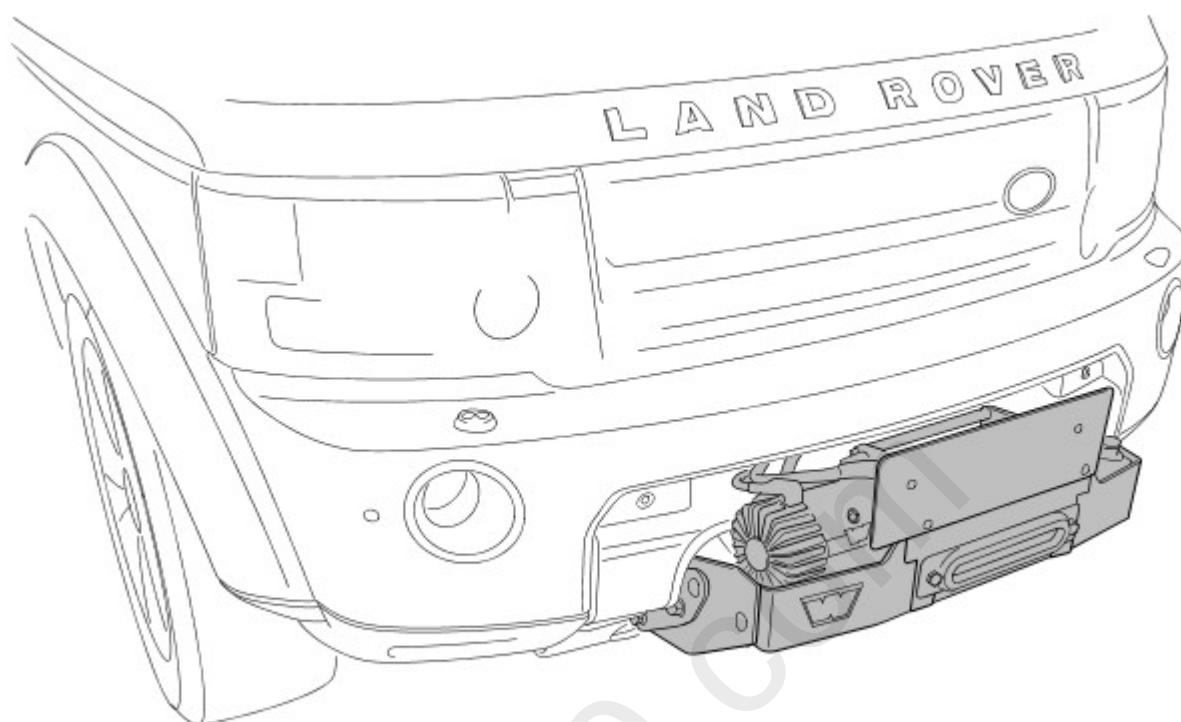


Winch - Winch - Component Location

Description and Operation

COMPONENT LOCATION



E136475

Winch - Winch - Overview

Description and Operation

OVERVIEW

The 9.5XP winch is manufactured by WARN in the U.S.A. The winch features a 6 Horse Power (HP) High Output Parallel Series Wound winch motor.

The winch has 3-stage planetary gearing and full-face contact drum seals, motor and end housing gaskets for extreme duty water resistance.

SPECIFICATIONS:

- WARN Part number: 70100 (12V)
- Rated Line Pull: 9,500 lbs. (4310 kgs) single-line
- Intended Use/Application: Vehicle Recovery
- Motor: 12V 6 hp, High Output Parallel Series Wound
- Remote Control: Remote switch, 12' (3.7m) lead
- Geartrain: 3-Stage Planetary Gear Ratio: 156:1
- Lubrication: 76 Moly low temperature
- Clutch (freespooling): Sliding Ring Gear
- Brake: Automatic Direct Drive Cone
- Wire Rope: 100', 5/16" diameter (30m, 8mm diam.)
- Fairlead: Hawse
- Recommended Battery: 650 CCA minimum for winching
- Battery Leads: 2 gauge, 85" (2.20m)
- Finish: High-gloss dark gray powder coat
- Drum Diameter/Length: 2.5"/9.0" (6.4cm/23cm)
- Weight: 87 lbs. (39.5 kgs.) (winch only, not including mounting cradle).

12V DC PERFORMANCE SPECIFICATIONS:

Line Pull Lbs.(Kgs.)	Line Speed FT. / min(M / min.)	Motor Current	Pull by Layer: Layer / Lbs(Kgs.)
0	38 (11.6)	70 Amps	1/9500 (4313)
2000 (910)	16.8 (5.1)	175 Amps	2/8650 (4927)
4000 (1818)	12.8 (3.9)	262 Amps	3/7920 (3595)
6000 (2720)	10.1 (3.1)	335 Amps	4/7400 (3359)
8000 (3630)	8.8 (2.7)	425 Amps	5/6940 (3150)
9500 (4310)	7.6 (2.3)	480 Amps	-

The above performance figures are based on the first layer of the drum.

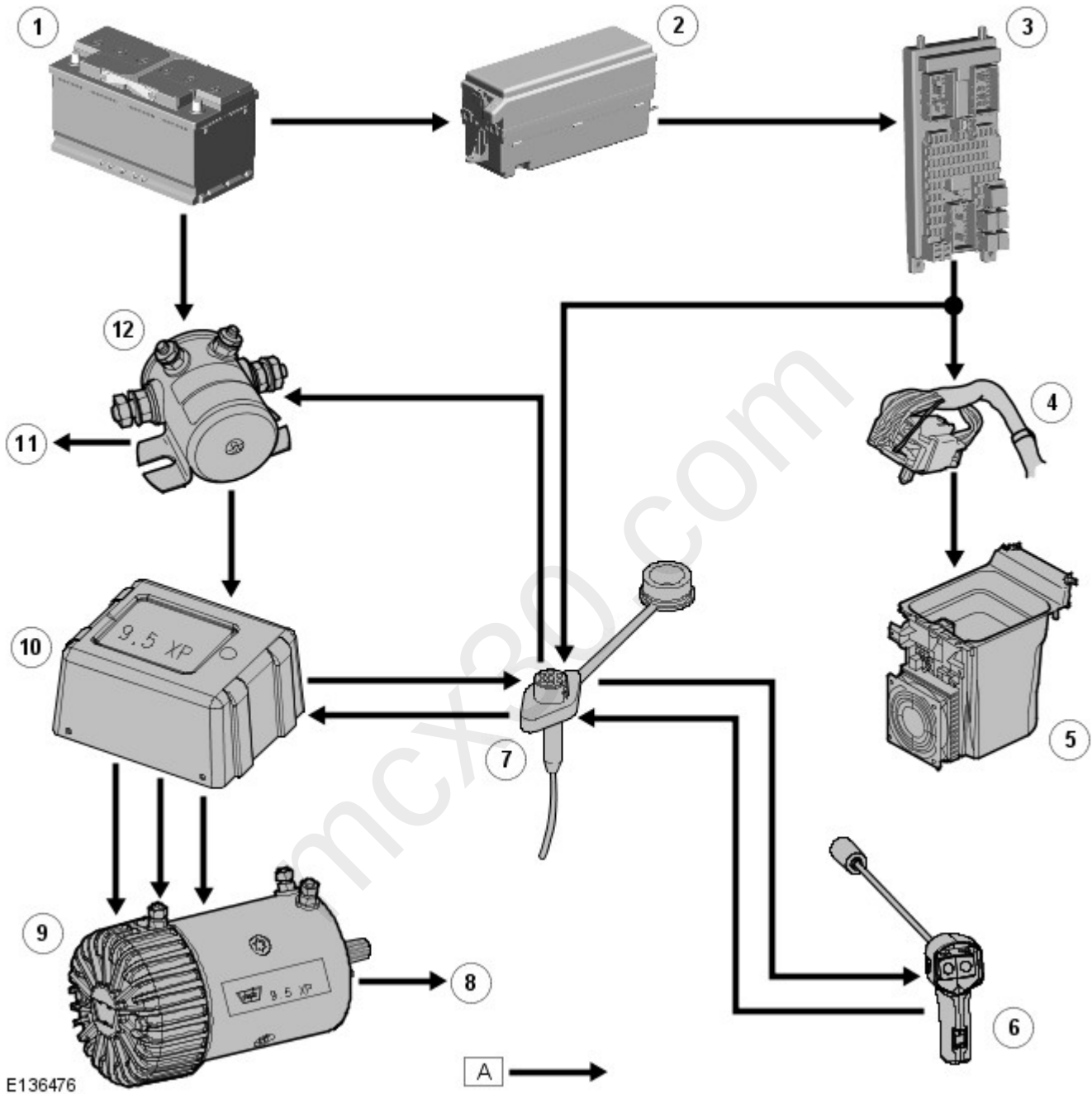
Winch - Winch - System Operation and Component Description

Description and Operation

Control Diagram

• NOTE: A = Hardwired

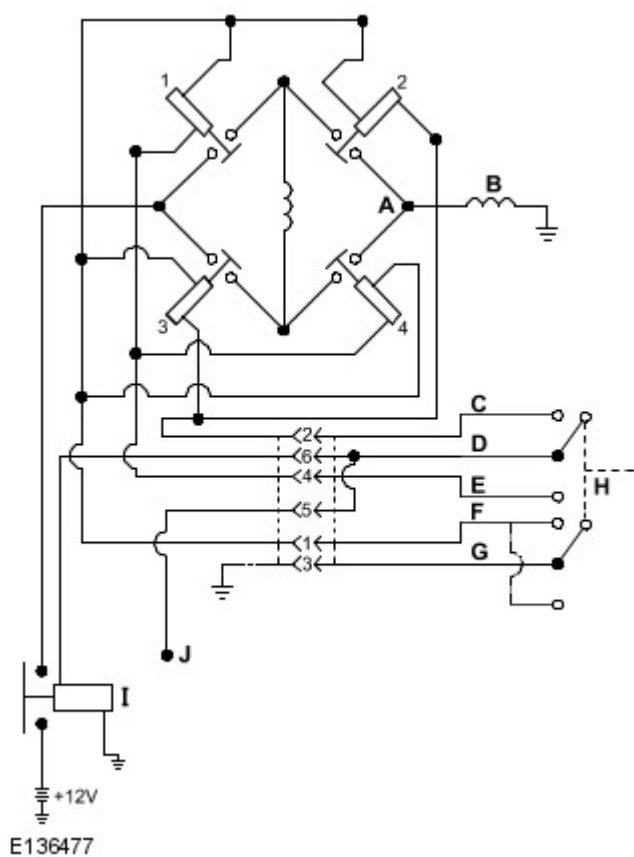
Vehicle connection



E136476

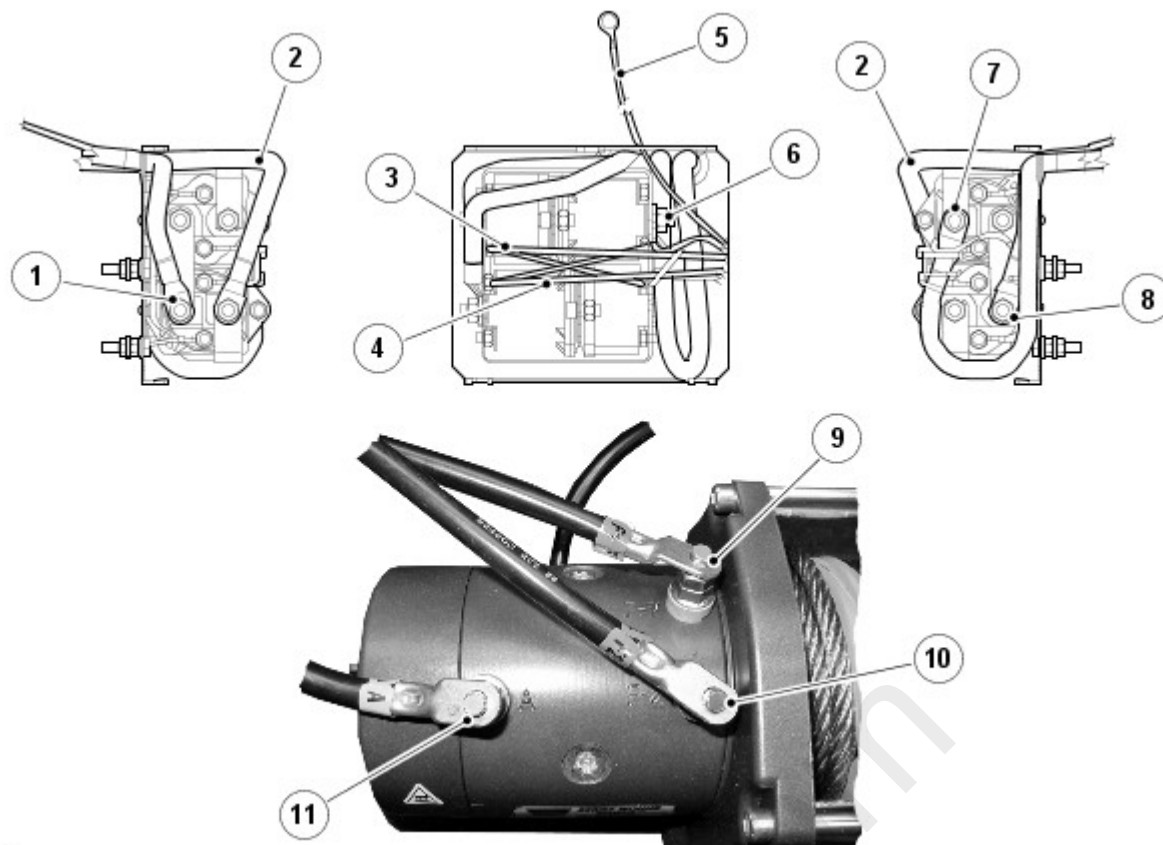
ItemDescription

1	Battery
2	Battery Junction Box (BJB)
3	Central Junction Box (CJB)
4	Harness connector (C2053-12 LR3 or C2754S-13 LR4) (ref only)
5	Floor console cool box (ref only)
6	Remote control
7	Remote control socket
8	Winch motor ground
9	Winch motor
10	Control box
11	Winch power interrupt solenoid ground



Item	Description
A	Field
B	Armature
C	Black wire
D	White wire
E	Green wire
F	Brown wire
G	Red wire
H	Remote control assembly
I	Winch power interrupt solenoid
J	Ignition power supply - Blue wire

Winch Motor/Control Box Connections



E137052

ItemDescription

1	Field cable F1
2	Armature cable A
3	Black wire
4	Green wire
5	Motor ground wire
6	Battery positive (+) cable
7	Battery positive (+) cable terminal
8	Field cable F2
9	Field cable F1
10	Field cable F2
11	Armature cable A

System Operation

OPERATION

WARNING: Observe all Warnings and Cautions detailed in the WARN Winch Operator's Guide and the WARN Basic Guide to Winching Techniques before and during winch operation.

The winch motor is powered by the vehicle battery. The motor provides rotational power to the gear mechanism, which in turn rotates the winch drum and winds the cable.

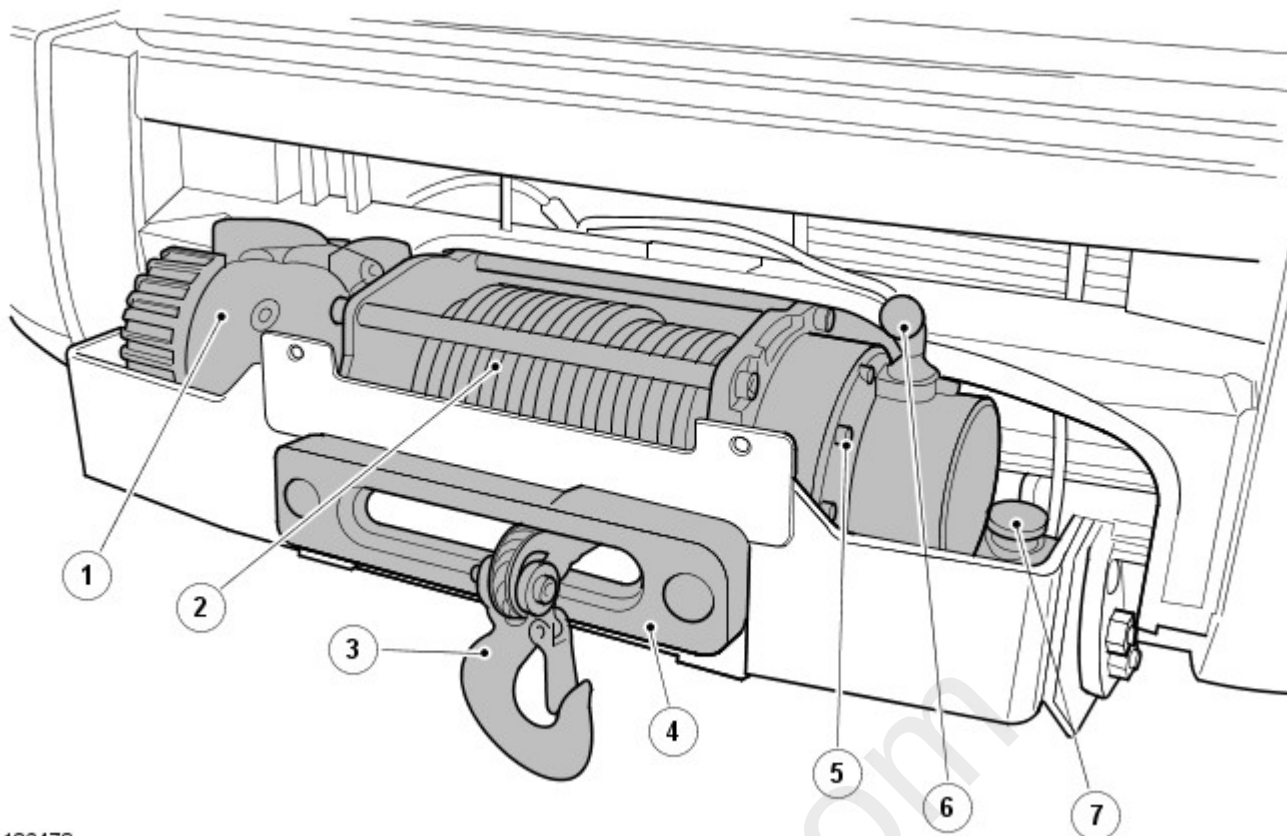
A remote control is used to operate the winch. The remote lead plugs into a remote control connector which is connected to the control box and allows the operator to control the winch winding direction while standing at a safe distance from the wire rope.

The clutch allows rope to be pulled off the drum without motor operation. Refer to the WARN Basic Guide to Winching Techniques.

Component Description

DESCRIPTION

Winch



E136478

ItemDescription

1	Motor
2	Winch drum and wire rope
3	Latching hook
4	Fairlead
5	Gear train housing
6	Clutch lever
7	Remote control socket

The winch is mounted on a bracket which is attached to the vehicle chassis frame. Two additional brackets are attached to the front bumper armature mounting plates. The brackets allow the attachment of the winch mounting bracket. The winch is secured to the bracket with four bolts, washers and nuts.

The winch control box is located on the rear of the front bumper armature. Two additional holes are drilled in the armature and the control box is attached with two bolts, washers and nuts.

The winch control box manages the power supplies to the winch motor and also receives the input from the remote control for winch operation. A remote control socket is located at the **LH (left-hand)** end of the winch mounting bracket and allows for the connection of the remote control.

The winch will operate with the ignition on and the engine not running, but this is not recommended due to excessive battery drain. Therefore it is recommended that the engine is running at all times when the winch is in operation.

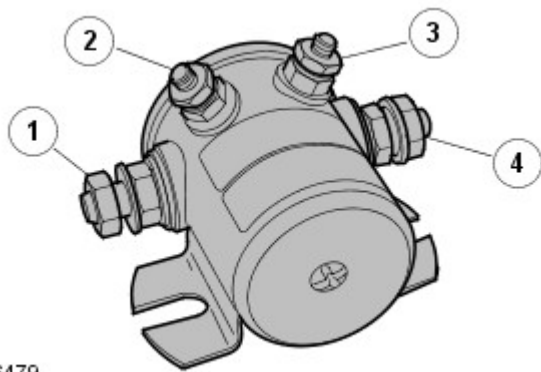
Winch / Vehicle Electrical Connections

A blue wire from the winch remote control socket is routed via a joint below the **EJB (engine junction box)**, through the vehicle bulkhead grommet behind the **EJB**. The blue wire is then routed behind the glove compartment and along the floor console to connector C0253-12 on LR3 vehicles (up to VIN 513325) and C2754S-13 on LR4 vehicles (from VIN 513326), which is located below the cup holder, behind the transmission selector lever. The wire is spliced into the green/white wire into the connector. This connection on the blue wire provides an ignition on signal to the winch control box when the remote control is plugged in.

A red cable is attached from the battery positive (+) terminal to the positive terminal on the winch power interrupt solenoid. This connection is the main power supply to the winch power interrupt solenoid for the winch motor and control box. The winch power interrupt solenoid is located on the plenum in the driver's side of the engine compartment.

A white wire from the winch remote control socket is connected to the winch power interrupt solenoid and energizes the solenoid relay when the ignition on signal is received. A large red wire from the winch power interrupt solenoid is routed to the winch control box. Power is not supplied to the winch control box until the remote control is connected to the remote control socket and the ignition is on.

Winch Power Interrupt Solenoid

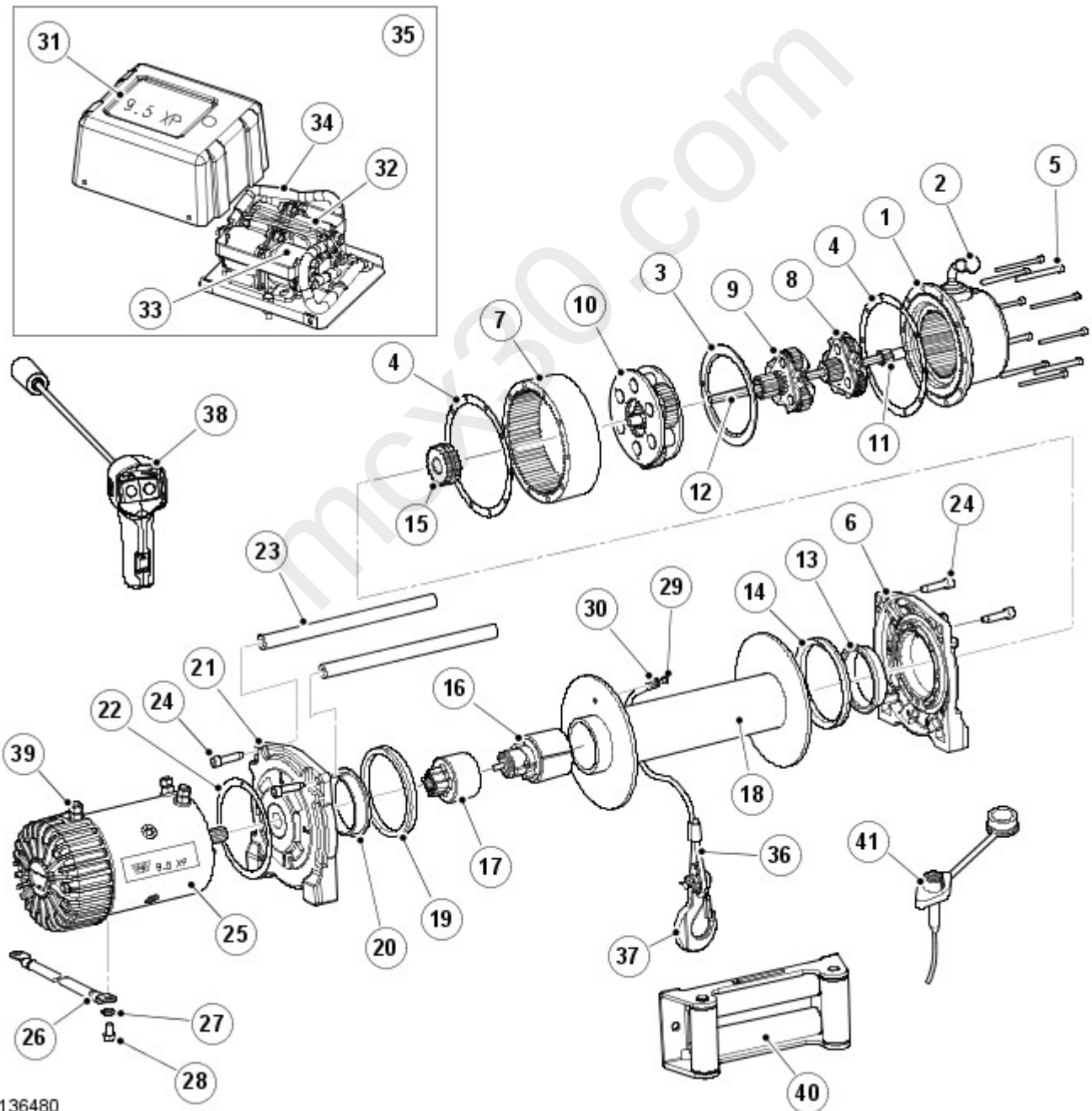


E136479

ItemDescription

1	Power to winch motor
2	Ground
3	Solenoid power supply (ignition on)
4	Power supply from vehicle battery

Winch Exploded View



E136480

ItemDescription

End housing assembly
2 Clutch lever
3 Nylon thrust washer
4 Housing gasket
5 Socket head capscrew (10 off)
6 Gear support drum
7 Ring gear
8 Planet carrier assembly (stage 1)
9 Planet carrier assembly (stage 2)
10 Planet carrier assembly (stage 3)
11 Sun gear
12 Drive shaft
13 Drum bushing
14 V-ring seal
15 Drive spline
16 Brake assembly
17 Motor coupler
18 Drum assembly
19 V-ring seal
20 Drum bushing
21 Motor drum support
22 Motor gasket
23 Tie rod (2 off)
24 Socket head cap screw (4 off)
25 Motor (4.5" Series wound)
26 Electrical cable (black)
27 Helical washer
28 Hex head cap screw
29 Button head cap screw
30 Terminal kit
31 Control pack cover
32 High current solenoid - Power in (2 off)
33 Solenoid - Power out (2 off)
34 Electrical cable (red)
35 Control pack 9.5XP
36 Wire rope assembly
37 Latching hook
38 Remote control assembly
39 Nut (3 off)
40 Fairlead Hawse (roller type shown)
41 Remote control socket assembly

- NOTE: The WARN part numbers for the above components are listed on the WARN web site: www.warn.com

Winch - Winch

Diagnosis and Testing

Principle of Operation

For a detailed description of the winch system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (419-12 Winch)

[Winch](#) (Description and Operation),

[Winch](#) (Description and Operation),

[Winch](#) (Description and Operation).

Inspection and Verification



WARNING: Observe all Warnings and Cautions detailed in the WARN Winch Operator's Guide before and during winch operation.



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. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
- Incorrect installation - Winch motor - Gearbox - Wire rope	- Fuses - Battery (650 CCA minimum) - Loose, corroded or damaged electrical connections - Winch power interrupt solenoid - Control box - Remote control

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

Symptom Chart

Symptom	Possible causes	Action
No winch operation	- Battery/power or ground supply fault - Remote control internal failure - Control box internal failure - Winch motor internal failure	- Refer to the electrical circuit diagrams, check the winch power interrupt solenoid supply fused link ((Fuse 16 to vin 513325)(Fuse 59p from vin 513326)) central junction box - For midtronics battery test GO to Pinpoint Test A. - For remote control circuit checks GO to Pinpoint Test C. - For winch circuit checks GO to Pinpoint Test B.
No winch operation (Clicking sound when remote control switch is activated)	- Battery/power or ground supply fault - Control box internal failure	- For midtronics battery test GO to Pinpoint Test A. - For winch circuit checks GO to Pinpoint Test B.
Winch lacks power, pulls slowly, stalls	- Battery/power or ground supply fault - Winch motor internal failure - Gearbox internal failure	- For midtronics battery test GO to Pinpoint Test A. - For winch circuit checks GO to Pinpoint Test B.
When the remote control is activated, winch operates in only one direction	- Battery/power or ground supply fault - Remote control internal failure - Control box internal failure	- For remote control circuit checks GO to Pinpoint Test C. - For winch circuit checks GO to Pinpoint Test B.
Difficulty in spooling rope from drum by hand	- Wire rope incorrectly wound on drum (Rubbing/binding) - Distorted drum flange - Worn drum bushes	- Confirm the rope is spooled correctly onto the drum - Install a new winch as required. REFER to: Winch (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

Symptom	Possible causes	Action
	- Damaged free spool clutch (inside gear train) - Corroded clutch ring gear	Install a new winch gearbox as required. REFER to: Winch Gear Assembly (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
Winch does not hold load	- Rope is spooled onto the drum in the wrong direction - Winch drum brake is worn or broken	- Confirm the rope is spooled correctly onto the drum - Confirm the clutch is fully engaged - Install a new winch as required. REFER to: Winch (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
Remote control fault	- Winch remote connector terminals damaged - Remote switch internal failure	For remote control circuit checks GO to Pinpoint Test C.
Clutch lever fault	- Cable under load - Clutch or gearbox mechanism internal failure	- Rotate clutch lever on winch. If clutch lever will not rotate, remove tension from the rope and hook by powering out for about 1 second - Attempt to rotate the clutch lever with tension removed. If clutch lever still does not rotate, Install a new winch gearbox as required. REFER to: Winch Gear Assembly (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

PINPOINT TEST A : BATTERY TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: MIDTRONICS BATTERY TEST	
	- Confirm that the vehicle battery charged, in good condition, and the correct specification (650 CCA minimum) - Using a Midtronics hand held tester or the Midtronics GR-1 diagnostic charger, carry out the "Midtronics battery test" as detailed in the battery care manual. Refer to (Service/Maintenance information/Battery care manual) - Record battery diagnostic result on the provided form
	Does the battery pass the "Midtronics battery test"? Yes Check for correct operation, refer to the symptom chart above if customer concern is still evident No Install a new battery as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Check for correct winch operation

PINPOINT TEST B : CIRCUIT CHECKS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: WINCH POWER INTERRUPT SOLENOID - CONNECTIONS	
NOTE: The winch power interrupt solenoid supplies power to the winch control box NOTE: The ignition feed is supplied to the remote control connector (terminal 5) linked internally to (terminal 6) then supplied to (solenoid terminal 3) to energize the winch power interrupt solenoid	
	- Refer to the landrover electrical circuit diagrams, check the winch power interrupt solenoid supply fused link (Fuse 16 to vin 513325)(Fuse 59p from vin 513326) central junction box - Refer to the winch circuit diagrams REFER to: Winch (419-12 Winch, Description and Operation). - Confirm the circuit connections to the winch power interrupt solenoid (Terminal 1 - power to winch control box, Terminal 2 - solenoid ground, Terminal 3 - solenoid power ((C2053-12 to vin 513325)(C2754S-13 from vin 513326)), Terminal 4 - battery supply)
	Are all the electrical connections to the winch power interrupt solenoid clean and secure? Yes GO to B2. No Clean and secure the electrical connections. Check for correct winch operation
B2: WINCH POWER INTERRUPT SOLENOID - OPERATION	
	- With the ignition state on, and the remote control connected - Using a multimeter, check for battery voltage between terminal 1 (power to winch control box) and terminal 2 (winch power interrupt solenoid ground)

	Is battery voltage present? (approx. 12 volts) Yes GO to B3. No Replace the winch power interrupt solenoid as required. REFER to: Winch Solenoid (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Check for correct winch operation
B3: POWER SUPPLY - CONTROL BOX	
 WARNING: Ensure the winch clutch is in free spool mode (Refer to winch operation manual)	
NOTE: The winch power interrupt solenoid supplies power to the winch control box	
	- With the ignition state on, and the remote control connected - Using a multimeter, check for battery voltage between the red power feed to the control box and vehicle ground
	Is battery voltage present? (approx. 12 volts) Yes GO to B4. No Carry out circuit checks to investigate the loss of supply. Rectify as required. Check for correct winch operation
B4: CONTROL BOX INPUT - REMOTE CONTROL	
 WARNING: Ensure the winch clutch is in free spool mode (Refer to winch operation manual)	
NOTE: The winch control box controls the winch motor direction	
NOTE: Power out - The remote control supplies power to remote connector terminal 2 and grounds terminal 1	
NOTE: Power in - The remote control supplies power to remote connector terminal 4 and grounds terminal 1	
	- Refer to the winch circuit diagrams REFER to: Winch (419-12 Winch, Description and Operation). - Using a multimeter, monitor terminal 2 (Black), terminal 4 (Green) and terminal 1 (White)
	Do the terminals 2 and 4 (Power) and terminal 1 (Ground) respond correctly when the remote control is used? Yes GO to B5. No Carry out circuit checks to investigate the loss of supply. Rectify as required. Check for correct winch operation
B5: CONTROL BOX - OUTPUT	
 WARNING: Ensure the winch clutch is in free spool mode (Refer to winch operation manual)	
NOTE: When activated the winch control box supplies power to the winch motor	
NOTE: Power out - The control box supplies power to the winch motor terminal F1 and connects winch motor terminal F2 to terminal A(Armature)	
NOTE: Power in - The control box supplies power to the winch motor terminal F2 and connects winch motor terminal F1 to terminal A(Armature)	
	- Refer to the winch circuit diagrams REFER to: Winch (419-12 Winch, Description and Operation). - Using a multimeter, monitor terminals F1, F2
	Do the terminals F1, and F2 respond correctly when the remote control is used? Yes GO to B6. No Check the connections to the control box. If all the connections are clean and secure, install a new control box as required. REFER to: Winch Control Unit (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Check for correct winch operation
B6: MOTOR CONNECTIONS	
 WARNING: Ensure the winch clutch is in free spool mode (Refer to winch operation manual)	
	- Refer to the winch circuit diagrams REFER to: Winch (419-12 Winch, Description and Operation). - Check the connections to the winch motor
	Are all the connections clean and secure? Yes GO to B7. No Clean and secure the electrical connections. Check for correct winch operation
B7: WINCH MOTOR TEST	
 WARNING: Ensure the winch clutch is in free spool mode (Refer to winch operation manual)	
	Disconnect the positive lead from the battery (leave the ground lead attached)
	Label and disconnect the three cables that run from the control pack to the three posts on the winch motor
	Stamped next to the three posts on the winch motor will be A, F1 and F2. Connect a test cable (Jump leads work well) from A to F1 and supply power from the battery to F2. The winch motor should operate
	Connect a test cable from A to F2 and supply power from the battery to F1. The winch motor should operate in the opposite direction

	Does the winch motor operate in both directions? Yes Check for correct operation, refer to the symptom chart above if customer concern is still evident No Check the connections to the winch motor. If all the connections are clean and secure, install a new winch motor as required. REFER to: Winch Motor (419-12 Winch, Removal and Installation). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Check for correct winch operation
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PINPOINT TEST C : REMOTE CONTROL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: REMOTE CONTROL - CONTINUITY TEST	
• NOTE: Visually inspect the winch remote connector terminals for damage, repair or replace as required	
• NOTE: The winch remote should be tested for continuity using a multimeter	
	1 With the winch remote disconnected check for continuity, using the instructions below 2 Move the switch to the power out position - Check for continuity between terminals (1) and (3), Check for continuity between terminals (2) and (6) 3 Move the switch to the power in position - Check for continuity between terminals (1) and (3), Check for continuity between terminals (4) and (6)
	Did the winch remote pass the continuity test (Resistance less than 1 ohm)? Yes Check for correct operation, refer to the symptom chart above if customer concern is still evident No Install a new winch remote as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Check for correct winch operation

Winch - Winch

Removal and Installation

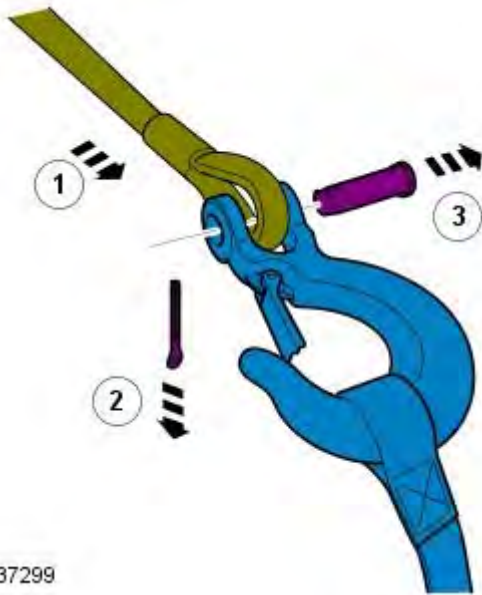
Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.

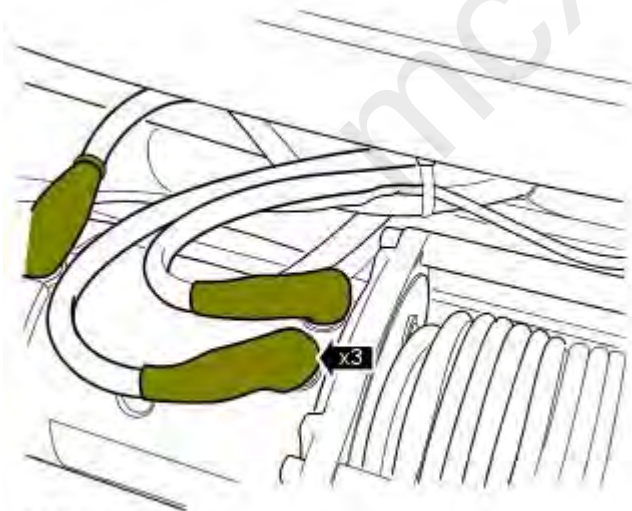
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

- 2.

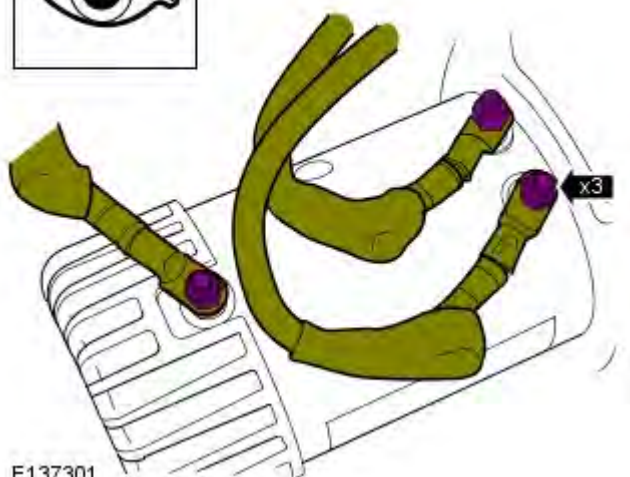


E137299

- 3.



E137300

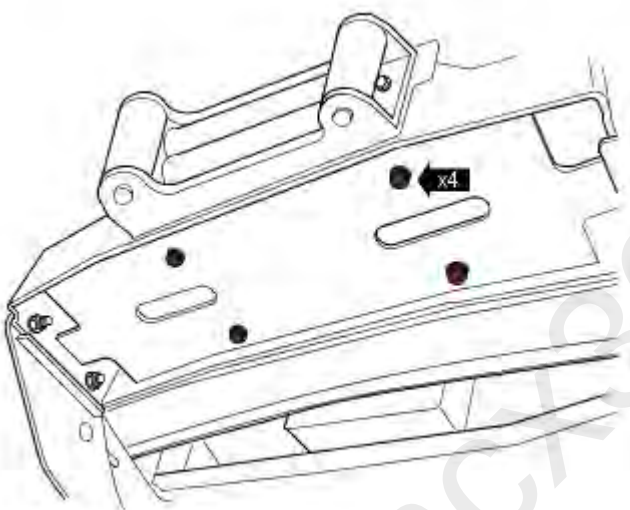


E137301

4.  **CAUTION:** To prevent damage to components, use an additional wrench when loosening or tightening terminals.

• **NOTE:** Note the position of the wiring harnesses to aid installation.

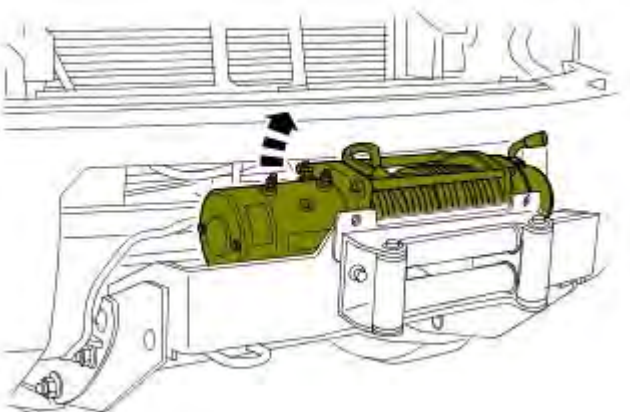
- Torque: 25 Nm



E137302

- 5.

- Torque: 40 Nm

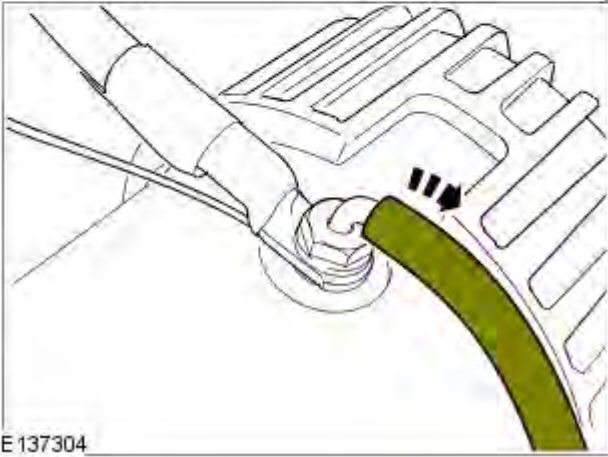
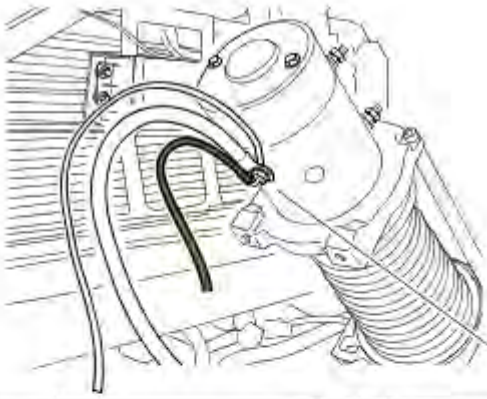


E137303

- 6.

- Raise the motor end of the winch to gain access to the winch ground point.

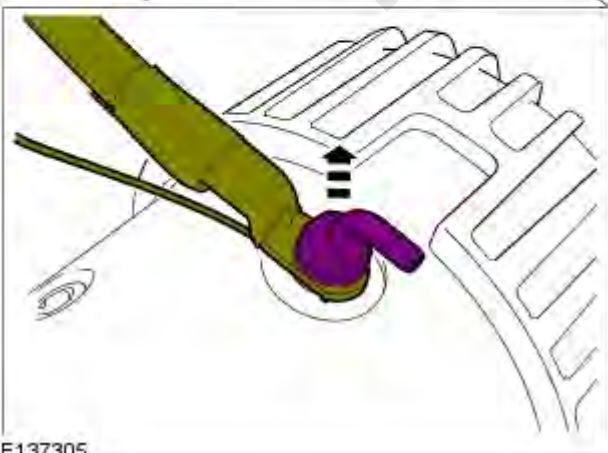
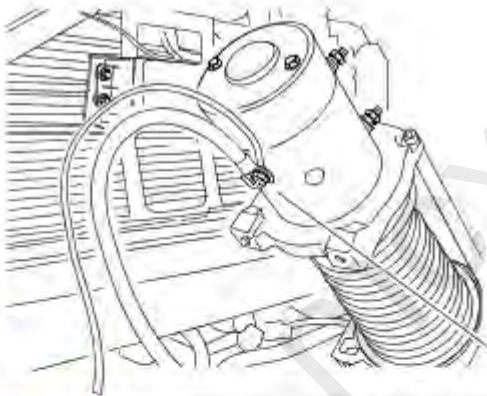
7.



E137304

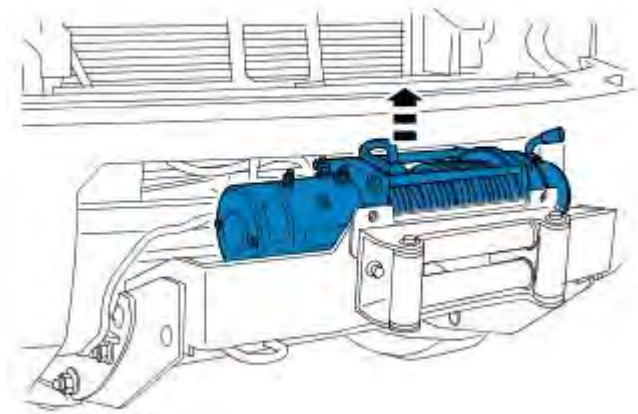
8.

- Torque: 25 Nm



E137305

9.  **WARNING:** This step requires the aid of another technician.



E137306

Installation

1. To install, reverse the removal procedure.

Winch - Winch Motor

Removal and Installation

Removal

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

1. Disconnect the battery ground cable.

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

2. Refer to: [Winch](#) (419-12 Winch, Removal and Installation).

3. **3. CAUTIONS:**

 If the armature is dislodged from the motor, the motor brushes will need to be reset to allow reinstallation.

 Make sure that the armature shaft is removed with the motor housing.

 Use a suitable tool if required to move the armature with the motor.

- Torque: 8 Nm



Installation

1. To install, reverse the removal procedure.

Winch - Winch Solenoid

Removal and Installation

Removal

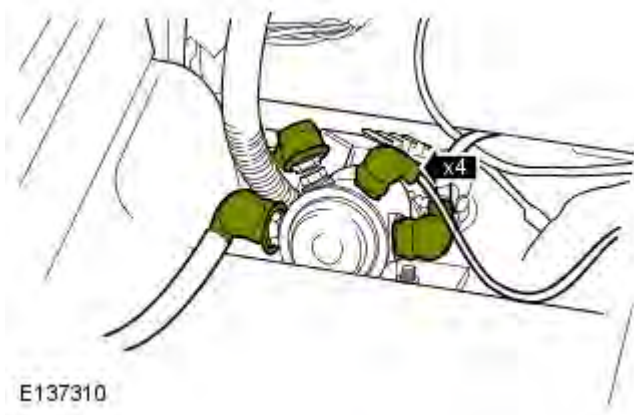
- NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

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

2. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

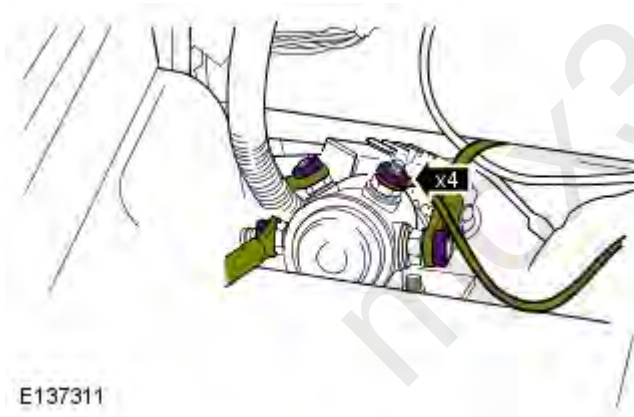
- 3.

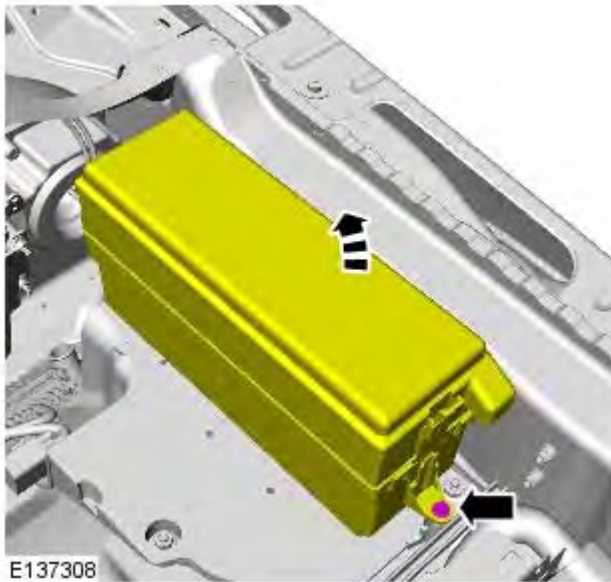


4.  CAUTION: To prevent damage to components, use an additional wrench when loosening or tightening terminals.

- NOTE: Note the position of the electrical connectors.

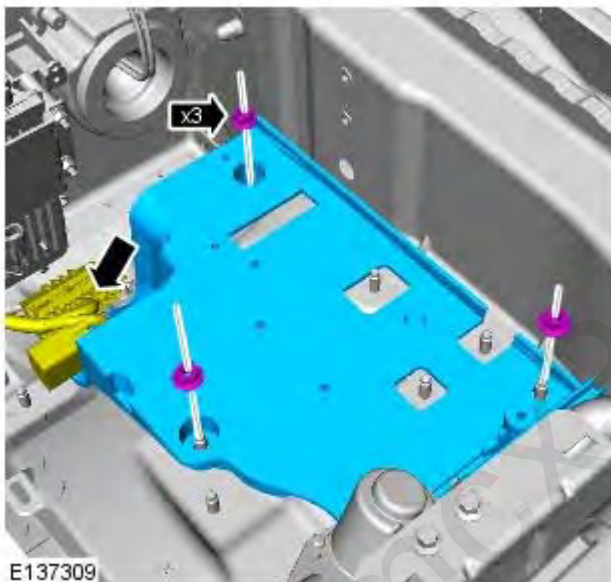
- Torque:
Two center terminals 10 Nm
Two outer terminals 7 Nm





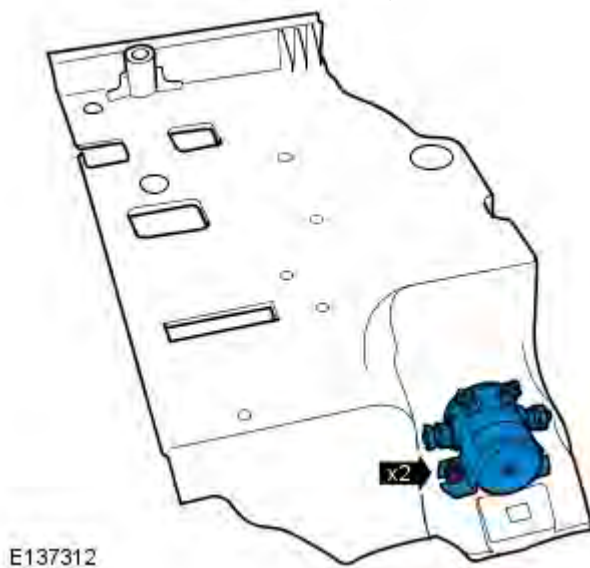
5.

- Torque: 5 Nm



6.

- Torque: 12 Nm



7.

- Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

mcx30.com

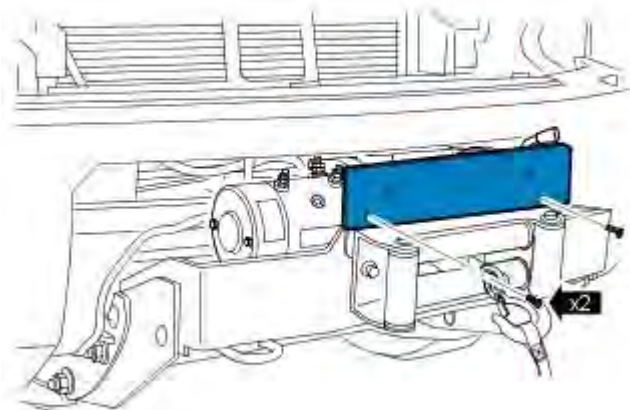
Winch - Licence Plate Panel

Removal and Installation

Removal

1.
 - If installed: Remove the license plate.

2.



E137298

Installation

1. To install, reverse the removal procedure.

Winch - Winch Cable Roller Assembly

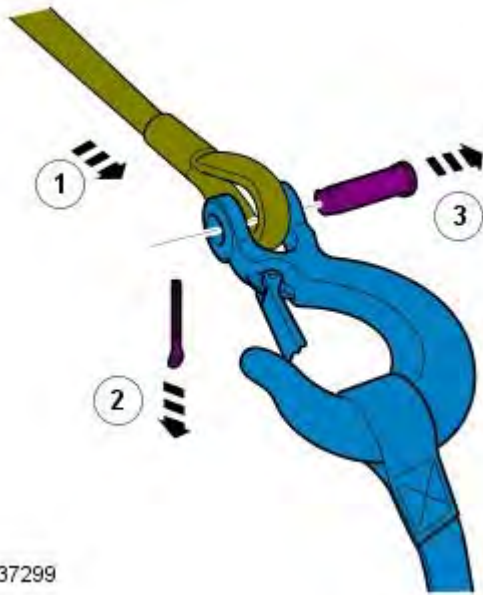
Removal and Installation

Removal

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

1. Refer to: [Licence Plate Panel](#) (419-12 Winch, Removal and Installation).

2.



E137299

3.

- Torque: 43 Nm



E137315

Installation

1. To install, reverse the removal procedure.

Winch - Winch Control Unit

Removal and Installation

Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

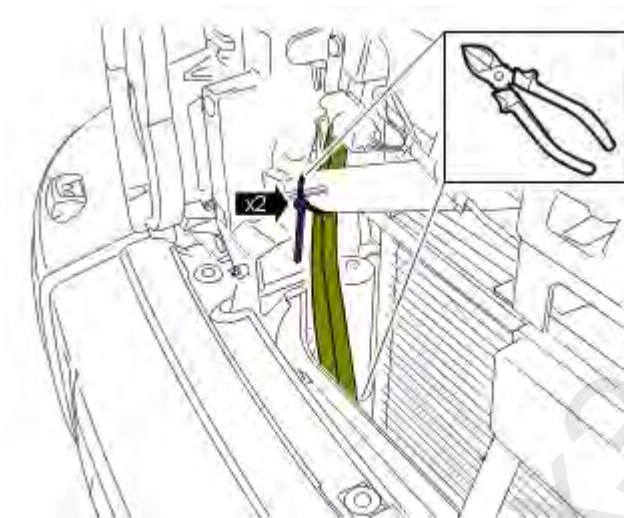
1. Disconnect the battery ground cable.

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

2. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

3. Refer to: [Winch](#) (419-12 Winch, Removal and Installation).

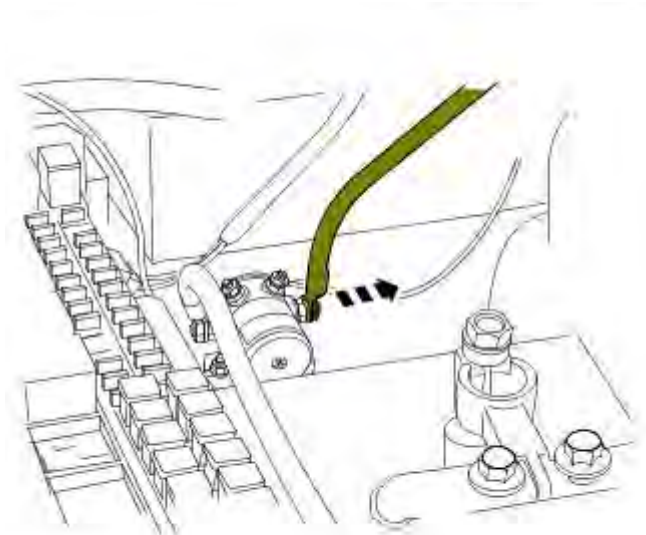
4.



E138614

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

6.



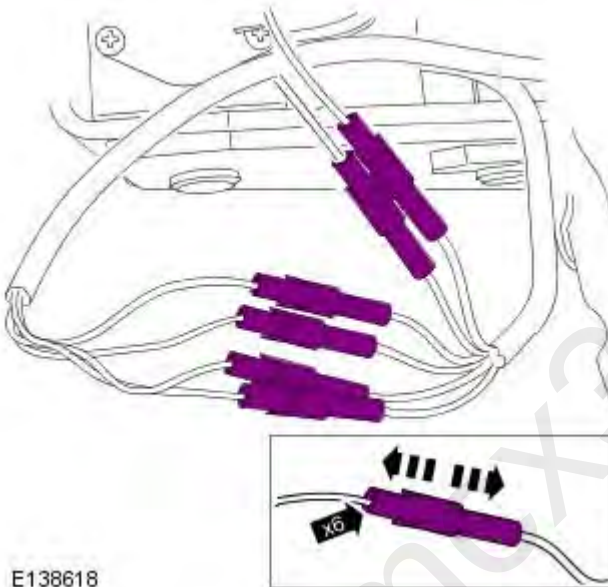
E138616

8.



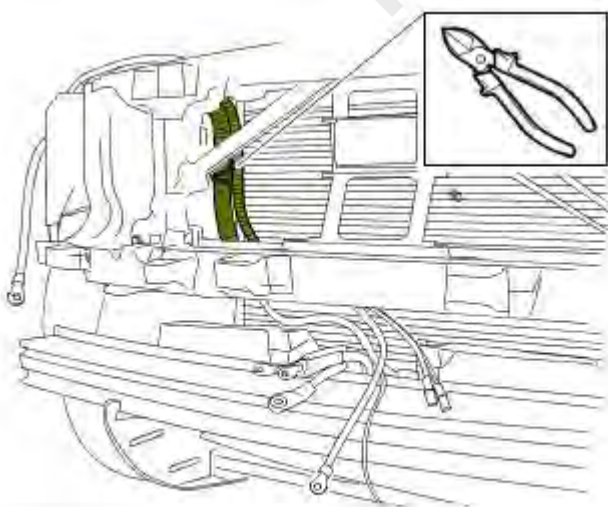
E138617

9.



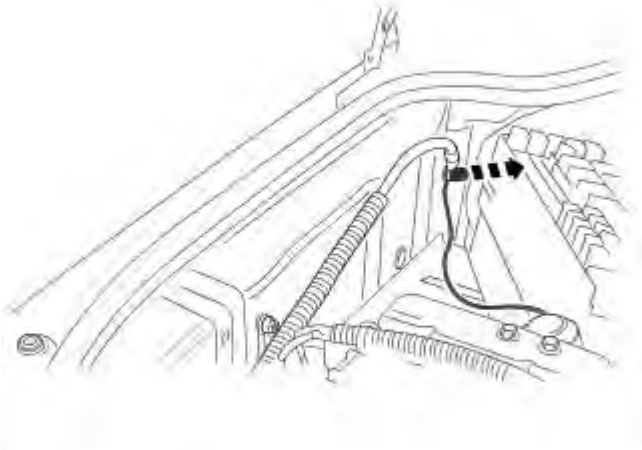
E138618

10.



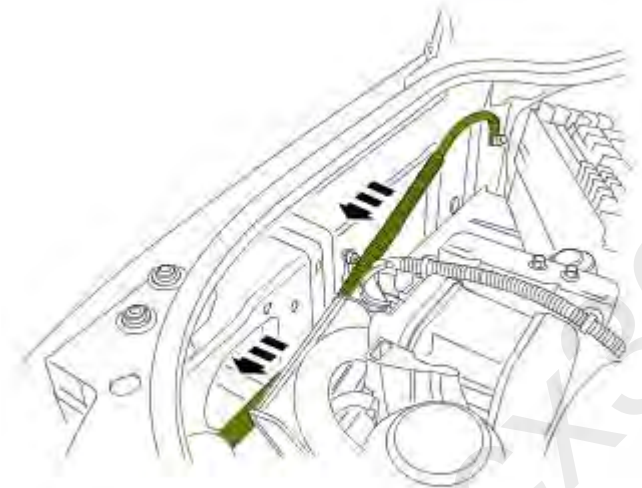
E138619

11.



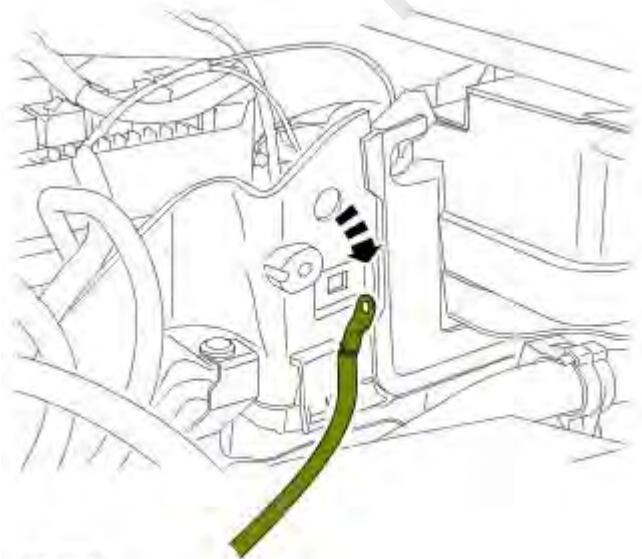
E138620

12.



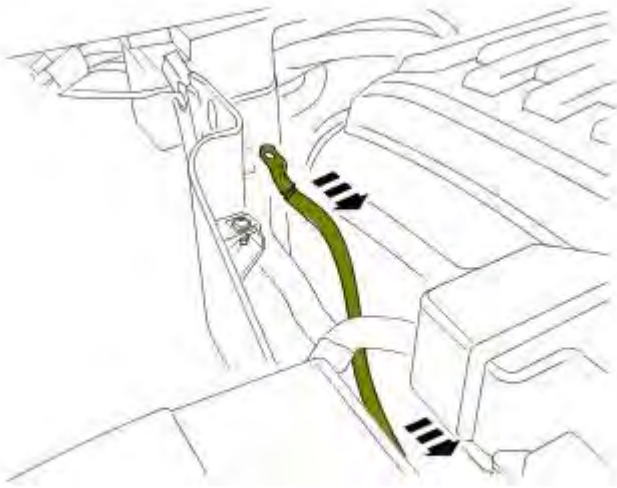
E138621

13.



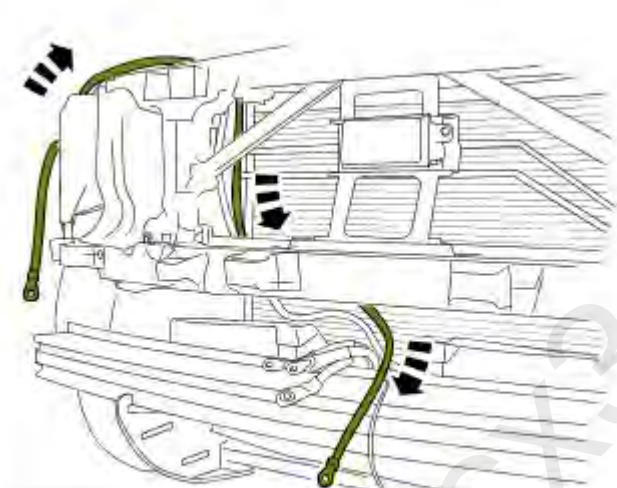
E138622

14.



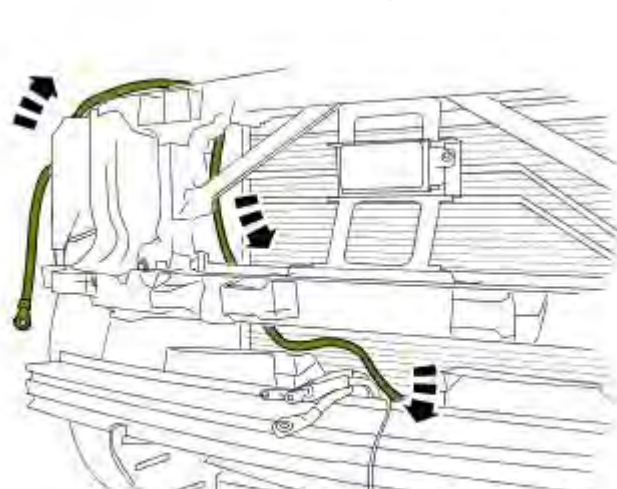
E138623

15.

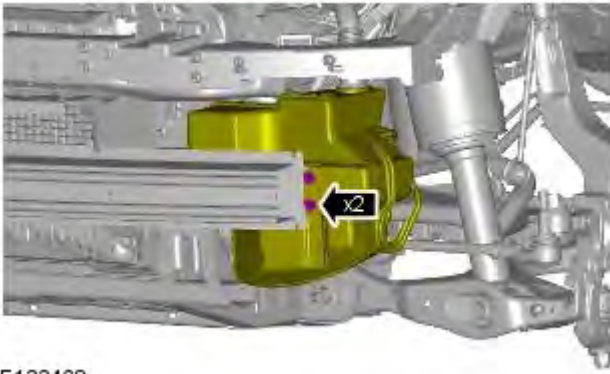


E138625

16.



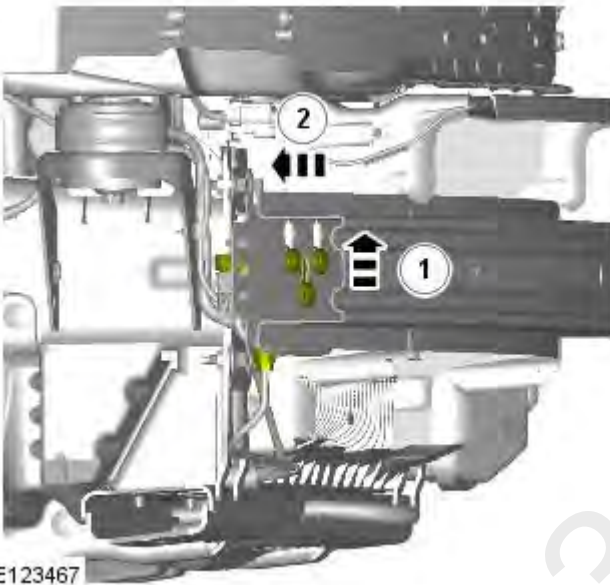
E138626



E123468

17. **17.** NOTE: Support as necessary.

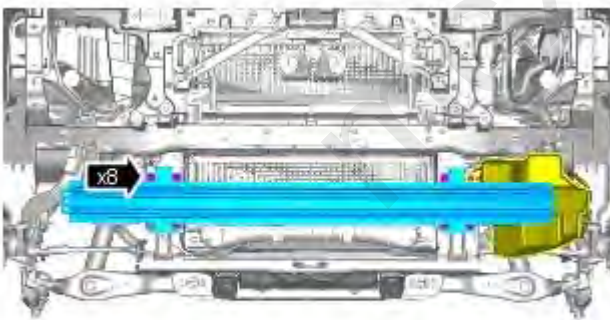
Torque: 10 Nm



E123467

18. **18.**  CAUTION: Take extra care not to damage the component.

- NOTE: Support as necessary.

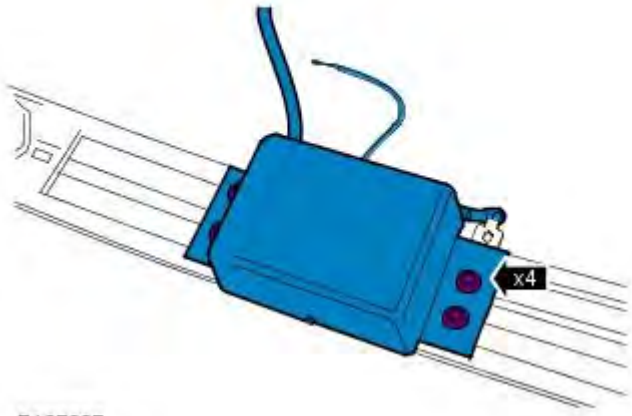


E123469

19. **19.** NOTE: With assistance remove the component.

Torque: 25 Nm

20. Torque: 10 Nm



E137307

Installation

1.  CAUTION: Do not route wires over sharp edges. Take care to avoid chaffing, and damage to the insulation.

To install, reverse the removal procedure.

Winch - Winch Gear Assembly

Removal and Installation

Removal

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

1. Disconnect the battery ground cable.

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

2. Refer to: [Winch](#) (419-12 Winch, Removal and Installation).



E138329

3.  CAUTION: Mark the components to aid installation.

- Torque: 10 Nm

- 4.



E138330



E138331

5.  CAUTION: Make sure that the mating faces are clean and free of foreign material.
 - NOTE: Remove and discard the gasket.

Installation

1. **1.** NOTE: Align to the position noted on removal.
 - NOTE: Install a new gasket.

To install, reverse the removal procedure.