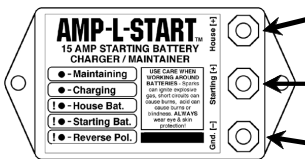
12/05/2020 Rev G5

AMP-L-START™ REVISION G5 Starting Battery Charger/Maintainer

GENERAL INFORMATION – AMP-L-START™ is designed to keep your engine starting battery(s) fully charged during long periods of storage or inactivity. Connected between the house and starting batteries, it diverts up to 15 amps of charging current from your existing house battery charger, sending it to the starting battery(s) instead. This current automatically tapers to a small fraction of an amp after the starting battery(s) reaches a full state of charge. A set of indicator lights display the charger's status and warns of improper hookup; an overvoltage protection feature temporarily disconnects the starting battery(s) when excessive house battery voltage is present; and an audible beeper warns of dangerously low starting battery voltage. Rev F2 and later versions also include a user-selectable "High Temperature" mode that reduces the turn-on and turn-off voltages to 12.7 and 12.5 volts, respectively, for compatability with some temperature-compensated house battery chargers. Rev G2 and later versions also have a "Lithium" mode for use with LiPo house batteries that increases the turn-on and turn-off voltages to 13.45 and 13.35 volts, respectively. Either mode is enabled by installing a jumper across pins on the back of the unit. Removing the jumper instantly restores the original 13.2/12.8 volt turn-on/turn-off settings.

Step-By-Step Installation Instructions

Installing **AMP-L-START™** requires just 3 connections:

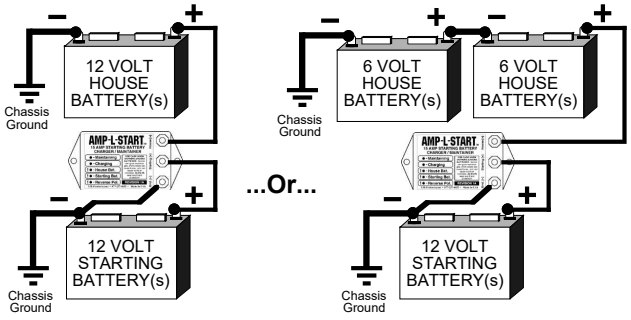


HOUSE [+] : This stud is connected to the positive terminal on your house battery(s). Use stranded automotive-grade wire, 12 gauge or thicker (10 gauge if the wire length exceeds 5 feet).

STARTING [+] : This stud is connected to the positive terminal on your engine starting battery(s). Use stranded automotive-grade wire, 12 gauge or thicker (10 gauge if the wire length exceeds 5 feet).

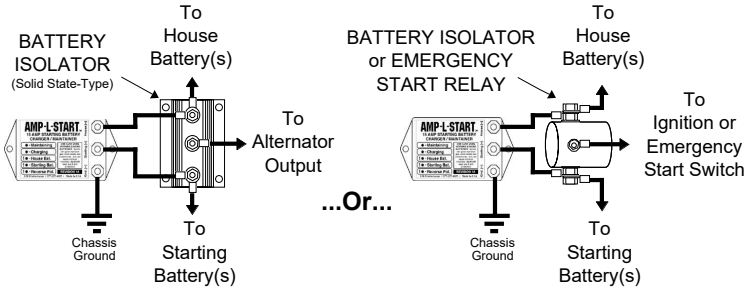
GND [–] : This stud is connected to chassis ground, which can also be the negative terminal on your house or starting battery(s). Since this connection carries almost no current,18 gauge or thicker stranded automotive-grade wire will suffice.

These connections can either be made directly to the battery posts...



(NOTE: In dual starting battery applications, the connections can be made to either starting battery.)

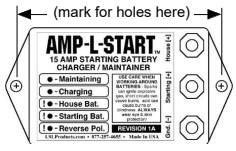
...or to terminals on your battery isolator or emergency start relay:

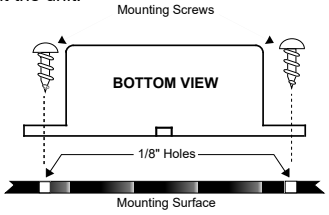


(NOTE: For tips on how to locate your Isolator or Relay, see the "Where's The Isolator?" section on Page 2.)

Connecting **AMP-L-START™** directly to the battery posts is often simpler, since the batteries are usually easier to find than the Isolator or Emergency Start Relay. However, connecting to the Isolator or Emergency Start Relay often results in much shorter wire runs, and avoids exposing the connections to corrosive battery fumes.

STEP 1: After choosing one of the connection methods described above, identify a flat mounting surface for the **AMP-L-START™**, preferably near your chosen wire connection points. Check that drilling holes won't interfere with any wiring, hoses or other parts on the other side. Next, temporarily hold the **AMP-L-START™** unit against your intended mounting surface, and mark the hole locations for the two mounting screws. Drill 1/8" (3MM) holes at these location, and use two of the sheet metal screws (included) to mount the unit.

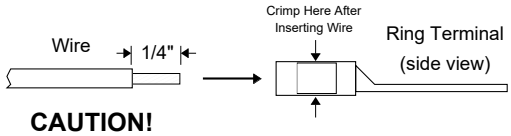




CAUTION!
USE CARE IN DRILLING HOLES NOT TO CONTACT ANY ELECTRICAL WIRING — HAZARD OF SHOCK, FIRE, BURNS.

STEP 2: Unplug from shore power, disconnect any solar panels, and remove the negative terminals of **BOTH** the house and starting battery banks. Next, cut sufficient lengths of stranded automotive-grade wire to connect the **AMP-L-START™** to your batteries or Isolator/Relay studs (as described above). Use 12 gauge or thicker wire for **HOUSE [+]** and **STARTING [+]** connections under 5 feet of length (or 10 gauge for longer runs), and 18 gauge or thicker wire for the **GND. [–]** connection.

Strip approx. 1/4" of insulation off both ends of these 3 wires, select the best size ring terminals (from the included assortment) to fit the **AMP-L-START™** and battery posts or Isolator/Relay , and crimp these terminals on the bare wire ends. (NOTE: Use 3 of the smallest-diameter yellow ring terminals for the studs on the **AMP-L-START™**.)



CAUTION!
USE CARE AROUND BATTERIES — SPARKS CAN IGNITE HYDROGEN GAS. SHORT CIRCUITS CAN CAUSE BURNS OR FIRE. CORROSIVE ACID CAN CAUSE SKIN BURNS OR BLINDNESS.

Wire Strip Gauge 1/4" (6MM)

STEP 3: Use brass nuts and bronze split-ring lockwashers (included) to connect the 3 wires with ring terminals to the studs on the **AMP-L-START™** unit. **CAUTION: Tighten the brass nuts only enough to compress the split-ring lockwashers - DO NOT OVERTIGHTEN!** Next, connect the opposite ends of these 3 wires with ring terminals to your chosen attachment points on the battery posts or Isolator/Relay studs.

Reconnect the negative terminals on your house and engine starting batteries (confirming that the red REVERSE POLARITY indicator is not lit), reconnect any solar panels, and restore shore power. (Unit beeps and lights rapidly flash 4 times to confirm power-up). Finally, peel the backing off the Status Indicator LEDs Description label, and affix it to a clean, flat surface near the **AMP-L-START™** unit. This completes the installation process.

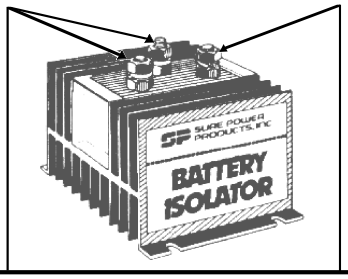
(NOTE: The kit includes spares for easily-lost hardware.)

“Where's The Isolator?”

Connecting your **AMP-L-START™** to the terminals on your battery isolator or emergency start relay has several advantages over connecting it directly to the posts on your batteries: (1.) It eliminates the need to run long wires to each battery bank (since the manufacturer has already routed wires from both battery banks to these devices). (2.) It avoids exposing the connections to corrosive battery fumes and electrolyte.

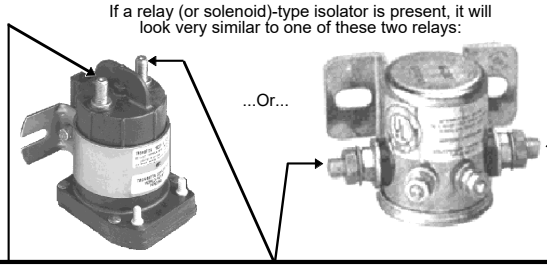
WHERE TO LOOK FOR THE ISOLATOR — The isolator is often located either inside or immediately next to the engine compartment:

If a solid-state isolator is present, it will look very similar to this:



At the factory, the manufacturer has connected one of these terminals to the positive terminal of your house battery bank. Another terminal is connected to the positive terminal on your starting battery(s), and the last terminal is connected to the DC output from your engine's alternator.You want to connect AMP-L-START's **HOUSE [+]** stud to the terminal that goes to the HOUSE batteries, and connect AMP-L-START's **STARTING [+]** stud to the terminal that goes to the STARTING battery(s). (**NOTE:** Some isolators show the connections on an attached sticker or label.)

If a relay (or solenoid)-type isolator is present, it will look very similar to one of these two relays:



At the factory, the manufacturer has connected one of these large terminals to the positive terminal of your house battery bank. The other large terminal is connected to the positive terminal on your starting battery(s). You want to connect AMP-L-START's **HOUSE [+]** stud to the terminal that goes to the HOUSE batteries, and connect AMP-L-START's **STARTING [+]** stud to the terminal that goes to the STARTING battery(s).

Note: An isolator relay will click whenever the engine ignition switch is turned from the "off" to "run" positions. An emergency start relay will click whenever the "Emergency Start" switch on the dashboard is pressed. Listen for these sounds to find the relay.

HOW TO TELL WHICH WIRE GOES TO WHICH BATTERY — When plugged into AC power (so that your DC converter or AC inverter is charging the house batteries), the wire that goes to your house batteries will measure around 13.5 to 14.5 volts (measuring between the terminal and ground). The wire that goes to your starting batteries will measure less than this (around 12.3 to 12.7 volts). If you don't have access to a DC voltmeter, you can use a 12-volt light bulb or test light instead — Temporarily disconnect the positive terminal of your starting battery and see which terminal on the isolator still lights the bulb. That will be the wire that goes to the house batteries. Reconnect the starting battery, and perform the same test on the house batteries (which will tell you which wire goes to the starting battery).

General Information

HOW IT WORKS - **AMP-L-START™** works by "borrowing" some charging current from the house batteries, using it to also recharge and maintain the starting battery(s). This only happens when the house batteries are receiving a charge from your DC power converter, AC inverter/charger or solar panels - The rest of the time, **AMP-L-START™** is inactive, and doesn't affect your motorhome's electrical system. After both the starting and house batteries become fully charged, **AMP-L-START™** continuously applies a small maintenance charge to the starting battery(s). During periods when the house batteries are being discharged (i.e., when dry-camping), **AMP-L-START™** automatically stops any reverse current flow, thereby preventing the starting battery(s) from also being discharged.

OPERATING INFORMATION - The yellow CHARGING light will glow steadily whenever the starting battery is accepting a substantial charge (i.e., more than several amps).After the starting battery approaches a full state of charge, the green MAINTAINING light will illuminate instead, indicating that the starting battery is only accepting a small maintenance charge. Shortly after shore power is disconnected or solar panel output ceases, the MAINTAINING light will briefly flash every several seconds, indicating that **AMP-L-START™** is in standby mode. While in this mode, the **AMP-L-START™** draws less than 0.002 amps (2 mA) from either battery bank.

"**HIGH TEMPERATURE" MODE** - Installing a jumper across the upper and middle 2 pins on the back of the unit reduces the turn-on voltage from 13.2 to 12.7 volts, and reduces the turn-off voltage from 12.8 to 12.5 volts. This allows the starting batteries to still receive a maintenance charge if the house battery charger has reduced its voltage in very hot weather. To confirm operation in this modem, the beeper on the unit sends Morse Code for the letter "H" (Dot-Dot-Dot-Dot) when first powered up; thereafter, the MAINTAINING light blinks TWICE in rapid succession whenever the unit is idle.

"**LITHIUM" MODE** - Installing a jumper across the middle and lower 2 pins on the back of the unit increases the turn-on voltage to 13.45 volts, and increases the turn-off voltage to 13.35 volts.This allows the starting batteries to still receive a maintenance charge if the house battery charger is maintaining Lithium Iron Phosphate ("LiFePO4") house batteries. To confirm operation in this mode, the beeper on the unit sends Morse Code for the letter "L" (Dot-Dash-Dot-Dot) when first powered up; thereafter, the MAINTAINING light blinks THREE TIMES in rapid sequence whenever the unit is idle.

The unit is shipped from the factory in **"NORMAL"** mode (jumper only installed on one pin). There is no need to disconnect the unit before changing modes. **NOTE:** The **"HIGH TEMPERATURE"** and **"LITHIUM"** modes are only intended for use in motorhomes equipped with house battery chargers or battery chemistries that require them. Other users will never need to activate them.

In Case Of Trouble

MAINTAINING light blinks every second - Indicates that the unit is operating normally, but the house battery voltage isn't high enough to charge or maintain the starting battery(s). If this occurs when the unit should be operating, check for (1.) disconnected shore power, (2.) house battery charger unplugged or switched off, (3.) battery disconnect switches left in their DISCONNECTED positions, or (4.) heavily-discharged house batteries.

HOUSE BAT. or STARTING BAT. lights are slowly flashing - Indicates that either the house or starting batteries are not connected to the unit. Check for loose connections, open disconnect switches or improper wiring.

CHARGING light is flashing - Indicates that the voltage supplied to the starting battery has reached its upper safe limit (13.8 volts), and has been temporarily suspended. Charging will resume as soon as the starting battery voltage drops to its normal resting value (12.6 volts).

Unit is beeping, and STARTING BAT. light is flashing rapidly - Indicates that the starting battery is severely discharged to the point where permanent battery damage is possible (approx. 11.9 volts). Check your house battery charger to confirm that it is powered up, and operating normally.

MAINTAINING or CHARGING lights are glowing steady after shore power is disconnected - Indicates that the house battery voltage has not yet dropped enough to turn the unit off. This situation will remedy itself as soon as the battery surface charge gradually bleeds off, but may take up to several hours.

REVERSE POL. light is illuminated - Indicates a wiring error (i.e., the **GND. [-]** terminal is connected to the positive side of the house or starting batteries).

This unit has a ONE YEAR warranty against defects. To obtain service, please email us at: Support@lslproducts.net.

LSLProducts.net • P.O. Box 681072 • San Antonio, TX 78240 • Support@LSLProducts.net