Section 12 Electrical System

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GENERAL

The HUMMER is equipped with an electrical system that meets the rigorous demands of the vehicle and its systems.

Initial power for starting the vehicle is provided by a pair of maintenance-free storage batteries.

The starter motor is a marine-grade sealed unit to allow for the HUMMER's water fording capabilities.

Electricity to recharge the batteries and operate the vehicle while running is provided by a Delco-Remy, internally-regulated alternator. This unit is driven by a self-tensioning serpentine belt for improved reliability and service.

Both the starter and alternator are serviceable with instructions included in this section.

The HUMMER is equipped with a weather-resistant electrical system. The harness uses a positive seal on all exterior connectors to resist water intrusion when operating in wet conditions.

NOTE: Ensure all connections below the standard thirty inch fording depth are watertight when repairing or replacing electrical connections or components.

NOTE: Due to the vehicle's capabilities, do not pierce wire insulation when checking circuitry. Back probe connectors, or disconnect and insert jumper wires, into the harness.

INSTALLATION OF AFTERMARKET ELECTRICAL ACCESSORIES

Three spare fuse circuits (Figure 12-1) are available for the installation of aftermarket electrical accessories. There is one each for battery power, ignition accessory power, and lights power. Each is terminated with a connector and can be found behind the instrument panel near the fuse box.

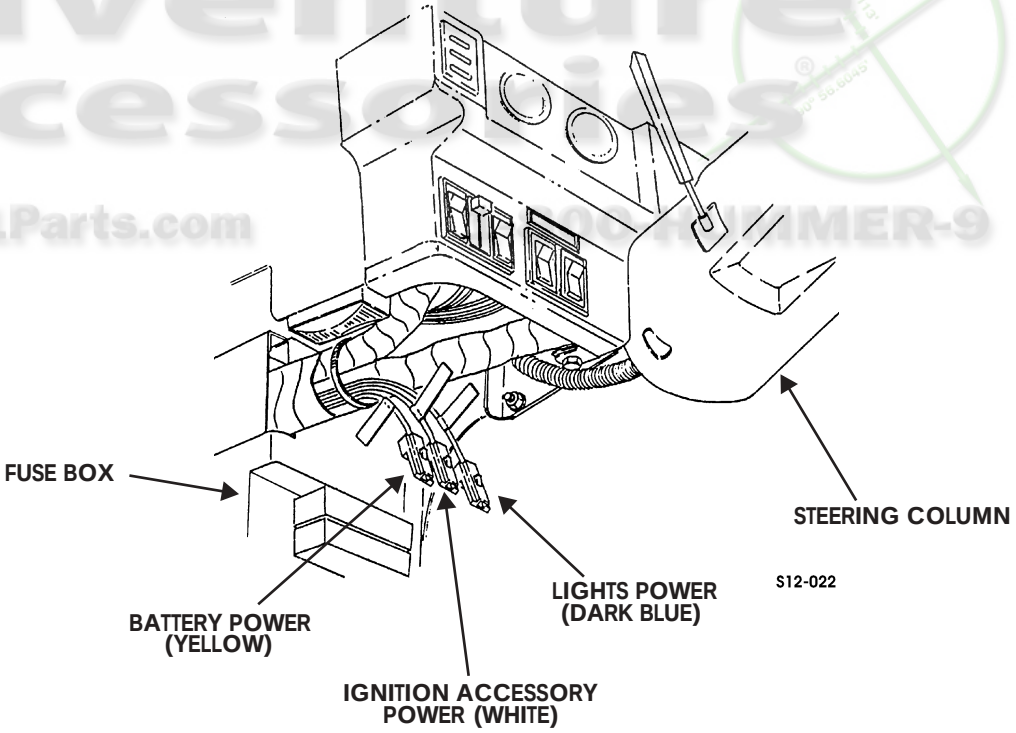

Figure 12-1: Spare Fuse Circuits

There is a permanent tag on each circuit, indicating the type of power available and the maximum usable amperage. These spare circuits provide electrical hookup of accessories such as a car phone or a CB radio.

POWER DOOR LOCKS SWITCH REPLACEMENT

NOTE: Power door lock switch replacement for all doors is similar.

Removal

1. Remove four capscrews, mounting plate, and switch from switch bezel.
2. Disconnect door harness from switch (Figure 12-2).
3. Separate switch from mounting plate.

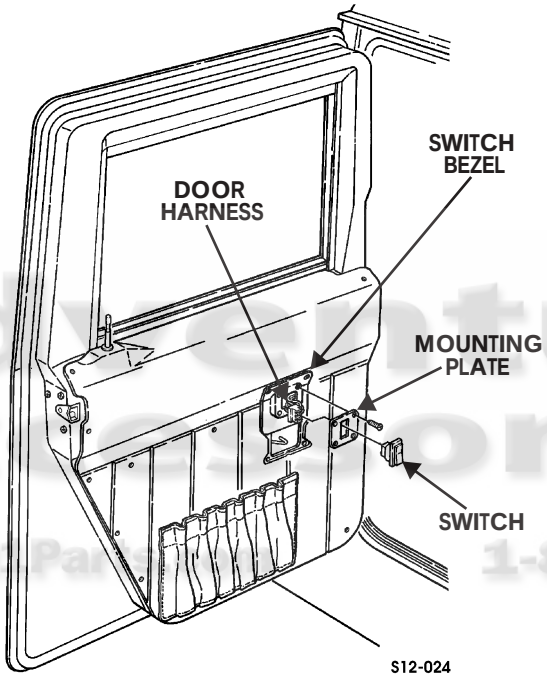

Figure 12-2: Power Door Locks

Installation

1. Assemble switch and mounting plate.
2. Connect switch and door harness.
3. Install switch and mounting plate on switch bezel with four capscrews.

POWER DOOR LOCKS ACTUATOR REPLACEMENT

Removal

NOTE: Actuator replacement for all doors is similar, with exceptions noted.

1. Raise window as far as possible.
2. Remove door trim.
3. Remove vapor barrier (Figure 12-3).

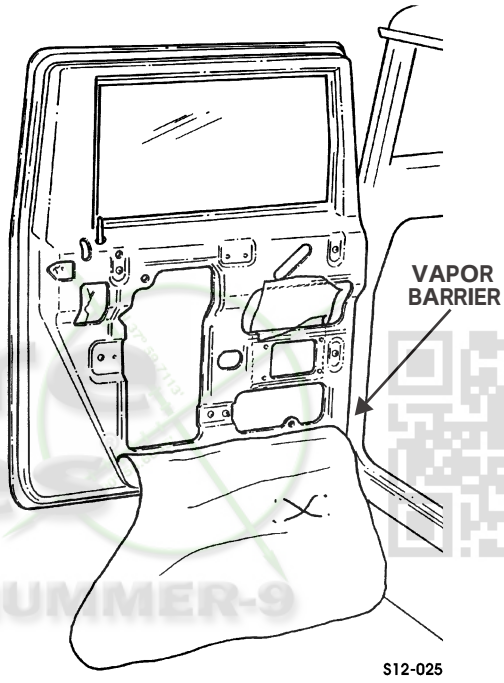

Figure 12-3: Vapor Barrier

4. Disconnect actuator power lead from door actuator (Figure 12-4).

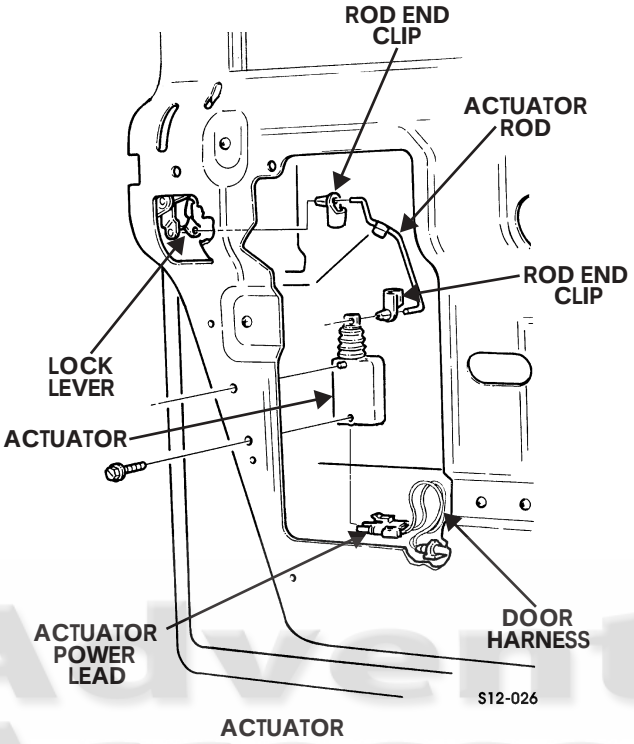

Figure 12-4: Door Lock Actuator

5. Remove capscrew from door and actuator.
6. Remove actuator from door and disconnect actuator rod from rod end clip and actuator.
7. Remove rod end clip from actuator.
8. Remove rod end clip and actuator rod from lock lever.

Installation

NOTE: Color coding on actuator rod is positioned away from actuator during installation. Actuator rods are color coded as follows: left front, red; right front, green; left rear, yellow; and right rear, blue.

1. Install end clip and actuator rod on lock lever (Figure 12-4).
2. Install end clip on actuator, position in door with pin in top mount hole, and connect actuator rod.

CAUTION: *Actuator threads could strip if care is not used when installing mounting capscrew.*

3. Secure actuator in door with capscrew in bottom mount hole.
4. Connect actuator power lead to door actuator.
5. Install vapor barrier (Figure 12-3).
6. Install door trim.

BATTERY CABLE MAINTENANCE

WARNING: ***Batteries emit explosive hydrogen gas. Keep flames or sparks away from batteries. Battery acid is extremely harmful. If acid contacts eyes or skin, flush affected area(s) liberally with clear water and seek medical help immediately. If acid contacts clothing, remove and discard affected clothing. Always disconnect ground cable, and remove all jewelry before working on batteries.***

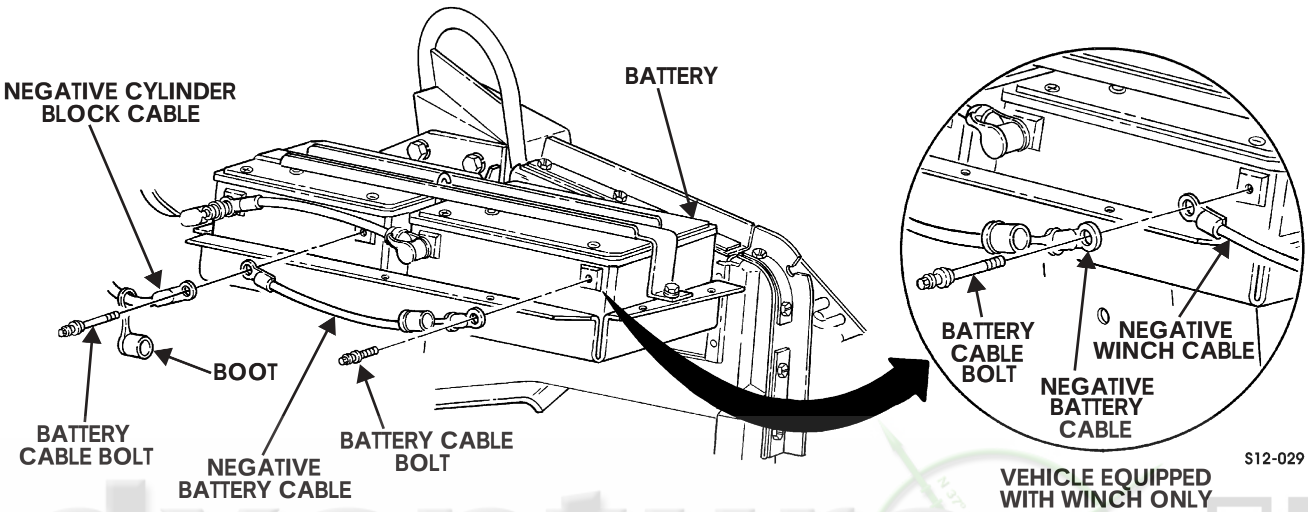

Figure 12-5: Negative Battery Cable

NOTE: Prior to removal, tag all wires and harnesses for installation.

NOTE: Remove tie straps as necessary.

Removal – Negative Battery Cables

1. Remove boots from negative battery cable and negative cylinder block cable bolts (Figure 12-5).
2. Remove battery cable bolt and negative cylinder block cable from battery.
3. Remove battery cable bolt, negative battery cable, and negative winch cable, if equipped, from battery.
4. Remove nut, lockwasher, clamp, and stud securing engine wiring harness and negative cylinder block cable to cylinder block. Discard lockwasher (Figure 12-6).

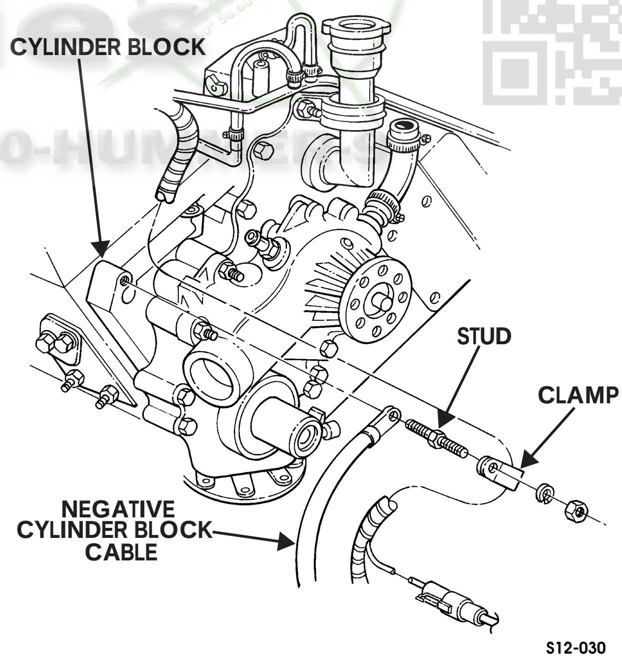

Figure 12-6: Negative Cylinder Block Cable

Cleaning and Inspection

NOTE: Clean all components, examine for wear or damage, and replace if necessary.

1. Clean acid from cables and battery cable studs with wire brush and sodium bicarbonate solution.
2. Inspect anti-chafe wrap on cables. If damaged, replace.
3. Inspect cables for corrosion and insulation cracks. If damaged, replace.

Removal – Positive Battery Cables

1. Disconnect negative battery cables from battery.
2. Remove boots from positive battery cable and positive starter bolts (Figure 12-7).
3. Remove battery cable bolt and positive starter cable from battery.
4. Remove battery cable bolt, positive battery cable, and positive winch cable, if equipped, from battery.
5. Remove locknut, washer, capscrew, and clamp securing positive starter cable to bracket. Discard locknut.
6. Remove nut, lockwasher, and positive starter cable from starter. Discard lockwasher.

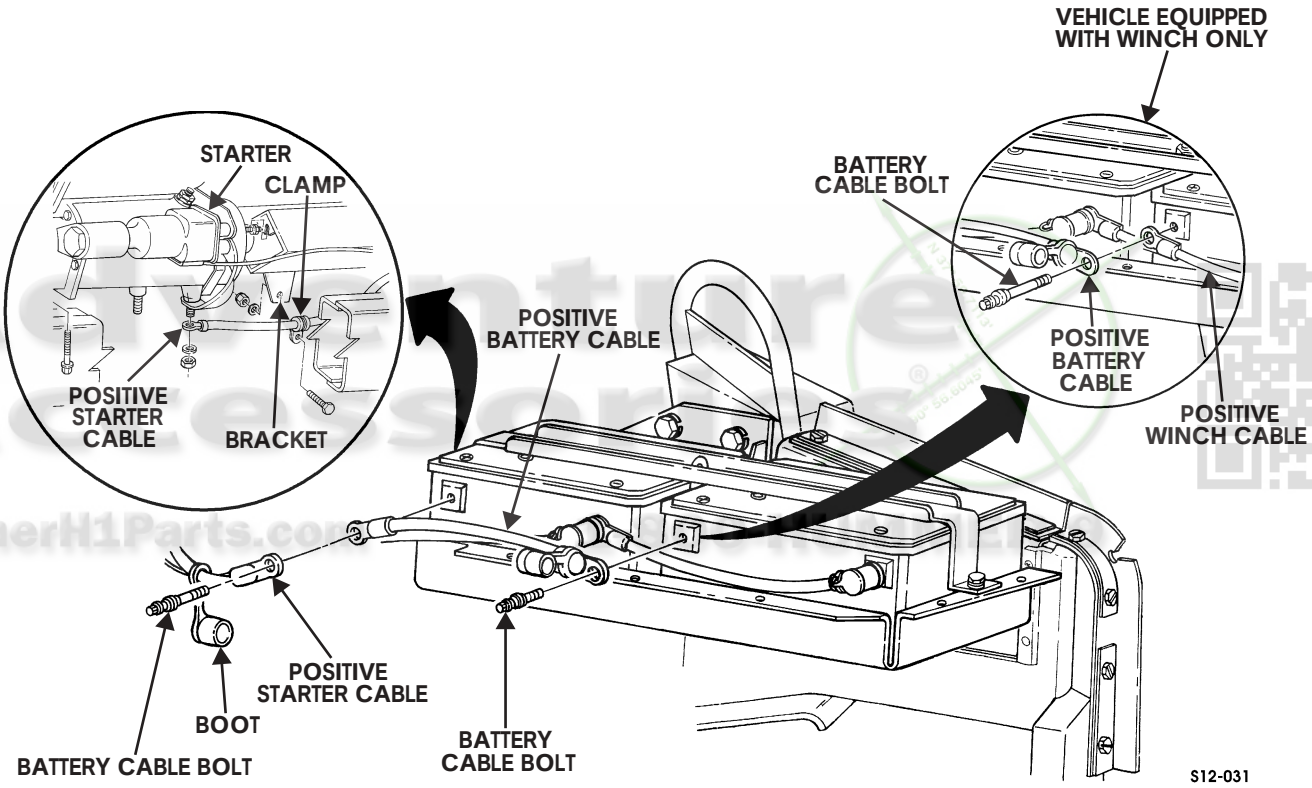

Figure 12-7: Positive Battery Cable

NOTE: Prior to removal, tag engine harness wire connector to aid in installation.

7. Disconnect positive battery wire from engine wiring harness and remove positive battery wire and positive starter cable (Figure 12-8).

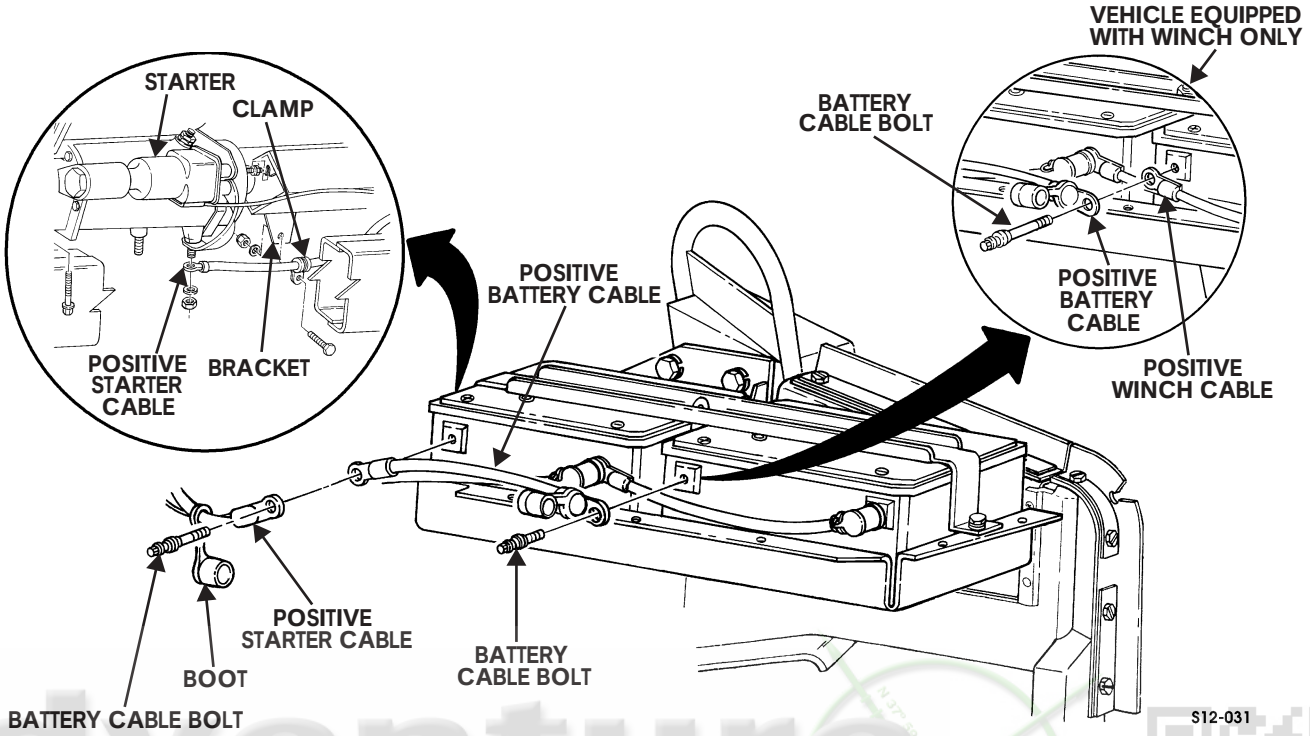

Figure 12-8: Battery Cables

Installation – Positive Battery Cables

NOTE: Install tie straps as necessary.

1. Install positive starter cable on starter with lockwasher and nut. Tighten nut to 12-16 lb-ft (16-22 N•m) (Figure 12-8).
2. Secure positive starter cable to bracket with clamp, capscrew, washer, and locknut.
3. Connect positive battery wire to engine wiring harness (Figure 12-9).

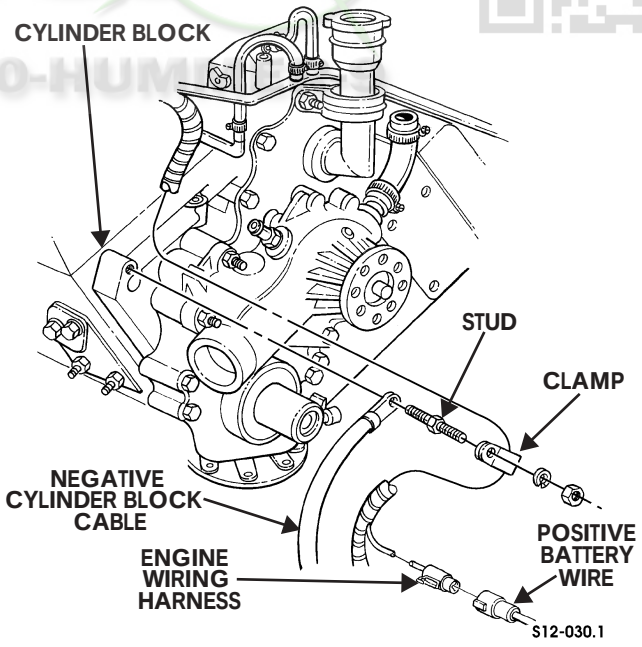

Figure 12-9: Cylinder Block

NOTE: If vehicle is equipped with a winch, proceed to step 5.

4. Using shorter battery cable bolt, secure positive battery cable to battery. Tighten battery cable bolt to 8-12 lb-ft (11-16 N•m) (Figure 12-8).
5. Using longer battery cable bolt, secure positive winch cable and positive battery cable to battery. Tighten bolt to 8-12 lb-ft (11-16 N•m).
6. Using longer battery cable bolt, secure positive starter cable and positive battery cable to battery. Tighten bolt to 8-12 lb-ft (11-16 N•m).
7. Install boots on battery cable bolts.
8. Connect negative battery cables to battery.

Installation – Negative Battery Cables

NOTE: Clean mounting area of cylinder block and cable. Remove any dirt, debris, or paint.

1. Secure negative cylinder block cable and engine wiring harness on cylinder block by installing stud, clamp, lockwasher, and nut on cylinder block (Figure 12-9).

NOTE: If vehicle is equipped with a winch, proceed to step 3.

2. Using shorter battery cable bolt, install negative battery cable on battery. Tighten battery cable bolt to 8-12 lb-ft (11-16 N•m) (Figure 12-10).
3. Using longer battery cable bolt, install negative winch cable and negative battery cable on battery. Tighten battery cable bolt to 8-12 lb-ft (11-16 N•m).
4. Using longer battery cable bolt, install negative cylinder block cable and negative battery cable on battery. Tighten battery cable bolt to 8-12 lb-ft (11-16 N•m).
5. Install boots on battery cable bolts at battery.

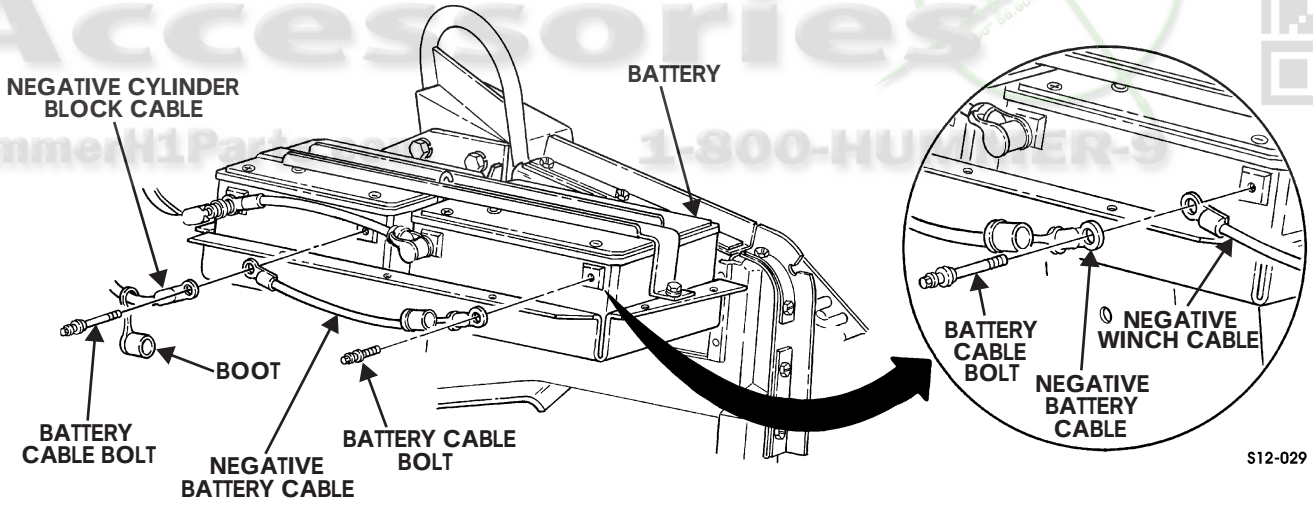

Figure 12-10: Negative Battery Cable

BATTERY AND BATTERY HOLDDOWN BRACKET MAINTENANCE

WARNING: Batteries emit explosive hydrogen gas. Keep flames or sparks away from batteries. Battery acid is extremely harmful. If acid contacts eyes or skin, flush affected area(s) liberally with clear water and seek medical help immediately. If acid contacts clothing, remove and discard affected clothing. Always disconnect ground cable, and remove all jewelry before working on batteries.

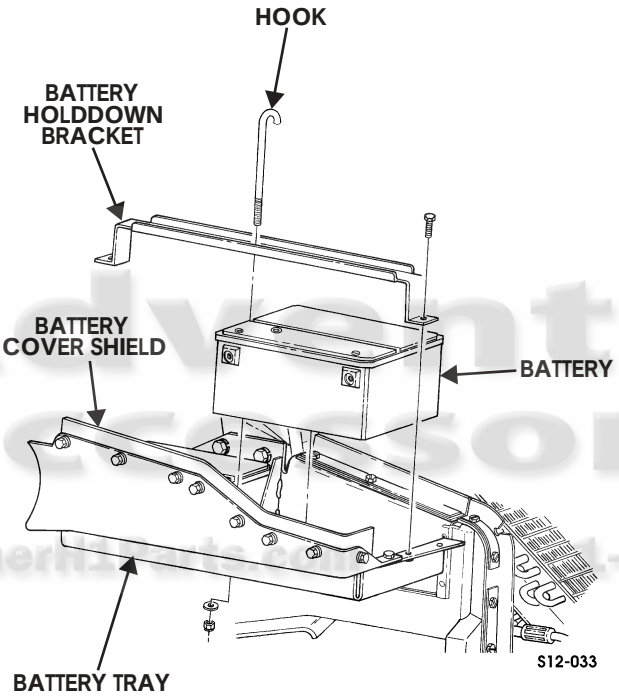

Figure 12-11: Battery Holddown Bracket

Removal

1. Remove battery cables from batteries.
2. Remove two capscrews, locknut, washer, hook, and battery holddown bracket from battery tray. Discard locknut (Figure 12-11).
3. Remove two batteries from battery tray.

Cleaning and Inspection

NOTE: Clean all components, examine for wear or damage, and replace if necessary.

NOTE: Clean acid from batteries and battery components with sodium bicarbonate solution.

Installation

1. Install two batteries in battery tray (Figure 12-11).
2. Install battery holddown bracket on batteries with hook, washer, locknut, and two capscrews.
3. Install battery cables on batteries.

BATTERY TRAY REPLACEMENT

Removal

1. Remove batteries from battery tray.
2. Remove battery tray splash shields and seals.
3. Remove two capscrews, lockwashers, and battery tray from airlift bracket. Discard lockwashers (Figure 12-12).

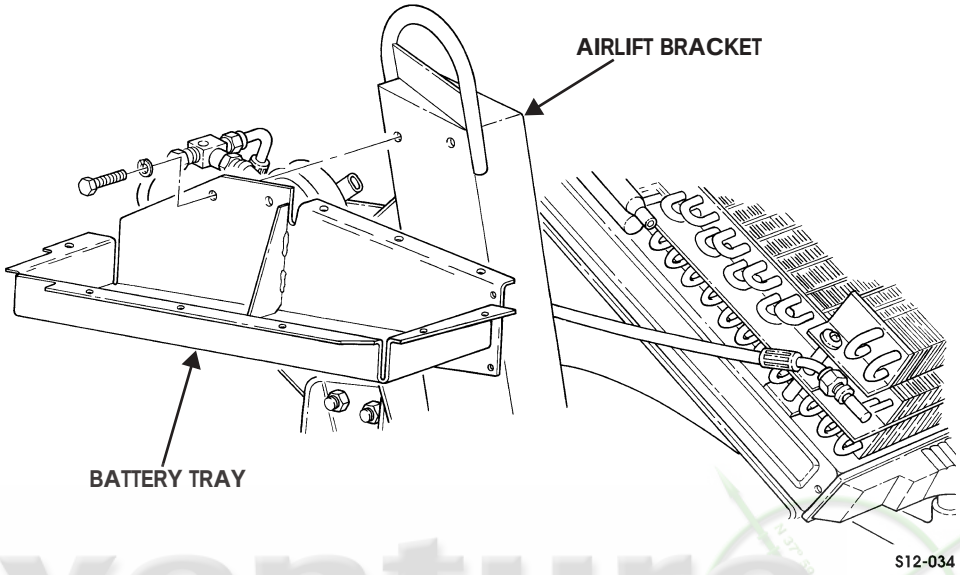

Figure 12-12: Battery Tray

Installation

1. Install battery tray on airlift bracket with two lockwashers and capscrews (Figure 12-12).
2. Install battery tray splash shields and seals.
3. Install batteries in battery tray.

BATTERY SPLASH SHIELDS AND SEALS REPLACEMENT

Removal

1. Remove battery cables.
2. Remove three locknuts, washers, capscrews, and washers from upper battery splash shield and battery seal. Discard locknuts (Figure 12-13).
3. Remove two locknuts, washers, capscrews, and retainer from upper battery splash shield and seal. Discard locknuts.
4. Remove three locknuts, washers, capscrews, retainer, and seal from upper battery splash shield. Discard locknuts.
5. Remove five locknuts, washers, capscrews, and upper battery splash shield from battery tray. Discard locknuts.
6. Remove seven locknuts, washers, capscrews, and three retainers and two seals from battery tray and lower battery splash shield. Discard locknuts (Figure 12-14).

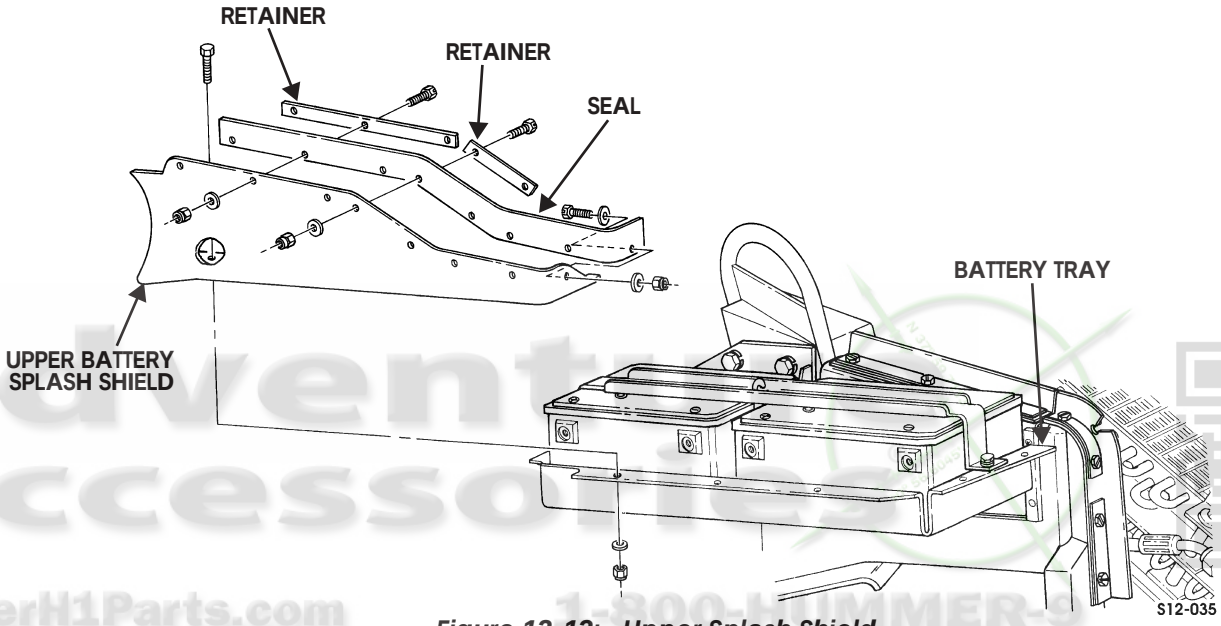

Figure 12-13: Upper Splash Shield

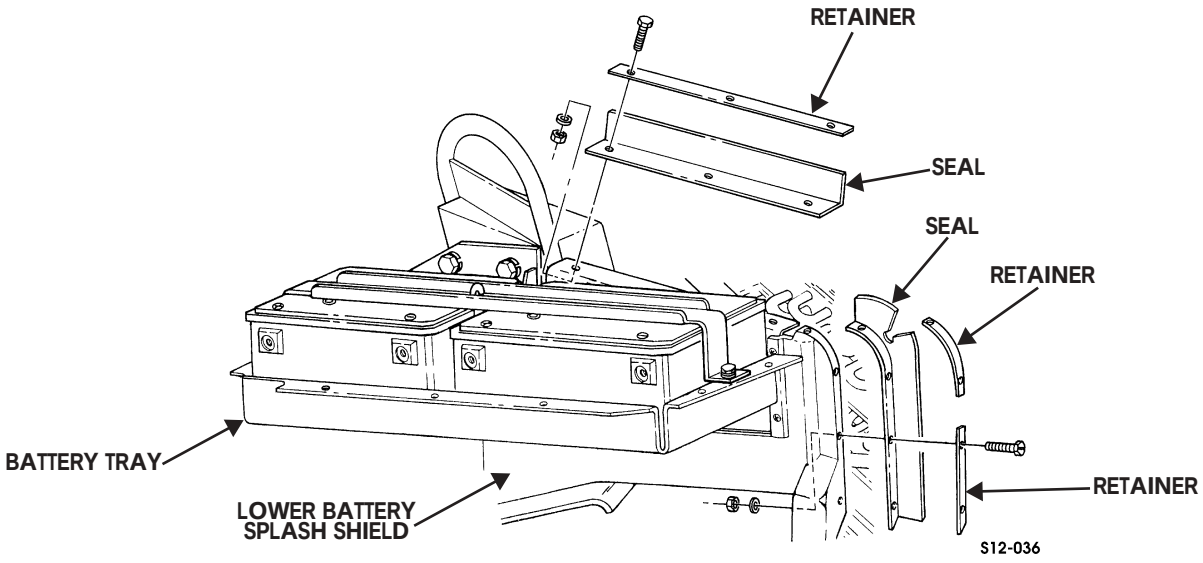

Figure 12-14: Seal End Retainer

7. Remove locknut, washer, capscrew, and washer from lower battery splash shield and frame. Discard locknut (Figure 12-15).
8. Remove locknut, washer, capscrew, and washer from lower battery splash shield and battery tray. Discard locknut.
9. Remove capscrew and two washers from lower battery splash shield and airlift bracket.
10. Remove locknut, two washers, capscrew, washer and lower battery splash shield from bracket. Discard locknut.

Installation

1. Install lower battery splash guard on bracket with washer, capscrew, two washers, and locknut (Figure 12-15).
2. Install two washers and capscrew on lower battery splash shield and airlift bracket.
3. Install washer, capscrew, washer, and locknut on lower battery splash shield and battery tray.
4. Install washer, capscrew, washer, and locknut on lower battery splash shield and frame.
5. Install two seals and three retainers on battery tray and lower battery splash shield with seven capscrews, washers, and locknuts (Figure 12-14).

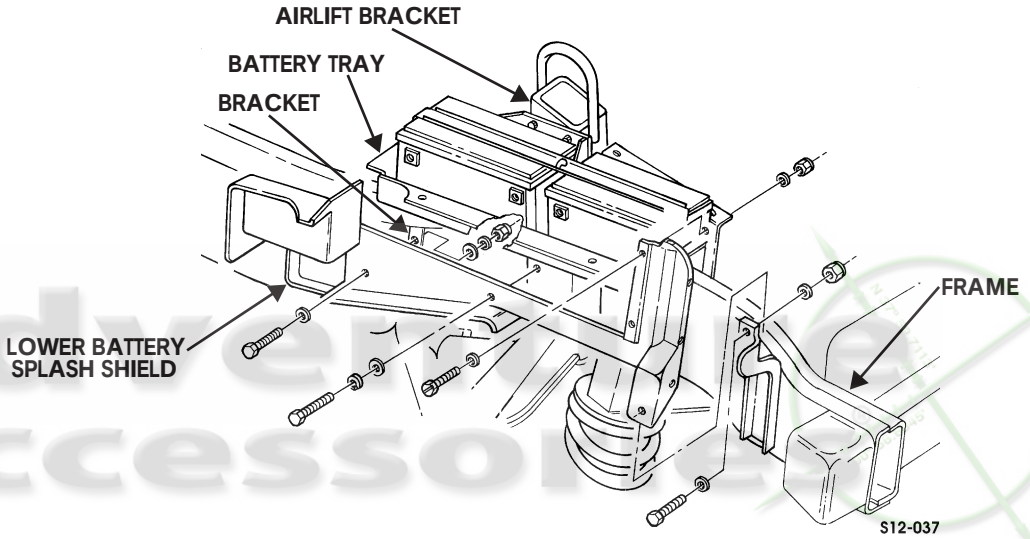

Figure 12-15: Lower Splash Shield

6. Install upper battery splash shield on battery tray with five capscrews, washers, and locknuts.
7. Install retainer and seal on upper battery splash shield with three capscrews, washers, and locknuts.
8. Install retainer on seal and upper battery splash shield with two capscrews, washers, and locknuts.
9. Install three washers, capscrews, washers, and locknuts on upper battery splash shield and battery seal.
10. Install battery cables.

STARTER REPLACEMENT

Removal

WARNING: Starter must be supported during removal and installation. Failure to do this may cause injury or damage to equipment.

NOTE: Tag leads for installation.

1. Disconnect negative battery cable.
2. Remove converter housing cover (Section 2).
3. Remove cap and/or adhesive sealant from positive terminal of starter (Figure 12-16).
4. Remove nut, lockwasher, and positive starter cable from starter positive terminal. Discard lockwasher.
5. Remove screw, clip, and solenoid lead from solenoid.
6. Remove locknut, washer, and capscrew from clamp securing positive starter cable to bracket. Discard locknut.
7. Loosen locknut and washer securing stud on front of starter and bracket on engine mount.
8. Supporting starter, remove two capscrews, starter, and shim(s) from engine. Record thickness of shim(s).

Installation

1. Position shim pack on starter (Figure 12-16).
2. Position starter, with shim pack, on flywheel housing, with solenoid facing away from engine.
3. Slide front stud of starter into bracket on engine mount, ensuring bracket is between washer and starter.
4. Install starter on engine with two capscrews. Tighten capscrews to 40 lb-ft (54 N•m).
5. Secure stud on front of starter and bracket on engine mount with washer and locknut. Tighten locknut to 24 lb-ft (33 N•m).
6. Secure positive starter cable to bracket with clamp, capscrew, washer, and locknut. Do not tighten capscrew.
7. Connect solenoid lead to solenoid with clip and screw. Tighten screw to 22 lb-in. (2 N•m).
8. Connect positive starter cable to starter positive terminal with lockwasher and nut. Tighten nut to 25-31 lb-ft (34-42 N•m).
9. Seal and/or cap positive terminal, cable, and lead ends. Cover all exposed metal if using sealant alone.
10. Tighten capscrew securing positive starter cable clamp to bracket.
11. Install upper converter housing (Section 2).
12. Install negative battery cable.

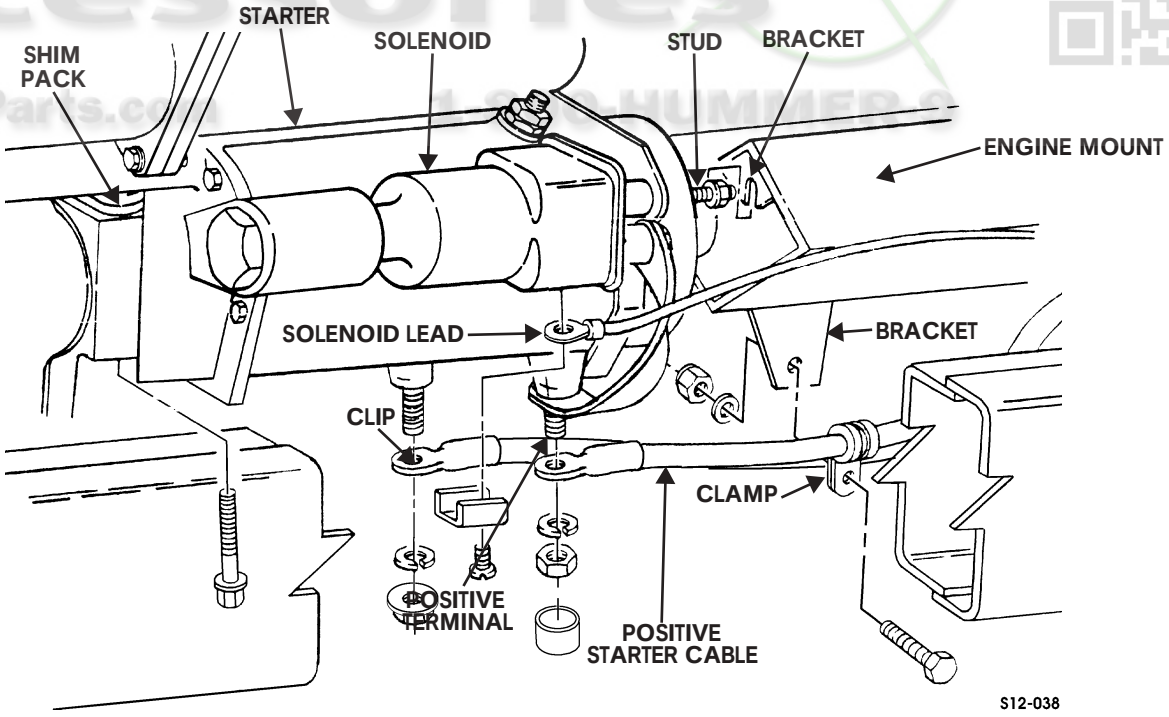

Figure 12-16: Starter

STARTER REPAIR

Disassembly

1. Remove starter.
2. Remove plug and gasket from pinion housing. Discard gasket (Figure 12-17).

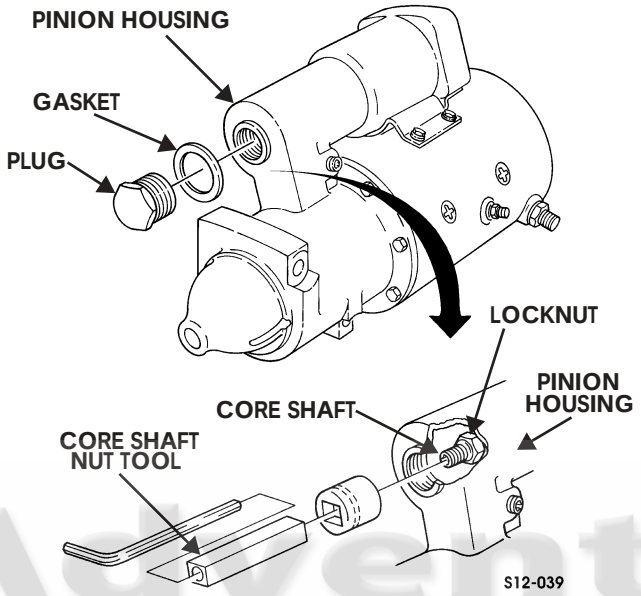

Figure 12-17: Core Shaft Nut

3. Using core shaft nut tool, remove locknut from end of core shaft inside pinion housing. Discard locknut.
4. Remove four nuts, lockwashers, and two solenoid connectors from frame assembly and solenoid. Discard lockwashers (Figure 12-18).

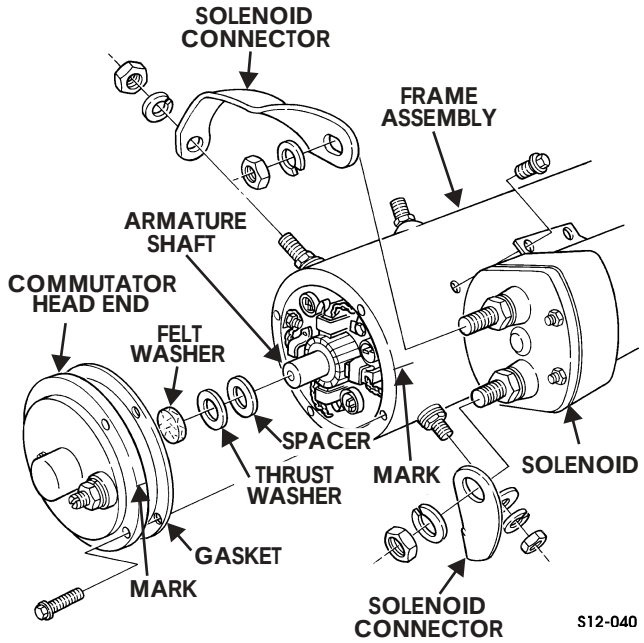

Figure 12-18: End Plate

5. Remove four capscrews and solenoid from frame assembly.
6. Scribe index marks on commutator head end and frame assembly.
7. Remove four capscrews, commutator head end, and gasket from frame assembly. Discard gasket.
8. Remove thrust washer(s) and spacer from armature shaft.
9. Remove felt washer from head end. Discard felt washer.
10. Scribe index marks on pinion housing and frame assembly (Figure 12-19).

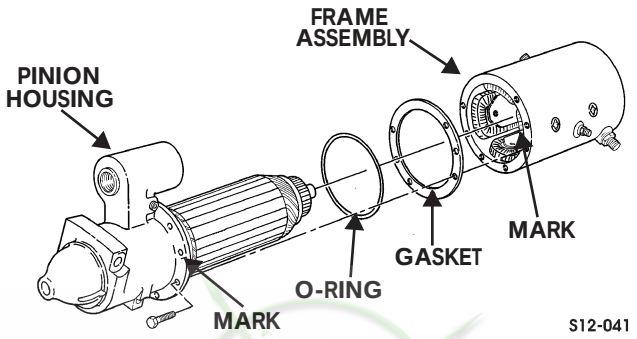

Figure 12-19: Starter Housing

11. Remove seven capscrews securing pinion housing to frame assembly.
12. Remove frame assembly, gasket, and O-ring from pinion housing. Discard gasket and O-ring.
13. Remove two plugs and pin from pinion housing and shift lever (Figure 12-20).

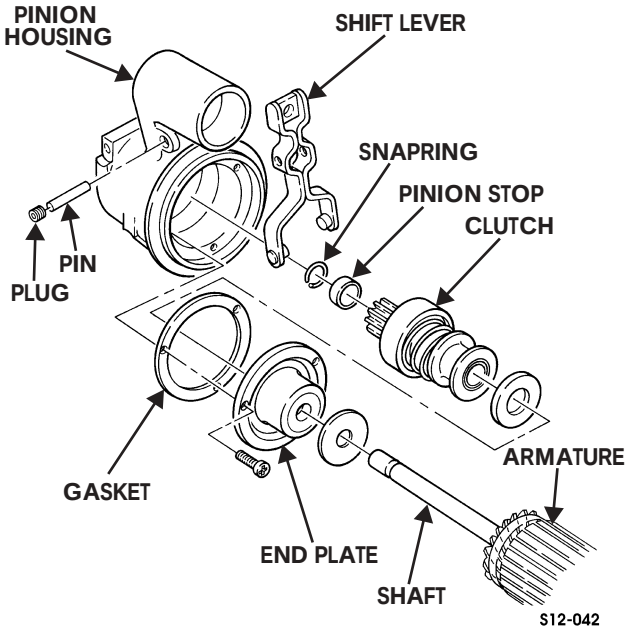

Figure 12-20: Starter Drive

14. Clamp pinion housing in vise and remove three screws from end plate and pinion housing (Figure 12-21).
15. Slide armature, end plate, and shift lever out of pinion housing.

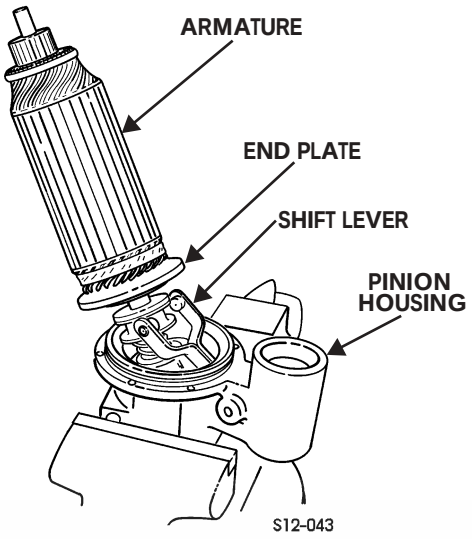

Figure 12-21: Armature

16. Remove snapring and pinion stop from armature shaft, and slide clutch off armature shaft. Discard snapring and pinion stop (Figure 12-20).
17. Remove washer, end plate, and washer from armature shaft.
18. Remove gasket from end plate. Discard gasket.
19. Remove two nuts, lockwashers, screws, copper washers, and negative brush leads from frame assembly. Remove brushes from brush holders. Discard lockwashers (Figure 12-22).

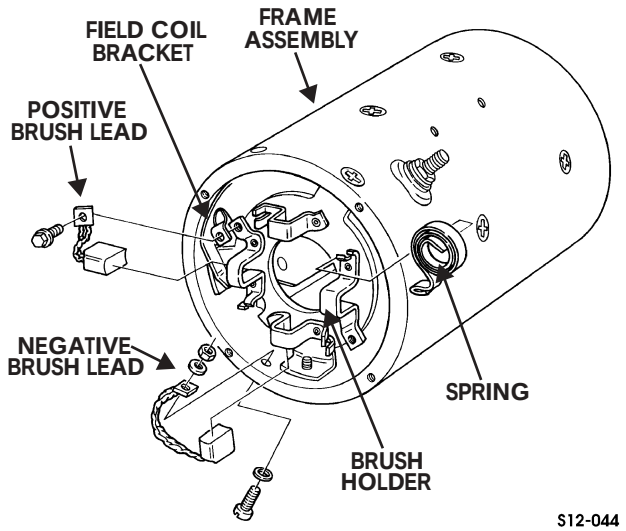

Figure 12-22: Brushes and Holder

20. Remove two screws and positive brush leads from field coil brackets. Remove brushes from holders.
21. Remove four springs from brush holders.
22. Remove four nut and lockwasher assemblies and rubber washers from solenoid housing. Discard rubber washers (Figure 12-23).

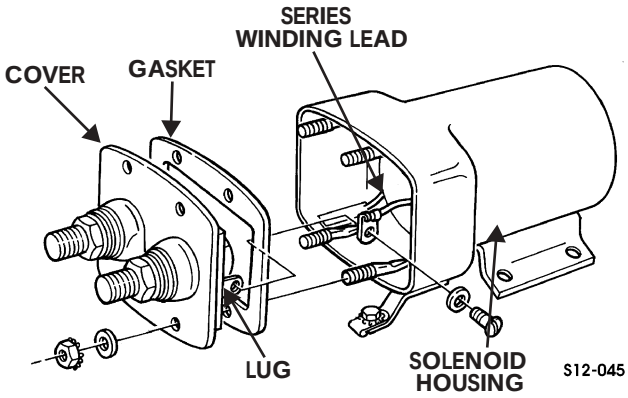

Figure 12-23: Solenoid Housing

23. Pull cover away from solenoid housing and remove screw and washer from lug on cover and series winding lead.
24. Remove cover and gasket from solenoid housing. Discard gasket.
25. Holding core shaft, remove locknut, washer, and contact from core shaft. Discard locknut (Figure 12-24).
26. Remove and separate spring from core shaft and washer.
27. Remove snapring, spring retainer, spring, spring retainer, rubber boot, and washer from core shaft.

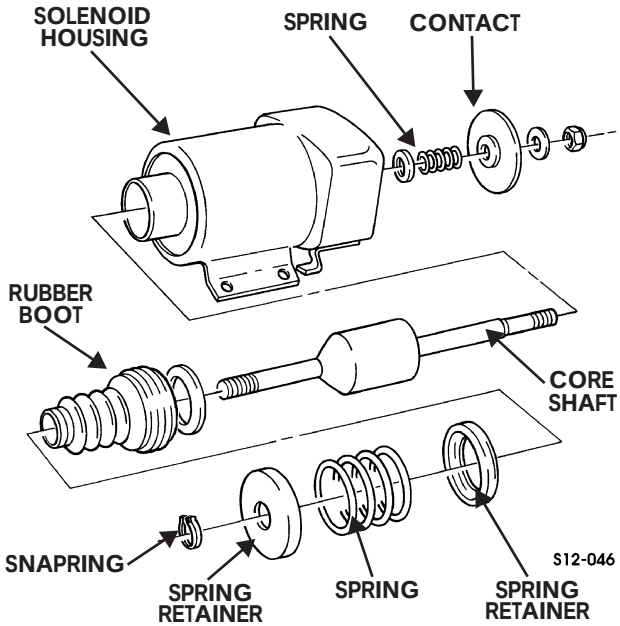

Figure 12-24: Solenoid Components

Inspection

1. Inspect clutch for broken spring, damaged gear or splines, and non-lockup. Replace clutch if damaged (Figure 12-25).

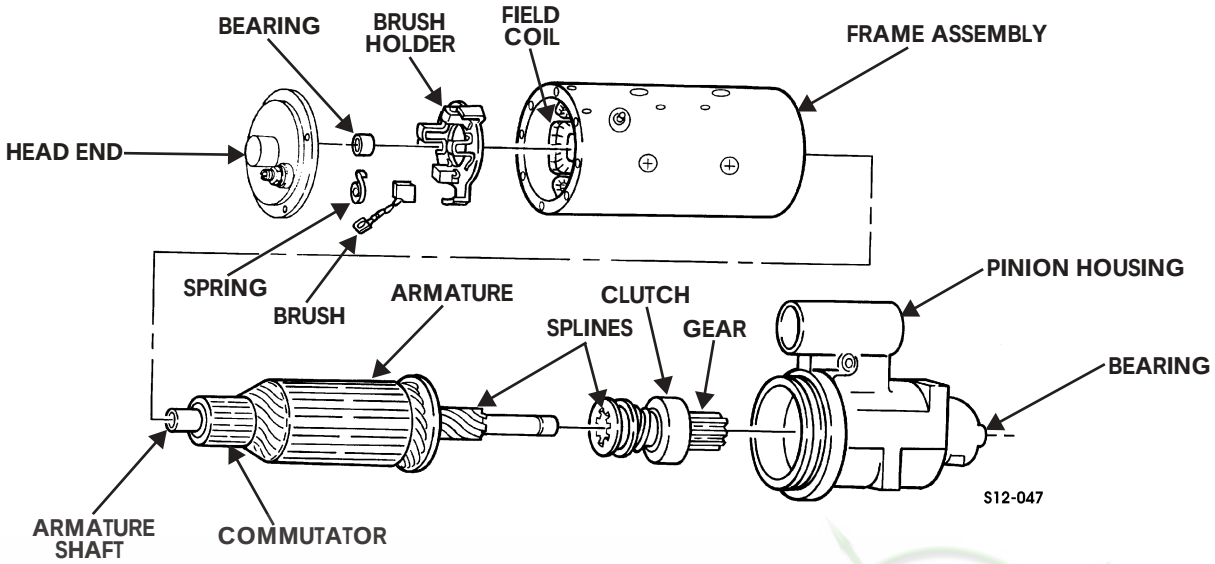

Figure 12-25: Starter Components

2. Inspect brushes for cracks, roughness, galling, wear, or damaged lead. If one brush length is less than 0.315 in. (8 mm) or has other damage, replace all brushes as a set.
3. Inspect springs for breaks, distortion, or other damage. Replace any damaged springs (Figures 12-25 and 12-26).

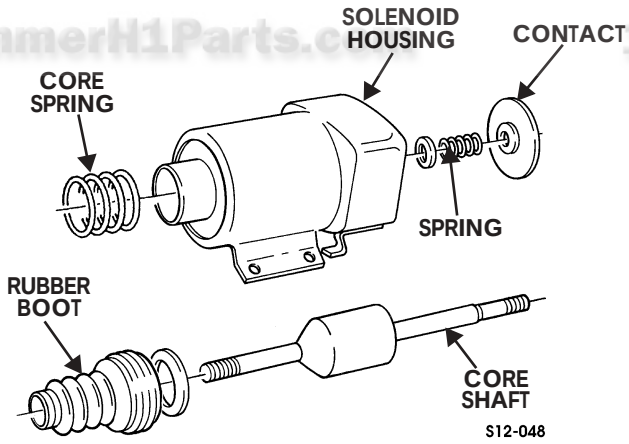

Figure 12-26: Core Shaft

4. Inspect bearings in head end and pinion housing for cracks, roughness, galling, or damage. Replace bearings if defective (Figure 12-25).
5. Inspect pinion housing for cracks, damaged pinion bearing, and damaged threads. Repair minor thread damage. Replace starter if otherwise damaged.
6. Inspect commutator for damage due to arcing (burned spots and pitting), damaged shaft, splines, or threads. Replace starter if commutator is damaged.
7. Test armature, field coils, and brush holders for shorts, grounds, and open circuits with an armature test set. Replace starter if any one of these parts is defective.
8. Inspect core spring, core shaft, and rubber boot for damage. Replace parts if damaged (Figure 12-26).
9. Inspect contact for burns or damage. Replace contact if burned or damaged.
10. Inspect housing of frame assembly, head end, and solenoid housing for cracks or damage. Replace starter if any part is damaged (Figures 12-25 and 12-26).

Assembly

1. Assemble washer, rubber boot, spring retainer, spring, and spring retainer on core shaft and secure with snapring (Figure 12-27).

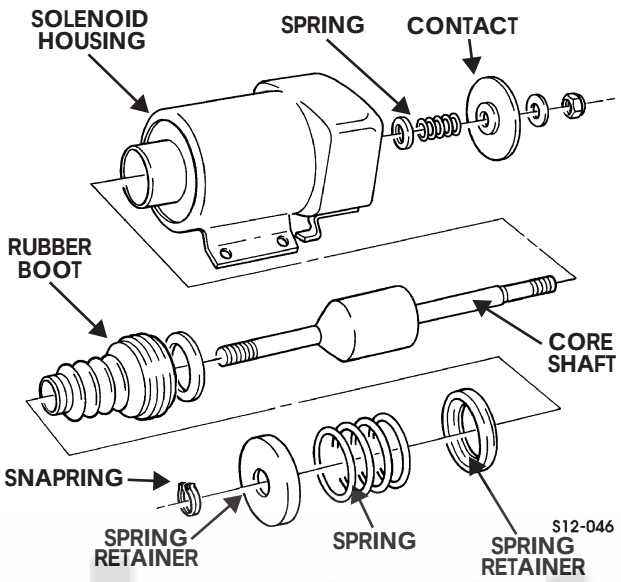

Figure 12-27: Solenoid Components

2. Place core shaft assembly into solenoid housing.
3. Install washer, spring, contact, washer and locknut on core shaft.
4. Place gasket on cover and secure series winding lead on lug with screw and washer (Figure 12-28).

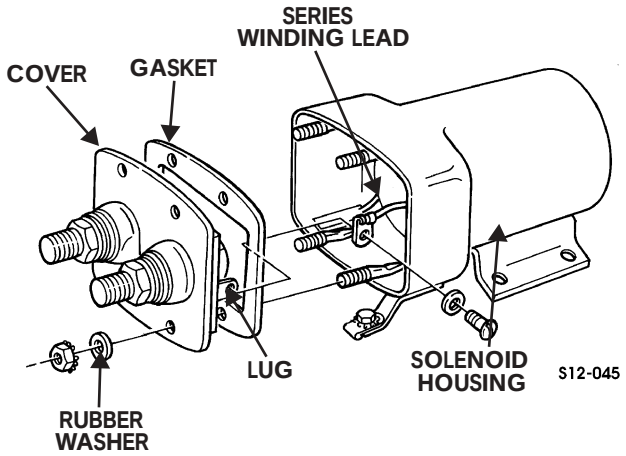

Figure 12-28: Solenoid End Cover

5. Install cover and gasket on solenoid housing with four rubber washers and nut and lockwasher assemblies.
6. Install two negative brushes and two positive brushes on brush holders and retain with four springs (Figure 12-29).

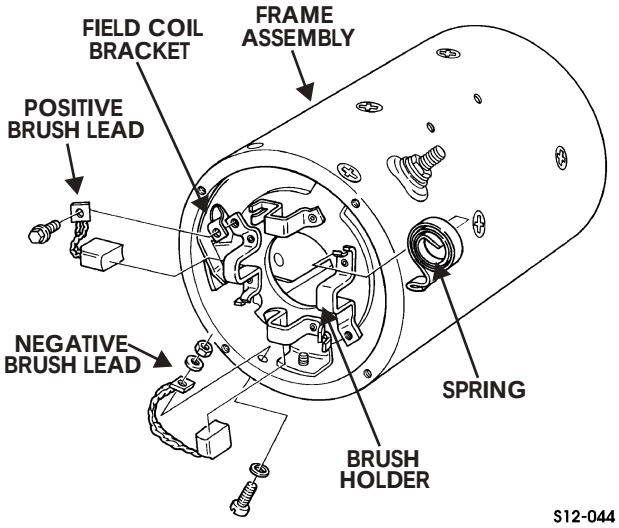

Figure 12-29: Brushes and Holder

7. Connect two positive brush leads to two field coil brackets with two screws.
8. Connect two negative brush leads to frame assembly with two copper washers, screws, lockwashers, and nuts.
9. Cover negative lead screw heads with adhesive sealant.
10. Apply a coating of aircraft grease to armature shaft, shift lever studs, groove of clutch, and inside diameter of end plate (Figure 12-30).
11. Place washer, end plate, and gasket over armature shaft.

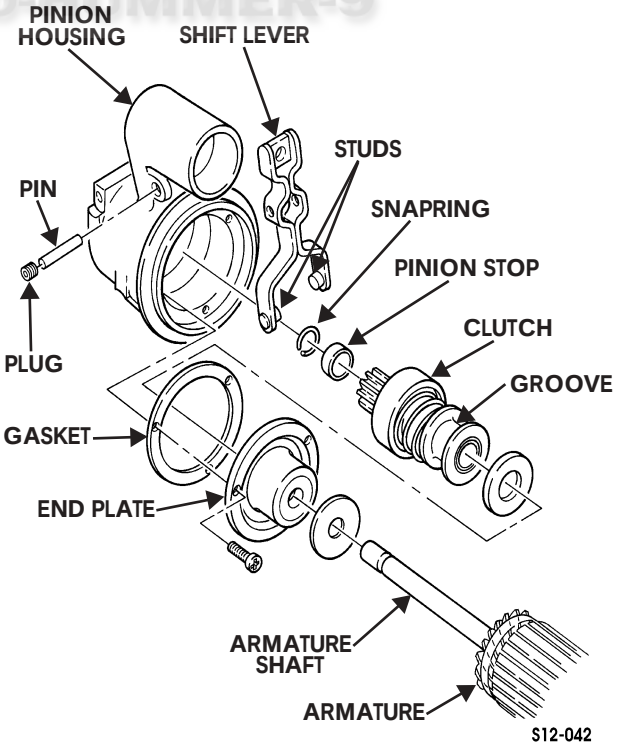

Figure 12-30: Starter Drive Gear

12. Place washer, clutch, and pinion stop on armature shaft and retain with snapring.

NOTE: Position armature and shift lever in position shown for installation.

13. Place shift lever over clutch with shift lever studs engaged in clutch groove.

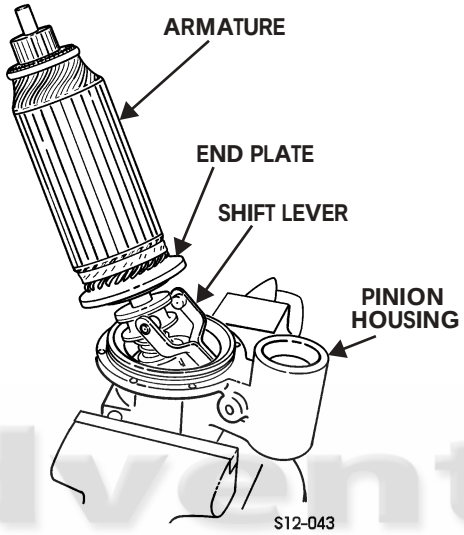

Figure 12-31: Armature

14. Feed shift lever into pinion housing as armature is positioned in large bore of pinion housing and install with three screws through end plate into pinion housing. Tighten screws to 40 lb-in. (5 N•m) (Figure 12-31).
15. Install pin through pinion housing and shift lever. Retain with two plugs in pinion housing (Figure 12-30).
16. Place O-ring and gasket on pinion housing (Figure 12-32).
17. Coat seven screws with adhesive sealant.

CAUTION: *As armature is inserted into frame assembly, carefully align brushes on commutator. Brushes chip and break easily.*

18. Align index marks on frame assembly and pinion housing and install armature and pinion housing on frame assembly with seven capscrews. Tighten capscrews to 50 lb-in. (6 N•m).
19. Saturate felt washer with lubricating oil and install on commutator end head (Figure 12-33).
20. Place spacer and thrust washer(s) on armature shaft.
21. Coat threads of capscrews with adhesive sealant.

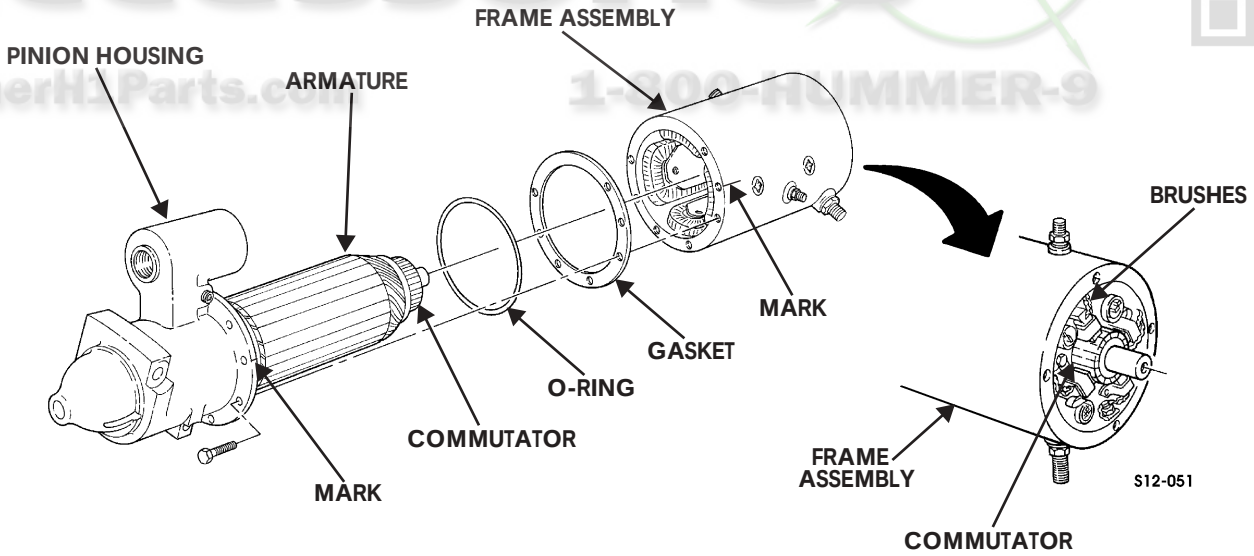

Figure 12-32: Starter Housing

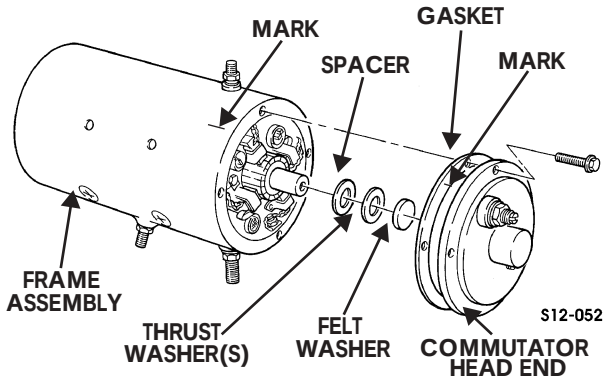

Figure 12-33: Starter End Plate

22. Align index marks and install commutator end head and gasket on frame assembly with four capscrews. Tighten capscrews to 25 lb-in. (3 N•m).
23. Coat threads of capscrews with adhesive sealant.

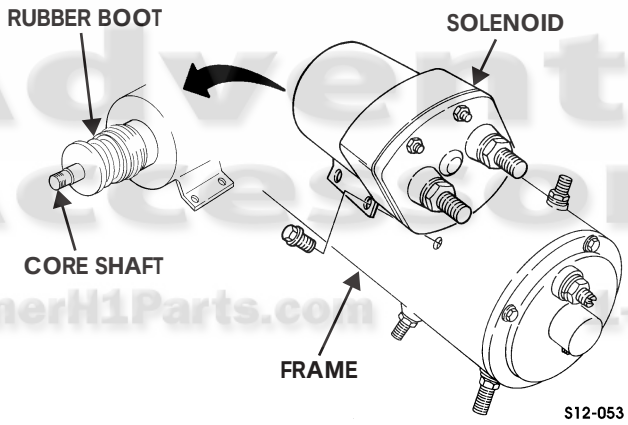

Figure 12-34: Solenoid Boot

24. Coat ribbed area of rubber boot with lithium grease (Figure 12-34).
25. Align end of core shaft into hole in shift lever and install solenoid on frame assembly with four capscrews. Tighten capscrews to 50 lb-in. (6 N•m).
26. Using core shaft nut tool, install locknut on core shaft (Figure 12-35).

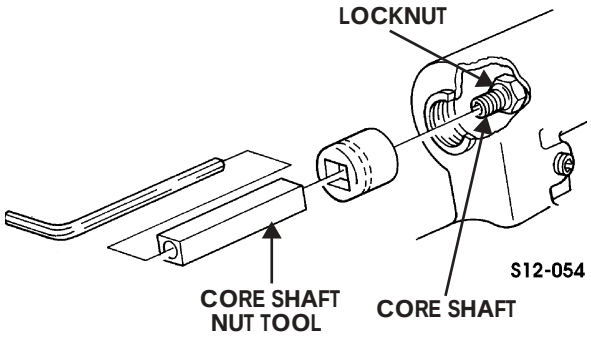

Figure 12-35: Core Shaft Nut

Adjustment

NOTE: Measure armature end play between snapring and pinion housing or on end of armature shaft in nose piece.

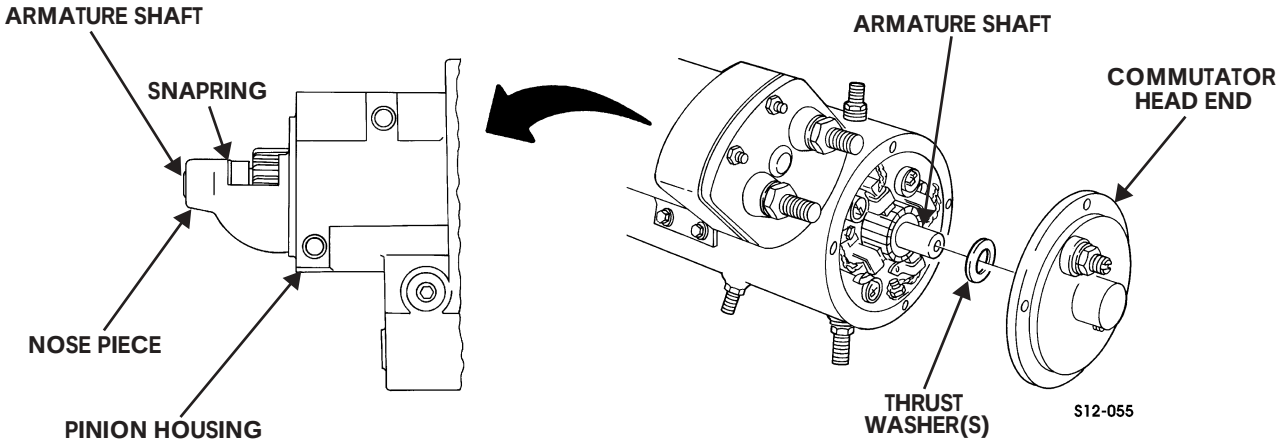

Figure 12-36: Armature End Play

1. Armature end play should be 0.005-0.030 in. (0.127-0.762 mm). If adjustment is necessary, remove commutator head end and add or remove thrust washer(s) (Figure 12-36).
2. Connect 12 volt power supply (DC) and momentarily connect jumper wire. This shifts clutch into cranking position (Figure 12-37).

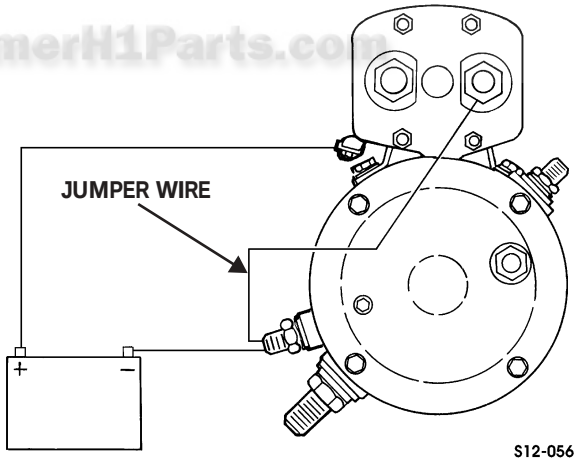

Figure 12-37: Jumper Connections

3. Push clutch toward disengage position to remove slack. Measure gap between edges of clutch and pinion stop (Figure 12-38). Gap should be 0.020-0.050 in. (0.508-1.27 mm).

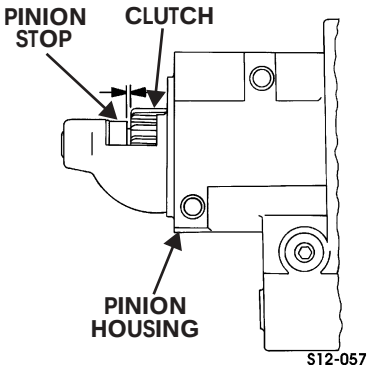

Figure 12-38: Pinion Stop Clearance

NOTE: Core shaft must be held while adjusting position of locknut.

4. Adjust clutch end play by turning locknut in or out (Figure 12-39).

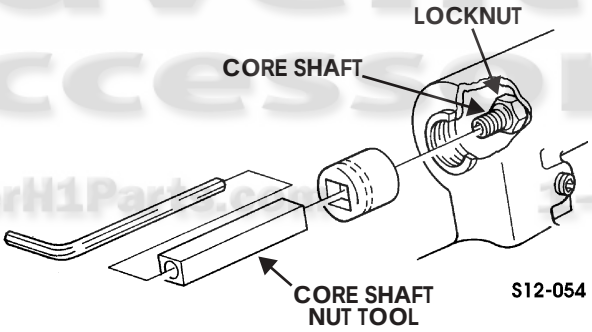

Figure 12-39: Pinion Adjustment

5. Install gasket and plug in pinion housing (Figure 12-40).

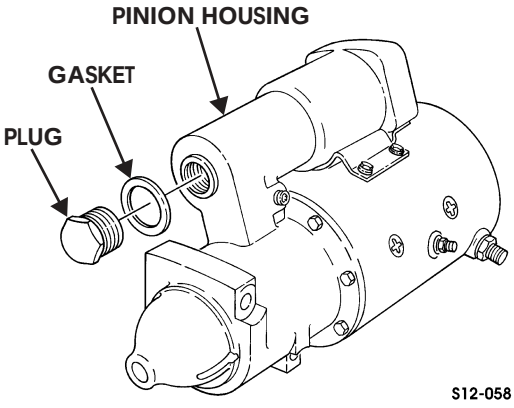

Figure 12-40: Pinion Housing Plug

6. Install two solenoid lead connectors on solenoid terminals and frame assembly terminals with four lockwashers and nuts (Figure 12-41).

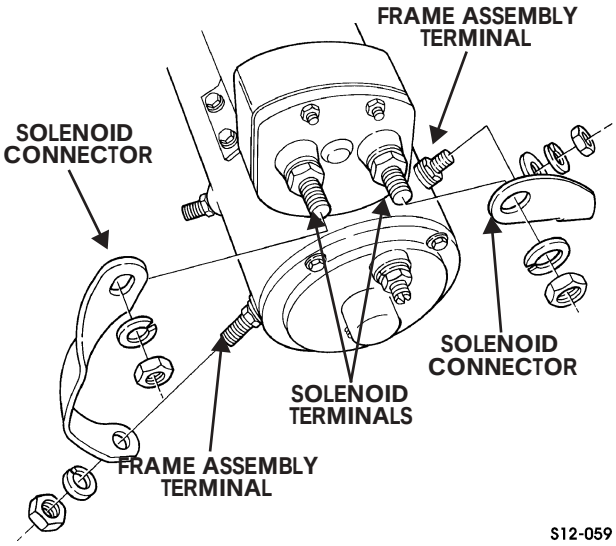

Figure 12-41: Positive Strap

7. Connect 12-volt supply (DC) to starter motor (Figure 12-42).

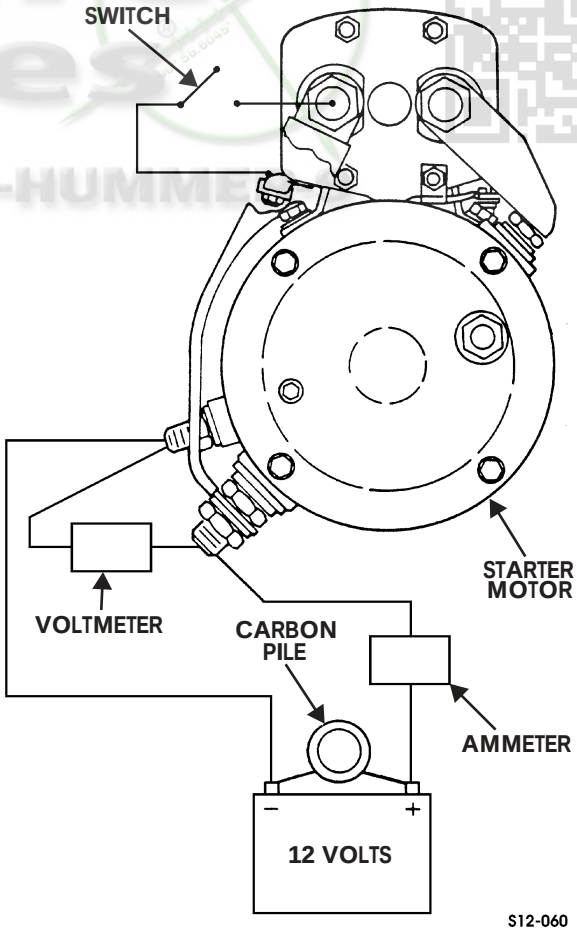

Figure 12-42: Test Connections

CAUTION: *Do not operate starter motor for more than 30 seconds at a time. Allow starter motor to cool at least 2 minutes between tests, or damage to starter motor may result.*

8. Close switch, adjust voltage to 9.5 volts on voltmeter using carbon pile. Check rotating speed of armature with tachometer. Current draw can be read on ammeter.
9. Maximum current draw should be 65 amps with a minimum armature speed of 5000 rpm. If a low speed, high current condition exists, check armature for shorts or grounds. If a low speed, low current draw exists, inspect starter motor for bad connections or poor brush contact.
10. Install starter.

ALTERNATOR REPLACEMENT

Removal

1. Disconnect battery ground cable.
2. Loosen pivot bolt and remove front and rear short bolts (Figure 12-43).
3. Remove serpentine drivebelt from alternator pulley.
4. Pull alternator away from engine. Remove nut and lockwasher and disconnect three battery wires from battery terminal of alternator. Discard lockwasher (Figure 12-44).
5. Unlock and disconnect ignition lead connector from side of alternator.
6. Remove pivot bolt and alternator from engine (Figure 12-43).

Installation

1. Position alternator in upper bracket and finger tighten pivot bolt (Figure 12-43).
2. Connect three battery wires on terminal of alternator (Figure 12-44). Secure with lockwasher and nut. Tighten nut to 62-80 lb-in (7-9 N•m).
3. Install ignition lead connector and ensure connector latch is locked.
4. Position serpentine drivebelt on alternator pulley.
5. Move alternator into alignment with lower bracket and install front and rear short bolts. Tighten bolts 18 lb-ft (25 N•m) (Figure 12-43).
6. Tighten pivot bolt to 37 lb-ft. (50 N•m).
7. Connect battery ground cable.

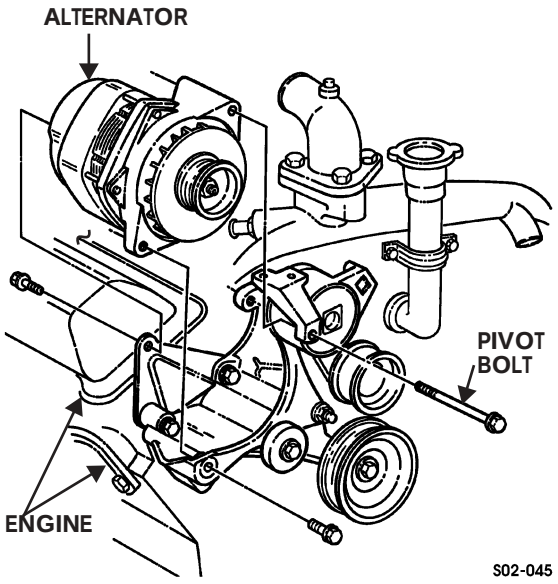

Figure 12-43: Alternator Mounting

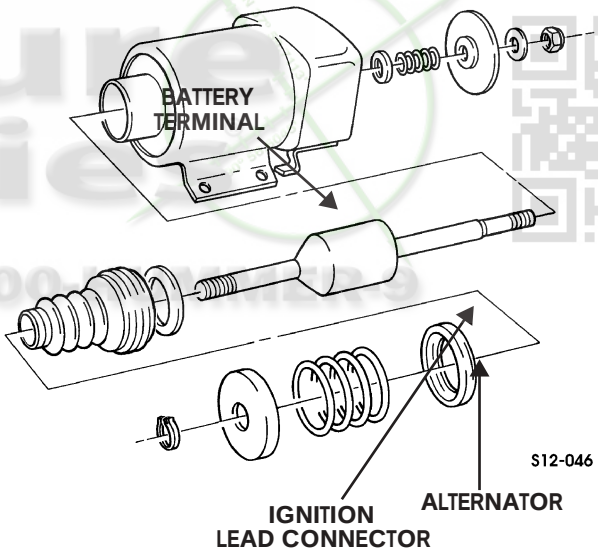

Figure 12-44: Alternator

124 AMPERE ALTERNATOR REPAIR

Disassembly

1. Remove alternator.

NOTE: Bench testing procedure may be used to determine or confirm alternator problems (refer to last section of this procedure). Mark drive end frame and slip ring end frame for assembly.

2. Holding rotor shaft with allen wrench, remove nut, washer, pulley, fan, and thin collar from rotor shaft (Figure 12-45).
3. Remove four through-bolts from slip ring end frame and drive end frame.
4. Remove drive end frame and thick collar from rotor shaft.
5. Remove three nuts from stator leads and rectifier bridge.
6. Remove stator from slip ring end frame.

NOTE: Record fasteners and parts positions for assembly.

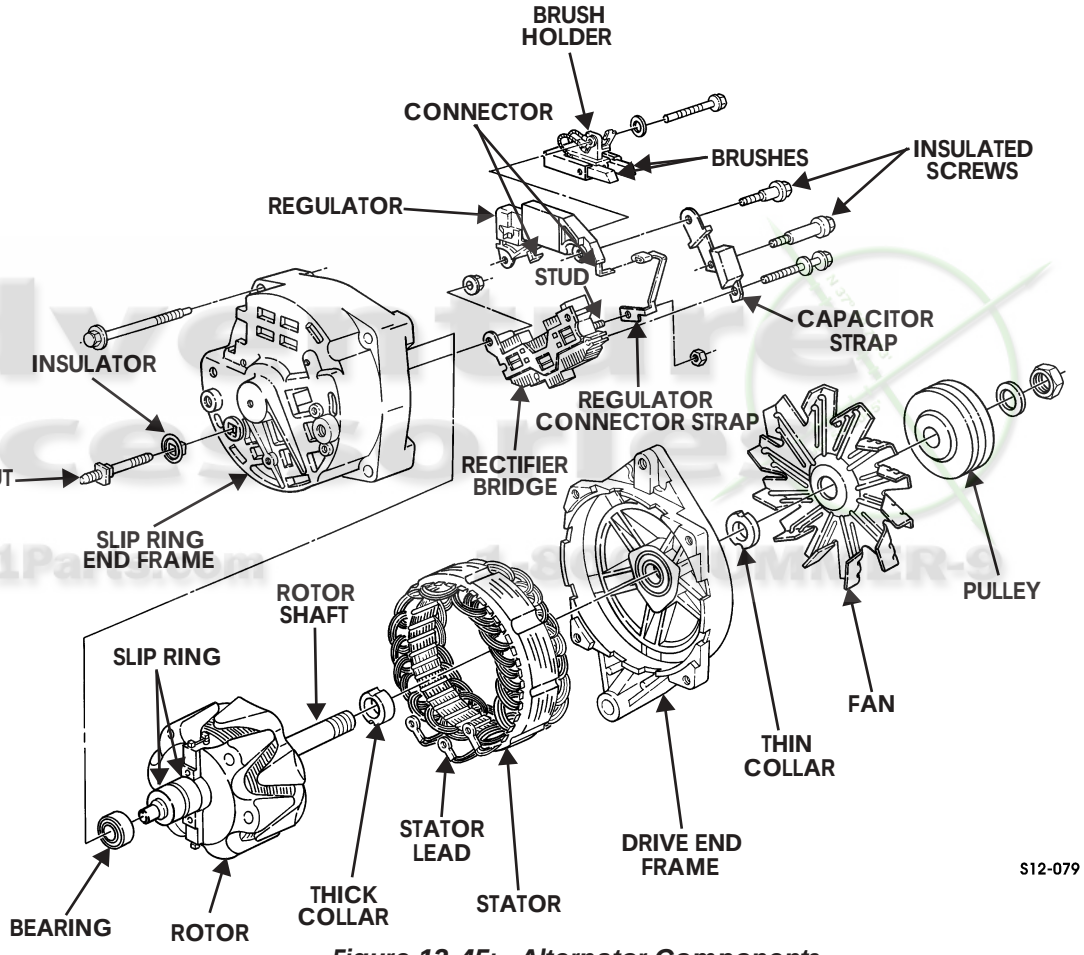

Figure 12-45: Alternator Components

7. Remove three screws, two insulated screws and washer from components in slip ring end frame.
8. Remove nut and output stud with insulator from slip ring end frame.
9. Remove rectifier bridge, capacitor strap, regulator connector strap, and brush holder from slip ring end frame.

NOTE: Perform steps 9, 10, and 11 only if parts must be replaced.

10. Unsolder and separate brush holder and regulator connector.
11. Unsolder and separate connector strap from regulator.

NOTE: Perform step 11 only if bearing is obviously defective.

12. Remove bearing from slip ring end of rotor shaft. Discard bearing.

Cleaning

CAUTION: *Encapsulated items and insulating coatings on wires in field coil and stator can be damaged by liquid or paste-type solvents. Use these solvents only for cleaning bare metal items.*

Clean encapsulated and exposed wire items by wiping with soft cloth and low pressure air.

Inspection and Repair

NOTE: Refer to Section 2 for general instructions on inspection and repairs.

a. Rotor

1. Inspect for cracked slip rings, damaged threads, and galling or scoring on bearing journal surfaces on shaft (Figure 12-46).
2. Corrosion or light scoring may be removed with 400 grit polishing material or turning on lathe to remove a minimum of material. Hold roundness to 0.002 in. (0.05 mm) maximum indicator reading. Repair minor thread damage per Section 2.
3. If there is other damage to rotor, wires, slip rings, and shaft, replace rotor and shaft as an assembly.
4. Test slip rings and field coil for opens (high resistance), shorts (very low resistance), and grounds (low resistance) to frame and shaft. Replace rotor and shaft as an assembly if any test is failed.
5. If ball bearing remained on rotor shaft during removal, inspect ball bearing for free play, roughness, leaking seals, and other damage. Replace bearing if damaged. Seat new ball bearing to shoulder of rotor shaft by pressing on inner race of bearing.

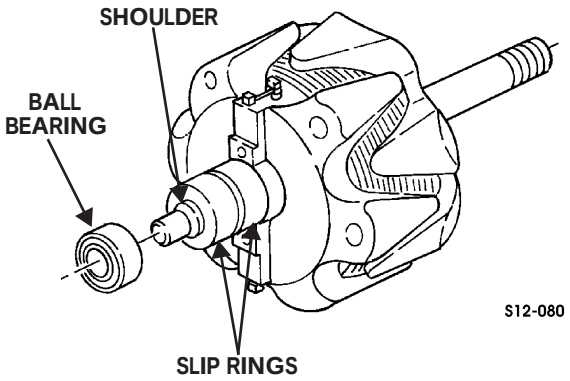

Figure 12-46: Rotor

b. Stator

NOTE: Standard VOM cannot reliably test delta wired stators for shorts and opens.

1. Check each pair of stator wires for continuity to laminations. Any continuity indicates defective stator (grounded) (Figure 12-47).
2. Visually examine stator wiring for discoloration due to overheating (which is a sign of short or ground). Normal color is reddish brown to purple. Bare copper, dark spots, or char (dull black) indicates trouble spots.
3. There are no repairs (except for replacing eye ends) possible for stator. Replace stator if damaged or discolored.

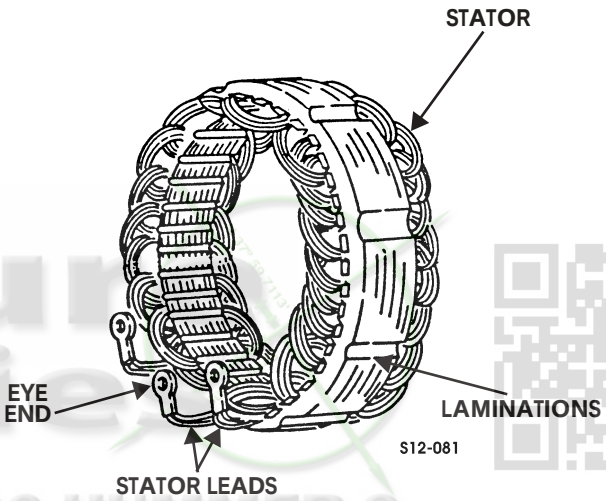

Figure 12-47: Stator

c. Rectifier Bridge

CAUTION: *Check ohmmeter manual before performing diodes check, as some meters can be damaged or can damage diodes during check.*

NOTE Studs are embedded in insulation. To obtain diode readings, probe must contact copper strap.

1. Connect ohmmeter leads to grounded side and strap as shown and take readings at each strap (Figure 12-48).
2. Repeat process of step 1 with leads reversed.

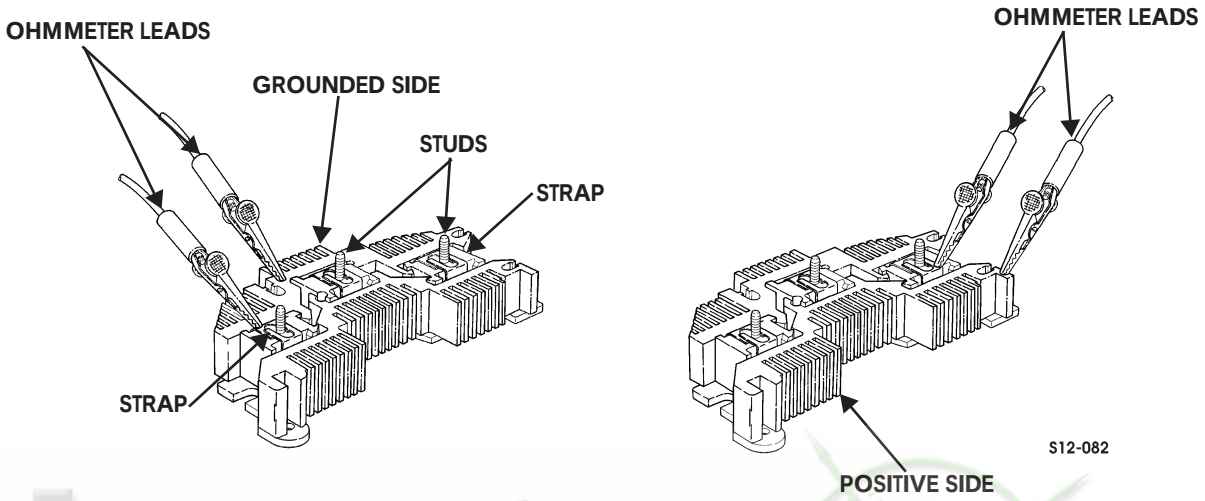

Figure 12-48: Rectifier Bridge

3. All three readings in steps 1 or 2 should read high resistance in one case and low resistance in other case.
4. Connect ohmmeter leads on positive side and strap as shown, and take readings at each strap (Figure 12-48).
5. Repeat process of step 4 with leads reversed.
6. All three readings in steps 4 and 5 should be the same, with resistance high in one set and low in the other set.
7. If any one reading in the sets of three readings of steps 1, 2, 3, and 4 is not the same as the other two readings, replace rectifier bridge.

d. Regulator

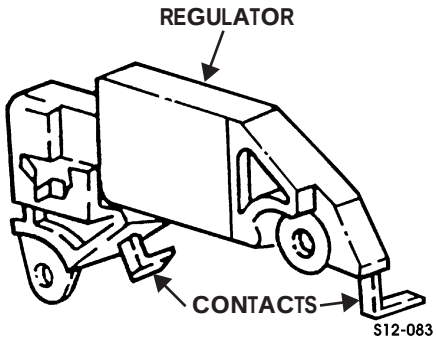

Figure 12-49: Regulator

NOTE Bench testing prior to disassembly often can determine if regulator is defective. Special equipment is required to perform an independent test of the regulator.

1. Inspect regulator for cracks, breaks, broken contacts, or surface defects. Replace if damaged (Figure 12-49).
2. Special equipment is required to perform a functional test. Bench check is only practical test for regulator functioning.

e. Brushes and Brush Holders

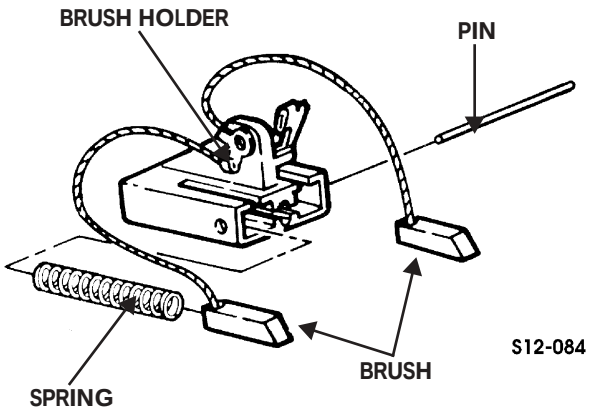

Figure 12-50: Brush Holder and Brushes

1. Inspect for broken or disconnected brushes, worn brushes with length less than 0.5 in. (12.7 mm), and broken or distorted springs. Replace brush holder and brushes as an assembly (Figure 12-50).

NOTE Pin to retain brushes can be made from local material. A standard unbent paper clip works well.

2. Assemble springs and brushes in brush holder. Compress springs and brushes in brush holder and hold compressed with pin (Pin will be removed after assembly) (Figure 12-50).

f. Drive End Frame and Bearing

1. Inspect bearing for roughness, looseness in bore, inner race free play, and damaged seals. Replace drive end frame and bearing as an assembly if damaged (Figure 12-51).

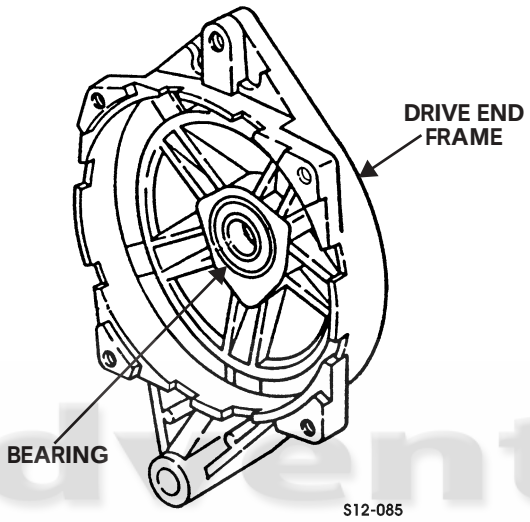

Figure 12-51: Drive End Frame

2. Inspect drive end frame for cracks, breaks, or damaged threads. Replace if casting is cracked or broken.
3. Repair minor through-bolt and adjusting bolt thread damage using a tap. For more serious through-bolt thread damage, replace drive end frame.

g. Fan

Inspect fan for bends and breaks. Minor bending repair is permissible. For broken or missing blade ends, cracks or breaks, replace fan (Figure 12-52).

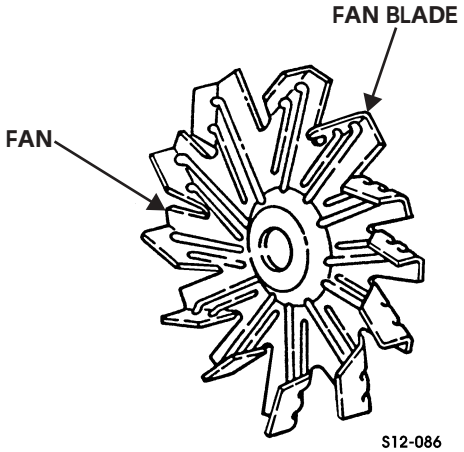

Figure 12-52: Fan

h. Slip Ring End Frame and Bearing

NOTE Bearing may remain on rotor shaft when end frames are separated. If bearing remains in slip ring end frame, inspect in place. Remove only to replace bearing.

1. Inspect bearing for roughness, looseness in retainer ring, free play or inner race, and damaged seals. Replace bearing if damaged or loose (Figure 12-53).

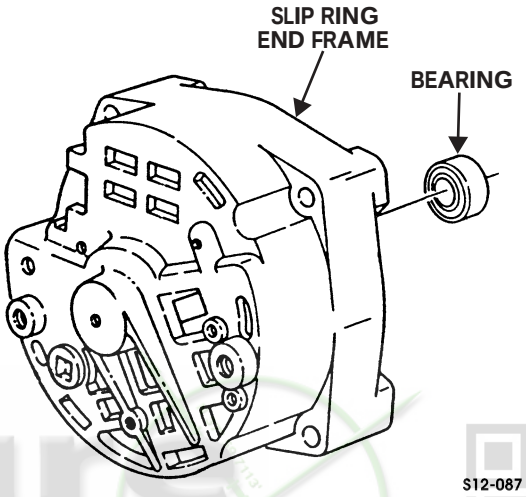

Figure 12-53: Rear Housing

2. Inspect slip ring end frame for breaks, cracks, evidence of spun ball bearing, and damaged threads. Repair minor thread damage. Replace if otherwise damaged.

i. Collars

Inspect collars for cracks, bends, and scoring. Replace if damaged (Figure 12-54).

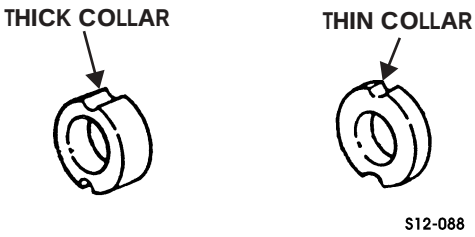

Figure 12-54: Fan Spacers

j. Output Stud Assembly

Inspect output stud assembly for cracked or broken insulator, bends, or damaged threads. Replace stud assembly if any part is damaged (Figure 12-55).

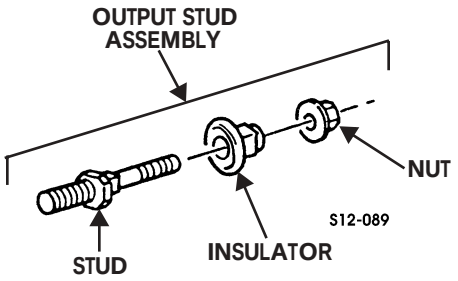

Figure 12-55: Output Stud

k. pulley

Inspect pulley for bends, breaks, and sharp edges on belt groove. Remove minor burrs and sharp edges with fine mill file. Replace pulley if otherwise damaged (Figure 12-56).

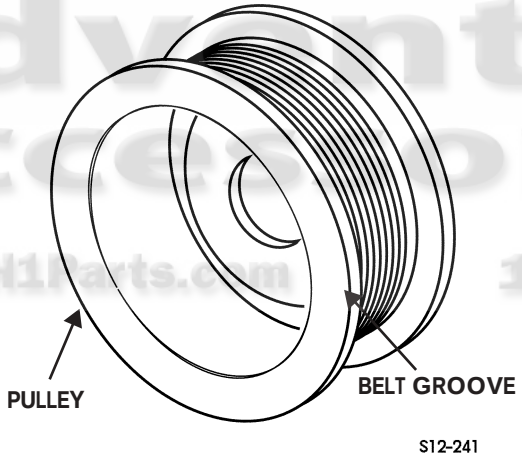

Figure 12-56: Alternator Pulley

l. Capacitor Strap

Inspect capacitor strap for breaks, cracks, bulged case, or surface defects. Replace if damaged (Figure 12-57).

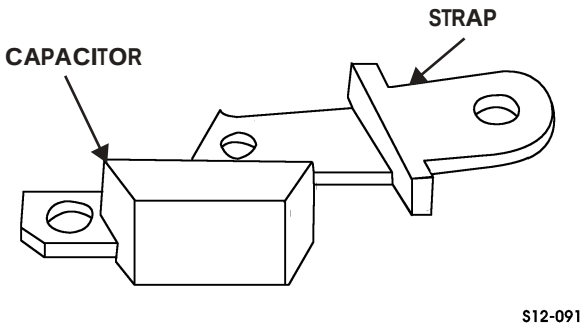

Figure 12-57: Noise Suppressor

Assembly

NOTE: Perform step 1 if slip ring end frame bearing is replaced.

1. Pressing on inner race, install bearing on rotor shaft. Seat to shoulder on shaft (Figure 12-58).

NOTE: Perform step 2 if new brushes and brush holder are replaced.

2. Assemble springs and brushes in brush holder and retain with pin. Pin holds brushes compressed in brush holder. (Pin will be removed after assembly).
3. Install rectifier bridge in slip ring end frame with screw, output stud insulator, and nut.
4. Assemble brush holder and regulator and install with washer and screw. Solder slip connection between brush holder and regulator if either was replaced.

NOTE: Perform step 5 if regulator is replaced.

5. Slide regulator regulator connector strap into regulator contact and solder union.

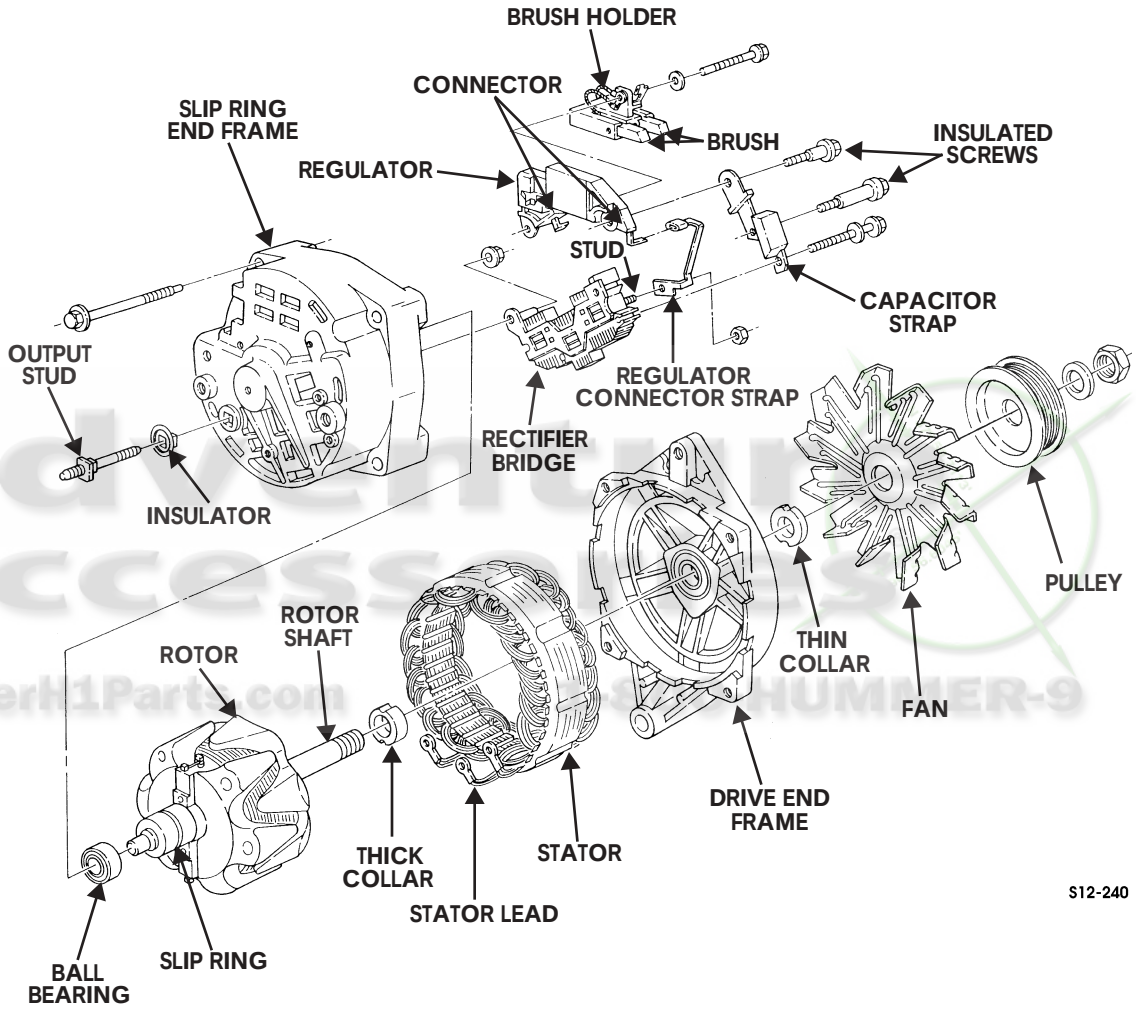

Figure 12-58: Alternator Components

6. Slip capacitor strap under connector strap and position on rectifier bridge and regulator. Secure capacitor strap with screw and two insulated screws. Tighten screws and nuts (Figures 12-58 and 12-59).

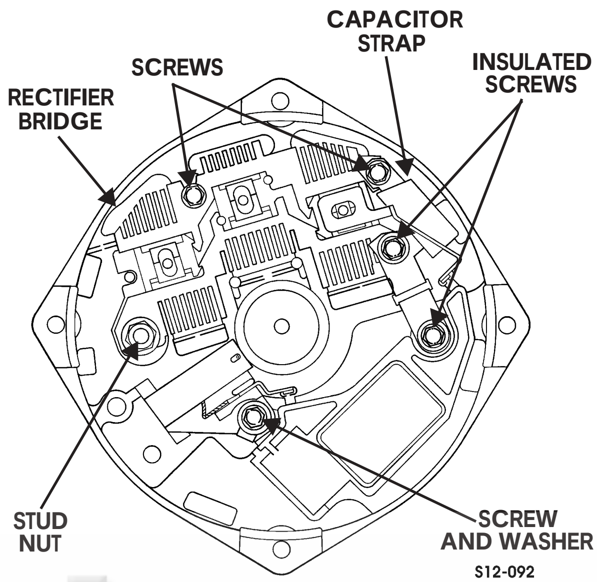

Figure 12-59: Alternator Rectifier

7. Position stator to align three stator lead eyes on three studs of rectifier bridge. Secure stator leads to studs with three nuts.
8. Place thick collar over rotor shaft up to rotor (Figure 12-58).
9. Insert rotor shaft through drive end frame. Seat bearing in drive end frame on thick collar.
10. Position thin collar, fan, and pulley over rotor shaft and secure with washer and nut. Tighten nut to 40-80 lb-ft (54-109 N•m).
11. Carefully position rotor through stator and seat ball bearing in slip ring end frame. At same the time, ensure drive end frame and stator mate.
12. If stator and two end frames mate, secure assembly with four through-bolts. Tighten through-bolts evenly to remove any slack.
13. Ensure rotor turns evenly and smoothly in alternator.
14. Remove brush retaining pin from brush holder. Ensure brushes extend out of brush holder and contact slip rings.
15. Install and check output.

JUNCTION BLOCK REPLACEMENT

WARNING: Batteries emit explosive hydrogen gas. Keep flames or sparks away from batteries. Battery acid is extremely harmful. If acid contacts eyes or skin, flush affected area(s) liberally with clear water, and seek medical help immediately. If acid contacts clothing, remove and discard affected clothing. Always disconnect ground cable, and remove all jewelry before working on batteries.

When removing battery clamps, disconnect ground cable first. Ensure all switches are off before disconnecting battery ground cable. Do not allow tools to come in contact with vehicle when disconnecting cable clamps. Indirect short can result, causing instant heating of tools, tool damage, battery damage, or battery explosion.

Removal

1. Disconnect battery ground cable at battery box negative stud.
2. Loosen two nuts and remove cover from terminal board (Figure 12-60).
3. Remove top nut, lockwasher, washer, and wires (one orange, two black, and one red) from terminal board. Discard lockwasher.
4. Remove bottom nut, lockwasher, washer and wires (five black and one white) from terminal board. Discard lockwasher.
5. Remove two nuts, two screws, and terminal board from terminal board plate.
6. Remove two screws and terminal board plate from bracket.

Installation

1. Install terminal board plate and install on bracket with two screws (Figure 12-60).
2. Install terminal board on terminal board plate with two nuts and screws.
3. Install five black wires and one white wire on bottom lug of junction block with washer, lockwasher, and nut.
4. Install one orange wire, two black, and one red wire on top lug of junction block with washer, lockwasher, and nut.
5. Install junction block cover on terminal board and tighten two nuts.
6. Install battery ground cable at battery box stud.

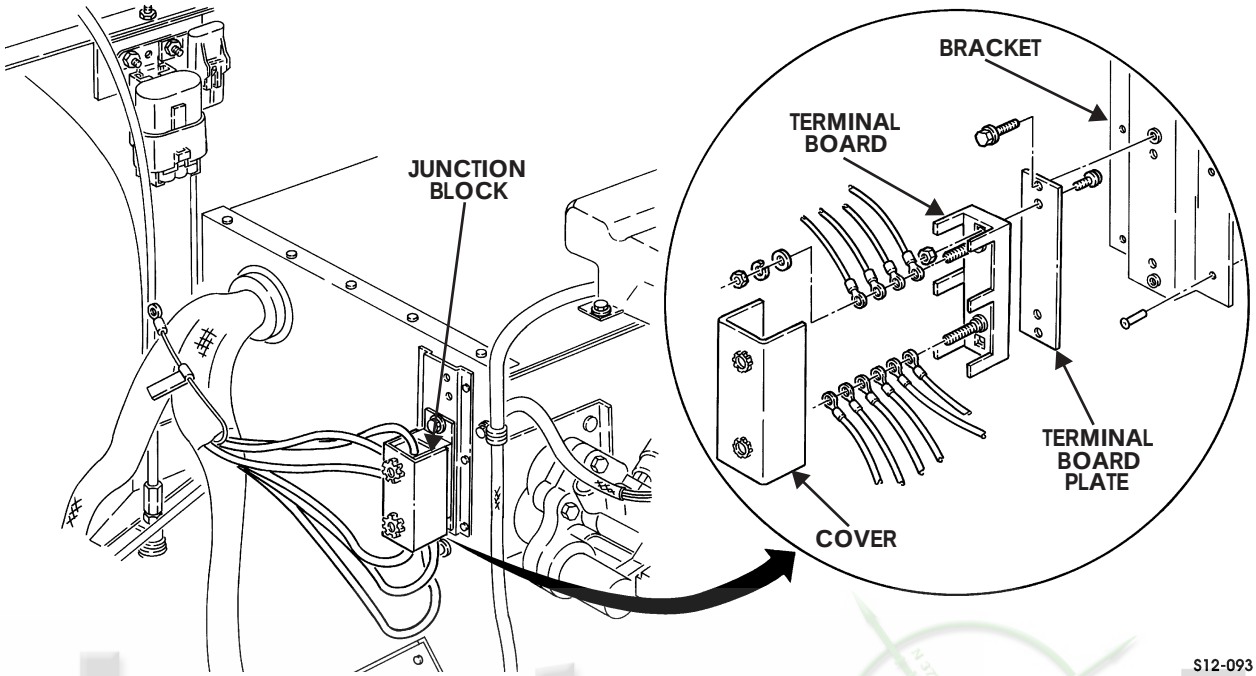

Figure 12-60: Power Junction Block

HOOD ELECTRICAL HARNESS REPLACEMENT

NOTE: Prior to removal, tag all leads. Note location of clamps and ground leads.

Removal - Left Side

1. Disconnect battery ground cable.
2. Disconnect four-wire hood harness connector from body harness connector.
3. Disconnect three-wire hood harness connector from body harness connector.
4. Disconnect three connectors from left side headlight.
5. Remove composite light/side marker cover and clearance lamp cover.
6. Disconnect ground lead and two connectors from left side composite light.
7. Remove ground lead and connector from left side marker lamp.
8. Disconnect two-wire connector from left side clearance lamp.
9. Disconnect two connectors from under hood lamp.

Removal - Right Side

1. Disconnect three connectors from right side headlight.
2. Remove composite light/side marker cover and clearance lamp cover.
3. Remove ground lead and connector from right side marker lamp.
4. Remove ground lead and two connectors from right side composite light.
5. Disconnect two-wire connector from right side clearance lamp.
6. Remove seven clamps securing hood electrical harness to hood.
7. Remove tie strap as required.
8. Remove hood harness from vehicle.

Installation

1. Place hood electrical harness in position for installation.
2. Install seven clamps on hood. Do not tighten clamps.

Installation - Right Side

1. Connect two-wire connector to right side clearance lamp.
2. Connect two connectors and install ground lead to right side composite light.
3. Connect connector and install ground lead to right side marker lamp.
4. Connect three connectors to right side headlight.
5. Install composite light/side marker cover and clearance lamp cover.

Installation - Left Side

1. Connect two-wire connector to left side clearance lamp.
2. Connect connector and install ground lead to left side marker lamp.
3. Connect two connectors and install ground lead to left side composite light.
4. Install composite light/side marker cover and clearance lamp cover.
5. Connect two connectors to under hood lamp.
6. Connect three connectors to left side headlight.
7. Connect three-wire hood harness connector to body harness connector.
8. Connect four-wire hood connector to body harness connector.
9. Connect battery ground cable.
10. Test all lamps/lights for proper operation.
11. Remove all tags.
12. Tighten seven clamps.
13. Install tie straps as required.

ENGINE ELECTRICAL HARNESS REPLACEMENT

Removal

NOTE: Prior to removal, tag all leads for installation. Note location of clamps and tie straps.

1. Disconnect battery ground cable.
2. Remove engine access covers.
3. Remove engine harness quick-disconnect (Figure 12-61).
4. Loosen two nuts and remove cover from junction box.

NOTE: Only remove engine harness leads from junction box studs.

5. Remove two nuts, lockwashers, washers, and one engine harness lead from each junction box stud. Reinstall remaining leads with two washers, lockwashers, and nuts.
6. Install junction box cover and tighten two nuts.
7. Disconnect harness connector from fuel pump fuse.
8. Disconnect harness connector from fuel pump relay.
9. Disconnect two harness connectors from fuel filter connectors.

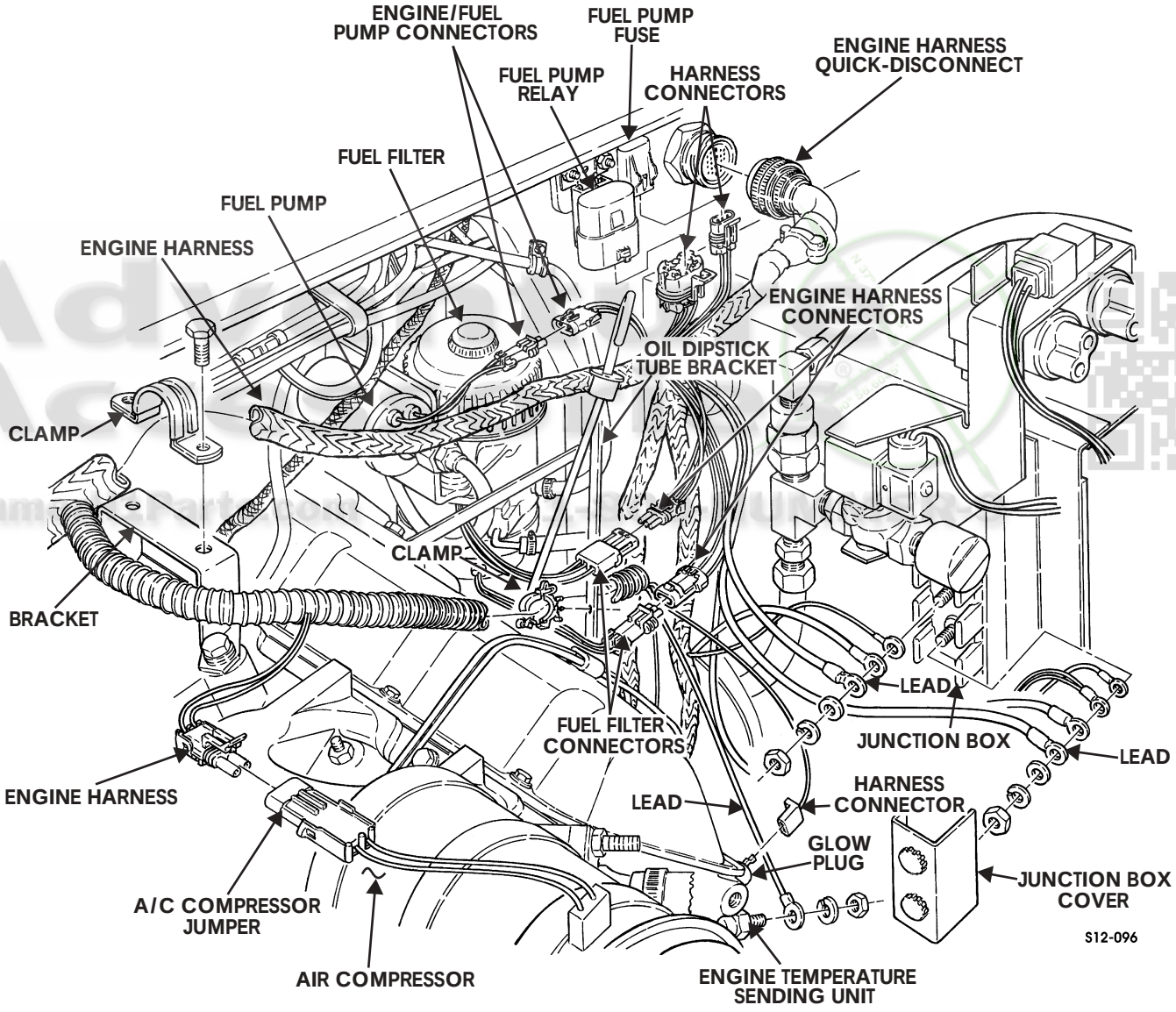

Figure 12-61: Engine Harness Connections

10. Disconnect harness connector from fuel pump connector.
11. Remove nut, lockwasher, and lead from engine temperature sending unit. Discard lockwasher.
12. Remove two capscrews and clamp securing engine harness to bracket.
13. Remove clamp from oil dipstick tube bracket.
14. Disconnect four harness connectors from left side glow plugs.
15. Disconnect engine harness from air conditioner compressor jumper harness connector.
16. Disconnect four harness connectors from right side glow plugs (Figure 12-62).
17. Disconnect harness connector from oil pressure switch.
18. Remove nut and three ground leads from right rear engine ground point.
19. Remove nut and clamp securing harness to engine.
20. Remove screw and clamp securing engine harness to engine bracket.
21. Remove nut, lockwasher, washer, and lead from oil pressure sending unit. Discard lockwasher.
22. Disconnect harness connector from glow plug controller.
23. Pull back boot and remove nut and two leads from glow plug controller.

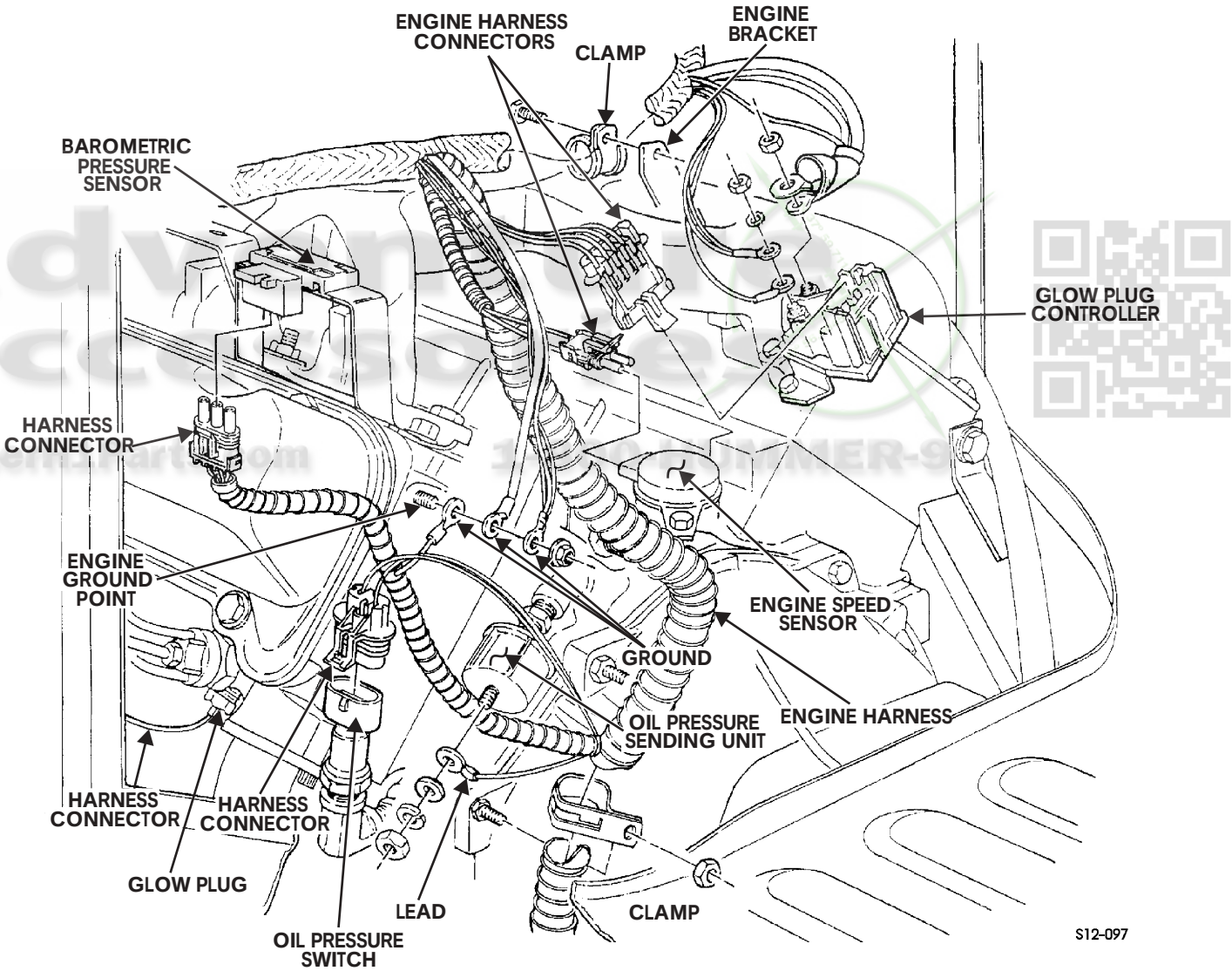

Figure 12-62: Engine Harness Connections

24. Remove nut, lockwasher, and two leads from glow plug controller. Discard lockwasher.
25. Disconnect harness connector from engine speed sensor.
26. Disconnect harness connector from barometric pressure sensor.
27. Disconnect harness connector from cold-advance/fast-idle switch (Figure 12-63).

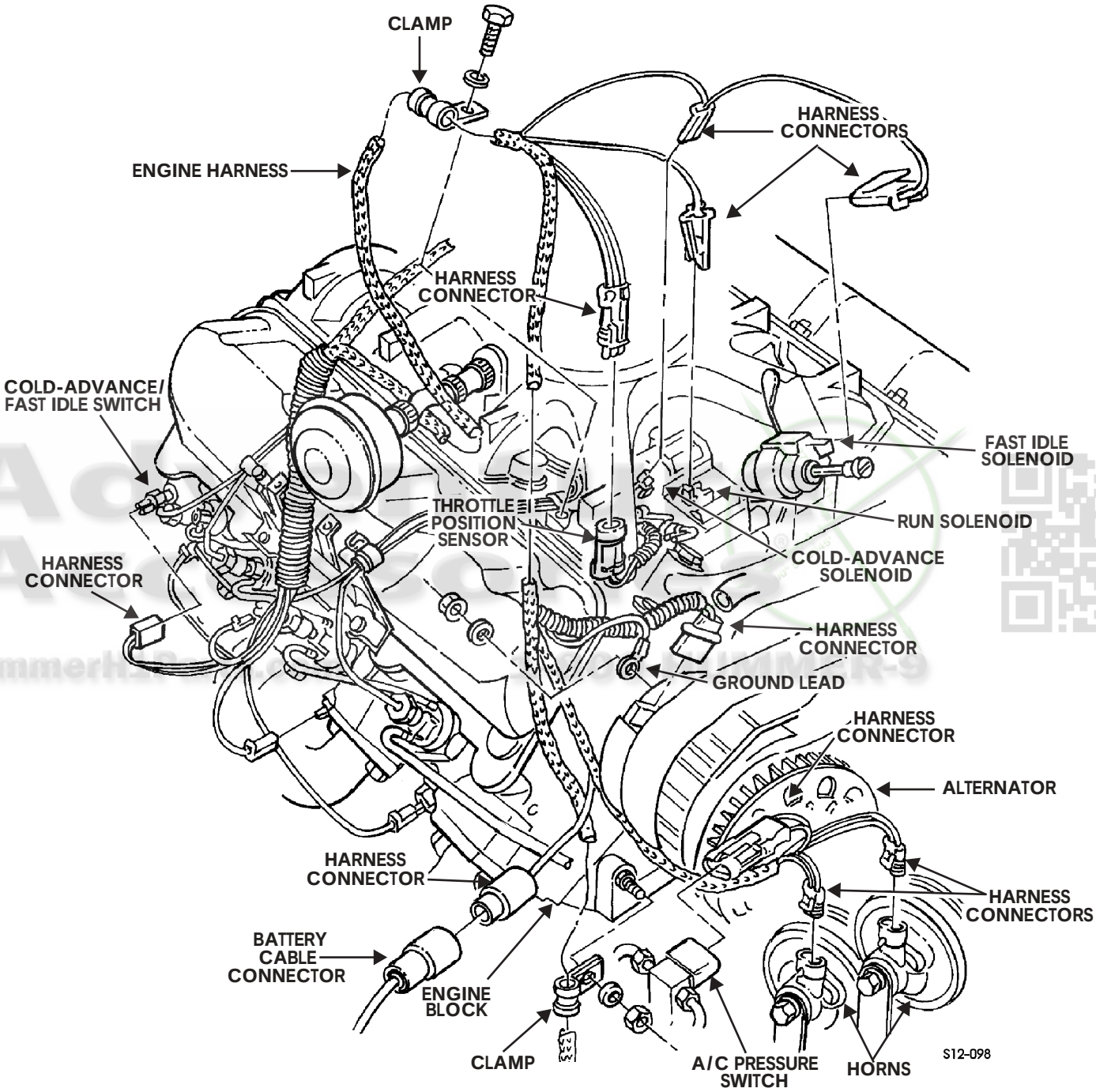

Figure 12-63: Engine Harness Connectors

28. Disconnect three harness connectors from idle, cold-advance, and run solenoids.
29. Disconnect harness connector from throttle position sensor connector.
30. Remove nut, washer, clamp, and engine harness from engine block.
31. Remove nut, washer, and ground lead from back of alternator.

32. Disconnect two harness connectors from horns.
33. Disconnect harness connector from A/C pressure switch.
34. Disconnect engine harness from battery cable connector.
35. Remove screw, washer, clamp, and engine harness from engine.
36. Disconnect harness connector from alternator.
37. Remove capscrew, nut, clamp, and engine harness from oil pan bracket (Figure 12-64).

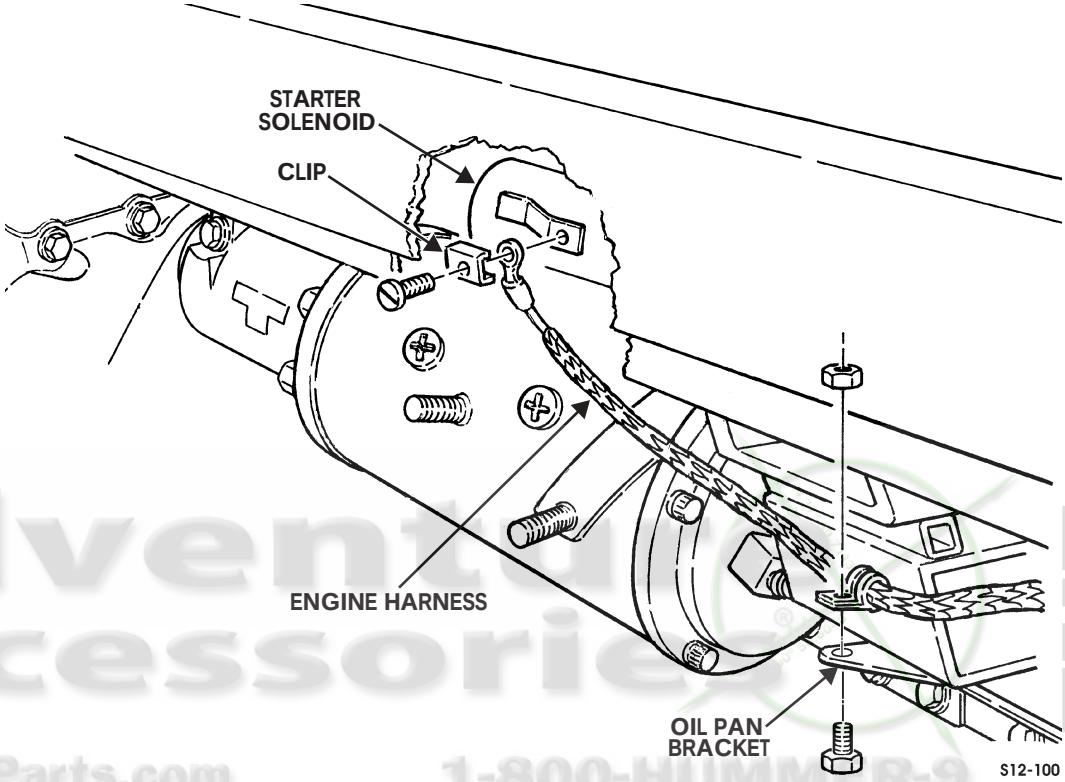

Figure 12-64: Starter Solenoid Connections

38. Disconnect harness connector from transmission input speed sensor (Figure 12-65).
39. Disconnect harness connector from transmission speed output speed sensor.
40. Disconnect engine harness from transmission connector.
41. Disconnect harness connector from transfer case lock switch.
42. Disconnect engine harness connector from vehicle speed sensor.
43. Remove two clamps and engine harness from transmission.
44. Remove screw, two washers, nut, clamp and engine harness from transfer case bracket.
45. Remove screw, clip, and engine harness from starter solenoid (Figure 12-64).

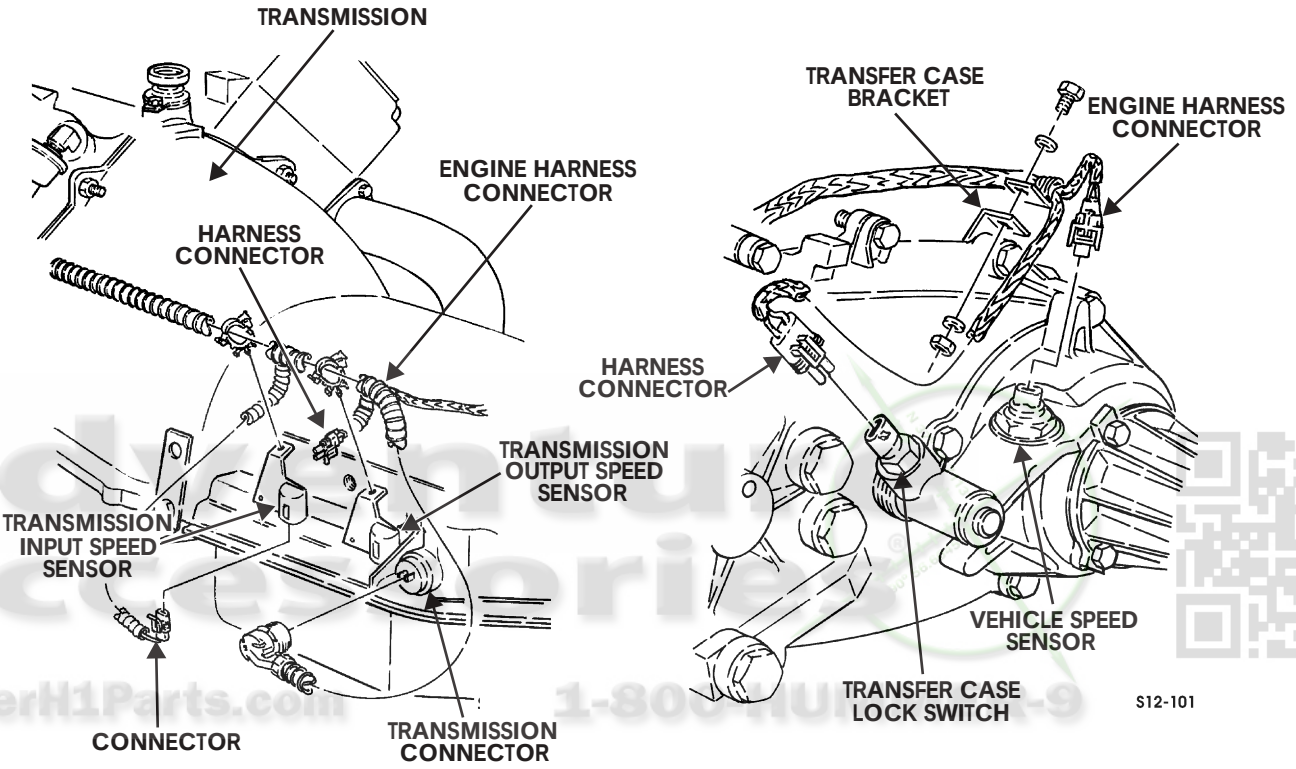

Figure 12-65: Transmission and Transfer Case Connections

46. Disconnect two harness connectors from transmission control module (Figure 12-66).
47. Disconnect harness connector from digital ratio adapter.
48. Remove grommet and engine harness from vehicle body.
49. Disconnect engine harness from body harness and carefully remove engine harness from vehicle.

Installation

1. Carefully place engine harness in position on vehicle and connect engine harness to body harness.
2. Connect harness connector to digital ratio adapter (Figure 12-66).
3. Connect two harness connectors to transmission control module.

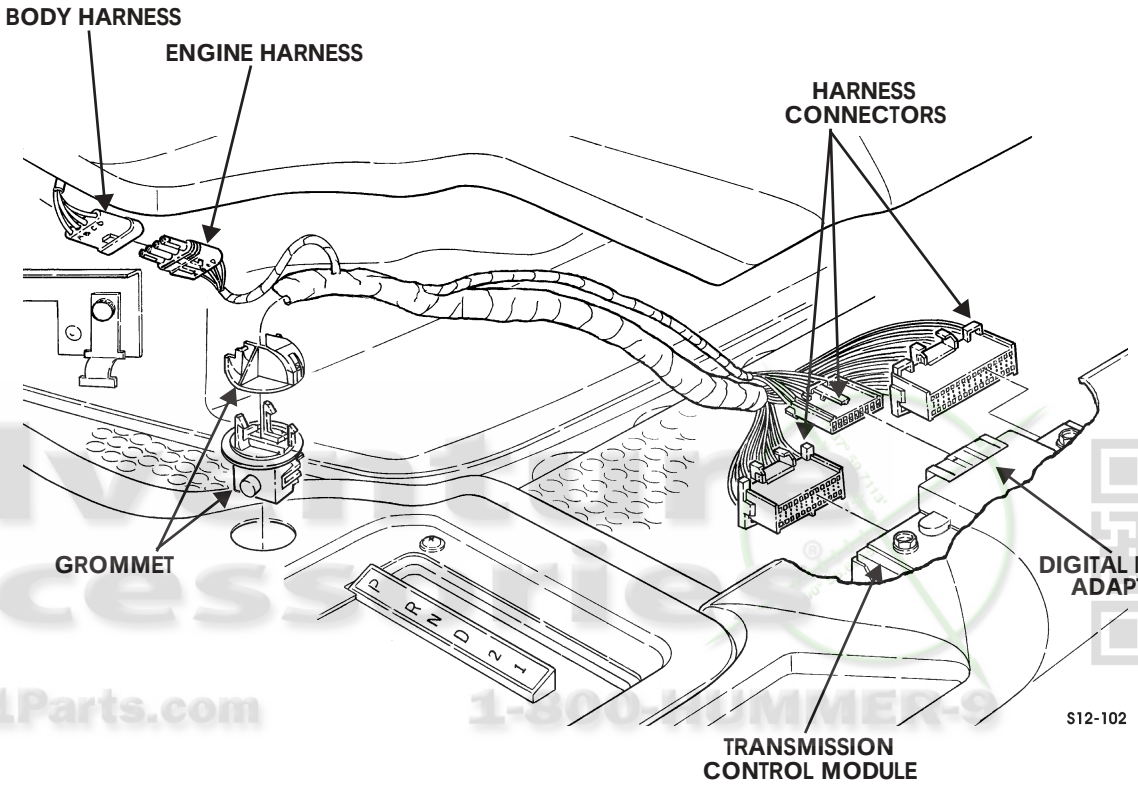

Figure 12-66: TCM and Digital Ratio Adapter

4. Install grommet and engine harness on vehicle body.
5. Install engine harness and clip on starter solenoid with screw (Figure 12-67).
6. Install engine harness and clamp on oil pan bracket with capscrew and nut.

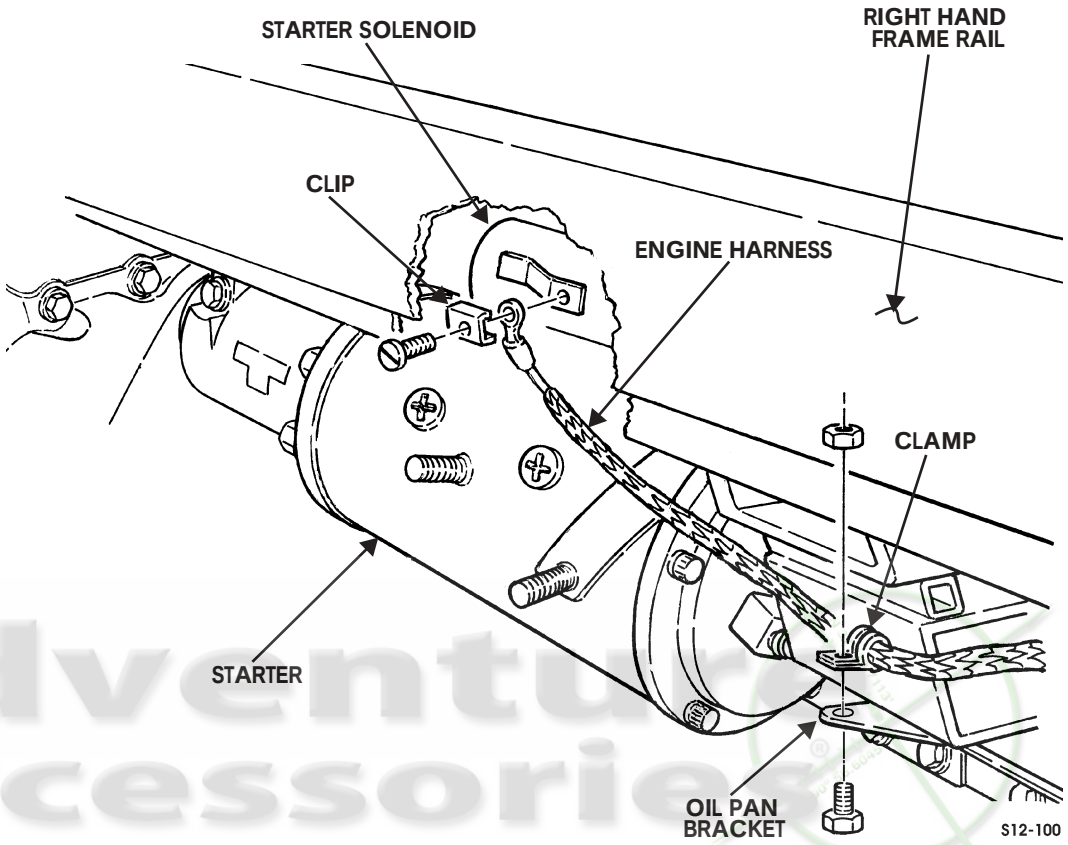

Figure 12-67: Starter Solenoid Connections

7. Install engine harness on transfer case bracket with washer, capscrew, clamp, washer, and nut (Figure 12-68).
8. Install two clamps and engine harness on transmission.
9. Connect engine harness connector to vehicle speed sensor.
10. Connect harness connector to transfer case lock switch.
11. Connect engine harness to transmission connector.
12. Connect engine harness connector to transmission output speed sensor.

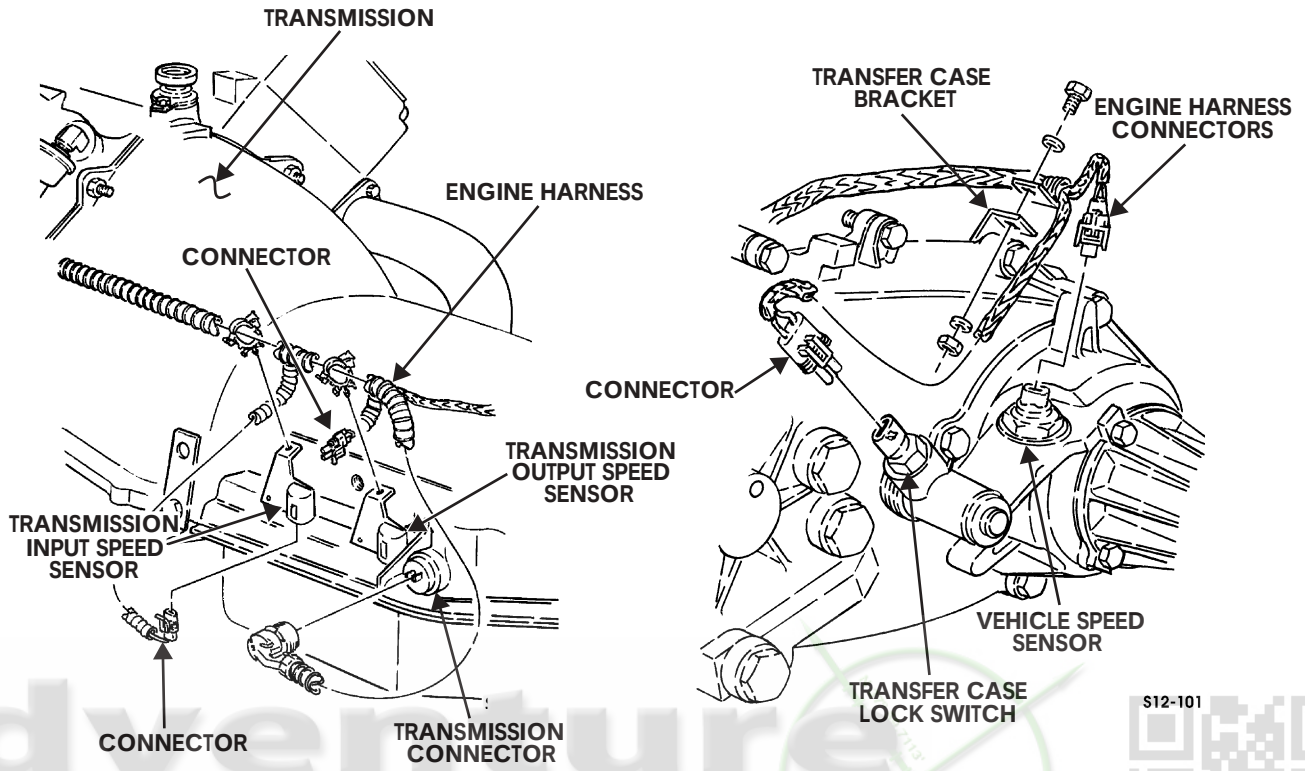

Figure 12-68: Transmission and Transfer Case Connections

13. Connect engine harness connector to transmission input speed sensor.
14. Connect harness connector to alternator (Figure 12-69).
15. Install engine harness on engine block with clamp, washer, and nut.
16. Connect engine harness to battery cable connector.
17. Connect harness connector to A/C pressure switch.
18. Connect two harness connectors on horns.
19. Install ground lead on back of alternator with washer and nut.
20. Install engine harness on engine with clamp, washer, and screw.
21. Connect harness connector on throttle position sensor connector.
22. Connect three harness connectors to fast-idle, cold-advance, and run solenoids.
23. Connect harness connector to cold advance/fast idle switch

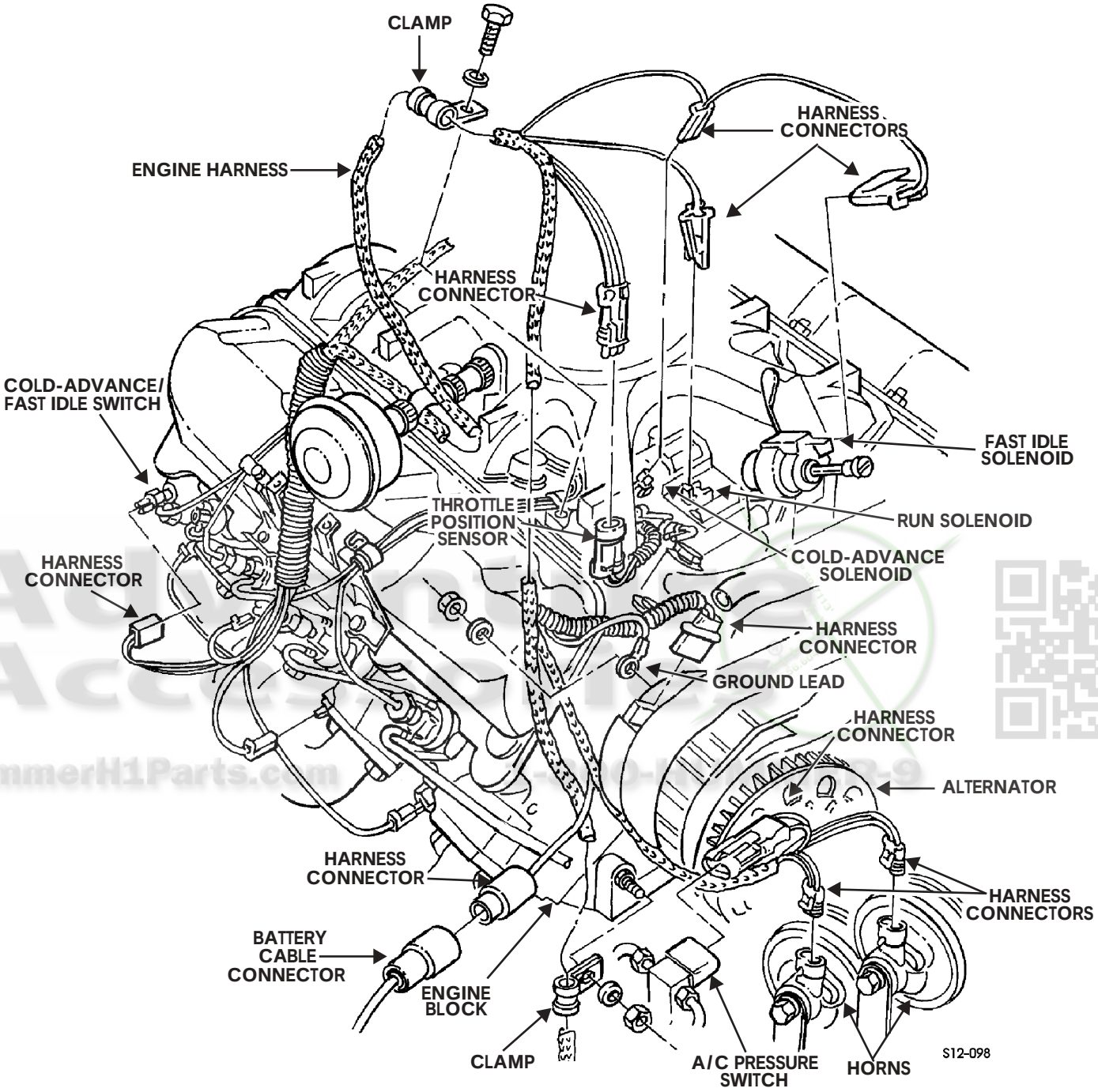

Figure 12-69: Engine Harness Connections

24. Connect harness connector to barometric pressure sensor (Figure 12-70).
25. Connect harness connector to engine speed sensor.
26. Install two leads on glow plug controller with lockwasher and nut.
27. Install two leads on glow plug controller with nut and cover with boot.
28. Connect harness connector to glow plug controller.
29. Install lead on oil pressure sending unit with washer, lockwasher, and nut.
30. Install engine harness on engine bracket with clamp and screw.
31. Install engine harness on engine with clamp and nut.
32. Install three ground leads on right rear engine ground point with nut.
33. Connect harness connector to oil pressure switch.
34. Connect four harness connectors at right side glow plugs.

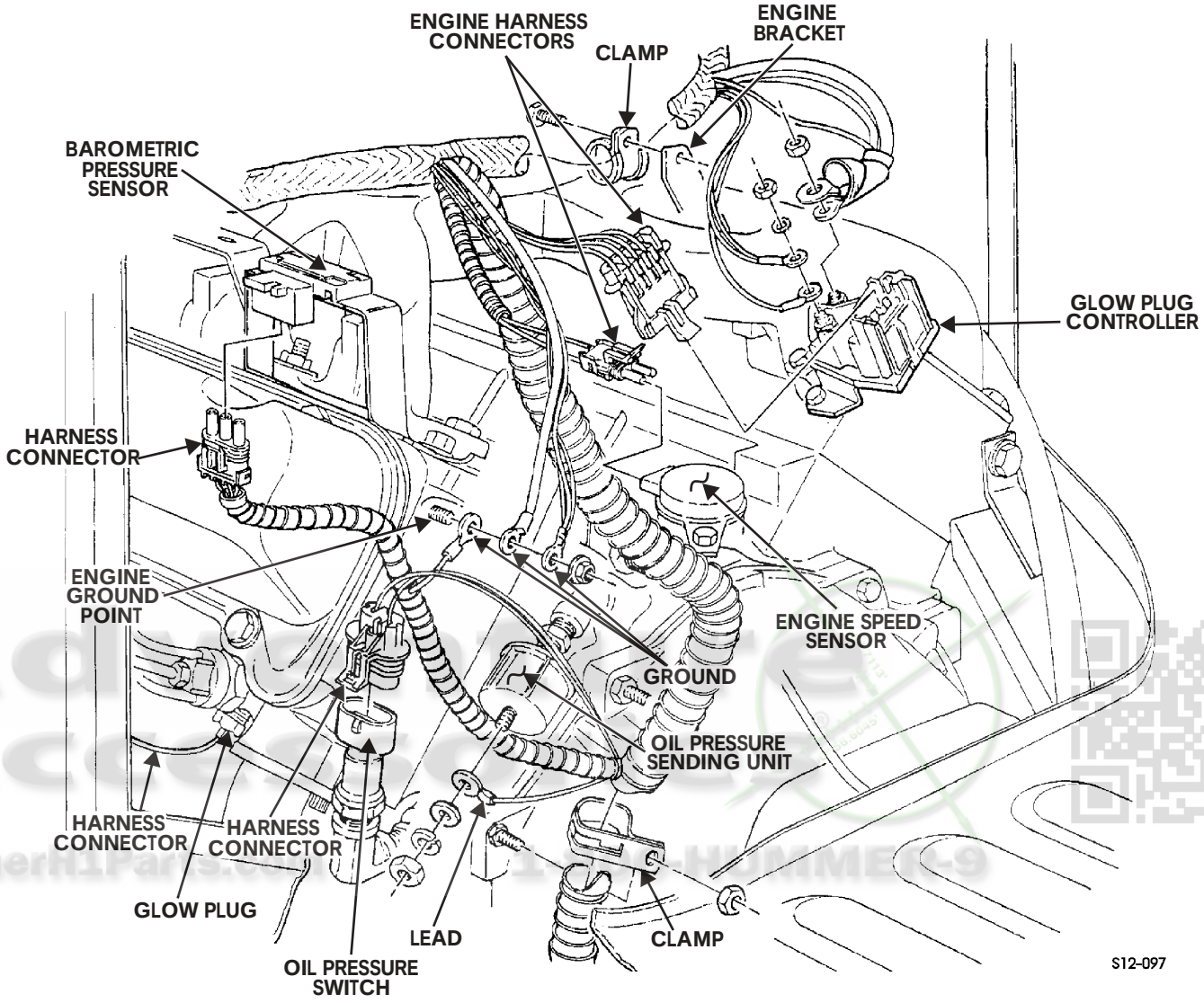

Figure 12-70: Engine Harness Connections

35. Connect engine harness to A/C compressor jumper harness connector (Figure 12-71).
36. Connect four harness connectors to left side glow plugs.
37. Install clamp and engine harness on oil dipstick tube bracket.
38. Install engine harness on bracket with clamp and two capscrews.
39. Install lead on engine temperature sending unit with lockwasher and nut.
40. Connect engine harness connector to fuel pump connector.
41. Connect two harness connectors to fuel filter connectors.
42. Connect harness connector to fuel pump relay.
43. Connect harness connector to fuel pump fuse.
44. Loosen two nuts and remove cover from junction box.
45. Install two engine harness leads on junction box studs with two washers, lockwashers, and nuts.
46. Install junction box cover and tighten two nuts.
47. Install engine harness quick-disconnect.
48. Install engine access covers.
49. Connect battery ground cable.
50. Remove tags from engine harness.

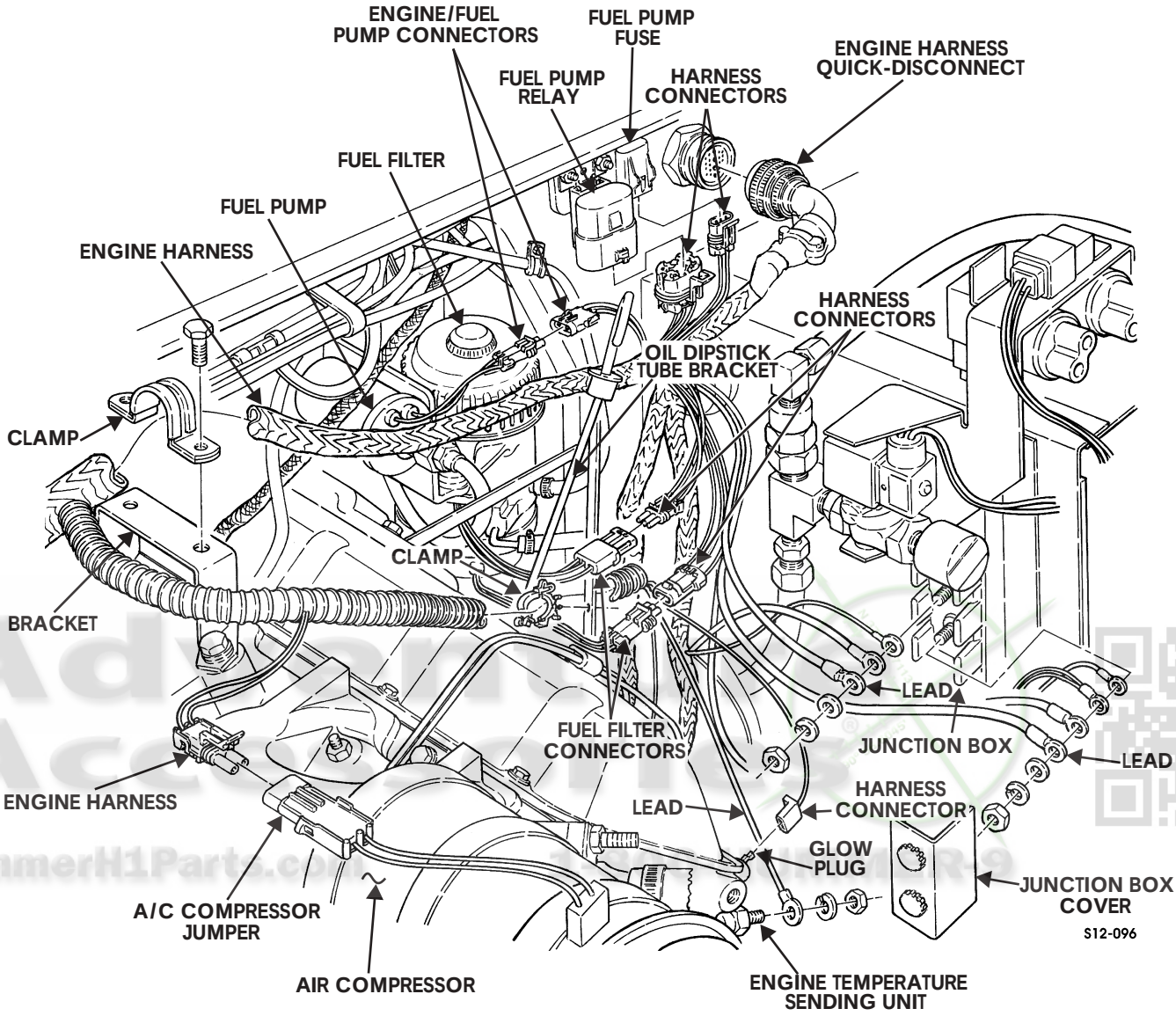

Figure 12-71: Engine Harness Connections

BODY WIRING HARNESS REPLACEMENT

Removal

1. Disconnect battery ground cable.
2. Remove eight screws and two gauge panels from instrument panel (Figure 12-72)
3. Remove eleven nuts and lockwashers from four gauges and remove fifteen body wiring harness gauge leads.
4. Disconnect two body wiring harness gauge illumination leads.
5. Remove eleven nuts and lockwashers from four gauges and remove fifteen body wiring harness gauge leads.
6. Disconnect two body wiring harness gauge illumination leads (Figure 12-73).
7. Remove body wiring harness connectors from rear of instrument panel (Figures 12-74 and 12-75).

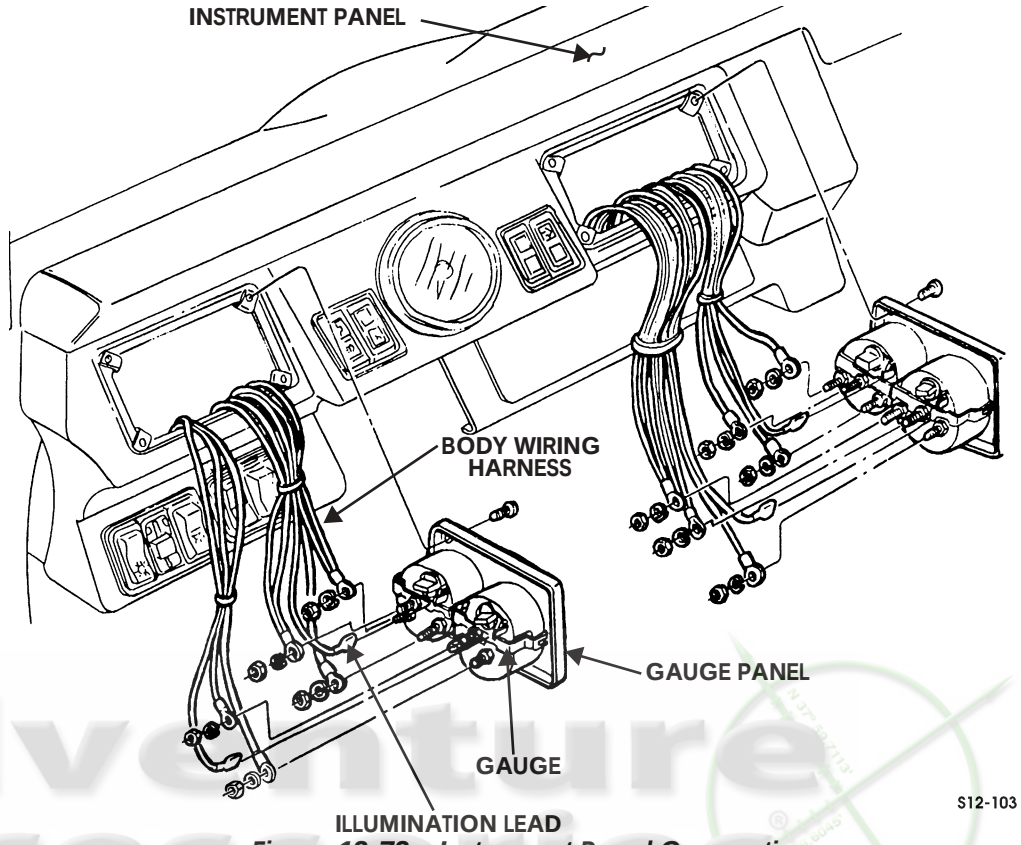

Figure 12-72: Instrument Panel Connections

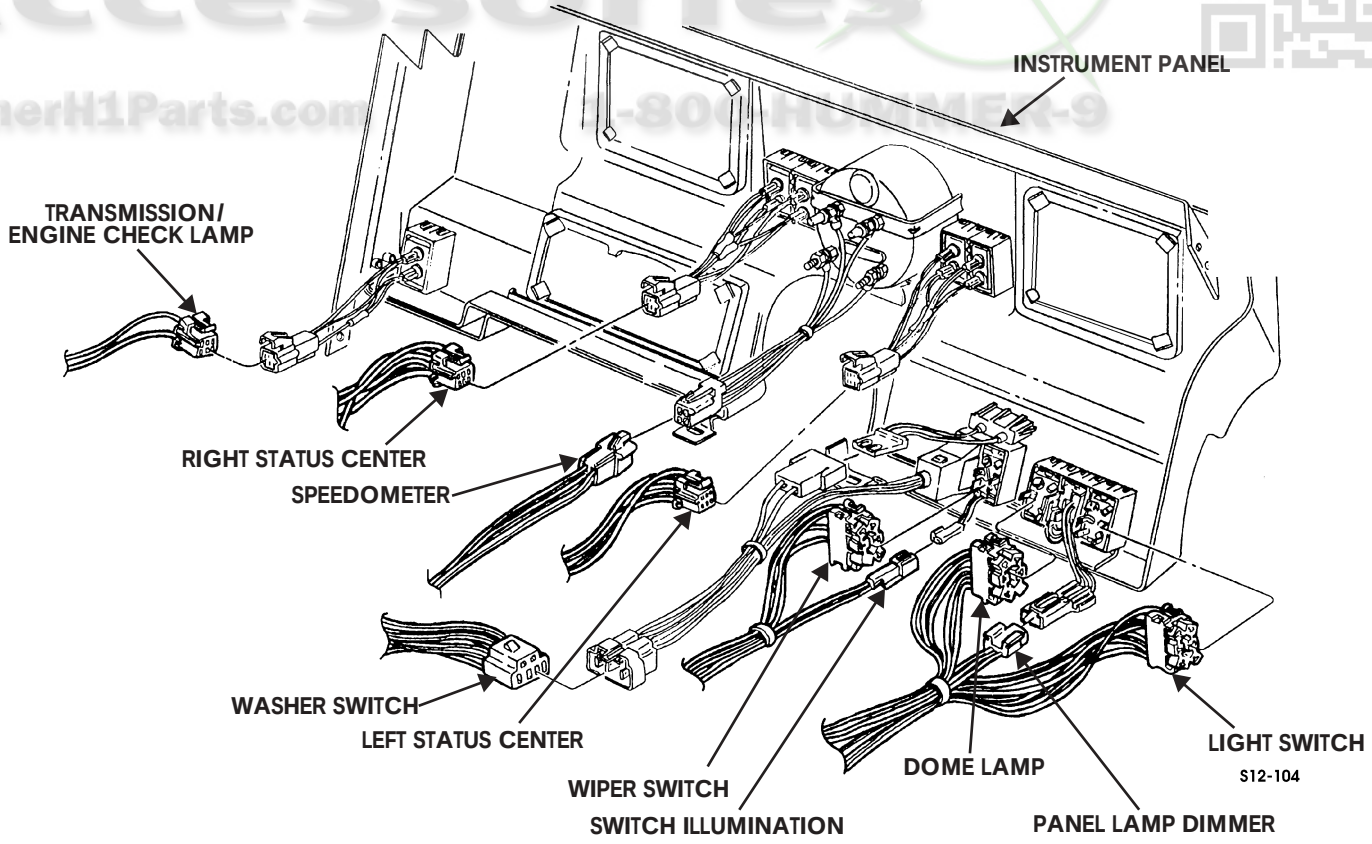

Figure 12-73: Status Center and Switch Connections

8. Remove harness connectors from jumper harness (not shown) if power windows or power mirrors are installed.
9. Remove nut and ground leads from ground stud (Figure 12-74).
10. Remove body wiring harness connectors from radio, engine console, and heating and air conditioning controller (Figure 12-75).

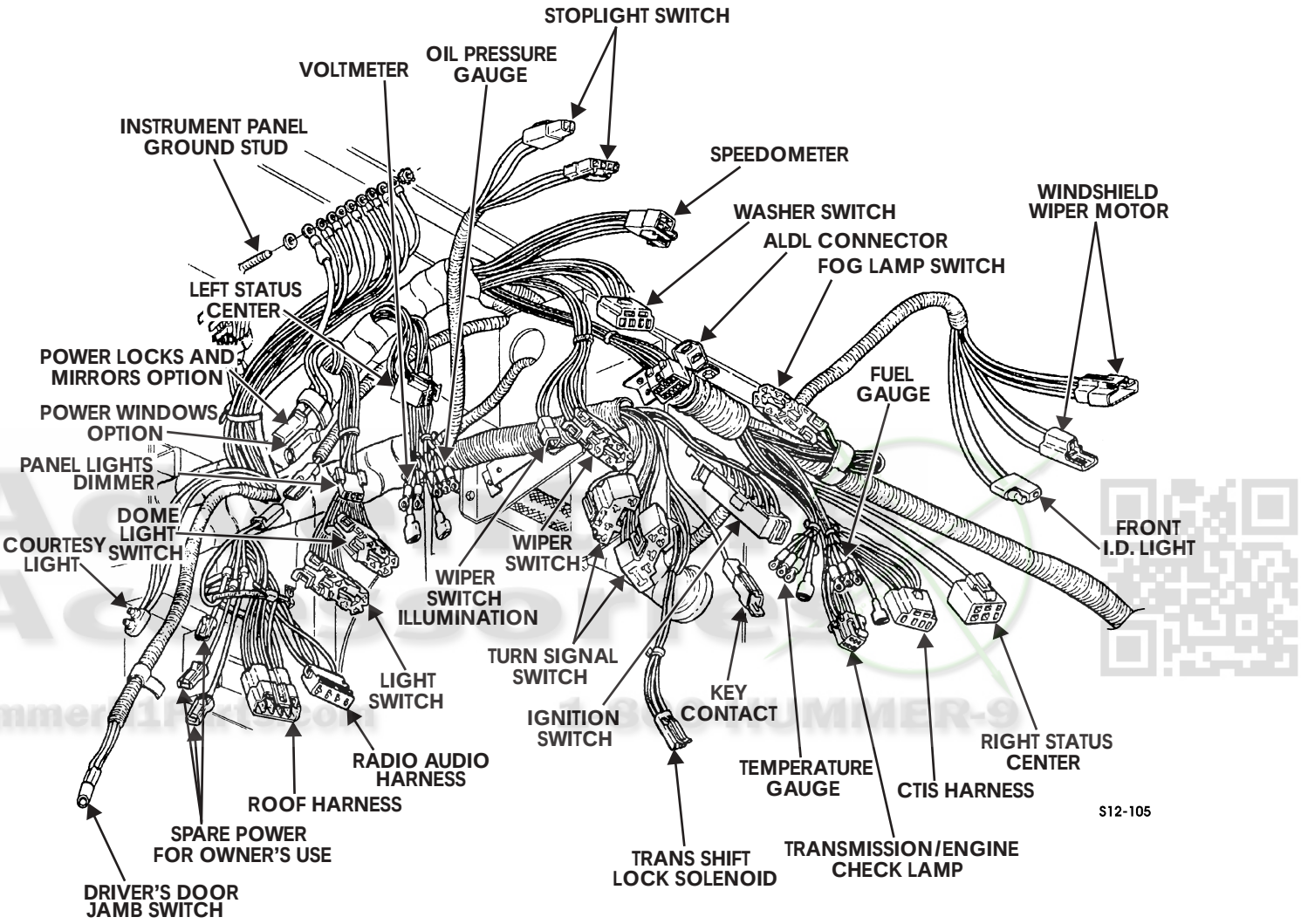

Figure 12-74: Body Harness-to-Dash Connections

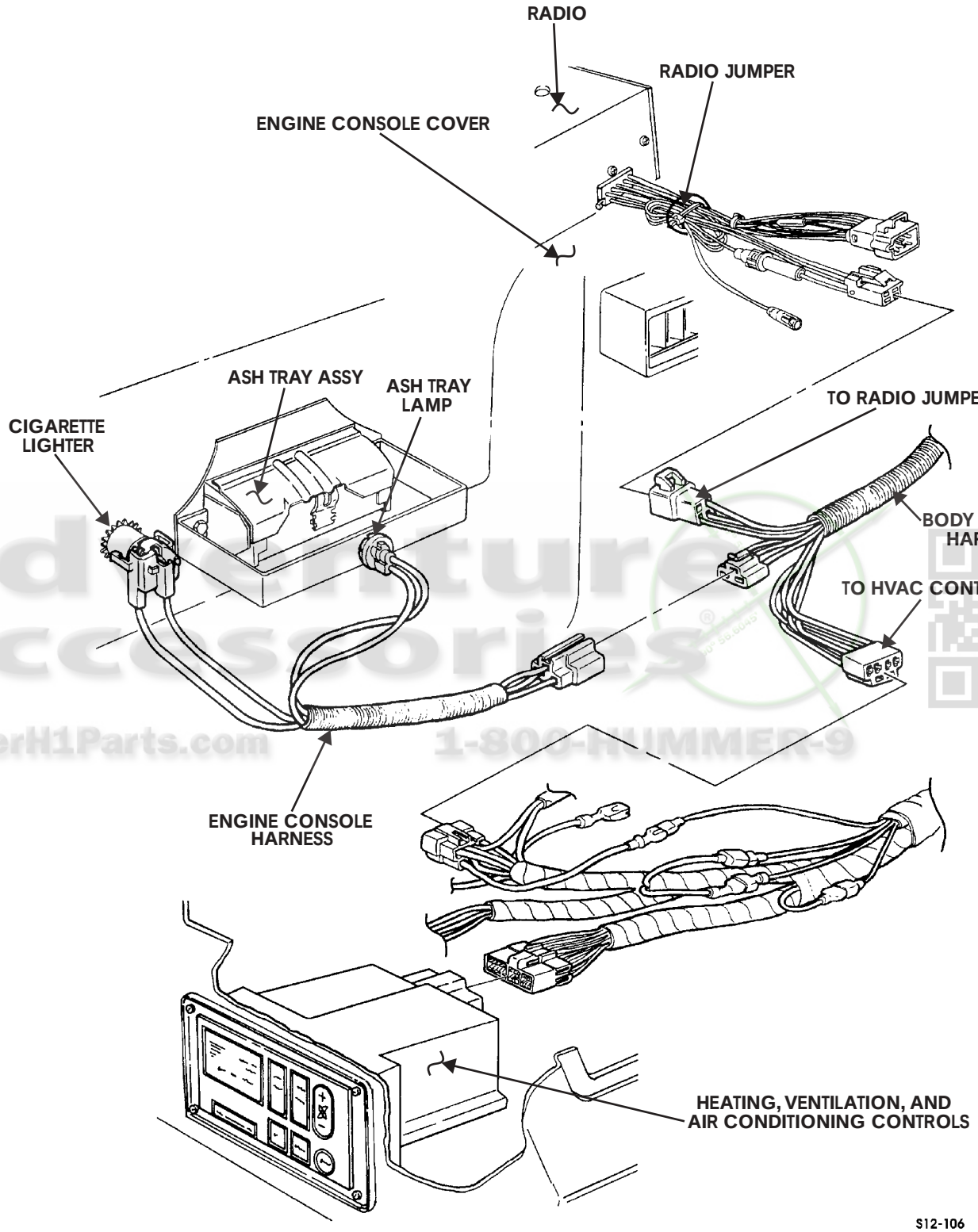

Figure 12-75: Engine Cover Console Connections

11. Remove body wiring harness connectors from turn signals, ignition, and key contact connectors on steering column (Figure 12-76).
12. Remove cable tie securing body harness to steering column support bracket. Discard cable tie.
13. Remove screw, nut, and two body wiring harness ground leads from steering column.

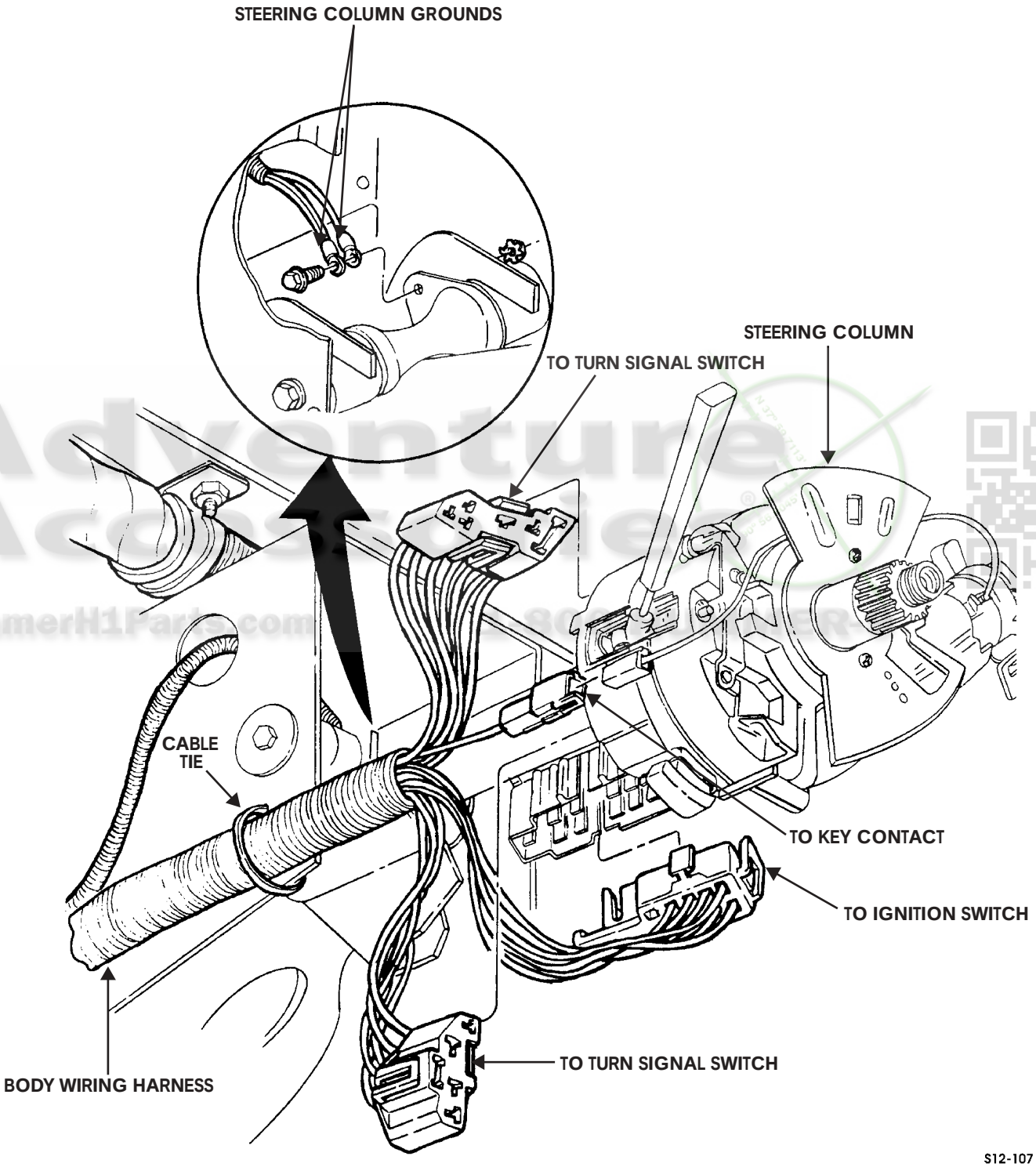

Figure 12-76: Steering Column Connections

14. Remove body wiring harness connectors from door jamb switch and roof harness connector (Figure 12-77).

15. Remove body wiring harness connectors from door jamb Remove body wiring harness connector from stoplight switch (Figure 12-78).

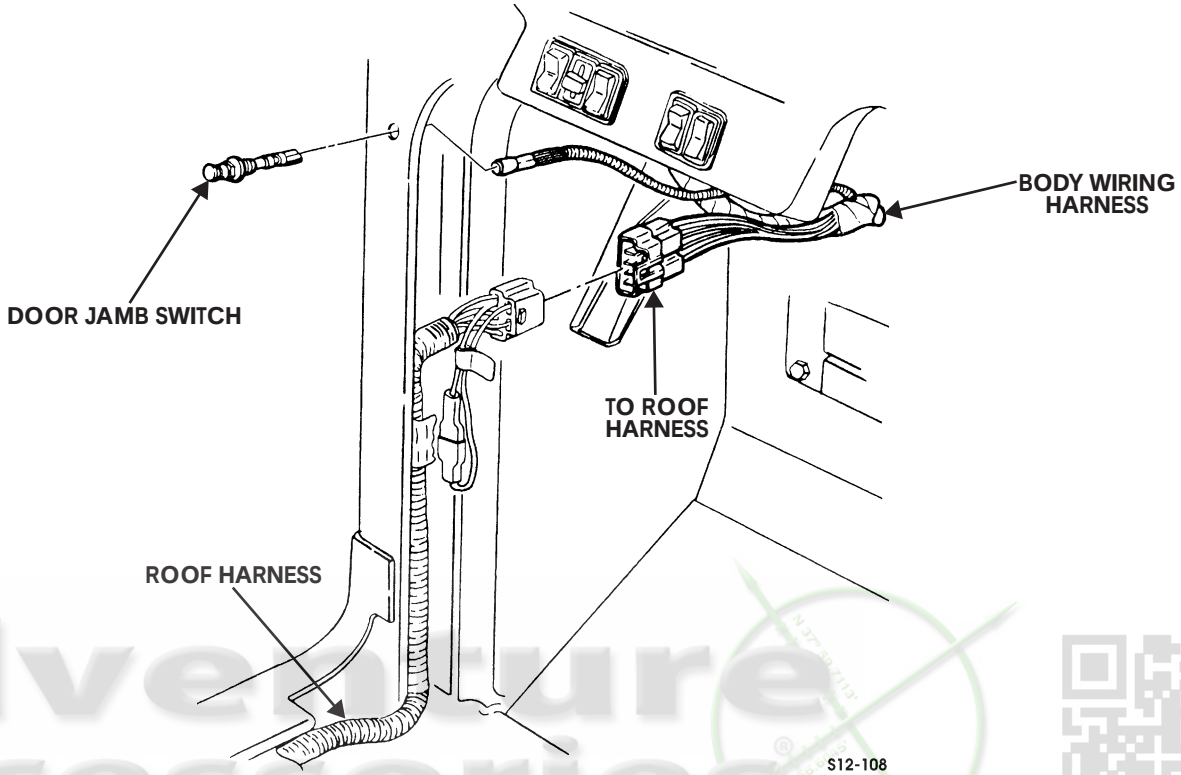

Figure 12-77: . Body Harness-to-Roof Harness Connection

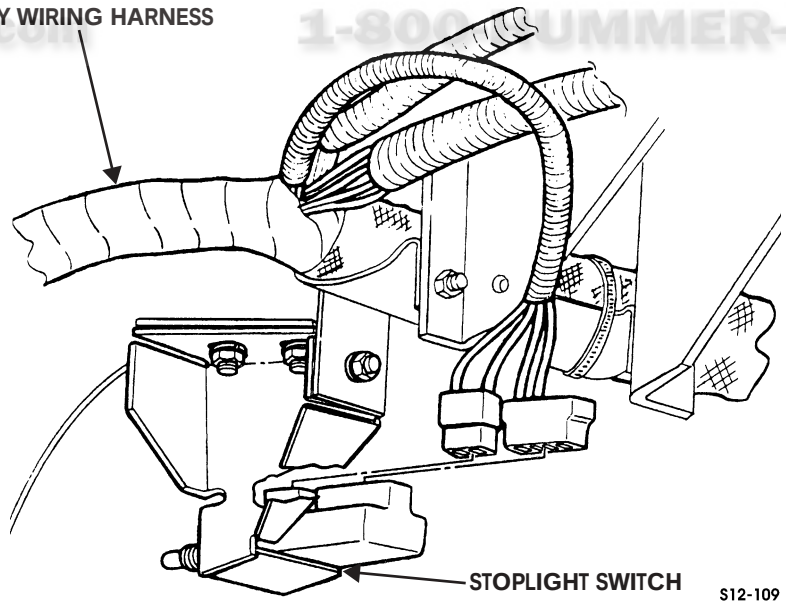

Figure 12-78: Stoplight Switch Connections

16. Remove body wiring harness connectors from wiper motor and front identification light jumper harness (Figure 12-79).

17. Remove body wiring harness connectors from transmission shift lock solenoid connector (Figure 12-80).

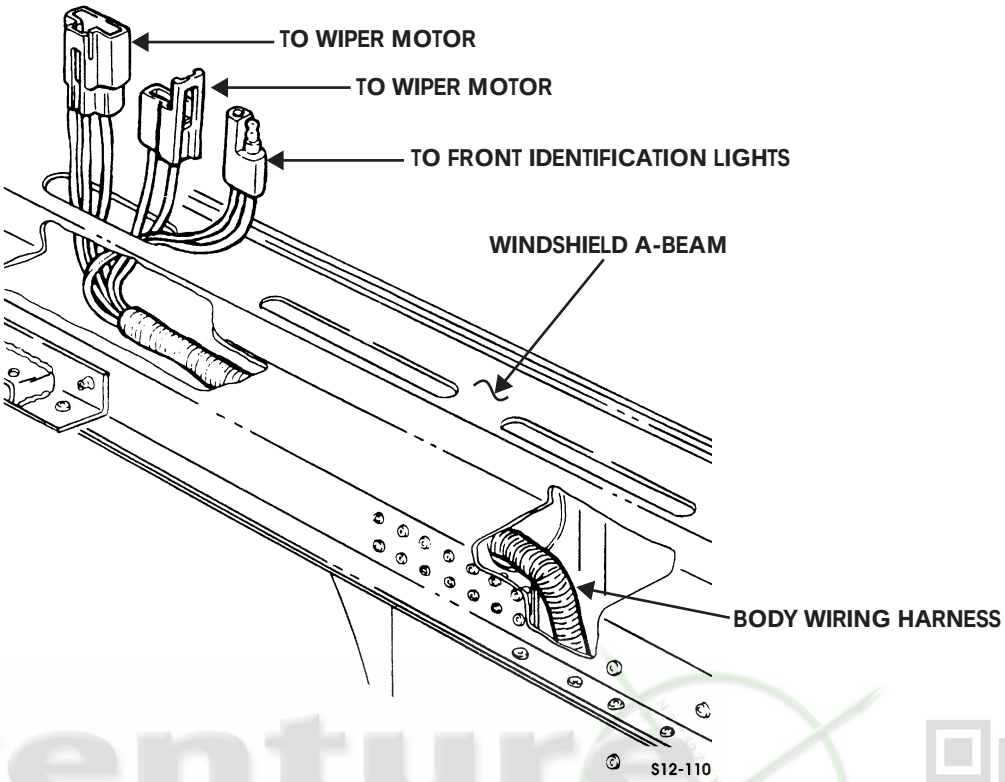

Figure 12-79: Windshield Frame Connections

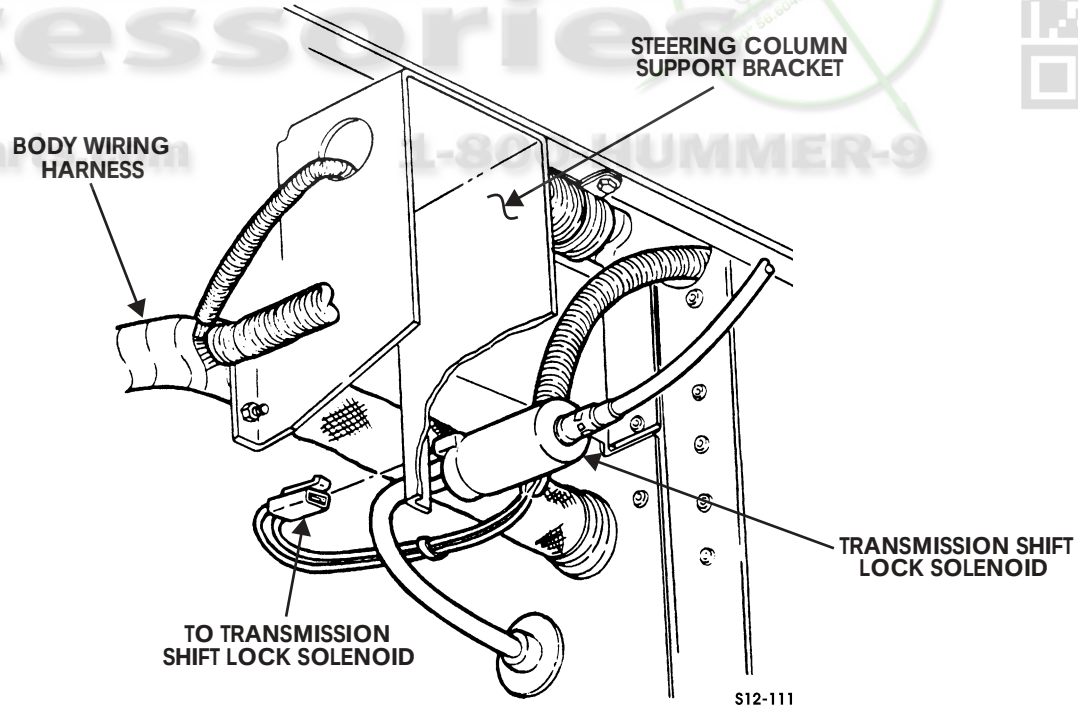

Figure 12-80: Shifter Interlock

NOTE: Fuse box is an integral part of the body wiring harness.

18. Remove two screws, lockwashers, washers, fuse box, and body wiring harness from supports on body. Discard lockwashers (Figure 12-81).

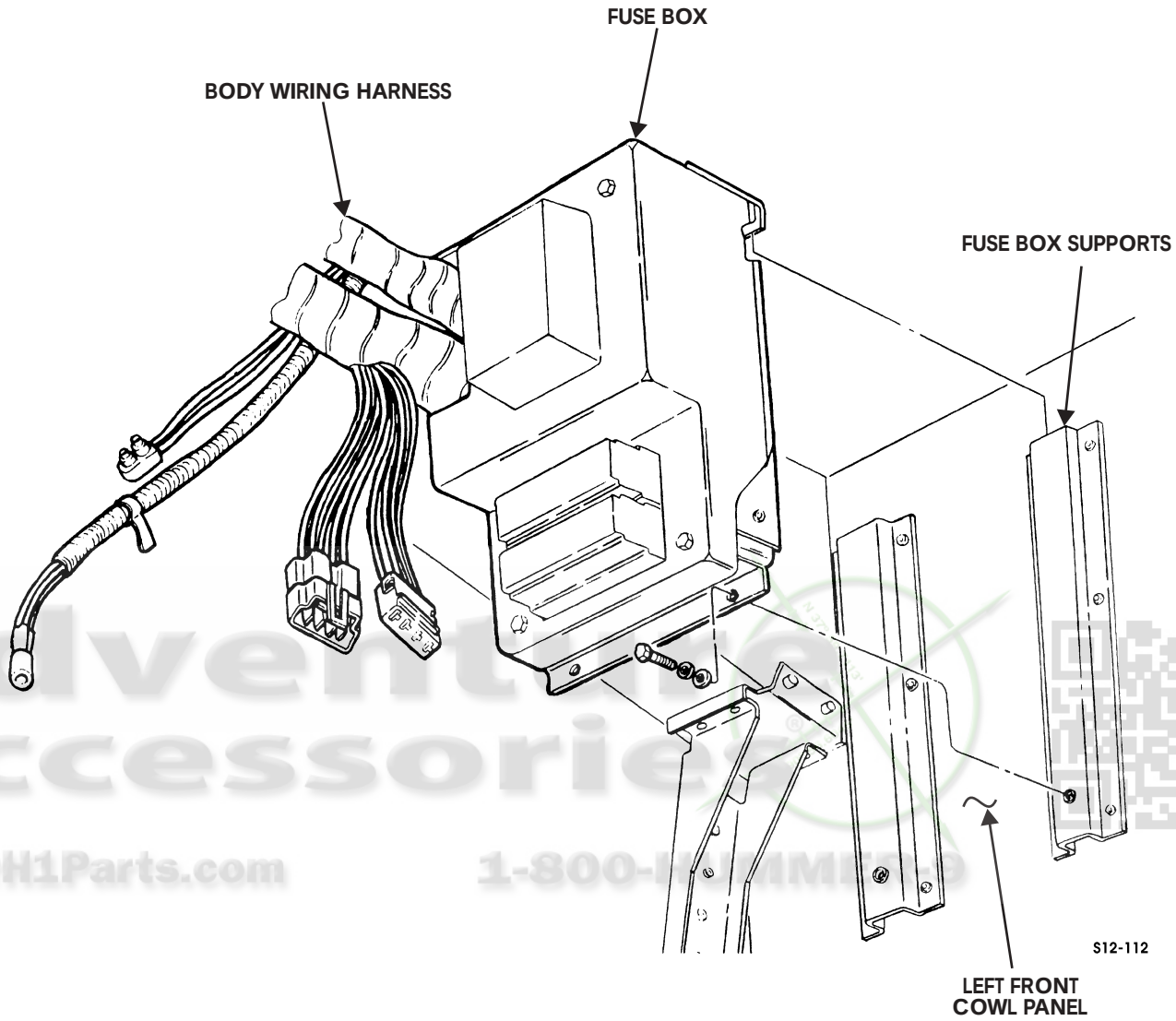

Figure 12-81: Fuse Box Mounting

19. Remove two screws and ALDL body wiring harness connector from support bracket (Figure 12-82).
20. Remove body wiring harness connector from cowl panel by first disconnecting engine connector then removing jamnut
21. Remove two tie straps, screws, lockwashers, washers, nuts, washers, harness support bracket and body wiring harness from steering column bracket.
22. Remove two screws, clamps and body wiring harness from A-beam..

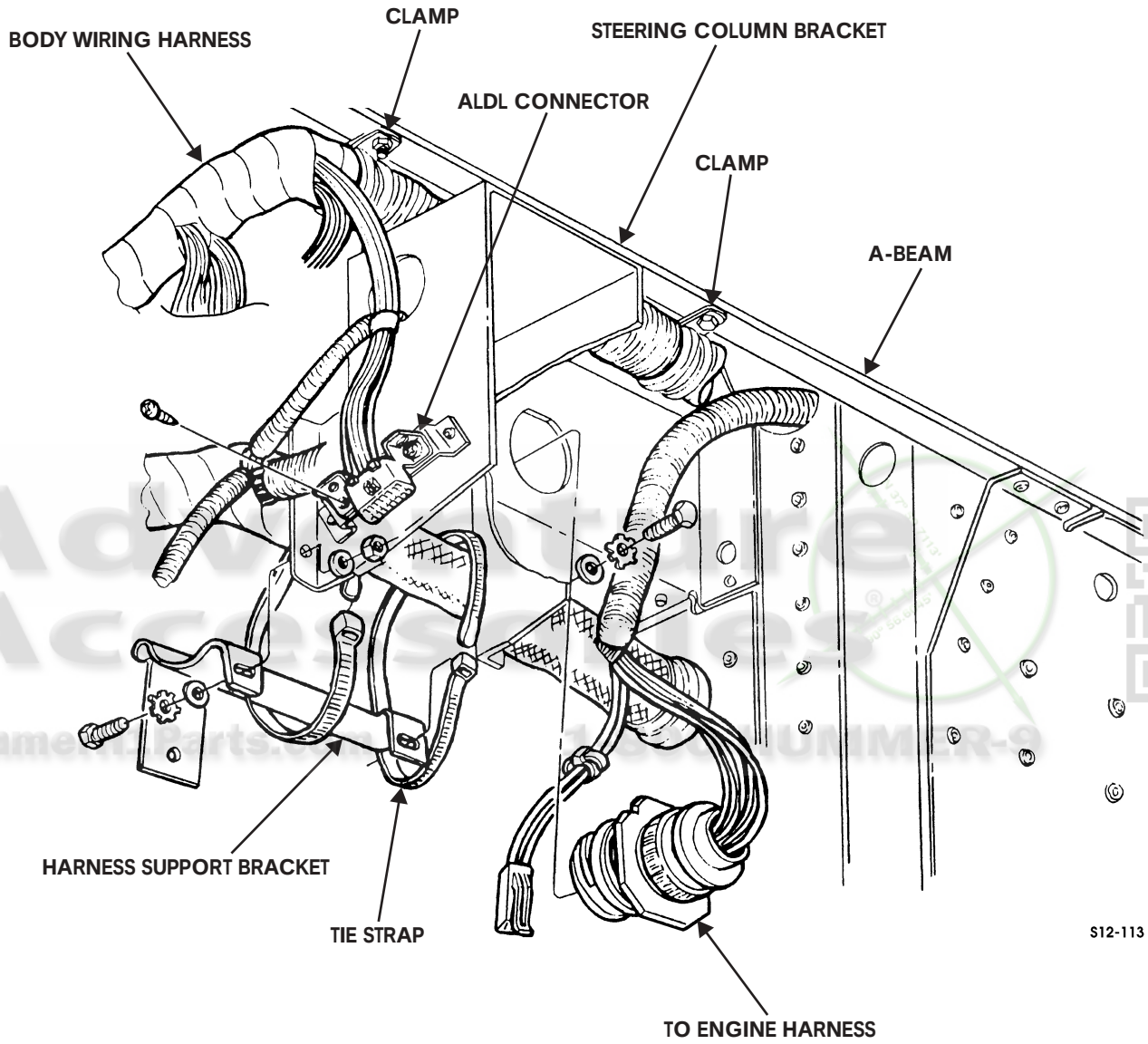

Figure 12-82: Body Harness Under Dash Mounting

23. Remove body wiring harness connector from windshield washer bottle (Figure 12-83).
24. Remove body wiring harness from CTIS harness connector, if installed.
25. Remove body wiring harness from trouble light harness, if installed.
26. Loosen two nuts and remove terminal block cover.
27. Remove two nuts, lockwashers, and washers from terminal block and remove body wiring harness power and ground leads. Discard lockwashers.
28. Install terminal block cover and tighten two nuts.
29. Remove body wiring harness connector from brake warning light switch.
30. Remove three screws, two nuts, three clamps, and two tie straps securing body wiring harness to left cowl inner panel.

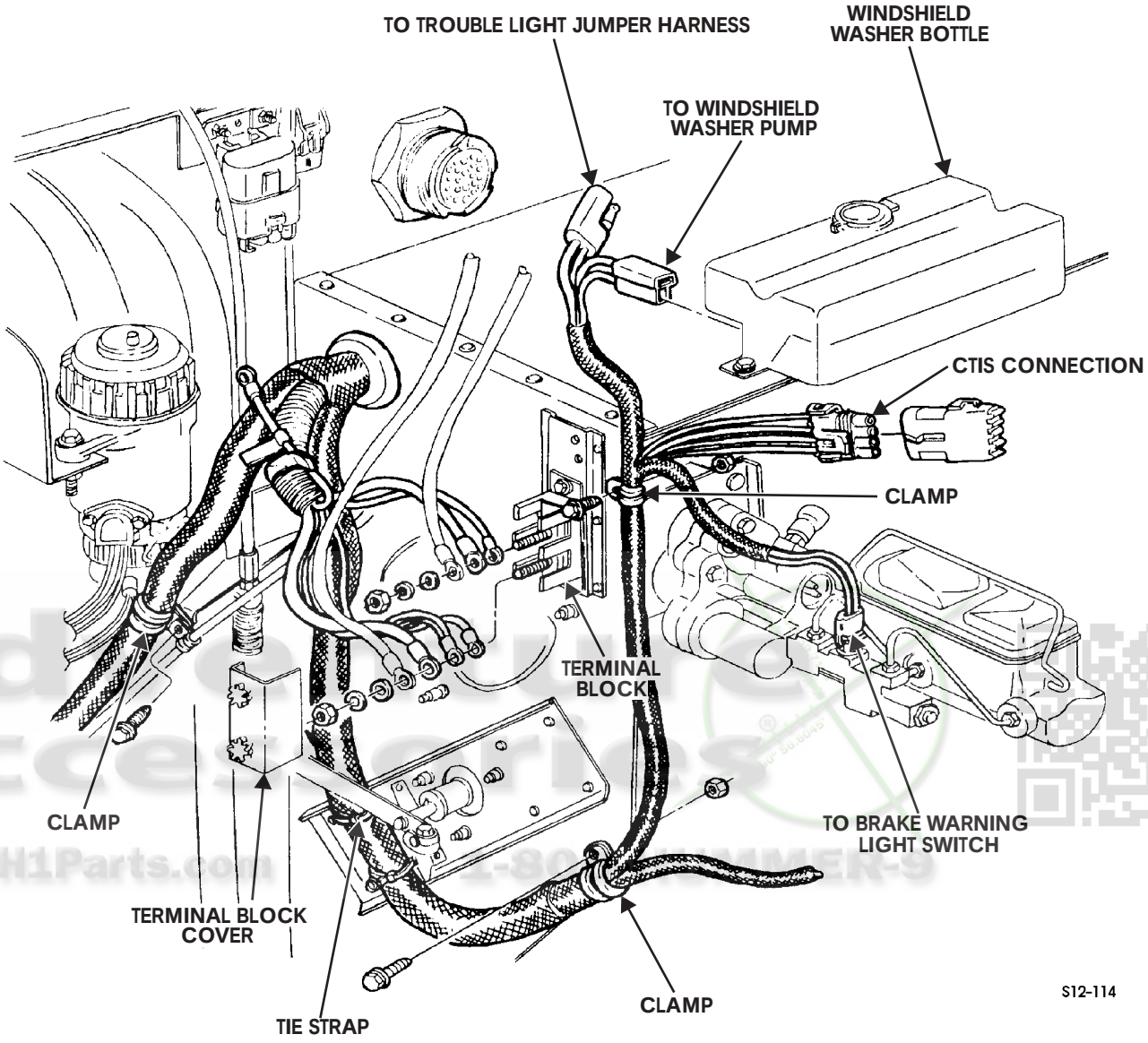

Figure 12-83: Underhood Connections

31. Remove two body wiring harness connectors from hood harness connectors (Figure 12-84).
32. Remove body wiring harness connector from fog lamp harness connector if installed.
33. Remove four screws, three nuts, four clamps and body wiring harness from splash shield and frame.
34. Remove body wiring harness connector from fuel tank sender harness (Figure 12-85).

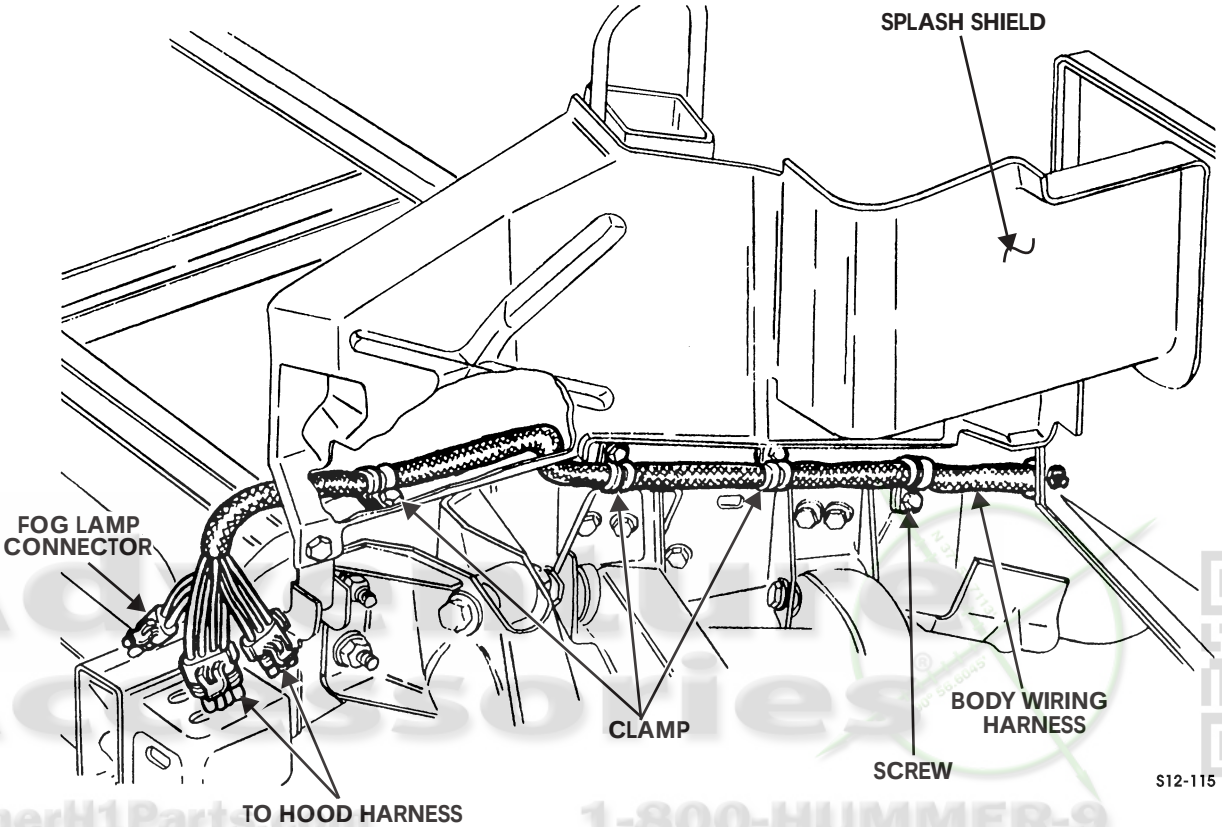

Figure 12-84: Harness to Splash Shield Retainers

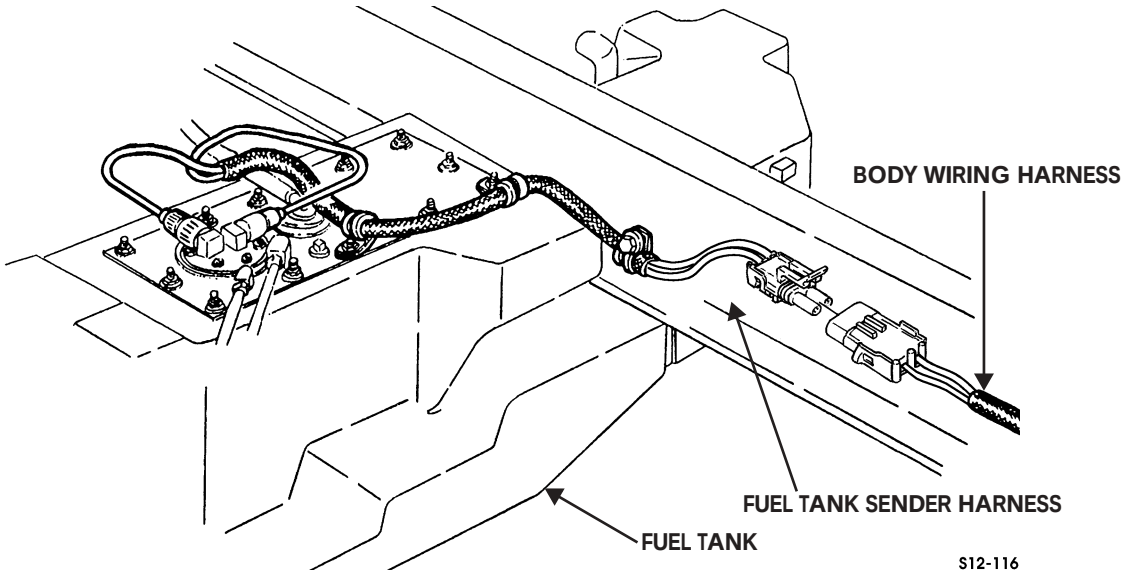

Figure 12-85: Fuel Tank Connections

35. Remove body wiring harness connector from trailer harness connector if installed. If no trailer harness exists, remove dummy plug from body wiring harness trailer connector (Figure 12-86).
36. Remove clamp and hardware.

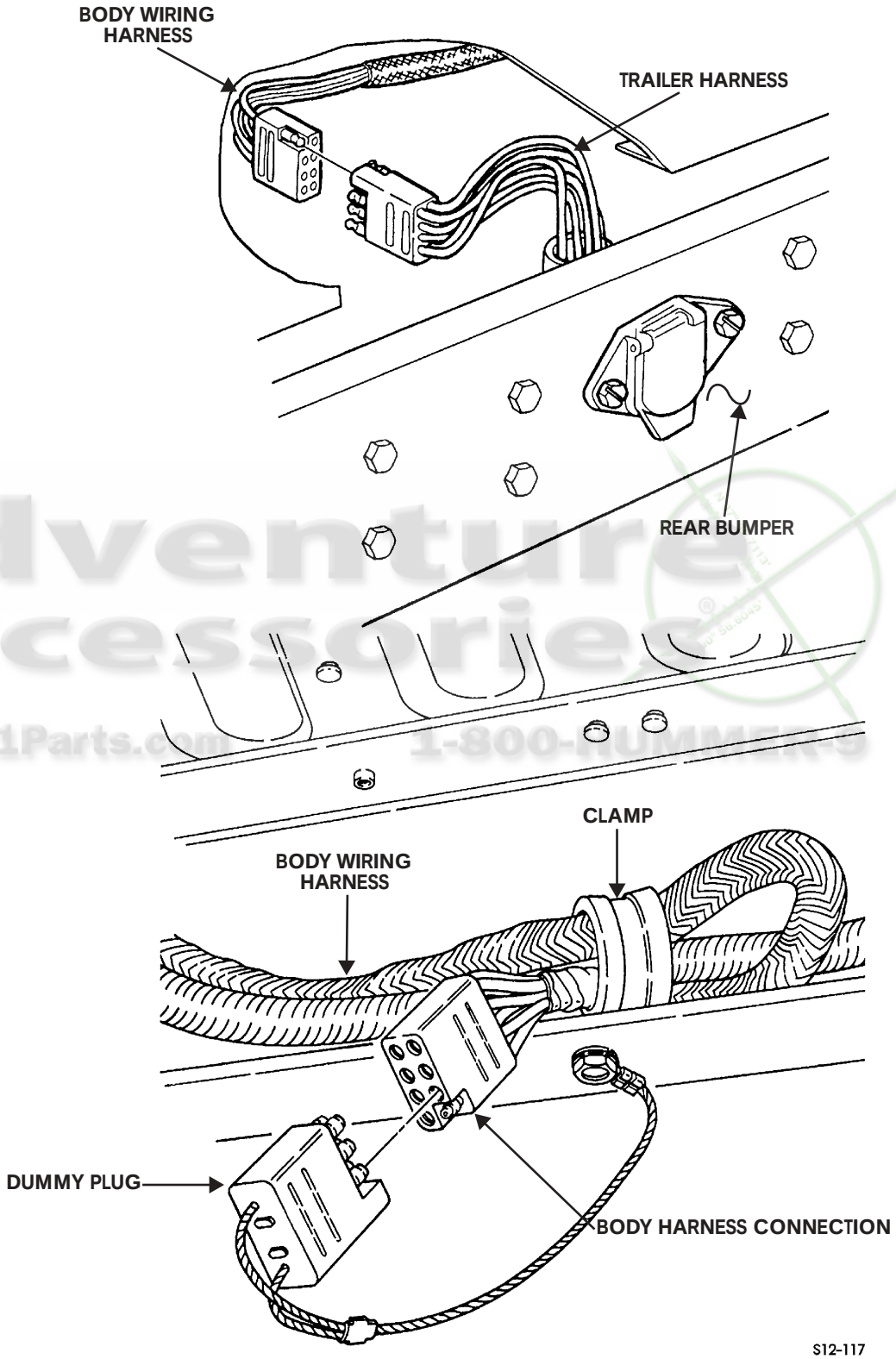

Figure 12-86: Trailer Jumper

37. Remove four screws, nuts and shield from body panel and body wiring harness clamps (Figure 12-87).
38. Remove locknut, washer, four body wiring harness ground leads, and washer from taillight. Discard locknut.
39. Remove two body wiring harness taillight connectors from taillight connectors.
40. Remove nut, washer, and body wiring harness ground lead from side marker light. Remove body wiring harness connector from side marker light.
41. Remove clamp, screw, nut and body wiring harness from D-beam.
42. Remove body wiring harness connector from clearance light.
43. Perform steps 37 through 42 for left side body wiring harness removal.

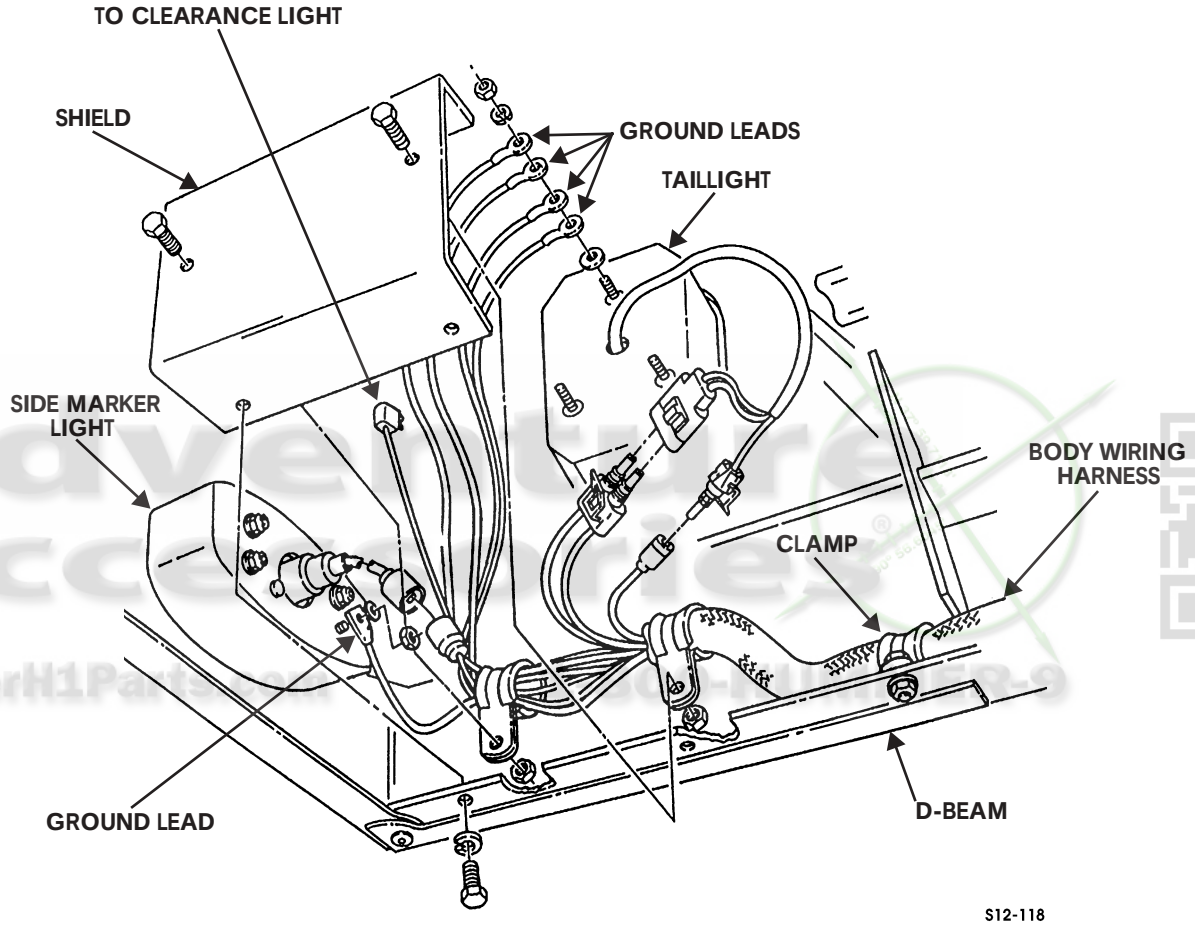

Figure 12-87: Marker and Taillight Connections

44. Remove two screws and rear identification light bar from vehicle. Remove body wiring harness connector from rear identification light bar (Figure 12-88)

45. .Remove body wiring harness connector from rear license plate light (Figure 12-89).

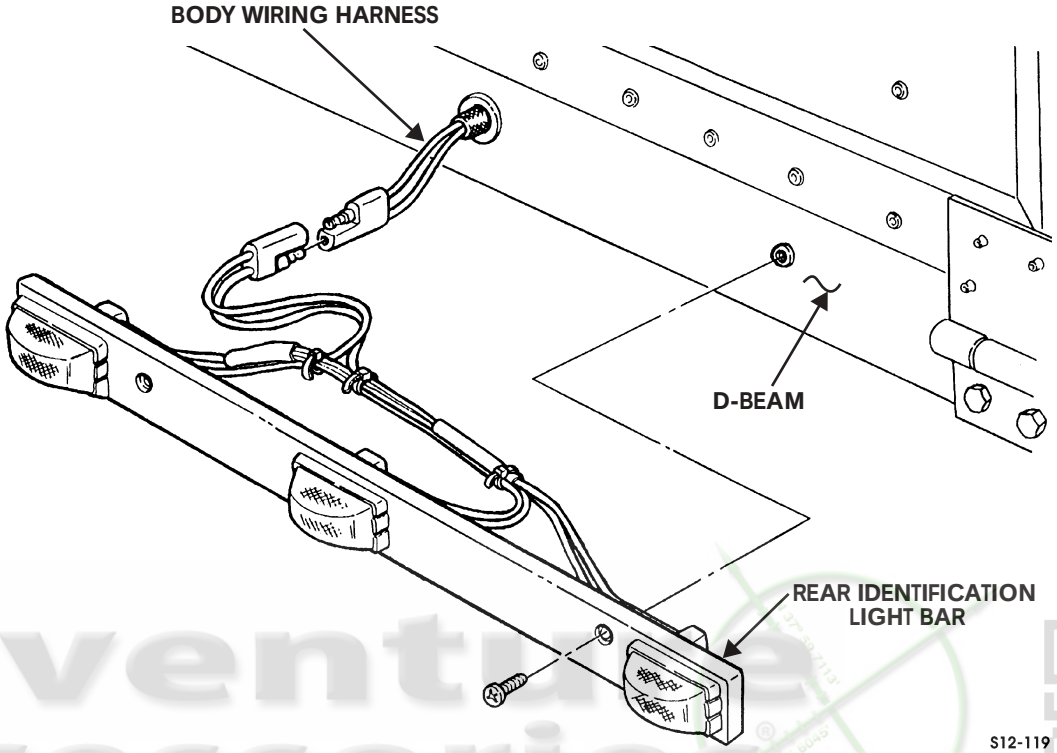

Figure 12-88: Identification LIghts

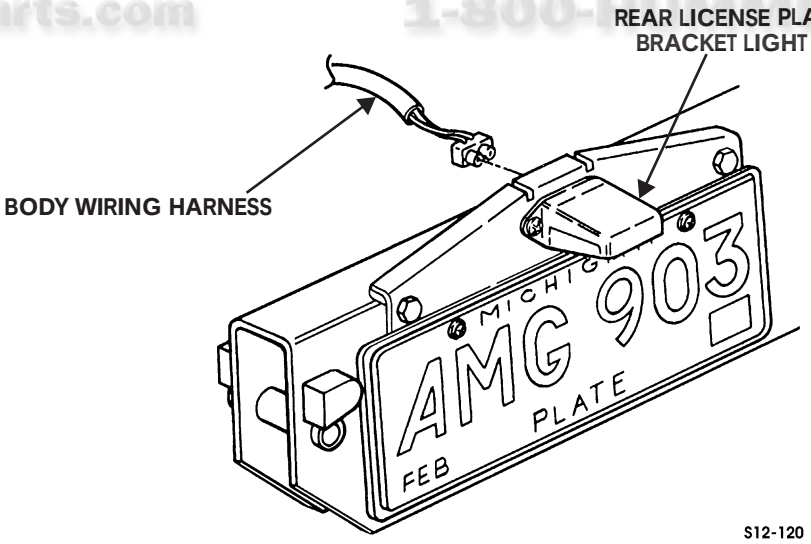

Figure 12-89: License Plate Light

46. Remove five transmission shifter and two parking brake switch connectors from body wiring harness connectors (Figure 12-90)
47. Remove five screws, two nuts and body wiring harness clamps from left tunnel side floor panel area.

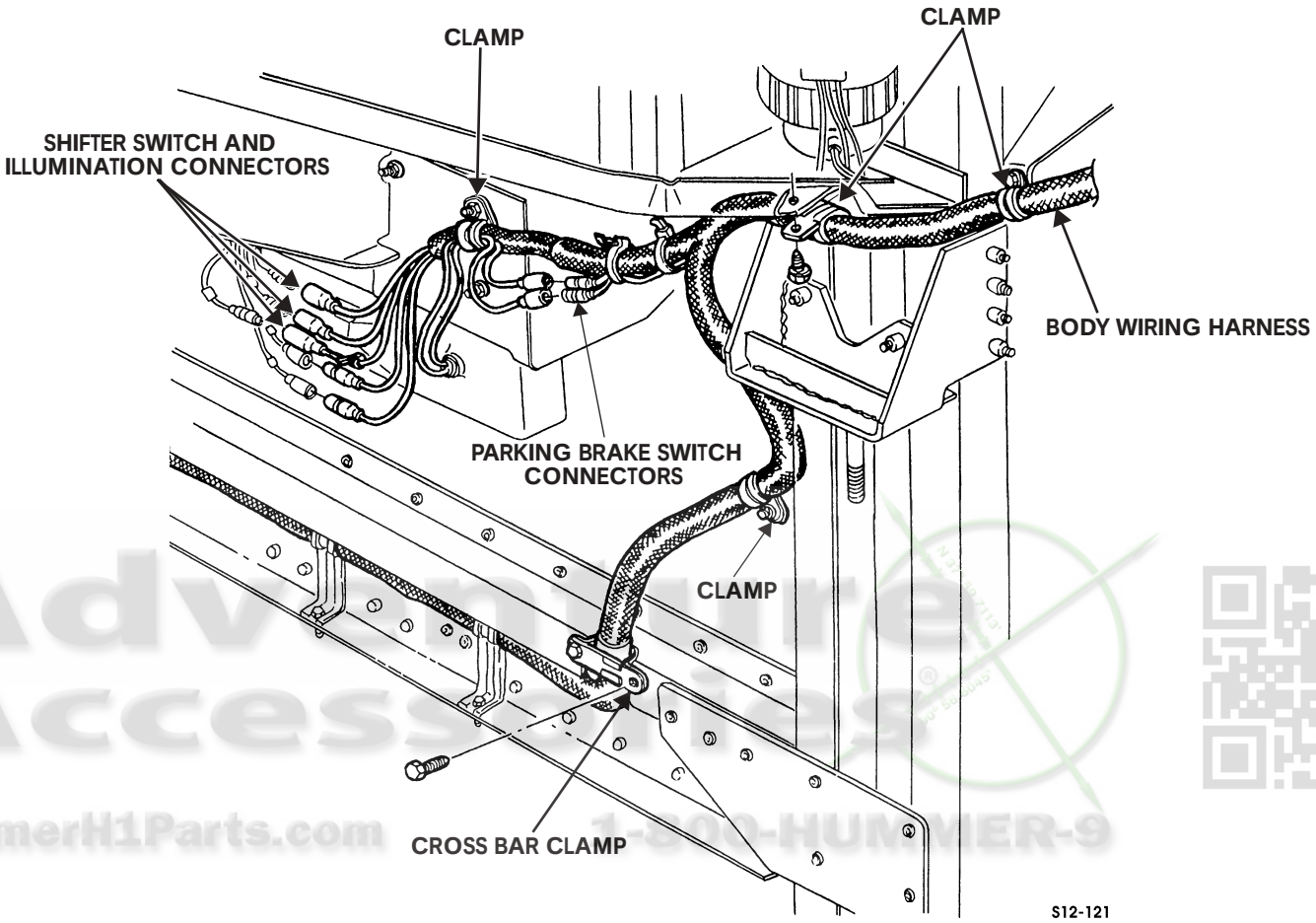

Figure 12-90: Shifter and Parking Brake Connections

48. Remove four screws, nuts, four harness retaining clamps and body wiring harness from body (Figure 12-91).
49. Remove thirteen self-tapping screws, clamps and body wiring harness from body.
50. Pull body wiring harness outer branches through body and into instrument panel and fuse box area of cab.
51. Remove body wiring harness and fuse box from vehicle.

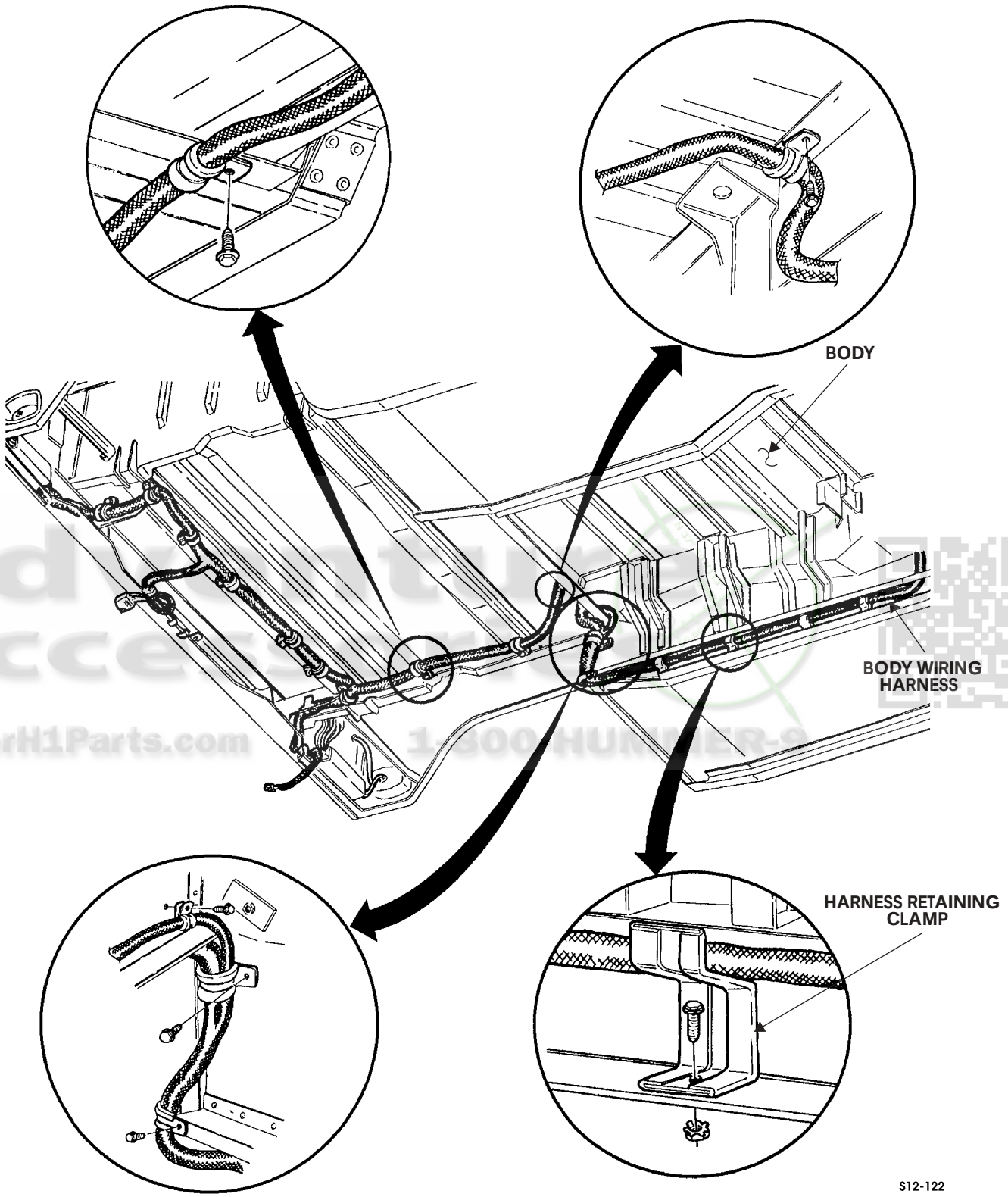

Figure 12-91: Harness Retainers

Installation

1. Position body wiring harness and fuse box in cab area of vehicle.
2. Position outer branches of body wiring harness through body into underbody area.
3. Install body wiring harness on body with thirteen clamps and self-tapping screws (Figure 12-92).
4. Install body wiring harness on body with four harness retaining clamps, screws, and nuts.

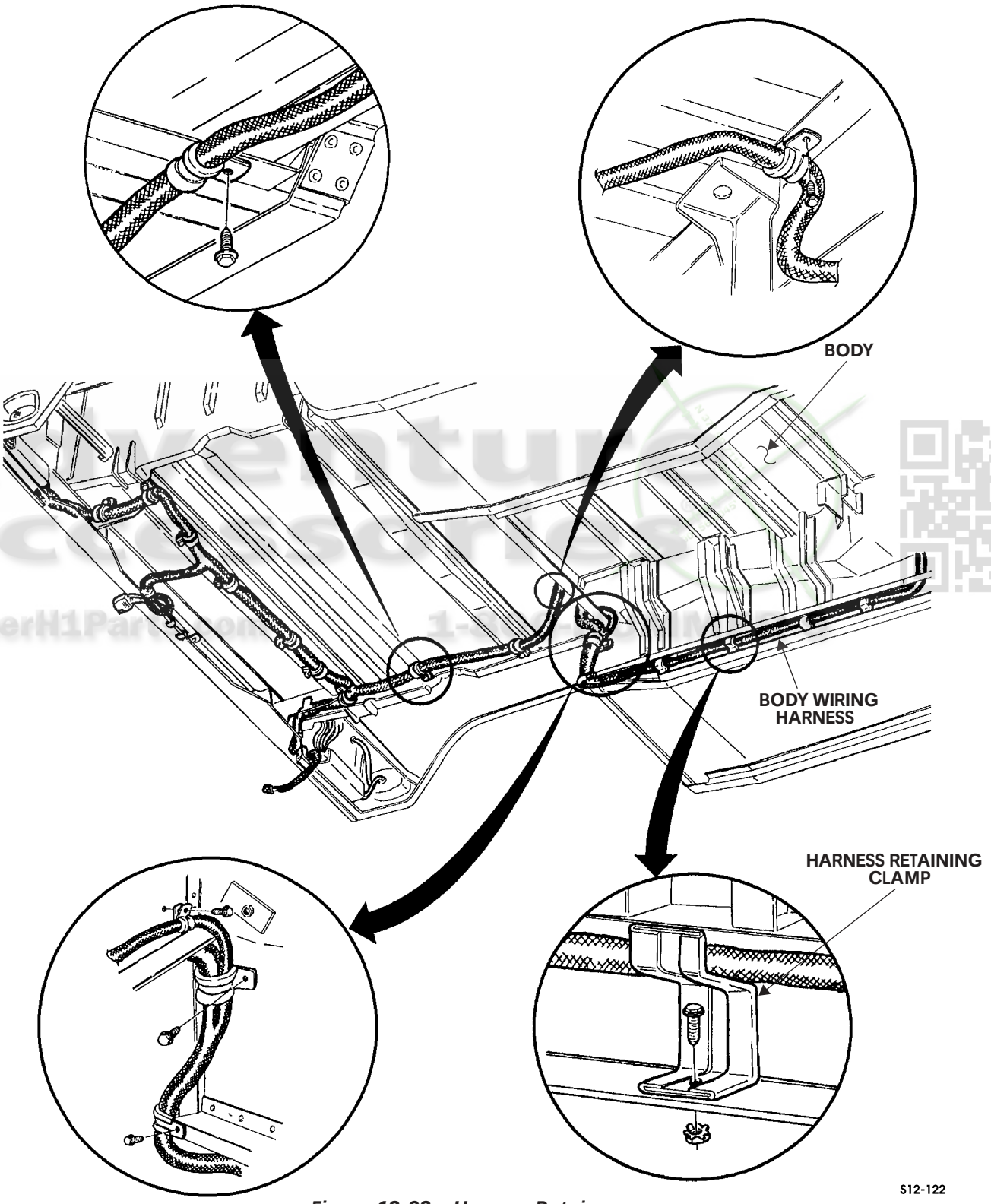

Figure 12-92: Harness Retainers

5. Install body wiring harness on left tunnel side floor panel area with four clamps, five screws, and two nuts (Figure 12-93).
6. Connect five transmission shifters and two brake illumination switch connectors to body wiring harness connectors.

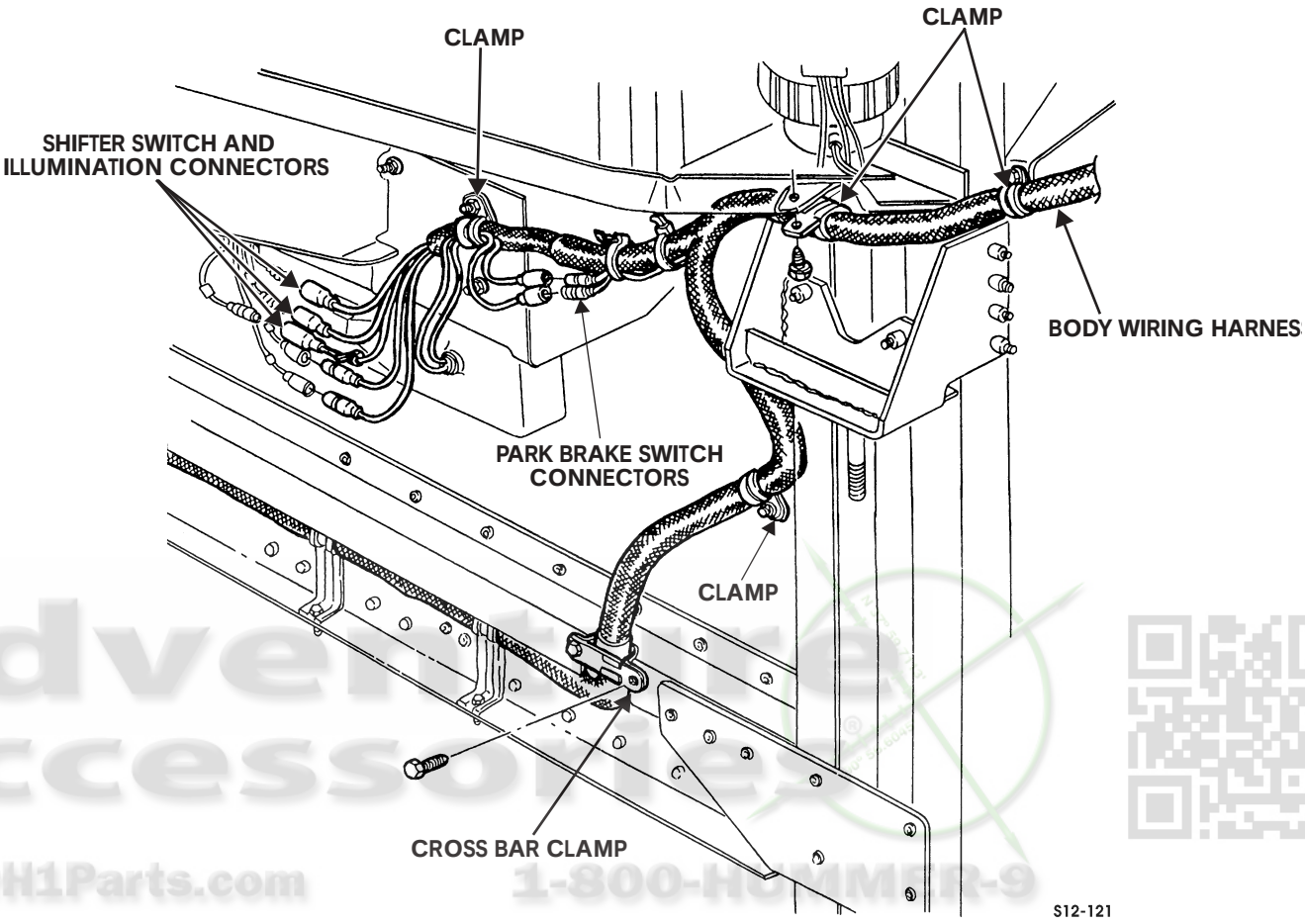

Figure 12-93: Parking Brake and Shifter Connections

7. Connect body wiring harness license plate light connector to license plate light (Figure 12-94).
8. Connect body wiring harness rear identification light connector to rear identification light bar. Install rear identification light bar on D-beam with two screws (Figure 12-95).

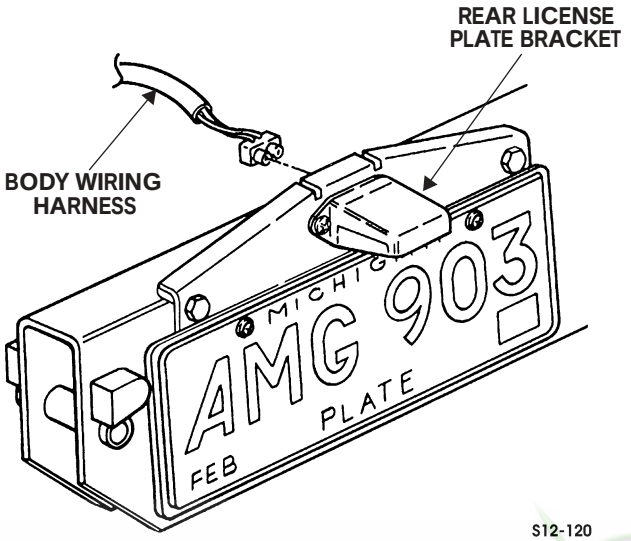

Figure 12-94: License Plate Light

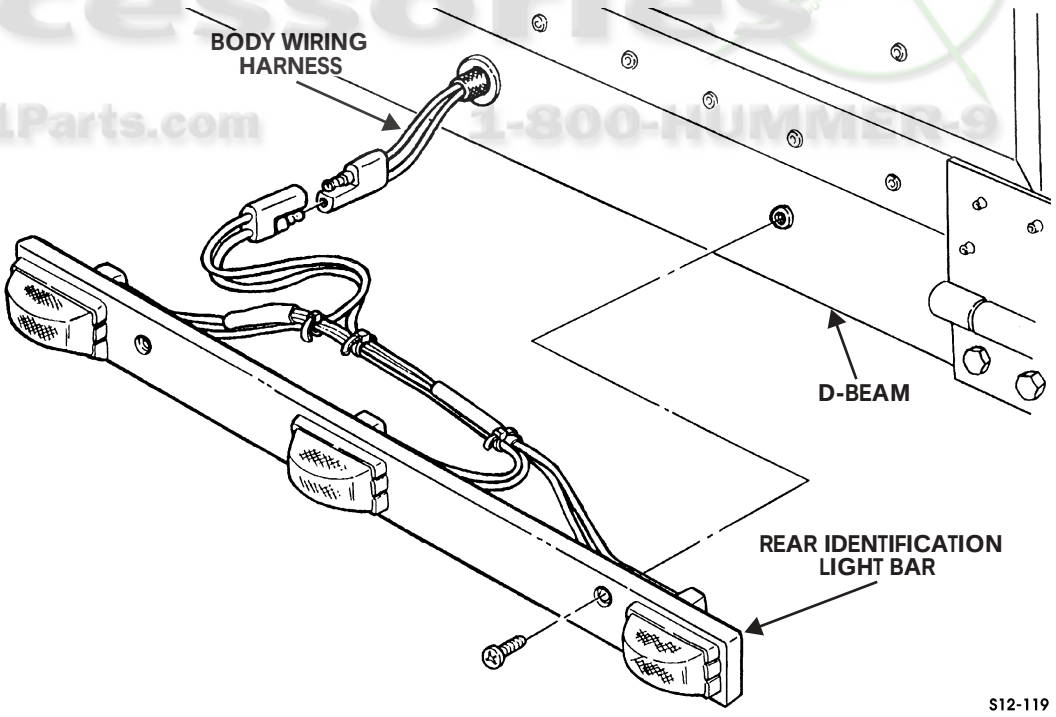

Figure 12-95: Identification Lights

9. Connect body wiring harness clearance light connector to clearance light (Figure 12-96).
10. Install body wiring harness to D-beam with clamp, screw, and nut.
11. Connect body wiring harness connector to side marker light. Install body wiring harness ground lead to side marker light with washer and nut.
12. Connect two body wiring harness connectors to two taillight connectors.
13. Install body wiring harness ground leads on taillight with washer, locknut, and washer.
14. Install shield on body panel and body wiring harness with two clamps, screws, and nuts.
15. Install shield to D-beam with two screws and nuts.
16. Perform steps 10 through 15 for left rear side body wiring harness installation.

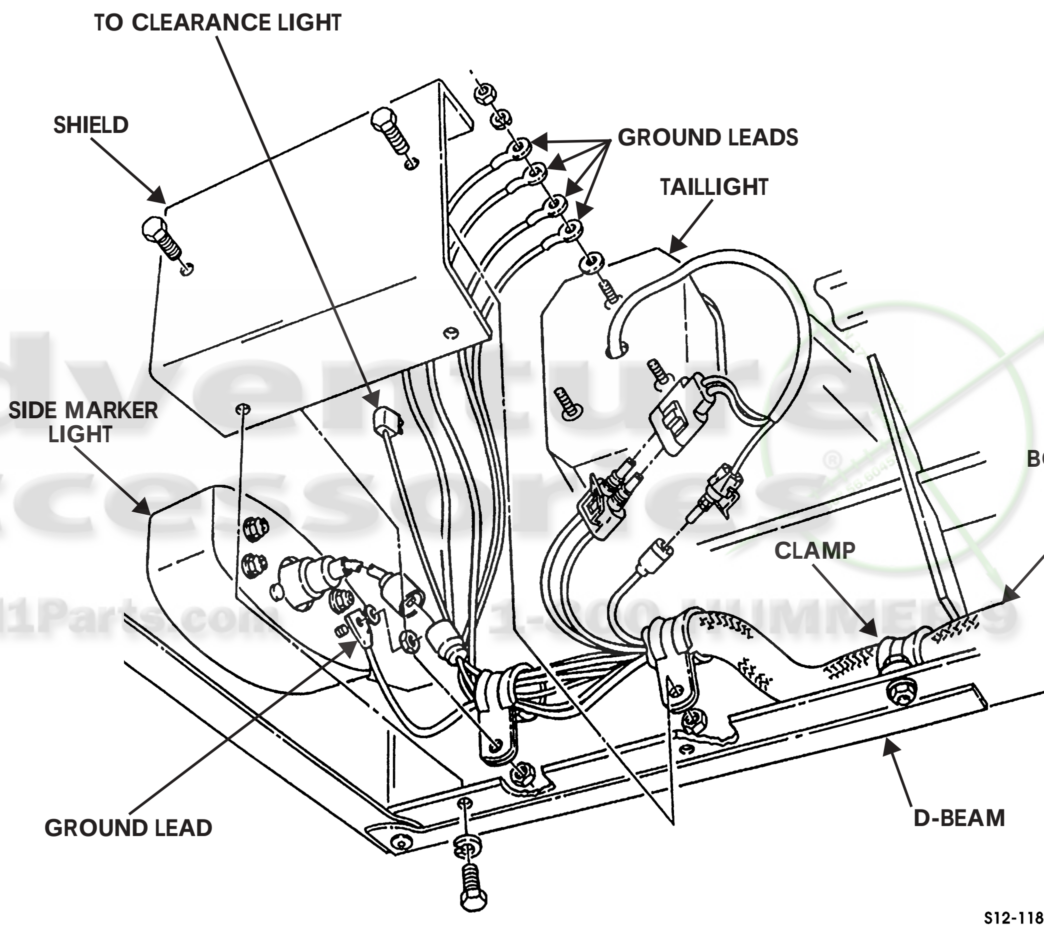

Figure 12-96: Marker and Taillight Connections

17. Connect body wiring harness connector to trailer harness connector if installed. If no trailer harness exists, connect dummy plug to body wiring harness trailer connector (Figure 12-97).
18. Install clamp and hardware.

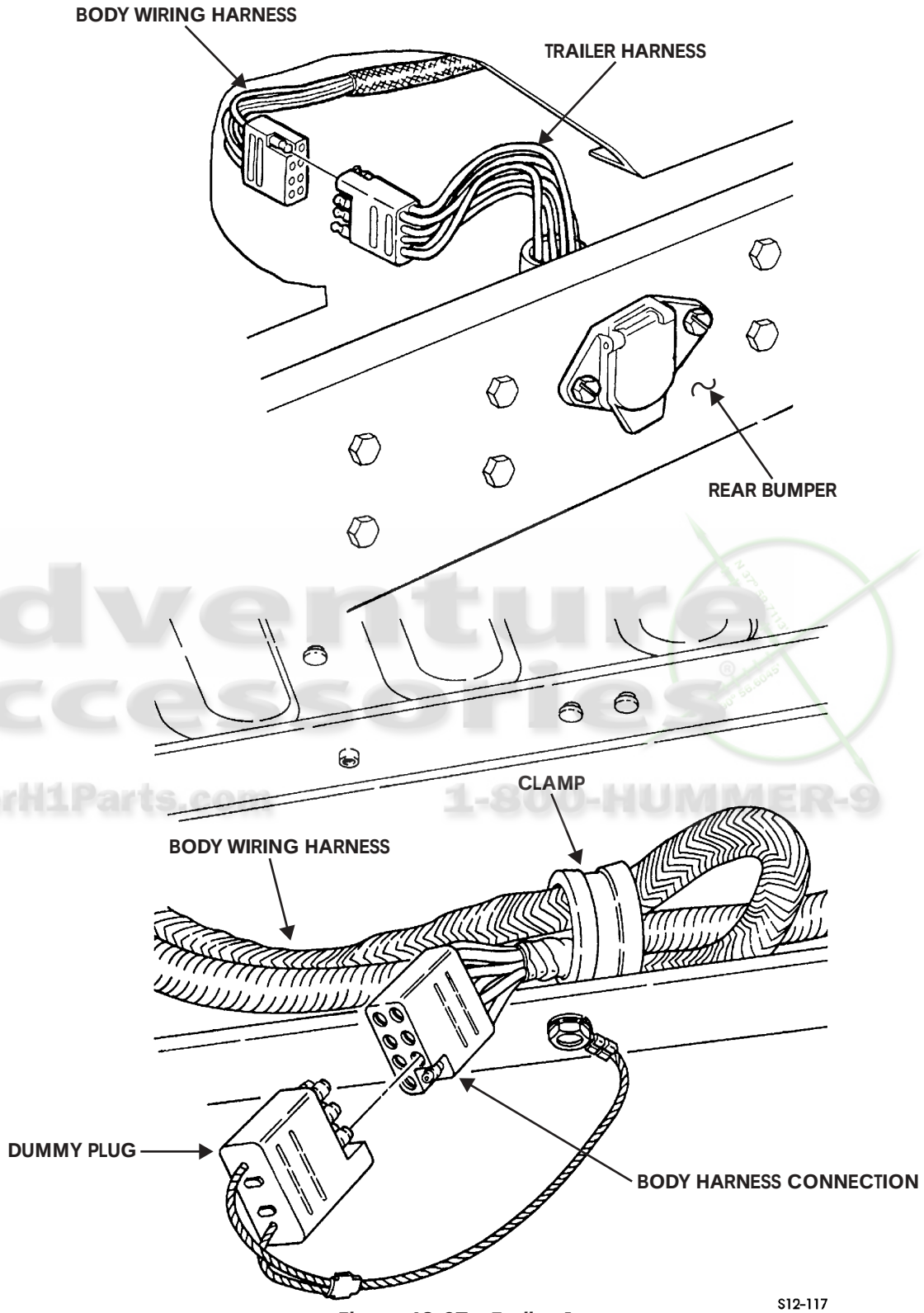

Figure 12-97: Trailer Jumper

19. Connect body wiring harness connector to fuel tank sender harness (Figure 12-98).
20. Secure body wiring harness to splash shield and frame with four screws, three nuts, and four clamps (Figure 12-99).

21. Connect body wiring harness connector to fog lamp harness connector, if installed.
22. Connect two body wiring harness connectors to hood harness connectors.

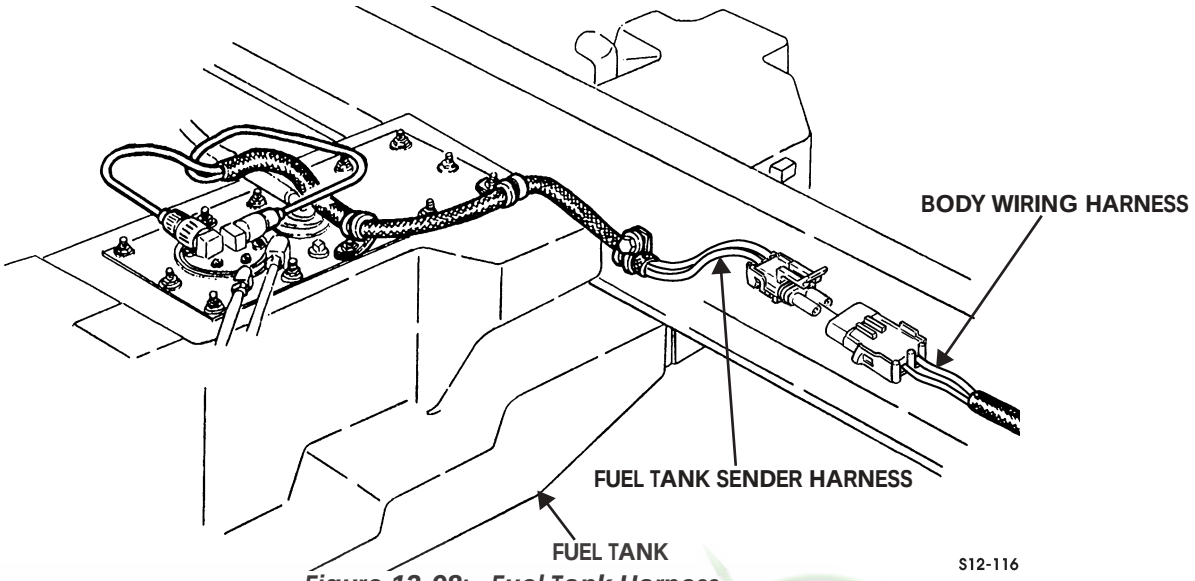

Figure 12-98: Fuel Tank Harness

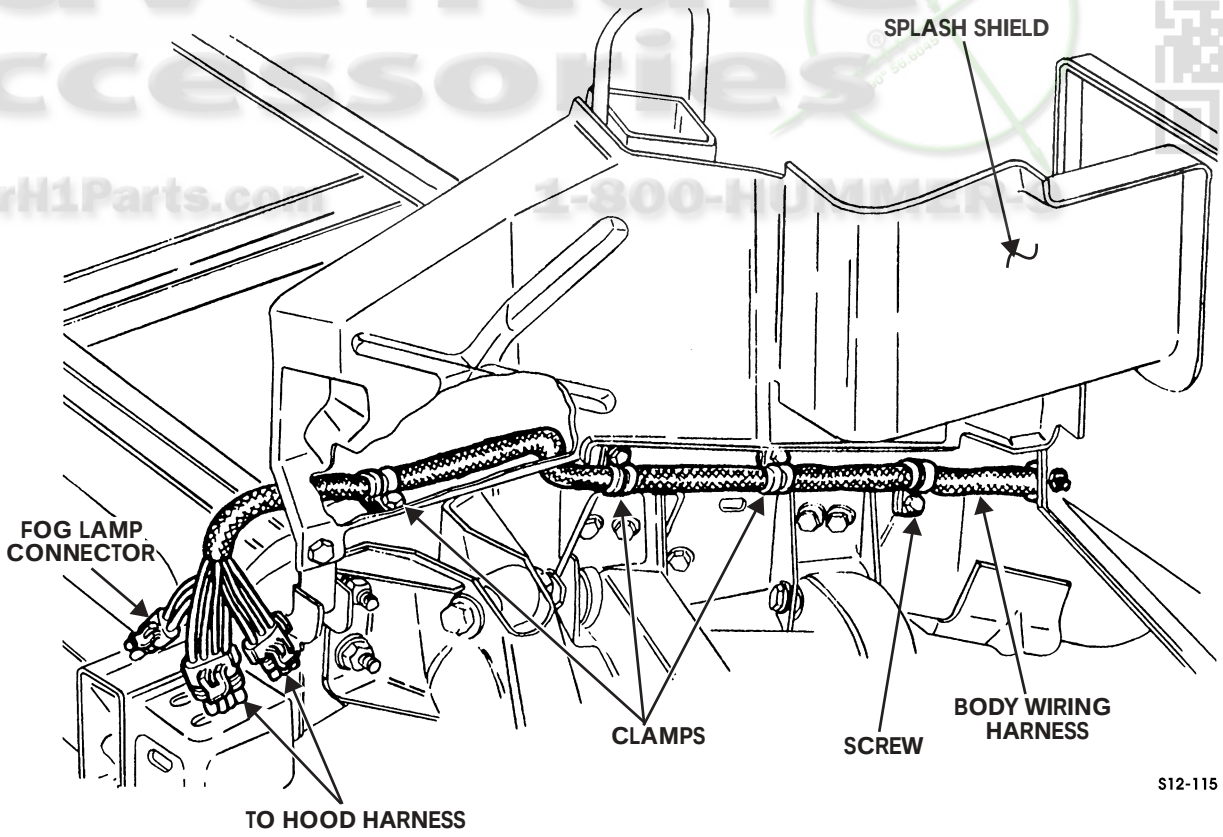

Figure 12-99: Splash Shield Harness Retainers

23. Secure body wiring harness to left cowl inner panel with three screws, two nuts, three clamps, and two tie straps (Figure 12-100).
24. Connect body wiring harness connector to brake warning light switch.
25. Loosen two nuts and remove terminal block cover.
26. Install body wiring harness ground and power cables on terminal block studs with two nuts, lockwashers, and washers. Tighten nuts to 96-120 lb-in. (11-14 N•m)
27. Connect body wiring harness connector to trouble light harness if installed.
28. Connect body wiring harness connector to CTIS harness connector if installed.
29. Connect body wiring harness connector to windshield washer bottle.

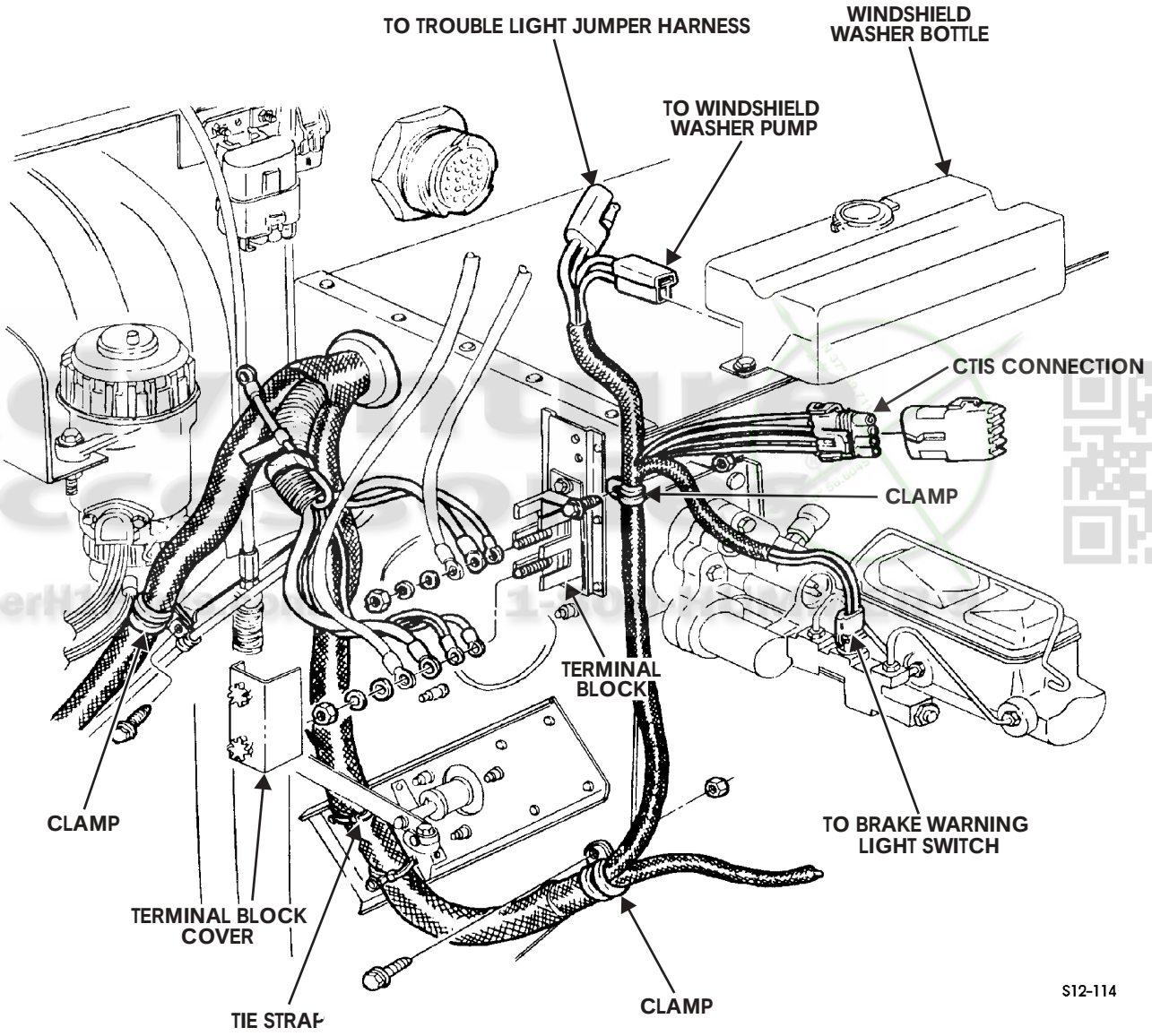

Figure 12-100: Under Hood Connections

30. Secure body wiring harness to A-beam with two screws and clamps. Secure body wiring harness to harness support bracket with two tie straps. Install support bracket on steering column bracket with two screws, lockwashers, washers, nuts, and washers (Figure 12-101).
31. Install body wiring harness engine connector to cowl panel.
32. Install ALDL body wiring harness connector to support bracket with two screws.

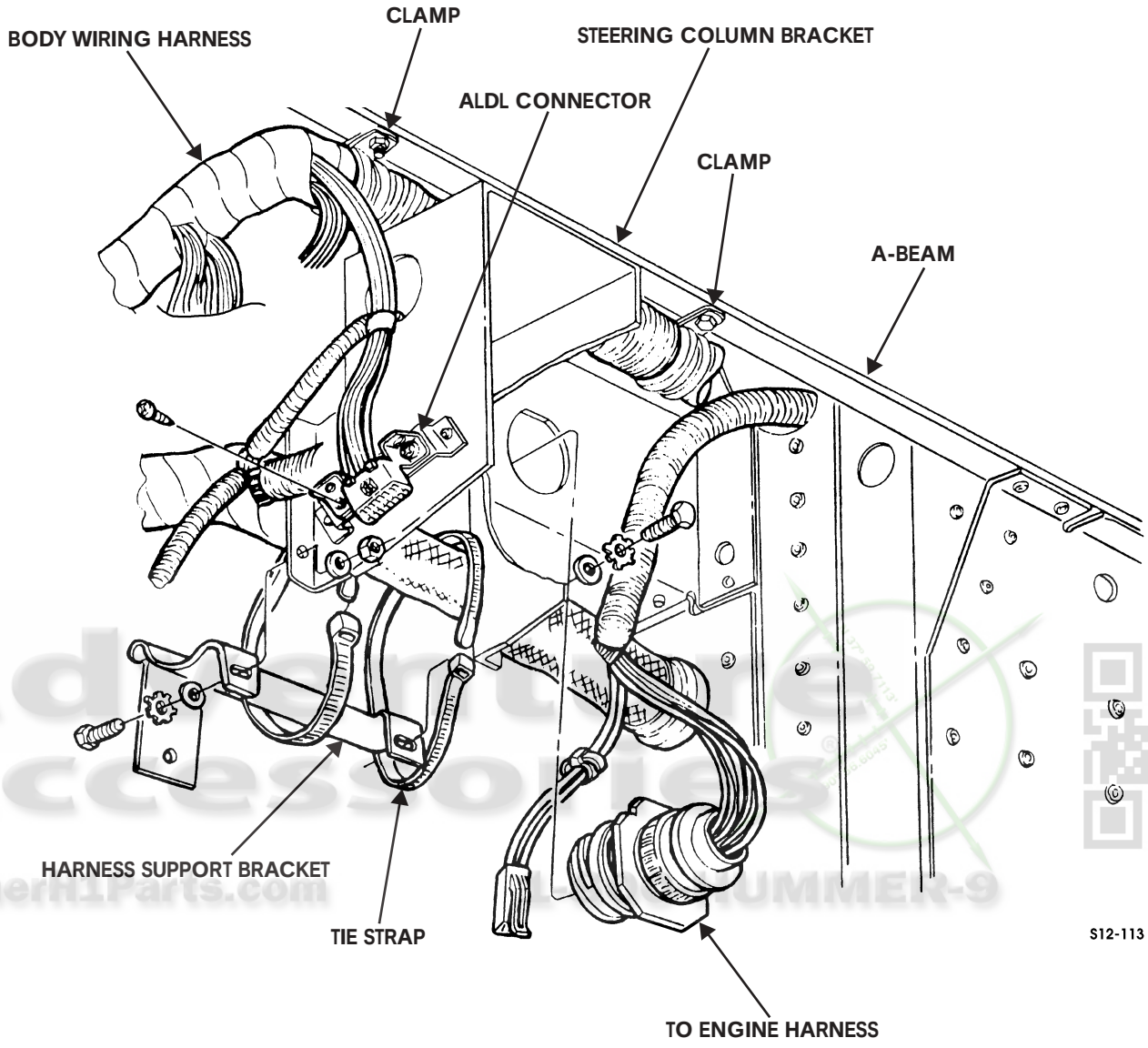

Figure 12-101: Under Dash Harness Mounting

33. Install fuse box on supports with two screws, lockwashers, and washers (Figure 12-102).

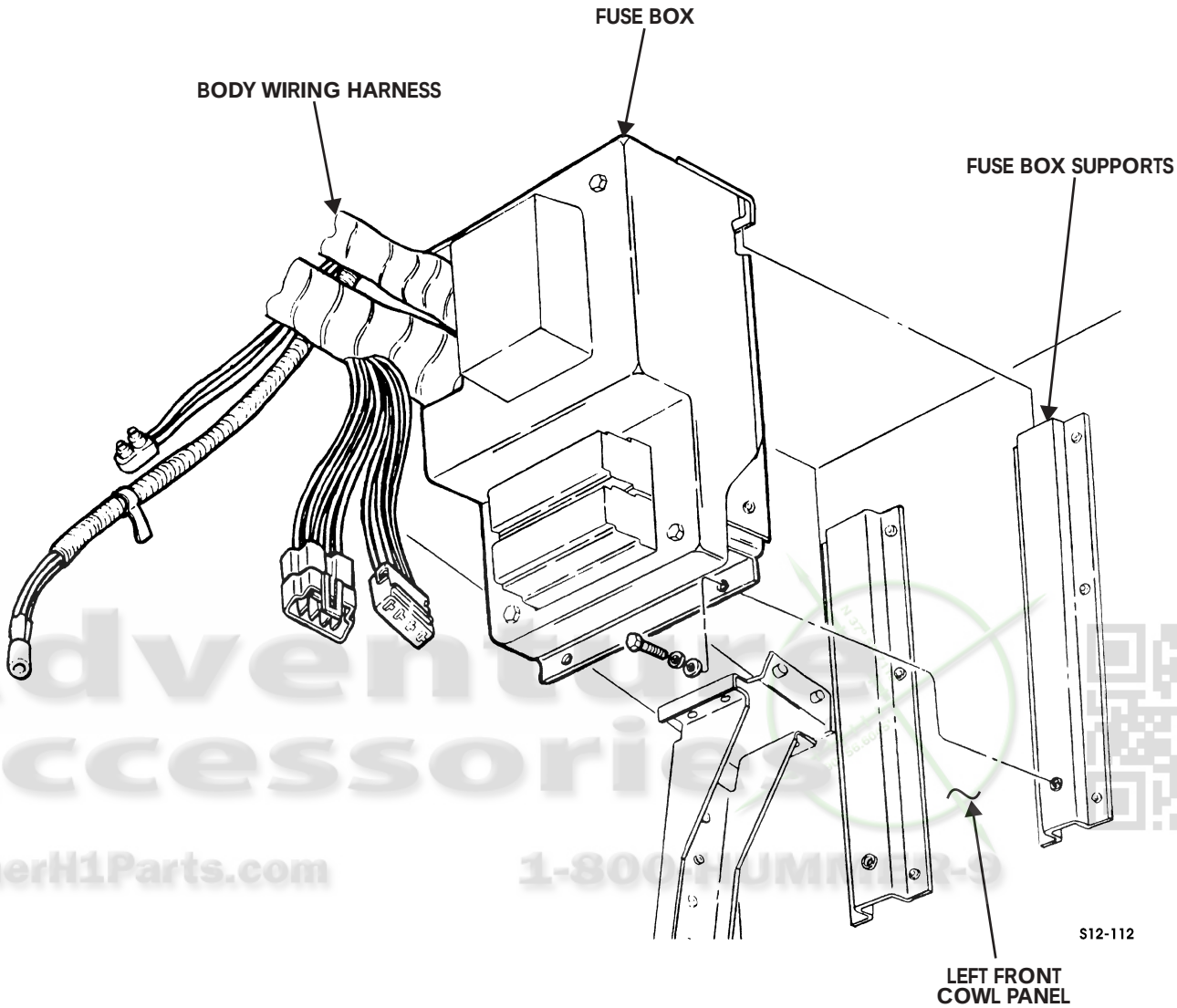

Figure 12-102: Fuse Box Mounting

34. Secure body wiring harness connector to transmission shift lock solenoid (Figure 12-103).

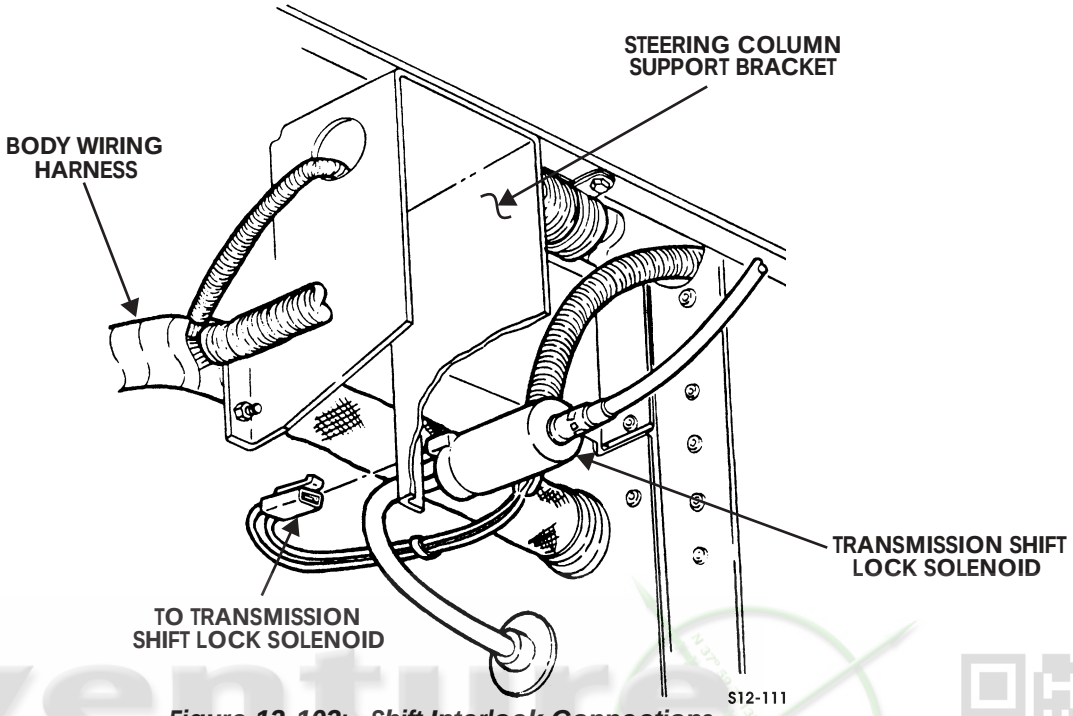

Figure 12-103: Shift Interlock Connections

35. Secure body wiring connectors to wiper motor and front identification light jumper harness connectors (Figure 12-104).

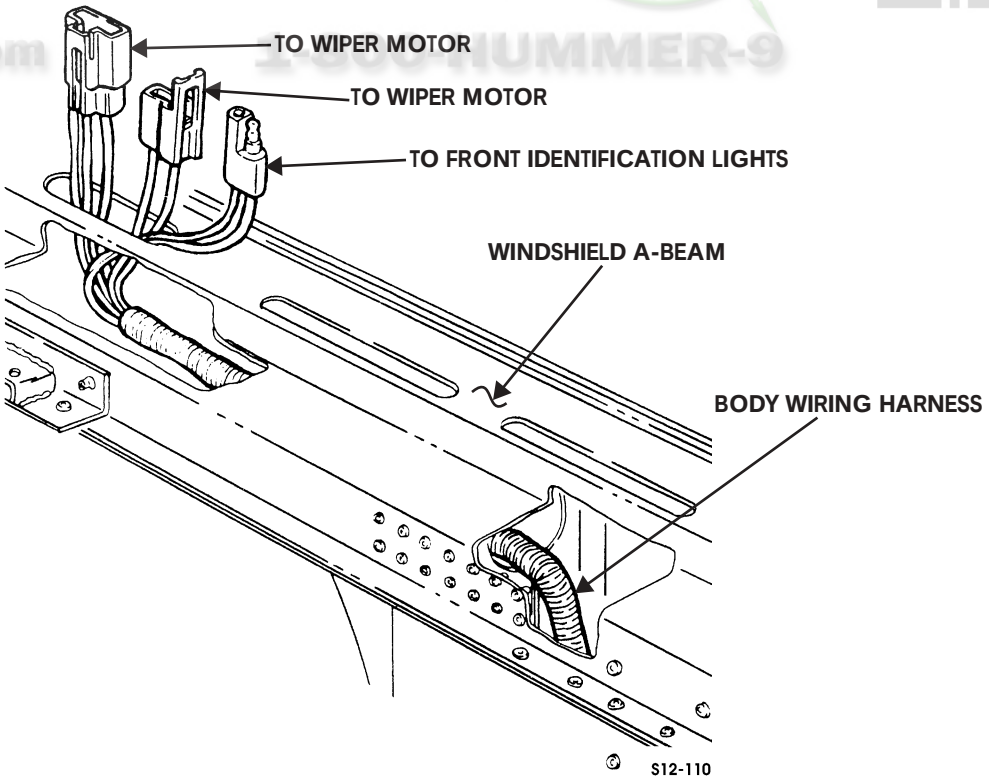

Figure 12-104: Windshield Frame Connections

36. Connect body wiring harness connectors to stoplight switch (Figure 12-105).

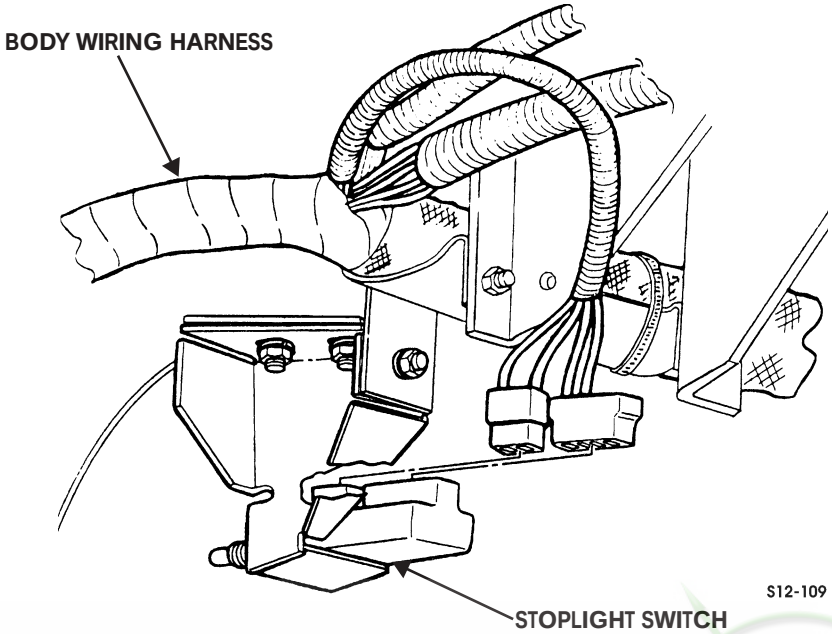

Figure 12-105: Stoplight Switch

37. Connect body wiring harness connectors to door jamb switch and roof harness connector (Figure 12-106).

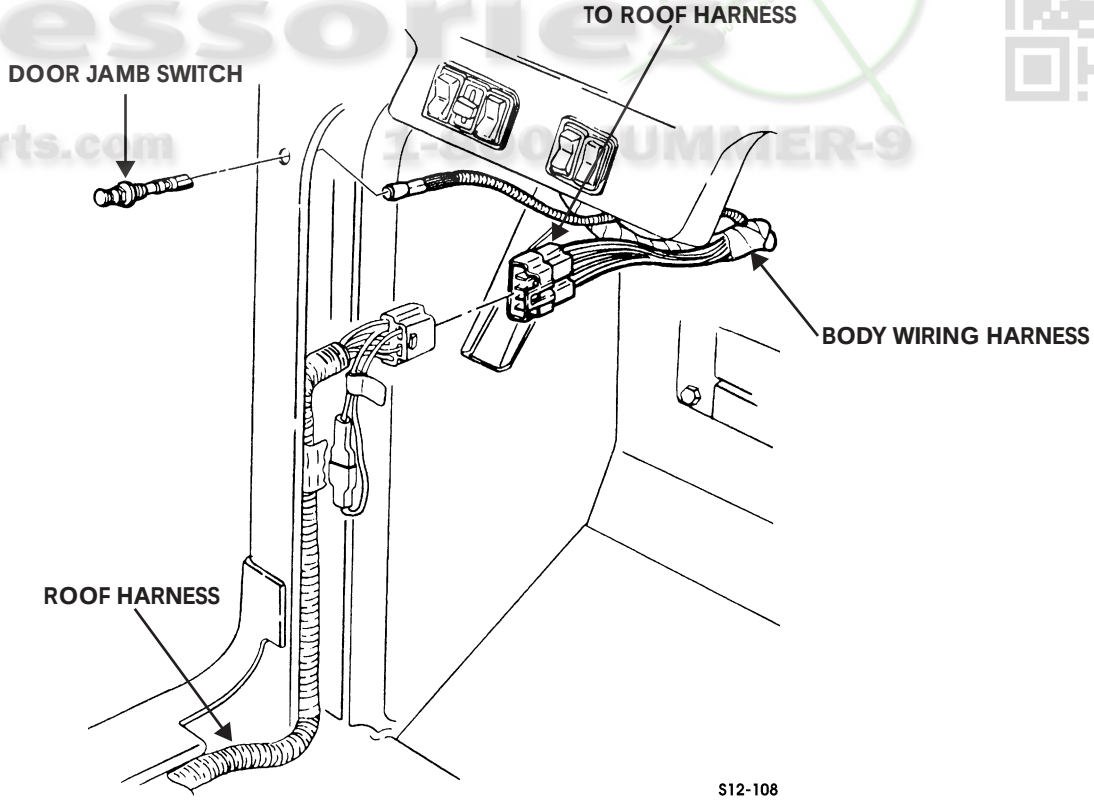

Figure 12-106: Body-to-Roof Harness Connection

38. Install body wiring harness ground leads on steering column with screw and nut (Figure 12-107).

39. Secure body wiring harness turn signal, ignition, and key contact connectors to steering column.

40. Install cable tie and body wiring harness on steering column bracket.

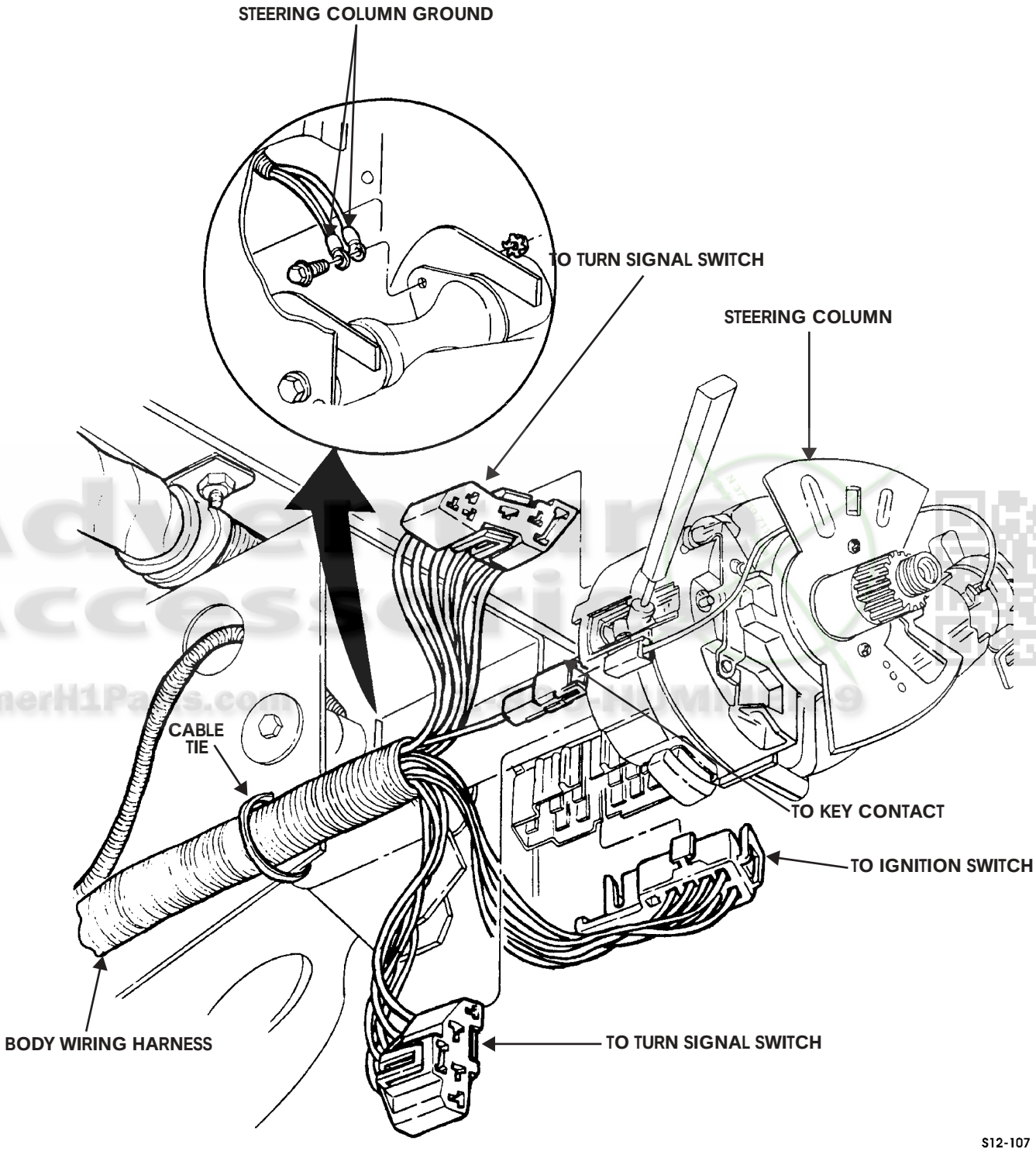

Figure 12-107: Steering Column Connection

41. Connect body wiring harness connectors to radio, engine console, and heat and A/C controller connectors (Figure 12-108).
42. Install ground leads on ground stud with nut (Figure 12-109).
43. Connect harness connector to jumper harness if power windows or power mirrors are installed.

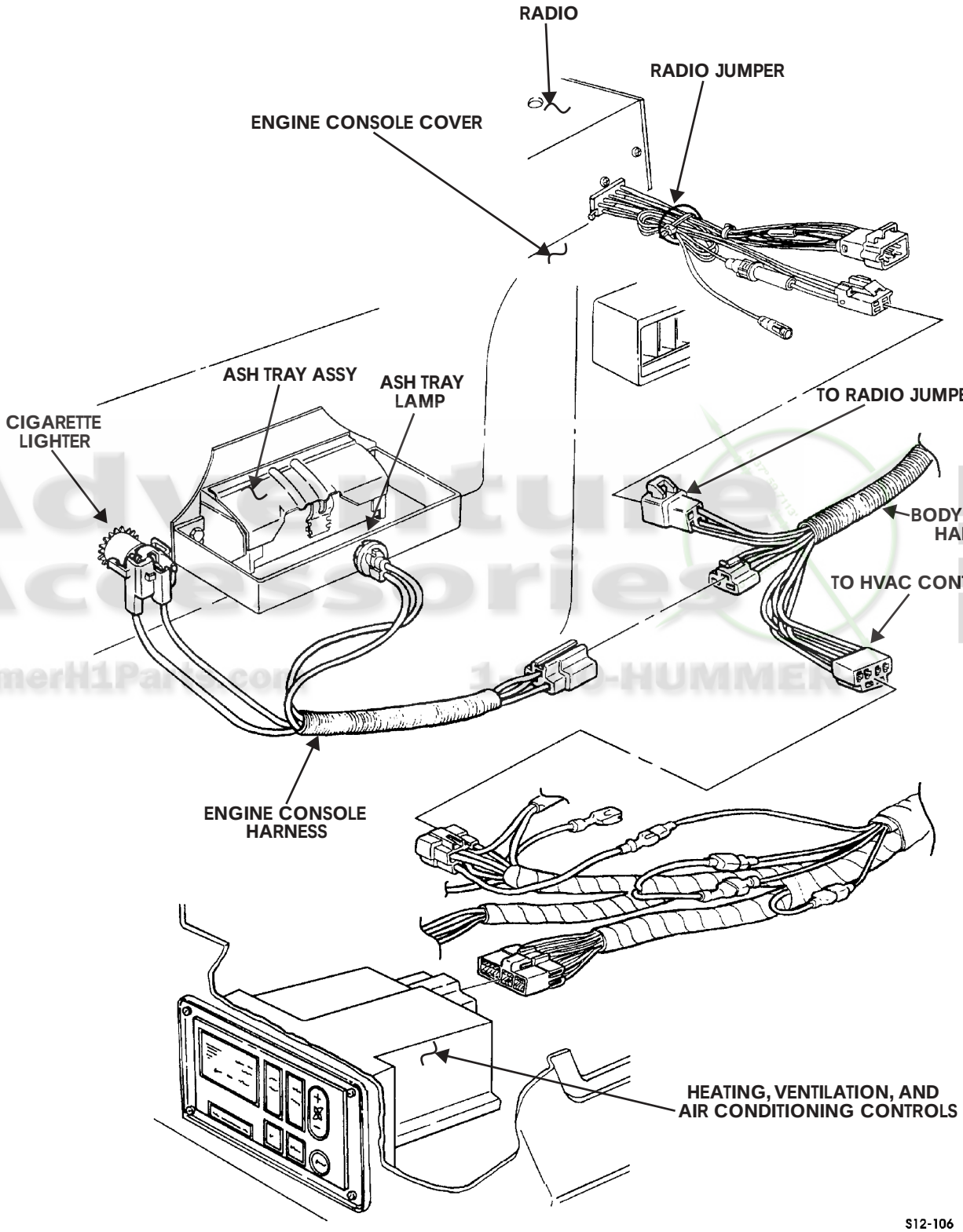

Figure 12-108: Engine Cover Console Connections

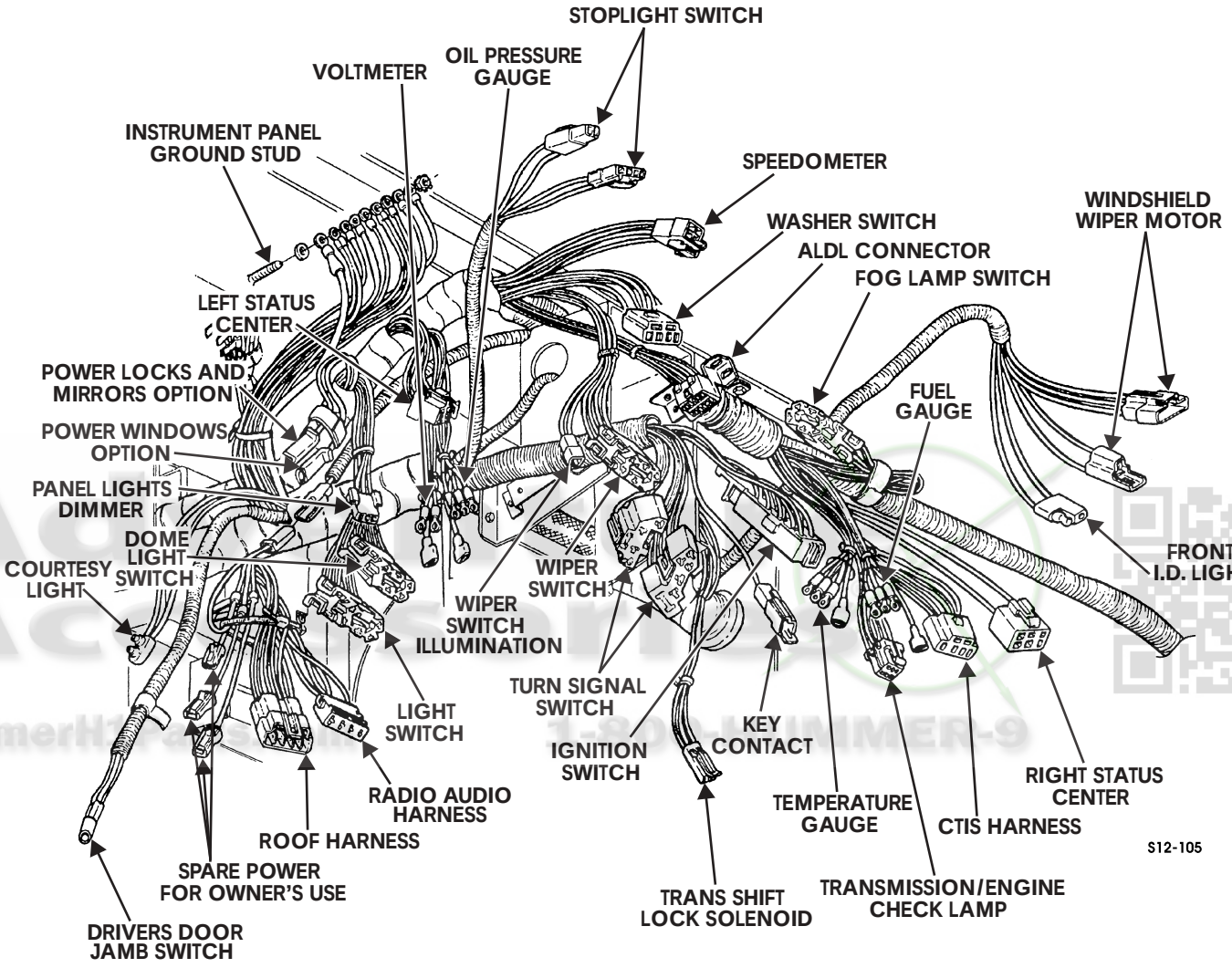

Figure 12-109: Body Harness-to-Dash Panel

44. Connect body wiring harness connectors to rear of instrument panel (Figure 12-110).

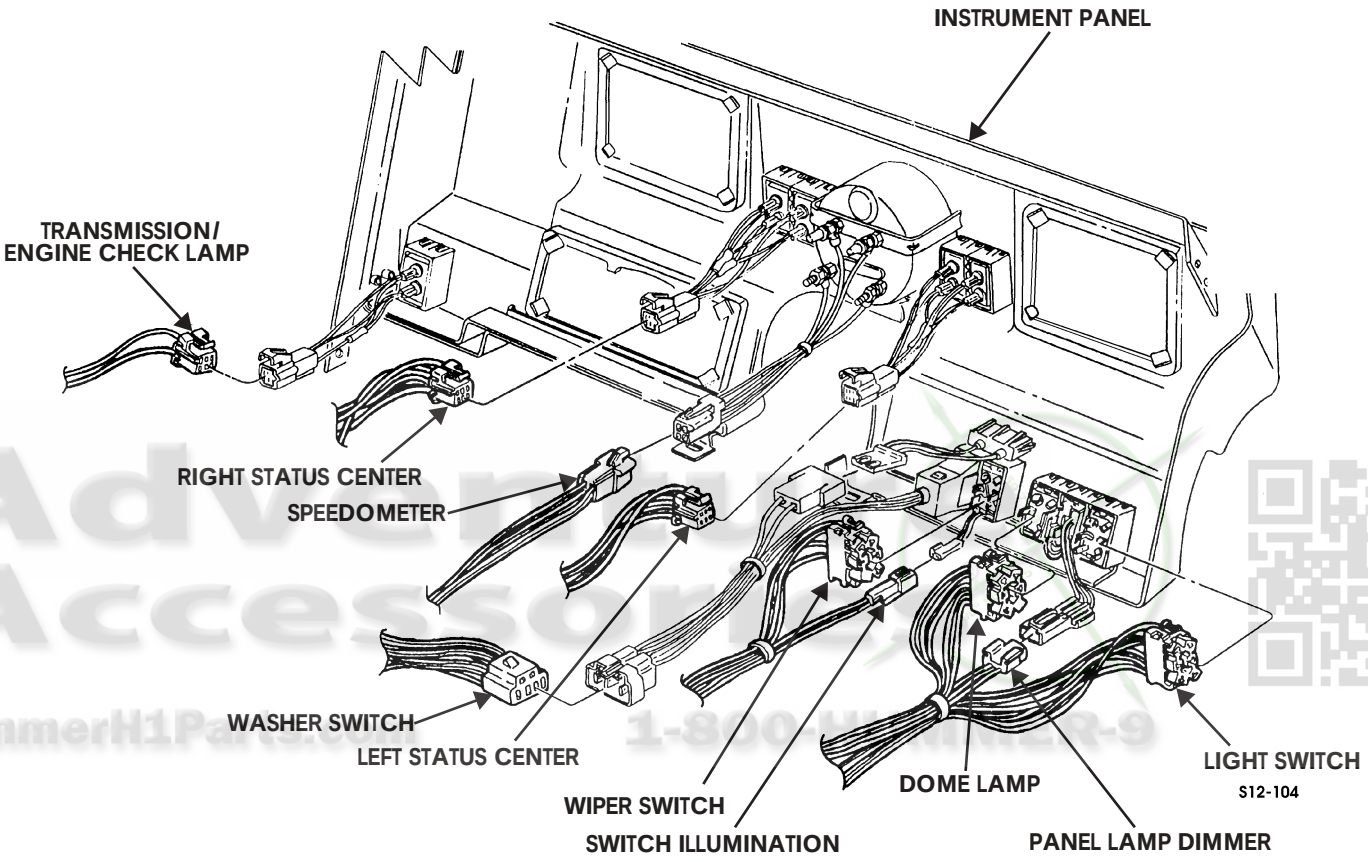

Figure 12-110: Status Indicator and Switch Connections

45. Install fifteen body wiring harness gauge leads on four gauges with eleven nuts and lockwashers (Figure 12-111).
46. Connect two body wiring harness gauge illumination leads to gauges.
47. Install two gauge panels to instrument panel with eight screws.
48. Connect battery ground cable.
49. Test electrical system for proper operation.

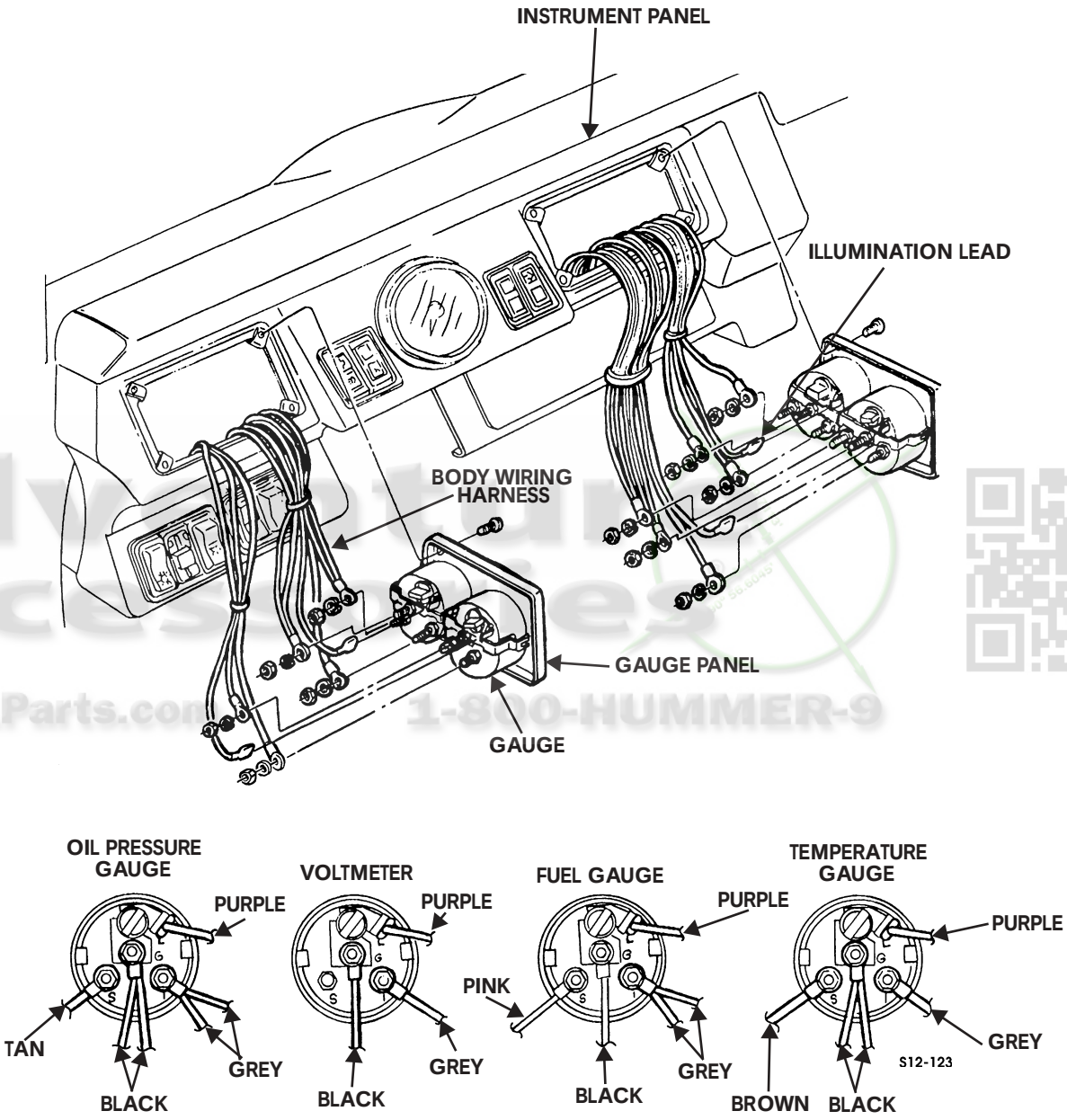

Figure 12-111: Body Harness to Gauge Connections

ROOF ELECTRICAL HARNESS (2-DOOR) REPLACEMENT

Removal

1. Remove trim as necessary to gain access to roof harness (Section 10).
2. Disconnect battery ground cable.

NOTE: Prior to removal, tag all leads. Use of a fish wire is recommended during removal to aid harness installation.

3. Remove domelight (Section 10).
4. Disconnect roof harness connector from body harness (Figure 12-112).

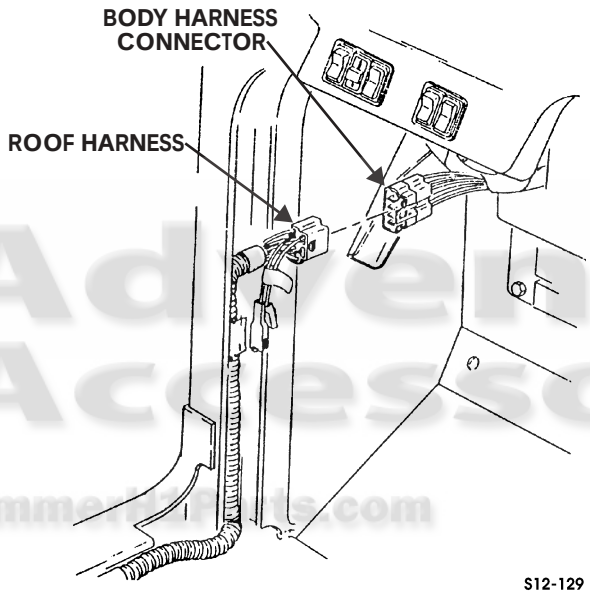

Figure 12-112: Roof Harness Connection

5. Disconnect roof harness connector from seat belt buckle switch (Figure 12-113).

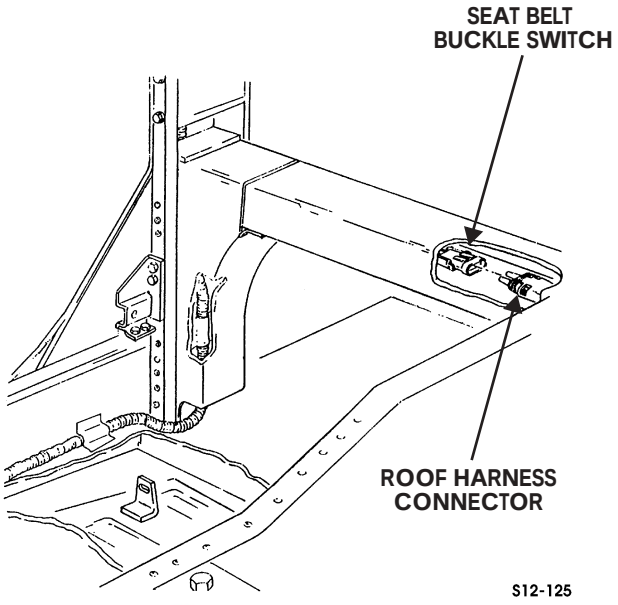

Figure 12-113: Seat Belt Switch Connection

6. Disconnect roof harness connector from right door jamb switch (Figure 12-114).
7. Disconnect roof harness connector from right courtesy light, if installed.
8. Remove two screws and cargo light from rear bulkhead, if installed (Figure 12-115).

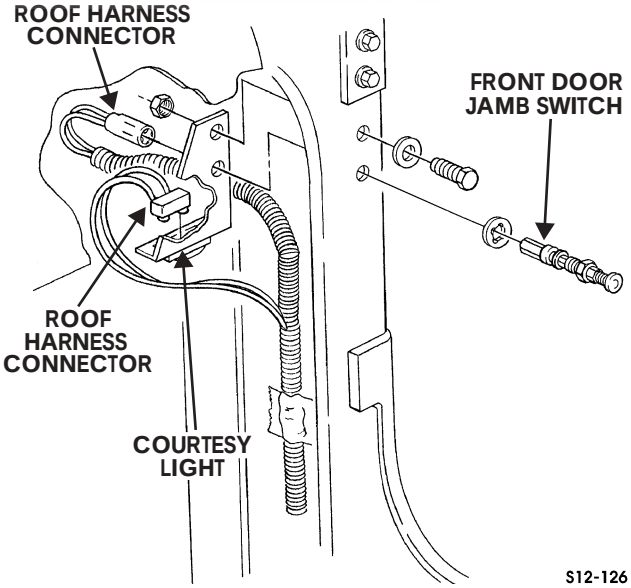

Figure 12-114: Door Jamb Switch

9. Disconnect roof harness connector from cargo light, if installed (Figure 12-115).
10. Remove roof harness from vehicle.

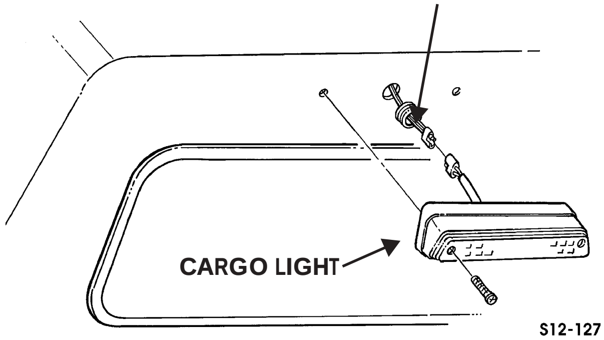

Figure 12-115: Cargo Light

Installation

1. Route roof harness to approximate mounting position.
2. Secure roof harness to vehicle with duct tape, where necessary.
3. Connect roof harness connector to cargo light, if removed (Figure 12-115).
4. Install cargo light on rear bulkhead with two screws, if removed.
5. Connect roof harness connector to right courtesy light, if installed (Figure 12-114).
6. Connect roof harness connector to right door jamb switch.
7. Connect harness connector to seat belt buckle switch (Figure 12-113).
8. Connect roof harness connector to body harness (Figure 12-112).
9. Install domelight (section 10).
10. Install trim (section 10).

ROOF ELECTRICAL HARNESS (4-DOOR/ STATION WAGON AND OPEN CAB) REPLACEMENT

Removal

NOTE: The roof electrical harnesses for the 4-door, station wagon, and open cab are installed the same, except the open cab harness crosses the rear cargo bulkhead. Also, the open cap harness is not equipped with a dome light or cargo light (Figure 12-116).

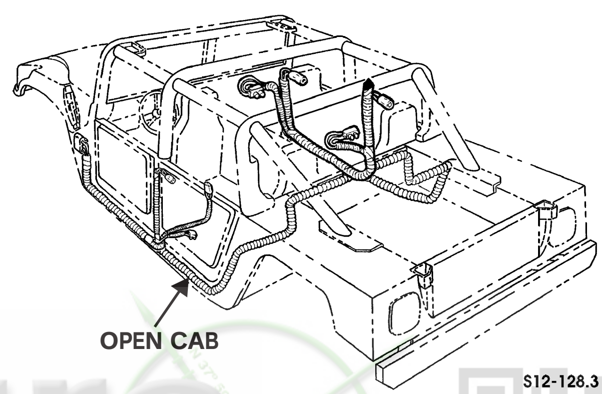

Figure 12-116: Roof Harness Routing

1. Remove trim as necessary to gain access to the harness (Section 10).

NOTE: Prior to removal, tag all leads. Use of a fish wire is recommended during removal to aid harness installation.

2. Disconnect battery ground cable.
3. Remove domelight (Section 10).

4. Disconnect roof harness connector from body harness (Figure 12-117).

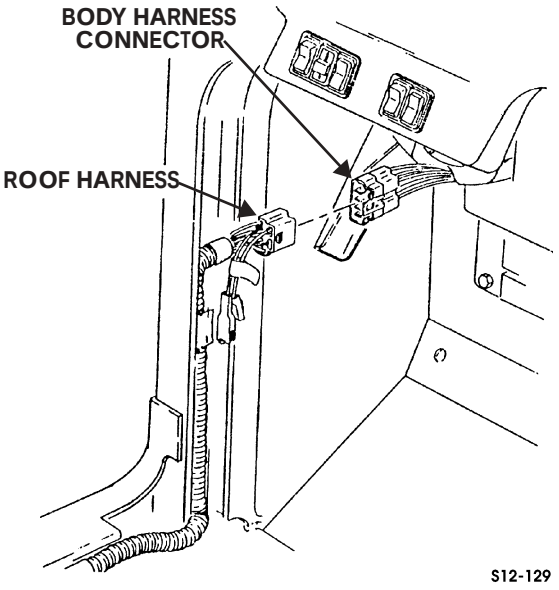

Figure 12-117: Roof Harness Connector

5. Disconnect roof harness connector from seat belt buckle switch (Figure 12-118).

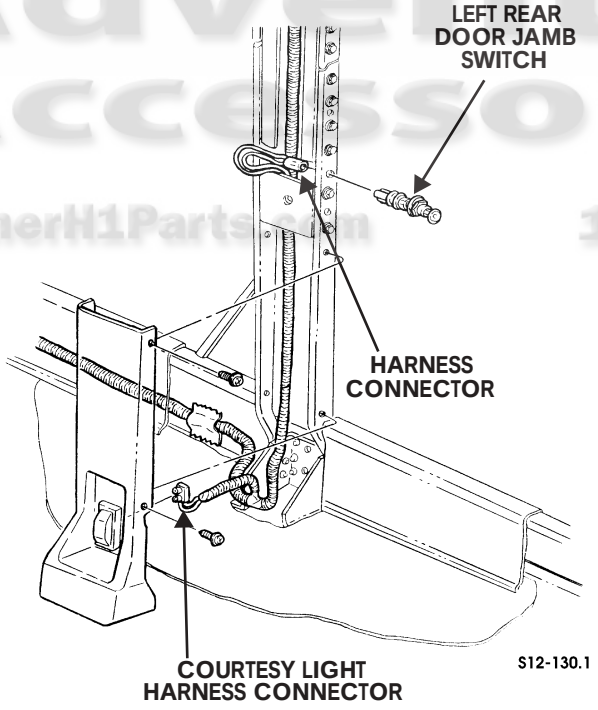

Figure 12-118: Seatbelt Connector

6. Disconnect roof harness connector from left rear courtesy light, if installed.
7. Disconnect roof harness connector from left rear door jamb switch.
8. Disconnect roof harness connector from right front door jamb switch (Figure 12-119).

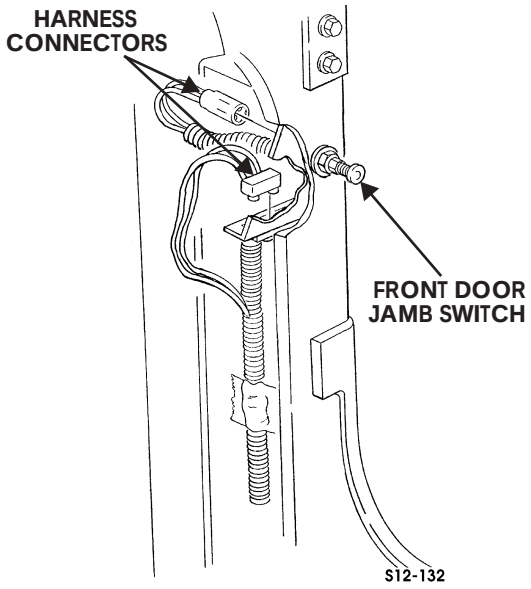

Figure 12-119: Door Jamb Switch

9. Disconnect roof harness connector from right front courtesy light, if installed.
10. Disconnect roof harness connector from right rear door jamb switch (Figure 12-120).

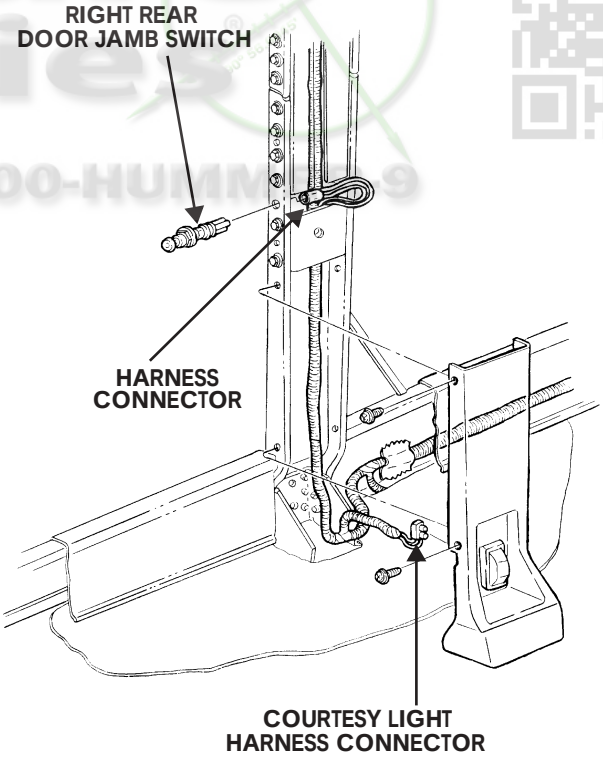

Figure 12-120: Courtesy Light

11. Disconnect roof harness connector from right rear courtesy light, if installed.
12. Remove two screws and cargo light from rear bulkhead, if installed (Figure 12-121).

13. Disconnect harness connector from cargo light, if installed.
14. Remove harness from vehicle.

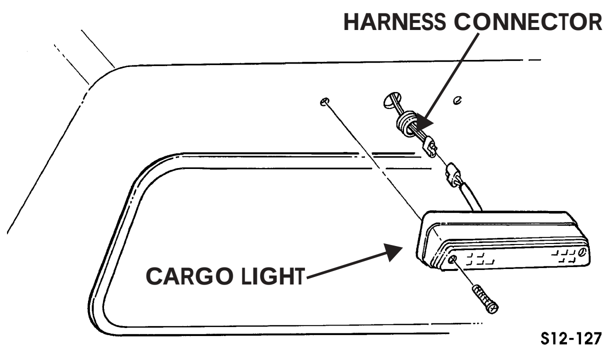

Figure 12-121: Cargo Light

Installation

1. Route roof harness to approximate mounting position.
2. Secure roof harness to vehicle with duct tape, where necessary.
3. Connect roof harness connector to cargo light, if removed (Figure 12-121).
4. Install cargo light on rear bulkhead with two screws, if removed.
5. Connect roof harness connector to right rear courtesy light, if installed (Figure 12-120).
6. Connect roof harness connector to right rear door jamb switch.
7. Connect roof harness connector to right front courtesy light, if removed (Figure 12-119).
8. Connect roof harness connector to right front door jamb switch.
9. Connect roof harness connector to left rear door jamb switch (Figure 12-118).
10. Connect roof harness connector to left rear courtesy light, if removed.
11. Connect roof harness connector to seat belt buckle switch.
12. Connect roof harness connector to body harness (Figure 12-117).
13. Install domelights (Section 10).
14. Connect battery ground cable.
15. Install trim (Section 10).

STEREO (BASIC) ELECTRICAL HARNESS (2-DOOR) REPLACEMENT

Removal

1. Remove front console (Section 10).

NOTE: Prior to removal, tag all leads. Use of a fish wire is recommended during removal to aid harness installation.

2. Disconnect stereo harness lead from harness connector (Figure 12-122).

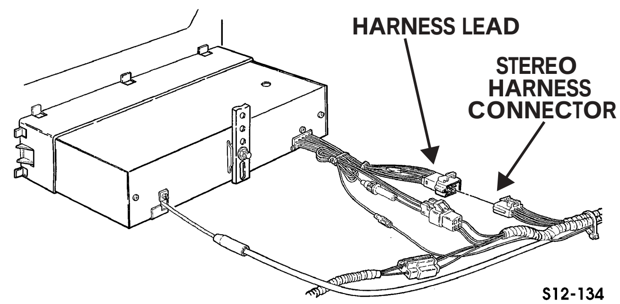

Figure 12-122: Radio Connections

3. Remove four screws, clips, cover, and right speaker from trim (Figure 12-123).

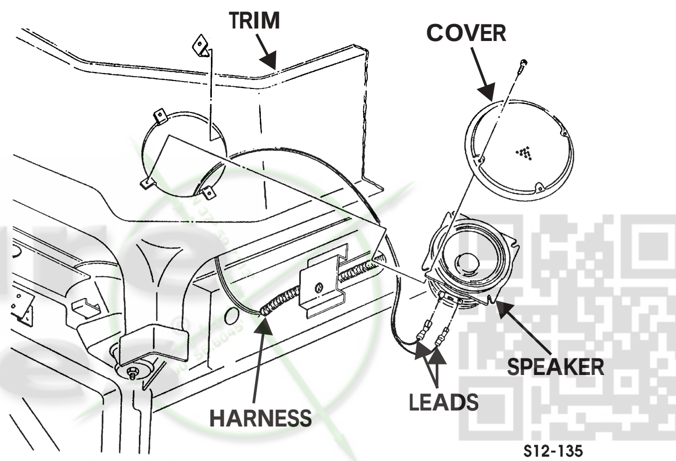

Figure 12-123: Speaker Mounting

4. Disconnect two leads from right speaker.
5. Repeat steps 3 and 4 for left speaker.
6. Remove trim as necessary to gain access to stereo harness (Section 10).
7. Remove stereo harness from vehicle.

Installation

1. Route stereo harness to approximate mounting position.
2. Secure stereo harness to vehicle with duct tape, where necessary.
3. Install trim (Section 10).
4. Connect two leads to right speaker (Figure 12-123).
5. Install right speaker and cover on trim with four clips and screws.
6. Repeat steps 4 and 5 for left speaker.
7. Connect harness lead to stereo harness connector (Figure 12-122).
8. Install front console (Section 10).

STEREO (BASIC) ELECTRICAL HARNESS (4-DOOR AND STATION WAGON) REPLACEMENT

Removal

1. Remove front console (Section 10).

NOTE: Prior to removal, tag all leads. Use of a fish wire is recommended during removal to aid harness installation.

2. Disconnect harness lead from stereo harness connector (Figure 12-124).

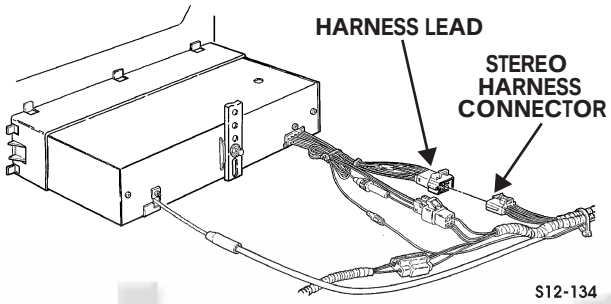

Figure 12-124: Radio Connections

3. Remove four screws, clips, cover, and right front speaker from trim (Figure 12-125).
4. Disconnect two leads from right front speaker.
5. Repeat steps 3 and 4 for left front speaker.

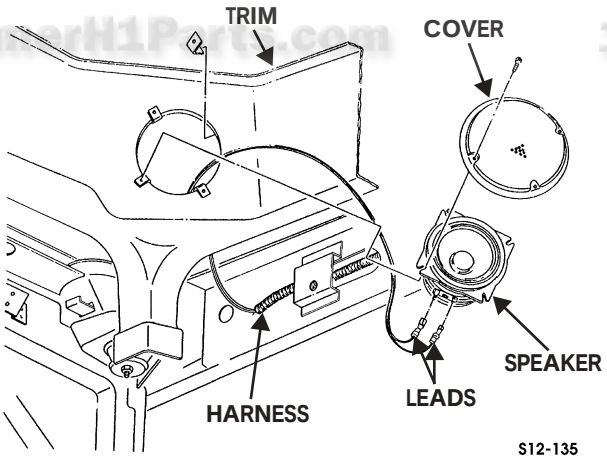

Figure 12-125: Front Speaker Mounting

6. Remove four screws, clips, cover, and right rear speaker from trim (Figure 12-126).
7. Disconnect two leads from right rear speaker.
8. Repeat steps 7 and 8 for left rear speaker.
9. Remove trim as necessary to gain access to stereo harness (Section 10).
10. Remove stereo harness from vehicle.

Installation

1. Route stereo harness to approximate mounting position.
2. Secure stereo harness to vehicle with duct tape, where necessary.
3. Install trim (Section 10).
4. Connect two leads to right rear speaker (Figure 12-126).

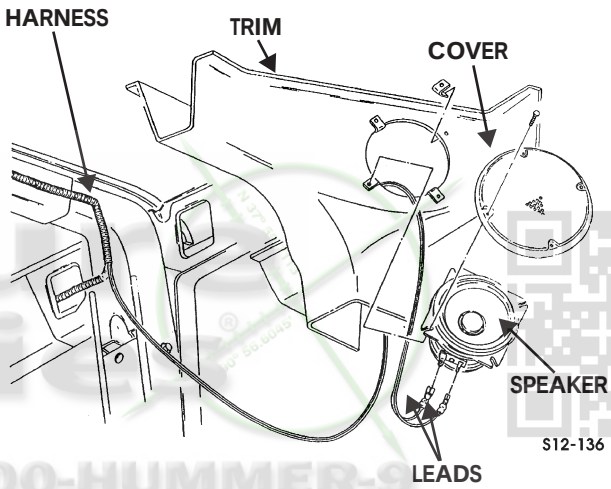

Figure 12-126: Rear Speaker Mounting

5. Install right rear speaker and cover on trim with four clips and screws.
6. Repeat steps 4 and 5 for left rear speaker.

7. Connect two leads to right front speaker (Figure 12-127).

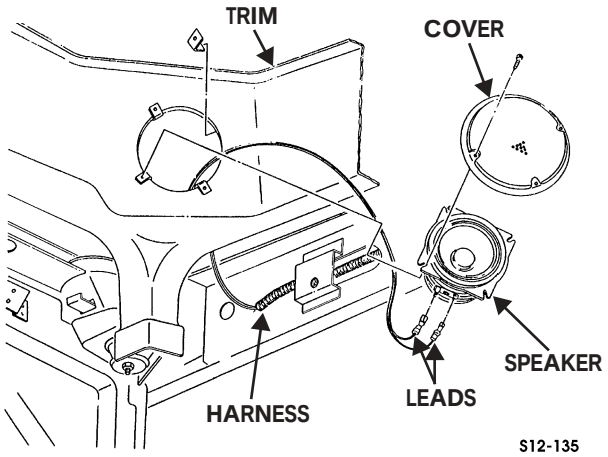

Figure 12-127: Front Speaker Mounting

8. Install right front speaker and cover on trim and secure with four clips and screws.
9. Repeat steps 7 and 8 for left front speaker.
10. Connect harness lead to stereo harness connector (Figure 12-124).
11. Install front console (Section 10).

STEREO (BASIC) ELECTRICAL HARNESS (4-DOOR OPEN CAB) REPLACEMENT

Removal

1. Remove front console (Section 10).

NOTE: Prior to removal, tag all leads. Use of a fish wire is recommended during removal to aid harness installation.

2. Disconnect harness lead from stereo harness connector (Figure 12-128).

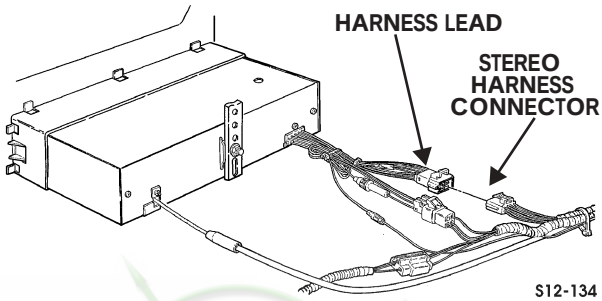

Figure 12-128: Radio Connections

3. Remove four screws, clips, cover, and right front speaker from trim (Figure 12-129).

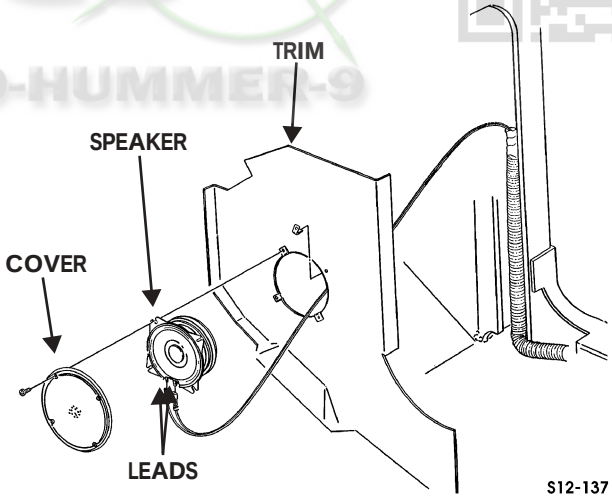

Figure 12-129: Front Speaker Mounting

4. Disconnect two leads from right front speaker.
5. Repeat steps 3 and 4 for left front speaker.
6. Remove four screws, clips, cover, and right rear speaker from trim (Figure 12-130).

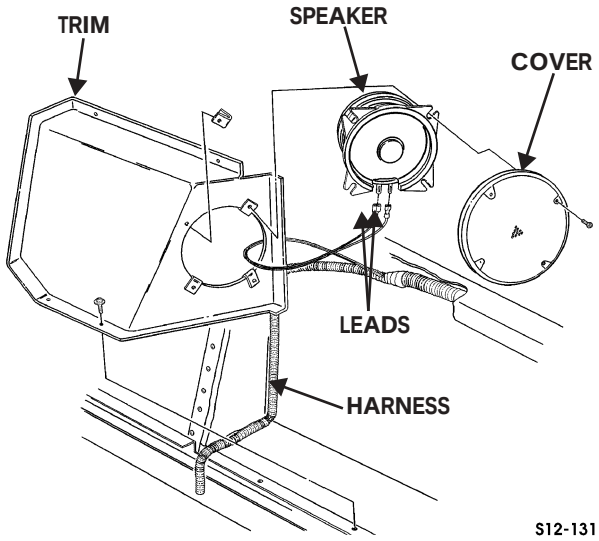

Figure 12-130: Rear Speaker Mounting

7. Disconnect two leads from right rear speaker.
8. Repeat steps 7 and 8 for left rear speaker.
9. Remove trim as necessary to gain access to harness (Section 10).
10. Remove stereo harness from vehicle.

Installation

1. Route stereo harness to approximate mounting position.
2. Secure harness to vehicle with duct tape, where necessary.
3. Install trim (Section 10).
4. Connect two leads to right rear speaker (Figure 12-130).
5. Install right rear speaker and cover on trim and secure with four clips and screws.
6. Repeat steps 4 and 5 for left rear speaker.

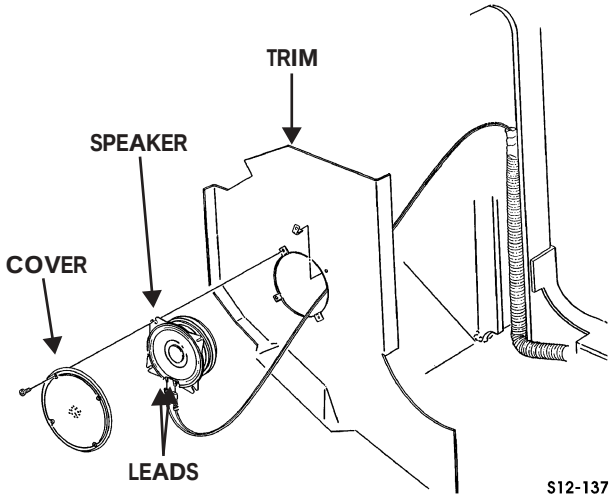

Figure 12-131: Front Speaker Mounting

7. Connect two leads to right front speaker (Figure 12-131).
8. Install right front speaker and cover on trim with four clips and screws.
9. Repeat steps 7 and 8 for left front speaker.

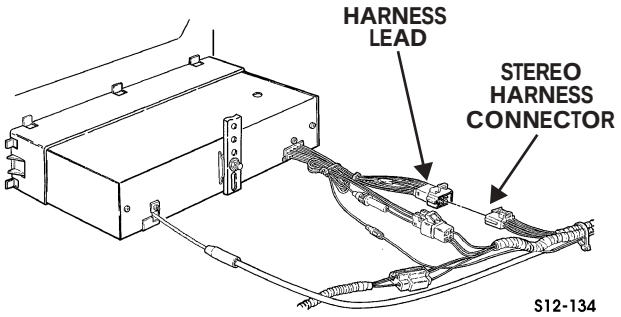

Figure 12-132: Radio Harness

10. Connect harness lead to stereo harness connector (Figure 12-132).
11. Install front console (section 10).

DASH HARNESS REPLACEMENT

Removal

1. Disconnect battery ground cable.
2. Remove driver's seat (Section 10).
3. Remove outer kick panels (Section 10).
4. Remove capscrew on left side of front console and two capscrews on right side of console (Figure 12-133).
5. Slide front console away from dash four inches to allow for routing of dash harness.

NOTE: Gauge cluster removal is for ease of crashpad removal and installation.

6. Remove eight screws and two gauge clusters from instrument panel but do not disconnect gauges.
7. Remove five capscrews and two turnbuttons from crashpad.

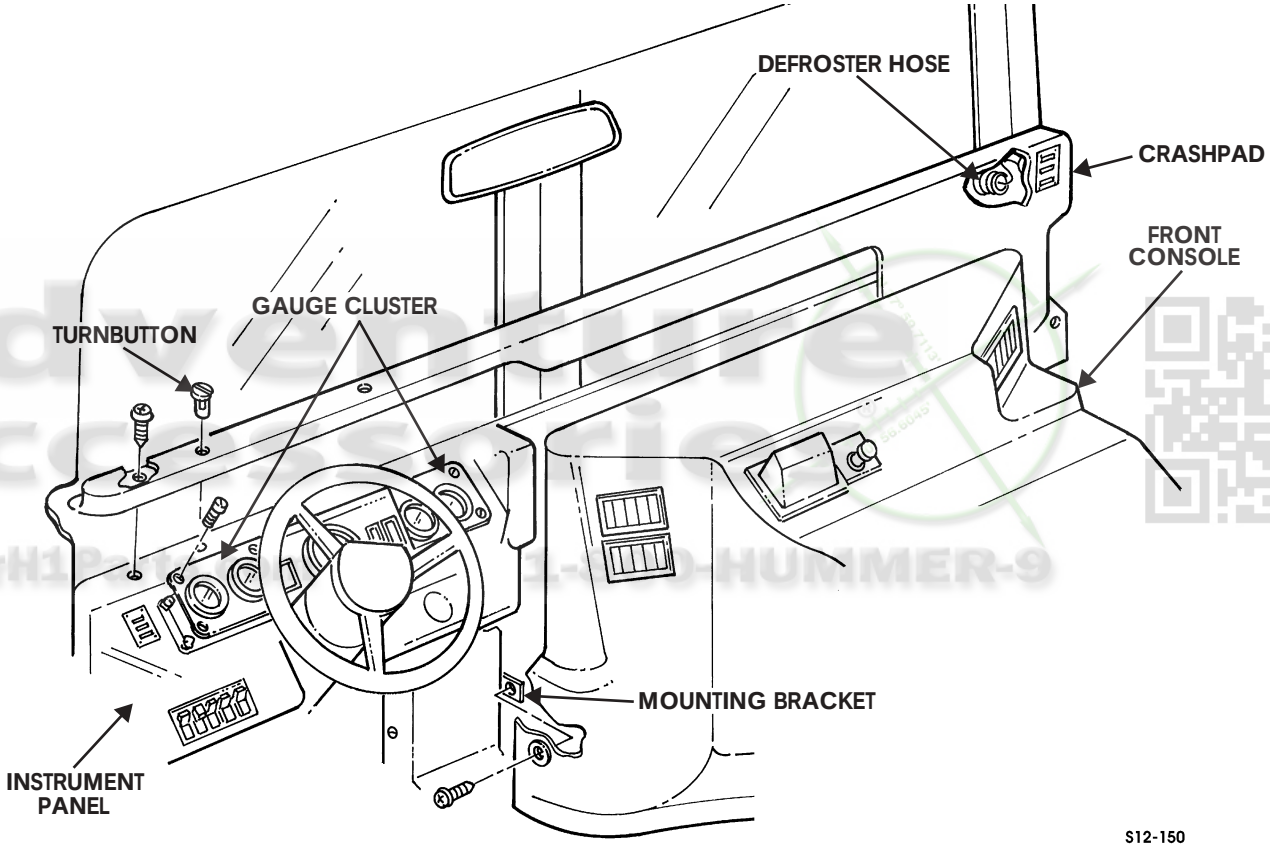

Figure 12-133: Front Trim and Instrument Panel

8. Disconnect defroster hose from crashpad and remove crashpad.
9. Remove capscrews, washers and nuts from instrument panel and dash.
10. Disconnect dash harness from door harnesses and jumper harnesses (4-door only) (Figure 12-134).

11. Disconnect pink power wire on dash harness from yellow spare circuit wire on body harness.

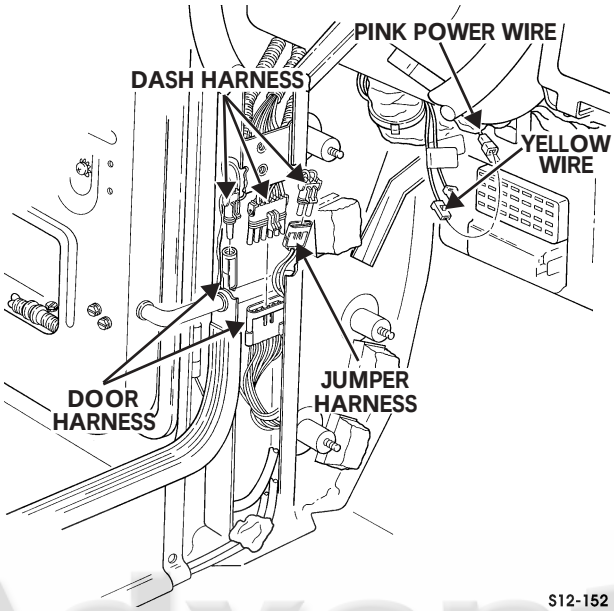

Figure 12-1 Harness Connections

Figure 12-134: Harness Connections

12. Remove nut and washer from instrument panel ground bolt and disconnect dash harness ground wire (Figure 12-135).
13. Remove two tie straps securing dash harness to defroster hose. Discard tie straps.
14. Remove dash harness.

Installation

1. Route dash harness to approximate mounting position.

NOTE: Ensure remote entry wires on dash harness are connected and ground wire and pink power wire are routed to the left side of vehicle.

2. Secure dash harness to defroster hose with two tie straps (Figure 12-135).
3. Install dash harness ground wire on instrument panel ground bolt with nut and washer.
4. Connect pink power wire on dash harness to yellow spare circuit wire on body harness (Figure 12-134).
5. Connect dash harness to door harnesses and jumper harnesses (4-door only).
6. Install instrument panel on dash with capscrews, washers, and nuts (Figure 12-133).
7. Install defroster hose in crashpad and install crashpad on instrument panel with five capscrews and two turnbuttons.
8. Install two gauge clusters in instrument panel with eight screws.
9. Install front console on mounting brackets with three capscrews.
10. Install outer kick panels (section 10).
11. Install driver's seat (section 10).
12. Connect battery ground cable.

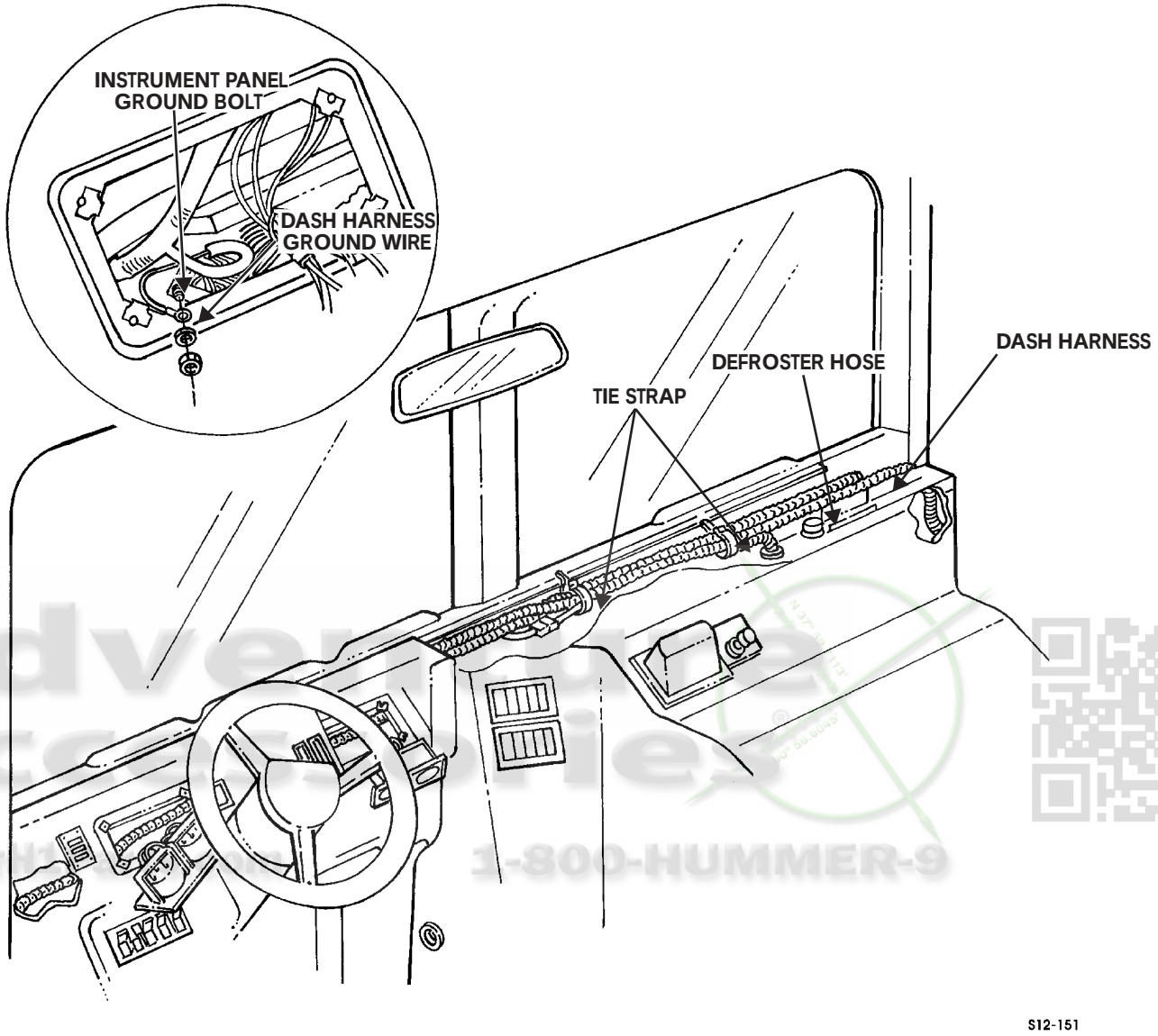

Figure 12-135: Harness Ground and Retainers

POWER DOOR LOCKS FRONT DOOR HARNESS REPLACEMENT

Removal

NOTE: Left and right front power door locks harness replacement procedures are similar.

1. Disconnect battery ground cable.
2. Remove front seat (Section 10).
3. Remove outer kick panels (Section 10).
4. Remove power door locks switch from door trim (Section 10).
5. Remove front door trim (Section 10).

NOTE: Vapor barrier may be positioned under velcro strip, if so, cut around velcro strip to remove vapor barrier.

6. Remove vapor barrier and moisture barrier flap from door (Figure 12-136).

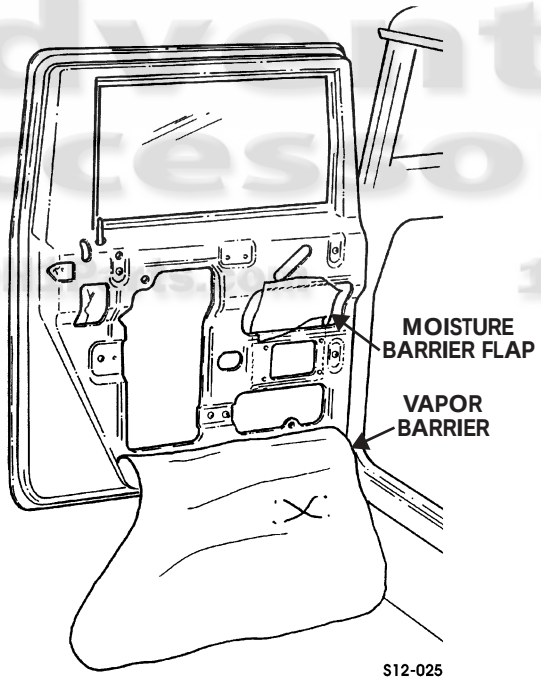

Figure 12-136: Vapor Barrier

7. Remove capscrew and P-clamp securing door harness to door reinforcement (Figure 12-137).
8. Remove capscrew, nut and lockwasher assembly, and P-clamp securing door harness to A-pillar.
9. Disconnect one-lead and six-lead connectors. Remove door harness wires from connectors with extraction tool.

NOTE: Lubricate bushings, grommet, and door harness teflon cover with silicone spray.

10. Pull harness through A-pillar rubber grommet.
11. Remove and inspect A-pillar rubber grommet. Discard if damaged.
12. Remove two capscrews and support bracket from inner door.
13. Pull harness through door bushing. Inspect door bushing. Replace if damaged.
14. Pull support bracket from harness. Inspect support bracket bushing. Replace if damaged.

NOTE: On vehicles equipped with power windows, it may be necessary to loosen motor mounting screws.

15. Disconnect harness connector from actuator.
16. Disconnect clip from door reinforcement and remove from door harness.

NOTE: Tie strap on access hole applies to left front door only.

17. Remove tie strap securing door harness to access hole and remove harness. Discard tie strap.

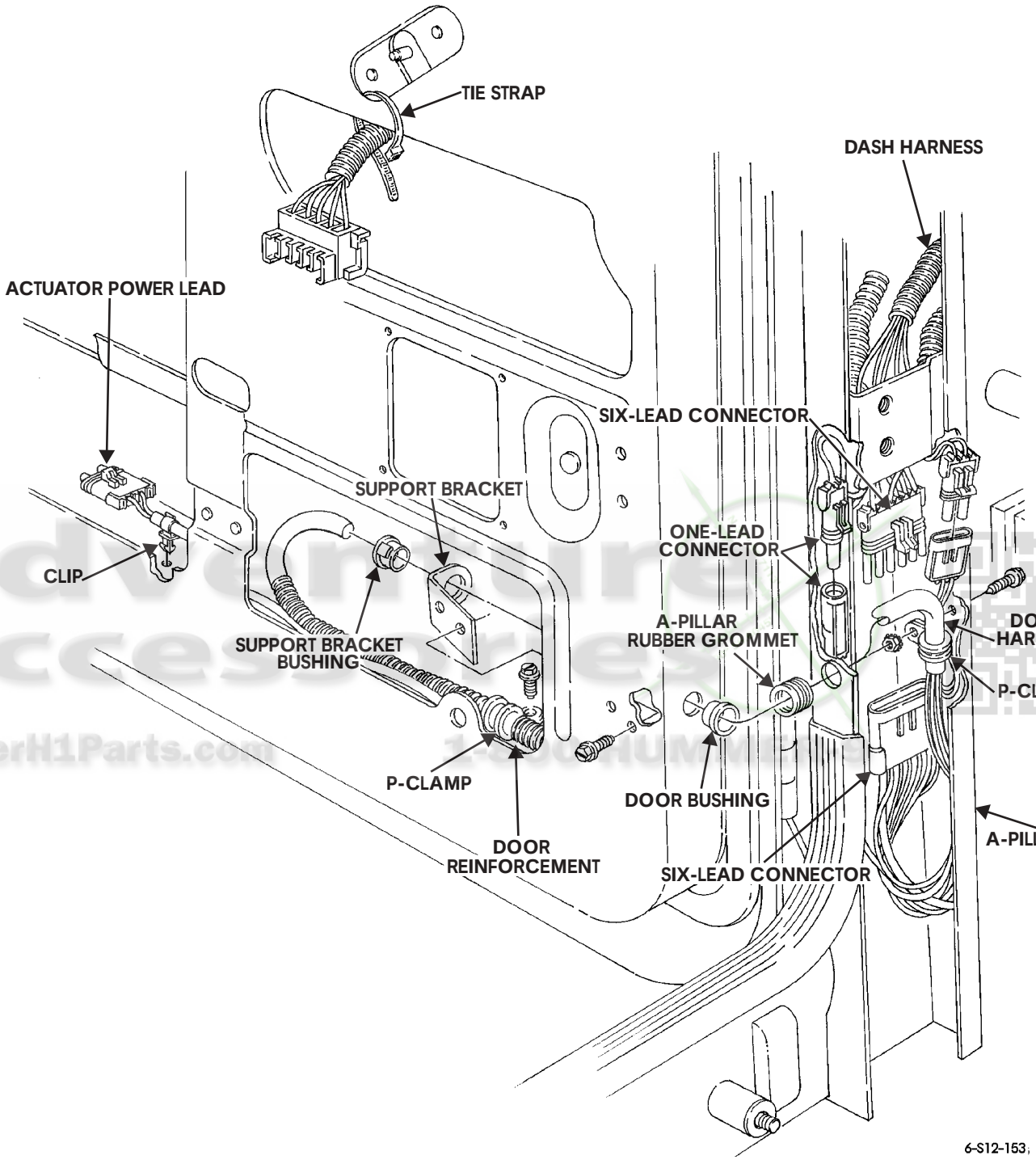

Figure 12-137: Door Harness

Installation

NOTE: Left and right front power door locks harness replacement procedures are similar.

1. Install harness in support bracket (Figure 12-138).
2. Install harness through door bushing and support bracket. Install support bracket on inner door with two capscrews.

NOTE: Lubricate A-pillar rubber grommet and door harness teflon cover with silicone spray.

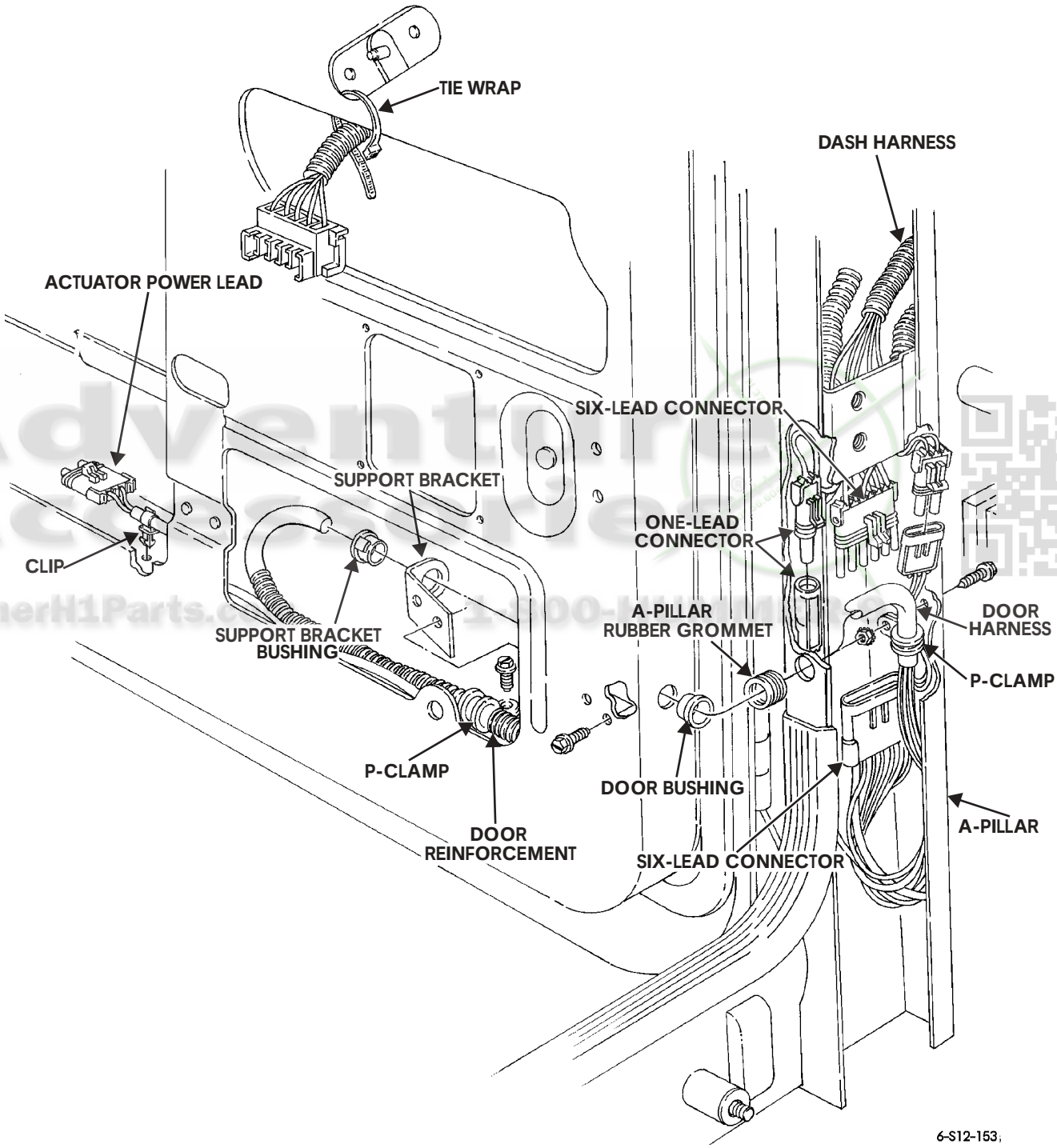

Figure 12-138: Door Harness

3. Install rubber grommet in A-pillar.
4. Install harness through grommet until yellow tape touches A-pillar front.
5. Install six-lead and one-lead connectors to door harness leads, matching colors to dash harness. Connect door harness to dash harness.
6. Install P-clamp and door harness on A-pillar with capscrew and nut and lockwasher assembly.
7. Install P-clamp and door harness at yellow tape area with capscrew.
8. Install clip on door harness and connect harness to actuator. Install clip in door reinforcement. Tighten power window motor mounting screws, if loose.
9. Lower window.
10. Route lock switch lead up through lower access hole between support bracket and window channel. Secure at top access hole with tie strap (left front door only).
11. Route lock switch lead through vapor barrier and moisture barrier flap and install moisture barrier and vapor barrier flap on door (Figure 12-139).

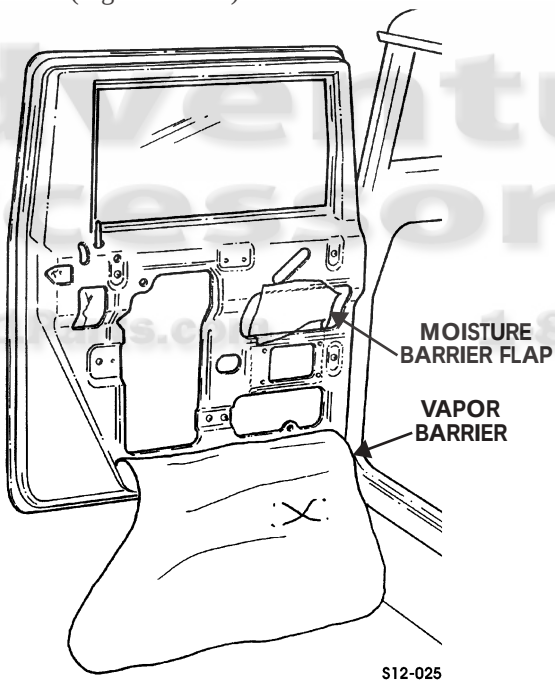

Figure 12-139: Vapor Barrier

12. Install front door trim (Section 10).
13. Install power door locks switch (Section 10).
14. Install outer kick panels (Section 10).
15. Install front seat (Section 10).
16. Connect battery ground cable.

POWER DOOR LOCKS REAR DOOR AND JUMPER HARNESS REPLACEMENT

Removal

NOTE: Left and right rear power door locks harness replacement procedures are identical.

1. Disconnect battery ground cable.
2. Remove front seat (Section 10).
3. Remove trim from B-beam and B-pillar (Section 10).
4. Remove side trim and outer kick panel (Section 10).
5. Remove rear door trim (Section 10).

NOTE: Vapor barrier may be positioned under velcro strip If so, cut around velcro strip to remove vapor barrier.

6. Remove vapor barrier and moisture barrier flap (Figure 12-140).

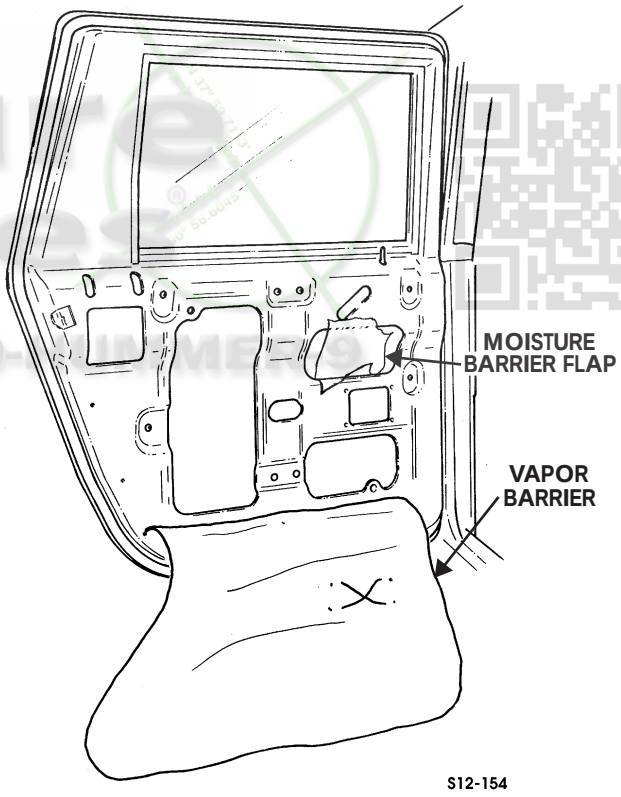

Figure 12-140: Vapor Barrier

7. Remove capscrew and P-clamp securing rear door harness to door reinforcement (Figure 12-141).
8. Disconnect rear door harness from jumper harness.
9. Remove plastic tubing from rear door harness.
10. Remove two-lead connector from rear door harness with pin extraction tool.
11. Remove capscrew, washer, nut and lockwasher assembly, and P-clamp from rear door harness and B-pillar.

NOTE: Lubricate bushings, rubber grommet, and door harness teflon cover with silicone spray.

12. Pull harness through rubber grommet in B-pillar.
13. Remove and inspect grommet. Discard if damaged.
14. Remove two capscrews and support bracket from rear door.
15. Pull harness through door bushing and remove support bracket from harness. Inspect support bracket bushing. Replace if damaged.
16. Inspect bushing in rear door. Replace if damaged.

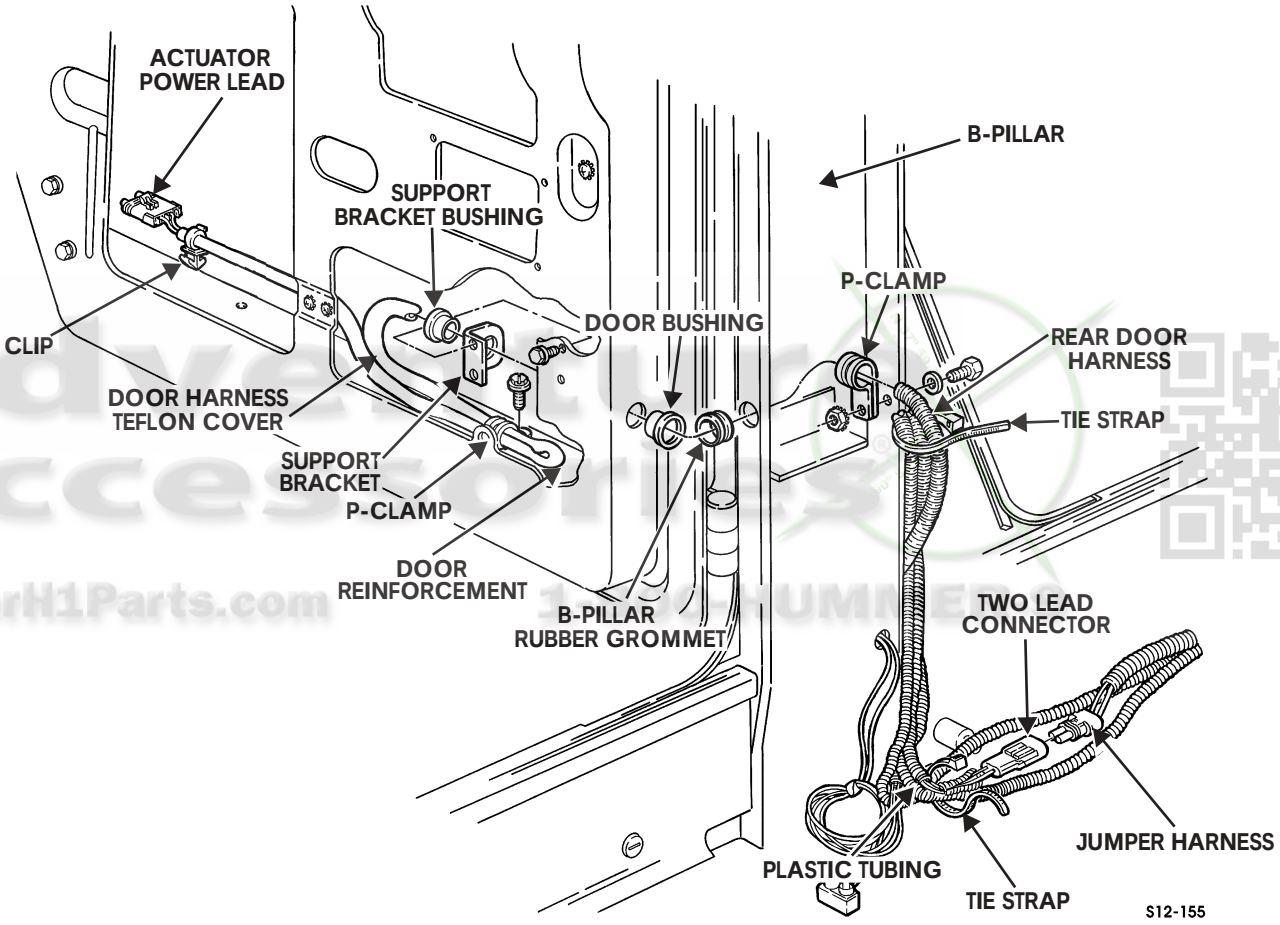

Figure 12-141: Door Harness

NOTE: On vehicle, equipped with power windows, it may be necessary to loosen motor mounting screws.

17. Disconnect door harness power lead from actuator lead.
18. Disconnect clip from door reinforcement and remove from rear door harness.
19. Remove rear harness from door.
20. Disconnect jumper harness from dash harness at A-pillar. Remove tie straps and jumper harness (Figure 12-142).

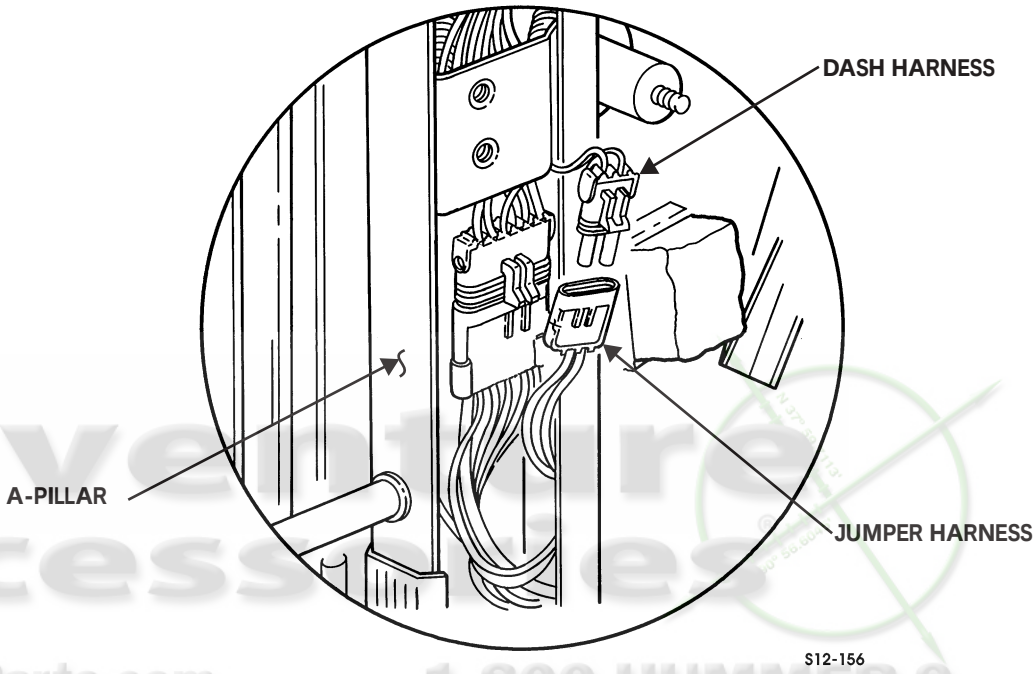

Figure 12-142: Door Harness Connection

Installation

NOTE: Left and right rear door harness replacement procedures are identical.

NOTE: Lubricate bushings, rubber grommet, and door harness teflon cover with silicone spray.

1. Secure jumper harness to existing harness along side panel with tie straps. Connect jumper harness to dash harness at A-pillar (Figure 12-142).

2. Install clip and support bracket on rear door harness (Figure 12-143).
3. Install harness in door bushing.
4. Install support bracket in rear door with two capscrews.
5. Install rubber grommet in B-pillar.
6. Install harness through grommet until yellow tape touches the back of B-pillar.
7. Install P-clamp on harness at yellow tape and B-pillar with capscrew, washer and lockwasher and nut assembly.
8. Install two-lead connector on rear door harness, matching wire colors to jumper harness. Connect harness to jumper harness.
9. Route rear door harness along bottom of rear door. Secure harness to door reinforcement with clip.
10. Connect door harness to actuator lead. Tighten power window motor mounting screws, if loose.
11. Install plastic tubing on rear door harness wires and secure with black electrical tape.
12. Install P-clamp on rear door harness at yellow tape area and secure to door reinforcement with one capscrew.

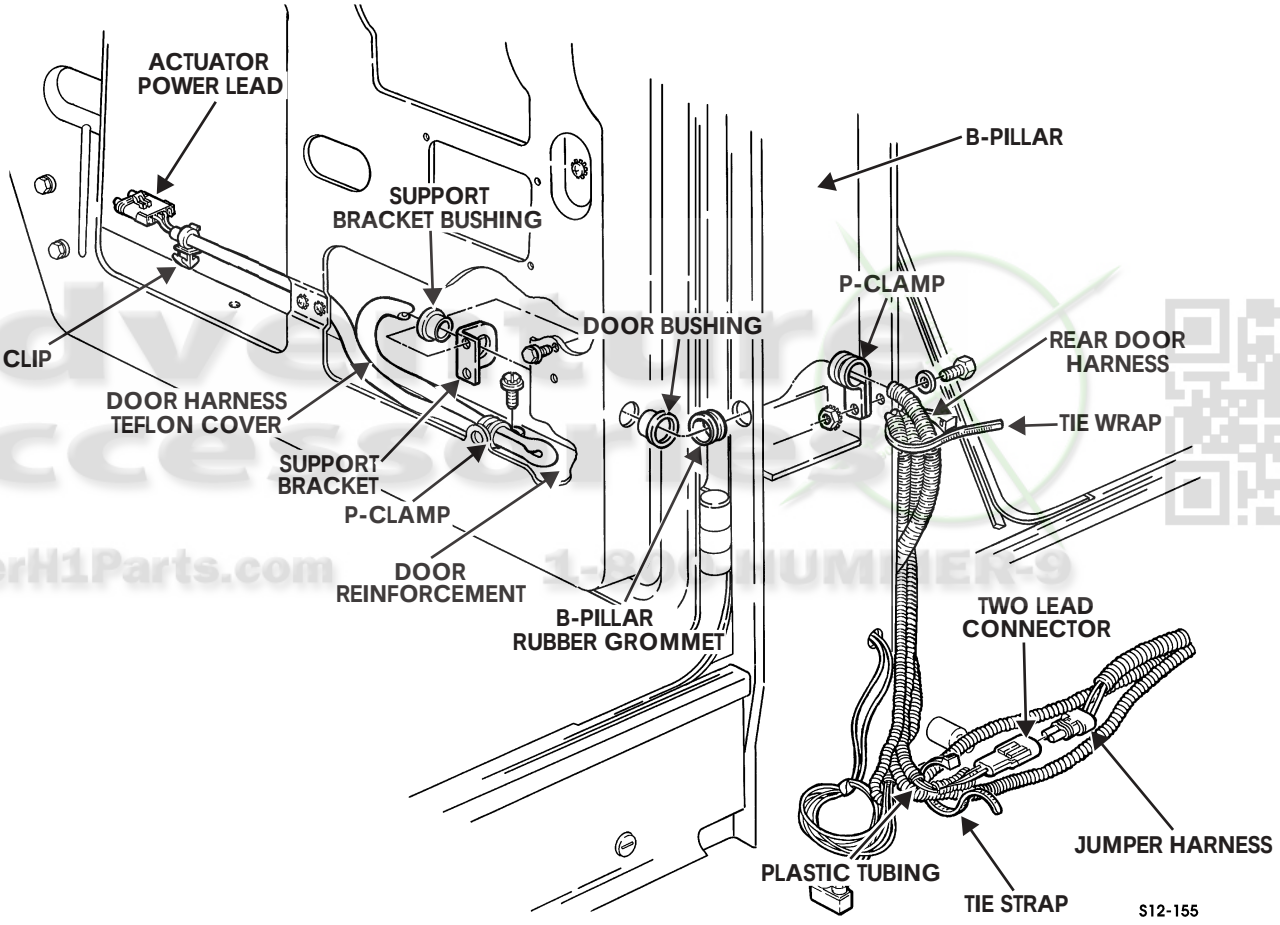

Figure 12-143: Door Harness

13. Install vapor barrier and moisture barrier flap (Figure 12-144).

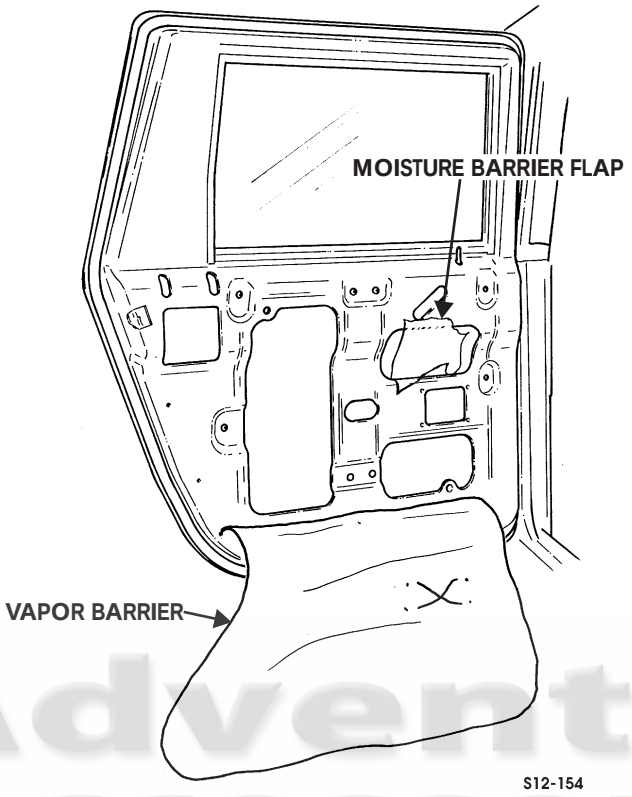

Figure 12-144: Vapor Barrier

14. Install rear door trim (Section 10).
15. Install side trim and outer kick panel (Section 10).
16. Install trim on B-pillar and B-beam (Section 10).
17. Install front seat (Section 10).
18. Connect battery ground cable.

REMOTE ENTRY HARNESS REPLACEMENT

Removal

NOTE: Tag all harnesses for installation.

1. Disconnect two battery ground cables.
2. Remove screw from left side and two screws from right side of front console (Figure 12-145).

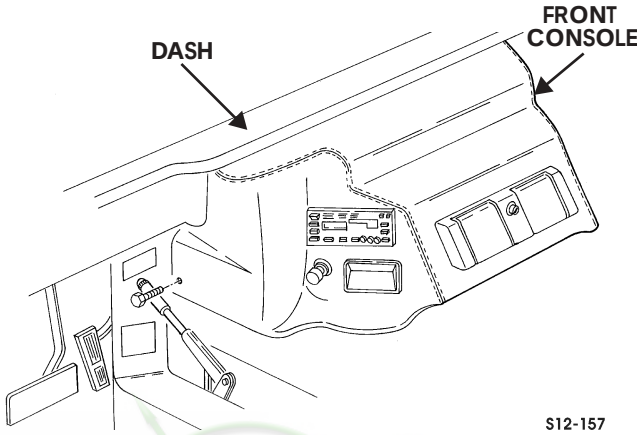

Figure 12-145: Engine Cover Console

3. Slide front console four inches toward rear of vehicle to allow access to dash harness.
4. Disconnect two dash harness connectors from remote entry harness connectors (Figure 12-146).

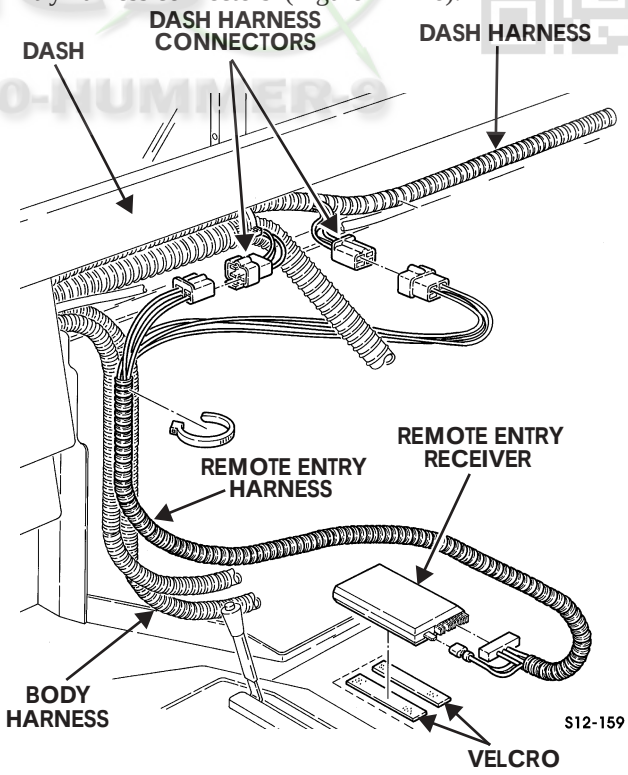

Figure 12-146: Receiver Harness

5. Disconnect remote entry harness connector from remote entry receiver.
6. Cut tie wraps as required and remove remote entry harness and remote entry receiver from vehicle.

Installation

1. Install remote entry receiver on velcro strips.
2. Connect remote entry harness connector at remote entry receiver (Figure 12-146).
3. Connect two dash harness connectors to remote entry harness connectors.
4. Secure remote entry harness to body and dash harness with tie straps as required.
5. Slide front console forward to dash.
6. Install front console with two screws on right side and one screw on left side (Figure 12-145).
7. Connect two battery ground cables.

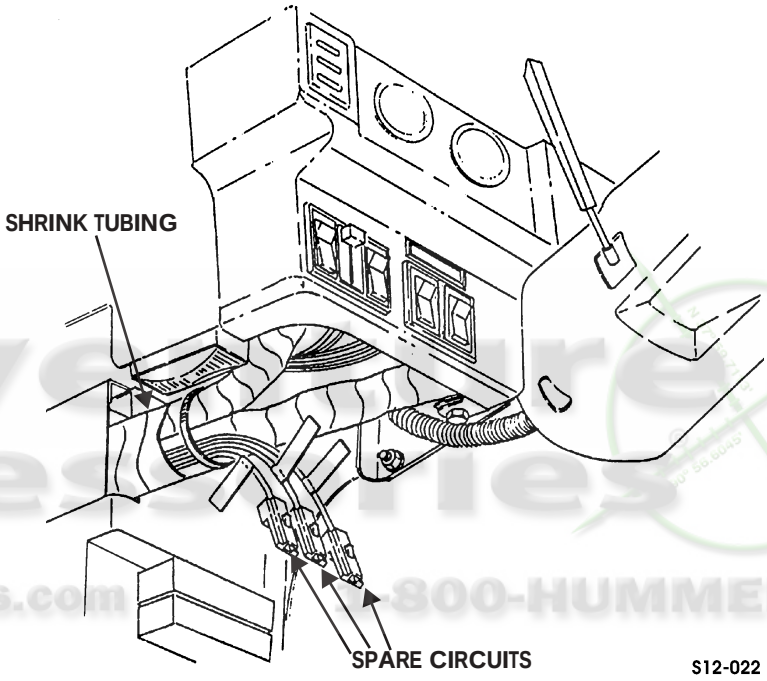

Figure 12-147: Spare Wires Location

TRAILER TOWING CONNECTOR ASSEMBLY

NOTE: The following procedure provides instructions to assemble a trailer towing connector needed when installing a trailer brake controller.

NOTE: Spare wires have been provided in the body harness (Figure 12-147) and routed from the instrument panel/fuse box area to the trailer connector at the rear of the vehicle.

1. Disconnect battery ground cable.
2. Install the brake controller using manufacturer's instructions.
3. Carefully remove and discard heat shrink tubing covering body harness and trailer harness connectors (Figure 12-148).
4. Cut dark blue (43A) wire and purple (50A) wire 2 in. (5 cm) from back of body harness trailer connector.
5. Slide adhesive wall heat shrink tubing over one end of dark blue and purple wires (Figure 12-149).
6. Connect dark blue body harness wire to purple connector wire. Secure connection using meltable adhesive crimp butt splices.
7. Connect purple body harness wire to dark blue connector wire. Secure connection using meltable adhesive crimp butt splices.
8. Cover both splices with heat shrink tubing, and shrink tubing with heat gun.
9. Slide large piece of heat shrink tubing over body harness connector.
10. Plug connector halves together, and position heat shrink tubing over mated connector.
11. Shrink tubing with heat gun.
12. Install a fuse in fuse position 7H as required per brake controller and trailer manufacturer's recommendations.
13. Connect battery ground cable, and test circuits for proper operation.

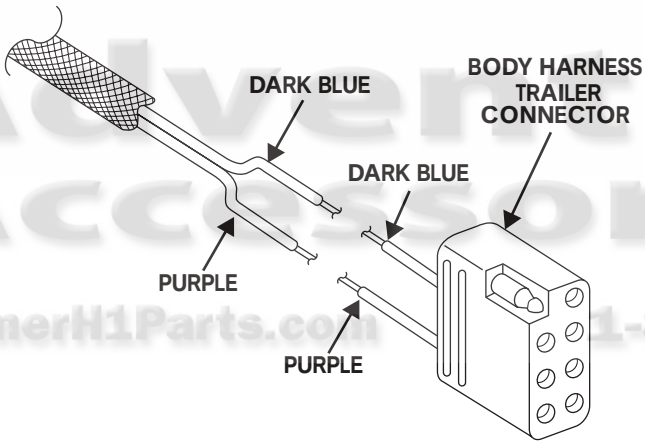

Figure 12-148: Wire Splice Locations

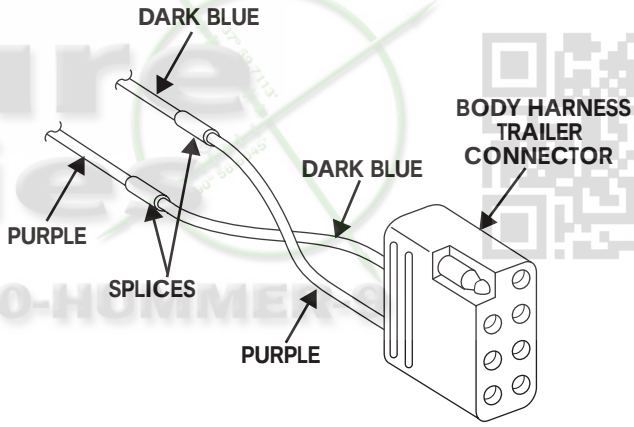

Figure 12-149: Spliced Connections

AUXILIARY AIR-CONDITIONING AND HEATING JUMPER HARNESS REPLACEMENT

NOTE: Tag leads for installation.

Removal

1. Remove auxiliary air-conditioning and heating fan switch (Section 11).
2. Remove front console enough to gain access to leads (Section 10).
3. Disconnect jumper harness connector from auxiliary unit blower motor connector.
4. Disconnect jumper harness purple, black, and red connectors from air-conditioning wiring harness connectors.

Installation

1. Connect jumper harness purple, black, and red connectors to air-conditioning wiring harness connectors.
2. Connect jumper harness connector to auxiliary unit blower motor connector.
3. Install front console (Section 10).
4. Install auxiliary air-conditioning and heating fan switch (Section 11).

FUSIBLE LINK MAINTENANCE

The following procedure covers the replacement of fusible links encountered through circuit diagnosis.

1. Disconnect battery ground cable.
2. Carefully remove old fusible link from termination (alternator, power stud, starter).
3. Locate original wiring harness splice between fusible link and wiring harness (Figure 12-150).
4. Cut fusible link splice on harness side. Do not splice into original fusible link; this may be weakened and cause a premature failure and repeat problem.
5. Identify the original fuse link size and length of fuse link cut from vehicle.
6. Matching the wire size, cut a length of fusible link wire to the total length cut from vehicle in Step 4. Be sure to compensate for any harness wire removed with original wire. This will avoid overtight wiring that may become separated with normal operation.
7. Install a new crimp on connector of the same type and size as the original lug or connector. Seal connection with low temperature heat shrink tubing.
8. Place a piece of heat shrink tubing onto the wire and install a butt connector onto the fusible link.
9. Install the fusible link by connecting it to the wiring harness with the butt connector and heat shrink tubing.
10. Connect terminal end to original location, alternator, power stud, or starter. Reconnect battery ground cable and check circuit(s) affected for proper operation.

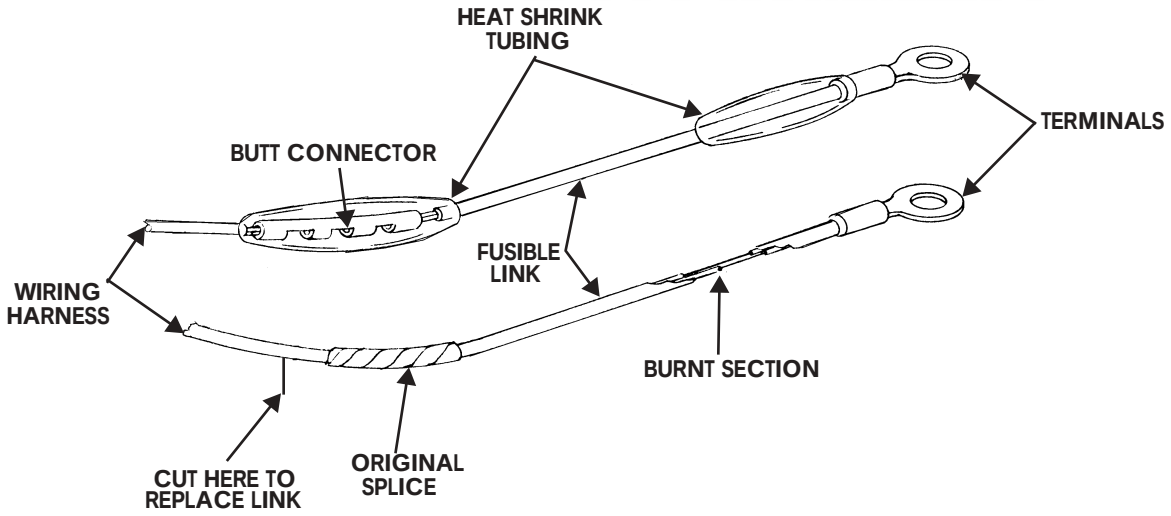

Figure 12-150: Fusible Link

IGNITION SWITCH REPLACEMENT

Removal

1. Disconnect battery ground cable.
2. Remove steering column (Section 8).
3. Remove multi-switch.
4. Remove screw and interlock cable from ignition switch (Figure 12-151).

5. Remove two capscrews and ignition switch from steering column.

Installation

1. Apply thread-locking compound to capscrew threads and install ignition switch on steering column with two capscrews (Figure 12-151).
2. Install interlock cable on ignition switch with screw.
3. Install multi-switch.
4. Install steering column (Section 8).
5. Connect battery ground cable.
6. Ensure ignition switch operates properly.

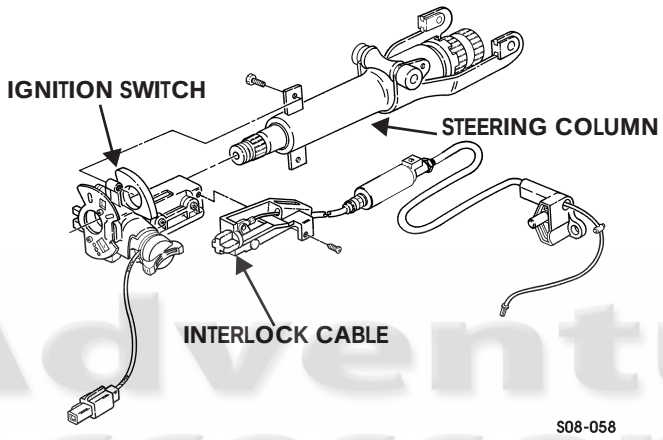

Figure 12-151: Ignition Switch