

AMP-L-START™

REVISION
F2

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 automatically disconnects the starting battery(s) when excessive house battery voltage is present; and an audible beeper warns of dangerously low starting battery voltage. The Revision F2 version also includes a user-selectable "High Temperature" mode that reduces the turn-on and turn-off voltages to 12.7 and 12.5 volts, respectively, for compatibility with some temperature-compensated house battery chargers. This mode is enabled by installing a jumper across two 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:



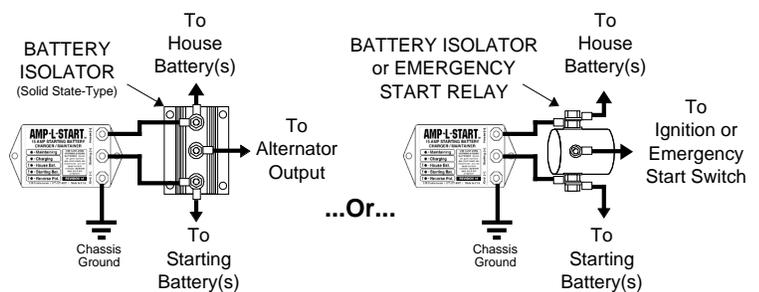
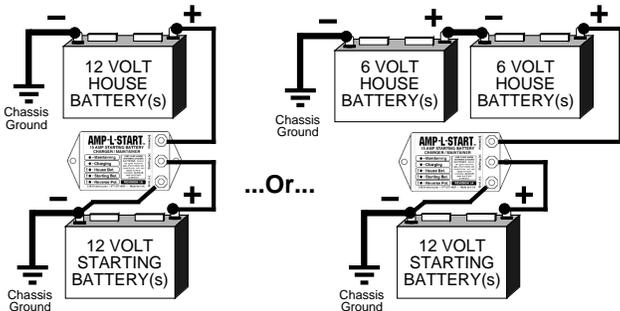
HOUSE [+] : This stud is connected to the positive terminal on your house battery(s). Use stranded automotive-grade wire, 12 gauge or thicker (10 gauge if the wire length exceeds 5 feet).

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...

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

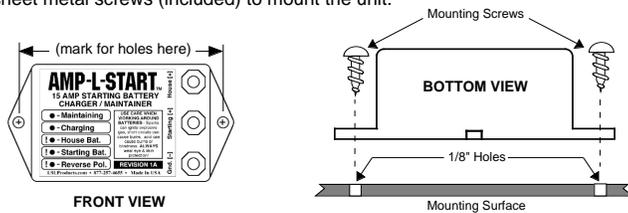


(NOTE: In dual starting battery applications, the connections can be made to either starting battery.)

(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.

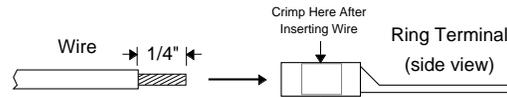


CAUTION!
USE CARE IN DRILLING HOLES NOT TO CONTACT ANY ELECTRICAL WIRING — HAZARD OF SHOCK, FIRE, BURNS.

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 [+], 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.



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.

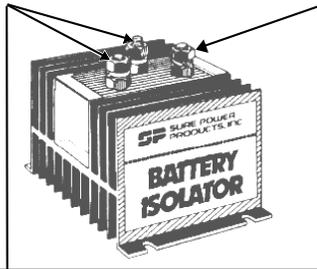
(NOTE: The kit includes spares for easily-lost hardware.)

“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.

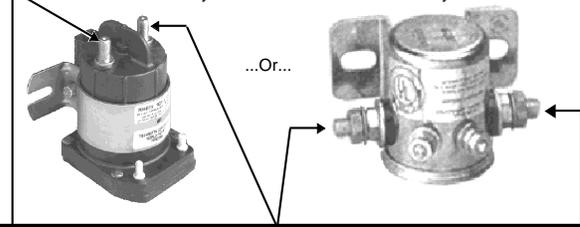
WHERE TO LOOK FOR THE ISOLATOR — The isolator is often located either inside or immediately next to the engine compartment:

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 the 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 illuminate 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 battery is accepting only a small maintenance charge. Shortly after shore power is disconnected or solar panel output ceases, the MAINTAINING light will briefly flash every few seconds, indicating that AMP-L-START™ is in standby mode. While in this mode, the current drain on the house and starting batteries is less than 0.002 amps (2 mA).

"HIGH TEMPERATURE" MODE — Installing a jumper across the 2 pins on the back of the unit (marked with a "**") 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 float voltage in very hot weather. To confirm operation in this mode, the unit beeps 8 times (rather than 4 times) when first powered up; thereafter, the **House Bat.** and **Starting Bat.** lights blink in rapid sequence every few seconds. Without the jumper installed (or only installed on 1 of the 2 pins), the unit operates in its "NORMAL" mode (13.2 volts turn-on, 12.8 volts turn-off). The unit is shipped from the factory in "NORMAL" mode (jumper only installed on 1 pin.) **NOTE:** "High Temperature" mode is only intended for use in motorhomes equipped with a temperature-compensated house battery charger or inverter/charger, and only then in very hot weather. Since most house battery chargers are not temperature-compensated, most users will never need to activate it.

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) (i.e., isn't above approx. 13.2 volts, measured at the **HOUSE [+]** terminal). If this occurs when the unit should be operating, check for (1.) disconnected shore power, (2.) house battery charger unplugged or switched off, (3.) heavily-discharged house batteries.

HOUSE BAT. or STARTING BAT. lights are flashing — Indicates that either the house or starting batteries are not connected to the unit (i.e., measured battery voltage is less than 2 volts). Check for loose connections, open disconnect switches or improper wiring.

MAINTAINING and CHARGING lights are flashing simultaneously — Indicates that the unit has shut down, due to excessively high house battery voltage (above approx. 14.75 volts). This is done to protect the starting batteries, and can occur when the house battery charger is either (1.) recharging or equalizing the house batteries, (2.) malfunctioning or misadjusted. Normal operation will resume when the house battery voltage drops back below approx. 14.5 volts.

Unit is beeping, and STARTING BAT. light glows steady — Indicates that the starting battery(s) is severely discharged to the point where permanent damage is possible (approx. 11.9 volts). Check your house battery charger to confirm that it is powered up, and is operating normally. To silence the beeper, temporarily disconnect **Starting [+]** terminal or your starting battery (by using your battery disconnect switch) until the battery can be recharged.

MAINTAINING or CHARGING lights are illuminated after shore power is disconnected — Indicates that the house battery voltage has not yet dropped enough to turn the unit off (i.e., below approx. 12.8 volts). This situation will remedy itself as the battery surface charge gradually bleeds off, but can take up to several hours.

Red 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).

Warranty

LSL Products warranties this unit for a period of **ONE YEAR** from the date of purchase against defects in materials and workmanship. Please save your receipt as proof of warranty coverage. LSL Products will, at its option, repair or replace any defective components, at no charge to the owner. Please contact us prior to returning the unit. This warranty does not cover damage due to improper installation or unreasonable use of the product. In no event shall LSL Products nor any of its representatives be responsible for incidental or consequential damages. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

LSL PRODUCTS • 5804 BABCOCK RD. # 512 • SAN ANTONIO, TX 78240 • TOLL-FREE: 877-257-4655 • www.LSLproducts.net