

## Technical Brief—Automatic Charging Relay (ACR) Explained

### What is an Automatic Charging Relay, and how does it work?

- **What is an Automatic Charging Relay (ACR)?**

An ACR parallels (combines) batteries during charging, and isolates them when charging has stopped and after battery voltage has fallen. An ACR is intended to keep a load from discharging both of the batteries.

- **How does an ACR work?**

An ACR senses when the voltage of either of the batteries rises to a level indicating that a charge source is active (13.0V for 2 minutes). The ACR's contacts then connect and the ACR applies the charge to both batteries. If the voltage on both of the batteries subsequently drops to 12.75V for 30 seconds, the ACR will disconnect, isolating the batteries.

- **Why do I need an ACR?**

An ACR allows two battery banks to be connected so that they can share the output of a single charge source, allowing the user to charge more battery banks than the number of charging outputs. For example, an ACR can be used with a single-output charger, resulting in a simpler system at lower cost than a dual-output charger.

- **How many ACRs do I need?**

To combine two battery banks, one ACR is needed; to combine three battery banks, two ACRs are required.

### What are some features of ACRs?

- **What does “Dual Sensing” mean?**

A dual-sensing ACR will sense an active charge source on one or both batteries and not solely on a designated battery. The ACR will operate if the measured voltage on either of the terminals is of a level to initiate a connection or disconnection.

- **How does an ACR differ from a battery isolator?**

Battery isolators use one-way electrical check valves called diodes that allow current to flow to, but not from, the battery. ACRs use a relay combined with a circuit that senses when a charging source is being applied to either battery. ACRs are more efficient than battery isolators because they create little heat and consume minimal charging energy. Read more about the differences between ACRs and battery isolators here: <http://blueseasystems.com/viewresource/58>

- **Will an ACR manage the charge of my individual battery banks?**

An ACR does not direct the charge to the battery that “needs it the most” or has the lowest terminal voltage. If there is a charge present on either battery, indicated by a high enough voltage, the ACR will combine the batteries.

Read more about this subject here: [http://blueseasystems.com/go/ADD\\_A\\_BATTERY](http://blueseasystems.com/go/ADD_A_BATTERY)

- **What charge sources will an ACR work with?**

An ACR will work with all charge sources, including an alternator, AC charger, or solar panel. However, low current charge sources might not produce the voltage rise required to force the ACR to combine.

### What else do I need to know about my ACR?

- **What are the minimum number of connections I need to make my ACR work?**

Three: One wire to each battery, and one for a ground (GND) connection. For safety reasons, remember to disconnect the negative battery connections before beginning any ACR installation. See this article for more information on selecting the right fuses for Blue Sea Systems ACRs: <http://blueseasystems.com/viewresource/578>

- **What does “Undervoltage Lockout” mean?**

As a safety feature, some ACRs prevent combining into a severely discharged battery. A dual-sensing ACR will monitor the voltage on both batteries and will not connect if either battery is below the undervoltage lockout level. Use caution when combining into a battery with extremely low voltage, because this might represent a faulty battery or a problem elsewhere in the system.

- **Why doesn't my ACR automatically combine every time my engine is running?**

For an ACR to automatically combine the batteries, voltage and time thresholds must be reached. Although these numbers vary somewhat from one ACR product to another, if ACR terminal voltage is greater than 13.0V for 2 minutes, the ACR should combine.

- **Why didn't the ACR disconnect when my engine was turned off?**

The ACR will not disconnect until the low voltage threshold is reached to isolate the circuit. It may take several minutes for the voltage of the batteries to drop to this level. Since the ACR incorporates a delay, additional time (up to 2 minutes) is required before the ACR disconnects.

- **Where can I get more troubleshooting information?**

For specific troubleshooting help with SI-Series and ML-Series ACRs, see the Diagnostic Flowcharts for these products.

For more information on specific ACR applications, please visit [www.blueseasystems.com](http://www.blueseasystems.com).

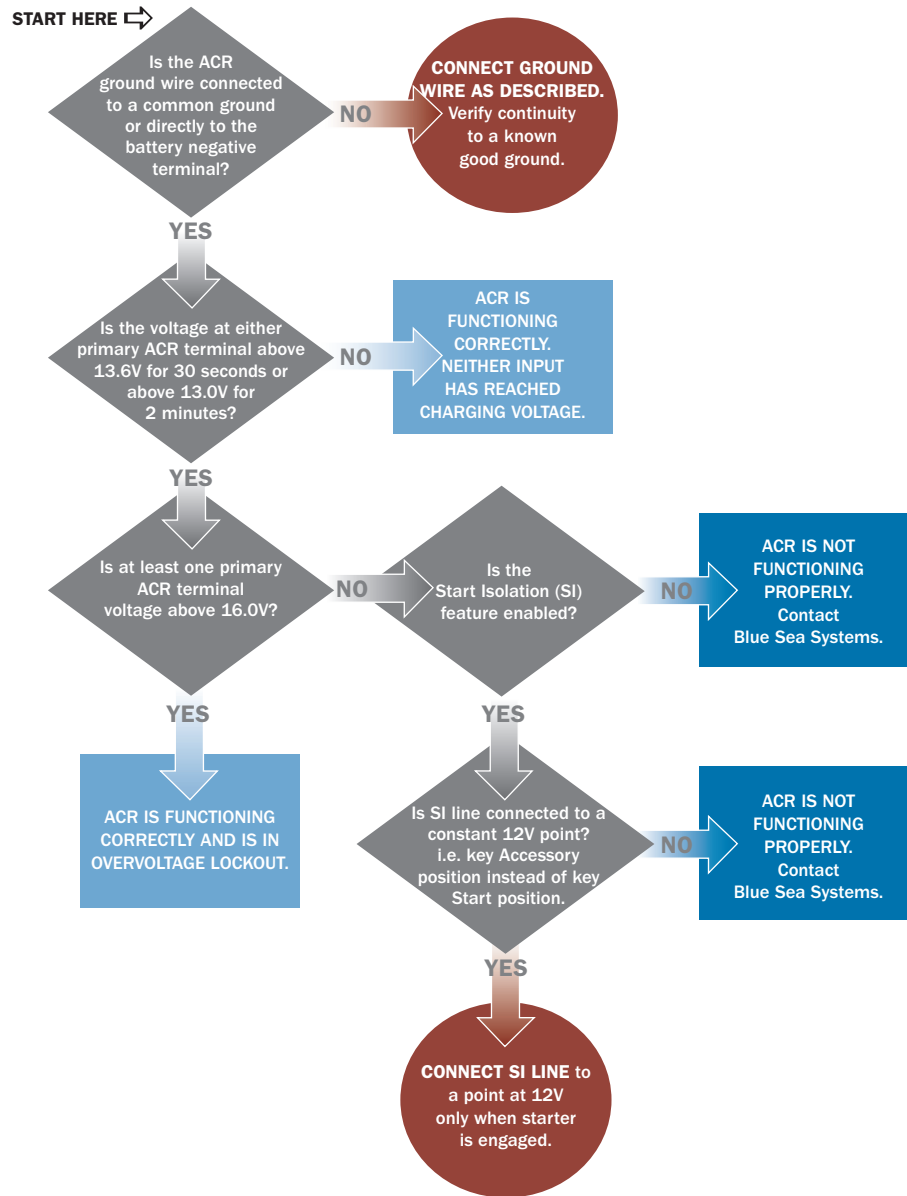
# SI-Series Heavy Duty Automatic Charging Relay (ACR) Diagnostic Flowchart

## PN 7610

SYMPTOM

THE ACR WILL NOT COMBINE BATTERIES.

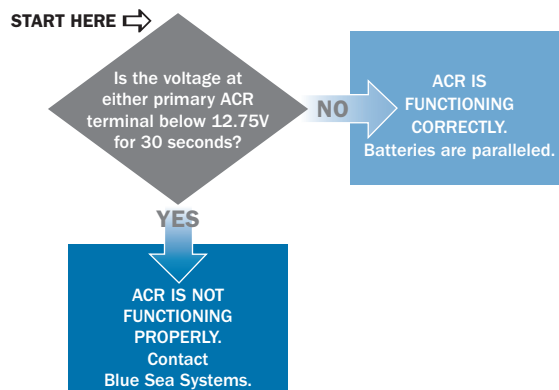
Batteries are ISOLATED: Green LED is "OFF"



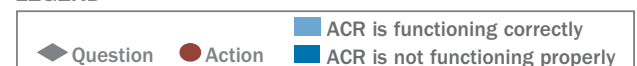
SYMPTOM

THE ACR WILL NOT ISOLATE BATTERIES.

Batteries are COMBINED: Green LED is "ON"



### LEGEND



# ML-Series Heavy Duty Automatic Charging Relay (ACR) Diagnostic Flowchart

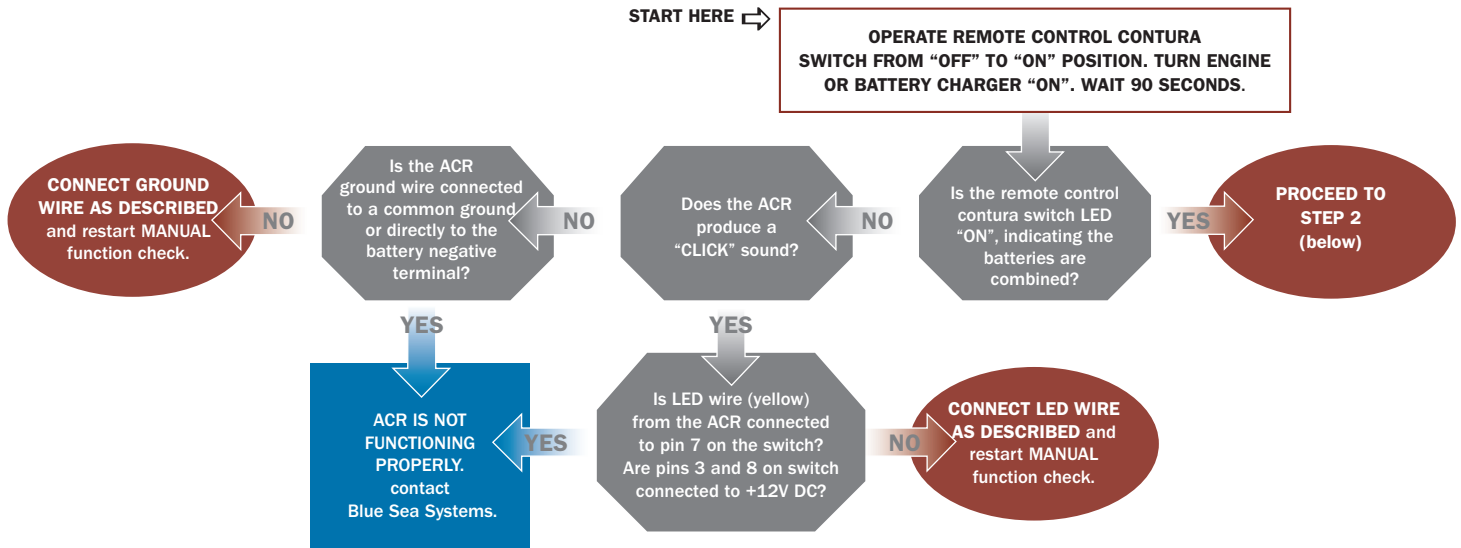
PN 7620 / PN 7622 / PN 7621 / PN 7623

## SYMPTOM

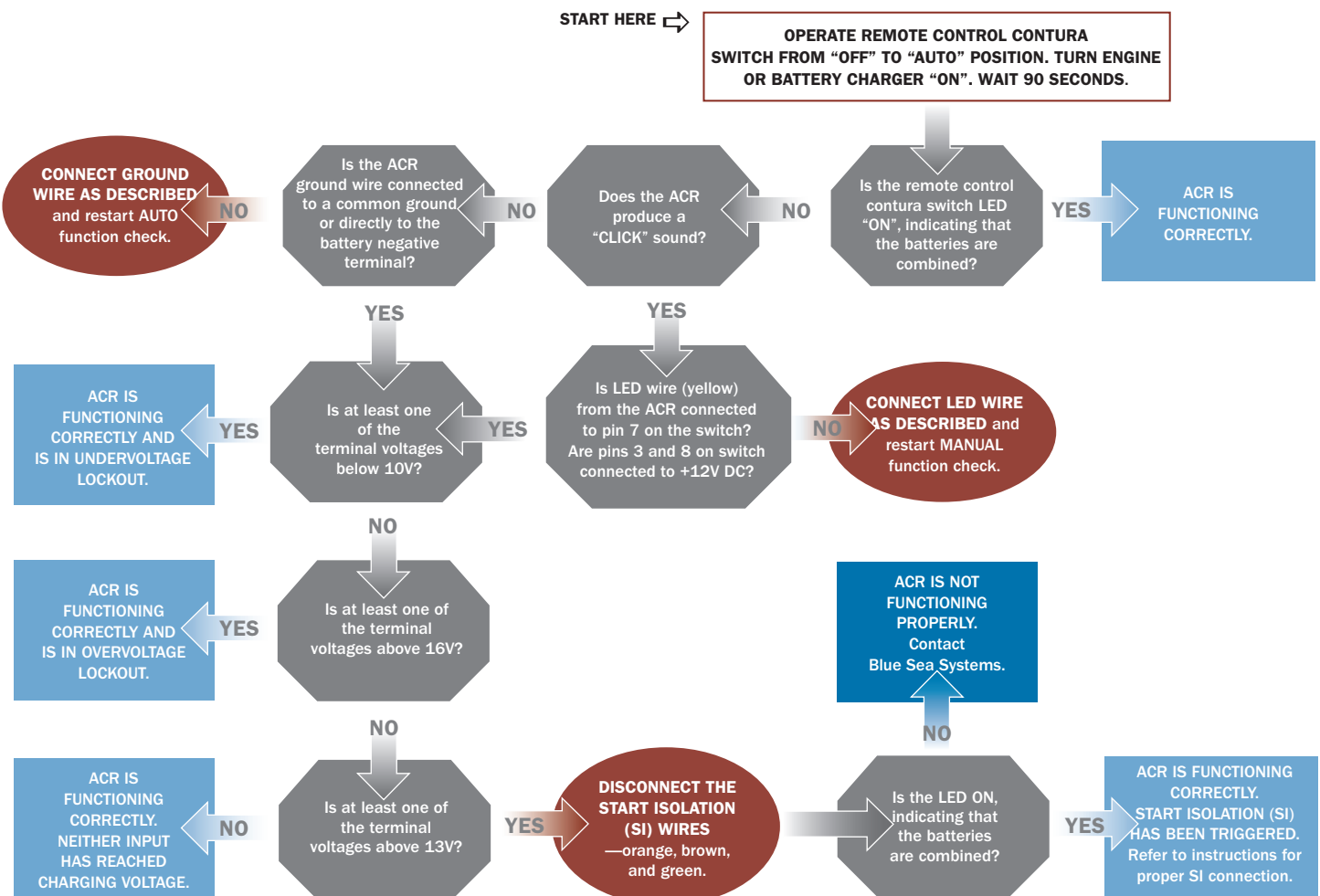
THE ACR WILL NOT COMBINE BATTERIES.

Ensure that manual override knob is in the "OFF" position with the latch up (7622 and 7623)

## STEP 1: Check MANUAL COMBINE function with Remote Control Contura Switch



## STEP 2: Check AUTO COMBINE function with Remote Control Contura Switch



### LEGEND

