

SPECIALTY CONCEPTS TIMER (SCT)

Photovoltaic Load Timer Installation and Operation Manual

SPECIALTY CONCEPTS, INC.
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Chatsworth, CA 91311 USA

MODELS COVERED: SCT-8

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GENERAL DESCRIPTION

The Specialty Concepts Timer (SCT) is a small, low-cost DC timer for the control of outdoor lights, pumps or other photovoltaic powered DC loads. This timer is designed to sense darkness at the PV array or via a photo sensor accessory, and then to automatically turn on lights or other loads. The loads are then allowed to run for an adjustable period of time for up to 15 hours, or until sunrise, whichever occurs first. The SCT operates in 12 or 24 volt DC systems and is rated for 8 amps. It is housed in an anodized aluminum chassis and encapsulated in a hard epoxy resin. The terminal block accepts up to 12 gauge wire or a spade connector. The SCT is designed to work with the photo sensor accessory or in conjunction with a photovoltaic system that has a blocking diode located between the battery and the array. In many systems, a blocking diode is already included within the charge controller.

A P P L I C A T I O N S

The SCT is designed as a system component for small to intermediate lighting applications that require more light than provided by a walkway light. The 8 amp capacity allows one SCT to control several small (16-30 watt) lights from a centrally located array and battery, or larger lights can be individually controlled. This allows each lighting system to be custom designed using a main battery bank or several distributed batteries. The SCT can be used to control an external relay for higher capacity, or to turn an inverter on for AC systems.

F E A T U R E S

LIGHT TIMER

- 8 amp capacity, 12 and 24 volt
- Turns light on at sundown
- Adjustable run time, up to 15 hours
- Can be used as a day/night switch
- Uses PV array for sundown detection
- Photocell sensor assembly available (accessory)

DESIGN FEATURES

- Encapsulated for protection
- 100% solid state
- Input noise suppression
- Reverse polarity protection
- Lightning protection

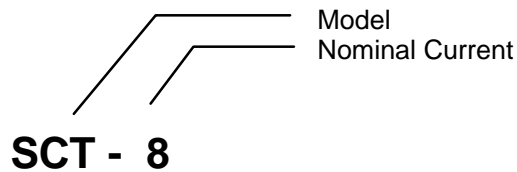
S P E C I F I C A T I O N S

PARAMETERS	UNITS	VALUE
Nominal Voltage	(Volts)	12 to 24
Load Current, Continuous, (1)	(Amps)	8
Load Current, Max (60 seconds) (2)	(Amps)	10.5
Array Voltage, Max Voc	(Volts)	44
Operating Voltage @ Battery, Maximum	(Volts)	31
Operating Voltage @ Battery, Minimum	(Volts)	10.5
Array Voltage to Reset, Minimum	(Volts)	.5
Quiescent Current Consumption, Day, Typ.	(Milliamps)	16
Quiescent Current Consumption, Night, Load Disconnected	(Milliamps)	7
Quiescent Current Consumption, Night, Load Connected	(Milliamps)	7
Voltage Drop, Battery to Load, @ 8 amps	(Volts)	.4
Adjustable Run Time, Loads, Range	(Minutes/Hours)	10 min. to 15 Hrs.
Time Delay, Typ. (3)	(Minutes)	15
Operating Temp. Range	(°C)	-20 to 50
Storage Temp. Range	(°C)	-55 to 85

Notes:

- (1) Non-inductive.
- (2) Carry only, Non-switching
- (3) Prevents false triggering

P A R T N U M B E R I N G K E Y



A C C E S S O R I E S

PHOTOCELL SENSOR - Assembly

Specifications and product availability subject to change without notice.

RELATED SYSTEM EQUIPMENT

The SCT can be an integral part of a solar electric power system that usually includes a solar panel (or other charging source), a charge controller, a battery and a light or other 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 / CHARGING SOURCES: The SCT is compatible with all makes and models of PV panels, provided the open circuit voltage of the solar panel (or charging source) does not exceed 44 volts.

BATTERIES: The standard SCT is designed to be used with lead-acid batteries. Other 12 or 24 volt nominal power sources would be suitable also.

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. The SCT can be used with DC loads not exceeding 8 amps. Higher current, or inductive loads such as pumps, motors or inverters cannot be switched by the SCT directly, and should be connected directly to the battery, with a relay controlled by the timer to provide switching. Properly rated over-current protection devices (fuses or circuit breakers) should be used.

ACCESSORY - PHOTO CELL SENSOR: For systems that are not photovoltaic powered, or PV systems that do not have a blocking diode, a photo cell sensor is available to detect night and start a light or other load.

I N S T A L L A T I O N

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 all applicable local electrical codes (or U.S. National Electrical Code in the absence of local codes) be followed.

WARNING: Follow all safety precautions of the battery manufacturer and the National Electrical Code. Proper ventilation must be provided for vented batteries. Most vented batteries produce hydrogen gas when charging, which is extremely explosive. DO NOT expose the battery to open flame, matches, cigarettes or sparks.

CAUTION: DO NOT subject the timer to voltages greater than 44 volts. This would be the open circuit voltage (Voc) of the solar panel, or the sum of the open circuit voltages of all modules connected in series.

CAUTION: DO NOT exceed the maximum current rating of the SCT, 8 amps, as stated in the specifications.

TOOLS AND MATERIALS NEEDED:

- 1 SCT (and possibly the Photo Sensor accessory - see below)
2. Standard screwdriver
3. Wire and wire strippers
4. Drill and appropriate bit: if holes must be drilled in the mounting surface
5. Fasteners to mount unit: Several types are suitable and will depend upon the type of material of which the wall is made. These are not included with the SCT.
6. Blocking Diode: This may be needed, see below.
7. Small slotted screwdriver: to set run time
8. Stop watch: for accurate run time settings

WHEN A BLOCKING DIODE IS REQUIRED:

A blocking diode is required when the SCT detects sundown by using the solar array (and not by using the Photo Sensor accessory) Note that the blocking diode is often already included within the charge controller (such as the ASC controller). In this case, no additional blocking diode is required.

WHEN THE PHOTO SENSOR ACCESSORY IS REQUIRED:

For systems that are not photovoltaic powered, or PV systems that do not have a blocking diode, a photo cell sensor is needed to detect night and start a light or other load. The photo sensor can also be used on systems where the light sensitivity needs to be adjusted.

MOUNTING INSTRUCTIONS:

1. A suitable location must be found for mounting the SCT. Select a location away from heat sources if possible, and close to the battery.
2. Follow the instructions for the system installation, including the array, battery and controller installation and wiring. Determine a proper location for the SCT and run the battery and load wires up to the timer, leaving sufficient wire for easy connection. Insure that the polarity of the wires is marked.
3. Secure the SCT to the selected location using the four mounting holes provided on the chassis, and suitable fasteners.

WIRING INSTRUCTIONS:

1. Refer to Figures 1 - 4 and WIRING DIAGRAM NOTES for specific instructions.

SETTING THE TIME PERIOD:

The "ON" time is adjustable from 10 minutes to 15 hours by turning a trim pot, and can be accurately set by timing the flashing time-base light located on the front of the timer. In most locations this unit can also be used as a "DAY/NIGHT" switch by turning the time period to the maximum period of 15 hours. Since the timer shuts the light off after the timer period is up or when the sun rises, whichever occurs first, the timer will turn the light on at dusk and off at dawn. Using a small, slotted screwdriver, turn the adjustment trim-pot for the desired time period. To insure a more accurate setting, use the TIME BASED LED in conjunction with a stopwatch in the following manner:

1. Observe the TIME BASED LED. It will flash at a duration dependent upon the setting of the trim-pot. Use the following chart to determine the actual time period for which the timer is set.

<u>LED TIME PERIOD</u>	<u>ACTUAL TIME PERIOD</u>	<u>LED TIME PERIOD</u>	<u>ACTUAL TIME PERIOD</u>
1.76 Seconds	1 Hour	15.82 Seconds	9 Hours
3.52	2	17.58	10
5.27	3	19.34	11
7.03	4	21.09	12
8.79	5	22.85	13
10.55	6	24.60	14
12.30	7	26.37	15
14.06	8		

2. When measuring the time period, consider one period of the TIME BASED LED as one complete cycle; from the light just turning on (or off) to just turning on (or off) again.
3. For intermediate time periods, use the following formula:

$$\text{LED TIME PERIOD (SECS)} = \text{TIME PERIOD (HRS)} \times 1.76$$

For example: If a time period of 3.6 hours is required, one cycle of the TIME BASED LED should last 6.34 seconds.

WIRING DIAGRAM NOTES

FUSE RECOMMENDATIONS

Location A: Should be rated for the lesser of the array, load and wire.

Location B: 5 - 10 amp fuse.

Location C: 1 amp fuse

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FIGURE 1 - Timer with ASC Controller

TIMER TERMINAL CONNECTIONS

Batt / Array (-): To ASC BATT (-). (...or to Array (-) or Battery (-))

Load (-): To load (-).

Array (+): To ASC ARRAY (+): The wire from the SCT ARRAY (+) terminal does not carry any current, therefore, small gauge wire may be used. (Wire as shown in diagram; this connection MUST be made to the array side of the system's blocking diode.)

Batt / Load (+): To ASC BATT (+) and additional wire connected to load (+)

LOAD May be a relay coil to increase load current capability of Timer. Negative side of load is controlled. Do not connect Load (-) to system common.

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FIGURE 2 - Timer with ASC Controller with Low-Voltage Load Disconnect (LVD)

TIMER TERMINAL CONNECTIONS

Batt / Array (-): To ASC BATT (-) (...or to Array (-) or Battery (-))

Load (-): To load (-)

Array (+): To ASC ARRAY (+): The wire from the SCT ARRAY (+) terminal does not carry any current, therefore, small gauge wire may be used. (Wire as shown in diagram; this connection MUST be made to the array side of the system's blocking diode.)

Batt / Load (+): To ASC BATT (+)

LOAD May be a relay coil to increase load current capability of Timer. Negative side of load is controlled. Do not connect Load (-) to system common.

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FIGURE 3 - Timer with Charge Controller with LVD (Non-ASC Controller)

TIMER TERMINAL CONNECTIONS

Batt / Array (-): To Controller Batt (-) (...or to Array (-) or Battery (-))

Load (-): To load (-)

Array (+): If controller has blocking diode, this connection goes to Controller Array (+). If controller does not have a blocking diode, install one as shown and wire this connection to array side of blocking diode. The wire from the SCT ARRAY (+) terminal does not carry any current, therefore, small gauge wire may be used. This connection MUST be made to the array side of the system's blocking diode.

Batt / Load (+): To Controller Batt (+)

LOAD May be a relay coil to increase load current capability of Timer. Negative side of load is controlled. Do not connect Load (-) to system common.

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FIGURE 4 - Timer with Photo sensor

TIMER TERMINAL CONNECTIONS

Batt / Array (-): To Controller Batt (-) (...or to Array (-) or Battery (-))

Load (-): To load (-)

Array (+): To Photo sensor (either wire).

Batt / Load (+): To Controller Batt (+) (or Battery (+)), and a second wire to load (+) and a third wire to the photo sensor

CONTROLLER No controller or blocking diode is needed for the operation of the timer and load.

LOAD May be a relay coil to increase load current capability of Timer. Negative side of load is controlled. Do not connect Load (-) to system common.

FIGURE 1
SPECIALTY CONCEPTS TIMER WITH ASC CONTROLLER

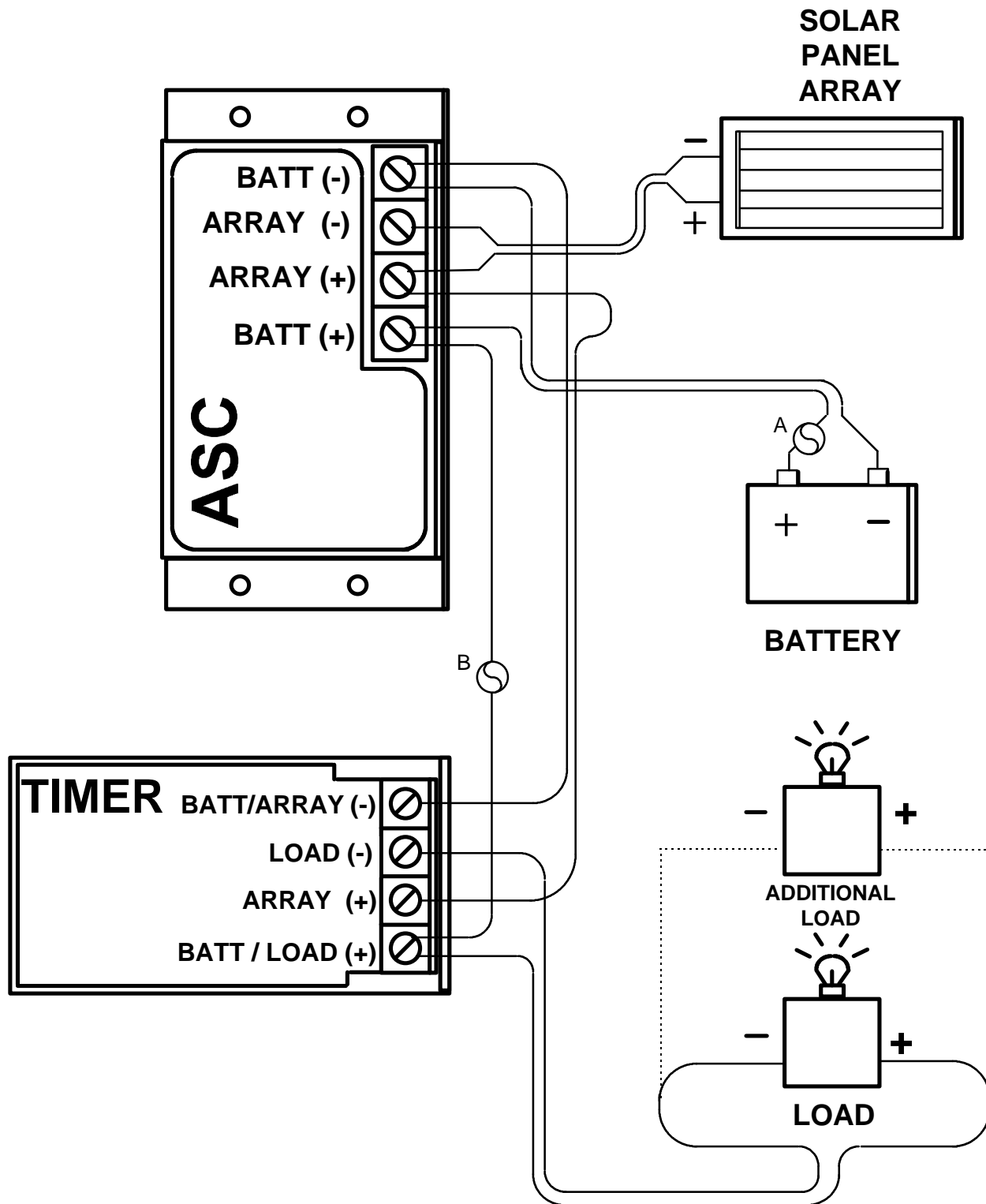


FIGURE 2
TIMER and ASC CONTROLLER with LVD OPTION

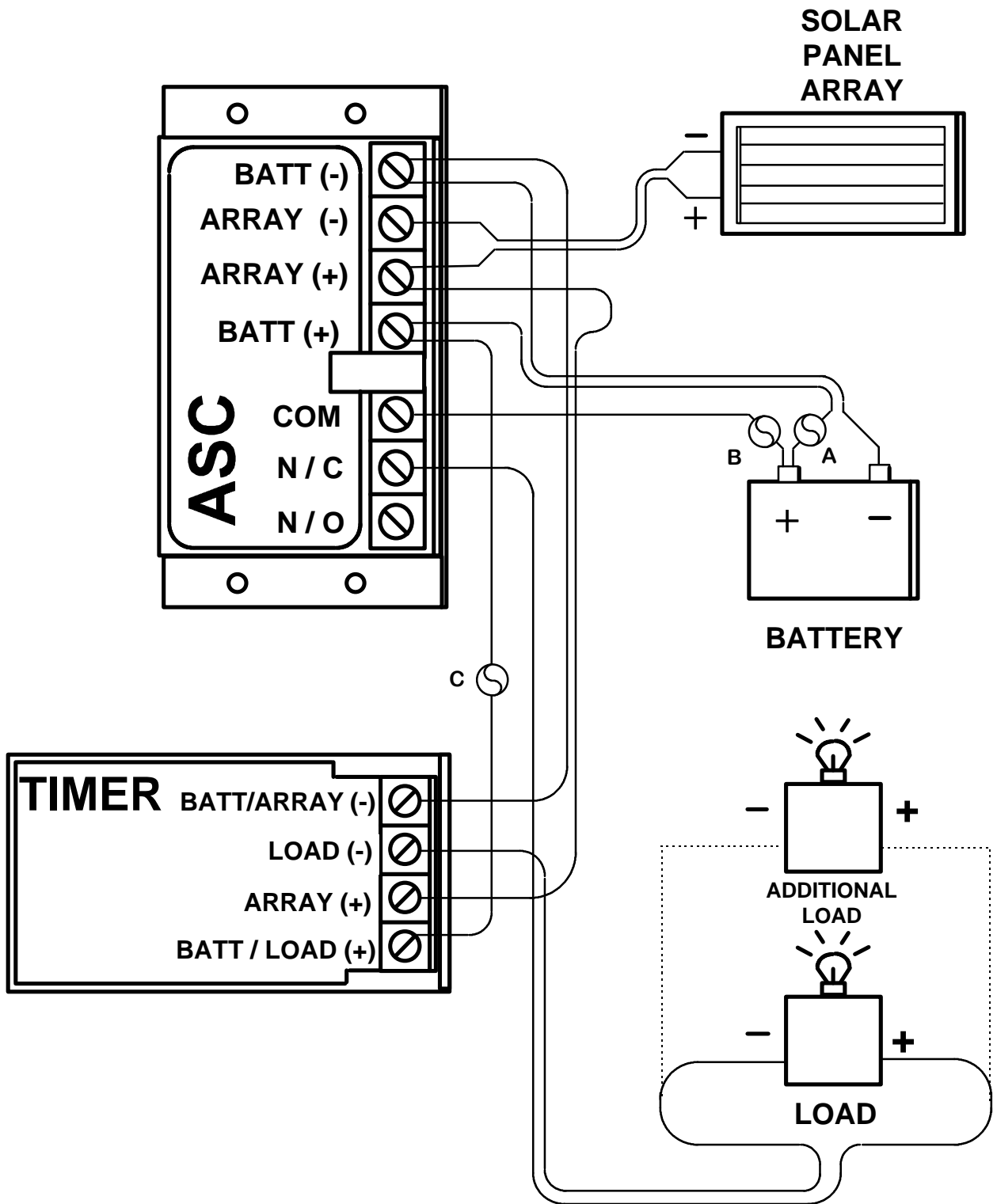


FIGURE 3

TIMER and CHARGE CONTROLLER with LVD*

* Non-ASC controller with negative ground Low-Voltage Disconnect.

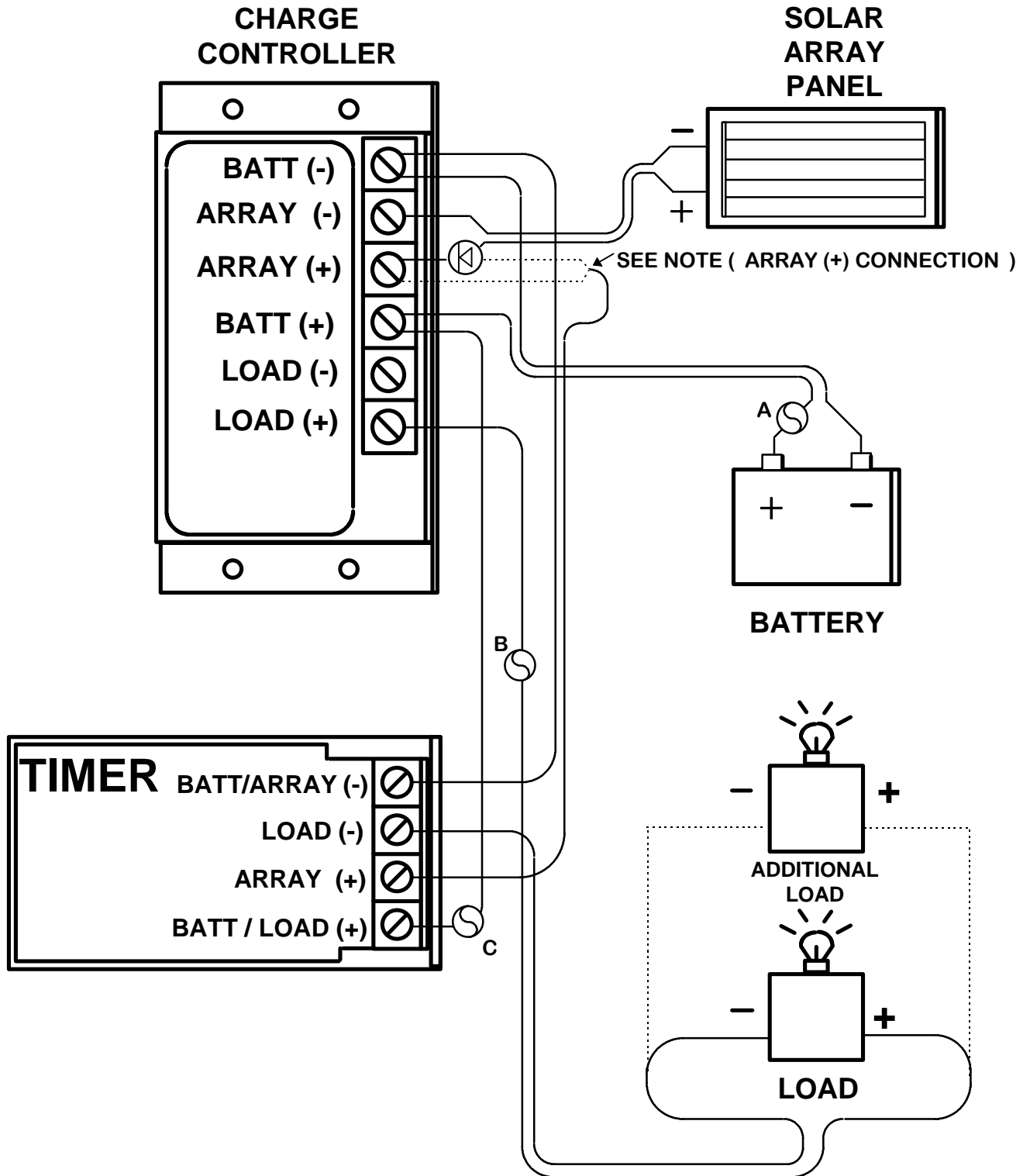
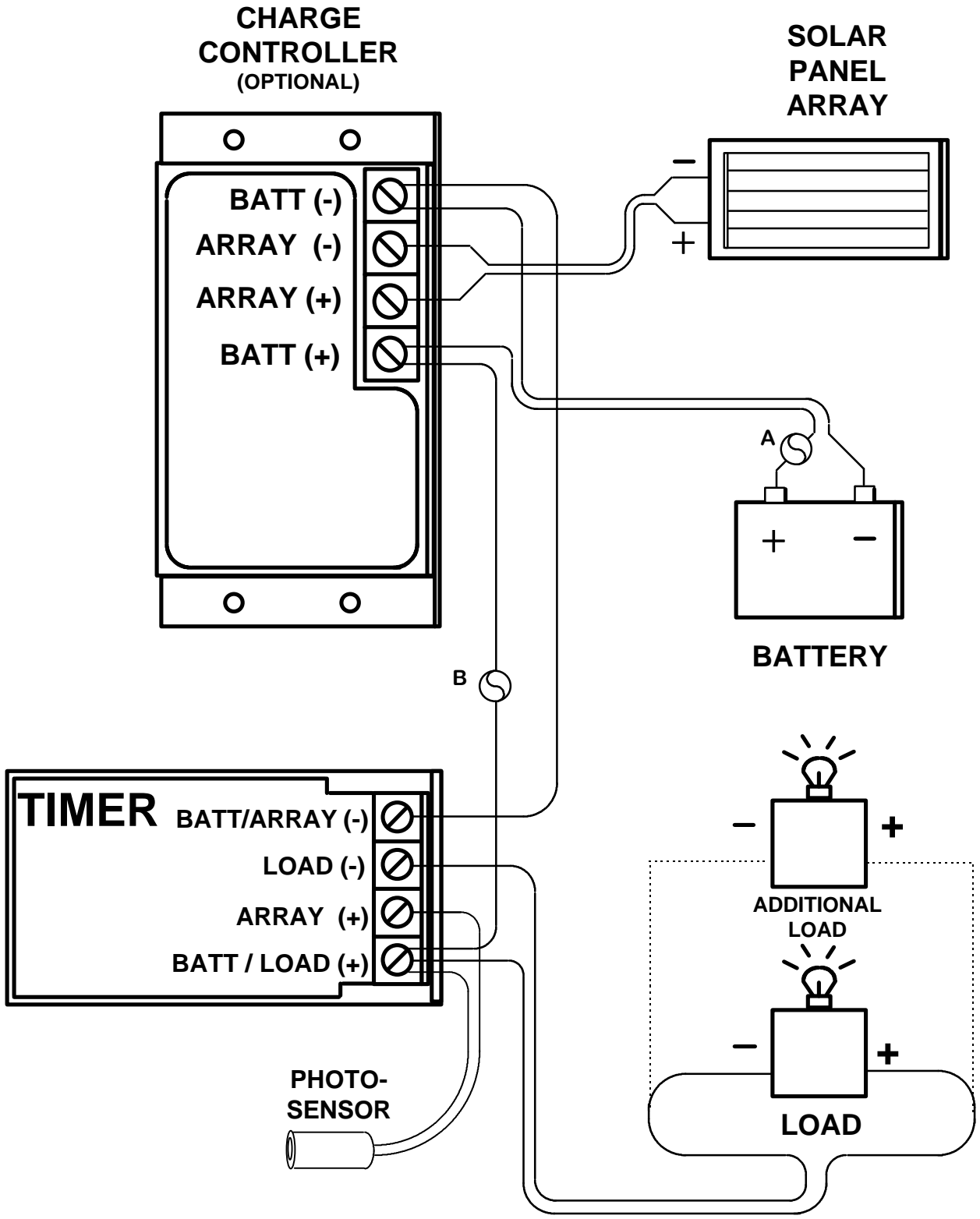


FIGURE 4
TIMER with PHOTO-SENSOR



OPERATION

The SCT (without the PHOTO SENSOR) detects sundown by sensing the voltage drop on the array and turns the light on, then lets it run for the pre-selected period

When the output voltage from the solar array falls to .5 volts, the SCT will turn on the load and begin its timing period. When the time period is complete, the load will turn OFF and the TIME BASED LED will remain on to indicate that the timing cycle has been completed. Sunrise will reset the unit and the TIME BASED LED will again begin pulsing.

To simulate sundown and a timing cycle, disconnect the array from the ARRAY (+) terminal. After a delay of about 10 to 15 minutes, the load should turn on, and the SCT will operate in its normal manner. Reconnect the ARRAY (+) terminal to the array and the load should immediately go off and the SCT should be reset.

TROUBLE SHOOTING

LIGHT (OR LOAD) WILL NOT TURN ON:

- 1) Check operation of light independently of the timer circuit to insure that it is operational.
- 2) Test the timer by removing the connection to "ARRAY +" and waiting about 15 minutes. Note: The SCT must have a light or load connected for the test. The output will not register on a meter.
- 3) Test for high ambient light conditions at the array. If array voltage does not drop below .5 volts, the timer will not turn the load lights on. Use the photocell accessory mounted in a shielded location to get the light to turn on in high ambient lighting situations.

LIGHT TURNS ON DURING THE DAY:

- 1) The SCT monitors array voltage to determine sundown. Some shunt controllers shunt the array for longer than the 15 minute delay of the timer, indicating sundown. The alternatives are to use a different controller (the ASC series of controllers manufactured by Specialty Concepts is well matched with the SCT) or to use the photocell accessory to monitor daylight.

LIGHT WILL NOT TURN OFF:

- 1) Check to see that the light negative is not connected to battery negative, or ground. The SCT is a positive ground device, so it switches the negative leg of the load circuit.

LIGHT TURNS ON TOO SOON OR TOO LATE:

- 1) Use the photocell accessory to adjust sensitivity to ambient lighting.

**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.

8954 MASON AVE., CHATSWORTH, CA 91311 USA PH: (818) 998-5238, FAX: (818) 998-5253