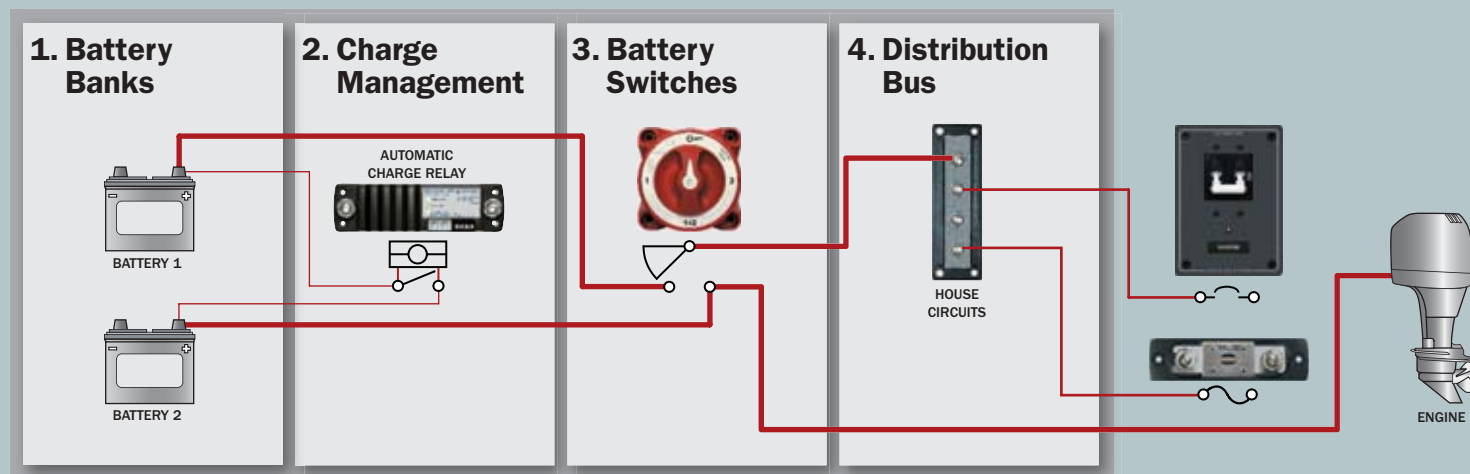


The DC Main Power Distribution System conducts power from the battery banks to the beginning of the DC Branch Distribution System. The four elements of the DC Main Power Distribution System are illustrated below:



1. Battery Banks

Purpose

To store sufficient energy to power the ship's loads between charging cycles. Charging is typically provided by the alternator while under way and the battery charger when connected to shore power. Additionally, for boats with two battery banks, to provide a second source of energy storage isolated from the first, sufficient to start the engine and recharge all battery banks.

Considerations

Blue Sea Systems advises having a second battery bank for emergency engine starting while attempting to avoid having more than two. Some engine manufacturers recommend having a separate battery bank dedicated to each engine in addition to the House battery bank. Limiting the boat to two battery banks, however, will provide the greatest simplicity and reliability.

2. Charge Management

Purpose

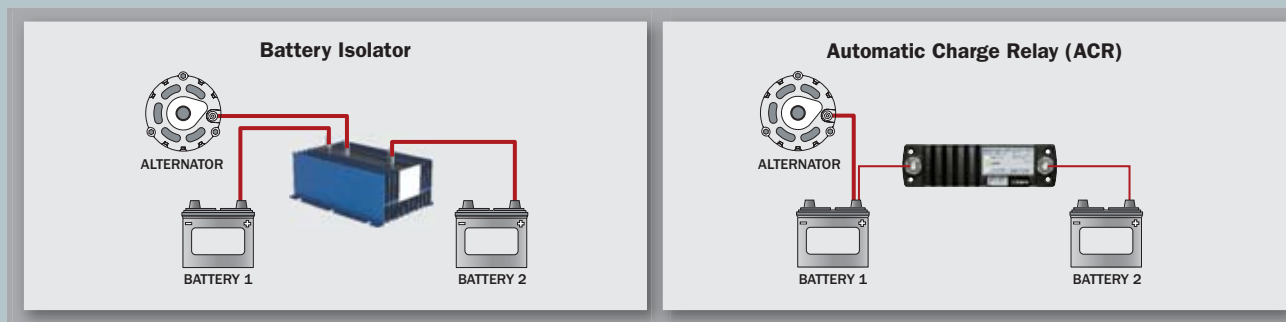
In multiple battery bank systems, Charge Management Devices (CMD's) provide a means of combining two battery banks when charging, while keeping the battery banks isolated from each other when the charging source is not charging. This assures that even if one battery bank is depleted there will always be a charged battery bank available for engine starting. Some devices can also provide a means of connecting both battery banks together for additional power while starting engines. There are many types of CMD's that fulfill this role; the two main categories are Battery Isolators and Automatic Charge Relays (ACR's).

Considerations

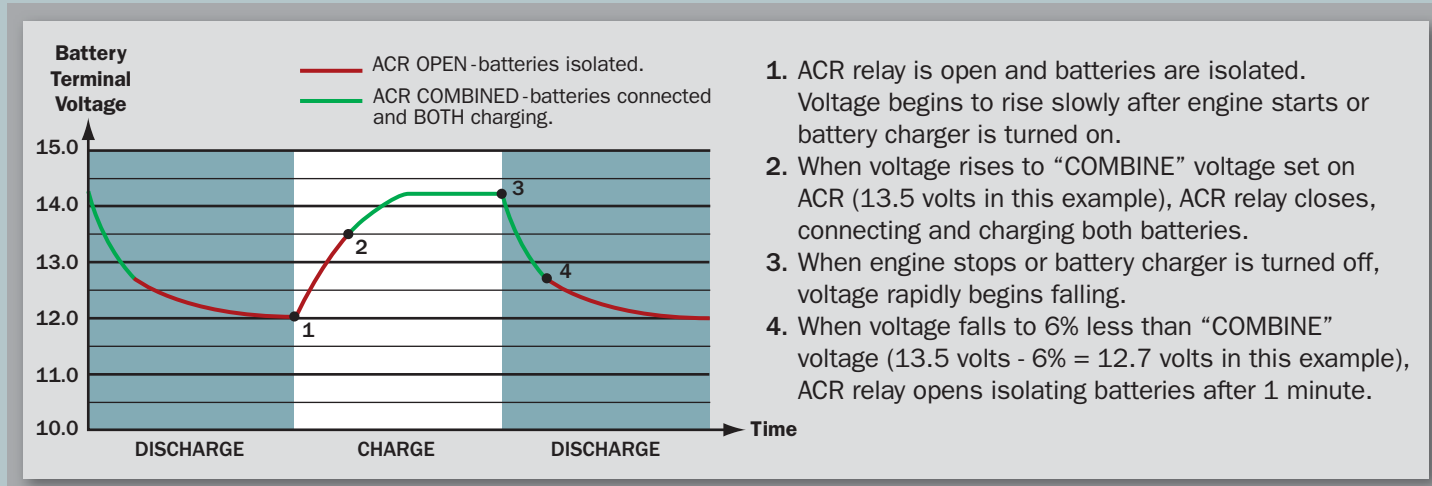
Battery Isolators are a common method of distributing charging current to multiple battery banks while assuring that they remain electrically isolated during discharge. These devices are electrical "one way check valves" that allow current flow to, but not from, the battery. Their disadvantage is that the diodes used to achieve this cause a voltage drop that consumes charging energy, creates heat, and causes batteries to be undercharged. Alternators with external voltage sensing can correct for the undercharging problem, but voltage drop and the heat generated remain a problem.

Automatic Charge Relays (ACR's) are becoming the popular method for achieving the same goal as isolators, but they work on a different principle. Instead of using diodes to block current from flowing in both directions, ACR's use mechanical relays combined with a circuit that senses when a charging source is being applied to either battery. When a charge is being applied, the ACR closes; and when the circuit senses that the charge is no longer present, the ACR opens after a short time delay which assures that the ACR does not open during temporary voltage sags due to load start-ups. The most common method of determining that a charge is being applied to the system is to sense voltages in the region above 12.6 Volts DC.

Battery Isolator and Automatic Charging Relay Comparison



Automatic Charge Relay Operation



Considerations when selecting an Automatic Charge Relay:

- **Current Management**

Automatic Charge Relays (ACR's) can potentially be exposed to very high currents if the engine is cranked while the ACR is closed, paralleling the battery banks. This can occur when an alternate charge source causes the ACR to close. Blue Sea Systems uses two methods for dealing with this. Smaller ACR's such as the CL-Series BatteryLink™ ACR have automatic current management circuits, while larger ACR's like the L-Series ACR have high amperage contacts rated for engine starting.

- **Over Voltage Adjustability**

This allows the ACR to be used between different type battery banks in which one battery bank requires lower maximum charging voltages than the other battery bank.

- **Combining and Disconnecting Voltage Adjustability**

This allows the voltage at which the ACR closes and its associated cut-out voltage to be adjusted for the specific requirements of each boat's electrical system.

- **Manual Override**

This allows the ACR to be manually opened, set to automatic, or manually combined from a remote location.

3. Battery Switches

Purpose

To isolate the potentially destructive energy in the battery banks when the boat is not in use or in emergencies.

ABYC 11.7.1.2.1. A battery switch shall be installed in the positive conductor(s) from each battery or battery bank with a CCA rating greater than 800 Amperes.

Considerations

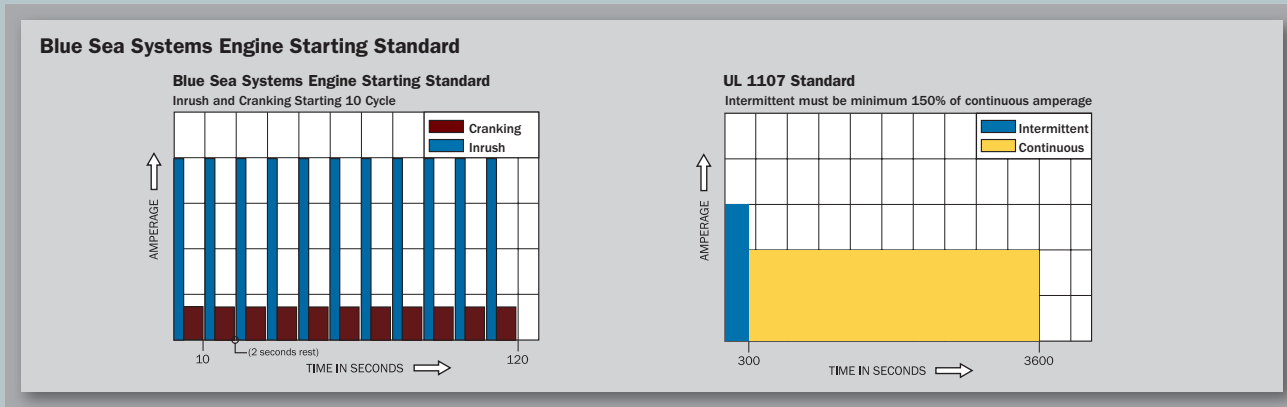
Historically there have been two types of battery switches used on boats; Single Circuit and Battery Selector Switches. In 2006, Blue Sea Systems is introducing a third option called a DUAL CIRCUIT PLUS Battery Switch as a better alternative. On page 9 are schematics for each type of switch and the advantages and disadvantages of each.

Selecting a Battery Switch

Any battery switch used in a marine application should be UL Listed to UL Standard 1107 or should be tested to this standard by a Nationally Recognized Testing Laboratory, of which UL is only one of many. In particular, any amperage rating other than those determined by UL 1107, or a standard whose details are publicly stated by the manufacturer, should be treated with skepticism.

Battery Switch Ratings

The UL standard for marine battery switches is UL Standard 1107. This standard rates switches only for 5 minute and 1 hour time periods. Clearly, these ratings are not useful for the boater using a switch in the engine starting circuit where current durations may be 10 seconds or less. For this reason, Blue Sea Systems has created an additional standard called the **Engine Starting Standard**. The **Engine Starting Standard** is 10 cycles, each consisting of an Inrush Current spike of 1/4 second duration, a Cranking period of 9-3/4 seconds duration, and a 2 second rest period for a total of 120 seconds. This is representative of the load imposed on a battery switch in the starting circuit under very difficult starting conditions. Blue Sea Systems battery switches, in addition to being tested to UL 1107, are also tested to the **Engine Starting Standard** by a United States Coast Guard certified Nationally Recognized Testing Laboratory.



When determining the proper size battery switch, consult your engine manufacturer for the amperage requirements of your engine starter motor. If this information is not available from the engine manufacturer you may refer to the following rule of thumb used by mechanics to roughly estimate the cranking requirement of various type and sizes of engines.

Estimating starter motor amperage draw to determine size of battery switch

Gasoline engines - 1 amp/cubic inch of engine displacement = cranking rating

Diesel engines - 2 amps/cubic inch of engine displacement = cranking rating

* These values are intended to be general estimates and do not apply to gear reduction starter motors. Ed, Sherman, *Power Boaters Guide to Electrical Systems*, 2000

ABYC Requirements

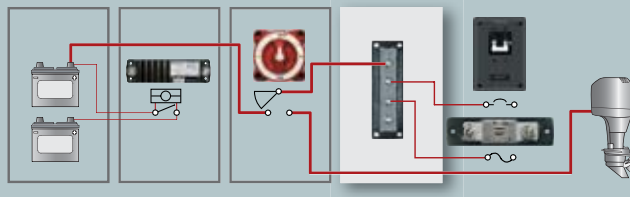
11.7.1.2.3. *Battery Switch Ratings – The intermittent rating of a battery switch shall not be less than the maximum cranking current of the largest engine cranking motor that it serves. The minimum continuous rating of a battery switch shall be the total of the ampacities of the main overcurrent protection devices connected to the battery switch, or the ampacity of the feeder cable to the switch, whichever is less.*

ABYC Standards for battery switches are currently under review by the ABYC Project Technical Committee for battery switches. The two major changes likely to be made are that allowable temperature rise will decrease, thereby lowering the amperage ratings that switches currently carry, and the Engine Starting Standard developed by Blue Sea Systems will be incorporated into the standard.

4. Distribution Bus

Purpose

On any but the smallest boats it is impractical to attach all of the wires from each load



directly to the battery terminal or the battery switch terminal. For this reason, a positive distribution bus, (a solid bar of tin-plated electrical copper) is used to convert the large wire from the batteries to the smaller wires that carry current out to the each load device. Large boats may have many layers of progressively smaller busbars, while small boats may have only a small busbar attached to the back of the electrical distribution panel.

Considerations

When selecting a distribution bus, Blue Sea Systems suggests it have the following qualities:

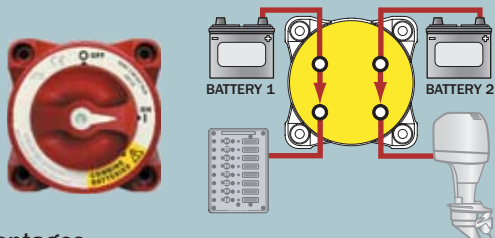
1. Solid copper construction for low voltage drop and low heat rise.
2. Stainless steel terminals for strength and corrosion resistance. In a distribution bus, the terminal is a compressive element, not a conductive element. Its purpose is to press the ring terminal against the busbar. This is different from a battery switch in which the terminal's job is to carry current through the terminal and into the interior of the switch.
3. Tin plating to resist corrosion and maintain low resistance connections.
4. Continuous rating equal to or greater than the maximum continuous amperage of the system in which it will be installed.

New DUAL CIRCUIT PLUS™ Battery Switch for 2006!

Dual Circuit switching technology offers the advantages of MULTIPLE Single Circuit ON/OFF switches in ONE switch

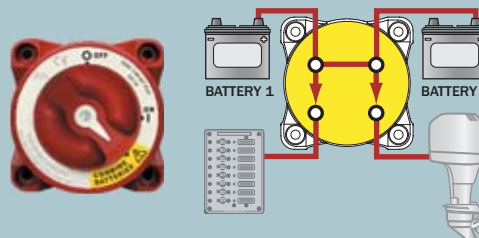
Switch Set to "ON"

Batteries isolated - Current flow from both House and Start batteries



Switch Set to "COMBINE BATTERIES" ⚠ SEE BELOW

Batteries combined - Current flow from both House and Start batteries



Advantages

- 1) Simple ON/OFF switching in NORMAL operation (with an ACR or isolator installed)
- 2) Isolates Start and House circuits reducing the chance of fully discharging both batteries
- 3) Isolates Start and House circuits protecting electronics from engine starting sags and spikes

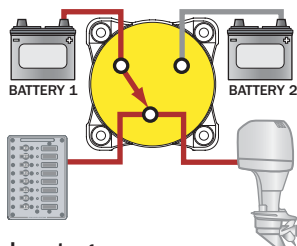
Compare with the alternatives

SELECTOR Battery Switch



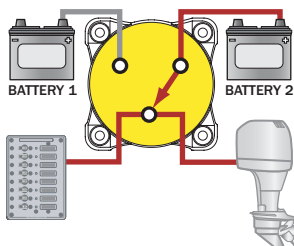
Switch Set to "1"

Current flow from Battery 1 to both House and Start circuits



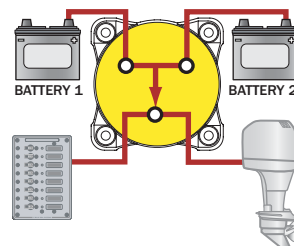
Switch Set to "2"

Current flow from Battery 2 to both House and Start circuits



Switch Set to "1+2" ⚠ SEE BELOW

Batteries combined - Current flow from both House and Start batteries



Disadvantages

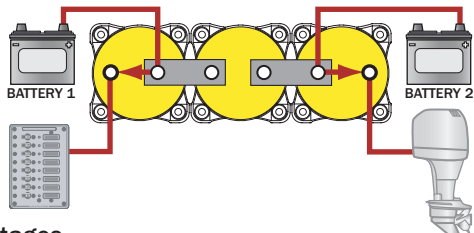
- 1) Not intuitive to operate
- 2) When the switch is left in "1+2" position all batteries can be discharged
- 3) The Engine circuit and House circuit are combined exposing electronics to sags and spikes caused by engine starting

Multiple SINGLE CIRCUIT ON/OFF Battery Switches



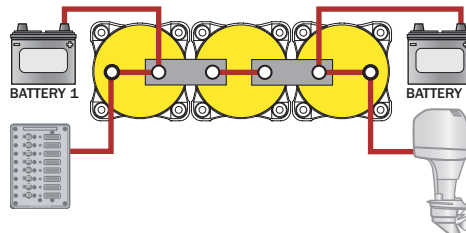
Battery 1 Switch Set to "ON" Battery 2 Switch Set to "ON"

Current flow from Battery 1 to House circuit and Battery 2 to Start circuit



Battery 1 Switch Set to "ON" ⚠ SEE BELOW Battery 2 Switch Set to "ON"

Emergency Parallel Battery Switch Set to "ON"
Batteries combined - Current flow from both House and Start batteries

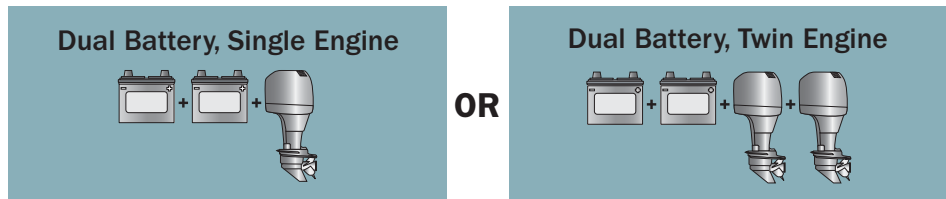


Disadvantages

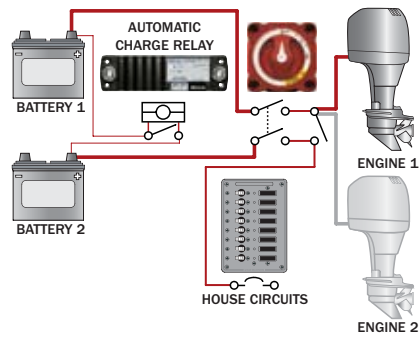
- 1) Most expensive option
- 2) Requires more space
- 3) Not intuitive to operate- user must operate 3 switches
- 4) Wiring and switch interconnection complexity

⚠ NORMAL OPERATION - Batteries combined for charging when no Automatic Charging Relay or Isolator is installed
EMERGENCY OPERATION - Batteries combined when Start battery is low

Products to consider for common electrical system configurations with various motor and battery bank combinations.

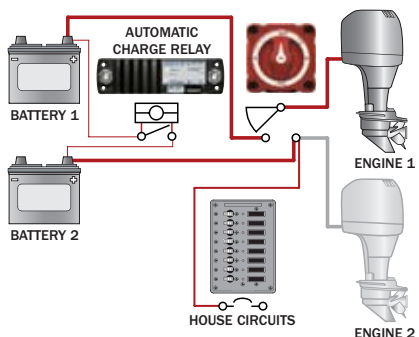


DUAL CIRCUIT PLUS™ Battery Switch



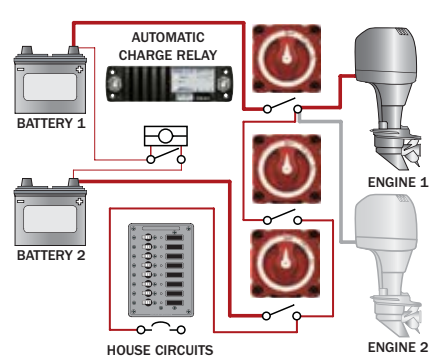
Products To Consider					
Product	Outboard Engine*		Small Inboard Gasoline or Diesel*		Large Inboard Gasoline or Diesel*
Automatic Charge Relay	7600 pages 24, 26		7600 pages 24, 26		9112 pages 25-26
DUAL CIRCUIT PLUS Battery Switch	6011 pages 12-13		5511c pages 14-15		5511c pages 14-15

SELECTOR Battery Switch



Products To Consider					
Product	Outboard Engine*		Small Inboard Gasoline or Diesel*		Large Inboard Gasoline or Diesel*
Automatic Charge Relay	7600 pages 24, 26		7600 pages 24, 26		9112 pages 25-26
SELECTOR Battery Switch	6007 pages 12-13		9001c pages 14-15		3002 pages 16-17

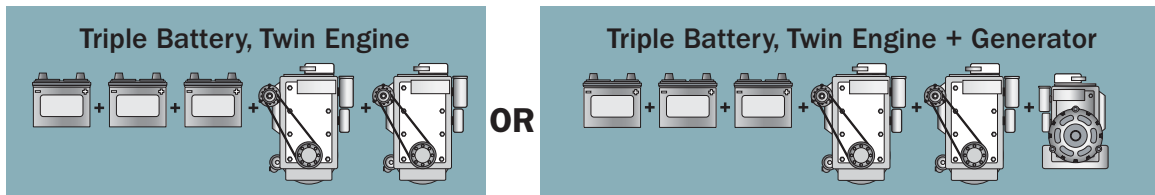
Multiple SINGLE CIRCUIT ON/OFF Battery Switches



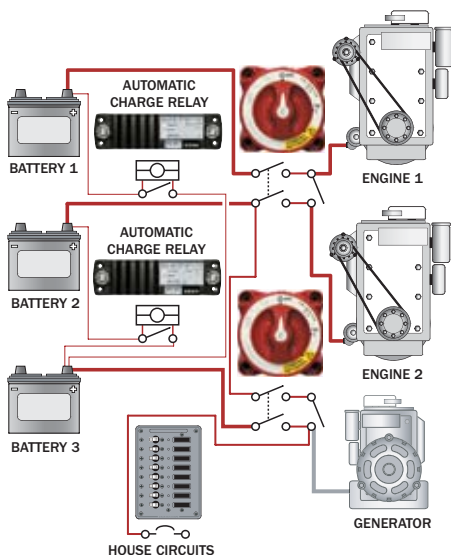
Products To Consider					
Product	Outboard Engine*		Small Inboard Gasoline or Diesel*		Large Inboard Gasoline or Diesel*
Automatic Charge Relay	7600 pages 24, 26		7600 pages 24, 26		9112 pages 25-26
SINGLE CIRCUIT ON/OFF Battery Switch	6006 pages 12-13		9003c pages 14-15		3000 pages 16-17







*Engine sizes are suggested only as general categories and are not intended to represent the variety of engine sizes. Please go to the product pages in this catalog for the detailed specifications of each product.

Products to consider for common electrical system configurations with various motor and battery bank combinations.



DUAL CIRCUIT PLUS™ Battery Switch and SINGLE CIRCUIT ON/OFF Battery Switch

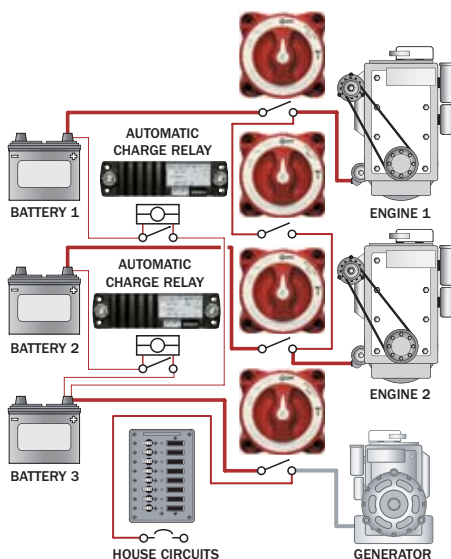








Products To Consider					
Product	Outboard Engine*	Small Inboard Gasoline or Diesel*	Large Inboard Gasoline or Diesel*		
Automatic Charge Relay	7600 pages 24, 26 	7600 pages 24, 26 	9112 pages 25-26 		
DUAL CIRCUIT PLUS Battery Switch	6011 pages 12-13 	5511C pages 14-15 	5511C pages 14-15 		

SELECTOR Battery Switch

The use of multiple SELECTOR Battery Switches is highly discouraged. Since the large number of possible switch settings is extremely confusing to the boat operator, and the possibility of operator error is very high. Two SELECTOR Battery Switches offer the operator 16 different combinations of settings.

Multiple SINGLE CIRCUIT ON/OFF Battery Switches



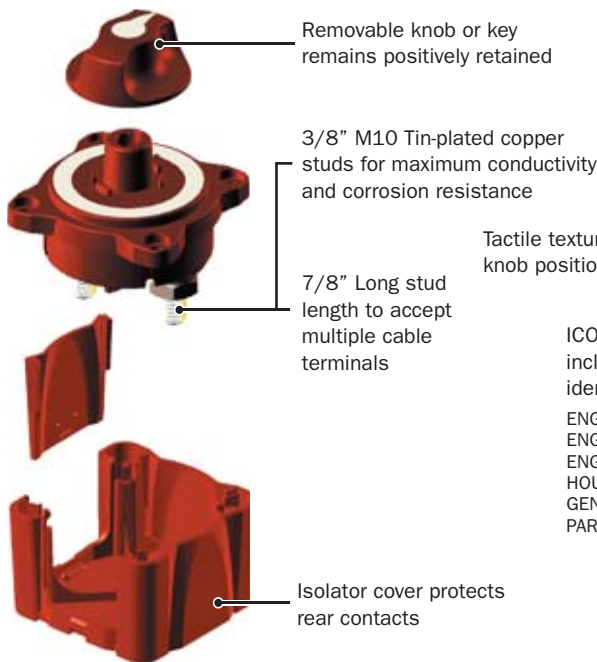
Products To Consider					
Product	Outboard Engine*	Small Inboard Gasoline or Diesel*	Large Inboard Gasoline or Diesel*		
Automatic Charge Relay	7600 pages 24, 26 	7600 pages 24, 26 	9112 pages 25-26 		
SINGLE CIRCUIT ON/OFF Battery Switch	6006 pages 12-13 	9003C pages 14-15 	3000 pages 16-17 		

*Engine sizes are suggested only as general categories and are not intended to represent the variety of engine sizes. Please go to the product pages in this catalog for the detailed specifications of each product.

Available January, 2006

M-Series Battery Switches (Mini) **NEW PRODUCT**

300 Amperes Continuous Rating for outboards and small inboard gasoline engines



Removable knob or key remains positively retained

3/8" M10 Tin-plated copper studs for maximum conductivity and corrosion resistance

7/8" Long stud length to accept multiple cable terminals

Isolator cover protects rear contacts

Ignition protected - Safe for installation aboard gasoline powered boats

Case design allows surface, front panel, or rear panel mounting

Label with international ON/OFF legends

Tactile textures indicate knob position by feel only

ICON label set included for circuit identification

- ENGINE
- ENGINE 1
- ENGINE 2
- HOUSE
- GENERATOR
- PARALLEL



- Ideal for marine or RV applications
- Accepts up to 4/0 battery cables
- All non-corrosive marine grade metals
- Molded in durable reinforced polycarbonate



Specifications

Inrush Rating: .25 sec (10 repeats)*	1,500 Amperes DC
Cranking Rating: 9.75 sec (10 repeats)*	700 Amperes DC
Intermittent Rating: 5 min (UL 1107)	500 Amperes DC
Continuous Rating: (UL 1107)	300 Amperes DC
Terminal Stud, Tin-Plated Copper	3/8" (M10)
Torque	140 in-lbs.
Cable Size to Meet Ratings ¹	4/0 Cables
Voltage Rating	48 Volts DC Maximum
Cable Clearance For 4/0 Cables	1.12" (25.4mm)
Case Material	Reinforced Polycarbonate

6005-6007

6010-6011

1,200 Amperes DC
500 Amperes DC
300 Amperes DC
200 Amperes DC
3/8" (M10)
140 in-lbs.
4/0 Cables
48 Volts DC Maximum
1.12" (25.4mm)
Reinforced Polycarbonate

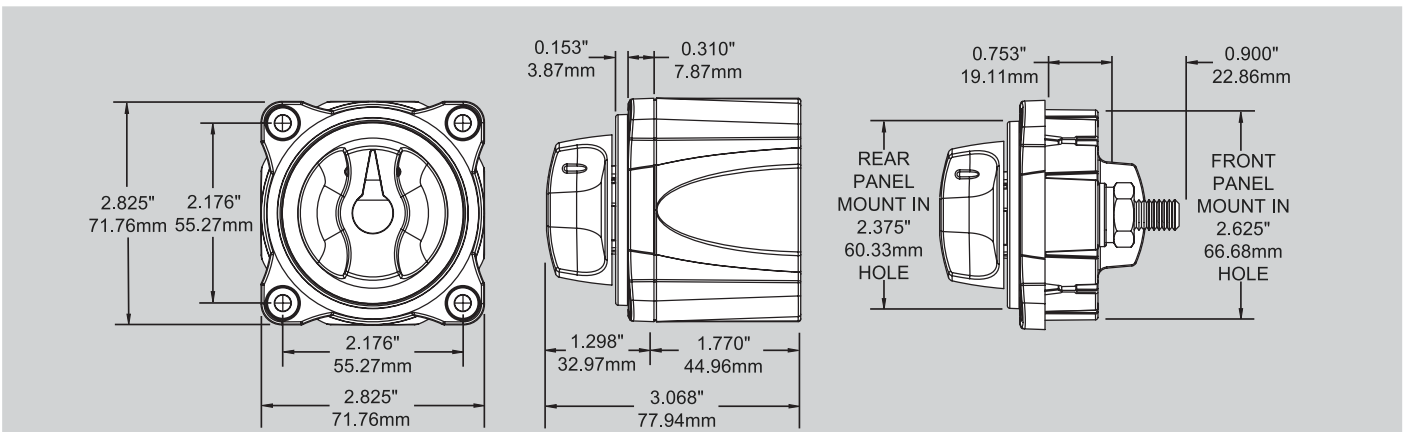
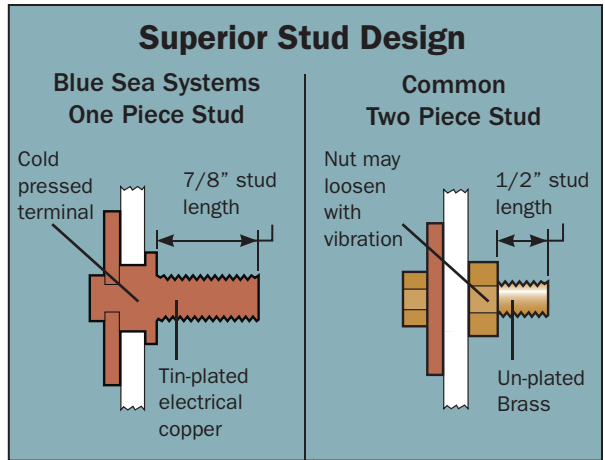
CE marked

Agency Specifications

- UL Listed - UL 1107 electric power switches**
- Meets UL 1500 and SAE J1171 external ignition protection requirements

* Blue Sea Systems Engine Starting Standard (see page 8)
 ** Pending testing

¹Reducing cable size will reduce current rating



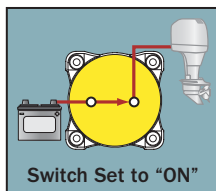
M-Series Battery Switch Dimensions



IP Single Circuit ON/OFF
6006



IP Single Circuit ON/OFF
6005



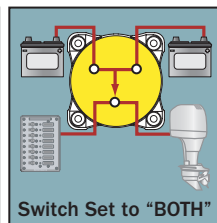
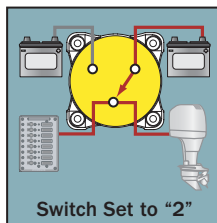
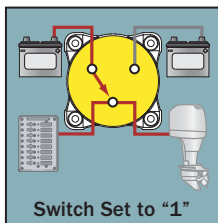
APPLICATIONS

1. Switches a single battery to a single load group.
2. Multiple switches can be used to manage several isolated circuits including cross connecting for emergency paralleling.

Note: 6005 replaces 9005
6006 replaces 9006



IP Selector 6007

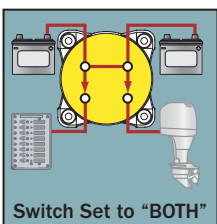
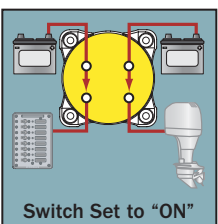


APPLICATION

Switches battery bank 1 or battery bank 2 or BOTH to a single load using one switch.



IP Dual Circuit Plus™ 6011

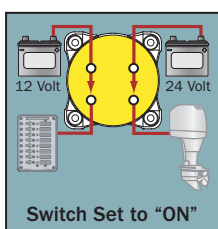


APPLICATIONS

1. Switches two battery banks simultaneously with one simple ON/OFF switch while maintaining battery bank isolation, minimizing the risk of a dead Start battery.
2. The BOTH function offers the ability to combine the two battery banks in the event of a low Start battery.



IP Dual Circuit 6010



APPLICATIONS

1. Switches both positive and negative lines simultaneously with one simple ON/OFF switch meeting European and metal boat requirements for a double pole switch.
2. Switches circuits of different voltages, such as 12 Volt and 24 Volt, simultaneously with one simple ON/OFF switch.

PN	Description	Weight Lb (Kg)
6005	SINGLE CIRCUIT ON/OFF Battery Switch	0.62 (0.28)
6006	SINGLE CIRCUIT ON/OFF Battery Switch	0.63 (0.29)
6007	SELECTOR Battery Switch	0.77 (0.35)
6010	DUAL CIRCUIT Battery Switch	0.80 (0.36)
6011	DUAL CIRCUIT PLUS™ Battery Switch	0.80 (0.36)
7901	Spare Knob for PN 6006	0.10 (0.05)
7900	Spare Key for PN 6005	0.10 (0.05)
7902	Luminous ICON Circuit Identification Label Kit	0.02 (0.01)

7902 Luminous ICON Circuit Identification Label Kit	
BATTERY 1	HOUSE
BATTERY 2	BOW THRUSTER
BATTERY 3	WINDLASS
ENGINE	GENERATOR
ENGINE 1	PARALLEL
ENGINE 2	INVERTER
ENGINE PORT	WINCH
ENGINE STAR	CHASSIS
ENGINE MID	

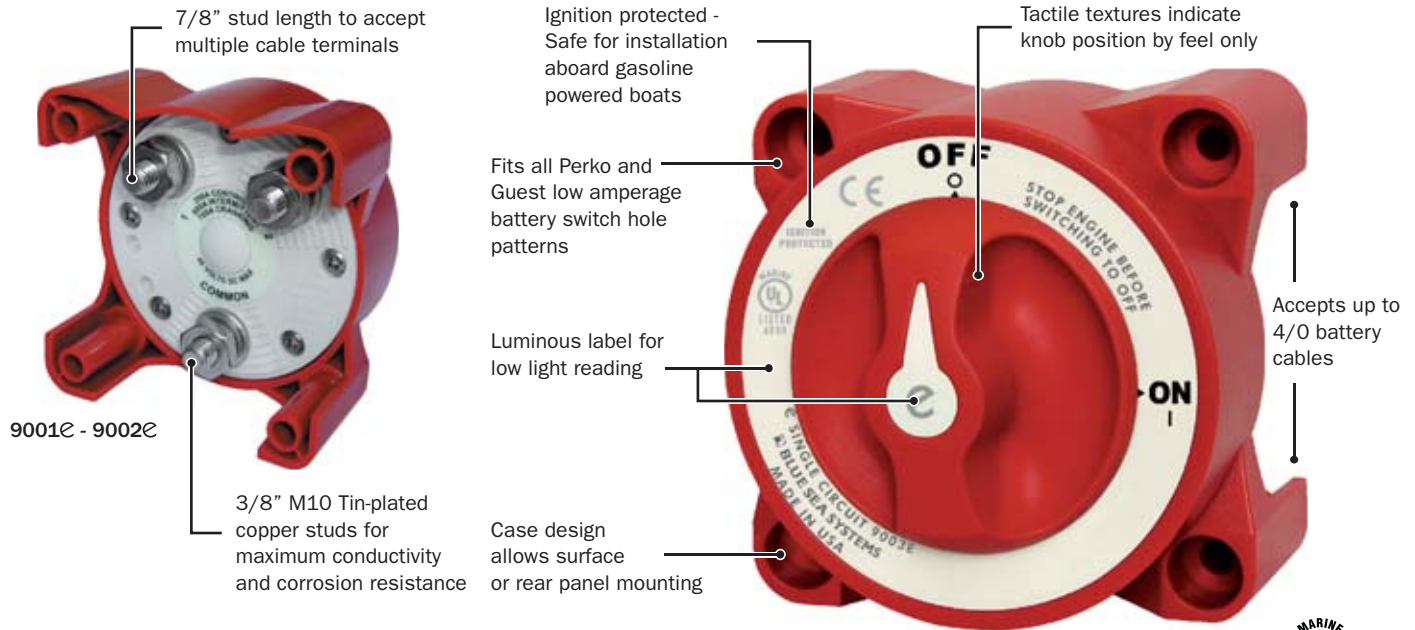
NEW PRODUCT

IP IGNITION PROTECTED

e-Series Battery Switches

Rated the top standard-duty switch by Powerboat Reports*

350 Amperes Continuous Rating for small inboard gasoline or diesel engines



- AFD (Alternator Field Disconnect) feature on 9002E and 9004E models
- Meets all American Boat and Yacht Council (ABYC) requirements for battery switches
- Make-before-break contact design on 9001E and 9002E models allows switching between battery banks without power interruption



* "Blue Sea Systems' switch (9001e) is our choice for best value in a standard-duty battery selector switch. It's made in the U.S. with high grade materials, comes with a lifetime warranty, and is the least expensive switch in our test." - Powerboat Reports , June 2005

Specifications

	9001E-9004E	5510E-5511E
Inrush Rating: .25 sec (10 repeats)*	1,750 Amperes DC	1,500 Amperes DC
Cranking Rating: 9.75 sec (10 repeats)*	900 Amperes DC	600 Amperes DC
Intermittent Rating: 5 min (UL 1107)	600 Amperes DC	450 Amperes DC
Continuous Rating: (UL 1107)	350 Amperes DC	300 Amperes DC
Terminal Stud, Tin-Plated Copper	3/8" (M10)	3/8" (M10)
Torque	140 in-lbs.	140 in-lbs.
Cable Size to Meet Ratings ¹	4/0 Cables	4/0 Cables
Voltage Rating	48 Volts DC Maximum	48 Volts DC Maximum
Cable Clearance For 4/0 Cables	1.10" (28.0mm)	1.10" (28.0mm)
Case Material	Reinforced Polycarbonate	Reinforced Polycarbonate

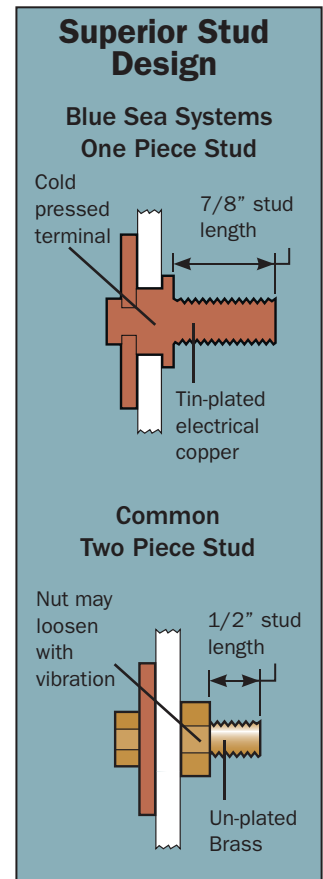
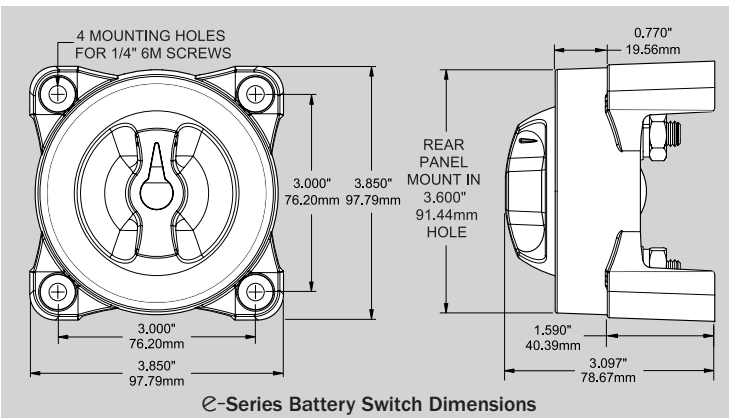
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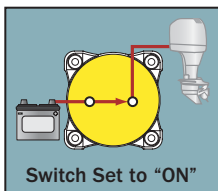
Agency Specifications

- UL Listed - UL 1107 electric power switches
- Meets UL 1500 and SAE J1171 external ignition protection requirements

* Blue Sea Systems Engine Starting Standard (see page 8)

¹ Reducing cable sizes will reduce current ratings



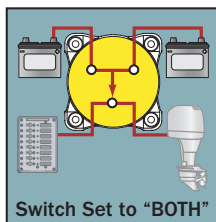
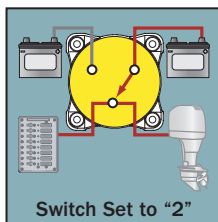
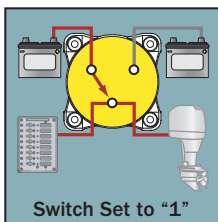


APPLICATIONS

1. Switches a single battery to a single load group.
2. Multiple switches can be used to manage several isolated circuits including cross connecting for emergency paralleling.

9004€ only - includes AFD*

IP Single Circuit ON/OFF
9003€-9004€

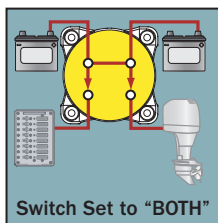
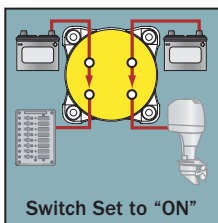


APPLICATION

9001€ and 9002€ switches battery bank 1 or battery bank 2 or both to a single load using one switch. 9002€ only - includes AFD*

IP Selector 9001€-9002€

Available January, 2006

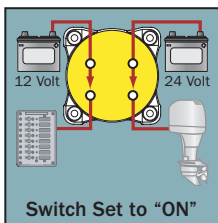


APPLICATIONS

1. Switches two battery banks simultaneously with one simple ON/OFF switch while maintaining battery bank isolation, minimizing the risk of a dead Start battery.
2. The BOTH function offers the ability to combine the two battery banks in the event of a low Start battery.

IP Dual Circuit Plus™ 5511€

Available January, 2006



APPLICATIONS

1. Switches both positive and negative lines simultaneously with one simple ON/OFF switch meeting European and metal boat requirements for a double pole switch.
2. Switches circuits of different voltages, such as 12 Volt and 24 Volt, simultaneously with one simple ON/OFF switch.

IP Dual Circuit™ 5510€

PN	Description	AFD *	Weight Lb (Kg)
9003€	SINGLE CIRCUIT ON/OFF Battery Switch	-	0.92 (0.42)
9004€	SINGLE CIRCUIT ON/OFF Battery Switch	Yes	0.96 (0.44)
9001€	SELECTOR Battery Switch	-	1.10 (0.50)
9002€	SELECTOR Battery Switch	Yes	1.15 (0.52)
5511€	DUAL CIRCUIT PLUS™ Battery Switch	-	1.27 (0.57)
5510€	DUAL CIRCUIT Battery Switch	-	1.27 (0.57)
7902	Luminous ICON Circuit Identification Label Kit	-	0.02 (0.01)

7902 Luminous ICON Circuit Identification Label Kit	
BATTERY 1	HOUSE
BATTERY 2	BOW THRUSTER
BATTERY 3	WINDLASS
ENGINE	GENERATOR
ENGINE 1	PARALLEL
ENGINE 2	INVERTER
ENGINE PORT	WINCH
ENGINE STAR	CHASSIS
ENGINE MID	

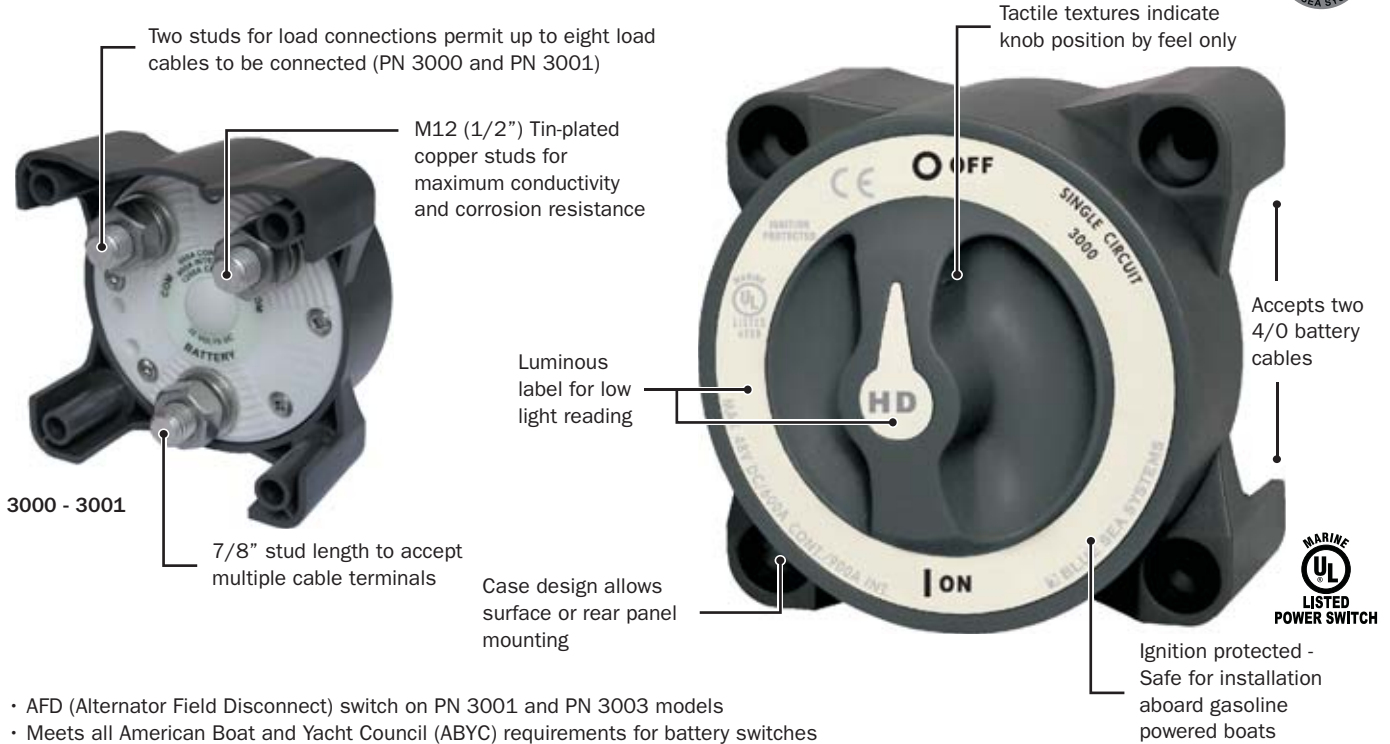
NEW PRODUCT

IP IGNITION PROTECTED

* Alternator Field Disconnect (AFD) protects the diodes in the alternator in the event of the switch being switched to the OFF position while the engine is running.

HD-Series Battery Switches (Heavy Duty)

Up to 600 Amperes Continuous Rating for large diesel engines, high power output, and low heat generation



- AFD (Alternator Field Disconnect) switch on PN 3001 and PN 3003 models
- Meets all American Boat and Yacht Council (ABYC) requirements for battery switches

Specifications

	3000-3001	3002-3003
Inrush Rating: .25 sec (10 repeats)*	2,000 Amperes DC	1,750 Amperes DC
Cranking Rating: 9.75 sec (10 repeats)*	1,200 Amperes DC	1,000 Amperes DC
Intermittent Rating: 5 min (UL 1107)	900 Amperes DC	700 Amperes DC
Continuous Rating: (UL 1107)	600 Amperes DC	500 Amperes DC
Terminal Stud, Tin-Plated Copper	1/2" (M12)	1/2" (M12)
Torque	220 in-lbs.	220 in-lbs.
Cable Size to Meet Ratings ¹	4/0 Cables	4/0 Cables
Cable Quantity to Meet Ratings ¹	Two Cables ²	Two Cables ³
Voltage Rating	48 Volts DC Maximum	48 Volts DC Maximum
Cable Clearance For 4/0 Cables	1.10" (28.0mm)	1.10" (28.0mm)
Case Material	Reinforced Polycarbonate	Reinforced Polycarbonate

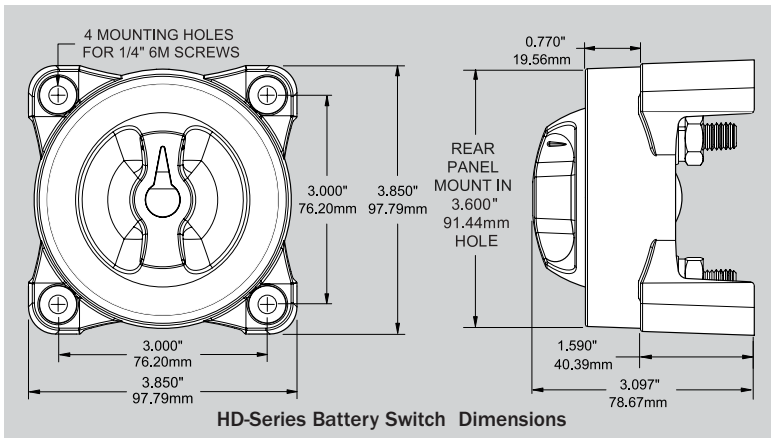
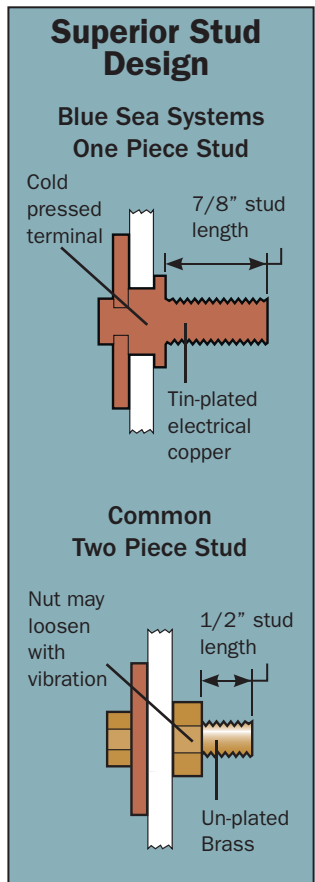
CE marked

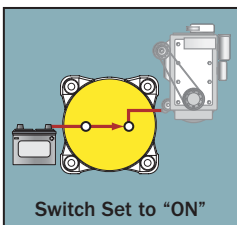
Agency Specifications

- UL Listed - UL 1107 electric power switches
- Meets UL 1500 and SAE J1171 external ignition protection requirements

* Blue Sea Systems Engine Starting Standard (see page 8)

- 1 Reducing cable sizes or quantities will reduce current ratings
- 2 Two cables on battery terminal, one cable on each common terminal
- 3 Per terminal



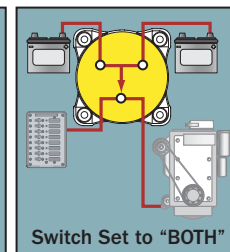
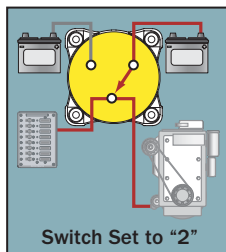
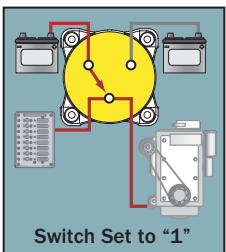


APPLICATIONS

1. Switches a single battery to a single load group.
2. Multiple switches can be used to manage several isolated circuits including cross connecting for emergency paralleling.

3001 only - includes AFD*

IP Single Circuit ON/OFF
3000-3001



APPLICATION

3002 and 3003 switches battery bank 1 or battery bank 2 or both to a single load using one switch.
3003 only - includes AFD*

IP Selector 3002-3003

PN	Description	AFD*	Weight Lb (Kg)
3000	SINGLE CIRCUIT ON/OFF Battery Switch	-	1.20 (0.54)
3001	SINGLE CIRCUIT ON/OFF Battery Switch	Yes	1.25 (0.56)
3002	SELECTOR Battery Switch	-	1.20 (0.54)
3003	SELECTOR Battery Switch	Yes	1.25 (0.56)
7902	Luminous ICON Circuit Identification Label Kit	-	0.02 (0.01)

NEW PRODUCT

IP IGNITION PROTECTED

7902 Luminous ICON Circuit Identification Label Kit	
BATTERY 1	HOUSE
BATTERY 2	BOW THRUSTER
BATTERY 3	WINDLASS
ENGINE	GENERATOR
ENGINE 1	PARALLEL
ENGINE 2	INVERTER
ENGINE PORT	WINCH
ENGINE STAR	CHASSIS
ENGINE MID	

* Alternator Field Disconnect (AFD) protects the diodes in the alternator in the event of the switch being switched to the OFF position while the engine is running.



Updated Version Available January, 2006

Parallel Circuit Mini Battery Switch Panels UPDATED PRODUCT

Enables a failed House or Start battery bank to be isolated from the electrical system and both House and Start loads to be operated from the remaining battery bank.

- Isolates Start circuit from House circuit
- Simplifies battery switch operation
- Protects electronics from sags and spikes caused by engine cranking
- Discharges batteries independently
- Addition of an Automatic Charging Relay automates charging both batteries (see pages 24-26)
- Ignition protected - Safe for installation aboard gasoline powered boats

Specifications

Inrush Rating: .25 sec (10 repeats)* 1,500 Amperes DC
 Cranking Rating: 9.75 sec (10 repeats)* 700 Amperes DC
 Intermittent Rating: 5 min (UL 1107) 500 Amperes DC
 Continuous Rating: (UL 1107) 300 Amperes DC
 Voltage 48 Volts DC Maximum
 * Blue Sea Systems Engine Starting Standard (see page 8)

CE marked

Agency Specifications

- All components meet SAE J1171 external ignition protection requirements



IP 8280



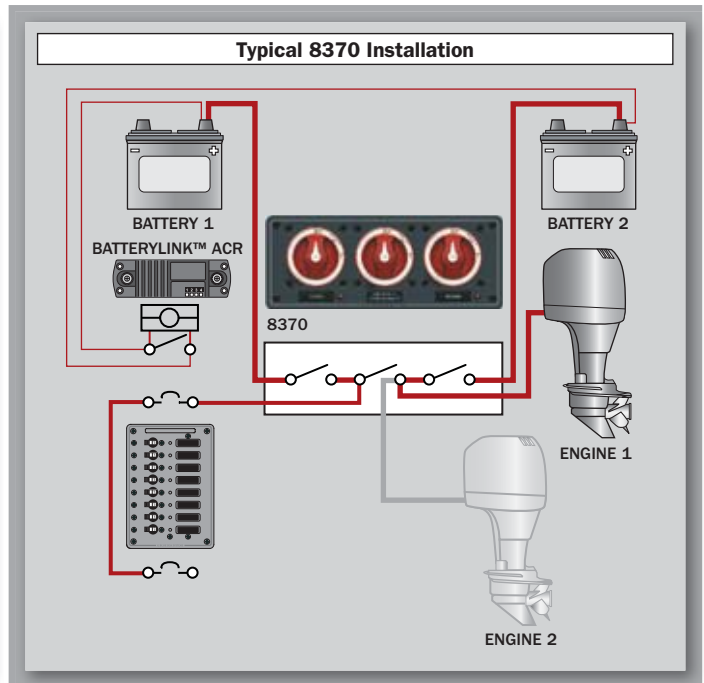
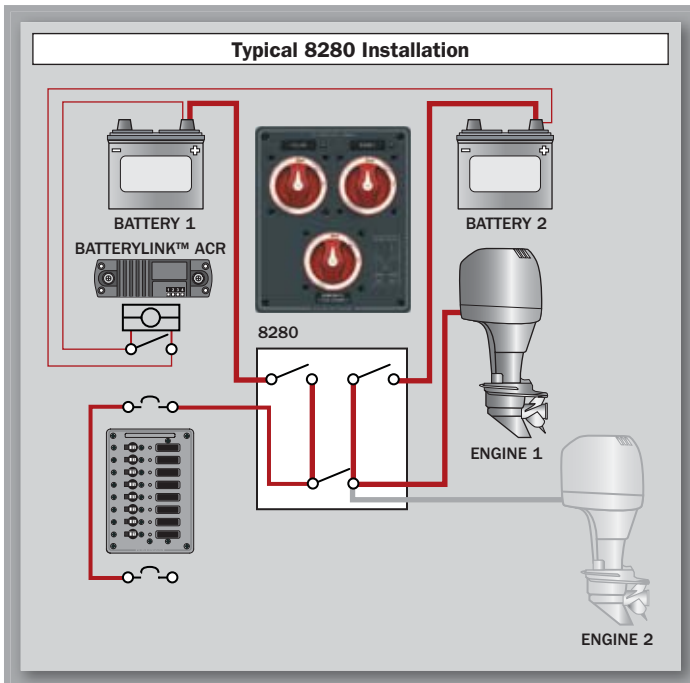
IP 8370

Combine with Blue Sea Systems CL-Series BatteryLink™ ACR (see page 24, 26) for a complete DC management solution.

Panel PN	Installed Battery Switch PN	Battery Switch Pages	Width in" (mm)	Height in" (mm)	Weight Lb (Kg)
8280	M-Series SINGLE CIRCUIT ON/OFF 3 of 6006	13-14	6.25 (158.75)	7.50 (190.50)	2.98 (1.35)
8370	M-Series SINGLE CIRCUIT ON/OFF 3 of 6006	13-14	9.50 (95.25)	3.75 (95.25)	2.30 (1.04)

UPDATED PRODUCT

IP IGNITION PROTECTED



Updated Version Available January, 2006

Parallel Circuit Mini Battery Switch Plus Main Panel UPDATED PRODUCT

Isolates batteries and provides DC main circuit protection.

- Ignition protected - Safe for installation aboard gasoline powered boats
- Isolates the Start circuit from the House circuit
- Simplifies battery switch operation
- Protects electronics from sags and spikes caused by engine cranking
- Discharges batteries independently
- Addition of an Automatic Charging Relay automates charging of both batteries (see pages 24-26)
- Enables a failed Start battery to be isolated from the electrical system and both House and Start loads to be operated from the remaining battery bank
- Provides main circuit protection for DC House power system



IP 8080

Specifications

Inrush Rating: .25 sec (10 repeats)*	1,500 Amperes DC
Cranking Rating: 9.75 sec (10 repeats)*	700 Amperes DC
Intermittent Rating: 5 min (UL 1107)	500 Amperes DC
Continuous Rating: (UL 1107)	300 Amperes DC
Voltage	48 Volts DC Maximum
House Circuit Protection	100 Amperes DC

* Blue Sea Systems Engine Starting Standard (see page 8)

Agency Specifications

- All components meet SAE J1171 external ignition protection requirements

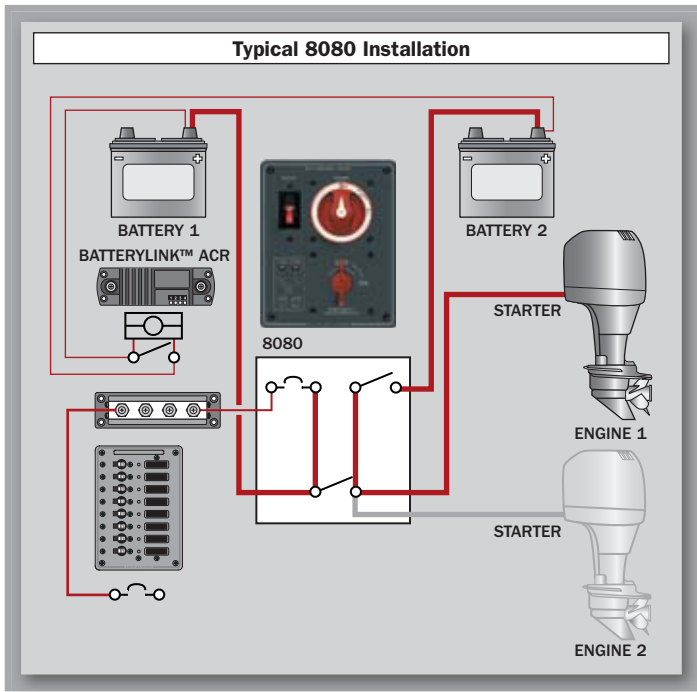
Combine with Blue Sea Systems CL-Series BatteryLink™ ACR (see page 24, 26) for a complete DC management solution.

Panel PN	Installed Battery Switch PN	Battery Switch Pages	Width in" (mm)	Height in" (mm)	Weight Lb (Kg)
8080	M-Series SINGLE CIRCUIT ON/OFF 6006, 6005	13-14	5.25 (133.40)	6.50 (165.10)	2.20 (1.00)

UPDATED PRODUCT

DC MAIN BATTERY MANAGEMENT

IP IGNITION PROTECTED

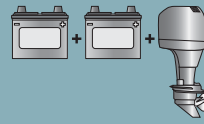


Available January, 2006

Dual Battery Main Distribution Panels NEW PRODUCT

- Available in four configurations
- Each panel can be mounted in four different orientations
- Isolates the Start circuit from the House circuit
- Simplifies battery switch operation
- Protects electronics from sags and spikes caused by engine cranking
- Discharges batteries independently
- Addition of an Automatic Charging Relay automates charging both batteries (see pages 24-26)
- Designed for single engine configurations
- Allows emergency cross connect between separate engine battery banks
- Provides main DC circuit protection in addition to high ampere loads
- Provides 24 hour circuit protection
- Includes 4218 - Set of 30 common DC labels (see page 89)

Dual Battery, Single Engine



8686



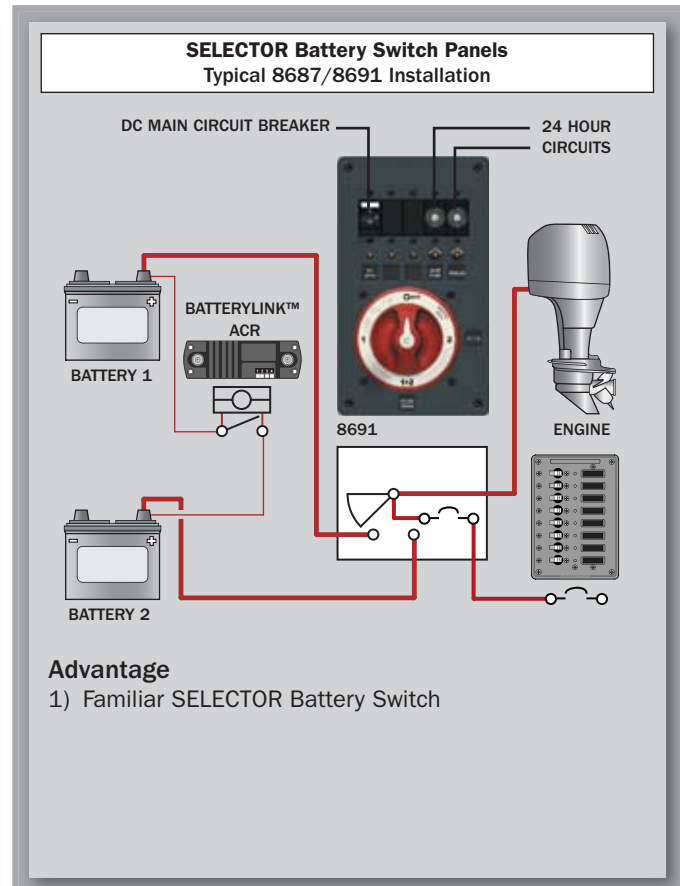
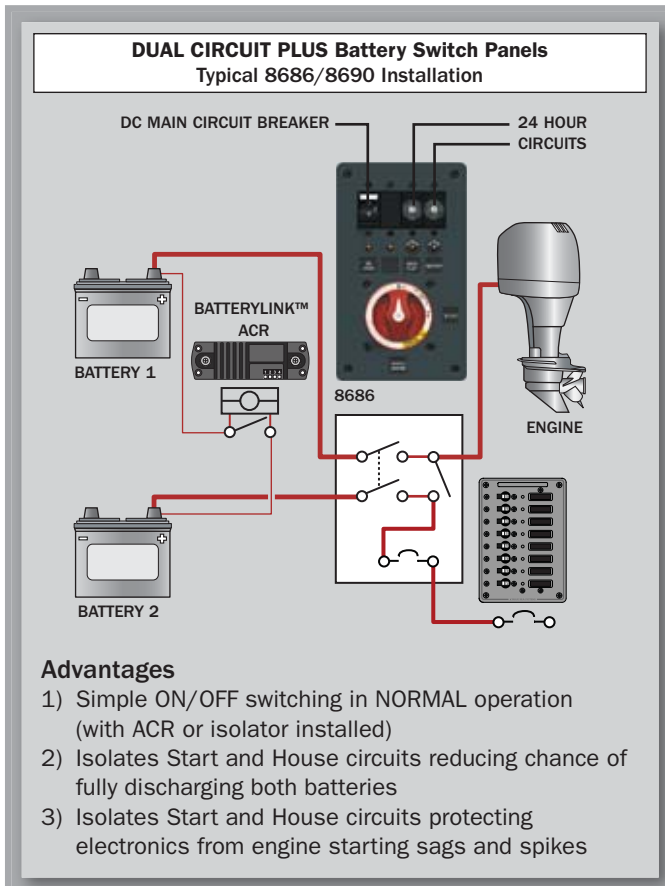
8691

Specifications	8686	8687	8690	8691
Inrush Rating: .25 sec (10 repeats)*	1,200 Amperes DC	1,500 Amperes DC	1,500 Amperes DC	1,750 Amperes DC
Cranking Rating: 9.75 sec (10 repeats)*	500 Amperes DC	700 Amperes DC	600 Amperes DC	900 Amperes DC
Intermittent Rating: 5 min (UL 1107)	300 Amperes DC	500 Amperes DC	450 Amperes DC	600 Amperes DC
Continuous Rating: (UL 1107)	200 Amperes DC	300 Amperes DC	300 Amperes DC	350 Amperes DC
Voltage	12-24 Volts DC	12-24 Volts DC	12-24 Volts DC	12-24 Volts DC
House Circuit Protection	100 Amperes DC	100 Amperes DC	100 Amperes DC	100 Amperes DC

* Blue Sea Systems Engine Starting Standard (see page 8)

Panel PN	Installed Battery Switch PN	Switch Pages	Width in" (mm)	Height in" (mm)	Installed Large Case Rocker Circuit Breaker	Installed Push Button Circuit Breakers
					100A	15A
8686	M-Series, DUAL CIRCUIT PLUS™ 6011	12-13	4.50 (114.30)	7.50 (190.50)	1	2
8687	M-Series, SELECTOR 6007	12-13	4.50 (114.30)	7.50 (190.50)	1	2
8690	E-Series, DUAL CIRCUIT PLUS™ 5511E	14-15	5.25 (139.70)	9.00 (228.60)	1	2
8691	E-Series, SELECTOR 9001E	14-15	5.25 (139.70)	9.00 (228.60)	1	2

NEW PRODUCT



Available January, 2006

L-Series Solenoid Switches NEW PRODUCT

250 Ampere Class, 12 or 24 Volt

- Hermetically sealed contacts
- Vaporproof
- Ignition protected - Safe for installation aboard gasoline powered boats
- Meets SAE J1171 - External ignition protection requirements
- Functions as a remote battery switch
- Activated by an ON-OFF switch mounted anywhere
- Used as a manual battery paralleling switch
- Noise free circuitry will not interfere with other devices

Specifications

Coil Circuit

Input Voltage 12 Volts/9.6-13.2 Volts DC Maximum
 24 Volts/19.2-26.9 Volts DC Maximum

Power Consumption

- inrush max, 130ms 12-36 Volts/2.0 Amperes
- holding 12 Volts/1.0 Ampere
- 24 Volts/0.59 Ampere

Main Power Contacts

Inrush Rating: 0.25 sec. (10 repeats)* 2,000 Amperes DC
 Voltage Rating 60 Volts DC
 Stud Terminal Size 5/16" (M8)
 Contact Form SPST-NO
 Mechanical Life 100,000 Cycles

CE marked

Wire Size	Cranking Rating 9.75 sec. (10 repeats)*	Intermittent Rating 5 min. (UL 1107)	Continuous Rating (UL 1107)
1/0	450A	375A	250A
2/0	500A	450A	300A
2x2/0	800A	600A	450A

*Blue Sea Systems Engine Starting Standard (see page 8)

PN	Description	Weight Lb (Kg)
5301	250 Ampere Class, 12 Volt Solenoid	1.30 (0.60)
5302	250 Ampere Class, 24 Volt Solenoid	1.30 (0.60)

NEW PRODUCT

IP IGNITION PROTECTED



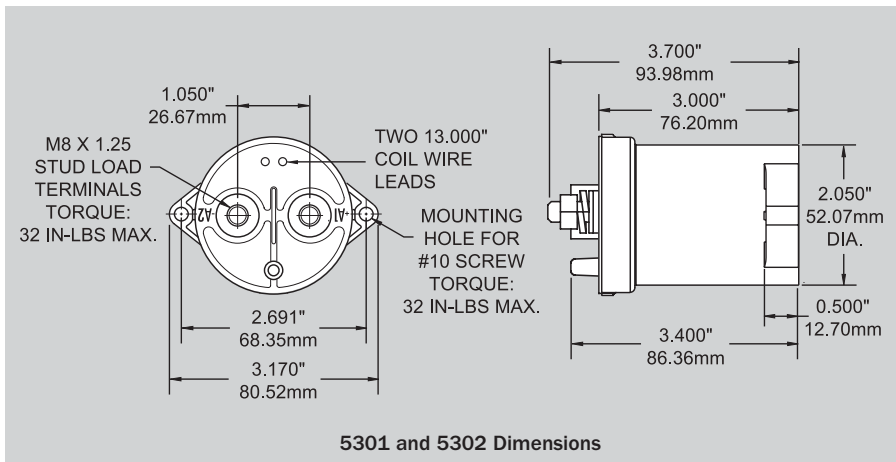
IP 5301-5302



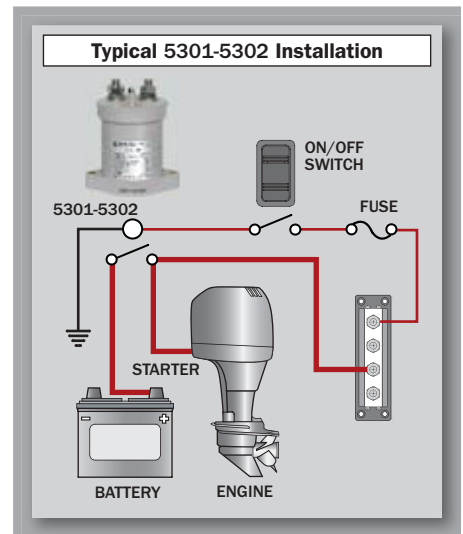
(Optional)

8230 · Provides ON/OFF switching

▶ See page 55 for full selection of Contura Rocker Switches and accessories.



5301 and 5302 Dimensions



L-Series Solenoid Switch with Coil Economizer

250 Ampere Class, 12/24 Volt

- Hermetically sealed contacts
- Vaporproof
- Ignition protected - Safe for installation aboard gasoline powered boats
- Pulse circuit requires low current draw when contact is closed
- UL Recognized - UL 508 industrial control equipment
- Meets SAE J1171 - External ignition protection requirements
- Functions as a remote battery switch
- Activated by an ON-OFF switch mounted anywhere
- Used as a manual battery paralleling switch
- Integrated coil control minimizes heating and amperage draw



IP 9012



(Optional)

8230 · Provides ON/OFF switching

▶ See page 55 for full selection of Contura Rocker Switches and accessories.

Specifications

Coil Circuit

Input Voltage	9-36 Volts DC Maximum
Power Consumption	
- inrush max, 130ms	12-36 Volts/3.80 Amperes
- holding	12 Volts/0.13 Amperes
	24 Volts/0.07 Amperes

Main Power Contacts

Inrush Rating: 0.25 sec. (10 repeats)*	2,000 Amperes DC
Voltage Rating	60 Volts DC
Stud Terminal Size	5/16" (M8)
Contact Form	SPST-NO
Mechanical Life	1,000,000 Cycles

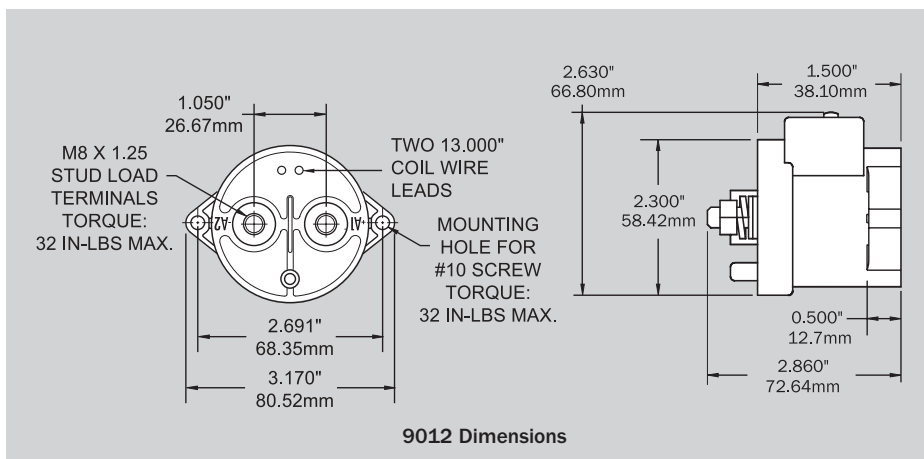
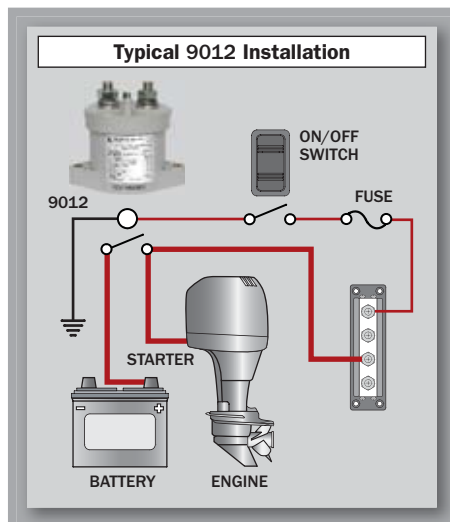
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Wire Size	Cranking Rating 9.75 sec. (10 repeats)*	Intermittent Rating 5 min. (UL 1107)	Continuous Rating (UL 1107)
1/0	450A	375A	250A
2/0	500A	450A	300A
2x2/0	800A	600A	450A

* Blue Sea Systems Engine Starting Standard (see page 8)

PN	Description	Weight Lb (Kg)
9012	250 Ampere Class, 12/24 Volt Solenoid with Coil Economizer	0.95 (0.43)

IP IGNITION PROTECTED



CL-Series BatteryLink™ ACR (Current Limiting)

with Over Current Protection

- Automatically combines battery banks during the charging cycle and isolates under discharge
- Activates from any charging source - alternators, battery chargers, or solar panels
- Senses charge voltages on up to two battery banks
- Sealed contact assembly
- Meets SAE J1171 - External ignition protection requirements
- Noise free circuitry will not interfere with other devices
- Limits current flow allowing smaller wire size
- Low current draw when closed: <0.2A

Specifications

Coil Circuit

Input Voltage 9-16 Volts Maximum

Main Power Contacts

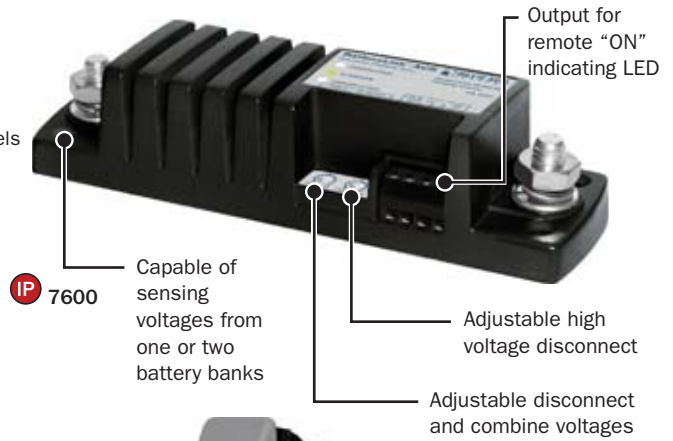
Voltage Rating 16 Volts DC for 12 Volts DC Nominal Systems
 Contact Form SPST-NO
 Stud Terminal Size 3/8" (M10)
 Mechanical Life 1,000,000 Cycles

Automatic Operation

Automatically combines when the higher battery has remained at the required voltage for at least 30 seconds. The CL-Series BatteryLink™ ACR disconnects when the voltage drops below the charging voltage to prevent accidental discharge of an unintended bank.

Manual Operation

When connected to an optional ON-OFF-ON switch the CL-Series BatteryLink™ ACR can be turned off, set to automatic, or manually combined.



8232
 · Provides manual operation explained at left
 ▶ See page 55 for full selection of Contura Rocker Switches and accessories.

NEW PRODUCT



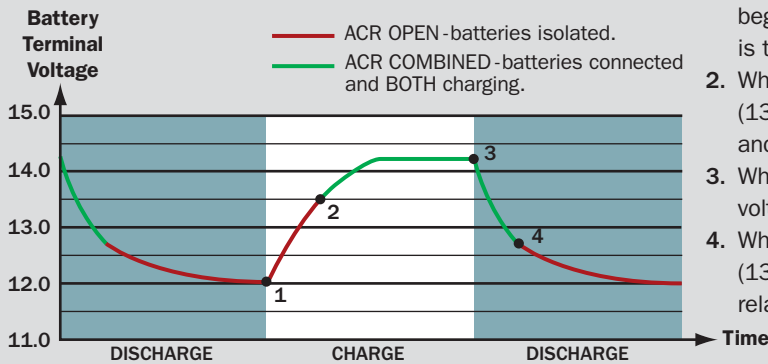
8270
 · Provides manual operation explained at left

PN	Description	Weight Lb (Kg)
7600	CL-Series BatteryLink™ ACR with over current protection	0.63 (0.29)
8232	Contura Rocker Switch	0.24 (0.11)
8270	Switch Panel	0.27 (0.12)

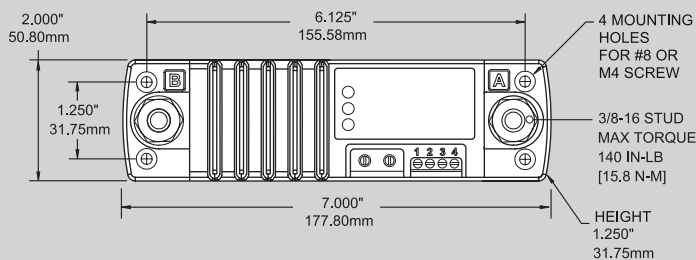
The BatteryLink™ ACR may also be used as a DC Low Voltage Disconnect (DC Load Manager) and as a means for charging a battery installed at a distance from a main battery bank (Battery Link). For these uses, please see the Application Brief section of our website at www.bluesea.com.

IP IGNITION PROTECTED

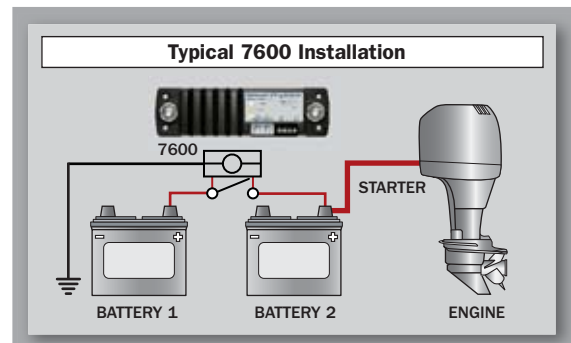
Automatic Charge Relay Operation



1. ACR relay is open and batteries are isolated. Voltage begins to rise slowly after engine starts or battery charger is turned on.
2. When voltage rises to "COMBINE" voltage set on ACR (13.5 volts in this example), ACR relay closes, connecting and charging both batteries.
3. When engine stops or battery charger is turned off, voltage rapidly begins falling.
4. When voltage falls to 6% less than "COMBINE" voltage (13.5 volts 6% = 12.7 volts in this example), ACR relay opens isolating batteries after 1 minute.



7600 Dimensions





IP 9112

L-Series ACR with Coil Economizer

250 Ampere Class, 12/24 Volt

- Hermetically sealed contacts
- Vaporproof
- Ignition protected - Safe for installation aboard gasoline powered boats
- Single or double sensing
- Pulse circuit requires very low current draw when contact is closed
- UL Recognized - UL 508 industrial control equipment
- Meets SAE J1171 - External ignition protection requirements
- Automatically connects battery banks during the charging cycle and disconnects under discharge
- Override for emergency engine paralleling to start an engine
- Activates whether the charging source is an alternator or battery charger
- Output for "ON" indicating LED
- Integrated coil control minimizes heating and amperage draw



(Optional)

8232

- Provides manual operation explained at left
- ▶ See page 55 for full selection of Contura Rocker Switches and accessories.

NEW PRODUCT



(Optional)

8270

- Provides manual operation explained at right

Specifications

Coil Circuit

Input Voltage	9-36 Volts Maximum
Power Consumption	
– inrush max, 130ms	12-36 Volts/3.80 Amperes
– holding	12 Volts/0.13 Amperes, 24 Volts DC/0.07 Amperes

Main Power Contacts

Inrush Rating: 0.25 sec. (10 repeats)*	2,000 Amperes DC
Voltage Rating	60 Volts DC
Stud Terminal Size	5/16" (M8)
Contact Form	SPST-NO
Mechanical Life	1,000,000 Cycles

Automatic Operation

Automatic closure occurs when the higher battery has remained at the required voltage for at least 30 seconds. The ACR opens when the voltage drops below the charging voltage to prevent accidental discharge of an unintended bank.

	Relay Contact Position		
	Combine	Open Low	Open High
12 Volt System	13.6V	12.6V	15.0V
24 Volt System	27.2V	25.2V	30.0V

Manual Operation

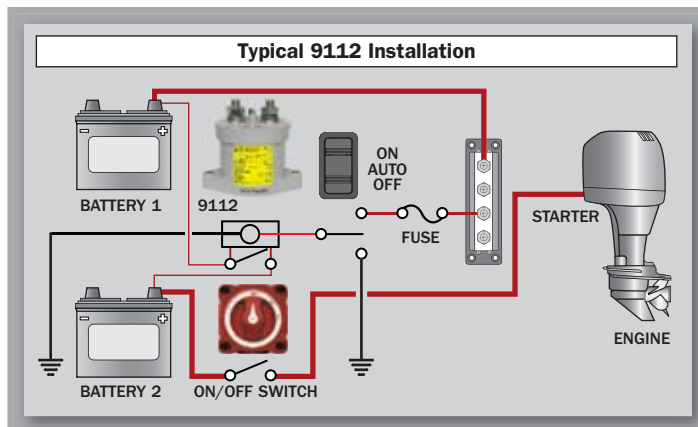
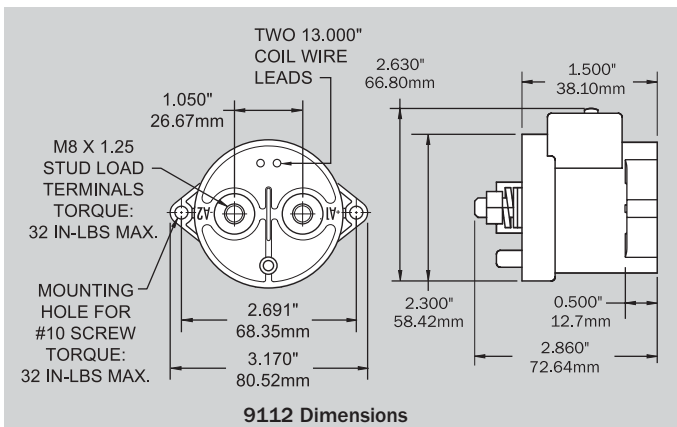
When connected to an ON-OFF-ON switch the ACR can be turned off, set to Automatic, or manually closed.

Wire Size	Cranking Rating 9.75 sec. (10 repeats)*	Intermittent Rating 5 min. (UL 1107)	Continuous Rating (UL 1107)
1/0	450A	375A	250A
2/0	500A	450A	300A
2x2/0	800A	600A	450A

*Blue Sea Systems Engine Starting Standard (see page 8)

PN	Description	Weight Lb (Kg)
9112	250 Ampere Class, 12/24 Volt ACR with Coil Economizer	0.95 (0.43)
8232	Water Resistant Contura Rocker Switch	0.24 (0.11)
8270	Switch Panel	0.27 (0.12)



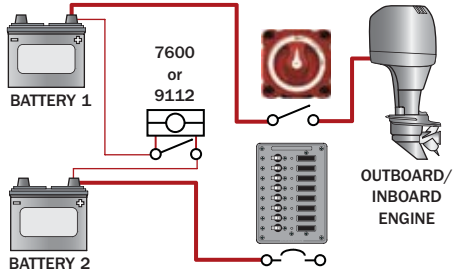


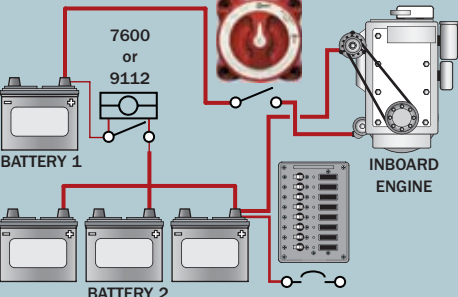

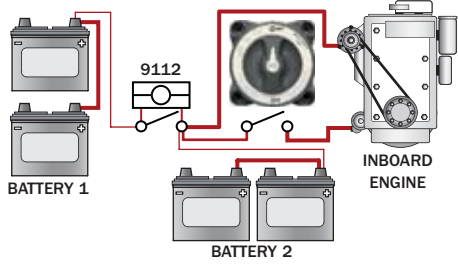

IP IGNITION PROTECTED



7600 BATTERYLINK™ ACR and 9112 ACR Comparison

Features	7600	9112
Auto Current Management	Yes	No
High Amperage Contacts	No	Yes
High Voltage Adjustability	Yes	No
Adjustable Combining	Yes	No
Manual Override	Yes	Yes
System Voltage	12 Volts	12/24 Volts

Ratings	7600	9112
Continuous	60 Amperes	250 Amperes
7 Minute	90 Amperes	275 Amperes
2 Minute	120 Amperes	600 Amperes

Applications	7600	9112	Schematic Diagrams
Fishing or Sport Boats <ul style="list-style-type: none"> • Outboard / small Inboard • Charge priority is to the Start battery 			
Sailing Auxiliary or Power Boats with a Large House Battery <ul style="list-style-type: none"> • Small inboard • Charge priority is to the House battery 			
Large Power Cruisers <ul style="list-style-type: none"> • Large Inboard engine • Large alternator • Charges either House or Start batteries 	Does Not Apply		
Remote Battery Charging For: <ul style="list-style-type: none"> • Anchor Windlasses • Bow Thrusters • Nav Station 		Does Not Apply	