

LC-221 User Manual

Warranty

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1 Introduction

The LC-221 is an easy-to-use dimming ballast control module that requires no specialist skills to install and operate. It provides two methods of controlling the brightness of fluorescent lamps via a dimmer, either via digital input or via a host controller. The digital input can be used to directly control the light value from 10% to 100% luminous flux in sequence, without requiring a remote host controller. 4 kV ESD protection and 2500 VDC intra-module isolation are also provided. When required, communication with the LC-221 is programmable based on the Modbus RTU protocol, and an added benefit is that different addresses can be set for Modbus RTU communication via hardware configuration.

2 Hardware Information

2.1 IO Specifications

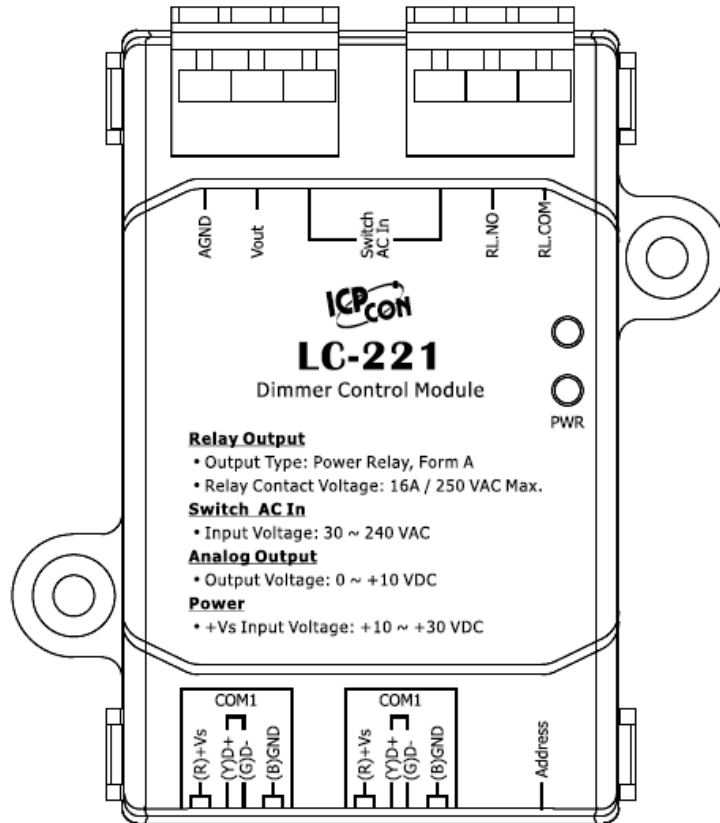
Analog Output	
Channels	1
Type	0 ~ 20 mA, 4 ~ 20 mA, 0 ~ 10 V
Resolution	12-bit
Accuracy	+/-0.1% of FSR
DA Output Response Time	10 ms
Voltage Output Capability	20 mA
Current Load Resistance	450 Ω
Digital Input	
Channels	1
Type	Wet
On Voltage Level	85 VAC
Off Voltage Level	45 VAC Max.
Input Impedance	68 K Ω , 1 W
Relay Output	
Channels	1
Type	Power Relay, Form A (SPST N.O.)
Operating Voltage	250 VAC or 30 VDC
Max. Load Current	16 A (Res. Load)
Operate Time	15 ms Max.

Release Time	5 ms Max.
Mechanical Endurance	10,000,000 ops.
Electrical Endurance	50,000 ops.
Power-on and Safe Values	Yes, programmable

2.2 System Specifications

Communication	
Interface	RS-485
Format	N,8,1
Baud Rate	1200 ~ 115200 bps
Protocol	DCON , Modbus RTU
Node Addresses	64 ~ 95
Connector	RJ-11
LED Indicators	
Power	1 LED as Power Indicator
Isolation	
Intra-module Isolation, Field-to-Logic	2500 VDC
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
Power	
Reverse Polarity Protection	Yes
Powered from Terminal Block	Yes, 10 ~ 30 VDC
Consumption	1.4 W Max.
Mechanical	
Dimensions (W x L x H)	52 mm x 98 mm x 27 mm
Installation	Screw Mounting
Environment	
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30°C ~ +75°C
Humidity	10 ~ 95% RH, Non-condensing

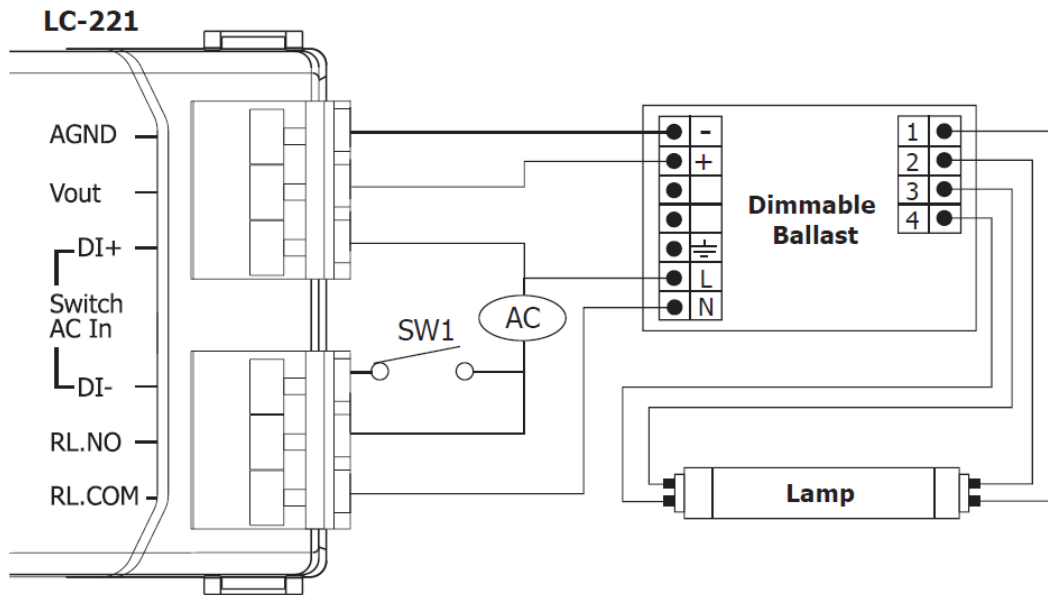
2.3 Pin Assignments



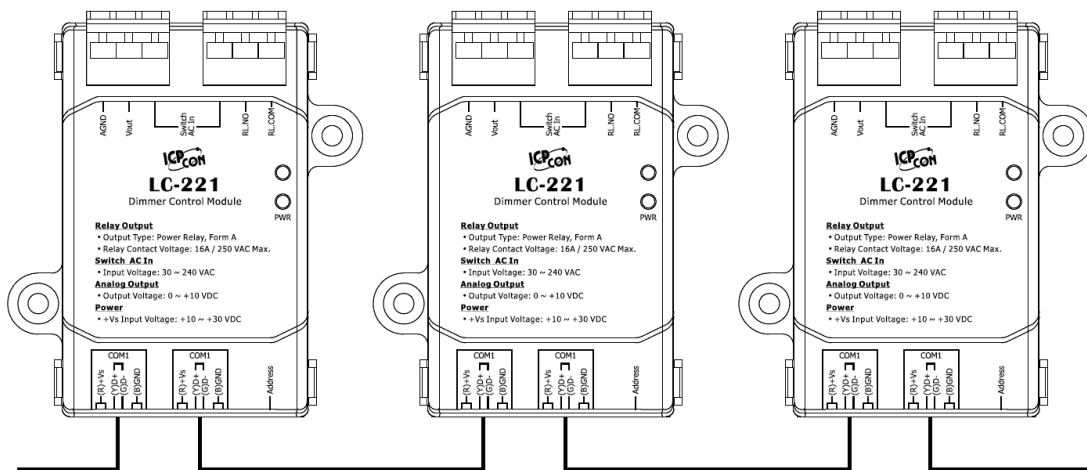
RJ-11 Connector

Pin	Descriptions	
	1	+VS
2		
3	DATA+	RS-485 Serial Communication Interface
4	DATA-	
5	GND	Ground
6		

2.4 Wire Connections



2.5 Power and Communication



RS-485 and power input daisy chain using RJ-11 connectors

2.6 DIP Switch and Jumper Settings

	SW1	ON	DCON Protocol
		OFF	Modbus RTU Protocol
	SW2	ON	Software Configuration
		OFF	Hardware Configuration
	SW3	ON	High Node Address
		OFF	Low Node Address
	SW4	ON	INIT Mode
		OFF	Normal Mode

Address Settings via Hardware Configuration

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

Analog Output Settings via JP4

JP4					
Vout			Iout		

3 Modbus Address Mapping

Address	Description	Attribute																				
30065	Analog output read back	R																				
30129	Counter value for digital input	R																				
40033	Analog output value	R/W																				
40097	Safe analog output value	R/W																				
40193	Power-on analog output value	R/W																				
40289	Analog output slew rate	R/W																				
40417	Analog output type code	R/W																				
40481	Firmware version (low word)	R																				
40482	Firmware version (high word)	R																				
40483	Module name (low word)	R																				
40484	Module name (high word)	R																				
40485	Module address, valid range: 1 ~ 247	R/W																				
40486	Bits 5:0 Baud Rate, 0x03 ~ 0x0A <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <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> </tbody> </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	Code	0x03	0x04	0x05	0x06	Baud	1200	2400	4800	9600	Code	0x07	0x08	0x09	0x0A	Baud	19200	38400	57600	115200	R/W
Code	0x03	0x04	0x05	0x06																		
Baud	1200	2400	4800	9600																		
Code	0x07	0x08	0x09	0x0A																		
Baud	19200	38400	57600	115200																		
40488	Modbus response delay time in ms, valid range: 0 ~ 30	R/W																				
40489	Host watchdog timeout value, 0 ~ 255, in 0.1s	R/W																				
40492	Host watchdog timeout count, write 0 to clear	R/W																				
40494 ^{*1}	Minimal voltage, 1 ~ 9 in volt.	R/W																				
40495 ^{*1}	Toggle type switch off time to turn off the lamp, 3 ~ 50 in 100ms.	R/W																				
10033	Digital input value of channel 0	R																				
10065	DI High latched values	R																				

Address	Description	Attribute
10073	DO High latched values	R
10097	DI Low latched values	R
10105	DO Low latched values	R
00001	Digital output value of channel 0	R/W
00033	Digital input value of channel 0	R
00065	DI High latched values	R
00073	DO High latched values	R
00097	DI Low latched values	R
00105	DO Low latched values	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
00265	DI active state, 0: normal, 1: inverse	R/W
00266	DO active state, 0: normal, 1:inverse	R/W
00268 ^{*1}	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
00273	Reset status, 1: first read after powered on, 0: not the first read after powered on	R
00513	Write 1 to clear counter value of channel 0	W
*1: only available with firmware version A1.7 and later.		

4 Type Code

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 ~ 10V	Engineering	10000	1000
		Hexadecimal	FFFFh	0000h

*1: only available with firmware version A1.5 and later.

5 Function Descriptions

DI channel 0 is used for dimming control.

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 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 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 switch. The next time the switch is pressed, 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.

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.