

#### Collision repair strategies

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BAM







## FCA vehicles equipped with full frames

- Body on Frame Design Characteristics
- Repair Methodology
- Vehicle Specific Scenarios



#### FCA Full Frame Vehicle Portfolio



RAM 1500 (DS)



RAM 2500 (DJ)



RAM 3500 (DD)



RAM 4500/5500 (DP)



Jeep Wrangler (JK)



RAM Pro Master (VF)

FIAT CHRYSLER AUTOMOBILES

**Design Characteristics** 

- Body in White (BIW)
  - Body Shell
- Structural support
  - Design intent
  - Impact Load
    - ▲ Lower cost to repair
- Complexity
  - Substrate Material
    - ▲ High Strength Steel







Additional assembly plant processing information

- Principal point location (PLP) should be used by all collision repair shops to confirm that the cab and/or pickup box is dimensionally correct & will fit on the frame.
  - They are 2 way & 4 way locating holes that assist with locating the transfer pins to confirm dimensional integrity throughout the assembly process.
- Body and pickup box when applicable are mounted to the frame using alignment pins at the assembly plant.
- Unibody dimensional shape/foundation of the vehicle is taken from the vehicle ladder of the BIW.



MEASUREMENTS ARE FROM CENTER LINES OF HOLES (PLP'S)

ALL DIMENSIONS ARE IN MILLIMETERS





# Is the use of heat permitted when repairing FCA vehicles?

A) Yes B) No











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Repair Methodology Disclosure

- Do not use heat during the collision repair process unless the subsequent component will be replaced after straightening.
  - Refer to Collision Bulletin 31-001-11
- Unless partial replacement procedures are documented in a FCA US LLC publication, structural panels must be installed in their entirety - partial replacement or "sectioning" of panels may compromise vehicle structure.
- FCA US LLC does not support the use or reuse of any structural component which has been removed from a vehicle previously damaged, flooded, burned, scrapped or removed from use for any other reason-commonly referred to as "salvage parts."



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Repair Methodology Disclosure Continued

- While some salvage parts may "appear" equivalent, there can be dramatic differences in the design and functional characteristics which cannot be determined by a visual inspection and which could have a negative effect on the vehicle occupants in a future collision event.
- Salvage components may have been affected by crash impact loads, incorrect, improper or inadequate disassembly and removal procedures, weathering or environmental exposure outside of that expected during normal use.
- Salvage components are not traceable should a component recall be required in the future.





Frame Rail Repair Equipment Requirements

- High Strength Steel
  - GMAW
    - Welder requirements
      - □ Electrode Type: AWS CLASS. ER70S-6
      - □ Electrode Size: 0.035
      - □ Wire Feed Speed in/min: 245-250 Vertical Down and 70-90 Flat & Horizontal
      - □ Voltage: 19-20
      - □ Polarity: DCEP
      - □ Electrical Stick out (in): 1/2 5/8
      - □ Type of ARC transfer: Short Circuit
    - ▲ Gas Requirements
      - □ Gas Flow(cfh) 25-35
      - □ Gas Type: 75% Argon/ 25%Co2
- Sheet Metal Repairs
  - Reference the applicable Collision Repair Manual at MoparRepairConnection.com





Frame Repair Methodology

- Remove all components from the vehicle that inhibit access to the structural damage.
- Evaluate frame damage on a frame machine and ensure the vehicle is level.
   Begin measuring with a 3D measurement system to confirm severity.
  - Note: MoparRepairConnection.com should be referenced to ensure measurement specifications are accurate.
- Anchor the vehicle in accordance with the frame equipment providers recommendations.
- When operating a frame machine be sure to follow the manufacturers safety recommendations to avoid serious or fatal injury.
- Begin cold pulling the frame to align within FCA measurement specifications. If frame will not align to FCA specification from cold pulling, the use of heat is permissible, but only on components that will be removed and replaced on the frame after the straightening process is complete.



Scenario- Frame Replacement

- When frame replacement is necessary
  - Frame is beyond repair
  - Sectioning procedures are not published
  - Service parts have not been released to support
    - ▲ Mounts, frame rail tips, crossmembers, etc
- Frequency
  - What percentage of front frame rail tips are replaced compared to full frames on RAM 1500's?
    - ▲ A) 82% Frame Rail Tip / 18% Frame
    - ▲ B) 76% Frame Rail Tip / 24% Frame
    - ▲ C) 64% Frame Rail Tip / 36% Frame
    - ▲ D) 53% Frame Rail Tip / 47% Frame
- Assessing BIW damage
  - Measure all door, under hood, underbody, cross vehicle and glass openings to verify dimensions are within specification.
  - Measure replacement frame to ensure it is dimensional correct.



Scenario: RAM Pickup Truck, Requires Front Frame Rail Tip Replacement

- Remove all necessary components to access the frame rail sectioning location.
- Remove the welds securing the front rail tips to the frame.
- Do not use an oxy-acetylene cutting torch to remove the damaged frame rail tip.
- Use a plasma cutter, reciprocating saw, or equivalent tool, carefully cut and remove the damaged frame rail tip (1). Cut at the forward edge of the weld at the tip to frame joint (2), do not cut the main frame rail.
- Using a plasma cutter, or die grinder, remove the puddle weld (3) that attaches the frame tip to the frame rail.
- With the puddle weld removed, grind any remaining weld and remove the remaining piece of the frame tip (1) from within the frame rail and discard.







# On which FCA vehicles is it acceptable to apply weld-thru primer?

- A.) RAM 1500 (DS), Jeep Wrangler (JK), Chrysler 300 (LX)
- B.) Jeep Renegade (BU), Jeep Compass (MP), Ram Promaster (VF), Alfa Romeo GIULIA
- (GA), Alfa Romeo Stelvio (GU)
- C.) Dodge Challenger (LA), Jeep Grand Cherokee (WK), Chrysler 200 (UF)
- D.) None of the above















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Scenario: RAM Pickup Truck, Requires Front Frame Rail Tip Replacement Continued

Smooth and square the cut edges of the original frame

Note: Remove any burrs at the hole and frame edge

**Caution:** Shield the surrounding area and components from exposure to the welding spatter and heat

- Dry fit the new rail to verify alignment and make any adjustments as necessary
- Remove all internal and external OEM e-coat within 25 mm (1.0 in.) of the weld joint on the replacement tip and the existing frame rail.
- Using the appropriate measuring equipment, verify the front end sheet metal bracket's location and adjust if required. Refer to specifications identified in the collision repair manual
- When correctly aligned, tack weld the new rail tip into place.
- Verify the rail tip is within measurement specifications
- Apply MIG plug weld (3) into the MIG plug weld hole on the replacement frame tip.
- Start the MIG plug welds at location (1) and follow around the circumference of the MIG plug weld hole and end weld overlapping start point (2).





Scenario: RAM Pickup Truck, Requires Front Frame Rail Tip Replacement Continued

Then weld at the tip to frame joint (2) should be performed in a skip (stitch) type method to minimize the heat buildup and frame distortion, utilizing the Weld Process Specifications. The preferred method is GMAW (MIG).



- Weld the joint, one quadrant at a time, switching to the opposite side of the frame rail for each quadrant.
- Confirm alignment of the replacement tip.



Scenario: RAM Pickup Truck, Requires Front Frame Rail Tip Replacement Continued

- Dress the welded area (2) and apply corrosion resistant coatings inside and out.
  - Apply epoxy primer to the inside of the frame rail repair area.
  - Inside the rail, inject a creeping wax based rust inhibitor compound through the existing holes in the frame ensuring 100% coverage including the space between the original frame rail and the replacement rail tip (1) using Mopar Cavity wax kit (part # 68042969AA) / Undercoating kit (part # 68042967AA) or equivalent.
  - Apply a durable top coat to the outside of the repair area (2).



Complete other repairs and install removed parts.



Scenario: Jeep Wrangler, Frame Replacement

 As with other frame replacement scenarios, measure all body dimensions to ensure they are within specification.



- Adjust accordingly if the openings are out of dimension, if it is determined that the damaged frame is resulting in the deviation, proceed with BIW removal.
- Measure the dimensions of the replacement frame to ensure they align with specifications in the collision repair manual.



Scenario: Jeep Wrangler, Frame Replacement

- Unique features of the Jeep Wrangler body construction.
  - Equipped with a soft top and/or removable freedom panel roof system
  - Exterior hinges on closure panels
  - Optional half doors
  - Foldable windshield
  - Sport Bar upper aperture support
- The vehicle does not have a fixed roof system
  - Generates panel alignment and dimensional variables when replacing vehicle frame.
    - Roof System Alignment
    - Windshield Frame alignment
    - Upper Door Fitment





Scenario: Jeep Wrangler, Frame Replacement

- If sport bar removal is necessary, support the cross-car areas where it was previously secured.
  - Areas the sports bar is secured or supported cross-car
    - ▲ Front windshield at a-pillar
    - ▲ B-pillar
    - ▲ C-Pillar
    - ▲ Rear Wheelhouse





Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

- Body adjustments that may be necessary when replacing a frame.
  - Windshield Frame Adjustment
    - ▲ In some instances the windshield frame may be out of adjustment fore/aft
    - ▲ To resolve follow the windshield frame adjustment process in the next slide:







Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

#### Windshield Frame Inspection Criteria:

The windshield frame adjustment should only be performed if the vehicle exhibits one of the following conditions:

• Gaps between the windshield frame and door exceeding 6.5 mm (.25

in.).

- Gaps between the windshield frame and top of cowl exceeding 6 mm
- (.23 in.) or less than 4 mm (.15 in.).
- Record measurements for reference.

Using a non-marring feeler gauge, measure the gap between the door and windshield frame and the gap between the windshield frame and top of cowl. Is the gap between the windshield frame and door larger than 6.5 mm (.25 in.)? Is the gap between the windshield frame and top of cowl larger than 6 mm (.23 in.) or less than 4 mm (.15in.)(Fig.1)?

If yes, proceed with <u>Windshield Frame Adjustment</u>, otherwise continue further diagnosis.

#### Windshield Frame Adjustment:

•Remove the modular tops (Freedom Top) and hard top. Refer to the detailed service procedures available in DealerCONNECT> TechCONNECT under: Service Info> 23 -Body/Removable Top, Hard/Removal. NOTE: It is important that the adjustments are made on one side of the windshield frame at a time. If both sides need to be adjusted, complete the whole procedure on one side, then repeat the procedure on the other side.

•Loosen the side bars by pulling the cross bar and side bar covers off to expose the end side bar bolts.

•Loosen but do not remove from the B-pillar (Fig. 2).

•Loosen but do not remove the bolt underneath the cross bar (Fig. 2).



Figure 2



Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

•The gray foam has access holes and should not be removed.

•Loosen but do not remove the bolt on top of the side bar (Fig. 3).

CAUTION: Do not remove the six gusset bolts. Loosening the bolts minimizes the risk of damaging the vehicles paint.

•Using a T40 Torx bit, loosen the six gusset bolts on one side of the windshield frame (Fig. 4).

•Are the gaps between the door and windshield frame larger than 6.5 mm (.25 in.)?

a. YES >>> Proceed to Repair Procedure A: <u>Door to Windshield</u> <u>Frame Adjustment.</u>

b. NO >>> The gaps between the windshield frame and cowl top are smaller than 4mm (.15 in.). Proceed to Repair Procedure B: <u>Windshield Frame to Cowl Panel</u> <u>Adjustment Gap less than 4mm</u>



Figure 3



Figure 4



Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

CAUTION: Do not wrap the ratchet strap around the speaker bar. Failure to do so may damage speaker bar.

•Loosen but do not remove the bolt on top of the side bar (Fig. 2). Using a ratchet strap, secure it between the cross bar and the windshield footman loop (Fig. 5).

•Using a non-marring feeler gauge, insert the 5 mm (.19 in.) gap gauge between the door and windshield frame. Tighten the ratchet strap pulling the windshield frame rearward until the gap is tight against the 5 mm (.19 in.) gauge (Fig. 6).

Note: An assistant is required to monitor the gap at the door to windshield frame as another individual is operating the ratchet strap.

CAUTION: The B-pillar bolt is easy to strip out. Do not over tighten. Use a ratchet

and socket to prevent stripping the bolt.



Figure 5



Figure 6



Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

•Tighten the bolt underneath the cross bar (1) (Fig. 6) to 19 N·m (14 ft. lbs.).

•Tighten the B-pillar bolt (2) (Fig. 7) to 19 N·m (14 ft. lbs.).

•Tighten the bolt on top of the side bar (Fig. 8) to 19 N·m (14 ft. lbs.).

•Replace the sport bar and side bar covers.



Figure 7







#### Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

•Using a non-marring feeler gauge, check the gap between the windshield frame and top of cowl. Place the feeler gauge in the location shown on the left and right side of the windshield frame and measure the gaps (Fig. 9).

•Are the gaps between 4 mm (.15 in.) and 6 mm (.24 in.) (Fig. 9)?

a)YES >>>

○Tighten the bolt underneath the cross bar (1) (Fig. 6) to 19 N·m (14 ft. lbs.).
○Tighten the B-pillar bolt (2) (Fig. 7) to 19 N·m (14 ft. lbs.).

 $\circ$ Tighten the bolt on top of the side bar (Fig. 8) to 19 N·m (14 ft. lbs.).

b)NO >>> Proceed to the next step.

•Is the gap smaller than 4 mm (.15 in.) (Fig. 9)? a. YES >>> Proceed to Repair Procedure B: <u>Windshield Frame to Cowl Panel Adjustment</u> <u>Gap Less than 4mm (.15mm) p.19</u>.

b. NO >>> The gap is larger then 6 mm (.24 in.) (Fig. 8). Proceed to Repair Procedure C: <u>Windshield Frame to Cowl Panel Adjustment</u> <u>Gap Greater than 6mm (.24in)</u>.

Repair Procedure C: <u>Windshield Frame to</u> <u>Cowl Panel Adjustment Gap Greater than 6mm</u> (.24in)

•Using a ratchet strap, fasten strap around the side bar (Fig. 10).



Figure 9





**CAUTION: Place a piece of cardboard or foam** between the ratchet strap and any point it contacts the body or side step. Failure to do so may cause damage to paint.

•Hook the other end of the ratchet strap into the hole in the frame that is directly below front edge of the door (Fig. 11).

•Tighten the ratchet strap pulling the windshield frame down until the gap is between 4mm (.15 in.) and 6 mm (.24 in.).

•Using a T40 Torx bit, tighten the six gusset bolts on each side of the windshield frame in the pattern shown (Fig. 12). Tighten bolts to 10 N·m (7.5 ft. lbs.).

•Repeat Repair Procedure C for the opposite side of the windshield if needed.

NOTE: Perform the following steps if the gap between the windshield frame and cowl top is less than 4 mm (.15 in.).

Repair Procedure B: Windshield Frame to Cowl top is less than 4 mm (.15 in.)

•Using a ratchet strap, fasten strap around the side bar on the opposite side of the gap (windshield frame) that's measuring smaller than 4 mm (.15 in.) (Fig. 10).

**CAUTION: Place a piece of cardboard or foam** between the ratchet strap and any point it contacts the body or side step. Failure to do so may cause damage to paint.

· Hook the other end of the ratchet strap into the hole in the frame that is directly below front edge of the door (Fig. 11).



Figure 11



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#### Scenario: Jeep Wrangler, Frame Replacement, Windshield Adjustment

•Tighten the ratchet strap pulling the windshield frame down until the gap is between 4mm (.15 in.) and 6 mm (.24 in.).

•Using a T40 Torx bit, tighten the six gusset bolts on each side of the windshield frame in the pattern shown. Tighten bolts to 10 N·m (7.5 ft. lbs.) (Fig.12).

•Repeat <u>Repair Procedure B</u> for the opposite side of windshield if needed.

•Using a non-marring feeler gauge, re-check the gap between the door and windshield frame (Fig. 13). Is the gap between 3.5 mm (.14 in.) and 6.5 mm (.25 in.)? a. YES >>> Proceed to the next step.

b. NO >>> Repeat <u>Repair Procedure A</u>.

•Using a non-marring feeler gauge, re-check the left side and right side gaps between the windshield frame and top of cowl (Fig. 14). Are gaps between 4 mm (.15 in.) and 6mm (.24 in.)? a. YES >>> Proceed to the next step.

b. NO >>> Repeat <u>Repair Procedure B</u>.

•Install the hard top and modular tops (Freedom Top). Refer to the detailed service procedures available in DealerCONNECT> TechCONNECT under: Service Info> 23 -Body/Removable Top, Hard/Installation.



Figure 13





Scenario: Jeep Wrangler, Frame Replacement, Freedom Panel Alignment

#### STEP 1: INSPECTION:

•Measure the gap between the edge of the freedom panel and the windshield header sheet metal for the left and right panel. Is the gap within 8-10mm and (Fig.1)?

Yes>>> Although the panels are misaligned the condition will not generate a water leak, continue further diagnosis.

No>>> Proceed to the repair procedure.

#### STEP 2: <u>REPAIR</u> <u>PROCEDURE:</u>

•Determine the direction of the stagger. Panels can either be staggered with the left panel behind the right panel or right panel behind the left (Fig.2, Fig.3).











Scenario: Jeep Wrangler, Frame Replacement, Freedom Panel Alignment

•Remove both freedom panels from the vehicle.

•Remove the two Freedom Top Torx fasteners located on the rear panel (Fig.4).

•For left panel behind right panel condition apply pressure to the hardtop above the left B-Pillar towards the right side of the vehicle (Fig.5).

•For right panel behind left panel condition apply pressure to the hardtop above the right B-Pillar towards the left side of the vehicle (Fig.6).







Scenario: Jeep Wrangler, Frame Replacement, Freedom Panel Alignment

•Forcing the hardtop to one side will shift the Freedom Top clearance hole at the Bpillar post (Fig.7). •While maintaining pressure against the freedom top panel in the previously determined direction, re-torque the freedom top panel B-Pillar bolts.

Note: An assistant is helpful when performing this procedure (Fig.8).

•After completing adjustments, reinstall the Freedom Top panels. Using the previous measuring device, verify the gap between the freedom panel edge and windshield header is within 8mm-10mm or repeat adjustment process (Fig.9).



Figure 7





Figure 9



## **Questions**?

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RAM



