

HARNESS FAILURE

DIAGNOSING HARNESS FAILURE

SECTION OBJECTIVES

1. Locating The Point Of Failure
2. Connector Damage
3. Harness Damage
4. Mechanical Damage

After identifying the harness as the source of the problem and concluding that there is no power at the connector of the lamp when the lights are switched on, be aware that most failures are caused due to wire harness failure from improperly maintained connectors.

1. Locating The Point Of Failure

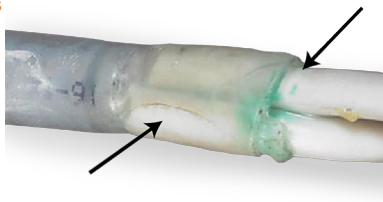
To diagnose the harness-based failure, start by examining the harness to find clues as to where the wire is broken.

To trace down the location of the failure, start at the lamp connector and look for abnormalities in the wire or connector that could indicate a failure, such as water wicking.

The term **water wicking** describes how water can travel internally through and along wires. When water seeps into small cracks and seams in connectors and wires, it uses adhesion, cohesion, and surface tension to stick to things. Just as rain sticks to the surface of clothing (rather than completely running off), water can stick to the copper in harness wiring, getting between the wires and the insulation. Water's high cohesion

properties cause it to bead up and, through surface tension, it will stick to itself—as shown on a newly waxed car. Water that gets pulled into the small spaces in wiring, between the wire and insulation, drags along more water because it sticks to itself.

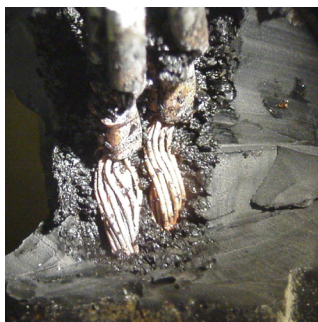
[The image to the right shows evidence of the damage caused by water creeping through the wiring from an opening at the connection.]



Despite starting out small, water wicking can become a large problem. Water can travel great distances by wicking, sometimes causing corrosion along the entire length of the wire. This type of corrosion can be extremely damaging as it often goes undetected until a failure has occurred in the wire. It can damage the entire length of wire, and when the harness eventually fails, the entire wire must be replaced.

[The image shown depicts a cut-away wire and shows the internal damage that a bend can cause.]

Failure commonly occurs close to, or even in the connector, because of water wicking through a damaged or missing seal. Examine the connectors at the lamp and at the nose box, checking their terminals for damage or corrosion. If the connectors



are good, the terminals should appear clean and the housing inside should be clean and straight. In bad connectors, terminals may appear dirty, have holes in them, or contain a powder-like substance inside the connector (which indicates past corrosion).

2. Connector Damage

A damaged connector should be replaced, though it is recommended that you first check the connector with a continuity meter to ensure that all wires are making contact with their connector pins. When it is necessary to cut off the connector, be sure to leave enough wire for working on both sides of the cut. Check the harness side of the cut to be sure power is present. At that point, observe the wire polarity and tag the wires for consistency when reattaching.

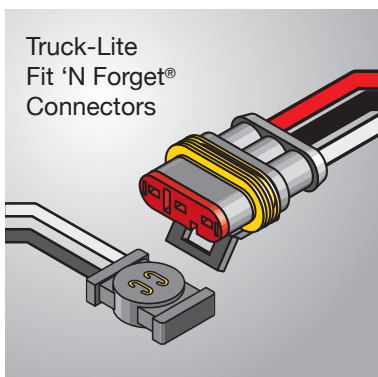
[Example of corroded connector.]



Once cut, verify that when the lights are switched on, the cut ends of the harness have power. If the nose box connector is faulty, apply power to the appropriate wires and verify that the corresponding lamp is illuminated. If it does not, there is likely further damage inside the wiring harness. Examine, identify, and correct faults inside the harness before reattaching the nose box connector.

When replacing a connector, use a sealed type, as a non-sealed connector can encourage water wicking despite a snug fit. A sealed connector prevents any moisture intrusion. It is best to replace the connector with a Truck-Lite specified mating connector for the Truck-Lite lamp being installed on the vehicle. If possible, use a Truck-Lite Fit 'N Forget® Connector for maximum seal [see image on the next page]. Reattach the connector wires only if the harness side tests correctly for power.

Connector seals are very important to the life of the harness, as they prevent corrosion by sealing the wires and connectors from water. Be sure the connectors seals are in good condition and properly in place to prevent water wicking. The seal in the connector actually presses against the housing and eliminates any gap that would allow water to wick into the connector.



3. Harness Damage

Sometimes corrosion can appear in the middle of the harness due to a break in the insulation from road damage, or through the use of a piercing probe. Look for signs of corrosion or breaks inside the wire.

Using a piercing probe is discouraged, as it leaves a hole in the wire that can lead to corrosion. If there is evidence that a piercing probe was used in the past, all holes in the insulation must be sealed.

Road debris can also cause breaks in the insulation and allow moisture to wick into the wire. Swelling in the wire insulation can indicate the presence of corrosion at a break in the insulation. The corrosion will often extend beyond the swelling, requiring a larger segment of the wire to be replaced.

When replacing corroded wire, it is necessary that the new wire must be of equal or larger size. Larger wire is indicated by a smaller gauge number.

4. Mechanical Damage

Stresses can easily damage a wire, as its design was meant to carry electricity, with little emphasis on mechanical strength. Weak spots due to corrosion, or mechanical stress can cause the wire to break without breaking the actual insulation, as the insulation is usually more resilient than the wire it protects. This type of break can be a very difficult failure to detect and repair; often, the entire length of wire must be replaced when the break cannot be found.

Wire tension can also cause a connector or wire to fail. If a wire is cut just long enough to reach the lamp, it can fail from an impact, from road debris, or from thermal expansion. Thermal expansion can cause the wires to shorten at cold temperatures, making them tight. This tightening may pull the wire out of the connector or cause internal breaks. Look for places where the wire appears to have little or no slack. Sharp bends in the wire can indicate an internal break as well.

Repeated flexing will stress the wire and sometimes cause it to break. To avoid this, connectors and splices should be restrained to prevent damage from excessive motion during vehicle movement. Often, failure locations can be found by moving the suspect wires and looking for intermittent operation when they change position.

Finally, look for any sharp bends in the wire, or the appearance of a wire kink. These may appear at the secured ends of excessively loose wire that can move a lot during vehicle motion. Remove the faulty segment and restrain the wire splices to prevent excessive motion and future internal breaks. For long wire runs (50 ft. and greater), the effects of thermal expansion can make the wire expand in hot weather or retract — sometimes up to several inches shorter — in cold weather.