

Hydraulic Slide Starts and Stops

This guide is intended to assist Heartland Owners in understanding why the Hydraulic Pump may start and stop while operating the slideouts.

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 as a service to the 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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Overview

A common problem with hydraulic slideouts is that when the switch is pressed to extend or retract the slide, movement starts, then stops, then starts, then stops. There may be a few seconds

of delay after a stop before it starts moving again. This guide explains what's happening and how to fix the problem.

Drawings and photos used in this guide are examples that are based on how Heartland built a particular RV at a particular time. Your trailer may have differences from what's shown, but the content here should help you identify the problem on your trailer.

How the Hydraulic Slide Works

When the rocker switch in the control panel is pressed and held to either extend or retract the slide(s), 12V DC power is applied to the motor in the hydraulic pump assembly. The rocker switch also opens or closes a valve to allow hydraulic fluid to flow to the hydraulically operated ram that pushes or pulls the slide.

Power Requirement

The hydraulic system uses hydraulic principles to multiply the force exerted by the pump in order to apply the force necessary to move heavy slides, or to raise and lower a coach that has an auto-leveling system. The pump motor requires a considerable amount of power to do its job, if only for a short time. Large slides may require more power than small slides.

Battery Power is Required to Reliably Operate the Hydraulics

Power to operate the slides needs to be available whether plugged into shore power, or just running from the battery at a rest stop or while boon docking. Even when plugged into shore power, the battery acts as a reservoir to supply the high power demand needed for 10-20 seconds when operating the slide. So the battery condition is critical to correct operation of the slides.

Note that if the battery is not in good condition, the hydraulic pump will try to operate with the amperage supplied by the Power Converter (if plugged into shore power). Hydraulic operation will be marginal and you may have problems.

How Much Power is Needed

For many years Heartland has supplied 12V DC at 50 amps to meet the power needs of the hydraulic pump. Barring problems as noted later in this document, most coaches will work with a 50 amp circuit. It's not unusual for the hydraulic pump to momentarily draw more than 50 amps at peak, but the 50 amp circuit will still usually suffice.

What About 80 Amps?

Beginning in late June 2017, on some larger coaches, Heartland began using an 80 amp circuit. This began on Landmark 365 models in conjunction with use of the KIB Multi-Plex Control System which in some configurations may require more than 50 amps. Heartland may have also started installing 80 amp circuits in Bighorn and Big Country models, and perhaps other large coaches to alleviate some of the problems noted in this document.

Doesn't Lippert Recommend an 80 Amp Circuit?

Lippert leaves it to the trailer manufacturer to determine how much power is required and to install appropriate components.

Several years ago, Lippert released a LIP Sheet (technical advisory) suggesting installation of an 80 amp breaker when having start/stop issues where a 50 amp breaker was tripping. A short time later, the LIP Sheet was withdrawn without explanation.

Some people have upgraded their 50 amp breakers to 80 amp. However, before doing so, you should try to determine why a 50 amp breaker is not sufficient. For example, a mechanical bind or pump problem could be causing the breaker to trip. Moving to a larger breaker might successfully mask the real problem, without fixing it. If the real problem gets worse over time, the situation could become more complicated.

Causes of the Start/Stop Symptom

The hydraulic pump stops if its circuit breaker trips, cutting power to the pump, even though you're still holding the switch. The circuit breaker resets automatically after a few seconds.

In general, the circuit breaker will trip if the number of amps consumed by the pump motor exceeds the rating of the breaker. As an example, a 50 amp, 12V circuit breaker is designed to support a nominal load of up to 600 watts. At 12V, 600 watts = 50 amps. If the pump starts drawing more than 50 amps for some reason, the breaker's internal mechanism heats up until the circuit "trips" or opens, cutting off power. After a few seconds, the internal mechanism cools down and the circuit resets, supplying power once again.

Low Voltage

The power required by the pump can be expressed in watts. If the pump needs 600 watts to operate normally, at a nominal battery voltage of 12.0V DC, that would equal 50 amps, which happens to be the rating of the circuit breaker.

How Many Watts Does the Motor Need to Operate Correctly

The answer to this will vary depending on the size of the motor, and the size of the load on the motor. A 1HP motor at maximum load would draw 764 watts. At 12V, that would be 63.6 amps. The obvious question is, if the pump uses 63.6 amps, how can we expect a 50 amp circuit breaker to handle that load? But just because a motor is rated at 1HP, it doesn't necessarily have to operate at full capability to do its job.

If you have a late model diesel tow vehicle, it probably is capable of developing around 400HP. If you're towing an 18,000 lb. Landmark, you may from time to time be depending on all of that 400HP. But if you are just driving down the highway without your trailer, the engine is not called upon to deliver 400HP of output.

Similarly, when you operate the hydraulic slides, a larger and heavier slide requires more from the motor than does a smaller, lighter slide.

Also, just like pulling your RV from a stop, when the hydraulic pump pulls from a stop, it has to overcome the inertia of the slideout's resting position. And in some cases, the slideout has to be raised a little from its resting position. The additional work effort by the pump at these times requires additional mechanical power. The mechanical power is derived from the electrical power, and is a function of Current * Voltage. At a constant voltage the only thing that can increase is current, or amperage. So when a slide starts moving, it's likely that there is a bit of a spike in the power demand, increasing the amps being pulled. But this is momentary.

Notably, when the slideout reaches the end of its travel, but the switch continues to be depressed, you will hear the pump make a lugging sound. That sound represents the pump in a partial stall because it cannot deliver enough mechanical power to continue moving the slideout. The entire time the motor is lugging, electrical power demand is at a maximum, raising the amperage drawn through the circuit breaker. If you keep the switch depressed long enough, the circuit breaker will trip. This may be a cause of weakened circuit breakers.

Voltage Levels Vary Under Different Conditions

When plugged into shore power, a fully charged battery will actually measure 13.2V DC, because that's the voltage level coming from the Power Converter, to a fully charged battery, when plugged into shore power. When not plugged in, a fully charged battery in good condition will read 12.6V DC. As the battery ages and its condition degrades over time, even when fully charged, it may only measure 12.5 or 12.4V DC. And its ability to provide a sustained power feed to a high wattage device like the hydraulic pump is lessened. So while operating the hydraulic pump, with an aging battery, voltage may start at 12.4V but drop below 12.0V after a few seconds. If plugged into shore power, the Power Converter will help offset this drop. But the Power Converter is not designed to supply continuous power to high demand devices like the hydraulic pump and will only help a little.

Relationship Between Available Voltage and Amps Drawn by the Pump

The higher the voltage at the battery, the fewer amps pulled by the pump, and the less likely that the circuit breaker will trip. At 13.2V DC, a 600 watt power requirement equals 45.45 amps. However, at 12.2V DC, the same 600 watt power requirement equals 49.18 amps. If the voltage on an aging battery drops to 10.0V DC when heavy demand is placed on it by the pump, the 600 watt power requirement goes up to 60 amps. Although the 50 amp breaker doesn't instantly trip when its rating is exceeded, after a few seconds at 60 amps, it will trip.

Obviously, higher voltage is better when it comes to operating the slideouts.

Causes of Low Voltage

Low voltage can be caused by a number of problems.

- A discharged battery – especially in the case where the power from the Power Converter is interrupted. If your battery never reads 13.2 – 13.6V DC, it is not getting recharged by the

Power converter. Consult our owner-written [12V Block Diagram and Diagnostic Guide](#) for help.

- Low water level in the battery (water level should be checked monthly).
- Battery is worn out (trailer deep cycle batteries may last only 2 or 3 years)
- Dirty or corroded connections at the battery terminals don't allow full power to be conducted through the cables.
- Loose connections at the battery terminal, circuit breakers, or at the pump motor don't allow full power to be conducted.
- Loose/poor crimps at the terminals attached to the wires. Wiggling the wires will usually reveal this.
- Poor ground connection to the frame. This could be the battery negative wire, the pump ground wire, or perhaps even the Power Converter ground wire. A close visual inspection is required to determine if the ground connections are inadequate.

Note that upgrading the breaker without correcting a low voltage problem may not alleviate your symptoms.

Weak Breaker

After low voltage problems, a weak breaker is the most common cause of the start/stop symptom.

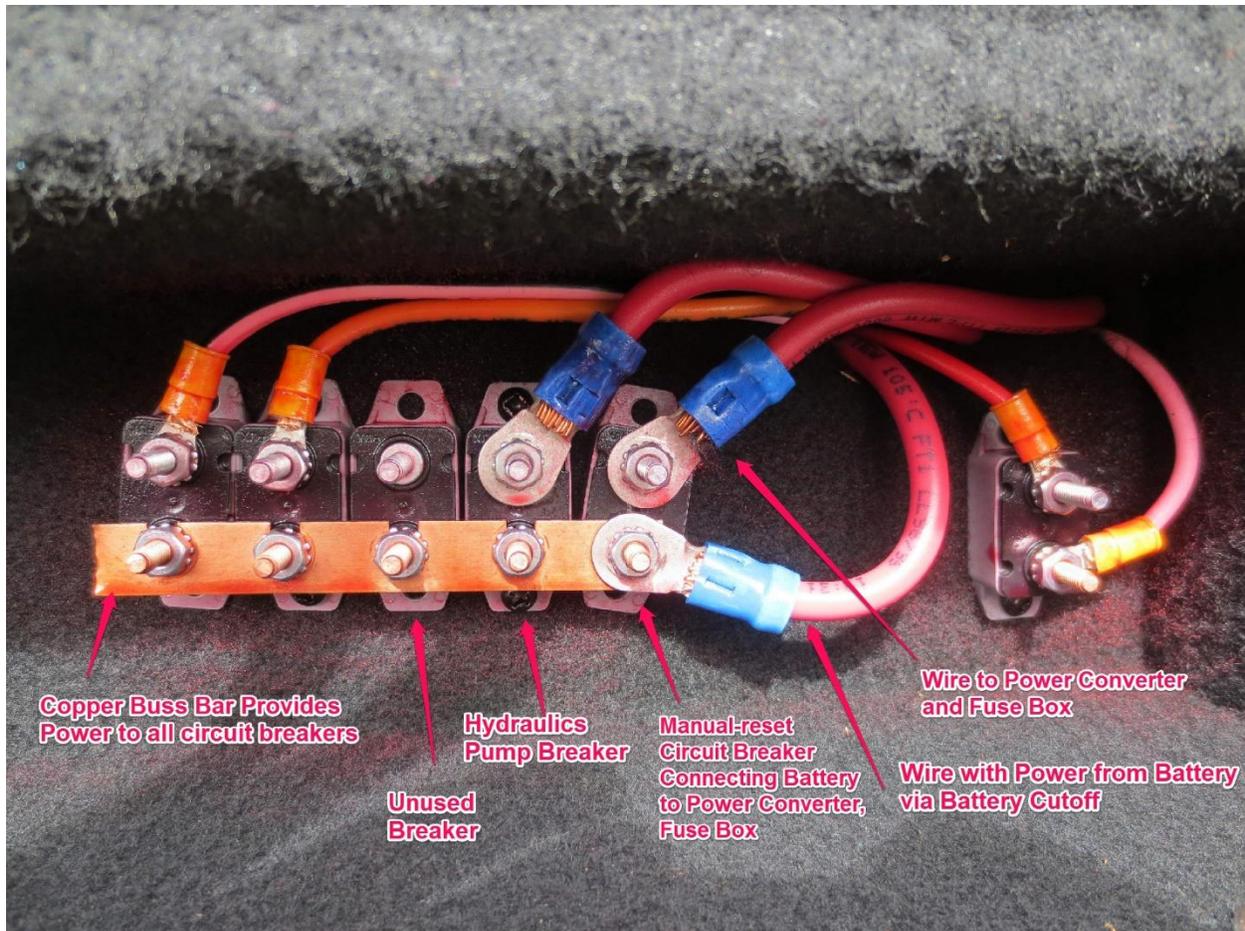
Sometimes the 50 amp circuit breaker gets weak and trips at a lower value than its rating. Once a breaker begins to trip for any reason, perhaps due to a temporary low voltage condition, it degrades and may never operate like it did when new.

Keeping the slideout switch depressed after the slideout is fully extended or retracted may also trip the circuit breaker, causing it to weaken.

A 50 amp circuit breaker may work without tripping, even when the pump draws more than 50 amps at peak. However, the higher the power draw from the pump, and the longer it stays that way, the more likely the breaker will eventually trip and weaken.

Locating the Breaker that Powers the Hydraulics Pump

Replacing the 50 amp breaker is a very simple operation. The hardest part is usually locating the correct breaker. The picture below illustrates a group of 12V mini-circuit breakers with the red rubber boot removed. Note that the arrangement of breakers on your coach may be different.

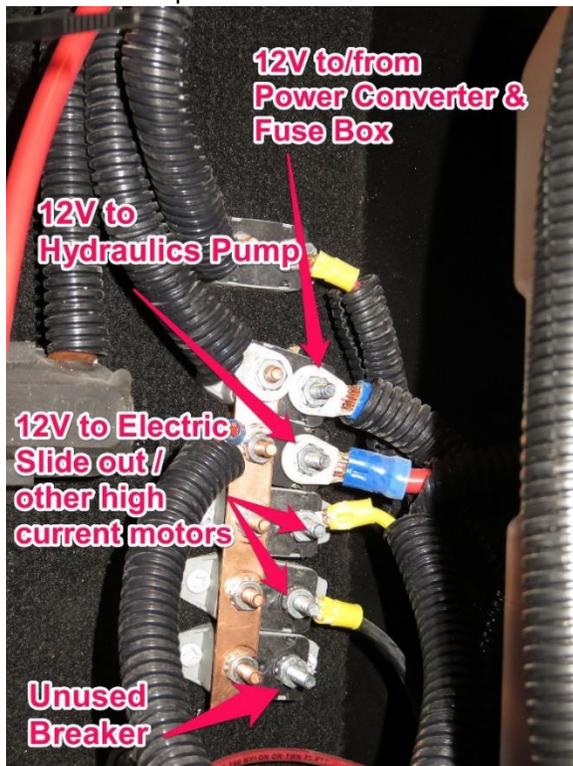


Note on the bottom right, the thick wire coming from the battery. It is connected to the bottom terminal of the right-most breaker with a copper buss bar spanning all of the breakers in order to share the 12V from the battery. Note that the wires on the tops of the breakers are different thicknesses. The thicker wires carry the most power. In this picture, the thick wire on top of the right-most breaker goes to the Power Converter and fuse box inside the coach. The thick wire 2nd to the right goes to the Hydraulic Pump. There typically are only 2 thick wires. One goes to the Power Converter/Fuse Box and the other goes to the Hydraulic Pump. Note that the circuit breaker for the Power Converter/Fuse Box wire is a manual reset breaker with a teeny-tiny reset button on the bottom edge as pictured below.



Manual Reset Breaker with Reset Button

Another example of a row of circuit breakers is shown below.



Mechanical Bind

It's unusual and fairly rare to have a mechanical bind in the slide or landing gear mechanism. However, if dirt or grit accumulates on the ram or on the gear pack under the slide, it is possible that it may cause the pump to draw more power than normal, tripping the breaker. Slide components may need to be maintained on occasion. The following direction is from a Lippert Slideout Manual.

The Lippert Through Frame Slideout System has been static tested to over 4,000 continuous cycles without any noticeable wear to rotating or sliding parts. It is recommended that when operating in harsh environments (road salt, ice build up, etc.) the moving parts be kept clean. They can be washed with mild soap and water. No grease or lubrication is necessary and in some situations may be detrimental to the environment and long term dependability of the system.

Some people use a dry lube on the gear packs under the slide. Unlike oil and grease, dry lube will not attract dirt.

NOTE: If the start/stop symptom occurs when operating more than 1 slideout, or also when operating landing gear or auto-leveling, the cause is probably not a mechanical bind in a slide mechanism.

Replacing a Weak Breaker

A Bussman 12-24V 50 amp Auto Reset mini-circuit breaker can usually be obtained from auto or boating parts stores, from Amazon.com, or from a local RV dealer parts department. Look for a breaker that is the same form factor so it fits on the buss bar. They usually cost about \$10.

The breaker is held in place by 2 screws and by the terminal connections. The nuts on the terminals are usually 5/16". The screws are likely to require a #2 Square Bit.

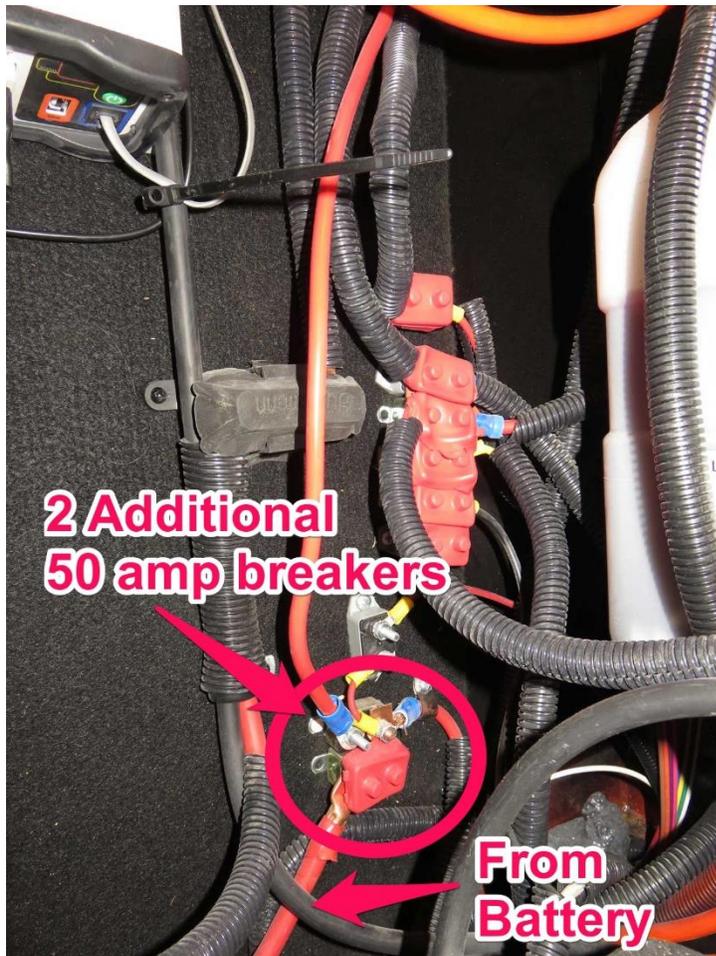
Replacement Procedure

It's a good practice to turn off power to the buss bar before removing the breaker. Turning the Battery Cutoff Switch to OFF will cut power coming to the buss bar from the battery. You'll also need to cut power coming from the Power Converter. This can be done by either disconnecting from shore power, or by turning off the Power Converter's circuit breaker in the main panel in the coach.

- Remove the nut and carefully disconnect the wire going to the Hydraulic Pump.
- Loosen the nut holding the copper buss bar. If there's a slot in the buss bar, it won't be necessary to remove the nut. The breaker can be slid away from the buss bar.
- Remove the 2 screws holding the breaker.
- Slide the breaker out and slide the new breaker into place.
- Reconnect wires, tighten nuts, replace screws.
- Restore power and check operation.

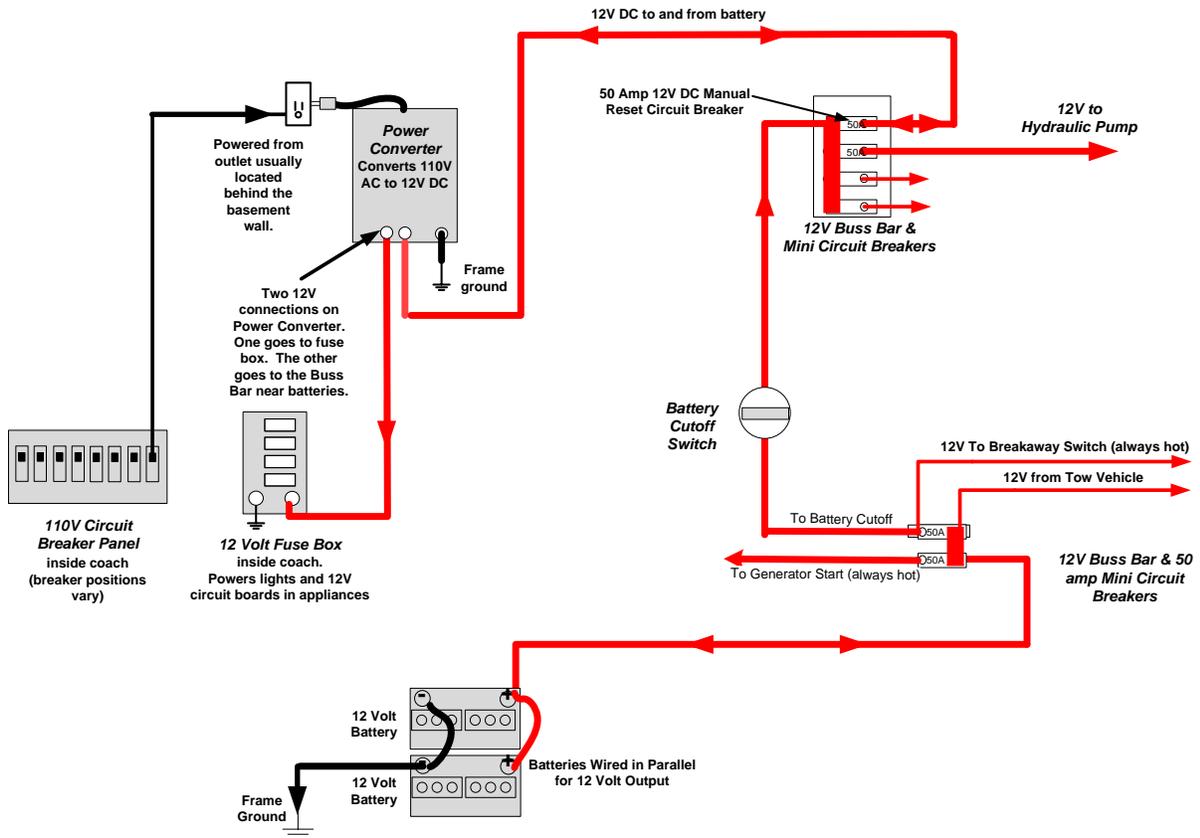
Other 50 Amp Breakers in the Circuit

It's possible that your coach could have additional 50 amp breakers in the path from battery to Hydraulic Pump. In some cases there may be 1 or 2 breakers closer to the battery as shown below. Any of these breakers may become weak and be the cause of the start/stop symptom. Unfortunately, there's no convenient way to determine which is causing the problem. Considering the low cost of breakers, it may be simplest to replace all the 50 amp breakers in the circuit.



Block Diagram of Power to Hydraulic Pump

Block Diagram of Hydraulic Pump Electrical Wiring 11/12/2017
(note that breaker positions vary)



Revision History

November 16, 2017 Initial Release

November 24, 2017 V1.1 Expanded discussion on power requirements