

Wipers and Washers -

Capacities

Item	Capacity (liters/pints/US quarts)
Windscreen washer reservoir:	
With headlamp wash	5.8/10.2/6.1
Without headlamp wash	3.1/5.5/3.3

General Specification

Item	Specification
Front wiper motor	Valeo
Power washer pump make	Kautex Textron
Rain sensor	Bonded to inner surface of the windscreen behind the interior mirror
Rear wiper motor	Valeo

Torque Specifications

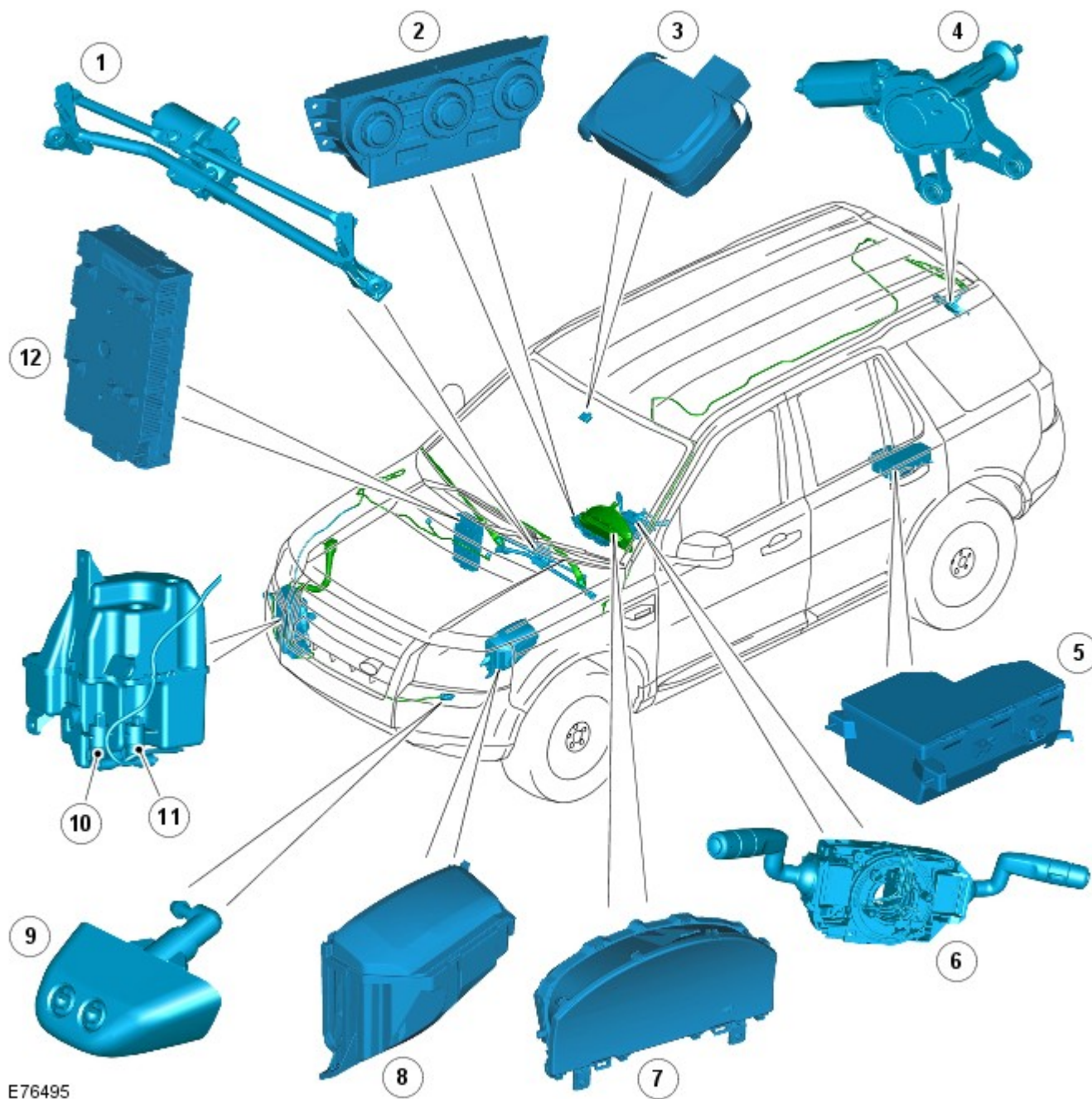
Description	NM	lb-ft
Front wiper arms to linkage nut	45	33
Rear window wiper motor nuts	10	7
Rear wiper arm to motor nut	7	5
Wiper linkage to body bolts	8	6
Washer reservoir and pump assembly to body bolts	6	4
Washer reservoir and pump assembly to bumper armature bolts	6	4
Washer reservoir filler neck support bolt	4	3
Windshield wiper motor bolts	10	7

Part Number

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Wipers and Washers - Wipers and Washers

Description and Operation

COMPONENT LOCATION

E76495

Item	Part Number	Description
1	-	Windshield wiper motor and linkage assembly
2	-	Automatic Temperature Control (ATC) module
3	-	Rain sensor (if fitted)
4	-	Rear screen wiper motor
5	-	Auxiliary Junction Box (AJB)
6	-	Right Hand (RH) steering column multi-function switch
7	-	Instrument cluster
8	-	Battery Junction Box (BJB)
9	-	Headlamp washer jets
10	-	Headlamp washer pump
11	-	Windshield and rear screen washer pump

OVERVIEW

Windshield wiper and washer operation is controlled by the CJB in response to driver input and if fitted, signals from the rain sensor. The front wipers have 4 operational states:

- Flick wipe
- Intermittent/Auto (vehicles without/with rain sensor fitted)
- Slow wipe
- Fast wipe.

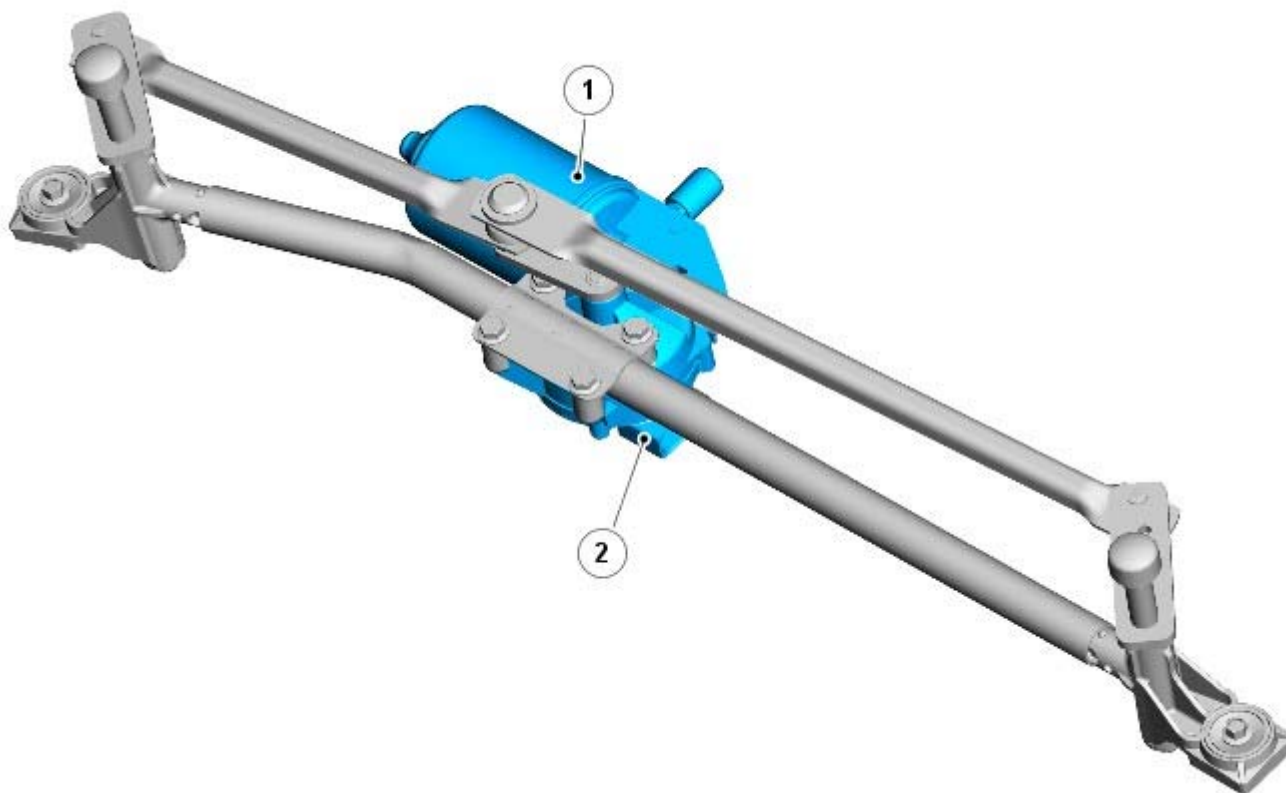
The 'Auto' function requires an input from the rain sensor. The rain sensor is mounted on the inner surface of the windshield and transmits an infra-red signal to determine the amount of water on the outer surface of the windshield. A value is then transmitted to the CJB over the Local Interconnect Network (LIN) bus.

The CJB also controls operation of the headlamp wash function. For more information, refer to 'Headlamp Washers' below.

The rear screen wiper system operates independently of the windshield wiper system and is controlled by the CJB on receipt of LIN bus messages from the RH steering column multi-function switch.

NOTE: The windshield and rear screen washers utilize the same pump meaning only 1 wash function, either front or rear, can be performed at any one time.

WINDSHIELD WIPER MOTOR



E84139

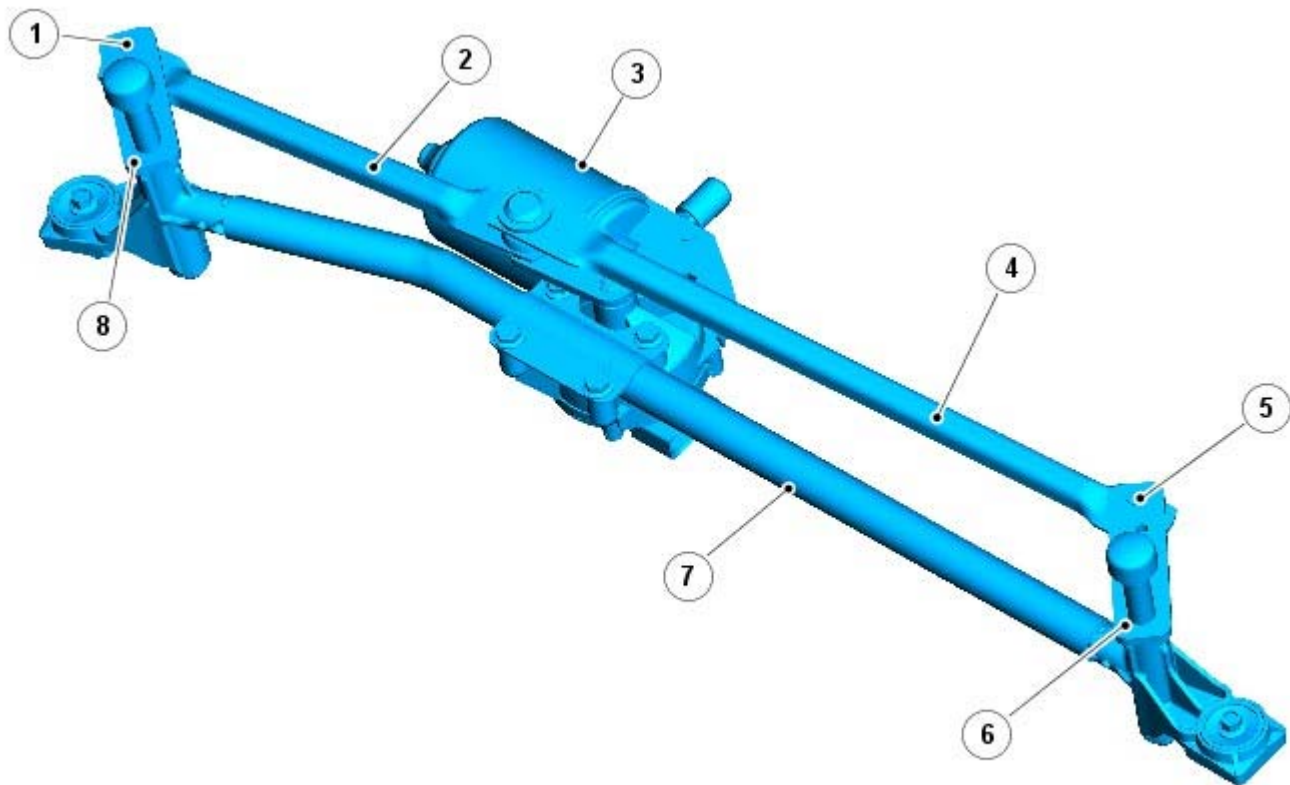
Item	Description
1	Motor
2	Electrical connector

The windshield wiper motor drives a gear wheel via a worm drive attached to the motor spindle. The gear wheel has a central spigot which provides the attachment point for the motor crank. The motor crank attaches directly to the wiper linkage link rods and is secured by a single nut. The motor assembly and wiper linkage are a single component and must be removed or replaced as such.

For additional information, refer to: [Windshield Wiper Motor](#) (501-16 Wipers and Washers, Removal and Installation).

The motor assembly is connected to the vehicle harness by a 4 pin electrical connector. The electrical connector provides 2 battery voltage feeds from the BJB, a wiper park feed from the CJB, and a ground path for the motor assembly.

WINDSHIELD WIPER LINKAGE



E84140

Item		Description
1		RH crank
2		RH link rod
3		Windshield wiper motor
4		Left Hand (LH) link rod
5		LH pivot assembly
6		LH crank
7		Main tube
8		RH pivot housing

The windshield wiper linkage comprises a main tube with a pivot housing at each end. The windshield wiper motor is mounted centrally on the main tube and acts directly on a pair of link rods. The link rods convert the rotary motion of the motor into a linear, reciprocating motion.

The link rods are connected to the main tube via a crank at each end. The cranks convert the linear, reciprocating motion of the link rods into a rotary, reciprocating motion of the pivots. This translates to a reciprocating motion of the wiper blades across the windshield.

The windshield wiper linkage and motor assembly are a single component and must be removed or replaced as such. For additional information, refer to: [Windshield Wiper Motor](#) (501-16 Wipers and Washers, Removal and Installation).

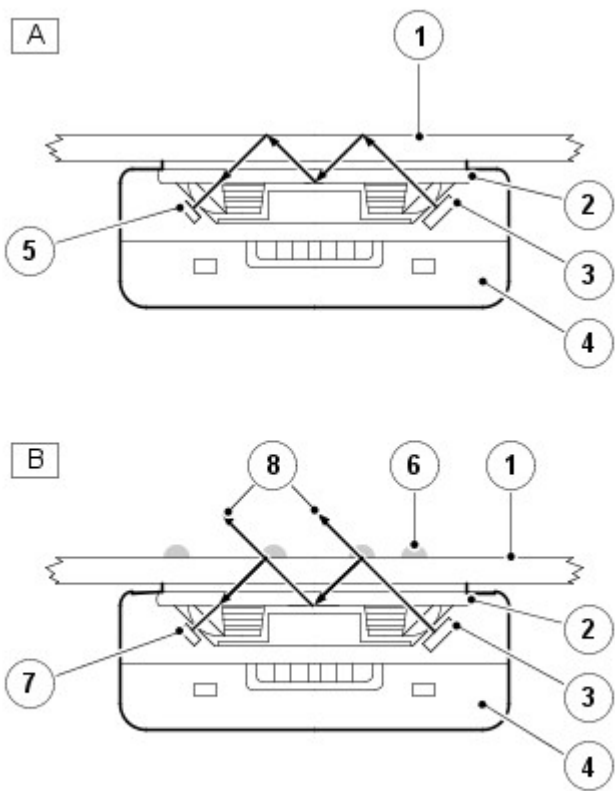
RAIN SENSOR



E84141

The rain sensor is located behind the interior mirror trim casing and sits in a bracket which is bonded to the inner surface of the windshield. The sensor contains a number of transmitter and receiver diodes which emit and receive infrared light. By comparing the received light signal against the known transmitted light signal, the rain sensor can determine the amount of water on the outer surface of the windshield.

NOTE: **A** = Clean and dry windshield; **B** = Wet and dirty windshield



E43326

Item		Description
1		Windshield outer surface
2		Optical element
3		Transmitter diodes (100% light transmitted)
4		Rain sensor
5		Receiver diodes (100% light received)
6		Water droplets/film
7		Receiver diodes (less than 100% light received)

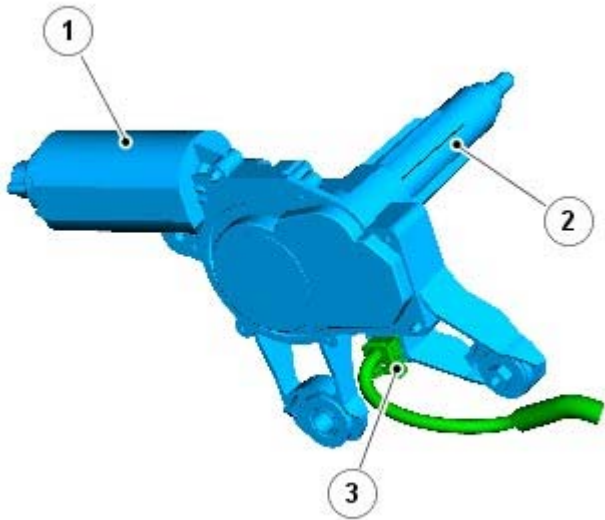
8	Lost light
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NOTE: The rain sensor also contains a light sensor. The light sensor is used to control operation of the automatic headlamps function.

For additional information, refer to: [Exterior Lighting](#) (417-01 Exterior Lighting, Description and Operation).

The rain sensor is connected to the vehicle harness by a 3 pin electrical connector. The electrical connector provides a power feed from the CJB, a LIN bus connection to the CJB and a ground path.

REAR SCREEN WIPER MOTOR



E84142

Item		Description
1		Motor
2		Spindle
3		Electrical connector

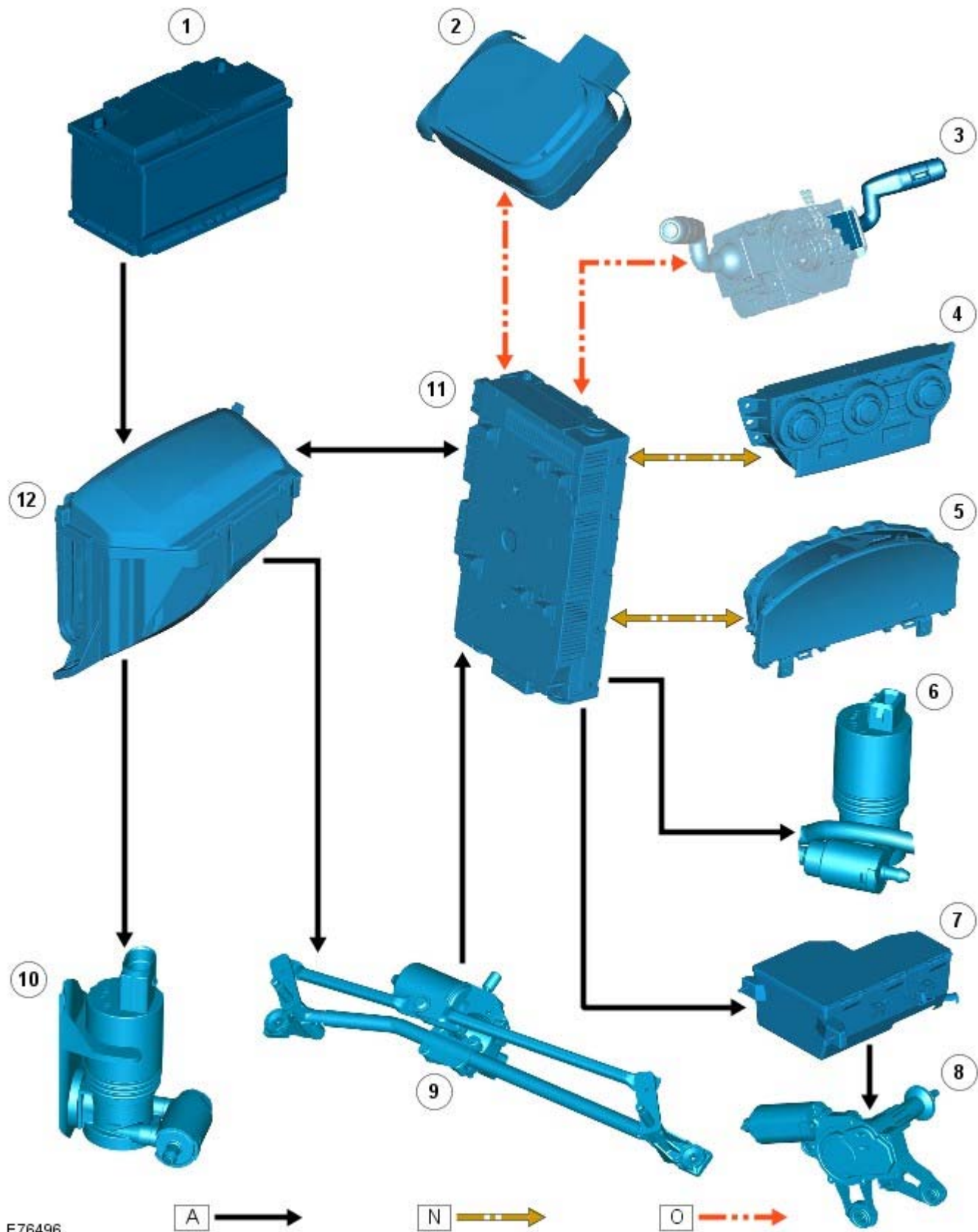
The single speed rear screen wiper motor is mounted on the inner surface of the liftgate and is secured by 3 bolts. Rubber bushes isolate the motor assembly from the body to help reduce the transmission of motor operating noise to the liftgate. The motor is located on a worm drive mechanism, which converts the rotary motion of the motor output spindle into the required arc for the rear wiper blade.

A 3 pin electrical connector is used to connect the rear screen wiper motor to the vehicle harness. The electrical connector provides a power feed to the motor from the AJB, a wiper park feed from the CJB, and a ground path.

The AJB contains the rear screen wiper relay. Operation of the relay is controlled by the CJB, which provides feed and ground paths according to logic contained within its software.

CONTROL DIAGRAM

NOTE: **A** = Hardwired; **N** = Medium speed CAN bus; **O** = LIN bus



E76496

Item		Description
1		Battery
2		Rain sensor
3		RH steering column multi-function switch
4		ATC module
5		Instrument cluster
6		Windshield and rear screen washer pump
7		AJB

8		Rear screen wiper motor
9		Windshield wiper motor
10		Headlamp washer pump
11		CJB
12		BJB

PRINCIPLES OF OPERATION

The wiper and washer system can operate in a number of different ways when the vehicle is in power mode 4 through 8. Requests from the RH steering column multi-function switch are transmitted over the LIN bus to the CJB, which is the main controller for the system.

Windshield Wiper Slow Wipe

On receiving a request for slow windshield wiper operation the CJB will energize relay 11 in the BJB. When energized, relay 11 provides a feed to the switch contacts of relay 8, which is also located in the CJB. Relay 8 is the fast/slow wipe relay. When slow wipe has been requested relay 8 remains de-energized, allowing a feed to flow across the relay switch contacts to the windshield wiper motor slow speed brush contacts.

Windshield Wiper Fast Wipe

On receiving a request for fast windshield wiper operation the CJB will energize relay 11 and relay 8 in the BJB. When energized, relay 11 provides a feed to the switch contacts of relay 8. The energized relay 8 provides a feed to the windshield wiper motor fast speed brush contacts.

Windshield Wiper Intermittent Wipe

On receiving a request for intermittent windshield wiper operation, the CJB will energize relay 11 in the BJB to operate the wipers at slow speed. Software contained within the CJB interprets the time delay requested and controls operation of relay 11 accordingly.

The intermittent wiper setting broadcast on the LIN bus to the CJB equates to the following time delays.

LIN Bus Signal	Time Delay (seconds)
1	22
2	15.5
3	9.5
4	6
5	3.5
6	1

In the event of a LIN bus failure between the CJB and the RH steering column multi-function switch, the CJB will default to 'Limp Home' mode (see below).

Windshield Wiper Automatic Wipe

On receiving a request for automatic windshield wiper operation, the CJB interprets LIN bus messages received from the rain sensor. The rain sensor provides LIN bus messages with values ranging from 0 to 7. A signal value of 0 is interpreted by the CJB as there being no water on the windshield.

A signal value from 1 to 5 is interpreted by the CJB as there being a small amount of water hitting the windshield. In this instance, the CJB initiates a slow wipe routine as detailed in the 'Windshield Wiper Slow Wipe' section above.

A signal value from 6 to 7 is interpreted by the CJB as there being a large amount of water hitting the windshield. In this instance, the CJB initiates a fast wipe routine as detailed in the 'Windshield Wiper Fast Wipe' section above.

Rain sensor sensitivity can be adjusted by turning the rotary control on the RH steering column multi-function switch to the required position. Six different sensitivity settings are available, which are broadcast over the LIN bus to the CJB.

NOTE: The CJB will only change a fast wipe routine to a slow wipe routine if the rain sensor value is lower than 4.

Windshield Wiper Flick Wipe

On receiving a request for flick wipe operation the CJB will operate the windshield wipers as described in the 'Slow Wipe' section above until the request is removed.

Windshield Wiper Park

The windshield wiper park switch is integral with the windshield wiper motor. The park switch ensures the windshield wipers return to the park position if the windshield wiper request is cancelled mid-stroke.

The CJB is connected to one side of the park switch. The park switch contacts are open when the wipers are in any position except the park position. While the switch contacts are open, the CJB continues to energize relays 11 and 8 in the BJB, even if a LIN bus signal has been received from the RH steering column multi-function switch requested the wipers are stopped.

When the wipers reach the park position, the park switch contacts close and a ground path is created. When the CJB registers this ground path its software logic determines the wipers are in the park position and de-energizes relays 11 and 8 in the BJB.

Windshield Wiper Limp Home Mode

In the event of a LIN bus failure between the CJB and the RH steering column multi-function switch when the windshield wipers are active, the CJB will enter limp home mode. In limp home mode, the CJB will only power the windshield wipers at slow speed.

Windshield Wiper Service Position

The windshield wipers can be parked on the windshield to aid the fitment of new wiper blades. For more information, refer to the 'Owners Handbook'.

Rear Screen Wiper

On receiving a request for rear screen wiper operation the CJB will energize relay RA2 in the AJB. When energized, relay RA2 provides a feed to the rear screen wiper motor. The rear screen wiper operates intermittently, with a delay between wipes of approximately 6 seconds. The CJB controls operation of relay RA2, and consequently rear screen wiper motor operation, accordingly.

The CJB also provides a feed to the rear screen wiper motor park switch. The park switch is integral with the rear screen wiper motor and ensures the wiper returns to the park position if the rear wiper request is cancelled mid-stroke. The park switch contacts are closed when the rear wiper is in any position except the park position. This allows the CJB to return the rear wiper to the park position when relay RA2 is de-energized.

The CJB will also power the rear screen wiper motor if reverse gear is selected while the windshield wiper function is active. On vehicles fitted with an automatic transmission, the reverse gear signal originates in the Transmission Control Module (TCM). The TCM broadcasts a reverse gear signal over the high speed CAN bus to the CJB, which responds by operating the rear wiper.

On vehicles fitted with a manual transmission, the reverse gear signal originates at the reverse gear switch. The reverse gear switch is hardwired to the CJB.

Windshield Washers

On receiving a request for windshield washer operation the CJB will energize the front washer control relay. This allows a battery voltage feed to flow to the washer pump. A ground path for the pump is provided by the de-energized rear washer control relay. Both washer control relays are integral with the CJB.

When windshield washer operation is requested, the windshield washers will operate. The CJB will delay wiper operation for 100 ms after the washer switch is pressed. If the switch is pressed for less than 100 ms, the CJB will not operate the wipers.

The CJB will power the windshield wipers for as long as washer operation is requested, although the washers will time out after 10 seconds. After the washer switch has been released, the CJB will operate the windshield wipers through 2 more wipe cycles.

Rear Screen Washer

On receiving a request for rear screen washer operation the CJB will energize the rear washer control relay. This allows a battery voltage feed to flow to the washer pump. A ground path for the pump is provided by the de-energized front washer control relay. Reversing the polarity of the pump (see 'Windshield Washers' above) allows washer fluid to be directed to the rear screen washer jet rather than the windshield washer jets. The rear screen washer jet is incorporated into the high mounted stop lamp.

The rear screen washer will operate for up to 10 seconds if continuously requested. When rear screen washer operation is requested, the rear screen wiper will operate continuously until the switch is released. After the switch has been released, or following 10 seconds of continuous operation, the CJB will operate the rear screen wiper through 2 or 3 more wipe cycles.

Headlamp Washers

When the vehicle enters ignition mode 4 (accessory) to 7 (engine running) the first windshield wash request greater than 100 ms will operate a headlamp power wash sequence. The CJB will then start a 10 minute timer. If 5 requests for windshield washer operation are made within this 10 minute window, the CJB will power the headlamp washers upon receiving the fifth request. When this occurs, the 10 minute timer is reset to 0.

If the CJB receives no windshield washer requests during a 10 minute window, the headlamp washers will operate on the first request received after the 10 minute window has elapsed. Again, once the headlamp washers have been operational, the CJB resets the timer to 0.

The headlamp washers will only operate when the headlamps are on. The CJB receives a 'lights on' signal from the light control module over the LIN bus.

When headlamp washer operation is required, the CJB energizes relay 9 in the BJB, allowing a battery voltage feed to power the headlamp washer pump. A ground path for the washer pump is provided by the de-energized relay 12, which is also located in the BJB. This sequence of events provides washer fluid to the headlamp 1 washer jets.

After this sequence the power supply to the pump is reversed. The CJB does this by de-energizing relay 9 and energizing relay 12. This allows the pump to provide washer fluid to the headlamp 2 washer jets. The sequence of events runs as follows:

- Power to headlamp 1 washer - 500 ms
- Delay to power headlamp 2 washer - 100 ms
- Power to headlamp 2 washer - 500 ms
- Delay (soak time) to power 1 headlamp washer - 700 ms
- Power to 1 headlamp washer - 500 ms
- Delay to power 2 headlamp washer - 100 ms
- Power to 2 headlamp washer - 500 ms

If there is less than 1 liter (0.26 US gallon) of washer fluid in the washer fluid reservoir, the CJB will suspend headlamp washer operation. The fluid level switch is hardwired to the CJB, which also transmits a low fluid signal to the instrument cluster over the medium speed CAN bus. For additional information, refer to:

[Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation),

[Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

Wipers and Washers - Wipers and Washers

Diagnosis and Testing

Principles of Operation

For a detailed description of the wiper and washer systems, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Wipers and Washers](#) (501-16 Wipers and Washers, 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"> ● Wiper blades ● Wiper pivot arm shaft ● Washer reservoir ● Hose(s) ● Washer jet(s) 	<ul style="list-style-type: none"> ● Fuses/relays (refer to electrical guide) ● Wiring harness ● Correct engagement of electrical connectors ● Loose or corroded connections

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, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

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 extra information read by the manufacturer-approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current 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, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B109512	Wiper On/Off Relay - circuit short to power	<ul style="list-style-type: none"> ● Wiper On/Off relay circuit - short to power 	Refer to electrical circuit diagrams and check wiper On/Off relay circuit for short to power
B109514	Wiper On/Off Relay - circuit short to ground or open	<ul style="list-style-type: none"> ● Wiper On/Off relay circuit - short to ground, open circuit 	Refer to electrical circuit diagrams and check wiper On/Off relay circuit for short to ground, open circuit
B109612	Wiper High/Low Relay - circuit short to power	<ul style="list-style-type: none"> ● Wiper High/Low relay circuit - short to power 	Refer to electrical circuit diagrams and check wiper High/Low relay circuit for short to power
B109614	Wiper High/Low Relay - circuit short to ground or open	<ul style="list-style-type: none"> ● Wiper High/Low relay circuit - short to ground, open circuit 	Refer to electrical circuit diagrams and check wiper High/Low relay circuit for short to ground, open circuit
B10AD04	Rain Sensor - System Internal Failure	<ul style="list-style-type: none"> ● Internal sensor failure 	Install a new rain sensor. REFER to: Rain Sensor (501-16 Wipers and Washers, Removal and Installation).
B10AD09	Rain Sensor - Component Failures	<ul style="list-style-type: none"> ● Rain sensor incorrectly installed ● Rain sensor internal failure 	Check for correct installation of rain sensor. Install a new sensor as required. REFER to: Rain Sensor (501-16 Wipers and Washers, Removal and Installation).

DTC	Description	Possible Cause	Action
B113188	Wiper Motor Module - Bus off	<ul style="list-style-type: none"> Lost communications with wiper motor module 	Carry out diagnostic strategy associated with this DTC using manufacturer approved diagnostic system
B1C8212	Headlamp Washer Relay Coil Circuit - circuit short to power	<ul style="list-style-type: none"> Headlamp washer relay control circuit - short to power 	Refer to electrical circuit diagrams and check headlamp washer relay control circuit for short to power
B1C8214	Headlamp Washer Relay Coil Circuit - circuit short to ground or open	<ul style="list-style-type: none"> Headlamp washer relay control circuit - short to ground, open circuit 	Refer to electrical circuit diagrams and check headlamp washer relay control circuit for short to ground, open circuit
C200412	Headlamp washer relay B - circuit short to power	<ul style="list-style-type: none"> Headlamp washer relay B circuit - short to power 	Refer to electrical circuit diagrams and check headlamp washer relay B circuit for short to power
C200414	Headlamp washer relay B - circuit short to ground or open	<ul style="list-style-type: none"> Headlamp washer relay B circuit - short to ground, open circuit 	Refer to electrical circuit diagrams and check headlamp washer relay B circuit for short to ground, open circuit
U023100	Lost Communication With Rain Sensing Module	<ul style="list-style-type: none"> Lost communication with rain sensing module 	Carry out the associated network test for this DTC using the manufacturer approved diagnostic system

Wipers and Washers - Windshield Wiper Motor

Removal and Installation

Removal

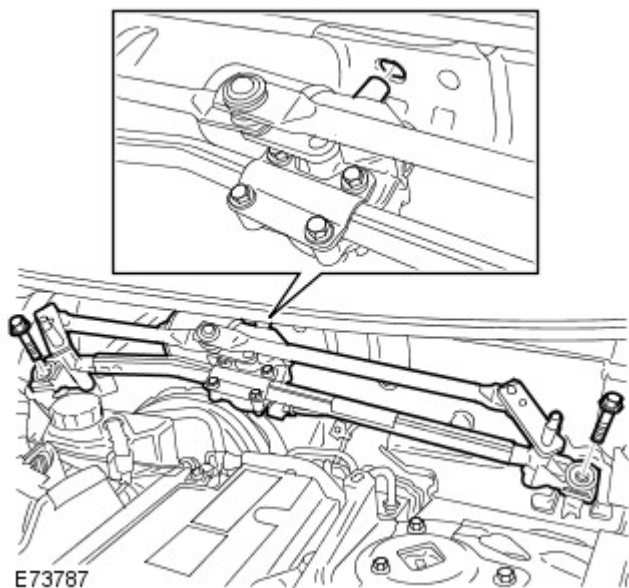
NOTE: Removal steps in this procedure may contain installation details.

1. Remove the plenum chamber panel.

Refer to: [Plenum Chamber](#) (412-01 Climate Control, Removal and Installation).

2. Remove the windshield wiper motor.

Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

Wipers and Washers - Rear Window Wiper Motor

Removal and Installation

Removal

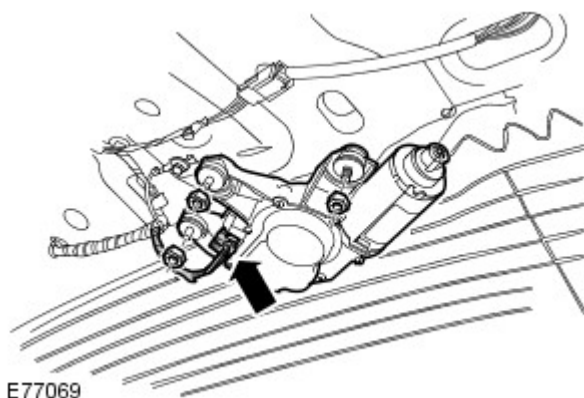
NOTE: Removal steps in this procedure may contain installation details.

1. Remove the rear window wiper pivot arm.
2. Remove the liftgate trim panel.

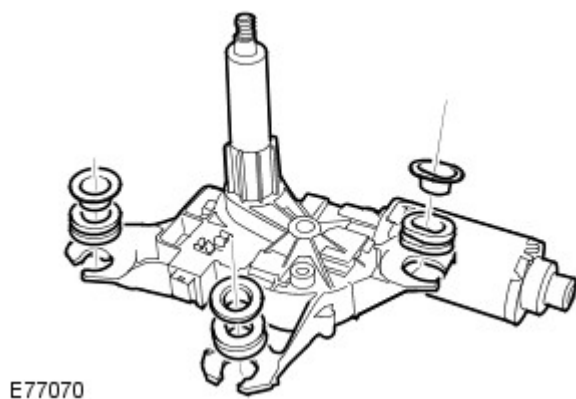
Refer to: [Liftgate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the rear window wiper motor.

Torque: 10 Nm



4. NOTE: Do not disassemble further if the component is removed for access only.



Installation

1. To install, reverse the removal procedure.

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Wipers and Washers - Rain Sensor

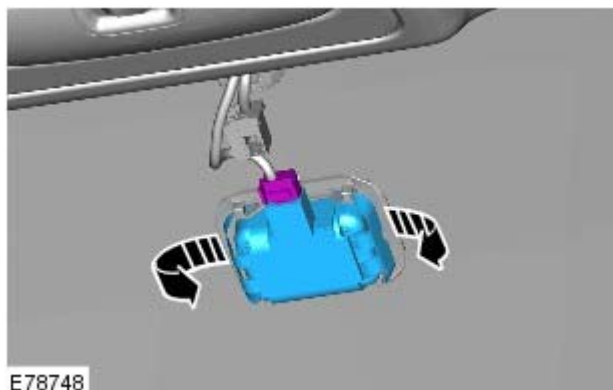
Removal and Installation

Removal

1. Remove the interior mirror.

Refer to: [Interior Rear View Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).

- 2.




Installation

1. To install, reverse the removal procedure.

Wipers and Washers - Headlamp Washer Jet

Removal and Installation

Removal

1.  **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.

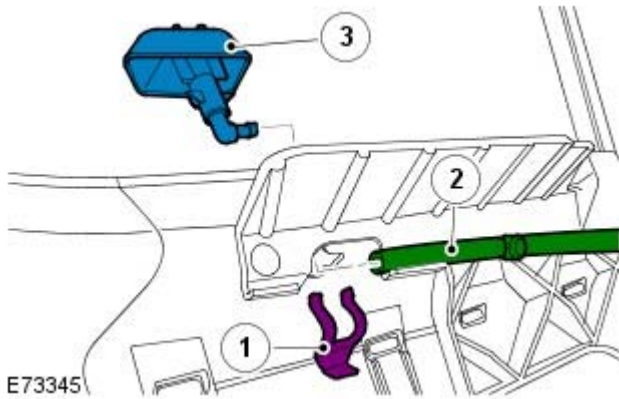
2. Remove the front wheels and tires.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3. Remove the front bumper cover.

Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

4.



Installation

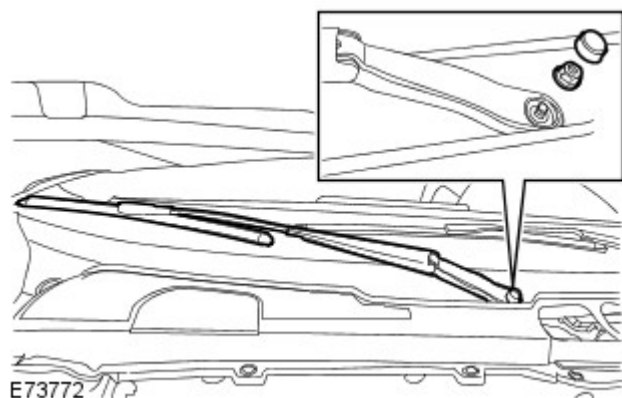
1. To install, reverse the removal procedure.

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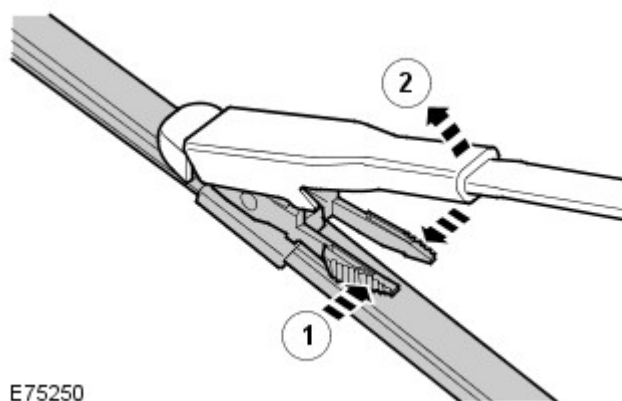
Wipers and Washers - Wiper Pivot Arm

Removal and Installation

Removal

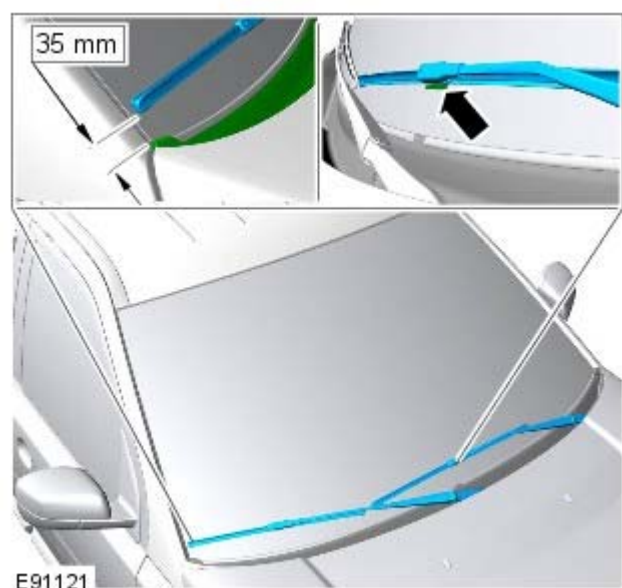


1.



2. **NOTE:** Do not disassemble further if the component is removed for access only.

Installation




1. **Torque:** 25 Nm

Wipers and Washers - Windshield Washer Reservoir

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.  **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.

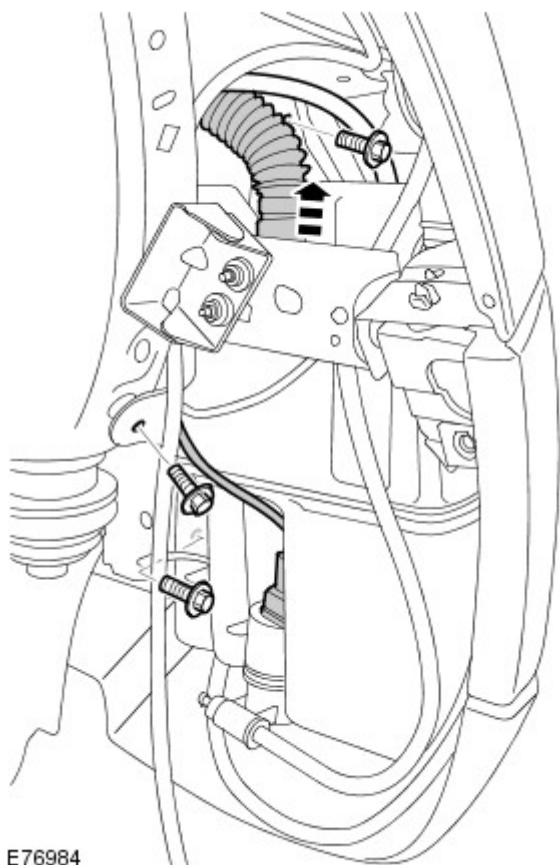
2. Remove the RH fender splash shield.

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

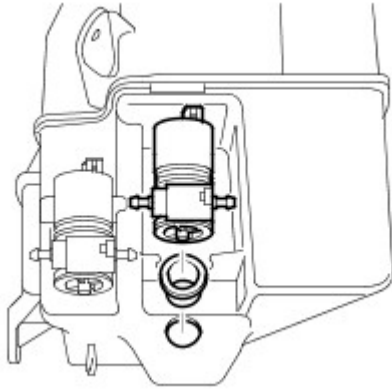
3. Drain the washer reservoir fluid.

4. Remove the windshield washer reservoir.

Torque: 6 Nm



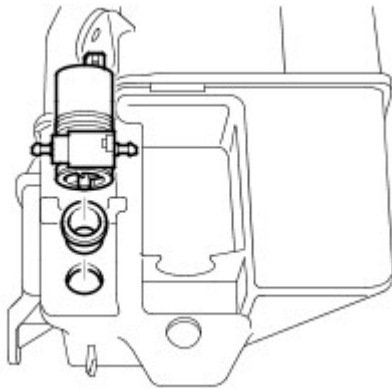
E76984



E76985

5. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the windshield washer pump.



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6. Remove the headlamp washer pump.


Installation

1. To install, reverse the removal procedure.

Wipers and Washers - Headlamp Washer Pump

Removal and Installation

Removal

1.  **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.

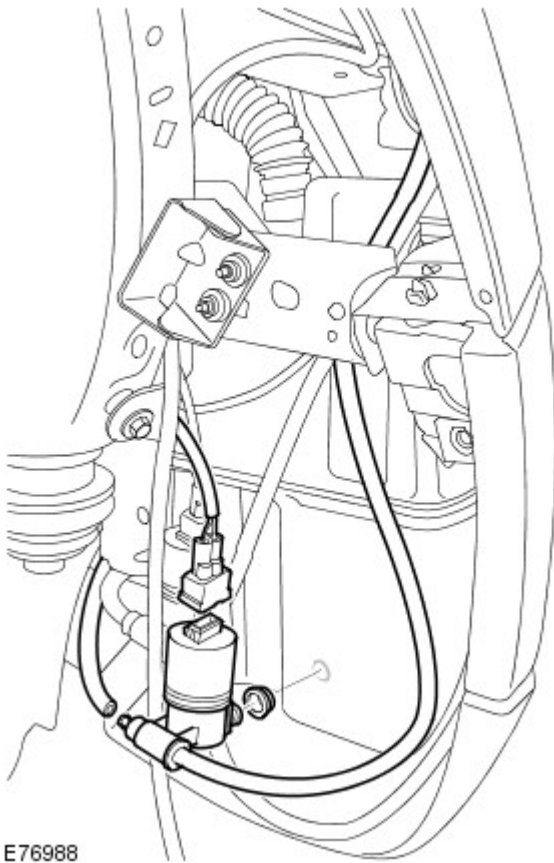
2. Remove the RH fender splash shield.

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

3. Drain the washer reservoir fluid.

4. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the headlamp washer pump.




Installation

1. To install, reverse the removal procedure.

Wipers and Washers - Rear Window Wiper Pivot Arm

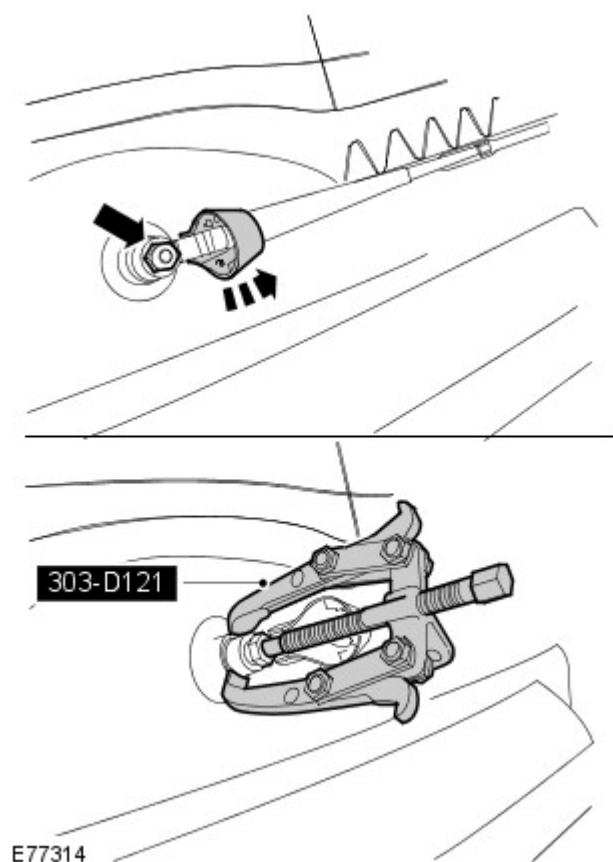
Removal and Installation


Special Tool(s)

	<p>303-D121 Puller, General Purpose</p>
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Removal

NOTE: Removal steps in this procedure may contain installation details.



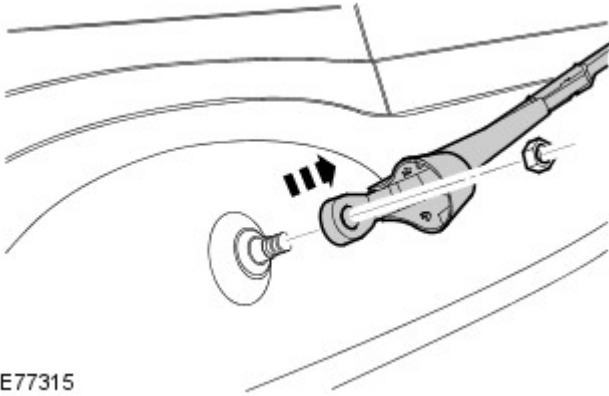
1.  **CAUTION:** Make sure that these components are installed to the noted removal position.

- Release the cover.
- Loosen, but do not remove the nut.
- Using the special tool, release the rear window wiper pivot arm.

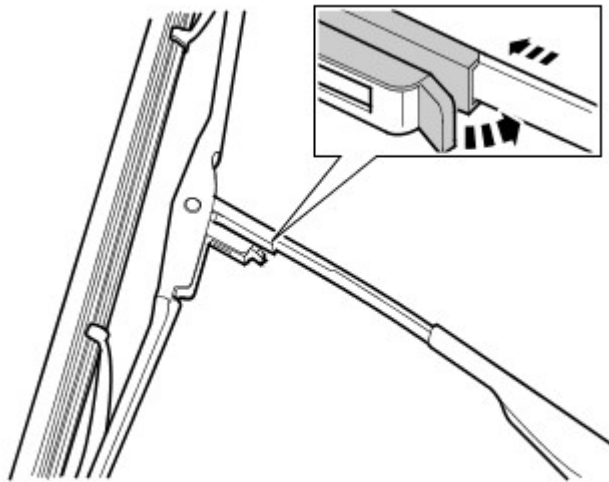
Special Tool(s): [303-D121](#)

2. Remove the rear window wiper pivot arm nut.

Torque: 7 Nm



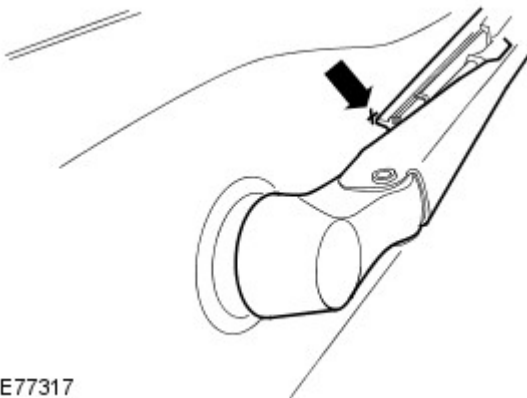
3. Remove the rear window wiper pivot arm.



4. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the rear window wiper blade.

Installation



1. **CAUTION:** Make sure that the component aligns with the installation mark.

To install, reverse the removal procedure.