



LC-18-4CH-A1 LC-18-4CH-X1 (Slave Unit) Lighting Controller Unit

USER MANUAL

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Revision Notes

Rev	Date/Author	Comment
1.0	July2020/KW	First Revision
1.1	Aug2020/KW	Added Communication Protocol Documentation
1.2	Dec2020/KW	Minor Correction

General Description

The LC-18-4CH-A1 / LC-18-4CH-X1 controller provides intensity control of LED lightings for machine vision applications. The controller consists of 4 channels with individual settings for each channel. There are 3 modes of operation provided to support different types of application.

Specification

Parameter	Value
Controller Supply Voltage	24 VDC
Lighting Supply Voltage	5/12/24/48 VDC
	(According to Lighting Voltage Rating)
No. of Channel	4
Channel Mode	Constant, Strobe, Trigger
Output Current	Maximum 1A per channel
Strobe Delay, Strobe Width,	Adjustable 0 – 99.99ms (10us/step)
Output Delay, Output Width	
Input Trigger Signal	3.3-24V, >5mA
	rising/falling edge trigger
Output Trigger Signal	Support rising/falling edge output trigger
Trigger Delay	≤ 25us
Software Control	RS232 / TCPIP

Connectors Description





Terminal	Function
VS (24V)	Controller Power Supply +
GND	Controller Power Supply –
COMM	Communication Port (between master and slave boards)
RS232	RS232 Communication
TCPIP	TCPIP Communication
ADDR	4 Way DIP Switch (for slave address selection)





Terminal	Function
LIGHT INPUT +	Power Supply for Lighting +
LIGHT INPUT –	Power Supply for Lighting –
CH +	Lighting Channel Output +
CH –	Lighting Channel Output –





Terminal	Function
IN +	External Input +
IN –	External Input –
OUT +	External Output +
OUT –	External Output –

Operation Mode

Constant Mode

Constant mode offers continuous lighting intensity control. Lighting intensity is controlled using constant current technique. Brightness can be adjusted from fully off to fully on in the range of 0 - 255.

Strobe Mode

Strobe mode provides short interval triggering for applications that require high intensity and high precision. An input trigger signal will turn on the lighting output based on pre-set delay and duration parameters.

There are 4 adjustable strobe parameters available:

Strobe Delay = Delay time between the external input signal and the lighting output Strobe Width = Duration of the lighting's turn on time Output Delay = Delay time between the external input signal and the external output signal Output Width = Duration of the external output signal's turn on time

Parameter timings are in the range of 0-9999 which is equivalent to 0-99.99ms (in step of 10us)



Trigger Mode

Trigger mode provides most flexibility for variable timing light output. The light output ON when input trigger signal received and OFF when no input signal.



Current Multiplier

Current Multiplier setting provides more precise control of lighting intensity for lightings with different current ratings.

Current Multiplier setting range = 1-10

- 1 = 10% of max output current (100mA)
- 2 = 20% of max output current (200mA)
- 3 = 30% of max output current (300mA)
- 4 = 40% of max output current (400mA)
- 5 = 50% of max output current (500mA)
- 6 = 60% of max output current (600mA)
- 7 = 70% of max output current (700mA)
- 8 = 80% of max output current (800mA)
- 9 = 90% of max output current (900mA)
- 10 = 100% of max output current (1000mA/1A)

For example: if the lighting's current rating is 260mA, current multiplier can be set to 3, setting the maximum output current to 300mA. So the lighting's intensity can be adjusted from low to high within the range of 0-255.

If multiplier is set too high, for example 10 (100% of max output = 1A), the adjustable intensity range for the lighting is only about 0-67. Setting the intensity value to 68 or higher will not have any effect towards the lighting output brightness.

Change IP Address

For TCPIP connection, the IP address can be changed using the Master IP Config software.

Default IP Setting: IP Address: 192.168.0.100 Subnet Mask: 255.255.255.0 Gateway: 192.168.0.1

🖳 LC-18 Master IP Config v0		—		×
Connection Comport CC TCPIP IP:	M3 ∨ 192.168.0.100	Softv	vare Versi ONNECT	on: v0 ED
Master Firmware \	/ersion:			
Current IP Address	3: -			
Current Submask:	-			
Current Gateway:	-			
New IP Address:	192.168.0.100			
New Submask:	255.255.255.0			
New Gateway:	192.168.0.1			
SET				

Step:

- 1) Connect using COMPort or TCPIP. Current IP will be displayed.
- 2) Type in the new IP address
- 3) Click SET button
- 4) Restart controller power

**** REMARK:**

Controller power must be restarted in order for the new IP to come into effect.

Slave Board Address Setting

The address of the slave boards must be set manually before power on the controller by using the 4-way DIP switch.

Address value is calculated in binary code

Settable address number = 0-15



SWITCH NO.	0	1	2	3
BINARY VALUE	20	21	2^{2}	2 ³
ADDRESS 0	0	0	0	0
ADDRESS 1	1	0	0	0
ADDRESS 2	0	1	0	0
ADDRESS 3	1	1	0	0
ADDRESS 4	0	0	1	0
ADDRESS 5	1	0	1	0
ADDRESS 6	0	1	1	0
ADDRESS 7	1	1	1	0
ADDRESS 8	0	0	0	1
ADDRESS 9	1	0	0	1
ADDRESS 10	0	1	0	1
ADDRESS 11	1	1	0	1
ADDRESS 12	0	0	1	1
ADDRESS 13	1	0	1	1
ADDRESS 14	0	1	1	1
ADDRESS 15	1	1	1	1

** REMARK:

Each slave board must have different address number, else the controller may malfunction

Communication Connection

All the COMM connector must be looped together for the communication between slave boards

All COMM1 and COMM2 must be looped together as shown below:



Input Signal

Input signal is used to turn on the lighting under Strobe/Trigger mode.

The lighting output is turned on after a delay time defined by Strobe Delay, while the turn on duration is defined by Strobe Width.

Acceptable voltage for external input signal is from 3.3-24VDC.

The external trigger signal can be configured as rising edge or falling edge trigger.



Output Signal

The output signal is optional and is used to trigger external devices such as smart camera. The output signal is only available in Strobe Mode.

The output pulse is triggered after a delay time defined by Output Delay, while the turn on duration is defined by Output Width.



Drawing Dimension

LC-18-4CH-A1



LC-18-4CH-X1



Communication Protocol

<u>1. Communication Setting</u>

COMPORT

Baud Rate = 115200 Data Bits = 8 Parity = None Stop Bits = 1

TCPIP

Default IP: 192.168.0.100 Default Subnet Mask: 255.255.255.0 Default Gateway: 192.168.0.1

2. Master Command.

Message Format (ASCII)

Write

@	YY	{	ZZZZ	}
Starting	Command	Open	Data	Close Bracket
Byte	Code	Bracket	Data	(End Byte)

Read

@	YY	{	}
Starting	Command	Open	Close Bracket
Byte	Code	Bracket	(End Byte)

Return Message

@	YY	{	ZZZZ	}
Starting	Command	Open	Data	Close Bracket
Byte	Code	Bracket	Data	(End Byte)

2.1 Write to Master

Command List

Command Cod (YY)	Command Description	Data	No. of Byte
MSI	Set IP Address	WWW.XXX.YYY.ZZZ	15
MSS	Set Subnet Mask	WWW.XXX.YYY.ZZZ	15
MSG	Set Gateway	WWW.XXX.YYY.ZZZ	15
MSU	Update IP	NONE	0

Send Update IP command after done setting IP/Submask/Gateway

****REMARK:**

Do a power restart on the Master Unit for the new IP Address to come into effect

 $\begin{array}{l} Update \ IP \ on \ Master \\ Tx > @MSU\{ \} \\ Rx < @MSU\{ \} \end{array}$

2.2 Read from Master

Command Code (VV)	Command Description	Return		
	Command Description	Data	No. of Byte	
MRI	Read IP Address	WWW.XXX.YYY.ZZZ	15	
MRS	Read Subnet Mask	WWW.XXX.YYY.ZZZ	15	
MRG	Read Gateway	WWW.XXX.YYY.ZZZ	15	
MRV	Read Firmware Version	WXYZ (W.X.Y.Z)	0	

$$\label{eq:result} \begin{split} & \underline{Example} \\ & Read \ IP \ Address = 192.168.0.123 \\ & Tx > @MRI\{ \} \\ & Rx < @MRI\{ 192.168.000.123 \} \end{split}$$

3. Slave Command

Message Format (ASCII)

Write

@	W	Х	YY	{	ZZZZ	}
Starting	Board	Channal No.	Command	Open	Doto	Close Bracket
Byte	Address	Channel No.	Code	Bracket	Data	(End Byte)

Read

@	W	Х	YY	{	}
Starting	Board	Channel No.	Command	Open	Close Bracket
Byte	Address		Code	Bracket	(End Byte)

Return Message

@	W	Х	YY	{	ZZZZ	}
Starting	Board	Channal No.	Command	Open	Data	Close Bracket
Byte	Address	Channel No.	Code	Bracket	Data	(End Byte)

<u>Starting Byte</u> Symbol "@" is used as starting byte

 $\frac{\text{Board Address}}{W = 0 \sim F (0-15)}$

 $\frac{\text{Channel No.}}{\text{Channel number}}$ $X = 1 \sim 4;$

<u>Data</u> Data is set inside a set of Bracket Max data length = 4 digits

Refer table Command List for No. of byte of data for each command

4. Write to Slave

Command List

Command Code (YY)	Command Description Data		No. of Byte
		0 = Constant	
SM	Set Channel Mode	1 = Strobe	1
		2 = Trigger	
SR	Set Current Multiplier	1-10	2
SI	Set Intensity	0 - 255	3
SD	Set Strobe Delay	0 – 9999 (99.99ms)	4
SW	Set Strobe Width	0 – 9999 (99.99ms)	4
SY	Set Output Delay	0 – 9999 (99.99ms)	4
SH	Set Output Width	0 – 9999 (99.99ms)	4
ST	Strobe	NONE	0
EE	Save EEPROM	NONE	0

**REMARK:

For Save EEPROM function, use any channel no. for x value, all channels' parameters will be saved

Return Message

Controller will send a return message same as the command sent to the controller to indicate successful sending.

If wrong command or data are sent, a message of {ERR} in the bracket will be returned.

5. Read from Slave

Command List

Command Code (VV)	Commond Description	Return		
	Command Description	Data (ZZZZ)	No. of Byte	
		0 = Constant		
RM	Read Channel Mode	1 = Strobe	1	
		2 = Trigger		
RR	Read Current Multiplier	1-10	2	
RI	Read Intensity	0-255	3	
RD	Read Strobe Delay	0 – 9999 (99.99ms)	4	
RW	Read Strobe Width	0 – 9999 (99.99ms)	4	
RY	Read Output Delay	0 – 9999 (99.99ms)	4	
RH	Read Output Width	0 – 9999 (99.99ms)	4	
RV	Read Version	WXYZ (W.X.Y.Z)	0	

**REMARK:

For Read Version function, use any channel no. for x value

Example

Write

Board Address = 0

 $\label{eq:second} \begin{array}{l} \mbox{1) Set CH1 to constant mode} \\ \mbox{Tx} > @01SM\{0\} \\ \mbox{Rx} < @01SM\{0\} \qquad (Success) \end{array}$

2) Set CH1 to strobe mode $Tx > @01SM{1} \\ Rx < @01SM{1}$ (Success)

3) Set CH1 Intensity = 90 Tx > @01SI{90} $Rx < @01SI{90}$ (Success)

4) Set CH1 Strobe Width = 500 (5.00 ms)Tx > @01SW{500} Rx < @01SW{500} (Success)

5) Strobe CH1 $Tx > @01ST{}$ $Rx < @01ST{}$ (Success)

6) Save EEPROM parameter $Tx > @01EE\{ \}$ $Rx < @01EE\{ \}$ (Success)

Board Address = 1

1) Set CH1 to constant mode $Tx > @11SM{0}$ $Rx < @11SM{0}$ (Success)

2) Set CH2 Intensity =200 Tx > @12S2{200} $Rx < @12S2{200}$ (Success)

3) Set CH1 Strobe Width = 1000 (10.00ms) Tx > @11SW{1000} Rx < @11SW{1000} (Success)

Read

1) Read CH1 mode = Constant $Tx > @01RM\{\}$ Rx < @01RM{0} (Success)

2) Read CH1 Current Multiplier = 2 Tx > @01RR{} Rx < @01RR{02} (Success)

4) Read CH1 Intensity = 150Tx > @01RI{} Rx < @01RI{150} (Success)

5) Read CH2 Strobe Delay = 500 (5.00ms) Tx > @02RD{} Rx < @02RD{0500} (Success)

6) Read CH2 Strobe Width = 2000 (20.00ms) Tx > @02RW{} Rx < @02RW{2000} (Success)

7) Read Board Version $Tx > @01RV{} \\Rx < @01RV{1000} (Success)$

Wrong Command or Data Sending

 $\begin{array}{l} Tx > @01SI\{500\} \\ Rx < @01SI\{ERR\} \end{array}$

 $Tx > @08SC{3}$ $Rx < @08SC{ERR}$

 $\begin{array}{l} Tx > @1SH{1} \\ Rx < @1SH{ ERR } \end{array}$



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