

12V Block Diagram & Diagnostics

This guide is intended to assist Heartland Owners in understanding the operation of the 12V power distribution system and to troubleshoot when multiple failures occur at the same time.

Important Notices

Who created this document?

This document has been created by Heartland Owners independently of the Heartland RV Company, and is posted to the Heartland Owners Forum, by owners, as a service to the entire owner community.

Errors and Omissions

Because the authors are Heartland owners, not engineers or service technicians, it's possible that this document could contain errors or omissions. Readers are advised to also review the manufacturers' product documentation for more complete information and guidance.

Additional Resources

The heartlandowners.org website has a collection of owner-written user guides, including information on water systems, heating and cooling, winterizing, residential refrigerator, water heater and other topics. This information is available at <http://manuals.heartlandowners.org/?man=User%20Guides>

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Contact Information

Questions and comments may be directed to manuals@heartlandowners.org

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12V Block Diagram & Diagnostics

How to use this guide

This guide is intended to assist Heartland Owners in understanding the 12V systems in their RVs, and to help diagnose 12V failures where **multiple** devices stop working at the same time.

Please note that the goal of this document is to help in the majority of circumstances where **multiple** 12V devices are failing at the same time. It is not comprehensive in that there may be less common causes of failure that are not included. Also note that diagnosis of failures affecting a **single** 12V device are outside the scope of this document.

To use the guide, first review the Block Diagram and notes page. Then step through the Diagnostic Pages to isolate the problem.

On the Diagnostic Pages, there are several shapes used. Diamonds indicate a question. Rectangles indicate an action you need to take. Ovals represent a diagnosis or corrective repair action. There are also shaded rectangles that provide background information.

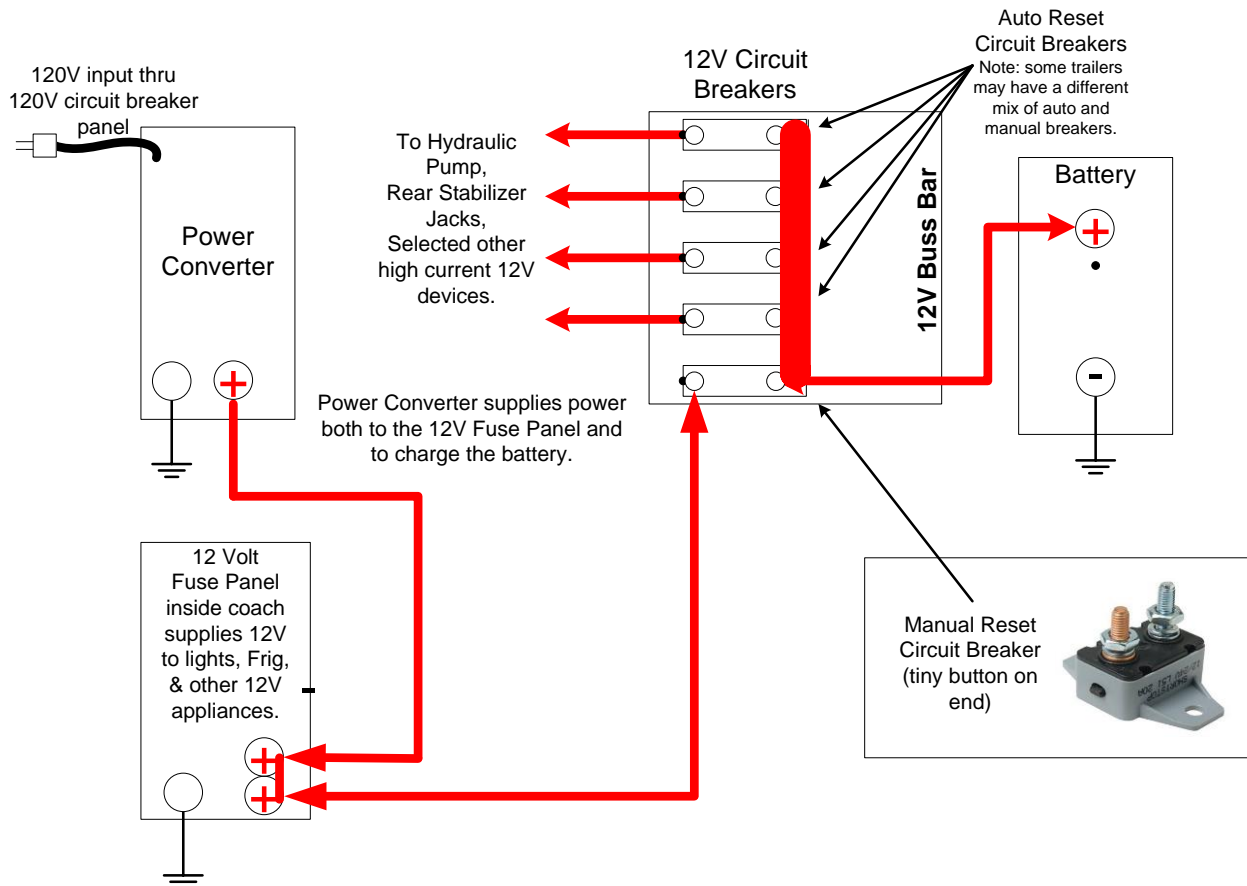
It is assumed that you have a volt meter capable of reading AC and DC voltage levels. If you don't have a volt meter, follow the flow charts as much as possible. Certain problems can be identified without a meter. For other problems, you will need a meter.

Additional information may be found in the [Electrical User Guide](#) and other owner-written materials.

CAUTION: Electricity is dangerous. Many of us are comfortable with checking 120V AC and 12V DC circuits and are confident we can do so without damaging the circuits or causing injury to ourselves. If you're are not comfortable around electrical circuits, you should consider letting a trained technician diagnose and correct the problem.

Block Diagram of 12V System Components

The block diagram below is a generic representation of how Heartland connects the key 12V DC components. Heartland has used a number of variations over the years, so your actual configuration may differ.



Note that the output of the Power Converter goes to the fuse box inside the trailer, and to the battery. And the output of the battery goes to the fuse box inside the trailer. Power can flow in both directions. Also note that the battery path goes through a 12V mini-circuit breaker that has a manual reset. If that breaker ever trips, the battery will not get recharged and will not be able to supply power to the fuse box for times where there is no shore power available.

When plugged into shore power, 120V is supplied to the main AC circuit breaker panel inside the RV. One of those circuit breakers supplies power to an outlet, usually found behind the basement wall, into which the Power Converter is plugged.

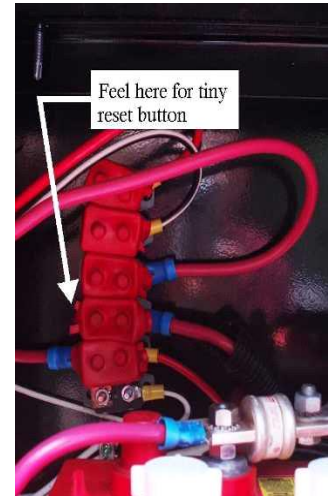
The Power Converter converts 120V AC into 12V DC power to both charge the battery, and to supply power directly to the 12V main Fuse Panel inside the RV.

In order to charge the battery, the output of the Power converter goes through one of the 12V automotive style circuit breakers located on a buss bar near the battery.

The other 12V Circuit Breakers supply power to high current devices like the Hydraulic Pump, Rear Stabilizer Jacks, Power Cord Reel, and electric slide-outs.

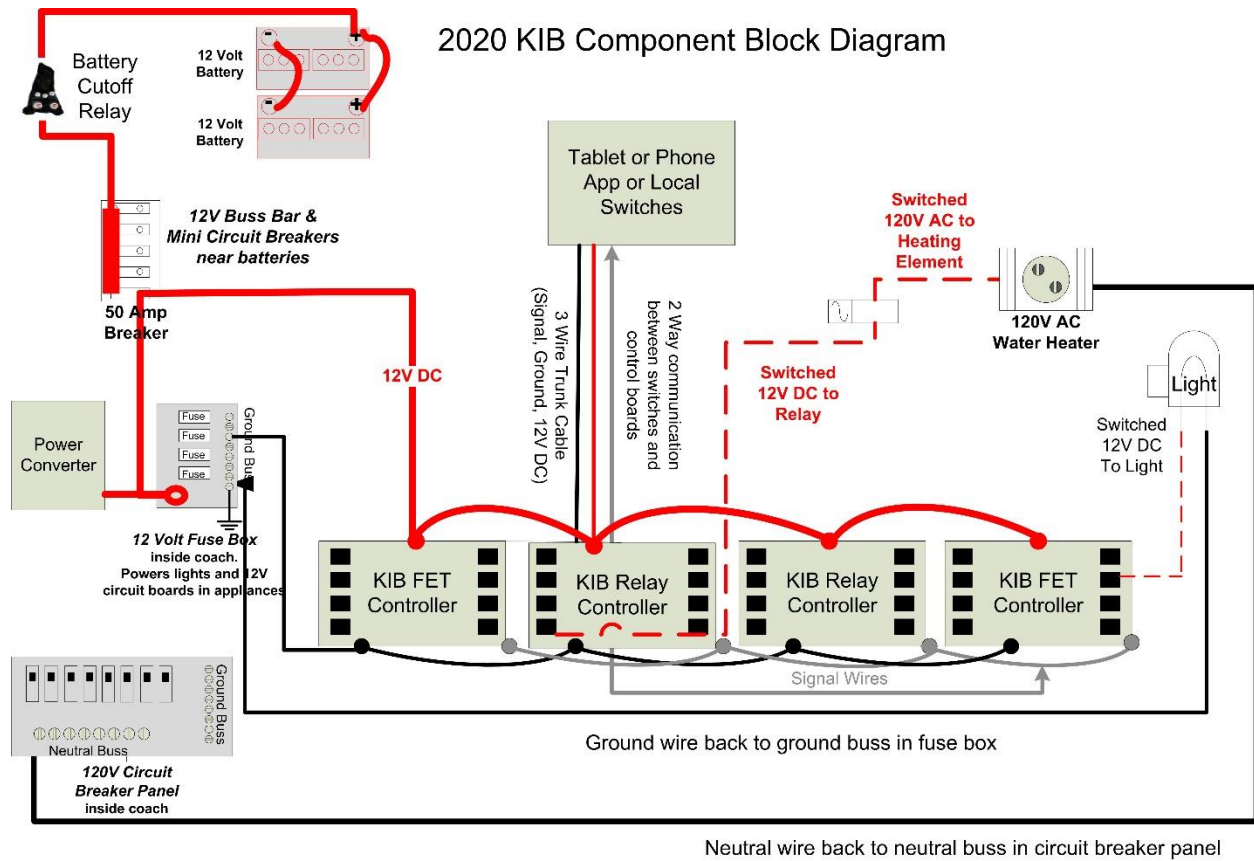
Intermittent tripping of the auto-reset circuit breakers, especially the one for the Hydraulic Pump, may indicate a weak breaker that needs to be replaced. For more information on this type of failure, see our owner-written [Hydraulic Slide Starts and Stops guide](#). The information in that guide applies mainly to hydraulic slides and hydraulic landing gear, but may also be helpful with the same symptoms on electric motor levelup systems.

12V DC configurations vary quite a bit. For example, on late 2020 and 2021 Landmark 365s, much of the 12V power is routed through a set of KIB Control Boards, allowing operation via a touchscreen tablet or a phone app. More information on this configuration may be found in the [Landmark 365 User Guide V30 Mid 2020](#) and in the [KIB Multi-Plex Control System V2 guide](#).



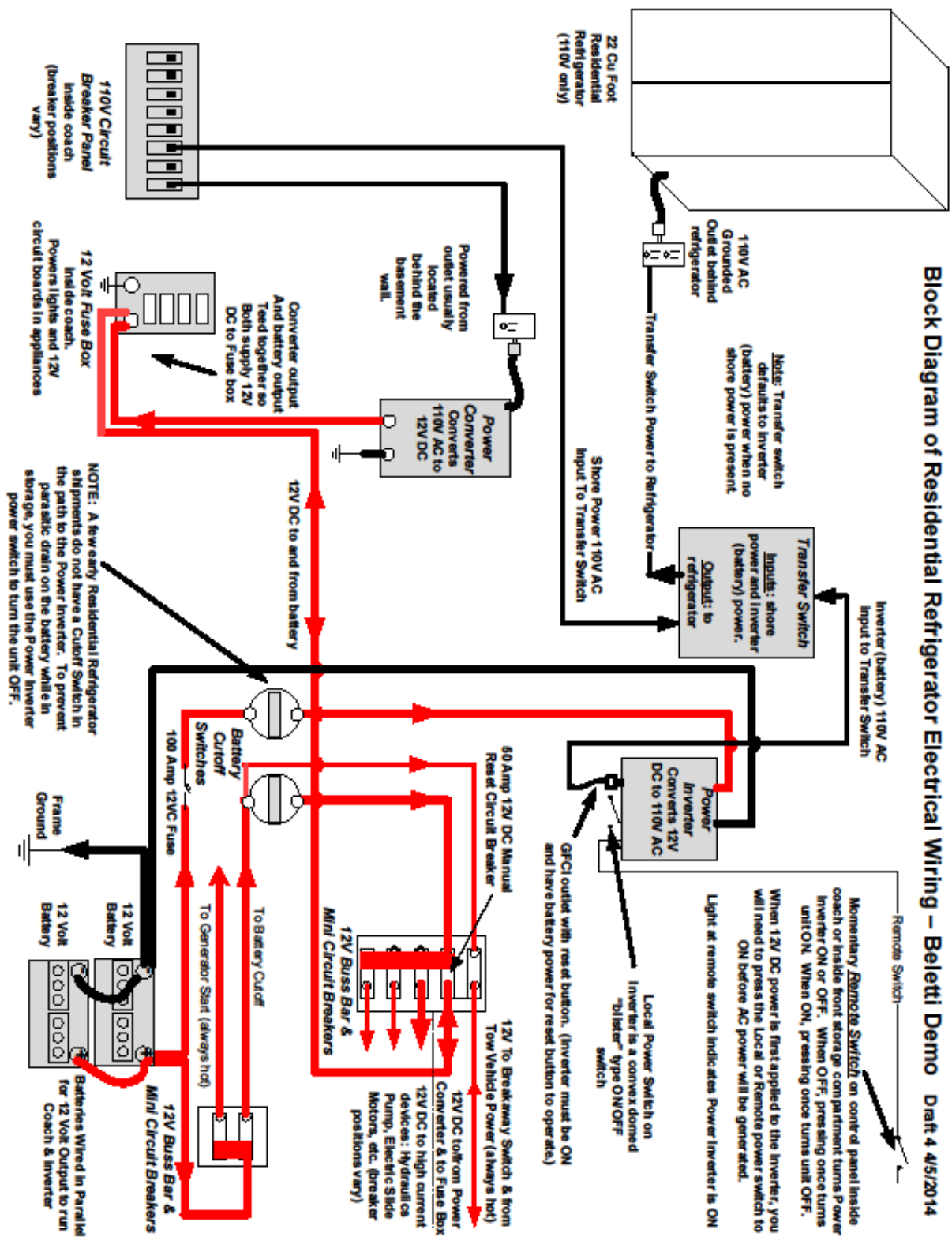
12V Circuit Breakers near the battery.

KIB Control System Block Diagram mid-2020 Landmark 365



12V Block Diagram for Residential Refrigerator

Units with a Residential Refrigerator (120V AC only) employ yet another 12V DC layout as shown below. More information may be found in the [Residential Refrigerator](#) guide.



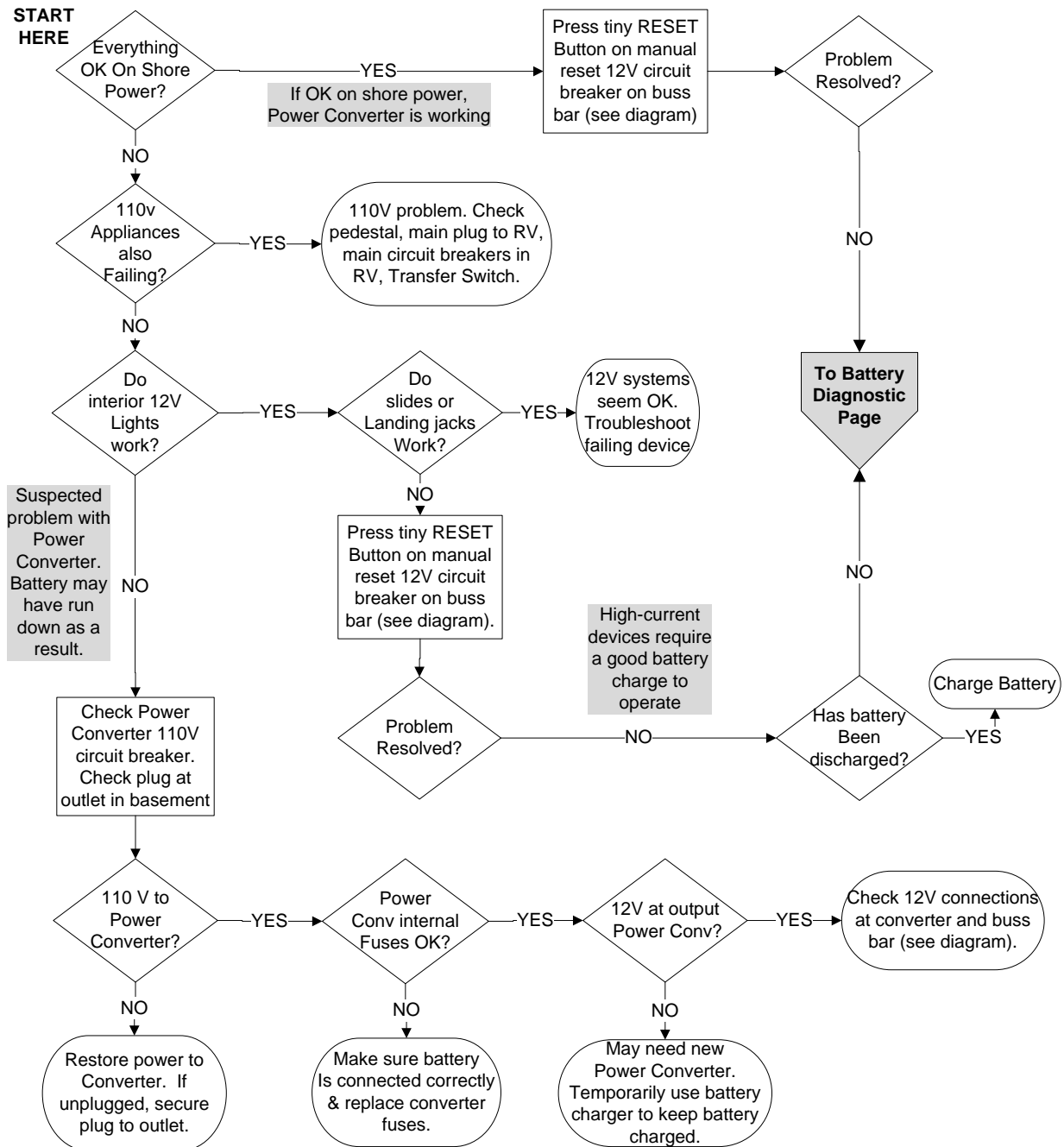
Failure of 12V Lights and other 12V Systems when Shore Power is Disconnected

If the 12V lights and other 12V systems lose battery power after disconnecting from shore power, it's often because the Manual Reset Circuit Breaker on the buss bar near the battery has tripped. If this circuit breaker trips, the battery no longer gets any charge from the power converter and will run down, causing failure of 12V systems. When plugged into shore power, the battery charging problem is masked because 12V power is also supplied by the Power Converter.

Troubleshooting Flow Chart – Start Page

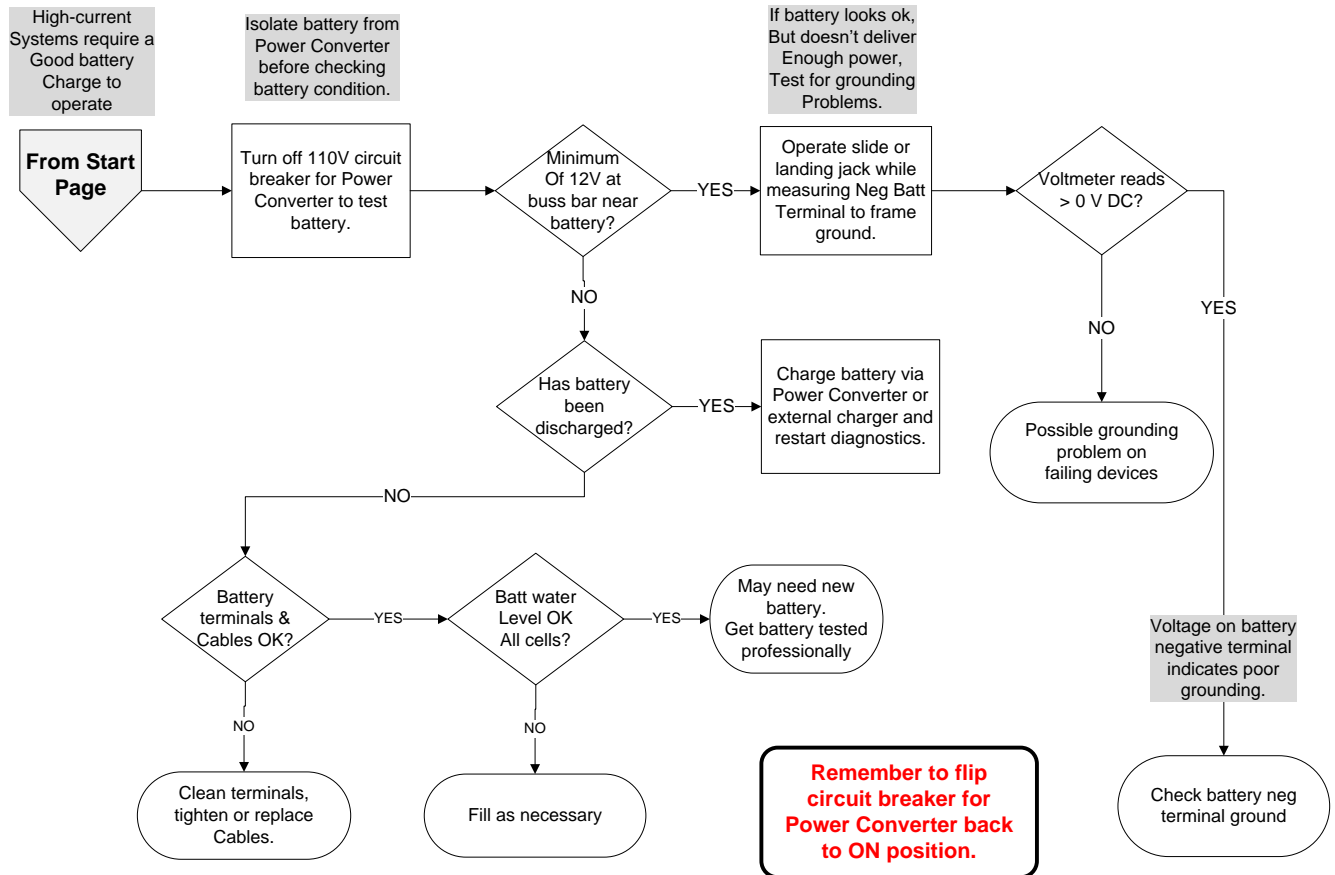
For use when multiple 12V appliances and devices are failing.

BATTERY CUTOFF MUST BE ON, SHORE POWER CONNECTED.



Troubleshooting Flowchart – Battery Diagnosis

BATTERY CUTOFF MUST BE ON, SHORE POWER CONNECTED.



Revision History

February 28, 2013

Version 1 Released

September 14, 2020

Version 2 Released with additional block diagram examples for Landmark 365 and Residential Refrigerator installations.