

KIB Multi-plex Control System

This guide is intended to assist Heartland Owners in understanding and operating the KIB Multi-plex Lighting and Control System when so equipped on the Landmark product, starting with units produced in the January 2017 timeframe.

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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Contact Information

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Overview

Heartland has partnered with KIB Electronics to introduce an intelligent lighting and device control system with new capabilities. The system uses simplified control wiring along with a message passing system that allows redundant controls to be located in various parts of the coach without the complexity of 3-way wiring. The control system is capable of operating a variety of lights and devices and includes dimming capability for LED lights, and status indicators to show when a device is ON.

From a user perspective, the heart of the system is the Convenience Control Panel, along with several other point-of-use switch panels located in various parts of the coach.



Operation

KIB Multi-plex system controllable loads (electrical devices) have switches located on the main Convenience Control Panel which is located in the living area. Additionally, some loads (typically lighting) may have smaller point-of-use located switch panels. These additional switch panel locations are often in the living room slide, on the rear wall, in the bedroom and bathroom.

LED Lighting

Pressing a switch momentarily turns the light or other device ON, or if it's already ON, a press will turn it OFF. In the case of LED lighting, when a light is off, depressing and holding the switch will activate the dimmer circuitry allowing you to set the desired light level.

M-Plex Master Off

The M-Plex Master Off switch turns off all lights with a single press, leaving only the floor-level night lights illuminated (if they were previously turned ON using the night light switches). This allows you to turn off all lights with a single button press when leaving the coach. Similarly, if there is a "point of use" switch in the bedroom, all lights can be turned off with a single button press when retiring for the night.

Water Pump Switches

The Water Pump switch on the Convenience Control Panel powers up the water pump. An additional convenience switch is located in the Universal Docking Center (UDC). The UDC switch sends a ground signal to the control board to toggle the operation of the water pump. If OFF, it will toggle ON. If ON, it will toggle OFF.

Water Heater Switches

The water heater can be operated by pressing either the 12V Water Heater button, or the 120V Water Heater button, or both, for faster recovery time. Note that the 12V Water Heater function operates the water heater using propane to heat the water while the 120V function uses only electric. Before using the 120V function, to avoid burning out the electric heating element, be sure there is water in the water heater tank. [The Water Heater Usage Guide](#) provides additional information.

Just above the two water heater switches is an LED marked "DSI Fault". This will illuminate if the 12V function fails to successfully ignite the propane.

Generator Switches

To start the generator, press the GENERATOR STOP/PRIME button first to prime the generator with fuel. Then press the GENERATOR START button to start the unit. While the starter cranks, the light will flash.

While the generator is running, pressing the GENERATOR STOP/PRIME button again will stop it.

Systems Monitor

Touching the systems monitor screen turns on a display of holding tank levels.



A second press displays the battery charge level. Note that if plugged into shore power, the battery voltage indication will usually be showing the output of the Power Converter.

Additional and Point-of-Use Switches

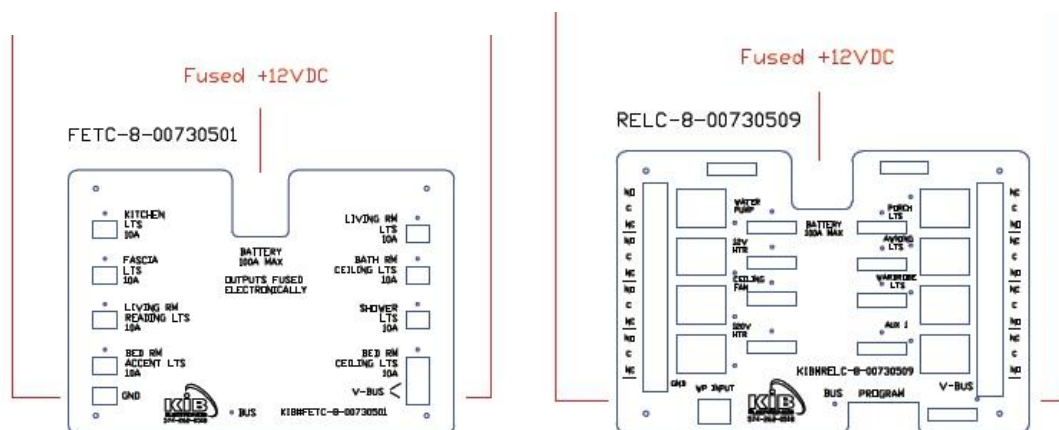
Additional and point-of-use switches may be located around the coach for convenience. For example, in the living room slide, the rear wall, the bedroom, and the bathroom. One or more of these additional switch panels may include another M-Plex Master Off switch.

How the Multi-plex Control System Works

The control system consists of switch panels and control boards. A simple 3-wire trunk cable connects the switches and the control boards, allowing the switches to send messages to the control boards, and to receive feedback. Messages and feedback travel on one of the three wires in the trunk cable. The other two wires carry 12 Volt DC power and ground for the switch panels.

With the KIB Multi-plex System, the switching is electronically controlled rather than being mechanical, and is activated indirectly by the lighted switch panels when the switch sends a message to a control board.

The large Convenience Switch Panel shown above is typically located in the living area with additional, smaller point-of-use switch panels located around the coach. The various control boards are located behind the wall, generally somewhere near the Convenience Switch Panel. There may be one or two 8-device Field Effect Transistor (FET) controllers along with an 8-device Relay controller, and a 2-device Relay controller for the generator.



Drawings used with permission from KIB.

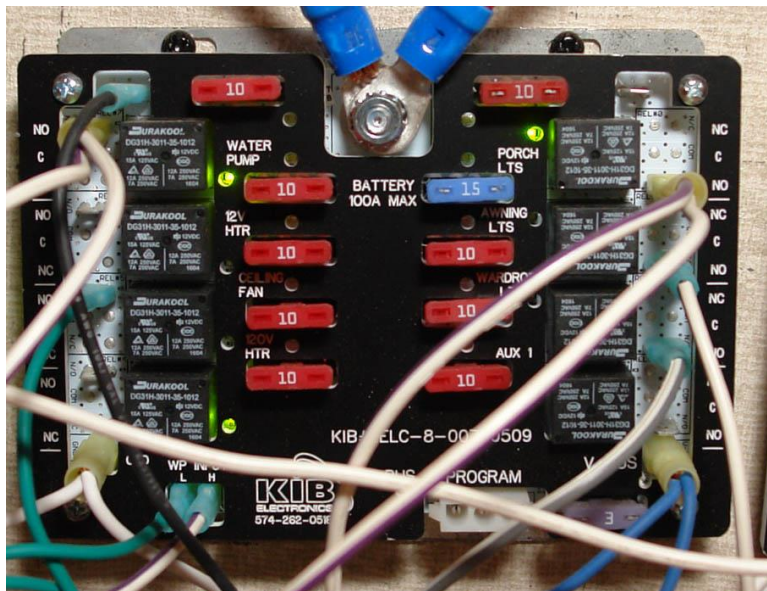
Wiring of Switches, Controllers, and Devices

12V DC Wiring

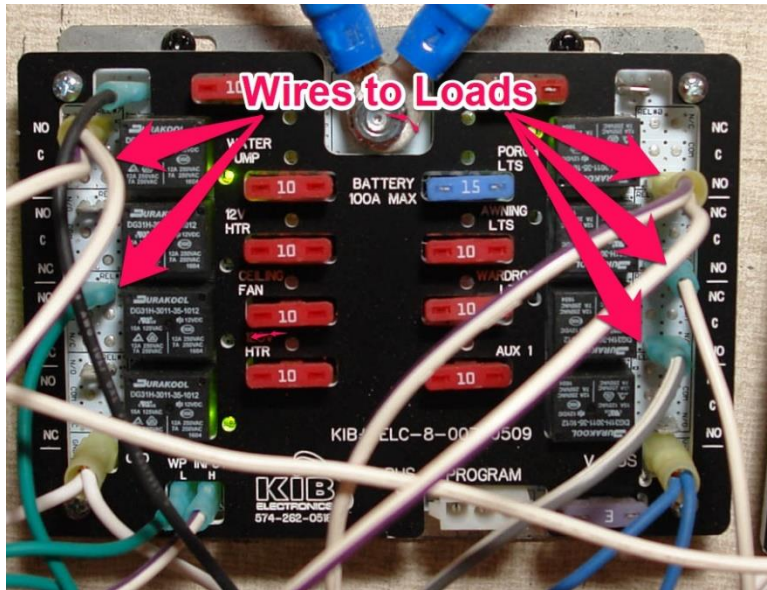
Power for 12V DC lights and other 12V devices managed by the KIB Multi-plex System comes directly from the batteries to the KIB Controllers, bypassing the main fuse box inside the coach. A single power circuit provides 12V DC to all the controlled devices. The KIB control boards have their own on-board fuses.

120V AC Wiring

Power for 120V AC devices including the electric heating element for the water heater, and the ceiling fan, comes from the main circuit breaker panel inside the coach and is switched at relays controlled by 12V DC managed at the KIB control boards. Beginning with units manufactured in June 2017, the water heater relay is located on the water heater. On earlier units, the relays for the water heater, ceiling fan, and for the tank heating pads (Yeti Option) are located in a metal junction box near the main circuit breaker panel.



KIB Relay Control Board



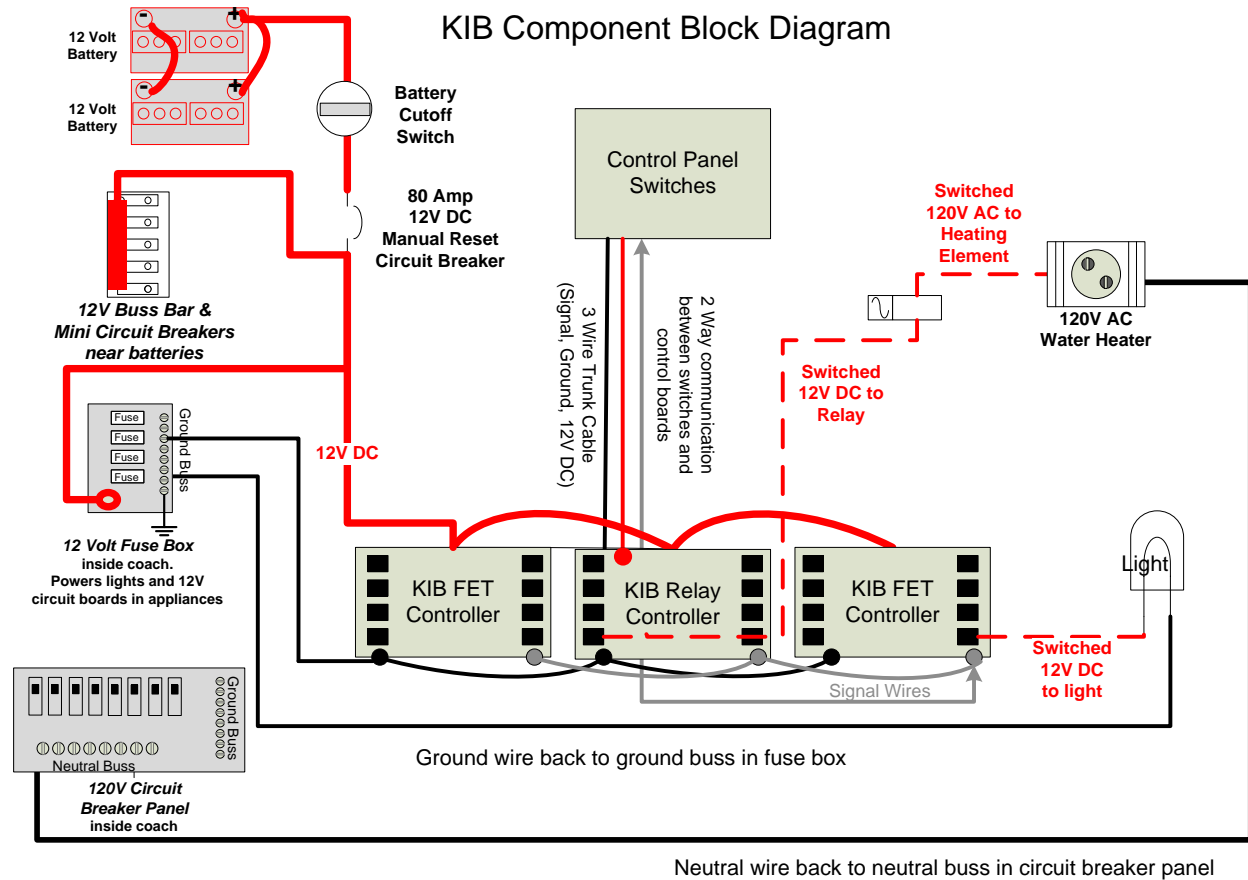
Generator Controls

The generator can be primed and started, and stopped, from switches on the KIB Multi-plex Convenience Switch Panel, as described above. The switches communicate with a module that signals the generator, which is where the start relay and priming circuitry are located. The generator control module is located behind the wall near the Convenience Switch Panel.



KIB Generator Control Module

Block Diagram of Major Components and Connections



The switches and controllers are programmed with specific identifiers and functions. The switch sends a message on the trunk that connects the switches and controllers. When a control board sees a message with its ID, it responds appropriately by sending power through one of the board's controller ports. Redundant point-of-use switches provided by Heartland send messages that are received and acted upon by the same controller port. The controller will respond to a message sent by either switch.

Controller Power and Ground Wiring

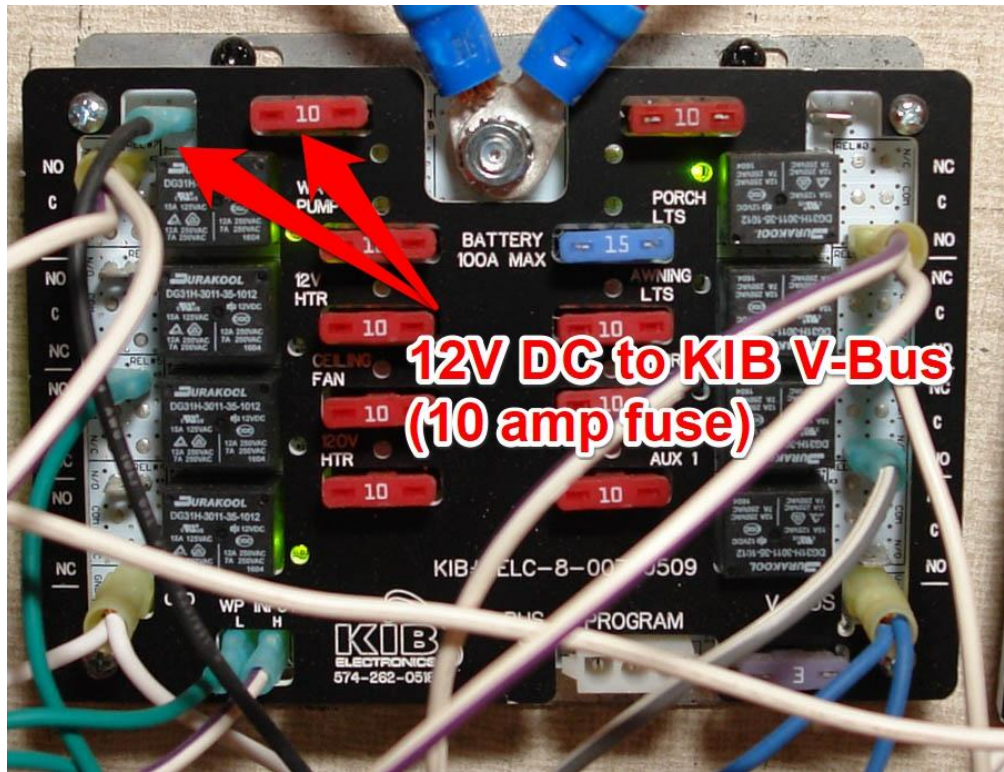
The controller boards are powered from an 80 amp 12V DC manual-reset circuit breaker near the batteries (after the battery cutoff switch).



Each controller's ground connection is to frame ground by way of the KIB V-Bus trunk wiring. Beginning with builds in early June 2017, the 80 amp manual-reset breaker also powers the 12V DC buss bar, the main fuse box inside the coach, and the hydraulic pump.

KIB V-Bus and Switch Panel Power and Ground

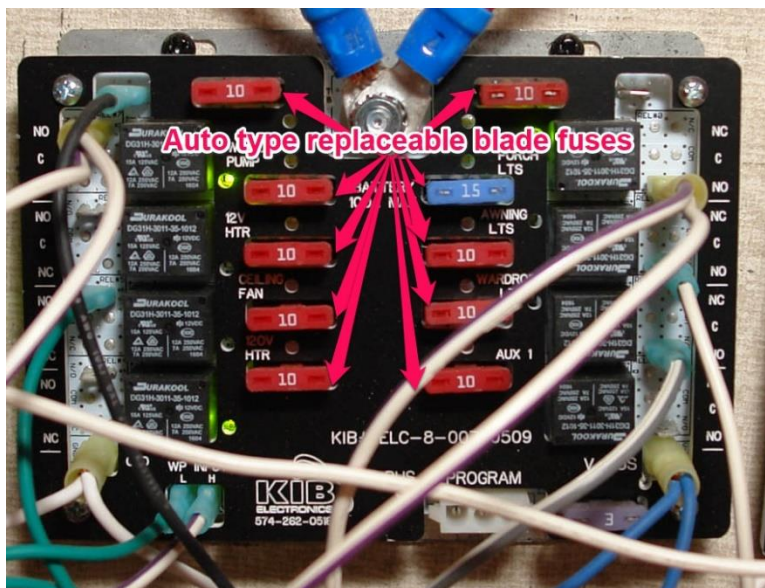
The Convenience Switch Panel and other switch plates get their 12V DC and ground from connections on the control boards, by way of a 3 wire cable that is called the V-Bus.



Troubleshooting and Repair

Fuses and Circuit Breakers

The KIB Multi-plex system depends on an 80 amp manual-reset 12V DC circuit breaker near the batteries to provide power to the KIB components and to operate the controlled devices. A 10 amp fuse on the KIB Relay Control Board (shown above) provides power to the KIB V-Bus and to the Convenience Switch Panel and other switch plates. There are ten 10-15 amp automotive style blade fuses located on the relay control board to protect against short circuits or overloads on the supported devices. The FET control boards use electronic circuit breakers that automatically reset.



What to Check if the Entire System Is Not Powering Up

If the entire system is not powering up, first make sure your coach batteries are charged and the battery cutoff switch is ON. There is a small 12V DC 50 amp manual reset circuit breaker between the Power Converter and the batteries that can trip, preventing the batteries from getting recharged. If the batteries are ok, next check the 80 amp circuit breaker near the batteries. Finally, check the 10 amp fuse on the KIB Relay Control Board.

What Happens If the Power Converter is Not Working, or the Electrical Path is Interrupted

A manual reset 12V DC mini-circuit breaker connects the electrical path between Power Converter and batteries.



If that breaker is tripped, the KIB system will be completely dependent on power from the batteries. The same is true if the Power Converter fails.

When that breaker is tripped, if the batteries are removed from the coach, or the battery cutoff switch is OFF, or the batteries are depleted, the KIB system will be completely down. If the batteries are depleted, connecting the tow vehicle to the trailer will re-charge the batteries and once minimum power levels are restored, the KIB system operation should be restored.

Partial Failures

Green Status LED Light is ON, but device doesn't function

If a single device fails to operate, but the device's green status LED light on the convenience switch panel or on the smaller switch plate illuminates normally, the most likely cause is a problem with the device, or with power getting to the device. It could also be a problem with wiring or connections at the controller.

Check power at the device itself. If power is present at the device, the problem is internal to the device, or perhaps a problem with the ground wiring.

If there is no power at the device, the next step would be to examine the controller. To locate the controller, you may have to call Heartland Customer Service at 877-262-8032 / 574-262-8030. Have your VIN # ready.

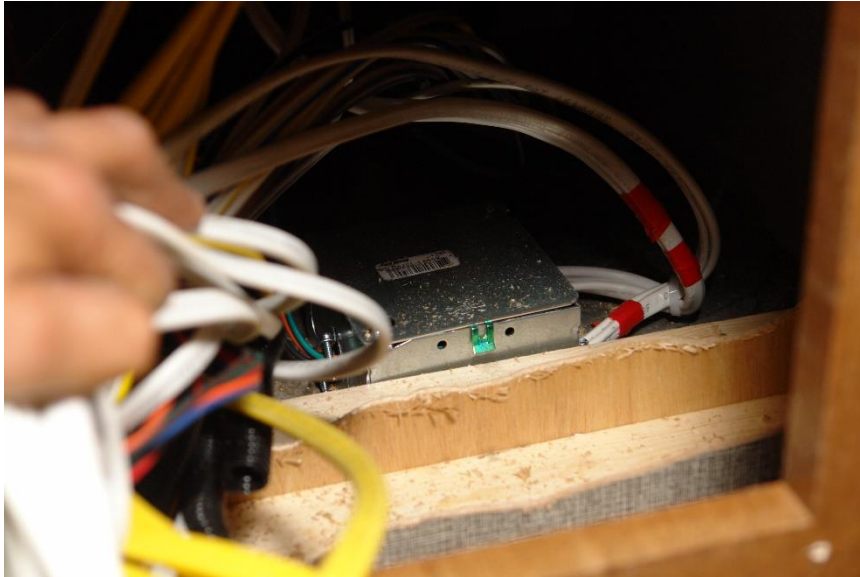
When you use the switch to turn on the device, and look at the control board outputs, the one labeled the same (or similar) to the switch label should have a green LED illuminated. If not illuminated, but the switch LED is illuminated, there may be a malfunction on the controller.

If the controller LED is illuminated, but there is a 0V reading at the controller output, there may be a malfunction on the controller. On the relay controller, if the device is switched ON and the LED is illuminated, the on-board fuse may be blown.

If the controller LED is illuminated, and there is 12V DC at the controller output, you may have a break in the wiring between controller and device. You'll want to check for junction boxes and other locations where there may be wire connections.

Ceiling Fan or 120V AC Water Heater Failure

The ceiling fan and 120V AC water heater element are operated by the 12V DC circuits on the KIB Relay Control Board. There is a junction box usually located behind and close to the main circuit breaker panel that contains those relays, and the relay for the optional holding tank heating pads (part of the Yeti Option). On builds beginning in June 2017, the relay for the water heater is on the water heater itself.



Green Status LED flashes on the Switch Plate

The output is shorted to ground or has an overcurrent condition. Locate the controller and unplug the connector from the appropriate port of the controller. Use the switch panel to turn on the device again. If the status LED on the switch panel illuminates normally, you probably have a shorted wire between the controller and the device. If the LED on the switch panel continues to flash, you probably have a malfunction on the controller.

Temporary Workarounds

If you have a single switch malfunction, it may be possible to use another switch to temporarily control the device that isn't operating. For example, if the Kitchen Lights switch fails, you may be able to go to the controller for the kitchen lights, move the kitchen light wire from its normal position on the controller to the position for the fascia lights. Then you could use the Fascia Lights switch to operate the kitchen lights. Movement of wires must only be to a controller port on the same board, with the same fuse rating and output. And of course, movement is limited by how much slack is in the wiring.

Customizing the Control System

Adding Additional Devices or Additional Controllers

Because each switch and controller port must be programmed with unique IDs and command functions, it's not possible to extend the system by adding new devices or additional controllers, beyond what Heartland offers.

Revision History

09/22/2017 Initial Release