BLUE SEA SYSTEMS
Marine Electrical Products

ML–Series
Automatic Charging Relay (ACR)

PN 7620B / PN 7620100B / PN 7621B / PN 7621100B (without manual control)
PN 7622B / PN 7622100B / PN 7623B / PN 7623100B (with manual control)

- Magnetic Latch (ML)—draws very low current (<10 mA to monitor terminal voltage) in the ON or OFF states, and draws moderate current for very short time when changing state
- Start Isolation (SI)—can be configured for temporary isolation of House loads from Engine circuit during engine cranking to protect sensitive electronics
- Engine Isolation (EI)—can be configured for isolation of two engines while both are running to protect engine electronics and maximize alternator output
- Senses charging on two battery banks
- LED output to remotely indicate when batteries are combined or isolated
- Tin-plated copper studs for maximum conductivity and corrosion resistance
- Label recesses for circuit identification
- Silver alloy contacts provide high reliability for switching live loads

Specifications

Cranking Rating: 10 sec.	2,500A DC
Intermittent Rating: 5 min.	See Table Below
Continuous Rating	See Table Below
Amperage Operating Current	<40 mA when changing state
Primary Circuit Voltage Rating	32V DC Max.
Relay Contact Position:	
-Combine (30 sec.)	13.5V@12V DC | 27.0V@24V DC
-Combine (90 sec.)	13.0V@12V DC | 26.0V@24V DC
-Open Low (10 sec.)	12.35V@12V DC | 24.7V@24V DC
-Open Low (30 sec.)	12.75V@12V DC | 25.5V@24V DC
-Open High	16.2V@12V DC | 32.4V@24V DC
Live Current Switching	300A@12V DC—10,000 Cycles
Terminal Stud Size	3/8"-16
Maximum Terminal Stud Torque	140 in-lb (15.5 N•m)
Ring Terminal Size	3/8", M10
Terminal Ring Diameter Clearance	1.18" (28.4mm)
Control Circuit Current Draw	<40 mA
Harness Connector: (select models)	Deutsch DTM Series DTM 06-6S
Mating Part Requirements:	(see LADD Industries at www.laddinc.com)
Receptacle Shell	DTM-04-6P*
Wedgelock	WM-6P
Terminal Pins	1060-20-0122†
Sealing Plugs	0413-204-2005†
Hand Crimp Tooling	DTT-20-0‡
Remote Control Switch (sold separately)	Sustained SPDT ON-OFF-ON, Momentary SPDT (ON)-OFF-(ON), or two momentary push button switches, 100mA rating Min.

Regulatory Meets ISO 8846 and SAE J1171 external ignition protection requirements, Rated IP66

* Special modifications are available depending on customer requirements. No polarization on standard product.
† Quantity depends on optional wire connections. The total number of pins and sealing plugs is 6.
‡ Required for hand assembly of wires and terminal pins.

Wire Size	Intermittent Rating 5 min.	Continuous Rating
2/0	400 Amps	225 Amps
4/0	400 Amps	300 Amps
2x (4/0)	700 Amps	500 Amps

PN	Termination	Manual Control	Control Circuit
7620B	Tinned Wires	No	12V DC
7620100B	Deutsch Connector	No	12V DC
7621B	Tinned Wires	No	24V DC
7621100B	Deutsch Connector	No	24V DC

PN	Termination	Manual Control	Control Circuit
7622B	Tinned Wires	Yes	12V DC
7622100B	Deutsch Connector	Yes	12V DC
7623B	Tinned Wires	Yes	24V DC
7623100B	Deutsch Connector	Yes	24V DC

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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.

ML-Series ACR Function	12 Volt DC Operation	24 Volt DC Operation
Automatically combines battery banks when sensed voltage levels are:	Above 13.5V for 30 sec. Above 13.0V for 90 sec.	Above 27.0V for 30 sec. Above 26.0V for 90 sec.
Automatically isolates battery banks when sensed voltage levels are:	Below 9.6V (undervoltage lockout) Below 12.35V for 10 sec. Below 12.75V for 30 sec. Above 16.2V (overvoltage lockout)	Below 19.2V (undervoltage lockout) Below 24.7V for 10 sec. Below 25.5V for 30 sec. Above 32.4V (overvoltage lockout)

Start Isolation or Engine Isolation. The isolation inputs enable one of two functions depending on how the inputs are configured.

NOTE: The ML-Series ACR can be configured for Start Isolation or Engine Isolation, but not both.

- **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 9.6V@12V DC operation or 19.2V@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. Optional 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

Guarantee

Blue Sea Systems stands behind its products for as long as you own them.
Find detailed information at www.bluesea.com/about. For customer service, call 800.222.7617.

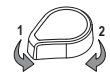
Overview of Application (continued)

Manual Control Override Knob PN 7622B / 7622100B / PN 7623B / 7623100B

The Manual Control Override Knob provides:
- an added level of safety that allows manual ON-OFF control with or without power
- LOCK OFF for servicing the electrical system

Remote LEDs in control switch indicate when ML-Series ACR is in manual override condition.

Manual Control Override Knob Operations* †

To combine battery banks	With Override Knob in REMOTE position, push button until latched (Push to Latch On).	
To isolate battery banks that are connected	Rotate Override Knob to right to release button from Latch On mode (button pops up). Rotate Override Knob to left (REMOTE position).	
To prevent remote operation	Rotate Override Knob to right (LOCK OFF position).	
To secure for servicing	With Override Knob in LOCK OFF position, pass cable tie through hole.	

* 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.

⚠ CAUTION ⚠

- ☑ These instructions are intended to provide assistance with the installation of this product, and are not a substitute for a more comprehensive understanding of electrical systems. We strongly recommend that a competent electrical professional perform the installation of this product.
- ☑ The illustrated wiring diagram represents a common installation and is not meant to be a guide for wiring a specific vessel. The wiring diagram shows a single battery bank installation.
- ☑ Disconnect all negative battery connections before beginning the installation.
- ☑ All unused control wires should be carefully insulated from each other and from accidental contact using heat shrink tubing or electrical tape. External contact or shorting between control wires can lead to malfunction.

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 a sustained (SPDT) ON-OFF-ON Remote Control Switch (sold separately)
Alternatively a momentary (SPDT) (ON)-OFF-(ON) Remote Control Switch, or two momentary push button switches (sold separately) can 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 (sold separately) – 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.

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.

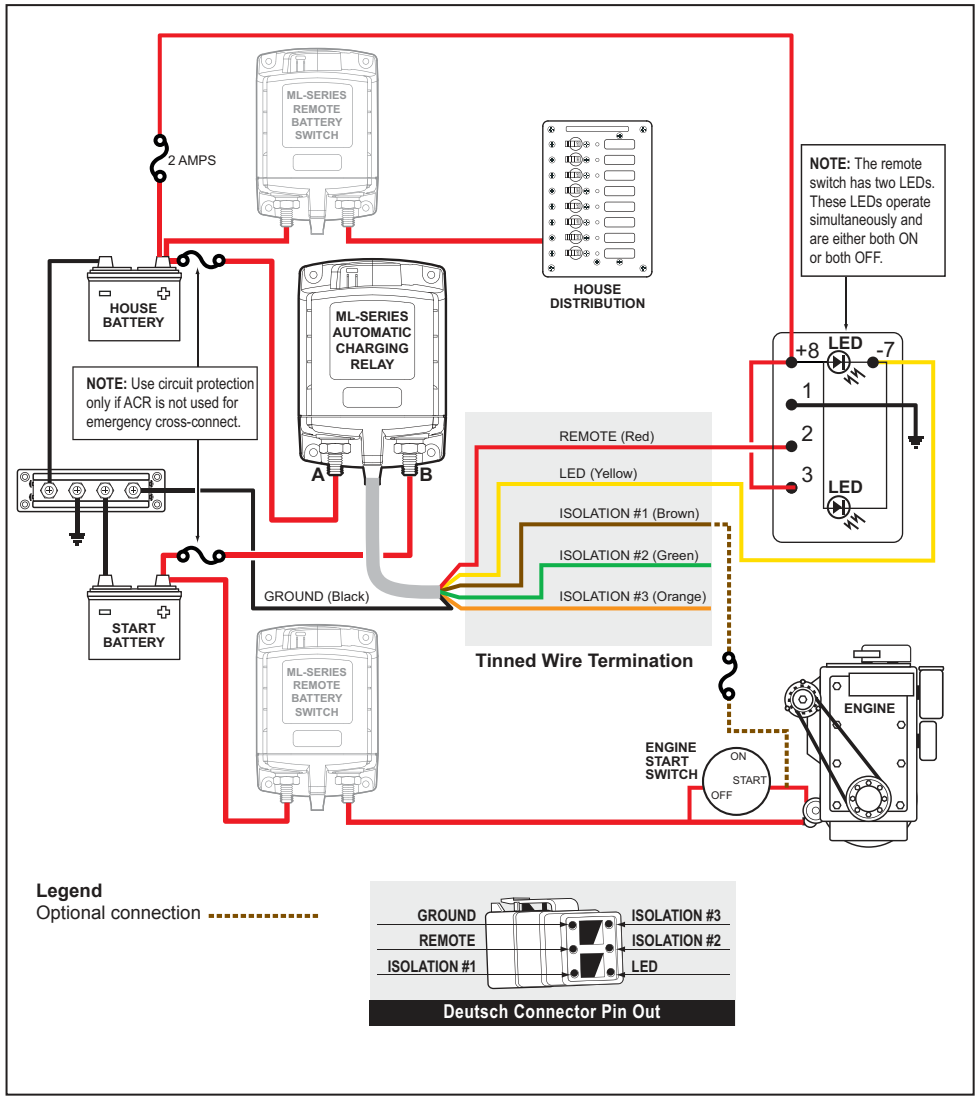
To enable Start Isolation:

- 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:

- Connect the green wire (ISOLATION #2) to ENGINE #2 in the same manner as above.
- Connect the orange wire (ISOLATION #3) to ENGINE #3 in the same manner as above.

Start Isolation Installation



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.

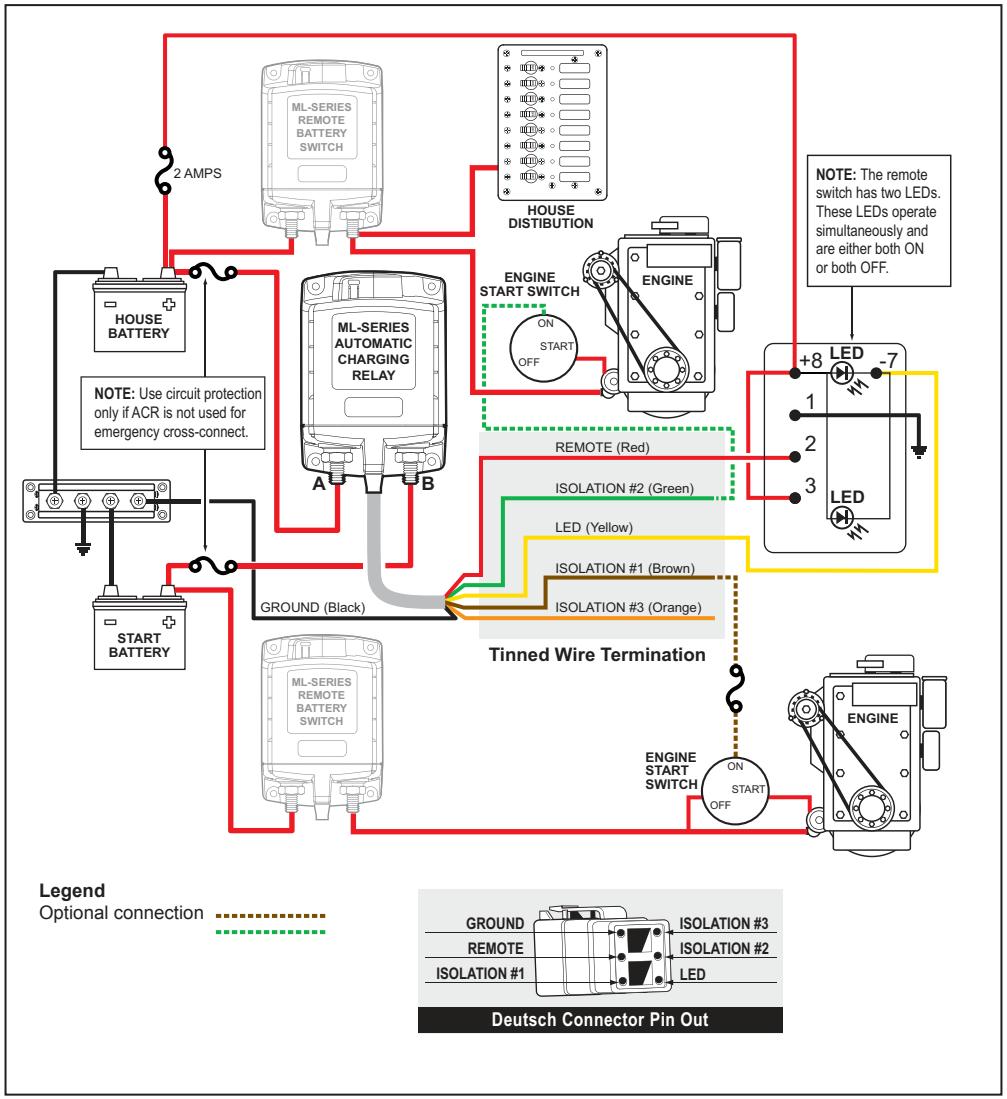
To enable Engine Isolation for two engines:

- 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.
- Connect the green wire (ISOLATION #2) to ENGINE #2 in the same manner as above.

To enable Engine Isolation for three engines:

- 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



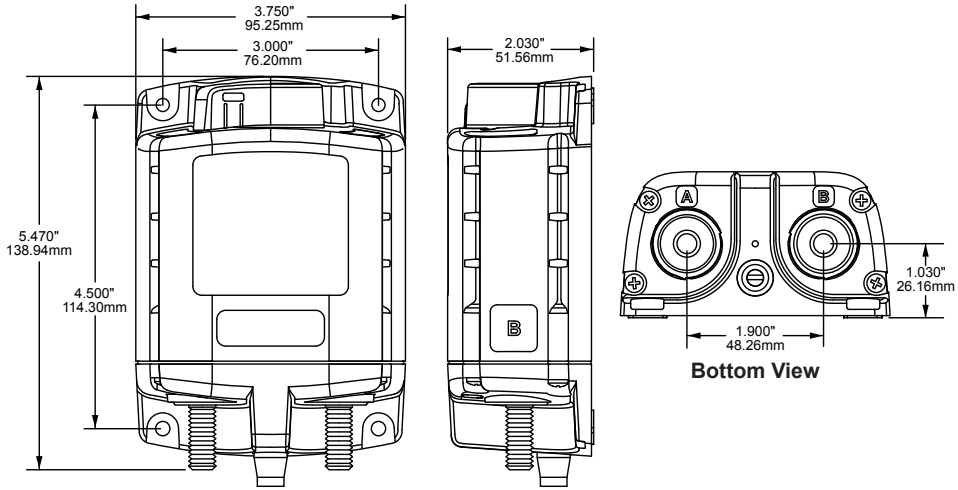
Installation Instructions (continued)

4. Remote indicator lamp (Optional)

Use Blue Sea Systems LED 8033 (amber), 8171 (red), or 8172 (green).

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.



Front View

Side View

Bottom View