

- CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
- NO RESP/NOT EQUIP for GEM, go to Pinpoint Test A.
- **NOTE:** For vehicles built prior to February 5, 1998, the following criteria must be met when performing the GEM On-Demand Self-Test: headlamps and parklamps must be off and the power windows must be completely up. Failure to meet this criteria will result in DTCs B1577 and B2337 being set. For vehicles built after February 5, 1998, the following criteria must be met when performing the GEM On-Demand Self-Test: headlamps and parklamps must be on. Failure to meet this criteria will result in DTC B1575 being set.

SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs, and perform self-test diagnostics for the GEM.

7. If the DTCs retrieved are related to the concern, go to the GEM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
8. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

GEM Diagnostic Trouble Code (DTC) Index

GEM Diagnostic Trouble Code (DTC) Index			
DTC	Description	DTC Caused By	Action
B1217	Horn Relay Coil Circuit Failure	GEM	GO to Pinpoint Test B .
B1218	Horn Relay Coil Circuit Short to Battery	GEM	GO to Pinpoint Test B .
B1243	Express Window Down Switch Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1300	Power Door Lock Circuit Failure	GEM	GO to Pinpoint Test C .
B1302	Accessory Delay Relay Coil Circuit Failure	GEM	REFER to Section 501-11 .
B1304	Accessory Delay Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1310	Power Door Unlock Circuit Failure	GEM	GO to Pinpoint Test D .
B1317	Battery Voltage High	GEM	REFER to Section 414-00 .

B1318	Battery Voltage Low	GEM	REFER to Section 414-00 .
B1322	Driver Door Ajar Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1323	Door Ajar Lamp Circuit Failure	GEM	REFER to Section 413-01 .
B1325	Door Ajar Lamp Circuit Short to Battery	GEM	REFER to Section 413-01 .
B1330	Passenger Door Ajar Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1338	Door Ajar RR Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1340	Chime Input Request Circuit Short to Ground	GEM	REFER to Section 413-09 .
B1342	ECU is Defective, RAM/ROM Checksum Failure	GEM	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, REPLACE the GEM. REFER to Section 419-10 . TEST the system for normal operation.
B1352	Ignition Key-In Circuit Failure	GEM	REFER to Section 413-09 .
B1355	Ignition Run Circuit Failure	GEM	REFER to Section 211-05 .
B1359	Ignition Run/ACC Circuit Failure	GEM	REFER to Section 211-05 .
B1366	Ignition Start Circuit Short to Ground	GEM	REFER to Section 211-05 .
B1371	Illuminated Entry Relay Circuit Failure	GEM	REFER to Section 417-02 .
B1373	Illuminated Entry Relay Short to Battery	GEM	REFER to Section 417-02 .
B1396	Power Door Lock Circuit Short to Battery	GEM	GO to Pinpoint Test C .
B1397	Power Door Unlock Circuit Short to Battery	GEM	GO to Pinpoint Test D .
B1398	Driver Power Window One Touch Window Relay Circuit Failure	GEM	REFER to Section 501-11 .
B1400	Driver Power Window One Touch Relay Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1405	Driver Power Window Down Circuit Short to Battery	GEM	REFER to Section 501-11 .

B1410	Driver Power Window Motor Circuit Failure	GEM	REFER to Section 501-11.
B1426	Lamp Seat Belt Circuit Short to Battery	GEM	REFER to Section 413-01.
B1428	Lamp Seat Belt Circuit Failure	GEM	REFER to Section 413-01.
B1431	Wiper Brake/Run Relay Circuit Failure	GEM	REFER to Section 501-16.
B1432	Wiper Brake/Run Relay Circuit Short to Battery	GEM	REFER to Section 501-16.
B1434	Wiper Hi/Low Speed Relay Coil Circuit Failure	GEM	REFER to Section 501-16.
B1436	Wiper Hi/Low Speed Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-16.
B1438	Wiper Mode Select Switch Circuit Failure	GEM	REFER to Section 501-16.
B1441	Wiper Mode Select Switch Circuit Short to Ground	GEM	REFER to Section 501-16.
B1446	Wiper Park Sense Circuit Failure	GEM	REFER to Section 501-16.
B1450	Wiper Wash/Delay Switch Circuit Failure	GEM	REFER to Section 501-16.
B1453	Wiper Wash/Delay Switch Circuit Short to Ground	GEM	REFER to Section 501-16.
B1458	Wiper Washer Pump Motor Relay Circuit Failure	GEM	REFER to Section 501-16.
B1460	Wiper Washer Pump Motor Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-16.
B1462	Seat Belt Switch Circuit Failure	GEM	REFER to Section 413-09.
B1473	Wiper Low Speed Circuit Motor Failure	GEM	REFER to Section 501-16.
B1475	Accessory Delay Relay Contact Short to Battery	GEM	REFER to Section 501-11.
B1476	Wiper High Speed Circuit Motor Failure	GEM	REFER to Section 501-16.
B1483	Brake Pedal Input Circuit Failure	GEM	REFER to Section 308-07A.
B1485	Brake Pedal Input Battery	GEM	REFER to Section 308-07A.

	Short		
B1574	Door Ajar LR Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1577	Lamp Park Input Circuit Short to Battery	GEM	REFER to Section 413-09 .
B1840	Wiper Front Power Circuit Failure	GEM	REFER to Section 501-16 .
B1982	Driver Door Unlock Relay Circuit Failure	GEM	GO to Pinpoint Test E .
B1983	Driver Door Unlock Relay Circuit Short to Battery	GEM	GO to Pinpoint Test E .
B2132	Dimmer Switch Circuit Short to Ground	GEM	REFER to Section 417-02 .
B2141	NVM Configuration Failure	GEM	CHECK the module configuration. REFER to the NGS Ford Service Function (FSF) card to verify proper module configuration. CLEAR the DTCs. RETRIEVE the DTCs. If DTC B2141 is still present, REPLACE the GEM. REFER to Section 419-10 . TEST the system for normal operation.
B2357	Driver Window Down Current Sense Low Circuit Failure	GEM	REFER to Section 501-11 .
B2425	Remote Keyless Entry Out of Synchronization	GEM	GO to Pinpoint Test F .
C1125	Brake Fluid Level Sensor Input Circuit Failure	GEM	REFER to Section 413-01 .
C1182	Park Lamp Flash Relay Circuit Failure	GEM	GO to Pinpoint Test B .
C1183	Park Lamp Flash Relay Circuit Short to Battery	GEM	GO to Pinpoint Test B .
C1189	Brake Fluid Level Sensor Input Circuit Short to Ground	GEM	REFER to Section 413-01 .
C1223	Lamp Brake Warning Output Circuit Failure	GEM	REFER to Section 413-01 .
C1225	Lamp Brake Warning Output Circuit Short to Battery	GEM	REFER to Section 413-01 .
C1230	Speed Wheel Sensor Rear Center Input Circuit Failure	GEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	GEM	REFER to Section 413-01 .

C1728	Transfer Case Unable to Transition Between 2H and 4H	GEM	REFER to Section 308-07A .
C1729	Transfer Case Unable to Transition Between 4H and 4L	GEM	REFER to Section 308-07A .
C1751	Vehicle Speed Sensor Number 1 Output Circuit Short to Battery	GEM	REFER to Section 310-03 .
C1752	Vehicle Speed Sensor Number 1 Output Circuit Short to Ground	GEM	REFER to Section 310-03 .
P0500	Vehicle Speed Sensor (VSS) Malfunction	GEM	REFER to Section 310-03 , Section 308-07A or Section 501-16 .
P1804	Transmission 4-Wheel Drive High Indicator Circuit Failure	GEM	REFER to Section 308-07A .
P1806	Transmission 4-Wheel Drive High Indicator Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1808	Transmission 4-Wheel Drive Low Indicator Circuit Failure	GEM	REFER to Section 308-07A .
P1810	Transmission 4-Wheel Drive Low Indicator Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1812	Transmission 4-Wheel Drive Mode Select Circuit Failure	GEM	REFER to Section 308-07A .
P1815	Transmission 4-Wheel Drive Mode Select Short Circuit to Ground	GEM	REFER to Section 308-07A .
P1819	Transmission Neutral Safety Switch Short Circuit to Ground	GEM	REFER to Section 308-07A .
P1820	Transmission Transfer Case Clockwise Shift Relay Coil Circuit Failure	GEM	REFER to Section 308-07A .
P1822	Transmission Transfer Case Clockwise Shift Relay Coil Short to Battery	GEM	REFER to Section 308-07A .
P1828	Transfer Case Counterclockwise Shift	GEM	REFER to Section 308-07A .

	Relay Coil Circuit Failure		
P1830	Transmission Transfer Case Counterclockwise Shift Relay Coil Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1832	Transmission Transfer Case Differential Lockup Solenoid Circuit Failure	GEM	REFER to Section 308-07A .
P1834	Transmission Transfer Case Differential Lockup Solenoid Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1838	Transmission Transfer Case Shift Motor Circuit Failure	GEM	REFER to Section 308-07A .
P1865	Transmission Transfer Case Contact Plate Power Short to Ground	GEM	REFER to Section 308-07A .
P1866	Transmission Transfer Case System Concern — Servicing Required	GEM	REFER to Section 308-07A .
P1867	Transmission Transfer Case Contact Plate General Circuit Failure	GEM	REFER to Section 308-07A .
P1876	Transmission Transfer Case 2-Wheel Drive Solenoid Circuit Failure	GEM	REFER to Section 308-07A .
P1877	Transmission Transfer Case 2-Wheel Drive Solenoid Circuit Short to Battery	GEM	REFER to Section 308-07A .

GEM Parameter Identification (PID) Index

GEM Parameter Identification (PID) Index		
PID	Description	Expected Values
ACCDLY	Accessory Delay Relay Circuit	ON, OFF
BOO_GEM	Brake Input Switch Status	ON, OFF
CLTCHSW	Transmission Clutch Interlock Switch	notEGD, ENGAGD
D_DN_	Driver Window Down Switch	OFF, DOWN

SW		
D_PWRLY	Driver Power Window Status	ON---, OFF---
D_PWAMP	Driver Power Window Motor Current	0.25 to 63.75 amps
DRAJR_L	Door Ajar Warning Lamp Status	ON---, OFF---
D_DR_SW	Left External Access Ajar Switch Status	CLOSED, AJAR
D_SBELT	Driver Seat Belt Status	IN, OUT
IGN_GEM	Ignition Switch Status	START, RUN, OFF, ACCY
IGN_KEY	Ignition Key In/Out	IN, OUT
MTR_CCW	Transmission Transfer Counter CW Motor Output	ON---, OFF---
MTR_CW	Transmission Transfer Clockwise Motor Output	ON---, OFF---
NTRL_SW	Neutral Safety Switch Input	NTRL, notNTRL
OTD_SW	Left Front Power Window One Touch Down Status	OFF, DOWN
P_DR_SW	Right External Access Ajar Switch Status	CLOSED, AJAR
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
PRK_BRK	Park Brake Switch Status	ON, OFF
BRKLAMP	Brake Warning Lamp Status	ON---, OFF---
FLUID_1	Brake Fluid Level Switch #1 Status	ON, OFF
FLUID_2	Brake Fluid Level Switch #2 Status	ON, OFF
PLATE_A	Transmission Transfer Case Contact Plate A	OPEN, CLOSED
PLATE_B	Transmission Transfer Case Contact Plate B	OPEN, CLOSED
PLATE_C	Transmission Transfer Case Contact Plate C	OPEN, CLOSED
PLATE_D	Transmission Transfer Case Contact Plate D	OPEN, CLOSED
PLATEPW	Transmission Transfer Case Contact Plate Pull	ON---, OFF---
SBLTLMP	Seat Belt Lamp Circuit	ON---, OFF---
VBATGEM	Battery Voltage	0.0 VDC-25.5 VDC
VSS_GEM	Vehicle Speed Input	0-255 MPH
WASH_SW	Washer Pump Switch	ON, OFF
WPHISP	Windshield Wiper HI/LO Speed Relay	ON---, OFF---
WPMODE	Windshield Wiper Control Mode Select	WASH, OPEN, OFF, INTVL 1-7, LOW, HIGH
WPRUN	Wiper Motor Run Relay Driver State	ON---, OFF---

2WDSOL	2WD Hub Lock Solenoid Output Status	ON---, OFF---
4WDHIGH	4WD High Output State	ON---, OFF---
4WDLow	4WD Low Output State	ON---, OFF---
4WD_SW	4WD Input Switch Status	2WD, 4WD LOW, 4WD HIGH, OPEN, GSHORT
4WDSOL	4WD Hub Lock Solenoid Output Status	ON---, OFF---
IPCHIME	External Chime Request	ON, OFF
PARK_SW	Exterior Lamp Control Input Park Lamps Switch Status	ON, OFF
HDL_DIM	Headlamp Dimmer Switch	ON---, OFF---
PRKFRLY	Park Lamp Flash Relay	ON, OFF
HORNRLY	Horn Control Relay Output Status	ON---, OFF---
DR_UNLK	All Doors Unlock Output Status	ON---, OFF---
DD_UNLK	Driver Door Unlock Output Status	ON---, OFF---
ALL_RLY	All Door Lock Output Status	ON, OFF
INTLMP	Illuminated Entry Relay Circuit	ON---, OFF---
CCNTGEM	Number of Continuous DTCs In GEM	One count per bit

GEM Active Command Index

GEM Active Command		
Active Command	Display	Action
FRONT WINDSHIELD WIPER	WIPER RLY	ON, OFF
FRONT WINDSHIELD WIPER	SPEED RLY	ON, OFF
FRONT WINDSHIELD WIPER	WASH RLY	ON, OFF
WARNING LAMPS AND CHIME	SBLT LAMP	ON, OFF
WARNING LAMPS AND CHIME	CHIME	ON, OFF
WARNING LAMPS AND CHIME	AJAR LAMP	ON, OFF
BATTERY SAVER & COURTESY ENTRY	INT LAMPS	ON, OFF
ONE TOUCH WINDOW DOWN & ACCY DELAY	ACCY RLY	ON, OFF
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	ON, OFF
DOOR LOCK CONTROL	ALL LOCK	ON, OFF
DOOR LOCK CONTROL	UNLOCK	ON, OFF
DOOR LOCK CONTROL	DD UNLOCK	ON, OFF
TURN SIGNAL AND MARKER LAMPS	PARK LAMPS	ON, OFF

HORN CONTROL	HORN	ON, OFF
4-WHEEL ELECTRONIC SHIFT	CW/CCW	ON, OFF
4-WHEEL ELECTRONIC SHIFT	HIGH LAMP	ON, OFF
4-WHEEL ELECTRONIC SHIFT	LOW LAMP	ON, OFF
INDICATOR LAMP CONTROL	BRK LAMP	ON, OFF
MODULE OPTION CONTENT	SPD WARN	ON, OFF
MODULE OPTION CONTENT	SPD WIPER	ACTIVE, notACT
4WD TRANSFR CASE & INDICATORS	NUBLOCK_L	ON, OFF
4WD TRANSFER CASE & INDICATOR	NUBLOCK_H	ON, OFF


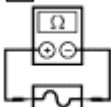
Symptom Chart

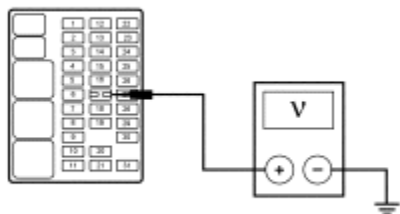
Symptom Chart		
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No Communication With the Module — Generic Electronic Module 	<ul style="list-style-type: none"> Circuitry. Fuse(s). GEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The Panic Function Does Not Operate Properly 	<ul style="list-style-type: none"> Fuse(s). Circuitry. GEM. Parking lamp flash relay. Horn relay. Remote transmitter. Horn. Remote transmitter. Fuse junction panel. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The Doors Do Not Lock/Unlock Using the Remote Transmitter — All Doors 	<ul style="list-style-type: none"> GEM. Remote transmitter. Remote transmitter not programmed to the vehicle. Circuitry. Fuse(s). 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The Doors Do Not Lock/Unlock Using the Remote Transmitter — Passenger Door(s) 	<ul style="list-style-type: none"> GEM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.

<ul style="list-style-type: none"> The Doors Do Not Lock/Unlock Properly Using the Remote Transmitter — Driver Door 	<ul style="list-style-type: none"> GEM. Driver door unlock relay. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
--	---	--

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE MODULE — GENERIC ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FUSE JUNCTION PANEL FUSE 15 (5A)	
<div>1</div> 	
<div>2</div>  <p>Fuse 15 (5A)</p>	
	<ul style="list-style-type: none"> Is the fuse OK? <p>→ Yes REINSTALL the fuse. GO to A2.</p> <p>→ No GO to A3.</p>
A2 CHECK FOR VOLTAGE AT FUSE/JUNCTION PANEL FUSE 15 (5A)	
<div>1</div>	<div>1</div> Measure the voltage between fuse junction panel fuse 15 (5A) and ground.



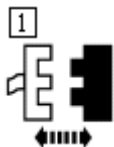
GK7657-A

- Is the voltage greater than 10 volts?

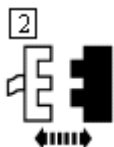
→ **Yes**
GO to [A4](#).

→ **No**
GO to [A5](#).

A3 CHECK FUSE JUNCTION PANEL FOR SHORT TO GROUND

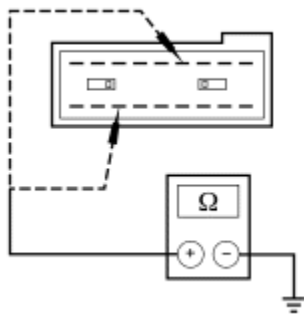


Fuse 15 (5A)



GEM C241


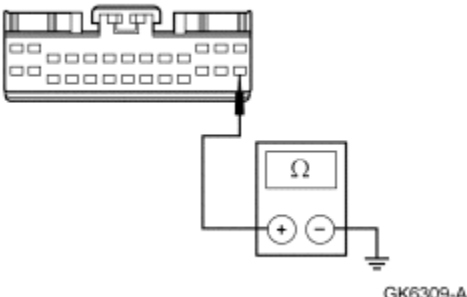

3


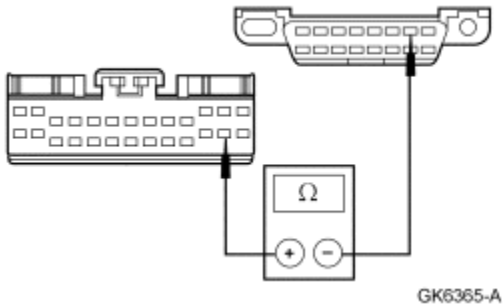


GK2450-A

3 Measure the resistance between fuse junction panel C241, terminal 4, and ground; and between fuse junction panel C241, terminal 16, and ground.

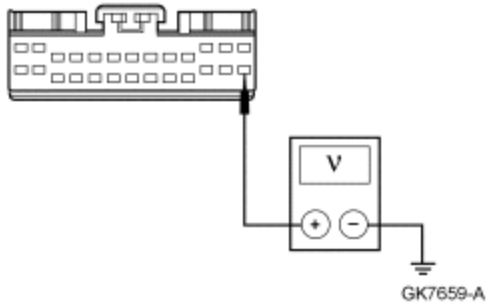
- Are the resistances greater than 10,000

	<p>ohms?</p> <p>→ Yes GO to A16.</p> <p>→ No REPLACE the fuse junction panel. TEST the system for normal operation.</p>
A4 CHECK CIRCUIT 676 (PK/O) FOR OPEN	
<p>1</p>  <p>GEM C239</p>	
<p>2</p> 	<p>2 Measure the resistance between GEM C239-26, circuit 676 (PK/O), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to A7.</p> <p>→ No REPAIR circuit 676 (PK/O). TEST the system for normal operation.</p>
A5 CHECK THE POWER DISTRIBUTION BOX FUSE 22 (50A)	
<p>1</p>  <p>Fuse 22 (50A)</p>	
	<p>2 Remove and inspect the fuse.</p>

	<ul style="list-style-type: none"> • Is the fuse OK? <p>→ Yes REINSTALL the fuse. GO to A6 .</p> <p>→ No REPAIR circuit 1052 (T/BK). TEST the system for normal operation.</p>
A6 CHECK CIRCUIT 1052 (T/BK) FOR OPEN	
	<p>1 Measure the voltage between power distribution box fuse 22 (50A) and ground.</p>
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 1052 (T/BK). TEST the system for normal operation.</p> <p>→ No REPAIR/REPLACE the power distribution box. TEST the system for normal operation.</p>
A7 CHECK CIRCUIT 70 (LB/W) FOR OPEN	
<p>1</p>  <p>GEM C239</p>	
	<p>2 Verify the NGS is disconnected.</p>
<p>3</p> 	<p>3 Measure the resistance between GEM C239-25, circuit 70 (LB/W), and DLC C227-7, circuit 70 (LB/W).</p>

	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to A8.</p> <p>→ No REPAIR circuit 70 (LB/W). TEST the system for normal operation.</p>
--	---

A8 CHECK CIRCUIT 676 (PK/O) FOR SHORT TO POWER

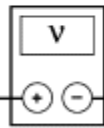
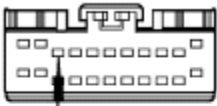
<p>1</p> 	<p>1 Measure the voltage between GEM C239-26, circuit 676 (PK/O), and ground.</p>
---	--

	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 676 (PK/O). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No If equipped with ESOF, GO to A9 . If not equipped with ESOF, GO to A11 .</p>
--	--

A9 CHECK CIRCUIT 465 (W/LB)

<p>1</p> 	
<p>2</p>  <p>GEM C247</p>	

<div>3</div> <div> </div>	
<div>4</div> <div> </div>	<div> <p>4 Measure the voltage between GEM C247-3, circuit 465 (W/LB), and ground.</p> </div>
	<div> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? </div> <div> <p>→ Yes GO to A10.</p> </div> <div> <p>→ No GO to A11.</p> </div>
<div> <h4>A10 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO POWER</h4> </div>	
<div>1</div> <div> </div>	
<div>2</div> <div> </div> <div> <p>4WD Mode Switch C246</p> </div>	
<div>3</div> <div> </div>	
<div>4</div>	<div> <p>4 Measure the voltage between GEM C247-3, circuit 465 (W/LB), and ground.</p> </div>



GK7660-A

- **Is the voltage greater than 10 volts?**

→ **Yes**

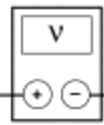
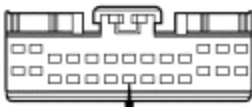
REPAIR circuit 465 (W/LB). REPLACE the GEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPLACE the 4WD mode select switch. REPLACE the GEM; REFER to [Section 419-10](#). TEST the system for normal operation.

A11 CHECK CIRCUIT 682 (DB) FOR SHORT TO POWER

1



GK7661-A

1 Measure the voltage between GEM C239-20, circuit 682 (DB), and ground.

- **Is the voltage greater than 10 volts?**




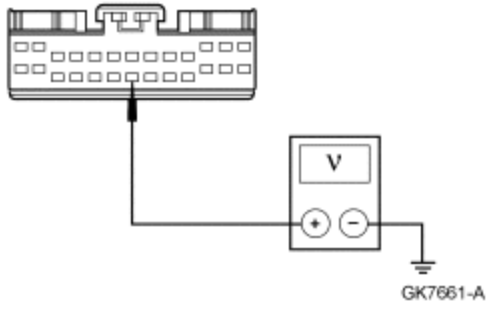
→ **Yes**

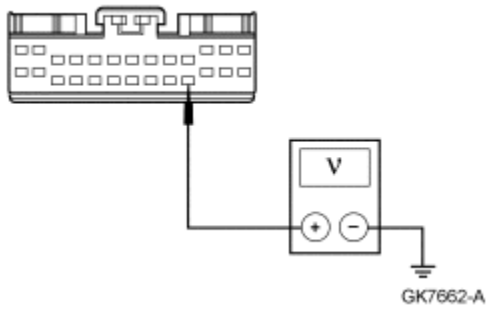



GO to [A12](#).

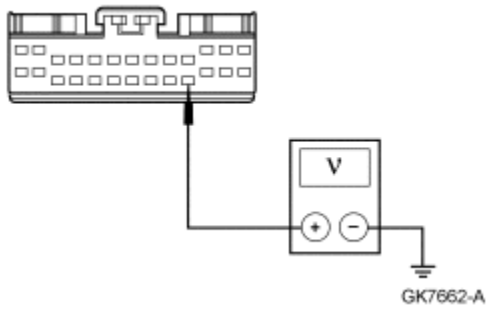



→ **No**

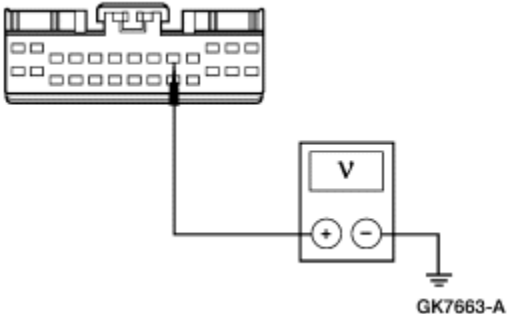
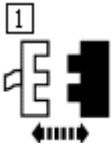

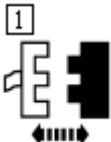
GO to [A13](#).

A12 CHECK CIRCUIT 682 (DB) FOR SHORT TO POWER (MULTI-FUNCTION SWITCH DISCONNECTED)

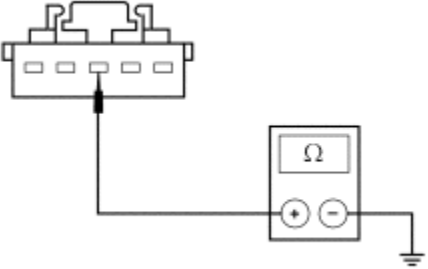
<div>1</div> 	
<div>2</div>  <p>Multi-Function Switch C230</p>	
<div>3</div> 	
<div>4</div> 	<div>4</div> <p>Measure the voltage between GEM C239-20, circuit 682 (DB), and ground.</p>
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 682 (DB). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPLACE the wiper multi-function switch. REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p>
A13 CHECK CIRCUIT 684 (PK/Y) FOR SHORT TO POWER	
<div>1</div>	<div>1</div> <p>Measure the voltage between GEM C239-23, circuit 684 (PK/Y), and ground.</p>

	
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to A14.</p> <p>→ No If the vehicle is not equipped with anti-lock brake control module, GO to A15 .</p> <p>If the vehicle is equipped with anti-lock brake control module, REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
A14 CHECK CIRCUIT 684 (PK/Y) FOR SHORT TO POWER (MULTI-FUNCTION SWITCH DISCONNECTED)	
<p>1</p> 	
<p>2</p>  <p>Multi-Function Switch C230</p>	
<p>3</p> 	
<p>4</p>	<p>4 Measure the voltage between GEM C239-23, circuit 684 (PK/Y), and ground.</p>





	
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 684 (PK/Y). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch. REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p>
A15 CHECK CIRCUIT 519 (LG/BK) FOR SHORT TO POWER	
<p>1</p> 	
<p>2</p>  <p>Differential Speed Sensor C404</p>	
<p>3</p> 	
<p>4</p>	<p>4 Measure the voltage between GEM C239-9, circuit 519 (LG/BK), and ground.</p>

	
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 519 (LG/BK). REPLACE the GEM. TEST the system for normal operation.</p> <p>→ No REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
A16 CHECK THE HORN RELAY	
 <p>Horn Relay</p>	
	<p> Check the horn relay; refer to Component Test.</p>
	<ul style="list-style-type: none"> • Is the horn relay OK? <p>→ Yes GO to A17.</p> <p>→ No REPLACE the horn relay. TEST the system for normal operation.</p>
A17 CHECK CIRCUIT 810 (R/LG) FOR SHORT TO GROUND	
	




GEM C241	
<div> </div>	
GEM C247	
<div> </div> <div> </div>	<div> <p>4 Measure the resistance between GEM C247-12, circuit 810 (R/LG), and ground.</p> </div>
	<div> <ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? </div> <div> <p>→ Yes GO to A18.</p> </div> <div> <p>→ No REPAIR circuit 810 (R/LG). TEST the system for normal operation.</p> </div>
A18 CHECK CIRCUIT 22 (LB/BK) FOR SHORT TO GROUND	
<div> </div>	
Fuse Junction Panel C243	<div> <p>2</p> </div> <div> <p>2 Measure the resistance between brake pedal position (BPP) switch C279-3, circuit 22 (LB/BK), and ground.</p> </div>

	
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes REPLACE the BPP switch. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 22 (LB/BK). TEST the system for normal operation.</p>

PINPOINT TEST B: THE PANIC FUNCTION DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCS)	
<div> <div>1</div>  </div>	
<div> <div>2</div>  </div> <p>NGS</p>	
<div> <div>3</div>  </div>	<div> <div>3</div> Retrieve and document continuous DTCs. </div>
<div> <div>4</div>  </div>	

Clear Continuous DTCs	
<div> </div> <p>GEM On-Demand Self-Test</p>	
	<ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes If DTC C1182, GO to B5 . If DTC C1183, GO to B5 . If DTC B1217, GO to B13 . If DTC B1218, GO to B13 . If DTC B1342, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to B2.</p>
B2 CHECK IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
<div> </div>	<div> <p>1 Monitor the PID IGN_GEM while cycling the ignition switch through the RUN, OFF, and ACC positions.</p> </div>
	<ul style="list-style-type: none"> • Do the PID values agree with the ignition switch positions? <p>→ Yes GO to B3.</p> <p>→ No REPAIR ignition circuit (RUN/ACC: circuit 297 [BK/LG]; RUN: circuits 1040 [R/BK], 687 [GY/Y]; START: circuit 32 [R/LB]; RUN/START: circuits 1000 [R/BK], 640 [R/Y]) in question. CLEAR the</p>

	DTCs. TEST the system for normal operation.
B3 CHECK THE GEM PID LAST DATA RECEIVED	
<div>1</div> 	
<div>2</div> 	<div>2</div> Monitor the GEM PID LAST DATA RECEIVED while pressing and releasing the panic button of both keyless entry remote transmitters.
	<ul style="list-style-type: none"> Does the word PANIC appear after pressing the panic buttons on both transmitters? <p>→ Yes If only the parking lights do not operate properly with remote transmitters, GO to B4 .</p> <p>If only the horn does not operate properly with remote transmitters, GO to B12 .</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
B4 CHECK THE GEM PID PRKFRLY	
<div>1</div> 	<div>1</div> Monitor the GEM PID PRKFRLY while depressing and releasing the remote transmitter panic button.
	<ul style="list-style-type: none"> Does the GEM PID PRKFRLY display ON and OFF? <p>→ Yes GO to B10.</p> <p>→ No REPROGRAM the remote transmitter. REFER to Programming. If the symptom still exists, REPLACE the GEM. REFER to Section 419-10. TEST the system for normal operation.</p>

B5 CHECK THE PARKLAMP FLASH RELAY

1 Check the parklamp flash relay; refer to Component Tests.

- **Is the parklamp flash relay OK?**

→ **Yes**

If DTC B1183 was recorded, GO to [B9](#).

If DTC B1183 was not recorded, GO to [B6](#).

→ **No**

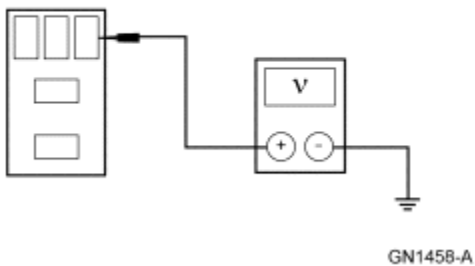
REPLACE the parklamp flash relay. CLEAR the DTCs. TEST the system for normal operation.

B6 CHECK FOR VOLTAGE TO PARKLAMP FLASH RELAY COIL — CIRCUIT 517 (BK/W)



Parklamp Flash Relay

2



2 Measure the voltage between parklamp flash relay connector pin 1, circuit 517 (BK/W), and ground.

- **Is the voltage greater than 10 volts?**

→ **Yes**

GO to [B7](#).

→ **No**

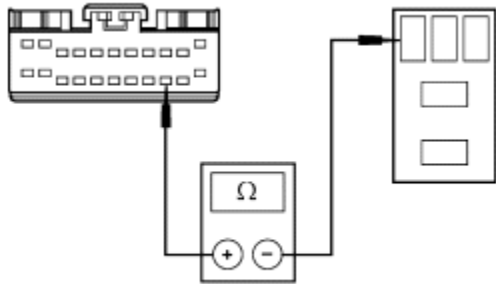
REPAIR circuit 517 (BK/W). CLEAR the DTCs. TEST the system for normal operation.

B7 CHECK CIRCUIT 7 (LG/Y) FOR OPEN



GEM C247

2



GN2509-A

2 Measure the resistance between GEM C247-20, circuit 7 (LG/Y), and parklamp flash relay connector pin 2, circuit 7 (LG/Y).

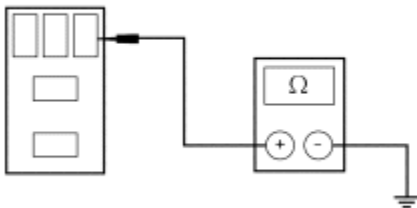
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [B8](#).

→ **No**
REPAIR circuit 7 (LG/Y). CLEAR the DTCs. TEST the system for normal operation.

B8 CHECK CIRCUIT 7 (LG/Y) FOR SHORT TO GROUND

1






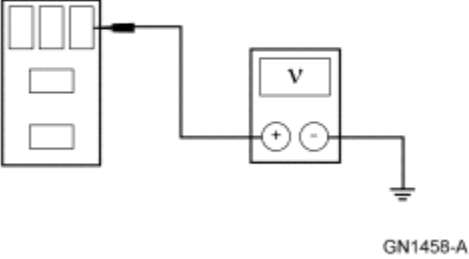
GN1453-A

1 Measure the resistance between parklamp flash relay connector pin 1, circuit 7 (LG/Y), and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [B9](#).

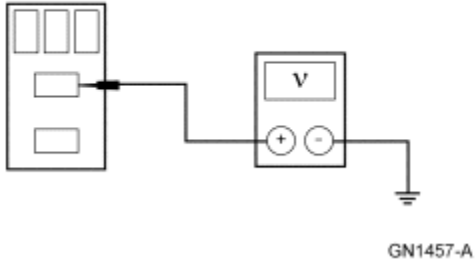
→ **No**

	REPAIR circuit 7 (LG/Y). CLEAR the DTCs. TEST the system for normal operation.
B9 CHECK CIRCUIT 7 (LG/Y) FOR SHORT TO POWER	
<div>1</div> 	
<div>2</div>  <p>GEM C247</p>	
<div>3</div>  <p>Parklamp Flash Relay</p>	
<div>4</div> 	<div>4</div> Measure the voltage between parklamp flash relay connector pin 1, circuit 7 (LG/Y), and ground.
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 7 (LG/Y). CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPLACE the GEM. REFER to Section 419-10. TEST the system for normal operation.</p>
B10 CHECK POWER TO PARKLAMP FLASH RELAY SWITCH	
<div>1</div>	



Parklamp Flash Relay

2



2 Measure the voltage between parklamp flash relay connector pin 5, circuit 195 (T/W), and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [B11](#).

→ **No**
REPAIR circuit 195 (T/W). CLEAR the DTCs.
TEST the system for normal operation.

B11 CHECK THE PARKLAMP FLASH RELAY

1 Check the parklamp flash relay; refer to Component Tests.

- Is the parklamp flash relay OK?



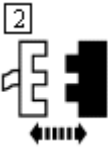
→ **Yes**
REPAIR circuit 14 (BR). CLEAR the DTCs. TEST the system for normal operation.

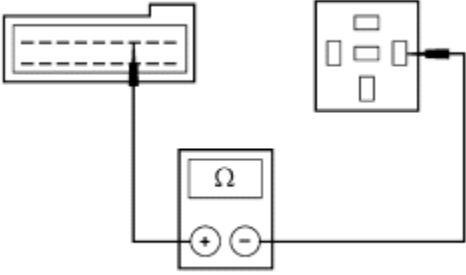
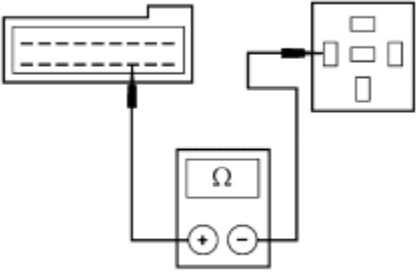

→ **No**
REPLACE the parklamp flash relay. CLEAR the DTCs. TEST the system for normal operation.

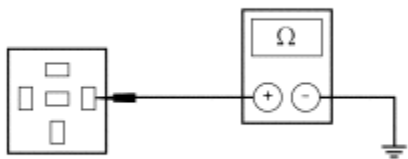
B12 CHECK THE GEM PID HORNRLY

1



	<p>2 Monitor the GEM PID HORNRLY while depressing and releasing the remote transmitter panic button.</p>
	<ul style="list-style-type: none"> • Does the GEM PID HORNRLY display ON and OFF? <p>→ Yes GO to B17.</p> <p>→ No REPROGRAM or REPLACE the remote transmitter. REFER to Programming. If the symptom still exists, REPLACE the GEM. REFER to Section 419-10. TEST the system for normal operation.</p>
B13 CHECK THE HORN RELAY	
	<p>1 Check the horn relay; refer to Component Tests.</p>
	<ul style="list-style-type: none"> • Is the horn relay OK? <p>→ Yes If DTC B1218 is recorded, GO to B16 .</p> <p>If DTC B1218 is not recorded, GO to B14 .</p> <p>→ No REPLACE the horn relay. CLEAR the DTCs. TEST the system for normal operation.</p>
B14 CHECK THE FUSE JUNCTION PANEL FOR OPEN	
<p>1</p>  <p>GEM C241</p>	
<p>2</p>  <p>Horn Relay</p>	

<p>3</p>  <p>GN2510-A</p>	<p>3 Measure the resistance between fuse junction panel C241 terminal 3 and horn relay connector pin 86.</p>
<p>4</p>  <p>GN2511-A</p>	<p>4 Measure the resistance between fuse junction panel C241 terminal 12 and horn relay connector pin 85.</p>
	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes GO to B15.</p> <p>→ No REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.</p>
<p>B15 CHECK FUSE JUNCTION PANEL FOR SHORT TO GROUND</p>	
<p>1</p>  <p>Fuse Junction Panel C242</p>	
<p>2</p>	<p>2 Measure the resistance between horn relay connector pin 86, and ground.</p>



GN1433-A

- **Is the resistance greater than 10,000 ohms?**

→ **Yes**

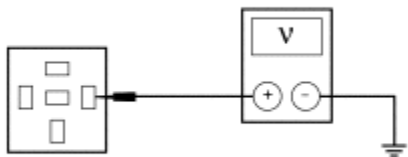
GO to [B16](#).

→ **No**

REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.

B16 CHECK FUSE JUNCTION PANEL FOR SHORT TO POWER

1



GN1438-A

1 Measure the voltage between horn relay connector pin 86 and ground.

- **Is the voltage greater than 10 volts?**

→ **Yes**

REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.



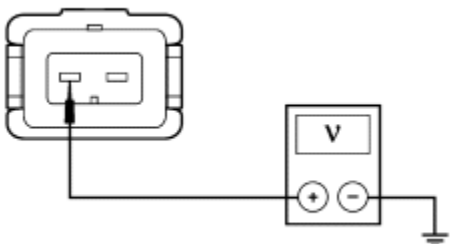
→ **No**

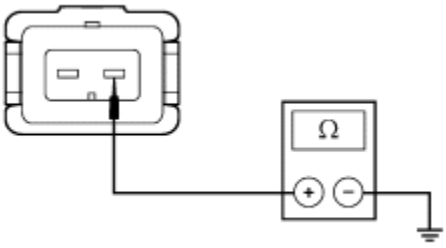

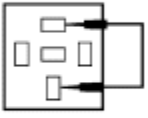
REPLACE the GEM. REFER to [Section 419-10](#). TEST the system for normal operation.


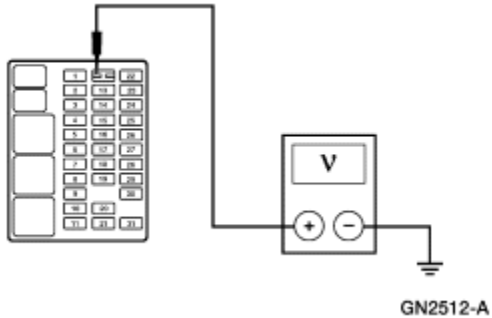
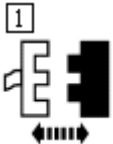
B17 CHECK GEM OUTPUT FUNCTION

1


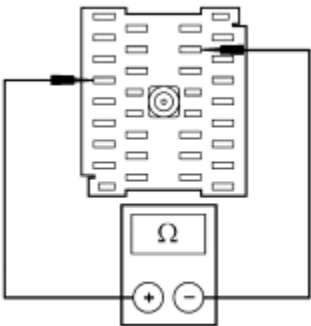


1 Trigger the GEM active command HORN ON and OFF.

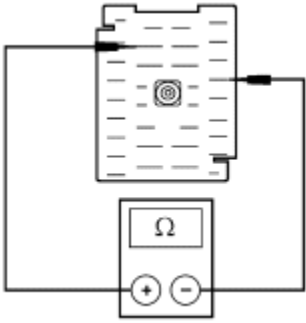
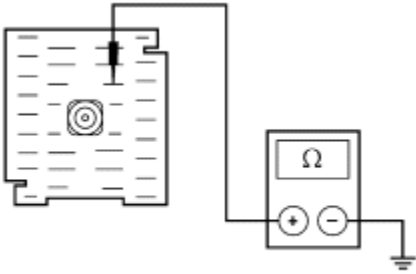
	
	<ul style="list-style-type: none"> • Does the horn activate on and off? <p>→ Yes REPLACE the GEM. REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No GO to B18.</p>
B18 CHECK FOR VOLTAGE AT HORN — CIRCUIT 6 (Y/LG)	
<p>1</p>  <p>Horn C1005</p>	
<p>2</p>  <p>GN2513-A</p>	<p>2 NOTE: Voltage will only be applied to circuit 6 (Y/LG) for 5 seconds during active command mode. Trigger the GEM active command HORN ON while measuring the voltage between horn C1005, circuit 6 (Y/LG), and ground.</p>
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to B19.</p> <p>→ No GO to B20.</p>
B19 CHECK GROUND AT HORN — CIRCUIT 57 (BK)	
<p>1</p>	<p>1 Measure the resistance between horn C1005, circuit 57 (BK), and ground.</p>

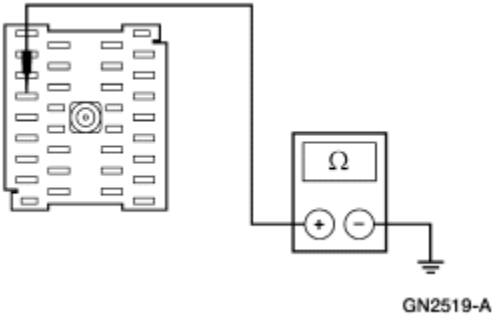

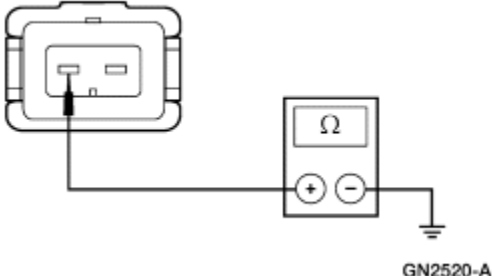
 <p>GN2514-A</p>	
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes REPLACE the horn. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 57 (BK). CLEAR DTCs. TEST the system for normal operation.</p>
B20 CHECK THE HORN RELAY	
<p>1</p>  <p>Horn C1005</p>	
<p>2</p>  <p>GN1428-A</p>	<p>2 Connect a jumper wire between horn relay connector pins 30 and 87.</p>
	<ul style="list-style-type: none"> • Does the horn sound? <p>→ Yes REPLACE the horn relay. CLEAR the DTCs. TEST the system for normal operation.</p>

	<p>→ No GO to B21.</p>
B21 CHECK THE FUSE JUNCTION PANEL FUSE 12 (15A)	
<p>1</p>  <p>Fuse 12 (15A)</p>	
	<ul style="list-style-type: none"> • Is the fuse OK? <p>→ Yes REINSTALL the fuse; GO to B22 .</p> <p>→ No GO to B26.</p>
B22 CHECK FOR VOLTAGE AT FUSE JUNCTION PANEL FUSE 12 (15A)	
<p>1</p>  <p>GN2512-A</p>	<p>1 Measure the voltage between fuse junction panel fuse 12 (15A) and ground.</p>
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to B23.</p> <p>→ No REPAIR the power supply to fuse junction panel fuse 12 (15A). TEST the system for normal operation.</p>
B23 CHECK FOR VOLTAGE TO HORN RELAY SWITCH	
<p>1</p> 	

Horn Relay	
<div>2</div> <div> </div> <div>GN1437-A</div>	<div>2</div> <div> <p>Measure the voltage between horn relay connector pin 30 and ground.</p> </div>
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes GO to B24.</p> <p>→ No GO to B25.</p>
B24 CHECK THE FUSE JUNCTION PANEL FOR OPEN	
<div>1</div> <div> </div> <div>Fuse Junction Panel C243</div>	
<div>2</div> <div> </div> <div>GN2515-B</div>	<div>2</div> <div> <p>Measure the resistance between fuse junction panel C243 terminal 23 and horn relay connector pin 87.</p> </div>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes REPAIR circuit 6 (Y/LG). CLEAR the DTCs. TEST</p>



	<p>the system for normal operation.</p> <p>→ No REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.</p>
B25 CHECK CIRCUIT 460 (Y/LB) FOR OPEN	
<p>1</p>  <p>Fuse Junction Panel C242</p>	
<p>2</p>  <p>GN2516-A</p>	<p>2 Measure the resistance between fuse junction panel C242-11, circuit 460 (Y/LB), and fuse junction panel C242-29, circuit 460 (Y/LB).</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 460 (Y/LB). CLEAR the DTCs. TEST the system for normal operation.</p>
B26 CHECK THE FUSE JUNCTION PANEL FOR SHORT TO GROUND	
<p>1</p>  <p>Horn Relay</p>	
<p>2</p> 	



Fuse Junction Panel	
<div>3</div>  <div>GN2517-A</div>	<div>3</div> Measure the resistance between fuse junction panel C242 terminals 11 and 29, and ground.
<div>4</div>  <div>GN2518-A</div>	<div>4</div> Measure the resistance between fuse junction panel C243 terminal 23 and ground.
	<ul style="list-style-type: none"> • Are the resistances greater than 10,000 ohms? <p>→ Yes GO to B27.</p> <p>→ No REPLACE the fuse junction panel. CLEAR the DTCs. TEST the system for normal operation.</p>
B27 CHECK THE HORN RELAY	
	<div>1</div> Check the horn relay; refer to Component Tests.
	<ul style="list-style-type: none"> • Is the horn relay OK? <p>→ Yes GO to B28.</p> <p>→ No REPLACE the horn relay. CLEAR the DTCs. TEST</p>



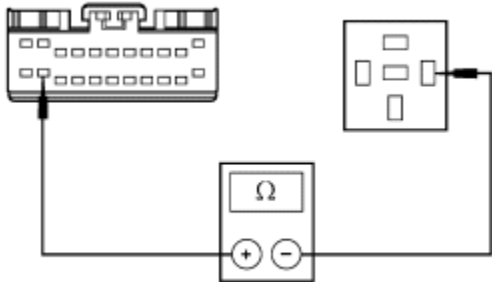
	the system for normal operation.
B28 CHECK CIRCUIT 460 (Y/LB) FOR SHORT TO GROUND	
<div>1</div> 	<div>1</div> <p>Measure the resistance between fuse junction panel C242-29, circuit 460 (Y/LB), and ground.</p>
	<ul style="list-style-type: none"> Is the resistance greater than 10,000 ohms? <p>→ Yes GO to B29.</p> <p>→ No REPAIR circuit 460 (Y/LB). CLEAR the DTCs. TEST the system for normal operation.</p>
B29 CHECK CIRCUIT 6 (Y/LG) FOR SHORT TO GROUND	
<div>1</div>  <p>Horn C1005</p>	
<div>2</div> 	<div>2</div> <p>Measure the resistance between horn C1005, circuit 6 (Y/LG), and ground.</p>
	<ul style="list-style-type: none"> Is the resistance greater than 10,000 ohms? <p>→ Yes</p>

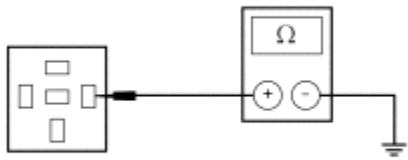
	REPLACE the horn; REFER to Section 413-06 . CLEAR the DTCs. TEST the system for normal operation. → No REPAIR circuit 6 (Y/LG). CLEAR the DTCs. TEST the system for normal operation.
--	---

PINPOINT TEST C: THE DOORS DO NOT LOCK/UNLOCK USING THE REMOTE TRANSMITTER — ALL DOORS

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 RETRIEVE RECORDED DIAGNOSTIC TROUBLE CODES (DTCs)	
<div>1</div> 	
	<div>2</div> Use the recorded results from GEM self-test.
	<ul style="list-style-type: none"> Are any DTCs recorded? → Yes If DTC B1300, GO to C5 . If DTC B1310, GO to C11 . If DTC B1396, GO to C7 . If DTC B1342, REPLACE the GEM; REFER to Section 419-10 . TEST the system for normal operation. → No GO to C2 .
C2 CHECK IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
<div>1</div> 	<div>1</div> Monitor the PID IGN_GEM while cycling the ignition switch through the RUN, OFF, and ACC positions.
	<ul style="list-style-type: none"> Do the PID values agree with the ignition

	<p>switch positions?</p> <p>→ Yes GO to C3.</p> <p>→ No REPAIR ignition circuit (RUN/ACC: circuit 297 [BK/LG]; RUN: circuits 1040 [R/BK], 687 [GY/Y]; START: circuit 32 [R/LB]; RUN/START: circuits 1000 [R/BK], 640 [R/Y]) in question. CLEAR the DTCs. TEST the system for normal operation.</p>
C3 CHECK THE GEM PID LAST DATA RECEIVED	
<p>1</p> 	
<p>2</p> 	<p>2 Monitor the GEM PID LAST DATA RECEIVED while pressing and releasing the remote transmitter lock and unlock buttons.</p>
	<ul style="list-style-type: none"> Does the PID display LOCK and UNLOCK appear after pressing the lock and unlock buttons on both transmitters? <p>→ Yes GO to C4.</p> <p>→ No GO to C8.</p>
C4 CHECK THE DOOR LOCKS	
	<p>1 Depress the LOCK and UNLOCK buttons at the driver and passenger door lock switches.</p>
	<ul style="list-style-type: none"> Do the locks operate properly? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No</p>

REFER to Section 501-14A .	
C5 CHECK CIRCUIT 119 (PK/Y) FOR OPEN	
<div>1</div>  <p>All Lock Relay</p>	
<div>2</div>  <p>GEM C247</p>	
<div>3</div>  <p>GN2521-A</p>	<div>3</div> Measure the resistance between all lock relay connector pin 86, circuit 119 (PK/Y), and GEM C247-13, circuit 119 (PK/Y).
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes GO to C6.</p> <p>→ No REPAIR circuit 119 (PK/Y). CLEAR the DTCs. TEST the system for normal operation.</p>
C6 CHECK CIRCUIT 119 (PK/Y) FOR SHORT TO GROUND	
<div>1</div>	<div>1</div> Measure the resistance between all lock relay connector pin 86, circuit 119 (PK/Y), and ground.



GN1433-A

- **Is the resistance greater than 10,000 ohms?**

→ **Yes**

REPROGRAM the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM; REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

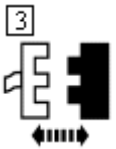
→ **No**

REPAIR circuit 119 (PK/Y). CLEAR the DTCs. TEST the system for normal operation.

C7 CHECK CIRCUIT 119 (PK/Y) FOR SHORT TO POWER



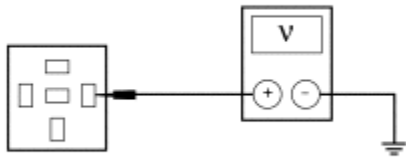
All Lock Relay



GEM C247



5



GN143B-A

5 Measure the voltage between all lock relay connector pin 86, circuit 119 (PK/Y), and ground.

- **Is the voltage greater than 10 volts?**

→ **Yes**

REPAIR circuit 119 (PK/Y). CLEAR the DTCs. TEST the system for normal operation.

→ **No**

REPROGRAM the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM; REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

C8 CHECK TRANSMITTER TIC/DATA

1



2



2 Monitor the transmitter TIC/DATA.



- **Is there at least one transmitter stored and displayed next to TIC 1 or TIC 2?**


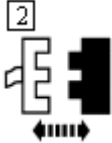
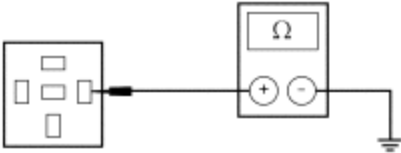
→ **Yes**

GO to [C9](#).

→ **No**

PROGRAM all the keyless entry remote transmitters. REFER to General Procedures. TEST the system for normal operation.

C9 CHECK THE GEM PID LAST TIC RECEIVED	
<div>1</div> 	
<div>2</div> 	<div>2</div> Monitor the GEM PID LAST TIC RECEIVED while pressing and releasing the remote transmitter lock and unlock buttons.
	<ul style="list-style-type: none"> • Does an eight-digit letter/number code appear under LAST TIC RECEIVED? <p>→ Yes GO to C10.</p> <p>→ No REPLACE the keyless entry remote transmitter. TEST the system for normal operation. If still unable to diagnose, REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
C10 CHECK THE TIC/DATA FOR TIC MATCH	
	<div>1</div> Monitor the GEM PID LAST TIC RECEIVED while pressing and releasing the remote transmitter lock and unlock buttons.
	<ul style="list-style-type: none"> • Does TIC under LAST TIC RECEIVED match TIC 1 or TIC 2? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No PROGRAM all the keyless entry remote transmitters. TEST the system for normal operation.</p>
C11 CHECK CIRCUIT 120 (PK/LG) FOR SHORT TO GROUND	
<div>1</div>	

 <p>All Unlock Relay</p>	
 <p>GEM C247</p>	
<p>3</p>  <p>GN1433-A</p>	<p>3 Measure the resistance between all unlock relay connector pin 86, circuit 120 (PK/LG), and ground.</p>
	<ul style="list-style-type: none"> Is the resistance greater than 10,000 ohms? <p>→ Yes REPROGRAM or REPLACE the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 120 (PK/LG). CLEAR the DTCs. TEST the system for normal operation.</p>

PINPOINT TEST D: THE DOORS DO NOT LOCK/UNLOCK USING THE REMOTE TRANSMITTER — PASSENGER DOOR(S)

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE RECORDED GEM DTCS	
1	



2 Use the recorded results from GEM self-test.

- **Are any DTCs recorded?**

→ **Yes**

If DTC B1310, GO to [D5](#).

If DTC B1310 and unable to lock all doors, GO to [Pinpoint Test C](#).

If DTC B1397, GO to [D6](#).

If DTC B1342, REPLACE the GEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

GO to [D2](#).

D2 CHECK IGNITION STATES — MONITOR THE GEM PID IGN_GEM



1 Monitor the PID IGN_GEM while cycling the ignition switch through the RUN, OFF, and ACC positions.

- **Do the PID values agree with the ignition switch positions?**

→ **Yes**

GO to [D3](#).

→ **No**

REPAIR ignition circuit (RUN/ACC: circuit 297 [BK/LG]; RUN: circuits 1040 [R/BK], 687 [GY/Y]; START: circuit 32 [R/LB]; RUN/START: circuits 1000 [R/BK], 640 [R/Y]) in question. CLEAR the DTCs. TEST the system for normal operation.

D3 CHECK THE GEM PID LAST DATA RECEIVED

1



2 Monitor the GEM PID LAST DATA RECEIVED while pressing and releasing both remote transmitter lock and unlock buttons.

- **Do the words LOCK and UNLOCK appear after pressing the lock and unlock buttons?**

→ **Yes**
GO to [D4](#).

→ **No**
GO to [D7](#).

D4 CHECK THE DOOR LOCKS

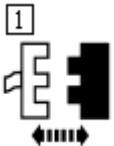
1 Depress the LOCK and UNLOCK switch at the driver and passenger door lock switches.

- **Do the locks function properly?**

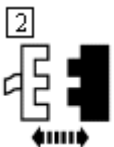
→ **Yes**
REPLACE the GEM; REFER to [Section 419-10](#).
CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REFER to [Section 501-14A](#).

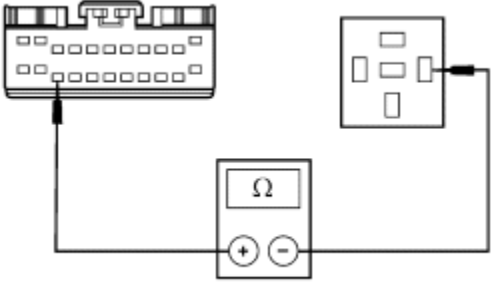



D5 CHECK CIRCUIT 120 (PK/LG) FOR OPEN

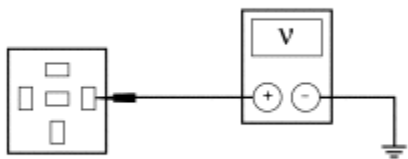


All Unlock Relay



GEM C247

<div>3</div>  <div>GN2612-A</div>	<div>3</div> <p>Measure the resistance between all unlock relay connector pin 86, circuit 120 (PK/LG), and GEM C247-14, circuit 120 (PK/LG).</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes REPROGRAM or REPLACE the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM. REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 120 (PK/LG). CLEAR the DTCs. TEST the system for normal operation.</p>
D6 CHECK CIRCUIT 120 (PK/LG) FOR SHORT TO POWER	
<div>1</div>  <div>All Unlock Relay</div>	
<div>2</div>  <div>GEM C247</div>	
<div>3</div> 	
<div>4</div>	<div>4</div> <p>Measure the voltage between all unlock relay connector pin 86, circuit 120 (PK/LG), and ground.</p>



GN1438-A

- **Is the voltage greater than 10 volts?**

→ **Yes**

REPAIR circuit 120 (PK/LG). CLEAR the DTCs. TEST the system for normal operation.

→ **No**

REPROGRAM or REPLACE the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM; REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

D7 CHECK TRANSMITTER TIC/DATA

1



2



- 2 Monitor the transmitter TIC/DATA.

- **Is there at least one transmitter stored and displayed next to TIC 1 or TIC 2?**




→ **Yes**

GO to [D8](#).



→ **No**

PROGRAM all of the keyless entry remote transmitters. REFER to Programming. TEST the system for normal operation.

D8 CHECK THE PID LAST TIC RECEIVED

	
	<p>2 Monitor the PID LAST TIC RECEIVED while pressing and releasing the lock and unlock buttons of both keyless entry remote transmitters.</p>
	<ul style="list-style-type: none"> • Does an eight-digit letter/number code appear under LAST TIC RECEIVED? <p>→ Yes GO to D9.</p> <p>→ No REPLACE the keyless entry remote transmitter. TEST the system for normal operation. If still unable to diagnose, REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
D9 CHECK THE TIC/DATA FOR TIC MATCH	
	<p>1 Monitor the PID LAST TIC RECEIVED.</p>
	<ul style="list-style-type: none"> • Does the TIC under LAST TIC RECEIVED match TIC 1 or TIC 2? <p>→ Yes REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No PROGRAM all of the keyless entry remoter transmitters. REFER to Programming. TEST the system for normal operation.</p>

PINPOINT TEST E: THE DOORS DO NOT LOCK/UNLOCK USING THE REMOTE TRANSMITTER — DRIVER DOOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE RECORDED GEM DTCS	
<div>1</div> 	
	<div>2</div> Use the recorded results from GEM self-test.
	<ul style="list-style-type: none"> Are any DTCs recorded? <p>→ Yes If DTC B1982, GO to E5 . If DTC B1983, GO to E9 . If DTC B1342, REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No GO to E2.</p>
E2 CHECK IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
<div>1</div> 	<div>1</div> Monitor the PID IGN_GEM while cycling the ignition switch through the RUN, OFF, and ACC positions.
	<ul style="list-style-type: none"> Do the PID values agree with the ignition switch positions? <p>→ Yes GO to E3.</p> <p>→ No REPAIR ignition circuit (RUN/ACC: circuit 297 [BK/LG]; RUN: circuits 1040 [R/BK], 687 [GY/Y]; START: circuit 32 [R/LB]; RUN/START: circuits 1000 [R/BK], 640 [R/Y]) in question. CLEAR the DTCs. TEST the system for normal operation.</p>
E3 CHECK THE GEM PID LAST DATA RECEIVED	
<div>1</div>	



2 Monitor the PID LAST DATA RECEIVED while pressing and releasing both remote transmitter lock and unlock buttons.

- **Do the words LOCK and UNLOCK appear after pressing both remote transmitter lock and unlock buttons?**

→ **Yes**
GO to [E4](#).

→ **No**
GO to [E13](#).

E4 CHECK THE GEM PID DD_UNLK



1 Trigger the GEM active command DD UNLOCK ON and OFF.

- **Does the driver door lock function properly?**

→ **Yes**
REPROGRAM or REPLACE the remote transmitter. REFER to Programming. If the symptom is still present, REPLACE the GEM. REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.


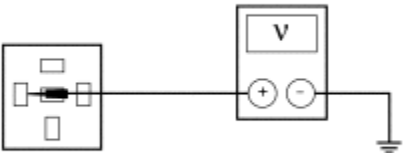

→ **No**
GO to [E11](#).

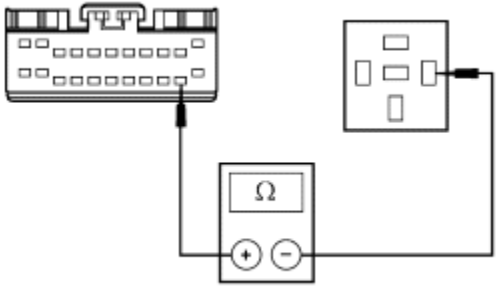
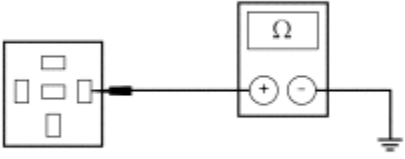
E5 CHECK THE DRIVER UNLOCK RELAY

1 Check the driver unlock relay; refer to Component Tests.

- **Is the driver unlock relay OK?**

→ **Yes**

	<p>GO to E6.</p> <p>→ No REPLACE the driver unlock relay. CLEAR the DTCs. TEST the system for normal operation.</p>
E6 CHECK POWER TO THE DRIVER UNLOCK RELAY — CIRCUIT 517 (BK/W)	
<p>1</p>  <p>Driver Unlock Relay</p>	
<p>2</p>  <p>GN1436-A</p>	<p>2 Measure the voltage between driver unlock relay connector pin 85, circuit 517 (BK/W), and ground.</p>
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to E7.</p> <p>→ No REPAIR circuit 517 (BK/W). CLEAR the DTCs. TEST the system for normal operation.</p>
E7 CHECK CIRCUIT 164 (P/LB) FOR OPEN	
<p>1</p>  <p>GEM C247</p>	
<p>2</p>	<p>2 Measure the resistance between driver unlock relay connector pin 86, circuit 164 (P/LB), and GEM C247-21, circuit 164 (P/LB).</p>

 <p>GN2523-A</p>	
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to E8.</p> <p>→ No REPAIR circuit 164 (P/LB). CLEAR the DTCs. TEST the system for normal operation.</p>
E8 CHECK CIRCUIT 164 (P/LB) FOR SHORT TO GROUND	
<p>1</p>  <p>GN1433-A</p>	<p>1 Measure the resistance between driver unlock relay connector pin 86, circuit 164 (P/LB), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 164 (P/LB). CLEAR the DTCs. TEST the system for normal operation.</p>
E9 CHECK THE DRIVER UNLOCK RELAY	
<p>1</p>	



Driver Unlock Relay

2 Check the driver unlock relay; refer to Component Tests.

- Is the driver unlock relay OK?

→ Yes

GO to [E10](#).

→ No

REPLACE the driver unlock relay. CLEAR the DTCs. TEST the system for normal operation.

E10 CHECK CIRCUIT 164 (P/LB) FOR SHORT TO POWER

1

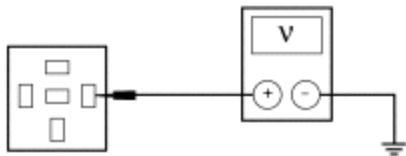


GEM C247

2



3





GN143B-A

3 Measure the voltage between driver unlock relay connector pin 86, circuit 164 (P/LB), and ground.

- Is the voltage greater than 10 volts?

→ Yes

REPAIR circuit 164 (P/LB). CLEAR the DTCs.

	<p>TEST the system for normal operation.</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
E11 CHECK THE DRIVER UNLOCK RELAY	
<div>1</div>  <p>Driver Unlock Relay</p>	
	<div>2</div> Check the driver unlock relay; refer to Component Tests.
	<ul style="list-style-type: none"> Is the driver unlock relay OK? <p>→ Yes GO to E12.</p> <p>→ No REPLACE the driver unlock relay. CLEAR the DTCs. TEST the system for normal operation.</p>
E12 CHECK THE VOLTAGE TO THE DRIVER UNLOCK RELAY	
	<div>1</div> Measure the voltage between driver unlock relay pin 87, circuit 517 (BK/W), and ground.
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 118 (PK/O). CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 517 (BK/W). CLEAR the DTCs. TEST the system for normal operation.</p>
E13 CHECK TRANSMITTER TIC/DATA	
<div>1</div> 	

<div> </div>	<div> <p>2 Monitor the transmitter TIC/DATA.</p> </div>
	<ul style="list-style-type: none"> • Is there at least one transmitter stored and displayed next to TIC 1 or TIC 2? <p>→ Yes GO to E14.</p> <p>→ No PROGRAM all of the remote transmitters. REFER to Programming. TEST the system for normal operation.</p>
E14 CHECK THE GEM PID LAST TIC RECEIVED	
<div> </div>	
<div> </div>	<div> <p>2 Monitor the GEM PID LAST TIC RECEIVED while pressing and releasing the lock and unlock buttons of both remote transmitters.</p> </div>
	<ul style="list-style-type: none"> • Does an eight-digit letter/number code appear under LAST TIC RECEIVED? <p>→ Yes GO to E15.</p> <p>→ No REPLACE the remote transmitter. TEST the system for normal operation. If still unable to diagnose, REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
E15 CHECK THE TIC/DATA FOR TIC MATCH	
<div> </div>	<div> <p>1 Monitor the GEM PID LAST TIC RECEIVED.</p> </div>

	<ul style="list-style-type: none"> • Does TIC under LAST TIC RECEIVED match TIC 1 or TIC 2? <p>→ Yes REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No PROGRAM all of the remote transmitters. REFER to Programming. TEST the system for normal operation.</p>
--	--

PINPOINT TEST F: REMOTE KEYLESS ENTRY OUT OF SYNCHRONIZATION

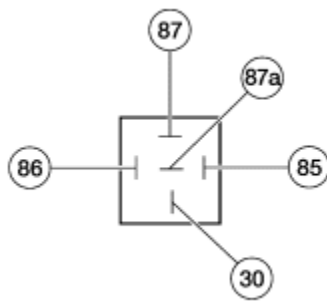
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 RESYNCHRONIZE THE REMOTE ENTRY TRANSMITTER	
	<p>1 Press any button on the inoperative remote entry transmitter four times consecutively.</p>
	<ul style="list-style-type: none"> • Does the remote entry transmitter operate properly? <p>→ Yes System OK. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to F2.</p>
F2 CHECK FOR A SECOND REMOTE ENTRY TRANSMITTER	
	<p>1 Check for another remote entry transmitter that works with the vehicle.</p>
	<ul style="list-style-type: none"> • Is there another remote entry transmitter that works with the vehicle? <p>→ Yes GO to F3.</p> <p>→ No GO to F4.</p>
F3 RESYNCHRONIZE THE INOPERATIVE REMOTE ENTRY TRANSMITTER USING THE SECOND REMOTE ENTRY TRANSMITTER	

	<ol style="list-style-type: none"> 1 Press any button on the operational remote entry transmitter.
	<ol style="list-style-type: none"> 2 Within 30 seconds, press a button on the inoperative remote entry transmitter.
	<ol style="list-style-type: none"> 3 Check the inoperative remote entry transmitter for proper operation.
	<ul style="list-style-type: none"> • Does the remote entry transmitter in question operate properly? <p>→ Yes CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to B22.</p>
F4 PROGRAM THE INOPERATIVE REMOTE ENTRY TRANSMITTER	
	<ol style="list-style-type: none"> 1 Reprogram the remote entry transmitter; refer to Programming.
	<ul style="list-style-type: none"> • Does the remote entry transmitter operate properly? <p>→ Yes CLEAR the DTC. INFORM the customer that any additional remote entry transmitters not present during the programming mode will not operate with the vehicle. All remote entry transmitters must be reprogrammed at the same time. TEST the system for normal operation.</p> <p>→ No GO to Pinpoint Test C.</p>

Component Tests

Relay — Mini ISO

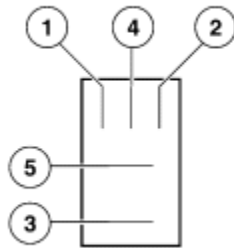
Use 73 Digital Multimeter to check for the continuity between terminal 85 and all other terminals. If resistance is 5 ohms or less between terminal 85 and any other terminal, replace the relay. If resistance is greater than 5 ohms, continue with the test. Use tow jumper wires to connect relay terminals 86 and 30 directly to the positive battery terminal. Use 73 Digital Multimeter set in the volts position to check for voltage at terminal 87A. If battery voltage is not indicated, replace the relay. If battery voltage is indicated, connect a third jumper wire to terminal 85 and ground the jumper wire to a known good ground. Check for voltage at terminal 87. If battery voltage is not indicated, replace the relay.



GN0901-A

Relay — Micro ISO

Use 73 Digital Multimeter to check for the continuity between terminal 2 and all other terminals. If resistance is 5 ohms or less between terminal 2 and any other terminal, replace the relay. If resistance is greater than 5 ohms, continue with the test. Use two jumper wires to connect relay terminals 1 and 3 directly to the positive battery terminal. Use 73 Digital Multimeter set in the volts position to check for voltage at terminal 4. If battery voltage is not indicated, replace the relay. If battery voltage is indicated, connect a third jumper wire to terminal 2 and ground the jumper wire to a known good ground. Check for voltage at terminal 5. If battery voltage is not indicated, replace the relay.



GN1054-A

SECTION 501-14B: Keyless Entry/Computer
Operated Locks
GENERAL PROCEDURES

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Programming

NOTE: All keyless entry remote transmitters (15K601) must be programmed at the same time.

NOTE: To program (or reprogram) the keyless entry remote transmitters into the generic electronic module (GEM), perform the following steps.

1. Turn the ignition from OFF to RUN five times within 10 seconds, ending in RUN. If the GEM has successfully entered program mode, it will lock and unlock all the doors.
2. Press any button on a keyless entry remote transmitter, and the doors will lock and then unlock to confirm that each keyless entry remote transmitter has been programmed.
3. If the door locks do not respond for any keyless entry remote transmitter, wait for several seconds and press the button again.
4. Turn the ignition switch to the OFF position, or wait up to five minutes after step 1, to exit program mode. If a keyless entry remote transmitter has been programmed (or reprogrammed), the GEM will lock and unlock all the doors one last time.

SECTION 501-14B: Keyless Entry/Computer
Operated Locks
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Module—Generic Electronic

Removal and Installation

For additional information, refer to [Section 419-10](#).

SECTION 501-16: Wipers and Washers

SPECIFICATIONS

DESCRIPTION AND OPERATION

[Wipers and Washers](#)

[Wipers and Washers—Operation, Super Duty Series F-250, F-350, F-450, F550](#)

[Wipers and Washers—Motorhome](#)

DIAGNOSIS AND TESTING

[Wipers and Washers—Super Duty Series F-250, F-350, F-450, F-550](#)

[Inspection and Verification — Super Duty Series F-250, F-350, F-450, F-550](#)

[GEM Diagnostic Trouble Code \(DTC\) Index](#)

[GEM Parameter Identification \(PID\) Index](#)

[GEM Active Command Index](#)

[Symptom Chart — Super Duty Series F-250, F-350, F-450, F-550](#)

[Pinpoint Tests — Super Duty Series F-250, F-350, F-450, F-550](#)

[Component Test](#)

[Wipers and Washers—Motorhome](#)

[Inspection and Verification — Motorhome](#)

[Symptom Chart — Motorhome](#)

[Component Test](#)

GENERAL PROCEDURES

[Wiper Blade and Pivot Arm Adjustment](#)

REMOVAL AND INSTALLATION

[Pivot Arm](#)

[Mounting Arm and Pivot Shaft](#)

[Motor—Windshield Wiper](#)

[Washer Pump and Reservoir](#)

[Switch—Windshield Wiper/Washer](#)

General Specifications	
Item	Specification
Driver Side Windshield Wiper Blade to the Bottom of the Windshield mm (in)	56.0 (2.20)
Passenger Side Windshield Wiper Blade to the Bottom of the Windshield mm (in)	74.0 (2.91)

Torque Specifications			
Description	Nm	lb-ft	lb-in
Windshield Wiper Mounting Arm and Pivot Shaft Bolts	7-9	—	62-79
Windshield Wiper Motor Bolts	15	11	—
Windshield Wiper Linkage Bolt	17	13	—
Windshield Washer Fluid Reservoir Bolt	4	—	35


SECTION 501-16: Wipers and Washers 1999 F-Super Duty 250-550 Workshop Manual
 DIAGNOSIS AND TESTING [Procedure revision date: 01/26/2000](#)



Wipers and Washers—Super Duty Series F-250, F-350, F-450, F-550

Refer to Wiring Diagrams Cell 20 ([F-53 Motorhome Chassis](#), [F-Super Duty 250-550](#)), Starting System for schematic and connector information.

Refer to Wiring Diagrams Cell 59 ([F-53 Motorhome Chassis](#), [F-Super Duty 250-550](#)), Generic Electronic Module for schematic and connector information.

Refer to Wiring Diagrams Cell 81 ([F-53 Motorhome Chassis](#), [F-Super Duty 250-550](#)), Interval Wiper/Washer for schematic and connector information.

Special Tool(s)	
	73 Digital Multimeter or equivalent 105-R0051

 ST1453-A	Alternator, Regulator, Battery and Starter Tester (ARBST) or equivalent 010-00725
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Inspection and Verification — Super Duty Series F-250, F-350, F-450, F-550

1. **NOTE:** The GEM must be reconfigured upon replacement. Refer to the NGS Tester help screen on the configuration card to program the tire size and axle ratio.

The wiper/washer system is a generic electronic module (GEM) controlled system.

2. Verify the customer concern by operating the wiper/washer system.
3. Visually inspect for the following obvious signs of mechanical and electrical damage.

Visual Inspection Chart	
Mechanical	Electrical
<ul style="list-style-type: none"> • Hoses to windshield washer pump • Wiper/washer switch • Wiper linkage • Windshield wiper motor 	<ul style="list-style-type: none"> • Fuse(s) • Damaged wiring harness • Loose or corroded connector(s) • Circuitry open/shorted

4. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is properly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
5. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
6. Perform the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:

- CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
- NO RESP/NOT EQUIP for GEM, go to Pinpoint Test A.
- **NOTE:** For vehicles built prior to February 5, 1998, the following criteria must be met when performing the GEM On-Demand Self-Test: headlamps and parklamps must be off and the power windows must be completely up. Failure to meet this criteria will result in DTCs B1577 and B2357 being set. For vehicles built after February 5, 1998, the following criteria must be met when performing the GEM On-Demand Self-Test: headlamps and parklamps must be on. Failure to meet this criteria will result in DTC B1575 being set.

SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and perform self-test diagnostics for the GEM.

7. If the DTCs retrieved are related to the concern, go to the GEM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
8. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

GEM Diagnostic Trouble Code (DTC) Index

GEM Diagnostic Trouble Code (DTC) Index			
DTC	Description	DTC Caused By	Action
B1217	Horn Relay Coil Circuit Failure	GEM	REFER to Section 501-14B .
B1218	Horn Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-14B .
B1243	Express Window Down Switch Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1300	Power Door Lock Circuit Failure	GEM	REFER to Section 501-14B .
B1302	Accessory Delay Relay Coil Circuit Failure	GEM	REFER to Section 501-11 .
B1304	Accessory Delay Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1310	Power Door Unlock Circuit Failure	GEM	REFER to Section 501-14B .
B1317	Battery Voltage High	GEM	REFER to Section 414-00 .

B1318	Battery Voltage Low	GEM	REFER to Section 414-00 .
B1322	Driver Door Ajar Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1323	Door Ajar Lamp Circuit Failure	GEM	REFER to Section 413-01 .
B1325	Door Ajar Lamp Circuit Short to Battery	GEM	REFER to Section 413-01 .
B1330	Passenger Door Ajar Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1338	Door Ajar RR Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1340	Chime Input Request Circuit Short to Ground	GEM	REFER to Section 413-09 .
B1342	ECU is Defective, RAM/ROM Checksum Failure	GEM	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, REPLACE the GEM. REFER to Section 419-10 . TEST the system for normal operation.
B1352	Ignition Key-In Circuit Failure	GEM	REFER to Section 413-09 .
B1355	Ignition Run Circuit Failure	GEM	REFER to Section 211-05 .
B1359	Ignition Run/ACC Circuit Failure	GEM	REFER to Section 211-05 .
B1366	Ignition Start Circuit Short to Ground	GEM	REFER to Section 211-05 .
B1371	Illuminated Entry Relay Circuit Failure	GEM	REFER to Section 417-02 .
B1373	Illuminated Entry Relay Short to Battery	GEM	REFER to Section 417-02 .
B1396	Power Door Lock Circuit Short to Battery	GEM	REFER to Section 501-14B .
B1397	Power Door Unlock Circuit Short to Battery	GEM	REFER to Section 501-14B .
B1398	Driver Power Window One Touch Window Relay Circuit Failure	GEM	REFER to Section 501-11 .
B1400	Driver Power Window One Touch Relay Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1405	Driver Power Window Down Circuit Short to Battery	GEM	REFER to Section 501-11 .

B1410	Driver Power Window Motor Circuit Failure	GEM	REFER to Section 501-11.
B1426	Lamp Seat Belt Circuit Short to Battery	GEM	REFER to Section 413-01.
B1428	Lamp Seat Belt Circuit Failure	GEM	REFER to Section 413-01.
B1431	Wiper Brake/Run Relay Circuit Failure	GEM	GO to Pinpoint Test B.
B1432	Wiper Brake/Run Relay Circuit Short to Battery	GEM	GO to Pinpoint Test B.
B1434	Wiper Hi/Low Speed Relay Coil Circuit Failure	GEM	GO to Pinpoint Test D.
B1436	Wiper Hi/Low Speed Relay Coil Circuit Short to Battery	GEM	GO to Pinpoint Test D.
B1438	Wiper Mode Select Switch Circuit Failure	GEM	GO to Pinpoint Test B.
B1441	Wiper Mode Select Switch Circuit Short to Ground	GEM	GO to Pinpoint Test C.
B1446	Wiper Park Sense Circuit Failure	GEM	GO to Pinpoint Test B.
B1450	Wiper Wash/Delay Switch Circuit Failure	GEM	GO to Pinpoint Test E.
B1453	Wiper Wash/Delay Switch Circuit Short to Ground	GEM	GO to Pinpoint Test C.
B1458	Wiper Washer Pump Motor Relay Circuit Failure	GEM	GO to Pinpoint Test F.
B1460	Wiper Washer Pump Motor Relay Coil Circuit Short to Battery	GEM	GO to Pinpoint Test F.
B1462	Seat Belt Switch Circuit Failure	GEM	REFER to Section 413-09.
B1473	Wiper Low Speed Circuit Motor Failure	GEM	GO to Pinpoint Test B.
B1475	Accessory Delay Relay Contact Short to Battery	GEM	REFER to Section 501-11.
B1476	Wiper High Speed Circuit Motor Failure	GEM	GO to Pinpoint Test B.
B1483	Brake Pedal Input Circuit Failure	GEM	REFER to Section 308-07A.
B1485	Brake Pedal Input Battery	GEM	REFER to Section 308-07A.

	Short		
B1574	Door Ajar LR Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1577	Lamp Park Input Circuit Short to Battery	GEM	REFER to Section 413-09 .
B1840	Wiper Front Power Circuit Failure	GEM	GO to Pinpoint Test B .
B1982	Driver Door Unlock Relay Circuit Failure	GEM	REFER to Section 501-14B .
B1983	Driver Door Unlock Relay Circuit Short to Battery	GEM	REFER to Section 501-14B .
B2132	Dimmer Switch Circuit Short to Ground	GEM	REFER to Section 417-02 .
B2141	NVM Configuration Failure	GEM	CHECK the module configuration. REFER to the NGS Ford Service Function (FSF) card to verify proper module configuration. CLEAR the DTCs. RETRIEVE the DTCs. If DTC B2141 is still present, REPLACE the GEM. REFER to Section 419-10 . TEST the system for normal operation.
B2357	Driver Window Down Current Sense Low Circuit Failure	GEM	REFER to Section 501-11 .
B2425	Remote Keyless Entry Out of Synchronization	GEM	REFER to Section 501-14B .
C1125	Brake Fluid Level Sensor Input Circuit Failure	GEM	REFER to Section 413-01 .
C1182	Park Lamp Flash Relay Circuit Failure	GEM	REFER to Section 501-14B .
C1183	Park Lamp Flash Relay Circuit Short to Battery	GEM	REFER to Section 501-14B .
C1189	Brake Fluid Level Sensor Input Circuit Short to Ground	GEM	REFER to Section 413-01 .
C1223	Lamp Brake Warning Output Circuit Failure	GEM	REFER to Section 413-01 .
C1225	Lamp Brake Warning Output Circuit Short to Battery	GEM	REFER to Section 413-01 .
C1230	Speed Wheel Sensor Rear Center Input Circuit Failure	GEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	GEM	REFER to Section 413-01 .

C1728	Transfer Case Unable to Transition Between 2H and 4H	GEM	REFER to Section 308-07A .
C1729	Transfer Case Unable to Transition Between 4H and 4L	GEM	REFER to Section 308-07A .
C1751	Vehicle Speed Sensor Number 1 Output Circuit Short to Battery	GEM	REFER to Section 310-03 .
C1752	Vehicle Speed Sensor Number 1 Output Circuit Short to Ground	GEM	REFER to Section 310-03 .
P0500	Vehicle Speed Sensor (VSS) Malfunction	GEM	GO to Pinpoint Test G .
P1804	Transmission 4-Wheel Drive High Indicator Circuit Failure	GEM	REFER to Section 308-07A .
P1806	Transmission 4-Wheel Drive High Indicator Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1808	Transmission 4-Wheel Drive Low Indicator Circuit Failure	GEM	REFER to Section 308-07A .
P1810	Transmission 4-Wheel Drive Low Indicator Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1812	Transmission 4-Wheel Drive Mode Select Circuit Failure	GEM	REFER to Section 308-07A .
P1815	Transmission 4-Wheel Drive Mode Select Short Circuit to Ground	GEM	REFER to Section 308-07A .
P1819	Transmission Neutral Safety Switch Short Circuit to Ground	GEM	REFER to Section 308-07A .
P1820	Transmission Transfer Case Clockwise Shift Relay Coil Circuit Failure	GEM	REFER to Section 308-07A .
P1822	Transmission Transfer Case Clockwise Shift Relay Coil Short to Battery	GEM	REFER to Section 308-07A .
P1828	Transfer Case Counterclockwise Shift	GEM	REFER to Section 308-07A .

	Relay Coil Circuit Failure		
P1830	Transmission Transfer Case Counterclockwise Shift Relay Coil Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1832	Transmission Transfer Case Differential Lockup Solenoid Circuit Failure	GEM	REFER to Section 308-07A .
P1834	Transmission Transfer Case Differential Lockup Solenoid Short Circuit to Battery	GEM	REFER to Section 308-07A .
P1838	Transmission Transfer Case Shift Motor Circuit Failure	GEM	REFER to Section 308-07A .
P1865	Transmission Transfer Case Contact Plate Power Short to Ground	GEM	REFER to Section 308-07A .
P1866	Transmission Transfer Case System Concern — Servicing Required	GEM	REFER to Section 308-07A .
P1867	Transmission Transfer Case Contact Plate General Circuit Failure	GEM	REFER to Section 308-07A .
P1876	Transmission Transfer Case 2-Wheel Drive Solenoid Circuit Failure	GEM	REFER to Section 308-07A .
P1877	Transmission Transfer Case 2-Wheel Drive Solenoid Circuit Short to Battery	GEM	REFER to Section 308-07A .

GEM Parameter Identification (PID) Index

GEM Parameter Identification (PID) Index		
PID	Description	Expected Values
ACCDLY	Accessory Delay Relay Circuit	ON, OFF
BOO_GEM	Brake Input Switch Status	ON, OFF
CLTCHSW	Transmission Clutch Interlock Switch	notEGD, ENGAGD
D_DN_	Driver Window Down Switch	OFF, DOWN

SW		
D_PWRLY	Driver Power Window Status	ON---, OFF---
D_PWAMP	Driver Power Window Motor Current	0.25 to 63.75 amps
DRAJR_L	Door Ajar Warning Lamp Status	ON---, OFF---
D_DR_SW	Left External Access Ajar Switch Status	CLOSED, AJAR
D_SBELT	Driver Seat Belt Status	IN, OUT
IGN_GEM	Ignition Switch Status	START, RUN, OFF, ACCY
IGN_KEY	Ignition Key In/Out	IN, OUT
MTR_CCW	Transmission Transfer Counter CW Motor Output	ON---, OFF---
MTR_CW	Transmission Transfer Clockwise Motor Output	ON---, OFF---
NTRL_SW	Neutral Safety Switch Input	NTRL, notNTRL
OTD_SW	Left Front Power Window One Touch Down Status	OFF, DOWN
P_DR_SW	Right External Access Ajar Switch Status	CLOSED, AJAR
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
PRK_BRK	Park Brake Switch Status	ON, OFF
BRKLAMP	Brake Warning Lamp Status	ON---, OFF---
FLUID_1	Brake Fluid Level Switch #1 Status	ON, OFF
FLUID_2	Brake Fluid Level Switch #2 Status	ON, OFF
PLATE_A	Transmission Transfer Case Contact Plate A	OPEN, CLOSED
PLATE_B	Transmission Transfer Case Contact Plate B	OPEN, CLOSED
PLATE_C	Transmission Transfer Case Contact Plate C	OPEN, CLOSED
PLATE_D	Transmission Transfer Case Contact Plate D	OPEN, CLOSED
PLATEPW	Transmission Transfer Case Contact Plate Pull	ON---, OFF---
SBLTLMP	Seat Belt Lamp Circuit	ON---, OFF---
VBATGEM	Battery Voltage	0.0 VDC-25.5 VDC
VSS_GEM	Vehicle Speed Input	0-255 MPH
WASH_SW	Washer Pump Switch	ON, OFF
WPHISP	Windshield Wiper HI/LO Speed Relay	ON---, OFF---
WPMODE	Windshield Wiper Control Mode Select	WASH, OPEN, OFF, INTVL 1-7, LOW, HIGH
WPRUN	Wiper Motor Run Relay Driver State	ON---, OFF---

2WDSOL	2WD Hub Lock Solenoid Output Status	ON---, OFF---
4WDHIGH	4WD High Output State	ON---, OFF---
4WDLow	4WD Low Output State	ON---, OFF---
4WD_SW	4WD Input Switch Status	2WD, 4WD LOW, 4WD HIGH, OPEN, GSHORT
4WDSOL	4WD Hub Lock Solenoid Output Status	ON---, OFF---
IPCHIME	External Chime Request	ON, OFF
PARK_SW	Exterior Lamp Control Input Park Lamps Switch Status	ON, OFF
HDL_DIM	Headlamp Dimmer Switch	ON---, OFF---
PRKFRLY	Park Lamp Flash Relay	ON, OFF
HORNRLY	Horn Control Relay Output Status	ON---, OFF---
DR_UNLK	All Doors Unlock Output Status	ON---, OFF---
DD_UNLK	Driver Door Unlock Output Status	ON---, OFF---
ALL_RLY	All Door Lock Output Status	ON, OFF
INTLMP	Illuminated Entry Relay Circuit	ON---, OFF---
CCNTGEM	Number of Continuous DTCs In GEM	One count per bit

GEM Active Command Index

GEM Active Command		
Active Command	Display	Action
FRONT WINDSHIELD WIPER	WIPER RLY	ON, OFF
FRONT WINDSHIELD WIPER	SPEED RLY	ON, OFF
FRONT WINDSHIELD WIPER	WASH RLY	ON, OFF
WARNING LAMPS AND CHIME	SBLT LAMP	ON, OFF
WARNING LAMPS AND CHIME	CHIME	ON, OFF
WARNING LAMPS AND CHIME	AJAR LAMP	ON, OFF
BATTERY SAVER & COURTESY ENTRY	INT LAMPS	ON, OFF
ONE TOUCH WINDOW DOWN & ACCY DELAY	ACCY RLY	ON, OFF
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	ON, OFF
DOOR LOCK CONTROL	ALL LOCK	ON, OFF
DOOR LOCK CONTROL	UNLOCK	ON, OFF
DOOR LOCK CONTROL	DD UNLOCK	ON, OFF
TURN SIGNAL AND MARKER LAMPS	PARK LAMPS	ON, OFF

HORN CONTROL	HORN	ON, OFF
4-WHEEL ELECTRONIC SHIFT	CW/CCW	ON, OFF
4-WHEEL ELECTRONIC SHIFT	HIGH LAMP	ON, OFF
4-WHEEL ELECTRONIC SHIFT	LOW LAMP	ON, OFF
INDICATOR LAMP CONTROL	BRK LAMP	ON, OFF
MODULE OPTION CONTENT	SPD WARN	ON, OFF
MODULE OPTION CONTENT	SPD WIPER	ACTIVE, notACT
4WD TRANSFR CASE & INDICATORS	NUBLOCK_L	ON, OFF
4WD TRANSFER CASE & INDICATOR	NUBLOCK_H	ON, OFF

Symptom Chart — Super Duty Series F-250, F-350, F-450, F-550

Symptom Chart		
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No Communication With the Module — Generic Electronic Module 	<ul style="list-style-type: none"> Circuitry. Fuse(s). GEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The Wipers Are Inoperative 	<ul style="list-style-type: none"> Fuse(s). Circuitry. GEM. Multi-function switch (13K359) (wiper/washer switch). Windshield wiper run/park relay. Windshield wiper HI/LO relay. Windshield wiper motor (17508). 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The Wipers Stay On Continuously 	<ul style="list-style-type: none"> GEM. Multi-function switch (wiper/washer switch). Circuitry. Windshield wiper run/park relay. Windshield wiper motor. Windshield wiper HI/LO relay. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.

<ul style="list-style-type: none"> The High/Low Wiper Speeds Do Not Operate Properly 	<ul style="list-style-type: none"> GEM. Multi-function switch (wiper/washer switch). Circuitry. Windshield wiper HI/LO relay. Windshield wiper motor. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The Intermittent Wiper Speed Does Not Operate Properly 	<ul style="list-style-type: none"> GEM. Multi-function switch (wiper/washer switch). Circuitry. Windshield wiper motor. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> The Wash and Wipe Function Does Not Operate Properly 	<ul style="list-style-type: none"> Circuitry. Washer pump relay. Windshield washer pump. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> The Speed Dependent Interval Mode Does Not Operate Properly 	<ul style="list-style-type: none"> GEM. Circuitry. Vehicle speed sensor. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.

Pinpoint Tests — Super Duty Series F-250, F-350, F-450, F-550



CAUTION: Disconnect the battery before removing and installing the GEM or its connectors. Failure to follow this caution will result in the GEM storing many erroneous DTCs and it may exhibit erratic operation after installation.



CAUTION: Be careful when probing the fuse junction panel, power distribution box, or any connectors. Damage will result to the connector receptacle if the probe or terminal being used is too large.



CAUTION: Electronic modules are sensitive to electrostatic discharges. If exposed to these charges, damage may result.

PINPOINT TEST A: NO COMMUNICATION WITH THE MODULE — GENERIC ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FUSE JUNCTION PANEL FUSE 15 (5A)	
1	



2



Fuse 15 (5A)

- Is the fuse OK?

→ Yes

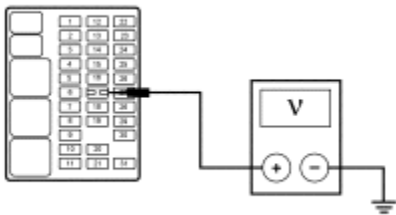
REINSTALL the fuse. GO to [A2](#) .

→ No

GO to [A3](#).

A2 CHECK FOR VOLTAGE AT FUSE/JUNCTION PANEL FUSE 15 (5A)

1



GK7657-A

1 Measure the voltage between fuse junction panel fuse 15 (5A) and ground.

- Is the voltage greater than 10 volts?

→ Yes

GO to [A4](#).

→ No

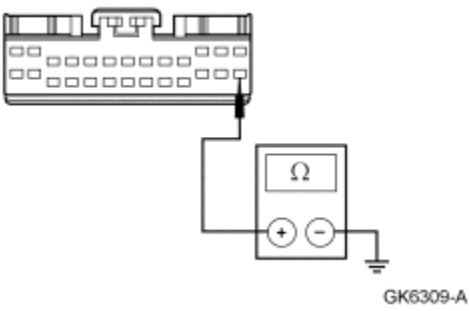
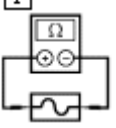
GO to [A5](#).


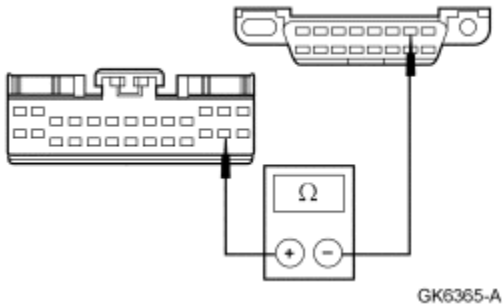
A3 CHECK FUSE JUNCTION PANEL FOR SHORT TO GROUND

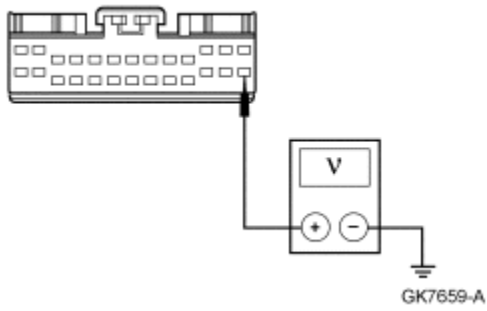



1

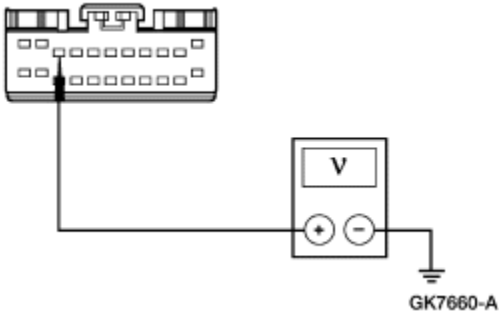



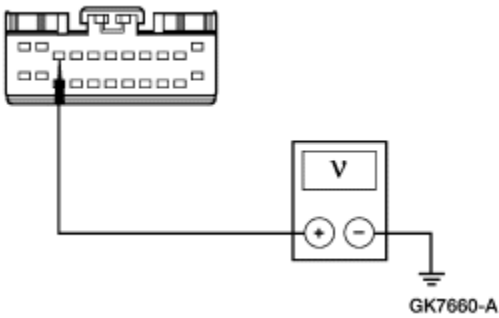


Fuse 15 (5A)	
<div> </div> <p>GEM C241</p>	
<div> <p>3</p> </div> <div> </div>	<div> <p>3</p> </div> <p>Measure the resistance between fuse junction panel C241, terminal 4, and ground; and between fuse junction panel C241, terminal 16, and ground.</p>
	<ul style="list-style-type: none"> • Are the resistances greater than 10,000 ohms? <p>→ Yes GO to A16.</p> <p>→ No REPLACE the fuse junction panel. TEST the system for normal operation.</p>
A4 CHECK CIRCUIT 676 (PK/O) FOR OPEN	
<div> </div> <p>GEM C239</p>	
<div> <p>2</p> </div>	<div> <p>2</p> </div> <p>Measure the resistance between GEM C239-26, circuit 676 (PK/O), and ground.</p>

	
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to A7.</p> <p>→ No REPAIR circuit 676 (PK/O). TEST the system for normal operation.</p>
A5 CHECK THE POWER DISTRIBUTION BOX FUSE 22 (50A)	
<p>1</p>  <p>Fuse 22 (50A)</p>	
	<p>2 Remove and inspect the fuse.</p>
	<ul style="list-style-type: none"> • Is the fuse OK? <p>→ Yes REINSTALL the fuse. GO to A6.</p> <p>→ No REPAIR circuit 1052 (T/BK). TEST the system for normal operation.</p>
A6 CHECK CIRCUIT 1052 (T/BK) FOR OPEN	
	<p>1 Measure the voltage between power distribution box fuse 22 (50A) and ground.</p>
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts?

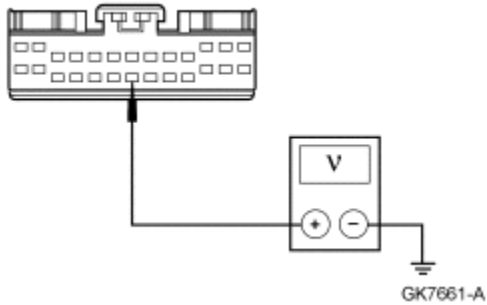
	<p>→ Yes REPAIR circuit 1052 (T/BK). TEST the system for normal operation.</p> <p>→ No REPAIR/REPLACE the power distribution box. TEST the system for normal operation.</p>
A7 CHECK CIRCUIT 70 (LB/W) FOR OPEN	
<p>1</p>  <p>GEM C239</p>	
2 Verify the NGS is disconnected.	
<p>3</p>  <p>GK6365-A</p>	<p>3 Measure the resistance between GEM C239-25, circuit 70 (LB/W), and DLC C227-7, circuit 70 (LB/W).</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes GO to A8.</p> <p>→ No REPAIR circuit 70 (LB/W). TEST the system for normal operation.</p>
A8 CHECK CIRCUIT 676 (PK/O) FOR SHORT TO POWER	
<p>1</p>	<p>1 Measure the voltage between GEM C239-26, circuit 676 (PK/O), and ground.</p>

	
	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 676 (PK/O). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No If equipped with ESOF, GO to A9 . If not equipped with ESOF, GO to A11 .</p>
A9 CHECK CIRCUIT 465 (W/LB)	
<div>1</div> 	
<div>2</div>  <p>GEM C247</p>	
<div>3</div> 	
<div>4</div>	<div>4</div> Measure the voltage between GEM C247-3, circuit 465 (W/LB), and ground.

	
	<ul style="list-style-type: none">• Is the voltage greater than 10 volts? <p>→ Yes GO to A10.</p> <p>→ No GO to A11.</p>
A10 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO POWER	
<p>1</p> 	
<p>2</p>  <p>4WD Mode Switch C246</p>	
<p>3</p> 	
<p>4</p> 	<p>4 Measure the voltage between GEM C247-3, circuit 465 (W/LB), and ground.</p>



	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 465 (W/LB). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPLACE the 4WD mode select switch. REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p>
--	--

A11 CHECK CIRCUIT 682 (DB) FOR SHORT TO POWER

<p>1</p> 	<p>1 Measure the voltage between GEM C239-20, circuit 682 (DB), and ground.</p>
--	--

	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to A12.</p> <p>→ No GO to A13.</p>
--	---

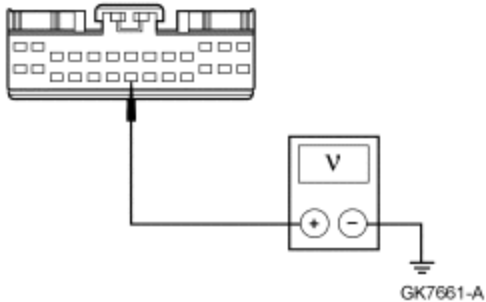
A12 CHECK CIRCUIT 682 (DB) FOR SHORT TO POWER (MULTI-FUNCTION SWITCH DISCONNECTED)

<p>1</p> 	
<p>2</p>  <p>Multi-Function Switch C230</p>	

3



4



4 Measure the voltage between GEM C239-20, circuit 682 (DB), and ground.

- Is the voltage greater than 10 volts?

→ Yes

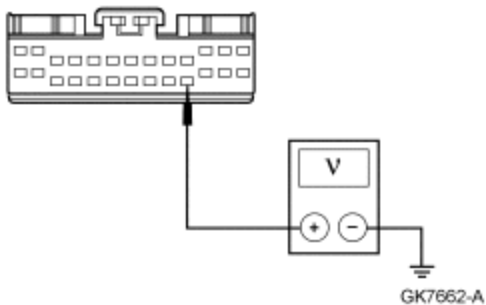
REPAIR circuit 682 (DB). REPLACE the GEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ No

REPLACE the wiper multi-function switch. REPLACE the GEM; REFER to [Section 419-10](#). TEST the system for normal operation.

A13 CHECK CIRCUIT 684 (PK/Y) FOR SHORT TO POWER

1




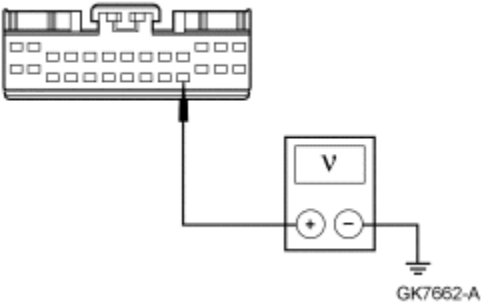





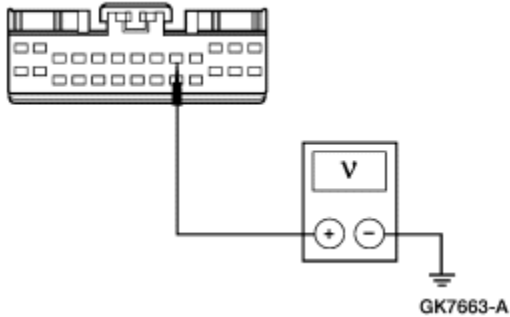

1 Measure the voltage between GEM C239-23, circuit 684 (PK/Y), and ground.


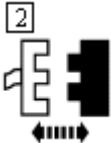
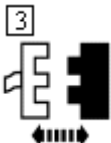
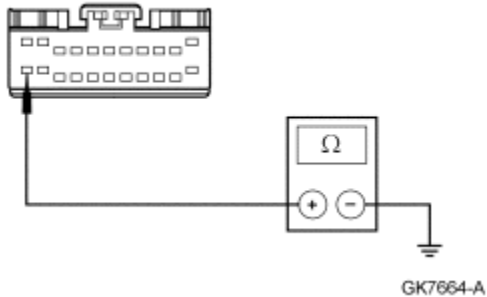
- Is the voltage greater than 10 volts?


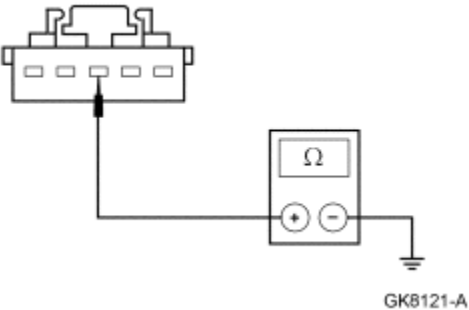
→ Yes

GO to [A14](#).

	<p>→ No If the vehicle is not equipped with anti-lock brake control module, GO to A15 .</p> <p>If the vehicle is equipped with anti-lock brake control module, REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
A14 CHECK CIRCUIT 684 (PK/Y) FOR SHORT TO POWER (MULTI-FUNCTION SWITCH DISCONNECTED)	
<p>1</p> 	
<p>2</p>  <p>Multi-Function Switch C230</p>	
<p>3</p> 	
<p>4</p> 	<p>4 Measure the voltage between GEM C239-23, circuit 684 (PK/Y), and ground.</p>
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 684 (PK/Y). REPLACE the GEM; REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch. REPLACE the</p>

	GEM; REFER to Section 419-10 . TEST the system for normal operation.
A15 CHECK CIRCUIT 519 (LG/BK) FOR SHORT TO POWER	
<div>1</div> 	
<div>2</div>  <p>Differential Speed Sensor C404</p>	
<div>3</div> 	
<div>4</div> 	<div>4</div> Measure the voltage between GEM C239-9, circuit 519 (LG/BK), and ground.
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPAIR circuit 519 (LG/BK). REPLACE the GEM. TEST the system for normal operation.</p> <p>→ No REPLACE the GEM. REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
A16 CHECK THE HORN RELAY	
<div>1</div> 	

Horn Relay	
	<div>2</div> Check the horn relay; refer to Component Test.
	<ul style="list-style-type: none"> Is the horn relay OK? <p>→ Yes GO to A17.</p> <p>→ No REPLACE the horn relay. TEST the system for normal operation.</p>
A17 CHECK CIRCUIT 810 (R/LG) FOR SHORT TO GROUND	
<div>1</div>  <p>GEM C241</p>	
<div>2</div>  <p>GEM C247</p>	
<div>3</div>  <p>BPP Switch C279</p>	
<div>4</div> 	<div>4</div> Measure the resistance between GEM C247-12, circuit 810 (R/LG), and ground.

	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes GO to A18.</p> <p>→ No REPAIR circuit 810 (R/LG). TEST the system for normal operation.</p>
A18 CHECK CIRCUIT 22 (LB/BK) FOR SHORT TO GROUND	
<p>1</p>  <p>Fuse Junction Panel C243</p>	
<p>2</p>  <p>GK8121-A</p>	<p>2 Measure the resistance between brake pedal position (BPP) switch C279-3, circuit 22 (LB/BK), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes REPLACE the BPP switch. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 22 (LB/BK). TEST the system for normal operation.</p>

PINPOINT TEST B: THE WIPERS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 RETRIEVE RECORDED GEM DIAGNOSTIC TROUBLE CODES (DTCS)	
1	



2 Use the recorded results from GEM self-test.

• **Are any DTCs recorded?**

→ **Yes**

If DTC B1431 and wipers are inoperative, GO to [B8](#) .

If DTC B1431 and wipers run continuously, GO to [C1](#) .

If DTC B1432, GO to [B12](#) .

If DTC B1438, GO to [B4](#) .

If DTC B1446, GO to [B2](#) .

If DTC B1458, GO to [B2](#) .

If DTC B1473, GO to [B2](#) .

If DTC B1476, GO to [B2](#) .

If DTC B1840, GO to [B2](#) .

If DTCs B1446, B1473, and B1476 are recorded and the wipers run on high speed only, or run on interval and low speed only, GO to [D1](#) .

If DTC B1342, REPLACE the GEM; REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

→ **No**

GO to [B2](#).

B2 CHECK POWER DISTRIBUTION BOX FUSE 15 (30A) AND FUSE JUNCTION PANEL FUSE 11 (10A)

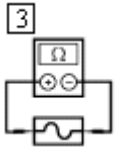
1



2



Fuse 15 (30A)



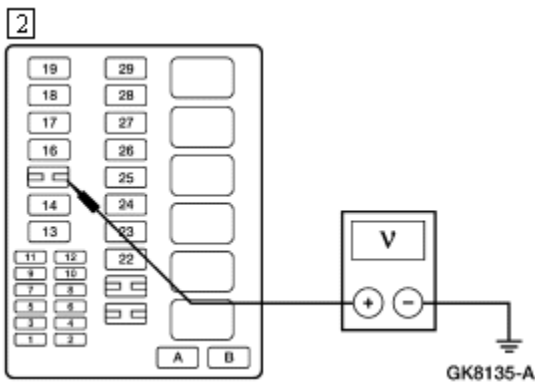
Fuse 11 (10A)

- **Are the fuses OK?**

→ **Yes**
GO to [B3](#).

→ **No**
If fuse 15 (30A) is faulty, GO to [B21](#) .
If fuse 11 (10A) is faulty, GO to [B27](#) .

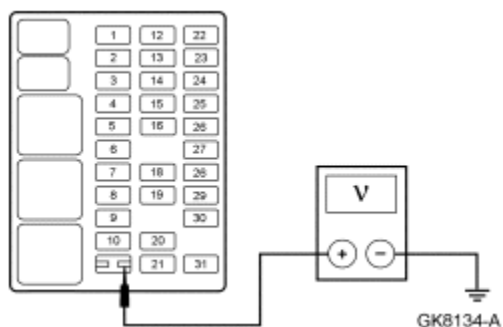
B3 CHECK POWER TO POWER DISTRIBUTION BOX FUSE 15 (30A) AND FUSE JUNCTION PANEL FUSE 11 (10A)



2 Measure the voltage between the input terminal of power distribution box fuse 15 (30A) and ground.

3

3 Measure the voltage between the input terminal of fuse junction panel fuse 11 (10A) and ground.



- Are the voltages greater than 10 volts?

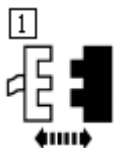
→ **Yes**
GO to [B4](#).

If only DTC B1446, B1473, and B1476 are present and wipers do not operate, GO to [B14](#).

If only DTC B1446, B1473, and B1476 are present and only intermittent wipers do not operate, GO to [Pinpoint Test E](#).

→ **No**
REPAIR the power input circuit to the fuse in question. TEST the system for normal operation.

B4 CHECK THE POWER TO THE WIPER/WASHER SYSTEM RELAYS — CIRCUIT 279 (BK/LG)

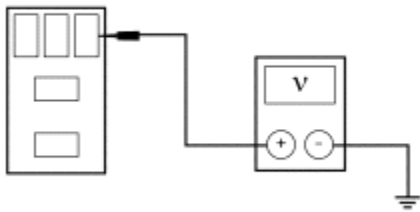


Wiper Run/Park Relay



3

3 Measure the voltage between the wiper run/park relay connector pin 1, circuit 297 (BK/LG), and ground.



GN1458-A

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [B5](#).

→ **No**
REPAIR circuit(s) 297 (BK/LG). CLEAR the DTCs.
TEST the system for normal operation.

B5 CHECK THE WIPER SWITCH OUTPUTS — MONITOR THE GEM PID WPMODE



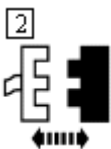
1 Monitor the GEM PID WPMODE while turning the wiper switch through all switch positions.


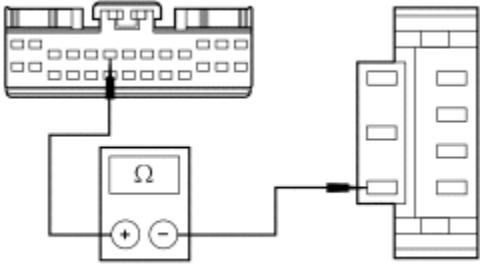
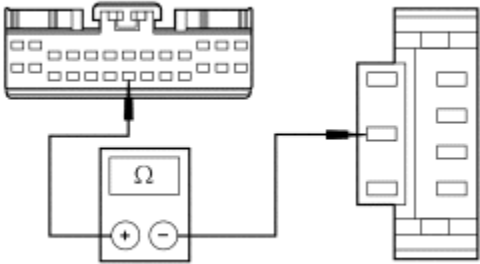
- Does the GEM PID WPMODE value agree with the wiper switch positions?

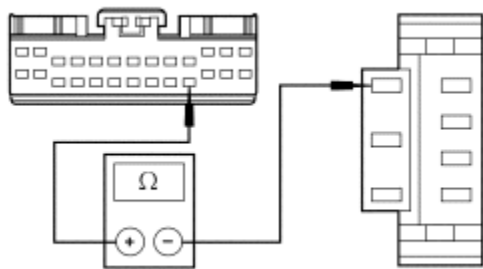
→ **Yes**
GO to [B8](#).

→ **No**
GO to [B6](#).

B6 CHECK THE WIPER/WASHER SWITCH



Multi-Function Switch	
	<p>3 Check the multi-function switch; refer to Section 211-05.</p>
	<ul style="list-style-type: none"> Is the multi-function switch OK? <p>→ Yes GO to B7.</p> <p>→ No REPLACE the multi-function switch; REFER to Section 211-05. CLEAR the DTCs. TEST the system for normal operation.</p>
B7 CHECK CIRCUITS 680 (LB/O), 682 (DB), 684 (PK/Y) FOR OPEN	
<p>1</p>  <p>GEM C239</p>	
<p>2</p>  <p>GK7496-A</p>	<p>2 Measure the resistance between GEM C239-6, circuit 680 (LB/O), and multi-function switch C230-590, circuit 680 (LB/O).</p>
<p>3</p>  <p>GK7497-A</p>	<p>3 Measure the resistance between GEM C239-20, circuit 682 (DB), and multi-function switch C230-993, circuit 682 (DB).</p>
<p>4</p>	<p>4 Measure the resistance between GEM C239-23, circuit 684 (PK/Y), and multi-function switch C230-</p>



GK7498-A

685, circuit 684 (PK/Y).

- **Are the resistances less than 5 ohms?**

→ **Yes**

REPLACE the GEM; REFER to [Section 419-10](#).
TEST the system for normal operation.

→ **No**

REPAIR circuit 680 (LB/O) and/or circuit 682 (DB) and/or circuit 684 (PK/Y). CLEAR the DTCs. TEST the system for normal operation.

B8 CHECK THE VOLTAGE TO THE WIPER RUN/PARK RELAY COIL — CIRCUIT 297 (BK/LG)

1



2



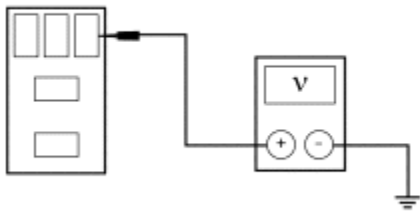
Wiper Run/Park Relay

3



4

4 Measure the voltage between wiper run/park relay connector pin 1, circuit 297 (BK/LG), and ground.



GN1458-A

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [B9](#).

→ **No**
CHECK fuse junction panel fuse 11 (10A) and/or
REPAIR circuit 950 (W/BK). CLEAR the DTCs.
TEST the system for normal operation.

B9 CHECK THE WIPER RUN/PARK RELAY COIL CIRCUIT — MONITOR THE GEM PID WPRUN



1 Monitor the GEM PID WPRUN while triggering the GEM active command WIPER RLY.

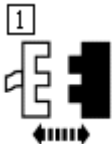
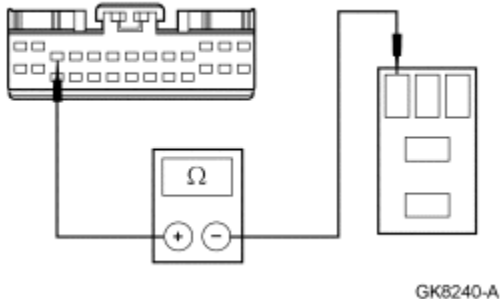
- Does the wiper motor operate, and does the GEM PID WPRUN read ON--- when the GEM active command WIPER RLY is triggered, and OFF--- when it is not?

→ **Yes**
REPLACE the GEM; REFER to [Section 419-10](#).
TEST the system for normal operation.

→ **No**
GO to [B10](#).

B10 CHECK THE WIPER RUN/PARK RELAY



	<p>2 Check the wiper run/park relay; refer to Component Test.</p>
	<ul style="list-style-type: none"> Is the wiper run/park relay OK? <p>→ Yes GO to B11.</p> <p>→ No REPLACE the wiper run/park relay. CLEAR the DTCs. TEST the system for normal operation.</p>
B11 CHECK CIRCUIT 646 (Y/W) FOR OPEN	
<p>1</p>  <p>GEM C239</p>	
<p>2</p>  <p>GK8240-A</p>	<p>2 Measure the resistance between GEM C239-3, circuit 646 (Y/W), and wiper run/park relay connector pin 2, circuit 646 (Y/W).</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes RECONNECT GEM C239. REINSTALL wiper run/park relay. GO to B14 .</p> <p>→ No REPAIR circuit 646 (Y/W). CLEAR the DTCs. TEST the system for normal operation.</p>
B12 CHECK CIRCUIT 646 (Y/W) FOR SHORT TO POWER	
<p>1</p>	



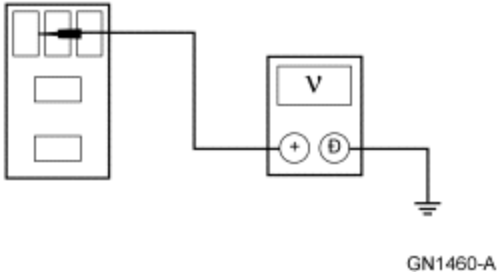
Wiper Run/Park Relay



GEM C239



5



5 Measure the voltage between wiper run/park relay connector pin 2, circuit 646 (Y/W), and ground.

- Is any voltage indicated?





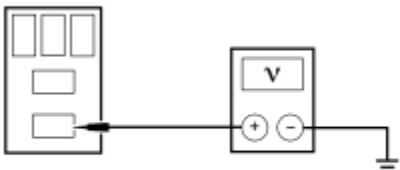
→ Yes
REPAIR circuit 646 (Y/W). CLEAR the DTCs.
TEST the system for normal operation.



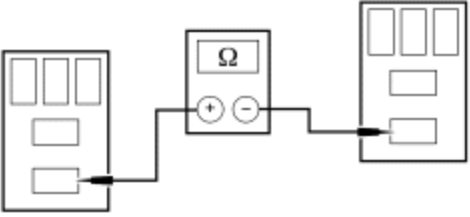
→ No
GO to [B13](#).

B13 CHECK THE WIPER RUN/PARK RELAY

1

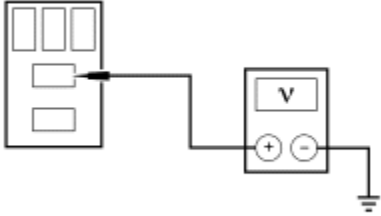


	<p>2 Check the wiper run/park relay; refer to Component Test.</p>
	<ul style="list-style-type: none"> Is the wiper run/park relay OK? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPLACE the wiper run/park relay. CLEAR the DTCs. TEST the system for normal operation.</p>
<p>B14 CHECK THE WIPER RUN/PARK RELAY SWITCH CIRCUIT FOR VOLTAGE — CIRCUIT 63 (R)</p>	
<p>1</p> 	
<p>2</p>  <p>Wiper HI/LO Relay</p>	
<p>3</p> 	
<p>4</p> 	<p>4 Trigger the GEM active command WIPER RELAY to ON.</p>
<p>5</p>  <p>GK3411-A</p>	<p>5 Measure the voltage between wiper HI/LO relay connector pin 3, circuit 63 (R), and ground.</p>

	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to B17.</p> <p>→ No GO to B15.</p>
B15 CHECK CIRCUIT 63 (R) FOR OPEN	
<p>1</p> 	
<p>2</p>  <p>Wiper Run/Park Relay</p>	
<p>3</p>  <p>GK3412-A</p>	<p>3 Measure the resistance between wiper HI/LO relay connector pin 3, circuit 63 (R), and wiper run/park relay connector pin 3, circuit 63 (R).</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to B16.</p> <p>→ No REPAIR circuit 63 (R). CLEAR the DTCs. TEST the system for normal operation.</p>
B16 CHECK THE VOLTAGE TO THE WIPER RUN/PARK RELAY SWITCH — CIRCUIT 950 (W/BK)	
<p>1</p>	



2



GK3413-A

2 Measure the voltage between the wiper run/park relay connector pin 5, circuit 950 (W/BK), and ground.

- Is the voltage greater than 10 volts?

→ Yes

REPLACE the wiper run/park relay. CLEAR the DTCs. TEST the system for normal operation.

→ No

CHECK power distribution box fuse 15 (30A) and/or REPAIR circuit 950 (W/BK). CLEAR the DTCs. TEST the system for normal operation.

B17 CHECK THE WIPER HI/LO RELAY SWITCH CIRCUIT

1 Turn the wiper switch to the LO position.

2


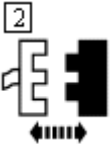
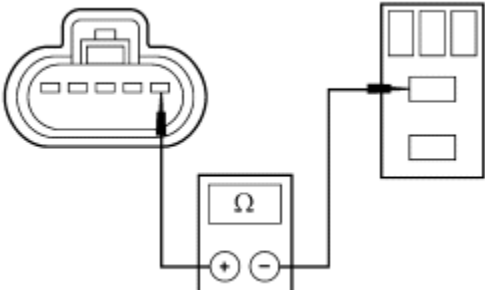
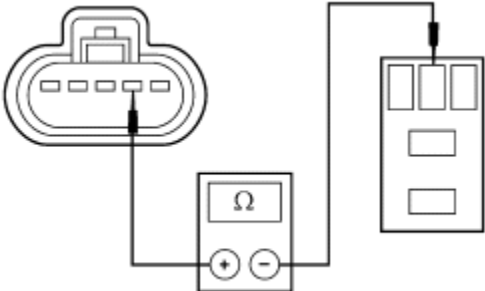



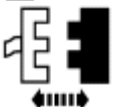
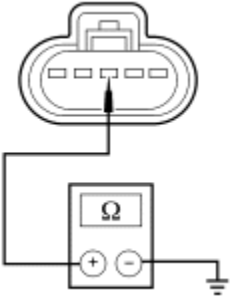
GK3414-A



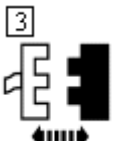
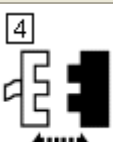
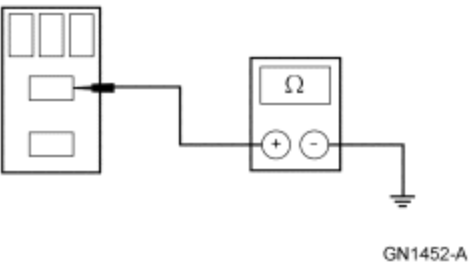
2 Connect a jumper between wiper HI/LO relay connector pin 3, circuit 63 (R), and pin 4, circuit 58 (W), or pin 5, circuit 56 (DB/O).

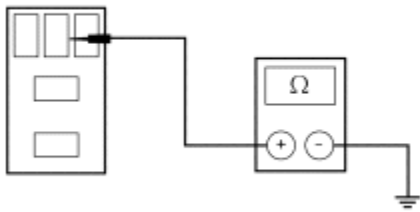
3



	<ul style="list-style-type: none"> • Do the wipers operate? <p>→ Yes REPLACE the wiper HI/LO relay. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to B18.</p>
B18 CHECK CIRCUITS 56 (DB/O) AND 58 (W) FOR OPEN	
<p>1</p> 	
<p>2</p>  <p>Wiper Motor C151</p>	
<p>3</p>  <p>GK8015-A</p>	<p>3 Measure the resistance between wiper motor C151-5, circuit 56 (DB/O), and wiper HI/LO relay connector pin 5, circuit 56 (DB/O).</p>
<p>4</p>  <p>GK8016-A</p>	<p>4 Measure the resistance between wiper motor C151-4, circuit 58 (W), and wiper HI/LO relay connector pin 4, circuit 58 (W).</p>
	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes</p>

	<p>GO to B19.</p> <p>→ No REPAIR circuit 56 (DB/O) and/or circuit 58 (W). CLEAR the DTCs. TEST the system for normal operation.</p>
B19 CHECK THE GROUND TO THE WIPER MOTOR — CIRCUIT 57 (BK)	
<p>1</p> 	
<p>2</p>  <p>Wiper Motor C151</p>	
<p>3</p>  <p>K25888-A</p>	<p>3 Measure the resistance between wiper motor C151-3, circuit 57 (BK), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to B20.</p> <p>→ No REPAIR circuit 57 (BK). CLEAR the DTCs. TEST the system for normal operation.</p>
B20 CHECK THE WIPER MECHANISM	
	<p>1 Remove the linkage from the windshield wiper motor.</p>
	<ul style="list-style-type: none"> • Are the wipers free?

	<p>→ Yes GO to B26.</p> <p>→ No REPAIR the wiper mechanism. CLEAR the DTCs. TEST the system for normal operation.</p>
B21 CHECK CIRCUITS 950 (W/BK) AND 671 (LB) FOR SHORT(S) TO GROUND	
<p>1</p> 	
<p>2</p>  <p>Wiper Run/Park Relay</p>	
<p>3</p>  <p>Wiper Motor C151</p>	
<p>4</p>  <p>GEM C239</p>	
<p>5</p> 	<p>5 Measure the resistance between wiper run/park relay connector pin 5, circuit 950 (W/BK), and ground.</p>
<p>6</p>	<p>6 Measure the resistance between wiper run/park relay connector pin 4, circuit 671 (LB), and ground.</p>



GN1454-A

- Are the resistances greater than 10,000 ohms?

→ Yes

GO to [B22](#).

→ No

REPAIR circuit 950 (W/BK) and/or circuit 671 (LB). CLEAR the DTCs. TEST the system for normal operation.

B22 CHECK THE WIPER RUN/PARK RELAY

1 Check the wiper run/park relay; refer to Component Test.

- Is the wiper run/park relay OK?

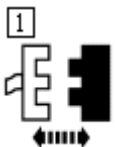
→ Yes

GO to [B23](#).

→ No

REPLACE the wiper run/park relay. CLEAR the DTCs. TEST the system for normal operation.

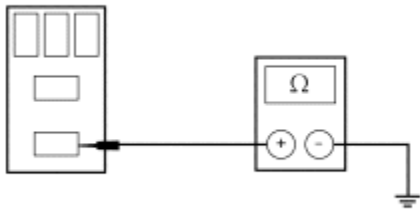
B23 CHECK CIRCUIT 63 (R) FOR SHORT TO GROUND



Wiper HI/LO Relay

2

2 Measure the resistance between wiper run/park relay connector pin 3, circuit 63 (R), and ground?



GN1451-A

- Is the resistance greater than 10,000 ohms?

→ **Yes**

GO to [B24](#).

→ **No**

REPAIR circuit 63 (R). CLEAR the DTCs. TEST the system for normal operation.

B24 CHECK THE WIPER HI/LO RELAY

1 Check the wiper HI/LO relay; refer to Component Test.

- Is the wiper HI/LO relay OK?

→ **Yes**

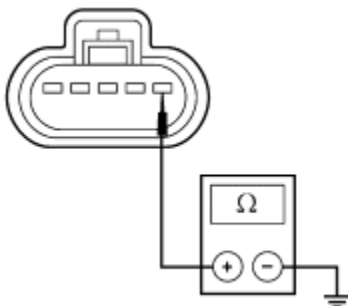
GO to [B25](#).

→ **No**

REPLACE the wiper HI/LO relay. CLEAR the DTCs. TEST the system for normal operation.

B25 CHECK CIRCUITS 56 (DB/O) AND 58 (W) FOR SHORT TO GROUND

1

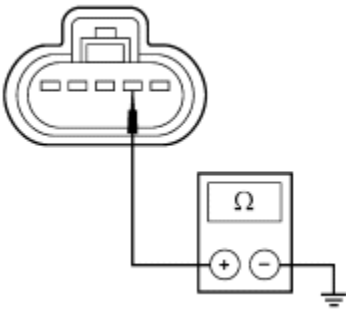






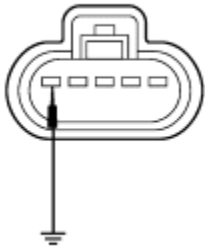
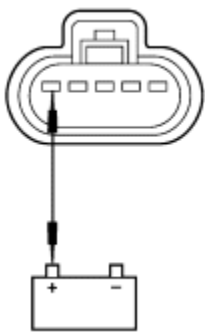


GK7502-A

1 Measure the resistance between wiper motor C151-5, circuit 56 (DB/O), and ground.


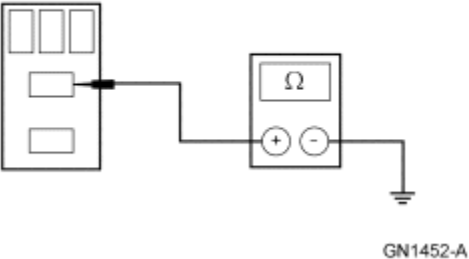
2

2 Measure the resistance between wiper motor

 <p>GK7503-A</p>	<p>C151-4, circuit 58 (W), and ground.</p>
	<ul style="list-style-type: none"> • Are the resistances greater than 10,000 ohms? <p>→ Yes GO to B26.</p> <p>→ No REPAIR circuit 56 (DB/O) and/or circuit 58 (W). CLEAR the DTCs. TEST the system for normal operation.</p>
<p>B26 CHECK THE PARK FUNCTION OF THE WIPER MOTOR — MONITOR THE GEM PID WPPRKS</p>	
<p>1</p>  <p>GEM C239</p>	
<p>2</p>  <p>Wiper Run/Park Relay</p>	
<p>3</p> 	
<p>4</p> 	<p>4 Monitor the GEM PID WPPRKS.</p>
<p>5</p>	<p>5 Connect a jumper wire between wiper motor</p>





 <p>K26343-A</p>	<p>C151-1, circuit 671 (LB), and ground.</p>
<p>7</p>  <p>K26344-A</p>	<p>6 Remove the jumper wire from wiper motor C151.</p> <p>7 Connect a jumper wire between wiper motor C151-1, circuit 671 (LB), and the positive battery terminal.</p>
	<ul style="list-style-type: none"> Does the GEM PID WPPRKSX indicate PARKED when the wiper motor is grounded and notPRK when the ground is removed? <p>→ Yes GO to B30.</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
<p>B27 CHECK CIRCUIT 297 (BK/LG) FOR SHORT TO GROUND</p>	
<p>1</p> 	
<p>2</p> 	




Wiper HI/LO Relay	
<div> <p>Diagram of the Wiper HI/LO Relay. It shows a relay with a coil and two contacts. A double-headed arrow indicates the relay's operation.</p> </div>	
Wiper Run/Park Relay	
<div> <p>Diagram of the Wiper Run/Park Relay. It shows a relay with a coil and two contacts. A double-headed arrow indicates the relay's operation.</p> </div>	
<div> <p>Diagram of the Washer Pump Relay. It shows a relay with a coil and two contacts. A double-headed arrow indicates the relay's operation.</p> </div>	<div> <p>6 Measure the resistance between fuse junction panel C243-19, circuit 297 (BK/LG), and ground.</p> </div> <div> <p>Diagram showing the Fuse Junction Panel C243 and an ohmmeter. The ohmmeter is connected to the panel and ground. The ohmmeter display shows a resistance value. The label GK7795-A is present.</p> </div>
	<div> <ul style="list-style-type: none"> Is the resistance greater than 10,000 ohms? </div> <div> <p>→ Yes GO to B28.</p> </div> <div> <p>→ No REPAIR circuit 297 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.</p> </div>
B28 CHECK THE WIPER HI/LO, WIPER RUN/PARK, AND THE WASHER PUMP RELAYS	
	<div> <p>1 Check the wiper HI/LO relay, wiper run/park relay and washer pump relay; refer to Component</p> </div>

	Test.
	<ul style="list-style-type: none"> • Are the relays OK? <p>→ Yes GO to B29.</p> <p>→ No REPLACE the relay in question. CLEAR the DTCs. TEST the system for normal operation.</p>
B29 CHECK CIRCUIT 941 (BK/W) FOR SHORT TO GROUND	
<p>1</p>  <p>Washer Pump Motor C1030</p>	
<p>2</p>  <p>GN1452-A</p>	<p>2 Measure the resistance between washer pump relay connector pin 5, circuit 941 (BK/W), and ground?</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes REPLACE washer pump motor; REFER to Washer Pump and Reservoir. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 941 (BK/W). CLEAR the DTCs. TEST the system for normal operation.</p>
B30 PERFORM WIPER MOTOR CURRENT DRAW TEST	
	<p>1 Perform wiper motor current draw test; refer to Component Test.</p>

	<ul style="list-style-type: none"> • Is the motor OK? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPLACE the windshield wiper motor. REFER to Motor—Windshield Wiper. CLEAR the DTCs. TEST the system for normal operation.</p>
--	---

PINPOINT TEST C: THE WIPERS STAY ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCs)	
	 Retrieve and document continuous DTCs.
 <p>Clear Continuous DTCs</p>	
 <p>GEM On-Demand Self-Test</p>	
	<ul style="list-style-type: none"> • Are any DTCs retrieved? <p>→ Yes If DTC B1431, GO to C5 . If DTC B1441, GO to C3 . If DTC B1453, GO to C3 . If DTC B1342, REPLACE the GEM; REFER to</p>

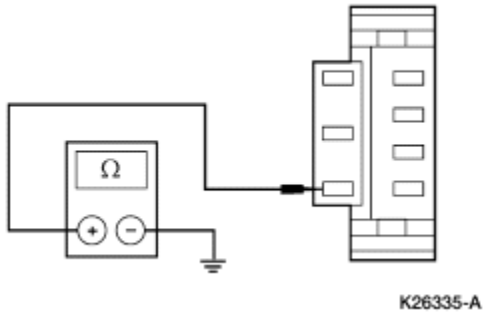
	<p>Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to C2.</p>
C2 CHECK THE WIPER SWITCH INPUTS — MONITOR THE GEM PID WPMODE	
<p>1</p> 	<p>1 Monitor the GEM PID WPMODE while turning the wiper switch through all switch positions.</p>
	<ul style="list-style-type: none"> Does the GEM PID WPMODE value agree with the wiper switch positions? <p>→ Yes GO to C5.</p> <p>→ No GO to C3.</p>
C3 CHECK THE WIPER/WASHER SWITCH	
<p>1</p> 	
<p>2</p>  <p>Multi-Function Switch C230</p>	
	<p>3 Check the multi-function switch; refer to Section 211-05.</p>
	<ul style="list-style-type: none"> Is the multi-function switch OK? <p>→ Yes GO to C4.</p> <p>→ No REPLACE the multi-function switch; REFER to Section 211-05. CLEAR the DTCs. TEST the system for normal operation.</p>

C4 CHECK CIRCUITS 680 (LB/O) AND 684 (PK/Y) FOR SHORTS TO GROUND



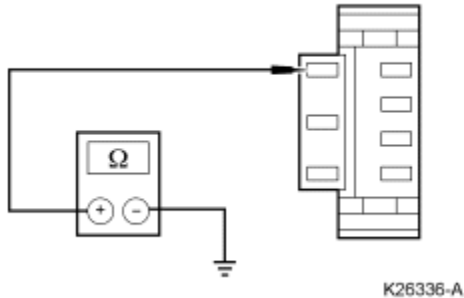
GEM C239

2



2 Measure the resistance between multi-function switch C230-590, circuit 680 (LB/O), and ground.

3



3 Measure the resistance between multi-function switch C230-589, circuit 684 (PK/Y), and ground.

- Are the resistances greater than 10,000 ohms?

→ Yes

REPLACE the GEM; REFER to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

→ No

REPAIR circuit 680 (LB/O) and/or circuit 684 (PK/Y). CLEAR the DTCs. TEST the system for normal operation.

C5 CHECK THE WIPER RUN/PARK RELAY

1

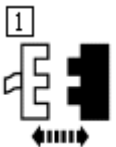


Wiper Run/Park Relay

3 Check the wiper run/park relay; refer to Component Test.

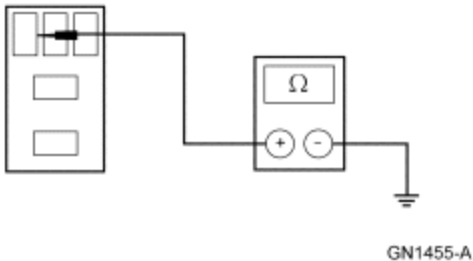
- Is the wiper run/park relay OK?
- Yes
GO to C6.
- No
REPLACE the wiper run/park relay. CLEAR the DTCs. TEST the system for normal operation.

C6 CHECK CIRCUIT 646 (Y/W) FOR SHORT TO GROUND




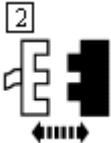

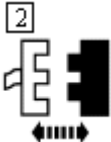
GEM C239



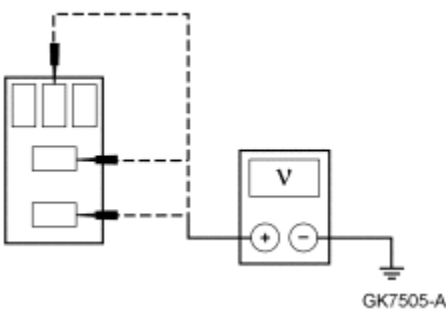

2

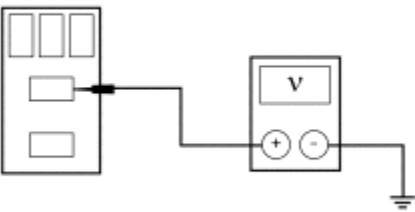
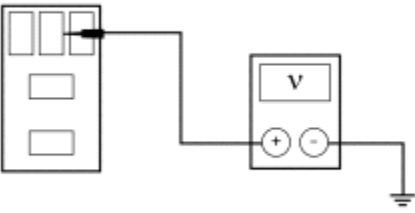
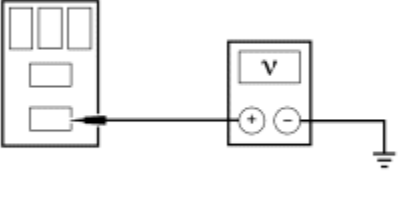


2 Measure the resistance between wiper run/park relay connector pin 2, circuit 646 (Y/W), and ground.





- Is the resistance greater than 10,000 ohms?
- Yes
GO to C7.




	<p>→ No REPAIR circuit 646 (Y/W). CLEAR the DTCs. TEST the system for normal operation.</p>
C7 CHECK THE WIPER RUN/PARK RELAY SWITCH CIRCUIT	
<p>1</p> 	
<p>2</p>  <p>Wiper Run/Park Relay</p>	
	<ul style="list-style-type: none"> • Do the wipers stop operating? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No RECONNECT the relay. GO to C8 .</p>
C8 CHECK THE WIPER HI/LO RELAY	
<p>1</p> 	
<p>2</p>  <p>Wiper HI/LO Relay</p>	
	<p>3 Check the wiper HI/LO relay; refer to Component Test.</p>
	<ul style="list-style-type: none"> • Is the wiper run/park relay OK? <p>→ Yes</p>






	<p>GO to C9.</p> <p>→ No REPLACE the wiper HI/LO relay. CLEAR the DTCs. TEST the system for normal operation.</p>
C9 CHECK CIRCUITS 63 (R), 56 (DB/O) AND 58 (W) FOR A SHORT TO POWER	
<p>1</p>  <p>Wiper Motor C151</p>	
<p>2</p> 	
<p>3</p> 	<p>3 Measure the voltage between wiper HI/LO relay connector pin 5, circuit 56 (DB/O), pin 4, circuit 58 (W), pin 3, circuit 63 (R), and ground.</p>
	<ul style="list-style-type: none"> Are any of the voltages greater than 10 volts? <p>→ Yes GO to C10.</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
C10 CHECK WIPER MOTOR FOR INTERNAL SHORT	
<p>1</p> 	
<p>2</p>	<p>2 Measure the voltage between wiper HI/LO relay</p>

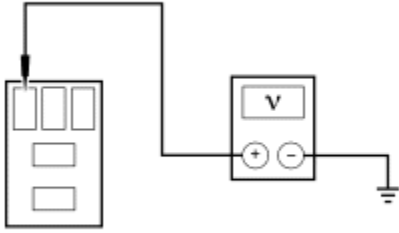
 <p>GN1457-A</p>	<p>connector pin 5, circuit 56 (DB/O), and ground.</p>
<p>3</p>  <p>GN1459-A</p>	<p>3 Measure the voltage between wiper HI/LO relay connector pin 4, circuit 58 (W), and ground.</p>
<p>4</p>  <p>GK3411-A</p>	<p>4 Measure the voltage between wiper HI/LO relay connector pin 3, circuit 63 (R), and ground.</p>
	<ul style="list-style-type: none"> • Is there voltage present? <p>→ Yes REPAIR circuit in question. TEST the system for normal operation.</p> <p>→ No REPLACE the windshield wiper motor. REFER to Motor—Windshield Wiper. CLEAR the DTCs. TEST the system for normal operation.</p>

PINPOINT TEST D: THE HIGH/LOW WIPER SPEEDS DO NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCS)	
<div> <div>1</div>  </div>	<div> <div>1</div> Retrieve and document continuous DTCs. </div>
<div> <div>2</div>  </div> <p>Clear Continuous DTCs</p>	
<div> <div>3</div>  </div> <p>GEM On-Demand Self-Test</p>	
	<ul style="list-style-type: none"> Are any DTCs recorded? <p>→ Yes</p> <p>If DTC B1434, GO to D6 .</p> <p>If DTC B1436, GO to D5 .</p> <p>If DTC B1342, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>If DTCs B1446, B1476, and B1473 are all recorded, GO to D10 .</p> <p>→ No</p> <p>GO to D2.</p>
D2 CHECK THE WIPER SWITCH OUTPUTS — MONITOR THE GEM PID WPMODE	
<div> <div>1</div>  </div>	
<div> <div>2</div> </div>	<div> <div>2</div> Monitor the GEM PID WPMODE while turning the wiper switch through all switch positions. </div>

	
	<ul style="list-style-type: none"> • Does the GEM PID WPMODE value agree with the wiper switch positions? <p>→ Yes GO to D4.</p> <p>→ No GO to D3.</p>
D3 CHECK THE WIPER/WASHER SWITCH	
<div>1</div> 	
<div>2</div>  <p>Multi-Function Switch</p>	
	<div>3</div> Check the multi-function switch; refer to Section 211-05 .
	<ul style="list-style-type: none"> • Is the multi-function switch OK? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch; REFER to Section 211-05. CLEAR the DTCs. TEST the system for normal operation.</p>
D4 CHECK THE GEM OUTPUT TO THE WIPER HI/LO RELAY — MONITOR THE GEM PID WPHISP	
<div>1</div>	<div>1</div> Monitor the GEM PID WPHISP while triggering the GEM active command SPEED RELAY.

	
	<ul style="list-style-type: none"> • Does the PID WPHISP change from OFF-- - to ON--- then back to OFF---? <p>→ Yes GO to D10.</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>
D5 CHECK CIRCUIT 647 (GY/LB) FOR SHORT TO POWER	
<p>1</p> 	
<p>2</p>  <p>Wiper HI/LO Relay</p>	
<p>3</p>  <p>GEM C239</p>	
<p>4</p> 	
<p>5</p>	<p>5 Measure the voltage between wiper HI/LO relay connector pin 2, circuit 647 (GY/LB), and ground.</p>



GK3410-A

- **Is the voltage greater than 10 volts?**

→ **Yes**

REPAIR circuit 647 (GY/LB). CLEAR the DTCs.
TEST the system for normal operation.

→ **No**

GO to [D9](#).

D6 CHECK CIRCUIT 647 (GY/LB) FOR OPEN

1



2



GEM C239

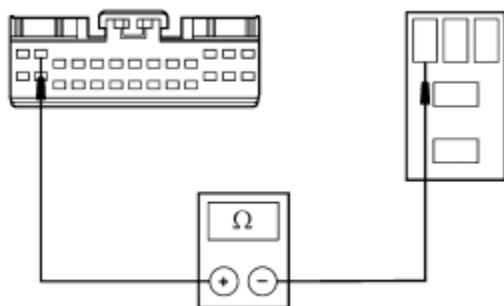
3



Wiper HI/LO Relay

4

4 Measure the resistance between wiper HI/LO relay connector pin 2, circuit 647 (GY/LB), and GEM C239-2, circuit 647 (GY/LB).



A0021370

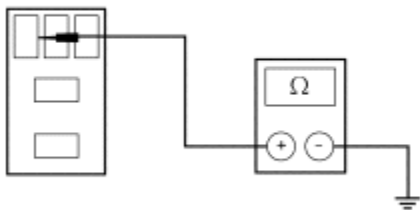
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D7](#).

→ **No**
REPAIR circuit 647 (GY/LB). CLEAR the DTCs.
TEST the system for normal operation.

D7 CHECK CIRCUIT 647 (GY/LB) FOR SHORT TO GROUND

1



GN1455-A

1 Measure the resistance between wiper HI/LO relay connector pin 2, circuit 647 (GY/LB), and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D8](#).

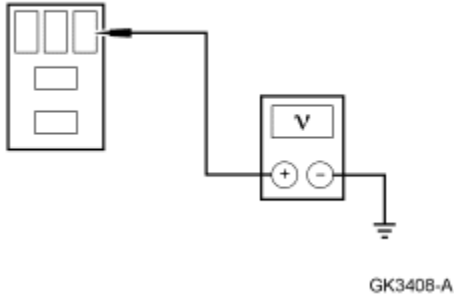
→ **No**
REPAIR circuit 647 (GY/LB). CLEAR the DTCs.
TEST the system for normal operation.

D8 CHECK THE VOLTAGE TO THE WIPER HI/LO RELAY — CIRCUIT 297 (BK/LG)

1



2



2 Measure the voltage between wiper HI/LO relay pin 1, circuit 297 (BK/LG), and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [D9](#).

→ **No**
REPAIR circuit 297 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.

D9 CHECK THE WIPER HI/LO RELAY

1



2 Check the wiper HI/LO relay; refer to Component Test.

- Is the wiper HI/LO relay OK?

→ **Yes**
REPLACE the GEM; refer to [Section 419-10](#). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPLACE the windshield wiper HI/LO relay. CLEAR the DTCs. TEST the system for normal operation.

D10 CHECK THE WIPER HI/LO RELAY SWITCH CIRCUIT

1



2

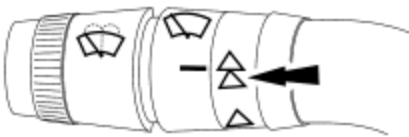


Wiper HI/LO Relay

3



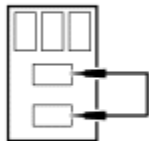
4



GK0918-A

4 Place the multi-function switch in the high position.

5



GK3421-A

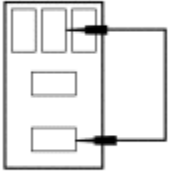


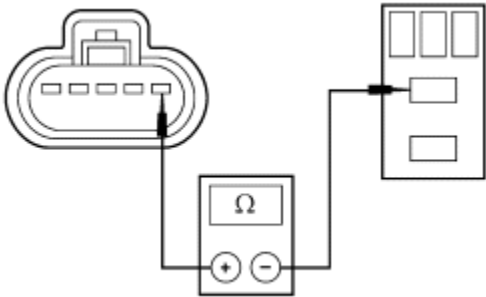
5 **NOTE:** The wipers should move at high speed. Connect a jumper wire between wiper HI/LO relay connector pin 3, circuit 63 (R), and pin 5, circuit 56 (DB/O).

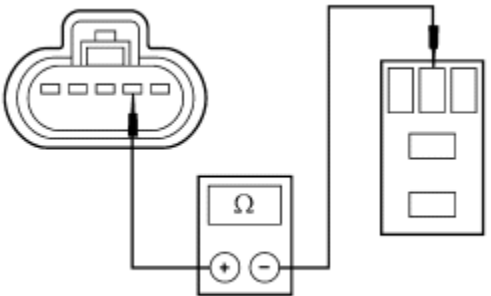
6






GK0920-A




6 Turn the multi-function switch in the low position.

<p>7</p>  <p>GN1444-A</p>	<p>7 NOTE: The wipers should move at low speed. Connect a jumper wire between wiper HI/LO relay connector pin 3, circuit 63 (R), and pin 4, circuit 58 (W).</p>
	<ul style="list-style-type: none"> • Do the wipers operate at the correct speeds? <p>→ Yes REPLACE the wiper HI/LO relay. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REMOVE the jumper wire. GO to D11.</p>
<p>D11 CHECK CIRCUITS 56 (DB/O) AND 58 (W) FOR OPEN</p>	
<p>1</p> 	
<p>2</p>  <p>Wiper Motor C151</p>	
<p>3</p>  <p>GK8015-A</p>	<p>3 Measure the resistance between wiper motor C151-5, circuit 56 (DB/O), and wiper HI/LO relay connector pin 5, circuit 56 (DB/O).</p>
<p>4</p>	<p>4 Measure the resistance between wiper motor C151-4, circuit 58 (W), and wiper HI/LO relay</p>

 <p style="text-align: right;">GK8016-A</p>	<p>connector pin 4, circuit 58 (W).</p>
	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes PERFORM the Windshield Wiper Motor; REFER to Component Test. REPLACE the windshield wiper motor if it does not pass the test; REFER to Motor—Windshield Wiper. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 56 (DB/O) and/or circuit 58 (W). CLEAR the DTCs. TEST the system for normal operation.</p>

PINPOINT TEST E: THE INTERMITTENT WIPER SPEED DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCs)	
<div>1</div> 	<div>1</div> Retrieve and document continuous DTCs.
<div>2</div>  <p>Clear Continuous DTCs</p>	
<div>3</div> 	

On-Demand Self-Test	
	<ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes If DTC B1450, GO to E3 .</p> <p>If DTCs B1446, B1473, and B1476 are all recorded, GO to E7 .</p> <p>If any other DTCs are retrieved, DIAGNOSE the other DTCs first.</p> <p>If DTC B1342, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to E2.</p>
E2 CHECK THE WIPER SWITCH OUTPUTS — MONITOR THE GEM PID WPMODE	
<p>1</p> 	
<p>2</p> 	<p>2 Monitor the GEM PID WPMODE while turning the wiper switch through all switch positions.</p>
	<ul style="list-style-type: none"> • Does the GEM PID WPMODE value agree with all the wiper switch positions? <p>→ Yes GO to E6.</p> <p>→ No GO to E3.</p>
E3 CHECK THE WIPER/WASHER SWITCH	
<p>1</p> 	

2



Multi-Function Switch

3 Check the multi-function switch; refer to [Section 211-05](#).

- **Is the multi-function switch OK?**

→ **Yes**

GO to [E4](#).

→ **No**

REPLACE the multi-function switch; REFER to [Section 211-05](#). CLEAR the DTCs. TEST the system for normal operation.

E4 CHECK CIRCUIT 680 (LB/O) FOR SHORT TO POWER

1

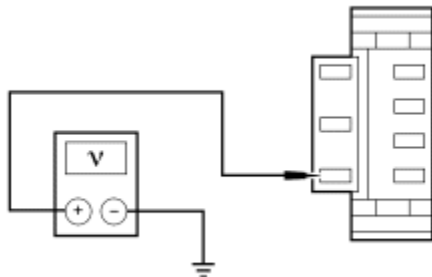


GEM C239

2




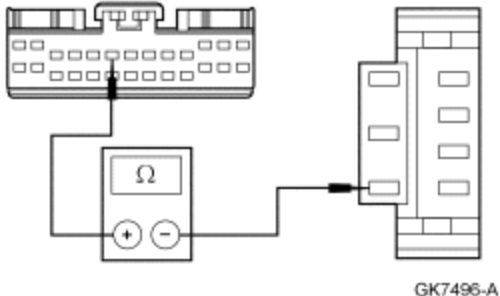
3

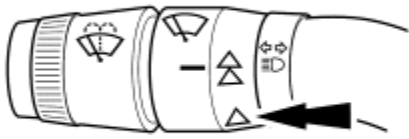


K26341-A

3 Measure the voltage between multi-function switch C230-590, circuit 680 (LB/O), and ground.

- **Is any voltage indicated?**

	<p>→ Yes REPAIR circuit 680 (LB/O). CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to E5.</p>
E5 CHECK CIRCUIT 680 (LB/O) FOR OPEN	
<p>1</p> 	
<p>2</p>  <p>GK7496-A</p>	<p>2 Measure the resistance between GEM C239-6, circuit 680 (LB/O), and multi-function switch C230-590, circuit 680 (LB/O).</p>
	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 680 (LB/O). CLEAR the DTCs. TEST the system for normal operation.</p>
E6 CHECK THE WIPER MOTOR PARK SWITCH STATUS — MONITOR THE GEM PID WPPRKS	
<p>1</p>	<p>1 Place the wiper/washer switch in the low position.</p>



J6137-A



2 **NOTE:** The record function of NGS must be used to perform this test.
Monitor and record the GEM PID WPPRKSX while the wipers are operating.



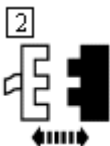
3 Use NGS View Recorder Areas to view the stored WPPRKSX graph.

- **Does the GEM PID WPPRKSX indicate PARK when the wipers are at the PARK position and notPRK when the wipers are out of the PARK position?**

→ **Yes**
REPLACE the GEM; REFER to [Section 419-10](#).
CLEAR the DTCs. TEST the system for normal operation.

→ **No**
GO to [E7](#).

E7 CHECK CIRCUIT 671 (LB) FOR OPEN



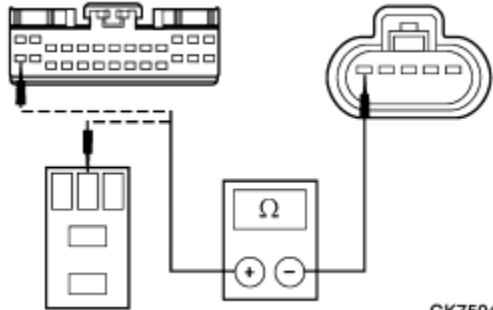
GEM C239

3



Wiper Run/Park Relay

4



GK7504-A

4 Measure the resistance between wiper motor C151-1, circuit 671 (LB), and GEM C239-14, circuit 671 (LB); and between wiper motor C151-1, circuit 671 (LB), and wiper run/park relay connector pin 4, circuit 671 (LB).

- Are the resistances less than 5 ohms?

→ Yes
GO to [E8](#).

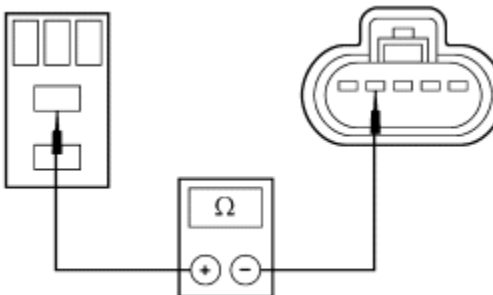
→ No
REPAIR circuit 671 (LB). CLEAR the DTCs. TEST the system for normal operation.

E8 CHECK CIRCUIT 950 (W/BK) TO THE WIPER MOTOR FOR OPEN

1



2


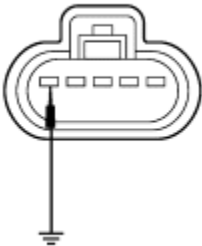




GK7895-A


2 Measure the resistance between the wiper run/park relay connector pin 5, circuit 950 (W/BK), and wiper motor C151-2, circuit 950 (W/BK).

- Is the resistance less than 5 ohms?

→ Yes

	<p>GO to E9.</p> <p>→ No REPAIR circuit 950 (W/BK). CLEAR the DTCs. TEST the system for normal operation.</p>
E9 CHECK THE WIPER MOTOR PARK FUNCTION — INPUT TO THE GEM	
<p>1</p> 	
<p>2</p>  <p>K26343-A</p>	<p>2 Connect a jumper wire between wiper motor C151-1, circuit 671 (LB), and ground.</p>
<p>3</p> 	<p>3 Monitor the GEM PID WPPRKSX.</p>
	<p>4 Remove the ground jumper wire.</p>
<p>5</p> 	<p>5 Monitor the GEM PID WPPRKSX.</p>
	<ul style="list-style-type: none"> Does the GEM PID WPPRKSX indicate PARKED when pin 1 is grounded and notPRK when the ground is removed? <p>→ Yes REPLACE the windshield wiper motor; REFER to Motor—Windshield Wiper. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p>

PINPOINT TEST F: THE WASH AND WIPE FUNCTION DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 RETRIEVE RECORDED GEM DIAGNOSTIC TROUBLE CODES (DTCS)	
	<div>1</div> <div>Use the recorded results from GEM self-test.</div>
	<ul style="list-style-type: none"> Are any DTCs recorded? <p>→ Yes If DTC B1453, GO to F3 . If DTC B1458, GO to F6 . If DTC 1458 and the wipers and washer are inoperative, GO to Pinpoint Test B. If DTC B1460, GO to F9 . If DTC B1342, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to F2.</p>
F2 CHECK THE WASHER SWITCH OUTPUT — MONITOR THE GEM PID WPMODE	
<div>1</div> 	<div>1</div> <div>Monitor the GEM PID WPMODE while turning the wiper switch through all positions and depressing the washer switch.</div>
	<ul style="list-style-type: none"> Does the GEM PID WPMODE agree with all the switch positions? <p>→ Yes GO to F5.</p> <p>→ No GO to F3.</p>
F3 CHECK THE MULTI-FUNCTION SWITCH	
<div>1</div>	



2



Multi-Function Switch

3 Check the multi-function switch; refer to [Section 211-05](#).

- Is the multi-function switch OK?

→ Yes
GO to [F4](#).

→ No
REPLACE the multi-function switch; REFER to [Section 211-05](#). CLEAR the DTCs. TEST the system for normal operation.

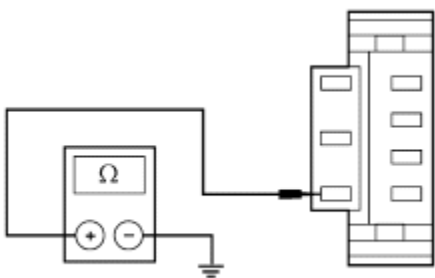
F4 CHECK CIRCUIT 680 (LB/O) FOR SHORT TO GROUND

1



GEM C239





2



K26335-A

2 Measure the resistance between multi-function switch C230-590, circuit 680 (LB/O), and ground.

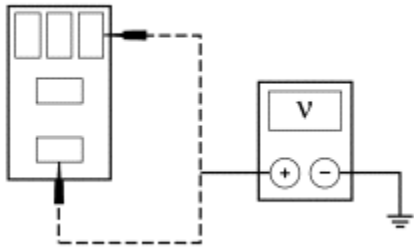
- Is the resistance greater than 10, 000 ohms?

	<p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 680 (LB/O). CLEAR the DTCs. TEST the system for normal operation.</p>
F5 CHECK THE WASHER PUMP RELAY COIL CIRCUIT — MONITOR THE GEM PID WASH_SW	
<p>1</p> 	
<p>2</p> 	<p>2 Monitor the GEM PID WASH_SW while triggering the GEM active command WASHRRLY.</p>
	<ul style="list-style-type: none"> Does the washer pump run and does the GEM PID WASH_SW agree with the command mode? <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to F6.</p> <p>If no DTCs were recorded, GO to F11 .</p>
F6 CHECK THE VOLTAGE TO THE WASHER PUMP RELAY — CIRCUIT 297 (BK/LG)	
<p>1</p> 	
<p>2</p>  <p>Washer Pump Relay</p>	

3



4



GK8241-A

4 Measure the voltage between washer pump relay connector pin 3, circuit 297 (BK/LG), and ground; and between washer pump relay connector pin 1, circuit 297 (BK/LG), and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [F7](#).

→ **No**
CHECK fuse junction panel fuse 11 (10A) and/or REPAIR circuit 297 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.

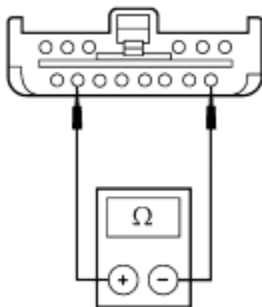
F7 CHECK CIRCUIT 686 (T/R) FOR OPEN

1



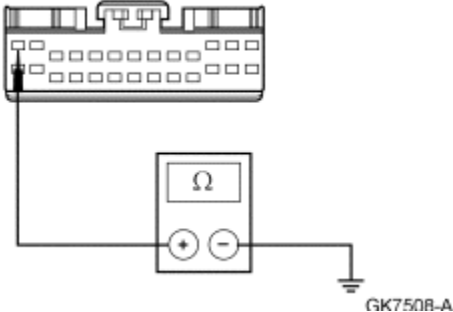

GEM C239

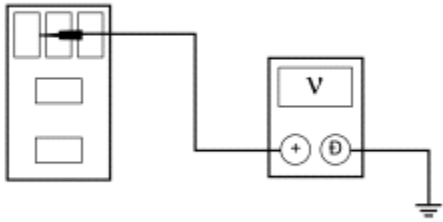
2



GK8142-A

2 Measure the resistance between washer pump relay connector pin 2, circuit 686 (T/R), and GEM C239-1, circuit 686 (T/R).

	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to F8.</p> <p>→ No REPAIR circuit 686 (T/R). CLEAR the DTCs. TEST the system for normal operation.</p>
F8 CHECK CIRCUIT 686 (T/R) FOR SHORT TO GROUND	
<p>1</p> 	<p>1 Measure the resistance between GEM C239-1, circuit 686 (T/R), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10, 000 ohms? <p>→ Yes GO to F9.</p> <p>→ No REPAIR circuit 686 (T/R). CLEAR the DTCs. TEST the system for normal operation.</p>
F9 CHECK CIRCUIT 686 (T/R) FOR SHORT TO POWER	
<p>1</p> 	
<p>2</p>	<p>2 Measure the voltage between washer pump relay connector pin 2, circuit 686 (T/R), and ground.</p>



GN1460-A

- **Is any voltage indicated?**

→ **Yes**

REPAIR circuit 686 (T/R). CLEAR the DTCs. TEST the system for normal operation.

→ **No**

GO to [F10](#).

F10 CHECK THE WASHER PUMP RELAY

1



2 Check the washer pump relay; refer to Component Test.

- **Is the washer pump relay OK?**

→ **Yes**

REPLACE the GEM; REFER to [Section 419-10](#). CLEAR THE DTCs. TEST the system for normal operation.

→ **No**

REPLACE the washer pump relay. CLEAR the DTCs. TEST the system for normal operation.

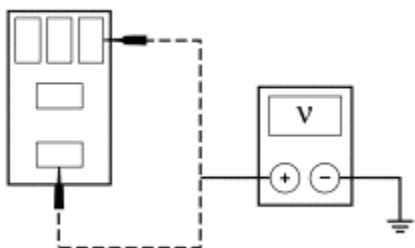
F11 CHECK THE WASHER PUMP RELAY FOR VOLTAGE — CIRCUIT 297 (BK/LG)

1



2

2 Measure the voltage between washer pump relay



connector pin 3, circuit 297 (BK/LG), and ground;
and between washer pump relay connector pin 1,
circuit 297 (BK/LG), and ground.

- **Are the voltages greater than 10 volts?**

→ **Yes**

GO to [F12](#).

→ **No**

REPAIR circuit 297 (BK/LG). CLEAR the DTCs.
TEST the system for normal operation.

F12 CHECK THE WASHER PUMP RELAY

1



2 Check the washer pump relay; refer to
Component Test.

- **Is the washer pump relay OK?**

→ **Yes**

GO to [F13](#).

→ **No**

REPLACE the washer pump relay. CLEAR the
DTCs. TEST the system for normal operation.

F13 CHECK CIRCUIT 941 (BK/W) FOR OPEN

1

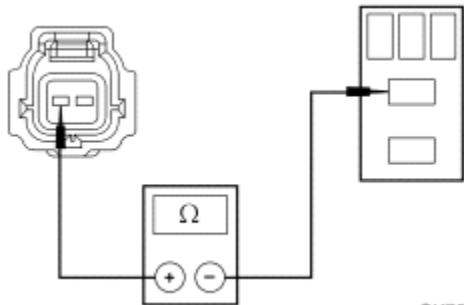


2



Washer Pump C1030

3



GK7509-A

3 Measure the resistance between washer pump C1030, circuit 941 (BK/W), and washer pump relay connector pin 5, circuit 941 (BK/W).

- Is the resistance less than 5 ohms?

→ Yes

GO to [F14](#).

→ No

REPAIR circuit 941 (BK/W). CLEAR the DTCs. TEST the system for normal operation.

F14 CHECK CIRCUIT 941 (BK/W) FOR SHORT TO POWER

1



2



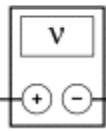
Washer Pump Relay

3



4

4 Measure the voltage between washer pump motor C1030, circuit 941 (BK/W), and ground.



GK789B-A

- **Is the voltage greater than 10 volts?**

→ **Yes**

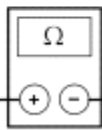
REPAIR circuit 941 (BK/W). CLEAR the DTCs. TEST the system for normal operation.

→ **No**

GO to [F15](#).

F15 CHECK THE GROUND TO THE WASHER PUMP — CIRCUIT 57 (BK)

1



GK7510-A

- 1** Measure the resistance between washer pump C1030, circuit 57 (BK), and ground.

- **Is the resistance less than 5 ohms?**



→ **Yes**




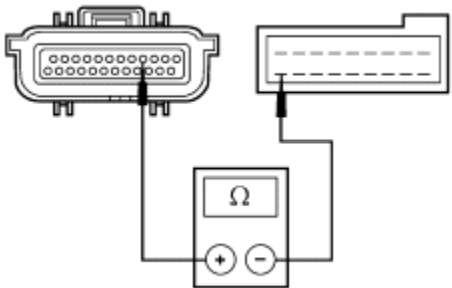
RECONNECT the windshield washer pump and ACTUATE the system. If the pump does not operate properly, REPLACE the windshield washer pump. REFER to [Washer Pump and Reservoir](#). CLEAR the DTCs. TEST the system for normal operation.


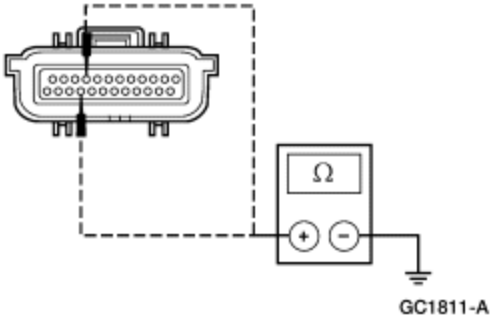
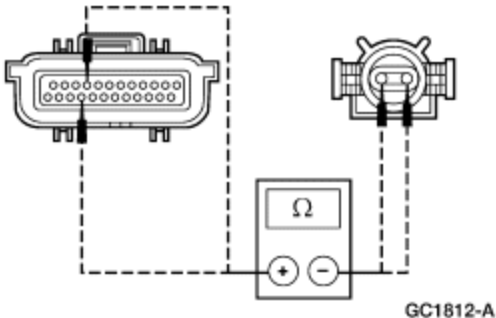
→ **No**

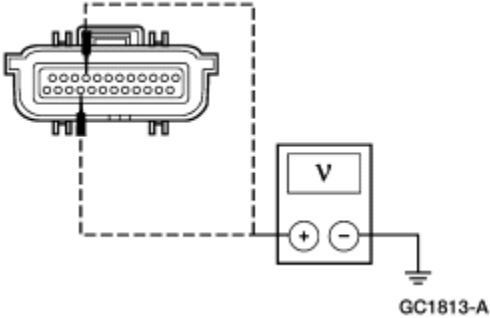
REPAIR circuit 57 (BK). CLEAR the DTCs. TEST the system for normal operation.

PINPOINT TEST G: THE SPEED DEPENDENT INTERVAL MODE DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 RETRIEVE RECORDED GEM DIAGNOSTIC TROUBLE CODES (DTCS)	
	<p>1 Use the recorded results from GEM self-test.</p>
	<ul style="list-style-type: none"> Are any DTCs recorded? <p>→ Yes If DTC P0500, GO to G3 .</p> <p>If DTC B1342, REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to G2.</p>
G2 CHECK THE GEM ACTIVE COMMAND SPEED DEPENDENT WIPER	
<p>1</p> 	<p>1 Verify the GEM active command SPD WIPER is set to ACTIVE.</p>
	<ul style="list-style-type: none"> Is the GEM active command SPD WIPER set to ACTIVE? <p>→ Yes GO to G3.</p> <p>→ No ENABLE the GEM active command SPD WIPER. CLEAR the DTCs. TEST the system for normal operation.</p>
G3 CHECK THE VEHICLE SPEED SIGNAL — MONITOR THE GEM PID VSS_GEM	
<p>1</p> 	<p>1 Monitor the GEM PID VSS_GEM while driving the vehicle from 0 to 88.5 km/h (55 mph).</p>
	<ul style="list-style-type: none"> Does the GEM PID VSS_GEM agree with

	<p>the speedometer?</p> <p>→ Yes REPLACE the GEM; REFER to Section 419-10. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No GO to G4.</p>
G4 CHECK CIRCUIT 679 (GY/BK) FOR OPEN	
<p>1</p> 	
<p>2</p>  <p>4WABS Control Module C1040</p>	
<p>3</p>  <p>GEM C241</p>	
<p>4</p>  <p>GC1810-A</p>	<p>4 Measure the resistance between 4WABS control module C1040-16, circuit 679 (GY/BK), and fuse junction panel C241 terminal 18.</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes GO to G5.</p> <p>→ No REPAIR circuit 679 (GY/BK). CLEAR the DTCs.</p>

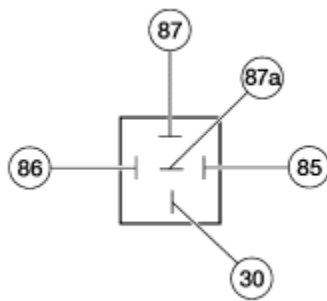
	TEST the system for normal operation.
G5 CHECK CIRCUITS 523 (R/PK) AND 519 (LG/BK) FOR SHORT TO GROUND	
<p>1</p>  <p>Rear Anti-Lock Brake Sensor C404</p>	
<p>2</p>  <p>GC1811-A</p>	<p>2 Measure the resistance between 4WABS control module C1040-9, circuit 523 (R/PK), and ground; and between 4WABS control module C1040-21, circuit 519 (LG/BK), and ground.</p>
	<ul style="list-style-type: none"> • Are the resistances greater than 10,000 ohms? <p>→ Yes GO to G6.</p> <p>→ No REPAIR circuit 523 (R/PK) or 519 (LG/BK). CLEAR the DTCs. TEST the system for normal operation.</p>
G6 CHECK CIRCUITS 523 (R/PK) AND 519 (LG/BK) FOR OPEN	
<p>1</p>  <p>GC1812-A</p>	<p>1 Measure the resistance between rear anti-lock brake sensor C404, circuit 523 (R/PK) and 4WABS control module C1040-9, circuit 523 (R/PK); and between rear anti-lock brake sensor C404, circuit 519 (LG/BK), and 4WABS control module C1040-21, circuit 519 (LG/BK).</p>

	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes GO to G7.</p> <p>→ No REPAIR circuit 523 (R/PK) or 519 (LG/BK). TEST the system for normal operation.</p>
G7 CHECK CIRCUITS 523 (R/PK) AND 519 (LG/BK) FOR SHORT TO POWER	
<p>1</p>  <p>GC1813-A</p>	<p>1 Measure the voltage between 4WABS control module C1040-9, circuit 523 (R/PK), and ground; and between 4WABS control module C1040-21, circuit 519 (LG/BK), and ground.</p>
	<ul style="list-style-type: none"> • Is any voltage indicated? <p>→ Yes REPAIR circuit 523 (R/PK) or 519 (LG/BK). TEST the system for normal operation.</p> <p>→ No DIAGNOSE the 4WABS system; REFER to Section 206-09B.</p>

Component Test

Relay — Mini ISO

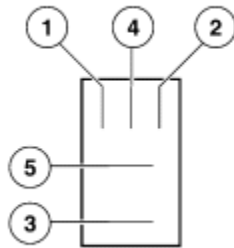
Use 73 Digital Multimeter to check for the continuity between terminal 85 and all other terminals. If resistance is 5 ohms or less between terminal 85 and any other terminal, replace the relay. If resistance is greater than 5 ohms, continue with the test. Use two jumper wires to connect relay terminals 86 and 30 directly to the positive battery terminal. Use 73 Digital Multimeter set in the volts position to check for voltage at terminal 87A. If battery voltage is not indicated, replace the relay. If battery voltage is indicated, connect a third jumper wire to terminal 85 and ground the jumper wire to a known good ground. Check for voltage at terminal 87. If battery voltage is not indicated, replace the relay.



GN0901-A

Relay — Micro ISO

Use 73 Digital Multimeter to check for the continuity between terminal 2 and all other terminals. If resistance is 5 ohms or less between terminal 2 and any other terminal, replace the relay. If resistance is greater than 5 ohms, continue with the test. Use two jumper wires to connect relay terminals 1 and 3 directly to the positive battery terminal. Use 73 Digital Multimeter set in the volts position to check for voltage at terminal 4. If battery voltage is not indicated, replace the relay. If battery voltage is indicated, connect a third jumper wire to terminal 2 and ground the jumper wire to a known good ground. Check for voltage at terminal 5. If battery voltage is not indicated, replace the relay.

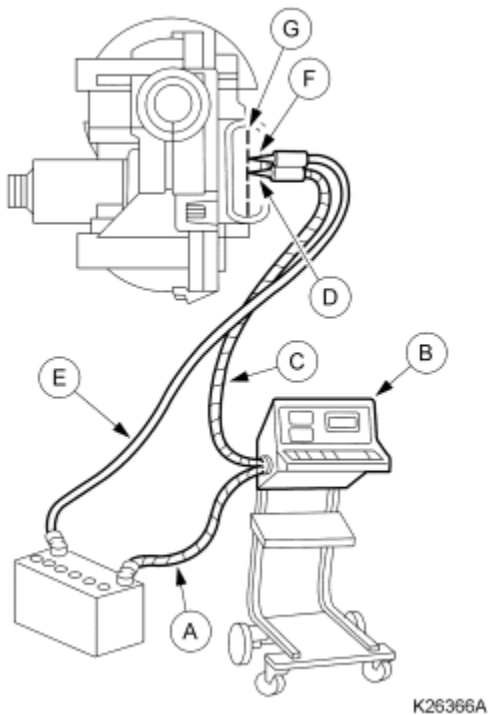


GN1054-A

Windshield Wiper Motor

⚠ CAUTION: Do not handle the windshield wiper motor abusively when diagnosing the wiper operations. Failure to follow this caution may result in damage to the motor magnets and will make the windshield wiper motor inoperative. Rough handling of new replacement windshield wiper motors may also damage the motor magnets.

Use Alternator, Regulator, Battery and Starter Tester (ARBST) to test the wiper motor on the vehicle.



To test the wiper motor, disconnect the wiper mounting arm and pivot shaft from the wiper motor; refer to [Mounting Arm and Pivot Shaft](#).


Disconnect the wiper motor connector. Connect the (A) green lead from the (B) ARBST to the battery negative (-) post. Connect the (C) red lead from the tester to the wiper motor (D) common brush terminal (terminal 3).

Test the low speed mode by connecting a (E) cable from the battery positive (+) post to the (F) low speed brush terminal (terminal 4) and measure the current draw. If the current draw is greater than 3.5 amperes, replace the wiper motor; refer to [Motor—Windshield Wiper](#).

Test the high speed mode by connecting a cable from the battery positive (+) post to the (G) high speed brush terminal (terminal 5) and measure the current draw. If the current draw is greater than 5.5 amperes, replace the wiper motor; refer to [Motor—Windshield Wiper](#).

Wipers and Washers—Motorhome

Refer to Wiring Diagrams Cell 81 ([F-53 Motorhome Chassis](#), [F-Super Duty 250-550](#)), Interval Wiper/Washer for schematic and connector information.

Special Tool(s)	
	73 Digital Multimeter or equivalent 105-R0051

Inspection and Verification — Motorhome

1. Verify the customer concern by operating the windshield wiper and washer system to duplicate the condition.
2. Visually inspect for the following obvious signs of mechanical or electrical damage.

Visual Inspection Chart	
Mechanical	Electrical
<ul style="list-style-type: none">• Wiper blade missing or damaged• Binding wiper pivot arm• Binding wiper mounting arm and pivot shaft• Empty washer reservoir• Kinked or broken washer hoses	<ul style="list-style-type: none">• Fuse• Wiper motor• Washer pump• Open connectors• Corroded connectors• Multi-function switch• Thermal breaker (internal to the wiper motor)• Circuit

3. If the concern is not visually evident, determine the symptom and proceed to Symptom Chart.

Symptom Chart — Motorhome


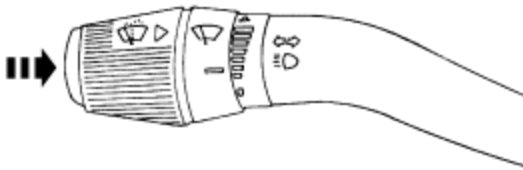
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> The Washer Pump Is Inoperative 	<ul style="list-style-type: none"> Circuitry. Multi-function switch (13K359). Wiper control module. Washer pump motor. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> The Wipers are Inoperative 	<ul style="list-style-type: none"> Fuse. Windshield wiper motor. Multi-function switch. Circuitry. Wiper control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The Low Wiper Speed Does Not Operate Properly 	<ul style="list-style-type: none"> Multi-function switch. Windshield wiper motor. Circuitry. Wiper control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The High Wiper Speed Does Not Operate Properly 	<ul style="list-style-type: none"> Multi-function switch. Windshield wiper motor. Circuitry. Wiper control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> The Intermittent Wiper Speed Does Not Operate Properly 	<ul style="list-style-type: none"> Multi-function switch. Circuitry. Wiper control module. Windshield wiper motor. 	<ul style="list-style-type: none"> GO to Pinpoint Test M.
<ul style="list-style-type: none"> The Wipers Will Not Park at the Proper Position 	<ul style="list-style-type: none"> Windshield wiper motor. Wiper control module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test N.

	<ul style="list-style-type: none"> Wiper arms. Linkage. 	
<ul style="list-style-type: none"> The Wipers Stay On Continuously 	<ul style="list-style-type: none"> Multi-function switch. Windshield wiper motor. Wiper control module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test P.

Pinpoint Tests — Motorhome

PINPOINT TEST H: THE WASHER PUMP IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE WASHER PUMP OPERATION	
<div>1</div> 	
<div>2</div>  K22383-A	<div>2</div> Press the washer button.
	<ul style="list-style-type: none"> Does the washer pump operate properly? <p>→ Yes GO to H2.</p> <p>→ No GO to H3.</p>
H2 CHECK FOR BLOCKAGE OR OBSTRUCTION IN THE WASHER HOSES	
<div>1</div>	



2 Inspect the washer nozzles, washer hoses, and washer pump for blockages or obstructions.

- Are any blockages or obstructions present?

→ **Yes**
REPAIR or REPLACE as required. TEST the system for normal operation.

→ **No**
REPLACE the washer pump motor. TEST the system for normal operation.

H3 CHECK THE WASHER PUMP MOTOR FOR VOLTAGE — CIRCUIT 941 (BK/W)

1



2

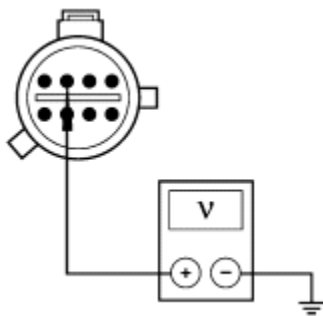


Wiper Motor C121M

3



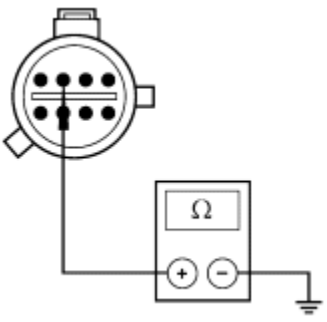


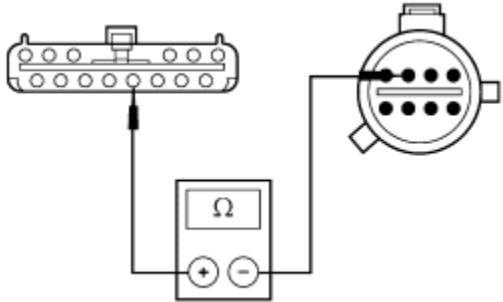

4



GK7579-A

4 Measure the voltage between wiper motor C121M-2, circuit 941 (BK/W), and ground while pressing the washer button.

	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes CHECK the washer pump motor ground for open. If OK, RECONNECT the washer pump motor and ACTUATE the system. If the pump does not operate properly, REPLACE the washer pump. If not OK, REPAIR the ground circuit. TEST the system for normal operation.</p> <p>→ No GO to H4.</p>
H4 CHECK CIRCUIT 941 (BK/W) FOR SHORT TO GROUND	
<div>1</div> 	
<div>2</div>  <p>Wiper Control Module C211</p>	
<div>3</div>  <p>GK7580-A</p>	<div>3</div> <p>Measure the resistance between wiper motor C121M-2, circuit 941 (BK/W), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes GO to H5.</p> <p>→ No REPAIR circuit 941 (BK/W). TEST the system for normal operation.</p>
H5 CHECK CIRCUIT 941 (BK/W) FOR OPEN	

<p>1</p>  <p>GK7581-A</p>	<p>1 Measure the resistance between wiper motor C121M-2, circuit 941 (BK/W), and wiper control module C211-4, circuit 941 (BK/W).</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to H6.</p> <p>→ No REPAIR circuit 941 (BK/W). TEST the system for normal operation.</p>
H6 CHECK THE MULTI-FUNCTION SWITCH	
<p>1</p>  <p>Multi-Function Switch C203</p>	
	<p>2 Check the multi-function switch; refer to Section 211-05.</p>
	<ul style="list-style-type: none"> • Is the multi-function switch OK? <p>→ Yes REPLACE the wiper control module. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch. TEST the system for normal operation.</p>

PINPOINT TEST J: THE WIPERS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

J1 CHECK FUSE JUNCTION PANEL FUSE 11 (30A)

1



2



Fuse 11 (30A)

- **Is the fuse OK?**

→ **Yes**
GO to [J2](#).

→ **No**
REPLACE fuse junction panel fuse 11 (30A). TEST the system for normal operation. If the fuse fails again, CHECK for a short to ground. REPAIR as necessary.

J2 CHECK FOR VOLTAGE TO THE WIPER CONTROL MODULE — CIRCUIT 65 (DG)

1

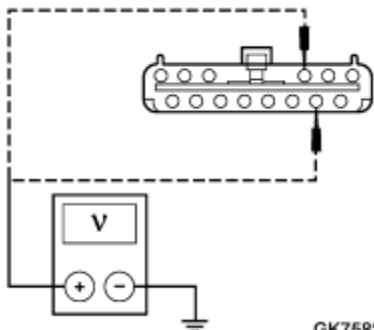


Wiper Control Module C211


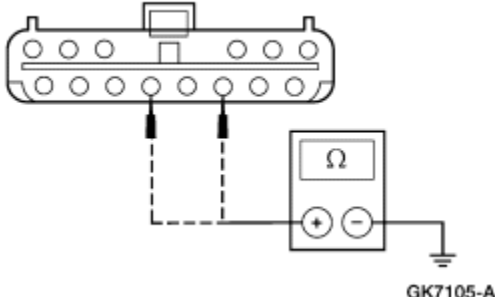

2

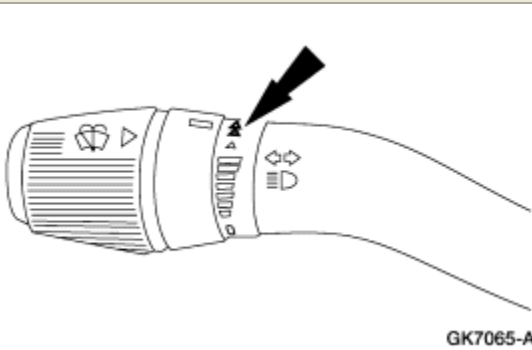


3

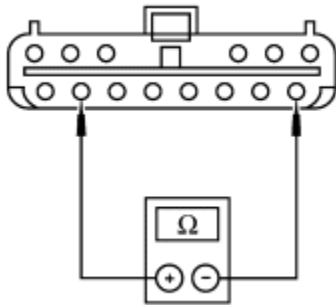


3 Measure the voltage between wiper control module C211-2, circuit 65 (DG), and ground; and between wiper control module C211-11, circuit 65 (DG), and ground.

	<ul style="list-style-type: none"> • Are the voltages greater than 10 volts? <p>→ Yes GO to J3.</p> <p>→ No REPAIR circuit 65 (DG). TEST the system for normal operation.</p>
J3 CHECK CIRCUIT 57 (BK) FOR OPEN	
<p>1</p> 	
<p>2</p> 	<p>2 Measure the resistance between wiper control module C211-3, circuit 57 (BK), and ground; and between wiper control module C211-5, circuit 57 (BK), and ground.</p>
	<ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes GO to J4.</p> <p>→ No REPAIR circuit 57 (BK). TEST the system for normal operation.</p>
J4 CHECK THE MULTI-FUNCTION SWITCH OUTPUT	
<p>1</p> 	
<p>2</p>	<p>2 Turn the multi-function switch to the high position.</p>



3



3 Measure the resistance between wiper control module C211-7, circuit 993 (BR/W), and wiper control module C211-1, circuit 589 (O).

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [J7](#).

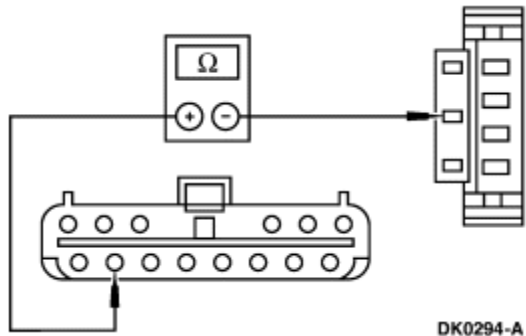
→ **No**
GO to [J5](#).

J5 CHECK CIRCUIT 993 (BR/W) FOR OPEN



Multi-Function Switch C203

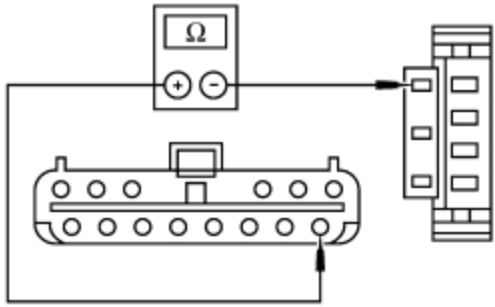
2



2 Measure the resistance between multi-function switch C203-4, circuit 993 (BR/W), and wiper control module C211-7, circuit 993 (BR/W).


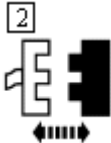
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to J6.</p> <p>→ No REPAIR circuit 993 (BR/W). TEST the system for normal operation.</p>
--	--

J6 CHECK CIRCUIT 589 (O) FOR OPEN

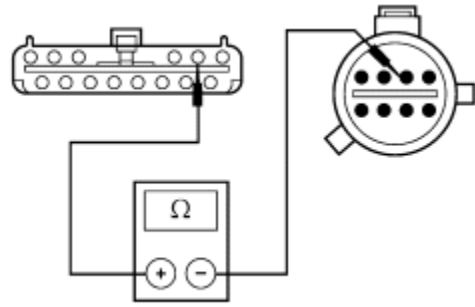
<p>1</p>  <p>DK0302-A</p>	<p>1 Measure the resistance between multi-function switch C203-1, circuit 589 (O), and wiper control module C211-1, circuit 589 (O).</p>
--	--

	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes REPLACE the multi-function switch. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 589 (O). TEST the system for normal operation.</p>
--	--




J7 CHECK THE WIPER CONTROL MODULE OUTPUT FOR VOLTAGE

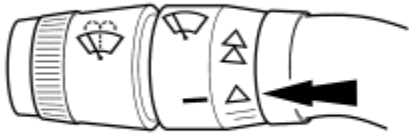
<p>1</p>  <p>Wiper Control Module C211</p>	
<p>2</p>  <p>Wiper Motor C121</p>	

<div>3</div> <div> </div> <div>GK7065-A</div>	<div> <p>3 Turn the multi-function switch to the high position.</p> </div>
<div>4</div> <div> </div>	
<div>5</div> <div> </div> <div>GK7583-A</div>	<div> <p>5 Measure the voltage between wiper motor C121M-3, circuit 61 (Y/R), and wiper motor C121M-1, circuit 58 (W).</p> </div>
	<div> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? </div> <div> <p>→ Yes REPLACE the wiper motor. TEST the system for normal operation.</p> </div> <div> <p>→ No GO to J8.</p> </div>
<div> <h3>J8 CHECK CIRCUIT 61 (Y/R) FOR OPEN</h3> </div>	
<div>1</div> <div> </div>	
<div>2</div> <div> </div> <div> <p>Wiper Control Module C211</p> </div>	

<div>3</div>  <div>GK7584-A</div>	<div>3</div> <p>Measure the resistance between wiper control module C211-10, circuit 61 (Y/R), and wiper motor C121M-3, circuit 61 (Y/R).</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes REPLACE the wiper control module. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 61 (Y/R). TEST the system for normal operation.</p>

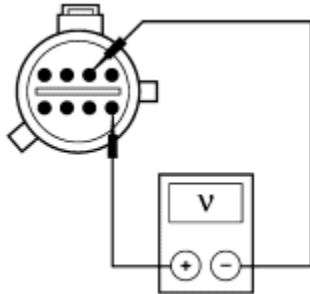
PINPOINT TEST K: THE LOW WIPER SPEED DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK THE VOLTAGE TO THE WIPER MOTOR LOW POSITION — CIRCUIT 56 (DB/O)	
<div>1</div> 	
<div>2</div>  <p>Wiper Motor C121</p>	
<div>3</div> 	
<div>4</div>	<div>4</div> <p>Turn the multi-function switch to the low position.</p>



GK0920-A

5



GK7585-A

5 Measure the voltage between wiper motor C121M-3, circuit 61 (Y/R), and wiper motor C121M-8, circuit 56 (DB/O).

- Is the voltage greater than 10 volts?

→ Yes

REPLACE the wiper motor. TEST the system for normal operation.

→ No

GO to [K2](#).

K2 CHECK CIRCUIT 56 (DB/O) FOR SHORT TO GROUND

1



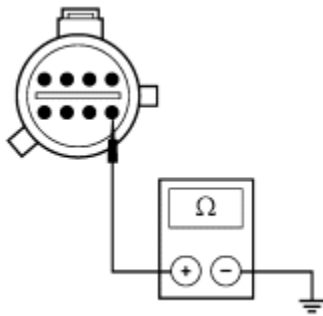
2



Wiper Control Module C211

3

3 Measure the resistance between wiper motor C121M-8, circuit 56 (DB/O), and ground.



GK7586-A

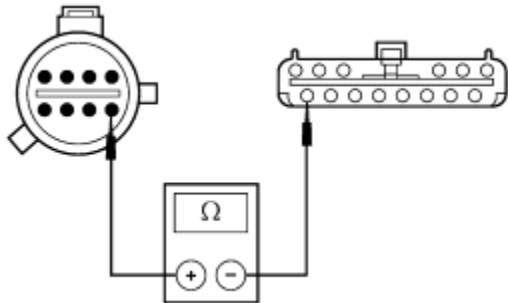
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [K3](#).

→ **No**
REPAIR circuit 56 (DB/O). TEST the system for normal operation.

K3 CHECK CIRCUIT 56 (DB/O) FOR OPEN

1



GK7587-A

1 Measure the resistance between wiper control module C211-8, circuit 56 (DB/O), and wiper motor C121M-8, circuit 56 (DB/O).

- Is the resistance less than 5 ohms?

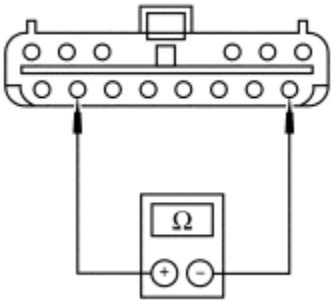
→ **Yes**
GO to [K4](#).

→ **No**
REPAIR circuit 56 (DB/O). TEST the system for normal operation.




K4 CHECK THE MULTI-FUNCTION SWITCH INPUT

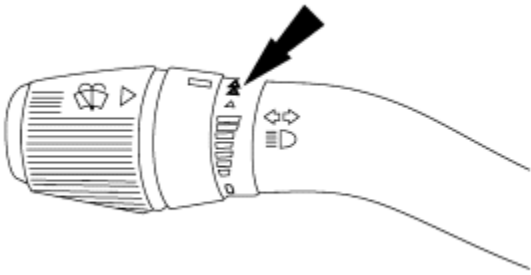
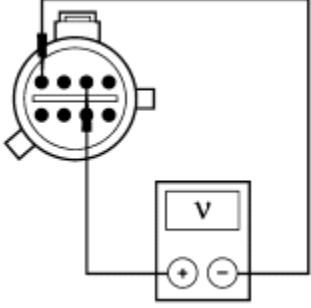

1

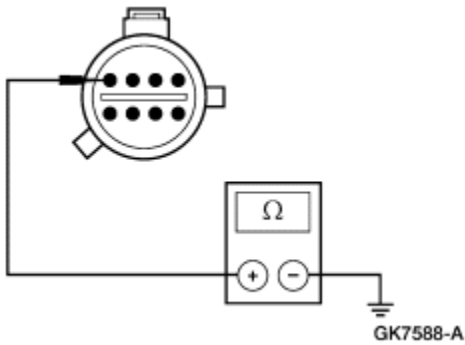
1 Measure the resistance between wiper control module C211-1, circuit 589 (O), and wiper control module C211-7, circuit 993 (BR/W).

 <p>DK0299-A</p>	
	<ul style="list-style-type: none"> • Is the resistance between 3500 and 4500 ohms? <p>→ Yes REPLACE the wiper control module. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch. TEST the system for normal operation.</p>

PINPOINT TEST L: THE HIGH WIPER SPEED DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK THE MULTI-FUNCTION SWITCH INPUT	
<p>1</p> 	
<p>2</p>  <p>Wiper Motor C121</p>	
<p>3</p> 	
<p>4</p>	<p>4 Turn the multi-function switch to the high position.</p>

 <p>GK7065-A</p>	
<p>5</p>  <p>GK7583-A</p>	<p>5 Measure the voltage between wiper motor C121M-3, circuit 61 (Y/R), and wiper motor C121M-1, circuit 58 (W).</p>
	<ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes REPLACE the wiper motor. TEST the system for normal operation.</p> <p>→ No GO to L2.</p>
<p>L2 CHECK CIRCUIT 58 (W) FOR SHORT TO GROUND</p>	
<p>1</p>  <p>Wiper Control Module C211</p>	
<p>2</p>	<p>2 Measure the resistance between wiper motor C121M-1, circuit 58 (W), and ground.</p>



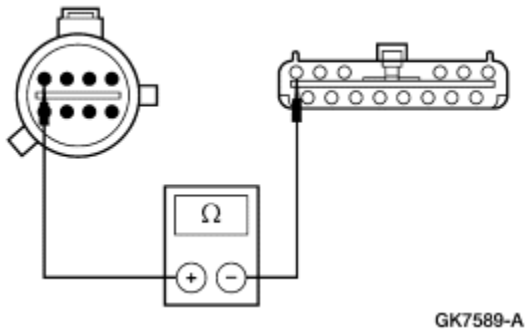
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [L3](#).

→ **No**
REPAIR circuit 58 (W). TEST the system for normal operation.

L3 CHECK CIRCUIT 58 (W) FOR OPEN

1



1 Measure the resistance between wiper module C211-14, circuit 58 (W), and wiper motor C121M-1, circuit 58 (W).

- Is the resistance less than 5 ohms?

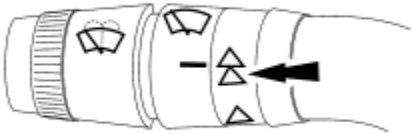
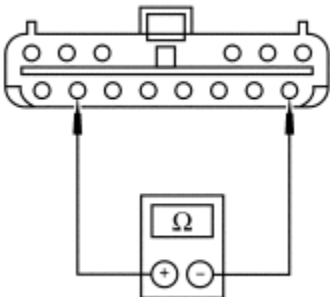
→ **Yes**
GO to [L4](#).

→ **No**
REPAIR circuit 58 (W). TEST the system for normal operation.


L4 CHECK THE MULTI-FUNCTION SWITCH INPUT

1

1 Turn the multi-function switch to the high position.

 <p>GK0918-A</p>	
<p>2</p>  <p>DK0299-A</p>	<p>2 Measure the resistance between wiper control module C211-1, circuit 589 (O), and wiper control module C211-7, circuit 993 (BR/W).</p>
	<ul style="list-style-type: none"> Is the resistance less than 5 ohms? <p>→ Yes REPLACE the wiper control module. TEST the system for normal operation.</p> <p>→ No REPLACE the multi-function switch. TEST the system for normal operation.</p>

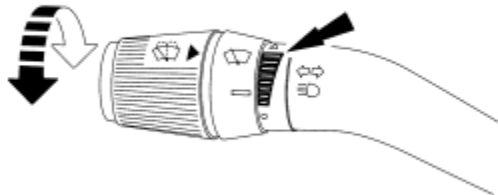
PINPOINT TEST M: THE INTERMITTENT WIPER SPEED DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK THE MULTI-FUNCTION SWITCH INTERVAL INPUT TO THE WIPER CONTROL MODULE	
<p>1</p> 	
<p>2</p>	



Wiper Control Module C211

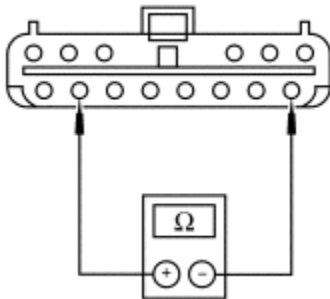
3



K22382-A

3 Turn the multi-function switch to any interval setting.

4



DK0299-A

4 Measure the resistance between wiper control module C211-7, circuit 993 (BR/W), and wiper control module C211-1, circuit 589 (O).

- Is the resistance between 10,500 and 12,000 ohms?

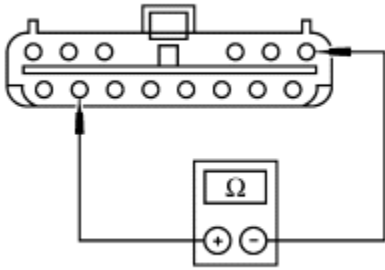
→ Yes
GO to [M2](#).

→ No
REPLACE the multi-function switch. TEST the system for normal operation.

M2 CHECK THE INTERVAL SETTING INPUT

1

1 Measure the resistance between wiper control module C211-7, circuit 993 (BR/W), and wiper control module C211-9, circuit 590 (DB/W).



DK0300-A

- **Is the resistance reading between 3300 and 103,300 ohms?**

→ **Yes**

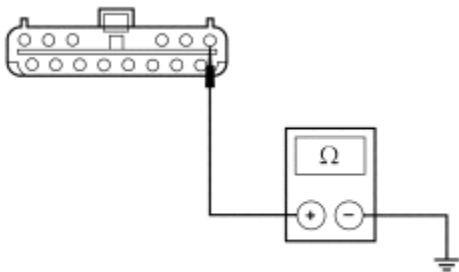
REPLACE the wiper control module. TEST the system for normal operation.

→ **No**

GO to [M3](#).

M3 CHECK CIRCUIT 590 (DB/W) FOR SHORT TO GROUND

1



GK5188-A

- 1 Measure the resistance between wiper control module C211-9, circuit 590 (DB/W), and ground.

- **Is the resistance greater than 10,000 ohms?**

→ **Yes**

GO to [M4](#).

→ **No**

REPAIR circuit 590 (DB/W). TEST the system for normal operation.

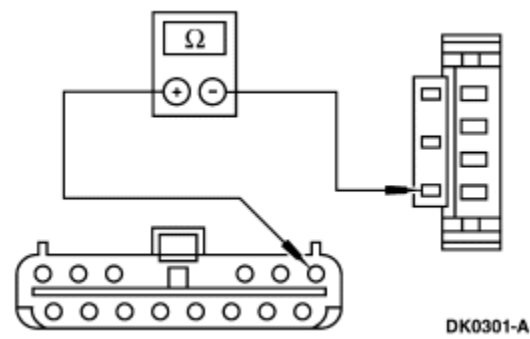
M4 CHECK CIRCUIT 590 (DB/W) FOR OPEN

1



Multi-Function Switch C203

2



2 Measure the resistance between wiper control module C211-9, circuit 590 (DB/W), and multi-function switch C203-6, circuit 590 (DB/W).

- Is the resistance less than 5 ohms?
- **Yes**
REPLACE the multi-function switch. TEST the system for normal operation.
- **No**
REPAIR circuit 590 (DB/W). TEST the system for normal operation.

PINPOINT TEST N: THE WIPERS WILL NOT PARK AT THE PROPER POSITION

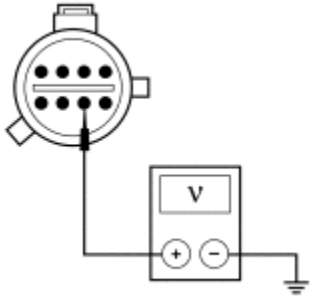
CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK THE WINDSHIELD WIPER MOTOR FOR VOLTAGE — CIRCUIT 65 (DG)	
1	
2	
3	



Wiper Motor C121



4



GK7590-A

4 Measure the voltage between wiper motor C121M-7, circuit 65 (DG), and ground.

- Is the voltage greater than 10 volts?

→ Yes
GO to [N2](#).

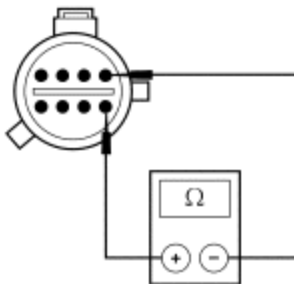
→ No
REPAIR circuit 65 (DG). TEST the system for normal operation.

N2 CHECK THE WIPER CONTROL MODULE RETURN CIRCUITS FOR OPEN — CIRCUIT 28 (BK/PK) AND CIRCUIT 61 (Y/R)

1



2

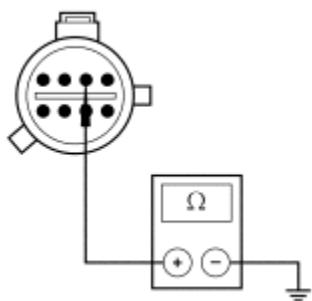


GK7591-A

2 Measure the resistance between wiper motor C121M-4, circuit 28 (BK/PK), and wiper motor C121M-8, circuit 56 (DB/O).

3

3 Measure the resistance between wiper motor C121M-3, circuit 61 (Y/R), and ground.



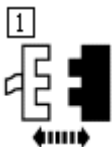
GK7592-A

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [N4](#).

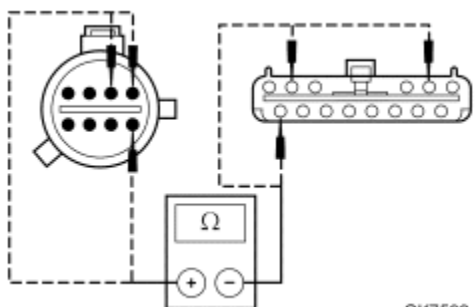
→ **No**
GO to [N3](#).

N3 CHECK THE WIPER CONTROL MODULE/WIPER MOTOR CIRCUITS FOR OPEN



Wiper Control Module C211

2



GK7593-A

2 Measure the resistance between wiper motor C121M and wiper control module C211; refer to the following chart:


Wiper Motor Connector	Circuit	Wiper Control Module Connector
C121M-4	28 (BK/PK)	C211-13
C121M-3	61 (Y/R)	C211-10
C121M-8	56 (DB/O)	C211-8

- Are the resistances less than 5 ohms?

→ **Yes**
REPLACE the wiper control module. TEST the system for normal operation.

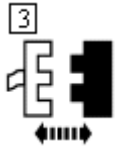
	<p>→ No REPAIR the circuits in question. TEST the system for normal operation.</p>
N4 CHECK THE WIPER LINKAGE	
	<p>1 Verify the wiper linkage is not bent, cracked, or mispositioned from the wiper motor shaft.</p>
	<p>• Is the wiper linkage OK?</p> <p>→ Yes REPLACE the wiper motor. TEST the system for normal operation.</p> <p>→ No REPAIR or REPLACE the wiper mounting arm and pivot shaft. TEST the system for normal operation.</p>

PINPOINT TEST P: THE WIPERS STAY ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK THE MULTI-FUNCTION SWITCH	
	<p>1 Check the multi-function switch; refer to Section 211-05.</p>
	<p>• Is the multi-function switch OK?</p> <p>→ Yes GO to P2.</p> <p>→ No REPLACE the multi-function switch. TEST the system for normal operation.</p>
P2 CHECK CIRCUIT 590 (DB/W) FOR SHORT TO GROUND	
<p>1</p> 	
<p>2</p>	

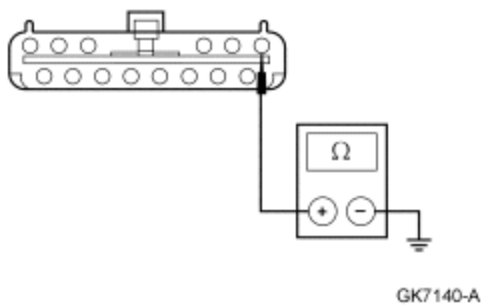


Wiper Control Module C211



Multi-Function Switch C203

4



4 Measure the resistance between wiper control module C211-9, circuit 590 (DB/W), and ground.

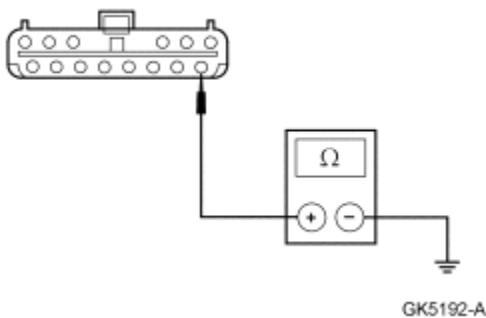
- Is the resistance greater than 10,000 ohms?

→ Yes
GO to [P3](#).

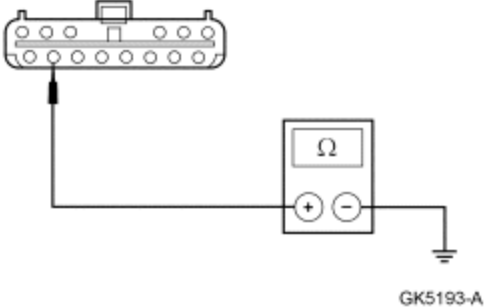
→ No
REPAIR circuit 590 (DB/W). TEST the system for normal operation.

P3 CHECK CIRCUIT 589 (O) FOR SHORT TO GROUND

1



1 Measure the resistance between wiper control module C211-1, circuit 589 (O), and ground.

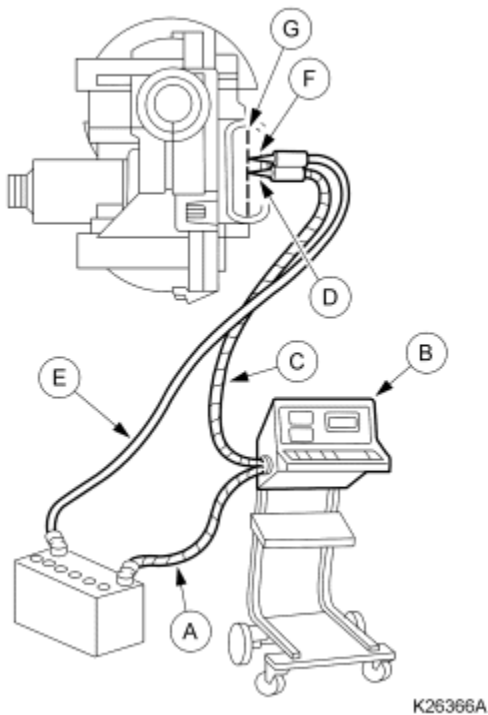
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes GO to P4.</p> <p>→ No REPAIR circuit 589 (O). TEST the system for normal operation.</p>
P4 CHECK CIRCUIT 993 (BR/W) FOR SHORT TO GROUND	
<p>1</p>  <p>GK5193-A</p>	<p>1 Measure the resistance between wiper control module C211-7, circuit 993 (BR/W), and ground.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes REPLACE the wiper control module. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 993 (BR/W). TEST the system for normal operation.</p>

Component Test

Windshield Wiper Motor

⚠ CAUTION: Do not handle the windshield wiper motor abusively when diagnosing the wiper operations. Failure to follow this caution may result in damage to the motor magnets and will make the windshield wiper motor inoperative. Rough handling of new replacement windshield wiper motors may also damage the motor magnets.

Use Alternator, Regulator, Battery and Starter Tester (ARBST) to test the wiper motor on the vehicle.



To test the wiper motor, disconnect the wiper mounting arm and pivot shaft from the wiper motor.

Disconnect the wiper motor connector. Connect the (A) green lead from the (B) ARBST to the battery negative (-) post. Connect the (C) red lead from the tester to the wiper motor (D) common brush terminal (terminal 3).

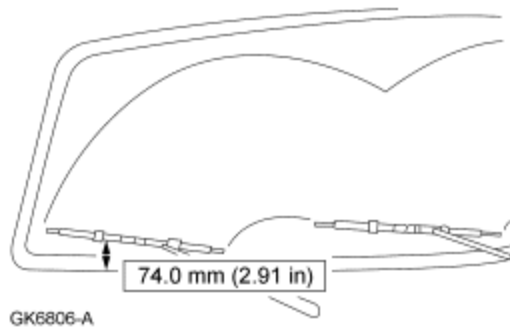
Test the low speed mode by connecting a (E) cable from the battery positive (+) post to the (F) low speed brush terminal (terminal 4) and measure the current draw. If the current draw is greater than 3.5 amperes, replace the wiper motor.

Test the high speed mode by connecting a cable from the battery positive (+) post to the (G) high speed brush terminal (terminal 5) and measure the current draw. If the current draw is greater than 5.5 amperes, replace the wiper motor.

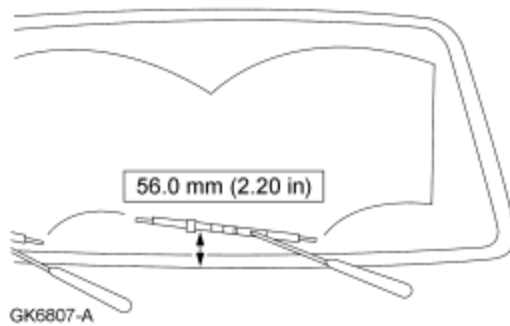
Wiper Blade and Pivot Arm Adjustment

1. Cycle and park the windshield wipers.

2. Verify the distance between the center of the RH windshield wiper blade and the bottom of the windshield glass is within specification.



3. Verify the distance between the center of the LH windshield wiper blade and the bottom of the windshield glass is within specification.

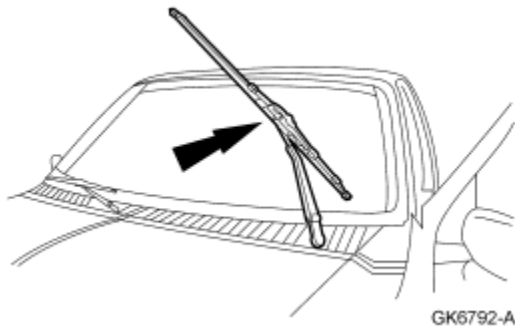


4. If the distance is not within specification, remove the windshield wiper pivot arms and reposition to specification; refer to [Pivot Arm](#).

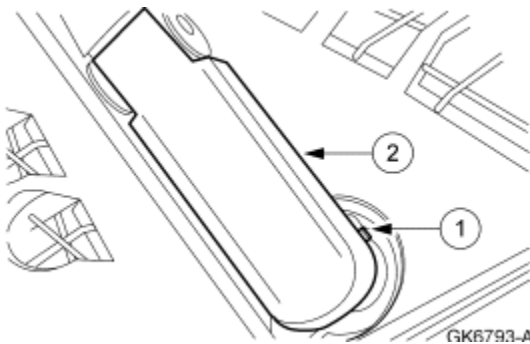
Pivot Arm

Removal

1. Lift the windshield wiper pivot arm off the windshield glass, to the full upright position.



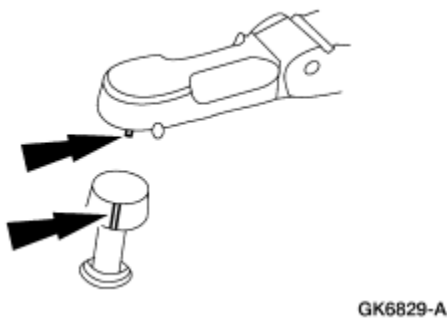
2. Remove the windshield wiper pivot arm.
 1. Release the locking tab.
 2. Remove the windshield wiper pivot arm.



Installation

1. **NOTE:** During installation, it is necessary to pull locking tab out to its full open (unlatched) position and hold while assembling pivot arm onto mounting arm and pivot shaft. Align the key on the pivot arm head with the key way on the shafts. This will ensure proper alignment of the pivot arm. If necessary, key way can be removed. To adjust wiper pivot arms, refer to [Wiper Blade and Pivot Arm Adjustment](#)

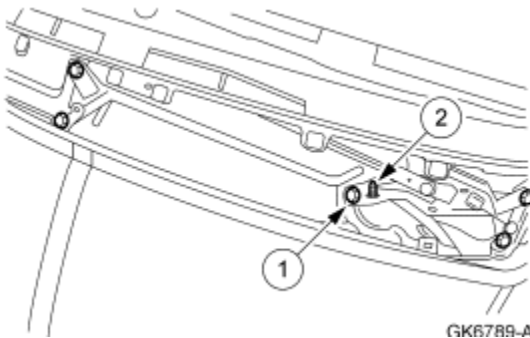
To install, reverse the removal procedure.



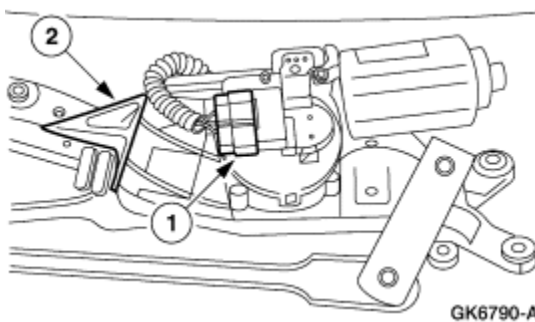
Mounting Arm and Pivot Shaft

Removal

1. Remove the cowl top vent panels; refer to [Section 501-02](#).
2. Position the wiper mounting arm and pivot shaft aside.
 1. Remove the bolts.
 2. Disconnect the harness push pin.

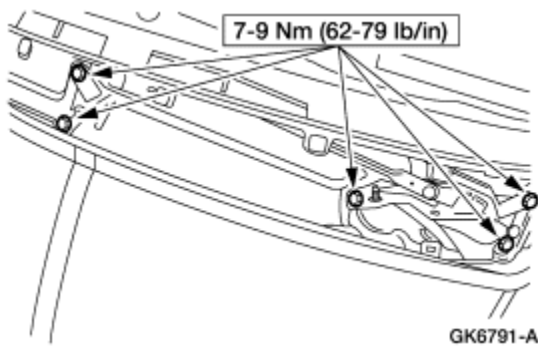


3. Remove wiper mounting arm and pivot shaft.
 1. Disconnect electrical connector.
 2. Remove the wiper mounting arm and pivot shaft.



Installation

1. To install, reverse the removal procedure.



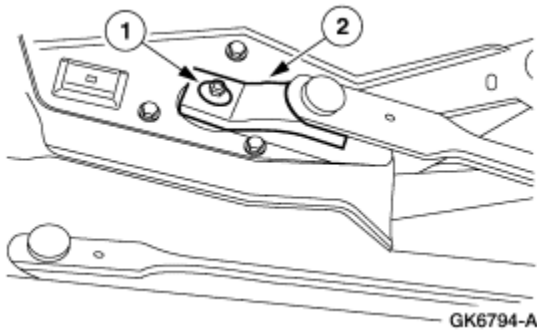
SECTION 501-16: Wipers and Washers
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

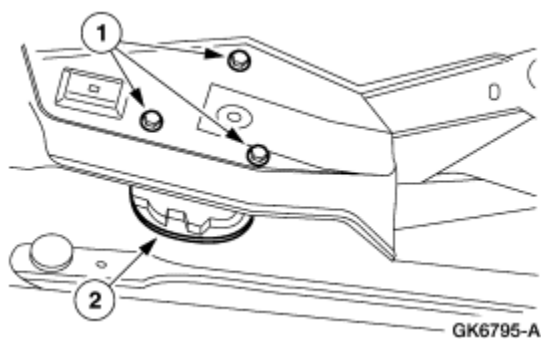
Motor—Windshield Wiper

Removal

1. Remove the mounting arm and pivot shaft, refer to [Mounting Arm and Pivot Shaft](#).
2. Remove the windshield wiper linkage.
 1. Remove the bolt.
 2. Remove the windshield wiper linkage.

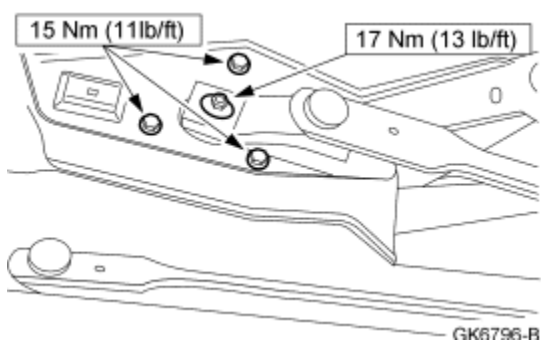


3. Remove the windshield wiper motor.
 1. Remove the bolts.
 2. Remove the windshield wiper motor.



Installation

1. To install, reverse the removal procedure.



SECTION 501-16: Wipers and Washers REMOVAL AND INSTALLATION

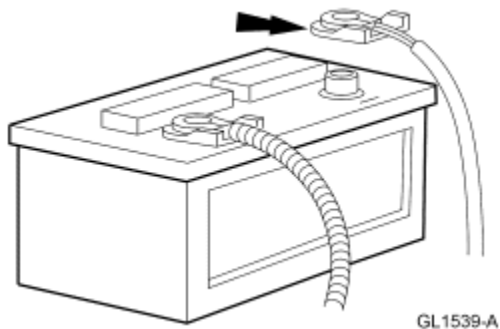
1999 F-Super Duty 250-550 Workshop Manual

[Procedure revision date: 01/26/2000](#)

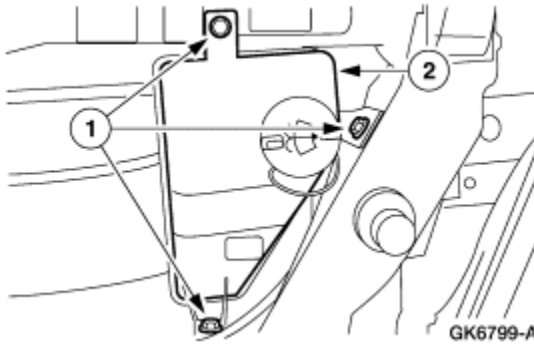
Washer Pump and Reservoir

Removal

1. Disconnect the battery ground cable.



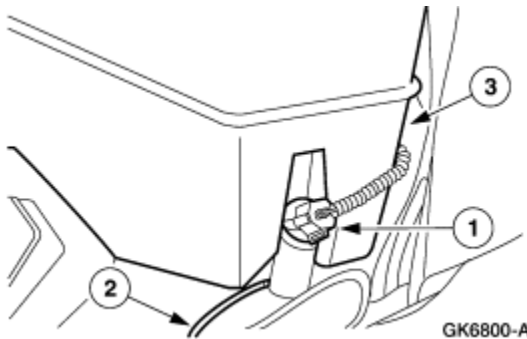
2. Remove the battery tray; refer to [Section 413-01](#).
3. Position windshield washer fluid reservoir aside.
 1. Remove the bolts.
 2. Position windshield washer fluid reservoir aside.



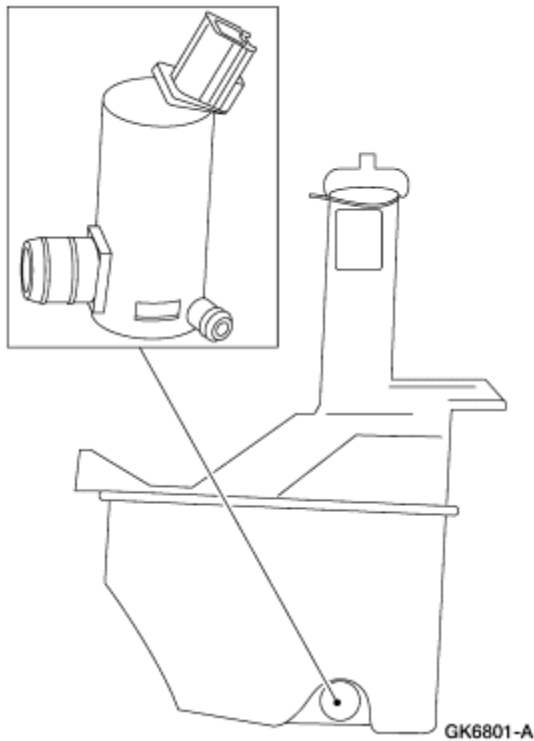
4. Remove windshield washer fluid reservoir.
 1. Disconnect the electrical connector.
 2. **NOTE:** Windshield washer fluid should be collected in a container after the windshield washer hose is disconnected.

Disconnect the windshield washer hose.


3. Remove the windshield washer fluid reservoir.



5. Remove the windshield washer pump.

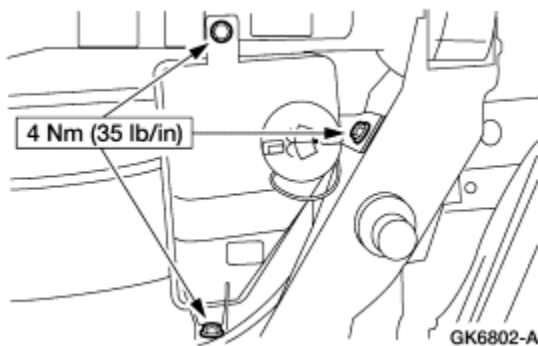


Installation

1.  **CAUTION:** Do not make electrical connection prior to filling the windshield washer reservoir. Do not operate the windshield washer pump prior to filling the windshield washer reservoir.

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

To install, reverse the removal procedure.



Switch—Windshield Wiper/Washer

Removal and Installation

NOTE: The multi-function switch is replaced as an assembly.

For additional information, refer to [Section 211-05](#).

SECTION 501-19: Bumpers

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Bumpers](#)

REMOVAL AND INSTALLATION

[Bumper—Front](#)

[Bumper Bracket—Front](#)

[Bumper Bracket—Front, Outer Brace](#)

[Bumper—Rear](#)

[Bumper Bracket—Rear](#)

[Bumper Bracket—Rear, Brace](#)

[Bumper Bracket—Rear, Reinforcing Bar](#)

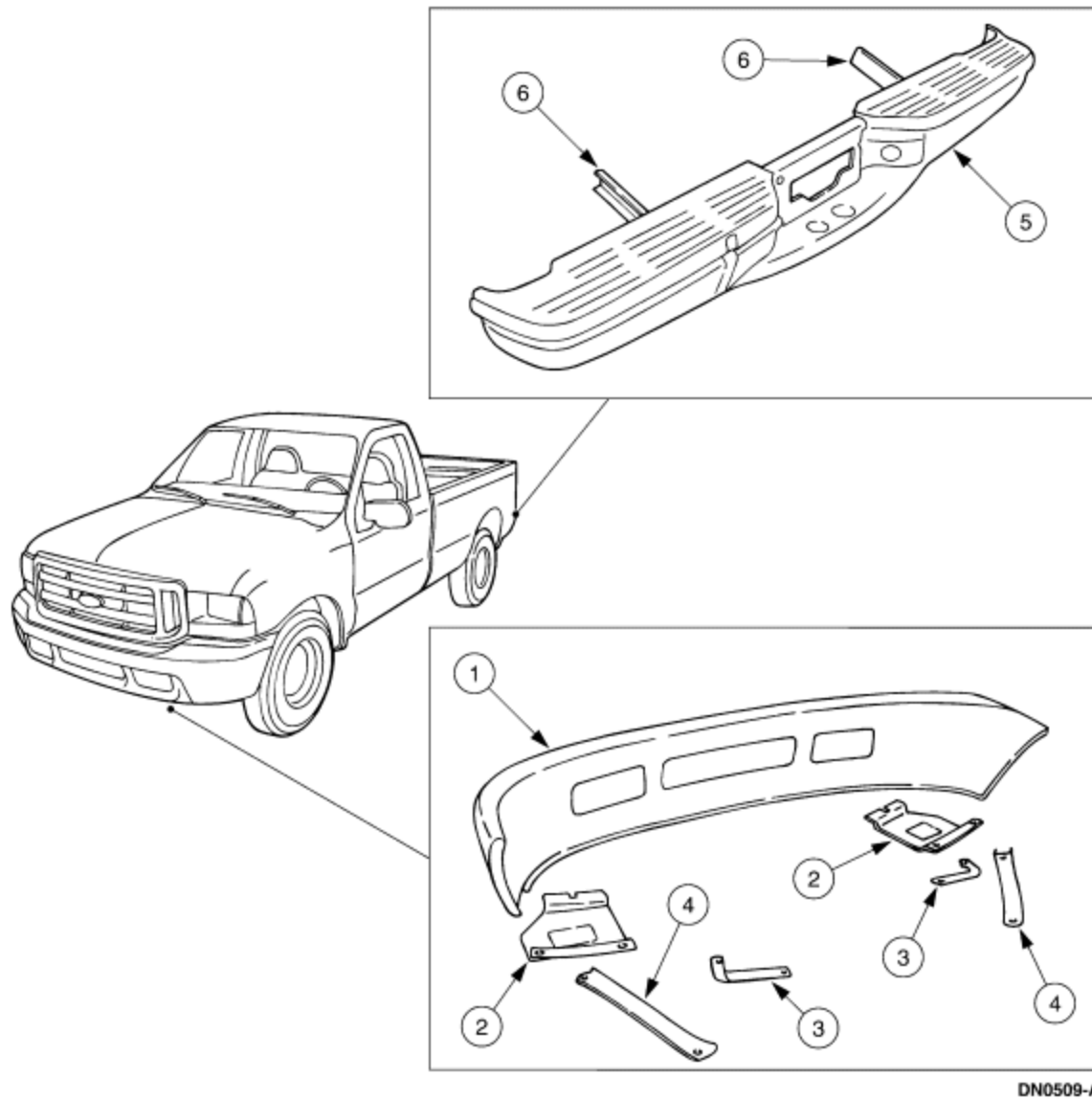
Description	Nm	Lb/Ft
Rear Bumper Reinforcement Bolt	45-65	34-48
Rear Bumper Brace Bolt	45-65	34-48
Rear Bumper Isolator and Bracket Bolt	98-132	73-98
Front Bumper to Bracket Bolt	26-34	20-26
Front Bumper Bolt	68-92	51-68

SECTION 501-19: Bumpers
DESCRIPTION AND OPERATION

1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

Bumpers

Bumper System



DN0509-A

Item	Part Number	Description
1	17757	Front Bumper
2	17753	Front Bumper Bracket
3	—	Front Bumper Backing Plate (Part of 17753)
4	17980	Front Bumper Brace
5	17906	Rear Bumper
6	17787	Rear Bumper Isolator

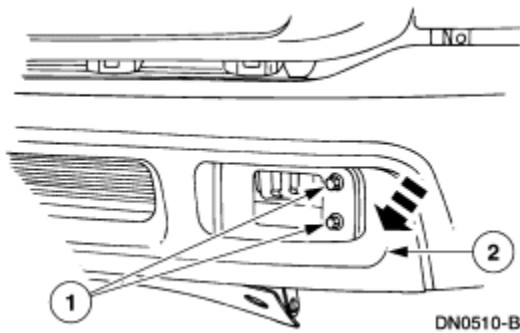
Bumper—Front

Removal

1. Support the front bumper (17757).
2. Remove the pushpins retaining the front of the splash shield, located at the center bottom of the front bumper.
3. **NOTE:** The left side of the front bumper is shown. The right side is symmetrically opposite.

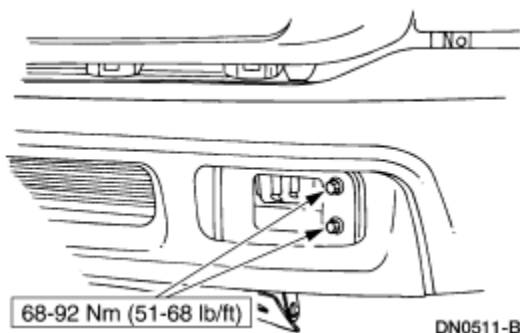
Remove the front bumper.

1. Remove the bolts.
2. Remove the front bumper.



Installation

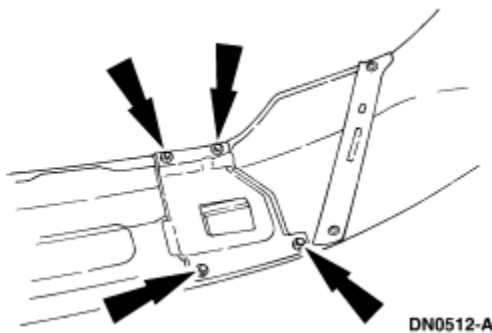
1. Follow the removal procedure in reverse order.



Bumper Bracket—Front

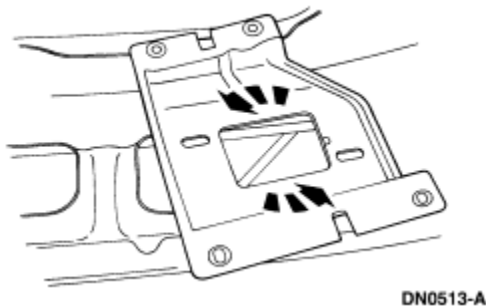
Removal

1. Remove the front bumper (17757); for additional information, refer to [Bumper—Front](#) in this section.
2. Remove the bolts.



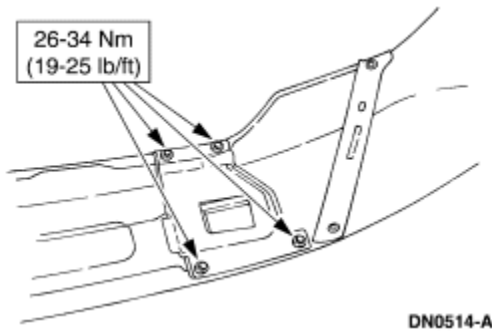
3. **NOTE:** The right side of the front bumper is shown. The left side is symmetrically opposite.

Rotate and remove the front bumper bracket.



Installation

1. Follow the removal procedure in reverse order.



SECTION 501-19: Bumpers
REMOVAL AND INSTALLATION

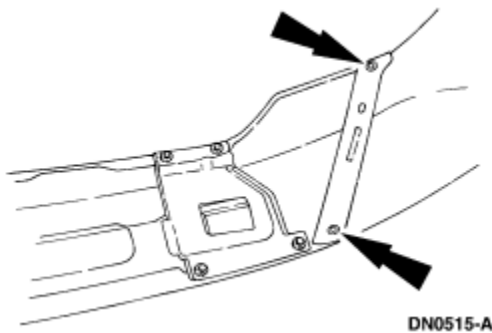
1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

Bumper Bracket—Front, Outer Brace

Removal

1. Remove the front bumper (17757); for additional information, refer to [Bumper—Front](#) in this section.
2. **NOTE:** The right side of the front bumper is shown. The left side is symmetrically opposite.

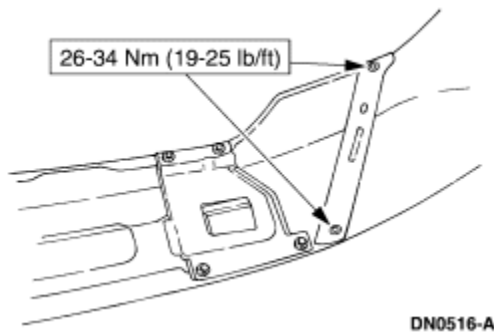
Remove the bolts.



3. Remove the front bumper brace.

Installation

1. Follow the removal procedure in reverse order.



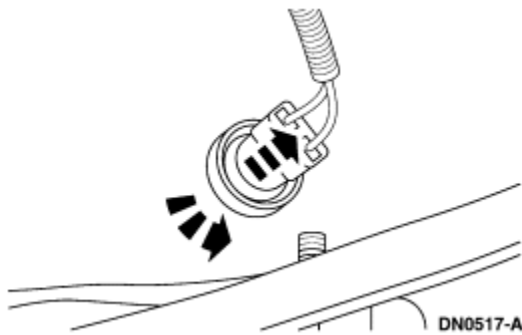
SECTION 501-19: Bumpers REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

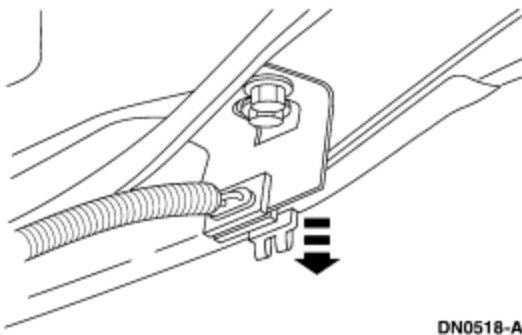
Bumper—Rear

Removal

1. Remove the license plate lamp assembly.
 - Twist the lamp socket, and pull the unit out of the rear bumper (17906).

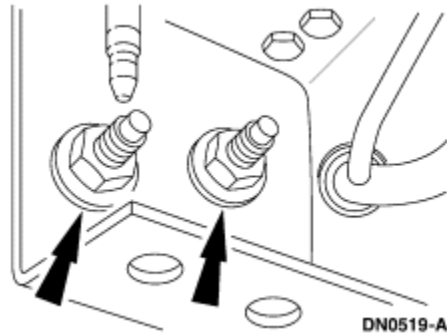


2. Remove the trailer light harness (if equipped).

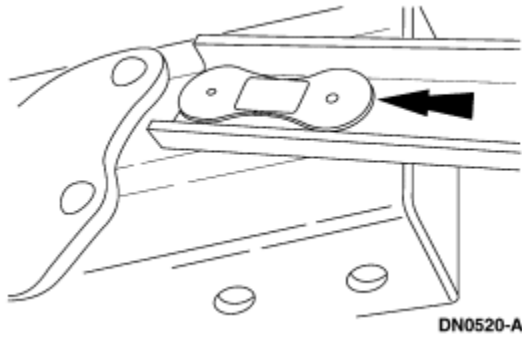


3. Support the rear bumper.
4. **NOTE:** The left side of the rear bumper is shown. The right side is symmetrically opposite.

Remove the nuts.



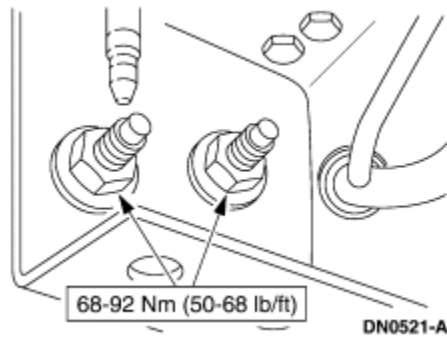
5. Remove the bolts.



6. Remove the rear bumper.

Installation

1. Follow the removal procedure in reverse order.

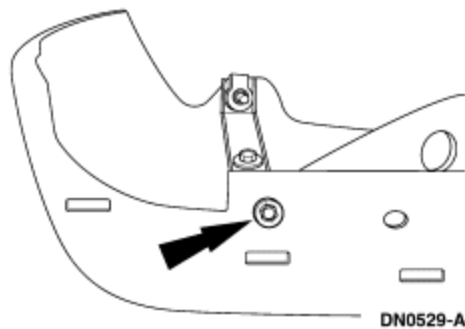


Bumper Bracket—Rear, Brace

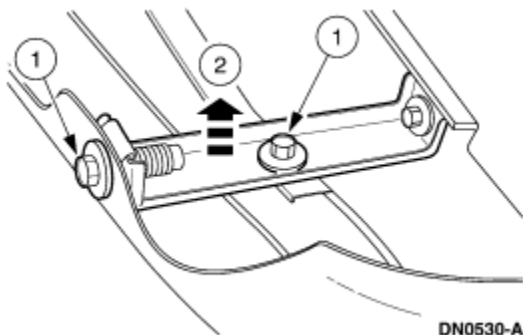
Removal

1. Remove the rear bumper (17906); for additional information, refer to [Bumper—Rear](#) in this section.
2. Remove the rear bumper step pad.
3. **NOTE:** The left side of the rear bumper is shown. The right side is symmetrically opposite.

Remove the bolt.



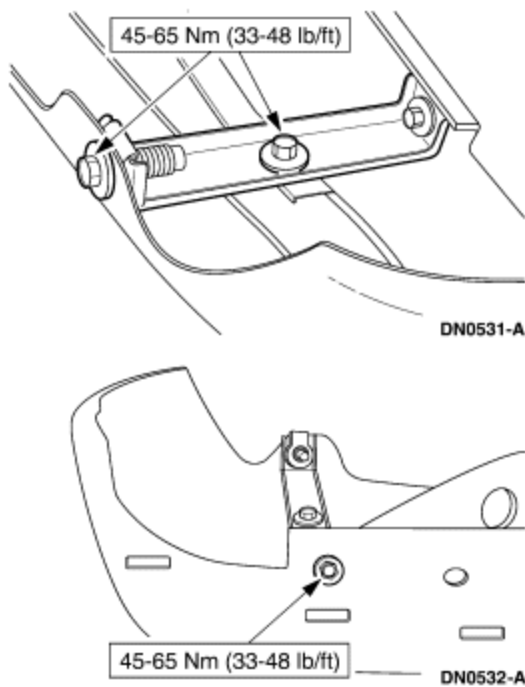
4. Remove the rear bumper brace.
 1. Remove the bolts.
 2. Remove the brace.



Installation

1. **NOTE:** Install the rear bumper step pad after the rear bumper has been reinstalled on the vehicle.

Follow the removal procedure in reverse order.



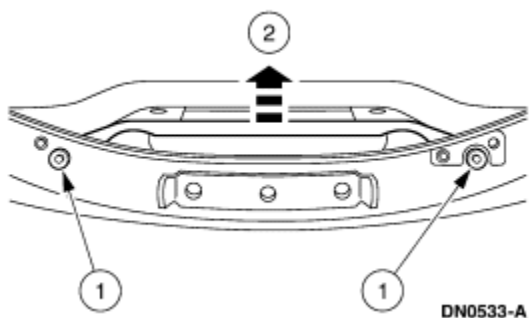
SECTION 501-19: Bumpers
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

Bumper Bracket—Rear, Reinforcing Bar

Removal

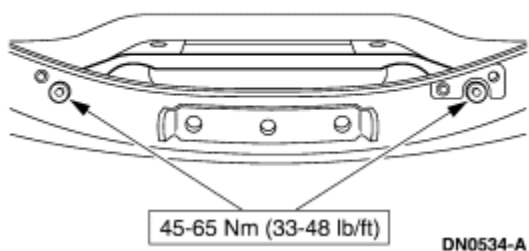
1. Remove the rear bumper (17906); for additional information, refer to [Bumper—Rear](#) in this section.
2. Remove the rear bumper step pad.
3. Remove the rear bumper isolator and bracket (17787); for additional information, refer to [Bumper Bracket—Rear](#) in this section.
4. Remove the rear bumper reinforcing bar.
 1. Remove the bolts.
 2. Remove the rear bumper reinforcing bar.



Installation

1. **NOTE:** Install the rear bumper step pad after the rear bumper has been reinstalled on the vehicle.

Follow the removal procedure in reverse order.



SECTION 501-20A: Occupant Restraints — Active

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Occupant Restraint System](#)

DIAGNOSIS AND TESTING

[Occupant Restraint System](#)

[Inspection and Verification](#)

[Symptom Chart](#)

[Component Test](#)

[Functional Test — Safety Belt, Vehicle Sensitive \(Emergency\) Locking Mode](#)

[Functional Test — Safety Belt, Automatic Locking Retractor \(ALR\) Mode](#)

GENERAL PROCEDURES

[Safety Belt With Anchor Plate Thread Damage](#)

[Replacement of the Weld Nut and Reinforcement](#)

[Safety Belt Shoulder Height Adjuster With Stripped Weld Nuts](#)

[Safety Belt Procedure After a Collision](#)

[Safety Belt Tongue Rotated on Belt](#)

REMOVAL AND INSTALLATION

[Retractor—Front Safety Belt and Tongue, Regular Cab](#)

[Retractor—Front Safety Belt and Tongue, SuperCab](#)

[Retractor—Front Safety Belt and Tongue, Crew Cab](#)

[Retractor—Rear Safety Belt and Tongue, SuperCab](#)

[Retractor—Rear Safety Belt and Tongue, Crew Cab](#)

[Safety Belt—Front Bench Seat](#)

[Safety Belt—Front 40/20/40 Seat](#)

[Safety Belt—Rear, SuperCab](#)

[Safety Belt—Rear, Crew Cab](#)

[Height Adjuster—Shoulder Safety Belt, Regular Cab](#)

[Height Adjuster—Shoulder Safety Belt, SuperCab](#)

[Height Adjuster—Shoulder Safety Belt, Crew Cab](#)

[Safety Belt Buckle—Front, Bench Seat](#)

[Safety Belt Buckle—Front, 40/20/40 Seat](#)

[Safety Belt Buckle—Front Captain's Chair](#)

[Safety Belt Buckle—Rear, SuperCab](#)

[Safety Belt Buckle—Rear, Crew Cab](#)

SECTION 501-20A: Occupant Restraints —
Active
SPECIFICATIONS

1999 F-Super Duty 250-550 Workshop
Manual

[Procedure revision date: 01/26/2000](#)

Parts Replacement Chart

Original Parts			Replacement Parts		
Part No.	Code Letter (a)	Part Name	Part No.	Code Letter (a)	Part Name
386273-S100	1A	Bolt — 7/16-20 x 1.38 Pan Head Tapping	383531-S36	X	Bolt — 1/2-13 x 1.38 Pan Locking
386274-S100	1B	Bolt — 7/16-20 x 1.75 Pan Head Tapping (0.50 Shoulder)	383753-S36	Y	Bolt — 1/2-13 x 1.75 Pan Locking (0.50 Shoulder)
382629-S100	—	Washer — .463/.443 I.D. Plate (1.80 Dia., 0.190 Thick)	382552-S100	—	Washer — 1/2 Flat (1.30 Dia., 0.190 Thick)
382583-S100	—	Washer — 1/2 Serrated (0.18 Thick)	382533-S100	—	Washer — 1/2 Flat (0.25 Thick)
386272-S100	IF	Bolt — 7/16-20 x 0.88 Pan Head Tapping	383437-S36	W	Bolt — 1/2 x 13 Pan Locking
386276-S100	IL	Bolt — 7/16-20 x 1.75 Pan Shoulder Tapping (0.75 Shoulder)	383754-S36	Z	Bolt — 1/2-13 x 2.25 Pan Locking (0.88 Shoulder)
386277-S100	1K	Bolt — 7/16-20 x 1.38 Pan Shoulder Tapping (0.50 Shoulder)	385709-S	T	Bolt — 1/2-13 x 1.38 Pan Head Shoulder Locking
382580-S100	—	Washer — 7/16	—	—	—
386392-S100	IG	Bolt — 7/16-20 x 2.15 Pan Head Tapping	383754-S36	Z	Bolt — 1/2-13 x 2.25 Pan Locking (0.88 Shoulder)
384966-S100	V	Bolt — 7/16-20 x 1.75 Pan Head Tapping	—	—	—
389370-S100	IM	7/16 x 20 x 1.15	389478-S190	U	1/2 x 13 x 1.15
389547-S190	IR	7/16 x 20 x 1.54	389548-S199	S	1/2 x 13 x 1.5
390775-S190	ID	7/16 x 20 x 2.00	390691-S190	D	1/2 x 13 x 2.0

(a) Identification letter on top of bolt head or face of spacer.

Torque Specifications		
Description	Nm	Lb/Ft
Shoulder Safety Belt Height Adjuster Bolts	40	30
Safety Belt Anchor Bolts	40	30
Safety Belt Retractor Bolts	40	30
Shoulder Strap Guide Nuts	40	30
Shoulder Strap Guide Bolts	40	30
Safety Belt Bolts	55	41
Safety Belt Nuts	55	41
Safety Belt Buckle Bolts	55	41
Safety Belt Buckle Nuts, 40/20/40 LH and RH Seats	40	30
Safety Belt Buckle Nut, 40/20/40 Center Seat	55	41

SECTION 501-20A: Occupant Restraints —
Active
DESCRIPTION AND OPERATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Occupant Restraint System

The outboard safety restraints in the vehicle are combination lap and shoulder belts. The front and rear seat passenger outboard safety belts have two types of locking modes: the vehicle-sensitive (emergency) locking mode and the automatic locking retractor (ALR) mode.

Vehicle-Sensitive (Emergency) Locking Mode

NOTE: The rear seat belts cannot be made to lock up by pulling quickly on the belt.

The vehicle-sensitive locking mode is the normal retractor mode, allowing free shoulder belt length adjustments to occupant movements and locking in response to vehicle movements. If the driver brakes suddenly, turns a corner sharply or the vehicle receives an impact of approximately 8 km/h (5 mph), the combination safety belts will lock to restrain forward movement of the driver and passengers.

The front seat belt system can also be made to lock manually by quickly pulling on the shoulder belt.

Automatic Locking Retractor (ALR) Mode

NOTE: The automatic locking retractor (ALR) mode is not available on the driver safety belt.

In the automatic locking retractor (ALR) mode, the shoulder belt is automatically pre-locked. However, the belt will still retract to remove any slack in the shoulder belt. This mode is used any time a child safety seat is installed in an outboard seating position, or when a tight lap/shoulder belt fit is desired. The ALR mode is automatically engaged when the webbing is fully extracted from the retractor. As the webbing is retracted back onto the spool, an audible clicking sound is made, indicating that the retractor is in the ILR mode. The ALR mode is automatically disengaged when the webbing is retracted back onto the spool. ALR mode is disengaged when the audible clicking sound ceases and the webbing is free to move in or out of the retractor, indicating that the belt was returned to the vehicle sensitive (emergency) locking mode of operation.

Fastening Safety Belts



WARNING: Do not introduce slack into the safety belt system because the belt locks upon impact where it is positioned. Use the shoulder safety belt on the outside shoulder only. Never wear the shoulder safety belt under the arm. Never swing the shoulder safety belt around the neck over the inside shoulder. Never use a single belt for more than one person. Make sure the lap portion of the belt is fitted snugly and as low as possible around the hips, not the waist. Failure to follow these precautions could increase the chance and severity of injury in a collision.

Always follow the preceding safety precautions when fastening the safety belts.

Safety Belt Extension Assembly

In certain cases, the safety belt may be too short even when it is fully extended. About 20 cm (8 in.) can be added to the belt length by using a safety belt extension. Safety belt extensions (part no. 611C22) are available at no cost through Ford or Lincoln-Mercury dealership parts departments. Safety belt extensions are available only with black webbing. The buckle must be from the same manufacturer as the belt system to which it is attached.

Warning System — Driver Safety Belt

The driver safety belt incorporates a safety belt warning indicator switch (10B924), an indicator light and warning chime. The indicator light and warning chime function as reminders to fasten the safety belt.

Safety Belt Indicator Light and Warning Chime

The safety belt indicator light illuminates in the instrument cluster and a warning chime sounds to remind the occupants to fasten their safety belts. The conditions of operation are as follows:

- If the driver safety belt is not buckled before the ignition key is turned to the ON position, the safety belt indicator light illuminates for 1-2 minutes and the warning chime sounds for 4-8 seconds.
- If the driver safety belt is buckled while the indicator light is illuminated and the warning chime is sounding, the safety belt indicator light and the warning chime turn off.

- If the driver safety belt is buckled before the ignition key is turned to the ON position, the safety belt indicator light and warning chime remain off.

Child Safety Seat — Tether Attachment

Some manufacturers make safety seats with a tether strap that goes over the back of the vehicle seat and attaches to an anchoring point behind the seat.

Ford recommends the placement of tethered safety seats in a rear seating position, with the tether strap attached to the tether anchoring point. The right front seating position can be used if it is the only seating position available. The tether anchor attachment point for the right front seating position is located on the back panel of the cab.

Tether Anchor Hardware

Three tether anchor points are provided on the back panel of the cab for child safety seats requiring a tether anchor. Tether anchor hardware kits (part no. 613D74) are available at no cost through Ford or Lincoln-Mercury dealership parts departments. These kits have instructions and hardware specific to the applicable vehicle.

SECTION 501-20A: Occupant Restraints —
Active
DIAGNOSIS AND TESTING

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Occupant Restraint System

Inspection and Verification

1. Verify the customer concern by operating the safety belt.
2. Visually inspect for obvious signs of mechanical and electrical damage. For additional information, refer to the following chart.

Visual Inspection Chart	
Mechanical	Electrical
<ul style="list-style-type: none">• Loose webbing	<ul style="list-style-type: none">• Blown fuse(s)• Damaged wiring harness

<ul style="list-style-type: none"> • Safety belt retractor and tongue assembly 	<ul style="list-style-type: none"> • Loose or corroded connections • Warning chime module • Safety belt warning indicator switch
---	---

3. If the fault is not visually evident, determine the symptom and proceed to the symptom chart.

Symptom Chart

SYMPTOM CHART		
Condition	Possible Sources	Action
<ul style="list-style-type: none"> • Vehicle Sensitive (Emergency) Locking Mode Inoperative 	<ul style="list-style-type: none"> • Loose webbing. • Safety belt retractor and tongue. 	<ul style="list-style-type: none"> • For additional information, REFER to Functional Test — Safety Belt in this section.
<ul style="list-style-type: none"> • Automatic Locking Retractor (ALR) Mode Inoperative 	<ul style="list-style-type: none"> • Loose webbing. • Safety belt retractor and tongue. 	<ul style="list-style-type: none"> • For additional information, REFER to Functional Test — Safety Belt in this section.
<ul style="list-style-type: none"> • Safety Belt Indicator Light or Warning Chime/Buzzer Inoperative 	<ul style="list-style-type: none"> • Fuse. • Circuitry. • Indicator light. • Warning chime module. 	<ul style="list-style-type: none"> • For additional information, REFER to Section 413-09.

Component Test

Functional Test — Safety Belt, Vehicle Sensitive (Emergency) Locking Mode

1. Buckle up and proceed to an area where you have plenty of space to accelerate and decelerate quickly. If the RH front or rear passenger safety belt must be tested, a passenger should be buckled into the RH front or rear seat. (The RH front belt can be tested using a driver only, providing the driver has the ability to grasp the RH front shoulder belt and extend it approximately 66 cm [26 in.] with no compromise to safe driving. This method applies to the 8 km/h [5 mph] test only.)

2. After reaching a safe area to perform sudden stops, attain a speed of approximately 8 km/h (5 mph). Advise the passenger (if applicable) to prepare for a severe brake application. At this time, both driver and passenger must grasp their respective shoulder safety belts and prepare to lean slightly forward at the moment brake application is made.

3.  **WARNING: The driver and passenger must be prepared to brace themselves in the event the retractor does not lock.**

Make the maximum brake application without tire skid. (The maximum brake application should be on dry concrete or equivalent hard road surface, never on a wet or gravel road.)

4. Both driver and passenger should lean slightly forward into the shoulder safety belts. At this instant, belts should lock up without webbing payout.
5. If both shoulder belts lock up, the safety belt assemblies are functioning properly.
6. **NOTE:** If the retractor of a new safety belt assembly is bolted into a damaged or distorted mounting area, the new retractor can be warped and not function. If this is the case, reshape the metal and install another new complete safety belt assembly.

If either or both retractors fail to lock up at the 8 km/h (5 mph) speed, repeat the test at a constant 24 km/h (15 mph). (This test must be performed with a passenger if other than the driver safety belt is to be tested.)

7. If either or both safety belts do not lock up at 24 km/h (15 mph) return the vehicle for service of safety belts. Remove the retractor and rework sheet metal in the retractor mounting surface. Install the retractor assembly and retest the safety belt assembly(s).

Functional Test — Safety Belt, Automatic Locking Retractor (ALR) Mode

1. Fully extract the safety belt webbing from the retractor.
 2. Allow the webbing to retract onto the spool. An audible clicking sound should be heard and the safety belt webbing should not be free to move out of the retractor.
 3. Allow the webbing to retract fully onto the spool. The webbing should now be free to move in or out of the spool without an audible clicking sound.
 4. If the safety belt does not operate as indicated in the previous steps, the safety belt must be repaired.
-

Safety Belt With Anchor Plate Thread Damage

1. Remove the broken or stripped bolt and discard.
 2. Drill out the internal threads in the seat belt anchor plate with a 27/64-inch drill.
 3. Rethread the anchor plate with a 1/2-13 tap (seat belt).
 4. Blow out the chips.
 5. Install the safety belt component(s).
 6. Install a new bolt with the same part number, unless otherwise specified. Refer to the Parts Replacement Chart in the Specifications portion of this section.
 7. Tighten the bolt(s) to specification. Refer to Torque Specifications in the Specifications portion of this section.
-

Replacement of the Weld Nut and Reinforcement


Missing Weld Nut — Upper B-Pillar

1. Remove the interior trim panel to expose the suspect anchor point; for additional information, refer to [Section 501-05](#).
2. Determine if the weld nut only or the weld nut and reinforcement and weld nut are missing. If it is determined that the reinforcement is missing, install a reinforcement. Refer to the Ford/Lincoln Mercury Master Parts Catalog for the appropriate part. To install a missing weld nut only, proceed to Step 3.
3. Obtain a M12 weld nut, part no. N806329, and a standard washer.

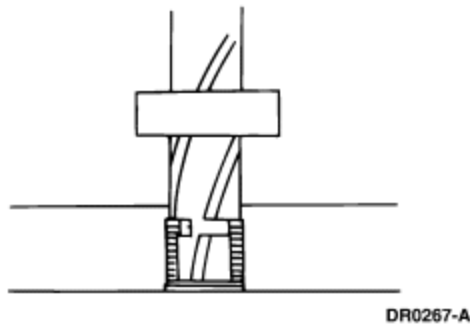
4. Drill out two 8-mm (5/16-in) diameter holes adjacent to the clearance hole.
5. Obtain a length of copper welding wire and feed through clearance hole in door frame opening until it becomes visible at the access hole.
6. Pull wire through so that it may be secured to the weld nut and washer.
7. Pull wire back up to the weld nut clearance hole.
8. Hold weld nut securely in place and using Rotunda MIG Wire Feed Welder 106-00053 or equivalent, plug weld the nut in place at the two 8-mm (5/16-in) diameter holes previously drilled.
9. Metal finish as required.
10. Verify the nut is securely in place.

Missing Weld Nut — Lower B-Pillar

1. Remove the interior trim panel to expose the suspect anchor point. For additional information, refer to [Section 501-05](#).
2. Obtain a M12 weld nut, part no. N806329.
3. Drill two 8-mm (5/16-in) diameter holes adjacent to the clearance hole.
4. Align weld nut with the clearance hole using a piece of round stock.
5. Secure in place and using Rotunda MIG Wire Feed Welder 106-00053 or equivalent, plug weld at the two 8-mm (5/16-in) diameter holes previously drilled.
6. Metal finish as required.
7. Verify the nut is securely in place.

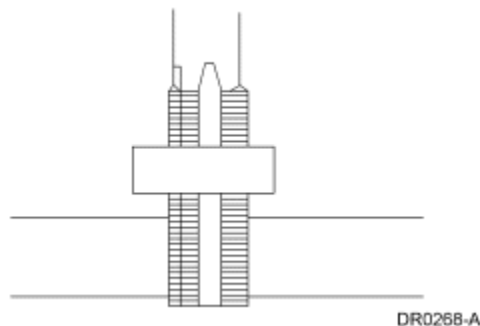
Special Tool(s)	
 <p>ST1657-A</p>	D-Ring Installation Kit 100-F012 (134-00018) or Equivalent

1. Remove the shoulder safety belt height adjuster (602B82). For additional information, refer to [Height Adjuster—Shoulder Safety Belt, Regular Cab](#) or [Height Adjuster—Shoulder Safety Belt, Crew Cab](#) in this section.
2. Use the half-inch drill provided in the D-Ring Installation Kit to drill out the damaged threads in the upper pillar structure.

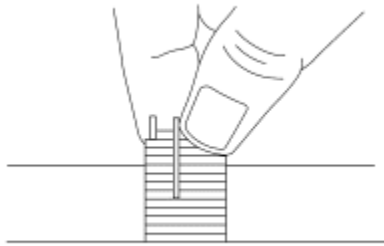


3. **NOTE:** After each rotation, back off the tap slightly to remove new cuttings and be sure to blow out any chips before proceeding.

Apply a suitable lubricant to the M14 x 1.5 tap provided in the D-Ring Installation Kit, and tap new threads.



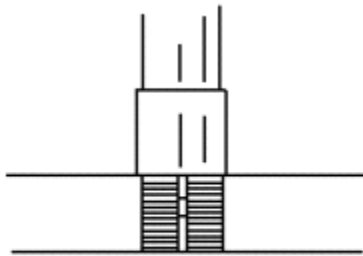
4. Use a threaded insert (part no. N807170-S190) provided in the D-Ring Installation Kit and screw it into the retapped hole until it is slightly below the surface.



DR0269-A

5. **NOTE:** Drive keys on the insert will act as an automatic stop.

Use a hammer to lightly tap the installation tool provided in the D-Ring Installation Kit several times to seat the insert keys.



DR0270-A

6. **NOTE:** If the shoulder safety belt height adjuster retaining bolts are stripped, replace the shoulder safety belt height adjuster and retaining bolts. Refer to the Ford/Lincoln Mercury Master Parts Catalog for the appropriate parts.

Install the shoulder safety belt height adjuster. For additional information, refer to [Height Adjuster—Shoulder Safety Belt, Regular Cab](#) or [Height Adjuster—Shoulder Safety Belt, Crew Cab](#) in this section.

Safety Belt Procedure After a Collision

⚠ WARNING: All safety belt assemblies, including retractors, safety belt height adjusters, buckles, front safety belt buckle support assemblies (slide bar), if so equipped, child safety seat tether attachments, and attaching hardware should be inspected after any collision. All belt assemblies should be replaced unless a qualified technician finds the assemblies show no damage and operate properly. Belt assemblies not in use during a collision should also be inspected and replaced if either damage or improper operation is noted.

1. Safety belt assemblies should be periodically inspected to make sure they have not become damaged and are in proper operating condition, particularly if subjected to severe stress.
2. Before installing a new safety belt assembly, the safety belt attaching areas must be inspected for damage and distortion. If the attaching points are damaged or distorted, the sheet metal must be worked back to its original shape and structural integrity.
3. Install the new safety belt(s). Refer to the appropriate procedure in this section. Perform the Functional Test — Safety Belt procedure in this section.

SECTION 501-20A: Occupant Restraints —
Active
GENERAL PROCEDURES

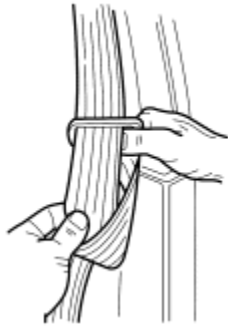
1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Safety Belt Tongue Rotated on Belt



DR0274-A

1. Grasp the belt tongue and pull down on the closest belt webbing to form a loop through the upper (narrower and longer) slot in the tongue.



DR0275-A

2. Working within the upper slot, rotate and fold the belt webbing over itself as required to remove the twist.
3. Pull the excess belt webbing back through the upper slot in the tongue.
4. Repeat Steps 1-3 to complete the removal of the twist at the lower (wider and larger) slot in the tongue.



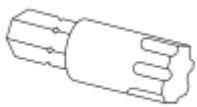

DR0276-A

5. When completed, the safety belt should look like the illustration.



DR0273-A

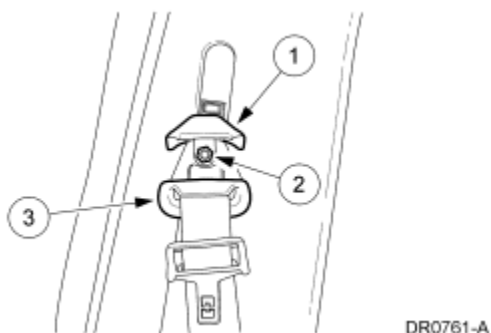
Retractor—Front Safety Belt and Tongue, Regular Cab

Special Tool(s)	
 ST1181-A	Seat Belt Bolt Bit used for T-50 head bolt 501-010 (T77L-2100-A)
 ST1442-A	Torx Bit Tool Set used for T-55 head bolt 501-D012 (D83L-2100-A)

Removal

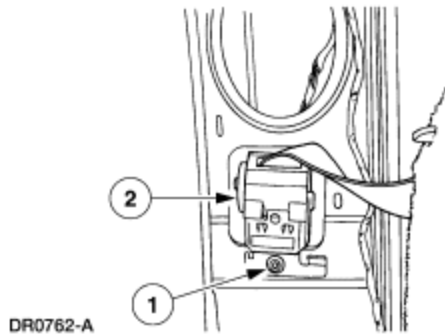
NOTE: Safety belt buckles, height adjusters, center adjust tongues and belts and retractors can be replaced separately. However, if a safety belt assembly was in use during a collision, the belt and retractor must be replaced as well as the center adjust tongue and belt and buckle assembly or the center adjust tongue and the cable and buckle assembly. When replacing safety belts and buckles, height adjusters, safety cables and buckles, center adjust tongues and belts and retractors, use only the replacement parts specified in the Ford Master Parts Catalogs for the make and model of the vehicle being serviced. Safety belt assemblies must not be interchanged between vehicle models.

1. Remove the shoulder strap guide.
 1. Position the shoulder strap guide cover up.
 2. Remove the shoulder strap guide nut.
 3. Remove the shoulder strap guide.

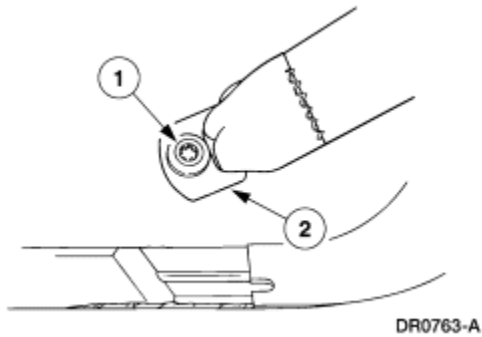


2. Remove the front door scuff plate and the rear corner trim panel.

3. Remove the front safety belt retractor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt retractor.



4. Remove the front safety belt anchor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt anchor.

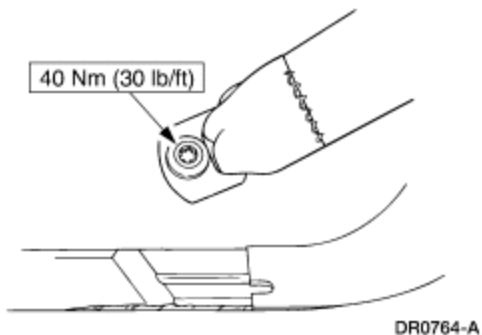


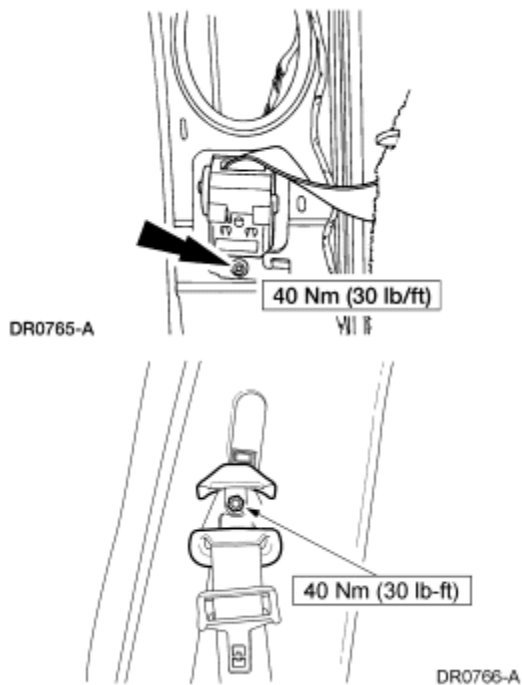
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten nuts and bolts to specification.

Follow the removal procedure in reverse order.





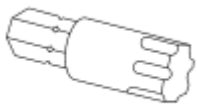
2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual

[Procedure revision date: 01/26/2000](#)

Retractor—Front Safety Belt and Tongue, SuperCab

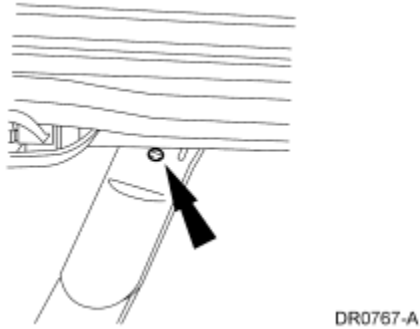
Special Tool(s)	
	Seat Belt Bolt Bit used to T-50 head bolt
	501-010 (T77L-2100-A)

Removal

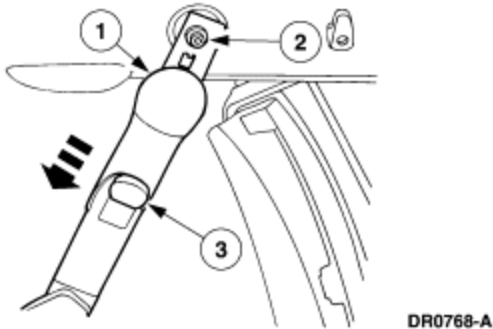
NOTE: Safety belt buckles, height adjusters, center adjust tongues and belts and retractors can be replaced separately. However, if a safety belt assembly was in use during a collision, the belt and retractor must be replaced as well as the center adjust tongue and belt and buckle assembly or the

center adjust tongue and the cable and buckle assembly. When replacing safety belts and buckles, height adjusters, safety cables and buckles, center adjust tongues and belts and retractors, use only the replacement parts specified in the Ford Master Parts Catalogs for the make and model of the vehicle being serviced. Safety belt assemblies must not be interchanged between vehicle models.

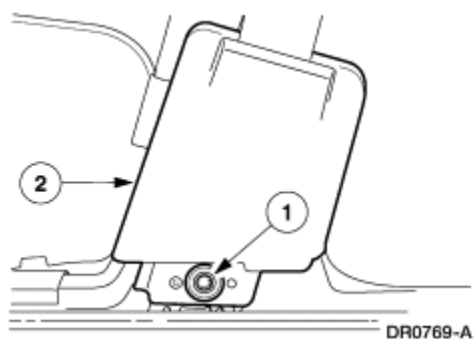
1. Remove the shoulder safety belt height adjuster cover push-pin.



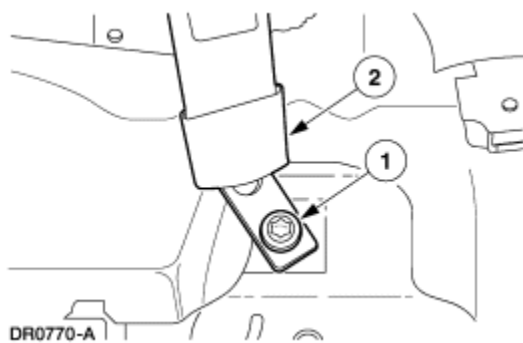
2. Remove the shoulder safety belt height adjuster.
 1. Position the shoulder safety belt height adjuster cover down.
 2. Use the Seat Belt Bolt Bit to remove the shoulder safety belt height adjuster bolt.
 3. Remove the shoulder safety belt height adjuster.



3. Remove the front door scuff plate.
4. Remove the front safety belt retractor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt retractor.



5. Remove the front safety belt anchor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt anchor.

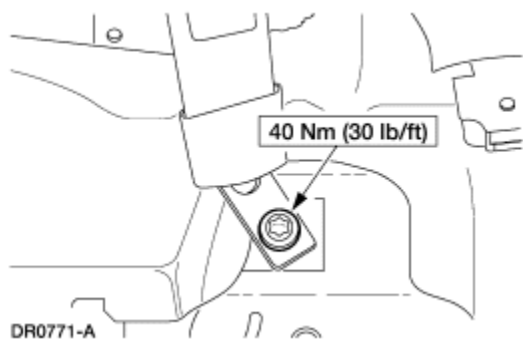


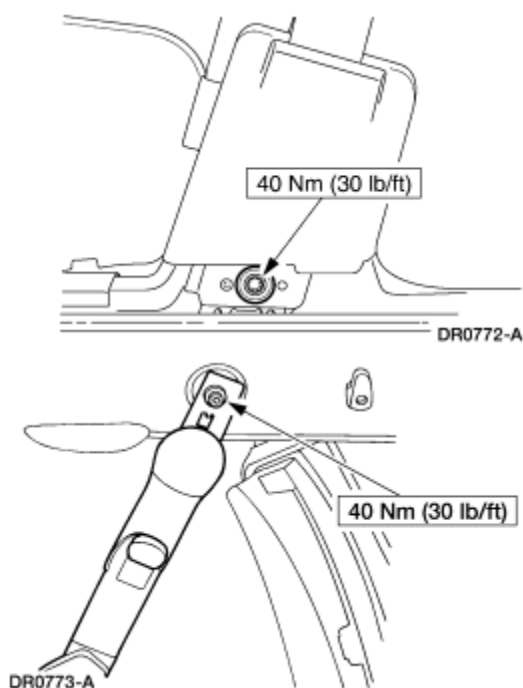
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

Follow the removal procedure in reverse order.



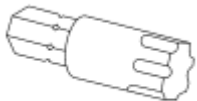


2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Retractor—Front Safety Belt and Tongue, Crew Cab

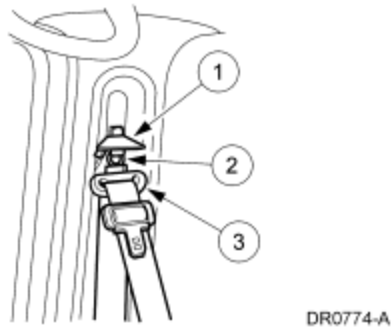
Special Tool(s)	
 ST1181-A	Safety Belt Bolt Bit
	501-010 (T77L-2100-A) (Used for T-50 Head Bolt)

Removal

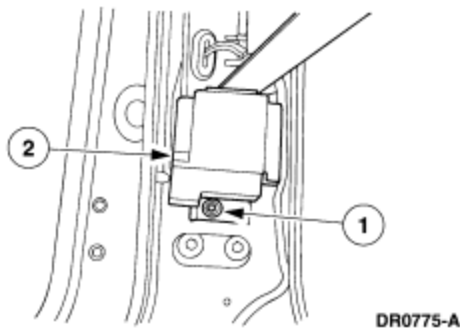
NOTE: Safety belt buckles, height adjusters, center adjust tongues and belts and retractors can be replaced separately. However, if a safety belt assembly was in use during a collision, the belt and retractor must be replaced as well as the center adjust tongue and belt and buckle assembly or the center adjust tongue and the cable and buckle assembly. When replacing safety belts and buckles,

height adjusters, safety cables and buckles, center adjust tongues and belt and retractors, use only the replacement parts specified in the Ford Master Parts Catalogs for the make and model of the vehicle being serviced. Safety belt assemblies must not be interchanged between vehicle models.

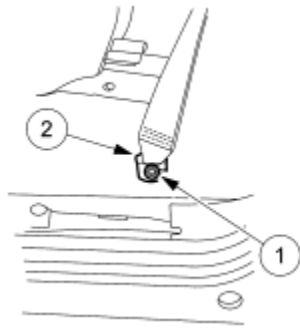
1. Remove the shoulder strap guide.
 1. Position the shoulder strap guide cover up.
 2. Remove the shoulder strap guide nut.
 3. Remove the shoulder strap guide.



2. Remove the front door scuff plate, the rear door scuff plate, the rear assist handle and the center body pillar trim panel.
3. Remove the front safety belt retractor.
 1. Use the Safety Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt retractor.



4. Remove the front safety belt anchor.
 1. Use the Safety Belt Bolt Bit to remove the bolt.
 2. Remove the front safety belt anchor.



DR0776-A

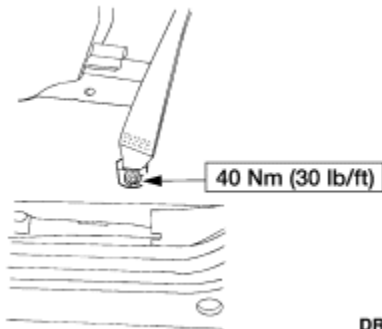
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

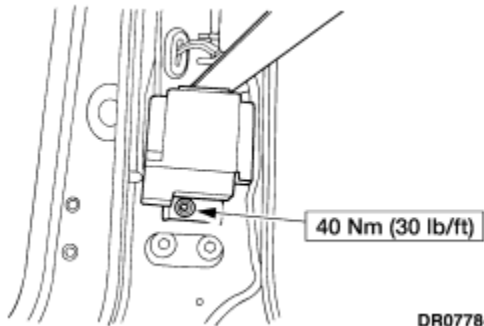
NOTE: Make sure to tighten nuts and bolts to specification.

Follow the removal procedure in reverse order.

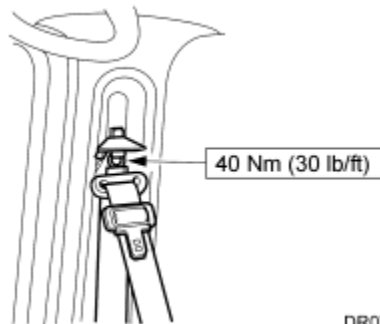
- Check the restraint system for proper operation.



DR0777-A



DR0778-A



DR0779-A

Retractor—Rear Safety Belt and Tongue, SuperCab

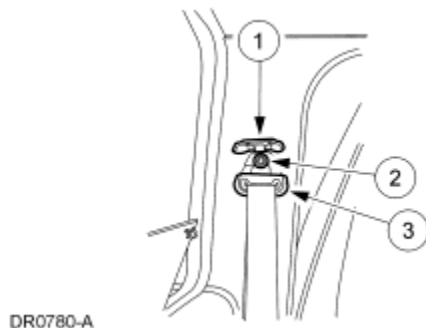
Special Tool(s)	
 ST1181-A	Seat Belt Bolt Bit used for T-50 head bolt 501-010 (T77L-2100-A)

Removal

1. **NOTE:** Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

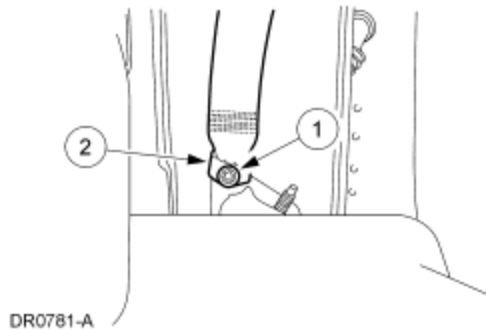
Remove the shoulder safety belt guide.

1. Position the shoulder safety belt guide cover up.
2. Use the Seat Belt Bolt Bit to remove the bolt.
3. Remove the shoulder safety belt guide.

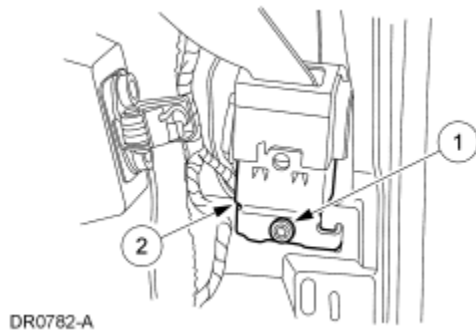


2. Remove the rear seat; for additional information, refer to [Section 501-10](#).
3. Remove the rear seat back upper moulding.

4. Remove the safety belt anchor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the safety belt anchor.



5. Remove the front door scuff plate and the rear center trim panel.
6. Remove the safety belt retractor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the safety belt retractor.



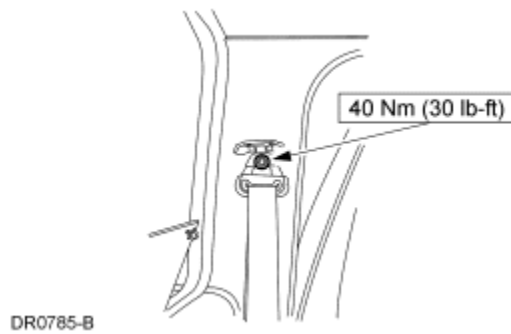
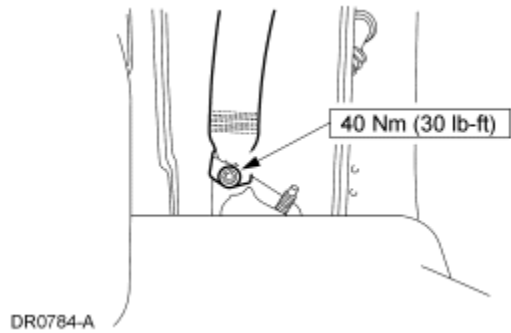
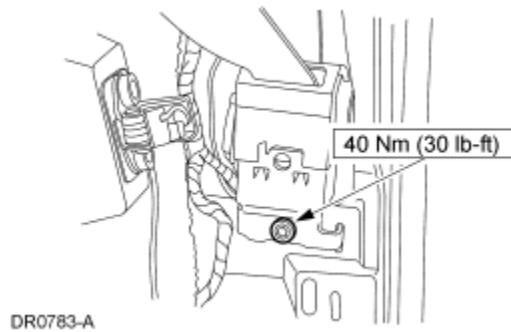
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

NOTE: Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

To install, reverse the removal procedure.



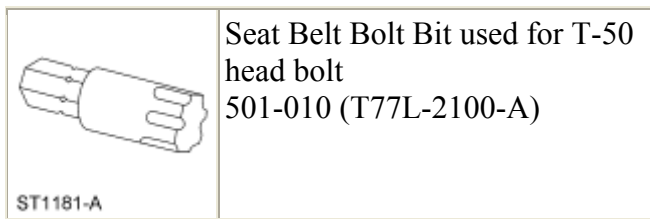
2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Retractor—Rear Safety Belt and Tongue, Crew Cab

Special Tool(s)



Removal

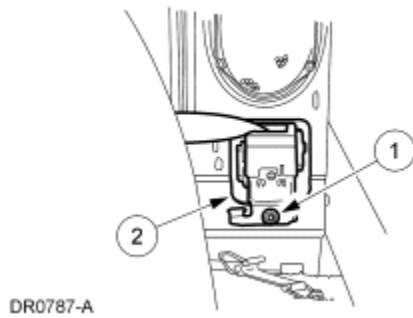
1. **NOTE:** Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

Remove the shoulder safety belt guide.

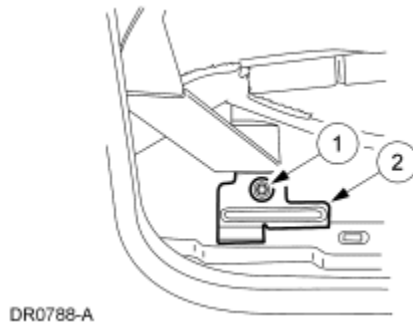
1. Position the shoulder safety belt guide cover up.
2. Use the Seat Belt Bolt Bit to remove the bolt.
3. Remove the shoulder safety belt guide.



2. Position the rear seat back forward.
3. Remove the utility tray, if necessary.
4. Remove the rear door scuff plate and the rear corner trim panel.
5. Remove the safety belt retractor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the safety belt retractor.



6. Remove the safety belt anchor.
 1. Use the Seat Belt Bolt Bit to remove the bolt.
 2. Remove the safety belt anchor.



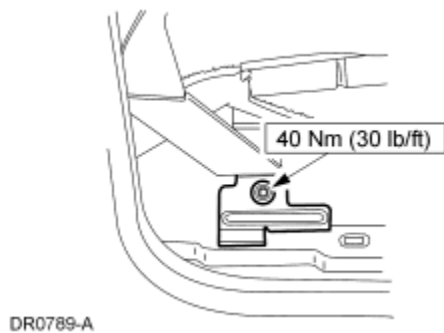
Installation

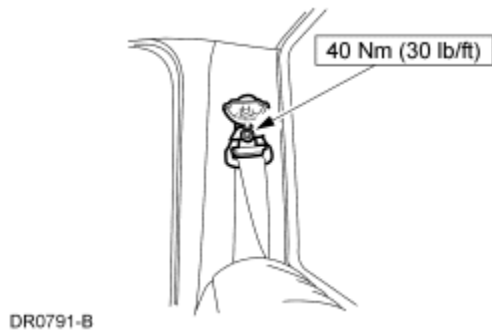
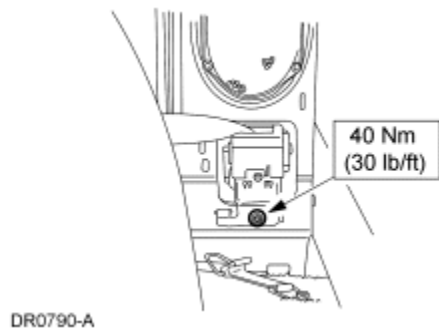
1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

NOTE: Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

To install, reverse the removal procedure.





2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual

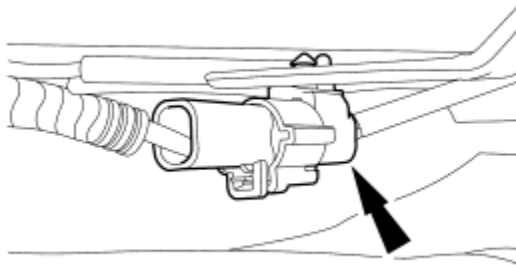
[Procedure revision date: 01/26/2000](#)

Safety Belt—Front Bench Seat

Special Tool(s)	
 <p>ST1442-A</p>	Torx Bit Tool Set used for T-55 head bolt
	501-D012 (D83L-2100-A)

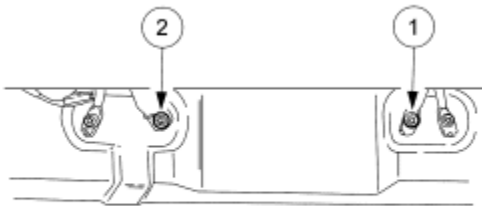
Removal

1. Remove the utility tray, if necessary.
2. Disconnect and detach the driver safety belt switch.



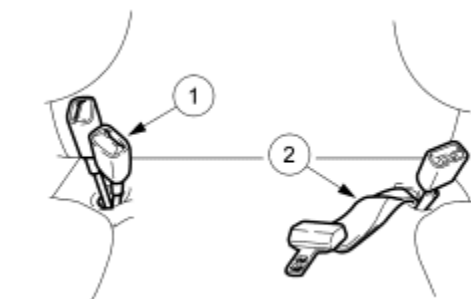
A0036367

3. Remove the safety belt bolts.
 1. Use the T-55 Torx bit to remove the safety belt buckle bolt.
 2. Use the T-55 Torx bit to remove the safety belt tongue bolt.



DR0792-A

4. Remove the safety belt.
 1. Remove the safety belt buckle.
 2. Remove the safety belt tongue.



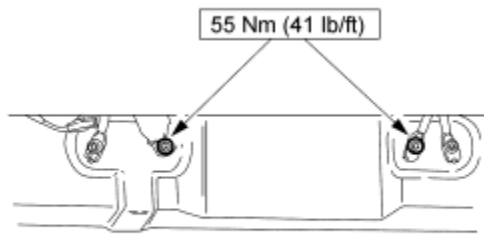
DR0793-A

Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

To install, reverse the removal procedure.



DR0794-B

2. Check the restraint system for correct operation.

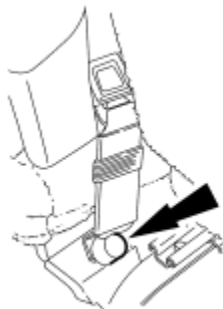
SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Safety Belt—Front 40/20/40 Seat

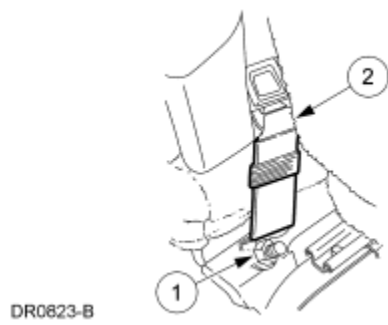
Removal

1. Remove the cap from the safety belt buckle nut.

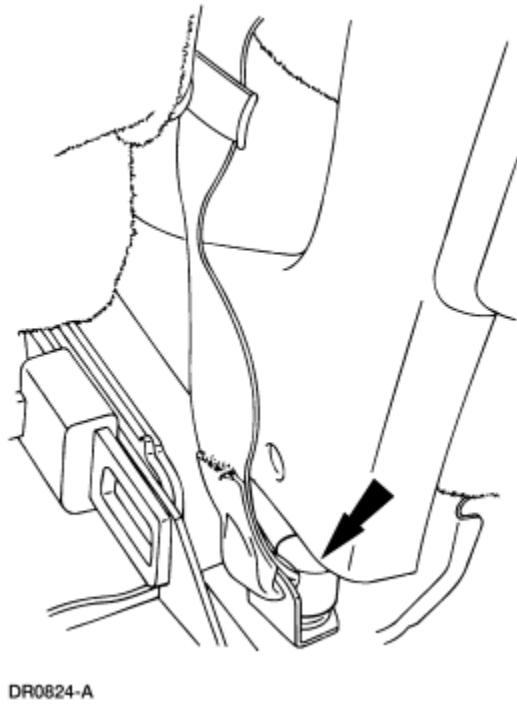


DR0795-B

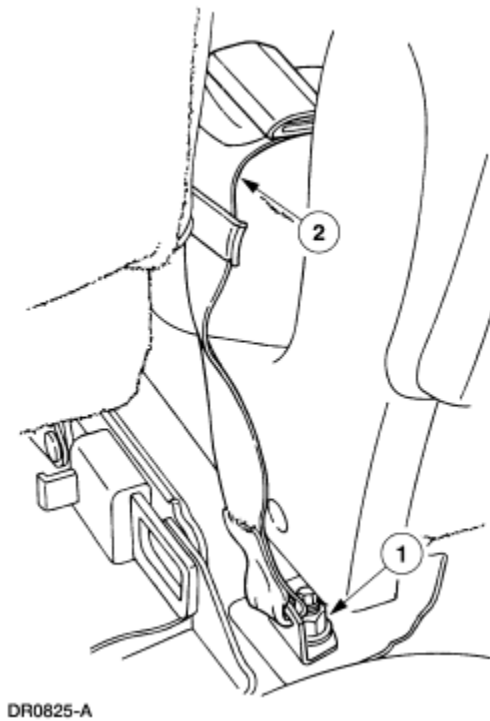
2. Remove the safety belt buckle.
 1. Remove the safety belt buckle nut.
 2. Remove the safety belt buckle.



3. Remove the cap from the safety belt tongue nut.



4. Remove the safety belt tongue.
 1. Remove the safety belt tongue nut.
 2. Remove the safety belt tongue.

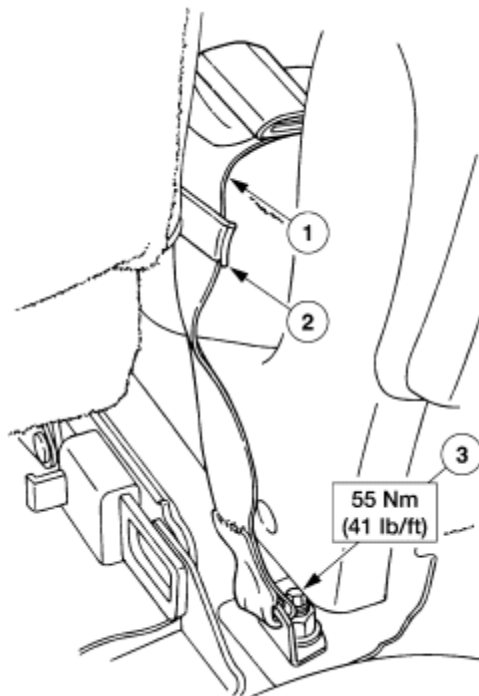


Installation

NOTE: Make sure the safety belt webbing is not twisted prior to installation.

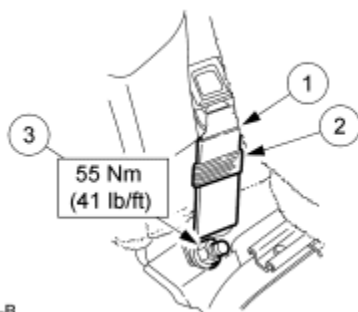
NOTE: Make sure to tighten nuts to specification.

1. Install the safety belt tongue.
 1. Position the safety belt tongue.
 2. Make sure the safety belt tongue is positioned in the retaining strap.
 3. Install the safety belt tongue nut.



DR0826-A

2. Install the safety belt buckle.
 1. Position the safety belt buckle.
 2. Make sure the safety belt buckle is positioned in the retaining strap.
 3. Install the safety belt buckle nut.



DR0827-B

3. Check the restraint system for correct operation.

Safety Belt—Rear, SuperCab

Special Tool(s)	
 ST1442-A	Torx Bit Tool Set D83L-2100-A (Used for T-55 Head Bolt)

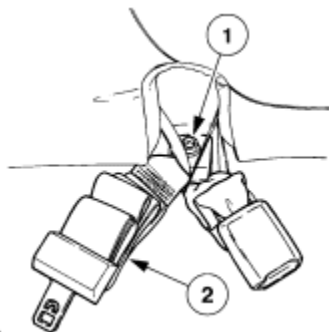
Removal

1. Remove the safety belt buckle.
 1. Use the T-55 Torx bit to remove the safety belt buckle bolt.
 2. Remove the safety belt buckle.



DR0828-A

2. Remove the safety belt tongue.
 1. Use the T-55 Torx bit to remove the safety belt tongue bolt.
 2. Remove the safety belt tongue.



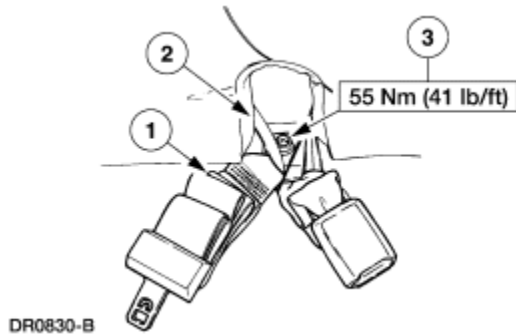
DR0829-A

Installation

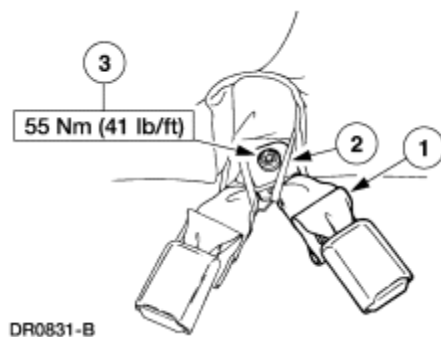
NOTE: Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

1. Install the safety belt tongue.
 1. Position the safety belt tongue.
 2. Make sure the safety belt tongue is positioned in the retaining strap.
 3. Use the T-55 Torx bit to install the safety belt tongue bolt.




2. Install the safety belt buckle.
 1. Position the safety belt buckle.
 2. Make sure the safety belt buckle is positioned in the retaining strap.
 3. Use the T-55 Torx bit to install the safety belt buckle.



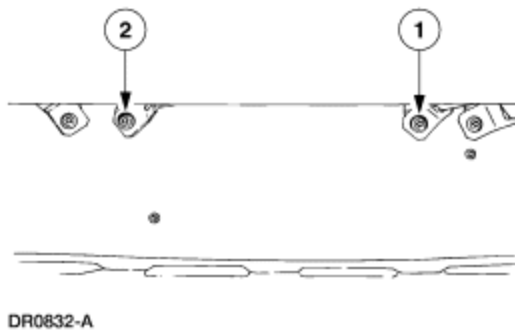
3. Check the restraint system for proper operation.

Safety Belt—Rear, Crew Cab

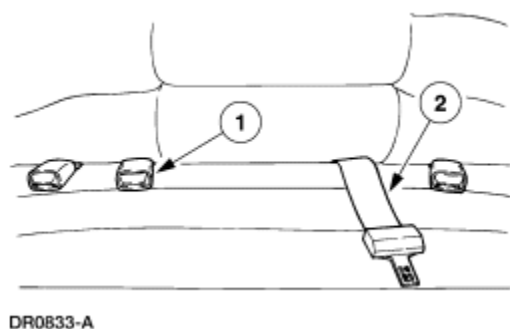
Special Tool(s)	
 ST1442-A	Torx Bit Tool Set used for T-55 head bolt 501-D012 (D83L-2100-A)

Removal

1. Remove the utility tray, if necessary.
2. Remove the safety belt bolts.
 1. Use the T-55 Torx bit to remove the safety belt buckle bolt.
 2. Use the T-55 Torx bit to remove the safety belt tongue bolt.



3. Remove the safety belt.
 1. Remove the safety belt buckle.
 2. Remove the safety belt tongue.

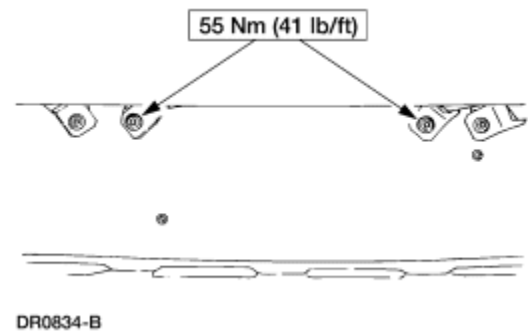


Installation

- 1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten nuts and bolts to specification.

To install, reverse the removal procedure.



- 2. Check the restraint system for correct operation.

Height Adjuster—Shoulder Safety Belt, Regular Cab

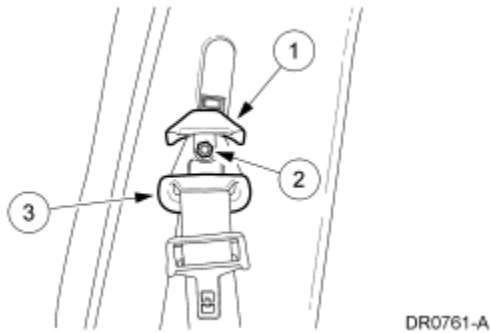
Special Tool(s)	
 ST1181-A	Seat Belt Bolt Bit used for T-50 head bolt 501-010 (T77L-2100-A)

Removal

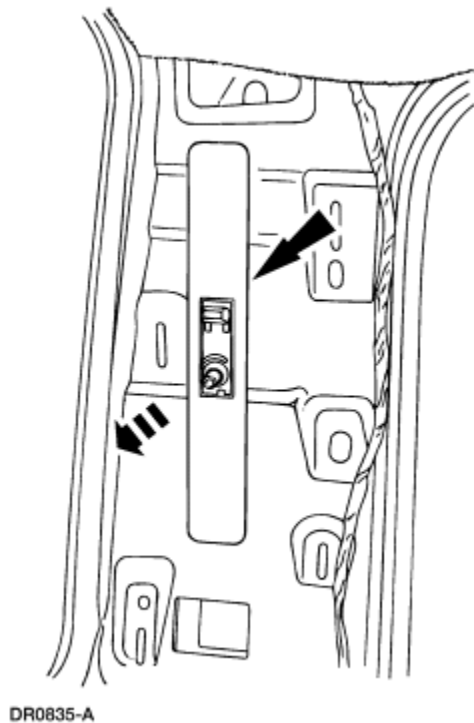
- 1. **NOTE:** Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

Remove the shoulder safety belt guide.

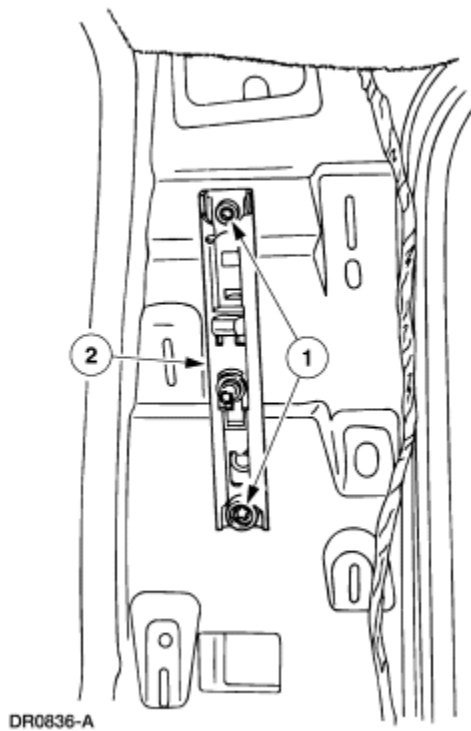
1. Position the shoulder safety belt guide cover up.
2. Remove the shoulder safety belt guide nut.
3. Remove the shoulder safety belt guide.



2. Remove the front door scuff plate and rear corner trim panel.
3. Remove the height adjuster cover (602B90).



4. Remove the shoulder safety belt height adjuster (602B82).
 1. Use the special tool to remove the bolts.
 2. Remove the shoulder safety belt height adjuster.



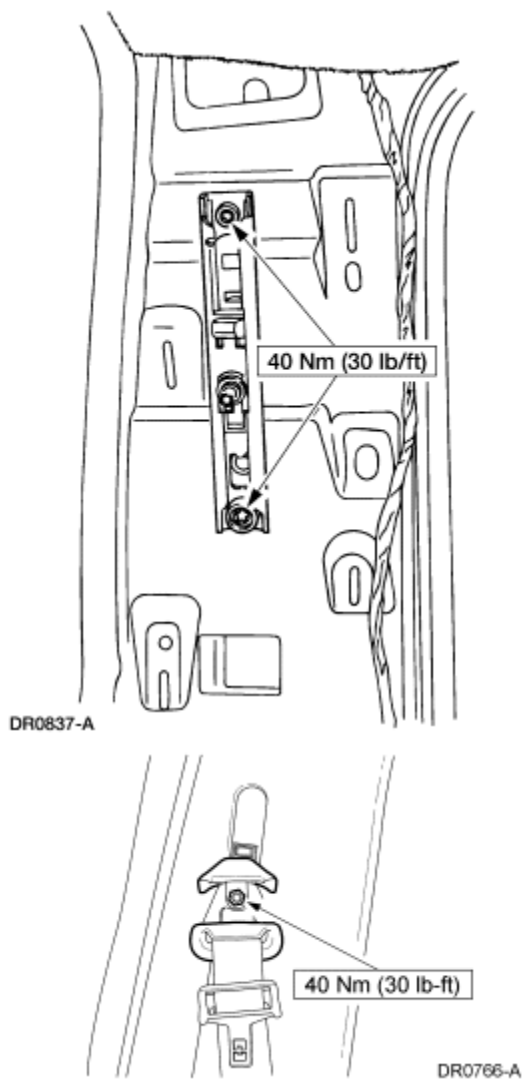
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten nuts and bolts to specification.

NOTE: Inspect the shoulder safety belt guide and cover for damage. If the shoulder safety belt guide or cover is damaged or cover does not remain closed, install a new shoulder safety belt guide.

To install, reverse the removal procedure.



2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Height Adjuster—Shoulder Safety Belt, SuperCab

Removal and Installation

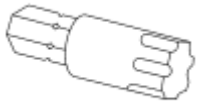
For additional information, refer to [Retractor—Front Safety Belt and Tongue, SuperCab](#) in this section.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual

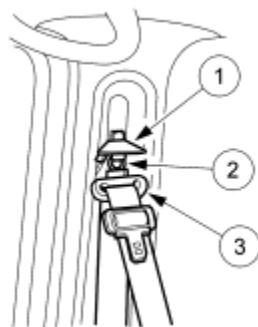
[Procedure revision date: 01/26/2000](#)

Height Adjuster—Shoulder Safety Belt, Crew Cab

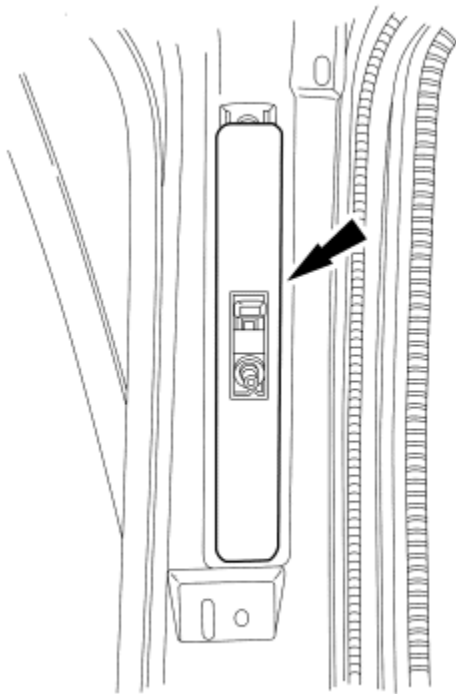
Special Tool(s)	
 ST1181-A	Safety Belt Bolt Bit 501-010 (T77L-2100-A) (Used for T-50 Head Bolt)

Removal

1. Remove the shoulder strap guide.
 1. Position the shoulder strap guide cover up.
 2. Remove the shoulder strap guide nut.
 3. Remove the shoulder strap guide.

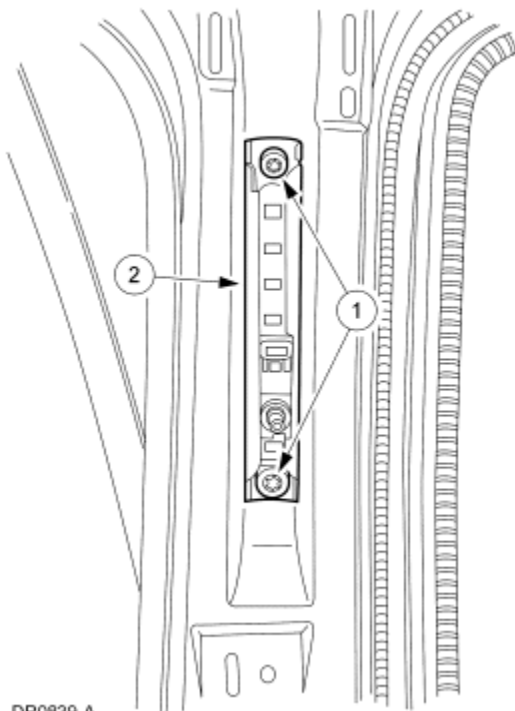


2. Remove the front door scuff plate, the rear door scuff plate, the rear assist handle and the center body pillar trim panel; for additional information, refer to [Section 501-05](#).
3. Remove the height adjuster cover (602B90).



DR0838-A

4. Remove the shoulder safety belt height adjuster (602B82).
 1. Use the Safety Belt Bolt Bit to remove the bolts.
 2. Remove the shoulder safety belt height adjuster.



DR0839-A

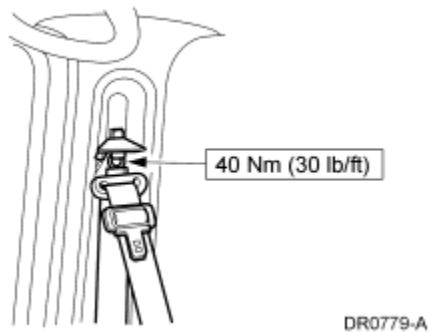
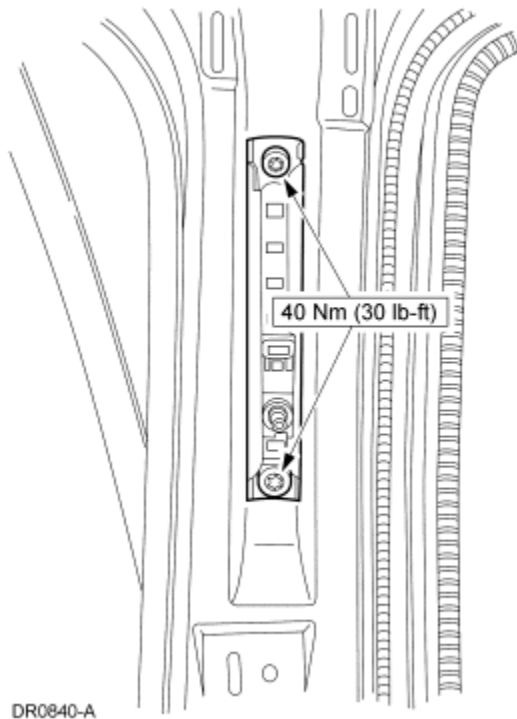
Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.


NOTE: Make sure to tighten nuts and bolts to specification.

Follow the removal procedure in reverse order.

- Check the restraint system for proper operation.

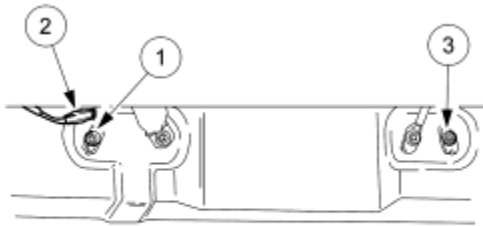


Safety Belt Buckle—Front, Bench Seat

Special Tool(s)	
 ST1442-A	Torx Bit Tool Set used for T-55 head bolt 501-D012 (D83L-2100-A)

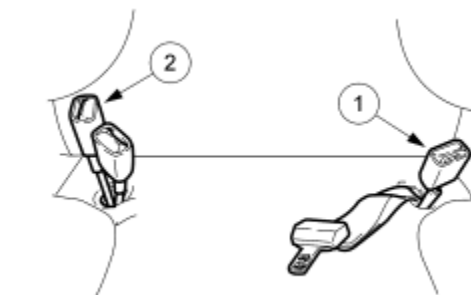
Removal

1. Remove the utility tray, if necessary.
2. Remove the safety belt buckle bolts.
 1. Use the T-55 Torx bit to remove the LH safety belt buckle bolt.
 2. Disconnect the safety belt warning indicator switch connector.
 3. Use the T-55 Torx bit to remove the RH safety belt buckle bolt.



DR0841-A

3. Remove the safety belt buckles.
 1. Remove the LH safety belt buckle.
 2. Remove the RH safety belt buckle.



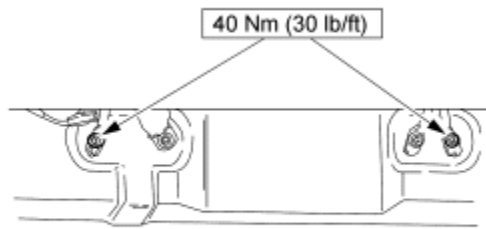
DR0842-A

Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

To install, reverse the removal procedure.



DR0843-A

2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

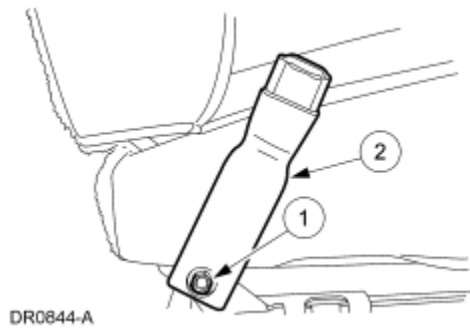
Safety Belt Buckle—Front, 40/20/40 Seat

Removal

1. Remove the driver passenger seat, as required; for additional information, refer to [Section 501-10](#).
2. **NOTE:** Driver side shown, passenger side similar.

Remove the safety belt buckle.

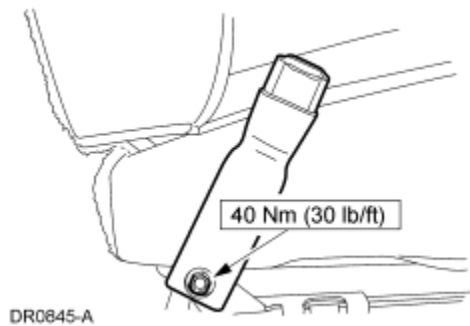
1. Remove the safety belt buckle nut.
2. Remove the safety belt buckle.



Installation

1. **NOTE:** Make sure to tighten nuts to specification.

To install, reverse the removal procedure.



2. Check the restraint system for correct operation.

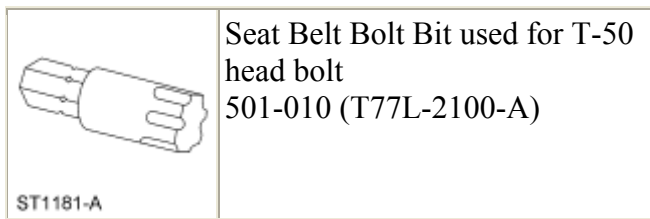
SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual

[Procedure revision date: 01/26/2000](#)

Safety Belt Buckle—Front Captain's Chair

Special Tool(s)



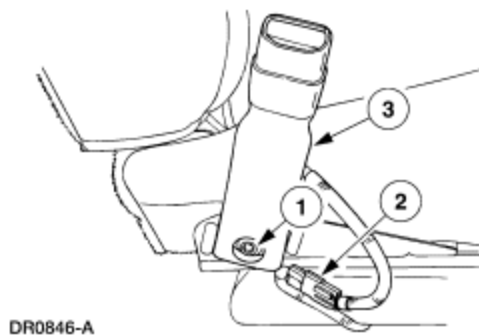
Removal

1. Remove the floor console.
2. **NOTE:** Driver side shown, passenger side similar.

NOTE: Passenger side safety belt buckle is not equipped with a safety belt warning indicator switch.

Remove the safety belt buckle.

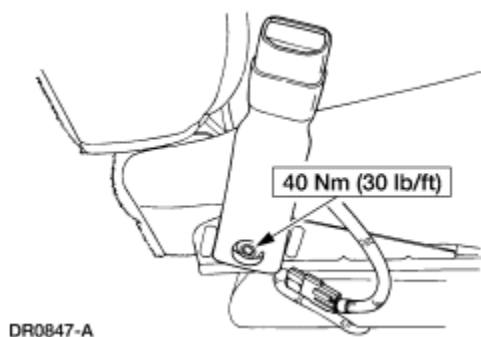
1. Use the Seat Belt Bolt Bit to remove the safety belt buckle bolt.
2. Disconnect the safety belt warning indicator switch connector.
3. Remove the safety belt buckle.



Installation

1. **NOTE:** Make sure to tighten bolts to specification.

To install, reverse the removal procedure.




2. Check the restraint system for correct operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

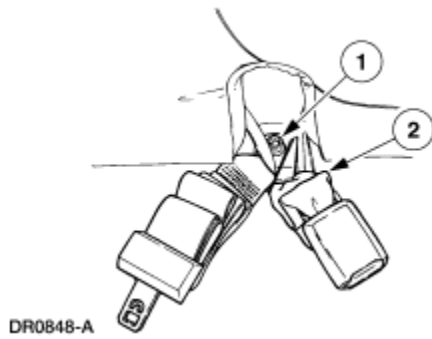
1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Safety Belt Buckle—Rear, SuperCab

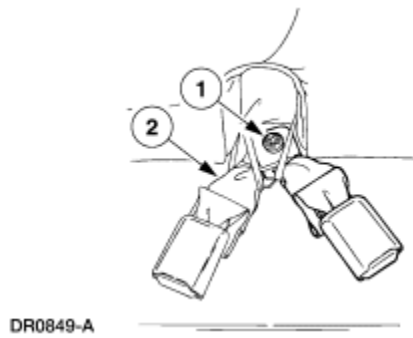
Special Tool(s)	
 ST1442-A	Torx Bit Tool Set D83L-2100-A (Used for T-55 Head Bolt)

Removal

1. Remove the LH safety belt buckle.
 1. Use the T-55 Torx bit to remove the LH safety belt buckle bolt.
 2. Remove the safety belt buckle.



2. Remove the RH safety belt buckle.
 1. Use the T-55 Torx bit to remove the RH safety belt buckle bolt.
 2. Remove the RH safety belt buckle.

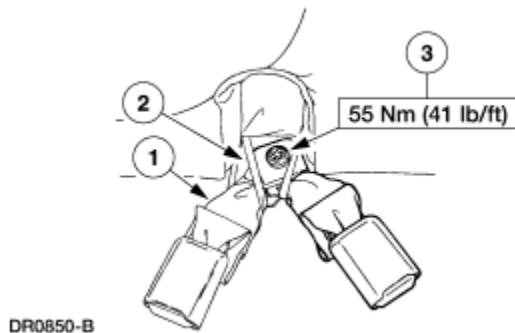


Installation

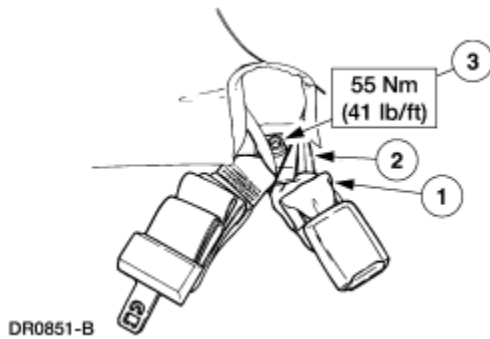
NOTE: Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

1. Install the RH safety belt buckle.
 1. Position the safety belt buckle.
 2. Make sure the RH safety belt buckle is positioned in the retaining strap.
 3. Use the T-55 Torx bit to install the RH safety belt buckle bolt.



2. Install the LH safety belt buckle.
 1. Position the LH safety belt buckle.
 2. Make sure the LH safety belt buckle is positioned in the retaining strap.
 3. Use the T-55 Torx bit to install the LH safety belt buckle bolt.




3. Check the restraint system for proper operation.

SECTION 501-20A: Occupant Restraints —
Active
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Safety Belt Buckle—Rear, Crew Cab

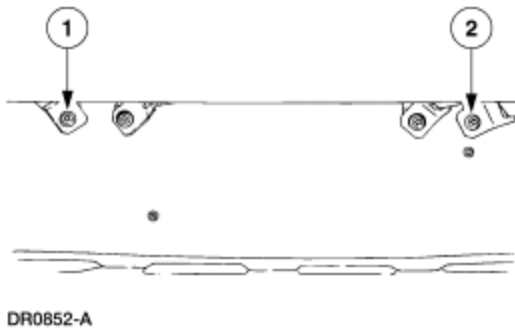
Special Tool(s)	
 <p>ST1442-A</p>	Torx Bit Tool Set used for T-55 head bolt
	501-D012 (D83L-2100-A)

Removal

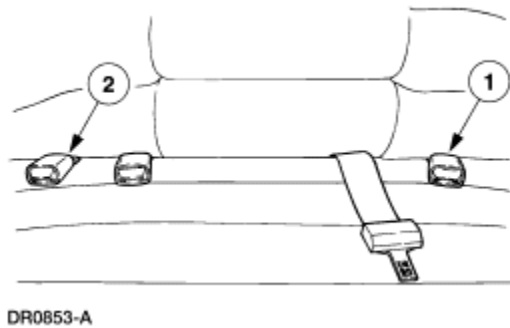
NOTE: Rear bench seat shown, rear captains chair is similar.

1. Remove the utility tray, if necessary.
2. Remove the safety belt buckles.
 1. Use the T-55 Torx bit to remove the LH safety belt buckle bolt.

2. Use the T-55 Torx bit to remove the RH safety belt buckle bolt.



3. Remove the safety belt buckles.
 1. Remove the LH safety belt buckle.
 2. Remove the RH safety belt buckle.

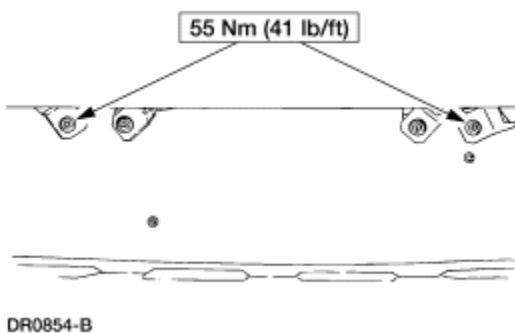


Installation

1. **NOTE:** Make sure the safety belt webbing is not twisted prior to installation.

NOTE: Make sure to tighten bolts to specification.

To install, reverse the removal procedure.



2. Check the restraint system for correct operation.

SECTION 501-20B:

Supplemental Restraint System

SPECIFICATIONS

DESCRIPTION AND OPERATION

[Air Bag Supplemental Restraint System \(SRS\)](#)

[Air Bag Module — Driver](#)

[Air Bag Sliding Contact](#)

[Air Bag Module — Passenger](#)

[Air Bag Electronic Crash Sensor \(ECS\) Module](#)

[Electrical System](#)

[Sensor](#)

DIAGNOSIS AND TESTING

[Air Bag Supplemental Restraint System \(SRS\)](#)

[Diagnosing Customer Concerns Without Hard Diagnostic Trouble Codes \(DTCs\)](#)

[Diagnosing Customer Concerns with Hard Diagnostic Trouble Codes \(DTCs\)](#)

[Deactivation Procedure](#)

[Reactivation Procedure](#)

[Glossary](#)

[Air Bag System Reconnect Checklist](#)

[Diagnostic Instructions—Air Bag Supplemental Restraint System \(SRS\)](#)

[Diagnostic Test Modes](#)

[Retrieve/Clear Continuous DTCs](#)

[On-Demand Self Test](#)

[PID/Data Monitor and Record](#)

[Active Command Modes](#)

[Inspection and Verification](#)

[Symptom Chart](#)

[Pinpoint Tests — Air Bag Supplemental Restraint System \(SRS\)](#)

[Pinpoint Test X: No Communication with the ECS Module](#)

GENERAL PROCEDURES

[Air Bag Disposal](#)

[Deployed Air Bag](#)

[Undeployed Air Bag — Inoperative](#)

[Undeployed Air Bag — Scrapped Vehicle](#)

REMOVAL AND INSTALLATION

[Module—Air Bag Electronic Crash Sensor \(ECS\)](#)

[Module—Driver Air Bag](#)

[Module—Passenger Air Bag](#)

[Air Bag Sliding Contact](#)

[Passenger Air Bag Deactivation \(PAD\) Switch](#)

SECTION 501-20B: Supplemental Restraint
System

1999 F-Super Duty 250-550 Workshop
Manual

SPECIFICATIONS

[Procedure revision date: 01/26/2000](#)

Torque Specifications			
Description	Nm	Lb/Ft	Lb/In
Air Bag Electronic Crash Sensor (ECS) Module Bolts	12	9	—
Driver Air Bag Module Bolts	11	—	98
Passenger Air Bag Module Bolts	9	—	80

SECTION 501-20B: Supplemental Restraint
System

1999 F-Super Duty 250-550 Workshop
Manual

DESCRIPTION AND OPERATION

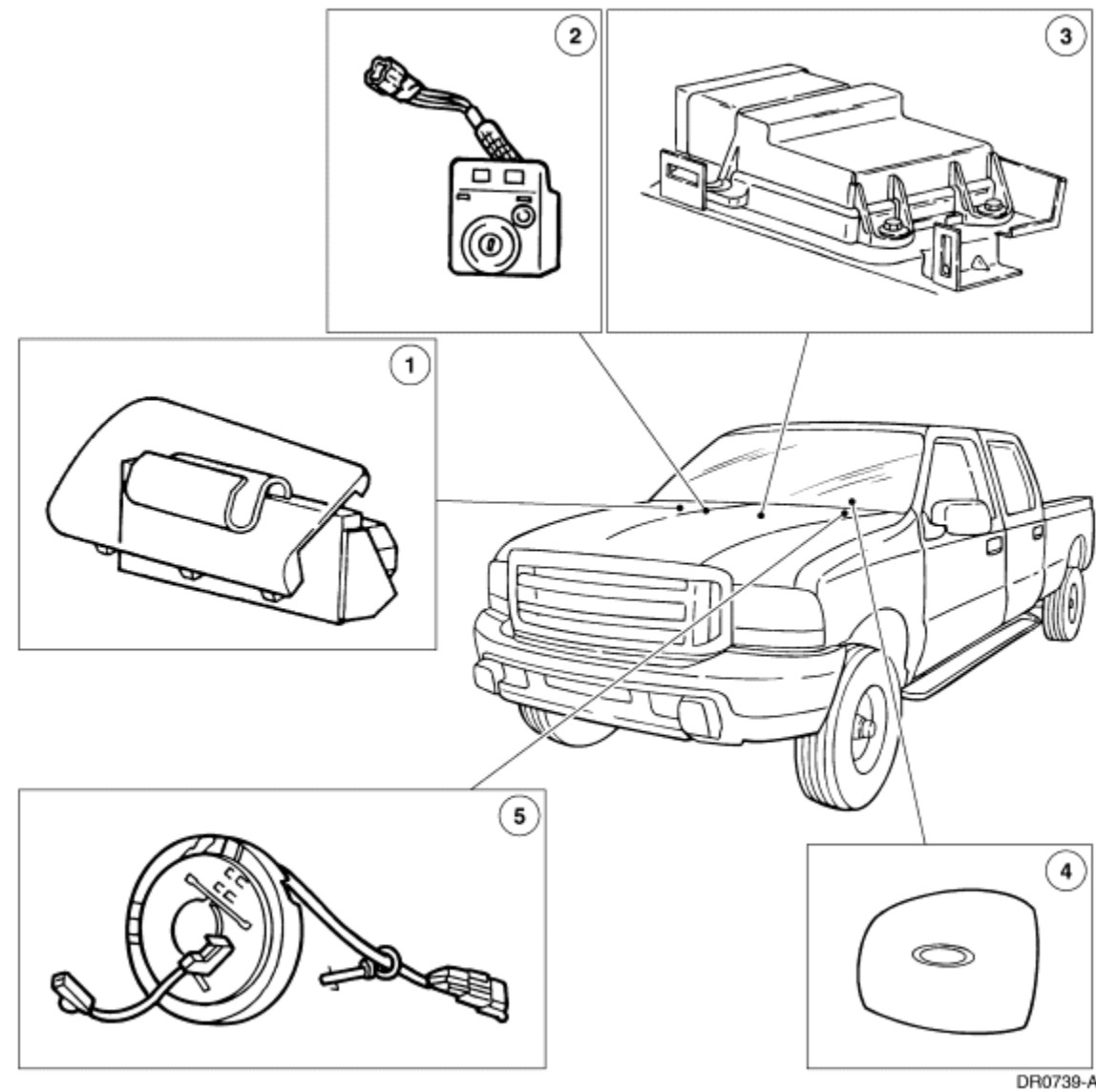
[Procedure revision date: 01/09/2003](#)

Air Bag Supplemental Restraint System (SRS)

The air bag supplemental restraint system (SRS) is designed to provide increased collision protection for front seat occupants in addition to that provided by the three-point safety belt system. Safety belt use is necessary to obtain the best occupant protection and to receive the full advantages of the SRS.

The air bag supplemental restraint system (SRS) components are shown in the following illustration.

Air Bag Supplemental Restraint System (SRS) Components



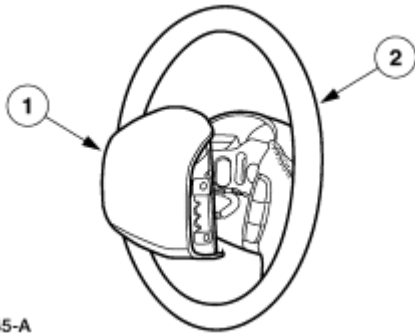
Item	Part Number	Description
1	044A74	Passenger Air Bag Module
2	14B268	Passenger Air Bag Deactivation (PAD) Switch
3	14B321	Air Bag Electronic Crash Sensor (ECS) Module
4	043B13	Driver Air Bag Module
5	14A664	Air Bag Sliding Contact

Air Bag Module — Driver

The driver air bag module:

- is replaced as an assembly.
- is mounted in the center of the steering wheel (3600).

Driver Air Bag Module



DR0945-A

Item	Part Number	Description
1	043B13	Driver Air Bag Module
2	3600	Steering Wheel

Air Bag Sliding Contact

The air bag sliding contact (14A664) :

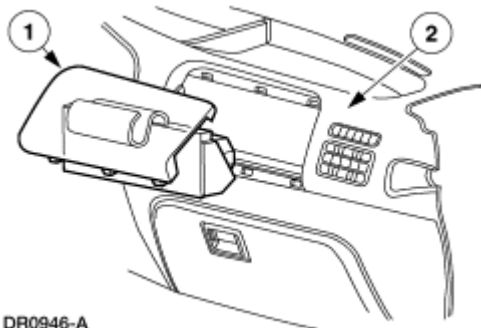
- is mounted on the steering column, behind the steering wheel.
- continuously transfers electrical signals from the driver air bag module to the air bag sensor.

Air Bag Module — Passenger

The passenger air bag module:

- is replaced as an assembly.
- is mounted in the RH side of the instrument panel (04320).

Passenger Air Bag Module



DR0946-A

Item	Part Number	Description
------	-------------	-------------

1	044A74	Passenger Air Bag Module
2	04320	Instrument Panel

Air Bag Electronic Crash Sensor (ECS) Module

NOTE: When a new ECS is first installed in the vehicle, module configuration must be carried out. If the ECS is incorrectly configured, erroneous DTC(s) will result.

The air bag electronic crash sensor (ECS) module performs the following functions:

- signals the inflators to deploy the air bags in the event of a deployable crash.
- monitors the air bag supplemental restraint system (SRS) for faults.
- illuminates the air bag indicator if a fault is detected.
- flashes the air bag indicator to indicate the lamp fault code (LFC) detected.
- communicates through the data link connector (DLC) the current and historical DTCs.
- signals the Generic Electronic Module (GEM) to activate a chime if the air bag indicator is not available and another SRS fault is present.

NOTE: The safing sensor is internal to the ECS and is not serviced separately.

The ECS monitors the SRS for possible faults. If a fault is detected while the ignition switch is in the RUN position, the ECS will illuminate the air bag indicator located in the instrument cluster (10849). When the ignition is cycled (turned off and then turned on), the air bag indicator will flash the two-digit lamp fault code (LFC). The air bag indicator will flash the LFC five times, then it will remain illuminated for the rest of the key cycle. The ECS will also communicate the current and historical DTCs through the data link connector (DLC), using the New Generation STAR (NGS) Tester. If the air bag indicator does not function, and the system detects a fault condition, the ECS will signal the GEM to activate an audible chime. The chime is a series of five sets of five tone bursts. If the chime or buzzer is heard, the SRS and the air bag indicator requires service.

Lamp fault codes are prioritized. If two or more faults occur at the same time, the fault having the highest priority will be displayed first. After that fault has been corrected, the next highest priority fault will be displayed.

The ECS includes an internal backup power supply. This feature provides sufficient backup power to deploy the air bags in the event the battery or battery cables are damaged in a collision before the safing and air bag sensors close. The backup power supply will deplete its stored energy approximately 1 minute after the battery ground cable is disconnected.

The ECS also employs a "keep-alive" period that allows the module to remain powered and active for approximately six minutes after switching the ignition key from the RUN position to the OFF position. During this period, the module is performing backup power supply regulation and crash discrimination while being completely capable of all deployment functions.

Electrical System

The electrical system that supports the air bag supplemental restraint system (SRS):

- is powered from the battery (10655) and the ignition.
- provides the electrical path from the ECS to the air bag modules.
- provides the electrical path from the ECS to the air bag indicator and data link connector (DLC).
- provides the electrical path from the ECS to the Generic Electronic Module (GEM).

Sensor



WARNING: The ECS module must be replaced if the air bag modules have deployed.



WARNING: The ECS orientation is critical for proper system operation. If a vehicle equipped with an SRS system has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the ECS must be replaced whether or not the air bag modules have deployed. In addition, make sure the area of the sensor mounting is restored to its original condition.

The SRS contains two sensors which are contained in the ECS. The ECS is mounted on the center tunnel under the instrument panel.

SECTION 501-20B: Supplemental Restraint
System

1999 F-Super Duty 250-550 Workshop
Manual

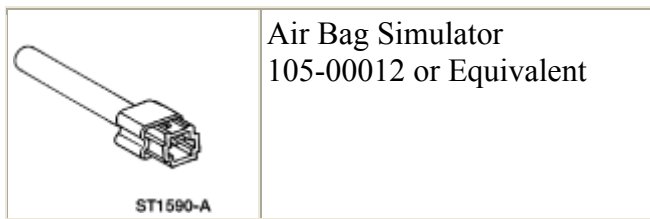
DIAGNOSIS AND TESTING

[Procedure revision date: 01/26/2000](#)

Air Bag Supplemental Restraint System (SRS)

Refer to Wiring Diagrams Cell 46 ([F-53 Motorhome Chassis](#), [F-Super Duty 250-550](#)), Air Bag for schematic and connector information.

Special Tool(s)



Diagnosing Customer Concerns Without Hard Diagnostic Trouble Codes (DTCs)

NOTE: The supplemental restraint system (SRS) utilizes shorting bars in the electrical system, located in some components and connectors. Do not remove or defeat the shorting bars when diagnosing or servicing the SRS.

If a lamp fault code (LFC) is reported by the customer but is not present when the vehicle comes in for repair, follow the Diagnostic Instructions procedure in this section to identify the intermittent DTC.

Once the DTC is known, read the Normal Operation section for the code involved.

- Follow the deactivation procedure in this section.
- Determine the location of components involved in creating that code.
- Perform a thorough visual inspection of:
 - components.
 - connectors.
 - splices and wiring harnesses.
 - pinched wires.
 - worn insulation on conductors.
 - opens, shorts or loosely mounted sensors.

Refer to Possible Causes, which lists the common concerns that relate to a particular code. Concerns are listed according to priority.

Diagnosing Customer Concerns with Hard Diagnostic Trouble Codes (DTCs)


NOTE: The supplemental restraint system (SRS) utilizes shorting bars in the electrical system, located in some components and connectors. Do not remove or defeat the shorting bars when diagnosing or servicing the SRS.

Most air bag supplemental restraint system (SRS) diagnostic procedures will require the use of the deactivation and reactivation procedures in this section. These procedures require the removal of the driver air bag module and disconnection of the passenger air bag module, thereby removing the risk of air bag deployment while diagnostics are performed.


Air bag simulators are required to perform diagnosis and testing of the SRS. The air bag simulator is a 2-ohm resistor used to simulate air bag module connections to the system. It is not acceptable to

short-circuit the air bag module connections with a zero-ohm jumper wire. If a zero-ohm jumper wire is used to short-circuit the air bag module connections, a lamp fault code (LFC) will be displayed.

Deactivation Procedure

1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if so equipped).

Disconnect the battery ground cable (14301); refer to [Section 414-01](#).


2. Wait one minute for the backup power supply in the air bag electronic crash sensor (ECS) module to deplete its stored energy.
3.  **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down.


Remove the driver air bag module from the vehicle; refer to [Module—Driver Air Bag](#) this section.

4. Connect an air bag simulator to the vehicle harness at the top of the steering column.
5. Disconnect the passenger air bag module electrical connector.
6. Connect an air bag simulator to the vehicle harness.
7. Reconnect the battery ground cable; refer to [Section 414-01](#).

Reactivation Procedure

1.  **WARNING:** The air bag simulators must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

Disconnect the battery ground cable; refer to [Section 414-01](#).

2. Wait one minute for the backup power supply in the air bag electronic crash sensor (ECS) module to deplete its stored energy.
3. Remove the air bag simulator from the vehicle harness connector at the top of the steering column.
4.  **WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.**

Install the driver air bag module; refer to [Module—Driver Air Bag](#) this section.

5. Remove the air bag simulator from the vehicle harness connector at the passenger air bag module.
6. Connect the passenger air bag module electrical connector.
7. Reconnect the battery ground cable; refer to [Section 414-01](#).
8. Prove out the system.

Glossary

Air Bag Simulator

Air bag simulators are used to simulate air bag module connections to the system.

Disconnect the Component

Disconnect the component means disconnect the component vehicle harness connector. It does not mean remove the component. Do not reconnect a disconnected component unless instructed to do so.

Deactivate the System

Deactivate the system means to perform the deactivation procedure; refer to Deactivation Procedure in this section.

Prove Out the System

Prove out the system means to turn the ignition switch from the OFF to the RUN position and visually monitor the air bag indicator with the air bag modules installed. The air bag indicator and the passenger air bag deactivation (PAD) switch will light continuously for approximately six seconds and then turn off. If an air bag supplemental restraint system (SRS) fault is present, the air bag indicator will either:

- fail to light.

- remain lit continuously.
- flash.

The flashing might not occur until approximately 30 seconds after the ignition switch has been turned from the OFF to the RUN position. This is the time required for the air bag electronic crash sensor (ECS) module to complete the testing of the SRS. If the air bag indicator is inoperative and an SRS fault exists, a chime will sound in a pattern of five sets of five beeps. If this occurs, the air bag indicator will need to be repaired before diagnosis can continue.

Reactivate the System

Reactivate the system means to perform the reactivation procedure; refer to Reactivation Procedure in this section.

Reconnect the System

Reconnect the system means to reconnect all system components; refer to Air Bag System Reconnect Checklist in this section.

Replace the Component

Replace the component means to remove the existing component and replace it with an authorized replacement part obtained from Ford Customer Service Division.

Verify the System


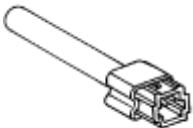

Verify the system means to prove out the system with air bag simulators for the air bag modules in place of the components.

Air Bag System Reconnect Checklist

The checklist below should be completed following diagnosis or repair of any air bag system concern:

1. Is the three-way connector at the base of the steering column connected?
 2. Are the air bag modules connected?
 3. Is the air bag electronic crash sensor (ECS) module connected?
 4. Is the vehicle battery connected?
-

Pinpoint Tests — Air Bag Supplemental Restraint System (SRS)

Special Tool(s)	
 ST1137-A	73 Digital Multimeter 105-R0051 or Equivalent
 ST1590-A	Air Bag Simulator 105-00012 or Equivalent
 ST1217-A	New Generation Star (NGS) Tester 418-F048 (007-00500) or Equivalent

Pinpoint Test A: Air Bag Indicator Illuminated Continuously — ECS Module Disconnected or Inoperative

Normal Operation

NOTE: During normal operation the air bag indicator will be lit continuously for 6 seconds after the ignition switch is placed in the RUN position and after five cycles of a lamp fault code (LFC) if a fault exists. Be sure to cycle the ignition switch and look for a 6 second indicator prove-out without LFCs.






The air bag electronic crash sensor (ECS) module will communicate diagnostic trouble codes (DTCs) through the New Generation Star (NGS) Tester using the data link connector (DLC). If the NGS Tester displays NO COMMUNICATION when retrieving continuous DTCs, use this pinpoint test to troubleshoot the system.


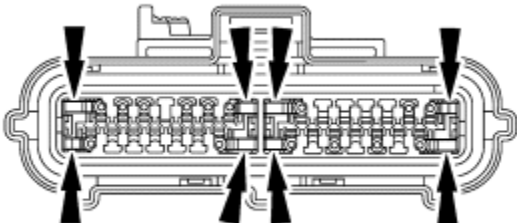
Possible Causes



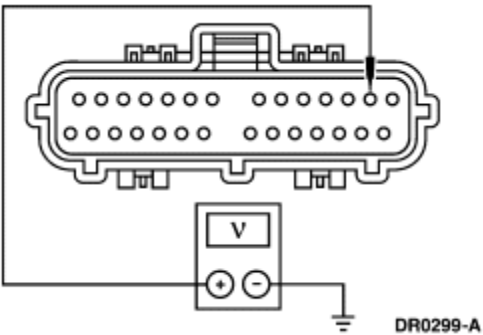
An air bag indicator that is illuminated continuously could be caused by one of the following:

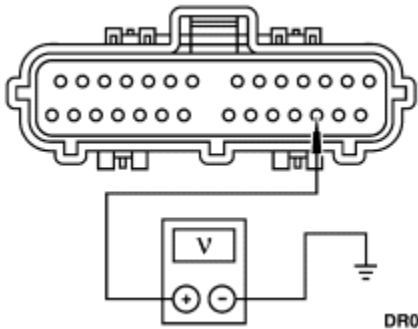
- the battery or ignition circuit damaged
- the ECS module disconnected from the vehicle harness
- a loss of ECS module ground circuits
- the ECS module inoperative
- the NGS Tester damaged

PINPOINT TEST A: AIR BAG INDICATOR ILLUMINATED CONTINUOUSLY — ECS MODULE DISCONNECTED OR INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  <p>NGS Tester</p>	
<div>3</div> 	
<div>4</div>  <p>Retrieve/Clear Continuous DTCs</p>	<div>4</div> Retrieve and record any continuous DTCs.
<div>5</div>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Were any continuous or on-demand self test DTCs retrieved? <p>→ Yes</p>

	<p>If continuous DTCs were retrieved, GO to A3 . If on-demand DTCs were retrieved, GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No GO to A2.</p>
A2 VERIFY THE OPERATION OF THE NGS TESTER	
	<p>1 Verify that the NGS tester is firmly connected to the data link connector (DLC).</p>
	<ul style="list-style-type: none"> Can other system information be accessed through the NGS Tester? <p>→ Yes GO to A3.</p> <p>→ No GO to Pinpoint Test X.</p>
A3 CHECK THE ECS HARNESS CONNECTION	
<p>1</p> 	
	<p>2 Deactivate the system.</p>
<p>3</p>  <p>DR0740-A</p>	<p>3 Make sure the shorting bars in the ECS connector are in good condition and in their proper position.</p>
	<p>4 Make sure the ECS is fully connected to the vehicle harness with the red clip inserted.</p>
	<ul style="list-style-type: none"> Is the ECS connected properly and the

	<p>shorting bars in good condition?</p> <p>→ Yes GO to A4.</p> <p>→ No REPAIR any shorting bar concerns and connect the ECS to the vehicle harness properly. GO to A8 .</p>
A4 CHECK THE ECS IGNITION CIRCUIT CONNECTION	
<p>1</p>  <p>ECS C223</p>	
<p>2</p> 	
<p>3</p> 	<p>3 Measure the voltage between Pin C223-2, Circuit 298 (P/O) and a sheet metal ground near the ECS module.</p>
	<p>• Is the voltage 9.0-16.0 volts?</p> <p>→ Yes GO to A5.</p> <p>→ No REPAIR Circuit 298 (P/O). CHECK the instrument panel Fuse 22 (7.5 A). GO to A8 .</p>
A5 CHECK CIRCUIT 937 (R/W)	
<p>1</p>	<p>1 Measure the voltage between Pin C223-17, Circuit 937 (R/W) and a sheet metal ground near the ECS module.</p>



- Is the voltage 8.0-18.0 volts?

→ **Yes**
GO to [A6](#).

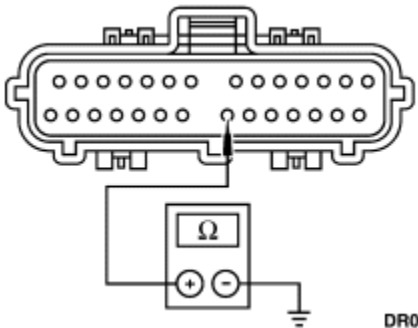
→ **No**
REPAIR Circuit 937 (R/W). CHECK the power distribution box mini Fuse 2 (10 A). GO to [A8](#).

A6 CHECK THE LAMP DRIVER GROUND CIRCUIT 649 (BK/O)

1



2



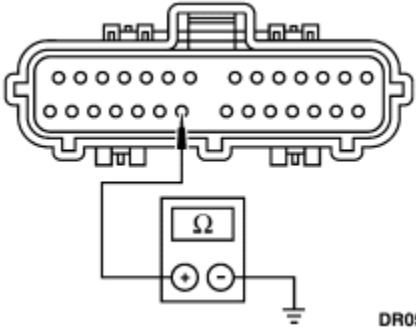
2 Measure the resistance between Pin C223-21, Circuit 649 (BK/O) and a sheet metal ground near the ECS module.

- Is the resistance less than 10 ohms?

→ **Yes**
GO to [A7](#).

→ **No**
REPAIR the open in Circuit 649 (BK/O). GO to [A8](#).

A7 CHECK THE ECS MODULE GROUND CIRCUIT 649 (BK/O)

<p>1</p>  <p>DR0515-B</p>	<p>1 Measure the resistance between Pin C223-22, Circuit 649 (BK/O) and a sheet metal ground near the ECS module.</p>
	<ul style="list-style-type: none"> • Is the resistance less than 10 ohms? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to A8 .</p> <p>→ No REPAIR the open in Circuit 649 (BK/O). GO to A8 .</p>
<p>A8 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step A1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step A1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test B: LFC 24/DTC B1342 — ECS Module is Faulted

Normal Operation

The air bag electronic crash sensor (ECS) module monitors the backup power supply, accelerometer operation and memory. If the ECS detects a fault in any of these components, it will store a






diagnostic trouble code (DTC) B1342 in memory and flash a lamp fault code (LFC) 24 on the air bag indicator.

Possible Causes

An ECS module fault could be caused by:

- the internal accelerometer not operating properly.
- the backup power supply not operating properly.
- an internal module circuit fault detected.
- a microcontroller RAM/ROM/EEPROM fault.

PINPOINT TEST B: LFC 24/DTC B1342 — ECS MODULE IS FAULTED

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  On-Demand Self Test	

	<ul style="list-style-type: none"> • Was DTC B1342 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. INSTALL and CONFIGURE a new ECS module. GO to B2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. INSTALL and CONFIGURE a new ECS module. GO to B2 .</p>
B2 CHECK FOR ADDITIONAL DTCs	
	<div>1</div> <p>Refer to the continuous DTCs recorded during Step B1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step B1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No CLEAR all DTCs.</p>

Pinpoint Test C: LFC 19/DTC B1231 — Crash Data Memory Full

Normal Operation



WARNING: The electronic crash sensor (ECS) module orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the ECS module should be replaced. In addition, make sure the area of the ECS module mounting is restored to its original condition.



WARNING: The ECS module must be replaced if the air bag modules have deployed.



WARNING: Clearing DTC B1231 will potentially remove all records of the crash event.






When the air bags are deployed during a collision, the air bag electronic crash sensor (ECS) module will flash a lamp fault code (LFC) 19 on the air bag indicator and store a diagnostic trouble code

(DTC) B1231 in memory. The LFC 19 and DTC B1231 indicate that a crash has been recorded by the ECS.

Possible Causes

Crash data memory full is caused by a crash event that deployed the air bags.

PINPOINT TEST C: LFC 19/DTC B1231 — CRASH DATA MEMORY FULL

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  On-Demand Self Test	
	<ul style="list-style-type: none">Was DTC B1231 retrieved during the on-demand self test?

	<p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. REPLACE the driver air bag module and passenger air bag module. GO to C2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to C3 .</p>
C2 CHECK THE CONDITION OF THE ECS MOUNTING BRACKET	
	<p>1 Inspect the ECS mounting bracket for damage.</p>
	<p>• Is there any damage to the ECS mounting bracket?</p> <p>→ Yes RESTORE sheet metal to its original shape and structural integrity. INSTALL and CONFIGURE a new ECS module and the mounting bracket. GO to C3 .</p> <p>→ No INSTALL and CONFIGURE a new ECS module. GO to C3 .</p>
C3 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step C1.</p>
	<p>• Were any continuous DTCs retrieved during Step C1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No CLEAR all DTCs.</p>

Pinpoint Test D: LFC 21/DTC B1921 — Ground Resistance Too High or the ECS Module Not Mounted to the Vehicle Properly

Normal Operation



WARNING: The tightening torque of the air bag electronic crash sensor (ECS) module retaining bolts is critical for proper air bag supplemental restraint system (SRS) operation.

Refer to module — air bag electronic crash sensor (ECS) in this section for proper torque values.





The air bag electronic crash sensor (ECS) module monitors the resistance between the ground connections at its housing and the reference ground at Pins 21 and 22. If the ECS detects a resistance greater than 100 ohms, it will store a diagnostic trouble code (DTC) B1921 in memory and flash a lamp fault code (LFC) 21 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

High resistance between the ECS module housing ground and pin ground could be caused by:

- improper seating of the ECS module retaining bolts.
- improper tightening torque of the ECS module retaining bolts.
- high resistance on both ECS logic ground circuits 649 (BK/O).

PINPOINT TEST D: LFC 21/DTC B1921 — GROUND RESISTANCE TOO HIGH OR THE ECS MODULE NOT MOUNTED TO THE VEHICLE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>	



On-Demand Self Test

- **Was DTC B1921 retrieved during the on-demand self test?**

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [D2](#) .

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [D9](#) .

D2 CHECK THE MOUNTING OF THE ECS

1



2 Inspect the ECS mounting.

- **Are the three ECS retaining bolts fully seated and tightened properly?**

→ **Yes**

GO to [D3](#).

→ **No**

Make sure the three retaining screws are fully seated and properly tightened. GO to [D10](#) .


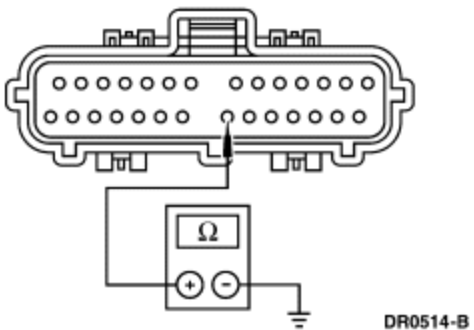
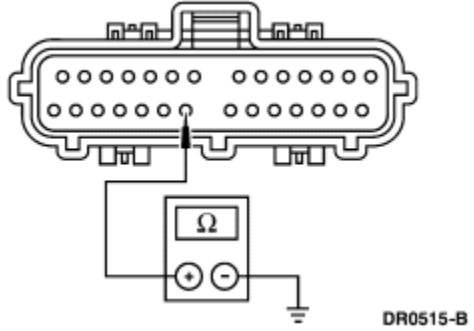
D3 CHECK THE MOUNTING OF THE ECS BRACKET AND MOUNTING SURFACE

1 Inspect the ECS bracket and mounting surface.

- **Is the ECS bracket attached to the mounting surface properly?**

→ **Yes**

	<p>GO to D4.</p> <p>→ No Make sure the bracket is clean and reattach the ECS and bracket to the mounting surface. GO to D10 .</p>
D4 CHECK THE ECS HARNESS CONNECTION	
	<p>1 Check the ECS harness connection.</p>
	<ul style="list-style-type: none"> Is the ECS connector C223 connected to the ECS module properly with the red clip inserted? <p>→ Yes GO to D5.</p> <p>→ No ATTACH the ECS connector C223 properly and MAKE SURE the red clip is inserted. GO to D10 .</p>
D5 CHECK THE VEHICLE CHASSIS GROUND	
	<p>1 Measure the resistance between a known good chassis ground and the mounting surface of the ECS module.</p>
	<ul style="list-style-type: none"> Is the resistance greater than 100 ohms? <p>→ Yes REPAIR the chassis grounding system.</p> <p>→ No GO to D6.</p>
D6 CHECK THE CONDITION OF THE ECS AND BRACKET INTERFACE	
	<p>1 Deactivate the system.</p>
	<p>2 Remove the ECS module. Visually inspect the ECS and mounting bracket and its mounting surface for corrosion and dirt.</p>
	<ul style="list-style-type: none"> Was a significant amount of corrosion or dirt found? <p>→ Yes</p>

	<p>CLEAN the mounting surface. INSTALL the ECS and mounting bracket. GO to D10 .</p> <p>→ No INSTALL the ECS and mounting bracket. GO to D7 .</p>
D7 CHECK THE ECS CONNECTOR PIN GROUND RESISTANCE	
<p>1</p>  <p>ECS C223</p>	
<p>2</p> 	<p>2 Measure the resistance between Pin C223-21, Circuit 649 (BK/O) and chassis ground.</p>
<p>3</p> 	<p>3 Measure the resistance between Pin C223-22, Circuit 649 (BK/O) and chassis ground.</p>
	<p>• Is the resistance greater than 100 ohms?</p> <p>→ Yes REPAIR Circuit 649 (BK/O). GO to D10 .</p> <p>→ No GO to D8.</p>
D8 CHECK FOR A HARD FAULT	
	<p>1 Refer to the continuous DTCs recorded during</p>

	Step D1 .
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step D1 a hard fault? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to D10 .</p> <p>→ No GO to D9.</p>
D9 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step D1.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step D1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent high-resistance on Circuit 649 (BK/O). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to D10 .</p> <p>→ No GO to D10.</p>
D10 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step D1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step D1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p>

	→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.
--	---

Pinpoint Test E: LFC 12/DTC B1318 — Low Battery Voltage

Normal Operation





The air bag electronic crash sensor (ECS) module checks for proper ignition voltage by monitoring the voltage of Circuit 298 (P/O) at Pin 2. If the ECS detects an ignition voltage below 9.0 volts on this pin, it will store a diagnostic trouble code (DTC) B1318 in memory and flash a lamp fault code (LFC) 12 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

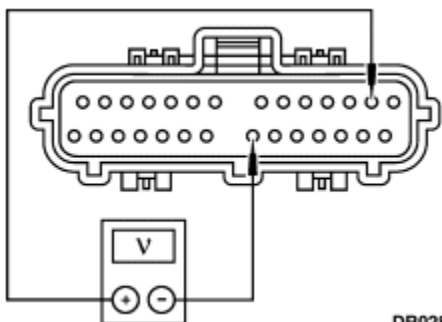
Voltage out of range at the ECS could be caused by:

- an open in the ignition circuit that would prevent battery positive voltage (B+) from reaching the ECS Pin 2.
- a short to ground on the ignition feed circuit.
- a concern in the charging system causing battery voltage to drop below 9.0 volts.

PINPOINT TEST E: LFC 12/DTC B1318 — LOW BATTERY VOLTAGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div> 	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.

Retrieve/Clear Continuous DTCs	
<div> </div>	
On-Demand Self Test	
	<ul style="list-style-type: none"> • Was DTC B1318 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to E2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to E3 .</p>
E2 CHECK THE ECS CIRCUIT	
<div> </div>	
	<div> <p>2 Deactivate the system.</p> </div>
<div> </div> <p>ECS C223</p>	
<div> </div>	
<div> <p>5</p> </div>	<div> <p>5 Measure the voltage between Pin C223-2, Circuit 298 (P/O) and Pin C223-21, Circuit 649 (BK/O).</p> </div>



DR0281-B

- **Is the voltage greater than 9.0 volts?**

→ **Yes**

REPLACE the ECS module. GO to [E4](#).

→ **No**

GO to [Section 414-00](#) and PERFORM charging system diagnostics. If the charging system is OK, INSPECT all crimps, terminals, fuses, wires and connectors in Circuit 298 (P/O) feeding the ECS module Pin 2. CHECK for pinched wires and damaged connector pin terminals. REPAIR as necessary. GO to [E4](#).

E3 CHECK FOR AN INTERMITTENT FAULT

1 NOTE: An intermittent charging concern can lead to a DTC B1318.

Refer to the continuous DTCs recorded during Step **E1**.

- **Was the DTC retrieved during Step E1 an intermittent fault?**

→ **Yes**

GO to [Section 414-00](#) and PERFORM charging system diagnostics. If the charging system is OK, CHECK for causes of intermittent battery out of range on Circuit 298 (P/O). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [E4](#).

→ **No**

GO to [E4](#).

E4 CHECK FOR ADDITIONAL DTCs	
	1 Refer to the continuous DTCs recorded during Step E1 .
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step E1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test F: LFC 29/DTC C1414 — Incorrect Module Design Level

Normal Operation


The air bag electronic crash sensor (ECS) module monitors the voltage at Pins 10, 11 and 12 to determine if it is installed on the correct vehicle. If the ECS detects an incorrect condition on any of these pins, it will store a diagnostic trouble code (DTC) C1414 in memory and flash a lamp fault code (LFC) 29 (or higher priority code if one exists) on the air bag indicator.






Possible Causes

An incorrect module design level code could be caused by:

- an ECS module installed on the wrong vehicle.
- a short to ground, short to battery or open circuit in the wiring harness.

PINPOINT TEST F: LFC 29/DTC C1414 — INCORRECT MODULE DESIGN LEVEL

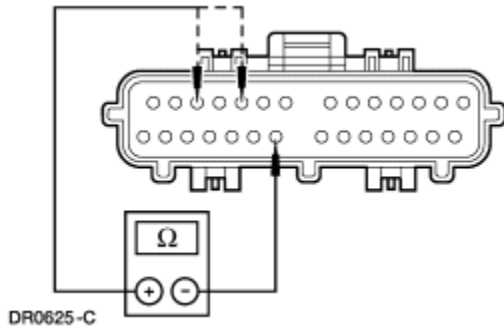
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK FOR A HARD OR INTERMITTENT DTC	
1 	
2	

 <p>NGS Tester</p>	
<p>3</p> 	
<p>4</p>  <p>Retrieve/Clear Continuous DTCs</p>	<p>4 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>
<p>5</p>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> Was DTC C1414 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to F2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to F4 .</p>
<p>F2 CHECK THE VEHICLE IDENTIFICATION PINS 1 AND 3</p>	
<p>NOTE: For this vehicle application, Pins C223-10, -12, Circuit 649 (BK/O) should be connected to ground.</p>	
<p>1</p> 	
	<p>2 Deactivate the system.</p>
<p>3</p>	



ECS C223

4



4 Measure the resistance of Circuit 649 (BK/LG) between Pins C223-10, -12.

- Is the resistance greater than 100 ohms?

→ **Yes**
REPAIR Circuit 649 (BK/LG). GO to [F5](#) .

→ **No**
GO to [F3](#).

F3 CHECK THE VEHICLE IDENTIFICATION PIN NO. 2

NOTE: For this vehicle application, Pin C223-11 should be open circuited.

1 Make sure Pin C223-11 of the ECS connector slot is empty and that no connection would be made when mated to the ECS module.

- Is Pin C223-11 of the ECS connector slot empty?

→ **Yes**
INSTALL and CONFIGURE a new ECS. TEST the system for normal operation. GO to [F5](#) .

→ **No**
REPAIR any concern found at Pin 223-11 of the ECS connector slot. GO to [F5](#) .

F4 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step **F1**.

	<ul style="list-style-type: none"> • Was the DTC retrieved during Step F1 an intermittent fault? <p>→ Yes CHECK for causes of an intermittent open on Pins C223-10, -12, Circuit 649 (BK/O). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to F5.</p> <p>→ No GO to F5.</p>
F5 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step F1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step F1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test G: LFC 15/DTC B1887 — Driver Air Bag Circuit Short to Ground

Normal Operation






The air bag electronic crash sensor (ECS) module checks for driver air bag circuit shorts to ground by monitoring the voltage of Circuits 614 (GY/O) and 615 (GY/W) at Pins 1 and 15. If the ECS detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1887 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver air bag circuit short to ground could be caused by:




- a short to ground on Circuit 614 (GY/O).
- a short to ground on Circuit 615 (GY/W).
- a short to ground on the air bag sliding contact (14A664).
- a short to ground on the driver air bag module.

PINPOINT TEST G: LFC 15/DTC B1887 — DRIVER AIR BAG CIRCUIT SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  <p>NGS Tester</p>	
<div>3</div> 	
<div>4</div>  <p>Retrieve/Clear Continuous DTCs</p>	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1887 retrieved during the on-demand self test?

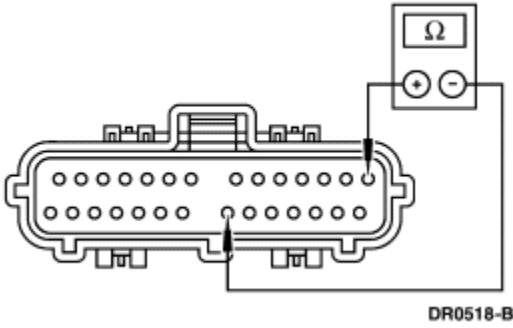


	<p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to G2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to G5 .</p>
--	--

G2 CHECK THE DRIVER AIR BAG

<p>1</p> 	
	<p>2 Deactivate the system.</p>
<p>3</p> 	
<p>4</p>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> Was the DTC B1887 retrieved? <p>→ Yes GO to G3.</p> <p>→ No INSTALL a new driver air bag module. GO to G6 .</p>

G3 CHECK THE DRIVER AIR BAG CIRCUIT

<p>1</p> 	
<p>2</p> 	

ECS C223	
<div>3</div>  <p>DR0518-B</p>	<div>3</div> <p>NOTE: Do not separate or remove the shorting bars from the ECS connector C223.</p> <p>Measure the resistance between Pin C223-1, Circuit 614 (GY/O) and Pin C223-21, Circuit 649 (BK/O).</p>
	<ul style="list-style-type: none"> • Is the resistance less than 10,000 ohms? <p>→ Yes GO to G4.</p> <p>→ No INSTALL and CONFIGURE a new ECS module. GO to G6 .</p>
G4 CHECK THE DRIVER AIR BAG WIRING AND THE AIR BAG SLIDING CONTACT	
<div>1</div>  <p>Driver Air Bag Module C255</p>	
<div>2</div>  <p>Air Bag Sliding Contact C238</p>	
	<div>3</div> <p>Inspect all crimps, terminals, wires and connectors in Circuit 614 (GY/O) feeding the ECS module Pin 1, Circuit 615 (GY/W) feeding the ECS module Pin 15, the air bag sliding contact assembly and the air bag sliding contact connector C238. Check for pinched wires and damaged connector pin terminals.</p>

	<ul style="list-style-type: none"> • Was any damage found? <p>→ Yes REPAIR as necessary. GO to G6 .</p> <p>→ No GO to G6.</p>
G5 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step G1.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step G1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to ground on Circuit 614 (GY/O), Circuit 615 (GY/W) and the air bag sliding contact assembly. Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to G6 .</p> <p>→ No GO to G6.</p>
G6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step G1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step G1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test H: LFC 15/DTC B1916 — Driver Air Bag Circuit Short to Battery or Ignition

Normal Operation





The air bag electronic crash sensor (ECS) module checks for driver air bag circuit shorts to battery or ignition by monitoring the voltage of Circuit 614 (GY/O) and 615 (GY/W) at Pins 1 and 15. If the ECS detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1916 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes





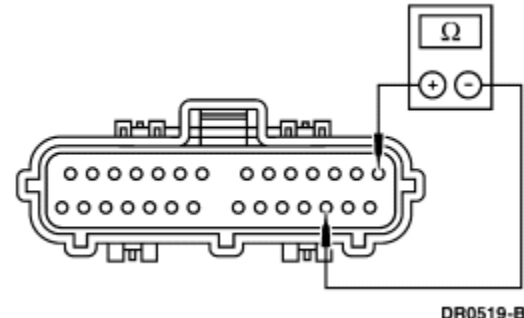
A driver air bag circuit short to battery or ignition could be caused by:

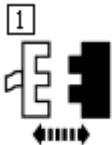
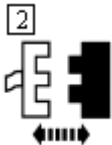
- a short to battery or ignition on Circuit 614 (GY/O).
- a short to battery or ignition on Circuit 615 (GY/W).
- a short to battery or ignition on the air bag sliding contact.
- a short to battery or ignition on the driver air bag module.

PINPOINT TEST H: LFC 15/DTC B1916 — DRIVER AIR BAG CIRCUIT SHORT TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.

<div> </div> <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1916 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to H2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to H5 .</p>
H2 CHECK THE DRIVER AIR BAG	
<div> </div>	
	<div> <p>2 Deactivate the system.</p> </div>
<div> </div>	
<div> </div> <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1916 retrieved? <p>→ Yes GO to H3.</p> <p>→ No</p>

	INSTALL a new driver air bag module. GO to H6 .
H3 CHECK THE DRIVER AIR BAG CIRCUIT	
<div>1</div> 	
<div>2</div>  <p>Battery</p>	
<div>3</div>  <p>ECS C223</p>	
<div>4</div> 	
<div>5</div>  <p>DR0519-B</p>	<div>5</div> <p>NOTE: Do not separate or remove the shorting bars from the ECS connector C223.</p> <p>Measure the resistance between Pin C223-1, Circuit 614 (GY/O) and Pin C223-17, Circuit 937 (R/W).</p>
	<ul style="list-style-type: none"> Is the resistance less than 10,000 ohms? <p>→ Yes GO to H4.</p> <p>→ No INSTALL and CONFIGURE a new ECS module. GO to H6 .</p>
H4 CHECK THE DRIVER AIR BAG WIRING AND THE AIR BAG SLIDING CONTACT	

 <p>Driver Air Bag Module C255</p>	
 <p>Air Bag Sliding Contact C238</p>	
	<p>③ Inspect all crimps, terminals, wires and connectors in Circuit 614 (GY/O) feeding the ECS module Pin 1, Circuit 615 (GY/W) feeding the ECS module Pin 15, the air bag sliding contact assembly and the air bag sliding contact connector C238. Check for pinched wires and damaged connector pin terminals.</p>
	<ul style="list-style-type: none"> • Was any damage found? <p>→ Yes REPAIR as necessary. GO to H6 .</p> <p>→ No GO to H6.</p>
H5 CHECK FOR AN INTERMITTENT FAULT	
	<p>① Refer to the continuous DTCs recorded during Step H1.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step H1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to battery or ignition on Circuit 614 (GY/O), Circuit 615 (GY/W) and the air bag sliding contact assembly. Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to H6 .</p>

	→ No GO to H6 .
H6 CHECK FOR ADDITIONAL DTCs	
	1 Refer to the continuous DTCs recorded during Step H1 .
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step H1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test I: LFC 16/DTC B1888 — Passenger Air Bag Circuit Short to Ground

Normal Operation

The air bag electronic crash sensor (ECS) module checks for passenger air bag circuit shorts to ground by monitoring the voltage of Circuits 607 (LB/O) and 616 (PK/BK) at Pins 14 and 28. If the ECS detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1888 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.








Possible Causes

A passenger air bag circuit short to ground could be caused by:


- a short to ground on Circuit 607 (LB/O).
- a short to ground on Circuit 616 (PK/BK).
- a short to ground on the passenger air bag module.

PINPOINT TEST I: LFC 16/DTC B1888 — PASSENGER AIR BAG CIRCUIT SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK FOR A HARD OR INTERMITTENT DTC	
1	

	
<div>  </div> <div>NGS Tester</div>	
<div>  </div>	
<div>  </div> <div>Retrieve/Clear Continuous DTCs</div>	<div>  Retrieve and record any continuous DTCs for use later in this pinpoint test. </div>
<div>  </div> <div>On-Demand Self Test</div>	
	<ul style="list-style-type: none"> Was DTC B1888 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to I2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to I5 .</p>
I2 CHECK THE PASSENGER AIR BAG	
<div>  </div>	

	<div> <p>2 Deactivate the system.</p> </div>
<div> <p>3</p> </div>	
<div> <p>4</p> </div> <div> <p>On-Demand Self Test</p> </div>	
	<div> <ul style="list-style-type: none"> • Was DTC B1888 retrieved? </div> <div> <p>→ Yes GO to I3.</p> </div> <div> <p>→ No INSTALL a new passenger air bag module. GO to I6.</p> </div>
<div> <h3>I3 CHECK THE PASSENGER AIR BAG CIRCUIT</h3> </div>	
<div> <p>1</p> </div>	
<div> <p>2</p> </div> <div> <p>ECS C223</p> </div>	
<div> <p>3</p> </div> <div> <p>DR0520-B</p> </div>	<div> <p>3 NOTE: Do not separate or remove the shorting bars from the ECS connector C223. Measure the resistance between Pin C223-14, Circuit 607 (LB/O) and Pin C223-21, Circuit 649 (BK/O).</p> </div>

	<ul style="list-style-type: none"> • Is the resistance less than 10,000 ohms? <p>→ Yes GO to I4.</p> <p>→ No INSTALL and CONFIGURE a new ECS module. GO to I6 .</p>
I4 CHECK THE PASSENGER AIR BAG WIRING	
<div>1</div>  <p>Passenger Air Bag Module C220</p>	
	<div>2</div> <p>Inspect all crimps, terminals, wires and connectors in Circuit 607 (LB/O) feeding the ECS module Pin 14 and Circuit 616 (PK/BK) feeding the ECS module Pin 28. Check for pinched wires and damaged connector pin terminals.</p>
	<ul style="list-style-type: none"> • Was any damage found? <p>→ Yes REPAIR as necessary. GO to I6 .</p> <p>→ No GO to I6.</p>
I5 CHECK FOR AN INTERMITTENT FAULT	
	<div>1</div> <p>Refer to the continuous DTCs recorded during Step I1.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step I1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to ground on Circuit 607 (LB/O) and Circuit 616 (PK/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent</p>

	concerns found. GO to 16 . → No GO to 16 .
I6 CHECK FOR ADDITIONAL DTCs	
	<div>1</div> Refer to the continuous DTCs recorded during Step I1.
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step I1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test J: LFC 16/DTC B1925 — Passenger Air Bag Circuit Short to Battery or Ignition

Normal Operation

The air bag electronic crash sensor (ECS) module checks for passenger air bag circuit shorts to battery or ignition by monitoring the voltage of Circuits 607 (LB/O) and 616 (PK/BK) at Pins 14 and 28. If the ECS detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1925 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger air bag circuit short to battery or ignition could be caused by:

- a short to battery or ignition on Circuit 607 (LB/O).
- a short to battery or ignition on Circuit 616 (PK/BK).
- a short to battery or ignition on the passenger air bag module.

PINPOINT TEST J: LFC 16/DTC B1925 — PASSENGER AIR BAG CIRCUIT SHORT TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

J1 CHECK FOR A HARD OR INTERMITTENT DTC

1



2



NGS Tester

3



4



Retrieve/Clear Continuous DTCs

4 Retrieve and record any continuous DTCs for use later in this pinpoint test.

5



On-Demand Self Test

- Was DTC B1925 retrieved during the on-demand self test?

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [J2](#) .

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [J5](#) .

J2 CHECK THE PASSENGER AIR BAG

1



2 Deactivate the system.



On-Demand Self Test

- Was DTC B1925 retrieved?

→ Yes

GO to [J3](#).

→ No

INSTALL a new passenger air bag module. GO to [J6](#)

.

J3 CHECK THE PASSENGER AIR BAG CIRCUIT



Battery

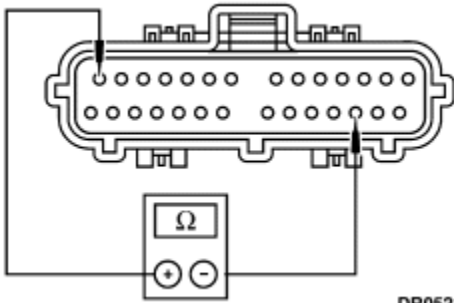


ECS C223

4



5



DR0521-B

5 NOTE: Do not separate or remove the shorting bars from the ECS connector C223.

Measure the resistance between Pin C223-14, Circuit 607 (LB/O) and Pin C223-17, Circuit 937 (R/W).

- **Is the resistance less than 10,000 ohms?**

→ **Yes**
GO to [J4](#).

→ **No**
INSTALL and CONFIGURE a new ECS module.
GO to [J6](#) .

J4 CHECK THE PASSENGER AIR BAG WIRING

1



Passenger Air Bag Module C220

2 Inspect all crimps, terminals, wires, and connectors in Circuit 607 (LB/O) feeding the ECS module Pin 14 and Circuit 616 (PK/BK) feeding the ECS module Pin 28. Check for pinched wires and damaged connector pin terminals.

- **Was any damage found?**

→ **Yes**
REPAIR as necessary. GO to [J6](#) .

→ **No**
GO to [J6](#).

J5 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step J1.</p>
	<ul style="list-style-type: none"> Was the DTC retrieved during Step J1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to battery or ignition on Circuit 607 (LB/O) and Circuit 616 (PK/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to J6 .</p> <p>→ No GO to J6.</p>
J6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step J1.</p>
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step J1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test K: LFC 32/DTC B1932 — Driver Air Bag Resistance High

Normal Operation






The air bag electronic crash sensor (ECS) module monitors the resistance for the driver air bag ignitor by measuring the resistance between Pins 1 and 15. If the ECS detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1932 in memory and flash a lamp fault code (LFC) 32 (or higher priority code if one exists) on the air bag indicator.





Possible Causes

Driver air bag high resistance could be caused by:

- a poor connection or corrosion in the driver air bag module circuits or the air bag sliding contact.
- an open circuit or high resistance in the air bag sliding contact windings.
- an open circuit or high resistance in the wiring harness.
- an open circuit or high resistance in the driver air bag module.

PINPOINT TEST K: LFC 32/DTC B1932 — DRIVER AIR BAG RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  On-Demand Self Test	
	<ul style="list-style-type: none">• Was DTC B1932 retrieved during the on-

	<p>demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to K2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to K5 .</p>
K2 CHECK THE DRIVER AIR BAG	
<p>1</p> 	
	<p>2 Deactivate the system.</p>
<p>3</p> 	
<p>4</p>  <p>On-Demand Self Test</p>	
	<p>• Was DTC B1932 retrieved?</p> <p>→ Yes GO to K3.</p> <p>→ No INSTALL a new driver air bag module. GO to K6 .</p>
K3 CHECK THE AIR BAG SLIDING CONTACT	
<p>1</p> 	
<p>2</p>	

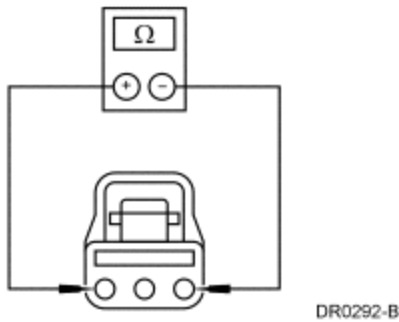


Air Bag Sliding Contact C238



Driver Air Bag Simulator

4



4 **NOTE:** By disconnecting the air bag sliding contact connector, the connector is shorted together by a shorting bar. Do not remove the shorting bar.

NOTE: Zero the multimeter prior to taking the measurement.

Measure the resistance between Circuit 614 (GY/O) and Circuit 615 (GY/W) of C255.

- Is the resistance greater than 1.0 ohm?

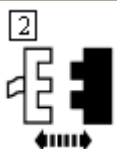
→ **Yes**

INSTALL a new air bag sliding contact. GO to [K6](#).

→ **No**

GO to [K4](#).

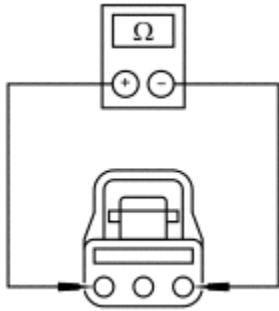
K4 CHECK THE DRIVER AIR BAG CIRCUIT



ECS C223

3

3 **NOTE:** By disconnecting the ECS connector C223, Circuit 614 (GY/O) and Circuit 615 (GY/W) of the ECS connector C223 are shorted together by a



DR0292-B

shorting bar. Do not remove the shorting bar.

NOTE: Zero the multimeter prior to taking the measurement.

Measure the resistance between Circuit 614 (GY/O) and Circuit 615 (GY/W) of the air bag sliding contact connector C238.

- **Is the resistance greater than 1.0 ohm?**

→ **Yes**

REPAIR Circuit 614 (GY/O) or Circuit 615 (GY/W) as necessary. GO to [K6](#).

→ **No**

INSTALL and CONFIGURE a new ECS module. GO to [K6](#).

K5 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step **K1**.

- **Was the DTC retrieved during Step K1 an intermittent fault?**

→ **Yes**

CHECK for causes of intermittent high resistance on Circuit 614 (GY/O), Circuit 615 (GY/W) and the air bag sliding contact assembly. Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [K6](#).

→ **No**

GO to [K6](#).

K6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step **K1**.

- **Were any continuous DTCs retrieved**

	<p>during Step K1 ?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>
--	--

Pinpoint Test L: LFC 33/DTC B1933 — Passenger Air Bag Resistance High

Normal Operation


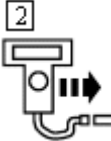
The air bag electronic crash sensor (ECS) module monitors the resistance of the passenger air bag igniter by measuring the resistance between Pins 14 and 28. If the ECS detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1933 in memory and flash a lamp fault code (LFC) 33 (or higher priority code if one exists) on the air bag indicator.







Possible Causes




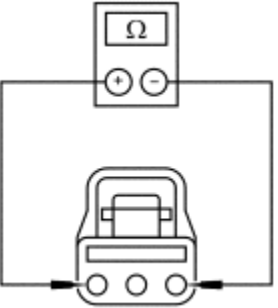
A passenger air bag high resistance could be caused by:

- a poor connection or corrosion in the passenger air bag module circuits.
- an open circuit or high resistance in the wiring harness.
- an open circuit or high resistance in the passenger air bag module.

PINPOINT TEST L: LFC 33/DTC B1933 — PASSENGER AIR BAG RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  <p>NGS Tester</p>	

<div>3</div> 	
<div>4</div>  <p>Retrieve/Clear Continuous DTCs</p>	<div>4</div> <p>Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>
<div>5</div>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1933 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to L2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to L4 .</p>
<p>L2 CHECK THE PASSENGER AIR BAG</p>	
<div>1</div> 	
	<div>2</div> <p>Deactivate the system.</p>
<div>3</div> 	
<div>4</div> 	

On-Demand Self Test	
	<ul style="list-style-type: none"> • Was DTC B1933 retrieved? <p>→ Yes GO to L3.</p> <p>→ No INSTALL a new passenger air bag module. GO to L5.</p>
L3 CHECK THE PASSENGER AIR BAG CIRCUIT	
<div>1</div> 	
<div>2</div>  <p>ECS C223</p>	
<div>3</div>  <p>Passenger Air Bag Simulator</p>	
<div>4</div>  <p>DR0292-B</p>	<div>4</div> <p>NOTE: By disconnecting the ECS connector C223, Circuit 607 (LB/O) and Circuit 616 (PK/BK) are shorted together by a shorting bar. Do not remove the shorting bar.</p> <p>NOTE: Zero the multimeter prior to taking the measurement.</p> <p>Measure the resistance between Circuit 607 (LB/O) and Circuit 616 (PK/BK) of the passenger air bag connector C220.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 1.0 ohm? <p>→ Yes</p>

	REPAIR Circuit 607 (LB/O) or Circuit 616 (PK/BK) as necessary. GO to L5 . → No INSTALL and CONFIGURE a new ECS module. GO to L5 .
L4 CHECK FOR AN INTERMITTENT FAULT	
	1 Refer to the continuous DTCs recorded during Step L1 .
	<ul style="list-style-type: none"> Was the DTC retrieved during Step L1 an intermittent fault? → Yes CHECK for causes of intermittent high resistance on Circuit 607 (LB/O) and Circuit 616 (PK/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to L5 . → No GO to L5 .
L5 CHECK FOR ADDITIONAL DTCs	
	1 Refer to the continuous DTCs recorded during Step L1 .
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step L1 ? → Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction. → No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.

Pinpoint Test M: LFC 34/DTC B1934 — Driver Air Bag Circuit Resistance Low

Normal Operation






The air bag electronic crash sensor (ECS) module monitors the resistance of the driver air bag igniter by measuring the resistance between Pins 1 and 15. If the ECS detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1934 in memory and flash a lamp fault code (LFC) 34 (or higher priority code if one exists) on the air bag indicator.




Possible Causes

Driver air bag low resistance could be caused by:

- a short in the air bag sliding contact windings.
- a short in the wiring harness.
- a low resistance in the driver air bag module.

PINPOINT TEST M: LFC 34/DTC B1934 — DRIVER AIR BAG CIRCUIT RESISTANCE LOW

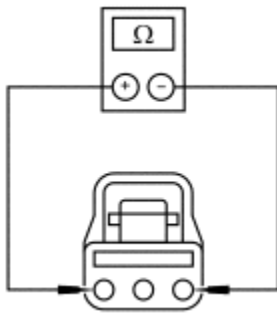
CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div> 	

On-Demand Self Test	
	<ul style="list-style-type: none"> Was DTC B1934 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to M2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to M5 .</p>
M2 CHECK THE DRIVER AIR BAG	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div> 	
<div>4</div> 	
On-Demand Self Test	
	<ul style="list-style-type: none"> Was DTC B1934 retrieved? <p>→ Yes GO to M3.</p> <p>→ No INSTALL a new driver air bag module. GO to M6 .</p>
M3 CHECK THE DRIVER AIR BAG CIRCUIT	
<div>1</div>	



Driver Air Bag Simulator

3



DR0292-B

3 NOTE: By disconnecting the driver air bag simulator, the driver air bag module circuit will be measured in series with a high resistance dummy squib inside the ECS module.

NOTE: Zero the multimeter prior to taking the measurement.

Measure the resistance between Circuit 614 (GY/O) and Circuit 615 (GY/W) of C255.

- **Is the resistance greater than 10,000 ohms?**

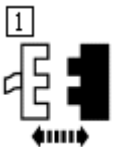
→ **Yes**

INSTALL and CONFIGURE a new ECS module.
GO to [M6](#) .

→ **No**

GO to [M4](#).

M4 CHECK THE AIR BAG SLIDING CONTACT



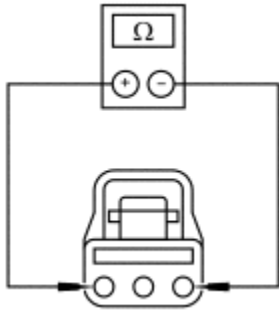
Air Bag Sliding Contact C238

2

2 NOTE: By disconnecting the air bag sliding contact, the driver air bag module circuit will be measured in series with a high resistance dummy squib inside the ECS module.

NOTE: Zero the multimeter prior to taking the measurement.

Measure the resistance between Circuit 614 (GY/O) and Circuit 615 (GY/W) of the air bag sliding contact connector C238.



DR0292-B

- **Is the resistance greater than 10,000 ohms?**

→ **Yes**

INSTALL a new air bag sliding contact. GO to [M6](#) .

→ **No**

REPAIR Circuit 614 (GY/O) or Circuit 615 (GY/W) as necessary. GO to [M6](#) .

M5 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step **M1**.

- **Was the DTC retrieved during Step M1 an intermittent fault?**

→ **Yes**

CHECK for causes of intermittent low resistance on Circuit 614 (GY/O) and Circuit 615 (GY/W) and the air bag sliding contact assembly. Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently.

REPAIR any intermittent concerns found. GO to [M6](#)

→ **No**

GO to [M6](#).

M6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step **M1**.

- **Were any continuous DTCs retrieved**

	<p>during Step M1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>
--	---

Pinpoint Test N: LFC 35/DTC B1935 — Passenger Air Bag Circuit Resistance Low

Normal Operation


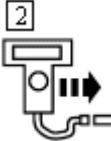
The air bag electronic crash sensor (ECS) module monitors the resistance of the passenger air bag ignitor by measuring the resistance between Pins 14 and 28. If the ECS detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1935 in memory and flash a lamp fault code (LFC) 35 (or higher priority code if one exists) on the air bag indicator.







Possible Causes



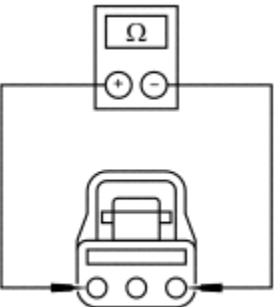
Passenger air bag low resistance could be caused by:

- a short in the wiring harness.
- a low resistance in the passenger air bag module.
- an incorrectly configured ECS.

PINPOINT TEST N: LFC 35/DTC B1935 — PASSENGER AIR BAG CIRCUIT RESISTANCE LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p> 	
<p>2</p>  <p>NGS Tester</p>	

<div>3</div> 	
<div>4</div>  <p>Retrieve/Clear Continuous DTCs</p>	<div>4</div> <p>Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>
<div>5</div>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1935 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to N2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to N4 .</p>
N2 CHECK THE PASSENGER AIR BAG	
<div>1</div> 	
	<div>2</div> <p>Deactivate the system.</p>
<div>3</div> 	
<div>4</div> 	

On-Demand Self Test	
	<ul style="list-style-type: none"> • Was DTC B1935 retrieved? <p>→ Yes GO to N3.</p> <p>→ No INSTALL a new passenger air bag module. GO to N5.</p>
N3 CHECK THE PASSENGER AIR BAG CIRCUIT	
<p>1</p> 	
<p>2</p>  <p>Passenger Air Bag Simulator</p>	
<p>3</p>  <p>DR0292-B</p>	<p>3 NOTE: By disconnecting the passenger air bag simulator, the passenger air bag module circuit will be measured in series with a high resistance dummy squib inside the ECS module.</p> <p>NOTE: Zero the multimeter prior to taking the measurement.</p> <p>Measure the resistance between Circuit 607 (LB/O) and Circuit 616 (PK/BK) of the passenger air bag module connector C220.</p>
	<ul style="list-style-type: none"> • Is the resistance greater than 10,000 ohms? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to N5.</p> <p>→ No REPAIR Circuit 607 (LB/O) or Circuit 616 (PK/BK) as necessary. GO to N5.</p>

N4 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step N1.</p>
	<ul style="list-style-type: none"> Was the DTC retrieved during Step N1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent low resistance on Circuit 607 (LB/O) and Circuit 616 (PK/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to N5 .</p> <p>→ No GO to N5.</p>
N5 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step N1.</p>
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step N1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test O: LFC 25/DTC B1871 — Passenger Air Bag Deactivation (PAD) Switch Fault

Normal Operation






The air bag electronic crash sensor (ECS) module monitors the status of the passenger air bag deactivation (PAD) switch at Pin C223-9, Circuit 1112 (W/LB). The PAD switch signals the ECS by switching a resistance to ground. If the ECS senses 900-1100 ohms in the PAD switch, it enables the passenger air bag and turns off the PAD switch warning lamp. If the ECS senses 400-600 ohms in



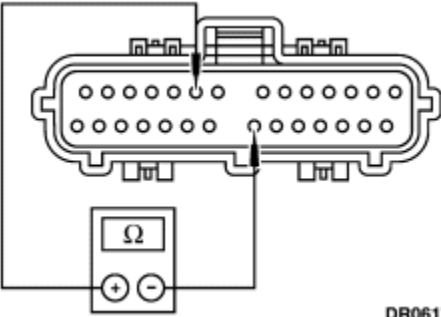
the PAD switch, it deactivates the passenger air bag and turns the PAD switch warning lamp on. If the ECS detects an invalid resistance, it will store a diagnostic trouble code (DTC) B1871 in memory and flash a lamp fault code (LFC) 25 (or higher priority code if one exists) on the air bag indicator.

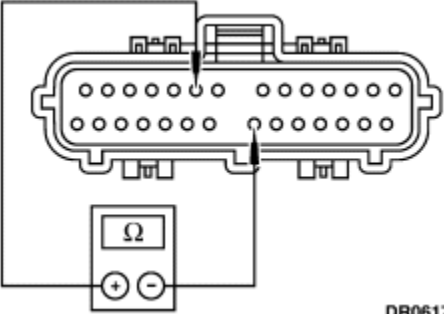


Possible Causes

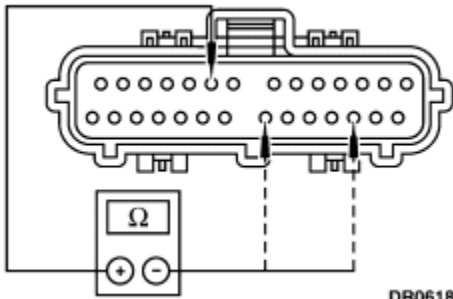
- a damaged or inoperative PAD switch.
- a damaged or inoperative ECS module.
- a short to battery, short to ground or open on Circuit 1112 (W/LB).
- an incorrectly configured ECS.

PINPOINT TEST 0: LFC 25/DTC B1871 — PASSENGER AIR BAG DEACTIVATION (PAD) SWITCH FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
01 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  On-Demand Self Test	

	<ul style="list-style-type: none"> • Was DTC B1871 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to O2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to O6 .</p>
O2 CHECK THE PAD SWITCH "ON" POSITION	
<p>1</p> 	
	<p>2 Deactivate the system.</p>
<p>3</p>  <p>ECS C223</p>	
<p>4 Place the PAD switch in the "ON" position.</p>	
<p>5</p>  <p>DR0617-A</p>	<p>5 Measure the resistance between Pin C223-9, Circuit 1112 (W/LB) and Pin C223-21, Circuit 649 (BK/O).</p>
	<ul style="list-style-type: none"> • Is the resistance between 900 and 1100 ohms? <p>→ Yes GO to O3.</p>

	<p>→ No GO to O4.</p>
O3 CHECK THE PAD SWITCH "OFF" POSITION	
	<p>1 Place the PAD switch in the "OFF" position.</p>
<p>2</p>  <p>DR0617-A</p>	<p>2 Measure the resistance between C223-9, Circuit 1112 (W/LB) and Pin C223-21, Circuit 649 (BK/O).</p>
	<ul style="list-style-type: none"> • Is the resistance between 400 and 600 ohms? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to O7 .</p> <p>→ No GO to O4.</p>
O4 CHECK CIRCUIT 1112 (W/LB) FOR A SHORT TO BATTERY	
<p>1</p>  <p>Battery Ground Cable</p>	
<p>2</p> 	
<p>3</p>	<p>3 Measure the resistance between Pin C223-9, Circuit 1112 (W/LB) and Pins C223-21, Circuit 649 (BK/O) and C223-17, Circuit 937 (R/W).</p>



DR0618-A

- **Is either resistance less than 100 ohms?**

→ **Yes**

REPAIR Circuit 1112 (W/LB). GO to [07](#) .

→ **No**

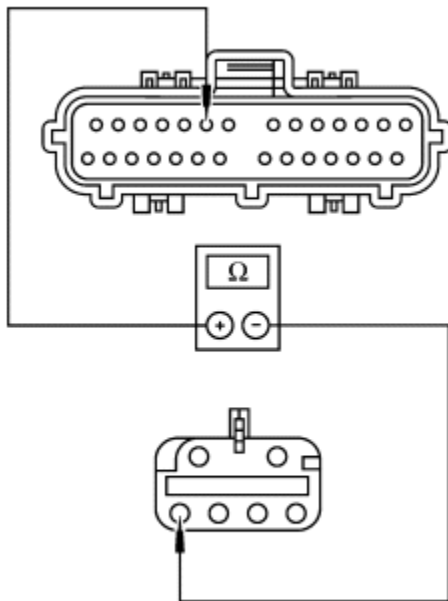
GO to [05](#).

05 CHECK CIRCUIT 1112 (W/LB) FOR AN OPEN



PAD Switch C226

2




DR0619-B

2 Measure the resistance of Circuit 1112 (W/LB) between Pin C223-9 and Pin C226-3.

	<ul style="list-style-type: none"> • Is the resistance less than 10 ohms? <p>→ Yes INSTALL a new PAD switch. GO to 07 .</p> <p>→ No REPAIR Circuit 1112 (W/LB). GO to 07 .</p>
06 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step 01.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step 01 an intermittent fault? <p>→ Yes CHECK for causes of intermittent faults on Circuit 1112 (W/LB). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to 07 .</p> <p>→ No GO to 07.</p>
07 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step 01.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step 01? <p>→ Yes Do not clear any DTCs until the DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test P: LFC 27/DTC B1884 — Passenger Air Bag Deactivation (PAD) Switch Warning Lamp Inoperative

Normal Operation

 **CAUTION:** The Electronic Crash Sensor (ECS) electrical connector is equipped with a shorting bar feature that connects harness terminals together when disconnected. Never remove or defeat the shorting bar.



The air bag electronic crash sensor (ECS) module has the ability to deactivate the passenger air bag under certain conditions. When the passenger air bag is deactivated, the passenger air bag deactivation (PAD) switch warning lamp will be illuminated.

The ECS monitors the PAD switch warning lamp for open or short to ground conditions. If the ECS detects an open or short to ground condition on the PAD switch warning lamp circuit, it will store a diagnostic trouble code (DTC) B1884 in memory and flash a lamp fault code (LFC) 27 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

- An open or short to ground on Circuit 1113 (Y/LG).
- A damaged or burned out PAD indicator.
- A damaged or inoperative PAD switch.
- A damaged or inoperative ECS module.
- A blown PAD switch I/P Fuse 22 (7.5A).

PINPOINT TEST P: LFC27/DTC B1884 — PASSENGER AIR BAG DEACTIVATION (PAD) SWITCH WARNING LAMP INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div><div>1</div></div>	
<div><div>2</div></div> <div>Scan Tool</div>	
<div><div>3</div></div>	



Retrieve/Clear Continuous DTCs

4 Retrieve and record any continuous DTCs for use later in this pinpoint test.



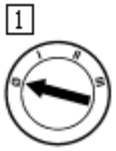
On-Demand Self Test

• **Was DTC B1884 retrieved during the on-demand self test?**

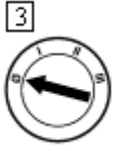
→ **Yes**
This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [P2](#) .

→ **No**
This is an intermittent fault. The fault condition is not present at this time. GO to [P6](#) .

P2 CHECK THE PAD SWITCH WARNING LAMP VOLTAGE



2 Deactivate the system. Refer to [Air Bag Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.



4



ECS C223

5



- Does the PAD switch indicator illuminate?

→ Yes

INSTALL and CONFIGURE a new ECS module.
GO to [P7](#).

→ No

GO to [P3](#).

P3 CHECK CIRCUIT 298 (VT/OG) FOR AN OPEN

1



2

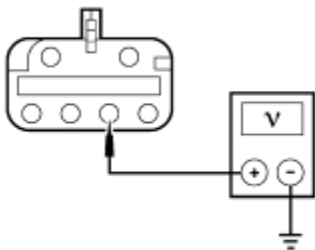


PAD Switch C226

3


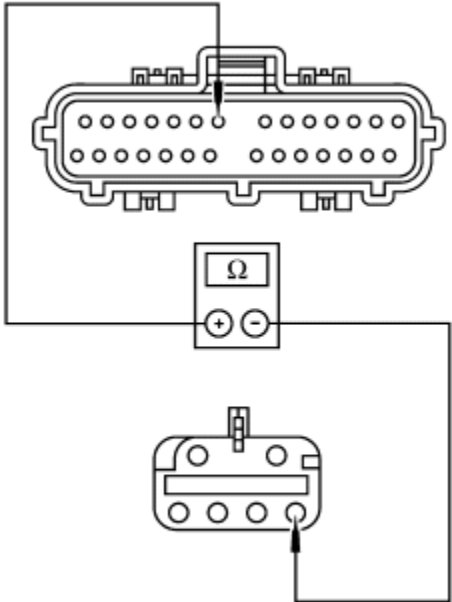


4



A0044825

4 Measure the voltage between the PAD switch C226-2, circuit 298 (VT/OG), harness side and ground.

	<ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to P4.</p> <p>→ No REPAIR circuit 298 (VT/OG). GO to P7 .</p>
P4 CHECK CIRCUIT 1113 (YE/LG) FOR AN OPEN	
<p>1</p> 	
<p>2</p>  <p>DR0622-B</p>	<p>2 Measure the resistance between the ECS module C223-8, circuit 1113 (YE/LG), harness side and the PAD switch C226-1, circuit 1113 (YE/LG), harness side.</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes GO to P5.</p> <p>→ No REPAIR circuit 1113 (YE/LG). GO to P7 .</p>
P5 CHECK CIRCUIT 1113 (YE/LG) FOR A SHORT TO GROUND	

<div> </div> <p>ECS Module C223</p>	
<div> <p>2</p> </div> <div> </div> <p>A0044826</p>	<div> <p>2</p> </div> <p>Measure the resistance between the PAD switch C226-1, circuit 1113 (YE/LG), harness side and ground.</p>
	<ul style="list-style-type: none"> Is the resistance greater than 10,000 ohms? <p>→ Yes INSTALL a new PAD switch. GO to P7 .</p> <p>→ No REPAIR circuit 1113 (YE/LG). GO to P7 .</p>
<p>P6 CHECK FOR AN INTERMITTENT FAULT</p>	
	<div> <p>1</p> </div> <p>Refer to the continuous DTCs recorded during Step P1.</p>
	<ul style="list-style-type: none"> Was the DTC retrieved during Step P1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent faults on circuit 1113 (YE/LG). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to P7 .</p> <p>→ No GO to P7.</p>
<p>P7 CHECK FOR ADDITIONAL DTCs</p>	
	<div> <p>1</p> </div> <p>Refer to the continuous DTCs recorded during</p>

	Step P1.
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step P1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag Supplemental Restraint System (SRS) in this section. CLEAR all DTCs.</p>

Pinpoint Test Q: LFC 27/DTC B1890 — Passenger Air Bag Deactivation (PAD) Switch Warning Lamp Short to Battery

Normal Operation

The air bag electronic crash sensor (ECS) module has the ability to deactivate the passenger air bag under certain conditions. When the passenger air bag is deactivated, the passenger air bag deactivation (PAD) switch warning lamp will be illuminated.








The ECS monitors the PAD switch warning lamp for short to battery conditions. If the ECS detects a short to battery condition on the PAD switch warning lamp circuit, it will store a diagnostic trouble code (DTC) B1890 in memory and flash a lamp fault code (LFC) 27 (or higher priority code if one exists) on the air bag indicator.






Possible Causes

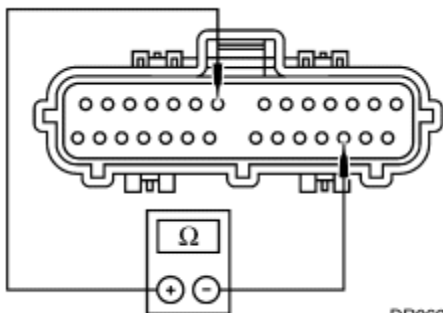
- A short to battery on Circuit 1113 (Y/LG).
- A damaged or inoperative PAD switch.
- A damaged or inoperative ECS module.

PINPOINT TEST Q: LFC 27/DTC B1890 — PASSENGER AIR BAG DEACTIVATION (PAD) SWITCH WARNING LAMP SHORT TO BATTERY

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK FOR A HARD OR INTERMITTENT DTC	
1	

	
 2 NGS Tester	
	
 4 Retrieve/Clear Continuous DTCs	 4 Retrieve and record any continuous DTCs for use later in this pinpoint test.
 5 On-Demand Self Test	
	<ul style="list-style-type: none"> • Was DTC B1890 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to Q2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to Q4 .</p>
Q2 CHECK THE PAD SWITCH WARNING LAMP	
	 1 Place the PAD switch in the OFF position.

	<ul style="list-style-type: none"> Does the PAD lamp illuminate properly? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to Q5.</p> <p>→ No GO to Q3.</p>
Q3 CHECK CIRCUIT 1113 (Y/LG) FOR A SHORT TO BATTERY	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div>  <p>ECS C223</p>	
<div>4</div>  <p>PAD Switch C226</p>	
<div>5</div>  <p>Battery Ground Cable</p>	
<div>6</div> 	
<div>7</div>	<div>7</div> Measure the resistance between Pin C223-8, Circuit 1113 (Y/LG) and Pin C223-17, Circuit 937 (R/W).



DR0623-B

- **Is the resistance less than 100 ohms?**

→ **Yes**

REPAIR Circuit 1113 (Y/LG). GO to [Q5](#).

→ **No**

INSTALL a new PAD switch. GO to [Q5](#).

Q4 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step **Q1**.

- **Was the DTC retrieved during Step Q1 an intermittent fault?**

→ **Yes**

CHECK for causes of intermittent short to battery on Circuit 1113 (Y/LG). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [Q5](#).

→ **No**

GO to [Q5](#).

Q5 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step **Q1**.

- **Were any continuous DTCs retrieved during Step Q1?**

→ **Yes**

	<p>Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>
--	---

Pinpoint Test R: B1892 — Air Bag Tone Warning Indicator Circuit Short to Ground or Open

Normal Operation



The air bag electronic crash sensor (ECS) module monitors its connection to the Generic Electronic Module (GEM) at Pin C239-8. This connection is used to signal a chime if the air bag indicator is inoperative and another SRS fault exists. If the ECS detects a short to ground or open on the connection to the GEM, it will store a diagnostic trouble code (DTC) B1892 in memory.

Possible Causes

An air bag tone warning indicator circuit short to ground or open could be caused by:

- a short to ground or open on Circuit 1083 (LB/BK).
- a damaged or inoperative GEM.

PINPOINT TEST R: DTC B1892 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORT TO GROUND OR OPEN

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  <p>NGS Tester</p>	
<div>3</div>	



Retrieve/Clear Continuous DTCs

4 Retrieve and record any continuous DTCs for use later in this pinpoint test.



On-Demand Self Test

- **Was DTC B1892 retrieved during the on-demand self test?**

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [R2](#) .

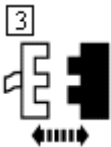
→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [R5](#) .

R2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT

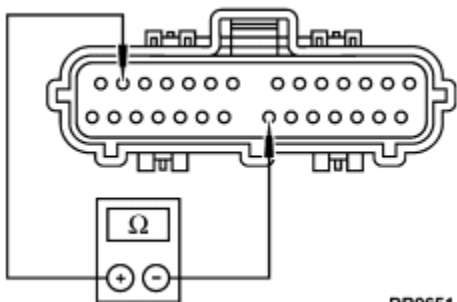


2 Deactivate the system.



ECS C223

4 Measure the resistance between Pin C223-13, Circuit 1083 (LB/BK) and Pin C223-21, Circuit 649 (BK/O).



DR0651-A

- Is the resistance less than 10,000 ohms?

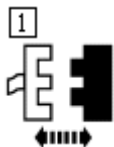
→ **Yes**

REPAIR Circuit 1083 (LB/BK). GO to [R6](#).

→ **No**

GO to [R3](#).

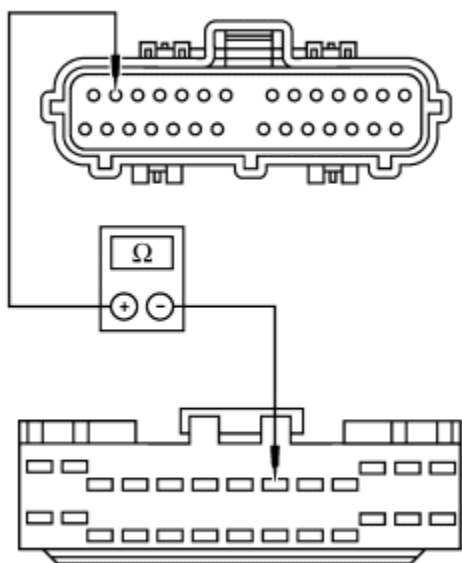
R3 CHECK THE AIR BAG TONE WARNING INDICATOR MODULE CIRCUIT







GEM C239

2

2 Measure the resistance of Circuit 1083 (LB/BK) between Pin C223-13 and Pin C239-8.



DR0738-A

	<ul style="list-style-type: none"> • Is the resistance greater than 100 ohms? <p>→ Yes REPAIR Circuit 1083 (LB/BK). GO to R6 .</p> <p>→ No INSTALL a new GEM. GO to R4 .</p>
R4 CHECK THE AIR BAG TONE WARNING INDICATOR	
<p>1</p>  <p>Instrument Cluster C250</p>	
<p>2</p>  <p>Driver Air Bag Simulator</p>	
<p>3</p>  <p>ECS C223</p>	
<p>4</p> 	
	<p>5 Listen for an audible warning tone. Allow at least one minute for sequence of tones to sound.</p>
	<ul style="list-style-type: none"> • Was the warning tone heard within one minute? <p>→ Yes GO to R6.</p> <p>→ No INSTALL and CONFIGURE a new ECS module.</p>

	GO to R6 .
R5 CHECK FOR AN INTERMITTENT FAULT	
	<div>1</div> Refer to the continuous DTCs recorded during Step R1 .
	<ul style="list-style-type: none"> Was the DTC retrieved during Step R1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to ground or open on Circuit 1083 (LB/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to R6.</p> <p>→ No GO to R6.</p>
R6 CHECK FOR ADDITIONAL DTCs	
	<div>1</div> Refer to the continuous DTCs recorded during Step R1 .
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step R1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test S: DTC B1891 — Air Bag Tone Warning Indicator Circuit Short to Battery or Ignition

Normal Operation

The air bag electronic crash sensor (ECS) module monitors its connection to the Generic Electronic Module (GEM) at Pin C239-8. This connection is used to signal a chime if the air bag indicator is






inoperative and another SRS fault exists. If the ECS detects a short to battery or ignition on the connection to the GEM, it will store a diagnostic trouble code (DTC) B1891 in memory.





Possible Causes

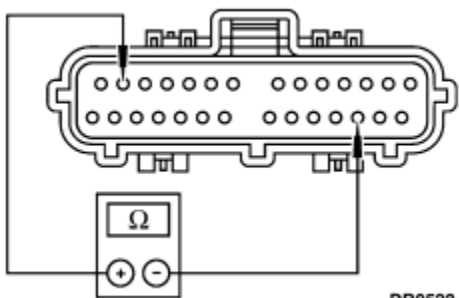
An air bag tone warning indicator circuit short to battery or ignition could be caused by:

- a short to battery or ignition on Circuit 1083 (LB/BK).
- a damaged or inoperative GEM.

PINPOINT TEST S: DTC B1891 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORT TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
S1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  On-Demand Self Test	

	<ul style="list-style-type: none"> • Was DTC B1891 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to S2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to S4 .</p>
S2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div>  <p>Battery</p>	
<div>4</div>  <p>ECS C223</p>	
<div>5</div> 	
<div>6</div>	<div>6</div> Measure the resistance between Pin C223-13, Circuit 1083 (LB/BK) and Pin C223-17, Circuit 937 (R/W).



DR0523-C

- Is the resistance less than 10,000 ohms?

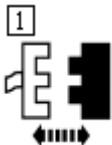
→ **Yes**

REPAIR Circuit 1083 (LB/BK). GO to [S5](#).

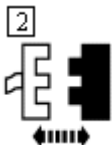
→ **No**

INSTALL a new GEM. GO to [S3](#).

S3 CHECK THE AIR BAG TONE WARNING INDICATOR



Instrument Cluster C250



Driver Air Bag Simulator



ECS C223



5 Listen for an audible warning tone. Allow at least one minute for sequence of tones to sound.

	<ul style="list-style-type: none"> • Was the warning tone heard within one minute? <p>→ Yes GO to S5.</p> <p>→ No INSTALL and CONFIGURE a new ECS module. GO to S5 .</p>
S4 CHECK FOR AN INTERMITTENT FAULT	
	<p>1 Refer to the continuous DTCs recorded during Step S1.</p>
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step S1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to battery/ignition on Circuit 1083 (LB/BK). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to S5 .</p> <p>→ No GO to S5.</p>
S5 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step S1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step S1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the</p>

	system. PROVE OUT the system. CLEAR all DTCs.
--	---

Pinpoint Test T: DTC B2141 — Non-Volatile Memory Configuration Fault

Normal Operation

The air bag electronic crash sensor (ECS) module memory must be configured differently for vehicles with different options. This can be done using either the Service Bay Diagnostic System (SBDS) or the New Generation Star (NGS) Tester.

The ECS checks the memory option content for the proper configuration.




If the ECS detects an improper configuration, it will store a diagnostic trouble code (DTC) B2141 in memory and flash the air bag indicator five times per second.



Possible Causes

A non-volatile memory configuration fault could be caused by:

- an improper configuration file used.
- a damaged or inoperative ECS module.

PINPOINT TEST T: DTC B2141 — NON-VOLATILE MEMORY CONFIGURATION FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.

 <p>Retrieve/Clear Continuous DTCs</p>	
 <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B2141 retrieved during the on-demand self test? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to T2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to T2 .</p>
T2 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step T1.</p>
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step T1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No CLEAR all DTCs.</p>

Pinpoint Test U: DTC B1869 — Air Bag Indicator Inoperative

Normal Operation

The air bag indicator is designed to illuminate for 6 (+/-2) seconds when the ignition switch is turned to the RUN position. This initial 6 seconds of illumination is considered normal operation and is called proveout of the air bag indicator. The air bag indicator is then used to warn the driver that there is a fault in the air bag supplemental restraint system (SRS).

The air bag electronic crash sensor (ECS) module monitors the air bag indicator for open and short to ground conditions. If the ECS detects an open or short to ground condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1869 in memory.






If the ECS detects an air bag indicator failure in addition to another SRS failure, the ECS will send a signal to the Generic Electronic Module (GEM) to produce five sets of five tone bursts.



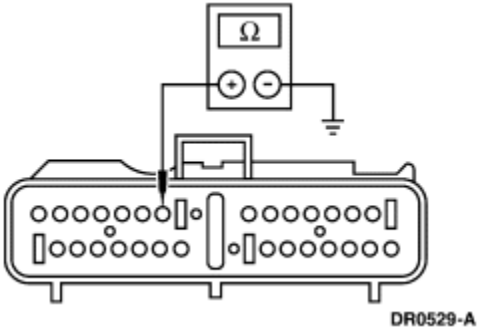
Possible Causes



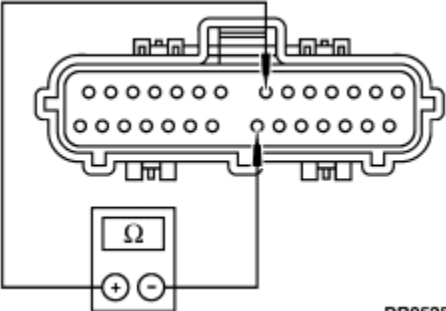
An air bag indicator inoperative condition could be caused by:

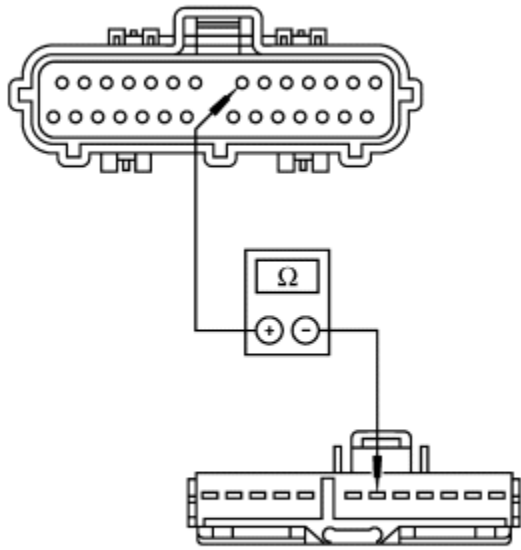
- damaged wiring on Circuit 608 (BK/Y).
- a damaged or burned out air bag indicator.
- an instrument cluster malfunction.

PINPOINT TEST U: DTC B1869 — AIR BAG INDICATOR INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  NGS Tester	
<div>3</div> 	
<div>4</div>  Retrieve/Clear Continuous DTCs	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div> 	

On-Demand Self Test	
	<ul style="list-style-type: none"> • Was DTC B1869 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to U2 .</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to U5 .</p>
U2 CHECK THE AIR BAG ECS	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div>  <p>ECS C223</p>	
<div>4</div>  <p>DR0529-A</p>	<div>4</div> Measure the resistance between the ECS module Pin 7 and a known good chassis ground.
	<ul style="list-style-type: none"> • Is the resistance less than 100 ohms? <p>→ Yes INSTALL and CONFIGURE a new ECS module.</p>

	<p>GO to U6 .</p> <p>→ No GO to U3.</p>
U3 CHECK CIRCUIT 608 (BK/Y) FOR A SHORT TO GROUND	
<p>1</p> 	
<p>2</p>  <p>Instrument Cluster C250</p>	
<p>3</p>  <p>DR0525-B</p>	<p>3 Measure the resistance between Pin C223-7, Circuit 608 (BK/Y) and Pin C223-21, Circuit 649 (BK/O).</p>
	<ul style="list-style-type: none"> • Is the resistance less than 100 ohms? <p>→ Yes REPAIR the short to ground on Circuit 608 (BK/Y). GO to U6 .</p> <p>→ No GO to U4.</p>
U4 CHECK CIRCUIT 608 (BK/Y) FOR AN OPEN	
<p>1</p>	<p>1 Measure the resistance of Circuit 608 (BK/Y) between Pin C223-7 and Pin C250-6.</p>



DR0297-A



Instrument Cluster C250

- **Is the resistance greater than 10 ohms?**

→ **Yes**

REPAIR the open in Circuit 608 (BK/Y). GO to [U6](#).

→ **No**

GO to [Section 413-01](#). GO to [U6](#).

U5 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step U1.

- **Was the DTC retrieved during Step U1 an intermittent fault?**

→ **Yes**

CHECK for causes of intermittent short to ground or

	<p>open on Circuit 608 (BK/Y). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to U6 .</p> <p>→ No GO to U6.</p>
U6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step U1.</p>
	<ul style="list-style-type: none"> Were any continuous DTCs retrieved during Step U1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test V: DTC B1870 — Air Bag Indicator Short to Battery

Normal Operation

The air bag indicator is designed to illuminate for 6 (+/-2) seconds when the ignition switch is turned to the RUN position. This initial 6 seconds of illumination is considered normal operation and is called proveout of the air bag indicator. The air bag indicator is then used to warn the driver that there is a fault in the air bag supplemental restraint system (SRS).

The air bag electronic crash sensor (ECS) module monitors the air bag indicator for short to battery conditions. If the ECS detects a short to battery condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1870 in memory.






If the ECS detects an air bag indicator failure in addition to another SRS failure, the ECS will send a signal to the Generic Electronic Module (GEM) to produce five sets of five tone bursts.




Possible Causes

An air bag indicator short to battery condition could be caused by:

- damaged wiring on Circuit 608 (BK/Y).
- an instrument cluster malfunction.

PINPOINT TEST V: DTC B1870 — AIR BAG INDICATOR SHORT TO BATTERY

CONDITIONS	DETAILS/RESULTS/ACTIONS
V1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div>1</div> 	
<div>2</div>  <p>NGS Tester</p>	
<div>3</div> 	
<div>4</div>  <p>Retrieve/Clear Continuous DTCs</p>	<div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test.
<div>5</div>  <p>On-Demand Self Test</p>	
	<ul style="list-style-type: none"> • Was DTC B1870 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to V2.</p>

	<p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to V3 .</p>
V2 CHECK THE AIR BAG ECS	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div>  <p>ECS C223</p>	
<div>4</div> 	
	<ul style="list-style-type: none"> • Is the air bag indicator illuminated? <p>→ Yes INSTALL and CONFIGURE a new ECS module. GO to V4 .</p> <p>→ No GO to Section 413-01. If the air bag indicator is OK, REPAIR short to battery on Circuit 608 (BK/Y). GO to V4 .</p>
V3 CHECK FOR AN INTERMITTENT FAULT	
	<div>1</div> Refer to the continuous DTCs recorded during Step V1 .
	<ul style="list-style-type: none"> • Was the DTC retrieved during Step V1 an intermittent fault? <p>→ Yes CHECK for causes of intermittent short to battery on Circuit 608 (BK/Y). Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to V4 .</p> <p>→ No</p>

	GO to V4 .
V4 CHECK FOR ADDITIONAL DTCs	
	1 Refer to the continuous DTCs recorded during Step V1 .
	<ul style="list-style-type: none"> • Were any continuous DTCs retrieved during Step V1 ? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test W: LFC 14/DTC B1901, LFC 41/DTC B1941, LFC 46/DTC B1885 and LFC 47/DTC B1886 — Unexpected Feature Present

Normal Operation


The air bag electronic crash sensor (ECS) module supports features that are not used in F250, F350, F450 or F550 vehicles. The wiring harness pins used by the ECS for these features are normally left disconnected in F250, F350, F450 or F550 vehicles. If the ECS detects a connection to Pin 6, 24, 25, 26 or 27 it will store a diagnostic trouble code (DTC) B1885, B1886, B1901 or B1941 in memory and flash a lamp fault code (LFC) 14, 41, 46 or 47.






Possible Causes

An unexpected feature present could be caused by:

- wiring harness fault causing connection to a normally unused ECS pin.
- internal ECS module fault.

PINPOINT TEST W: LFC 14/DTC B1901, LFC 41/DTC B1941, LFC 46/DTC B1885 AND LFC 47/DTC B1886 — UNEXPECTED FEATURE PRESENT

CONDITIONS	DETAILS/RESULTS/ACTIONS
W1 CHECK FOR A HARD OR INTERMITTENT DTC	
1 	

<div> <div>2</div>  </div> <div>NGS Tester</div>	
<div> <div>3</div>  </div>	
<div> <div>4</div>  </div> <div>Retrieve/Clear Continuous DTCs</div>	<div> <div>4</div> Retrieve and record any continuous DTCs for use later in this pinpoint test. </div>
<div> <div>5</div>  </div> <div>On-Demand Self Test</div>	
	<div> <ul style="list-style-type: none"> Was DTC B1885 or B1886 retrieved during the on-demand self test? </div> <div>→ Yes</div> <div> This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to W2 . </div> <div>→ No</div> <div> This is an intermittent fault. The fault condition is not present at this time. GO to W3 . </div>
W2 CHECK THE ECS MODULE CONNECTOR C250	
<div> <div>1</div>  </div>	
	<div> <div>2</div> Deactivate the system. </div>
<div>3</div>	



ECS C223

4 Inspect the ECS connector C223 for connections made to normally unused Pins 3, 4, 5, 6, 11, 12, 16, 18, 20, 23, 24, 25, 26 and 27.

- **Are there any connections to the normally unused pins?**

→ **Yes**

REPAIR any connections to the normally unused pins. REACTIVATE the system. CLEAR all DTC's. GO to [W4](#) .

→ **No**

INSTALL and CONFIGURE a new ECS module. REACTIVATE the system. CLEAR all DTC's. GO to [W4](#) .

W3 CHECK FOR AN INTERMITTENT FAULT

1 Refer to the continuous DTCs recorded during Step **W1**.

- **Was the DTC retrieved during Step W1 an intermittent fault?**

→ **Yes**

CHECK for causes of an intermittent connection to the normally unused Pins 3, 4, 5, 6, 11, 12, 16, 18, 20, 23, 24, 25, 26 or 27. Attempt to recreate the hard fault by driving the vehicle, flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [W4](#) .

→ **No**

GO to [W4](#).

W4 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step **W1**.

- **Were any continuous DTCs retrieved during Step W1?**



→ **Yes**

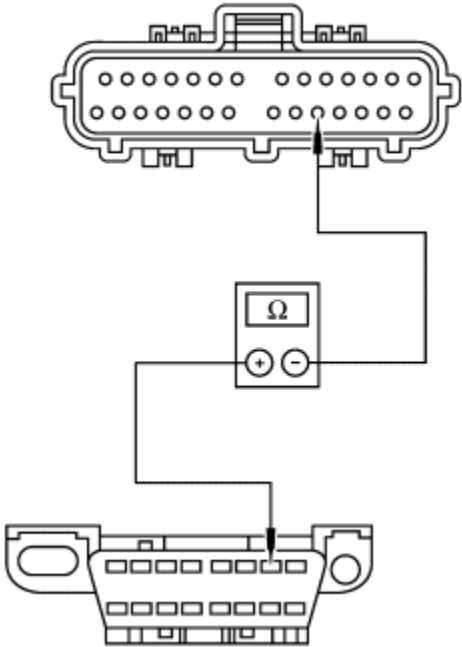
Do not clear any DTC's until all DTCs have been resolved. GO to the Air Bag Electronic Crash Sensor (ECS) Module Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

	→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. CLEAR all DTCs.
--	---

Pinpoint Test X: No Communication with the ECS Module

PINPOINT TEST X: NO COMMUNICATION WITH THE ECS MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
X1 CHECK THE ECS CONNECTOR C223 AND CONNECTOR PIN C223-19 FOR DAMAGE	
<div>1</div> 	
	<div>2</div> Deactivate the system.
<div>3</div>  ECS C223	
	<div>4</div> Inspect C223 and C223-19 for damage.
	<ul style="list-style-type: none"> Are C223 and C223-19 OK? → Yes GO to X2 . → No REPAIR C223 and C223-19 as necessary. REACTIVATE the system.
X2 CHECK THE DLC CONNECTOR C227 AND CONNECTOR PIN C227-7 FOR DAMAGE	
	<div>1</div> Inspect C227 and C227-7 for damage.
	<ul style="list-style-type: none"> Are C227 and C227-7 OK? → Yes


	<p>GO to X3.</p> <p>→ No REPAIR C227 or C227-7 as necessary. REACTIVATE the system.</p>
X3 CHECK CIRCUIT 70 (LB/W) FOR AN OPEN	
<p>1</p>  <p>DK0349-B</p>	<p>1 Measure the resistance of Circuit 70 (LB/W) between C223-19 and C227-7.</p>
	<ul style="list-style-type: none"> • Is the resistance less than 5 ohms? <p>→ Yes INSTALL and CONFIGURE a new ECS module. REACTIVATE the system.</p> <p>→ No REPAIR Circuit 70 (LB/W). REACTIVATE the system.</p>

Deployed Air Bag

1.  **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

Dispose of the deployed air bag modules in the same manner as any other part to be scrapped.

Undeployed Air Bag — Inoperative

1.  **WARNING:** Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

NOTE: All inoperative air bag modules have been placed on the Mandatory Return List. All discolored or damaged air bag modules must be treated the same as any inoperative live air bag being returned.

Remove the inoperative driver air bag module or passenger air bag module. Refer to [Module—Driver Air Bag](#) or [Module—Passenger Air Bag](#) in this section.

NOTE: When replacing an air bag module, a prepaid return postcard is provided with the replacement air bag module. The serial number for the new part and the vehicle identification number (VIN) must be recorded and sent to Ford Motor Company.

- When replacing the driver air bag module, record the necessary information and return the inoperative driver air bag module to Ford Motor Company.

AIR BAG MODULE VERIFICATION


VEHICLE SERIAL NO.

ATTENTION INSTALLER

Please complete and mail this postcard with your Air Bag Module Serial Number (see sample below) and Vehicle Identification Number (VIN) of the vehicle in which you are installing this module.



LOOK FOR YOUR AIR BAG MODULE SERIAL NUMBER AT THE LOCATION SHOWN IN THIS SAMPLE AND ENTER IT IN THE SPACE PROVIDED BELOW

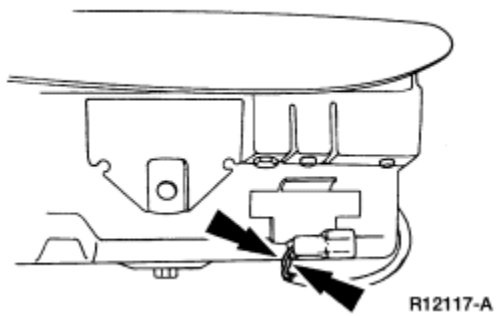

 EF089D11N20

SAMPLE

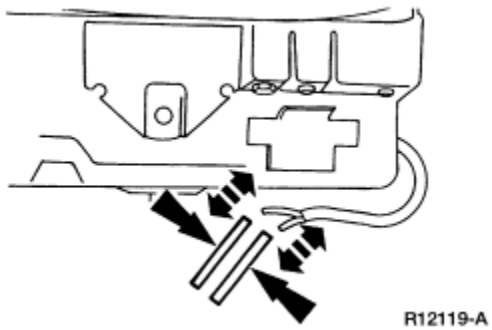
AIR BAG MODULE SERIAL NO. ★

R12122-A

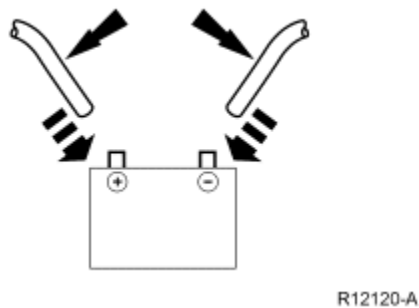
- When replacing the passenger air bag module, record the necessary information and return the inoperative passenger air bag module to Ford Motor Company.



3. Obtain two wires at least 6.1 meters (20 feet) long and connect one end of each wire to each of the wires on the passenger air bag module.



4. Place the passenger air bag module on a flat surface with the deployment door facing upward in an open outdoor area.
5. Remain at least 6.1 meters (20 feet) away from the passenger air bag module.
6. Deploy the air bag by touching the other ends of the two wires to the terminals of a 12-volt battery.



7. Allow at least ten minutes before approaching the deployed air bag to allow for cooling.
 8. Dispose of the deployed air bag module in the same manner as any other part to be scrapped.
-

Module—Air Bag Electronic Crash Sensor (ECS)

Removal

⚠ WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if so equipped).

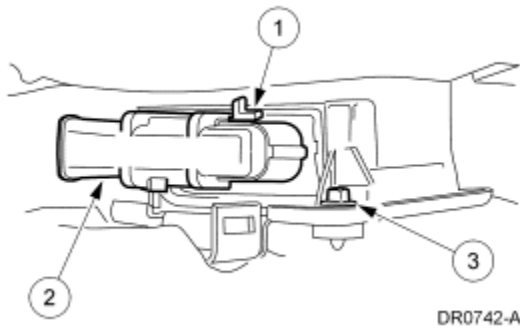
⚠ CAUTION: Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage can result.

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

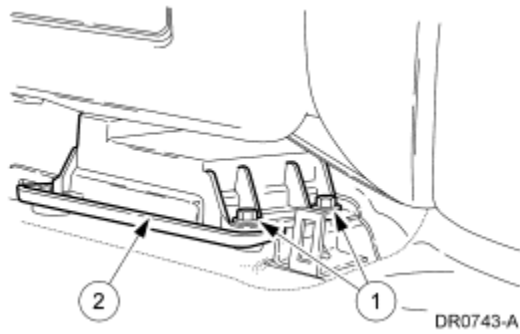
1. Disconnect the battery ground cable (14301); refer to [Section 414-01](#).
2. Remove the air bag electronic crash sensor (ECS) module cover.



3. Disconnect the air bag electronic crash sensor (ECS) module.
 1. Disconnect the ECS electrical connector locking clip.
 2. Disconnect the ECS electrical connector.
 3. Remove the ECS retaining screw.



4. Remove the ECS module.
 1. Remove the ECS retaining screws.
 2. Remove the ECS module.



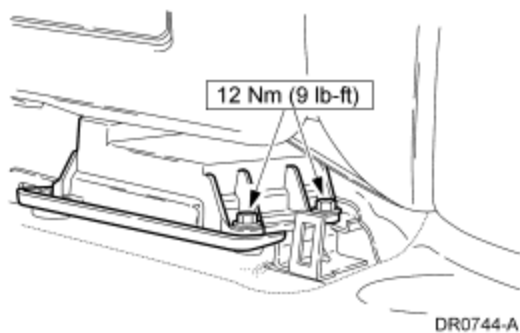
Installation

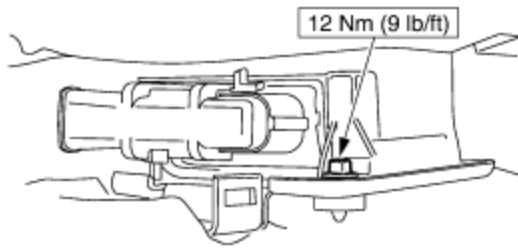
⚠ WARNING: The tightening torque of the air bag electronic crash sensor (ECS) module retaining screws is critical for proper system operation.

NOTE: Make sure to tighten the retaining bolts to specification.

NOTE: A repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

1. Follow the removal procedure in reverse order.





DR0745-A

2. **NOTE:** When a new ECS is first installed in the vehicle, module configuration must be carried out. If the ECS is incorrectly configured, erroneous DTC(s) will result.


If a new ECS is being installed, configure the ECS using a scan tool.


SECTION 501-20B: Supplemental Restraint
System
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Module—Driver Air Bag

Removal

 **WARNING:** If replacing a deployed air bag module, always replace the air bag electronic crash sensor (ECS) module.

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

⚠ WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

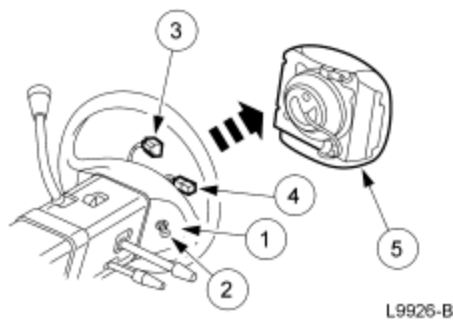
⚠ WARNING: Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

⚠ WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.


⚠ WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if so equipped).

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.


1. Disconnect the battery ground cable (14301); refer to [Section 414-01](#).
2. Remove the driver air bag module.
 1. Remove the two back cover plugs.
 2. Remove the two driver air bag module screws.
 3. Disconnect the horn electrical connector.
 4. Disconnect the air bag sliding contact electrical connector.
 5. Remove the driver air bag module.




Installation

1.  **WARNING:** If replacing a deployed air bag module, always replace the air bag electronic crash sensor (ECS) module.

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

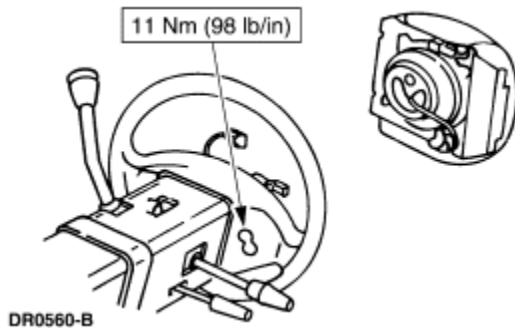
 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.


NOTE: Make sure to tighten the retaining bolts to specification.


Follow the removal procedure in reverse order.




Module—Passenger Air Bag

Removal

 **WARNING:** If replacing a deployed air bag module, always replace the air bag electronic crash sensor (ECS) module.

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.


 **WARNING:** Carry a live air bag module with the air bag and deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** Do not set a live air bag module down with the deployment door face down.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment which can result in personal injury.

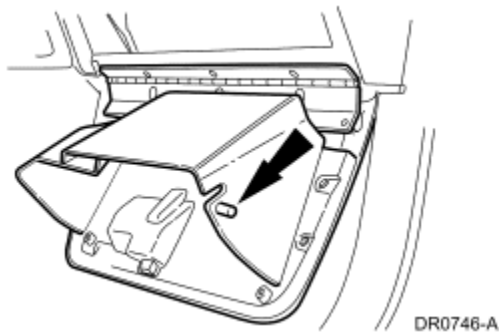
 **WARNING:** Air bag modules with discolored or damaged deployment doors must be replaced, not repainted.

 **WARNING:** Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.

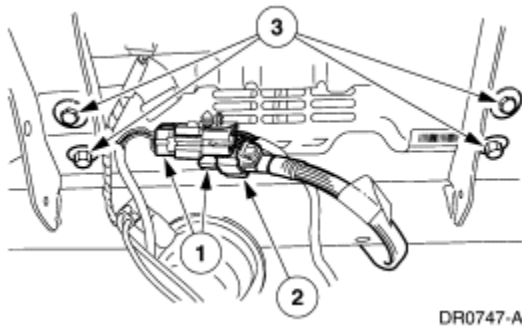
 **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if so equipped).

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

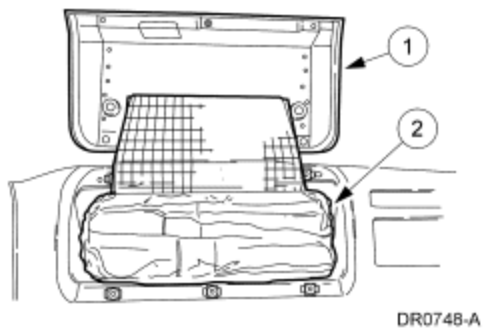
1. Disconnect the battery ground cable (14301); refer to [Section 414-01](#).
2. Push in on the two glove compartment door tabs and position downward.




3. Disconnect the passenger air bag module.
 1. Disconnect the harness connectors from the passenger air bag module bracket.
 2. Disconnect the passenger air bag module electrical connector.
 3. Remove the four passenger air bag module retaining screws.




4. Remove the passenger air bag module.
 1. Using a 3/8-inch x 4-inch flat head screwdriver, or equivalent, carefully slide the head of the screwdriver under the right bottom edge of the door and lift upward, separating the door from the clip. Separate the rest of the door from the clips by lifting the door with your hands.
 2. Remove the passenger air bag module.




Installation

1.  **WARNING:** If replacing a deployed air bag module, always replace the air bag electronic crash sensor (ECS) module.

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

 **WARNING:** Carry a live air bag module with the air bag and deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

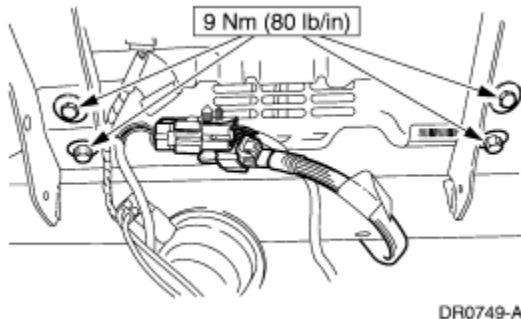
 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment which can result in personal injury.

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

NOTE: Make sure to tighten the retaining bolts to specification.


Follow the removal procedure in reverse order.

- Place six new offset fasteners onto the deployment door.



Air Bag Sliding Contact


Removal

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.


 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** Do not set a live air bag module down with the trim cover face down.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

 **WARNING:** Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, the sensor should be replaced whether or not the air bag is deployed.

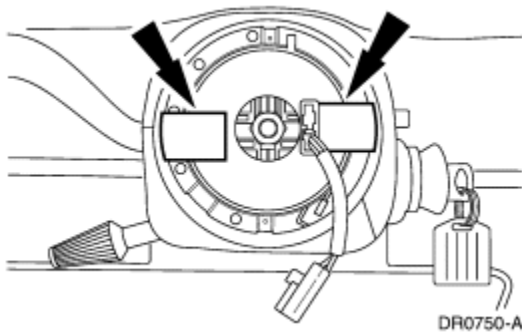
 **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

NOTE: A repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

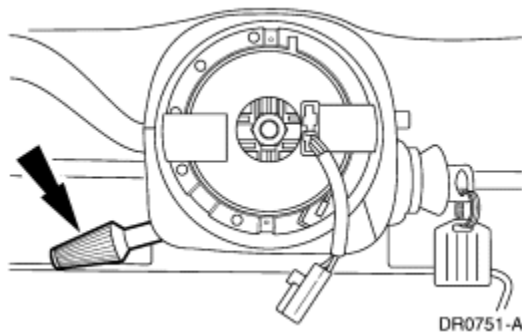
1. Remove the driver air bag module. Refer to [Module—Driver Air Bag](#) in this section.
2. **NOTE:** Make sure the wheels (1007) are in the straight-ahead position.

Remove the steering wheel (3600); refer to [Section 211-04](#).

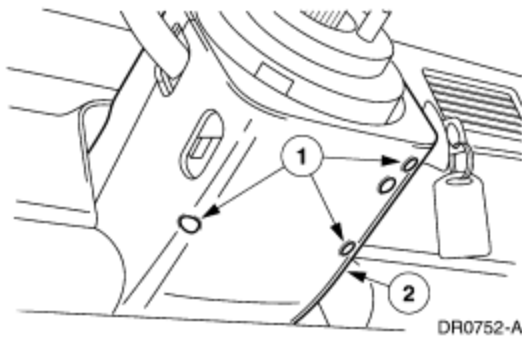
3. Apply two strips of masking tape across the air bag sliding contact (14A664) to prevent accidental rotation.



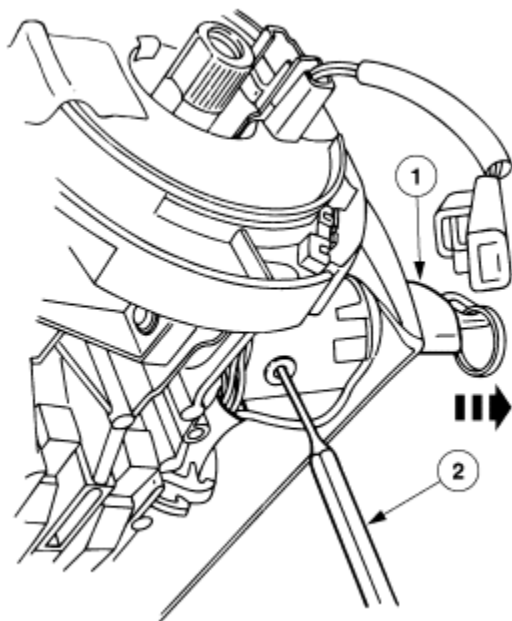
4. Twist the tilt wheel handle and shank (3F609) and remove.



5. Remove the lower steering column shroud (3530).
 1. Remove the three screws.
 2. Remove the steering column shroud.

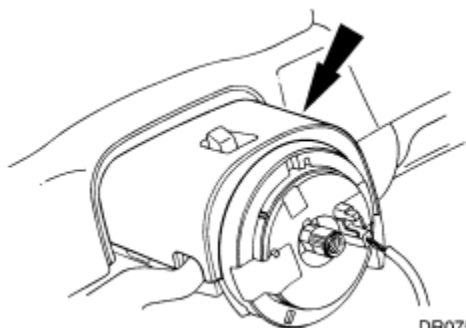


6. Remove the ignition switch lock cylinder (11582).
 1. Position the lock cylinder to RUN.
 2. Using a suitable tool, push upward on the cylinder release tab while pulling the cylinder outward.



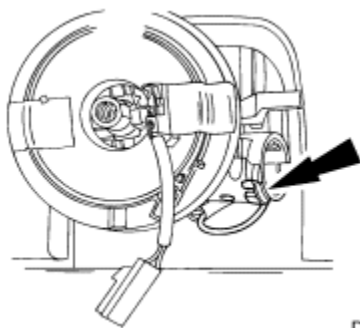
DR0753-A

7. Remove the upper steering column shroud.



DR0754-A

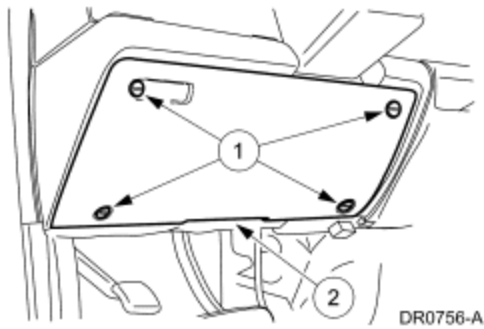
8. Remove the key-in-ignition warning indicator switch.



DR0755-A

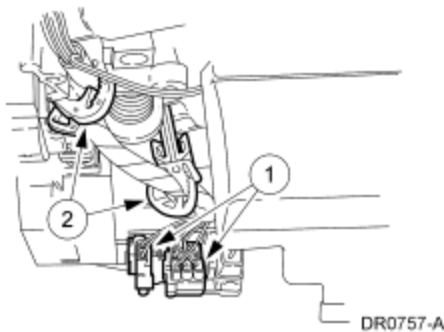
9. Remove the instrument panel steering column cover (04459).
 1. Turn the retaining clips a quarter-turn counterclockwise to release.

2. Remove the instrument panel steering column cover.

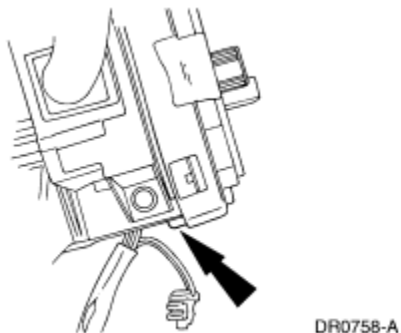


10. Disconnect the air bag sliding contact electrical connectors.

1. Separate the electrical connectors from the retaining bracket and disconnect from the harness.
2. Separate the air bag sliding contact pigtail from the two clips retaining it to the steering column.

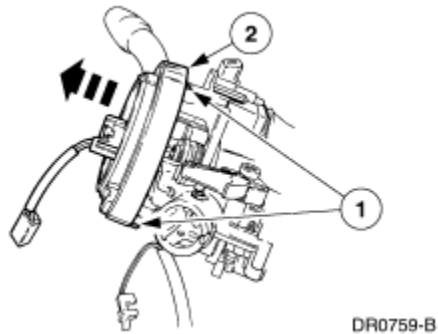


11. Pry the lower retaining clip loose.



12. Remove the air bag sliding contact.

1. Pry the upper and RH retaining clips loose.
2. Remove the air bag sliding contact.



Installation

1. **⚠ WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

⚠ WARNING: Carry a live air bag module with the air bag and deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

⚠ WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: Repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

Follow the removal procedure in reverse order.

- If a new air bag sliding contact is being installed, remove the anti-rotation tab.

Passenger Air Bag Deactivation (PAD) Switch

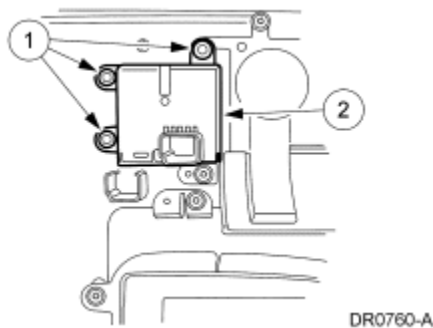
Removal

⚠ WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental

restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Be sure to disconnect auxiliary batteries and power supplies (if so equipped).

NOTE: A repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

1. Disconnect the battery ground cable (14301); refer to [Section 414-01](#).
2. Remove the instrument panel finish panel (044D70); refer to [Section 501-12](#).
3. Remove the passenger air bag deactivation (PAD) switch.
 1. Remove the retaining screws.
 2. Remove the passenger air bag deactivation (PAD) switch.



Installation

1. **NOTE:** A repair is made by replacement only. If a part is replaced and the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

Follow the removal procedure in reverse order.

GROUP 02: Frame and Mounting

[SECTION 502-02: Full Frame and Body Mounting](#)

SECTION 502-02: Full Frame and Body Mounting

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Frame and Body Mounting](#)

GENERAL PROCEDURES

[Frame Maintenance](#)

[Body Misalignment Check](#)

[Underbody Misalignment Check](#)

[Diagonal Or X-Frame Checking Method](#)

REMOVAL AND INSTALLATION

[Body Support—Front Radiator Support Upper](#)

[Body Support—Front Radiator Support Lower](#)

[Body Support—Front Lower](#)

[Body Support—Front Upper](#)

[Body Support—Middle, Crew Cab, Lower](#)

[Body Support—Middle, Crew Cab, Upper](#)

[Body Support—Rear, Regular Cab, Lower](#)

[Body Support—Rear, SuperCab, Lower](#)

[Body Support—Rear, Crew Cab, Lower](#)

[Body Support—Rear, Regular Cab, Upper](#)

[Body Support—Rear, SuperCab, Upper](#)

[Body Support—Rear, Crew Cab, Upper](#)

[Frame Extension—Stub Frame, Front](#)

[Crossmember—Transmission Support](#)

SECTION 502-02: Full Frame and Body
Mounting
SPECIFICATIONS

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Torque Specifications		
Description	Nm	Lb/Ft
Insulator Bolts	80	60
Gusset-to-Frame Nuts	90	67
Gusset-to-Transmission Support Crossmember Nuts	90	67
Transmission Support Crossmember-to-Frame Nuts	90	67
Transmission Support Insulator Nuts	103	76

Transmission Support Crossmember Nut and Bolt Replacement Chart	
M12 x 1.75 x 35, Bolt	N802114-S426, Nut
M12 x 1.75, Bolt	N800937-S426, Nut

Bolt Selection Chart					
Rivet Diameter	Bolt Size	Bolt Part Number	Washer Part Number	Nut Part Number	Torque Specs.
3/8-Inch and 10 mm	7/16-14 x 1.25	56561-S2 (Class S)	Not Req'd	382400-S2 (Class RG)	33-50 Lb-Ft (45-68 Nm)
3/8-Inch and 10 mm	7/16-14 x 1.75	56563-S2 (Class C)	Not Req'd	382400-S2 (Class RG)	33-50 Lb-Ft (45-68 Nm)
7/16-Inch	1/2-13 x 1.5 (Grade 5)	56783-S100 (Class S)	Not Req'd	33773-S2 (Class S)	53-75 Lb-Ft (72-102 Nm)
7/16-Inch	1/2-13 x 2.0 (Grade 8)	383896-S2 (Class BS)	44879-S2 (Class BS)	33773-S2 (Class S)	75-105 Lb-Ft (102-142 Nm)

Stub Frame Parts Identification Chart	
Part Number	Description
5C145	Frame (Front Stub Assembly)

5015	Side Rail Reinforcement (RH)
5016	Side Rail Reinforcement (LH)

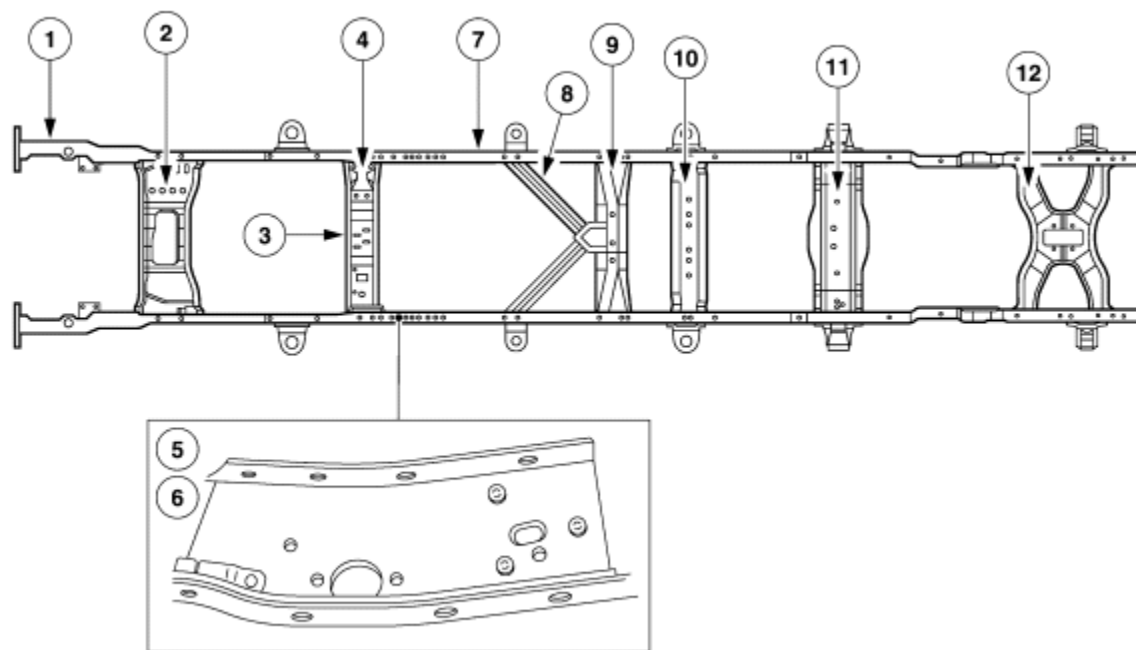
SECTION 502-02: Full Frame and Body
Mounting
DESCRIPTION AND OPERATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Frame and Body Mounting

The frame is made up of steel channel two-piece rails and riveted crossmembers, except for the transmission support crossmember which is bolted. The vehicle body sits on rubber body supports. There are lower and upper body supports to keep the vehicle body from sitting directly on the frame.

Frame, Crew Cab

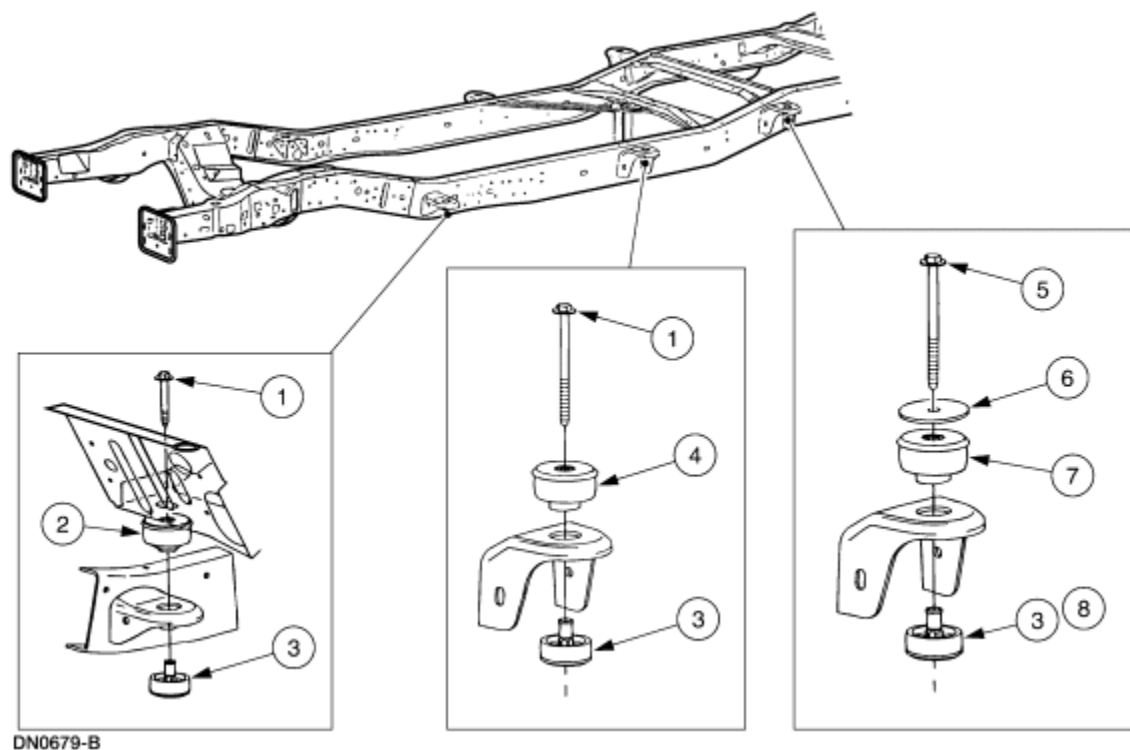


DN0731-B

Item	Part Number	Description
1	5C145	Frame (Front Stub Assy)
2	—	Engine Support Crossmember (Part of 5C145)
3	6A023	Transmission Support Crossmember

4	6096	Transmission Crossmember Gusset
5	5015	Side Rail Reinforcement — (RH)
6	5016	Side Rail Reinforcement — (LH)
7	—	Rear Side Rail (Part of 5C145)
8	—	Crossmember 2A (Part of 5C145) (Available on Crew Cab Pickup Only)
9	—	Crossmember 2B (Part of 5C145)
10	—	Crossmember 3 (Part of 5C145)
11	—	Crossmember 4 (Part of 5C145)
12	—	Crossmember 6 (Part of 5C145)

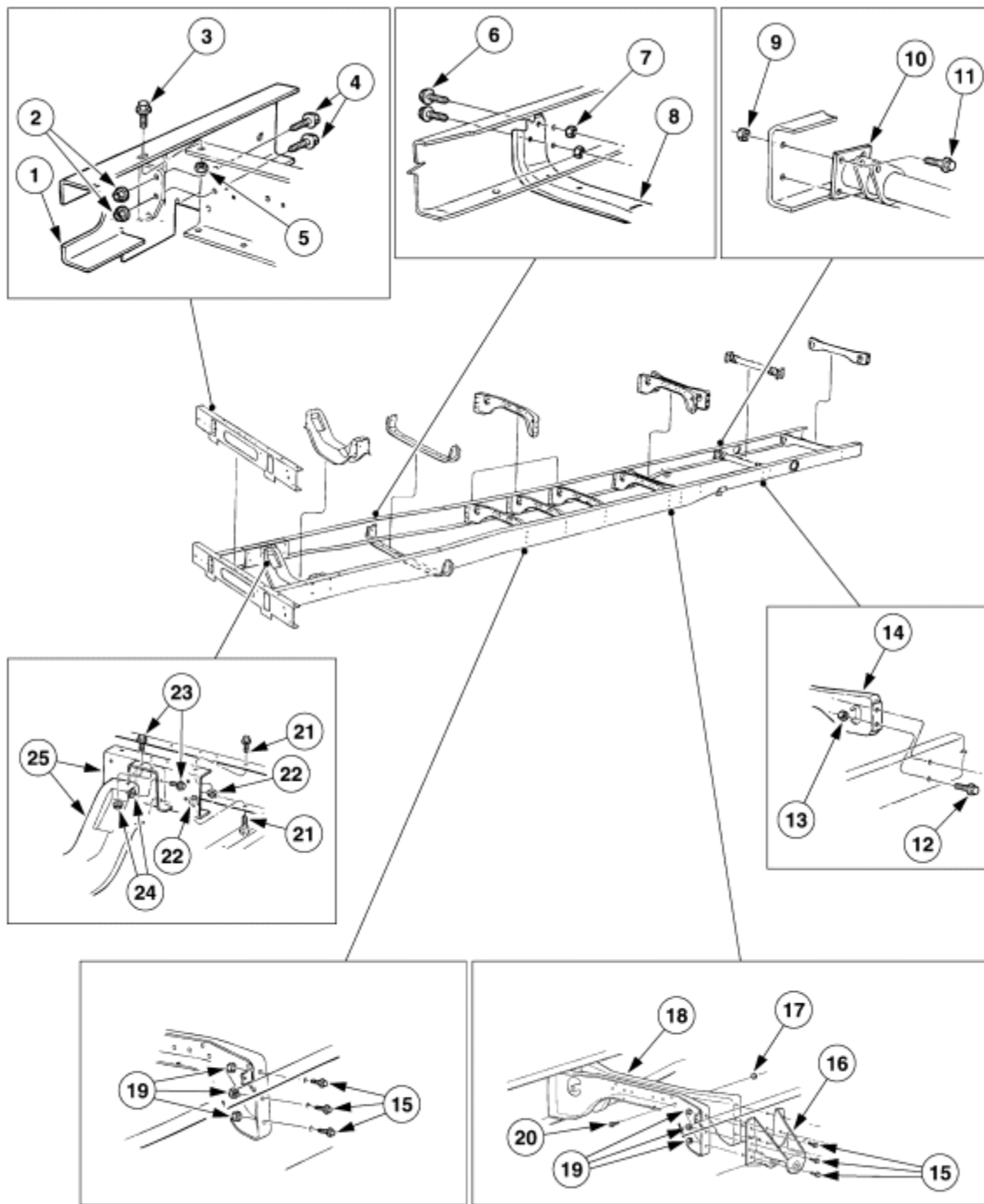
Frame and Body Mounting Locations, Crew Cab



Item	Part Number	Description
1	W705264-S301	Bolt
2	1000192	Body Insulator, Upper (Yellow)

3	1000193	Body Insulator, Lower (Purple)
4	1000192	Body Insulator, Upper (Brown)
5	W705262-S301	Bolt
6	1000145	Shim (as Required)
7	1000192	Body Insulator, Upper (Purple)
8	10000193	Body Insulator, Lower (Black) Regular and SuperCab

Frame, Motorhome



DN0769-B

Item	Part Number	Description
1	F81D-5020-A	Front Crossmember Frame
2	N620484-S56	Nut
3	N802114-S2	Bolt
4	N605829-S2	Bolt
5	N620469-S2	Nut

6	N802114-S2	Bolt
7	N620483-S2	Nut
8	F81D-5028-A	Frame #3 Crossmember
9	N620485-S2	Nut
10	F81D-18169-A	Bracket, Rear Shock Absorber— (Upper)
11	N605842-S2	Bolt
12	N802115-S2	Bolt
13	N620483-S2	Nut
14	F81D-5C054-A	Rear Frame Crossmember Assy
15	N802115-S2	Bolt
16	—	Bracket
17	N620482-S2	Nut
18	F81D-5030-A	Crossmember Assy, Frame #4
19	N602483-S2	Nut
20	N605804-S2	Bolt
21	N605829-S2	Bolt
22	N620484-S56	Nut
23	W500443-S426	Bolt
24	W520114-S427	Nut
25	F81D-5025-A	Crossmember Assy, Frame #2

SECTION 502-02: Full Frame and Body
Mounting
GENERAL PROCEDURES


1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Frame Maintenance

Frame Strength Identification

1. F-Series and F-Series Super Duty Chassis Cab use a 36,000 psi steel frame.

Welding Precautions

1.  **CAUTION:** When welding is performed anywhere on the vehicle, precautionary measures should be taken to prevent damage to electrical system wiring or components.

Prior to welding, any parts which could be damaged by excessive temperatures should be removed or adequately shielded. Also prior to welding, disconnect both batteries, then the ABS module, then the PCM. The welding ground clamp should be positioned as close to the affected welding area as possible. Computer processors should be removed if welding is to be done within their close proximity. Welding cables should never be allowed to lay on, near, or across any electrical wiring or electronic component during welding. After welding, when parts are cool, carefully inspect wiring and electrical components for shorts or other damage which could draw excessive currents and possibly cause an electrical system short when the battery is reconnected.

When welding low carbon steel side rails (35,000 psi yield strength), emphasis should be placed upon weld application techniques to avoid stress risers that may adversely affect frame operating stresses. When welding within 4 inches of any crossmember rivet, remove the rivets and replace with grade 8 bolt/nuts.

NOTE: Do not weld on any reinforcement. Use compression type fasteners when attaching any component to the frame in the reinforcement area.

NOTE: On Motorhome, welding to the frame flange is not recommended; welding to the vertical side web is preferred.

If welding must be done on a frame (5005), make sure the following requirements are met:

- If the frame is attached to the vehicle, the battery ground cable (14301) must be disconnected before using any electrical welding equipment.
- Do not use gas welding equipment; mig welding is the only approved method.
- Replace spot-welded components by spot welding where possible.
- If spot welding is not possible, use puddle welding.

Weld Attachments

1. Wire brush the area around the crack to remove the paint, grease, mud, etc., to expose the crack completely and to ensure good weld adhesion.
2. To stop the crack from spreading, drill a 6.35-mm (1/4-inch) hole at a point 12 mm (0.05 inch) beyond the root of the crack.
3. Grind out the full length of the crack to the hole to form a V-shaped slot with the base of the V-slot contacting the reinforcement.
4. The base of the V-slot should have at least a 1.52-mm (0.06-inch) opening to ensure weld penetration to the reinforcement when welding the crack.
5. Drill clearance holes in the reinforcements to clear rivet heads and bolt heads or nuts where necessary.
6. In the event that a repair is required on more than one frame surface (for example, a flange crack that extends into the web), two pieces of flat stock should be welded together where

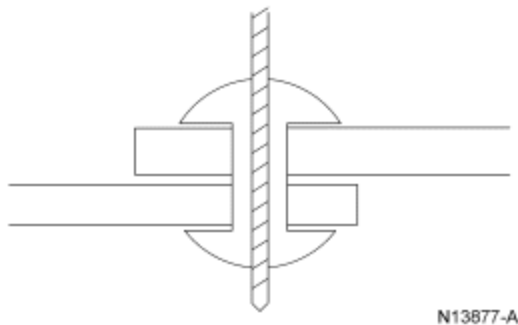
they join. The web reinforcement should be a minimum of 76.2-mm (3.0-inches) high and have a 63.5-mm (2.5-inch) radius at each of the two corners.

7. Completely clean the surface of the frame under and around the reinforcements.
8. Clamp the reinforcements securely to the frame prior to welding.
9. Weld the reinforcement all around after welding the crack V-slot to the reinforcement.
10. Ground the flange edge weld until smooth after all pit holes have been filled by the weld.
11. If a damaged bolted-on-frame bracket is to be replaced, make sure the new bolts, washers and nuts are of the same specifications and bolt torques as the original parts.
12. If cases where it is necessary to remove rivets, replace the rivets with Property Class 9.8 metric (Grade 8) nuts, bolts and washers of the next larger size (for example, for 3/8-inch diameter rivets, use 7/16-inch bolts and for 7/16-inch diameter rivets, use 1/2-inch bolts). This requires line drilling of the holes to the same diameter as the new bolt (either 0.437-inch diameter or 0.500-inch diameter).

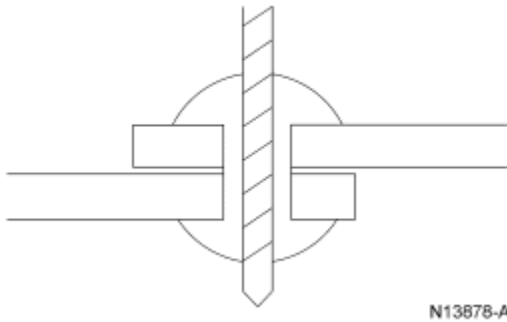
Rivet Removal

1.  **CAUTION: Do not drill outside the rivet into the frame because that will weaken the frame.**

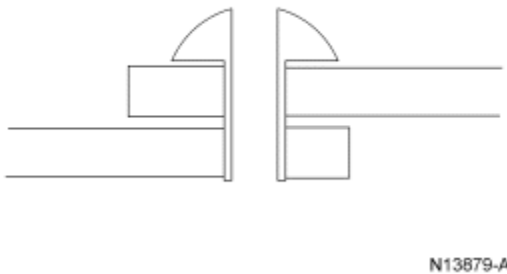
Drill an 1/8-inch pilot hole through the rivet.



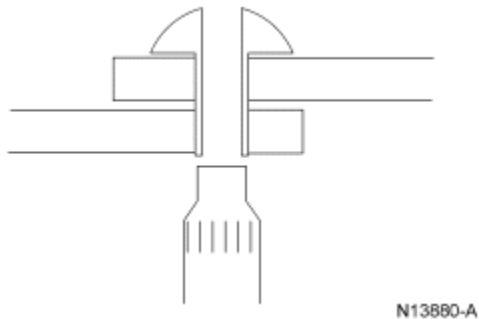
2. Redrill an 11/32-inch hole through the shank of the rivet.



3. Remove the rivet head using an air chisel.



4. Drive out the rivet with a punch.



5. Remove the support.

Rivet Replacement

1.  **CAUTION: Drill only where a rivet was removed. Drilling outside the rivet hole will weaken the frame.**

NOTE: When replacing rivets with bolts, refer to Specifications in this section for bolt selection.

Drill a bolt hole in the support and the frame.

1. Line drill a hole the size of the bolt through the old rivet hole. For a 7/16-inch diameter rivet, use a 1/2-inch drill bit.
2. Position the support.
3. **NOTE:** Rivets that are removed will be replaced with the next larger size bolts.

Insert the bolts, nuts and washer that are Property Class 9.8 Metric (Grade 8) in the drilled holes.

4. Tighten the bolts.

Drilling Precautions — Except Motorhome

1. Holes that would weaken the frame sidemember should not be drilled in the frame.
2. Holes are not to be drilled in the sidemember's top or bottom flange.
3. Holes to mount brackets, out-riggers and supports, may be drilled in the vertical frame side rail web with the following restrictions:
 - Material between edge of hole and inside of upper or lower flange must not be less than 1.50 inch for low carbon steel (36,000 psi yield).
 - The minimum edge distance between any two holes up to 5/8-inch diameter must be 1.00 inch. For larger than 5/8-inch diameter holes, the minimum edge distance must be 1.5 times the diameter of the largest hole.
 - No holes will be allowed to exceed 0.75 inch in diameter.
 - Avoid close vertical succession of fasteners.
 - All attaching fasteners, including flat washers, must be of high strength steel (Grade 8).


Drilling Precautions — Motorhome

1. The frame web holes to mount brackets, outriggers, and supports may be drilled in the vertical side rail web with the following restrictions:
 - The material between the edge of the hole and the inside of the upper or lower flange must be at least 38 mm (1.50 inch).
 - The minimum edge distance between any two holes must be at least twice the diameter of the largest hole.
 - The holes must be no larger than 19 mm (0.75 inch) in diameter. Avoid close vertical succession of fasteners.
 - All attaching fasteners, including the flat washers, must be of high strength steel (Grade 8 or metric equivalent).
2. The frame flange hole may be drilled in the horizontal frame flanges with the following instructions:
 - The material between the edge of the hole and the radius/edge of the flange must be at least 25 mm (1.0 inch).


- The minimum edge distance between any two holes must be at least twice the diameter of the largest hole.
- The holes must be no larger than 12.5 mm (0.5 inch) in diameter.

Frame Straightening

1. When straightening the frame, make sure the following requirements are met:

-  **CAUTION: Straightening of the front frame convolute can cause frame degradation and is prohibited.**

Straightening should only be attempted on a frame that fails to meet specifications of the diagonal checking method or where damage is apparent.

- Straightening should be limited to parts which are not severely bent.
-  **CAUTION: Do not use water to cool the frame after heating. Drenching a hot frame with water causes the frame to become brittle and changes the strength of the frame. Let the frame cool naturally.**

If heat is needed to straighten a frame member, keep the temperature below 650°C (1200°F) and at a dull red glow.

- Heat should be kept to a minimum area so that the hardness of the metal will not be affected.

Body Misalignment Check

1. When making a visual inspection for proper body panel alignment, make sure the following areas are looked at:
 - Fender-to-hood body panel gap
 - Hood-to-cowl body panel gap
 - Door-to-fender body panel gap
 - Door-to-roof body panel gap
 - Door-to-cab gap
 - Front door-to-rear door body panel gap, if applicable
 - Rear door-to-roof body panel gap, if applicable

Underbody Misalignment Check

NOTE: Underbody misalignment can be the result of damage or loose frame components. It can affect front and rear wheel alignment and cause improper operation and abnormal wear of tires and chassis parts.

NOTE: Refer to the Body Builders Book for dimensional data when performing repairs on the cab or frame.

1. Inspect the frame for damage and loose parts before checking the frame alignment.
2. Inspect all crossmembers for cracks, twists, or bends.
 - Inspect all of the welded connections for cracks. For repairs, refer to Weld Attachment in this section.
 - Check all of the support brackets for looseness. If the brackets are loose, tighten to specification.

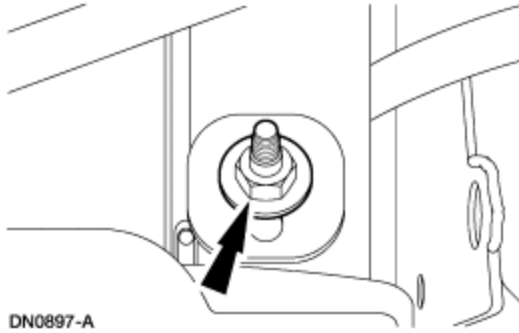
Diagonal Or X-Frame Checking Method

1. Refer to Rotunda Laser Measuring System operating instructions for diagonal or X-frame checking.

Body Support—Front Radiator Support Upper

Removal

1. Remove lower insulator; for additional information refer to [Body Support—Front Lower](#) in this section.



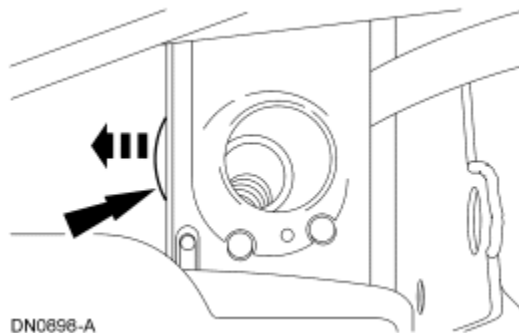
2. Remove the front frame upper insulator retaining nut and washer.
3. Remove the opposite side body insulator bolt; for additional information refer to [Body Support—Front Lower](#) in this section.
4. **NOTE:** Step 3 is for Crew Cab vehicles only.

Remove and discard the left and right middle insulator bolts; for additional information, refer to [Body Support—Middle, Crew Cab, Lower](#).

5. **NOTE:** Choose the proper procedure to match the vehicle that is being serviced.

Remove and discard the left and right rear body insulator bolts; for additional information, refer to [Body Support—Rear, Regular Cab, Lower](#); [Body Support—Rear, SuperCab, Lower](#); or [Body Support—Rear, Crew Cab, Lower](#).

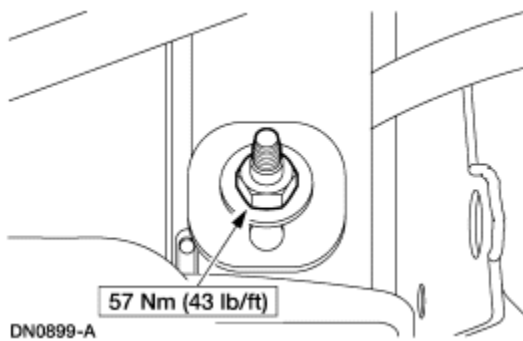
6. Raise the vehicle body enough to allow removal of the insulator.
7. Remove the insulator.



Installation

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



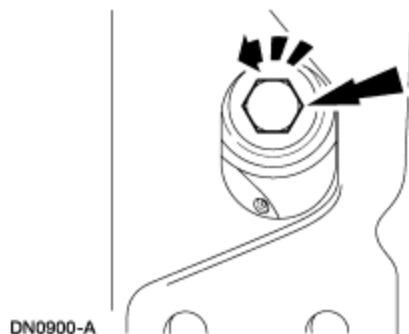
SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Body Support—Front Radiator Support Lower

Removal

1. Remove the front frame lower insulator retaining bolt.



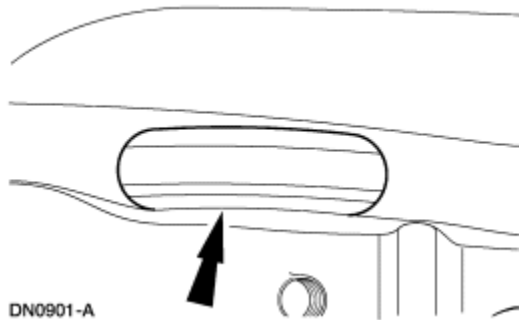
2. Remove the opposite side body insulator bolt.
3. **NOTE:** Step 3 is for Crew Cab vehicles only.

Remove and discard the left and right middle insulator bolts; for additional information refer to [Body Support—Middle, Crew Cab, Lower](#) in this section.

4. **NOTE:** Choose the proper procedure to match the vehicle that is being serviced.

Remove and discard the left and right rear body insulator bolts; for additional information refer to [Body Support—Rear, Regular Cab, Lower](#); [Body Support—Rear, SuperCab, Lower](#); or [Body Support—Rear, Crew Cab, Lower](#).

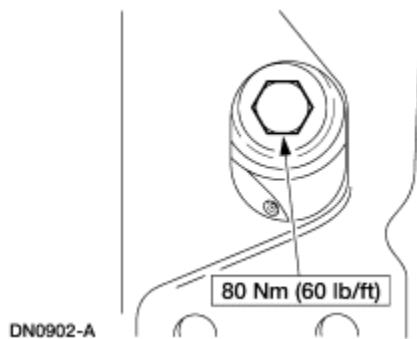
5. Remove the insulator.



Installation

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.

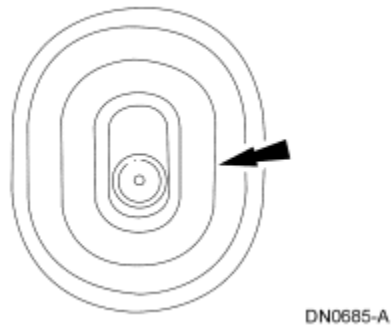


Body Support—Front Lower

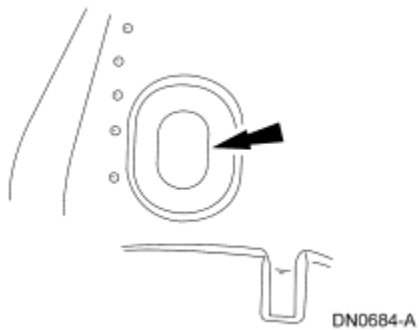
Removal

1. Remove the scuff plate.

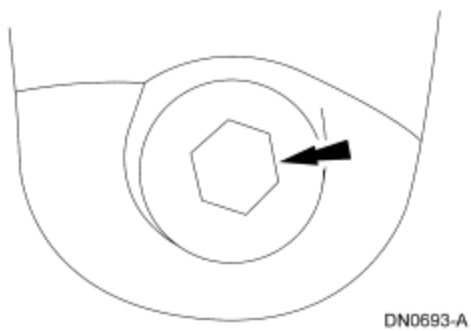
2. Remove the cowl side trim panel; for additional information, refer to [Section 501-05](#).
3. Pull the carpet or mat back to see the front body insulator plug button.



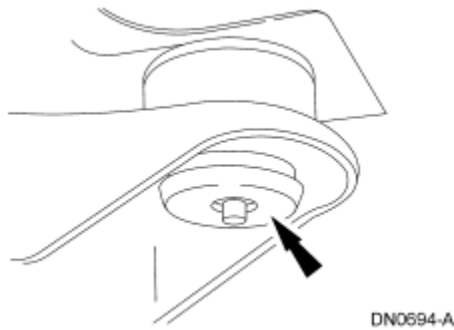
4. Remove the button.



5. Remove and discard the bolt.



6. Remove the insulator.

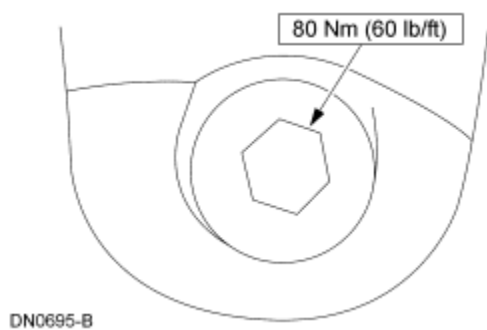


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.




SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Body Support—Front Upper

Removal

1.  **CAUTION:** When removing upper body insulators, all other body mount support bolts must be loose before raising the vehicle cab to prevent permanent structural damage from occurring to the vehicle cab.

Remove the lower body insulator; for additional information, refer to [Body Support—Front Lower](#) in this section.

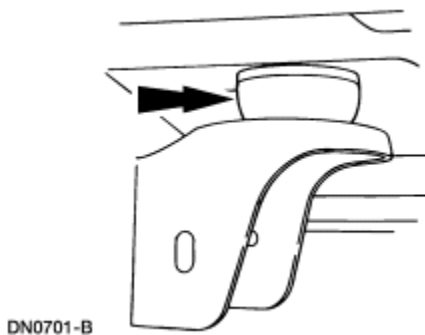
2. Remove the opposite side front body insulator bolt; for additional information, refer to [Body Support—Front Lower](#) in this section.
3. **NOTE:** Step 3 is for Crew Cab vehicles only.

Remove and discard the left and right middle insulator bolts; for additional information, refer to [Body Support—Middle, Crew Cab, Lower](#) in this section.

4. **NOTE:** Choose the proper procedure to match the vehicle that is being serviced.

Remove and discard the left and right rear body insulator bolts; refer to [Body Support—Rear, Regular Cab, Lower](#); [Body Support—Rear, SuperCab, Lower](#); or [Body Support—Rear, Crew Cab, Lower](#).

5. Raise the vehicle body enough to allow removal of the insulator.
6. Remove the insulator.

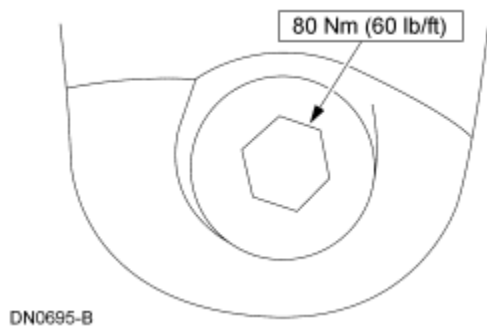


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



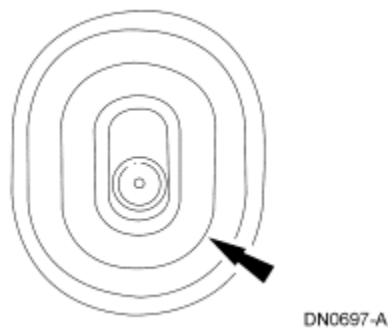
SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

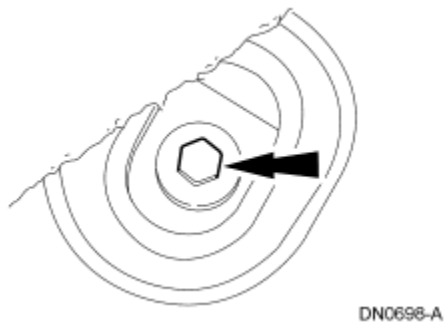
Body Support—Middle, Crew Cab, Lower

Removal

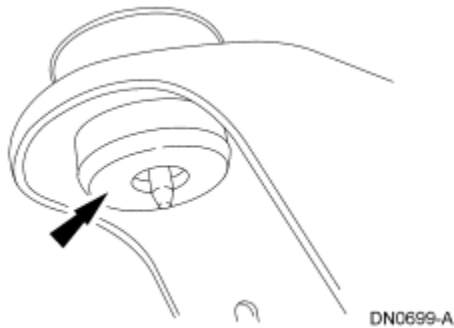
1. Move the front seat forward.
2. Remove the rear door cowl side trim panel (02345); for additional information, refer to [Section 501-05](#).
3. Pull the carpet or mat back to expose the middle body insulator button plug.



4. Remove the plug.
5. Remove and discard the bolt.



6. Remove the insulator.



Installation


NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.

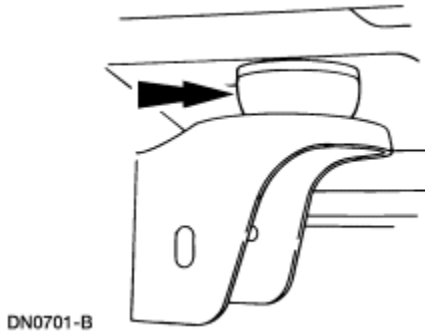
Body Support—Middle, Crew Cab, Upper

Removal

1.  **CAUTION:** When removing upper body insulators, all other body mount support bolts must be loose before raising the vehicle cab to prevent permanent structural damage from occurring to the vehicle cab.

Remove the middle lower body insulator; for additional information, refer to [Body Support—Middle, Crew Cab, Lower](#) in this section.

2. Remove and discard the opposite side middle body insulator bolt; for additional information, refer to [Body Support—Middle, Crew Cab, Lower](#) in this section.
3. Remove and discard the left and right front body insulator bolts; for additional information, refer to [Body Support—Front Lower](#) in this section.
4. Remove and discard the left and right rear body insulator bolts; for additional information, refer to [Body Support—Rear, Crew Cab, Lower](#) in this section.
5. Raise the vehicle body enough to allow removal of the insulator.
6. Remove the insulator.

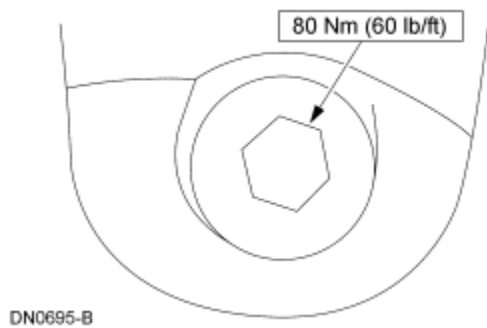


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



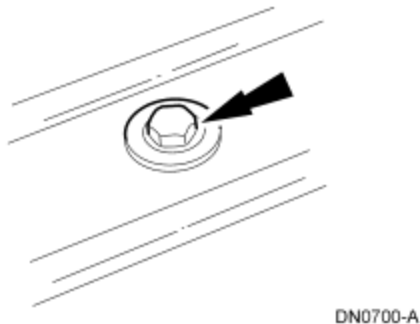
SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

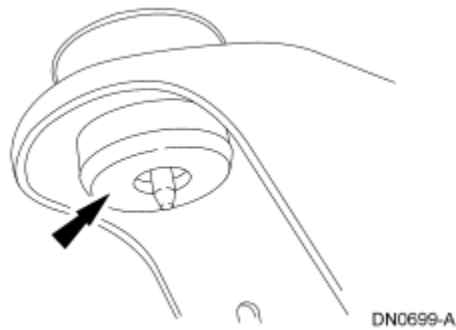
Body Support—Rear, Regular Cab, Lower

Removal

1. Move the front seat forward.
2. Move the front seatback forward.
3. If equipped, remove the utility tray behind the seat; for additional information, refer to [Section 501-05](#).
4. Pull the carpet, or mat back to see the rear body insulator bolt head.
5. Remove and discard the bolt.



6. Remove the insulator.

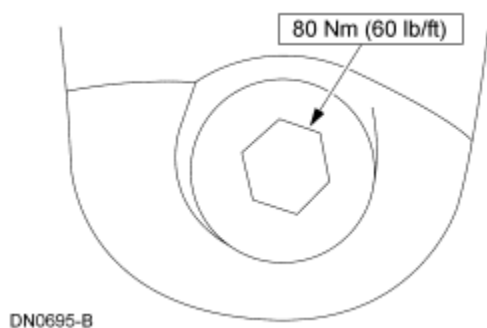


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



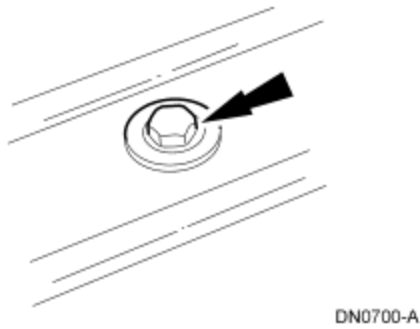
SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

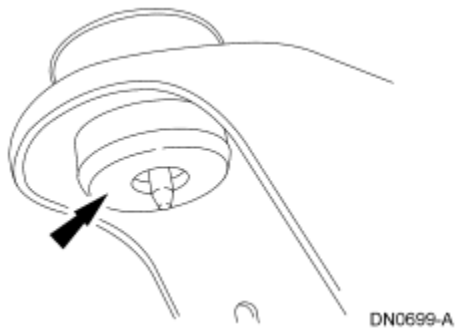
Body Support—Rear, SuperCab, Lower

1. Move the front seat forward.
2. Remove the vehicle jack; refer to the Owner Guide.
3. Remove the rear seat; for additional information, refer to [Section 501-10](#).
4. Pull the carpet or mat back to expose the rear body insulator bolt head.

5. Remove and discard the bolt.



6. Remove the insulator.

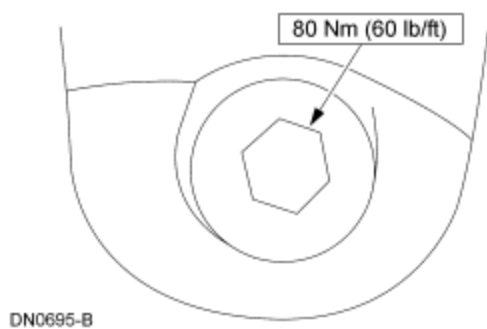


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

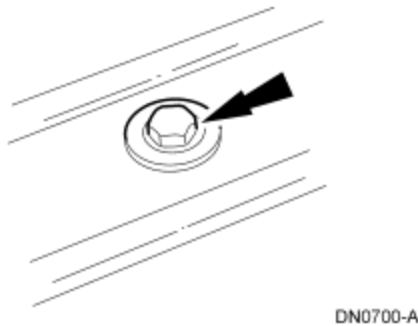
Follow the removal procedure in reverse order.



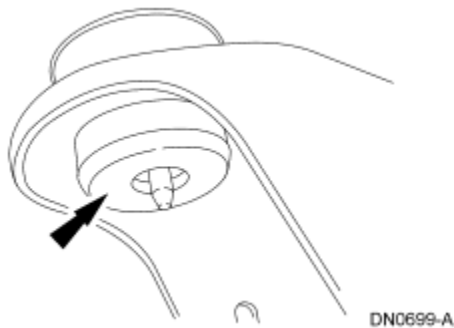
Body Support—Rear, Crew Cab, Lower

Removal

1. Remove the rear door scuff plate; for additional information, refer to [Section 501-05](#).
2. Remove the rear seat; for additional information, refer to [Section 501-10](#).
3. If equipped, remove the utility tray from behind the rear seat; for additional information, refer to [Section 501-05](#).
4. Pull the carpet or mat back to expose the lower body insulator bolt head.
5. Remove and discard the bolt.



6. Remove the insulator.

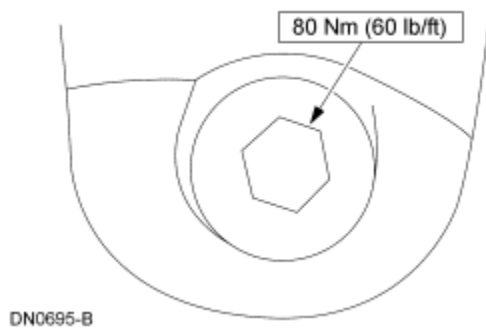


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.




SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

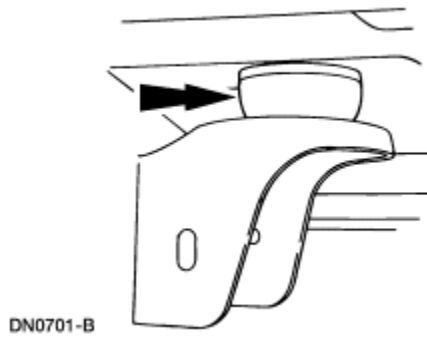
Body Support—Rear, Regular Cab, Upper

Removal

1.  **CAUTION:** When removing upper body insulators, all other body mount support bolts must be loose before raising the vehicle cab to prevent permanent structural damage from occurring to the vehicle cab.

Remove the rear lower body insulator; for additional information, refer to [Body Support—Rear, Regular Cab, Lower](#) in this section.

2. Remove and discard the opposite side rear body insulator bolt; for additional information, refer to [Body Support—Rear, Regular Cab, Lower](#) in this section.
3. Remove and discard the left and right front body insulator bolts; for additional information, refer to [Body Support—Front Lower](#) in this section.
4. Raise the vehicle body enough to allow removal of the insulator.
5. Remove the insulator.

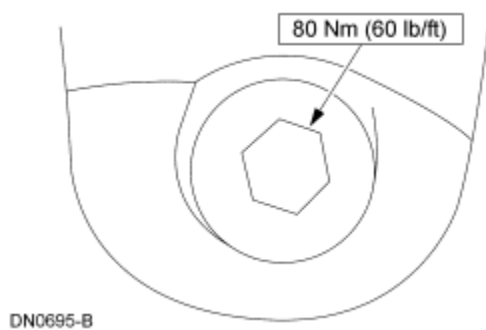


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.




SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

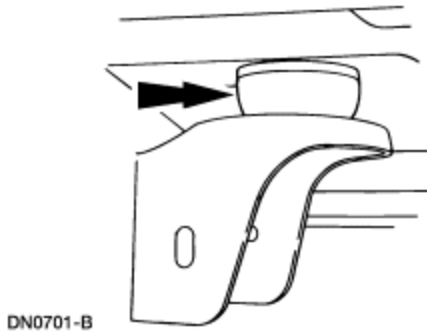
Body Support—Rear, SuperCab, Upper

Removal

1.  **CAUTION:** When removing upper body insulators, all other body mount support bolts must be loose before raising the vehicle cab to prevent permanent structural damage from occurring to the vehicle cab.

Remove the rear lower body insulator; for additional information, refer to [Body Support—Rear, SuperCab, Lower](#) in this section.

2. Remove and discard the opposite side rear body insulator bolt; for additional information, refer to [Body Support—Rear, SuperCab, Lower](#) in this section.
3. Remove and discard the left and right front body insulator bolts; for additional information, refer to [Body Support—Front Lower](#) in this section.
4. Raise the vehicle cab enough to allow removal of the insulator.
5. Remove the insulator.

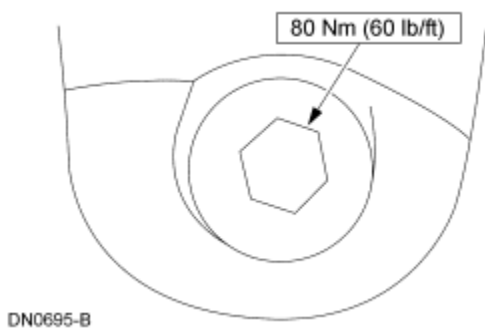


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.


1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



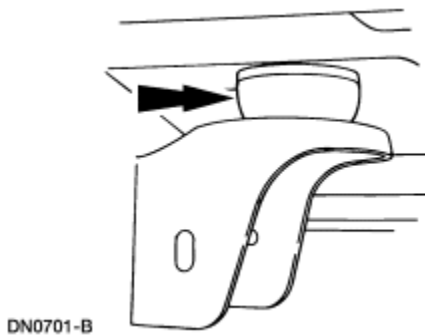
Body Support—Rear, Crew Cab, Upper

Removal

1.  **CAUTION:** When removing upper body insulators, all other body mount support bolts have to be loose before raising the vehicle cab to prevent permanent structural damage from happening to the vehicle cab.

Remove the rear lower body insulator; for additional information, refer to [Body Support—Rear, Crew Cab, Lower](#) in this section.

2. Remove the opposite side rear body insulator bolt; for additional information, refer to [Body Support—Rear, Crew Cab, Lower](#) in this section.
3. Remove and discard the left and right middle body insulator bolts; for additional information, refer to [Body Support—Middle, Crew Cab, Lower](#) in this section.
4. Remove and discard the left and right front body insulator bolts; for additional information, refer to [Body Support—Front Lower](#) in this section.
5. Raise the vehicle cab enough to allow removal of the insulator.
6. Remove the insulator.

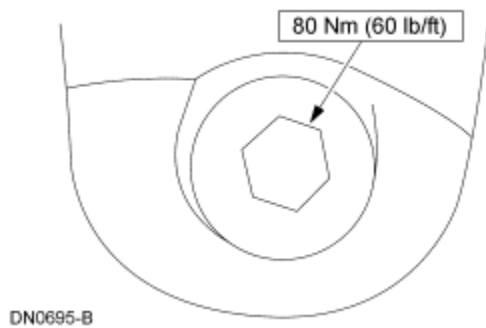


Installation

NOTE: Do not reuse body support mounting fasteners. New fasteners must be installed for each fastener that has been removed or loosened.

1. **NOTE:** No lubricants of any kind are to be used during body insulator installation.

Follow the removal procedure in reverse order.



SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)


Frame Extension—Stub Frame, Front

Removal

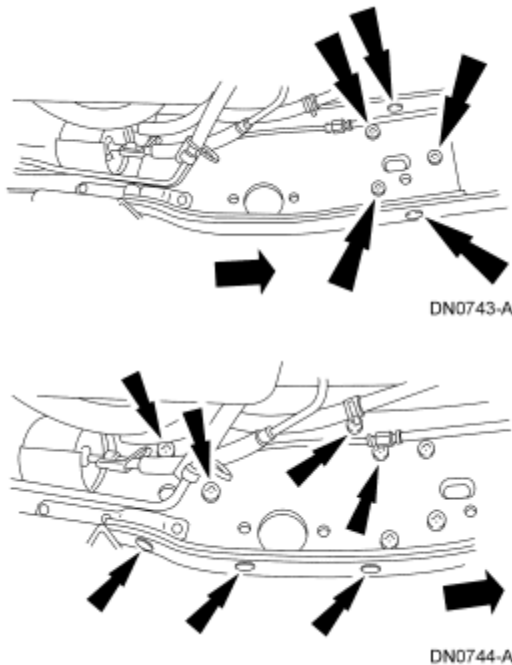
NOTE: The LH side of the front stub frame extension is shown, the RH side is similar.

1. Prepare the vehicle for front stub frame extension removal.
 1. Remove the front bumper/body.
 2. Vehicles with automatic transmission, remove the transmission. For additional information, Refer to the appropriate section in Group [307](#) for the procedure.
 3. Vehicles with manual transmission, remove the transmission. For additional information, Refer to the appropriate section in Group [308](#) for the procedure.
 4. Remove the engine. For additional information, Refer to the appropriate section in Group [303](#) for the procedure.
 5. Remove the exhaust system components as necessary to access the front stub-to-reinforcement rivets. For additional information, refer to [Section 309-00](#).
 6. Remove the power steering gear and any steering components attached to the frame. For additional information, refer to [Section 211-02](#).
 7. Vehicles with 4-wheel drive, remove the front drive axle. For additional information, refer to [Section 205-03](#).

8. Vehicles with 2-wheel drive, remove the front axle. For additional information, refer to [Section 204-01A](#).
9. Remove all suspension components attached to the front stub frames including the front leaf spring rear shackle bracket or the radius arm pivot bracket. For additional information, Refer to the appropriate section in Group [204](#) for the procedure.

2.  **CAUTION:** Before this step is carried out, the reinforcement and surrounding frame area must be correctly prepared. For additional information, refer to General Procedures in this section.

Remove and discard the rivets used to secure the side rail reinforcements to the front stub frame and rear side rail. Separate the weld joints. For additional information, refer to [Frame Maintenance](#) in this section.



3. Remove the front stub assembly and the side rail reinforcement at the joint.

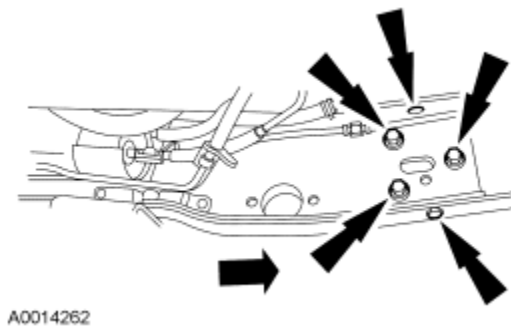
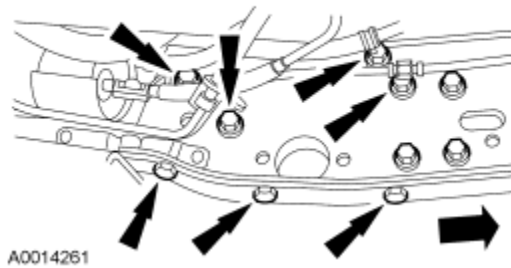
Installation

1. **NOTE:** Refer to Specifications in this section for parts identification when installing new stub frames and side rail reinforcements.

NOTE: The side rail reinforcement must be attached to the rear stub frame first during installation.

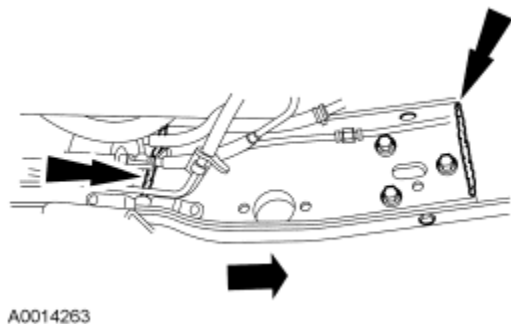
Position the front stub assembly and the side rail reinforcements on the frame assembly.

2. Install new bolts, washers, and nuts of the same size as the rivets that were removed.



3. **NOTE:** The side rail reinforcement must be attached to the rear side rails first during installation.

Weld the side rail reinforcement to the front stub frame and the rear side rails following good weld application techniques. Do not weld at the corners to minimize stress concentrations. For additional information, refer to [Frame Maintenance](#) in this section.



4. Restore the vehicle to operating condition.
 1. Install all suspension components that were removed. For additional information, Refer to the appropriate section in Group [204](#) for the procedure.
 2. Vehicle with 2-wheel drive, install the front axle. For additional information, refer to [Section 204-01A](#).
 3. Vehicles with 4-wheel drive, install the front drive axle. For additional information, refer to [Section 205-03](#).

4. Install the power steering components that were removed. For additional information, refer to [Section 211-02](#).
5. Install the exhaust system components that were removed. For additional information, refer to [Section 309-00](#).
6. Install the engine. For additional information, Refer to the appropriate section in Group [303](#) for the procedure.
7. Vehicles with manual transmission, install the transmission. For additional information, Refer to the appropriate section in Group [308](#) for the procedure.
8. Vehicles with automatic transmission, install the transmission. For additional information, Refer to the appropriate section in Group [307](#) for the procedure.
9. Install the front bumper/body.

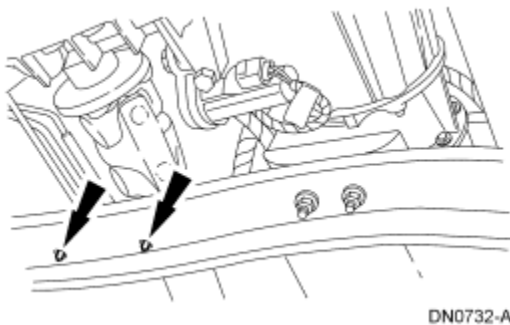
SECTION 502-02: Full Frame and Body
Mounting
REMOVAL AND INSTALLATION

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Crossmember—Transmission Support

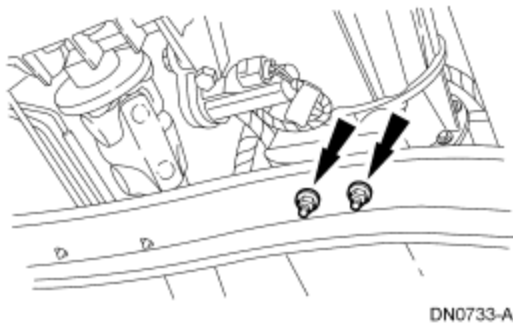
Removal

1. Raise and support the vehicle; for additional information, refer to [Section 100-02](#).
2. Disconnect the electrical connection from the transmission support crossmember (6A023).

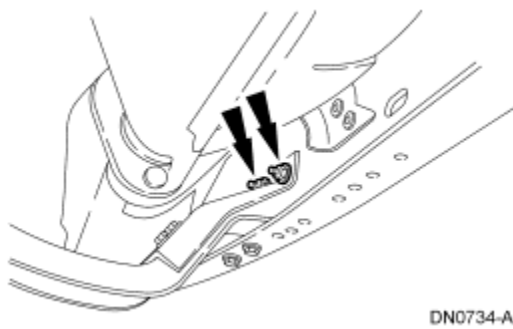


3. Support the transmission.

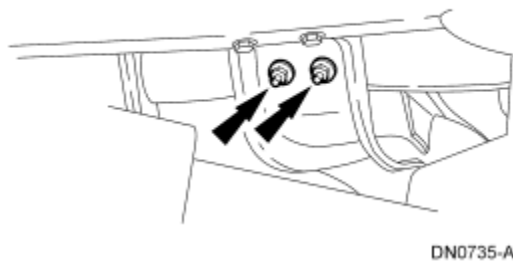
4. Remove the transmission insulator nuts.



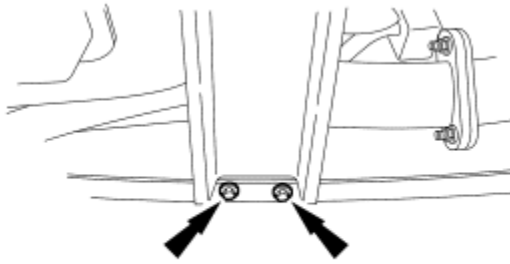
5. Remove the nuts and bolts retaining the gusset to the frame.



6. Remove the nuts and bolts retaining the gusset to the transmission support crossmember, then remove the gusset.

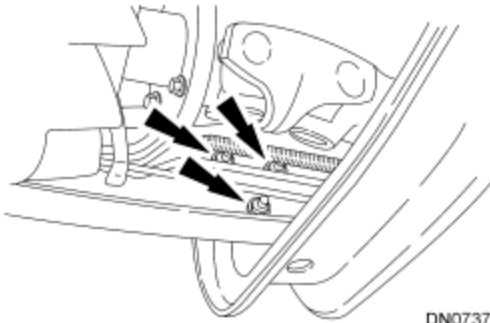


7. Remove the transmission support crossmember nuts and bolts (RH side).



DN0736-A

8. Remove the transmission support crossmember nuts and bolts (LH side).
 - Position the lines to access the nuts and bolts.



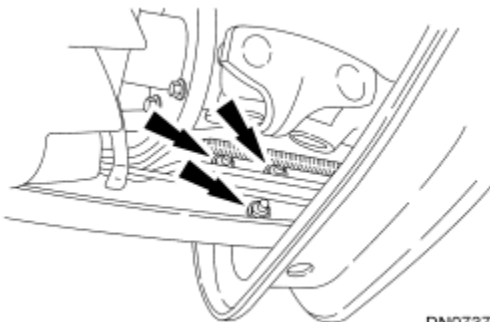
DN0737-A

9. Remove the transmission support crossmember.

Installation

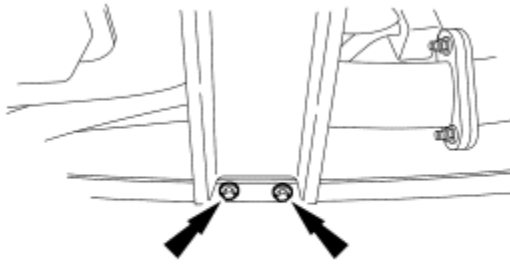
1. **NOTE:** Refer to Specifications in this section for transmission support crossmember nut and bolt applications.

Position the transmission support crossmember and loosely install the transmission support crossmember nuts and bolts (LH side).



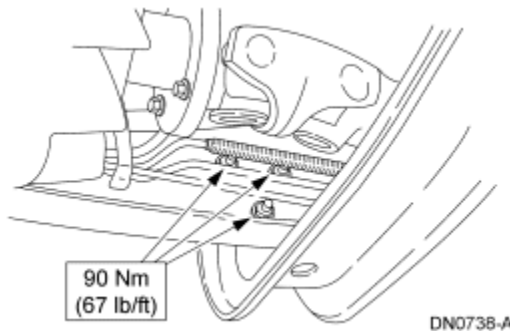
DN0737-A

2. Loosely install the transmission support crossmember nuts and bolts (RH side).



DN0736-A

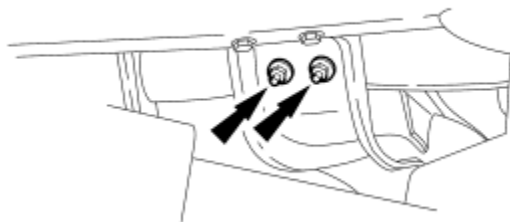
3. Tighten the transmission support crossmember nuts and bolts (LH side) to specification.



DN0738-A

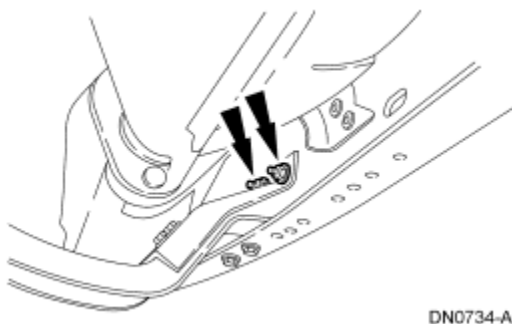
4. **NOTE:** Be sure to install the transmission crossmember gusset to transmission crossmember bolts as shown to avoid interference with the exhaust.

Loosely install the nuts and bolts retaining the transmission crossmember gusset to the transmission support crossmember.

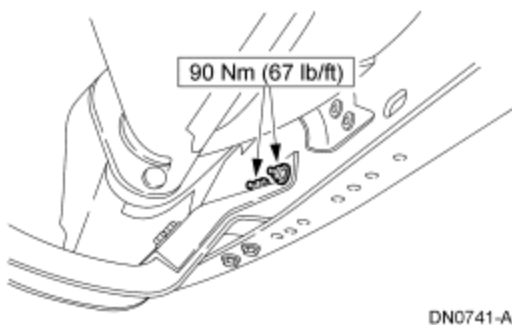


DN0735-A

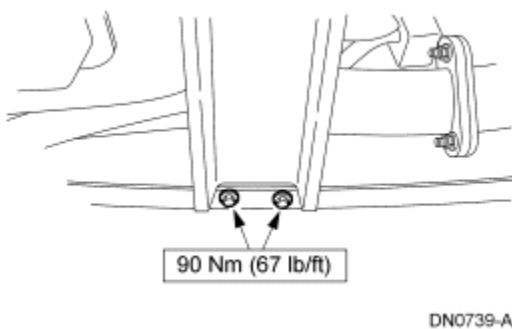
5. Loosely install the nuts and bolts retaining the transmission crossmember gusset to the frame.



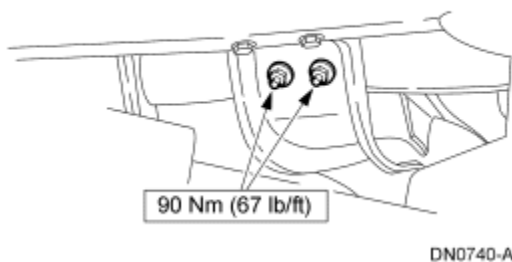
6. Tighten the nuts and bolts retaining the transmission crossmember gusset to the frame to specification.



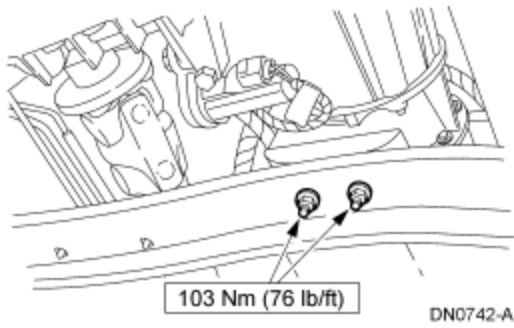
7. Tighten the transmission support crossmember nuts and bolts (RH side) to specification.



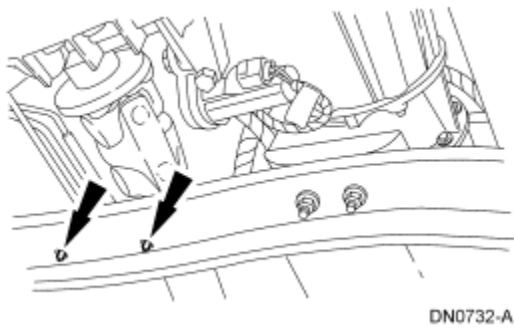
8. Tighten the nuts and bolts retaining the gusset to the transmission support crossmember to specification.



9. Install new transmission support insulator nuts.



10. Remove the support from the transmission.
11. Connect the electrical connection to the transmission support crossmember.



12. Lower the vehicle.
-