

# LIGHTNING PROTECTION UNIT (LPU)

## Photovoltaic Lightning Protection Device Installation and Operation Manual

SPECIALTY CONCEPTS, INC.  
8954 Mason Ave.  
Chatsworth, CA 91311 USA

MODELS COVERED: LPU-50, LPU-150, LPU-200

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### GENERAL DESCRIPTION

The Specialty Concepts Lightning Protection Unit (LPU) provides primary (gas discharge arrester) and secondary (MOVs) protection against induced transients generated from lightning strikes. The primary protection device is a three electrode gas filled surge protector tube. These devices simultaneously ground both sides of a pair when a surge appears on either line of the pair. The tube then restores when the surge dissipates. The secondary protection feature grounds any high voltage peak (spike) which might be passed by the primary protector. A high power inductor placed between the primary and secondary protectors exhibits a high impedance for most lightning induced voltage transients. This high impedance insures that the primary protector will operate first and the secondary protector will not be exposed to the full surge. The LPU is designed to be installed in series between the PV array and a Specialty Concepts designed PV system control electronics. Specialty Concepts designed electronics have additional lightning protection features in the form of MOVs that compliment the action of the LPU.

Terminals are provided for connection to "ARRAY IN" and "ARRAY OUT" plus and minus for each sub-array for each sub-array. Each sub-array channel is rated for 50 amps and is suitable for use in DC systems up to 48 volts DC nominal. Provisions are made for earth ground for each channel and for a chassis ground. The standard LPU is provided with a steel, wall mount, gasketed enclosure.

Note: The standard LPU is designed for negative ground systems. DO NOT wire the array with a common positive ground connection to the battery as this will reduce the effectiveness of the LPU.

### FEATURES

#### **SYSTEM LIGHTNING PROTECTION**

- 50 amp, up to 48 volt nominal capacity per channel
- Two stage protection
  - High capacity gas discharge tube
  - Fast response MOV

#### **DESIGN FEATURES**

- 4 gauge terminal block connection
- Earth and chassis ground connections
- Higher capacity available by paralleling channels
- Negative ground
- Positive ground available (optional)
- Wall mount indoor enclosure
- Outdoor enclosure available (optional)

# S P E C I F I C A T I O N S

PARAMETERS	UNITS	VALUE
Nominal Voltage	(Volts)	12-48
Array Voc., Max.	(Volts)	95
Array Current, Continuous / Channel	(Amps)	50
Array Current, Max / Channel (60 seconds)	(Amps)	65
<u>Primary Stage</u>		
Single Impulse Discharge Current, 8/20 $\mu$ sec waveform, Max.	(Amps)	20,000
Impulse Life - 1000A, 10/1000 $\mu$ sec waveform, Min.	(Surges)	400
Typ.	(Surges)	600
DC Breakdown Voltage Line to Ground	(Volts)	150-300
Impulse Breakdown Voltage Line to Ground		
@ 100 V / $\mu$ sec, Typ.	(Volts)	500
Max.	(Volts)	750
@ 10 KV / $\mu$ sec, Typ.	(Volts)	750
Max.	(Volts)	1000
DC Holdover @ 200mA, Min.	(Volts)	150
<u>Secondary Stage</u>		
Peak Surge Capacity 8/20 $\mu$ sec, Max.	(Amps)	1500
Peak Voltage Clamping @ 1mA, Min.	(Volts)	85
Max.	(Volts)	115
Response Time, Typ.	(Nanosec.)	50

## PART NUMBERING KEY

EXAMPLE:  Model  
Nominal Current  
Options

**LPU - 50 - M**

MODEL	NOMINAL CURRENT	OPTIONS
LPU	50 150 200	M - Outdoor enclosure with clear door (NEMA 4X) P - Positive ground

Specifications and product availability subject to change without notice.

## **RELATED SYSTEM EQUIPMENT**

The SC2 is an integral part of a solar electric power system that includes a solar panel, a battery and a load. These items should be installed according to the instructions provided by the equipment supplier, and this manual assumes that the rest of the equipment installation has been properly completed.

**PANELS:** The SC2 is compatible with all makes and models of PV panels, provided the open circuit voltage and the maximum power current of the solar panel does not exceed the maximum open circuit voltage (Array Voltage, Max Voc) and the maximum charge current (Charge Current, Max) specifications for the SC2 being used.

**BATTERIES:** The standard SC2 is designed to be used with the most common lead-acid batteries. These are wet cell batteries using pure lead, lead antimony and/or lead calcium grids.

The standard charging set points should be adjusted when using sealed, maintenance free batteries, or vented pocket plate nickel-cadmium batteries. This will maximize performance and battery life. Adjustments in set points may be made on SC2 models with the Adjustability option. For these batteries, consult the battery manufacturer for recommended set points and refer to Table 1 (OPTIONS section) for appropriate settings.

**LOADS:** The load is considered the item or equipment that the PV system is powering. System loads such as lights, radios, DC/AC inverters, etc. must be rated for the proper DC input voltage. DC loads not exceeding the rated SC2 load current (see specification section) can be connected to the load terminals of the SC2, which provides an additional connection to battery plus and minus for convenience. Higher current, or inductive loads such as pumps, motors or inverters should be connected directly to the battery, using properly rated over-current protection devices (fuses or circuit breakers).

**OTHER CHARGING SOURCES:** Do not use the SC2 to regulate a power source other than a solar panel, such as a hydro or wind generator/alternator or an AC battery charger. This could result in damage to the SC2 and/or the generating equipment. Connect other charging sources with their own regulation devices directly to the battery, using properly rated over-current protection devices.

Note: The SC2 and solar panel can remain connected to a battery being charged by other sources, (alternator, battery charger, etc.) without damage to the control or solar panel.

## INSTALLATION

### WARNINGS / CAUTIONS:

**WARNING:** Electricity, even low voltage electricity, can be dangerous. Installation should be performed by a licensed electrical contractor or other qualified personnel only. It is recommended that the requirements of the U.S. National Electrical Code (NEC) be followed. Relevant sections of the 1984 NEC include articles 250 and 690.

**CAUTION:** DO NOT drill or punch holes in the enclosure while the panel is still mounted in it. Refer to "MOUNTING AND WIRING" section.

**CAUTION:** DO NOT exceed the maximum current or voltage ratings as stated in the specifications.

### TOOLS AND MATERIALS NEEDED

1. Standard screwdriver
2. Wire strippers
3. If holes must be drilled in the mounting surface: Drill and appropriate bit
4. Chassis punch of appropriate size for installation of conduit hubs of waterproof fittings for wire entry into enclosure.
5. Fasteners to mount unit to wall of structure: Several types are suitable and will depend upon the type of material of which the wall is made. These fasteners must support the weight (about 30 pounds) of the unit. These are not included with the LPU.
6. Water-tight feed throughs or conduit of the proper type and size.

## MOUNTING AND WIRING

### MOUNTING

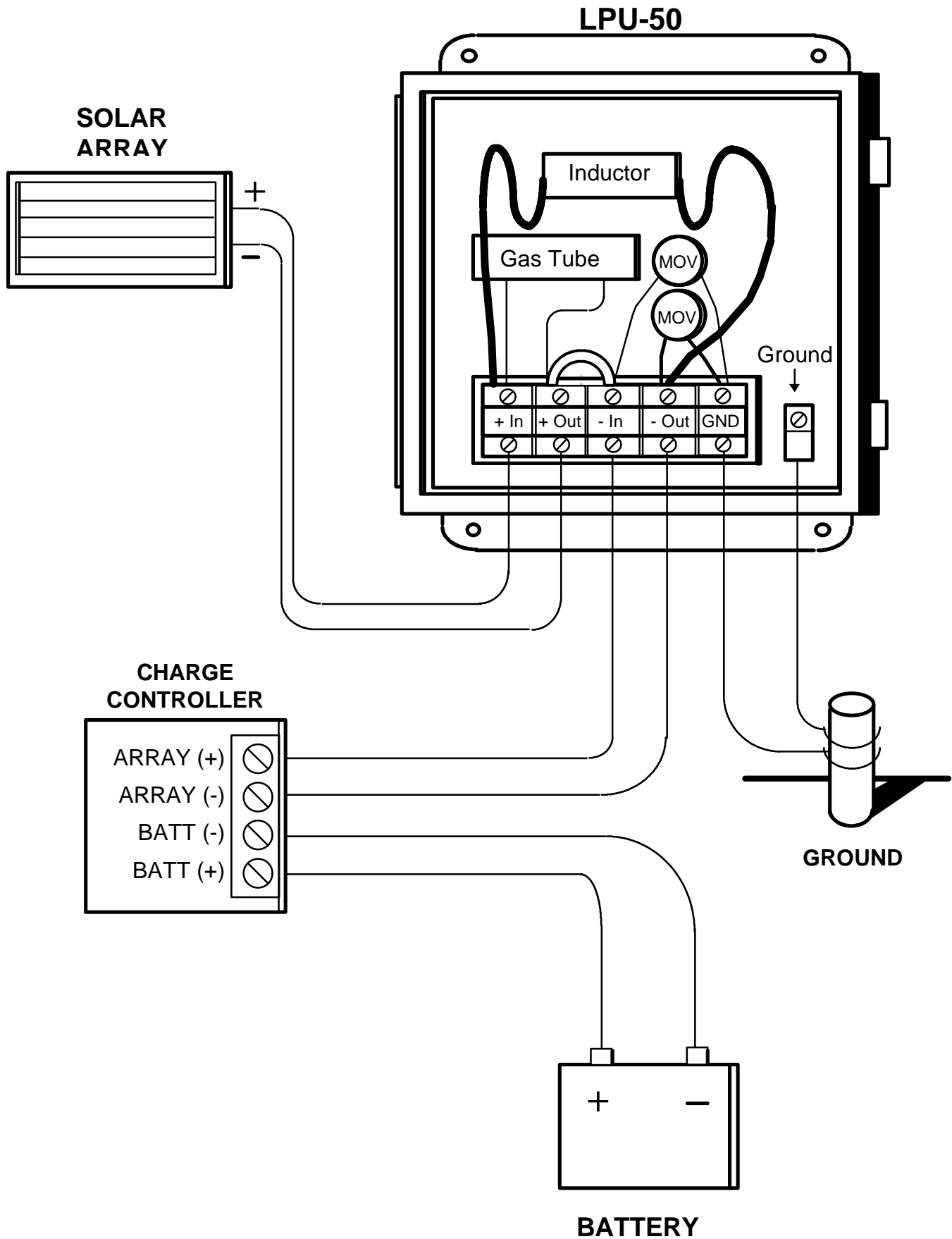
1. **Location:** A suitable location must be found for mounting the LPU. Ideally, this location would be close to the systems control electronics and out of direct sunlight if possible.
2. **Complete System Installation:** Follow the instructions for the system installation, including the array, control and battery installation and wiring. Determine a proper location for the LPU and run the array wires and control wires up to the selected location, leaving sufficient wire for easy connection. Insure that the polarity of the wires is marked.
3. **Enclosure cutouts:** To punch hole-cutouts in the enclosure, first remove the internal panel containing the components from within the enclosure. This can be accomplished by removing the four screws in the four corners of the panel, thereafter carefully lifting the panel out of the enclosure and placing it in a safe location. Proceed with making the hole-cutouts and installing the entries. Thoroughly clean the inside of the box to remove all metal shavings before re-installing the panel.
4. **Mounting:** Secure the LPU enclosure to the selected location using the four mounting holes provided on the box, and suitable fasteners. Replace the component panel in the enclosure and tighten the four screws to secure it.
5. **Prepare for wiring:** It is assumed at this point that the system batteries and the PV array and control are installed and properly wired. The wires should reach at least to the desired location for the LPU with a few extra inches for ease of connection. The wires should be labeled and color coded for polarity identification. Insure that all wires are disconnected from their power sources.

### WIRING

**CAUTION:** Before doing the wiring to the LPU, insure that all wires are disconnected from their power sources (battery and array) to prevent accidental damage and/or bodily harm.

1. Connect the wires to the LPU based upon the labeled terminal strips.
2. Insure that a proper earth ground is provided for each LPU.

**Figure 1 - LPU Installation**



**LIMITED FIVE YEAR WARRANTY  
SPECIALTY CONCEPTS, INC.**

1. Specialty Concepts, Inc. warrants all its products for a period of five (5) years from the date of shipment from its factory. This warranty is valid against defects in materials and workmanship for the five (5) year warranty period. It is not valid against defects resulting from, but not limited to:
  - A. Misuse and/or abuse, neglect or accident.
  - B. Exceeding the unit's design limits.
  - C. Improper installation, including, but not limited to, improper environmental protection and improper hook-up.
  - D. Acts of God, including lightning, floods, earthquakes, fire and high winds.
  - E. Damage in handling, including damage encountered during shipment.
2. This warranty shall be considered void if the warranted product is in anyway opened or altered. The warranty will be void if any eyelet, rivets, or other fasteners used to seal the unit are removed or altered, or if the unit's serial number is in any way removed, altered, replaced, defaced or rendered illegible.
3. The five (5) year term of this warranty does not apply to equipment where another manufacturers' warranty is available. An example of such equipment may be, but is not limited to, an electronic enclosure. The time limit for this warranty may be for less than the Specialty Concepts limited warranty. Specialty Concepts will assist the claimant in attempts to seek warranty claims for such equipment, where appropriate.
4. Specialty Concepts cannot assume responsibility for any damages to any system components used in conjunction with Specialty Concepts products nor for claims for personal injury or property damage resulting from the use of Specialty Concepts' products or the improper operation thereof or consequential damages arising from the products or use of the products.
5. Specialty Concepts cannot guaranty compatibility of its products with other components used in conjunction with Specialty Concepts products, including, but not limited to, solar modules, batteries, and system interconnects, and such loads as inverters, transmitters, and other loads which produce "noise" or electromagnetic interference, in excess of the levels to which Specialty Concepts products are compatible.
6. Warranty repair and/or evaluation will be provided only at Chatsworth, California facility of Specialty Concepts. Units for such repair and/or evaluation must be returned freight prepaid to Specialty Concepts with a written description of any apparent defects. Specialty Concepts will not be required at any time to visit the installation site wherein Specialty Concepts' products are subject to warranty repair and/or evaluation.
7. Only Specialty Concepts is authorized to repair any of its products, and they reserve the right to repair or replace any unit returned for warranty repair. The party returning a unit for repair is responsible for proper packaging and for shipping and insurance charges, as well as any other charges encountered, in shipping to and from Specialty Concepts.
8. This warranty supersedes all other warranties and may only be modified by statement in writing, signed by Specialty Concepts.

Warranty terms effective as of April 1, 1993

**REPAIR INFORMATION**

Directions for returning units needing repair.

1. Write up a note with the following information:
  - Name / Company Name
  - Return Address : (For USA/Canada: UPS Deliverable. Avoid PO Boxes)
  - Daytime Phone
  - Description the failure
  - Specify amount of repair charges pre-approved (we will contact you if repair charges are larger than this amount.)
2. Box up unit with copy of sales receipt (if available).
3. Send by UPS or Parcel Post to :

**Specialty Concepts, Inc.**  
**Attn : Repair Dept.**  
**8954 Mason Ave**  
**Chatsworth, CA 91311 USA**

If the Repair is not covered under warranty, the repair charges will not exceed 30% of the value of a new unit. (shipping and handling not included) Domestic charges are collected via UPS-COD.

For non-warranty repairs, repaired portion features an additional one-year warranty.

**SPECIALTY CONCEPTS, INC.**

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