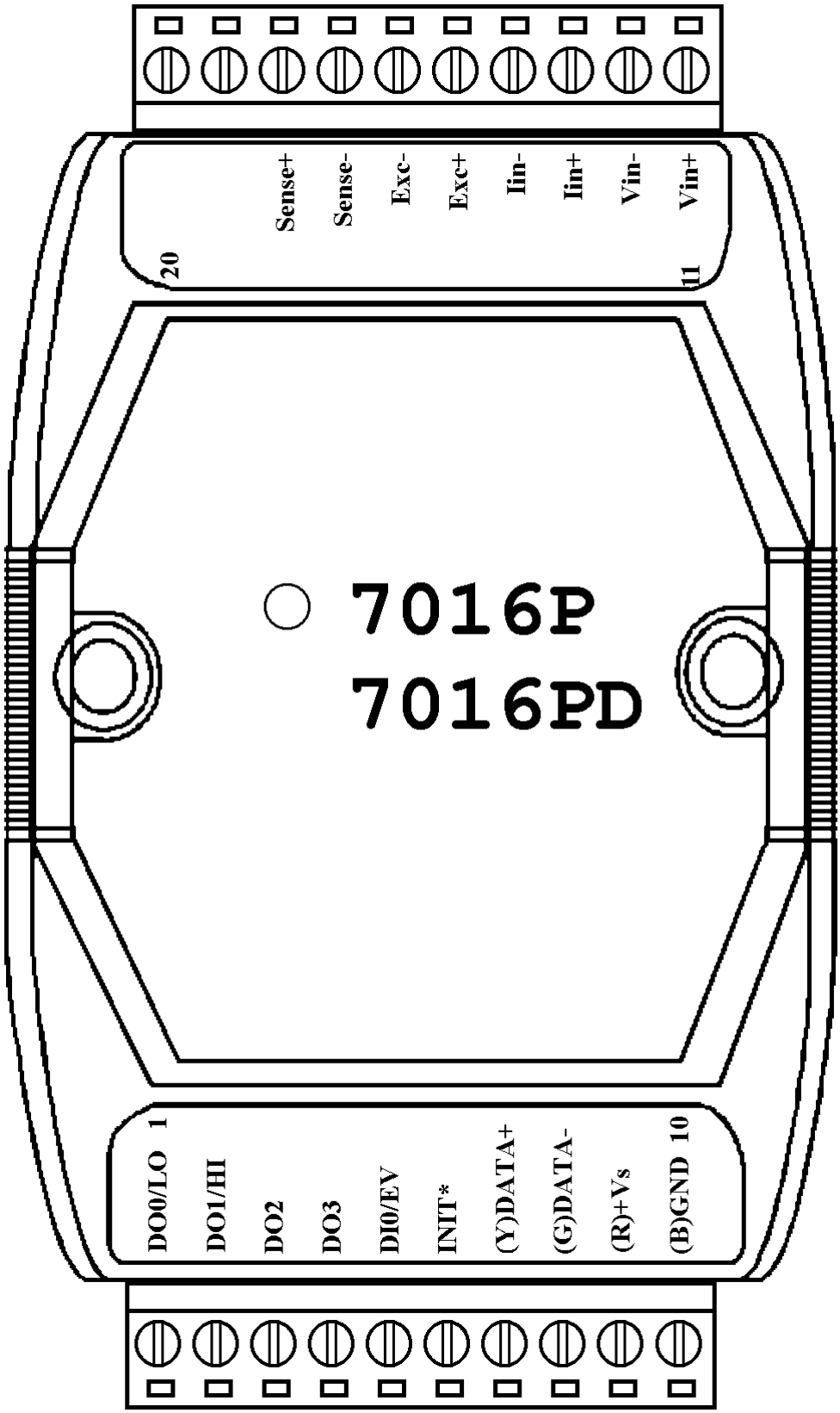
1.1 I-7000 Overview
1.2 I-7000 Related Documentation
1.3 I-7000 Command Features
1.4 I-7000 System Network Configuration
1.5 I-7000 Dimension

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1.2 Pin Assignment



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1.3 Specifications

I-7016/I-7016D

Analog Input

Input Channel : 2

Analog Input Type :

mV, V, mA

Sampling Rate :

10 Samples/Second

Bandwidth : 5.24 Hz

Accuracy : ±0.05%

Zero Drift : 0.5μV/°C

Span Drift : 25ppm/°C

CMR@50/60Hz : 150dB

NMR@50/60Hz : 100dB

Input Impedance : 20M Ohms

Isolation : 3000VDC

Excitation Voltage Output

Output Channel : 1

Output Range : 0 to +10V

Max Output Load : 40mA

Accuracy : ±0.05% of FSR

Drift : ±50ppm/°C

Output Impedance :12 Ohms

Isolation : 3000VDC

Digital Output

4 channel

Open Collector to 30V

Output Load : sink 30mA max

Power Dissipation : 300mW

Digital Input

1 channel

Logic Level 0 : +1V max

Logic Level 1 : +3.5 to 30V

Event Counter

Max Input Frequency : 50 Hz

Min. Pulse Width : 1 mS

Displayed LED

4½ digits (for I-7016D)

Power Supply

Input : +10 to +30VDC

Consumption :

2.4W for I-7016

3.0W for I-7016D

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I-7016P/I-7016PD

Analog Input

Input Channel : 1

Analog Input Type :

mV, V, mA

Sampling Rate :

10 Samples/Second

Bandwidth : 5.24 Hz

Accuracy : ±0.05%

Zero Drift : 0.5μV/°C

Span Drift : 25ppm/°C

CMR@50/60Hz : 150dB

NMR@50/60Hz : 100dB

Input Impedance : 20M Ohms

Isolation : 3000VDC

Excitation Voltage Output

Output Channel : 1

Output Range : 0 to +10V

Max Output Load : 40mA

Accuracy : ±0.05% of FSR

Drift : ±50ppm/°C

Output Impedance :12 Ohms

Isolation : 3000VDC

Digital Output

4 channel

Open Collector to 30V

Output Load : sink 30mA max

Power Dissipation : 300mW

Digital Input

1 channel

Logic Level 0 : +1V max

Logic Level 1 : +3.5 to 30V

Event Counter

Max Input Frequency : 50 Hz

Min. Pulse Width : 1 mS

Displayed LED

4½ digits (for I-7016PD)

Power Supply

Input : +10 to +30VDC

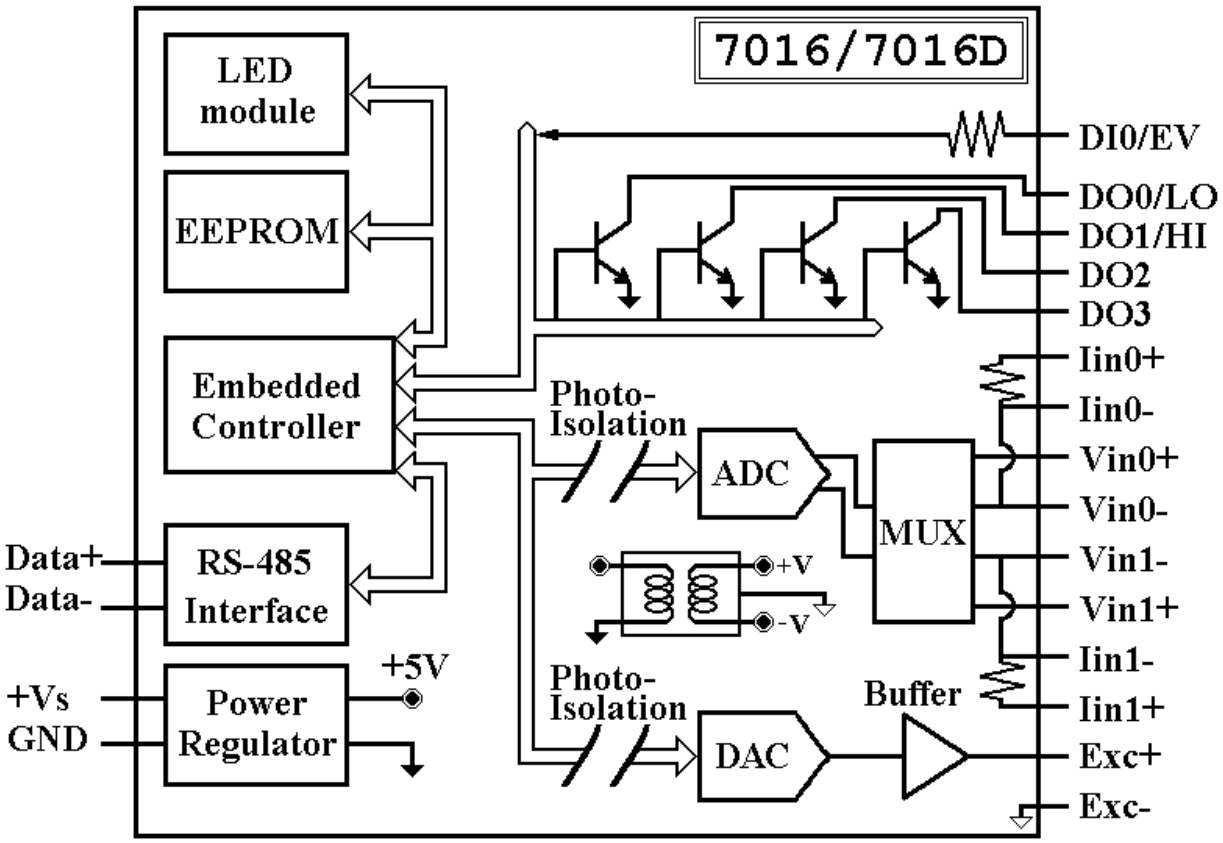
Consumption :

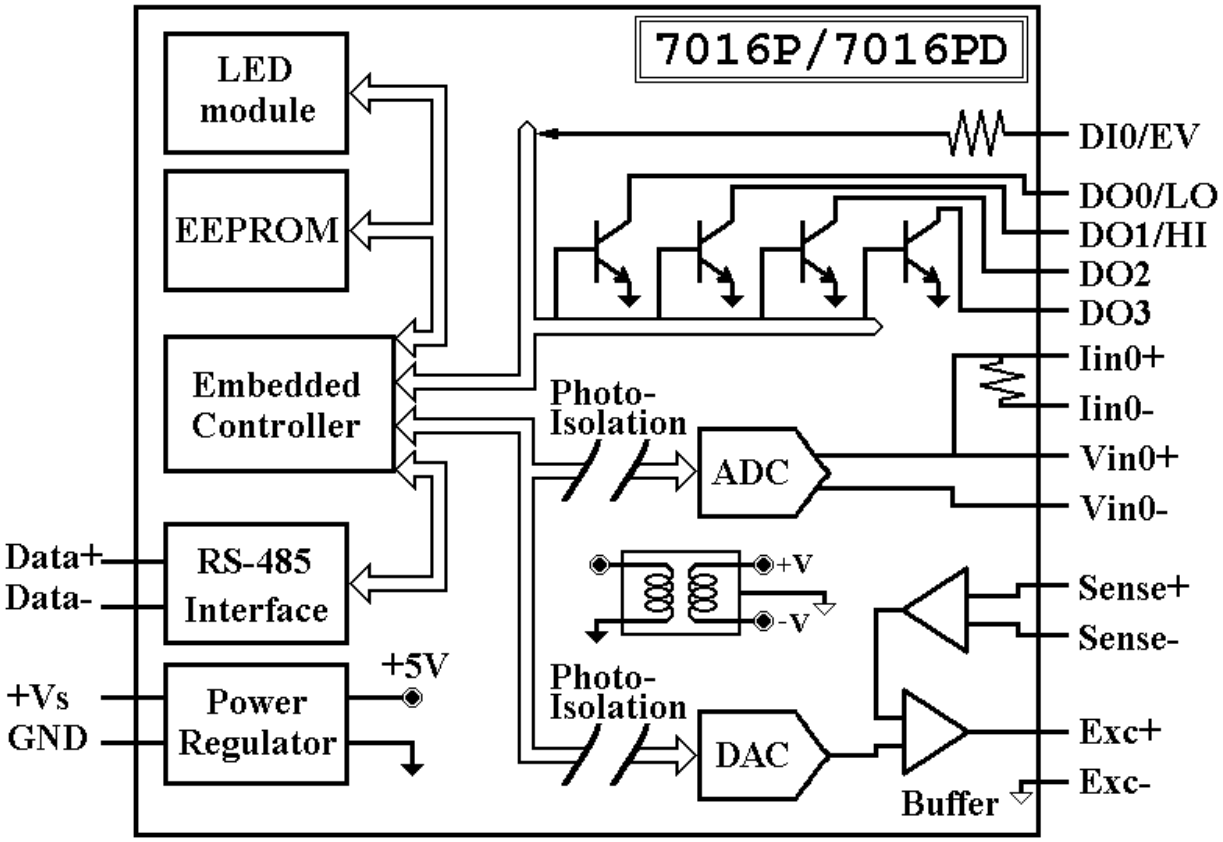
2.4W for I-7016P

3.0W for I-7016PD

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1.4 Block Diagram

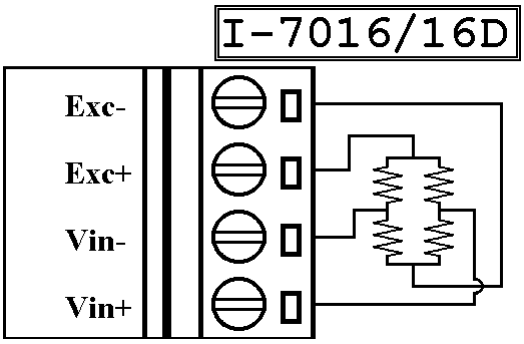


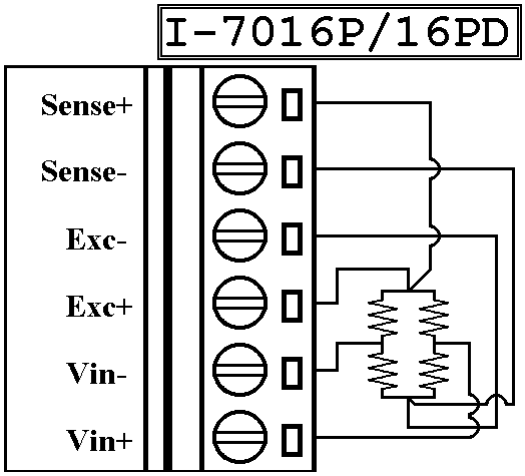


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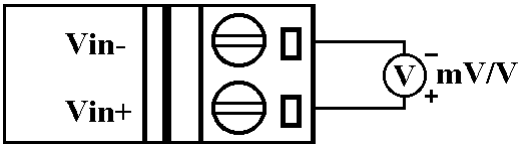
1.5 Wire Connection

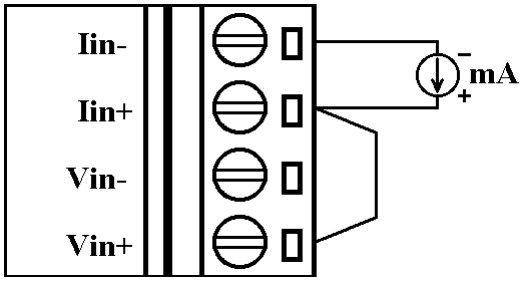
Bridge Sensor/Load Cell/Strain Gauge Wire Connection



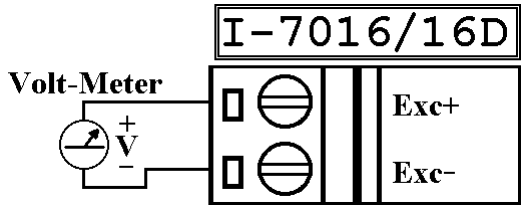


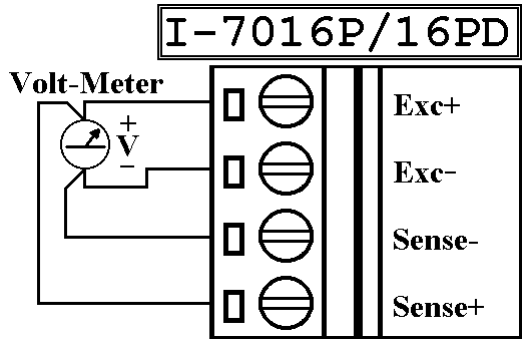
Analog Input Wire Connection





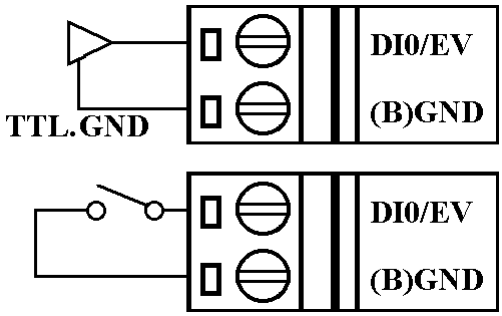
Analog Output Wire Connection

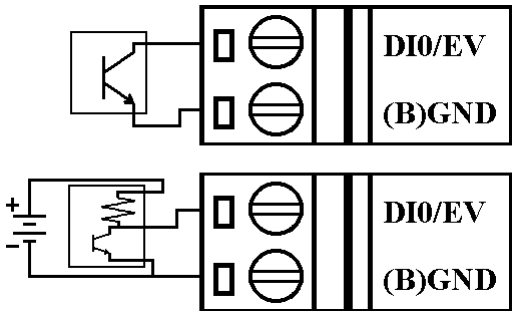




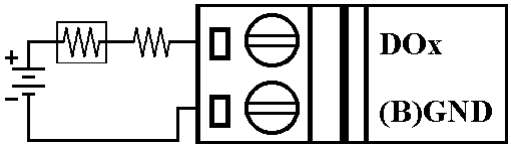
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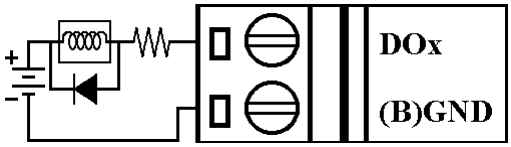
Digital Input Wire Connection





Digital Output Wire Connection





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1.6 Quick Start

Refer to "**I-7000 Bus Converter User Manual**" and "**Getting Start**" for more detail.

1.7 Default Setting

Default setting for I-7016/16D/16P/16PD :

- Address : 01
- Analog Input Type : Type 05, -2.5 to +2.5 V
- Baudrate : 9600 bps
- Checksum disable, engineer unit format, 60Hz filter

1.8 Calibration

Don't Perform Calibrate Until You Really Understand.

Analog Input Calibration Requirement for I-7016/16D/16P/16PD

Type Code	00	01	02	03	04	05	06
Zero Input	0 mV	0 mV	0 mV	0 mV	0 V	0 V	0 mA
Span Input	+15 mV	+50 mV	+100 mV	+500 mV	+1 V	+2.5 V	+20 mA

Calibration Sequence :

1 Connect calibration voltage/current to module's input channel 0. (Wire connect ref *Sec.1.5)*

2 Warm-Up for 30 minutes

3 Setting Type to 00 -> Ref *Sec.2.1.*

4 Enable Calibration -> Ref *Sec.2.16.*

5 Apply Zero Calibration Voltage

6 Preform Zero Calibration Command -> Ref *Sec.2.5.*

7 Apply Span Calibration Voltage

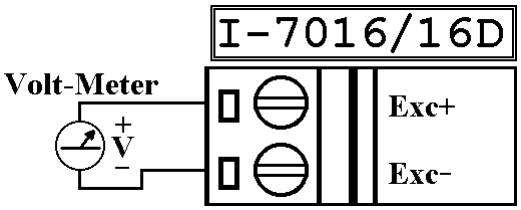
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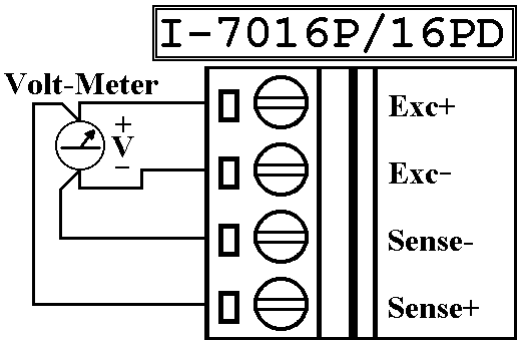
8 Perform Span Calibration Command -> Ref *Sec.2.4.*

9 Repeat step4 to step8 three times.

10. Perform step1 to step9 for each type with change the step3: setting type, step5:zero calibration voltage, step7:span calibration voltage.

Excitation Voltage Calibration Requirement for I-7016/16D/16P/16PD





Calbration Sequence :

1 Connect voltmeter to module's excitation output pin.

2 Warm-Up for 30 minutes.

3 Output 0V. -> Ref *Sec.2.18*

4 Trim the output until the value in voltmeter is closest to 0V. -> Ref *Sec.2.20*

5 Perform Excitation Voltage Zero Calibration. -> Ref *Sec.2.21*

6 Output 10V. -> Ref *Sec.2.18*

7 Trim the output until the value in voltmeter is closest to 10V. -> Ref *Sec.2.20*

8 Perform Excitation Voltage Span Calibration. -> Ref *Sec.2.22*

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1.9 Configuration Tables

Configuration Table of I-7016/16D/16P/16PD

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)

00 : -15mV to +15mV

01 : -50mV to +50mV

02 : -100mV to +100mV

03 : -500mV to +500mV

04 : -1V to +1V

05 : -2.5V to +2.5V

06 : -20mA to +20mA

Data Format Setting (FF)

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

*1 :Filter Select : 0 = 60Hz rejection

1 = 50Hz rejection

*2 :Checksum Bit : 0=Disable, 1=Enable

*3 :00 = Engineer Unit Format

01 = Percent Format

10 = 2's Complement HEX Format

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Analog input type and data format table

Type Code	Input Range	Data Format	+F.S.	Zero	-F.S.
00	-15 to +15 mV	Engineer Unit	+15.000	+00.000	-15.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
01	-50 to +50 mV	Engineer Unit	+50.000	+00.000	-50.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
02	-100 to +100 mV	Engineer Unit	+100.00	+000.00	-100.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
03	-500 to +500 mV	Engineer Unit	+500.00	+000.00	-500.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
04	-1 to +1 V	Engineer Unit	+1.0000	+0.0000	-1.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
05	-2.5 to +2.5 V	Engineer Unit	+2.5000	+0.0000	-2.5000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000
06	-20 to +20 mA	Engineer Unit	+20.000	+00.000	-20.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7FFF	0000	8000

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2. Command

Command Format : **(Leading)(Address)(Command)[CHK](cr)**

Response Format : **(Leading)(Address)(Data)[CHK](cr)**

[CHK] 2-character checksum

(cr) end-of-command character, character return(0x0D)

General Command Sets			
Command	**Response**	**Description**	**Section**
%AANNTTCCFF	!AA	Set Module Configuration	***Sec.2.1***
#**	No Response	Synchronized Sampling	***Sec.2.2***
#AA	>(Data)	Read Analog Input	***Sec.2.3***
$AA0	!AA	Perform Span Calibration	***Sec.2.4***
$AA1	!AA	Perform Zero Calibration	***Sec.2.5***
$AA2	!AANNTTCCFF	Read Configuration	***Sec.2.6***
$AA3	!AAN	Read Channel Select	***Sec.2.7***
$AA3N	!AA	Set Channel Select	***Sec.2.8***
$AA4	>AAS(Data)	Read Synchronized Data	***Sec.2.9***
$AA8	!AAV	Read LED Configuration	***Sec.2.10***
$AA8V	!AA	Set LED Configuration	***Sec.2.11***
$AA9(Data)	!AA	Set LED Data	***Sec.2.12***
$AAF	!AA(Data)	Read Firmware Version	***Sec.2.13***
$AAM	!AA(Data)	Read Module Name	***Sec.2.14***
~AAO(Data)	!AA	Set Module Name	***Sec.2.15***
~AAEV	!AA	Enable/Disable Calibration	***Sec.2.16***

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Excitation Voltage Command Sets			
Command	**Response**	**Description**	**Section**
$AA6	!AA(Data)	Get Excitation Voltage Output Value	***Sec.2.17***
$AA7(Data)	!AA	Excitation Voltage Output	***Sec.2.18***
$AAS	!AA	Start-Up Voltage Output Configuration	***Sec.2.19***
$AAEVV	!AA	Excitation Voltage Trim Calibration	***Sec.2.20***
$AAA	!AA	Excitation Voltage Zero Calibration	***Sec.2.21***
$AAB	!AA	Excitation Voltage Span Calibration	***Sec.2.22***

Digital Input/Output, Alarm and Event Counter Command Sets			
Command	**Response**	**Description**	**Section**
@AADI	!AASOOII	Read Digital I/O and Alarm Status	***Sec.2.23***
@AADO(Data)	!AA	Set Digital Output	***Sec.2.24***
@AAEAT	!AA	Enable Alarm	***Sec.2.25***
@AAHI(Data)	!AA	Set High Alarm	***Sec.2.26***
@AALO(Data)	!AA	Set Low Alarm	***Sec.2.27***
@AADA	!AA	Disable Alarm	***Sec.2.28***
@AACA	!AA	Clear Latch Alarm	***Sec.2.29***
@AARH	!AA(Data)	Read High Alarm	***Sec.2.30***
@AARL	!AA(Data)	Read Low Alarm	***Sec.2.31***
@AARE	!AA(Data)	Read Event Counter	***Sec.2.32***
@AACE	!AA	Clear Event Counter	***Sec.2.33***

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Linear Mapping Command Sets			
Command	**Response**	**Description**	**Section**
@AA6	!AA(SL)(SH)	Read Source Low/High Values for Linear Mapping	***Sec.2.34***
@AA6(SL)(SH)	!AA	Set Source Low/High Values for Linear Mapping	***Sec.2.35***
@AA7	!AA(TL)(TH)	Read Target Low/High Values for Linear Mapping	***Sec.2.36***
@AA7(TL)(TH)	!AA	Set Target Low/High Values for Linear Mapping	***Sec.2.37***
@AAA	!AAV	Read Linear Mapping Enable/Disable	***Sec.2.38***
@AAAV	!AA	Enable/Disable Linear Mapping	***Sec.2.39***

Host Watchdog Related Command Sets			
Command	**Response**	**Description**	***Section***
~**	No Response	Host OK	***Sec.2.40***
~AA0	!AASS	Read Module Status	***Sec.2.41***
~AA1	!AA	Reset Module Status	***Sec.2.42***
~AA2	!AATT	Read Host Watchdog Timeout Interval	***Sec.2.43***
~AA3ETT	!AA	Set Host Watchdog Timeout Interval	***Sec.2.44***
~AA4	!AAPPSS	Read PowerOn Value and Safe Value	***Sec.2.45***
~AA5PPSS	!AA	Set PowerOn Value and Safe Value	***Sec.2.46***

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2.1 %AANNTTCCFF

Description : Set Module Configuration

Syntax : **%AANNTTCCFF[CHK](cr)**

% a delimiter character

AA address of setting module(00 to FF)

NN new address for setting module(00 to FF)

TT new type for setting module (Ref *Sec.1.9*)

CC new baudrate for setting module (Ref *Sec.1.9*). It is needed to short INIT* to ground while change baudrate. (Ref *Sec. 3.1*)

FF new data format for setting module (Ref *Sec.1.9*). It is needed to short INIT* to ground while change checksum setting. (Ref *Sec.3.1*)

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command. While change baudrate or checksum setting without short INIT* to ground, the module will return invalid command.

AA address of response module(00 to FF)

Example :

Command : %0102050600 Receive : !02

Change address from 01 to 02, return success.

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Command : %0202050602 Receive : !02

Change data format from 00 to 02, return success.

Related Command :

Sec.2.6 $AA2

Related Topics :

Sec.1.9 Configuration Tables, *Sec.3.1* INIT* pin Operation

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2.2 #**

Description : Synchronized Sampling

Syntax : **#**[CHK](cr)**

a delimiter character

** synchronized sampling command

Response : No response

Example :

Command : #** No response

Send synchronized sampling command.

Command : $014 Receive : >011+025.123

First read, get status=1.

Command : $014 Receive : >010+025.123

Second read, get status=0.

Related Command :

Sec.2.9 $AA4

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2.3 #AA

Description : Read Analog Input

Syntax : **#AA[CHK](cr)**

delimiter character

AA address of reading module(00 to FF)

Response : Valid Command : **>(Data)[CHK](cr)**

Syntax error or communication error may get no response.

> delimiter for valid command

(Data) analog input value, reference *Sec.1.9* for its format.

Example :

Command : #01 Receive : >+02.635

Read address 01, get data success.

Command : #02 Receive : >4C53

Read address 02, get data in 2's complement HEX format success.

Related Command :

Sec.2.1 %AANNTTCCFF, *Sec.2.6* $AA2

Related Topics :

Sec.1.9 Configuration Tables

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2.4 $AA0

Description : Perform Span Calibration

Syntax : **$AA0[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

0 command for performing span calibration

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $010 Receive : !01

Perform address 01 span calibration, return success.

Command : $020 Receive : ?02

Perform address 02 span calibration, return not enable calibration before perform calibration command.

Related Command :

Sec.2.5 $AA1, *Sec.2.16* ~AAEV

Related Topics :

Sec.1.8 Calibration

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2.5 $AA1

Description : Perform Zero Calibration

Syntax : **$AA1[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

1 command for performing zero calibration

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $011 Receive : !01

Perform address 01 zero calibration, return success.

Command : $021 Receive : ?02

Perform address 02 zero calibration, return not enable calibration before perform calibration command.

Related Command :

Sec.2.4 $AA0, *Sec.2.16* ~AAEV

Related Topics :

Sec.1.8 Calibration

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2.6 $AA2

Description : Read Configuration

Syntax : **$AA2[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

2 command for reading configuration

Response : Valid Command : **!AATTCCFF[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

TT type code of module (reference *Sec.1.9*)

CC baudrate code of module (reference *Sec.1.9*)

FF data format of module (reference *Sec.1.9*)

Example :

Command : $012 Receive : !01050600

Read address 01 configuration, return success.

Command : $022 Receive : !02030602

Read address 02 configuration, return success.

Related Command :

Sec2.1 %AANNTTCCFF

Related Topics :

Sec.1.9 Configuration Tables, *Sec.3.1* INIT* pin Operation

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2.7 $AA3

Description : Read Channel Select

Syntax : **$AA3[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

3 command for reading channel select

Response : Valid Command : **!AAN[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

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

Example :

Command : $013 Receive : !010

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

Related Command :

Sec2.8 $AA3N

Note : The command is for I-7016, I-7016D only

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2.8 $AA3N

Description : Set Channel Select

Syntax : **$AA3N[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

3 command for setting channel select

N channel N is selected

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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.

Related Command :

Sec2.7 $AA3

Note : The command is for I-7016, I-7016D only

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2.9 $AA4

Description : Read Synchronized Data

Syntax : **$AA4[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

4 command for reading synchronized data

Response : Valid Command : **>AAS(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

> delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

S status of synchronized data, 1 = first read, 0 = been readed

(Data) synchronized data, format reference *Sec.1.9*

Example :

Command : $014 Receive : ?01

Read address 01 synchronized data, return no data valid.

Command : #** Receive : no response

Preform synchronized sampling.

Command : $014 Receive : >011+02.556

Read address 01 synchronized data, return status 1 and data.

Command : $014 Receive : >010+02.556

Read address 01 synchronized data, return status 0 and data.

Related Command :

*Sec.2.2 #***

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2.10 $AA8

Description : Read LED Configuration

Syntax : **$AA8[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

8 command for setting LED configuration

Response : Valid Command : **!AAV[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

V LED configuration

1=module control, 2=host control

Example :

Command : $018 Receive : !011

Read address 01 LED configuration, return module control.

Command : $028 Receive : !012

Read address 02 LED configuration, return host control.

Related Command :

Sec2.11 $AA8V, *Sec2.12* $AA9(Data)

Note : The command is for I-7016D, I-7016PD only

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2.11 $AA8V

Description : Set LED Configuration

Syntax : **$AA8V[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

8 command for setting LED configuration

V 1=Set LED to module, 2=Set LED to host

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $0182 Receive : !01

Set address 01 LED to host control, return success.

Command : $0281 Receive : !02

Set address 02 LED to module control, return success.

Related Command :

Sec2.10 $AA8, *Sec2.12* $AA9(Data)

Note : The command is for I-7016D, I-7016PD only

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2.12 $AA9(Data)

Description : Set LED Data

Syntax : **$AA9(Data)[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

9 command for setting LED data

(Data) data display on the LED, range from -19999. to +19999. The data need sign, 5 digits and decimal point.

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command or LED not set to host control

AA address of response module(00 to 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.

Related Command :

Sec.2.10 $AA8, *Sec2.11* $AA8V

Note : The command for I-7016D, I-7016PD only

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2.13 $AAF

Description : Read Firmware Version

Syntax : **$AAF[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

F command for reading firmware version

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) firmware version of module

Example :

Command : $01F Receive : !01A2.0

Read address 01 firmware version, return version A2.0.

Command : $02F Receive : !01B1.1

Read address 02 firmware version, return version B1.1.

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2.14 $AAM

Description : Read Module Name

Syntax : **$AAM[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

M command for reading module name

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) Name of module

Example :

Command : $01M Receive : !017016

Read address 01 module name, return name 7016.

Command : $03M Receive : !037016D

Read address 03 module name, return name 7016D.

Related Command :

Sec.2.15 ~AAO(Data)

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2.15 ~AAO(Data)

Description : Set Module Name

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

~ delimiter character

AA address of setting module (00 to FF)

O command for setting module name

(Data) new name for module, max 6 characters

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : ~01O7016 Receive : !01

Set address 01 module name to 7016, return success.

Command : $01M Receive : !017016

Read address 01 module name, return 7016.

Related Command :

Sec.2.14 $AAM

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2.16 ~AAEV

Description : Enable/Disable Calibration

Syntax : **~AAEV[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

E command to enable/disable calibration

V 1=Enable/0=Disable calibration

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $010 Receive : ?01

Perform address 01 span calibration, return not enable calibration.

Command : ~01E1 Receive : !01

Set address 01 to enable calibration, return success.

Command : $010 Receive : !01

Preform address 01 span calibration, return success.

Related Command :

Sec.2.4 $AA0, *Sec.2.5* $AA1

Related Topic :

Sec.1.8 Calibration

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2.17 $AA6

Description : Get Excitation Voltage Value

Syntax : **$AA6[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

6 command for reading excitation voltage value

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) exciataion voltage value, engineer unit format

Example :

Command : $017+05.123 Receive : !01

Set address 01 exciataion 5.123V, return success.

Command : $016 Receive : !01+05.123

Read address 01 excitation voltage, return 5.123V.

Related Command :

Sec.2.18 $AA7(Data)

Related Topic :

Sec.1.8 Calibration

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2.18 $AA7

Description : Excitation Voltage Output

Syntax : **$AA7(Data)[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

7 command for setting excitation voltage

(Data) excitation voltage value, engineer unit format

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $017+05.123 Receive : !01

Set address 01 exciataion 5.123V, return success.

Command : $016 Receive : !01+05.123

Read address 01 excitation voltage, return 5.123V.

Related Command :

Sec.2.17 $AA6

Related Topic :

Sec.1.8 Calibration

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2.19 $AAS

Description : Start-Up Voltage Output Configuration

Syntax : **$AAS[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

S command for setting Start-Up Voltage

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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 moudle's Start-Up Voltage is 5.123V now.

Related Command :

Sec.2.18 $AA7(Data)

Related Topic :

Sec.1.8 Calibration

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2.20 $AAEVV

Description : Excitation Voltage Trim Calibration

Syntax : **$AAEVV[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

E command for performing trim calibration

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

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : $017+05.123 Receive : !01

Set address 01 exciataion 5.123V, return success.

Command : $01E03 Receive : !01

Trim address 01 excitation voltage +0.6mV, return success.

Related Command :

Sec.2.18 $AA7(Data), *Sec.2.21* $AAA, *Sec.2.22* $AAB

Related Topic :

Sec.1.8 Calibration

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2.21 $AAA

Description : Excitation Voltage Zero Calibration

Syntax : **$AAA[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

A command for excitation voltage zero calibration

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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.

Related Command :

Sec.2.18 $AA7(Data), *Sec.2.20* $AAEVV, *Sec.2.22* $AAB

Related Topic :

Sec.1.8 Calibration

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2.22 $AAB

Description : Excitation Voltage Span Calibration

Syntax : **$AAB[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

B command for excitation voltage span calibration

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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.

Related Command :

Sec.2.18 $AA7(Data), *Sec.2.20* $AAEVV, *Sec.2.21* $AAA

Related Topic :

Sec.1.8 Calibration

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2.23 @AADI

Description : Read Digital I/O and Alarm Status

Syntax : **@AADI[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

DI command for reading digital input and alarm status

Response :Valid Command : **!AASOOII[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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, digital

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outputs all off, and digital input high level.

Related Command :

Sec.2.24 @AADO(Data), *Set.2.25* @AAEAT, *Sec.2.28* @AADA

Related Topic :

Sec.3.6 High/Low Alarm

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2.24 @AADO(Data)

Description : Set Digital Output

Syntax : **@AADO(Data)[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

DO command for setting digital output

(Data) output value.00=DO0, DO1 off; 01=DO0 on, DO1 off; 02=DO0 off, DO1 on; 03=DO0, DO1 on; 10=DO2, DO3 off; 11=DO2 on, DO3 off; 12=DO2 off, DO3 on; 13=DO2, DO3 on.

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command. When the alarm is enabled, the command will return invalid.

AA address of response module(00 to FF)

Example :

Command : @01DO00 Receive : !01

Set address 01 digital output 00, return success.

Related Command :

Sec.2.23 @AADI, *Set.2.25* @AAEAT, *Sec.2.28* @AADA

Related Topic :

Sec.3.6 High/Low Alarm

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2.25 @AAEAT

Description : Enable Alarm

Syntax : **@AAEAT[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

EA command for enable alarm.

T alarm type, M=momentary alarm, L=latch alarm.

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @01EAM Receive : !01

Set address 01 enable momentary alarm, return success.

Related Command :

Sec.2.28 @AADA, *Sec.2.29* @AACA

Related Topic :

Sec.3.6 High/Low Alarm

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2.26 @AAHI(Data)

Description : Set High Alarm

Syntax : **@AADI[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

HI command for setting high alarm value

(Data) high alarm values, data format is in engineer unit format.

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @01HI+2.5000 Receive : !01

Set address 01 high alarm +2.5000, return success.

Related Command :

Sec.2.25 @AAEAT, *Sec.2.30* @AARH

Related Topic :

Sec.3.6 High/Low Alarm

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2.27 @AALO(Data)

Description : Set Low Alarm

Syntax : **@AALO(Data)[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

LO command for setting low alarm value

(Data) low alarm values, data format is in engineer unit format.

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @01LO-2.5000 Receive : !01

Set address 01 low alarm -2.5000, return success.

Related Command :

Sec.2.25 @AAEAT, *Sec.2.31* @AARL

Related Topic :

Sec.3.6 High/Low Alarm

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2.28 @AADA

Description : Disable Alarm

Syntax : **@AADA[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

DA command for disable alarm

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @01DA Receive : !01

Disable address 01 alarm, return success.

Related Command :

Sec.2.25 @AAEAT

Related Topic :

Sec.3.5 Digital Output

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2.29 @AACA

Description : Clear Latch Alarm

Syntax : **@AACA[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

CA command for clear latch alarm

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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.

Related Command :

Sec.2.23 @AADI, *Sec.2.25* @AAEAT, *Sec.2.28* @AADA

Related Topic :

Sec.3.6 High/Low Alarm

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2.30 @AARH

Description : Read High Alarm

Syntax : **@AARH[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

RH command for reading high alarm

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command.

? delimiter for invalid command.

AA address of response module(00 to FF)

(Data) high alarm value in engineer unit format.

Example :

Command : @01RH Receive : !01+2.5000

Read address 01 high alarm, return +2.5000.

Related Command :

Sec.2.26 @AAHI

Related Topic :

Sec.3.6 High/Low Alarm

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2.31 @AARL

Description : Read Low Alarm

Syntax : **@AARL[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

RL command for reading low alarm

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command.

? delimiter for invalid command.

AA address of response module(00 to FF)

(Data) low alarm value in engineer unit format.

Example :

Command : @01RL Receive : !01-2.5000

Read address 01 low alarm, return -2.5000.

Related Command :

Sec.2.27 @AALO

Related Topic :

Sec.3.6 High/Low Alarm

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2.32 @AARE

Description : Read Event Counter

Syntax : **@AARE[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

RE command for reading event counter

Response : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) event counter value, from 00000 to 65535.

Example :

Command : @01RE Receive : !0101234

Read address 01 event counter, return 1234.

Related Command :

Sec.2.33 @AACE

Related Topic :

Sec.3.4 Digital Input and Event Counter

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2.33 @AACE

Description : Clear Event Counter

Syntax : **@AACE[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

CE command for clear event counter

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to 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.

Related Command :

Sec.2.32 @AARE

Related Topic :

Sec.3.4 Digital Input and Event Counter

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2.34 @AA6

Description : Read Source Low/High Values for Linear Mapping

Syntax : **@AA6[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

6 command for reading source values

Response : Valid Command : **!AA(SL)(SH)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

SL low limit of source values in engineer unit format.

SH high limit of source values in engineer unit format.

Example :

Command : @016 Receive : !01-2.5000+2.5000

Read address 01 source value, return from -2.5 to +2.5.

Related Command :

Sec.2.35 @AA6(SL)(SH), *Sec.2.36* @AA7, *Sec.2.37* @AA7(TL)(TH), *Sec.2.38* @AAA, *Sec.2.39* @AAAV.

Related Topic :

Sec.3.7 Linear Mapping

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2.35 @AA6(SL)(SH)

Description : Set Source Low/High Values for Linear Mapping

Syntax : **@AA6(SL)(SH)[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

6 command for setting source values

SL source low level value in engineer unit format

SH source high level value in engineer unit format

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @016-2.5000+2.5000 Receive : !01

Set address 01 source value -2.5 to +2.5, return success.

Related Command :

Sec.2.34 @AA6, *Sec.2.36* @AA7, *Sec.2.37* @AA7(TL)(TH), *Sec. 2.38* @AAA, *Sec.2.39* @AAAV.

Related Topic :

Sec.3.7 Linear Mapping

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2.36 @AA7

Description : Read Target Low/High Values for Linear Mapping

Syntax : **@AA7[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

7 command for reading target values

Response : Valid Command : **!AA(TL)(TH)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

TL target low values in engineer unit format.

TH target high values in engineer unit format.

Example :

Command : @017 Receive : !01-02.500+02.500

Read address 01 target value, return from -2.5 to +2.5.

Related Command :

Sec.2.34 @AA6, *Sec.2.35* @AA6(SL)(SH), *Sec.2.37* @AA7(TL)(TH), *Sec.2.38* @AAA, *Sec.2.39* @AAAV.

Related Topic :

Sec.3.7 Linear Mapping

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2.37 @AA7(TL)(TH)

Description : Set Target Low/High Values for Linear Mapping

Syntax : **@AA7(TL)(TH)[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

7 command for setting target values

TL target low level value in engineer unit format

TH target high level value in engineer unit format

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @017-02.500+02.5000 Receive : !01

Set address 01 target value -2.5 to +2.5, return success.

Related Command :

Sec.2.34 @AA6, *Sec.2.35* @AA6(SL)(SH), *Sec.2.37* @AA7(TL)(TH), *Sec.2.38* @AAA, *Sec.2.39* @AAAV.

Related Topic :

Sec.3.7 Linear Mapping

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2.38 @AAA

Description : Read Linear Mapping Status

Syntax : **@AAA[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

A command for reading linear mapping status

Response : Valid Command : **!AAV[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

V 0=disable linear mapping, 1=enable linear mapping

Example :

Command : @01A Receive : !011

Read address 01 linear mapping status, return enable.

Related Command :

Sec.2.34 @AA6, *Sec.2.35* @AA6(SL)(SH), *Sec.2.36* @AA7, *Sec. 2.37* @AA7(TL)(TH), *Sec.2.39* @AAAV.

Related Topic :

Sec.3.7 Linear Mapping

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2.39 @AAAV

Description : Enable/Disable Linear Mapping

Syntax : **@AAAV[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

A command for enable/disable linear mapping

V 0=disable linear mapping, 1=enable linear mapping

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : @01A0 Receive : !01

Disable address 01 linear mapping, return success.

Related Command :

Sec.2.34 @AA6, *Sec.2.35* @AA6(SL)(SH), *Sec.2.36* @AA7, *Sec. 2.37* @AA7(TL)(TH), *Sec.2.38* @AAA.

Related Topic :

Sec.3.7 Linear Mapping

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2.40 ~**

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

Send Host OK to all modules

Related Command :

Sec.2.41 ~AA0, *Sec.2.42* ~AA1, *Sec.2.43* ~AA2, *Sec.2.44* ~AA3EVV, *Sec.2.45* ~AA4, *Sec.2.46* ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.41 ~AA0

Description : Read Module Status

Syntax : **~AA0[CHK](cr)**

~ delimiter character

AA address of reading module (00 to FF)

0 command for reading module status

Response : Valid Command : **!AASS[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

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

Example :

Refer *Sec.2.44* ~AA3EVV example.

Related Command :

Sec.2.40 ~**, *Sec.2.42* ~AA1, *Sec.2.43* ~AA2, *Sec.2.44* ~AA3EVV, *Sec.2.45* ~AA4, *Sec.2.46* ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.42 ~AA1

Description : Reset Module Status

Syntax : **~AA1[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

1 command for reset module status

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Refer *Sec.2.44* ~AA3EVV example.

Related Command :

Sec.2.40 ~**, *Sec.2.41* ~AA0, *Sec.2.43* ~AA2, *Sec.2.44* ~AA3EVV, *Sec.2.45* ~AA4, *Sec.2.46* ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.43 ~AA2

Description : Read Host Watchdog Timeout Interval

Syntax : **~AA2[CHK](cr)**

~ delimiter character

AA address of reading module (00 to FF)

2 command for reading host watchdog timeout interval

Response : Valid Command : **!AAVV[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

VV timeout interval in HEX format, each count stand for 0.1 second, 01=0.1 second and FF=25.5 second

Example :

Refer *Sec.2.44* ~AA3EVV example.

Related Command :

Sec.2.40 ~**, *Sec.2.41* ~AA0, *Sec.2.42* ~AA1, *Sec.2.44* ~AA3EVV, *Sec.2.45* ~AA4, *Sec.2.46* ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.44 ~AA3EVV

Description : Set Host Watchdog Timeout Interval

Syntax : **~AA3EVV[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

3 command for setting host watchdog timeout interval

E 1=Enable/0=Disable host watchdog

VV timeout interval, from 01 to FF, each for 0.1 second

Response : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : ~010 Receive : !0100

Read address 01 module status, return host watchdog status is clear.

Command : ~013164 Receive : !01

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

Command : ~012 Receive : !0164

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

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Command : ~** Receive : no response

Reset the host watchdog timer.

Wait for 10 seconds and don't send command ~**, the LED of this module will go to flash.

Command : ~010 Receive : !0104

Read address 01 module's status, return host watchdog status is set.

Command : ~011 Receive : !01

Reset address 01 module status, return success. The LED of module will stop flash.

Related Command :

Sec.2.40 ~**, *Sec.2.41* ~AA0, *Sec.2.42* ~AA1, *Sec.2.43* ~AA2, *Sec.2.45* ~AA4, *Sec.2.46* ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.45 ~AA4

Description : Read PowerOn Value and Safe Value

Syntax : **~AA4[CHK](cr)**

~ delimiter character

AA address of reading module (00 to FF)

4 command for reading PowerOn Value and Safe Value

Response : Valid Command : **!AAPPSS[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

PP PowerOn Value, refer table for data format

SS Safe Value, refer table for data format

	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 : ~0150003 Receive : !01

Set address 01 PowerOn Value is DO0 to DO3 off, Safe Value is DO0,DO1 on, DO2,DO3 off return success.

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Command : ~014 Receive : !010003

Read address 01 PowerOn/Safe Value, return PowerOn Value is DO0 to DO3 off, Safe Value is DO0, DO1 on, DO2, DO3 off.

Related Command :

Sec.2.46 ~AA5PPSS

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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2.46 ~AA5PPSS

Description : Set PowerOn Value and Safe Value

Syntax : **~AA5PPSS[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

5 command for setting PowerOn Value and Safe Value

PP PowerOn Value, refer table for data format

SS Safe Value, refer table for data format

	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 : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

Example :

Command : ~0150003 Receive : !01

Set address 01 PowerOn Value is DO0 to DO3 off, Safe Value is DO0,DO1 on, DO2,DO3 off return success.

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Command : ~014 Receive : !010003

Read address 01 PowerOn/Safe Value, return PowerOn Value is DO0 to DO3 off, Safe Value is DO0, DO1 on, DO2, DO3 off.

Related Command :

Sec.2.45 ~AA4

Related Topic :

Sec.3.2 Module Status, *Sec.3.3* Dual Watchdog Operation

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3. Application Note

3.1 INIT* pin Operation

Each I-7000 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 I-7000 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 follow 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.

Refer to "**7000 Bus Converter User Manual**" *Sec.5.1* and "**Getting Start**" for more information.

3.2 Module Status

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

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

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3.3 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

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

The Host Watchdog is a software function to monitor the host's operation status. Its purpose is to prevent from the network/ communication problem or host halt. While the timeout interval expired, the module will turn the all output to safe state to prevent from unexpected problem of controlled target.

The I-7000 module with Dual Watchdog may let the control system more reliable and stable.

3.4 Digital Input and Event Counter

The digital input DI0 may work as event counter. The counter updates while the input changes from high level to low level. The counter is 16-bit width and useful for low speed count, frequency is lower than 50Hz.

3.5 Digital Output

When the module power on, the host watchdog timeout status is checked first. If the status is set, the digital outputs (DO0 to DO3) of module will set to Safe Value. If the status is clear, the digital outputs will set to PowerOn Value.

If the host watchdog timeout status is set, the module will ignore the digital output command @AADO(Data).

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3.6 High/Low Alarm

The analog input module I-7016 equips with the high alarm and low alarm function. When the alarm function is enabled, the digital otput DO0 is the low alarm indicator, DO1 is the high alarm indicator, and the digital output command to change the DO0 and DO1 is ignored. The alarm function is to compare the analog input value with given high alarm value and low alarm value. There are two alarm types as follows :

- **Momentary Alarm** : the alarm status is cleared while the analog input is not exceed the alarm value.
  If Analog Input Value > High Alarm, DO1(High alarm) is on, else DO1 is off.
  If Analog Input Value < Low Alarm, DO0(Low alarm) is on, else DO0 is off.
- **Latch Alarm** : the alarm is cleared only the user send command to clear.
  If Analog Input Value > High Alarm, DO1(High alarm) is on, else if Analog Input Value < Low Alarm, DO0(Low alarm) is on.

3.7 Linear Mapping

Linear mapping function is to translate the input value to the desired output value. The linear mapping is a mechanism that convert the analog input value into physical quantity.

Linear mapping have some values to given : mapping source low value (SL) to target low value(TL), source high value

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(SH) to target high value(TH). For input value(AI), the output value is :

if AI < SL, output value = -19999. (under limit)

else if AI > SH, output value = +19999. (over limit)

else output value = (AI-SL)/(SH-SL) * (TH-TL) + TL

For example, if we connect a load cell to I-7016, and the sensor output is -5mV while the input weight is 0 kg, 40mV while the input weight is 25kg. We want to read the weight directly. We have the source values, -5 to 40mV, and target values, 0 to 25kg. Suppose the I-7016 is address 01, and baud 9600 bps, no-checksum.

1. Set the I-7016 to read ±50mV type.

   Command : *%0101010600* Receive : *!01*

   (Ref *Sec.2.1* %AANNTTCCFF)

2. Set the source low value(SL)=-5 and source high value(SH) =40.

   Command : *@016-05.000+40.000* Receive : *!01*

   (Ref *Sec.2.35* @AA6(SL)(SH))

3. Set the target low value(TL)=0 and target high value(TH)=25.

   Command : *@017+000.00+025.00* Receive : *!01*

   (Ref *Sec.2.37* @AA7(TL)(TH))

4. Enable linear mapping function.

   Command : *@01A1* Receive : *!01*

   (Ref *Sec.2.39* @AAAV)

Then we'll get the weight value from I-7016 directly for command #AA.

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