REPAIR PROCEDURES

CONTENTS

ELECTRICAL REPAIRS

This section provides instruction in the following repairs:

- Circuit Protection
- Typical Electrical Repairs
- Splicing Copper Wire
- Splicing Twisted/Shielded Cable
- Repairing Connectors (Except Weather Pack®)
- Repairing Weather Pack® (Environmental) Connectors
- Terminal Repair
- Diode Replacement
- Heated Oxygen Sensor (HO2S) Repair
- OBDII Circuit Repair
- GMSPO Service Parts Ordering

After any electrical repair is made, always test the circuit afterwards by operating the devices in the circuit This confirms not only that the repair is correct but, also, that it was the cause of the complaint.

Repair of circuits which are part of the OBDII (On-Board Diagnostics II) emissions control system have several special requirements which must be followed to ensure proper system operation. These requirements are listed on page 8A-5-12 under OBDII CIRCUIT REPAIRS.

CIRCUIT PROTECTION

The purpose of circuit protection is to protect the wiring assembly during normal and overload conditions. An overload is defined as a current requirement that is higher than normal. This overload could be caused by a short circuit or system malfunction. The short circuit could be the result of a pinched or cut wire or an internal device short circuit, such as an electronic module failure.

The circuit protection device is only applied to protect the wiring assembly, and not the electrical load at the end of the assembly. For example, if an electronic component short circuits, the circuit protection device will assure a minimal amount of damage to the wiring assembly.

However, it will not necessarily prevent damage to the component.

There are three basic types of circuit protection devices: Circuit Breaker, Fuse and Fusible Link.

CIRCUIT BREAKERS

A circuit breaker is a protective device designed to open the circuit when a current load is in excess of rated breaker capacity. If there is a short or other type of overload condition in the circuit, the excessive current will open the circuit between the circuit breaker terminals. There are two basic types of circuit breakers used in GM vehicles: cycling and non-cycling.

CYCLING CIRCUIT BREAKER

The cycling breaker will open due to heat generated when excessive current passes through it for a period of time. Once the circuit breaker cools, it will close again after a few seconds. If the cause of the high current is still present it will open again. It will continue to cycle open and closed until the condition causing the high current is removed.

NON-CYCLING CIRCUIT BREAKER

There are two types of non-cycling circuit breakers. One type is mechanical and is nearly the same as a cycling breaker. The difference is a small heater wire within the non-cycling circuit breaker. This wire provides enough heat to keep the bimetallic element open until the current source is removed.

The other type is solid state, called out in this section as Electronic Circuit Breaker (ECB). This device has a Positive Temperature Coefficient. It increases its resistance greatly when excessive current passes through it. The excessive current heats the ECB. As it heats, its resistance increases, therefore having a Positive Temperature Coefficient. Eventually the resistance gets so high that the circuit is effectively open. The ECB will not reset until the circuit is opened, removing voltage from its terminals. Once voltage is removed, the circuit breaker will re-close within a second or two.

FUSES

The most common method of automotive wiring circuit protection is the fuse (Figure 1). A fuse is a device that, by the melting of its element, opens an electrical circuit when the current exceeds a given level for a sufficient time. The action is non-reversible and the fuse must be replaced each time a circuit is overloaded or after a malfunction is repaired.

Fuses are color coded. The standardized color identification and ratings are shown in Figure 2. For service replacement, non-color coded fuses of the same respective current rating can be used.

Examine a suspect fuse for a break in the element. If the element is broken or melted, replace the fuse with one of equal current rating.

There are additional specific circuits with in-line fuses. These fuses are located within the individual wiring harness and will appear to be an open circuit if blown.

AUTOFUSE

The Autofuse, normally referred to simply as "Fuse," is the most common circuit protection device in today's vehicle. The Autofuse is most often used to protect the wiring assembly between the Fuse Block and the system components.

MAXIFUSE

The Maxifuse was designed to replace the fusible link and Pacific Fuse elements. The Maxifuse is designed to protect cables, normally between the battery and fuse block, from both direct short circuits and resistive short circuits.

Compared to a fusible link or a Pacific Fuse element, the Maxifuse performs much more like an Autofuse, although the average opening time is slightly longer. This is because the Maxifuse was designed to be a slower blowing fuse, with less chance of nuisance blows.

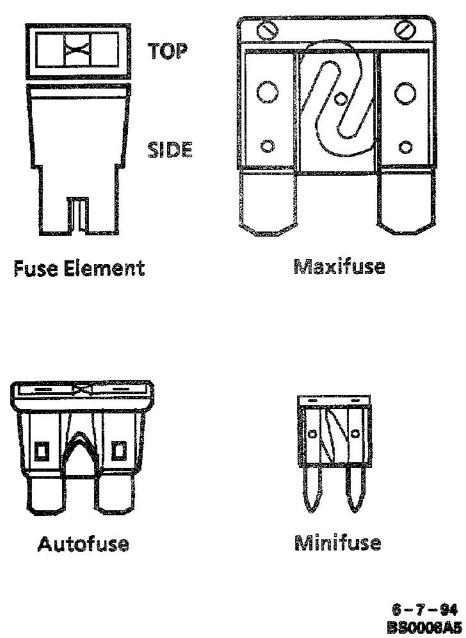

Figure 1 - Fuse Devices

REPAIR PROCEDURES

AUTOFUSE

CURRENT RATING	COLOR
3	VIOLET
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

MAXIFUSE

CURRENT RATING	COLOR
20	YELLOW
30	GREEN
40	AMBER
50	RED
60	BLUE
70	BROWN
80	NATURAL

MINIFUSE

CURRENT RATING	COLOR
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

PACIFIC FUSE ELEMENT

CURRENT RATING	COLOR
30	PINK
40	GREEN
50	RED
60	YELLOW

8-9-94
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Figure 2 - Fuse Rating and Color

MINIFUSE

The Minifuse is a smaller version of the Autofuse and has a similar performance. As with the Autofuse, the Minifuse is usually used to protect the wiring assembly between a fuse block and system components. Since the Minifuse is a smaller device, it allows for more system specific fusing to be accomplished within the same amount of space as Autofuses.

PACIFIC FUSE ELEMENT/MAXIFUSE

The Pacific Fuse Element and Maxifuse were developed to be a replacement for the fusible link. Like a fusible link, the fuses are designed to protect wiring from a direct short to ground. These elements are easier to service and inspect than a fusible link and will eventually replace fusible links in all future vehicle applications.

FUSIBLE LINKS

In addition to circuit breakers and fuses, some circuits use fusible links to protect the wiring. Like fuses, fusible links are "one-time" protection devices that will melt and create an open circuit (see Figure 3).

Not all fusible link open circuits can be detected by observation. Always inspect that there is battery voltage past the fusible link to verify continuity.

Fusible links are used instead of a fuse in wiring circuits that are not normally fused, such as the ignition circuit. For AWG sizes, each fusible link is four wire gage sizes smaller than the wire it is designed to protect. For example: to protect a 10 gage wire use a 14 gage link or for metric, to protect a 5 mm^2 wire use a 2 mm^2 link (see Figure 6). Links are marked on the insulation with wire-gage size because the heavy insulation makes the link appear to be a heavier gage than it actually is. The same wire size fusible link must be used when replacing a blown fusible link.

Fusible links are available with three types of insulation: Hypalon®, Silicone/GXL (SIL/GXL) and Expanded Duty. All future vehicles that use fusible links will utilize the Expanded Duty type of fusible link. When servicing fusible links, all fusible links can be replaced with the Expanded Duty type. SIL/GXI fusible links can be used to replace either SIL/GXI or Hypalon® fusible links. Hypalon® fusible links can only be used to replace Hypalon® fusible links.

Determining characteristics of the types of fusible links are:

- Hypalon® (limited use): only available in 0.35 mm^2 or smaller and its insulation is one color all the way through.
- SIL/GXL (widely used): available in all sizes and has a white inner core under the outer color of insulation.

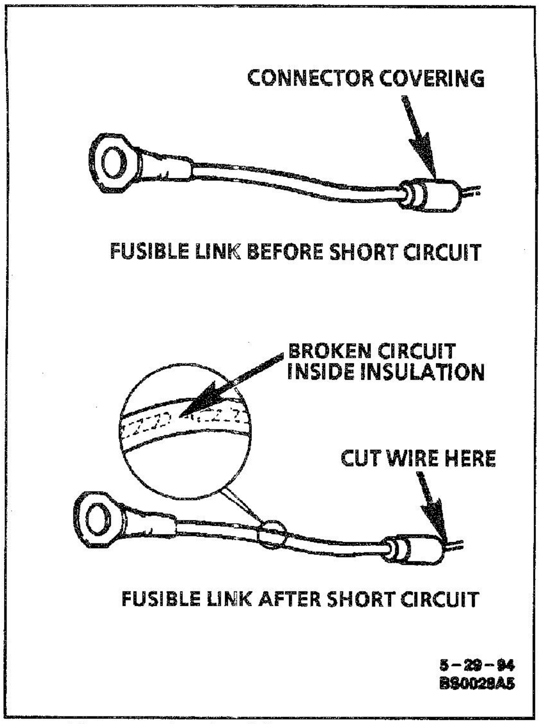

Figure 3 - Good and Damaged Fusible Links

— Expanded Duty: available in all sizes, has an insulation that is one color all the way through and has three dots following the writing on the insulation.

Service fusible links are available in many lengths. Choose the shortest length that is suitable. If the fusible link is to be cut from a spool, it should be cut 150-225 mm (approx. 6-9 in.) long. NEVER make a fusible link longer than 225 mm (approx. 9 in.).

CAUTION: Fusible links cut longer than 225 mm (approx. 9 in.) will not provide sufficient overload protection.

To replace a damaged fusible link (Figure 4), cut it off beyond the splice. Replace with a repair link. When connecting the repair link, strip wire and use staking-type pliers to crimp the splice securely in two places. For more details on splicing procedures, see "Splicing Copper Wire." Use crimp and seal splices whenever possible. When using splice clips, refer to page 8A-5-4; when using crimp and seal splice sleeves, refer to page 8A-5-6.

To replace a damaged fusible link which feeds two harness wires, cut them both off beyond the splice. Use two repair links, one spliced to each harness wire (see Figure 5).

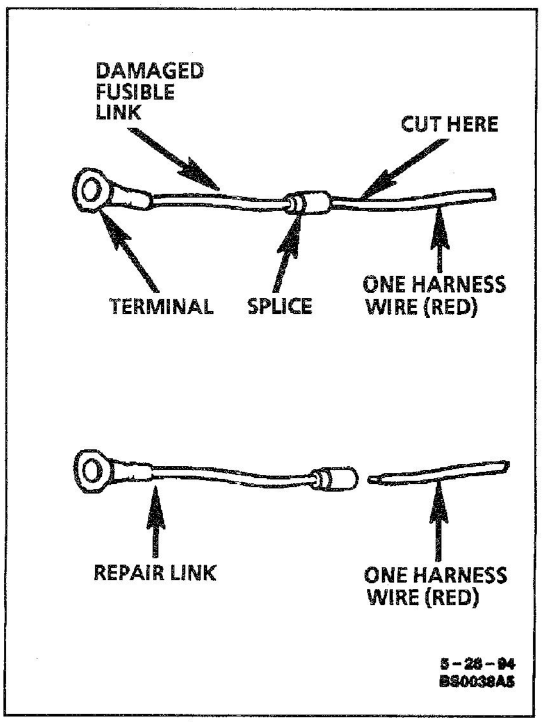

Figure 4 - Single Wire Feed Fusible Link

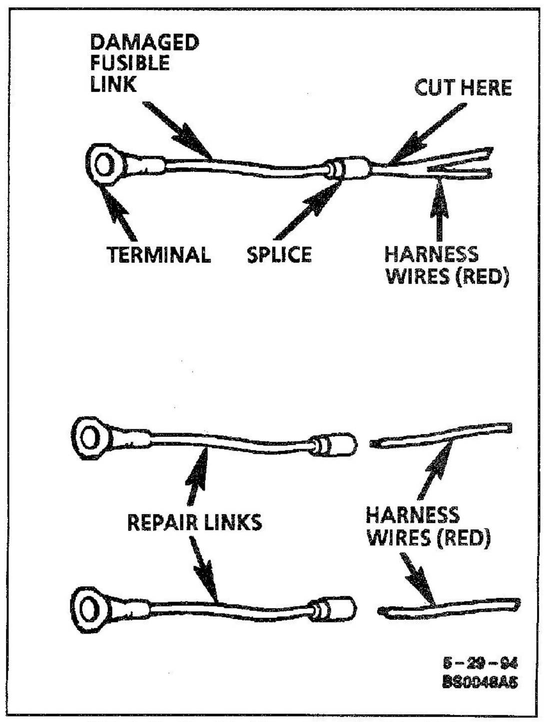

Figure 5 - Double Wire Feed Fusible Link

REPAIR PROCEDURES

TYPICAL ELECTRICAL REPAIRS

An open circuit is an incomplete circuit. Power cannot reach the load or reach ground. If a circuit is open, active components do not energize. A short circuit is an unwanted connection between one part of the circuit and either ground or another part of the circuit. A short circuit causes a fuse to blow or a circuit breaker to open.

REPAIRING SHORT CIRCUITS CAUSED BY DAMAGED WIRE INSULATION

- Locate the damaged wire.
- Find and correct the cause of the wire insulation damage.
- For minor damage, tape over the wire. If damage is more extensive, replace the faulty segment of the wire (refer to the splicing instructions for copper or shielded cable for the correct splicing procedure).

SPLICING COPPER WIRE USING SPLICE CLIPS

Splice clips are included in the J 38125-A Terminal Repair Kit. The splice clip is a general purpose wire repair device. It may not be acceptable for applications having special requirements such as moisture sealing. Refer to the appropriate Service Manual section to determine if there are any special requirements.

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). If the harness has a black plastic conduit, simply pull out the desired wire.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of the wire later if you decide to cut more wire off to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm (1.5 in.) away from other splices, harness branches or connectors.

Step 3: Strip the Insulation

When replacing a wire, use a wire of the same size as the original wire or larger. The schematics list wire size in metric units. The following table (Figure 6) shows the commercial (AWG) wire sizes that can be used to replace each metric wire size. Each AWG size is either equal to or larger than the equivalent metric size.

To find the correct wire size either find the wire on the schematic page and convert the metric size to the AWG size, or use an AWG wire gage.

If you aren't sure of the wire size, start with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Be careful to avoid nicking or cutting any of the wires.

METRIC WIRE SIZES (mm^2)	AWG SIZES
0.22	24
0.35	22
0.5	20
0.8	18
1.0	16
2.0	14
3.0	12
5.0	10
8.0	8
13.0	6
19.0	4
32.0	2

Figure 6 - Wire Size Conversion Table

Step 4: Crimp the Wires

Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, follow the directions included in the J 38125-A Terminal Repair Kit. Select the correct anvil on the crimper. (On most crimpers your choice is limited to either a small or large anvil.) Overlap the stripped wire ends and hold them between your thumb and forefinger as shown in Figure 7. Then, center the splice clip under the stripped wires and hold it in place.

- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the former touches the wings of the clip.
- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes (see Figure 8).
- Before crimping the ends of the clip, be sure that:
  - — The wires extend beyond the clip in each direction.
  - — No strands of wire are cut loose.
  - — No insulation is caught under the clip.

Crimp the splice again, once on each end. Do not let the crimping tool extend beyond the edge of the clip or you may damage or nick the wires (see Figure 9).

Step 5: Solder

Apply 60/40 rosin core solder to the opening in the back of the clip (see Figure 10). Follow the manufacturer's instruction for the solder equipment you are using.

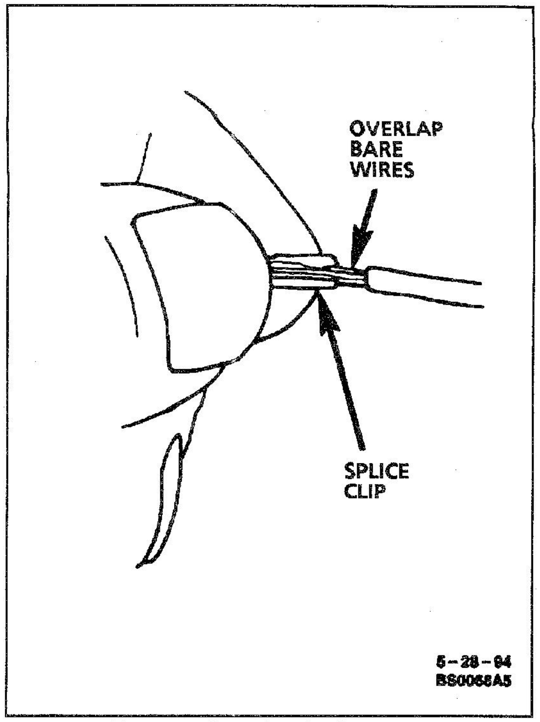

Figure 7 - Centering the Splice Clip

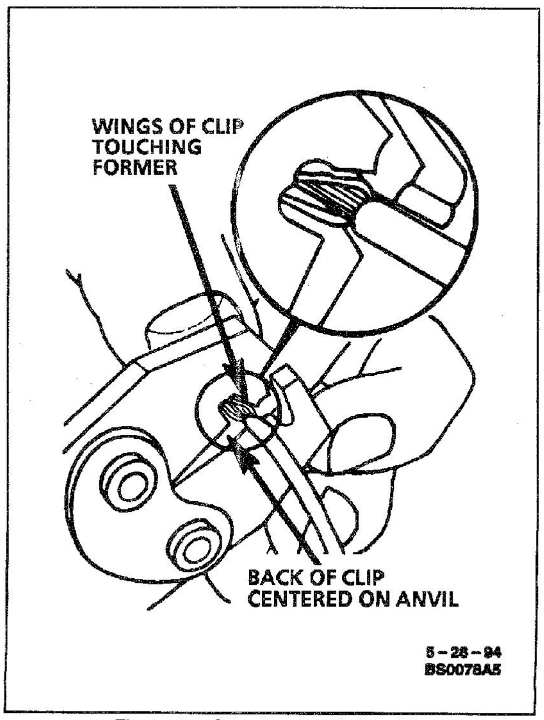

Figure 8 - Crimping the Splice Clip

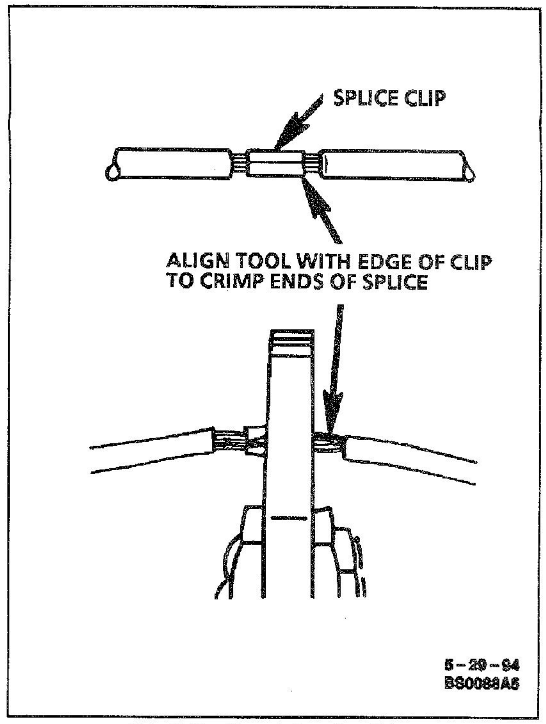

Figure 9 - Completing the Crimp

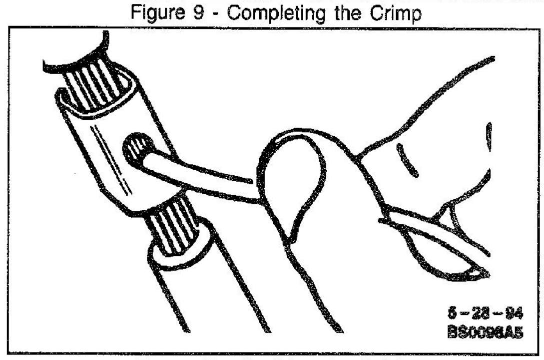

Figure 10 - Applying the Solder

Step 6: Tape the Splice

Center and roll the splicing tape. The tape should cover the entire splice. Roll on enough tape to duplicate the thickness of the insulation on the existing wires. Do not flag the tape. Flagged tape may not provide enough insulation, and the flagged ends will tangle with the other wires in the harness (see Figure 11).

If the wire does not belong in a conduit or other harness covering, tape the wire again. Use a winding motion to cover the first piece of tape (Figure 12).

REPAIR PROCEDURES

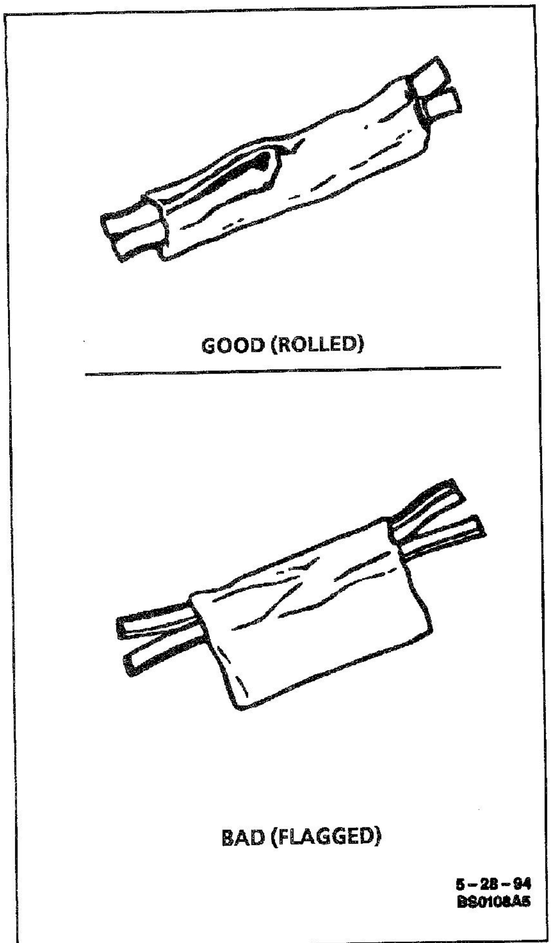

Figure 11 - Proper First Taping

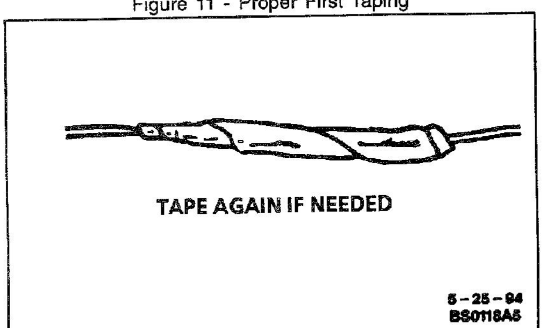

Figure 12 - Proper Second Taping

SPLICING COPPER WIRE USING CRIMP AND SEAL SPLICE SLEEVES

Crimp and seal splice sleeves may be used on all types of insulation except Tefzel and coaxial to form a one-to-one splice. They are to be used where there are special requirements such as moisture sealing. Refer to the appropriate section of the Service Manual to determine if the crimp and seal is necessary. Crimp and seal splice sleeves are included in the J 38125-A Terminal Repair Kit.

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). The crimp and seal splice sleeves may be used on all types of insulation except Tefzel and coaxial and may only be used to form a one-to-one splice.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of wire later if you decide to cut more wire to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm (1.5 in.) away from other splices, harness branches or connectors. This will help prevent moisture from bridging adjacent splices and causing damage.

Step 3: Strip the Insulation

If it is necessary to add a length of wire to the existing harness, be certain to use the same size as the original wire (refer to Figure 6, "Wire Size Conversion Table").

To find the correct wire size either find the wire on the schematic and convert the metric size to the equivalent AWG size or use an AWG wire gage. If unsure about the wire size, begin with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Strip approximately 7.5 mm (5/16 in.) of insulation from each wire to be spliced. Be careful to avoid nicking or cutting any of the wires. Check the stripped wire for nicks or cut strands. If the wire is damaged, repeat this procedure after removing the damaged section.

Step 4: Select and Position the Splice Sleeve

Select the proper splice sleeve according to wire size. The splice sleeves and tool nests are color coded (see following chart).

CRIMP AND SEAL SPLICE SLEEVE CHART

Color splice sleeve	Crimp tool nest color	Wire gage AWG/(metric)
Salmon (yellowish-pink)	Red	20, 18/(0.5, 0.8)
Blue	Blue	16,14/(1.0, 2.0)
Yellow	Yellow	12, 10/(3.0,5.0)

Using the J 38125-8 splice crimp tool (Figure 13), position the splice sleeve in the proper color nest of the hand crimp tool. Place the splice sleeve in the nest so that the crimp falls midway between the end of the barrel and the stop.

The sleeve has a stop in the middle of the barrel to prevent the wire from going further (see Figure 14). Close the hand crimper handles slightly to hold the splice sleeve firmly in the proper nest.

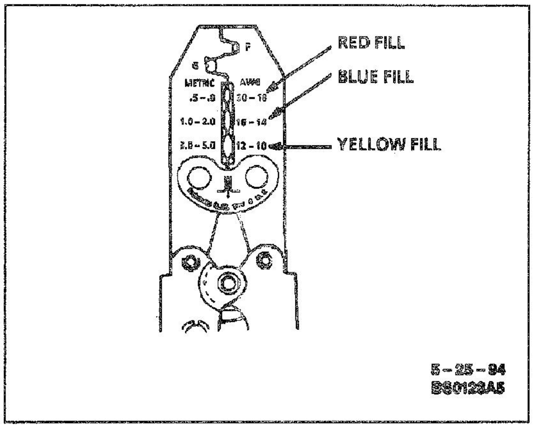

Figure 13 - Hand Crimp Tool

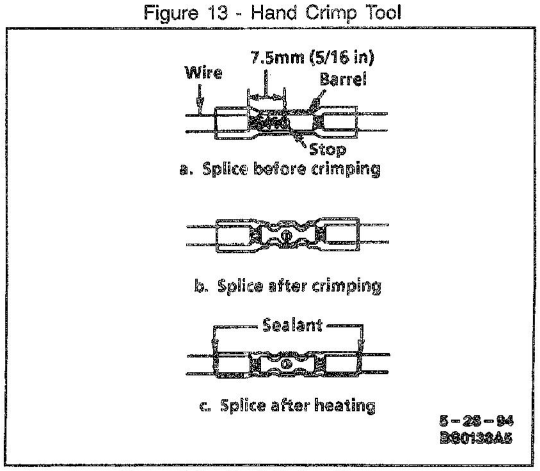

Figure 14 - Seal Splice Sequence

Step 5: Insert Wires Into Splice Sleeve and Crimp

Insert the wire into the splice sleeve until it hits the barrel stop and close the handles of the J 38125-8 crimper tightly until the crimper handles open when released. The crimper handles will not open until the proper amount of pressure is applied to the splice sleeve. Repeat steps 4 and 5 for opposite end of the splice.

Step 6: Shrink the Insulation Around the Splice

Using the Ultratorch J 38125-5 (follow instructions that accompany Ultratorch), apply heat where the barrel is crimped. Gradually move the heat barrel to the open end of the tubing, shrinking the tubing 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 shrinking is achieved (Figure 14).

SPLICING TWISTED/SHIELDED CABLE

Twisted/shielded cable is sometimes used to protect wiring from electrical noise (stray signals). For example, two-conductor cable of this construction is used between the ECM and the distributor. See Figure 15 for a breakdown of twisted/shielded cable construction.

Step 1: Remove Outer Jacket

Remove the outer jacket and discard it. Be careful to avoid cutting into the drain wire or the mylar tape.

Step 2: Unwrap the Tape

Unwrap the aluminum/mylar tape, but do not remove it. The tape will be used to rewrap the twisted conductors after the splices have been made.

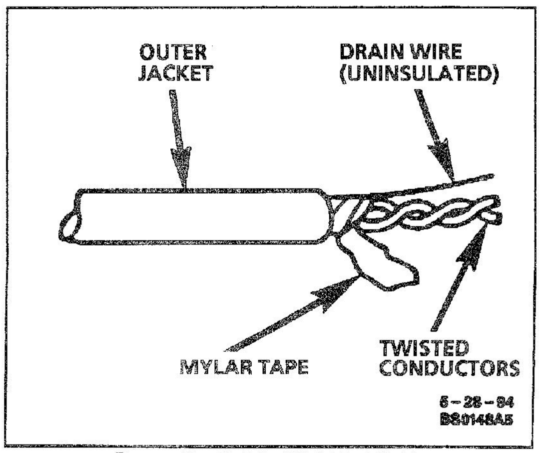

Figure 15 - Twisted/Shielded Cable

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Step 3: Prepare the Splice

Untwist the conductors. Then, prepare the splice by following the splicing instructions for copper wire presented earlier. Remember to stagger splices to avoid shorts (Figure 16).

Step 4: Re-assemble the Cable

After you have spliced and taped each wire, rewrap the conductors with the mylar tape. Be careful to avoid wrapping the drain wire in the tape.

Next, splice the drain wire following the splicing instructions for copper wire. Then, wrap the drain wire around the conductors and mylar tape (Figure 17).

Step 5: Tape the Cable

Tape over the entire cable using a winding motion (see Figure 18). This tape will replace the section of the jacket you removed to make the repair.

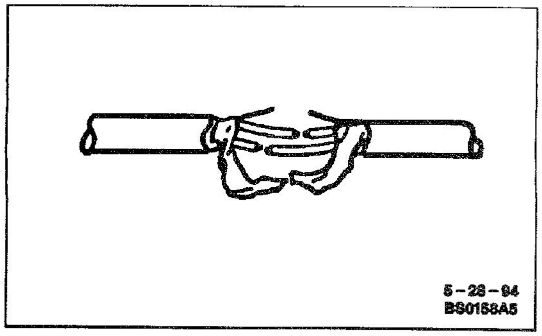


Figure 16 - The Untwisted Conductors

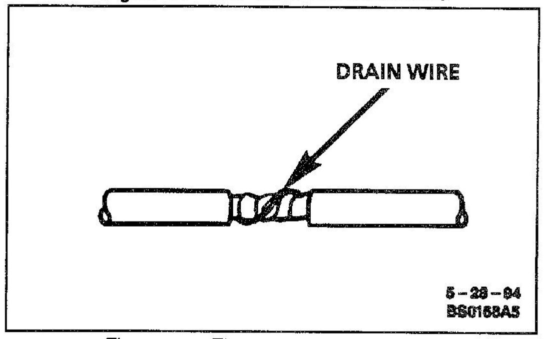


Figure 17 - The Re-assembled Cable

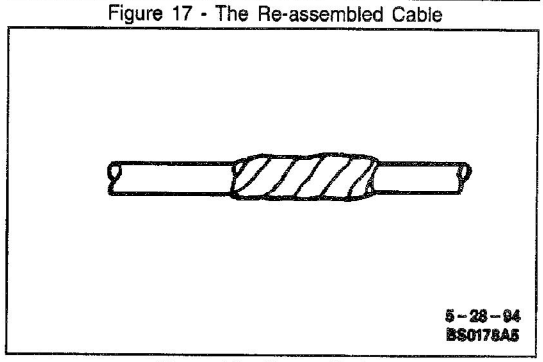


Figure 18 - Proper Taping

REPAIRING CONNECTORS

- The following general repair procedures can be used to repair most types of connectors. The repair procedures are divided into three general groups: Push-to-Seat and Pull-to-Seat and Weather Pack®.
- See "Harness Connector Faces," page 8A-202-0, to determine which type of connector is to be serviced.
- Use the proper Pick(s) or Tool(s) that apply to the terminal.
- The Terminal Repair Kit (J 38125-A) contains further information.

PUSH-TO-SEAT AND PULL-TO-SEAT CONNECTOR REPAIR

Follow the steps below to repair Push-to-Seat (Figure 19) or Pull-to-Seat (Figure 20) connectors. The steps are illustrated with typical connectors. Your connector may differ, but the repair steps are similar. Some connectors do not require all the steps shown. Skip those that don't apply.

Step 1:

Remove any CPA (Connector Position Assurance) Locks. CPAs are designed to retain connectors when mated.

Step 2:

Remove any TPA (Terminal Position Assurance) Locks. TPAs are designed to keep the terminal from backing out of the connector.

NOTICE: The TPA must be removed prior to terminal removal and must be replaced when the terminal is repaired and reseated.

Step 3:

Open any secondary locks. A secondary lock aids in terminal retention and is usually molded to the connector.

Step 4:

Separate the connector halves and back out seals.

Step 5:

Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 6:

Locate the terminal lock tang in the connector canal.

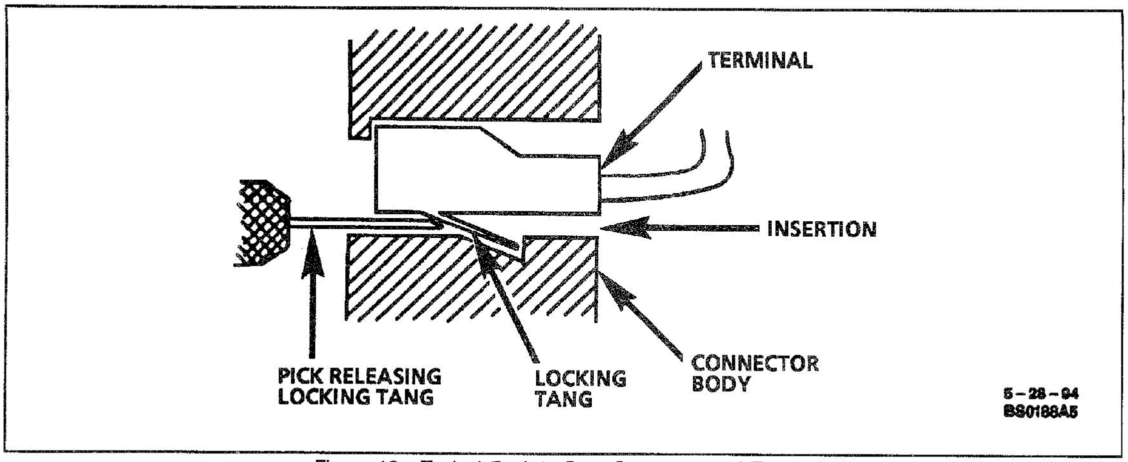


Figure 19 - Typical Push-to-Seat Connector and Terminal

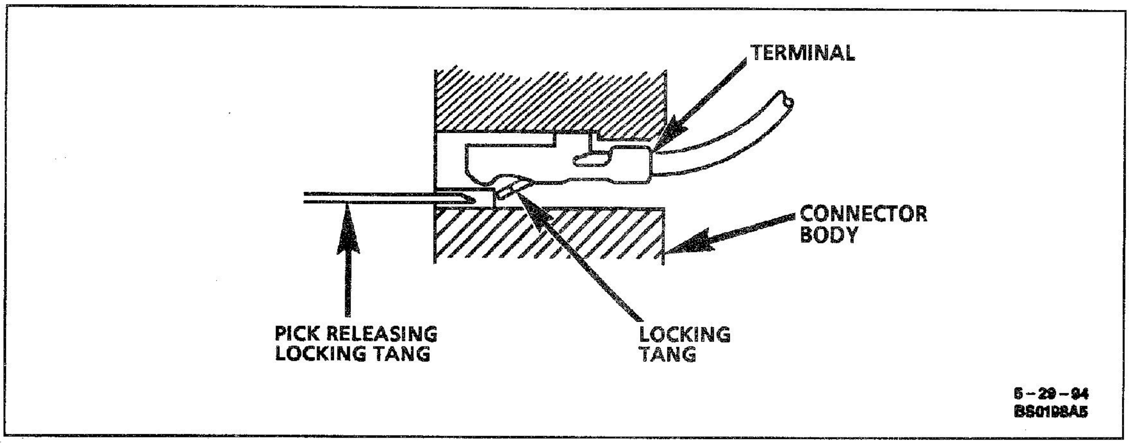


Figure 20 - Typical Pull-to-Seat Connector and Terminal

Step 7:

Insert the proper size pick (refer to Terminal Repair Kit J 38125-A) straight into the connector canal at the mating end of the connector.

Step 8:

Depress the locking tang to unseat the terminal.

- Push-to-Seat—Gently pull on the lead to remove the terminal through the back of the connector.
- Pull-to-Seat—Gently push on the lead to remove the terminal through the front of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 9:

Inspect terminal and connector for damage. Repair as necessary (see "Terminal Repair," page 8A-5-10).

Step 10:

Reform lock tang and reseat terminal in connector body. Apply grease if connector was originally equipped with grease.

Step 11:

Install any CPAs or TPAs, close any secondary locks and join connector halves.

WEATHER PACK® CONNECTOR REPAIR

Follow the steps below to repair Weather Pack® connectors (Figure 21).

Step 1:

Separate the connector halves.

Step 2:

Open secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector.

REPAIR PROCEDURES

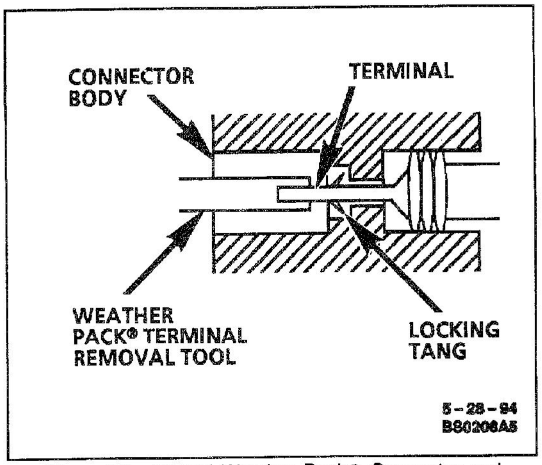


Figure 21 - Typical Weather Pack® Connector and Terminal

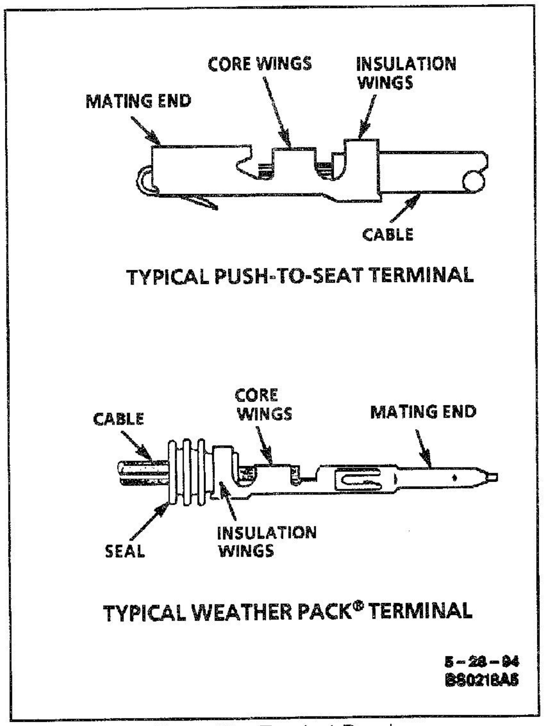


Figure 22 - Terminal Repair

Step 3:

Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 4:

Insert the Weather Pack® terminal removal tool into the front (mating end) of the connector cavity until it rests on the cavity shoulder.

Step 5:

Gently pull on the lead to remove the terminal through the back of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 6:

Inspect the terminal and connector for damage. Repair as necessary (see "Terminal Repair," on this page).

Step 7:

Re-form the lock tang and reseat terminal in connector body.

Step 8:

Close secondary locks and join connector halves.

TERMINAL REPAIR

The following repair procedures can be used to repair Push-to-Seat, Pull-to-Seat or Weather Pack® terminals (Figure 22). Some terminals do not require all steps shown. Skip those that don't apply. The Terminal Repair Kit (J 38125-A) contains further information.

Step 1:

Cut off terminal between core and insulation crimp (minimize wire loss) and remove seal for Weather Pack® terminals.

Step 2:

Apply correct seal per gauge size of wire and slide back along wire to enable insulation removal (Weather Pack® terminals only).

Step 3:

Remove insulation.

Step 4:

Align seal with end of cable insulation (Weather Pack® terminals only).

Step 5:

Position strip (and seal for Weather Pack®) in terminal.

Step 6:

Hand crimp core wings.

Step 7:

Hand crimp insulation wings (non-Weather Pack®). Hand crimp insulation wings around seal and cable (Weather Pack®).

Step 8:

Solder all hand crimped terminals.

DIODE REPLACEMENT

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:

Step 1: Open the Harness

If the diode is taped to the harness, remove all of the tape.

Step 2: Remove Inoperative Diode

Paying attention to current flow direction, remove inoperative diode from the harness with a suitable soldering tool. If the diode is located next to a connector terminal, remove the terminal(s) from the connector to prevent damage from the soldering tool.

Step 3: Strip the Insulation

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.

Step 4: Install 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. Reference Figure 23 for replacement diode symbols and current flow explanations. Attach the new diode to the wire(s) using 60/40 rosin core solder. Use a heat sink (aluminum alligator clip) attached across the diode wire ends to protect the diode from excess heat. Follow the manufacturer's instructions for the soldering equipment you are using.

Step 5: Install Terminal(s)

Install terminal(s) into the connector body if previously removed in Step 2.

Step 6: Tape Diode to Harness

Tape the diode to the harness or connector using electrical tape. To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points.

ACCEPTABLE DIODE REPLACEMENTS

Diode Brand	Rating Number	Rating	P/N
GMSPO	1N4004	1 amp, 400 PIV	12112421
GMSPO	1N5404	3 amp, 400 PIV	12112422
GMSPO	1N4001	1 amp, 50 PIV	16020519
GMSPO	1N4005	1 amp, 600 PIV	16011840
GMSPO	1N4004	1 amp, 400 PIV	16039386

In the event 1 amp, 50 PIV (Peak Inverse Rating) diodes are unavailable, a universal diode with a 1 amp, 400 PIV rating can be used for the following applications:

- A/C Compressor Clutch
- ABS/4WAL (the ABS Diode on the Delco Moraine is hidden inside of an electrical connector under the carpet at the right panel)

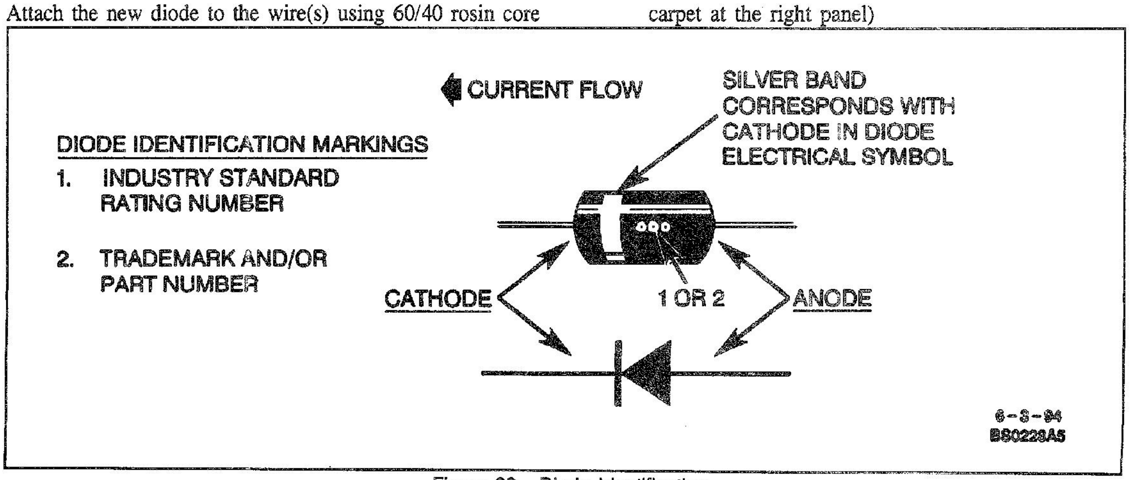


Figure 23 - Diode Identification

REPAIR PROCEDURES

- Wiper
- Charging System (hidden in wire harness)
- Parking Brake (vehicle with ABS)
- Relays
- Solenoids
- Diesel Glow Plug Circuit

HEATED OXYGEN SENSOR (HO2S) REPAIR

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 provided to it 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 degraded 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 or 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 wired 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.

The Engine Harness may be repaired using Packard's Crimp and Splice Seals Terminal Repair Kit J 38125-A. Under no circumstances should repairs be soldered since this could result in the air reference being obstructed.

OBDII CIRCUIT REPAIRS

Repairs for On-Board Diagnostics II (OBDII) emission control circuits follow the procedures stated in SECTION 8A-5. When servicing OBDII circuits, the following guidelines are also essential:

- Do not move or alter grounds from their manufactured locations.
- Do not tie aftermarket accessories into OBDII circuits.
- Only repair OBDII circuits in accordance with the manufactured configuration.
- Always replace a relay in an OBDII circuit the same replacement part. Damaged relays should be discarded, not repaired.
- Refer to SECTION 8A-11 to identify OBDII circuit fusing.
- Make sure that CPA (connector position assurance) locks and TPA (terminal position assurance) locks are reinstalled on connectors that use them.
- After repair of connectors or connector terminals, make sure to achieve proper terminal retention. Refer to REPAIRING CONNECTORS on page 8A-5-8 for procedures.
- Before repairing OBDII heated oxygen sensors and related wiring, always review the special repair guidelines provided on page 8A-5-12 under HEATED OXYGEN SENSOR REPAIR.
- When installing an electrical ground fastener, be sure to apply the specified torque. Ground torque specifications are listed in SECTION 8A-14.
- After repair of connectors, make sure to reinstall connector seals, where used. Inspect seals for wear and damage. Replace worn or damaged seals.

GMSPO SERVICE PARTS

GMSPO STANDARD PARTS CATALOG

Check the GMSPO Standard Parts Catalog, Group 8.965. Fuses, circuit breakers, connectors, terminals, conduit, pigtail kits, and seals are listed in that group.

GMSPO CARLINE PARTS CATALOG

The GMSPO Carline Parts Catalog, Group 2.535 contains connector repair kits with terminals and leads.

COMPLETE HARNESS

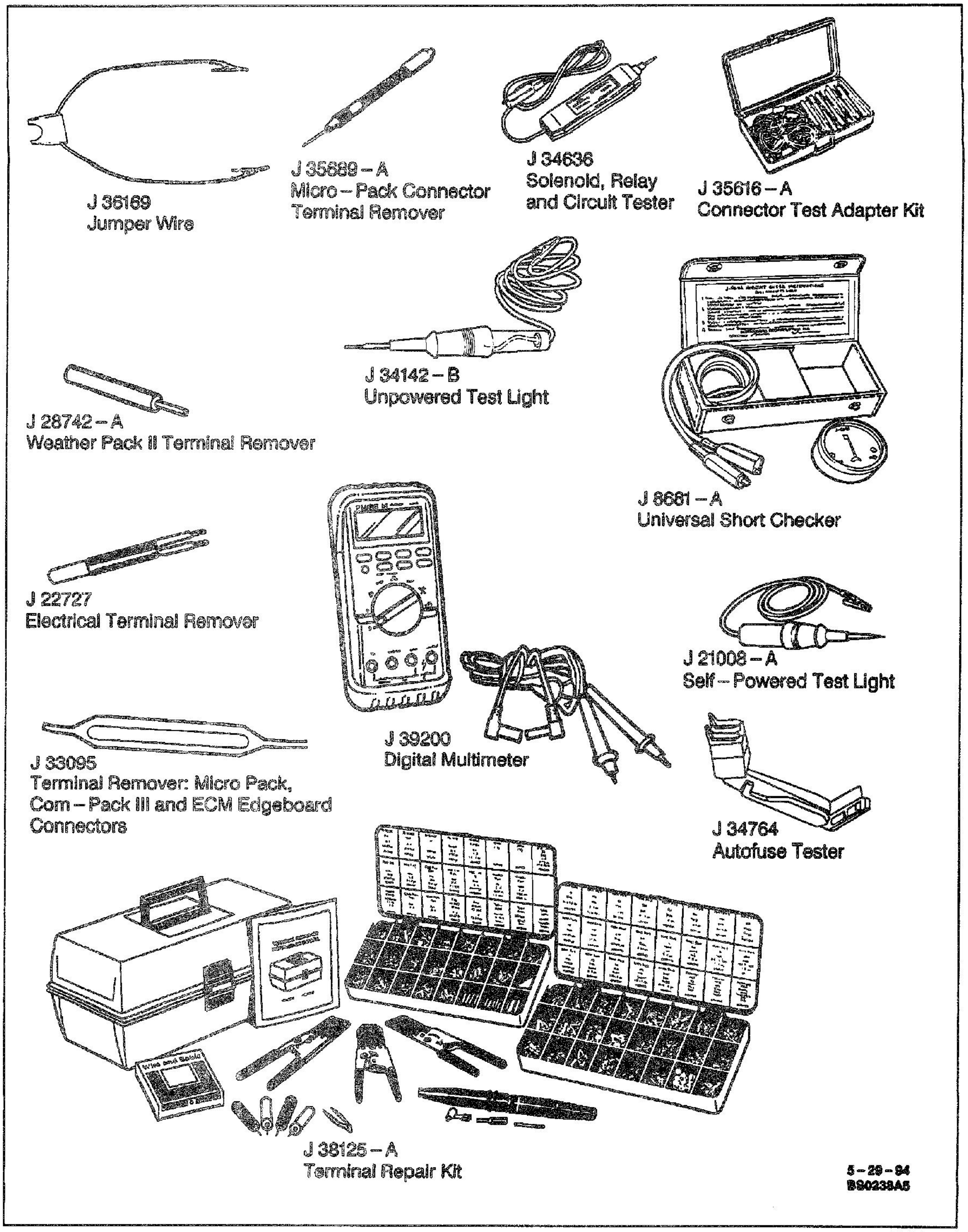
In many cases repairs can be made by ordering pigtail assemblies (prewired connectors) rather than the entire wiring harness. Only order complete harnesses when there is major damage to the wiring harness. Always repair minor damage. Complete harnesses and pigtail part numbers can be found in the GMSPO Carline Parts Catalog.

ORDERING SERVICE PARTS

1. If you can't find the repair parts you need in the J 38125-A Terminal Repair Kit, GMSPO Standard Parts Catalog, or the GMSPO Carline Parts Catalog, refer to SECTION 8A-202 (Harness Connector Faces) to find a listing of the OE part number(s).

2. Call PARTECH (1-800-433-6961) and give the PARTECH advisor the OE part number(s). The PARTECH advisor can determine if there is a GMSPO part number(s) for the OE part number(s).
3. If PARTECH cannot find a GMSPO part number, call the Service Parts Assistance Center (SPAC) with the OE part number(s). The SPAC advisor will assist you in placing a priority order using the "No Part Number" process with the Packard Electric Division. The SPAC advisor may have you place the order with the Packard Electric Division (1-800-PACKARD). Parts are typically shipped within 24 hours direct to your dealership.

REPAIR PROCEDURES



Special Tools

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