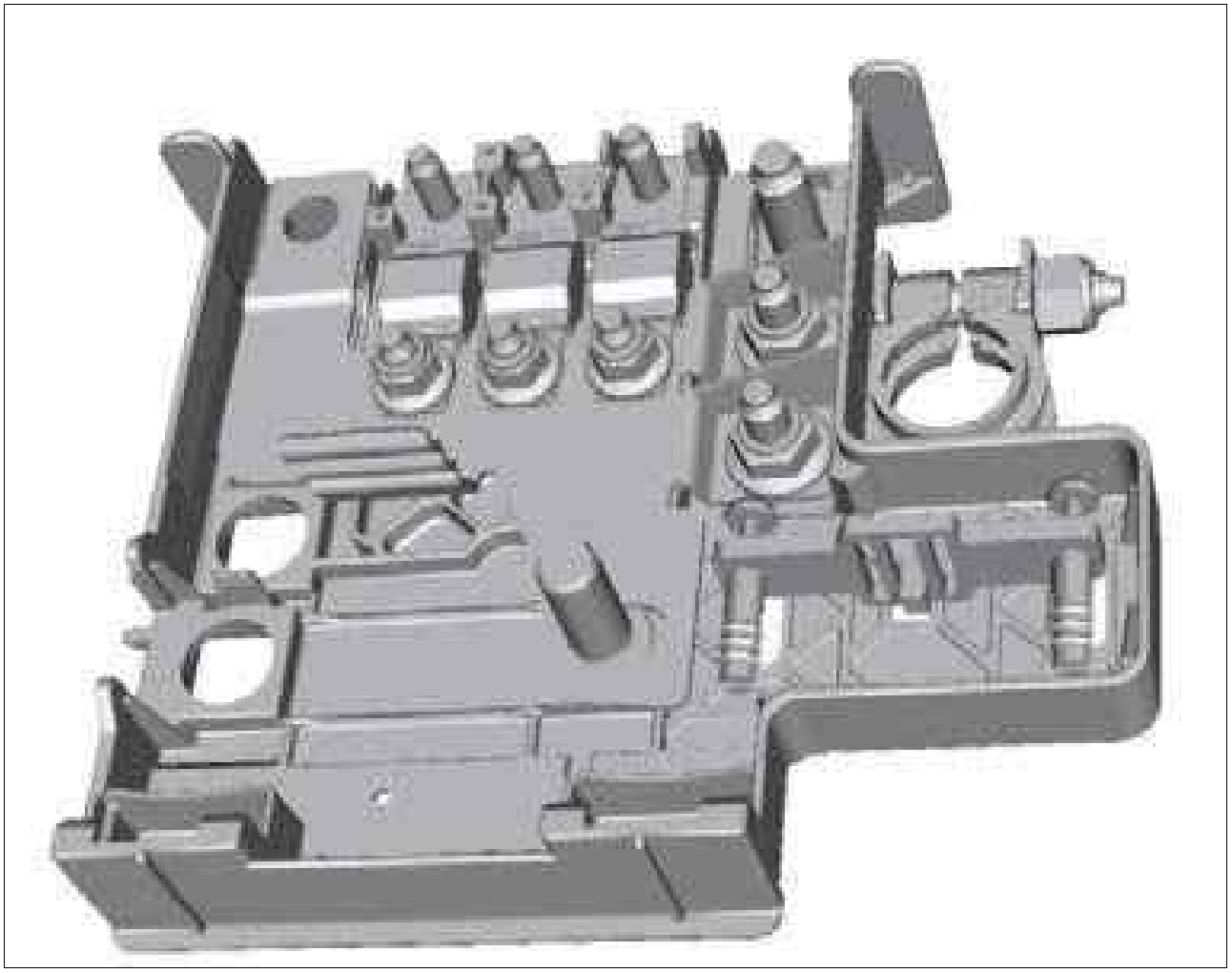
DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > DESCRIPTION

Batteries - The batteries fitted on the vehicle differ according to model and market. Some examples are given below:

Vehicle model	Battery type
1.4-MAIR/2-170 HP ATX	72AH L3 HD S/S
1.4-MAIR/2-170 HP MTX	63AH 450 A L2 HD S/S
1.4-MAIR-160 HP MTX	H5 500 CCA (NAFTA)
1.6- MJ 120 HP-2.0 MJ-140 HP MTX	72AH L3 S/S
1.6- EVO 110 HP MTX	72AH L3 S/S
2.4 TIGER SHARK ATX	70AH 600A SAE (NAFTA)
2.4 TIGER SHARK ATX	70AH 640 L3 EN2

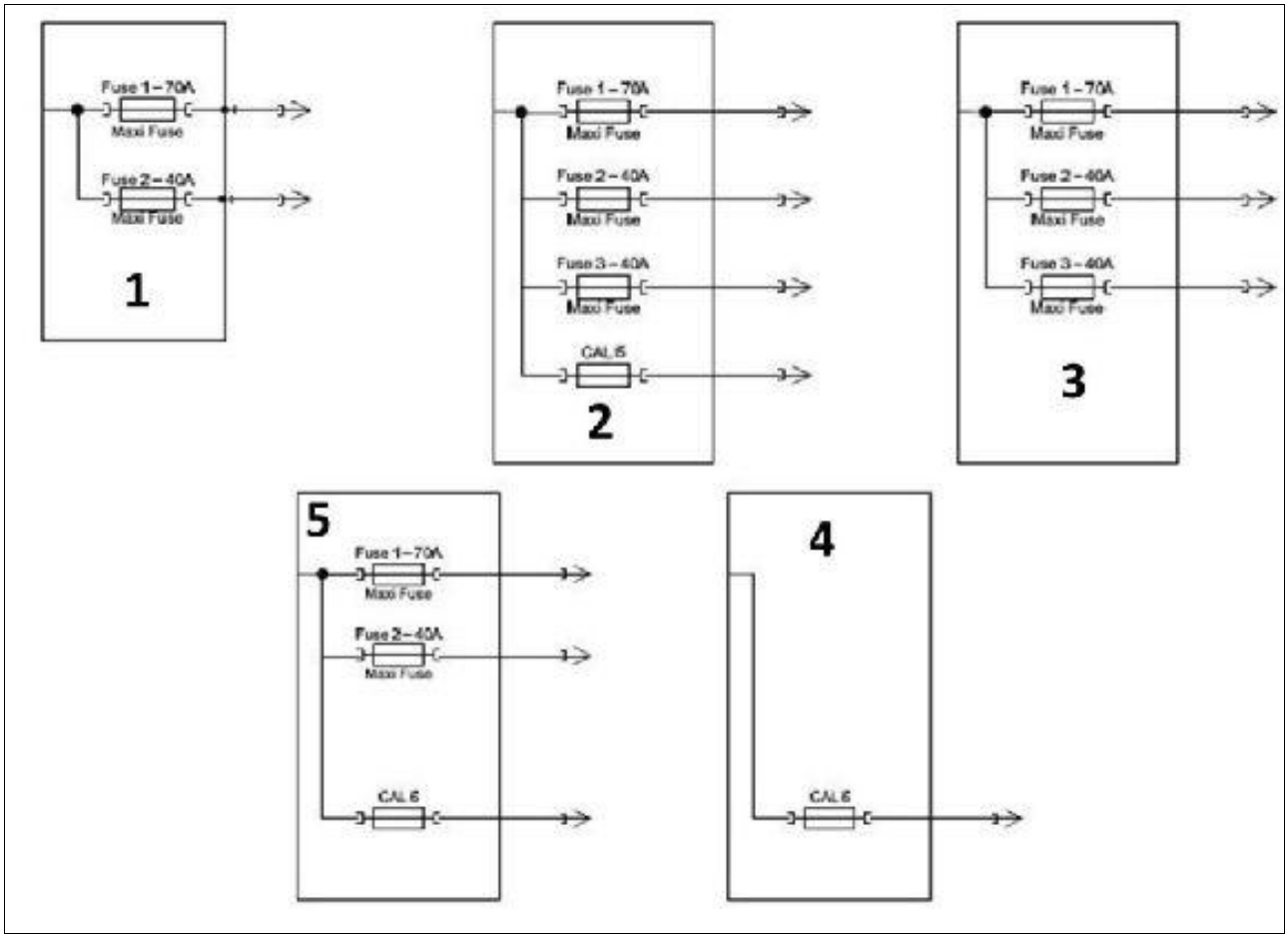
Fig 1: Junction Unit On Battery



Courtesy of CHRYSLER GROUP, LLC

Junction unit on battery - The junction units from CBA battery are indicated below:

Fig 2: Fuses Fitted In The CBA



Courtesy of CHRYSLER GROUP, LLC

The following fuses are fitted in the CBA:

- F1 70 A for the protection of the additional PTCs
- F2 40 A for the protection of the additional PTCs
- F3 40 A for the protection of the trailer setup
- CAL Not connected

CBA for vehicle:

1. 1.4 MultiAir / 2.0 MJet / 1.6 MJet1
2. 1.6 Etorque / 2.4 Tiger shark
3. 1.4 MultiAir / 2.0 MJet / 1.6 MJet1
4. 2.4 Tiger shark
5. 1.6 Etorque

DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

SPECIFICATIONS > BATTERY

	1.4 Turbo MultiAir	1.6 16V MultiAir	2.0 16V Multijet
Voltage (V)	12	12	12
Capacity (Ah)	63 72 (*)	72	72
Intensity (A)	450 570 (*)	570	570

(*) Cold Countries

SPECIFICATIONS > TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	NEW FASTENER*
Generator M12	70	52		
Generator M8	25	18.5		
Battery Nut M8	14	10.5		
Battery Box Screw M8	20	15		
Ground Cable	14	10.5		
Ground Cable Side Post	16	12		

***NEW FASTENER:** Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.

BATTERY > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > DESCRIPTION

Low-maintenance conventional batteries are used on this vehicle. These batteries have non-removable battery cell caps. Under normal service, the composition of this battery reduces gassing and water loss at normal charge rates.

Conventional batteries are made up of six individual cells that are connected in series. Each cell contains positive charged cell groups made of lead oxide, and negatively charged cell groups made of sponge lead. The cells are submerged in a sulfuric acid and water solution called electrolyte.

The battery performs the function of a chemical storage device for electrical energy generated by the alternator. It must be capable of supplying high current for starting and powering other electrical loads. The battery function is also to serve as a stabilizing component in the charging system by providing energy when the system demands exceed the output of the generator.

BATTERY > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

BATTERY > DIAGNOSIS AND TESTING > DIAGNOSIS AND TESTING - BATTERY

WARNING:

IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING:

EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING:

THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

A battery that will not accept a charge is inoperative, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is inoperative and must be replaced.

NOTE:

Completely discharged batteries may take several hours to accept a charge. Refer to STANDARD PROCEDURE for the proper battery charging procedures.

BATTERY > DIAGNOSIS AND TESTING > DIAGNOSIS AND TESTING - BATTERY > MIDTRONICS GR8 BATTERY TESTER

The Midtronics GR8 battery tester is designed to help diagnose the cause of an inoperative battery. for instructions on the use of the Midtronics GR8 battery tester. Refer to BATTERY, STANDARD PROCEDURE .

BATTERY > STANDARD PROCEDURE > BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Midtronics (special tool #GR8-1220KIT-CHRY, AGM Battery Tester/Charger Station) tester indicates battery is OK.
- All of the battery cells are gassing freely during battery charging.
- Open-circuit voltage of the battery is 12.65 volts or above.

WARNING:

Never exceed twenty amperes when charging a cold (-1° C [30° F] or lower) battery. The battery may arc internally and explode. Personal injury and/or vehicle damage may result.

WARNING:

If the battery shows signs of freezing, leaking, loose posts, do not test, assist-boost, or charge. The battery may arc internally and explode. Personal injury and/or vehicle damage may result.

WARNING:

EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING:

THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

WARNING:

If the battery is equipped with removable cell caps, be certain that each of the cell caps is in place and tight before the battery is returned to service. Personal injury and possible vehicle damage may result from loose or missing cell caps.

CAUTION:

Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system

components may result.

> ⚠ *CAUTION:*
>
> *Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.*

> ⚠ *CAUTION:*
>
> *The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.*

After the battery has been charged to 12.65 volts or greater, perform a load test to determine the battery cranking capacity. For the proper battery load test procedures, refer to BATTERY, STANDARD PROCEDURE . If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is inoperative and must be replaced.

Clean and inspect the battery hold-down, tray, terminals, posts, and top before completing battery service.

BATTERY > STANDARD PROCEDURE > BATTERY CHARGING > CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt. If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.
2. Disconnect and isolate the battery negative cable. Connect the Midtronics (special tool #GR8-1220KIT-CHRY, AGM Battery Tester/Charger Station).

> 📌 *NOTE:*
>
> *Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-*

sensing circuitry.

3. Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the CHARGE RATE TABLE. If the charging current is still not measurable at the end of the charging time, the battery is inoperative and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

BATTERY > STANDARD PROCEDURE > BATTERY CHARGING > CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours

12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER

Always use the Midtronics GR8 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:

> *WARNING:*
>
> *Always wear appropriate eye protection and use extreme caution when working with batteries.*

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > BATTERY TESTING

1. If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing. . If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.
2. If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. Connect the Midtronics GR8 directly to the battery posts.

   > *NOTE:*
   >
   > *Multiple batteries connected in parallel must have the ground cable disconnected to perform a battery test. Failure to disconnect may result in false battery test readings.*

3. Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.
4. If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to TEST RESULTS-CHARGING SYSTEM .
5. While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

NOTE:

The SERVICE CODE is required on every warranty claim submitted for battery replacement.

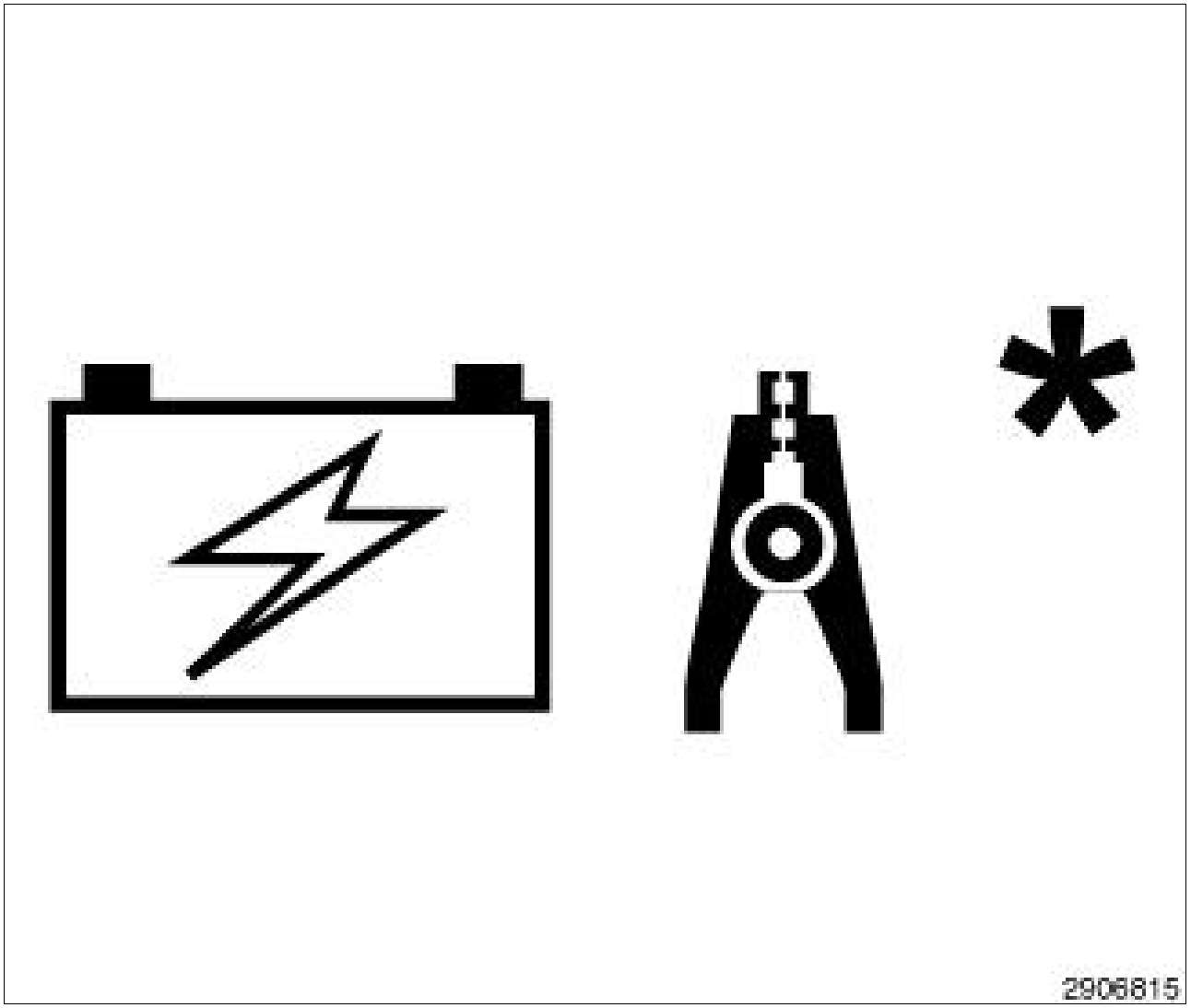
BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > QUICK REFERENCE GUIDE

Inspect the battery for damages and check the electrolyte level. Always use the necessary safety precautions when working with batteries to prevent severe injury or death. Follow all manufacturers' instructions and BCI (Battery Council International) safety recommendations, which include the following precautions:

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > QUICK REFERENCE GUIDE > MAIN MENU

The Main Menu is the starting point for all tools and utilities, which are depicted as icons. Some icons lead directly to the function they represent, while others are menu icons that lead to two or more options.

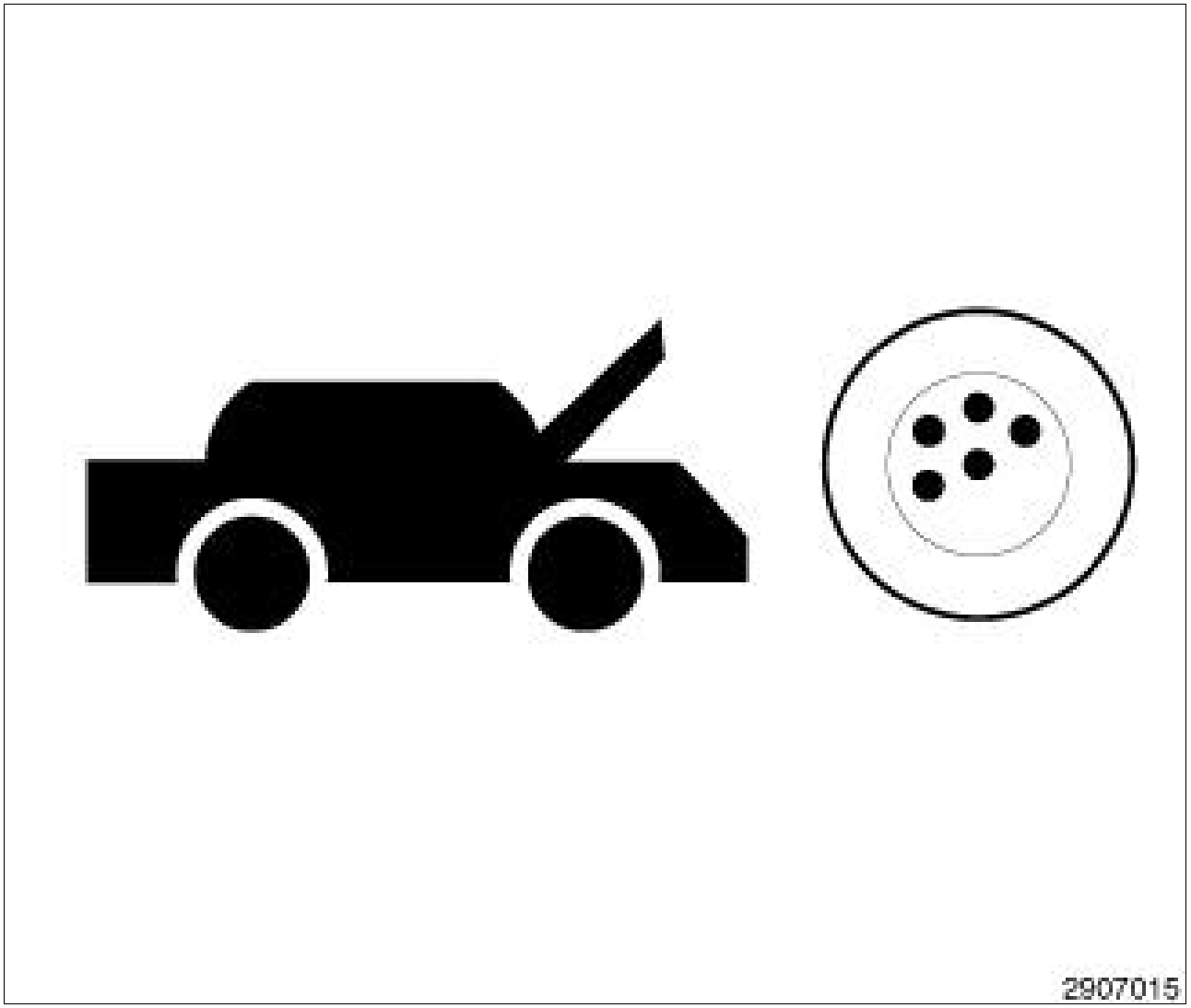
Fig 1: Identifying Battery Tester Main Menu Icon 1



Courtesy of CHRYSLER GROUP, LLC

Automatically tests, charges, and provides battery decision using the information you select in a series of screens. Start here to generate warranty codes.

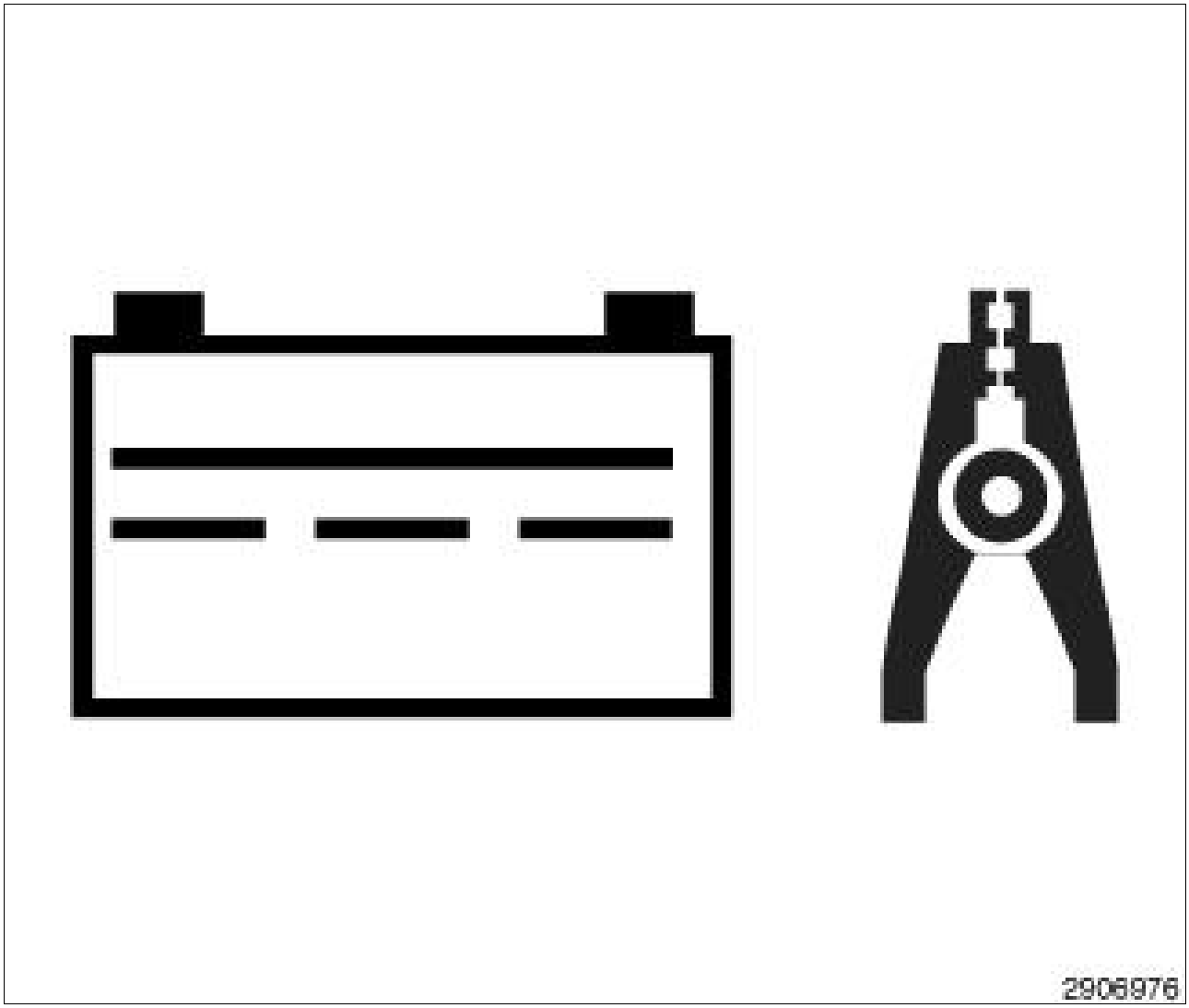
Fig 2: Identifying Battery Tester Main Menu Icon 2



Courtesy of CHRYSLER GROUP, LLC

Tests the starting and charging systems.

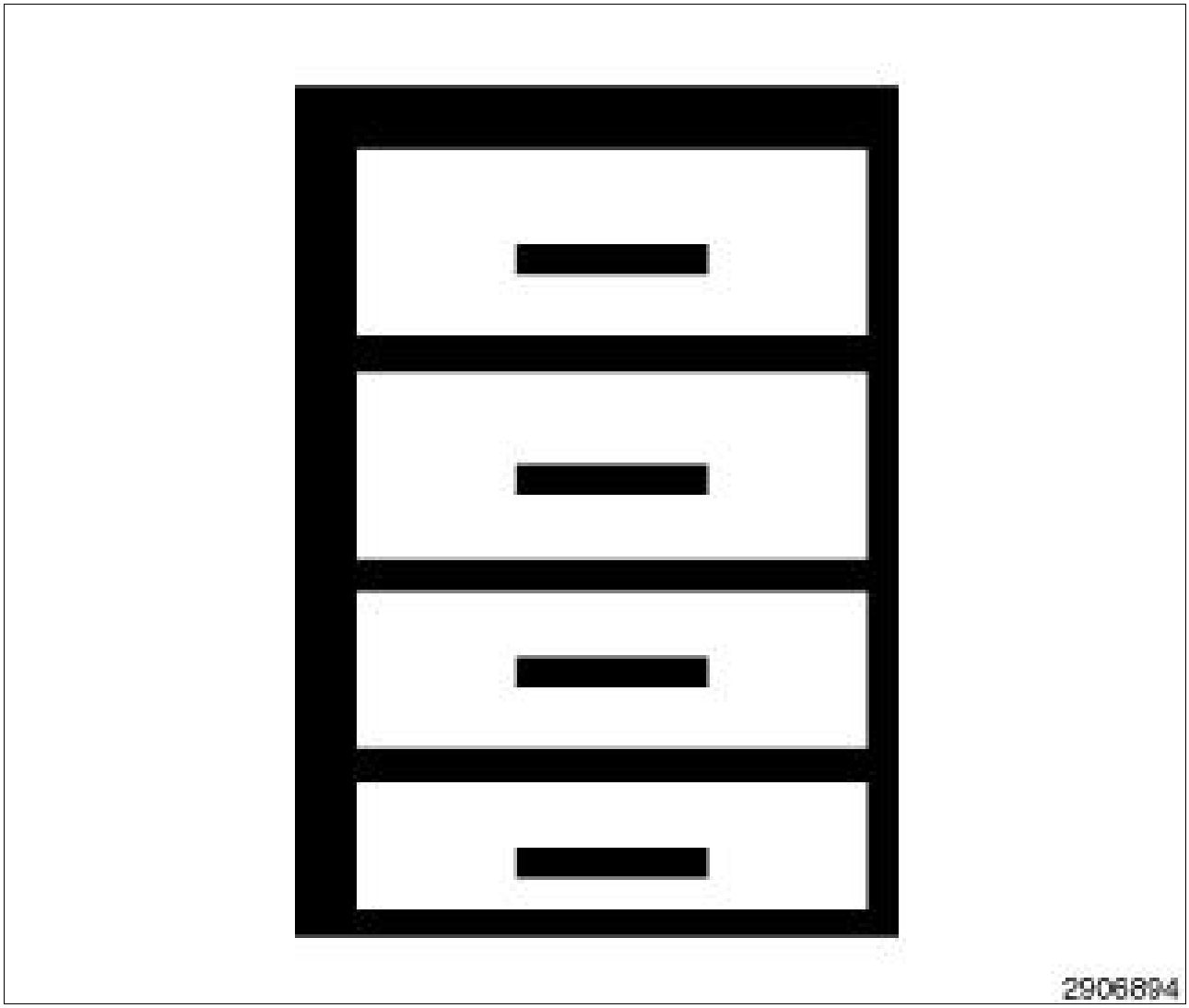
Fig 3: Identifying Battery Tester Main Menu Icon 3



Courtesy of CHRYSLER GROUP, LLC

Maintains battery voltage at 13.5 volts to provide uninterrupted reprogramming of ECUs and retain vehicle system settings.

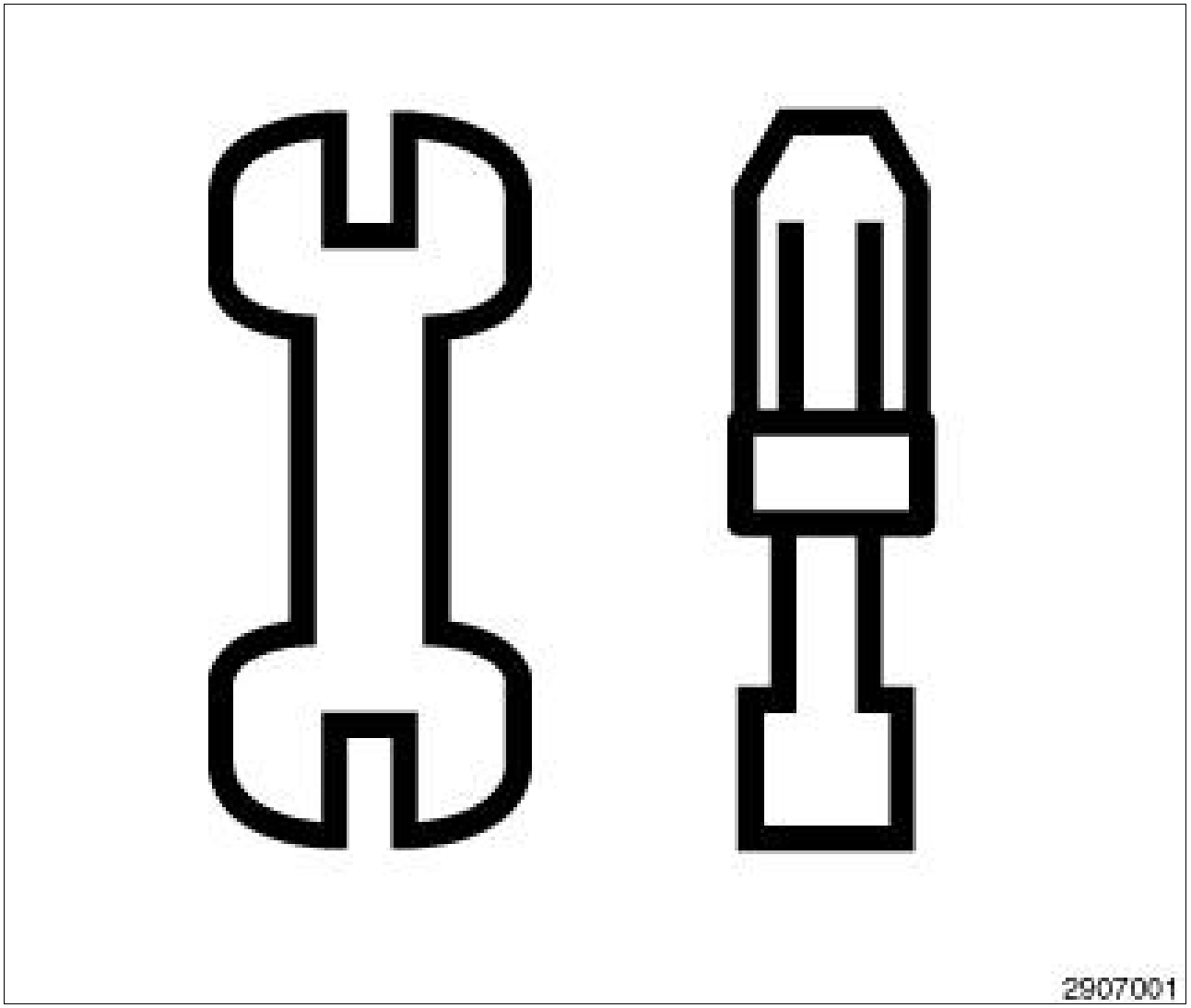
Fig 4: Identifying Battery Tester Main Menu Icon 4



Courtesy of CHRYSLER GROUP, LLC

Includes a utility to view and print a test counter, a data transfer utility, the software version and date, the Midtronics GR8 serial number for the control module, and current wireless channel.

Fig 5: Identifying Battery Tester Main Menu Icon 5



Courtesy of CHRYSLER GROUP, LLC

The Setup Menu lets you customize options in the Midtronics GR8 to suit your needs.

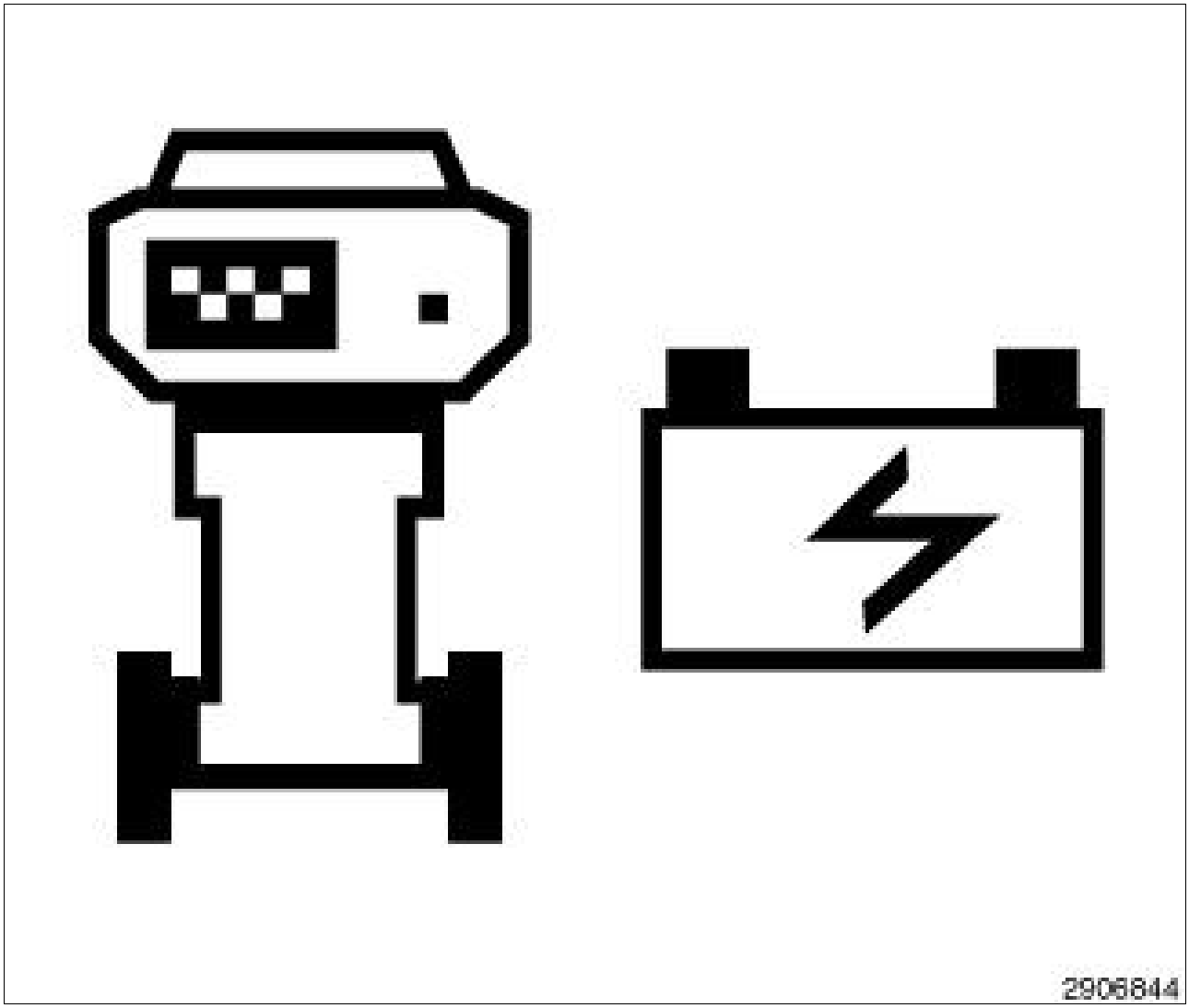
Fig 6: Identifying Battery Tester Main Menu Icon 6

Courtesy of CHRYSLER GROUP, LLC

Provides a list of topics and definitions. Also includes Midtronics Customer Service phone numbers.

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > QUICK REFERENCE GUIDE > CHARGE/TEST MENU

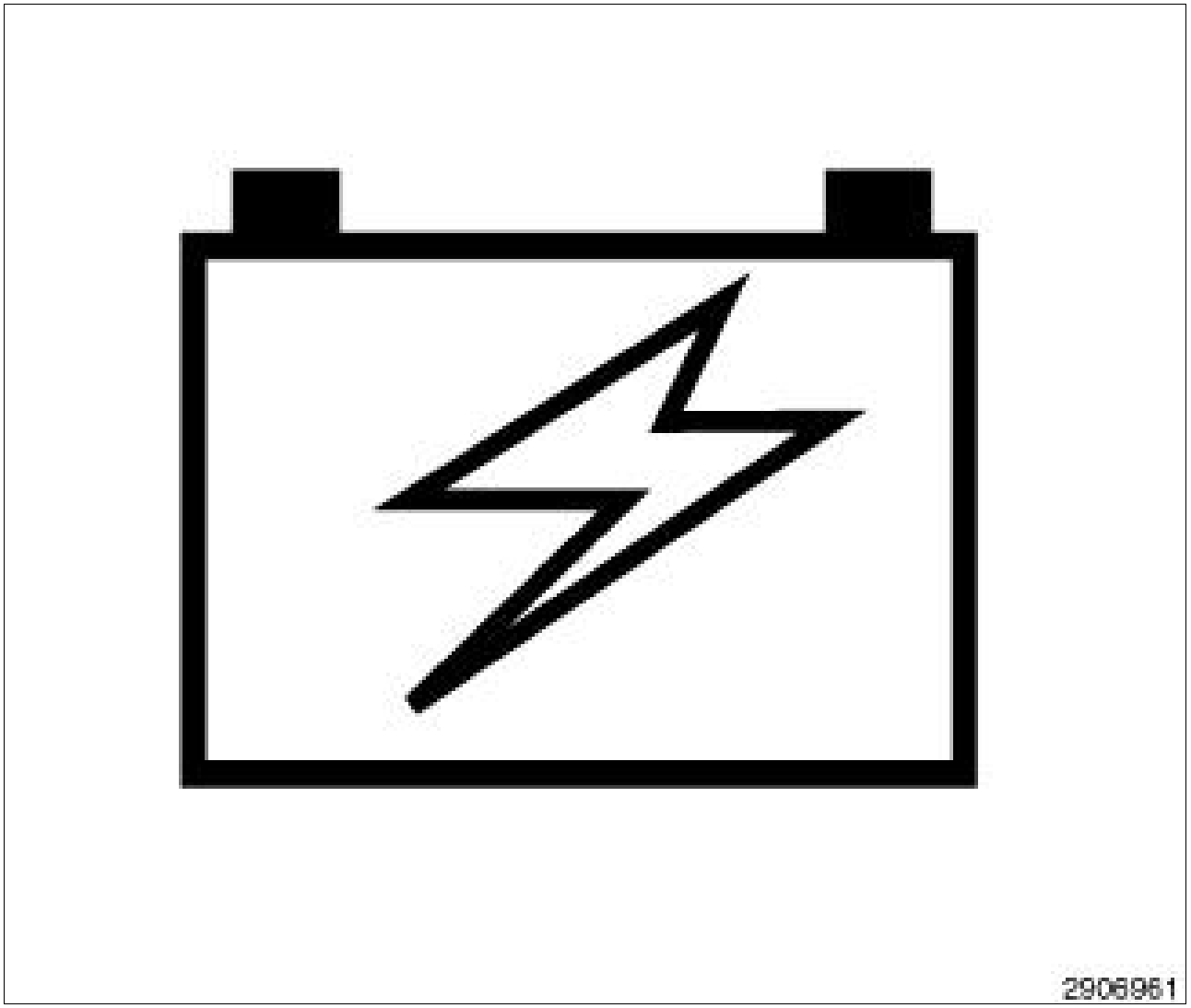
Fig 1: Identifying Charge/Test Menu Icon 1



Courtesy of CHRYSLER GROUP, LLC

Automatically tests and charges battery, starting, and charging system. Generates a warranty code for Replace and Bad Cell decisions.

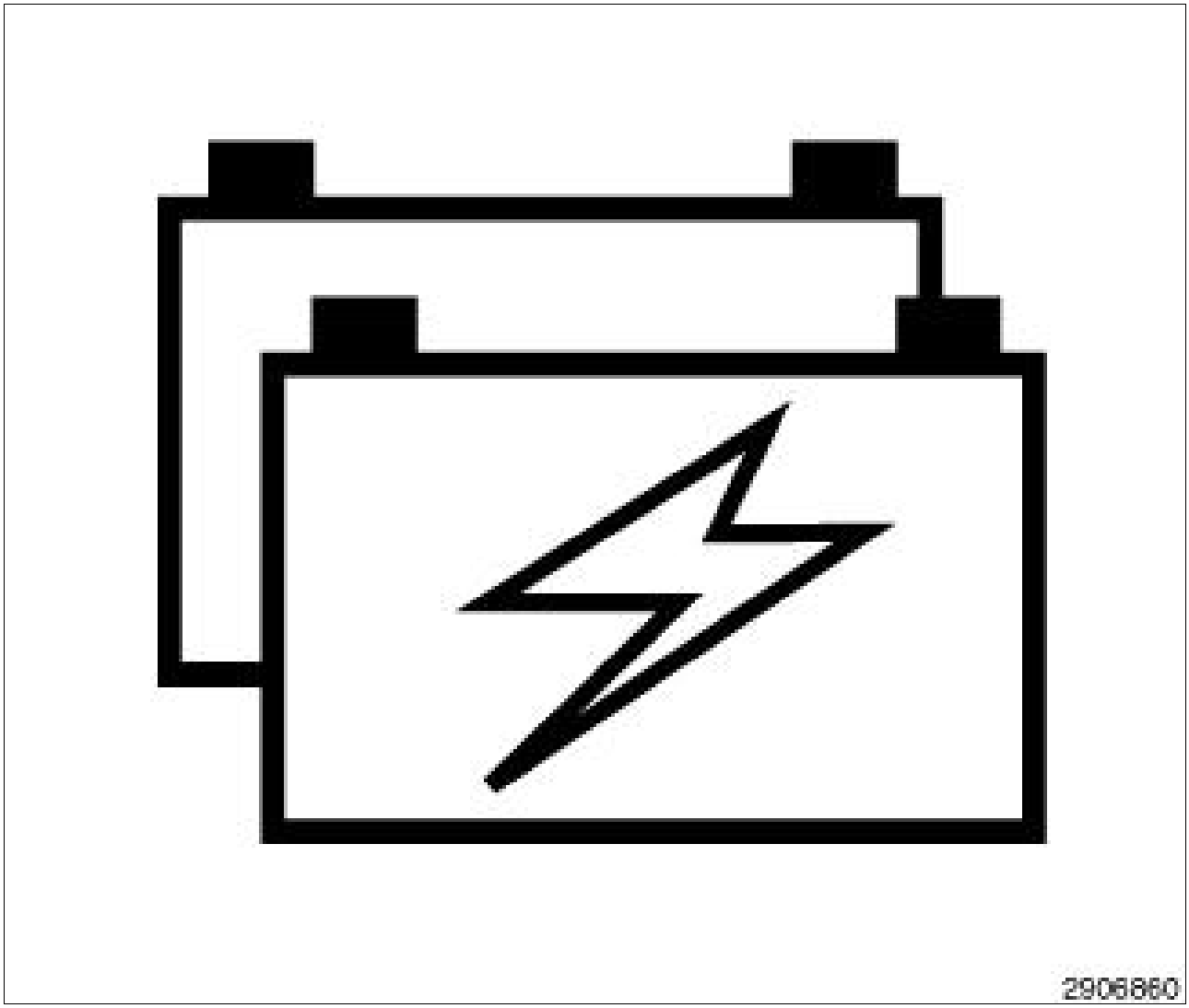
Fig 2: Identifying Charge/Test Menu Icon 2



Courtesy of CHRYSLER GROUP, LLC

Pre Delivery Inspection (PDI): For testing delivered vehicles and lot maintenance. Uses the same inputs as a diagnostic charge.

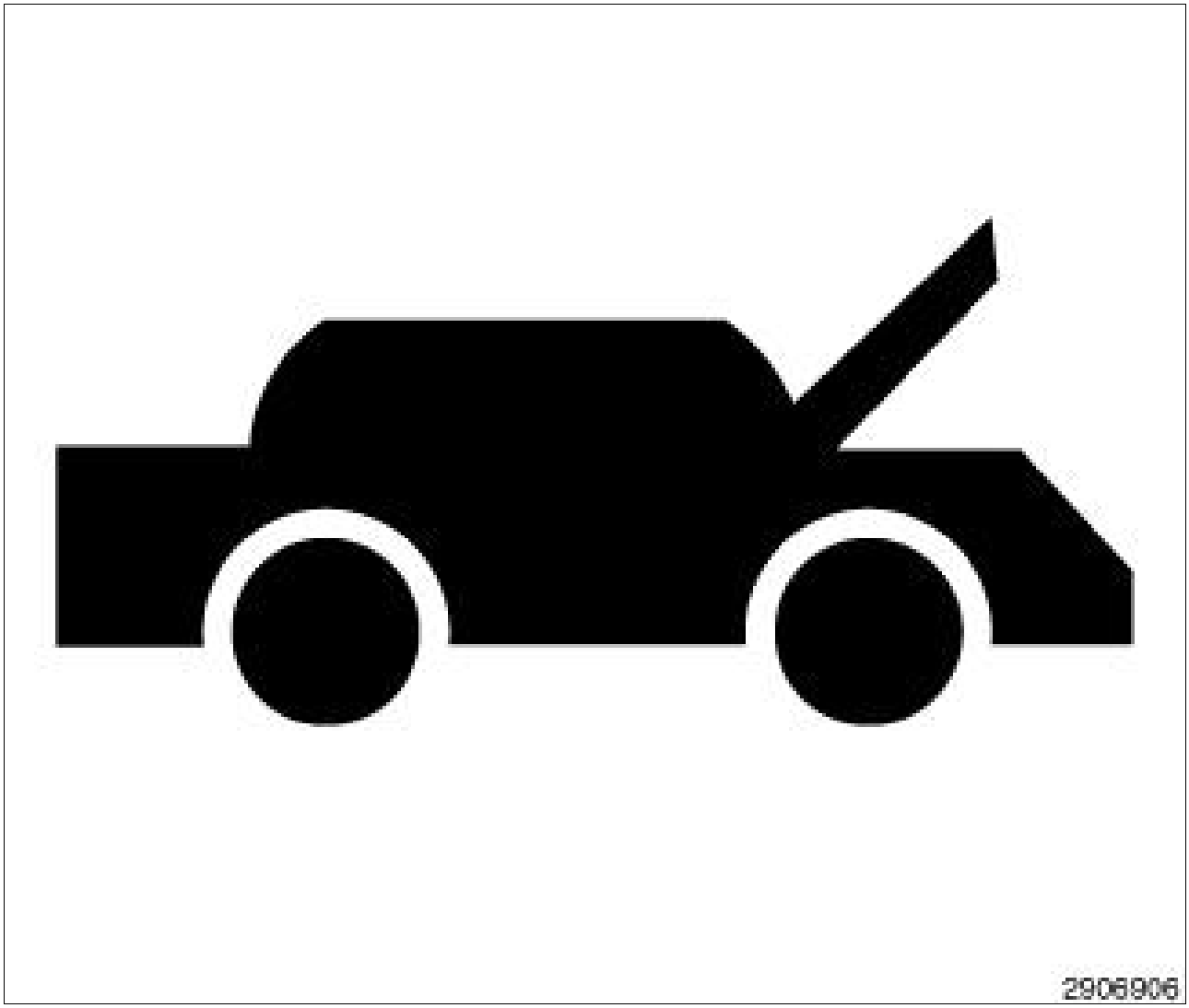
Fig 3: Identifying Charge/Test Menu Icon 3



Courtesy of CHRYSLER GROUP, LLC

Dual Battery Charge mode allows the charger to be used with dual battery systems.

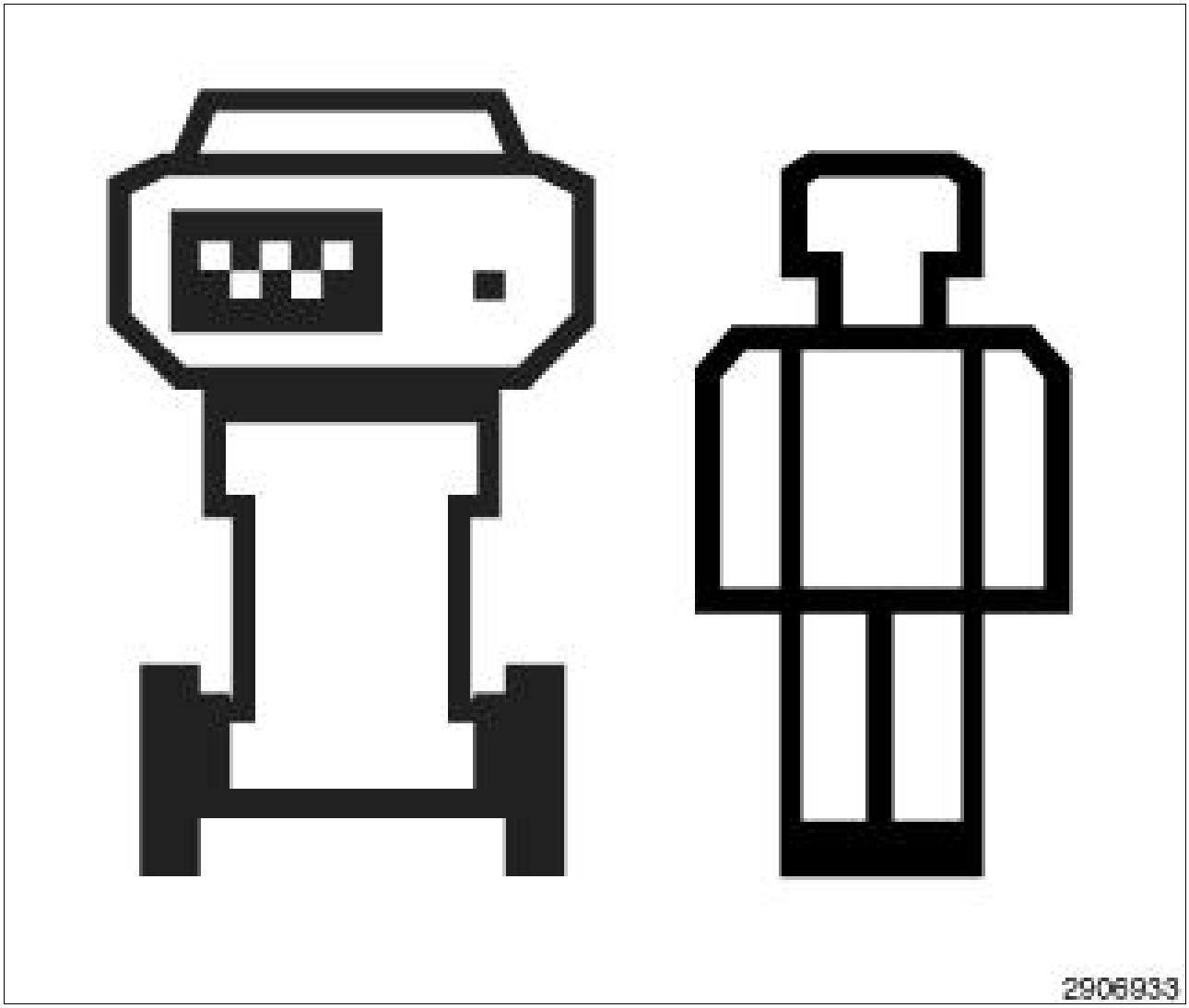
Fig 4: Identifying Charge/Test Menu Icon 4



Courtesy of CHRYSLER GROUP, LLC

Makes high output current available to boost charge an in-vehicle battery and assist in starting the engine.

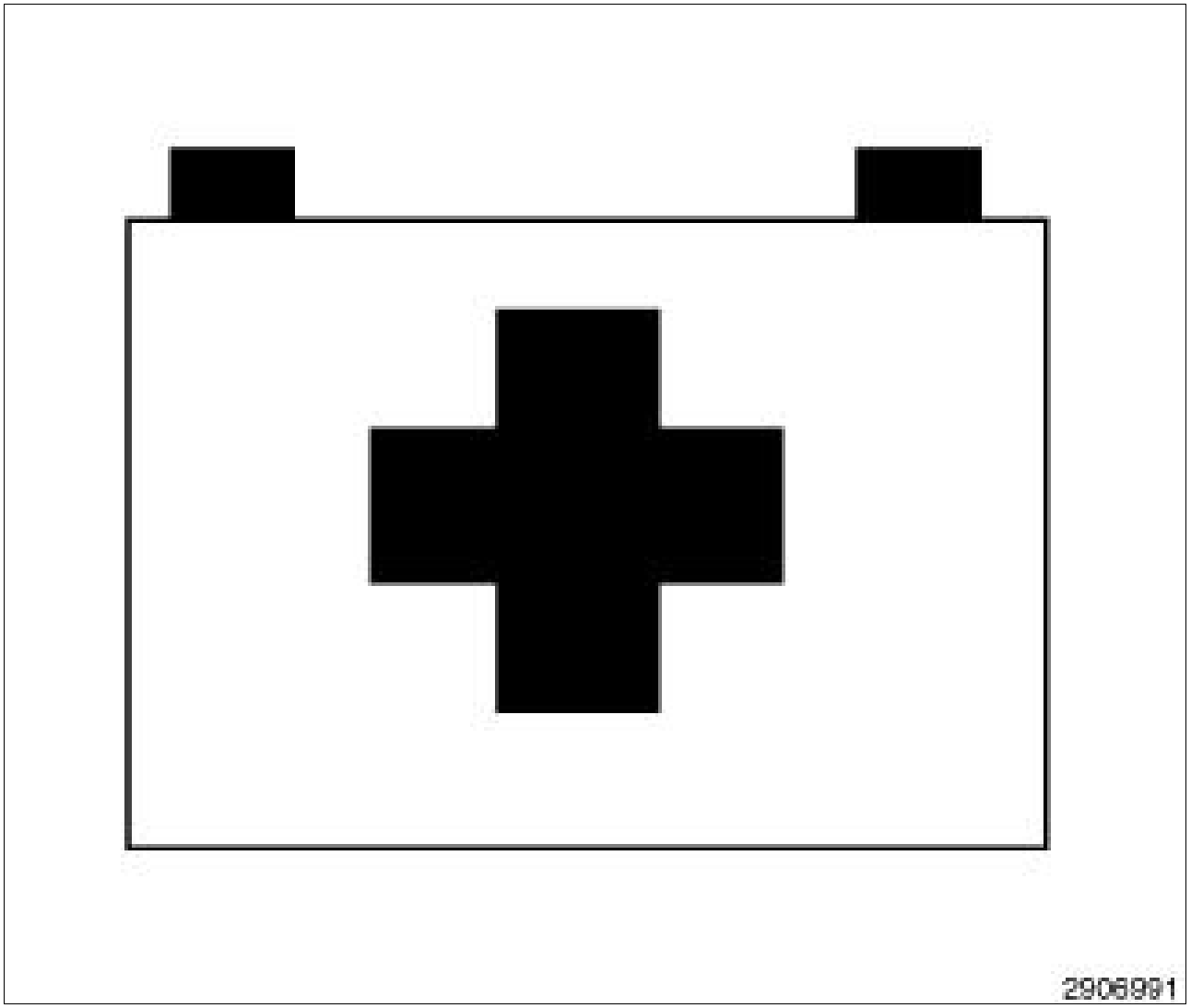
Fig 5: Identifying Charge/Test Menu Icon 5



Courtesy of CHRYSLER GROUP, LLC

Provides a timed charge that ranges from 5 to 120 minutes or a continuous charge that ends when you press the STOP key.

Fig 6: Identifying Charge/Test Menu Icon 6



Courtesy of CHRYSLER GROUP, LLC

In this mode the charger can provide a trickle charge for long term, low amp battery charging.

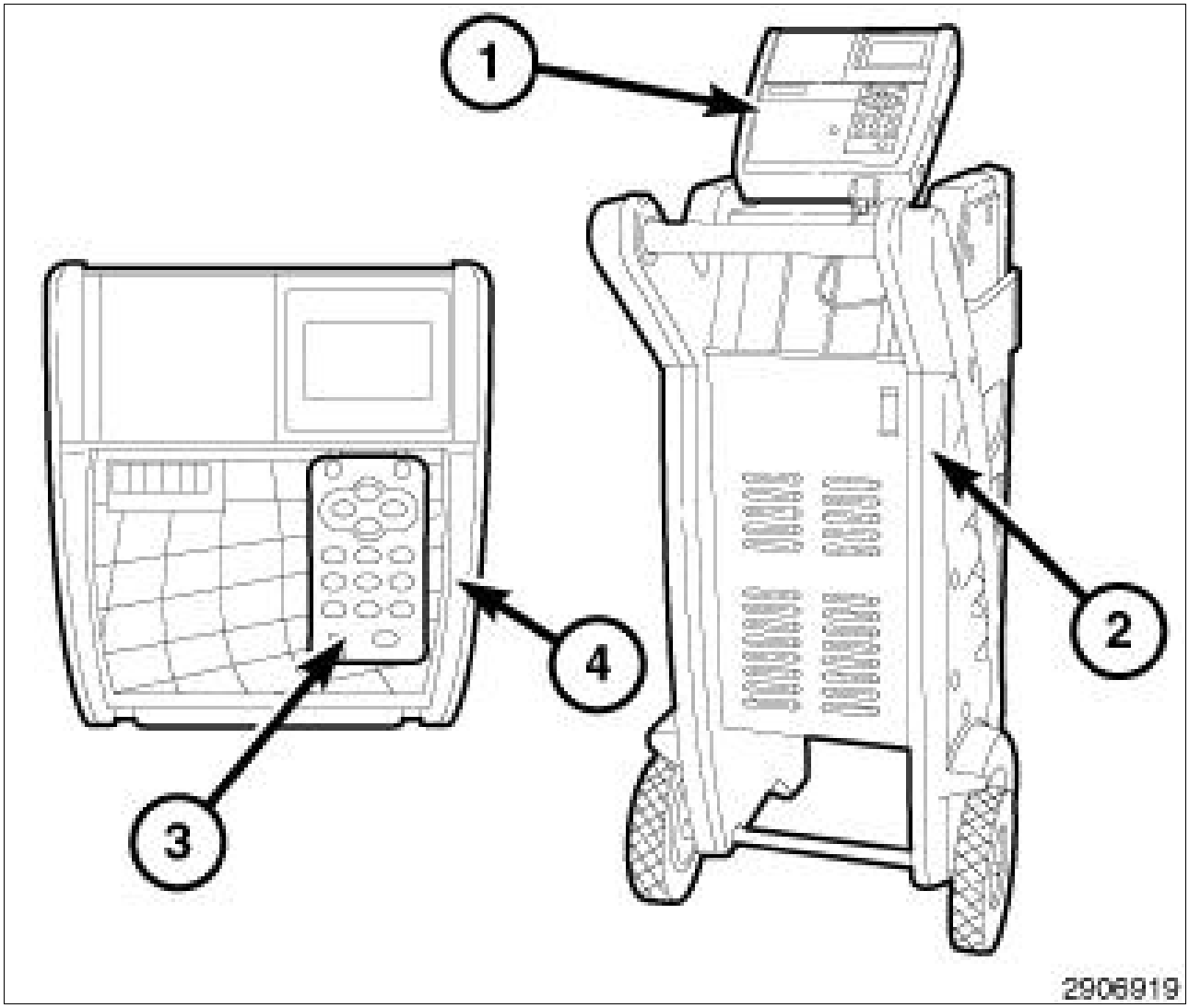
Fig 7: Identifying Charge/Test Menu Icon 7

Courtesy of CHRYSLER GROUP, LLC

Generates 15-digit warranty codes for physically defective batteries or customer good will.

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > QUICK REFERENCE GUIDE > GR8 BATTERY TESTER

Fig 1: Identifying GR8 Battery Tester Components

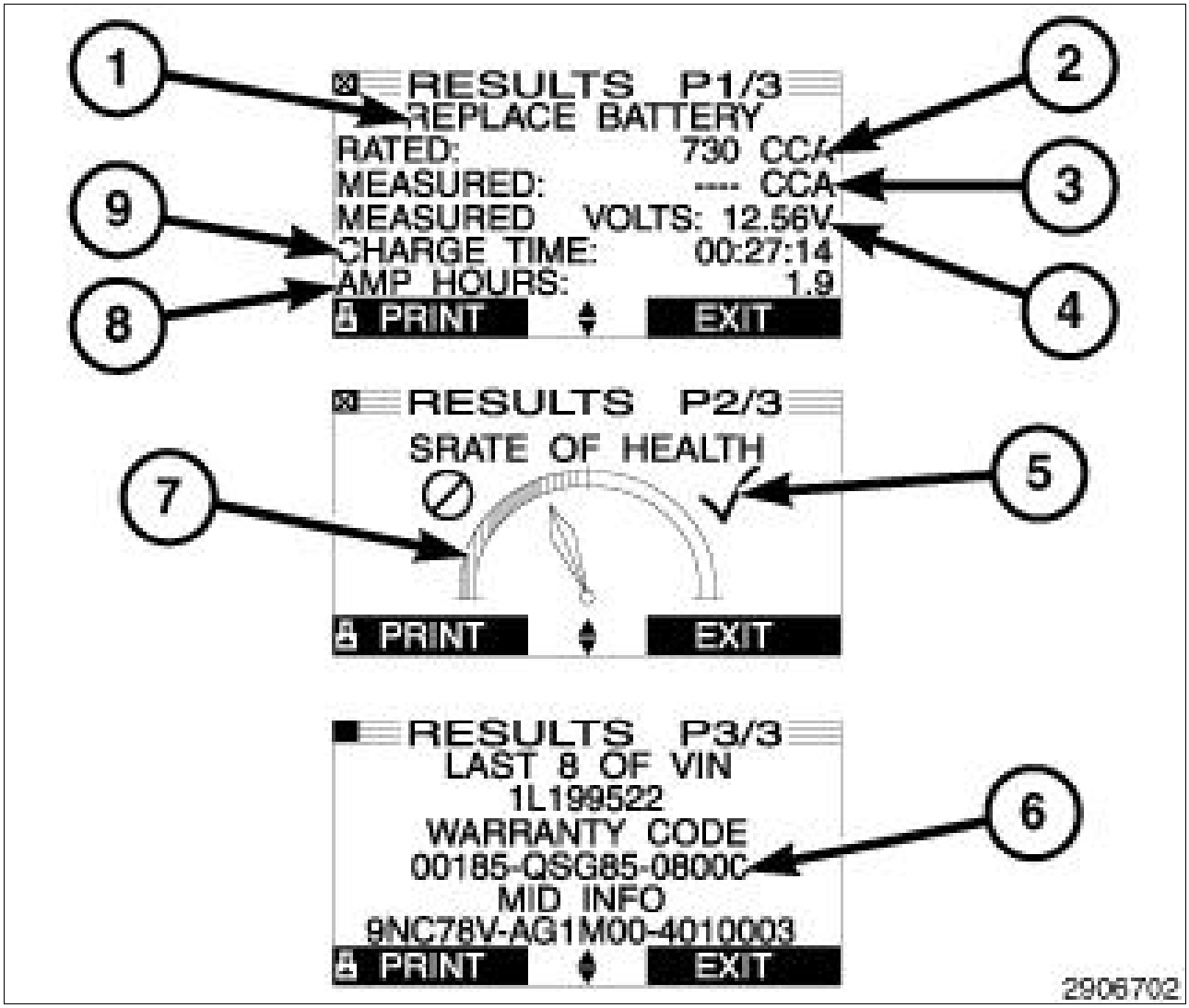


Courtesy of CHRYSLER GROUP, LLC

1. **Control module:** Backlit graphical display and keypad for data entry.
2. **ON/OFF switch:** ON/OFF switch Turns power on and off to the GR8.
3. **STATUS light:** Lights in conjunction with beeping alarm to indicate transitions and warnings.
4. **Data card slot:** For future upgrades via a data card. The slot contains a plastic filler card for protection.

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > REPLACE BATTERY DECISIONS > BATTERY DECISIONS

Fig 1: Battery Test Screen - Example



Courtesy of CHRYSLER GROUP, LLC

1. Battery Decisions
2. Select Rating
3. Measured capacity
4. Measured voltage
5. Good Range

> *NOTE:*
>
> *The warranty code screen will only be displayed for REPLACE BATTERY and BAD CELL-REPLACE decisions.*

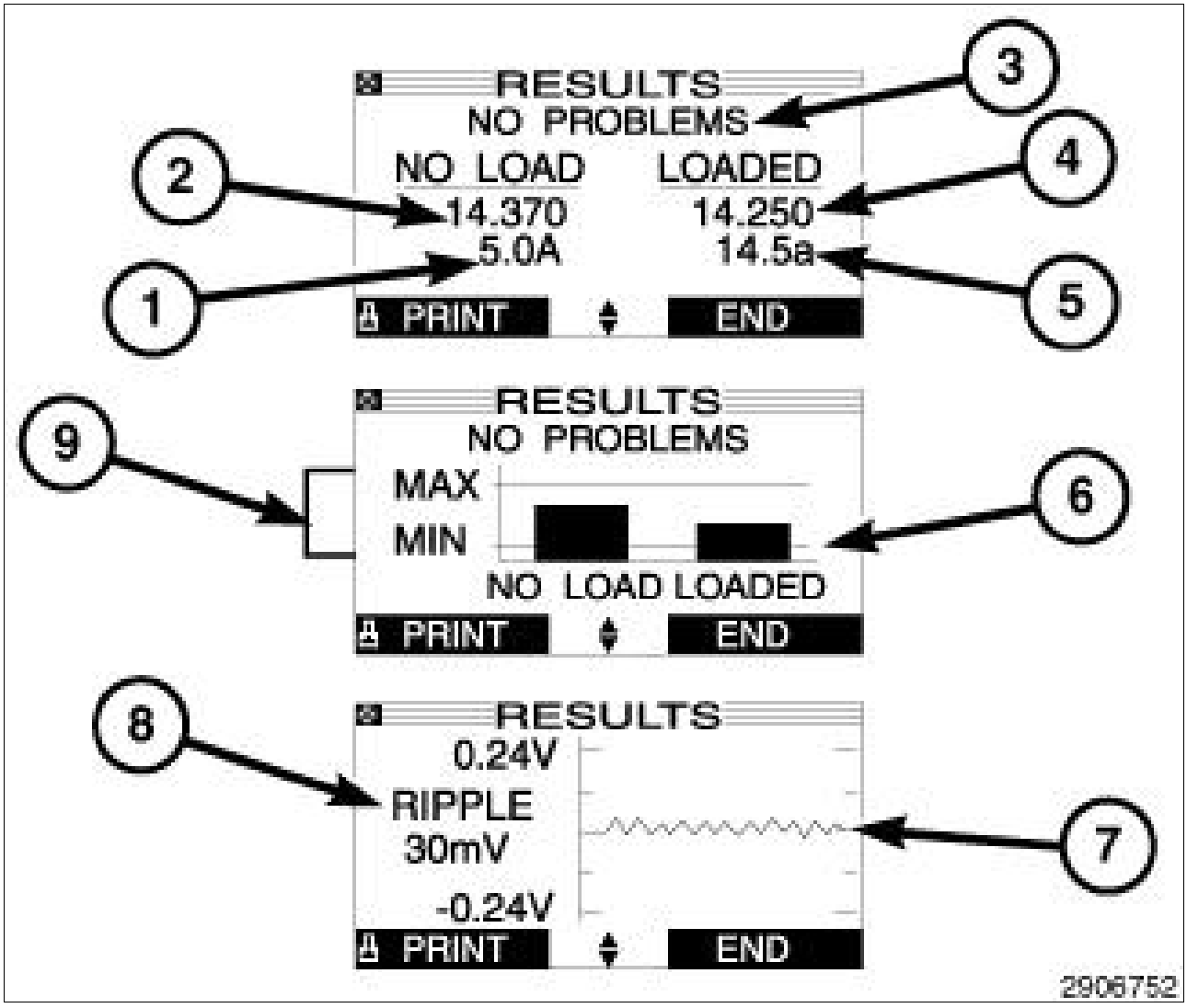
6. Enter this number into scan tool

7. Replace range
8. Replaced AMP Hours
9. Charging Time

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > REPLACE BATTERY DECISIONS > TEST RESULTS-CHARGING SYSTEM

A REPLACE BATTERY or BAD CELL-REPLACE decision gives you the option of generating a warranty code. Enter that warranty code into your scan tool in the Midtronics warranty code validation routine.

Fig 1: Battery Tester Test Results Screen - Example



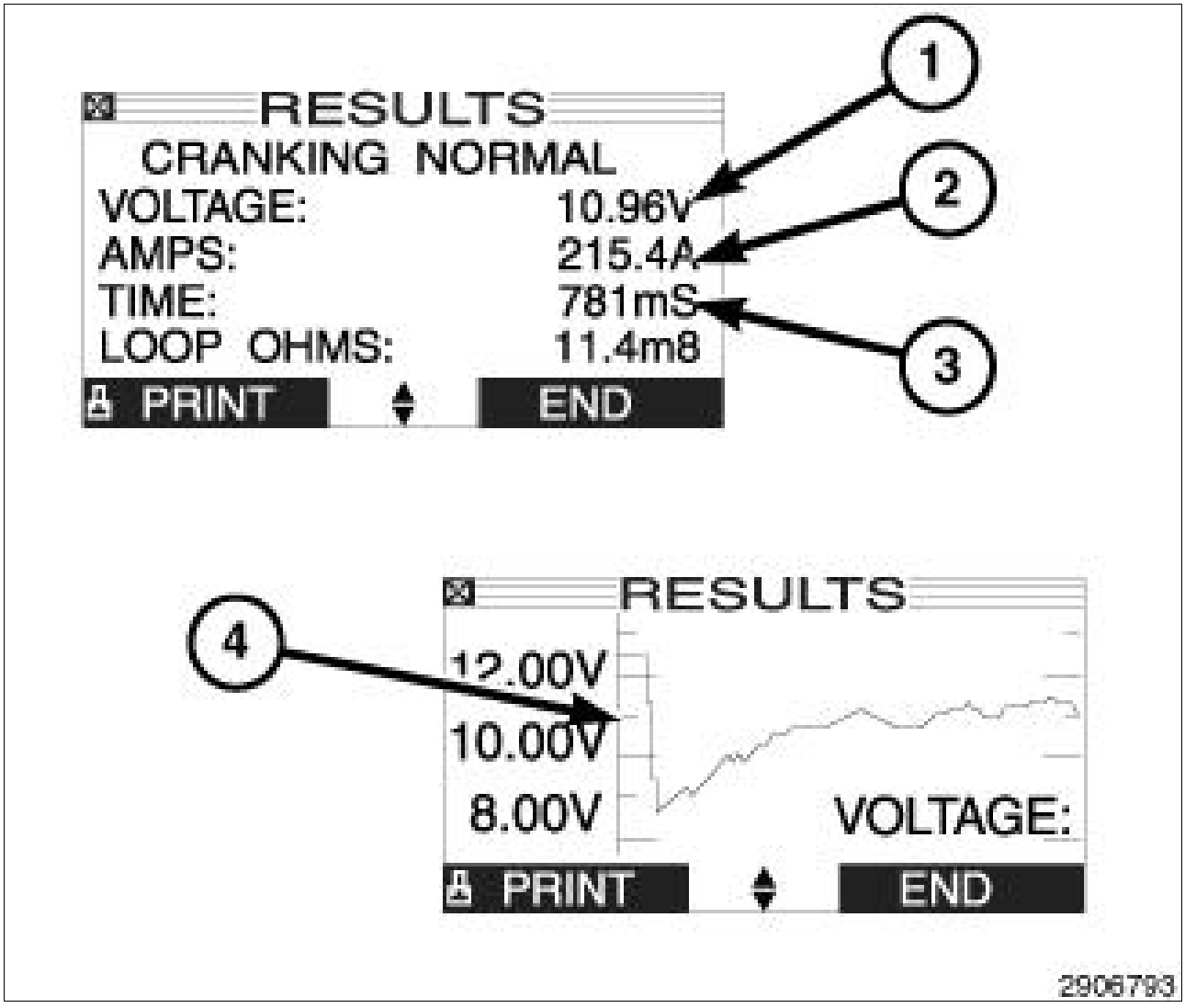
Courtesy of CHRYSLER GROUP, LLC

1. Loads-off current at rev if amp clamp is used
2. Loads-off DC voltage at rev
3. Decision

4. Loads-on DC voltage at rev
5. Loads-on current at rev if amp clamp is used
6. Bar graph of DC voltage within normal range (loads on and off)
7. Graph of diode waveform
8. Peak-to-peak AC voltage
9. Normal DC voltage range

BATTERY > STANDARD PROCEDURE > GR8 BATTERY TESTER / CHARGER > REPLACE BATTERY DECISIONS > TEST RESULTS-STARTER SYSTEM

Fig 1: Test Results-Starter System Example



Courtesy of CHRYSLER GROUP, LLC

1. Average cranking voltage

2. Average cranking current if amp clamp is used
3. Cranking time in seconds
4. Y axis = System performance: cranking voltage

BATTERY > STANDARD PROCEDURE > IGNITION-OFF DRAW TEST

YouTube	A multimedia supplement to the instructions contained in this article is available. To view the multimedia example of the condition described go to; **http://www.youtube.com, search for "Mitchell1Videos" then type, "A00735755.vid1" into the "Search Channel" box.**

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

Excessive IOD can be caused by:

- Electrical items left on.
- Inoperative or improperly adjusted switches.
- Inoperative or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

1. Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to ten minutes. See the ELECTRONIC MODULE IGNITION-OFF DRAW TABLE below for more information.

ELECTRONIC MODULE IGNITION-OFF DRAW (IOD) TABLE			
Module	Time Out? (If Yes, Interval And Wake-Up Input)	IOD	IOD After Time Out
Radio	No	1 to 3 milliamperes	N/A

Audio Power Amplifier	No	up to 1 milliampere	N/A
Powertrain Control Module (PCM)	No	0.95 milliampere	N/A
Instrument Cluster	No	0.44 milliampere	N/A

2. Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.
3. Turn off all electrical accessories.
4. Disconnect the battery negative cable.

> *CAUTION:*
>
> *Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multimeter may be damaged.*

5. Connect a 10 gauge jumper wire between the negative battery cable and the negative battery post.
6. Turn the ignition key ON and then OFF and wait 10 minutes for all systems to enter sleep mode.

> *NOTE:*
>
> *Do not break the connection between the jumper wire and the battery. If the connection between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.*

7. Set an electronic digital multimeter to its highest amperage scale. Connect the multimeter to the battery negative cable terminal clamp and the battery negative terminal post, but not on the jumper connection.
8. Remove the jumper wire without breaking the digital multimeter connection.
9. The multimeter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post, but not the jumper wire.
10. The high-amperage IOD reading on the multimeter should be very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the BCM and PDC, one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information for complete BCM and PDC, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent,

diagnose and repair the Charging System as necessary. After the high-amperage IOD has been corrected, switch the multimeter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multimeter to check the low-amperage IOD.

11. Observe the multimeter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process. The multimeter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or an inoperative component is the cause.

BATTERY > STANDARD PROCEDURE > OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery.

Before proceeding with this test, completely charge the battery, refer to the appropriate battery charging procedure.

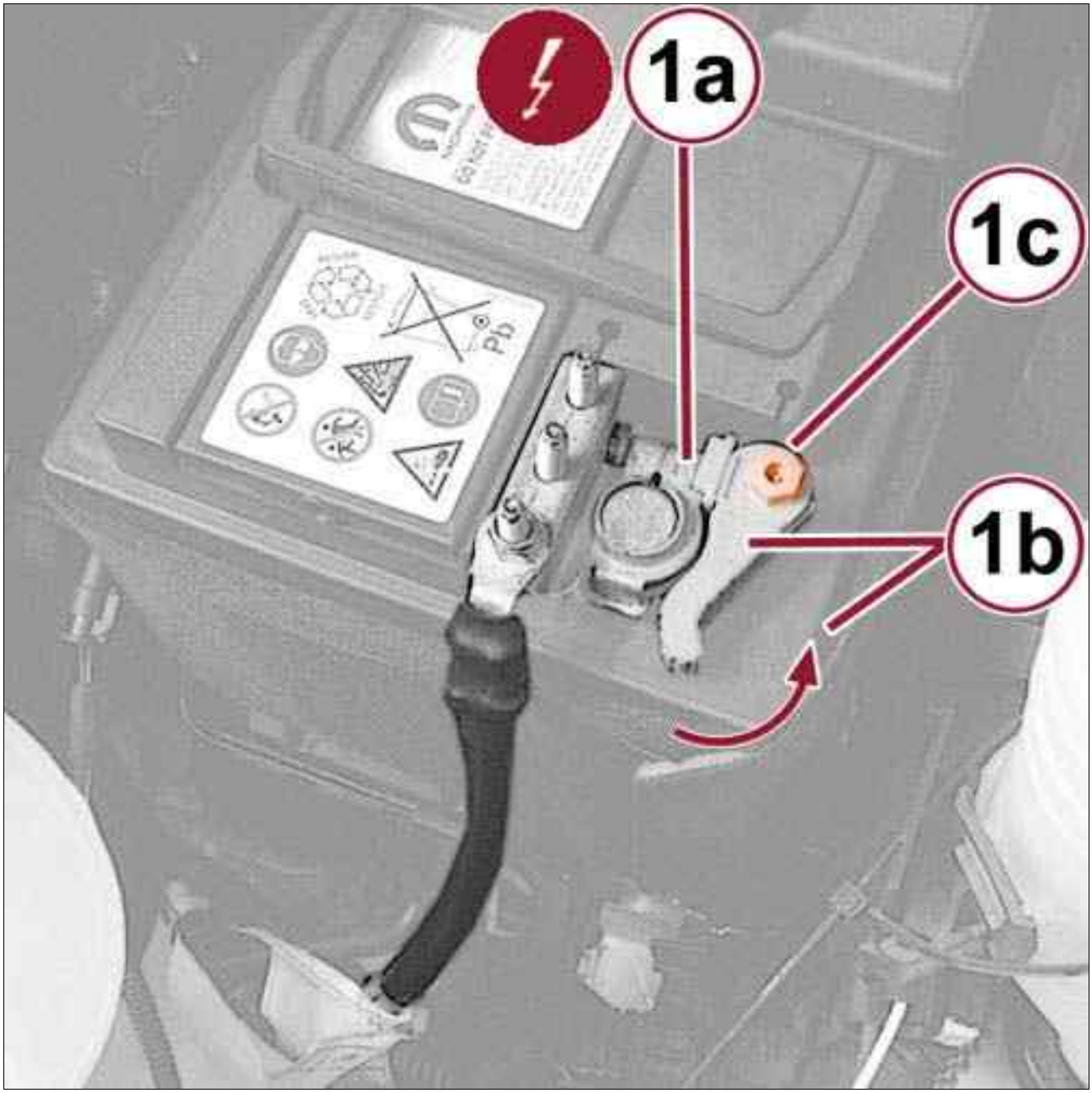
1. Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.
2. Disconnect and isolate both battery cables, negative cable first.
3. Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage.

See the OPEN-CIRCUIT VOLTAGE TABLE. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity.

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

BATTERY > REMOVAL AND INSTALLATION > 1.4L REMOVAL AND INSTALLATION > REMOVAL 1.4L

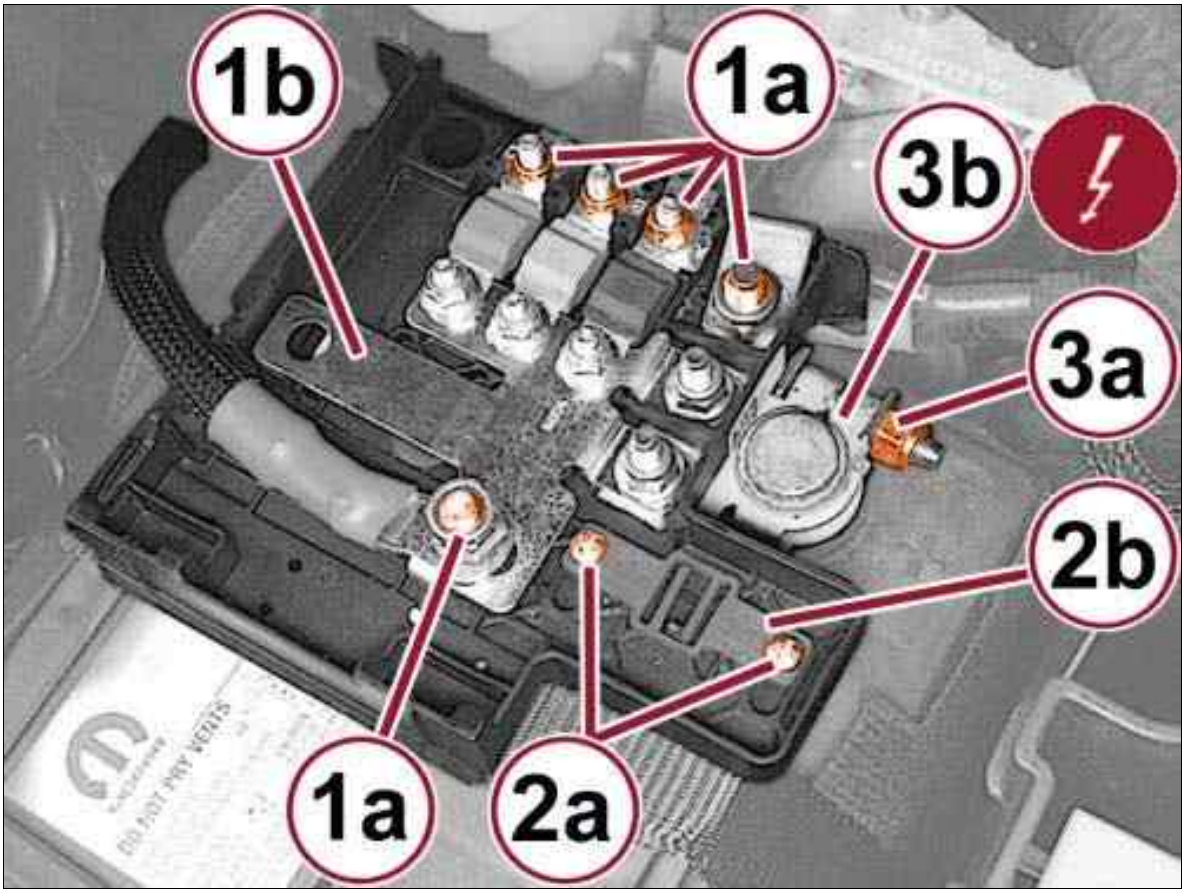
Fig 1: Retainers, Clamp, Lever & Hexagon Socket



Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the clamp (1a) of the negative pole of the battery, after having loosened by turning the lever (1b). Loosen the lever (1b) by wrench applied to the hexagon socket (1c).
2. Press retainers (1a) and disconnect the positive battery terminal.

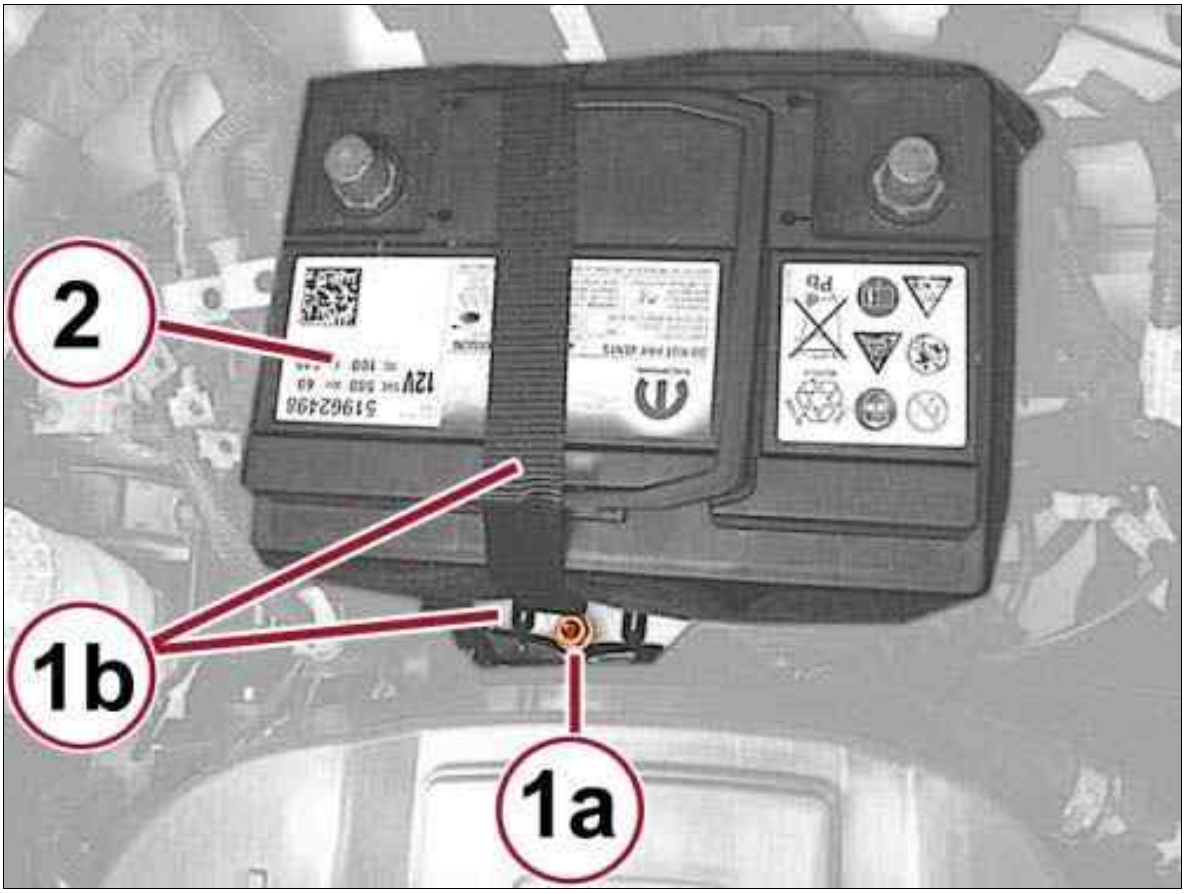
Fig 2: Power Supply Box, Plate, Screws, Nuts, Battery Positive Terminal & Power Box



Courtesy of CHRYSLER GROUP, LLC

3. Remove the nuts (1a) and disconnect the electrical connections from the power supply box (1b).
4. Remove the screws (2a) and remove the plate (2b).
5. Loosen the positive terminal (3b) nut (3a).
6. Disconnect the battery positive terminal (3b) from the power box (1b).

Fig 3: Battery, Nut & Retaining Belt

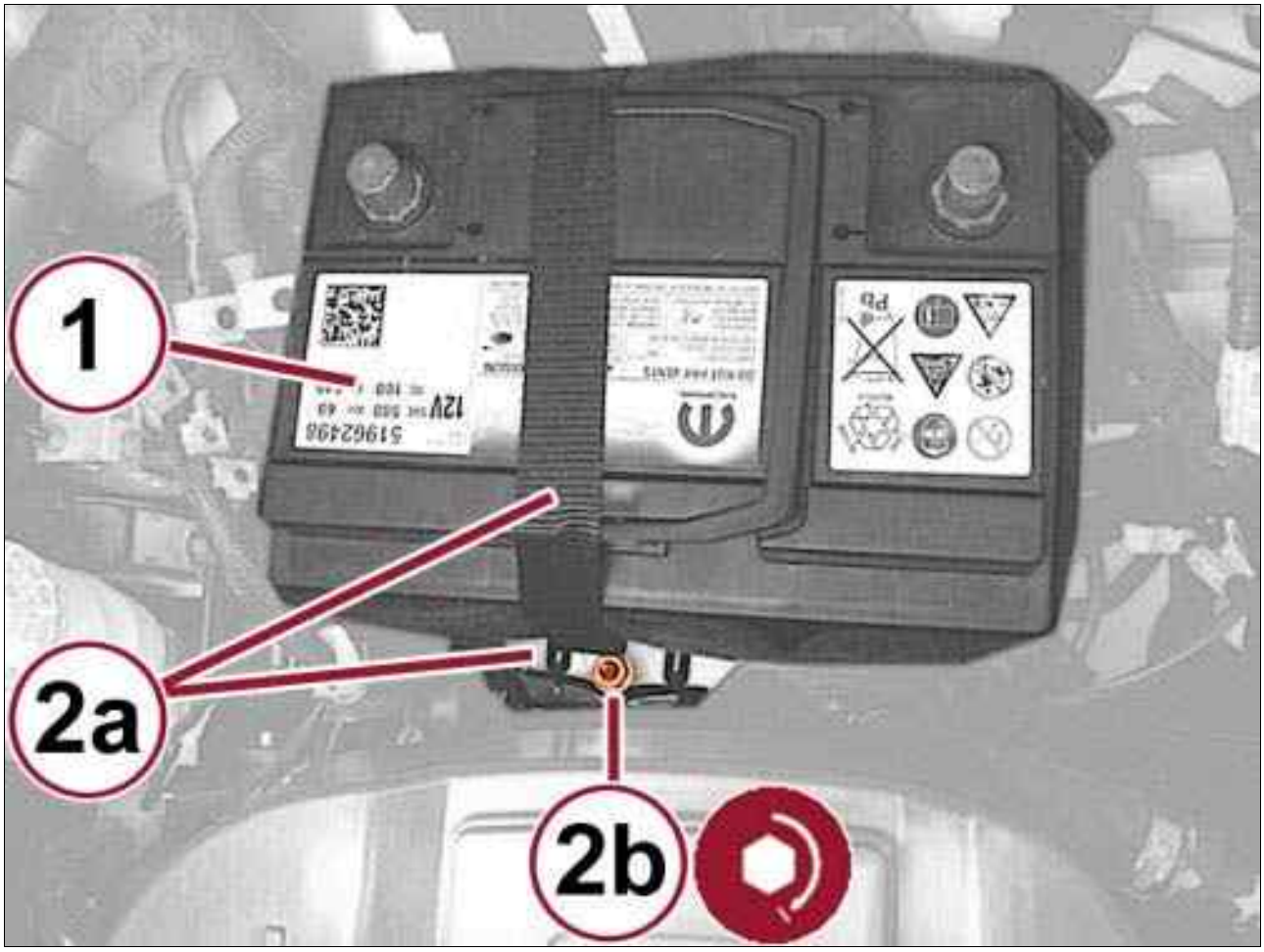


Courtesy of CHRYSLER GROUP, LLC

7. Remove the nut (1a) and move the bracket with retaining belt (1b).
8. Remove the battery.
9. Check that the battery is not damaged.

BATTERY > REMOVAL AND INSTALLATION > 1.4L REMOVAL AND INSTALLATION > INSTALLATION 1.4L

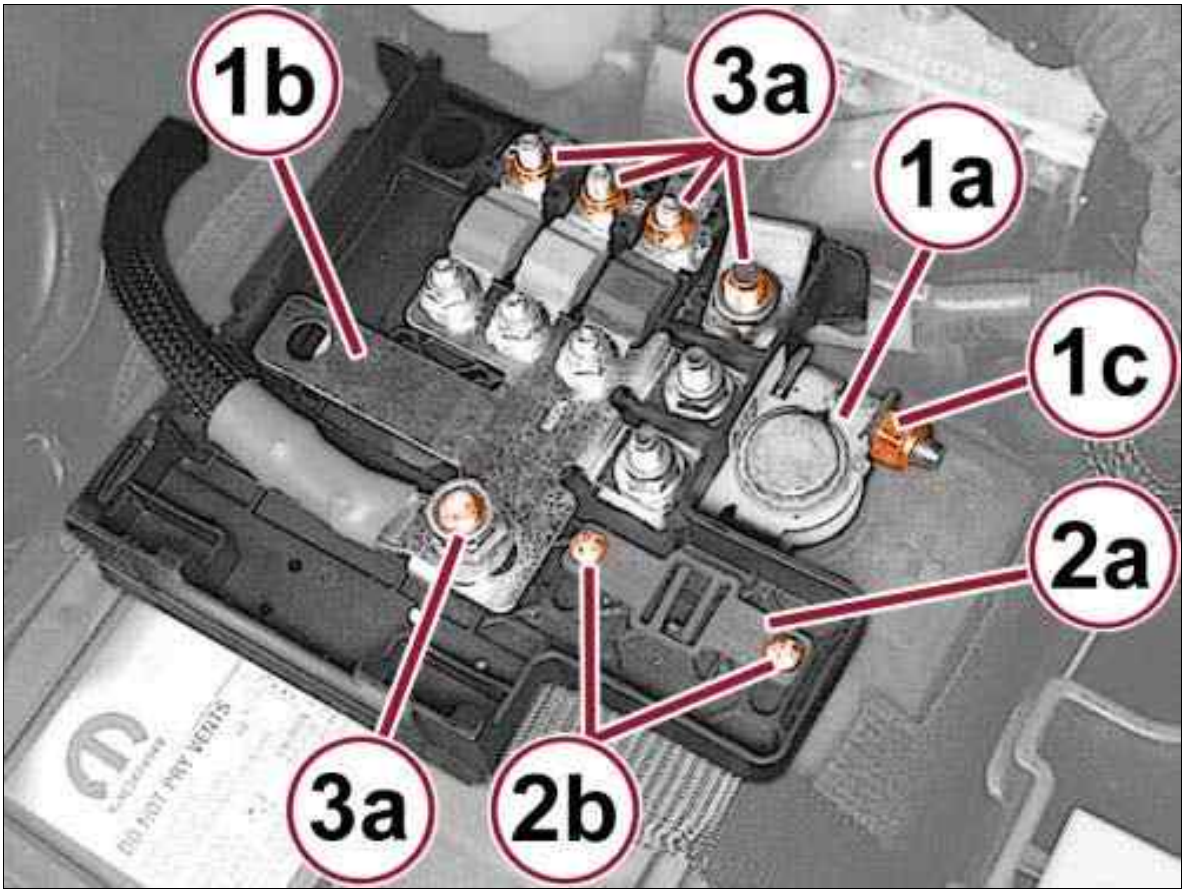
Fig 1: Battery, Nut & Retaining Belt



Courtesy of CHRYSLER GROUP, LLC

1. Position the battery for installation.
2. Place the retaining strap bracket (2a) on the battery and tighten the nut (2b) to the proper torque specification. Refer to SPECIFICATIONS .

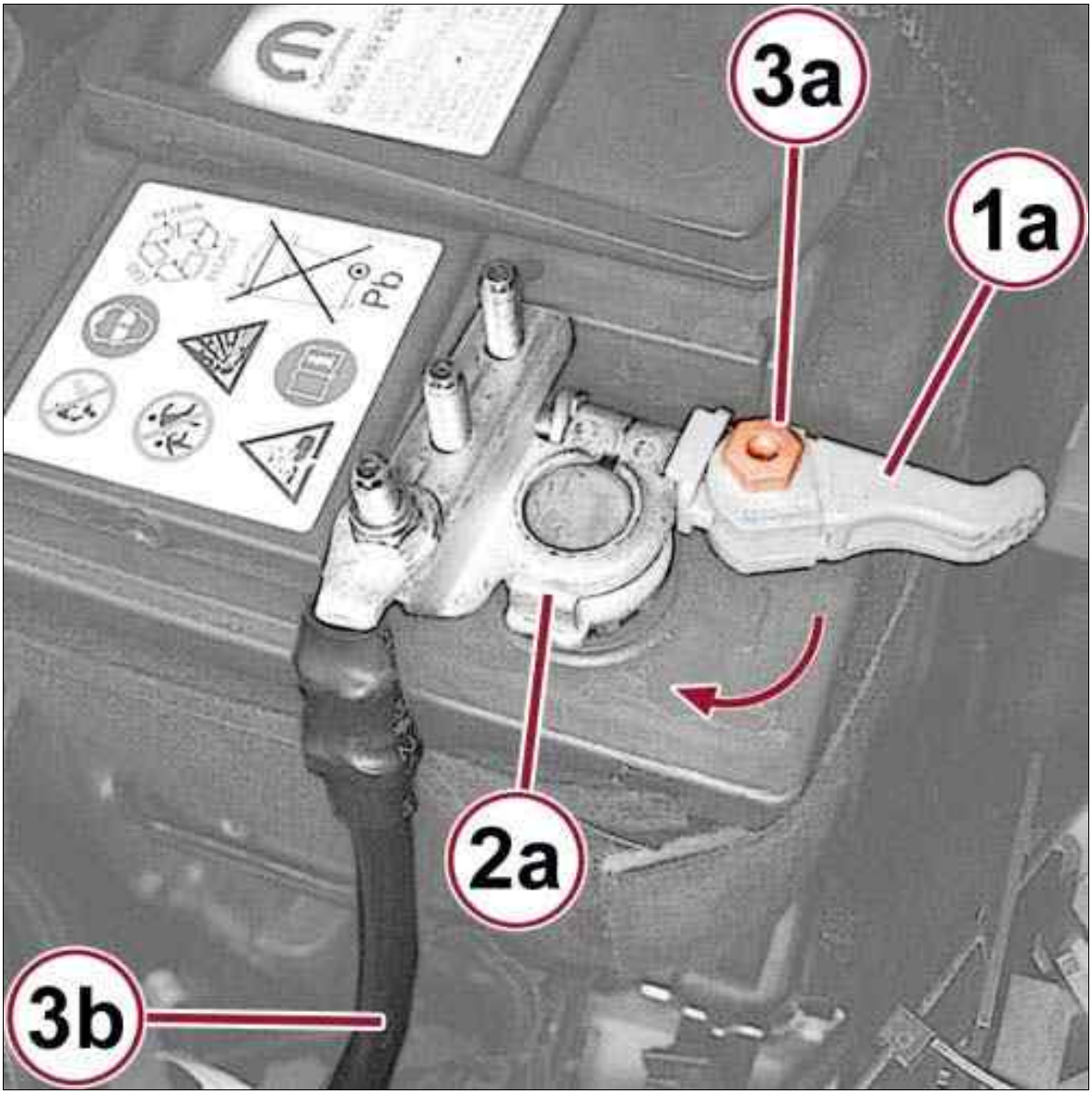
Fig 2: Battery Positive Terminal, Power Box, Nut, Plate, Screws & Power Supply Box



Courtesy of CHRYSLER GROUP, LLC

3. Connect the battery positive terminal (1a) to the power box (1b), then tighten the nut (1c) of the positive terminal.
4. Place the plate (2b) and tighten the screws (2c).
5. Connect the electrical connections to the power supply box (1b) and tighten the nuts (3a).
6. Place the lid of the box power on the positive battery terminal, then engage the retainers.

Fig 3: Control Lever, Terminal, Clamp, Cable & Lever

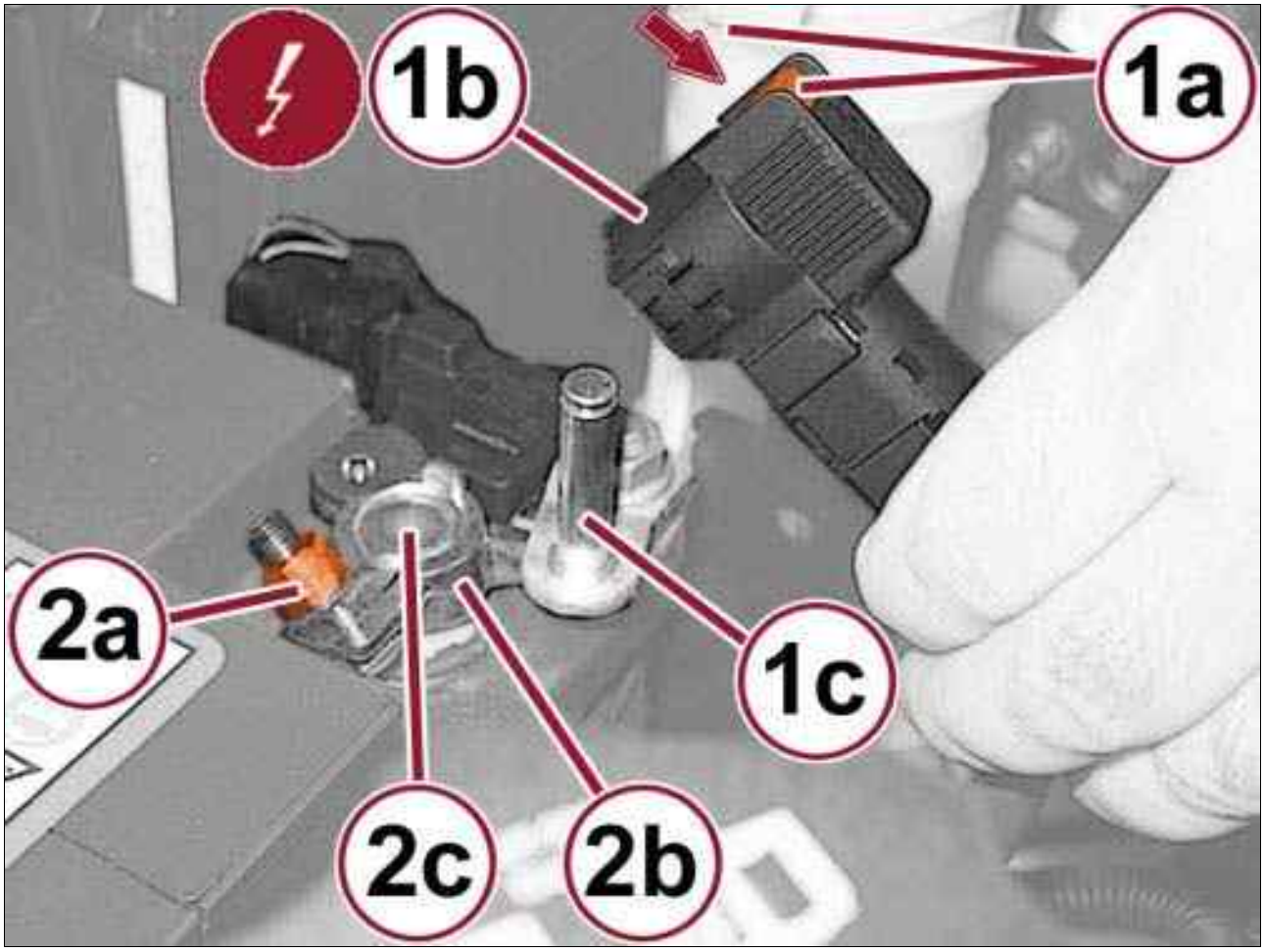


Courtesy of CHRYSLER GROUP, LLC

7. Ensure that the control lever (1a) is in the open position.
8. Insert the terminal (2a) to the negative battery pole and press it fully.
9. Turn the lever (1a) and tighten the clamp (2a) on the negative pole. If necessary, rotate the lever (1a) by means of a key applied to the hexagonal socket (3a). Check that the cable (3b) follows the correct path without tension and forcing.
10. Apply manipulate the cable (3b) to check that the terminal (2a) is correctly hooked.

BATTERY > REMOVAL AND INSTALLATION > 1.6L - 2.0L REMOVAL AND INSTALLATION > BATTERY REMOVAL 1.6L - 2.0L

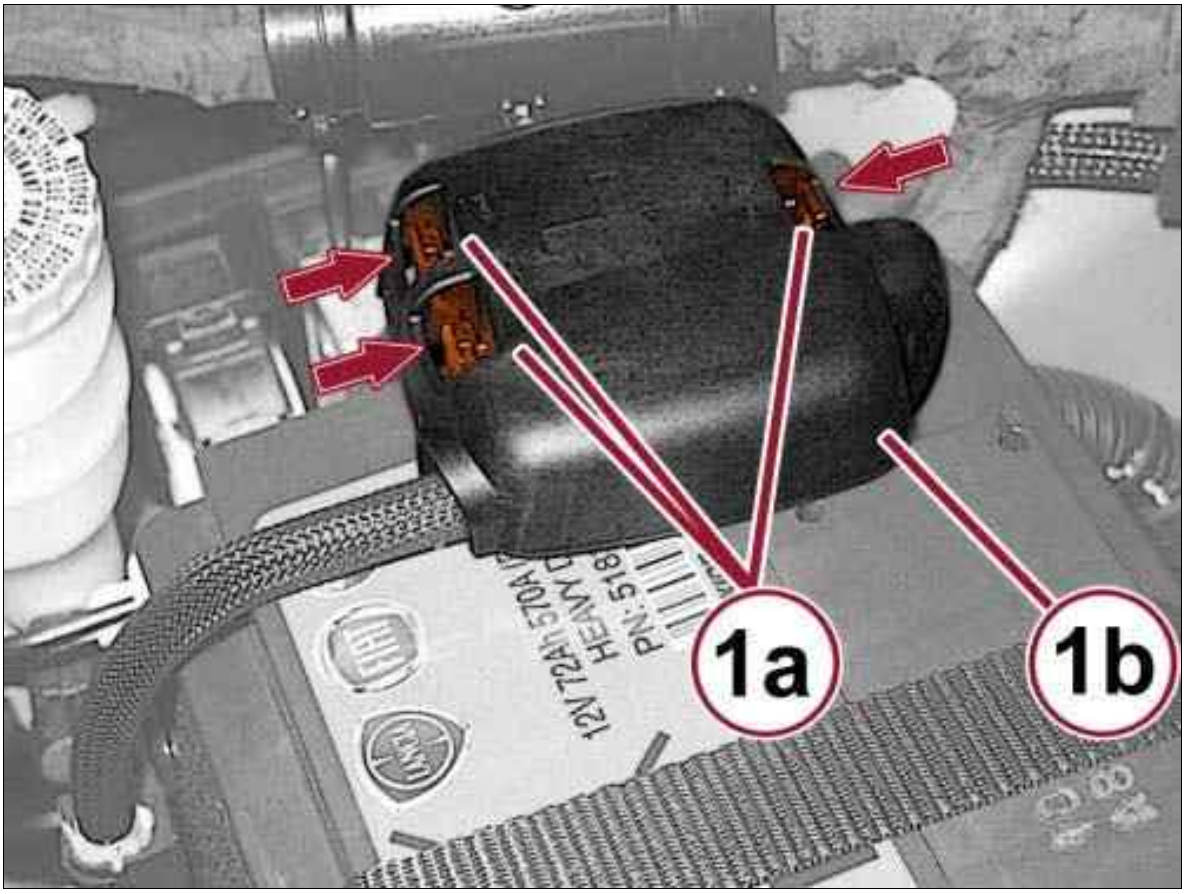
Fig 1: Release, Cable, Negative Battery Pole, Terminal, Nut & Battery



Courtesy of CHRYSLER GROUP, LLC

1. Press the release (1a) and disconnect the cable (1b) from the negative battery pole (1c).
2. Loosen the terminal nut (2a) and disconnect the terminal (2b) complete with the intelligent battery sensor, from the battery (2c). Isolate the terminal (2b).

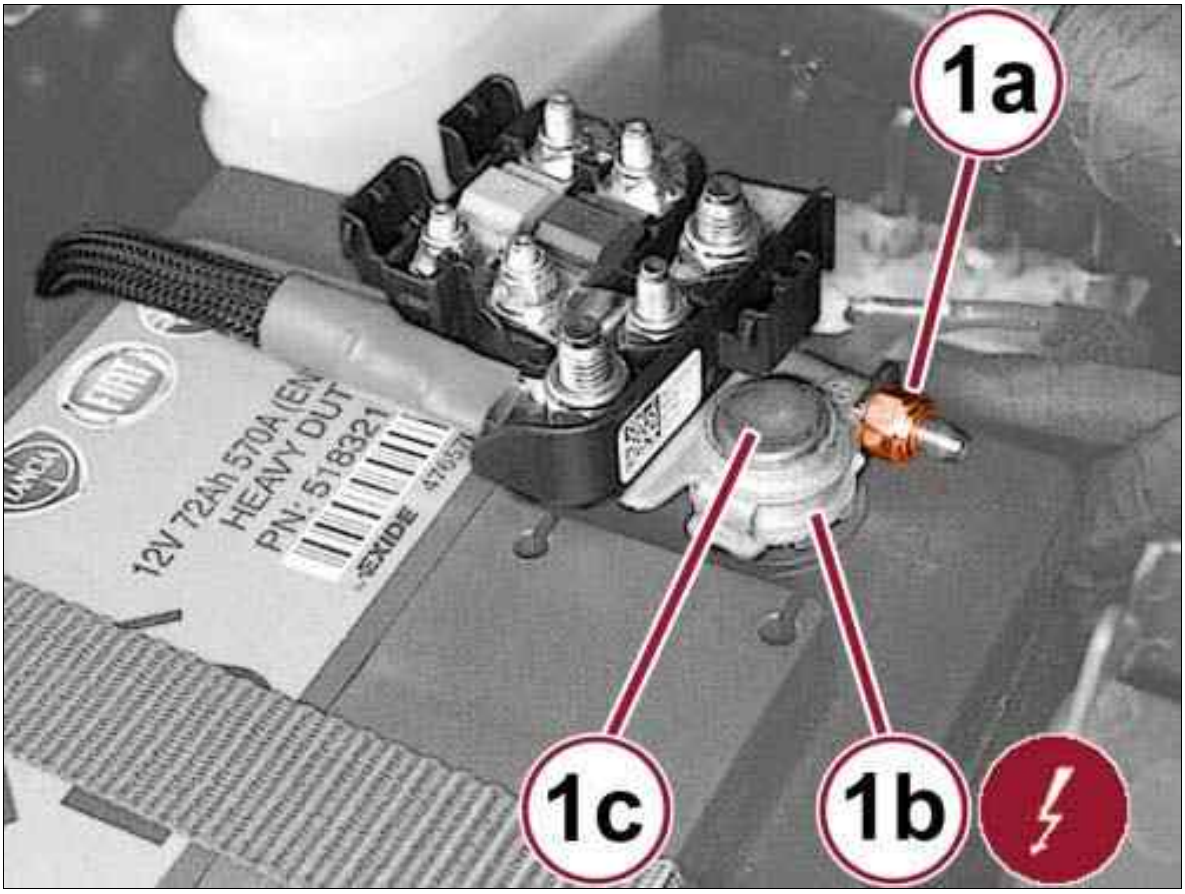
Fig 2: Retainers & Cover



Courtesy of CHRYSLER GROUP, LLC

3. Press retainers (1a) and disengage the cover (1b) from the power supply box from the seat cover (1a).

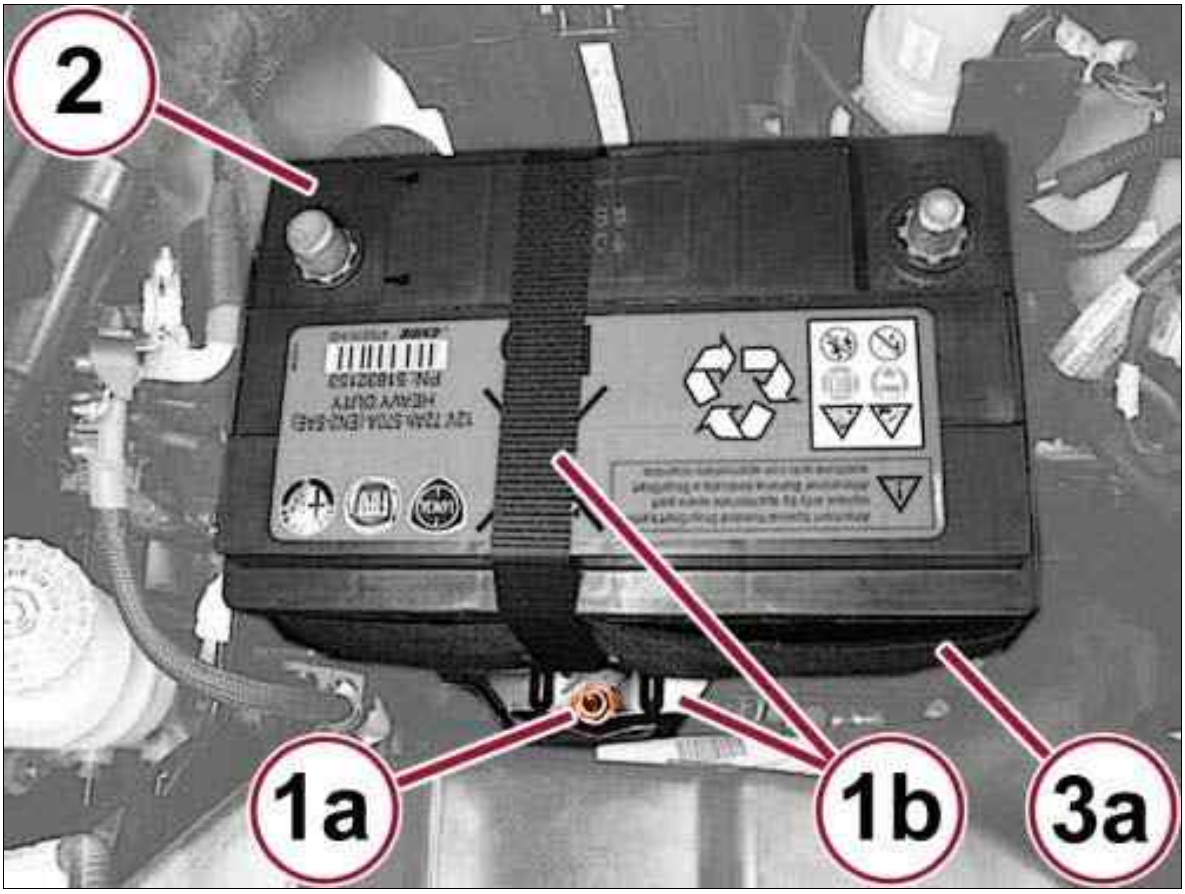
Fig 3: Terminal, Nut & Positive Battery Post



Courtesy of CHRYSLER GROUP, LLC

4. Loosen the nut (1a) and disconnect the terminal (1b) with the power supply box from the positive terminal (1c) of the battery. Isolate the terminal (1b).

Fig 4: Battery, Retaining Belt & Nut



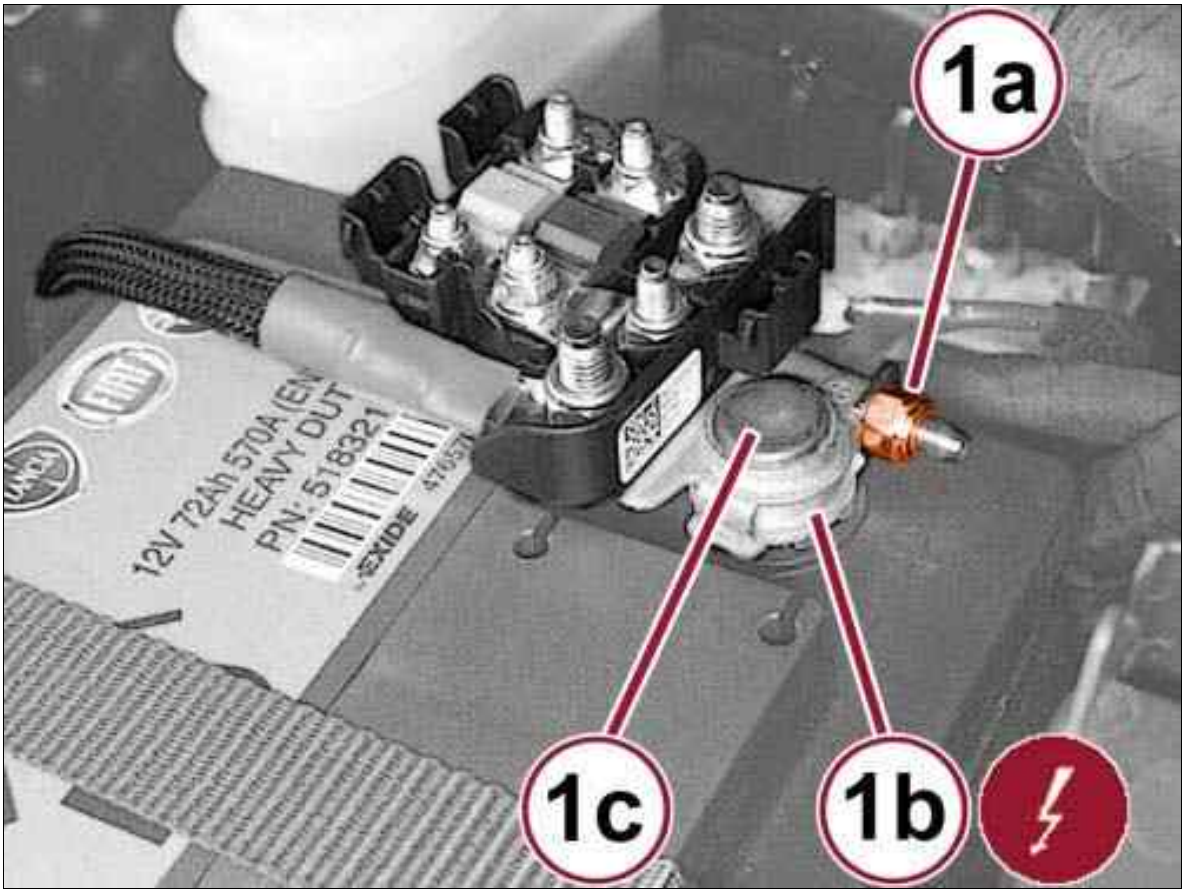
Courtesy of CHRYSLER GROUP, LLC

5. Remove the nut (1a) and move the battery retaining belt (1b) bracket.
6. Remove the battery.
7. check that the battery is not damaged.

BATTERY > REMOVAL AND INSTALLATION > 1.6L - 2.0L REMOVAL AND INSTALLATION > BATTERY INSTALLATION 1.6L - 2.0L

1. Place the battery in place for installation.
2. Place the retaining strap bracket (2a) and tighten the nut (2b) to the specified torque.

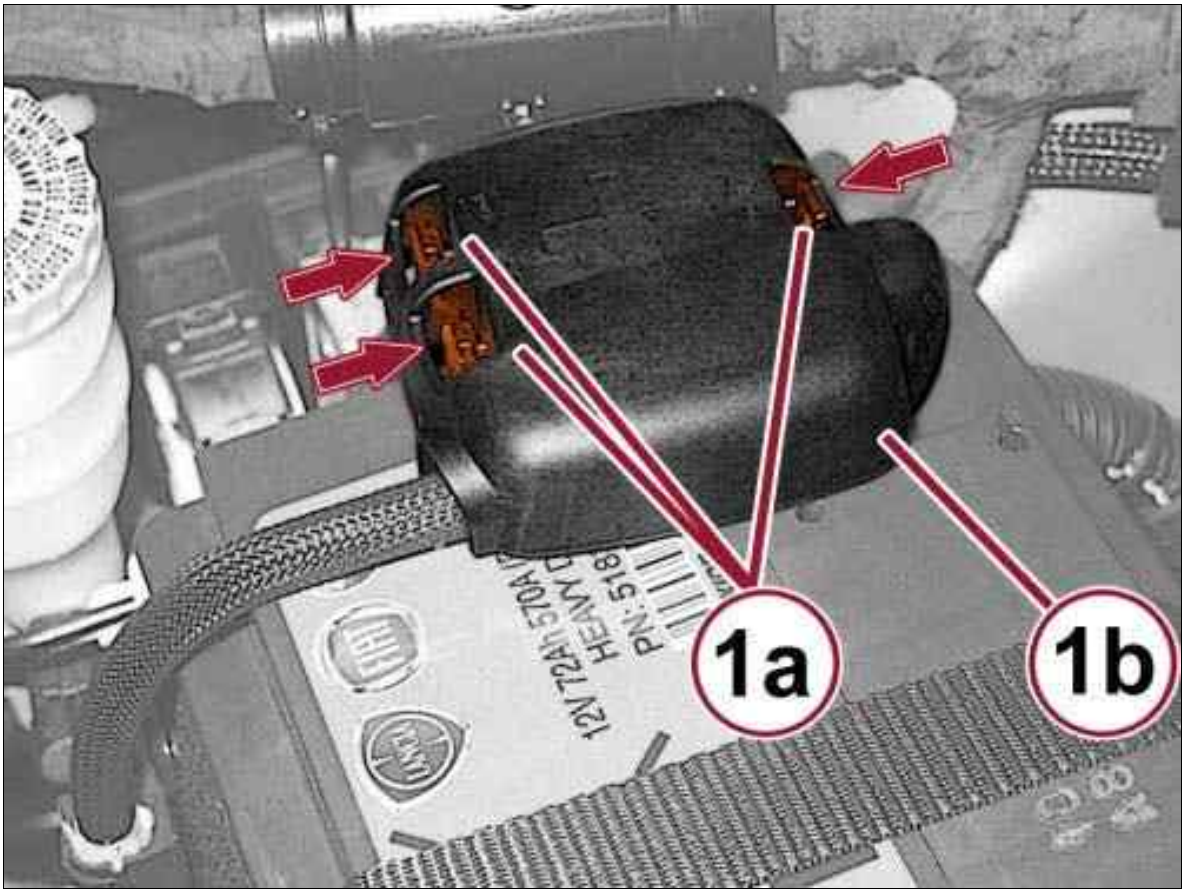
Fig 1: Terminal, Nut & Positive Battery Post



Courtesy of CHRYSLER GROUP, LLC

3. Connect the positive battery terminal (1a) then tighten the positive terminal nut (1b).

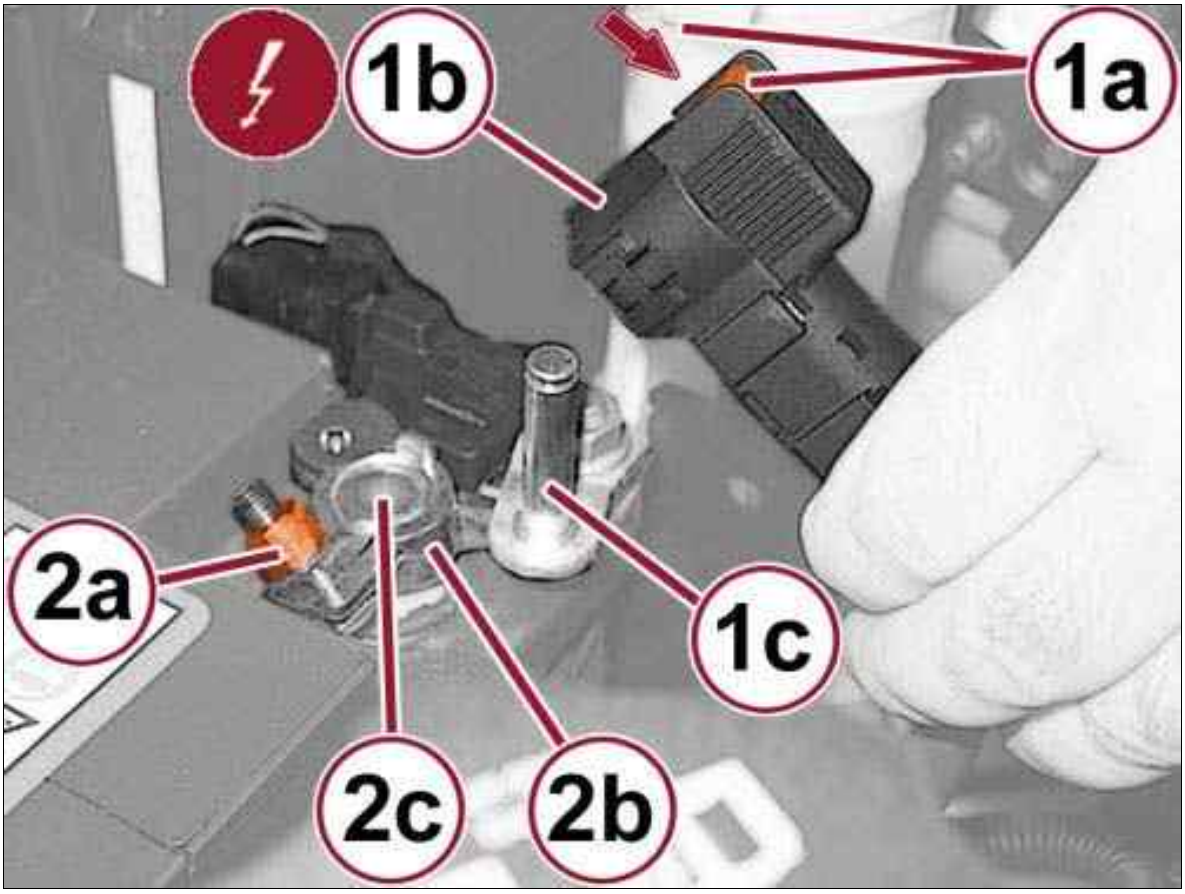
Fig 2: Retainers & Cover



Courtesy of CHRYSLER GROUP, LLC

4. Install the positive battery terminal cover.

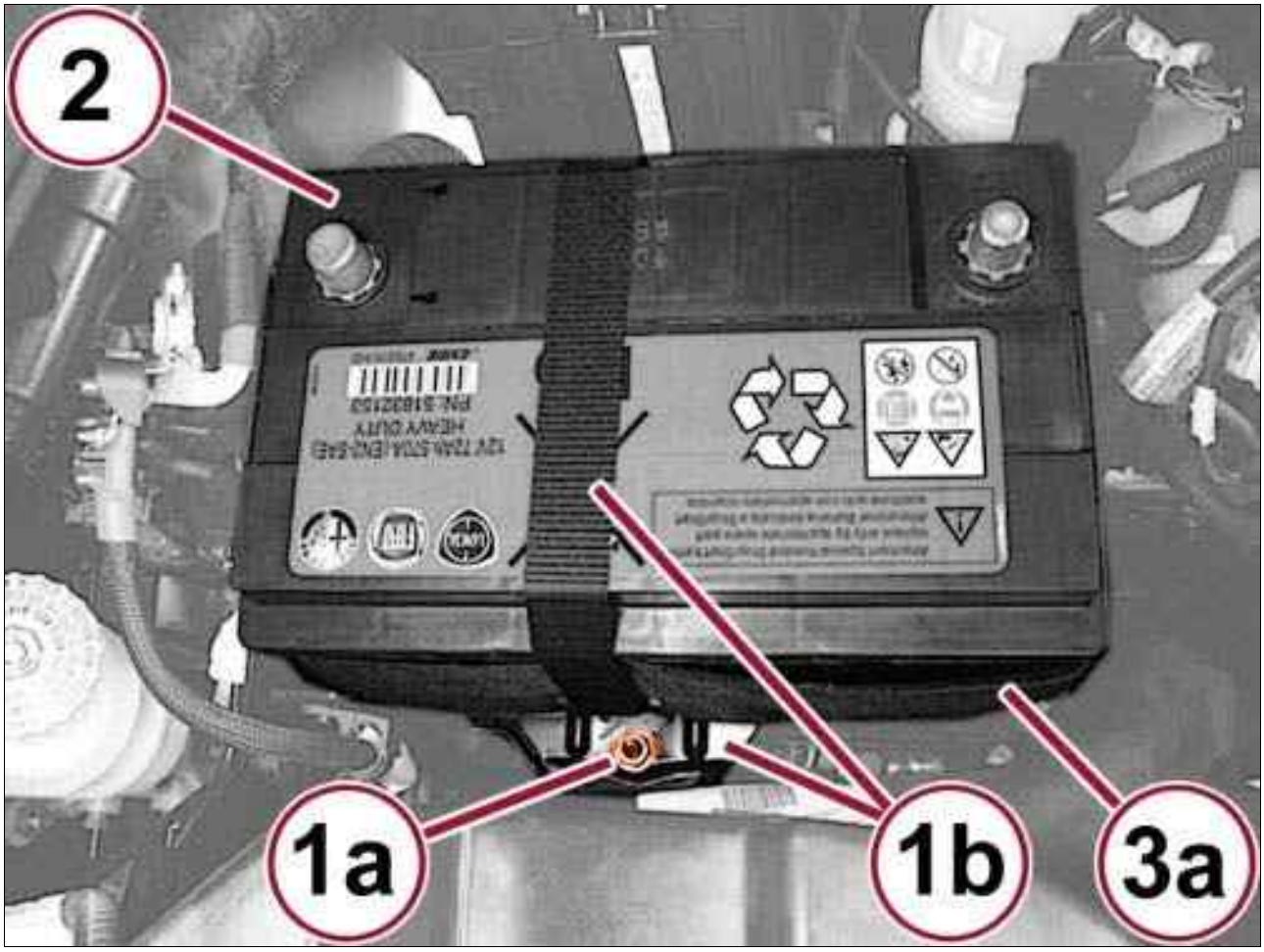
Fig 3: Release, Cable, Negative Battery Pole, Terminal, Nut & Battery



Courtesy of CHRYSLER GROUP, LLC

5. Connect the terminal (1a) to the negative pole of the battery and tighten the nut (1b).
6. Install and secure the negative battery cable to the battery.

Fig 4: Battery, Retaining Belt & Nut



Courtesy of CHRYSLER GROUP, LLC

CABLES, BATTERY > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > DESCRIPTION

The standard battery cables are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. The battery cables feature a clamping type female battery terminal made of stamped sheet metal that is die cast onto one end of the battery cable wire. A pinch-bolt and nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then soldered. The battery positive cable wires feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a smaller female battery terminal clamp.

The battery harness includes both the battery positive and negative cables to the remote battery connection and may include portions of the wiring circuits for other components on some vehicles. The starter harness includes both the battery positive and negative cables from the remote battery connection to the starter and engine ground location. The battery cables are part of the engine wiring harness. If the cables need to be serviced. The engine harness will need to be replaced as an assembly.

CABLES, BATTERY > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > OPERATION

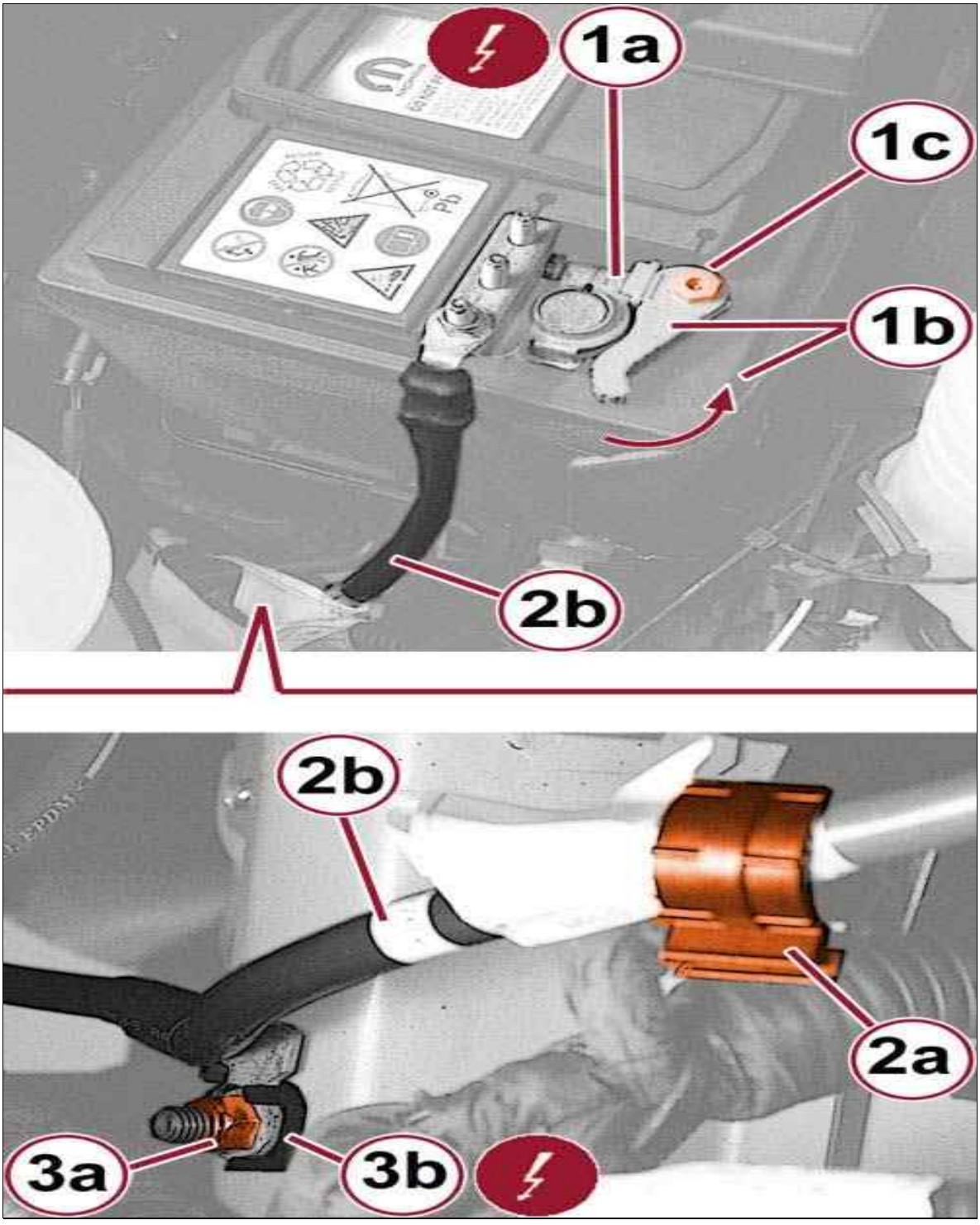
The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

One wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the Body Control Module (BCM), and the other wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the engine starter motor solenoid. The battery negative cable terminal clamp has one wire as an eyelet terminal that connects the battery negative cable to the vehicle powertrain through a ground connection, typically on the engine cylinder block.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 1.4L REMOVAL AND INSTALLATION > REMOVAL

1. Open the hood to access the battery.

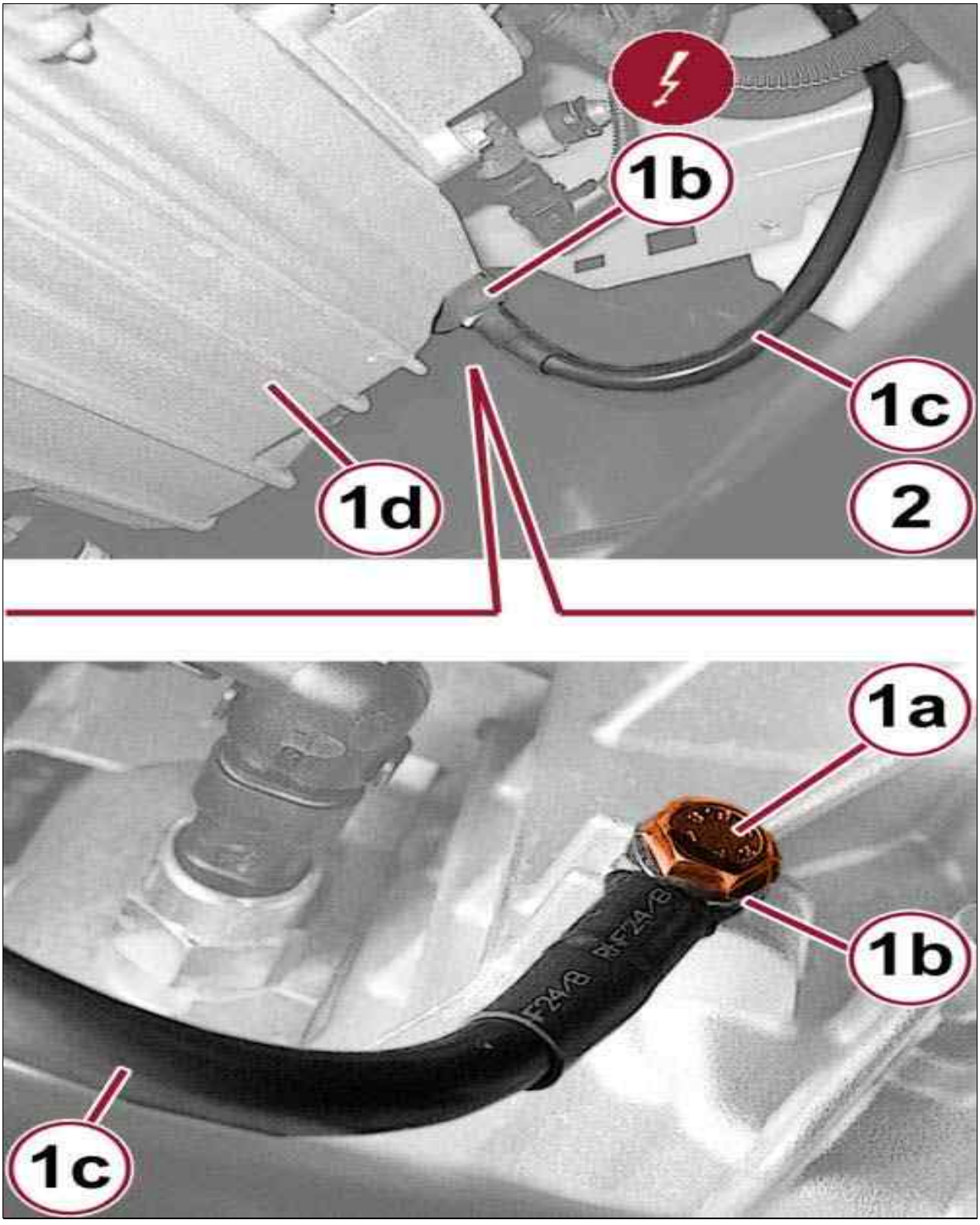
Fig 1: Battery Pole Clamp, Lever, Hexagon Socket, Clamp, Ground Cable, Nut & Chassis Terminal



Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the negative battery pole clamp (1a), after having loosened by turning the lever (1b). If you need to turn the lever (1b), use a wrench applied to the hexagon socket (1c).
3. Open the clamp (2a) and disconnect the battery ground cable (2b).
4. Remove the nut (3a) and disconnect the battery ground cable from the chassis terminal (3b).

Fig 2: Battery Cable, Ground Terminal, Gearbox, Screw & Ground Wire



Courtesy of CHRYSLER GROUP, LLC

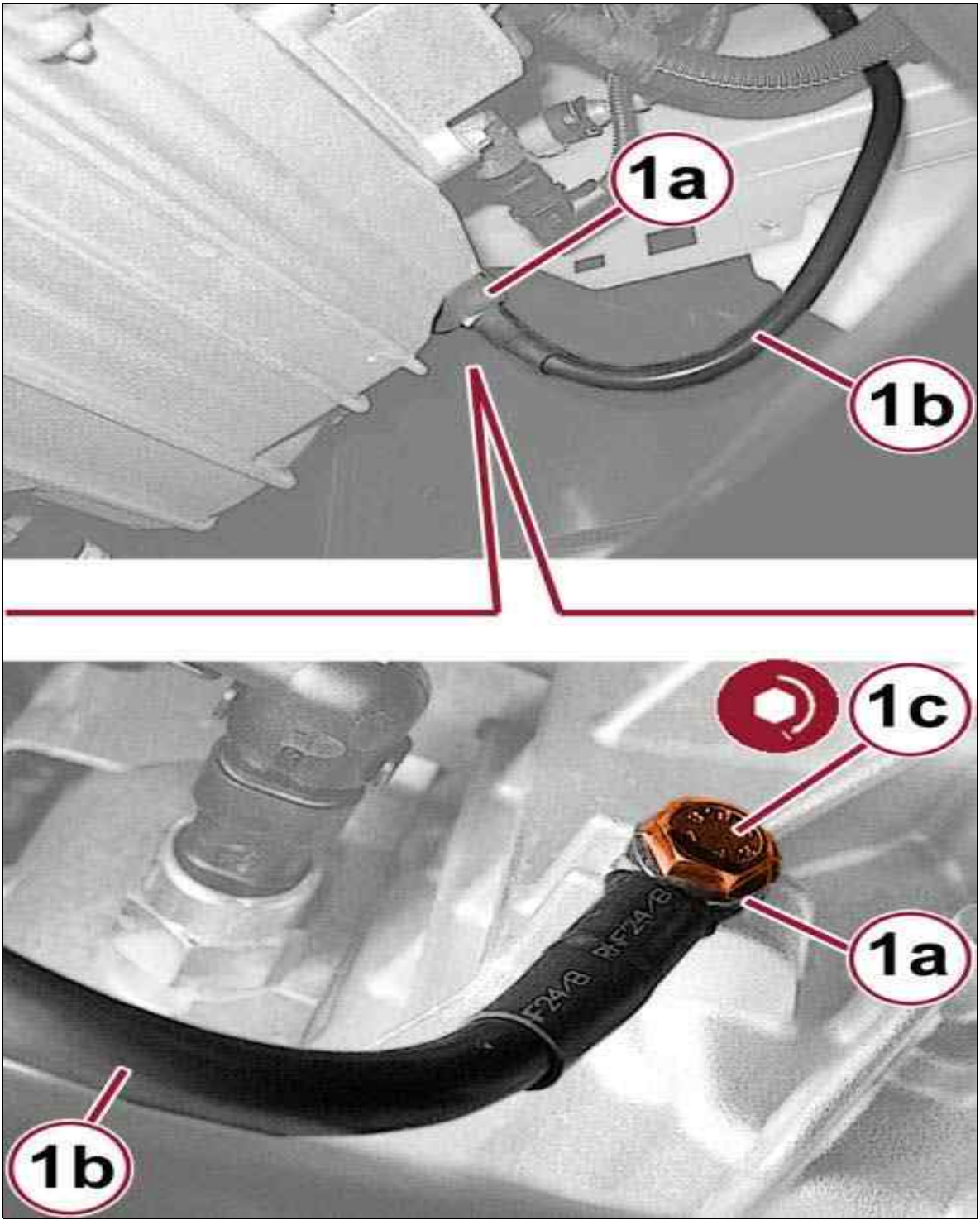
5. Raise and support the vehicle.
6. Remove the under guard body protection.
7. Remove the screw (1a) and disconnect the battery cable (1c) ground terminal (1b) from the gearbox (1d).
8. Retrieve the battery ground wire (1c).

9. Check that the ground wire from the battery is not damaged and that the individual wires are securely attached to the connections. If needed, perform the appropriate checks of continuity.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 1.4L REMOVAL AND INSTALLATION > INSTALLATION

1. Position the negative battery cable for installation.

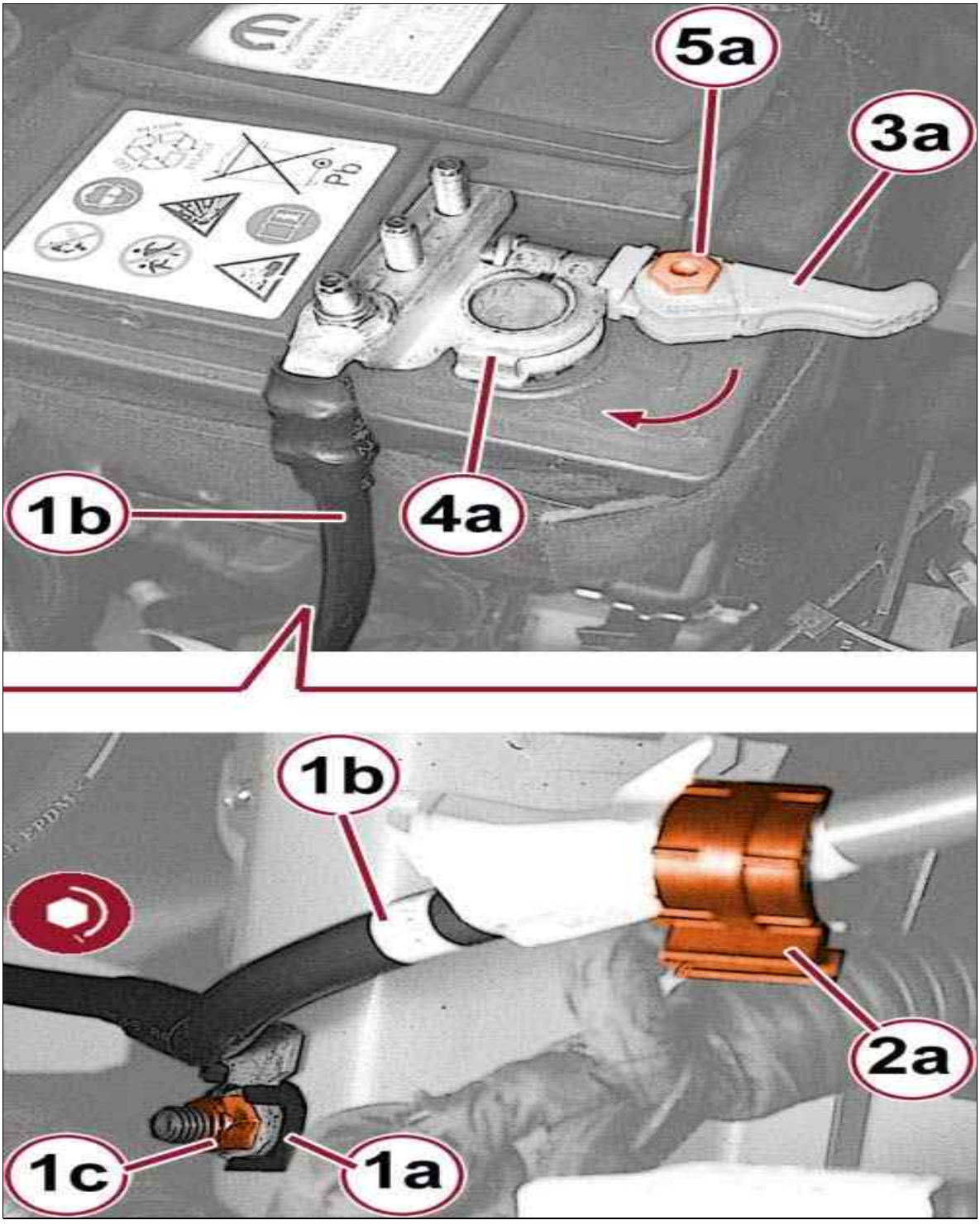
Fig 1: Battery Negative Cable, Gearbox Terminal & Screw



Courtesy of CHRYSLER GROUP, LLC

2. Connect the battery negative cable (1b) to the gearbox terminal (1a) then tighten the screw (1c) to the specified torque.
3. Install the under guard protection cover.

Fig 2: Battery Negative Cable, Chassis, Nut, Clamp, Control Lever, Terminal & Hexagonal Socket



Courtesy of CHRYSLER GROUP, LLC

4. Lower the vehicle.
5. Connect the battery negative cable (1b) to the chassis (1a). Tighten the nut (1c) to the specified torque.
6. Apply the clamp (2a) to the negative battery cable.

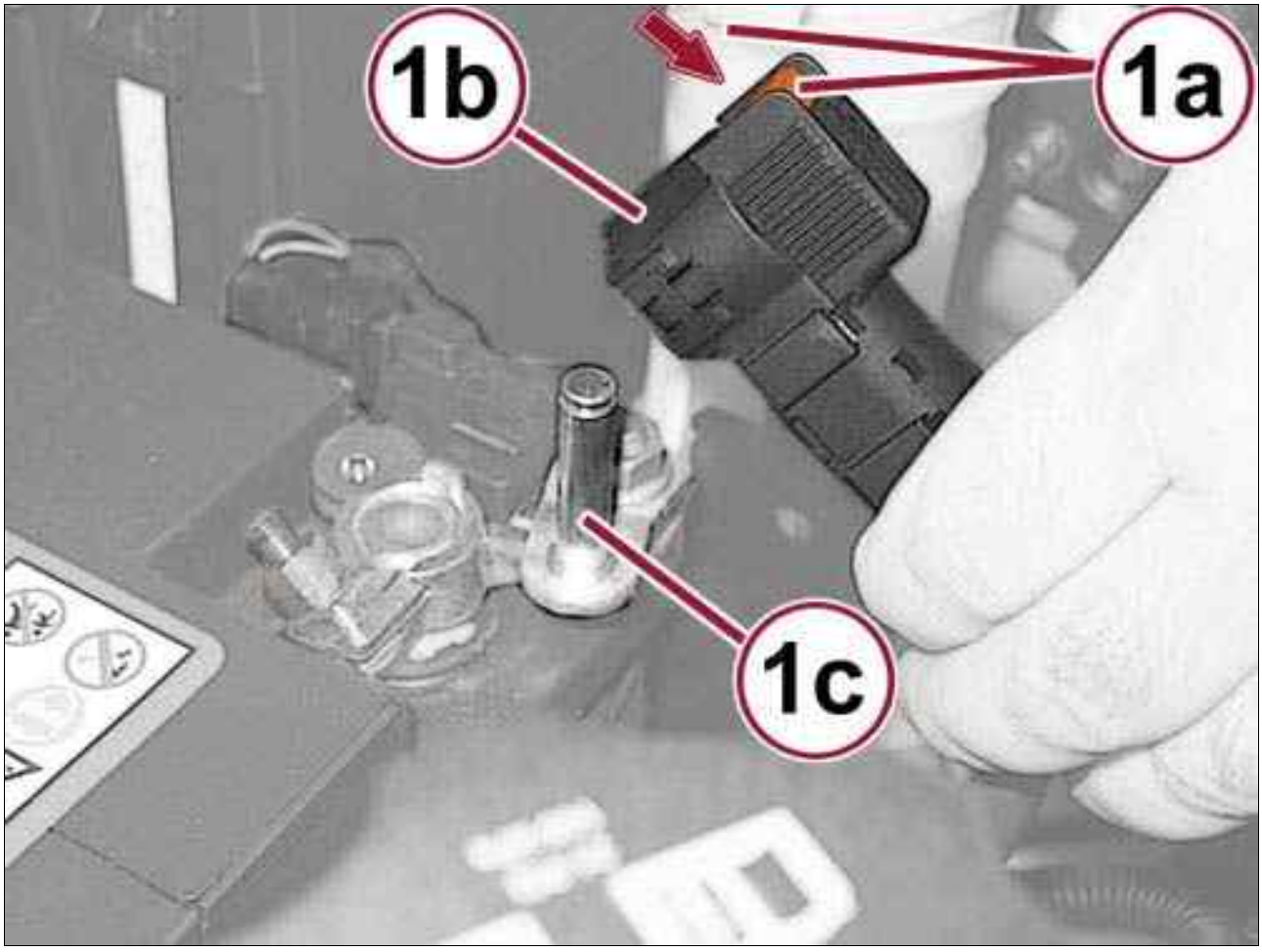
7. Ensure that the control lever (3a) is in the open position.
8. Insert the terminal (4a) on the negative pole of the battery. press fully to seat.
9. Turn the lever (3a) by tightening the clamp (4a) on the negative pole. If necessary, rotate the lever (3a) by turning the hexagonal socket (5a). Check that the cable (1b) follows the correct path without tension or forcing.
10. Apply gentle pressure to the cable (1b) and check that the clamp (4a) stays correctly hooked.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 1.6L REMOVAL AND INSTALLATION > NEGATIVE BATTERY CABLE REMOVAL - 1.6L

NOTE:

Battery terminals must be disconnected only with the ignition key on STOP or removed for at least one minute and never with key on or when the engine is running.

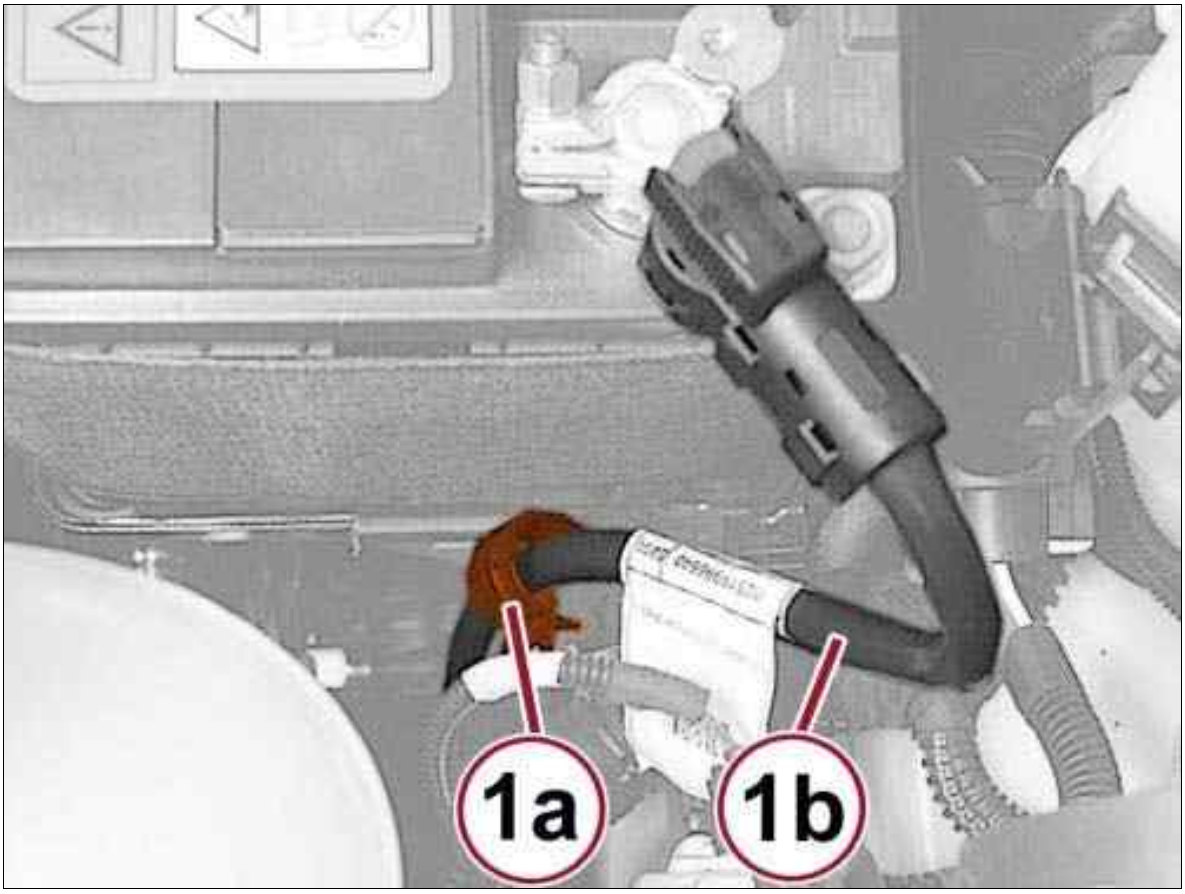
Fig 1: Negative Battery Pole, Terminal & Release



Courtesy of CHRYSLER GROUP, LLC

1. Press the release (1a) and disconnect the terminal (1b) from the negative battery pole (1c).

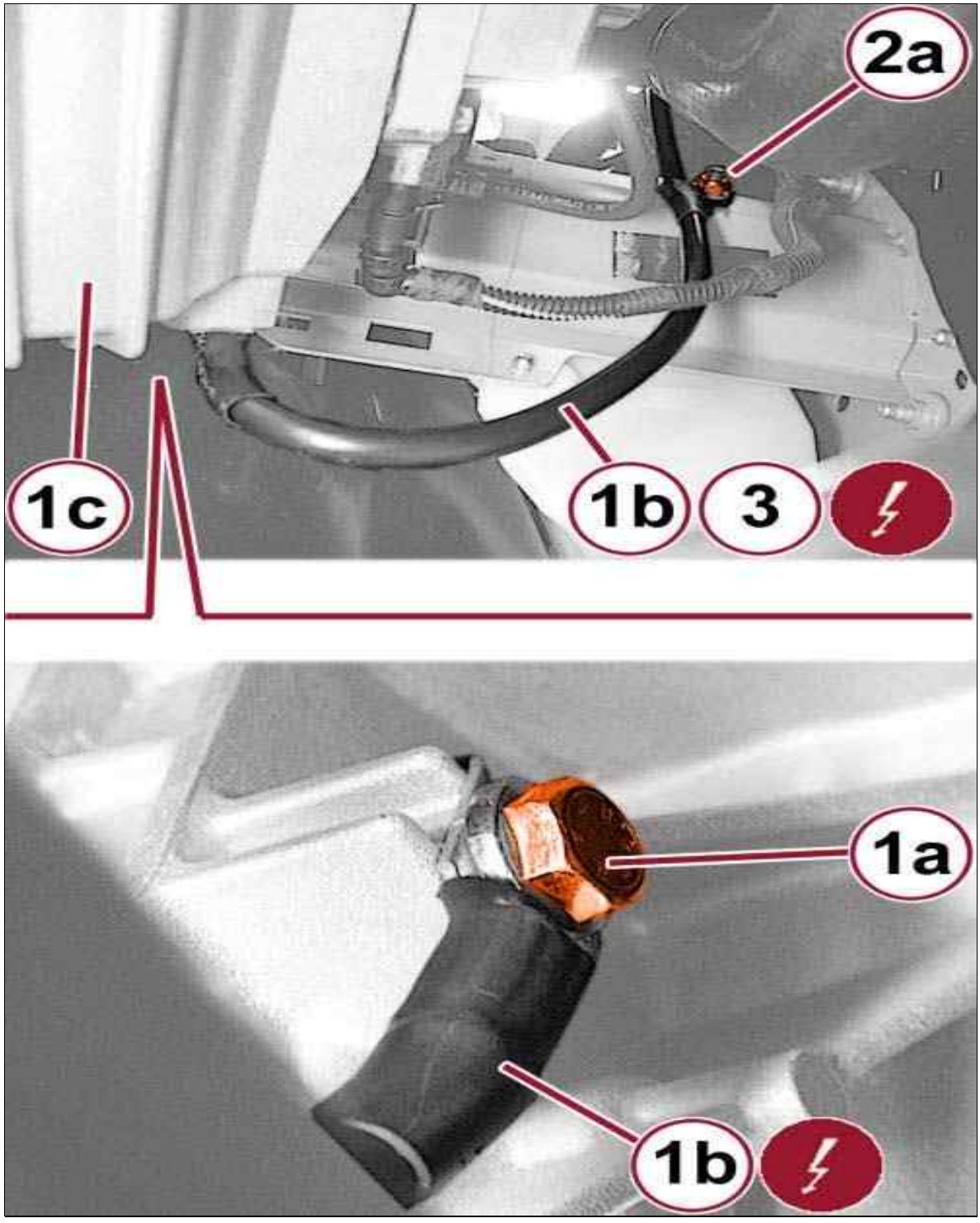
Fig 2: Ground Lead & Retaining Clip



Courtesy of CHRYSLER GROUP, LLC

2. Open the retaining clip (1a) and disengage the ground wire (1b).

Fig 3: Ground Wire, Gearbox & Terminal



Courtesy of CHRYSLER GROUP, LLC

3. Raise and support the vehicle.
4. Remove the under guard protection cover.
5. Remove the screw (1a) and disconnect the ground wire (1b) from the gearbox (1c).

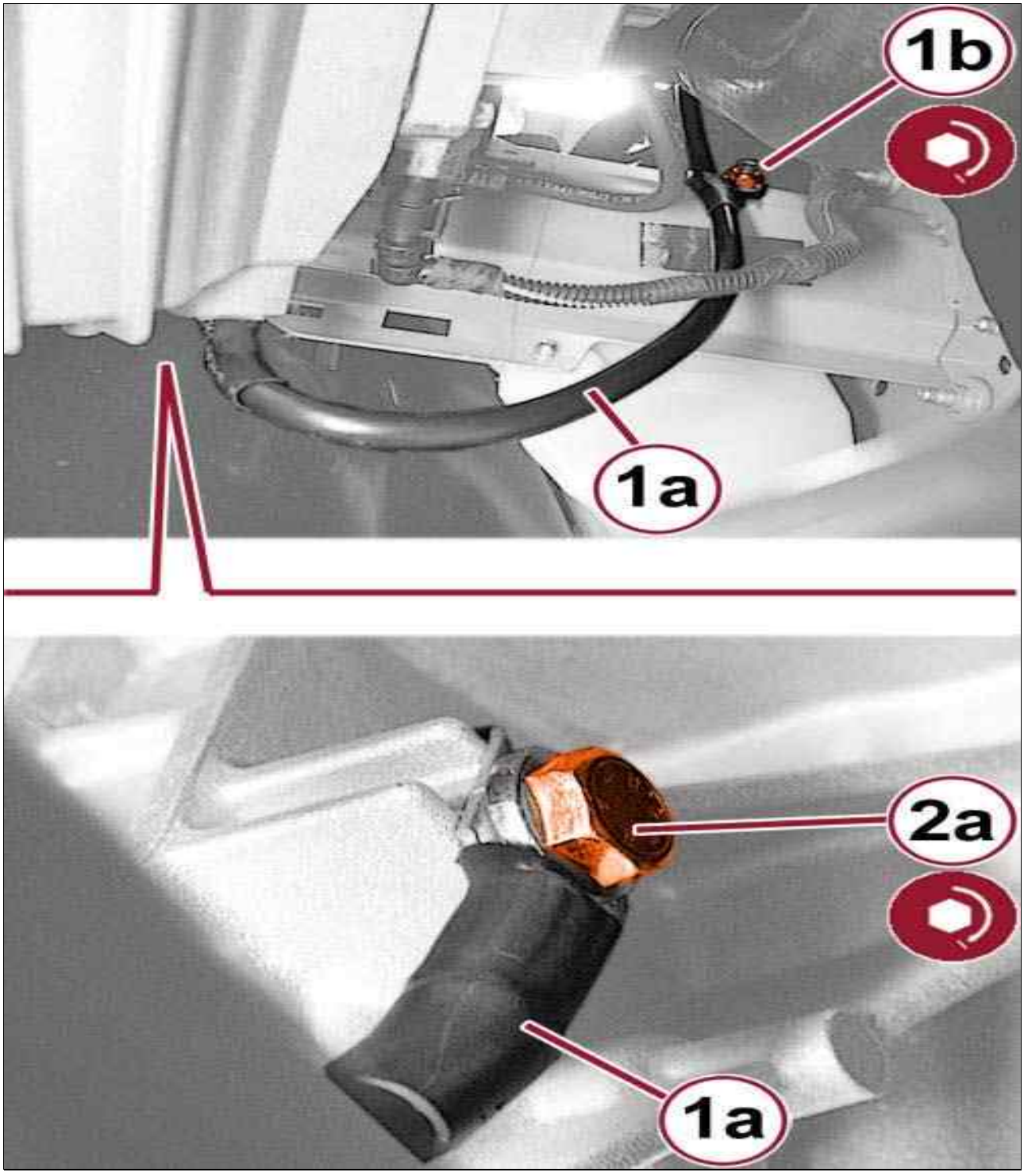
NOTE:

The positioning of the terminal (1b) on the gearbox can change depending on the type of gearbox installed.

6. Remove the nut (2a) and disconnect the ground wire (1b) from the frame.
7. Recover the ground wire (1b).
8. Check that the ground wire is not damaged and that the individual wires are securely attached to the connections. If needed, perform continuity checks.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 1.6L REMOVAL AND INSTALLATION > NEGATIVE BATTERY CABLE INSTALLATION - 1.6L

Fig 1: Chassis Ground, Nuts & Ground Wire

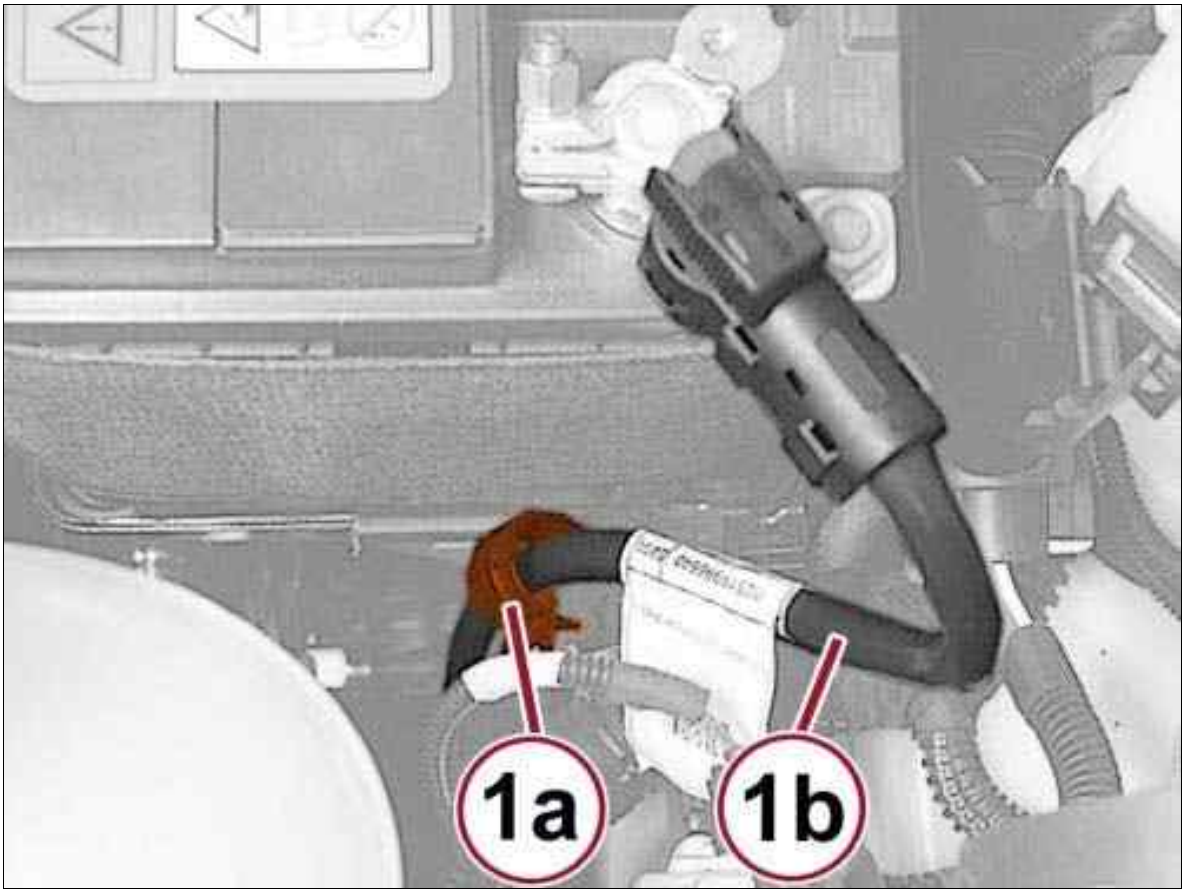


Courtesy of CHRYSLER GROUP, LLC

1. Place the ground cable for installation.
2. Connect the cable terminal to the chassis ground (1a) then screw the nut (1b) and tighten to the proper torque specification.
3. Connect the terminal to the gearbox of the ground wire (1a) and tighten the nut (2a) to the proper torque specification.

4. Install the under guard protection covers.

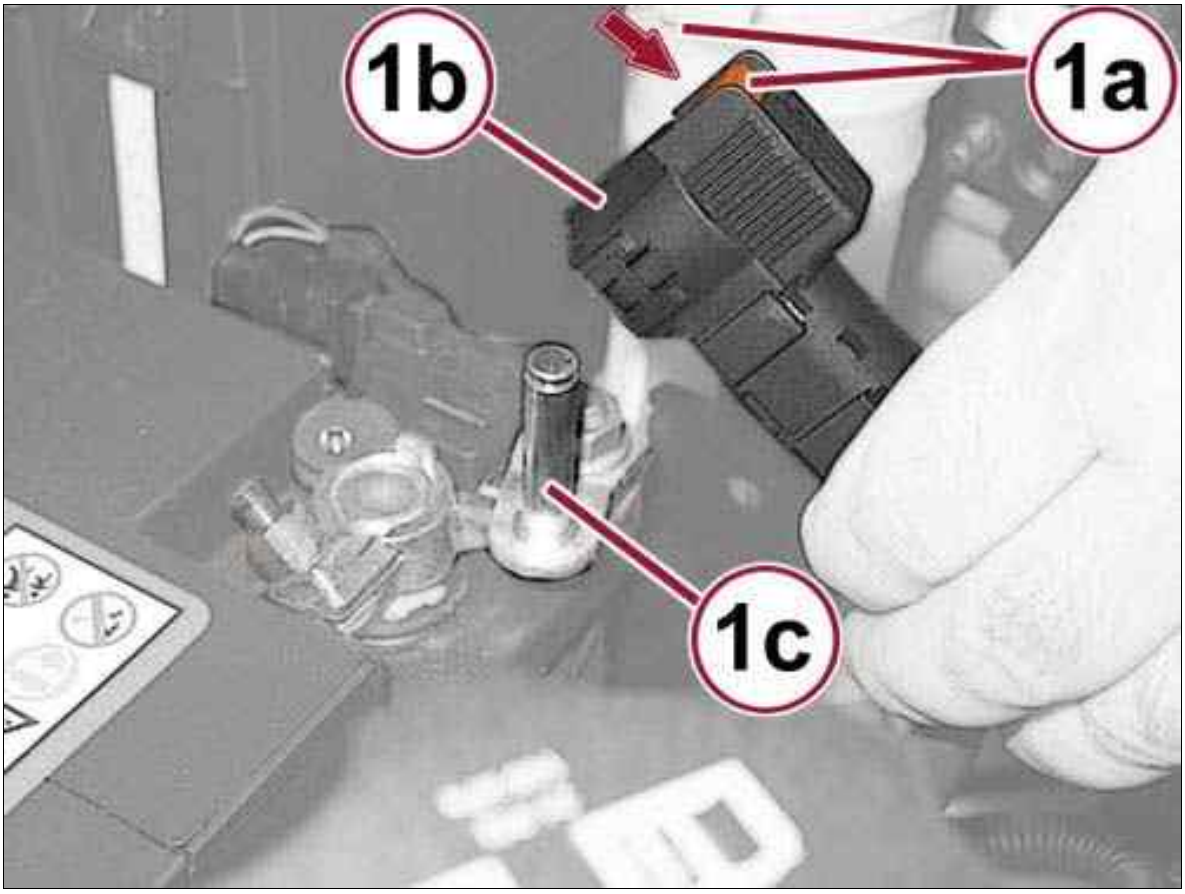
Fig 2: Ground Lead & Retaining Clip



Courtesy of CHRYSLER GROUP, LLC

5. Engage the ground lead to the retaining clip.

Fig 3: Negative Battery Pole, Terminal & Release



Courtesy of CHRYSLER GROUP, LLC

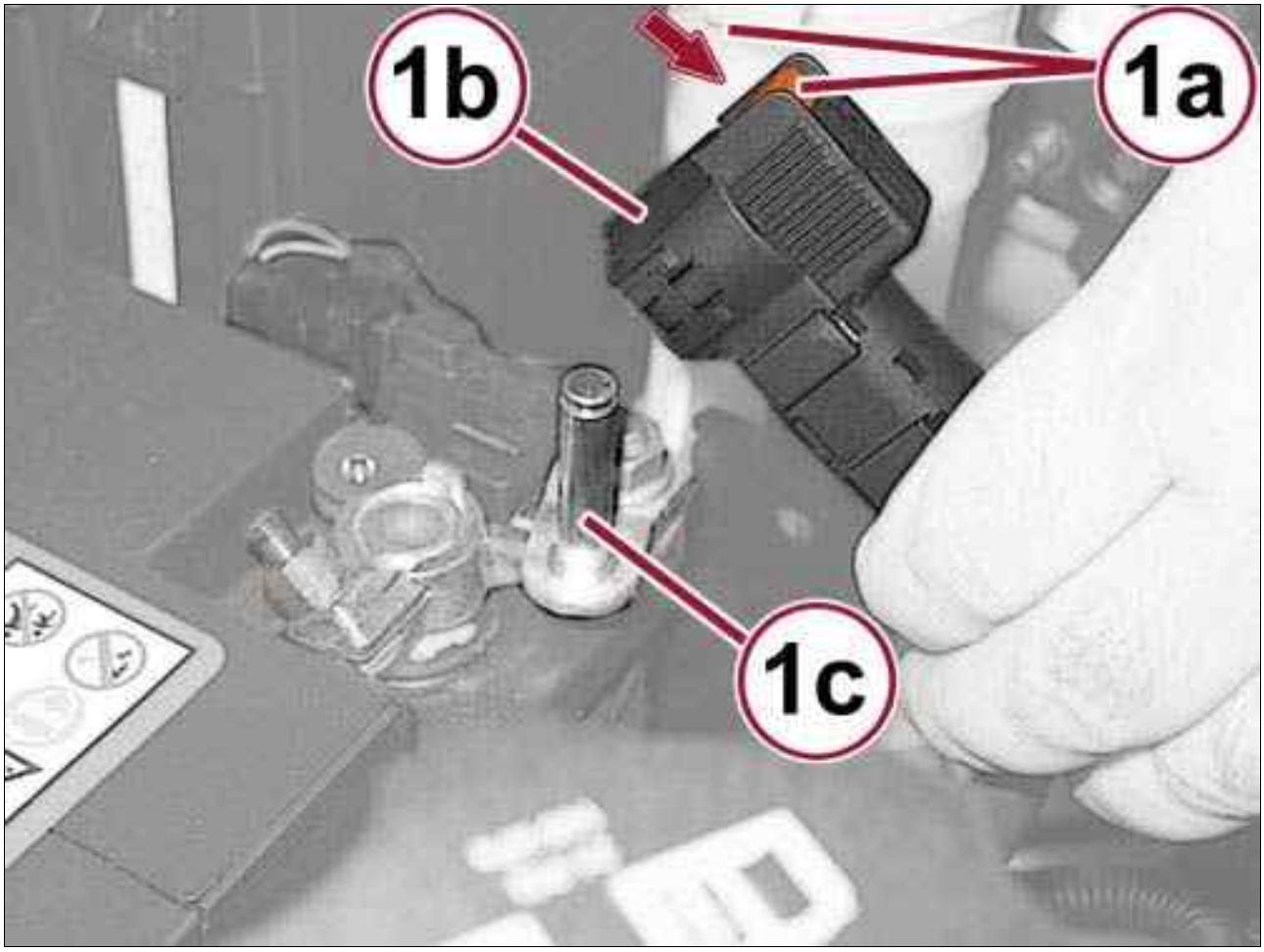
6. Connect the terminal to the negative post pole and engage the retainer.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 2.0L 4WD REMOVAL AND INSTALLATION > NEGATIVE BATTERY CABLE REMOVAL - 2.0L

NOTE:

Battery terminals must be disconnected only with the ignition key on STOP or removed for at least one minute and never with key on or when the engine is running.

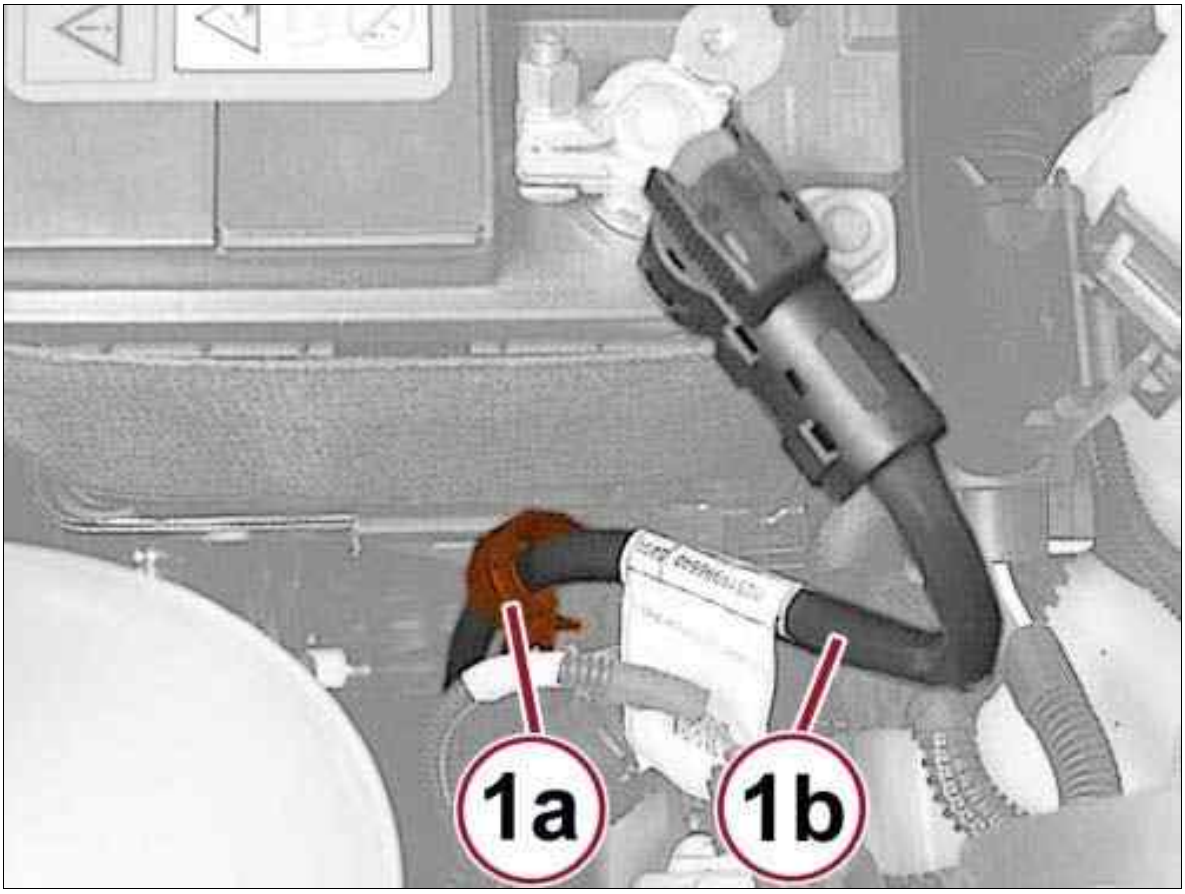
Fig 1: Negative Battery Pole, Terminal & Release



Courtesy of CHRYSLER GROUP, LLC

1. Press the release (1a) and disconnect the terminal (1b) from the negative battery pole (1c).

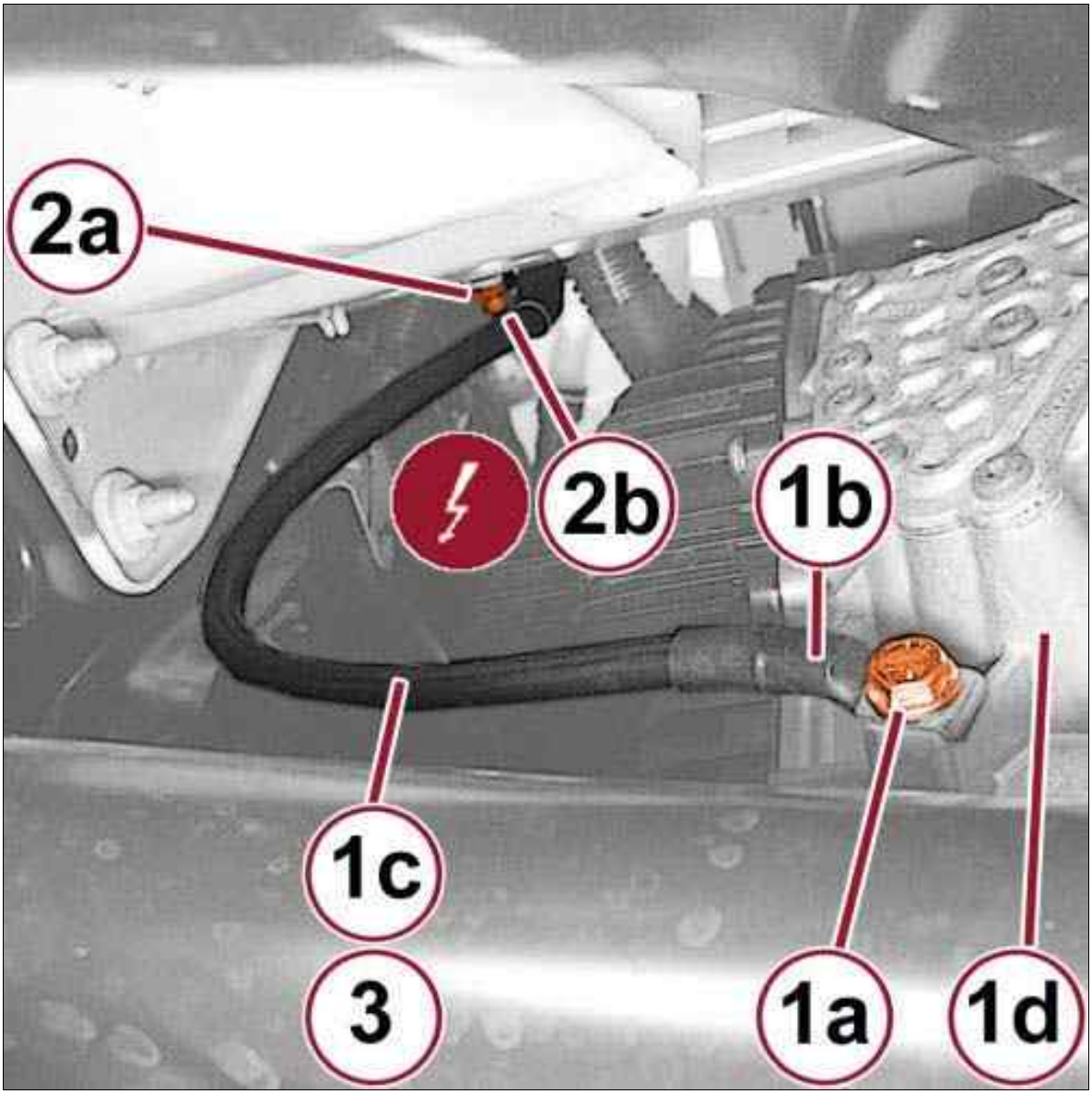
Fig 2: Ground Lead & Retaining Clip



Courtesy of CHRYSLER GROUP, LLC

2. Open the retaining clip (1a) and disengage the ground wire (1b).

Fig 3: Ground Wire, Gearbox, Screw & Terminal



Courtesy of CHRYSLER GROUP, LLC

3. Remove the left front wheel splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
4. Remove the screw (1a) and disconnect the ground wire (1c) from the gearbox (1d).

> *NOTE:*
>
> *The positioning of the terminal (1b) on the gearbox can change depending on the type of gearbox installed.*

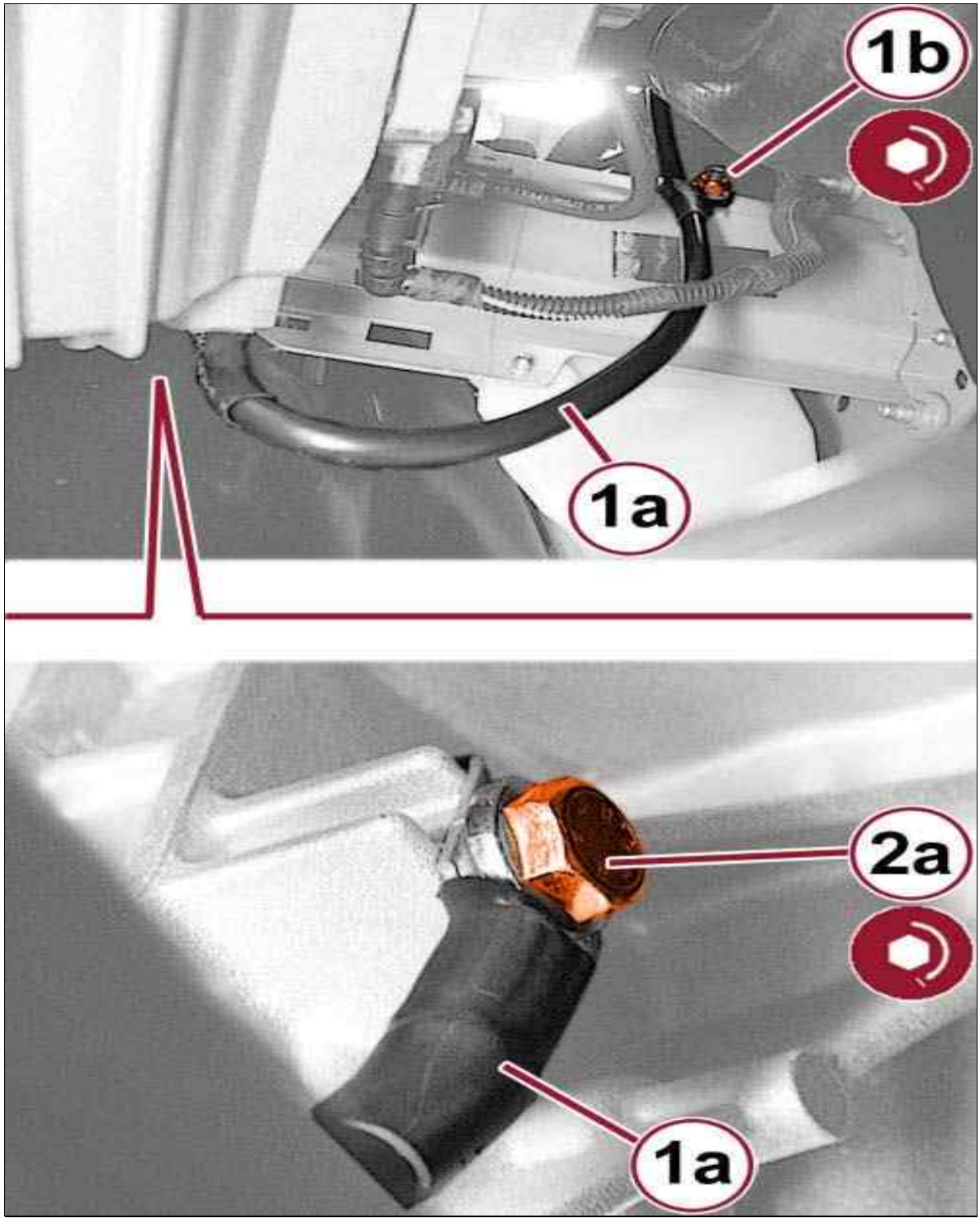
5. Remove the nut (2a) and disconnect the ground wire (1c) from the frame.
6. Recover the ground wire (1c).

7. Check that the ground wire is not damaged and that the individual wires are securely attached to the connections. If needed, perform continuity checks.

CABLES, BATTERY > REMOVAL AND INSTALLATION > 2.0L 4WD REMOVAL AND INSTALLATION > NEGATIVE BATTERY CABLE INSTALLATION - 2.0L

1. Position the negative battery cable for installation.

Fig 1: Chassis Ground, Nuts & Ground Wire



Courtesy of CHRYSLER GROUP, LLC

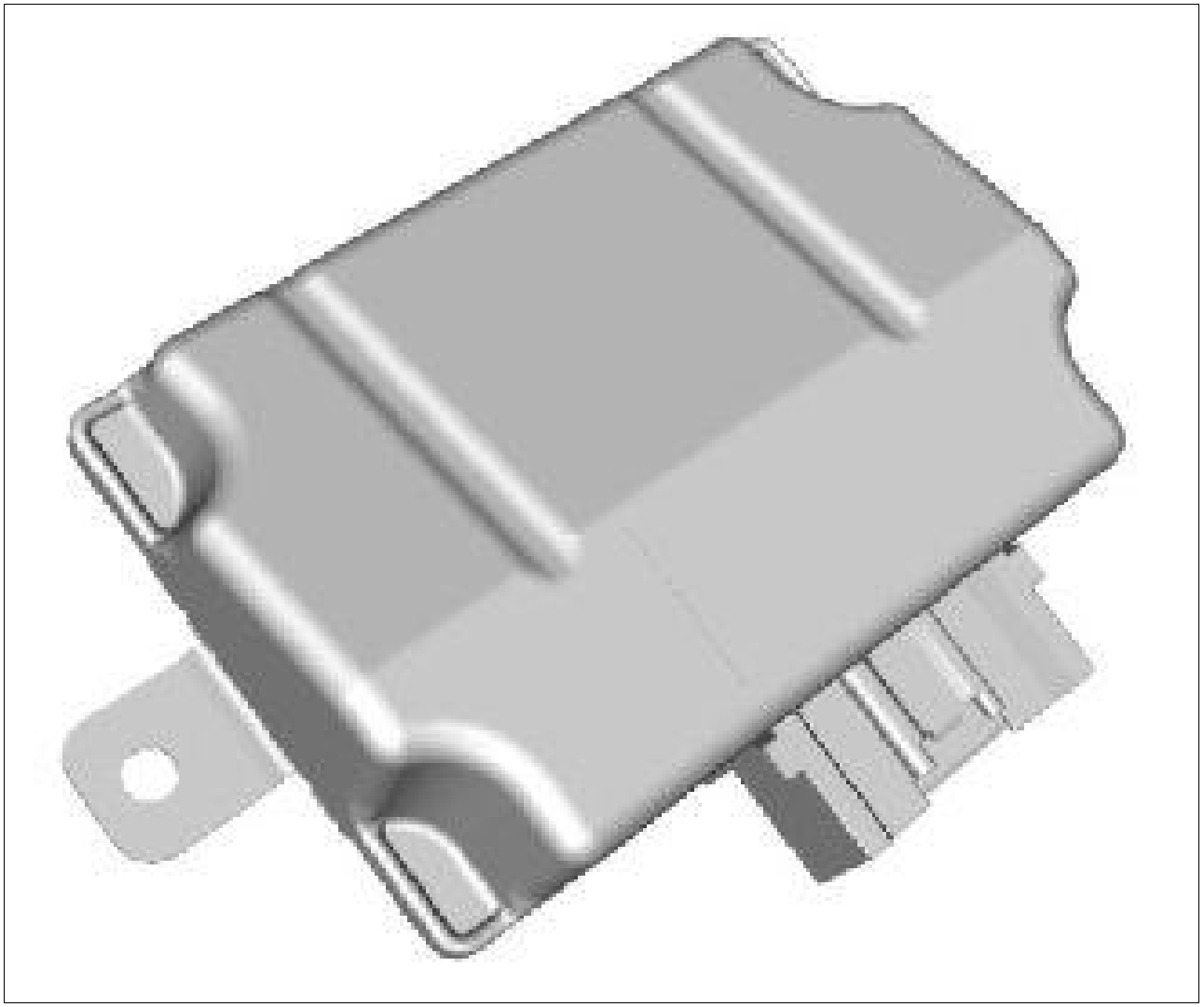
2. Connect the cable terminal to the chassis ground (1a), then screw the nut (1b) and tighten it to the specified torque.
3. Connect the terminal to the gearbox of the ground wire (1a), then tighten the screw (2a) and tighten to the specified torque.
4. Install the left front wheel splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE,

REMOVAL AND INSTALLATION .

5. Engage the ground lead to the retaining clip.
6. Connect the terminal to the negative battery pole and to engage the retainer.

MODULE, VOLTAGE STABILITY (VSM) > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > DESCRIPTION

Fig 1: Voltage Stabilizer Module



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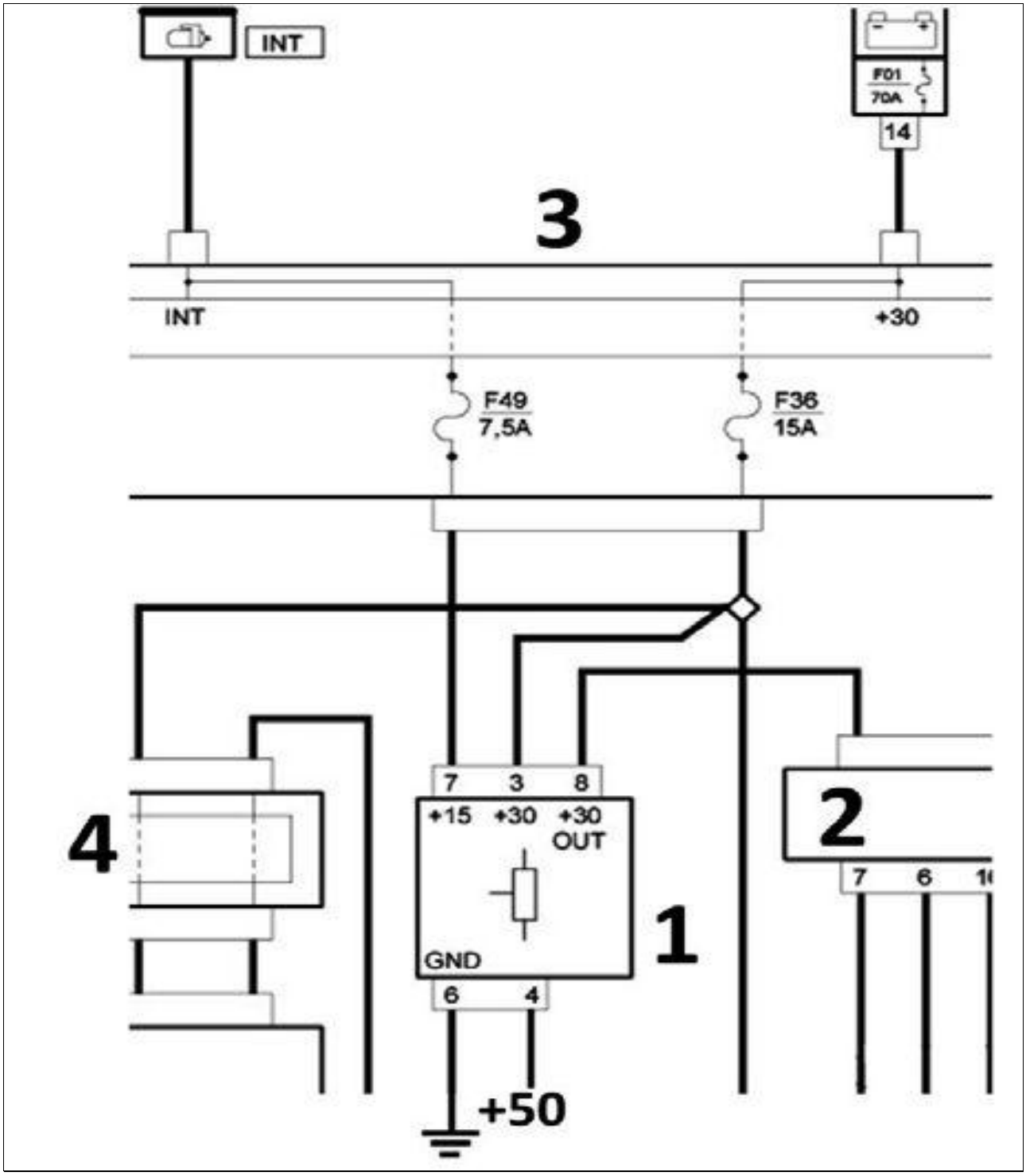
The voltage stabilizer module can be included to support the audio system. The purpose of this module is to stabilize the voltage level sent to the audio system during the start-up stages, when fluctuations in the voltage value may occur.

The voltage stabilizer is located behind the glove compartment in front of the passenger's legs.

MODULE, VOLTAGE STABILITY (VSM) > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > OPERATION

Fig 1: Voltage Stabilizer, ETM, BCM & Joint For Steering Wheel Controls



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KEY

1. Voltage stabilizer

2. ETM
3. BCM
4. Joint for steering wheel controls

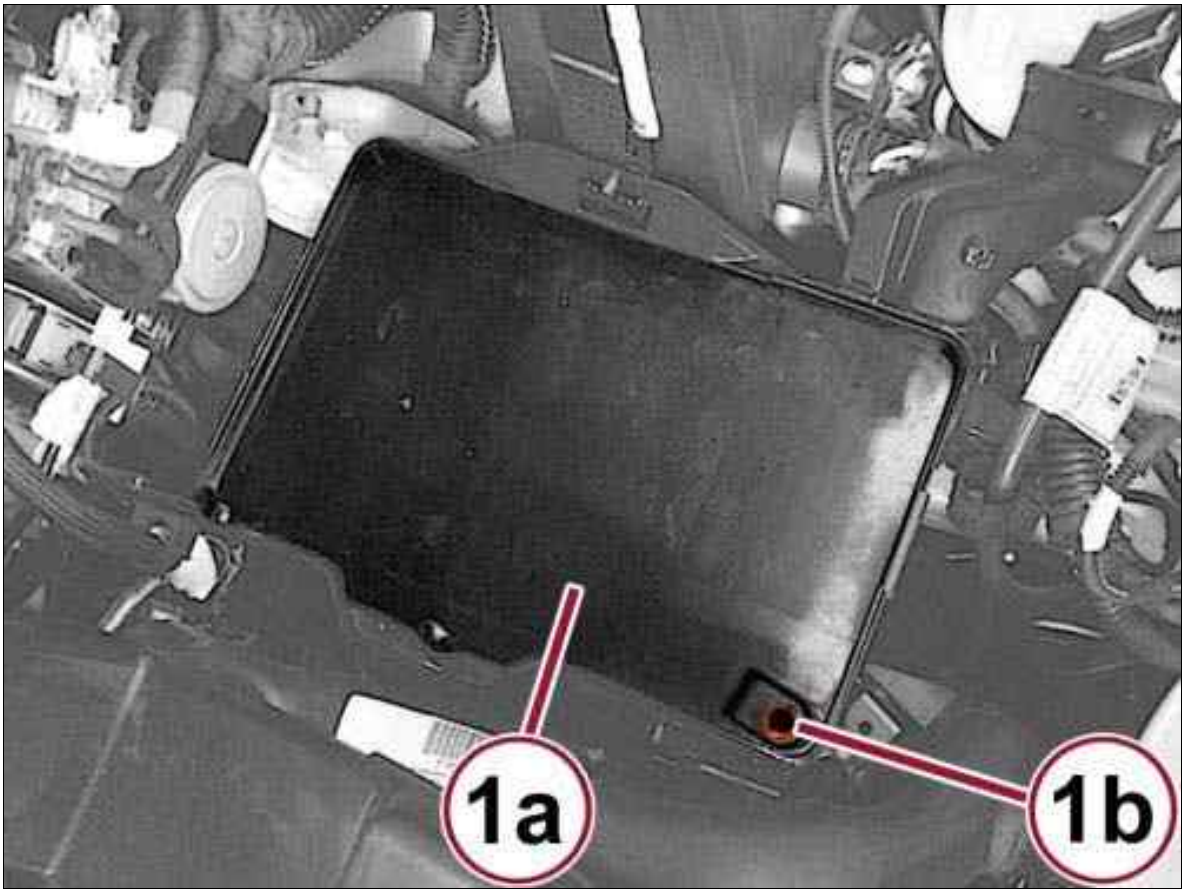
Voltage Stabilizer pinout

Pin	Function
3	+30
4	+50 from T20 relay
6	Earth
7	+15
8	+30 OUT

TRAY, BATTERY > REMOVAL AND INSTALLATION > 1.6L - 2.0L REMOVAL AND INSTALLATION > 1.6L - 2.0L BATTERY TRAY REMOVAL

1. Remove the battery. Refer to BATTERY, REMOVAL AND INSTALLATION .

Fig 1: Battery Tray Cover & Drain Pipe



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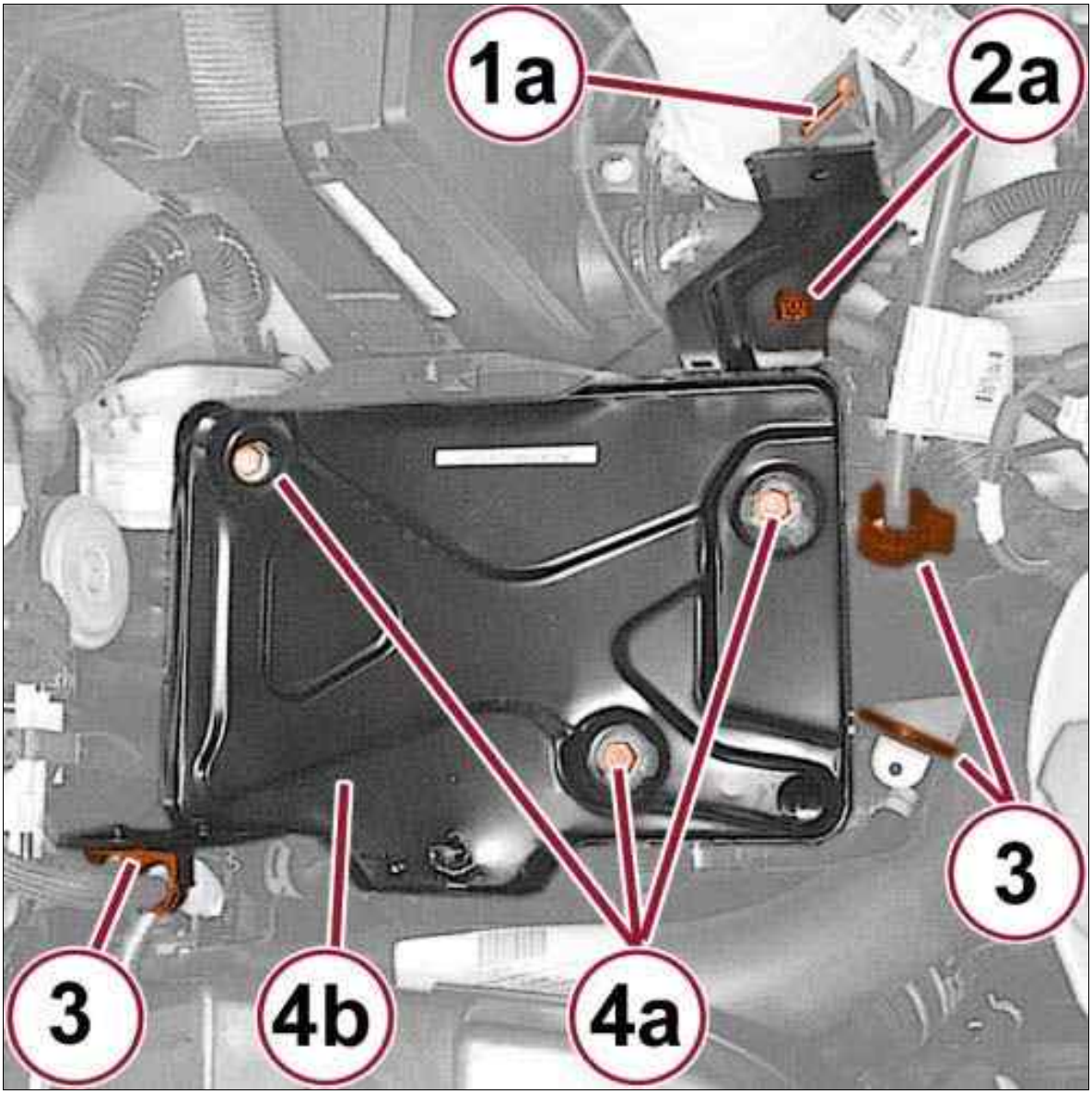
2. Remove the battery tray cover (1a) with the drain pipe (1b).

Fig 2: Washer Fluid Tank Retainer, Retaining Clip, Clamps, Screws & Battery Tray



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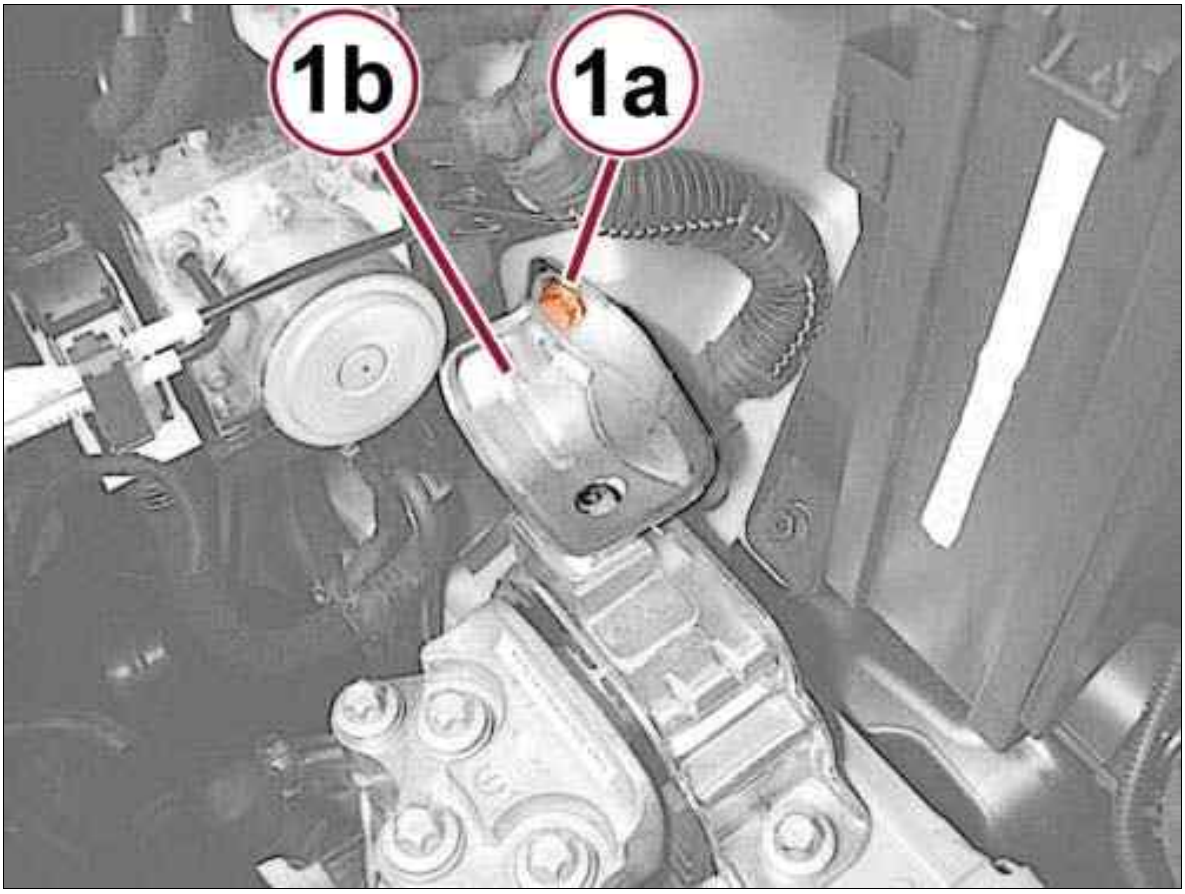
3. Disconnect the washer fluid tank retainer (1a) from the tray.
4. Disconnect the wiring retaining clip (2a) from the tray.
5. Open the wiring retaining clamps (3).
6. Remove the screws (4a) and remove the battery tray (4b).

Fig 3: Guard & Screw



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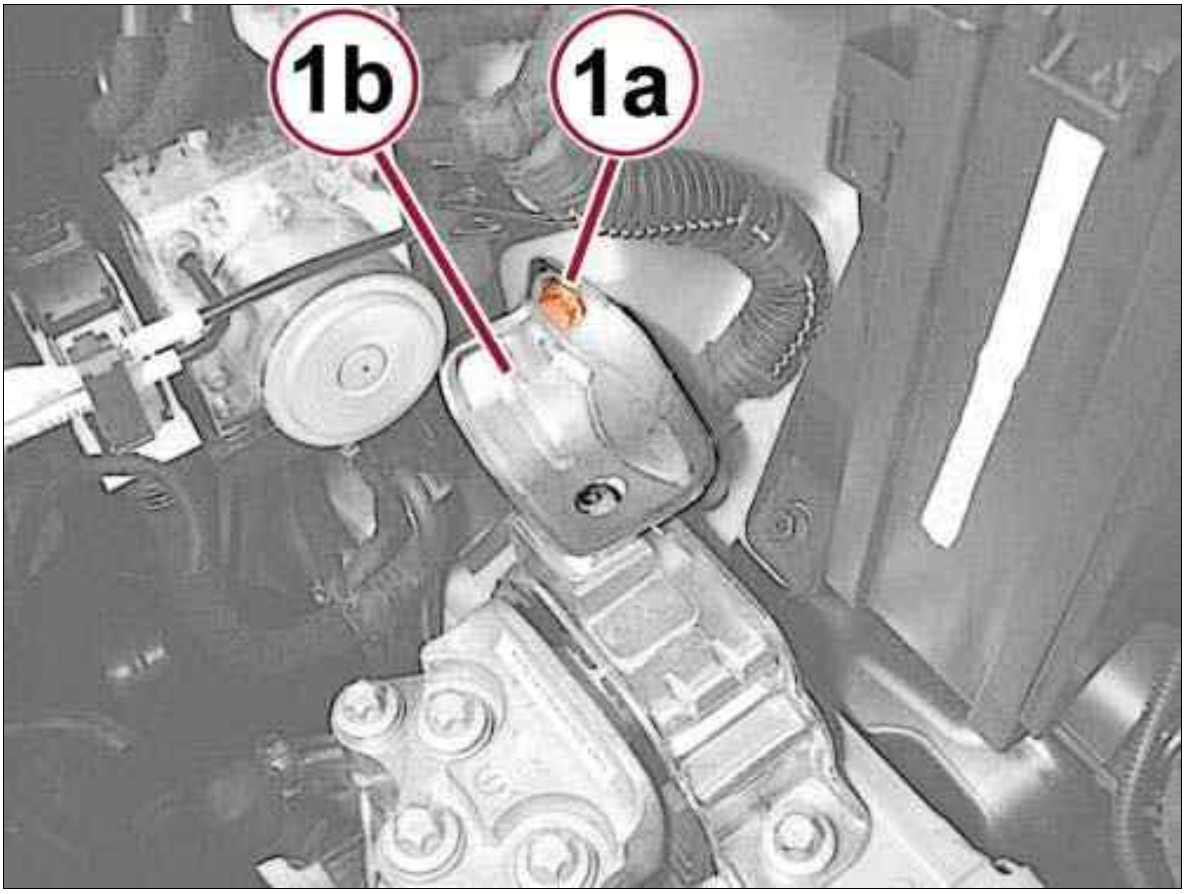
7. If necessary, loosen the screw (1a) and remove the guard (1b).

TRAY, BATTERY > REMOVAL AND INSTALLATION > 1.6L - 2.0L REMOVAL AND INSTALLATION > 1.6L - 2.0L BATTERY TRAY INSTALLATION

1. Check that the battery box with fastening strap battery is not damaged.
2. Check that the battery tray is not damaged.

Fig 1: Guard & Screw



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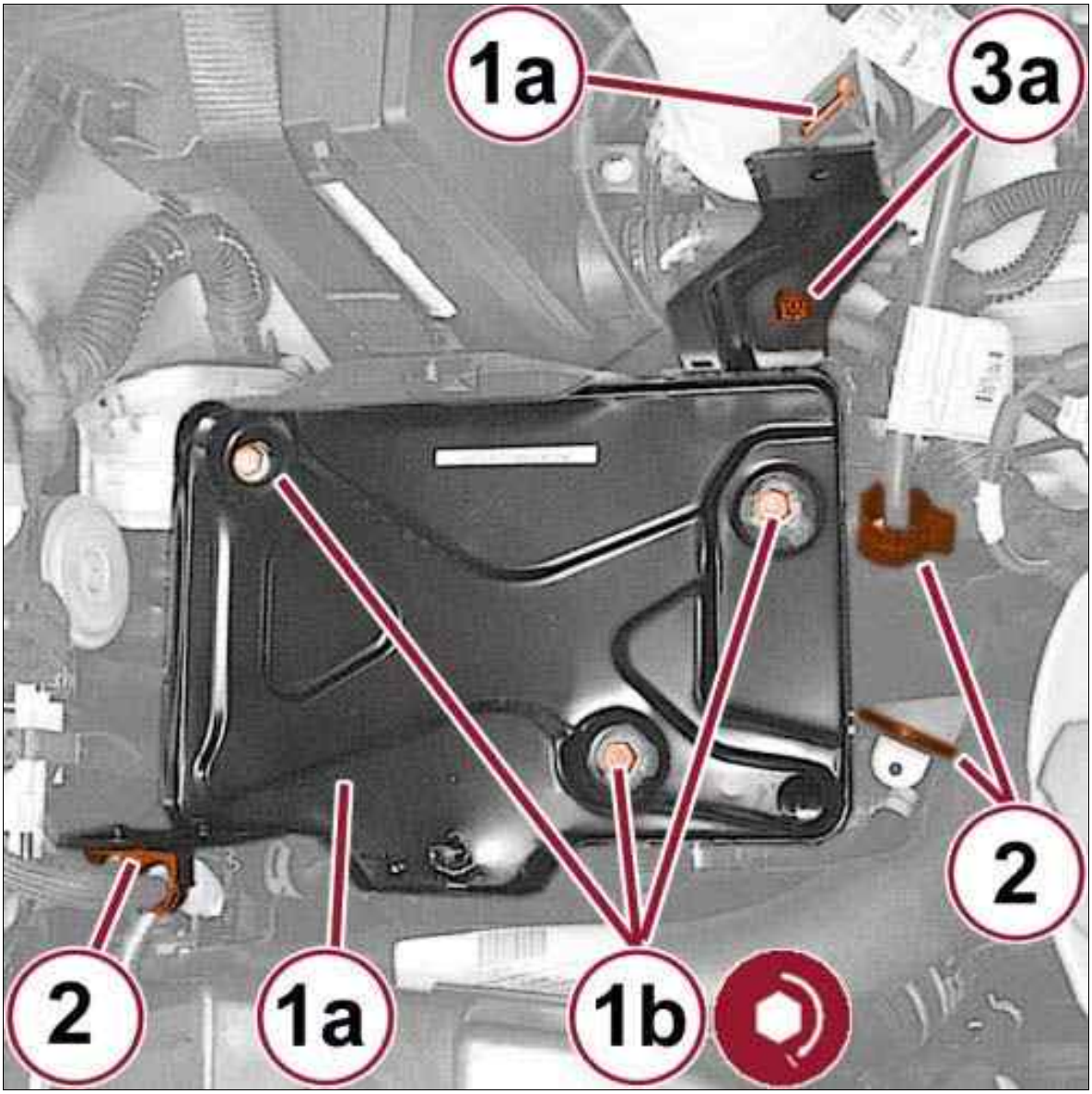
3. If removed, place the guard (1b) and tighten the screw (1a).

Fig 2: Battery Tray, Screws, Retaining Clamps, Clip & Washer Fluid Reservoir Retainer



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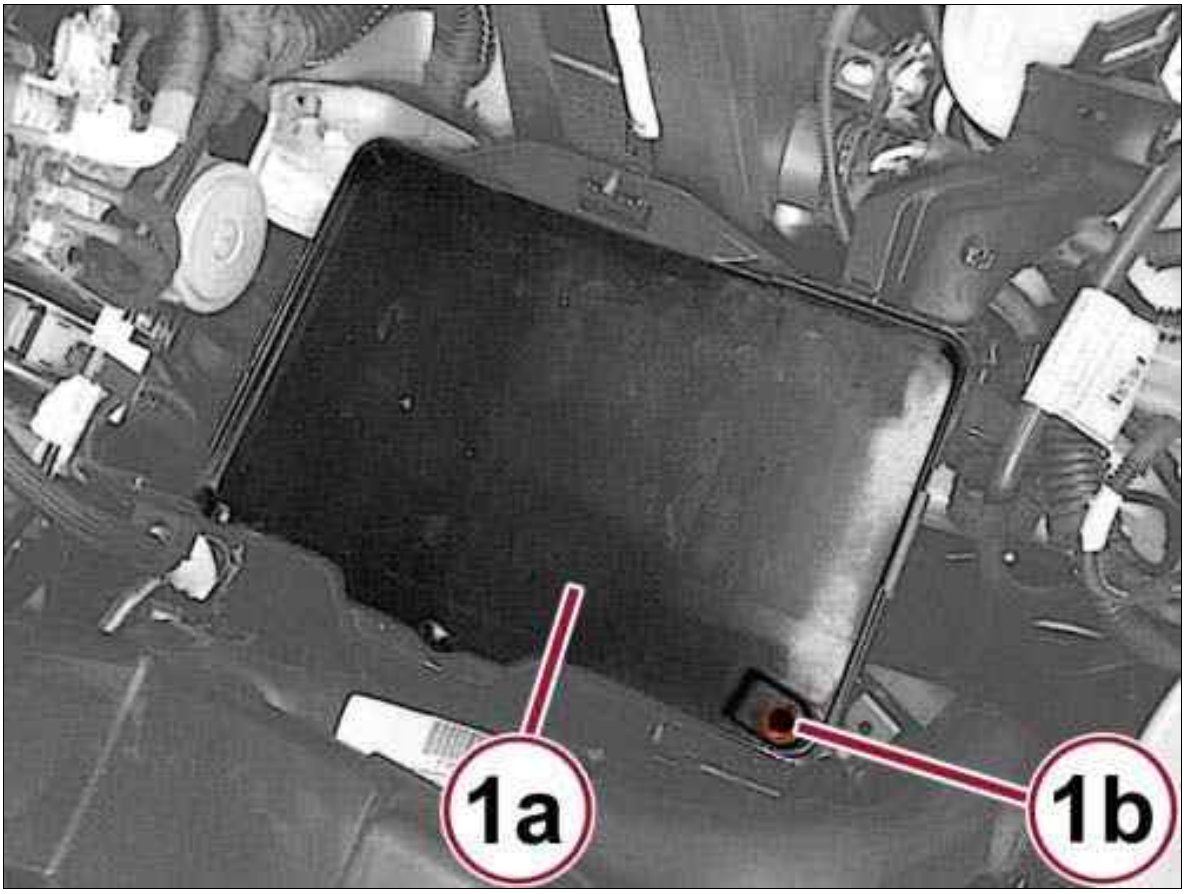
4. Place the battery tray (1a) with the battery fastening strap, then tighten the screws (1b) to the specified torque.
5. Apply the wiring retaining clamps (2).
6. Connect the wiring retaining clip retainer (3a).
7. Connect the washer fluid reservoir retainer (4a).

Fig 3: Battery Tray Cover & Drain Pipe



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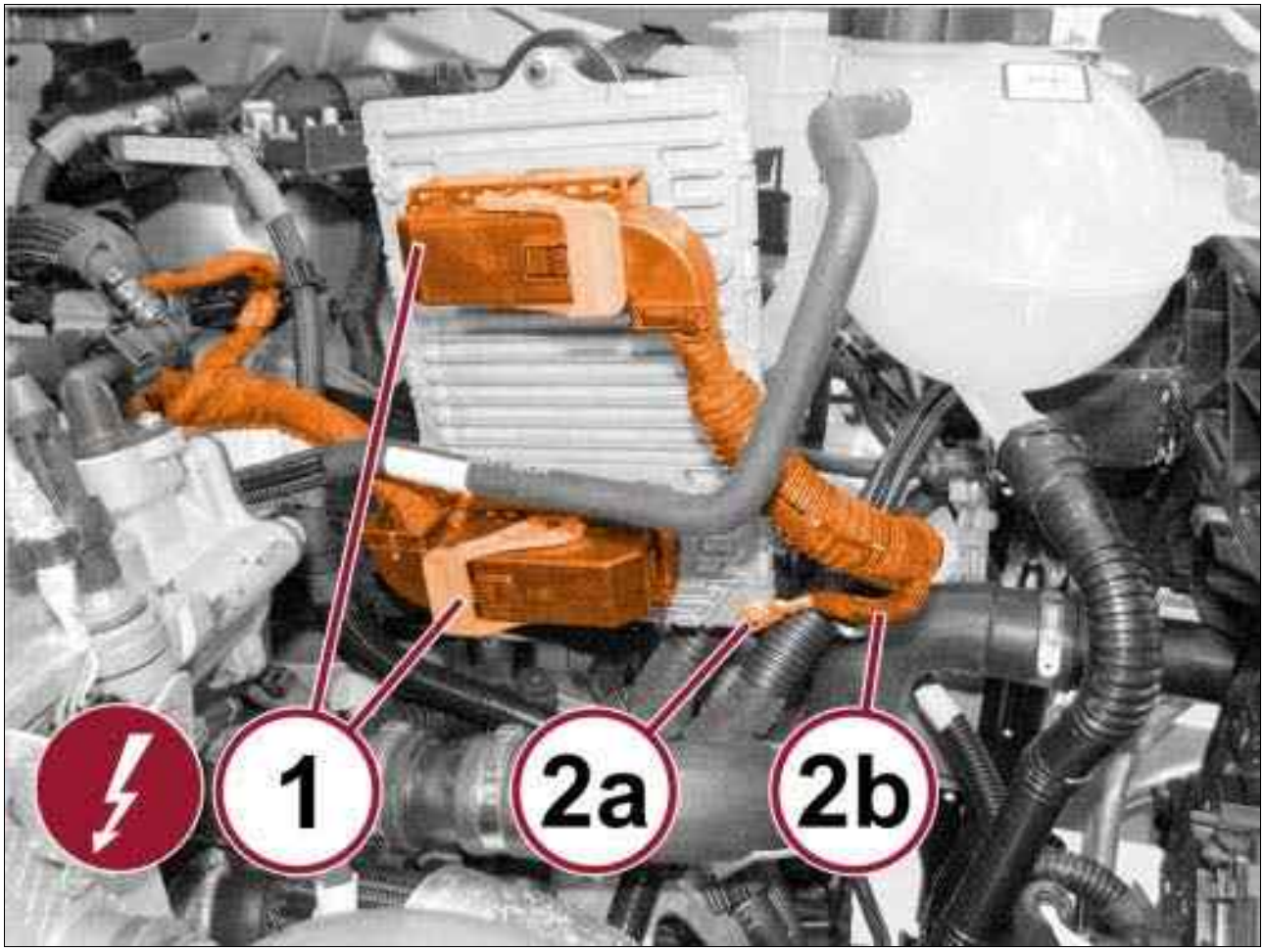
8. Install the battery tray cover (1a) and drain pipe (1b).
9. Install the battery to the battery tray. Refer to BATTERY, REMOVAL AND INSTALLATION .

TRAY, BATTERY > REMOVAL AND INSTALLATION > 2.4L REMOVAL AND INSTALLATION > 2.4L BATTERY TRAY REMOVAL

Fig 1: Connectors, Nut & Power Plant Unit Mass Injection-Ignition Cable



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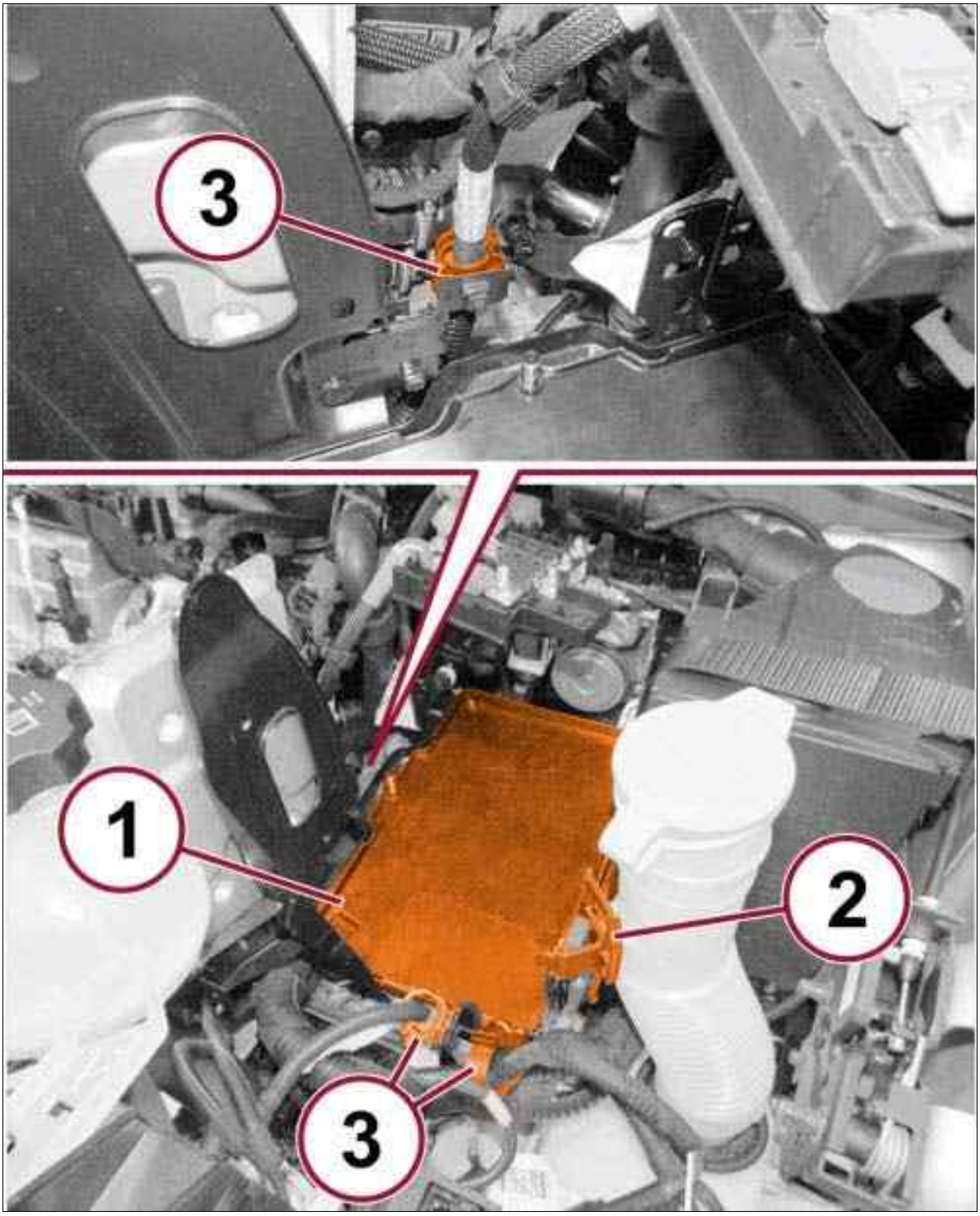
1. Remove the battery. Refer to BATTERY, REMOVAL AND INSTALLATION .
2. Unscrew the nut (2a) and unplug the power plant unit mass injection-ignition (2b).

Fig 2: Washer Fluid Assembly, Retaining Clips & Bottom Cover



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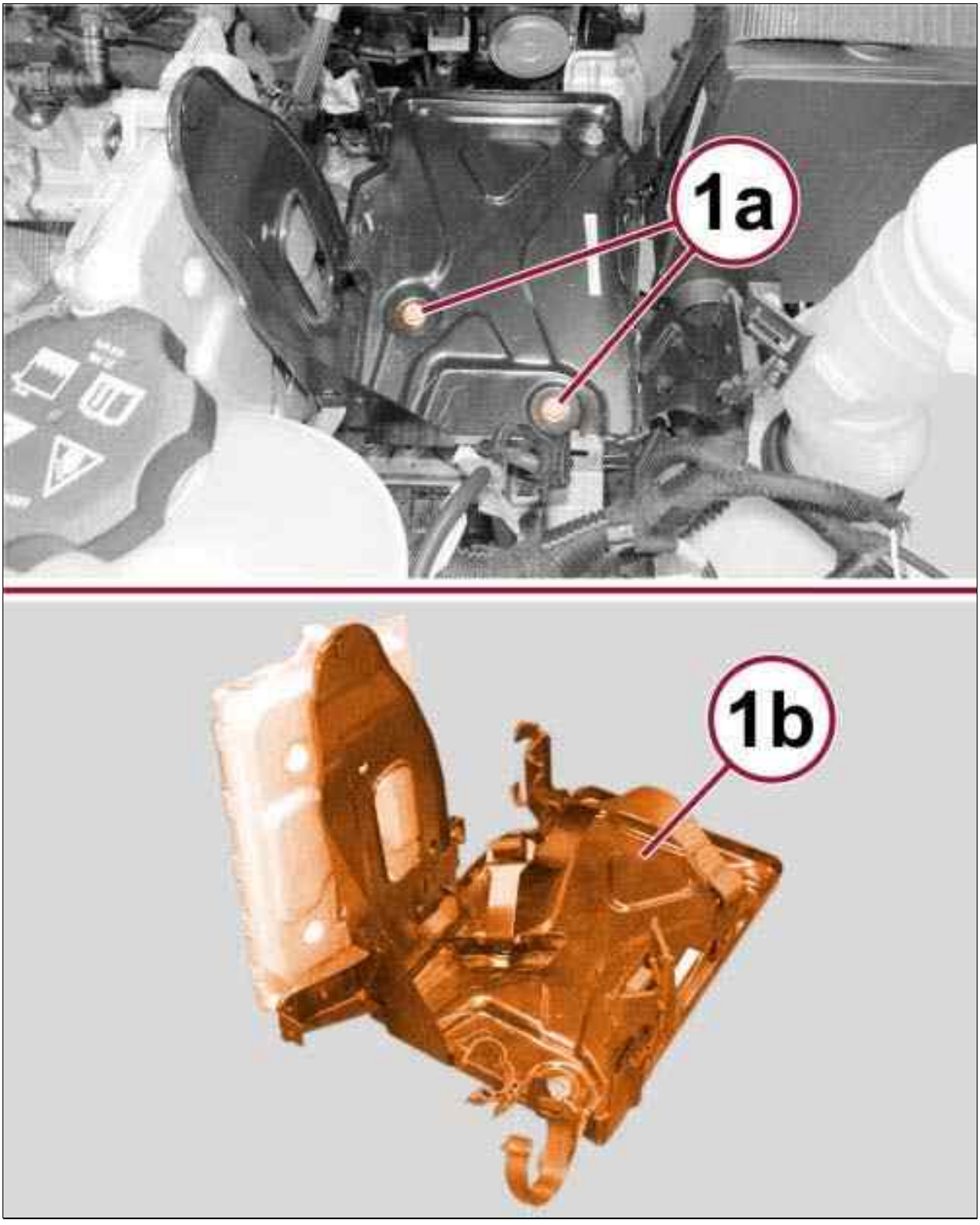
3. Remove the bottom cover (1).
4. Untie the washer fluid assembly (2).
5. Open the wiring retaining clips (3).

Fig 3: Battery Tray & Screws



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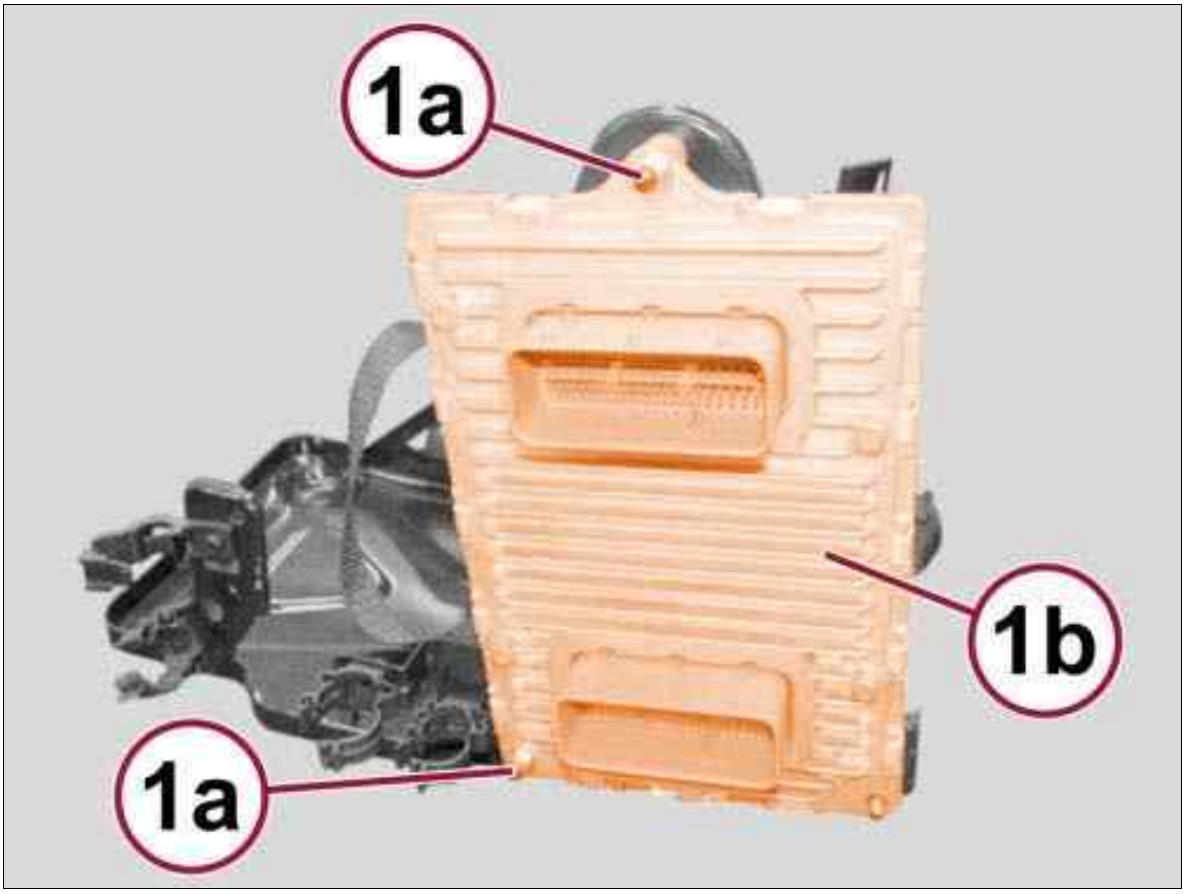
6. Remove the screws (1a) and remove the battery tray (1b) with the PCM attached.

Fig 4: PCM Battery Tray & Nuts



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7. If necessary, remove the nuts (1a) and remove the PCM (1b) battery tray.
8. Check that the battery box is not damaged.

TRAY, BATTERY > REMOVAL AND INSTALLATION > 2.4L REMOVAL AND INSTALLATION > 2.4L BATTERY TRAY INSTALLATION

1. Check that the battery tray is not damaged.
2. If removed, install the PCM to the battery tray. Tighten the screws to the proper torque specification.
3. Attach the washer fluid assembly to the battery tray.
4. Install the battery tray to the vehicle.
5. Secure the PCM to the battery tray.
6. Connect the electrical connections to the PCM.
7. Install the battery to the battery tray. Refer to BATTERY, REMOVAL AND INSTALLATION .