OBELUX CSW-DCW

Fault monitoring, switch-over and flash controller unit

Manual

Version 1.1

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1 CHANGE LOG

Version	Date:	Description:	Author
0.1	24.03.2016	Document created	AHa
1.0	07.07.2016	Document release	AHa
1.1	05.10.2016	External photocell support added	AHa

2 ABOUT THIS DOCUMENT

This document describes the installation and setup of the CSW-DCW unit, DIP switch effects and operation of the unit on practical level.

CPU	Central Processing unit, Microprocessor
GPS	Global Positioning System
Light Head	Aviation light

Table 1: Acronyms and Abbreviations

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3 ABOUT THIS PRODUCT

Obelux CSW-DCW is a combined all-in-one aviation obstacle light controller, flasher and photocell unit with independent outputs to drive obstacle warning lights.

GPS options are factory-installable so they need to be included in the first order. This manual explains using options that are not present at every CSW-DCW.

CSW-DCW has four output channels that have power monitoring feature. Power monitoring windows can be set for all individual channels with dial switches. In addition to sending an alarm via dry contact, the CSW-DCW can drive backup light(s) during master light outage.

CSW-DCW is microprocessor-controlled. Application software is stored in the CPU, the central processing unit. CPU programming is done at the factory. Application upgrade, if such exists, can be done at Obelux. This requires that the CSW-DCW is sent to Obelux for the upgrade. The customer can also do the update on-site with a programming device and instructions that Obelux can provide.

3.1 Versions

Obelux CSW-DCW is available as the following models:

Order code	GPS synch.	GPS antenna cable
CSW-DCW-B-F	No	NA
CSW-DCW-B-G	Yes	NA
CSW-DCW-B-G3	Yes	3m
CSW-DCW-B-G5	Yes	5m
CSW-DCW-B-G10	Yes	10m

Antenna for use with Obelux CSW-DCW:

GPS External Antenna
Order code: -G, -G3, -G5, -G10
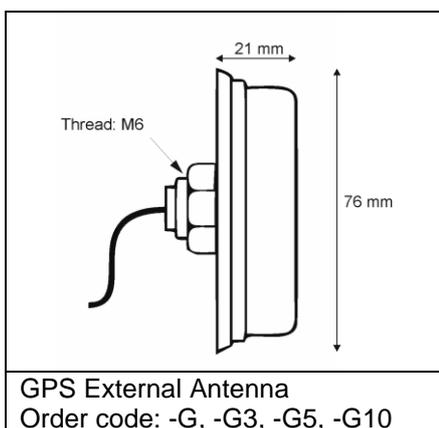
4 SAFETY INSTRUCTIONS

In this section you will find general safety instruction for the device. Please read the instructions carefully before installing or using the device to avoid any personal, environmental or material damages.

4.1 General considerations

Install device observing manufactures installation guide

Use only cables and connectors specified by the manufacture

Keep your device away from heat sources, dust, smoke or other harmful substances

Do not add or remove any components inside the device unless otherwise approved by the manufacture

Do not spill food or other liquids on device

If you have any error situation with the device, do not try to fix it by yourself, contact your reseller.

4.2 End-of-Life/Disposal

The European Parliament and the Council of European Union issued directive 2012/19/EU to contribute to sustainable production and consumption by, as a first priority, the prevention of WEEE and, in addition, by the re-use, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste and to contribute to the efficient use of resources and the retrieval of valuable secondary raw materials.

Obelux aviation obstacle light products sold inside European Union can be returned to manufacturer if no local WEEE separate collection and re-use services are available. Please contact Obelux for details.

Obelux does not refurbish returned items but forwards them to authorized WEEE treatment facility.

4.3 Personal considerations

HIGH VOLTAGE! Device contains high voltage which is very dangerous to human beings. Any direct contact to high voltage could lead to serious injury, worst case even death. Make sure the mains power supply is disconnected before starting the installation process.

CAUTION. Do not look directly in to the lights from close range. In some cases, this can cause damage to your eyes. Make sure that the system is off before servicing the aviation lights.

5 INSTALLATION

5.1 Device installation

Mount the CSW device to the selected mounting point using quality made fasteners. When the cover door is open, check that there is no inflow of water (incl. hail and snow) into the cabinet.
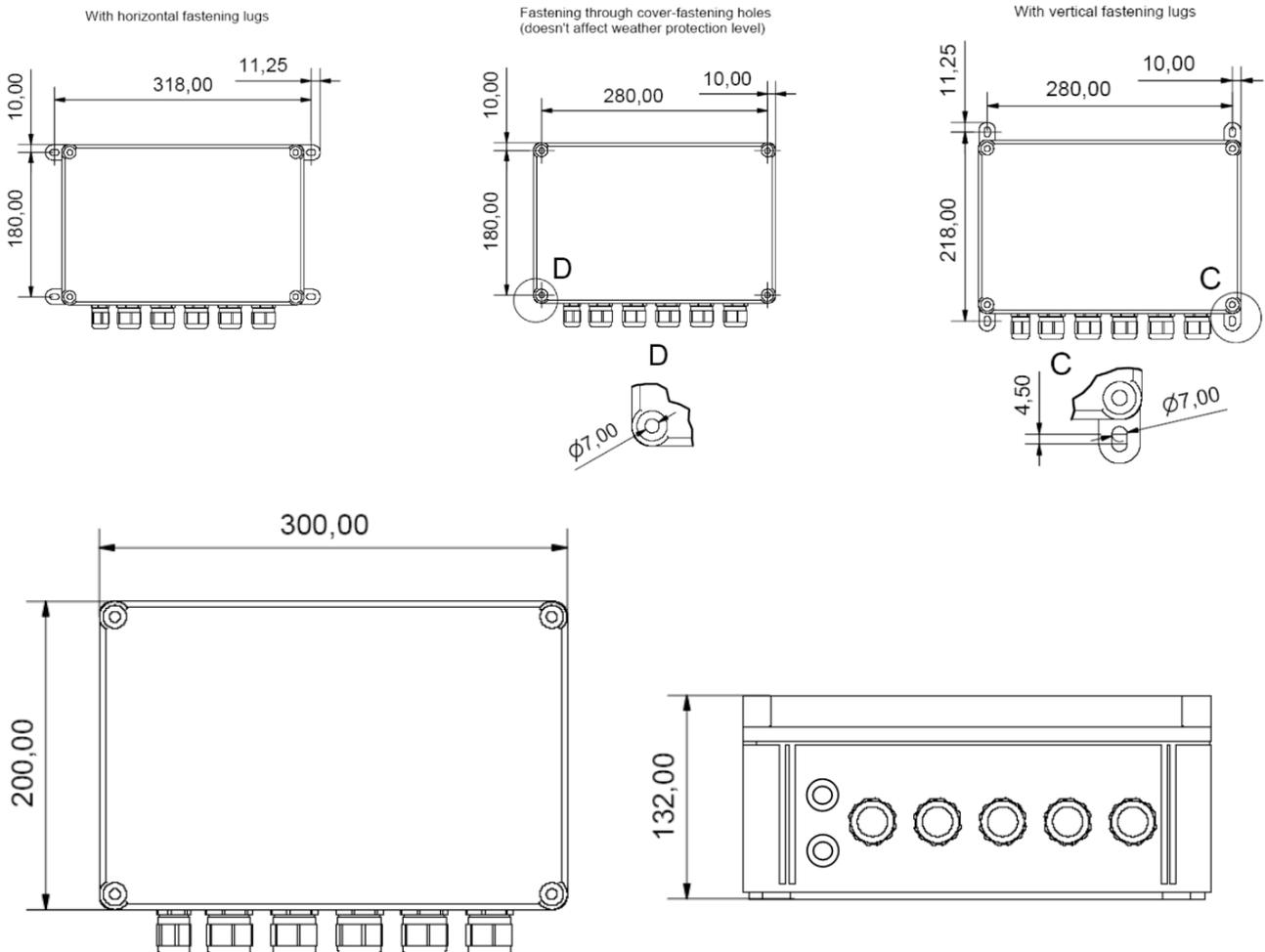
5.2 Wiring

Route cables using cable glands on the bottom side of controller. Connect the cable wires securely to appropriate terminal block connectors. Connect GND connection on the DC power input directly to a good ground point to ensure system is properly protected from overvoltage and electrostatic discharges. If you are using shielded cables connect shields to the appropriate GND connection. Place the cover properly on its place and securely tighten all four screws on all corners of the cover. There are two different size cable glands available on the cabin. Make sure that unused glands and gland holes are plugged shut.

Cable gland 5 x M25 for 13-18 mm cable diameter

Cable gland 2 x M16 for 4.5-10 mm cable diameter
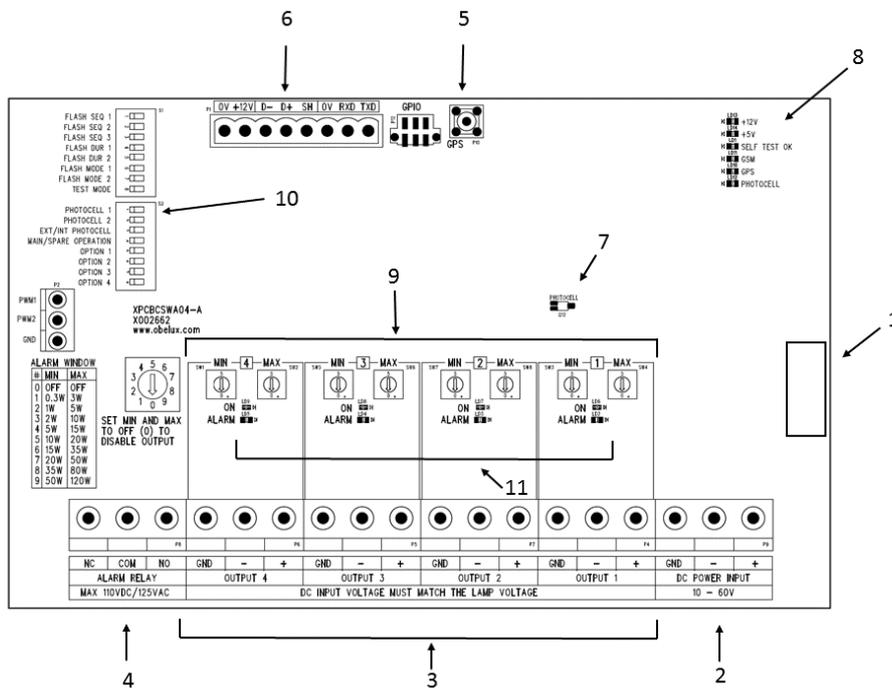
Figure 1: Controller module

1. CSW-DCW Application software version label
2. DC power input
3. Output connectors (four channels)
4. Alarm relay output connector
5. GPS External Antenna connector
6. External photocell data and power connection. Power supply and data to GSM modem.
7. Internal photocell
8. Status LEDs
9. Rotary DIP switches to set power monitoring window for each output channel
10. Configuration DIP switches (two switch blocks with eight switches in each)
11. Status LEDs for alarms.

⚠	Positive (+) DC supply power to CSW and positive (+) DC supply on outputs to lamps are connected together i.e. hard-wired to each one. DC input voltage must match lamp voltage.

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5.2.1 DC power input

Mark	Description	Information
+	Positive	Connect to power supply positive
-	Negative	Connect to power supply negative
GND	Ground	Protective earth

The positive connector (+) on each output channel is hard-wired to positive connector (+) of supply power connector. Supply voltage shall not exceed 60 V $_{DC}$. Tighten the connector screws using flat-head (straight) screwdriver.

Conductor cross-section (stranded)   0.2mm² - 4mm²

Conductor cross-section (solid)   0.2mm² - 4mm²

5.2.2 Outputs 1-4

Mark	Description	Information
+	Positive	Connect to light head positive
-	Negative	Connect to light head negative
GND	Ground	Connect to light head PE

The positive connector (+) on each output channel is hard-wired to positive connector (+) of supply power connector. Unused output connectors can be left floating i.e. no wiring there is required. They shall not be short-circuited. Tighten connectors securely using flat-head (straight) screwdriver.
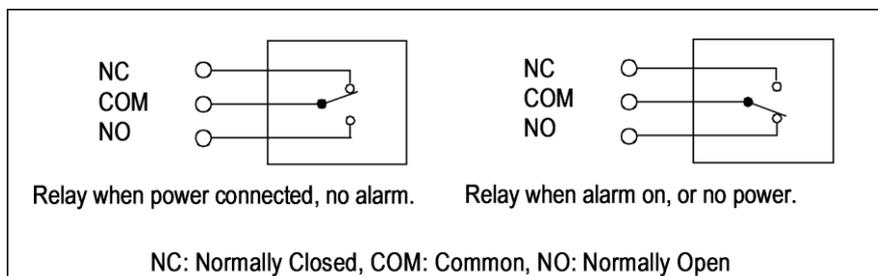
Conductor cross-section   0.2mm² - 4mm²

5.2.3 Alarm relay output

Mark	Description	Information
NO	Normally Open	In alarm, connected with COM (Common)
NC	Normally Connected	During normal operations, connected with COM (Common)
COM	Common	Common relay contact

This relay is a small signal relay. Unused alarm relay connectors can be left floating i.e. no wiring there is required. When CSW-DCW is without power and when it starts (reboots), the relay signals an alarm. Alarm relay state changes during start-up process if there are no pending alarms to be signalled.

Conductor cross-section   0.2mm² - 4mm²

Relay when power connected, no alarm.   Relay when alarm on, or no power.

NC: Normally Closed, COM: Common, NO: Normally Open

5.2.4 GPS External Antenna

GPS receiver is factory-installed option. If the CSW-DCW is mounted indoors or with limited sky view, an external GPS antenna needs to be used. Antenna is connected to the SMA connector on the CSW board. Connector location can be seen in the Figure 1. Be careful not to overtighten the connector.

6 CONFIGURATION

This chapter describes the configuration of the CSW-DCW board. The configuration is carried out by setting the 16 DIP switches on the CSW-DCW board. OFF position for a dip-switch is towards the left edge of the CSW-DCW board.

Having all 16 DIP switches to OFF is a special case. CSW-DCW reads stored configuration from memory and starts using this configuration if it is a valid one. If there is no valid configuration, the CSW-DCW uses configuration where all DIP switches are set to OFF. This configuration disables all channels.

```
FLASH SEQ 1    →■  □  ON   S1
FLASH SEQ 2    ℕ■  □
FLASH SEQ 3    ω■  □
FLASH DUR 1    ꜰ■  □
FLASH DUR 2    ⑤■  □
FLASH MODE 1   ⑥■  □
FLASH MODE 2   ⑦■  □
TEST MODE      ⑧■  □

PHOTOCELL 1          →■  □  ON   S2
PHOTOCELL 2          ℕ■  □
EXT/INT PHOTOCELL    ω■  □
MAIN/SPARE OPERATION ꜰ■  □
OPTION 1             ⑤■  □
OPTION 2             ⑥■  □
OPTION 3             ⑦■  □
OPTION 4             ⑧■  □
```
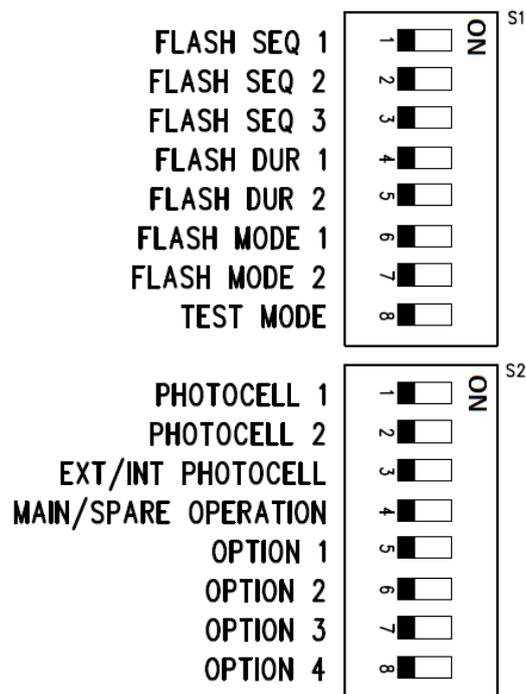
Figure 2: DIP switches in off position

6.1 Base sequence

DIP switches named ***FLASH SEQ 1, 2, 3*** select the Base Sequence.

- (off,off,off) Selects always Steady-burn.

- (on,off,off) Selects 60 flashes per minute total. (One flash / second)

- (off,on,off) Selects 40 flashes per minute total. (One flash / 1.5 seconds)

- (on,on,off) Selects 20 flashes per minute total. (One flash / 3 seconds)

- (off,off,on) Selects the BMVBW flash sequence. 1s on - 0.5s off - 1s on - 1.5s off
  Please note: Set DIP switches 4 and 5 to OFF when using this base sequence.

- (off,on,on) Selects 30 flashes per minute total. (One flash / 2 seconds)

- Any other selection is RESERVED for future expansions.

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6.2 Flash duration

DIP switches named **FLASH DUR 1, 2** select the Flash duration. The Flash duration tells the CSW how long each flash is.

- (off,off) Selects 100ms flash duration. (1/10 of a second)

- (on,off) Selects 250ms flash duration. (¼ of a second)

- (off,on) Selects 500ms flash duration. (½ of a second)

- (on,on) Selects CASA compliant flash duration (Duty cycle: 2/3 ON, 1/3 OFF)

IMPORTANT: Only use Steady Burn, 20 FPM, 30FPM, 40 FPM or 60 FPM base sequences with the CASA compliant flash duration setting! Other base sequences may cause undesired operation.

6.3 Flash mode

DIP switches named **FLASH MODE 1, 2** select the flash mode. The flash mode setting effects the method with which the flashes are directed to the outputs.

- (off,off) All enabled outputs flash together.

6.4 Test mode

DIP switch named **TEST MODE** selects the test mode. Test mode makes CSW-DCW system testing easier. Set the test-mode DIP switch to ON to enter test mode. In test mode output channel 1 can set ON from the Option 1 DIP. Option 2 DIP turns on the channel 2. Same applies to Option 3,4 DIP switches and output channels 3,4. In test mode, the CSW-DCW shortens the photocell timing periods. By physically blocking the photocell all the channels are set to night mode with a short delay.

After using test mode, turn off the Option 1-4 DIP switches. If they are not off, the CSW will not function normally.

	In production environment, use test mode with appropriate caution.

6.5 Photocell sensitivity

DIP switches named **PHOTOCELL 1, 2** select the photocell sensitivity.

- (off,off) Photocell operation disabled

- (on,off) Photocell enabled, disables outputs if light level above 400 Lux.

- (off,on) Photocell enabled, disables outputs if light level above 800 Lux.

- (on,on) Photocell enabled, disables outputs if light level above 1600 Lux.

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6.6   Photocell operation

DIP switch named *EXT/INT PHOTOCELL* selects internal photocell.

- (off) Internal photocell is used.
- (on) External photocell is used.

6.7   Main/Spare operation

DIP switch named *MAIN/SPARE* set the main/spare operation.

First pair:

- Output 1 (Main 1)
- Output 2 (Spare 1)

Second pair

- Output 3 (Main 2)
- Output 4 (Spare 2)

6.8   Options

DIP switches named *OPTION 1, 2, 3, 4* must be set to off in normal operation. If DIP switches Option 1 or 2 are turned on, the CSW will function in modus mode. In this mode it will listen to commands from the RS485 bus. This functionality is not covered in this manual.

6.9   Alarm windows

All four channels have their own rotary switch dials to select minimum and maximum alarm limits. Alarm window is selected by turning the dials with a flathead screwdriver to the wanted setting. Each number represents a certain power limit. For example, selecting number 4 from the MIN dial and number 5 from MAX dial selects the alarm window to be from 5W to 20W. If the power consumption on that channel is outside this window the alarm is triggered. If the lights are used in flashing mode, the maximum alarm limit must be selected according to the maximum power consumption during the flash pulse.

When both MIN and MAX dials are set to zero position, the output channel is disabled.

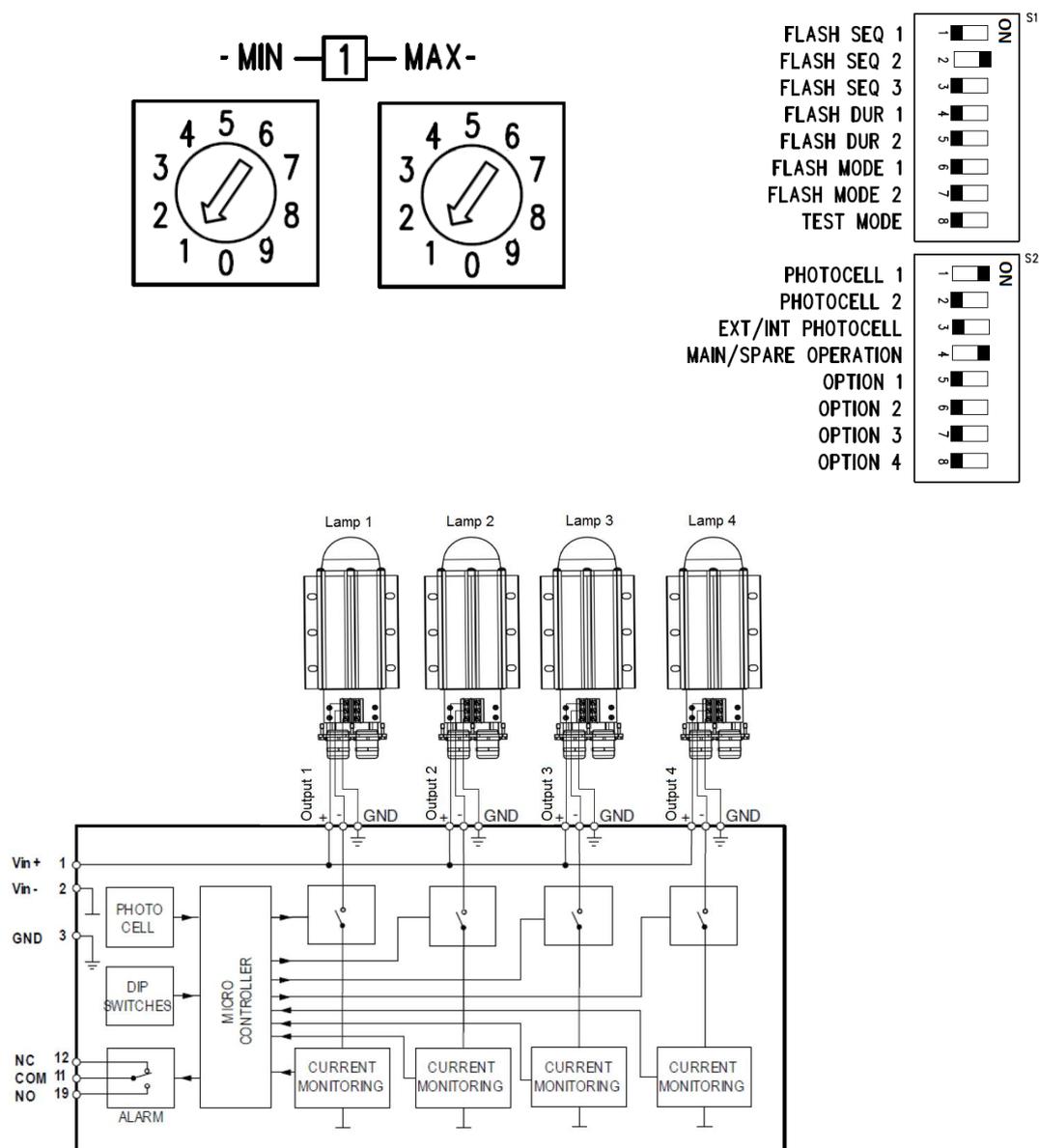| #	MIN	MAX
0	OFF	OFF
1	0.3W	3W
2	1W	5W
3	2W	10W
4	5W	15W
5	10W	20W
6	15W	35W
7	20W	50W
8	35W	80W
9	50W	120W
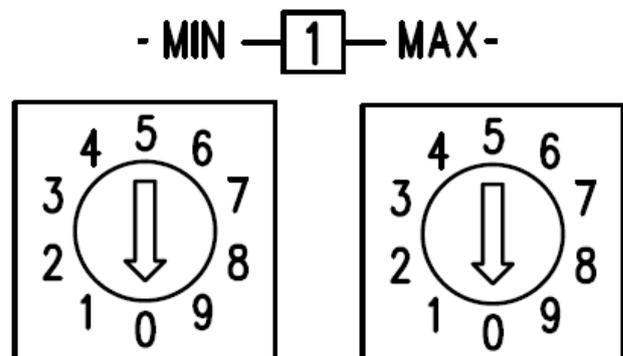
Table 2: Alarm window settings

6.10 Configuration example

This example presents how to use Obelux CSW to control Obelux LI-10-DCW-F low intensity aviation obstacle lights in master/spare set-up with internal photocell. We have selected 400lux to be the threshold where low intensity lights are turned off. Flashing frequency is selected 40 flashes / minute and flash duration 100ms.

In this example Lamp1 and Lamp3 are main lamps. Lamp2 and Lamp3 are spare. If Lamp 1 fails, the CSW turns Lamp1 off and Lamp2 on. If Lamp3 fails, the CSW turns Lamp3 off and Lamp4 on.

Obelux LI-10-DCW-F consumes approx. 70 mA when operated with 12 VDC. Power consumptions during flash pulse is 0.83W. Power window is selected to be from 0.3W to 3W on all output channels. This is done by selecting number 1 on both MIN and MAX rotary switch dials and on all four output channels.

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6.11 Dip Switch Settings

DIP Switches				
1 -> 3	**1**	**2**	**3**	**Flashing sequence selection.**
	off	off	off	Steady burning. All active channels.
	on	off	off	60 flashes / minute
	off	on	off	40 flashes / minute
	on	on	off	20 flashes / minute
	off	off	on	BMVBW sequence: 1s on - 0.5s off - 1s on - 1.5s off.
	off	on	on	30 flashes / minute
	on	on	on	RESERVED
4 -> 5	**4**	**5**		**Flash duration.**
	off	off		100 millisecond flashes.
	on	off		250 millisecond flashes.
	off	on		500 millisecond flashes.
	on	on		CASA Flash duration (Duty cycle: 2/3 ON, 1/3 OFF)
6 -> 7	**6**	**7**		**Flashing mode.**
	off	off		All active Outputs flash together.
	off	on		Outputs 1-3 are flashing together, output 4 is steady burning.
8	**8**			**Test mode enable**
	off			Normal operation
	on			Test mode. (*See documentation for information about test mode)
9 -> 10	**9**	**10**		**Photocell operation (External and Internal photocell)**
	off	off		Photocell not used.
	on	off		Lights are disabled if lighting level is above 400 lux.
	off	on		Lights are disabled if lighting level is above 800 lux.
	on	on		Lights are disabled if lighting level is above 1600 lux.
11	**11**			**External / Internal photocell selection.**
	off			Use internal photocell
	on			Use external photocell
12	**12**			**Main / Spare operation select.**
	off			Normal operation
	on			Main / Spare operation.
13	**13**			Option1
14	**14**			Option2
15	**15**			Option3
16	**16**			Option4

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7 OPERATION

The CSW-DCW is used to flash aviation obstruction warning lights. It monitors the current going into each lamp and raises an alarm if the output power is either lower than expected or higher than expected.

The CSW-DCW can have a GPS receiver mounted on the printed circuit board that is used to synchronize all CSW-DCW flash sequences so that all CSW-DCW units flash their lights simultaneously all over the planet. Also, the CSW-DCW has an internal photocell on the board that can be used to switch off the lights at day time.

7.1 Start-up

The CSW-DCW application takes some time to perform start-up tests as there are numerous features that require detection and initialization. Also, the start-up process now includes an output test pattern. The Self-test OK LED blinks during start-up process.

7.2 Flash sequence

The CSW-DCW has several different user selectable flash sequences. Base sequence, Flash duration, Flash mode. User can select the flash frequency (FPM) and flash duration. In addition to this the CSW also has special flash sequences. These settings are described in more detail in the Chapter 6.

7.3 Power monitoring

The CSW-DCW monitors the current going into each aviation obstacle light once it is lit. Every time a light is set to illuminate, the channel output is checked for short-circuit. If short-circuit is detected, the output channel (light) is disabled and an alarm is raised.

Also, whenever a light is illuminated, the current this obstacle light draws from power supply via CSW-DCW current monitoring circuit is checked 20 times in each second in order to detect possible light unit failure. If the current going to a light is outside the selected range, an alarm is raised. Over-current situation will also disable the light. User sets these limits by selecting the power window with the rotary dial switches separately for each output. It is important to select the correct power range for the connected lights, as temperature changes may alter the current required by the lamp.

7.4 Global synchronization with GPS

The CSW-DCW unit has a factory-installed GPS module. When a GPS module is installed with appropriate antenna, the CSW-DCW synchronizes its clock and the flash models so that units flash simultaneously. The timing difference from one CSW-DCW to another is less than one millisecond when the units are GPS-synchronized. GPS synchronization status is signalled with GPS led on the CSW-DCW board. When the CSW unit is powered on, it can take up to 15 min to synchronize the flashing lights to the GPS signal.

7.5 Photocell

Photocell measures the ambient light in lux. When the ambient light level rises above the set threshold CSW turns off its outputs. When the lights are turned off by photocell, it will take 15 minutes to turn them on, and when lights are on, it will take another five minutes to turn them off by photocell. The photocell can be disabled, or set to threshold of 400, 800 or 1600 lx.

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7.6 Alarms

There are several types of alarms to indicate possible problems in the system.

7.6.1 Output power alarm

Over/Under power alarm is raised when the output power of individual output channel is outside the user defined window. Output alarm LED is turned on and alarm relay is triggered when the output power on the output channel is too high. Alarm relay is also triggered when the output power is too low. There is a small delay implemented in to this feature to minimize the amount of unnecessary alarms. CSW will try to recover to normal operation when power alarm is triggered.

When the output power is close to the limits, the ON LED will turn orange. In this case the power alarm window should be adjusted so that unnecessary alarms can be avoided. Normally the ON LED is green.

7.6.2 GPS alarm

When the CSW powered up the GPS alarm is triggered after 30min if GPS signal is not available. In normal operation GPS alarm is triggered if valid GPS time pulses are not received for 3 hours. CSW-DCW will also try to clear the error when GPS received. This way, GPS synchronization alarms caused by poor weather or similar will probably clear without any intervention.

7.7 Main/Spare operation

The Main/Spare operation changes the output layout of the CSW-DCW to use two Main/Spare output combinations. If the light unit connected to the main output fails, the spare light unit is used instead. CSW will not try to recover to the main output after it switches to the spare output channel. Alarms are generated as in normal operation.

First pair:

- Output 1 (Main 1)
- Output 2 (Spare 1)

Second pair

- Output 3 (Main 2)
- Output 4 (Spare 2)

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7.8   On-board LEDs

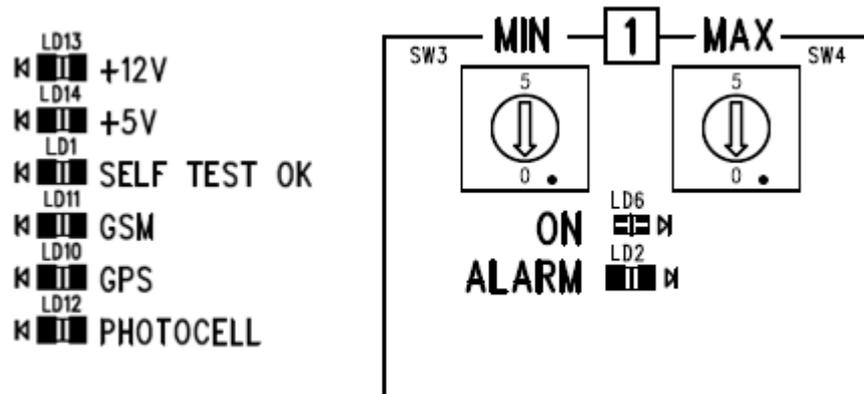This chapter describes the behaviour of the on-board message LEDs during start-up, normal operation and during alarms.

Figure 3: Status LEDs

+12V

This LED indicates that internal 12V operating voltage is ok.

+5V

This LED indicates that internal 5V operating voltage is ok.

SELF TEST OK

The Self-test LED flashes when CSW software is running normally.

GSM

Not used

GPS

In normal operation the LED is on if a navigation fix is obtained. If a fix is not found or is lost the LED stays off.

Photocell indicator

Not used

ON

All the four outputs have their own ON led. The ON LED follows the output of the channel. This means that the ON light is flashing with the same time and frequency as the aviation light. Green coloured light indicates that the aviation lights are working normally. Orange light indicates the output power is near limits of the output power window.

ALARM

All the four outputs have their own ALARM LED. This LED indicates whether there is alarm the output.

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