Harness and Wire Repair Manual

DSM.0036 Ver 1.0
October 26, 2021

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Overview

This document provides instruction on approved components, materials, tools, and methods to repair damaged fuel system harnesses and associated wire circuits, terminals, and connectors.

Warning Statements Used in this Manual

NOTICE

***NOTICE* is used to address practices not related to physical injury, such as best practices or tips to help an operation or procedure go smoothly and prevent equipment damage.**

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Required Tools (most repairs*)

Item	Purpose
side cutters	cut wires
wire strippers	remove insulation from wires
soldering iron	tin over terminal connections
heat gun with reflector *(Steinel® HL 1910E/HL 2010E or equivalent)*	melt heat shrink tubing and splice connector adhesive
insulated terminal crimper *(Raychem® AD-1522 or equivalent)*	crimp splice connectors and terminals
thermal blanket or other appropriate heat shielding	protect fuel system components when using soldering iron or heat gun
sewing seam ripper	remove harness wrap or loom to access wire splices

**Some repairs may require a specific OEM crimping tool or die; please refer to individual connectors for details.*

Required Materials

Item	Purpose
splice sleeve, 18-22 AWG (red)	approved method for wire splice repairs
splice sleeve, 14-16 AWG (blue)	approved method for wire splice repairs
splice sleeve, 10-12 AWG (yellow)	approved method for wire splice repairs
wire loom (braided, mesh or split corrugated tubing)	cover repaired portions of wire harness
electrical tape *(3M® Scotch® Super 33+ or equivalent)*	secure wire loom to harness
dielectric grease	prevent corrosion on electrical contacts
wire terminals and seals *(Refer to OEM specifications)*	replace damaged terminals; prevent water/debris intrusion and corrosion

Preliminary Instructions

Secure Vehicle

⚠WARNING **Wear approved personal protective equipment (PPE) including safety glasses.**

⚠WARNING **Set emergency brake and place wheel chocks in front of and behind vehicle tires.**

⚠WARNING **Only perform work on fueled vehicles in well-ventilated facilities designed for the specific vehicle fuel type or in safe spaces outdoors in accordance with all jurisdictional and industry regulations.**

⚠WARNING **When performing service or repairs on any portion of the fuel system, install proper lockout/tagout (LOTO) device(s) and observe all LOTO practices.**

General Instructions

⚠WARNING **Always disconnect negative battery cable when repairing electrical components installed on the vehicle.**

1. Only use OEM specified tools for depinning and crimping connector terminals.
2. When extending or replacing a section of wire, the replacement section of wire should be the same gauge or larger than the original section.
3. Corroded components must be repaired by replacing the affected connector assembly—terminals, seals, and connector body—or with an OEM pigtail assembly designed for the repair.
4. If reusing a connector, always verify new seals are properly installed, all plugs (if applicable) are in place, and all terminals are completely seated and locked.
5. When required apply a small amount of dielectric grease to all connector junctions when reconnecting harnesses and components.

On-Vehicle Soldering and Heat Shrink Precautions

⚠WARNING

1. Verify vehicle is leak-free. *Refer to DSM.0037 Leak Check procedure.*
2. Refer to *ENP-422 Welding and Hot Work Precautions Near CNG and LNG Vehicles* to determine whether vehicle must be **depressurized** or **defueled** prior to beginning any repair procedure requiring heat, sparks, flame, or other thermal activity.
3. Always cover fuel system plumbing and cylinders with a thermal blanket or other appropriate heat shielding when applying solder or working with a heat gun.
4. Never use a torch or other open flame to apply heat to heat shrink tubing.

Splice Procedure

NOTICE **When performing multiple splices in a harness, plan to offset splice locations to minimize the possibility of creating a bulge or ridged section in the harness.**

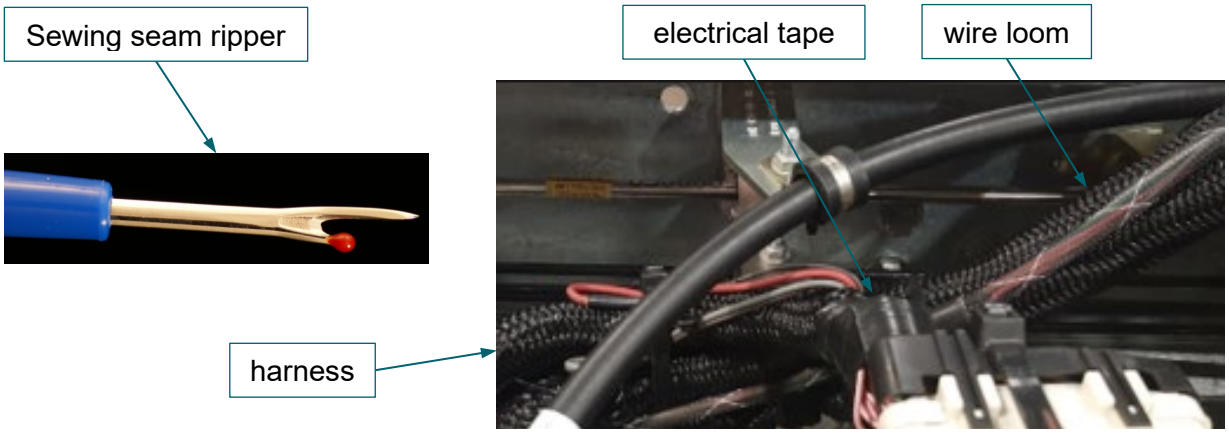
Step 1

- Identify the harness location where the splice connector is to be installed.

Step 2

- Use a sewing seam ripper to open harnesses protected by layers of electrical tape, heat shrink material, wire loom, etc. to allow unobstructed access to the wire(s).

NOTICE **Remove electrical tape first and leave as much wire loom intact as possible.**



Step 3

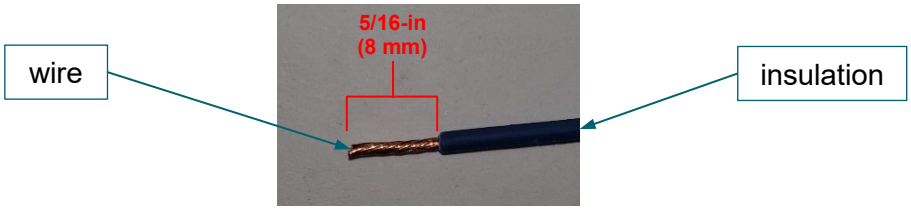
- Use side cutters to cut the suspect/damaged wire harness circuit.

NOTICE **Leave as much wire intact as possible.**

Step 4

- Use wire strippers to remove approximately 5/16-in (8 mm) of insulation from the wire end and twist the wire stands together.

NOTICE **Do not cut or damage any wire strands during this process.**



Step 5

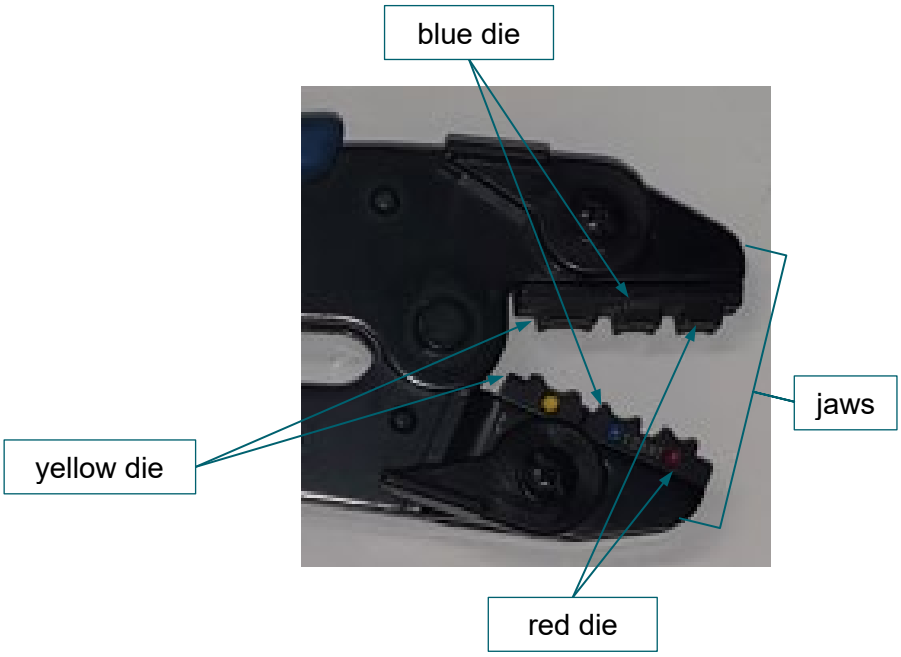
- Select correct splice sleeve size and crimping die based on wire gauge size listed in Table 1:

TABLE 1: Splice Sleeve by Wire Size, Sleeve Color, and Die Size

Wire Size (AWG)	Splice Color	Crimping Die
18 – 22	red	red
14 – 16	blue	blue
10 - 12	yellow	yellow

Step 6

- Verify crimping die corresponding to the splice sleeve is installed in crimping tool jaws; install correct die if necessary. *Refer to manufacturer instructions.*

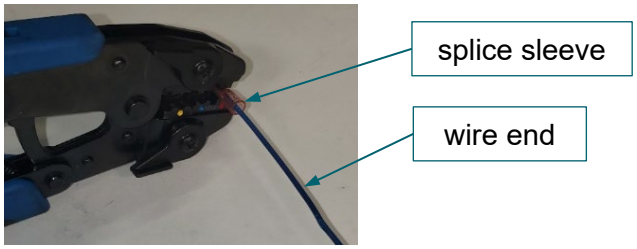


Step 7

- Insert splice sleeve into crimping tool jaws rest slightly on the terminal near the middle of the crimping area.

Step 8

- Slide one end of wire to be repaired into splice sleeve until the wire strands are inserted fully into the metal portion of the sleeve (the wire should bottom out).



Step 9

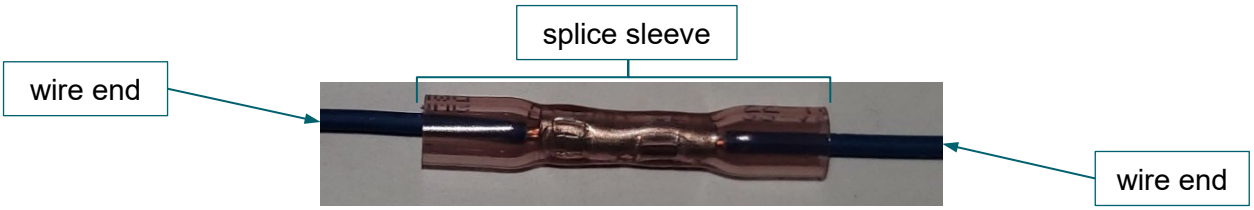
- Squeeze crimping tool until the handles are fully compressed the to fully secure the splice sleeve to the wire. NOTE: When fully compressed, crimping tool will ratchet back to the neutral position. *Refer to manufacturer instructions.*

Step 10

- Gently tug on wire to verify a proper crimp.

Step 11

- Repeat Step 3 through Step 10 for other wire end.



Step 12

⚠WARNING **Cover fuel system plumbing and cylinders with a thermal blanket or other appropriate heat shielding.**

Step 13

- Use a heat gun with a reflector to gently apply heat to splice sleeve starting from the middle and working outwards.

- When tubing has shrunk, a small amount of sealant should extend out from the ends of the splice sleeve to insure a complete seal.

Step 14

- If wire loom material was removed to access wires, install new wire mesh loom or split corrugated tubing over splice area and secure to harness with electrical tape.

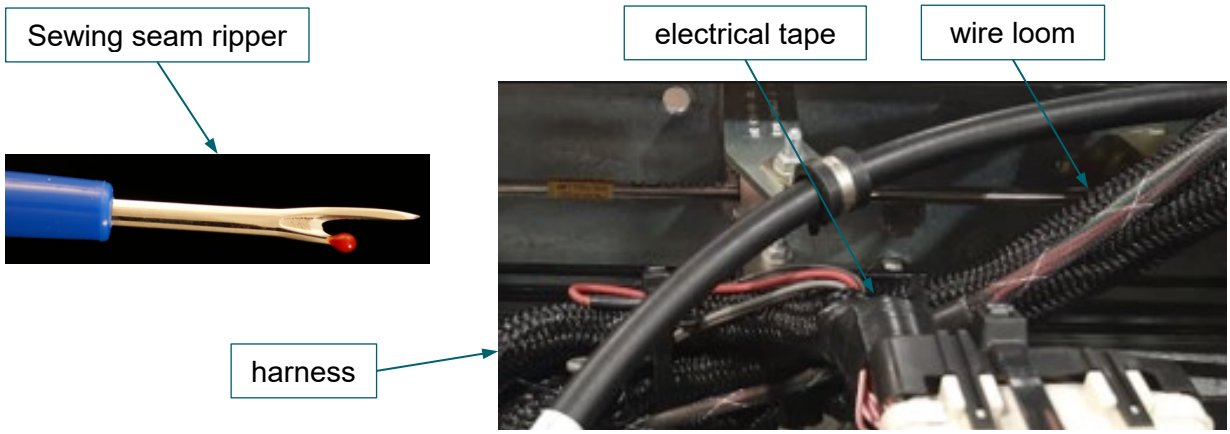
Termination Procedure

A. Sealed Connectors

Step 1

- Use a sewing seam ripper to open harnesses protected by layers of electrical tape, heat shrink material, wire loom, etc. to allow unobstructed access to the wire(s).

NOTICE **Remove electrical tape first and leave as much wire loom intact as possible.**



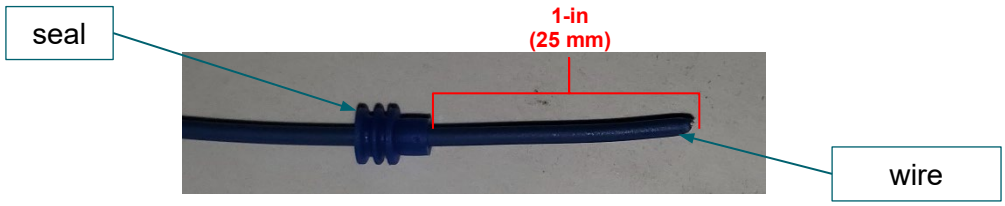
Step 2

- Use side cutters to cut the suspect/damaged wire harness circuit.

NOTICE **Leave as much wire intact as possible.**

Step 3

- Select the appropriate size seal for the wire gauge and slide it approximately 1-in (25 mm) from the wire end.



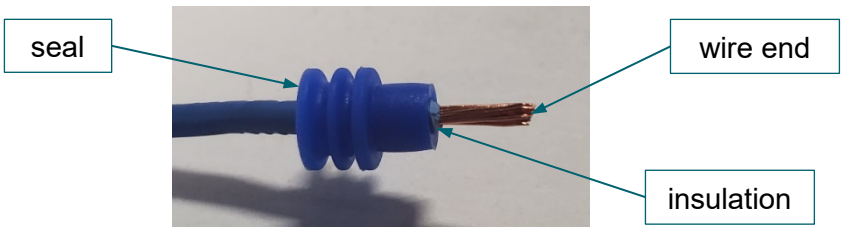
Step 4

- Use wire strippers to remove approximately 3/8-in (9.5 mm) of insulation from the wire end and twist the wire strands together.

NOTICE **Do not cut or damage any wire strands during this process.**

Step 5

➢ Slide seal so face of the crimp end of the seal is even with the edge of the insultation at the wire end.

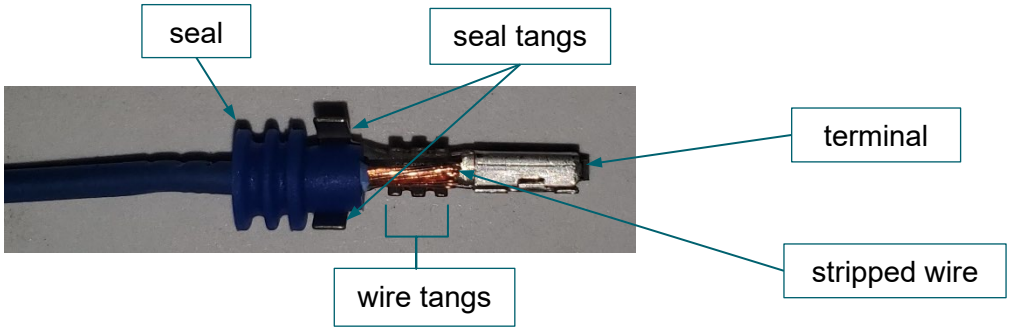


Step 6

➢ Insert wire and seal into terminal as follows:

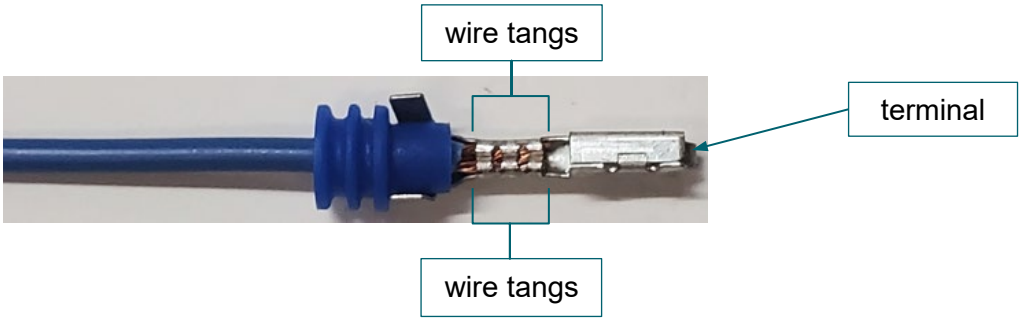
a) center seal tangs on seal body

b) stripped wire should not extend past wire tangs



Step 7

➢ Use appropriate crimping tool and die to crimp terminal wire tangs. *Note: Some crimping tools secure the wire tools and the seal tangs simultaneously.*



Step 8

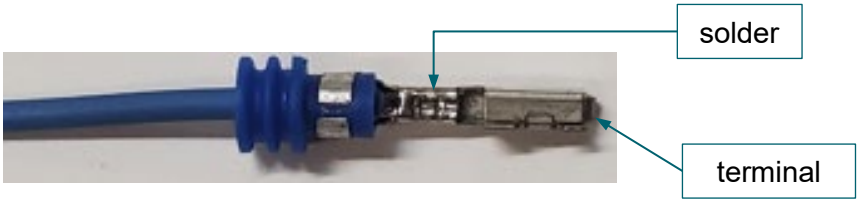
➢ *If required:* Use appropriate crimping tool and die to crimp terminal seal tangs.

Step 9

⚠WARNING **Cover fuel system plumbing and cylinders with a thermal blanket or other appropriate heat shielding.**

Step 10

- Use a soldering iron and rosin core solder to secure terminal to the wire.



Step 11

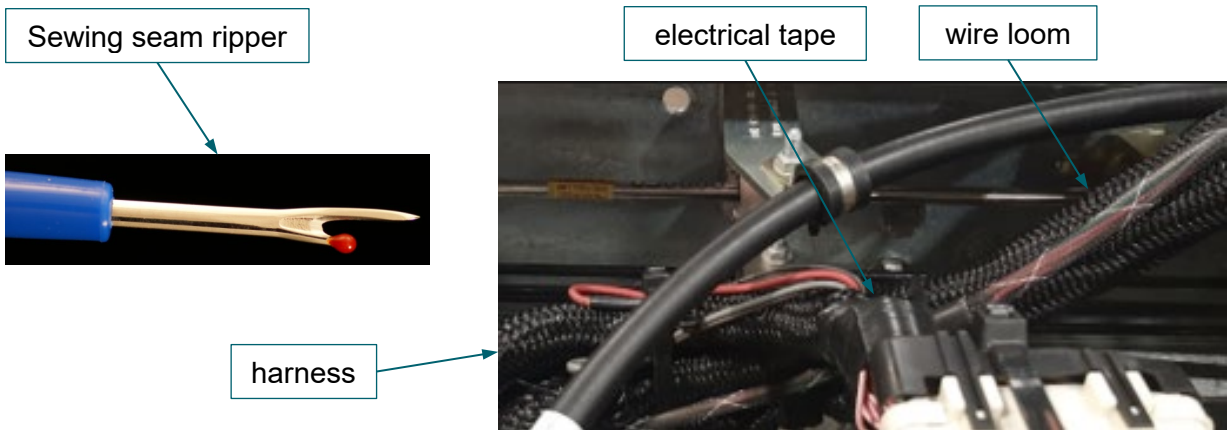
- If wire loom material was removed to access wires, install new wire mesh loom or split corrugated tubing over splice area and secure to harness with electrical tape.

B. Unsealed Connectors

Step 1

- Use a sewing seam ripper to open harnesses protected by layers of electrical tape, heat shrink material, wire loom, etc. to allow unobstructed access to the wire(s).

NOTICE **Remove electrical tape first and leave as much wire loom intact as possible.**



Step 2

- Use side cutters to cut the suspect/damaged wire harness circuit.

NOTICE **Leave as much wire intact as possible.**

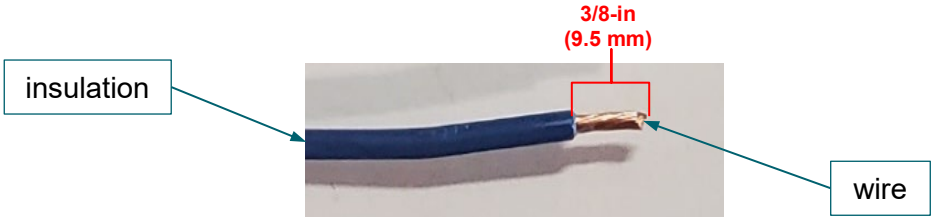
Step 3

- Select the appropriate size terminal for the wire gauge.

Step 4

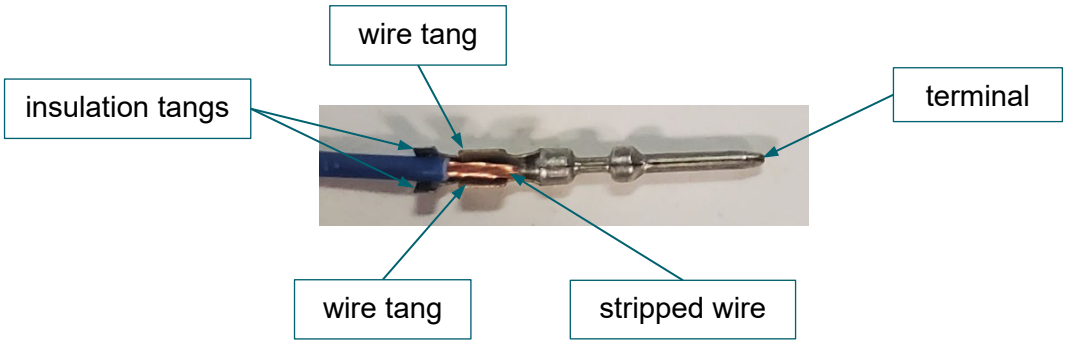
- Use wire strippers to remove approximately 3/8-in (9.5 mm) of insulation from the wire end and twist the wire strands together.

NOTICE **Do not cut or damage any wire strands during this process.**



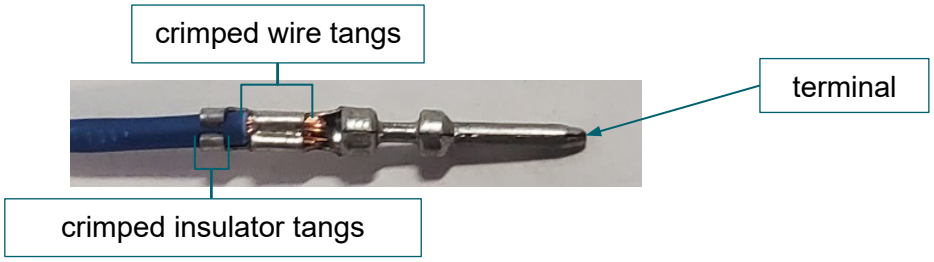
Step 5

- Insert wire into terminal as follows:
  a) insulation tangs should rest on wire insulation
  b) wire tangs should rest evenly on the stripped wire end
  c) stripped wire should not extend beyond the tangs



Step 6

- Use appropriate crimping tool and die to crimp all terminal tangs.

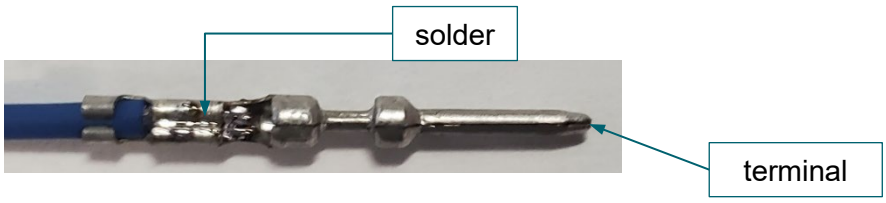


Step 7

⚠WARNING **Cover fuel system plumbing and cylinders with a thermal blanket or other appropriate heat shielding.**

Step 8

- Use a soldering iron and rosin core solder to secure the terminal to the wire.



Step 9

- If wire loom material was removed to access wires, install new wire mesh loom or split corrugated tubing over splice area and secure to harness with electrical tape.

Hexagon Agility® Customer Care and Technical Services

Fuel system warranty or non-warranty product support may be obtained by calling or emailing Hexagon Agility® Customer Care and Technical Services (CCTS).

Please provide **your name, phone number, email address, and complete vehicle information: VIN, year, make, model, mileage, unit number vehicle owner,** and **current vehicle location.** A service advisor will contact you to arrange vehicle repair or ship a part.

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