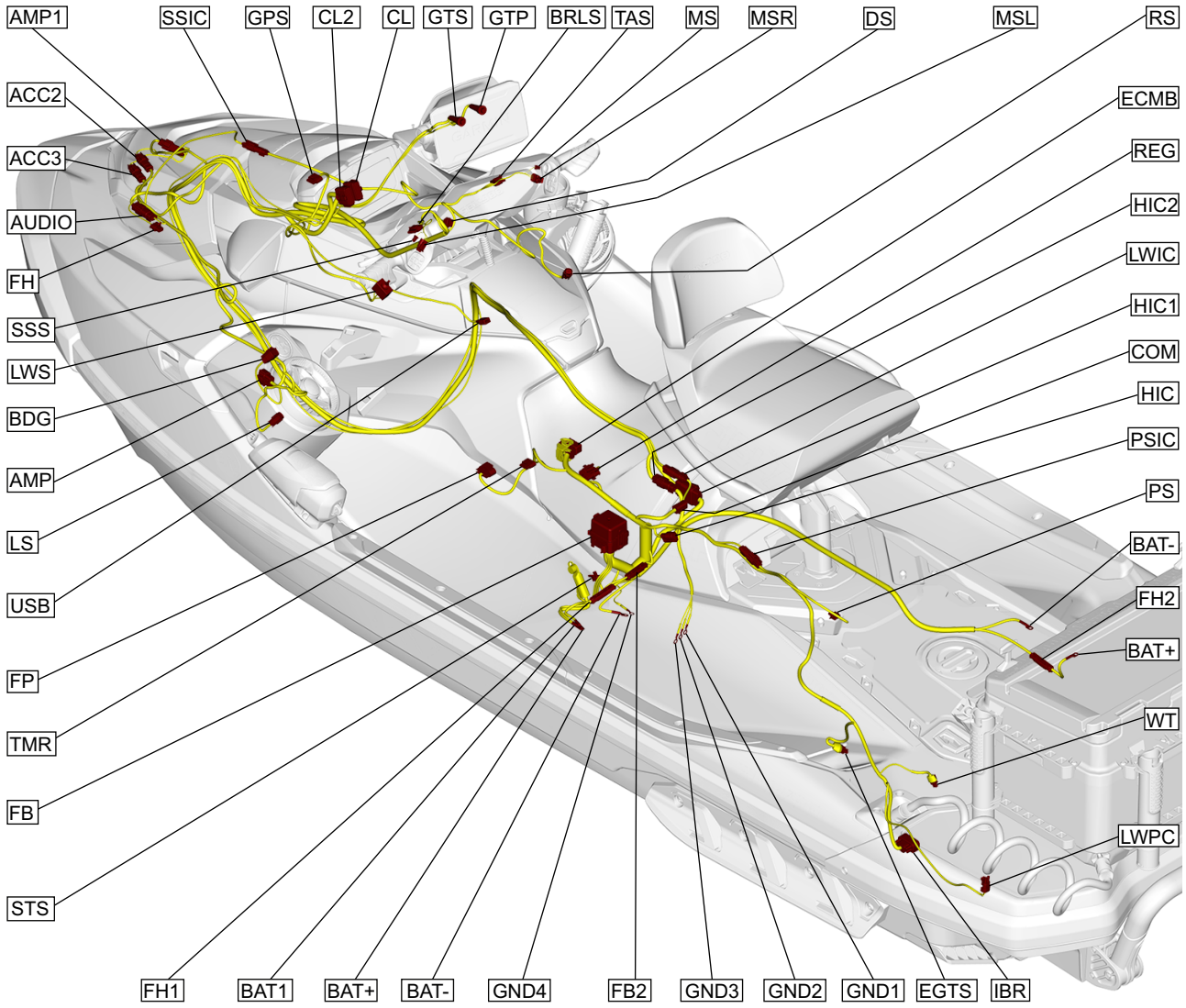
Wiring Harness and Connectors

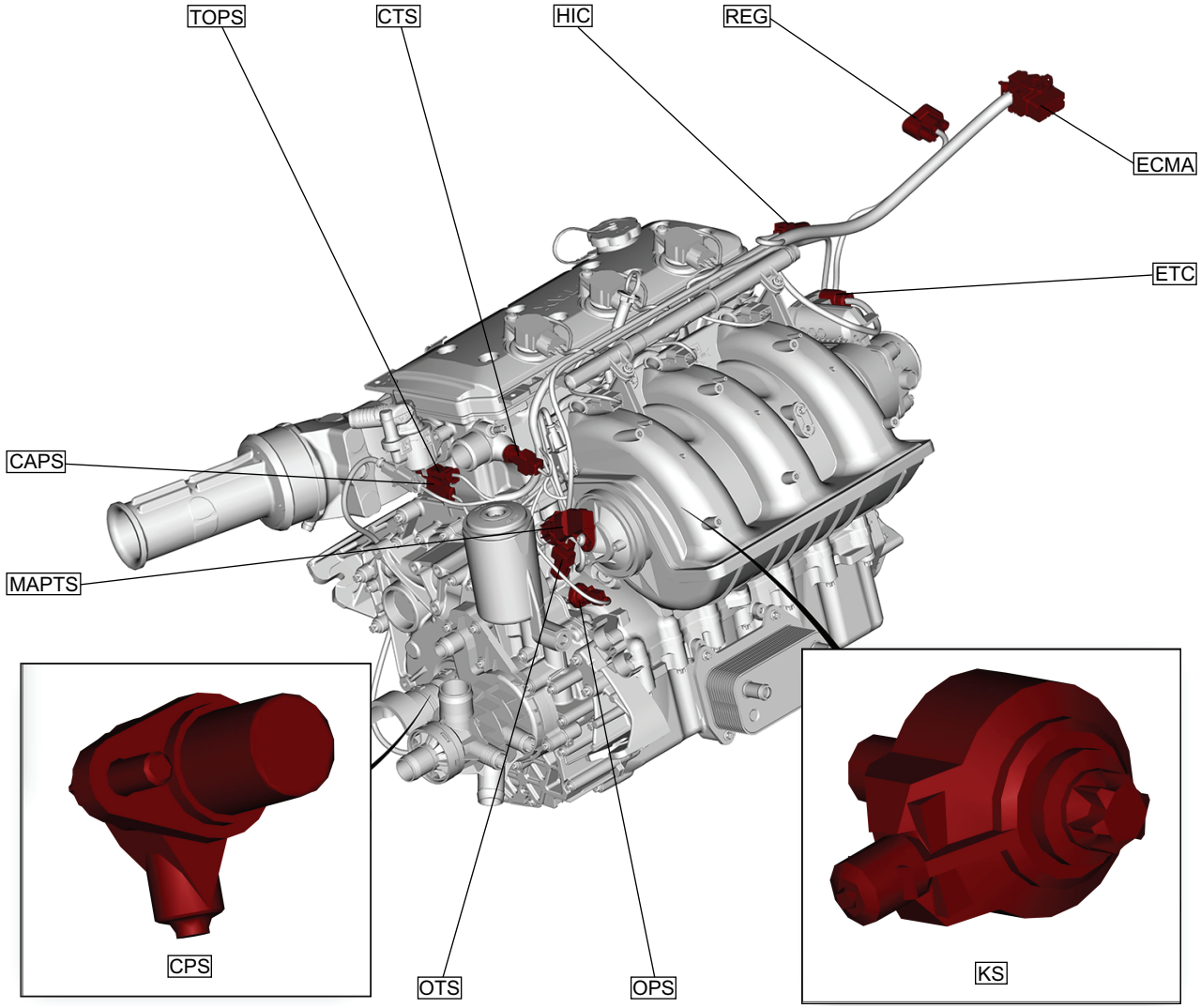
Wiring Harness and Connectors

Figure 1. 1630 ACE Engines - Vehicle



1630 ACE ENGINES - VEHICLE

Figure 2. 1630 ACE Engines - 170 Engines



1630 ACE ENGINES - 170 ENGINES

Acronyms

Acronym	Description
ACC	Accessories
AMP	Amplifier
AUDIO	Audio System
BAT	Battery
BDG	Bluetooth Dongle
BRLS	Brake and Reverse Lever Sensor
CAPS	Camshaft Position Sensor
CL	Cluster

Acronym	Description
COM	Communication
CTS	Coolant Temperature Sensor
DS	DESS post
ECM	Electronic Control Module connector
EGTS	Exhaust Gas Temperature Sensor
ETC	Electronic Throttle Control
FB	Fuse Box
FH	Fuse Holder
FP	Fuel Pump
GND	Ground
GTP	GPS Transducer Power
GTS	GPS Transducer Sensor
HIC	Harness Interconnect
IBR	Intelligent Braking and Reverse
KS	Knock Sensor
LS	Left Speaker
LWPC	Live Well Pump Cooler
LWIC	Live Well Interconnect
LWS	Live Well Switch
MAPTS	Manifold Air Pressure And Temperature Sensors
MS	Multi Function Switch
MSL	Multi Function Switch Left
MSR	Multi Function Switch Right
OPS	Oil Pressure Sensor
OTS	Oil Temperature Sensor
PS	Pedestal Sensor
PSIC	Pedestal Sensor Interconnect
REG	Voltage Regulator/Rectifier connector
RS	Right Speaker
SSIC	Sound System Interconnect
SSS	Start/Stop Switch
STM	Starter Motor

Acronym	Description
STS	Starter Solenoid
TAS	Throttle Acceleration Sensor
TMR	Live Well Cooler Timer
TOPS	Tip Over Position Sensor
USB	USB connector
WT	Water Temperature Sensor

Procedures

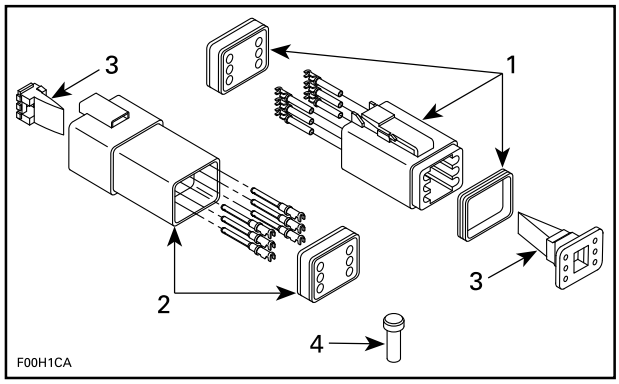
⚠ WARNING

When disassembling any connector for repair or replacement on the vehicle, always disconnect the battery to ensure all electrical power is removed and prevent any possibility of a short circuit. Refer to *Charging System* subsection.

Data Link Connector (Deutsch)

Disassembling and Reassembling the Connector

Figure 3. Typical - Deutsch Connector



TYPICAL - DEUTSCH CONNECTOR

1. *Male connector*
2. *Female connector*
3. *Secondary lock*
4. *Sealing cap*

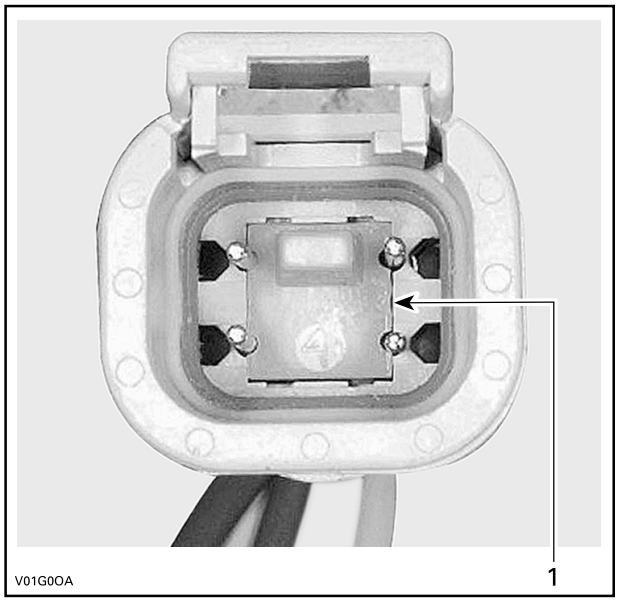
NOTICE

Do not apply dielectric grease on terminal inside connector.

To remove terminals from connector, proceed as follows:

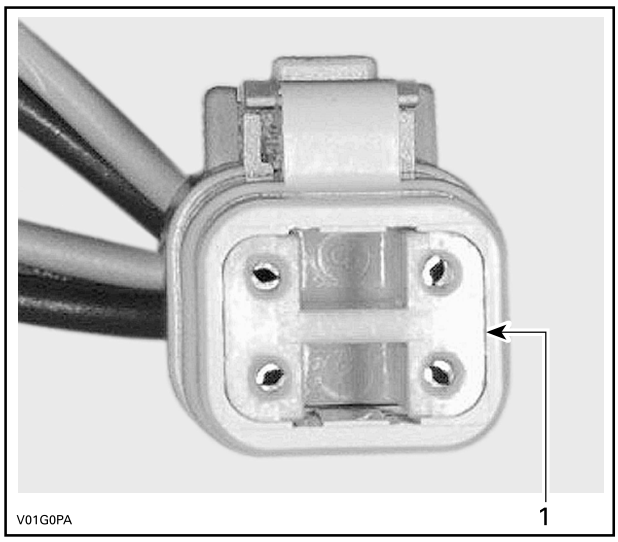
1. Using long nose pliers, pull out the plastic lock from between the terminals.

Figure 4. Typical - Female Connector



TYPICAL - FEMALE CONNECTOR
1. Female lock

Figure 5. Typical - Male Connector

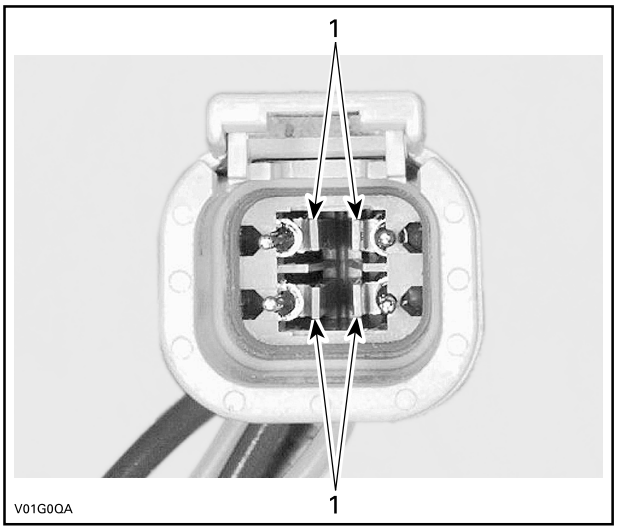


TYPICAL - MALE CONNECTOR
1. Male lock

NOTE: Before pin extraction, push wire forward to relieve pressure on retaining tab.

2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.

Figure 6. Typical - Female Connector

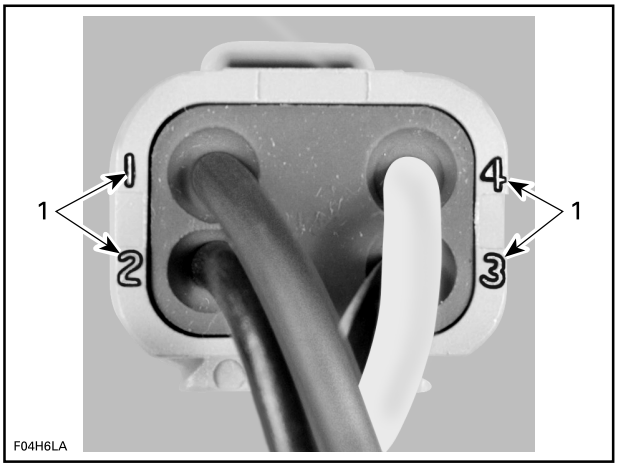


TYPICAL - FEMALE CONNECTOR
1. Retaining tabs

To install:

1. For insertion of a terminal, ensure the plastic lock is removed.
2. Insert terminal through the back of the connector in the appropriate position, and push it in as far as it will go. You should feel or hear the terminal lock engage.
3. Pull back on the terminal wire to ensure the retention fingers are holding the terminal.
4. After all required terminals have been inserted, the lock must be installed.

Figure 7. Typical - Connector Pin-Out

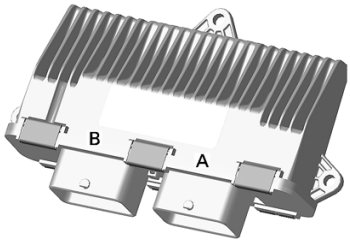


TYPICAL - CONNECTOR PIN-OUT
1. Terminal position identification numbers

ECM Connector (MOLEX)

1. There are 2 connectors on the ECM.
2. The engine wiring harness connector is connected to ECM connector "A". The vehicle wiring harness connector is connected to ECM connector "B".
3. Each ECM connector has 48 pins however, connectors "A" and "B" are not interchangeable due to their specific keyways.

Figure 8. ECM Connectors

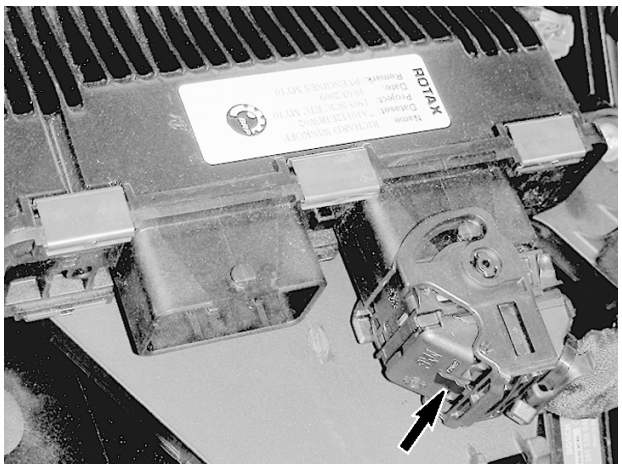


ECM CONNECTORS

Removing the Connectors

1. To access the ECM, refer to *electronic fuel injection (efi)* subsection.
2. Press **and hold** the locking tab on the connector to be disconnected.

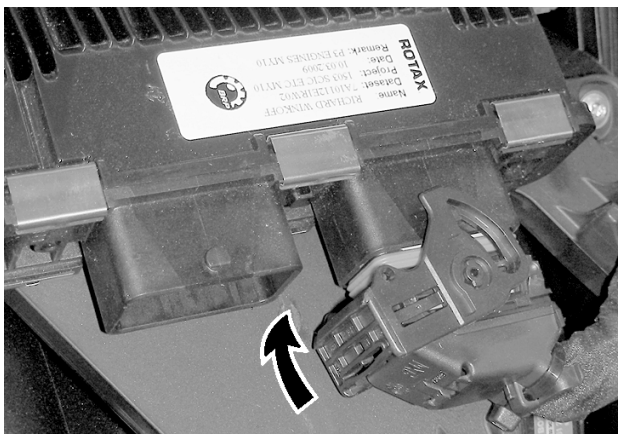
Figure 9. Locking Tab To Press And Hold



LOCKING TAB TO PRESS AND HOLD

3. As you hold the locking tab, rotate the connector locking cam until it stops.

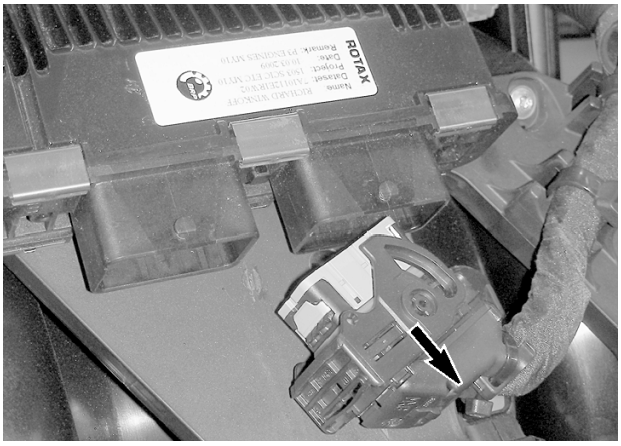
Figure 10. Connector Locking Cam Rotation To Release



CONNECTOR LOCKING CAM ROTATION TO RELEASE

4. Pull connector off ECM.

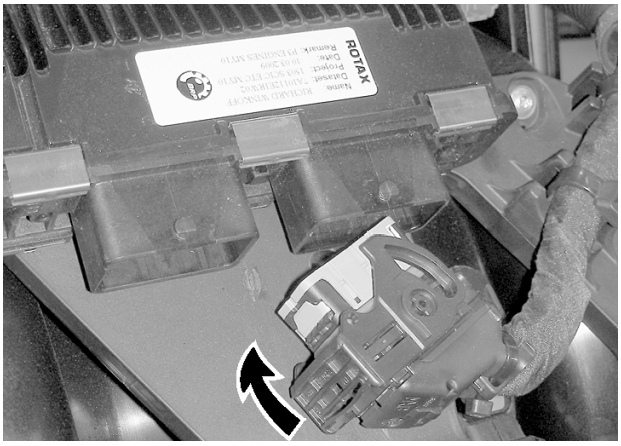
Figure 11.



Installing the Connectors

1. Fully open connector locking cam.

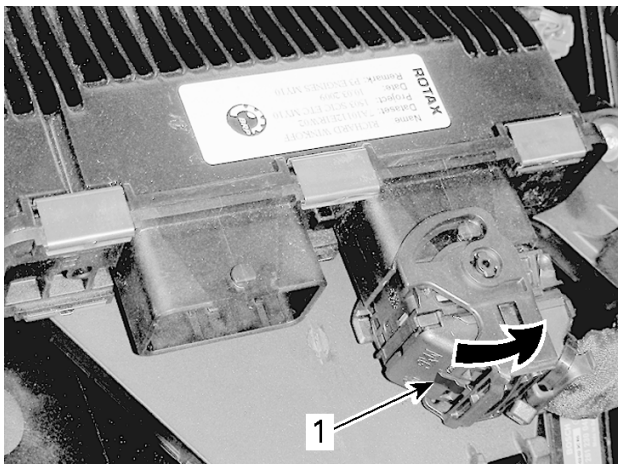
Figure 12. Connector Locking Cam In Release Position



CONNECTOR LOCKING CAM IN RELEASE POSITION

2. Insert connector on ECM.
3. As you push the connector onto the ECM, rotate the connector locking cam until it snaps locked.

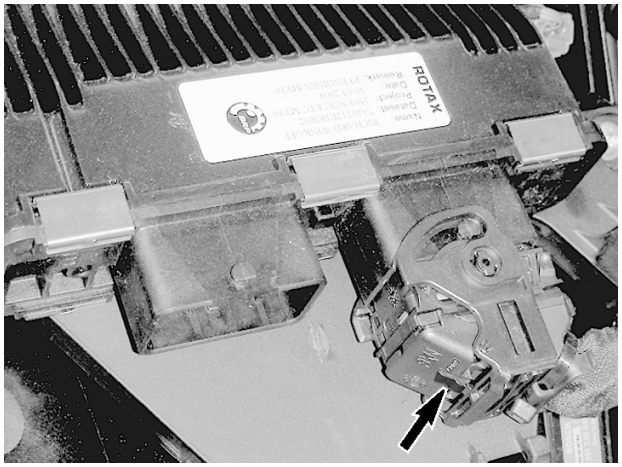
Figure 13.



1. Locked here

4. Ensure the locking tab is fully out.

Figure 14. Locking Tab Fully Out



LOCKING TAB FULLY OUT

Inspecting the Connectors

Before replacing an ECM, always check electrical connections.

1. Ensure connector locking mechanism is functioning properly.
2. Ensure all wire terminals (pins) are properly locked in the connector.
3. Ensure they are very tight, make good contact with the pins in the ECM.
4. Ensure the pins in the harness connector and the ECM connector are clean, shiny and corrosion-free.
5. Check wiring harness for signs of scoring.

NOTE: A “defective ECM module” could possibly be repaired simply by disconnecting and reconnecting it.

NOTICE
Do not apply any lubricant product to the pins of the ECM connector.

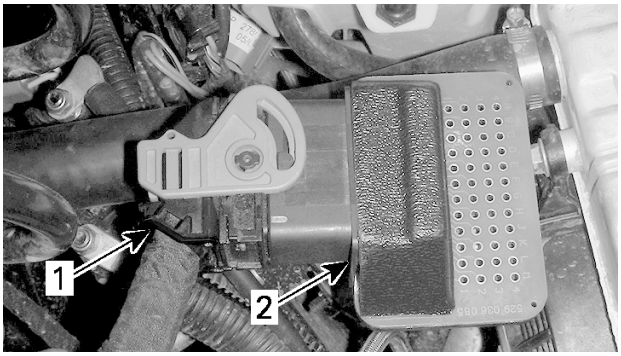
Probing the Connectors

The most recommended and safest method to probe the MOLEX (ECM) connector terminals is to use the ECM adapter tool. This tool will prevent deforming or enlarging of the terminals, which would lead to bad ECM terminal contact creating intermittent or permanent problems.

Required Tools	
ECM adapter tool (P/N 529 036 166)	

1. Disconnect the ECM connector to be probed, and reconnect it on the ECM adapter.
2. Probe wire terminals of the circuit to be tested directly in the adapter holes.

Figure 15. Typical



TYPICAL

1. ECM connector
2. ECM adapter

NOTICE
Never probe directly on the ECM harness connector. This could change the shape or enlarge the terminals and create intermittent or permanent contact problems.

Removing the Connector Terminal (Harness Connector)

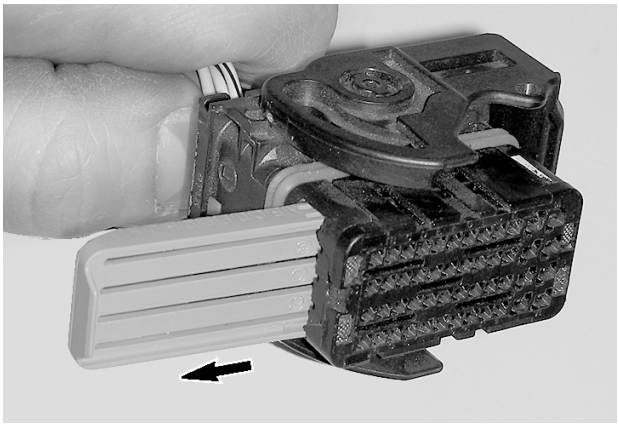
To remove a signal terminal from the ECM harness connector, use the ECM terminal remover 2.25.

To remove a power terminal, use the ECM terminal remover 3.36.

Required Tools	
ECM terminal remover 2.25 (P/N 529 036 175)	
ECM terminal remover 3.36 (P/N 529 036 174)	

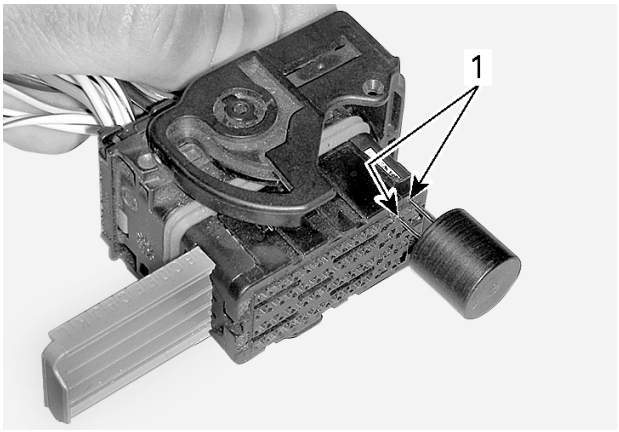
1. Remove rear protector from connector.
2. Pull out the connector lock.

Figure 16.



3. Insert tool to unlock terminal.

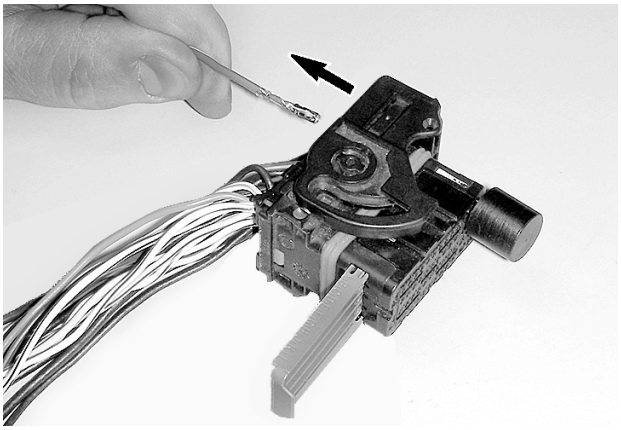
Figure 17.



1. Unlock here

4. Gently pull on the wire to extract the terminal out the back of the connector.

Figure 18.



NOTICE
Before installing wire terminals in the connector, ensure all terminals are properly crimped on wires. After installation of wire terminals in the connectors, ensure they are properly locked by gently pulling on them as if to extract them.

TAS, STS, FP, Bilge Pump, and OTAS Connectors (Delphi/Packard)

Connector Terminal Removal

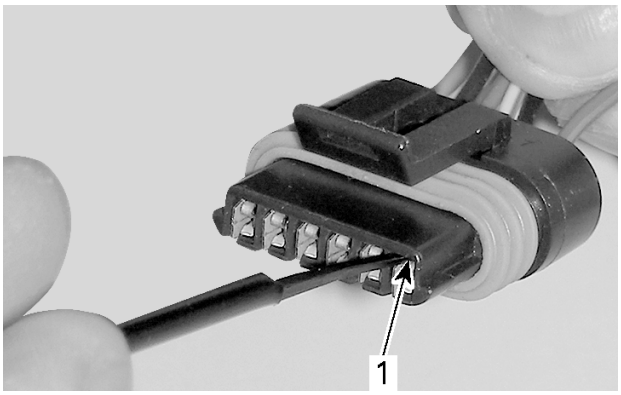
To remove a terminal (pin) from the connector, use a special tool such as the Delphi terminal extractor.

Required Tool	
Delphi terminal extractor (P/N 12094429)	

NOTE: Grinding the tool end to a taper is required.

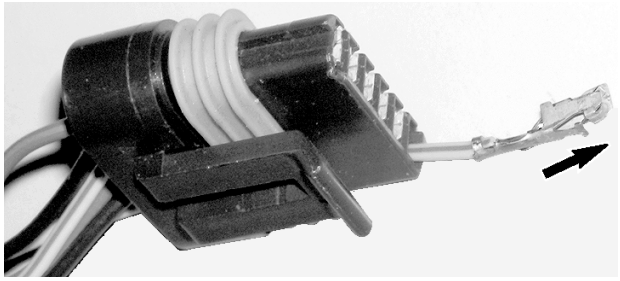
1. Carefully insert the tool in the space provided to release the pin lock.
2. Push the pin out the front of the connector by pushing on the wire.

Figure 19.



1. Unlock terminal here

Figure 20.



NOTICE
Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

DS, STS, FP, TAS, BRLS, FB, DCC, MSL, MSR Connectors (Delphi/Packard)

Removing the Connector Terminal

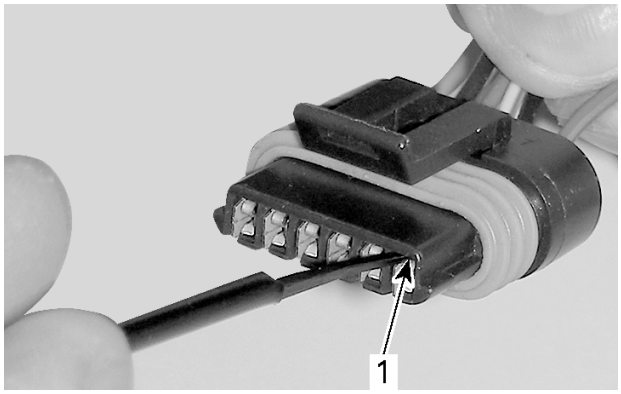
To remove a terminal (pin) from the connector, use a special tool such as the Delphi terminal extractor.

Required Tool	
Delphi terminal extractor (P/N 12094429)	

NOTE: Grinding the tool end to a taper is required.

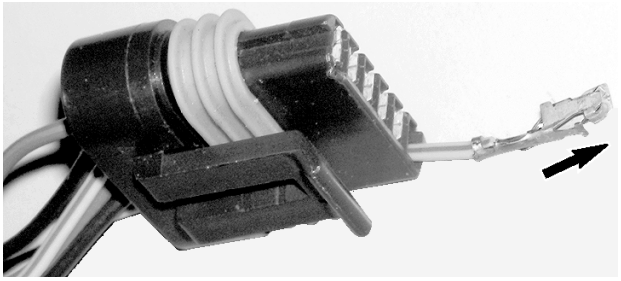
1. Carefully insert the tool in the space provided to release the pin lock.
2. Push the pin out the front of the connector by pushing on the wire.

Figure 21.



1. Unlock terminal here

Figure 22.



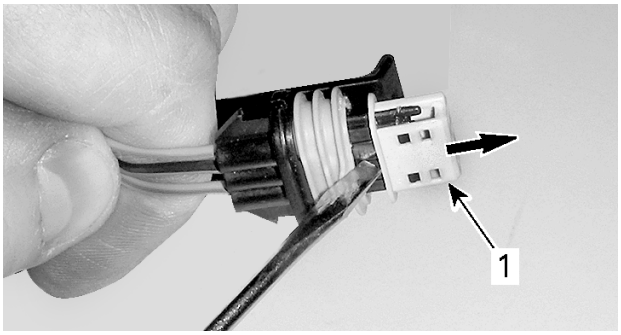
NOTICE
Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

MSL, MSR Connectors (Delphi)

Removing the Terminal

1. To remove a terminal from connector, first remove the locking cap.

Figure 23.

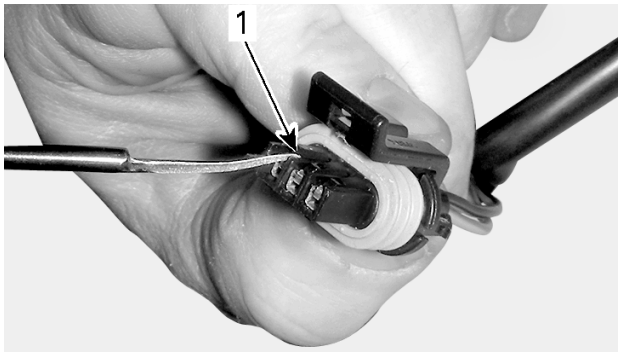


1. Pry out locking cap

2. Carefully insert the Delphi terminal extractor in the space provided to release the pin lock.

Required Tools	
Delphi terminal extractor (P/N 12094429)	

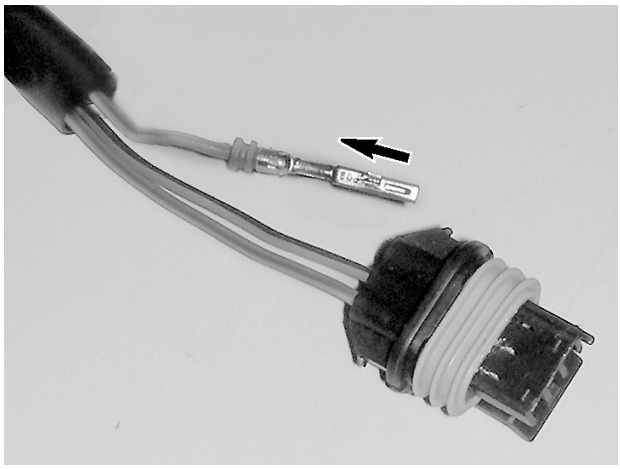
Figure 24.



1. Unlock here

3. Gently pull on the wire to extract the pin out the back of the connector.

Figure 25.



NOTICE

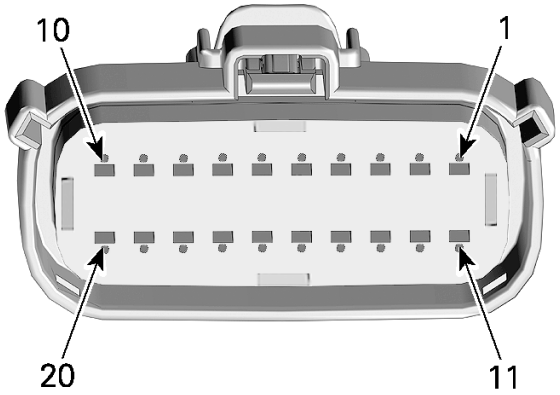
Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

MOLEX Connector

Steering Connector

ACC, HIC, HIC1, HIC2, USB IC

Figure 26. 20 Pin MOLEX Connector Shown

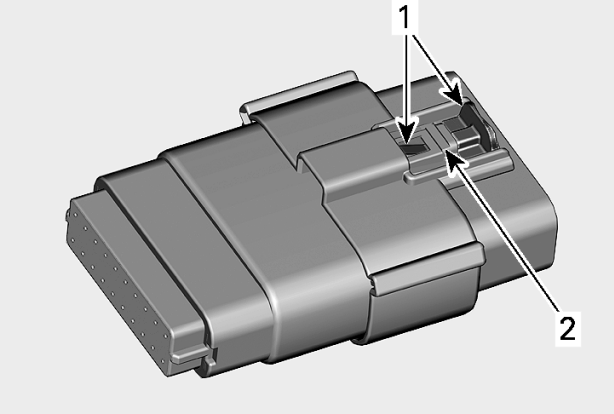


20 PIN MOLEX CONNECTOR SHOWN
1. Female connector pin-out (sockets)

Disconnecting the Connector

1. Pull back the red secondary lock from the connector latch lever. Do not remove it from the latch.
2. Push the two connector assemblies together to unload the latch.
3. Depress the latch lever and pull the two connector assemblies apart.

Figure 27.



1. Red secondary lock (shown out)
2. Latch lever

Probing the Connector

1. Disconnect the steering connector in the vehicle and connect it to the diagnostic harness.

Required Tools	
Diagnostic harness (P/N 529 036 384)	

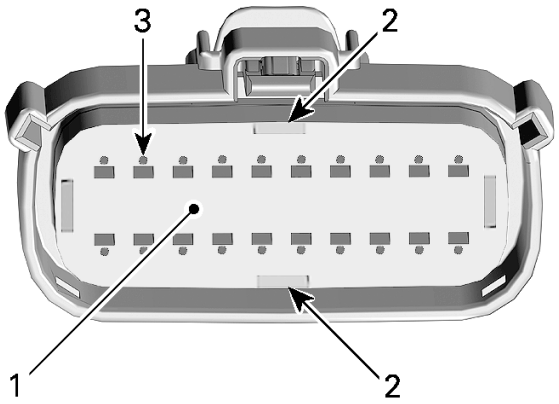
2. Probe the applicable circuit using the test connector on the diagnostic harness.

NOTICE
Attempting to probe the connector without using the diagnostic connector may damage the connector pins, or even cause a short circuit if testing an energized circuit.

Extracting the Socket (Female Connector)

1. Insert a small flat screwdriver in the pry holes of the socket locator, on the socket side of the connector.

Figure 28.



1. *Socket locator*
2. *Pry holes*
3. *Holes for inserting terminal extractor tool*

2. Carefully pull out the socket locator out to the detent position (approximately 5 mm).

NOTE: Do not remove the socket locator from the connector housing.

3. Insert the terminal extractor tool in the small hole adjacent to the socket.

Required Tools	
FCI Terminal extractor tool (P/N 54241678)	
MOLEX 150 Terminal extractor tool (P/N 63813 - 1500)	

NOTE: Push the extractor tool in only as far as required to release the lock from the socket. The tool should slide along the socket and be inserted between the socket and the lock.

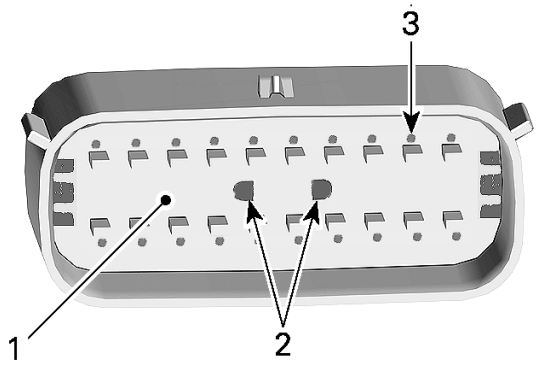
4. Gently pull on the wire to extract the socket out the back of the connector.

Extracting the Pin (Male Connector)

1. Using a pair of thin long nose pliers, pull the pin locator out to the detent position (approximately 5 mm). This will allow unlocking of the pins.

NOTICE
Do not attempt to remove the pin locator or damage will occur. Be careful not to bend the pins when using the pliers.

Figure 29.



1. Pin locator
2. Insert long nose pliers here
3. Holes for inserting terminal extractor tool

2. Insert the extractor tool in the small hole adjacent to the pin.

Required Tools	
FCI Terminal extractor tool (P/N 54241678) or,	
MOLEX 150 Terminal extractor tool (P/N 63813 - 1500)	

NOTE: Push the extractor tool in only as far as required to release the lock from the pin. The tool should slide along the pin and be inserted between the pin and the lock.

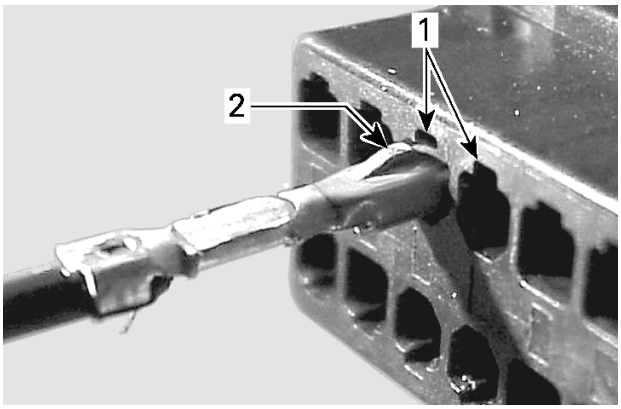
3. Gently pull on the wire to extract the pin out the back of the connector.

Inserting the Pin

1. Ensure the terminal (pin) is properly crimped onto the wire.
2. Ensure the pin locator (the white plastic insert in the connector) is out in the detent position.
3. Insert the pin in through the back of the connector.

NOTE: When inserting the pin, insert the stepped portion facing the notch in the connector pin hole.

Figure 30. Typical - Pin Insertion



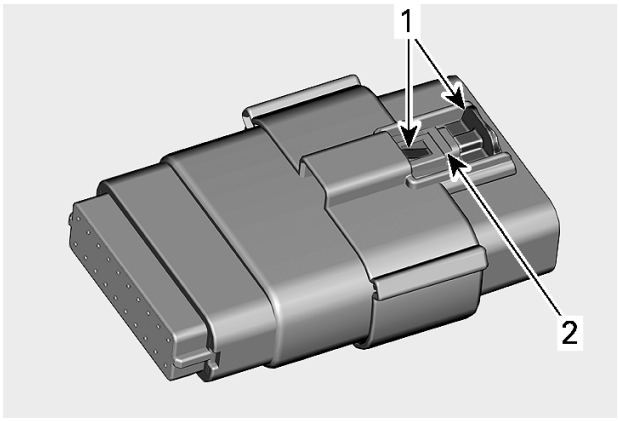
TYPICAL - PIN INSERTION
1. Notch
2. Stepped portion towards notch

4. Push the pin in until the pin lock engages the pin.
5. Gently pull on the pin to ensure it is properly locked.
6. Repeat previous steps for each pin to be inserted.
7. Push the pin locator into the connector to the locked position.

Reconnecting the MOLEX Connector

1. Insert the male connector into the female connector and push it in until the latch lever fully engages.
2. Push in the secondary lock (red tab) until it fully engages into the latch lever.

Figure 31.



1. Red secondary lock (shown out)
2. Latch lever

Engine Connector (4 Pin MOLEX 150)

Refer to *MOLEX Connector* for applicable procedures.

Multifunction Gauge Connector (6 Pin MOLEX 150)

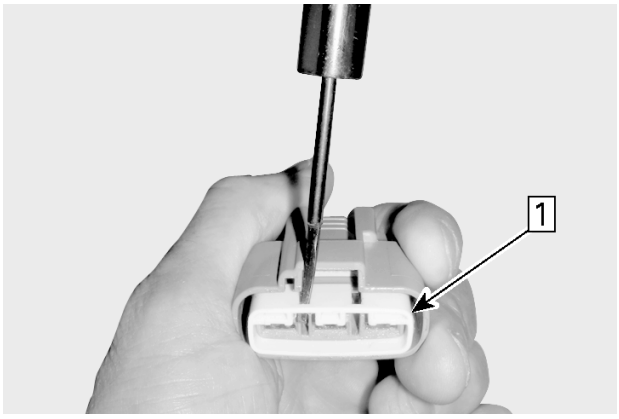
Refer to *MOLEX Connector* for applicable procedures.

Voltage Regulator/Rectifier Connector (Furukawa)

Removing the Terminal

1. Remove the secondary lock (plastic insert).

Figure 32.

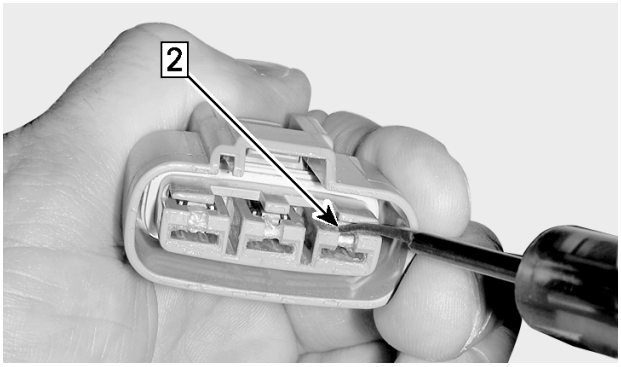


Step 1. Remove the secondary lock

2. Carefully insert the GM terminal extractor between the lock and the pin to release the pin.

Required Tools	
GM terminal extractor (P/N 12094430)	

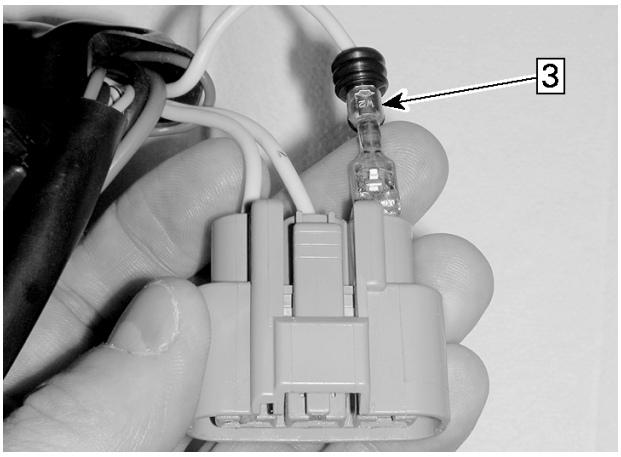
Figure 33.



1. *Step 2: Insert GM extractor tool*

3. Gently pull on the wire to extract the pin out the back of the connector.

Figure 34.



1. *Step 3: Pull wire to extract pin*

NOTICE

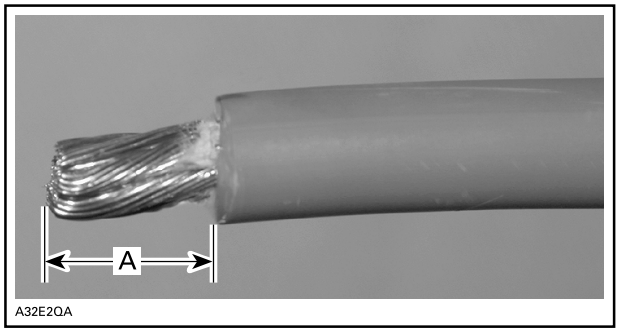
Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

Battery Cables

Crimping the Battery Cable

1. Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.

Figure 35.

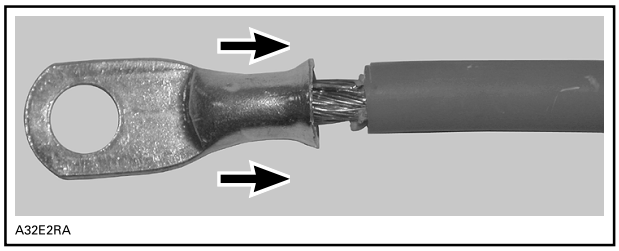


A. 10 mm (3/8 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

2. Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *parts catalog*.

Figure 36. Installation of Terminal



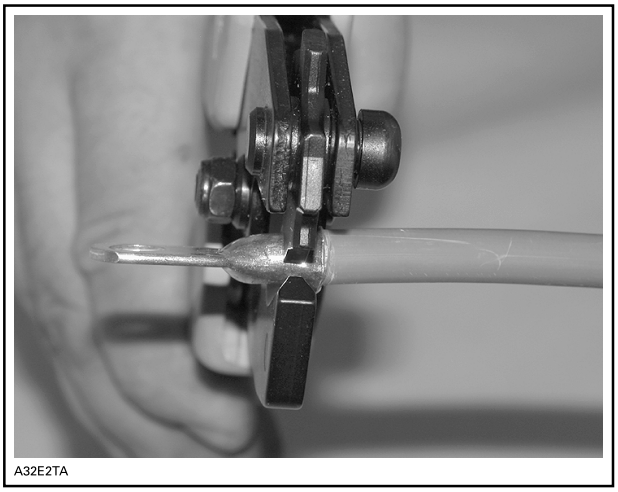
INSTALLATION OF TERMINAL

3. Follow the instructions provided with the crimping tool to select the proper position of the tool.

NOTE: Different wires require different crimping pliers settings, so make sure to follow the instruction supplied with the tool.

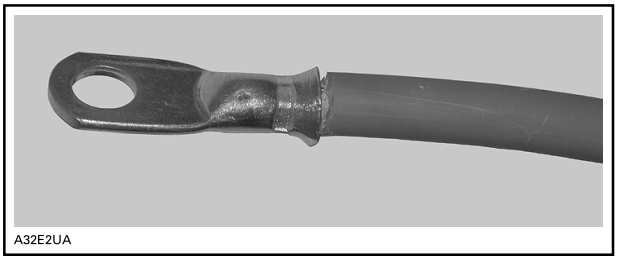
4. After positioning the crimping pliers, crimp the terminal already installed on wire.

Figure 37. Crimping of Wire



CRIMPING OF WIRE

Figure 38. Properly Crimped Wire



PROPERLY CRIMPED WIRE

5. To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

NOTICE

Never weld the wire to the terminal. Welding can change the property of the wire and it can become brittle and break.

6. Install the protective heat shrink rubber tube on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

NOTICE

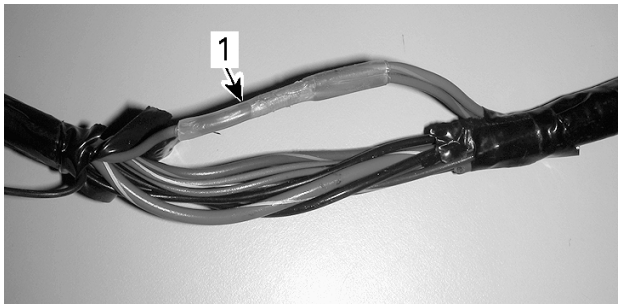
Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

Splices Repair Procedure

Case 1: Wire Detached from Splice

1. Remove wires from protector tube.
2. Locate the shrink tube protecting the defective splice.

Figure 39.



1. Shrink tube

3. Remove the shrink tube.
    1. Using a blade, cut the shrink tube.

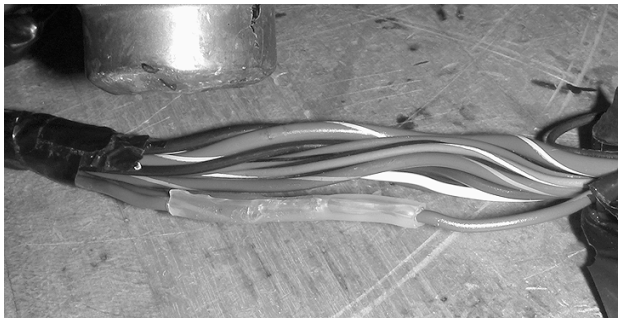
Figure 40.

NOTICE

Be careful with the blade to avoid cutting wires insulation.

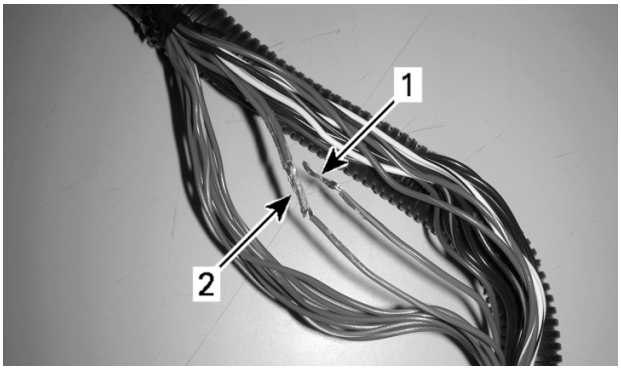
    2. Slightly heat the shrink tube using a heat gun.

Figure 41.



    3. Remove the shrink tube with long nose pliers.
4. Locate detached wire from splice.

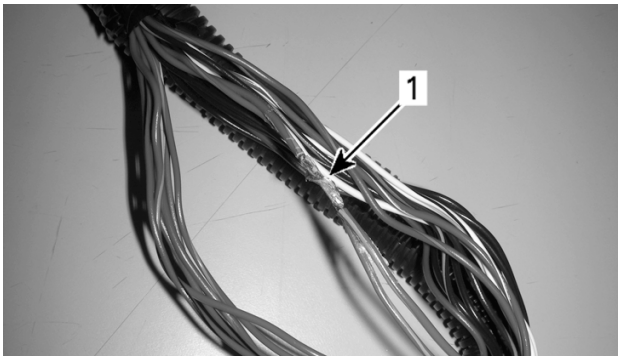
Figure 42.



1. Detached wire
2. Splice

5. Twist detached wire around splice.

Figure 43.



1. Twisted wire

6. Perform a tin solder on twisted wire.
7. Apply electrical tape to cover splice.

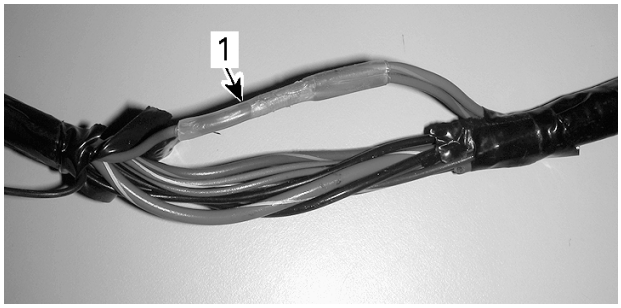
NOTE: Make sure tape overlaps on wire insulation, approximately 13 mm (1/2 in) each side.

8. Reinstall wires into protector tube.

Case 2: Wire Broken from Splice

1. Remove wires from protector tube.
2. Locate the shrink tube protecting the defective splice.

Figure 44.



1. Shrink tube

3. Remove the shrink tube.
    1. Using a blade, cut the shrink tube.

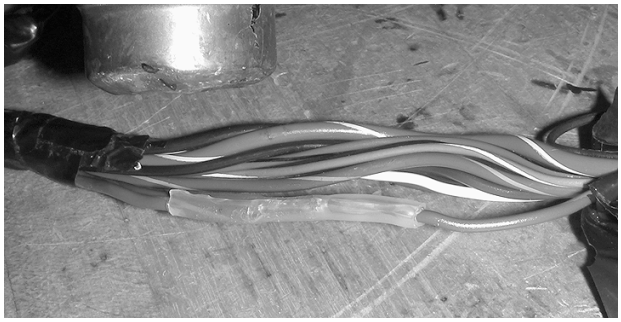
Figure 45.

NOTICE

Be careful with the blade to avoid cutting wires insulation.

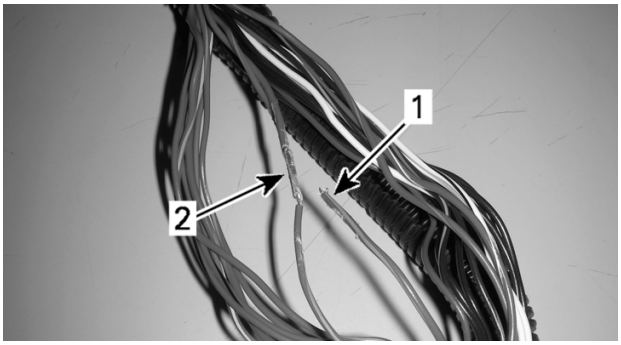
    2. Slightly heat the shrink tube using a heat gun.

Figure 46.



    3. Remove the shrink tube with long nose pliers.
4. Locate broken wire from splice.

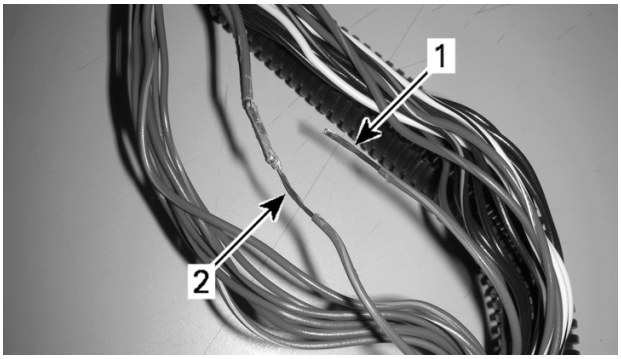
Figure 47.



1. Broken wire
2. Splice

5. Strip wire insulation at the end of broken wire.
6. Strip wire insulation below the splice.

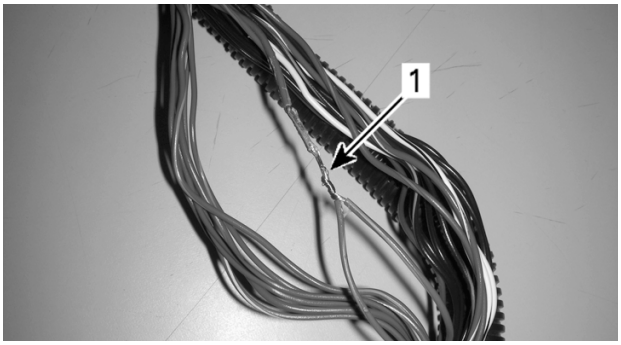
Figure 48.



1. Broken wire stripped
2. Splice wire stripped

7. Cut splice wire and insert a new shrink tube.
8. Twist wire around stripped wire.

Figure 49.



1. Twisted wire

9. Perform a tin solder on twisted wire.
10. Apply electrical tape to cover splice.

NOTE: Make sure tape overlaps on wire insulation, approximately 13 mm (1/2 in) each side.

11. Install the shrink tube as it was before removal.
12. Reinstall wires into protector tube.

NOTE: Always perform a solder on a bigger wire (lower gage).