

Main components	
STLUX385A	Digital controller for lighting and power supply applications
STEVAL-ILL066V1 (ex. STEVAL385LEDPSR)	100W LED street lighting demonstration board using STLUX385A

## Specification

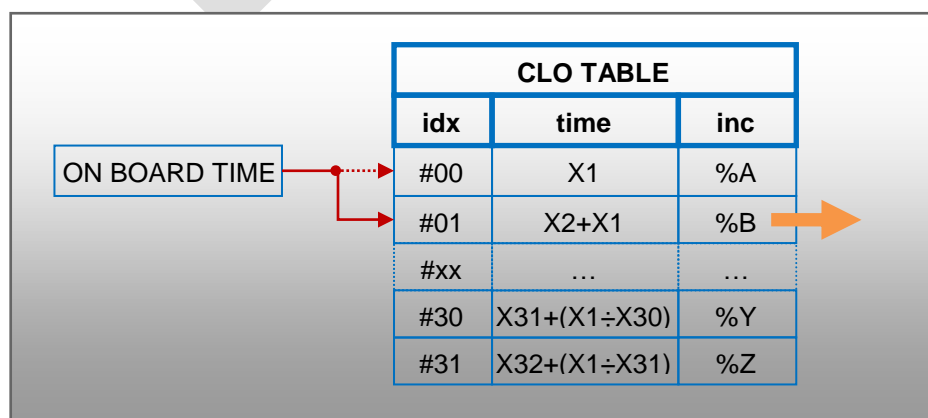
- Implement the CLO (Constant Light Output) function on the ILL066V1 demo board FW

## Function description

This document describes in detail the implementation of the CLO function on the ILL066V1 demo board FW. The CLO function is a system to compensate the output light level during the LED life. The CLO function use the “on board time” and a modifiable table to setup the light variation during the LED life. Customer is able to specify the time and the increment applied during the LED life. The CLO function is normally disable on the source code. To enable the CLO function set to one the “USE\_CLO\_FUNC” definition on the led.h file during the compile time.

The CLO function is available starting on the V3R35b10 FW release.

The following figure show the CLO function implementation.



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The on board time is showed using the “t” command. The “t” command show the seconds starting by the first power-on and count the power-on time in seconds. The on board time count a maximum of  $(2^{32}-1)$  seconds (more than 136 years). The on board time is automatically saved every power-off into an EEPROM area and restored at every power-on when the AC power line is used. The on board time is not automatically saved when the board is powered by the 14Vdc.

As an example the following figure show the time in second (10951) and the hundred microsecond (7347) after the first power on. The example show 3 hours, 2 minutes and 31 seconds.

```
ti
Time is 10951:7347
```

The CLO function is programmable by the user using a simple serial command. The maximum CLO (lout) increment is “+20%” and the Customer take this in account during the board design if you want to use the CLO function. The Customer is responsible to setup a correct CLO table to compensate the own LED light variation.

*NOTE: The ILL066V1 demo board is able to increment the lout only by a “+10%”÷“+15%” due to an hardware limitation.*

The CLO function implement a thirty-two (32) available slot (from 0 to 31) to setup the Customer LED light variation. Every slot is composed by an index to identify the slot, by a time to identify the thousand hours and by the increment percentage (from 0% to 20%). The CLO function is manipulated by the “c” serial command. The “c” serial command require three parameters; slot numbers, time increment and percentage to add.

- The first parameter is the index of the slot. Available numbers is from 0 to 31.
- The second parameter is the “time” increment (Khrs) waiting before apply the CLO output current compensation (third parameters). Available numbers is from 1 to 100 (from 1 Khrs to 100Khrs). The total time applied is the sum of the previous slot time starting from the slot 0 plus the time of actual slot, not the absolute time define into the actual slot. The CLO table ends when this parameter (“time”) is set to “0”. Any next CLO slot, after the first slot with the time equal to “0”, is ignored.
- The third parameters define the percentage to add to the actual “Il” value”. This increment is apply when the on board time is equal or more than sum of the time specified on the previous CLO slot plus the actual. Available percentage number is form 0 to 20 (equal to 0% to 20%). The percentage to add is apply at every output current level.

As an example, the next “c” serial command setup

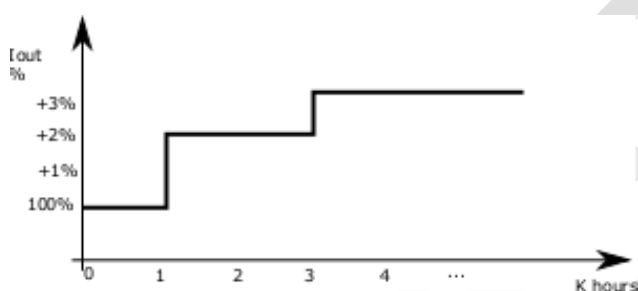
- The slot #0 to wait “1” Khours before apply the “2%” of lout increment, so, staring from the fist power on to the start of the 1000 hour, the output is the expected without CLO compensation.

- The second “cl” command setup slot #1 to wait “1”+“2” Khours before apply the “3%” of lout increment.
- The last “cl” command (slot 2) setup the end of the CLO table because set to “0” the time increment.

Using this example, the increment apply when the on board time is more than “1+2=3” Khours is the last increment, in this case “3%”.

```
cl 0 1 2
cl 1 2 3
cl 2 0 0
```

The result of the previous example is shown on the next figure when the lout is set to 100%.



All the “cl” serial command value are always stored into EEPROM area. The new parameters are apply immediately during run time.

When the “CLO” function is enable, the execution of the “st” command show one new line. The line is:

```
CLO Khrs=0 slot=0 inc=0 now=0
```

and define:

- CLO as the CLO identification line
- Khrs is the thousand hours unit reading the on board time. It is display the “K” to indicate thousand hours. Display “0” if the on board time is lower than 1000 hrs or “1” if the on board time is between 1000 and 1999 hrs, etc. If the “time speed-up” flag is active, the “K” is removed and display only hour/s.
- slot is the CLO slot number used, sensing the on board time and the CLO slot user definition.
- inc is the percentage applied at the actual “I” value using the on board time and CLO slot number defined on “slot” field.

- now is the “II” increment applied at the actual “II” value using the on board time, the CLO slot number and the actual “II” value defined by the user/DALI or 0-10 interface.

During the debug phases there are more serial commands available on “cl” command if the source code define the “CLO\_DEBUG” flag on “clo.c” file. To remove this debug serial command, remove or comment the “CLO\_DEBUG” definition on the “clo.c” source file. The “debug” serial command are:

- “cl 99 0 0” Call the CLO\_init routine to simulate the power on to initialize the CLO structure. This routine is called automatically during power on startup.
- “cl 98 0 0” Store the actual on board time into EEPROM area. This command is used when the board is powered by 14Vdc because only when the AC is removed, store automatically the on board time into the EEPROM area.
- “cl 97 0 0 ” Execute the CLO\_check routine. The CLO\_check routine is called every 1.6mS to update the value of the CLO increment when connected to an AC power line. This command is used when the board is powered by 14Vdc.
- “cl 96 0 0” Display the actual on board time, define the percentage used by the CLO function and apply it. Do not change the CLO increment, only actualize the percentage used by the CLO\_check routine.
- “cl 95 0 0” speed-up the board time for debug purpose. When the command is executed one time, the single hour is equivalent to 1000 hours, this speed-up the CLO function. The speed-up flag is volatile and is clear at every power on.
- “cl 94 [time] 0” “[time]” (hour number) is add to the board time. Max “[time]” value is 255 (u8) equivalent of 255 hours. For example “cl 94 2 0” add 7200 second (2 hours) to the on board time.
- “cl 93 0 0 ” show all the CLO slot table. End at the first slot with time set to “0”.
- “cl 92 0 0” Set the on board time to 0, clear (restart from 0) the on board time.

NOTE: The “CLO\_ct[CLO\_CT\_N]” table define the CLO increment percentage using “II” numbers only if the ILL066V1 demo board is used. For a Customer board the value on the table need to be adapted.

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## Support material

Related design support material
STWS-PSRDEMO-V3R35 (or next), source for STEVAL-ILL066V1 or STEVAL385LEDPSR
Documentation
Datasheet: STLUX385A - Digital controller for lighting and power supply applications
Application note: AN4461 - 100 W LED street lighting application using STLUX385A

## Revision history

Date	Version	Changes
21-Apr-2015	1	Initial release
5-Jan-2016	2	Fix some misunderstanding

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