Solid State Battery Separator
(Quick Reference Install and Troubleshooting Guide)

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Bi-Directional Models:
BSD125, BSD175, BSD200 & BSD250

Features:

- **Prevents excessive battery discharge by automatically disconnecting loads**
- **Assist start allowing current flow from auxiliary battery to chassis battery**
- **Weather Resistant, Compact Size and Low Profile**
- **Minimal Voltage Drop**
- **100% solid state design - No moving parts to cause arcing and electrical noise**
- **Automatic shutdown protection for over temperature, short- circuit, over-current and loss of ground.**

Introduction

Ultimate Power introduces state-of-the-art technology in its solution to isolate the chassis and auxiliary batteries while providing an option to assist start a weakened or dead battery. Our battery separators use solid-state, micro processing algorithms that sense current draw and voltage levels that control the steady flow of electricity between both sets of batteries.
The normal operating process follows that the auxiliary battery charges from the chassis battery and alternator, while the chassis battery is shielded from auxiliary battery load discharges. Conversely, shore-power, a battery charger, generator or power inverter connected to the auxiliary battery can supply charging current to the chassis battery.
The separator continues to sense current and voltage differentials. The green LED is lit when the switch is closed to allow current to pass between battery sets. The red LED lights when it detects either battery at low voltage or disconnects and opens the circuit to prevent damage to the stronger battery. A flashing green LED indicates over current or over temperature (85°C/185ºF) cut-off; and a flashing red LED indicates over voltage cut-off (16 VDC).
The separator is designed to prevent both battery sets from failure. It has a connector that can act as an assist start switch to allow the auxiliary battery to bypass the circuit and supply current to the chassis battery to help start the motor.

Theory of Operation

When the engine is running, the alternator begins supplying current to the chassis battery and the auxiliary battery. When the chassis battery reaches 13.1 VDC for 20 seconds, and the auxiliary battery's voltage no lower than 8.0 VDC, the BSD switch closes allowing current to flow to both batteries. This charges the auxiliary battery. Please note that both batteries must achieve 8.0 VDC for the BSD switch to remain closed. Less than that, the connection opens to eliminate the possibility of a shorted auxiliary battery. If current reaches more than 110% of its continuous rating for 500 milliseconds, the BSD switch will disconnect. It automatically resets every 20 seconds.
When the engine is stopped, current no longer runs from the alternator to charge the batteries. Therefore, the batteries are in discharge mode. When the voltage of both batteries dips below 12.8 VDC for 10 seconds, the BSD switch is opened, separating the auxiliary from the chassis battery.

Specifications				
Model	BSD125	BSD175	BSD200	BSD250
Rated Current@ Mount A*	**125 Amps**	**175 Amps**	**200 Amps**	**250 Amps**
Rated Current@ Mount B**	100 Amps	130 Amps	150 Amps	175 Amps
Max Voltage Drop @ Mount A*	0.33Vdc	0.34Vdc	0.24Vdc	0.24Vdc
Max Voltage Drop @ Mount B**	0.5Vdc	0.52Vdc	0.32Vdc	0.36Vdc
Logic Power Current Draw	5 milliamps			
Operating Voltage Range (VDC)	8 to 16			
Nominal Operating Temperature	68°F (20°C)			
Over Current Trip	Over 110% for 500 milliseconds, resets every 20s			
Assist Start Surge	150% for 2 seconds (reset control input)			
LED Indicator Status	Solid Green: Connect			
	Flashing Green: Over current or over temp cut off, freq. 1Hz			
	Solid Red: Low voltage cut off (both below 8V)			
	Flashing Red: Over voltage cut off (over 16V), freq. 1Hz			
	Dim: Cut off			
High Temperature Protection	185°F (85°C)			
High Temperature Recover	140°F (60°C)			
Power Terminals	M10 copper stud with tin plating and stainless steel locking nuts			
Power Terminal Torque	10 to 15 ft. lbs.			
Ground Connection	1/4 inch male faston blade terminal			
Dimensions (Inches) (LxWxH)	4.25 x 4.49 x 2.28			5 x 4.49 x 2.28
Weight (lbs.)	1.48			1.76

Mount A* - Mounting surface such as an aluminum plate 1.5 x 4.5 x 23.5 inch or larger
Mount B** - Mounting surface such as wood, plastic or free air

Assist Start

In the event that a discharged chassis battery is in a weakened state, there is a connector post on the BSD that can engage it as a bypass circuit and draw 12.0 VDC power from the auxiliary battery.
This manual assist start function allows the BDS switch to close when activated from a remote location using 16# AGW and a momentary switch that is mounted near the dashboard on the driver's side. The connector closes the switch for the time that assist start is carried out. Please note that both batteries must be above 8.0 VDC for this manual control to operate. If the BSD senses current that is 150% over its continuous rating for more than 2 seconds, the BSD switch will shut off. It will reset after removing the Assist Start control input and reapplying it.

For more information please call
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BSD Installation Guide

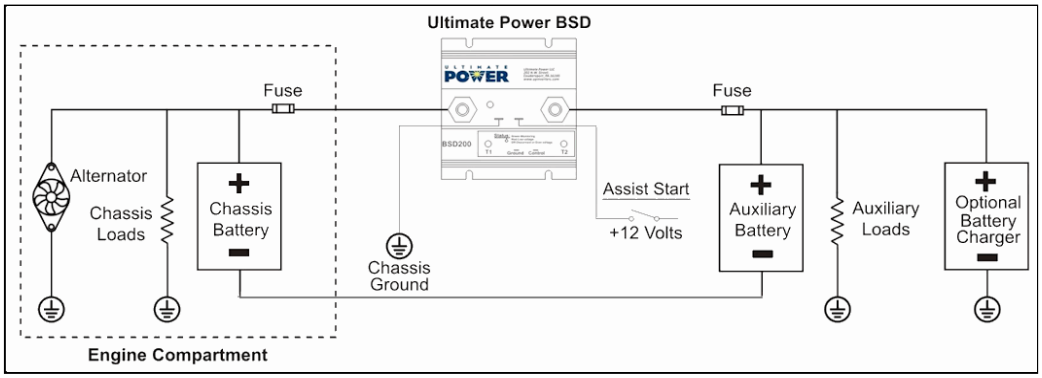

Figure 1

Safety Fuse and Cable Size		
BSD Model	Minimum Fuse Size	AWG
BSD-125	150 amps	#4
BSD-175	200 amps	#2
BSD-200	225 amps	#2
BSD-250	275 amps	#1/0

Table A

NOTE: (Table A) Cable length should not exceed 20 ft. Max

Fusing and Battery Cable: A properly sized fuse must be installed in each cable connecting from the BSD to the chassis and auxiliary battery positive terminal (**Refer to Figure 1**). Each fuse must be located within 16 inches of the respective battery.

Important: Do not weld on the vehicle with the Bi-Directional Battery Separator installed as damage to the unit may result. In the event that electric welding is necessary, please disconnect the cables attached to the T1 and T2 terminal posts. Damage due to electric welding while the BDS is installed can void the Ultimate Power Advance Replacement warranty.

Safety Precautions: This product requires the installer to be trained for installation and work on vehicle electrical systems. We recommend that all wiring meet the SAE and applicable vehicle manufacturer's wiring specifications. Inspect the product and all other components for damage before starting the installation. Do not perform the installation if any problems exist.

Mounting Location:

- The BSD, although sealed, must be mounted in a protected dry area and away from heat sources.
- The BSD is not designed for exposure to saltwater spray, environmental debris or power washing.
- It must be mounted to a flat metal surface that maintains ambient temperature.
- The module must not be mounted in the engine compartment or any location near the engine's heat.
- Take into consideration the routing of the two battery cables.
- Connect only the battery cables to the BSD power terminals.

NOTE: Do not use these terminals for a junction post.

NOTE: The BSD performs optimally mounted to a metal surface. If mounted on a non-metallic surface, maximum current capacity diminishes by 25%.

Grounding:

Proper operation of the BSD is dependent on a good quality ground system. Both the chassis battery and the auxiliary battery must be connected to a solid common ground. The BSD must be connected to this common ground. Connect a #16 AWG ground wire with a 0.25" blade socket to the common battery ground.

NOTE: The best ground is at the chassis battery's negative terminal.

Connecting the Power Cables and Fuse:

Prepare the two cables to the batteries using a suitable size cable for the current required (**Refer to Table A)** and install a crimped lug terminal on the end. Install a fuse in each battery cable. The fuse rating must match the BSD rated current capacity. Terminal T1 is connected to the positive terminal of the chassis battery and terminal T2 is connected to the positive terminal of the auxiliary battery.

NOTE: Torque Separator nuts to 10-15 ft. lbs.
NOTE: (Table A) Cable length should not exceed 20 ft. Max

Separator Status	Voltage		LED Indicator	Operation
	Chassis Battery	Auxiliary Battery		
Connect	⩾13.1V	⩾8.0V	Solid Green	In the chassis battery and auxiliary battery, when the voltage of one rises above 13.1 volts for 20 seconds, and the other battery's voltage is no lower than 8.0 VDC the BSD switch will connect the two batteries.
	⩾8.0V	⩾13.1V		If the BSD current is exceeded to 110% rated for 500 milliseconds, the BSD switch will turn off. It will automatically reset every 20 seconds.
Disconnect 1	<13.1V or ≥8.0V	⩾8.0V	Dim	Powered On
Disconnect 2	<12.8V	<12.8V	Dim	When the voltage of the combined batteries drops below 12.8 VDC for 10 seconds the BSD switch opens, isolating the auxiliary battery from the chassis battery and alternator.
Disconnect 3	<8.0V	<8.0V	Solid Red	Low voltage
Disconnect 4	>16.0V	⩾8.0V	Flashing Red	Over voltage
	⩾8.0V	>16.0V		
Disconnect 5	⩾13.1V	⩾8. 0V	Flashing Green	Over current or over temp protection
	⩾8. 0V	⩾13.1V		
Assist Start	⩾8.0V	⩾8.0V	Solid Green	The Assist Start function enables the BSD to connect the auxiliary battery to the over-discharged chassis battery to aid engine starting. It also enables an external battery charger to charge the auxiliary and chassis battery. When it is activated, the BSD offers a surge current of 150% rating for 2 seconds before it turns off. It will reset after removing the Assist Start control input and reapplying it.

Figure 2

ULTIMATE POWER

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BSD Troubleshooting Guide

What can cause a battery separator failure?

1. Blown fuse or tripped circuit breaker, either at the chassis or auxiliary battery;
2. Loose connections at the: batteries, fuse blocks or circuit breakers, battery separator or ground connections;
3. Auxiliary battery that is under or over charged (below 8Vdc or above 16Vdc);
4. Loss of ground on the battery separator;
5. Over temperature (over 185ºF or 85ºC);
6. Over current (over 110% of BSD rating);
7. Short circuit;
8. Leaving a load on that is connected to the auxiliary battery, causing it to drain excessively over a period of time (below 8Vdc).

Steps in trouble-shooting the battery separator circuit:

1. Check the status of the LED display on the battery separator (refer to figure 2 – LED indicator status).
2. If the status indicator is not illuminated, check the input voltage at terminal “T1” on the battery separator. It should read the same as the chassis battery (8 to 16Vdc).
3. If you detect voltage at T1 (8 to 16Vdc), check the output voltage at terminal “T2” (it should read the same as T1). If no voltage is present at T2, check the status of fuse or circuit breaker between the battery separator and auxiliary battery (see figure 1), and replace the fuse or reset the circuit breaker if necessary.
4. If the battery voltage at T2 on the battery separator is less than 8Vdc, then the auxiliary battery is drawn down below its safe operation and the battery separator is powered off. Safely jump the auxiliary battery from the chassis battery to bring the voltage over the minimum threshold (8Vdc). At this point, the LED status display on the battery separator should turn solid green, thus indicating it is operating properly.

Other trouble-shooting tips:

1. Check all connections at the chassis battery, auxiliary battery, fuse blocks or circuit breakers and the battery separator (T1, T2 and the ground spade) for tightness;
2. If the auxiliary battery is below 8Vdc, check to see what device loads are connected to it causing the auxiliary battery to drain excessively. Please turn off devices when not in use.

For Additional Technical Assistance – please call 610.360.3937 or 651.494.2057

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