Safety First!

This service manual is for model LL274FHP Lightbar. It has been designed to enable a qualified field technician to diagnose and troubleshoot specific problems that may occur over the life of this product. It is important to understand that the design of this lightbar precludes the field repair of any electrical assembly. Failed components must either be replaced or returned to the factory for repair. The installation technician must read this manual completely prior to performing any service on this lightbar. Important information is contained herein that could prevent serious injury or damage.

• For this product to operate at optimum efficiency, a good electrical connection to chassis ground must be made. The recommended procedure requires the product ground wire to be connected directly to the NEGATIVE (-) battery post.

• This product contains strobe lights, halogen lights and high-intensity LEDs. Do not stare directly into these lights. Momentary blindness and/or eye damage could result.

• Use only soap and water to clean the outer lens. Use of other chemicals could result in premature lens cracking (crazing) and discoloration. Lenses in this condition have significantly reduced effectiveness and should be replaced immediately. Inspect and operate this product regularly to confirm its proper operation and mounting condition. Do not use a pressure washer to clean this product.

• It is recommended that these instructions be stored in a safe place and referred to when performing maintenance and/or reinstallation of this product.

• FAILURE TO FOLLOW THESE SAFETY PRECAUTIONS AND INSTRUCTIONS COULD RESULT IN DAMAGE TO THE PRODUCT OR VEHICLE AND/OR SERIOUS INJURY TO YOU AND YOUR PASSENGERS!
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**Lightbar Components**

The model LL274FHP lightbar is comprised of the following components:

<table>
<thead>
<tr>
<th>Qty.</th>
<th>Description</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3)</td>
<td>500-series Linear Strobe Module</td>
<td>#B1 / #B2 / #B3</td>
</tr>
<tr>
<td>(4)</td>
<td>Corner Strobe Assemblies</td>
<td>#A1 / #A2 / #A3 / #A4</td>
</tr>
<tr>
<td>(5)</td>
<td>500-series Amber LED Lightheads</td>
<td>#L1 / #L2 / #L3 / #L4 / #L5</td>
</tr>
<tr>
<td>(4)</td>
<td>500-series Halogen Snap-in Reflectors w/27 watt Halogen Lamps</td>
<td></td>
</tr>
<tr>
<td>(10)</td>
<td>500-series Snap-in Reflector Housings</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Strobe Power Supplies</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>LFL LC Input/Output (I/O) Board</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Endcap Gaskets</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Blue Endcaps w/Clear Alley Light Lens</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>Blue Lens (5 11/16&quot;)</td>
<td></td>
</tr>
<tr>
<td>(12)</td>
<td>Lens Dividers w/gaskets</td>
<td></td>
</tr>
<tr>
<td>(8)</td>
<td>Clear Lens (5 1/16&quot;)</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Blue Lens (5 1/16&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

*Fig. 1: Top View of Lightbar*

"Fig. 1: Top View of Lightbar" (page 3) shows lens length and location. Refer to “Fig. 2: Component Identification” (page 4) for an overall view of the lightbar with individual lighthead designations. Refer to “Fig. 3: Exploded View” (page 5) for an exploded view along with each components corresponding part number."
Fig. 2: Component Identification
Fig. 3: Exploded View

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>68-196333B02</td>
<td>LENS, BLUE (5 11/16&quot;)</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>02-0342791-00</td>
<td>DIVIDER, LENS (w/GASKET)</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>68-196333C01</td>
<td>LENS, CLEAR (5 1/16&quot;)</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>68-196333B01</td>
<td>LENS, BLUE (5 1/16&quot;)</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>02-036332-00</td>
<td>STROBE, CORNER LINEAR</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>02-036358-00</td>
<td>REFLECTOR, SNAP-IN 500-SERIES HAL.</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>11-463564-000</td>
<td>HOUSING, SNAP-IN LIGHTHEAD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3</td>
<td>02-0363292-00</td>
<td>500-SERIES LINEAR STROBE</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>68-1963237-30</td>
<td>LENS, CLEAR (w/OPTICS)</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>38-0283572-00</td>
<td>GASKET, ENDCAP</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>01-0463566-23</td>
<td>ENDCAP, BLUE (INCLUDES 3 &amp; 11)</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>01-0269098-00</td>
<td>POWER SUPPLY, LFL412 STROBE</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>01-0269116-00</td>
<td>ASS'Y, LFL IO BOARD</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>01-0463286-1A</td>
<td>ASS'Y, 500-SERIES LED (AMBER)</td>
</tr>
<tr>
<td>15*</td>
<td>4</td>
<td>H27 SN1.2</td>
<td>BULB, SNAP-IN HALOGEN</td>
</tr>
</tbody>
</table>

* NOT SHOWN
Wiring

Power Cable
The Power Cable contains a 8 AWG Black wire and a 8 AWG Red wire. Connect the BLACK wire directly to chassis ground (typically adjacent to the vehicle battery). Connect the RED wire, fused @ 40 amps (customer supplied), to the POSITIVE battery terminal. IMPORTANT! There should not be more than 2 (two) feet of wire between the fuse and battery.

WARNING! All customer supplied wires that connect to the positive terminal of the battery must be sized to supply at least 125% of the maximum operating current and FUSED at the battery to carry that load. DO NOT USE CIRCUIT BREAKERS WITH THIS PRODUCT!

Fig. 4: Main Power Wiring

Control Wire Functions
The control wires (22 AWG) are used to activate specific lightbar functions. These wires should be connected to a customer supplied control head or switched output. Any control wire that requires +12VDC for activation must be fused using a 1 Amp fuse (customer supplied). Please note that the current draw values shown represent the amount the lightbar will draw through the main power cable with the corresponding control wire active. These values are cumulative (Yellow + Green = 14 Amps Current Draw).

<table>
<thead>
<tr>
<th>Color</th>
<th>Activates</th>
<th>Current Draw</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Strobe</td>
<td>9 Amps</td>
<td>Applying +12VDC to this wire activates: Corner Strobes A2 &amp; A3 Inboard Strobes B2 &amp; B3</td>
</tr>
<tr>
<td>Grey</td>
<td>Strobe+LED</td>
<td>5 Amps</td>
<td>Applying +12VDC to this wire activates: Corner Strobes A1 &amp; A4 LED L2 &amp; L4</td>
</tr>
<tr>
<td>Blue</td>
<td>Strobe+LED+Halogen</td>
<td>26 Amps</td>
<td>Applying +12VDC to this wire activates: Corner Strobes A1, A2, A3 &amp; A4 Inboard Strobes B1, B2 &amp; B3 LED L2 &amp; L4 Both Take-Down Lights (flashing) Both Alley Lights (flashing)</td>
</tr>
</tbody>
</table>
Yellow Halogen 2.5 Amps Applying +12VDC to this wire activates: Passenger side Alley Light (steady on)
White Halogen 2.5 Amps Applying +12VDC to this wire activates: Driver side Alley Light (steady on)
White/Black Halogen 5 Amps Applying +12VDC to this wire activates: Both Take-Down Lights (steady on)
White/Brown LED .75 Amps (3A Peak) Applying +12VDC to this wire activates: LED L1, L2, L3, L4 & L5
White/Orange Strobes 9 Amps Applying +12VDC to this wire activates: Corner Strobes A1, A2, A3 & A4
White/Yellow LED 1.1 Amps (3A Peak) Applying +12VDC to this wire activates: “Sequence:Left” Pattern (LED’s).
White/Green LED 1.1 Amps (3A Peak) Applying +12VDC to this wire activates: “Sequence:Right” Pattern (LED’s). Note: White/Yellow + White/Green = “Split” pattern
White/Blue Strobe Flash Pattern N/A Applying +12VDC to this wire changes the active strobe’s pattern to “Action Flash™”.
White/Violet Strobe Flash Pattern N/A Applying +12VDC to this wire changes the active strobe’s pattern to “Longburst”.
Violet Low Power N/A Applying +12VDC to this wire places the bar into Low Power operation mode.
No Color RF Drain N/A Connect to chassis ground.
Brown No Function N/A
**Troubleshooting**

This section will outline the necessary diagnostic procedures for determining the probable cause for component failure within your lightbar. Disassembly of the lightbar may be required in order to perform specific diagnostic tests and for component removal and/or replacement. Although the process is not difficult, it does require focused attention to ensure proper re-assembly. It is a good idea to keep careful notes documenting the procedure. All components MUST be returned to their original mounting location WITH THEIR ORIGINAL ELECTRICAL CONNECTIONS IN TACT before reassembly.

**WARNING! THIS PRODUCT CONTAINS HIGH VOLTAGE. DISCONNECT THE LIGHTBAR FROM POWER AND WAIT 10 MINUTES BEFORE PERFORMING ANY DISASSEMBLY PROCEDURES.**

**Opening the Lightbar**

**Tools Required:** #20 Torx™ head screwdriver  
#25 Torx™ head screwdriver

1. Using the #25 Torx™ head screwdriver, remove the 4 endcap screws from each endcap.
2. Remove the endcaps and endcap gasket from the extrusion. If the alley light is not being tested it may be unplugged and the endcap assembly may be moved away from the work area.
3. Remove all lenses and dividers. It is important to note the location of each lens and divider so that each may be returned to their original location.
4. Slide the 4 corner strobes out of the extrusion.
5. Using the #20 Torx™ head screwdriver, remove the 4 screws located on the top of the lightbar extrusion. Remove the top of the extrusion from the lightbar.

**Replacing the Strobe Power Supply**

1. Locate and disconnect the 8-position and 12-position power supply connectors.
2. Slide the power supply out of the extrusion.
3. Slide the replacement power supply into the extrusion, using the same extrusion guide tracks as the original.

**Caution:** It is very important to visually confirm that no wires are being pinched between the power supply and the extrusion.

4. Reconnect the two connectors disconnected in step 1.
Replacing the LFL LC I/O Board

1. Remove the main power fuse installed at the vehicle battery. This will remove all voltage from the lightbar.

2. Record the location of where each connector plugs into the I/O board. Beginning with the main voltage cables, unplug each connector from the I/O board.

3. Locate and remove the 5 Phillips-head screws used to secure the I/O board to its mounting plate.

4. Carefully lift the I/O board up and away from the mounting plate.

Note: Remnants of insulating material may remain on the mounting plate after the board has been removed. These remnants must be completely removed from the mounting plate prior to installation of the new I/O board.

5. Install the new I/O board onto the mounting plate using the original mounting hardware.

6. Return all the connectors to their original location.

Fig. 6: I/O Board Connections

Diagnosis

The following section will present diagnostic flow charts designed to allow service personnel to isolate the probable cause for specific lightbar failures.

WARNING! High Voltage is present within the lightbar! The diagnostic procedures outlined herein should not be attempted by anyone other than trained and experienced service technicians.

Note: When measuring voltages within the lightbar, clip the Negative lead from your volt meter to the BLACK, 8 AWG wire contact at the I/O board (see Fig. 6).
All Lamp Failure (dead bar)

Perform these procedures with BLUE control wire active for the duration of this test.

1. **Check master fuse at battery and replace if necessary.**
   - **Yes:** New fuse blows. Main power cable is suspect. Inspect, repair or replace.
   - **No:** Bar operates properly.

2. **Check power and ground wires at battery. Confirm good electrical connections.**
   - **Yes:** Bar operates properly.
   - **No:** Is Problem Solved?
     - **Yes:** Bar operates properly.
     - **No:** Open lightbar as outlined previously.

3. **Confirm BLU control wire has +12VDC at switch output.**
   - **Yes:** Switch output is suspect. Inspect, repair or replace.
   - **No:** Is +12VDC present?
     - **Yes:** Input harness is suspect. Inspect, repair or replace.
     - **No:** Confirm +12VDC @ BLU wire in input control connector.

4. **Check both fuses on I/O board and replace if necessary.**
   - **Yes:** Bar is operating properly.
   - **No:** Is bar operating properly?
     - **Yes:** Bar operates properly.
     - **No:** Contact Whelen Engineering Technical Support.

   - **Yes:** New fuses blow. Disconnect TD, Alley & LED harnesses from I/O Board and replace blown fuses.
   - **No:** Did new fuses blow?
     - **Yes:** Bar operates properly.
     - **No:** Harness wires are suspect. Inspect, repair or replace.

   - **Yes:** Bar is operating properly.
   - **No:** I/O board is malfunctioning and must be replaced.

   - **Yes:** Main wiring is suspect. Inspect, repair or replace.
All Strobe Failure

Perform these procedures with GREEN & GREY control wire active for the duration of this test.

Confirm GRN & GRY control wires have +12VDC at switch output.

Is +12VDC present?

Y: Open lightbar as outlined previously.

N: Switch output is suspect. Inspect, repair or replace.

Confirm +12VDC @ GREEN wire in input control connector.

Is +12VDC present?

Y: Input harness is suspect. Inspect, repair or replace.

N: Check the fuses & ground at both power supplies and replace if necessary.

Is bar operating properly?

Y: Bar operates properly.

N: I/O card is malfunctioning and must be replaced.
Outboard Strobe Failure

Perform these procedures with WHITE/ORANGE control wire active for the duration of this test.

Confirm WHT/ORN control wire has +12VDC at switch output.

- Is +12VDC present?
  - Yes
    - Switch output is suspect. Inspect, repair or replace.
  - No
    - Open lightbar as outlined previously.

Confirm +12VDC @ WHT/ORN wire in input control connector.

- Is +12VDC present?
  - Yes
    - Input harness is suspect. Inspect, repair or replace.
  - No
    - Check the fuses & ground at power supply “A” and replace if necessary.

New fuse blows; Bad Power Supply.

- Is bar operating properly?
  - Yes
    - Bar operates properly.
  - No
    - Swap the two Power Supplies.

- Are outbound strobes still bad?
  - Yes
    - Power Supply is suspect.
  - No
    - Disconnect strobes one at a time (no more than 1 strobe unplugged at any one time).

- Did all strobes start working?
  - Yes
    - Disconnected strobe is suspect. Replace with known good strobe.
  - No
    - Did remaining strobes start working?
      - Yes
        - Inspect the wires between strobe lighthheads and Power Supply “A”. Repair any breaks or damage.
      - No
        - Wires were intact.

- Did this solve problem?
  - Yes
    - Bar operates properly.
  - No
    - Contact Whelen Engineering Technical Support.
Inboard Strobe Failure

Perform these procedures with BLUE control wire active for the duration of this test.

- Confirm BLU control wire has +12VDC at switch output.
  - Is +12VDC present?
    - No: Switch output is suspect. Inspect, repair or replace.
    - Yes: Open lightbar as outlined previously.

- Confirm +12VDC @ BLU wire in input control connector.
  - Is +12VDC present?
    - No: Input harness is suspect. Inspect, repair or replace.
    - Yes: Check the fuses & ground at power supply “B” and replace if necessary.

  - New fuse blows; Bad Power Supply.
    - Is bar operating properly?
      - No: Bar operates properly.
      - Yes: Bar operates properly.

- Swap the two Power Supplies.
  - Are inboard strobes still bad?
    - Yes: Power Supply is suspect.
    - No: Disconnect strobes one at a time (no more than 1 strobe unplugged at any one time).

  - Did all strobes start working?
    - No: Disconnected strobe is suspect. Replace with known good strobe.
    - Yes: Did remaining strobes start working?
      - No: Inspect the wires between strobe lighthheads and Power Supply “B”. Repair any breaks or damage.
      - Yes: Did this solve problem?
        - No: Contact Whelen Engineering Technical Support.
        - Yes: Bar operates properly.
All Halogen Failure

Perform these procedures with BLUE control wire active for the duration of this test.

1. Confirm BLU control wire has +12VDC at switch output.
   - Is +12VDC present?
     - Y: Switch output is suspect. Inspect, repair or replace.
     - N: Open lightbar as outlined previously.

2. Confirm +12VDC @ BLUE wire in input control connector.
   - Is +12VDC present?
     - Y: Input harness is suspect. Inspect, repair or replace.
     - N: Check Halogen fuse on I/O board and replace if necessary.

3. New fuse blows. Disconnect TD & Alley harnesses from I/O Board and replace blown fuse.
   - Did new fuse blow?
     - Y: I/O board is suspect. Inspect, repair or replace.
     - N: Bar operates properly.

4. Hamness wires are suspect. Inspect, repair or replace.
   - Is bar operating properly?
     - Y: Bar operates properly.
     - N: I/O board is malfunctioning and must be replaced.

5. Contact Whelen Engineering Technical Support.
   - Is bar operating properly?
     - Y: Bar operates properly.
     - N: Bar operates properly.
Alley Light Failure

Perform these procedures with the WHITE & YELLOW control wires active for the duration of this test.

1. Confirm WHT & YEL control wires have +12VDC at switch output.
   - Is +12VDC present? (Y) Switch output is suspect. Inspect, repair or replace.
   - Open lightbar as outlined previously.

2. Confirm +12VDC @ WHT & YEL wires in input control connector.
   - Is +12VDC present? (Y)

3. Check Halogen fuse on I/O board and replace if necessary.
   - Is bar operating properly? (Y) Bar operates properly.

4. Locate the alley light connector on the I/O board. Insert the (+) lead of voltmeter into Pos. 1 and the (-) lead into Pos. 2.
   - Is +12VDC present? (N) I/O board is malfunctioning and must be replaced.
   - Wiring to lighthead is suspect. Inspect, repair or replace.
   - Is bar operating properly? (N) Bar operates properly.

5. Locate the alley light connector on the I/O board. Insert the (+) lead of voltmeter into Pos. 3 and the (-) lead into Pos. 4.
   - Is +12VDC present? (N)
Take-Down Light Failure
Perform these procedures with the WHITE/BLACK control wire active for the duration of this test.

1. Confirm WHT/BLK control wire has +12VDC at switch output.
   - Is +12VDC present? Y: Open lightbar as outlined previously. N: Switch output is suspect. Inspect, repair or replace.

2. Confirm +12VDC @ WHT/BLK wire in input control connector.
   - Is +12VDC present? Y: Input harness is suspect. Inspect, repair or replace. N: Check Halogen fuse on I/O board and replace if necessary.

3. Check Halogen fuse on I/O board and replace if necessary.
   - Is bar operating properly? Y: Bar operates properly. N: Locate the Take-Down light connector on the I/O board. Insert the (+) lead of voltmeter into Pos. 1 and the (-) lead into Pos. 2.
     - Is +12VDC present? Y: I/O board is malfunctioning and must be replaced. N: Locate the Take-Down light connector on the I/O board. Insert the (+) lead of voltmeter into Pos. 3 and the (-) lead into Pos. 4.
LED Lighthouse Failure
Perform these procedures with the WHITE/BROWN control wire active for the duration of this test.

Is lighthead steady-on or Dead?

Confirm WHT/BRN control wire has +12VDC at switch output

Open lightbar as outlined previously.

Confirm +12VDC @ WHT/BRN wire in input control connector.

Input harness is suspect. Inspect, repair or replace.

Check LED fuse on I/O board and replace if necessary.

Bar operates properly.

Is bar operating properly?

At the failed lighthouse, insert the (+) lead of voltmeter into Pos. 1 and the (-) lead into Pos. 2.

LED Lighthouse has failed and must be replaced.

Steady Voltage is present.

Measure voltage at the appropriate wire colors on the I/O board’s LED connector for the failed lighthouse.

I/O board is malfunctioning and must be replaced.

Is pulsing voltage present?

Wiring to lighthouse is suspect. Inspect, repair or replace.

Is bar operating properly?

Contact Whelen Engineering Technical Support.

*Note and record the LED wire colors at the harness-side of the lighthouse connector. For example, the Orange wire connects to the Red (+) lighthouse wire, while the White/Orange wire connects to the Black (-) wire for the same lighthouse. Measurements will be taken at the rear LED connector on the I/O board at the corresponding colors for each failed lighthouse (important; Solid colors are always POSITIVE).
LED Traffic Advisor Failure

Perform these procedures with the appropriate control wire active for the duration of this test (WHITE/YELLOW - sequence to LEFT WHITE/GREEN - sequence to RIGHT Both active - Split).

- Confirm the appropriate control wires have +12VDC at switch output.
  - Is +12VDC present? Y: Switch output is suspect. Inspect, repair or replace.
  - N: Open lightbar as outlined previously.

- Confirm +12VDC @ the appropriate wire in input control connector.
  - Is +12VDC present? Y: Input harness is suspect. Inspect, repair or replace.
  - N: Check LED fuse on I/O board and replace if necessary.
    - Is bar operating properly? Y: Bar operates properly.
    - N: Measure voltage at the appropriate wire colors on the I/O board’s LED connector for a failed lighthouse.*
      - Is pulsing voltage present? Y: I/O board is malfunctioning and must be replaced.
      - N: Wiring to lighthouse is suspect. Inspect, repair or replace.
        - Is bar operating properly? Y: Bar operates properly.
        - N: Contact Whelen Engineering Technical Support.

*Note and record the LED wire colors at the harness-side of the lighthouse connector. For example, the Orange wire connects to the Red (+) lighthouse wire, while the White/Orange wire connects to the Black (-) wire for the same lighthouse. Measurements will be taken at the rear LED connector on the I/O board at the corresponding colors for each failed lighthouse (Important! Solid colors are always POSITIVE).