

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

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6693 Rev.005

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:	Inrush, 130ms: 3.8 Amperes@12-36V DC
	Holding 12 Volts: 0.13 Amperes@12V DC
	0.07 Amperes@24V 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	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

Guarantee

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

Installation Instructions

Mounting

- Select a dry and protected mounting location near the battery banks or the battery switch.
- Choose a cool, dry, and well-ventilated location if possible. The L-Series ACR with Coil Economizer may become very warm when operating at full current-carrying capacity.
- Avoid locations directly above batteries where corrosive fumes may be present.
- Mount the relay securely with #10, #12, or 5mm screws through the flanges at the base. Hole size is 0.22 inches.

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.

Disconnect 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 with the starting battery.

Typical Configuration - Sense Both Battery Banks

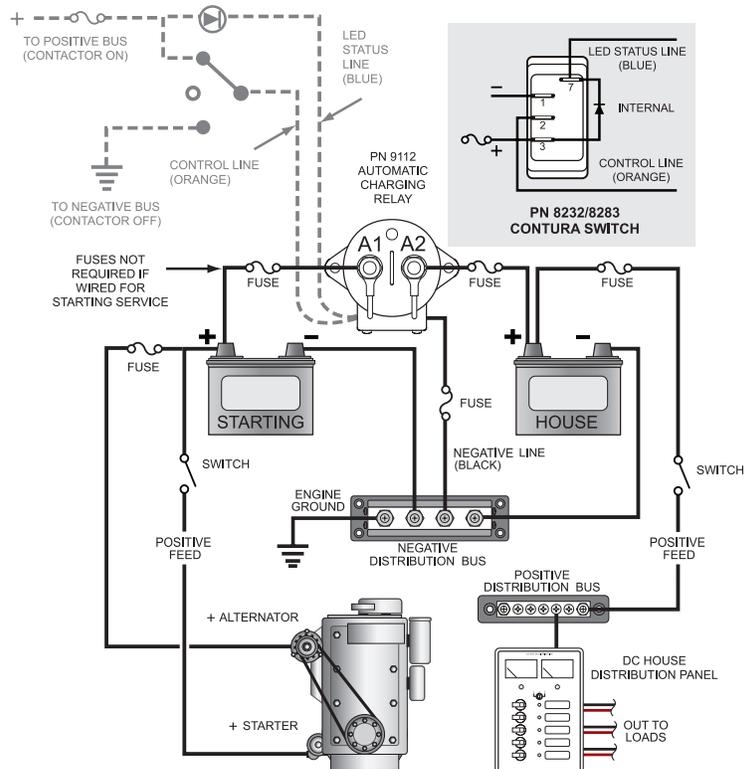
- Connect one battery bank to stud terminal A1
- Connect the other battery bank to stud terminal A2.
- Connect the black line (negative) from the relay to the battery negative through a 10-15 Amp in-line fuse to prevent fault current from flowing in this wire.

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.

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.



• Gray dashed lines indicate optional connections

Wiring Diagram

Installation Instructions (continued)

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.

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.

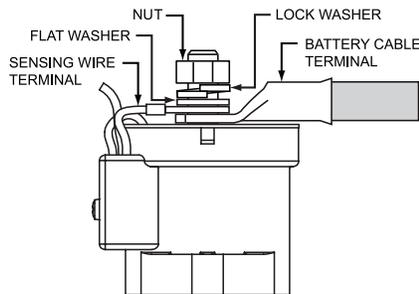
- When the control line is switched to a positive supply, the relay is closed when ever the voltage is greater than about 9 volts at either terminal.
- When the control line is switched to the negative supply line, the relay will be held open.
- When the switch is in the center position, with no command 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).



Lug Installation Diagram

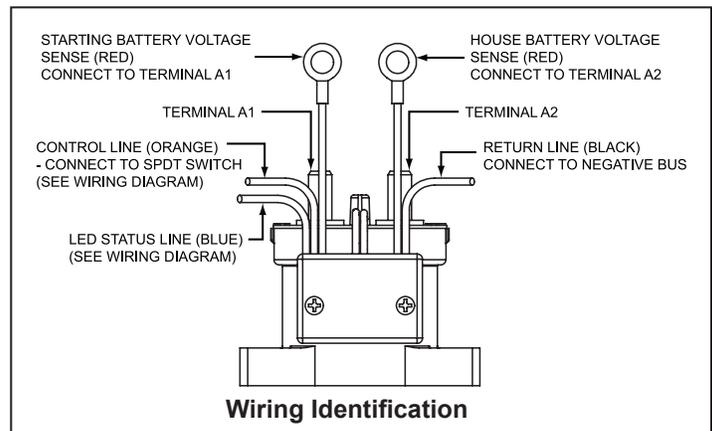
Wire Sizing Chart

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

Allowable Amperage of Conductors

Wire Size (AWG)	Outside Engine Spaces	Inside Engine Spaces
10	60.0	51.0
8	80.0	68.0
6	120.0	102.0
4	160.0	136.0
2	210.0	178.5
1	245.0	208.3
0	285.0	242.3
00	330.0	280.5
000	385.0	327.3
0000	445.0	378.3

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.



Wiring Identification

Operation

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.

	Control Line	PN 9112 Contacts	Starting Battery Voltage Sense	House Battery Voltage Sense
Relay ON (Manual)	>9V	Closed	>9	Anything
	>9V	Closed	Anything	>9
Relay Pickup (Auto)	Open	Open	<13.6, 15 to 27.2, >30	<13.6, 15 to 27.2, >30
	Open	Closed	13.6 to 15, 27.2 to 30	<Starting Battery
	Open	Closed	< House Battery	13.6 to 15, 27.2 to 30
Relay Dropout (Auto)	Open	Closed	12.6 to 15, 25.2 to 30	12.6 to 15, 25.2 to 30
	Open	Open	<12.6, 15 to 25.2, >30	<12.6, 15 to 25.2, >30
Relay Off (Manual)	<1V	Open	Anything	Anything
	Anything	Open	<6	<6

Table of Operation

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.

Performance Specifications	Units	Min	Nom	Max
AUTOMATIC MODE@25C				
Pickup Voltage (PU1)	V DC	13.5	13.6	13.7
Drop-out Voltage (DO1)	V DC	12.5	12.6	12.7
Over Voltage (OV1)	V DC	14.8	15	15.2
Pickup Voltage (PU2)	V DC	27.0	27.2	27.4
Drop-out Voltage (DO2)	V DC	25.0	25.2	25.4
Over Voltage (OV2)	V DC	29.6	30	30.4
Over Voltage Hysteresis	V DC		.35	
Coil				
Inrush Current	A	1.5	2.8	3.5
Inrush Time	s	.80	.100	0.13
Hold Current, Ave	A	.03	.110	.160
PWM Frequency	kHz		20	
Time Delay on Close	s	25	30	35
MANUAL MODE				
Maximum Input Voltage	V DC	-	-	36
Pickup Voltage	V DC	8	8.5	9
Drop-out Voltage	V DC	6	6.5	7
Current Draw When Contactor is "Off"	mA	.05	1	2
Status Line (Open Collector with 1k Limiting Resistor)				
Voltage, Maximum	V DC	-	-	36
Current, Maximum	mA	-	-	36