LIGHT SENSOR

Description D014

Figure 1. The Light Sensor

Short description
The Light sensor is a phototransistor, which receives light through a glass fibre. The phototransistor converts the light intensity in the output voltage. The sensor can be used to measure light, but also to detect events such as falling water droplets.
The circuitry of the sensor is shown in figure 2.

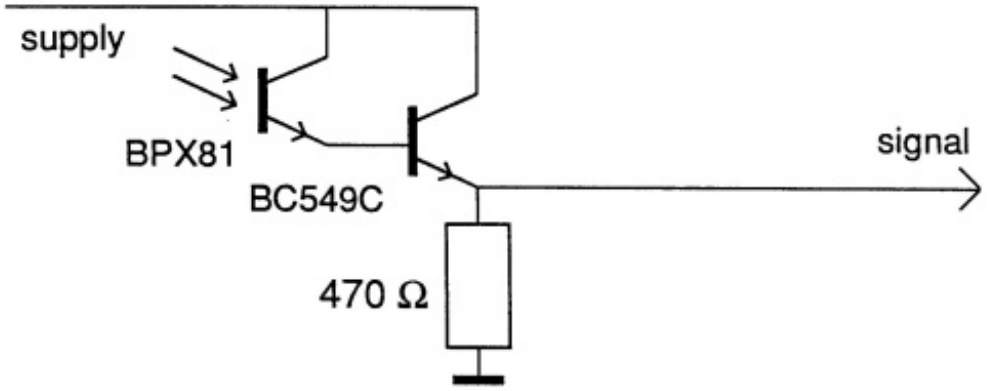


Figure 2. Circuitry of the light sensor

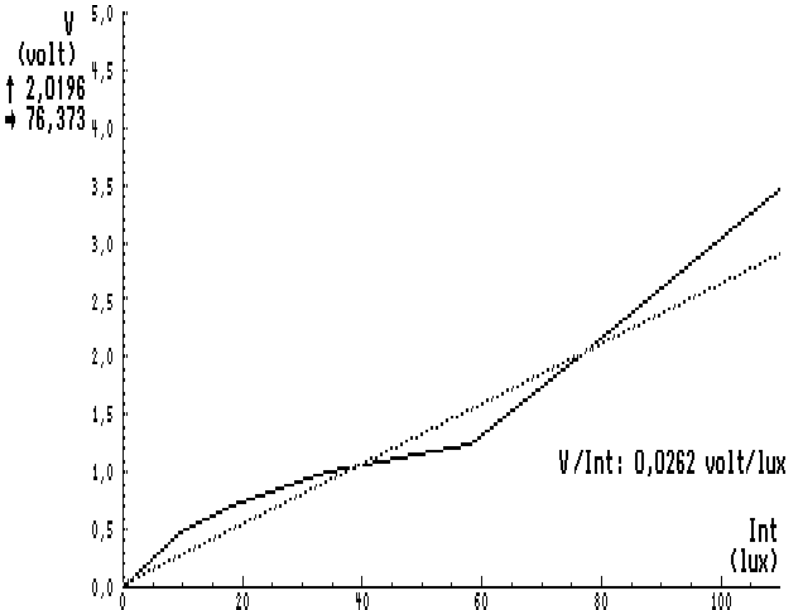
The light sensor is delivered with a BT-plug and can be connected to the following interfaces:

- UIA/UIB through Measuring console (via 0520 adapter)
- CoachLab
- CoachLab II
- SMI (via 0520 adapter)
- Texas Instruments CBL™ data-logger.

There is an adapter (art. 0520) to connect sensors with BT-plugs to 4-mm inputs.

Suggestion for experiments
Measurements of changes in the light intensity:
- Darkening of a solution caused by a chemical reaction.
- The rapid changes of the light intensity of a bulb because of 50/60 Hz variation in the supply voltage.
- Effects caused by on/off switching.
- Light interference.

Digital application (as a light gate):
- Measuring the acceleration due to gravity (falling stick with slits).
- Measuring the speed of objects undergoing collisions.
- Timing the period of a rotating object.
- Measuring the volume in titration experiments (by counting the number of falling drops).



Power (watt)	Light (lumen)
15	120
25	230
40	430
60	730
75	960
100	1380

Figure 4. Table with data about bulbs.

Figure 3. Calibration graph of the light sensor

The calibration graph has been measured by placing different bulbs at a distance of 1.0 m from the sensor: 26 mV per lux.

Linearity of the light sensor

The linearity of the sensor has been measured by varying the distance between the sensor and a source of light. For this purpose a bulb (100 W; 1300 lm) has been used. The output voltage of the sensor is plotted versus the light intensity in lm/m^2 (lux). Specifications of the sensor are with respect to the linear part of the calibration graph.

Because of small differences in the way the phototransistor and the glass fibre are positioned in the box, and of differences in the sensitivity of the phototransistors, the sensors may differ from each other in sensitivity.

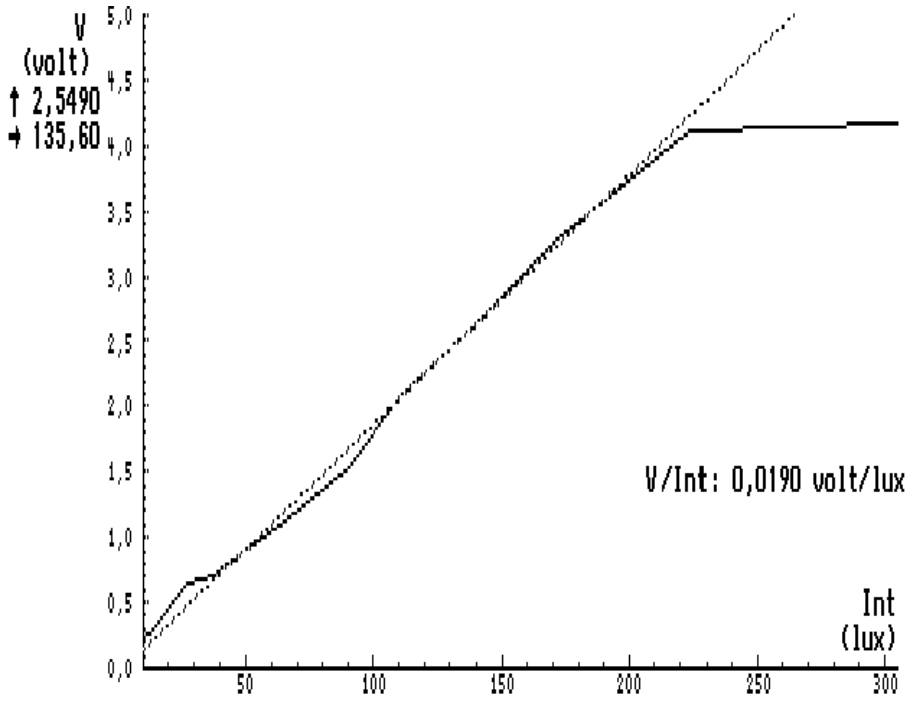


Figure 5. Output voltage versus light intensity

The name of the light sensor in the sensor library of Coach 5 program is **Light sensor (014&bt) (CMA) 0..200lux.**

Technical data

Sensitivity	≈ 20 mV/lux Because of differences in the way the phototransistor and the glass fibre are positioned in the box, and of differences in the sensitivity of the transistors, the sensors may differ from each other in sensitivity.
Output voltage	0 - 4 V
Light intensity range	0 - 200 lux
Resolution using 12 bit 5V A/D converter	0.06 lux
Glass fibre Plastic cover Metal end	Length = 100 cm Diameter = 0.1 cm Diameter = 0.22 cm Diameter = 0.3 cm
Connections	 BT (British Telecom) plug

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