

ISO 9001:2000 Registered Company

DIMENSIONS™

DC to AC Standby Power Systems

Owners Manual for Models:

12UV12B3RT

**Including Optional:
B3: 3-Step Battery Charger**

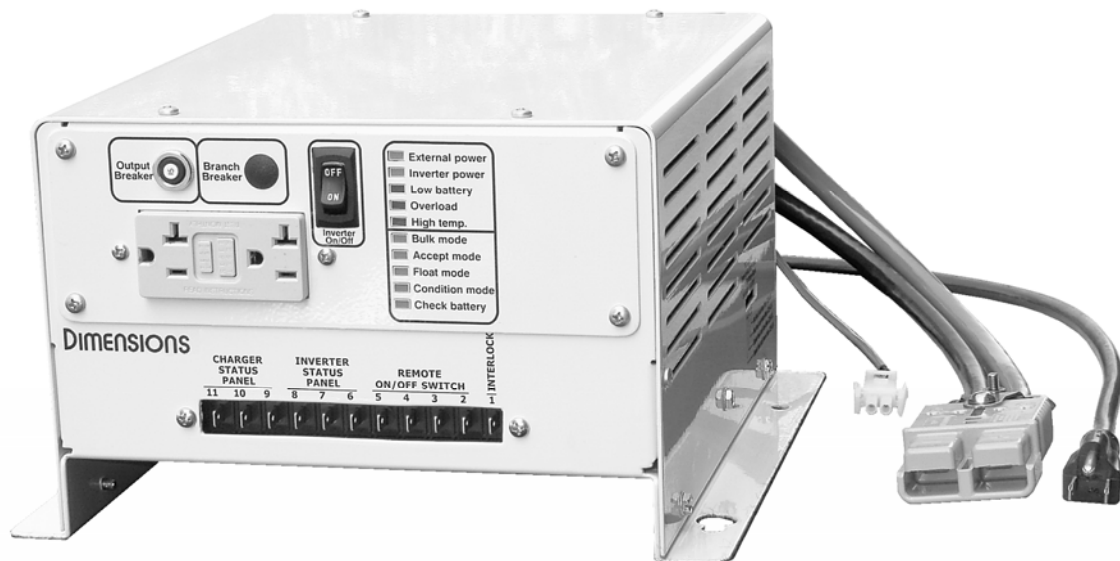


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Safety Instructions

Important: Read this manual before installation, it contains important safety, installation, and operating instructions. Save this manual and keep it in a safe place.

1.1 Warning and Danger Symbols:

To reduce the risk of electrical shock and to ensure the safe operation of your Dimensions power inverter, the following symbols are used throughout the manual.

<p>ATTENTION:</p>  <p>Important operating instructions. Follow them closely.</p>	<p>DANGER:</p>  <p>Risk of personal harm and/or electrocution exists in this area. Use extreme caution.</p>
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1.2 Standby Power System Precautions:

- Standby Power Systems produce hazardous voltages. To avoid risk of harm or fire, the unit must be properly installed.
- There are no user serviceable parts inside, do not remove the cover.
- The Standby Power Systems should not be mounted in a location that may be exposed to rain or spray.
- The Standby Power Systems should not be installed in a zero clearance enclosure.
- Damage to the Standby Power Systems will occur if correct polarity is not observed when installing the DC input cables.
- Damage to the Standby Power Systems will occur if an external AC power source is applied to the inverter's AC hardwire output.
- The Standby Power Systems contains a circuit breaker and capacitor that may produce a spark. Do not mount in a confined battery or gas compartment.
- Be sure the Standby Power Systems is turned OFF during installation.

1.3 Battery Precautions:

- Working in the vicinity of lead-acid batteries is dangerous. There is a risk of acid exposure.
- Batteries generate explosive gases during operation.
- There is risk of high current discharge from shorting a battery that can cause fire and explosion. Use insulated tools during installation.
- Remove all rings, watches, jewelry or other conductive items before working near the batteries.
- Inspect the batteries once a year for cracks, leaks or swelling.
- Dispose of the batteries according to local regulations. Do not incinerate batteries; risk of explosion exists.

2.0 Specifications:

Emergency Vehicle Power Inverter

Environmentally Friendly, Quiet, Reliable, AC Power



ADI-12UV12B3RT

Output Voltage (VAC)	120 RMS \pm 5%
Output Frequency:	60 Hz \pm 0.05%
Output Waveform:	Quasi-sine wave, with proprietary waveform stabilizer circuit
Input Voltage: (VDC)	11 to 14
Operating Temperature:	-20° to 40° C (0° to 104° F)
Efficiency:	Up to 93%

Other Design Features:

- Large TO-247 MOSFET technology
- KKK-A-1822E Certification pending
- Thermally-controlled cooling fan
- GFCI protected receptacle
- Quick connect AC and DC cable connections
- Remote ON/OFF switch hookup, positive or negative start
- LED for Inverter power, Low battery, High temperature, & Overload
- Transfer Relay
- Optional Battery Charger "B3" with Safety Start; automatic conditioning; Temperature compensated output voltage; selectable between wet and sealed lead acid batteries; selectable between small and large battery banks
- Optional LED Remote Status Panels: Charger Status and Inverter Status

Unit Protection:

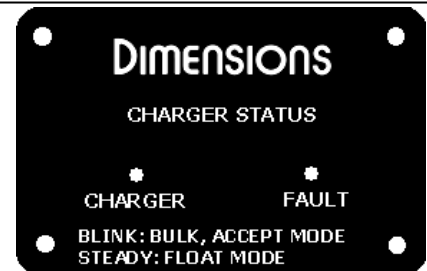
- Automatic electronic short circuit/overload protection
- Automatic over temperature shutdown
- Output circuit breaker

Battery Protection:

- Automatic low battery shutdown at 10.5 VDC (with in-rush delay)

MODEL NUMBER	ADI-12UV12RT
Output Power (Watts Cont.)	1,200
Output Current (Amps AC)	Up to 10
Peak Output (Amps AC)	30
Input Current (Amps DC)	Up to 120
Weight (lbs.)	27
Dimensions in. (LxWxH)	11.20" x 11.5" x 6.75"
Optional - BATTERY CHARGER "B3"	3 step charger (as shown in picture)
Output Current (Amps DC)	55
Input Current (Amps AC)	Up to 13
TRANSFER RELAY	Fail-safe shore power Transfer Relay
Current Rating (Amps AC)	15
Transfer Time (milliseconds)	Less than 16 typical

Optional Remote Status Panels



Model# 245029



Model# 245030

Usage: Any 120 VAC, 60 Hz, product within the inverter's power rating that does not require a pure sine waveform.

Warranty: Full year parts and factory labor

Technical Description

3.1 Standby Power System:

A Standby Power System is a DC to AC power inverter that includes a battery charger “B3” option and an automatic fast transfer switch “T”.

Note: In this manual, we will use the acronym SPS when referring to a Standby Power System.

Both the main and remote “On/Off” switches control the SPS. A LED status panel is included to provide system status. Optional “Charger” and “Inverter” remote LED status panels may also be connected to the SPS.

The system has two operational modes: Inverter power mode and external power mode.

3.1.1 Inverter Power Mode: The SPS converts DC power from batteries to usable 120 VAC, 60 Hz power. The direct current (DC) that enters the SPS is filtered by a large input capacitor and switched “On” and “Off” by the Metal Oxide Silicon Field Effect Transistors (MOSFET) at a rate of 60 cycles per second, and directed into the transformer which steps the voltage up to 120 volts. The unit has a Digital System Processor (DSP) to control the output voltage and frequency as the DC input voltage and/or output load varies. The signal output waveform shape is not sinusoidal; it has a total harmonic distortion of 31% and a maximum single harmonic distortion of 25%.

3.1.2 External Power Mode: 120 VAC, 60 Hz external power can be applied directly to the SPS by the AC Input cord. When external power is present, the internal transfer switch cannot be defeated; it automatically turns the DC to AC inverter OFF and activates the optional three-step battery charger. At this time the loads attached to the SPS output will operate directly from the external power line even if the SPS was turned OFF manually. The internal transfer relay automatically switches the SPS back to “inverter power” mode in the absence of external power whenever the SPS was previously set to ON.

3.2 Available Option and Included Features

3.2.1 Battery Charger – “B3” Option Included: External power 120 VAC, 60 Hz is applied as explained in section 3.1.2 The internal transfer switch automatically turns the DC to AC inverter OFF and turns the three-step built-in battery charger ON. The battery charger cannot be defeated at this time and will engage even if the inverter has been set OFF manually.

The 3-step charging process goes through the following stages: The bulk stage, here the electrical current is returned to the batteries until a factory set voltage limit is reached. The acceptance stage is then engaged immediately; the battery voltage is kept constant while decreasing the charging current gradually up to the transition point or when it reaches the pre-set timer limit. In the floating stage the batteries are recharged at a very low current rate to prevent them from self-discharging. Finally the condition stage is engaged every 10th complete battery charging cycles to ensure full restoration of active materials in all the plates of the battery cells.

The SPS has an automatic power sharing feature that automatically decrease the battery charger output so that the total AC input of the SPS for both the AC loads and the battery charger does not exceed the main 30 amps input circuit breaker. If the loads exceed 30 amps the charger will be at zero amp draw and the input circuit breaker will trip. The battery charger draw will automatically increase when the external loads are reduced if the batteries will accept more current.

3.2.2 Remote Wiring Terminal Block – “R” Included: The SPS can be controlled by a remote “On/Off” switch connected to the terminal block on the front of the SPS module. The remote switch can be wired to work as either positive or negative start.

The “Charger” and “Inverter” LED remote status panels are also connected to the SPS module at the remote wiring terminal block.

3.2.3 Transfer Switch – “T” Included: The transfer switch automatically switches between “Inverter mode” and “External power mode” depending of the external power line availability. External power 120 VAC, 60 Hz can be applied directly to the SPS AC input as explained in section 6.5.2.

SPS Physical Description

4.1 SPS Module

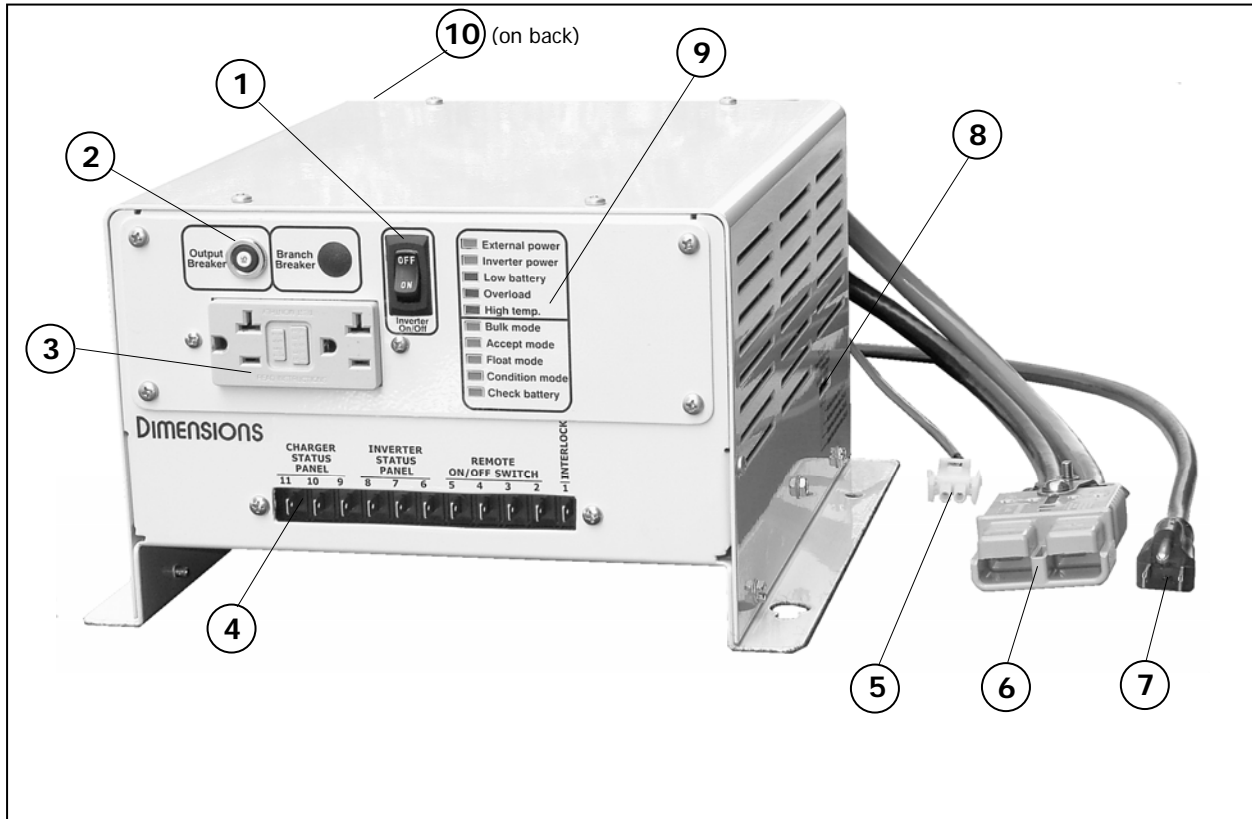


FIGURE 1: SPS physical description




Item #	Description	Function
1	"On/Off" Switch	Turns the SPS On/Off
2	Output Breaker – 15A	Trips to protect the SPS from hardwire AC output short circuit or overload.
3	GFCI Outlet – 15A	One outlet, output power 120 VAC 60 Hz.
4	Remote Wiring Terminal Block	For remote switch and status panel wiring.
5	Temp. Comp. Sensor Connector	Connects to the remote temperature sense probe.
6	DC Input Quick Connector	DC Input Connection.
7	AC Input Cord	Connects to shore power.
8	Battery Capacity Selector Switch	Sets the correct battery type and the capacity of the battery bank for proper charging.
9	LED Status Panel	Provides system status. See page 15, figure 8.
10	Bonding Lug	Connects to the ground system.

Installation


5.1 Tools for Installation:

Tools required for installation: socket wrench, connectors (1/4" quick-connect type and insulated), drill, Crimpers (for insulated and non-insulated connectors), wire cutters, wire strippers, cable ties, tape measure.

5.2 System Components:

Picture	Model and Description	Qty.
	12UV12B3RT with option B3	1
	Optional LED Remote status panel (Charger 245029, Inverter 245030)	1
	Temp. Comp. Cable 611440-XX; XX: Length of the cable in feet.	1

5.3 Mounting the inverter:

	<i>The SPS mounting location should provide adequate ventilation and clearance to maintain room temperature during operation. At least 1/2 inch of clearance is required on all sides.</i>
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- Locate a suitable, secure vertical or horizontal mounting surface as close to the batteries as possible without being in the same airtight compartment.
- If mounting the SPS on a vertical surface, it is recommended that the front control panel be pointing down whenever possible.
- Locate the mounting holes on the chassis flanges and fasten them using ¼ inch diameter screws to secure the inverter. See figure 2, page 9.

5.3.1 Chassis Bonding Lug: Connect the bonding lug located at the rear of the SPS chassis to the earth grounding system using an 8-gauge copper wire.



5.3.2 Temperature Compensated Wire Sense (for “B3” Option): Connect the two-conductor gray wire to the negative post of the battery bank. Failure to connect the remote temperature sense probe correctly will result in high output voltage that will cause severe damage and exploding batteries and fire.

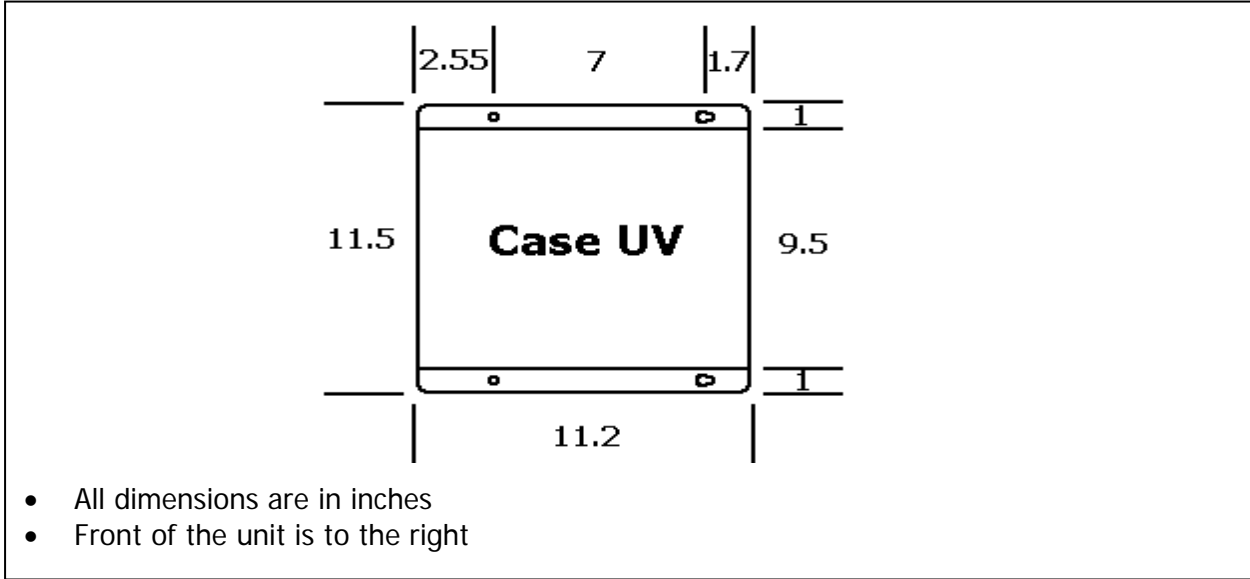



Figure 2: SPS footprint

SPS Wiring Assembly:

6.1 DC Wiring:

- 1 It is recommended in all cases to use stranded copper wires.
- 2 Use SGX cross-linked polyurethane insulation type that complies with the high temperature insulation requirements (125°C.) of SAE J-1127 and vehicle manufacturer requirements.
- 3 Wire gauge recommendations are minimum. For lower temperature rated, applications inside engine spaces or large motor loads and other applications with high surge currents use wire gauge 1 to 2 sizes larger than shown on table I.
- 4 Keep the wire runs between the Battery Disconnect Switch and SPS as short as possible.
- 5 Use Bussmann fuse type ANN-XXX and fuseblock # 3576 where XXX is the size of the fuse.

6.1.1 Inverter Cable: This is the cable that runs from the SPS to the Battery Disconnect Switch. Estimate the "inverter cable" length and cross-reference the wire gauge and fuse size.

	<i>Damage to the SPS not covered under warranty will occur if correct polarity is not observed when installing the DC input cables.</i>
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SPS Model	Full Load (Amps DC)	SPS to Battery Disconnect Switch, estimated cable length in feet		
		1' – 10'	11' – 15'	16' – 20'
12UV12B3RT	120	4-gauge, 200A fuse	2-gauge, 250A fuse	1-gauge, 300A fuse

Table I: Wire and Fusing Guide for 12VDC systems at 5% Voltage Drop at Full Output

6.1.2 Connecting the DC wires:

- Remove the fuse in the red cable for cable installation.
- Connect the red POS (+) end to the load side of the Battery Disconnect Switch.
- Make sure that the black wire (return wire) is connected directly to the battery NEG (-) post and does not use the chassis to carry the return current.
- Install the in-line fuse in the fuseholder.
- To determine the fuse size, see Table I.
- Terminal block position 1 must be connected to the Module Disconnect Switch through a 1 amp fuse. This wire must be connected in order for either the front panel or remote "On/Off" switch to work.



6.2 DC Wiring Diagram

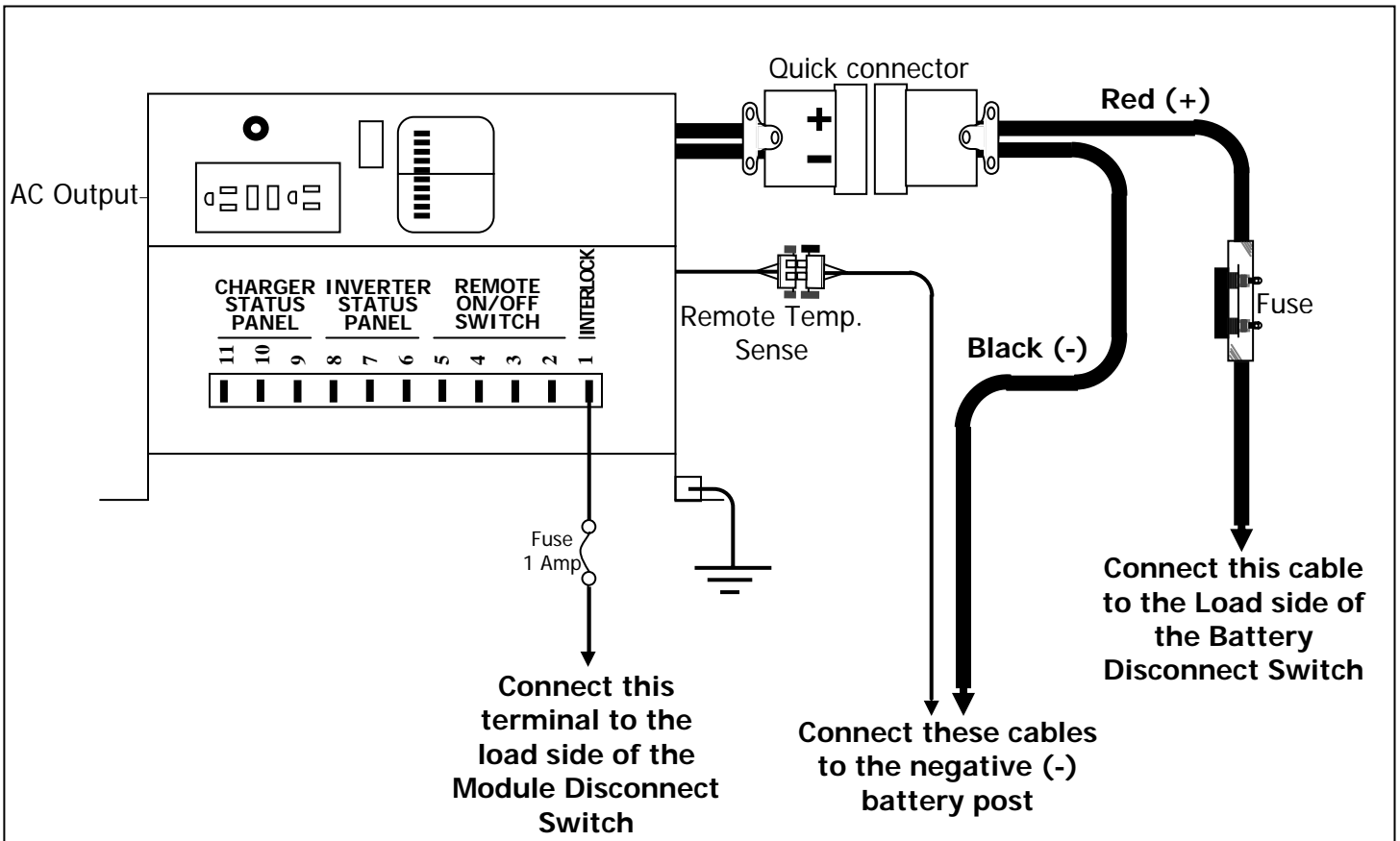


Figure 3: DC wiring diagram.

6.3 Remote “On/Off” Switch: A customer supplied “On/Off” switch may be connected to control the SPS.

The SPS can be wired to be turned on by a remote switch. There are two different methods of wiring the remote switch. Figure 4 shows a “positive” start method. Figure 5 shows a “negative” start method.

- Use 18-gauge wire when wiring the remote switch.
- The wire going to the Module Disconnect Switch from terminal 1, needs to be fused with a 1 amp fuse.
- All material used for the remote switch should be UL listed and installed per code.

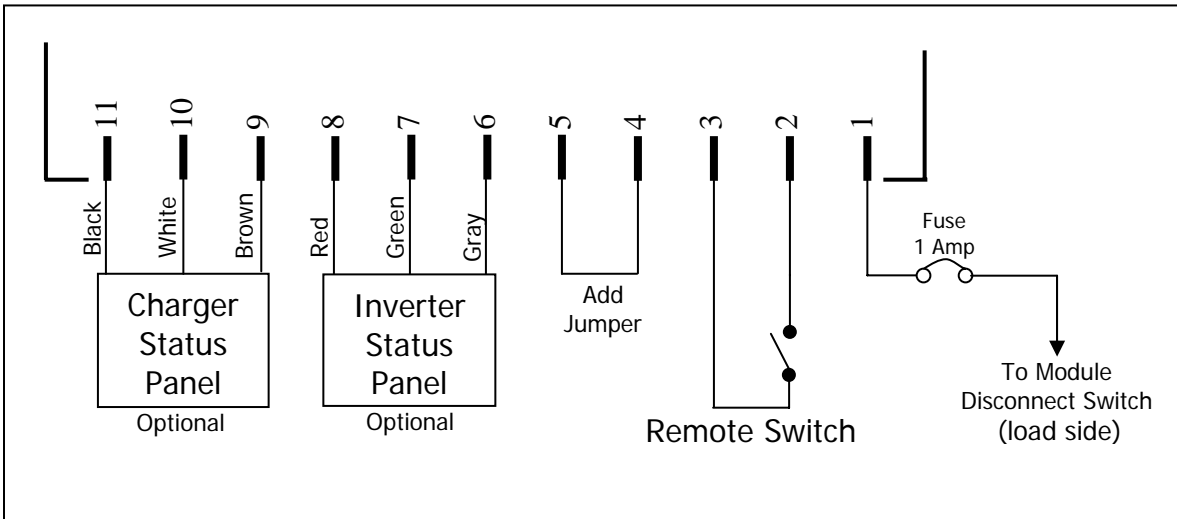


Figure 4: “Positive” start wiring diagram.

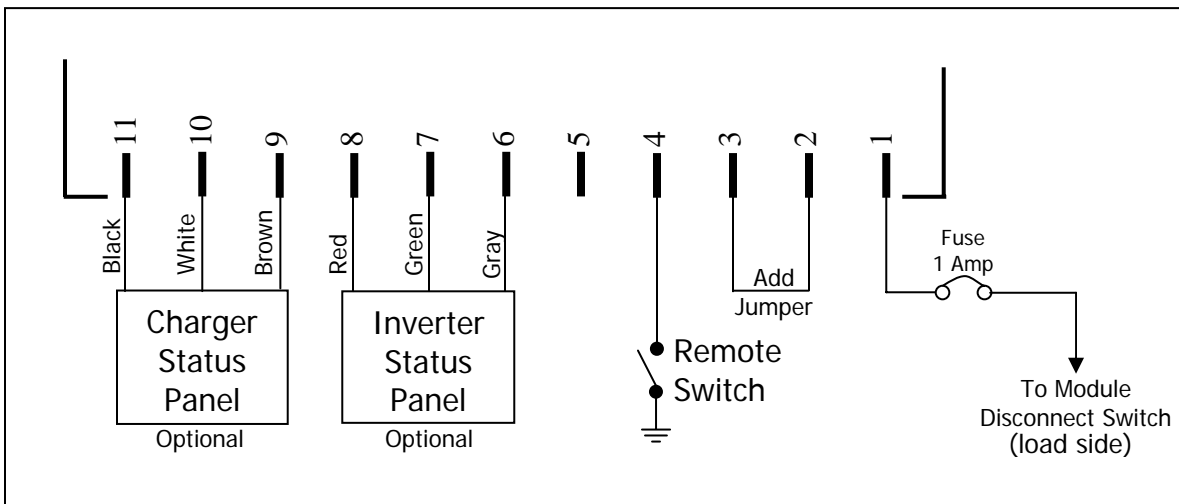


Figure 5: “Negative” start wiring diagram.

6.4 Status Display Panel Wiring

- Mount the LED remote status panel in a convenient, visible and accessible location. See figure 6 for mounting footprint.
- Mount the panel with #8 screws.
- Wire the panel as per figure 4 or 5 using insulated butt splice or equivalent. The terminal block on the SPS accepts insulated ¼" quick connect connectors.

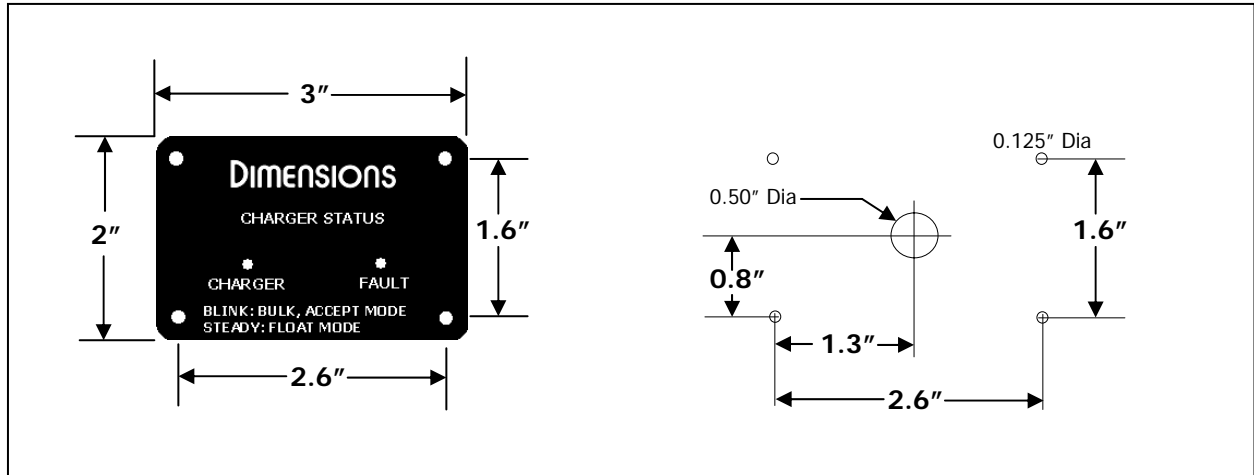



Figure 6: LED Remote status panel footprints – 245029 and 245030

6.5 AC Wiring:

6.5.1 AC Output: The 120 VAC, 60 Hz current produced by the SPS is provided at the GFCI receptacle outlet located on front of the SPS.

	<p><i>Do not connect another source of AC power directly to the output of the SPS. This will result in damage to the SPS that is not covered under warranty.</i></p>
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6.5.2 AC Input: Plug the AC Input cord into the shore power circuit. The input circuit should have a maximum 15 amps circuit protection from the distribution panel.

6.6 AC Wiring Diagram

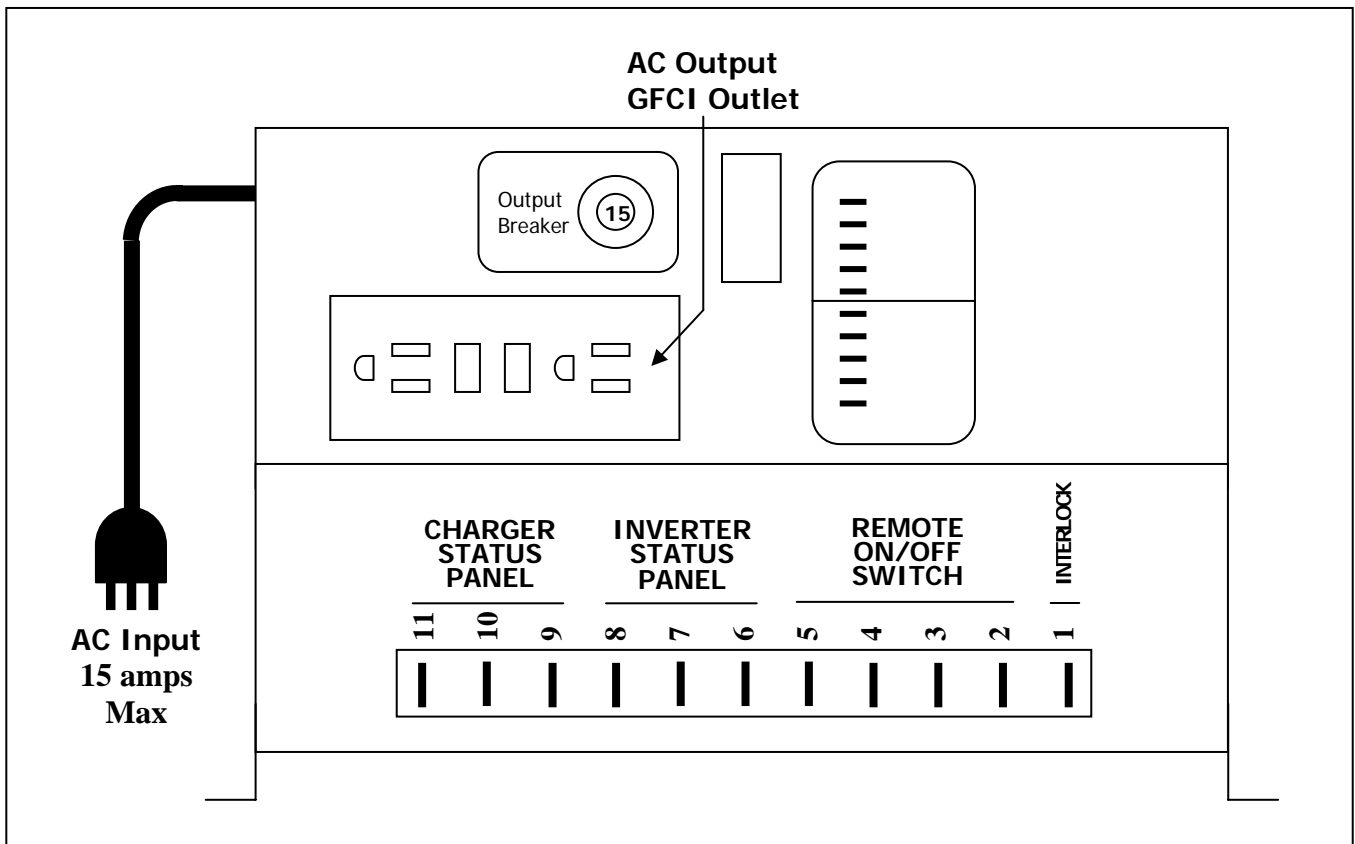



Figure 7: AC wiring diagram.

Operation and Troubleshooting

7.1 Operation

	<i>The battery voltage must be higher than 9 volts for the SPS to operate.</i>
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7.1.1 Setting the Battery Size and Type (for “B3” option): The battery selector switch located at the right side of the chassis must be set according to the type and size of the battery bank the SPS is connected to as shown in table II below.

TABLE II: BATTERY SELECTOR SWITCH POSITION


BATTERY BANK SIZE (Amp-Hour)	DEEP CYCLE BATTERY TYPE	
	SEALED LEAD ACID	WET LEAD ACID
More than 200	A	C
Less than 200	B	D

TABLE III: BATTERY CHARGER VOLTAGES

BATTERY TEMPERATURE		WET CELL BATTERIES			SEALED BATERIES		
		ACCEPT (Volts)	FLOAT (Volts)	CONDITIONING (Volts)	ACCEPT (Volts)	FLOAT (Volts)	CONDITIONING (Volts)
°F	°C						
78	25	14.6	13.2	14.9 to 15 max.	14.2	13.2	14.4 to 15 max.

TABLE IV: BATTERY CHARGER TIME PERIODS

BATTERY BANK SIZE (Amp-Hour)	WET CELL TYPE BATTERIES			SEALED TYPE BATTERIES		
	BULK (max.)	ACCEPT (max.)	CONDITIONING (max.)	BULK (max.)	ACCEPT (max.)	CONDITIONING (max.)
Less than 200	6-hrs.	2-hrs.	3-hrs.	6-hrs.	2-hrs.	3-hrs.
Greater than 200	8-hrs.	3-hrs.	6-hrs.	8-hrs.	3-hrs.	4-hrs.

	<i>If the bulk mode times-out the charging process will go to the float mode immediately bypassing the acceptance mode.</i>
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7.1.2 Turning the SPS ON: After the correct installation, the built-in transfer relay automatically switches the SPS to “external power” mode activating the battery charger any time a proper external AC voltage source is present.

The “inverter mode” can only be activated when there is no proper voltage external AC power source and there is +12VDC at terminal 1 (Module Disconnect Switch is “On”). The inverter is turned “On” or “Off” by either the front panel or optional remote “On/Off” switch. The inverter can be left “On” and the SPS will automatically cycle back and forth between the battery charger and inverter. However, there is a one to two amps draw on the batteries when the inverter is “On” and there are no AC loads. When the Module Disconnect Switch is turned “Off” and the wiring to the SPS is done properly, the inverter will be turned “Off”.

7.1.3 LED Status Panel

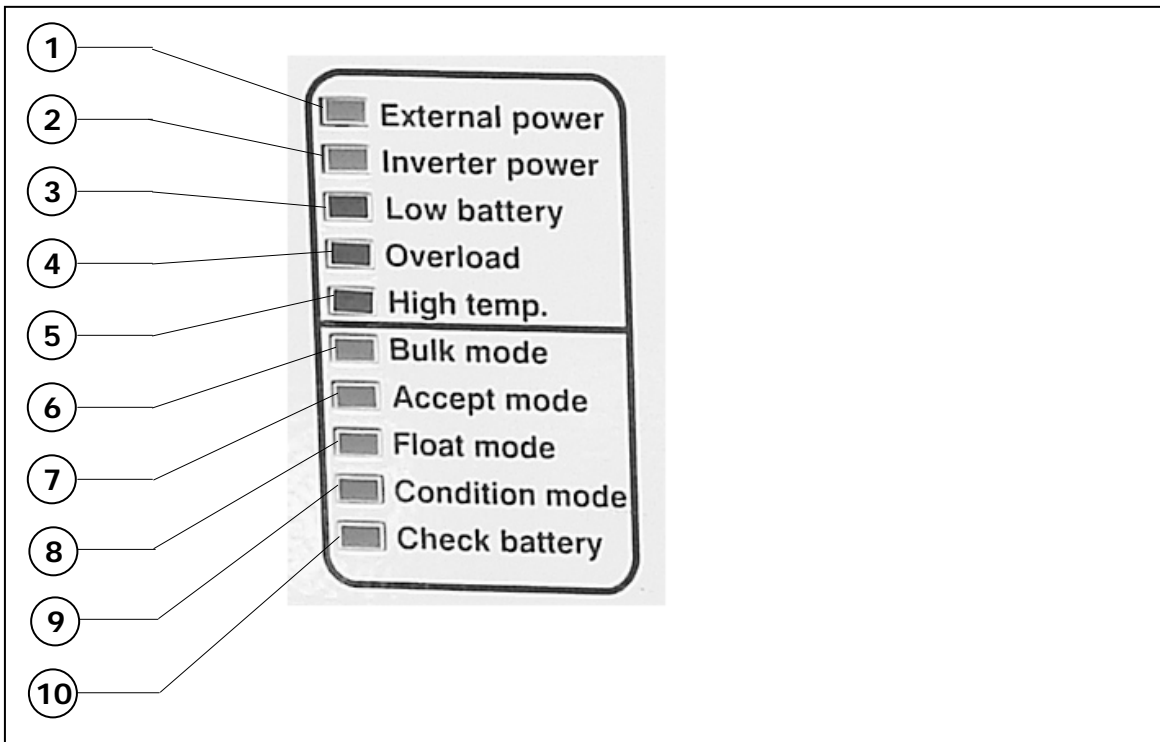


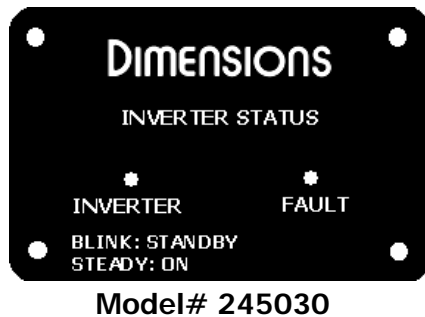
FIGURE 8: LED Status Panel

- 1) **External power:** The green LED indicates that there is external 120 VAC, 60 Hz connected to the unit.
- 2) **Inverter power:** The green LED indicates that the SPS is operating from batteries in "inverter mode". Steady indicates that the inverter is on and producing AC power. Blinking indicates that the inverter is in standby mode and once shore power is removed the inverter will then produce AC.
- 3) **Low battery:** The red LED indicates that the SPS is in a low battery voltage condition.
- 4) **Overload:** The red LED indicates that the SPS is in an overload condition.
- 5) **High temp:** The red LED indicates that the SPS has a high internal temperature.
- 6) **Bulk mode:** The green LED indicates that the battery charger is in the bulk mode.
- 7) **Accept mode:** The green LED indicates that the battery charger is in the acceptance mode.
- 8) **Float mode:** The green LED indicates that the battery charger is in the float mode.
- 9) **Condition mode:** The green LED indicates that the battery charger is in the condition mode.
- 10) **Check battery:** The green LED indicates a possible fault in the battery bank or DC cables.

7.1.4 Remote Status Panels: The SPS has two optional remote LED status panels. Each status panel has a green and a red LED. The green LED gives an indication of the status of the charger or the inverter. The red LED shows if there is a fault. Their operation is as follows:



Charger LED	
Indication	Description
None	Shore Power is not present.
Blinking Green	Shore Power is present and the Charger is charging in "Bulk" or "Accept" mode.
Steady Green	Shore Power is present and the Charger is charging in "Float" mode.
Fault LED	
Indication	Description
None	There are not any faults.
Steady Red	There is a fault. Consult the front panel LED display of the SPS for more information.



Inverter LED	
Indication	Description
None	Inverter is "Off"
Blinking Green	Shore Power is present and the Inverter is in "Standby" mode.
Steady Green	Shore Power is not present and the SPS is "On" and providing AC power.
Fault LED	
Indication	Description
None	There are not any faults.
Steady Red	There is a fault. Consult the front panel LED display of the SPS for more information.

7.2 Troubleshooting

Call or e-mail Customer Service Department for free consultation during business hours (central time zone) at: 1-800-553-6418 or 1-651-653-7000; fax: 1-651-653-7600; e-mail: inverterinfo@sensata.com

- A TRUE RMS voltmeter is required for accurate AC output voltage readings on a quasi-sine SPS. A voltmeter that uses averaging circuitry will give a false reading.
- Unplug all loads and connect a 100-watt light bulb to the inverter output. Observe the LED's light coming on at the remote or front status panel then check the troubleshooting table.

7.2.1 Troubleshooting Chart

PROBLEM	POSSIBLE CAUSES OR SOLUTIONS
No LEDs: No power output. The SPS is not connected to the Battery Disconnect Switch; the battery voltage is below 9 volts DC, the SPS is not connected to the Module Disconnect Switch or a fault in the remote On/Off circuit.	Check the in-line fuses for continuity. Make sure the DC wires are clean and tight. Check the DC voltage at the SPS DC input. Check or bypass the remote On/Off circuit. Make sure that the Battery Disconnect Switch and the Module Disconnect Switch are turned on. Check for DC voltage at terminal 1 (Interlock).
Low battery: Red LED indicator light on steady. Indicates that the SPS has shut off due to a low battery voltage condition.	Fault in the battery wiring, battery capacity and voltage or an in-line fuse. This message will automatically clear or the SPS will shut off.
Overload: Red LED indicator light on steady. Indicates that the SPS has shut off due to an overload condition.	The SPS output wiring is shorting or loads exceed the inverter rating. This message will automatically clear or the SPS will shut off. Remove the short circuit or excessive load from the output, and then switch the SPS off then on.
High Temp: Red LED indicator light on steady. Indicates that the SPS has shut off due to high internal temperature. The unit will automatically turn back on when it has cooled down to 40°C (104°F).	Verify that the SPS is in a vented compartment and that the fan is not blocked. High ambient temperatures combined with poor ventilation may also contribute to the shut down.
Red LED indicator light blinking. Indicates that the SPS has shut off due to high battery temperature 47°C – 50°C (117°F-122°F).	Battery compartment is too hot and needs to cool down. The charger will automatically turn back on when it has cooled down to 40°C (104°F)
Overload & High Temp: Both of these red LED indicator lights are on steady. Indicates that the charger has shut off due to short or open temperature compensating sensor cable.	Temperature compensation sensor cable needs to be replaced.
Check battery - "B3" Option: Green LED indicator light. Indicates that the charger is operating in a low DC output voltage condition. The battery voltage must be higher than 9 volts for the charger to operate.	Shorted or defective battery. Make sure that the DC cable connections are tight and clean and not shorted, and that the proper wire gauge is used.
Indicates that the charger is operating in a high DC output voltage condition.	There is another source of battery charging or there is a defective battery charger. Disconnect and reconnect the external AC power to restart the battery charger.
Indicates that the SPS has shut off due to high battery voltage.	Check battery wiring or remove other source of battery charging, such as the vehicle alternator. Disconnect and reconnect the external AC power to restart the battery charger.

Warranty

SHIPPING TERMS: F.O.B. St. Paul Minnesota. Freight prepaid and billed, subject to prior credit approval.

MINIMUM ORDER: \$50.00 Net Price

LOSS OR DAMAGE: Loss or damage in transit are the responsibility of the carrier. Any claim should be filed with the delivering transport company. Invoice, Bill of Lading and Delivery receipt with damage noted therein must accompany any claims for freight damage. Claims for shortage and lost shipments must be made in writing to Sensata Technologies, Power Controls White Bear, St. Paul, MN within 10 days of date of shipment. Claims not reported within this time frame will not be honored.

PRICES: Prices are subject to change without notice. All orders are subject to acceptance at the factory. We reserve the right to invoice prices in effect at time of shipment.

TERMS: Net 30 days with approved credit, credit card or C.O.D.

RETURN GOODS POLICY:

- No returned materials will be accepted without an accompanying Returned Materials Authorization Number (RMA) from the factory.
- Credit will be issued for returned goods to the original purchaser within 60 days of purchase, provided the inverter is returned to Sensata unused and not mounted. The amount of credit will be issued at Sensata's discretion based on the condition of the product.
- Customer must be in good standing with Sensata Technologies.
- Inverters that are discontinued, high-voltage (over 24vdc), special-order or used are excluded and will not be eligible for credit. Non-inverter items such as cable assemblies, fuses and fuse holders, will not be eligible for credit
- Support components supplied by Sensata vendors will be covered under that manufacturer's credit return policy.
- Customer pays return freight.

PLEASE SHIP AUTHORIZED RETURNS TO:

Sensata Technologies | Power Controls White Bear | 4467 White Bear Parkway | St. Paul, MN 55110
Return Freight Prepaid

LIMITED WARRANTY:

Sensata Technologies extends the following warranty to the original purchaser of those goods subject to the qualifications indicated. Sensata warrants to the original purchaser for use that the goods or any component thereof manufactured by Sensata will be free from defects in workmanship from the date of purchase for the period listed on the product label, provided such goods are installed, maintained and used in accordance with Sensata and the original manufacturer's written instructions. Damages caused by the misuse, undue care or obvious wear through use will not be covered by this warranty.

Components not manufactured by Sensata, but used within the assembly provided by Sensata, are subject to the warranty period as specified by the individual manufacturer of said component, provided such goods are installed, maintained and used in accordance with Sensata and the manufacturer's written instructions.

Sensata's sole liability and the Purchaser's sole remedy for a failure of goods under this limited warranty and for any and all claims arising out of the purchase and use of the goods, shall be limited to the repair or replacement of the goods that do not conform to this warranty.

To obtain repair or replacement service under the limited warranty, the purchaser must contact the factory for a Return Material Authorization (RMA). Once obtained, send the Return Material Authorization Number along with the defective part or goods to:

Sensata Technologies, Power Controls White Bear, 4467 White Bear Parkway, St. Paul, MN 55110. Return Freight Prepaid.
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