TMS LITE SDN. BHD. (Co. No. 671971V)
LED ILLUMINATION SOLUTION PARTNER

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LC-18-SQ-4CH-A1
Lighting Controller Unit
(Sequence)

USER MANUAL

Table of Contents

Revision Notes

Rev	Date/Author	Comment
1.0	Aug2020/KW	First Revision
1.1	Dec2020/KW	Correction and Picture Update
1.2	DEC2024/KW	Minor Correction & Photo Update

General Description

LC-18-SQ-4CH-A1 Lighting Controller Unit provides sequence switching of lighting output up to 4 channels. Upon receiving external trigger signal, the LC-SQ executes a pre-set sequence of lighting output and also a camera triggering output. Suitable for photometry applications.

Specification

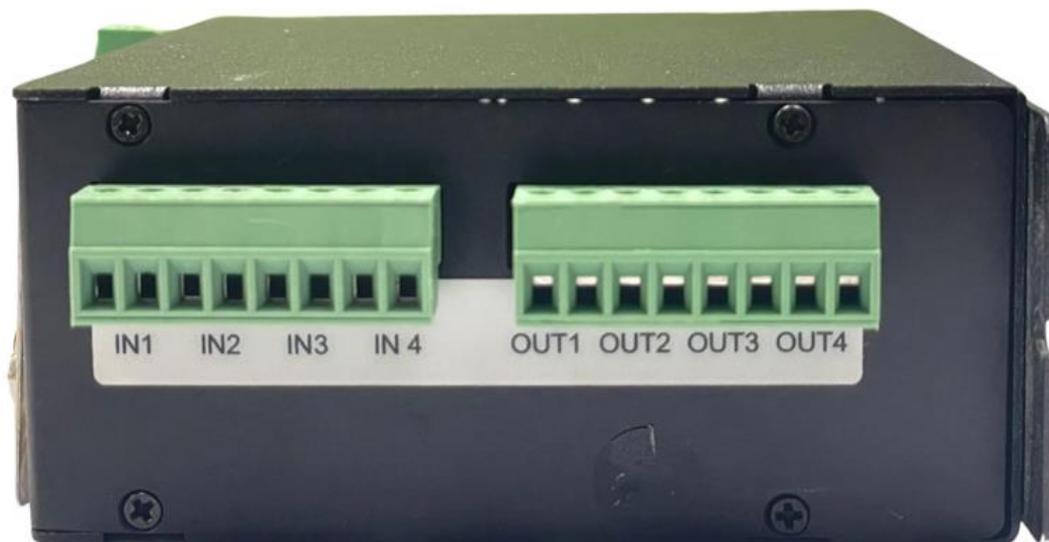| Parameter	Value
Controller Supply Voltage	24 VDC
Lighting Supply Voltage	5/12/24/48 VDC (According to Lighting Voltage Rating)
No. of Lighting Channel	4
No. of Input Channel	1
No. of Output Channel	1
Channel Mode	Constant, Strobe, Trigger
Output Current	Maximum 1A per channel
Input Trigger Signal	3.3-24V, >5mA rising/falling edge trigger
Output Trigger Signal	Support rising/falling edge output trigger
Trigger Delay	≤ 25us; Delay on the start of first frame only
Software Control	RS232 / TCPIP
User Parameters	
Current Multiplier	Adjustable 10% - 100% of maximum current output; 10% step For better tuning of lighting output intensity
Intensity	0 – 255 Adjustable range
Frame Width	0 – 99.99ms; 10us step Duration of each frame
Strobe Width	0 – 99.99ms; 10us step Duration of the lighting output turn on time
Output Delay	0 – 99.99ms; 10us step Delay time for output signal
Output Width	0 – 99.99ms; 10us step Duration of output signal Output Delay + Output Width must be < Frame Width
No. of Frame per sequence	Maximum of 10 frames

Connectors Description

Terminal	Function
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 –

**REMARK

- **LC-18-SQ-4CH only has single input and single output**
- **Only IN1 and OUT1 is functional**

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

An input trigger signal will execute sequence once for each input trigger signal, regardless of signal width

There are 4 adjustable strobe parameters available:

Frame Width = Duration of each frame
Strobe Width = Duration of the lighting output turn on time
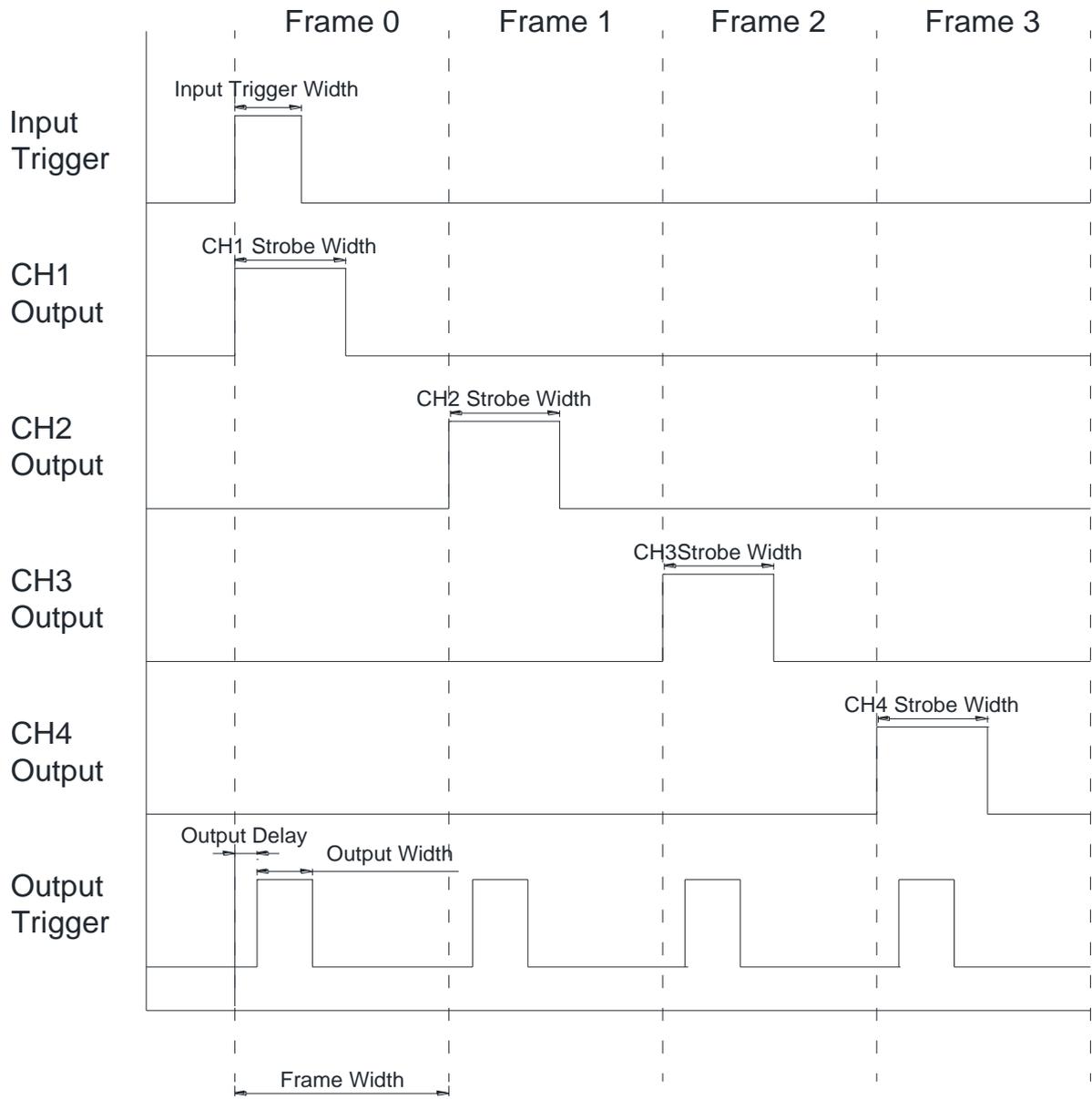Output Delay = Delay time for output signal
Output Width = Duration of output signal

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

Trigger Mode

Trigger mode executes sequence on rising edge of input signal and repeats continuously while input signal remains in high state. Sequence ends on completion of last frame when input signal fall to low state

Timing Diagram

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.
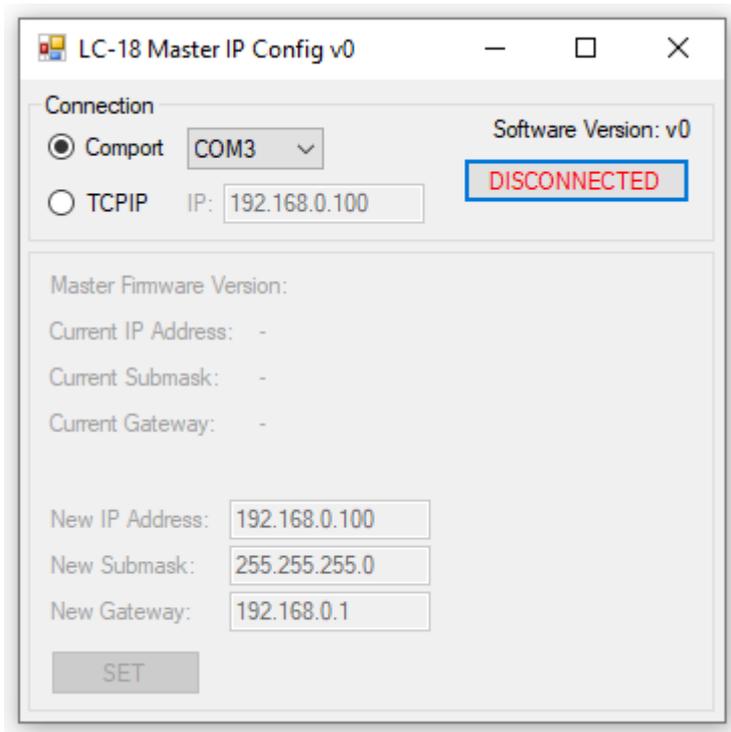
Change IP Address

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

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	2^0	2^1	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:
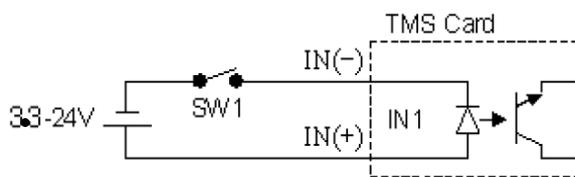

Communication Connection

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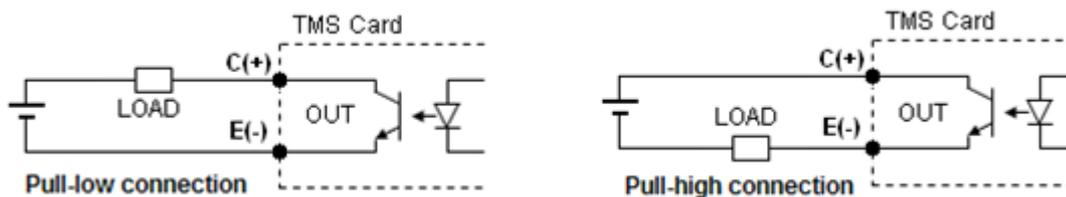
Acceptable voltage for external input signal is from 3.3-24VDC.

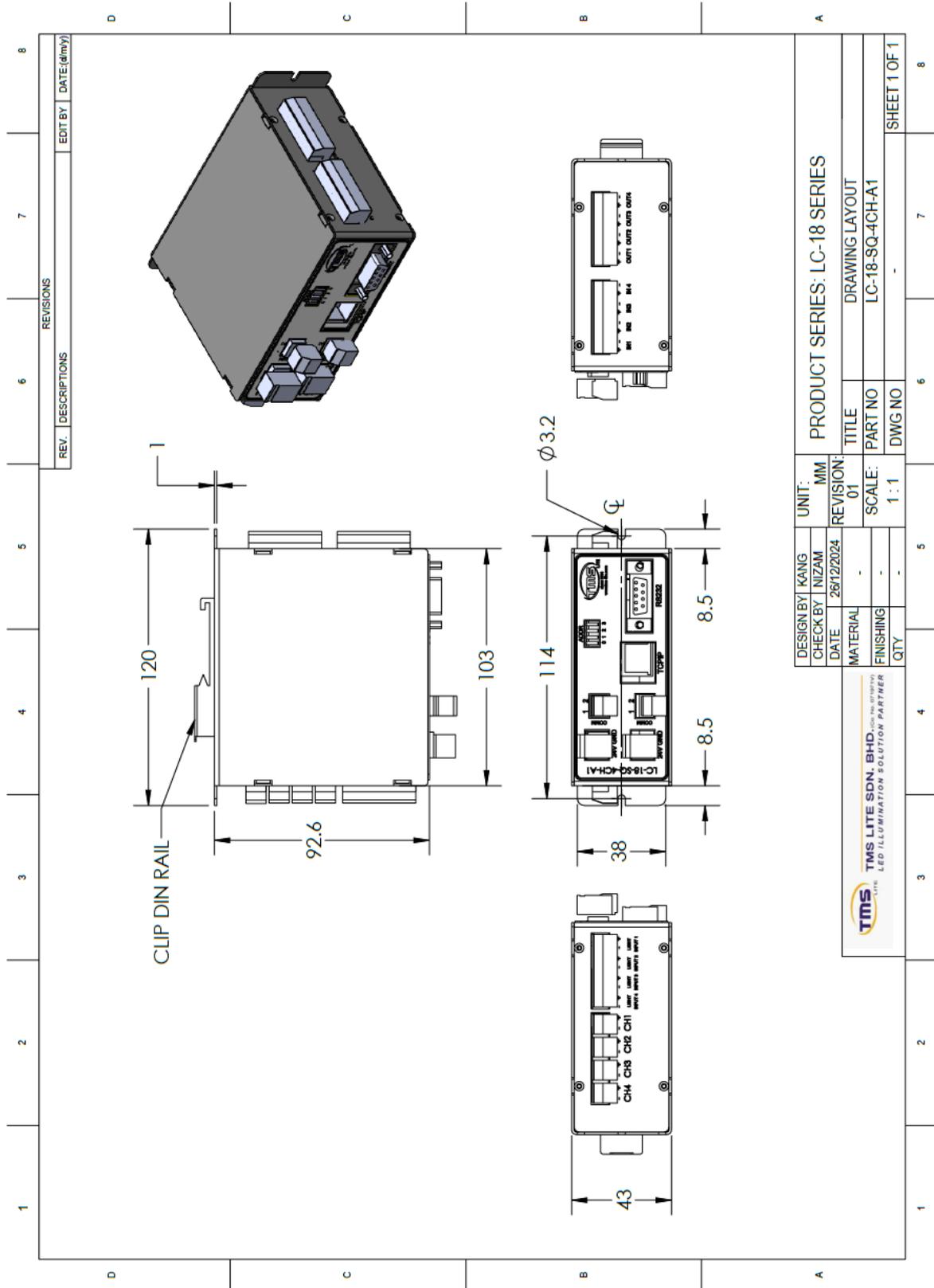The external trigger signal can be configured as rising edge or falling edge trigger.

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

Communication Protocol

1. Communication Setting

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 Byte	Command Code	Open Bracket	Data	Close Bracket (End Byte)

Read

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

Return Message

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

2.1 Write to Master

Command List

Command Code (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

Example
Set IP Address = 192.168.0.123
Tx > @MSI{192.168.000.123}
Rx < @MSI{192.168.000.123}

Update IP on Master
Tx > @MSU{}
Rx < @MSU{}

2.2 Read from Master

Command Code (YY)	Command Description	Return	
		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

Example
Read IP Address = 192.168.0.123
Tx > @MRI{}
Rx < @MRI{192.168.000.123}

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3. SQ Slave Command

Message Format (ASCII)

Write

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

Read

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

Return Message

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

Starting Byte
Symbol "@" is used as starting byte

Board Address
W = 0 ~ F (0-15)

Channel No.
Channel number
X = 1 ~ 4;
Set any valid value (1-4) for global type parameter setting

Data
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
SM	**Set Channel Mode**	0 = Constant 1 = Strobe 2 = Trigger	1
Type: Global	Tx: @0xSM{Z}		
SR	**Set Current Multiplier**	1-10	2
Type: Individual	Tx: @0xSR{ZZ}		
SI	**Set Intensity**	0 – 255	3
Type: Individual	Tx: @0xSI{ZZZ}		
SW	**Set Strobe Width**	0 – 9999 (99.99ms)	4
Type: Individual	Tx: @0xSW{ZZZZ}		
SY	**Set Output Delay**	0 – 9999 (99.99ms)	4
Type: Global	Tx: @0xSY{ZZZZ}		
SH	**Set Output Width**	0 – 9999 (99.99ms)	4
Type: Global	Tx: @0xSH{ZZZZ}		
ST	**Strobe**	NONE	0
Type: Global	Tx: @0xST{}		
TR	**Trigger**	0 = OFF 1 = ON	1
Type: Global	Tx: @0xTR{Z}		
SN	**Set No. of Frame**	1 – 10	2
Type: Global	Tx: @0xSN{ZZ}		
SE	**Set Frame Width**	0 – 9999 (99.99ms)	4
Type: Global	Tx: @0xSE{ZZZZ}		

SF	Set Frame	Frame No X: 0-9 Frame Value Z: 0-F		1+1
Type: Global	Tx: @0xSN{XZ}			

Bit3 CH4	Bit2 CH3	Bit1 CH2	Bit0 CH1	Frame Value
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F

EE	Save EEPROM	NONE	0
Type: Global	Tx: @0xEE{}		

**REMARK:
For global type function, set channel no. to any valid number (1-4).

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 (YY)	Command Description	Return	
		Data (ZZZZ)	No. of Byte
RM	**Read Channel Mode**	0 = Constant 1 = Strobe 2 = Trigger	1
Type: Global	Tx = @0xRM{}	Rx = @0xRM{Z}	
RR	**Read Current Multiplier**	1-10	2
Type: Individual	Tx = @0xRR{}	Rx = @0xRR{ZZ}	
RI	**Read Intensity**	0 – 255	3
Type: Individual	Tx = @0xRI{}	Rx = @0xRI{ZZZ}	
RW	**Read Strobe Width**	0 – 9999 (99.99ms)	4
Type: Individual	Tx = @0xRW{}	Rx = @0xRW{ZZZZ}	
RY	**Read Output Delay**	0 – 9999 (99.99ms)	4
Type: Global	Tx = @0xRY{}	Rx = @0xRD{ZZZZ}	
RH	**Read Output Width**	0 – 9999 (99.99ms)	4
Type: Global	Tx = @0xRH{}	Rx = @0xRH{ZZZZ}	
RN	**Read No. of Frame**	1-10	2
Type: Global	Tx = @0xRN{}	Rx = @0xRN{ZZ}	
RE	**Read Frame Width**	0 – 9999 (99.99ms)	4
Type: Global	Tx = @0xRE{}	Rx = @0xRE{ZZZZ}	
RF	**Read Frame**	Frame Value Z: 0-F	1
Type: Global	Frame No X: 0-9 Tx = @0xRF{X}	Rx = @0xRF{Z}	
RV	**Read Version**	WXYZ (W.X.Y.Z)	0
Type: Global	Tx = @0xRV{}	Rx = @0xRV{W.X.Y.Z}	

**REMARK:
For global type function, set channel no. to any valid number (1-4).

<u>Example</u>

1) Set Mode to constant mode
Tx > @01SM{0}
Rx < @01SM{0}   (Success)

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

3) Set CH1 Multiplier = 5
Tx > @01SR{105}
Rx < @01SR{105}   (Success)

4) Set CH2 Intensity = 90
Tx > @02SI{090}
Rx < @02SI{090}   (Success)

5) Set CH3 Strobe Width = 500 (5.00ms)
Tx > @03SW{0500}
Rx < @03SW{0500}   (Success)

6) Set Output Delay = 150 (1.50ms)
Tx > @01SD{0150}
Rx < @01SD{0150}   (Success)

7) Set Output Width = 300 (30.0ms)
Tx > @01SH{0300}
Rx < @01SH{0300}   (Success)

8) Strobe
Tx > @01ST{}
Rx < @01ST{}   (Success)

9) Set No of Frame = 10
Tx > @01SN{10}
Rx < @01SN{10}   (Success)

10) Set Frame Width = 2500 (25.00ms)
Tx > @01SE{2500}
Rx < @01SE{2500}   (Success)

11) Save EEPROM parameter
Tx > @01EE{}
Rx < @01EE{}   (Success)

12) Set Frame[0] = F (ALL CHANNEL ON)
Tx > @01SF{0F}

13) Set Frame[1] = 5 (CH1 & CH3 ON)
Tx > @01SF{15}

14) Set Frame[2] = A (CH2 & CH4 ON)
Tx > @01SF{2A}

Wrong Command or Data Sending

Tx > @01SI{500}
Rx < @01SI{ERR}

Tx > @02SR{30}
Rx < @02SR{ERR}

Tx > @01SH{50000}
Rx < @01SH{ERR}

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