# Frame and Body Mounting

The frame consists of 2 steel channels, a front crossmember, transmission support crossmember and mid and rear bolt-on crossmembers (dependant on wheelbase) as well as bolt-on frame extensions for some models.

**General Frame Recommendations**

The frame is the structure that carries and supports the rated load under anticipated driving conditions and secures the major components of a vehicle in their relative positions. The frame assembly consists of 2 sidemembers and depending upon the length of the frame, 5 or more crossmembers.

It is very important that the frame be inspected periodically for cracks, buckling, crossmember loosening or other damage that may cause eventual failure of the frame. Additional inspections should be made whenever the chassis has been overloaded or involved in an accident. An alignment check is not sufficient since local cracks, crossmember loosening or sidemember buckling will not necessarily cause misalignment.

On reinforced sidemember sections, when cracks exist in either of the sidemember sections, the members must be separated for repair. The 2 sidemember sections must not be welded together. After the weld repairs, the sections should be reinforced with the appropriate section and re-assembled with mounting bolts tightened to SAE Grade 8 torque levels.
For additional information, refer to: Frame Repair and Reinforcement (502-02 Full Frame and Body Mounting, General Procedures).

**Drilling or Notching**

Sidemembers should not be drilled or notched without approval from engineering. The maximum allowable sidemember hole size in the unrestricted zones is 19 mm (0.75 in).
For additional information, refer to: Drilling Precautions (502-02 Full Frame and Body Mounting, General Procedures).

**Welding or Flame Cutting**

**NOTICE: On any vehicle, disconnect both the positive and negative battery cables from the battery before welding or cutting on the vehicle. Attach the welder ground cable as close as possible to the part being welded or cut.**

In instances where plasma or similar cutting processes that utilize a ground cable, extended care must be taken to prevent damage to the electronic components of the vehicle.

With an electronic engine controller, do not connect the ground cable to the control module(s) or the cooling plate. To protect the control module(s), disconnect all connectors going to the control module(s).

**Reinforcement To Increase Capacity**

Reinforcement of the chassis frame to support either additional loading or concentrated loading does not increase vehicle load carrying capacity unless it has been fully verified that all other vehicle components, (such as the brake system, steering system, suspension system, etc.) can properly and safely support the increased loading.

**Increase In Local Stress**

In any modification of the chassis frame, the addition of holes, reinforcements, welds, clamps or splices may cause an increase in the local stress in the frame at the point of the modification, therefore causing a stress concentration in the frame sidemember(s).

These local stress concentrations can significantly affect the life of the chassis frame. The specific effect which the stress concentrator will have on the life of the chassis frame is influenced by the location of the stress concentration, the frequency and severity of the loading and the magnitude of stress concentration.

**Identification of Frame Rail Material**

Chassis are manufactured with frame rails of different alloy steels and some are heat-treated. A factory reinforced frame is optional. Each material must be handled in a specific manner to assure maximum service life; therefore, the frame material must be determined before attempting repair or modification.

Chassis are presently manufactured with frame rails of:

- HSLA (high-strength low alloy) steel
- Heat-treated steel

The frame rail material can be determined by inspecting the frame and consulting the dealer vehicle line setting ticket and the sales data book.

Heat-treated rails are marked on the inside of the section with a decal which cautions against welding, flame cutting or the addition of holes in critical zones. These practices are restricted for all frame rails, however, heat-treated rails are much more sensitive to these alterations.

In either case, welding must be held to a minimum during repair to reduce welding heat-effected zone.
For additional information, refer to: Frame Repair and Reinforcement (502-02 Full Frame and Body Mounting, General Procedures).

**Frame Damage**

The major sources of frame damage are accidents, overloading the vehicle and local overstressing due to a variety of causes. In accident cases, the reasons for the damage are readily apparent. Such damage may often be repaired by:

- Straightening and reinforcing the frame.
- Repairing the damaged area and reinforcing the frame sidemember.
- Replacing the frame sidemembers and crossmembers.

Damage to the chassis frame, such as a crack in the frame sidemember or crossmember, which is not associated with impact damage, may be an indication of overloading the vehicle. Damage to the chassis frame may also be an indication of the creation of locally high stresses due to operating conditions or equipment mounting practices. Examples of overloading are:

- Exceeding either the GVW Rating or the GAWR (Gross Axle Weight Rating) (loading the frame beyond its design capacity).
- Uneven load distribution.
- Using the vehicle in operating conditions or with equipment it was not designed for.

Examples of creation of locally high stresses are:

- Mounting bodies or equipment in a manner that causes stress concentrations and/or abrasive wear in either the flange or web portion of the sidemember.
- Improper modification or repair of frame components.
- Equipment which is susceptible to resonant vibration due to excess flexibility of its mounting.

Frame damage may also be caused by corrosion resulting from the contact between dissimilar metals.

Damage to the chassis frame, which is not associated with impact damage, should not be repaired until the cause of the damage has been determined and corrective actions taken to prevent re-occurrence of the non-impact damage.

**Aftermarket Modifications**

Cutting the frame behind the rear axle to shorten the frame is acceptable. Mechanical, cutting, electrical cutting or sawing is the preferred method(s). Flame cutting must be avoided. Whenever it is necessary to cut the frame, the sidemember should be cut at an angle of 90 degrees to the longitudinal axis.

For information on cutting of the frames to lengthen the frames or modify the wheelbase, refer to Wheelbase Alterations in this section.

In some cases, specialized equipment such as hoists, winches, lifts, snowplows, pusher and tag axles are added to the vehicle by distributors, installers or dealers. Unless otherwise specified by the customer at the time of assembly, the vehicle is generally equipped with a standard chassis frame and the manufacturer has not made special allowances for the special equipment which is being added.

The addition or installation of this special equipment on the vehicle can significantly affect the loading of the chassis frame. In some cases, it may be necessary to reinforce the frame. Care must be exercised to make sure that the GVW Rating and/or the GAWR (gross axle weight rating) are not exceeded.

Installation of this special equipment may involve State and Federal requirements which affect vehicle certification for noise emissions, exhaust emissions, brake requirements or lighting system requirements. The specialized equipment installer is responsible for the safety and durability of their product and, in addition, is responsible to make sure that the equipment and its installation comply with all applicable State and Federal Department of Transportation requirements and OSHA regulations.

Addition of specialized equipment may have a significant effect on other vehicle components, such as the brake system, steering system or suspension system. Simple reinforcement of the chassis frame may not be adequate to provide safe operation of the vehicle.

In any modification of the chassis frame, the addition of holes, reinforcements, welds, clamps or splices may cause an increase in the local stress in the frame at the point of the modification. These local stress concentrations can significantly affect the life of the chassis frame. The specific effect which the stress concentrator will have on the life of the chassis frame is influenced by the location of the stress concentration, the frequency and severity of the loading and the type of stress concentration. Any modification of the frame may void the manufacturer's warranty.

**Wheelbase Alterations**

Shortening or lengthening a wheelbase is an added expense for the customer. Therefore, it is often to the customer's benefit to order a chassis from the factory with the desired wheelbase rather than to alter the wheelbase of the chassis on-site.

The preferred method for altering the wheelbase is to slide the rear axle forward or rearward as required. Invariably, this requires the lengthening or shortening of air lines, brake lines, electrical lines and driveline. Extreme care should be taken in the modification of the air lines, brake lines, electrical lines and driveline to make sure that they operate as reliably as those with which the vehicle was manufactured.

If the wheelbase is lengthened, a reinforcement may be required. Consult your dealer before lengthening the wheelbase.

In those instances when it is necessary to cut and weld the frame to alter the wheelbase, the frame must be reinforced with a channel-type reinforcement of the same strength as the original frame material in the area where the frame has been cut.
For additional information, refer to: Frame Repair and Reinforcement (502-02 Full Frame and Body Mounting, General Procedures).

If the frame was built with both a main frame and a reinforcement, the reinforcement should be removed before cutting the main frame. It is essential that a new 1-piece outer channel reinforcement be obtained rather than cutting and re-using the original reinforcement.

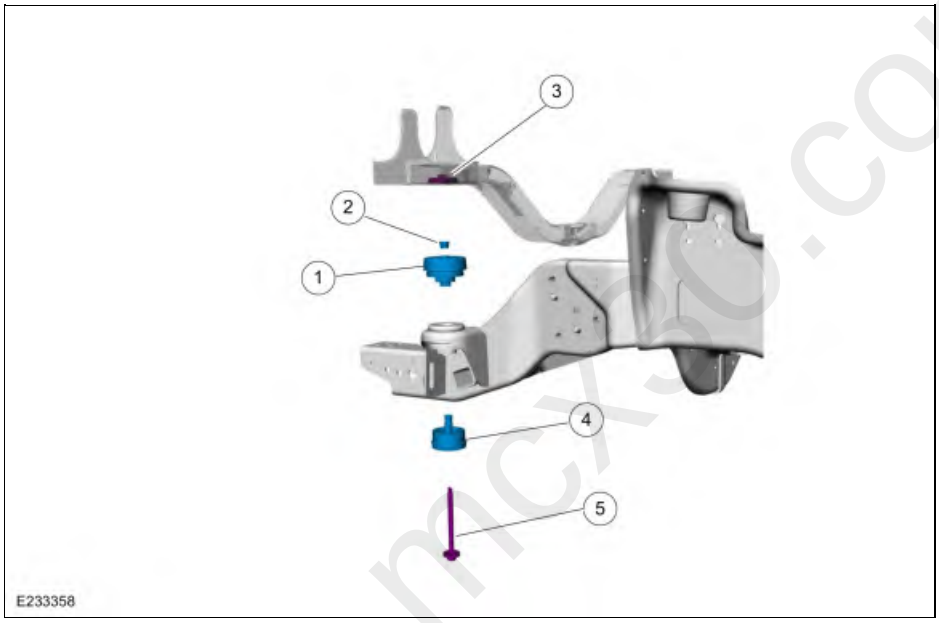
**Body Mounts**

The body support mounts:

- secure the body to the frame.
- cannot be lubricated during body support mount installation
- Body retainer cage nuts must be serviced as an assembly.
- Refer to the following illustrations for body bolt torque values.

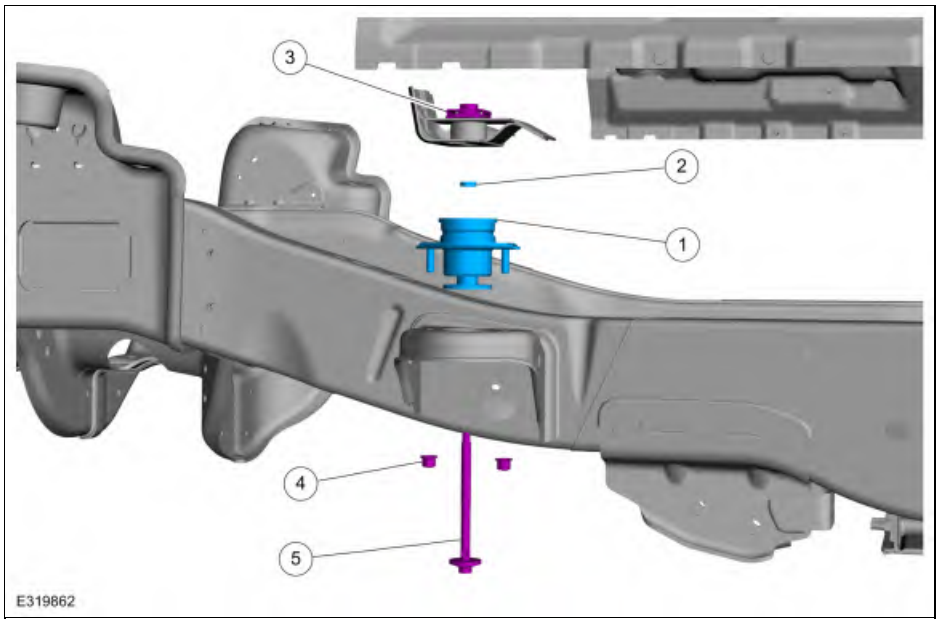
**NOTE:** *Body mount bolts are NOT reusable due to torque plus angle securing on some of body mount locations.*

**Front End Sheet Metal (FESM) Body Mount LH/RH**



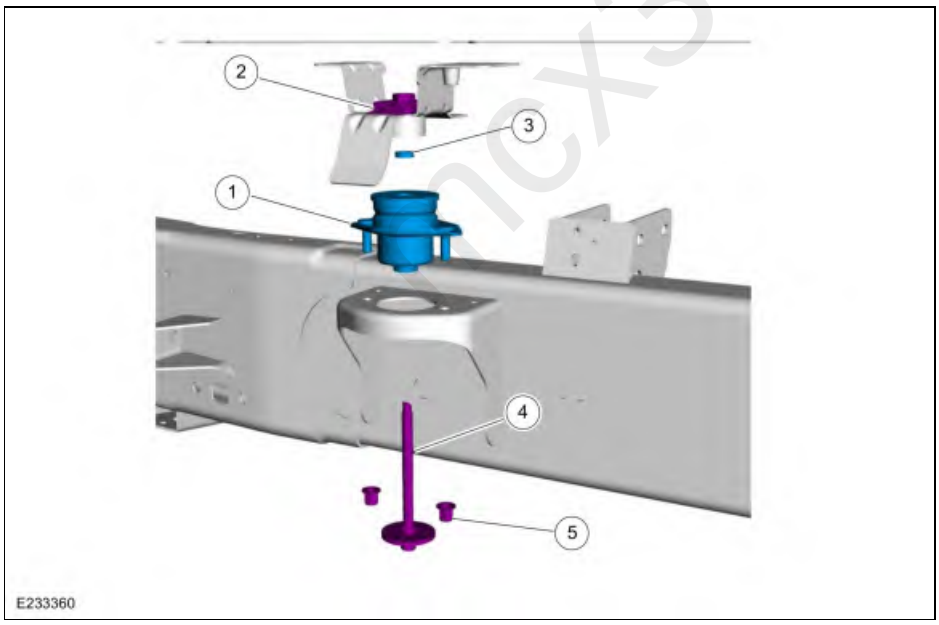

| Item | Description | Torque |
|---|---|---|
| 1 | Upper insulator | â€” |
| 2 | Bolt capture | â€” |
| 3 | Body retainer cage nut | â€” |
| 4 | Lower insulator | â€” |
| 5 | Body mount bolt | 103 Nm (76 lb-ft) |

**Body Mount â€” No. 1, (LH/RH All Cabs)**



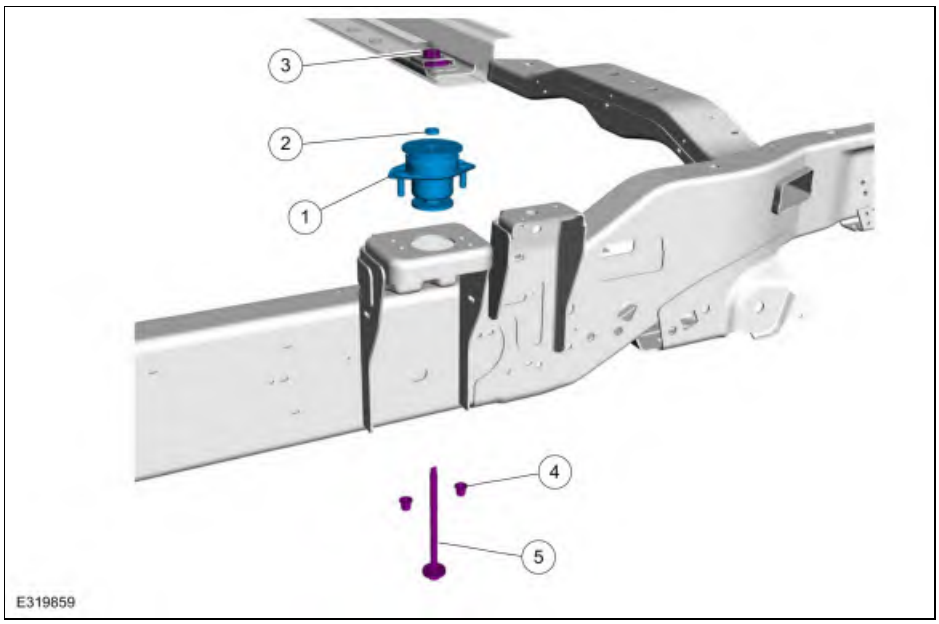

| Item | Description | Torque |
|---|---|---|
| 1 | Upper insulator | â€” |
| 2 | Bolt capture | |
| 3 | Body retainer cage nut | â€” |
| 4 | Bracket nut (2 required) | 63 Nm (46 lb-ft) |
| 5 | Body mount bolt | 103 Nm (76 lb-ft) Single Rear Wheel vehicle, 103 Nm (76 lb-ft) plus 90Â° angle Dual Rear Wheel vehicle |

**Body Mount â€” No. 2, (LH/RH Super Cab and Crew Cab)**




| Item | Description | Torque |
|---|---|---|
| 1 | Upper insulator | â€” |
| 2 | Body retainer cage nut | â€” |
| 3 | Bolt capture | â€” |
| 4 | Body mount bolt | 103 Nm (76 lb-ft) |
| 5 | Bracket nut (2 required) | 63 Nm (46 lb-ft) |

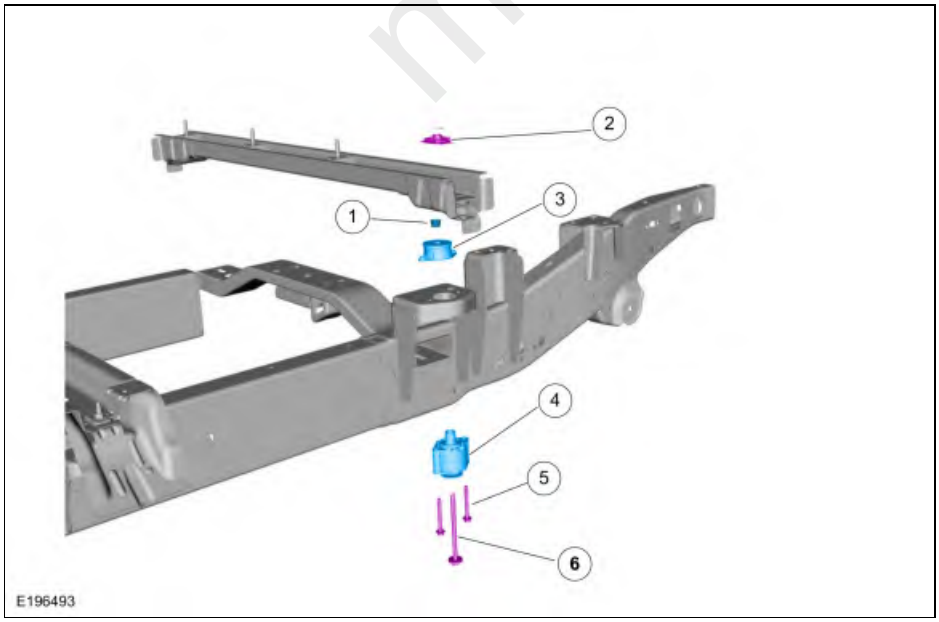
**Body Mount â€" No. 3, Chassis Cab (LH/RH All Cabs)**




| Item | Description | Torque |
|---|---|---|
| 1 | Upper insulator | â€" |
| 2 | Bolt capture | â€" |
| 3 | Body retainer cage nut | â€" |
| 4 | Bracket nut (2 required) | 63 Nm (46 lb-ft) |
| 5 | Body mount bolt | 103 Nm (76 lb-ft) Single Rear Wheel vehicle, 103 Nm (76 lb-ft) plus 90Â° angle Dual Rear Wheel vehicle |

**Body Mount â€" No. 3, (LH/RH All cabs)**

**NOTE:** *With hydraulic mounts.*

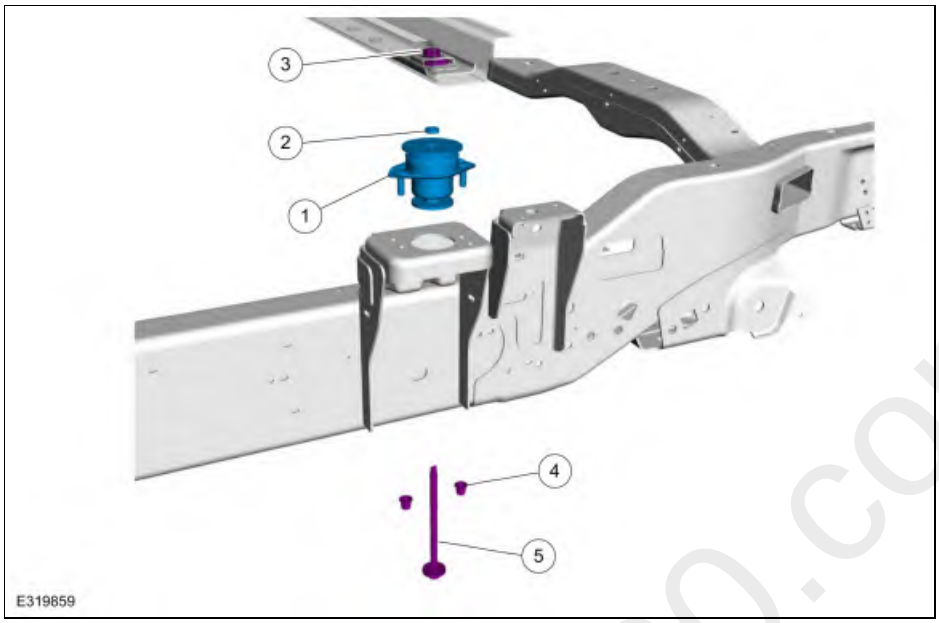



| Item | Description | Torque |
|---|---|---|
| 1 | Bolt capture | â€" |

| | | |
|---|---|---|
| 2 | Body retainer cage nut | â€” |
| 3 | Upper insulator | â€” |
| 4 | Hydraulic body mount | â€” |
| 5 | Body mount bolt (2 required) | 63 Nm (46 lb-ft) |
| 6 | Body mount bolt | 103 Nm (76 lb-ft) Single Rear Wheel vehicle, 103 Nm (76 lb-ft) plus 90Â° angle Dual Rear Wheel vehicle |

**Body Mount â€” No. 3, (LH/RH All Cabs)**

**NOTE:** *With shear mounts.*




| Item | Description | Torque |
|---|---|---|
| 1 | Upper insulator | â€” |
| 2 | Bolt capture | â€” |
| 3 | Body retainer cage nut | â€” |
| 4 | Bracket nut (2 required) | 63 Nm (46 lb-ft) |
| 5 | Body mount bolt | 103 Nm (76 lb-ft) Single Rear Wheel vehicle, 103 Nm (76 lb-ft) plus 90Â° angle Dual Rear Wheel vehicle |