

# WINCH

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## WINCH

### DESCRIPTION

The winch uses the electrical power from the vehicle charging system to power a motor that winds wire rope into the winch drum by means of planetary gear reduction.

The winch assembly includes the following:

- **Motor:** The winch motor is powered by the vehicle electrical system and features a thermal protection switch that automatically stops the motor function in the power-in direction if the motor gets too hot.
- **Winch Drum:** The winch drum allows the wire rope to be stored on the winch and transmits force to the wire rope.
- **Wire Rope:** The wire rope allows the winch to be connected to an anchor to provide a pulling force.
- **Fairlead:** The fairlead consists of four rollers and acts as guide for the wire rope and minimizes damage to the rope.
- **Automatic Brake:** The winch is equipped with an automatic brake that will stop rotation of the winch drum if the winch motor is stopped.
- **Clutch Lever:** The clutch lever allows the winch drum to be disconnected from the winch motor to allow the wire rope to be pulled from the winch by hand.
- **Remote Socket:** The remote socket allows the remote control to be attached to the control pack to allow the winch to function.
- **Remote Control:** The remote control provides the interface between the winch operator and the winch. The remote control provides the ability to power the winch in, out, and stop the winch.

### OPERATION

**Winch:** The winch uses the electrical power from the vehicle charging system to power a motor that winds wire rope into the winch drum via planetary gear reduction. By nature, a winch is capable of generating very high forces and should be used with care. Do not operate the winch without reading and understanding the complete winch owner's manual.

**Low Voltage Interrupt:** The winch is equipped with a device that will interrupt winch function if the vehicle charging system voltage drops to a low level. The winch will not power-in or out for 30 seconds if this device is tripped. If the interrupt is tripped, the vehicle should be operated at high idle for a few minutes to allow the vehicle charging system to recover before continuing to winch.

**Winch Motor Thermal Protection:** The winch is equipped with a thermal protection device in the motor. If the winch is operated for an excessive duration, the device may interrupt motor function to protect the winch motor. During this time the winch will power-out but will not power-in. Allow the winch motor to cool for a few minutes before continuing operation of the winch. The winch will resume normal function once the motor cools.

**Remote Control:** To operate the winch, the toggle switch is pressed down to power the winch in and up to power the winch out. The winch will stop if the switch is left in the neutral (center) position.

**Clutch Lever:** The clutch lever is used to allow free spooling of the winch drum. Rotate the clutch lever on the winch to disengage the clutch.

**WARNING**

**WARNING:** Disconnect and isolate battery negative cable before attempting any troubleshooting or repairs.

- Do not disengage the clutch if the winch is under a load or wire rope is under tension.
- Do not route electrical cables across sharp edges.
- Do not route electrical cables through or near moving parts.
- Always wear heavy leather gloves when handling a wire rope.
- Never let wire rope slip through your hands.
- Always keep hands clear of wire rope, hook loop, hook and fairlead opening during installation, operation, and when spooling in or out.
- Always use supplied hook strap whenever spooling wire rope in or out, during installation or operation.

Failure to follow these instructions may result in personal injury.

**CAUTION:** Do not leave the remote plugged into the winch when not in use. Leaving the remote plugged in, may result in a dangerous condition and/or battery drain.

- Always make sure the clutch is fully engaged or disengaged.

**DIAGNOSIS AND TESTING**

**DIAGNOSIS AND TESTING – WINCH**

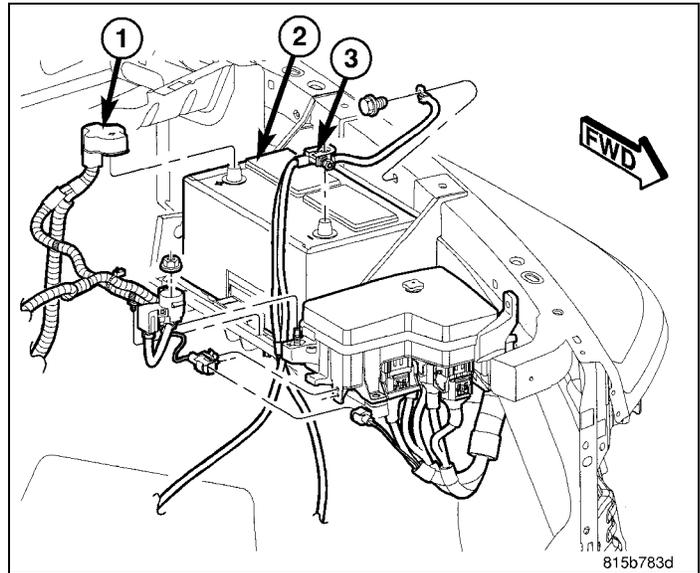
CONDITION	POSSIBLE CAUSES	CORRECTION
Winch does not hold the load.	Faulty winch drum brake.	Replace the winch assembly. (Refer to 23 - BODY/WINCH - REMOVAL)
	Load exceeds rating for the winch.	Refer to operators manual for the correct line pull rating for the winch.
Brake overheats and will not hold the load.	The wire rope is on the drum backwards.	Remove all the wire rope and respool in the proper direction.
	The wire rope is spool onto the drum in the wrong direction and working against the brake in the "power in" mode.	The wire rope must always spool onto the drum as indicated by the drum rotation label on the winch. Winches are equipped with an automatic brake and <b>WILL NOT FUNCTION</b> if the wire rope spools in the opposite direction. The wire rope spooling can accidentally be reversed by running the wire rope all the way out and re-spooling in with the control switch in the "power out" mode.
	Load exceeds rating for winch	Refer to operators manual for the correct line pull rating for the winch.
	After a very long "power out" cycle, in excess of 50 feet under high loads, the brake has overheated and needs a cool down cycle of approximately 30 minutes.	These winches are rated for intermittent duty operations only. As the load is increased, the duration of power out cycles must be reduced to limit the brake temperature. Allow adequate time for the brake to cool between uses when performing extended power out cycles.

CONDITION	POSSIBLE CAUSES	CORRECTION
Difficult to spool the wire rope off the drum by hand.	Bent drum flanges or worn drum bushings.	Rotate the drum while it is still on the winch to see if the drum flanges appear to be bent. If the flanges appear to be bent, the winch will have to be replaced.
	Free spool clutch is damaged inside the gear train.	Replace winch. (Refer to 23 - BODY/WINCH - REMOVAL)
	Wire rope is bound up on the drum.	Should the wire rope become bound onto the drum, connect the hook to a load, then by alternately "powering in" then "powering out", the wire rope will usually work itself free.  <b>WARNING: Do not put your hands anywhere near the wire rope when working a bind free.</b>
	Winch is not mounted correctly, causing the drum to bind.	Check winch mounting and repair as necessary.
Winch lacks power or will not run at all.	Faulty ground cable attachment to the motor housing.	Verify that the ground cable is correctly installed to the threaded hole in the motor housing. See Motor Ground Test below.
	The vehicle battery is inadequate in size, terminals are corroded, is defective or worn out, or is not fully charged.	Use a fully charged conventional automotive battery with a minimum of 650 cold cranking amps rating to obtain peak performance from the winch. Make sure all terminals are clean and the battery is fully charged. Replace battery if necessary.
	Faulty cable connections on battery or motor terminals	Clean and tighten all terminals.
	Faulty power supply to the winch.	Check for proper power supply. See Power Test below.
	Faulty remote control switch or cord.	Check for faulty switch. See Remote Switch Test below. Replace the remote switch is necessary.
When remote control switch is activated, there is only a "clicking" sound, and the winch does not operate in either "power in" or "power out" modes.	Low battery charge, corroded terminals, defective battery.	Use a fully charged conventional automotive battery with a minimum of 650 cold cranking amps rating to obtain peak performance from the winch. Make sure all terminals are clean and the battery is fully charged. Replace battery if necessary. Check for proper power supply. See Power Test below.
	Faulty ground cable attachment to the motor housing.	Check for proper ground. See Motor Ground Test below.
	Faulty motor armature, brushes, or water in the motor.	Replace the motor. (Refer to 23 - BODY/WINCH/MOTOR - REMOVAL)
	Faulty control relay.	Check and replace relays as necessary. See Relay Pack Test below (Refer to 23 - BODY/WINCH/RELAY - REMOVAL)

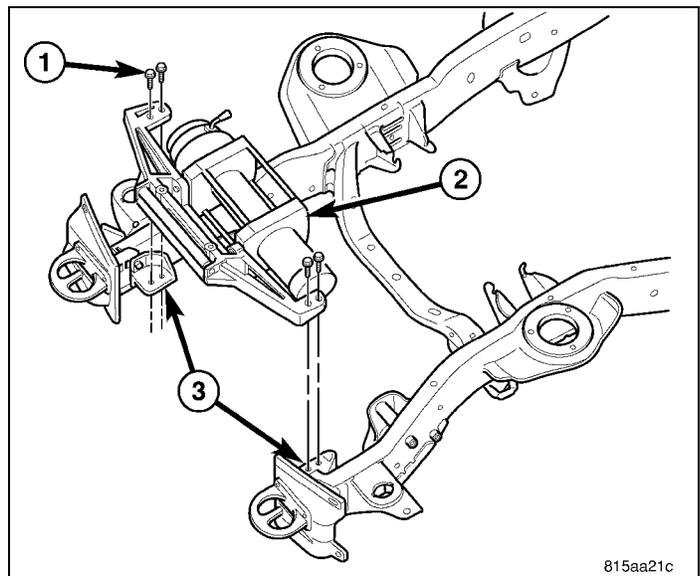
CONDITION	POSSIBLE CAUSES	CORRECTION
Winch runs slowly and lacks power when pulling a load, won't pull load, or stalls easily.	The wire rope is spool onto the drum in the wrong direction and working against the brake in the "power in" mode.	The wire rope must always spool onto the drum as indicated by the drum rotation label on the winch. Winches are equipped with an automatic brake and WILL NOT FUNCTION if the wire rope spools in the opposite direction. The wire rope spooling can accidentally be reversed by running the wire rope all the way out and re-spooling in with the control switch in the "power out" mode.
When the remote control is activated, the winch will operate only in one direction.	One or more of the control pack relays is damaged	Check and replace relays as necessary. See Relay Pack Test below (Refer to 23 - BODY/WINCH/RELAY - REMOVAL)
	The remote control switch is damaged.	Check and replace switch as necessary. See Remote Switch Test below.
Power-out mode only.	Tripped or damaged thermal switch	Let motor cool for at least 30 minutes, then try to power-in again.
		Check thermal switch. See Thermal Switch Test below. Replace the motor if the thermal switch is faulty. (Refer to 23 - BODY/WINCH/MOTOR - REMOVAL)
When the remote control is activated, the winch will not operate and no "clicking" sound is heard.	Tripped or damaged Low Voltage Interrupt (LVI)	Use a fully charged conventional automotive battery with a minimum of 650 cold cranking amps rating to obtain peak performance from the winch. Make sure all terminals are clean and the battery is fully charged. Replace battery if necessary.
		Check LVI. See Low Voltage Interrupt (LVI) Test below. Replace the relay pack if the LVI is faulty. (Refer to 23 - BODY/WINCH/RELAY PACK - REMOVAL)

## Relay Test

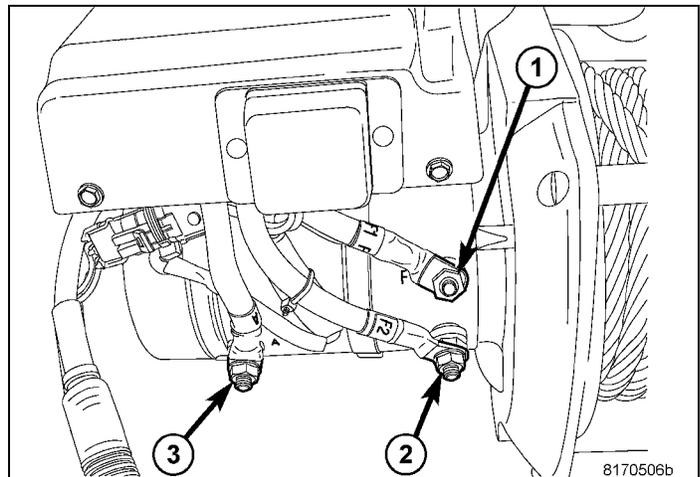
1. Disconnect the red (+) battery cable (1).



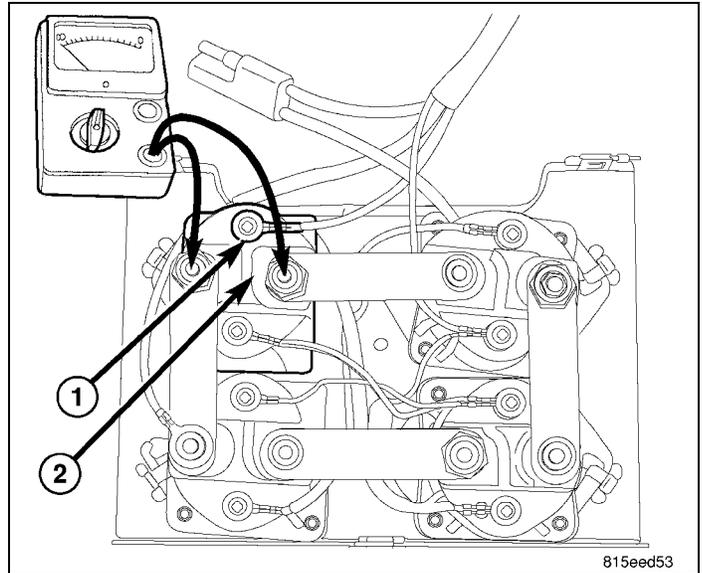
2. Remove the winch assembly (2) as necessary to gain access to the relay pack and cover (Refer to 23 - BODY/WINCH - REMOVAL).



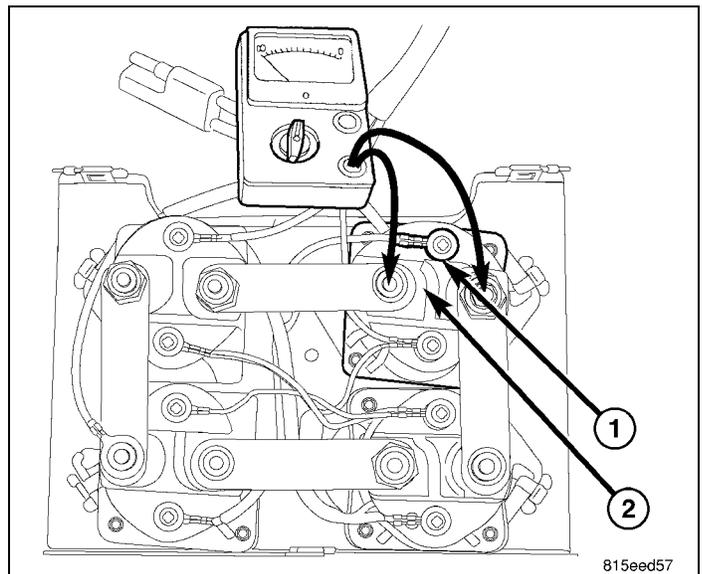
3. Disconnect the three cables connected to the motor on the studs marked F1 (2) , F2 (1) and A (3).



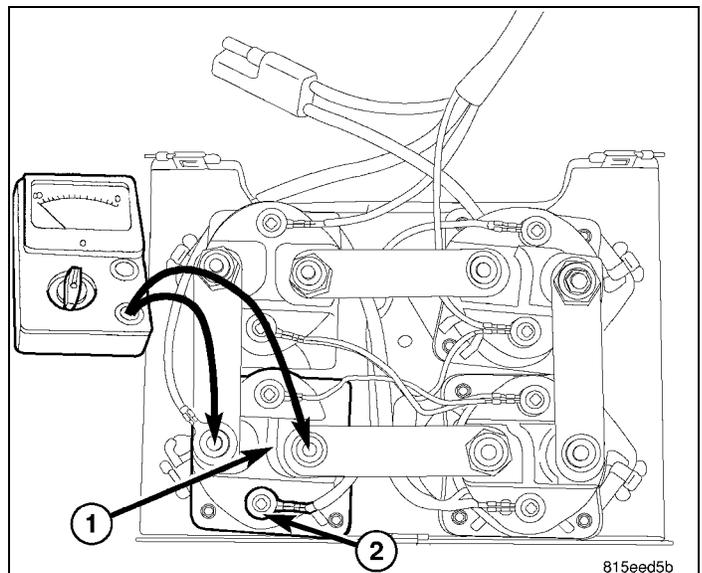
- 4. Apply 12 volts to the small terminal (1) of relay #1 (2) and measure the resistance across the two large studs.



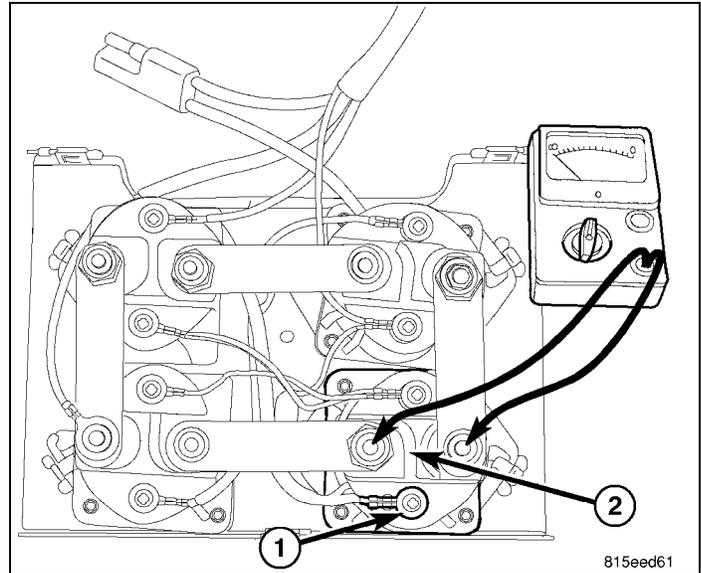
- 5. Apply 12 volts to the small terminal (1) of relay #2 (2) and measure the resistance across the two large studs.



- 6. Apply 12 volts to the small terminal (2) of relay #3 (1) and measure the resistance across the two large studs.



7. Apply 12 volts to the small terminal (1) of relay #4 (2) and measure the resistance across the two large studs.
8. If the resistance across any of the relays doesn't go from open to closed (megaohms to tenths) then the relay is bad and needs to be replaced (Refer to 23 - BODY/WINCH/RELAY - REMOVAL).

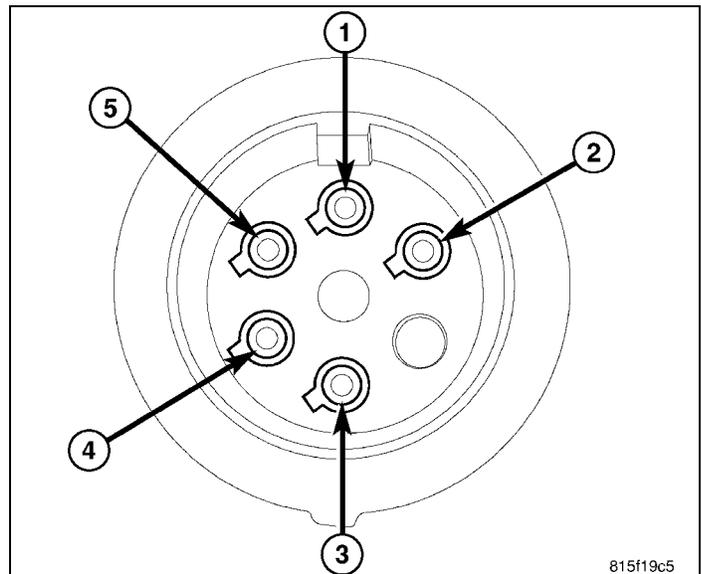


### Remote Switch Test

1. To check switch, follow the steps below to check for switch continuity.

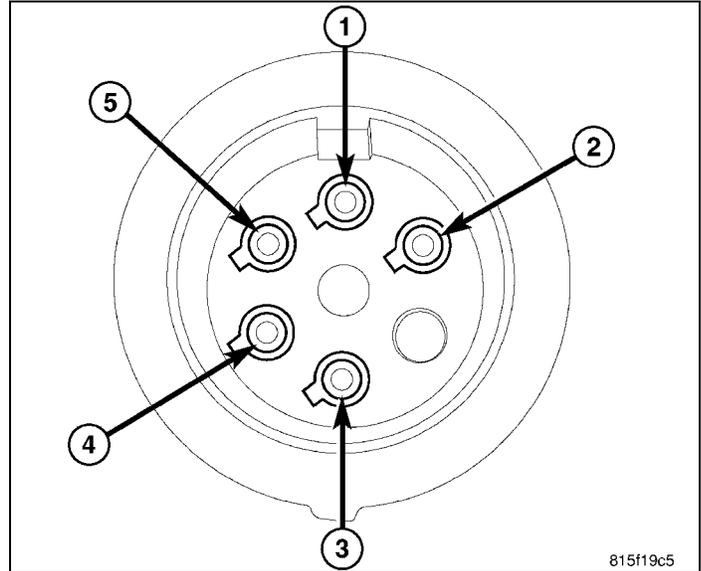
#### *Power-Out*

1. Move switch to the power-out position.
2. Check for continuity between pins (1) and (4).
3. Check for continuity between pins (2) and (5).



**Power-In**

1. Move switch to the power-in position.
2. Check for continuity between pins (1) and (4).
3. Check for continuity between pins (2) and (3).



2. If there is no continuity, then the remote switch is bad and needs to be replaced.

**Thermal Switch Test**

The motor will not power-in if the thermal switch is open or if its terminals are in contact with the motor case. The switch should normally open when the temperature at the motor brushes reaches 205+°C (400+°F).

If the Thermal Switch is suspected to be failing check the following:

1. Disconnect the switch.
2. Measure the resistance of the switch at the electrical connector.
3. If the switch is open at room temperature then replace the motor.
4. If the switch is closed then the switch is good.
5. Check for resistance between both terminals and the motor case.
6. If the resistance is less than 1 megaohm then the winch is grounded. Replace the motor (Refer to 23 - BODY/WINCH/MOTOR - REMOVAL).

**Low Voltage Interrupt (LVI) Test**

If the LVI is suspected to be failing check the following:

1. Check to make sure the battery has 10.5 to 12 volts.
2. If low, charge battery.
3. Wait for 30 seconds or more.
4. Check for a ground on pin 4.
5. If no ground then check control ground Relay Pack Test.
6. If ground good then replace the relay pack (Refer to 23 - BODY/WINCH/RELAY PACK - REMOVAL).

**Motor Test**

If the motor is suspected to be failing check the following:

1. Disconnect the motor power connectors F1, F2 and A.
2. Measure the resistance between F1 and F2. Resistance should be less than 1Ω.
3. Measure the resistance between A and ground. Resistance should be less than 1Ω.
4. If the resistance is greater than 1Ω the motor brushes could be worn or the internal wiring could be burned. Replace the motor (Refer to 23 - BODY/WINCH/MOTOR - REMOVAL).

**Power Test**

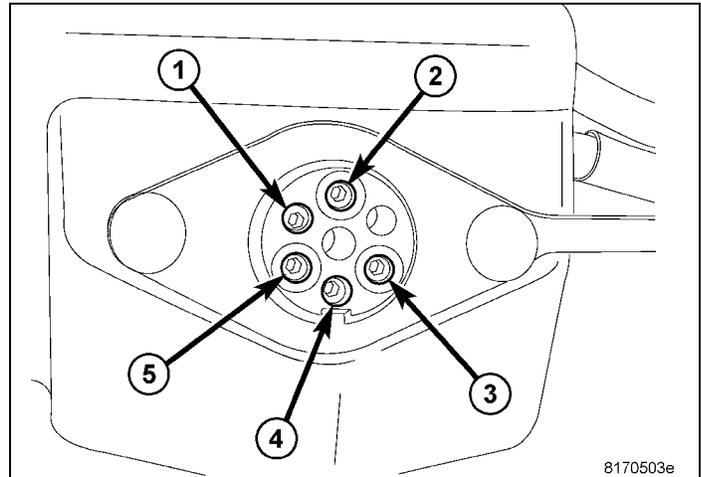
1. Check for a tight fit of all connections.

2. Using a volt meter, verify  $12 \pm 2$  volts at the bus bar connecting relays #1 and #3.

**Motor Ground Test**

1. Check for continuity between the ground stud and the battery.
2. If no continuity then repair the ground cable from the battery to the motor.

**Relay Pack Test**

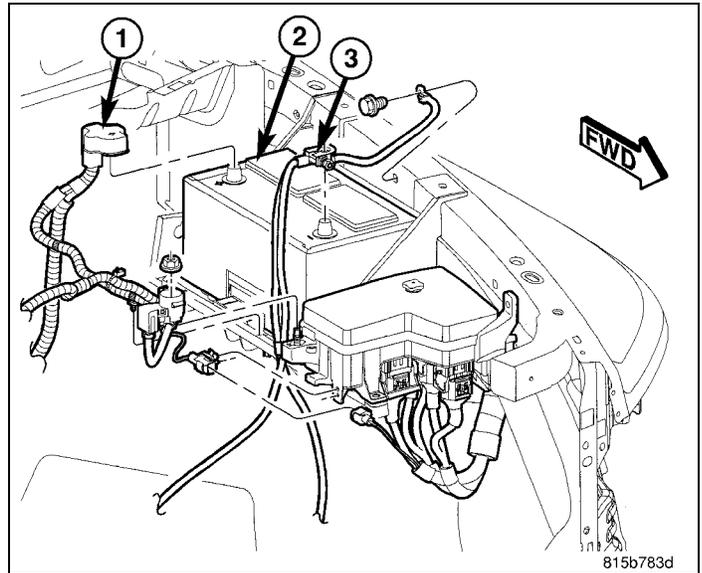


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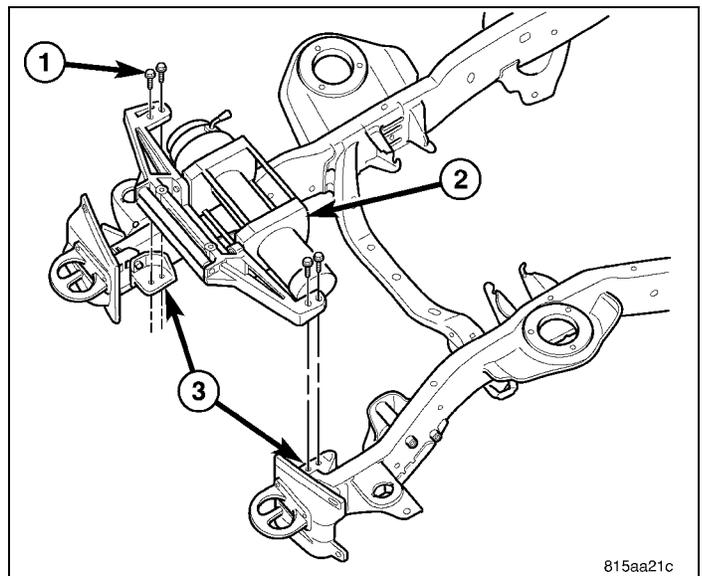
Measurement between pins	Resistance $\Omega$	Voltage (V)	Results	Correction
"4" to "5"	2	—	Yes	Relay pack OK.
			No	1. Check for any faulty relay or motor electrical connections and repair if necessary. 2. Check for a faulty relay and replace as necessary. Refer to Relay Test.
"4" to "2"	2	—	Yes	Relay pack OK.
			No	1. Check for any faulty relay or motor electrical connections and repair if necessary. 2. Check for a faulty relay and replace as necessary. Refer to Relay Test.
"1" to "2"	$\geq 100K$	—	Yes	Relay pack OK.
			No	Check for shorted Thermal Switch. Refer to Thermal Switch Test.
"1" to "3"	—	12	Yes	Relay pack OK.
			No	1. Check for any faulty relay or motor electrical connections and repair if necessary. 2. Check for faulty LVI, Refer to Low Voltage Interrupt (LVI) Test.

### REMOVAL

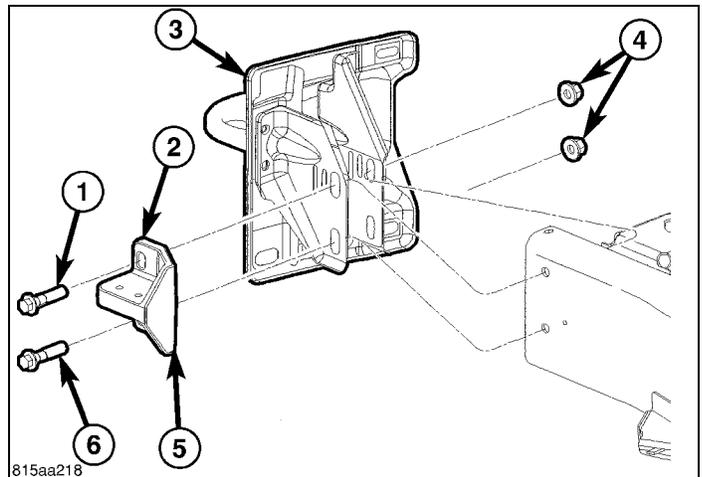
1. Disconnect and isolate battery negative (3) and positive (1) cables.



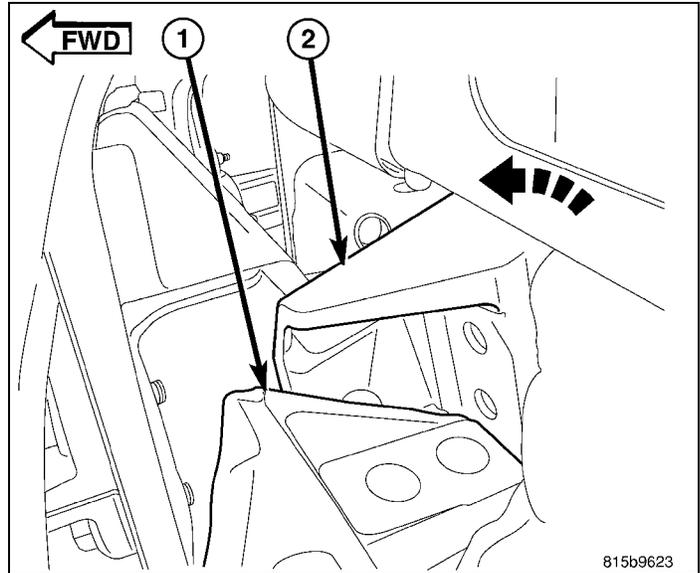
2. Remove the winch support bolts (1).



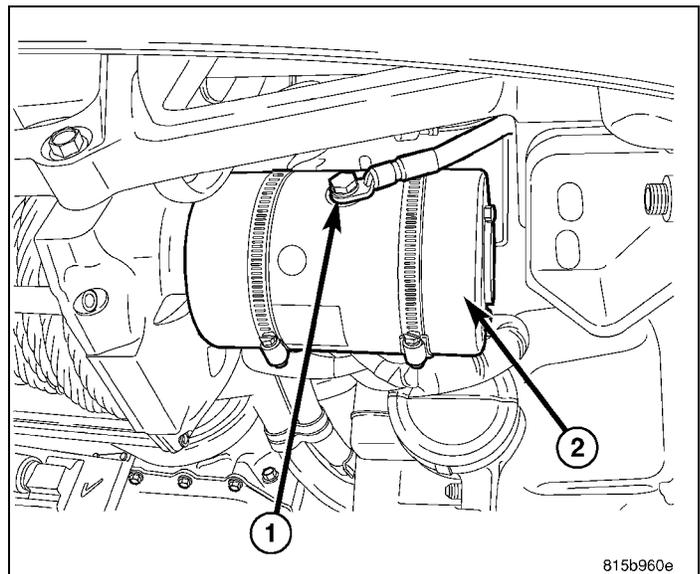
3. Remove the lower frame bracket (2) bolts (6) and loosen the upper bolts (1).



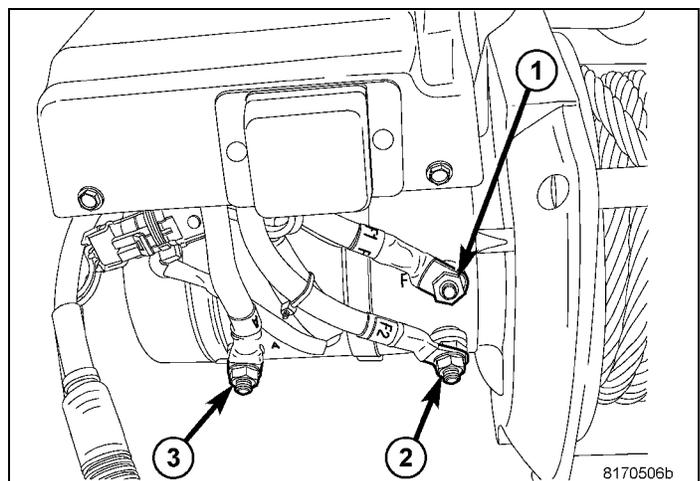
4. Support the winch using a jack or other suitable lift device.
5. Lift the winch assembly off the support brackets.
6. Pivot the frame support brackets (2) up and position out of the way.
7. Carefully lower the winch assembly out of the vehicle.



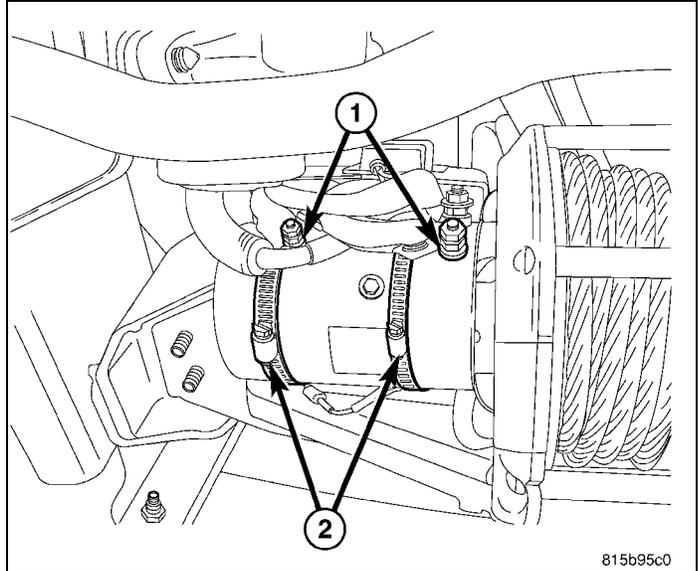
8. Remove the nut and disconnect the ground cable (1) from the motor (2).



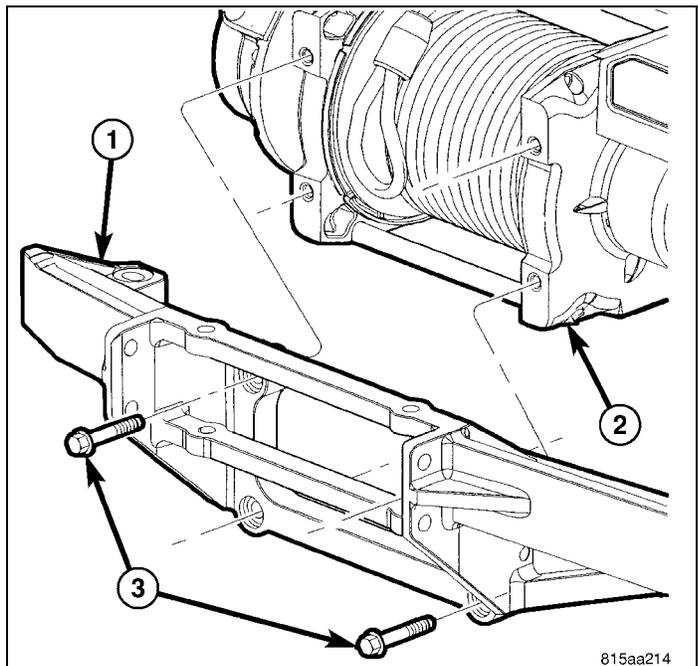
9. Disconnect the three cables connected to the motor on the studs marked F1 (2), F2 (1) and A (3).
10. Disconnect the thermal switch electrical connector.



11. Remove the clamps (2) and separate the coil pack from the motor.

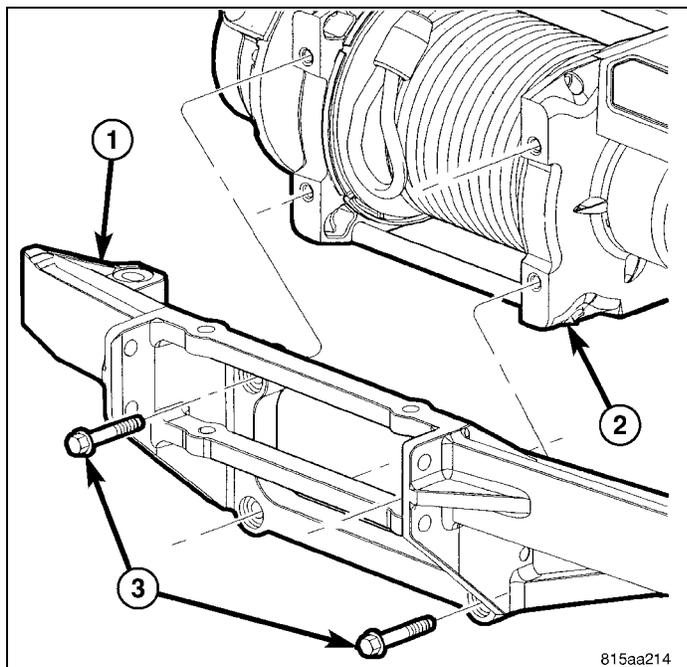


12. Remove the four winch mounting and roller bracket bolts (3).
13. Separate the mounting bracket assembly (1) from the winch assembly.

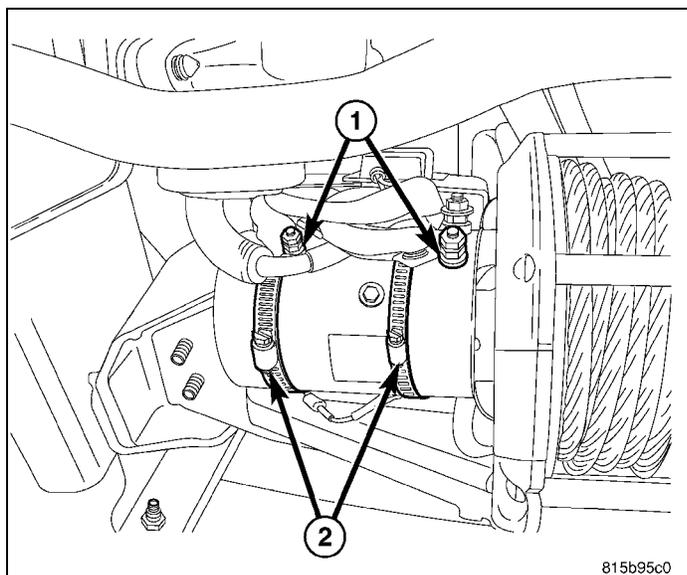


## INSTALLATION

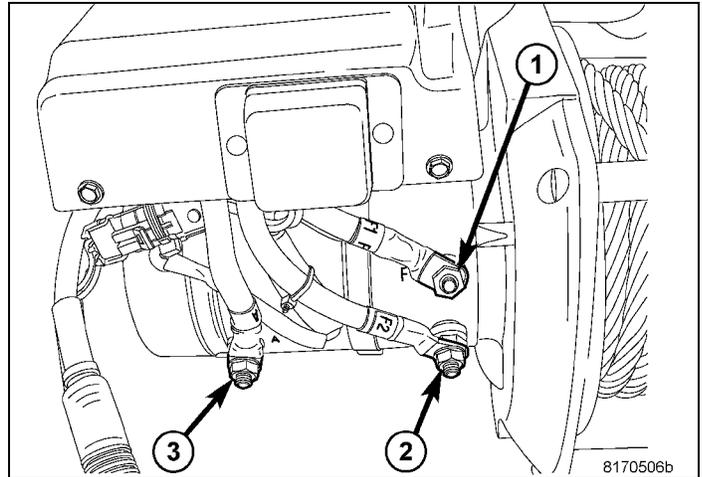
1. Position the winch (2) onto the support bracket (1) and install the bolts (3).
2. Tighten the bolts to 108 N·m (80 ft. lbs.)



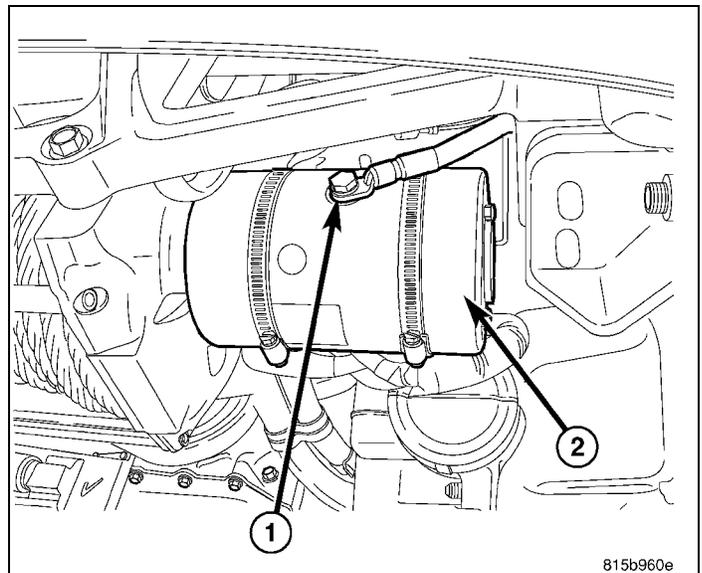
3. Position the relay pack onto the motor and tighten the band clamps (2).
4. Connect the thermal switch electrical connector.



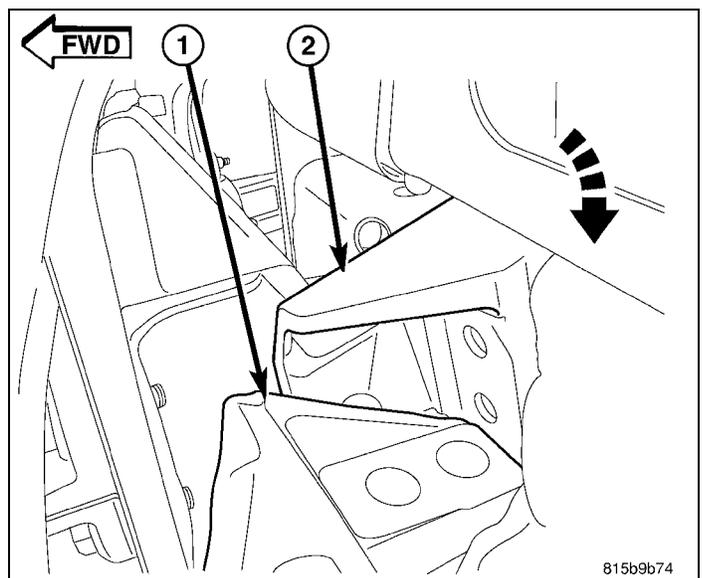
- 5. Connect the three cables connected to the motor on the studs marked F1 (2) , F2 (1) and A (3).
- 6. Tighten the nuts to 7 N·m (60 in. lbs.).



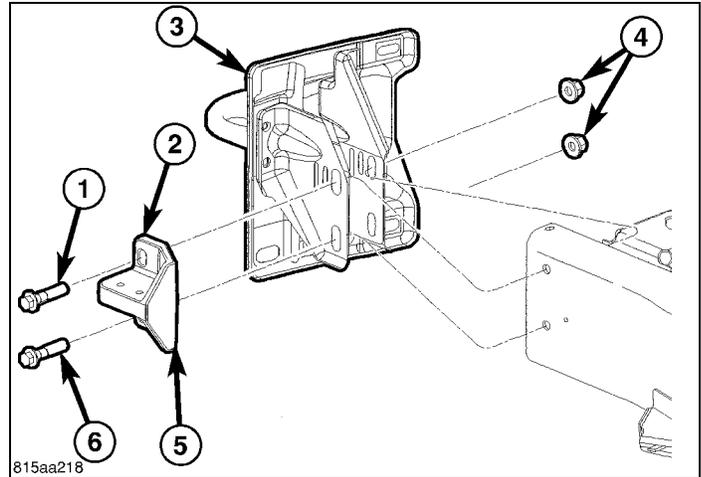
- 7. Install the ground cable and install the bolt (1).
- 8. Tighten the bolt to 14 N·m (10 ft. lbs.).



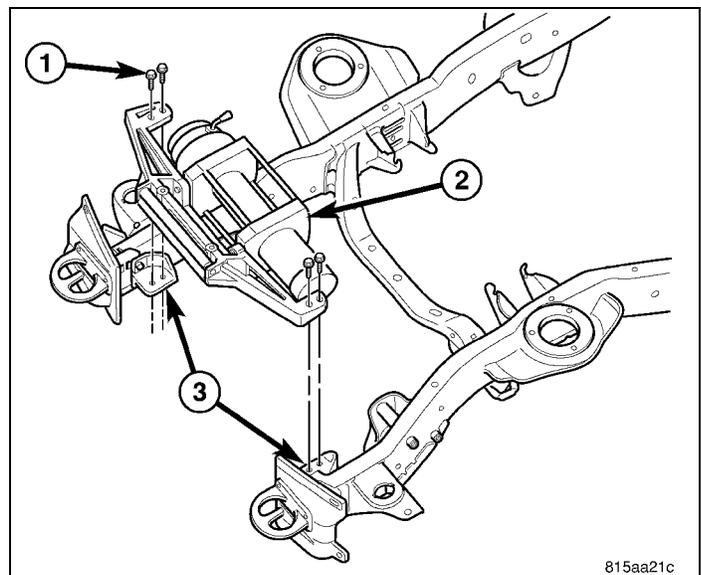
- 9. Raise the winch assembly into position.
- 10. Pivot the frame support brackets (2) down under the winch mounting bracket (1).



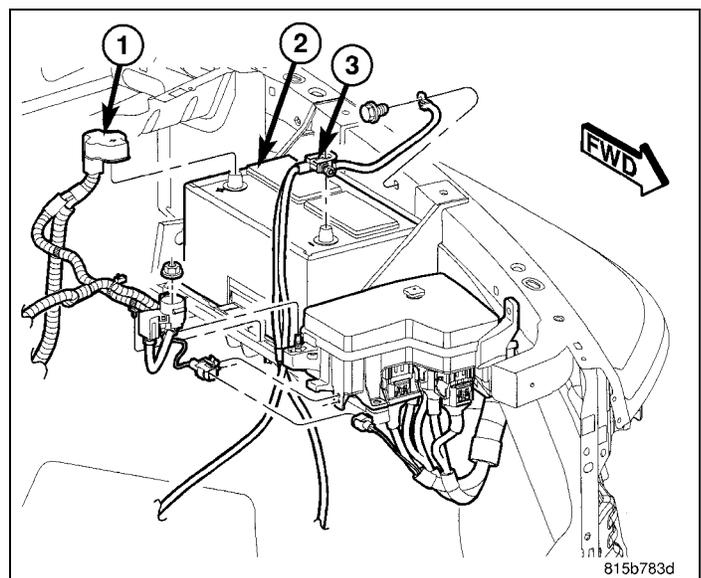
11. Install the lower frame bracket bolt (6) and nut (4).
12. Check and adjust the bumper alignment as necessary (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS).
13. Tighten the bolts and nuts to 95 N·m (70 ft. lbs.).



14. Install the winch mounting bolts (1) and tighten to 41 N·m (30 ft. lbs.)

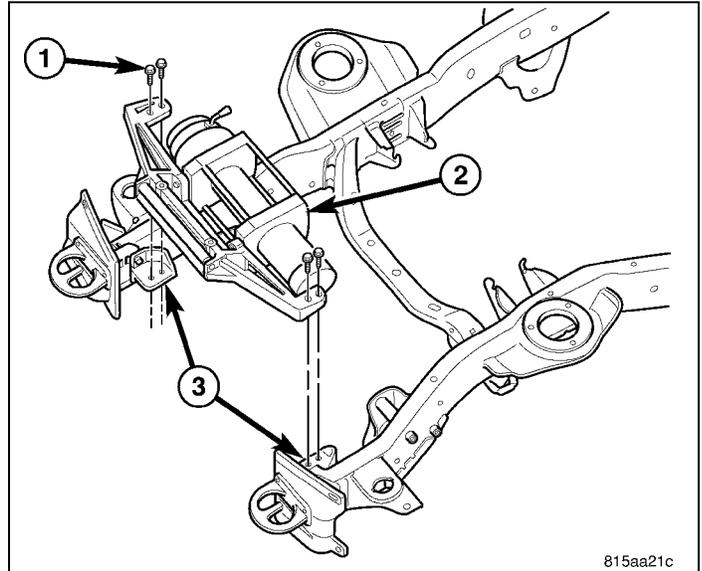


15. Connect battery negative cable (3).
16. Verify the operation of the winch.

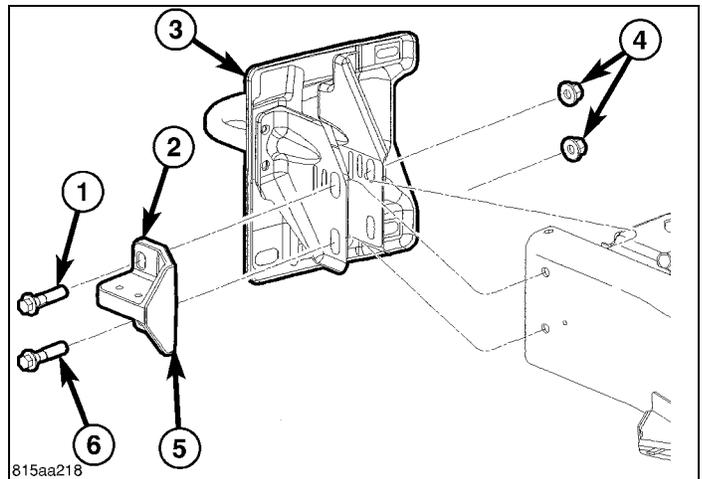


# BRACKETS REMOVAL

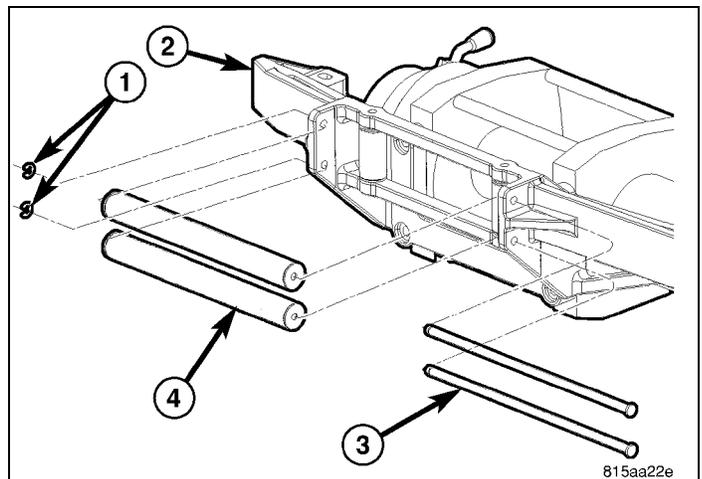
1. Remove the winch (2). (Refer to 23 - BODY/WINCH - REMOVAL)



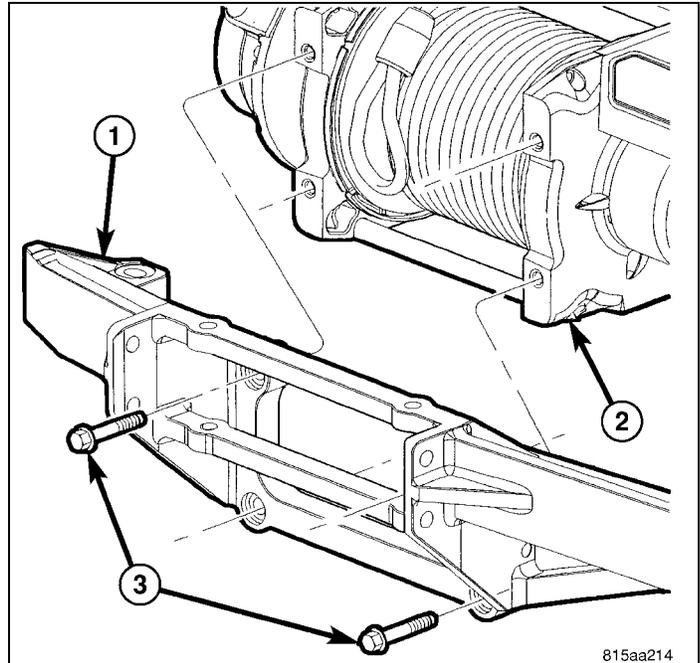
2. Remove the upper bolts (1) and remove the frame brackets (2).



3. Separate one of the roller shaft clips (1), remove the shaft (3) and the roller (4).

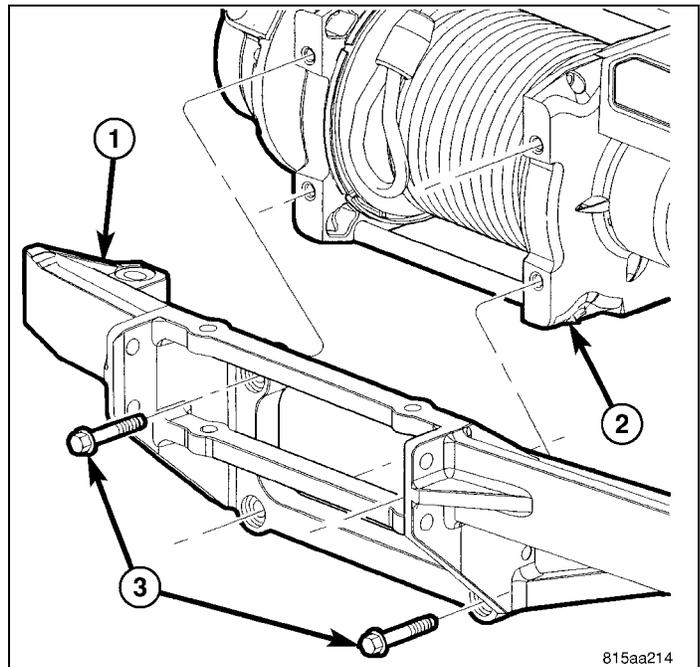


4. Remove the bolts (3) and separate the support bracket (1) from the winch assembly (2).

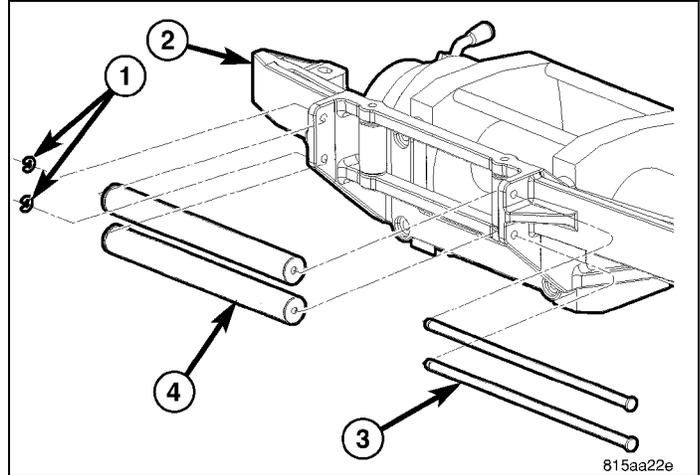


## INSTALLATION

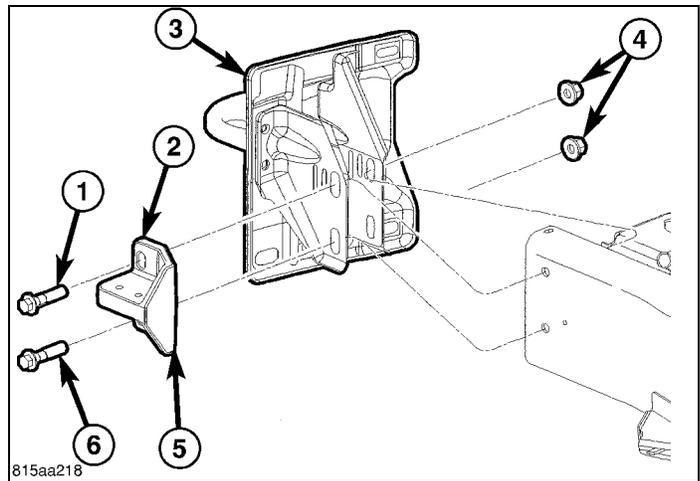
1. Install the support bracket (1) and install the bolts (3).
2. Tighten the bolts to 108 N·m (80 ft. lbs.).



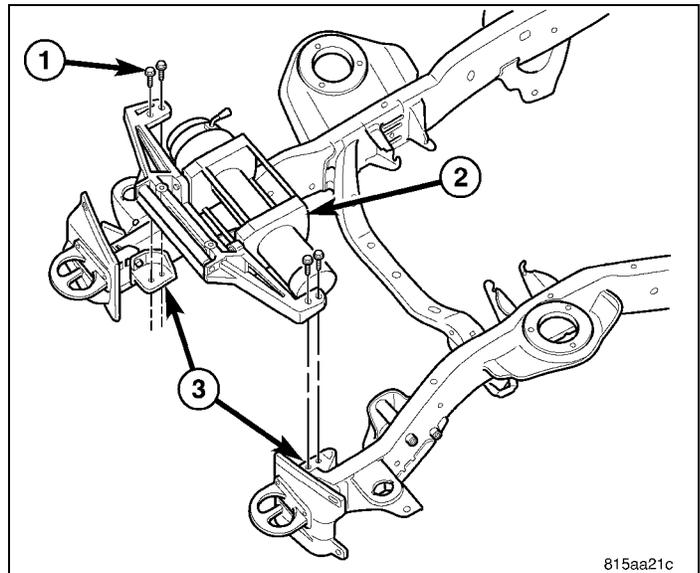
3. Position the wire rope through the roller opening and install the roller (4), shaft (3) and clip (1).



4. Install the frame bracket (2) and install the upper bolt (1) and nut (4) and hand tighten.



5. Install the winch (2). (Refer to 23 - BODY/WINCH - INSTALLATION)

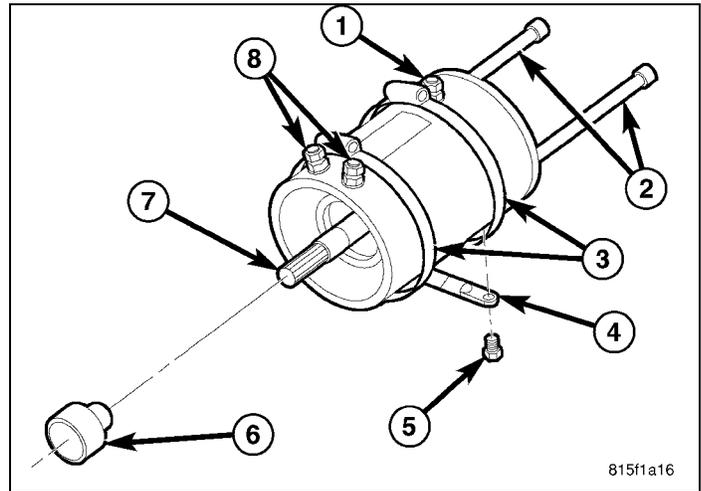


## MOTOR

### DESCRIPTION

The winch is driven on one end by a two direction electric motor powered by the vehicle electrical system. The motor is internally protected by a thermal switch that is activated when the motor gets too hot to operate efficiently.

Winch motor controls consist of a relay pack mounted to the motor, and a remote control connected to the relay pack with a cord. The winch power source cables are connected to the relay pack which in turn feeds power to the winch motor through electrical cable connections. The main function of the relay pack is to allow the operator to switch the winch on and off in both directions. The winch relay pack also includes a Low Voltage Interrupt (LVI) used to prevent winch operation in the event of battery power dropping below 10 volts.

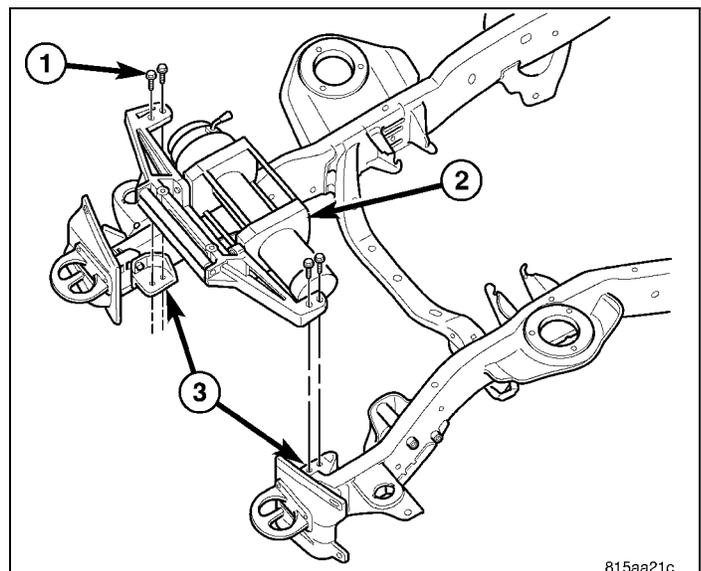


### MOTOR

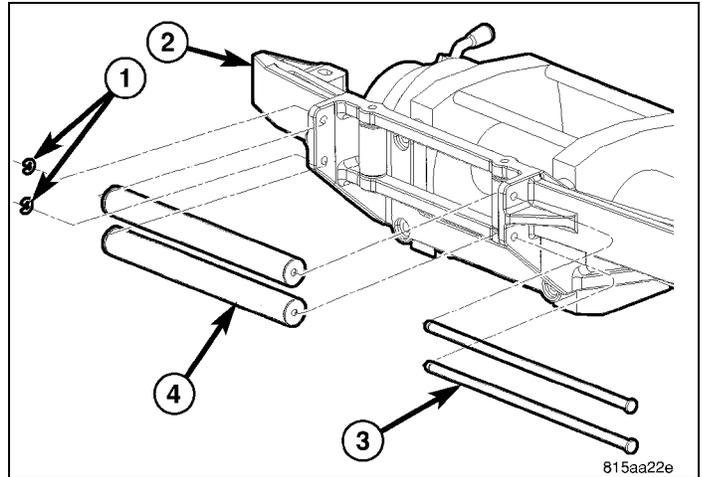
- 1 - ARMATURE STUD/NUT 7 N·m (60 in. lbs.)
- 2 - MOTOR BOLTS (2) 9 N·m (82 in. lbs.)
- 3 - MOUNTING BAND CLAMPS
- 4 - GROUND CABLE
- 5 - GROUND BOLT 14 N·m (10 ft. lbs.)
- 6 - MOTOR COUPLER
- 7 - MOTOR DRIVE SHAFT
- 8 - FIELD STUDS/NUTS 7 N·m (60 in. lbs.)

### REMOVAL

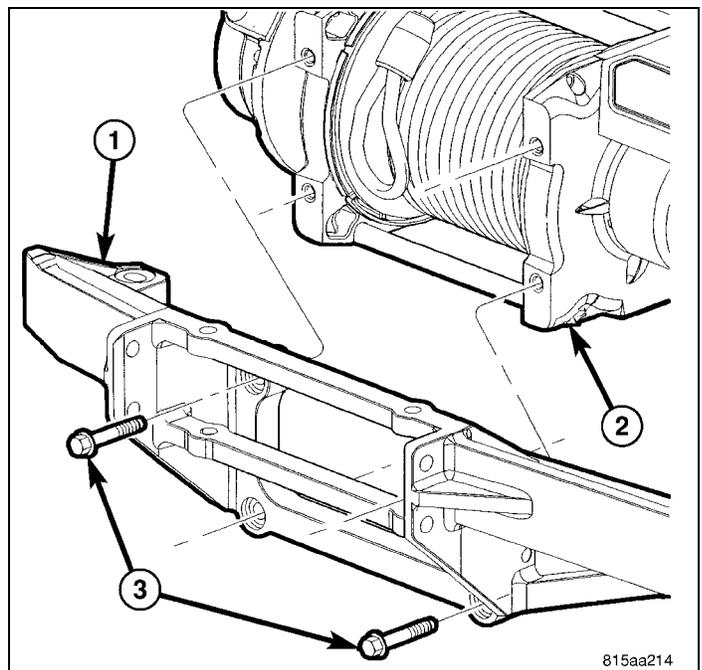
1. Remove the winch assembly (2). (Refer to 23 - BODY/WINCH - REMOVAL)



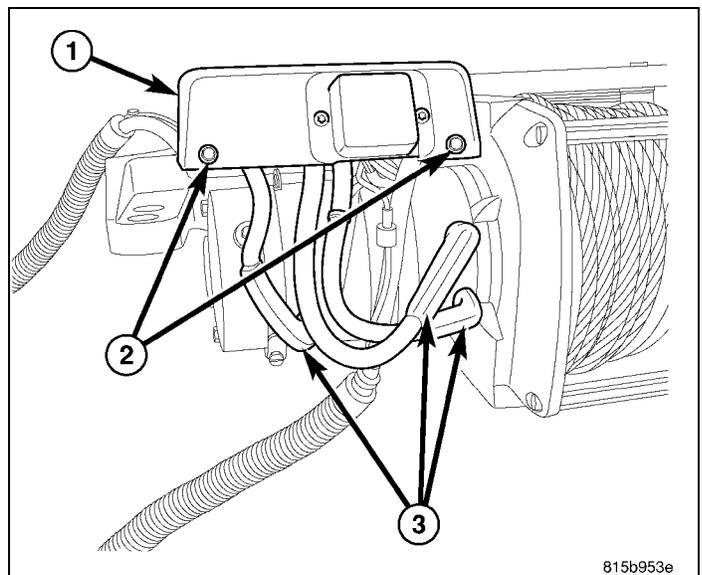
- 2. Separate one of the roller shaft clips (1), remove the shaft (3) and the roller (4).



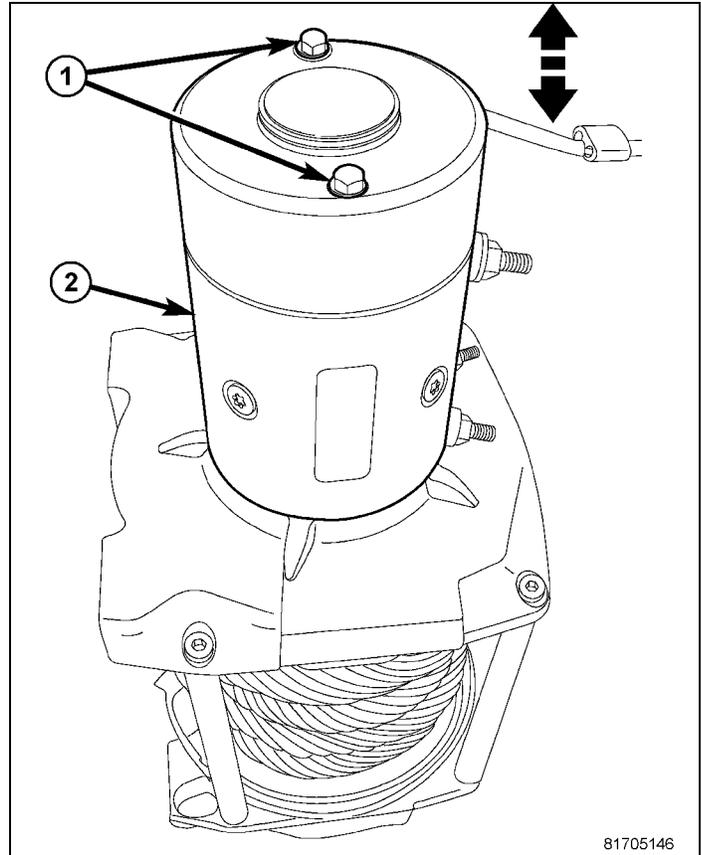
- 3. Remove the bolts (3) and separate the support bracket (1) from the winch assembly (2).



- 4. Remove the relay pack (1). (Refer to 23 - BODY/ WINCH/RELAY PACK - REMOVAL)

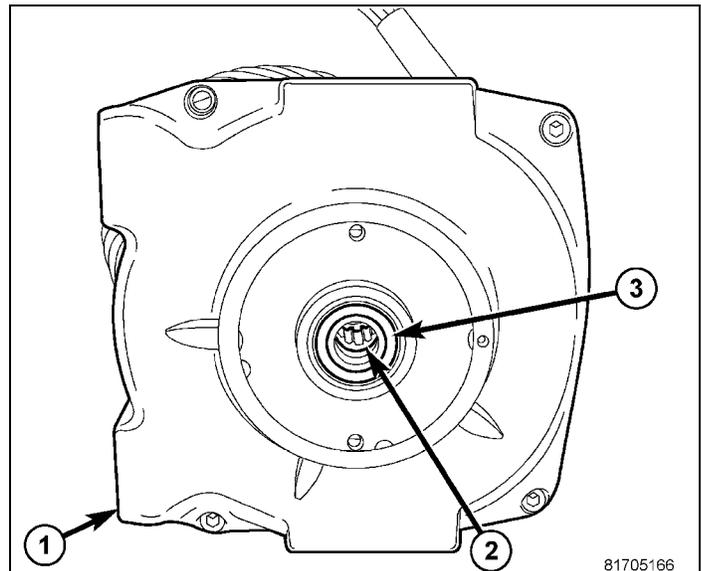


- Stand winch assembly on the clutch end with the motor up to make it easier to align the motor coupler and drive shaft.
- Remove the two motor mounting bolts (1) and carefully lift the motor (2) off of the drum assembly.

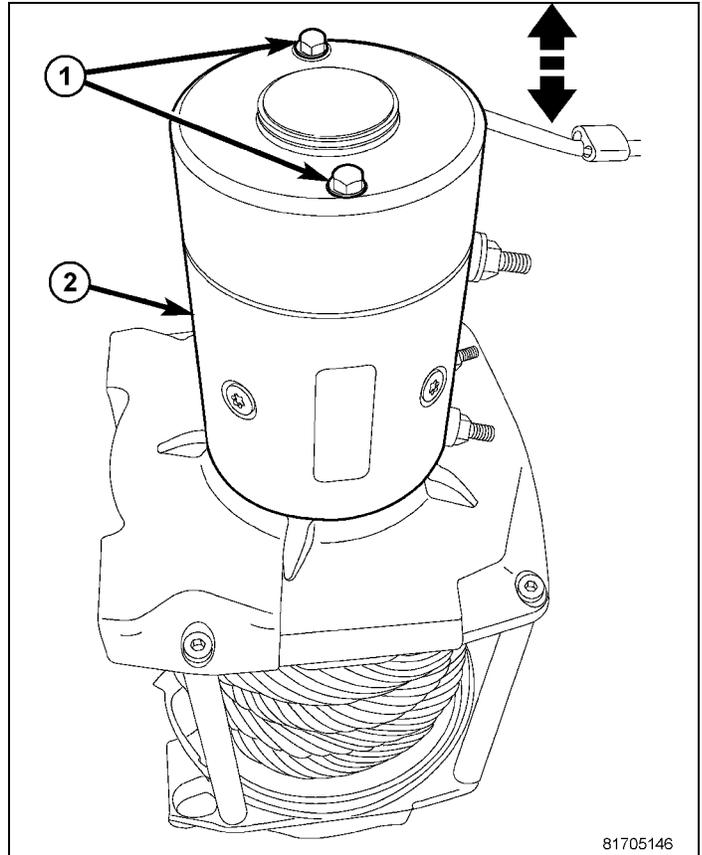


## INSTALLATION

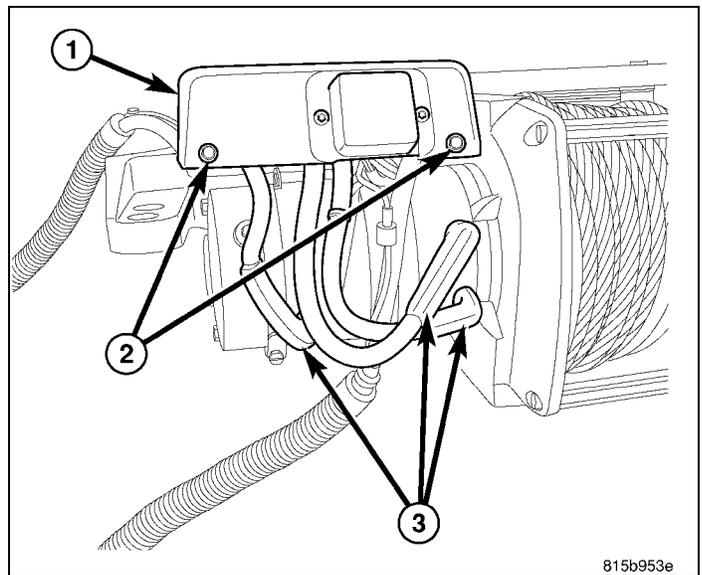
- With the winch assembly (1) standing on the clutch side verify that the motor coupler (2) is centered in the drive shaft opening (3).



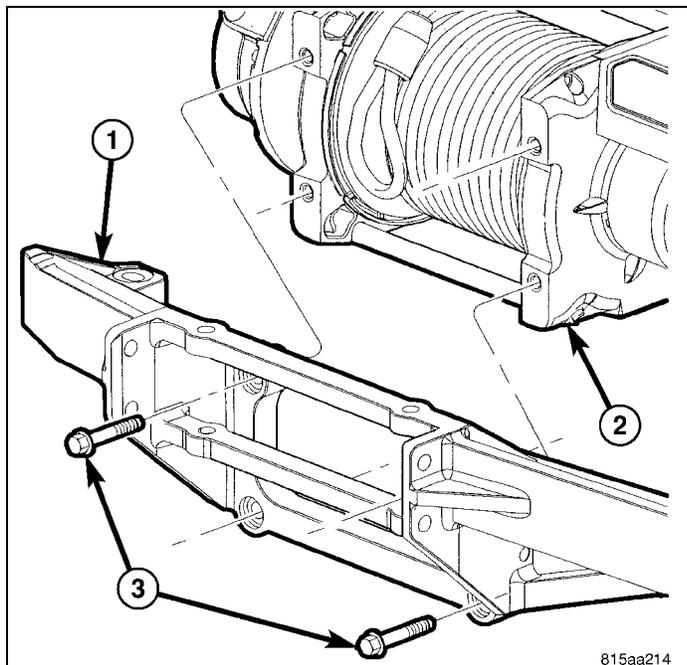
- 2. Position the motor drive shaft into the motor coupler splines and install the motor (2).
- 3. Install the bolts (1) and tighten to 9 N·m (82 in. lbs.).



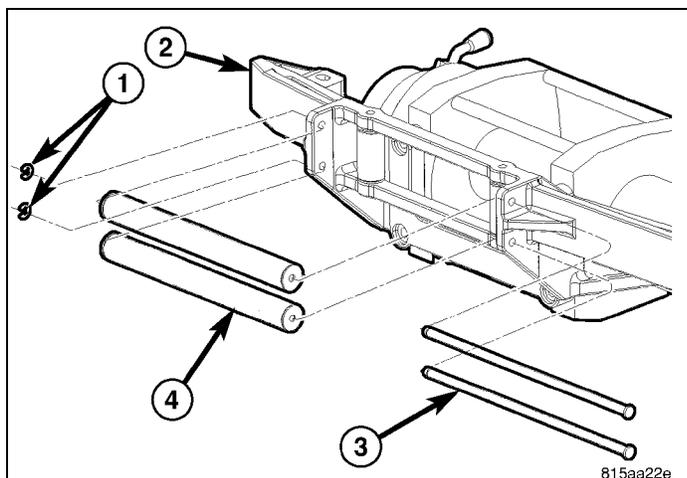
- 4. Install the relay pack (1). (Refer to 23 - BODY/ WINCH/RELAY PACK - INSTALLATION)



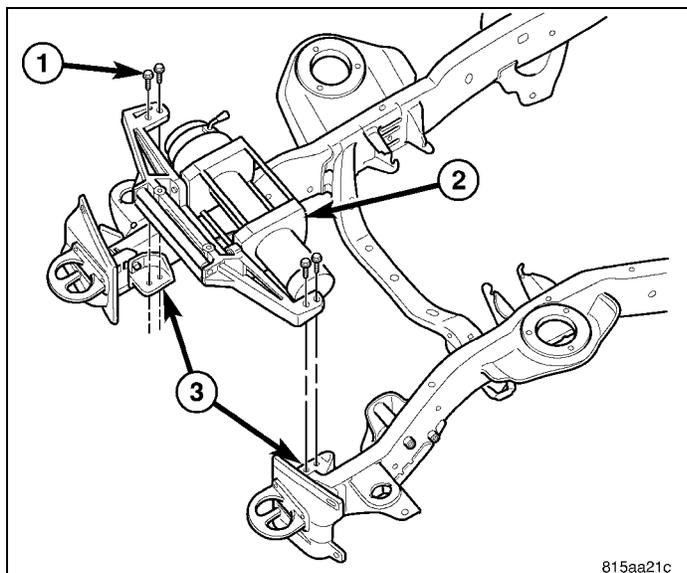
5. Install the support bracket (1) and install the bolts (3).
6. Tighten the bolts to 108 N·m (80 ft. lbs.).



7. Position the wire rope through the roller opening and install the roller (4), shaft (3) and clip (1).



8. Install the winch assembly (2). (Refer to 23 - BODY/ WINCH - INSTALLATION)



## MOTOR-TIE RODS

### REMOVAL

1. Remove the winch assembly. (Refer to 23 - BODY/WINCH - REMOVAL)
2. Remove the bolts and remove the damaged tie rod(s).

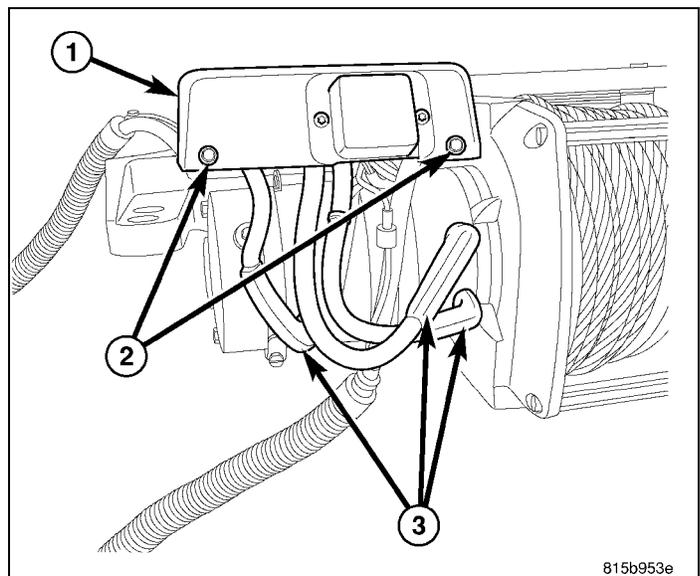
### INSTALLATION

1. Install the tie rod(s) and install the bolts.
2. Tighten the bolts to 23 N·m (17 ft. lbs.).
3. Install the winch assembly. (Refer to 23 - BODY/WINCH - INSTALLATION)

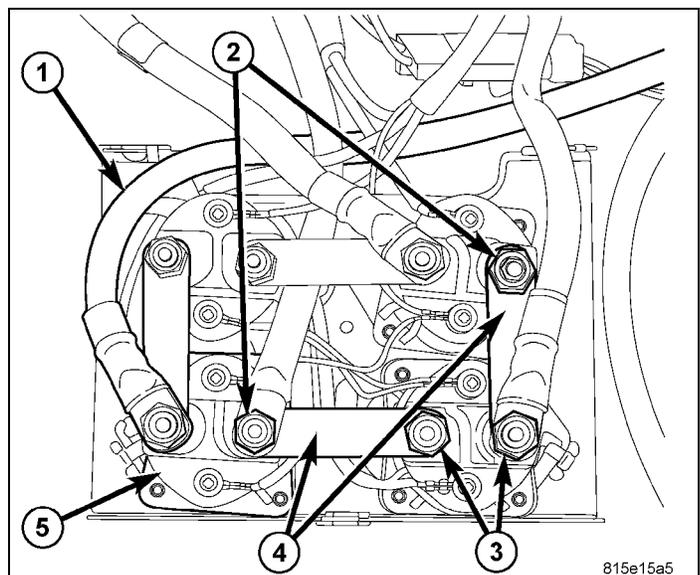
## RELAY

### REMOVAL

1. Remove the relay pack (1). (Refer to 23 - BODY/WINCH/RELAY PACK - REMOVAL)

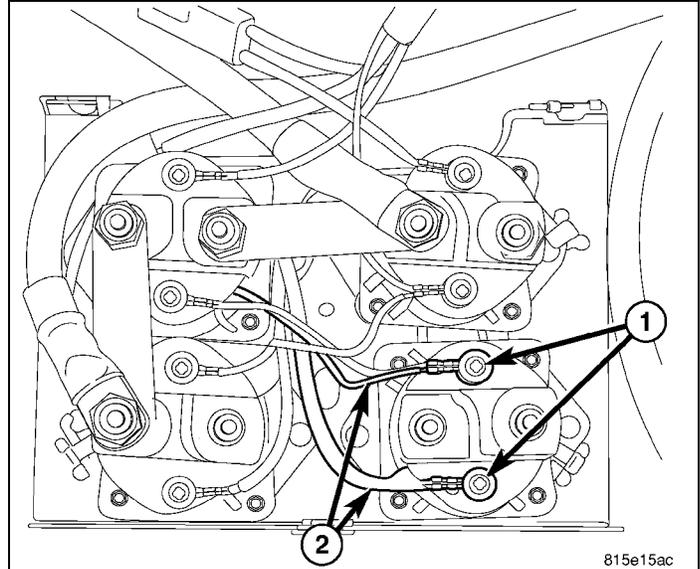


2. Remove the nuts (2 & 3), disconnect the cables and remove the bus straps (4).

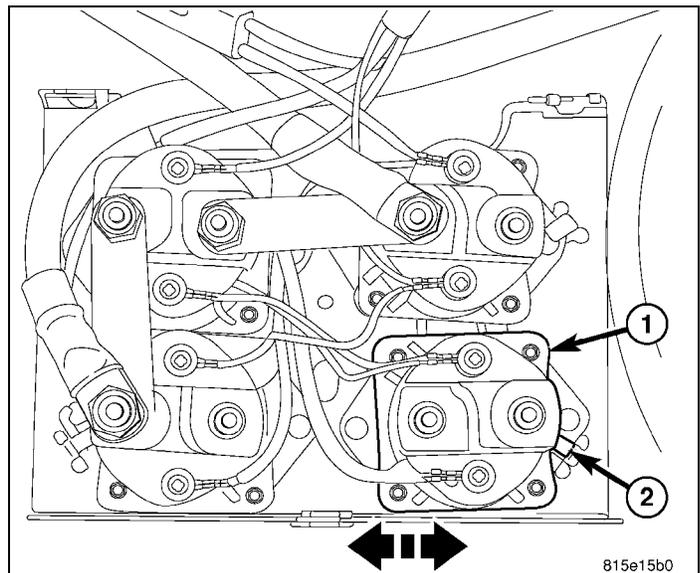


**NOTE: Relay #4 shown, all others similar.**

3. Remove the nuts (1) and disconnect the control wires (2).



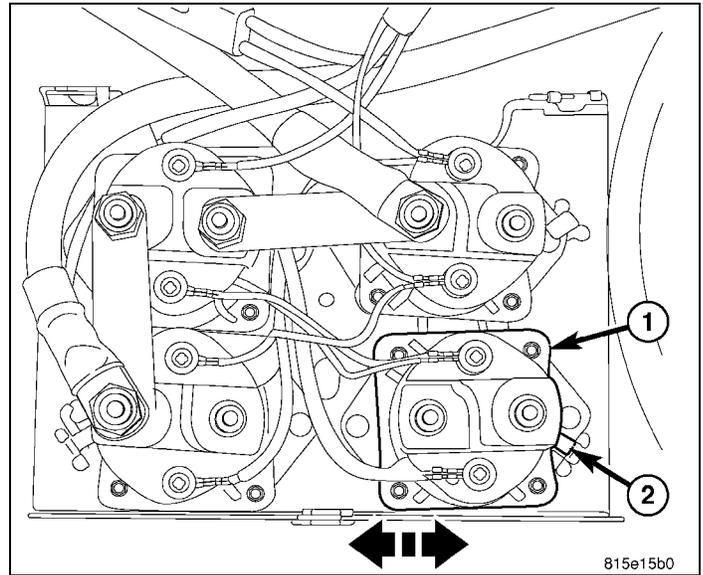
4. Slide the relay (1) out of the retaining tab (2) and remove.



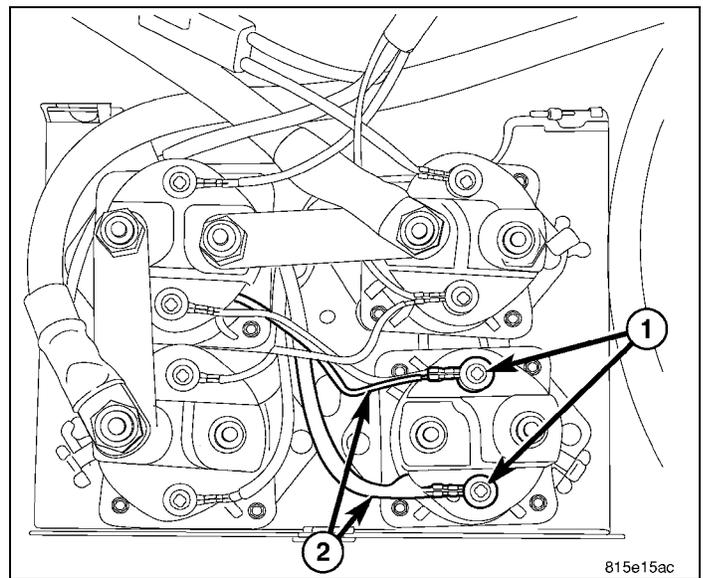
### INSTALLATION

**NOTE: Relay #4 shown, all others similar.**

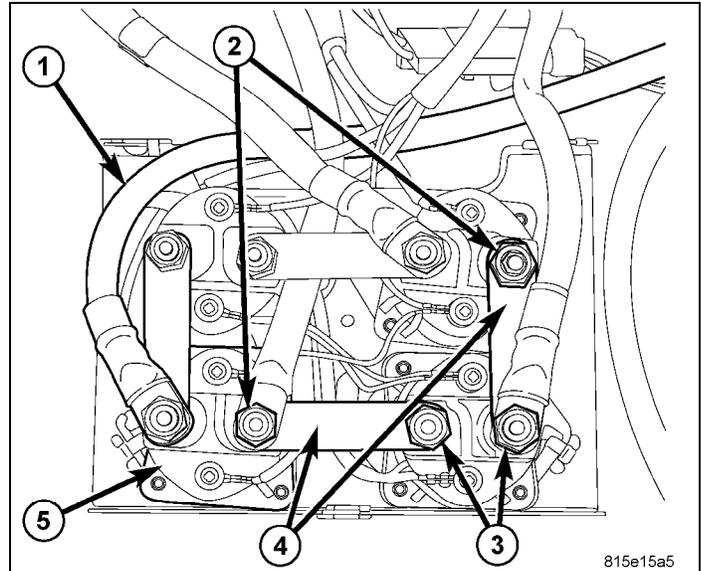
1. Slide the relay (1) into the retaining tab (2).



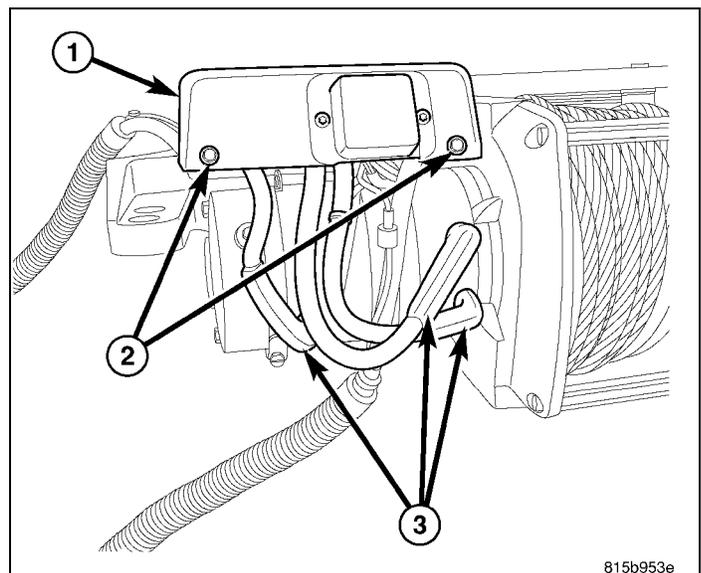
2. Install the control wires (2) and install the nuts (1).
3. Tighten the nuts to 3 N-m (25 in. lbs.).



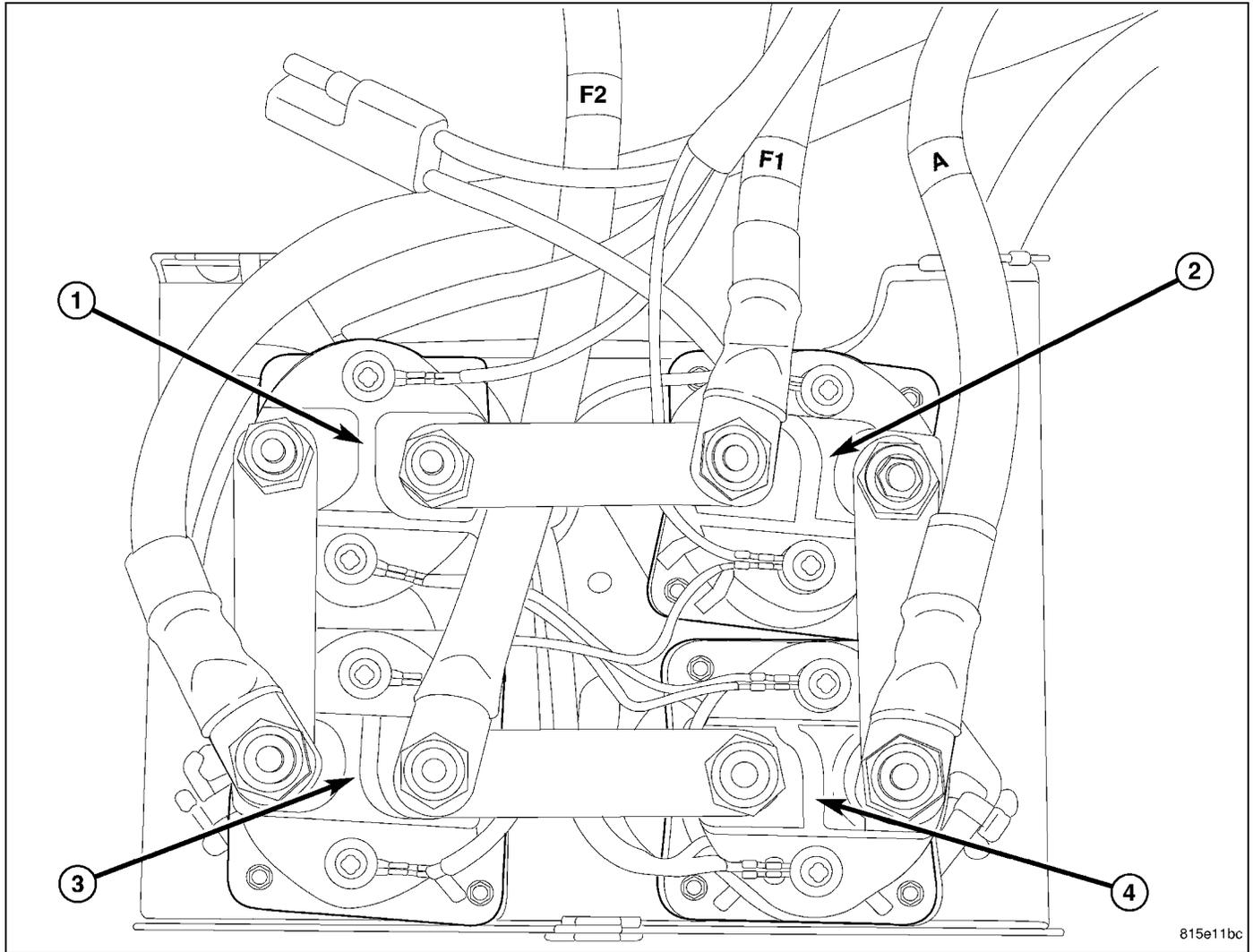
4. Install the bus straps (4) and connect the cables.
5. Install the nuts (2 & 3) and tighten to 9.5 N·m (85 in. lbs.).



6. Install the relay pack (1). (Refer to 23 - BODY/WINCH/RELAY PACK - INSTALLATION)



**RELAY PACK**  
**DESCRIPTION**



**RELAY PACK**

- |              |                    |
|--------------|--------------------|
| 1 - RELAY #1 | F2 - FIELD #2 LEAD |
| 2 - RELAY #2 | F1 - FIELD #1 LEAD |
| 3 - RELAY #3 | A - ARMATURE LEAD  |
| 4 - RELAY #4 |                    |

Electrical operation of the control assembly consists of four heavy duty relays, a thermal-switch located on the motor armature brush holder and a Low Voltage Interrupt (LVI) located in the control assembly. The thermal-switch interrupts the power-in function and the LVI affects both the power-in and power-out functions and must be reset by allowing the charging circuit voltage to rise above 10 volts for more than 30 seconds. The thermal switch is reset only by allowing the winch motor to cool adequately (about 30 minutes). Relay number 1 and 3 control current flow through the field windings and relay number 2 and 4 supply current to the motor armature.

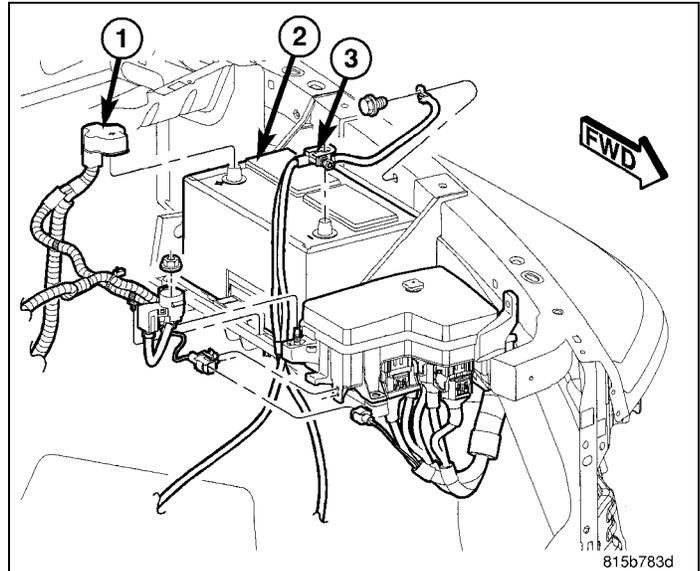
**Operation**

In the power-out mode, relay number 2 and 3 are energized by the remote control switch. Current flows from the positive battery terminal through relay number 3 then through the black motor cable to the number 2 and number 1 field windings. From the black motor cable current then flows through solenoid number 2 to the motor armature to ground.

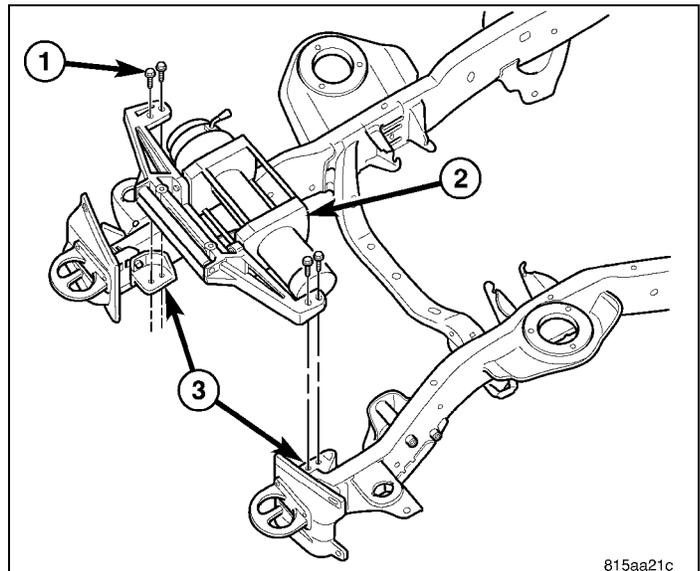
In power-in mode, relay number 1 and 4 are energized. Current again flows from the battery positive cable, but this time current flows through solenoid number 1 then through field winding number 1. Current flowing in the reverse direction through the field windings cause the motor to turn in the opposite direction. From the red motor cable current then flows through relay number 4 to the black cable going to the motor armature to ground.

## REMOVAL

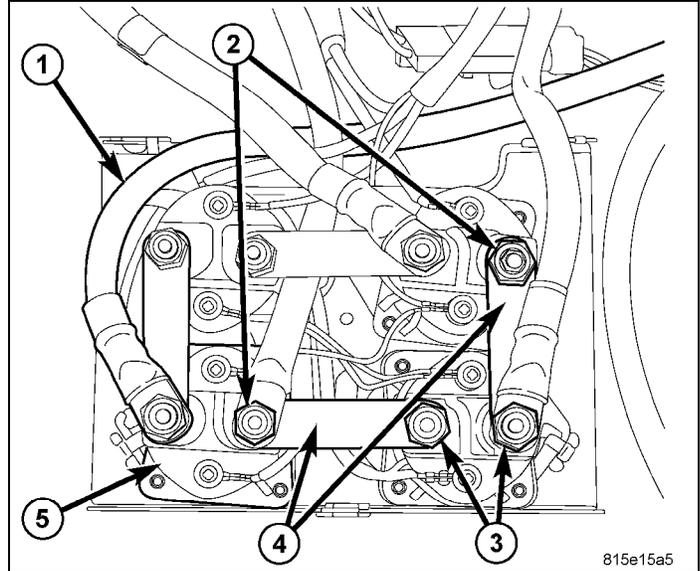
1. Disconnect and isolate battery negative cable (3).



2. Remove the winch assembly (2). (Refer to 23 - BODY/WINCH - REMOVAL)

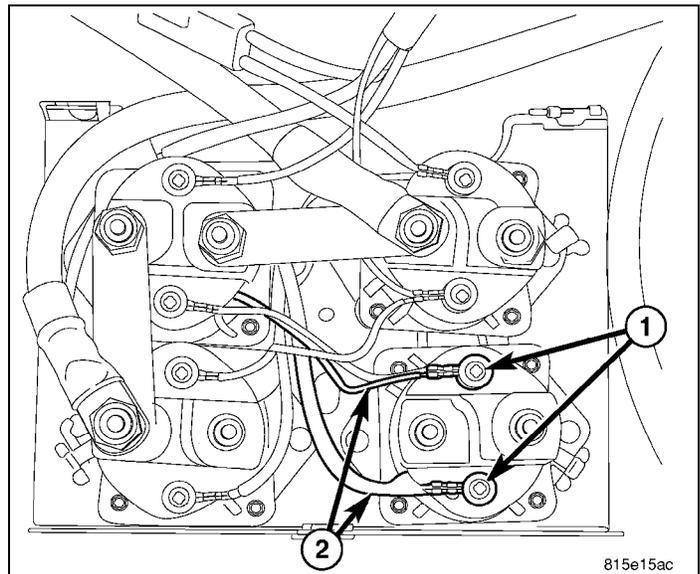


- 3. Remove the nut and disconnect the red battery positive cable (1).



**NOTE: Relay #4 shown, all others similar.**

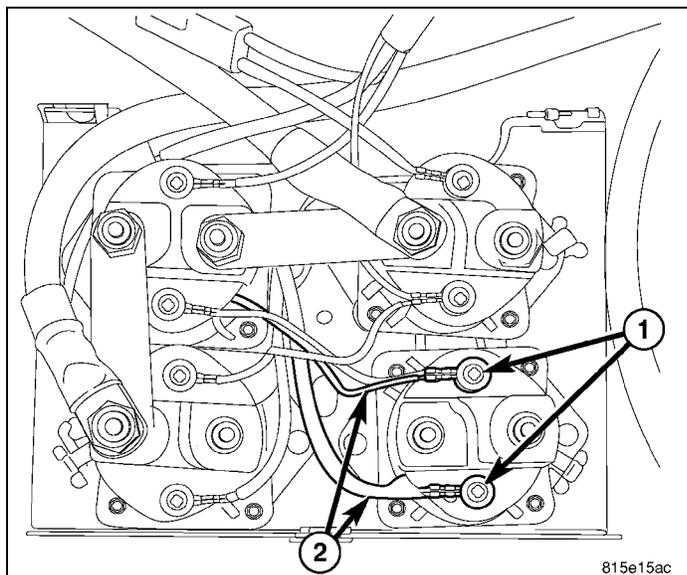
- 4. Remove the control wire nuts (1) and disconnect the control wires (2) from each relay.



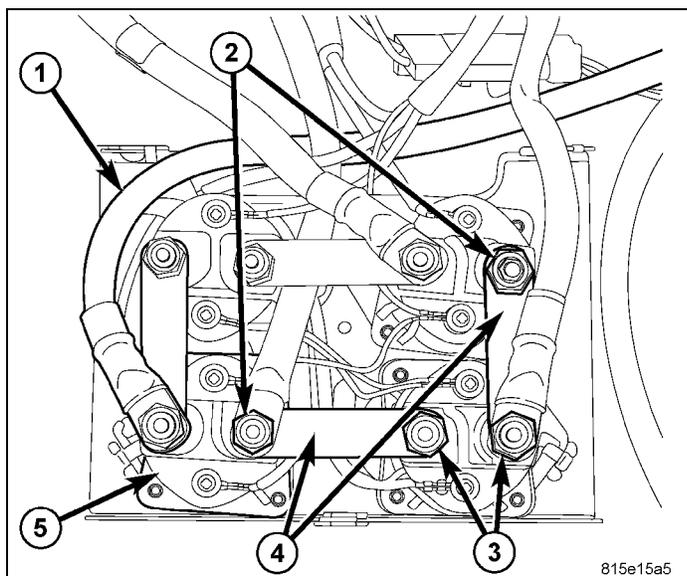
## INSTALLATION

**NOTE: Relay #4 shown, all others similar.**

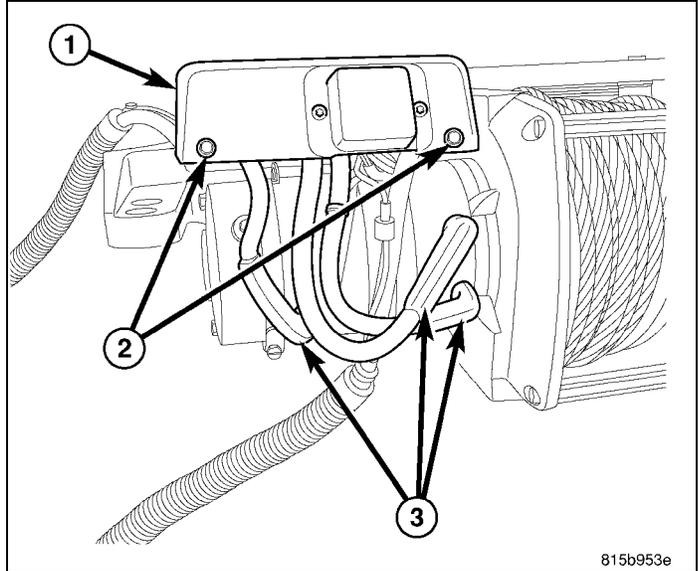
1. Install the control wires (2) to all the relays and install the nuts (1).
2. Tighten the nuts to 3 N·m (25 in. lbs.).



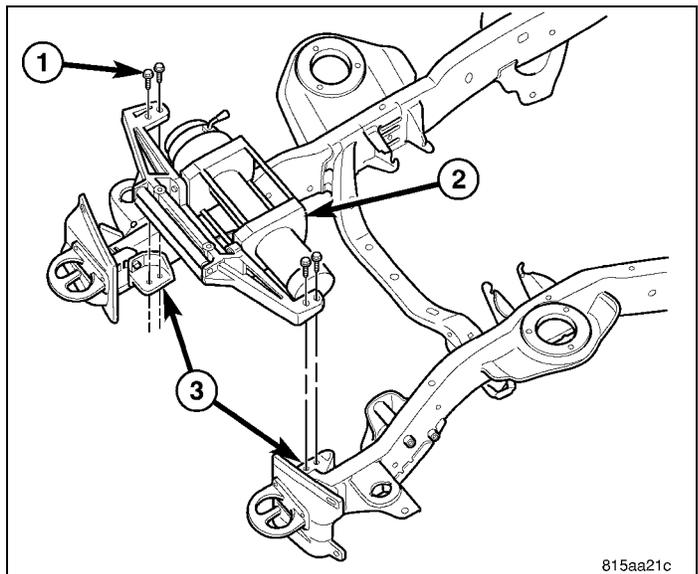
3. Install the red battery positive cable (1) and install the switch wire.
4. Install the nut and tighten to 10 N·m (85 in. lbs.).



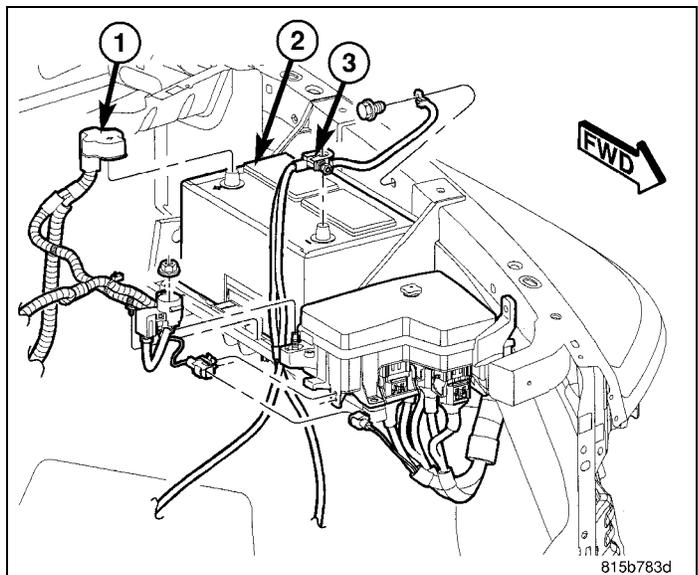
- 5. Install the relay pack cover (1) and install the three screws (2).



- 6. Install the winch assembly (2). (Refer to 23 - BODY/ WINCH - INSTALLATION)



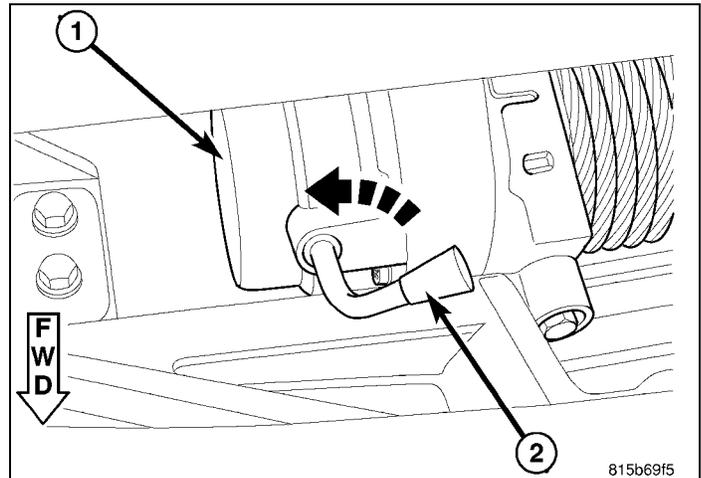
- 7. Connect the battery negative cable (3) and verify winch operation.



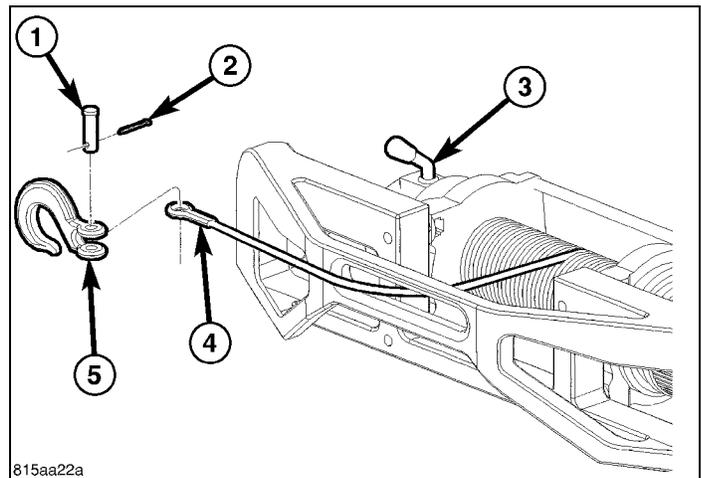
## WIRE ROPE

### REMOVAL

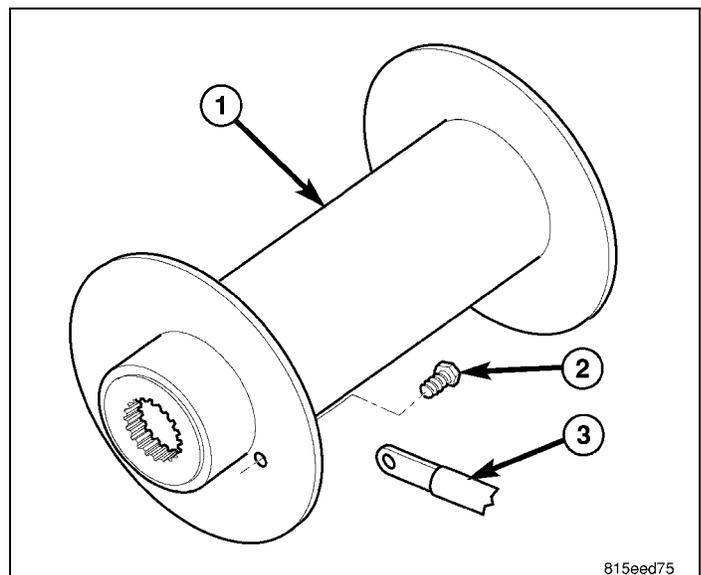
1. Move the clutch lever (2) to "Free Spool" and disengage the wire rope. Pull out a portion to give it some slack.



2. Remove the clip (2), pin (1) and remove the hook (5) from the wire rope (4).



3. Pull the wire rope out and unwind the winch drum (1).
4. Remove the bolt (2) and remove the rope (3).



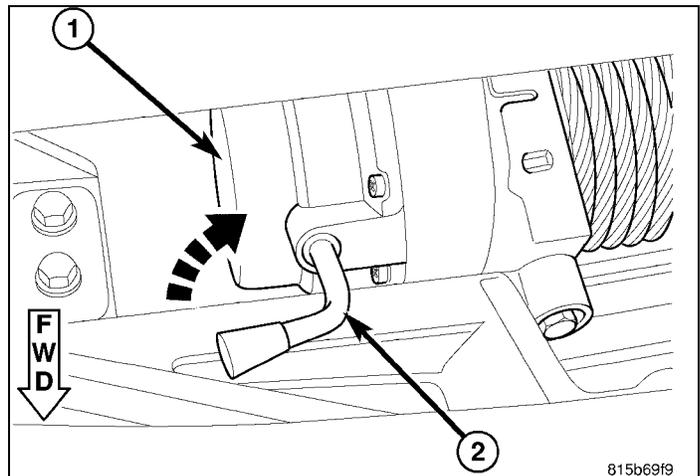
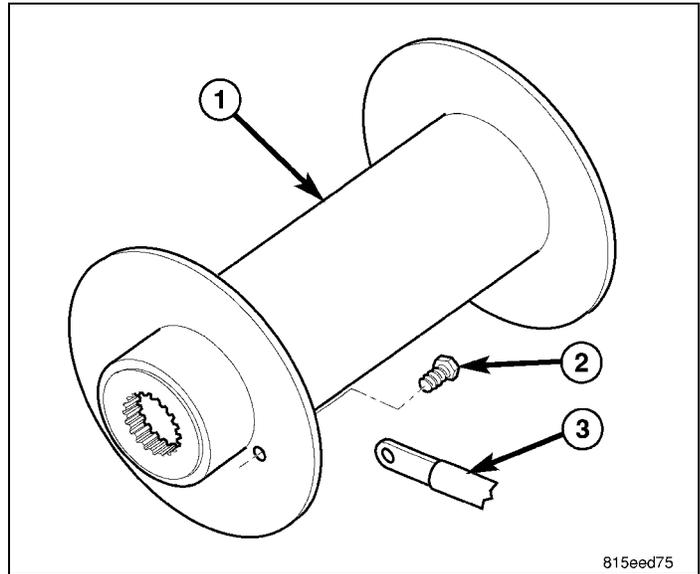
## INSTALLATION

**WARNING:** Always keep hands and clothing clear of the wire rope, hook and fairlead opening during operation and when spooling. Failure to follow these instructions may result in personal injury or death.

**CAUTION:** Wire rope must spool on the winch drum in the direction indicated.

1. Feed the new wire rope end (3) through the guide rollers.
  2. Attach the flat side of the wire rope end (3) to the winch drum (1), apply red thread locker to the threads and install the bolt (2).
  3. Wrap the wire rope around the spool approximately one time, in the direction indicated on the spool.
  4. Tighten the bolt to 3 N·m (25 in. lbs.).
- 
5. Arrange the wire rope so it will not kink or tangle when spooled.
  6. Lock the winch drum by rotating the clutch lever (2) on the winch to "Engage."

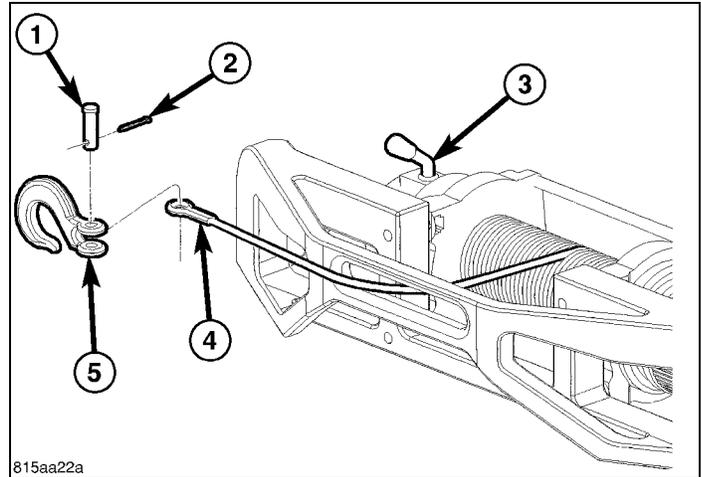
**NOTE:** Always make sure the clutch is engaged or disengaged fully.



7. Connect the remote control to the socket.
8. Install the hook (5), the pin (1) and clip (2) to the end of the wire rope (4).
9. Keep the rope under light tension and spool the rope back onto the winch drum in even layers.
10. Stop frequently to tighten and straighten the layers as necessary.
11. Repeat this process until the winch hook (5) is the same distance from the winch as the full length of the remote control.
12. Using the hook strap, walk the wire rope towards the guide rollers, carefully spooling in the remaining wire rope by pulsing the remote control switch.

**NOTE: If you do not have the hook strap, use a length of cord or similar when handling the hook during servicing of the winch.**

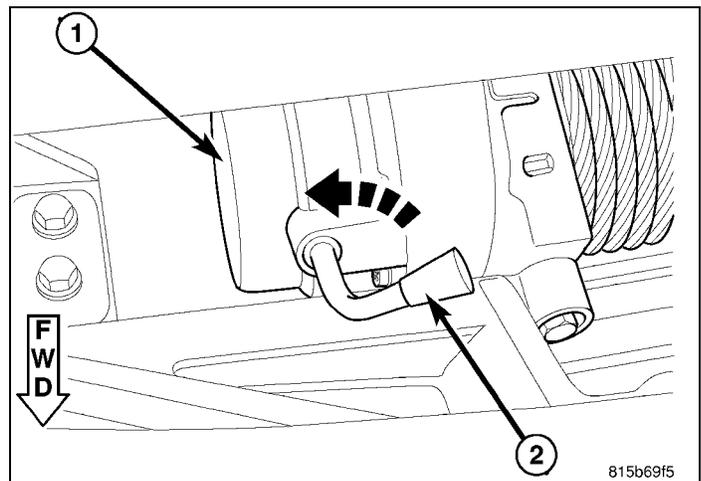
13. Store the winch hook on the most outboard loop of the tow hook and remove the slack from the wire rope.



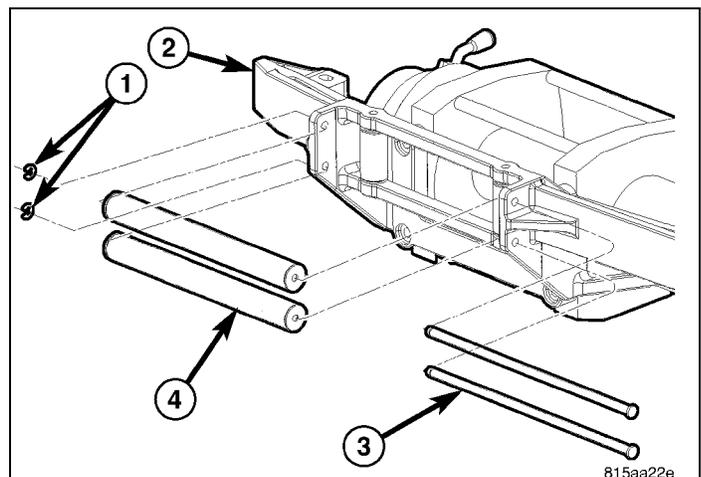
## WIRE ROPE GUIDE ROLLERS

### REMOVAL

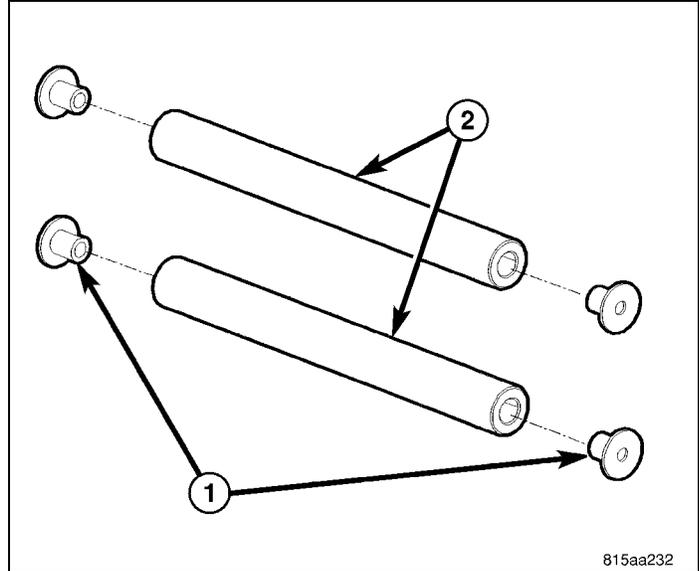
1. Move the clutch lever (2) to "Free Spool" and disengage the wire rope. Pull out a portion to give it some slack.



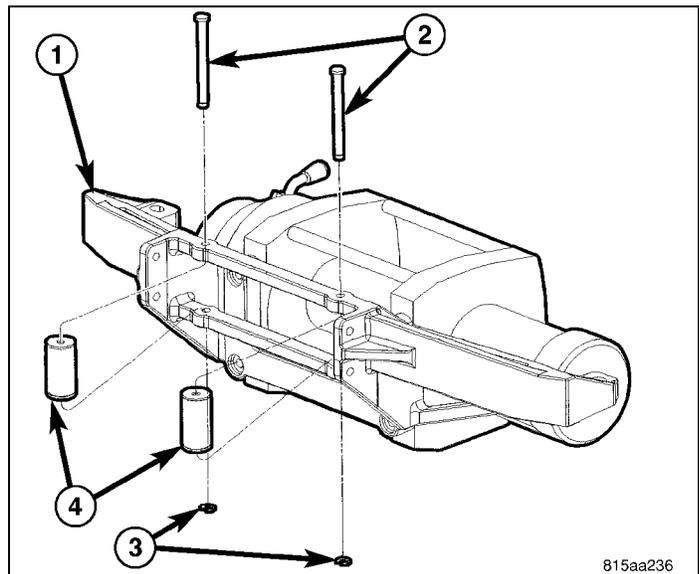
2. Remove the clips (1).
3. Remove the roller axle rods (3) and remove the rollers (4) from the support bracket (2).



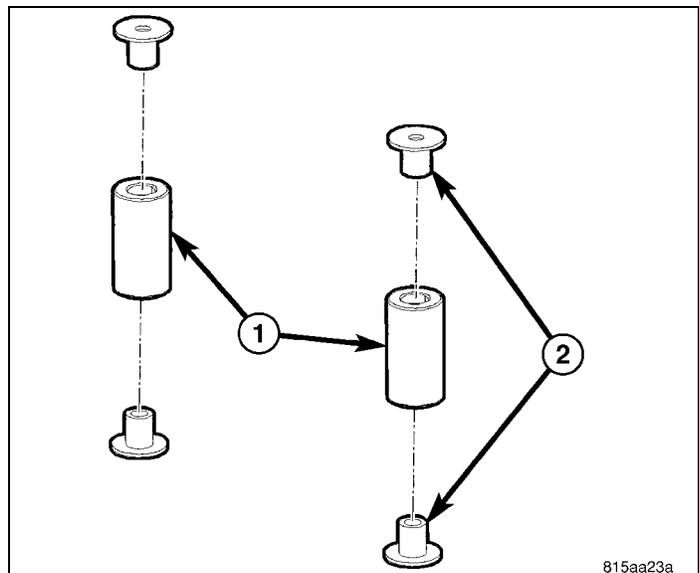
- 4. Separate the bushings (1) from the rollers (2) and replace if necessary.



- 5. Remove the clips (3).
- 6. Remove the roller axle rods (2) and remove the rollers (4) from the support bracket (1).

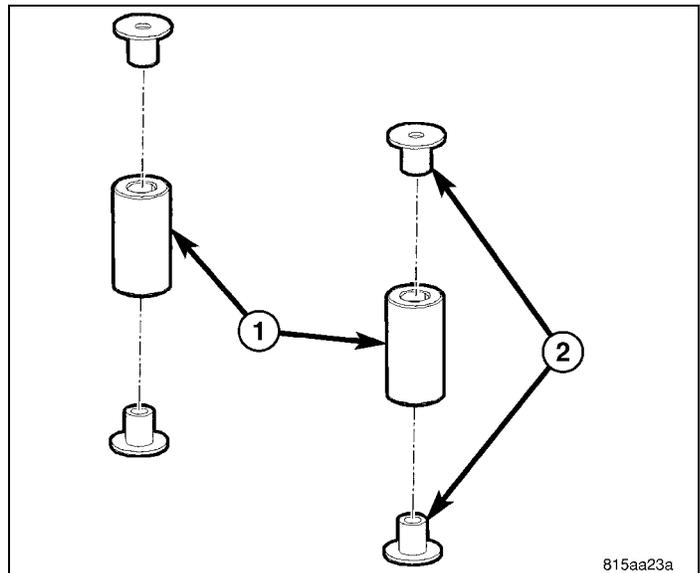


- 7. Separate the bushings (2) from the rollers (1) and replace if necessary.

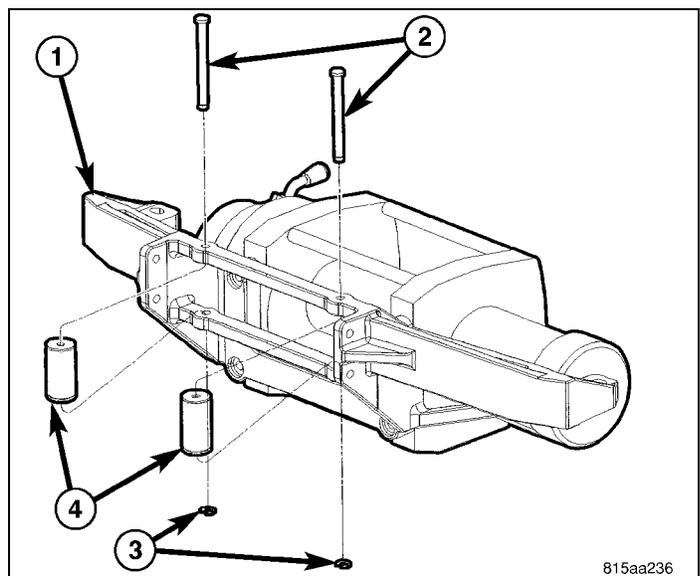


## INSTALLATION

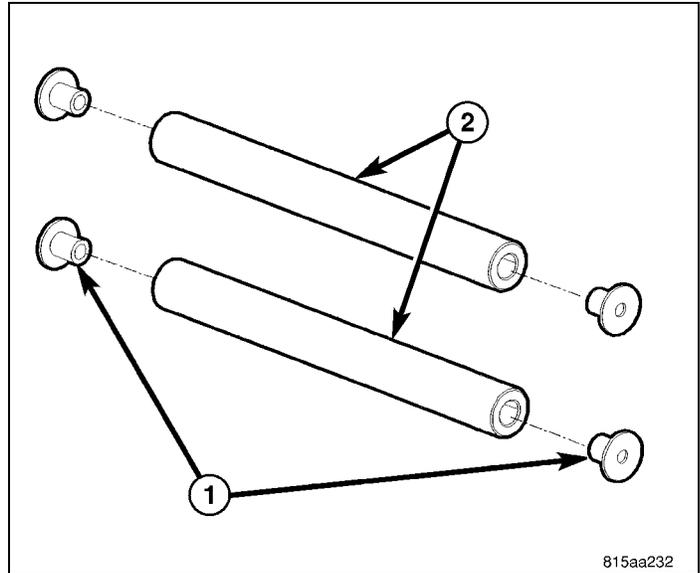
1. Install the roller bushings (2) onto the rollers (1).



2. Install the rollers (4) and install the axle rods (2).
3. Install the clips (3).

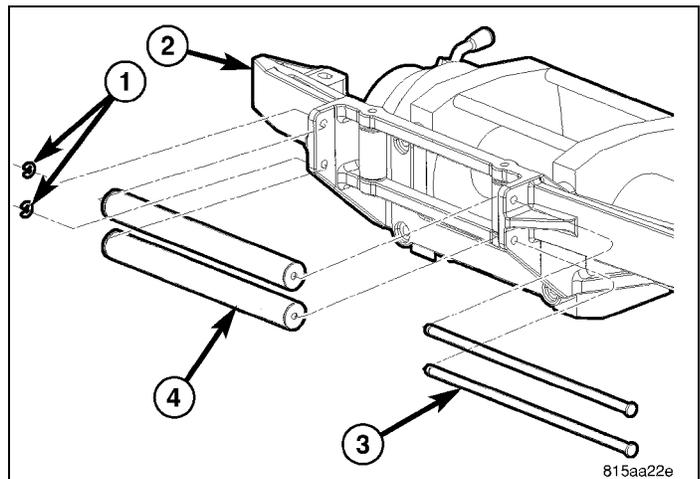


4. Install the roller bushings (1) onto the rollers (2).



5. Install the roller axle rods (3) and install the rollers (4) onto the support bracket (2).

6. Install the clips (1).



7. Store the winch hook on the most outboard loop of the tow hook.

8. Engage the clutch lever (2) and remove the slack from the wire rope.

