A comprehensive guide to identifying, repairing and refinishing virtually any plastic.
Every step of the way, Urethane Supply Company has what you need!

Since 1981, Urethane Supply Company has been at the forefront of automotive plastic repair technology. We introduced the industry’s first and most popular airless plastic welder back in 1983. Since then, our list of plastic repair innovations have continued to grow. In 1999, we developed Uni-Weld FiberFlex; a universal rod that eliminates the need to identify plastic while being very strong with its fiber reinforcement. In 2000, we introduced the PlastiFix Rigid Plastic Repair Kit, a revolutionary method for repairing rigid plastics like ABS and Polycarbonate. In 2002 we introduced the revolutionary Bumper and Cladding Coat paint and in 2004 the worlds first catalyzed waterborne primer, Black Cat. Our latest ground breaking introduction is Prime Time, a catalyzed waterborne primer for pre-primed OEM bumpers that doesn’t require sanding at any step! As a result of our total commitment to serving the needs of the automotive collision repair market, we have developed a complete line of products that makes all plastic repair fast and easy.

### Plastic ID Reference Chart

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### Repair Method

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### Repair Chart

- **A**: Thermoset Polyurethane
- **B**: ABS, polyethylene, nylon, polycarbonate
- **C**: PP, TPO, TEO, TPE, PE, or other
- **D**: All Thermoplastics
- **E**: SMC, UP, FRP, Fiberglass
- **F**: ABS, SMC, Fiberglass, PC blend
- **G**: ABS, SMC, Fiberglass, PC blend

**Clean**: Clean part with soap & water and Super Clean Plastic Cleaner

**Repair**: Grind, then apply filler that matches the hardness of the substrate

**Prime**: Apply Top Coat
The easiest way to identify the type of plastic you’re working with is to look for the plastic ID symbol on the backside of the part. Simply match the symbol on the part with the table below and look at the suggested repair method, listed in order of preference. See the next page for tips when you can’t find the plastic ID symbol.

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<th>Recyling Symbol</th>
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<th>Description/ How to Identify</th>
<th>Typical Applications</th>
<th>Suggested Repair Method</th>
<th>Repair Tips</th>
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<tbody>
<tr>
<td>PUR, RIM, RRIM</td>
<td>Thermotest Polyurethane</td>
<td>Usually flexible, may be yellow or gray, bubbles &amp; smokes when melted.</td>
<td>Flexible bumper covers (esp. on domestics, filler panels, rocker panel covers, snowmobile cowls.</td>
<td>Method A w/ urethane rod (5003R1) or Method C w/ Uni-Weld FiberFlex</td>
<td>Don’t melt base material! Melt rod into v-groove like a hot metal glue.</td>
</tr>
<tr>
<td>SMC, UP, FRP</td>
<td>Fiberglass</td>
<td>Rigid, polyester matrix reinforced with glass fibers, sands finely.</td>
<td>Rigid body panels, fenders, hoods, deck lids, header panels, spoilers.</td>
<td>Method E - Two-part epoxy repair with fiberglass reinforcement</td>
<td>Use backing plate over holes, layer in fiberglass cloth for extra strength.</td>
</tr>
<tr>
<td>XPE, XLPE, PE-X, PE-Xb, Crosslinked Polyethylene</td>
<td></td>
<td>Semi-flexible, usually semi-translucent, waxy or greasy feel, softens when heated but does not melt.</td>
<td>Gas tanks, kayaks, canoes, trash cans, use is declining</td>
<td>Method C with polyethylene rod (5003R4), (5004)</td>
<td>Applying filler or painting is impossible. Browses when heated</td>
</tr>
<tr>
<td>PS</td>
<td>Polystyrene (Styrofoam)</td>
<td>Semi-flexible, usually expanded into foam</td>
<td>Packaging material, insulation, food containers, light switch plates</td>
<td>Method E - Two-part epoxy repair</td>
<td>Very sensitive to solvents and high heat.</td>
</tr>
<tr>
<td>PA</td>
<td>Polyamide (Nylon)</td>
<td>Semi-rigid or rigid, sands finely.</td>
<td>Radiator tanks, head lamp bezels, exterior trim parts, mirrors, plastic engine parts.</td>
<td>Method B or D w/ nylon rod (5003R6)</td>
<td>Preheat plastic with heat gun before welding, mix completely with base mat’.</td>
</tr>
<tr>
<td>PC + ABS</td>
<td>Pulse (Polycarbonate &amp; ABS)</td>
<td>Rigid, sands finely, usually dark in color.</td>
<td>Door skins (Saturn), instrument panels, street fairings.</td>
<td>Method B or D w/ polycarbonate rod (5003R7) or Methods E, F, or G.</td>
<td>Preheat plastic with heat gun before welding with Method B.</td>
</tr>
<tr>
<td>PC + PBT</td>
<td>Xenoy (Polycarbonate blend)</td>
<td>Very rigid, sands finely, usually dark in color.</td>
<td>Bumper covers (84-95 Ford Taurus, Aerostar, some M-B and Hyundai).</td>
<td>Method B or D w/ polycarbonate rod (5003R7) or Method E or G.</td>
<td>Preheat plastic with heat gun before welding with Method B.</td>
</tr>
<tr>
<td>HDPE</td>
<td>Polyethylene</td>
<td>Semi-flexible, melts &amp; smears when grinding, usually semi-translucent, waxy or greasy feel.</td>
<td>Overflow tanks, inner fender panels, ATV fenders, RV water storage tanks, gas tanks, kayaks canoes, picnic tables, lumber</td>
<td>Method B or D with high density polyethylene rod (5003R12)</td>
<td>Applying filler or painting is impossible.</td>
</tr>
<tr>
<td>PE/LOPE</td>
<td>Polyethylene</td>
<td>Semi-flexible, melts &amp; smears when grinding, usually semi-translucent, waxy or greasy feel.</td>
<td>Overflow tanks, inner fender panels, ATV fenders, RV water storage tanks, gas tanks, kayaks, canoes, trash cans</td>
<td>Method B or D with polyethylene rod (5003R4)</td>
<td>Applying filler or painting is impossible.</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
<td>Semi-flexible, melts &amp; smears when grinding, usually semi-translucent, waxy or greasy feel.</td>
<td>Bumper covers (usually blended w/ EPDM), inner fenders, radiator shrouds, gas tanks, battery cases, pallets</td>
<td>Method C with Uni-Weld FiberFlex (5003R10) or Method B or D w/ PP rod.</td>
<td>Use 1060FP Filler Prep before applying two-part epoxy filler.</td>
</tr>
<tr>
<td>PPO + PA</td>
<td>Noryl GTX (Nylon blend)</td>
<td>Semi-rigid, sands finely, usually off-white in color.</td>
<td>Fenders (Saturn &amp; GM), exterior trim.</td>
<td>Method B or D w/ nylon rod (5003R6) or Methods E, F, or G adhesive repairs.</td>
<td>Preheat plastic with heat gun before welding with Method B.</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
<td>Rigid, sands finely. Usually white or gray but can be made any color.</td>
<td>Pipe, siding, window frames, decking, gutters, speed bumps</td>
<td>Method B or D w/ (5003R9) PVC welding rod</td>
<td></td>
</tr>
<tr>
<td>TPE</td>
<td>Thermoplastic Elastomer</td>
<td>Semi-flexible, usually black or gray, melts &amp; smears when grinding.</td>
<td>Bumper covers, filler panels, underhood parts.</td>
<td>Method C with Uni-Weld FiberFlex (5003R10)</td>
<td>Use 1060FP Filler Prep before applying two-part epoxy filler.</td>
</tr>
<tr>
<td>TPO, TEO, PP/EPDM, TSOP</td>
<td>Thermoplastic Olefin</td>
<td>Semi-flexible, usually black or gray, melts &amp; smears when grinding.</td>
<td>Bumper covers, air dams, grilles, interior parts, instrument panels, snowmobile cowls.</td>
<td>Method C with Uni-Weld FiberFlex (5003R10) or Method B or D w/ PP or TPO rod.</td>
<td>Use 1060FP Filler Prep before applying two-part epoxy filler.</td>
</tr>
<tr>
<td>TPU, TUPR</td>
<td>Thermoplastic Polyurethane</td>
<td>Flexible, sands finely.</td>
<td>Bumper covers, soft filler panels, gravel deflectors, rocker panel covers.</td>
<td>Method B or D w/ urethane rod (5003R1) or Method C w/ Uni-Weld FiberFlex (R10)</td>
<td></td>
</tr>
<tr>
<td>PETE, PET</td>
<td>Polyethylene Terephthalate</td>
<td>Flexible, strong</td>
<td>Soda bottles, various yam fibers, headliners, fuse boxes, door panels</td>
<td>Method B or D w/ slivers cut from scrap.</td>
<td>Can’t make as strong as original part; manufactured in crisscrossed layers and can’t be duplicated.</td>
</tr>
</tbody>
</table>
If you can't find the Plastic ID Symbol...

Identification Process for Plastics in General

Is the part very rigid with lots of glass fibers in the broken area?
Yes

No

Probably SMC. Repair using Method E with 2020 SMC Hardset Epoxy.

Does it bubble, brown or smoke when you try to melt it?
Yes

No

Flexible or Rigid?

Flexible

Rigid


Judging from the feel and appearance of the plastic, test weld with one that matches best.

- Very Rigid - R7
- Rigid - R3, R6
- Semi-Rigid - R2, R4, R5
- Flexible - R1, R4

Do any of these rods stick well?

No

Yes

Repair with selected welding rod using Method B.

Identification Process for Bumpers

Is the plastic extremely rigid?
No

Yes

Is the backside of the part yellow?
No

Yes

Does it bubble and smoke when you try to melt it?
No

Yes

Xenoy (PC/PBT). Repair using Method A with 5003R7 Urethane Rod.

Polyurethane. Repair using Method A with 5003R1 Urethane Rod.

Note: welder must be very hot to perform this test effectively.

Does it bubble, brown or smoke when you try to melt it?
Yes

No

Polyurethane. Repair using Method A with 5003R1 Urethane Rod.

Probably TPO, TEO, or TPE. Repair using Method C with Uni-Weld FiberFlex.

More than 95% of late model bumper covers are made from one of three materials. Here's the approximate breakdown:

- TPO, TEO ........... 85%
- PUR ................... 10%
- Xenoy ............ 3%
- Other ............... 2%

FiberFlex will be the best way to repair most of today's bumpers. PUR is used most commonly on higher-end cars. Xenoy is almost gone nowadays.

To perform a test weld, clean and sand a small area on the backside of the part. Make a small spot weld on the surface. After the weld cools, try to pick it off with your fingernail. The one that sticks best is the one to use.

Clean Surface Before Repair

In order to maximize strength and adhesion of the repair, it is important to thoroughly clean all contaminants from the surface in the damaged area.

Step 1. Clean both sides with soap and water. Dry off with a clean cloth or compressed air.

Step 2. Spray on 1000 Super Clean Plastic Cleaner and wipe off while wet with a clean, lint-free cloth. Wipe in one direction to avoid spreading contaminants back over the clean area.

Align Damage

If the plastic is distorted, heat with 6500VT high temp heat gun and reshape the distorted area. When heating plastic, it is important that the plastic be heated all the way through. Hold the heat gun on the area until the opposite side of the plastic is uncomfortable to the touch. Once heated, force the plastic back into position with a block of wood or other tool, then cool the area with a clean cloth.

Thermoset polyurethanes (PUR, RIM) have a “memory” that will often cause them to go back to their original position if held under a heat lamp or in a heated spray booth.

If the part is cut or torn to the edge, align the outer surface with 6481 aluminum body tape and begin the repair process on the backside. By aligning the outer surface, you minimize the amount of filler required later to restore the proper profile to the part.
Repairing Thermoset Urethanes

Automotive urethane, or PUR, is a “thermoset” material. Similar to what happens when you mix body filler and cream hardener, it is formed when two liquid chemicals come together in the mold to form a solid. The point of telling you this is to say that you cannot melt urethane bumpers with the welder. Repeat: YOU CANNOT MELT URETHANE BUMPERS WITH THE WELDER!

A sure-fire way of identifying a urethane bumper is to lay your hot welder on the backside. If it’s a urethane, the plastic will liquefy and bubble and smoke will rise (note: welder must be extremely hot for this to happen). After this “melted” area cools off, it will still be sticky to the touch. This is an indication that the heat actually broke down the chemicals in the plastic. Thermoset urethanes can be easily repaired with the airless plastic welder, but the repair will be more like a brazing process rather than a true fusion weld.

V-Groove Damaged Area

- Line up the outer surface of the tear with 6481 Aluminum Body Tape or with clamps. You can also tack the tear together with 2200 Insta-Weld 1 thin adhesive.
- V-groove halfway through the backside of the part with the 6121-T Teardrop Cutter Bit. You cannot use a hot tool to melt the v-groove into urethane because it does not melt.
- Sand the v-groove with coarse sandpaper (80 grit or coarser) to put some extra “tooth” in the plastic. Also remove the paint in the area surrounding the v-groove and radius into the v-groove for extra strength.

Melt the Rod into the V-Groove

- Set the temperature setting of your airless plastic welder to the “clear” or “R1” rod setting. Using the 5003R1 Polyurethane welding rod, the rod should come out of the bottom of the welder’s shoe completely melted and clear, not discolored or bubbling.
- Holding the welder’s tip off the surface of the plastic, melt the rod into the v-groove. Don’t overheat the base material, simply melt the rod onto the surface. Again, you are NOT trying to melt the rod and the bumper together; the bumper material is NOT melt-able!
- Lay down no more than 2 inches of welding rod into the v-groove at a time. Remove the rod from the welder tip, and before the melted rod has time to cool down, go back over it with the hot welder tip and smooth out the weld. Don’t overheat the base material.

V-Groove and Weld Opposite Side

- After the weld on the backside cools, repeat the v-grooving and welding process on the opposite side.

Grind Weld to a Smooth Contour

- Using coarse sandpaper, grind weld to a smooth contour. The urethane welding rod will not feather very well, so it will need to be covered with 2000 Flex-Filler 2 epoxy filler to refinish completely. Grind the weld slightly flush so that filler can cover the welded area completely. Follow instructions for Step 4 (Page 12) for filler application.

Repairing Torn Bolt Holes on Urethanes

- Taper the plastic all around the hole down to a point on both sides using a Roloc disc.
- Use 6481 Aluminum Body Tape to create a bridge across the torn mounting hole. Melt 5003R1 urethane welding rod into the area. Drill out hole when finished.
Repairing Thermoplastics with Fusion Welding

Outside of urethane, all other bumpers, and most other plastics on automobiles, are made from thermoplastic materials. This means they can be melted with the application of heat. Thermoplastic parts are made by melting pellets of plastic and squirting the melted material into a mold, where it cools and resolidifies. This means that thermoplastic parts can be melted.

The most common thermoplastic automobile bumper material is TPO. TPO is fast becoming the most popular material for all sorts of interior and underhood plastics as well. TPOs can be welded using the fusion technique described on this page, but our FiberFlex rod often makes an easier and stronger repair on TPO (see Repair Method C, Page 7).

The third most common bumper material, Xenoy, is best repaired using the following thermoplastic Fusion technique.

V-Groove Damaged Area

- Line up the outer surface of the tear with 6481 Aluminum Body Tape or with clamps. You can also tack the tear together with 2200 Insta-Weld 1 thin adhesive.
- V-groove halfway through the backside of the part with either the 6121-T Tear-drop Cutter Bit or the 6200VG V-Groovin' Tool.
- Remove the paint in the area surrounding the v-groove and radius into the v-groove with coarse sandpaper.

Melt the Rod Together with the Base Material

- Set the temperature setting of your airless plastic welder to the setting that's appropriate for the welding rod you selected in the identification process. In most cases, the welding rod should melt cleanly and not be discolored (the only exception would be nylon, where the rod should turn a light brown).
- Lay the welder tip on the surface of the plastic and slowly melt the rod into the v-groove. Pull the welder toward you so you can see the welding rod fill the v-groove as you make your pass.
- Lay down no more than 2 inches of welding rod into the v-groove at a time. Remove the rod from the welder tip, and before the melted rod has time to cool down, go back over it with the hot welder tip and thoroughly melt the rod together with the base material. It helps to press into the plastic with the edge of the welder tip to mix the materials, then go back and smooth it out. Keep the heat on it until you have a good mix between the rod and base.

V-Groove and Weld Opposite Side

- After the weld on the backside cools, repeat the v-grooving and welding process on the opposite side.

Grind Weld to a Smooth Contour

- If you need to refinish the plastic, grind weld to a smooth contour with coarse sandpaper. Grind the weld slightly flush so that filler can cover the welded area completely. Follow instructions for Step 4 (Page 12) for filler application.
Repairing with Uni-Weld FiberFlex Universal Rod

Uni-Weld FiberFlex is a unique repair material in that it sticks to any plastic substrate. It is not a true welding rod, but rather a thermoplastic or hot-melt adhesive. When you do a repair with the FiberFlex, you will actually be using the heat of the welder to apply an adhesive. FiberFlex has a very strong bond and is reinforced with carbon and glass fibers for outstanding strength.

FiberFlex is the best way to repair TPOs (aka TEO, PP/EPDM, TSOP), the most common automotive bumper material. The reason is that there are no two TPOs that are exactly alike. As a result, our 5003R5 TPO welding rod will not match any TPO exactly. The FiberFlex, with its fiber reinforcement, actually makes a stronger repair than the true welding rod. Therefore, you'll find the FiberFlex to be the easiest and best way to repair TPOs.

The FiberFlex can also be used to repair virtually any plastic. It will stick to urethanes and Xenoy also. When you are not sure what type of plastic you are repairing, try the FiberFlex.

V-Groove Damaged Area

- Line up the outer surface of the tear with 6481 Aluminum Body Tape or with clamps. You may also tack the tear together with 2200 Insta-Weld 1 thin adhesive, however, instant adhesives don't stick well to TPO.
- Remove plastic in the shape of a broad V-groove halfway through the backside of the part using a die grinder with either the 6122 or 6122NF Heavy Duty Round Burr or the 6134-R Round Cutter Bit. You’ll want the v-groove to be about 1-1/2 inches wide when you get done.
- It is very important to put some “tooth” in the plastic by grinding the v-groove with 50 grit or coarser sandpaper. Use a low speed grinder. Grinding at high speed will tend to melt many thermoplastics.
- Using 80 grit in a DA sander, remove the paint in the area around the v-groove and radius smoothly into the v-groove. This will give you a better featheredge when you get ready to sand the FiberFlex.

Melt on the FiberFlex

- With the airless welder set to the highest temperature setting, use the 6028RT Round Tip to melt the 5003R10 FiberFlex welding rod onto the surface. Best adhesion is achieved by premelting one side of the end of the rod, then flipping the rod over so that the melted portion sticks to the plastic. Cut the melted part of the ribbon off using the edge of the welder tip and spread the FiberFlex into the v-groove. Do not attempt to melt the base material together with the FiberFlex. Repairing with Fiber-Flex is similar to a brazing process.
- You may also apply the 5003R11 FiberFlex Round Rod with the 6030 Speed Welding Tip for faster application.

V-Groove and Weld Opposite Side

- After the FiberFlex on the backside cools (you may force cool with water), repeat the v-grooving and welding process on the opposite side. Build the FiberFlex slightly higher than the surface. FiberFlex is also a sandable filler.

Finish Sand

- After allowing the FiberFlex to cool completely, sand with 80 grit paper in a DA sander at low speed. Progress to finer grits, ending with 320 grit.
- Fill any low spots with more FiberFlex or with a skim coat of 2000 Flex Filler 2 or 2020 SMC Hardset epoxy filler.
Repairing Thermoplastics with Hot Air Fusion Welding

With practice, you will find welding plastics with hot air to be quick, strong, and very cost effective. Using our specialty welding rods, you will be able to repair virtually any type of thermoplastic part. With R-13 welding ribbon, you will be able to repair broken tabs and mounts on polypropylene based plastics like TPO without having to worry about strength.

**V-Groove Damaged Area**

- Line up the outer surface of the tear with 6481 Aluminum Body Tape or with clamps. You can also tack the tear together with 2200 Insta-Weld 1 thin adhesive.
- V-groove the part with either the 6121-T Teardrop Cutter Bit or the 6200VG V-Groovin’ Tool making a V-groove almost all the way through the plastic where the plastic is cracked or needs to be welded. This will ensure the weld has optimal penetration into the plastic and will produce the strongest possible joint. The only exception to this is when making a weld using the R-13 welding ribbon. In that case, the increased surface area of the welding material makes up for the lost penetration in the seam.
- Remove the paint in the area surrounding the v-groove and radius into the v-groove with coarse sandpaper.

![Figure 1](image1.png)

Figure 1 shows the V-groove made at the point where the pieces of plastic will be welded together. Notice the depth of the groove, this will allow a piece of plastic to have maximum weld penetration by allowing the welder to make one or more passes, filling the groove from the bottom to the top with filler rod.

**Set the Temperature and Airflow**

- The key to properly setting the temperature and airflow is to match the type of filler rod you are using. Typically, the lowest balance of airflow and temperature that you can get to work for the material you are welding will produce the most satisfactory welds.
- For the 6050HA, the airflow is usually set somewhere in the ballpark of 3 psi.
- For the 6055, the airspeed is usually set in the lowest speed range.
- At a distance of approximately ¼” to ½”, direct the airflow at the rod or base material for a couple of seconds. The rod and the base material should turn glossy as the surface begins melt. If it takes longer than several seconds, you may need to either increase the temperature or adjust the airflow. Should the plastic begin to turn glossy and begin to bubble after only briefly heating the material, you will need to reduce the heat or adjust the airflow.

![Figure 2](image2.png)

Figure 2

**Aim the airflow and the welding rod**

- Hold the welder with the tip between ¼” and ¾” away from the material to be welded. Heat the base material and the rod until both become shiny and tacky. (Figure 2)
- Because the base material acts as a heat sink it typically requires more heat than the rod.
- The objective is melt the rod and base material simultaneously, so when they are pressed together they melt together, not just melt to one another.

![Figure 3](image3.png)  ![Figure 4](image4.png)

**Welding the Joint:**

- Holding the welding rod at about a 45 degree angle away from the welder, begin pressing the rod into the v-groove of the material. Holding this angle on the rod, work your way down the v-groove steadily, melting the rod and the base material together. (Figure 3 and 4)
- Make sure the rod and the base material are heated equally to ensure a good weld. If the base material is allowed to overheat, the surface may scorch or the substrate will melt. Should the rod be heated and the base material left too cool, you will not get adequate penetration of the weld and the weld will be very weak.
- The approximate speed of a hot air weld is roughly 6 to 8 inches per minute depending on the thickness of the base material.
Repair Method D: hot air welding

- When welding plastic, a common misconception is that the welding rod should flow into the base material and produce a fillet type weld. With metal welding, this may be true, but for plastic welding the strongest welds are those where the filler rod will retain its basic shape after being pressed into the joint.
- This can easily be seen when using the R-13 ribbon. Aside from some distortion of the edges, the basic profile of the material remains intact after the welding process. (Figure 5)
- When welding very thick materials it may be necessary to make multiple passes with the welding rod. If possible, stagger the starting points of subsequent passes to achieve the strongest possible weld.
- Once you complete the weld, you should not immediately pull the welding rod away from the surface being welded. This may cause the rod to break away from the base material. A better way of ending the weld is to remove the heat source and continue to apply pressure with the welding rod directed at the base material for several seconds. To remove the rod, release the downward pressure and twist the rod to break it off. (Figure 6)

Using Speed Tips:
- When using the speed tip that comes with the 6055 welder or the optional speed tip for the 6050HA welder (PN: 6050-NHS1), the principle is the same as with the tube tips or reduction nozzle; heat the rod and the base material sufficiently to get the two to stick together. The difference is the speed tip allows the heat to be more easily confined to the joint being welded and allows the rod to be more rapidly heated. This allows the user to make faster welds with less heat escaping into the surrounding areas. Using a speed tip also allows some shaping of the finished weld because the filler rod is melted on all sides and the tip can be dragged over the surface of the weld to press the material into shape.
- Because you cannot see the area being welded where the rod and base material are joined, it is our recommendation the weld be tested after it has cooled to ensure adequate penetration.
- Heat levels and air speeds are roughly the same as with the tube tips and reduction nozzle. You will be able to make additional adjustments based on your need for speed and the thickness and type of base material.

Clean and V-Groove Damaged Area
Clean the damaged area with 1000 Super Clean Plastic Cleaner. Bevel the edges of the area to be welded with 6275 Electric Die Grinder and open up a cavity at least 1/4" deep in the foam backing and vinyl cover. Sand and bevel the vinyl cover around the cavity to allow for featheredging of filler.

Fill Cavity with Urethane Welding Rod
Using the 5003R1 Urethane Welding Rod, start your weld at the bottom of the cavity using your Airless Plastic Welder. Fill the cavity up with melted plastic and spread it out so that it overlaps the edges of the vinyl cover about 1/4".

Sand and Apply Padded Dash Filler
After allowing the weld area to cool, grind the weld area smooth with the 6407 Drum Sander attachment for the 6275 Electric Die Grinder. Rough up the surrounding area to improve adhesion of the filler. Mix 2050-9 Padded Dash Filler and apply with plastic squeegee. Cover an area larger than the weld in order to feather out the repair to a smooth contour.

Finish Sand and Apply Texture Material
Allow the filler to cure at least 15 minutes, then sand to a smooth contour. Finish sand with 220 grit paper. Retexture the panel with 3800 Flex Tex flexible texture material according to directions on Page 9. Do not try to spot retexture. Retexture and blend the leading edge or most visible area of the pad all the way across. If there is a noticeable difference in texture, retexture the entire pad.
Repair Method E: Epoxy repair

Repairing Plastics with Epoxy Based Adhesives

- Sand backside of area to be repaired with 50 grit paper or coarser. Heavy grooving of the plastic is desirable to maximize the mechanical strength of the bond. Afterward, sand lightly with 80 grit for finer grooving which will further improve adhesion.
- If the material is TEO, TPO or PP, you must apply 1060FP Filler Prep Adhesion Promoter. Brush onto the sanded area and allow to flash off.
- Apply 2044-2 Fiberglass Reinforcing Tape over the damaged area. If part is SMC, cut a backing panel from a scrap piece of SMC. Make sure the backing panel extends at least 2” beyond damage in all directions.
- Choose a two-part epoxy adhesive system to match the hardness of the substrate.

<table>
<thead>
<tr>
<th>Flexible</th>
<th>2000 Flex Filler 2 (gray)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid</td>
<td>2020 SMC Hardset Adhesive Filler (gray)</td>
</tr>
</tbody>
</table>

- Mix epoxy adhesive in equal parts, apply over fiberglass reinforcing tape on backside of repair. Allow 15 minutes to cure before handling. On SMC, apply a bead of 2020 SMC Hardset Filler to the backing panel and press into place. Allow epoxy at least 20 minutes to cure before handling.
- Sand front side of damaged area with 50 grit paper or coarser and v-groove away from tear. The deeper and wider the v-groove is, the stronger the repair will be. Remove paint in the surrounding area and radius into the v-groove with 80 grit in a DA.
- Again, if the material is a TPO or PP, apply 1060FP Filler Prep Adhesion Promoter.
- Mix and apply selected epoxy adhesive. Build up slightly higher than the surface to allow for sanding. Allow at least 20 minutes to cure before sanding. On SMC, layer pieces of 2043-U Uni-Cloth fiberglass cloth into the v-groove between coats of epoxy. Use a saturation roller if necessary to fully wet the cloth with epoxy.
- Contour and smooth the surface with 80 and 180 grit paper.

Repair Method F: Insta-Weld repair

Repairing Plastics with Insta-Weld Adhesives

Our line of Insta-Weld adhesives are specially formulated to provide maximum adhesion on a wide variety of common automotive plastics. Because Insta-Weld forms rigid bonds, it works best with rigid plastics like ABS, polycarbonate, and SMC. It may also be used to tack parts together while performing a welding repair.

Fixing Cracks Quickly

- Prior to assembling parts, lightly spray area to be bonded with 2303 Insta-Weld Activator.
- Assemble and align parts. Use clamps or 6481 Aluminum Body Tape to hold parts together while bonding.
- Apply a small amount of 2200 Insta-Weld 1 thin adhesive to the joint or crack. Optimum results are obtained with the minimum quantity of adhesive needed to fill the joint. The adhesive is thin enough to allow it to be wicked down into the crack. Use 2250 Insta-Weld 2 thick gap-filling adhesive for parts that do not fit together perfectly.
- Spray on additional 2303 Activator to complete the cure. Additional Activator and Insta-Weld 2 may be applied to fill any small remaining gaps.

Filling Gaps, Holes, and Gouges

- Use 6481 Aluminum Body Tape as a back-up under the hole.
- Rough sand and v-groove area around the hole and blow dust free.
- Spray a light coat of 2303 Activator in and around hole.
- Fill hole with 2300 Weld Compound and saturate with a few drops of 2200-1 Insta-Weld 1. Smooth and saturate the Weld Compound with Insta-Weld using a disposable tool if desired. Wait 5 or 10 seconds and apply another light coat of 2303 Activator. The repair may be sanded or drilled immediately.
Repairing Plastics with PlastiFix® Rigid Plastic Repair Kit

The PlastiFix® Rigid Plastic Repair Kit is a revolutionary plastic repair system that allows you to repair cracks, fill gaps, rebuild tabs, and fix stripped threads. The most unique feature of the PlastiFix® Rigid Plastic Repair Kit is the FlexMold® flexible molding bar. The FlexMold bar allows you to replace a broken tab by forming a mold from an undamaged piece, then casting your new part using the PlastiFix acrylic adhesive system. This system does not work on olefinic plastics like PE, PP, or TEO.

Getting Ready

Dispense powder into cup. Use pipet to dispense liquid into the dropper bottle. Insert dropper tip into bottle and place applicator needle onto dropper tip.

Application

Squeeze one drop of liquid into powder. Pick up liquid/powder mix with tip of needle. Squeeze bottle to apply liquid/powder mix to repair area.

FlexMold Molding Bar Use

Place FlexMold bar in very hot water until it softens. Shape FlexMold bar over pattern. Caution! Very hot! When FlexMold bar cools, position in repair area. Fill mold with PlastiFix powder/liquid mix, allow to cure 30 min., remove mold.

Reinforcing

Cut fiberglass cloth to cover damage on backside. Cover fiberglass cloth with thin layer of PlastiFix powder. Saturate powder with PlastiFix liquid. Cover with plastic sheet, press to shape, allow to cure.

Repairing Threads

Drill or file threads from hole. Apply lubricant to screw threads. Apply PlastiFix powder/liquid mixture to screw threads. While adhesive is wet, insert into hole.
Repairing Flexible Tabs on TEO Plastics

- Many TEO bumpers have mounting tabs that have to flex during installation. These can be repaired very durably with the mesh and FiberFlex. First, rough grind the area with a coarse Roloc disc.
- Cut 2045W Stainless Steel Wire Mesh to size to fit in the corner areas on both sides of the tab. Using the hot welder tip, bury the mesh directly into the plastic. After you’ve melted the mesh into the plastic, scuff the melted plastic with coarse sandpaper to remove the gloss.
- Melt on a thin layer of FiberFlex over the mesh just to cover. In this repair, the mesh provides the strength and flexibility while the FiberFlex just gives a cosmetic covering.

Repairing Torn Tabs

- Rough grind the area surrounding the crack with a coarse Roloc disc.
- Cut 2045W Stainless Steel Wire Mesh to size to fit in the corner areas on both sides of the tab. Using the hot welder tip, bury the mesh directly into the plastic. (This won’t work on urethane parts since they don’t melt. See Page 5). After you’ve melted the mesh into the plastic, scuff the melted plastic with coarse sandpaper to remove the gloss.
- Melt either the FiberFlex or the matching standard plastic rod over the mesh. If using the standard rod, keep the heat on the plastic to make sure the rod melts thoroughly with the base material. Keep adding more rod to make a bigger fillet and increase strength.

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- Melt either the FiberFlex or the matching standard plastic rod over the mesh. If using the standard rod, keep the heat on the plastic to make sure the rod melts thoroughly with the base material. Keep adding more rod to make a bigger fillet and increase strength.

Repairing Torn Bolt Holes in TPO with FiberFlex

1. Taper both side of plastic to a point with a coarse Roloc disc. Grind and taper around the edges of the entire bolt hole. Taper back about 1 inch on all sides. Remove paint and radius into taper with 80 grit in a DA.
2. Melt 2045W Stainless Steel Reinforcing Mesh into the plastic across the gap if desired for extra strength. This step is often not necessary because FiberFlex is blended with glass fibers for strength.
3. Apply FiberFlex to area using the instructions on Page 7. After cooling, remove aluminum tape and repeat on opposite side.
4. Allow FiberFlex to cool completely. Open the hole with a die grinder or drill bit, then sand with 80 grit in a DA at low speed to finish the repair.

Applying Epoxy Filler

- Grind area to be filled with coarse sandpaper. Slightly v-groove away from the damaged area. All gloss on the surface should be removed to maximize filler adhesion.
- If the material is a polyolefin (PP, PE, TEO, or TPO), apply 1060FP Filler Prep Adhesion Promoter.
- Choose a two-part epoxy filler to match the hardness of the substrate. If flexible, use 2000 Flex Filler 2. If rigid, use 2020 SMC Hardset Filler.
- Mix epoxy adhesive in equal parts and apply. Build up slightly higher than the surface to allow for sanding. Allow at least 20 minutes to cure before sanding. Contour and smooth the surface with 80 and 180 grit paper.
Repairing Living Hinges on TEO Plastics

- One of the most difficult tabs to repair are those which are designed to flex along a “hinge” line. The 5010-1 polypropylene sheet was developed to perform such repairs on TPO bumpers.

- If you have a good tab left to trace, begin the repair process by tracing the tab onto the 5010-1 PP sheet using a marker or a razor knife. If you have no tab to trace, create a cardboard template for the tab, then trace the template onto the plastic sheet. When making the new tab, be sure to leave an extra strip of plastic past the hinge to allow a place to weld in the new tab into the bumper. Cut the tab out of the polypropylene sheet using a jigsaw or hacksaw.

- To make the “living” hinge, clamp your tab into a vise along the hinge line, then bend back and forth to make the hinge line flexible. If the final shape of the tab has an “L” shape, bend this area only one way to keep it stiff.

- Cut a notch in the bumper to receive the new tab. Trim the tab or bumper as needed for a snug fit.

- Hold the tab in place using 6481-2 foil tape. Weld the tab onto the bumper using R13-W PP strip welding rod and a hot air welder.

- While still hot, burnish the R13-W strip into the tab and bumper using an airless plastic welder with the 6028RT tip. Let cool, then repeat the same procedure on the opposite side. Once cool, the tab should be as least as strong as the original.

- Finish the repair by sanding the welded area slightly flush, then fill with 5003R10 FiberFlex. Allow to cool, then finish sand.

Using 3800 Flex-Tex

- Scuff Sand - After repairing the damage, scuff sand the area you intend to retextrue with 320 grit paper and blow dust free.

- Decide How to Blend Texture - Check the grain, texture, and contours of the panel to be repaired. It is not necessary to exactly duplicate the existing texture to achieve a quality repair. You may be able to blend the new texture out into the old or retextrue to a natural break line in the panel to avoid having to retextrue the entire panel.

- Mix Texture Material - Stir 3800 Flex Tex flexible texture material and pour into a primer gun with a 1.8 - 2.0mm nozzle. Spray some test patterns on a scrap piece of paper and dial in the size and grain of the texture by adjusting the speed of the pass, the air pressure, and the fluid flow. A lower air pressure will give you a larger grain.

- Apply Texture Material in Light Coats - When applying Flex Tex, hold the gun about 18 - 24 inches from the surface. Apply in light coats and allow flash time between each coat. Do not wet spray the material as it will flow out and destroy the grain effect. It may require as many as 8 - 10 light coats to achieve the necessary buildup.

- Nib Sand and Blend Texture - When the desired texture buildup is achieved, allow the texture to dry completely. Then, using a scuff pad, lightly nib sand the newly textured area. As you nib sand you will detect the repair area begin to blend into the original texture of the panel and the sprayed look will disappear.

- Apply Flexible Color Coat - After sanding the texture, blow dust free and apply a flexible color coat. To match over 40 OEM shades of gray, topcoat with 3500 series Bumper and Cladding Coat Paint.
### Priming Plastics: primer selection & use

#### Repair Step 5

<table>
<thead>
<tr>
<th>Types of Bumpers</th>
<th>New Replacement Bumpers</th>
<th>Repaired Bumpers</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM Primed Bumpers</td>
<td>RAW TPO Bumpers</td>
<td>RAW PUR Bumpers</td>
</tr>
<tr>
<td>Domestic bumpers (GM, Ford, Chrysler) usually have OEM primer. Color is usually black with high sheen and uniform appearance. Occasionally gray. Sanding the surface lightly with 400 grit sandpaper will produce fine dust. The color or appearance of the painted side is different or if overspray is visible on the inside of the bumper.</td>
<td></td>
<td>OEM Painted Bumpers</td>
</tr>
<tr>
<td>Toyota, Nissan, Kia and Subaru are usually raw, unprimed TPO. ID symbol is PP, PP/EPDM, TSOP, TPO, TEO, or TPE. Usually black with dull finish, sometimes non-uniform in appearance, may have tacky mold release agent on surface. When sanded lightly with 400 grit sandpaper, virtually no dust is produced.</td>
<td>May be PUR if Toyota or Lexus with light gray color. All yellow plastic bumpers are PUR. ID symbol is PUR. When lightly sanded with 400 grit sandpaper will produce virtually no dust.</td>
<td>High Gloss. Color matches body color. Base material different color than top coat.</td>
</tr>
</tbody>
</table>

#### Identify Bumper:

- **Domestic bumpers (GM, Ford, Chrysler)** usually have OEM primer. Color is usually black with high sheen and uniform appearance. Occasionally gray. Sanding the surface lightly with 400 grit sandpaper will produce fine dust. The color or appearance of the painted side is different or if overspray is visible on the inside of the bumper. **NOTE**: Sometimes the inside is primed also.

- **Toyota, Nissan, Kia and Subaru** are usually raw, unprimed TPO. ID symbol is PP, PP/EPDM, TSOP, TPO, TEO, or TPE. Usually black with dull finish, sometimes non-uniform in appearance, may have tacky mold release agent on surface. When sanded lightly with 400 grit sandpaper, virtually no dust is produced.

- **OEM Primed Bumpers**

  - Clean entire bumper with 1020 Scuff Magic Prep Soap and a red scuff pad. Rinse with clean water. Allow to Dry. Bumper surface and ambient temperature should be between 65°F and 95°F.
  - Clean entire bumper with 1020 Scuff Magic Prep Soap and a gray scuff pad. Allow to Dry. Bumper surface and ambient temperature should be between 65°F and 95°F. Clean entire surface to be primed with 1000 Super Clean Plastic Cleaner. Spray heavy, wet coat over a 1 to 2 square foot area, wipe dry with a clean cloth, exposing clean surface to plastic with each wipe. Repeat until the entire surface has been cleaned.

- **RAW TPO Bumpers**

  - Clean Bumper with 1020 Scuff Magic Prep Soap and a gray scuff pad. Allow to Dry. Bumper surface and ambient temperature should be between 65°F and 95°F. Clean entire surface to be primed with 1000 Super Clean Plastic Cleaner. Spray heavy, wet coat over a 1 to 2 square foot area, wipe dry with a clean cloth, exposing clean surface to plastic with each wipe. Repeat until the entire surface has been cleaned.

- **RAW PUR Bumpers**

  - Clean Bumper with 1020 Scuff Magic Prep Soap and a gray scuff pad. Allow to Dry. Bumper surface and ambient temperature should be between 65°F and 95°F. Clean entire surface to be primed with 1000 Super Clean Plastic Cleaner. Spray heavy, wet coat over a 1 to 2 square foot area, wipe dry with a clean cloth, exposing clean surface to plastic with each wipe. Repeat until the entire surface has been cleaned.

- **OEM Painted Bumpers**

  - Clean entire surface to be primed with 1000 Super Clean Plastic Cleaner. Spray heavy, wet coat over a 1 to 2 square foot area, wipe dry with a clean cloth, exposing clean surface to plastic with each wipe. Repeat until the entire surface has been cleaned.

  - Sand overall with 320 grit sand paper. Blow dust free.
<table>
<thead>
<tr>
<th>Paint Preparation</th>
<th>Paint Gun</th>
<th>Catalyst Mix Ratio</th>
<th>Application</th>
<th>Dry Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OEM Primed Bumpers</strong></td>
<td>Stir Prime Time, do not shake. Mix appropriate shade of Prime Time using 3030 series toners.</td>
<td>Paint gun with a 1.0 mm to 1.4 mm nozzle.</td>
<td>Apply one light coat. Immediately apply second light coat if needed to hide thin areas. If second full coat is desired, allow Prime Time to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 10 and 30 minutes.</td>
<td>Allow at least 60 minutes dry time at room temperature or 30 minutes at 120°F. Dry time will vary depending on temperature and humidity. Prime Time must be completely dry before topcoating. The crosslinking process takes six hours at room temperature or one hour at 120°F. Prime Time may be topcoated before crosslinking is complete.</td>
</tr>
<tr>
<td><strong>RAW TPO Bumpers</strong></td>
<td>Shake or stir Bumper and Cladding Coat. Pour appropriate amount into gun to meet job requirements.</td>
<td>Paint gun with a 0.8 mm to 1.3 mm nozzle.</td>
<td>Apply one light coat. Immediately apply second light coat if needed to hide thin areas. If second full coat is desired, allow Bumper and Cladding Coat to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 5 and 10 minutes.</td>
<td>Allow at least 60 minutes dry time at room temperature or 15 minutes at 130°F. Dry time will vary depending on temperature and humidity. Bumper and Cladding Coat must be completely dry before topcoating. Any unused paint may be returned to the can for future use.</td>
</tr>
<tr>
<td><strong>RAW PUR Bumpers</strong></td>
<td>Stir Prime Time, do not shade. Mix appropriate shade of Prime Time using 3030 series toners.</td>
<td>Paint gun with a 1.0 mm to 1.4 mm nozzle.</td>
<td>Apply one light coat. Immediately apply second light coat if needed to hide thin areas. If second full coat is desired, allow Prime Time to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 10 and 30 minutes.</td>
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</tr>
<tr>
<td><strong>OEM Painted Bumpers</strong></td>
<td>Stir Black Cat, do not shake. If desired, Black Cat may be thinned with water up to 5% by volume.</td>
<td>Paint gun with a 1.2 mm to 1.4 mm nozzle for smooth finish. Primer gun with a 1.8 mm to 2.0 mm nozzle for high build.</td>
<td>Apply one medium coat. If second coat is desired, allow Black Cat to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 10 and 30 minutes. Additional coats may be applied after sanding to achieve desired surface finish if needed.</td>
<td>Allow at least 30 minutes dry time at room temperature or 20 minutes at 120°F before dry sanding. Black Cat may be wet sanded after 6 hours dry time at room temperature or after 60 minutes at 120°F. Dry time will vary depending on temperature and humidity. Black Cat must be completely dry before topcoating. The crosslinking process takes six hours at room temperature or one hour at 120°F. Black Cat may be topcoated before crosslinking is complete.</td>
</tr>
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Flash time is usually between 5 and 10 minutes. If second full coat is desired, allow Bumper and Cladding Coat to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 5 and 10 minutes. If desired, Black Cat may be thinned with water up to 5% by volume. If using 3103 catalyst, then mix 2% by weight to Black Cat or 2 grams of catalyst for every 100 grams of Black Cat. If no scale is available, then mix 2 teaspoons of catalyst per pint of Black Cat. Mix thoroughly. Do not shake.

Shade® system. Catalyzed Black Cat has an 8 hour pot life. Catalyzed Black Cat resembles Dupont® Value Black Cat and resembles Dupont® Value Black Cat. Black Cat may be topcoated before dry sanding. Black Cat may be wet sanded after 6 hours dry time at room temperature or after 60 minutes at 120°F. Dry time will vary depending on temperature and humidity. Black Cat must be completely dry before topcoating. The crosslinking process takes six hours at room temperature or one hour at 120°F. Black Cat may be topcoated before crosslinking is complete.

Mix appropriate shade of Prime Time using 3030 series toners. Mix 3103 catalyst with Prime Time using 3030 series toners. Mix 2% by weight. (weight of paint) x .02 = weight of catalyst. If no scale is available, then mix 2 teaspoons of catalyst per pint of Prime Time. Mix thoroughly. Do not shake.

Mix 3103 catalyst with Prime Time 2% by weight. (weight of paint) x .02 = weight of catalyst. If no scale is available, then mix 2 teaspoons of catalyst per pint of Prime Time. Mix thoroughly. Do not shake.

Apply one light coat. Immediately apply second light coat. Immediately apply second light coat if needed to hide thin areas. If second full coat is desired, allow Bumper and Cladding Coat to flash off before applying second full coat. Flash time varies depending on temperature and humidity. Flash time is usually between 5 and 10 minutes.

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Mix 2% by weight to Black Cat or 2 grams of catalyst for every 100 grams of Black Cat. If no scale is available, then mix 2 teaspoons of catalyst per pint of Black Cat. Mix thoroughly. Do not shake.
### Priming Plastics: premier selection & use

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<th>OEM Painted Bumpers</th>
</tr>
</thead>
</table>
| Top Coat

- No sanding required before applying the topcoat. If required, surface may be lightly scuffed or sanded to achieve desired smoothness. If sanded, blow or wipe dust off surface before applying topcoat. Apply any Base/Clear or single stage topcoat system according to the manufacturer’s instructions. Topcoating window does not close. Prime Time may be topcoated at any time once fully dry.

- No sanding required before applying topcoat. Although sanding Bumper and Cladding Coat Adhesion Primer is not recommended, trapped debris may be removed with very light sanding using 600 grit paper. Apply any approved Base/Clear system according to the manufacturer’s instructions. Bumper and Cladding Coat Adhesion Primer may not be topcoated with 2K primers, single stage paint or catalyzed base coats. Topcoating window does not close. Bumper and Cladding Coat Adhesion Primer may be topcoated at any time once fully dry.

- No sanding required before applying the topcoat. If required, surface may be lightly scuffed or sanded to achieve desired smoothness. If sanded, blow or wipe dust off surface before applying topcoat. Apply any Base/Clear or single stage topcoat system according to the manufacturer’s instructions. Topcoating window does not close. Prime Time may be topcoated at any time once fully dry.

- Finish Sand with 400 to 600 grit sand paper. Apply any sealer, Base/Clear or single stage topcoat system according to the manufacturer’s instructions.

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### more information on plastic repair!

**Website** - If you’ve got an internet connection, you’re a keystroke away from a wealth of information about plastic repair on our website. We have all the old issues of our Plastic Pointers newsletters, the latest edition of The Book of Automotive Plastic Repair, MSDS’s, and many other resources.

**Plastic Pointers** - Our periodic newsletter on plastic repair is available free to anyone in the collision repair trade. The newsletter keeps you up to date with new plastic repair techniques, the latest technical and market research, and new product releases. If you’d like to get on the mailing list, give us a call at our toll free number!

**DVD** - This fast-paced, professionally-produced 40 minute dvd on plastic repair is the best in the industry. Train your whole crew in less than an hour and start making profits with plastic repair!

**Book** - “How to Repair Plastic Bodywork” is the world’s most comprehensive publication printed related to plastic repair. Owning this book will not only teach you how to perform virtually any plastic repair, but it also explains why. You’ll find this to be a truly valuable addition to your library.

**Technical Support** - Free technical support from our friendly staff is available at our toll free number. We’ll be happy to help you identify a type of plastic, the best repair procedure, or help you to solve any problem you might be having with plastic repair. Give us a call, we will help!

**dBumper Bumper ID & Management Software** - The most comprehensive software available for identifying, managing and pricing recycled bumpers. Features the largest bumper database in the industry with continuous updates and easy to use features.

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