LC-223H User Manual

Warranty

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

Warning

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Date: 2018/01/25

Table of Contents

1 Introduction

The LC-223H is an easy-to-use dimming ballast control module that can be easily installed and operated without requiring specialist knowledge or skills. The brightness of a fluorescent lamp can be controlled using a dimmer, either via digital input or a host controller. The digital input can be used to directly control the light value of the luminous flux in sequence from 10% to 100%, without the need for a remote host controller. 4 kV ESD protection and 2500 V_{DC} intra-module isolation are also provided. When required, communication with the LC-223H is programmable based on the Modbus RTU/DCON protocol, with the added benefit that different addresses can be set via hardware configuration.

2 Hardware Information

2.1 IO Specifications

Analog Output		
Channels		1
Type		0 to 20 mA, 4 to 20 mA, 0 to 10 V, 1 to 10 V
Resolution		12-bit
Accuracy		+/-0.1% of FSR
DA Output Response Time		10 ms
Voltage Output Capability		20 mA
Current Load Resistance		450 Ω
Digital Input		
Wet Contact Input Channels		1 for the Dimming Trigger
Dry Contact Input Channels		2 for the Wall Switch Control
Wet	On Voltage Level	65 V_{AC} to 240 V_{AC}
	Off Voltage Level	58 V_{AC} Max.
Dry	On Voltage Level	Close to GND

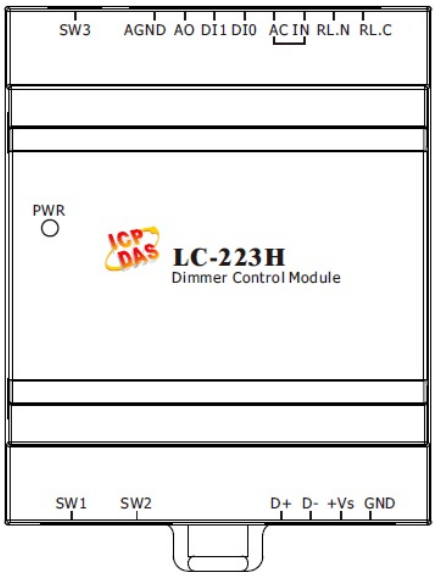
	Off Voltage Level	Open
Relay Output		
Channels		1
Type		Power Relay, Form A (SPST N.O.)
Operating Voltage		250 V_{AC} or 30 V_{DC}
Max. Load Current		16 A (Res. Load) (1).250 VAC (Recommend Working Current 1.5 A)
Operate Time		10 ms Max.
Release Time		5 ms Max.
Mechanical Endurance		5,000,000 ops.
Electrical Endurance		120,000 ops.
Application Specification		(1).Incandescent Lamp: 40W/ 220VAC * 8 Sets (2).LED(Electronic ballast): 40W/ 220VAC * 10 Sets
Power-on and Safe Values		Yes, Programmable

2.2 System Specifications

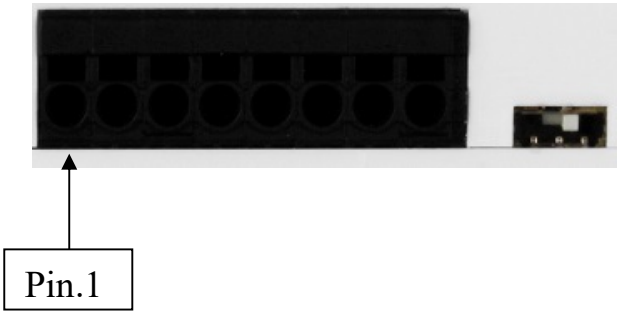
Communication	
Interface	RS-485
Format	N,8,1
Baud Rate	1200 to 115200 bps
Protocol	DCON , Modbus RTU
Node Addresses	64 to 95
LED Indicators	
Power	1 LED as Power Indicator
Isolation	
Intra-module Isolation, Field-to-Logic	2500 V_{DC}
EMS Protection	
ESD (IEC 61000-4-2)	±4 kV Contact for Each Terminal ±4 kV Air for Random Point
EFT (IEC 61000-4-4)	±4 kV for Power
SURGE(IEC 61000-4-5)	±2 kV for Power
Power	
Reverse Polarity Protection	Yes

Powered from Terminal Block	Yes, 10 to 30 V_{DC}
Consumption	1.5 W Max.
Mechanical	
Dimensions (W x L x H)	72 mm x 100 mm x 59 mm
Installation	DIN-Rail Mounting
Environment	
Operating Temperature	-25°C to +75°C
Storage Temperature	-30°C to +80°C
Humidity	10 to 95% RH, Non-condensing

2.3 Pin Assignments



2.3.1 CN1 Connector

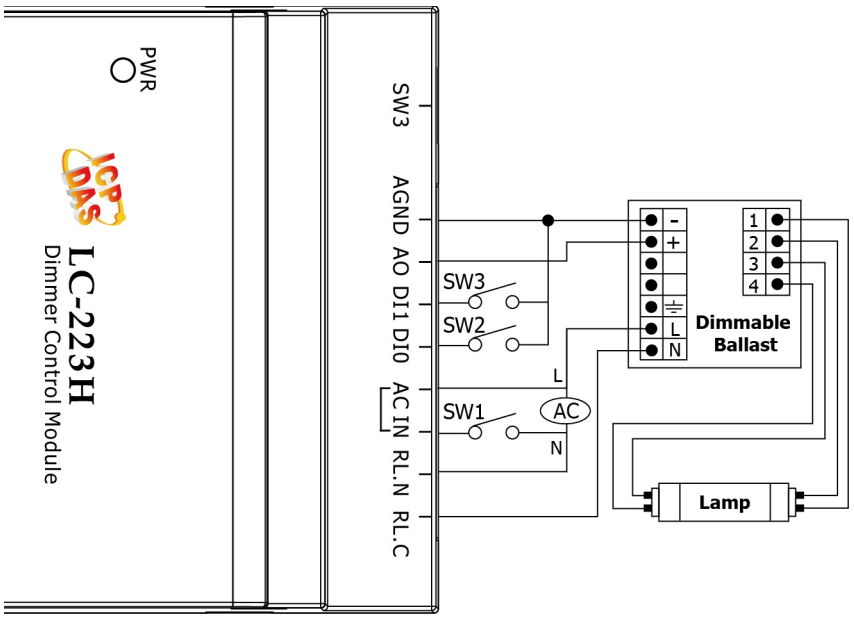


No.	Pin	Function
1	RL.C	Relay Output
2	RL.N	
3	AC_IN	Wet Contact Input Channels
4	AC_IN	
5	DI0	Dry Contact Input Channels
6	DI1	Dry Contact Input Channels
7	AO	Analog Output Voltage Or Current
8	AGND	Analog Output Ground

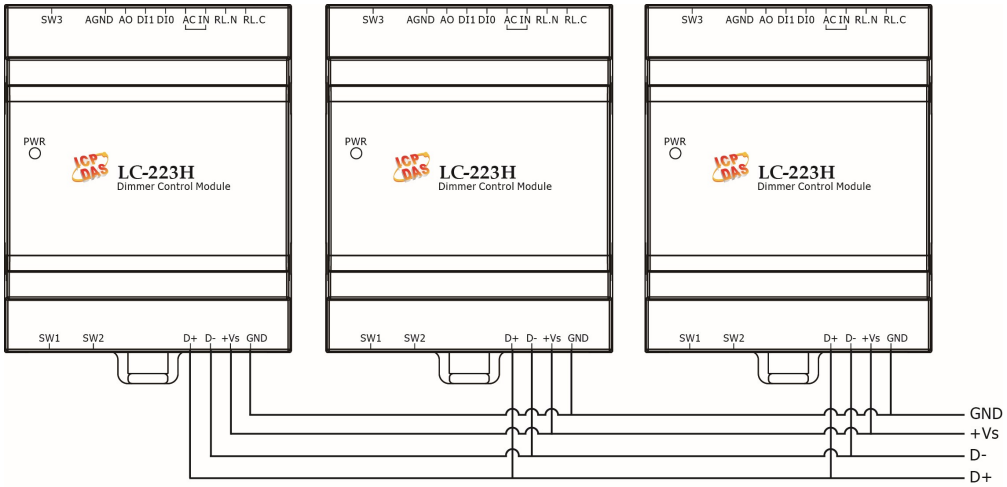
2.3.2CN2 Connector

No.	Pin	Function
1	GND	Ground
2	VSS	Power Supply
3	D-	RS-485 Data-
4	D+	RS-485 Data+

2.4 Wire Connections



2.5 Power and Communication

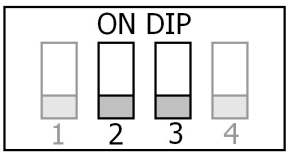
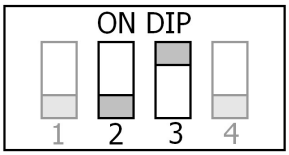


2.6 DIP Switch and Jumper Settings

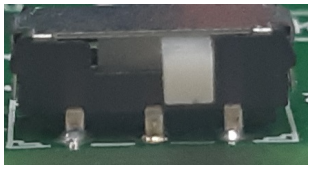
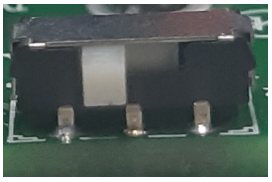
2.6.1 Configuration(SW2)

SW2 	1	Protocol	ON	DCON
			OFF	Modbus RTU
	2	Configuration	ON	By Software
			OFF	By Hardware
	3	Address	ON	Added by 16
			OFF	Added by 0
	4	INIT mode	ON	INIT
			OFF	Normal

2.6.2Address Settings via Hardware Configuration(SW1)

SW1 		0 ~ F for Addresses 64 ~ 79 (Low Node Address)
		0 ~ F for Addresses 80 ~ 95 (High Node Address)

2.6.3Analog Output Settings via SW3

SW3	
Vout	Iout
	

3 Modbus Address Mapping

<table>
<tr><th>Address</th><th>Description</th><th>Attribute</th></tr>
<tr><td>30065</td><td>Analog output read back</td><td>R</td></tr>
<tr><td>30129</td><td>Counter value for digital input</td><td>R</td></tr>
<tr><td>40033</td><td>Analog output value</td><td>R/W</td></tr>
<tr><td>40097</td><td>Safe analog output value</td><td>R/W</td></tr>
<tr><td>40161</td><td>Action on falling edge of DI channel 1 and 2, 0 for relay off, 1 to 10 for 10% to 100% of dimming and relay on. Refer to Section 5 for details.</td><td>R/W</td></tr>
<tr><td>40193</td><td>Power-on analog output value</td><td>R/W</td></tr>
<tr><td>40289</td><td>Analog output slew rate</td><td>R/W</td></tr>
<tr><td>40417</td><td>Analog output type code</td><td>R/W</td></tr>
<tr><td>40481</td><td>Firmware version (low word)</td><td>R</td></tr>
<tr><td>40482</td><td>Firmware version (high word)</td><td>R</td></tr>
<tr><td>40483</td><td>Module name (low word)</td><td>R</td></tr>
<tr><td>40484</td><td>Module name (high word)</td><td>R</td></tr>
<tr><td>40485</td><td>Module address, valid range: 1 ~ 247</td><td>R/W</td></tr>
<tr><td>40486</td><td>Bits 5:0
Baud Rate, 0x03 ~ 0x0A
<table>
<tr><td>Code</td><td>0x03</td><td>0x04</td><td>0x05</td><td>0x06</td></tr>
<tr><td>Baud</td><td>1200</td><td>2400</td><td>4800</td><td>9600</td></tr>
<tr><td>Code</td><td>0x07</td><td>0x08</td><td>0x09</td><td>0x0A</td></tr>
<tr><td>Baud</td><td>19200</td><td>38400</td><td>57600</td><td>115200</td></tr>
</table>
Bits 7:6
00: no parity, 1 stop bit
01: no parity, 2 stop bits
10: even parity, 1 stop bit
11: odd parity, 1 stop bit</td><td>R/W</td></tr>
<tr><td>40488</td><td>Modbus response delay time in ms, valid range: 0 ~ 30</td><td>R/W</td></tr>
<tr><td>40489</td><td>Host watchdog timeout value, 0 ~ 255, in 0.1s</td><td>R/W</td></tr>
<tr><td>40492</td><td>Host watchdog timeout count, write 0 to clear</td><td>R/W</td></tr>
</table>

Address	Description	Attribute
40494	Minimal voltage, 1 ~ 9 in volt.	R/W
40498	Digital filter time of DI channel 1 and 2 in ms, 3 ~ 255	R/W
10033 ~ 10035	Digital input value of channel 0 to 2	R
10065 ~ 10067	DI High latched values of channel 0 to 2	R
10073	DO High latched values	R
10097 ~ 10099	Low latched values of DI channel 0 to 2	R
10105	Low latched values of DO	R
00001	Digital output value of channel 0	R/W
00033 ~ 00035	Digital input value of channel 0 to 2	R
00065 ~ 00067	High latched values of DI channel 0 to 2	R
00073	High latched values of DO	R
00097 ~ 00099	Low latched values of DI channel 0 to 2	R
00105	Low latched values of DO	R
00129	Safe value of digital output channel 0	R/W
00161	Power on value of digital output channel 0	R/W
00193	Counter update trigger edge of channel 0	R/W
00257	Protocol, 0: DCON, 1: Modbus RTU	R/W
00258	0: Modbus RTU, 1: Modbus ASCII	R/W
00260	Modbus host watchdog mode 0: same as I-7000 1: can use AO and DO command to clear host watchdog timeout status	R/W
00261	1: enable, 0: disable host watchdog	R/W
00264	Write 1 to clear latched DIO	W

Address	Description	Attribute
00265	DI active state, 0: normal, 1: inverse Not available to DI channel 0.	R/W
00266	DO active state, 0: normal, 1:inverse	R/W
00268	Dimming control switch type, 0: push button type, 1: toggle type	R/W
00269	Modbus data format, 0: hex, 1: engineering	R/W
00270	Host watch dog timeout status, write 1 to clear host watch dog timeout status	R/W
00271	Select dimming control DI channel, 0 for channel 0, 1 for channel 2	R/W
00273	Reset status, 1: first read after powered on, 0: not the first read after powered on	R
00513 ~ 00515	Write 1 to clear counter value of channel 0 to 2	W

4 Type Codes

Type Code	Output Range	Data Format	Max	Min
0	0 ~ 20 mA	Engineering	20000	0
		Hexadecimal	FFFFh	0000h
1	4 ~ 20 mA	Engineering	20000	4000
		Hexadecimal	FFFFh	0000h
2	0 ~ 10 V	Engineering	10000	0
		Hexadecimal	FFFFh	0000h
4	0 ~ 5 V	Engineering	5000	0
		Hexadecimal	FFFFh	0000h
7[*1]	1 ~ 10 V	Engineering	10000	1000
		Hexadecimal	FFFFh	0000h

5 Function Descriptions

DI channel 0 or DI channel 2 can be used for dimming control. The Modbus register 00271 is used to specify which channel is used for dimming control.

If the DI channel 0 is used for dimming control, then both DI channel 1 and DI channel 2 can be used to turn the light on or off. In this case, when the state of one of the DI channel 1 and DI channel 2 is changed from off to the on state, the light is turned on to the previous dimming state. When the state of one of the DI channel 1 and DI channel 2 is changed from on to the off state and the other DI channel is at the off state, the light is changed to the state specified by the Modbus register 40161. If the other DI channel is at the on state, then the light is not changed.

If the DI channel 2 is used for dimming control, then DI channel is of no use and DI channel 1 is used to turn the light on or off. In this case, when the state of the DI channel 1 is changed from off to the on state, the light is turned on to the previous dimming state. When the state of the DI channel 1 is changed form on to the off state, the light is changed to the state specified by the Modbus register 40161.

The dimming control switch type can be push button type or toggle type, as specified by Modbus register 00268.

For push button type, the dimming control is operated as follows.

- If the switch is pressed for less than one second, then the switch is considered to be a normal switch and is used to turn the light on or off.

- If the switch is pressed and remains pressed for longer than one second, then the switch is considered to be a dimmer controller that can be used to adjust the brightness of the light.

- The dimming control process can be ended at any time by releasing the switch. The next time the switch is pressed, dimming control will begin form the exact position of the last break is control.

- The dimming control is cyclic, meaning that once the brightness control reaches its maximum position(100%), the next control action will begin to decrease the brightness value. Similarly, once the brightness control reaches its minimum position(10%), the next control action will begin to increase the brightness.

For toggle type, the dimming control is operated as follows

- Normally, the on or off of the switch is used to turn the light on or off.

- When the switch is off for less than one second, then the on state of the switch is considered to be a dimmer controller that can be used to adjust the brightness of the light.

- The dimming control process can be ended at any time by turning off the switch. The next time the switch is turned on after a short off time, dimming control will begin from the exact position of the last break is control.

- The dimming control is cyclic, meaning that once the brightness control reaches its maximum position (100%), the next control action will begin to decrease the brightness value. Similarly, once the brightness control reaches its minimum position (10%), the next control action will begin to increase the brightness.