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# **1. Specification(DIO&AIO)**

## **1.1 DIO(Digital I/O Modules)**

### **a. Digital I/P Modules:**

**EX 9041D, EX 9052D, EX 9053D**

### **b. Photo MOS O/P Module:**

**EX 9066D**

### **c. Open Collector O/P Modules:**

**EX 9042D, EX 9043D, EX 9044D, EX 9050D**

### **d. Relay O/P Modules:**

**EX 9060D, EX 9063D, EX 9065D, EX 9067D**

### **e. Solid-State Relay O/P Modules:**

**EX 9063AD, EX 9065AD, EX 9063BD, EX 9065BD**

## 1.1 DIO (Digital I/O Modules)

**a.**

Digital Input Modules			
	EX9041D	EX9052D	EX9053D
Input Channels	14	8	16
Isolation	Isolation with Common Source	6 differential and 2 common ground	Non-Isolated
Isolation Voltage	3750 Vrms	5000 Vrms	Non-Isolated
Digital Level 0	+1V max	+1V max	+2V max
Digital Level 1	+4 to +30 V	+4 to +30 V	+4 to +30 V
Input Impedance	3K Ohms	3K Ohms	820 Ohms
Power Input	+10 to +30 VDC		
Power Consumption	0.9W	0.6W	0.9W

**b.**

Photo MOS Output Module	
	EX9066D
Output Channels	7
Load Current	0.13A
Load Voltage	350V max
Isolation Voltage	5000VAC
TurnOn Time	0.7mS typ
TurnOff Time	0.05mS typ
Power Input	+10 to +30 VDC
Power Consumption	0.8W

**C.**

Open Collector Output Modules				
	EX9042D	EX9043D	EX9044D	EX9050D
Output Channels	13	16	8	8
Isolation	Isolation with Common Power	Non Isolation	Isolation with Common Power	Non Isolation
Isolation Voltage	3750 Vrms		3750 Vrms	
Load Voltage	Max +30V			
Max Load Current	100mA		375 mA	30 mA
Input Channels	No Input		4	7
Isolation			Isolation with Common Source	Non Isolation
Isolation Voltage			3750 Vrms	
Digital Level 0			1V max	1V max
Digital Level 1			4 to 30V	3.5 to 30V
Input Impedance			3K Ohms	3K Ohms
Power Input			+10 to +30 VDC	
Power Consumption	1.7W	1.1W	1.7W	1.1W

**d.**

Relay Output Modules				
	EX9060D	EX9063D	EX9065D	EX9067D
Output Channels	4	3	5	7
Relay Type	RL1,RL2: Form A RL3,RL4: Form C	Form A	Form A	Form A
Contact Rating	0.6A @125VAC 2A @30VDC	5A@250VAC 5A@30VDC		0.5A @120VAC 1.0A @24VDC
Surge Strength	500V	4000V		1500V
Operate Time	3mS	6mS Max		5mS Max
Release Time	2mS	3mS Max		2mS Max
Min. Life	5*10 <sup>5</sup> ops.	10 <sup>5</sup> ops.		10 <sup>5</sup> ops.
Input Channels	4	8	4	No Input
Isolation	Isolation with Common Source			
Insulation Voltage	3750 Vrms			
Digital Level 0	+1V max			
Digital Level 1	+4 to +30 V			
Input Impedance	3K Ohms			
Power Input	+10 to 30VDC			
Power Consumption	1.9W	1.5W	2.2W	2.2W



e.

Solid-State Relay Output Modules				
	EX9063AD	EX9065AD	EX9063BD	EX9065BD
Output Channels	3	5	3	5
SSR Type	AC-SSR, Normal Open		DC-SSR, Normal Open	
Load Voltage Range	24 to 265 Vrms		3 to 30 VDC	
Leakage Current	1.5 mArms		0.1mA	
Max Load Current	1.0 Arms		1.0 A	
Min. Operate Time	1mS			
Min. Release Time	1/2 cycle + 1mS		1mS	
Dielectric Strength	2500Vrms			
Input Channels	8	4	8	4
Isolation	Isolation with Common Source			
Isolation Voltage	3750 Vrms			
Digital Level 0	+1V max			
Digital Level 1	+4 to +30 V			
Input Impedance	3K Ohms			
Power Input	+10 to +30 VDC			
Power Consumption	1.5W	1.6W	1.4W	1.5W

## 1.2 AIO (Analog I/O Modules)

a.

		Analog I/O Modules			
		EX9016PD	EX9017F/14D/12FD	EX9011PD	EX9013D
Analog	Resolution	16bit	12bit/16bit/12bit	16bit	16bit
	Input Channel	1 diff.	8diff./1diff./1 diff.	1diff.	1 Diff.
	Sampling rate	10HZ	75HZ/10HZ/100Hz	10HZ	15HZ
	Voltage I/P	+/-15mv +/-50mv +/-100mv +/-500mv +/-1v +/-2.5v	+/-150mv +/-500mv +/-1v +/-5v +/-10v	+/-15mv +/-50mv +/-100mv +/-500mv +/-1v +/-2.5v	×
	Current I/P	+/-20ma	20mA*/ 20mA/ 20mA*	+/-20ma*	×
	Sensor I/P	6 wire	×	J.K.T.E.R.S B.N.C.L.M.	RTD(Pt,Ni)
	4.5 digit LED	√	/ √ / √	√	√
	Isolated Loop Power	×	/√(15v)/	×	×
	I/P Linear Scaling	√	/ √ /	×	×
	Isolation	3000v	3000v	3000v	3000v
Digital	Digital I/P Channels	1	/ 1 / 1	1	×
I/P &	Digital O/P Channels	4	/ 2 / 2	2	×
Digital	Event Counter	√	/ √ / √	√	×
O/P	H/L Alarm	√	/ √ / √	√	×
Dual Watchdog Timer		√	√	√	√
Power I/P		+10v to +30v	+10v to +30v	+10v to +30v	+10v to +30v
Power Consumption		1.0w	1.3/1.9w/1.9w	1.5w	2.2w

\*With external 125 Ohms resistor

## 1.3 Application Note For DIO, AIO

### 1.4 INIT\* Pin Operation For DIO, AIO

Each EX9000 module has a build-in EEPROM to store configuration information such as address, type, baudrate and other information. Sometimes, user may forget the configuration of the module. Therefore, the EX9000 have a special mode named "**INIT mode**", to help user to resolve the problem. The "**INIT mode**" is setting as **Address=00, baudrate=9600bps, no checksum**

To enable INIT mode, please following these steps:

Step1. Power off the module

Step2. Connect the INIT\* pin with the GND pin.

Step3. Power on

Step4. Send command \$002 (cr) in 9600bps to read the  
Configuration stored in the module's EEPROM.

### 1.5 Module Status For DIO, AIO

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

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

## **1.6 Dual Watchdog Operation For DIO, AIO**

### **Dual Watchdog=Module Watchdog+Host Watchdog**

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

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

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

## **2. EX9000 DIO Series**

### **2.1 Reset Status**

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

## 2.2 Digital O/P

The module's output have 3 different situation:

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

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

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

## 2.3 Latch Digital I/P

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



## 2.4 Default Setting

Default setting for Ex9000 DIO modules:

- . Address :01
- . Baudrate:9600bps
- . Type: Type 40 for DIO mode
- . Checksum Disable
- . EX9043D jumper setting at INIT\*
- . EX9053D jumper setting at INIT\*

## 2.5 Jumper Setting

EX9043D:Jumper J3 for select the pin INIT\*/DO15

Select DO15 DO15  INIT\*

Select INIT\* DO15  INIT\*(default)

EX9053D:Jumper J1 for select the pin INIT\*/DI15

Select DI15 DI15  INIT\*

Select INIT\* DI15  INIT\*(default)

## 2.6 Configuration Tables

Configuration Table of EX9000 DIO modules

### Baudrate Setting(CC)

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

### Type Setting(TT)

TYPE=**40** for DIO mode

### Data Format Setting(FF)

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

\*1: Counter Update Direction : 0=falling Edge,  
1=Rising Edge

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

\*3: 9050=0(Bit[2.1.0]=000),9060=1(Bit[2.1.0]=001)

9052=2(Bit[2.1.0]=010),9053=3(Bit[2.1.0]=011)

### Read Digital Input/Output Data Format

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

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

	First Data		Second Data	
	EX9041D	DI(8-13)	00 to 3F	DI(0-7)
EX9042D	DO(8-12)	00 to 1F	DO(0-7)	00 to FF
EX9043D	DO(8-15)	00 to FF	DO(0-7)	00 to FF
EX9044D	DO(1-8)	00 to FF	DI(1-4)	00 to 0F
EX9050D	DO(0-7)	00 to FF	DI(0-6)	00 to 7F
EX9052D	DI(0-7)	00 to FF	00	00
EX9053D	DI(8-15)	00 to FF	DI(0-7)	00 to FF
EX9060D	DO(1-4)	00 to 0F	DI(1-4)	00 to 0F
EX9063S <sup>*1</sup>	DO(1-3)	00 to 07	DI(1-8)	00 to FF
EX9065S <sup>*2</sup>	DO(1-5)	00 to 1F	DI(1-4)	00 to 0F
EX9066D	DO(1-7)	00 to 7F	00	00
EX9067D	DO(1-7)	00 to 7F	00	00
EX9063S <sup>*1</sup> :EX9063D/63AD/63BD				
EX9065S <sup>*2</sup> :EX9065D/65AD/63BD				



## 2.7 Command(For EX9000 DIO &AIO)

### 2.7.1 %AANNTTCCFF(For DIO, AIO)

**Description :** Set Module Configuration

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

- % a delimiter character
- AA address of setting/response module(00 to FF)
- NN new address for setting/response module(00 to FF)
- TT type 40 for DIO module
- CC new baudrate for setting module. It is needed to short the INIT\* to ground while change baudrate.
- FF new data format for setting module. It is needed to short the INIT\* to ground to change checksum setting.

**Response:** Valid Command: !AA

Invalid Command: ?AA

#### **Example:**

Command :%0102400600            Receive:!02

Set module address 01 to 02, return Success.

## 2.7.2 ###(For DIO, AIO)

**Description :** Synchronized Sampling

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

# a delimiter Character

\*\* synchronized sampling command

**Response :** No response

**Example:**

Command : ### No response

Send synchronized sampling command to all modules.

Command :\$014 Receive : !10F0000

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

Command \$014 Receive : !00F0000

Read synchronized data from address 02, return S=0, have readed and data.

## 2.7.3 #AABBDD

**Description :** Digital Output

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

# delimiter character

AA address of reading module(00 to FF)

BBDD output command and parameter

For output multi-channel, the BB=00, 0A or 0B the select which output group, and the DD is the output value.

Parameter for Multi-Channel Output					
	Output Channels	DD for command #AABBDD			
		BB=00/0A		BB=0B	
EX9042D	13	00 to FF	DO(0-7)	00 to 1F	DO(8-12)
EX9043D	16	00 to FF	DO(0-7)	00 to FF	DO(8-15)
EX9044D	8	00 to FF	DO(1-8)	NA	NA
EX9050D	8	00 to FF	DO(0-7)	NA	NA
EX9060D	4	00 to 0F	RL(1-4)	NA	NA
EX9063S <sup>1</sup>	3	00 to 07	RL(1-3)	NA	NA
EX9065S <sup>2</sup>	5	00 to 1F	RL(1-5)	NA	NA
EX9066D	7	00 to 7F	RL(1-7)	NA	NA
EX9067D	7	00 to 7F	RL(1-7)	NA	NA
EX9063S <sup>1</sup> Include:EX9063D/63AD/63BD					
EX9065S <sup>2</sup> Include:EX9065D/65AD/65BD					

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

Parameter for Single-Channel Output				
	Single channel output command #AABBDD			
	c for BB=1c/Ac		c for BB=Bc	
EX9042D	0 to 7	DO(0-7)	0 to 4	DO(8-12)
EX9043D	0 to 7	DO(0-7)	0 to 7	DO(8-15)
EX9044D	0 to 7	DO(1-8)	NA	NA
EX9050D	0 to 7	DO(0-7)	NA	NA
EX9060D	0 to 3	RL(1-4)	NA	NA
Ex9063 S <sup>*1</sup>	0 to 2	RL(1-3)	NA	NA
Ex9065 S <sup>*2</sup>	0 to 4	RL(1-5)	NA	NA
EX9066D	0 to 6	RL(1-7)	NA	NA
EX9067D	0 to 6	RL(1-7)	NA	NA
Ex9063S <sup>*1</sup> Include:EX9063D/63 AD/63 BD				
Ex9065S <sup>*2</sup> Include:EX9065D/65 AD/65 BD				

**Response :** Valid Command: >

Invalid Command: ?

Ignored Command: !.

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

**Example :**

Command : #0100FF                      Receive:>

Assume module is EX9044, set address 01 output value FF, return success

Command : #021001                      Receive:>

Assume module is EX9067, set address 02 channel 0 on, Return success.

Command : #021701                      Receive:?

Set address 02 channel 7 on, return the channel is invalid For EX9067 only have 7-channel outputs (0 to 6).

Command:#0300FF                      Receive:!

Set address 03 output value FF, return ignore, The module's host watchdog timeout status is set, and the output is set to Safe Value.

## 2.7.4 #AAN

**Description :** Read Digital Input Counter from channel N

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

# delimiter character

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

N channel to read

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

  Invalid Command.       **?AA**

(Data) digital input counter value in decimal, from 00000 to 65535

**Example :**

Command : #032                            Receive : !0300103

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

Command : #025                            Receive : ?02

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

## 2.7.5 \$AA2(For DIO, AIO)

**Description :** Read Configuration

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

\$ delimiter character

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

2 command for read configuration

**Response :** Valid Command: !AATTCCFF

Invalid Command. ?AA

TT type code of module, it must be 40

CC baudrate code of module

FF data format of module

**Example :**

Command : \$012                      Receive : !01400600

Read address 01 status, return DIO mode, baud 9600, no checksum.

## 2.7.6 \$AA4(For DIO, AIO)

**Description :** Read Synchronized Data

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

\$ delimiter character

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

4 command for read synchronized data

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

Invalid Command.       **?AA**

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

(Data) synchronized DIO value

**Example :**

Command : \$014                   Receive : ?01

Read address 01 synchronized data, return no data available.

Command : #\*\*                   Receive : no response

Send synchronized sampling to all modules.

Command : \$014                   Receive: !1000F00

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



## 2.7.7 \$AA5

**Description :** Read Reset Status

**Syntax :** \$AA5[CHK](cr)

\$        delimiter character

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

5        command for read reset status

**Response :** Valid Command:        **!AAS**

          Invalid Command.        **?AA**

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

**Example :**

Command : \$015                      Receive : !011

Read address 01 reset status, return first read.

Command : \$015                      Receive : !010

Read address 01 reset status, return no reset occurred.

## 2.7.8 \$AA6

**Description :** Read Digital I/O Status

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

\$ delimiter character

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

6 command for read digital input/output status

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

Invalid Command.        **?AA**

(Data) digital input/output value

**Example :**

Command : \$016                      Receive : !0F0000

Assume module is Ex9060, read address 01 DIO status, return 0F00, digital input IN1 to IN4 are open, digital output RL1 to RL4 are off.

## 2.7.9 \$AAF(For DIO, AIO)

**Description :** Read Firmware Version

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

\$ delimiter character

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

F command for read firmware version

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

                  Invalid Command.   **?AA**

(Data) firmware version of module

**Example :**

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

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

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

Read address 01 firmware version, return version B1.1.

## 2.7.10 \$AAM(For DIO, AIO)

**Description :** Read Module Name

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

\$ delimiter character

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

M command for read module name

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

                  Invalid Command.   **?AA**

(Data) Name of module

**Example :**

Command : \$01M                   Receive : !019042

Read address 01 module name, return name 9042.

Command : \$03M                   Receive : !039060D

Read address 03 module name, return name 9060D

## 2.7.11 \$AAC

**Description :** Clear Latched Digital Input

**Syntax :** \$AAC[CHK](cr)

\$ delimiter character

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

C command for clear latched digital input

**Response :** Valid Command: !AA

Invalid Command. ?AA

### **Example :**

Command : \$01L0                      Receive : !FFFF00

Read address 01 latch-low data, return FFFF.

Command : \$01C                      Receive : !01

Clear address 01 latched data, return success.

Command : \$01L0                      Receive : !000000

Read address 01 latch-low data, return 0000.

## 2.7.12 \$AACN

**Description :** Clear Digital Input Counter

**Syntax :** \$AACN[CHK](cr)

\$ delimiter character

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

C command for clear digital input counter

N digital counter channel N to clear

**Response :** Valid Command: !AA

Invalid Command. ?AA

### **Example :**

Command : #010                      Receive : !0100123

Read address 01 input channel 0 counter value, return 123

Command : \$01C0                      Receive : !01

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

Command : #010                      Receive : !0100000

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

## 2.7.13 \$AALS

**Description :** Read Latched Digital Input

**Syntax :** \$AALS[CHK](cr)

\$        delimiter character

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

L        command for read latched digital input

S        1=select latch high status, 0=select latch low status

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

          Invalid Command.        **?AA**

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

**Example :**

Command : \$01L1                    Receive : !012300

Read address 01 latch-high data, return 0123.

Command : \$01C                    Receive : !01

Clear address 01 latched data, return success.

Command : \$01L1                    Receive : !000000

Read address 01 latch-high data, return 0.

## 2.7.14 @AA

**Description :** Read Digital Input/Output Status

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

@ delimiter character

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

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

Invalid Command. ?AA

(Data) readed DIO status

**Example :**

Command : @01                      Receive : >0F00

Read address 01 DIO status, return 0F00.



## 2.7.15 @AA(Data)

**Description :** Set Digital Output

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

@ delimiter character

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

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

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

For EX9060D, from 0 to F

For EX9063D/63AD/63BD, from 0 to 7

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

For EX9044D/50D,from 00 to FF

For EX9065D/65AD/65BD,from 00 to 1F

For EX9066D/67D, from 00 to 7F

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

For EX9042D, from 0000 to 1FFF

For EX9043D, from 0000 to FFFF

**Response :** Valid Command: >

Invalid Command: ?

Ignore Command: !

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

**Example :**

Command : @017                      Receive : >

Output address 01 value 7, return success.(The example is suitable for EX9060D/63D/63AD/63BD)

Command : @0200                      Receive : >

Output address 02 value 00, return success. (The example is suitable for EX9044D/50D/65D/65AD/65BD/66D/67D)

Command : @030012                      Receive : !

Output address 03 value 0012, return the module is in host watchdog timeout mode, the output command is ignored.(The example is suitable for EX9042D/43D)

## 2.7.16 ~AAO(Data)(For DIO, AIO)

**Description :** Set Module Name

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

~ delimiter character

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

O command for set module name

(Date) new name for module, max 6 characters

**Response :** Valid Command:       !AA

                  Invalid Command:   ?AA

### **Example :**

Command:~01O9050                    Receive :!01

Set address 01 module name 9050, return success.

Command : \$01M                        Receive : !019050

Read address 01 module name, return name 9050.

## 2.7.17 Host Watchdog(For DIO, AIO)

### 2.7.18 ~\*\*

**Description :** Host OK.

Host send this command to all modules for send the information "Host OK"

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

~        delimiter character

\*\*        command for all modules

**Response :** No response

**Example :**

Command:~\*\*                    No response

## 2.7.19 ~AA0

**Description :** Read Module Status.

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

~ delimiter Character

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

0 command for read module status

**Response :** Valid Command:       **!AASS**

                  Invalid Command:   **?AA**

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

## 2.7.20 ~AA1

**Description :** Reset Module Status.

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

~ delimiter Character

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

1 command for reset module status

**Response :** Valid Command:       **!AA**

                  Invalid Command:   **?AA**

## 2.7.21 ~AA2

**Description :** Read Host Watchdog Timeout Value

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

~ delimiter Character

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

2 command for read host watchdog timeout value

**Response :** Valid Command: **!AAEVV**

Invalid Command: **?AA**

E host watchdog enable status, 1=Enable, 0=Disable

VV timeout value in HEX format, each count is 0.1 second 01=0.1 second and FF=25.5 seconds

## 2.7.22 ~AA3EVV(For DIO, AIO)

**Description :** Set Host Watchdog Timeout Value

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

~ delimiter Character

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

3 command for set host watchdog timeout value

E 1=Enable/0=Disable host watchdog

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

**Response :** Valid Command: !AA

Invalid Command: ?AA

### **Example :**

Command : ~010                      Receive : !0100

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

Command : ~013164                  Receive : !01

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

Command : ~012                      Receive : !01164

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

Command : ~\*\*                        No response



Reset the host watchdog timer.

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

Command : ~010                      Receive : !0104

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

Command : ~012                      Receive : !01064

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

Command : ~011                      Receive : !01

Reset address 01 host watchdog timeout status, return success And the LED of this module stop flash.

Command : ~010                      Receive : !0100

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

## 2.7.23 ~AA4V

**Description :** Read Power On/Safe Value.

**Syntax :** ~AA4V[CHK](cr)

~ delimiter Character

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

4 command for read Power On/Safe value

V P=read Power On Value, S=read Safe value

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

                  Invalid Command:    ?**AA**

(Data) Power On Value or Safe Value

For EX9042D/43D(Data)isVVVV, where VVVV is the Power On Value (or Safe Value).

For other modules, (Data) is VV00, where VV is the Power On Value(or Safe Value).

### **Example :**

Command :@010000                    Receive : >

Output address 01 Value 0000, return success.

Command : ~015S                      Receive : !01

Set address 01 Safe Value, return success.

Command : @01FFFF                    Receive : >

Output address 01 Value FFFF, return success.

Command : ~015P                      Receive : !01

Set address 01 Power On Value, return success.

Command : ~014S                      Receive : !010000

Read address 01 Safe Value, return 0000.

Command : ~014P                      Receive : !01FFFF

Read address 01 Power On Value, return FFFF

## 2.7.24 ~AA5V

**Description :** Set Power On/Safe Value

**Syntax :** ~AA5V[CHK](cr)

~ delimiter Character

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

5 command for set Power On/Safe value

V P=set current output as Power On Valus, S=set current output as Safe Value

**Response :** Valid Command: !AA

Invalid Command: ?AA

### **Example :**

Command : @01AA                      Receive : >

Output address 01 value AA, return success

Command : ~015P                      Receive : !01

Set address 01 Power On Value, return success

Command : @0155                      Receive : >

Output address 01 value 55, return success.

Command : ~015S                      Receive : !01

Set address 01 Safe Value, return success.

Command : ~014P                      Receive : !01AA00

Read address 01 Power On Value, return Power On Value AA.

Command : ~014S                      Receive : !015500

Read address 01 Safe Value, return Safe Value 55.

### **3. EX9000 AIO Series--EX9014D, EX9017F, EX9016PD EX9013D/12FD/11PD**

#### **3.1 Digital I/P and Event Counter For AIO (EX9011PD/12FD/14D/16PD)**

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.

#### **3.2 Digital O/P For AIO**

When the module power on, the host watchdog timeout status is checked first. If the status is set, the digital outputs (DO0 and DO1) of module will set to Safe Value. If the status is clear, the digital outputs will set to Power On Value.

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

### 3.3 H/L Alarm For AIO (EX9011PD/12FD/14PD/16PD)

Some analog input modules, like Ex9012, equip with the high/low alarm function. When the alarm function is enabled, the digital output 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.

### 3.4 Transmitter For AIO

Transmitter is an instrument to convert the signal from the sensor to 4-20mA or 0-5V signal level. Transmitters may support driving or compensation circuit for sensor, and the output is after linearization and amplification.

2-wire transmitter, typical 4 to 20mA current output signal. One for power input, the other is signal output.

3-wire transmitters, typical 0 to 5V voltage output signal. One pair for power input and ground and the other is signal output.

### 3.5 Linear Mapping (For EX9014D/16PD only)

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 (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 temperature sensor to



EX9014D, and the sensor output is 4mA while the temperature is 0 degree Celsius, 20mA while the temperature is 100 degree Celsius. We want to read the temperature directly. We have the source values, 4 to 20mA, and target values, 0 to 100 degree Celsius.

Suppose the EX9014D is address 01, and baud 9600 bps, no-checksum.

1. Set the EX9014D to read ;20mA type.

Command: %01010D0600                      Receive: !01  
(Ref %AANNTCCFF)

2. Set the source low value(SL)=4 and source high value (SH)=20.

Command: \$016+04.000+20.000              Receive: !01  
(Ref ~AA6(SL)(SH))

3. Set the target low value(TL)=0 and target high value (TH)=100.

Command: \$017+000.00+100.00              Receive: !01  
(Ref \$AA7(TL)(TH))

4. Enable linear mapping function.

Command: \$01A1                                      Receive: !01  
(Ref \$AAAV)

Then we'll get the temperature value from EX9014D directly for command #AA.

## **3.6 Default Setting**

### **3.6.1 For EX9017F/14D/12FD**

Default setting for EX9014D/17F/12FD

Address:01

Analog Input Type:Type 08, -10 to +10 V

Baudrate:9600bps

60 Hz filter rejection, Checksum disable, engineer unit format

EX9017F set as 6 differential and 2 single-ended mode

EX9017F set as Fast Mode

### **3.6.2 For EX9016PD**

Default setting for EX9016PD

Address:01

Analog Input Type : Type 05, -2.5 to +2.5V

Baudrate : 9600bps

Checksum disable, engineer unit format, 60Hz, filter

### 3.6.3 For EX9013D

Default setting for EX9013D

Address:01

RTD Type : Type 20, Pt100, -100 $\phi$  to 100 $\phi$

Baudrate : 9600bps

Checksum disable, engineer unit format

Filter at 60Hz rejection

## 3.7 Jumper Setting

### 3.7.1 For EX9017F/14D/12FD

EX9017F:Jumper JP1 for select the pin INIT\*/Vin7-

Select 8 differential JP1  INIT\*/Vin7-is set to Vin7-

Select INIT\* mode, Jp1  Vin7- is set to INIT\*

## 3.8 Calibration

### 3.8.1 For EX9017F/14D/12FD

Calibration Requirement for EX9014D/17F/12FD  
While calibrate type 0D, the EX9014D/17F/12FD  
need connect external shunt resistor, 125Ohms,  
0.1%

Type Code	08	09	0A	0B	0C	0D
Zero Input	0V	0V	0V	0mV	0mV	0mA
Span Input	+10V	+5V	+1V	+500mV	+150mV	+20mA

Calibration Sequence:

1. Connect calibration voltage/current to module's input.  
For EX9017F, connect to channel 0.
2. Warm-Up for 30 minutes
3. Setting type to 08
4. Enable Calibration (P.76)
5. Apply Zero Calibration Voltage
6. Perform Zero Calibration Command (P.67)
7. Apply Span Calibration Voltage
8. Perform Span Calibration Command (P.66)
9. Repeat step4 to step 8 three times.

**Warning: Pls don' t calibrate before you really understand.**

### 3.8.2 For EX9016PD

#### Analog Input Calibration Requirement EX9016PD

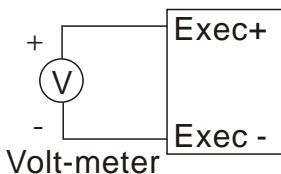
Type Code	00	01	02	03	04	05	06
Zero Input	0mV	0mV	0mV	0mV	0V	0V	0mA
Span Input	+15 mV	+50 mV	+100 mV	+500 mV	+1V	+2.5V	+20 mA

Calibration Sequence:

1. Connect calibration voltage/current to module's input channel 0
2. Wam-Up for 30 minutes
3. Setting Type to 00
4. Enable Calibration (P.76)
5. Apply Zero Calibration Voltage
6. Preform Zero Calibration Command (P.67)
7. Apply Span Calibration Voltage
8. Perform Span Calibration Command (P.66)
9. Repeat step4 to step8 three times.
10. Perform step1 to step 9 for each type with change the step3:setting type, step 5:zero calibration voltage, step7:span calibration voltage.

**Warning: Pls don't calibrate before you really understand.**

## Excitation Voltage Calibration Requirement for Ex9016PD



### 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.

**Warning: Pls don't calibrate before you really understand.**

### 3.8.3 For EX9013D

#### Calibration Requirement for EX9013D

Type	Zero Calibration Resistor	Span Calibration Resistor
20 to 29	0 ohm/55 ohm	375.0ohm
2A	0 ohm	3200.0ohm

#### Calibration Sequence:

1. Connect calibration resistor to module by 4-wire RTD connection. For EX9033D/13D, connect to channel 0
2. Warm-Up for 30 minutes
3. Setting Type to 20
4. Enable Calibration
5. Install Zero Calibration Resistor
6. Perform Zero Calibration Command
7. Install Span Calibration Resistor
8. Perform Span Calibration Command
9. Repeat step4 to step8 three times.

**Warning: Pls do not calibration before you really understand.**

## 3.9 Configuration Tables

### 3.9.1 For Ex9017F/14D/12FD

Configuration Table of Ex9014D/17F/12FD

#### 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 Code	08	09	0A	0B	0C	0D
Min. Input	-10V	-5V	-1V	-500mV	-150mV	-20mA
Max Input	+10V	+5V	+1V	+500mV	+150mV	+20mA

#### Data Format Setting (FF)

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

\*1:0=60Hz rejection

1=50 Hz rejection

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

\*3:Fast/Normal Bit:0=Normal, 1=Fast

(For EX9017F/12FD only)

\*4:00=Engineer Unit Format

01=Percent Format

10=2's Complement HEX Format



**Analog input type and data format table**

<b>Type Code</b>	<b>Input Range</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>Zero</b>	<b>-F.S.</b>
08	-10 to +10 V	Engineer Unit	+10.000	+00.000	-10.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
09	-5 to +5 V	Engineer Unit	+5.0000	0.0000	-5.0000
		% of FSR	+100.00	000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
0A	-1 to +1 V	Engineer Unit	+1.0000	+0.0000	-1.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
0B	-500 to +500 mV	Engineer Unit	+500.00	+000.00	-500.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
0C	-150 to +150 mV	Engineer Unit	+150.00	+000.00	-150.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
0D	-20 to +20 mA	Engineer Unit	+20.000	+00.000	-20.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000

### 3.9.2 For EX9016PD

Configuration Table of 9016PD

#### 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=50 Hz rejection

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

\*3:00=Engineer Unit Format

01=Percent Format

10=2's Complement HEX Format

**Analog input type and data format table**

<b>Type Code</b>	<b>Input Range</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>Zero</b>	<b>-F.S.</b>
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	7 FFF	0000	8000
01	-50to 50 mV	Engineer Unit	+50.000	+00.000	-50.000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
02	-100to +100 mV	Engineer Unit	+100.00	+000.00	-100.00
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	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	7 FFF	0000	8000
04	-1 to +1V	Engineer Unit	+1.0000	+0.0000	-1.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	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	7 FFF	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	7 FFF	0000	8000

### 3.9.3 For EX9013D

Configuration Table of EX9013D

#### Baudrate Setting(CC)

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

#### RTD Type Setting(TT)

Type Code	RTD Type	Temperature Range
20	Platinum 100, $\pm 0.00385$	-100 to +100
21	Platinum 100, $\pm 0.00385$	0 to 100
22	Platinum 100, $\pm 0.00385$	0 to 200
23	Platinum 100, $\pm 0.00385$	0 to 600
24	Platinum 100, $\pm 0.003916$	-100 to 100
25	Platinum 100, $\pm 0.003916$	0 to 100
26	Platinum 100, $\pm 0.003916$	0 to 200
27	Platinum 100, $\pm 0.003916$	0 to 600
28	Nickel 120	-80 to 100
29	Nickel 120	0 to 100
2B	CU 100	
2C	CU 50	
2D	BA 1	
2E	BA 2	
2F	G 53	

### 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=50 Hz rejection

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

\*3:00=Engineer Unit Format

01=Percent Format

10=2's Complement HEX Format

11=Ohms

## RTD type and data format table

<b>Type Code</b>	<b>RTD Type</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>-F.S.</b>
20	Platinum 100 =0.00385 -100 to 100 degree Celsius	Engineer Unit	+100.00	-100.00
		% of FSR	+100.00	-100.00
		2's complement HEX	7 FFF	8000
		Ohm	+138.50	+060.60
21	Platinum 100 =0.00385 0 to 100 degree Celsius	Engineer Unit	+100.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+138.50	+100.00
22	Platinum 100 =0.00385 0 to 200 degree Celsius	Engineer Unit	+200.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+175.84	+100.00
23	Platinum 100 =0.00385 0 to 600 degree Celsius	Engineer Unit	+600.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	8000
		Ohm	+313.59	+060.60
24	Platinum 100 =0.003916 -100 to 100 degree Celsius	Engineer Unit	+100.00	-100.00
		% of FSR	+100.00	-100.00
		2's complement HEX	7 FFF	8000
		Ohm	+139.16	+060.60
25	Platinum 100 =0.003916 0 to 100 degree Celsius	Engineer Unit	+100.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+139.16	+100.00

<b>Type Code</b>	<b>RTD Type</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>-F.S.</b>
26	Platinum 100 =0.003916 0 to 200 degree Celsius	Engineer Unit	+200.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+177.13	+100.00
27	Platinum 100 =0.003916 0 to 600 degree Celsius	Engineer Unit	+600.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+317.28	+100.00
28	Nickel 120 -80 to 100 degree Celsius	Engineer Unit	+100.00	-080.00
		% of FSR	+100.00	-080.00
		2's complement HEX	7 FFF	999A
		Ohm	+200.64	+066.60
29	Nickel 120 0 to 100 degree Celsius	Engineer Unit	+100.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7 FFF	0000
		Ohm	+200.64	+120.60
2A	Platinum 1000 =0.00385 -200 to 600 degree Celsius	Engineer Unit	+600.00	-200.00
		% of FSR	+100.00	-033.33
		2's complement HEX	7 FFF	AAAA
		Ohm	+3137.1	+185.20

### **RTD Overage/Underrange Reading**

	<b>Over Range</b>	<b>Under Range</b>
Engineer's Unit	+9999	-0000
Perencent of FSR	+9999	-0000
2's Complement HEX	7FFF	8000

## 3.10 Command For Ex9000 AIO Series

### 3.10.1 #AA

**Description :** Read Analog Input

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

# delimiter character

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

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

(Data) analog input value for its format while use #AA command to EX9017F, the data is the combination for each channel respectively.

#### **Example :**

Command :#01                    Receive : >+02.635

Read address 01, get data successfully.

Command : #02                    Receive : >4C53

Read address 02, get data in HEX format successfully.

Command : #04

Receive:>+05.123+04.153+07.234-02.356+10.000-05.133+02.345+08.234

The module address 04 is EX9017F. Read address 04 for getting data of all 8 channels.



### 3.10.2 #AAN

**Description :** Read Analog Input from channel N

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

# delimiter character

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

N channel to read, from 0 to 7

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

Invalid Command: ?AA

(Data) analog input value for its format

**Example :**

Command :#32                      Receive : >+02.513

Read address 03 channel 2, get data successfully.

Command : #029                      Receive : ?02

Read address 02 channel 9, return error channel number.

### 3.10.3 \$AA0

**Description :** Perform Span Calibration

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

\$ delimiter character

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

0 command for performing span calibration

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **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.

**Warning: Pls don't calibrate before you really understand.**

### 3.10.4 \$AA1

**Description :** Perform Zero Calibration

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

\$ delimiter character

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

1 command for performing zero calibration

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **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.

**Warning: Pls don't calibrate before you really understand.**

### 3.10.5 \$AA3(For EX9016PD only)

**Description :** Read Channel Select

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

\$ delimiter character

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

3 command for reading channel select

**Response :** Valid Command: !AA

Invalid Command: ?AA

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.

### 3.10.6 \$AA3N(For EX9016PD only)

**Description :** Set Channel Select

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

\$ delimiter character

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

3 command for setting channel select

N channel N is selected.

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **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.

### 3.10.7 \$AA5VV(Not for Ex9013)

**Description :** Set Channel Enable

**Syntax :** \$AA5VV[CHK](cr)

\$ delimiter character

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

5 command for set channel enable

VV channel enable/disable, 00 is all disabled and FF is all enabled.

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **Example :**

Command :\$0155A                      Receive : !01

Set address 01 to enable channel 1,3,4,6 and disable channel 0,2,5,7 return success.

Command : \$016                      Receive : !015A

Read address 01 channel status, return channel 1,3,4,6 are enabled and channel 0,2,5,7 are disabled.

### 3.10.8 \$AA6 (Not for Ex9013)

**Description :** Read Channel Status

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

\$ delimiter character

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

6 command for read channel status

**Response :** Valid Command:       !AAVV

                  Invalid Command:   ?AA

VV channel enable/disable, 00 is all disabled and FF is all enabled.

**Example :**

Command :\$015A5                    Receive : !01

Set address 01 to enable channel 0,2,5,7 and disable channel 1,3,4,6, return success.

Command : \$016                    Receive : !01A5

Read address 01 channel status, return channel 0,2,5,7 are enabled and channel 1,3,4,6 are disabled.

### 3.10.9 \$AA8 (For Ex9013 only)

**Description :** Read LED Configuration

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

\$ delimiter character

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

8 command for reading LED configuration

**Response :** Valid Command:       **!AAV**

                  Invalid Command:   **?AA**

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.



### **3.10.10 \$AA8V (For Ex9013 only)**

**Description :** Set LED Configuration

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

\$        delimiter character

AA      address of setting/response 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

          Invalid Command:        ?AA

#### **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.

### 3.10.11 \$AA9(Data)

(For EX9012FD/14D/13D/16PD only)

**Description :** Set LED Data

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

\$ delimiter character

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

9 command for setting LED data

(Data) data for show on the LED, from -19999. to +19999.

The data format is sign, 5 numeral and decimal point.

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **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.

### 3.10.12 \$AAA(For EX9017F only)

**Description :** Read 8 channel data

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

\$ delimiter character

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

A command for read 8 channel analog input data

**Response :** Valid Command: >(Data1)..(Data8)

Invalid Command: ?AA

(Data)..(Data8) 8 channel analog input data, in format 2's complement HEX.

**Example :**

Command :\$01A

Receive:>0000012301257FFF1802744F98238124

Read address 01 8-channel analog input data, return success.

### 3.10.13 ~AAEV

**Description :** Enable/Disable Calibration

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

~ delimiter character

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

E command for enable/disable calibration

V 1=Enable/0=Disable calibration

**Response :** Valid Command:       !AA

                  Invalid Command:   ?AA

#### **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.

**Warning: Pls don't calibrate before you really understand.**

### **3.10.14 AIO Alarm & Event Counter (For EX9016PD/14D/12FD/11PD only)**

#### **3.10.15 @AADI**

**Description :** Read Digital I/O and Alarm Status

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

@ delimiter character

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

DI command for reading digital input and alarm status

**Response :** Valid Command: **!AASOOII**

Invalid Command: **?AA**

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

OO digital output status, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 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 output all off, and digital input high level.

### **3.10.16 @AADO(Data)**

**Description :** Set Digital Output

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

@ delimiter character

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

DO command for set digital output

(Data) output value, 00=DO0 off, DO1 off, 01=DO0 on, DO1 off, 02=DO0 off, DO1 on, 03=DO0 on, DO1 on

**Response :** Valid Command:       **!AA**

                  Invalid Command:   **?AA**

**Example :**

Command:@01DO00

Receive:!01

Set address 01 digital output 00, return success.

### 3.10.17 @AAEAT

**Description :** Enable Alarm

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

@ delimiter character

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

EA command for enable alarm.

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

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **Example :**

Command:@01EAM

Receive:!01

Set address 01 momentary alarm, return success.

### **3.10.18 @AAHI(Data)**

**Description :** Set High Alarm

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

@ delimiter character

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

HI command for set high alarm value

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

**Response :** Valid Command:       !AA

                  Invalid Command:   ?AA

**Example :**

Command:@01HI+10.000

Receive:!01

Set address 01 high alarm +10.000, return success.



### **3.10.19 @AALO(Data)**

**Description :** Set Low Alarm

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

@ delimiter character

AA address of setting/response 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

                  Invalid Command:   ?AA

**Example :**

Command:@01LO-10.000

Receive:!01

Set address 01 low alarm -10.000, return success.

### **3.10.20 @AADA**

**Description :** Disable Alarm

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

@ delimiter character

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

DA command for disable alarm

**Response :** Valid Command:       **!AA**

                  Invalid Command:   **?AA**

**Example :**

Command:@01DA                    Receive:!01

Disable address 01 alarm, return success.

### 3.10.21 @AACCA

**Description :** Clear Latch Alarm

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

@ delimiter character

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

CA command for clear latch alarm

**Response :** Valid Command:       !AA

Invalid Command:       ?AA

#### **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.

### **3.10.22 @AARH**

**Description :** Read High Alarm

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

@ delimiter character

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

RH command for reading high alarm

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

                  Invalid Command:   **?AA**

(Data) high alarm value in engineer unit format.

**Example :**

Command:@01RH                    Receive:!01+10.000

Read address 01 high alarm, return +10.000

### **3.10.23 @AARL**

**Description :** Read Low Alarm

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

@ delimiter character

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

RL command for reading low alarm

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

                                  Invalid Command:   **?AA**

(Data) low alarm value in engineer unit format.

**Example :**

Command:@01RL

Receive:!01-10.000

Read address 01low alarm, return -10.000

### 3.10.24 @AARE

**Description :** Read Event Counter

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

@ delimiter character

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

RH command for reading event counter

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

Invalid Command:       **?AA**

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

**Example :**

Command:@01RE                      Receive:!0101234

Read address 01 event counter, return 1234.

### 3.10.25 @AA CE

**Description :** Clear Event Counter

**Syntax :** @AA CE[CHK](cr)

@ delimiter character

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

CE command for clear event counter

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **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.

### 3.10.26 Linear Mapping

(For EX9014D/16PD)

### 3.10.27 \$AA3(For EX9014FD only)

**Description :** Read Source Low/High Values for Linear Mapping

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

\$ delimiter character

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

3 command for reading source values

**Response :** Valid Command: !AA(SL)(SH)

Invalid Command: ?AA

SL low limit of source values in engineer unit format.

SH high limit of source value in engineer unit format.

**Example :**

Command:\$013                      Receive:!01-10.000+10.000

Reading address 01 source value, return from -10 to +10.



### 3.10.28 \$AA5(For EX9014FD only)

**Description :** Read Target Low/High Values for Linear Mapping

**Syntax :** \$AA5[CHK](cr)

\$ delimiter character

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

5 command for reading target values

**Response :** Valid Command: !AA(TL)(TH)

Invalid Command: ?AA

TL target low values in engineer unit format.

TH target high values in engineer unit format.

**Example :**

Command:\$015                      Receive:!01-10.000+10.000

Read address 01 target value, return from -10 to +10.

### **3.10.29 \$AA6(SL)(SH) (For EX9014FD only)**

**Description :** Set Source Low/High Values for Linear Mapping. The data is stored into EEPROM after the command \$AA7(TL)(TH)applied.

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

\$ delimiter character

AA address of setting/response 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**

Invalid Command:       ?**AA**

#### **Example :**

Command:\$016-10.000+10.000    Receive:!01

Set address 01 source value, -10 to +10, return success..

### **3.10.30 \$AA7(TL)(TH) (For EX9014FD only)**

**Description :** Set Target Low/High Values for Linear Mapping  
The command follows \$AA6(SL)(SH) command.

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

\$ delimiter character  
AA address of setting/response 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**  
                  Invalid Command:   ?**AA**

#### **Example :**

Command:\$076-10.000+10.000    Receive:!01  
Set address 01 target value-10 to +10, return success.

### 3.10.31 \$AAA (For EX9014FD only)

**Description :** Read Linear Mapping Status

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

\$ delimiter character

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

A command for reading linear mapping status

**Response :** Valid Command:       !AA

                  Invalid Command:   ?AA

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

**Example :**

Command:\$01A   Receive:!011

Read address 01 linear mapping status, return enable.

### 3.10.32 \$AAAV (For EX9014FD only)

**Description :** Enable/Disable Linear Mapping

**Syntax :** \$AAAV[CHK](cr)

\$ delimiter character

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

A command for enable/disable linear mapping

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

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **Example :**

Command:\$01A0 Receive:!01

Disable address 01 linear mapping, return success.

### **3.10.33 @AA6 (For EX9016PD only)**

**Description :** Read Source Low/Hight Values for Linear Mapping

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

@ delimiter character

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

6 command for reading source values

**Response :** Valid Command: !AA(SL)(SH)

Invalid Command: ?AA

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.

### **3.10.34 @AA6(SL)(SH) (For EX9016PD only)**

**Description :** Set Source Low/High Values for Linear Mapping

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

@ delimiter character

AA address of setting/response 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

                  Invalid Command:   ?AA

#### **Example :**

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

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

### **3.10.35 @AA7 (For EX9016PD only)**

**Description :** Read Target Low/High Values for Linear Mapping

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

@ delimiter character

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

7 command for reading target values

**Response :** Valid Command: !AA(TL)(TH)

Invalid Command: ?AA

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.



### **3.10.36 @AA7(TL)(TH) (For EX9016PD only)**

**Description :** Set Target Low/High Values for Linear Mapping

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

@ delimiter character

AA address of setting/response 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

                  Invalid Command:   ?AA

#### **Example :**

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

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

### **3.10.37 @AAA(For EX9016PD only)**

**Description :** Read Linear Mapping Status

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

@ delimiter character

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

A command for reading linear mapping status

**Response :** Valid Command:       **!AAV**

                  Invalid Command:   **?AA**

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

**Example :**

Command:@01A   Receive:!011

Read address 01 linear mapping status, return enable

### **3.10.38 @AAAV (For EX9016PD only)**

**Description :** Enable/Disable Linear Mapping

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

@ delimiter character

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

A command for enable/disable linear mapping

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

**Response :** Valid Command: !AA

Invalid Command: ?AA

#### **Example :**

Command:@01A0 Receive:!01

Disable address 01 linear mapping, return success.

### **3.10.39 Excitation Voltage(For EX9016PD only)**

### **3.10.40 \$AA6(For EX9016PD)**

**Description :** Get Excitation Voltage Value.

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

\$ delimiter character

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

6 command for reading excitation voltage value

**Response :** Valid Command:       **!AA**

                                  Invalid Command:   **?AA**

(Data) excitation voltage value, engineer unit format

#### **Example :**

Command:\$017+05.123   Receive:!01

Set address 01 excitation 5.123V, return success.

Command:\$016            Receive:!01+05.123

Read address 01 excitation voltage, return 5.123V

### **3.10.41 \$AA7(Data For EX9016PD)**

**Description :** Excitation Voltage Output

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

\$        delimiter character

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

7        command for setting excitation voltage

**Response :** Valid Command:        **!AA**

          Invalid Command:        **?AA**

#### **Example :**

Command:\$017+05.123    Receive:!01

Set address 01 excitation 5.123V, return success.

Command:\$016            Receive!01+05.123

Read address 01 excitation voltage, return 5.123V

### **3.10.42 \$AAS(For EX9016PD)**

**Description :** Start-Up Voltage Output Configuration

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

\$ delimiter character

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

S command for setting Start-Up Voltage

**Response :** Valid Command: **!AA**

Invalid Command: **?AA**

#### **Example :**

Command:\$017+05.123 Receive:!01

Set address 01 excitation 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

### 3.10.43 \$AAEVV(For EX9016PD)

**Description :** Excitation Voltage Trim Calibration

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

\$ delimiter character

AA address of setting/response 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

                  Invalid Command:   ?AA

#### **Example :**

Command:\$017+05.123   Receive:!01

Set address 01 excitation 5.123V, return success.

Command:\$01E03        Receive:!01

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

### **3.10.44 \$AAA(For EX9016PD)**

**Description :** Excitation Voltage Zero Calibration

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

\$ delimiter character

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

A command for excitation voltage zero calibration

**Response :** Valid Command:       **!AA**

                  Invalid Command:   **?AA**

#### **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.



### **3.10.45 \$AAB(For EX9016PD)**

**Description :** Excitation Voltage Span Calibration

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

\$ delimiter character

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

B command for excitation voltage span calibration

**Response :** Valid Command:       **!AA**

                  Invalid Command:   **?AA**

#### **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.

## **4. EX9000 AIO Series--EX9011PD**

### **4.1 Thermocouple Measurement**

When two wires composed of dissimilar metal are joined at one end and heated, the open circuit voltage is a function of the junction temperature and the composition of the two metals. All dissimilar metals exhibit this effect. The voltage is called "seebeck voltage". For small changes in temperature the Seebeck voltage is linearly proportional to temperature.

To measure the Seebeck voltage directly is not available because we must first connect a voltmeter to the thermocouple, and the voltmeter leads themselves create a new thermoelectric circuit. Therefore we need to eliminate the junction thermoelectric to measure to correct Seebeck voltage, and this is called "Cold Junction Compensation".

For most thermocouples, the Seebeck voltage is 0V while in 0°C. One simple way to cancel the junction voltage is to put the junction into 0°C environment and the junction voltage is 0V. Normally, this is not a good method for most application. Typical method is to measure the junction temperature by thermistor, and measure the junction voltage from the junction temperature. Then we may get the Seebeck voltage from measured thermocouple voltage and junction voltage, and we may calculate the temperature from the Seebeck voltage.

## **4.2 Default Setting**

Default setting EX9011PD

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

## **4.3 Jumper Setting**

## 4.4 Calibration

### Calibration Requirement for EX9011PD

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

#### Notification:

1. While calibrate type 06, need connect external shunt resistor, 125 ohms, 0.1%
2. Connect calibration voltage(or current)signal to module's input.
3. Before calibration, warm-up module about 30 minutes for better accuracy.

#### Example Calibration Sequence for type 00:

1. Setting type to 00
2. Enable Calibration (P.76)
3. Apply Zero Calibration Voltage(0m V)
4. Perform Zero Calibration Command (P.67)
5. Apply Span Calibration Voltage(15mV)
6. Perform Span Calibration Command (P.66)
7. Repeat step 1 to step 6 three times.

Calibration sequence for other type is similiar but different in step 1 to set different type.

**Warning: Pls don't calibrate before you really understand.**

## 4.5 Configuration Tables

Configuration Table of EX9011PD

### 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 Code	00	01	02	03	04	05	06
Min. Input	-15 mV	-50 mV	-100 mV	-500 mV	-1V	-2.5V	-20 mA
Max. Input	+15 mV	+50 mV	+100 mV	+500 mV	+1V	+2.5V	+20 mA

Type Code	0E	0F	10	11	12	13	14	15	16	17	18
T.C. Type	J	K	T	E	R	S	B	N	C	L	M
Min Temp.	-210	-270	-270	-270	0	0	0	-270	0	-200	-200
Max Temp.	760	1372	400	1000	1768	1768	1820	1300	2320	800	100
The temperature is shown in degree Celsius											

T.C. Type L and M for EX9011PD

### 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

**Analog input type and data format table**

<b>Type Code</b>	<b>Input Range</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>Zero</b>	<b>-F.S.</b>
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	7 FFF	0000	8000
01	-50 to +50 mV	Engineer Unit	+50.000	0.0000	-50.000
		% of FSR	+100.00	000.00	-100.00
		2's complement HEX	7 FFF	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	7 FFF	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	7 FFF	0000	8000
04	-1 to +1V	Engineer Unit	+1.0000	+0.0000	-1.0000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	0000	8000
05	-2.5 to +2.5 V	Engineer Unit	+2.5000	+00.000	-2.5000
		% of FSR	+100.00	+000.00	-100.00
		2's complement HEX	7 FFF	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	7 FFF	0000	8000

<b>Type Code</b>	<b>Input Range</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>Zero</b>	<b>-F.S.</b>
0E	J Type	Engineer Unit	+760.00	+00.000	-210.00
	-210 to 760	% of FSR	+100.00	+000.00	-027.63
	degree Celsius	2's complement HEX	7 FFF	0000	DCA2
0F	K Type	Engineer Unit	+1372.0	+00.000	-0270.0
	-270 to 1372	% of FSR	+100.00	+000.00	-019.68
	degree Celsius	2's complement HEX	7 FFF	0000	E6D0
10	T Type	Engineer Unit	+400.00	+000.00	-270.00
	-270 to 400	% of FSR	+100.00	+000.00	-067.50
	degree Celsius	2's complement HEX	7 FFF	0000	A99A
11	E Type	Engineer Unit	+1000.0	+000.00	-0270.0
	-270 to 1000	% of FSR	+100.00	+000.00	-027.00
	degree Celsius	2's complement HEX	7 FFF	0000	Dd71
12	R Type	Engineer Unit	+1768.0	+0000.0	+0000.0
	0 to 1768	% of FSR	+100.00	+000.00	+0000.0
	degree Celsius	2's complement HEX	7 FFF	0000	0000
13	S Type	Engineer Unit	+1786.0	+0.0000	+0000.0
	0 to 1768	% of FSR	+100.00	+000.00	+0000.0
	degree Celsius	2's complement HEX	7 FFF	0000	0000
14	B Type	Engineer Unit	+1820.0	+00.000	+0000.0
	0 to 1820	% of FSR	+100.00	+000.00	+000.0
	degree Celsius	2's complement HEX	7 FFF	0000	0000

<b>Type Code</b>	<b>Input Range</b>	<b>Data Format</b>	<b>+F.S.</b>	<b>Zero</b>	<b>-F.S.</b>
15	N Type	Engineer Unit	+1300.0	+00.000	-0270.0
	-270 to 1300	% of FSR	+100.00	+000.00	-20.77
	degree Celsius	2's complement HEX	7 FFF	0000	E56B
16	C Type	Engineer Unit	+2320.0	+00.000	+00.000
	0 to 2320	% of FSR	+100.00	+000.00	+000.00
	degree Celsius	2's complement HEX	7 FFF	0000	0000
17 <sup>*1</sup>	L Type	Engineer Unit	+800.00	+000.00	-200.00
	-200 to 800	% of FSR	+100.00	+000.00	-025.00
	degree Celsius	2's complement HEX	7 FFF	0000	E000
18 <sup>*1</sup>	M Type	Engineer Unit	+100.0	+000.00	-200.00
	-200 to 100	% of FSR	+050.00	+000.00	-100.00
	degree Celsius	2's complement HEX	4000	0000	8000
*1:Only available for EX9011PD					



## 4.6 Command (For EX9011PD)

### 4.6.1 \$AA3 (for EX9011PD)

**Description :** Read CJC Temperature

**Syntax :** \$AA3(CHK)(cr)

\$        delimiter character

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

3        command for reading CJC temperature

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

          Invalid Command:        ?AA

(Data) CJC temperature degree Celsius.

**Example :**

Command:\$033    Receive:>+0025.4

Read address 03 CJC temperature, return 25.4

## 4.6.2 \$AA9(Data) (For EX9011PD)

**Description :** Set CJC Offset Value

**Syntax :** \$AA9(Data)(CHK)(cr)

\$ delimiter character

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

9 command for setting CJC offset value

(Data) CJC offset value comprises a sign and 4 hexadecimal digits, from -1000 to +1000, each count is 0.01

**Response :** Valid Command:       !AA

Invalid Command:       ?AA

### **Example :**

Command:\$019+0010   Receive:!01

Set address 01 CJC offset increase 16 counts (+0.16 ),  
return success.

### 4.6.3 \$AAB (For EX9011PD)

**Description :** Thermocouple Open Detection

**Syntax :** \$AAB(CHK)(cr)

\$ delimiter character

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

B command for reading thermocouple open status

**Response :** Valid Command: **!AAS**

Invalid Command: **?AA**

S 0=close-loop detection

1=open-circuit detection, need to check the thermocouple

**Example :**

Command:\$01B Receive:!010

Read address 01 thermocouple open status, return the thermocouple is close-loop.

#### 4.6.4 \$AAZ (Data)(For EX9011PD)

**Description :** Set LED Data

**Syntax :** \$AAZ(Data)[CHK](cr)

\$ delimiter character

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

Z command for setting LED data

(Data) data for show on the LED, from -19999. to +19999.

The data need sign, 5 digits and decimal point.

**Response :** Valid Command:       !AA

Invalid Command:       ?AA

#### **Example :**

Command:\$01Z+123.45   Receive:!01

Send address 01 LED data+123.45, return success.

Command:\$02Z+512.34   Receive:?02

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