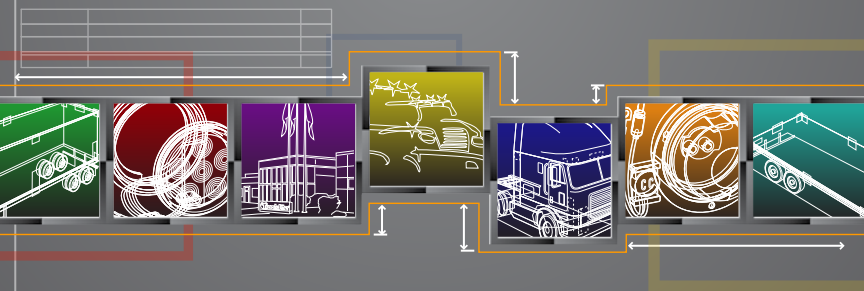




Harness

USER'S GUIDE



PRODUCT ID	L181 - HARNESS USER'S GUIDE	2007



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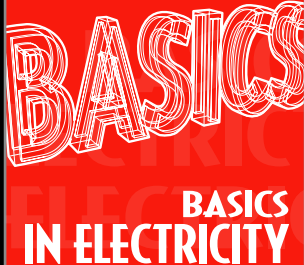
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Definitions

A comparison between electrical energy and water flow will be useful in explaining and understanding electrical concepts, but remember - water and electricity generally should not be mixed.



BASICS IN ELECTRICITY

SECTION OBJECTIVES

1. Definitions & Major Concepts
2. Wire Calculations
3. Useful Formulas

1. VOLT (Potential) V

The unit of measurement applied to the difference in electrical potential between two points; that is, the potential for electricity to flow.

- Usually referenced from "ground."
- In water, voltage is roughly equivalent to the difference in elevation from ground to a tank of water elevated above the ground; the electrical potential is similar to water pressure.
- The higher the potential (or elevation), the more force the water is able to exert and the more likely it is to flow.

2. AMP (Current) I

The unit of measurement applied to the flow of electrical current through a conductor.

- The amount of current (electrons) passing through a conductor or passing a point in a wire or other electrical device such as a light bulb.

3. OHM (Resistance) Ω

As electrons flow through conductors, they meet opposition due to the collisions between the



electrons flowing and the electrons and atoms of the conductor.

- This opposition to current flow, called Resistance, is measured in Ohms.

4. WATT (Power) P, W or Pw

The unit of power applied to the rate at which energy is used.

- Power is the amount of work that can be accomplished in a specified amount of time.
- Work is simply defined as converting energy from one form to another (changing electrical energy into light energy).

5. WIRE SIZE (AWG)

Because everything electrical depends on current flow, the conductors that carry the electricity are a critical part of any electrical system. The size of wires is important to allow the proper flow of electrons.

- Resistance is opposition to current flow.
- Wires that are too small in diameter will oppose current flow (the opposition to current flow is because of the collisions of electrons which do not have enough room through which to pass).
- These collisions convert electrical energy into heat (if enough of these collisions occur, the wire could overheat to the point of causing insulation melt-down and/or fire).
- Wire sizes are measured according to the American Wire Gage (AWG).

6. VOLTAGE DROP Vd

Voltage drop occurs when power is dissipated across a component of the electrical system.

- In the case of a bulb or other lighting device, voltage is dropped in the production of light and heat.



- Typically, the more current that flows through a system, the higher the voltage drop will be.
- Voltage drop across a wire is undesirable, as it is an indication that power is being wasted and heat is being generated.

7. HORSEPOWER

To determine horsepower required to operate lighting equipment, calculate the total power requirements of all lamps (in watts). Then divide that total by a value of 746 ($HP = P / 746$).

QTY	LAMP TYPE	INCANDESCENT TOTAL AMPS	LED TOTAL AMPS
11	Clearance/Sidemarkers/Identification	3.63	0.66
1	Licence	0.33	0.06
2	Tail (minor function)	0.96	0.05
2	Rear Clearance (minor function)	0.96	0.05
2	Stop (major function)	4.20	0.61
2	Turn (major function)	4.20	0.61
		14.28	2.04

INCANDESCENT

$$P = V \times I$$

$$P = 12.8v \times 14.28a$$

$$P = 182.784 \text{ watts}$$

$$HP = P \div 746$$

$$HP = 182.784 \div 746$$

$$HP = 0.2450$$

LED

$$P = V \times I$$

$$P = 12.8v \times 2.04a$$

$$P = 26.112 \text{ watts}$$

$$HP = P \div 746$$

$$HP = 26.112 \div 746$$

$$HP = 0.0350$$



Wire Size Calculations

The length of wire in a circuit is a major contributing factor to voltage drop. The table below may be used in determining adequate wire gauge sizes for specific lengths of cable when the amperage (current) requirements are known.

- Everything electrical relies upon current flow
- The conductor that carries the electricity is a critical part of the system
- Wire size is vital to allow the proper flow of electrons (smaller diameter wire will oppose current flow)
- Constricting the room for electrons to pass within the wire causes collision of electrons, which generates heat inside the wire

WIRE GAUGE REQUIREMENTS

TOTAL FOOTAGE OF WIRE FROM POWER SOURCE
TO THE MOST DISTANT ELECTRIC LAMP

AMPERAGE REQUIRED	24 VOLT SYSTEM (AMPERES)	12 VOLT SYSTEM (AMPERES)	10' GAUGE	20' GAUGE	30' GAUGE	40' GAUGE	50' GAUGE	60' GAUGE	70' GAUGE	80' GAUGE	90' GAUGE	100' GAUGE
2.0	1.0		18	18	18	18	18	18	18	18	18	18
3.0	1.5		18	18	18	18	18	18	18	18	18	18
4.0	2.0		18	18	18	18	18	18	18	16	16	16
6.0	3.0		18	18	18	18	18	16	16	16	14	14
8.0	4.0		18	18	18	16	16	16	14	14	14	12
10.0	5.0		18	18	18	16	14	14	14	12	12	12
12.0	6.0		18	18	16	16	14	14	12	12	12	12
14.0	7.0		18	18	16	14	14	12	12	12	10	10
16.0	8.0		18	18	16	14	12	12	12	10	10	10
20.0	10.0		18	16	14	12	12	12	10	10	10	10
22.0	11.0		18	16	14	12	12	10	10	10	10	8
24.0	12.0		18	16	14	12	12	10	10	10	8	8
30.0	15.0		18	16	12	12	10	10	10	8	8	8
36.0	18.0		16	14	12	10	10	8	8	8	8	8
40.0	20.0		16	14	12	10	10	8	8	8	8	6



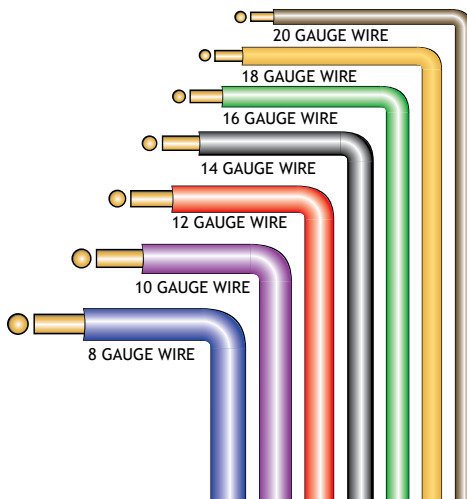
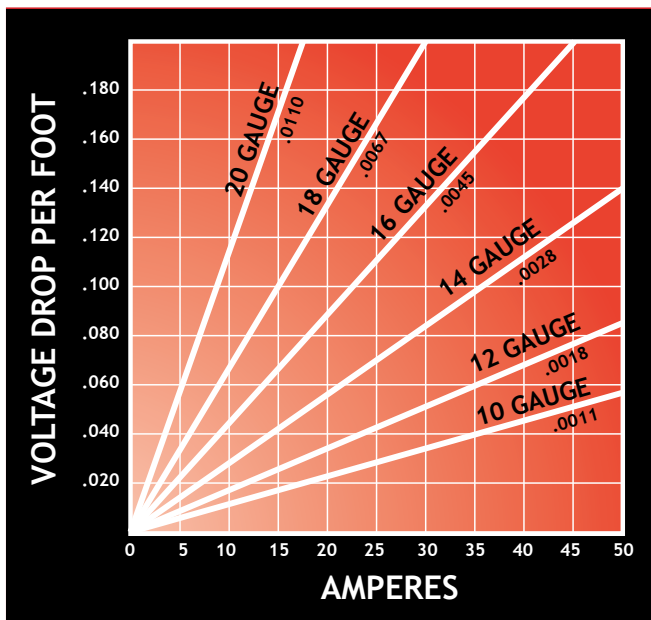
Example: A lamp is 38' from the power source and required 10 amperes. This figure, rounded upwards to the nearest column heading given in the table is 40'. The wire gauge in the 40' column corresponding to 10 amperes is No. 12

*Recommended minimum wire gauge size for stop light and ground circuits

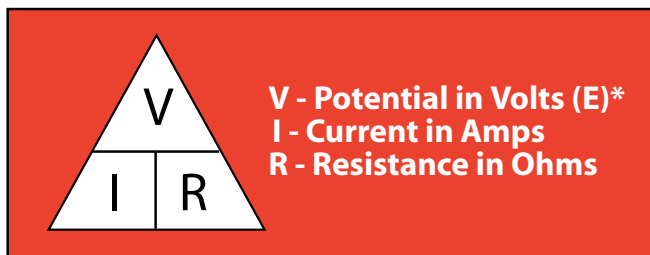
	Stop (red)	Ground (white)
Single trailer up to 50' length	12 ga.	10 ga.
Doubles trailer 2-28' lengths	12 ga.	10 ga.
Doubles trailer 2-40' lengths	10 ga.	8 ga.
Triples trailer 3-28' lengths	10 ga.	8 ga.

*Compiled from SAE, TMC & Other sources.





Useful Formulas



* E is the symbol for Electromotive Force in Volts, as defined in Ohms Law.

$$V = I \times R$$

Voltage (volts) = Current (amps) x Resistance (ohms)

$$I = \frac{V}{R}$$

Current (amps) = Voltage (volts) ÷ Resistance (ohms)

$$R = \frac{V}{I}$$

Resistance (ohms) = Voltage (volts) ÷ Current (amps)

Frequency is stated as E = I x R

Power can be represented as P, W or Pw.

a) $Pw = V \times R$

Power (watts) = Voltage (volts) x Current (amps)

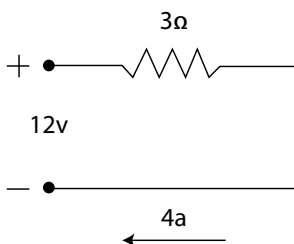
b) $Pw = I^2 \times R$

Power (watts) = Current (amps) x Current (amps) x Resistance (ohms)

c) $Pw = \frac{V^2}{R}$

Power (watts) = Voltage (volts) x Voltage (volts) ÷ Resistance (ohms)





$$a) P_w = V \times I$$

$$P_w = 12 \times 4$$

$$P_w = 48w$$

$$b) P_w = I^2 \times R$$

$$P_w = 4 \times 4 \times 3$$

$$P_w = 48w$$

$$c) P_w = \frac{V^2}{R}$$

$$P_w = 12 \times 12 \div 3$$

$$P_w = 48w$$



Harness Basics

Trailer harnesses are collections of multiple wires within a single cable assembly, that route power to all lighting applications throughout the trailer.



SECTION OBJECTIVES

1. Harness Basics
2. Wiring Color Codes
3. Wiring Schematic
4. Tools of the Trade

These days, with a greater number of legally required lighting components, the trailer harness is growing in its importance and significance within the electrical system. While bringing power to so many applications, the single cable can become the culprit of lighting failure with the most problem-free lighting components.

As it is run throughout the underside of trailers, harness components are exposed to even greater amounts of corrosives than the lamps they bring power to. With every day concerns from the rigorous vibration of the road to varying weather conditions and the impact of salt and road debris, maintenance has become more important than ever to assure wiring systems perform as designed.

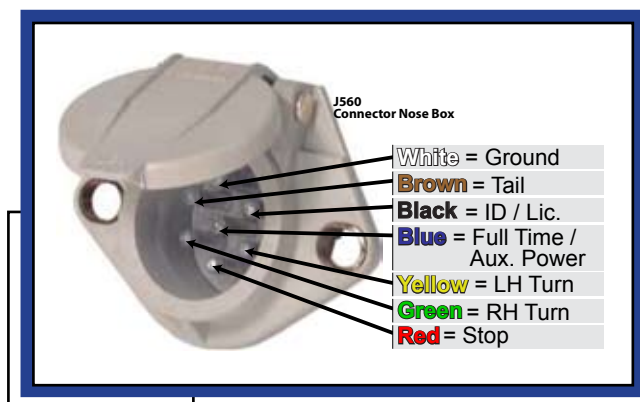
Within harness cable there are two protective layers inside that offer both electrical insulation and environmental protection to the current-carrying wire.



Wiring Color Codes

Trailer wiring systems are designed using varying colors of wire within the main harness assembly. These different colors designate which lighting applications the wires are being routed to. This aids in finding the culprit for electrical malfunctions.

Example of wire color codes as connected to a nose box, as referenced in regulation SAEJ560:



Tools of the Trade



Probe

- Checks & measures voltage
- Checks continuity



Lamp Tester

- Feature 01
- Feature 02
- Feature 03



Multi-Meter

- Feature 01
- Feature 02
- Feature 03



Wire Strippers

- Feature 01
- Feature 02
- Feature 03



Wire Cutters

- Feature 01
- Feature 02
- Feature 03



NYK-77 Compound

- Feature 01
- Feature 02
- Feature 03



Zip Ties/Wire Clamps

- Feature 01
- Feature 02
- Feature 03



Cable Coverings

- Feature 01
- Feature 02
- Feature 03



Soldering Iron

- Feature 01
- Feature 02
- Feature 03



Harness

[illegible]

Is it the Lamp or the Harness?

In locating the source of your electrical malfunction, the first step is to assure you have proper voltage at the J560 connector (as shown on right), where the system power comes in. Using a Multi-Meter, test for adequate power. If a Multi-Meter is not available, substituting a "test" lamp (a new lamp sure to be problem-free itself) for the malfunctioning unit will show if power is present.

If it is found that appropriate power is being fed to the lamp, the next step is to check the lamp itself for failure. Remove the lamp from it's mounting application, unplug it from the harness, and test the lamp using a lamp checker or meter to verify it's status. It is recommended to first use a new lamp (or one known to be in good working condition) assure the testing device is in proper working order.

It is also recommended to closely review the lamp's plug connection to be sure it is in good, working condition. Lamps

TROUBLESHOOTING

SECTION OBJECTIVES

1. Is it the Lamp or the Harness
2. ID Codes
3. Most Common Legal



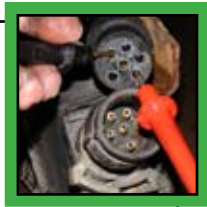
can easily be damaged at the connection, and as a result could cause a seemingly working lamp to malfunction.

If it is found that the lamp failure is not the result of a malfunctioning lamp, check to see that the harness pigtail is in proper working condition.

Check for evidence of corrosion and clean all contacts to assure an even contact with the current. Check to be sure the lamp is properly grounded, and test the exposed terminals on the harness pigtail with a Multi-Meter. Testing should also be performed with a working test light.

Once it has been found that the lamp and pigtail are not responsible for the problem, it is required to move to the nearest wire connection to locate any problem areas. Follow the wiring harness to next plugged connection or junction box.

Begin by unplugging the harness, and test for proper voltage on exposed terminals. Next, the terminals in the J-box should be checked as well. In this instance, do not use test probe wires. Probe wires can puncture an otherwise healthy wire, opening the door for future failure.



After successfully testing the wiring connections and lamps, testing should be performed at the J-560 (nose box) connection. At this point, the cause of the fault likely lies in trouble within the main cable.

The best way to identify the problem within the harness system is to evaluate the system's continuity and resistance. To do so, a break in the system must be found, by looking for highs and lows in the system. Highs and lows in the current could be caused by inconsistencies in wire, and can be found in broken wires and even instances of cross-talk within the wire.

In order to test the system for continuity and resistance, a multi-meter should be used. However, a multi-meter must not be used while a system is powered up.

To test the harness for continuity issues, begin by connecting one end of a test lead to one end of the wire, and the other end of the test lead to the other end of the same wire. When connected to the multi-meter, listen for the beep that will identify no continuity problems.

Cross talk should also be checked for, assuring no wires are receiving power from other wires within a circuit. A beep from the multi-meter in this instance means there is a presence of cross talk.

As far as multi-meter setup is concerned, checking for resistance problems can be done with the same procedure as when checking for continuity issues.

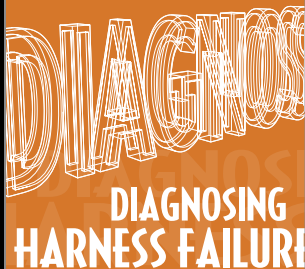
First, look for the a low reading. If a low number is found, the wire is good, and you should move on. At this point, look for a high reading. A high reading



can indicate a problem, and likely represents damage from corrosion, cross talk or a break (overload).



Diagnosing Harness Failure



After identifying that the harness is causing your problem and there is no power at the connector of the lamp (when the lights are switched on), it should be known that most failures outside of inferior or damaged lamps is due to wire harness failure from improperly maintained connectors.

SECTION OBJECTIVES

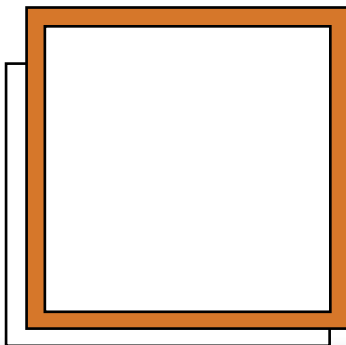
1. Diagnosing Harness Failure
2. Connector Damage
3. Harness Damage
4. Mechanical Damage

LOCATING THE STARTING POINT OF FAILURE

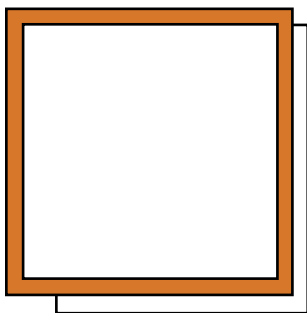
To diagnose the harness-based failure, start by examining the harness to find clues as to where the wire is broken.

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

Water wicking is a term describing how water can travel internally through and along wires due to some of water's very strong properties. When water seeps into very small cracks and seams in connectors and wires, it uses adhesion,



cohesion and surface tension to stick to things. Through high adhesion, water's "sticking" property, water will hold to surfaces, just as rain sticks to the surface of clothing (rather than completely running off). It is in this manner that water sticks to the copper in harness wiring well, and gets into the small places between the wires and the insulation. Water's high cohesion properties cause it to bead up and, 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 well.



The problem escalates when these properties propel the water up the wire far more than the level the connector may have been immersed to begin with. Water can travel great distances by wicking, sometimes causing corrosion along the entire length of the wire. This is the most damaging form of corrosion because it can be slow and difficult to detect until a failure has occurred deep in a wire. It can damage the whole wire length, and when the harness eventually fails, the entire length must be replaced.

Failure commonly occurs close to or in the connector because of water wicking or through a bad or missing seal. Examine the connectors both 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, may have holes in



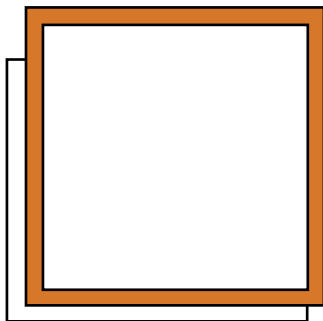
them or contain a powder-like substance inside the connector (indicating past corrosion). The housing may actually appear swollen or cracked from the pressure of the corrosion, with moisture present in the connector (indicating wicking action). If moisture is wicking into the connector, it is also likely that wicking has drawn into the wires as well.

Connector Damage

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

Once cut, verify that the cut ends of the harness have power (when the lights are switched on). If the nose box connector is faulty, apply power to the appropriate wires and verify that the corresponding lamp illuminates. 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 the connector, use a sealed type. Using a connector that is simply tight fitting may encourage wicking,



where a sealed connector prevents any moisture inclusion. It is best to replace the connector with a Truck-Lite specified mating connector for the Truck-Lite lamp you will install onto the vehicle. Re-attach 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 connector seals are in good condition and in place, because water can wick into the smallest cracks and cause damage. The seal in the connector actually presses against the housing and eliminates any gap that would allow water to wick into the connector.

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 itself. 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 break 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.

It is necessary that when replacing corroded wire, new wire of equal or larger size is used. Larger wire

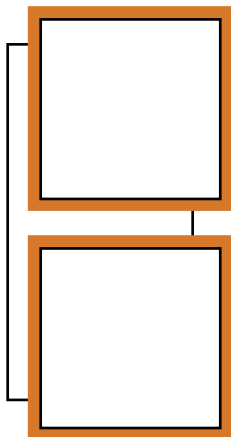


is indicated by a smaller gauge number.

Mechanical Damage

Sometimes weak spots due to corrosion inside the wire can cause breaks inside the insulation. Mechanical stresses can also break the wires inside without breaking the insulation. Stresses can easily damage a wire, because it's design was meant to carry electricity, with little emphasis on mechanical strength. The insulation is usually more resilient than the wire it protects, so it may be intact even when the wires inside are broken. This can be a very difficult failure to detect and repair, and often the entire length must be replaced when the break can not be found.

Tension on the wire can cause a connector or wire failure. If a wire is cut just long enough to reach the lamp, it can fail from impact by road debris or from thermal expansion. Thermal expansion can cause the wires to shorten at cold temperatures and make it tighten. This tightening can pull the wire out of connectors or cause internal breaks. Look for places where wire appears to have little or no slack. Sharp bends in the wire can indicate an internal break as well.

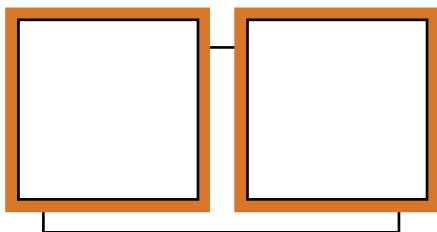


Repeated flexing will stress the wire and can sometimes cause it to break. To avoid this, connectors and splices should be restrained to prevent damage from excessive motion during vehicle movement. Often failure locations can be



found by moving the suspect wires and looking for intermittent operation when they change position.

Look for sharp bends in the wires or the appearance of a wire kink. Look for these at the secured ends of a tight wire or 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 retract several inches shorter in the cold or expand longer in hot weather in a 75° F change in temperature.



Harness Repair Methods

When cutting out the damaged portion of a wire, examine the cut ends of the remaining wire to be sure there is no corrosion present. If there is corrosion present, additional wire must be removed to assure that the repair will not fail from the corrosion already present.

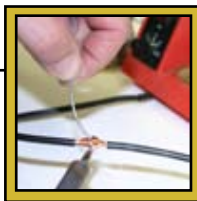
The cut and stripped wires should be clean

and bright, but dull or dirty wires can be cleaned with steel wool or fine sand paper to assure a good electrical contact. Dark internal wire indicates signs of corrosion or moisture, and should be cut further back until clean bright wire is exposed. It is best to remove and replace damaged or corroded wires instead of repeatedly repairing the wires.

REPAIR HARNESS REPAIR METHODS

SECTION OBJECTIVES

1. Harness Repair Methods
2. Splicing New Wire
3. Stripping & Crimping Basics
4. Sealing New Wire



Splicing New Wire

To begin splicing in a new length of wire, be sure to cut the new section of wire to be slightly longer than needed to assure there will be adequate slack.

1. It is important to avoid any damage-prone methods, such as insulation-displacement clamp connectors. They tend to create more problems than they solve in harsh environments.

Use of these connectors also causes the insulation to be displaced or moved out of the way by a blade that cuts through the insulation to make the electrical connection to the copper inside. This is a weak mechanical connection, both mechanically and electrically. The exposed wire and weak connection also provides an easy target to corrosives, arcing, and mechanical vibration. Sealing the connector with tape is also not practical, because water can wick into holes in the tape. A fully sealed permanent repair is recommended to prevent the connection from failing in the future.



2. Soldering the wires together with heat shrink tubing provides the best electrical and mechanical solution and seals the joint, but it may not be practical at the time of the repair. At times, a road repair may be necessary to get to a location where solder and heat shrink tubing can be applied to as a permanent repair.



3. Solder is a weak material, so a double J-bend is recommended to provide a strong mechanical joint in the wire. Solder can be weak, but provides a permanent electrical contact. Without solder, wiring can move around in within the new connection, which could allow arcing that can cause the adjoining connection to fail.



4. Crimp connectors can provide connection solidification and mechanical strength similar to soldering, but must be properly applied and sealed to be effective. A crimp connection is an acceptable electrical and mechanical solution that can more effectively be completed at the road side. To make the repair permanent, care must be taken in the application and sealing of a crimp connector.



Color coding for wire size has been created for wire crimps in order to indicate what wire gauge sizes they are designed for. Incorrectly sizing the crimp connector can lead to a loose connection and joint failure.

Stripping and Crimping Basics

1. Tools are available specifically designed for crimping these connectors. Using the wrong tools can compromise the connector or the tightness of the joint.

2. Wire strip length is critical to assure a strong mechanical and electrical joint. The wires must pass all the way into the crimp, and contact the bottom



of the crimp pocket to assure a strong mechanical joint. It is important that insulation must not be extended into the crimp and that the wire must be clean and bright to assure a strong electrical connection.

3. Crimp tightness is also important to assure that the wires can not move within the connector. The tools used to crimp the connector must be capable of fully crimping the device closed. An incomplete crimp will likely fail.



4. Test a crimp connection by pulling on it with about the same force used to tie a shoelace. If the crimp connection can not hold the wires together or is loose, it will not survive on the vehicle. Visually inspect the connection to assure all wires are included in the crimp, and there are no gaps inside the connection.

5. Be sure all wires are cut to the same length and fully inserted into the crimp connector. If crimping is performed with only a few wires exposed to the device, it will lead to a loose or weak connection; ensure all the strands in a wire are inside the crimp. By crimping only a few wires within the connection, a reduction in the current carrying capacity of the wire can be seen. The same way a weak link in a chain makes the whole chain weak, a weak splice connection will weaken the entire length of wire.



Sealing New Wire

Sealing the splice is equally as important as making solid mechanical and electrical connections.

Taping up a splice is not recommended for permanent repairs. Tape can lose adhesion, especially on a dirty or oily surface. It is easy for holes to form in adhesive tape from damage caused while on the road. Adhesive tape has fine flexibility properties, and allows for wrapping around a wire, but the flexibility also causes it's mechanical weakness. Road debris can easily cut or tear through a taped repair.

If you must use tape to make an emergency repair

- a. Be sure the tape adheres on all sides to clean surfaces, oily surfaces are especially difficult to bond to.
- b. Overlap the tape at least to 50% coverage to strengthen and improve the seal over the joint.
- c. Be sure there is no place for water to wick into the splice joint by making all laps tight and sealing down each edge of the tape.
- d. Make a permanent repair to the taped area as soon as possible.

Adhesive-lined heat shrink tubing is the preferred material to seal a soldered connection. When shrunk, the adhesive melts and glues the entire connection together, providing a strong seal and improving the mechanical strength of



the joint. Be sure the tubing is not too large for the connection, to assure the adhesive will make full contact and bond with the wires inside the joint. The heat shrink tubing should be just large enough, before shrinking, to pass the joint through, but not so large after shrinking that the tubing moves or gaps are apparent in the adhesive.

Tubing size is important and must be matched to the size of wire that is being repaired. If not, water can wick into the joint and corrode the connection.

Single wall vs. Double wall tubing: Single walled tubing relies on mechanical pressure to seal the joint from impacts, abrasion, and thermal expansion that can compromise the connection's seal. With double walled tubing, an additional adhesive liner fills in the connection with to assure even an abraded repair stays intact and sealed.



DuraSeal splice connectors from Raychem integrate a heat shrink tubing component into a standard crimp connector. These connectors are crimped on like a common crimp splice connector, but their sleeve is constructed of the same material as used in double walled heat shrink tubing. When the crimp is complete and tight, the entire connector can be heated, to allow it's casing to seal the connection.



[illegible]

Harness

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Harness

Glossary

Acrylic - A glassy thermoplastic polymerized from acrylonitrile which can be cast and molded, which is resistant to damage from many cleaning solvents.

Aftermarket - A term that refers to the market place for our replacement or retro-fit business. The customer in this market is replacing an existing lamp or accessory on his vehicle.

Bracket - A rigid mounting device that allows a lamp to be mounted on the surface of the vehicle body. Some brackets are designed to be used alone or with a grommet.

Bulb Replaceable - Opposite of sealed. The lens is removable on a lamp of this type. When the bulb fails, the lamp may be repaired by replacing the bulb.

Cab Marker - A lamp similar in function to the marker clearance lamp, but these are always mounted on the roof of the truck or tractor cab. Technically, these are called a front identification or ID lamp.

Custom Cut - A term that refers to the harnesses that must be cut and terminated to the customer's specifications.

DOT - United States Department of Transportation, was created to serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.



Grommet - A rubber like device used to mount a lamp into a hole in a vehicle body or a mounting bracket. The grommet may allow a lamp to be mounted "flush" into the body and thereby protects the lamp from physical damage. A grommet also gives the lamp additional protection against shock and vibration.

Harness - Also a wiring device. A harness can include MULTIPLE plug connectors and be used to control different types of lamps. Harnesses tend to be heavy duty, jacketed cable as opposed to lighting duty, unprotected wire as in "plugs".

HID - High Intensity Discharge, produces light by an electric arc between two closely spaced electrodes in a quartz glass bulb.

HIR - Halogen Infra Red, is a halogen lamp with an elliptical bulb envelope. The exterior of the bulb is coated with several layers of material, which are transparent to visible light but reflect infrared back to the filament. The effect is a brighter light for a given current.

ID Codes - ID Codes are the classifications given to various lighting applications in order to establish minimum requirements set forth by the SAE J759 regulations.

Junction Box - An accessory used with harness systems. All harnesses in a system are connected to this box. Signals from the control devices (switches on brake pedals, turn signal switches, etc.) are received in the accessory and are re-routed to the appropriate lamps via the harnesses.



Kit - A NAPA Lighting term used to describe the combining of related products. For example, a lamp, a grommet, and a plug can be put together and sold as a unit or "Kit". A "Kit" can also be an entire "vehicle set", including all lamps, harnesses, and accessories needed to equip a vehicle.

LED - Light Emitting Diode. A "solid state" electronic device that converts electrical energy directly to light energy. When an electrical current is applied to the LED "chip", a colored light is emitted. The color depends on the chemical composition of the chip. Very little heat is produced with this process. Because the "diode" is cast into a solid block of epoxy, the LED is immune to vibrations and shock and can last up to 100,000 hours of operation.

Marker Clearance - Also called marker lamp. A small lamp used to mark the edges or corners of the trailer or truck body. These are normally amber in the front and middle of the vehicle, and red at the rear. Other colors are available for "auxiliary" use, but only red or amber (yellow) are legal for the use as marker clearance lamps in the U.S.

Module - A term used to describe a complete rear lighting assembly. The module usually consists of a housing (metal or plastic) with one or more tail lamps, and includes a harness or wiring assembly. The module may also include a marker lamp, reflector, or back-up lamps.

Multi-Function Lamp - A specialized Stop/Turn/Tail lamp. This type of lamp usually has a larger housing and can include side marker, license plate illumination, or reflectors, in addition to the basic rear lighting function.



NHTSA - The National Highway Traffic Safety Administration creates values and regulations which underpin the assurance of safe, secure, efficient automotive travel.

Ohms Law - Ohm's Law describes mathematically how voltage, current and resistance in a circuit are related through the formula: $V = I \times R$, where V is equal to Potential in Volts, I is equal to current in amps and R is equal to Resistance in Ohms.

Plug Together Harness - The "brand name" for Truck-Lite's 88 series harness system and accessories. It features a system that eliminates the need for any type of distribution module. All components simply plug together insuring a solid electrical contact throughout.

Plug/Pigtail - The basic wiring accessory. Usually a 1, 2, 3, or 4 wire design with termination designed to mate with a socket or pin connection area on the lamp.

Polycarbonate - Any of a family of thermoplastics characterized by high-impact strength, light weight, and flexibility, and used as a shatter-resistant substitute for glass.

Reflector - A non-powered (non-electrical) device designed to reflect light. A reflector does not emit light by itself, but will return light that is aimed at it. Reflective tape or reflectors are required by law to supplement lighting systems.

Sealed Lamp - Any lighting device that has its bulb permanently sealed inside the lens and housing assembly. When this lamp fails, the entire unit must be



Shock Mounted - A system used to suspend and insulate the bulb from vibration and shock (impact).

Stop/Turn Lamp - A rear lamp that is brighter than a tail lamp used to indicate that the vehicle is turning or stopping. The "major" filament of the bulb is used to perform this function. Sometimes referred to as a "SC" or since contact lamp.

Stop/Turn/Tail Lamp - A rear lamp that contains one or more bulbs with both major and minor filament functions. This one lamp performs the duties of both the Stop/Turn lamp and Tail lamp. Sometimes referred to as a "DC" or double contact lamp.

Super System - The "brand name" for Truck-Lite's 50 Series Harnesses and accessories. This system features both the "custom cut" and customer buildable harnesses. "Compression fittings" are used to seal outlets where harnesses enter the junction box.

Tail Lamp - This term is used in general to describe the rear lighting of the vehicle. Specifically, the tail lamp function is performed by the "minor filament" of the bulb. This red light remains "on" as long as the headlamps/parking lamps are in use. This light is not as bright as a turn or stop lamp.



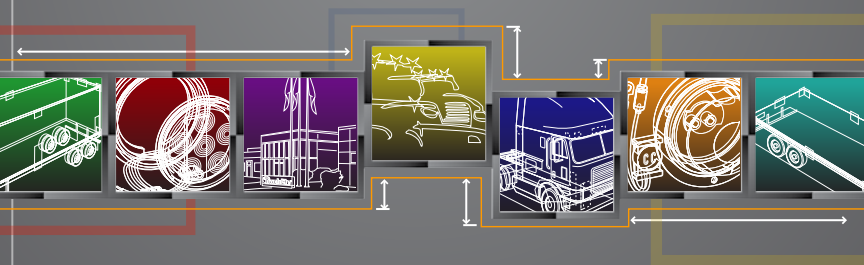
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Part No. L181



USER'S GUIDE

