L-Series ACR with Coil Economizer
PN 9112

Features
- Automatically combines battery banks during the charging cycle and isolates 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” indication LED.
- Integrated coil control minimizes heating and amperage draw.
- Hermetically sealed contacts/vaporproof.
- Single or double sensing.
- Pulse circuit requires very low current draw when contact is closed.
- Ignition protected - Safe for installation aboard gasoline powered boats.
- Meets SAE J1171 - External ignition protection requirements.
- UL Recognized - UL 508 industrial control equipment.

Electrical Connections
The wiring configuration to the right represents a common installation and is not meant to be a guide for the wiring of a specific vessel. Consult your marine electrical professional for the wiring system applicable to your boat.

Discontinue the positive battery connection before beginning the installation. If there is a possibility of tools causing a short, disconnect the negative terminals before disconnecting the positive battery terminals.

Make electrical connections based on the wiring diagram to the right. Consult the Wire Sizing Chart on the following page to determine the appropriate wire size. If a manual control is installed to use this device for emergency paralleling of batteries for engine starting, no fusing is required in the main circuit, but wire sizes should be chosen for the full starting currents. If starting service is not included, choose circuit protection according to wire capacity. If a charging source is present and the relay is closed in automatic mode when an engine is started, starting currents can flow through this circuit. This can result in blowing of protection fuses if the wiring system does not limit the current.

Voltage Sensing
The 9112 ACR is designed to sense, and operate from, the voltage supplied by either battery. In a typical application, the engine driven alternator is connected to the starting battery. When the starting battery is sufficiently charged, the ACR will close and share charging with the house battery. If a shore charger is supplying the house battery, when it has brought the house battery up to voltage, the ACR will close and share charging with the house battery.

Making Connections
- Connect one battery bank to stud terminal A1.
- Connect the other battery bank to stud terminal A2.
- Connect the black line (negative) from the relay to the battery negative.
- Connect the red line (positive) from the relay to the alternator.

Caution: Battery cable terminals must be placed at the bottom of the stack under the sensing wire terminals, the flat washer, the lock washer, and the nut. Tighten securely. Refer to the Lug Installation Diagram on following page.

Specifications
- Combine: 13.6, 27.2 Volts
- Automatic Drop Out: 12.6, 25.2 Volts
- Automatic Over Voltage Drop Out: 15, 30 Volts
- Combine Time Delay: 30 Seconds

Coil Circuit:
- Input Voltage: 9 - 36 Volts DC
- Power Consumption: Holding 12 Volts: 0.13 Amperes@12V DC
- Break Current@10,000 Cycles: 2000 Amps at 28V DC

Main Power Contacts:
- Voltage Rating: 60 Volts DC
- Stud Terminal Size: M8 (accepts 5/16” terminals)
- Terminal Stud Torque: 80-100 in-lb
- Contact Form: SPST-NO.
- Inrush Rating: 250ms (10 repeats)*: 2000 Amperes
- Mechanical Life: 1 Million Cycles
- Make Current@10,000 Cycles: 2000 Amperes@28V
- Break Current@10,000 Cycles: 2000 Amperes@28V

Wire Size

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Cranking Rating 9.75 sec. (10 repeats)*</th>
<th>Intermittent Rating 5 min. (UL 1107)</th>
<th>Continuous Rating (UL 1107)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/0</td>
<td>450A</td>
<td>375A</td>
<td>250A</td>
</tr>
<tr>
<td>2/0</td>
<td>500A</td>
<td>450A</td>
<td>300A</td>
</tr>
<tr>
<td>2x2/0</td>
<td>800A</td>
<td>600A</td>
<td>450A</td>
</tr>
</tbody>
</table>

* Blue Sea Systems Engine Starting Standard

Guarantee
Any Blue Sea Systems product with which a customer is not satisfied may be returned for a refund or replacement at any time.

Wiring Diagram

Sense One Battery Bank
- Remove red ring terminal voltage sensing wire from the stud terminal A1 or A2 associated with the battery bank that you don’t want to sense.
- Place the removed ring terminal over the stud terminal to which the other voltage sensing wire is attached, or insulate the ring terminal and fold it out of the way.

The negative (black wire) connection from the relay to the battery negative must be as short as possible. Because the built-in coil economizer causes current pulses in the control circuit, there may be noise present on the black wire and it should not be run with sensitive wires from other circuits.
Manually Connect and Disconnect Battery Banks
A control switch such as a Blue Sea System’s Switch Panel 8270 or Contura Switch 8232/8283 may be used to manually connect and disconnect battery banks by overriding the L-Series ACR voltage sensing circuit.

Wire Identification

To connect a manual override switch:
- Connect Control Line (orange) to the center common terminal of an ON-OFF-ON single pole, double throw switch.
- Connect negative and positive to the outside terminals of the switch.
- When the control line is switched to a positive supply, the relay is closed when ever the voltage is greater than about 9 volts at either terminal.
- When the control line is switched to the negative supply line, the relay will be held open.
- When the switch is in the center position, with no command to the relay, the relay will operate automatically to close and open when it senses charging voltages. The control signal passes very little current and can be supplied from any fused positive source.

Remote Indicator Lamp
To determine at a remote location when the battery banks are connected, a remote LED indicator can be connected to the L-Series ACR. Suitable indicator lamps are Blue Sea Systems PN 8033 (amber), PN 8171 (red), or PN 8172 (green).

To connect an LED indicator:
- Connect the red wire of the LED to a positive source.
- Connect the yellow wire of the LED to the Status Line (blue).

Wire Sizing Chart
Use the wire sizing chart below to determine minimum wire sizes open to free air circulation.

<table>
<thead>
<tr>
<th>Wire Size (AWG)</th>
<th>Outside Engine Spaces</th>
<th>Inside Engine Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>60.0</td>
<td>51.0</td>
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<tr>
<td>8</td>
<td>80.0</td>
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<tr>
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<tr>
<td>4</td>
<td>160.0</td>
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<tr>
<td>1</td>
<td>245.0</td>
<td>208.3</td>
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<tr>
<td>0</td>
<td>285.0</td>
<td>242.3</td>
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<tr>
<td>000</td>
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<tr>
<td>00000</td>
<td>445.0</td>
<td>378.3</td>
</tr>
</tbody>
</table>

Note: For wire with 105°C insulation rating, no more than 2 conductors are bundled, and not enclosed in conduit or other extra insulation. Not suitable for sizing flexible shore power cords.

Lug Installation Diagram

Starting Battery Voltage Sense (Red) Connect to Terminal A1
House Battery Voltage Sense (Red) Connect to Terminal A2
Control Line (Orange) - Connect to Spot Switch (See Wiring Diagram)
Return Line (Black) Connect to Negative Bus
LED Status Line (Blue) (See Wiring Diagram)

Operation

When all wiring is complete and has been checked, restore battery connections. The relay may momentarily energize when power is first applied. The automatic charging circuit has a 30 second time delay to reduce cycling caused by noise in the system.

Open/Close Cycling
If your electrical system is configured with a charging source that cannot supply the full load current being drawn from the receiving battery, a cycling process can occur. With the ACR open and the charging source supplying the first battery bank, its voltage will rise until the ACR senses sufficient to indicate charging and combine the two battery banks. If the second battery bank is supplying loads that are drawing greater current than the capacity of the charging source, the voltage will drop because there is a net discharge on the system. The ACR will respond to the low voltage and open, disconnecting the second battery bank and its load.

The voltage will again rise as the first battery bank recovers and the ACR will close again after a delay. If this open/close cycling continues, the second battery bank could eventually discharge even though a charge source is present.

Table of Operation