

- **Power and Signal Distribution**

- **General Electrical**

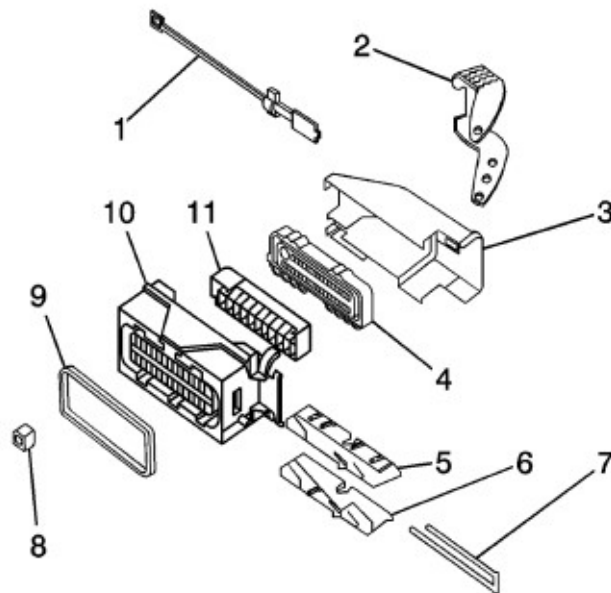
- **Repair instructions**

- **Connector Repairs**

Connector Repairs contains a list of all connector repairs. The connector repairs are listed by the connector manufacturer and then by connector type. If the technician cannot identify the manufacturer of the connector, refer to Identifying Connectors below. Knowing the connector manufacturer will assist in finding the correct connector repair from the following list:

- Connector Position Assurance Locks
- Terminal Position Assurance Locks
- AFL/EPC Connectors
- Bosch Connectors
- Delphi Connectors
- FCI Connectors
- FEP Connectors
- JST Connectors
- Kostal Connectors
- Molex Connectors
- Sumitomo Connectors
- Tyco/AMP Connectors
- Yazaki Connectors
- Repairing Connector Terminals

- **Connector Anatomy**



- (1) Connector Positive Assurance (CPA)
- (2) Assist Lever
- (3) Wire Dress Cover
- (4) Seal Strain/Relief
- (5) Slide Left Hand
- (6) Slide Right Hand
- (7) Terminal Positive Assurance (TPA)
- (8) Terminal Positive Assurance (TPA)
- (9) Connector Seal
- (10) Connector Housing
- (11) Inner Connector

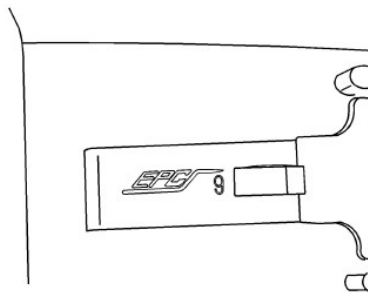
- **Identifying Connectors**

Knowing the connector manufacturer is helpful when trying to locate the correct connector repair procedure. There are many different connector designs used on Vanderhall vehicles and it is sometimes difficult to identify the connector manufacturer. The information in this document should help with the identification of connector manufacturers.

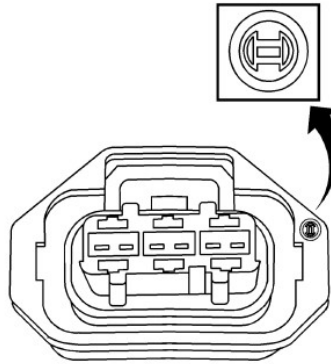
The following connector manufacturers make most of the connectors found in GM vehicles:

- AFL/EPC (Alcoa Fujikura Ltd./Engineered Plastics Components)
- Bosch
- Delphi
- FCI (Framatome Connectors International)
- JAE (Japan Aviation Electronics)
- JST (Japan Solderless Terminals)
- Kostal
- Molex
- Sumitomo
- Tyco/AMP
- Yazaki

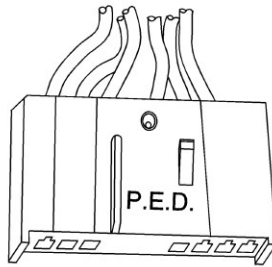
Identifying the manufacturer of a connector is often difficult. When trying to determine the manufacturer of a connector, look for specific identifying marks that are unique to that connector supplier. Most of these identifying marks are hard to find or see. Check the connector carefully and refer to the information below for pictures and descriptions of connector identification markings.



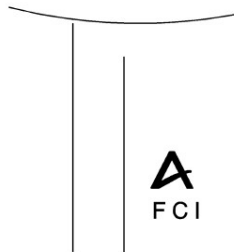
- Most of AFL's connectors have EPC on their connector body. Some of the smaller connectors will not have any markings on them.



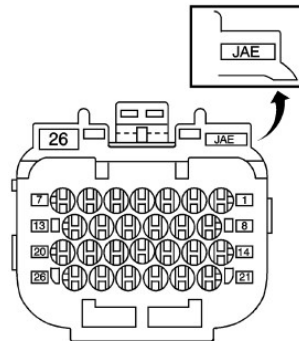
- In some cases Bosch will actually be printed on the connector. If Bosch does not appear on the connector, look for the Bosch logo. The Bosch logo is a circle with a blunted arrow inside. This logo can appear anywhere on the connector and is often very small.



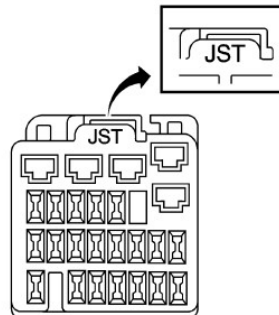
- In some cases Delphi will actually be printed on the connector. If Delphi is not printed on the connector, look for PED. In both cases there is no specific orientation for Delphi or PED and they can appear anywhere on the connector.



- FCI connectors may have the FCI logo on their connectors. The logo is the letters FCI with an "A" above it.



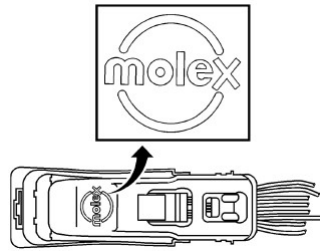
- JAE connector have JAE in small letters on their connectors.



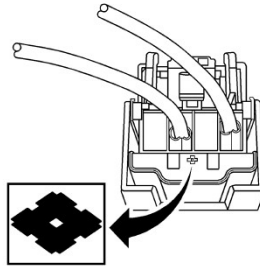
- JST connectors have JST in small letters on their connectors, similar to that above. The location of the logo will vary with the connector size and style.



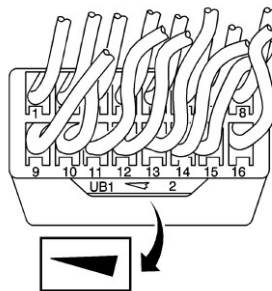
- Kostel has an "LK" with a circle around it. These connector are usually used as a transmissions connection.



- Most Molex connectors will have the Molex logo on the dresscover of the connector. In some cases the connectors may have MX followed by another letter. The third letter indicates where the connector was made. A connector with MXD is a Molex connector made in Detroit.



- Sumitomo has a unique symbol on their connector and possibly a part number. The symbol is similar to that of a diamond lying on its side, similar to that shown. The logo could appear anywhere but the most common place is at the wire side of the housing.
- Tyco/AMP has many different and unique connector designs. Some may or may not have identifiable marks on them.



- Yazaki has a wedge or arrow shape, similar to that shown.

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- **Wire to Wire Repair**
- **Special Tools**
 - EL-38125-10 Splice Sleeve Crimping Tool
 - J-38125-5A Ultra Torch Special Tool
 - J-38125-8 Splice Sleeve Crimping Tool

Danger:
In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

Note:
If the wiring harness internal to the transmission is damaged, the wiring harness must be replaced. The use of splice sleeves in an attempt to repair the internal transmission wires, connectors, or terminals could result in performance issues.

Note:
Do not splice wires in Door Harness Grommets.

Note:
The DuraSeal splice sleeves have the following 2 critical features: • A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside. • A cross hatched (knurled) core crimp provides the necessary low resistance contact integrity for these sensitive, low energy circuits.

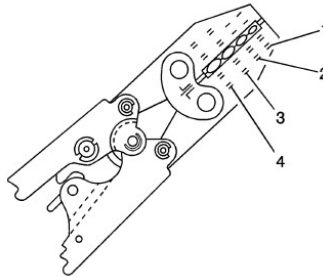
Use only DuraSeal splice sleeves to form a one-to-one splice on all types of insulation except high voltage and specialty cables. Use DuraSeal splice sleeves where there are special requirements such as moisture sealing. Follow the instructions below in order to splice copper wire using DuraSeal splice sleeves.

Splice Sleeve Selection

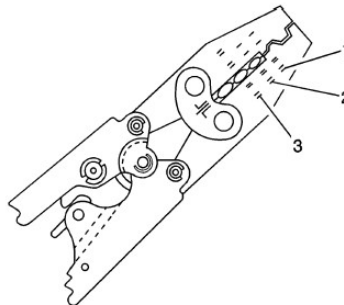
Splice Sleeve Color	Crimp Tool Nest Color		Wire Gauge mm ² / (AWG)
	3 Crimp Nests	4 Crimp Nests	
Salmon (YellowPink) 19300089	Red (1) or Red/Green (1)	Red (2)	0.22–0.8/(18–26)
Blue 19168447	Blue (2)	Blue (3)	1.0–2.0/(14–16)
Yellow 19168448	Yellow (3)	Yellow (4)	3.0–5.0/(10–12)

Note:
You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must obtain a clean strip with all of the wire strands intact.

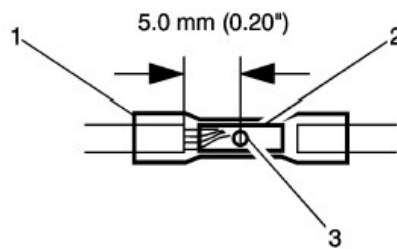
- Open the harness by removing any tape:
 - Use a sewing seam ripper, available from sewing supply stores, in order to cut open the harness in order to avoid wire insulation damage.
 - Use the DuraSeal splice sleeves on all types of insulation except Tefzel and coaxial.
 - Do not use the crimp and DuraSeal splice sleeve to form a splice with more than 2 wires coming together.
- Cut as little wire off the harness as possible. You may need the extra length of wire in order to change the location of a splice. Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.
- Strip the insulation:
 - When adding a length of wire to the existing harness, use the same size wire as the original wire.
 - Perform one of the following items in order to find the correct wire size:
 - Find the wire on the schematic and convert to regional wiring gauge size.
 - If you are unsure of the wire size, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.
 - Strip approximately 5.0 mm (0.20 in) of insulation from each wire to be spliced.
 - Do not nick or cut any of the strands. Inspect the stripped wire for nicks or cut strands.
 - If the wire is damaged, repeat this procedure after removing the damaged section.
- For high temperature wiring, slide a section of high temperature SCT1 shrink tubing down the length of wire to be spliced. Ensure that the shrink tubing will not interfere with the splice procedure.
- Select the proper DuraSeal splice sleeve according to the wire size. Refer to the above table at the beginning of the repair procedure for the color coding of the DuraSeal splice sleeves and the crimp tool nests.



- The EL-38125-10 splice sleeve crimping tool has four crimp nests. The largest crimp nest (4) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (3) is used for crimping 14 and 16 gauge wires. The third largest crimp nest (2) is used for crimping 18 and 20 gauge wires. The smallest crimp nest (1) is used for crimping 22 to 26 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.



- The J381258 splice sleeve crimping tool has three crimp nests. The largest crimp nest (3) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (2) is used for crimping 14 and 16 gauge wires. The smallest crimp nest (1) is used for crimping 18 to 20 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.
- Use the splice sleeve crimp tool in order to position the DuraSeal splice sleeve in the proper color nest of the splice sleeve crimp tool. For the four crimp nest tool, use the three largest crimp nests to crimp the splice sleeves. For the three crimp nest tool, use all three crimp nests to crimp the splice sleeves. Use the four and three crimp tool diagrams (above) and the table (farther above) to match the splice sleeve with the correct crimp nest. The crimp tool diagram **callout** numbers match the numbers in the table (under crimp tool nest color).



- Place the DuraSeal splice sleeve in the nest. Ensure that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) in order to prevent the wire (1) from going further. Close the hand crimper handles slightly in order to firmly hold the DuraSeal splice sleeve in the proper nest.



- Insert the wire into the splice sleeve barrel until the wire hits the barrel stop. Refer to **Folded-Over Wire Repair** for splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes) and for splicing wires of different gauges.
- Tightly close the handles of the crimp tool until the crimper handles open when released. The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Repeat steps 4 and 6 for the opposite end of the splice.



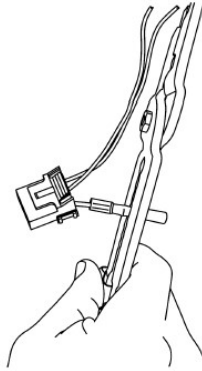
- Using the heat torch, apply heat to the crimped area of the barrel.
- Start in the middle and gradually move the heat barrel to the open ends of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

- **Weatherpack™ Wiring Repair**

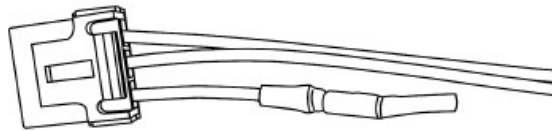
Note:

Some replacement pigtail connectors may be delivered without the terminated leads installed into the connector. For Weatherpack™ connectors, all terminated leads included in the package should to be installed into the connector. If the connector end view shows that a terminal is not occupied, the extra terminated lead(s) need to be installed and the end(s) sealed using a DuraSeal splice sleeve and taped back into the harness.

- Insert the wire into the splice sleeve barrel until the wire hits the barrel stop. Refer to Folded-Over Wire Repair for splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes) and for splicing wires of different gauges.



- Tightly close the handles of the crimp tool until the crimper handles open when released. The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Holding the DuraSEAL with one hand gently tug on the wire to ensure it is crimped in the DuraSeal.
- Using the heat torch, apply heat to the crimped area of the barrel.



- Start in the middle and gradually move the heat barrel to the open ends of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.



- Tape the extra terminated lead(s) back into the harness.

- **High Temperature Wiring Repairs**

Use the following procedures to perform high temperature wiring repairs:

- Center the high temperature SCT1 shrink tube over the DuraSeal splice sleeve.
- Using the heat torch, apply heat to the high temperature heat shrink tubing.
- Gradually move the heat from the center to the open end of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.
- Replace any reflective tape and clips that may have been removed during the repair.
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- **Testing for Intermittent Conditions and Poor Connections**
- **Special Tools**

EL-35616 Terminal Test Probe Kit

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- A terminal not seated all the way into the connector body
- Poor terminal to wire connection Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to Inducing Intermittent Fault Conditions in order to duplicate the conditions required, in order to verify the customer concern.
- Refer to Testing for Electrical Intermittents for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to Scan Tool Snapshot **Procedure** for advanced intermittent diagnosis and Vehicle Data Recorder operation.

- **Testing for Terminal Fretting**

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a buildup of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface. To correct a fretting condition disconnect the suspect connector and add dielectric grease / lubricant (Nyogel 760G or equivalent) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

- **Testing for Proper Terminal Contact**

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the EL-35616 kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

- **Testing for Proper Terminal Contact in Bussed Electrical Centers**

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center. Use the EL-35616 kit to test for proper terminal contact. Failure to use the EL-35616 kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

- Separate the connector halves.
- Visually inspect the connector halves for contamination. Contamination may result in a white or green buildup
 - within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
- Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

- Remove the component in question.
- Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
- Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
- Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

- **Control Module/Component Voltage and Grounds**

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to **Circuit Testing** and **Power**

Distribution Schematics.

- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to Circuit Testing and Ground Distribution Schematics.

- **Temperature Sensitivity**

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
 - High ambient temperatures
 - Underhood/engine generated heat
 - Circuit generated heat due to a poor connection, or high electrical load
 - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
 - Low ambient temperatures In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
 - The condition only occurs on a cold start.
 - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to **Inducing Intermittent Fault Conditions** in order to duplicate the conditions required.

- **Electromagnetic Interference and Electrical Noise**

Some electrical components/circuits are sensitive to electromagnetic interference or other types of electrical noise. Inspect for the following conditions:

- A mis-routed harness that is too close to high voltage/high current devices such as secondary ignition components, motors, generator etc. — These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch — These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Installation of non-factory or aftermarket add on accessories such as lights, 2way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. — These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to Checking Aftermarket Accessories.
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

- **Incorrect Control Module**

- There are only a few situations where reprogramming a control module is appropriate:
 - A new service control module is installed.
 - A control module from another vehicle is installed.
 - Revised software/calibration files have been released for this vehicle.

Note:
DO NOT reprogram the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.

Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to **Control Module References** for

replacement, setup, and programming.

- **Flat Wire Repairs**

The flat wire within the flex wiring harness is not serviceable. If an open or short exists within the flex wiring harness the complete harness must be replaced.

- **LAN and Media Oriented Systems Transport MOST Wiring Repairs**

Special Tools

EL-38125-10 Splice Sleeve Crimping Tool

DuraSeal splice sleeves

A wire stripping tool

The DuraSeal splice sleeves have the following 2 critical features:

- A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside.
- A cross hatched (knurled) core crimp provides necessary contact integrity for the sensitive, low energy circuits.

The Local Area Network (LAN) System requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working on LAN connectors and terminals.

- **LAN Repairs**

Note:
When making a repair to any LAN network, the original wire length after the repair must be the same length as before the repair. If the network is a twisted pair, the twist must be maintained after the repair is completed.

LAN has 2 types of networks, low speed and high speed. Low speed LAN has a single wire and works at slow speeds. High speed LAN has 2 wires in a twisted pair and works at higher speeds. For more information on LAN, refer to Data Link Communications Description and Operation.

- **GMLAN Connector Terminal Repair**

Note:
A terminated lead can be used to replace damaged connector terminals for both high speed and low speed LAN systems. When making a connector terminal repair on a LAN high speed system with twisted pair wires, do not untwist the wires more than necessary to make the repair.

If the individual terminals are damaged on any LAN connection, use the appropriate connector repair procedure in order to repair the terminal. Refer to **Connector Repairs** for the appropriate connector repair procedure.

- **LAN Wire Repair**

Note:
Refer to Wiring Repairs in the service information connector end views or the vehicle schematics in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm², 0.8 mm², 1.0 mm² etc.). Use the DuraSeal splice sleeves and EL-38125-10 tool. For wiring repair, refer to Splicing Copper Wire Using Splice Sleeves.

- **Media Oriented Systems Transport (MOST) Wiring Repair**

Note:
If harness repair/analysis is performed, MOST bus Twist Pair unshielded wire should be 0.35 mm ² (22 AWG) wire with at least one twist per each 1 45/64 inch (45 mm) and must not be untwisted for more than 3 15/16 of an inch (10 cm).

The following conditions need to be met to ensure a valid continuity:

- Untwisted length for all MOST 50 circuits at each wire harness connector should be no longer 50 mm max (25 mm preferred).
- When wire repairs are made, a minimum 25 twists/meter for all MOST 50 circuits.
- MOST 50 has specific receive and transmit I/O.

The transmit of one module is connected to receive of the next module in ring topology.

- **High Temperature Wiring Repairs**

Note:
All wiring repairs need to be 200 mm from the heat zone. Areas of consideration would be any area located near the exhaust manifolds, catalytic converter, exhaust pipes, and turbocharged engines.

Items Required

- DuraSeal splice sleeves to crimp and seal connections
- High temperature SCT1 shrink tubing to protect the splice sleeves
- Terminated leads or pigtails
- The correct tools to remove the terminals from the connectors

Use high temperature bulk wire rated at 150°C (302°F) continuous temperature of the same or larger gauge size as the original wire when repair damage wire. Also replace any reflective tape that you remove during the repair.

- **High Temperature Wiring**

Wiring that is exposed to high temperatures, 135°C (275°F) or higher, for prolonged periods of time may use materials i.e. wires, connectors, and shielding that has a higher heat rating than typical wiring. When making a repair in a high temperature area observe the following:

- Use high temperature bulk wire rated at 150°C (302°F) continuous temperature to replace any damaged wire.
- Replace any heat shielding that is removed.
- Cover any DuraSeal splice sleeves with SCT1 shrink tubing.
- After making a wiring repair, ensure that the location of the wiring is not moved closer to the heat source.

- **Identifying High Temperature Wiring**

Note:
High temperature areas would be areas located near exhaust manifolds, catalytic converters, exhaust pipes, and turbocharged engines.

Wiring that is exposed to high temperature, 135°C (275°F) or higher, for prolonged periods of time need special considerations when making wiring repairs. Areas that may be exposed to higher temperatures can be identified by heat resistant materials that are being used in those areas. These materials may include heat reflective tape, moon tape, and high temperatures shrink tubing. Also conduit and other protective coverings may be used. Because conduit or similar coverings are used throughout the vehicle regardless of the temperature, it may be necessary for the technician to determine if an area is exposed to excessive heat before making a wiring repair.

- **Heated Oxygen Sensor Wiring Repairs**

Caution:
Do not solder repairs under any circumstances as this could result in the air reference being obstructed.

If the heated oxygen sensor pigtail wiring, connector, or terminal is damaged the entire oxygen sensor assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly it must have a clean air reference. This clean air reference is obtained by way of the oxygen sensor signal and heater wires. Any attempt to repair the wires, connectors or terminals could result in the obstruction of the air reference and degrade oxygen sensor performance.

The following guidelines should be used when servicing the heated oxygen sensor:

- Do not apply contact cleaner or other materials to the sensor or vehicle harness connectors. These materials may get into the sensor, causing poor performance. Also, the sensor pigtail and harness wires must not be damaged in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and cause performance problems.
- Neither the sensor nor vehicle lead wires should be bent sharply or kinked. Sharp bends, kinks, etc., could block the reference air path through the lead wire.
- Do not remove or defeat the oxygen sensor ground wire (where applicable). Vehicles that utilize the ground wire sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will also cause poor engine performance.
- To prevent damage due to water intrusion, be sure that the peripheral seal remains intact on the vehicle harness connector.

- **Splicing Inline Harness Diodes**

Many vehicle electrical systems use a diode to isolate circuits and protect the components from voltage spikes. When installing a new diode use the following procedure.

- Open the harness.
 - If the harness is taped, remove the tape.
 - To avoid wiring insulation damage, use a sewing seam ripper (available from sewing supply stores) in order to cut open the harness.
 - If the harness has a black plastic conduit, pull out the diode.
- If the diode is taped to the harness, remove all of the tape.
- Check and record the current flow direction and orientation of diode.
- Remove the inoperative diode from the harness with a suitable soldering tool.

Note:

If the diode is located next to a connector terminal remove the terminal(s) from the connector to prevent damage from the soldering tool.

- Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.
- Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position.
- Attach the new diode to the wire(s) using 60/40 rosin core solder. Before soldering attach some heat sinks (aluminum alligator clips) across the diode wire ends to protect the diode from excessive heat. Follow the manufacturer's instruction for the soldering equipment.
- Reinstall terminal(s) into the connector body if previously removed.

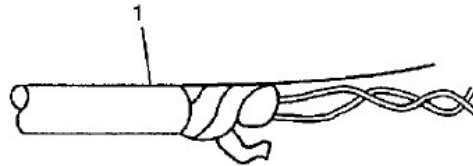
Note:

To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points with tape.

- Tape the diode to the harness or connector using electrical tape.

- **Splicing Twisted or Shielded Cable**

Twisted/shielded cable is used in order to protect wiring from electrical noise. Two-conductor cable of this construction is used between the radio and the speaker/amplifier units and other applications where low level, sensitive signals must be carried. Follow the instructions below in order to repair the twisted/shielded cable.



- Remove the outer jacket (1). Use care not to cut into the drain wire of the mylar tape.
- Unwrap the tape. Do not remove the tape. Use the tape in order to rewrap the twisted conductors after the splice is made.
- Prepare the splice. Untwist the conductors and follow the instructions for Splicing Copper Wire Using Splice Sleeves. Staggering the splices by 65 mm (2.5 in) is recommended.

Note:
Apply the mylar tape with the aluminum side inward. This ensures good electrical contact with the drain wire.

- Reassemble the cable.
 - Rewrap the conductors with the mylar tape. If the mylar tape is damaged, use 3M product AL36FR to replace the damaged mylar tape.
 - Use caution not to wrap the drain wire in the tape (1).
 - Follow the splicing instructions for copper wire and splice the drain wire.
 - Wrap the drain wire around the conductors and tape with electrical tape to replace the outer insulation.
- Tape over the entire cable. Use a winding motion when you apply the tape.

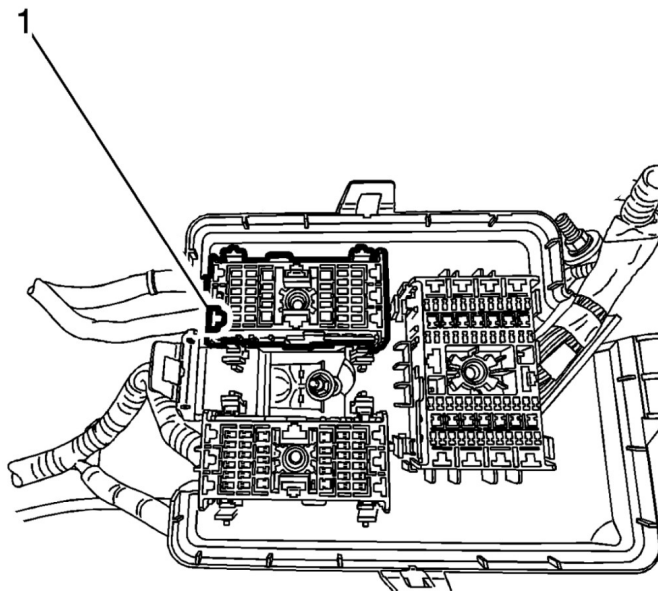
- **Junction Block Replacement**
- **Removal**
- Disconnect the Negative Battery Cable
- Remove Hood, **Refer to Hood in Body Repair**



- Remove the junction block cover (1).



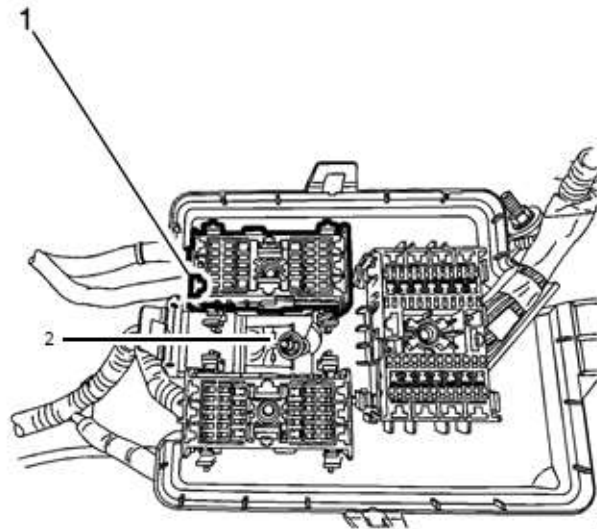
- Remove the positive battery cable nut (1) from the junction block.
- Remove the positive battery cable (2) from the junction block.
- Remove the junction block nut (3).
- Remove the junction block bolts (4).
- Disconnect the wiring harness from the junction block base.
- Remove the junction block from the base.



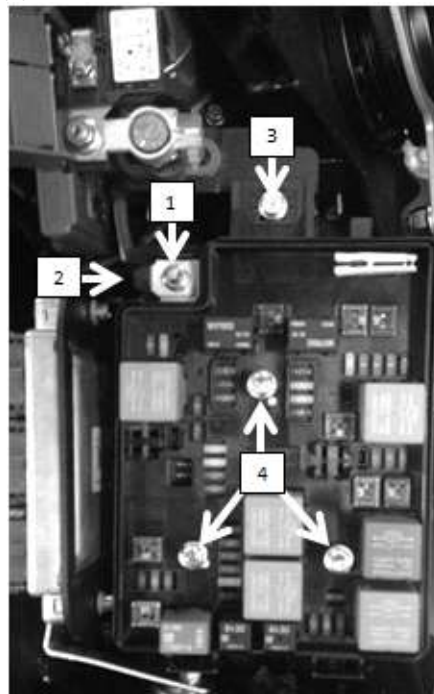
- Disconnect the wiring harness plug from the front compartment fuse block.
- Remove the Junction Block Base bolt (2)

- Remove Junction Block Base

- **Installation**



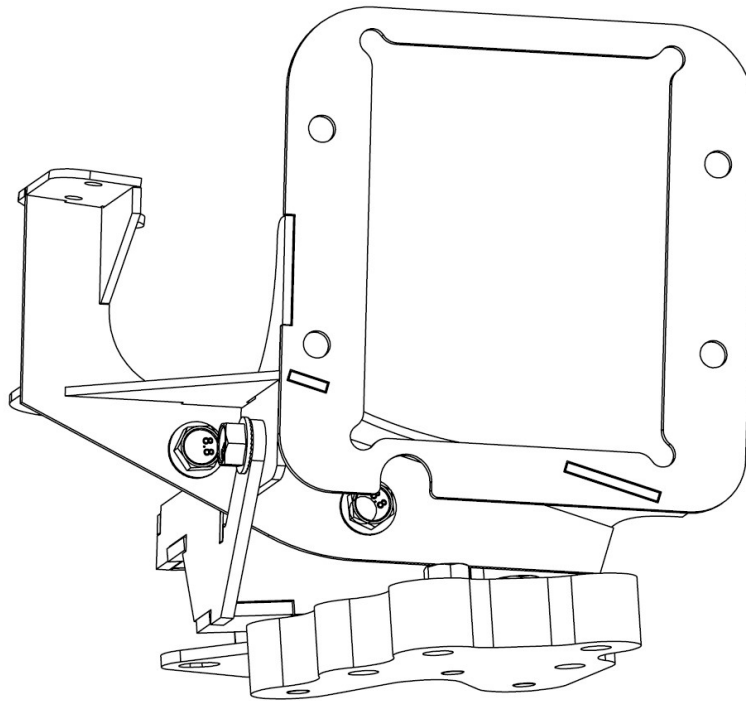
- Inset Junction block Base in chassis
- Install and tighten the junction block bolt (2) tighten to 5 Nm (44 lb in)
- Clip in the wiring harness plugs (1).



- Install the junction block to the base (3).
- Install the junction block bolts (4) and tighten to 5 Nm (44 lb in).
- Install the junction block nut (3) and tighten to 5 Nm (44 lb in).
- Position the positive battery cable (2) to the junction block.
- Install the positive battery cable nut (1) and tighten to 7 Nm (62 lb in).

- Install the Junction Block Cover
- Connect the Negative Battery Cable

- **Junction Bock/ ECU Bracket Replacement**



Callout	Component Name
Preliminary Procedures • Disconnect the Negative Battery Cable • Remove the ECU, Refer to ECU Replacement • Remove the Junction Block, Refer to Junction Block Replacement	
1	Junction Block/ ECU Bracket (Qty:3) Tighten: 22 Nm (16 lb. ft.)
2	Left Transmission Bracket