		Project – LCH1510-XXX			
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User Manual for:
Capacitor Charging Power Supply model LCH1510-XXX
ADVICE Part Number – LCH1510-XXX

## Revision History

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## Table of contents

Description of the LCH1510-XXX Capacitor Charging Power Supply .....	3
Symbols explanation .....	3
LCH1510-XXX Capacitor Charging Power Supply Specification.....	4
Input.....	4
Output Voltage & Current.....	4
Environmental Specifications .....	4
Safety Regulation & EMC Specifications .....	4
Mechanical Dimensions .....	4
User interface signals detailed description .....	5
LCH1510-XXX Capacitor Charging Power Supply block diagram.....	6
LCH1510-XXX typical application in laser-based systems .....	6
Warnings .....	8
LCH1510-XXX Installation.....	9
LCH1510-XXX Service.....	10
LCH1510-XXX outline drawing.....	10

## Description of the LCH1510-XXX Capacitor Charging Power Supply

Advice model LCH1510-XXX is an OEM Capacitor Charging Power Supply used mainly for laser systems. It operates from the mains line, and delivers power for charging capacitors, with an average power output of 1,500 Joules per second.

Model LCH1510-XXX is part of a large family of Capacitor Charging Power Supplies ranging from 750J/S up to 9,000J/S, with output voltages from 400V up to 1,500V, when XXX denotes the output voltage in tens of volts, for example, 060 denotes a charging power supply of 600V.

Using Advice's QCP (Quasi-Constant-Power) technology, Advice Capacitor Chargers deliver constant current to the capacitor during the first fraction of the charging process, then it delivers constant power until the capacitor voltage reaches the desired set voltage. This strategy has several advantages over constant current designs offering lower components stress, lower weight, improved reliability and more competitive products.

The unit is cooled by means of an internal fan.

The Capacitor Charger has a 15 D-Type connector for user interface, comprising an auxiliary voltage of 15V. The signals are referenced to the negative lug of the high voltage output.

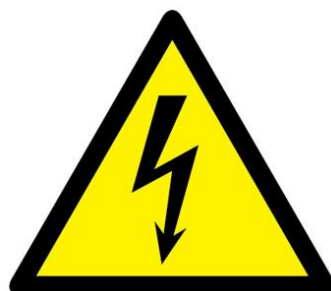
The output lugs may carry high voltages and must be handled with proper caution in order to avoid electrical shock which may be life threatening.

Units can be ordered either with the negative lug of the high voltage output tied to the Protective earth or floating.

## Symbols explanation



**Hazard:** This Capacitor Charger unit produces high voltages which may cause electrical shock and may be lethal.



**Electrical Shock Hazard:** This Capacitor Charger unit produces high voltages which may cause electrical shock and may be fatal.

Do not open the unit and do not service the Capacitor Charger. Only Advice Electronics Ltd. personnel are qualified to service this Capacitor Charger.

Only qualified personnel are allowed to install this Capacitor Charger.

## LCH1510-XXX Capacitor Charging Power Supply Specification

<b>Input</b>	
Input Voltage	90-264VAC
Frequency	47-63Hz
Initial Inrush current	<25A
Power Factor (typical, at full load)	0.99
Efficiency (typical, at full load)	88% at 220Vac
Max. Input Current	12A at 220VAC input voltage
<b>Output Voltage &amp; Current</b>	
Output Voltage	User controllable from 20% to 100% of Vmax.
Average Power (Maximum)	1,500W
Line Regulation (Maximum)	±0.1%
Load Regulation (Maximum)	±0.5%
Ripple & Noise (Max @ 20 MHz bandwidth with 1uF ceramic capacitor and 10uF capacitor connected in parallel on the measuring point)	≤ 2% p-p
Output Voltage Accuracy	±1% of setting from 20% of Vmax. to 100% of Vmax.
Charge Time – max'	According to Vmax, Please refer to the specific model specification
Over Temperature Protection	Shutdown, automatically recovers when the temperature decreases
Output Grounding	Negative output shorted to Protective Earth

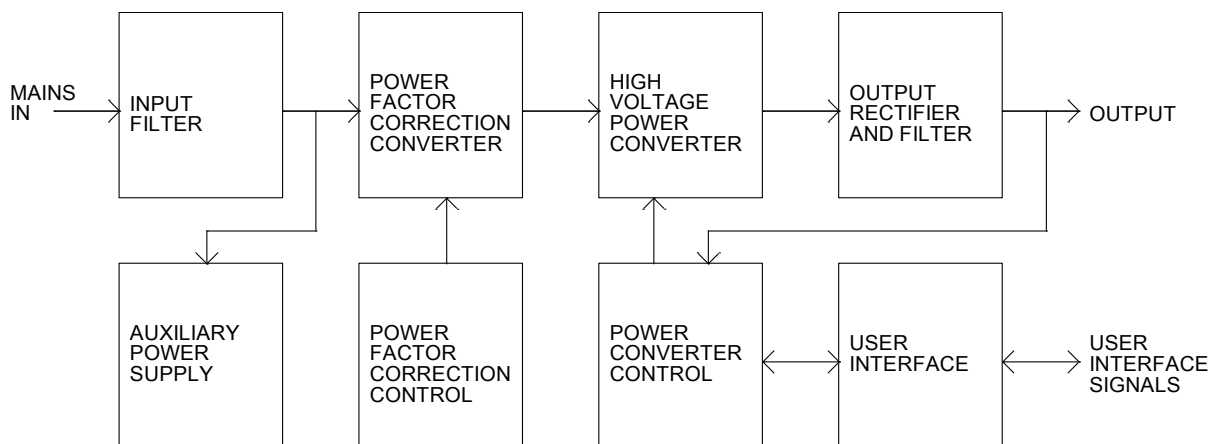
<b>Environmental Specifications (Designed to meet when installed within the 19", 3U drawer)</b>	
Operating Temperature	0°C to +40°C
Storage Temperature	-20°C to +60°C
Cooling	By an internal fan
Humidity	10% to 90% RH non-condensing
<b>Safety Regulation &amp; EMC Specifications (Designed to meet when installed within the 19", 3U drawer)</b>	
EMI	EN 55011 Class A , Group 1 (without external filter)
Insulation	Input to chassis: 1,750Vac. Input to SELV Circuit : 4,000Vac
Safety	cTUVus, EN 60601-1 3rd edition and CE Mark
Leakage Current to Protective Earth	<120uA
<b>Mechanical Dimensions</b>	
Size L x W x H in Inches (mm)	12.75 x 5.75 x 4.10 (324 x 146 x 104)
AC Input Connector	Terminal Block, 2 positions
AC Earth	10-32 GND stud, use at least 14AWG wire
HV Output Connector	MHV Male / coax cable rated at least 150% of max. rated output voltage
Interface Connector	15 pin D-type (female)
Weight	4Kg Maximum

## User interface signals detailed description

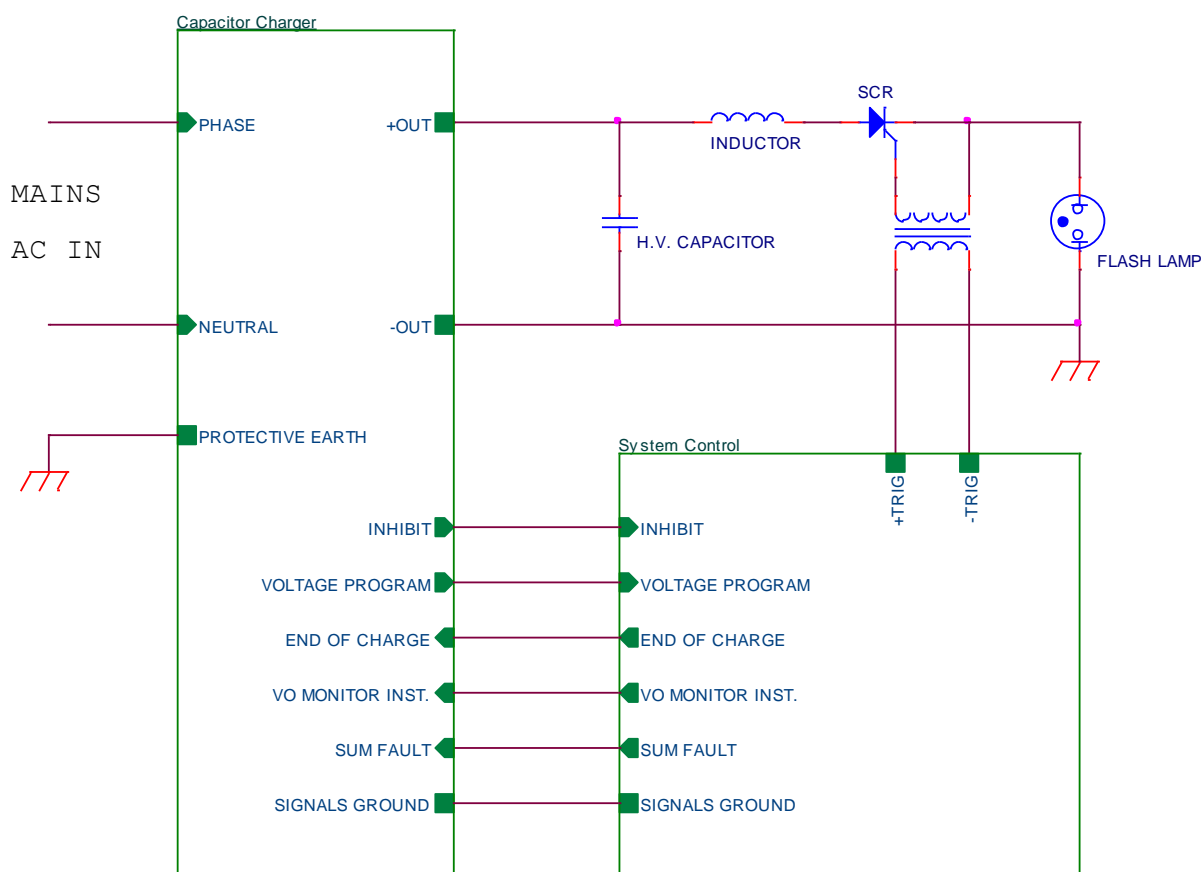
Pin #	Signal	Remarks
1	Inhibit (Charge/Standby )	Turn the output On and Off by electrical signal or dry contact: <ul style="list-style-type: none"> <li>0V-0.6V or Short to GND: HV output is On (Charge)</li> <li>15V (or Open): HV output is Off (Standby)</li> </ul> Remarks: <ol style="list-style-type: none"> <li>There is an internal 5K<math>\Omega</math> pull-up to 15V</li> <li>Inhibit polarity can be inverted (factory set)</li> </ol>
2	Power fault	Low in case of power fail, normally high (15V)
3	Sum Fault	Pulled low in case of an internal fault/s, normally high (15V)
4	HVON	Pulled low when the unit is enabled (Inhibit input low) and there is no internal fault
5	Voltage Program	Positive input voltage 0 to 10V accordingly controls the output voltage from up to 100% of the rated output voltage. Input Impedance: approx. 100K $\Omega$
6	Fault Indication	Output rise time is measured: If the rise time>approx. 6 Sec., a malfunction is assumed and an "Active LOW" indication is provided from an open collector (rated to 30V/10mA) and the output voltage is shut down. The input supply voltage needs to be recycled to restart.
7	Vo Monitor - Peak	0V to 10V for 0 to Vout max. (peak measurement, decaying with a time constant of 20 Sec.) Drive capability: 1.5mA (through 200 $\Omega$ )
8	Vo Monitor - Instantaneous	0V to 10V for 0 – Vout max. Drive capability: 1.5mA (through 200 $\Omega$ )
9, 11, 12	15V Reference	15V $\pm$ 5%, up to 100mA output
10	Not connected	
13	End of Charge Indication	Provides "LOW" indication when the load capacitor reaches the set voltage, otherwise it is "HIGH" (15V)
14, 15	Signals ground	All the signals in the connector are referred to this ground, which is shorted internally to the high voltage output negative line, and to the chassis (Protective Earth)

- Remark: the levels of the signals in pins 2, 3, 4, 6 and 13 are:  
Low state: <1V for 20mA current (darlington Vce sat)  
High state: 10K $\Omega$ m pull-up resistor to +15V

## LCH1510-XXX Capacitor Charging Power Supply block diagram



## LCH1510-XXX typical application in laser-based systems



The above diagram depicts a typical laser-based system with a controller connected to the capacitor charger, which in turn drives a flash lamp through a pulse forming network (PFN) comprised by a high voltage capacitor discharging through an inductor into the flash lamp for achieving a high intensity flash.

There are additional applications but this section describes only the main application of driving a flash lamp in order to achieve a laser shot.

In case there is any doubt about any application, please apply to your local Advice Electronics Ltd. Representative, and they will be glad to assist.

The capacitor charger charges the high voltage capacitor, then the controller turns on the SCR by inducing a short pulse through the transformer which offers also insulation from the high voltage. Once the high voltage capacitor transferred its energy to the flash lamp and the flash has been achieved, the current decreases and the SCR turns OFF and the high voltage capacitor may be charged again for the next flash.

It is highly recommended to connect a high voltage reverse protective diode in parallel to the high voltage capacitor (with its anode connected to the –OUT and its cathode to the +OUT).

In order to drive a flash lamp for achieving a laser shot, the controller will typically perform the following sequence:

- a. The controller sets the desired voltage by accordingly applying a voltage in the "VOLTAGE PROGRAM" pin of the interface connector (pin 5).
- b. The controller checks the capacitor charger status through signal "SUM FAULT", making sure it is in "high" state, indicating the capacitor charger has no faults and is ready to operate.
- c. The controller activates the "INHIBIT" signal, which initiates the high voltage capacitor charging process.
- d. The controller waits until an active signal "END OF CHARGE" is received, indicating the capacitor charger has charged the high voltage capacitor to the desired voltage. It may check the "VO MONITOR INSTANTANEOUS" analog signal as a means of double-check.
- e. The controller de-activates the "INHIBIT" command signal, inducing the capacitor charger into an idle state.

Note: In this kind of application the user must take care to de-activate the "INHIBIT" command signal prior to discharging the load capacitor. Otherwise the capacitor charging power supply will keep on delivering energy during the discharge and may be disturbed by the capacitor high energy discharge pulse.

- f. The controller drives the transformer with a pulse, triggering the SCR, which in turn allows for the discharge of the high voltage capacitor into the flash lamp through the inductor which assists in shaping the pulse form. This discharge causes the desired flash in the lamp.
- g. The controller may wait a fixed amount of time during which it is assumed that the high voltage capacitor has discharged and the lamp current is zero, meaning that the SCR is OFF, or it may check the "VO MOITOR INSTANTANEOUS" analog signal in order to make sure the capacitor has indeed discharged.
- h. At this point, the system is ready for the next flash, which may be carried out by reassuming the sequence from stage "b" (assuming the "VOLTAGE PROGRAM" signal has been kept constant).

## Warnings



**Hazard:** Do not use this Capacitor Charger in presence of flammable materials, vapors, gases, explosives or nitrous oxide as this may initiate burning or cause an explosion.



**Hazard:** Do not use this Capacitor Charger in presence of oxygen, flammable anesthetic gases, vapors or nitrous oxide as this may initiate burning or cause an explosion.



**Hazard:** This Capacitor Charger should be used only as part of laser or medical equipment, and there should not be any contact between its connections and personnel or patients. Equipment manufacturer must provide an isolation between this Capacitor Charger and personnel or patients who may be in contact with its equipment.



## LCH1510-XXX Installation

Advice Capacitor Charging Power Supply model LCH1510-XXX is intended for installation in laser systems for charging capacitors, for driving flash lamps.

Please follow the following guidelines:



Only qualified personnel (Engineers, technicians or qualified assemblers) may install this capacitor charger into laser-based systems.



Only qualified Advice Electronics Ltd. personnel may open or service this capacitor charger.

There are no serviceable components or parts within this capacitor charger.

In order to correctly connect and integrate this capacitor charger into a laser-based system, please follow the following recommendations:

- a. For connecting the mains lines, use cables of AWG#14 or thicker.
- b. For connecting the Protective Earth to the 10-32 GND stud, use a cable of AWG#14 or thicker.
- c. For connecting the user interface signals use a standard, two rows 15 pin male D-type connector, typically with wires AWG#22 or AWG#24.
- d. For connecting the high voltage output, depending on the option ordered, please use high voltage coax cable, or a pair of wires AWG#18 or thicker, rated for at least 150% the rated voltage of the capacitor charger model.
- e. For mounting the capacitor charger in the laser-based system, refer to the location of the four holes intended for mounting screws in the outline drawing.
- f. The capacitor charger is cooled by an internal fan. Please take care to keep a clearance of at least 5cm from both sides of the unit (air intake and air exhaust). The air intake should be provided with cool air at ambient temperature, while the exhaust air should be routed outside the user's system.

## LCH1510-XXX Service



Only qualified Advice Electronics Ltd. personnel may open or service this capacitor charger.

For service information please apply to your local Advice Electronics representative, or contact:

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Phone: +972-3-9000-900 email: [sales@advice.co.il](mailto:sales@advice.co.il)

## LCH1510-XXX outline drawing

