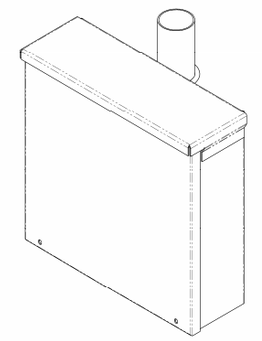
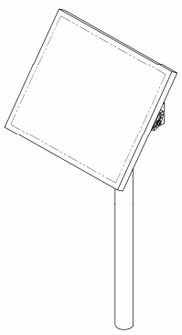
SOLAR POWER SUPPLY MODELS BPSS-10 AND BPSS-20 INSTALLATION AND OPERATING INSTRUCTIONS

1. INTRODUCTION

The Solar Power Supply models BPSS-10 and BPSS-20 combine Securitron's renowned power supply technology with solar capability for access control in remote/isolated locations. The BPSS controller, contained in a NEMA-3R rated cabinet, is specifically designed for outdoor applications and is provided with its own separately mounted, adjustable solar PV array power panel and battery backup. Each unit operates at 12 VDC and is intended to operate an access control device (e.g. DK-26 keypad or card access system) and fail secure intermittent lock (e.g. GL-1 gate lock or electric strike). This manual is intended to provide the installation, electrical requirements and functional options required to successfully install a BPSS unit.

2. SPECIFICATIONS

Power Supply Cabinet	10 Watt PV Array Panel	20 Watt PV Array Panel
		

MODEL BPSS-10/BPSS-20 Power Supply Specifications	
Use/Environment	Outdoor (NEMA-3R)
Cabinet Weight (without batteries)	14 Lbs [6.4 kg]
Cabinet Dimensions: Length	12.8" [325mm]
Height	12.2" [310mm]
Depth	4.7" [119mm]
Voltage	11.5-14.1 Volts DC
*Maximum Output Current – Continuous	*Up to 125mA
*Maximum Output Current – While Operating Lock	*Up to 425mA
Operating Temperature Range (with batteries)	-4° to +113° F [-20° to +45° C]

*Number of daily lock operations may vary due to solar activity and system current draw.

3. RECOMMENDED TOOLS

- Hammer
- Center Punch
- Power Drill
- Drill bits
- Wrenches
- Pliers, vise grip
- Screwdrivers: Phillips & 1/8" Flat Blade
- Fish Tape or Lead Wire
- Wire Strippers/Cutter
- Multimeter

4. INSTALLATION INSTRUCTIONS

It is recommended that a site survey be performed to determine the mounting location prior to installation. The following should be considered:

- The unit should be placed in a position without obstruction of the sun which will allow optimum use of the PV array panel.
- Physical strength of mounting areas should provide adequate support of the installed unit.
- Adequate space should be provided for ventilation. Ensure that there is at least 2" of unobstructed space provided around the four sides of the enclosure.
- Ensure wiring can be routed to protect from damage due to intrusion or vandalism. (The enclosure is provided with knock-outs for conduit connections).

4.1 Physical Installation

The BPSS controller is rated for outdoor use and is specifically designed to be affixed to a pole or post up to 2" O.D. (outer diameter) using the included hardware. **Use short U-bolt in lower mounting holes to allow room for battery.** A bracket kit accessory package for larger diameters is also available (see **Section 6**). A drop-in hasp for a padlock (not included) has been furnished to secure the cabinet cover.

The BPSS controller is furnished with a pole/post mounted adjustable PV array panel to be mounted above the BPSS controller cabinet. Please see **Section 5** for PV array panel installation and adjustment information.

4.2 Electrical Installation

4.2.1 Power Controller Characteristics

Securitron's BPSS utilizes a sophisticated power controller which incorporates advanced technology and series switching, pulse width modulation (PWM) charging. The battery charging process has been optimized for longer battery life and improved system performance. Many specifications of the controller are unique. Although the controller is very simple to use, please take the time to read this manual and become familiar with its functions. This will help to make full use of the many advantages the controller can provide to the PV system being used.

4.2.2 Controller Safety

- **SAVE THESE INSTRUCTIONS! -** This manual contains important instructions that should be followed during installation and maintenance of the controller.
- **WARNING! -** Be very careful when working with batteries. Lead acid batteries can generate explosive gases, and short circuits can draw thousands of amps from the battery. Read and follow all instructions provided with the battery.
- Do not exceed the voltage or current ratings of the controller. **Use only with a 12 Volt battery rated between 5Ah and 20Ah**.
- **DO NOT** short circuit the PV array or load while connected to the controller. This will DAMAGE the controller.
- The controller should be protected from direct sunlight. Ensure adequate space for air flow around the controller.
- The negative system conductor should be properly grounded. All grounding and wiring should comply with local codes.

4.2.3 Controller Wiring

The six (6) system connections to the controller terminals are numbered "**1**" to "**6**" on the label as shown in **Figure 1**. **It is recommended that the connections be made in order from 1 to 6**.

1. **Connect the BATTERY first**. Use care that bare wires do not touch the metal case of the controller.
2. **Connect the SOLAR (PV array) next**. The green LED indicator will light if sunlight is present.
3. **Connect the LOAD last**. This model includes a low voltage disconnect (LVD). If the red LED indicator lights, the battery capacity is low and should be charged before completing the system installation.

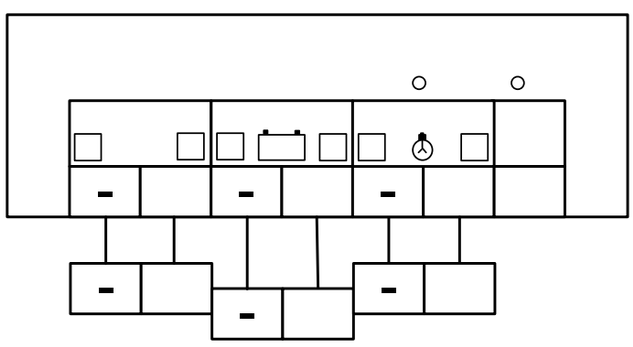


Figure 1

Notes:

- The controller is shipped with a jumper installed. This sets the controller for charging SEALED batteries. If a FLOODED battery is being used, simply remove the jumper to optimize the battery charging for a flooded battery. If the jumper is connected again, the charging will return to the set-points for a sealed battery.
- For safety and the most effective lightning protection, the negative conductor of the PV system should be properly grounded. The controller connects the PV-negative, Battery negative and Load- negative internally per UL recommendations. No switching is done in the negative current path.

4.2.4 Operating Characteristics

4.2.4.1 Polarity Protection

The controller is generally protected from reversed connections, but the system operator and other equipment will be at risk when polarities (**+** and **–**) are reversed. Carefully check before making each connection to ensure that the polarity is correct.

4.2.4.2 LED Indicators

Green LED:

The green LED indicator located on the power controller is lit whenever sunlight is available for battery charging. The green LED will turn off at night. Because the controller uses a PWM constant voltage charging process, there is usually some amount of energy going into the battery at all times. Although the charging current falls to very low levels when the battery reaches full charge, the green LED will continue to stay ON (during the daytime). This is to indicate that the controller is working and that energy is available from the PV array for charging.

Red LED:

The controller includes an automatic load disconnect (LVD) feature along with a red LED indicator. Whenever the battery charge state falls below the LVD set-point, the load will be disconnected and the red LED will light. This indicates that the controller has disconnected the load to protect the battery from further discharge and possible damage. After some period of recharging the battery, such that it recovers to approximately 40 to 50 percent of its rated capacity, the load will automatically be reconnected and the red LED will turn off.

4.2.4.3 Controller Features and Functions

Low Voltage Disconnect (LVD):

If the battery falls below 11.5 volts, the load is disconnected from the battery to protect against harmful deep discharges. A 2-second delay prevents load disconnects from transients. The load is automatically reconnected when the battery voltage recovers to 12.6 volts.

Battery Disconnect:

If the battery is disconnected during the daytime, the PV array will continue to provide power to the controller. The controller will immediately go into PWM and provide power at a constant voltage to the load. This may continue as long as power is available from the PV array.

Auxiliary Generators:

Engine generators and other sources of power may be connected directly to the battery for charging. It is not necessary to disconnect the controller from the battery. However, do not use the controller to regulate these other generators.

Reverse Current:

The controller prevents the battery from discharging through the PV array at night. There is no need to install a blocking diode for this purpose.

Noise:

The controller circuit minimizes switching noise and filters all noise output to extremely low levels when the system is properly grounded. If noise is present in a telecom load, it is most likely due to a grounding problem in the system.

5. PV ARRAY PANEL INSTALLATION

5.1 INSTALLING THE PANEL

The following exploded illustration **Figure 2** shows the included hardware required to properly mount the array panel to a vertical pole. (10 Watt PV array panel shown).

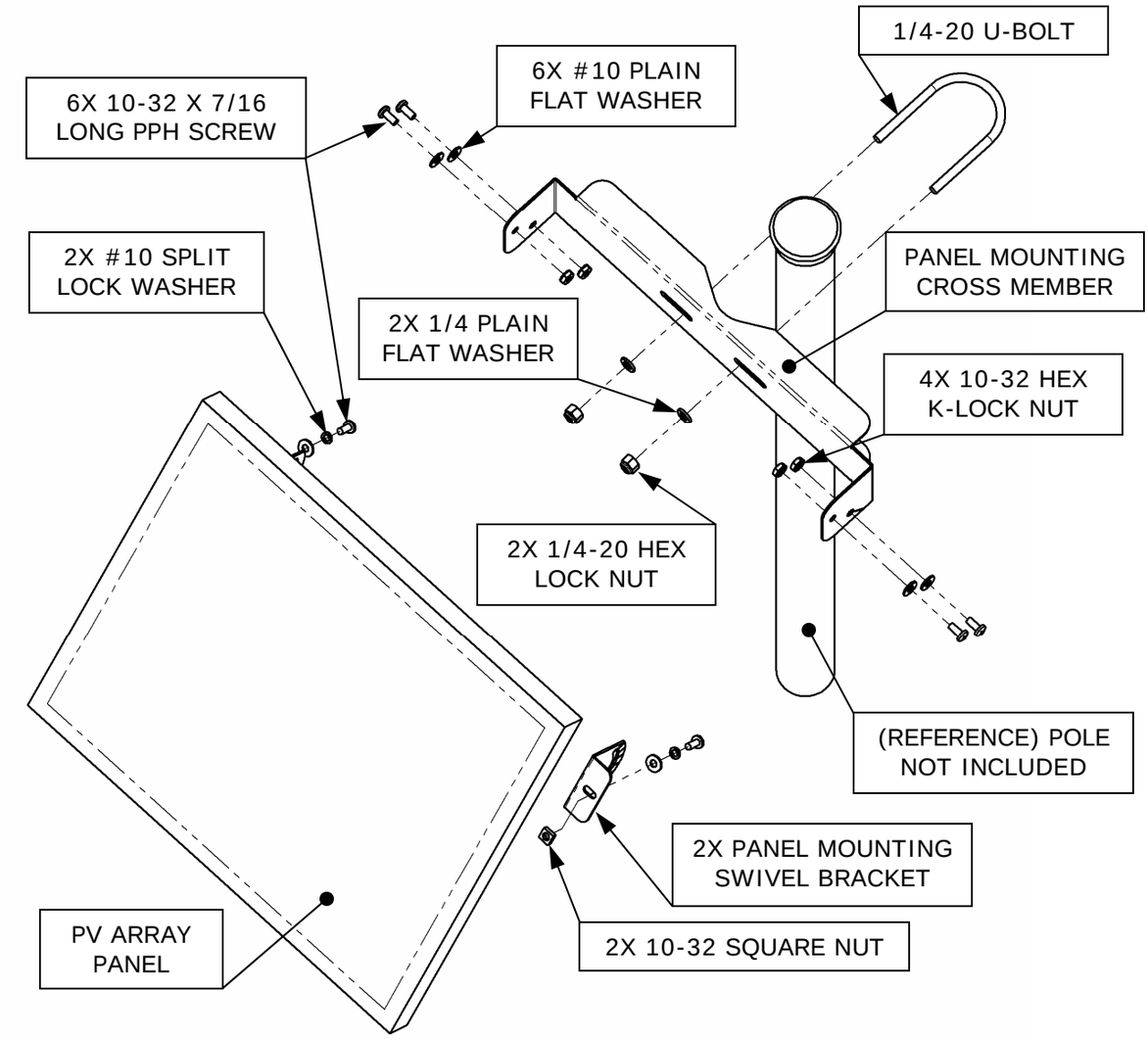
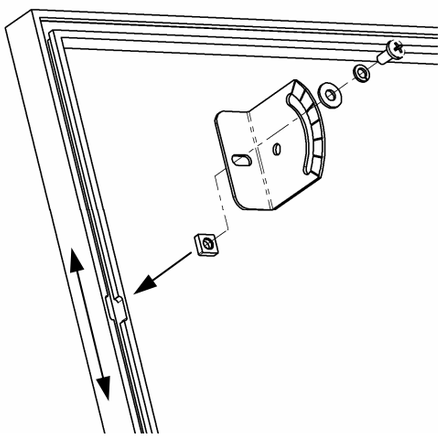


Figure 2

The swivel brackets are to be mounted to the sides of the array panel as shown in **Figure 3**.



1. Insert the square nuts into the cutouts at each side of the panel and slide in slot to initial position.
2. Assemble swivel brackets with the included hardware to the nuts.
3. Tighten screws securely when brackets are adjusted to the desired position.

Figure 3

5.2 ADJUSTING THE PANEL

Figure 4 shows the PV array panel mounted to a vertical pole.

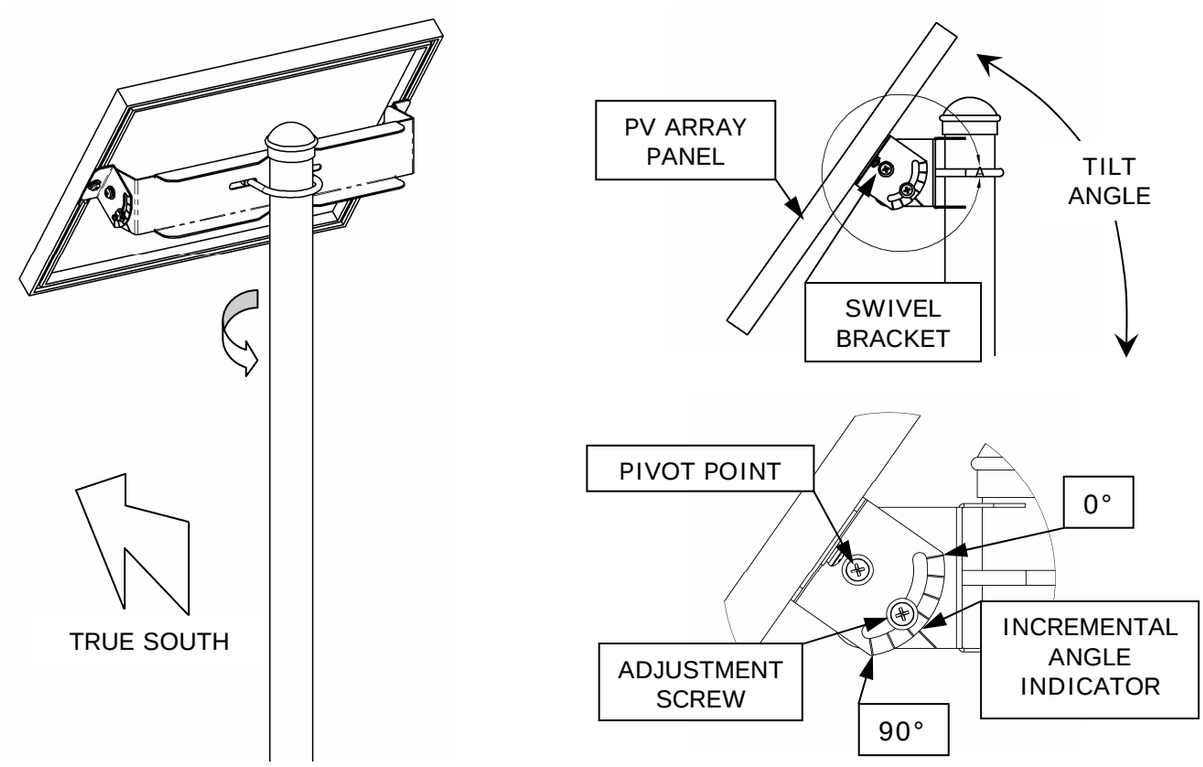


Figure 4

5.2.1 DIRECTION

The panel can be adjusted axially to the pole by loosening the U-bolt and rotating the cross member to face the desired true South direction.

It is important for proper solar power system operation that the array panel be oriented toward true South (if you are located in the northern hemisphere). The directions of magnetic South and true South differ from one another depending on geographic location. This variance is called declination.

Check the declination for your region in order to extrapolate true South from a compass heading of magnetic South. There is a map available online which shows the magnetic declination for various locations in the US at: http://www.securitron.com/en/site/securitron/Library/Solar-Product-Information. (For example, true south in central Texas falls between the 7 degree East and the 8 degree East lines. This means that, for optimum exposure, the solar panel should be aligned 7-8 degrees east of magnetic South (on a compass).

5.2.2 TILT ANGLE

The panel can be adjusted to the desired tilt angle using the swivel bracket at each side of the panel. Simply loosen the pivot and the adjustment screw at each bracket. The brackets are marked at 15° increments from 0° (horizontal) to 90° (vertical). Align the indicator on the bracket to the desired angle, and then tighten the screws.

Optimum tilt angle is measured from horizontal and can be measured using the indication marks on the panel swivel brackets. As a general rule the tilt angle of the panel should be set as follows:

- For **year-round applications** the tilt angle should be set equal to the location latitude (e.g. latitude 40° North = tilt angle 40°).
- For **winter applications** the tilt angle should be set to the location latitude **plus 15°** (e.g. latitude 40° North + 15° = tilt angle 55°).
- For **summer applications** the tilt angle should be set to the location latitude **minus 15°** (e.g. latitude 40° North - 15° = tilt angle 35°).

Note: Seasonally adjusting the tilt angle of the PV array panel can significantly increase power production for year-round loads.

6. SPECIALIZED MOUNTING BRACKETS

- **PMK-3: 3" Pole/Post Mount Kit** – This bracket kit is designed for mounting a Solar Power Supply (BPSS) directly to a fence post or pole up to 3" [76mm] O.D. This kit is available through Securitron or their authorized distributors.

7. MAINTENANCE

7.1 Cleaning Methods

- Use canned/compressed air to blow out dirt and dust from inside the cabinet.
- Cleaning once a year is recommended.
- Clean every six months in very dusty environments.
- Cleaning more often may be required in outdoor applications.

Troubleshooting (Solar Controller)

Problem	Battery is not charging…
Solution	a. Check the green LED indicator. The green “CHARGING” LED should be on if it is daytime. b. Check that the proper battery type (sealed or flooded) has been selected. c. Check that all wire connections in the system are correct and tight. Check the polarity (+ and –) of the connections. d. Measure the PV array open-circuit voltage and confirm it is within normal limits. If the voltage is low or zero, check the connections at the PV array itself. Disconnect the PV from the controller when working on the PV array. e. Check that the load is not drawing more energy than the PV array can provide. f. Check if there are excessive voltage drops between the controller and the battery. This will cause undercharging of the battery. g. Check the condition of the battery. Determine if the battery voltage declines at night with no load. If unable to maintain its voltage, the battery may be failing. h. Measure the PV voltage and the battery voltage at the controller terminals. If the voltage at the terminals is the same (within a few tenths of volts) the PV array is charging the battery. If PV voltage is close to the open circuit voltage of the panels and the battery voltage is low, the controller is not charging the batteries and may be damaged.

Problem	Battery Voltage is too high…
Solution	a. First check the operating conditions to confirm that the voltage is higher than specifications. Consider the temperature compensation of the controller’s PWM set-point. For example, 15 at 0°C the controller will regulate at about 15.1 volts (for 12 volt flooded batteries). b. Check that the proper battery type (sealed or flooded) has been selected. c. Check that all wire connections in the system are correct and tight. d. Disconnect the PV array and momentarily disconnect the lead from the “BATTERY” positive terminal. Reconnect the battery terminal and leave the PV array disconnected. The green charging LED should not be lit. Measure the voltage at the “SOLAR” terminals (with the array still disconnected). If the green charging light is on or battery voltage is measured at the “SOLAR” terminals, the controller may be damaged.

Problem	Load not operating properly…
Solution	a. Check that the load is turned on. Check that no system fuses are defective. Check that no system circuit breakers are tripped. Remember that there are no fuses or circuit breakers inside the controller. b. Check connections to the load, and other controller and battery connections. Make sure voltage drops in the system wires are not too high. c. Check for proper LED indications on the controller. If the red “LOAD DISCONNECT” LED is on, the load has been disconnected due to low battery voltage. This is generally a normal state when the load exceeds the PV array output due to weather and other sunlight conditions. d. Measure the voltage at the controller “BATTERY” terminals. If this voltage is above the LVD, the load should have power. Then measure the voltage at the controller “LOAD” terminals, and if there is no voltage present, the controller may be defective.

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