



TECHNICAL SERVICE BULLETIN

Electronic Shift On-The-Fly (ESOF) 4WD - Intermittent Grinding Noise While Driving

21-2076

17 March 2021

This bulletin supersedes 20-2278. Reason for update: Missing or Incorrect Applications

Model:

Ford 2013-2018 F-150

Summary

This article supersedes TSB 20-2278 to update the Issue and Service Procedure.

Issue: Some 2013-2018 F-150 vehicles equipped with ESOFF 4-wheel drive (4WD) may exhibit an intermittent grinding noise while driving in 2-wheel drive (2WD) mode most commonly on acceleration. ESOFF can be identified as it does not have a 4WD AUTO (4A) position on the mode selector switch (MSS). This may be due to a loss of vacuum to the integrated wheel end (IWE) actuators and/or wear of the IWE components. To correct the condition, follow the Service Procedure steps to reprogram the transfer case control module (TCCM) and replace any worn vacuum and/or IWE components.

Action: Follow the Service Procedure steps to correct the condition on vehicles that meet the following criteria:

- 2013-2018 F-150
- Equipped with ESOFF 4WD (does not have a 4A position on the MSS)
- Customer concern of intermittent grinding noise in 2WD mode

NOTE: Part quantity refers to the number of that service part number required, which may be different than the number of individual pieces. Service part numbers contain 1 piece unless otherwise stated. "As Needed" indicates the part is required but the number may vary or is not a whole number; parts can be billed out as non-whole numbers, including less than 1.

Parts

Part Number		Description	Quantity
W720613-S439	Package Contains 4 Pieces, 2 Pieces Required Per Affected Side	Caliper Anchor Plate Bolt (2015-2018 F-150)	1
W714743-S439	Package Contains 4 Pieces, 2 Pieces Required Per Affected Side	Caliper Anchor Plate Bolt (2013-2014 F-150)	1
N802827-S100A	Package Contains 4 Pieces, 1 Piece Required Per Affected Side	Front Half Shaft Nut (2016-2018 F-150 Built On Or After 3-Aug-2016)	1
N802827-S100	Package Contains 4 Pieces, 1 Piece Required Per Affected Side	Front Half Shaft Nut (2013-2016 F-150 Built On Or Before 2-Aug-2016)	1
W520215-S441		Tie Rod Nut (2013-2014 F-150 Built On Or Before 23-Dec-2014)	1

	Package Contains 4 Pieces, 1 Piece Required Per Affected Side		
W520215-S440	Package Contains 4 Pieces, 1 Piece Required Per Affected Side	Tie Rod Nut (2014-2018 F-150 Built On Or After 24-Dec-2014)	1
W520214-S440	Package Contains 2 Pieces, 1 Piece Required Per Affected Side	Upper Ball Joint Nut	1
7L1Z-3C247-A	Package Contains 1 Piece, 1 Piece Required Per Affected Side	IWE Actuator (2013-2015 F-150 Built On Or Before 11-Oct-2015)	1 Per Affected Side
HL1Z-3C247-A	Package Contains 1 Piece, 1 Piece Required Per Affected Side	IWE Actuator (2015-2018 F-150 Built On Or After 12-Oct-2015)	1 Per Affected Side
W706890-S439	Package Contains 4 Pieces, 4 Pieces Required Per Affected Side	Front Hub Bearing Bolts	1 Per Affected Side
HL1Z-3C247-B	Package Contains 1 Piece, 1 Piece Required Per Affected Side	IWE Clutch Ring Kit	1 Per Affected Side
3A788	-	Check Valve - Refer To The Parts Catalog For The VIN Specific Application	1
1104	Package Contains 1 Piece, 1 Piece Required Per Affected Side	Front Hub Bearing - Refer To The Parts Catalog For The VIN Specific Application	1 Per Affected Side
BL3Z-7A785-A	-	Vacuum Lines (2013-2014 F-150 Except Raptor)	1
BL3Z-7A785-B	-	Vacuum Lines (2013-2014 Raptor)	1
FL3Z-7A785-A	-	Vacuum Lines (2015-2018 F-150 Except Raptor)	1
HL3Z-7A785-A	-	Vacuum Lines (2017-2018 Raptor)	1
HL3Z-3C125-A	-	Vacuum Hose To IWE (2017-2018 Raptor)	1
FL3Z-3C125-A	-	Vacuum Hose To IWE (2015-2018 F-150 Except Raptor)	1
XG-1-E1	-	Motorcraft® Premium Long-Life Grease	As Needed

Warranty Status: Eligible under provisions of New Vehicle Limited Warranty (NVLW)/Service Part Warranty (SPW)/Special Service Part (SSP)/Extended Service Plan (ESP) coverage. Limits/policies/prior approvals are not altered by a TSB. NVLW/SPW/SSP/ESP coverage limits are determined by the identified causal part and verified using the OASIS part coverage tool.

Labor Times

Description	Operation No.	Time
	212076A	0.8 Hrs.

2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Pass) Road Test (Pass) (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)		
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Fail) Apply Vacuum Directly To Each IWE (One Fail) Remove One IWE, Inspect Wheel Bearing Splines (Pass) Replace One (1) IWEs (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076B	1.1 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Fail) Apply Vacuum Directly To Each IWE (One Fail) Remove IWE, Inspect Wheel Bearing Splines (One Fail) Replace One (1) Wheel Bearing And One (1) IWE (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076C	1.2 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Fail) Apply Vacuum Directly To Each IWE (Both Fail) Remove Both IWEs, Inspect Wheel Bearing Splines (Both Pass) Replace Both (2) IWEs (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076D	1.8 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Fail) Apply Vacuum Directly To Each IWE (Both Fail) Remove IWEs, Inspect Wheel Bearing Splines (One Fail) Replace One (1) Wheel Bearing And Both (2) IWE's (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076E	1.9 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Fail) Apply Vacuum Directly To Each IWE (Both Fail) Remove IWEs, Inspect Wheel Bearing Splines (Both Fail) Replace Both (2) Wheel Bearings And Both (2) IWEs (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076F	2.1 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Both Pass) Road test (Fail One Side) Remove IWE, Inspect Wheel Bearing Splines (Pass) Replace One (1) IWE Clutch Ring (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076G	1.6 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both IWEs (Both Pass) Road test (Fail Both Sides) Remove Both IWEs, Inspect Wheel Bearing Splines (Both Pass) Replace Both (2) IWE Clutch Rings (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076H	2.3 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both (2) IWEs (Both Pass) Road Test (Fail One Side) Remove IWE, Inspect Wheel Bearing Splines (Fail One Side) Replace One (1) Wheel Bearing And One (1) IWE Clutch Ring (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076J	1.8 Hrs.
2013-2018 F-150 4X4: Inspect, Replace Check Valve, Apply Vacuum To Both (2) IWEs (Both Pass) Road test (Fails Both Sides) Remove Both IWEs, Inspect Wheel Bearing Splines (Fail Both Sides) Replace Both (2) Wheel Bearings And Both (2) IWE Clutch Rings (Can Be Claimed With Operations L, M And N) (Do Not Use With Any Other Labor Operations Outside Of This Article)	212076K	2.6 Hrs.
2013-2018 F-150 4X4: Additional Time Use Scan Tool To Active Solenoid And Measure Vacuum At Both IWEs (Can Be Claimed With Operations A-K)	212076L	0.3 Hrs.
2013-2018 F-150 4X4: Additional Time To Be Used When Vacuum Harness Replacement Is Necessary (Can Be Claimed With Operations A-K)	212076M	0.5 Hrs.
2017-2018 F-150 4X4: Additional Time To Be Used When TCCM Reprogramming Is Necessary (Can Be Claimed With Operations A-K)	212076N	0.2 Hrs.

Repair/Claim Coding

Causal Part:	3C247
Condition Code:	D4

Service Procedure

1. Does the vehicle have a MSS that only includes 2H, 4H and 4L positions (does not include 4A)? (Figure 1)

(1). Yes - proceed to Step 2.

(2). No - this article does not apply. Refer to the Workshop Manual (WSM) or other service articles for normal diagnostics.

Figure 1 - Example of MSS without 4A selection



2. For 2017-2018 vehicles only, reprogram the TCCM using the latest version of the appropriate Ford scan tool.

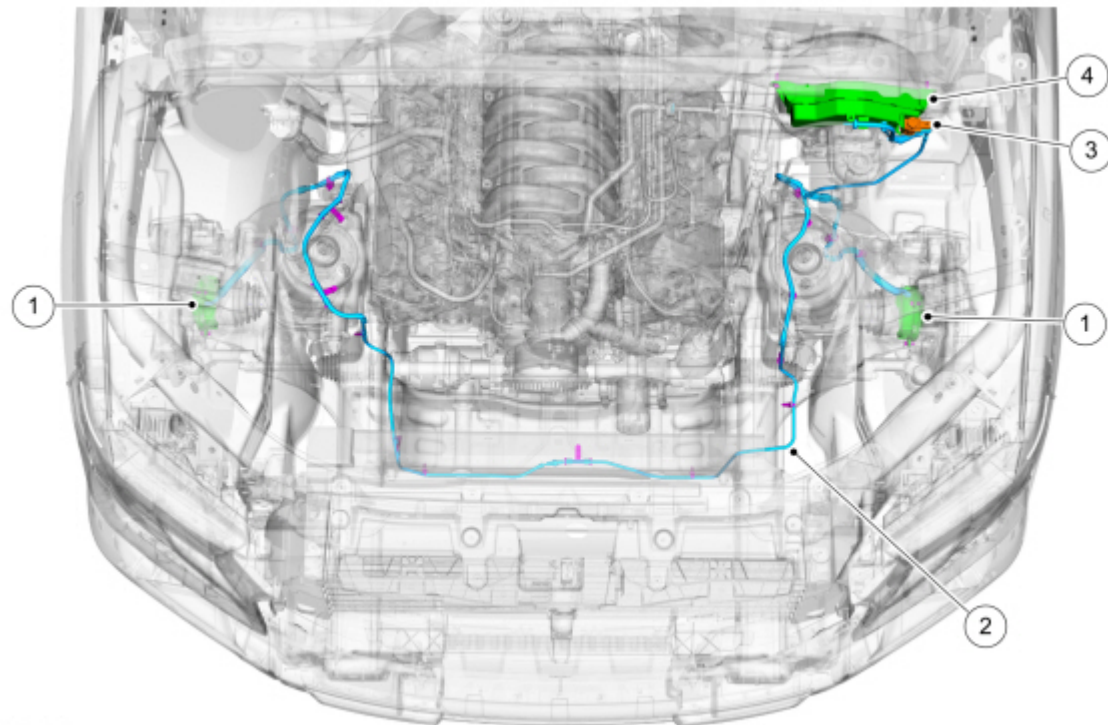
NOTE: The new TCCM calibration changes IWE operation at start up. When ambient temperature is above 0°C (32°F) the IWEs stay engaged regardless of a 4WD mode selection for approximately 0.8 km (0.5 miles). IWE engagement only occurs once per key cycle and is not reset when shifting between PARK and DRIVE. The TCCM uses this strategy to delay vacuum use until vacuum-intensive engine startup has completed and sufficient vacuum is available to fully disengage IWEs.

3. Inspect the IWE vacuum hoses. Refer to Workshop Manual (WSM), Section 308-07A. Are there any disconnected or damaged vacuum hoses? (Figure 2)

(1). Yes - reconnect or replace the vacuum hose as required. Refer to WSM, Section 308-07A.

(2). No - proceed to Step 4.

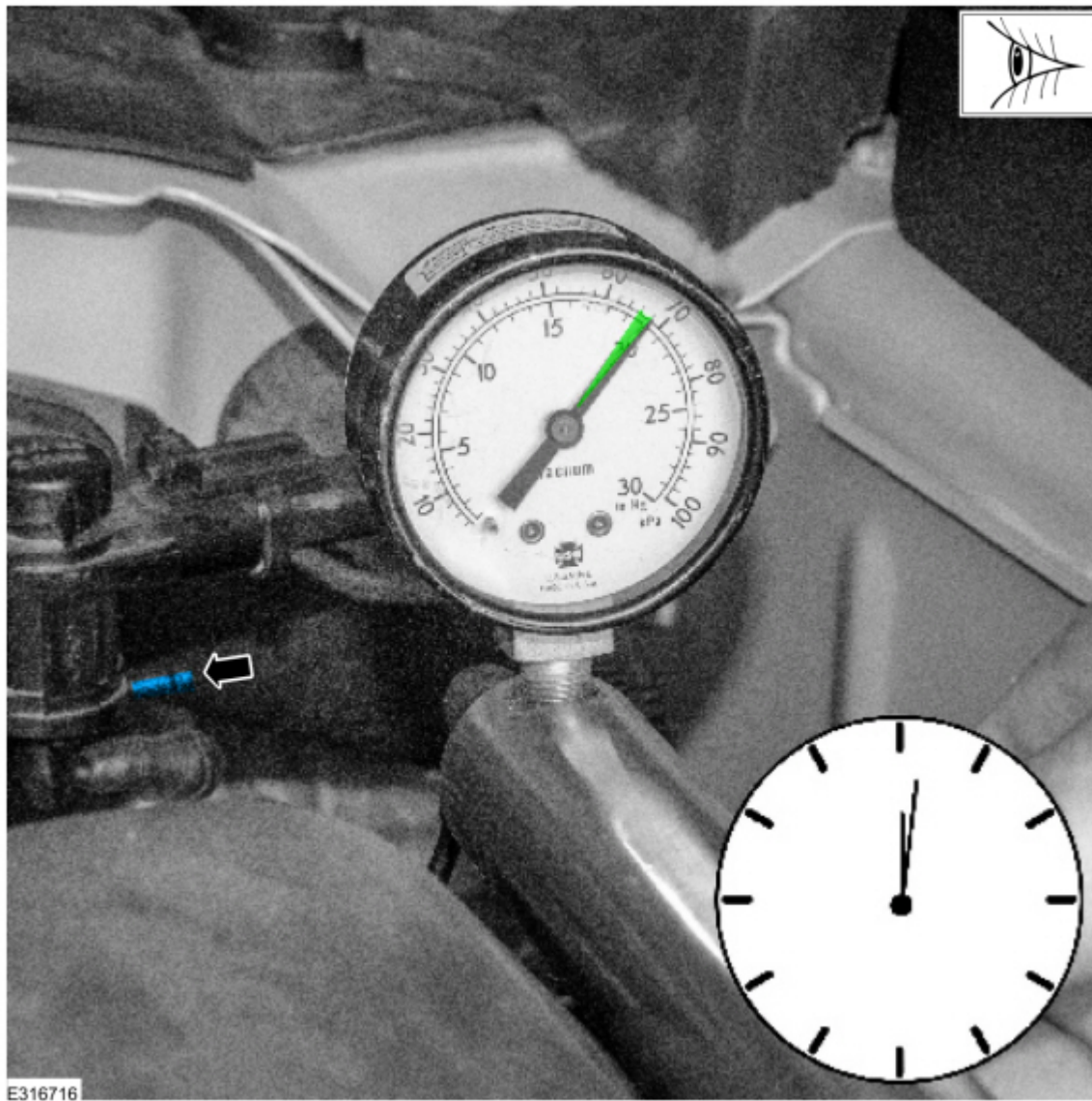
Figure 2



E226414

4. Replace the vacuum check valve located near the vacuum reservoir. Refer to WSM, Section 308-07A.
5. Disconnect the vacuum line to the IWEs at the vacuum solenoid.
6. Connect a hand vacuum pump to the IWE vacuum supply line and apply 508 mm (20 in) Hg of vacuum. Does the vacuum drop more than 12.5 mm (0.5 in) Hg per minute? (Figure 3)
 - (1). Yes - proceed to Step 7.
 - (2). No - connect the IWE vacuum supply line to the solenoid and proceed to Step 11.

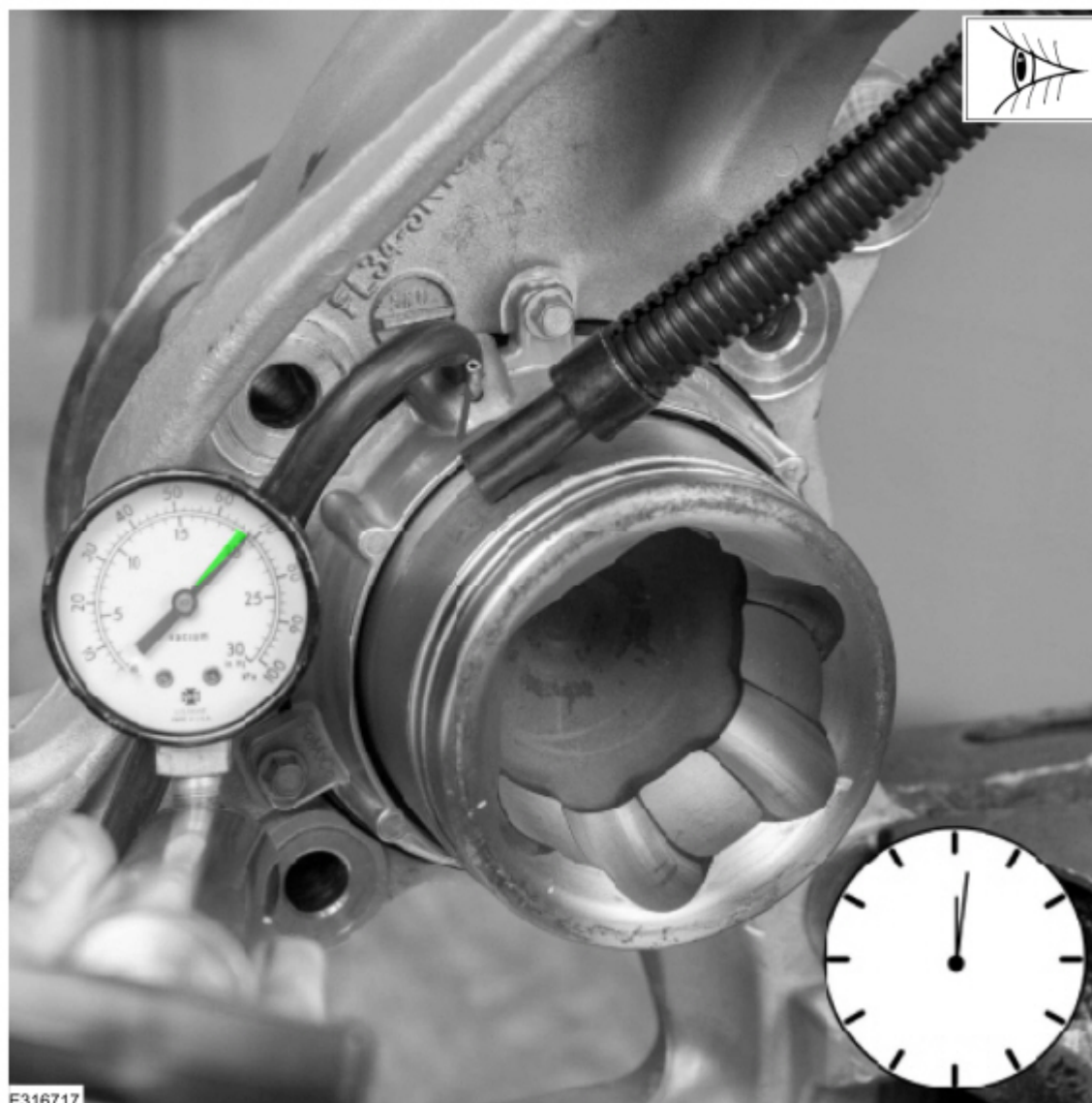
Figure 3



7. Using a hand vacuum pump, apply 508 mm (20 in) Hg of vacuum to each IWE, one at a time, and monitor the vacuum gauge. Does the vacuum drop more than 12 mm (0.5 in) Hg per minute? (Figure 4)

- (1). Yes - proceed to Step 9.
- (2). No - proceed to Step 8.

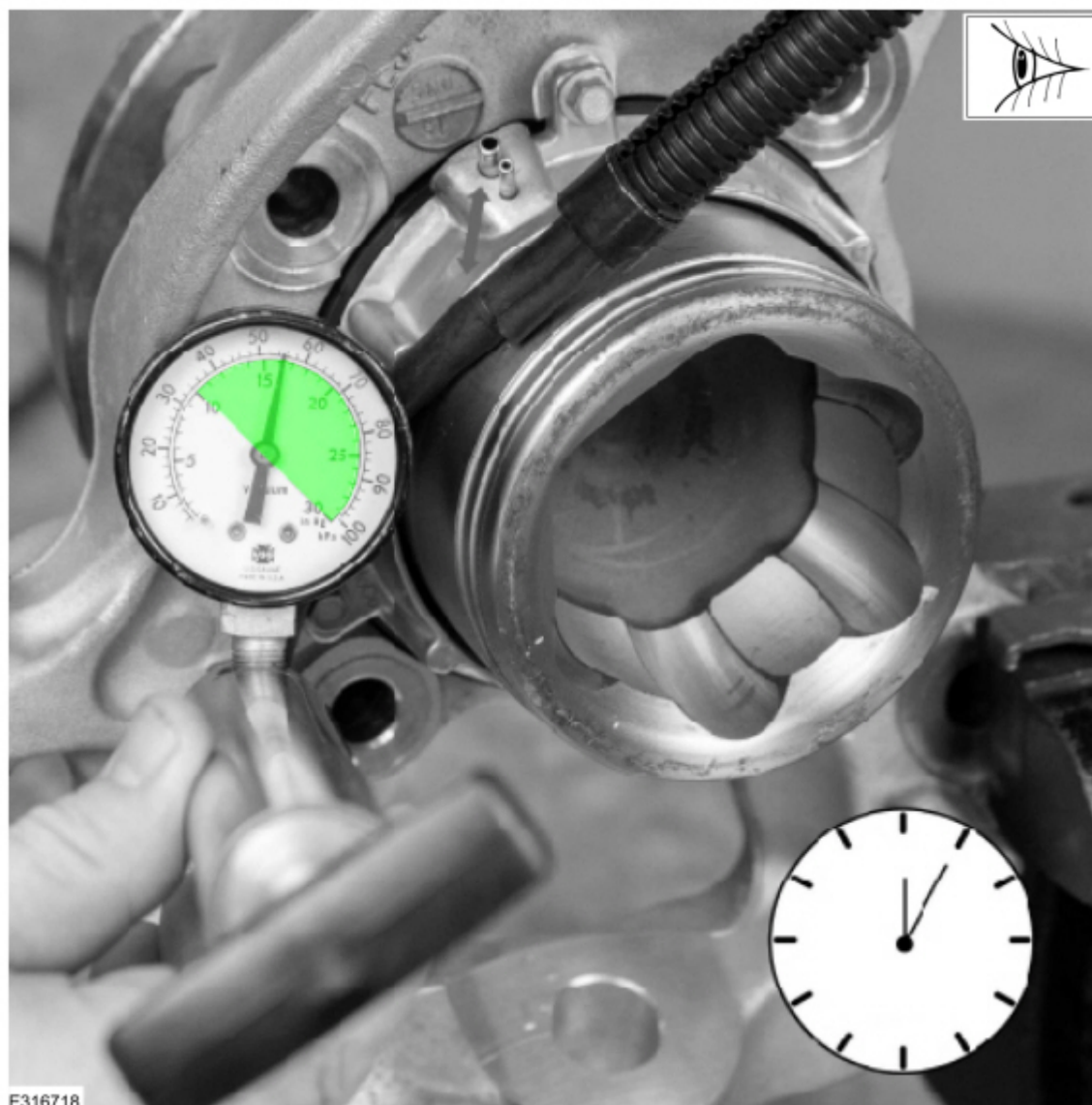
Figure 4



8. Replace the vacuum lines between the solenoid and IWEs. Refer to the WSM, Section 308-07A. Proceed to Step 13.
9. Remove the IWE assembly from the affected wheel. Refer to WSM, Section 308-07A.
10. Inspect the wheel bearing splines for damage or excessive wear. Is wheel bearing spline damage or excessive wear present?
 - (1). Yes - replace the IWE assembly and wheel bearing. Refer to WSM, Section 308-07A and 204-01B. Proceed to Step 13.
 - (2). No - replace the IWE assembly. Refer to WSM, Section 308-07A. Proceed to Step 13.
11. Test the IWE vacuum supply lines.
 - (1). Disconnect the vacuum supply line at the left or right IWE and connect a vacuum gauge to the supply line as shown in Figure 5.
 - (2). Start the engine and allow it to idle for 5 minutes to build vacuum.
 - (3). Connect the appropriate Ford diagnostic scan tool and enter TCCM data logger.
 - (4). Active command the vacuum solenoid.
 - Command IWE_OS # to No.

(5). Repeat this test on the opposite IWE vacuum supply line.

Figure 5



12. Is the vacuum at both left and right supply lines greater than 254 mm (10 in) Hg?

(1). Yes - proceed to step 13.

(2). No - replace the vacuum lines between the solenoid and IWEs. Refer to the WSM, Section 308-07A. Proceed to Step 13.

13. Road test the vehicle for noise by performing heavy accelerations in 2WD. Engage the 4WD system to verify proper engagement/disengagement quality. Is a grinding noise present in 2WD mode that is not present in 4WD mode?

NOTE: When ambient temperature is above 0°C (32°F) the IWEs stay engaged regardless of a 4WD mode selection for approximately 0.8 km (0.5 miles).

(1). Yes - proceed to Step 14.

(2). No - repair is complete.

14. Remove the IWE assembly from the affected wheel. Refer to WSM, Section 308-07A.

15. Inspect the wheel bearing splines. Is wheel bearing spline damage present?

- (1). Yes - replace the IWE clutch ring and wheel bearing. Refer to WSM, Sections 308-07A and 204-01B.
- (2). No - replace the IWE clutch ring. Refer to WSM, Section 308-07A.

© 2021 Ford Motor Company

All rights reserved.

NOTE: The information in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford or Lincoln dealership to determine whether the Bulletin applies to your vehicle. Warranty Policy and Extended Service Plan documentation determine Warranty and/or Extended Service Plan coverage unless stated otherwise in the TSB article. The information in this Technical Service Bulletin (TSB) was current at the time of printing. Ford Motor Company reserves the right to supersede this information with updates. The most recent information is available through Ford Motor Company's on-line technical resources.