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Introduction

In response to numerous requests from valued Collision Advice customers across the US, we have created this tool to help explain, justify and negotiate time for repair operations. The collected information and documentation are intended to help clarify whether or not specific repair processes are considered to be required repair operations and if they are included or not-included within any other repair procedures. Our objective is to help our customers build a complete repair plan and to get paid for the work they do.

To do so, we utilize four negotiation questions and supporting documentation as described below:

1. Is it required to put the vehicle back to pre-accident condition?
   - OEM Position Statements
   - ALLDATA®, Tech Advisor and Other Similar Systems
   - Paint Manufacture Bulletins
   - Material Manufacturer Bulletins (ex. 3M, Wurth, Kent)
   - Equipment Manufacturers
   - Internet (www.YouTube.com)
   - Estimating Systems
   - Scan Tools (Ex. ASTech)
   - The Vehicle

2. Is it included in any other labor operations?
   - Estimating Systems
   - ASA Not-Included Charts
   - www.Degweb.org
   - www.Estimatescrubber.com
   - SCRS Guide to Estimating

3. Is there a pre-determined time in the database?
   - Estimating Systems
   - www.Degweb.org

4. What is it worth?
   - Do a Time Study
   - Print an Invoice
   - OEM Warranty Times
   - Equipment Manufacture Times
   - ALLDATA®, Tech Advisor and Other Similar Systems
   - Internet
Definition
Definition

Speculation runs rife regarding whether the negative terminal of a vehicle’s battery should be disconnected before welding on that vehicle. The reasoning is that it helps to prevent damage to the vehicle’s ECU and other electronics, but how so and why?

To understand what is happening, you first need to understand two electrical principles:

- Ohm’s Law
- Kirchhoff’s Circuit Laws

Ohm’s Law: Represented as $V=IR$, where $V$ is voltage, $I$ is current and $R$ is resistance. It tells us that voltage is required for current to flow. If there is current flowing through a conductor then there must be voltage across that conductor.

Kirchhoff’s Circuit Laws: This law states that the sum of the voltages around a continuous electrical loop must be zero. It also states that the sum of the currents into and out of an electrical node is zero.

Example: If you walk around a track with varying elevation, no matter what route you take, and you end up at the same spot you started then your net elevation change is zero.
These are circuit drawings that depict welding a vehicle. The left is with the battery connected and the right is with the battery terminal disconnected. We assumed that the vehicle battery is 12 V and the welder is 100 V (although the actual voltage is irrelevant). Trying to protect the ECU or the engine control unit.
With the battery connected, the left drawing shows a closed loop. Thus, using Kirchhoff’s laws, the voltage across the ECU is 112V. This means the ECU is suffering from overvoltage and could be damaged. It is designed for 12V, yet has 112V across it.
With the battery disconnected on the right, the loop is open and Kirchhoff’s law dictates that no current is flowing through the ECU and Ohm’s law determines that the voltage across the ECU is zero. Therefore, it does not experience any overvoltage.
# Justifying Each Line on the Repair Plan

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Question 1.
Is it required?
Four Negotiation Questions

1. Is it required to D&R the battery in order to return the vehicle back to pre-accident condition?

Answer: Yes, it is required based on the following supporting documentation.

Answer Documentation:
Disconnect and reconnect the battery is required based on the following:

- The major Information Providers
- Documentation from OE manufacturers
D&R (Disconnect & Reconnect)

Some labor procedures require disconnecting (unplug and/or unbolt) of a component/assembly at the point where it is attached to the subject part. The component assembly is not completely removed from the vehicle. The component is reconnected during the assembly procedure. Due to various configurations and type of parts that may be involved in the D&R operations and considering that the times involved are generally not definable in tenths of hours, time for D&R is not provided. When D&R is necessary to perform a labor operation, it is included in that labor operation’s time.

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G5

ELECTRONIC SYSTEMS & ON-BOARD COMPUTERS

Disconnect battery cable

I-CAR’s Uniform Procedures for Collision Repair states that electronic components should be removed from the vehicle if welding is to take place within 12 inches of the component. Refer to manufacturer’s specific recommendations for each vehicle.

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G7
GUIDE TO ESTIMATING

ADD IF REQUIRED

MOTOR Collision Estimating Data is based on the base model vehicle configuration, standard or regular production options, and/or standard replacement operations. “Add if required” operations are for extra procedures necessitated by optional factory equipment or certain collision scenarios that may be encountered. “Add if required” operations should be added to the estimate whenever applicable after an “on the spot” inspection of vehicle damage and/or vehicle options.

COMPONENT CLASSIFICATION

The purpose of classifying components is to describe physical properties of the component, and classifications may inform the estimator that specialized technician level skill and/or tools may be required. Indicators are not intended to determine labor rates charged, or to be inclusive of all components. Any additional component classification(s) should be determined after an on-the-spot evaluation of required repair procedures.

CLASSIFICATION INDICATORS ARE PROVIDED FOR YOUR CONVENIENCE AND MUST ONLY BE CONSIDERED A HELPFUL GUIDE.

MOTOR component classifications are defined as follows:

(M) Mechanical: Components that transform one form of motion or energy into another. Mechanical components would likely be serviced at a mechanical service facility rather than a body repair facility if that component failed during normal operation. Mechanical components will likely require a specialized technician skill level and/or specialized tools.

(S) Structural: Components that provide a load bearing foundation for the purpose of safety and/or stability

(no classification) Body: Components that do not fall under the mechanical or structural classification.

D&R [Disconnect & Reconnect]

Some labor procedures require disconnecting (unplug and/or unbolt) of a component/assembly at the point where it is attached to the subject part. The component assembly is not completely removed from the vehicle. The component is reconnected during the assembly procedure. Due to various configurations and types of parts that may be involved in the D&R operations and considering that the times involved are generally not definable in terms of hours, time for D&R is not provided. When D&R is necessary to perform a labor operation, it is included in that labor operation’s time.

FRAME MACHINE SET-UP

Due to the different types of frame machines used in the collision repair industry, labor times for frame machine set-up are not developed by MOTOR, nor otherwise included in any operation. Each frame machine manufacturer may have its own unique configurations and setup processes. For example, some machines are of a “closed” type while others are of a “dedicated bench” type, and there are procedural differences between the two set-up methods. Additionally, there may be variables unique to the actual vehicle that may increase or decrease frame machine set-up time. MOTOR suggests using an on-the-spot evaluation to determine an appropriate frame machine set-up time.

INCLUDED and/or NOT INCLUDED LABOR OPERATIONS

INCLUDED OPERATIONS:

When items or operations appear in the Guide to Estimating pages under the “Included” heading it means that the operation is performed in conjunction with another operation. For example, Steering Wheel R&R is an individual operation, but when replacing a steering column, steering wheel R&R is also performed and therefore included in Steering Column R&R.

If an item is listed without a qualifier, it means all labor has been considered within the indicated labor procedure. If a specific qualifier (such as R&R) appears, it means only the specified qualifier applies.

NOT INCLUDED OPERATIONS:

Items or operations listed under “Does Not Include” were not considered in the development of published labor operation times. These operations may or may not be required depending upon the vehicle or repair process used. If any of these items or operations are required, they should be considered by the estimator. If a specific qualifier (such as R&R) appears, it means only the specified qualifier applies.

NAGS - GLASS PRICES

Glass Prices: We include, when available, both the vehicle manufacturer and the NAGS benchmark prices as applicable to each make and model. All NAGS part numbers and benchmark prices are provided from National Auto Glass Specifications, a division of Mitchell International, Inc. Labor operation times listed on the line with the NAGS information are MOTOR suggested labor operation times; NAGS labor operation times are not included.

OEM [Original Equipment Manufacturer]

Used to define original vehicle manufacturer.

OVERHAUL

Remove an assembly from the vehicle, disassemble, clean, inspect, replace parts as needed, reassemble, install and adjust (except wheel/suspension alignment). Overhaul time should be used only if the time for individual parts (less overlap) is more than the overhaul time. Overhaul operations include component R&R procedure steps and inclusions unless otherwise noted.

OVERLAP

When replacing two or more components the duplication of included labor procedures is known as overlap. Labor procedures (R&R/R&R/D&R) that create overlap include, but are not limited to, mechanical attachment, welding, bonding and/or technician preparation.

For example, when replacing a quarter panel and rear body panel on the same vehicle, the common required labor procedures necessary to remove and replace or reinstall these components is known as overlap.

When a labor overlap condition exists, less time is required to replace adjoining components collectively than is required when they are replaced individually.

Overlap labor information is generally included at the beginning of each group or subgroup within each chapter.

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G5
GUIDE TO ESTIMATING

ACOUSTICAL AND STRUCTURAL FOAM FILLERS

This type of product is used by some OEMs to control NVH (noise, vibration and harshness) or add structural integrity to the vehicle body. Acoustical foam is a soft to firm, pliable product while structural foam is a hard, dense, rigid product. Acoustical and/or structural fillers may be found internally on vehicle panels; therefore, identification of foam type and location may require an inspection after vehicle disassembly. Foam products must be removed if within six inches of an open flame, excessive heat (600 degrees) or welding operation. Any foam damaged or removed during the repair process must be replaced.

SPECIAL NOTATION:

Not all vehicles contain foam fillers; others may contain foam fillers in one or more locations. Refer to OEM for specific repair recommendations/procedures and replacement product(s).

Electronic Systems & On-Board Computers

Special caution should be taken when servicing vehicles due to the wide use of computer modules, electronic sensors and printed circuit boards. This type of equipment is very sensitive to high temperatures and voltage fluctuations, including electrostatic discharge. A few safety tips you should consider are:

- Disconnect battery cable
- Computer modules should not be exposed to temperatures exceeding OEM recommendations
- Remove component if necessary
- Discharge static electricity before handling component(s)
- Avoid touching electrical terminals of component

ICAR’s Uniform Procedures for Collision Repair states that electronic components should be removed from the vehicle if welding is to take place within 12 inches of the component. Refer to manufacturer’s specific recommendations for each vehicle.

Hazardous Materials

Regulations and safety considerations may require protective clothing, respirator, protective eyeglasses, and/or ear plugs be worn in certain areas of collision repair facilities. Caution must be exercised when dealing with isocyanates, flammables, fumes, liquids and airborne particles.

Hybrid/Electric Vehicles

Warning: High Voltage Electrical System

These vehicles are equipped with high voltage batteries and are capable of causing electrical shock. Failure to use caution in the proper disconnection of this electrical system may result in serious injury or death. For safety and ease of identification, electrical cables carrying the high voltage are colored orange. Any orange-colored cable should be avoided until the high voltage electrical system has been disabled. Follow OEM safety precautions including wearing personal protective equipment rated for working on Hybrid/Electric Vehicles. Follow OEM service repair information for disabling the high voltage electrical system before beginning any repairs.

OEM Collision Repair Network

Some OEM(s) manufacture aluminum vehicles that have an established repair network for these vehicles and require collision repairs to be performed at an OEM authorized aluminum repair center. Manufacturers with collision repair networks covered in MOTOR’s guide are Audi, BMW, Jaguar and Mercedes-Benz. Refer to the OEM for complete information on collision repair network program.

OEM Component Replacement - General

The collision repair facility must have the equipment, training, and experience using the latest factory/industry information and procedures. Ultimately, the safety and quality of any repair will depend not only on the equipment that is used and the procedure that is followed, but also on the skill and knowledge of the repair technicians, the steps they take to control repair quality and how well they check the details of the repair.

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G7
6. Personnel Safety (cont’d)
- Wear leather gloves and leather cape welding sleeves.
- Do not handle metal parts until they have cooled.
- Wear high-top leather shoes or boots.
- Make sure clothing and shoes are free from oil, grease, or other flammable materials.
- Remove all flammable materials from the area to be welded.
- Do not carry matches or butane lighters in pockets.
- Do not weld near parts containing fuel, such as fuel tanks, lines, pumps, etc.
- Keep a fire extinguisher in the work area while welding.

7. Environmental Safety
Does not apply.

8. Vehicle Protection

8.1 Electronic Parts
To protect computers and other sensitive parts from damage:
- Follow the vehicle maker’s recommendations for recording and resetting electronic memory settings, such as radio, seats, etc.
- Ensure that the ignition switch is in the LOCK position.
- Disconnect and isolate the negative battery cable, and disarm the passive restraint system. Follow the vehicle maker’s recommendations.
- Carefully remove computer modules when welding or heating within 300 mm (12”). Some vehicle makers specify greater distances. Protect modules, connectors, and wiring from dirt, heat, static electricity, and moisture.
- Loosen or remove any wiring harnesses or electrical parts that could be damaged during the repair process.

Remove the battery if it is near an area to be welded or heated.

8.2 Sparks
To protect surfaces from welding sparks:
- Use welding blankets on surfaces that can be covered.
- Remove interior trim, headliners, upholstery, and other parts if the interior will be exposed to heat or sparks.

2013 BMW 335i Sedan – A-Pillar Replacement

- Improper, unauthorised operations may result in serious dangers.
- Unauthorised persons are strictly prohibited from performing any operations on this system.

**WARNING:**
- Read and comply with safety instructions for handling airbag modules and pyrotechnical belt tensioners.
- Incorrect handling can activate airbag and cause injury.
- A damaged head airbag must be replaced.
- A damaged head airbag exhibits an impaired protective function and in extreme cases loses its protective function altogether.

**Necessary preliminary work:**
- Disconnect negative battery cable.
- Remove trim panel for roof pillar.

Quarter Outer Panel Sectioning (With HP6)

Removal Procedure

**Danger:** Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

1. Identify how to disable high voltage.
2. Identify how to test for the presence of high voltage.
3. Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

   Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

   - Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
   - Certified and up-to-date Class "0" insulation gloves rated at 1000V with leather protectors.
   - Visually and functionally inspect the gloves before use.
   - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

   Failure to follow the procedures may result in serious injury or death.

**Warning:** Refer to Approved Equipment for Collision Repair Warning.

1. **Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection.**

2. Disable the SIR system. Refer to SIR Disabling and Enabling.

3. Restore as much of the damage as possible to factory specifications. Refer to Dimensions - Body. See: Body Dimensions > Dimensions.

4. Remove all related panels and components.

5. Note the location and remove the sealers and anti-corrosion materials from the repair area, as necessary. Refer to Anti-Corrosion Treatment and Repair. See: Corrosion Protection > Body Shop Basics > Anti-Corrosion Treatment and...
Front Full Frame Sectioning

**Removal Procedure**

The re-designed frame assembly for the new C/K Pick-Up and Utility Trucks is a mild steel, hydroformed frame assembly. A pre-sleeved replacement front frame service section, consisting of the left and right frame rail ends, body mounting brackets and front connecting cross tube is available. Replacement bolt-on front bumper brackets are available and must be ordered separately.

**Caution:** Refer to Approved Equipment for Collision Repair Caution in Cautions and Notices.

**Caution:** Refer to Collision Sectioning Caution in Cautions and Notices.

Important: Perform all of the steps on both rails for complete module replacement.

1. Disable the SIR system. Refer to SIR Disabling and Enabling
2. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection

Source: Chevrolet Silverado / GMC Sierra, page 1.
2015 – ZD – Dodge Viper – 8.4L V10 SFI – Chrysler

WARNING

WARNING: During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the Chrysler Mopar® parts catalog. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with airbags, before performing any welding operations, disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the Airbag Control Module (ACM). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components. Failure to follow these instructions may result in personal injury or death.

WARNING: Replace all restraint system components only with parts specified in the Chrysler Mopar® parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection. Failure to follow these instructions may result in personal injury or death.

WARNING: The fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the Chrysler Mopar® parts catalog. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with the Occupant Classification System (OCS) do not hang any after market devices from the front passenger seat back. Do not install a front drivers seat back cover with map pocket onto the passenger seat. Failure to follow these instructions may result in personal injury or death.

WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2015 - ZD - DODGE VIPER - 8.4L V10 SFI

23 - Body/Seats/Warning

**WARNING**

**WARNING:** During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the Chrysler Mopar® parts catalog. Failure to follow these instructions may result in personal injury or death.

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**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2008 Ford Focus

Ford F-150

NOTICE: Electronic modules and related wiring can be damaged when exposed to heat from welding procedures. Carefully disconnect and remove, or position away from heat affected areas.

NOTE: When it is necessary to carry out weld-bonding procedures, refer to Weld-Bonding in this section.

The correct equipment and settings must be used when welding mild or High-Strength Steel (HSS). Metal Inert Gas (MIG) and Squeeze-Type Resistance Spot Welding (STRW) are the preferred methods. Surfaces must be clean and free of foreign materials.

- Adequate ventilation must be provided to avoid accumulation of poisonous gases.
- A test weld should always be carried out on a test sample. Refer to the Weld Nugget Chart in Specifications for Ford-approved weld nugget information.
- Use cleaning brushes and abrasive grinding wheels dedicated to the type of materials being welded.
- Follow the equipment manufacturer's prescribed procedures and equipment settings for the type of welder being used. ER70S-6 or ER70S-6 wire are typically used for MIG welding steel.

**Disconnect the battery ground cable. Refer to Section 414-01.**
- Disconnect on-vehicle modules adjacent to the welding area and protect them from possible heat damage and electrical currents when welding.
- Corrosion protection must be restored whenever bare metal repairs are made. Refer to Restoring Corrosion Protection Following Repair in this section.
- Adequate power supply needs to be used to make sure of correct equipment performance.
- Factory spot welds may be substituted with either STRW welds or MIG plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.
- Correct eye protection must be worn.
- The correct protective clothing should always be worn.
- Components made of HSS should not be heated to straighten or repair. If components are severely bent or kinked, new components should be installed.

Arc welding is an acceptable method for welding heavier metal components such as frame parts. When arc welding, the following guidelines should be followed:

- A temperature indicating crayon calibrated to 650°C (1,200°F) or below, should be used to avoid overheating and weakening the metal.
- Attach the ground clamp as close as possible to the work area.
- Choose welding electrodes according to the type of steel, thickness and polarity of the arc welder AC or DC.
- Do not use water or compressed air to cool welding. This can cause the metal to become brittle and weak.

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WARNING: invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.

The correct equipment and settings must be used when welding mild or high-strength steel. Metal Inert Gas (MIG) and Squeeze-Type Resistance Spot Welding (STRW) are the preferred methods. Surfaces must be clean and free of foreign materials.

- Correct eye protection must be worn.
- The correct protective clothing should always be worn.
- Adequate ventilation must be provided to avoid accumulation of poisonous gases.
- A test weld should always be carried out on a test sample.
- Use cleaning brushes and abrasive grinding wheels dedicated to the type of materials being welded.
- Follow equipment manufacturer's prescribed procedures and equipment settings for the type of welder being used. 673986-3 or 673983-S cups are typically used for MIG welding steel.

- Disconnect the battery ground cable.

- Unconnected conductor end must be removed from possible heat damage and electrical currents when welding.
- Corrosion protection must be restored whenever bare metal repairs are made. Refer to Restoring Corrosion Protection Following Repair  See: Corrosion Protection > Procedures > Restoring Corrosion Protection Following Repair.
- Adequate power supply needs to be used to make sure of correct equipment performance.
- Factory spot welds may be substituted with either STRW or MIG plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.
- Vehicles equipped with optional safety canopy require removal of these components prior to any welding procedures being carried out in the roof-line or body side areas of the vehicle.
2014 Honda Accord Hybrid

Forward Collision Warning and Lane Departure Warning (FCW/LDW):
The FCW/LDW camera must be re-aimed if:
- The FCW/LDW camera unit is removed or replaced
- The windshield is removed or replaced
If the aiming is incomplete, the FCW and LDW indicators come on and/or blink.

Adaptive Cruise Control (ACC):
The millimeter wave radar for the ACC must be re-aimed if:
- The radar unit is removed or replaced
- The radar unit’s mounting area was damaged
The green-amber ACC indicator comes on if the aiming process is not completed, or the service manual procedure is not followed. The ACC warning message may also appear.

12 VOLT ELECTRICAL PIGTAIL AND CONNECTOR REPAIR
- Disconnect the vehicle’s 12 volt battery before doing any welding or electrical repairs. Refer to “12 Volt Battery Terminal Disconnection and Reconnection” in this service or body repair manual for more information.
- Certain front and rear electrical connectors subject to collision damage may be repaired using pigtailed and connectors listed in the ELECTRICAL CONNECTORS illustrations in the parts catalog (example shown here).
- Pigtailed attach to the vehicle wiring using special crimp-and-seal terminal joints. After crimping, the joints are heated using a heat gun to seal out the environment.
- Repair pigtailed come in a limited range of colors that usually don’t match the vehicle’s wiring. Pay close attention during repairs to ensure correct locations.
- Vehicle wiring schematics service information can be found in the Electrical Wiring Diagram (EWD).
- If wiring is damaged and a repair pigtail or connector is not available, replace the affected harness.
- NEVER attempt to modify, splice, or repair airbag system wiring.

ELECTRICAL GROUND WIRE PROTECTION
- Painting over electrical ground locations may cause electrical systems, such as Vehicle Stability Assist (VSA), to malfunction and set DTCs that may be difficult to diagnose.
- Protect the ground wire and the ground wire mounting hole threads with a bolt or silicone plug when priming or painting.

2014 Volvo S60 Welding and Battery Disconnect

Welding, general

Note! The illustrations in this service information are used for different model years and/or models. Some variation may occur. However, the essential information in the illustrations is always correct.

General

Volvo bodies are manufactured to the highest quality. All bodywork repairs must therefore take place following the same principles. Use light tools. Take care of the surface coating, electro dip (ED) and phosphating. Always use welding primer between welded panel flanges.

Prior to welding

Caution! Always remove the battery cables before welding in accordance with: Battery disconnecting and connecting, D0004T4, D5254T12. See: Battery > Procedures > Battery Disconnecting And Connecting.

Caution! Locate the welding ground connection as close as possible to the welding point.

Caution! If the welding must be carried out in the immediate vicinity of an electronic unit then this must be removed.

Assembly

Spot welding is mainly used when the bodies are manufactured, and use of this method should always be aimed for with a repair.

Caution! Gas welding must not be used on Volvo bodywork.

Warning! Use ventilation / extraction equipment.

Unless otherwise specified in the method, the distance between the welds must be the same as the original design.

Negotiation Question # 1 - Summary

It has been established and proved thru the source documentation it is required to D&R the battery in order to return the vehicle to pre-accident condition.
Question 2.
Is it included?
2. Is D&R the battery included in any other labor operation?

Answer: No, D&R the battery is not included with any other labor operation.

Answer Documentation:
- AudaExplore
- CCC/MOTOR
- Mitchell
- DEG Inquiry #6158

The original source documents from the leading Information Providers follow.
AudaExplore

Labor Exclusions

Disabling and enabling of Hybrid Vehicle components (i.e. high voltage systems, battery packs, and power cables).

Diagnosis and testing of electronic components or systems (e.g., airbags).

Section 4-2 Labor Exclusions

Labor Exclusions

Because each vehicle’s collision damage is unique, labor to perform some of the following operations may vary. In other cases, the operation is performed less than 80% of the time and may or may not be required due to the collision damage. To address these situations, Audatex provides:

- ‘Standard Manual Entries’ that are entered by the estimate preparer (for a complete listing, see Section 5-1).
- ‘Additional Labor’ operations which are Audatex pre-stored labor for many of these operations.

When the operation has a ‘Standard Manual Entry’ or an ‘Additional Labor’ operation available, a note will appear next to the appropriate exclusion.

- Additional labor for removal of parts that have been impeded by crash damage (access labor). (Standard Manual Entry M62 is available).
- Alignment of front or rear suspension (‘Additional Labor’).
- Alignment of parts adjacent to parts being replaced.
- Application of lubricant or similar material.
- Bleeding of brake, cooling, or hydraulic systems (‘Additional Labor’ for brake bleeding).

**Body Materials are not included in Audatex labor values.**

- Complete R&I of brake line, transmission line, or fuel line.
- Cutting and splicing of lamp wiring.
- Detailing.

- **Disabling and enabling of Hybrid Vehicle components (i.e. high voltage systems, battery packs, and power cables).**

- Diagnosis and testing of electronic components or systems (e.g., airbags).
- Disassembly of recycled parts and assemblies.
- Disconnect and reconnect of un-deployed airbag.
- **Disconnect / reconnect computer modules for welding purposes.**
- **Drain, refill and/or top off engine oil.**

*Any printed copy of this document may not contain the most current information. For the latest version, please refer to the Database Reference Manual accessed through the Help Menu in the current release of Audatex Estimating, PerFix or ShopLink. The current version of the Database Reference Manual may also be found at www.training.audatex.us.*

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D&R (Disconnect & Reconnect)

Some labor procedures require disconnecting (unplug and/or unbolt) of a component/assembly at the point where it is attached to the subject part. The component assembly is not completely removed from the vehicle. The component is reconnected during the assembly procedure. Due to various configurations and type of parts that may be involved in the D&R operations and considering that the times involved are generally not definable in tenths of hours, time for D&R is not provided. When D&R is necessary to perform a labor operation, it is included in that labor operation’s time.

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G5

SPECIAL NOTATION: The items listed below apply to all labor procedures.

Battery D&R/recharge

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G10
GUIDE TO ESTIMATING

LABOR TIME LISTINGS

All operation times are listed in hours and tenths of an hour. A time listed as 3.5 indicates three and one half hours.

LABOR TIME PREMISE

The times reported in this publication are to be used as a GUIDE ONLY. Reported times include normal align procedure to insure proper fit of the individual new part being replaced. Reported times include tube/paddled OEM caulkng and seam sealer removal/application on welded replacement panels. Sprayable seam sealer equipment requires preparation and adjustment before application and is NOT INCLUDED IN LABOR TIME.

Times do not apply to vehicles with equipment other than that supplied by the vehicle manufacturer as standard or regular production options. If other equipment is used, the time may be adjusted to compensate for the variables. Removal and replacement of exchanged or used parts is not considered. If additional aligning or repair must be made, such factors should be considered when developing the estimate. Items not listed under the INCLUDED/DOES NOT INCLUDE heading for any given procedure have not been considered in the estimated work time development for that procedure, unless specified by a footnote. All included/not included items for labor procedures listed between pages G10 and G33 are for component R&R and R&I procedures unless otherwise indicated in operation heading.

OPERATION TIMES LISTED ARE BASED ON NEW UNDAMAGED PARTS INSTALLED ON NEW UNDAMAGED VEHICLES AS INDIVIDUAL OPERATIONS. TIME HAS NOT BEEN CONSIDERED FOR ALIGNMENT PULLS, DAMAGE-RELATED ACCESS TIME, DAMAGED, USED, REMANUFACTURED OR AFTERMARKET PARTS. SOME OPERATION TIMES ARE APPLICABLE AFTER BOILED, ATTACHED OR RELATED PARTS HAVE BEEN REMOVED. REFER TO SPECIFIC FOOTNOTES ATTACHED TO OPERATION TIME LISTINGS.

LABOR TIME DOES NOT INCLUDE:

SPECIAL NOTATION:
The items listed below apply to all labor procedures.

- A/C System, Evacuate and Recharge
- Aftermarket & OEM accessories
- Alignment, check or straightening related parts
- Alignment check of front or rear suspension/steering
- Battery, charge
- Battery, D/R/Charge
- Bumpers, a/c repair
- Caution (non-OEM), sound absorber, or paint inner areas
- Clean up of detailing of vehicle prior to delivery
- Computer control module D/R/Repair
- Conversion Vans (special components, equipment and trim)
- Cutting, pulling or pushing collision damaged parts for access
- Damaged or defective replacement parts
- Drain, refuel fuel tank
- Drilling, modification or fabrication of mounting holes
- Fabricate templates, reinforcing inserts, sleeves or flanges
- Filling, plugging and finishing of unneeded holes in new parts
- Information label installation
- Material costs
- Pinch weld clamp damage repair
- Refinishing

Source: CCC/Motor Guide to Estimating, Rev. 9-14, Page G10
ADD IF REQUIRED

MOTOR Collision Estimating Data is based on the base model vehicle configuration, standard or regular production options, and/or standard replacement operations. "Add if required" operations are for extra procedures necessitated by optional factory equipment or certain collision scenarios that may be encountered. "Add if required" operations should be added to the estimate whenever applicable after an "on the spot" inspection of vehicle damage and/or vehicle options.

COMPONENT CLASSIFICATION

The purpose of classifying components is to describe physical properties of the component, and classifications may inform the estimator that specialized technician skill levels and/or tools may be required. Indicators are not intended to determine labor rates charged, or to be inclusive of all components. Any additional component classification(s) should be determined after an on-the-spot evaluation of required repair procedures.

CLASSIFICATION INDICATORS ARE PROVIDED FOR YOUR CONVENIENCE AND MUST ONLY BE CONSIDERED A HELPFUL GUIDE.

MOTOR component classifications are defined as follows:

(M) Mechanical: Components that transform one form of motion or energy into another. Mechanical components would likely be serviced at a mechanical service facility rather than a body repair facility if that component failed during normal operation. Mechanical components will likely require a specialized technician skill level and/or specialized tools.

(S) Structural: Components that provide a load bearing foundation for the purpose of safety and/or stability

(no classification) Body: Components that do not fall under the mechanical or structural classification

D&R (Disconnect & Reconnect)

Some labor procedures require disconnecting (unplug and/or unbolt) of a component/assembly at the point where it is attached to the subject part. The component assembly is not completely removed from the vehicle. The component is reconnected during the assembly procedure. Due to various configurations and type of parts that may be involved in the D&R operations and considering that the times involved are generally not definable in terms of hours, time for D&R is not provided. When D&R is necessary to perform a labor operation, it is included in that labor operation's time.

INCLUDED and/or NOT INCLUDED LABOR OPERATIONS

INCLUDED OPERATIONS:

When items or operations appear in the Guide to Estimating pages under the "Included" heading it means that the operation is performed in conjunction with another operation. For example, Steering Wheel R&I is an individual operation, but when replacing a steering column, steering wheel R&I is also performed and therefore included in Steering Column R&I.

If an item is listed without a qualifier, it means all labor has been considered within the indicated labor procedure. If a specific qualifier (such as R&I) appears, it means only the specified qualifier applies.

NOT INCLUDED OPERATIONS:

Items or operations listed under "Does Not Include" were not considered in the development of published labor operation times. These operations may or may not be required depending upon the vehicle or repair process used. If any of these items or operations are required, they should be considered by the estimator. If a specific qualifier (such as R&I) appears, it means only the specified qualifier applies.

NAGS - GLASS PRICES

Glass Prices: We include, when available, both the vehicle manufacturer and the NAGS benchmark prices as applicable to each make and model. All NAGS part numbers and benchmark prices are provided from National Auto Glass Specifications, a division of Mitchell International, Inc. Labor operation times listed on the line with the NAGS information are MOTOR suggested labor operation times; NAGS labor operation times are not included.

OEM (Original Equipment Manufacturer)

Used to define original vehicle manufacturer.

OVERHAUL

Remove an assembly from the vehicle, disassemble, clean, inspect, replace parts as needed, reassemble, install and adjust (except wheel/suspension alignment). Overhaul time should be used only if the time for individual parts (less overlap) is more than the overhaul time. Overhaul operations include component R&I procedure steps and inductions unless otherwise noted.

OVERLAP

When replacing two or more components the duplication of included labor procedures is known as overlap. Labor procedures (R&I/R&I/OCI/R) that create overlap include, but are not limited to, mechanical attachment, welding, bonding and/or technician preparation.

For example, when replacing a quarter panel and rear body panel on the same vehicle, the common required labor procedures necessary to remove and replace or reattach these components is known as overlap.

When a labor overlap condition exists, less time is required to replace adjoining components collectively than is required when they are replaced individually.

Overlap labor information is generally included at the beginning of each group or subgroup within each chapter.
DEG Inquiry #6158

Inquiry #6158

Inquiry Description

Section4_AreaVehicle
Front fender

Section4_PartName
A-pillar, Upper unirail, Apron of wheel well and internal reinforcements inside quarter panel

Section4_IssueSummary
Underestimation of required work time and materials.

Section4_NumberWelds
21 also 3 stich welds and 6 plug welds

Section4_TypeMaterials
steel, high strength steel, cavity wax, weld through primer, seam sealer, panel bond sealer

Section4_ProcedureSteps
Remove damaged fender.
Begin cleaning cavity wax off all surfaces with mechanical force.
Wipe down all surfaces with the proper solvents to remove any left over residue from cavity wax.
Sand and or grind both A-pillar and upper uni-rail to remove seam sealer and panel bond sealer from welded surfaces.
Apply weld through primer on all exposed surfaces.
Drill carefully all spot welds and plug welds with proper drill bits (high strength steel or titanium) to remove welds without damaging underlying surfaces.
clean all bonding off uni-rail internal structure/reinforcement to separate the two and insure a strong bond between surfaces on re-installation.
Clean replacement parts by grinding, sanding and wiping down with proper solvents to clean away any and all primers or other obstructions that may interfere with welding.
Resistance spot weld all 21 spot welds followed by stitch (3) and plug welds(6).
After priming and paint, apply cavity wax re-install sound deadening and then finish cavity waxing.

Section4_TechnicianSkill
high to very high

Section4_ActualTime
4 hours per side
Section4_SuggestedAction
Increase the given book time to remove and replace uni-rails and reinforcements due to increased work times required on new model year design.

Section1_AreaVehicle
FRONT

Section5_AreaVehicle
Front cowl,

Section5_PartName
cowl panel, fuse box, coolant and washer reservoirs and related hardware

Section5_IssueSummary
No given book times for remove and install of a number of mechanical items in the engine bay and wiper cowl areas.

Section5_ProcedureSteps
Remove wiper cowl, fuse box on drivers side of engine bay and coolant and washer reservoirs on passenger side of engine bay.

Re-install all previously mentioned parts after uni rail replacement is completed.

Section5_TechnicianSkill
mechanical

Section5_ActualTime
3

Section5_SuggestedAction
Increase the given book time to remove and install needed mechanical elements to properly remove and replace upper uni-rail structures.

Resolution Description
Estimated Release Date: Closed
Proposed Resolution: MOTOR stated:
After review, the following has been determined:
1. The estimated work time of 3.8 hours applied to the Upper Rail is appropriate, so an adjustment was not necessary.

2. The estimated work times applied to the Cowl, Fuse Box and Coolant Washer Reservoir are appropriate, so an adjustment was not necessary.
Please refer to the “Guide To Estimating, Fender-Inner Panel (Welded Apron & Rails,) for the complete list of included/not included items.
FENDER – INNER PANEL (Welded Apron & Rails)

SPECIAL NOTATION:
Detach and weld at floor pan, radiator support, hinge pillar and cowl panel.

INCLUDED:
• Adhesive application if required (all types) • Battery tray • Carpet & insulation turn back • Caulk/seam sealer • Cowl trim • Cutting & welding as necessary • Grind, fill and smooth welded seams (up to 150 grit sandpaper)

DOES NOT INCLUDE:
• Adjacent panels
• Air inlet system (if necessary)
• Attached standard items
• Battery
• Bolted-on parts
• Bumper assembly
• Carpet, insulation or seat R&I
• Cruise control
• Dash panel
• Decals/labels
• Electrical wiring
• Energy absorber
• Engine
• Front suspension assembly
• Hood hinges & support cylinder
• Horns
• Outer sheet metal
• Pulling or straightening time
• Reservoir
• Set up on frame machine & diagnosis
• Steering components
• Suspension/wheel alignment
• Washer/Coolant reservoir
• Welded brackets & braces transfer

Additional 'not included' items can be found in the “Guide To Estimating, Labor Time Premise, Does Not Include.”

LABOR TIME DOES NOT INCLUDE:

SPECIAL NOTATION:
The items listed below apply to all labor procedures.

• A/C System, Evacuate and Recharge
• Aftermarket & OEM accessories
• Alignment, check or straightening related parts • Alignment check of front or rear suspension/steering • Anticorrosion material restoration/application • Battery D&R/recharge • Brackets & braces transfer • Broken glass removal or clean up • Brakes, bleed and adjust • Caulk (non-OEM), sound insulate or paint inner areas • Clean up or detailing of vehicle prior to delivery • Computer control module D&R/relearn • Conversion Vans (special components, equipment and trim) • Cutting, pulling or pushing collision damaged parts for access • Damaged or defective replacement parts • Drain & refill fuel tank • Drilling, modification or fabrication of mounting holes • Fabricate templates, reinforcing inserts, sleeves or flanges • Filling, plugging and finishing of unneeded holes in new parts • Information label installation • Material costs • Pinch weld clamp damage repair • Refinishing • Reset electronic memory functions after battery disconnect • Road test vehicle • Rusted, frozen, broken or corrosion damaged components or fasteners • Scan tool clear/reset electronic module • Scan tool diagnostics • Steering Angle Sensor recalibration • Straighten or align used, reconditioned or non-OEM parts • Structural damage diagnosis and vehicle set up time • Structural foam removal or application • Test panel/spray caulk • Undercoating, tar or grease removal • Unprimed bumpers, removal of mold-release agents • Waste disposal fees (all types) • Weld through primer • Welded seam surface finishing finer than 150 grit sandpaper • Wheel or hub cap locks R&I

No changes required.

DEG Inquiry #6158

Inquiry #6158

<table>
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<th>Track #</th>
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<th>Inquiry Category</th>
<th>Year Make Model</th>
<th>Resolution Status</th>
<th>Origination Date</th>
<th>Submission Date</th>
<th>Resolution Date</th>
<th>Total Time to Resolve</th>
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<table>
<thead>
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| Section 4. Area/Location:

- Face fender to
- A-pillar, upper unibody, apron of wheel well and internal reinforcements inside quarter panel.

Section 4. Issue/Summary:

- Underestimation of required work time and materials.

Section 4. Number/Welds:

- 21 also 3 stich welds and 6 plug welds.

Section 4. Type/Materials:

- Steel, high strength steel, cavity wax, weld through primer, seam seal, panel bond sealer.

Section 4. Procedure/Steps:

- Remove damaged fender.
- Begin cleaning cavity wax off all surfaces with mechanical force.
- Wipe down all surfaces with the proper solvents to remove any left off residue from cavity wax.
- Sand and/or grind both A-pillar and upper unibody to remove seam sealer and panel bond sealer from welded surfaces.
- Apply weld through primer on all exposed surfaces.
- Drill carefully all spot welds and plug welds with proper drill bits (high strength steel or titanium) to remove welds without damaging underlying surfaces.
- Clean all bonding off unibody internal structure/reinforcement to separate the two and ensure a strong bond between surfaces on re-installation.
- Clean replacement parts by grinding, sending and wiping down with proper solvents to clean away any and all primers or other obstructions that may interfere with welding.
- Resistance spot weld all 21 spot welds.

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<td>Proposed Resolution: MOTOR stated: After review, the following has been determined:</td>
</tr>
<tr>
<td>1. The estimated work time of 3 hours applied to the Upper Rail is appropriate, so an adjustment was not necessary.</td>
</tr>
<tr>
<td>2. The estimated work time applied to the Cowl, Fuse Box and Coolant Reservoir were appropriate, so an adjustment was not necessary.</td>
</tr>
</tbody>
</table>

Please refer to the "Guide to Estimating, Fender-Inner Panel (Welded Apron & Rails)" for the complete list of included/not included items. |

FENDER—INNER PANEL (Welded Apron & Rails) |

SPECIAL NOTATION: Detach and weld at floor pan, radiator support, hinge pillar and cowl panel.

INCLUDED: |

- Adhesive application if required (all types) • Battery tray
- Carpet & insulation turn back • Caulk/seam sealer • Cowl trim • Cutting & welding as necessary • Grind, fill and smooth welded seams (up to 150 grit sandpaper)

DOES NOT INCLUDE: |

- Adjacent panels
- Air inlet system (if necessary) • Blister/bonding items • Bumper assembly
- Carpet, insulation or seat RMI
- Cruise control
- Dash panel
- Decals/labels
- Electrical wiring
- Energy absorber
- Engine
- Front suspension assembly
- Hood hinges & support cylinder
- Hoses
- Outer sheet metal
- Pulling or straightening time
- Reservoir
- Set up on frame machine & diagnosis
- Steering components

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Mitchell

Computer Modules

When working with vehicles equipped with on-board computers, manufacturers recommend removal if temperatures are likely to exceed 176°F (80°C). Do not apply heat from a torch or weld in the immediate vicinity of computers without protecting them. Remove if necessary.

Many vehicles have multiple computers such as: Electronic Control Modules (ECM), Body Control Modules (BCM), individual computers for Anti-Lock Brake Systems and Electronic Suspension systems. All of these computers should be protected or removed before exposing them to high heat. Never connect or disconnect these units with ignition switch on, or charge a battery with battery cables connected. Before servicing, ground yourself and ground the work area to discharge stored static electricity.

Computer control information is listed in the Electrical Section of all Mitchell Collision Estimating Guides. There is a footnote below the listing or an illustration describing the location of each unit.

Source: Portions Copyright 2012, Mitchell International, Inc. – Mitchell P-Pages, Rev. 10-09. Page 19
Procedure 29—Special Caution

Computer Modules
When working with vehicles equipped with on-board computers, manufac-
turers recommend removal if temperatures are likely to exceed 176°F
(80°C). Do not apply heat from a torch or weld in the immediate vicinity
of computers without protecting them. Remove if necessary.

Many vehicles have multiple computers such as Electronic Control Modules
(ECM), Body Control Modules (BCM), individual computers for Anti-Lock
Brake Systems and Electronic Suspension systems. All of these computers
should be protected or removed before exposing them to high heat. Never
connect or disconnect these units with ignition switch on, or charge a battery
with battery cables connected. Before servicing, ground yourself and
ground the work area to discharge stored static electricity.

Computer control information is listed in the Electrical Section of all Mitchell
Collision Estimating Guides. There is a footnote below the listing or an illus-
tration describing the location of each unit.

Structural Glass
Windshields, back windows and other glass that was originally installed by
vehicle manufacturer utilizing urethane, should be reinstalled with urethane.
The urethane bonds the glass to the vehicle and makes the glass part of the
vehicle’s structure. Ensure that the vehicle manufacturer and/or I-CAR rec-
ommended installation is followed, and that the urethane is properly cured
before returning the vehicle to service.

Supplemental Restraint/Air Bag System
Vehicle manufacturer’s recommended service and repair procedures must
be followed when servicing any Supplemental Restraint/Air Bag System.
Certain safety precautions and disabling procedures must be observed
when performing repairs.

See Mitchell’s Air Bag Service & Repair Manual for system description and
operation checks, precautions, disabling and activating procedures, compo-
nent removal and installation procedures, and diagnosis and testing infor-
mation. Refer to Air Bag/SRS Component Inspection & Replacement Tables.

Seat Belts
Many vehicle manufacturer’s advise replacement of seat belts when
stressed by occupants in a collision. Refer to vehicle manufacturer or ser-
vice manual for specific clarification.

Rev. 02-10
Negotiation Question # 2 – Summary

It has been established and proved thru the source documentation that D&R the battery is a not-included labor operation.
Question 3.
Are there pre-determined times?
3. Is there a pre-determined time for D&R the battery?

Answer:
There is not a time to disconnect and reconnect the battery. There is only time to R&I the battery.
### Sample Estimate with R&I Battery Time

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<thead>
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<th>Line</th>
<th>Oper</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
<th>Extended Price $</th>
<th>Labor</th>
<th>Paint</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>REAR BODY &amp; FLOOR</td>
<td></td>
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<td></td>
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<tr>
<td>2</td>
<td>Repl</td>
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<td>494.12</td>
<td>9.4</td>
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<tr>
<td>3</td>
<td></td>
<td>Add for Clear Coat</td>
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<td></td>
<td></td>
<td>0.6</td>
<td></td>
</tr>
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<td>4</td>
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<td></td>
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<tr>
<td>8</td>
<td>R&amp;I</td>
<td>Battery</td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td>M</td>
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</table>

**SUBTOTALS** 494.12 11.9 2.9

### Sample Estimate without R&I Battery Time

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<th>Line</th>
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<tr>
<td>5</td>
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<td>LT Head air bag sedan</td>
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<td>* Notes: Disconnect/Reconnect for welding</td>
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<td>9</td>
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**SUBTOTALS** 945.63 20.2 4.2
Question 4. What is it worth?
4. If not, then what is D&R the battery worth?

Answer Documentation:

- When you remove a component, click on it in the R&I time in the estimating system. If there is a time, use it.
- If there is no R&I time, take the R&R times and adjust it accordingly.
- You can also look for an inquiry on the DEG website. If there is nothing on the DEG website, you can designate a time based on how long it takes the average technician to gather up their tools, equipment, and supplies and perform the task in a safe manner and return the tools, equipment and supplies back to their storage location.
- Sometimes OEMs may have a warranty time.
- Sometimes ALLDATA®, TechAdvisor® and other similar systems have mechanical times.
Additional Thoughts
Additional Thoughts

- You may need to R&I something to get to the battery, like an engine shield, and that will not be included, such as DEG 4300 (see image below)
- On a hybrid (high voltage) vehicle, you may have to activate and deactivate the system – DEG 5361 (see image on next page)
- When disconnecting the battery, disconnect the negative terminal first.

**DEG Inquiry #4300**

<table>
<thead>
<tr>
<th>Track_#</th>
<th>Estimating Platform</th>
<th>Inquiry Category</th>
<th>Year Make</th>
<th>Model</th>
<th>Resolution Status</th>
<th>Origination Date</th>
<th>Submission Date</th>
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<th>Total Time to Resolve</th>
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<tr>
<th>Inquiry Description</th>
<th>Resolution Description</th>
<th>Estimated Fix May 2012</th>
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<tr>
<td>Area/Vehicle/DRIVERS SEAT AREA</td>
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<td>Estimated DVD Release Date: 05-2012</td>
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<td>IssueSummary/SYSTEM TIME OF .2 TO R&amp;I BATTERY</td>
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<td>MCTCR Publication Fix Date: 07-2012</td>
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<td>VEHICLE BATTERY IS LOCATED UNDER DRIVERS SEAT BELOW CARPET WITH NO ACCESS COVER BUILT IN</td>
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<td>Proposed Resolution: MOTOR stated: After review the estimated work time applied to the battery has been adjusted to 0.5 hours with a footnote that states: &quot;LABOR: Time is for procedure as outlined by the CEM. Time is after left front seat is removed.&quot;</td>
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<td>SuggestedAction/REVISE TIME</td>
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DEG Database Inquiry

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<td>CCC</td>
<td>- Non-Welded Part Operations</td>
<td>2012 Toyota Camry Hybrid</td>
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<td>1/14/2013 3:47:00 PM</td>
<td>1/15/2013 5:15:00 AM</td>
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Inquiry Description

**Disconnect Hybrid Battery**
- Section5_Area: Vehicle Electrical
- Section5_Partment: Hybrid Battery
- Section5_IssueSummary: System does not show an option in the additional operations to activate/deactivate the hybrid system
- Section5_ProcedureSteps: Rear trim must come out of the vehicle, in order to gain access to the connector to activate/deactivate hybrid system
- Section5_TechnicianSkill: Experienced
- Section5_ActualTime: .7

Resolution Description

**Estimated Fix February 2013**

- Estimated UN Release Date: 02/01/2013
- Estimated DVD Release Date: 02-2013
- MOTOR Publication Fix Date: 04-2013

- Proposed Resolution: MOTOR stated:
  1. A "Special Caution" notation has been added to the "Electrical" group headnotes that states: "The high voltage system may remain powered for up to 10 minutes after vehicle is deactivated. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting or breaching any orange high voltage power cable or high voltage component. Consult Toyota service procedures for service and safety information."
  2. An "Add If Required" operation has been applied, "High voltage system deactivates/activates 0.6 hours," with a labor footnote that states, "LABOR: Time is for deactivating and activating the high-voltage power system as outlined in the OEM service manual."
The proper way to disconnect a vehicle battery is always, always disconnect the negative cable first, and when reconnecting battery cables to a battery always reconnect the negative cable last. This procedure prevents electrical arcing which can cause the battery to explode.

On vehicles with two or more batteries always disconnect the negative cable from every battery.

When working underhood, many technicians place something over the battery to ensure nothing metal comes in contact with the battery. This is a safety procedure for technicians. In addition, the battery must be disconnected to deactivate many other electronic systems in the vehicle, such as the air bag sensors.