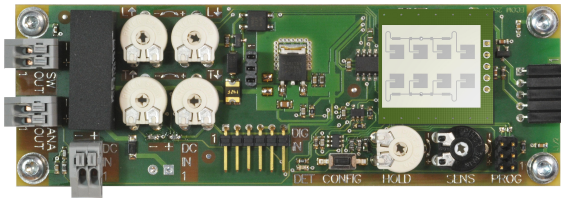
ST500 Indoor LED Activator Starterkit

Preliminary Datasheet

Features

- Movement Detector for Indoor LED Lighting
- Compatible with most RFbeam K-LCx Sensors
- 1...10V Analog and Isolated Digital Output
- Adjustable Sensitivity and Hold Time
- Adjustable Ramp Times and Brightness
- Power Supply 15V … 75VDC
- Selectable Energy Saving Pulsed Mode
- Fluorescent Lamp Interference Suppression



ST500 with RFbeam K-LC1a Radar sensor

Applications

- Indoor LED lighting control in conjunction with an external LED Driver
- Evaluating and comparing different radar sensor types
- Learning analogue Radar signal processing for movement detectors
- Using ST500 technology as a base for high volume customer specific solutions

Description

ST500 is a Radar based movement detector for objects moving up to 50km/h.
It consists of a Radar and a brightness processing section. It can directly be connected to a standard LED driver.
ST500 provides an isolated 1-10V standard analog output for driving LED power supplies. An additional isolated digital output becomes active during object detection.

ST500 allows individual settings of full and dimmed brightness, up and down ramp times, hold time and sensitivity.
Large input voltage range allows connecting ST500 directly in parallel to the LED array. Circuit schematic is included. Controller chip and software are available on request from RFbeam.

Electrical Connection

ST500 builds a part of an LED lighting system. It is sensing moving objects and generates a voltage at connector X2. The maximal voltage range is 1V (LED dimmed, no detection) to 10V (LED full power, moving object detected). ST500 takes its power directly from the LEDs. This is possible because the external LED driver delivers always a minimal current into the LEDs: the dim current. This current leads to a voltage drop in the LEDs that suppplies also the ST500 circuitry.

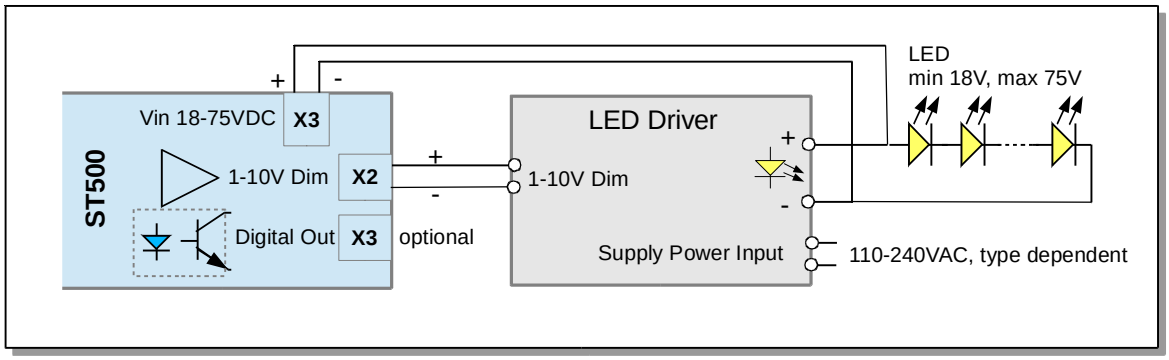
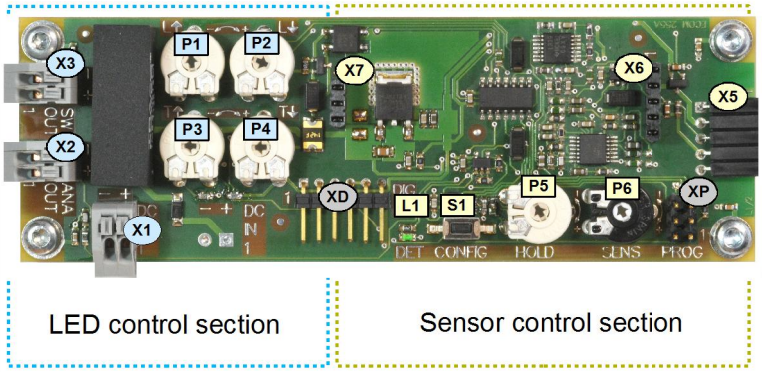


Fig. 1: Typical connection diagram

Connectors and Control Elements



X1: ST500 supply power input 18-75VDC
X2: Analog output "1-10VDC"
X3: Digital optocoupler output

X5: Radar sensor connector parallel to X6
X6: Radar sensor connector parallel to X5
X7: Support for optional K-LC6 sensor

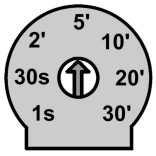
P1: Active brightness 0-10V
P2: Dimmed brightness 0-5V
P3: Ramp up time 0-30s
P4: Ramp down time 0-30s

P5: Hold time
P6: Sensitivity (max. detection distance)

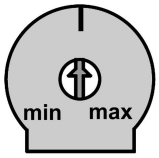
S1: Mode Selector
L1: Detection and mode LED

Fig. 2: Connectors and control elements

Sensor Settings



P5: **Hold Time**
Hold time ranges from 1 second until 30 minutes. Time setting is progressive.



P6: Sensitivity
Sensitivity sets the maximal distance range. Setting is approximately linear. With K-LC1a sensor: 1m ..10m.

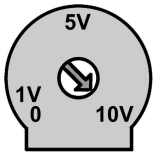
Light Control Settings

Changes of settings are only active after next detection.
Brightness levels however can be changed in real time by using the "Live Setting Mode":

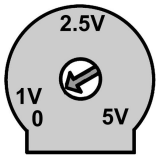
Live setting mode

Dimmed and active brightness can be conveniently observed andadjusted without detection.
By pressing S1, modes will change: Active brightness → Dimmed brightness → Normal Mode
The small detection LED beneath switch S1 flashes according to the mode.

1. Switch on light power
2. Press S1 → Active brightness mode → Mode LED L1 blinks fast → Set P1 to desired level
3. Press S1 → Dimmed brightness mode → Mode LED L1 blinks slowly → Set P2 to desired level
4. Press S1 → ST500 returns in normal detection mode



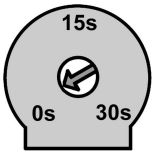
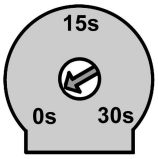
P1: **Active Brightness**
Active brightness ranges from dimmed to 10V (→ max. LED current)



P2: Dimmed Brightness
Dimmed brightness ranges from 0 to 5V.

- Active brightness can never be lower than dimmed brightness
- Dimmed brightness can never be higher than active brightness

- Setting between 0-1V normally has no effect on the brightness.
- 0V setting has beed introduced for very special LED drivers.

	**P3**: **Up Ramp Time** This setting allows smooth ramp up from dimmed to active brightness		**P4: Down Ramp Time** This setting allows smooth ramp down from active to dimmed brightness

Up ramp may be interrupted, if hold time is lower than up ramp time.

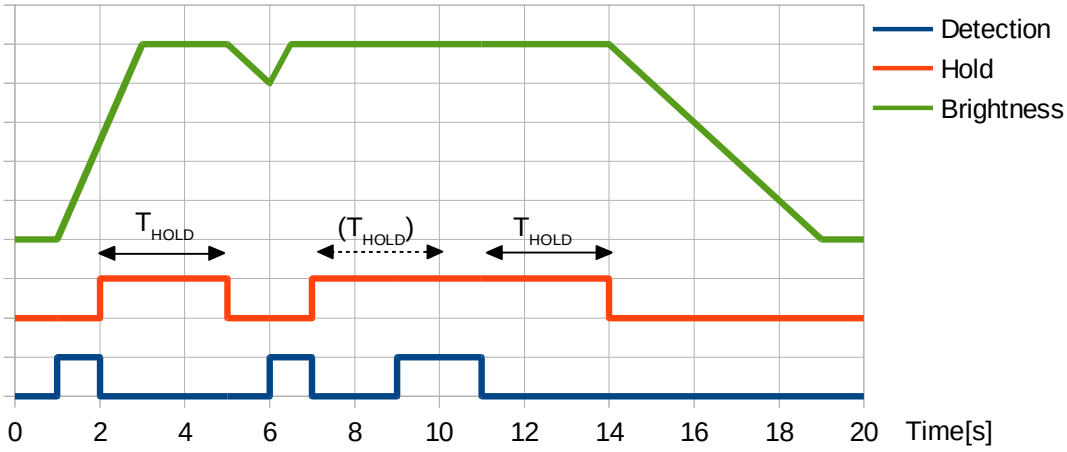
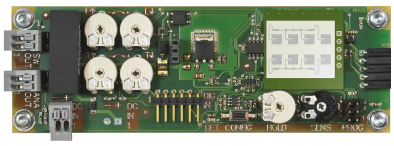
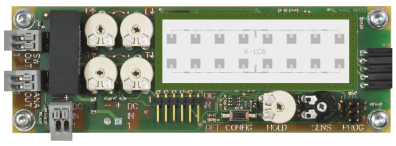
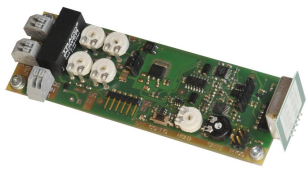


Fig. 3: System Example: Hold time = 3s, Up Ramp = 2s, Down Ramp = 5s

Hold time is retriggered by each detection.

Radar Sensor Types

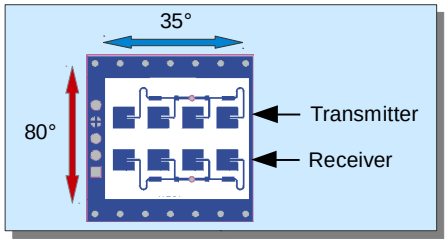
ST500 allows using different sensor types and sensor mountings.

		
Using K-LC1a or K-LC5	Using K-LC6	Using K-LC1a or K-LC5 frontal

Sensor Type	Field Pattern	Typical Detection Distance *)
K-LC1a	80° x 34°	10m
K-LC5	80° x 34°	20m
K-LC6	80° x 12°	30m

*) Person moving in frontal direction

The more antenna patches, the narrower the beam:



The broader the antenna, the narrower the beam. Most RFbeam sensors have 2 antennas, one for transmitting and one for receiving signals.
For transceivers, antenna pattern designates the resulting combination of transmitter and receiver characteristics. In this example, both antennas have the same characteristics.

Detection Field

Text follows

Principle of Operation

Text follows

Electrical Characteristics

Text follows

Application Notes

Continuous and Energy Saving Mode

Mode Selection

Text follows

Installation Tips

Radar for movement detection is a very reliable and robust technology. It is insensitive to heat, wind, dust, sunlight and other influences.

However, there are some important issues to take into consideration:

- Sensitivity to fluorescent light
- Material and thickness of cover
- Sensitivity to vibrations

The following application notes should help to optimize your application.

Cover

Every cover has some influence on the shape of detection field and the achievable maximum distance. Radar can „view“ through plastic and glass of any color. This makes a high degree of design freedom. Nevertheless, some rules should be considered.

- Cover must not be metallic.
- Plastic coating with colors NOT containing metallic or carbon particles.
- Distance between cover and front of Radar sensor > 1cm
- Best cover material is Polycarbonat or ABS
- Best cover thickness is 3-4mm
- Vibrations of RFA1 relatively to the cover should be avoided, because this generates signals that can trigger the output

Interference Factors

All these interferences can lead to false triggers of the output. Use RFA1 at the lowest possible sensitivity for your application.

Fluorescence Light

- Do not mount RFA1 directly facing to fluorescent lamps
- Use RFA1 at the lowest possible sensitivity for your certain application

Radar is susceptible to fluorescent lamps, even if controlled by electronic ballasts. These lamps produce a 100Hz (50Hz mains, Europe) or 120Hz (60Hz mains, USA) Radar signal that is similar to the signals produced by a person walking at about 2km/h.
RFA1 is equipped with a 100Hz filter, that can absorb a certain amount of fluorescent light interference. However, 100% protection against fluorescent light susceptibility is technically not possible.

Rain

- Prevent cover to get wet
- The lager the distance to rainy environment, the smaller the rain effect.

Raindrops can be interpreted by Radar as moving objects and may trigger the output.

Vibrations, Ventilators etc.

- RFA1 and its cover should be mounted stable to prevent vibrations
- Try to prevent objects like ventilators in the sight of RFA1

RFA1 Radar detects moving objects. Vibrations, ventilators, moving plants etc can also be interpreted as moving objects. Such objects can therefore trigger RFA1.

Sensitivity and Maximum Range

Sensitivity defines the necessary signal strength at the Radar sensor to trigger the output.
RFA1 allows adjusting sensitivity by a potentiometer.

Trigger distance at same sensitivity setting can vary depending on

- Type of Radar sensor used
- Type of moving object (person, car etc.).
- Moving direction of the object or the angle of RFA1 to the moving direction respectively

Datasheet Revision History

V0.1	2012-10-31	Initial preliminary release