

## Starting System - I6 3.2L Petrol -

### General Specification

Item	Specification
<b>Starter motor:</b>	
Make	Bosch
Type	1.4 kW
Voltage	12

### Torque Specifications

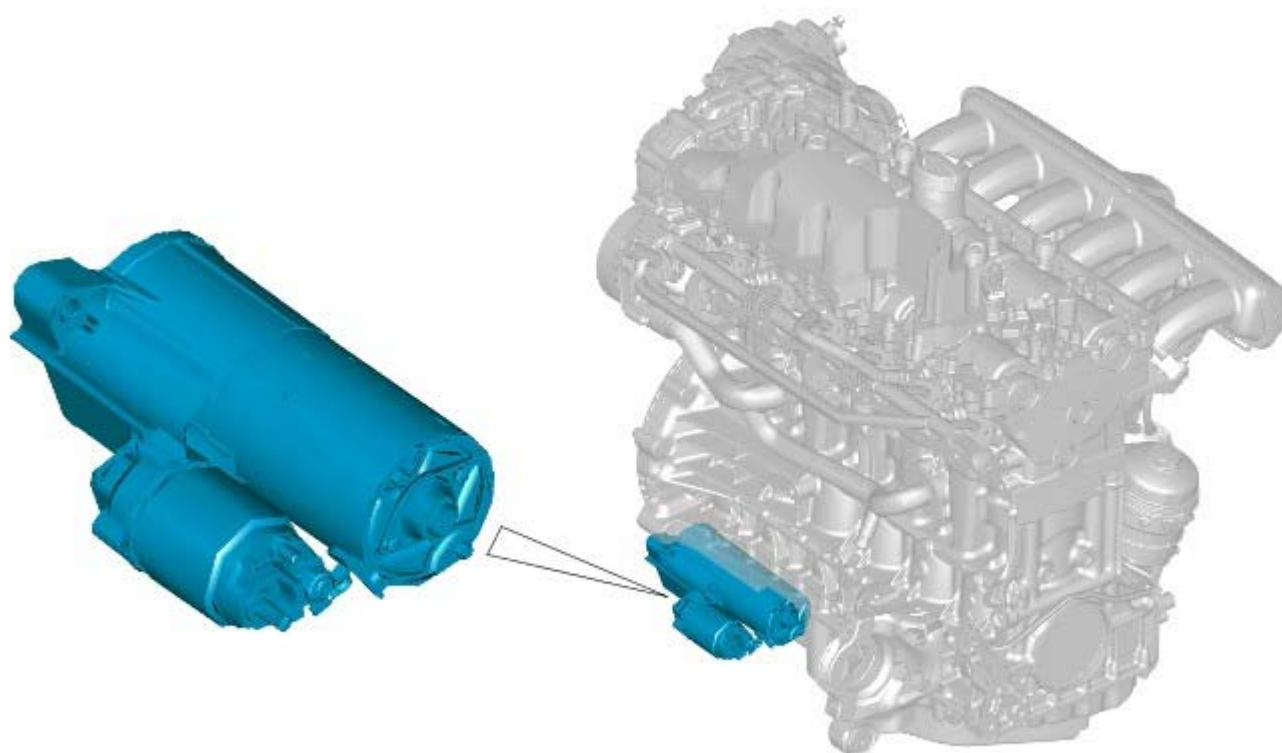
Description	Nm	lb-ft
Starter motor bolts	45	33
Starter motor solenoid terminal nut*	10	7

\* **Damage to the internal connections will occur if this torque is exceeded**

## Starting System - I6 3.2L Petrol - Starting System

Description and Operation

### COMPONENT LOCATION



E79497

### OVERVIEW

The starter motor rated at 1.4 kW uses permanent magnets instead of field windings to provide a low-weight starter motor; with the use of planetary gears to deliver a good torque to weight ratio.

The starter relay is energized by a signal from the engine control module (ECM) when the ignition is in engine crank mode. The ECM checks that a valid code has been received before granting the engine crank mode request. When the request is granted the starter relay energizes the starter solenoid to engage the starter motor's pinion with the flexplate's ring gear. Once the engine has started and engine speed exceeds starter motor speed the pinion disengages to prevent over-cranking of the starter motor.

The electrical power for starter operation is supplied via a cable connected directly from the battery positive terminal to the solenoid.

# Starting System - I6 3.2L Petrol - Starting System

Diagnosis and Testing

## Principles of Operation

For a detailed description of the starting system, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Starting System](#) (303-06A Starting System - I6 3.2L Petrol, Description and Operation) / [Starting System](#) (303-06B Starting System - TD4 2.2L Diesel, Description and Operation).

## Inspection and Verification



**CAUTION:** Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> <li>● Gear selector lever cable adjustment</li> <li>● Starter Motor</li> <li>● Battery</li> </ul>	<ul style="list-style-type: none"> <li>● Battery</li> <li>● Fuses</li> <li>● Wiring harness</li> <li>● Damaged, loose or corroded connectors</li> <li>● Starter relay</li> <li>● Engine Control Module (ECM)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

## Symptom Chart

Symptom	Possible Cause	Action
The engine does not crank (starter motor <b>does not</b> turn)	<ul style="list-style-type: none"> <li>● Gear selector not in <b>P</b> or <b>N</b> position</li> <li>● Battery</li> <li>● Harness/Connectors</li> <li>● Starter motor</li> <li>● Starter relay</li> <li>● Start switch</li> <li>● Transmission control module (TCM)</li> <li>● Engine control module (ECM)</li> <li>● Engine seized</li> </ul>	<p>Make sure the gear selector is in the <b>P</b> or <b>N</b> position and correctly adjusted.</p> <p>REFER to: <a href="#">Selector Lever Cable Adjustment</a> (307-05 Automatic Transmission/Transaxle External Controls, General Procedures).</p> <p>Check the battery condition and state of charge.</p> <p>REFER to: <a href="#">Battery</a> (414-01 Battery, Mounting and Cables, Diagnosis and Testing).</p> <p>Check the starter motor and harness. Check for DTCs and refer to relevant DTC Index</p>
The engine does not crank (starter motor <b>does</b> turn)	<ul style="list-style-type: none"> <li>● Starter motor installation</li> <li>● Starter motor</li> <li>● Ring gear</li> </ul>	<p>Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the ring gear teeth for damage, foreign objects, etc.</p>
Engine cranks too slowly	<ul style="list-style-type: none"> <li>● Battery</li> <li>● Harness/Connectors</li> <li>● Starter motor</li> <li>● Engine oil incorrect grade</li> </ul>	<p>Check the battery condition and state of charge.</p> <p>REFER to: <a href="#">Battery</a> (414-01 Battery, Mounting and Cables, Diagnosis and Testing).</p> <p>Refer to the electrical circuit diagrams and test the starter motor and starter motor circuits</p>
Engine cranks too fast	<ul style="list-style-type: none"> <li>● Low engine compression</li> </ul>	<p>Check the engine compressions.</p> <p>REFER to: <a href="#">Engine</a> (303-00 Engine System - General Information, Diagnosis and Testing).</p>
Excessive starter motor noise	<ul style="list-style-type: none"> <li>● Starter motor</li> <li>● Starter motor installation/casing</li> <li>● Ring gear</li> </ul>	<p>Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the ring gear teeth for damage, foreign objects, etc.</p>

## DTC Index

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to 3 decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE: If DTCs are recorded and, after performing the pinpoint tests, the fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B100A11	Fuel Pump Authorisation - circuit short to ground	<ul style="list-style-type: none"> <li>Fuel pump authorisation circuit - short to ground</li> </ul>	Refer to electrical circuit diagrams and check fuel pump authorisation circuit for short to ground
B100A15	Fuel Pump Authorisation - circuit short to power or open	<ul style="list-style-type: none"> <li>Fuel pump authorisation circuit - short to power, open circuit</li> </ul>	Refer to electrical circuit diagrams and check fuel pump authorisation circuit for short to power, open circuit
B102408	Transponder - Bus signal/Message Failures	<ul style="list-style-type: none"> <li>Transponder - Bus signal/message failures</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102451	Start Control Unit - not programmed	<ul style="list-style-type: none"> <li>Start control unit - not configured</li> </ul>	Re-configure the start control unit using the manufacturer approved diagnostic system
B102481	Start Control unit - invalid serial data received	<ul style="list-style-type: none"> <li>Invalid serial data received</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102487	Start control unit - missing message	<ul style="list-style-type: none"> <li>Missing message</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102496	Start control unit - component internal failure	<ul style="list-style-type: none"> <li>Internal failure</li> </ul>	Install a new start control unit. REFER to: <a href="#">Start Control Unit</a> (303-06B Starting System - TD4 2.2L Diesel, Removal and Installation).
B102581	Transponder - invalid serial data	<ul style="list-style-type: none"> <li>Invalid serial data received</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102608	Steering Column Lock - Bus Signal/Message Failures	<ul style="list-style-type: none"> <li>Steering column lock - Bus signal/message failures</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102651	Steering Column Lock - not programmed	<ul style="list-style-type: none"> <li>Steering column lock - not configured</li> </ul>	Re-configure the steering column lock using the manufacturer approved diagnostic system
B102652	Steering Column Lock - not activated	<ul style="list-style-type: none"> <li>Request to enable the steering column lock supply not approved</li> </ul>	<p>NOTE: If the vehicle is parked in circumstances where a continuous torque acts on the column (on partial lock, or tire against a curb) it could prevent the lock from disengaging. The driver may need to rock the steering wheel to allow the column lock to disengage.</p> <p>Clear DTC and test system with steering straight. If the DTC does not re occur advise the customer of the above note. If the DTC does reoccur - Check LIN circuit between steering column lock and CJB</p>
B102671	Steering Column Lock - actuator stuck	<ul style="list-style-type: none"> <li>Should be set if the SCL is unable to reach locked and OK position</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102682	Steering Column Lock	<ul style="list-style-type: none"> <li>Steering column lock incorrectly programmed</li> </ul>	Install a new steering column lock
B102692	Steering Column Lock - performance or incorrect operation	<ul style="list-style-type: none"> <li>Micro switch/sensor fault</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B102694	Steering Column Lock - unexpected operation	<ul style="list-style-type: none"> <li>Status messages are received from the SCL when SCL should be turned off</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system


DTC	Description	Possible Cause	Action
B102696	Steering Column Lock - component internal failure	<ul style="list-style-type: none"> <li>Internal failure</li> </ul>	Install a new steering column lock, refer to the new module/component installation note at the top of the DTC Index
B108A23	Start button - signal stuck low	<ul style="list-style-type: none"> <li>SW1 and SW2 constantly active</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B108B23	Start Button Circuit "A" - signal stuck low	<ul style="list-style-type: none"> <li>SW1 constantly active for long time while button press detected at SW2</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B108B24	Start button circuit "A" - signal stuck high	<ul style="list-style-type: none"> <li>SW1 never active while button press detected at SW2</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B108C23	Start button circuit "B" - signal stuck low	<ul style="list-style-type: none"> <li>SW2 constantly active for long time while button press detected at SW1</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B108C24	Start button circuit "B" - signal stuck high	<ul style="list-style-type: none"> <li>SW2 never active while button press detected at SW1</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B108D24	Start button circuit "C" - signal stuck high	<ul style="list-style-type: none"> <li>SW3 never active while button press detected at SW1</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
B10D794	PATS Key - unexpected operation	<ul style="list-style-type: none"> <li>No response from transponder in key</li> </ul>	Replace key
C1A4121	Clutch Pedal Sensor - signal amplitude < minimum	<ul style="list-style-type: none"> <li>signal &lt; 3% of supply(5V)</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
C1A4122	Clutch Pedal Sensor - signal amplitude > maximum	<ul style="list-style-type: none"> <li>signal ≥ 97% of supply(5V)</li> </ul>	Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
P051300	Incorrect immobilizer key	<ul style="list-style-type: none"> <li>Security key invalid</li> </ul>	Program the keys using the approved diagnostic system.
P061511	Starter relay circuit	<ul style="list-style-type: none"> <li>Starter relay control circuit: short circuit to ground</li> <li>Starter relay control circuit: open circuit</li> <li>Starter relay failure</li> </ul>	Check the starter relay and circuits. Refer to the electrical guides. Install a new relay as necessary.
P061512	Starter relay circuit	<ul style="list-style-type: none"> <li>Starter relay control circuit: short circuit to power</li> <li>Starter relay failure</li> </ul>	Check the starter relay and circuits. Refer to the electrical guides. Install a new relay as necessary.
P061513	Starter relay circuit	<ul style="list-style-type: none"> <li>Starter relay control circuit: open circuit</li> <li>Starter relay failure</li> </ul>	Check the starter relay and circuits. Refer to the electrical guides. Install a new relay as necessary.
P061711	Starter Relay Circuit High	<ul style="list-style-type: none"> <li>Starter motor relay control circuit, high side - short to ground</li> </ul>	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P061712	Starter Relay Circuit High	<ul style="list-style-type: none"> <li>Starter motor relay control circuit, high side - short to power</li> </ul>	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P085086	Park/Neutral switch input circuit	<ul style="list-style-type: none"> <li>Signal invalid</li> </ul>	Carry out a complete vehicle read for related DTCs. Rectify as necessary.
POA0F68	Engine failed to start	<ul style="list-style-type: none"> <li>Long cranking time</li> </ul>	No action necessary. Code for information only.
P125983	Immobilizer to PCM Signal Error	<ul style="list-style-type: none"> <li>Checksum error</li> </ul>	<p><b>NOTE: If the vehicle starts, ignore this DTC</b></p> <p>Check the CAN network between the ECM, ABS module and CJB. Carry out CAN network integrity tests using the manufacturer approved diagnostic system</p>

DTC	Description	Possible Cause	Action
P125984	Immobilizer to PCM Signal Error	<ul style="list-style-type: none"> <li>Signal below allowable range</li> </ul>	<p><b>NOTE: If the vehicle starts, ignore this DTC</b></p> <p>Check the CAN network between the ECM and ABS module. Carry out CAN network integrity tests using the manufacturer approved diagnostic system</p>
P125985	Immobilizer to PCM Signal Error	<ul style="list-style-type: none"> <li>Signal above allowable range</li> </ul>	<p><b>NOTE: If the vehicle starts, ignore this DTC</b></p> <p>Run the ECM renew procedure using the manufacturer approved diagnostic system. If DTC remains, suspect ECM. Refer to the new module/component installation note at the top of the DTC Index</p>
P125986	Immobilizer to PCM Signal Error	<ul style="list-style-type: none"> <li>Signal invalid</li> </ul>	<p><b>NOTE: If the vehicle starts, ignore this DTC</b></p> <p>Run the ECM renew procedure using the manufacturer approved diagnostic system. If DTC remains, suspect ECM. Refer to the new module/component installation note at the top of the DTC Index</p>
P125987	Immobilizer to PCM Signal Error	<ul style="list-style-type: none"> <li>Missing message</li> </ul>	<p><b>NOTE: If the vehicle starts, ignore this DTC</b></p> <p>Check the CAN network between the ECM and CJB. Carry out CAN network integrity tests using the manufacturer approved diagnostic system</p>
U010000	Lost Communication With ECM/PCM 'A'	<ul style="list-style-type: none"> <li>Lost communication with ECM</li> </ul>	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system
U010100	Lost Communication with TCM	<ul style="list-style-type: none"> <li>Lost communication with TCM</li> </ul>	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	<ul style="list-style-type: none"> <li>Lost communication with instrument cluster</li> </ul>	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system
U021400	Lost Communication With Remote Function Actuation	<ul style="list-style-type: none"> <li>Lost communication with Remote Keyless Entry module</li> </ul>	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system
U023600	Lost Communication With Column Lock Module	<ul style="list-style-type: none"> <li>Lost communication with steering column lock module</li> </ul>	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system
U051500	Invalid data received from remote function actuation	<ul style="list-style-type: none"> <li>Invalid data received from keyless entry module</li> </ul>	Check keyless entry module for DTCs and refer to DTC Index. Carry out the pinpoint tests associated to this DTC using the manufacturer approved diagnostic system

# Starting System - I6 3.2L Petrol - Starter Motor


## Removal and Installation

### Removal

1.  **CAUTION:** After switching of the ignition, wait for 2 minutes before disconnecting the battery. Failure to wait for 2 minutes will damage the navigation computer.

Disconnect the battery ground cable.

Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

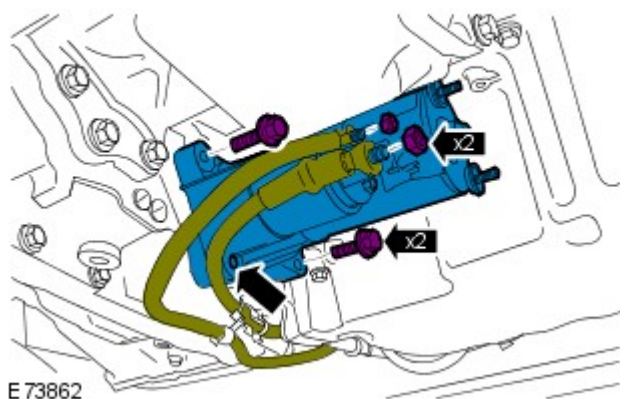
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.


3. Remove the engine undershield.

Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

4.



### Installation

1.  **CAUTION:** Make sure that the mating faces are clean and free of corrosion and foreign material.

Install the starter motor and tighten the bolts.

*Torque:* 45 Nm

2. Connect the cable and lead to the starter motor solenoid and tighten the nuts.

*Torque:* 10 Nm

3. Install the engine undershield.

Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

4. Connect the battery ground cable.

Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).



# Starting System - I6 3.2L Petrol - Start Control Unit

## Removal and Installation

### Removal

1. **NOTE:** This step must be performed if replacing the start control unit.

**NOTE:** Make sure that all keys (remote control handsets) are present when performing this procedure.

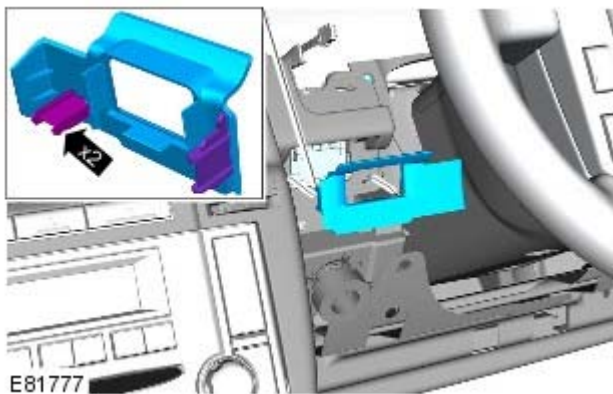
Using the Land Rover approved diagnostic equipment, interrogate the start control unit and upload the stored data.

2. Make the SRS system safe.

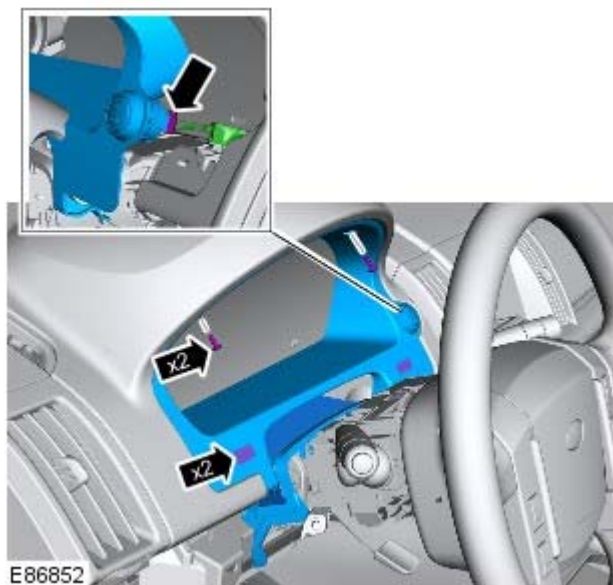
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

3. Remove the driver lower air bag.

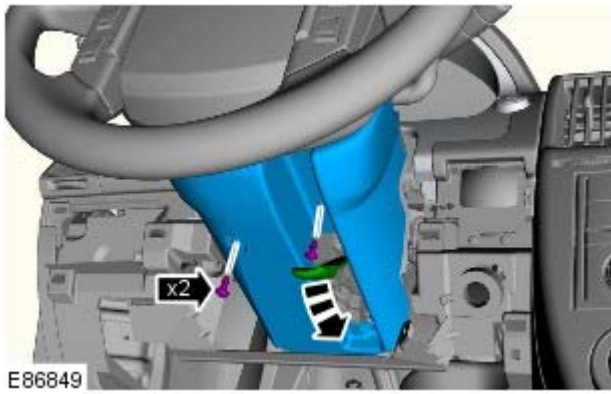
Refer to: [Driver Lower Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).



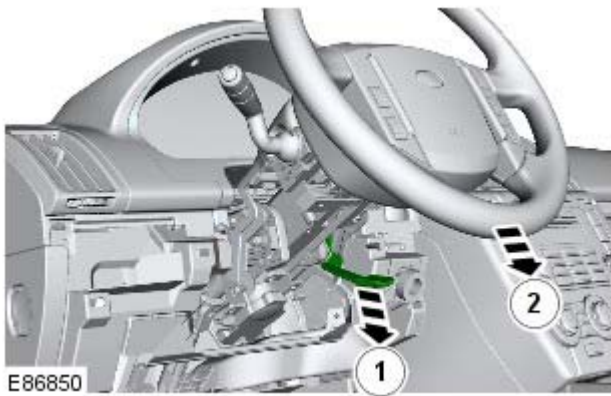
4. Remove the starter control unit trim cover.



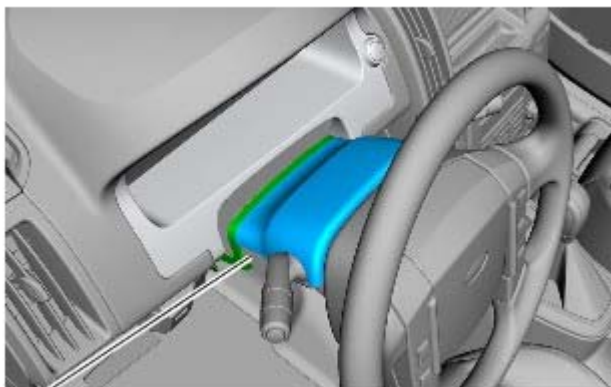
5. Remove the instrument cluster surround.



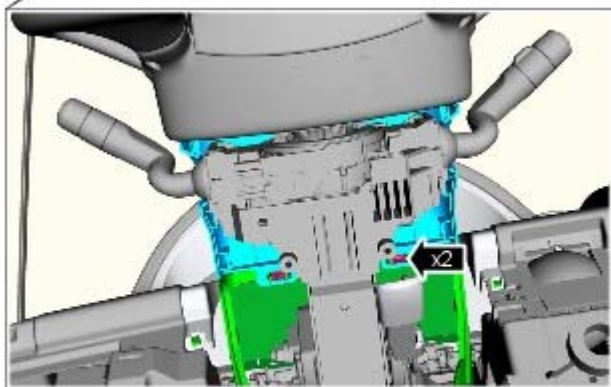
6. Remove the steering column lower cowl.



7. Adjust the steering column to its lowest position.

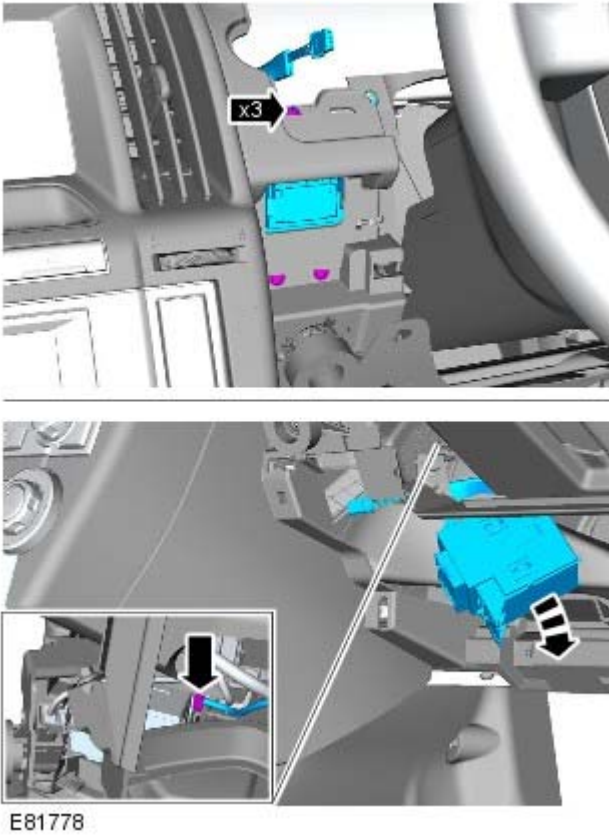


8.



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9. Remove the start control unit.



## Installation

1. To install, reverse the removal procedure.
2. Using the Land Rover approved diagnostic equipment, download the previously stored information to a new start control unit.