

Time LED Lighting Controller - TL²C

Specifications

	Min	Max
Line Voltage	110V	250V
Load Current	–	10A
Control Voltage	12V	30V
Current	10mA	300mA
LED Zones	1	3
On Delay	–	255 Seconds

- Drives up to three zones¹ of high powered LEDs.
- I²C Interface
- Individual control of each LED zone.
- Interfaces to the PIR13 module²
- Up to 4 minutes delay on each zone.

Description

The Timed LED Lighting Controller (TL²C) is a I²C device to control up to three zones of high powered LEDs through relays. Enabling the zones to be switched on via a signal from a PIR13 module for up to 4 minutes.

The controller uses an ATTiny20 to drive three 12V relays. Communication to the ATTiny20 is via the I²C bus. The provided API enables each LED zone to be individually controlled.

¹ A Zone is connected appropriately compliant high powered LED driver.

² <https://www.elv.de/bewegungsmeldermodul-pir-13.html>

Addressing

The compact design has made it difficult to implement a hardware based addressing system. The device is configured with a 7-bit default address of 0b0100000x.

Register Description

The four registers of the TL²C will enable each zone to be controlled individually as well as providing the current state of each zone.

Register	Name	D7	D6	D5	D4	D3	D2	D1	D0
00	Status		Z3T	Z2T	Z1T		Z3F	Z2F	Z1F
01	Configuration		PIR3E	PIR2E	PIR1E		Z3A	Z2A	Z1A
02	Zone 1 On delay Sec	SEC1[7:0]							
03	Zone 2 On delay Sec	SEC2[7:0]							
04	Zone 2 On delay Sec	SEC3[7:0]							
05	Firmware version	VER[7-1]							

Detailed Register Description

Register 0x00: Zone Status Flag

A read-only flag to interrogate the current state of the zones.

Bit	D7	D6	D5	D4	D3	D1	D1	D0
Name		Z3T	Z2T	Z1T		Z3F	Z2F	Z1F
Reset								

ZxF – Zone x Flag

The Zone Status Flag indicates if the respective zone is activated i.e. switched on. This flag will remain high for the duration that the zone is activated.

0 – Zone off

1 – Zone on.

ZxT – Zone x Test Flag

This flag will be high for the duration that a particular zone has its Test Configuration flag enabled.

0 – Zone Test active

1 – Zone Test active.

Register 0x01: Zone Configuration Register

Bit	D7	D6	D5	D4	D3	D1	D1	D0
Name		PIR3E	PIR2E	PIR1E		Z3A	Z2A	Z1A
Reset		0	0	0		0	0	0

Reading this register will return the current state of the zone configuration. Writing to this register will configure the respective zones as described.

ZxA – Zone x Activation (Test) Flag

The activation bits will activate i.e. turn on the respective LED zone permanently with no regard to the configurations of the Zone On Delay settings. Setting the respective bits High (1) will activate the LED zone. This will also set the respective bit in the Zone Status Flag register. Setting the bit Low (0) will switch off the LED zone. This will also affect the ZxT flags in the status register.

PIRxE – PIR13 x Enable Flag

The PIR13 Enable Flag will indicate if the controller will react to a signal from the respective PIR13 motion detector. When the flag is set High (1), signals from the PIR13 will be enabled and will cause the LED zone to be switched on for the amount of time as configured in the respective Zone On Delay Register. Setting the flag to Low (0) will disable the signal from the PIR13 module.

Register 0x02 - 0x04: Zone x On Delay Register

Bit	Name	Function
Name	SEC[7:0]	Delay in seconds

Reading this register will return the current delay time for the respective zone. Writing to this register will configure the delay for the next time the zone is activated.

The Zone Delay is the number of seconds the LED zone should be activated for when it receives a signal from the respective PIR13 and the PIR13 is enabled for that zone. This register has no impact when the Zone Activation Flag is enabled. The value provided is expected to be an unsigned 8bit value. This provides a maximum delay of 255 seconds i.e. 4.25 minutes.

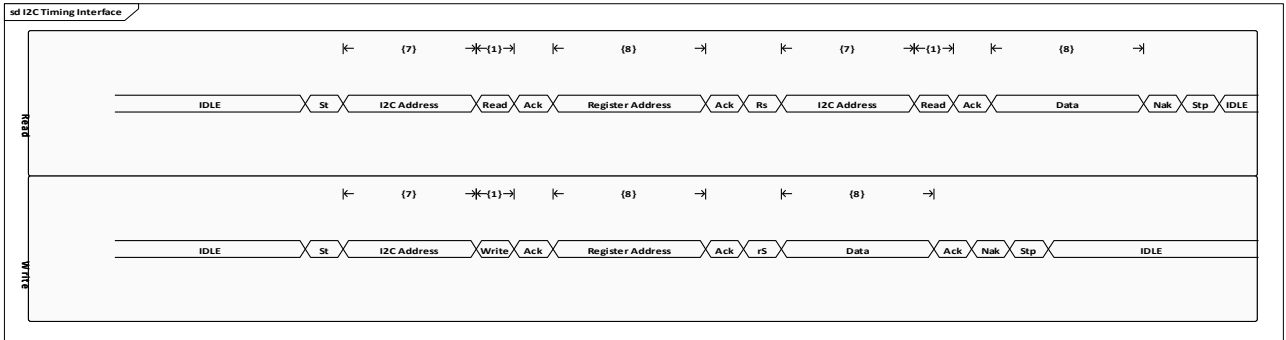
Register 0x05: Firmware version

This is a read-only register to return an unsigned eight bit value to indicate the firmware version.

Bit	Name	Function
Name	VER[7:1]	Firmware version

Timing

Diagram 1 shows the timing diagram for the I2C interface. The address is a 7-Bit address. The data is 8bit unsigned.



Application

The connection diagram below shows the intended application for the device. There are three banks of high powered LEDs. Each is driven by their own 30W LED driver. These are controlled internally by the Timed LED Lighting controller relays. Each zone will be monitored by its own PIR-13 motion detection module. The state of the lighting and the setting of the devices properties will be performed via the Raspberry Pi I²C interface.

