

360 Degree View Camera Alignment

Special Tool(s)	
	Mats, 360 Camera Calibration 501-411

NOTE: On vehicles equipped with Trailer Reverse Guidance (TRG) this procedure also perform the Trailer Reverse Guidance camera alignment.

NOTE: Prior to beginning this procedure, perform the following:

1. Inspect the exterior rear view mirrors to make sure they are not folded (if equipped).
2. Using a scan tool retrieve and if necessary repair any IPMB Diagnostic Trouble Codes (DTCs).
3. Clean the camera lenses. Inspect all cameras (except center high-mounted stoplamp camera and trailer camera, if equipped), the associated mounting hardware and body components for damage.

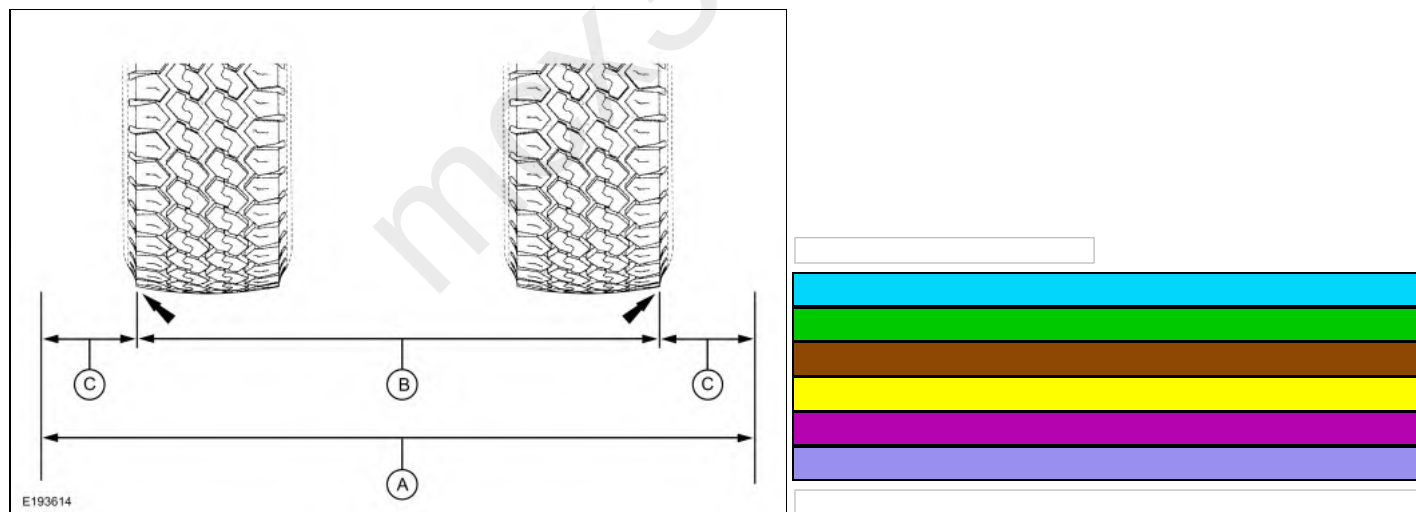
NOTE: Damage to or misalignment of any of these components can cause the camera alignment to be unsuccessful.

4. Park the vehicle in a flat, open area (preferably indoors) with the front wheels straight ahead, steering wheel centered, and with a minimum of 6 feet of open space to each side, 7 feet of open space in front, and 11 feet of open space behind the vehicle. The area where the vehicle is parked **must** be flat (total height variation of less than 1"), have uniform lighting of good quality, and be free of debris or obstacles.

NOTE: The area where the alignment is performed **must** be free of shadows and glare. Areas of shadow or bright light will degrade the ability of the cameras to see the target pattern on the calibration mats. Facing the front of the vehicle towards the light source may reduce glare on the calibration mats.

5. Obtain the mat spacing specification and note this as measurement "A".
For additional information, refer to: Specifications (413-13B Parking Aid - Vehicles With: Parking Aid Camera, Specifications).
6. With the help of an assistant, measure the distance between the outer edge of the RH rear tire tread block and the outer edge of the LH rear tire tread block. Note this measurement of tire width as "B".

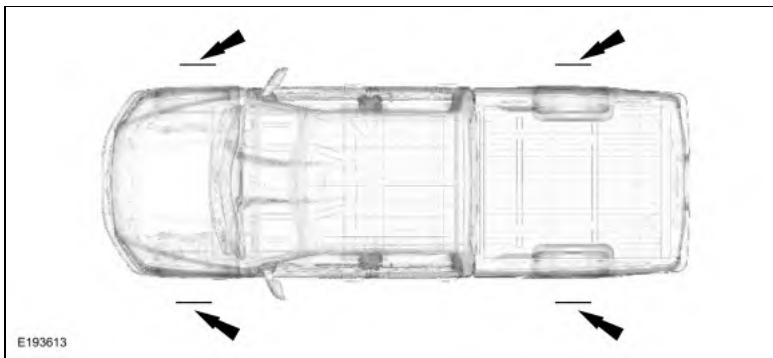
NOTE: Make sure the measurement is taken at the same location on both tires.



7. Calculate the mat spacing distance from the tire: $(A-B)/2=C$
 1. Subtract the tire width (measurement "B") from the mat spacing specification (measurement "A").
 2. Divide the result by 2. Note this measurement as "C". This is the mat spacing distance from the outer edge of the tire block.
8. Create mat spacing guidelines at all 4 tires:

NOTE: F-series shown, other vehicles similar.

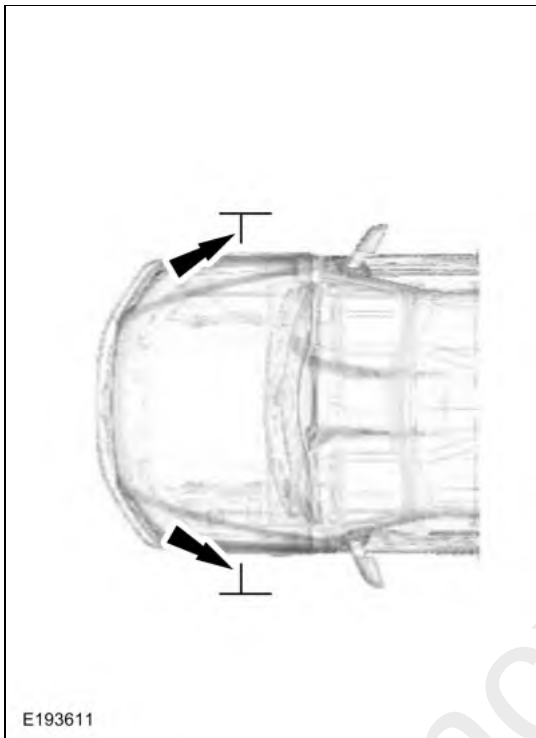
1. Measure distance "C" from the outer edge of the tire tread block.
2. Using chalk, at distance "C" for each tire, draw a line on the ground parallel to the side of the vehicle that is several inches long and roughly aligned with the center of the axle.



9. Create front axle alignment guidelines:

NOTE: *F-series shown, other vehicles similar.*

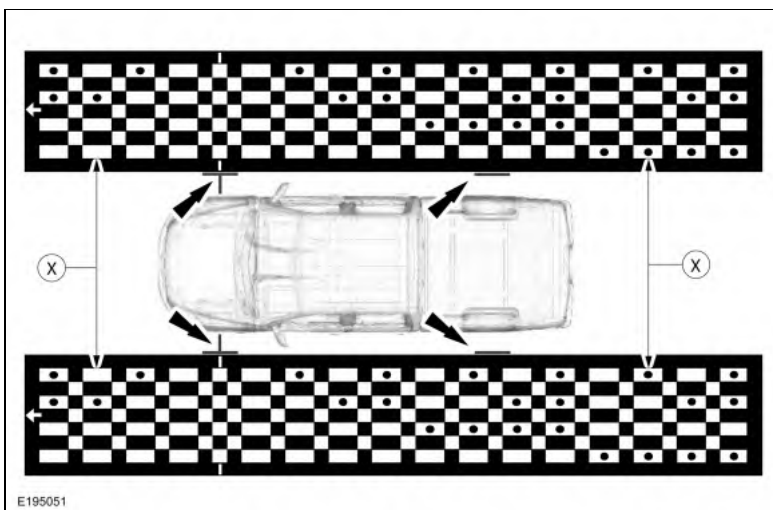
1. Locate the centerline of the front axle.
2. Using chalk, draw a line on the ground extending outwards from the center of the front axle, perpendicular to the wheel.



10. Position the calibration mats on both sides of the vehicle:

NOTE: *F-series shown, other vehicles similar.*

1. Align the front axle alignment mark on each mat with the front axle alignment guideline created in step 7.
 2. Align the inside edge of each mat with the respective front and rear mat spacing guidelines created in step 6.
 3. Verify the spacing between the target pattern blocks matches measurement "X" from the specifications in this section.
- For additional information, refer to: Specifications (413-13B Parking Aid - Vehicles With: Parking Aid Camera, Specifications).



11. Verify all vehicle doors and tailgate/luggage compartment lid are fully closed.
12. Connect a battery charger. A battery voltage of greater than 11 volts must be maintained throughout the calibration procedure. A battery charger can be used to maintain the battery voltage. Make sure any extension cords that are used do not obstruct the calibration mats.
13. Turn the ignition ON. Do not start the engine.
14. Using a diagnostic scan tool, perform the 360 degree camera alignment procedure following the on-screen instructions under Electrical>Service Functions>360 Camera Calibration.

The camera alignment success is indicated by the diagnostic scan tool.

If the camera alignment is successful, INSPECT the 360 degree overhead image for proper alignment.

If the camera alignment is unsuccessful, the diagnostic scan tool indicates one of the following faults:

Fault Condition	Fault Code	Front Camera Action	Rear Camera Action	LH Camera Action	RH Camera Action
Missing software	02	INSTALL a new IPMB. Refer to: Parking Aid - Vehicles With: Parking Aid Camera (413-13B).			
PreCondition not correct (VRange)	03	INSPECT and VERIFY battery voltage and condition. Battery voltage of at least 11 volts must be maintained during the calibration procedure.			
PreCondition not correct (NumCameras)	04	INSTALL IPMB as-built data from Professional Technician Society (PTS), following the diagnostic scan tool instructions under Module Programming>As-Built			
Missing Internal Link	05	- Turn the ignition OFF - Wait 10 seconds - Turn the ignition ON, engine off - REPEAT the alignment procedure using a diagnostic scan tool			
Variant Coding Issue	06	INSTALL IPMB as-built data from Professional Technician Society (PTS), following the diagnostic scan tool instructions under Module Programming>As-Built			
Target not found (Init)	07	-	-	VERIFY the following: - LH calibration mat placement at the front axle - Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) - The LH calibration mat is free of obstructions and dirt - The LH camera lens is clean and free of scratches - The LH camera is producing an image of good quality	VERIFY the following: - RH calibration mat placement at the front axle - Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) - The RH calibration mat is free of obstructions and dirt - The RH camera lens is clean and free of scratches - The RH camera is producing an image of good quality
Target not found (Left)	08	VERIFY the following: - LH calibration mat placement at the front of the vehicle - Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) - The LH calibration mat is free of obstructions and dirt - The front camera lens is clean and free of scratches - The front camera has been configured using a diagnostic scan tool - Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	VERIFY the following: - LH calibration mat placement at the rear of the vehicle - Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) - The LH calibration mat is free of obstructions and dirt - The rear camera lens is clean and free of scratches - The rear camera has been configured using a diagnostic scan tool - Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	-	-

Fault Condition	Fault Code	Front Camera Action	Rear Camera Action	LH Camera Action	RH Camera Action
Target not found (Right)	09	VERIFY the following: • RH calibration mat placement at the front of the vehicle • Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) • The RH calibration mat is free of obstructions and dirt • The front camera lens is clean and free of scratches • The front camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	VERIFY the following: • RH calibration mat placement at the rear of the vehicle • Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) • The RH calibration mat is free of obstructions and dirt • The rear camera lens is clean and free of scratches • The rear camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	-	-
PreCondition not correct (Velocity)	10	• VERIFY that the vehicle is stationary during the alignment procedure. • VERIFY the speedometer operates correctly. If the speedometer does not operate correctly, For additional information, refer to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes, Diagnosis and Testing). • RETRIEVE and DIAGNOSE any PCM Diagnostic Trouble Codes (DTCs) that are present. Refer to the appropriate section in Group 303 for the procedure. • RETRIEVE and DIAGNOSE any IPMB Diagnostic Trouble Codes (DTCs) that are present. For additional information, refer to: Parking Aid (413-13B Parking Aid - Vehicles With: Parking Aid Camera, Diagnosis and Testing).			
PreCondition not correct (Doors)	11	• VERIFY that all doors and the tailgate/luggage compartment lid are fully closed. • RETRIEVE and DIAGNOSE any BCM Diagnostic Trouble Codes (DTCs) that are present. For additional information, refer to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing). • RETRIEVE and DIAGNOSE any IPMB Diagnostic Trouble Codes (DTCs) that are present. For additional information, refer to: Parking Aid (413-13B Parking Aid - Vehicles With: Parking Aid Camera, Diagnosis and Testing).			
PreCondition not correct	13	RETRIEVE and DIAGNOSE any IPMB Diagnostic Trouble Codes (DTCs) that are present. For additional information, refer to: Parking Aid (413-13B Parking Aid - Vehicles With: Parking Aid Camera, Diagnosis and Testing).			
Target Identification Error (Left)	0A	VERIFY the following: • LH calibration mat is oriented correctly • LH calibration mat placement at the front of the vehicle • Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) • The LH calibration mat is free of obstructions and dirt • The front camera lens is clean and free of scratches • The front camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	VERIFY the following: • LH calibration mat is oriented correctly • LH calibration mat placement at the rear of the vehicle • Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) • The LH calibration mat is free of obstructions and dirt • The rear camera lens is clean and free of scratches • The rear camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	-	-

Fault Condition	Fault Code	Front Camera Action	Rear Camera Action	LH Camera Action	RH Camera Action
Target Identification Error (Right)	0B	VERIFY the following: • RH calibration mat is oriented correctly • RH calibration mat placement at the front of the vehicle • Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) • The RH calibration mat is free of obstructions and dirt • The front camera lens is clean and free of scratches • The front camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	VERIFY the following: • RH calibration mat is oriented correctly • RH calibration mat placement at the rear of the vehicle • Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) • The RH calibration mat is free of obstructions and dirt • The rear camera lens is clean and free of scratches • The rear camera has been configured using a diagnostic scan tool • Diagnose and repair any IPMB Diagnostic Trouble Codes (DTCs)	-	-
Result Exceed Quality Limit	0C	-	-	VERIFY the following: • LH calibration mat placement at the side of the vehicle • Lighting on the LH calibration mat is uniform and of good quality (free of shadows and glare) • The LH calibration mat is free of obstructions and dirt • The LH camera lens is clean and free of scratches • The LH camera is producing an image of good quality	VERIFY the following: • RH calibration mat placement at the side of the vehicle • Lighting on the RH calibration mat is uniform and of good quality (free of shadows and glare) • The RH calibration mat is free of obstructions and dirt • The RH camera lens is clean and free of scratches • The RH camera is producing an image of good quality
Not Calibrated	0D	REPEAT the camera alignment using a diagnostic scan tool			
Aborted	0E	VERIFY the following: • Battery condition and state of charge • All door and tailgate/luggage compartment lid are fully closed			
Missing Internal Link	0F	• Turn the ignition OFF. • Wait 10 seconds. • Turn the ignition ON, engine off. • REPEAT the camera alignment procedure using a diagnostic scan tool.			