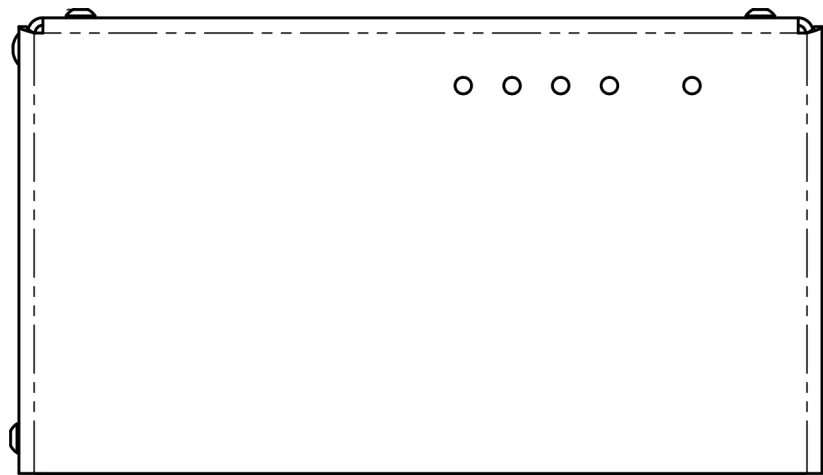


LSCB control board

User manual



Description

LSCB is a controlling board designed to simplify the design and use of flashlamp drivers based on power modules by OEM Tech.

By default LSCB supports the next capabilities:

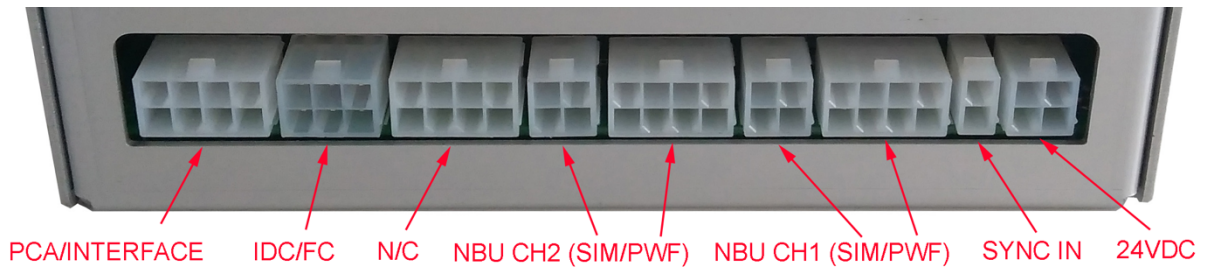
- 1) One capacitor charger of PCA-series
- 2) One or two NBU-1012 discharge circuits
- 3) One Pockels cell driver of QBU-series
- 4) Minor features like IDC, footswitch, sync input and outputs

Base interface is RS-232 (RS-485 is available on request). Simple PC software is supplied together with the controller.

Appearance



Connections, signals, signal descriptions



PCA/INTERFACE: Molex 3930-1080

Capacitor charger of PCA-series to be connected here.

8	7	6	5
4	3	2	1

PIN (color)	DESIGNATION	DESCRIPTION
1 (black)	Interface Return	See user manual of PCA-series capacitor charger for the detailed signal description
2 (white)	Fault	
3 (blue)	Inhibit	
4	N/C	
5 (red)	+15VDC	Important note: interface signals of PCA-series capacitor charger are galvanically isolated from other circuits of LSCB controller.
6 (green)	Ready Indicator	
7 (yellow)	Voltage Program	
8 (violet)	Voltage Monitor	

IDC/FS: Molex 3930-1060

Door interlock connector and/or footswitch or fingerswitch to be connected here.

6	5	4
3	2	1

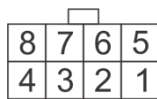
PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	IDC	Door-interlock connection. Should be pulled to the ground to allow the operations.
2 (blue)	Footswitch (Fingerswitch)	Footswitch (fingerswitch) connections. Once output is enables, should be pulled to the ground to enable flashes.
3, 5 (white)	Synchro Outputs	Synchro output signal coincided with pulse applied to the flashlamp. The same signal is paralleled to both synchro outputs. Other synchro output signals are available on request.
4, 6 (black)	GND	LSCB common ground.

NBU/SIM CH1 and NBU/PWF CH1: Molex 3930-1040 and Molex 3930-1080

Discharge circuit of NBU-series to be connected here.



PIN (color)	DESIGNATION	DESCRIPTION
1 (violet)	GND	See user manual of NBU-1012 discharge circuit for the detailed signal description
2 (yellow)	Simmer Sensor	
3 (red)	Simmer Enable	
4 (black)	GND	



PIN (color)	DESIGNATION	DESCRIPTION
1, 6 (black)	GND	See user manual of NBU-1012 discharge circuit for the detailed signal description
2, 4, 7, 8	N/C	
3 (orange)	Pulse	
5 (green)	Discharge	

NBU/SIM CH2 and NBU/PWF CH2: Molex 3930-1040 and Molex 3930-1080

The second discharge circuit of NBU-series to be connected here (of course this is possible to operate LSCB control board with the only NBU discharge circuit connected).

Pin layout and signal description is identical to NBU/SIM CH1 and NBU/PWF CH1 connectors.

SYNC IN: Molex 3930-1020

Synchronization input for operations in regimes with external synchronization of flashes.



PIN (color)	DESIGNATION	DESCRIPTION
1 (white/blue)	Synchro Input	Incoming synchronization pulses should be applied to these pins if controller is run in external synchronization mode.
2 (black)	GND	

24VDC: Molex 3930-1040

Power feeding LSCB controller to be provided here.



PIN (color)	DESIGNATION	DESCRIPTION
1, 2 (red)	24VDC	24VDC power to be applied here.
3, 4 (black)	GND	

RS-232: Molex 43045-0400

Connection to the PC or to the master control boards.



PIN (color)	DESIGNATION	DESCRIPTION
1 (orange)	RX	to be connected to TX of the host
2 (blue)	TX	to be connected to RX of the host
3, 4 (black)	GND	

LEDS:

There are several LEDs indicating state of LSCB controller

Power LED (blue):

- lits steadily while LSCB is powered

Simmer LED (yellow):

- blinking if at least one simmer supply is enabled (“s 1”), but the simmer monitor returns the absence of the simmer discharge (mS returns 0)
- lits steadily if all active flashlamps are simmered successfully

Charger LED (yellow):

- blinking if capacitor charger is enabled (“c 1”), but the capacitor bank isn’t charged yet (charger is not ready, i.e. mR returns 0)
- lits steadily capacitor charger is enabled (“c 1”), and the capacitor bank is charged up to ordered value (charger is ready, i.e. mR returns 1)

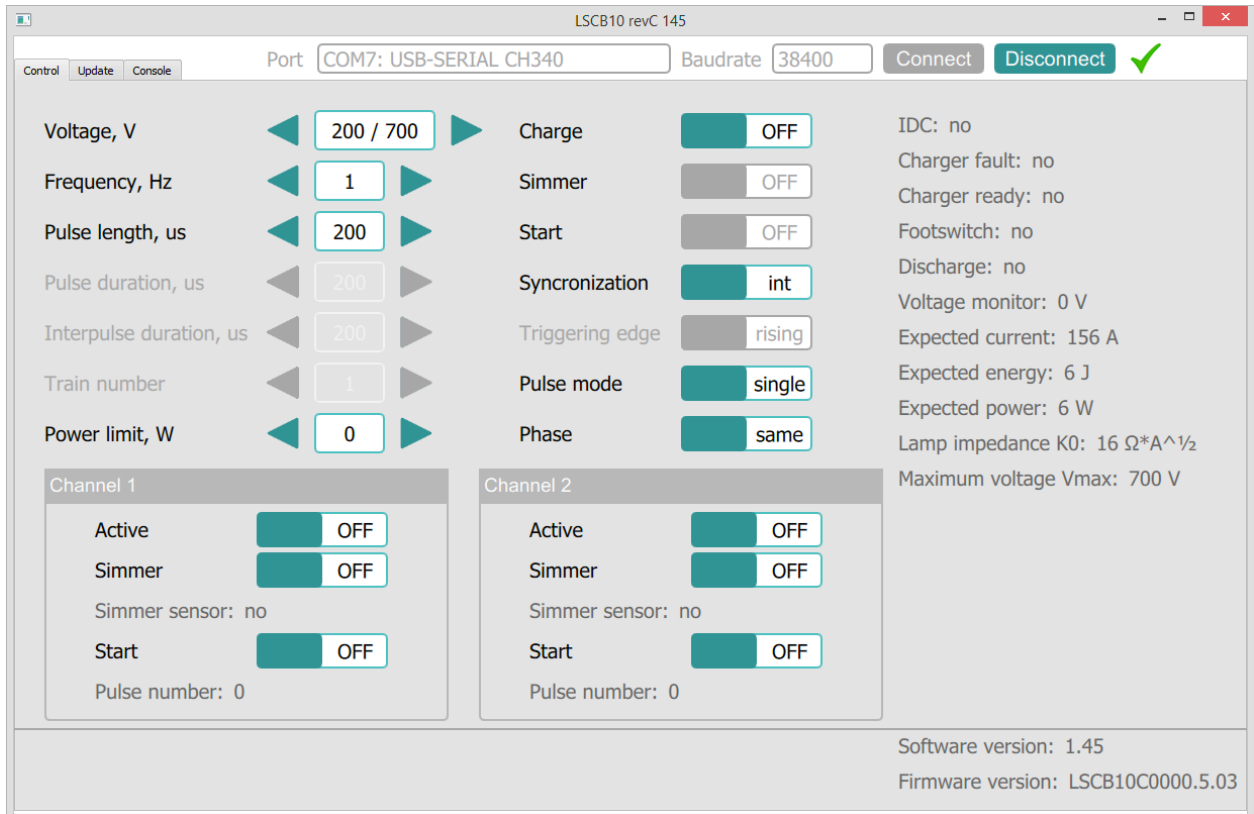
Pulse LED (green):

- off when outputs are disabled
- in run mode, lits steadily if output in two channels is set to synchronous («g 0») and blinking if output in two channels is set to counter-phasal («g 180»)

Error LED (red):

- lits steadily if one of connected devices reports about failure
- blinking if internal Fault of LSCB occurred

Software description



Voltage – sets the desired output voltage (V)

Frequency – sets the desired repetition rate of flashes (Hz)

Pulse length – in **Single pulse mode** – sets the desired pulse width (us)

Pulse duration – in **Pulse train mode** – sets the duration of individual pulselets (us)

Interpulse duration – in **Pulse train mode** – sets the interval between the individual pulselets (us)

Train number – in **Pulse train mode** – sets the number of pulselets in each train

Power limit – sets the average power limit (W)

Charge – turns capacitor charging module on and off

Simmer – turns simmer supplies of all **active** NBU-1012 on and off

Start – enables and disables flashes in all **active** channels

Synchronization – select synchronization mode – **Internal synchronization** / **External synchronization**

In **Internal synchronization mode** flashes are defined by LSCB

In **External synchronization mode** flashes are defined by external signal applied to SYNC IN connector of LSCB

Triggering edge – in **External synchronization mode** defines the triggering edge of synchronization signal – either rising edge or falling edge

Pulse mode – switches LSCB between **Single pulse mode** and **Pulse train mode**

Phase – switches LSCB between synphase and counterphase operations of Channel 1 and Channel 2 (if both are active)

Channel 1 Active and **Channel 2 Active** – makes the corresponding channel active or inactive

Channel 1 Simmer and **Channel 2 Simmer** – starts/stops simmer supply in Channel 1 and Channel 2 respectively

Channel 1 Start and **Channel 2 Start** – starts/stops flashes in Channel 1 and Channel 2 correspondingly

IDC – status of Door Interlock (IDC signal of IDC/FS connector) – flashes are prohibited if IDC loop is open

Charger fault – internal fault status of the capacitor charging power supply (Fault signal of PCA)

Charger ready – Ready signal of PCA

Footswitch – footswitch status (FS signal of IDC/FS connector)

Discharge – status of discharge resistors (Discharge signal of NBU-1012)

Voltage monitor – the actual voltage on the capacitor bank (Voltage monitor of PCA)

Expected current – the calculated current through the flashlamp (calculations are based on Voltage and Flashlamp impedance K0 values)

Expected energy – the calculated flash energy (calculations are based on Voltage, Flashlamp impedance K0 and Pulse length values)

Expected power – the calculated power through flashlamp (calculations are based on Voltage, Flashlamp impedance K0, Pulse length and Frequency values)

Lamp impedance K0 – should be set in accordance flashlamp datasheet

Maximal voltage Vmax – maximal voltage of the particular capacitor charger (should be set in accordance with PCA part number)

RS-232 protocol description

RS-232 connection parameters: 38400 bps, 8 data bit, 1 stop bit, no parity

Command format is: {command} {data (optionally)} {end-of-line}

- Command is 1 or 2 character long (see list below)
- Data is ASCII-string, command and data must be separated with space (space symbol)
- End-of-line symbols are \n or \r\n

List of available commands:

- v – sets the desired output voltage (in volts, example «v 300»)
- p – sets the desired pulse width (in us, example «p 250») – in single pulse mode of operations only
- f – sets the desired pulse repetition rate (in hertz, example «f 0.5», «f 0» means single shot)
- V, P, F – return the corresponding set points

- b – sets “single pulse” or “train of pulses” mode of operations («b 0» – single pulse, «b 1» – train of pulses); in train of pulses mode parameter p is ignored, parameter f defines the repetition rate of pulse trains
- n – sets number of pulses in pulse train mode («n 3»)
- on – sets pulse duration in pulse train mode (in us, example «on 1000»)
- off – sets interpulse interval in pulse train mode (in us, example «off 1000»)
- B, N, ON, OFF – return the corresponding set points

- x – sets the synchronization mode («x 0» – internal, «x 1» – external)
- t – sets triggering edge in external synchronization mode («t 0» – rising, «t 1» – falling)
- X, T – return the corresponding set points

- a – sets the mask of active channels («a 0» – neither channel 1 nor channel 2 is active; «a 1» – only channel 1 is active; «a 2» – only channel 2 is active; «a 3» – both channels 1 and 2 are active).
- *Note: any use of the command forcedly sets “s”, “s1”, “s2”, “r”, “r1”, “r2” to 0*
- A – returns the mask of active channels

- s1 – turns the simmer supply in channel 1 on and off («s1 1» – on, «s1 0» – off)
Note: the command is ignored if channel isn't set active with “a” command
- s2 – turns the simmer supply in channel 2 on and off («s2 1» – on, «s2 0» – off)
Note: the command is ignored if channel isn't set active with “a” command
- s – turns the simmer supply in all active channels on and off («s 1» – on, «s 0» – off)
Note: “s1” and “s2” follow “s” automatically (once the corresponding channels are set active with “a” command)
- c – turns the capacitor charging module on and off («c 1» – on, «c 0» – off)
- r1 – enables / disables the output in channel 1 («r1 1» – enables)
Note: the command is ignored if channel isn't set active with “a” command
- r2 – enables / disables the output in channel 2 («r2 1» – enables)
Note: the command is ignored if channel isn't set active with “a” command
- r – enables / disables the output in all active channels («r 1» – enables)
Note: “r1” and “r2” follow “r” automatically (once the corresponding channels are set active with “a” command)
- S1, S2, S, C, R1, R2, R – returns the corresponding set point

Note: “S” command returns the mask (0 – both simmer supplies are disabled; 1 – only simmer supply in channel 1 is enabled; 2 – only simmer supply in channel 2 is enabled; 3 – both simmer supplies are enabled)

Note: “R” command also returns the mask (0 – both outputs are disabled; 1 – only channel 1 is enabled; 2 – only channel 2 is enabled; 3 – both outputs are enabled)

- h – sets maximal power limit (in watts, example «h 1000», «h 0» disables the protection)
- H – returns the corresponding set point
- !k0 – sets flashlamp impedance used for calculations (in $\text{VA}^{-1/2}$, example «!k0 28»)
- !K0 – returns the corresponding set point
- !i – sets maximal current limit (in amps, example «!i 1000»)
- !I – returns the corresponding set point
- !t – defines if simmer sensor is mandatory to permit pulses (0 – mandatory, 1 – isn’t mandatory, «!t 1» might be used in systems where the load is different from flashlamp)
- !T – returns the corresponding set point

- mV – voltage monitor (volts)
- mF – returns fault state (0 – no fault, 1 – fault)
- mR – returns ready state (status of the capacitor charging module, 0 – not ready, 1 – ready)
- mI – returns IDC state (0 – open, 1 – closed)
- mW – returns footswitch state (0 – footswitch is released, 1 – footswitch is stepped)
- mS1 – returns simmer sensor state in channel 1 (0 – off, 1 – on)
- mS2 – returns simmer sensor state in channel 2 (0 – off, 1 – on)
- mS – command returns the mask of simmer sensors (0 – both simmers are off; 1 – only simmer in channel 1 is on; 2 – only simmer in channel 2 is on; 3 – both simmers are on)
Note: generally the return of “S”, “R”, “mS” commands coincides with mask while “s1”, “s2”, “r1”, “r2” commands aren’t used and no fault occurs
- mD – returns state of embedded discharging resistors (0 – no discharge, 1 – discharging)
- mP – returns expected power (in watts)
- mC – returns expected current (in amperes)
- mE – returns expected pulse or pulse train energy (in joules)

- g – sets phase shift between channel 1 and channel 2 («g 0» – phase shift is 0 degrees i.e. both channels are run simultaneously; «g 180» – phase shift is 180 degrees i.e. channels are run in counter-phase)
*Note: if phase shift is set to 180 degrees, this means the pulses in channel 2 are delayed relatively to the pulses in channel 1 for $1/(2*f)$ second*
- G – returns the corresponding set point

- vm – sets V_{MAX} , i.e. the maximal voltage of the capacitor charger; correct setting of V_{MAX} is necessary to match the output signal of LSCB programming the voltage with the corresponding input signal of the capacitor charger unit
Note: set V_{MAX} accordingly to the p/n of the capacitor charger used
- VM – returns the corresponding set point

- !J1 – returns the pulse counter for channel 1
- !J2 – returns the pulse counter for channel 2
- j1 – sets pulse counter for channel 1 to zero («j1 0»)
- j2 – sets pulse counter for channel 2 to zero («j2 0»)

Presets

Parameter	Minimum (*)	Maximum (*)	Increment (*)	Default value (**)
Output voltage, V	100	V _{MAX}	1	200
Pulse width, us	50	1000	1	200
Rep. rate, Hz	Single shot, then 0.3	50	0.1	1
V _{MAX} , V	100	1000	1	1000
K0, VA ^{-1/2}	5	50	0.1	20
Power limit, W	100	2000	1	2000

(*) Other values are available on request

(**) Might be set in accordance with your application (if known)

Operations

1. Before starting the operations please check if the states of the following commands match your application and re-set their values if necessary:

Parameter	Comment
a	active and non-active channels
b	single pulse mode or pulse train mode
g	channels are synphase or in counter-phase
x	internal or external synchronization
t	external synchronization trigger edge
vm	V _{MAX} of the capacitor charger
!k0	impedance of your flashlamp
h	output power limitation

2. Set main parameters – v, p (on, off, n), f
3. Enable capacitor charger – c
4. Trigger flashlamp/flashlamps – s (s1, s2)
5. Enable flashes – r (r1, r2)