

# 1 System Overview Diagram

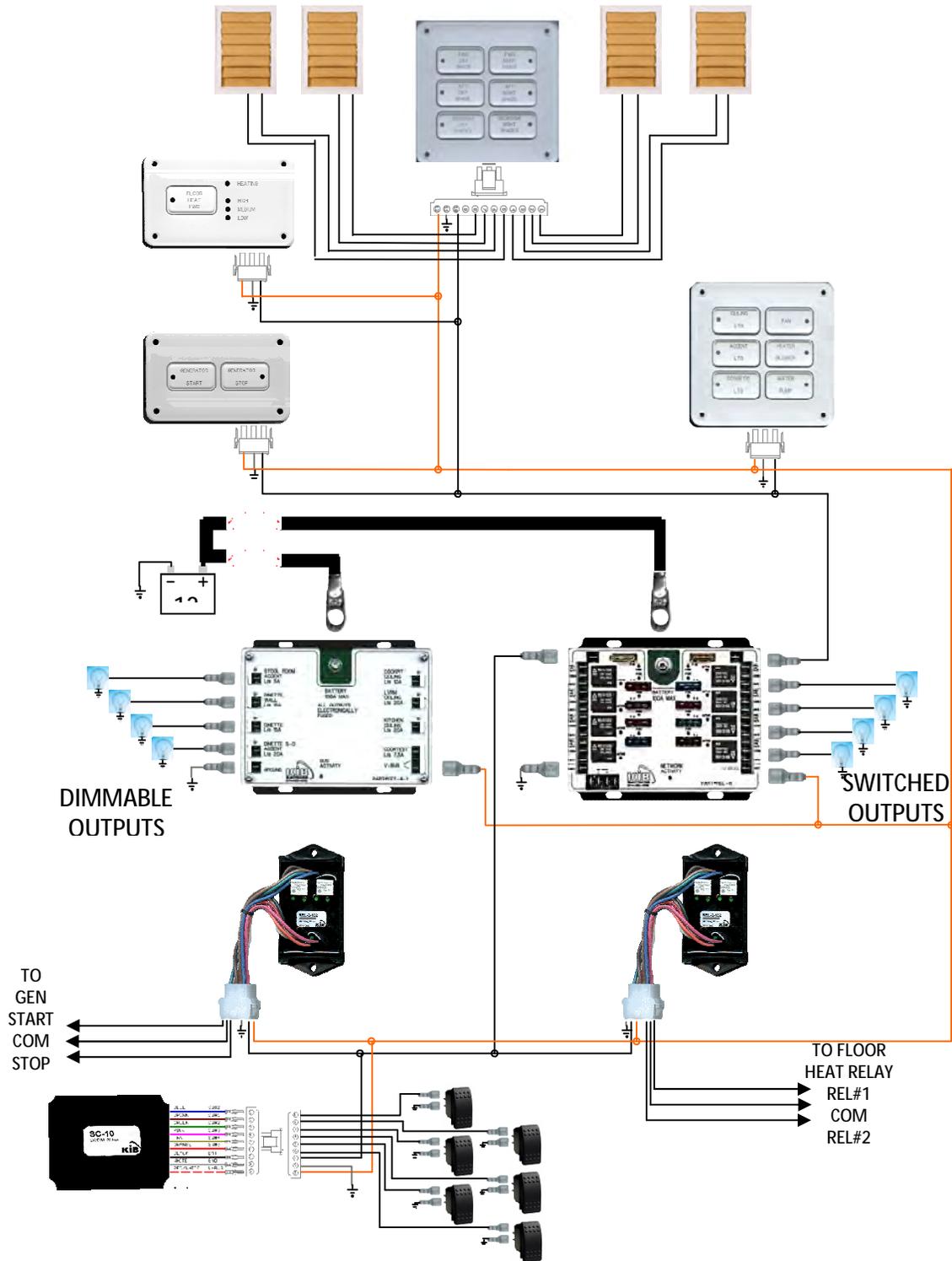


Figure 1.1

## 1.1 System Overview

V-Bus is a single wire communication designed by KIB Electronics Inc. V-Bus offers benefits such as single wire communication, wire reduction, wire diagram simplification, easy installation, and total system control from a single point, which shortens trouble shooting time.

There are many boards that make up the V-Bus system.

Section	Product Description
1	System Overview
2	FET-8 (Eight outputs FET controlled)
3	REL-8 (Eight outputs RELAY controlled)
4	REL-2 (Two outputs RELAY controlled dry contacts only)
5	SPBL-1, 2, 3, 4, 5, 6 (Switch Plate Back lit 1-6 switches)
6	SPBLSC-1, 2, 3, 4, 5, 6 (Switch Plate Back lit w/Shade Control 1-6 switches)
7	SPBLFH-1 (Switch Plate Back lit Floor Heat 1 switch)
8	SC-10-21 (Switch Controller 10 inputs max)
9	SWSTC-8 (Switch Controller 8 inputs max)
10	FET-2 & DTMFET-2 (Two outputs FET controlled)

Chart 1.2

## 1.2 System Electrical Specifications

All voltages are with respect to ground unless otherwise noted.

Typical values noted reflect the assumed parameters of  $T_a=25^{\circ}\text{C}$  and voltage of 12VDC.

The following is a single board description unless noted otherwise.

Characteristic	Min	Typ	Max	Unit
Operating Voltage Range Fully Operational	7	12	16.5	V
Micro Controller clock		8		MHz
V-Bus Communication clock (1)		7.812		KHz
V-Bus Control Voltage	6.25	6.9	8	V
V-Bus Operational Current V-BUS Load = $257\Omega$ and $3.6\text{nF}$ (2)		22.4	32	mA
V-Bus shorted	60	129	170	mA

Chart 1.3

**Note:** Do not exceed maximum values or damage to the components could occur.

1. The V-Bus uses Variable Pulse Width Modulation (VPWM).
2. This is with 38 V-Bus boards connected in a system, if more than 38 V-Bus boards are required please contact KIB for a load resistance change per board.

## 2 FET-8

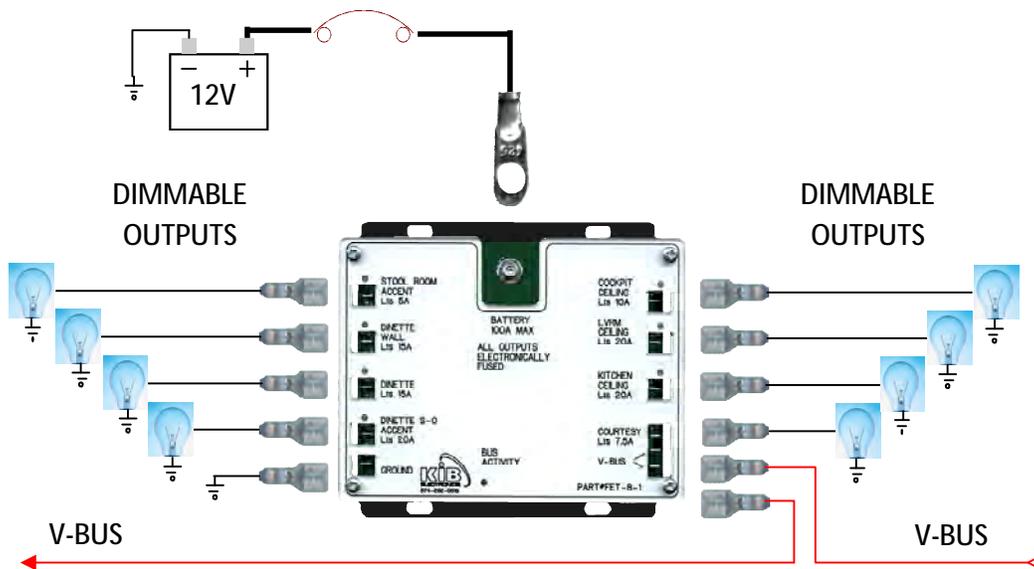


Figure 2.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 2.1 Tool Requirements

- 7/16" Socket
- 7/16" Wrench
- Philips screw driver

### 2.2 Overview

The FET-8 has eight outputs that are FET controlled. The FET outputs are capable of different settings such as PWM dimming, electronic fusing, over and under voltage, and internal temperature protection. The FET-8 board is powered from a single power lug that is fused by the manufacture near the batteries. The ground wire has less than 1 Amp flowing through it at any given time, therefore is a small gauge wire.

Please see Chart 2.2 for output configuration and assignment.

## 2.3 Trouble shooting guide

Problem	Possible Causes	Possible Solutions
When the switch is pressed the green status LED flashes on the switch plate	The output is shorted to ground or has an Overcurrent condition	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Unplug the load from the FET-8 and try to turn on again</li> <li>2. If status LED on switch plate turns on, possibly short to ground or an overload in wire</li> <li>3. If status LED on switch plate still flashes call for service</li> </ol>
When the switch is pressed the green status LED does nothing on the switch plate	The FET-8 has no power or ground has become disconnected	<p>Use a test light or multi-meter and check power and ground going to the FET-8:</p> <ul style="list-style-type: none"> <li>- If voltage is not present check fuse feeding board, call RV Manufacturer for fuse location</li> <li>- If ground is not present run new ground wire</li> </ul>
	The communication wire has become disconnected from the switch board	<p>Try another switch plate that would control another output on the same FET-8:</p> <ul style="list-style-type: none"> <li>- If another output functions then it must be the communication wire going to the switch plate that is not working.</li> <li>- If another switch plate does not function proceed to next problem</li> </ul>
	The communication wire has become disconnected from the FET-8 board	If other FET-8 boards are working run a new communication wire to the FET-8 board
	The entire communications has become short to ground or power	<p>Turn battery disconnect off!</p> <p>Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground</p>
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	Wiring that is plugged into the FET-8 has become disconnected	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Turn output on using the switch</li> <li>2. Look for a green LED to light on the FET-8 board next to the output, if not lit call RV Manufacturer with information</li> <li>3. If LED is lit use a multi-meter and measure voltage <ul style="list-style-type: none"> <li>- if it reads 0V the board could be defective call RV Manufacturer with information</li> <li>- if it reads 12V then the problem is the RV wiring after the FET-8</li> </ul> </li> </ol>
Everything works correctly for awhile and then the entire FET-8 powers down and will not power backup for awhile	The breaker feeding the board is either undersized, defective, or a system overload is occurring	Using a current clamp meter measure the current going through the power wire feeding the FET-8 board then call RV Manufacturer with information
A single output works correctly for awhile and then the status LED on the switch plate flashed and the output shuts off	Output are FET driven and it is possible that a single FET could shutdown from overheating	Using a current clamp meter check current going to every output and compare to current ratings on panel, the current should not exceed 80% of the rated fused value continuously, call RV Manufacturer with information
When a switch is pressed the wrong outputs turn on	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information
	Outputs are wired incorrectly	Swap output wiring until correct

## 2.4 FET-8 CONTROL BOARDS OUTPUT OVERVIEW

Output Labeling	Board	Output	Fused AMPS	FUSE SPEED
COCKPIT CEILING	FET-8-1	0	10	400mS
LVRM CEILING	FET-8-1	1	20	400mS
KITCHEN CEILING #1	FET-8-1	2	20	400mS
COURTESY	FET-8-1	3	10	500mS
KIT/LVRM CEILING #2	FET-8-1	4	20	400mS
DINETTE	FET-8-1	5	15	400mS
DINETTE WALL	FET-8-1	6	15	400mS
STOOL RM ACCENT	FET-8-1	7	7	400mS
KITCHEN S-O ACCENT	FET-8-2	0	20	400mS
KITCHEN S-O SEATING	FET-8-2	1	10	400mS
KITCHEN S-O WALL	FET-8-2	2	15	400mS
KITCHEN OVHS	FET-8-2	3	15	400mS
HALL	FET-8-2	4	15	400mS
DINETTE S-O ACCENT	FET-8-2	5	20	500mS
BED AFT READING	FET-8-2	6	7	400mS
BATHROOM S-O ACCENT	FET-8-2	7	10	500mS
BEDROOM CEILING	FET-8-3	0	20	400mS
BED FWD READING	FET-8-3	1	10	400mS
BEDROOM ACCENT	FET-8-3	2	20	600mS
DRESSER OVHS	FET-8-3	3	10	400mS
STOOL ROOM CEILING	FET-8-3	4	7	400mS
STOOL ROOM COSMETIC	FET-8-3	5	10	400mS
BATHROOM CEILING	FET-8-3	6	15	400mS
BATHROOM COSMETIC	FET-8-3	7	10	400mS

Chart 2.2

### 3 REL-8

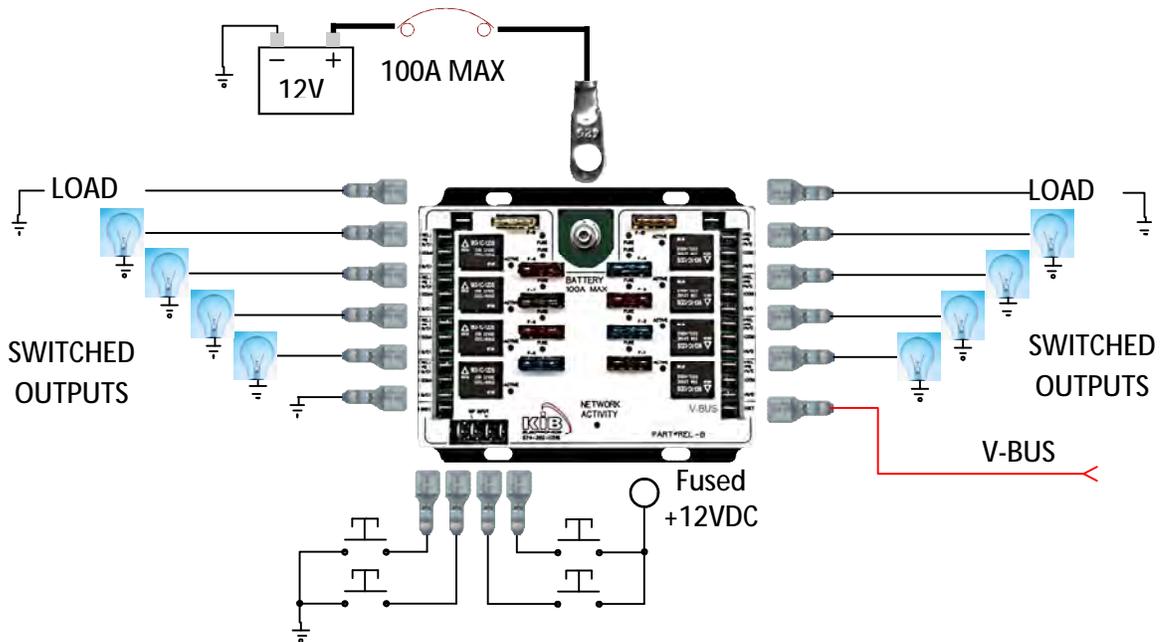


Figure 3.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer’s end product labeling or wiring.

#### 3.1 Tool Requirements

- 7/16” Socket
- 7/16” Wrench
- Philips screw driver

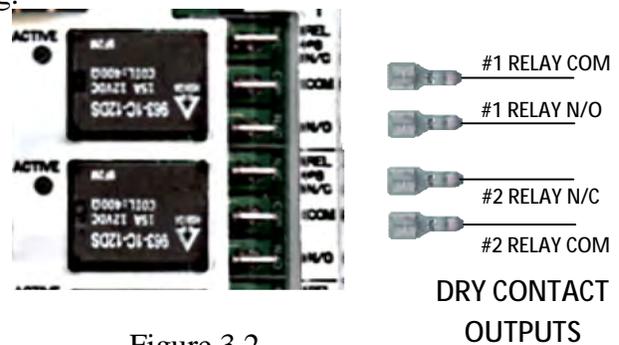


Figure 3.2

#### 3.2 Overview

The REL-8 has eight outputs that are RELAY controlled. The REL-8 is straight forward in design, the relays are either ON or OFF. The relays then have the option to be a fused output or can be used as a dry contact (see Fig 3.2) to control other devices outside the V-Bus system. The REL-8 board controls Fantastic Vent fans, pump switch, and 12VDC heaters. The REL-8 also has inputs that are used for sensing whether the device it is controlling is either on or off. In the case of the water pump the status LED on the switch plate will not light until the water pump running status line has gone high. Then this wire is fed into one of the REL-8 inputs and the REL-8 reports back to the switch plate that the water pump is running and the switch plates status LED will then light. The REL-8 board is powered from a single power lug that is fused near the battery. The ground wire has less than 1 Amp flowing through it at any given time, therefore is a small gauge wire.

### 3.3 Trouble shooting guide

<b>Problem</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
When the switch is pressed the green status LED lights on the switch plate but the fuse blows on the REL-8	Output is shorted to ground or has an Overcurrent condition.	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Unplug the load from the REL-8 board, replace fuse and try to turn on again</li> <li>2. If fuse blows call RV Manufacturer with information</li> <li>3. If fuse does not blow and status LED next to relay output lights, check output wiring</li> </ol>
When the switch is pressed the green status LED does nothing on the switch plate	The REL-8 has no power or ground has become disconnected	<p>Use a test light or multi-meter and check power and ground going to the REL-8</p> <ul style="list-style-type: none"> <li>- If voltage is not present check fuse feeding board, call RV Manufacturer for fuse location</li> <li>- If ground is not present run new ground wire</li> </ul>
	The communication wire has become disconnected from the switch board	<p>Try another switch plate that would control another output on the same REL-8 board</p> <ul style="list-style-type: none"> <li>- If another output functions then it must be the communication wire going to the switch plate that is not working.</li> <li>- If another switch plate does not function proceed to next problem</li> </ul>
	The communication wire has become disconnected from the REL-8 board	If other FET-8 boards are functioning then run a new communication wire from the FET-8 to the REL-8 board
	The entire communications has become short to ground or power	<p>Turn battery disconnect off!</p> <p>Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground</p>
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	Wiring that is plugged into the REL-8 has become disconnected	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Turn output on using the switch</li> <li>2. Look for green LED to light on the REL-8 board next to the output relay, if not lit call RV Manufacturer with information</li> <li>3. If LED is lit use a multi-meter and measure voltage (Only if this is a fused output) <ul style="list-style-type: none"> <li>- If it reads 0V the board could be defective call RV Manufacturer with information</li> <li>- If it reads 12V then the problem is the RV wiring after the REL-8</li> <li>- If used as a dry contact measure for continuity</li> </ul> </li> </ol>
Everything works correctly for awhile and then the entire REL-8 powers down and will not power back up for awhile	The breaker feeding the board is either undersized, defective, or a system overload is occurring	Using a current clamp meter measure the current going through the power wire feeding the REL-8 board then call RV Manufacturer with information (Be aware the breaker may be feeding other devices then the REL-8)
When a switch is pressed the wrong outputs turn on	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information

### 3.4 REL-8 CONTROL BOARD OUTPUT OVERVIEW

Output Labeling	Output Type	Board	Output	Fused AMPS
KIT FAN	Dry Contact	REL-8	0	
BATH FAN	Dry Contact	REL-8	1	
STLRM FAN	Dry Contact	REL-8	2	
4 <sup>th</sup> FAN	Dry Contact	REL-8	3	
WATER PUMP	Dry Contact	REL-8	4	
LIGHTING	Fused 12VDC	REL-8	5	15
2 <sup>nd</sup> HEATER	Fused 12VDC	REL-8	6	15
STLRM HEATER	Fused 12VDC	REL-8	7	15

Chart 3.3

## 4 REL-2

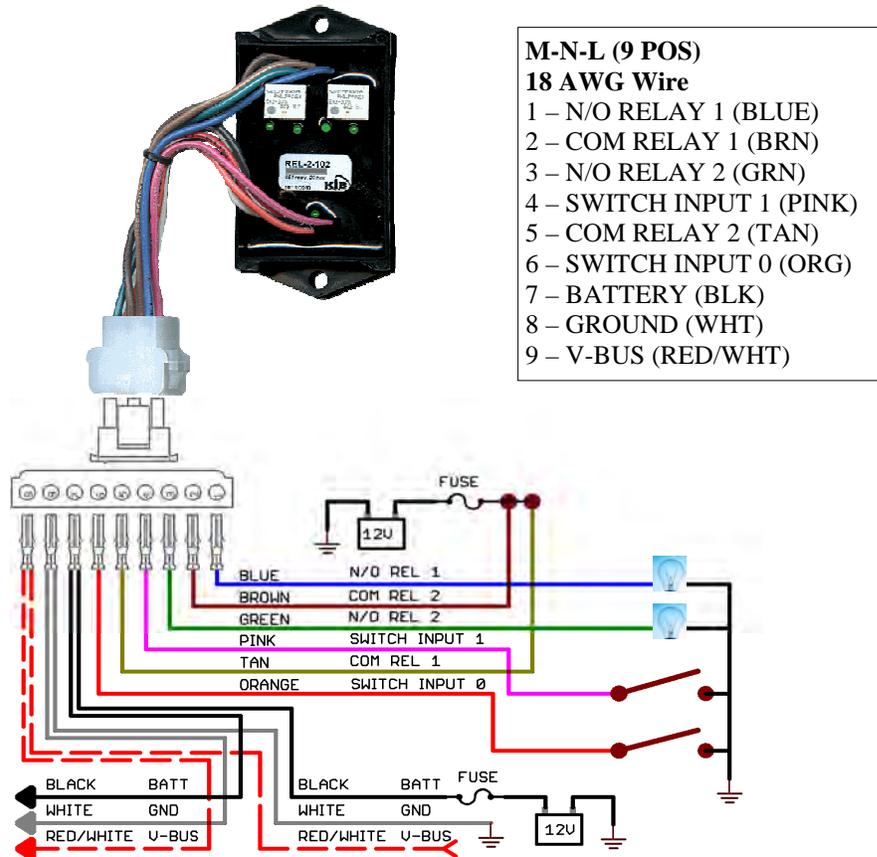


Figure 4.1

**Note:** Words and wire colors in diagram are for example only and do not necessarily represent a customer's end product labeling or wiring.

### 4.1 Tool Requirements

- Philips screw driver

### 4.2 Overview

The REL-2 has two outputs that are RELAY controlled. The REL-2 has dry contact relays only and is intended to control devices outside the V-Bus system. Currently the REL-2 is used to control the Floor Heat and the generator. In both setups there is a failsafe in the network so that if the switch plate becomes disconnected the relay board will shut itself off. The REL-2 also has inputs that are used for sensing whether the device it is controlling is on or off. In the case of the generator the status LED on the switch plate will not light until the generator running status line has gone high. Then this wire is fed into one of the REL-2 inputs and the REL-2 reports back to the switch plate that the generator is running and the switch plates status LED lights. The REL-2 has a single 9 pos M-N-L connector for all electrical connections. The REL-2 pulls less than 1 Amp during normal operation and in most cases is fused with the switch plates.

### 4.3 Trouble shooting guide

<b>Problem</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
Relay status LED's turn on and off with time	This is correct operation when being controlled by the SPBLFH-1	
When controlling a slide-out or a generator the status LED's on the switch plates never light	The status return line is not connected to the device it is controlling	Check wiring Check pink or orange wire on REL-2
When the switch is pressed the green status LED does nothing on the switch plate	The REL-2 has no power or ground has become disconnected	Use a test light or multi-meter and check power and ground going to the REL-2 - If voltage is not present check fuse feeding board, call RV Manufacturer for fuse location - If ground is not present run new ground wire
	The communication wire has become disconnected from the switch board	Try another switch plate that would control another output on the same REL-2 - If another output functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The communication wire has become disconnected from the REL-2 board	- Check if status LED on REL-2 flickers with any switch, if so this is not the problem - If other REL-2 boards are working run a new communication wire to the REL-2 board
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	Wiring that is plugged into the REL-2 has become disconnected	Do step 1-4 in order! 1. Disconnect the wires to the relay contacts 2. Turn output on using the switch 3. Look for a green LED to light on the REL-2 board next to the output relay, if not lit call RV Manufacturer with information 4. If LED is lit use a multi-meter and measure continuity - if it reads more than 1 Ohm the board could be defective call RV Manufacturer with information - if it reads 0 Ohms then the problem is the RV wiring after the REL-2
When a switch is pressed the wrong outputs turn on	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information

**4.4 REL-2 CONTROL BOARD INPUT/ OUTPUT CHART**

Output Labeling	Output Type	Board	Output	INPUT
FH-FWD	Dry Contact	REL-2-100	0	
FH-MID	Dry Contact	REL-2-100	1	
		REL-2-100		0
		REL-2-100		1
FH-AFT	Dry Contact	REL-2-101	0	
	Dry Contact	REL-2-101	1	
		REL-2-101		0
		REL-2-101		1
GEN-START	Dry Contact	REL-2-102	0	
GEN-STOP	Dry Contact	REL-2-102	1	
GEN-STATUS		REL-2-102		0
		REL-2-102		1

Chart 4.2

## 5 SPBL

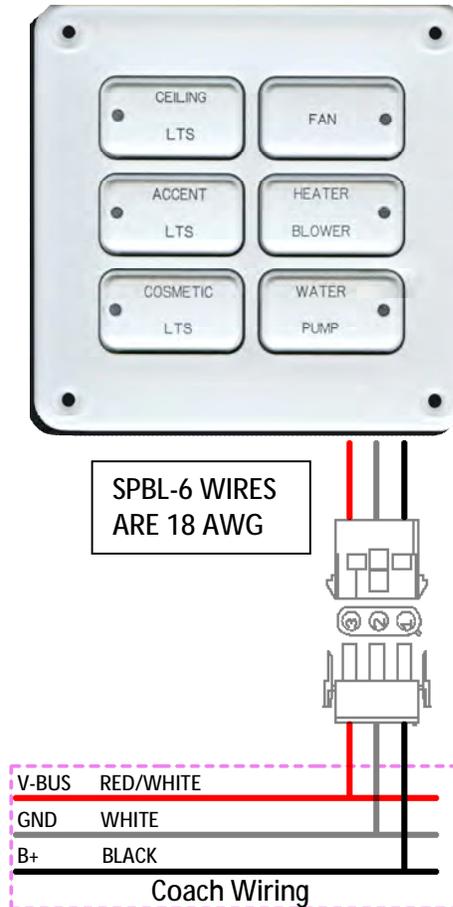


Figure 5.1

**Note:** Words and wire colors in diagram are for example only, and do not represent a customer's end product labeling or wiring.

### 5.1 Tool Requirements

- Philips screw driver

### 5.2 Overview

The SPBL (Switch Plates Back Lit) are the main human interface to the V-Bus system. Each switch plate is back lit to Lt Blue by Newmar request and is **NOT!** field changeable without Newmar approval. The intensity of the switch plates above the bed has been intentionally dimmed by Newmar because of customer complaints. Some of the earlier units still have full brightness above the bed, but will be dimmed automatically after the reprogramming recall is completed. The SPBL has a single 3 pos M-N-L connector for all electrical connections. The three connections are Power (+12VDC), Ground, and V-Bus.

### 5.3 Trouble shooting guide

Problem	Possible Causes	Possible Solutions
Switch plate has no backlighting and switches <b>DO NOT</b> function	There is no power being supplied to the switch plate or a wire has disconnected or voltage is to low	- Check fuse feeding switch plates - Using a multi-meter check voltage at the switch plate wires Black(+12VDC), White(Gnd) battery voltage, needs to be at least 9.5VDC
Switch plate has no backlighting and switches <b>DO</b> function	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
Status LED's are flashing randomly and nothing is functioning	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
When the switch is pressed the green status LED flashes on the switch plate	The problem is on the FET-8 board	Goto the FET-8 trouble shooting guide
When the switch is pressed the green status LED does nothing on the switch plate	The communication wire has become disconnected between the switch plate and output board it was to control	Try another switch plate that would control same output - If another switch plate functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
	The problem is on the board the switch is controlling	Goto the trouble shooting guide that the switch is controlling
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	The problem is on the board the switch is controlling	Goto the trouble shooting guide of the product the switch is controlling
Backlight is a white color and none of the switches function	The switch plate was never programmed from KIB's factory	Call RV Manufacturer with this information (You'll need to get a replacement part)
When a switch is pressed the wrong outputs turn on	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information
When a switch is pressed there is no noticeable clicking action and switch does not work	Mechanical failure of the switch plate	Call RV Manufacturer with this information
Switch is pressed and output turns on but status LED is off	The switch board missed the acknowledgement that the output turned on probably because of voltage drops around the RV	Call RV Manufacturer with this information Depending on the year of manufacturing there may be a program update that will fix this issue
When a switch is pressed there is no noticeable clicking action and switch does not work	Mechanical failure of the switch plate	Call RV Manufacturer with this information (You'll need to get a replacement part)

## 6 SPBLSC

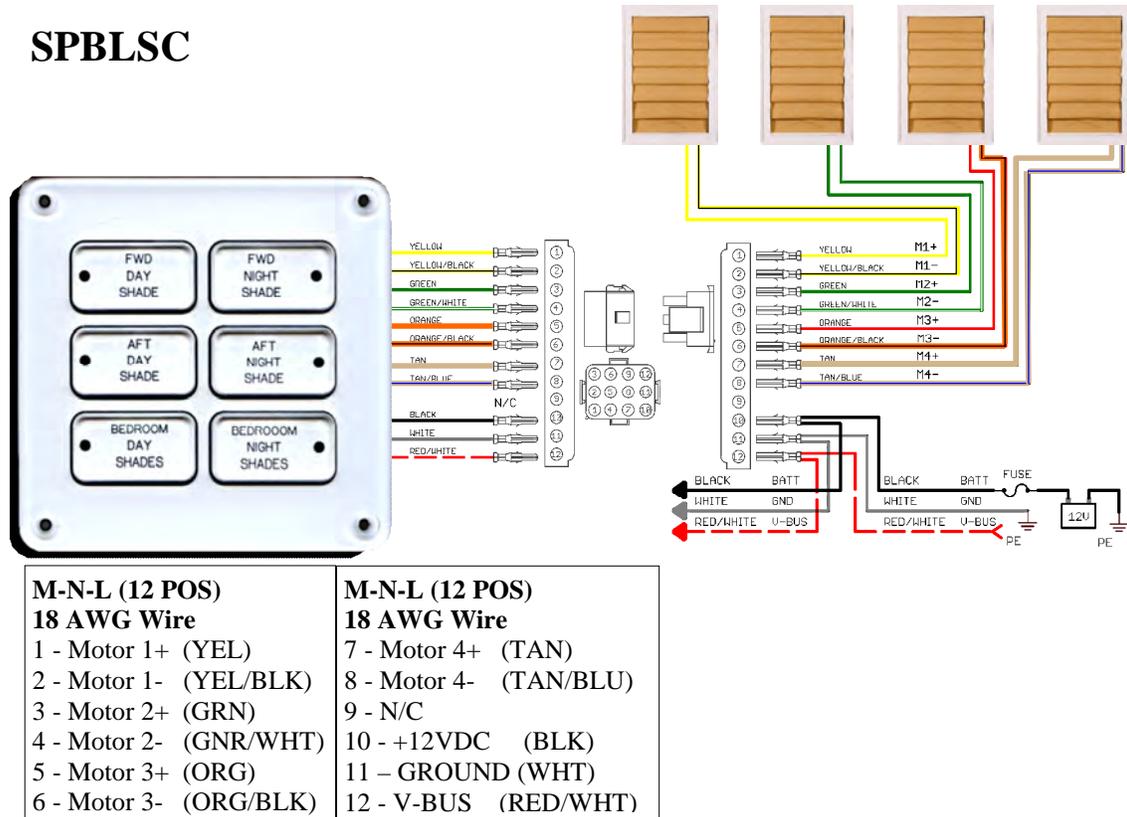


Figure 6.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 6.1 Tool Requirements

- Philips screw driver

### 6.2 Overview

The SPBLSC-6 (Switch Plate Back lit w/Shade Control) is a self contained shade controller. This means that only power (+12VDC) and ground are required to function, but because switch plates have whole room shade buttons they are connected through the V-Bus. The SPBLSC-6 is a mother daughter board setup. The mother board is the SPBL board and the daughter board is a REL-4. There is a single twelve pos M-N-L connector for all electrical connections. See fig 6.1 for wire connections.

There are two kinds of shades, silhouette and day/night. Silhouette shades are single blinds that on the way up open there slats and on the way down close there slats. For this reason when using the "All shades down" button there is built in time delay which reverses the shades up for a half of a second to open them all together. The day/night shades are two separate shades, the day shade allows some light through while the night shades allow no light through. There is no current or voltage detection in a SPBLSC plate. Current drawn from a SPBLSC plate under normal operation is less than 1 Amp, for this reason the SPBLSC plate is usually fused with the SPBL plates.

### 6.3 Trouble shooting guide

Problem	Possible Causes	Possible Solutions
Switch plate has no backlighting and switches <b>DO NOT</b> function	There is no power being supplied to the switch plate or a wire has disconnected or voltage is to low	- Check fuse feeding switch plates - Using a multi-meter check voltage at the switch plate wires Black(+12VDC), White(Gnd) battery voltage, needs to be at least 9.5VDC
Switch plate has no backlighting and switches <b>DO</b> function	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
Status LED's are flashing randomly and nothing is functioning	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
When the switch is pressed the green status LED does nothing on the switch plate	The communication wire has become disconnected between the switch plate and output board it was to control	Try another switch plate that would control same output - If another switch plate functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
	The problem is on the board the switch is controlling	Goto the trouble shooting guide that the switch is controlling
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	The problem is on the board the switch is controlling	Goto the trouble shooting guide of the product the switch is controlling
Backlight is a white color and none of the switches function	The switch plate was never programmed from KIB's factory	Call RV Manufacturer with this information (You'll need to get a replacement part)
When a switch is pressed the wrong shade or no shades move	Switch plate was wired incorrectly	Check wiring on this switch board to shade motors
	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information
	Relay board is defective	Look for green status LED on back of SPBLSC-6 if it is lit solid board is defective
When the all shades switch is pressed all shades move except for the shades on the panel the button was pressed	Relay board is defective	Look for green status LED on back of SPBLSC-6 if it is lit solid board is defective
	Motor board on back of shade panel was programmed incorrectly	Call RV Manufacturer with this information
When a switch is pressed there is no noticeable clicking action and switch does not work	Mechanical failure of the switch plate	Call RV Manufacturer with this information (You'll need to get a replacement part)
Switch is pressed and output turns on but status LED is off	The switch board missed the acknowledgement that the output turned on probably because of voltage drops around the RV	Call RV Manufacturer with this information Depending on the year of manufacturing there may be a program update that will fix this issue

## 7 SPBLFH-1

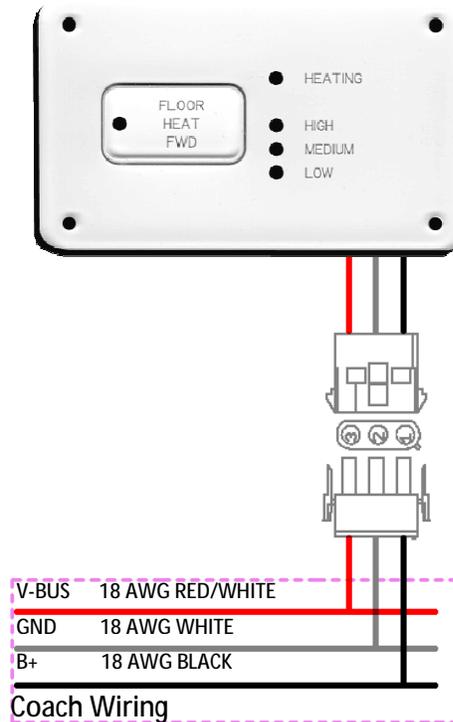


Figure 7.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 7.1 Tool Requirements

- Philips screw driver

### 7.2 Overview

The SPBLFH-1 (Switch Plate Back lit Floor Heat 1 switch) is a modified SPBL that controls the electric floor heaters. The SPBLFH-1 works in conjunction with the REL-2. The SPBLFH-1 has four settings LOW, MID, HIGH, and OFF and are cycled through with every button push. The different settings have different time intervals of on and off for heating. There is a status LED to show when the heating element is on or off. The SPBLFH-1 uses a failsafe timer in programming so if the SPBLFH-1 becomes disconnected with the REL-2 the REL-2 will shut itself off.

### 7.3 Trouble shooting guide

<b>Problem</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
Heating LED turns on and off with time	This is the correct operation	
Switch plate has no backlighting and switches <b>DO NOT</b> function	There is no power being supplied to the switch plate or a wire has disconnected or voltage is to low	- Check fuse feeding switch plates - Using a multi-meter check voltage at the switch plate wires Black(+12VDC), White(Gnd) battery voltage, needs to be at least 9.5VDC
Switch plate has no backlighting and switches <b>DO</b> function	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
Status LED's are flashing randomly and nothing is functioning	The RV's battery voltage is to low	Check batteries Need at least 9.5VDC
When the switch is pressed the green status LED does nothing on the switch plate	The communication wire has become disconnected between the switch plate and output board it was to control	Try another switch plate that would control same output - If another switch plate functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
	The problem is on the board the switch is controlling	Goto the trouble shooting guide that the switch is controlling
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	The problem is on the board the switch is controlling	Goto the trouble shooting guide of the product the switch is controlling
Backlight is a white color and none of the switches function	The switch plate was never programmed from KIB's factory	Call RV Manufacturer with this information (You'll need to get a replacement part)
When a switch is pressed the wrong outputs turn on	REL-2 was wired incorrectly	Check wiring on the REL-2 board
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information (You'll need to get a replacement part)
When a switch is pressed there is no noticeable clicking action and switch does not work	Mechanical failure of the switch plate	Call RV Manufacturer with this information (You'll need to get a replacement part)
Switch is pressed and output turns on but status LED is off	The switch board missed the acknowledgement that the output turned on probably because of voltage drops around the RV	Call RV Manufacturer with this information Depending on the year of manufacturing there may be a program update that will fix this issue

## 8 SC-10-21

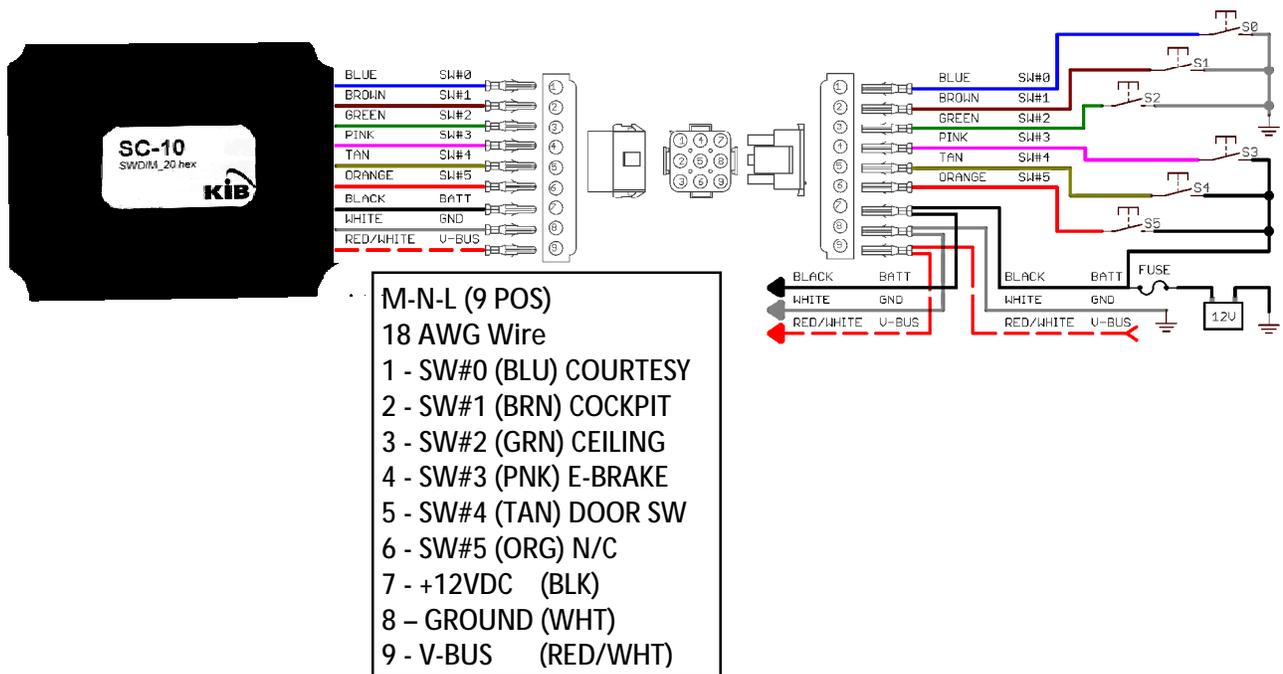


Figure 8.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 8.1 Tool Requirements

- Call Newmar, this board is located behind the dash board behind the E-Brake

### 8.2 Overview

The SC-10-21 (Switch Controller 6 inputs max) is a simplified version of the SPBL board which has 6 switch inputs, but instead of switches on the switch panel it connects to external switches. The SC-10-21 is located in the dash behind the E-Brake. Some switches in the dash are wired to the SC-10-21's, all switches are active ground except for the E-Brake which is active power but still must go to ground when not active. The SC-10-21 has a single 9 pos M-N-L connector for all electrical connections.

An important thing worth mentioning about the SC-10-21 setup is the when the E-Brake is disengaged the cockpit light will not function with the ceiling lights. The door switch turns the cockpit light ON for 30 seconds every time the door is opened.

### 8.3 Trouble shooting guide

<b>Problem</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
Switches do not function	There is no power be supplied to the switch plate or a wire has disconnected or voltage is to low	- Check fuse feeding switch plates - Using a multi-meter check voltage at the switch plate wires Black(+12VDC), White(Gnd) battery voltage, needs to be at least 9.5VDC
	Ground wire on switches is disconnected	Check switch wiring
Switches do not function and switch wiring has been verified	The communication wire has become disconnected between the switch plate and output board it was to control	Try another switch plate that would control same output - If another switch plate functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
	The problem is on the board the switch is controlling	Goto the trouble shooting guide that the switch is controlling
When a switch is pressed the wrong outputs turn on	SC-10-21 is wired incorrectly	Check wiring on the SC-10-21 board
	SC-10-21 was programmed incorrectly	Call RV Manufacturer with this information (You'll need to get a replacement part)
	The problem is on the board the switch is controlling	Goto the trouble shooting guide of the product the switch is controlling

## 9 SWSTC-8

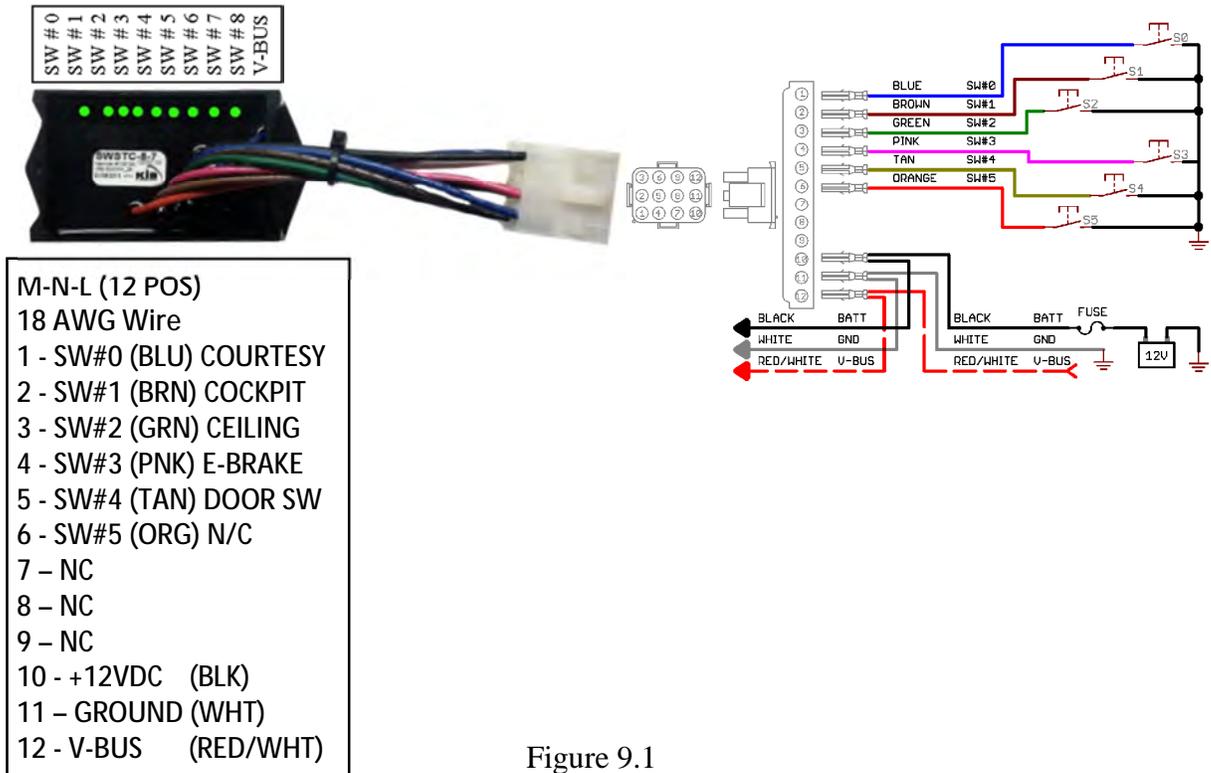


Figure 9.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 9.1 Tool Requirements

- Call Newmar, this board is located behind the dash board behind the E-Brake

### 9.2 Overview

The SWSTC-8 (Switch Controller 8 inputs max) is a simplified version of the SPBL board which has 8 switch inputs w/status LED's, but instead of switches on the switch panel it connects to external switches. The SWSTC-8 is located in the dash behind the E-Brake. Some switches in the dash are wired to the SWSTC-8, all switches are active ground except for the E-Brake which is active power but still must go to ground when inactive. The SWSTC-8 has a single 12 pos M-N-L connector for all electrical connections.

An important thing worth mentioning about the SWSTC-8 setup is the when the E-Brake is disengaged the cockpit light will not function with the ceiling lights. The door switch turns the cockpit light ON for 30 seconds every time the door is opened or closed.

### 9.3 Trouble shooting guide

<b>Problem</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
Switches do not function	There is no power be supplied to the switch plate or a wire has disconnected or voltage is to low	- Check fuse feeding switch plates - Using a multi-meter check voltage at the switch plate wires Black(+12VDC), White(Gnd) battery voltage, needs to be at least 9.5VDC
	Ground wire on switches is disconnected	Check switch wiring
Switches do not function and switch wiring has been verified	The communication wire has become disconnected between the switch plate and output board it was to control	Try another switch plate that would control same output - If another switch plate functions then it must be the communication wire going to the switch plate that is not working. - If another switch plate does not function proceed to next problem
	The entire communications has become short to ground or power	Turn battery disconnect off! Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground
	The problem is on the board the switch is controlling	Goto the trouble shooting guide that the switch is controlling
When a switch is pressed the wrong outputs turn on	SWSTC-8 is wired incorrectly	Check wiring on the SWSTC-8 board
	SWSTC-8 was programmed incorrectly	Call RV Manufacturer with this information (You'll need to get a replacement part)
	The problem is on the board the switch is controlling	Goto the trouble shooting guide of the product the switch is controlling

## 10 FET-2

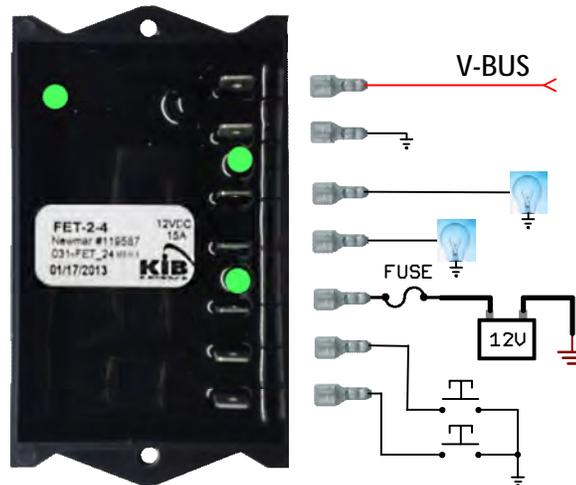


Figure 10.1

**Note:** Words and wire colors in diagram are for example only and do not represent a customer's end product labeling or wiring.

### 10.1 Tool Requirements

- Philips screw driver

### 10.2 Overview

The FET-2 has two outputs that are FET controlled. The FET outputs are capable of different settings such as PWM dimming, electronic fusing, over and under voltage, and internal temperature protection. The FET-2 board is powered from a single power faston that is fused by the manufacture. The ground wire has less than 1 Amp flowing through it at any given time, therefore is a small gauge wire.

Please see Chart 10.2 for output configuration and assignment.

### 10.3 Trouble shooting guide

Problem	Possible Causes	Possible Solutions
When the switch is pressed the green status LED flashes on the switch plate	The output is shorted to ground or has an Overcurrent condition	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Unplug the load from the FET-2 and try to turn on again</li> <li>2. If status LED on switch plate turns on, possibly short to ground or an overload in wire</li> <li>3. If status LED on switch plate still flashes call for service</li> </ol>
When the switch is pressed the green status LED does nothing on the switch plate	The FET-2 has no power or ground has become disconnected	<p>Use a test light or multi-meter and check power and ground going to the FET-2:</p> <ul style="list-style-type: none"> <li>- If voltage is not present check fuse feeding board, call RV Manufacturer for fuse location</li> <li>- If ground is not present run new ground wire</li> </ul>
	The communication wire has become disconnected from the switch board	<p>Try another switch plate that would control another output on the same FET-2:</p> <ul style="list-style-type: none"> <li>- If another output functions then it must be the communication wire going to the switch plate that is not working.</li> <li>- If another switch plate does not function proceed to next problem</li> </ul>
	The communication wire has become disconnected from the FET-2 board	If other FET-2 boards are working run a new communication wire to the FET-2 board
	The entire communications has become short to ground or power	<p>Turn battery disconnect off!</p> <p>Check the continuity between the communication wire, power, and ground, it should read high impedance to power and more than 50 Ohms to ground</p>
When the switch is pressed the green status LED lights on the switch plate and stays on, but nothing functions	Wiring that is plugged into the FET-2 has become disconnected	<p>Do step 1-3 in order!</p> <ol style="list-style-type: none"> <li>1. Turn output on using the switch</li> <li>2. Look for a green LED to light on the FET-2 board next to the output, if not lit call RV Manufacturer with information</li> <li>3. If LED is lit use a multi-meter and measure voltage <ul style="list-style-type: none"> <li>- if it reads 0V the board could be defective call RV Manufacturer with information</li> <li>- if it reads 12V then the problem is the RV wiring after the FET-2</li> </ul> </li> </ol>
Everything works correctly for awhile and then the entire FET-2 powers down and will not power backup for awhile	The breaker feeding the board is either undersized, defective, or a system overload is occurring	Using a current clamp meter measure the current going through the power wire feeding the FET-2 board then call RV Manufacturer with information
A single output works correctly for awhile and then the status LED on the switch plate flashed and the output shuts off	Output are FET driven and it is possible that a single FET could shutdown from overheating	Using a current clamp meter check current going to every output and compare to current ratings on panel, the current should not exceed 80% of the rated fused value continuously, call RV Manufacturer with information
When a switch is pressed the wrong outputs turn on	Switch plate was built with the PCB upside down	Call RV Manufacture with information (Probably unscrew PCB and rotate 180°)
	Switch plate was programmed incorrectly	Call RV Manufacturer with this information
	Outputs are wired incorrectly	Swap output wiring until correct

## 10.4 FET-2 CONTROL BOARD INPUT/ OUTPUT CHART

Output Labeling	Board	Output	Fused AMPS	FUSE SPEED	INPUT	ACTIVE
BED SOFFIT LIGHTS	FET-2-4	1	15	400mS		
	FET-2-4	2	15	400mS		
	FET-2-4				1	
	FET-2-4				2	
COCKPIT CEILING	FET-2-5	1	15	400mS		
STEP WELL LIGHTS	FET-2-5	2	15	400mS		
STEP LIGHT SWITCH	FET-2-5				1	HIGH
DOOR SWITCH	FET-2-5				2	LOW
COCKPIT CEILING	DTMFET-1-30	1	15	400mS		
STEP WELL LIGHTS	DTMFET-1-30	2	15	400mS		
	DTMFET-1-30				1	
DOOR SWITCH	DTMFET-1-30				2	LOW

Chart 10.2

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Over the years of running a mobile RV repair service, having a dedicated place to access service manuals for all the different appliances and components found on RVs was something that I always had a desire to create.

I hope this resource makes your RV repairs easier, as it has mine, but please be careful and follow proper safety practices when attempting to repair your own RV.

If in doubt, please consult with a professional RV technician!



DARREN KOEPP - OWNER, MY RV WORKS, INC.

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