# LC-103-C 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



## Trademarks

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

# Table of Contents

# Introduction

The LC-103-C is an easy-to-use lighting control module that requires no specialist skills to install and operate, and no software is needed in order to control the DO channels.

The LC-103-C provides 1 channel for digital input (photocouple isolation) and 3 channels for relay output. All output channels are form A type relays, while the input channel is based on a sink-type using a wire connection. The input channel can be used to directly control a 3-channel relay ON and OFF sequence without requiring a remote host controller. 4 kV ESD protection and 5000 Vrms intra-module isolation are also provided.

When required, communication with the LC-103-C is programmable based on the DCON protocol, and an added benefit is that different addresses can be set for DCON communication via hardware configuration.

# 1 Hardware Information

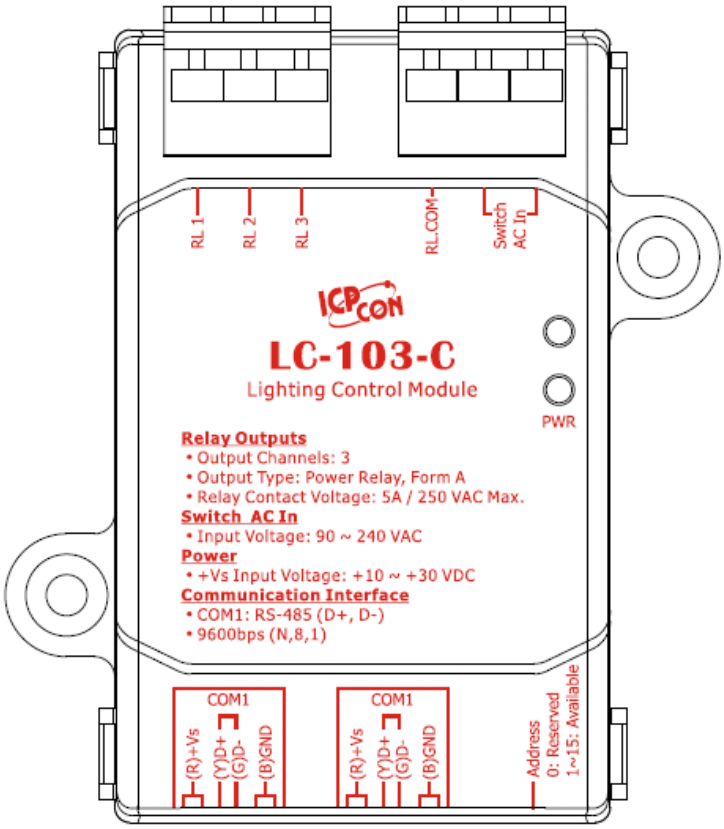
## 1.1 IO Specifications

| Digital Input | |
|---|---|
| Input Channels | 1 |
| Type | 90~240 VAC |
| On Voltage Level | 85 VAC |
| Off Voltage Level | 60 VAC |
| Input Impedance | 68 KΩ, 1 W |
| Isolation | 5000 Vrms |
| Function | Local and Remote Direct Control Relay ON/OFF and Remote Status Monitoring |
| Relay Output | |
| Output Channels | 3 |
| Type | Power Relay, Form A (SPST N.O.) |
| Operating Voltage | 250 VAC or 30 VDC |
| Max. Load Current | 5 A |
| Operating Time | 10 ms Max. |
| Release Time | 5 ms Max. |
| Electrical Life (Resistive load) | 100,000 ops |
| Mechanical Life | 20,000,000 ops at no load (300 ops/minute) |
| Safety Approval | UL/CUL, TÜV |
| Power-on Value | No |
| Safe Value | No |

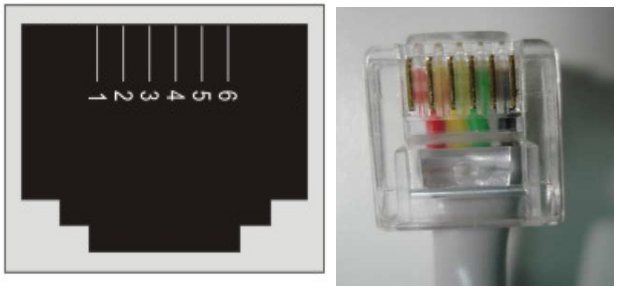
## 1.2 System Specifications

| | |
|---|---|
| Communication | |
| Interface | RS-485 |
| Format | N,8,1 |
| Baud Rate | 9600 bps |
| Protocol | Modbus RTU /DCON |
| Node Addresses | 1~31 |
| Connector | RJ-11 |
| LED Indicators | |
| Power | 1 LED as Power Indicator |
| EMS Protection | |
| ESD (IEC 61000-4-2) | ±2 kV Contact for Each Terminal |
| | ±4 kV Air for Random Point |
| EFT (IEC 61000-4-4) | ±2 kV for Power |
| Power Requirements | |
| Input Voltage Range | 10 ~ 30 VDC |
| Consumption | 0.5 W Max. |
| Connector | RJ-11 |
| Mechanical | |
| Dimensions (W x L x H) | 52 mm x 98 mm x 27 mm |
| Installation | Screw Mounting |
| Environment | |
| Operating Temperature | -25℃ ~ +75℃ |
| Storage Temperature | -30℃ ~ +75℃ |
| Humidity | 10 ~ 95% RH, Non-condensing |

## 1.3 Pin Assignments



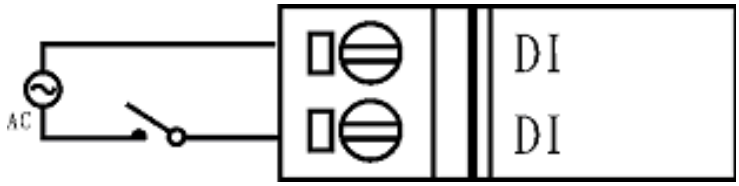
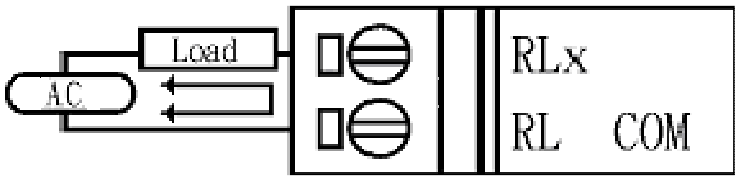
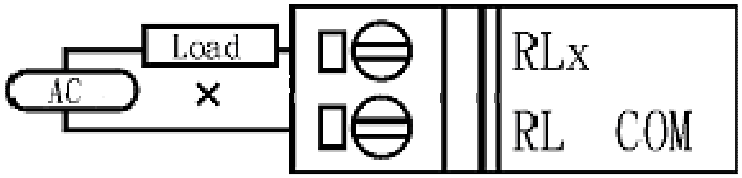

### RJ-11 Connector



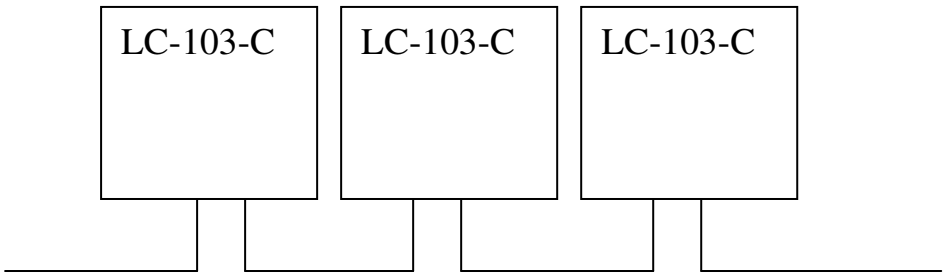

| Pin | Description | |
|---|---|---|
| 1 | +VS | Power Input Voltage (+10 VDC ~ 30 VDC) |
| 2 | +VS | Power Input Voltage (+10 VDC ~ 30 VDC) |
| 3 | DATA+ | RS-485 Serial Communication Interface |
| 4 | DATA- | |
| 5 | GND | Ground |
| 6 | GND | Ground |

## 1.4 Wire Connections

### DIO Wire Connections

| DI |
| --- |
|  |
| Relay Output ON |
|  |
| Relay Output OFF |
|  |

### Power and communication




RS-485 and Power Input Daisy Chain using an RJ-11 Connector

## 1.5 DI/O Data Format

The data format for the response to the **$AA4**, **$AA6** and **@AA** commands is:
**(the First Data value)(the Second Data value)**.

**Note:** Both the First Data value and the Second Data value are in the format of two hexadecimal digit.

# 2 DCON Protocol

All communication with LC-103-C modules consists of commands generated by the host and responses transmitted by the LC-103-C module. Each module has a unique ID number that is used for addressing purposes and is stored in non-volatile memory. The ID is 01 by default and can be changed by sedning a user command. All commands to the modules contain the ID address, meaning that only the addressed module will respond.

## Command Format:

| Leading Character | Module Address | Command | CR |
|---|---|---|---|

## Response Format:

| Leading Character | Module Address | Data | CR |
|---|---|---|---|

CR End of command character, carriage return (0x0D)

Note:
All characters should be in upper case.

| General Command Sets | | | |
|---|---|---|---|
| **Command** | **Response** | **Description** | **Section** |
| #AA00(Data) | > | Sets the Digital Output | 2.1 |
| #AA0A(Data) | > | Sets the Digital Output | 2.2 |
| #AA1CDD | > | Sets the Digital Output | 2.3 |
| #AAACDD | > | Sets the Digital Output | 2.4 |
| $AA5 | !AAS | Reads the Reset Status of the Module | 2.5 |
| $AA6 | !(Data) | Reads the Status of the Digital I/O channels | 2.6 |
| $AAF | !AA(Data) | Reads the Firmware Version of the Module | 2.7 |
| $AAM | !AA(Data) | Reads the Name of the Module | 2.8 |
| @AA | >(Data) | Reads the Status of the Digital I/O channels | 2.9 |
| @AA(Data) | > | Sets the Digital Output Channels | 2.10 |

## 2.1 #AA00(Data)

**Description:**

Ths command is used to set the digital output value for each of the three channels (RL1-RL3) of a specified module.

**Syntax:**

**#AA00(Data)(CR)**

| | |
|---|---|
| # | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| 00 | The command to set the digital output value for each of the three channels (RL1-RL3). |
| (Data) | A two-digit hexadecimal value, where bit 0 corresponds to RL1, bit 1 corresponds to RL2, etc. When the bit is 0, it denotes that the digital output channel is off, and 1 denotes that the digital output channel is on. |

**Response:**

| | |
|---|---|
| Valid: | **>(CR)** |
| Invalid: | **?AA(CR)** |
| Ignored Command: | **!(CR)** |

| | |
|---|---|
| > | Delimiter character to indicate the command was valid. |

?  Delimiter character to indicate the command was invalid.

!  Delimiter character to indicate the command was ingored.

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.

**Examples:**

Command: #020006

Response: >

Sets RL1 the module to off and sets RL2 and RL3 to on. The module returns a valid response.

**Related Commands:**

Section 2.2 #AA0A(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.2 #AA0A(Data)

**Description:**

Ths command is used to set the digital output value for each of the three channels (RL1-RL3) of a specified module.

**Syntax:**

**#AA0A(Data)(CR)**

| | |
|---|---|
| # | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| 0A | The command to set the digital output value (RL1, RL2 or RL3) |
| (Data) | A two-digit hexadecimal value, where bit 0 corresponds to RL1, bit 1 corresponds to RL2, etc. When the bit is 0, it denotes that the digital output channel is off, and 1 denotes that the digital output channel is on. |

**Response:**

| | |
|---|---|
| Valid: | **>(CR)** |
| Invalid: | **?AA(CR)** |
| Ignored Command: | !**(CR)** |

| | |
|---|---|
| > | Delimiter character to indicate the command was valid. |

?  Delimiter character to indicate the command was invalid.

!  Delimiter character to indicate the command was ingored.

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.

**Examples:**

Command: #020A02

Response: >

Sets RL1 the module to off and sets RL2 and RL3 to on. The module returns a valid response.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.3 #AA1CDD

**Description:**

Ths command is used to set the digital output value for a single channel of a specified module.

**Syntax:**

**#AA1CDD(CR)**

| | |
|---|---|
| # | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| 1 | The command to set the digital output value for a single channel. |
| C | Specifies the relay output channel to be set, zero based. (valid values: 0 to 2) |
| DD | The command to set the relay ouput channel<br>00: Sets the relay output channel to off.<br>01: Sets the relay output channel to on. |

**Response:**

| | |
|---|---|
| Valid: | **>(CR)** |
| Invalid: | **?AA(CR)** |
| Ignored Command: | **!(CR)** |

| | |
|---|---|
| > | Delimiter character to indicate the command was valid. |

?  Delimiter character to indicate the command was invalid.

!  Delimiter character to indicate the command was ingored.

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.

**Examples:**

Command: #021001

Response: >

Sets RL1 the module 02 to on, and the module returns a valid response.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.4 #AAACDD

**Description:**

Ths command is used to set the digital output value for a single channel of a specified module.

**Syntax:**

**#AAACDD (CR)**

| | |
|---|---|
| # | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| A | The command to set the digital output value for a single channel. |
| C | Specifies the relay output channel to be set, zero based. (valid values: 0 to 2). |
| DD | The command to set the relay ouput channel<br>00: Sets the relay output channel to off.<br>01: Sets the relay output channel to on. |

**Response:**

| | |
|---|---|
| Valid: | **>(CR)** |
| Invalid: | **?AA(CR)** |
| Ignored Command: | **!(CR)** |

| | |
|---|---|
| > | Delimiter character to indicate the command was valid. |

?  Delimiter character to indicate the command was invalid.

!  Delimiter character to indicate the command was ingored.

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.

**Examples:**

Command: #02A201

Response: >

Sets RL3 of module 02 to on, and the module returns a valid response.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.5 $AA5

**Description:**

Ths command is used to read the reset status of a specified module.

**Syntax:**

**$AA5(CR)**

| | |
|---|---|
| $ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| 5 | The command to read the reset status of the module. |

**Response:**

Valid: **!AAS(CR)**

Invalid: **?AA(CR)**

| | |
|---|---|
| **!** | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the command was invalid. |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| S | The reset status of the module<br>1: This is the first time the command has been sent since the module was powered on. |

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.

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.

**Examples:**

Command: $015

Response: !011

Reads the reset status of module 01and returns a valid response indicating that it is the first time the $AA5 command has been sent since the module was powered-on.

Command:$015

Response:!010

Reads the reset status of module 01 and returns a valid response indicating that there has been no module reset since the last $AA5 command was sent.

## 2.6 $AA6

**Description:**

Ths command is used to read the status of the digital input/output channels of a specified module.

**Syntax:**

**$AA6(CR)**

| | |
|---|---|
| $ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| 6 | The command to read the status of the digital input/output channels |

**Response:**

| | |
|---|---|
| Valid: | **!(Data)(CR)** |
| Invalid: | **?AA(CR)** |
| **!** | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the command was invalid. |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| (Data) | The status of the digital input/output channels, a four-digit hexadecimal value followed by 00. See Section 1.5 for more |

details.

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.

**Examples:**

Command: $026

Response: !070F

Reads the status of the digital input/output channels for module 02 and returns a valid response indicatinfs thst the current Digital Output value is 07 and the Digital Iutput value is 0F.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.7 $AAF

**Description:**

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

**Syntax:**

**$AAF(CR)**

| | |
|---|---|
| $ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| F | The command to read the firmware version |

**Response:**

Valid: **!AA(Data)(CR)**

Invalid: **?AA(CR)**

| | |
|---|---|
| **!** | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the command was invalid. |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| (Data) | A string indicating the firmware version of the module |

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.

**Examples:**

Command: $01F

Response: !0101.02

Reads the firmware version of module 01, and returns a valid response indicating that it is version 01.02.

## 2.8 $AAM

**Description:**

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

**Syntax:**

**$AAM(CR)**

| | |
|---|---|
| $ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| M | The command to read the name of the module |

**Response:**

| | |
|---|---|
| Valid: | **!AA(Data)(CR)** |
| Invalid: | **?AA(CR)** |
| **!** | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the command was invalid. |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| (Data) | A string indicating the name of the module |

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.

Command: $02M

Response: !02LC103

Reads the module 02 and returns a valid response indicating that the name of the module is "LC-103-C"

## 2.9 @AA

**Description:**

Ths command is used to read the status of the digital input/output channels of a specified module.

**Syntax:**

**@AA(CR)**

| | |
|---|---|
| @ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |

**Response:**

| | |
|---|---|
| Valid: | **>(Data)(CR)** |
| Invalid: | **?AA(CR)** |
| **>** | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the command was invalid. |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| (Data) | The status of the 3-bit digital input/output as four-digit hexadecimal value. See Section 1.5 for more details. |

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.

**Examples:**

Command: @02

Response: >0701

Reads the status of the digital input/output channels for module 02 and returns a valid response indicatinfs thst the current Digital Output value is 07 and the Digital Iutput value is 01.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format

## 2.10 @AA(Data)

**Description:**

Ths command is used to set the digital output channels of a specified module.

**Syntax:**

**@AA(Data)(CR)**

| | |
|---|---|
| @ | Delimiter character |
| AA | The address of the module to be set in hexadecimal format (00 to 0F) |
| (Data) | The data to be written to the digital output channels.<br>Bit 0 of the value corresponds to RL1 and bit 1 of the value corresponds to RL2, etc.<br>When the bit is 0, it denotes that the digital output channel is off, and 1 denotes that the digital output channel is on. |

**Response:**

| | |
|---|---|
| Valid: | **>(CR)** |
| Invalid: | **?AA(CR)** |
| Ignored Command: | !**(CR)** |

| | |
|---|---|
| > | Delimiter character to indicate the command was valid. |
| ? | Delimiter character to indicate the |

command was invalid.

! Delimiter character to indicate the command was ingored.

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.

**Examples:**

Command: @027

Response: >

Sets RL1, RL2 and RL3 of module 02 to on, and module returns a valid response.

**Related Commands:**

Section 2.1 #AA00(Data), Section 2.3 #AA1cDD, Section 2.4 #AAAcDD, Section 2.7 $AA6, Section 2.10 @AA, Section 2.11 @AA(Data)

**Related Topics:**

Section 1.5 DI/O Data Format