CB-7013, CB-7013D,

&

CB-7033, CB7033D

User's Manual

Table of Contents

1. Introduction

CB-7000 is a family of network data acquisition and control modules. They provide analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. These modules can be remote-controlled by a set of commands. Common features of the CB-7013/13D and CB7033/33D are as follows:

- 24-bits sigma-delta ADC for excellent accuracy.
- RTD direct connection
- Software calibration

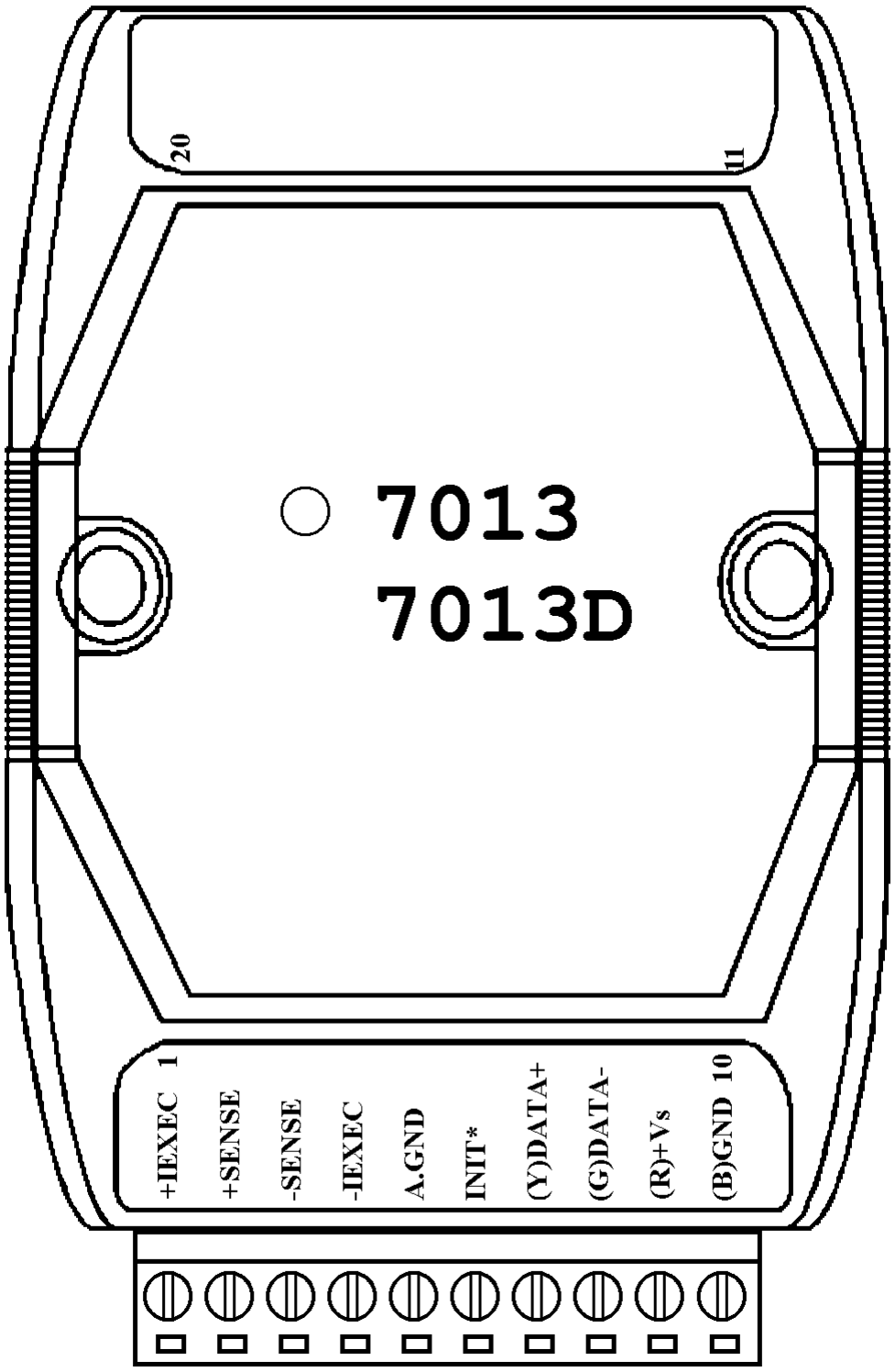
The CB-7013 is a single-channel RTD input module. The CB-7013D is the CB-7013 with a 4½ digit LED display. The CB-7033 is a three-channel RTD input module. The CB-7033D is the CB-7033 with a 4½ digit LED display.

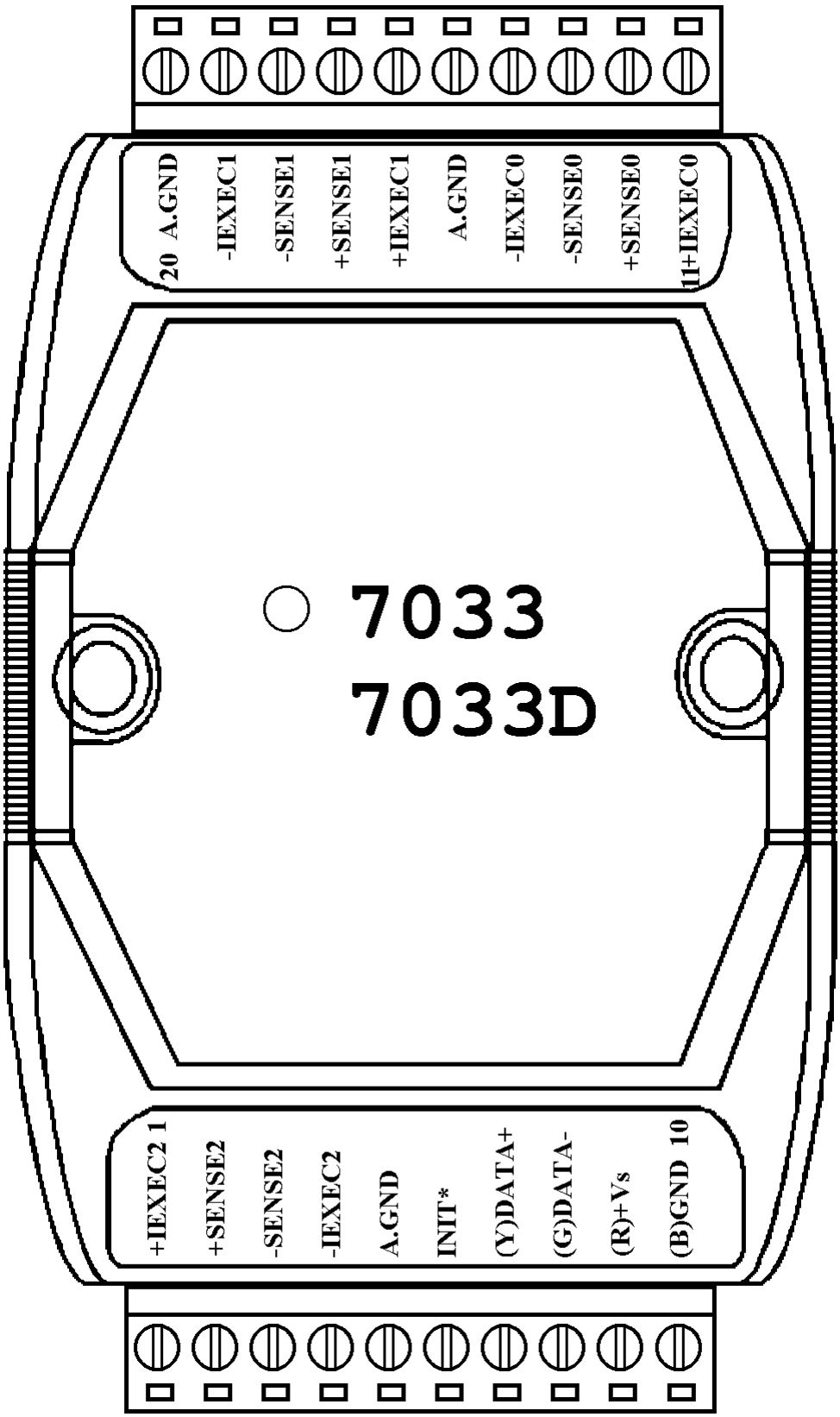
1.1 More Information

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

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

1.2 Pin Assignment




20 A.GND
-IEXEC1
-SENSE1
+SENSE1
+IEXEC1
A.GND
-IEXEC0
-SENSE0
+SENSE0
11+IEXEC0
7033
7033D
+IEXEC2 1
+SENSE2
-SENSE2
-IEXEC2
A.GND
INIT*
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10

1.3 Specifications

CB-7013/CB-7013D

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@50/60 Hz: 150dB min

NMR@50/60 Hz: 100dB min

Displayed LED

4½ digits (CB-7013D only)

Power Supply

Input: +10 to +30VDC

Consumption:

0.7 W. for CB-7013

1.3 W. for CB-7013D

CB-7033/CB-7033D

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 Samples/Second

with filter at 60/50Hz

Bandwidth: 15.7 Hz

Accuracy: ±0.1%

Zero Drift: 0.5μV/°C

Span Drift: 1.0μV/°C

CMR@50/60 Hz: 150dB min

NMR@50/60 Hz: 100dB min

Displayed LED

4½ digits (CB-7033D only)

Power Supply

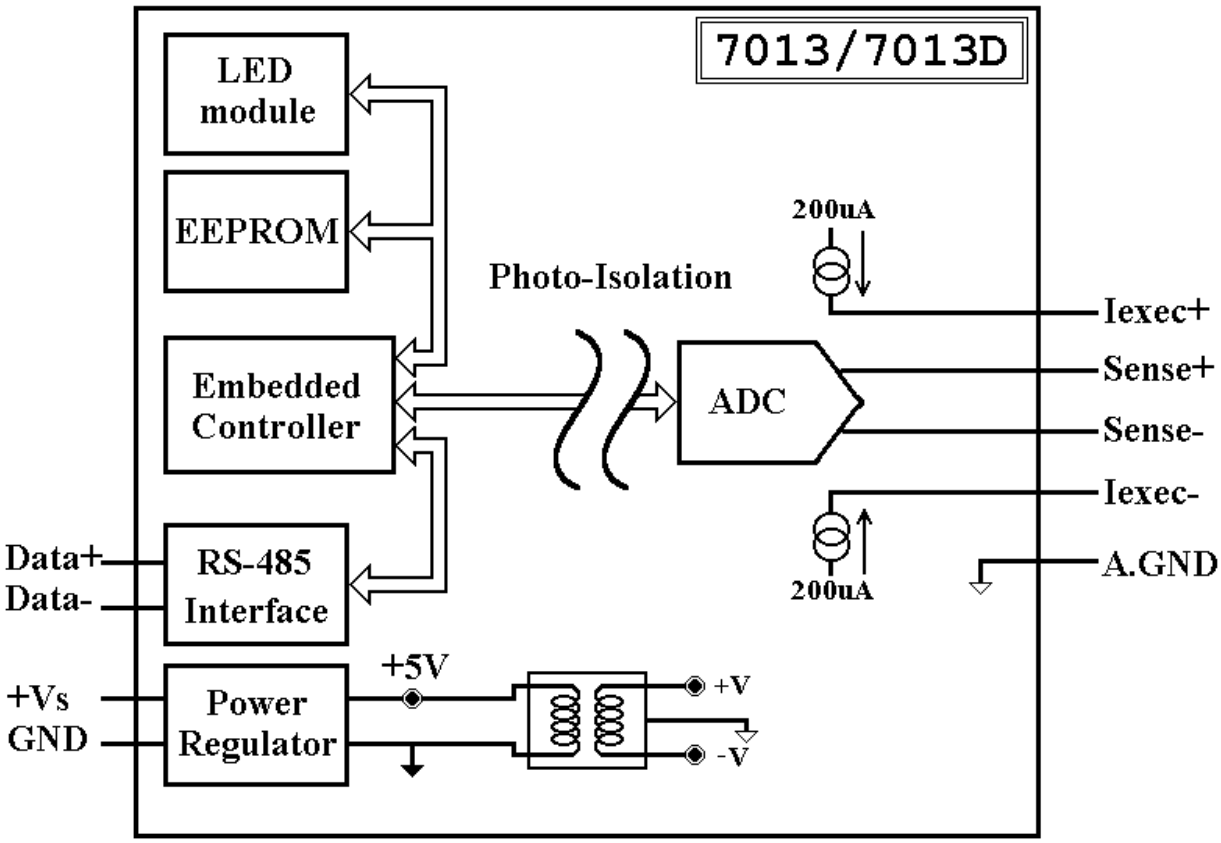
Input: +10 to +30VDC

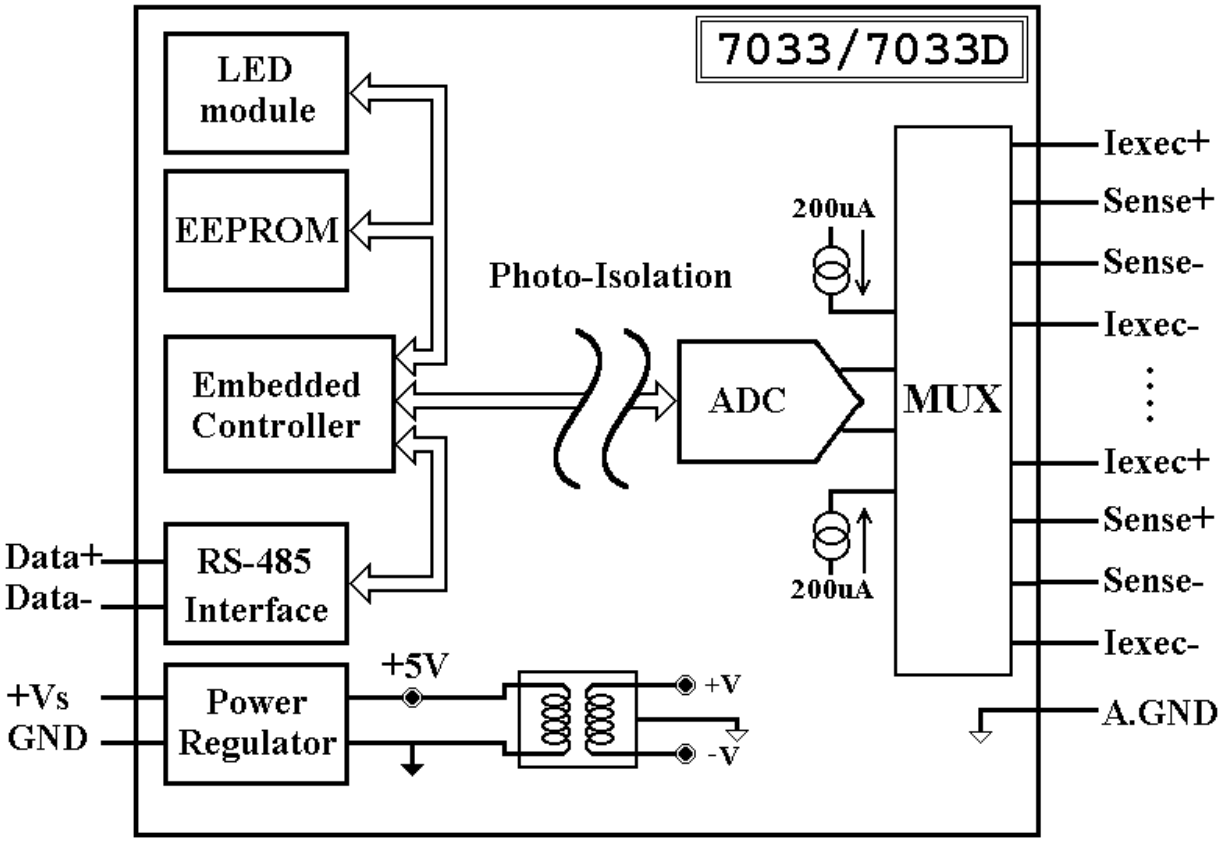
Consumption:

1.0 W. for CB-7033

1.6 W. for CB-7033D

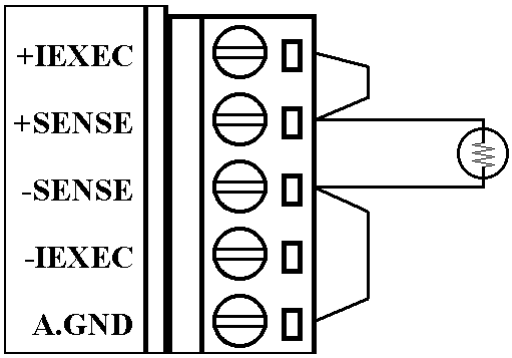
1.4 Block Diagram



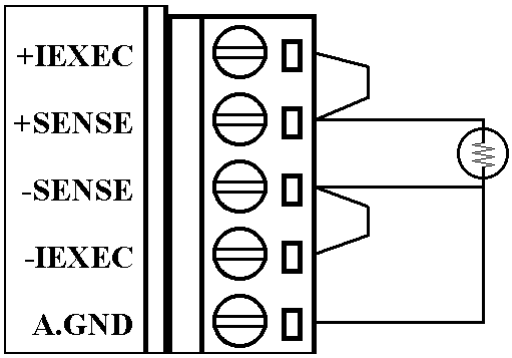


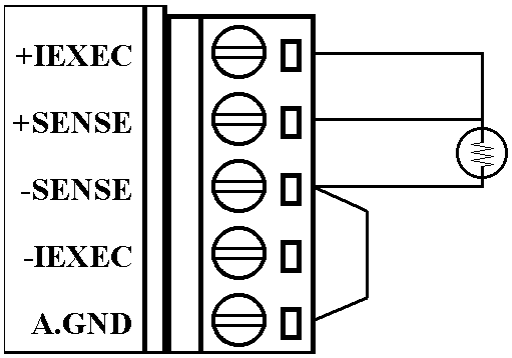
1.5 Wire Connection

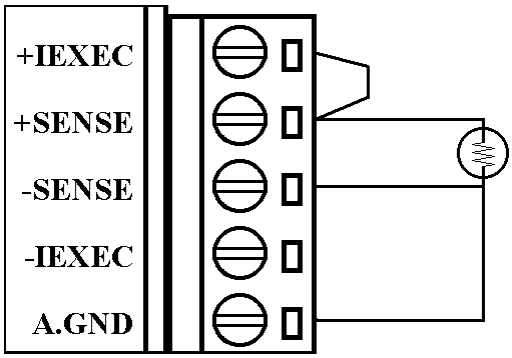
2-wire RTD connection



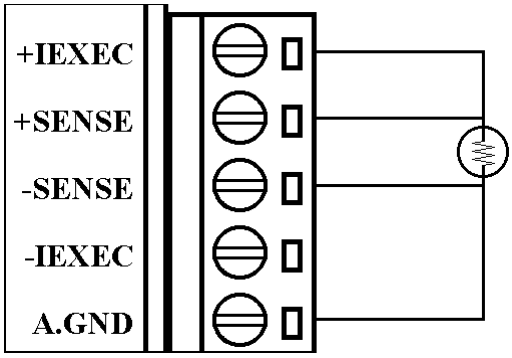
3-wire RTD connection







4-wire RTD connection



1.6 Quick Start

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

1.7 Default Setting

Default setting for CB-7013/13D, CB-7033/33D:

- Address: 01
- RTD Type: Type 20, Pt100, -100°C to 100°C
- Baud rate: 9600 bps
- Checksum disable, engineering unit format
- Filter for 60 Hz rejection

1.8 Calibration

Don't Do Calibration Until You Understand the Procedure.

Calibration Requirement for CB-7013/13D version A1.x or A2.x.

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

Calibration Requirement for CB-7013/13D version B1.0 or later and CB-7033/33D.

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 CB-7033/33D, connect to channel 0.
2. Warm-Up for 30 minutes.
3. Set 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 step 4 to step 8 three times.

Note:

1. Step 4 is not needed for CB-7013/13D, version A1.x or A2.x.
2. Same for type 2A only different for set different type (step 3), and install different Zero/Span Calibration Resistor (step 5, 7).

1.9 Configuration Tables

Code	Baudrate
03	1200
04	2400
05	4800
06	9600

Code	Baudrate
07	19200
08	38400
09	57600
0A	115200

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

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

Baud rate Setting (CC)

RTD Type Setting (TT)

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

Note: Type 2A is only for CB-7013/13D version B1.0 or later and CB-7033/33D.

Data Format Setting (FF)

*1: Filter Setting 0 = 60 Hz rejection
1 = 50 Hz rejection

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

*3: 00 = Engineering Unit Format

01 = Percent Format

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

10 = 2’s Complement HEX Format

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

11 = Ohms

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 baud rate for setting module (Ref *Sec. 1.9*). It is needed to short the INIT* to ground while change baud rate. (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 successful.

Command: %0202200603 Receive: !02

Change data format from 00 to 03, return successful.

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 is for CB-7013/13D 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 CB-7033/33D, the data is the combination for each channel respectively.

Example:

Command: #01 Receive: >+026.35

Read address 01, get data successfully.

Command: #02 Receive: >4C53

Read address 02, get data in HEX format successfully.

Command: #03 Receive: >-0000

Read address 03, get data underrange.

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

Read address 04, is I7033/I7033D, 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 successfully.

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 CB-7033/33D 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 successful.

Command: $020 Receive: ?02

When performing address 02 zero calibration, return was not enabled before performing 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 successful.

Command: $021 Receive: ?02

When performing address 02 zero calibration, return was not enabled before performing 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 Baud rate 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 successful

Command: $022 Receive: !02230602

Read address 02 configuration, return successful.

Related Command:

Sec2.1 %AANNTTCCFF

Related Topics:

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

2.8 $AA4

Description: Read Synchronized Data

Note: This command is for CB-7013/13D only.

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 #***

2.9 $AA8

Description: Read LED Configuration

Note: This command is for CB-7013D/CB-7033D only.

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 CB-7013D, 1=module control, 2=host control For CB-7033D, 0~2=LED show channel 0~2, 3=LED is 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:

Sec. 2.10 $AA8V, *Sec. 2.11* $AA9(Data)

2.10 $AA8V

Description: Set LED Configuration

Note: This command is for CB-7013D/CB-7033D only.

Syntax: $AA8V[CHK](cr)

$	Delimiter character.
AA	Address of setting module (00 to FF).
8	Command for set LED configuration.
V	For CB-7013D, 1=Set LED to module, 2=Set LED to host. For CB-7033D, 0~2=Set LED to show channel 0~2 3=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 successful

Command: $0281 Receive: !02

Set address 02 LED to 1, return successful

Related Command:

Sec. 2.9 $AA8, *Sec. 2.11* $AA9(Data)

2.11 $AA9(Data)

Description: Set LED Data

Note: The command is for CB-7013D/33D only.

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

$ Delimiter character

AA Address of setting module (00 to FF)

9 Command for set LED data

(Data) Data for display on the LED, from –19999. to +19999. The data needs a sign, five digits and a decimal point.

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

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

Syntax error or communication error may get no response.

! Delimiter for valid command.

? Delimiter for invalid command or LED not set to host control.

AA Address of response module (00 to FF)

Example:

Command: $019+123.45 Receive: !01

Send address 01 LED data +123.45, return successful

Command: $029+512.34 Receive: ?02

Send address 02, LED data +512.34. Return indicates the LED is not in the host mode.

Related Command:

Sec. 2.9 $AA8, *Sec. 2.10* $AA8V

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, returns version A2.0.

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

Read address 02 firmware version, returns 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, returns name 7013.

Command: $03M Receive: !037033D

Read address 03 module name, returns name 7033D.

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, maximum six 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 7013, returns successful.

Command: $01M Receive: !017013

Read address 01 module name, returns 7013.

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, returns successful.

Command: $010 Receive: !01

Preform address 01 span calibration, returns successful.

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:

Sec. 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 comm. error may get no response.

! Delimiter for valid command.

? Delimiter for invalid command.

AA Address of response module (00 to FF).

SS host watchdog time-out 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. A return of 04, means the host watchdog time-out status is set; module is in safe mode.

Related Command:

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

Related Topic: *Sec. 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 comm. 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 time-out.

Command: ~011 Receive: !01

Reset address 01 module status, return successful.

Command: ~010 Receive: !0100

Read address 01 module status, return 00, no host watchdog time-out.

Related Command:

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

Related Topic:

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

2.19 ~AA2

Description: Read Host Watchdog Time-out Value

Syntax: ~AA2[CHK](cr)

~ Delimiter character.

AA Address of reading module (00 to FF).

2 Command for read host watchdog time-out 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 Time-out 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 time-out value. On return of FF, the host watchdog time-out value is 25.5 second.

Related Command:

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

Related Topic:

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

2.20 ~AA3EVV

Description: Set Host Watchdog Time-out Value

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

~ Delimiter character.

AA Address of setting module (00 to FF).

3 command for set host watchdog time-out value.

E 1=Enable/0=Disable host watchdog.

VV Time-out 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 enables host watchdog and time-out value is set to 64 (10.0 seconds); returns successful.

Command: ~012 Receive: !0164

Read address 01 host watchdog time-out value. Return 64, the time-out value is 10.0 seconds.

Related Command:

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

Related Topic:

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

3. Application Note

3.1 INIT* pin Operation

Each CB-7000 module has a build-in EEPROM to store configuration information such as address, type, baud rate, and other information. Sometimes, a user may forget the configuration of the module. Therefore, the CB-7000 modules have a special mode named "**INIT mode**", to help user to resolve the problem. The "**INIT mode**" is setting as **Address=00, baud rate=9600 bps, no checksum**

To enable INIT mode, do the following steps:

Step 1. Power-off the module.

Step 2. Connect the INIT* pin to the GND pin.

Step 3. Turn power on.

Step 4. Send command $002(cr) at 9600 bps to read the configuration stored in the module's EEPROM.

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

3.2 Module Status

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

Host Watchdog Time-out will cause all digital outputs to go to their **Safe Value**. The module's status (read 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 go down by the external noise 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 detect a network/communication problem or host halt. When a time-out occurs, the module changes all outputs to the safe state to prevent possible dangerous problems of a controlled unit/process.

The CB-7000 module with Dual Watchdog makes the control system more reliable and stable.

For your notes.

EC Declaration of Conformity

We, **Measurement Computing Corporation**, declare under sole responsibility that the product:

CB-7013/CB-7013D, CB-7033/CB-7033D RTD Input Modules

Part Number Description

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

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