Maker Power™

Light Controller TWO

Features

Powered by USB power or any 5VDC source.
Controls up to 6 independent LEDs.
Direct control by PC or Simple visual script language

Applications

Control Lights in a Lego MOC

Description

The Light Controller TWO is a small controller module designed to control up to six independent LED type devices. The controller module can be controlled directly thorough either a PC via the development USB interface or it can be controlled through the visual scripting language available on the PC. Power is supplied through the 3 pin connector (J9).

Electrical Characteristics

Parameter	Min	Max	Unit
External Power Input Voltage	4.5	5.5	VDC
LED Output Current (per pin)1	0	50	mA
USB current	10	300	mA

Note 1. Total current out is dependent on the power source. Total current out cannot exceed current/power capability of the power source.
Note 2. 5 VDC voltage output is entirely dependent on the USB power supply and the load placed on it.

Connection Characteristics

Paramter	Value
Baud Rate	19,200
Data Bits	8
Stop Bits	1
Parity	None

Note: Standard serial port over USB.

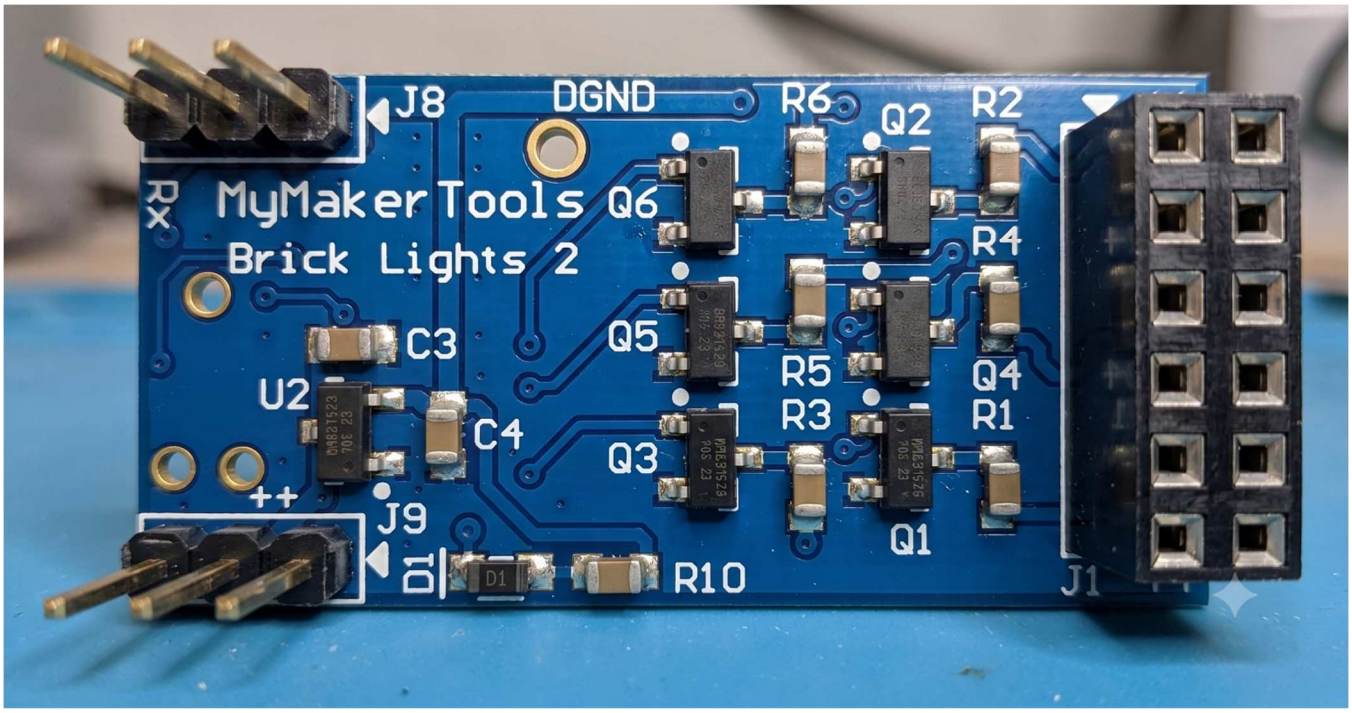

Figure 1 Top View

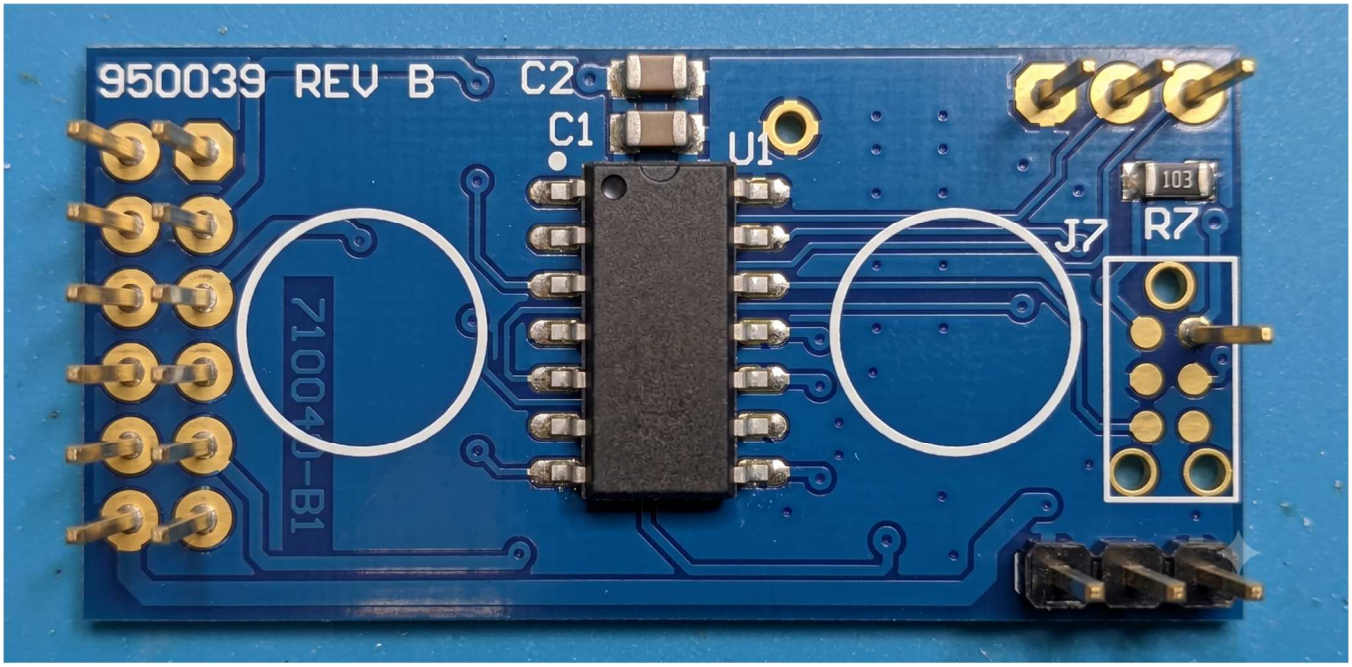

Figure 2 Bottom View

NOTE

These pictures represent typical images of the Light Controller TWO. Actual appearance can differ.

Connector Descriptions

There are three connectors that are of concern for the user. J1 is the connector for the LEDs. J8 is used to interface with the Light Controller TWO with a PC, using the developer's USB adaptor. J9 is used to power the controller. J7 on the backside is used in production only.

Pin 1 will always be next to the white triangle on the PCB. On J1 the row of pins next to the edge of the board are all 5VDC. They are intended to be connected to the LED anode pin. The odd numbered pins are for the limiting resistor which is then connected to the cathode of the LED. The LED reference numbers refer to the PC program labeling.

Caution

You must use a limiting resistor. The Light Controller comes with 10-20 ohms already installed in the path of each LED channel. But that is intended to protect the device and will not protect the LED.

Connector J1 Pinout

1	LED 1
2	5VDC
3	LED 3
4	5VDC
5	LED 4
6	5VDC
7	LED 5
8	5VDC
9	LED 6
10	5VDC
11	LED 2
12	5VDC

Connector J8 Pinout

1	Ground
2	Serial Tx
3	Serial Rx

Connector J9 Pinout

1	Ground
2	5 VDC
3	Ground

CAUTION

Do not apply more the 5.5VDC to the Light Conroller. That voltage will be directly applied to the LEDs and they may not survive, depending on the limiting resistor.

Light Controller Operation

The Light Controller TWO will control up to six independent LED type devices. The controller produces different styles and features as described below.

There are ten LED Styles as described here.

- OFF - the LED is off.
- STEADY - the LED is on. Brightness may vary by using the PWM parameter.
- BURST1 - the LED does a quick burst of LED on/off. The intensity can vary with the Brightness parameter. This simulates a Laser weapon.
- CYCLE1 - the LED cycles on and off in equal on and off periods. Brightness may vary by using the Brightness parameter.
- PWM1 - the LED varies in intensity as does the on and off period. All three LED attributes are randomly varied, intensity, on time and off time. The Brightness parameter has no effect. This simulates an arc generator or Tesla effect.
- BURST2 - same as BURST1, just different timing.
- CYCLE2 - same as CYCLE1, just different timing.
- PWM2 - same as PWM1, just different timing.
- Program - future style..
- ON/OFF - future style.

There are four LED Features as described here.

- Sawtooth - the LED will increase (slowly, though this is a relative term) in intensity. When it reaches maximum intensity, it goes back to OFF immediately. The Brightness parameter has no effect.
- Triangle - the LED will increase (slowly, though this is a relative term) in intensity. When it reaches maximum intensity, it then will decrease in intensity until it reaches the minimum intensity. The Brightness parameter has no effect.
- Repeat - when applied to a feature, the feature will repeat at some interval, with an off gap in between.
- Always ON - when applied to a feature, the feature will repeat at the minimum interval. For Sawtooth and Triangle the next cycle will start immediately.

Brick Controller Status LED

These is a single LED on the PCB. In Figure 1, it is labeled D1. The LED will cycle ON-OFF while power is applied. The LED indicates that the firmware in the microprocessor is probably working. If the LED does not cycle ON-OFF, then the microprocessor has an issue. There is one exception to this. It is possible through the PC interface to turn off the LED status LED. This may be desirable in some installations where the user does not want this LED light showing. But since it is an excellent indicator

of normal operation, we recommend that you leave it on. You will find this option in the Options menu.

Using Saved Configurations

Using the USB interface, it is possible to configure all 6 LED channels and then save this configuration in local non-volatile memory. At power on reset, the Light Controller TWO will load the configuration and it will run until the power is removed. This is the option of choice if no time line specific actions are needed. As an example, if at power on you need the following:

- An LED in a room/enclosure to come on.
- An LED to exhibit a continuous sawtooth type pattern
- An LED to exhibit a continuous cycling pattern

Then setting up this configuration is the simple way to implement. Then in the LED menu, you select Auto Start and this configuration will load every time there is a power on start.

Using Scripts

Scripts are a set of time sequenced commands. When entering a script, at each time interval (0.1 sec resolution) you indicate what action should happen. For example

at 1.0 seconds LED2 enters Burst1 mode and Feature repeat
at 2.3 seconds LED3 turns on, LED5 enters PWM2 mode, LED6 enters Cycle1 mode
at 5.2 seconds LED3 turns off
at 7.5 seconds LED2 turns off
at 11.0 seconds LED5 turns off, LED6 turns off
at 11.5 seconds the script stops

Once the script is entered into the PC, it must be stored in the Brick Controller by using the Store option on the Script Action menu. Scripts can also be stored on the PC by using the Save option. The PC interface can be used to enter the Script. Once a script is constructed, it can either be saved on the PC and/or stored in the connected light controller. It is highly recommended to save all scripts on the PC.

One simple way to build a script is to construct a table of the different options and then indicate what is to happen at each time interval. Here is an example

Time		LED1	LED2	LED3	LED4	LED5	LED6
0		off	off	off	off	off	off
3		off	b1	Pwm2	Pwm2	Pwm1	off
4		off	b1	Pwm2	Pwm2	Pwm1	b1
19		Pwm1	off	Pwm2	Pwm2	Pwm1	off
20		Pwm1	off	Pwm2	Pwm2	Pwm1	off
22		Pwm1	b2	off	off	off	b1
25		Pwm1	off	off	off	off	off
28		Pwm1	off	off	off	off	off

35		off	off	off	off	off	off
37		off	b2	off	off	off	b1
38		Pwm2	b2	Pwm1	Pwm2	Pwm1	b1
39		Pwm2	b2	Pwm1	Pwm2	Pwm1	b1
40		Pwm2	off	Pwm1	Pwm2	Pwm1	off
50		Pwm2	b1	Pwm1	Pwm2	Pwm1	b2
53		Pwm2	off	Pwm1	Pwm2	Pwm1	off
55		Pwm2	b1	Pwm1	Pwm2	Pwm1	b2
58		off	off	off	off	off	off
60	reset						

Mounting the Light Controller in a MOC

In figure 2, the bottom view of the Light Controller, there are two circles on the silk screen. These are where two 1 x 1 round plates or round tiles will be attached. Best adhesive is plain “super glue”. Build a fixture as shown in Figure 3 or Fighure 4 from bricks. Depending on whether the Light Controller will be mounted on studs or tubes, determines which side of the larger plate shown will be used. Place the plates/tiles in the correct place. Double check that when the controller is placed in the fixture, that the plates/tiles line up on the silk screen circles, see Figure 5. When you have verified the placement, apply glue to the plates/tiles. Then carefully place the Light Controller in the fixture so that it is up against the two walls formed by the bricks and press down. How long you need to press and then let the glue cure, is determined by the glue you use. Consult the instructions as appropriate. Once the glue has cured, carefully remove the light controller from the fixture. The Light Controller should line up exactly on the studs and you should be able to build around it.

Note

The fixture shown is just an example of what can be built. There are multiple possibilities that will work just as well. Just make sure the glue points are inside the slik screen circles.

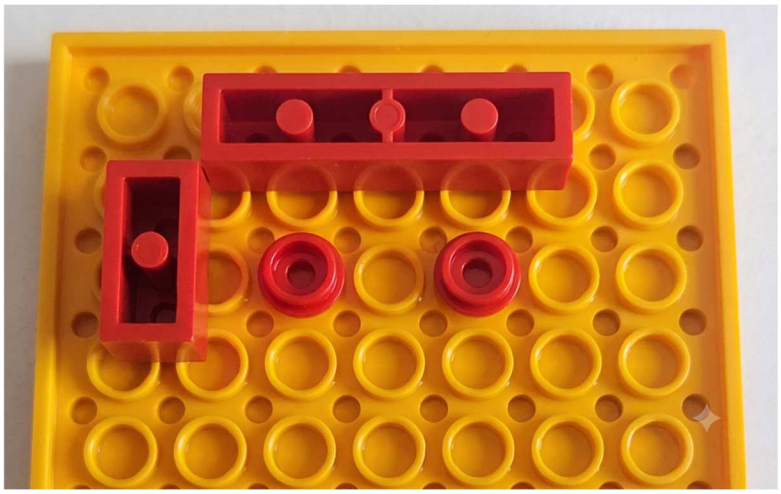

Figure 3 Mounting on a Ceiling

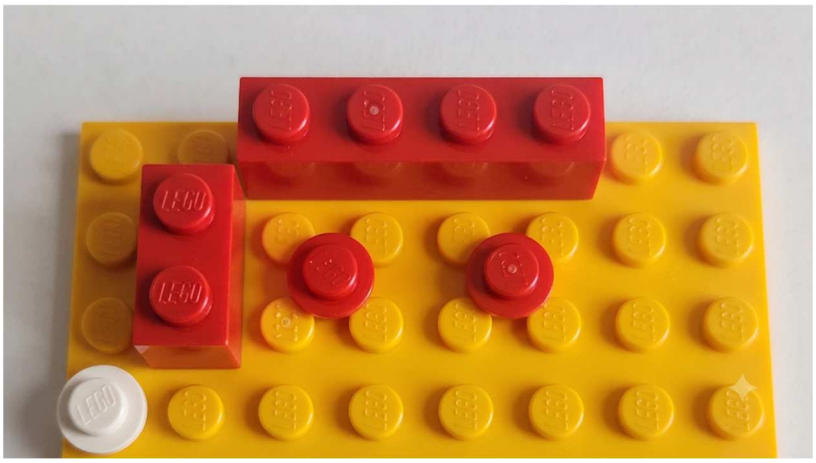

Figure 4 Mounting on the Floor

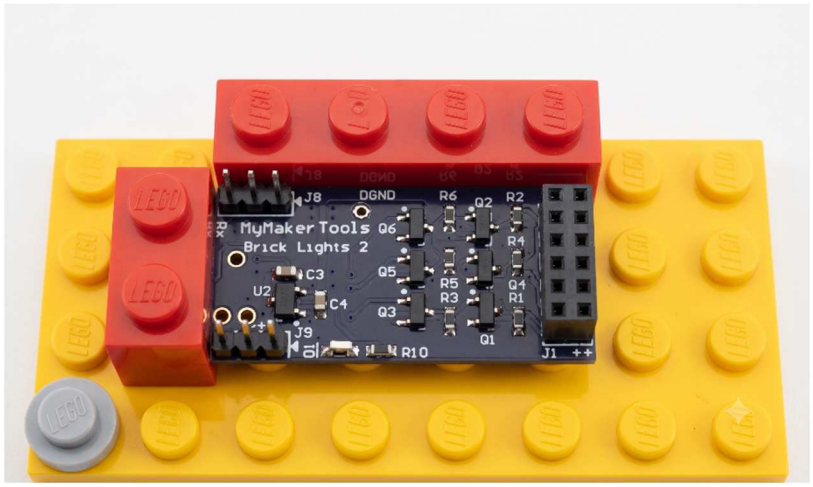

Figure 5 Light Controller in Fixture

Brick Controller Windows Software

The Windows (10 and 11) software program provides the interfaces to the Light Controller Two. the user will need to either setup a configuration or write and save a script. A quick start version is contained below. The latest version of the manual is located on the website.
https://mymakertools.com/support

Developer Support and Software Quick Start

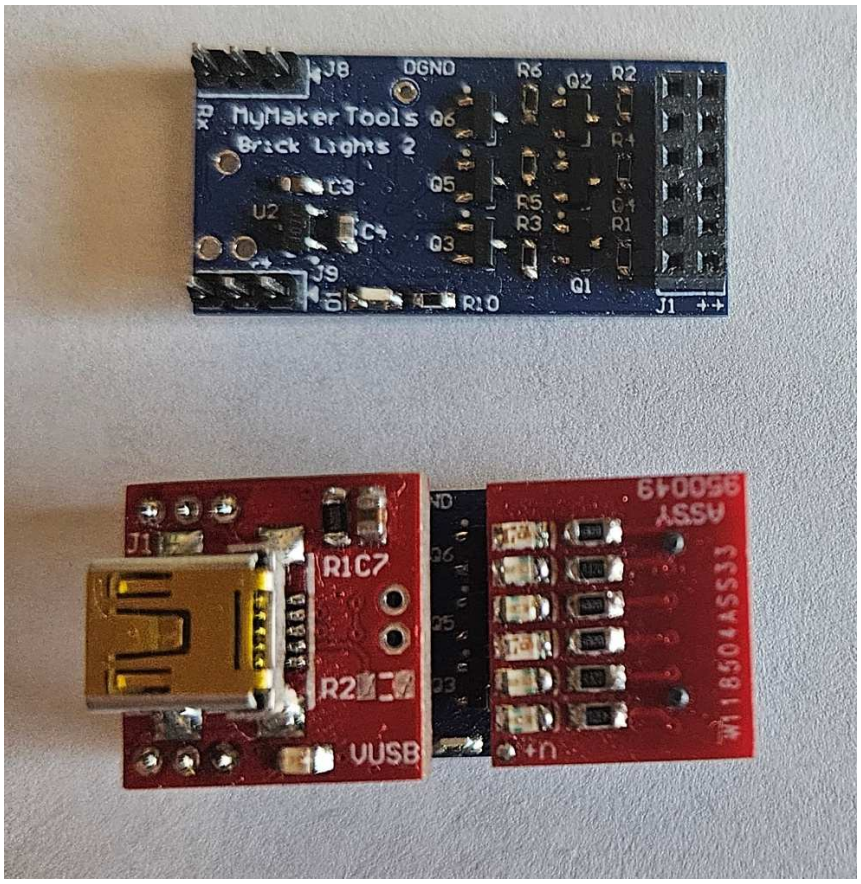

Figure 6 Developer Kit

To aid in developing either configurations and/or scripts for the Light Controller TWO, a developer kit is available. This kit consists of three parts as seen in Figure 6.

1. USB to Serial interface that connects the controller to the PC and provides power, the red PCB on the left.
2. LED PCB with six LED s and appropriate limiting resistors, the red PCB on the right.
3. USB-A to USB Mini cable to connect the Light Controller TWO to the PC, not shown.

Using the Windows Control Software

Launch the Brick Controller software and the following window will appear.

Figure 7 Brick Control Center Main Window

Select Options and then Non USB Device from the drop down menu.

Figure 8 Serial Port Setup Window

Before selecting anything in the Serial Port Setup window, wait for the Brick Control Center window to appear. It will probably be behind the Serial Port Setup window, but is larger and will be easy to see. Once it has appeared, select 19200 as the Baud Rate. In the Serial Port drop down menu, pick the serial port that the USB connection is using.

Note

This can be challenging if there are several simulated serial ports. If you choose the wrong one, nothing bad will happen. But you will have to start the process all over from the beginning. That means closing all the Brick Controller windows and restarting the program.

Once the serial port and the baud rate is selected, press the OK button and the window in Figure 9 will appear. This window allows the user to control the Light Controller TWO. Each LED has three control functions:

1. LED Style, as described above
2. LED Features, as described above
3. LED Brightness, which varies from 0 to 100%, in steps of 10

Changing any of these will automatically cause the LED on the controller to change.

The LEDs menu has four options

1. Set LEDs, which will set the LEDs configuration as shown in the window. This is mostly used in conjunction with the Retrieve LEDs option
2. Store LEDs, which will transmit the current displayed LED configuration and store this in the non-volatile memory in the controller.
3. Retrieve LEDs, which will retrieve the LED configuration stored in the non-volatile memory on the controller and display it in the window.
4. Auto Start, which will cause the currently stored configuration to be loaded into the controller at power on.

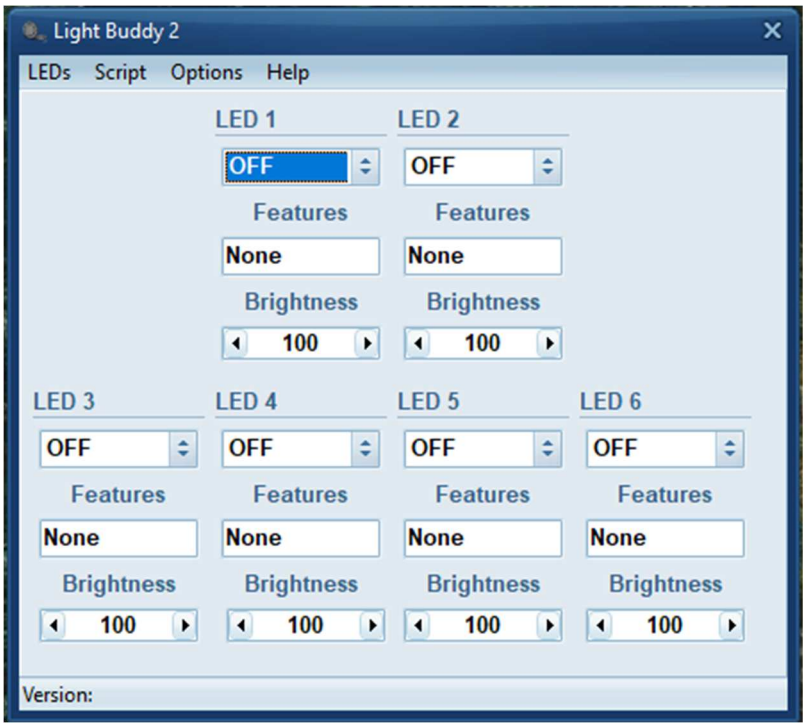

Figure 9 Light Buddy 2 Window

The Script Menu option will cause the Script window to appear, as described later.

The Options Menu has one item.

Status LED, when if checked, the status LED on the controller will flash on-off at slow rate. If unchecked, it will not illuminate.

The Help menu is not implemented in this version.

The Script window is shown in Figure 10. It contains five main functions as described here.

LED Control

This is similar to the LED control described earlier. What ever is displayed here will be saved once the script line is recorded.

Time

This is the relative time from the beginning of the script where the current displayed script line will be executed. The smallest interval is 0.1 second. The largest value is 400 seconds and cannot be exceeded. Thus any value between 0 and 400, at 0.1 steps is allowed. When saving a script line, the time will automatically increment 0.1.

Instruction

There are three type of instructions for the Light Controller TWO.

1. LED, which is used to build an LED script instruction.
2. Reset Script, which is used to instruct the controller to go back to the beginning of the script and repeat. Any script lines after this are ignored.
3. Stop Script, which is used to instruct the controller to stop. Any script lines after this are ignored.

Script Control

There are four buttons in this section. If they are greyed out, that control is not available at this position of the script.

1. **Next** - which will move the script editor to the next command. If the button is grayed out, then the editor is at the first script command.
2. **Previous** - which will move the script editor to the previous command. If the button is grayed out, then the editor is at the first script command.
3. **Insert After** - which will will insert a the current screen configuration as a script command after the current script command.
4. **Delete** – which will delete the current script command

Parameters

There are three parameters

1. Line Number, which is the current script line number. A single script line number may contain multiple actions.
2. Total Lines, which is the total number of script lines contained in the window.
3. Memory Left, which basically tells how many more lines can be added. However, some script lines will take multiple memory locations, so watch this number carefully.

Script Action Menu

In the Script Action pulldown menu there are nine items

1. Store Script, which will take the current script in the window and store it in non-volatile memory in the controller.
2. Retrieve Script, which will load the script stored in the non-volatile memory in the controller and place it in the window.
3. Save Script, which will save the script in the window to the PC. Through a standard File Selection window, the user will be able to name and choose which directory to place the script

in.

4. Load Script, which will allow the user, through a standard File Selction window, to choose which script to load into the window.
5. Clear Script, which will clear out all of the script data in the window and reset all the script parameters.
6. Reset Script, which will instruct the controller to stop the script and reset to the first script instruction.
7. Start Script, which will start the current script loaded into the controller.
8. Stop Script, which will stop the script at the next instruction.
9. Auto Start, which will cause the currently stored script to be loaded into the controller at power on and begin executing.

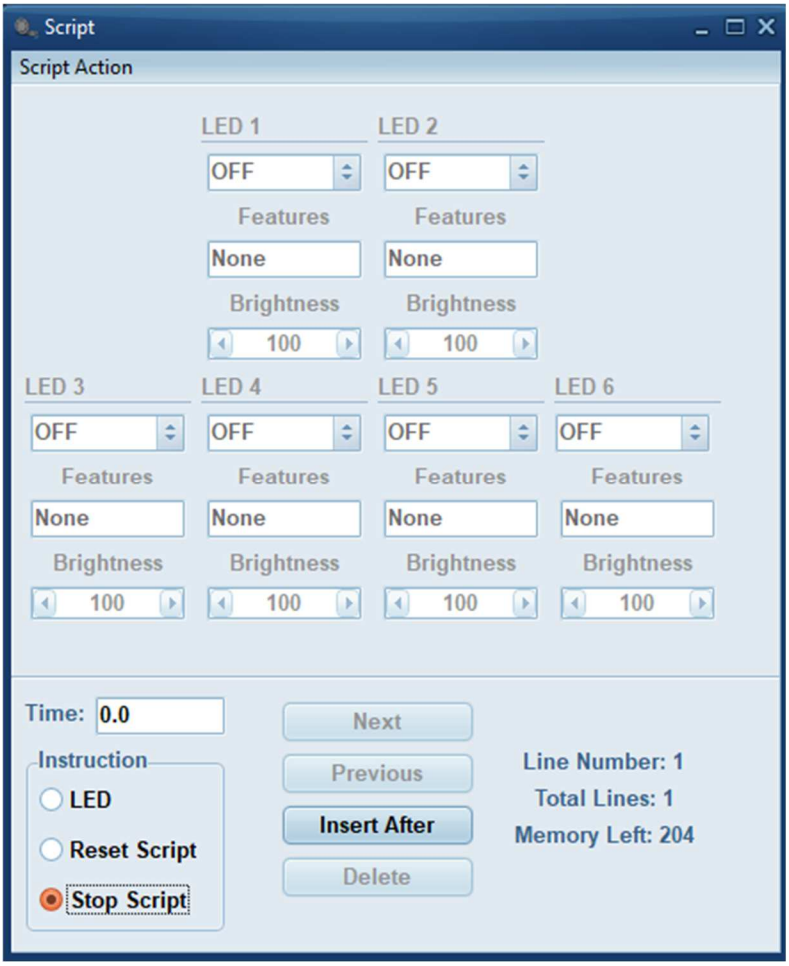

Figure 10 Script Window