**Overview of Application**

The ML-Series ACR automatically combines batteries during charging, and isolates batteries when there is no charging sensed on either battery bank.

<table>
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<tr>
<th>ML-Series ACR Function</th>
<th>12 Volt DC Operation</th>
<th>24 Volt DC Operation</th>
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</thead>
<tbody>
<tr>
<td>Automatically combines battery banks when sensed voltage levels are:</td>
<td>Above 13.5V for 30 sec.</td>
<td>Above 27.0V for 30 sec.</td>
</tr>
<tr>
<td>Automatically isolates battery banks when sensed voltage levels are:</td>
<td>Below 9.6V (undervoltage lockout)</td>
<td>Below 19.2V (undervoltage lockout)</td>
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</table>

**Start Isolation or Engine Isolation.** The isolation inputs enable one of two functions depending on how the inputs are configured.
- **Start Isolation** - Temporary isolation (3–5 minutes) of house loads from the engine circuit during engine cranking to protect sensitive electronics. Configure Start Isolation when there are heavy cranking loads causing sags and spikes that might damage electronics in the House circuit. See page 3.
- **Engine Isolation** - Isolate two engines while both are running to protect engine electronics, and to maximize alternator output. Configure Engine Isolation when the engine manufacturer requires it, and when there are separate batteries for each engine. See page 3.

**Undervoltage or Overvoltage Lockout.**
- Undervoltage lockout prevents batteries from being combined when either battery is below 12.35V@12V DC operation or 24.7V@24V DC operation.
- Overvoltage lockout prevents batteries from being combined when either battery is above 16.2V@12V DC operation or 32.4V@24V DC operation.

**Control Switch Remote Operation.** Included Contura Control Switch—sustained (SPDT) ON-OFF-ON. The Control Switch should be mounted in a convenient location near helm controls to allow for quick access. **NOTE:** Alternatively use a momentary (SPDT) ON-OFF-ON or momentary push button switch to provide cross connect and/or battery isolation.

- To cross connect (combine) battery banks: Switch to “ON” combines battery banks to provide more battery power in hard starting situations.
- To isolate battery banks: Switch to “OFF”- when the battery banks are isolated using the Control Switch, the battery banks remain isolated, and for at least 30 seconds after the control switch is returned to the “AUTO” position.

**Control Switch Remote Indication or ML-ACR Status.** **NOTE:** The remote switch has two LEDs (top and bottom). These LEDs operate simultaneously—either they are both ON or both OFF.

**LED INDICATION**
- **ACR STATE OR CONDITION**
- **Remote Switch Set to “AUTO” or no Remote Switch Installed**
- **LEDs OFF**
  - Batteries are isolated
- **LEDs ON**
  - Batteries are combined
- **LEDs slow steady blink, ON-OFF**
  - Start or Engine Isolation is causing batteries to be isolated
- **LEDs quick steady blink, ON-OFF**
  - Undervoltage lockout—either battery is below 9.6V@12V DC operation or 19.2V@24V DC operation. Overvoltage lockout—either battery is above 16.2V@12V DC operation or 32.4V@24V DC operation.

**Remote Switch Set to OVERRIDE “ON” or “OFF”—Automatic operation is suspended for 10 minutes after remote switch is returned to “AUTO”**
- **LEDs double blink, Blink-Blink-Pause, Repeat**
  - Manual override—check ACR for switch states OR ACR mechanical failure

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Overview of Application (continued)

To Connect Sustained (SPDT) ON-OFF-ON Contura Control Switch:
1. Connect pin 3 of the Control Switch to DC+ through a 2A (min) circuit protection device.
2. Connect pin 1 to DC ground.
3. Connect pin 2 to ACR “REMOTE” wire (red).
4. Connect pin 8 to DC+ through a 2A (min) circuit protection device.
5. Connect pin 7 to ACR “LED” ground wire (yellow).

Manual Control Override Knob Operations* †

- With Override Knob in REMOTE position, push button until latched (Push to Latch On).
- Rotate Override Knob to right to release button from Latch On mode (button pops up). Rotate Override Knob to left (REMOTE position).
- Rotate Override Knob to right (LOCK OFF position).
- With Override Knob in LOCK OFF position, pass cable tie through hole.

Manual Control Override Knob Operations* †

- Operating the Manual Control Override Knob will override automatic operation of the ML-Series ACR for 10 minutes if the override forces a change in switch state.
- The ML-Series ACR will wait 10 minutes if it attempts to automatically close while the manual knob is rotated to LOCK OFF.

Installation Instructions

Mounting
Install the ML-Series ACR as close as possible to both battery banks so that positive and negative wires are as short as possible, and voltage drop in these wires is kept to a minimum. To avoid corrosion to terminals and connecting wires, mount in a dry and protected location. Avoid mounting directly above vented lead acid batteries so that the ACR is not exposed to corrosive gasses expelled from the batteries.
† Because the ACR senses the voltage between its negative ground connection and its positive sense connections, both positive and negative wires should be as short as possible so that the influence of voltage drop on sensed voltage levels is minimized.

High Current Primary Circuit Connections (stud terminals A and B)
For help selecting the appropriate wire size and circuit protection rating, go to www.bluesea.com and click the Circuit Wizard quick link.

To connect high current circuit wires:
1. Connect the battery banks to the stud terminals marked A and B.
2. Torque the high current terminal stud nuts to 140 in-lbs (15.5 N•m) maximum.

NOTES:
- Stud terminals A and B are interchangeable. Either battery bank can be connected to A or B.
- If the ACR is to be used for cross connect, fuses between ACR terminals A and B and each battery positive are not required according to ABYC guidelines. If the ACR is not used for cross connect, install fuses to prevent a hazard if there is damage to the wires connecting the batteries to the ACR.
- The fuses should be placed as close as possible to the batteries so that most of the wire is protected.

Control Circuit Connection (wire contained in the wire harness)

Ground Connection
Connect the black wire in the wire harness to DC ground at the main ground terminal busbar.

Optional Control Circuit Connections (wires contained in the wire harness)

Cross Connect or Isolate Battery Banks
Use the included Control Switch—sustained (SPDT) ON-OFF-ON.
Alternatively use a momentary (SPDT) (ON)-OFF-(ON) or momentary push button switch (sold separately) to provide cross connect and/or battery isolation. The Control Switch should be mounted in a convenient location near helm controls to allow for quick access.

NOTE: Use 16 AWG wire for all Control Circuit connections to meet ABYC minimum wire size requirement.

Cross Connect or Isolate Battery Banks Using Optional Control Switch

Use Control Switch—momentary or sustained single pole double throw (SPDT) to provide these settings:
- CROSS CONNECT (I) - Battery banks are combined to provide more battery power in hard starting situations.
- ISOLATE (O) - Battery banks are isolated until the Control Switch is returned to AUTO (center position). When the Control Switch is returned to AUTO, the ACR returns to automatic mode.

To enable cross connect and isolation, connect:
- Red wire from harness to center (common) of SPDT switch.
- CROSS Connect terminal of SPDT switch to DC positive through 2A circuit protection.
- ISOLATE terminal of SPDT switch to DC negative (ground).

To enable temporary cross connect using momentary push-button switch:
- Connect the red wire from the harness to one side of a momentary push-button switch (sold separately).
- Connect the other side of the push button switch to DC positive through 2A circuit protection.
**Installation Instructions**

**Start Isolation**
The ML-Series ACR can be configured to automatically open temporarily (3-5 minutes) when voltage is sensed on any one of up to three start-isolation inputs. Enable this feature to isolate Start circuits from the House circuit and prevent starting current transients from interfering with sensitive house electronics.

To enable Start Isolation:
1. Connect the brown wire (ISOLATION #1) from the harness to the terminal or wire running from the start key switch to the starter solenoid. Make this connection through a 2 Amp in-line fuse. This connection can be made at the start key switch or at the starter solenoid, but must be to the line that is positive only when cranking the engine, as shown below.

To enable Start Isolation for two or three engines starting from the same battery:
1. Connect the green wire (ISOLATION #2) to ENGINE #2 in the same manner as above.
2. Connect the orange wire (ISOLATION #3) to ENGINE #3 in the same manner as above.

**Start Isolation Installation**

![Start Isolation Diagram](attachment:image.png)

**Engine Isolation**
The ML-Series ACR can be configured to automatically open when two engines are simultaneously running to ensure that two running engines are never electrically connected. Enable this feature to reduce noise and communication cross-talk between engines, and to maximize total potential alternator output.

To enable Engine Isolation for two engines:
1. Connect the brown wire (ISOLATION #1) from the harness to the ON terminal of the start key switch on one engine. Make this connection through a 2 Amp in-line fuse. This connection must be to the line that is positive while the engine is normally running.
2. Connect the green wire (ISOLATION #2) to ENGINE #2 in the same manner as above.

To enable Engine Isolation for three engines:
1. Connect the brown wire (ISOLATION #1) to ENGINE #1, the green wire (ISOLATION #2) to ENGINE #2, and the orange wire (ISOLATION #3) to ENGINE #3 in the same manner as above.

**Engine Isolation Installation**

![Engine Isolation Diagram](attachment:image.png)
To install a remote LED indicator:
• Connect switch pin 8 to DC positive protected by a 2 Amp in-line fuse.
• Connect pin 7 to the yellow wire from the harness.