

FORD **Ranger Super Duty** Body and Equipment Mounting Manual



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1 General Information

1.1 About this Publication.....	5
1.1.1 Rest of World.....	5
1.1.2 Main content inclusions for Super Duty - March 2026.....	5
1.1.3 Main content inclusions for Super Duty - October 2025.....	5
1.2 About this Manual.....	6
1.2.1 Introduction.....	6
1.2.2 How to Use This Manual.....	6
1.2.3 Important Safety Instructions.....	6
1.2.4 CAD Models.....	6
1.3 Commercial and Legal Aspects.....	7
1.3.1 Terminology.....	7
1.3.2 Warranty on Ford Vehicles.....	7
1.3.3 Emissions Performance & In-service compliance.....	7
1.3.4 Legal and Vehicle Type Approval.....	7
1.3.5 Alternative Type Approval.....	7
1.3.6 Legal Obligations and Liabilities.....	7
1.3.7 General Product Safety Requirement.....	7
1.3.8 Product Liability.....	8
1.3.9 Restraints System.....	8
1.3.10 Drilling and Welding.....	8
1.3.11 Minimum Requirements for Brake system	8
1.3.12 Road Safety.....	8
1.4 Electromagnetic Compatibility (EMC).....	9
1.4.1 Electromagnetic Compatibility (EMC).....	9
1.5 Vehicle Duty Cycle Guidelines.....	10
1.5.1 Vehicle Ride and Handling Attributes.....	10
1.6 Jacking.....	11
1.7 Lifting.....	13
1.8 Noise, Vibration and Harshness (NVH).....	14
1.9 Vehicle Transportation Aids and Vehicle Storage.....	15
1.10 Package and Ergonomics.....	17
1.10.1 General Component Package Guidelines.....	17
1.10.2 Driver Reach Zones.....	17
1.10.3 Driver Field of View.....	17
1.10.4 Conversion Effects on Parking Aids.....	17
1.10.5 Aids for Vehicle Entry and Exit.....	17
1.10.6 Vehicle Height.....	19
1.10.7 Recommended Maximum Main Load Area Dimensions.....	20
1.10.8 Registration Plates.....	21
1.11 Package and Ergonomics—Specifications.....	22
1.11.1 Recommended Body Dimensions.....	22
1.11.2 Chassis Cab Body - Basic Dimensions and Weights.....	25
1.11.3 Vehicle Cabin Clearance	25
1.11.4 Kerb Mass and Payload.....	26
1.11.5 Gross Vehicle Mass and Axle Load Ratings.....	26
1.11.6 Front, Rear and Side Under-Run Protection.....	26
1.12 Hardware—Specifications.....	27

1.13 Load Distribution—Specifications.....	28
1.13.1 Load Distribution Calculations - Driver and Passenger Weight Distribution.....	28
1.13.2 Center of Gravity.....	31
1.13.3 Vehicle Weights.....	33
1.14 Towing.....	34
1.14.1 Towing Requirements.....	34
1.14.2 Towing.....	34
1.14.3 Towing Capacities and Specifications.....	34

2 Chassis

2.1 Suspension System.....	35
2.2 Wheels and Tires.....	36
2.3 Brake System.....	37
2.3.1 General.....	37
2.3.2 Brake Hoses.....	37
2.3.3 Trailer Brake Connection.....	37

3 Powertrain

3.1 Engine.....	38
3.1.1 Engine Cooling Airflow Envelopes.....	38
3.1.2 Air Intake.....	38
3.2 Selective Catalytic Reduction System.....	40
3.2.1 Selective Catalytic Reduction System - Diesel Exhaust Fluid (DEF) / Urea / AdBlue®.....	40
3.3 Fuel System.....	48
3.3.1 Fuel Filler Pipe Restraining During Shipping.....	48
3.3.2 Fuel Filler Mounting.....	48
3.3.3 Fuel Filler Vent Hose - (Diesel).....	53
3.3.4 Axle Breather Vent Hose.....	55

4 Electrical

4.1 Wiring Installation and Routing Guides.....	56
4.1.1 Wiring Splicing Procedures.....	56
4.1.2 Wiring Through Cabin Sheet Metal.....	56
4.2 Battery and Cables.....	59
4.2.1 Battery Information.....	59
4.2.2 Grounding Points.....	64
4.2.3 Connection of Auxiliary Loads / Accessories - Vehicles with Factory Fit Auxiliary Switches, Wiring and Fuse Box.....	66
4.2.4 Charging System.....	69
4.2.5 Ignition Signal.....	71
4.2.6 AC Inverter Deactivation.....	72
4.3 Parking Aid.....	73
4.3.1 Sensor Location.....	74
4.4 Electronic Engine Controls.....	80

4.4.1	Vehicle Speed Signal.....	80	5.1.12	Front Fender Liner.....	136
4.5	Information and Entertainment System.....	81	5.2	Front End Body Panels.....	137
4.5.1	Instrument Panel 12V supply.....	81	5.2.1	Hood Strut.....	137
4.5.2	Rear View Camera.....	82	5.3	Airbag Supplemental Restraint System (SRS).....	138
4.5.3	Auxiliary Rear View Camera.....	85	5.3.1	Air Bags.....	138
4.6	Exterior Lighting.....	88	5.3.2	Integrated Device Mount System.....	144
4.6.1	Rear Lighting Signal - Vehicles with Loadbox.....	88	5.3.3	Supplementary Restraint Sensors (Front).....	146
4.6.2	Headlamp Aiming.....	88	5.4	Seatbelt Systems.....	148
4.6.3	Rear Combination lamps.....	90	5.4.1	SeatBelts - No Drill Zones.....	148
4.6.4	Rear Fog Lamp.....	90	5.5	Corrosion Prevention.....	154
4.6.5	Rear License Plate Lamp.....	91	5.5.1	General.....	154
4.6.6	Additional External Lamps.....	92	5.5.2	Repairing Damaged Paint.....	154
4.6.7	Headlamps - Connection of Auxiliary Driving Lamp Signal.....	92	5.5.3	Under Body Protection and Material.....	154
4.6.8	Driving Lamps - Auxiliary Bracket Addition.....	95	5.5.4	Painting Road Wheels.....	154
4.6.9	Brake (Stop) Lamps.....	96	5.5.5	Galvanic (bi-metallic) Corrosion.....	154
4.6.10	Position (Park) Lamps.....	97	5.6	Frame and Body Mounting.....	155
4.6.11	Loadbox / Tub - Lighting Connections.....	97	5.6.1	Mounting Points and Tubing.....	155
4.6.12	Trailer Towing - Lighting Connections.....	98	5.6.2	Rear Seat Deletion.....	156
4.6.13	Lamps - Hazard / Direction Indication.....	104	5.6.3	Self-Supporting Body Structure.....	157
4.6.14	Interior Lamps.....	106	5.6.4	Frame Drilling and Tube Reinforcing.....	157
4.6.15	Electrically Operated Door Mirrors.....	106	5.6.5	Ancillary Equipment - Sub Frame Mounting.....	158
4.6.16	Centre High Mount Stop Lamp (CHMSL).....	106	5.6.6	Area for Fitting Additional Body Attachments to the Rear of the Bumper.	158
4.6.17	Automatic High Beam Control.....	106	5.6.7	Water Tank on Camper Vehicles.....	158
4.6.18	Handbrake Signal.....	106	5.6.8	Long Wheelbase Conversions.....	158
4.7	Cruise Control.....	107			
4.7.1	Adaptive Cruise Control.....	107			
4.8	Driver Assist Technology.....	108			
4.9	Blind Spot Information System.....	113			
4.10	Side View Camera.....	114			
4.11	Lane Keeping System.....	116			
4.11.1	Lane Centering Assist.....	116			
4.12	Handles, Locks, Latches and Entry Systems.....	117			
4.12.1	Central Locking.....	117			
4.13	Fuses and Relays.....	119			
4.13.1	Fuses.....	119			

5 Body and Paint

5.1	Body.....	120
5.1.1	Body Structures - General Information.....	120
5.1.2	Integrated Bodies and Conversions.....	121
5.1.3	Wheelhouse Envelope.....	122
5.1.4	Chassis Cab.....	123
5.1.5	Frame Feature Centerline Distance - All Cab Styles.....	131
5.1.6	Front End Integrity for Cooling, Crash, Aerodynamics and Lighting.....	131
5.1.7	Tipper Bodies.....	131
5.1.8	Tank and Dry Bulk Carriers.....	132
5.1.9	Genuine Ford Accessory Bull Bar (if available).....	132
5.1.10	Roof Racks.....	132
5.1.11	Cargo Management on Vehicle Tub.....	133

1.1 About this Publication

1.1.1 Rest of World

NOTE: This publication includes various global models and variants sold worldwide, therefore some specific catalogues and versions may not be applicable to your market.

It is recommended to review this manual in full. The BEMM is a live document which can be viewed on <https://www.fordtechservice.dealerconnection.com/> or <https://www.ford.com.au/owners/vehicle-support/body-equipment-manuals/>. It is the vehicle converters responsibility to review the online version for the most current information prior to starting any conversion. For further information please contact your National Sales Company representative, or local Ford Dealer.

In addition to the detail available in this manual, further information related to servicing and maintenance of Ford vehicles is available using a subscription service via <https://www.fordserviceinfo.com/> or see your National Sales Company representative, or local Ford Dealer.

1.1.2 Main content inclusions for Super Duty - March 2026

- 1.2.4 CAD Models - Ford Pro Special Vehicles helpline at FPSVhelp@ford.com updated
- 1.3.3 Emissions Performance & In-service compliance - Section updated
- 1.3.4 Legal and Vehicle Type Approval - Type approval paragraph added
- 1.6 Jacking - Image update
- 1.14 Towing - Hitch details updated
- 2.2 Wheel and Tires - New section
- 3.1.2 Air Intake - Snorkel kit and Cyclone pre-filter inclusion
- 3.2.1 Selective Catalytic Reduction System - Diesel Exhaust Fluid (DEF) Filler Pipe Kit Installation Process added
- 4.2.1 Battery Information - Auxiliary Battery Accessory Kit table and notes updated, B+ Connection content updated
- 4.2.6 AC Inverter Deactivation - Ford Pro Special Vehicles helpline at FPSVhelp@ford.com updated
- 4.5.1 Instrument Panel 12v Supply - Section updated
- 4.6.1 Rear Lighting Signal - New section
- 4.6.12 Trailer Towing - Anderson Plug kit inclusion, Trailer Module table and Socket Pin-outs updated
- 5.1. Body Structures - Computer-Aided Engineering (CAE) content added
- 5.1.4 Chassis Cab - 2g text update
- 5.1.11 Cargo Management on Vehicle Tub - New section

- 5.2.1 Hood Strut - New section
- 5.3.1 Air Bags - Front seat cover content added
- 5.3.2 Integrated Device Mount System - Section updated

1.1.3 Main content inclusions for Super Duty - October 2025

This BEMM publication is All New for the introduction of Ranger Super Duty.

1.2 About this Manual

1.2.1 Introduction

This manual has been written in a format that is designed to meet the needs of Vehicle Converters. The objective is to use common formats with the workshop manual which is used by technicians worldwide.

This guide is published by Ford and provides general descriptions and advice for converting vehicles.

It must be emphasized that any change to the basic vehicle which does not meet the enclosed guideline standards may severely inhibit the ability of the vehicle to perform its function. Mechanical failures, structure failure, component unreliability or vehicle instability will lead to customer dissatisfaction. Appropriate design and application of body, equipment and or accessories is key to ensuring that customer satisfaction is not adversely affected.

The information contained within this publication takes the form of recommendations to be followed when vehicle modifications are undertaken. It must be remembered that certain modifications may invalidate legal approvals and application for re-certification may be necessary.

Ford cannot guarantee the operation of the vehicle if non-Ford -approved electrical systems are installed. Ford electrical systems are designed and tested to function under operational extremes and have been subjected to the equivalent of ten years of driving under such conditions.

Not all information in this manual applies to all territories. For availability of options and parts please contact your National Sales Company representative or local Ford dealer. If they are unable to help you then please contact Ford Pro Special Vehicles helpline at FPSVhelp@ford.com.

1.2.2 How to Use This Manual

This manual covers vehicle conversion procedures.

The pages at the start of this manual list the content, by group. A group covers a specific portion of the vehicle. The manual is divided into five groups:

- General Information
- Chassis
- Powertrain
- Electrical
- Body and Paint

The number of the group is the first number of a section number. Each title listed in the contents links to the relevant section of the manual.

In some sections of the book it may refer you to see additional sections for information. The links have been provided in blue text. Page numbers have also been provided.

There is also an alphabetical index at the back of the manual. As with the contents pages you will be able to link to sections. To do this just click on the page number.

All left and right handed references to the vehicle are taken from a position sitting in the driver seat looking forward unless otherwise stated.

All references to ADR vehicle standards are only applicable to the Australian and New Zealand markets. Where no ADR is specified the EU standard is recommended.

1.2.3 Important Safety Instructions

Appropriate conversion procedures are essential for the safe, reliable operation of all vehicles as well as the personal safety of the individual carrying out the work.

This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Anyone who does not follow the instructions provide in this manual must first establish that they compromise neither their personal safety nor the vehicle integrity by their choice of methods, tools or components.

As you read through this manual, you will come across WARNINGS, CAUTIONS and NOTES.

If a warning, caution or note is placed at the beginning of a series of steps, it applies to multiple steps. If the warning, caution or note only applies to one step, it is placed at the beginning of the specific step (after the step number).



WARNING: Warnings are used to indicate that failure to follow a procedure correctly may result in personal injury.



CAUTION: Cautions are used to indicate that failure to follow a procedure correctly may result in damage to the vehicle or equipment being used.

NOTE: Notes are used to provide additional essential information required to carry out a complete and satisfactory conversion.

"Appropriate Training" means that you as a person who followed the training, has sufficient knowledge about the risks and that you have knowledge about the required safety measures to perform the work in a safe way. The competencies granted by this training are still up-to-date and have not expired.

1.2.4 CAD Models

As a convertor, to enable the virtual development of your vehicle, 3D data models in STEP and JT formats can be provided via CoLab upon request at Ford Pro Special Vehicles helpline at FPSVhelp@ford.com.

1.3 Commercial and Legal Aspects

1.3.1 Terminology

NOTE: Any modifications to the vehicle must be noted in the owner's handbook or new descriptive literature included with the owner's documentation.

The term "Vehicle Converter" refers to any party altering the vehicle by converting the body and adding or modifying any equipment not originally specified and or supplied by Ford. Similar terms such as Vehicle Converter, Upfitter, Body Builder may be referenced in this manual and also refer to any party altering the vehicle by converting the body and adding or modifying any equipment not originally specified and or supplied by Ford.

The term "Unique component" or similar wording refers to non-Ford specified or after sale components which are fitted by a Vehicle Converter and are not covered by any Ford warranty.

1.3.2 Warranty on Ford Vehicles

Please contact the National Sales Company in the country where the vehicle will be registered for details of the terms of any applicable Ford warranty.

The Vehicle Converter should warrant its design, materials and construction for a period at least equal to any applicable Ford warranty.

The Vehicle Converter must ensure that any alteration made to a Ford vehicle or component does not reduce the safety, function, or durability of the vehicle or any component.

The Vehicle Converter shall be solely responsible for any damage resulting from any alteration made by the Vehicle Converter or any of its agents to a Ford Vehicle Component.

The Vehicle Converter releases Ford from all claims by any third party for any cost or loss (including any consequential damages) arising from work performed by a Vehicle Converter unless Ford has given its prior written consent to such liability.

1.3.3 Emissions Performance & In-service compliance

The emissions regulation EU6 Heavy Duty (ECE R49.07 Suppl 2), now includes new requirements for completed vehicles with regards to emissions performance and in service compliance. Ford has developed an emissions envelope that the Vehicle Converter must stay within.

For further information please contact FPSVHelp@ford.com.

1.3.4 Legal and Vehicle Type Approval

- All components embodied on Ford vehicles are approved to the applicable legal requirements.
- Ford vehicles have Type Approval for the intended marketing territories.

 **WARNING: Exception - Incomplete vehicles require further approval when completed by the vehicle converter.**

- The Ranger range has Type Approval for many territories, although the full range of vehicles shown in this manual are not necessarily released in all territories. Check with your local Ford National Sales Company representative.
- The Ranger Super Duty has no EU or GB WVTA Type Approval and is only suitable for specialist applications in those territories which do not require EU or GB WVTA Type Approval. Check with your local Ford National Sales Company representative or conversion manager.
- Significant changes to the vehicle may affect its legal compliance. Strict adherence to the original design intent for brakes, weight distribution, lighting, emissions, occupant safety, front and/or rear under-run compliance and hazardous materials compliance in particular is mandatory.

1.3.5 Alternative Type Approval

If significant changes are made to the vehicle the Body Builder / Vehicle Converter / Upfitter must negotiate with the relevant authority. Any changes to the vehicle operating conditions must be advised to the customer.

1.3.6 Legal Obligations and Liabilities

The Vehicle Converter should consult with its legal advisor on any questions concerning its legal obligations and liabilities.

Ford recommends that the Vehicle Converter and Ford Dealer must understand their individual and joint responsibilities in supplying a safe and compliant motor vehicle fitted with safe and compliant accessories.

1.3.7 General Product Safety Requirement

The Vehicle Converter shall ensure that any vehicle it places on the market complies with all local laws relating to the safe carriage of loads on public roads. The Vehicle Converter shall also ensure that any alteration it makes to a Ford vehicle or component does not reduce its compliance with local design rules.

The Vehicle Converter must provide sufficient Load Restraint tie down points or compartmentalized storage areas that enable the driver to safely carry loads that match the use criteria for which the body was designed.

The Vehicle Converter shall release Ford from all liability for damages resulting from:

- Failure to comply with these Body Equipment Mounting directives, in particular warnings.
- Faulty design, production, installation, assembly or alteration not originally specified by Ford.
- Failure to comply with the basic fit for purpose principles inherent in the original product.

WARNINGS:

 **Do not exceed the gross vehicle mass, gross combination mass, axle ratings and trailer rating.**

 **Do not change the tire size or load rating.**

 **Do not modify the steering system.**

 **Excessive heat can build up from the exhaust system, in particular from the catalytic converter and from the Diesel Particulate Filter (DPF). Ensure adequate heat shields are maintained. Maintain sufficient clearance to hot parts.**

 **Do not modify or remove heat protection shields.**

 **Do not route any electrical cables with the Anti-lock Brakes System and Traction Control System cables because of extraneous signal risk. It is generally not recommended to hang electrical cables off existing looms or pipes.**

 **Do not change original location or remove warning labels provided with the base vehicle in view to the driver. Ensure that labels in view to the driver remain in full view to the driver.**

NOTE: For further information please contact your local National Sales Company representative, or Local Ford Dealer.

1.3.8 Product Liability

The Vehicle Converter shall be liable for any product liability (whether for death, personal injury, or property damage) arising from any alteration to a Ford vehicle or component made by the Vehicle Converter or any of its agents. Ford shall not be liable for any such liability (except as provided by law).

The Vehicle Converter or equipment manufacturer is liable for the:

- Operational reliability and road-worthiness of the vehicle to its original intent.
- Operational reliability and road-worthiness of any component or conversion, not listed in original Ford documentation.

- Operational reliability and road-worthiness of the vehicle as a whole (for example the body changes and/or additional equipment must not have a negative effect on the driving, braking or steering characteristics of the vehicle).
- Subsequent damage resulting from the conversion or attachment and installation of unique components, including unique electrical or electronic systems.
- Functional safety and freedom of movement of all moving parts (for example axles, springs, propeller shafts, steering mechanisms, brake and transmission linkage).
- Functional safety and freedom of the tested and approved flexibility of the body and integral chassis structure.

1.3.9 Restraints System

WARNINGS:

 **Modifications to the restraints system are not allowed.**

 **Airbags are explosive. For safe removal and storage during conversion follow the procedures in the Ford workshop manual or consult your local National Sales Company representative.**

 **Do not alter, modify or relocate the airbag, sensor and modules of the restraints system or any of its components.**

 **Attachments or modifications to the front end of the vehicle may affect the airbag deployment timing and result in unsafe deployment of safety devices.**

 **Modifications to the side structure including doors, sills, B and C pillars might affect the side airbag deployment timing and result in unsafe deployment of safety devices.**

Refer to: 5.3 Airbag Supplemental Restraint System (SRS) (page 138).

1.3.10 Drilling and Welding

Drilling and welding of frames and body structures have to be conducted following the guidelines within this document.

1.3.11 Minimum Requirements for Brake system

- Changes to the Antilock Brake System (ABS), Traction Control System (TCS) and Electronic Stability Program (ESP), Electronic Brake Booster (EBB) and Driver Assistance Technologies are not permitted.

1.3.12 Road Safety

The respective instructions should be strictly observed to maintain operational and road safety of the vehicle.

1.4 Electromagnetic Compatibility (EMC)

1.4.1 Electromagnetic Compatibility (EMC)

WARNINGS:

⚠ Do not place objects or mount equipment on or near the airbag cover, on the side of the seatbacks (of the front seats), or in front seat areas that may come into contact with a deploying airbag. Failure to follow these instructions may increase the risk of personal injury in the event of a crash.

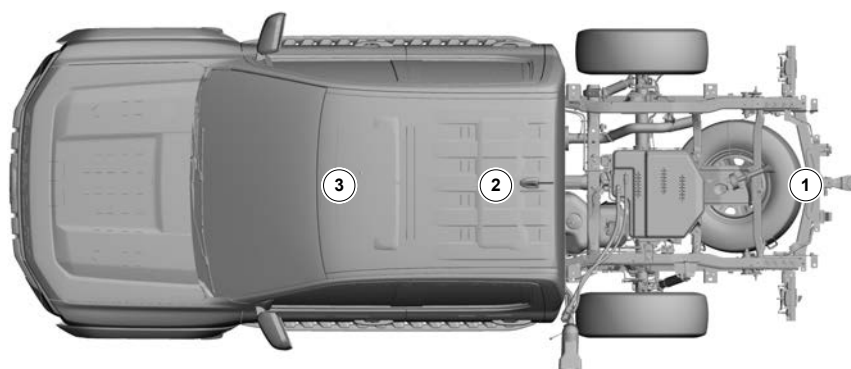
⚠ Do not fasten antenna cables to original vehicle wiring, fuel pipes and brake pipes.

⚠ Keep antenna and power cables at least 4 in (10 cm) from any electronic modules and airbags.

NOTE: We test and certify your vehicle to meet electromagnetic compatibility legislation. It is your responsibility to make sure that any equipment an authorized dealer installs on your vehicle complies with applicable local legislation and other requirements. Installation of some aftermarket electronic devices could degrade the performance of vehicle functions, which use radio frequency signals such as broadcast radio receiver, tyre pressure monitoring system, push button start, Bluetooth connectivity or satellite navigation.

NOTE: Any radio frequency transmitter equipment in your vehicle (such as cellular telephones and amateur radio transmitters) must keep to the parameters in the following illustrations and table. We do not provide any other special provisions or conditions for installations or use.

Truck



E455484

Frequency Band MHz	Maximum Output Power Watts (Peak RMS)	Antenna Position
1-30	50	1
50-54	50	2, 3
68-88	50	2, 3
142-176	50	2, 3
380-512	50	2, 3
806-870	10	2, 3

1.5 Vehicle Duty Cycle Guidelines

NOTE: For further information contact your National Sales Company representative, or local Ford dealer.

It is necessary to take into account the customer usage profile and the anticipated vehicle duty cycles of the modified vehicle in order to choose the appropriate specification of the base vehicle.

It is necessary to select the appropriate drive, engine, gear ratio, gross vehicle mass, gross train mass, axle plates and payloads of the base vehicle to match the customer requirements.

Where possible make sure that the base vehicle is ordered with any necessary plant fit options.

A high numeric gear ratio is recommended for vehicles with customer requirements for:

- High payload
- Trailer tow
- Frequent stop-and-go cycles
- High altitude and gradients
- Terrain conditions such as found on building and construction sites

1.5.1 Vehicle Ride and Handling Attributes

 **CAUTION: Do not exceed the axle plate, gross vehicle mass, trailer plate and gross trailer mass limits.**

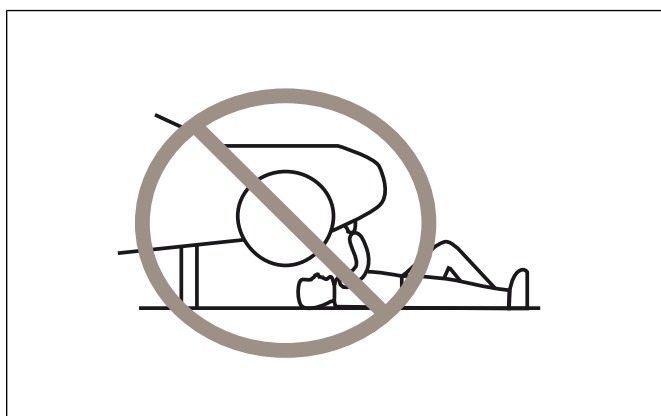
Conversions to the base vehicle that change the center of gravity may affect the ride and handling attributes.

NOTE: All vehicles should be evaluated for safe operation prior to sale.

1.6 Jacking

WARNINGS:

-  **Ensure jack screwthread is adequately lubricated before use.**
-  **The jack should be used on level firm ground wherever possible.**
-  **Switch the ignition off and apply park brake fully before lifting vehicle.**
-  **It is recommended that the wheels of the vehicle be chocked, and that no person should remain in a vehicle that is being jacked.**
-  **No person should place any portion of their body under a vehicle that is supported by a jack.**
-  **Do not get under a vehicle that is supported by a jack.**



 **WARNING: The jack supplied with this vehicle is only intended for changing wheels. Do not use the vehicle jack other than when you are changing a wheel in an emergency.**

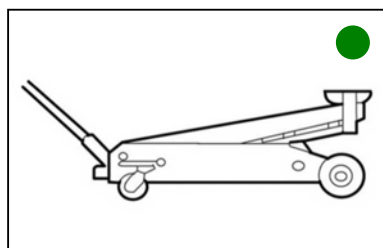
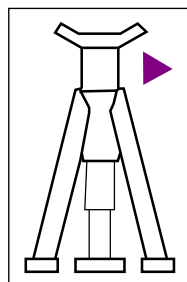
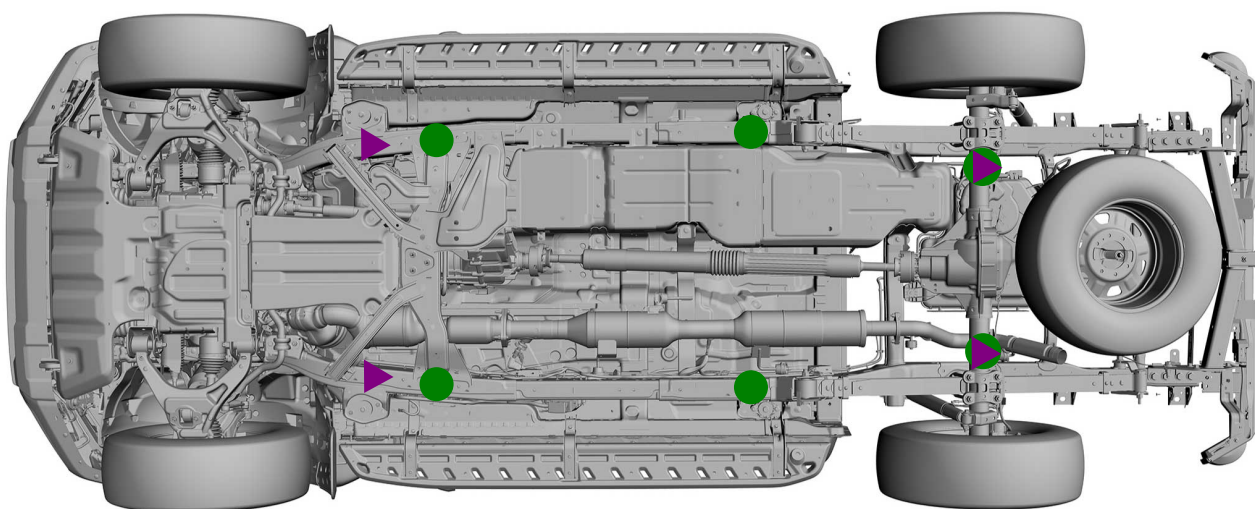
 **CAUTION: Make sure that access to the spare wheel is maintained when converting the vehicle or relocating the spare wheel. If the vehicle service body or mounted assembly affects the area surrounding the spare wheel, make sure sufficient clearance is left for successful lowering and raising of the spare wheel. Failure to adhere to this requirement may cause damage to the winching mechanism and insecure location of the spare wheel.**

NOTE: When using the vehicle jack, refer to the owner guide for correct operating instructions.

The spare wheel winch is located above the spare wheel and can be accessed from the rear of the chassis frame.

The jack must be assembled and fixed appropriately to the body to ensure safety, durability and accessibility.

Vehicle Jacking Points and Axle Stand Positions



E455281



CAUTION: Care must be taken to not damage the diesel fuel filter located under the floor in front of the transmission cross member on the LH side against the chassis. If care is not taken in placement of the jack or axle stands, damage to the fuel system could result.

1.7 Lifting

⚠ WARNING: When lifting the vehicle with a two post lift for the removal of the engine/transmission or rear axle, make sure the vehicle is secured to the lift using vehicle retention straps to prevent tilting. Failure to follow these instructions may result in serious injury or death.

CAUTIONS:

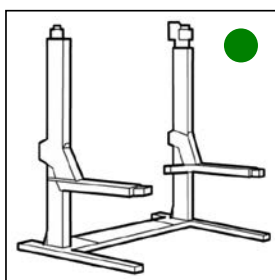
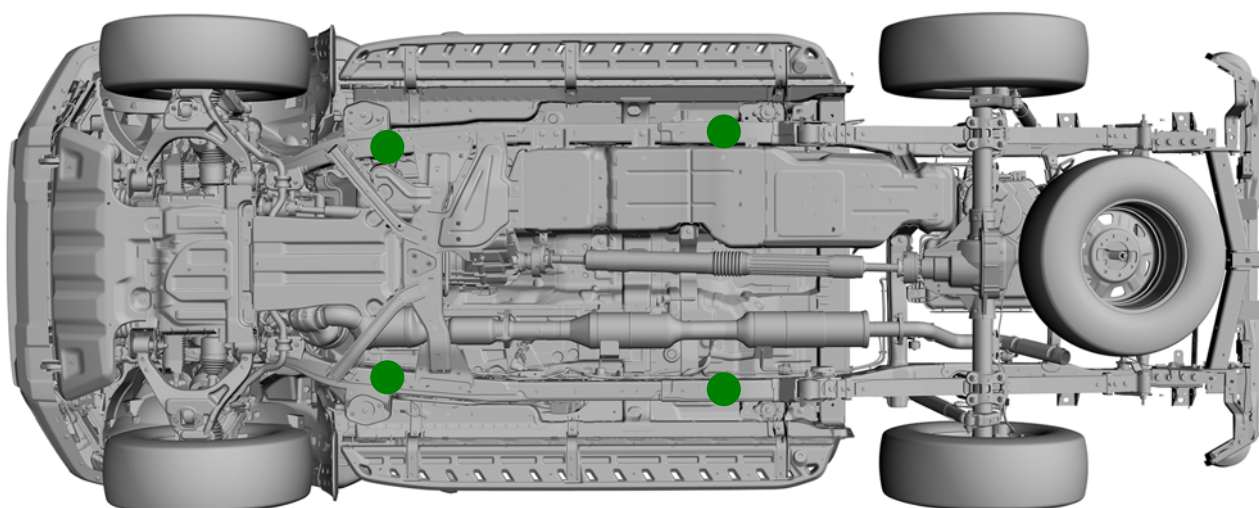
⚠ Consider the total weight and also the weight distribution of the vehicle prior to lifting. Ensure the lifting equipment is appropriately rated for the weight of the vehicle and any added accessories, equipment and cargo.

⚠ When lifting the vehicle with a two post lift, vehicle lift arm adapters must be used under the lifting points.

⚠ When lifting the vehicle with a two post lift, the maximum kerb weight must not be exceeded.

⚠ It is important that only the correct lifting and support locations are used at all times.

Lifting Points



E455282

⚠ CAUTION: Care must be taken to not damage the diesel fuel filter located under the floor in front of the transmission cross member on the LH side against the chassis. If care is not taken in placement of the lifting pads, damage to the fuel system could result.

1.8 Noise, Vibration and Harshness (NVH)

 **WARNING: Make sure that the modified vehicle complies with all relevant legal requirements.**

Changes to the powertrain, engine, transmission, exhaust, air intake system or tires may influence the exterior noise emissions. Therefore the exterior noise level of the converted vehicle has to be verified.

The interior noise levels should not be deteriorated by the conversion. Reinforce panels and structures as appropriate to avoid vibrations. Consider the usage of sound deadening materials where appropriate.

1.9 Vehicle Transportation Aids and Vehicle Storage

CAUTIONS:

-  **Disconnect the battery if the vehicle is to be stored for more than 30 days.**
-  **Make sure that the protective covers are not removed from an incomplete vehicle until the conversion is started.**
-  **Make sure that components removed during conversion are kept clean and dry.**
-  **Make sure that components removed during conversion are refitted to the same vehicle.**
-  **Transport Mode includes a calibration feature to reduce the risk of fuel injector nozzle corrosion. Exiting Transportation Mode prior to upfitting/ conversion increases the risk of early life injector failure. Refer to your local Ford dealer or national sales agent for information on how to activate or deactivate transport mode.**

In addition:

- The windscreen wipers should be lifted off the glass and set right up.
- All air intakes should be closed.
- Increase normal tyre pressure by 0.5 bar / 7 psi / 50 kpa.
- The hand brake system should not be used.
- Apply suitable wheel chocks to prevent roll away.

A significant risk during storage is deterioration of vehicle bodywork, therefore, appropriate storage procedures must be observed, including periodic inspection and maintenance.

Claims arising from deterioration caused by incorrect storage, maintenance or handling are not the responsibility of Ford.

Vehicle Converters must determine their own procedures and precautions, particularly where vehicles are stored in the open as they are exposed to any number of airborne contaminants.

The following may be considered a sensible approach to storage:

Short Term Storage

- Wherever possible vehicles should be stored in an enclosed, dry, well-ventilated area based on firm, well drained ground which is free of long grass or weeds and where possible protected from direct sunlight.
- Vehicles must not be parked near, under foliage or close to water as additional protection may be necessary for certain areas.

Long term storage:

- Battery to be disconnected but not removed from the vehicle.
- The wiper blades should be removed and placed inside the vehicle. Make sure the wiper arms are suitably prevented from resting on the windscreen.
- Engage first gear and release the parking brake completely. Chock the wheels first if the vehicle is not on level ground.
- Set climate controls to the "open" position to provide ventilation, where possible.
- Where protective film has been applied in manufacture it must be left on the vehicle until prepared for delivery but must be removed after a maximum storage period of six months (film is date stamped to indicate required removal date).
- Make sure that all windows, doors, hood, tailgate and luggage compartment lid are completely closed and the vehicle is locked.

The Pre Delivery Inspection (PDI) is the final opportunity to make sure a battery is fit for purpose prior to the customer taking delivery of their new vehicle. The battery must be checked and appropriate action taken prior to the vehicle being handed over to the customer. Test results must be recorded on the PDI repair order.

Batteries: To make sure the battery is maintained correctly and to assist in preventing premature failure, it is necessary to check and recharge the battery regularly while a vehicle is not in use. Where a battery is left below its optimum charge level for any length of time, it may result in premature failure of the battery.

Battery Drain Prevention: As part of the Vehicle Convertor process and to maximise battery life and prevent premature failure of the Ford batteries, protect and prevent battery discharge during any conversion or whilst the vehicle is in storage. This may include leaving the vehicle in Transport mode as long as possible, reducing the amount of crank cycling around the facility, door ajar events and duration. The voltage MUST be checked when receiving and before shipping. Recharge with an appropriate proprietary battery charger if the vehicle battery voltage is below 12.4V for Standard and Enhanced flooded or 12.3V for AGM. Measure connected to the vehicle at ignition of and no loads active including interior or exterior lights in Off status.

Subsequent stage manufacturers and vehicle alterers who will be working with BEV vehicles should develop a plan to potentially charge these vehicles.

Charging stations are recommended at vehicle storage locations.

Convertors should also consider the vehicle state of charge as it leaves their facility:

- Vehicles should enter the Ford transportation system with the same state of charge they had leaving the Ford assembly plant.
- In other cases, upftters should consider their customer’s expectations and transportation arrangements when determining any state of charge requirements.

Action / Time in storage	Monthly	Every 3 Months
Check vehicle is clean	X	-
Remove external contamination	X	-
Check battery condition - Recharge if necessary	Connected	Disconnected
Visually check tyres	X	-
Check interior for condensation	-	X
Run engine until coolant gauge reaches temperature (60 °C) with aircon switched on, where applicable	-	X

To reduce the likelihood of premature battery failure it is recommended that where:

- A battery is left connected – monthly checks should be carried out.
- A battery has been disconnected – no greater than a 3 monthly check should be carried out.

1.10 Package and Ergonomics

1.10.1 General Component Package Guidelines

 **WARNING: Do not modify, drill, cut or weld any suspension components, specifically the steering gear system, subframe or anti-roll bars, springs or shock absorbers including mounting brackets.**

The Vehicle Converter must ensure that sufficient clearance is maintained under all drive conditions to moving components such as axles, fans, steering, brake system etc.

The Vehicle Converter is responsible for all installed components during the conversion. The durability must be confirmed by appropriate test procedures.

1.10.2 Driver Reach Zones

Controls and/or equipment required to be used while driving should be located within easy reach of the driver so as not to impair driver control.

1.10.3 Driver Field of View

 **WARNING: Make sure that the modified vehicle complies with all relevant legal requirements.**

1.10.4 Conversion Effects on Parking Aids

 **WARNING: Ensure that monitors mounted in the cabin meet the interior package and safety requirements.**

On conversions requiring a rear camera, the reverse signal may be taken as described in the reversing lamps section.

Refer to: 4.6 Exterior Lighting (page 88).

1.10.5 Aids for Vehicle Entry and Exit

Steps

WARNINGS:

 **Make sure that the modified vehicle complies with all relevant legal requirements.**

 **If this modification alters the homologated dimensions, a new approval may be necessary.**

 **CAUTION: Make sure that reinforcements are installed to maintain the integrity of the original body structure.**

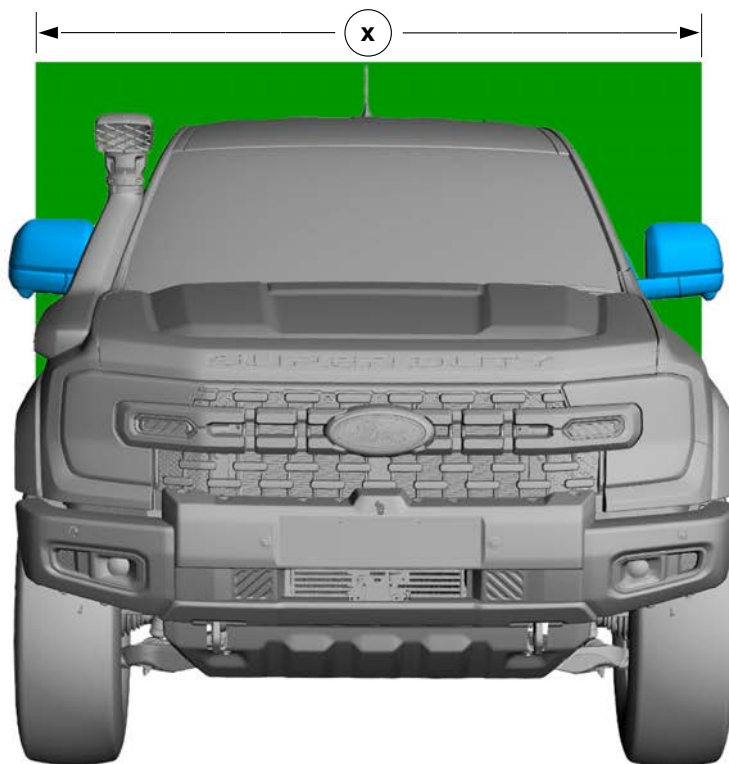
Steps can be ordered as an accessory on the base vehicle. Please check for availability.

Where additional steps are installed the required ground clearance line must be maintained.

The Vehicle Converter must make sure that a movable step is set in the stored position when the vehicle is running. The step surface must be non-slip.

Rear View Mirrors

NOTE: Overall width with exterior rear view mirrors extended is 2197 mm.

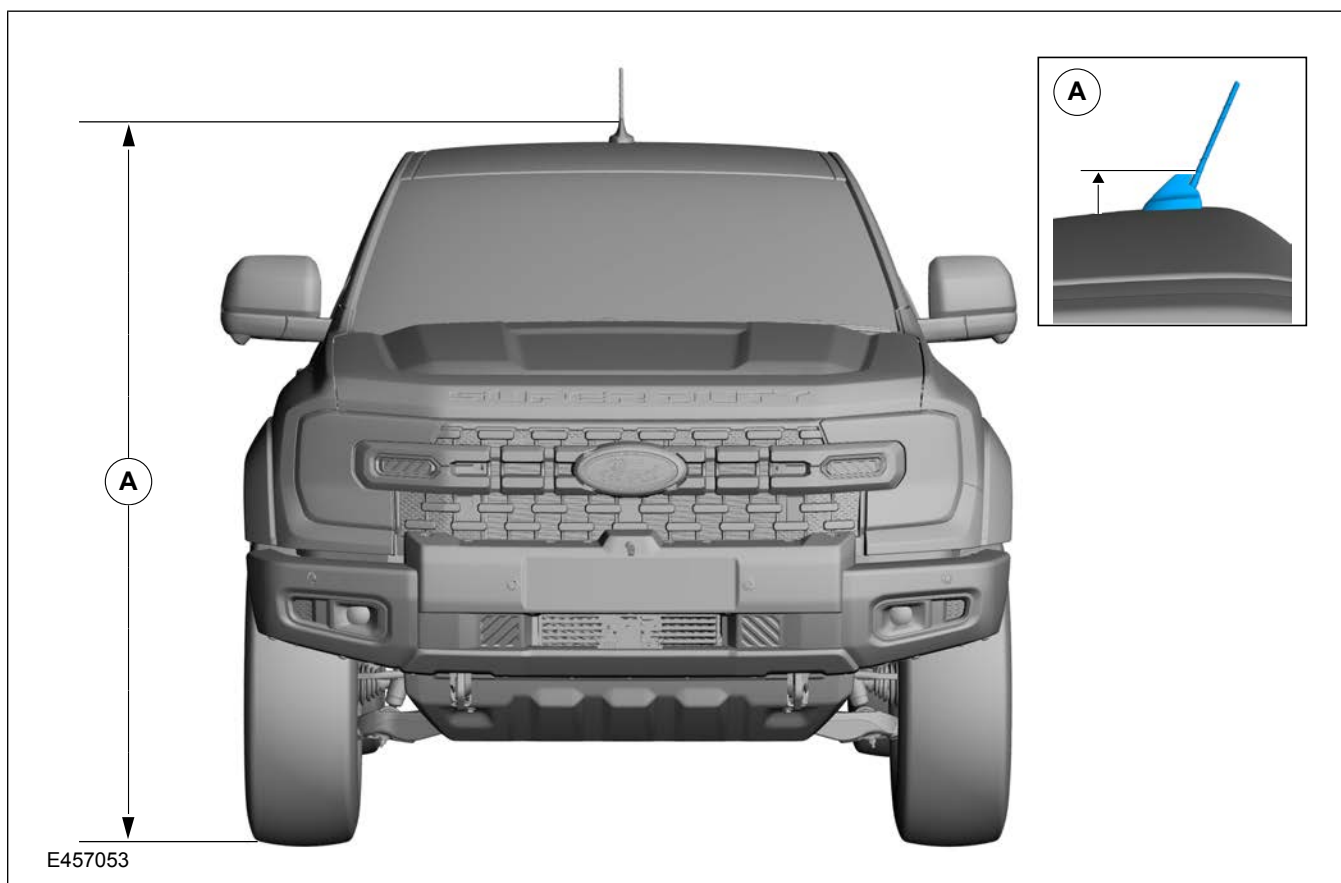


E455239

Description	Single Cab	Super Cab	Double Cab
Maximum Body Width (mm)	1960 mm	1990 mm	2010 mm

Beyond these values extended mirrors may be required to comply with rear vision requirements. Refer to ECE R46 / ADR 14 (Indirect Vision) or Local Requirements.

1.10.6 Vehicle Height

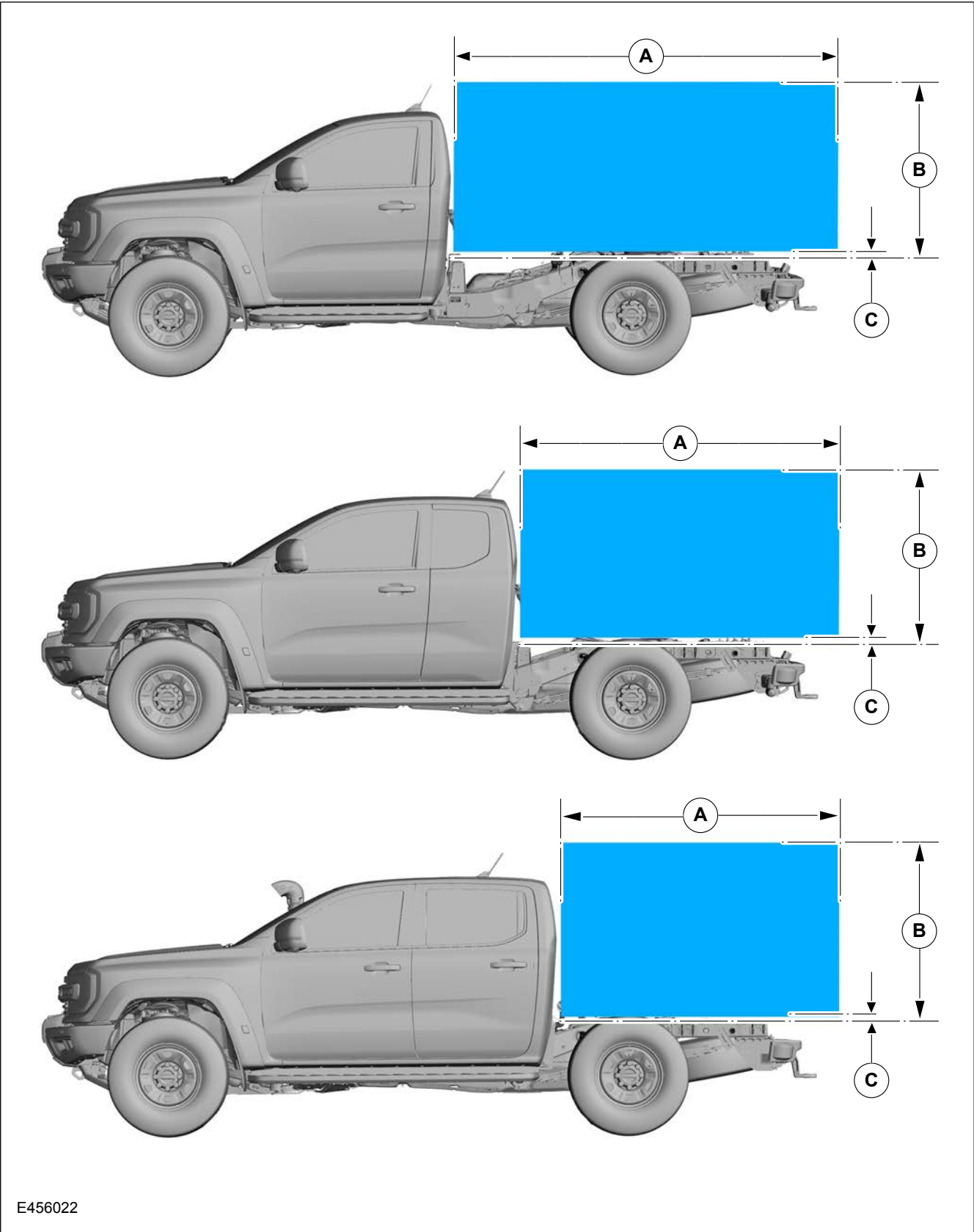


Description	Single Cab	Super Cab	Double Cab
Overall Height (mm) *	1983 / 1960	1977 / 1955	1985 / 1960
Overall Height (mm) **	1900	1885	1890

* Base bare Cab-Chassis / base vehicle with steel tray fitted.

** At GVM and RGAWR (maximum rear loading).

1.10.7 Recommended Maximum Main Load Area Dimensions



Vehicle	A (mm)	B (mm)	C (mm)
Single Cab	2670	2400	65
Super Cab	2190	2400	65
Double Cab	1890	2400	65

Dimension A does not include the 28mm tray to cabin clearance requirement.

Refer to: 4.3 Parking Aid (page 73).

Dimension C is taken from the forward and mid body mounting pads (not rearmost).

Refer to: 5.1 Body (page 120).

for mounting pad heights and general chassis protrusions.

1.10.8 Registration Plates

Front Registration Plate

WARNINGS:



The mounting of a registration plate to the front of the vehicle must comply with local regulations.



No part of a vehicle registration plate may be obscured by standard equipment, regular production options or equipment, in line with local regulations.

The registration plate must be affixed to the front of the motor vehicle forward of and parallel to the front 'Axle' so that no part of such registration plate is more than 1,300 mm from the ground.

Rear Registration Plate

WARNINGS:



The mounting of a registration plate to the front of the vehicle must comply with local regulations.



No part of a vehicle registration plate may be obscured by standard equipment, regular production options or equipment, in line with local regulations.

The registration plate must be affixed to the rear of the motor vehicle so that no part of such registration plate is more than 1,300 mm from the ground.

1.11 Package and Ergonomics—Specifications

1.11.1 Recommended Body Dimensions

WARNINGS:

 **Do not modify the wheelbase or add any type of frame extension to vehicles fitted with Electronic Stability Program (ESP).**

 **Ensure that any mass added to the vehicle does not compromise vehicle stability.**

NOTE: Extreme rear overhang may encourage unacceptable loading conditions, which could unload the front axle, producing unacceptable handling and braking characteristics. Ensure that the center of gravity of the body and payload does not fall outside of the recommended zone.

NOTE: An excessively high center of gravity could reduce vehicle stability. Ensure that the center of gravity of the body and payload does not fall outside of the recommended zone.

Refer to: 1.13 (page 28).

NOTE: When extending the length of the frame rearward of the rear axle, it is recommended that the overall rear overhang is limited to a maximum of 50% of the wheelbase of the vehicle.

NOTE: If a towball is fitted to the vehicle, the body dimensions must incorporate a towball clearance zone in accordance with local regulatory requirements.

If a conversion requires more than 50% overhang, please contact your local National Sales Company representative, or Local Ford Dealer.

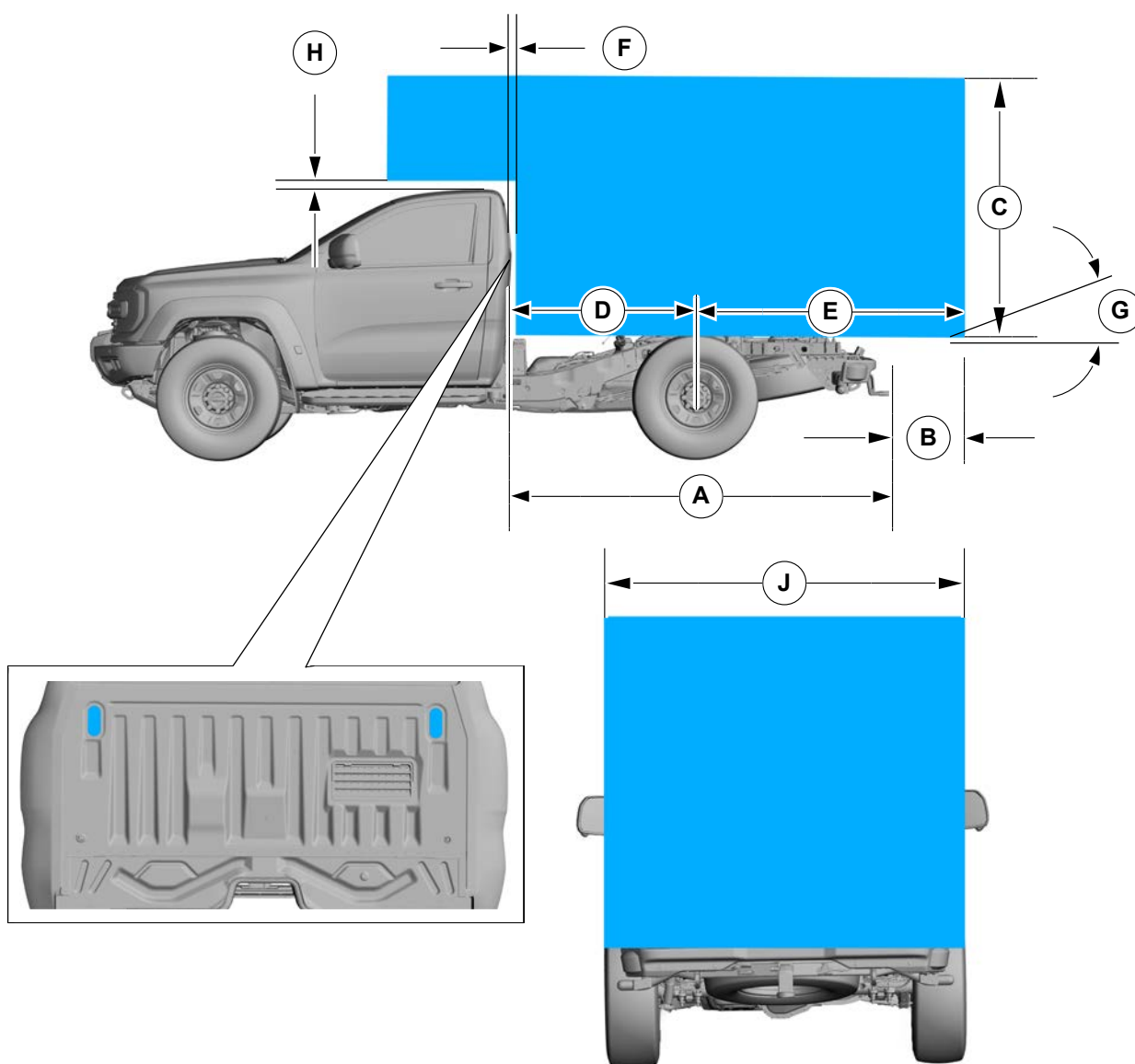
NOTE: To access the wheel winch with a longer tray overhang, an additional extension bar will be required.

The extension bar can be purchased from any authorised Ford Dealer: **JB3Z-17081-A**

Load carrying structures should not be mounted onto an existing load tray or load box. Body attachment points are provided on the frame.

Refer to: 5.1 Body (page 120).

Chassis Cab Body - Single Cab Illustrated



E455999

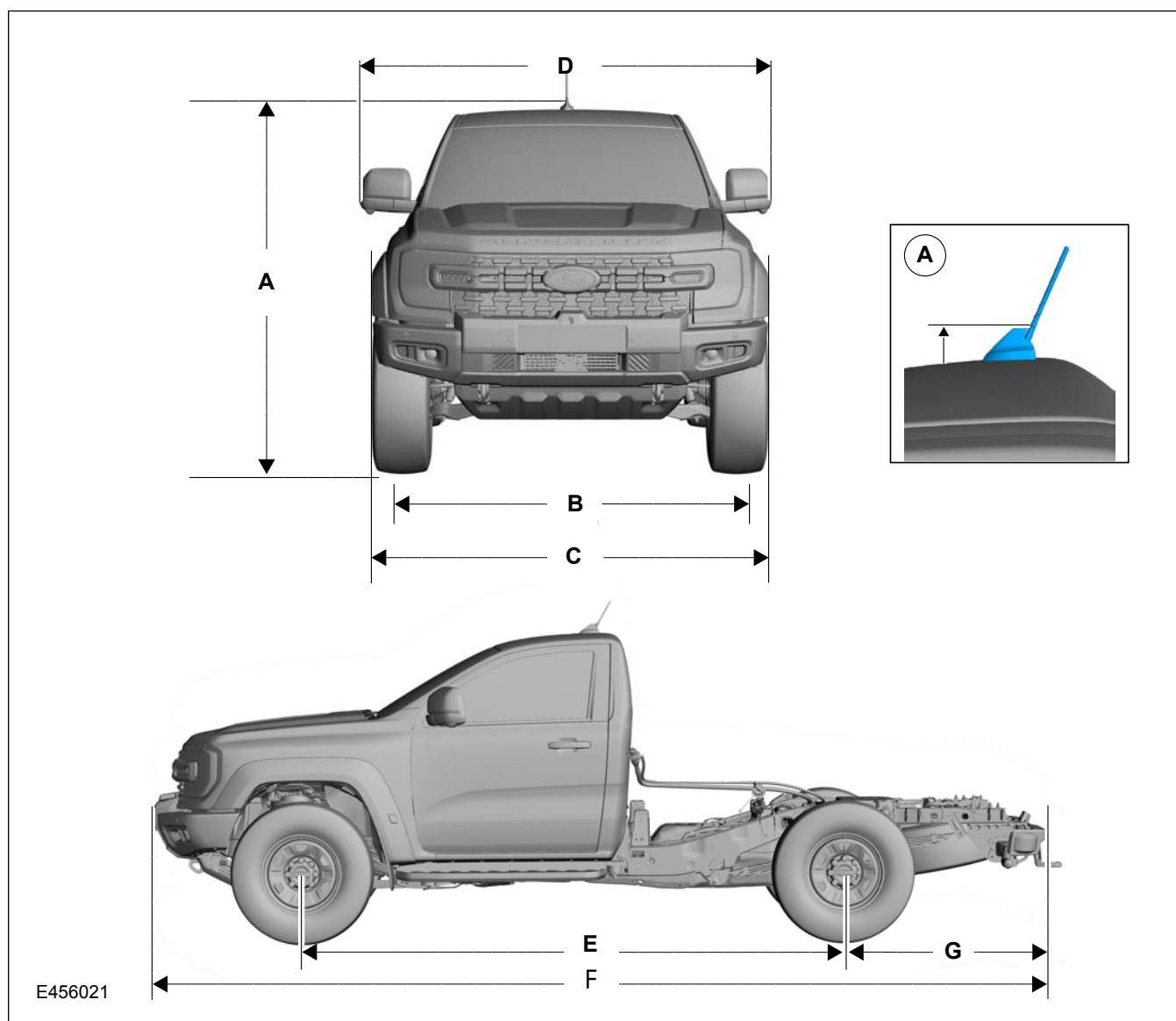
Dimensions - not to exceed for Chassis Cab body Length

Description		Dimension (mm)		
		Single Cab	Super Cab	Double Cab
A	Frame length behind back of cab (top of main rails, not including towbar)	2286	1816	1518
B	Under run bar and towing attachment legislation to be maintained			
C	Maximum recommended external body height	2400 over the top of frame, provided load distribution requirements are met		
D	Front outside of body to rear axle centre line	1265mm	795mm	497mm
E	Maximum recommended rear overhang	(50% of vehicle wheelbase), provided load distribution requirements are met		
F	Clearance between the back of the cab and the body	28mm Minimum		
G	Ensure local lighting legislation is maintained. Refer to: 4.6 Exterior Lighting (page 88).			
H	Clearance between the top of the cab and the body	30mm		
J	Maximum external body width (standard mirrors)	1960	1990	2010

All dimensions (shown in mm) are subject to manufacturing tolerances and refer to min specification models which do not include additional equipment. The illustrations are for guidance only.

1.11.2 Chassis Cab Body - Basic Dimensions and Weights

Chassis Cab Body - Single Cab Illustrated



Chassis Cab Body

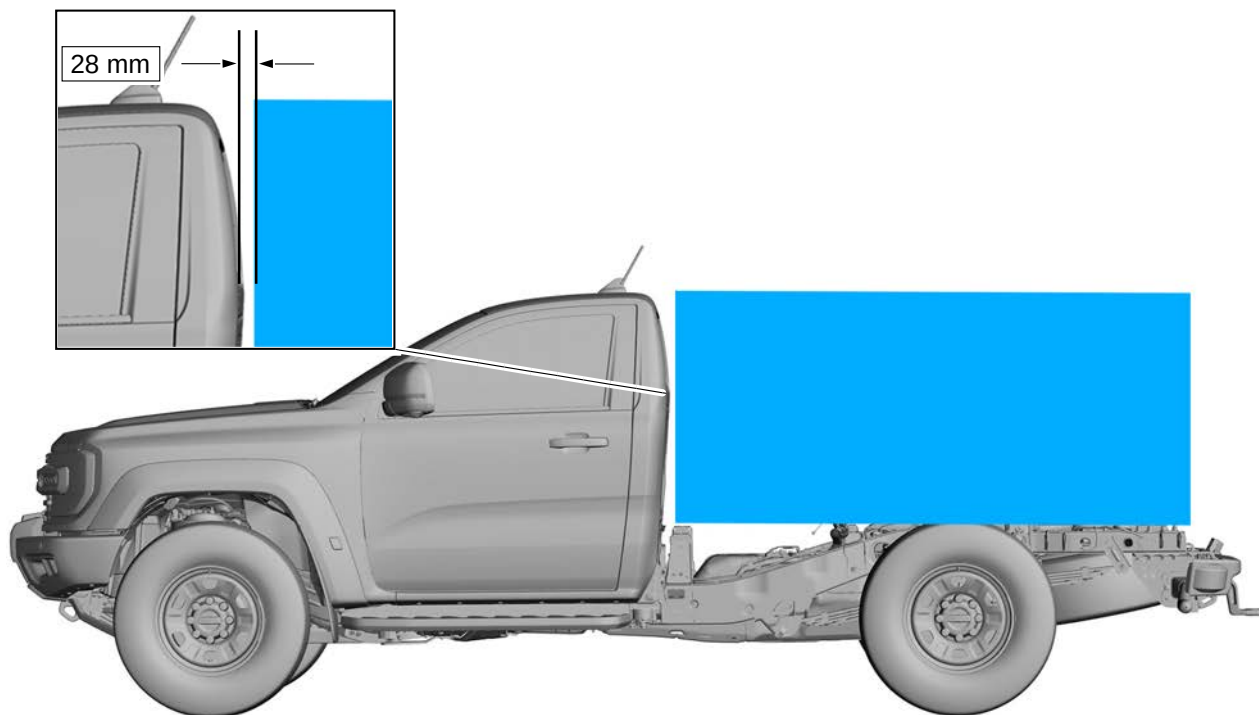
Description		Single Cab	Super Cab	Double Cab
A	Overall height (mm) - measured to top of antenna base *	1983	1977	1985
B	Track (mm)	1710		
C	Overall body - excluding exterior mirrors (mm)	2032		
D	Overall width - including exterior mirrors (mm)	2197		
E	Wheelbase (mm)	3270		
F	Overall length (mm)	5470		
G	Rear Overhang (mm) - top edge of main rails, not including towbar	1020		

* Base Cab-Chassis vehicle at Kerb condition.

1.11.3 Vehicle Cabin Clearance

NOTE: Single Cab shown, Super Cab, Double Cab similar.

Ford recommend minimum gap of 28mm between the vehicle cabin sheet-metal and any canopy, service body or equipment fitted to the vehicle.



E456020

1.11.4 Kerb Mass and Payload

WARNING: Check local legislation for legal requirements.

Details of vehicle kerb mass and payload capacities can be provided by your local National Sales Company representative.

1.11.5 Gross Vehicle Mass and Axle Load Ratings

WARNING: Check local legislation for legal requirements.

Details of gross vehicle axle load ratings are listed in the vehicle weights section.

Refer to: 1.13 (page 28).

1.11.6 Front, Rear and Side Under-Run Protection

WARNING: Check local legislation for legal requirements.

Front Under-Run Protection, Rear Under-Run Protection and Side Under-Run Protection must meet the requirements of local design rules.

1.12 Hardware—Specifications

Material Specification, Strength and Torque

Standard Hardware and Tightening Torques (Nm) Bolts/Studs: ISO 898-1, Nuts: ISO 898-2						
	Grade 4.8		Grade 8.8		Grade 10.9	
Thread Size	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
M4	1.1	1.4	2.4	3.4		
M5	2.2	2.7	4.9	6.7		
M6	3.7	4.7	8.5	11.5	11	15
M8			20	28	25	35
M10			41	55	50	70
M12			68	92	95	125
M14			113	153	150	200
M16			170	230	230	310
M18			250	315	315	400
M20			345	430	435	540
M22			470	590	590	745
M24			600	750	755	945

This torque chart is a recommendation and the converter is responsible for the optimal torque for a specific joint. For specific vehicle torque specification, refer to the relevant Ford Workshop Manual or contact your local Ford dealer or National Sales Agent.

1.13 Load Distribution—Specifications

1.13.1 Load Distribution Calculations - Driver and Passenger Weight Distribution

CAUTIONS:



Do not exceed the axle ratings.



Do not exceed the gross vehicle mass.

Refer to Gross Weight and Axle Ratings in this section.



CAUTION: Tyre minimum specification must be maintained.

NOTE: Uneven load distribution could result in unacceptable handling and braking characteristics.

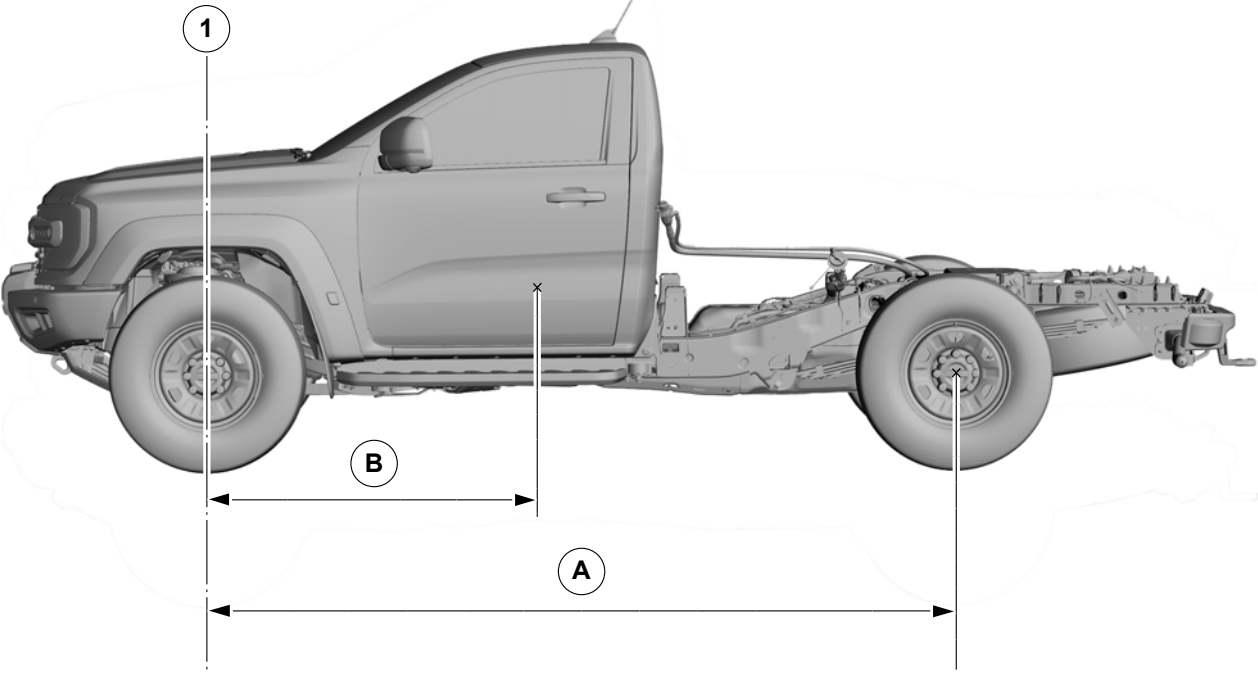
NOTE: Over loading of the vehicle could result in unacceptable ground clearance.

NOTE: The center of mass of the body equipment and the payload it contains should be located within the dimensions given.

NOTE: Avoid one-sided load distribution.

NOTE: For further information please contact your local National Sales Company representative, or local Ford dealer.

Single Cab

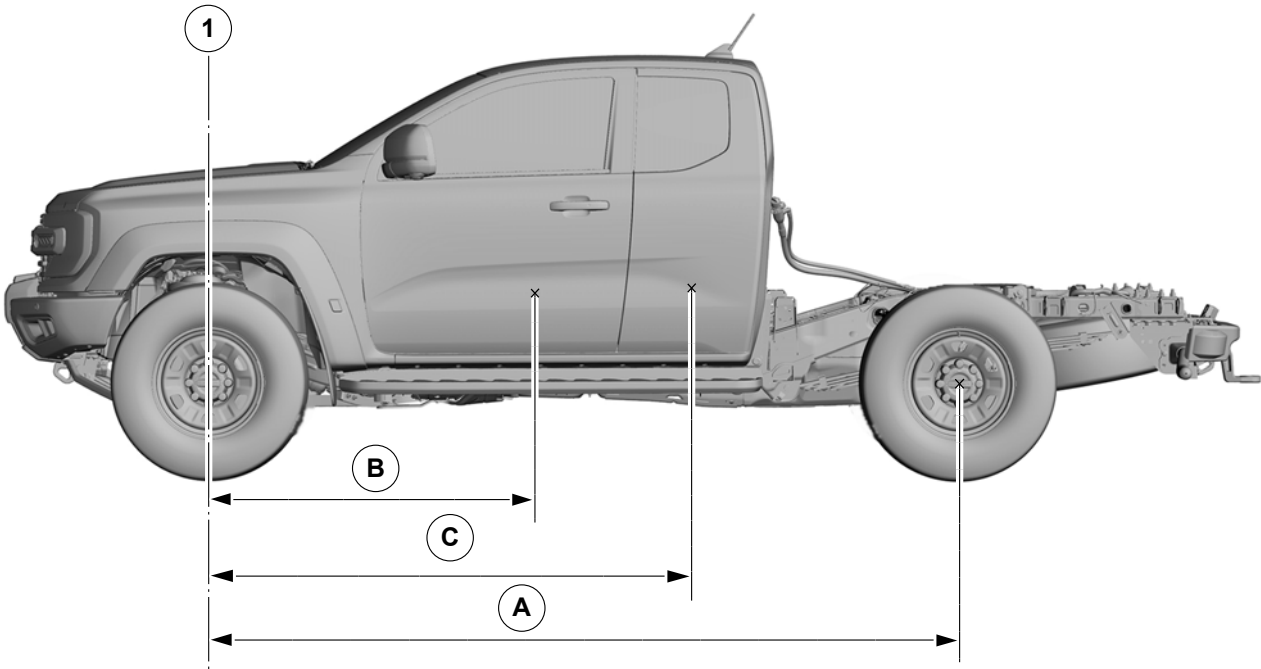


E455814

Single Cab Driver and Passenger Weight Distribution

'A' Wheelbase (mm)	'B' Front row seats and driver (mm)	Weight distribution per person (Kg)		
		On Front Axle	On Rear Axle	Total
3270	1544	40	35	75

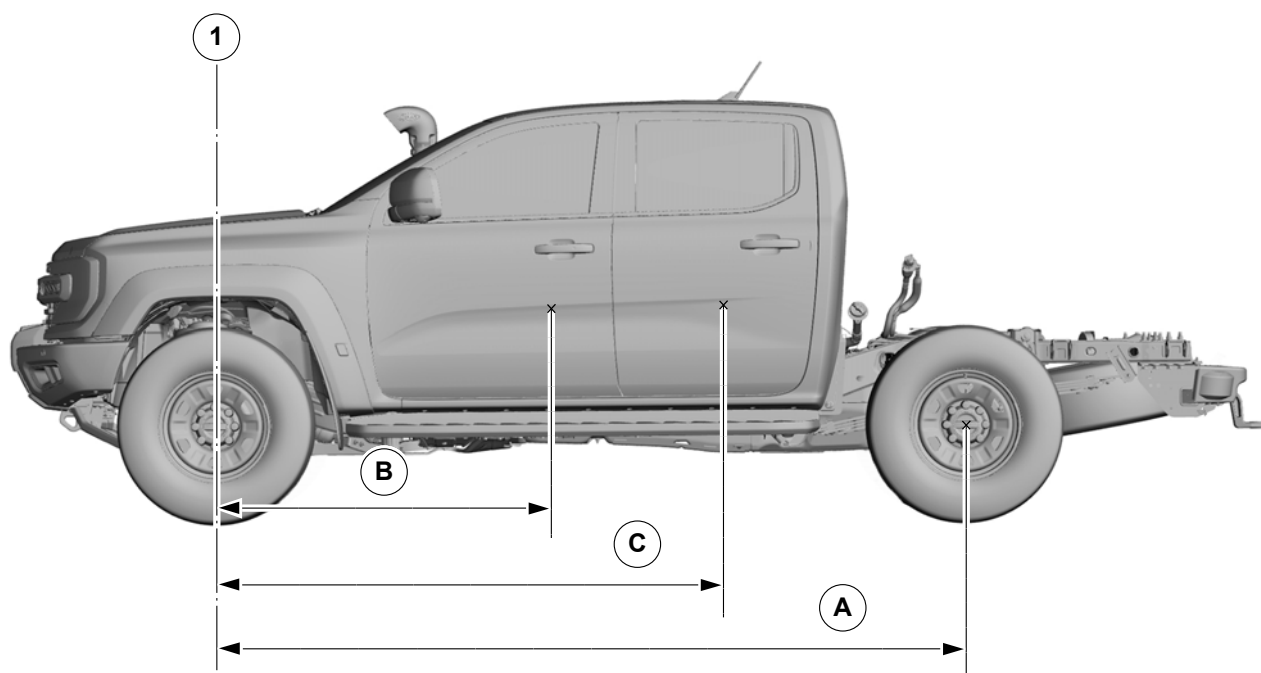
Super Cab



E455815

Super Cab Driver and Passenger Weight Distribution

'A' Wheelbase (mm)	'B' Front row seats and driver (mm)	'C' Second row seats (mm)	Weight distribution per person (Kg)		
			On Front Axle	On Rear Axle	Total
3270					
	1544	-	40	35	75
	-	2230	24	51	75

Double Cab

E455487

Double Cab Driver and Passenger Weight Distribution

'A' Wheelbase (mm)	'B' Front row seats and driver (mm)	'C' Second row seats (mm)	Weight distribution per person (Kg)		
			On Front Axle	On Rear Axle	Total
3270	1544	-	40	35	75
	-	2360	21	54	75

1.13.2 Center of Gravity

NOTE: Calculations shown are not inclusive of dealer fitted accessories.

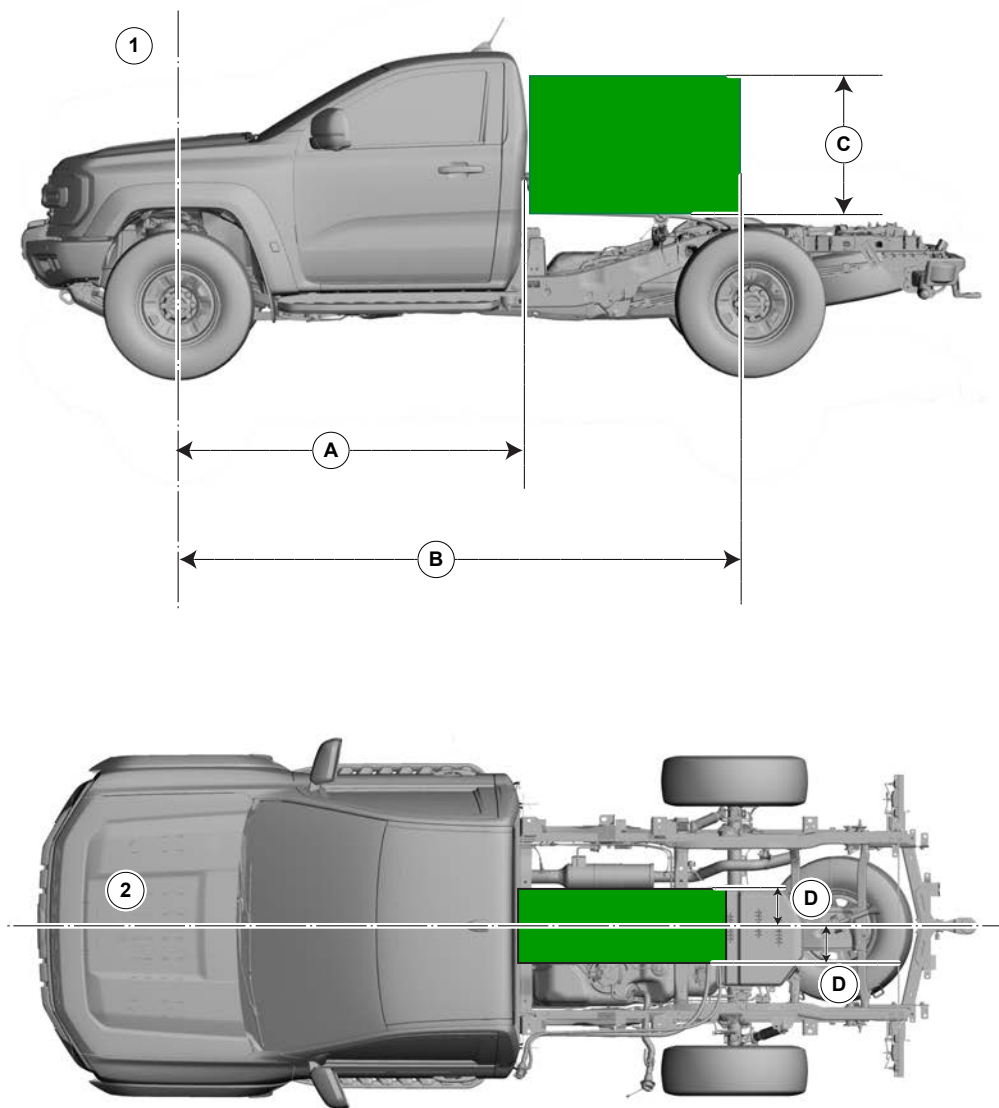
The following charts define the recommended Centre of Gravity Position for the mass added to the vehicle by the vehicle converter.

"Added mass" includes all added body equipment and cargo, but excludes passengers seated in standard cab seating.

The effect of any roof loads are not included in the Centre of Gravity values. Any roof loads need to be factored into the overall assessment. See Roof Racks.

[Refer to: 5.1 Body \(page 120\).](#)

Centre of Gravity - All Cab Styles



E459559

Recommended centre of gravity location for added mass

Added Mass (Structure and Payload)	'A' Min (mm)	'B' Max (mm)	'C' Max (mm)**	'D' Max (mm)
GVM @ RGAWR	1965	3350	530	65
800kg	1965	3255	630	130

NOTE: (1) Is the centre line through the front axle.

NOTE: (2) Is the centre line through the vehicle.

1.13.3 Vehicle Weights

NOTE: AUSTRALIA AND NEW ZEALAND ONLY:
Subject to Australian and New Zealand State and Territory regulations, all payloads are calculated by deducting the vehicle's Kerb Weight from its Gross Vehicle Mass (GVM). Payload (based on Kerb Weight) is the maximum combined value of occupants, cargo, added options, added structures and tow ball download (when towing). Kerb Weight includes the vehicle with a full tank of fuel, without occupants, luggage or cargo and with factory fitted optional equipment included. Minimum Kerb Weight excludes factory fitted optional equipment. Vehicle weights are approximate and subject to individual variances. Vehicles should be weighed before and after adding additional load, accessories or towing a trailer to ensure the maximum Gross Vehicle Mass (GVM), Gross Combined Mass (GCM) and Gross Axle Weight Ratings are not exceeded.

NOTE: All weights are shown in Kilograms (kg).

Engine	Drive	Variant	Front Axle Limit (FGAWR)	Rear Axle Limit (RGAWR)	Gross Vehicle Limit (GVM)	Gross Combined Limit (GCM)
3.0L V6 Diesel	AWD	All	1900	2800	4500	8000

1.14 Towing

1.14.1 Towing Requirements

When a towing device is required, the Vehicle Converter should use a Ford approved tow bar.

1.14.2 Towing

WARNINGS:

-  **Do not exceed the Gross Combination Mass (GCM) or towing capacities for your specific vehicle. Refer to the vehicles owner guide for specifications related to the towing capacities and local regulatory standards.**
-  **Ensure that the trailer towball download weight falls within the specified range.**
-  **Towing trailers beyond the maximum recommended gross trailer weight exceeds the limit of your vehicle and could result in engine damage, transmission damage, structural damage, loss of vehicle control, vehicle rollover and personal injury.**
-  **Do not cut, drill, weld or modify the trailer hitch. Modifying the trailer hitch could reduce the hitch rating.**
-  **Do not exceed the maximum vertical load on the tow ball. Failure to follow this instruction could result in the loss of control of your vehicle, personal injury or death.**
-  **Do not install a Ø50mm / 3.5t tow-ball into a Ø70mm / 4.5t towing hitch. The tow-ball shank must fit firmly in the hitch hole without play.**

The vehicle comes shipped with either the 4.5T hitch and 70mm ball or the 3.5T hitch with 50mm ball depending on how originally ordered. Either may also be available in some markets as an accessory that can be purchased from authorised Ford Dealers:

- 3.5T hitch - Part Number: R1WZ-17D826-A
- Ø50mm ball - Part Number: U019B012-A
- 4.5T hitch - Part Number: RB3Z-17D826-A
- Ø70mm ball - Part Number: VR1WZ-17F000-A

For towing devices fitted by the Vehicle Converter the following applies:

- Towing capacities must not exceed those of the unmodified vehicle.
- Any modifications to the vehicle must be noted in the vehicle owner guide descriptive literature included with the owners documentation.
- Tow bar installations must meet the requirements of the local regulatory standards.
- Whenever frame drilling is necessary use tube reinforcement.

Refer to: 5.6 Frame and Body Mounting (page 155).

1.14.3 Towing Capacities and Specifications

NOTE: Refer to the vehicles owner guide for specifications related to the towing capacities and local regulatory standards.

2.1 Suspension System

WARNINGS:

 **Do not modify, drill, cut or weld any suspension components, specifically the steering gear system, subframe or anti-roll bars, springs or shock absorbers including mounting brackets.**

 **The rear leaf springs are pre-stressed in manufacture and should not be altered for rate or height in any way during vehicle conversion. Adding or removing leaves may result in failure or reduced function of the spring as well as other vehicle related issues for which Ford Motor Company cannot be held responsible.**

CAUTIONS:

 **Modifications to the suspension system can cause a deterioration of the vehicle handling characteristics and durability.**

 **Modifications to the suspension system may degrade the accuracy and function of the On Board Scale system.**

 **When carrying out welding work the springs must be covered to protect them against weld splatter.**

 **Do not touch springs with welding electrodes or welding tongs.**

 **Any modifications to the suspension system will require front wheel alignment and headlamp alignment to be checked and adjusted as required.**

Refer to: [4.6 Exterior Lighting \(page 88\)](#).

NOTE: Modification of the wheelbase or adding any type of frame extension to vehicles fitted with Electronic Stability Program (ESP) is not recommended.

NOTE: Do not damage the surface or corrosion protection of the spring during disassembly and installation.

NOTE: Do not add any additional axles.

2.2 Wheels and Tires

WARNINGS:

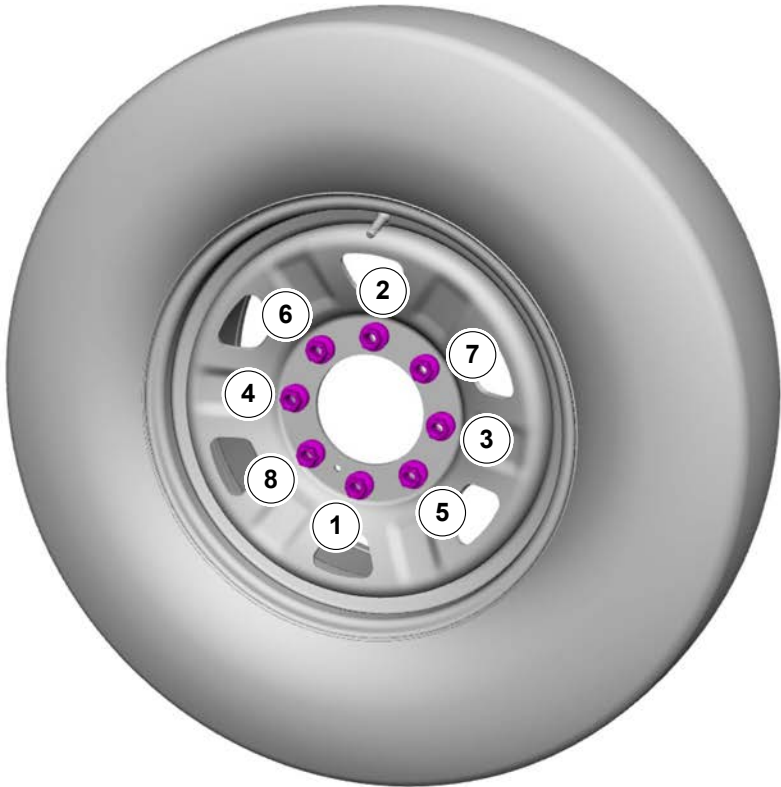
- 

Only use M14x1.5 Step-Loc™ wheel nuts. Failure to follow this instruction may result in serious personal injury or death.
- 

Retighten wheel nuts within 160KM (100mi) after a wheel is reinstalled. Wheels can loosen after initial tightening. Failure to follow this instruction may result in serious injury to vehicle occupant(s).

- NOTE:** Failure to tighten the wheel nuts in a star/cross pattern can result in high brake disc runout, which accelerates the development of brake roughness, shudder and vibration.
- NOTE:** The wheel nut torque specification is for clean, dry wheel stud and wheel nut threads.
- NOTE:** Final tightening to be performed with vehicle resting on tires.
- NOTE:** If replacement wheels are fitted they must be adequately load-rated and also be hub-centric in design. The wheel hub mounting diameter is 125.0mm.

Wheel nut tightening sequence and torque specification



E453866

Item	Torque
Wheel Nuts	204 Nm

- Wheel Nut Part Number: BK3Z-1012-A

2.3 Brake System

2.3.1 General

The Brake System must be fully functional when the vehicle conversion is completed. The vehicle brake operating modes must be checked, including warning system and parking brakes.

WARNING: Do not restrict the airflow and cooling to the brake system.

NOTE: Do not obstruct the view of the brake fluid reservoir level.

The brake fluid reservoir must remain accessible for servicing and for adding brake fluid.

2.3.2 Brake Hoses

WARNING: Ensure care is taken when removing or securing brake tube attachment points. Damage to the attachment points or brake tube alignment could result in reduced clearance and wear on critical brake components. Replace any damaged items before using the vehicle.

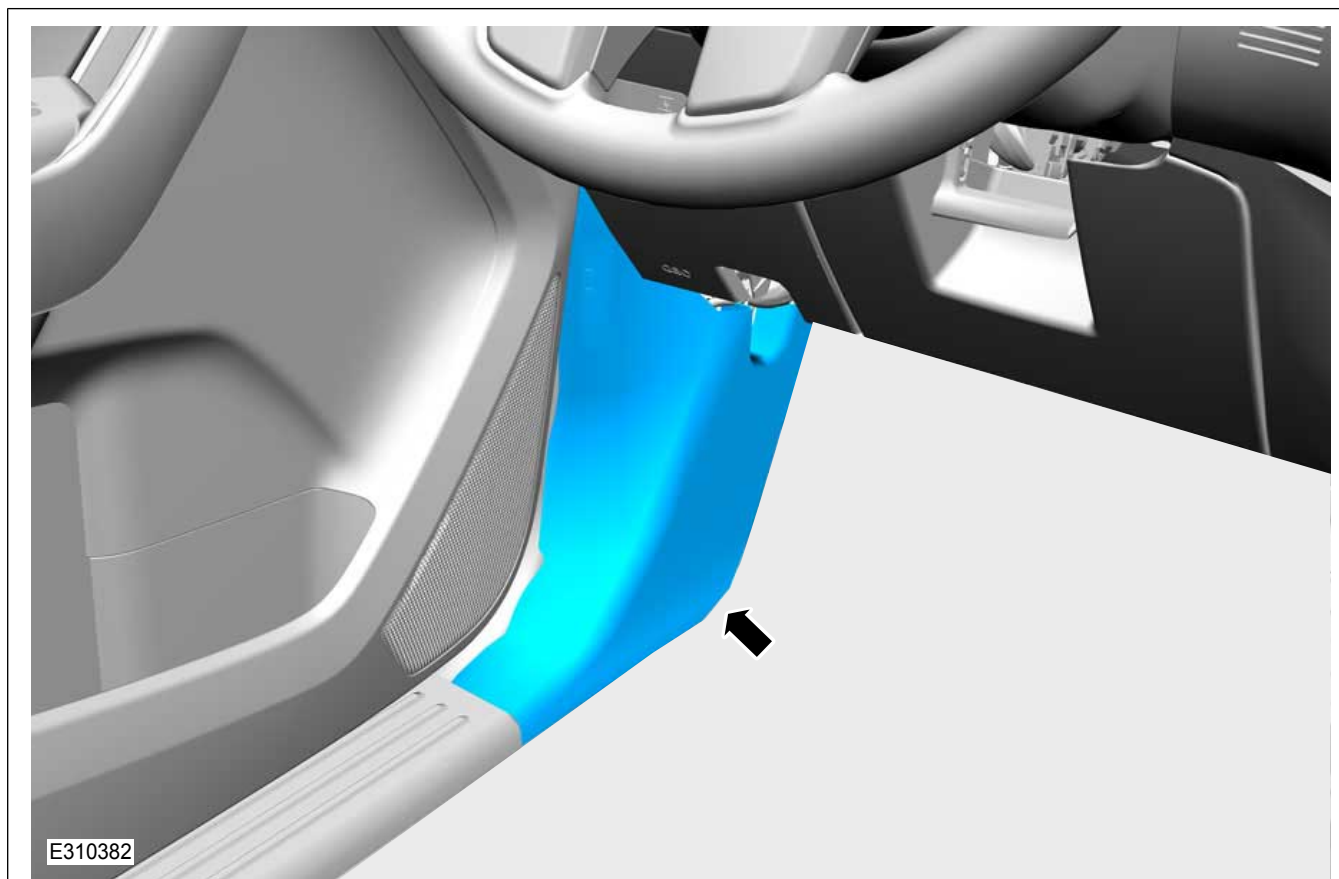
CAUTION: Make sure that the front and rear brake hoses are not twisted and are correctly located away from body and chassis components.

Front and rear brake hoses must not rub, chafe or rest on body or chassis or body components. There must be clearance under all operating conditions, between full compression and extension and full lock to lock.

Brake lines must not be used to support or secure any other component.

2.3.3 Trailer Brake Connection

WARNING: A pre-installed trailer brake wire provides a pulsed brake signal of varying frequencies. This pulsed signal is not a direct current (DC) signal. If an aftermarket brake controller is installed, the vehicle owner or installer must ensure that it is compatible with all pulsed signals from the pre-installed trailer brake wire. Failure to ensure compatibility of your brake controller may result in loss of vehicle control, which could result in serious injury or death. If clarification is required on the specifications of the pulsed signals, please contact your Authorised Ford Dealer.



A pre-installed wire is located behind the A-Pillar kick panel and is marked TRAILER BRAKE CONTROLLER (If equipped). See Trailer Towing.

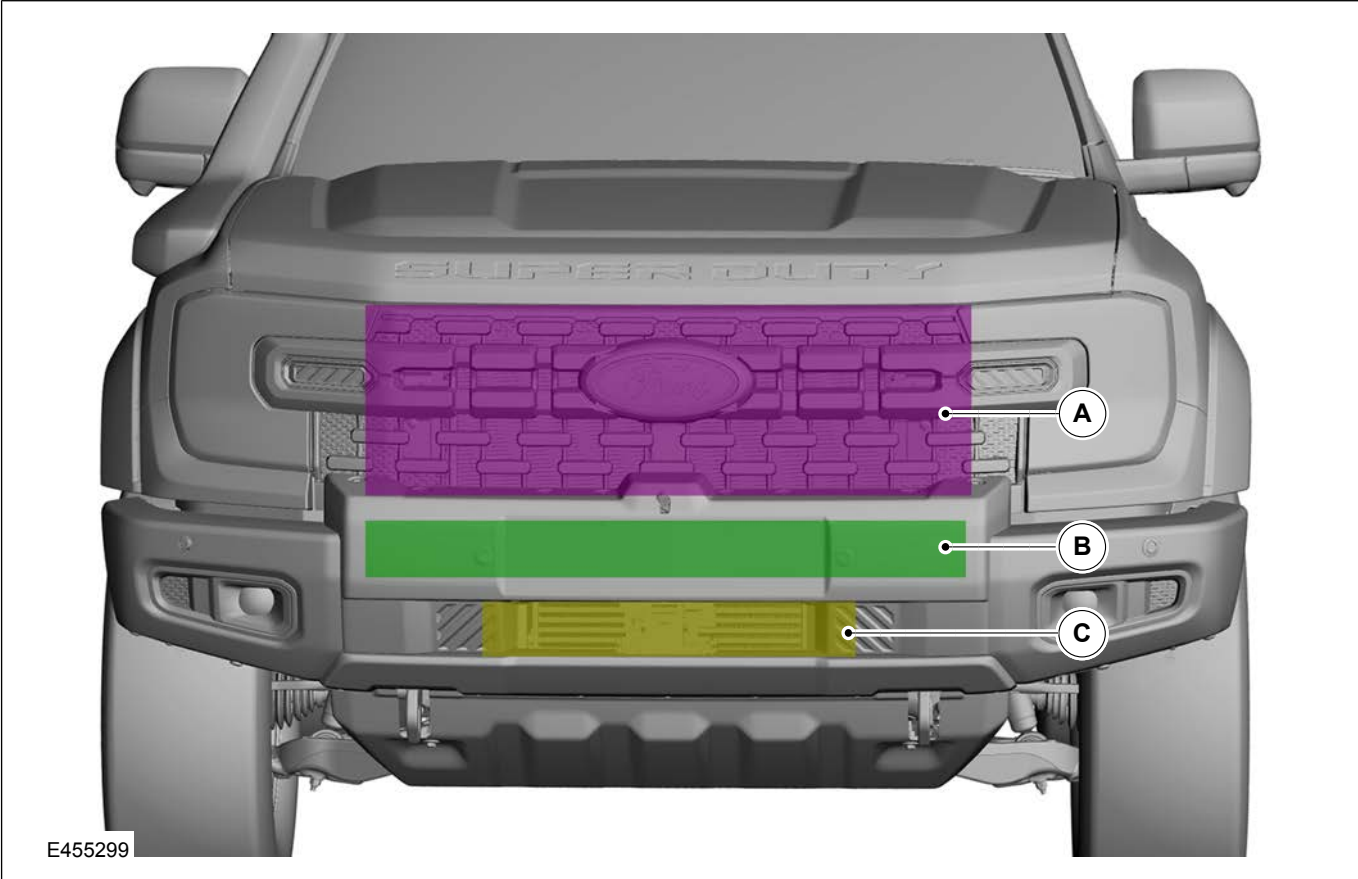
Refer to: 4.6 Exterior Lighting (page 88).

3.1 Engine

3.1.1 Engine Cooling Airflow Envelopes

Engine cooling performance is to be maintained by preventing accessories and vehicle additions from intruding on the airflow cooling envelopes.

Base



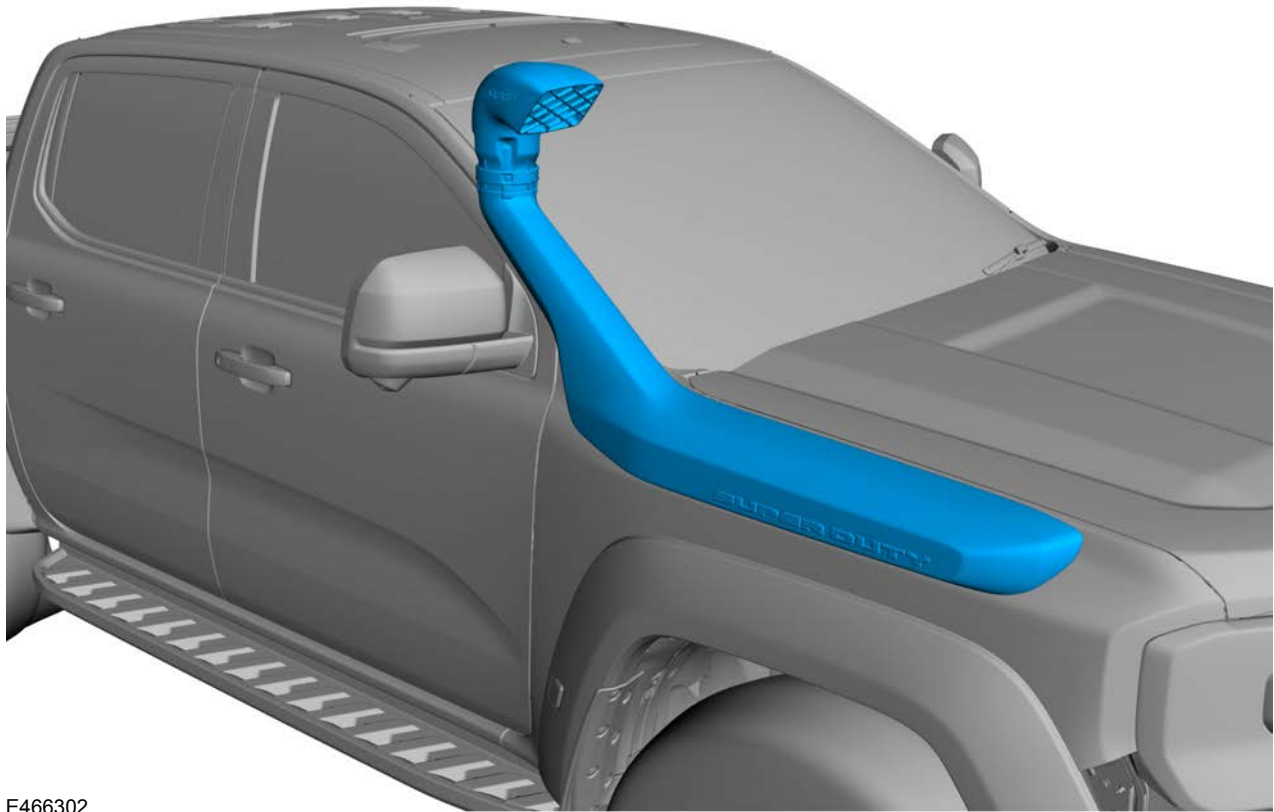
Item	Description
A	Restriction of cooling airflow within this area may cause a degradation of engine and transmission cooling performance.
B	Restriction of cooling airflow within this area poses a low risk of powertrain cooling performance degradation.
C	Restriction of cooling airflow within this area may cause a degradation of engine performance due to intercooler airflow obstruction.

Engine / E-Drive Types

Engine	Emissions / Fuel Type	Max Power kW @RPM	Max Torque Nm @RPM
3.0L Powerstroke V6	Eu6.2 Emissions / Diesel	154kW (210PS) @3250rpm	600Nm (442 ft lbs) @1750rpm

3.1.2 Air Intake

If your Super Duty is not optioned with a Snorkel. A Snorkel kit may also be available in some markets as an accessory that can be purchased from authorised Ford Dealers:



E466302

Snorkel Kit

Description	Part Number
Super Duty Snorkel	RIWZ-9A626-A
Lower Air Box	RB3Z-9A612-A
Fender Cut Out Template	VR1WZ-9A626-A

Cyclonic Pre-Filter

⚠ WARNING: The fitment of non-approved pre-filters may affect engine performance, fuel efficiency, emissions compliance and engine durability.

For continued driving through dusty conditions Ford advises that the fitment of a cyclonic pre-filter (to replace the Ram head on the snorkel) may be beneficial. As at the time of publication, the Donaldson TopSpin cyclonic pre-filter listed below is a direct fit and correct specification.

- Donaldson Part Number: H002394

3.2 Selective Catalytic Reduction System

3.2.1 Selective Catalytic Reduction System - Diesel Exhaust Fluid (DEF) / Urea / AdBlue®

WARNINGS:

-  **The engine may not start if you tamper with or disable the selective catalytic reduction system.**
-  **The engine may not start if the Diesel Exhaust Fluid (DEF) level is low. Make sure it is refilled.**
-  **The engine may not start if the DEF is contaminated. Replace the contaminated fluid immediately.**
-  **The use and refilling of DEF is mandatory for the vehicle to comply with the legal emission requirements.**

The Selective Catalytic Reduction System helps to reduce exhaust emission levels by injecting DEF into the exhaust system. For proper functioning of this system make sure you refill the DEF periodically.

NOTE: If removing or replacing the load box ensure the filler hose angle and clearances of both the fuel filler and DEF filler are maintained.

Refer to: 3.3 Fuel System (page 48).

NOTE: Refer to the vehicle owner manual for further information on the DEF system.

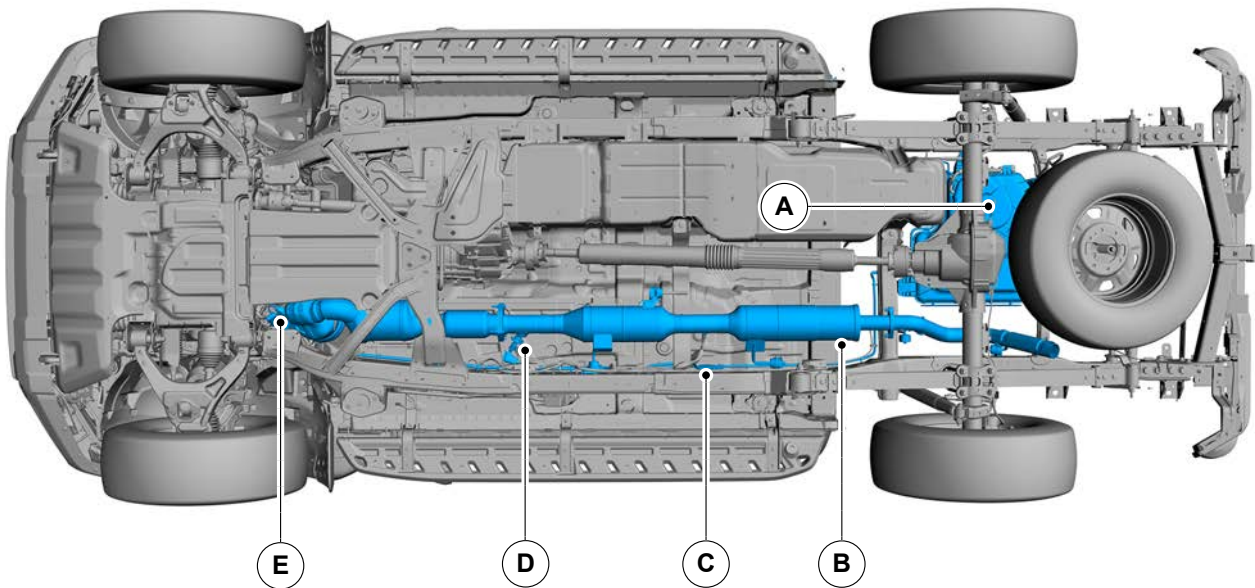
Filling the Diesel Exhaust Fluid Tank

-  **WARNING: Do not allow DEF to come into contact with eyes, skin or clothing. Should the fluid come into contact with eyes, flush them with plenty of water and seek medical attention. Clean affected skin with soap and water. If swallowed, drink plenty of water and seek medical attention immediately.**
-  **CAUTION: Use only the vented type DEF filler cap that is specific to the vehicle. Use of any other DEF filler cap may cause system damage.**



NOTE: Immediately wash off any DEF that has spilled on to a painted surface with mild soapy water.

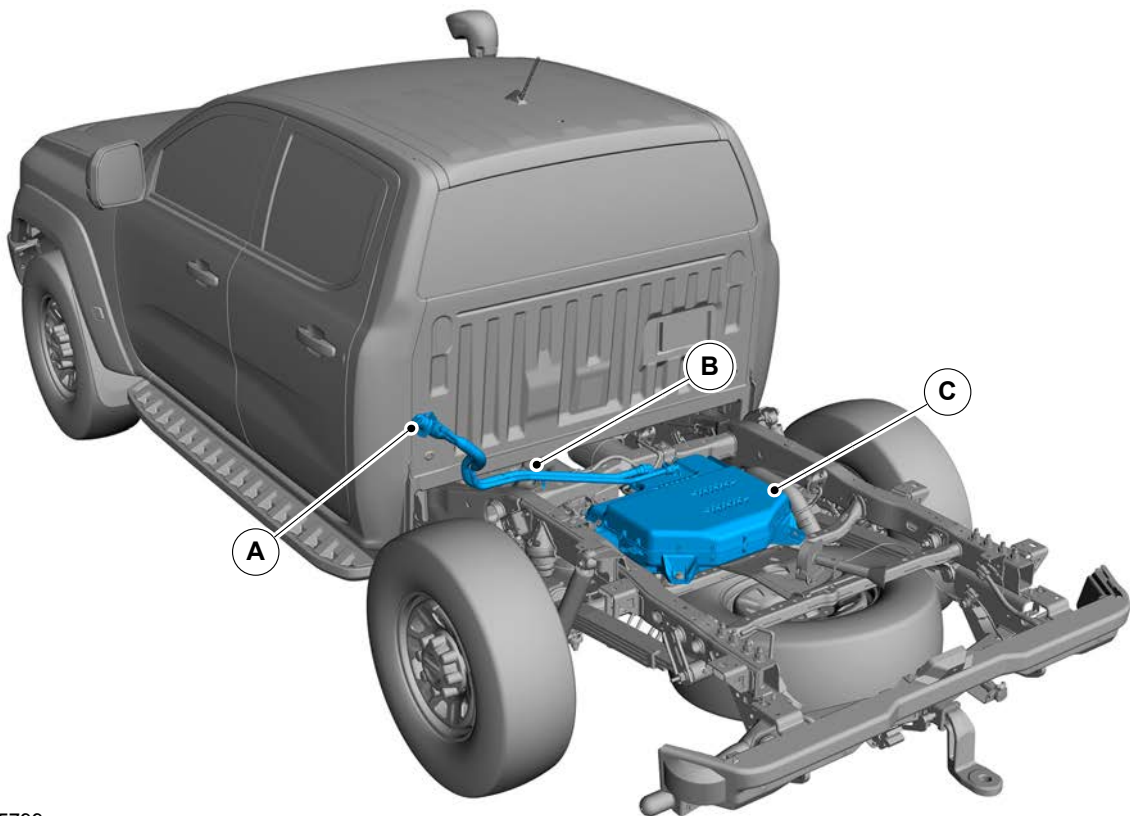
3.0L Diesel



E455221

Item	Description
A	DEF tank
B	Exhaust system with selective catalytic reduction catalyst
C	DEF pressure line
D	DEF injector
E	DEF injector

Diesel Exhaust Fluid (DEF) Tank and Filler Tube



E455799

Item	Description
A	DEF filler
B	DEF filler hose
C	DEF tank

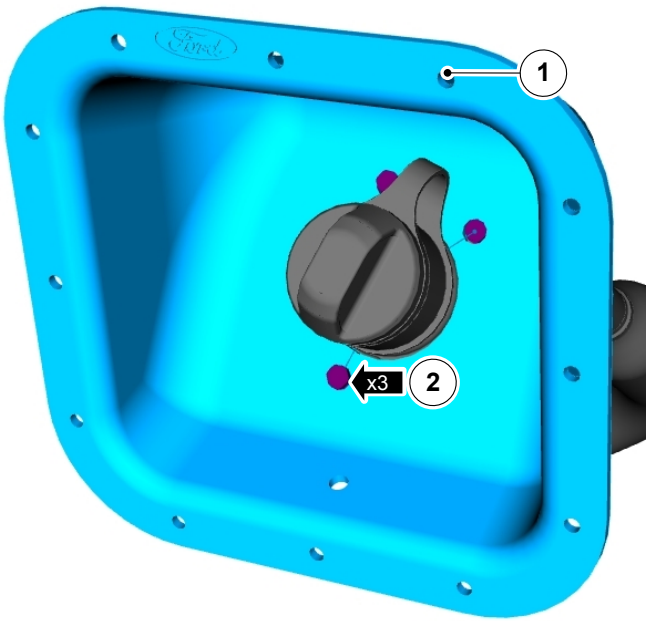
Diesel Exhaust Fluid (DEF) Filler Mounting - Chassis Cab Vehicles

 **WARNING: Make sure that the filler neck mounting bracket is made of a conductive material, and that it provides a grounding path for the filler neck to avoid risk of fire.**

Suitable mounting fixtures and alignment of the of the diesel exhaust fluid filler cup and filler pipes is required when vehicle modification impacts on the DEF System.

If the vehicle body and mounting bracket does not provide a grounding path for the filler neck, an earth strap must be added, connecting the filler neck to the chassis frame.

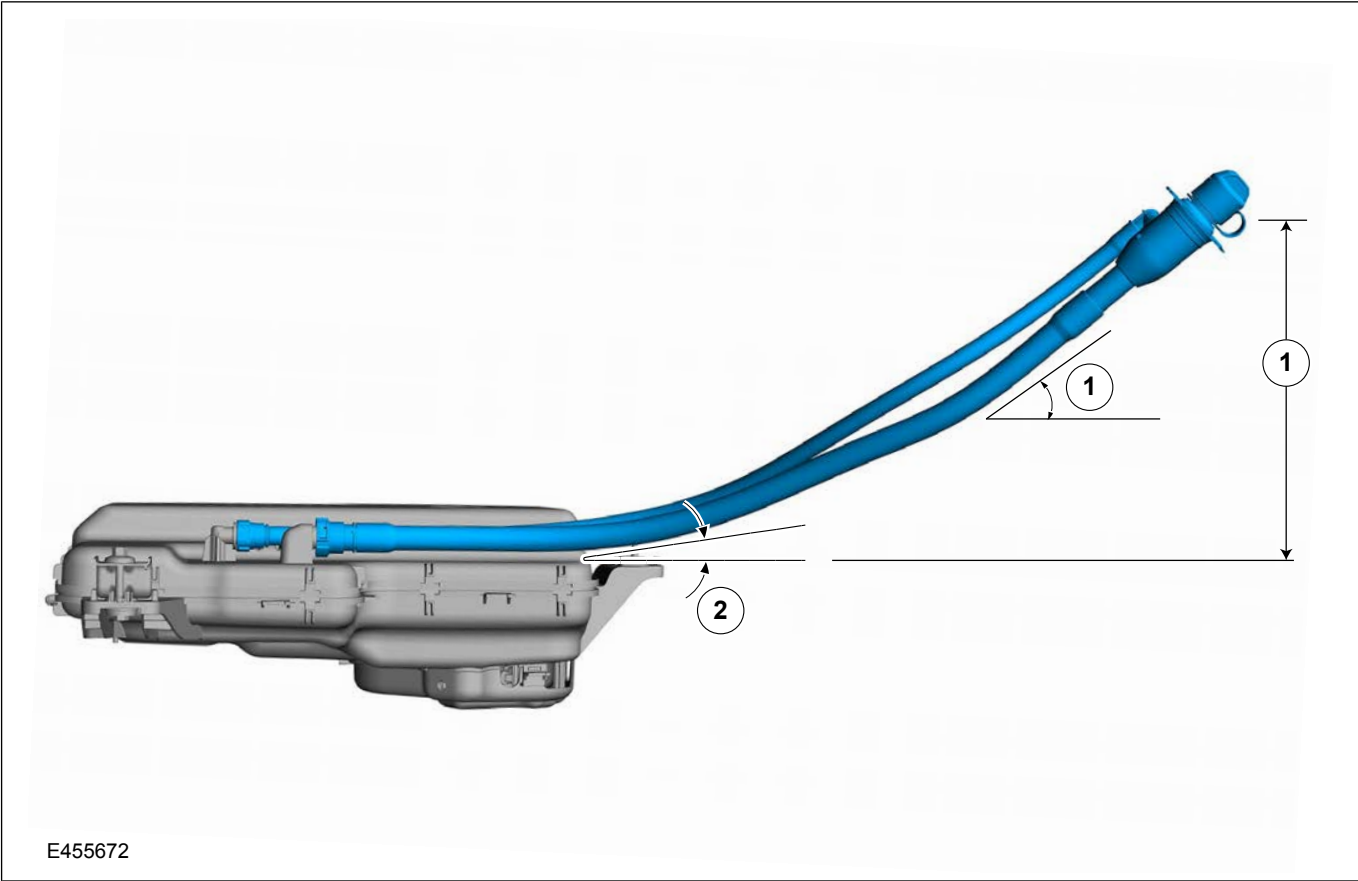
Diesel Exhaust Fluid (DEF) Filler Mounting Bracket (If Required)



E367864

Item	Description
1	DEF filler mounting bracket fixing points.
2	All 3x fixing points on the diesel exhaust fluid filler neck must be utilised and tightened to 5.4 Nm.

Angle of Diesel Exhaust Fluid (DEF) Filler Neck



E455672

Item	Description
1	A 30° angle at the filler cup and an overall minimum drop of 180 mm should be achieved to ensure adequate flow of diesel exhaust fluid when refilling to prevent flow back.
2	A minimum of 2° angle must be maintained in the entire filler hose and vent hose starting from filler cup to the diesel exhaust fluid tank. This is needed to ensure proper filling operation.

CAUTION: Care should be taken when mounting U-bolts or other hardware to the frame rail as the diesel exhaust fluid line can be trapped and crushed. In order to prevent damage / crushing of the diesel exhaust fluid line, body builders / installers should inspect the underside of the frame rails and verify diesel exhaust fluid hose routing prior to any hardware installation. Ensure that the diesel exhaust fluid line does not interfere with clamping surface. If additional diesel exhaust fluid line slack is required, the diesel exhaust fluid line can be moved within the existing positioning clips by rotating the diesel exhaust fluid line back and forth while gently pulling on the diesel exhaust fluid line. This will provide the slack required for the insertion of the U-bolt strap between the frame rail and the diesel exhaust fluid line.

NOTE: The completed diesel exhaust fluid filler kit must provide a minimum 2° continuous downward slope from filler cup to the tank.

NOTE: Routing of the diesel exhaust fluid filler hoses must ensure no contact with any exhaust components or sharp edges.

NOTE: Routing of diesel exhaust fluid filler hose and vent hose must not contain any sumps. Additional support may be required to prevent the diesel exhaust fluid filler hose sagging which could create a sump. A sump in the pipe can cause spray or spit-back during normal filling operations and may also cause the pooled DEF to freeze inside the pipe and damage the component.

NOTE: No kinking is allowed in the diesel exhaust fluid filler hose.

NOTE: Do not extend the diesel exhaust fluid filler hose outboard of the vehicle body.

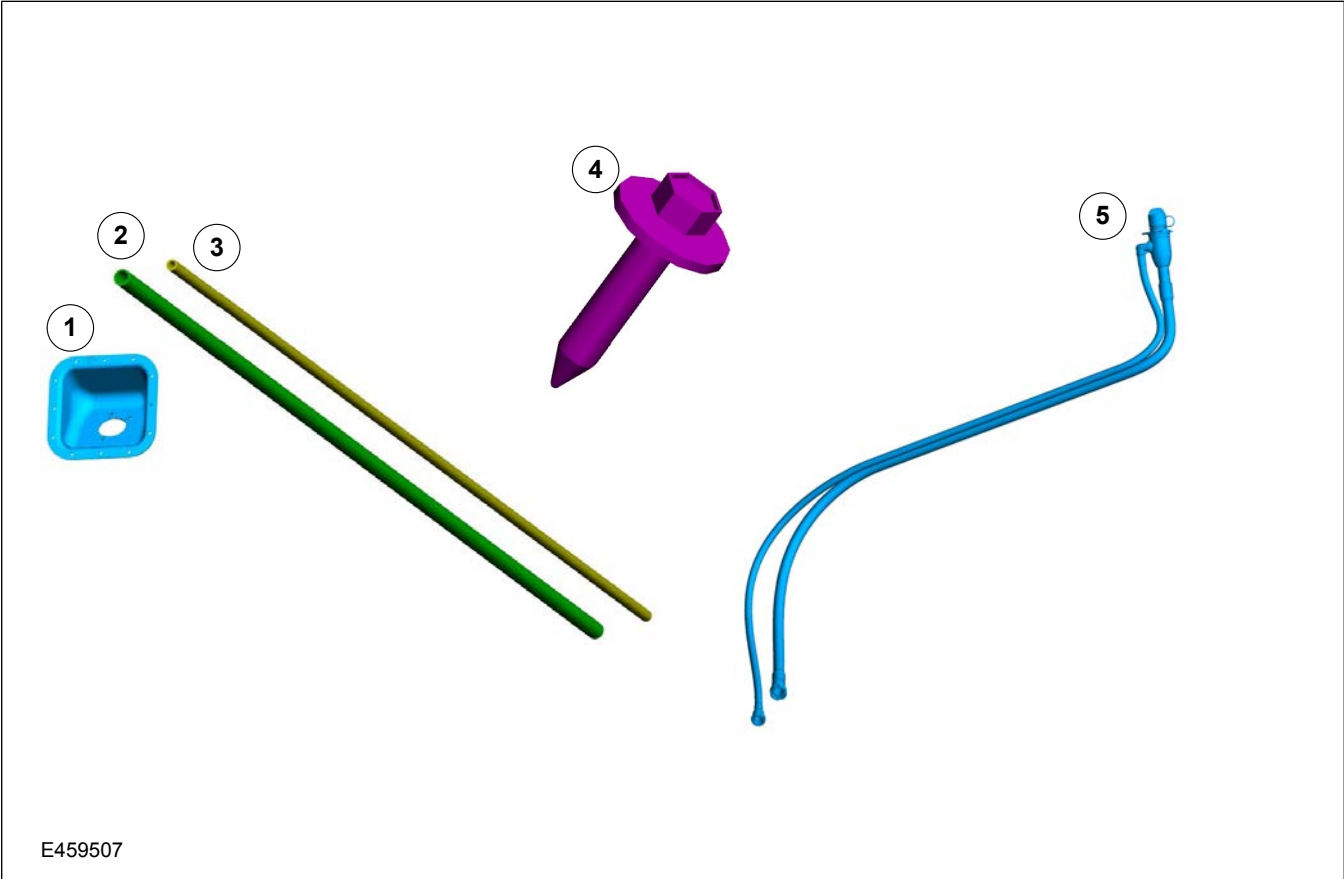
NOTE: If the diesel exhaust fluid filler housing provided with the kit is not used, technician should ensure that the filler cup angle to the horizontal is at least 30°.

NOTE: If the diesel exhaust fluid filler housing provided with the kit is used, the three fasteners are provided in the kit must be used to secure the cup to the housing.

NOTE: At least 9mm clearance between the diesel exhaust fluid filler assembly and the vehicle body must be maintained.

A Ford approved diesel exhaust fluid filler neck relocation kit is provided with the vehicle. This can be used to modify the diesel exhaust fluid filler routing if required.

Diesel Exhaust Fluid (DEF) Filler Neck Relocation Kit



E459507

The DEF Filler neck relocation kit contains:

Item	Description
1	Filler housing
2	Main filler tube (large diameter EPDM tube)
3	Vent tube (smaller diameter EPDM tube)
4	Screws to attach the filler neck to the housing
5	Standard diesel exhaust fluid filler

The relocation kit may also be available in some markets as an accessory that can be purchased from authorised Ford Dealers:

- Part Number: MB3Z-5K289-A

If required, hoses and tubes in the DEF filler neck relocation kit can be trimmed to suit the required length.

Use zip ties or similar fasteners to retain hoses and tubes within the desired routing path during the vehicle operation.

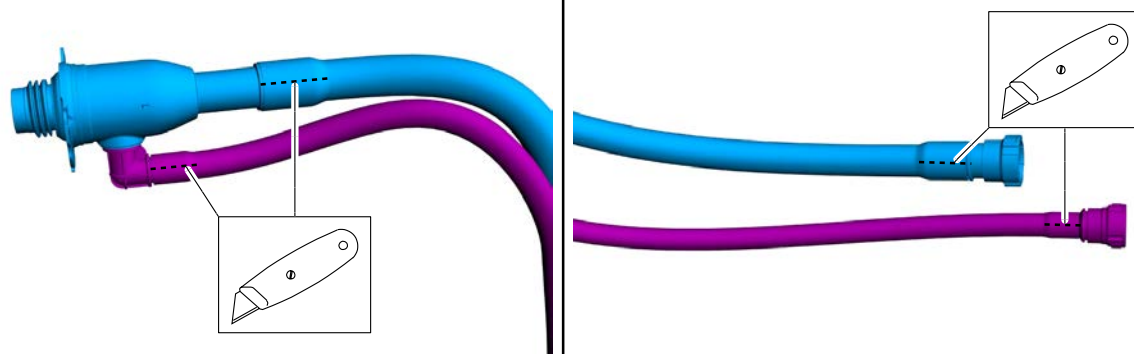
NOTE: The kit does not contain zip ties, hose clamps, or the rivets/screws to attach housing to the vehicle body.

NOTE: Care must be taken when removing the diesel exhaust fluid filler head and connectors from the existing part

Diesel Exhaust Fluid (DEF) Filler Pipe Kit Installation Process

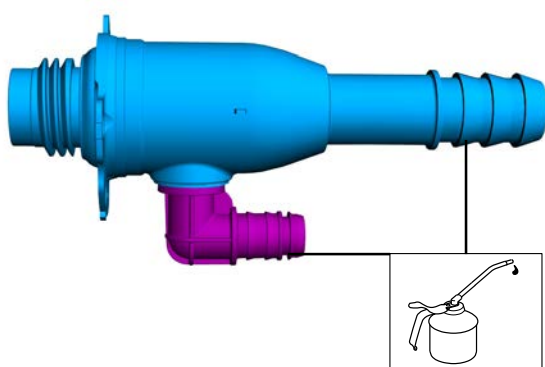
1. Remove the original DEF filler pipe.
2. Cut each hose to the length required to suit the specific installation and routing required. Ensure that the chosen routing follows the recommended guidelines.

NOTE: This step is only to make it easier for the hoses to be removed from the connectors



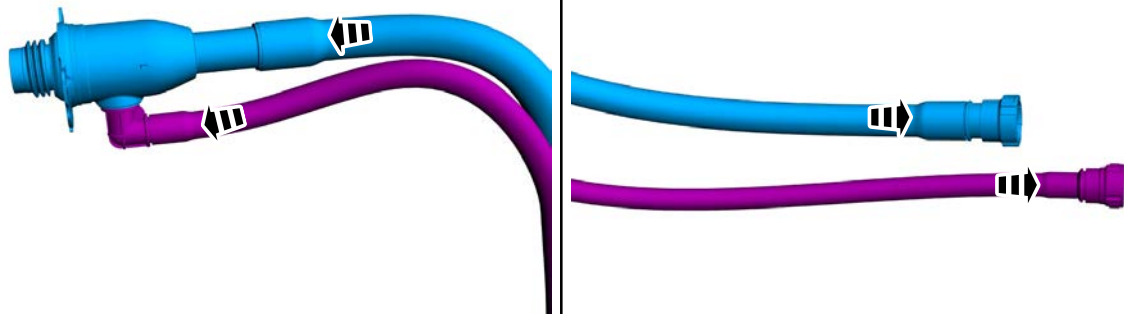
E465426

3. Make a shallow cut as indicated in the original filler pipe rubber hoses. Do not cut through to the connector and damage it. These connectors will need to be reused.



E465424

4. Apply Mervol SH lubricant or a suitable equivalent to the connectors and kit hose internal ends.



E465425

5. Insert the kit hose with the bigger diameter to the filler head and matching tank-end quick connector then insert the kit hose with the smaller diameter to the filler head and matching tank-end quick connector. Ensure the hose ends are fully seated.
6. The revised DEF filler pipe can now be installed in the vehicle. Ensure the DEF filler pipe meets the installation requirements outlined earlier in the section.

3.3 Fuel System

WARNINGS:

-  **Make sure that the modified vehicle complies with all relevant legal requirements.**
-  **Do not remove or relocate the fuel cooler (if equipped) when modifying the vehicle.**
-  **Make sure that sufficient clearance is maintained for all driving conditions to all hot and moving components.**
-  **Make sure that there are no sharp edges, including fasteners, pointing towards any fuel system component.**
-  **The fuel filler pipe must be supported in accordance with the guidelines in this section.**

CAUTIONS:

-  **Ensure modifications to vehicle do not obstruct airflow to fuel cooler (where fitted).**
-  **Transport Mode includes a calibration feature to reduce the risk of fuel injector nozzle corrosion. Exiting Transportation Mode prior to upfitting / conversion increases the risk of early life injector failure. Refer to your local Ford dealer or national sales agent for information on how to activate or deactivate transport mode.**

3.3.1 Fuel Filler Pipe Restraining During Shipping

-  **CAUTION: The vehicle must not be operated with the fuel filler pipe in the shipping condition.**

The fuel filler pipe is secured to the frame bracket on chassis cab vehicles using a cable tie for shipping of the vehicle only.

3.3.2 Fuel Filler Mounting

WARNINGS:

-  **Make sure that the filler neck mounting bracket is made of a conductive material, and that it provides a grounding path for the filler neck to avoid risk of fire.**
-  **Routing of the fuel filler pipe must ensure no contact with any exhaust components or sharp edges.**

CAUTIONS:

-  **The completed fuel filler pipe system must provide a minimum 2° continuous downward slope from fuel filler cap to fuel tank and should have a minimum entry angle of 30° at the fuel filler cap.**
-  **No kinking of the fuel filler hose is acceptable.**
-  **The filler neck entry center-point should be at a minimum height of 250mm from the fuel tank Inlet Check Valve (ICV) center-point and have a minimum entry angle of 30°.**

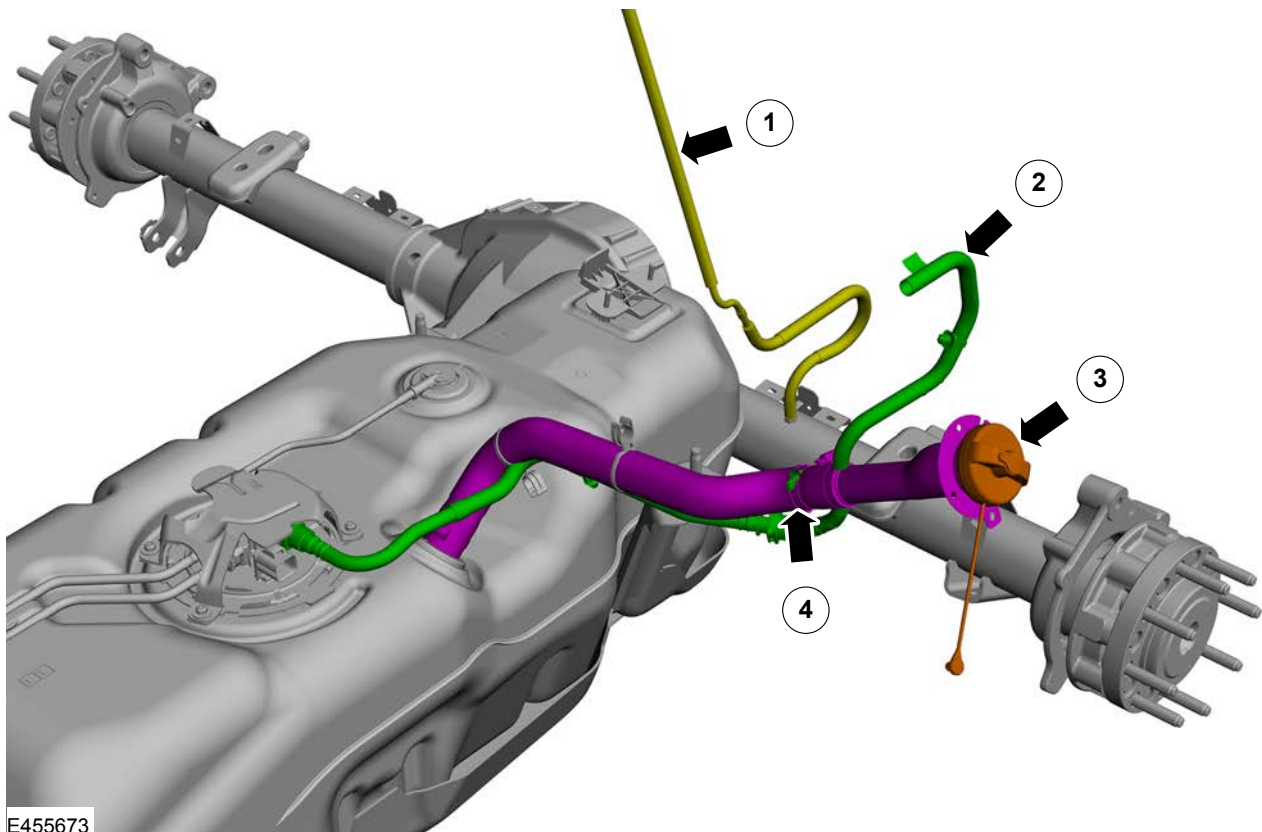
NOTE: Fasteners for attaching fuel filler pipe to the vehicle body are not supplied by Ford.

NOTE: Routing of filler hose and vent hose must not contain any sumps. Additional support may be required to prevent hose sagging which could create a sump. A sump in the pipe can cause spray or spit-back during normal filling operations.

If the vehicle body and mounting bracket does not provide a grounding path for the fuel filler neck, an earth strap must be added, connecting the filler neck to the chassis frame.

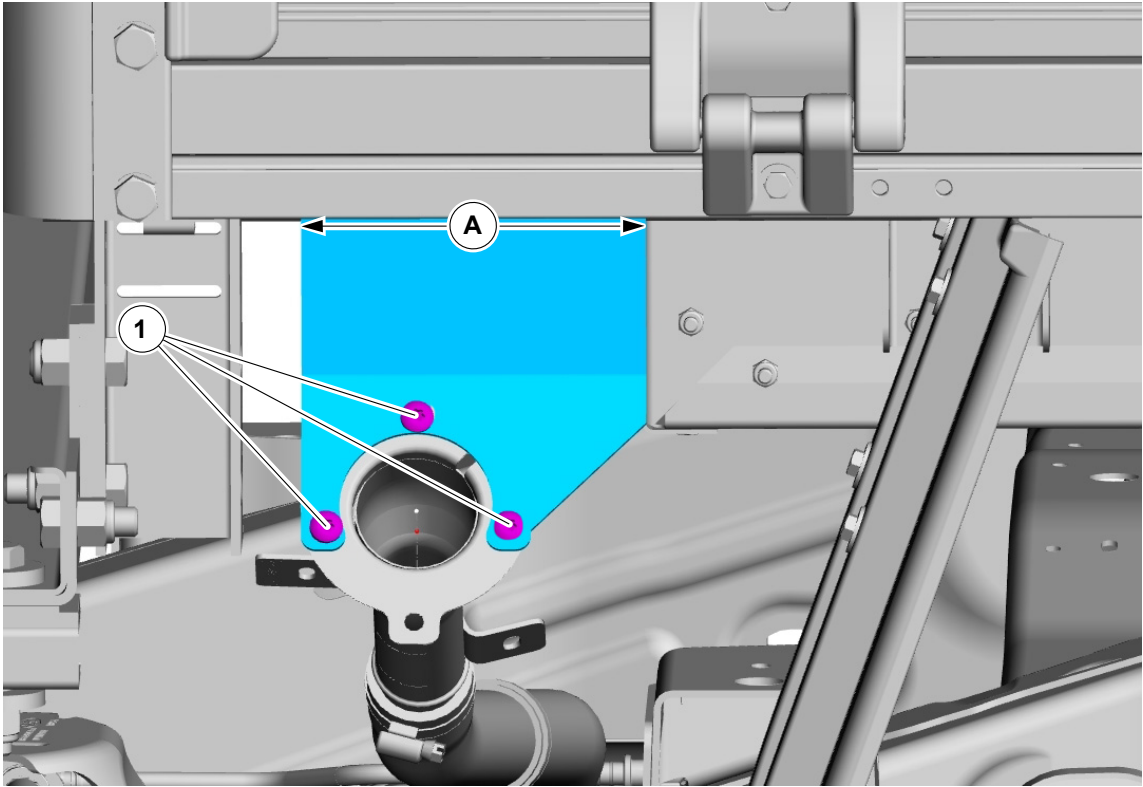
Do not extend the fuel filler system outboard of the vehicle dimensions or the service body dimensions.

Fuel Filler Overview



Item	Description
1	Rear Axle Breather Pipe
2	Fuel Tank Vent Hose
3	Fuel Filler Cap
4	Fuel Filler Pipe

Fuel Filler Mounting Bracket



E376926

Fuel Filler Mounting Notes

Item	Description
A	The width of the bracket, where it joins the body to be at least 180 mm
1	All 3x hardware fixation points on the filler neck must be utilised

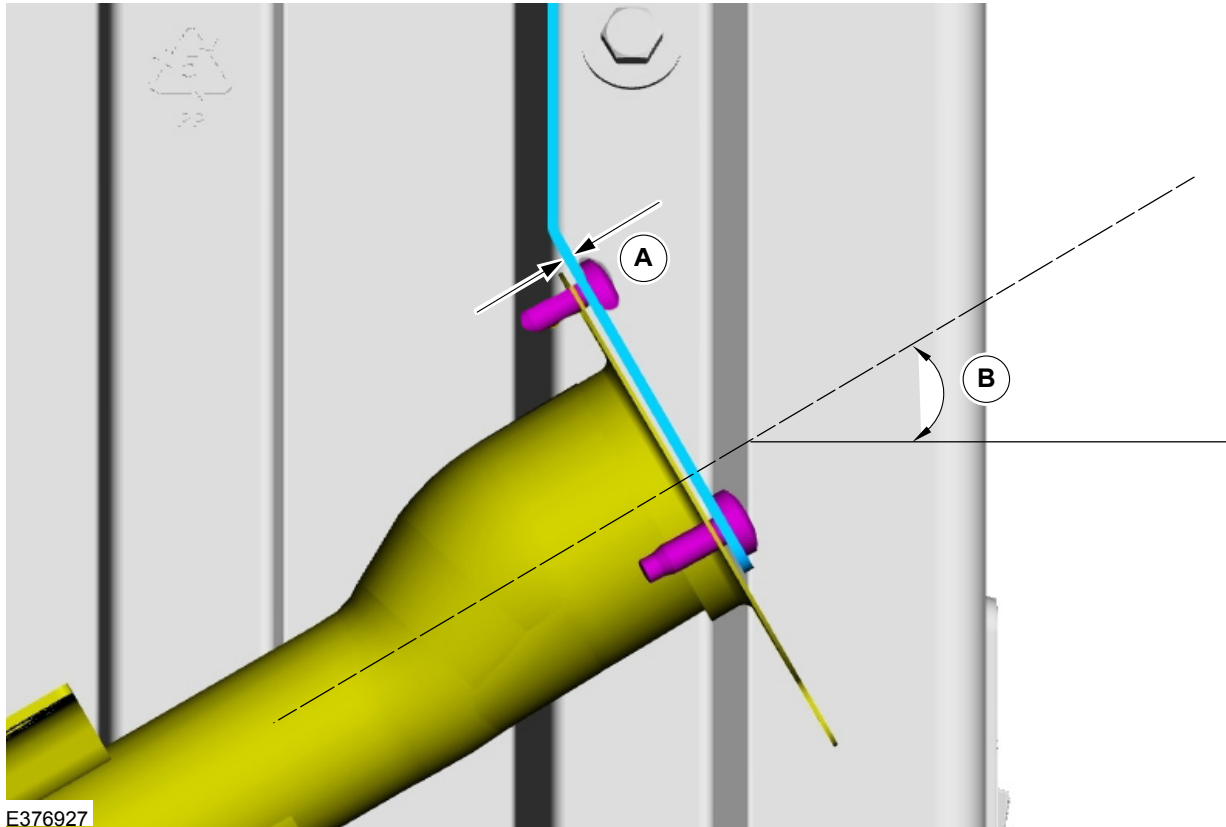
Fuel Filler Neck Assembly

NOTE: The fuel filler neck must be properly grounded to the vehicle body/chassis.

Ford also makes the fuel filler neck assembly available for cab chassis builds as a Ford service part that can be purchased from any authorised Ford Dealer:

- All Cab Styles - Part Number: RB3Z-9034-B

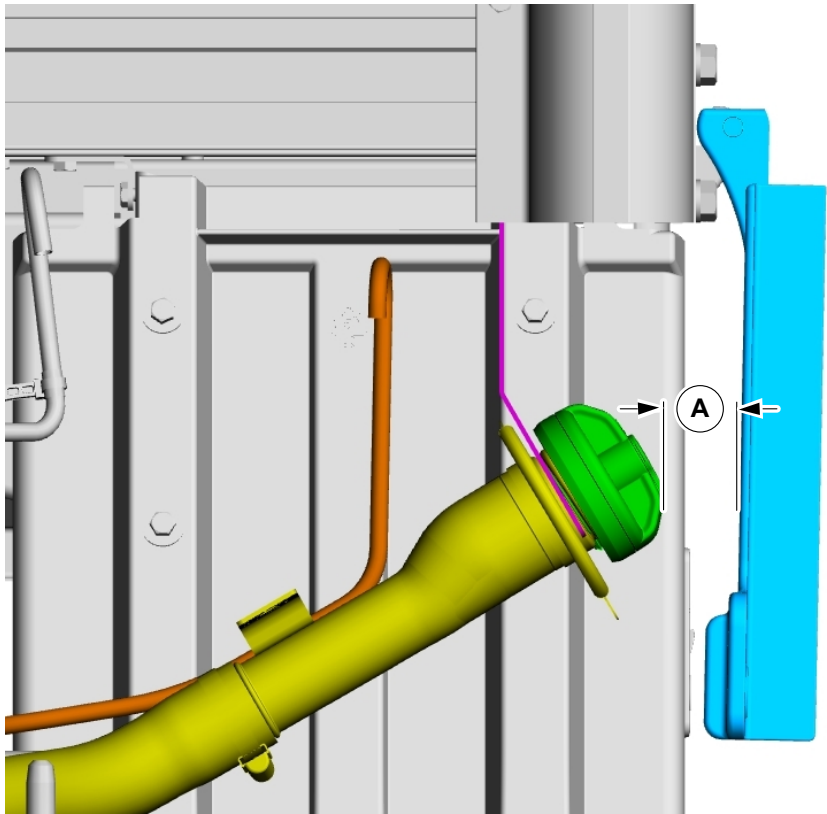
Angle of Filler Neck



Filler Neck Installation Dimensions

Item	Description
A	2mm minimum bracket thickness
B	30° angle should be maintained to ensure good flow of fuel when refueling and prevent flow back when using high-flow fuel pump nozzle.

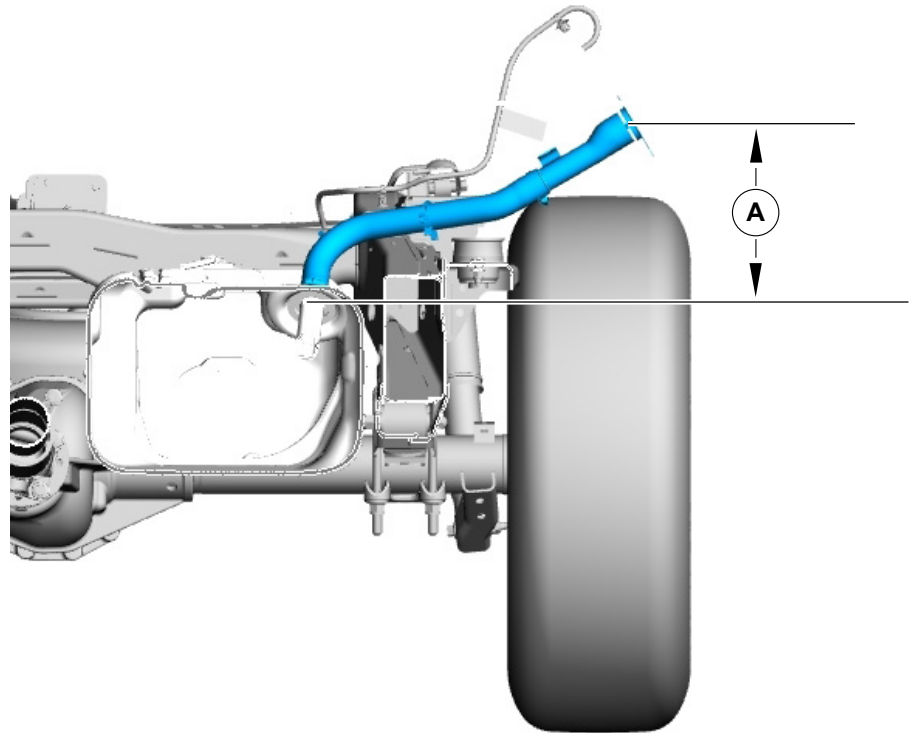
Clearance From Vehicle Body



E376928

Item	Description
A	At least 9mm clearance between the fuel filler cap and vehicle body, in the worst case opening angle if applicable.

Fuel Filler Height - Cab Chassis Vehicles



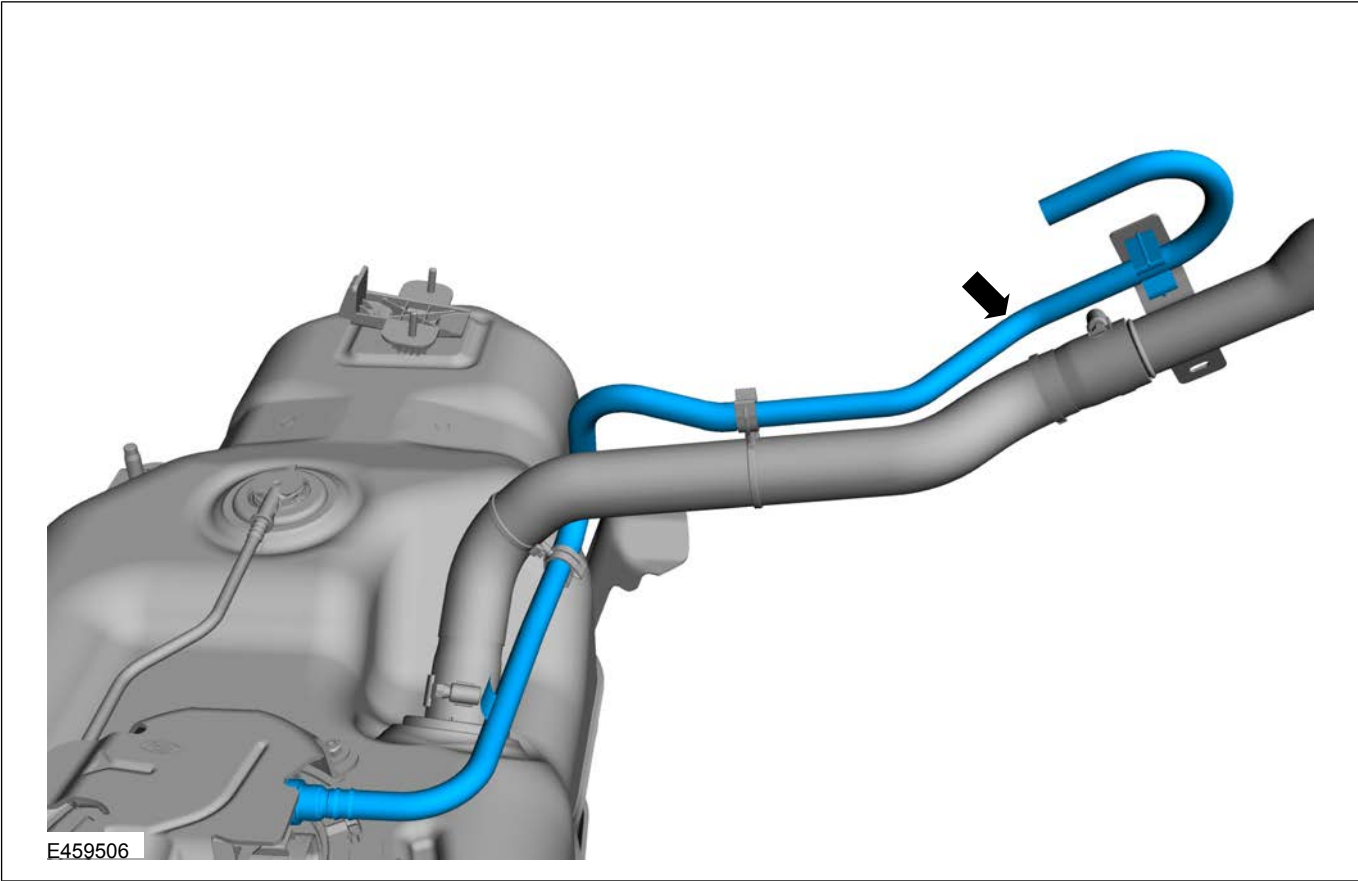
E363646

Item	Description
A	A filler neck opening height of at least 250mm should be maintained, measured from the fuel tank Inlet Check Valve (ICV) opening center point to the fuel filler pipe opening center point.

3.3.3 Fuel Filler Vent Hose - (Diesel)

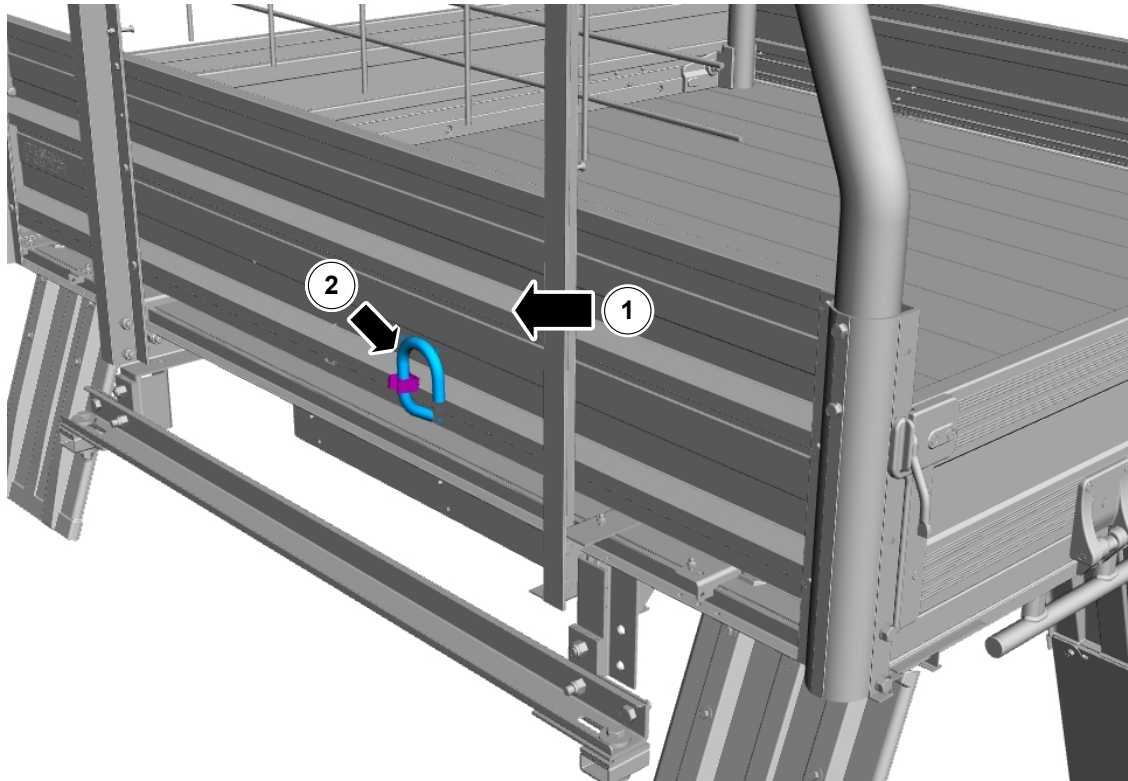
- The fuel tank vent hose routing at end will need to have shepherd hook with opening at or above height as described in this document in order to maintain water wading specifications and prevent water ingress into the fuel system.
- The fuel tank vent hose should be protected and positioned away from direct water spray, wheel splash and mud splash, and water drainage holes that may be present.
- The fuel tank vent hose must be either in the position as shown in the view or must be upright with the shepherds hook at the end.
- A length of fuel grade flexible hose should be clipped to the vehicle body. The open-end must be located at least 850mm above the ground when the vehicle is fully loaded (higher than 100mm above the body mounting pads on the rear chassis).

Fuel Filler Vent Breather Shepherds Hook



NOTE: See your authorised dealer to confirm the correct part number for your vehicle.

Example of Fuel Tank Vent Hose Mounting Location



E376759

Item	Description
1	Front Lower Head Board of a Load Tray
2	Fuel Tank Vent Hose affixed securely.

3.3.4 Axle Breather Vent Hose

The rear differential breather hose is provided already fitted to the vehicle and needs to be mounted and routed appropriately to the second unit body when installed. This breather hose has a clip and 'jiggle' cap fitted instead of a Shepherds hook at the open end, but either execution is acceptable. Where possible, routing the breather hose to the fuel filler is preferred as the fuel tank breather has similar open-end requirements and the clip is designed to attach there.

If the hose needs to be shortened please give some thought to fitting an appropriate 'jiggle' cap or Shepherds hook to the open-end. It may be easier to shorten the hose by disconnecting the flexible hose from the moulded line near the chassis rail and shortening that end (leaving the open-end unaltered). If the hose needs to be extended an appropriate fuel grade flexible hose and joiners should be used. The open end must be protected and positioned away from direct water spray, wheel splash and mud splash, and any water drainage paths that may be present. The open-end must be located at least 850mm above the ground when the vehicle is fully loaded (higher than 100mm above the body mounting pads on the rear chassis). Regular clipping points should be used ensuring that the final hose routing allows the total range of suspension travel from full compression to full extension without any contact, rubbing or chafing. The lower section of the hose routing from axle to chassis should ideally not be altered, unless suspension changes put tension on the hose at full downward travel.

4.1 Wiring Installation and Routing Guides

4.1.1 Wiring Splicing Procedures

NOTE: Contact your local Ford Dealer or National Sales Representative to check the electrical repairing strategy in your market.

TYCO-RAYCHEM crimp splices



E131081

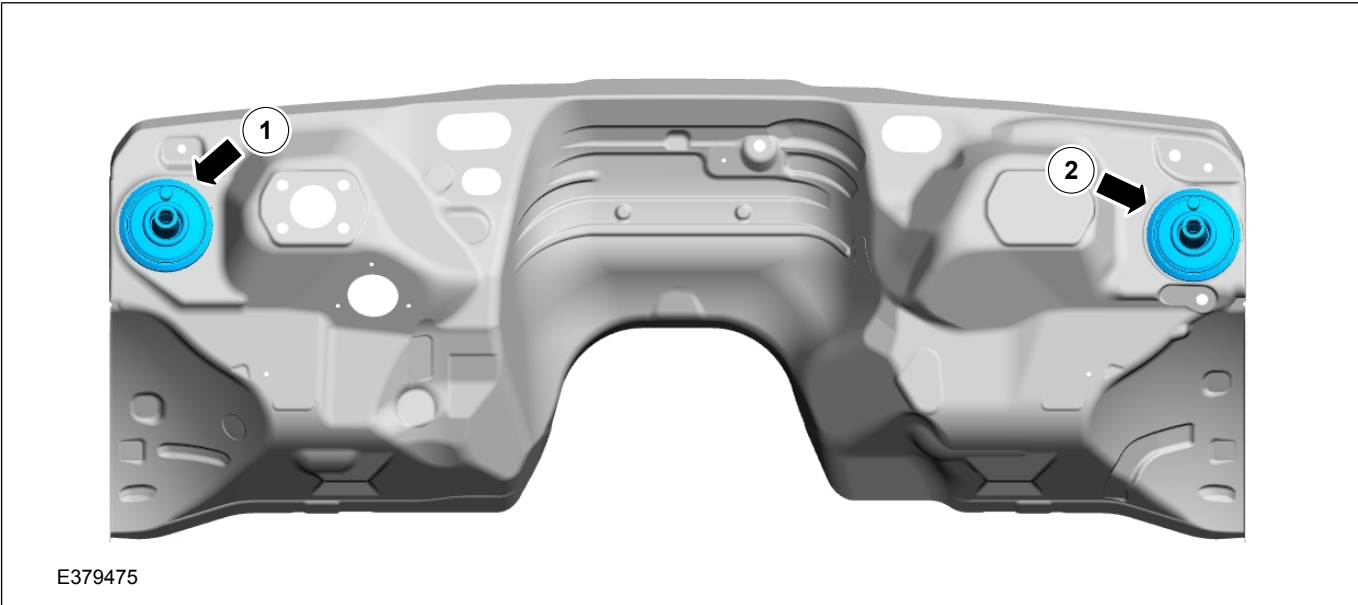
Ford Motor Company strongly advises against the use of wire splicing due to the variable and unpredictable nature of the joint created. However, if it is decided that a wire splice is unavoidable, it must be made using **DuraSeal Heat-Shrinkable, Environmentally Sealed, Nylon-Insulated Crimp Splices** (manufactured by TYCO-RAYCHEM) or a suitable commercially available equivalent. As a further process to improve the splice integrity, the splice should be further sealed with a suitable heat shrink tubing.

For further information, refer to your national sales agent or refer to General Service Bulletin "Wiring Repair Job Aid".

4.1.2 Wiring Through Cabin Sheet Metal

There are four locations provided for additional wiring to pass through the cabin sheet metal.

Wiring Pass Through Locations



E379475

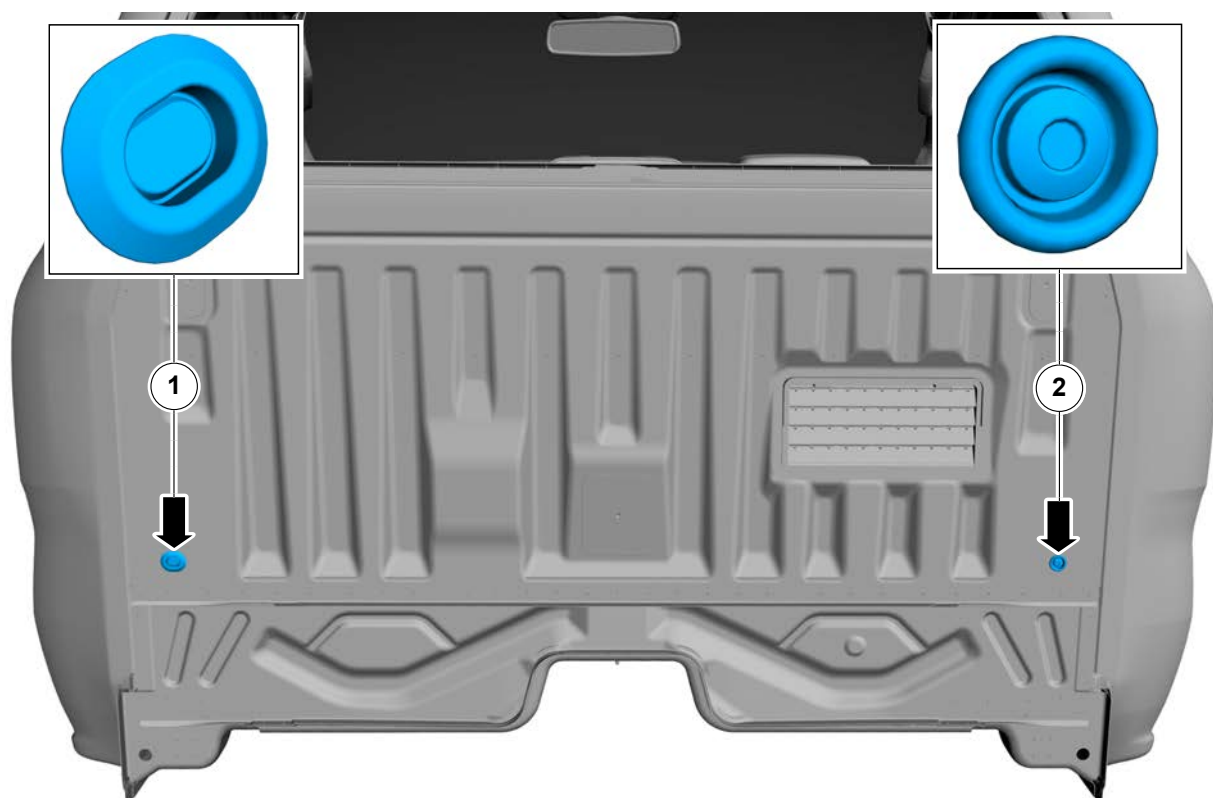
Item	Description
1	Dash Grommet Right Hand Side
2	Dash Grommet Left Hand Side

CAUTIONS:

! Electrical harnesses passing through sheet metal must be through protective grommets that also ensure a watertight seal. A windscreen type or silicone sealant should be used. Adhesive or tape is not acceptable.

! The grommet pass through must be adequately sealed to prevent corrosion and water ingress.

There are two locations in the dash panel and two locations in the cabin rear wall which have been provided as additional holes to route wires through.



E455997

These plugs have a provision where an additional hole can be made using the following steps:

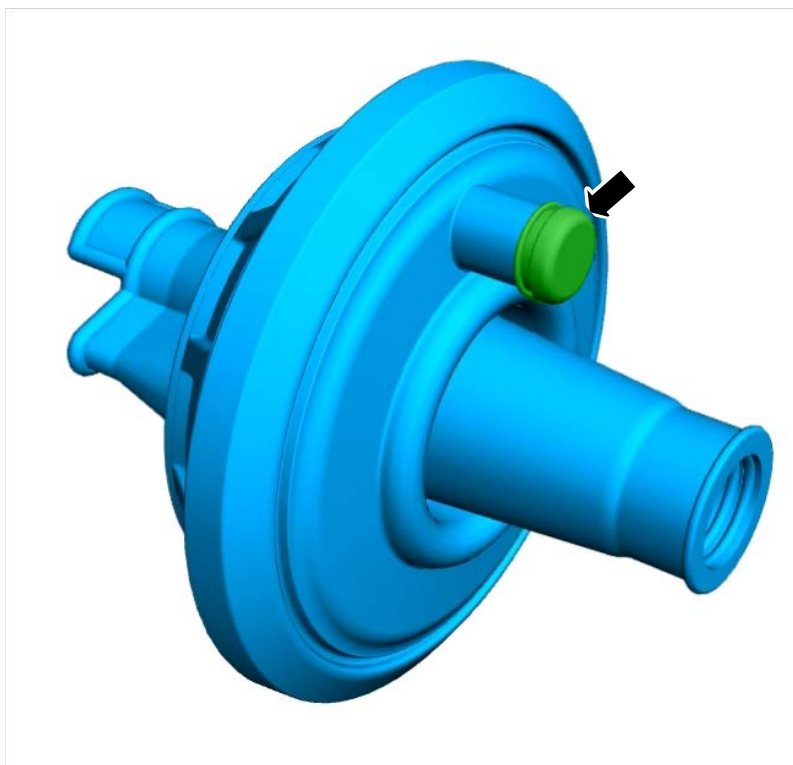
- Check that the immediate surrounding area is free from obstructions and/or components to prevent damage to critical systems.
- Use a suitable tool, for example a sharp knife or spike.
- Make hole in the center of the plug to suit the wires being passed through.

- Pass electrical wiring through the plug as required.
- Apply sealant as required to ensure water-tightness.

As these holes are standard sized, the existing plugs can be replaced with appropriate grommets for the desired wiring being passed through. Ensure that the area remains water tight.

1. LH grommet = Ø19mm x 25mm
2. RH grommet = Ø19mm

Grommet Pass Through Knob



E379476

Grommets are a component of the main wiring harness that contains securely bound wire bundles. It is not possible to feed extra wires through with the wire bundle. The grommets have a pass through knob molded into the grommet where an additional hole can be made using the following procedure:

NOTE: The maximum size of additional wire bundle diameter is 8mm.

- Check that the immediate surrounding area is free from obstructions and/or components to prevent damage to critical systems.
- Use a suitable tool, for example a knife or side cutters.
- Cut off or snip the outer end of the pass through knob.
- Pass electrical wiring through the grommet as required.
- Apply sealant as required to ensure water-tightness.

4.2 Battery and Cables

4.2.1 Battery Information

If a battery is disconnected, there is no requirement to reprogram the vehicle; the vehicle retains its 'normal' power management setting and remembers exactly what its previous configuration was (although the central locking latches may cycle if a door or lock latch was opened manually in the intervening period). All radio settings will be retained. The clock will need resetting. The window control module will also need to be reset. Refer to the vehicle's owner manual for further information.

Battery Voltage Requirements and Testing

All voltages are to be measured with an accuracy of: + / - 5% of published values.

To maximize battery life, at the time of arrival at the vehicle converter, all batteries must have a minimum Open Circuit Voltage (OCV) of not less than 12.75 volts.

When the battery is installed and connected to the vehicle's electrical system with no load, the Closed Circuit Voltage (CCV) must not be less than 12.65 volts. When the vehicle is released to the customer, the CCV must not be less than 12.50 volts.

Surface Charge Dissipation

Prior to carrying out manual voltage checks, it is necessary to establish that the battery voltage is stable and free from surface charges that could be present due to certain engine run conditions making the voltage readings unreliable and inaccurate.

To ensure surface charges are not present the following actions are recommended:

1. Turn on the headlamps for 5 seconds, or the parking lamps for 15 seconds.
2. Turn off all electrical loads (including lamps, fan, heater etc).
3. Wait 10 minutes.

Delayed Vehicles

Vehicles held at the vehicle converter premises and not in use for longer than 4 days, should have the battery's negative cable disconnected. Before shipping to the customer, the battery negative cable must be re-connected and the voltage re-checked. The voltage should be not less than 12.5 volts.

Battery Charging Procedure

WARNINGS:

-  **Always observe the battery charger equipment manufacturer's instructions.**
-  **Do not jump/slave start using a battery charging system from another vehicle.**
-  **Connect the battery charger cables to the battery before switching the battery charger on.**
-  **Switch the battery charger off before disconnecting the battery charger cables from the battery.**
-  **CAUTION: Do not rely on the alternator to recharge a discharged battery. It would take in excess of eight hours of continuous driving with no additional loads placed on the charging system.**

NOTE: AGM / VRLA batteries generally require no maintenance as they are sealed for life.

NOTE: Charging methods and types of battery chargers vary widely. Whichever method is utilized it must be carried out carefully to avoid damage to the battery and possible personal injury. Specific instructions accompanying each battery charger and must be followed exactly. Safeguards provided by the equipment manufacturer should not be disregarded by the operator.

NOTE: A battery which has been stored in a highly discharged state may be slow to accept a charge at first. In such cases the initial charging rate may be so low that the ammeter on some battery testers will not show any indication of charge for 5 to 10 minutes.

NOTE: Batteries should only be stored after charging. Batteries should not be left in discharged state as it results in formation of sulphate crystals that cannot be broken by conventional charging. This degrades the battery performance significantly. Batteries should be connected to trickle chargers during storage. Conventional chargers should not be rated under 10% of Ah rating to prevent excessive gassing. Smart multi stage chargers may also be used for better performance.

NOTE: Automatic battery chargers are also protected against reverse polarity connection and require no adjustment or monitoring.

NOTE: Slow-charging will readily restore a battery to a full state of charge and, since the charging current is relatively low, the possibility of overcharging a battery are minimized. The charge rate used should be approximately equal to 5% of the reserve capacity of the battery being charged (approximately three to six Amps depending on battery size). The charging current should be adjusted 10 minutes after initial setting and again after 1 hour before being left to charge the battery for between 8 and 12 hours.

NOTE: A constant voltage battery charger will charge a battery at a set maximum voltage. The voltage used depends upon the design and condition of the battery charger and the age and temperature of the battery. This type of battery charger initially charges at a high rate of current that reduces as battery voltage is restored. When using a constant voltage battery charger, the charging current should be recorded after five minutes and the battery charger switched off when the charging current falls to one-third of the recorded value, or after eight hours whichever occurs first.

NOTE: Multiple battery chargers are designed to charge a number of batteries, simultaneously. Of the two different types of multiple battery chargers available, only those that charge batteries in series should be used and it is important that batteries are of the same or very similar ratings and voltages. Multiple battery chargers that charge batteries in parallel are not recommended.

NOTE: The use of a fast (boost) battery charger is not recommended as it can cause damage to a battery. Fast charging will only restore a battery to a state of charge that will enable it to carry out it's critical function of cranking the engine. Fast charging will not restore a battery to a full state of charge and must therefore be followed by a period of slow charging. Excessively fast charging can cause damage to a battery. For this reason, charging times must be carefully controlled. Fast battery chargers vary widely in design so it is very important to strictly adhere to the equipment manufacturer's instructions. A charge of 30 amps for up to 30 minutes is the most common fast charging application. If the battery is very discharged and requires additional restoration, an additional charge of 20 amps for a period up to one and a half hours should be applied. Fast charging for a period in excess of two hours significantly increases the risk of causing damage to the battery.

Battery Part Numbers and Usage

Ford Plant	Type	Specifications	Size
Thailand	Starting Battery	80Ah, 800CCA, AGM Deep Cycle Technology	H7

If the battery type on a vehicle is changed to other compatible derivatives it is required to reconfigure the vehicle to the new battery types. The vehicle configuration can be updated at a dealership.

NOTE: When connecting and disconnecting the battery from the vehicle, make sure that the battery ground cable is disconnected first and connected last and that all electrical items are switched off.

1. Remove the battery.
2. Disconnect the battery ground cable
3. Connect the positive red clamp from the battery charger to the positive battery terminal.
4. Connect the negative black clamp from the battery charger to the negative battery terminal.
5. Follow the instructions supplied with the battery charger to charge the battery.
6. To disconnect the battery charger, reverse the connection procedure.

Battery Cable Fixing Torque

Refer to the workshop manual for the correct battery terminal fixing torque. See your National Sales Company representative, or Authorized Ford Dealer.

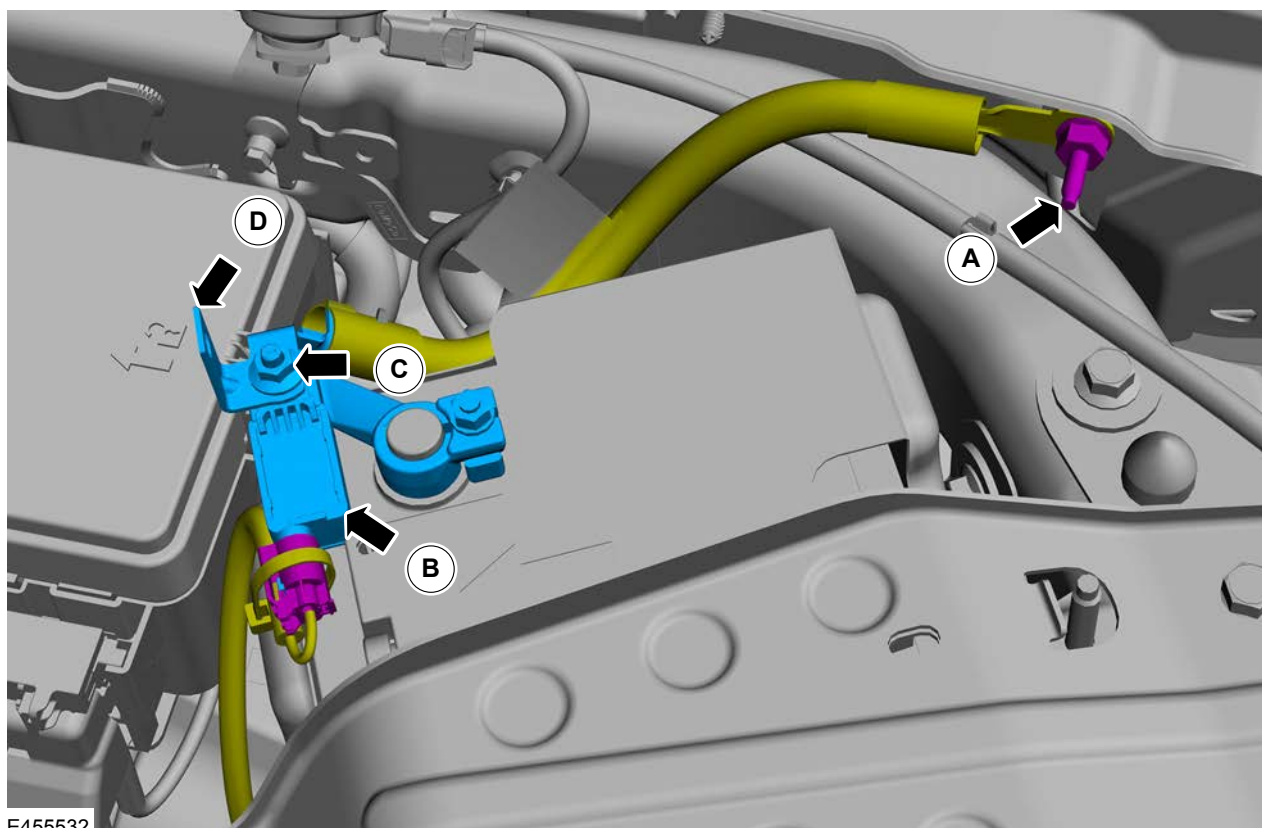
Battery Rules:

- **WARNING:** When charging, ensure the battery charger is securely connected to the vehicle ground and not to the battery negative terminal. This is to ensure that the BMS identifies the battery charge.
- For external charging of batteries ensure that the maximum voltage of 14.6V is not exceeded.

Battery Management Sensor (BMS)

CAUTIONS:

- **Do not disturb the joint at the BMS (C). This joint is designed as a one-time connection and should not be unscrewed, loosened or modified.**
- **High current loads must be grounded at the provided tab at the BMS (D) or at the vehicle/chassis ground point (A).**



E455532

Item	Description
A	Vehicle / Body Ground
B	Battery Management Sensor
C	Battery Management Sensor Connection - Do Not Disturb
D	High Current Battery Grounding Tab

For manual isolation of the battery, disconnect the ground cable at the vehicle/body ground point (A) and place the isolator switch between that terminal and the existing ground point. Use an appropriate gauge of wire and switch rating (300A minimum) and minimise the length of the additional cable.

CAUTION: No loads should be connected directly to the battery negative B- post as that would by-pass the Battery Management Sensor which will generate false state of charge (SOC) readings.

NOTE: The Battery Management Sensor (BMS) is connected to the vehicle BCM and will also shut down when the battery is isolated and the BCM is not powered. At this point the vehicle is fully electrically isolated from the battery.

The Battery Management Sensor (BMS) system measures the battery load in order to efficiently charge the battery.

It is important to ensure any additional electrical load or accessory is properly grounded to the vehicle's body, in order for the system to identify the additional load. If a connection is made to the battery negative terminal, the Battery Management Sensor will not identify the load or charge. This may cause the battery to be undercharged and consequently not able to re-start the vehicle.

Auxiliary Battery fitted to vehicles with a Battery Management Sensor (BMS)

NOTE: For high loads, a battery isolator should be used cutting off the primary battery at 12.7V (75% SOC) to ensure you can start the vehicle after regular stand time. Examples of high load connections include Winches / Trailer accessories / Fridges etc.

NOTE: Auxiliary loads must always be connected to the vehicle ground or the provided grounding tab and not to the battery negative terminal directly.

NOTE: Ensure the auxiliary battery connection is safely secured using suitable fixtures to reduce vibration damage or contact with surrounding components.

NOTE: Ford offers a Ford Licenced Accessory dual battery kit in some markets. This kit comprises the battery mounting tray and mounts, charge controller and applicable wiring, label and all required hardware.

For vehicles equipped with Battery Management Sensor, an additional battery can be connected using an in-vehicle battery charger (DC/DC converter) such as the BCDC models from REDARC (www.redarc.com.au) or similar, connected via an additional terminal to the appropriately fused and grounded connection.

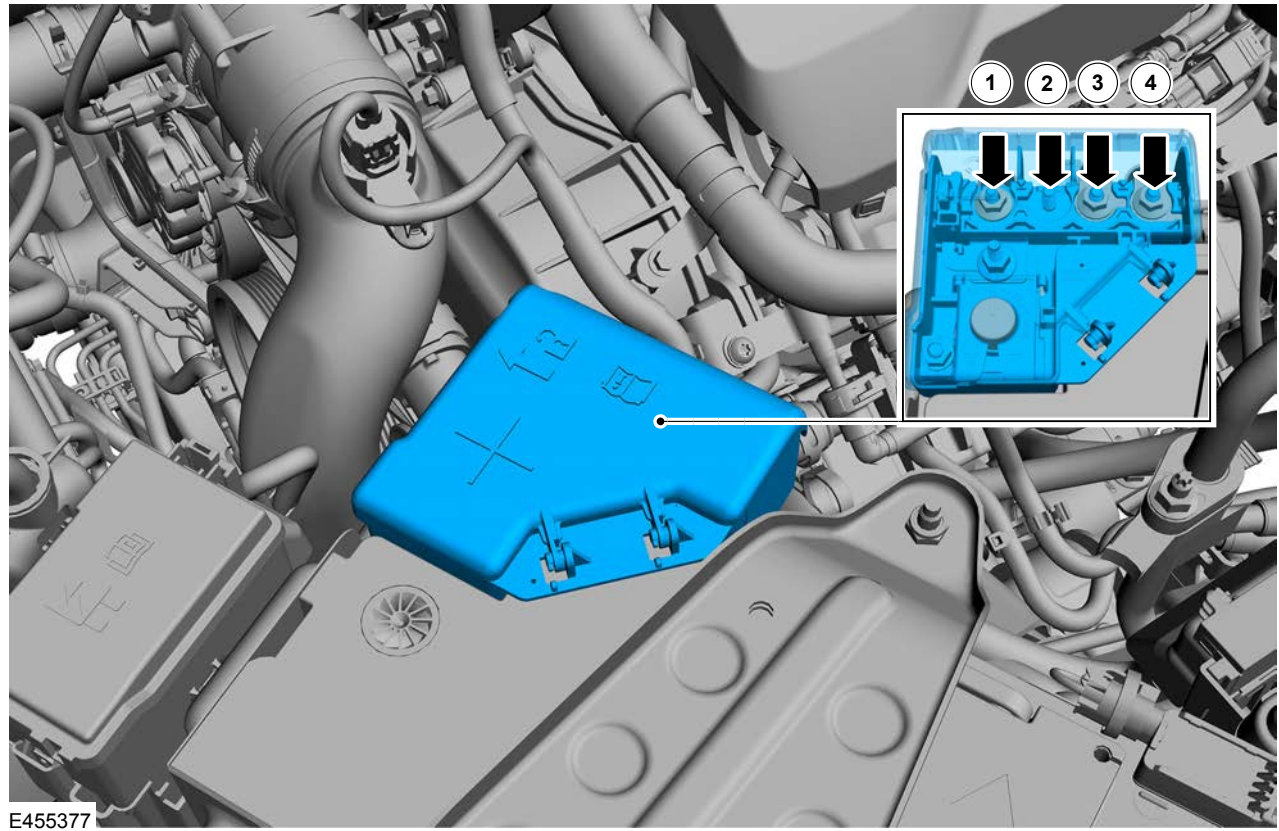
NOTE: If equipped, ensure the existing nut is reused.

Auxiliary Battery Accessory Kit

Description	Part Number
Auxiliary Battery Assembly (H7/94R-size, AGM)	EB3Z-10655-E
Auxiliary Battery Heat Shield	MB3Z-10A687-F
DC-DC Charger Assembly*	RB3Z-10E994-A
Battery Tray	RB3Z-9910696-B, -C, -D, and -E (four parts)
Battery Hold Down Spacer Assembly	RB3Z-10756-B
M8x32 Hex Flange Pilot Adhesive Bolt	W714409-S439
M8x25 Hex Flange Bolt and Washer	A-W715684-S439
M8 Flanged Anchor Nut	W720776-S450
M8 Nylock Flange Nut	W702651-S437
M6x20 Hex Flange Bolt	W500014-S439
Degas Label	RB3Z-8B099-A

*Includes Charger, mounting bracket and wiring harness.

B+ Connection



Item	Description
1	M5 Stud - Upfitter switches
2	M6 - Spare – to be used for aftermarket connections
3	M6 - Starter Motor
4	M6 - Power Distribution Block (PDB)

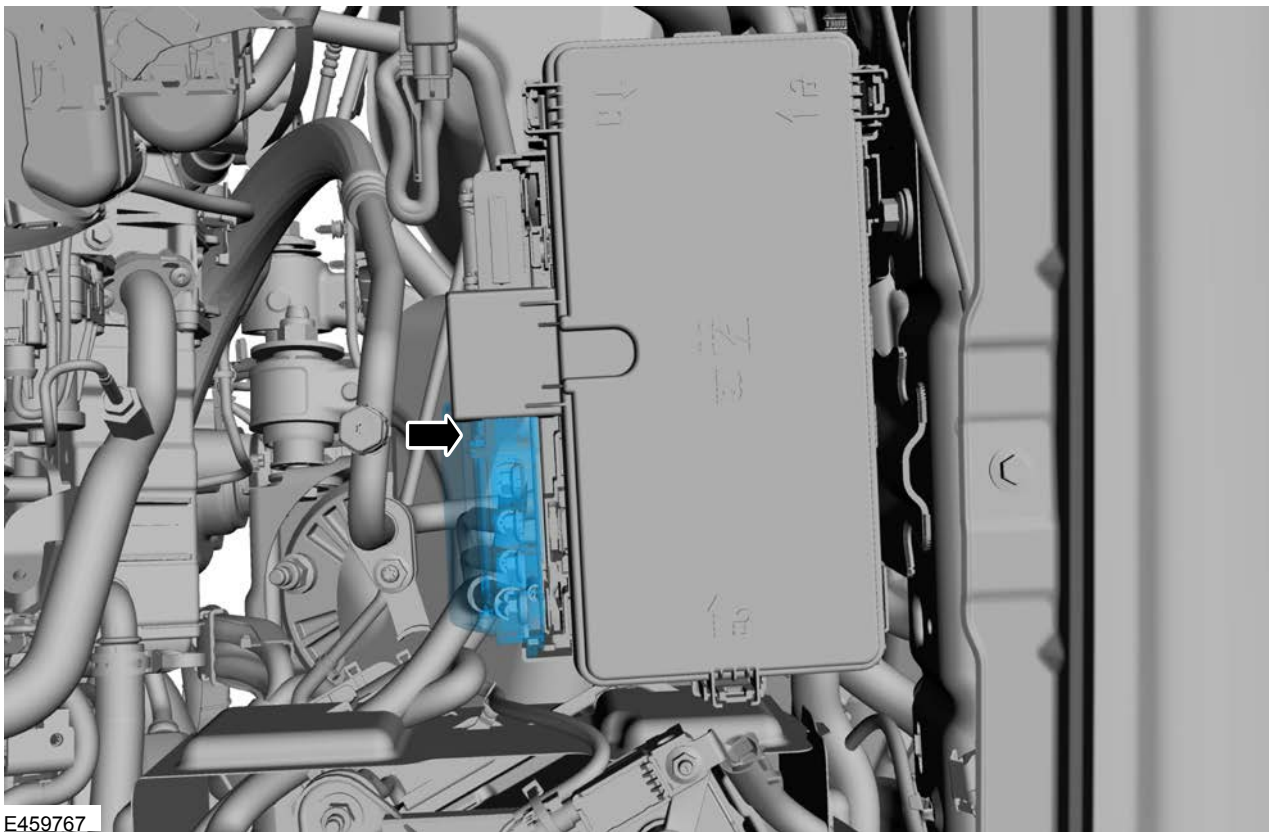
A spare position on the positive battery fuse block is provided. This empty position can be used for auxiliary battery system connection and any aftermarket installations requiring 12v battery feed.

CAUTION: Additional connections at the battery terminal should use 90deg terminals angled down to allow the positive terminal box cover to be refitted correctly.

All M6 battery and PDB connections should be torqued to 9Nm. The battery positive terminal retaining nut should also be torqued to 9Nm.

NOTE: Ensure the fused connection is secured using suitable fixtures to reduce vibration damage or contact with surrounding components.

Additional Battery Connection



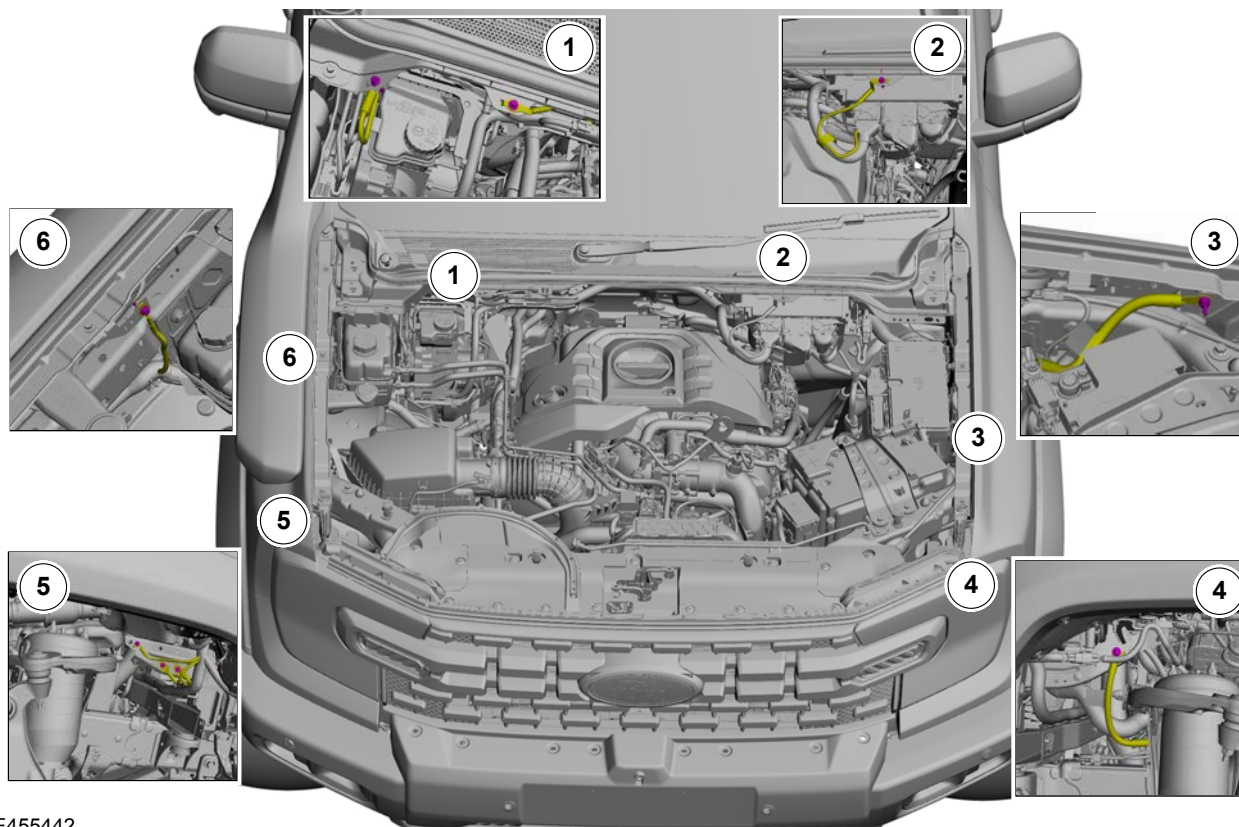
E459767

An additional battery connection provision is available on the Power Distribution Block (PDB). This spare M6 stud can be used for auxiliary/second battery or other upfitter connections requiring a 12V battery feed.

4.2.2 Grounding Points

NOTE: Some details in grounding illustrations has been removed for clarity.

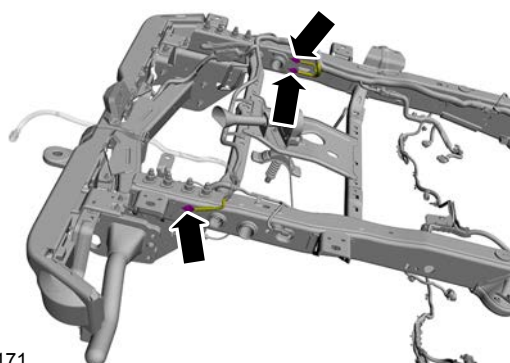
Grounding Points - Engine Bay



E455442

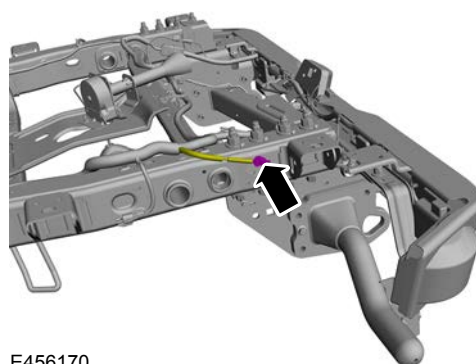
Item	Description
1	Grounding Point located on cowl
2	Grounding Point located on cowl
3	Grounding Point located on LH fender upper
4	Grounding Point located on sheet metal below vehicle battery
5	Grounding Point located on sheet metal below air cleaner assembly (behind fender liner)
6	Grounding Point located on RH fender upper

Grounding Points - Right Rear Frame



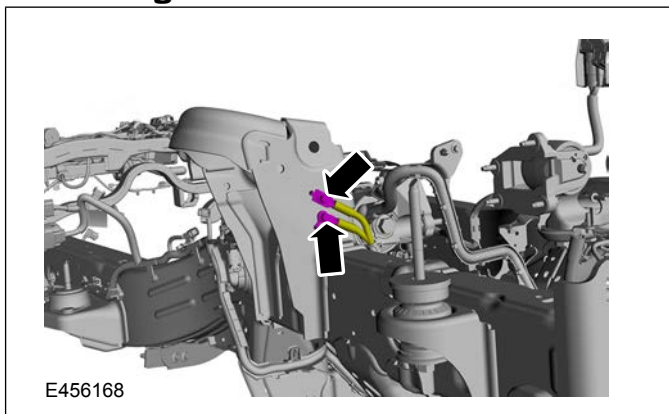
E456171

Grounding Points - Left Rear Frame

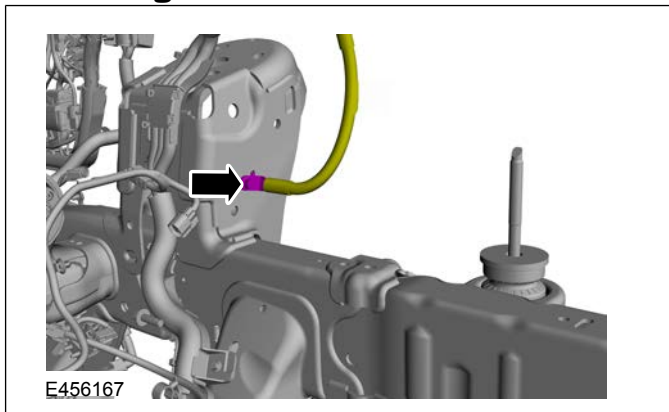


E456170

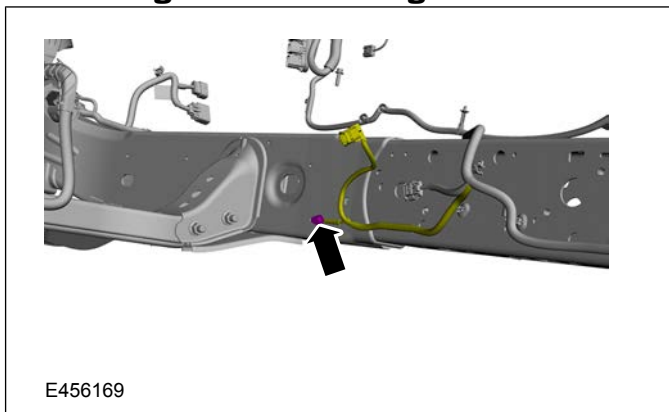
Grounding Points - Front Frame



Grounding Points - Front Left Frame



Grounding Points - Front Right Inner Frame



Ground point connections should be tightened correctly. Contact your authorised Ford dealer for the correct torque specifications.

4.2.3 Connection of Auxiliary Loads / Accessories - Vehicles with Factory Fit Auxiliary Switches, Wiring and Fuse Box

WARNINGS:

⚠ Make sure all electrical connections and wiring comply with local regulatory standards.

⚠ Under no circumstances should any unfused connections be made directly to any of the vehicle's battery terminals.

NOTE: Auxiliary load grounding points must always be connected to the nominated grounding points and not to the battery negative terminal.

NOTE: Refer to the vehicles owner manual for operational overview of the auxiliary switches.

NOTE: Vehicles fitted with a diesel engine should only use the auxiliary switches when the engine is running. Diesel engine glow plug can cause a reduction in the battery cranking power when the ignition key is in the ON position. Using the auxiliary switches, even for a short time, can cause your battery to drain and prevent the engine from being started.

Vehicles may be fitted with factory fit auxiliary switches, fuses and wiring that allows the installation of electrical accessories that are powered by fuse protected relays. The auxiliary switches, fuses and wiring comprise of:

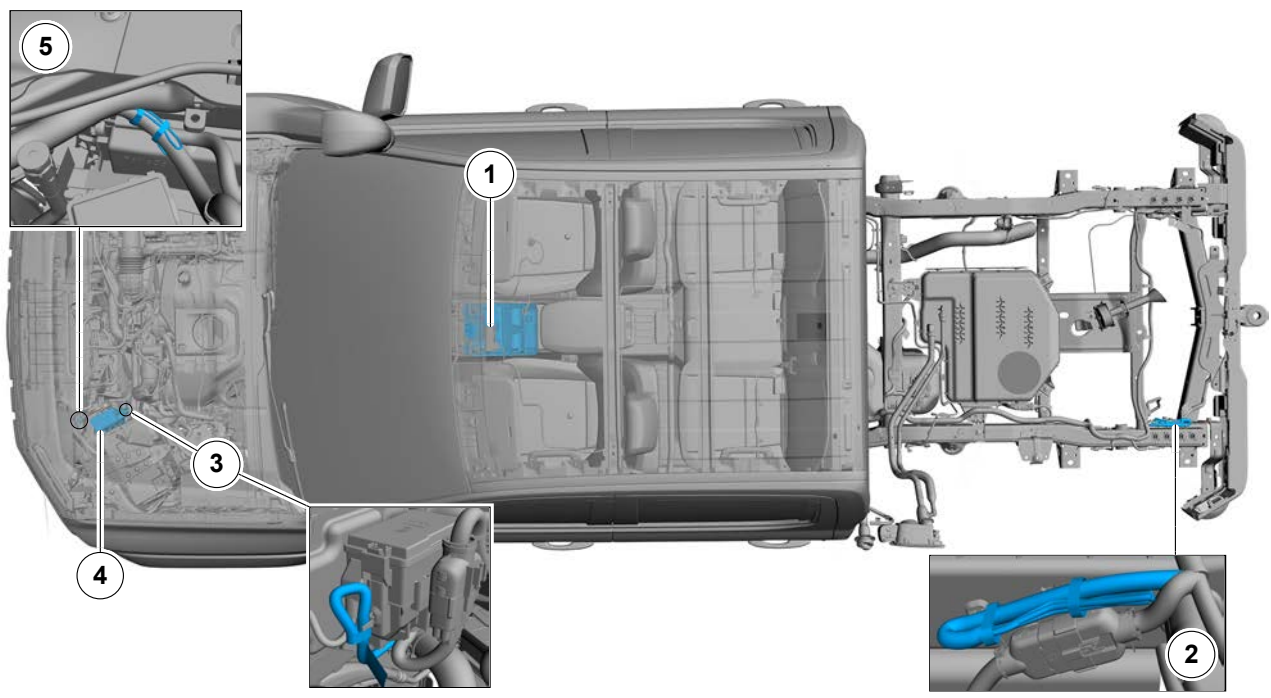
- Auxiliary Switch Panel
- Auxiliary Fuse Box with integrated relays
- Auxiliary Wiring Connections

The auxiliary switches only operate when the ignition is in the ON position.

Locating the Auxiliary Switches, Fuse Box and Wiring

Auxiliary Switches, Fuse Box and Wiring Positions

- A = Located Near to Auxiliary Fuse Box
- B = Auxiliary Fuse Box near to Left Hand Headlamp
- C = Near to Trailer Towing Electrical Connector Point

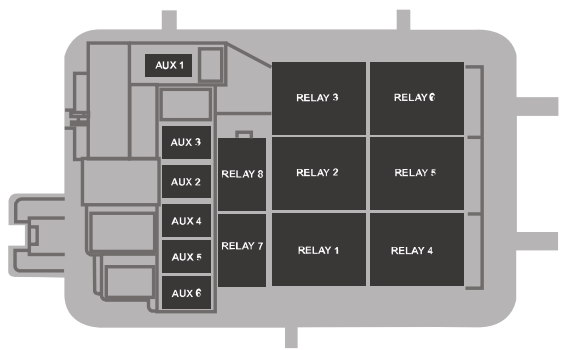


E455845

Item	Description
1	Auxiliary Switch Pack
2	Wiring Circuit Located Near to Trailer Towing Electrical Connector Point - POSITION C
3	Wiring Circuit Located Near to Auxiliary Fuse Box - POSITION A
4	Auxiliary Fuse Box (with relays) - POSITION B
5	Wiring Circuit Located Near to Radiator Support Panel

NOTE: Circuits from the auxiliary fuse box are powered during Run/Start condition. All other wiring is not connected at either end.

Identifying the Auxiliary Fuse Box Connections



Identifying the Auxiliary Fuse Box Connections

Auxiliary Switches Overhead Console	Wire Color	Wire Size	Fuse	Protected Component	Position	Note
AUX 1	Violet/Green	1.5mm ²	5A	Relay 1	B	-
AUX 2	Blue/Green	1.5mm ²	15A	Relay 2	B	-
AUX 3	Yellow Orange	1.5mm ²	15A	Relay 3	C	-
AUX 4	Brown	1.5mm ²	15A	Relay 4	C	-
AUX 5	Green/Brown	2.5mm ²	25A	Relay 5 - Driving Lamps	B	-
AUX 6	Yellow	2.5mm ²	25A	Relay 6 - Driving Lamps	A	-
-	-	-	-	Relay 7	-	This relay only works when the high beam headlamps are engaged per federal requirement.
-	-	-	-	Relay 8	-	Auxiliary switch power.
AUX 3 - GROUND	Black/Grey	1.5mm ²	-	-	C	-
AUX 4 - GROUND	Black/Green	1.5mm ²	-	-	C	-
AUX 6 - GROUND	Black/Yellow	2.5mm ²	-	-	A	-

12V B+ Power At All Times (PAAT)

E387821

A 12V B+ power at all times (PAAT) supply is available as a blunt cut wire taped back against the harness branch located behind the kick-panel on the LHS A-Pillar.

- Wire colour Green/White (GN/WH) - 10 Amps maximum

4.2.4 Charging System

WARNING: Do not cut into the alternator wires.

Summary of the Available Charging Modes - alternator equipped vehicles

	Charge Mode	Approximate Charging Voltages (Measured at battery post)
CC	Conventional Charging - applies a strong charging voltage until the battery is full and maintains alternator voltage above 13.5V unless battery temperature >40°C. The actual voltage at the battery will vary depending on the alternator load.	Minimum 13.5V - Maximum 14.9V

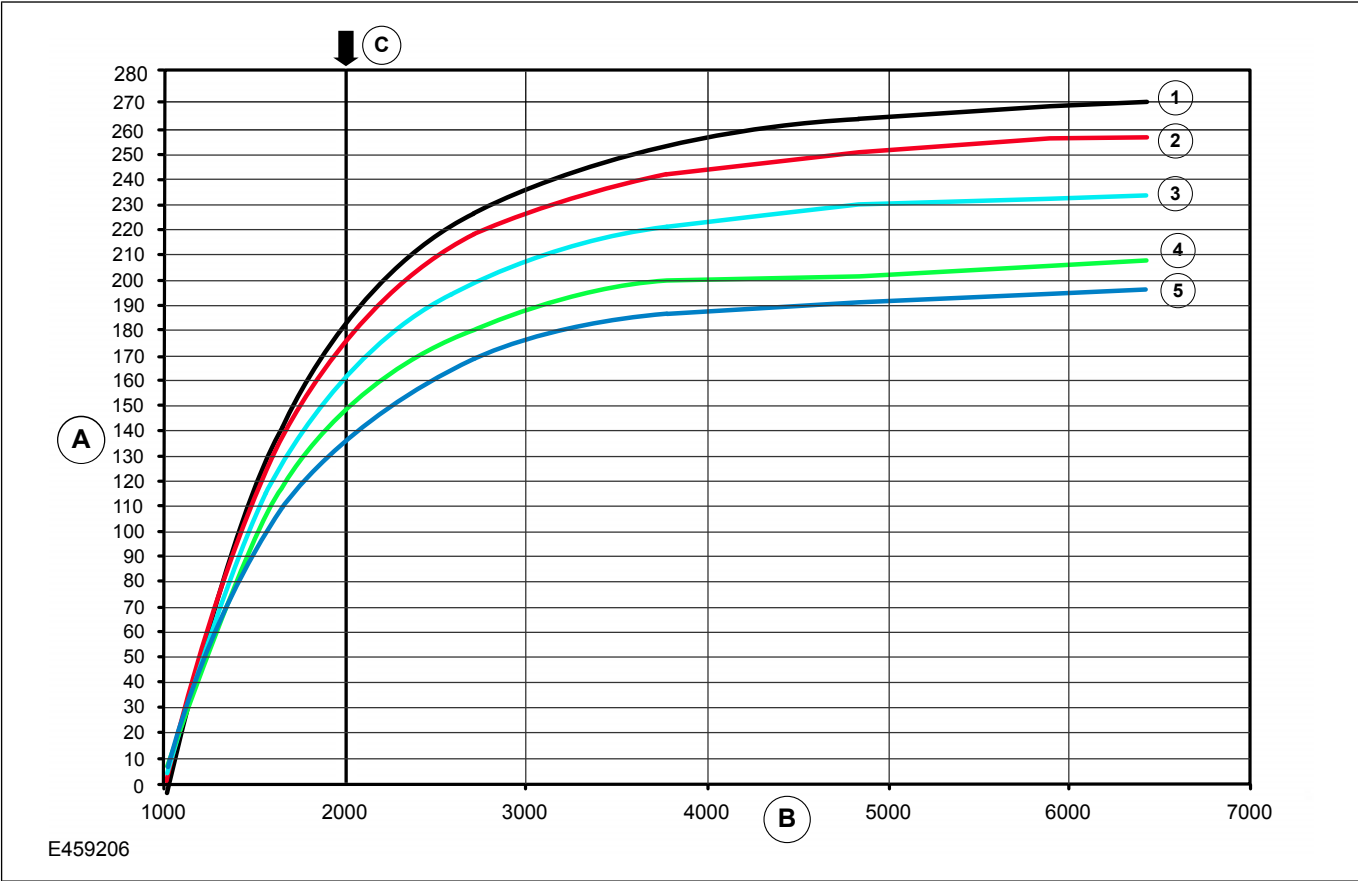
The voltages in the above table are approximate as the charging system is dynamic and can vary the voltage at any time. There is also a refresh mode that is activated periodically if the vehicle stands for more than 30 days. This may take the voltage to 15.2 volts.

Alternator Current Output

Powertrain	Current Output	Amps @ 80°F (27°C)	Pulley Ratio	Pulley type	Voltage regulator type
3.0L Diesel	250 amps	145 amps at 750 rpm (min) to 250 amps at 2,500 rpm (max)	2.66	Overrunning Alternator Decoupler (OAD)	Electronic internal

NOTE: RPM speeds shown in table are engine crankshaft speeds, not alternator rotation speed.

Alternator Output Performance Curve - 250A Current Output



Item	Description
A	Output Current (Amps)
B	Alternator Speed (RPM)
C	Engine Idle Speed (750rpm @ engine = 2000rpm @ alternator)
1	Temperature 30°F (0°C)
2	Temperature 80°F (27°C)
3	Temperature 140°F (60°C)
4	Temperature 200°F (93°C)
5	Temperature 240°F (115°C)

4.2.5 Ignition Signal



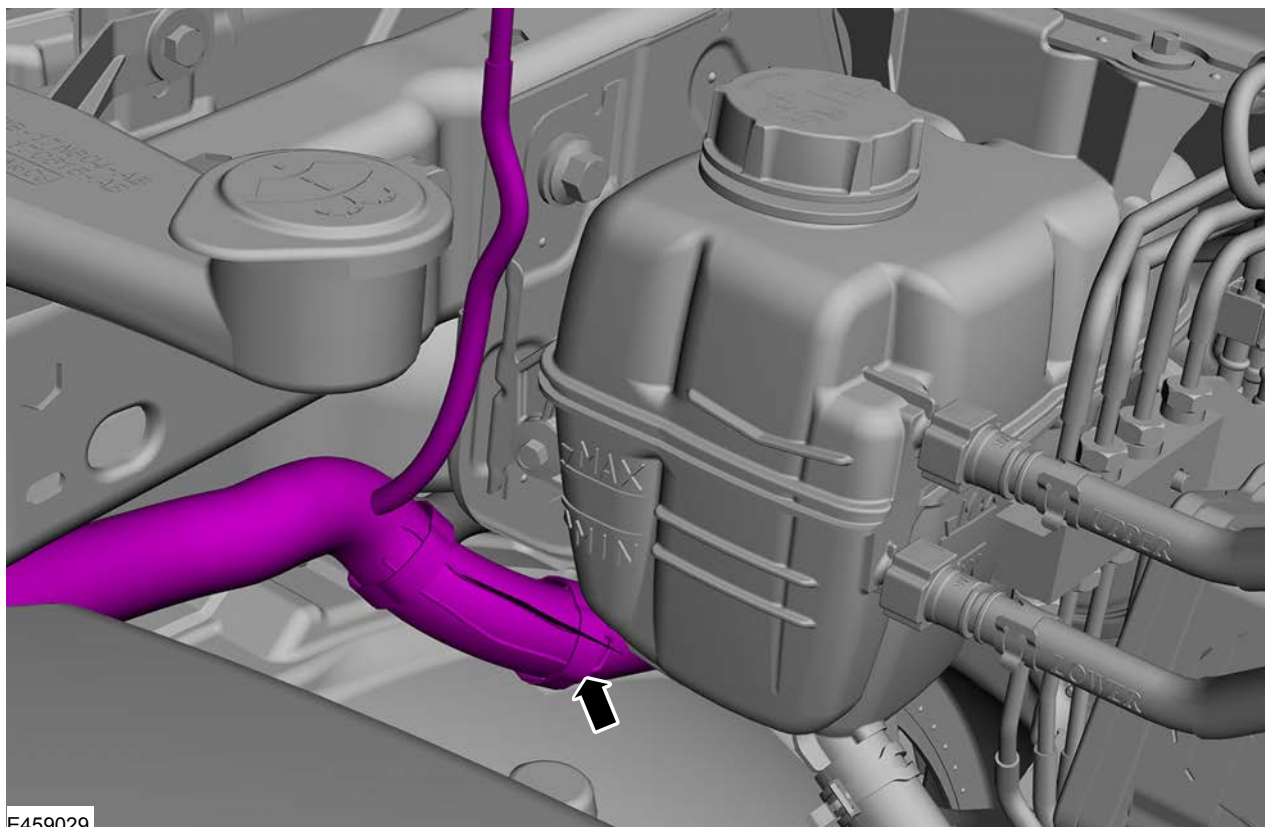
E387821

A Run-Start/Ignition signal is available as a blunt cut wire taped back against the harness branch located behind the kick-panel on the LHS A-Pillar.

An additional signal is also available as a blunt cut wire taped back against the harness location in the engine bay on the right side (image below).

The signal in either location can be used via an external relay for a variety of Converter applications, subject to load required.

- Wire colour White/Green (WH/GN) - 10 Amps maximum (shared)



E459029

4.2.6 AC Inverter Deactivation

NOTE: The on-board 230V AC 400W inverter can be deactivated via a fuse removal and by updating the vehicle configuration by downloading and running application Disable/Enable 400W Power Outlet (G2506307) located in the Programmable Features menu tab in FDRS. Failure to follow this process will result in error codes (DTC group: B1330) being logged. Disabling the inverter will deactivate all related power outlets in the cabin and loadbox area (as applicable). Please contact the Ford Pro Special Vehicles helpline at FPSVhelp@ford.com for further information. This is a password-protected process that should be submitted and approved prior to requiring the deactivation.

4.3 Parking Aid

WARNINGS:

-  **To help avoid personal injury, always use caution when in reverse (R) and when using the sensing system.**
-  **The system may not detect objects with surfaces that absorb reflection. Always drive with due care and attention. Failure to take care may result in a crash.**
-  **Traffic control systems, inclement weather, air brakes, external motors and fans may affect the correct operation of the sensing system. This may cause reduced performance or false alerts.**
-  **The system may not detect small or moving objects, particularly those close to the ground.**
-  **Do not use the system with items that extend past the front and rear ends of the vehicle, for example, bike rack accessories. The system is not able to correct for the additional extrusions.**
-  **You must remain in your vehicle when the system turns on. At all times you are responsible for controlling your vehicle, supervising the system and intervening, if required. Failure to take care may result in loss of control of your vehicle, serious personal injury or death.**
-  **The sensors may not detect objects in heavy rain or other conditions that cause interference.**
-  **You are responsible for controlling your vehicle at all times. The system is designed to be an aid and does not relieve you of your responsibility to drive with due care and attention. Failure to follow this instruction could result in the loss of control of your vehicle, personal injury or death.**

NOTE: Keep the sensors free from snow, ice and large accumulations of dirt. If the sensors are covered, the system's accuracy can be affected. Do not clean the sensors with sharp objects.

NOTE: If your vehicle sustains damage to the bumper or fascia, leaving it misaligned or bent, the sensing zone may be altered causing inaccurate measurement of obstacles or false alerts.

NOTE: Certain add-on devices installed around the bumper or fascia may create false alerts. For example, large trailer hitches, bike or surfboard racks, license plate brackets, bumper covers or any other device that may block the normal detection zone of the system. Remove the add-on device to prevent false alerts.

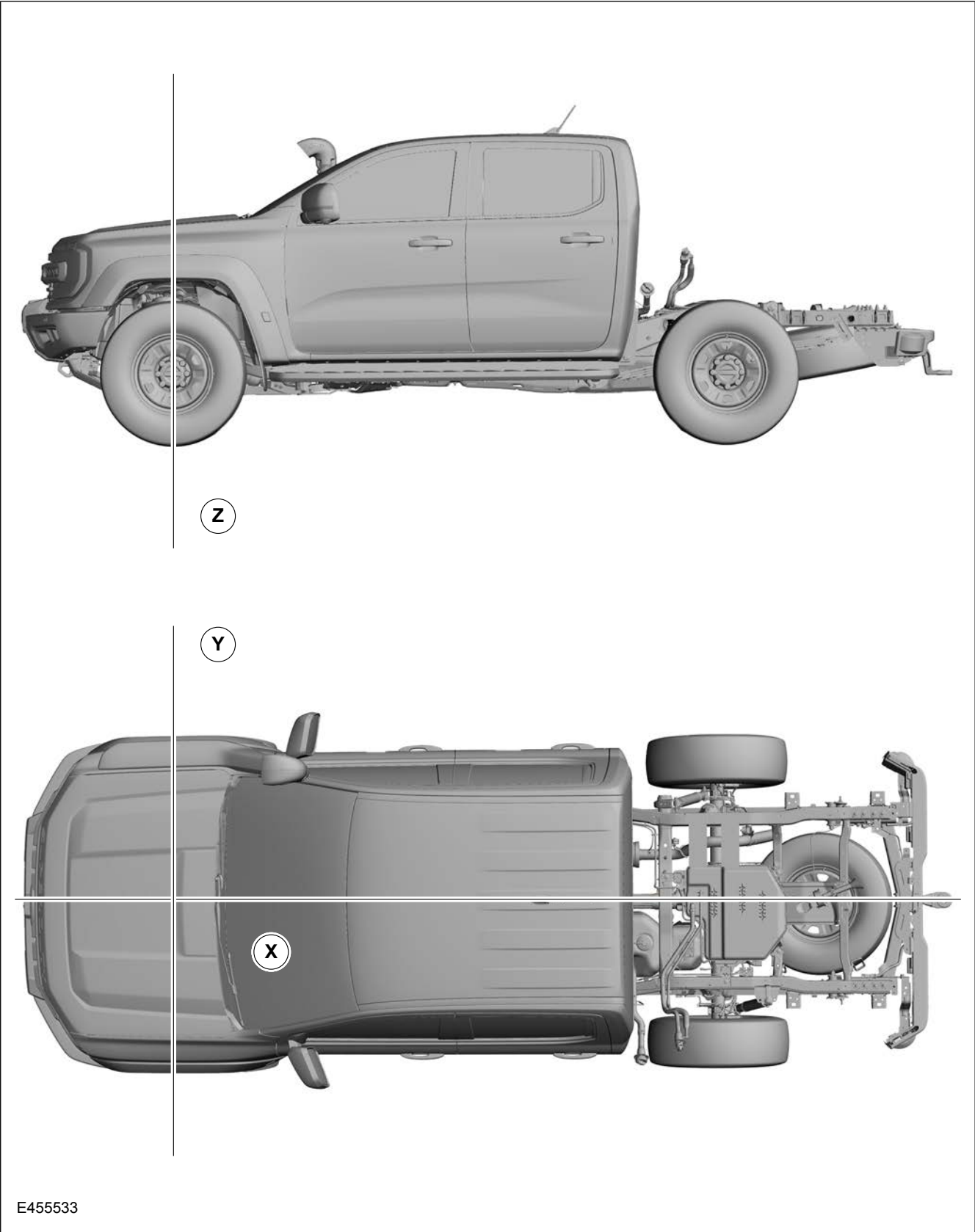
The parking aid sensing system warns the driver of obstacles within a certain range of your vehicle. The system turns on automatically whenever you switch the ignition on. The system can be switched off via the following methods:

- Through the information display menu.
- From the pop-up message that appears once you shift the transmission into reverse (R).
- Using the Parking Aid Button (if equipped).

If a fault is present in the system, a warning message appears in the information display. See the vehicle owner manual for further information on the correct operation of the parking aid system.

Where possible, parking aid sensors should not be moved from the original positions on the X, Y and Z plane. Maintaining the sensors location on these planes is important for correct operation of the system.

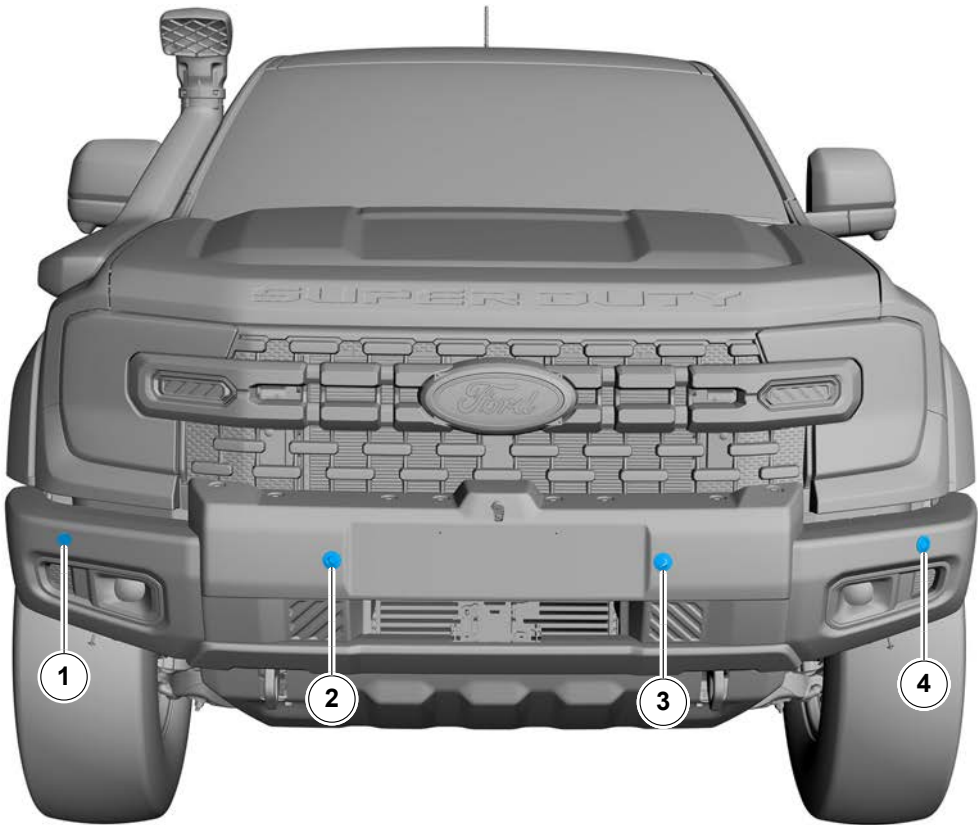
Vehicle Location Planes



4.3.1 Sensor Location

NOTE: Relocated sensors must be installed in the same position as originally fitted in the bumper bar. Make sure that each sensor is installed in the correct corresponding position.

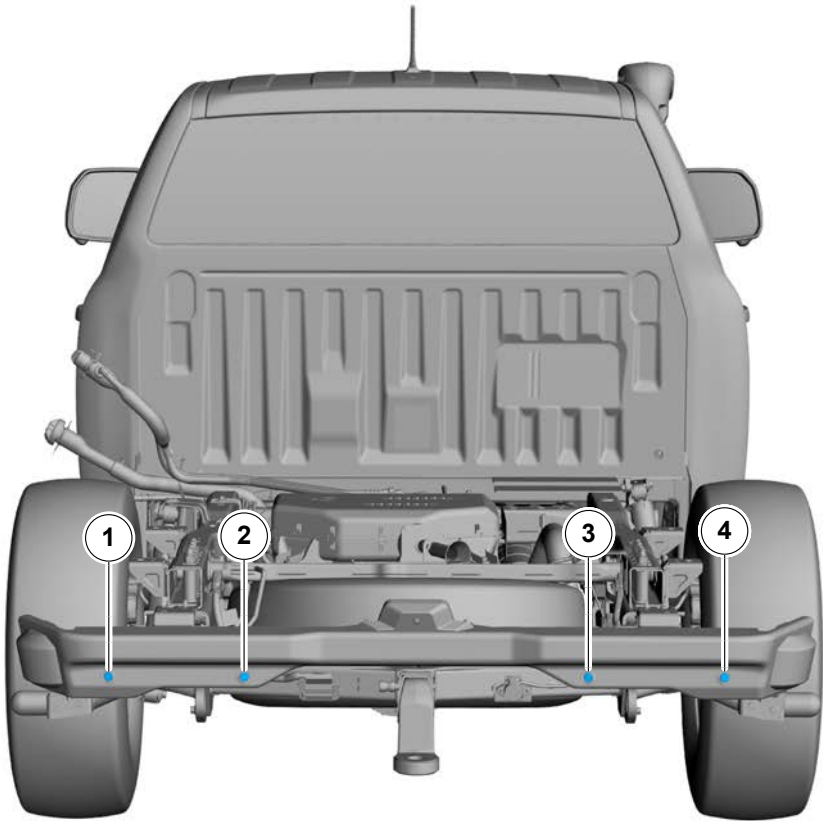
Front Parking Aid Sensor Location



E455201

Sensor	Number
Front Right Outer	1
Front Right Inner	2
Front Left Inner	3
Front Left Outer	4

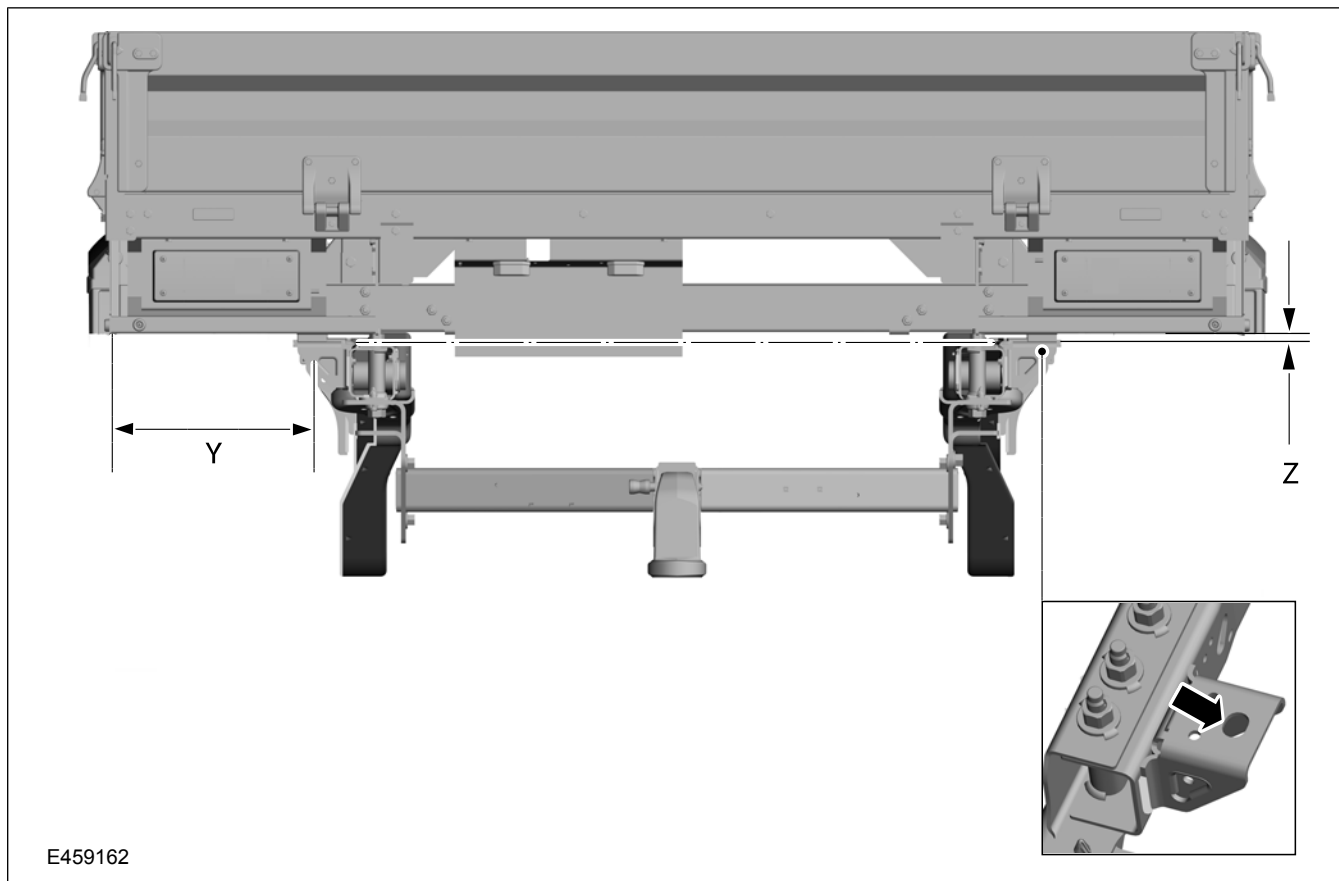
Rear Parking Aid Sensor Location



E455661

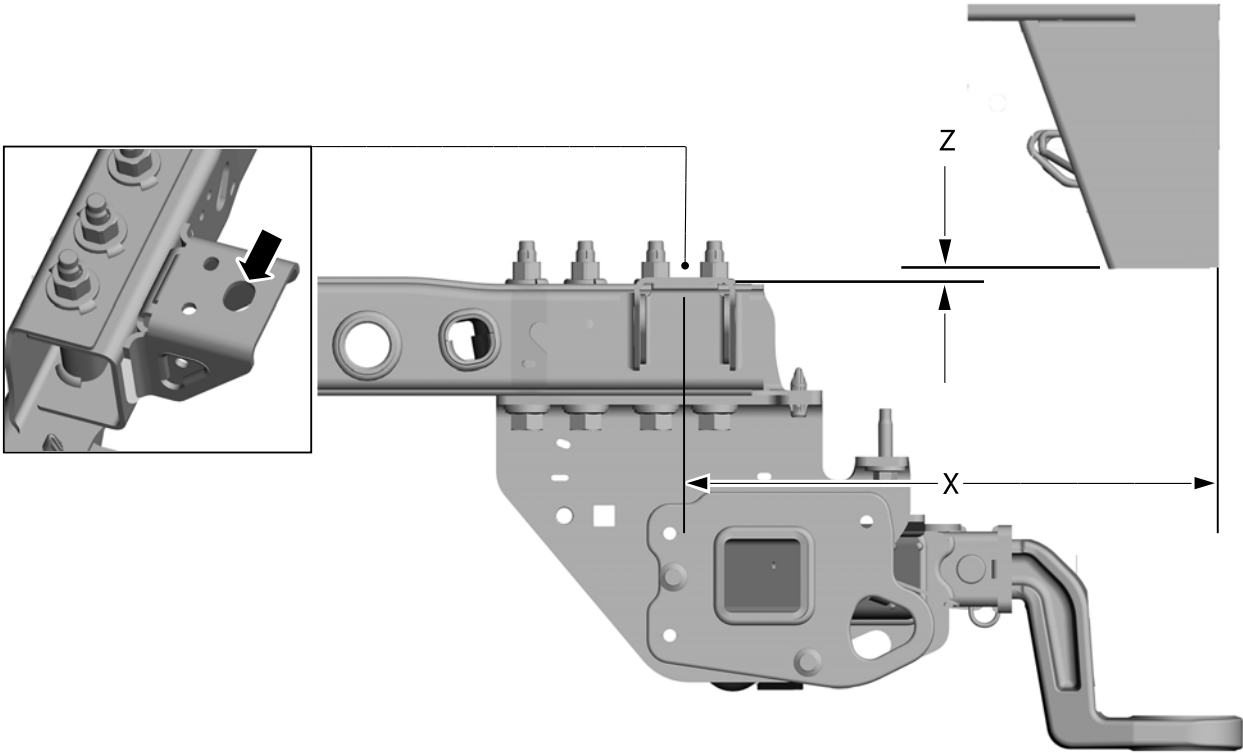
Sensor	Number
Rear Left Outer	1
Rear Left Inner	2
Rear Right Inner	3
Rear Right Outer	4

Rear sensor overhang relative to the rear chassis mount



Dimension	Measurement (mm)
Y	< 345mm
Z	> 15mm

Exceeding the Y dimension may result in the sensors not adequately detecting items in the reversing path of the vehicle. (i.e. vehicle may be wider than the sensing zone).

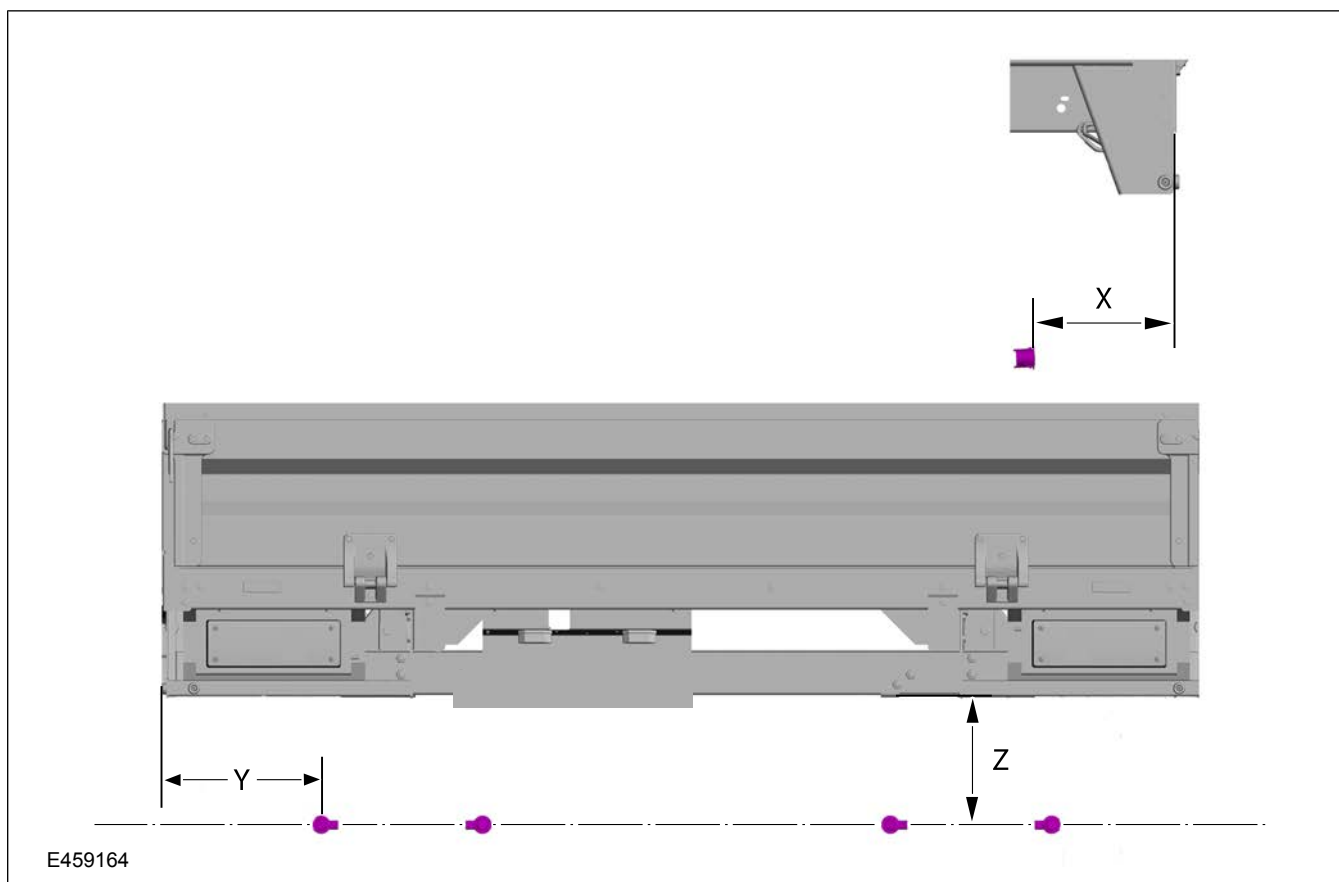


E459163

Dimension	Measurement (mm)
Z	> 15mm
X	< 480mm

Exceeding these X and Z dimensions will likely result in the sensors false-detecting (sensors will alarm without any items behind the vehicle in the sensing zone).

Rear sensor overhang relative to the sensors



Dimension	Measurement (mm)
X	225mm maximum (sensor surface to lowest, rearmost point of tray)
Y	290mm maximum (sensor midpoint to the outermost point of the rear of the tray)
Z	240mm minimum (sensor midpoint to the lowest, rearmost point of the tray)

4.4 Electronic Engine Controls

4.4.1 Vehicle Speed Signal

 **WARNING:** Do not interface with the CAN for vehicle speed.

The vehicle speed signal can be acquired from the Body Control Module. This output may require enabling by a Ford Dealer on some models.

NOTE: If the vehicle speed drops below 2.5MPH (4KPH) the vehicle speed signal may not be distinguishable for the Tachograph.

Square Wave Characteristics

Specifications	
Max High Signal	Battery Voltage
Min High Signal	3.67V
Max Low Signal	1.1V
Min Low Signal	-1.1V
Max Ground Offset	± 1.0V
Rise Time	10µs <= tr <=250µs
Fall Time	10µs <= tf <=250µs
Duty Cycle	50% ± 10%
Pulse Rate	2.2Hz/MPH (1.3808Hz/KPH)

Body Control Module

The vehicle speed signal can obtained on the following connector:

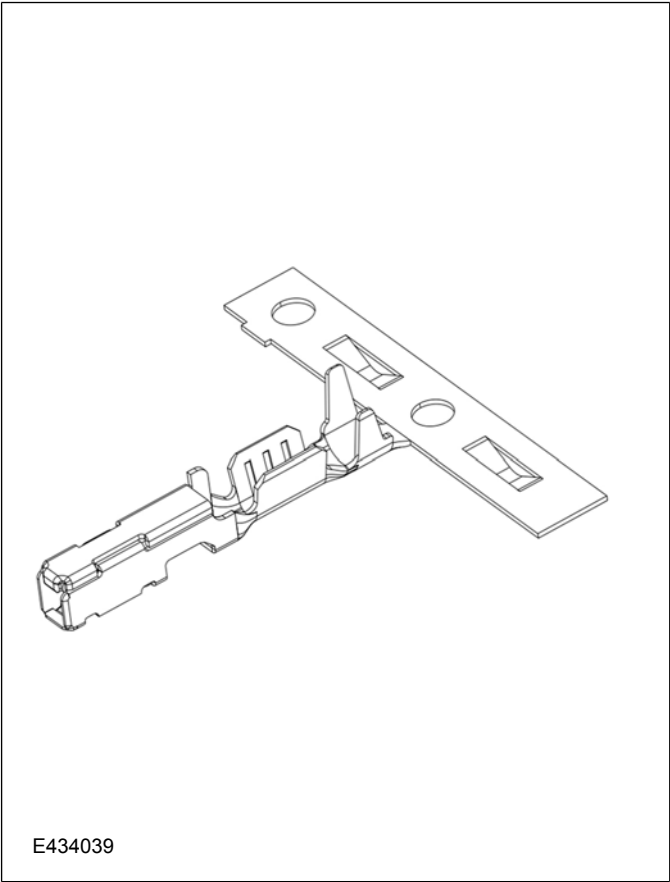
- Body Control Module J5 (Blue connector) Pin 41, no wire assignment currently

A wiring pigtail can be made up and inserted in to the Body Control Module connector to acquire the vehicle speed signal. (0.5mm² wire recommended)

NOTE: The vehicle speed signal wiring should be shielded and twisted to reduce EMC effects.

- Wiring terminal service part: DU2Z-14474-AA

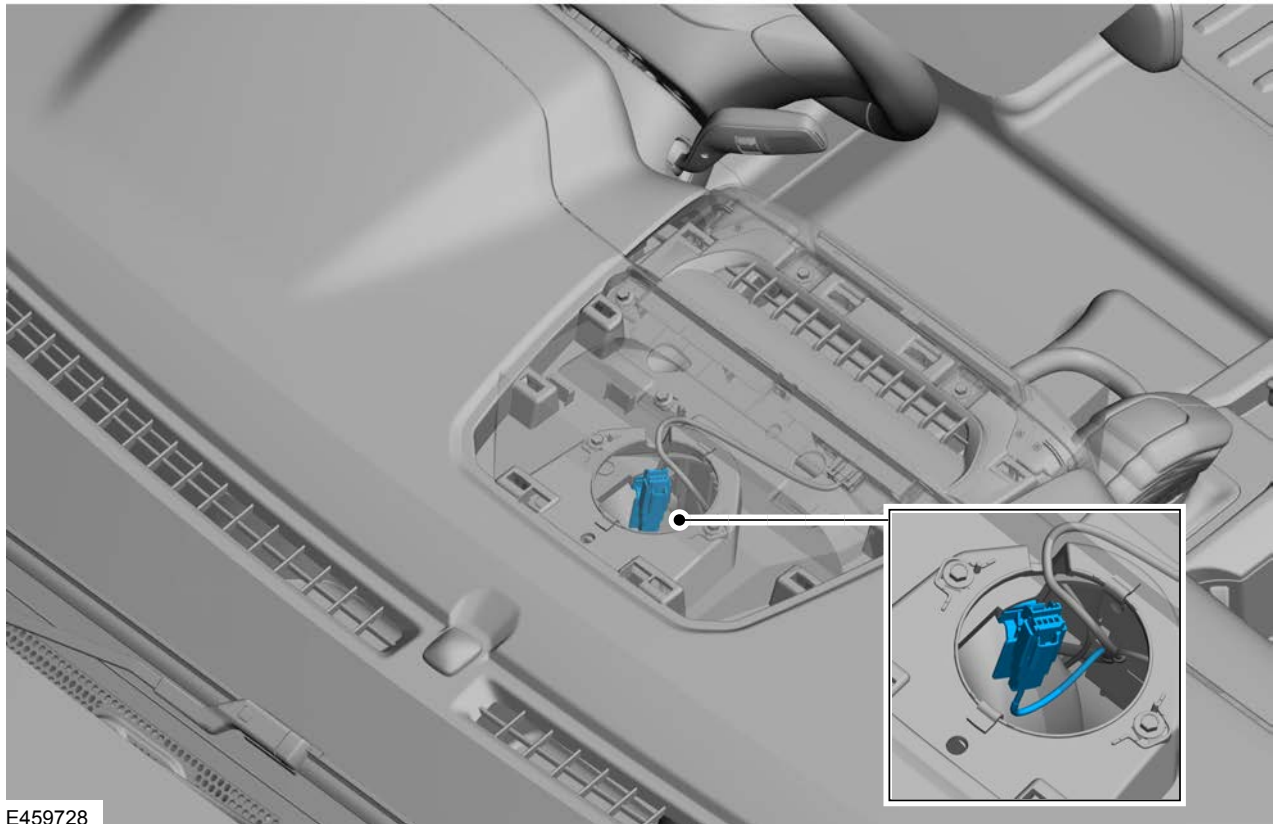
Pigtail Terminal Connector



4.5 Information and Entertainment System

4.5.1 Instrument Panel 12V supply

A 12V and ground connection is available at the USB connector interface located underneath the IP finishing panel.



E459728

PIN	Wire Colour	Circuit Function
1	Yellow / Violet (YE/VT)	Power - 5 Amps maximum
2	-	-
3	-	-
4	Black / Violet (BK/VT)	Ground



E466263

NOTE: As at the time of publication, Ford offers a Ford Licenced Accessory Instrument Panel Top Mounting System kit in some markets. This kit comprises a replacement upper tray with dual USB charging ports and a mounting base suitable for GoPro™ and other accessories.

- Part number is R1WZ-2604338-AA

The instrument panel top mounting system is powered by the 12V supply detailed above.

4.5.2 Rear View Camera

Aftermarket Rear View Camera - Connecting straight to SYNC

NOTE: The display screen does not have a direct input for connection to devices such as cameras. Only vehicles with SYNC radios have the capability to support aftermarket fitment of the rear view camera.

There are three pins on the SYNC module.

- C1-14: Input Camera - Parking Aid Rear Video (+)
- C1-15: Input Camera - Parking Aid Rear Video (-)
- C1-33: Ground: Camera-Parking Aid Rear Video

The cable between the rear view camera and SYNC module needs to be screened twisted pair, preferably of a single run to minimize signal loss.

In addition to this, the vehicle will have certain parameters reconfigured. This needs to be carried out at an authorized Ford dealership to not invalidate warranty.

The display will only provide rear view camera information when reverse gear is engaged.

Rear Brake Assist

NOTE: Do not paint or modify the rear camera or rear bumper as this will impede the Rear Brake Assist functionality.

NOTE: No change to power steering system is supported by Reverse Brake Assist.

NOTE: No modification to the traction control system or ABS system is supported by Reverse Brake Assist.

NOTE: Modification to door latching system or removal of doors may interfere with Reverse Brake Assist.

NOTE: Fitting of accessories to the rear of the vehicle will impede the functionality of Reverse Brake Assist, in these instances the feature should not be used - False Reverse Brake Assist events may occur.

NOTE: Do not obstruct the rear camera.

All Cameras



CAUTION: When the Pickup Box/Tub and Tail Lamps are removed on vehicles with a rear view camera, the feature will be disabled. The vehicle can be reconfigured to deactivate this feature and avoid warning messages in the instrument cluster. See your local Ford Dealer or contact your National Sales Agent for further information.

NOTE: Do not move or modify any camera mounting positions or brackets, as this will impede on camera and Rear Brake Assist functionality.

NOTE: Do not disconnect or remove any cameras fitted to the vehicle.

NOTE: Do not interfere with the full field of view cone of the rear camera.

NOTE: Any object mounted within the field of view cones of the front and side-mirror cameras will obstruct the 360-camera visibility.

NOTE: Any change to track width will result in the dynamic guidelines not being representative of vehicle turning circle.

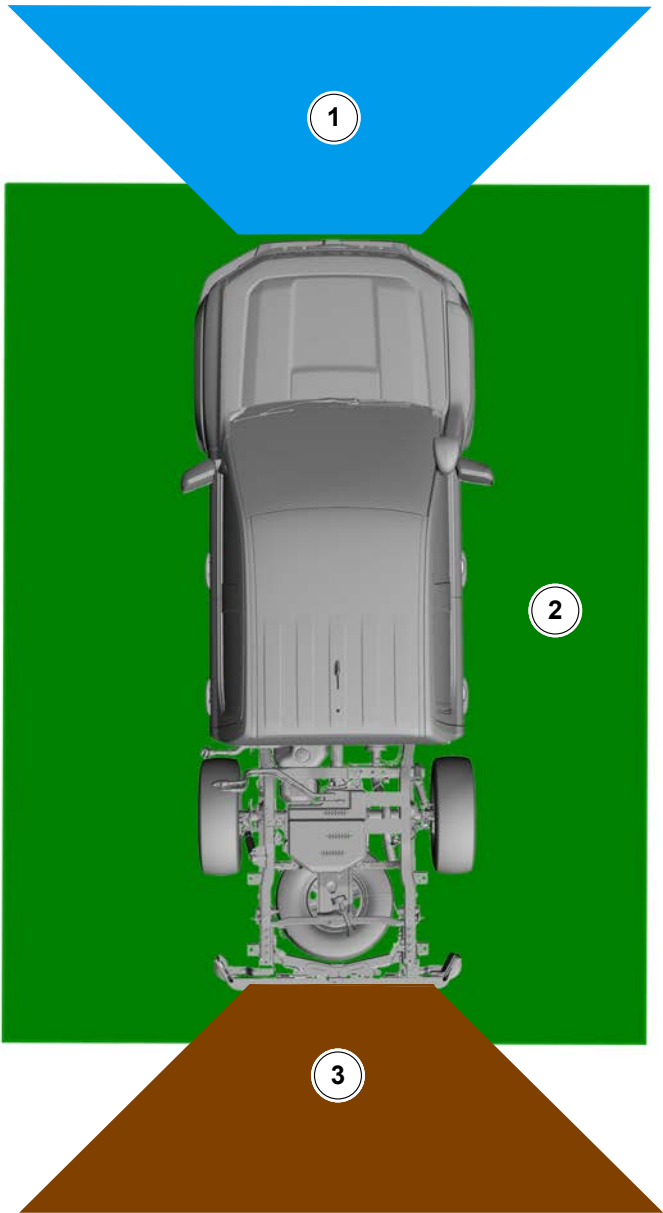
360° Camera

NOTE: Any change to track width will result in the dynamic guidelines not being representative of vehicle turning circle.

NOTE: Attachment of towing extensions to side mirrors may impede on 360 camera visibility.

NOTE: Do not interfere with the full field of view cones of the 360° camera.

NOTE: Any object mounted within the field of view cones of the front and side-mirror cameras will obstruct the 360-camera visibility.



E455598

Item	Description
1	Front Camera Field of View
2	360° Camera Field of View
3	Rear Camera Field of View

Front Camera - Front Protection Bar Limitations

CAUTION: Do not move or modify any camera mounting positions or brackets, as this may impede camera and Rear Brake Assist functionality.

NOTE: When fitting a Ford Licensed Accessory (FLA) Compatible Bullbar, ensure the "IPMA Front Bumper Calibration" is performed. This will include a Recalibration of the 360-degree camera system to the new location. Only a Super Duty FLA Compatible Bullbars are supported.

NOTE: Any object mounted within the field of view cones of the front and side-mirror cameras will obstruct the 360-camera visibility.

NOTE: Fitment of any accessories on the front bullbar that interfere with the front camera field of view will obstruct part of the camera video and will cause an incomplete or degraded 360 view.

NOTE: Any change to track width may result in the dynamic guidelines not being representative of vehicle turning circle.

Rear View Camera Equipped Vehicles

CAUTIONS:

CAUTION: Do not remove or re-position the Driver Assistance Technology Bar assembly from the original factory location, as it may impede the functionality of the rear camera and reverse brake assist. The rear guidelines may not be representative and the 360 camera stitching may be broken.

CAUTION: The tray overhang to Driver Assistance Technology Bar is critical to the rear camera performance and functionality and could impact reverse brake assist. Please maintain the same requirements.

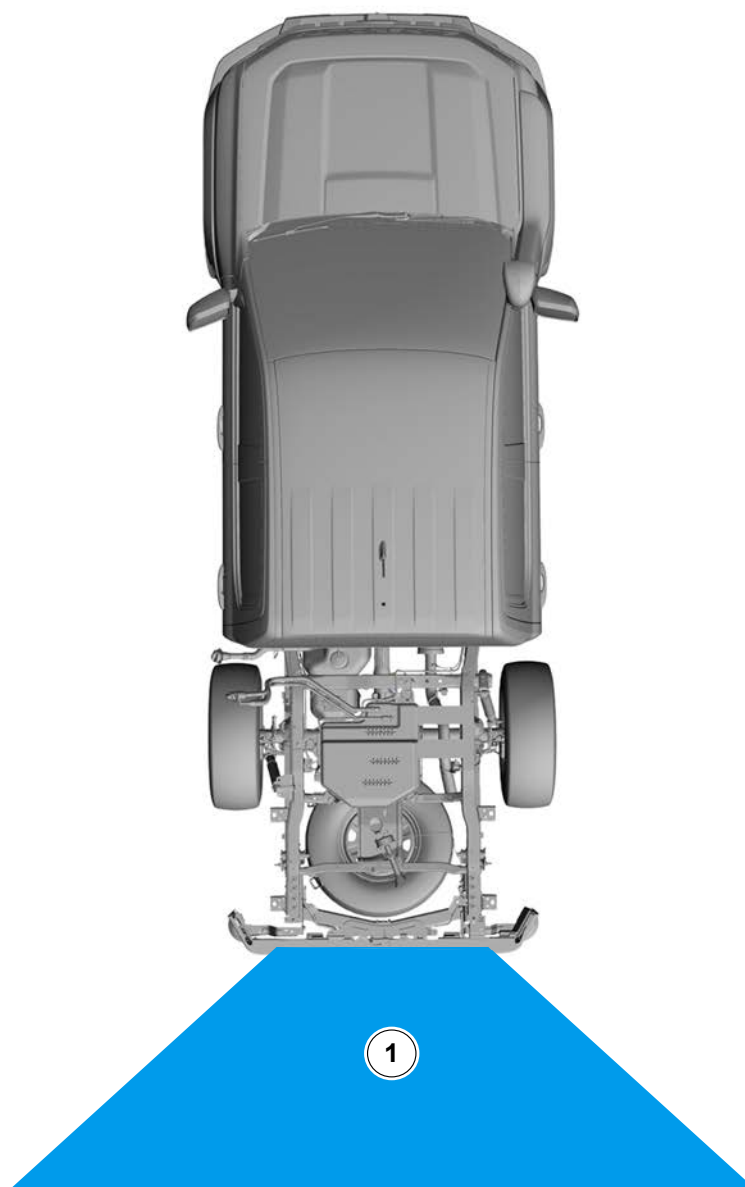
See Rear Sensor Overhang Relative to the Rear Chassis Mount.

Refer to: 4.3 Parking Aid (page 73).

NOTE: Do not move or modify any camera mounting positions or brackets, as this may impede on camera and Rear Brake Assist functionality.

NOTE: Do not interfere with the full field of view cone of the rear camera.

NOTE: Any change in vehicle ride height may result in the rear camera guidelines being not representative of vehicle width distances from vehicle.



E455657

Item	Description
1	Rear Camera Field of View

4.5.3 Auxiliary Rear View Camera

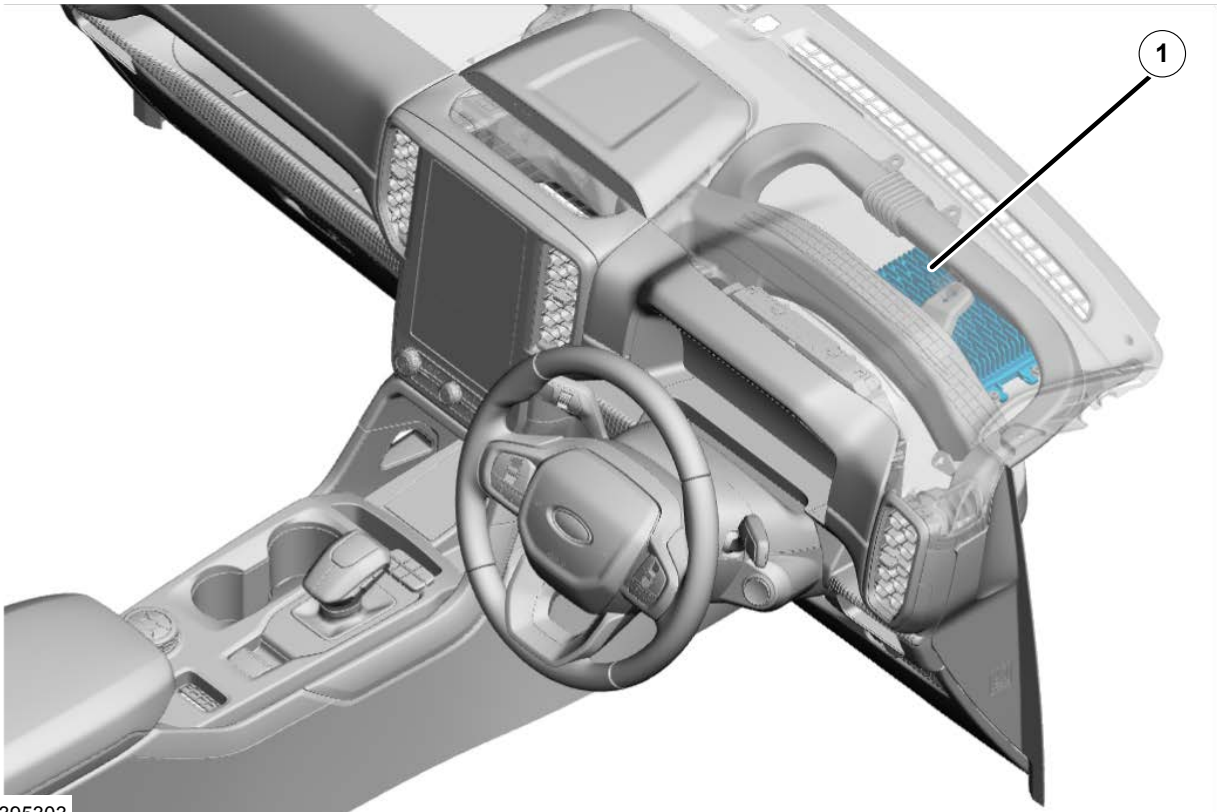
NOTE: Only vehicles with Digital Rear Vision and/or 360 deg Cameras (J3KAG, J3KAH or J3KAR) have the IPMA capability to support aftermarket fitment of an Auxiliary camera (NTSC format).

NOTE: Reprogramming of the APIM and the IPMA using the FDRS will be required to allow the IPMA to display the auxiliary rear view camera whilst the vehicle is moving. See your local Ford Dealer or National Sales agent for further information on the APIM reprogramming.

A compatible Auxiliary Rear View Camera kit is available from Ford in selected regions. See your local Ford Dealer or National Sales Agent.

The Auxiliary Camera Kit (containing the camera, mounting bracket and bezel) is P1WZ-19G490-B. The wiring kit (body and trailer wiring harnesses with instructions) is P1WZ-19G490-A. Available in Australia and New Zealand.

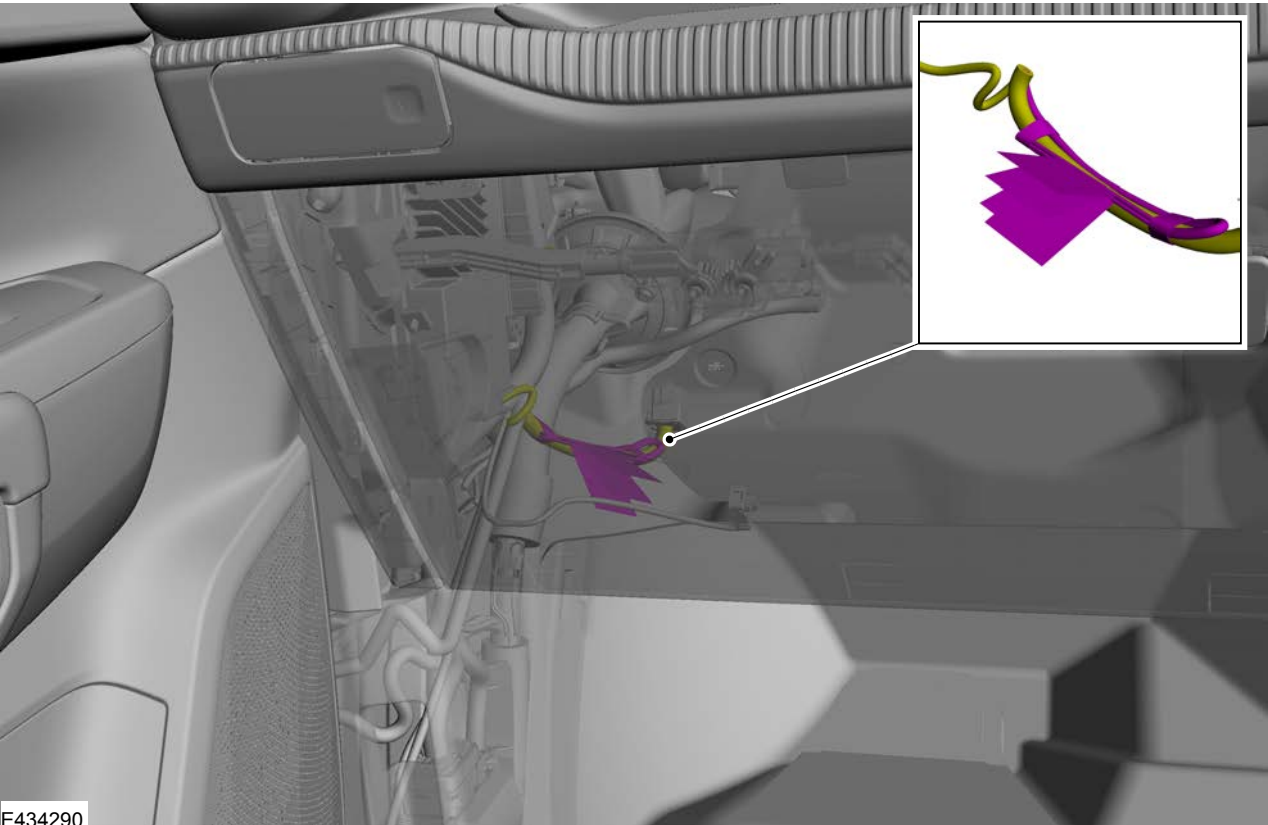
Integration of an auxiliary rear view camera requires the connection of NTSC standardized connections to the IPMA



E395303

Item	Description
1	IPMA (Image Processing Module A)

NTSC standardized connections for an auxiliary rear view camera is via nominated wires located on the Connector C3 of the IPMA.



E434290

NOTE: Right Hand Drive vehicle shown, Left Hand Drive vehicle similar.

Vehicles built with Digital rear Vision and/or 360 deg Camera (J3KAG, j3KAH or J3KAR) have auxiliary camera blunt cut wires taped back against the harness behind the glovebox near the firewall. There are four labelled wires:

- AUX_CAMERA VIDEO (+) - Wire colour Grey/Violet (GY/VT)
- AUX_CAMERA VIDEO (-) - Wire colour Blue/Orange (BU/OG)
- POWER (+) - Wire colour Yellow/Grey (YE/GY)
- GROUND (-) - Wire colour Black/Yellow (BK/YE)

The Aux Camera button should already be visible in the Camera drop-down of the Sync screen on these vehicles.

[Refer to: 4.2 Battery and Cables \(page 59\).](#)

4.6 Exterior Lighting

WARNINGS:

-  **Make sure that the modified vehicle complies with all local regulatory standards.**
-  **Make sure all electrical connections and wiring comply with local regulatory standards.**
-  **CAUTION: Do not use alcohol-based cleaning fluids on or near the tail lamps. Contact with alcohol-based cleaners can cause chemical stress cracking in the lamp lens material. When fitting foils, decals, or wraps, convertors must take appropriate steps (such as masking) to ensure these fluids do not come into contact with the tail lamps.**

NOTE: Chassis Cab vehicles are supplied with rear combination lamps and license plate lamps. Where fitted, these lamps must be mounted in accordance with the following guidelines.

Refer to: 4.13 Fuses and Relays (page 119).

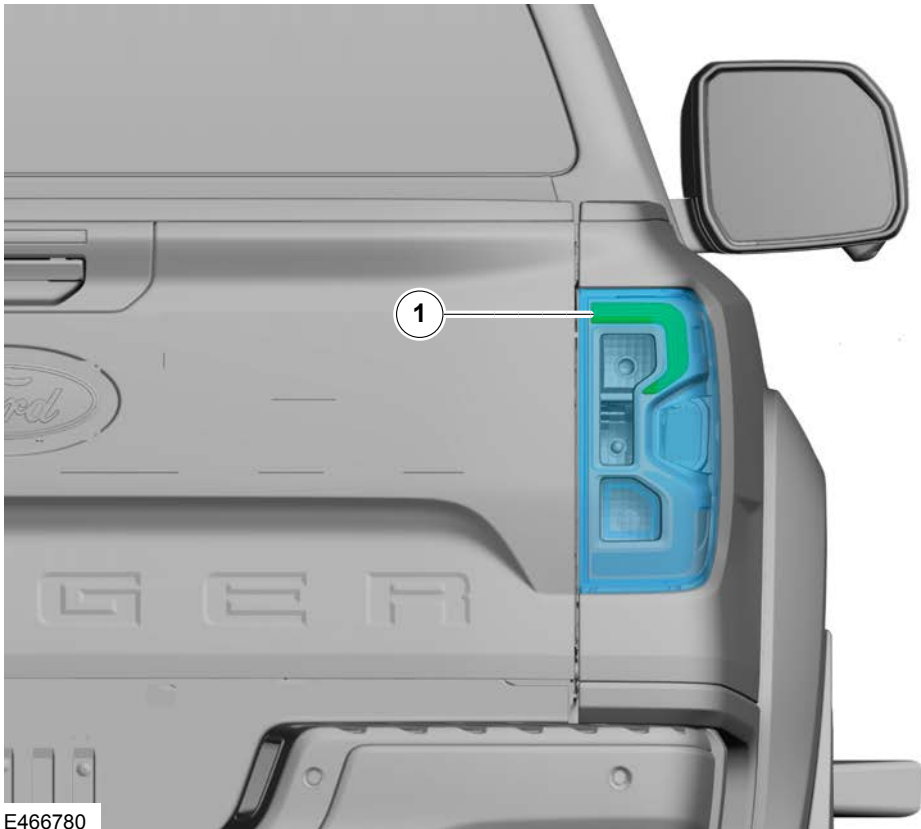
4.6.1 Rear Lighting Signal - Vehicles with Loadbox

This applies only to vehicles built with a sheetmetal loadbox and integrated multi-function taillights.

-  **CAUTION: Attempting to connect aftermarket taillights directly to this circuit may result in non-compliant lighting.**

The taillight uses a combination of LED and incandescent lights, with the brake and position functions being LED and the remaining functions being incandescent. The brake (stop) and position (park) functions are on the same circuit (single wire) with the position function using a PWM signal and the brake function being a 12V feed.

Ford recommends that the separate blunt-cut provisions for brake (Refer to Brake (Stop) Lamps in this section) and position (Refer to Position (Park) Lamps in this section) are used in this situation. Other taillight functions can be taken from the taillight wiring.

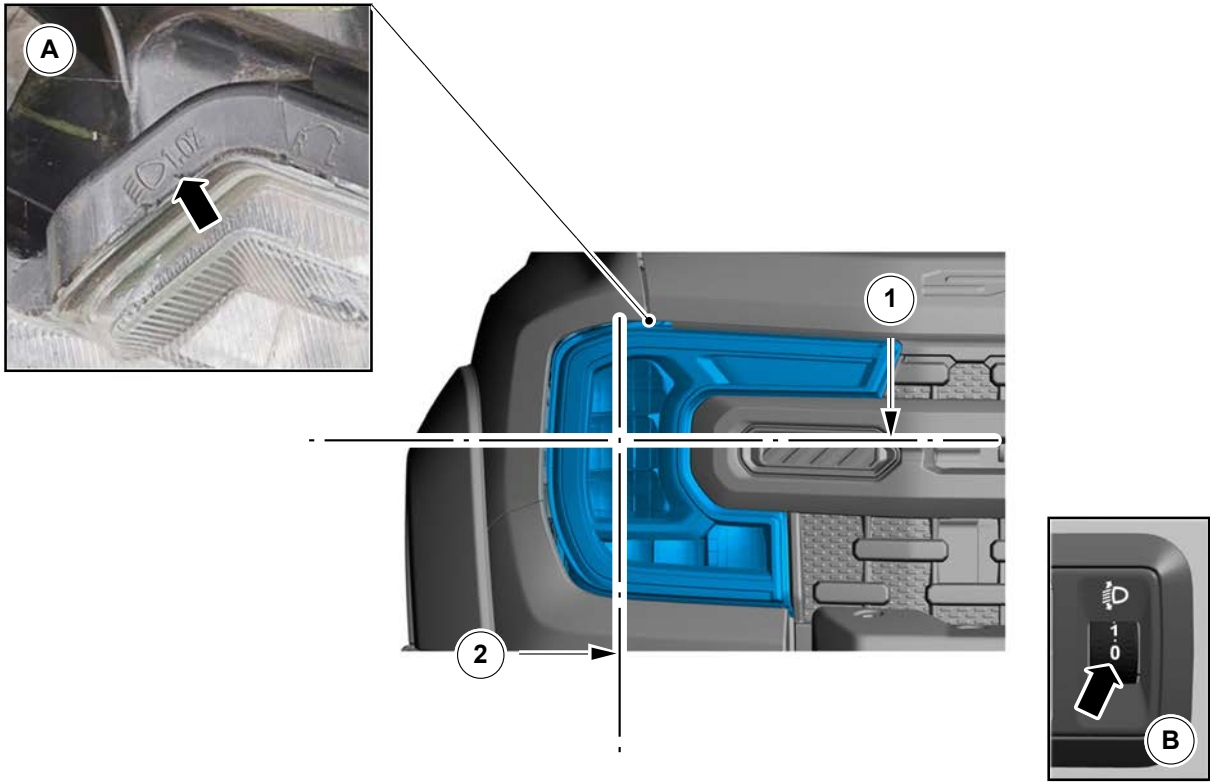


Item	Description
1	Brake (Stop) and Position (Park) Lamp

4.6.2 Headlamp Aiming

Prior to checking and/or adjusting the headlamp aim:

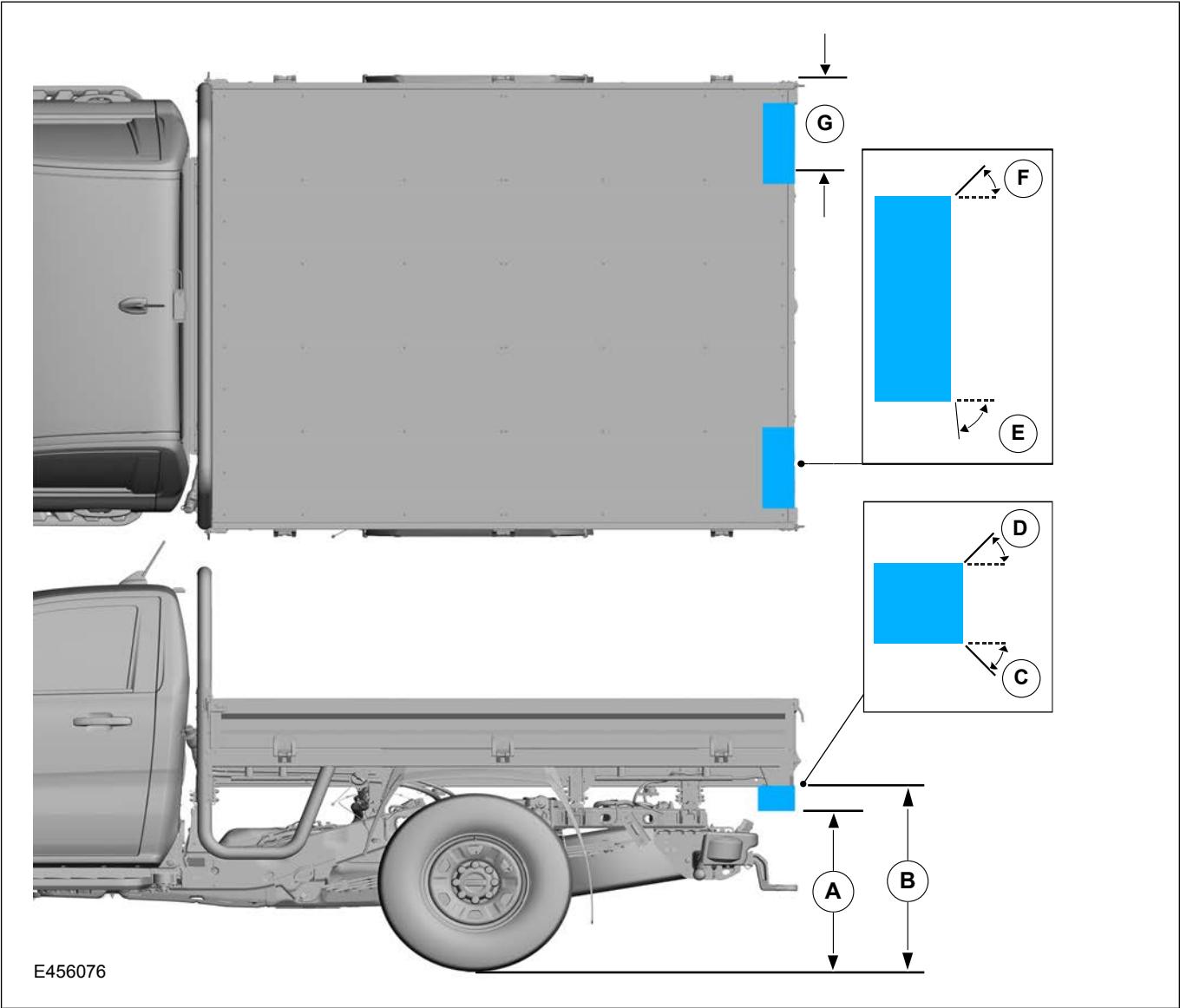
- Ensure that the vehicle is sitting on level ground and at a representative weight and loading distribution (ideally the loading and configuration with the most weight on front axle, least weight on rear axle). Most nose-down attitude.
- Where fitted, zero the headlamp adjuster next to the headlamp switch (per image below).
- Observe the headlamp aim down-angle moulded into the headlamp upper surface (refer images below left). 1.0% example indicates the beam cut-off should drop 10mm for each 1000mm distance from the headlamp.
- Follow the adjustment procedure as defined in the WSM.



E459022

Item	Description
1	Horizontal centre line
2	Vertical centre line
A	Down angle indicator
B	Headlamp leveling switch

4.6.3 Rear Combination lamps



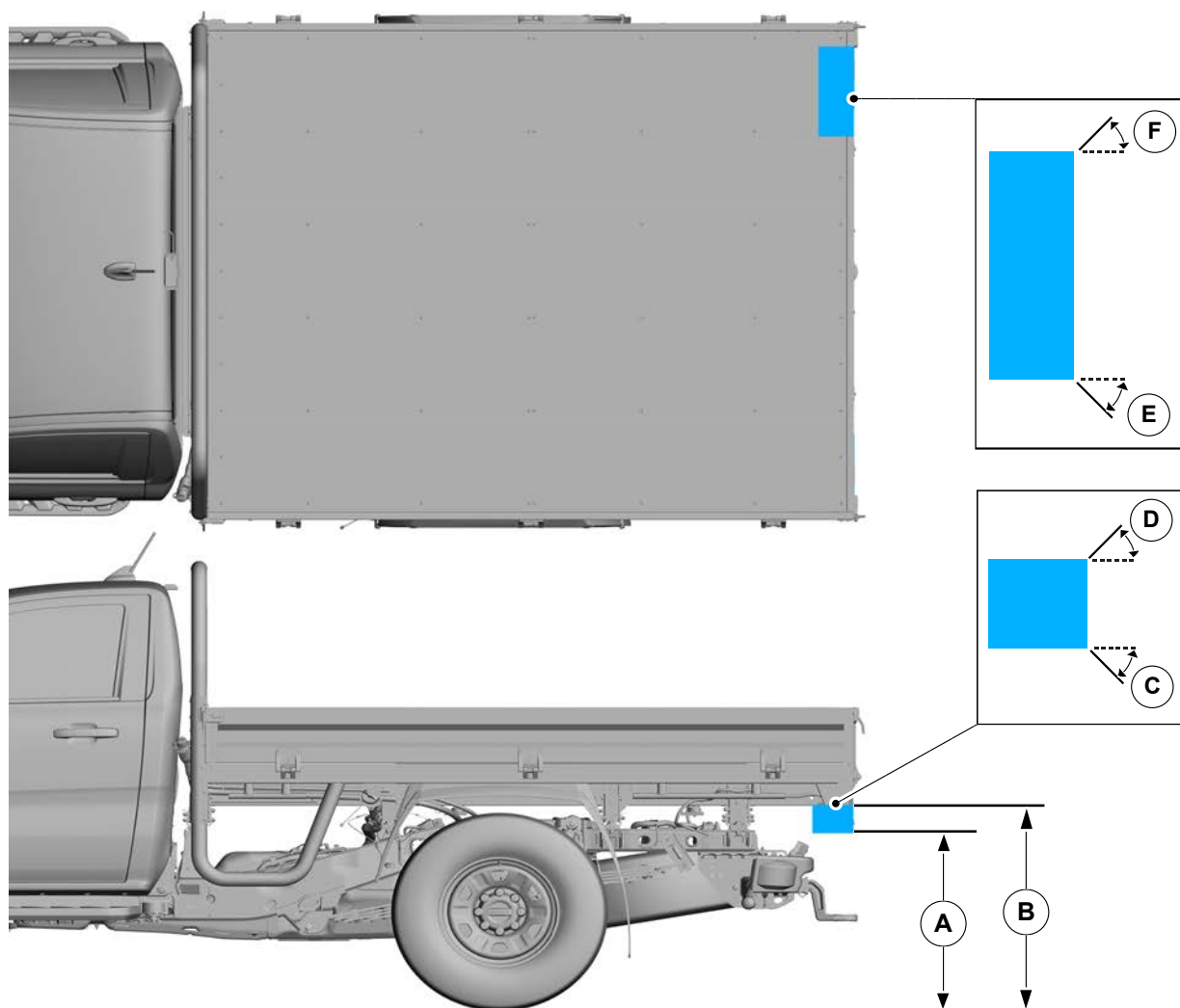
Positioning of Rear Combination Lamps

Description		Dimension
A	Minimum distance from ground to lower edge of lamp	500mm
B	Maximum distance from ground to upper edge of lamp	1200mm
C	Minimum angle of obstruction free zone downwards of the lamp	15°
D	Minimum angle of obstruction free zone upwards of the lamp	15°
E	Minimum angle of obstruction free zone towards the outside of the vehicle	80°
F	Minimum angle of obstruction free zone towards the centre of the vehicle	45°
G*	Maximum distance from outer edge of vehicle (excluding mirrors) to incorporate brake, tail and indicator lamps (complete or partial)	400mm

* Refer to ECE R48 / ADR43 for more information.

4.6.4 Rear Fog Lamp

NOTE: Where only one rear fog lamp is fitted, it must be positioned on the vehicle centre line, or to the drivers side of the vehicle.

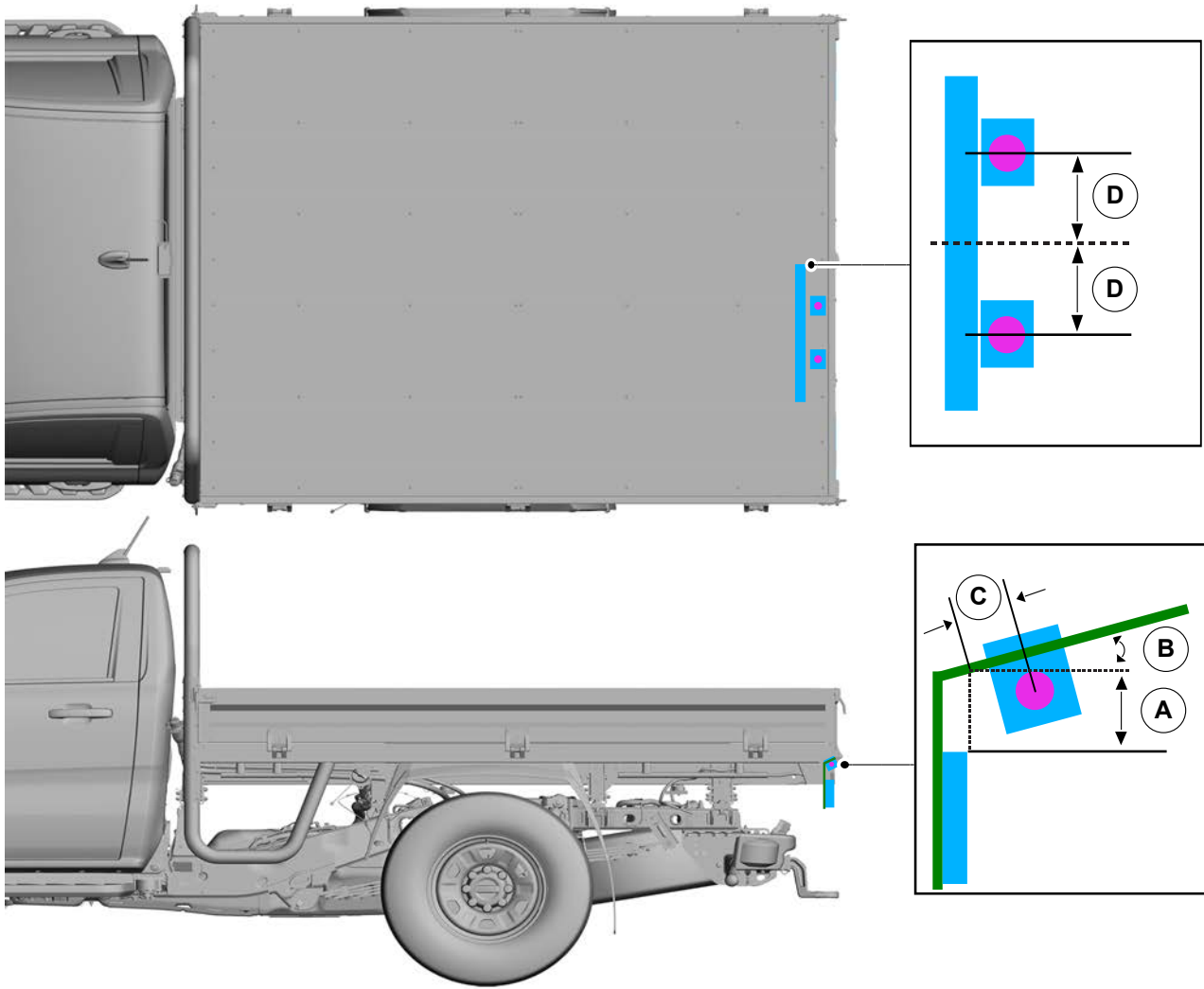


E456348

Positioning of Rear Fog Lamp

Description		Dimension
A	Minimum distance from ground to lower edge of lamp	250mm
B	Maximum distance from ground to upper edge of lamp	1000mm
C	Minimum angle of obstruction free zone downwards of the lamp	5°
D	Minimum angle of obstruction free zone upwards of the lamp	5°
E	Minimum angle of obstruction free zone towards the outside of the vehicle	25°
F	Minimum angle of obstruction free zone towards the center of the vehicle	25°

4.6.5 Rear License Plate Lamp



E456349

Positioning of Rear License Plate Lamp (recommended)

Description		Dimension
A	Distance from rear face of license plate to centre of lamp along lamp mounting face	35mm
B	Angle between license plate and lamp mounting face	8°
C	Distance between top of rear face of license plate and lamp mounting face	35mm
D	Distance between license plate centre line and centre of lamp	One quarter of licence plate width (min 90mm, max 175mm)

4.6.6 Additional External Lamps

WARNING: Do not directly splice into the vehicle wiring in order to install auxiliary lamps or other electrical devices as it may overload the system and impact the operation of other vehicle systems.

When installing auxiliary tail lamps, Ford recommends that power is provided via the trailer tow module and associated circuitry. For all other additional exterior lamps, power must be taken through an auxiliary fuse box with a suitable switch and / or relay as required.

When installing auxiliary driving lights, power can be provided via a relay energised by the headlamp feed.

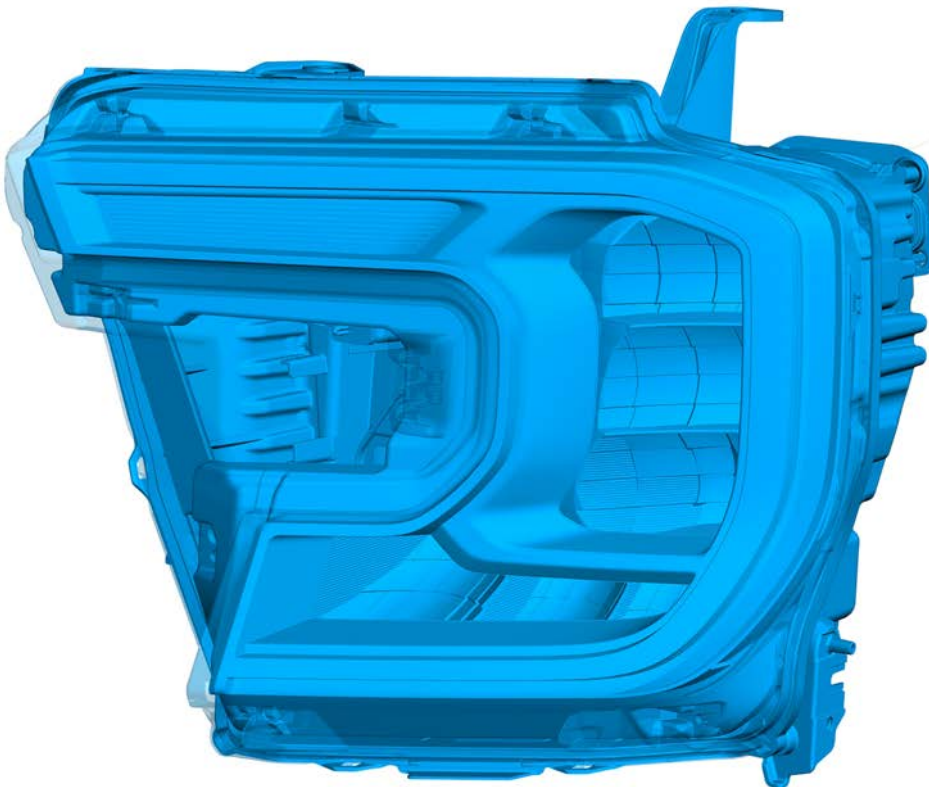
4.6.7 Headlamps - Connection of Auxiliary Driving Lamp Signal

Connection of auxiliary loads to trigger items such as relay driven driving light circuits can be supported.

NOTE: LH lamp shown, RH lamp similar.

Headlamp Level Identification

1



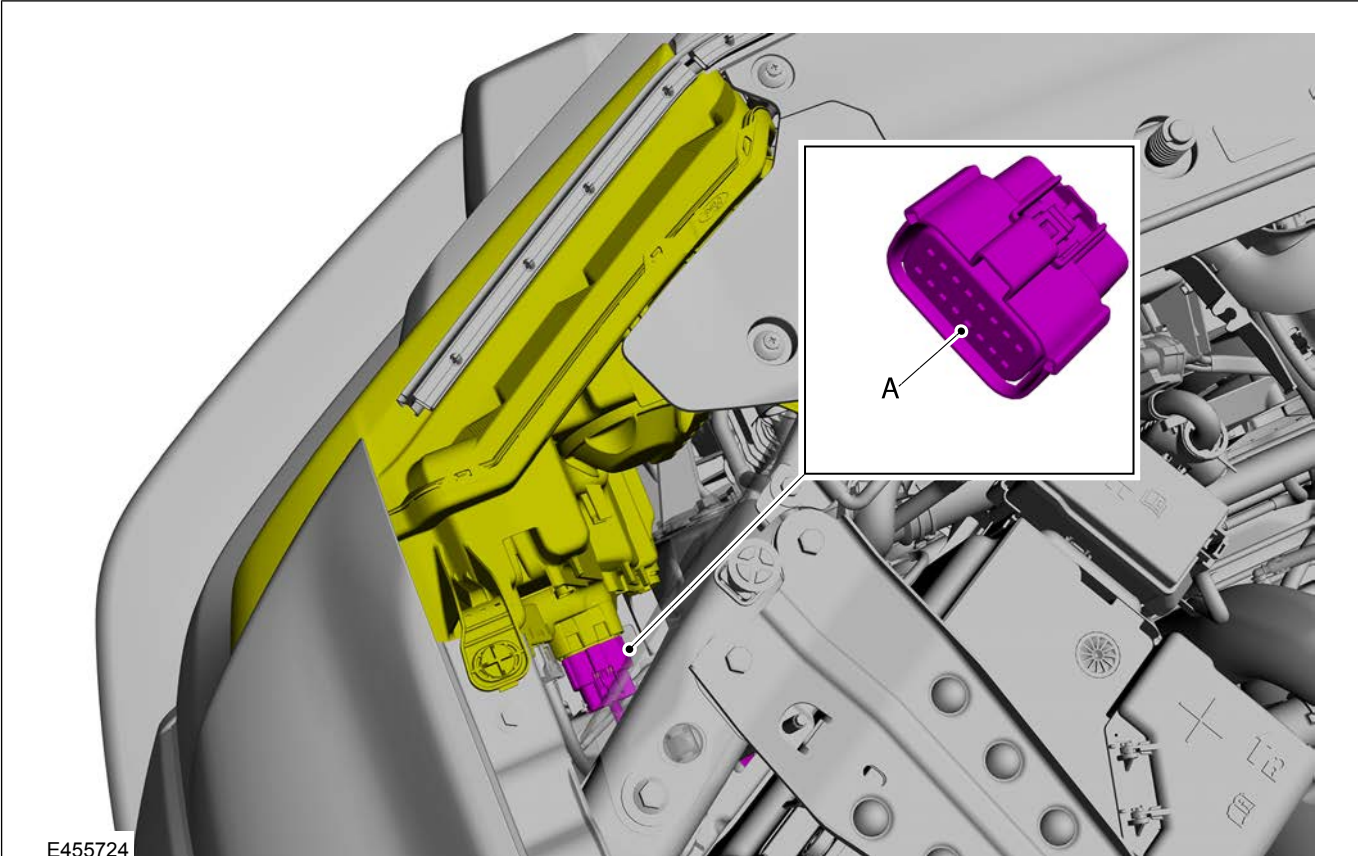
E455200

Item	Description
1	Headlamps - LED reflector

Connection of auxiliary loads to trigger a relay for solutions such as driving light activation is different for depending on the level of headlamp assembly equipped on the vehicle.

Connection of Auxiliary Loads - Headlamps

Headlamps - Low Beam Connection



Item	Description
A	Low beam = Connector C1 Pin 1

Signals are available on the harness side.

Headlamps - High Beam Connection



E375900



CAUTION: Do not connect auxiliary loads directly to the headlamp high beam wiring. Damage to the headlamp control components may result.

NOTE: Right Hand Drive vehicle shown, Left Hand Drive vehicle similar.

Connection of auxiliary loads triggered by the headlamp high beam being switched on is via a pre-installed blunt cut wire located in the passenger foot well, behind the kick panel on the main harness. A blunt cut wire will be tagged to suit such a connection.

The signal can be used via an external relay for a variety of Converter applications, subject to load required.

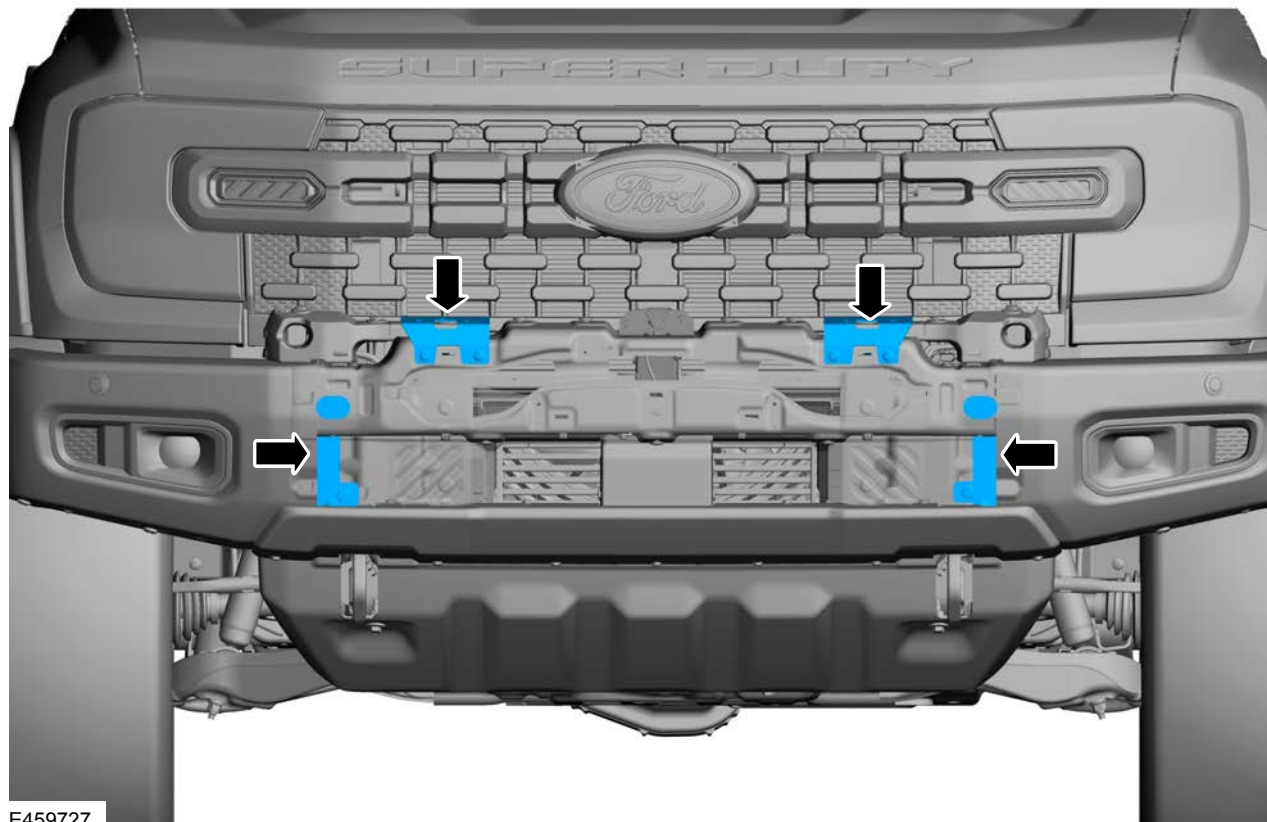
- Wire colour Grey/Brown (GY/BN) - 6 Amps maximum

Headlamp Fuse

Lighting Fuses		
F100	20A	Headlamp LH/RH

4.6.8 Driving Lamps - Auxiliary Bracket Addition

Vehicles with a Steel Bumper, a bracket kit (part number: AMR1WJ-13E006-AA) has been developed to allow driving lights to be mounted. The brackets provide additional reinforcements through to the Frame-mounted Bumper Attachment Structure to ensure the durability performance of the bumper is maintained when driving lamps are fitted. A maximum weight of 3.3kg per lamp should not be exceeded (ARB Solis 9-inch lamp unit, or equivalent). The full set of four brackets in this kit must be fitted when driving lamps are mounted in this location.



4.6.9 Brake (Stop) Lamps

Provision for additional Brake (Stop) Lamps is available via a blunt cut wire located behind the kick panel on the inside of the vehicle A-pillar.

- Wire colour Yellow/Grey (YE/GY) - 1.75 Amps maximum

4.6.10 Position (Park) Lamps



E387821

A Position (Park) lamp signal is available as a blunt cut wire taped back against the harness branch located behind the kick-panel on the LHS A-Pillar.

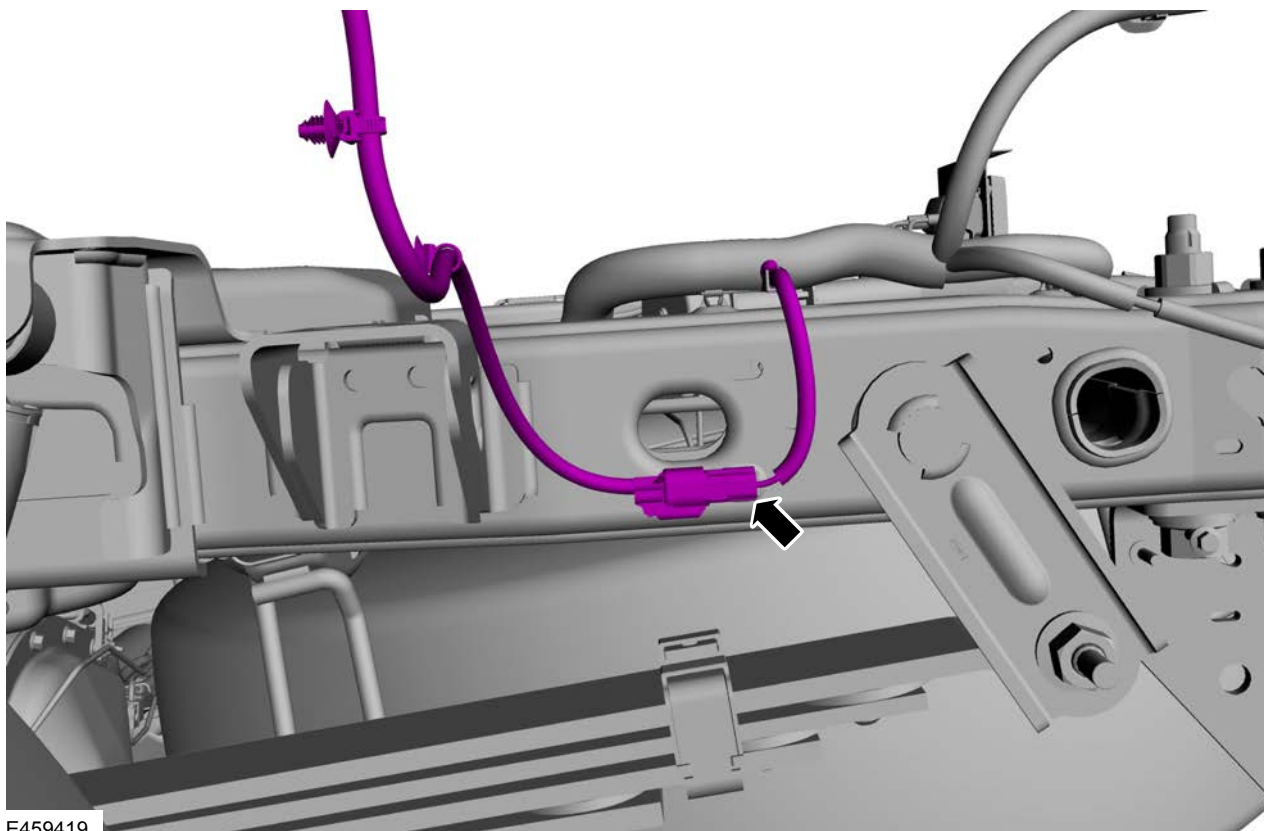
- Wire colour Blue/Grey (BU/GY) - 4.7 Amps maximum

4.6.11 Loadbox / Tub - Lighting Connections

The loadbox / tub lighting circuit is controlled via zone lighting on the centre screen.

- Wire colour White/Green (WH/GN) - 1.6 Amps maximum (both sides combined)

The loadbox / tub light lamp signals are available on each side of the chassis frame.



E459419

NOTE: LHS Shown, RHS Similar

Ford recommends that all trailer tow electrical connections use the genuine Ford accessory trailer tow kit(s) available in your market.

4.6.12 Trailer Towing - Lighting Connections

WARNING: Do not directly splice into the vehicle wiring in order to install aftermarket trailer tow kits as it may overload the system and impact the operation of other vehicle systems.

Refer to: 2.3 Brake System (page 37).



E387821

NOTE: This trailer brake wire provides a pulsed brake signal of varying frequencies, not a direct (DC) signal.

A Trailer Brake signal is available as a blunt cut wire taped back against the harness branch located behind the kick-panel on the LHS A-Pillar.

- Wire colour Yellow/Grey (YE/GY) - 2.1 Amps maximum

Trailers Equipped with LED (light emitting diode) lamps

Most trailers, caravans, camper trailers etc are now fitted with LED lamps. There are many different sizes, configurations & quality in the market place.

The Trailer Tow Module (TTM) can support pure LED trailer lamps as long as each circuit exceeds 500mA, below this and the system will not detect a trailer has been connected and shuts down all outputs (sleep mode). It is recommended to target a 550mA minimum load to allow for system tolerances.

If the LED lamps on the trailer fall outside specific tolerances, customers can experience the following symptoms on the vehicle when LED trailer lamps are connected to the vehicle:

- LED trailer lamps flickering when lamps are not in use
- DAT (Driver Aid Technology) not being disabled
- Rear park sensors (where fitted) continually fire in Reverse gear when a trailer is connected to the vehicle
- Vehicle does NOT acknowledge that a trailer has been connected when it has (either through Icon on centre screen OR message on the instrument cluster Multi-Function display)
- "Check trailer park lamps" OR "Check trailer brake lamps" warnings appear on the instrument cluster Multi-Function display

In order to correct this, supplemental load resistors would need to be used to meet the target system tolerances.

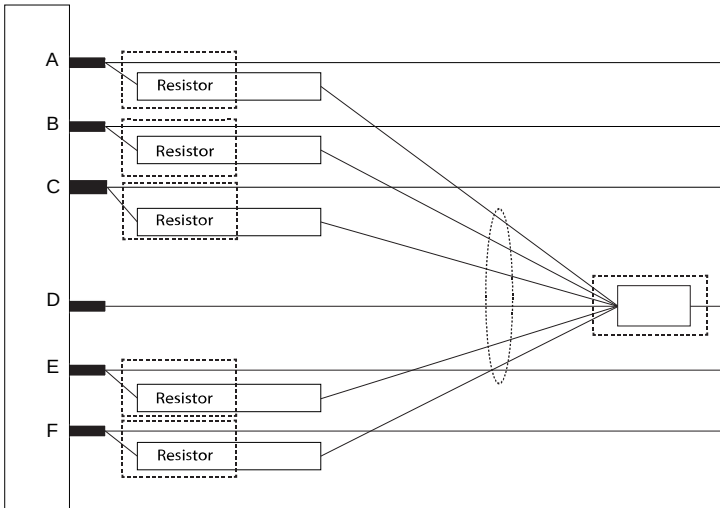
CAUTION: Do not connect the patch harness to the vehicle when the trailer is not connected.

NOTE: A RESISTOR PATCH HARNESS should be used between the vehicle & the trailer to address these issues (12 Pin example below).



E371558

The Resistor Patch Harness consists of multiple 2W, 120 Ohm resistors as shown in the schematic below. This could also be incorporated directly into the trailer-side wiring if a more permanent solution is desired. Do not apply this to the vehicle-side wiring. This should only be in effect when a trailer is connected.



E434083

Item	Description
A	LH turn indicator lamp
B	RH turn indicator lamp
C	Stop / brake lamps
D	Ground
E	RH tail lamp (where applicable)
F	Tail lamps (all or LH where applicable)

Trailer Towing Lighting Connection - System Recommendations

NOTE: Not all features and outputs are supported in all markets. Refer to your authorised Ford Dealer for further information.

NOTE: The trailer detect circuit is part of the Ford Trailer Tow module, it can only be implemented on vehicles with power locking and perimeter or CAT 1 alarms.

Each output driver can handle a current of 15A but it is not recommended to always run to this maximum. A higher current is interpreted as short circuit. If a short circuit is detected the related output will be switched off. The following table shows the recommended output maximums per circuit.

Trailer Module Connections - Super Duty

Connector Number	Trailer Tow Connector (AS4177.5-2004)			Feature	Max Current @ 12.5V
	12-Pin Flat Terminal	Colour	Gauge (mm²)		
J6 Connector (C2498A 10-Pin)					
1	1	Yellow (YE)	1.5	Left Turn Signal	3
2	4	Green (GN)	1.5	Right Turn Signal	3
5	11	Grey (GY)	1.5	Rear Fog Lamp	2
6	2	Black (BK)	1.5	Reverse Lamp	4
7	6	Red (RD)	1.5	Stop Lamps	4
9	7	Brown (BN)	1.5	Position Lamps	7
3	n/a	n/a	n/a	Trailer Detect - Perimeter Alarm	-
J3 Connector (C2498A 14-Pin)					
12	8	Orange (OG)	2.5	Battery Charging - where used	15
14	5	Blue (BU)	1.5	Trailer Brake Control	24*
Additional					
n/a	9	Pink (PK)	2.5	12V Power (B+) - Battery (PAAT)	15**
n/a	3	White (WH)	2.5	Ground	-
n/a	10	White (WH)	4.0	Ground	-
n/a	12	Violet (VT)	1.5	Aux - pigtail only - not connected	-

All values above represent the engine-on operating condition.

* If the detected current is less than 4A while actively braking the vehicle may show a "Trailer Disconnected" warning (indicating that an element of the trailer braking system may not be functioning correctly).

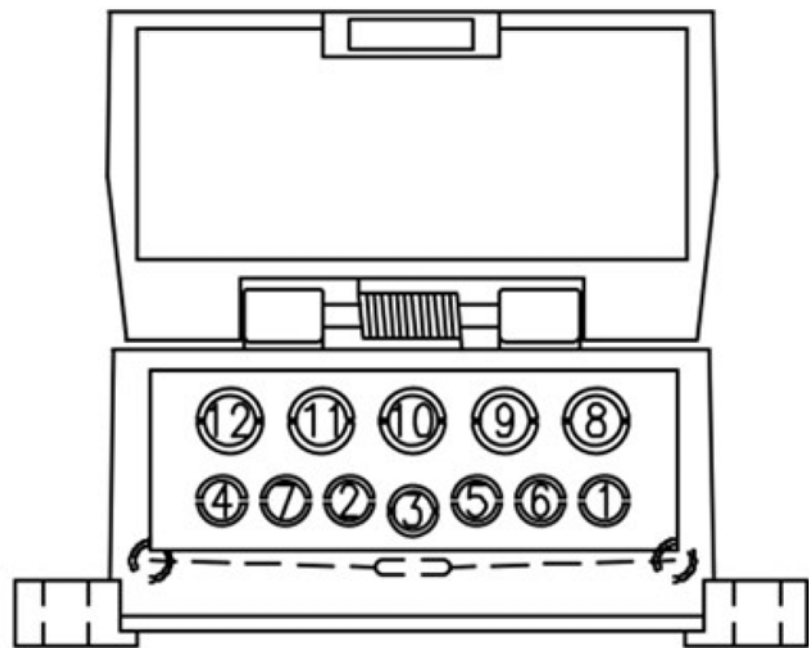
** 15A is available @ 12.5V. Higher current draws are possible as it is a direct connection to the battery (PAAT) via the PDB, however the voltage drop will increase accordingly. This circuit is fused at 30A.

The vehicle power supply system voltage can vary between 7 and 16V during normal operation.

Any equipment connected to these circuits should be robust to this range.

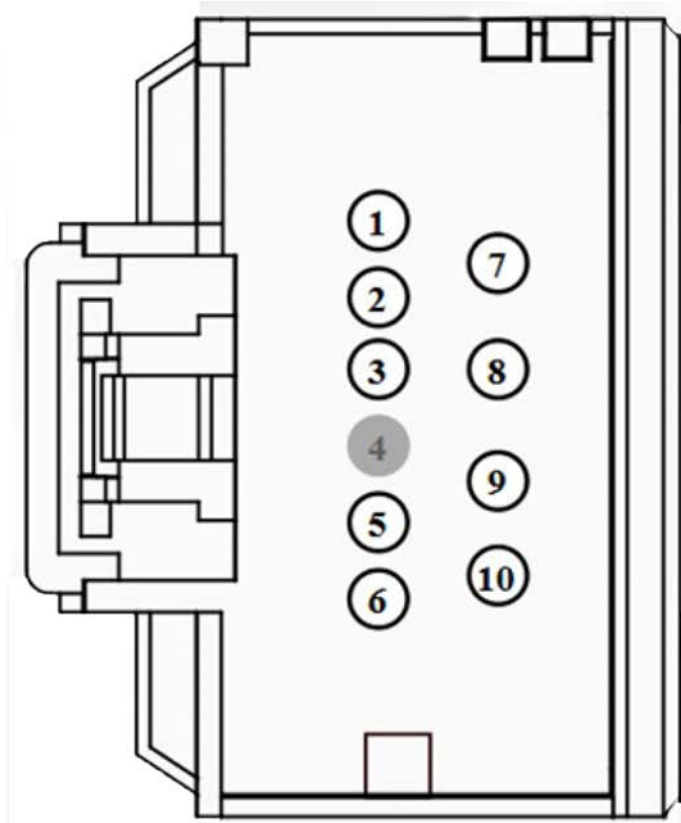
The trailer module can be accessed via the glovebox opening. Located above the LH kickpanel.

Trailer Socket - 12 pin flat (AS4177.5-2004)



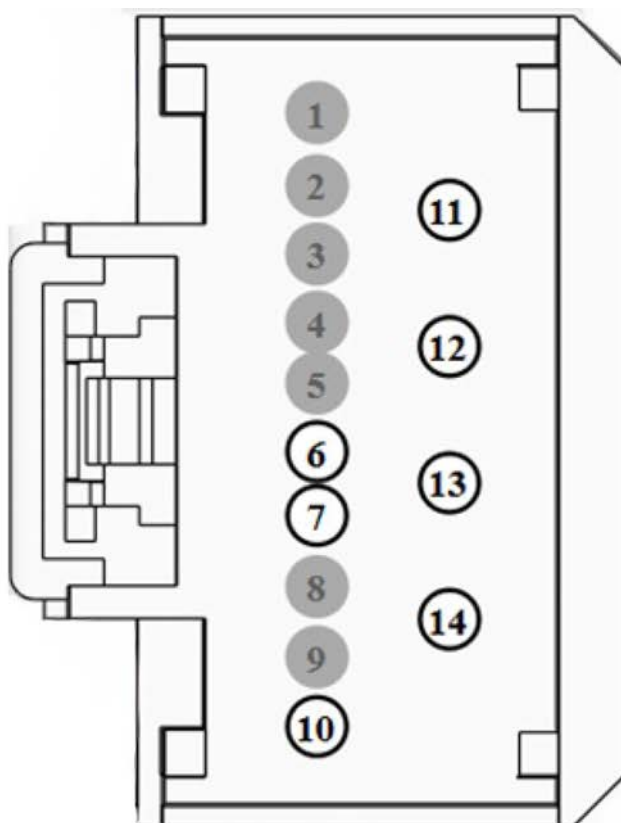
E466888

J6 Connector (C2498A 10-Pin) - Harness Side



E466782

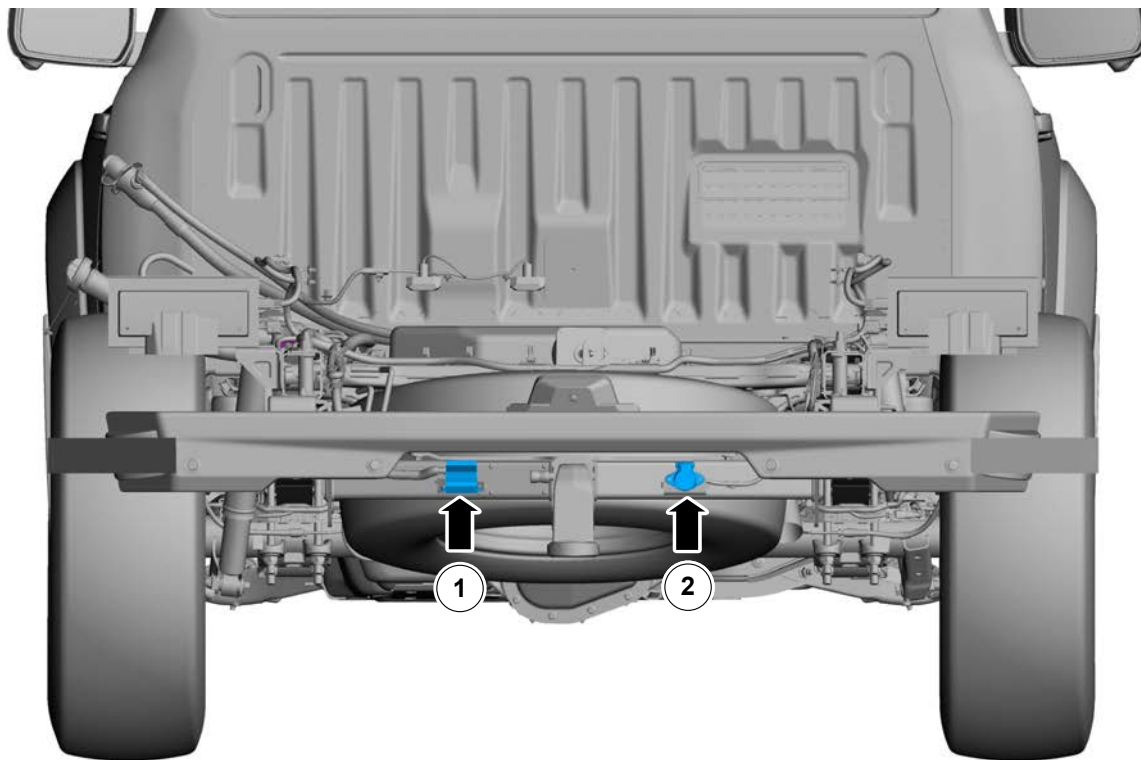
NOTE: The Grey Pins in the image indicates unused and empty pins at the connector.

J3 Connector (C2498A 14-Pin) - Harness Side

E466781

NOTE: The Grey Pins in the image indicates unused and empty pins at the connector.

For vehicles fitted without a tow bar as standard, a genuine Ford accessory trailer tow electrical kit has been developed to enable a tow bar to be installed. The kit comprises of the trailer towing control module, trailer plug, wiring and associated hardware components. Once the kit is installed, the vehicle must then be configured using a Ford FDRS diagnostic tool. This configuration can be performed by your Ford authorised dealer.



E459813

Item	Description
1	12 Pin flat - trailer connection
2	12 Pin round - trailer backup assistance sensor (Yaw Rate) connection

Powered Anderson Plug

The 50Amp Powered Anderson Plug kit may also be available in some markets as an accessory that can be purchased from authorised Ford Dealers:

- Part Number: VS1WZ-15A416-A

The Anderson plug kit is specifically designed to work with the Upfitter Switches and provides up to 50Amps high capacity current draw.

The Upfitter Switches and the 50A Anderson Plug only operate when the ignition is ON.

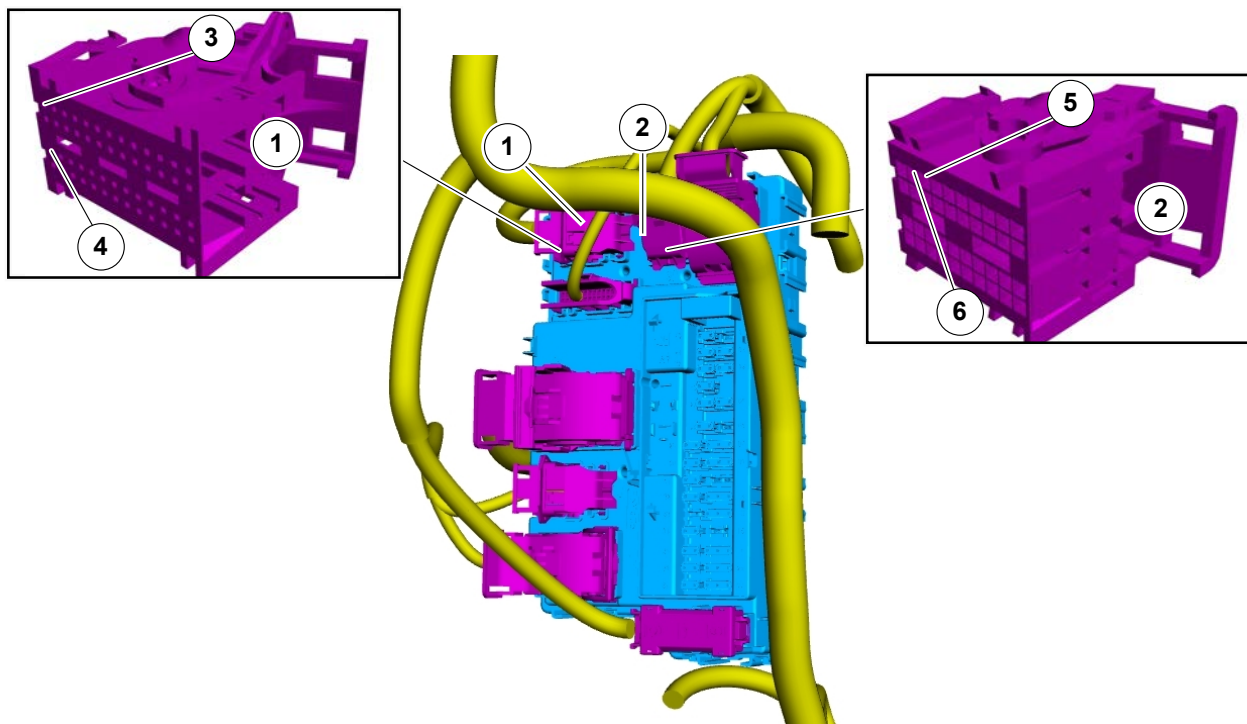
4.6.13 Lamps – Hazard / Direction Indication

The maximum permissible load with the standard system is:

- 3 x 5W – front and rear indicators + side repeaters (Left Hand Side)
- 3 x 5W – front and rear indicators + side repeaters (Right Hand Side)

NOTE: The maximum output of the turn/hazard signal is 3.2 amps.

Turn/Hazard lamp signals are available as an output from the BCM.



E364606

Item	Description
1	BCM Connector C5
2	BCM Connector C6
3	RH Rear Turn Signal Output = BCM Connector C5 Pin 52
4	LH Rear Turn Signal Output = BCM Connector C5 Pin 26
5	RH Front Turn Signal Output = BCM Connector C6 Pin 38
6	LH Front Turn Signal Output = BCM Connector C6 Pin 39

4.6.14 Interior Lamps



E387821

An Interior Lamp signal is available as a blunt cut wire taped back against the harness branch located behind the kick-panel on the LHS A-Pillar.

- Wire colour Grey/Violet (GY/VT) - 3.5 Amps maximum

4.6.15 Electrically Operated Door Mirrors

WARNING: Do not tamper with the base system (controlled by Central Junction Box and multiplex architecture) and any feeds taken from the associated wiring or controller.

NOTE: These options are not suitable for aftermarket or converter modification.

4.6.16 Centre High Mount Stop Lamp (CHMSL)

NOTE: When replacing the factory fitted CHMSL with a canopy mounted CHMSL, the same type must be used. Replace a bulb/incandescent type only with a bulb/incandescent. Replace an LED type only with an LED type.

NOTE: The maximum current load that can be applied to the CHMSL circuit is 2.5A for either incandescent globes or LED lamps. Do not exceed the rated load.

Centre High Mount Stop Lamp (CHMSL) usage must comply with ECE R48-04 or local regulations.

When installing a canopy equipped with a CHMSL, a feed for the CHMSL can be taken from the BCM (Connector 5 Pin 13).

4.6.17 Automatic High Beam Control

NOTE: The automatic high beam control feature will not function, or performance may be degraded if any conversion or installation is in the field of view of the front camera.

NOTE: The automatic high beam control feature will not function, or performance may be degraded if the vehicles ride height is increased, or decreased, or if the pitch of vehicle is modified.

Be aware, when no headlamp switch Auto Position is available (or Auto is not selected on the original switch), auto high beam control (provided with forward vision camera) will not be available or shown in the cluster.

4.6.18 Handbrake Signal

NOTE: On vehicles built with EPB there is no handbrake signal available. This system is controlled via CAN.

4.7 Cruise Control

4.7.1 Adaptive Cruise Control

CAUTION: For converted vehicles fitted with adaptive cruise control where vehicle mass or geometry is significantly altered, it is recommended that the radar vertical alignment system functionality is checked by a Ford dealer. For further information refer to Owner's Manual.

NOTE: Do not obstruct the cruise control radar, including the clearance zone. Any obstruction can block the radar from being able to detect objects in front of the vehicle.

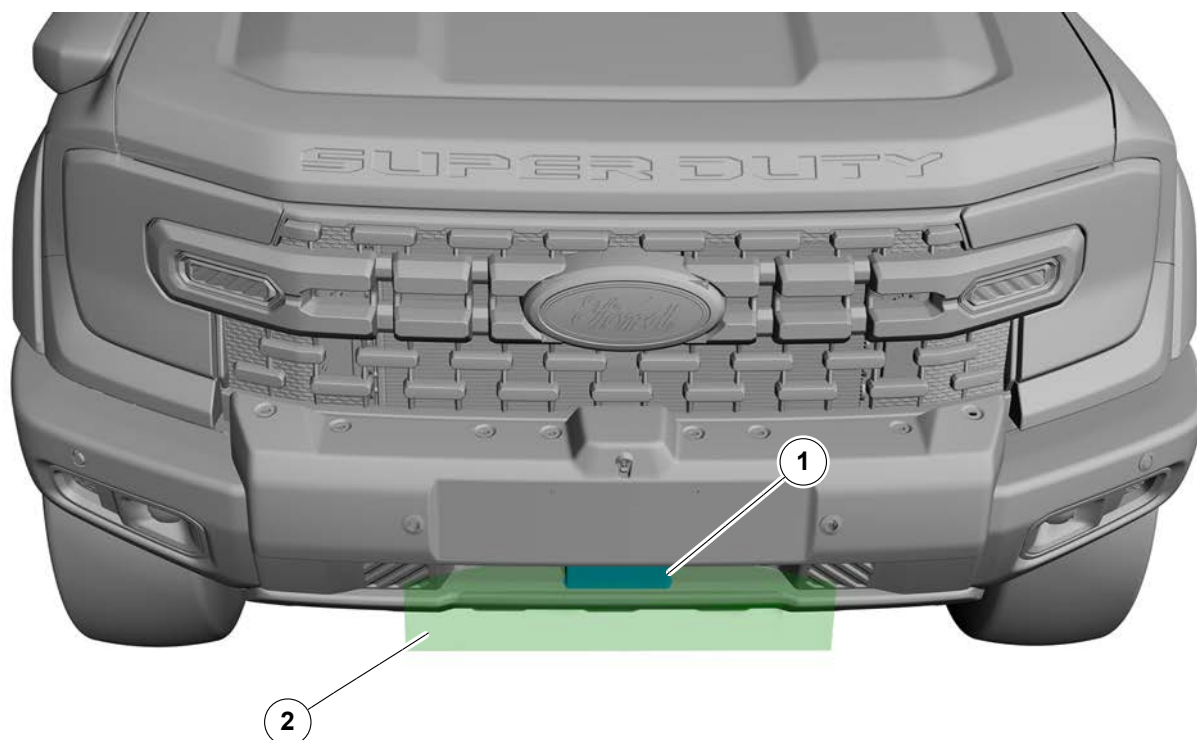
NOTE: Do not paint the front grille of the vehicle as this may affect the functionality of the cruise control radar. Different paint types and colours can have different effects on the radar beam and performance cannot be guaranteed.

NOTE: Do not alter the lower grille design as this will degrade the performance of the cruise control module.

NOTE: Do not move / change the location of radar as this will drastically degrade the performance of the cruise control module and its ability to detect objects reliably.

NOTE: Do not change / alter the mass and shape of the radar in such a way that it will change the radar pitch. Any changes in the radar pitch will deteriorate the efficiency of cruise control module either by decreasing the maximum detection range of the radar, its ability to detect high or low targets or its ability to detect objects without obstruction.

NOTE: Do not change or remove the radar cover as this will impact radar performance. This cover has been specifically designed to have minimal interference with the radar beam. Removing the cover opens the radar to environmental factors such as rain, road spray, snow and mud, and radar performance and long term durability of cannot be guaranteed.



E455224

Item	Description
1	Adaptive Cruise Control Module
2	Adaptive Cruise Control Radar Clearance Zone

4.8 Driver Assist Technology

⚠ WARNING: Modifications that affect the operation and alignment of driver-assist technologies may cause system malfunction and the potential for road accidents/injury and or death. Do not modify the Ford Driver Assist components.

Ford Driver Assist Technology is a suite of driver-assist technology features that variously utilize a radar and/or camera system. The radar and camera systems help provide features such as:

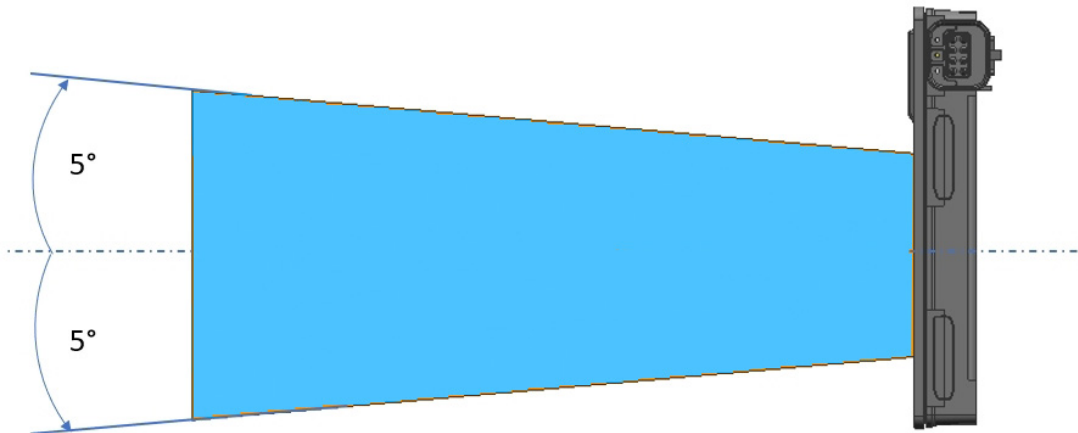
- Pre-Collision Assist with Automatic Emergency Braking (AEB)
- Forward Collision Warning
- Lane Keeping System
- Lane Departure Warning
- Automatic High Beam

- Adaptive Cruise Control with Stop-and-Go and Lane Centering Assist
- BLIS@ (Blind Spot Information System) with cross-traffic alert, trailer-tow monitoring and Lane Change Warning and Aid.

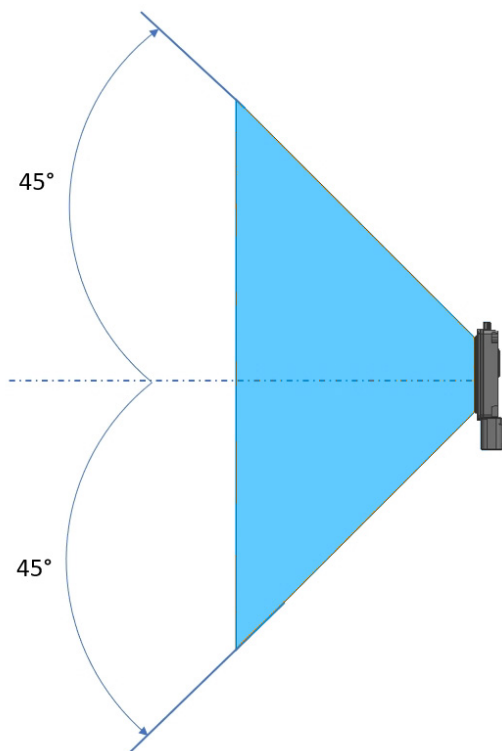
⚠ CAUTION: During any conversion work if the radar and cameras are disconnected and the vehicle battery is also disconnected, the radar and cameras must be re-connected before the vehicle battery is re-connected. Failure to follow these steps will cause error lights and fault codes, you may need to visit a Ford Dealer to have these error codes removed.

Installed upfitter equipment should not infringe on the radar or camera view zones. The CAD files of the radar and camera view zones are available upon request via the Ford BBAS web site (www.fordbbas.com/contactus) or consulting your local Ford Dealer or National Sales Representative.

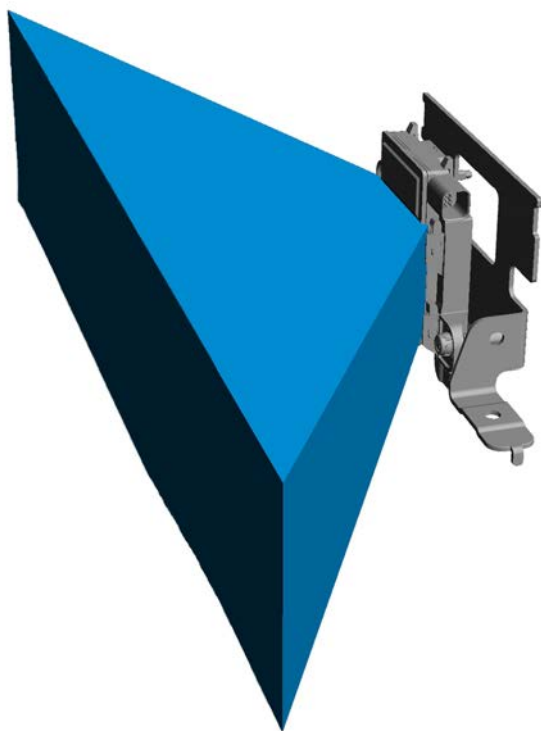
Radar View Zone - Side View



E375774

Radar View Zone - Plan View

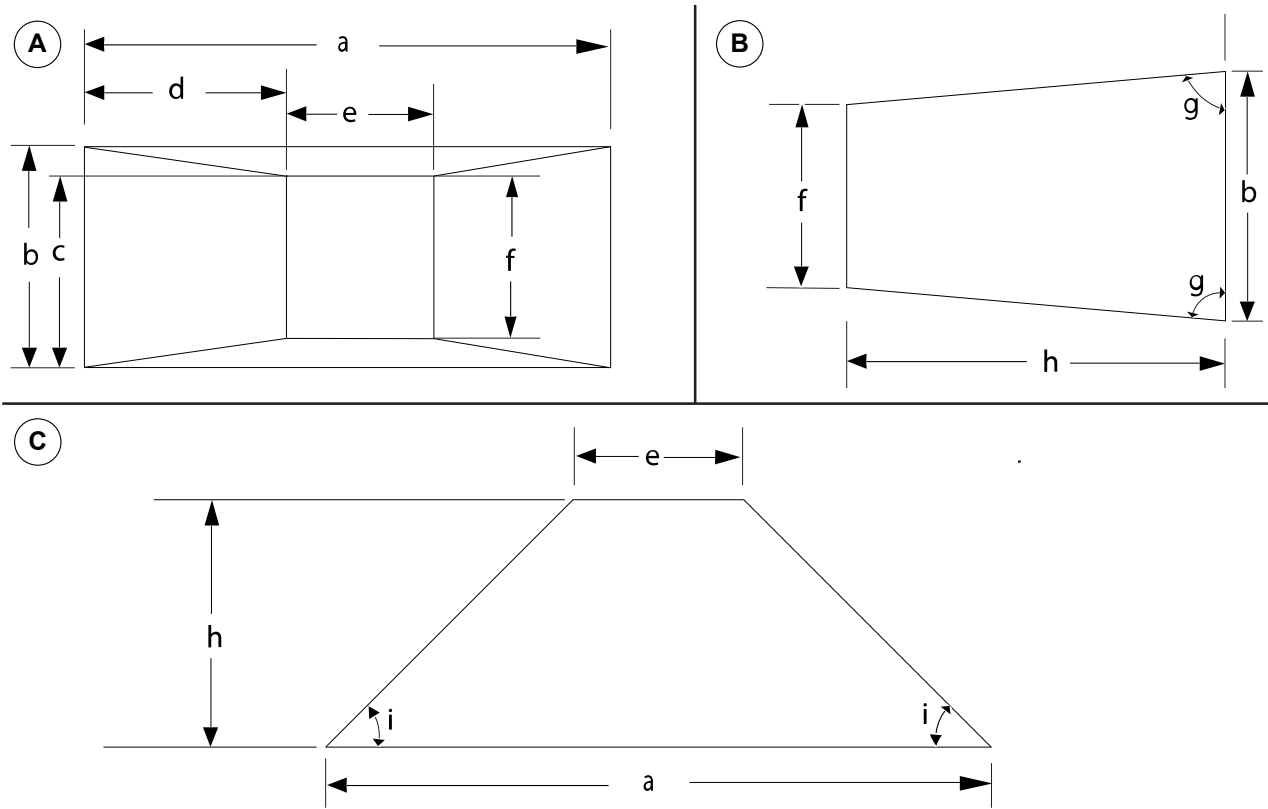
E375767

Radar View Zone Template

E434946

Installed upfitter equipment should not infringe on the radar or camera view zones. A template for creating a physical clearance zone is also shown below.

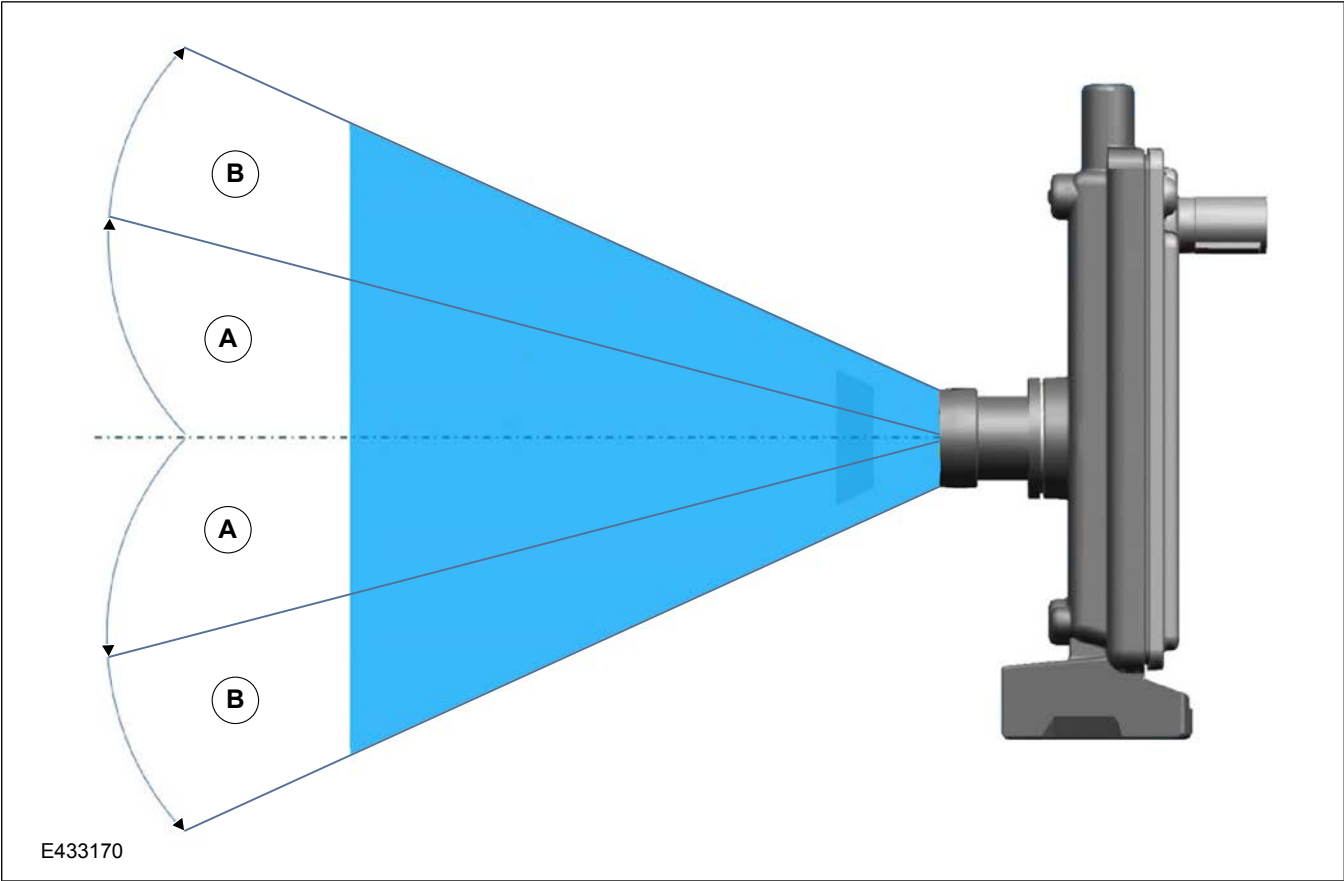
Radar View Zone Template Dimensions



E434949

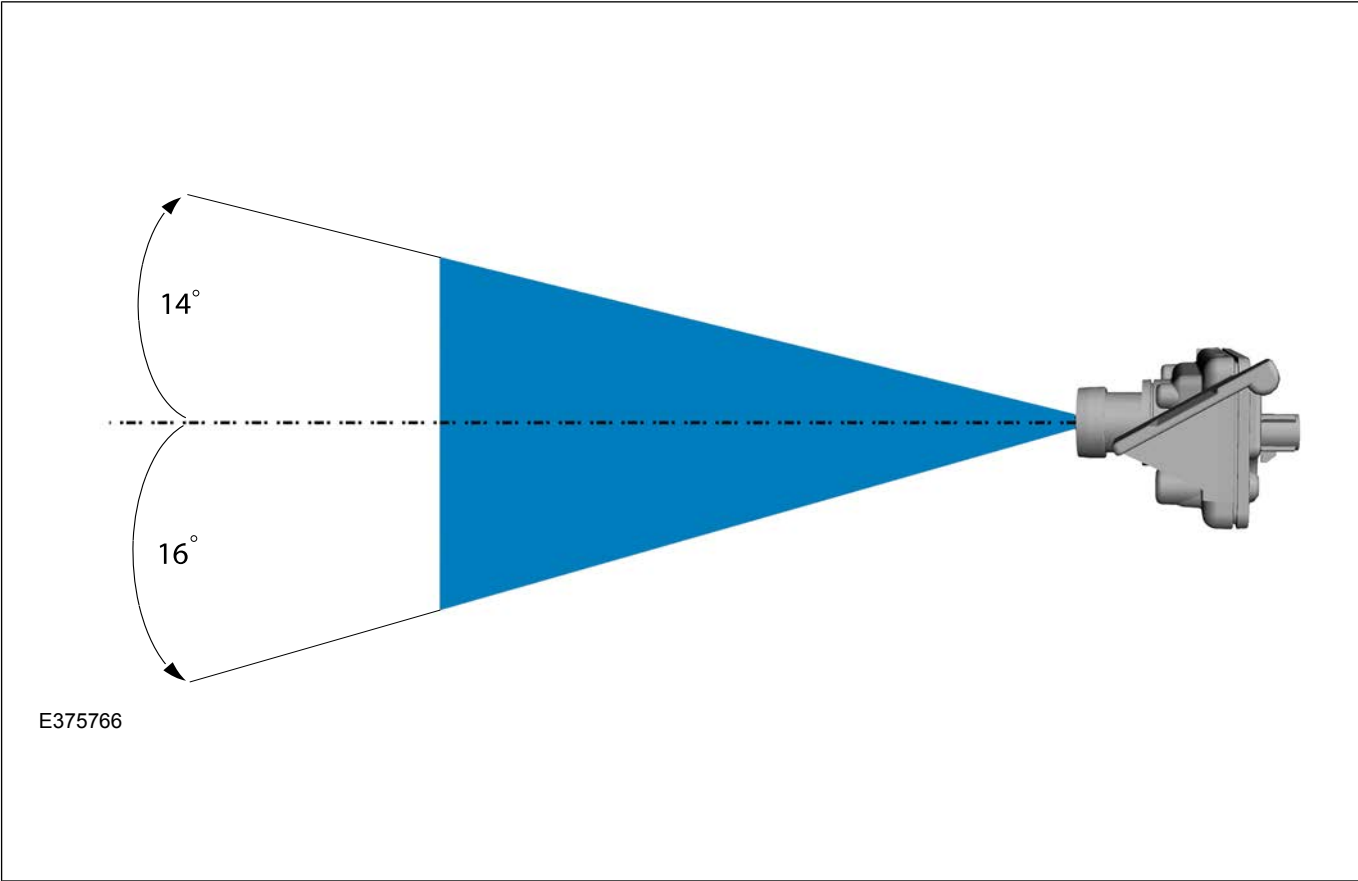
Dimensions	
A	Front View
B	Side View
C	Plan View
a	400 mm
b	90 mm
c	75 mm
d	167 mm
e	67 mm
f	60 mm
g	85 °
h	167 mm
i	45 °

Camera View Zone - Plan View



Item	Description
A	26° - Without Active Cruise Control
B	50° - With Active Cruise Control

Camera View Zone - Side View



Refer to the vehicle owner manual for further information on the driver assist features.

4.9 Blind Spot Information System

CAUTION: For converted vehicles fitted with Blind Spot Information System (BLIS) feature and Cross Traffic Alert (CTA) where vehicle mass or geometry is significantly altered, it is recommended that the radar vertical alignment is checked by a Ford dealer.

NOTE: Do not apply sticker / repair compound to these areas, this can deteriorate the performance of the system and block or impede the radar beam.

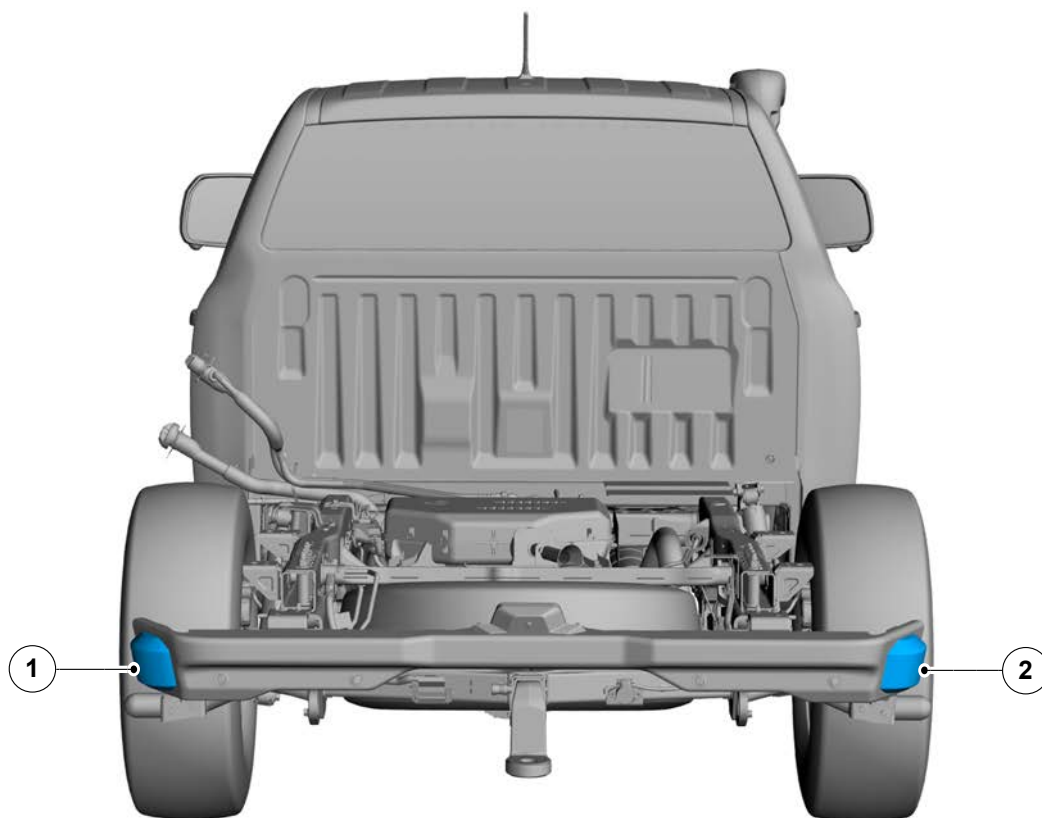
NOTE: The BLIS alert indicator(s) may turn on during heavy rain even though no vehicle(s) has entered the blind zone.

NOTE: If the BLIS sensors are altered, the BLIS and CTA alert indicator(s) may give false alerts or not detect objects.

NOTE: If the radar beam is blocked or obstructed, the BLIS and CTA alert indicator(s) may give false alerts or not detect objects.

NOTE: If your vehicle has a tow bar with factory equipped trailer tow module and it is towing a trailer, the sensor will automatically turn the BLIS and CTA off if you do not set up and select a valid trailer in the trailer menu. If your vehicle has a tow bar but no factory equipped trailer tow module, it is recommended to turn both off both BLIS and CTA manually. Operating the BLIS feature with a trailer attached but without the Blind Spot Trailer Tow package will cause poor system performance.

BLIS location



E455660

Item	Description
1	BLIS Radar housed in LH side of the DAT bar
2	BLIS Radar housed in RH side of the DAT bar

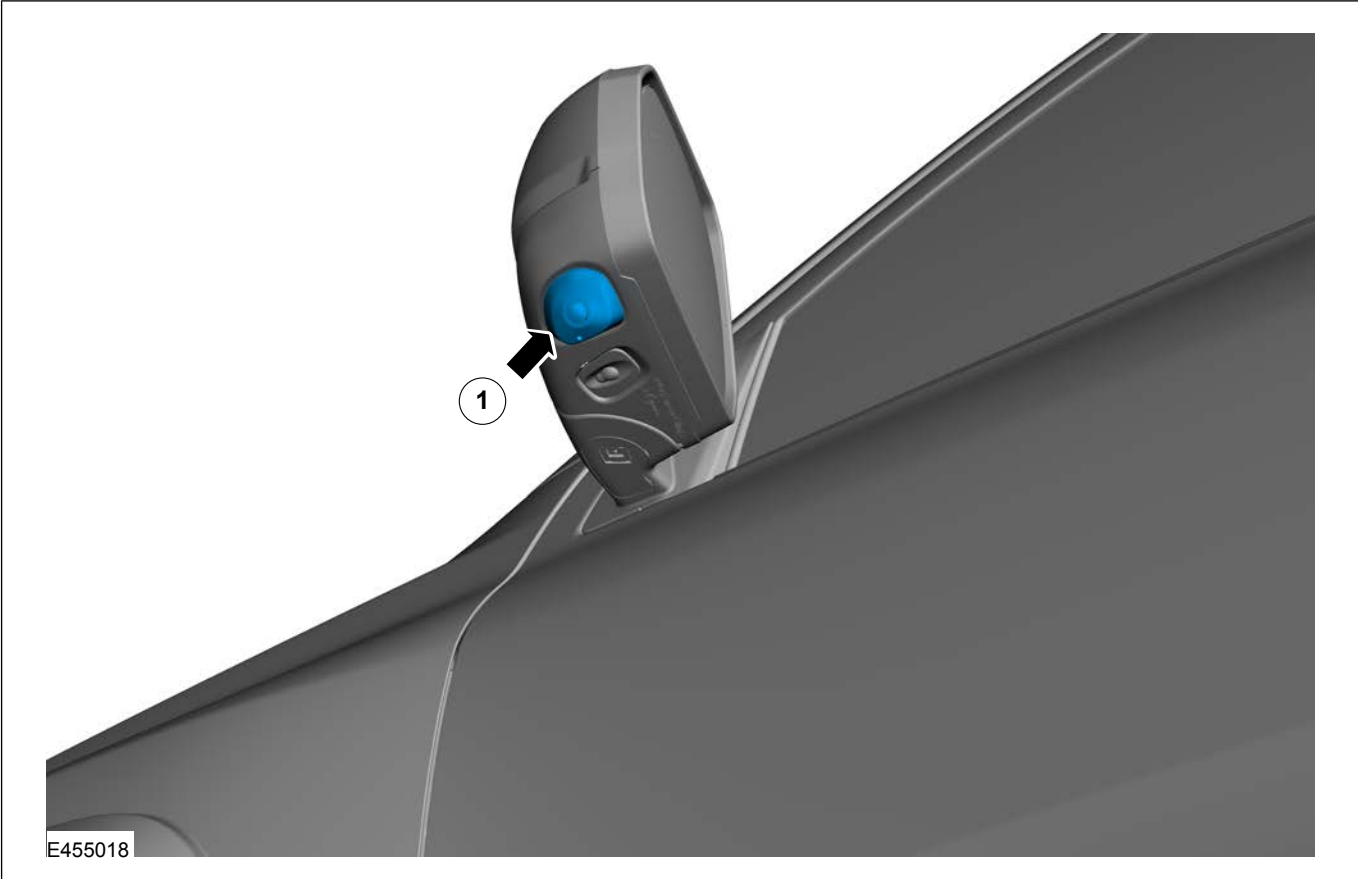
4.10 Side View Camera

⚠ WARNING: You are responsible for controlling your vehicle at all times. The system is designed to be an aid and does not relieve you of your responsibility to drive with due care and attention. Failure to follow this instruction could result in the loss of control of your vehicle, personal injury or death.

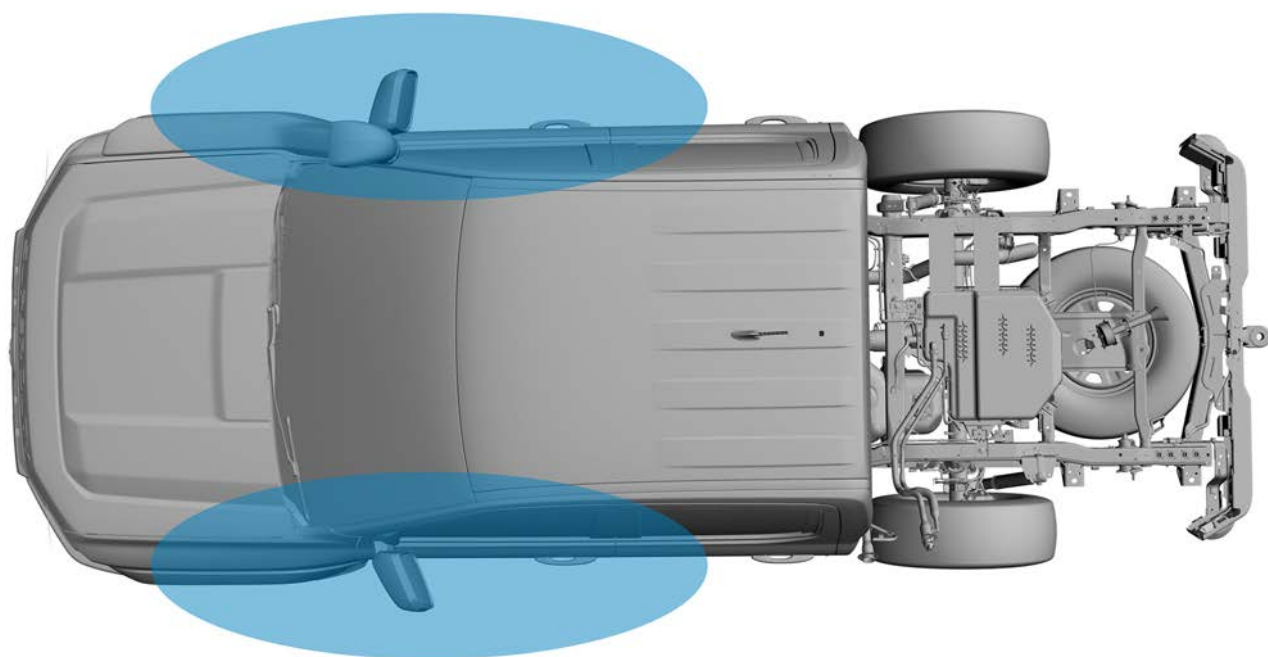
⚠ CAUTION: The 360 degree camera system still requires the driver to use it in conjunction with looking out of the windows, and checking the interior and exterior mirrors for maximum coverage.

Side view cameras located on the underside of the exterior rear view mirrors form part of the 360 Degree Camera System. Any modification to the exterior of the vehicle should ensure that the function and installed position of the side view cameras is not impeded.

Side View Camera Location



Item	Description
1	Side View Camera (LH Shown, RH Similar)

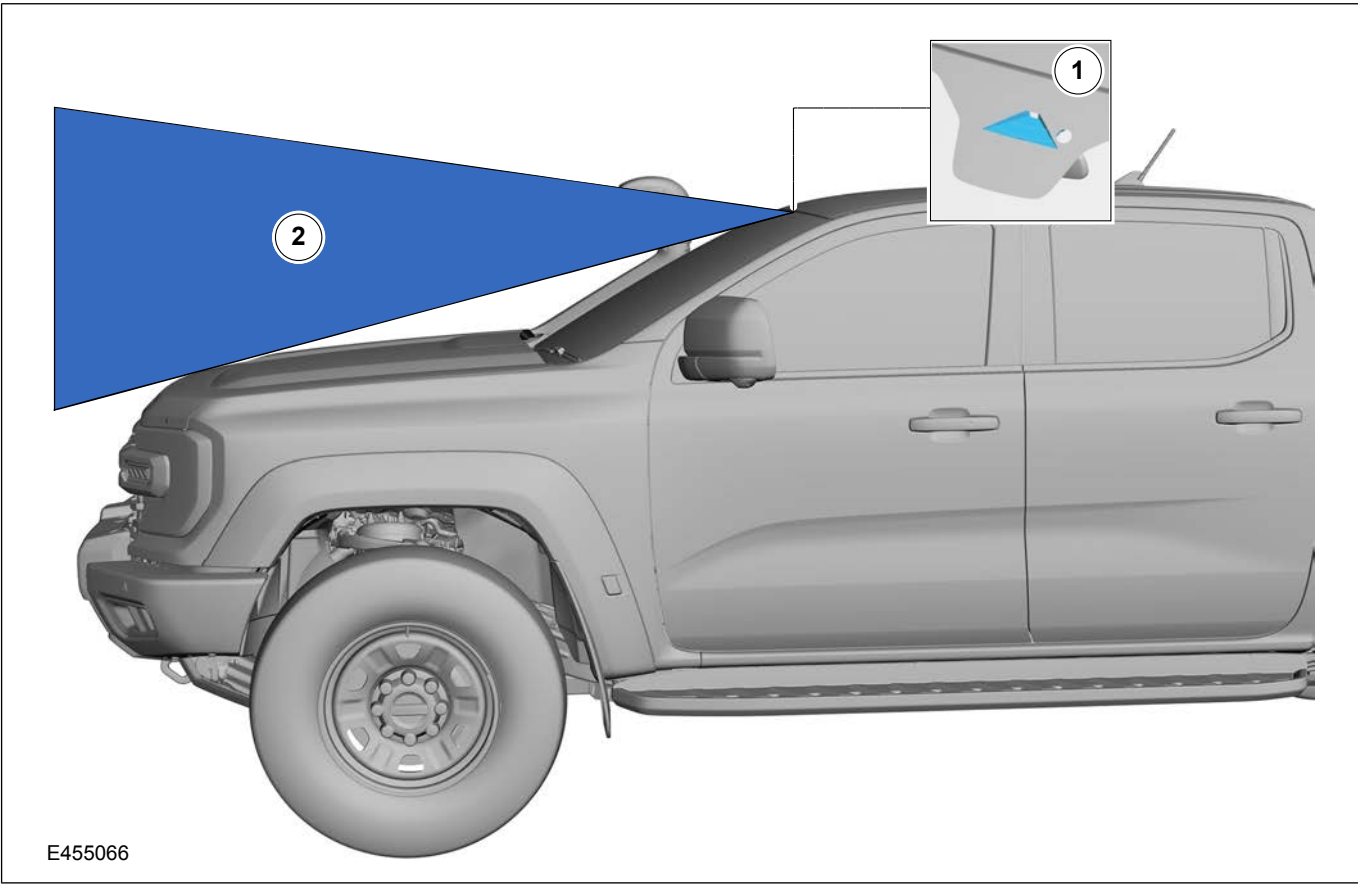
Side View Camera View Areas

E455106

4.11 Lane Keeping System

NOTE: The lane keep alert feature will not function if any conversion or installation is in the field of view of the lane keeping system camera.

NOTE: For converted vehicles fitted with the lane keeping system, where vehicle mass or geometry is significantly altered, a new calibration for the camera needs to be made. See your local Ford dealer or contact your national sales agent for further information.



Item	Description
1	Lane Keeping System Camera located behind the interior rear view mirror trim
2	Viewing field of view from camera

Please refer to the Adaptive Cruise Control section for further considerations.

Refer to: [4.7 Cruise Control \(page 107\)](#).

4.11.1 Lane Centering Assist

NOTE: The lane centering assist feature will not function, or performance may be degraded if any conversion or installation is in the field of view of the front camera.

NOTE: For converted vehicles fitted with the lane centering assist feature, where vehicle mass or geometry is significantly altered, a new calibration needs to be made.

NOTE: The lane centering assist feature will not function, or performance may be degraded if the vehicles ride height is increased, or decreased, or if the pitch of vehicle is modified.

NOTE: The lane centering assist feature will not function, or performance may be degraded if the vehicles track width is modified.

4.12 Handles, Locks, Latches and Entry Systems

4.12.1 Central Locking

NOTE: Additional/auxiliary locks will not be integrated with the vehicle alarm or operate BCM controlled lighting.

The central locking function is controlled by the BCM (located under the instrument panel). The vehicle locks are operated by Field Effect Transistors (FETs) in the BCM.

It is possible to add an additional / auxiliary lock(s) with the use of relays triggered by the BCM outputs.

BCM Output for Central Locking

BCM Connector	Pin	Function
C3	35	CTRL MOD. - DOOR LOCK # ALL LOCK
C3	32	CTRL MOD. - DOOR LOCK # ALL UNLOCK

CAUTION: In addition to two relays, two diodes are required to prevent signal back-feed into the relays & BCM. Failure to follow these instructions may result in accumulated error codes and eventually lead to permanently reduced or limited BCM functionality.

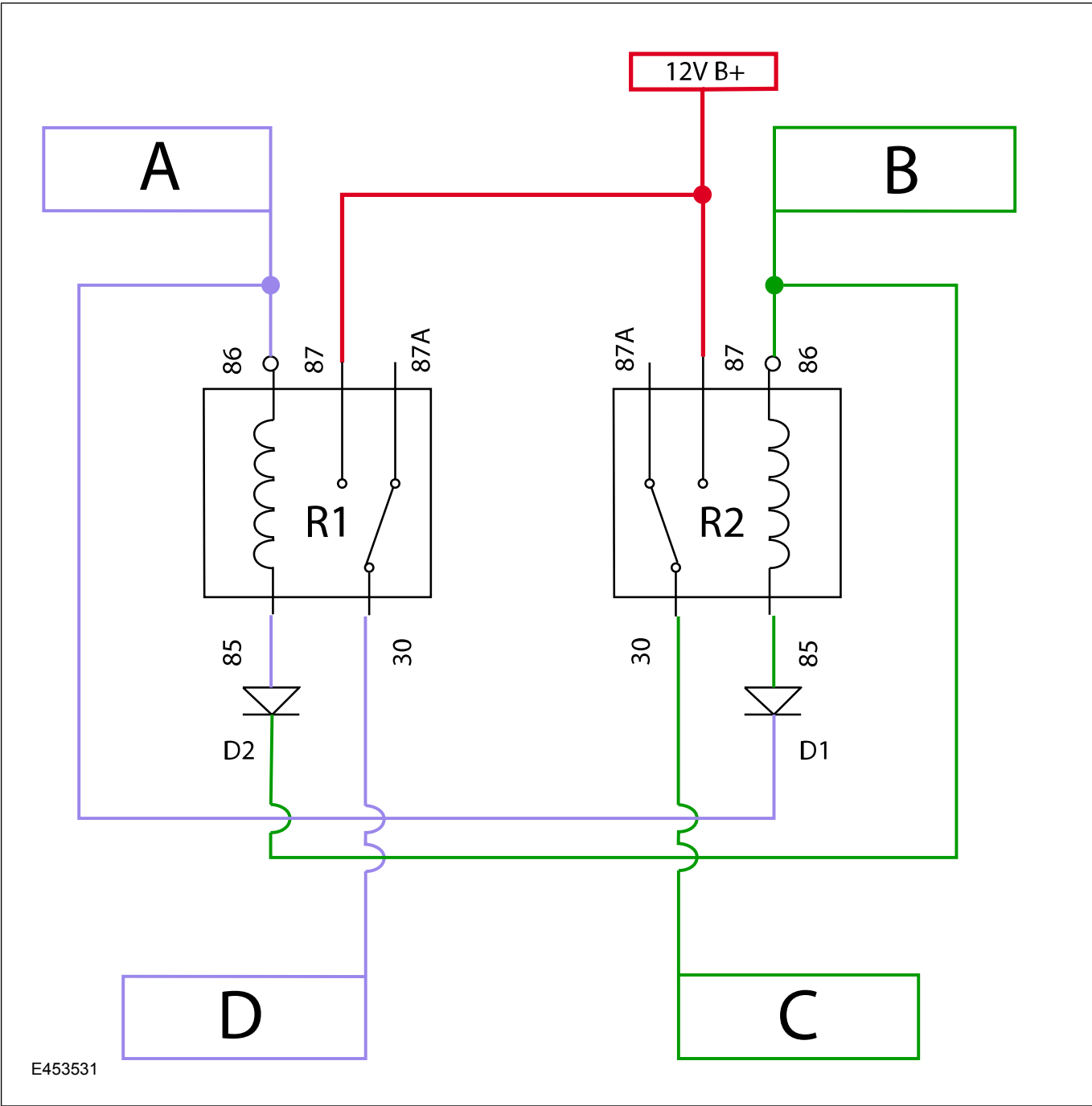
NOTE: The location of additional relays should be considered carefully. A suitable mounting location away from the passenger compartment will allow for more robust functionality and reduced noise. Depending on the functionality required, the pins used will emulate the basic locking/unlocking operation of an existing lock.

12V Power (B+) for the additional relays should be taken from a suitably fused B+ feed. The relays should be sized to suit the auxiliary actuators being used. The BCM outputs are active for 110ms when a lock or unlock command is requested. Relays and auxiliary locking mechanisms should be selected to be compatible with this pulse duration.

We recommend verifying correct operation after installation and also scanning the vehicle for fault codes. The vehicle needs to be placed in an ignition off state (can be either locked or unlocked) for 15 minutes and then placed in ignition on prior to checking for these codes. The presence of any of the following error codes indicates incorrect installation and further investigation and rectification should be conducted.

DTCs: B1585-11, B1586-11, B1587-11 and/or B1588-11 ("Circuit Short To Ground")

Schematic diagram showing the required configuration



Item	Description
A	Vehicle Lock Signal (BCM C3-35)
B	Vehicle Unlock Signal (BCM C3-32)
C	To Auxiliary Actuator(s) Unlock
D	To Auxiliary Actuator(s) Lock
R1	Lock Relay
R2	Unlock Relay
D1	Diode
D2	Diode

4.13 Fuses and Relays

4.13.1 Fuses

NOTE: Refer to the vehicle owner's manual for information on the location and rating of electrical system fuses.

5.1 Body

5.1.1 Body Structures - General Information

WARNINGS:

- ⚠ All external or internal projections must comply with local regulatory standards.**
- ⚠ Do not cut, drill or weld any parts that are load path relevant in case of crash. Vehicle Converter shall confirm any changes comply with general product safety requirements, legal requirements or type approvals.**
- ⚠ CAUTION: Load carrying structures should not be mounted onto an existing load tray or load box.**

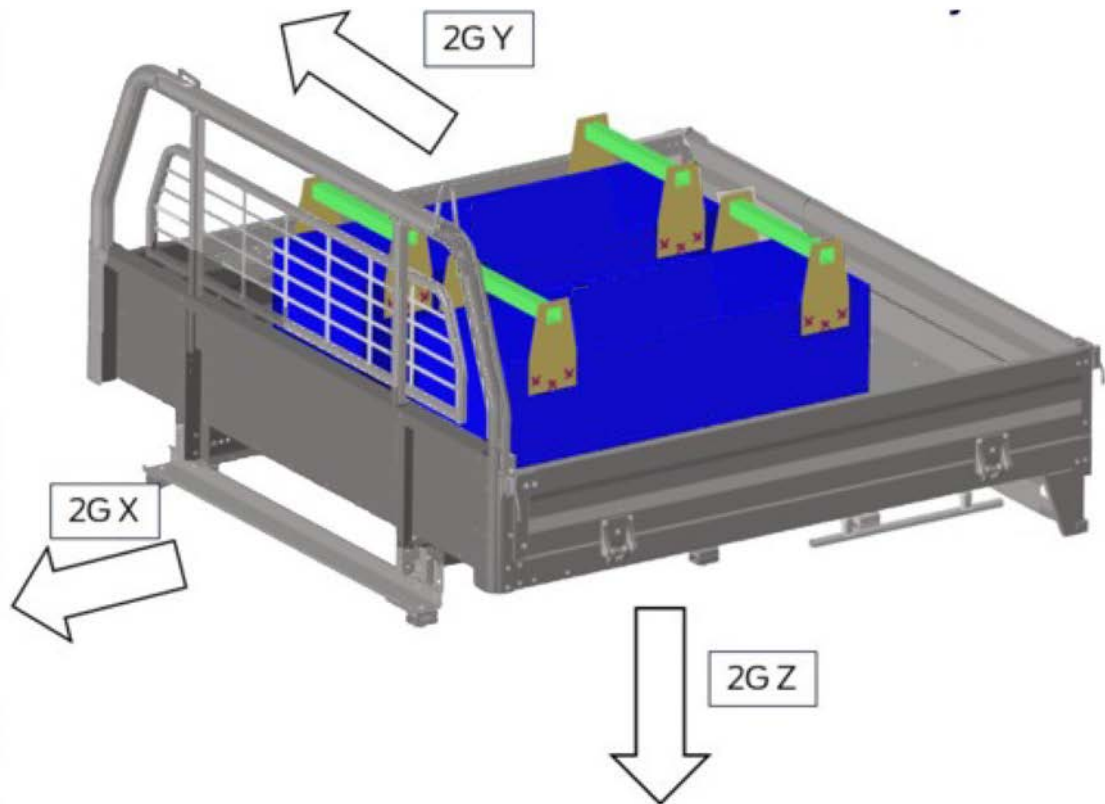
Refer to: 1.3 Commercial and Legal Aspects (page 7).

- When carrying out vehicle conversions/modifications the following points should be considered:
- Make sure that the vehicle structural integrity is maintained.
 - Do not drill into closed frame body members.
 - Make sure that the design for the body alterations or additional structure disperse the load evenly.

- ⚠ WARNING: Uneven load distribution could result in unacceptable handling and braking characteristics.**
- Re-paint metal edges after cutting and drilling. All metal edges must comply with exterior and interior protection local regulatory standards.
- All fixings through the floor, sides or roof must be sealed.
- Make sure that fixings in the 'B'-pillar area do not encroach on the seat belts or seat belt reels.

Computer-Aided Engineering (CAE)

The following section is provided to guide those modifiers seeking to assess their design formally using CAE methods. It provides our recommendations for model inputs, loading cases and acceptance criteria. It can also be used as a general guide for those seeking to understand the expected operating environment and planning to conduct more simplified analysis. Please note that this guidance is directional and intended only to assist initial design. The varied nature of aftermarket second-unit-bodies and their operating environment dictates that final assessment of suitability remains with the Vehicle Converter. For further information please contact FPSVhelp@ford.com.



E466266

Strength Assessment:

±2.0g in X, Y and Z. Apply loadings individually.
 Von Mises stress should be less than yield .
 Engineering judgement can be applied when:

- Local areas are in contact between 2 parts
- Stress is mostly in compression (check negative normal stress)
- Elements are adjacent to rigid elements or constraints

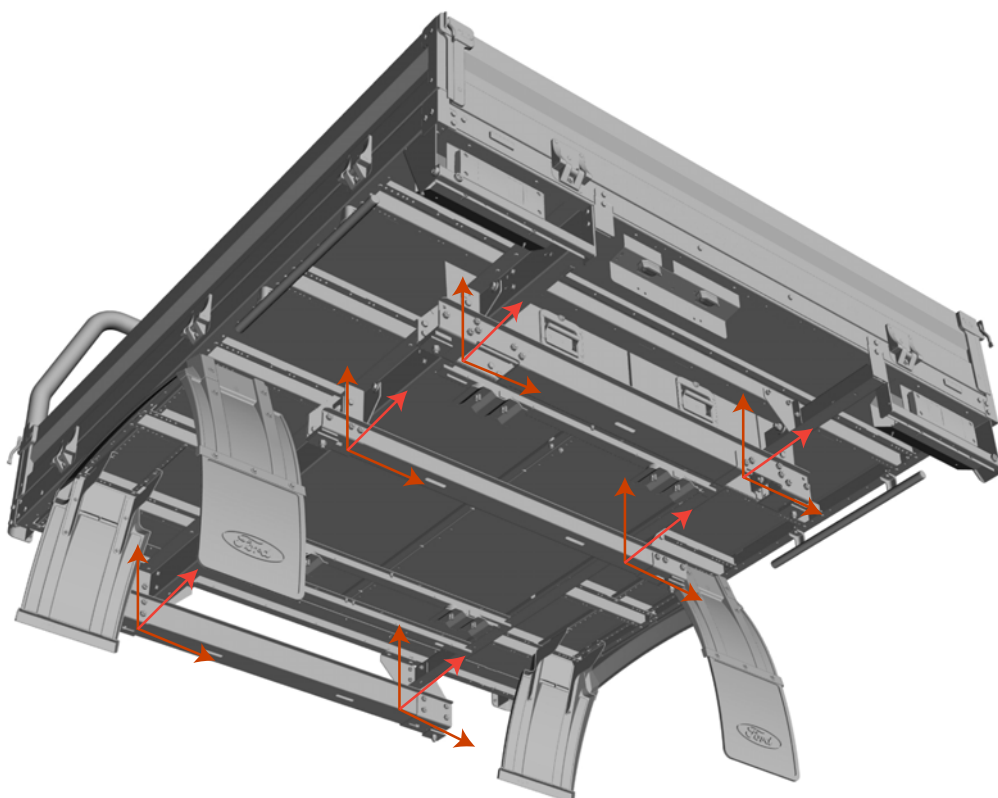
Fatigue Assessment:

$\pm 0.4g$ in X, Y and Z for 1 million cycles minimum for steel * or 2.5 million cycles for aluminium **.

Apply loadings individually.

- * Applies if the stress seen during strength loading is $>50\%$ of allowable for the material(s) used (eg. $>150\text{MPa}$ for 300MPa steel (UTS)). Below that the risk is relatively low due to steel's inherent resistance to fatigue at typical endurance limits.
- ** Aluminium is not considered fatigue-resistant hence the recommendation is to analyse to 2.5 million cycles to simulate near-infinite life.

In all cases this assumes robust engineering design with no notches, sharp edges, defects, or other undue stress concentrators present.



E466267

Dynamic Load Case (Normal Modes):

NOTE: The second-unit body should be assessed as a separate entity, constrained in X, Y & Z at the fixing points to the frame as shown in the image above.

Calculate the Natural Frequencies for the Second-unit Body + Payload/Cargo up to 20Hz.

There should be no modes at 14Hz or lower in any part of the main structure.

Other Considerations:

Structure in the transverse (y-axis) direction is critical. This is especially true around the forward mounts. Pay attention to the lateral stiffness and resistance to pantograph-type collapse. Use of lateral gussets and robust crossmembers, etc is highly recommended.

In all cases the loadings should be representative of the second-unit body fitted and the payload/cargo considered to be worst-case. Both for weight and Centre of Gravity location.

All analyses should use a linear-elastic solution; no nonlinear contacts or nonlinear material properties.

5.1.2 Integrated Bodies and Conversions

WARNING: All wheelhouse coverage must comply with local regulatory vehicle standards.

For integral structures such as ambulances or motor-homes with increased rear overhang built onto the chassis the following applies:

- Reduced departure angles, e.g. rear entry step, should be discussed with the end user / customer. Consider removable components to avoid damage on ferries or low-loaders.
- Unique spare wheel stowage may be required if obscured by rear step, check for accessibility.
- Parking sensor operation may be affected.

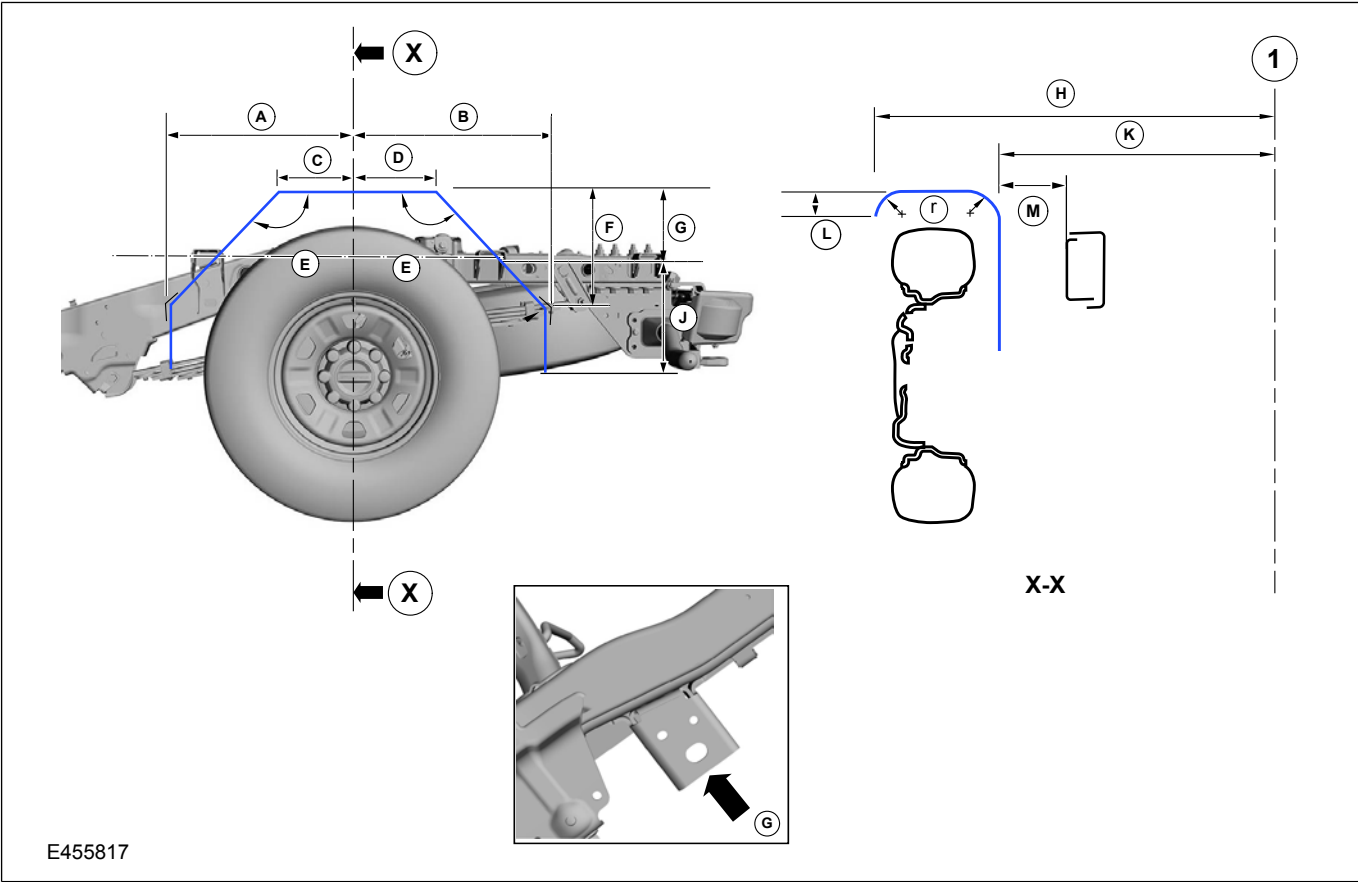
Refer to: 4.3 Parking Aid (page 73).

5.1.3 Wheelhouse Envelope

Refer to the Frame Feature Centreline Distance (All CAB Styles) also shown in the section.

The recommended minimum tyre clearance to mudguard dimensions on conversions are outlined in the following figures and tables:

Wheelhouse Envelope



WARNING: Changes to wheel and tyre sizes may impact the ride and handling of the vehicle, certain Ford Driver Assist Technology functions and other vehicle attributes. Any change must be in adherence to local regulatory standards. See your National Sales Agent for clarification.

CAUTIONS:

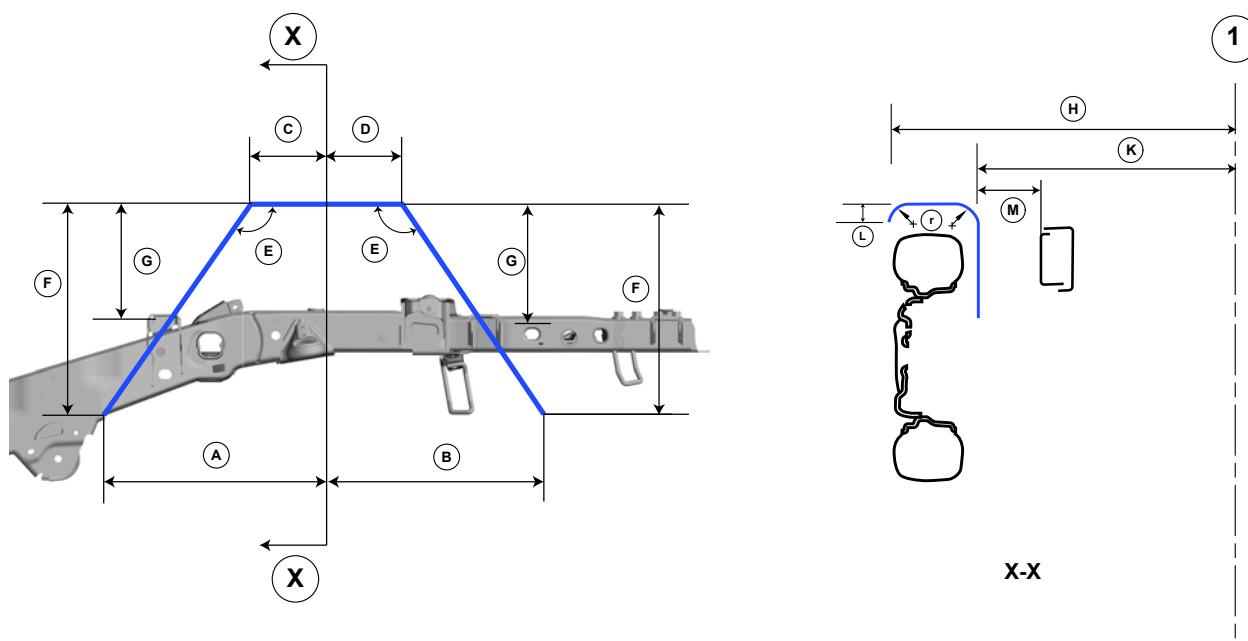
Wheelhouse dimensions are provided as a guide only.

Wheelhouse envelopes are intended to represent an "open" wheelhouse only.

NOTE: All dimensions are in millimeters.

Wheel Guard Dimensions	
Tyre Specification	LT275/70R18
A & B	505mm
C & D	210mm
E	135°
F	300mm (approx.)
G	195mm
H	1005mm
J	300mm
K	660mm
L	30mm (recommended)
M	130mm (approx.)
r	50mm (maximum)
1	Center line of Vehicle
X	Section through Center of Rear Axle

Wheelhouse Envelope Additional Option (Simplified Guard)



E459025

Wheel Guard Dimensions	
Tyre Specification	LT275/70R18
A	560mm
B	515mm
C	265mm
D	220mm
E	125° (approx.)
F	430mm
G	195mm
H	1005mm
K	660mm
L	30mm (recommended)
M	130mm (approx.)
r	50mm (maximum)
1	Center line of Vehicle
X	Section through Center of Rear Axle

5.1.4 Chassis Cab

WARNINGS:

! Do not cut, drill or weld any parts that are load path relevant in case of crash. Vehicle Converter shall confirm any changes comply with general product safety requirements, legal requirements or type approvals.

! Excessive heat can build up from the exhaust system, in particular from components such as the catalytic converter and the diesel particulate filter. Ensure adequate heat shields are maintained.

! Uneven load distribution could result in unacceptable handling and braking characteristics.

When carrying out vehicle conversions / modifications the following points should be considered:

- Upfit body mounts must sit flush with and cover the entire surface of the chassis mounts to spread the weight and forces evenly. All provided mounting points on the vehicle chassis must be used.
- For most upfits it is recommended to use rigid (non-flexible) connections at all mounting points. Avoid 'sprung' mounts on sub-frames.
- If the fitted sub-frame is exceptionally rigid, you must use flexible mounts with captive (fail-safe) bolts at the forward location mounts only to allow the vehicle frame to flex naturally. This flexibility should be in the order of approximately 1kN/mm at each mount and restrict total travel (snubbed) to ± 12 mm in all directions. All mounts other than the two forward location mounts must be rigid.
- Add lateral cross members between each mount pair and/or design your mounts with high lateral stiffness to resist side-to-side forces.
- Position the main longitudinal supports directly over the vehicle chassis whenever possible to minimise the mount offset.
- Minimise the height of the upfitted body over the chassis to lower the overall centre of gravity and to reduce the bending loads on the mounts. Ensure sufficient tyre clearance is maintained. See wheelhouse envelope.

[Refer to: 5.1 Body \(page 120\).](#)

- Ensure the upfit design accounts for the differences in the heights of the chassis mounts and naturally conforms without any pre-load. Refer to the specific mount height information later in this section.
- Use large, hardened (high-tensile) steel washers (minimum $\text{Ø}50 \times 5$ mm or $50 \times 50 \times 5$ mm recommended) to spread the load between the chassis and mounting hardware. These washers must not deform when installed at correct torque. Consider also using flanged hardware where possible.

- When designing the upfitted body and mountings to the vehicle chassis be advised that the road-load inputs of up to 2g in the x, y, and z directions have been observed during vehicle testing and development at each of the chassis mounting positions. Ensure your mounting leg and overall structure is robust to the equivalent forces and inputs of this magnitude.
- The surfaces where the chassis and mounts meet must not have 'soft' finishes (like powder coating) that can easily chip or degrade. Any degradation may lead to a soft joint and damaged mounts. Hard, galvanic coatings are preferred.
- The minimum requirement is M12 Grade 10.9 bolts with locknuts, tightened to the correct torque at each mounting location. However M14 hardware at a higher torque is recommended for a more robust connection.
- Make sure that the vehicle structural integrity is maintained.
- Do not drill into closed frame body members.
- Make sure that the design for the body alterations or additional structure disperse the load evenly.
- Re-paint metal edges after cutting and drilling. All metal edges must comply with exterior and interior protection local regulatory standards.
- All fixings through the floor, sides or roof must be sealed.

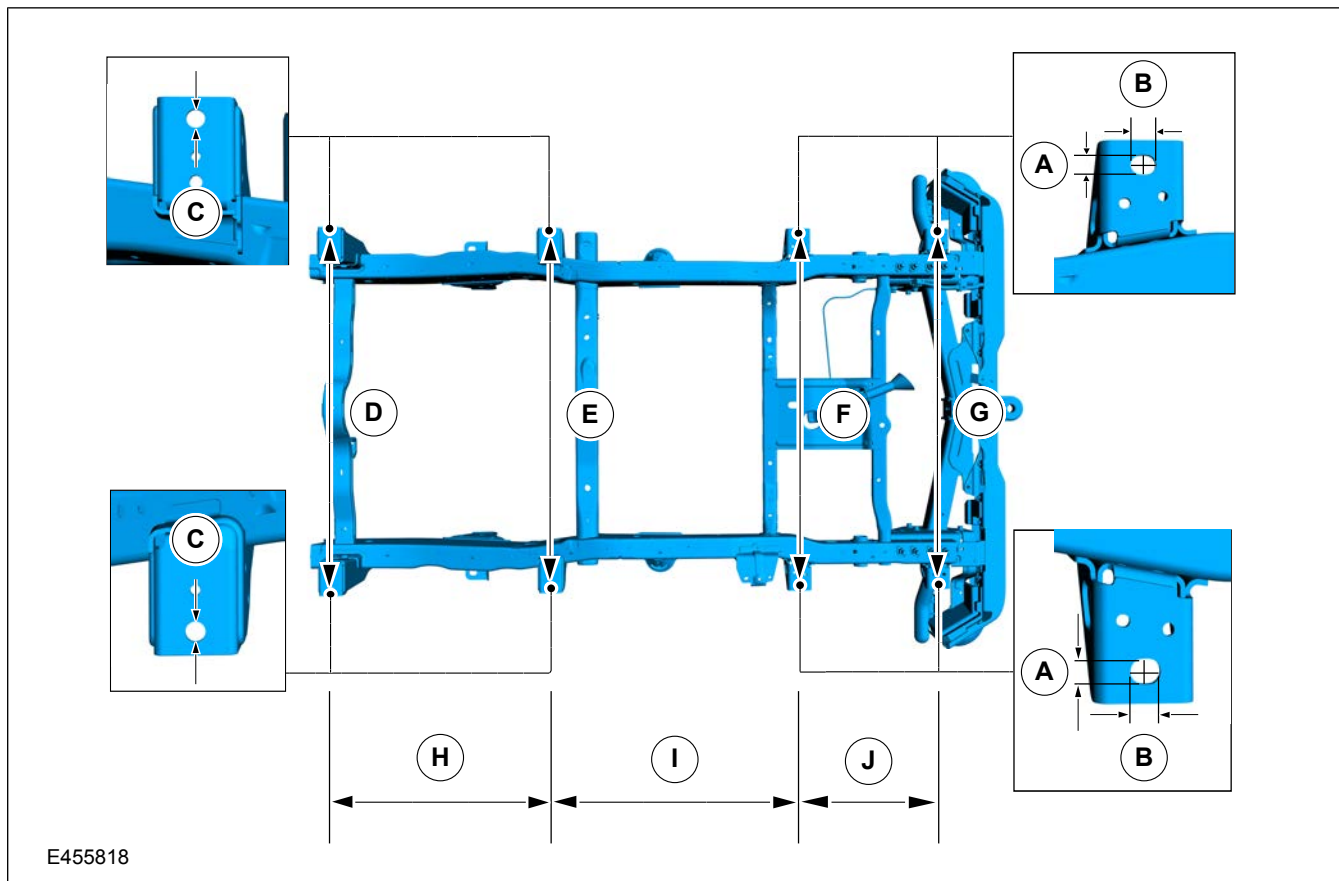
[Refer to: 5.5 Corrosion Prevention \(page 154\).](#)

- Ensure that any additional equipment in the vicinity of the fuel tank will not damage the tank in a crash condition.

For any conversion structure attached to or mounted onto the base vehicle cab structure the following applies:

- Ensure that neither the conversion structure nor the existing vehicle structure get pre-loaded by the assembly process.
- Adhesive jointing is recommended but should be supplemented with mechanical fasteners to prevent initial peel and long term failure.
- Spread bolt loads to minimize local stress.

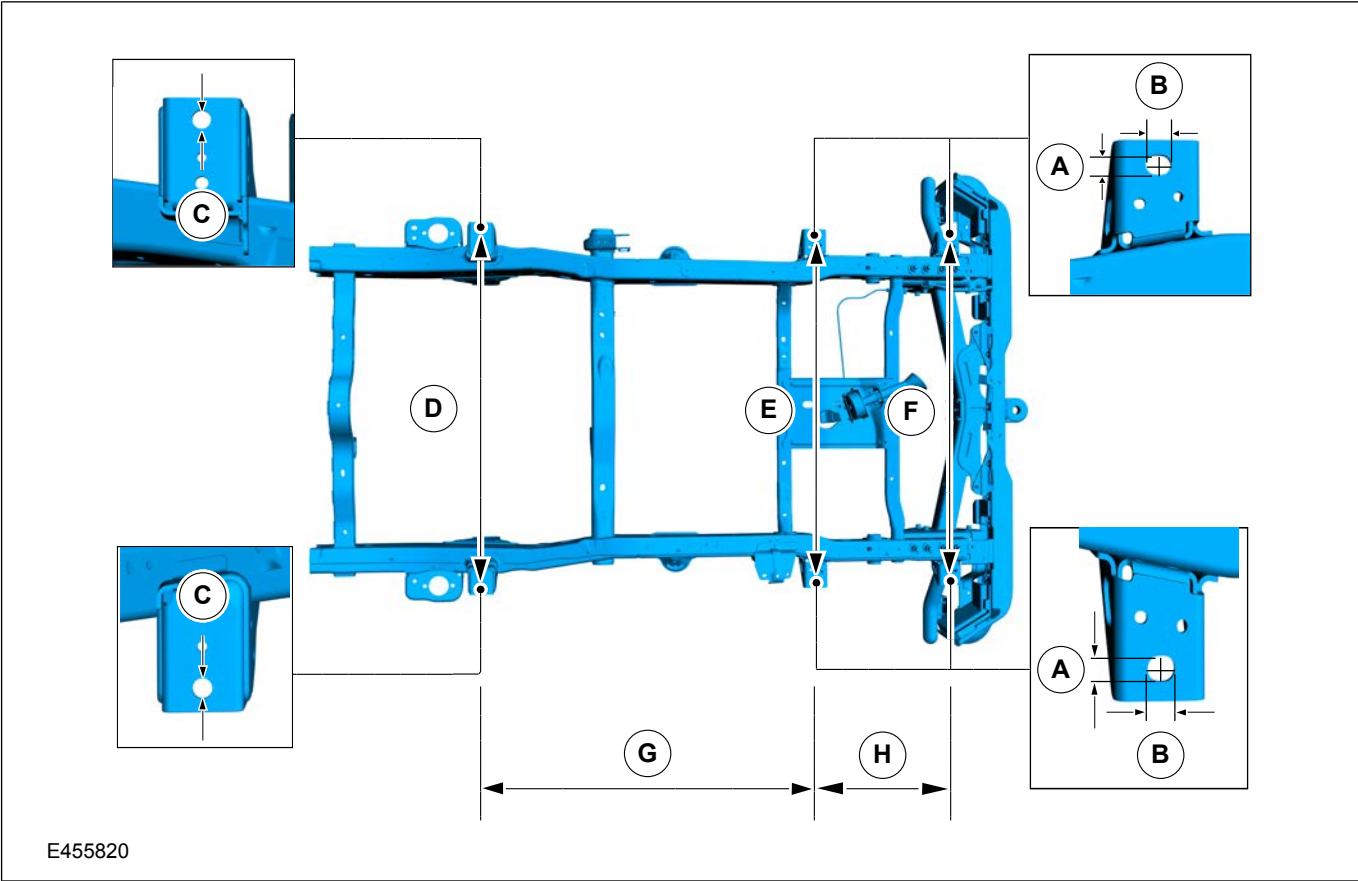
Body Attachment Holes in Chassis Frame - Single Cab



Dimensions (mm) for Body Attachment Holes in Chassis Frame - Single Cab

Dimension		Dimension	
A	20mm	H	768mm
B	26mm	I	891mm
C	20mm	J	506mm
D	1244mm	-	-
E	1244mm	-	-
F	1244mm	-	-
G	1248mm	-	-

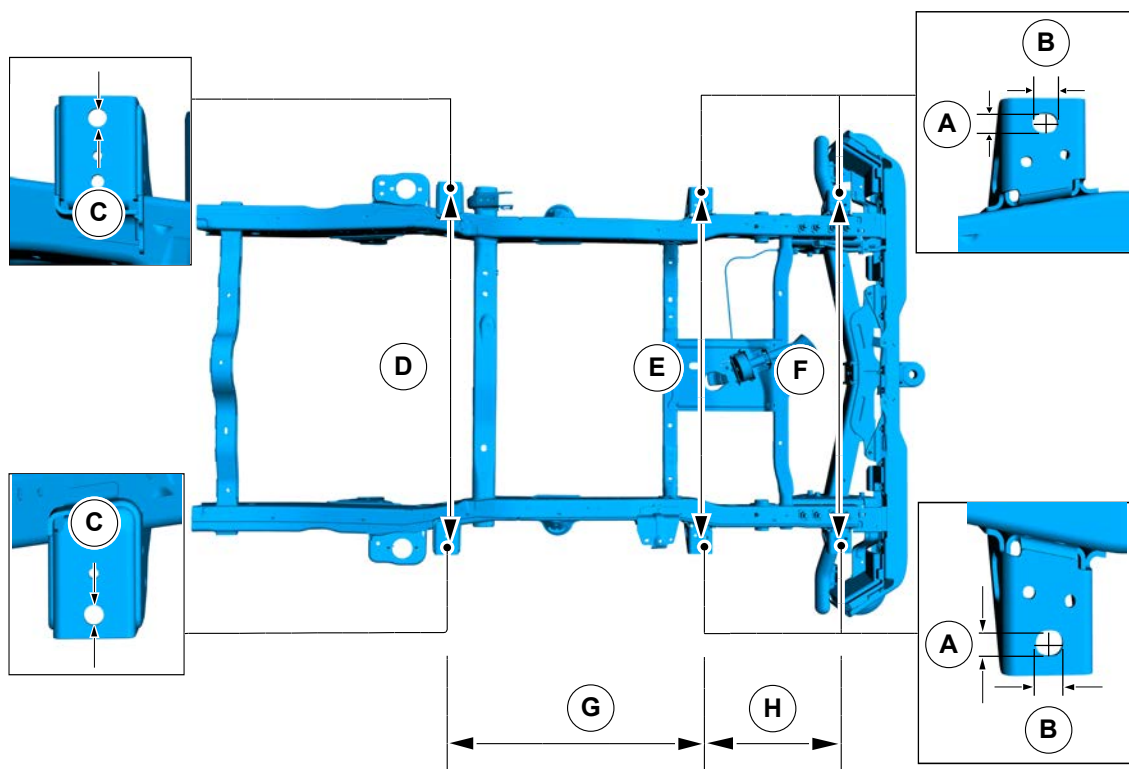
Body Attachment Holes in Chassis Frame - Super Cab



Dimensions (mm) for Body Attachment Holes in Chassis Frame - Super Cab

Dimension		Dimension	
A	20mm	G	1188mm
B	26mm	H	506mm
C	20mm	-	-
D	1244mm	-	-
E	1244mm	-	-
F	1248mm	-	-

Body Attachment Holes in Chassis Frame - Double Cab

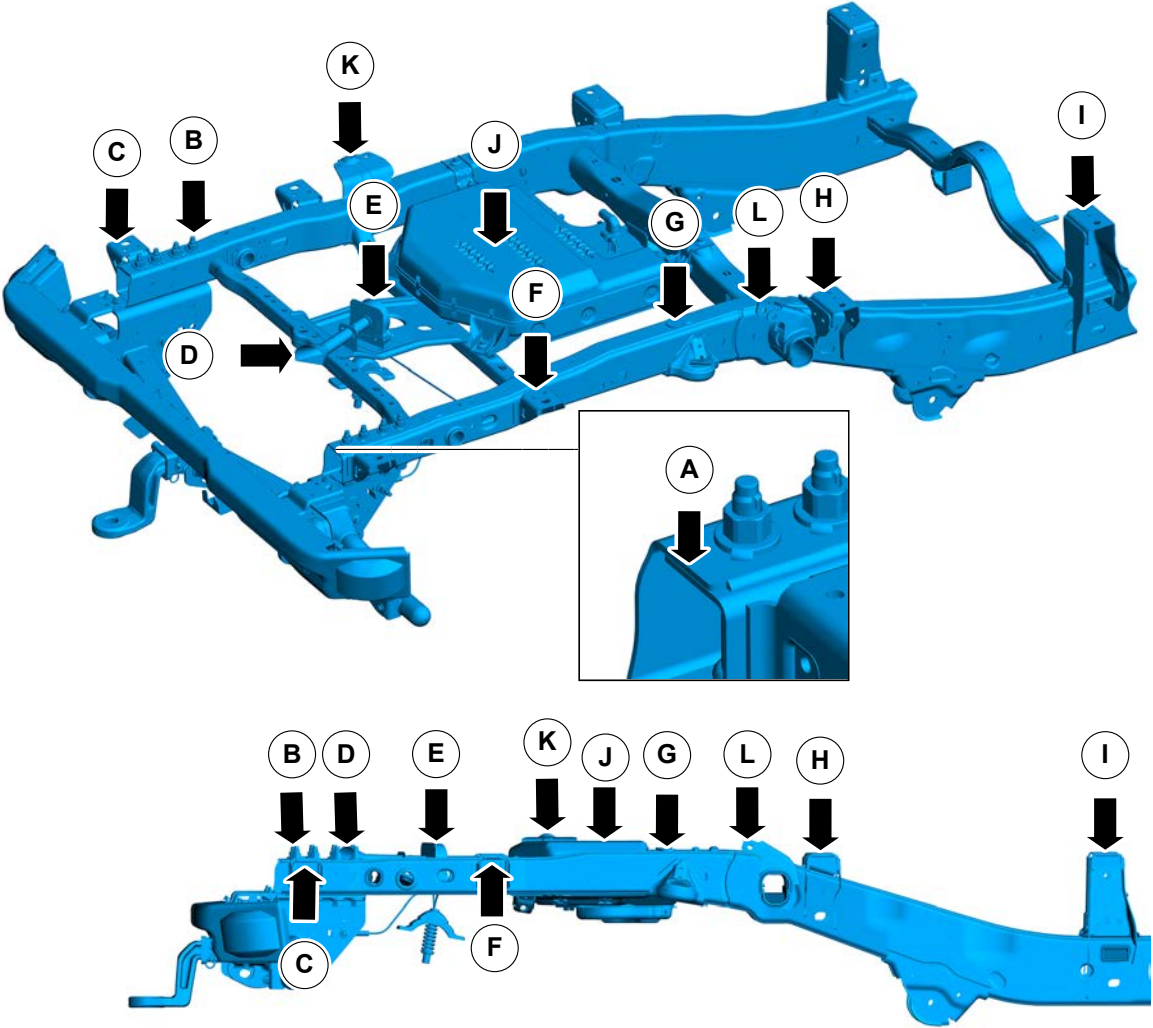


E455819

Dimensions (mm) for Body Attachment Holes in Chassis Frame - Double Cab

Dimension		Dimension	
A	20mm	G	890mm
B	26mm	H	506mm
C	20mm	-	-
D	1244mm	-	-
E	1244mm	-	-
F	1248mm	-	-

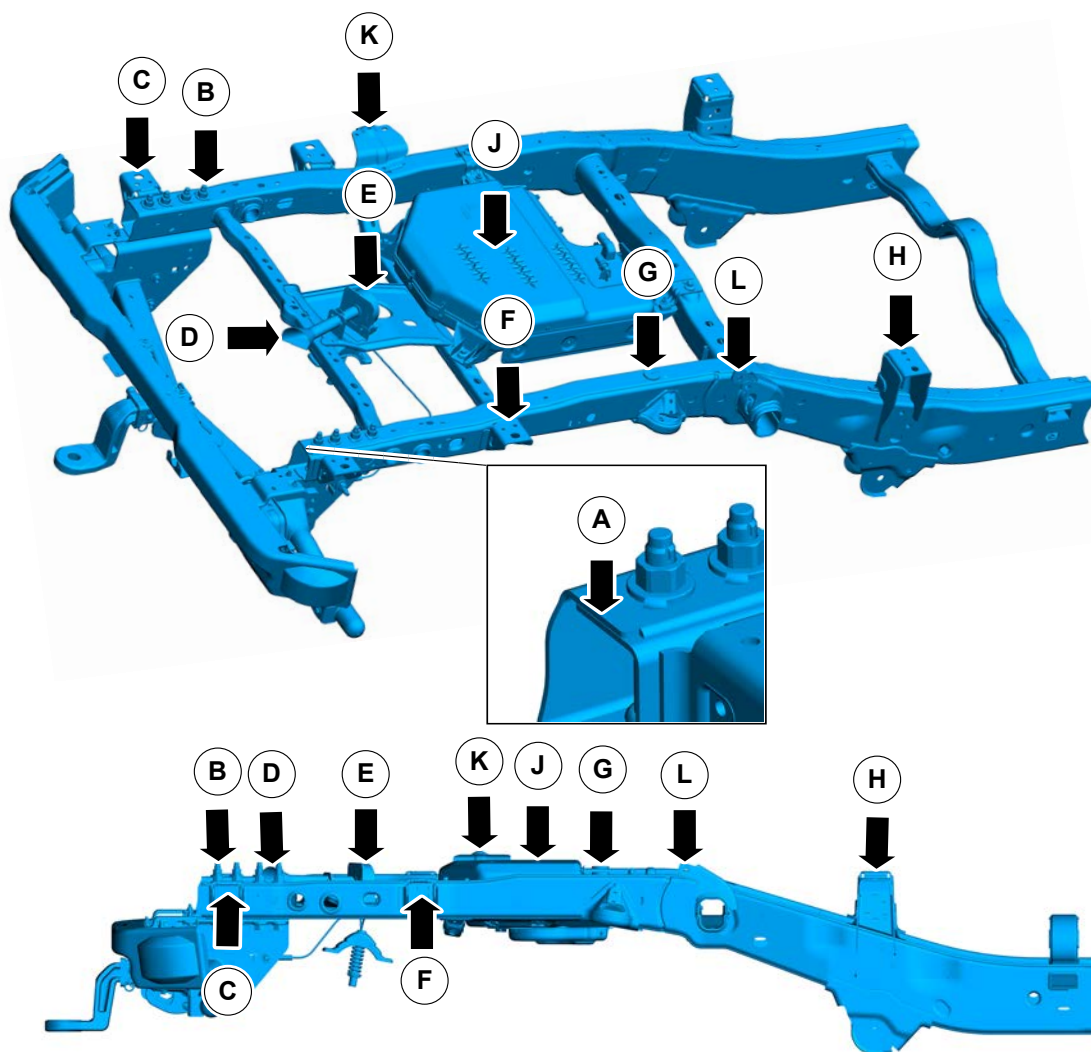
Body Mounting Pad Vertical Dimensions - Single Cab



E455869

Dimension	GVM @ RGAWR	MRO	Height from A
A	740mm	850mm	-
B - Towbar Bolts	-	-	37mm
C - Mounting Pad	-	-	6mm
D - Spare Wheel Winch Guide Cone	-	-	36mm
E - Spare Wheel Winch	-	-	44mm
F - Mounting Pad	-	-	12mm
G- Bump Stop	-	-	28mm
H- Mounting Pad	-	-	12mm
I- Mounting Pad	-	-	12mm
J- Urea Tank top surface	-	-	47mm
K- LH Damper Upper Mount	-	-	66mm
L- RH Damper Upper Mount	-	-	54mm

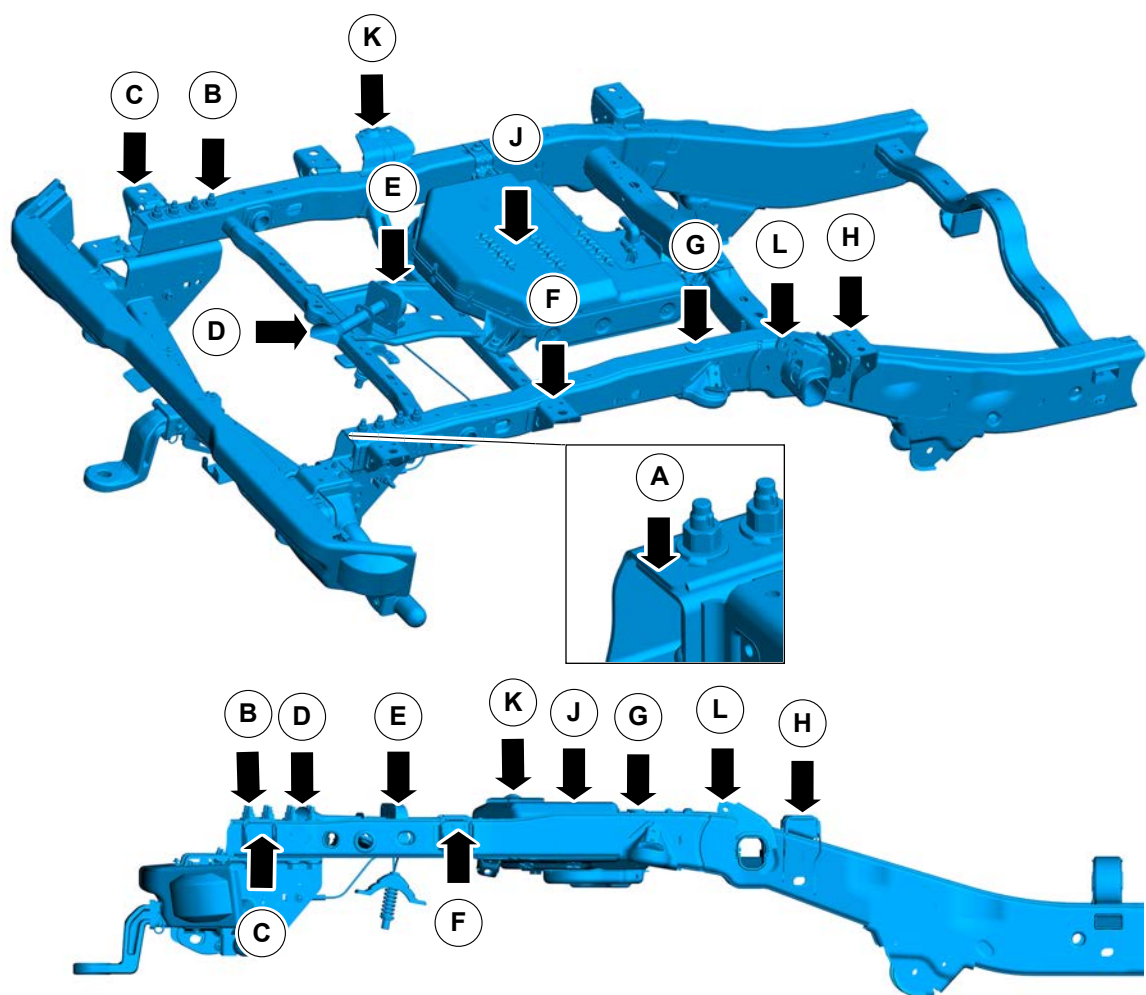
Body Mounting Pad Vertical Dimensions - Super Cab



E455871

Dimension	GVM @ RGAWR	MRO	Height from A
A	740mm	845mm	-
B - Towbar Bolts	-	-	37mm
C - Mounting Pad	-	-	6mm
D - Spare Wheel Winch Guide Cone	-	-	36mm
E - Spare Wheel Winch	-	-	44mm
F - Mounting Pad	-	-	12mm
G- Bump Stop	-	-	28mm
H- Mounting Pad	-	-	12mm
J- Urea Tank top surface	-	-	47mm
K- LH Damper Upper Mount	-	-	66mm
L- RH Damper Upper Mount	-	-	54mm

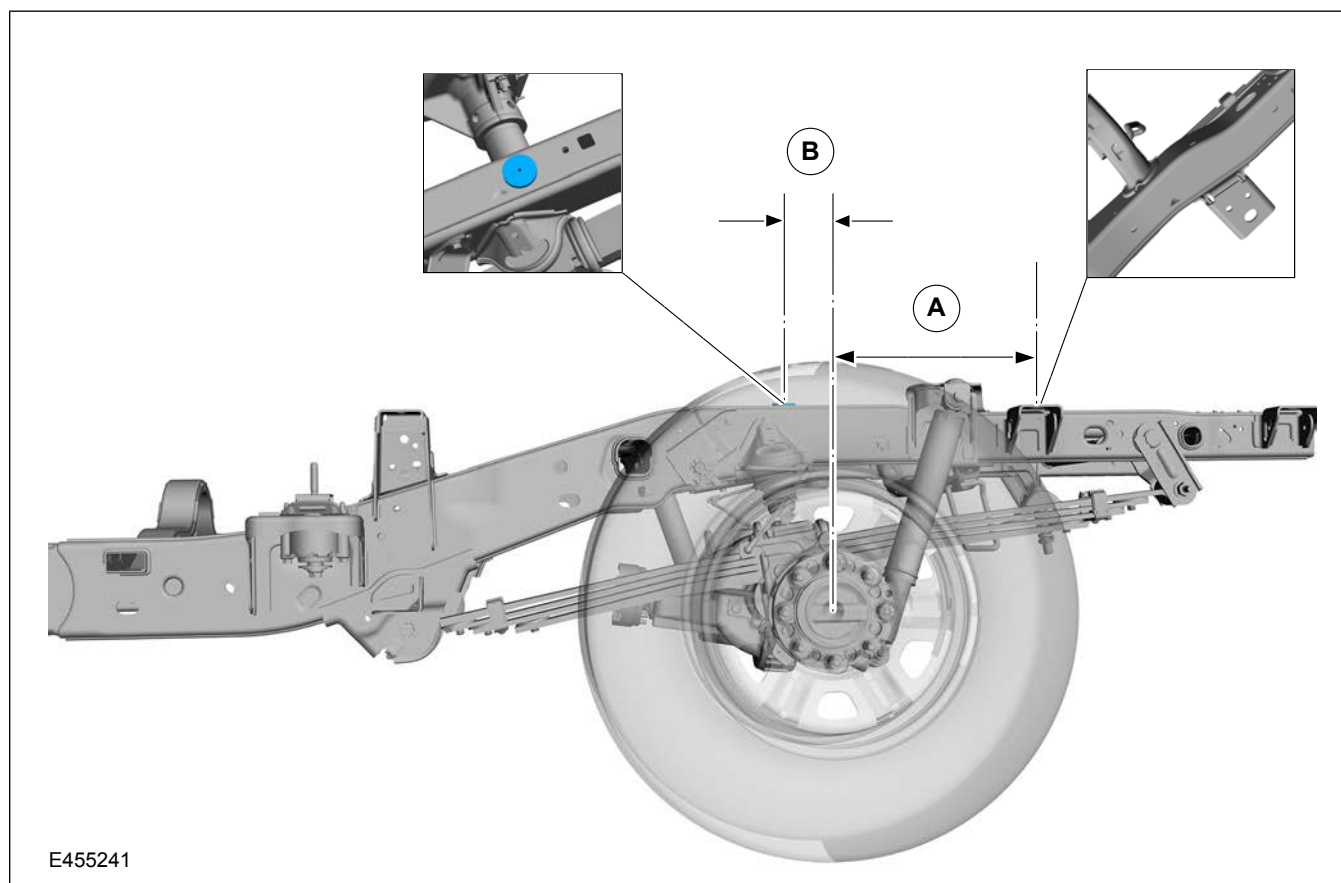
Body Mounting Pad Vertical Dimensions - Double Cab



E455870

Dimension	GVM @ RGAWR	MRO	Height from A
A	740mm	840mm	-
B - Towbar Bolts	-	-	37mm
C - Mounting Pad	-	-	6mm
D - Spare Wheel Winch Guide Cone	-	-	36mm
E - Spare Wheel Winch	-	-	44mm
F - Mounting Pad	-	-	12mm
G- Bump Stop	-	-	28mm
H- Mounting Pad	-	-	12mm
J- Urea Tank top surface	-	-	47mm
K- LH Damper Upper Mount	-	-	66mm
L- RH Damper Upper Mount	-	-	54mm

5.1.5 Frame Feature Centerline Distance - All Cab Styles



Dimension	Measurement
A	446mm
B	23mm

5.1.6 Front End Integrity for Cooling, Crash, Aerodynamics and Lighting

WARNINGS:

-  **Do not alter the lighting system.**
-  **Do not cut, drill or weld any parts that are load path relevant in case of crash. Do not add material in the crash zone. This could affect the crash sensor calibration.**
-  **CAUTION: Continuous air flow through the front end and engine compartment is not to be hindered by adding any additional equipment. If uncertain please consult the Ford dealer.**

The side airbag system is not permitted if:

- A swiveling device is fitted on the front seats.
- A side wall or any other additional material or structure is attached to the B-pillar inner and/or outer area.

Static & Dynamic Sealing and Finishing Ensure proper sealing against ingress of water, salt, dust etc. after cutting or drilling the body. Use Ford approved sealing and finishing material, and underbody corrosion protection.

Refer to: 5.5 Corrosion Prevention (page 154).

5.1.7 Tipper Bodies

For tipper conversions single and double Chassis Cab versions except extended rear chassis frame can be used. All variants allow single and three way tipping.

It is recommended to have the tipping system operative only when the engine is running. It is also recommended to have the master control switch in the security of the cab. According routing of wires and hydraulic lines please refer to section hydraulic lift.

Ensure that axle plated weights including the front axle minimum are not exceeded.

For tipper sub-frames please refer to the following guidelines:

Refer to: 5.1 Body (page 120).

- Design for full length continuous frame with mountings for motor, pump unit, reservoir, pivot points and ram.
- Use all mounting points on chassis frame to mount sub-frame.

- Sub-frame must extend to the back of the cab and attach to all mounting locations, with the forward end designed to minimize local frame stress. It is however, preferable to mount the sub-frame onto the mounting brackets with a clearance to the chassis frame top surface.
- Side tipping loads/forces must be resolved by the sub-frame. It is not recommended to strain the chassis frame.

5.1.8 Tank and Dry Bulk Carriers

Due to the high rigidity of tanks it is necessary to isolate the tank and its sub-frame from the chassis frame allowing the chassis frame to naturally flex. Please refer to the following guidelines:

Refer to: 5.1 Body (page 120).

- Mount tank to full length of sub-frame.
- Mount sub-frame to all chassis frame mounting points.
- The forward location mounts must be flexible to allow relative chassis frame to sub-frame deflections.

Refer to: 5.1 Body (page 120).

- Sub-frame must extend to the back of the cab and not contact chassis frame at forward end under worst case deflection.
- The minimum requirement is M12, Grade 10.9 bolts with washers and self lock nuts for the chassis frame mount bracket at each solid and compliant location. The use of M14 bolts is recommended.

5.1.9 Genuine Ford Accessory Bull Bar (if available)

The Genuine Ford Accessory bull bar includes brackets which are mounting points for driving lights, aerials, antennas and flags.

WARNINGS:

 **Follow all accessory manufacturer's instructions when connecting accessories and equipment to the vehicle.**

 **Do not fit a non-Ford approved bull bar to your vehicle as this may interfere with the operation of the restraint system, including the air bag deployment, and could result in injury to yourself and others. Fitment of a bull bar may also void the vehicle's compliance with Australian Design Rules.**

 **Do not modify the front of your vehicle in any way. This could adversely affect deployment of the airbags. Failure to adhere to this warning could result in serious personal injury or death.**

 **After bullbar installation, contact your authorised Ford Dealer to correctly calibrate the Adaptive Cruise Control Radar Module, the Restraint Control Module and the Parking Aid Module. This is required to ensure correct operation of the advanced safety features this vehicle offers.**

NOTE: Please refer to the electromagnetic compatibility (EMC) section in this book before installing any aerials.

Antenna Cables Routing

WARNINGS:

 **Ensure that the antenna cables have sufficient clearance from hot and moving parts.**

 **Do not fasten the antenna cables to original vehicle wiring, fuel pipes and brake pipes.**

 **Keep the antenna and power cables at least 100mm from any electronic modules and airbags and associated wiring.**

NOTE: Make sure the sealing integrity is maintained to avoid water ingress into the cabin while routing the cables through the grommet.

Antenna cables should be routed from the engine bay into the cabin area through the existing grommet. There is a service nib provided on the grommet.

Refer to Exterior lighting - Additional external lamps for driving lights cable routing.

5.1.10 Roof Racks

Roof racks may be fitted to all Super and Double cab variants providing the following is satisfied:

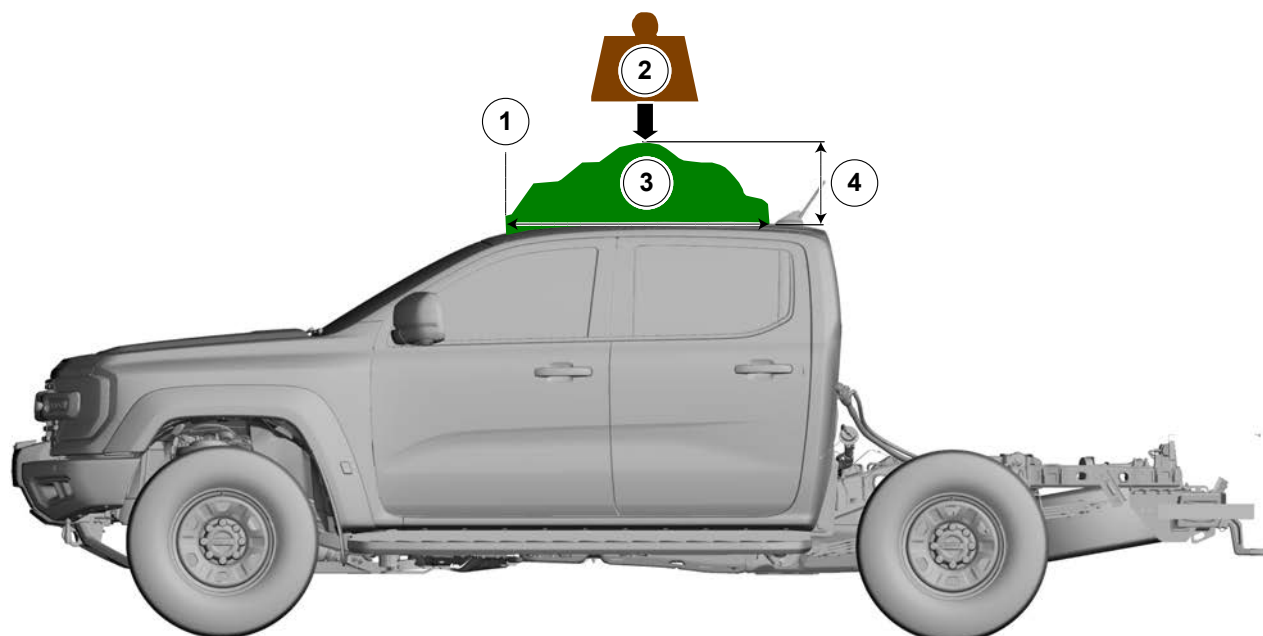
- The carried load does not exceed 85kg (converter to ensure owner's information book identifies this limitation).
- The carried load does not exceed 300mm load height (converter to ensure owner's information book identifies this limitation).
- The load is evenly distributed (converter to ensure owner's information book identifies this limitation).
- The rack and subsequent carried load is supported according to the your local Ford dealer irrespective of rack retaining method.
- Removing or obstructing the radio antenna mast (especially with metal objects) will impact radio performance and mounting anything directly over the mast base will impact GPS performance.

Double Cab / Super Cab

The forgoing limitations are based on ensuring body structure integrity, vehicle handling, braking and plated axle weights. Such considerations must also be applied to any double cab and super cab applications, in particular steering, braking and front axle ratings and the extra continuous loads on the "A" pillar, which should not exceed 60 kg total incremental load.

Ensure that the loaded vehicle operates within its designed Center of Gravity condition. For details please consult the Ford dealer.

Roof Rack Vehicle Converter Special Fit



E455459

Item	Description
1	Rear edge of front attachment point
2	85kg maximum (Dynamic) / 350kg maximum (Static)
3	Maximum roof rack length: within length of drain channel
4	Maximum load height 300mm

5.1.11 Cargo Management on Vehicle Tub

WARNING: Only use the recommended attachment points, otherwise damage may occur to the load box.

CAUTIONS:

Weight and load should pass through the recommended structural attachment points.

A minimum clearance of 28mm between the vehicle cab and any fitted service body, load-bearing elevated accessories, canopy, tray or load management structure must be maintained to prevent damage to the vehicle cab structure during operation.

Ranger vehicles built with a cargo "tub" are pre-equipped with mounting positions in the tub side rail to allow the fitment of upfitter cargo solutions such as canopies, sports bars, carry racks etc.

NOTE: Side rail attachment points using M8 threaded fasteners must not be tightened to a torque higher than 25Nm.

Refer to the vehicle's owner manual for information related to factory fit cargo management.

Refer to: 1.11 (page 22).

Canopy, Ladder Rack or Canoe Rack

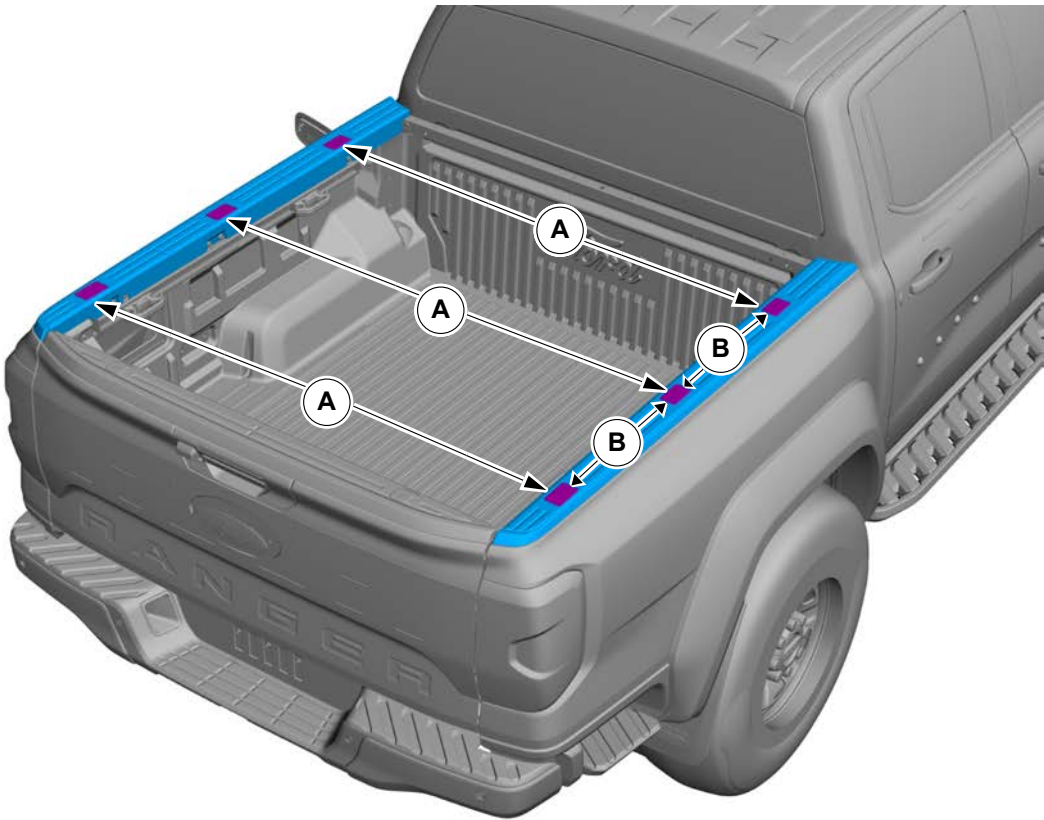
CAUTIONS:

! When a canopy, ladder rack, canoe rack or similar load box mounted accessory is fitted, a combination of the indicated mounting points on top of the load box must be used for suitable fixture to the vehicle. Load bearing and heavy vehicle accessories must use cross plane attachment points to ensure secure fitment.

! The loadbox upper plastic capping (box top moulding) is not designed to bear significant load. Do not clamp directly to this surface.

Load bearing and heavy vehicle accessories must use cross plane attachment points to ensure secure fitment.

Structural Attachment Points - Double Cab



E466270

Item	Measurement
A	1498mm
B	510mm

Side Rail Mounting Points



E364788

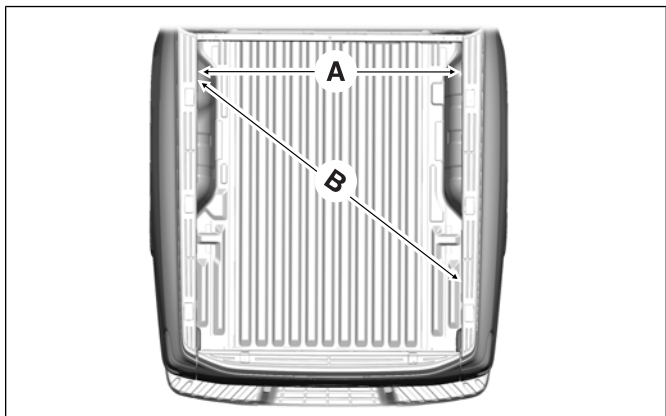
Item	Description
1	LH cargo mounting rail
2	RH cargo mounting rail

NOTE: Ranger image shown, Super Duty similar.

Some vehicles are equipped with side rail mounting rails that incorporate multiple pre-threaded M8 mounting points.

Additional load carrying capabilities and mounting fixtures are outlined in the vehicle owner manual.

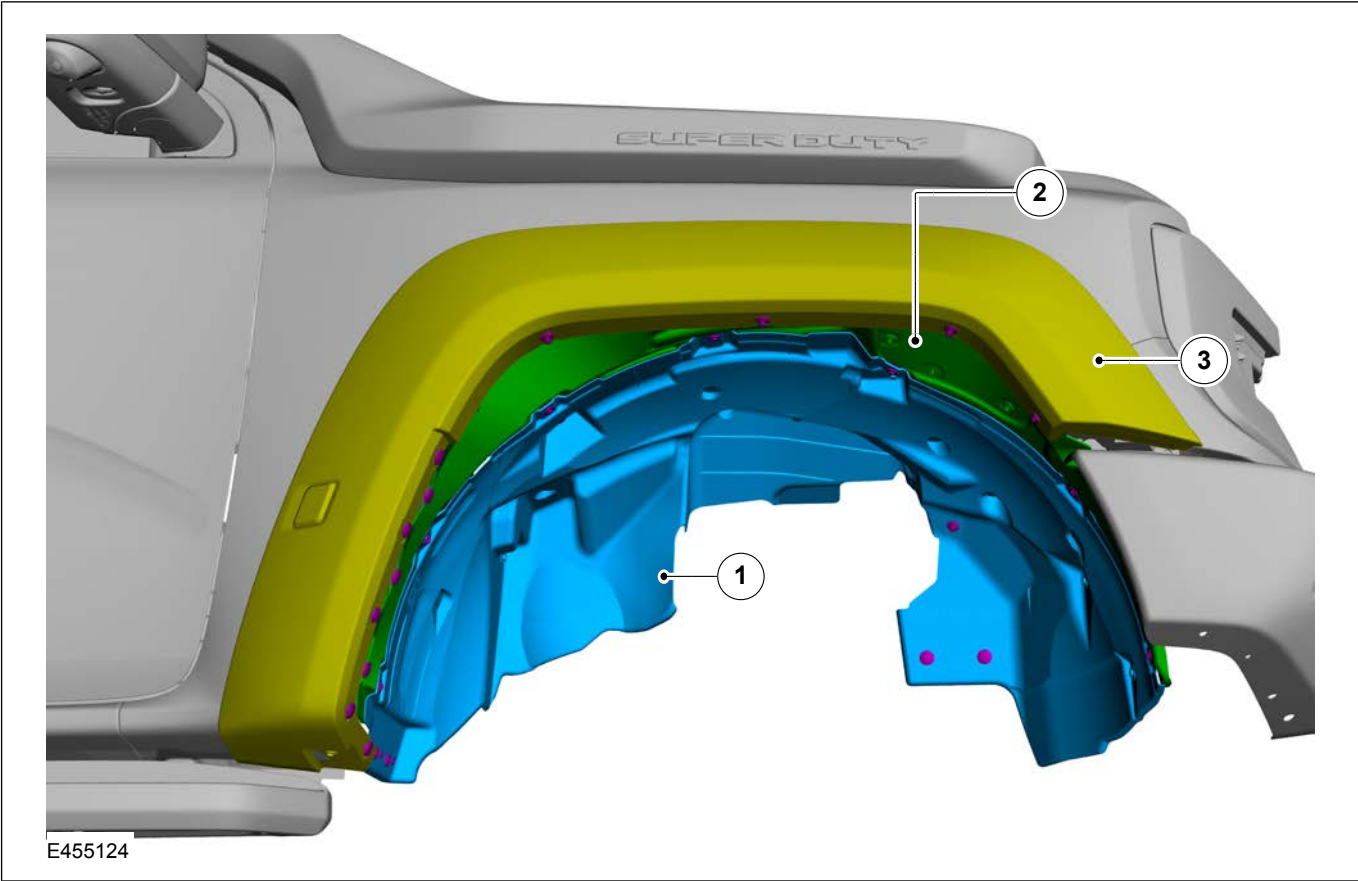
Mounting Point Load Capacities



A	B
Maximum force between directly opposed mounting points is 125Kg	Maximum force between diagonally opposed mounting points is 272Kg

5.1.12 Front Fender Liner

NOTE: RH shown, LH similar.



Item	Description
1	Fender Liner
2	Front Fender Splash Shield
3	Wheel Opening Molding

To allow access to the engine bay and select accessory mounting fixtures, the front RH and LH fender liners can be removed without removing the wheel opening moldings and the front fender splash shield.

Removal of the wheel opening moldings can be undertaken after removal of the fender liner, by accessing and releasing the wheel opening molding retainers from inside the fender cavity.

Refer to the workshop manual or your National Sales Agency for information on the correct removal and installation procedure to support the inner wheel house liner removal process.

5.2 Front End Body Panels

5.2.1 Hood Strut

 **CAUTION: Aftermarket hood gas struts may impact the hood hinge joint.**

It is not recommended to use aftermarket hood gas struts that connect to the hood hinges as this may degrade the hinge joint, hood alignment and hood mobility. As at the time of publication, Ford offers an approved gas-strut kit in some markets as an accessory that can be purchased from authorised Ford Dealers:

- Part Number: R1WZ-16C826-C

If required, the standard hood prop rod can still be utilised in conjunction with the Ford accessory gas strut when the hood is open, as the full open angle remains unchanged.

5.3 Airbag Supplemental Restraint System (SRS)

5.3.1 Air Bags

Front Seats

WARNINGS:

- 

Accessory seat covers not approved by Ford could prevent the correct deployment of the airbags and increase the risk of injuries in a crash.
- 

If installing aftermarket seat covers make sure they are certified as airbag compliant.

Ford offers certified and approved accessory seat covers in grey and black to suit all cab styles. These are available in some markets as an accessory that can be purchased from authorised Ford Dealers.

Side airbags are not compatible with swiveling front seats.

Do not specify the base vehicle with side airbags when planning to retrofit a swiveling device on the front seats and/or an armrest on the outer side of the front seats, this may affect the function and/or deployment of the side airbags.

Pressure based airbag sensors for side airbags are located near the centre top of the front doors inner door sheet metal for all cab styles.

Acceleration based airbag sensors for side airbags are located near the bottom of the C-pillar inner for all cab styles.

For Super Cab and Double Cab vehicles there are additional acceleration based airbag sensors located on the B Pillar lower just above the seatbelt retractor on Double Cab vehicles and on the forward edge or the rear door on the Super Cab vehicles.



WARNING: Modifications or reinforcements in the area of the sensors may affect the side airbag fire timing and result in uncontrolled side air bag deployment.

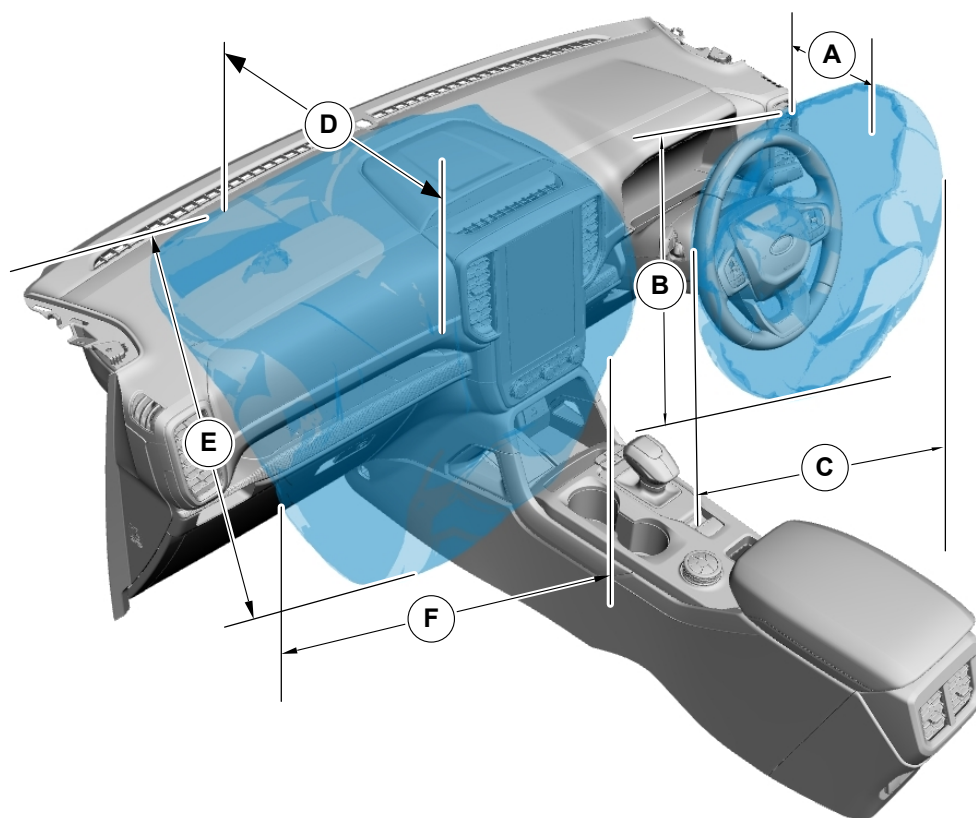
Drilling or grinding operations in this area are only permitted when battery cables are disconnected.

Seatbelt and Airbag implementation

Market Type Approval	Specification
Type Approval Not Available (including Thailand)	Seat Belt (CPAAC)
	90L Passenger Airbag (CPHAB)
Type Approval Available	Seat Belt (CPAAD)
	120L Passenger Airbag (CPHAD)

Refer to your local Ford dealer or National Sales Agent for further information.

Driver and Passenger Front Airbag Deployment Zones



E364184

Dimensions (mm)			
A	268	E*	550
B	530	E**	521
C	525	F*	600
D*	630	F**	527
D**	592	-	-

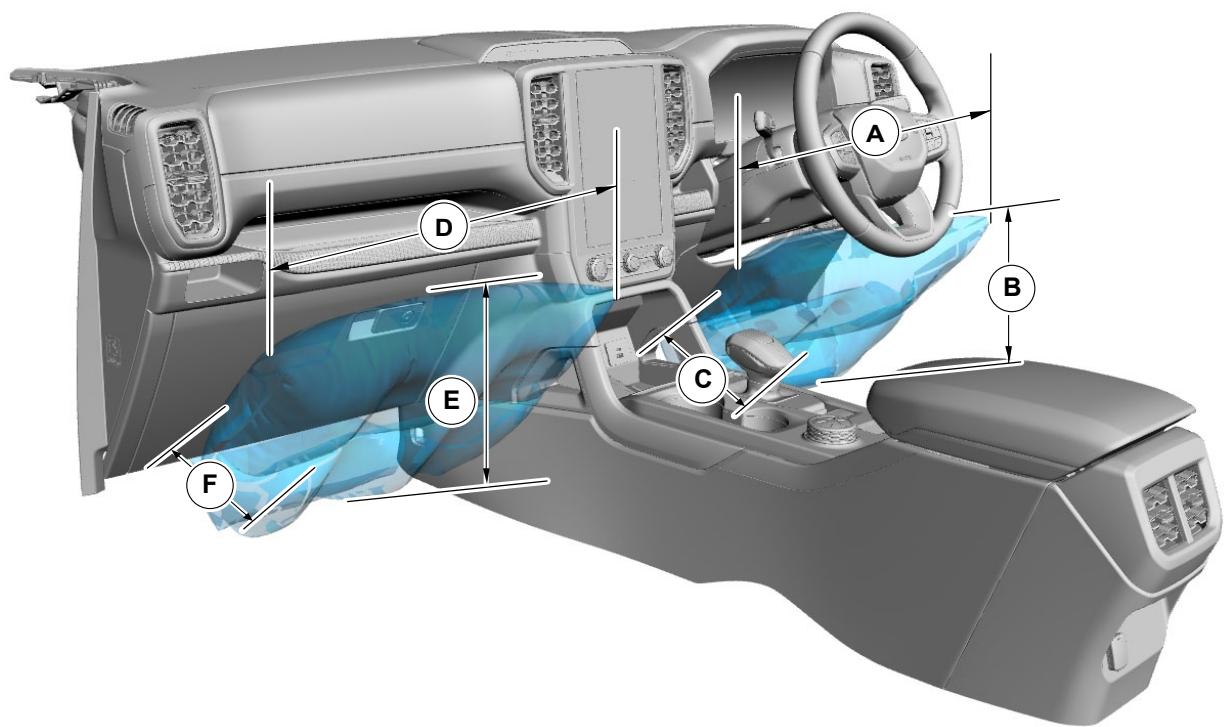
*120L Single Stage Passenger Airbag (CPHAD)

- Market with type approval (excluding Thailand)

**90L Single Stage Passenger Airbag (CPHAB)

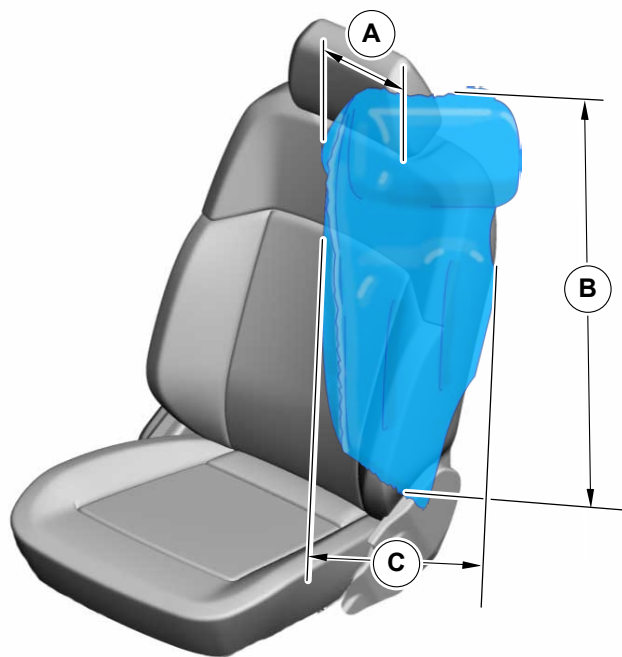
- Market without type approval (including Thailand)

Driver and Passenger Knee Airbag



E363495

Dimensions (mm)			
A	540	D	540
B	400	E	400
C	170	F	170

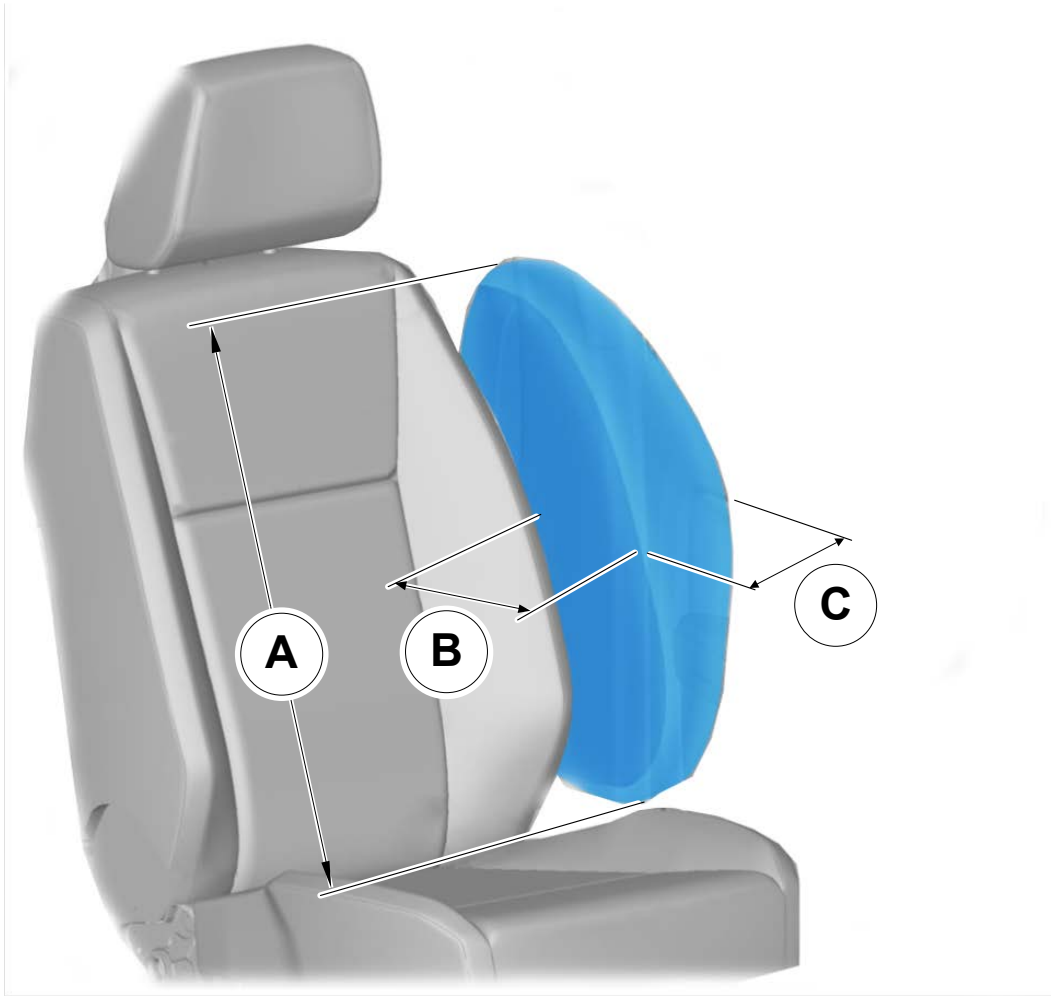
Far Side Airbag (Centre Airbag)

E364200

Dimensions (mm)			
A	350		
B	750		
C	450		

NOTE: LHS shown, RHS Similar.

Side Airbag

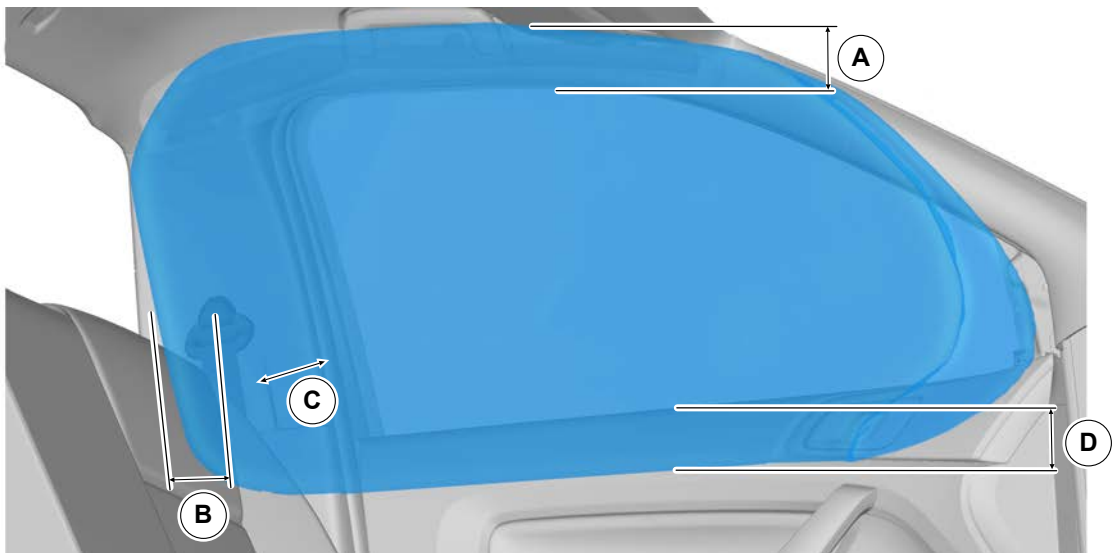


E363732

Dimensions (mm)			
A	550		
B	350		
C	250		

NOTE: LHS shown, RHS Similar.

Curtain Airbag - Single cab



E136172

Dimensions (mm)			
A	140	C	250
B	40	D	100

NOTE: LHS shown, RHS Similar.

Curtain Airbag - Double cab

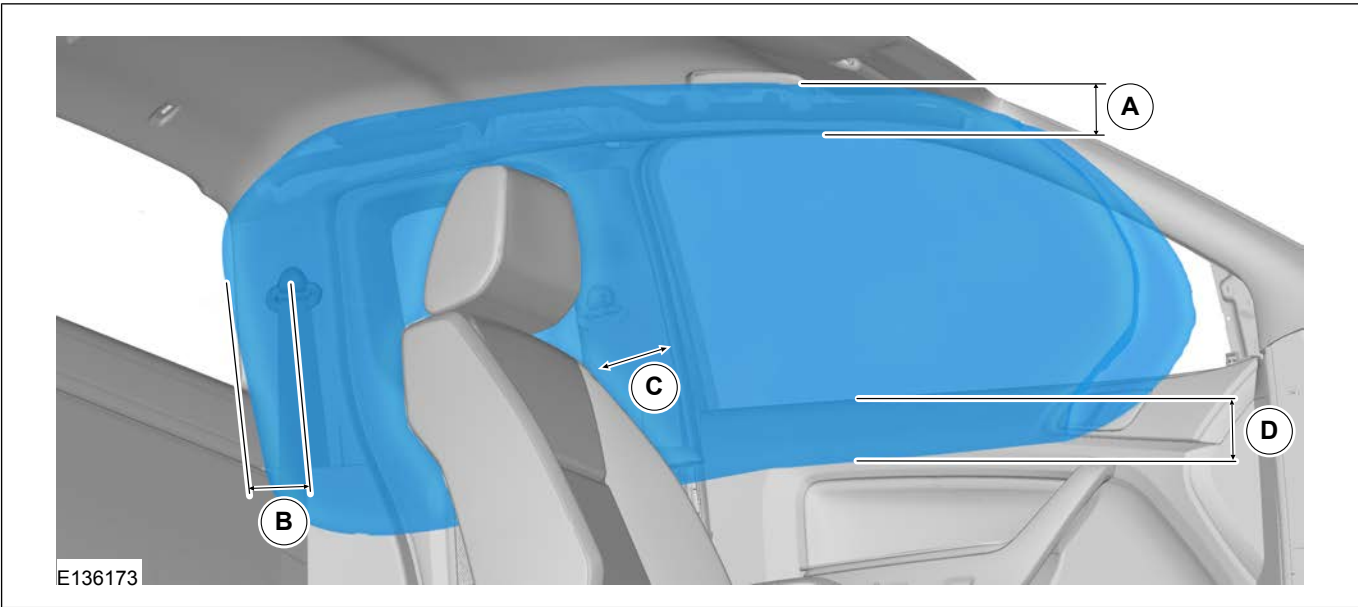


E134610

Dimensions (mm)			
A	140	C	250
B	40	D	100

NOTE: LHS shown, RHS Similar.

Curtain Airbag - Super cab

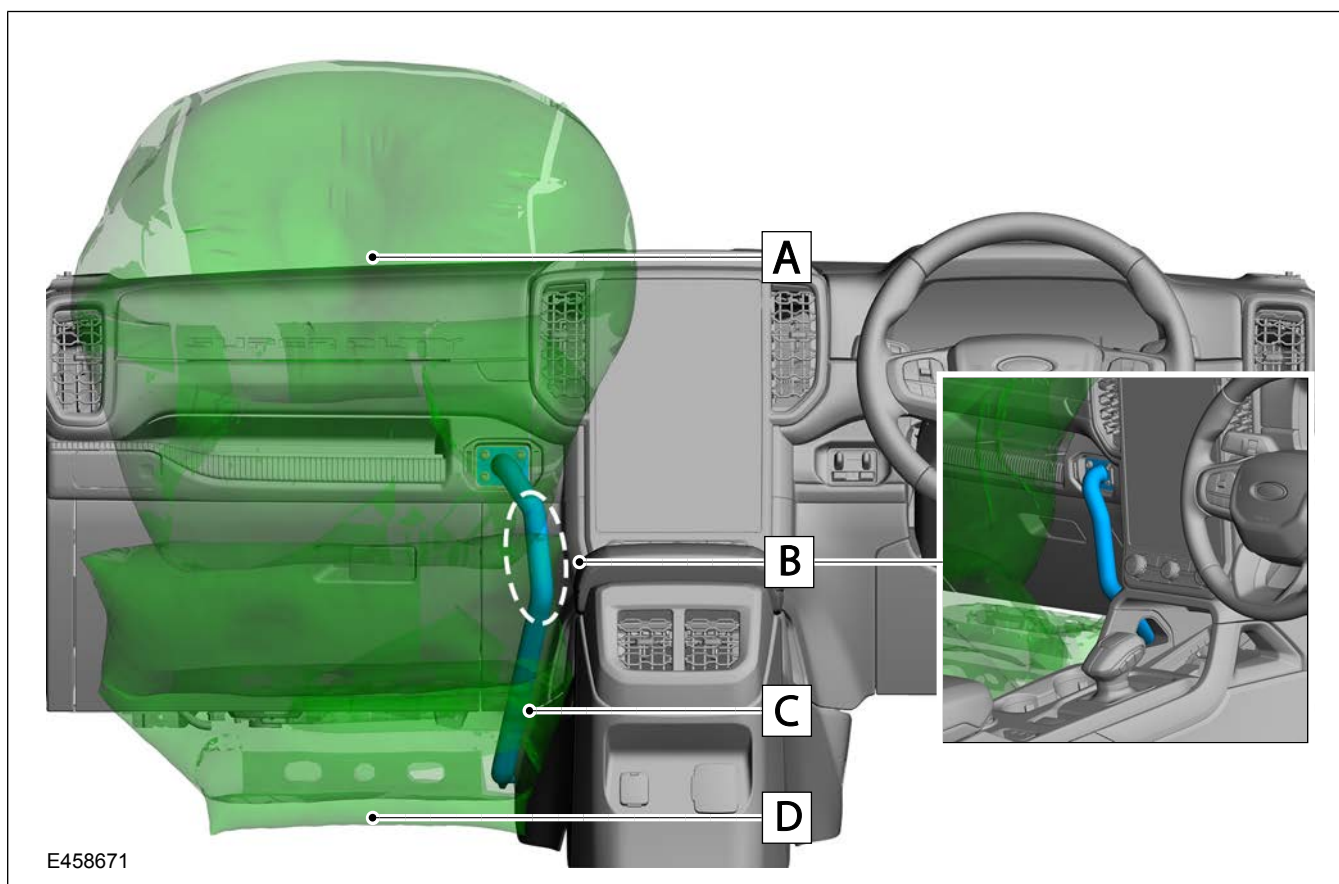


Dimensions (mm)			
A	140	C	250
B	40	D	100

NOTE: LHS shown, RHS Similar.

5.3.2 Integrated Device Mount System

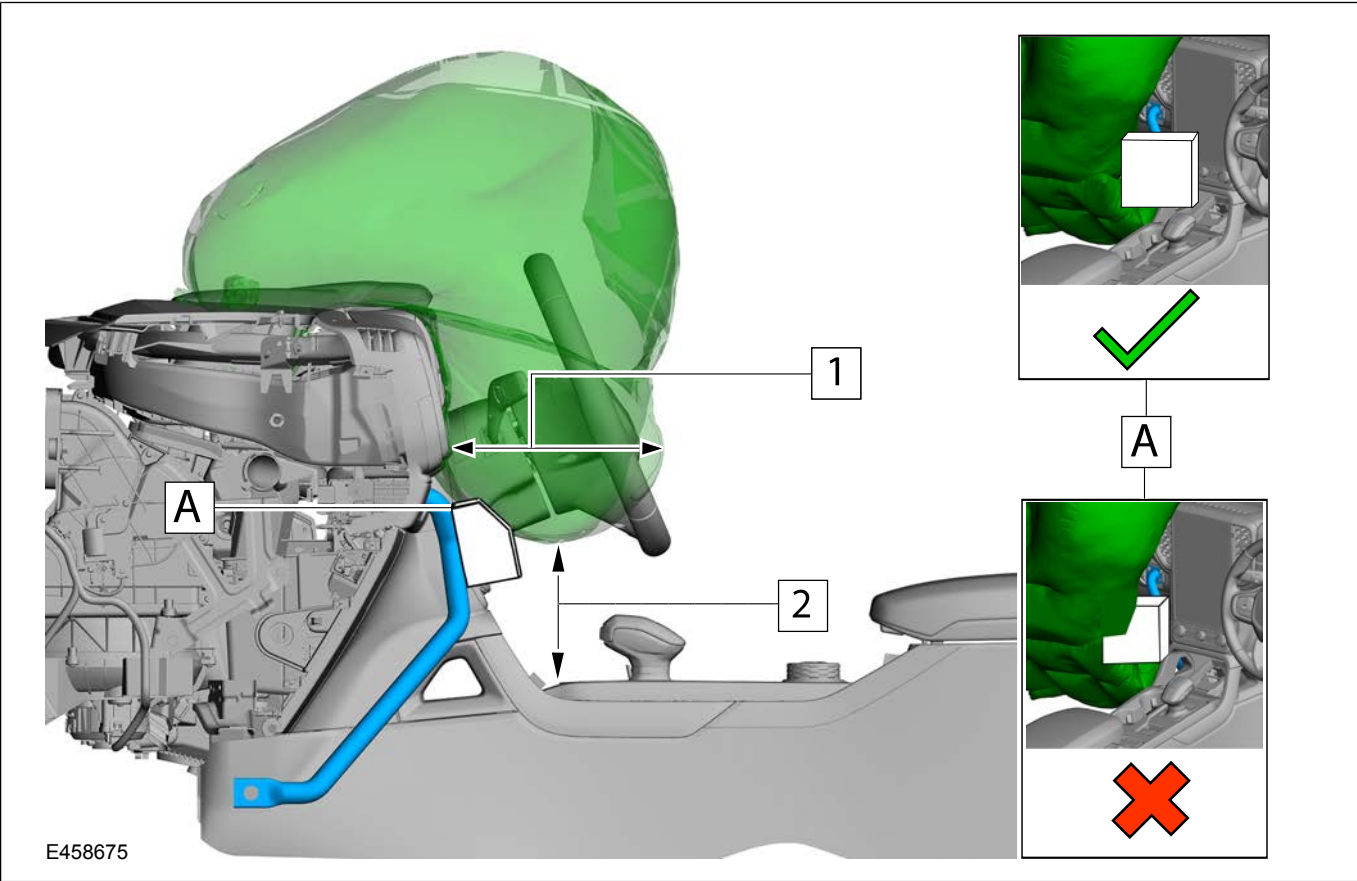
 **WARNING:** The integrated device mount system enables devices to be mounted, however these devices must remain outside of the passenger airbag zones. The weight of the mounted aftermarket device must not exceed 2.5kg.



Item	Description
A	Passenger airbag zone
B	Device mounting area
C	IDMS bar
D	Passenger knee airbag zone

The integrated device mount system kit is available in some markets as an accessory that can be purchased from authorised Ford Dealers:

- Part Number: R1WZ-19A464-AC



WARNING: The installation of aftermarket devices that interfere or obstruct the functionality of the airbags can significantly increase the risk of personal injury in the event of a collision.

Aftermarket devices mounted on the IDMS must be clear of the passenger airbag zones.

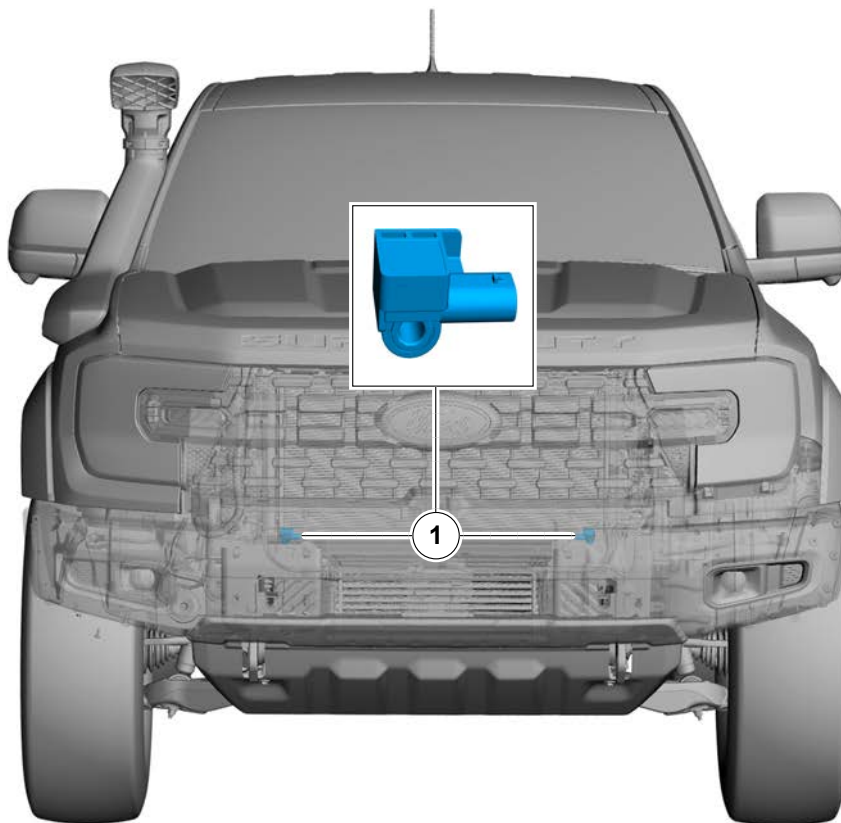
Item	Dimension (mm)
1	150 mm
2	200 mm

5.3.3 Supplementary Restraint Sensors (Front)

WARNINGS:

WARNING: Modifications or reinforcements in the area of the front supplementary restraint sensors may affect their operation.

WARNING: Modifying or adding equipment to the front end of your vehicle (including hood, bumper system, frame, front end body structure, tow hoots and hood pins) may affect the performance of the airbag system, increasing the risk of injury. Do not modify or add equipment to the front end of your vehicle.



E455729

Item	Description
1	Front SRS Impact Sensors

5.4 Seatbelt Systems

 **WARNING: Follow the Ford approved removal and installation procedures for the seatbelt system to ensure correct function of the restraints system.**

The removal and reinstallation of the seatbelt, retractor or any component of the seatbelt system should be avoided. However if removal and re-installation of the system is required during the conversion, follow the removal and installation guidelines of the seatbelt system as described in the workshop manual. Please consult your local National Sales Company representative for further information.

When removing the seatbelt system, a seatbelt webbing forked retainer should be applied to the webbing 200mm below the tongue stop feature. This prevents a situation where all the webbing runs back into the retractor and the retractor becomes locked.

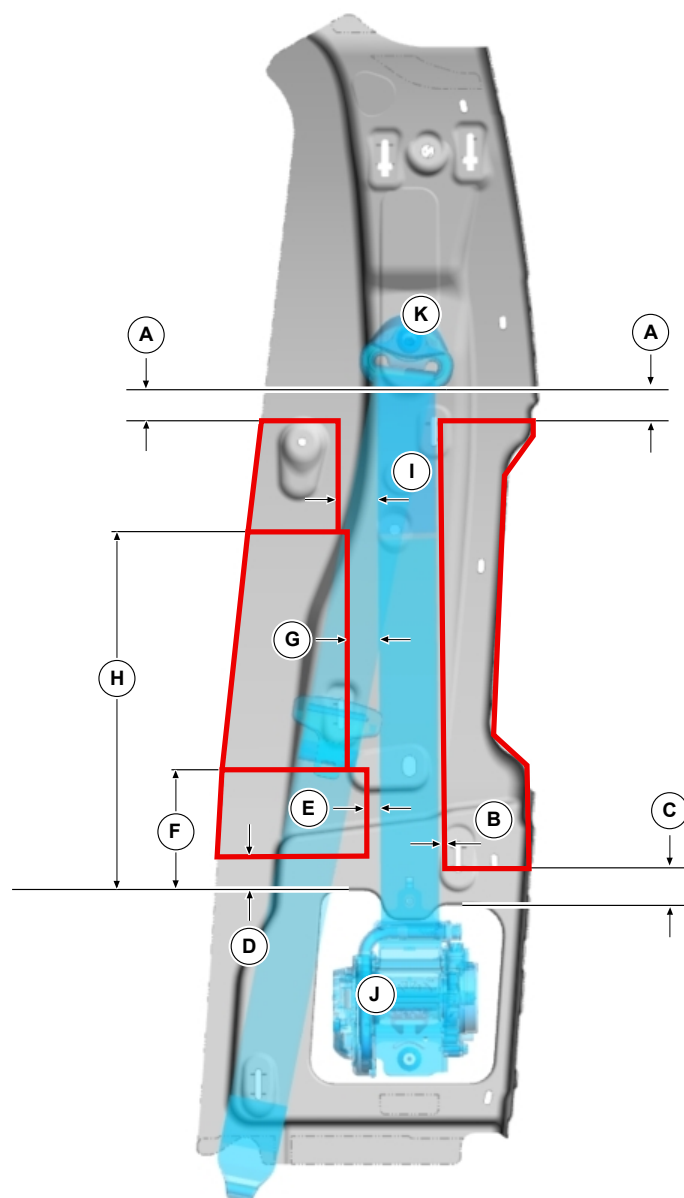
When reinstalling, fit the retractor to the body first and gently pull the webbing out of the retractor to allow fitment of the D loop. Then remove the forked retainer. If the retractor is locked, allow a small amount of webbing to reel back into the retractor to allow the webbing lock to release. Do not attempt to release the retractor by pulling on the webbing with significant force or by manually interfering with the locking mechanism.

5.4.1 SeatBelts - No Drill Zones

Single Cab - First Row Seat Belt

WARNINGS:

-  **Do not drill in right hand/left hand side retractor assembly area.**
-  **Drilling is only permitted in the red area indicated.**
-  **Retractor damage: If drilling holes near or above the retractor and anchor pretensioner, the mechanisms must be covered to prevent metal shavings/debris from falling into the assembly and causing functional issues.**
-  **Webbing damage: Any outfitted hardware must not cut, pinch or interfere with the seatbelt webbing along its entire path (from retractor to D-ring area). Avoid sharp brackets near webbing; all edges must have a minimum radius of 0.5mm. Avoid upfitting parts that may change the belt routing to the occupant.**



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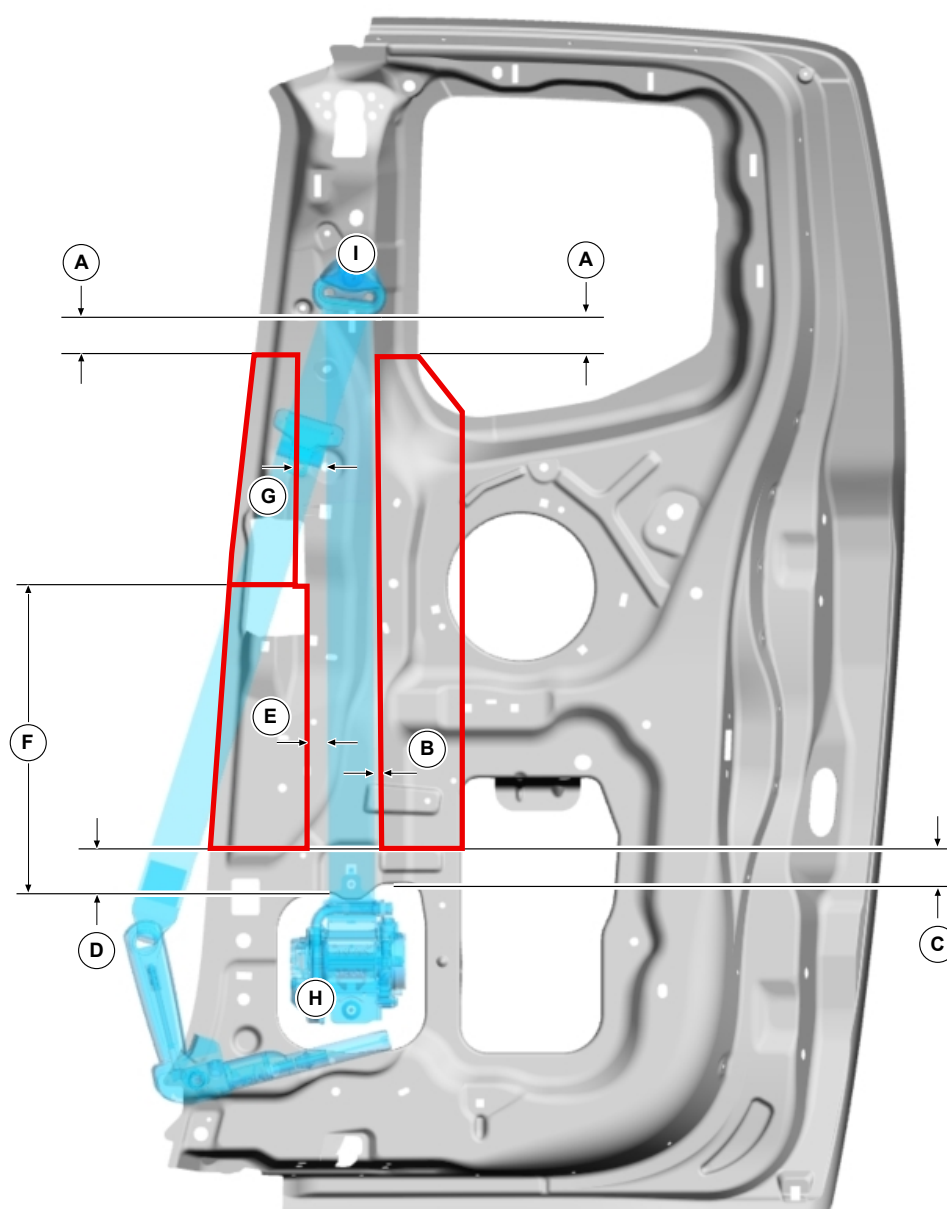
Item	-
A	30mm below bottom of D-Ring
B	15mm right of webbing
C	30mm above retractor hole (right hand side)
D	30mm above retractor hole (left hand side)
E	25mm left of webbing
F	100mm above retractor hole (left hand side)
G	35mm left of webbing
H	300mm above retractor hole (left hand side)
I	50mm left of webbing

NOTE: Right hand side shown, left hand side mirrored.

Super Cab - First Row Seat Belt

WARNINGS:

-  **Do not drill in right hand/left hand side retractor assembly area.**
-  **Drilling is only permitted in the red area indicated.**
-  **Retractor damage: If drilling holes near or above the retractor and anchor pretensioner, the mechanisms must be covered to prevent metal shavings/debris from falling into the assembly and causing functional issues.**
-  **Webbing damage: Any outfitted hardware must not cut, pinch or interfere with the seatbelt webbing along its entire path (from retractor to D-ring area). Avoid sharp brackets near webbing; all edges must have a minimum radius of 0.5mm. Avoid upfitting parts that may change the belt routing to the occupant.**



E387442

Item	-
A	30mm below bottom of D-ring
B	15mm right of webbing
C	30mm above retractor hole (right hand side)
D	30mm above retractor hole (left hand side)
E	25mm left of webbing
F	280mm above retractor hole (left hand side)
G	35mm left of webbing

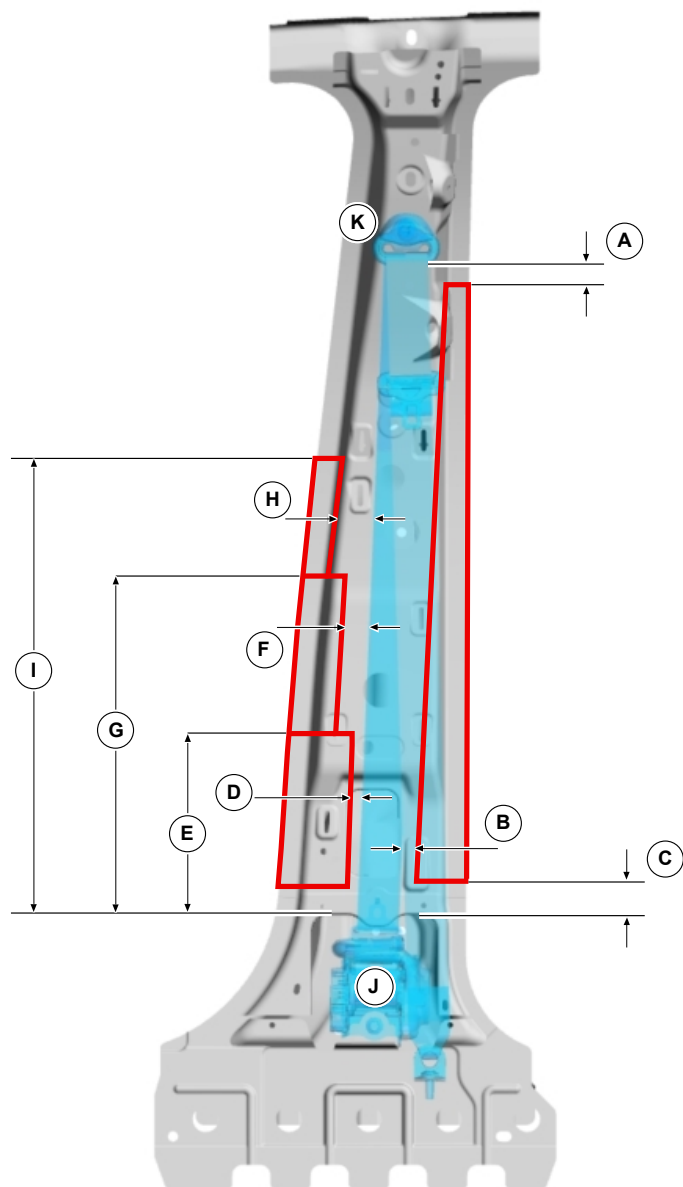
NOTE: Right hand side shown, left hand side mirrored.

Double Cab - First Row Seat Belt

WARNINGS:

-  **Do not drill in right hand/left hand side retractor assembly area.**
-  **Drilling is only permitted in the red area indicated.**
-  **Retractor damage: If drilling holes near or above the retractor and anchor pretensioner, the mechanisms must be covered to prevent metal shavings/debris from falling into the assembly and causing functional issues.**

⚠ Webbing damage: Any outfitted hardware must not cut, pinch or interfere with the seatbelt webbing along its entire path (from retractor to D-ring area). Avoid sharp brackets near webbing; all edges must have a minimum radius of 0.5mm. Avoid upfitting parts that may change the belt routing to the occupant.



E385972

Item	-
A	30mm below bottom of D-Ring
B	15mm right of webbing
C	30mm above retractor hole
D	25mm left of webbing
E	220mm above retractor hole
F	35mm left of webbing
G	380mm above retractor hole
H	50mm left of webbing
I	525mm above retractor hole

NOTE: Right hand side shown, left hand side mirrored.

5.5 Corrosion Prevention

5.5.1 General

Avoid drilling into closed frame body members to avoid the risk of corrosion from swarf.

If drilling is required, however:

- After cutting or drilling operations, de-burr before repainting to protect against corrosion
- Re-paint metal edges and protect against corrosion after cutting or drilling operations.
- Endeavor to remove all swarf from inside the side member and treat to prevent corrosion.
- Apply corrosion protection inside and outside of the chassis frame when coating is damaged by drilling or welding.
- In markets or regions where salt is used to de-ice road surfaces, cavity wax may need to be re-applied to the internal frame section damaged by drilling or welding.

5.5.2 Repairing Damaged Paint

After cutting or reworking any sheet metal on the vehicle the damaged paint must be repaired.

Ensure all materials are compatible with the relevant Ford specifications and maintain the original performance.

5.5.3 Under Body Protection and Material

 **WARNING: Do not over-coat or contaminate surfaces of components such as brakes or catalytic converters.**

Ensure all materials are compatible with the relevant Ford specifications and maintain the original performance.

Some proprietary products affect the original coatings. For specifications of corrosion protection materials, please consult your local National Sales Company representative.

5.5.4 Painting Road Wheels

 **WARNING: Do not paint wheel mating surfaces in contact with other wheels, brake drum or disc, hub and holes or surface under wheel nuts. Any further treatment in these areas may affect the wheel clamp performance and the vehicle safety. Mask the wheel when changing the color or repairing paint.**

5.5.5 Galvanic (bi-metallic) Corrosion

When materials with different electrochemical potential come in contact with each other, ensure appropriate measures are taken to isolate electrical contact by use of an insulating material.

5.6 Frame and Body Mounting

5.6.1 Mounting Points and Tubing

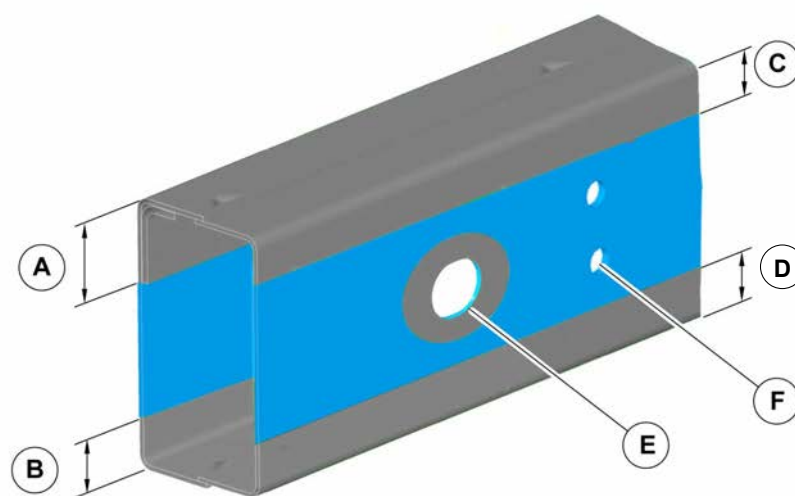
⚠ WARNING: Drilling into reinforcements and load paths may have a detrimental affect on crash performance. Vehicle Converter shall confirm any changes comply with general product safety requirements, legal requirements or type approvals

Unused holes on frame maybe a result of the production process and may not necessarily be designed for fixing additional equipment. Always use chassis mounts as shown in sub frame for low floor or other equipment. If additional fixings are required please follow the recommendation given in the figure shown. This does not apply to areas of load applications such as spring fixings or damper fixings.

NOTE: After drilling, deburr and countersink all holes and remove chips from the frame. Follow corrosion prevention.

Refer to: 5.5 Corrosion Prevention (page 154).

Frame Drilling and Welding



E134173

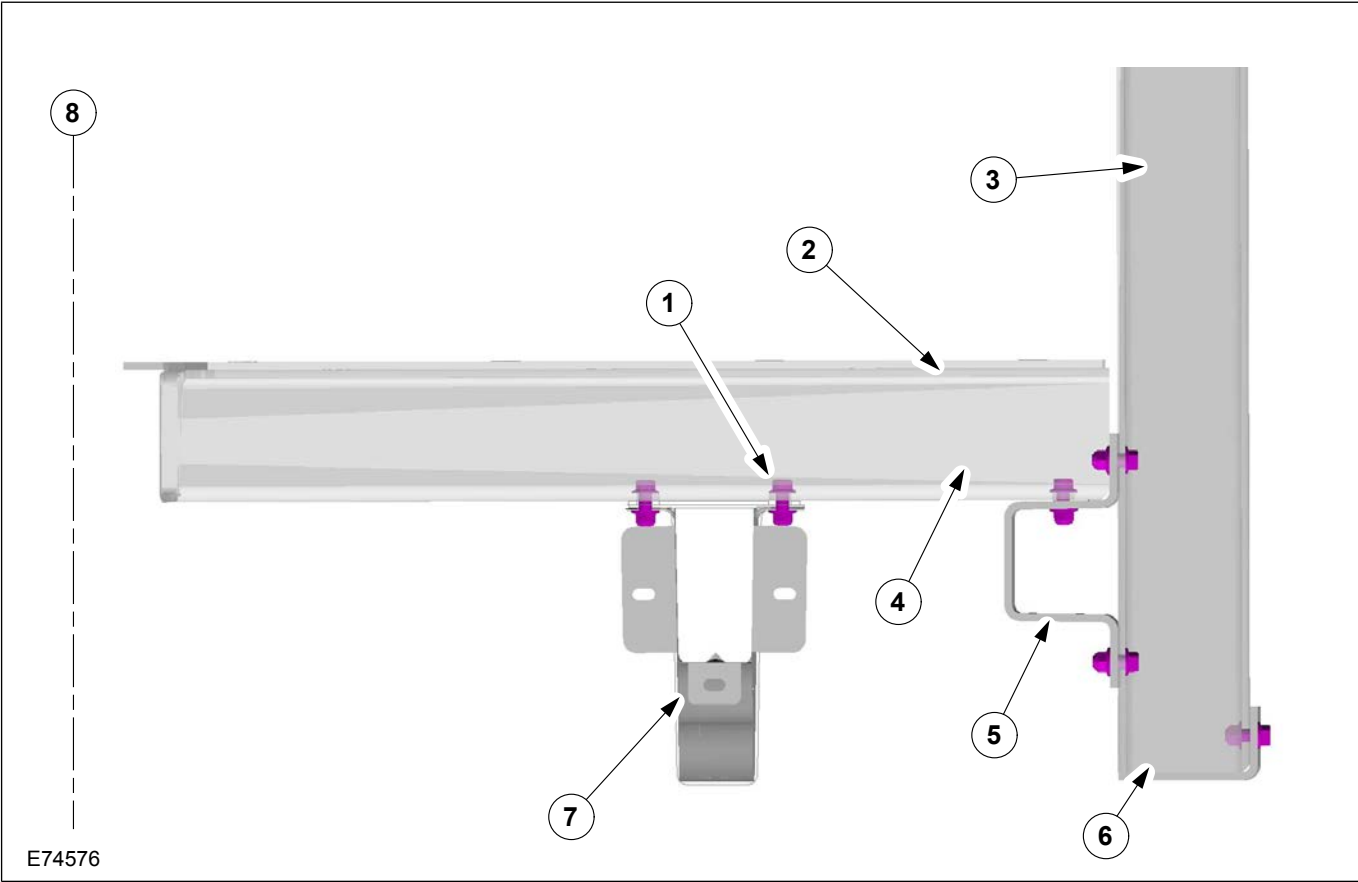
Dimensions (mm) for Body Attachment Holes in Chassis Frame Top Flange

Item	Description
A	45 mm FRONT / 15mm REAR
B	45 mm FRONT / 15mm REAR
C	45 mm FRONT / 15mm REAR
D	45 mm FRONT / 15mm REAR
E	Do NOT enlarge chassis rail holes, or drill within the surrounding area.
F	Do not drill any more than 2 vertical holes in the chassis rail.

- No welding permitted except as detailed below:
- To make holes in frames do not use a gas flame. Drill holes using sharp drills.
- Use cold riveting only when attaching brackets with rivets.
- Use high tensile bolts and appropriate nuts when bolted attachments are used.
 - Bolt Specifications :
 - Metric – Property class 8.8 or 10.9
 - Japanese – 7T or 9T
 - SAE – Grade 5 or 8
- Deburr holes after drilling to fit bolts or rivets. Chamfer 1.0mm x 45 degree on the bolt head side of the hole to facilitate bolt seating.
- Holes must NOT be drilled near side member profile changes.
- Existing holes in top and bottom flanges must NOT be bored out.
- No more than two holes are to be drilled in a vertical line down from the frame web.
- Corrosion protection is to be applied post drilling operations to the vehicle. Corrosion protection & protective coatings for all modifications should conform to all local regulatory standards.

10. Reinforcements should be added to the vehicle structure where appropriate, to avoid excessive load concentrations.
11. DO NOT DRILL or MODIFY extruded (datum) holes/slots
12. No modified or new holes greater than 16.5mm

Typical Design Principle of a Self-Supporting Body Structure



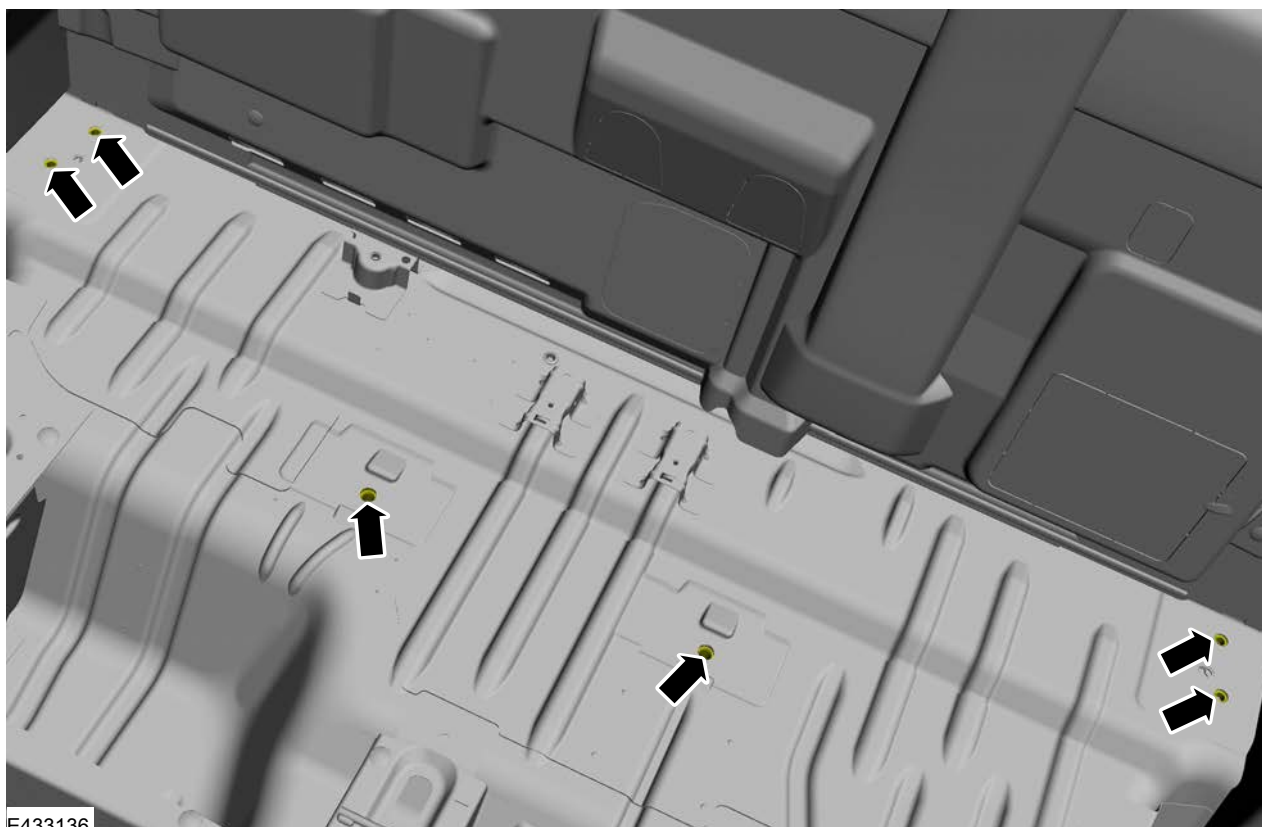
Item	Description
1	Use all standard locations with 2x M10 fixings
2	Floor panel
3	Body side frames
4	Floor cross members
5	Continuous floor U-profile frame
6	Longitudinal L-profile
7	Chassis frame rail of base vehicle
8	Vehicle center line of base vehicle

Also see:
[Refer to: 5.1 Body \(page 120\).](#)

5.6.2 Rear Seat Deletion

NOTE: If the rear seat is to be permanently removed as part of the conversion the rear seat fixing positions in the floor must be covered up to prevent noise, dirt and water ingress.

Rear Seat Fixing Positions



E433136

5.6.3 Self-Supporting Body Structure

Bodies and structures can be judged as self-supporting providing they maintain the following rules:

- Cross members are used at each chassis mounting point, please refer to figures shown.
- Each cross member has a suitably engineered connection to the body side wall (3) or to the continuous floor frame (5), see figure shown.
- The body side wall or the continuous floor frame supports any overhang beyond the chassis frame, whether on standard frame or extended frame.

Alternatively, the self-supporting body structure can also be designed as shown in figure shown.

- This concept is based on a self-supporting structure where the floor is mounted directly onto the top surface of the chassis frame.
- See figure shown for a generic vehicle cross section where the cross members and opposing out riggers are flush with the surface of the chassis frame side members.
- It is important to the overall function of the vehicle structure that the out riggers are each connected to a continuous longitudinal floor side frame or a structural body side structure assembly.

Low floor-re-work for guidance only:

- Engineer unique cross members and out-riggers spaced at approximately 600mm maximum pitch.
- Out-rigger moment to be re-acted with cross-member between chassis frame with common through bolts where possible.
- Drill frame and add spacer tubes.

[Refer to: 5.6 Frame and Body Mounting \(page 155\).](#)

- Out-rigger outboard ends should be attached to load bearing body side / floor edge frame or body side structure (including over wheel support).
- Structural wheel box should maintain longitudinal continuity with a rigid attachment to the floor edge frame or to the body side structure.
- Floor boards should be substantially attached to cross members and outriggers, but not to the chassis frame top surface.
- Low floor exhaust heat shields.

5.6.4 Frame Drilling and Tube Reinforcing

The chassis frame may be drilled and reinforcing spacer tubes may be welded in place, providing the following is applied:

- Adhere to all details shown in figure.
- Drill and weld only side walls of the chassis frame.

- Locate and drill holes accurately, using a drill guide to ensure holes are square to frame vertical center line (note: allow for side member draft angle).
 - Drill undersize and ream out to size.
 - Remove all swarf from inside side member and treat to prevent corrosion.
 - Fully weld each end of the tube and grind flat and square, in groups if applicable. Be aware of side member draft angle.
 - Apply corrosion protection inside and outside of the chassis frame.
- Refer to: 5.5 Corrosion Prevention (page 154).
- Holes should be in groups of two (2), either vertically spaced at 30 to 35mm from chassis frame top and/or bottom surface, or horizontally at 50mm minimum pitch, 30 to 35mm from top and/or bottom chassis frame surface.
 - Always use M10 bolts with grade 8.8 minimum.
 - Do not position tubes at the medium chassis frame height, this may create “oil canning” of the deep section side walls.
 - Where possible, the outrigger moments should be resolved by matching inner cross members between the chassis side members inline with the outriggers.
 - A diameter of 16.5mm is the maximum allowable hole size in the chassis frame side wall, irrespective of the usage.

Avoid drilling into closed frame body members to avoid the risk of corrosion from swarf.

Refer to: 5.5 Corrosion Prevention (page 154).

5.6.5 Ancillary Equipment - Sub Frame Mounting

Typical sub-frames and longitudinal members for flatbed and low or drop-side bodies or equipment exceeding the standard or Regular Production Order frame length should adhere to the following guidelines:

- Flat-beds and low bodies mounted on integral longitudinal members (channel or box section metal – not wood) must use both sides of all frame mounting pads.
- Longitudinal members must be relieved at the front end if they are to contact the chassis frame top surface, to minimize stress concentrations. It is preferable however, to mount the longitudinal onto the mounting brackets, with a clearance to the chassis frame top surface.
- Each mounting point to the chassis pads must use a Minimum M12 grade 10.9 bolt. However M14 grade 10.9 is recommended.
- Minimum floor heights will require wheel arch boxes to clear the rear tyres. See Wheelhouse Envelope

Refer to: 5.1 Body (page 120).

5.6.6 Area for Fitting Additional Body Attachments to the Rear of the Bumper.

NOTE: With the vehicle on level ground and with all measurements taken rear ward of the bumper bar edge: The area designated for the fitting of attachment is defined as 220mm horizontally by 95mm vertical downward to the road surface, with a max width of 1390mm about vehicle center line.

It is not the manufactures recommendation to fit additional body attachments (Tow bars, Steps, Bicycle racks & Carriers) outside of the designated area.

5.6.7 Water Tank on Camper Vehicles

NOTE: It is recommended that a decal or label is fitted adjacent to the filler aperture identifying the correct fluid to be used, for example: 'Water only' for water tanks.

5.6.8 Long Wheelbase Conversions

WARNINGS:

 **All long wheelbase conversion must adhere to the frame and mounting guidelines referenced in this publication.**

 **All vehicles subject to wheelbase extensions must adhere to the local regulations for emissions, durability and conformity.**

 **CAUTION: All emission control systems must remain operative and fully functioning after LWB conversion has taken place.**

Refer to your local Ford dealer or National Sales Agent for further information.

Fuel System Modifications for Long Wheelbase Conversions

WARNINGS:

 **All modification to the fuel system must adhere to local regulations.**

 **All modifications of fuel system components such as extension or rerouting of fuel lines and relocation of fuel system components need to be approved by a local regulatory authority.**

Exhaust Modifications for Long Wheelbase Conversions

WARNINGS:

 **All modification to the exhaust system must adhere to local regulations.**

⚠ Service bodies and load carrying equipment intended to house or transport humans or live animals must be manufactured and installed in such a way that the tailpipe outlet is positioned so that exhaust gas is emitted outside and away from the sealed passenger/animal compartment.

⚠ Any modification or added body structure that affects the exhaust system and tailpipe should not cause blocking or obstruction. of the exhaust gas flow.

CAUTIONS:

⚠ Acoustic/Silencing devices located in the allowable modification zone may be relocated but not removed and may require approval testing by regulatory authorities to ensure compliance with applicable pass by noise regulations.

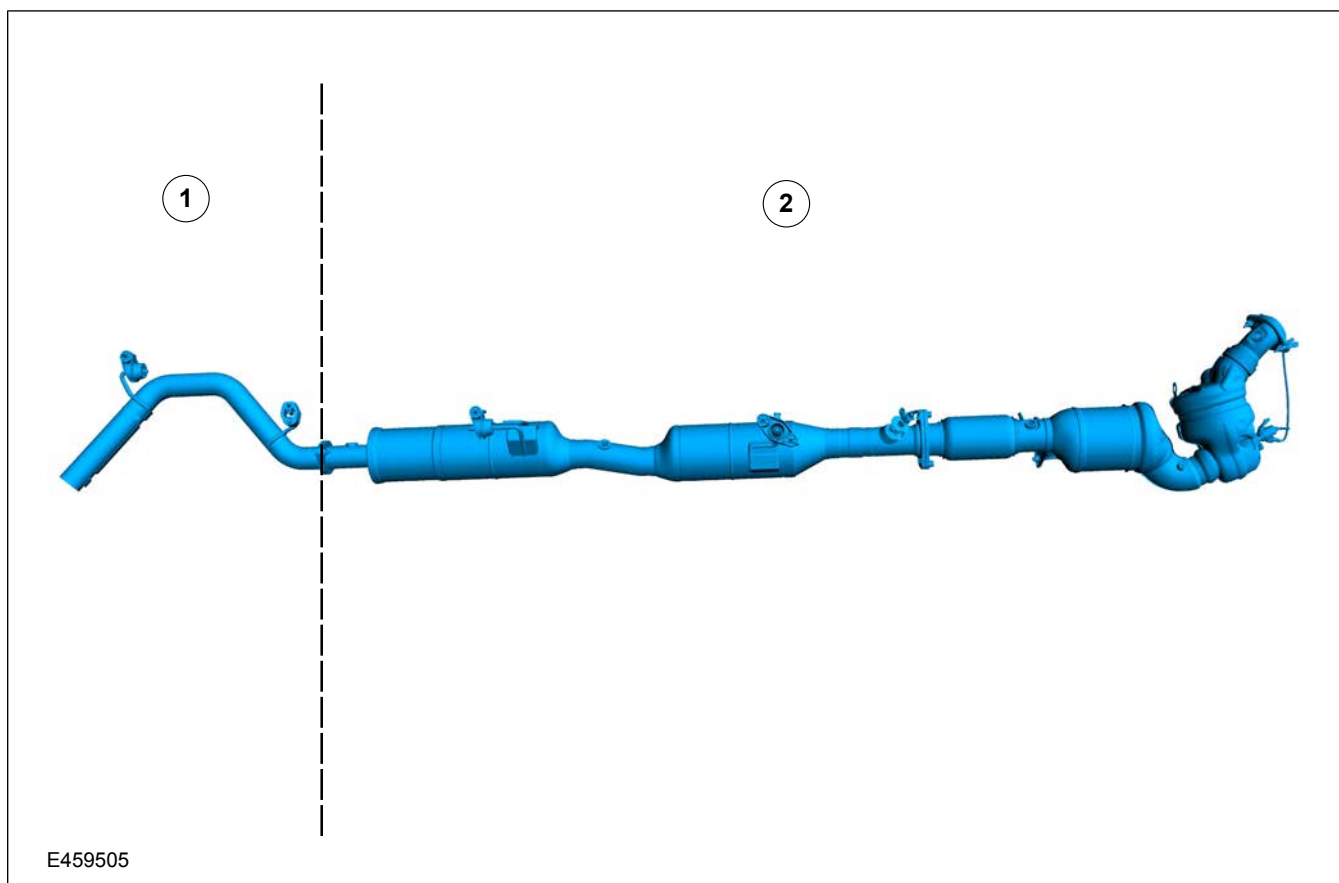
⚠ Where possible, utilise existing exhaust isolator mounts for the modified exhaust system.

NOTE: No modifications to the emission control system as part of the exhaust after treatment (Selective Catalytic Reduction System) are allowed, except for those in areas outlined below.

Vehicles equipped with Stage 6.2 Emissions controls require careful consideration and planning around the extension of the exhaust.

Exhaust modifications to support long wheelbase conversions are limited to the section of exhaust downstream from the indicated point in the images below:

3.0L Turbo Diesel Engine - Stage 6.2 Emissions



Item	Description
1	Modification Zone
2	DO NOT MODIFY Zone

Selective Catalytic Reduction System Modifications for Long Wheelbase Conversions

WARNINGS:

 **All modification to the Selective Catalytic Reduction System must adhere to local regulations.**

 **All modifications of Selective Catalytic Reduction System components such as extension or rerouting of pressure lines and relocation of system components need to be approved by a local regulatory authority.**

Refer to your local Ford dealer or National Sales Agent for further information.

A

About this Manual.....	6
About this Publication.....	5
AC Inverter Deactivation.....	72
Adaptive Cruise Control.....	107
Additional External Lamps.....	92
Aids for Vehicle Entry and Exit.....	17
Air Bags.....	138
Airbag Supplemental Restraint System (SRS).....	138
Air Intake.....	38
Alternative Type Approval.....	7
Ancillary Equipment - Sub Frame Mounting.....	158
Area for Fitting Additional Body Attachments to the Rear of the Bumper.....	158
Automatic High Beam Control.....	106
Auxiliary Rear View Camera.....	85
Axle Breather Vent Hose.....	55

B

Battery and Cables.....	59
Battery Information.....	59
Blind Spot Information System.....	113
Body.....	120
Body Structures - General Information.....	120
Brake Hoses.....	37
Brake (Stop) Lamps.....	96
Brake System.....	37

C

CAD Models.....	6
Cargo Management on Vehicle Tub.....	133
Center of Gravity.....	31
Central Locking.....	117
Centre High Mount Stop Lamp (CHMSL).....	106
Charging System.....	69
Chassis Cab Body - Basic Dimensions and Weights.....	25
Chassis Cab.....	123
Commercial and Legal Aspects.....	7
Connection of Auxiliary Loads / Accessories - Vehicles with Factory Fit Auxiliary Switches, Wiring and Fuse Box.....	66
Conversion Effects on Parking Aids.....	17
Corrosion Prevention.....	154
Cruise Control.....	107

D

Drilling and Welding.....	8
Driver Assist Technology.....	108
Driver Field of View.....	17
Driver Reach Zones.....	17
Driving Lamps - Auxiliary Bracket Addition.....	95

E

Electrically Operated Door Mirrors.....	106
Electromagnetic Compatibility (EMC).....	9
Electronic Engine Controls.....	80
Emissions Performance & In-service compliance.....	7
Engine Cooling Airflow Envelopes.....	38
Engine.....	38
Exterior Lighting.....	88

F

Frame and Body Mounting.....	155
Frame Drilling and Tube Reinforcing.....	157
Frame Feature Centerline Distance - All Cab Styles.....	131
Front, Rear and Side Under-Run Protection.....	26
Front End Body Panels.....	137
Front End Integrity for Cooling, Crash, Aerodynamics and Lighting.....	131
Front Fender Liner.....	136
Fuel Filler Mounting.....	48
Fuel Filler Pipe Restraining During Shipping.....	48
Fuel Filler Vent Hose - (Diesel).....	53
Fuel System.....	48
Fuses and Relays.....	119
Fuses.....	119

G

Galvanic (bi-metallic) Corrosion.....	154
General.....	37, 154
General Component Package Guidelines.....	17
General.....	37, 154
General Product Safety Requirement.....	7
Genuine Ford Accessory Bull Bar (if available).....	132
Gross Vehicle Mass and Axle Load Ratings.....	26
Grounding Points.....	64

H

Handbrake Signal.....	106
Handles, Locks, Latches and Entry Systems.....	117
Hardware—Specifications.....	27
Headlamp Aiming.....	88
Headlamps - Connection of Auxiliary Driving Lamp Signal.....	92
Hood Strut.....	137
How to Use This Manual.....	6

I

Ignition Signal.....	71
Important Safety Instructions.....	6
Information and Entertainment System.....	81
Instrument Panel 12V supply.....	81
Integrated Bodies and Conversions.....	121
Integrated Device Mount System.....	144
Interior Lamps.....	106
Introduction.....	6

J

Jacking.....	11
--------------	----

K

Kerb Mass and Payload.....	26
----------------------------	----

L

Lamps – Hazard / Direction Indication.....	104
Lane Centering Assist.....	116
Lane Keeping System.....	116
Legal and Vehicle Type Approval.....	7
Legal Obligations and Liabilities.....	7
Lifting.....	13
Loadbox / Tub - Lighting Connections.....	97
Load Distribution—Specifications.....	28

Load Distribution Calculations - Driver and Passenger Weight Distribution.....28

Long Wheelbase Conversions.....158

M

Main content inclusions for Super Duty - March 2026.....5

Main content inclusions for Super Duty - October 2025.....5

Minimum Requirements for Brake system.....8

Mounting Points and Tubing.....155

N

Noise, Vibration and Harshness (NVH).....14

P

Package and Ergonomics—Specifications.....22

Package and Ergonomics.....17

Painting Road Wheels.....154

Parking Aid.....73

Position (Park) Lamps.....97

Product Liability.....8

R

Rear Combination lamps.....90

Rear Fog Lamp.....90

Rear License Plate Lamp.....91

Rear Lighting Signal - Vehicles with Loadbox.....88

Rear Seat Deletion.....156

Rear View Camera.....82

Recommended Body Dimensions.....22

Recommended Maximum Main Load Area Dimensions.....20

Registration Plates.....21

Repairing Damaged Paint.....154

Rest of World.....5

Restraints System.....8

Road Safety.....8

Roof Racks.....132

S

SeatBelts - No Drill Zones.....148

Seatbelt Systems.....148

Selective Catalytic Reduction System - Diesel Exhaust Fluid (DEF) / Urea / AdBlue®.....40

Selective Catalytic Reduction System.....40

Self-Supporting Body Structure.....157

Sensor Location.....74

Side View Camera.....

Supplementary Restraint Sensors (Front).....146

Suspension System.....35

T

Tank and Dry Bulk Carriers.....132

Terminology.....7

Tipper Bodies.....131

Towing Capacities and Specifications.....34

Towing Requirements.....34

Towing.....34

Trailer Brake Connection.....37

Trailer Towing - Lighting Connections.....98

U

Under Body Protection and Material.....154

V

Vehicle Cabin Clearance.....25

Vehicle Duty Cycle Guidelines.....10

Vehicle Height.....19

Vehicle Ride and Handling Attributes.....10

Vehicle Speed Signal.....80

Vehicle Transportation Aids and Vehicle Storage.....15

Vehicle Weights.....33

W

Warranty on Ford Vehicles.....7

Water Tank on Camper Vehicles.....158

Wheelhouse Envelope.....122

Wheels and Tires.....36

Wiring Installation and Routing Guides.....56

Wiring Splicing Procedures.....56

Wiring Through Cabin Sheet Metal.....56

