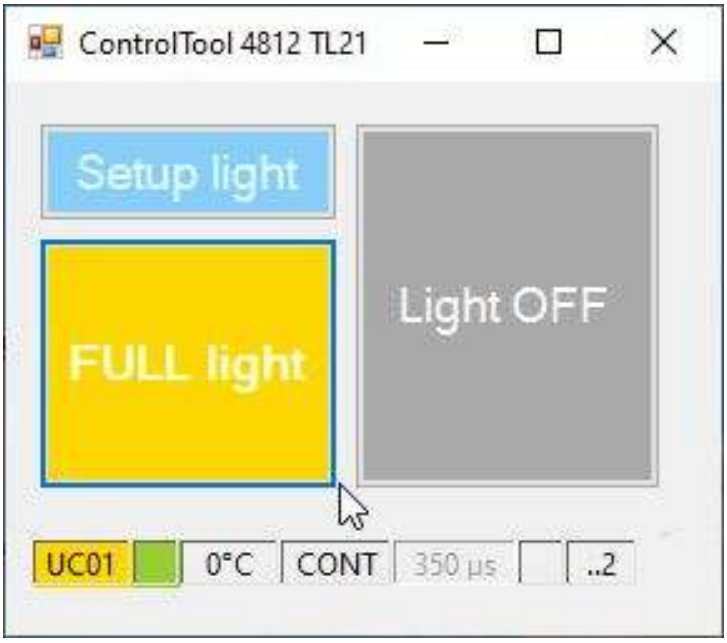
# IES 4812
# LED Controller

SYSTEM DESCRIPTION (Rev. UH11)

Stationary LED Controller for high speed video.

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# 1 Scope of usage and warnings

The LED Controller IES4812 is a power supply and control device for LED heads like IES4420, IES4421, IES4422, IES4423 and IES4425. It is made for indoor and stationary usage, and is not onboard crash test equipment.

It is lighting equipment for the field of high speed video filming and not intended for general illumination. It is designed for short term lighting as is common at crash testing or test stand scenarios, where maximum light output is needed just for seconds.

Attention! Never stare into the LED heads as it may be harmful to the eyes.

Attention! Never connect or disconnect LED heads while light is switched ON, as it may damage the controller or the LED heads.

Attention! High power LED heads will generate heat. Their cases may be hot.

Attention! High intensity light from the LED heads will be absorbed from many materials and cause heating of those materials. Keep a reasonable distance between LED heads and objects.

Attention! Ensure free airflow through controller. Fans are at rear side and air intake is below front panel.

# 2 Front panel elements

## 2.1 LED head connector

The LED controller has 8 current control output stages for LED arrays, which are routed to the two LED head connectors.

Each connector provides power to four LED arrays and has one temperature measuring channel. The pinout is given here:

Socket in front panel: Lemo EGG.2B.310
Plug for cable: Lemo FGG.2B.310

| Pin | Signal |
|---|---|
| 1 | Sup1 |
| 2 | Rtn1 |
| 3 | Sup2 |
| 4 | Rtn2 |
| 5 | Sup3 |
| 6 | Rtn3 |
| 7 | Sup4 |
| 8 | Rtn4 |
| 9 | NTC a |
| 10 | NTC b |

LED heads with four LED arrays (like model 4425, which is mostly used with this controller) can be directly plugged into the LED head connector.

Smaller LED heads may be connected to the controller with respective cable splitters. If cable splitters are used, pay attention to route the temperature sensor of a LED head to the controller. The cable splitters are marked with a transparent tube for the channel, that connects the temperature sensor to the controller. That means, if you are using not all splits of a splitter, please use the tube marked split preferably, because this is needed for temperature monitoring.

## 2.2 RMT remote connector

This connector is used for communication with the controller. It offers an RS485 interface, which allows easy integration of many controllers into a bigger system, including SyncLamps like IES4432 and/or sync-generators like IES4732.

It is also possible to use USB interfaces (USB to RS485 converters) or Ethernet interfaces (Ethernet to RS485 converters) to enable the connection of the LED controller to a PC.

An external synchronisation signal with electrical RS485 signalling can be input here. See 2.3 for a sync BNC input.

Socket in front panel:Lemo EGG.0B.305
Plug for cable: Lemo FGG.0B.305

| Pin | Signal |
|---|---|
| 1 | CMD+ |
| 2 | CMD- |
| 3 | SYNC+ |
| 4 | SYNC- |
| 5 | GND |
| Case | Shield |

## 2.3 BNC Sync IN

This BNC socket is provided as a TTL/CMOS 5 V compatible synchronisation input. Typically the sync output from a camera is input here, or the system wide sync signal in bigger installations.

## 2.4 CTL/STS connector

This connector provides control and status signals for interaction with peripheral devices, like a PLC. All signals are opto-isolated and have a current limiting circuit. They accept input voltages between 5 V and 24 V. Also provided is an isolated 5 V source, with facilitates interfacing.

Opto-Start
A voltage at Opto-Start switches ON the light. The duration for light ON can be selected in setup software to be self timed (internal timer trggered from the start signal) or timed from the signal duration.

Opto-Setup
A voltage at Opto-Setup acts like pressing the MODE front panel button. It can be used for remotely switch betwen setup light, full light and light OFF.

Opto-RDY
This is an open collector output whichs signals the READY status of the device. See description in 2.6.

Socket in front panel:Lemo EGG.1B.308
Plug for cable: Lemo FGG.1B.308

| Pin | Signal |
|---|---|
| 1 | Opto-Start K |
| 2 | ISO 0V |
| 3 | Opto RDY C |

| | |
|---|---|
| 4 | Opto RDY E |
| 5 | ISO +5 V |
| 6 | Opto Start A |
| 7 | Opto-Setup A |
| 8 | Opto-Setup K |

## 2.5 LED status indicators

The SUP LED indicates power good. If it is off, the device has no power supply or a fuse is blown (fuse located at rear side).

The RDY LED indicates READY status of the device. For the controller 4812 its ready status simply reflects the highest LED temperature. The device signals READY, if highest temperature of all LED heads is lower than 40°C. As a consequence, it signals not READY, if the temperature of any LED head is higher than this limit.

The background for the setting of this ready limit is in unattended series testing. A supervisor controller for a test stand may poll the ready status and if ready is signalled may initiate a next filming cycle. The LED heads have room for heating up between 40 °C and 75 °C in this scenario.

The SYN LED is the only orange LED and signals sync mode and signal as follows:
- device in sync-mode and sync-signal detected: ON
- device in cont-mode and no sync-signal detected: OFF
- sync-signal detected but device in cont-mode: blink 50%
- device in sync-mode but no sync-signal detected: blink 20%

The ETH LED signals ethernet connection and activity, blinking when communication occurs.

## 2.6 MODE front panel button

This button is provided to give some quick local control:

Short Press (1-3sec):
First press of button switches ON the setup light (small output level).
Second press of button switches ON the full light (high output level).
Third press of button switches OFF the light.

Press and hold for at least 5sec:
Activates the edit-mode, RDY and SYN LEDs now signal a 2bit mode-number, rotating through the available modes, as follows:
RDY OFF SYN OFF: Mode 0
RDY OFF SYN ON: Mode 1
RDY ON SYN OFF: Mode 2
RDY ON SYN ON: Mode 3

Chose mode by releasing the MODE button when the corresponding 2bit mode-number is shown.

Please keep in mind that switching ON the light may not result in actual light output, if sync mode is selected and no sync signal is present. Light will then go ON immediately when sync is applied.

| Mode Selector | Operation |
|---|---|
| 0 | Sync mode, synchronisation to rising edge |
| 1 | Sync mode, synchronisation to falling edge |
| 2 | Continuous mode |
| 3 | Pulse mode, if implemented, otherwise also continuous mode |

Modes 0 and 1 are the synced modes of operation. A sync signal from a camera or another sync infrastructure is required. In these modes light is output only during the time interval when the camera shutter is open. This is the by far best way of making high speed video lighting as it has best energy usage, best LED chip capacity usage and lowest heating up. It is the recommended method of using this controller and the LED heads.

Mode 2 is continuous mode and is provided for situations, where synchronizing is not possible. Compared to synced modes much more heat is generated in the LED heads. At the same time the camera will only use a fraction of this light, only during its shutter interval. LED power is reduced to 50% for continuous mode with respect to heat generation in small LED heads.

Mode 3 is a placeholder for a possible special mode, not implemented in most cases.

Take note that the RDY and SYN LEDs will also display the 2bit mode-number on POR for a short time, to tell the user the currently chosen mode in case no software is used.

# 3 PC Software Diag4812

## 3.1 Connection

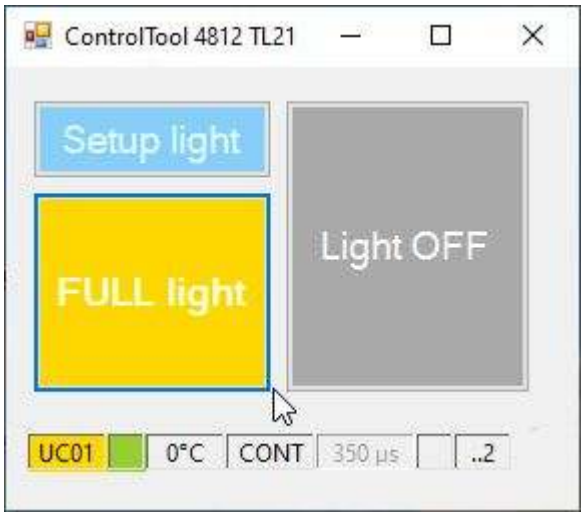
4812 has an Ethernet port, it can easily be integrated into the user's LAN.
A single instance of Diag4812 can control multiple 4812 devices simultaneously.

## 3.2 Ini file setup

The file "IES4812.ini" contains settings for the controller.
For each 4812 device to be controlled by the software a new LAMPGROUP# section has to be created.
The user can name it and customize the layout.
Important is to set the correct IP, so the correct 4812 unit is communicated with, the IP in the below example is the default IP 4812 is delivered with, it likely has to be changed to be compatible with the user's LAN, see corresponding section further below.

```
[LAMPGROUP1]
NAME=YourNameHere
LAYOUT=T(20,10)
GRIDSIZE=25
INTERFACE=TCP:192.168.1.40
BROADCASTLIGHTCMD=OFF
NUMDEV=1
DEV01=N:VR01 M:4812 S:UC01 L:(1,1)
C:Ies4812-1000fps
```

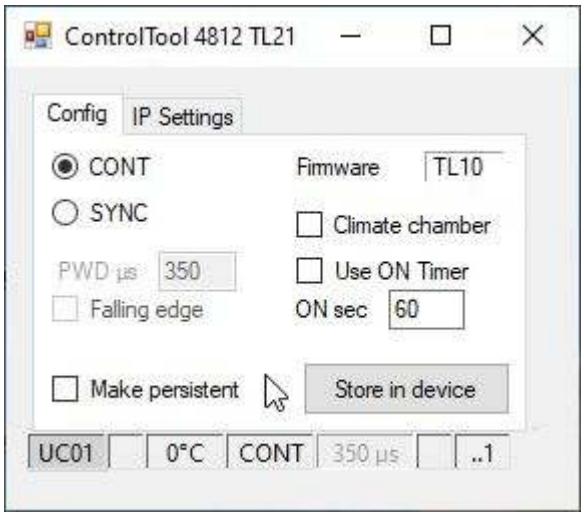
## 3.3 Control panel

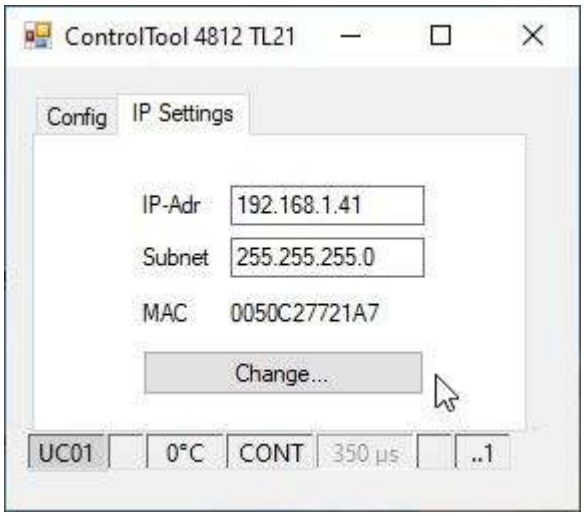



The software control panel is mostly self explaining. Setup light, full light and light off are the same as the short press of the MODE button.

In the lower left corner 4418's serial number is displayed, the background there indicates the currently active mode, full light in the example shown. A mouseover displays any connectivity errors, in that case the area stays empty with a red background.
The square next to the serial number is blinking green, indicating an active connection.
Also displayed are current temperature, cont/sync mode chosen and pulse width (greyed out if in cont mode).
A click on the '..2' area switches to the settings.

## 3.4 Controller settings




The 'Config' tab contains the advanced options.
Additionally the firmware serial is displayed here.

CONT and SYNC chose sync or cont mode.

If sync mode is chosen PWD sets the pulse width, checking 'falling edge' switches from the default rising edge mode.

Check 'climate chamber' if using one.

The ON timer allows for automatic light OFF after the chosen number of seconds.

Make persistent
Settings can be stored in the controller only for this session or permanently. If this is checked, they are stored non volatile, so they are available after next power up.

Store in device
Send command to store the new settings.

The 'IP Settings' tab configures the LAN settings to set 4418 up for the user's LAN.

# 4 CE Conformity

We,

IES Ingenieurbüro für Elektronikentwicklung und Spezialgerätebau Dr.-Ing. U. Bahr
In den Waashainen 2
38108 Braunschweig
Germany

hereby declare in sole responsibility, that our product

## IES 4438 LED Controller

complies in conception and production with the following EU standards

## 2014/30/EC (EMC)

## 2014/35/EC (LVD)

## 2011/65/EU (RoHS)

Applied standards:

**EN 61000-6-2**

**EN 61000-6-4**

If any modifications are applied from the end user, this declaration is invalid.

2018-12-02
*(Date)*

U. Bahr
*(Dr.-Ing. U. Bahr, company owner)*

# 5 Appendix for System Integrators

Revision TF08

## General communication scheme

Communication is done over **Ethernet** at the devices IP and using **TCP** protocol with **port 8000** (decimal). Communication is initiated by a master (normally a PC), which sends a command string to the device. The device sends an answer within 100 ms. Then a next command sequence can be started.

A command string looks like

#LK13LAMP00<LF>

where "#" is a fixed char, marking the start of a command. The "LK13" is the serial number of the device, which is used as a unique identifier. Next, "LAMP" is the command mnemonic. The commands are always 4 capital letters, as described in the table below. Some commands may have parameters, in this example "00". Parameters can have any length, but must be printable ASCII codes. Numbers are normally given as Hex-ASCII. The command string must end with the linefeed char (ASCII 0x0A), shown as <LF>.

Devices in general only respond, if the command is sent with their serial number identifier. There is one exception: Identifier "0000" is recognized from any device, and *any device will execute* the command. But devices will *not send an answer*, when adressed with "0000", execept for commands SSYS and SRCH, where an answer is sent in any case.

## Command set

The command set is given in the table below. Spaces are printed for better readability, but are not sent to or from the device.

| | |
|---|---|
| SSYS ssss mmmmmmmmmmmm | Setup System<br>Factory use only. Write serial number, MAC address and initialize system.<br>Parameters: Serial number, MAC-ID<br>Example: #0000SSYSMK010050C2772032<br>Answer: OK |
| SRCH | Search<br>Useful to find devices if serial number is not known a priori. Device answeres after an individual short delay with its serial number<br>Answer: ssss |
| IDFY | Identify<br>Read information for model, serial number, firmware revision and hardware features, including the bitmask of available lamp groups<br>Answer: IES4812 ssss rrrr ff<br>Remarks:<br>Some early devices answer with model code 4412.<br>Lamp group bitmask is 0x01, only one lamp group in |

| | |
|---|---|
| | 4812. |
| SIPS iiiiiiii ssssssss | Set IP settings<br>Parameters: New IP address 4 bytes in Hex-ASCII and subnet mask 4 bytes in Hex-ASCII<br>Example: #MK19SIPSC0A8012CFFFFFF00 for 192.168.1.44<br>Answer: OK<br>New settings are effective after next power on reset. |
| GIPS | Get IP settings<br>Read IP address, subnet and MAC of device.<br>Answer: iiiiiiii ssssssss mmmmmmmmmmmm |
| GSTS | Get status<br>Read status bits, max. temperature, **Lightlevel**.<br>Answer: ssss tt ll<br>Temperature is in degrees celsius, light level is 0 to 3. Status bits are shown in table below. |
| SMOD aa ff | Set mode<br>Set device sync mode and sync edge.<br>Parameter aa: 00=Sync/01=Cont/other: reserved<br>Parameter ff: 00=rising/01=falling<br>Answer: OK<br>Remark: SMOD and GMOD are deprecated and only supported as a legacy service. Preferably use the config block. |
| GMOD | Get mode<br>Read devices sync mode (aa) and sync edge (ff).<br>Answer: aa ff<br>Remark: SMOD and GMOD are deprecated and only supported as a legacy service. Preferably use the config block. |
| RDCF | Read configuration data block<br>Answer: Long string of ASCII text with layout given in table below. |
| WRCF cccccccc... | Write configuration data block<br>Parameter: Long string of ASCII text with layout given in table below. The new config is stored in RAM and will be lost after power down.<br>Answer: OK |
| STCF | Store configuration data block<br>Actual configuration as set with WRCF is stored in Flash memory and thus is conserved. If device is powered up, this configuration is used.<br>Answer: OK |
| LAMP nn | Switch on/off the lamp<br>Paramter nn: 00=off/01=low power/02=half/03=full<br>Answer: OK |
| LGIN mm | Lamp group info<br>Read information about a lamp group<br>Parameter mm: Bitmask for desired lampgroups.<br>For device 4812 only one lamp group exists, mask is 01.<br>Answer: nn hh rr tttttttttttttttt<br>nn number of light fields in this group (8)<br>hh actual power level 00 to 03<br>rr lamp ready bits, if a bit set 0, failure of LED<br>tt number of nn temperatures for all lamps in the |

| | |
|---|---|
| | group<br>Value FF, if individual temperature is not available |
| RLMF | Reset temperature limit flags.<br>Limit Flags are reset automatically after LED heads return to room temperature. Software can reset the limit flags also at higher temperatures, if desired.<br>Answer: OK |

## Status information

The **LampStatus** as read from command GSTS has this layout:

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|
| OVT | TLIM | TRDY | LEDFAIL | TEDSERR | OPTOIN | SUPAVL | RDY |

| b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 |
|---|---|---|---|---|---|---|---|
| NN | NN | NN | NN | NN | NN | SYNCAVL | LAMPENA |

RDY
Device is ready. Battery has enough charge and temperature of lamps is lower 45°.

SUPAVL
Charger supply is present or regular mains is present. If no charger supply is present, the controller runs from internal battery and will shut down after some time (configurable). For devices with no battery this bit is always 1.

OPTOIN
Reflects signal at START input.

TEDSERR
The TEDS checksum is incorrect and config settings may be damaged.

LEDFAIL
Set, if LED´s are supposed to be on, but no light is produced.

TRDY
Temperature ready flag. This flag shows a raised temperature, like it is present in normal operation. It can be used to judge, if a new test sequence should be started. The lamp is considered "ready" for the next test run, if the temperature is below 40°C, shown by this flag.

TLIM
Temperature limit is reached and the lamp power is automatically reduced by 50% or more

OVT
Overtemperature. The Lamp was switched off due to an overtemperature situation.

LAMPENA
The lamp is logically on. It might still be dark, if in sync mode and no sync is applied.

SYNCAVL

If a sync signal is detected, this bit is a 1.

## Error anwers

The device normally anwers with data, or with "OK". In case of an error it answers in a form like

```
ERR:DVST
```

where "ERR:" is a fixed part of the answer and the four consecutive letters describe the type of error. See table below.

| | |
|---|---|
| ERR:PARM | Invalid parameter |
| ERR:DVST | Actual device status does not allow this command |
| ERR:CHKS | Invaild checksum |
| ERR:UKWN | Unknown command, not implemented |

## Configuration Data Block

The configuration block contains all relevant configuration information for this device. It can be read and written. If written, information is stored in RAM, and device brings into effect the changed values. The config block is not automatically stored in Flash. If desired, use command STCF.
Device uses the configuration read from Flash at power up time.

| Offset | Bytes | Name | Description |
|---|---|---|---|
| 0 | 1 | Length | Size of Config-Block including checksum but excluding this Length field. Currently 27 Bytes. |
| 1 | 1 | SyncEdge | **Selects controlling edge of external signal.**<br>**00**: rising<br>01: falling |
| 2 | 1 | SyncMode | Selects how device synchronises light output to external signal.<br>00: SYNC ext (without PLL, allows quickly changing frequencies)<br>01: CONT (continuous light, no sync required) |
| 3 | 1 | SyncFrequency | Selects sync frequency for internal sync generator<br>Mult. of 100 Hz, Range 5 ... 100 |
| 4 | 2 | SyncDelay0 | Delay after controlling edge for sync group 0 in microseconds. Range 0 ... 65535 |
| 6 | 2 | SyncPulsWidth0 | Pulse width for sync group 0 in microseconds. Range 10 ... 5000 |
| 8 | 2 | SyncDelay1 | dito |
| 10 | 2 | SyncPulsWidth1 | dito |
| 12 | 2 | SyncDelay2 | read as 0, write don´t care |
| 14 | 2 | SyncPulsWidth2 | read as 0, write don´t care |

| | | | |
|---|---|---|---|
| 16 | 1 | SetupMode | Selects mode for setup light, when started from front panel Btn.<br>00: Sync from SyncMode<br>01: Force to Cont Mode |
| 17 | 1 | SetupOnDuration | Duration for setup light in seconds. Range 0 ... 255 |
| 18 | 1 | SetupLightPower | Power for setup light in percent %. Range 2 ... 50 |
| 19 | 1 | StartMode | Selects how device handles the end of START signal pulse.<br>0x00: Stop light controlled from timer ONLY<br>0x01: Stop light controlled from timer AND signal |
| 20 | 1 | StartPower | Power for start by START signal<br>00: 100%<br>01: Setup %<br>02: 50%<br>03: 100% |
| 21 | 1 | LampOnTimeLimit | Light on time after START signal (or CMD) in seconds. Range 0 ... 255 |
| 22 | 1 | LampOnTrailingTime | Light on trailing time after events like T0 (time zero) or sync fail, in seconds. Range 0 ... 255<br>---DEPRECATED--- |
| 23 | 1 | ReadyMode | Selects how ready status is built.<br>00: BAT + TEMP<br>---DEPRECATED--- |
| 24 | 1 | SearchDelay | Delay for response to SRCH command in 50 ms. Range 1 ... 255<br>---DEPRECATED--- |
| 25 | 1 | PowerOff-TrailingTime | Trailing time for power down after power is disconnected. Range 0 ... 255 |
| 26 | 1 | SpecialFunctionBits | Bitmask for special function settings<br>01: shift temperature limits for climate chamber use<br>02: 0=use Sync from MAIN, 1=use Sync from CAM1<br>04: 0=no T0 "emergency" LightON, 1=LightON at T0 |
| 27 | 1 | CHKSUM | Prüfsumme mod 256 |

This same layout of configuration block is used for different devices to enable control software beeing reused efficiently. But implemented functionality differs from device to device. In the table above, not implemented functionality for 4812 is colored in gray. Values must be written, but have no effect.

The configuration data block will potentially see changes over time. The length of the block (currently 27 bytes) will be used as a version information. Blocks with different length may have a different layout.