



SafeLights Installation, Calibration and User Manual

To ensure proper functionality and long-term reliability of your SafeLights unit, please following the following procedure closely. For updates on this document, please go to: www.beartoothrc.com/installation.htm. Please review our warranty documentation for information about installation and product modification at www.beartoothrc.com/warranty.htm.

Last Revision
January 30, 2007

SAFELIGHTS INSTALLATION INSTRUCTIONS

The Beartooth RC SafeLights system can be setup in one of four modes depending on your particular application. Each mode is outlined below. Please select the mode that best suits your needs and refer to the setup diagram for that mode. Please note that mode 2 has two different setups, Switched Light Control and Failsafe Only. Both modes are functionally the same in the eyes of the SCB, Failsafe Only mode does not use a light kit.

**NOTE – DO NOT PLUG IN LED'S while receiver is ON – this will overload and ruin the leds.
– ALWAYS TURN THE RECEIVER OFF CONNECTING THE LED's.**

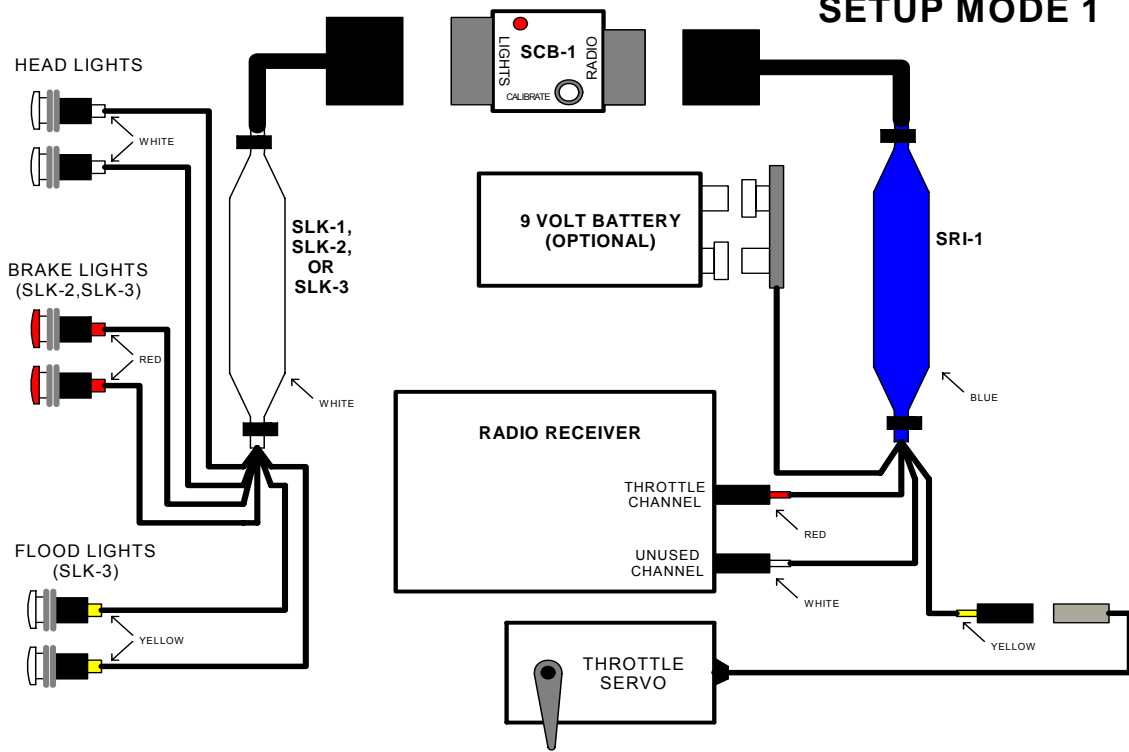
ATTENTION SCB-2 USERS! *The SCB-2 has the same functionality of the SCB-1 except that the throttle servo will not failsafe, this feature has been disabled. Please disregard any references in this document concerning the servo failsafe.*

MODE 1 – Full Feature Mode

- **FAILSAFE**
- **UNUSED CHANNEL PROVIDES ON/OFF CONTROL OF LIGHTS**
- **THROTTLE CHANNEL PROVIDES BRAKE LIGHT INTENSITY CONTROL**

- Features
 - This mode provides failsafe functionality.
 - Lights are turned on and off with an unused radio channel.
 - One of the Beartooth RC light kits (SLK-x) should be used in this mode.
 - Brake lights will increase intensity when brakes are applied.
 - Failsafe will activate when there are poor radio communications or when the receiver batteries are low.
 - Lights will blink a diagnostic pattern when there is a problem.
- Required Parts
 - SCB-1 (SafeLights Control Box)
 - SRI-1 (SafeLights Radio Interface)
 - SLK-x (Light Kit, x= 1,2, or 3)
- Receiver Channels Used
 - Throttle
 - Unused radio channel

SETUP MODE 1

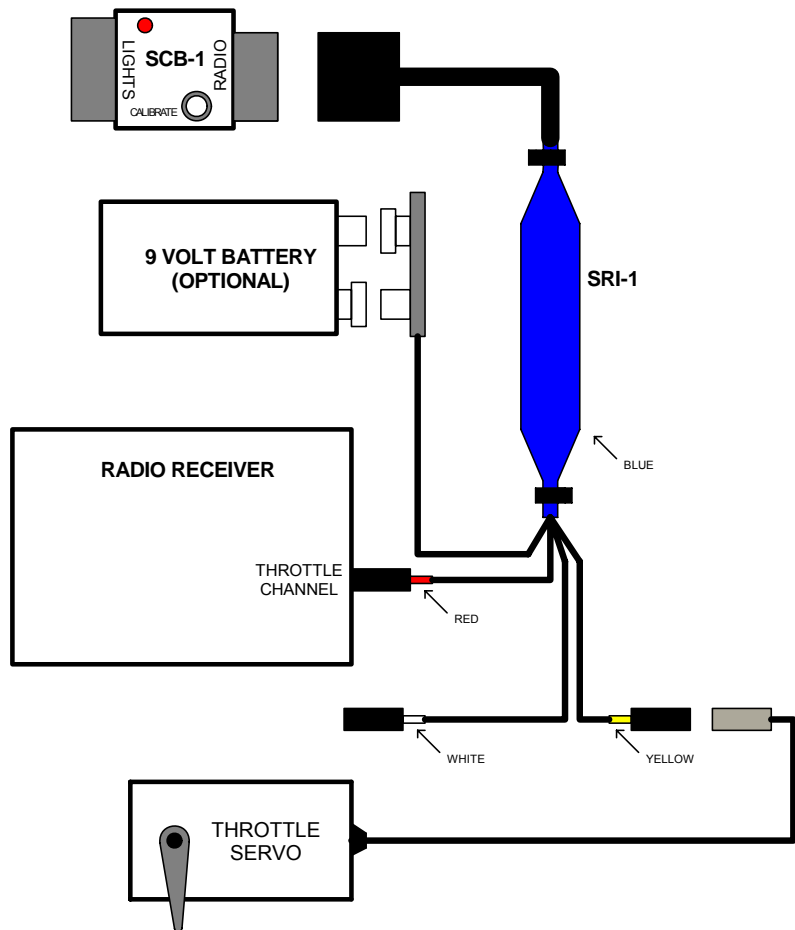


MODE 2 – Failsafe Only Mode

– Failsafe Only Mode

- FAILSAFE
- NO LIGHTS
- Features
 - This mode provides failsafe functionality.
 - No light kits are used in this mode.
 - Failsafe will activate when there are poor radio communications or when the receiver batteries are low.
- Required Parts
 - SCB-1 (SafeLights Control Box)
 - SRI-1 (SafeLights Radio Interface)
- Receiver Channels Used
 - Throttle

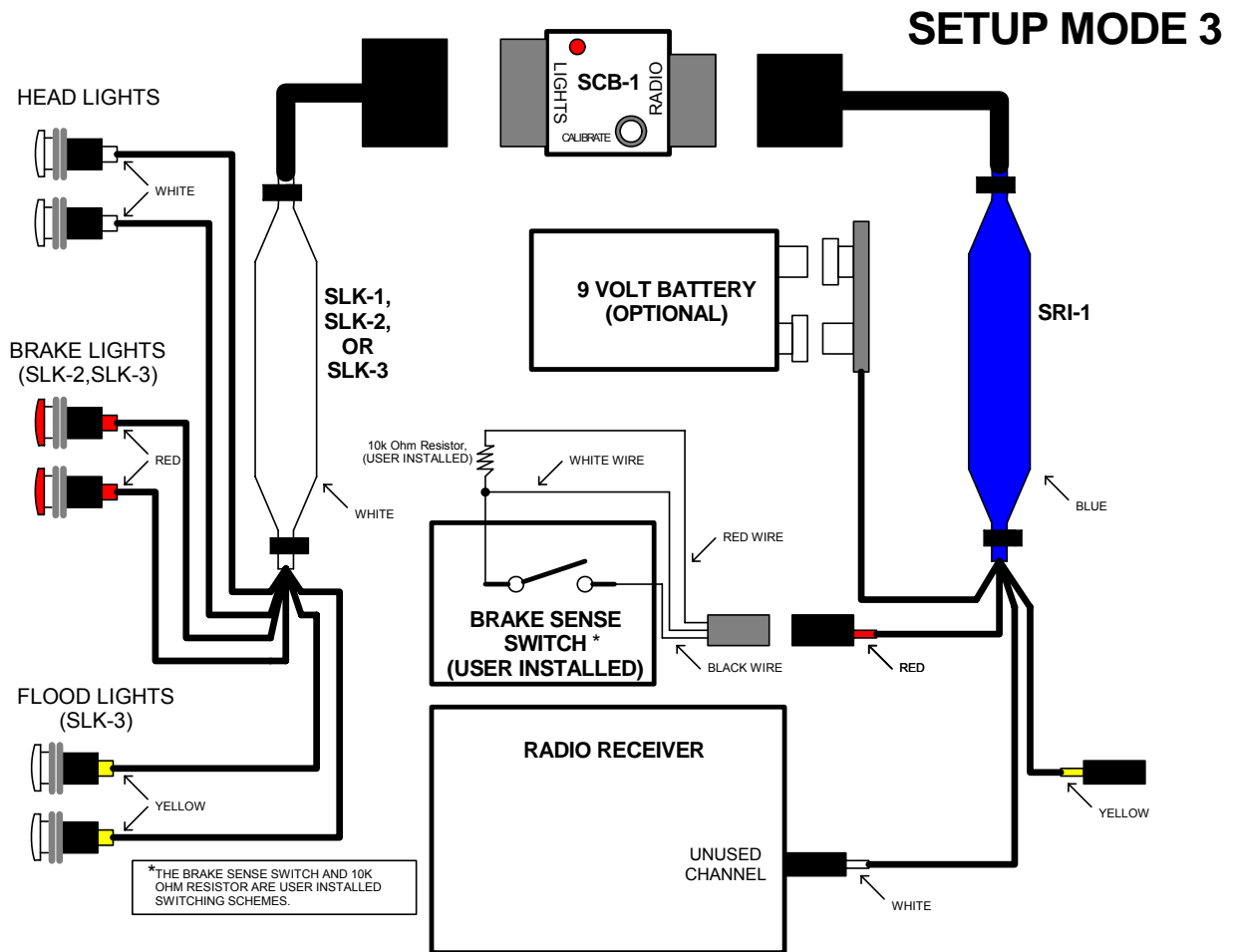
SETUP MODE 2, FAILSAFE ONLY



MODE 3 – Mechanical Brake Switching Mode

- NO FAILSAFE
- UNUSED CHANNEL PROVIDES ON/OFF CONTROL OF LIGHTS
- USER SUPPLIED BRAKE SWITCH PROVIDES BRAKE LIGHT INTENSITY CONTROL

- Features
 - No Failsafe functionality is available
 - Lights are turned on and off with an unused radio channel.
 - One of the Beartooth RC light kits (SLK-x) should be used in this mode.
 - Brake lights will increase intensity when brakes are applied and the state of the users braking switch changes.
 - Lights will blink a diagnostic pattern when the batteries get low or when the unit enters a failsafe state.
- Required Parts
 - SCB-1 (SafeLights Control Box)
 - SRI-1 (SafeLights Radio Interface)
 - User supplied braking switch.
 - SLK-x (Light Kit, x= 1,2, or 3)
- Receiver Channels Used
 - Unused radio channel.



INSTALLING YOUR SAFELIGHTS KIT

All of the setup modes (with the exception of Mode 2 – Failsafe Only) use of the Beartooth RC (SLK-x) Light Kits. Please refer to the following instructions to install the light kit on your RC vehicle.

Installation of Light Kit and SafeLights Control Box into Vehicle

Images depict installation on Traxxas T-Maxx Vehicle, procedures may vary depending on your configuration.

Mounting your LED's

1. Mark locations on the vehicle body where your led's will be placed.
2. Using a **17/64" drill bit**, drill corresponding holes in body where you marked. Do NOT use a smaller or larger bit, 17/64" will ensure a tight and proper fit. It may require some force to get the LED covers into the hole or some additional work with the drill, but the lexan should stretch, making a tight fit.
CAUTION – Drills can be quite dangerous, especially when using them to drill unsecured items, please use EXTREME CAUTION when drilling, and take proper precautions such as gloves, eye protection, and extra care to ensure you do not injure yourself or others.
3. After drilling is complete, clean up holes and lexan/plastic/aluminum shards.
4. Remove the LED Lens from the LED assembly for each LED.
5. Carefully push the LED Lens into the hole.
6. Carefully push the LED assembly into the LED cover inside the body, use caution to ensure you do not damage the LED or harness.

Note: Each LED set has a small piece of shrink tubing indicating the LED color:

LED Shrink Tubing COLORS:

White – Head Lights

Red – Brake Lights

Yellow – Accessory Lights – (3-Pair Kits only)

7. Using included tie mounts and zip ties, properly secure all wiring to the body – it is imperative to ensure the wiring is out of the way of all moving parts, as well as the engine. Engine temps can exceed 250 degrees, and will melt the protective coating on the wiring. **NOTE – Please be aware that once adhered to the body surface, the tie mounts are permanent, and removal may cause damage to the paint surface of your vehicle body.**
8. Optional: You may wish to add some CA glue to the point at which the LED lens inserts into the body for a more secure installation. This would be a permanent step, and would not allow you to remove them from that body in the future without damage, so do so at your own risk.

SafeLights Control Box Mounting

1. Please see instructions for connections in previous sections of this manual. **NOTE – DO NOT PLUG IN LED'S while receiver is ON – this will overload and ruin the leds. – ALWAYS TURN THE RECEIVER OFF CONNECTING THE LED'S.**

The instructions below are designed to supplement the previous diagram, please refer to it as the main installation instruction source.

Installation of SafeLights Unit into Vehicle – Vehicles WITH Empty Receiver Channel

1. Open any protective covering boxes for your vehicle receiver unit and remove the receiver, exposing the connections to the servos and battery system.
2. Ensure that the battery switch to the vehicle is turned OFF.
3. Disconnect the throttle/brake servo wire from the receiver, connect the throttle/brake wire (please see previous diagram for identification) from the SafeLights unit into the slot the servo came out of (typically channel 2). Connectors have slots on them for proper insertion, but please pay special attention to ensure that the leads are connected correctly (see wire colors in the previous diagram).
4. Connect the second wire (please see previous diagram for identification) into the empty servo channel. Connectors have slots on them for proper insertion, but please pay special attention to ensure that the leads are connected correctly (see wire colors).
5. Connect the throttle/brake servo wire into the female connector on the SafeLights unit. NOTE – the male connector may not have a slot on it, and therefore, it is very important to ensure you connect the leads correctly, making sure the white, red, and black leads line up on the male and female connectors.
6. Proceed to **calibration procedure** (below) before finishing installation, just in case you need to check/modify connections on the receiver during calibration.
7. After calibration is completed, carefully reassemble receiver into protective box and put back on the vehicle. NOTE – due to the high-gauge wiring used on the SafeLights unit, and the addition of the extra wire, you may find it necessary to notch or trim the opening for the wiring to exit the protective receiver box. DO NOT FORCE the wiring, as this may result in cut wires and voiding your product warranty (s). It may also be necessary to add your own zip tie to secure the wiring inside the box.
8. To Mount the SafeLights unit, use the enclosed mounting pad, or some other method to secure the unit to the vehicle, again, ensuring that the wiring is secure and out of the way of moving parts and heat producing sources.

Installation of SafeLights Unit into Vehicle – Vehicles WITHOUT Empty Receiver Channel

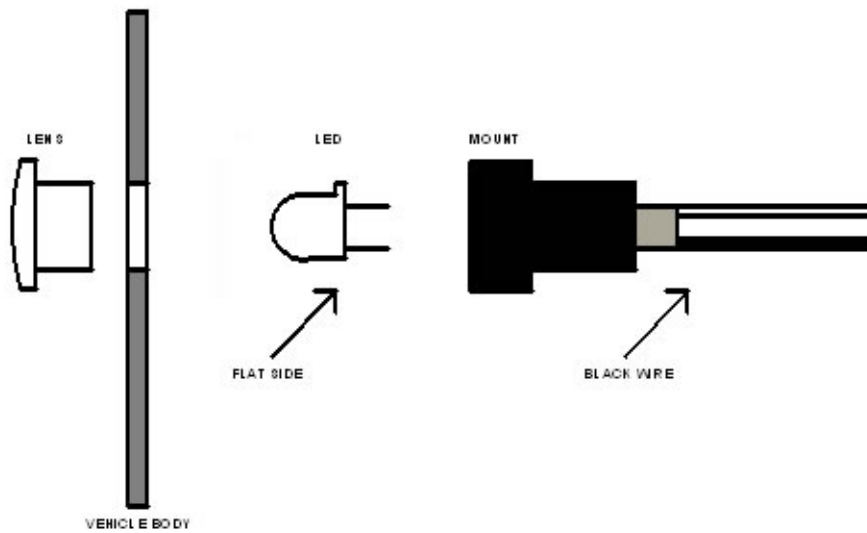
1. Open any protective covering boxes for your vehicle receiver unit and remove the receiver, exposing the connections to the servos and battery system.
2. Ensure that the battery switch to the vehicle is turned OFF.
3. Disconnect the throttle/brake servo wire from the receiver, connect the throttle/brake wire (please see previous diagram for identification) from the SafeLights unit into the slot the servo came out of (typically channel 2). Connectors have slots on them for proper insertion, but please pay special attention to ensure that the leads are connected correctly (see wire colors).
4. Connect the second wire (please see previous diagram for identification) into the enclosed on/off switch (this will be used to turn the light kits on and off. Connectors have slots on them for proper insertion, but please pay special attention to ensure that the leads are connected correctly (see wire colors).
5. Connect the throttle/brake servo wire into the female connector on the SafeLights unit. NOTE – the male connector may not have a slot on it, and therefore, it is very important to ensure you connect the leads correctly, making sure the white, red, and black leads line up on the male and female connectors.
6. Proceed to **calibration procedures** (below) before finishing installation, just in case you need to check/modify connections on the receiver during calibration.
7. After calibration is completed, carefully reassemble receiver into protective box and put back on the vehicle. NOTE – due to the high-gauge wiring used on the SafeLights unit, and the addition of the extra wire, you may find it necessary to notch or trim the opening for the wiring to exit the protective receiver box. DO NOT FORCE the wiring, as this may result in cut wires and voiding your product warranty (s). It may also be necessary to add your own zip tie to secure the wiring inside the box.
8. To Mount the SafeLights unit, use the enclosed mounting pad, or some other method to secure the unit to the vehicle, again, ensuring that the wiring is secure and out of the way of moving parts and heat producing sources.
9. To Mount the on/off switch, pick a convenient location on the vehicle or body and mount it securely using a tie mount, tie wrap, or double-sided tape. It may be necessary to drill an

additional hole for the switch, depending on the location of the switch. Once again, ensure that the wiring is out of the way of moving parts and heat sources.

To view larger versions of these images, go to www.beartoothrc.com/installation.htm.





NOTE – LEDs are polarized devices and must be installed correctly in the mount to work. Please refer to the following diagram when replacing or changing LEDs. The flat side of the LED goes to the Black wire side of the mount.



CALIBRATION PROCEDURE

Prior to using your SafeLights system it must be calibrated to your radio. Please follow these instructions to insure you system is calibrated correctly.

ATTENTION! - It is important that your system be calibrated in an RF noise free environment. Calibrate it away from computer monitors, neon lights, and any other device that may cause noise in the receiver. If at any point something goes wrong just cycle the receiver power and start over.

1. Double check all wiring and insure both the transmitter and receiver have good batteries.
2. Turn the transmitter ON.
3. Turn the receiver ON. The LEDs may blink, this is okay, just ignore it. **NOTE – DO NOT PLUG IN LED’S while receiver is ON – this will overload and ruin the leds. – ALWAYS TURN THE RECEIVER OFF CONNECTING THE LED’S.**
4. Press the CAL button on the SCB-1. All LEDs should turn on. The SCB-1 will analyze the input signals and determine which setup mode you are using. After a brief delay the SCB-1 will be ready for calibration. (For clarity, =LED ON, =LED OFF)

The SCB-1 LED should blink the following code:

 (NEUT/LIGHTS OFF)

5. Trim your radio channels.
 - For Setup Mode 1 and 3:
 - Set the throttle to neutral and set the unused channel control to the Lights OFF position.
 - For Setup Mode 2 – Switch Light Control Mode:
 - Set the throttle to neutral and set the toggle switch to the Lights OFF position.
 - For Setup Mode 2 – Failsafe Only Mode:
 - Set the throttle to neutral.

6. Press the CAL button on the SCB-1.

The SCB-1 LED should blink the following code:

 (BRAKES)

7. While applying full brakes, press the CAL button on the SCB-1.

The SCB-1 LED should blink the following code:

 (FAILSAFE)

8. Set the Failsafe Position
 - For Setup Mode 1,2:
 - While holding the throttle in the failsafe position, press the CAL button on the SCB-1.
 - For Setup Mode 3:
 - Press the CAL button on the SCB-1.

The SCB-1 LED should blink the following code:

 (LIGHTS ON)

9. Set the Lights ON position.
 - For Setup Mode 1 and 3:
 - Set the unused channel control to the Lights ON position and press the CAL button on the SCB-1.
 - For Setup Mode 2 – Switch Light Control Mode:
 - Set the toggle switch to the Lights ON position and press the CAL button on the SCB-1.
 - For Setup Mode 2 – Failsafe Only Mode:
 - Press the CAL button on the SCB-1.

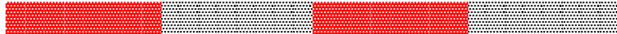
This completes the calibration procedure.

The unit should reset and blink the code for normal operation in the setup mode you



If an error occurred during calibration, the unit will blink an error code:

Calibration Error Code:



← 2 sec →

If this occurs, check all connections, ensure you have good batteries in both the transmitter and receiver, and run through the entire calibration procedure again. In addition, the unit may not be able to write the calibration values to the EEPROM if the temperature is very cold or very hot, this can cause a calibration error. Try recalibrating at room temperature.

Once the unit is calibrated correctly, it is a good idea to test the calibration before operating the vehicle.

NOTE: After calibration, it is advised that you take steps to prevent dirt, water, or other foreign substances from entering the SafeLights control box. This may be as simple as placing a small piece of tape over the calibration button hole, or, in some cases, water proofing the entire unit by placing it inside a balloon with zip ties on both ends.

Failsafe Testing

The simplest way to test the failsafe is to turn the transmitter off with the receiver on. This is a lost signal condition. The SCB-1 should enter a poor communications failsafe. Verify that the servo goes to the failsafe position you set, and the the Lights blink the poor communications failsafe code:



← 2 sec →

Turning your transmitter back on should restore communications and after a brief time period the unit should return to normal operations.

Test the Lights

Turn the lights on and off, also check that the brake lights are bright when the brake is applied, and return to dim when not braking.

If anything is not operating correctly, check all connections, insure you have good batteries in both the transmitter and receiver, run through the entire calibration procedure again. If you are still having visit the Beartooth RC support website and view the FAQs or fill out a support form at <http://www.beartoothrc.com/support.htm>

NOTE - If you change any aspects of vehicles control system, i.e. servos or control rod settings, it is always a good idea to recalibrate your SafeLights system.

USING YOUR SAFELIGHTS SYSTEM

Usage

Your SafeLights system should be reliable and simple to use once it is installed and calibrated correctly.

If you are using a light kit, you should be able to turn the lights on and off with the flip of a switch on the Transmitter (Modes 1 and 3) or with the toggle switch (Mode 2).

The brake lights should brighten and dim as you apply brakes.

Voltage Monitoring

If the unit senses a battery voltage drop below 4.2 volts the lights will blink a low voltage warning in 250mS pulses:



This should prompt you to charge your receiver batteries as they are starting to become very low.

If the unit senses a dangerously low battery voltage less than 3.8 volts the unit will enter a low voltage failsafe condition, by setting the throttle servo to failsafe and the lights will blink the low voltage pattern:



It will remain in this state until the batteries are charged or changed and the power is cycled.

ATTENTION! It is not a good idea to let your batteries drop below 3.3V at this point the SCB-1 is on the threshold of powering down and may cause unpredictable positioning of the throttle servo. Future versions may correct this problem.

Communications Monitoring

Should the failsafe system detect a communications problem, the unit will enter a poor communications failsafe condition and the lights will blink a poor communications pattern:



← 2 sec →

It will remain in this state until poor communications are restored. There is a slight delay before the unit enters a poor communications failsafe, this is to allow the vehicle to coast through a noisy area without entering failsafe. Likewise, if the unit enters a poor communication failsafe, there is a delay of a few seconds after communications are restored before the unit returns to normal operations. These delays create a type of failsafe hysteresis and prevents the unit from rapidly entering and exiting failsafe in intermittently noisy conditions.

NOTE - Some types of pulsing noise may actually fit within the specifications of a valid signal, and the unit will see this as a good signal, rather than noise. The unit is designed to recognize various types of poor communications but may not enter failsafe if the noise source generates a "servo-like" signal.

Thank you for purchasing a SafeLights system. We hope it exceeds your expectations and will provide reliable service for many years. Please visit our website, www.beartoothrc.com for upgrades to your system and other great RC products. You may also fill out a customer survey.

***Sincerely,
Beartooth RC staff***

SAFELIGHTS TECHNICAL SPECIFICATIONS

Sizes:

SCB-1, SCB-2: 1.6" x 1.0" x 0.75" (w x l x h)

SRI-1: 2.0" x 0.6" (board), 6" SCB cable, 4" radio and servo cables

SWT-1: 0.5" x 0.3" x 0.4", 5" cable

SLK-1,2,3: 2.0" x 0.6" (board), 6" SCB cable, 18" LED cables

Operating Voltage SCB-1,2: 3.3VDC to 6VDC

Operating Current SCB-1,2: 25mA-40mA

Operating Current SLK-1: 20mA

Operating Current SLK-2: 40mA

Operating Current SLK-3: 60mA

Setup Modes:

1 - Radio control of Lights on/off, electronic brake light dimming, failsafe (SCB-1 only)

2 - Manual (SWT-1) control of Lights on/off, electronic brake dimming, failsafe (SCB-1), also operates as a failsafe only mode if lights are not hooked up.

3 - Radio control of Lights on/off, mechanical switch (user supplied) brake dimming control, non-failsafe.

Setup Mode 1:

VALID SIGNALS:

Throttle: $0.5\text{mS} < \text{TpW} < 2.5\text{mS}$ (pulse width range), $12.5\text{mS} < \text{Tper} < 30\text{mS}$ (period range)

Lights: $0.5\text{mS} < \text{TpW} < 2.5\text{mS}$ (pulse width range), $12.5\text{mS} < \text{Tper} < 30\text{mS}$ (period range)

*unit will enter a poor communications failsafe condition on any signal out side these parameters, exits failsafe upon return of valid signals.

Setup Mode 2:

VALID SIGNALS:

Throttle: $0.5\text{mS} < \text{TpW} < 2.5\text{mS}$ (pulse width range), $12.5\text{mS} < \text{Tper} < 30\text{mS}$ (period range)

Lights: High or Low.

*unit will enter a poor communications failsafe condition on any signal out side these parameters, exits failsafe upon return of valid signals.

Setup Mode 3:

VALID SIGNALS:

Throttle: High or Low

Lights: $0.5\text{mS} < \text{TpW} < 2.5\text{mS}$ (pulse width range), $12.5\text{mS} < \text{Tper} < 30\text{mS}$ (period range)

*Lights will blink in poor communications, the unit is ***not*** designed to be used as a failsafe in this mode, connect the throttle directly to the receiver.

POOR COMMUNICATIONS FAILSAFE HYSTERISIS

Condition to enter failsafe:

Noise is present 25% of the time in 2 consecutive measurement periods.

Condition to exit failsafe:

Noise is not present 75% of the time in 18 consecutive measurement periods.

BATTERY LEVELS

0 to 3.3VDC : ***DO NOT OPERATE UNIT WITH LESS THAN 3.3VDC, unpredictable results.***

3.3VDC to 3.8VDC: Low Battery Failsafe Condition, will not exit until the power is cycled. If powered up in this voltage range it will set the output low and do nothing.

3.8 to 4.2VDC: Low Battery Warning, Lights blink, but servo does not failsafe.

4.2 to 6.0VDC: Normal Operating Voltage

Warranty Information

Beartooth RC strives to create products that are well engineered, well built, and well supported. All of our products are covered by a **FULL ONE-YEAR WARRANTY** from the date of purchase.

Beartooth RC hereby warrants, subject to the conditions herein below set forth that should this product become defective by reason of improper workmanship or material during the specified warranty period, Beartooth RC will repair the same, effecting all necessary parts replacements, without charge for either parts or labor.

Conditions

Registration:

Registration Form must be completed and sent to Beartooth RC within thirty (30) days after the date of original purchase, either by mail, or via the internet at:

<http://www.beartoothrc.com/registration.htm>.

Unauthorized Repair, Abuse, Modification, Etc.:

The unit must not have been previously altered, modified, repaired or serviced by anyone other than the service facilities authorized by Beartooth RC to render such services. The serial number on the unit must not have been altered or removed. The unit must not have been subject to accident, misuse, abuse or operated contrary to the instructions contained in the Owner's Manual, or used for commercial purposes. The opinion of Beartooth RC with respect to this matter shall be final.

Water/Snow Precautions:

Although the unit is designed to perform in normal radio controlled vehicle conditions, special care should always be taken when subjecting electronics to moisture. The unit warranty will be void in cases where moisture exposure is evident and causal for unit failure. If high-moisture conditions are expected, appropriate waterproofing precautions should be taken to ensure the unit electronics will not be damaged.

Property Installation:

Care should be exercised to ensure included and update installation instructions are followed to minimize possible damage to the unit. This includes ensuring wiring is not exposed to engine/high temperature surfaces, rotating and possibly damaging parts, crimping of wires in covering boxes, etc. Failure to follow these guidelines may result in voidance of product warranty.

Proper Delivery:

The unit must be shipped, prepaid, in either its original package or similar package affording an equal degree of protection and with instructions indicating a location to which the unit must be returned. The repaired unit will be returned to customer freight prepaid. All accessories that are enclosed with the unit must be listed individually on the packing slip for the shipping documentation. Beartooth RC shall have no liability whatsoever for loss or damage to such accessories if they are not listed. Defective accessories should be returned to Beartooth RC as a separate repair item.

Proof of Date Purchase:

This warranty applies to the product from the original date of purchase. Therefore, the owner must furnish proof of original purchase.

This warranty does not extend to damage to vehicle, property, persons, plants, animals, or other non-product items. This warranty does not cover regular product maintenance. This warranty is valid only in the United States and Canada.

EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ALL OTHER WARRANTIES AND CONDITIONS, EXPRESS OR IMPLIED, AND WHETHER ARISING BY LAW, BY STATUTE, BY COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCES SHALL BEARTOOTH RC BE LIABLE FOR AN AMOUNT GREATER THAN THE ACTUAL PURCHASE PRICE OF THE UNIT OR FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES SUSTAINED IN CONNECTION WITH SAID UNIT AND Beartooth RC NEITHER ASSUMES NOR AUTHORIZES ANY REPRESENTATIVE OR OTHER PERSON TO ASSUME FOR IT ANY OBLIGATION OR LIABILITY OTHER THAN SUCH AS IS EXPRESSLY SET FORTH HEREIN. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES AND CONDITIONS.

Disclaimer

Design and Use

Beartooth RC fail-safe related products are designed to provide an additional layer of protection for your RC vehicle in the event of signal disruption, signal loss, interference, battery loss, and other electronic failures within your vehicle. The primary responsibility for the reliability of the vehicle's system lies on the owner/driver. All manufacturers' recommendations should be followed for safe operation of RC vehicles. Beartooth RC offers no warranty, nor accepts any liability, either expressed or implied, for the vehicle, property, persons, or animals in the event of a product failure and resulting damage or injury.

Vehicle Manufacturer's Warranty

Vehicle owners should review their product literature for information on vehicle manufacturer's warranty for issues relating to alteration/modification of vehicle systems. Vehicle owners accept full responsibility for their vehicle by installing aftermarket products such as the Beartooth RC system. Beartooth RC offers no warranty for primary vehicle systems as a result of the installation of our products.

For support information, please go to www.beartoothrc.com/support.htm. For additional information, please email us at support@beartoothrc.com.