8013,8013D, 8033
User Manual

Warranty

All products manufactured by SuperLogics are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

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Date:2000-04

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1. Introduction

8000 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 common features of 8013/13D and 8033 are given as following :

- 24-bits sigma-delta ADC to provide excellent accuracy.
- RTD direct connect
- Software calibration

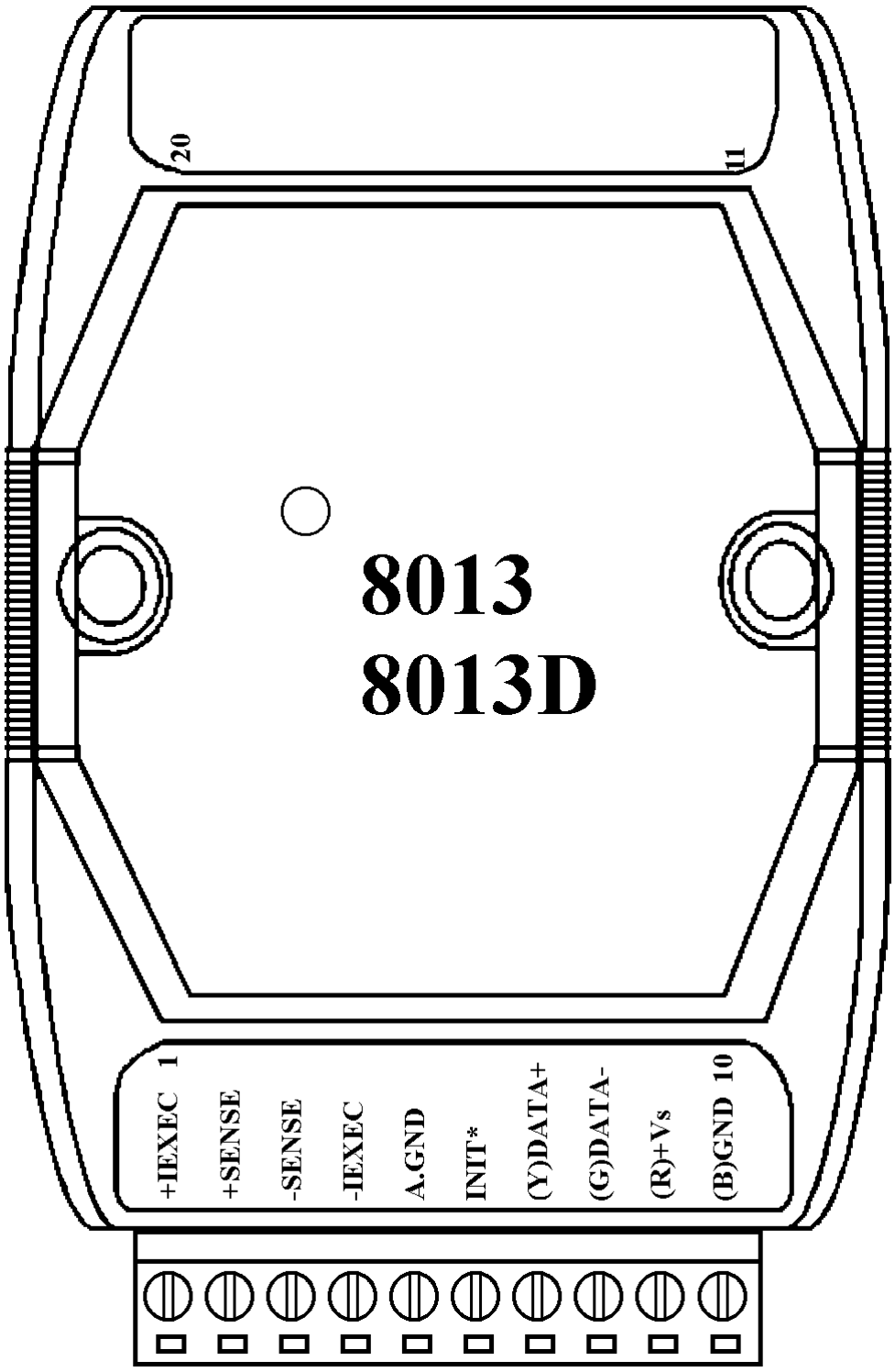
The 8013 is a single channel RTD input module. The 8013D is the 8013 with a 4½ digit LED display. The 8033 is a three channel RTD input module.

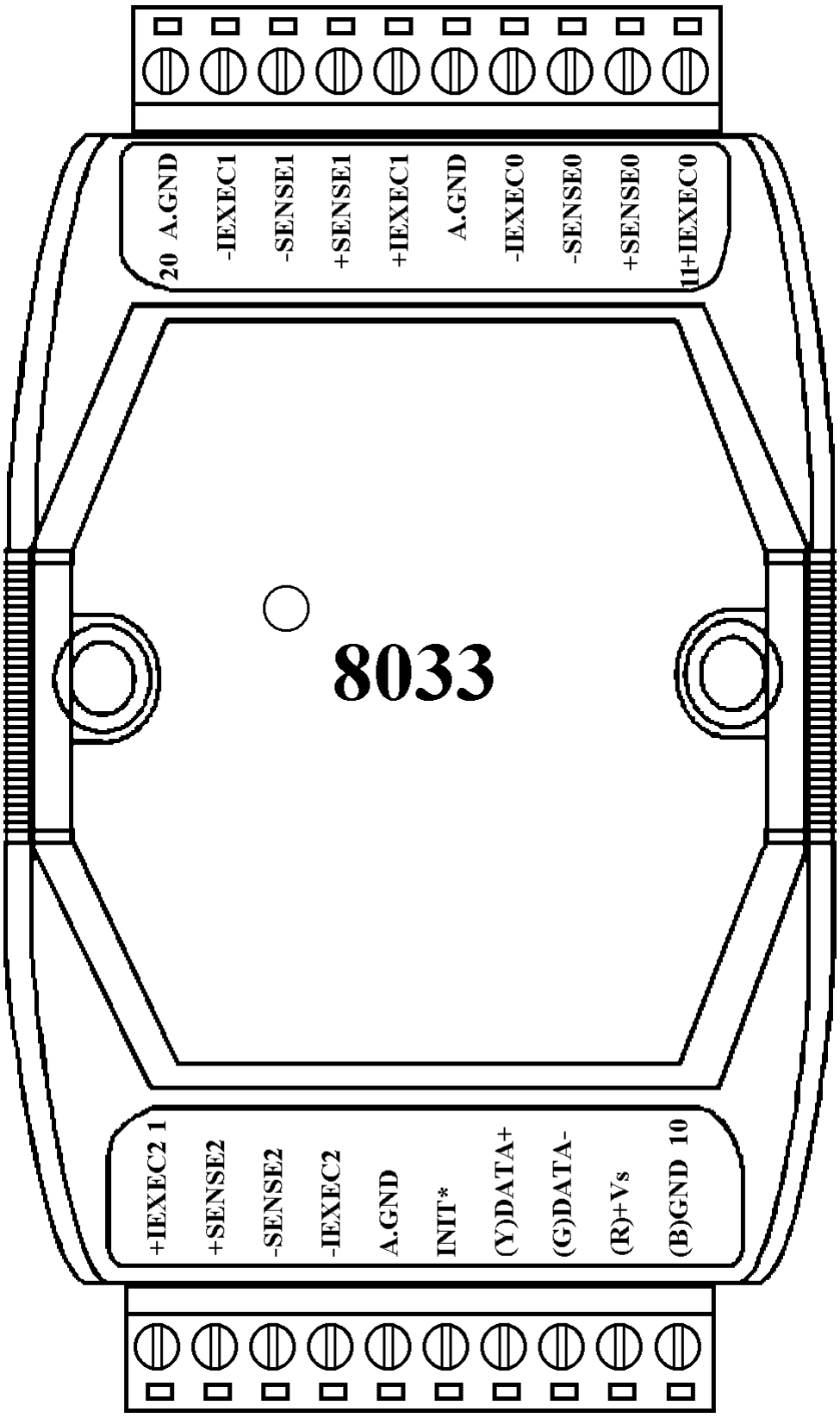
1.1 More Information

Refer to "**8000 Bus Converter User Manual**" chapter 1 for more information as following:

1.1 8000 Overview
1.2 8000 Related Documentation
1.3 8000 Command Features
1.4 8000 System Network Configuration
1.5 8000 Dimension

1.2 Pin Assignment




20 A.GND
-IEXEC1
-SENSE1
+SENSE1
+IEXEC1
A.GND
-IEXEC0
-SENSE0
+SENSE0
11+IEXEC0
8033
+IEXEC2 1
+SENSE2
-SENSE2
-IEXEC2
A.GND
INIT*
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10

1.3 Specifications

8013/8013D

Analog Input

Input Channel : 1

Input Type : 2/3/4 wire RTD

RTD Type :

Pt100 α=0.00385

Pt100 α=0.003916

Ni 120

Pt1000 α=0.00385

(version B1.0 or later)

Sampling Rate :

10 Samples/Second

Bandwidth : 5.24 Hz

Accuracy : ±0.05%

Zero Drift : 0.5μV/°C

Span Drift : 1.0μV/°C

CMR@50/60Hz : 150dB min

NMR@50/60Hz : 100dB min

Displayed LED

4½ digits (for 8013D only)

Power Supply

Input : +10 to +30VDC

Consumption :

0.7W for 8013

1.3W for 8013D

8033

Analog Input

Input Channel : 3

Input Type : 2/3/4 wire RTD

RTD Type :

Pt100 α=0.00385

Pt100 α=0.003916

Ni 120

Pt1000 α=0.00385

Sampling Rate :

15/12.5 Samles/Second

while filter at 60/50Hz

Bandwidth : 15.7 Hz

Accuracy : ±0.1%

Zero Drift : 0.5μV/°C

Span Drift : 1.0μV/°C

CMR@50/60Hz : 150dB min

NMR@50/60Hz : 100dB min

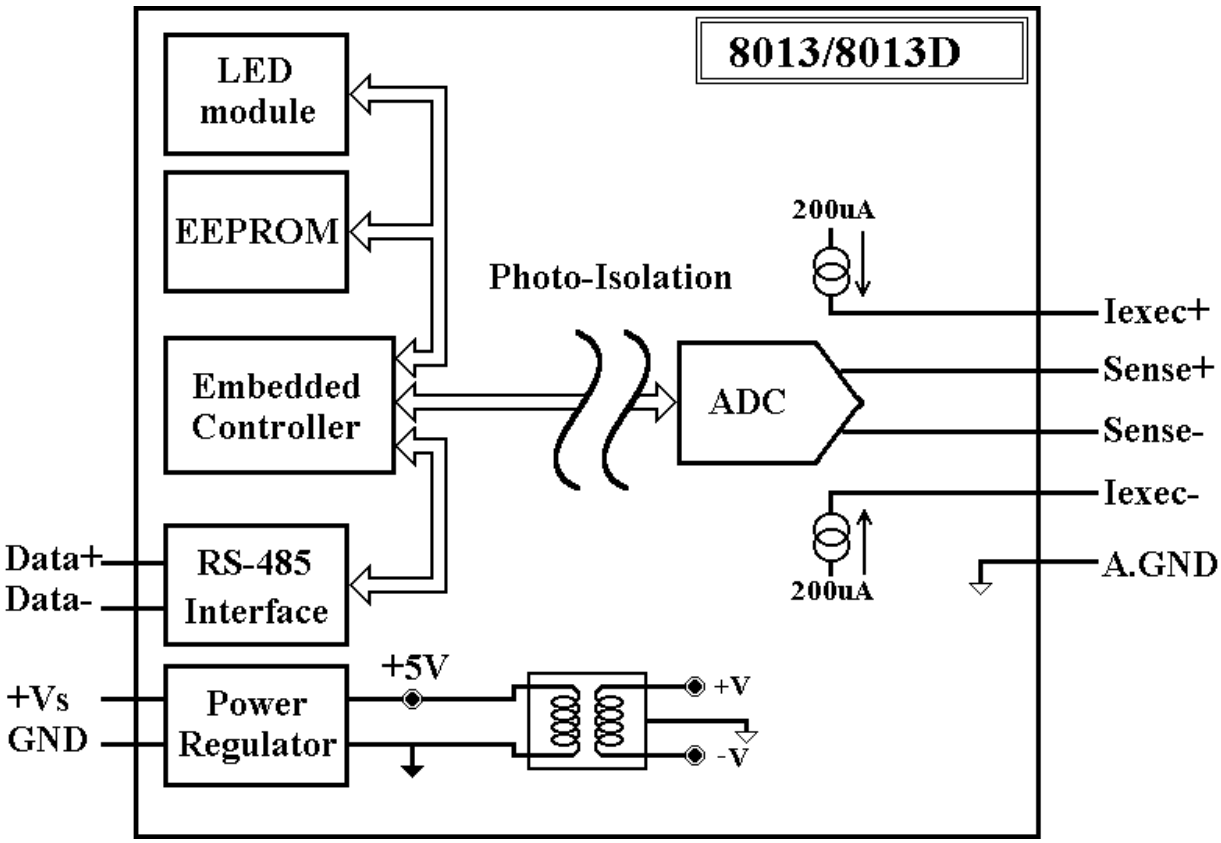
Power Supply

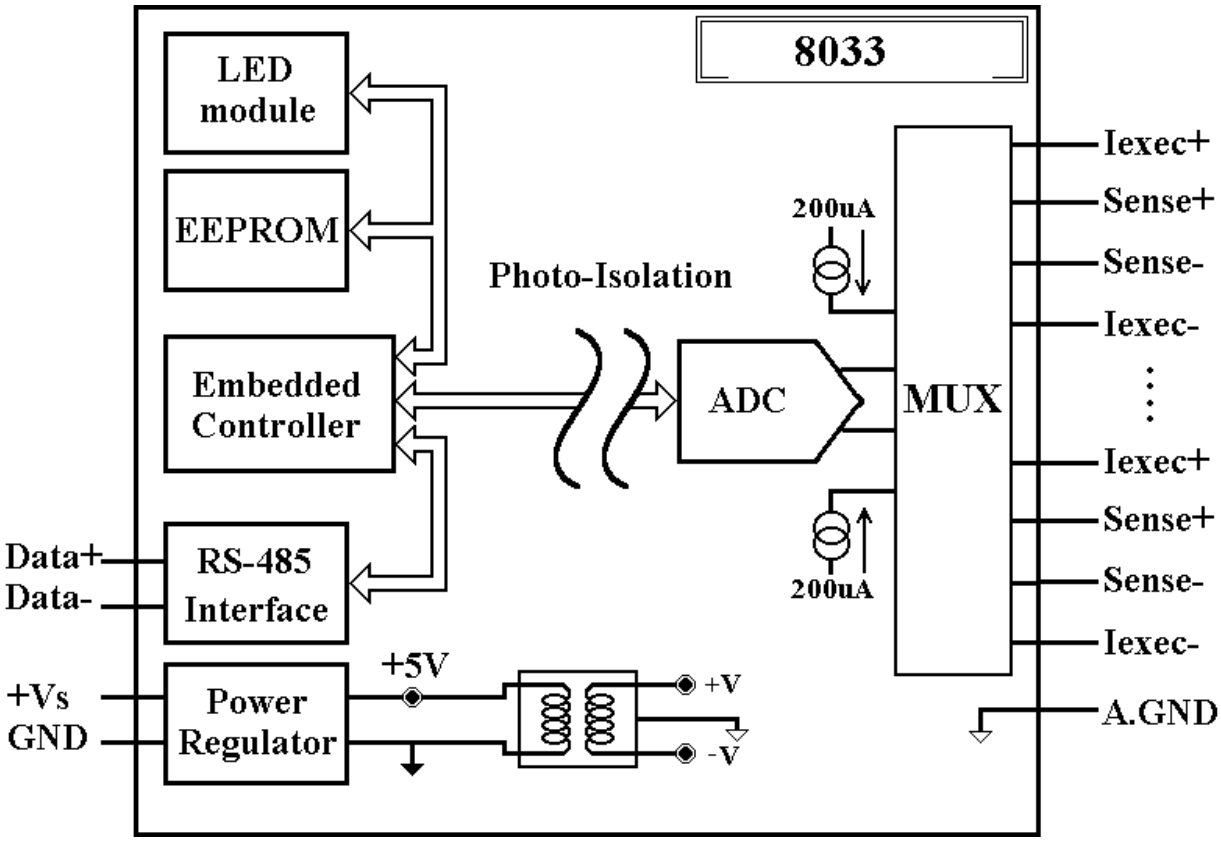
Input : +10 to +30VDC

Consumption :

1.0W for 8033

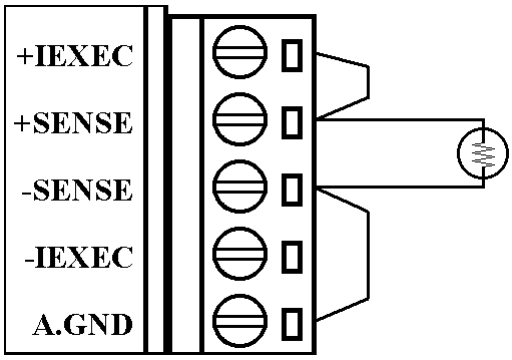
1.4 Block Diagram



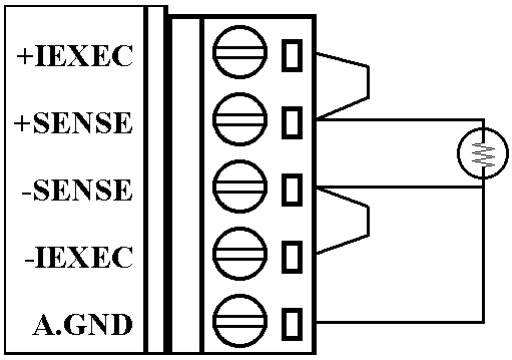


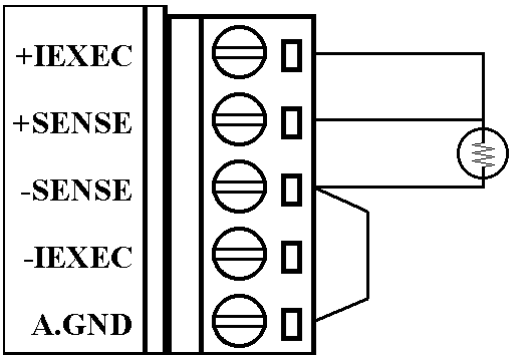
1.5 Wire Connection

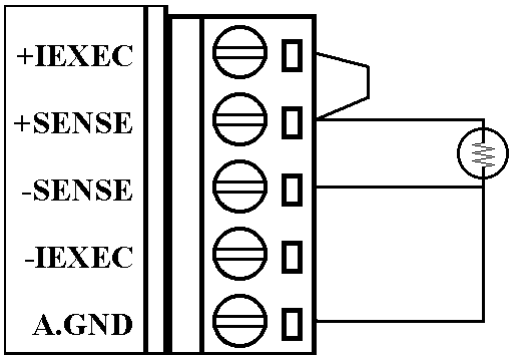
2-wire RTD connection



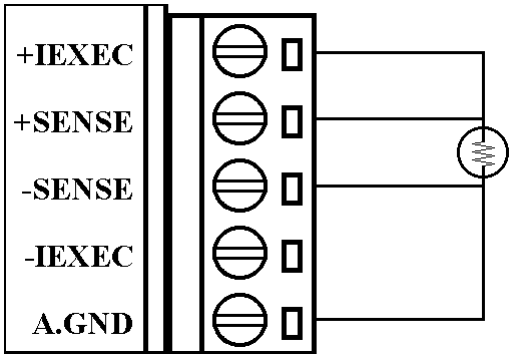
3-wire RTD connection







4-wire RTD connection



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 8013/13D, 8033 :

- Address : 01
- RTD Type : Type 20, Pt100, -100°C to 100°C
- Baudrate : 9600 bps
- Checksum disable, engineer unit format
- Filter at 60Hz rejection

1.8 Calibration

Don't Do Calibrate Until You Realy Understand.

Calibration Requirement for 8013/13D version A1.x or A2.x

Type	Zero Calibration Resistor	Span Calibration Resistor
20 to 29	55 ohm	375.0 ohm

Calibration Requirement for 8013/13D version B1.0 or later and 8033

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

Calibration Sequence :

1 Connect calibration resistor to module by 4-wire RTD connection. For 8033, connect to channel 0

2 Warm-Up for 30 minutes

3 Setting Type to 20 -> Ref *Sec.2.1*.

4 Enable Calibration -> Ref *Sec.2.15*.

5 Install Zero Calibration Resistor

6 Preform Zero Calibration Command -> Ref *Sec.2.6*.

7 Install Span Calibration Resistor

8 Perform Span Calibration Command -> Ref *Sec.2.5*.

9 Repeat step4 to step8 three times.

Note :

1 The step 4 is not need for 8013/13D version A1.x or A2.x.

2 Do for type 2A only different for set different type(step3), and install different Zero/Span Calibration Resistor(step5,7).

1.9 Configuration Tables

Configuration Table of I-7013/13D, I-7033/33D

Baudrate Setting (CC)

Code	Baudrate
03	1200
04	2400
05	4800
06	9600

Code	Baudrate
07	19200
08	38400
09	57600
0A	115200

RTD Type Setting (TT)

Type Code	RTD Type	Temperature Range
20	Platinum 100, a=0.00385	-100 to 100
21	Platinum 100, a=0.00385	0 to 100
22	Platinum 100, α=0.00385	0 to 200
23	Platinum 100, α=0.00385	0 to 600
24	Platinum 100, α=0.003916	-100 to 100
25	Platinum 100, α=0.003916	0 to 100
26	Platinum 100, α=0.003916	0 to 200
27	Platinum 100, α=0.003916	0 to 600
28	Nickel 120	-80 to 100
29	Nickel 120	0 to 100
2A	Platinum 1000, α=0.00385	-200 to 600

Note : Type 2A only for 8013/13D version B1.0 or later and 8033.

Data Format Setting (FF)

*1 : Filter Setting 0 = 60Hz rejection

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

1 = 50Hz 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

RTD Overrange/Underrange Reading

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

Type Code	RTD Type	Data Format	+F.S.	-F.S.
26	Platinum 100 α=0.003916 0 to 200 degree Celsius	Engineer Unit	+200.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7FFF	0000
		Ohm	+177.13	+100.00
27	Platinum 100 α=0.003916 0 to 600 degree Celsius	Engineer Unit	+600.00	+000.00
		% of FSR	+100.00	+000.00
		2's complement HEX	7FFF	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	7FFF	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	7FFF	0000
		Ohm	+200.64	+120.60
2A	Platinum 1000 α=0.00385 -200 to 600 degree Celsius	Engineer Unit	+600.00	-200.00
		% of FSR	+100.00	-033.33
		2's complement HEX	7FFF	AAAA
		Ohm	+3137.1	+185.20

	Over Range	Under Range
Engineer's Unit	+9999	-0000
Percent of FSR	+9999	-0000
2's Complement HEX	7FFF	8000

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)

Calculate Checksum :

1. Calculate ASCII sum of all characters of command(or response) string except the character return(cr).

2. Mask the sum of string with 0ffh.

Example :

Command string : $012(cr)

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

The checksum is B7h, and [CHK] = "B7"

Command string with checksum : $012B7(cr)

Response string : !01200600(cr)

Sum of string : '!'+'0'+'1'+'2'+'0'+'0'+'6'+'0'+'0'

= 21h+30h+31h+32h+30h+30h+36h+30h+30h = 1AAh

The checksum is AAh, and [CHK] = "AA"

Response string with checksum : !01200600AA(cr)

General Command Sets			
Command	**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***
#AAN	>(Data)	Read Analog Input from channel N	***Sec.2.4***
$AA0	!AA	Perform Span Calibration	***Sec.2.5***
$AA1	!AA	Perform Zero Calibration	***Sec.2.6***
$AA2	!AANNTTCCFF	Read Configuration	***Sec.2.7***
$AA4	>AAS(Data)	Read Synchronized Data	***Sec.2.8***
$AA8	!AAV	Read LED Configuration	***Sec.2.9***
$AA8V	!AA	Set LED Configuration	***Sec.2.10***
$AA9(Data)	!AA	Set LED Data	***Sec.2.11***
$AAF	!AA(Data)	Read Firmware Version	***Sec.2.12***
$AAM	!AA(Data)	Read Module Name	***Sec.2.13***
~AAO(Data)	!AA	Set Module Name	***Sec.2.14***
~AAEV	!AA	Enable/Disable Calibration	***Sec.2.15***

Host Watchdog Command Sets			
Command	**Response**	**Description**	**Section**
~**	No Response	Host OK	***Sec.2.16***
~AA0	!AASS	Read Module Status	***Sec.2.17***
~AA1	!AA	Reset Module Status	***Sec.2.18***
~AA2	!AATT	Read Host Watchdog Timeout Value	***Sec.2.19***
~AA3ETT	!AA	Set Host Watchdog Timeout Value	***Sec.2.20***

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 the 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 the INIT* to ground to 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 : %0102200600 Receive : !02

Change address from 01 to 02, return success

Command : %0202200603 Receive : !02

Change data format from 00 to 03, return success

Related Command :

Sec.2.7 $AA2

Related Topics :

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

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.2.8 $AA4

Note : The command for 8013/13D only

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

While using #AA command to 8033, the data is the combination for each channel respectively.

Example :

Command : #01 Receive : >+026.35

Read address 01, get data success

Command : #02 Receive : >4C53

Read address 02, get data in HEX format success

Command : #03 Receive : >-0000

Read address 03, get data underrange

Command : #04 Receive : >+025.12+054.12+150.12

Read address 04, is 8033, get 3 channel data

Related Command :

Sec2.1 %AANNTTCCFF, *Sec.2.7* $AA2

Related Topics :

Sec.1.9 Configuration Tables

2.4 #AAN

Description : Read Analog Input from channel N

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

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

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

Invalid Command : **?AA[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
?	delimiter for invalid command
AA	address of response module (00 to FF)

Example :

Command : #032 Receive : >+025.13

Read address 03 channel 2, get data success

Command : #024 Receive : ?02

Read address 02 channel 4, return error channel number

Related Command :

Sec2.1 %AANNTTCCFF, *Sec.2.7* $AA2

Related Topics :

Sec.1.9 Configuration Tables

Note : The command for 8033 only

2.5 $AA0

Description : Perform Span Calibration

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

$ delimiter character

AA address of setting module (00 to FF)

0 command for 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 :

Sec2.6 $AA1, *Sec.2.15* ~AAEV

Related Topics :

Sec.1.8 Calibration

2.6 $AA1

Description : Perform Zero Calibration

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

$ delimiter character

AA address of setting module (00 to FF)

1 command for 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

Preform address 01 zero calibration, return success

Command : $021 Receive : ?02

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

Related Command :

Sec2.5 $AA0, *Sec.2.15* ~AAEV

Related Topics :

Sec.1.8 Calibration

2.7 $AA2

Description : Read Configuration

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

$ delimiter character

AA address of reading module (00 to FF)

2 command for read 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 : !01200600

Read address 01 configuration, return success

Command : $022 Receive : !02230602

Read address 02 configuration, return success

Related Command :

Sec2.1 %AANNTTCCFF

Related Topics :

Sec.1.9 Configuration Tables, *Sec3.1* INIT* pin Operation

2.8 $AA4

Description : Read Synchronized Data

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

$ delimiter character

AA address of reading module (00 to FF)

4 command for read 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 : #** No response

Perform synchronized sampling

Command : $014 Receive : >011+025.56

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

Command : $014 Receive : >010+25.56

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

Related Command :

*Sec2.2 #***

Note : The command for 8013/13D only

2.9 $AA8

Description : Read LED Configuration

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

$ delimiter character

AA address of reading module (00 to FF)

8 command for set 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

For 8013D, 1=module control, 2=host control

Example :

Command : $018 Receive : !011

Read address 01 LED configuration, return 1.

Command : $028 Receive : !012

Read address 02 LED configuration, return 2

Related Command :

Sec2.10 $AA8V, *Sec2.11* $AA9(Data)

Note : The command for 8013D only

2.10 $AA8V

Description : Set LED Configuration

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

$	delimiter character
AA	address of setting module (00 to FF)
8	command for set LED configuration
V	For 8013D, 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 : $0180 Receive : !01

Set address 01 LED to 0, return success

Command : $0281 Receive : !02

Set address 02 LED to 1, return success

Related Command :

Sec2.9 $AA8, *Sec2.11* $AA9(Data)

Note : The command for 8013D only

2.11 $AA9(Data)

Description : Set LED Data

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

$ delimiter character

AA address of setting module (00 to FF)

9 command for set 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[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 controll.

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 :

Sec2.9 $AA8, *Sec2.10* $AA8V

Note : The command for 8013D only

2.12 $AAF

Description : Read Firmware Version

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

$ delimiter character

AA address of reading module (00 to FF)

F command for read 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.

2.13 $AAM

Description : Read Module Name

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

$ delimiter character

AA address of reading module (00 to FF)

M command for read 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 : !017013

Read address 01 module name, return name 8013.

Related Command :

Sec.2.14 ~AAO(Data)

2.14 ~AAO(Data)

Description : Set Module Name

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

~	delimiter character
AA	address of setting module (00 to FF)
O	command for set 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 : ~01O7013 Receive : !01

Set address 01 module name to 8013, return success.

Command : $01M Receive : !017013

Read address 01 module name, return 8013.

Related Command :

Sec.2.12 $AAM

2.15 ~AAEV

Description : Enable/Disable Calibration

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

~ delimiter character

AA address of setting module (00 to FF)

E command for 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 addreess 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.2.5 $AA0, *Sec.2.6* $AA1

Related Topic :

Sec.1.8 Calibration

2.16 ~**

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.2.17 ~AA0, *Sec.2.18* ~AA1, *Sec.2.19* ~AA2, *Sec.2.20* ~AA3EVV

Related Topic :

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

2.17 ~AA0

Description : Read Module Status

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

~ delimiter character

AA address of reading module (00 to FF)

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

Example :

Command : ~010 Receive : !0100

Read address 01 module status, return 00.

Command : ~020 Receive : !0204

Read address 02 module status, return 04, means the host watchdog timeout status is set and the module is in safe mode.

Related Command :

Sec.2.16 ~**, *Sec.2.18* ~AA1, *Sec.2.19* ~AA2, *Sec.2.20* ~AA3EVV

Related Topic :

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

2.18 ~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 :

Command : ~010 Receive : !0104

Read address 01 module status, return 04, host watchdog timeout.

Command : ~011 Receive : !01

Reset address 01 module status, return success.

Command : ~010 Receive : !0100

Read address 01 module status, return 00, no host watchdog timeout.

Related Command :

Sec.2.16 ~**, *Sec.2.17* ~AA0, *Sec.2.19* ~AA2, *Sec.2.20* ~AA3EVV

Related Topic :

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

2.19 ~AA2

Description : Read Host Watchdog Timeout Value

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

~ delimiter character

AA address of reading module (00 to FF)

2 command for read host watchdog timeout value

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 value in HEX format, count for 0.1 second

01=0.1 second and FF=25.5 second

Example :

Command : ~012 Receive : !01FF

Read address 01 host watchdog timeout value, return FF, the host watchdog timeout value is 25.5 second.

Related Command :

Sec.2.16 ~**, *Sec.2.17* ~AA0, *Sec.2.18* ~AA1, *Sec.2.20* ~AA3EVV

Related Topic :

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

2.20 ~AA3EVV

Description : Set Host Watchdog Timeout Value

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

~	delimiter character
AA	address of setting 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[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 : ~013164 Receive : !01

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

Command : ~012 Receive : !0164

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

Related Command :

Sec.2.16 ~**, *Sec.2.17* ~AA0, *Sec.2.18* ~AA1, *Sec.2.19* ~AA2

Related Topic :

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

3. Application Note

3.1 INIT* pin Operation

Each 8000 module has a build-in EEPROM to store configuration information like address, type, baudrate and other information. Sometimes, user may forget the configuration of the module. Therefore, the 8000 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, need following step:

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 "**8000 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 outputs 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.

3.3 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

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

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

The 8000 module with Dual Watchdog may let the control system more reliable and stable.