POLIFEMO RADIO LIGHT

USER MANUAL

Release 200_006

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1. SUMMARY

2. INTRODUCTION

The new Microgate reflection photocell Polifemo is outstanding for its attractive design, conceived to meet the requirements of safety standards. Its unique optical design guarantees a high range and greater accuracy of measurement. In addition, special optical and electronic features guarantee maximum reliability even in poor outdoor light.
Internal power supply is provided by rechargeable batteries (the 'smart' recharge circuit is built into the photocell) which can be replaced with two normal AA size batteries, and allow 18 hours of autonomous functioning. Its microprocessor management and programming switches also make it a very versatile instrument.

Radio transmission of an impulse is a critical phase in timekeeping. The timekeeper and/or trainer have always displayed a certain scepticism towards timing via radio because of the fear of losing timing data and of inaccurate time taking.
Polifemo-Radio is a highly innovative instrument in the field of radio transmission of timing impulses. Thanks to technical innovation, the old impulse transmission systems have been replaced by data transmission which ensures maximum precision and reliability thanks to transmission redundancy and the use of error correction codes.

Built into the Polifemo-Radio photocell is an EncRadio-Light, the device for radio transmission of impulses which is part of the LinkGate-Light system. A high-performance top-quality FM radio module (433MHz 10mW) is used for transmission. It is possible to use the EncRadio-Light module to send impulses coming from other devices.

The Microgate Photocell Polifemo-radio-light

3. POLIFEMO-RADIO-LIGHT

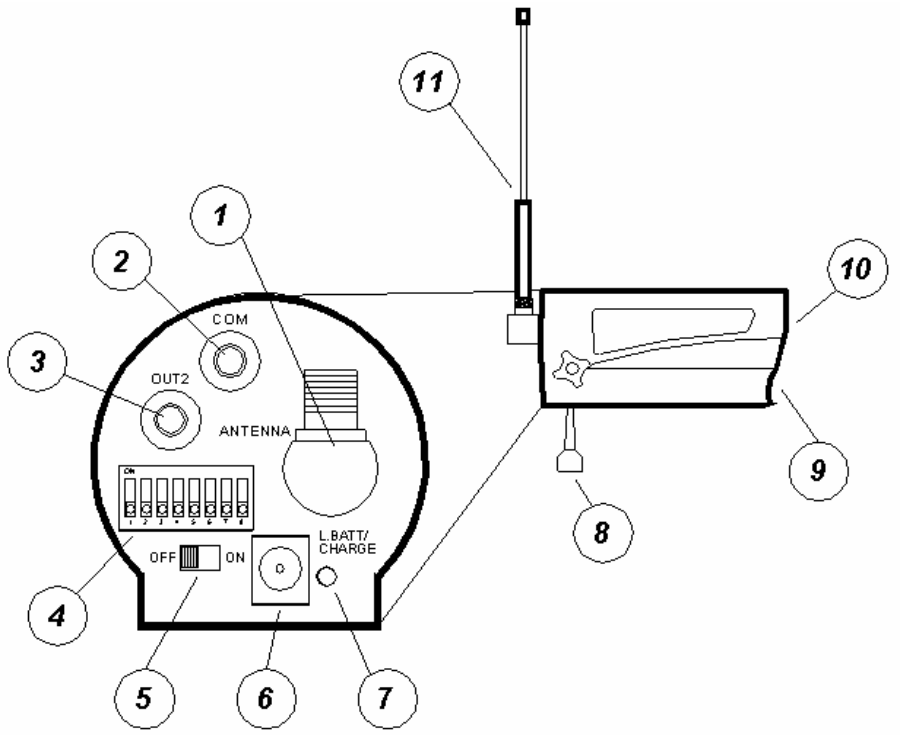


Fig. 1

1. **TNC CONNECTOR FOR EXTERNAL ANTENNA CONNECTION**
2. **COM: Black banana socket**
3. **OUT2: Green banana socket**
4. **DIP-SWITCHES FOR SELECTING SETTINGS**
5. **ON/OFF SWITCH**
6. **RECHARGE SOCKET**
7. **SIGNAL LED**
8. **BALL-JOINT**
9. **BATTERY COMPARTMENT**
10. **LENSES**
11. **EXTERNAL ANTENNA**

3.1. DIP SWITCH CONFIGURATION

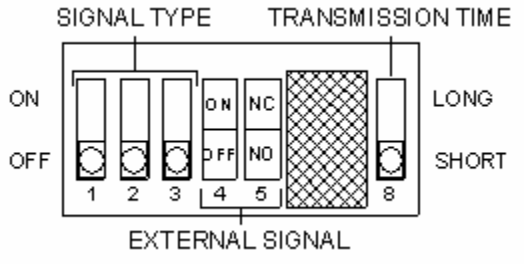


Fig. 2

4. OPERATING MODES

The Polifemo-Radio-Light photocell works by reflection: the maximum operating distance between the photocell and the reflector is 15 metres.

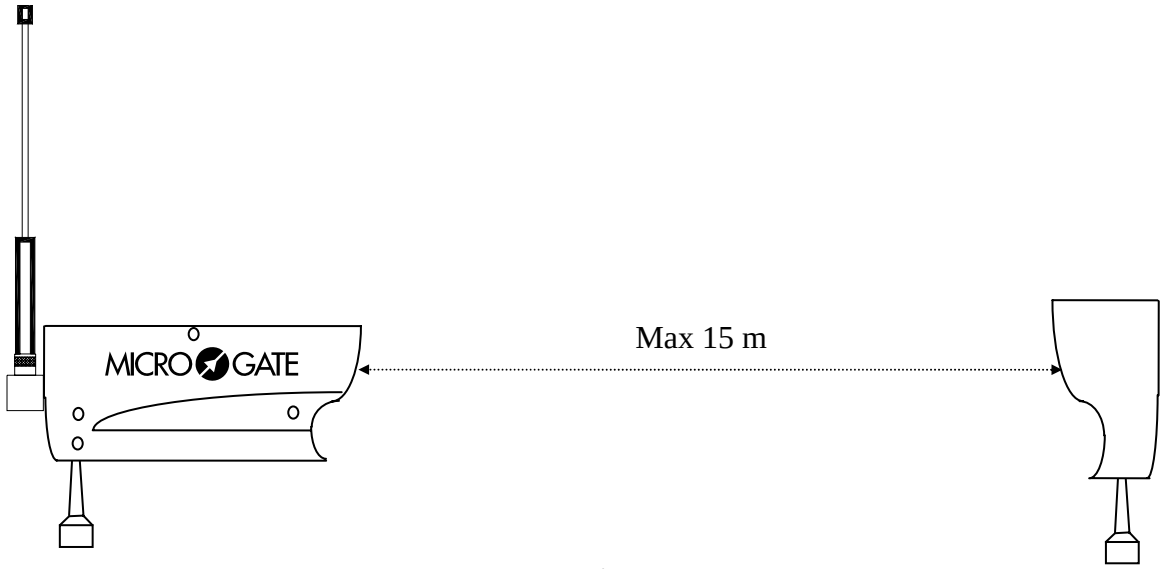


Fig. 3

4.1. CENTERING

Centering takes place in the following way: when switched on, the photocell emits a continuous BEEP, pointing the photocell on the reflector, the BEEP stops, thus indicating correct centering.

5. RADIO TRANSMISSION

The LinkGate-Light system incorporates special technological features to ensure maximum reliability in the transmission of acquired impulses.

5.1. DIGITAL TRASMISSION OF IMPULSES

EncRadio-Light transmits a set of data (no longer a single impulse!) that contains a large quantity of information. In particular, the following are transmitted:

- The transmitter's code
- The type of signal transmitted (Start, Lap number or Stop, which can be selected with the Signal Type switch)
- How long ago the event took place.

To the set of data are added numerous control codes and error self-correction codes which prevent a signal from being incorrectly interpreted during reception.

All the data (information + control codes) are transmitted 16 times, in order to reduce the possibility of reception failure.

Even with very disturbed signal transmission, this system ensures maximum reliability and precision (+/- 0.4 thousandths of a second); the complete reception of a single set of data is all that is required to reconstruct the original time of the event

5.2. SELECTING SIGNAL TYPE

Switches 1 to 3 make it possible to set the type of impulse you wish to transmit . The following table summarises the types of impulse available.

SWITCH 1	SWITCH 2	SWITCH 3	Signal type
ON	ON	ON	START
OFF	ON	ON	LAP 6
ON	OFF	ON	LAP 5
OFF	OFF	ON	LAP 4
ON	ON	OFF	LAP 3
OFF	ON	OFF	LAP 2
ON	OFF	OFF	LAP 1
OFF	OFF	OFF	STOP

5.3. IMPULSE TRASMISSION

By using a switch (switch n°8 next to the words TRASMISSION TIME) you can set transmission duration (approximately 2.3 seconds for long transmission and 0.6 seconds for short). By selecting long transmission, you will obtain greater redundancy of information as the same data will be transmitted 16 times. If you select short transmission the set of data will only be transmitted 4 times so you will have lower redundancy but with a substantial reduction of transmission time.

For normal use, we advise you always to use long transmission (switch n°8 ON)) in order to maximise the redundancy of transmitted data. However, for special applications such as the taking of several intermediate times very close together, using short transmission is the only practical solution if transmissions are not to overlap.

5.4. TRANSMISSION OF EXTERNAL IMPULSES

The EncRadio-Light module built into the photocell is able to send impulses taken from a source other than the photocell itself (e.g. gates, pressure switches, buttons …).

The use of this function is controlled by switches 4 and 5 labelled EXTERNAL SIGNAL.

Switch 4 in position ON enables the possibility of sending the impulse taken by other devices and at the same time disables the photocell itself. Consequently only the EncRadio-Light module built into the photocell is used.

Switch 5 selects the type of contact used, whether normally open (OFF) or normally closed (ON).

The external device is connected using the black and green banana jacks usually used for acquiring the photocell signal.

The following table summarises the function of switches 4 and 5.

SWITCH		Function		Banana jacks
4	5	Photocell	EncRadio-Light	
OFF	OFF	Active	Transmission of signals acquired by photocell	Output of signal acquired by photocell
OFF	ON	Active		
ON	OFF	Not active	Transmission of signals acquired on banana jack sockets	Input normally open
ON	ON	Not active		Input normally closed

5.5. START TIMER WITH START PAD

Connect the Start Pad with the black and green banana jack sockets (usually used for acquiring the photocell signal).
Set the Dip Switch 4 to ON to enable external input. The photocell is not active in this mode.
Select the type of external contact with Dip Switch 5 (normally open/closed).
Enable timer mode by switching Dip Switches 6 and 7 to ON.
Switch the photocell off and switch it back on with the On/Off switch to activate timer mode.
Typical Dip Switch setting for timer mode with Start Pad:

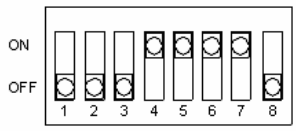


Figure 4

The start timer is activated when the athlete takes up position on the Start Pad.
After 1 second the photocell emits a BEEP to communicate that the time for taking up position is finished and waiting time has begun.
The photocell emits a BEEP-BEEP after 3 more seconds to indicate the end of waiting time and the start of random time, which ranges from 1 to 1.5 seconds.
The LONG BEEP at the end of random time signals the Start for the athlete.
When the athlete leaves the Start Pad the photocell transmits the event and reaction time.
The various timer phases are shown in figure 5.

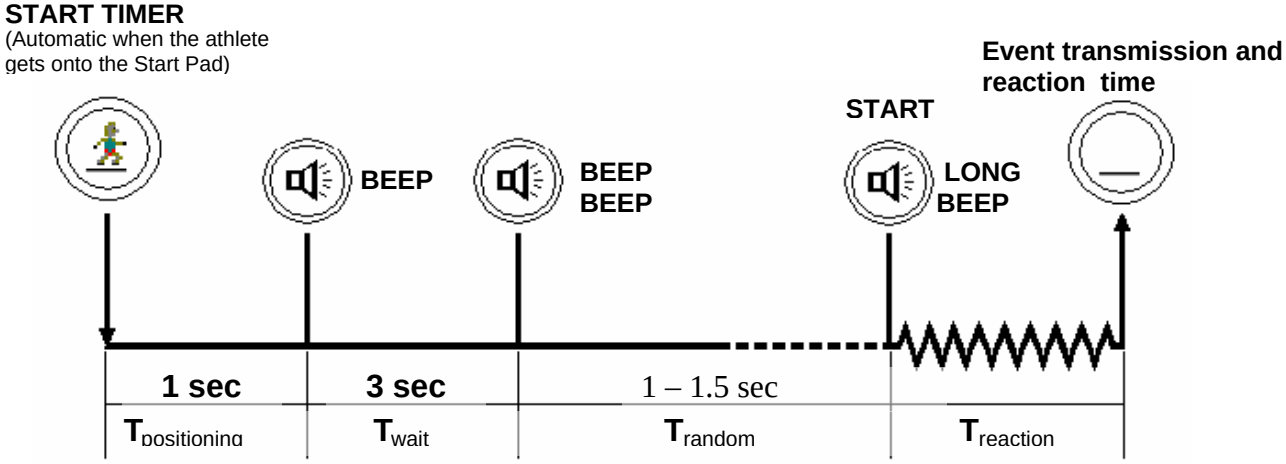
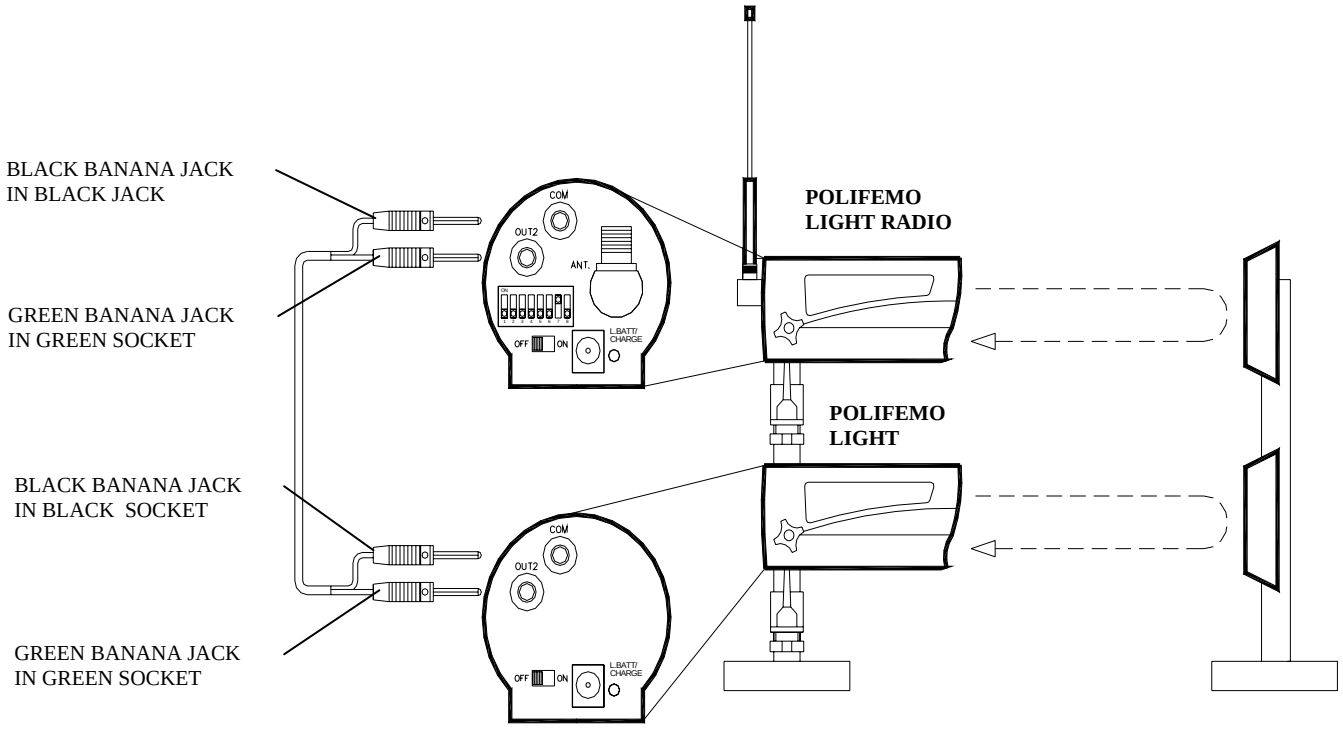


Figure 5

5.6. DOUBLE PHOTOCELLS FOR ATHLETICS

The double photocell system for athletics consists of 2 photocells placed one over the other and synchronised together. Only the simultaneous interruption of both photocells generates a signal. This system ensures that the photocells are interrupted by the competitor's bust and not by the movement of his/her arms

The special anchoring clamps make it easy to align the photocells and relative reflectors and make it possible to achieve the correct width of the sensitive zone.



This figure shows the connection of a double photocell system using a Polifemo Light Radio and a Polifemo Light. The two photocells must be connected together (2-meter CAB050 cables or 20-meter CAB048 cable) to make the system synchronous.
This function mode is used by means of switches 6 and 7 (Polifemo Light Radio), which must be set in the following way:

SWITCH	
6	**7**
OFF	ON

5.7. THE RECEIVING DEVICE

The DecRadio_Light modules are powered directly from the Microgate stopwatches using the special connecting cable. It is very simple to use:

- connect the Nucletron connector (see Fig. 6 N° 2) to the corresponding connector on the stopwatch
- screw in the antenna (see Fig. 6 N° 1)
- check that the channel set on the photocell corresponds to the channel set on the stopwatch (consult the relative manual for the stopwatch).

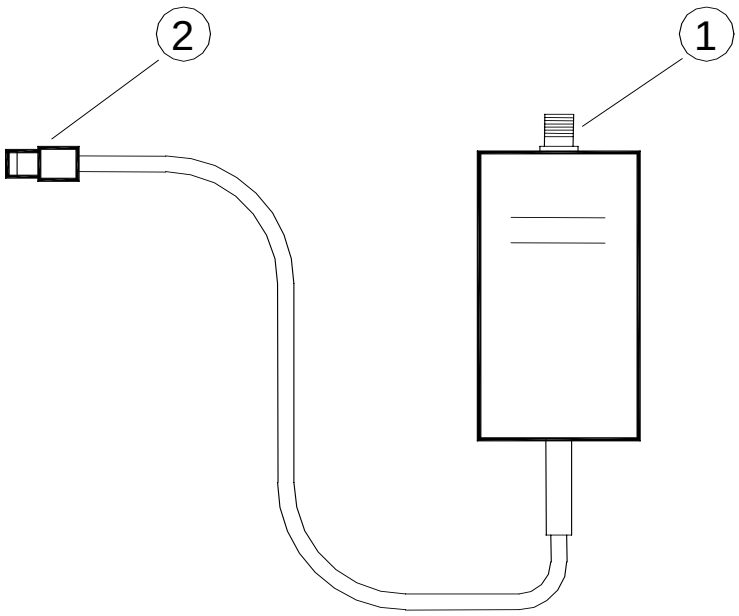


Fig. 6

1. BNC for external antenna connection
2. 5 pole Nucletron connector for Radio output

5.8. DISABLING OF RADIO TRANSMISSION

To disable radio transmission of the event, set Dip Switches 6 and 7 to ON (see Figure 7). Switch the photocell off and switch it back on with the On/Off switch to activate this mode.

Disabling transmission

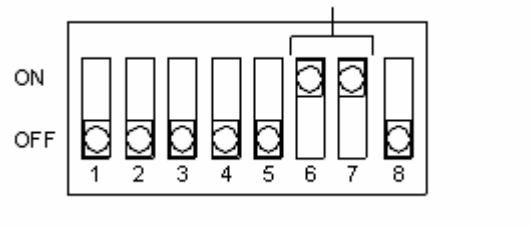


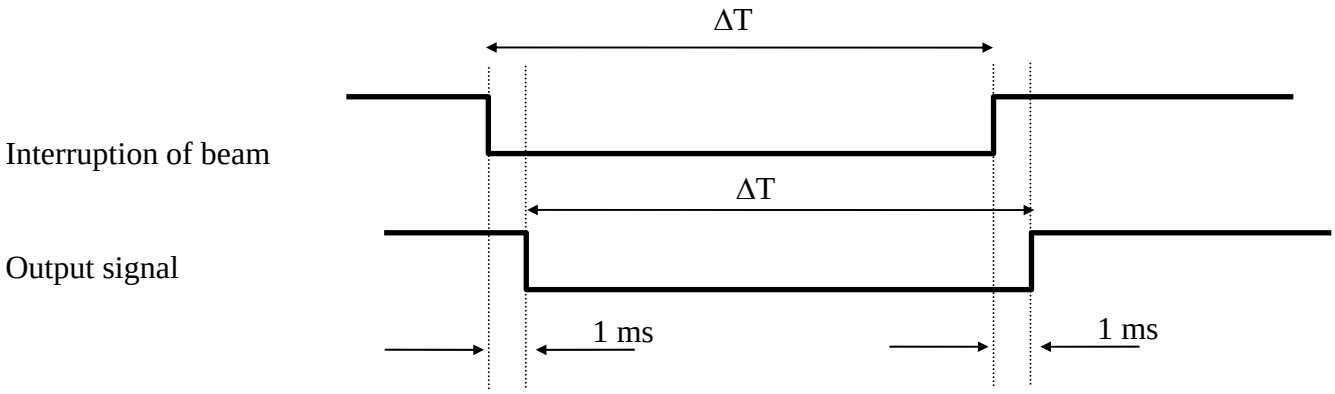
Figure 7

6. THE OUTPUTS

The Polifemo photocell emits a signal on the output, normally open, and is brought to the reference level (COM socket – BLACK banana jack) if the infrared beam is interrupted The signal is presented on the green banana jack (OUT2) and is compatible with every type of timing device.

6.1. OUTPUT SIGNAL

The output signal has a minimum duration of 3 hundredths of a second and has a constant delay relative to the event of a thousandth of a second. Of course the delay does not affect resolution, which for Polifemo is 125μs (0.125 milliseconds). The output level passes from high to low (contact closes) and is kept in this situation until the end of the interruption of the infrared beam



7. POWER SUPPLY

The Polifemo photocell can be powered in 2 different ways:

- with batteries
- from recharge power source

Before continuing, it would be better to make clear what the various terms mean:

- batteries: Size AA batteries, both rechargeable and non-rechargeable types;
  rechargeable: both NiCd and NiMH 1.2V
  non-rechargeable: Alkaline 1.5V

- recharge power source: power applied to recharge jack (see fig 1 n° 6). Voltage must be between 8V and 13V (we strongly advise you not to use voltages above 13V; for higher voltages a security mechanism - varistor – breaks the supply circuit. The circuit is restored when voltage has returned within the operative range).

Polifemo can manage both types of power supply simultaneously. If the photocell is on and powered from an external power source or from a recharge power source, the batteries are protected by using 'external' power sources; moreover, if recharge power is sufficient, the batteries are kept charged by a recharge current with a suitable duty cycle.

7.1. RECHARGE MANAGEMENT

Recharging the Polifemo batteries can only take place with the photocell off and is managed 'smartly' by the microprocessor in the photocell itself. The standard procedure is to discharge the batteries and then to fully recharge them. Recharging starts after insertion of the power supply jack with sufficient voltage (Vch>8V) and the photocell off.
The following steps are carried out by the program which manages recharging:

STEP	ACTIONS	LED	DURATION	POSSIBLE ANOMALIES
1	Checking of presence of rechargeable batteries	Continuous red	1 minute	Presence of non-rechargeable batteries
2	Battery discharge	Continuous red	variable according to previous state of charge	Batteries removed or reach dangerous voltage levels (faulty batteries)
3	Battery recharge	Blinking green	7 hours	Batteries removed or reach dangerous voltage levels (faulty batteries)
4	End of recharge and maintenance of charge level	Continuous green		

Switching on the photocell or lack of recharge voltage result in interruption of the recharge procedure.

7.1.1. IMMEDIATE RECHARGE

If immediate battery recharge is required without first discharging the batteries, put the switch (Fig. 1 n° 5) to ON for an instant and return rapidly to OFF. The recharge management program will not first discharge the batteries (steps 3 and 4)
Only in exceptional circumstances should the batteries be recharged straightaway without being first discharged as this shortens their life.

7.1.2. ANOMALIES

Any anomalies occurring during the recharge procedure are signalled by slow blinking of the red LED and the sound signal BOOP-pause-BOOP. When an anomaly is detected, the recharge cycle is interrupted.

8. TECHNICAL DATA

Weight	
Size	59 x 180 x 104 (l x p x h)
Minimum resolution	0.125 ms
Delay in relation to event	1 ms
Temperature of use	-25°C/+70°C
Power supply:	
batteries	rechargeable: NiCd, NiMH 1.2V non-rechargeable: alkaline 1.5V
external power source	4V÷13V with overvoltage-protection
Battery recharge	Built-in "smart" recharge device
Autonomy	18 hours
Processor	8 bit C-MOS microprocessor
Connections	Connections on optoinsulated banana jacks
Optical range	15 m
Transmission mode	Digital FSK transmission; redundancy code with information accuracy check and self-correction
Radio frequency	433 MHz
Radio transmission power	10 mW
Transmission channelization	(16 selectable channels)
Impulse transm. precision	± 0.4 ms
Time base	4 MHz quartz ±10 ppm from -25°C to +50°C
Controls	*Dip switch* for selecting type of signal transmitted (Start, Lap 1..6, Stop) *Dip switch* for selecting long/short signal *Dip switch* for selecting transmission channel
Radio transmission range	About 300 m

9. LINKGATE_LIGHT DECODER TECHNICAL DATA

Weight	120 g
Size	65 x 50 x 30 mm (l x h x w)
Reception mode	FSK decodifying
Time base	4 MHz quartz
Operating temperature	-25° / +70°C
Power supply	5 Vcc, supplied directly from stopwatch
Connections	Cable with 5 pole connector for connection to stopwatch