

## Body Repair Tech Note: Repairing Aluminum Cosmetic Damage

*Body Repair Tech Notes provide information about Tesla-approved methods and practices for body repair. These instructions assume knowledge of motor vehicle and high voltage electrical component repairs, and should only be executed by trained professionals. Tesla assumes no liability for injury or property damage due to a failure to properly follow these instructions or for repairs attempted by unqualified individuals.*

In most cases, dents and tears on the aluminum outer panels on Model X and Model S can be successfully repaired by a technician with the appropriate skills and dedicated aluminum hand tools. The skills and knowledge required to successfully perform aluminum cosmetic repairs can be enhanced by taking the Tesla Aluminum Cosmetic Craftsmanship course.

**⚠ CAUTION:** Never use tools on aluminum components that have been used on steel components. Using tools on aluminum that have also been used on steel components can lead to galvanic corrosion and failure of the repair.

**⚠ CAUTION:** Before welding on a Tesla vehicle, disconnect 12V and high voltage power (refer to Service Manual procedure 17010100 for 1st Generation Rear Wheel Drive Model S, procedure 17010200 for 1st Generation Dual Motor Model S, and procedure 17010200 for Model X and for 2nd Generation Model S). Welding on a Tesla vehicle with an energized high voltage or 12V system might damage vehicle components.

**NOTE:** Although any aluminum panel dent pulling tool can be used to perform aluminum cosmetic repairs on Tesla vehicles, Tesla has evaluated and recommends the Star Miracle system.

Even significant cosmetic damage (Figure 1) can be successfully repaired with basic metal-finishing skills and a moderately-priced dent repair aluminum station (Figure 2).



Figure 1



Figure 2

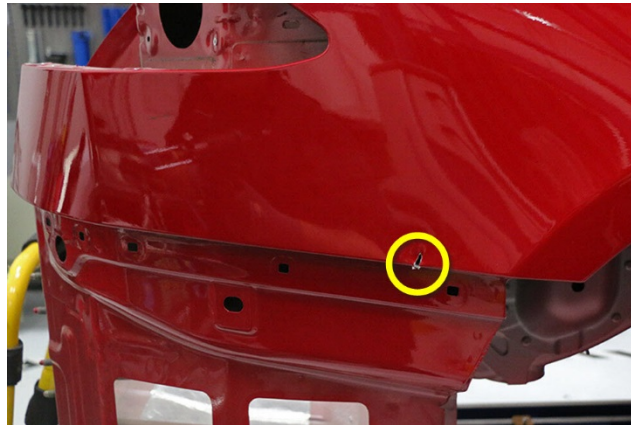
## Common Repairable Situations

Many instances of non-structural aluminum damage can be repaired to avoid panel replacement. The sections below provide instructions on repairing three common situations:

- Tears in the quarter panel
- Dents in the quarter panel
- Puncture tears

### Tears in the Quarter Panel

When there is an impact on the rear fascia, the force of the impact often causes a tear on the quarter panel near the fascia (Figure 3). These tears can usually be successfully repaired.



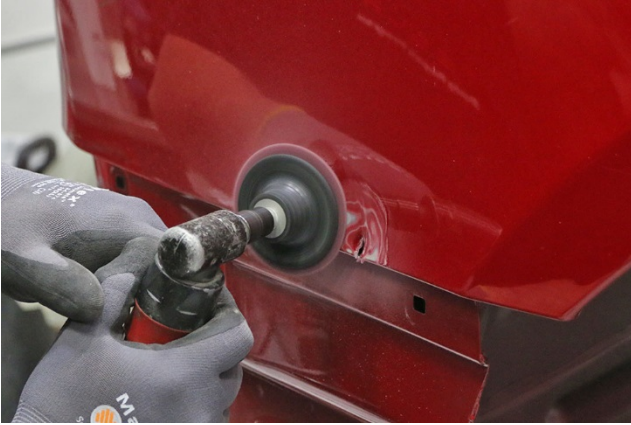
**Figure 3**

1. Inspect the back side of the panel being repaired before starting and remove any sound-absorbing material, sensors, or modules that are in the immediate area of the repair.
2. Disconnect 12V and high voltage power (refer to Service Manual procedure 17010100 for 1st Generation Rear Wheel Drive Model S, procedure 17010200 for 1st Generation Dual Motor Model S, and procedure 17010200 for Model X and for 2nd Generation Model S).

3. Remove the paint from the area around the tear (Figure 4) and from the area where the ground clamp will be attached (Figure 5).

**⚠ WARNING:** Remove the paint in a well-ventilated area. Wear suitable personal protective equipment.

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.



**Figure 4**



**Figure 5**

4. Use a stainless steel brush to remove any remaining paint from the repair area (Figure 6).



**Figure 6**

5. Attach the ground clamp (Figure 7).



**Figure 7**



6. Assess where to attach the first pull tab.

**TIP:** This is usually at the deepest point of the repair area.

7. Use an aluminum dent repair system to weld a pull tab (Figures 8 and 9).



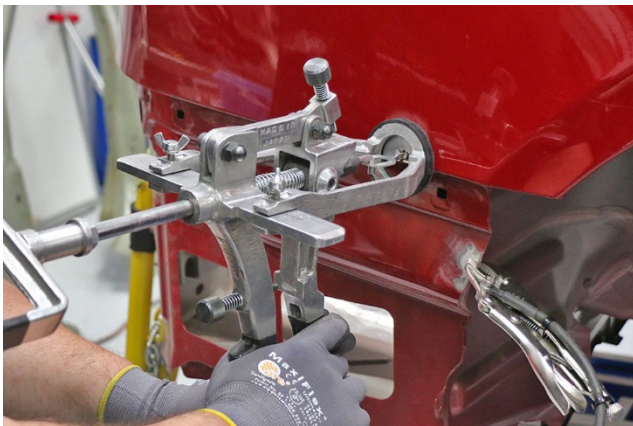
**Figure 8**



**Figure 9**

8. Use the appropriate tool to pull on the pull tab (Figure 10). If necessary, use a heat gun to heat the panel to make it easier to pull the panel back into its original shape (Figure 11).

**⚠ CAUTION:** Do not heat the adhesive joints above 100°C (212°F). Heating the adhesive joints above 100°C (212°F) can weaken the aluminum and compromise vehicle crash integrity.



**Figure 10**



**Figure 11**

9. Repeat steps 7 and 8 until the panel has been returned to its original shape.

10. Remove all pull tabs and grind down any remaining pull tab material (Figures 12 and 13).

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.



**Figure 12**



**Figure 13**

11. Use the appropriate welding technique for a thin aluminum panel to weld the tear (Figures 14 and 15).

**⚠ WARNING:** Failure to follow all welding safety precautions, including the use of personal protective equipment, could result in serious injury or property damage.

**⚠ CAUTION:** Do not weld on a Tesla vehicle with an energized high voltage or 12V system. Welding on a Tesla vehicle with an energized high voltage or 12V system might damage vehicle components.

**NOTE:** Before MIG welding, a test weld using material of the same gauge and type should be performed to make sure that the welding equipment settings produce a satisfactory joint.



**Figure 14**



**Figure 15**



12. Use a stainless steel brush to clean the repair area (Figure 16).



**Figure 16**

13. Grind down the welds to restore all components to their original dimensions (Figure 17).



**Figure 17**

14. Use an appropriate tool to identify any high spots (Figure 18), and then file down the high spots (Figure 19).



**Figure 18**



**Figure 19**

15. Put the rear fascia into position to make sure the fit matches the undamaged side of the vehicle.

16. If necessary, apply glazing putty to any deep scratches.

17. Prime and paint the repaired area according to the paint manufacturer's recommendations.
18. Apply a suitable cavity wax or body filler to the back side of the repair area to help prevent corrosion.

## Dents in the Quarter Panel

1. Inspect the back side of the panel being repaired before starting and remove any sound-absorbing material, sensors, or modules that are in the immediate area of the repair.
1. Disconnect 12V and high voltage power (refer to Service Manual procedure 17010100 for 1st Generation Rear Wheel Drive Model S, procedure 17010200 for 1st Generation Dual Motor Model , and procedure 17010200 for Model X and for 2nd Generation Model S).
2. Remove the paint from the repair area and from the area where the ground clamp will be attached.

**⚠ WARNING:** Remove the paint in a well-ventilated area. Wear suitable personal protective equipment.

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.

3. Use a stainless steel brush to remove any remaining paint from the repair area.
4. Attach the ground clamp.
5. Assess where to attach the first pull tab.

**TIP:** This is usually at the deepest point of the repair area.

**NOTE:** If a bodyline is present, it might be necessary to pull on that location to relieve stress on the other areas of the dent.

6. Use an aluminum dent repair system to weld a pull tab (Figures 20 and 21).



Figure 20



Figure 21

7. Use the appropriate tool to pull on the pull tab (Figure 22). If necessary, heat the panel to make it easier to pull the panel back into its original shape (Figure 23).

**⚠ CAUTION:** Do not heat the adhesive joints above 100°C (212°F). Heating the adhesive joints above 100°C (212°F) can weaken the aluminum and compromise vehicle crash integrity.

**TIP:** Use a hammer to tap around the edge of the tab to release tension while pulling.



**Figure 22**



**Figure 23**

8. If necessary, use a hammer to flatten the bottom edge of the dent (Figure 24).



**Figure 24**

9. Repeat steps 7–9 until the panel is back to its original shape.

**TIP:** Work from the deepest point of the dent, and then move outwards.



10. Remove all pull tabs and grind down any remaining pull tab material (Figure 25).

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.



**Figure 25**

11. Use an appropriate tool to identify any high spots, and then file down the high spots (Figure 26).



**Figure 26**

12. If necessary, apply glazing putty to any deep scratches.

13. Prime and paint the repaired area according to the paint manufacturer's recommendations.

14. Apply a suitable cavity wax or body filler to the back side of the repair area to help prevent corrosion.

## **Puncture Tears**

1. Inspect the back side of the panel being repaired before starting and remove any sound-absorbing material, sensors, or modules that are in the immediate area of the repair.

1. Disconnect 12V and high voltage power (refer to Service Manual procedure 17010100 for 1st Generation Rear Wheel Drive Model S, procedure 17010200 for 1st Generation Dual Motor Model , and procedure 17010200 for Model X and for 2nd Generation Model S).

2. Remove the paint from the repair area and from the area where the ground clamp will be attached.

**NOTE:** Use a stainless steel brush to remove paint from any areas that are not flush with the surrounding material (Figure 27).



**Figure 27**

3. Use a paintless dent removal (PDR) bar and a hammer to remove any dents from the tear area until the area is as close to its original shape as possible (Figures 28 and 29).



**Figure 28**

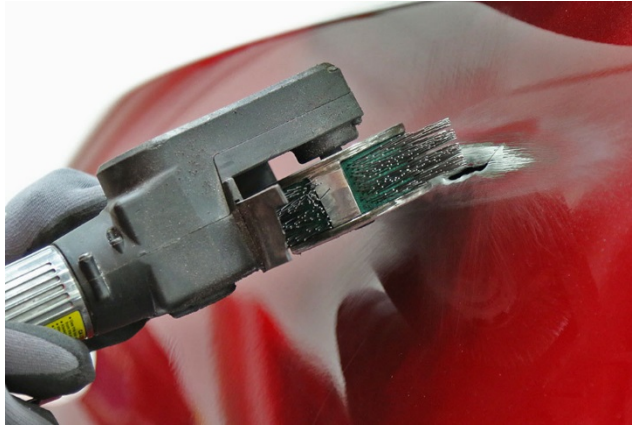


**Figure 29**

4. Use a wire wheel to remove any remaining paint from the repair area and the area the ground clamp will be attached to (Figure 30).

**⚠ WARNING:** Remove the paint in a well-ventilated area. Wear suitable personal protective equipment.

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.



**Figure 30**

5. Attach the ground clamp.
6. Use the appropriate welding technique for a thin aluminum panel to weld the tear (Figure 31).

**⚠ WARNING:** Failure to follow all welding safety precautions, including the use of personal protective equipment, could result in serious injury or property damage.

**⚠ CAUTION:** Do not weld on a Tesla vehicle with an energized high voltage or 12V system. Welding on a Tesla vehicle with an energized high voltage or 12V system might damage vehicle components.

**NOTE:** Before MIG welding, a test weld using material of the same gauge and type should be performed to make sure that the welding equipment settings produce a satisfactory joint.



**Figure 31**

7. Use a stainless steel brush to clean the repair area.
8. Grind down welds to restore all components to their original dimensions.

**⚠ WARNING:** Use only sanding wheels and belts that are 80 grit or finer on aluminum components. Using sanding wheels or belts that are coarser than 80 grit can cause fractures in the aluminum.

9. Use an appropriate tool to identify any high spots, and then file down the high spots (Figure 32).





**Figure 32**

10. If necessary, apply glazing putty to any deep scratches.
11. Prime and paint the repaired area according to the paint manufacturer's recommendations.
12. Apply a suitable cavity wax or body filler to the back side of the repair area to help prevent corrosion.

*For feedback on the accuracy of this document, email [collision-techinfo@tesla.com](mailto:collision-techinfo@tesla.com).*