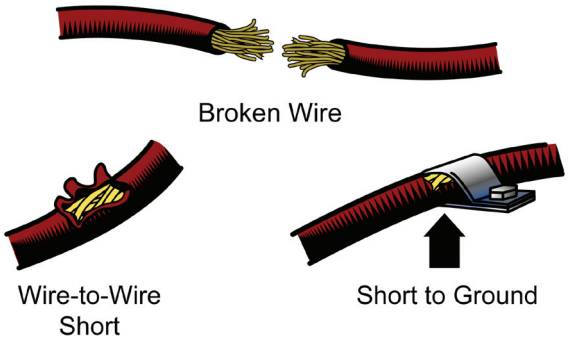
UNIT 3: GENERAL ELECTRICAL SYSTEM DIAGNOSIS

LESSON 4: WIRE AND CONNECTOR REPAIRS

I. Connector repairs

A. Connector repairs involve fixing damaged wires. Wires are marred due to physical abuse or electrical faults.



1. Physical damage to wires results from scraped or cut insulation, chemical or heat exposure, or breaks caused during testing or repairs.

2. Electrical faults to wires result from short circuits between wires or from wires to ground or overloads, which melt fusible links.

II. Wire repairs

A. The wire repair process involves some general rules.

1. Choose the proper wire size when splicing a damaged wire. Wires that are too thick for the circuit make splicing difficult, wires that are too thin limit current flow or melt the wire.

2. Choose the same size or slightly larger size of wire when replacing a damaged wire.

3. If possible, replace or splice a wire with a wire of the same color.

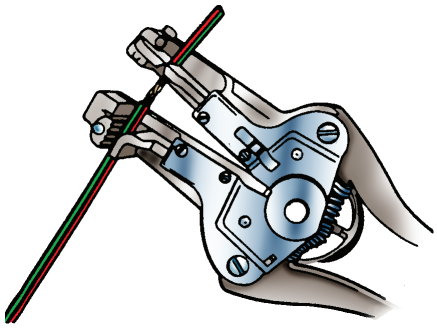
4. Disconnect the battery when splicing wires.

5. Wrap cut insulation with tape or cover it with heat-shrink tubing. Overlap the repaired wire about ½ inch on either side.

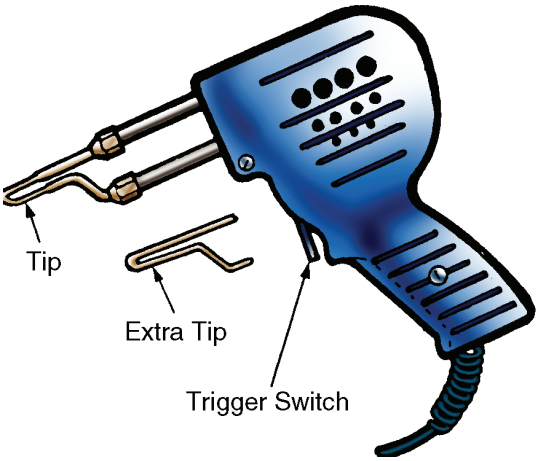
6. Clean the wire ends. Remove traces of paint, rust, grease, and scale.

B. The wire repair process involves special equipment.

1. Wire strippers remove insulation without breaking or nicking the wire strands.



2. Solder irons join two pieces of metal together with a lead and tin alloy called solder.



a. A crimp is used to splice two wires together. This minimizes the amount of solder separating the wire strands, which creates a stronger joint.

b. A low-watt soldering iron works well. The iron should be an appropriate size because one that is too small takes too long to heat the work and may not heat properly.

c. Flux-core solder is wire solder with a flux-filled center. It is recommended for electrical splices.

d. Resin or resin-type flux must be used for all electrical work because its residue does not cause corrosion or conduct electricity.

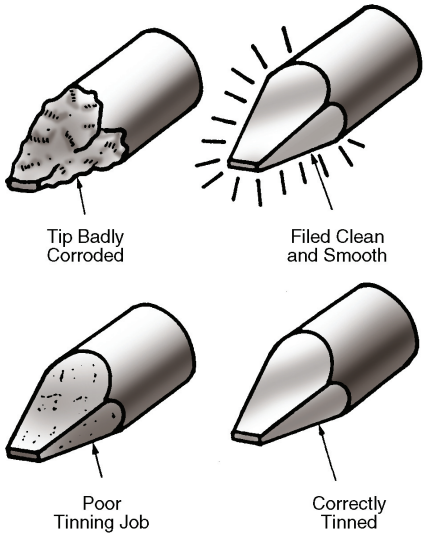
e. Flux removes the oxide and prevents further oxidation during the soldering process.

NOTE: Oxide appears as a thin film on wires that results from the heating of the wire. Oxide rejects solder.

III. Procedures for tinning the soldering iron and soldering wire splices

A. Tin the soldering iron, as needed.

NOTE: The soldering iron tip is made of copper. The solvent action of solder and prolonged heating pits and corrodes the iron tip. An oxidized or corroded tip does not satisfactorily transfer heat from the iron to the work.



1. Using a file, dress the tip of the soldering iron down to the bare copper.

2. File the surfaces of the tip until they are smooth and flat.

3. Plug in the soldering iron.

4. When the tip color begins to change to brown and light purple, dip the tip in and out of a can of resin-type soldering flux.

5. Apply flux to soldering contacts before soldering.

6. Quickly apply resin-core wire solder to the surfaces.

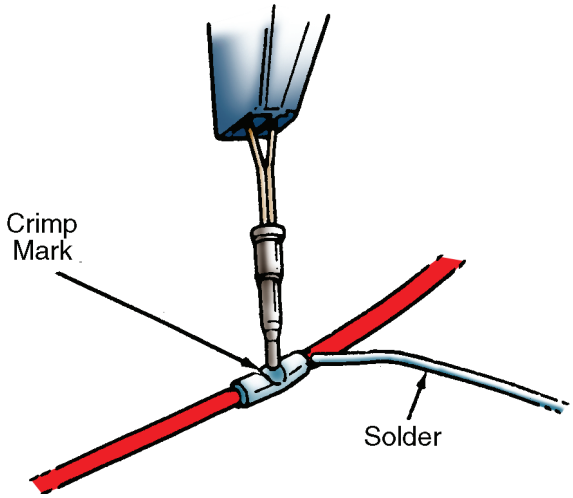
7. Place the hot soldering iron on a soldering stand or protective pad.

   NOTE: The soldering iron must be at normal operating temperature to properly tin. Solder melts quickly and flows freely.

B. Solder a wire splice.

   CAUTION: Never try to solder until the iron is properly tinned.

1. Clean the wires.
2. Crimp the wires together.
3. Apply the full surface of a tinned tip of a hot soldering iron against the splice of the wire.
4. Apply flux to soldering contacts before soldering.
5. Apply the resin-core wire solder to the flat of the soldering iron where it contacts the splice. As the wire heats, the solder flows through the splice.



6. Apply enough solder to form a secure splice.

   CAUTION: Do not move the splice until the solder sets.

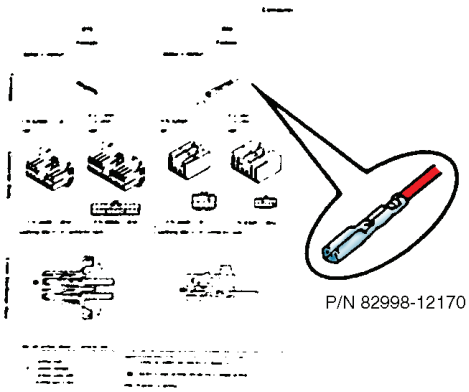
7. Place the hot soldering iron on a soldering stand or protective pad.
8. Unplug the soldering iron.

IV. Procedures for repairing terminals, wiring, and wiring harnesses

NOTE: These procedures may be used to repair most electrical wiring circuits including CAN circuits. Some manufacturers do not recommend repairing fiber optic, supplemental restraint system (SRS), and CAN wiring circuits. If damaged or defective, the complete related harness must be replaced as a unit.

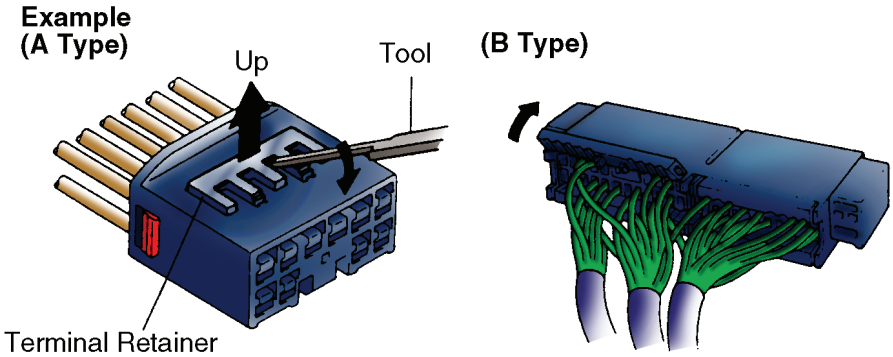
A. Repair terminals.

1. Identify the connector name, locking clips position, unlocking direction, and terminal type.



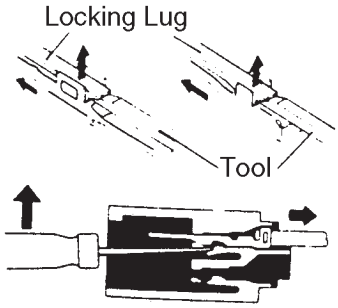
2. Disengage the locking device before releasing the terminal locking clip and the terminal removed from the connector.

3. Unlock the secondary locking device with a miniature screwdriver or terminal pick.

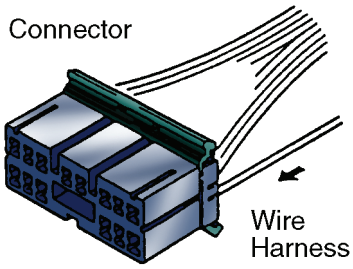


4. Locate the locks on the terminal and connector.

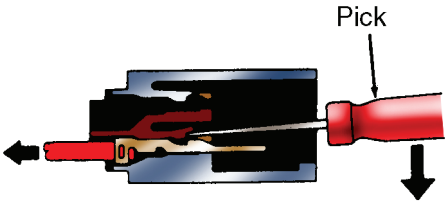
5. Release the locking clip to remove the terminal from the connector.



6. Gently push the terminal into the connector and hold in position.



7. Insert the miniature screwdriver or terminal pick into the connector in the direction shown in the following illustration.



8. Move the locking clip to the unlock position, and hold it there.

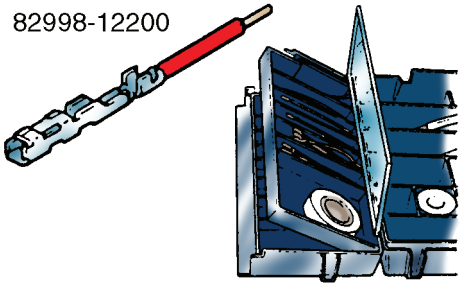
NOTE: Do not apply excessive force or pry on the terminal.

9. Pull the lead toward the rear of the connector to withdraw the terminal from the connector.

NOTE: Do not use too much force. If the terminal does not come out easily, repeat steps 6 through 9.

10. Using wire cutters, cut the lead at the base of the terminal.

11. Select the correct replacement terminal.



12. Using wire stripers, remove 1/2 inch of insulation from the lead.

13. Crimp the replacement terminal to the wire lead. Solder the lead to the terminal, if required by service procedures.

14. Install the new terminal into the connector.

15. Reconnect the connector and install the locking devices.

16. Test the operation of the circuit.

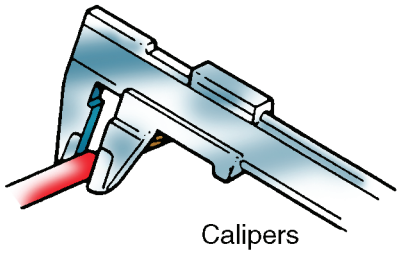
B. Repair wiring and wiring harness leads.

1. Locate the defective or damaged portion of the harness.

2. Remove the harness plastic or tape protective cover to gain access to the area to be repaired.

3. Using wire cutters, cut and remove the damaged sections of the leads.

4. Select the correct size and type of electrical wire to replace the damaged leads. To measure the nominal size of the wire lead, place a measuring device such as a micrometer or caliper across the diameter of the insulation on the lead or use a wire gauge.



5. Select the correct size of the splice. The size of the splice is based on the nominal size of the wire.

Splice Size	Part Number	Wire Size
Small	00204-34130	22-18 AWG 0.3-0.8 mm
Medium	00204-34137	16-14 AWG 1.0-2.0 mm
Large	00204-34138	12-10 AWG 3.0-5.0 mm

Small: 00204-34130

Medium: 00204-34137

Large: 00204-34138

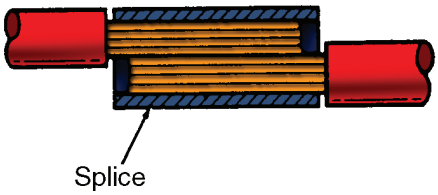
6. Using wire strippers, remove 1/2 inch of insulation from each of the leads to be spliced.

7. Cut a piece of heat shrink tube that is slightly larger in diameter than the splice and slightly longer than the splice.

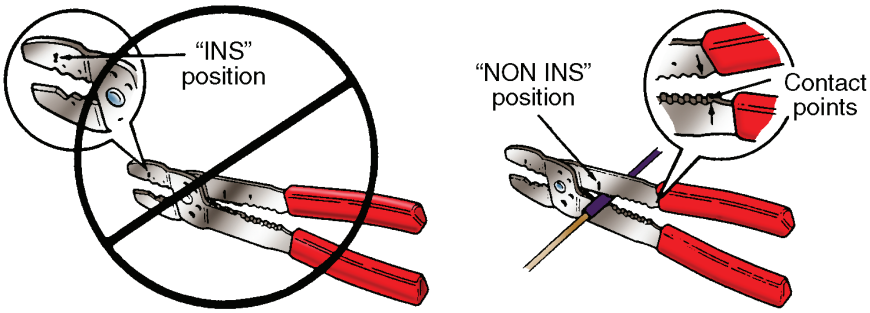
8. Slide the tube over the end of one wire to be spliced. This must be done before joining the wires together.

9. Insert the stripped ends of both the harness lead and replacement lead into the splice to overlap the wires inside the splice.

NOTE: Do not place the insulation in the splice. Only place the stripped wire in the splice.



CAUTION: The crimping tool has positions marked for insulated splices that are marked "INS." These positions should not be used because they do not crimp the splice tightly onto the wires. Only use the position marked "NON INS."



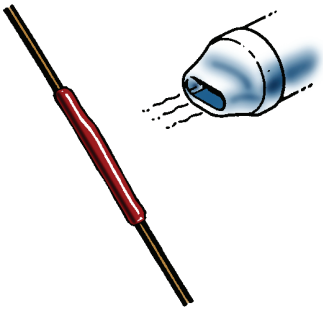
10. Center the splice between the crimping jaws and squeeze until the contact points of the crimper come together.

    NOTE: Make sure the wires and the splice are still in the proper position before closing the ends of the crimping tool. Use steady pressure.

11. Make sure that the splice is crimped tightly. Solder the splice if required by service procedures.

12. Center the tube over the soldered splice.

13. With a heat gun, gently heat the tubing until it has shrunk tightly around the splice.



    NOTE: Do not continue heating the tubing after it has shrunk around the splice. Be careful not to melt the insulation on the adjoining wires.

14. After repairing the damaged leads, reinstall the harness protective cover.

15. Test the operation of the circuit.

NOTE: After completing repairs of terminals, wiring, and wiring harnesses, some service procedures require measuring circuit resistance and comparing readings to specifications (too high of resistance would indicate a defective repair). On CAN circuits, a scan tool may be used to test the circuit operation.