SC-4104-W1
User Manual

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

Warning!

ICP DAS assumes no liability for any damage resulting from the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

Copyright

Copyright © 2015 ICP DAS Co., Ltd. All rights are reserved.

Trademarks

Names are used for identification purposes only and may be registered trademarks of their respective companies.

Contents

1. Introduction 5
2. Hardware Information 7
2.1. IO Specifications 7
2.2. System Specifications 8
2.3. Pin Assignments 9
2.4. Wire Connections 10
2.5. DIP Switch Configuration 12
2.5.1. INIT Mode 13
2.5.2. Hardware Configuration Mode 14
2.5.3. Software Configuration Mode 14
2.6. Software Configuration Tables 15
3. DCON Protocol 16
3.1. %aannttccff 19
3.2. $aa2 21
3.3. $aa5 23
3.4. $aa6 25
3.5. $aaF 27
3.6. $aaLC0n(n) 28
3.7. $aaLC1 35
3.8. $aaLC2nnnn 36
3.9. $aaLC3 38
3.10. $aaM 40
3.11. $aaP 41
3.12. $aaPc 43
3.13. #aa 45
3.14. @aa 46
3.15. @aah 48
3.16. @aaDI 49
3.17. @aaDOhh 50
3.18. @aaHI(data) 51
3.19. @aaRH 52
3.20. @aaLO(data) 53
3.21. @aaRL 54
3.22. @aaDT(data) 55
3.23. @aaDT 56
3.24. @aaIT(data) 57
3.25. @aaIT 59

3.26. @aaPThh 60
3.27. @aaPT 61
3.28. @aaA2CjToo 62
3.29. @aaA3Cj 64
3.30. ~** 65
3.31. ~aa0 66
3.32. ~aa1 67
3.33. ~aa2 68
3.34. ~aa3ehh 69
3.35. ~aa4 70
3.36. ~aa4P 71
3.37. ~aa4S 72
3.38. ~aa5ppss 73
3.39. ~aa5P 74
3.40. ~aa5S 75
3.41. ~aaD 76
3.42. ~aaDt 77
3.43. ~aaRS 78
3.44. ~aaRD 79
3.45. ~aaRDhh 80
4. Modbus RTU Protocol 81
4.1. Modbus Address Mapping 82
4.2. Function 01 - Read Coils 85
4.3. Function 02 - Read Discrete Inputs 86
4.4. Function 03 - Read Multiple Registers 87
4.5. Function 04 - Read Multiple Input Registers 88
4.6. Function 05 – Write Single Coil 89
4.7. Function 06 – Write Single Register 90
4.8. Function 15 – Write Multiple Coils 91
4.9. Function 16 – Write Multiple Registers 92
4.10. Function 70 – Read/Write Module Setting 93
4.10.1. Sub-function 00 – Read Module Name 94
4.10.2. Sub-function 04 – Write Module Address 95
4.10.3. Sub-function 05 – Read Communication Setting 96
4.10.4. Sub-function 06 – Write Communication Setting 97
4.10.5. Sub-function 32 – Read Firmware Version 98
4.10.6. Sub-function 39 – Write Power-on Value 99
4.10.7. Sub-function 40 – Read Power-on Value 100

4.10.8. Sub-function 53 – Set Response Delay Time 101
4.10.9. Sub-function 54 – Read Response Delay Time 102

1. Introduction

The SC-4104-W1 is an easy-to-use smart control module. It can be used in such as FCU control system and lighting control system. SC-4104-W1 requires no specialist skills to install and operate, and no software is needed in order to control the Digital Output channel.



The SC-4104-W1 provides 1 channel for Digital Input (photocouple isolation), 4 channels for relay output and 1 channel for temperature sensor (thermistor). The output channels are 4 Form C type relay, while the input channel is based on a sink-type using a wire connection. The input channel can be used to directly control the 4 channels relay ON and OFF sequence without requiring a remote host controller. And the SC-4104-W1 support 7 kinds coordinated function for users select. 4 kV ESD protection and 5000 Vrms intra-module isolation are also provided.

When required, communication with the SC-4104-W1 is programmable based on either the DCON or the Modbus RTU protocol, and an added benefit is that different addresses can be set for DCON or Modbus RTU communication via hardware or software configuration.

Warning

Do not use the SC-4104-W1 to connect to any device where the loading is greater than 160 W per channel, as this may cause the module to malfunction.

Features

- Cost-effective for Lighting control and small FCU control module
- Power Relay Outputs
- Isolated AC Digital Input
- Support 24 kinds AC DI Input Direct Control Relay ON/OFF Function
- 1 Channel Thermistor Temperature Sensor (-40℃ ~ +80℃)
- Easy installation
- Use fireproof materials (UL94-V0 Level)
- Low power consumption
- Support Modbus RTU and DCON Protocol
- Two RJ-11 Connector **(6P4C or 6P6C)**, Quick and easy wiring

2. Hardware Information

2.1. IO Specifications

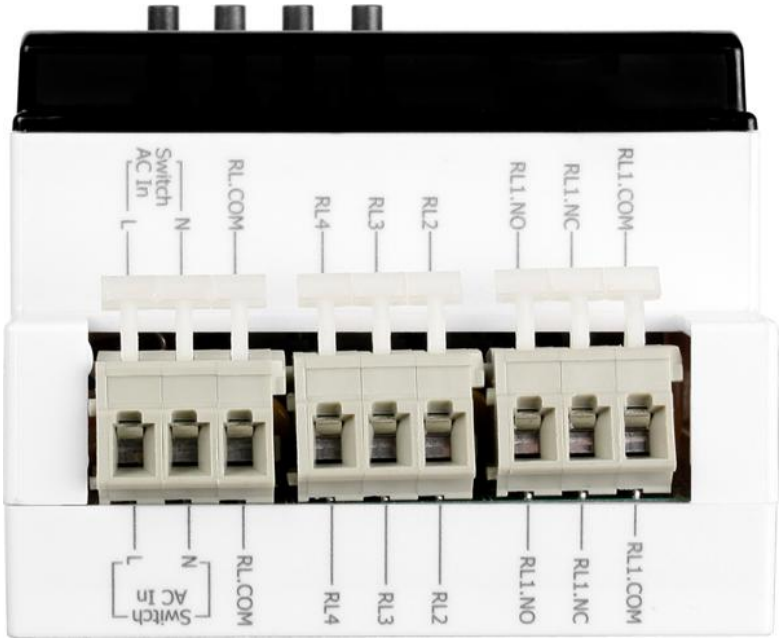
Digital Input	
Input Channel	1
Type	90 ~ 240 V_{AC}
On Voltage Level	85 V_{AC}
Off Voltage Level	60 V_{AC}
Input Impedance	68 kΩ, 1 W
Isolation	5000 Vrms
Function	Local and remote direct control relay ON/OFF and remote status monitoring.
Digital Output	
Output Channel	4
Type	Power Relay, 1 Form C, 3 Form A
Operating Voltage	250 V_{AC} or 30 V_{DC}
Max. Load Current	7 A (NO) / 5 A (NC) @ 250 V_{AC} **(Recommend Working Current 1 A)**
Operating Time	Form C: 10 ms Max. Form A: 10 ms Max.
Release Time	Form C: 5 ms Max. Form A: 10 ms Max.
Electrical Life (900 ops/hr)	Form C: 100,000 ops Form A: 100,000 ops
Mechanical Life (1800 ops/hr)	Form C: 10,000,000 ops Form A: 5,000,000 ops
Power-on & Safe Value	Yes, Programmable
Temperature Sensor	
Temperature Channel	1
Type	Thermistor
Operating Temperature Range	-40℃ ~ +80℃
Temperature Tolerance	±1℃

2.2. System Specifications

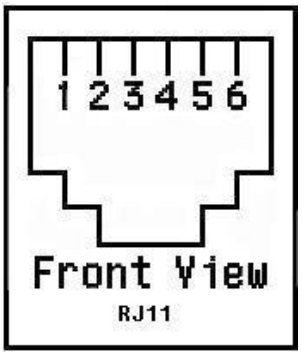
Communication	
Interface	RS-485
Data Format	N,8,1 / O,8,1 / E,8,1 / N,8,2
Baud Rate	Hardware Configuration: Fixed 9600 bps
	Software Configuration: 1200 ~ 115200 bps
Protocol	Modbus RTU or DCON
Node Address	128 ~ 159 for hardware configuration 0 ~ 255 for software configuration * For Modbus RTU, address 0 is auto become to 1
Connector	RJ-11 / 4-pin screw terminal
LED Indicators	
Power	1 LED as power indicator
Digital Output	4 LED as digital output indicator
EMS Protection	
ESD	±4 kV contact for each terminal
EFT	±1 kV for power and communication
Power Requirements	
Input Voltage Range	+10 ~ +30 V_{DC}
Consumption	2.4 W Max.
Connector	RJ-11 / 4-pin screw terminal
Mechanical	
Dimensions (W x L x H)	72 mm x 100 mm x 59 mm
Installation	DIN-Rail
Environment	
Operating Temperature	-25℃ ~ +75℃
Storage Temperature	-30℃ ~ +80℃
Humidity	10 to 95% RH, Non-condensing

2.3. Pin Assignments



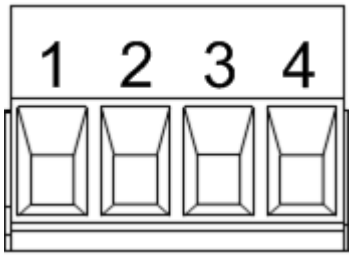


RJ11 Pin Assignment



Pin	Description	
1	+VS	Power Input (+10 ~ +30 V_{DC})
2	+VS	Power Input (+10 ~ +30 V_{DC})
3	DATA+	RS-485 Interface (D+)
4	DATA-	RS-485 Interface (D-)
5	GND	Ground
6	GND	Ground

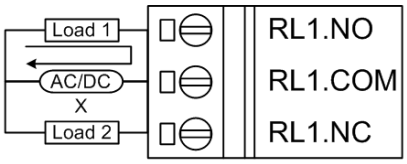
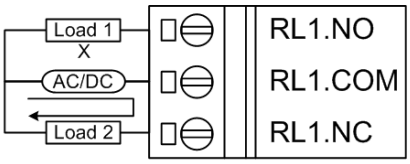
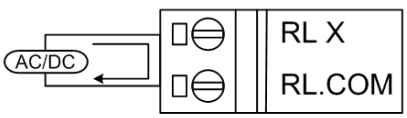
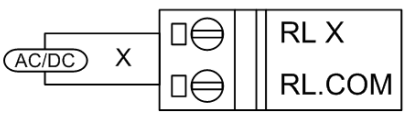
Terminal Block Assignment

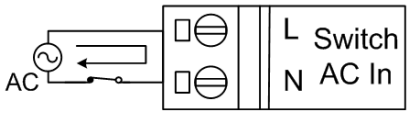
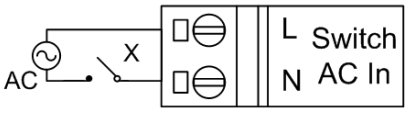


Pin	Description	
1	DATA+	RS-485 Interface (D+)
2	DATA-	RS-485 Interface (D-)
3	+VS	Power Input (+10 ~ +30 V_{DC})
4	GND	Ground

2.4. Wire Connections

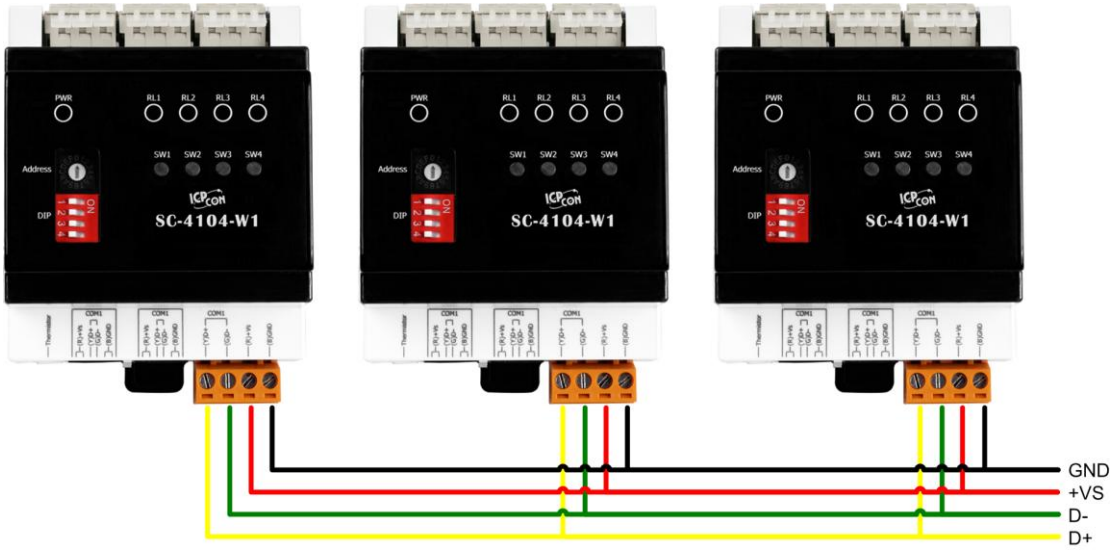
DIO Wire Connections

Output Type	ON State LED ON Readback as 1	OFF State LED OFF Readback as 0
Drive Relay RL1	Relay ON	Relay Off
		
Drive Relay RL2 ~ 4		
		

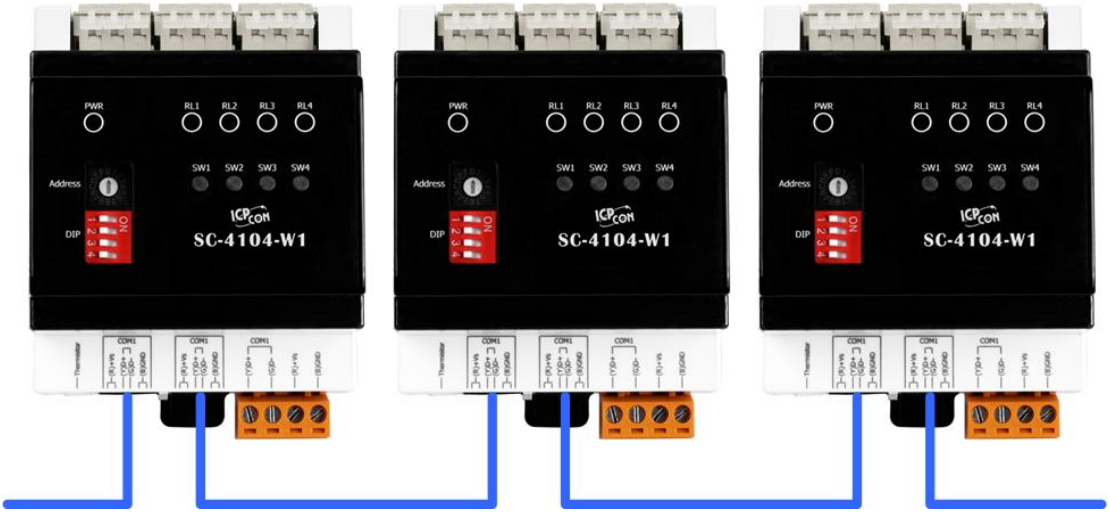
Input Type	DI Read Back as 1	DI Read Back as 0
AC Input	ON	Off
		

Power and Communication Connections

Using Terminal Block

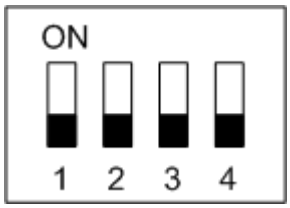


Using RJ-11 Connector



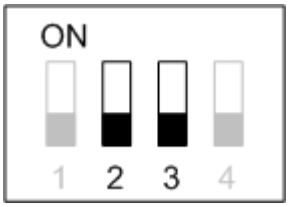
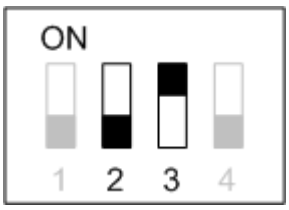
2.5. DIP Switch Configuration

Configure DIP Switch Description



DIP 1	ON	DCON Protocol
	OFF	Modbus RTU Protocol
DIP 2	ON	Software Configuration
	OFF	Hardware Configuration
DIP 3	ON	High Node Address
	OFF	Low Node Address
DIP 4	ON	INIT Mode
	OFF	Normal Mode

Address Setting via DIP Switch Configuration

Module Address 		0 to F for Address 128 - 143 (Node Address - Low)
		0 to F for Address 144 - 159 (Node Address High)

Relay Test Button



SW1 ~ SW4 are test push buttons that control Relay 1 ~ Relay 4 ON / OFF.



RL1 ~ RL4 are LED Indicators to Relay 1 ~ Relay 4. When a relay is ON, the corresponding LED will be ON, too.

2.5.1. INIT Mode

When the SC-4104-W1 is powered on with Configure DIP switch 8 in the ON position, the module will be set to INIT Mode. In this mode, the position of DIP switches 5 ~ 7 and the Address settings switch will be ignored and the SC-4104-W1 module will use the fixed configuration parameters listed below.

Protocol:	DCON
Address:	00
Baud Rate:	9600 bps
Data Format:	N, 8, 1

In this mode, the relevant commands can be used to change the configuration, and the new settings will be saved to the EEPROM.

2.5.2. Hardware Configuration Mode

When the SC-4104-W1 is powered on with both the Configure DIP switches 6 and 8 in the OFF position, the module will be set to Hardware Configuration Mode. In this mode, the following configuration parameters are used.

Protocol:	Dependent on the position of DIP switch 5
Address:	Refer to the “Address Settings via Hardware Configuration” table above
Baud Rate:	Fixed at 9600 bps
Data Format:	Fixed to N,8,1

In this mode, any software command related to configuration will be ignored when using the Modbus RTU protocol, or will return an error when using the DCON protocol.

2.5.3. Software Configuration Mode

When the SC-4104-W1 is powered on with DIP switch 8 in the OFF position and DIP switch 6 in the ON position, the module will be set to Software Configuration Mode. In this mode, the configuration parameters to be used will be retrieved from the EEPROM. The default configuration parameters stored in the EEPROM is:

Protocol:	Modbus RTU
Address:	01 (0x01)
Baud Rate:	9600 bps
Data Format:	N,8,1

In this mode, the relevant commands can be used to change the configuration parameters, and the new settings will be saved to the EEPROM.

2.6. Software Configuration Tables

Baud Rate Settings (CC)

7	6	5	4	3	2	1	0
Data Bit, Parity, Stop Bit		Reserved		Data Rate			

Data Rate (Bit 0 ~ Bit 3)

Code	3	4	5	6	7	8	9	A
Baud	1200	2400	4800	9600	19200	38400	57600	115200

Data Bit, Parity and Stop Bit (Bit 6 ~ Bit 7)

Code	0	1	2	3
Format	8, n, 1	8, n, 2	8, e, 1	8, o, 1

Type Code Settings (TT)

For the SC-4104-W1, the Type Code is fixed to 40 and cannot be changed.

Data Format Settings (FF)

7	6	5	4	3	2	1	0
Reserved	CS	Reserved					

Key	Description
CS	Checksum Setting 0: Disabled 1: Enabled

Note: All Reserved bits should be zero.

3. DCON Protocol

All communication with the SC-4104-W1 consists of commands generated by the Host and responses transmitted by the SC-4104-W1 module. Each module has a unique ID number that is used for addressing purposes and is stored in non-volatile memory. The module ID number is set to 01 by default and can be changed by sending a user command. All commands to the modules contain the ID number as the address, meaning that only the addressed module will respond.

Command Format:

Delimiter Character	Module Address	Command	Checksum	CR

Response Format:

Delimiter Character	Module Address	Data	Checksum	CR

CR = End of command character, carriage return (0x0D), used to end a frame.

Note:

1. **All characters should be in upper case.**
2. **There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.**

An Overview of the DCON Command Set

General Command Set			
Command	**Response**	**Description**	**Section**
%aannttccff	!aa	Set configuration of the module	3.1
$aa2	!aattccff	Read configuration of the module	3.2
$aa5	!aa	Read reset status of the module	3.3
$aa6	!(data)	Read all digital input/output data	3.4
$aaF	!aa(data)	Read firmware version of the module	3.5
$aaLC0n(n)	!aa	Coordinate the operation status between the digital input and the digital output	3.6
$aaLC1	!aan	Read whether or not the operation status between the digital input and the digital output is coordinated	3.7
$aaLC2nnnn	!aa	Set the active delay time for the digital output	3.8
$aaLC3	!aannnn	Read the active delay time for the digital output	3.9
$aaM	!aa(data)	Read module name	3.10
$aaP	!aasc	Read communication protocol information	3.11
$aaPc	!aa	Set communication protocol	3.12
#aa	>(data)	Read all analog input data	3.13
@aa	>(data)	Read all digital input/output data	3.14
@aah	>	Set all digital output channels	3.15
@aaDI	!aasooii	Read digital I/O and alarm status	3.16
@aaDOhh	!aa	Set digital output states	3.17
@aaHI(data)	!aa	Set high Alarm temperature	3.18
@aaRH	!aa(data)	Read high Alarm temperature	3.19
@aaLO(data)	!aa	Set low Alarm temperature	3.20

@aaRL	!aa(data)	Read low Alarm temperature	3.21
@aaDT(data)	!aa	Set delta temperature	3.22
@aaDT	!aa(data)	Read delta temperature	3.23
@aaIT(data)	!aa	Set increase temperature	3.24
@aaIT	!aa(data)	Read increase temperature	3.25
@aaPThh	!aa	Set relay protection time	3.26
@aaPT	!aahh	Read relay protection time	3.27
@AAA2CjT00	!aa	Set Temperature Offset	3.28
@AAA3Cj	!aaoo	Get Temperature Offset	3.29
~**	None	Host OK notification	3.30
~aa0	!aass	Read host watchdog status	3.31
~aa1	!aa	Clear host watchdog timeout state	3.32
~aa2	!aaehh	Read host watchdog settings	3.33
~aa3ehh	!aa	Set host watchdog settings	3.34
~aa4	!aappss	Read power-on and safe digital output values	3.35
~aa4P	!aa(data)	Read the power-on digital output value	3.36
~aa4S	!aa(data)	Read the safe digital output value	3.37
~aa5ppss	!aa	Set power-on and safe digital output values	3.38
~aa5P	!aa	Set the current digital output value as the power-on value	3.39
~aa5S	!aa	Set the current digital output value as the safe value	3.40
~aaD	!aat	Read temperature scale	3.41
~aaDt	!aa	Set temperature scale	3.42
~aaRS	!aard	Read rotary and dip switch	3.43
~aaRD	!aahh	Read response delay time	3.44
~aaRDhh	!aa	Set response delay time	3.45

3.1. %aannttccff

Description:

This command is used to set the configuration of a specified module.

Syntax:

%aannttccff[CHKSUM](CR)

%	Delimiter character.
aa	The address of the module to be set in hex format (00 to FF).
nn	The new address of the module in hex format (00 to FF).
tt	The Type code, which should be set to 40 for DIO modules.
cc	The new Baud Rate, see **section 2.6** for details. The module must boot up at INIT mode (**section 2.5**) in order to change Baud Rates.
ff	The command used to set the counter update direction and the checksum (**section 2.6**). The module must boot up at INIT mode (**section 2.5**) in order to change the checksum settings.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid. If an attempt is made to change the **Baud Rate** or **Checksum** settings without first connecting the INIT* pin to the ground pin or without switching the rear slide switch to the INIT position, the module will return a response indicating that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	%0102400600	Response:	!02
	Changes the address of module 01 to 02. The module returns a response indicating that the command was valid and includes the new address of the module.		

Command:	%0101400A00	Response:	?01
	Changes the Baud Rate of module 01 to 115200bps. The module returns a response indicating that the command was invalid, because it is not in INIT mode.		

Command:	%010140CA00	Response:	!01
	Changes the Baud Rate of module 01 to 115200bps with 8 o 1 format and the module is in INIT mode. The module returns a response indicating that the command was valid.		

Related Command:

Section 3.2 $aa2

Related Topics:

Section 2.5 DIP Switch Configuration

Section 2.6 Software Configuration Tables

Notes:

Changes to the address settings take effect immediately after a valid command is received. Changes to the baud rate and checksum settings take effect on the next power-on reset.

3.2. $aa2

Description:

This command is used to read the configuration of a specified module.

Syntax:

$aa2[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
2	The command to read the configuration of the module.

Response:

Valid Command: **!aattccff[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
tt	The type code, it should be 40 for the module.
cc	The baud rate for the module. See section 2.6 for details.
ff	The checksum of the module. See section 2.6 for details.

Examples:

Command:	$012	Response:	!01400600
	Read the configuration of module 01 and returns a response indicating that the command was valid, and showing that the Type code is set to 40, the Baud Rate is 9600 bps, the Checksum is Disabled and the counter update direction is Falling Edge.		

Command:	$032	Response:	?03
	Attempts to read the configuration of module 03, but returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

Section 3.1 %aannttccff

Related Topics:

Section 2.5 DIP Switch Configuration

Section 2.6 Software Configuration Tables.

3.3. $aa5

Description:

This command is used to read the reset status for a specified module.

Syntax:

$aa5[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
5	The command to read the reset status of the module.

Response:

Valid Command: **!aaS[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
5	The reset status of the module: 0: This is **NOT** the first time the command has been sent since the module was powered on, which denotes that there has been no module reset since the last $AA5 command was sent. 1: This is the first time the $AA5 command has been sent since the module was powered on.

Examples:

Command:	$015	Response:	!011
	Read the reset status for module 01 and returns a response indicating that the command was valid, and that it is the first time the $AA5 command has been sent since the module was powered on.		

Command:	$015	Response:	$010
	Read the reset status for module 01 and returns a response indicating that the command was valid, and that there has been no module reset since the last $AA5 command was sent.		

Command:	$035	Response:	?03
	Attempts to read the reset status for module 03, but returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

None

Related Topics:

None

3.4. $aa6

Description:

This command is used to read the status of both the digital input and digital output channels of a specified module.

Syntax:

$aa6[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
6	The command to read the status of the Digital I/O channels.

Response:

Valid Command: **!(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	The status of the digital output and digital input channels represented by a four-digit hexadecimal value followed by 00. The first two digits represent the status of the digital output channels and the second two represent the status of the digital input channels.

(data) Format:

(Byte 1)(Byte 2)00

Byte 1	Digital output data. Range is 00 ~ 0F.
Byte 2	Digital input data. Range is 00 ~ 01.
00	Fix response end of the command.

Examples:

Command:	$026	Response:	!0F0100
	Read the status of the digital output and digital input channels for module 02 and returns a response indicating that the command was valid and that the current digital output value is 0F and the current digital input value is 01 denoting that both the digital output and digital input channels are ON.		

Command:	$036	Response:	?03
	Attempts to read the status of the digital output and digital input channels for module 03 and returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

Section 3.14 @aa , Section 3.15 @aah
Section 3.16 @aaDI , Section 3.17 @aaDOhh

Related Topics:

None

3.5. $aaF

Description:

This command is used to read the firmware version of a specified module.

Syntax:

$aaF[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
F	The command to read the firmware version.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	A string indicating the firmware version of the module.

Examples:

Command:	$01F	Response:	!0101.00
	Read the firmware version of module 01, and returns a response indicating that the command was valid, and that the firmware version is 01.00.		

Command:	$03F	Response:	?03
	Attempts to read the firmware version of module 03 and returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

None

Related Topics:

None

3.6. $aaLC0n(n)

Description:

This command is used to coordinate the operation status between the digital input and the digital output for a specified module.

*** Note: This command only for INIT mode (refer to section 2.5).**

Syntax:

$aaLC0n(n)[CHKSUM](CR)

$ Delimiter character.

aa The address of the module to be read in hex format (00 to FF).

LC0 The command to coordinate the operation status between the digital input and the digital output.

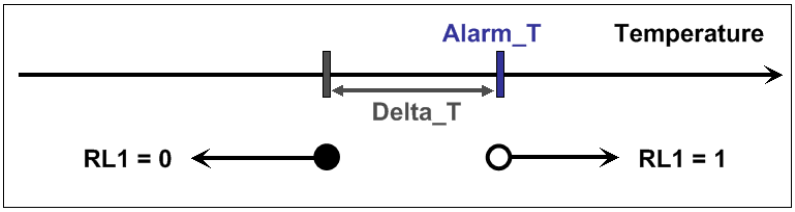
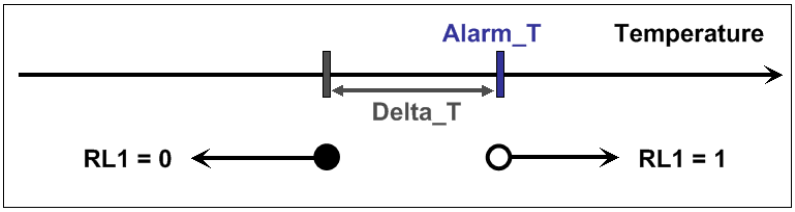
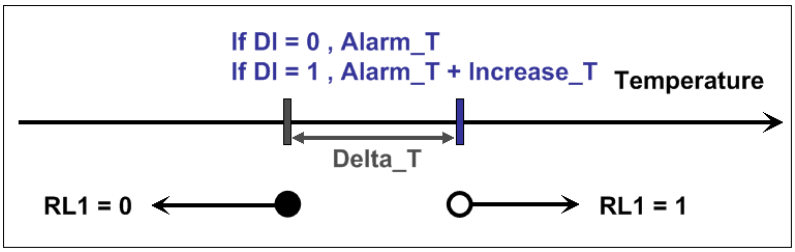
n(n) The DI DO coordinated function number.

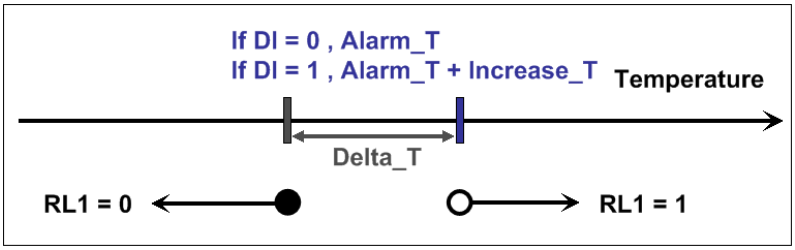
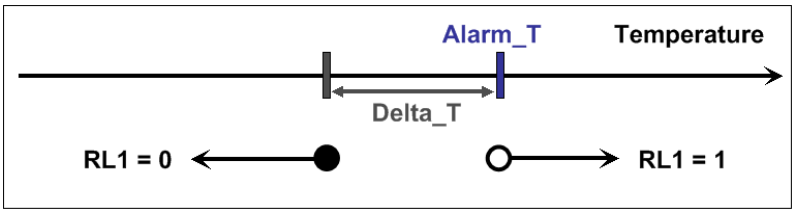
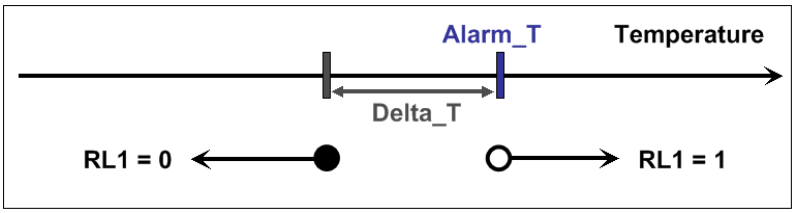
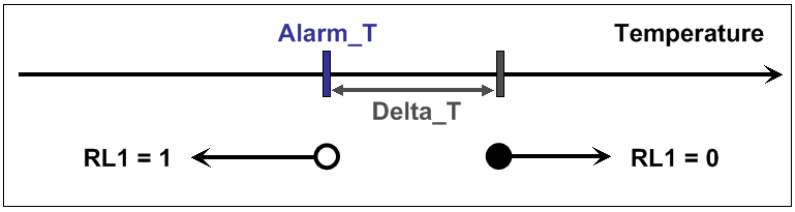
0: The ON/OFF sequence of the digital output will **NOT** be coordinated when the status of the digital input is changed.

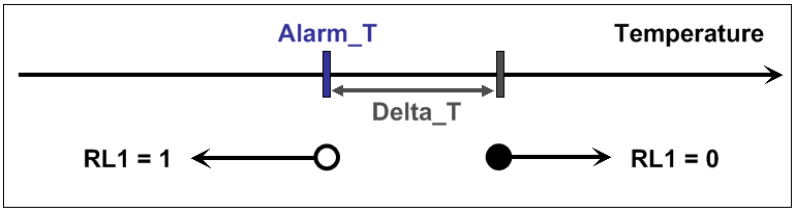
Others: The ON/OFF sequence of the digital output will be coordinated with **n** function when the status of the digital input is changed.

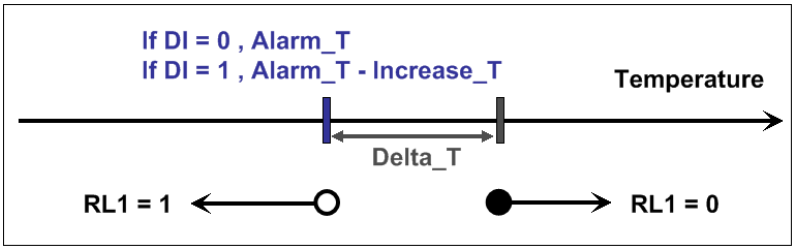
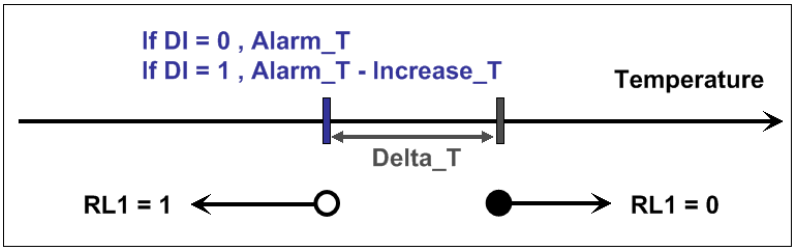
The command to set the operating status:

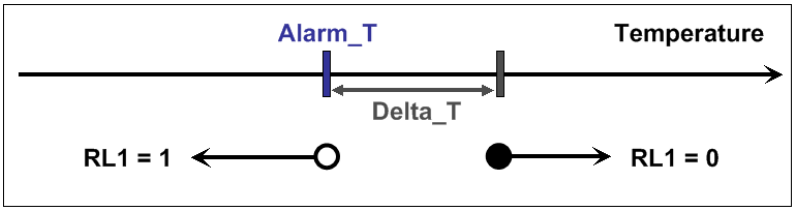
n	The ON/OFF Sequence of The Digital Output
0	Coordinated Disable
1	DI coordinated with RL1 ~ 4, the 4 operating status are: 1 0 0 0 | 1 1 0 0 | 1 1 1 0 | 1 1 1 1
2	DI coordinated with RL1 ~ 4, the 4 operating status are: 1 0 0 0 | 0 1 0 0 | 0 0 1 0 | 0 0 0 1
3	DI coordinated with RL1 ~ 4, the 3 operating status are: 1 1 0 0 | 1 1 1 0 | 1 1 1 1
4	DI coordinated with RL1 ~ 4, the 3 operating status are: 1 1 0 0 | 1 0 1 0 | 1 0 0 1
5	DI coordinated with RL2 ~ 4, the 3 operating status are: X 1 0 0 | X 1 1 0 | X 1 1 1
6	DI coordinated with RL1 ~ 4, the 3 operating status are: X 1 0 0 | X 0 1 0 | X 0 0 1
7	DI coordinated only with RL1. When the DI gets high,

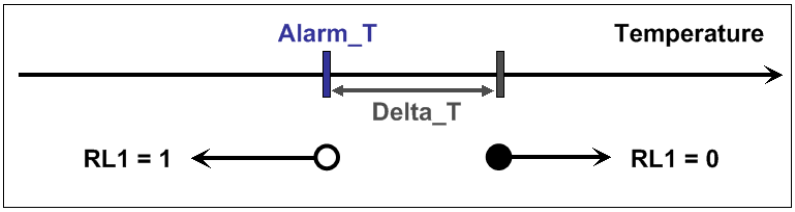
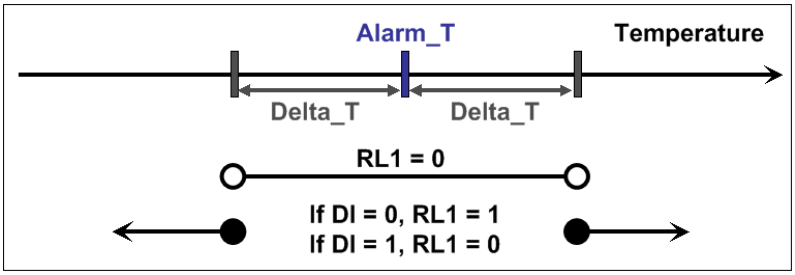
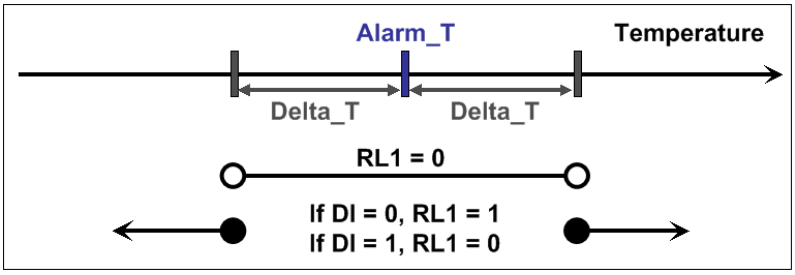
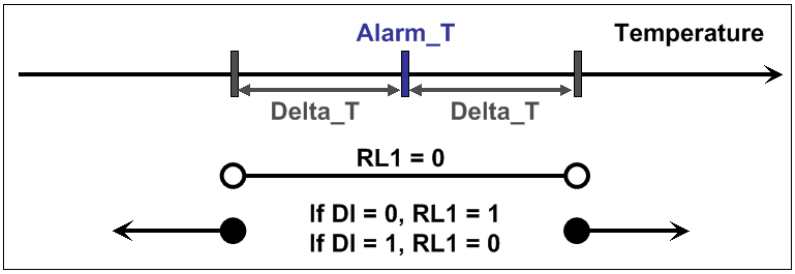
<table>
<tr><td></td><td>RL1 is switch to NO. When the DI gets low, RL1 is switch to NC.</td></tr>
<tr><td>8</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 0 1 0</td><td>T 0 0 1</td></tr>
</table>
Temperature Function: Enable any time.

</td></tr>
<tr><td>9</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 0 1 0</td><td>T 0 0 1</td></tr>
</table>
* Relay supports power off record.
Temperature Function: Enable any time.

</td></tr>
<tr><td>A</td><td>DI coordinated only with temperature function:
<table>
<tr><td>T X X X</td></tr>
</table>
Temperature Function: Enable any time.

</td></tr>
<tr><td>B</td><td>DI coordinated only with temperature function:
<table>
<tr><td>T X X X</td></tr>
</table>
* Relay supports power off record.
Temperature Function: Enable any time.</td></tr>
</table>

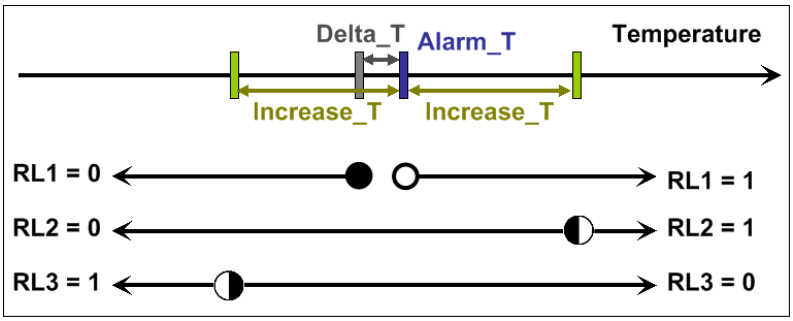
<table>
<tr><td></td><td>
</td></tr>
<tr><td>C</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 1 1 0</td><td>T 1 1 1</td></tr>
</table>
Temperature Function: Enable any time.

</td></tr>
<tr><td>D</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 1 1 0</td><td>T 1 1 1</td></tr>
</table>
* Relay supports power off record.
Temperature Function: Enable any time.

</td></tr>
<tr><td>E</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 0 1 0</td><td>T 0 0 1</td></tr>
</table>
Temperature Function: Enable any time.

</td></tr>
<tr><td>F</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 0 1 0</td><td>T 0 0 1</td></tr>
</table>
* Relay supports power off record.
Temperature Function: Enable any time.</td></tr>
</table>

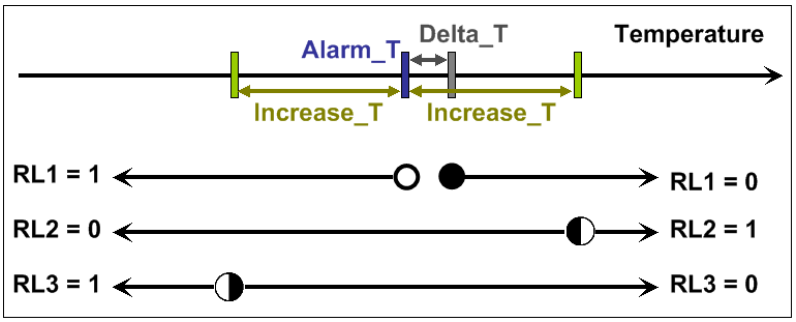
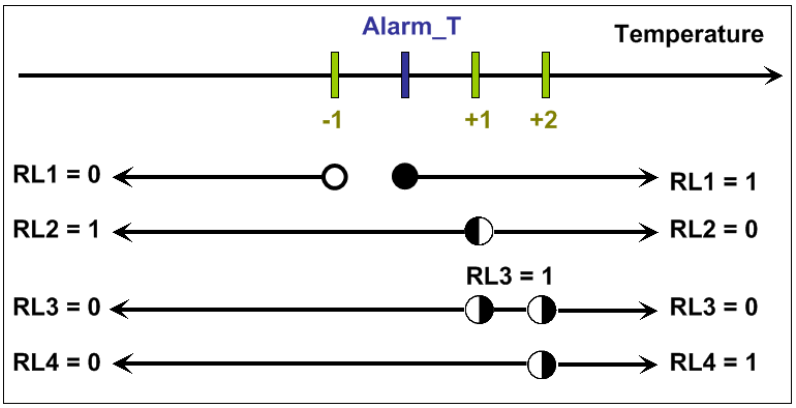
<table>
<tr><td></td><td>
</td></tr>
<tr><td>10</td><td>DI coordinated only with temperature function:
T X X X

Temperature Function: Enable any time.

</td></tr>
<tr><td>11</td><td>DI coordinated only with temperature function:
T X X X
* Relay supports power off record.
Temperature Function: Enable any time.

</td></tr>
<tr><td>12</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
T 1 0 0 | T 1 1 0 | T 1 1 1

Temperature Function: Enable any time.

</td></tr>
<tr><td>13</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
T 1 0 0 | T 1 1 0 | T 1 1 1
* Relay supports power off record.
Temperature Function: Enable any time.</td></tr>
</table>

<table>
<tr><td></td><td>
</td></tr>
<tr><td>14</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 0 1 0</td><td>T 0 0 1</td></tr>
</table>
Temperature Function: Enable with DI = 0.

</td></tr>
<tr><td>15</td><td>DI coordinated only with temperature function:
<table>
<tr><td>T X X X</td></tr>
</table>
Temperature Function: Enable with DI = 0.

</td></tr>
<tr><td>16</td><td>DI coordinated with RL2 ~ 4, the 3 operating status are:
<table>
<tr><td>T 1 0 0</td><td>T 1 1 0</td><td>T 1 1 1</td></tr>
</table>
Temperature Function: Enable with DI = 0.

</td></tr>
<tr><td>17</td><td>DI coordinated with RL3, it's on/off is the same as DI:
<table>
<tr><td>T T T 1</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>Temperature Function: Enable any time.

</td></tr>
<tr><td>18</td><td>DI coordinated with RL3, it's on/off is the same as DI:
T T T 1

Temperature Function: Enable any time.

</td></tr>
<tr><td>19</td><td>DI not coordinated with any RL.
Temperature Function: Enable any time.

</td></tr>
</table>

The description of symbols of above list is below.

0	:	Relay Switch to Normal Close
1	:	Relay Switch to Normal Open
T	:	Temperature Function
X	:	don’t care

Response:

Valid Command: **>aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

> Delimiter character to indicate that the command was valid.

? Delimiter character to indicate that the command was invalid.

aa The address of the responding module in hex format (00 to FF).

Examples:

Command:	$01LC01	Response:	!01
	Coordinates the function 1 operation between the digital input and the digital output of module 01, and the module returns a response indicating that the command was valid.		

Related Command:

Section 3.7 $aaLC1

Related Topics:

None

3.7. $aaLC1

Description:

This command is used to read whether the operation between the digital input and the digital output for a specified module is coordinated.

Syntax:

$aaLC1[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
LC1	The command to read whether the operation between the digital input and the digital output is coordinated

Response:

Valid Command: **!aan(n)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
n(n)	The operation status (Hex format): 0: The ON/OFF sequence of the digital output is NOT coordinated when the status of the digital input is changed 1 ~ 18: The ON/OFF sequence of the digital output is coordinated when the status of the digital input is changed

Examples:

Command:	$01LC1	Response:	!011
	Read whether the operation between the digital input and the digital output is coordinated and the module returns a response indicating that the command was valid with a value of 1 meaning that the sequence of the digital output will be coordinated with function 1 when the status of the digital input is changed.		

Related Command:

Section 3.6 $aaLC0n

Related Topics:

None

3.8. $aaLC2nnnn

Description:

This command is used to set the active delay time for the digital output of a specified module.

Syntax:

$aaLC2nnnn[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
LC2	The command to set the active delay time for the digital output.
nnnn	A four-digit hexadecimal value representing the active delay time in milliseconds. The maximum delay time is 0x0BB8 (3000 milliseconds).

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	$01LC203E8	Response:	!01
	Set the active delay time for the digital output of module 01 to 0x03E8 (1000 milliseconds) and the module returns a response indicating that the command was valid. The digital output will be active 1000 milliseconds after the module is powered on.		

Command:	$01LC20BB9	Response:	?01
	Attempts to set the active delay time for the digital output of module 01 to 0x0BB9 (3001 milliseconds), but the module returns a response indicating that the command was invalid because the value for the active delay time was not within the valid range.		

Related Command:

Section 3.9 $aaLC3

Related Topics:

None

3.9. $aaLC3

Description:

This command is used to read the active delay time for the digital output of a specified module.

Syntax:

$aaLC3[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
LC3	The command to read the active delay time for the digital output.

Response:

Valid Command: **!aannnn[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
nnnn	A four-digit hexadecimal value representing the active delay time in milliseconds

Examples:

Command:	$01LC20BB8	Response:	!01
	Set the active delay time for the digital output of module 01 to 0x0BB8 (3000 milliseconds) and the module returns a response indicating that the command was valid. The digital output will be active 3000 milliseconds after the module is powered on.		

Command:	$01LC3	Response:	!010BBB
	Read the active delay time for the digital output of module 01 and returns a response indicating that the command was valid, with a value of 0BB8 meaning that the active delay time is 3000 milliseconds.		

Related Command:

Section 3.8 $aaLC2nnn

Related Topics:

None

3.10. $aaM

Description:

This command is used to read the name of a specified module.

Syntax:

$aaM[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
M	The command to read the name of the module.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	A string indicating the name of the module.

Examples:

Command:	$02M	Response:	!02SC4104
	Read the name of module 02 and returns a response indicating that the command was valid, and that the name of the module is SC-4104-W1.		

Command:	$03M	Response:	?03
	Attempts to read the name of module 03 and returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

None

Related Topics:

None

3.11. $aaP

Description:

This command is used to read the communication protocol information for a specified module.

Syntax:

$aaP[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
P	The command to read the communication protocol information.

Response:

Valid Command: **!aasc[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
s	The protocols supported by the module: 0: Only the DCON protocol is supported. 1: Both the DCON and Modbus RTU protocols are supported.
c	The current protocol that is saved in the EEPROM that will be used at the next power-on reset: 0: The protocol saved in the EEPROM is DCON. 1: The protocol saved in the EEPROM is Modbus RTU.

Examples:

Command:	$01P	Response:	!0110
	Read the communication protocol information for module 01 returns a response indicating that the command was valid, with a value of 10, which denotes that the module supports both the DCON and Modbus RTU protocols and that the protocol that will be used at the next power-on reset is DCON.		

Command:	$03P	Response:	?03
	Attempts to read the communication protocol information for module 03 and returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

Section 3.12 $aaPn

Related Topics:

None

3.12. $aaPc

Description:

This command is used to set the communication protocol for a specified module.

Syntax:

$aaPc[CHKSUM](CR)

$	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
P	The command to set the communication protocol.
c	The protocol to be used: 0: DCON Protocol 1: Modbus RTU Protocol

Note:

Before using this command, the module must be boot up at INIT mode (**section 2.5**) if in DCON protocol mode. The new protocol information will be saved in the EEPROM and will become effective after the next power-on reset.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	$01P1	Response:	?01
	Attempts to set the communication protocol to be used for module 01 to Modbus RTU, but returns a response indicating that the command was invalid because the module is not in INIT mode.		

Command:	$01P1	Response:	!01
	Set the communication protocol to be used for module 01 to Modbus RTU and returns a response indicating that the command was valid.		

Related Command:

Section 3.11 $aaP

Related Topics:

Section 2.5 DIP Switch Configuration

3.13. #aa

Description:

This command is used to read analog input data of the module.

Syntax:

#aa[CHKSUM](CR)

#	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).

Response:

Valid Command: **>(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	Analog input value in engineer unit format.

Examples:

Command:	~01D	Response:	!010
	Read the temperature scale for module 01 returns a response indicating that the command was valid, with a value of 0, which denotes that the temperature scale is Celsius (℃).		

Command:	#01	Response:	>+026.40
	Read the temperature analog value for module 01 returns a response indicating that the command was valid, with a value of +026.40, which denotes that the temperature sensor indicated now is 26.4℃.		

Related Command:

Section 3.28	@aaA2CjToo	Section 3.29	@aaA3Cj
Section 3.41	~aaD	Section 3.42	~aaDt

Related Topics:

None

3.14. @aa

Description:

This command is used to read the status of both the digital output and digital input channels of a specified module.

Syntax:

@aa[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).

Response:

Valid Command: **>(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	The status of the digital output and digital input channels represented by a four-digit hexadecimal value. The first two digits represent the status of the digital output channels and the second two represent the status of the digital input channels.

(data) Format:

(Byte 1)(Byte 2)

Byte 1	Digital output data. Range is 00 ~ 0F.
Byte 2	Digital input data. Range is 00 ~ 01.

Examples:

Command:	@02	Response:	>0F01
	Read the status of the digital output and digital input channels for module 02 and returns a response indicating that the command was valid and that the current digital output value is 0F and the current digital input value is 01 denoting that both the digital output and digital input channels are ON.		

Command:	@03	Response:	?03
	Attempts to read the status of the digital output and digital input channels for module 03 and returns a response indicating that the command was invalid because module 03 does not exist.		

Related Command:

Section 3.4 $aa6 , Section 3.15 @aah
Section 3.16 @aaDI , Section 3.17 @aaDOhh

Related Topics:

None

3.15. @aah

Description:

This command is used to set the value for all digital output channels of a specified module.

Syntax:

@aah[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
h	A single-digit hexadecimal value representing the data to be written to the digital output channels, where bit 0 ~ 3 of the value corresponds to channel RL1 ~ RL4. When the bit is 0, it denotes that the digital output channel is set to OFF, and 1 denotes that the digital output channel is set to ON.

Response:

Valid Command: **>[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

Ignored Command: **![CHKSUM](CR)**

>	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
!	Delimiter character to indicate that the command was ignored. The module is in host watchdog timeout mode, and the output is set to safe value.

Examples:

Command:	@023	Response:	>
	Set channels RL1 and RL2 of module 02 to ON, and the module returns a response indicating that the command was valid.		

Related Command:

Section 3.4 $aa6 , Section 3.14 @aa

Section 3.16 @aaDI , Section 3.17 @aaDOhh

Related Topics:

None

3.16. @aaDI

Description:

This command is used to read the status of both the digital output and digital input channels and alarm status of a specified module.

Syntax:

@aaDI[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
DI	The command to read the digital I/O and alarm status.

Response:

Valid Command: **!aasooii[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
s	Alarm status. Now the parameter is reserved and got always 0.
oo	Digital output data. Range is 00 ~ 0F.
ii	Digital input data. Range is 00 ~ 01.

Examples:

Command:	@01DI	Response:	!0100F01
	Read the status of the digital output and digital input channels for module 01 and returns a response indicating that the command was valid and that the current digital output value is 0F and the current digital input value is 01 denoting that both the digital output and digital input channels are ON.		

Related Command:

Section 3.4 $aa6 , Section 3.14 @aa

Section 3.15 @aah , Section 3.17 @aaDOhh

Related Topics:

None

3.17. @aaDOhh

Description:

This command is used to set the value for all digital output channels of a specified module.

Syntax:

@aaDOhh[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
DO	The command to set the digital output of the module.
hh	A byte hexadecimal value representing the data to be written to the digital output channels, where bit 0 ~ 3 of the value corresponds to channel RL1 ~ RL4 and others bit must be 0. When the bit is 0, it denotes that the digital output channel is set to OFF, and 1 denotes that the digital output channel is set to ON.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@02DO0F	Response:	!aa
	Set channels RL1 ~ RL4 of module 02 to ON, and the module returns a response indicating that the command was valid.		

Related Command:

Section 3.4 $aa6 , Section 3.14 @aa

Section 3.15 @aah , Section 3.16 @aaDI

Related Topics:

None

3.18. @aaHI(data)

Description:

This command is used to set the high temperature alarm limit value (Alarm_T) for DI coordinator function 0x08 ~ 0x18. This parameter Alarm_T is always used with Delta_T or Increase_T.

Note: For the module, this command is the same as @aaLO(data).

Syntax:

@aaHI(data)[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
HI	The command to set the high temperature alarm limit value.
(data)	High alarm limit value and value range is -040.00 ~ +080.00.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@01HI+030.00	Response:	!01
	Set the high temperature alarm limit of module 01 to 30℃, and the module return the command setting ok.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.19 @aaRH

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

Related Topics:

None

3.19. @aaRH

Description:

This command is used to read the high temperature alarm limit value (Alarm_T) for part of DI coordinator functions. The default value is +026.00℃.

Note: For the module, this command is the same as @aaRL.

Syntax:

@aaRH[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
RH	The command to read the high temperature alarm limit value.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	High temperature alarm limit value in engineer unit format.

Examples:

Command:	@01RH	Response:	!01+045.50
	Read the high temperature alarm limit for module 01, and the module return the limit is 45.5℃.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaHI(data)

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

Related Topics:

None

3.20. @aaLO(data)

Description:

This command is used to set the low temperature alarm limit value (Alarm_T) for DI coordinator function 0x08 ~ 0x18. This parameter Alarm_T is always used with Delta_T or Increase_T.

Note: For the module, this command is the same as @aaHI(data).

Syntax:

@aaLO(data)[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
LO	The command to set the low temperature alarm limit value.
(data)	Low alarm limit value and value range is -040.00 ~ +080.00.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@01LO-010.00	Response:	!01
	Set the low temperature alarm limit of module 01 to -10℃, and the module return the command setting ok.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.21 @aaRL

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

Related Topics:

None

3.21. @aaRL

Description:

This command is used to read the low temperature alarm limit value (Alarm_T) for part of DI coordinator functions. The default value is +026.00℃.

Note: For the module, this command is the same as @aaRH.

Syntax:

@aaRL[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
RL	The command to read the low temperature alarm limit value.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	Low temperature alarm limit value in engineer unit format.

Examples:

Command:	@01RL	Response:	!01+015.50
	Read the low temperature alarm limit for module 01, and the module return the limit is 15.5℃.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.20 @aaLO(data)

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

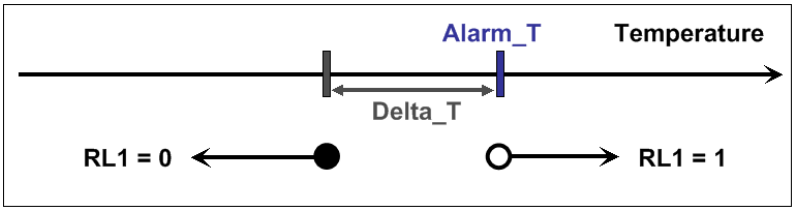
Related Topics:

None

3.22. @aaDT(data)

Description:

This command is used to set the delta of temperature (Delta_T). The Delta_T is based on high/low alarm temperature limit (Alarm_T) of DI coordinator function 0x08 ~ 0x18. For example, if the DI coordinator function 0x08 is used and enabled, the Delta_T parameter will work as below:



Syntax:

@aaDT(data)[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
DT	The command to set the Delta_T parameter.
(data)	Delta temperature value and value range is +000.00 ~ +060.00.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@01DT+005.50	Response:	!01
	Set the value of the delta temperature, Delta_T, to 5.5℃ for module 01.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaHI(data)

Section 3.23 @aaDT , Section 3.24 @aaIT(data)

Related Topics:

None

3.23. @aaDT

Description:

This command is used to read the delta of temperature (Delta_T). The default value is +000.50℃.

Syntax:

@aaDT[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
DT	The command to read the Delta_T parameter.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	Delta temperature value in engineer unit format.

Examples:

Command:	@01DT	Response:	!01+005.50
	Read the value of the delta temperature, Delta_T for module 01 for specific setting temperature.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaIH(data)

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

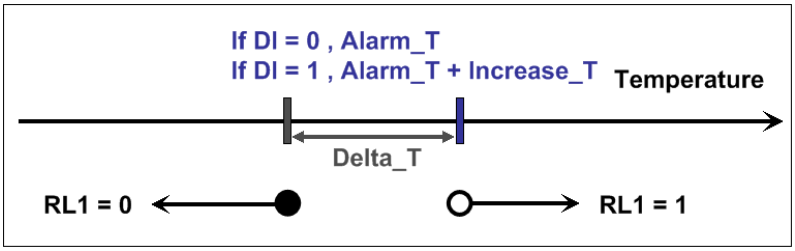
Related Topics:

None

3.24. @aaIT(data)

Description:

This command is used to set the increase of temperature (Increase_T). The Increase_T is based on high/low alarm temperature limit (Alarm_T) of DI coordinator function 0x0A, 0x0B, 0x10, 0x11, 0x17 and 0x18. For example, if the DI coordinator function 0x0A is used and enabled, the Increase_T parameter will work as below:



Syntax:

@aaIT(data)[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
IT	The command to set the Increase_T parameter.
(data)	Increase temperature, value range is +000.00 ~ +060.00.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@01IT+002.00	Response:	!01
	Set increase temperature parameter, Increase_T to module 01 for specific setting temperature.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaIH(data)

Section 3.22 @aaDT(data) , Section 3.25 @aaIT

Related Topics:

None

3.25. @aaIT

Description:

This command is used to read the increase of temperature (Increase_T). The default value is +002.00℃.

Syntax:

@aaDI[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
IT	The command to read the Increase_T parameter.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	Increase temperature value in engineer unit format.

Examples:

Command:	@01IT	Response:	!01+003.50
	Read the value of the increase temperature, Increase_T for module o1 for specific setting temperature.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaIH(data)

Section 3.22 @aaDT(data) , Section 3.24 @aaIT(data)

Related Topics:

None

3.26. @aaPThh

Description:

This command is used to set the relay protection time for DI coordinator function 0x08 ~ 0x18. This parameter is mainly to avoid the rapid switching of relays due to the critical temperature.

Syntax:

@aaDI[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
PT	The command to read the protection time parameter.

Response:

Valid Command: **!aahh[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
hh	Relay protection time in hex format and the unit is second.

Examples:

Command:	@01PT	Response:	!010A
	Read the relay protection time for module 01, and the module return 0A. It means the relay DO0 ~ DO3 will not be changed in 10 seconds.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaIH(data)

Section 3.22 @aaDT(data) , Section 3.27 @aaPT

Related Topics:

None

3.27. @aaPT

Description:

This command is used to read the relay protection time for part of DI coordinator functions. The default value is 10 (0x0A) second.

Syntax:

@aaDI[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
PT	The command to read the protection time parameter.

Response:

Valid Command: **!aahh[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
hh	Relay protection time in hex format and the unit is second.

Examples:

Command:	@01PT	Response:	!010A
	Read the relay protection time for module 01, and the module return 0A. It means the relay DO0 ~ DO3 will not be changed in 10 seconds.		

Related Command:

Section 3.6 $aaLC0n(n) , Section 3.18 @aaIH(data)

Section 3.22 @aaDT(data) , Section 3.26 @aaPT(data)

Related Topics:

None

3.28. @aaA2CjToo

Description:

This command is used to set the temperature offset value of a specified module.

Syntax:

@aaA2CjToo[CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
A2C	The command to select temperature channel to set.
j	Temperature input channel. For SC-4104-W1 must be 0.
T	The command to set temperature offset value.
oo	Temperature offset value in Hex format. 00 ~ 7F is plus value (+0 ~ +127) and FF ~ 80 is minus value (-1 ~ -128). The offset temperature unit is 0.1.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~01D	Response:	!010
	Read the temperature scale for module 01 returns a response indicating that the command was valid, with a value of 0, which denotes that the temperature scale is Celsius (℃).		

Command:	#01	Response:	>+026.40
	Read the temperature analog value for module 01 returns a response indicating that the command was valid, with a value of +026.40, which denotes that the temperature sensor indicated now is 26.4℃.		

Command:	@01A2C0T06	Response:	!01
	Set the temperature offset to 06 and returns a response indicating that the command was valid.		

Command:	#01	Response:	>+027.00
	Read the temperature analog value for module 01 returns a response indicating that the command was valid, with a value of +027.00, which denotes that the temperature sensor indicated now is 27℃ (26.4 + 0.6).		

Related Command:

Section 3.13	#aa	Section 3.29	@aaA3Cj
Section 3.41	~aaD	Section 3.42	~aaDt

Related Topics:

None

3.29. @aaA3Cj

Description:

This command is used to read the temperature offset value of a specified module.

Syntax:

@aaA3Cj [CHKSUM](CR)

@	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
A3C	The command to select temperature channel to read.
j	Temperature input channel. For SC-4104-W1 must be 0.

Response:

Valid Command: **!aaoo[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
oo	Temperature offset value in Hex format. 00 ~ 7F is plus value (+0 ~ +127) and FF ~ 80 is minus value (-1 ~ -128). The offset temperature unit is 0.1.

Examples:

Command:	@01A3C0	Response:	!0106
	Read the temperature offset value for module 01 returns a response indication that the command was valid, with a value of 06, which demotes that the temperature offset is +0.6.		

Related Command:

Section 3.13	#aa	Section 3.28	@aaA2CjToo
Section 3.41	~aaD	Section 3.42	~aaDt

Related Topics:

None

3.30. ~**

Description:

Host sends this command to all modules for broadcasting the information “Host OK”. If the module waits the command timeout when enable WDT function. The module will in host watchdog timeout mode, and the output is set to safe value.

Syntax:

~ [CHKSUM](CR)**

~ Delimiter character.

**** Command for all modules.

Response:

None

Examples:

Command:	~**	Response:	No response
	Send “Host OK” to all modules.		

Related Command:

Section 3.41	~aa0	Section 3.42	~aa1
Section 3.43	~aa2	Section 3.44	~aa3ehh
Section 3.45	~aa4	Section 3.47	~aa4S
Section 3.48	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.31. ~aa0

Description:

Read host watchdog status of the module.

Syntax:

~aa0 [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
0	The command to read host watchdog status.

Response:

Valid Command: **!aass[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
ss	Host watchdog status. The status will store into flash and only may reset by the command ~aa1.

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

***1: Host watchdog status, 0=disable, 1=enable**

***2: Host watchdog timeout flag, 0=clear, 1=set**

Examples:

Command:	~010	Response:	!0104
	Read module 01 host watchdog status returns 04, host watchdog timeout flag is set.		

Related Command:

Section 3.30	~**	Section 3.32	~aa1
Section 3.33	~aa2	Section 3.34	~aa3ehh
Section 3.35	~aa4	Section 3.37	~aa4S
Section 3.38	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.32. ~aa1

Description:

Reset host watchdog status of the module.

Syntax:

~aa1 [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
1	The command to reset host watchdog status.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~010	Response:	!0104
	Read module 01 host watchdog status returns 04, host watchdog timeout flag is set.		

Command:	~011	Response:	!01
	Reset module 01 host watchdog status returns success.		

Command:	~010	Response:	!0100
	Read module 01 host watchdog status returns 00, host watchdog timeout flag is clear.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.33	~aa2	Section 3.34	~aa3ehh
Section 3.35	~aa4	Section 3.37	~aa4S
Section 3.38	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.33. ~aa2

Description:

Read host watchdog activation and timeout interval.

Syntax:

~aa2 [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
2	The command to read host watchdog activation and timeout interval.

Response:

Valid Command: **!aaehh[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
e	Host watchdog activation, 0=disable, 1=enable.
hh	Timeout interval in Hex format, each count for 0.1 second, ex: 01 = 0.1 second and FF = 25.5 seconds.

Examples:

Command:	~012	Response:	!011FF
	Read module 01 host watchdog activation and timeout interval returns 1FF, host watchdog is enabled now and timeout interval is 25.5 seconds.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.34	~aa3ehh
Section 3.35	~aa4	Section 3.37	~aa4S
Section 3.38	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.34. ~aa3ehh

Description:

Set host watchdog activation and timeout interval.

Syntax:

~aa3ehh [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
3	The command to set host watchdog activation and timeout interval.
e	Host watchdog activation, 0=disable, 1=enable.
hh	Timeout interval in Hex format, each count for 0.1 second, ex: 01 = 0.1 second and FF = 25.5 seconds.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~013164	Response:	!01
	Set module 01 enable host watchdog and timeout interval is 64 (10.0 seconds), returns success.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.33	~aa2
Section 3.35	~aa4	Section 3.37	~aa4S
Section 3.38	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.35. ~aa4

Description:

Read power-on value and safe value of digital output for a specified module.

Syntax:

~aa4 [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
4	The command to read power-on value and safe value of digital output.

Response:

Valid Command: **!aappss[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
pp	The digital output power-on value.
ss	The digital output safe value.

Examples:

Command:	~014	Response:	!010F03
	Read module 01 power-on and safe value returns power-on value is 0F, safe value is 03.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.33	~aa2
Section 3.34	~aa3ehh	Section 3.36	~aa4P
Section 3.37	~aa4S	Section 3.38	~aa5ppss
Section 3.39	~aa5P	Section 3.40	~aa5S

Related Topics:

None

3.36. ~aa4P

Description:

Read power-on value of digital output for a specified module.

Syntax:

~aa4P [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
4P	The command to read power-on value of digital output.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	The digital output power-on value.

Examples:

Command:	~014P	Response:	!010F00
	Read module 01 power-on value returns 0F.		

Related Command:

Section 3.35 ~aa4 Section 3.38 ~aa5ppss

Section 3.39 ~aa5P

Related Topics:

None

3.37. ~aa4S

Description:

This command is used to read the digital output safe value for a specified module.

Syntax:

~aa4S [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
4S	The command to read safe value of digital output.

Response:

Valid Command: **!aa(data)[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
(data)	The digital output safe value.

Examples:

Command:	~014S	Response:	!010300
	Read module 01 safe value returns 03.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.33	~aa2
Section 3.34	~aa3ehh	Section 3.35	~aa4
Section 3.38	~aa5ppss	Section 3.40	~aa5S

Related Topics:

None

3.38. ~aa5ppss

Description:

Set power-on value and safe value of digital output to a specified module.

Syntax:

~aa5ppss [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
5	The command to set power-on value and safe value of digital output.
pp	The digital output power-on value.
ss	The digital output safe value.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~0150F03	Response:	!01
	Set module 01 power-on value to 0F and safe value to 03 and returns success.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.33	~aa2
Section 3.34	~aa3ehh	Section 3.35	~aa4
Section 3.36	~aa4P	Section 3.37	~aa4S
Section 3.39	~aa5P	Section 3.40	~aa5S

Related Topics:

None

3.39. ~aa5P

Description:

Set current digital output value as the power-on value for a specified module.

Syntax:

~aa5P [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
5P	Command for setting current digital output value as the power-on value.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	@01F	Response:	>
	Set module 01 digital output value to F, and the module returns a response indicating that the command was valid.		

Command:	~015P	Response:	!01
	Set current digital output value of module 01 as the power-on value and returns success.		

Related Command:

Section 3.35 ~aa4 Section 3.36 ~aa4P

Section 3.38 ~aa5ppss

Related Topics:

None

3.40. ~aa5S

Description:

Set current digital output value as the safe value for a specified module.

Syntax:

~aa5S [CHKSUM](CR)

~ Delimiter character.

aa The address of the module to be read in hex format (00 to FF).

5S Command for setting current digital output value as the safe value.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

! Delimiter character to indicate that the command was valid.

? Delimiter character to indicate that the command was invalid.

aa The address of the responding module in hex format (00 to FF).

Examples:

Command:	@013	Response:	>
	Set module 01 digital output value to 3, and the module returns a response indicating that the command was valid.		

Command:	~015S	Response:	!01
	Set current digital output value of module 01 as the safe value and returns success.		

Related Command:

Section 3.30	~**	Section 3.31	~aa0
Section 3.32	~aa1	Section 3.33	~aa2
Section 3.34	~aa3ehh	Section 3.35	~aa4
Section 3.37	~aa4S	Section 3.38	~ aa5ppss

Related Topics:

None

3.41. ~aaD

Description:

Read temperature scale of the module.

Syntax:

~aaD [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
D	The command for read temperature scale.

Response:

Valid Command: **!aat[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
t	Temperature scale. C → Celsius (℃), F → Fahrenheit (℉)

Examples:

Command:	~01D	Response:	!01C
	Read module 01 temperature scale returns C (℃).		

Related Command:

Section 3.13 #aa Section 3.42 ~aaDt

Related Topics:

None

3.42. ~aaDt

Description:

Set temperature scale to the module.

Syntax:

~aaDt [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
D	The command for read temperature scale.
t	Temperature scale. C → Celsius (℃), F → Fahrenheit (℉)

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~01DF	Response:	!01
	Set module 01 temperature scale to F (℉) and returns success.		

Command:	~01D	Response:	!01F
	Read module 01 temperature scale returns F (℉).		

Related Command:

Section 3.13 #aa Section 3.41 ~aaD

Related Topics:

None

3.43. ~aaRS

Description:

Read current address and configure DIP switch value of the module.

Syntax:

~aaRS [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
RS	The command for read the DIP switches value.

Response:

Valid Command: **!aard[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
r	Address DIP switch value, range is from 0 ~ F.
d	Configure DIP switch value, range is from 0 ~ F.

Examples:

Command:	~03RS	Response:	!0331
	Read module 03 switch value returns address DIP switch value is 3 and configure DIP switch value is 1.		

Related Command:

None

Related Topics:

Section 2.5 DIP Switch Configuration

3.44. ~aaRD

Description:

This command is used to read the response delay time for a specified module.

Syntax:

~aaRD [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
RD	The command to read the response delay time.

Response:

Valid Command: **!aahh[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).
hh	Response delay time, range is from 00 ~ 1E in 1 ms intervals.

Examples:

Command:	~03RD1E	Response:	!03
	Set the response delay time for module 03 to 1E (30 ms), and returns a response indicating that the command was valid.		

Command:	~03RD	Response:	!031E
	Read the response delay time for module 03 and returns a response indicating that the command was valid, with a value of 1E (30 ms).		

Related Command:

Section 3.45 ~aaRDhh

Related Topics:

None

3.45. ~aaRDhh

Description:

This command is used to set the response delay time for a specified module.

Syntax:

~aaRDhh [CHKSUM](CR)

~	Delimiter character.
aa	The address of the module to be read in hex format (00 to FF).
RD	The command to read the response delay time.
hh	Response delay time, range is from 00 ~ 1E in 1 ms intervals.

Response:

Valid Command: **!aa[CHKSUM](CR)**

Invalid Command: **?aa[CHKSUM](CR)**

!	Delimiter character to indicate that the command was valid.
?	Delimiter character to indicate that the command was invalid.
aa	The address of the responding module in hex format (00 to FF).

Examples:

Command:	~03RD1E	Response:	!03
	Set the response delay time for module 03 to 1E (30 ms), and returns a response indicating that the command was valid.		

Command:	~03RD	Response:	!031E
	Read the response delay time for module 03 and returns a response indicating that the command was valid, with a value of 1E (30 ms).		

Related Command:

Section 3.44 ~aaRD

Related Topics:

None

4. Modbus RTU Protocol

The Modbus protocol was originally developed for Modicon controllers by Modicon Inc. Detailed information related to the Modbus RTU protocol can be found at http://www.modbus.org for more valuable information.

The SC-4104-W1 module supports the Modbus RTU protocol, with communication baud rates ranging from 1200 bps to 115200 bps. The data bits, parity and stop bits are supported 8 n 1, 8 n 2, 8 e 1 and 8 o 1. The following Modbus functions are supported.

Function Code	Description	Section
0x01	Read the coils	
0x02	Read the discrete inputs	
0x03	Read multiple registers	
0x04	Read multiple input registers	
0x05	Write a single coil	
0x06	Write a single register	
0x0F	Write multiple coils	
0x10	Write multiple registers	
0x46	Read/Write the module settings	

If the function specified in the message is not supported, then the module responds as below. Note that the address mapping for the Modbus protocol is Base 0.

Error Response

Byte	Description	Length (Byte)	Value
00	Address	1	1 ~ 247
01	Function Code	1	Function Code + 0x80
02	Exception Code	1	02: Register not support 03: Modbus format invalid

Note: If a CRC mismatch occurs, the module will not respond.

4.1. Modbus Address Mapping

Coils

Address		Description	Attribute
00001	10001	Digital Output RL1	R / W
00002	10002	Digital Output RL2	R / W
00003	10003	Digital Output RL3	R / W
00004	10004	Digital Output RL4	R / W
	10033	Digital Input Channel	R
00129	10129	Digital Output RL1 Safe Value	R / W
00130	10130	Digital Output RL2 Safe Value	R / W
00131	10131	Digital Output RL3 Safe Value	R / W
00132	10132	Digital Output RL4 Safe Value	R / W
00161	10161	Digital Output RL1 Power-on Value	R / W
00162	10162	Digital Output RL2 Power-on Value	R / W
00163	10163	Digital Output RL3 Power-on Value	R / W
00164	10164	Digital Output RL4 Power-on Value	R / W
00257	10257	Communication Protocol 0: DCON 1: Modbus RTU	R / W
00260	10260	Modbus host watchdog mode 0: do not allow DO command when watchdog timeout occur 1: can use DO command to clear host watchdog timeout status	R / W
00261	10261	1: enable, 0: disable host watchdog	R / W
00267	10267	Temperature Scale 0: Celsius (℃) 1: Fahrenheit (℉)	R / W
00268	10268	DCON Protocol Checksum 0: Enable 1: Disable	R / W
00270	10270	Host watch dog timeout status, write 1 to clear host watch dog timeout status	R / W
00273	10273	Read the Reset Status 0: This is NOT the first time the module has been read since being powered on	R

		1: This is the first time the module has been read since being powered on	
00274	10274	Coordinate the status between DI and DO 0: Enable 1: Disable	R / W
	10321	Configure DIP Switch Bit 0	R
	10322	Configure DIP Switch Bit 1	R
	10323	Configure DIP Switch Bit 2	R
	10324	Configure DIP Switch Bit 3	R
	10325	Address DIP Switch Bit 0	R
	10326	Address DIP Switch Bit 1	R
	10327	Address DIP Switch Bit 2	R
	10328	Address DIP Switch Bit 3	R

Register

Address		Description	Attribute
30001		Temperature Analog Input Channel	R
30274		Coordinate Function 0x0 ~ 0x18 (section 3.6)	R
30275	40275	Alarm temperature (Alarm_T) for temperature function (section 3.18, 3.20)	R / W
30276	40276	Protection time of relay switch with temperature jitter. Default is 0x0A second (section 3.26).	R / W
30277	40277	Delta temperature (Delta_T) (section 3.22)	R / W
30278	40278	Increase temperature (Increase_T). Default value is 0xC8 0.01℃ unit (section 3.24).	R / W
30289	40289	Temperature Offset (offset unit: 0.1)	R / W
30481		Firmware Version (Low Word)	R
30482		Firmware Version (High Word) Read 40482 and 40483 Response: 0x00 0x01 0x00 0x01 (version 1.01)	R
30483		Module Name (Low Word)	R
30484		Module Name (High Word) Read 40483 and 40484 Response: 0x41 0x04 0x53 0x43 (SC4104)	R
30485	40485	Module Address Valid Range: 1 ~ 247	R / W
30486	40486	Module Baud Rate See Section 2.6 Software Configuration Table	R / W

30488	40488	Modbus Response Delay Time (≤ 30ms) Valid Range: 0x0000 ~ 0x001E ms	R / W
30489	40489	Host watchdog timeout value, 0 ~ 255, in 0.1s	R / W
30492	40492	Host watchdog timeout count, write 0 to clear	R / W
30498	40498	Module Boot Up Delay Time (≤ 3000ms) Valid Range: 0x0000 ~ 0x0BB8 ms	R / W

4.2. Function 01 - Read Coils

This function code is used to read the value at addresses 0xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x01
02 – 03	Reference Address	Refer to section 4.1 – Address 0xxxx
04 – 05	Bit Count	Number of bit (**B**) to read

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x01
02	Byte Count	Response data byte **N = B/7**
03 – (**N**+2)	Bit Value	Response bit data

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x81
02	Exception Code	Refer to section 4 – Error Response

4.3. Function 02 - Read Discrete Inputs

This function code is used to read the value at addresses 1xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x02
02 – 03	Reference Address	Refer to section 4.1 – Address 1xxxx
04 – 05	Bit Count	Number of bit (**B**) to read

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x02
02	Byte Count	Response data byte **N = B/7**
03 – (**N**+2)	Bit Value	Response bit data

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x82
02	Exception Code	Refer to section 4 – Error Response

4.4. Function 03 - Read Multiple Registers

This function code is used to read the value at addresses 4xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x03
02 – 03	Reference Address	Refer to section 4.1 – Address 4xxxx
04 – 05	Word Count	Number of word (**W**) to read

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x03
02	Byte Count	Response data byte **N = W*2**
03 – (**N**+2)	Word Value	Response word data

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x83
02	Exception Code	Refer to section 4 – Error Response

4.5. Function 04 - Read Multiple Input Registers

This function code is used to read the value at addresses 3xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x04
02 – 03	Reference Address	Refer to section 4.1 – Address 3xxxx
04 – 05	Word Count	Number of word (**W**) to read

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x04
02	Byte Count	Response data byte **N = W*2**
03 – (**N**+2)	Word Value	Response word data

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x84
02	Exception Code	Refer to section 4 – Error Response

4.6. Function 05 – Write Single Coil

This function code is used to write a value to addresses 0xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x05
02 – 03	Reference Address	Refer to section 4.1 – Address 0xxxx
04 – 05	Output Value	Output ON: 0xFF00 Output OFF: 0x0000

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x05
02 – 03	Reference Address	The same as byte 02 – 03 of request
04 – 05	Output Value	The same as byte 04 – 05 of request

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x85
02	Exception Code	Refer to section 4 – Error Response

4.7. Function 06 – Write Single Register

This function code is used to write a value to addresses 4xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x06
02 – 03	Reference Address	Refer to section 4.1 – Address 0xxxx
04 – 05	Output Value	A word value

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x06
02 – 03	Reference Address	The same as byte 02 – 03 of request
04 – 05	Output Value	The same as byte 04 – 05 of request

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x86
02	Exception Code	Refer to section 4 – Error Response

4.8. Function 15 – Write Multiple Coils

This function code is used to write values to addresses 0xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x0F
02 – 03	Reference Address	Refer to section 4.1 – Address 0xxxx
04 – 05	Bit Count	Number of bit (**B**) to write
06	Byte Count	Byte number **N = B/7**
07 – (**N**+6)	Write Data	A bit corresponds to a channel. Output ON: The bit = 1 Output OFF: The bit = 0

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x0F
02 – 03	Reference Address	The same as byte 02 – 03 of request
04 – 05	Output Value	The same as byte 04 – 05 of request

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x8F
02	Exception Code	Refer to section 4 – Error Response

4.9. Function 16 – Write Multiple Registers

This function code is used to write values to addresses 4xxxx.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x10
02 – 03	Reference Address	Refer to section 4.1 – Address 0xxxx
04 – 05	Word Count	Number of word (**W**) to write
06	Byte Count	Byte number **N = W*2**
07 – (**N**+6)	Write Data	Multiple word data

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x10
02 – 03	Reference Address	The same as byte 02 – 03 of request
04 – 05	Output Value	The same as byte 04 – 05 of request

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x90
02	Exception Code	Refer to section 4 – Error Response

4.10. Function 70 – Read/Write Module Setting

This function code is used to read the configuration settings from the module or to change the settings for the module. The following sub-function codes are supported.

Sub-function Code	Description	Section
00(0x00)	Read the name of the module	4.10.1
04(0x04)	Set the module address	4.10.2
05(0x05)	Read the communication settings	4.10.3
06(0x06)	Set the communication settings	4.10.4
32(0x20)	Read the firmware version	4.10.5
39(0x27)	Set the digital output power-on value	4.10.6
40(0x28)	Read the digital output power-on value	4.10.7
53(0x35)	Set the response delay time	4.10.8
54(0x36)	Read the response delay time	4.10.9

If the module does not support the sub-function code specified in the message, then it will respond as follows:

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.1. Sub-function 00 – Read Module Name

This sub-function code is used to read the name of the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x00

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x00
03 – 06	Module Name	0x53 0x43 0x41 0x04 (SC-4104)

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.2. Sub-function 04 – Write Module Address

This sub-function code is used to set the address of the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x04
03	New Address	1 ~ 247
04 – 06	Reserved	0x00 0x00 0x00

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x04
03	New Address	0: OK. Others: Error
04 – 06	Reserved	0x00 0x00 0x00

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.3. Sub-function 05 – Read Communication Setting

This sub-function code is used to read the communication protocol settings for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x05
03	Reserved	0x00

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x05
03	Reserved	0x00
04	Baud Rate	Refer to section 2.6 Baud Rate Setting
05 – 07	Reserved	0x00
08	Mode	0: DCON. 1: Modbus RTU
09 – 10	Reserved	0x00 0x00

Note: This information is the data saved in the EEPROM and will be used for the next power-on reset. It is NOT the currently used settings

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.4. Sub-function 06 – Write Communication Setting

This sub-function code is used to configure the communication protocol for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x06
03	Reserved	0x00
04	Baud Rate	Refer to section 2.6 Baud Rate Setting
05 – 07	Reserved	0x00
08	Mode	0: DCON. 1: Modbus RTU
09 – 10	Reserved	0x00 0x00

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x06
03	Reserved	0x00
04	Baud Rate	Refer to section 2.6 Baud Rate Setting
05 – 07	Reserved	0x00
08	Mode	0: DCON. 1: Modbus RTU
09 – 10	Reserved	0x00 0x00

Note: This information is the data saved in the EEPROM and will be used for the next power-on reset. It is NOT the currently used settings

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.5. Sub-function 32 – Read Firmware Version

This sub-function code is used to read the firmware version information for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x20

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x20
03	Major Version	0x00 – 0xFF
04	Minor Version	0x00 – 0xFF
05	Build Version	0x00 – 0xFF

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.6. Sub-function 39 – Write Power-on Value

This sub-function code is used to set the power-on value for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x27
03	Power-on Value	0x00 ~ 0x0F

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x27
03	Power-on Value	0: OK. Others: Error

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.7. Sub-function 40 – Read Power-on Value

This sub-function code is used to read the power-on value for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x28

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x28
03	Power-on Value	0x00 ~ 0x0F

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.8. Sub-function 53 – Set Response Delay Time

This sub-function code is used to set the Modbus RTU response delay time for the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x35
03	Response Delay Time	0x00 ~ 0x1E (ms)

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x35
03	Response Delay Time	0: OK. Others: Error

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response

4.10.9. Sub-function 54 – Read Response Delay Time

This sub-function code is used to read the Modbus RTU response delay time of the SC-4104-W1 module.

Request

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function code	0x36

Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0x46
02	Sub-function Code	0x36
03	Response Delay Time	0x00 ~ 0x1E (ms)

Error Response

Byte	Description	Value
00	Module ID	1 ~ 247
01	Function Code	0xC6
02	Exception Code	Refer to section 4 – Error Response