
INSTALLATION AND INSTRUCTION MANUAL

STAR RAZOR and **STAR SABRE**

ECE Compliant

M-Tech[®] Plus Lightbars



This light utilizes high-intensity LED Lamps. DO NOT stare directly into the light while it is on, as momentary blindness and/or permanent eye damage may occur.



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STAR
WARNING
SYSTEMS

STAR SIGNAL
VEHICLE PRODUCTS

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PLIT429ECE REV. C 3/31/14

Please Note: These instructions are provided as a general guideline only. Specific mounting, wiring, and/or weather-sealing may be necessary and are the sole responsibility of the installer. The manufacturer assumes no responsibility for the integrity of the installation for this or any of its products.

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It is the sole responsibility of the owner to ensure the lightbar is mounted securely. Check your light every time you enter the vehicle to ensure that it is mounted securely. The manufacturer assumes no responsibility for the secure mounting of this light.

NOTICE

Due to continuous product improvements, we must reserve the right to change any specifications and information, contained in this manual at any time without notice. Star Headlight & Lantern Co., Inc. makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Star Headlight & Lantern Co., Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual.

Quick-Wiring Guide

20-Wire Harness Wiring (271RAZOR)	
Blue	Left* Side Alley Light
White w/Blue	ICL Power (<i>Intersection Clearing Lights</i>)
White w/Yellow	Stop Lights for STT
Orange w/Yellow	Front M-Tech Plus™ Enable
Brown w/Yellow	Auxiliary Front Flashing
Red	Power (<i>Connect to constant +9-32 VDC †</i>)
Red w/Green	Right* Side Pattern Select (<i>Touch and release to +9-32 VDC to change patterns</i>)
Purple	Optional - M-Tech Plus™ High (Day)/Low (Night) (Ground for low intensity)
Green w/Yellow	Front Pursuit
Red/Black	Left* Side Pattern Select (<i>Touch and release to +9-32 VDC to change patterns</i>)
White w/Brown	Front Takedowns
Green w/Red	Rear Flood/Worklights
Brown w/Red	Auxiliary Rear Flashing Lights
Orange w/Red	Rear M-Tech Plus™ Enable
White w/Red	Taillights for STT
Yellow w/Black	Right Turn Signal for STT
White w/Black	Left Turn Signal for STT
Gray	Left* Side Alley Light
Black	Ground (<i>Connect to the negative side of the battery</i>)
Bare	Ground (<i>Shield - Connect to a good chassis ground</i>)

† - The Red wire **MUST** be connected to +9-32VDC for the front and rear warning LEDs to operate. If you are NOT utilizing a separate Front and Rear enable function, you may connect the Red wire, along with the Front enable wire and Rear Enable wire to +9-32VDC through your On/Off switch. If you ARE using a separate Front and Rear Enable function, connect this wire to constant +9-32VDC. *Please note: When the red POWER wire is connected to constant power the light will draw a small current (25 mA). If your vehicle will be sitting for extended periods of time (i.e. more than a few days), it is recommended all power wires be routed through an ignition switched power source.*

* - "Right" and "Left" sides refer to the perspective of the driver of the vehicle.

Mounting Instructions

Please review the separate Mounting Bracket manual that is also enclosed with your bar for mounting instructions.



PLEASE NOTE: THE DIRECT MOUNT IS THE STANDARD MOUNT INCLUDED WITH THE LIGHTBAR. THE HOOK MOUNTS MUST BE USED ON ALL POLICE AND/ OR OTHER EMERGENCY VEHICLES!!! THE HOOK MOUNTS ARE SOLD SEPARATELY. THEY ARE NOT INCLUDED WITH EACH LIGHTBAR. THEY MUST BE ORDERED SEPARATELY. SEE THE ACCOMPANYING HOOK MOUNT MANUAL FOR A COMPLETE LIST OF AVAILABLE MOUNTS AND KNOWN VEHICLE APPLICATIONS.

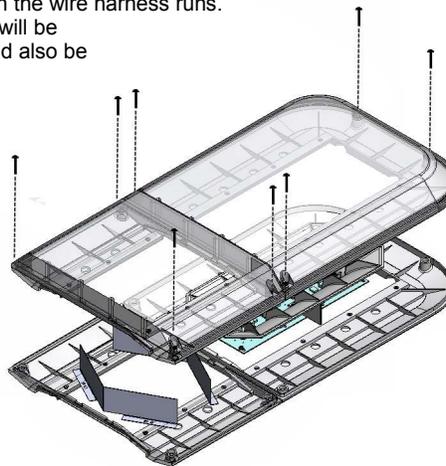
Wiring Harness Replacement

All of our ECE compliant lightbars are designed for 9-32VDC negative ground vehicles only. Reverse polarity may cause damage to the lightbar and/or vehicle. Contact the automotive dealer if there are any doubts about the polarity of your vehicle.

PLEASE NOTE: If you are using the existing wire harness supplied with the lightbar, you may skip to the Electrical Connections section on page 4.

These lightbars come with a 15-foot wiring harness. If the harness supplied with the lightbar is not long enough for your application, Star recommends ordering the proper cable of the desired length from the factory. Completely remove the pre-installed wire harness and replace it with one that is the correct length.

- *Star recommends direct wiring to the terminal block on the inside of the lightbar, rather than making connections to the end of the wire that is supplied.*
 - *This lightbar is designed so that when replacing the wire harness, no wire connectors are needed and only a few common tools are necessary.*
 - *Direct wiring allows the wire connections to the lightbar to be made in a clean and dry environment, avoiding any problems that may arise due to weathering on external connections.*
 - *Wiring directly inside the lightbar reduces the number of connections. There is an increase in voltage loss with the addition of each connection.*
 - *Making connections to the wires already provided is an acceptable alternative, as long as these connections are good electrical connections and are resistant from weathering effects.*
1. Determine the number of wires that you will need to run. Your lightbar may not use all of the wires in the harness that was shipped with the lightbar. Please note which functions your bar has, then review the lists on pages 1-2 to determine which wires you will need to connect. The bare drain wire in our harness is optional (but recommended) and is only necessary if you are experiencing RFI problems.
 2. Locate the end of the lightbar into which the wire harness runs. The black terminal block(s), which you will be making your wire terminations to, should also be located at this same end.
 3. Remove the dome lens at this end of the lightbar:
 - Step A:** Loosen the four screws holding each dome on.
 - Step B:** Lift the dome off of the base exposing the interior components.
 - Step C:** When all work is completed, reverse the steps to reinstall the dome, taking care that the gasket is properly aligned.

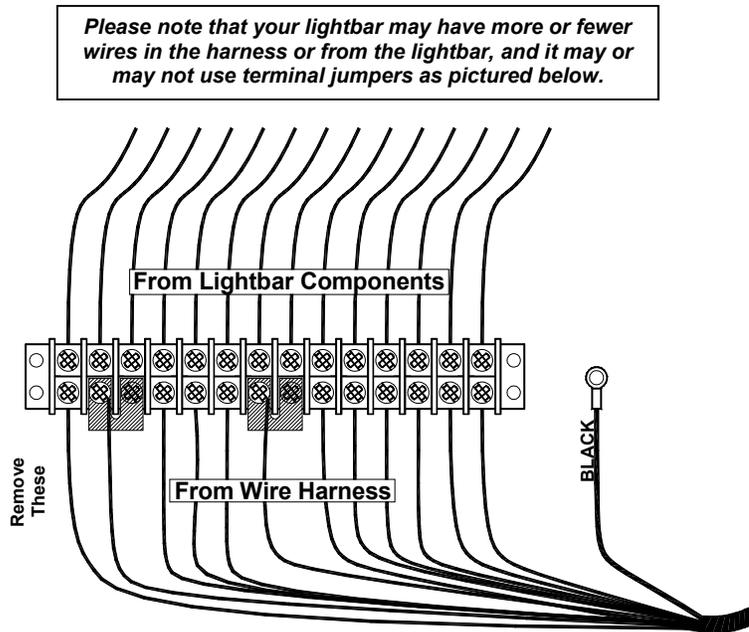


(Wiring Harness Replacement CONT'D)

4. The wiring harness will connect to one or more terminal blocks inside the lightbar. All of the wires coming from the harness are terminated on one side of the terminal block and the wires leading to the internal components terminate on the opposite side of the terminal block. The Wiring Guide on page 1 lists the wire colors from the harness in the same order as they are connected to the terminal block(s). Using the Wiring Guide, note which end of the terminal block(s) the wires in your harness start from.
5. Loosen the screws on the HARNESS SIDE of the terminal block and remove the harness. Remember that there may be "dead" wires from the harness connected to the terminal block inside your lightbar, but there will be no wires connected to the terminal across from them. These are extra wires in the harness that are not used. Replacing these wires in your new harness is not necessary.
6. Run the new external wires up through the wire bushing into the base and to the terminal block(s). Use the Wiring Guide to help determine where each of your new wires should be connected.
7. Strip each wire 1/4". Connect the external wires to the proper poles of the terminal block by inserting the stripped portion of the wire under the rising clamp screw and tightening down the screw. Note that no wire terminals are needed for connecting wires to this terminal block.

Be sure to check that no strands of wire are loose and shorting to the adjacent terminal or to the base of the lightbar.

All switches used should be rated for at least 125% of their rated load.



Electrical Connections

All of our ECE compliant lightbars are designed for 9-32VDC negative ground vehicles only. Reverse polarity may cause damage to the lightbar and/or vehicle. Contact the automotive dealer if there are any doubts about the polarity of your vehicle.



RF INTERFERENCE

Please take the following steps to help eliminate any Radio Frequency Interference (RFI) with your two-way radio.

- **DO NOT** run the power wire for the lightbar along same path as any antenna wires.
 - **DO NOT** run the power wire for the lightbar along same path as any radio power wires.
 - **DO NOT** tap power for the lightbar off of the radio power wires.
 - **DO NOT** mount the lightbar within 20" of any antennae. Sometimes mounting the lightbar or antenna over by just one foot can make a large difference in the interference.
 - Ensure the black wire from the lightbar has a good connection to the **negative side of the battery.**
-
- For all standard lightbars, 15 feet of cable (plus a drain wire and a foil shield) is supplied with the bar. All wires are color coded and sized at the correct gauge. If this length is not sufficient, it is recommended that the wire harness be completely replaced with the only connections to be made directly at the terminal block inside the lightbar. This will reduce the number of wire connections and help prevent any weathering problems on these connections. Refer to the *Wiring Harness Replacement* section on pages 2-3 for further instructions on this.
 - **CAUTION: All wires and switches should be rated for at least 125% of their maximum current load.** In addition, all wires connected to the positive terminal of the battery should be fused at the battery for 125% of their rated load. If you are unsure of the current draw, please use a test meter for an accurate measurement. Refer to the manufacturer's specifications on the wire you are using to determine the proper gauge recommended for the current draw and wire length of your application.
 - **TESTING THE LIGHTBAR BEFORE IT IS PROPERLY FUSED & INSTALLED WILL VOID THE WARRANTY!! Do not use 1/4" diameter glass fuses, as they are not suitable for continuous duty above 20 amps.**
 - The black ground wire should be connected to the negative terminal of your vehicle's battery. This wire should be as short as possible in order to minimize the voltage loss in this wire and reduce any chance of overheating.
 - Your harness will contain all of the colored wires in its corresponding harness. Most applications though, will not use every wire. The "dead" wires in the harness will be connected to the terminal block inside your lightbar, but there will be no wires connected to the terminal across from them. These "dead" wires can be used for additional components that may be added at some point in the future, or they may be used to separately switch components that are currently wired together.
 - Many of the lightbars built have custom component, thus wire colors may vary. In general though, you can use the Quick-Install Wiring Guide on page 1 to identify the function of each wire. If you are still unsure of the function of a particular wire, you may test the function by grounding the black wire and applying +9-32VDC to the wire in question. Be sure to use a 20-amp fuse when testing.

Wire Functions

Ground - Connect to the negative side of the battery.

Bare/Shield - Connect to the negative side of the battery.

Power (Red) - Connect to +9-32 VDC through your switch. *Be sure to use a 10 amp fuse when connecting the switch to the positive side of the power supply.*

The Red wire **MUST** be connected to +9-32VDC for the front and rear M-Tech Plus™ LEDs to operate.

Please note: *When the red POWER wire is connected to constant power the light will draw a small current (20 mA). If your vehicle will be sitting for extended periods of time (i.e. more than a few days), it is recommended all power wires be routed through an ignition switched power source.*

Front Enable - When the red POWER wire has power to it, applying +9-32VDC to the Front Enable wire will switch the front M-Tech Plus™ lights on independently from the rear M-Tech Plus™ lights.

Rear Enable - When the red POWER wire has power to it, applying +9-32VDC to the Rear Enable wire will switch the rear M-Tech Plus™ lights on independently from the front M-Tech Plus™ lights.

If you do not need independent control of the front and rear M-Tech Plus™ lights, it is recommended that you connect all THREE wires (Power, Front Enable, and Rear Enable) together through your switch.

Left Side Pattern Select - Touch and release to +9-32 VDC to change the flash pattern on the Left side M-Tech Plus™ array (*see page 7*).

Right Side Pattern Select - Touch and release to +9-32 VDC to change the flash pattern on the Right side M-Tech Plus™ array (*see page 7*).

High (Day)/Low (Night) - Used for optional switching between High Power (Day Mode) and Low power (Night Mode).

- Leave disconnected for High Power only (cover with wirenut or tape).
- Connect to Ground for Low Power only.
- Connect to Ground through a switch for High/Low switching.

Additional components -If your bar contains any additional components including, but not limited to, those listed below, applying +9-32 VDC to the appropriate wire will activate those components:

- Left Alley
- Right Alley
- Intersection Clearing Lights
- Takedown Lights
- Pursuit Lights
- Rear Flashers
- Flood/Work Lights
- Right Turn Lights
- Left Turn Lights
- Tail Lights
- Stop Lights

Low Voltage Detection

The circuit, used in these lightbars, has low input voltage detection. With this feature the lightbar senses the input voltage. When it drops below 10VDC the circuit flashes a fast pattern (approximately 16 cycles per second) to indicate to the user that the battery voltage is low. Once the input voltage returns to normal (greater than 12V) the unit will return to the normal flashing.

M-Tech Plus® Pattern Programming



PLEASE NOTE: This lightbar is shipped pre-programmed for pattern #4 (Alternating ECE Double Flash). Other patterns can be selected, but only those marked as ECE patterns are approved for EU use.

Before changing the pattern, please review these key points about programming the lightbar:

- The lightbar consists of two separate circuits. One circuit controls the left side and the other circuit controls the right side.
 - The left side circuit and right side circuit are programmed with different wires. Review the chart on page 1 to identify the color of each of the programming wires.
 - The two sides are usually programmed at the same time by connecting the two pattern programming wires together. The only exception typically will be when you wish to set the two sides for patterns that differ from one another.
 - The **default pattern** for this lightbar will produce an Alternating ECE Doubleflash pattern that alternates between the two halves of both the right side and left side.
1. Connect **both** the left side and right side Pattern Select wires together.
 2. Power up the light so that it is flashing.
 3. Touch and hold the **Pattern Select Wires** to +9-32VDC for 3 seconds. After 3 seconds, the light should blink once and you should release the Pattern Select wires. This will set both circuits to Pattern 4 (Alternating ECE Doubleflash).
 4. Touch the Pattern Select wires to +9-32VDC for **one second** and release them to scroll through the patterns listed on the following page. The cycle will repeat itself after the last pattern.
 5. Once you find the pattern you wish to display, connect the Pattern Select wires to ground and deactivate the light. This will store the selected pattern.



M-Tech Plus[®] Flash Patterns



PLEASE NOTE: This lightbar is shipped pre-programmed for pattern #4 (Alternating ECE Double Flash). Other patterns can be selected, but only those marked as ECE patterns are approved for EU use.

#	Pattern Description	ECE	Title 13	SAE J6845	CPS**	Shortcut
1	Alternating Flicker			X	1.00	
2	Alternating Fast Double Flash				3.30	
3	Alternating Triple Flash			X	2.50	
4	Alternating ECE Double Flash (Default Pattern)	X		X	2.04	† 3Sec
5	Alternating ECE Quad Flash	X		X	2.13	
6	Alternating Quad Flash		X	X	1.00	†† 6Sec
7	Alternating Quad Flash w/Post-Pop		X	X	1.00	
8	Alternating Single Flash		X	X	1.00	
9	Alternating Slow Double Flash		X	X	1.00	
10	Alternating Variable				0.20	
11	Alternating Post Pop		X	X	1.40	
12	Alternating Random				0.40	
13	Alternating Quintflash		X	X	1.20	††† 9Sec
14	Swing				1.30	
15	Alternating Fast Double Flash, Alternating Flicker				N/A	
16	Alt. Quad Flash, Alt. Flicker, Alt. Fast Double Flash, Flicker				N/A	
17	Counter Clockwise Rotation				2.50	
18	Simultaneous Quad w/Post Pop (Phase 1)		X	X	1.00	†††† 12Sec
19	Simultaneous Quad w/Post Pop (Phase 2)		X	X	1.00	
20	Alt. Triple, Alt. Non-Synch Double, Alt. Quint, Flicker				N/A	
21	Steady burn one side, Other side Single Flash		X		1.00	
22	Cycle All				N/A	
23	Quad w/Post Pop, Fast Double w/Post Pop				N/A	
24	Alternating Non-Synch Double				3.40	
25	Swing, Flicker				N/A	
26	Slow Double, Fast Double				N/A	
27	Alternating Fade				0.80	
28	Simultaneous Flicker (Phase 1)		X	X	1.0	
29	Simultaneous Flicker (Phase 2)		X	X	1.0	
30	Simultaneous ECE Doubleflash (Phase 1)	X		X	2.04	††††† 15Sec
31	Simultaneous ECE Doubleflash (Phase 2)	X		X	2.04	
32	Simultaneous ECE Quadflash (Phase 1)	X		X	2.13	
33	Simultaneous ECE Quadflash (Phase 2)	X		X	2.13	
34	Sim. Quad (Phase 1), Alt. Triple, Sim. Flicker (Phase 1), Alt. Fast Double				N/A	
35	Sim. Quad (Phase 2), Alt. Triple, Sim. Flicker (Phase 2), Alt. Fast Double				N/A	

†, ††, †††, ††††, ††††† = Programming Shortcuts 1, 2, 3, 4, and 5 (hold to +9-32VDC)
 ** = Cycles Per Second

Programming Shortcuts

Touch and hold the Pattern Select wires to +9-32 VDC for the length of time that corresponds to the pattern you would like to jump to. Then release the Pattern Select wires once the light blinks the appropriate number of times.

Length of Hold	Unit Blinks	Jumps to
3 seconds	1 time	† - Pattern 4
6 seconds	2 times	†† - Pattern 6
9 seconds	3 times	††† - Pattern 13
12 seconds	4 times	†††† - Pattern 18
15 seconds	5 times	††††† - Pattern 30

Optional DLX Series Head Programming

If your lightbar contains any additional components besides the M-Tech Plus® heads, the additional DLX series lights will be pre-set for the correct mode (flashing or steady burn), and will be pre-programmed with a default pattern (unless specified when ordering). These heads will include any of the following:

- Left Alley
- Right Alley
- Intersection Clearing Lights
- Takedown Lights
- Pursuit Lights
- Rear Flashers
- Flood/Work Lights
- Traffic Directors
- Right Turn Lights
- Left Turn Lights
- Tail Lights
- Stop Lights

Under most circumstances you will not need to program any of these heads.

If you do wish to change the pre-programmed pattern of any flashing heads (*ICL, Pursuit, or Flashers*), you will need to gain access to the inside of the bar. Please refer to page 2 and follow the section of the instructions that explains how to remove the domes.

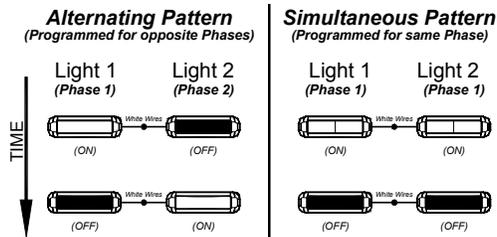
Typically between two and six heads will be synchronized and thus controlled by one wire in the harness. **These heads must be all programmed for the same Pattern Type.**

1. Activate the heads you wish to program by applying power to the corresponding harness wire.
2. Select one of the illuminated heads and locate the green wire from it. Touch and release the green wire to ground to change patterns until you find the pattern that you wish to use.

3. Program additional synchronized heads with the same **Pattern Type**.

Lights with the SAME phase flash together (simultaneous).

Lights with DIFFERENT phases flash opposite one another (alternate).



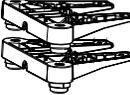
4. After programming all heads, cap off the green wires to prevent them from accidentally grounding.
5. Test your lights by removing power for a few seconds then re-applying power. Ensure that they are all flashing in the desired fashion. Repeat programming if necessary.

Phase 1 Flash Pattern	Phase 2 Flash Pattern	Pattern Type	SINK SYSTEM Pattern Description	Shortcut
1	13	K	Flicker †	← Pattern 1 (Phase 1) 3 sec or 1 flash
2	14	L	Fast Doubleflash	
3	15	M	Tripleflash †	
4	16	N	PSU Flicker	← Pattern 13 (Phase 2): 3 sec or 3 flashes
5	17	O	PSU Random	
6	18	F	Quadflash †	← Pattern 6 (Phase 1) 6 Sec or 2 flash Pattern 16 (Phase 2): 12 sec or 4 flashes
7	19	G	Quadflash w/Post-Pop †	
8	20	H	Singleflash †	
9	21	I	Doubleflash †	
10	22	J	Variable AKA Delta-Omega	
11	23	C	Post pop	
12	24	E	Random	

† - Approved patterns for SAE J845 and California Title 13

Pattern Shortcuts: Hold Green wire to ground for indicated time.

Parts

	<u>RAZOR</u>	<u>SABRE</u>
 UPPER END DOME	520-21-*	520-21-*
 UPPER CENTER DOME	520-22-*	520-22-*
 LOWER END DOME	220-21L-*	520-21L-*
 LOWER CENTER DOME	220-22L-*	520-22L-*
 RAZOR TOP COVER	220-CTC	N/A
 DOME GASKETING (1 FOOT)	30047-61	30047-61
 TOP DOME SCREWS	30053-33	30053-33
 DLX4 FLASHING OR STEADY BURN LED HEAD WITH BRACKET	220-DLX4-FS-*	520-DLX4-FS-*
 DLX4 TRAFFIC DIRECTOR LED HEAD WITH BRACKET	220-DLX4-TD-A	520-DLX4-TD-A
 DLX4 STOP/TAIL LED HEAD WITH BRACKET	220-DLX4-ST-R	520-DLX4-ST-R
 6-HEAD DLX4 LED TRAFFIC DIRECTOR WITH BRACKETS	S220-DLX4TDK6A	S520-DLX4TDK6A
 8-HEAD DLX4 LED TRAFFIC DIRECTOR WITH BRACKETS	S220-DLX4TDK8A	S520-DLX4TDK8A
 LARGE HALF-DIAMOND	920-29-2R	520-29-3
 TRAFFIC DIRECTOR CONTROL BOX	TD77-2 (12VDC) or TD77-2-24 (24 VDC)	
 DIRECT MOUNT KIT	820-39-PB	
 THESE ARE PICTURED IN THE HOOK MOUNT MANUAL AND WORK IN CONJUNCTION WITH THE 820-39PB	SEE HOOK MOUNT INSERT	

*=COLOR

Please note that these items are not drawn to scale. Many have been enlarged to show more detail.

Troubleshooting

Symptom	Possible solutions
Flash Pattern is not changing	Pattern select wire must be pulled to +9-32VDC to change pattern.
Unit stuck in high power	High/Low wire must be grounded to activate low power mode.
Bar is not synchronizing with other product	<ul style="list-style-type: none"> -Check to ensure all desired lights to be synchronized have the capability of being synchronized. -Check to ensure synchronization wire is connected to all units that are desired to be synchronized. -Check to ensure all lights to be synchronized are set to same <i>Pattern</i>. -Ensure that the entire system that is desired to be synchronized is powered up at the same time via the same switch. -Ensure that the total amount of synchronizable products in the system does not exceed 6 lights.
One single LED is out.	The entire flasher board will need to be replaced.
One complete half of the bar is out.	<ul style="list-style-type: none"> -Check wiring to the flasher board that is experiencing the problem. -The entire LED board on that side may need to be replaced.
If the bar is experiencing erratic flashing or side to side synchronizing within the bar is not working.	<ul style="list-style-type: none"> -Ensure both sides are set to the same <i>Pattern Type</i>. -Ensure synchronization wire is connected between both flasher boards internally. -Ensure both flasher circuits in the bar are powered from the same power switch.

Warranty

FIVE YEAR LIMITED WARRANTY

The manufacturer warrants each new product, under normal use, against factory defects in material and workmanship for **one year** after the date of purchase. The manufacturer warrants the **LED components** in this light against factory defects in material and workmanship for **five years** after the date of purchase. The owner will be responsible for returning to the Service Center any defective item(s) with the transportation costs prepaid. The manufacturer will, without charge, **repair or replace at its option**, products, or part(s), which its inspection determines to be defective. Repaired or replacement item(s) will be returned to the purchaser with transportation costs prepaid from the service point. A copy of the purchaser's receipt must be returned with the defective item(s) in order to qualify for the warranty coverage. If a copy of the receipt is not provided, the warranty period shall cover five years from the date of manufacture.

Exclusions from this warranty include, but are not limited to, bulbs, strobe tubes, domes, and/or the finish. This warranty shall not apply to any light, which has been altered, such that in the manufacturer's judgment, the performance or reliability has been affected, or if any damage has resulted from abnormal use or service. This warranty does not apply to defect or damage occurring as a result of disaster, accident, abuse, misuse, lightning, power surges, or failure to follow instructions in any enclosed manuals. Any damage or defects occurring as a result of any unauthorized service or repairs by unauthorized persons shall be excluded from this warranty.

There are no warranties expressed or implied (including any warranty of merchantability or fitness), which extend these warranty period. **The loss of use of the product, loss of time, inconvenience, commercial loss or consequential damages, including costs of any labor, are not covered.** The manufacturer reserves the right to change the design of the product without assuming any obligation to modify any product previously manufactured.

This warranty gives you specific legal rights. You might also have additional rights that may vary from state to state. Some states do not allow limitations on how long an implied warranty lasts. Some states do not allow the exclusion or limitation of incidental or consequential damages. Therefore, the above limitation(s) or exclusion(s) may not apply to you.