

COMPLIMENTS OF

Polyvance

ADVANCING POLYMER REPAIR



THE BOOK

OF PLASTIC REPAIR

A comprehensive guide to identifying, repairing
and refinishing virtually any plastic.



11th Edition

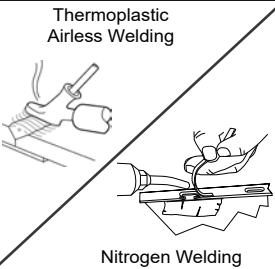
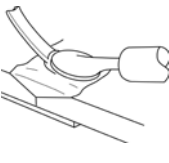

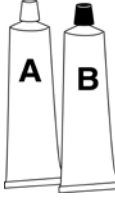

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Every step of the way, Polyvance has what you need!

Born as Urethane Supply Company in 1981, Polyvance has been at the forefront of automotive plastic repair technology ever since. 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 line of Bumper and Cladding Coat paint and in 2006 we introduced the world to welding plastic with nitrogen gas, a quantum leap in plastic repair. Through our continual quest to innovate, we have created products to make plastic repair easier, stronger and more profitable for the user, year after year!

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PLASTIC REPAIR QUICK REFERENCE CHART

		Repair Method				
		AW-1, N2-1 Pages 5 - 8 Pages 9-12	AW-2 Page 6	AW-3 Page 7	AD-1 Page 13	PF-1 Page 14
Repair Step	1 Identify Plastic Page 3	ABS, HDPE*, LDPE*, PA-6 (nylon), PBT, PC, PP, PVC, TEO, TPE, TPO	PP, TPO, TEO, TPE, PE, or other	Thermoset Polyurethane	SMC, UP, FRP, Fiberglass	ABS, Acrylic, SMC, Fiberglass, PC blend, Metton®
	2 Clean Page 4	Clean part with soap & water and plastic cleaner				
	3 Repair Page 5 - 14					
	4 Fill Page 15	Grind, then apply filler that matches the hardness of the substrate				
	5 Prime Page 15	Prime				
	6 Paint Page 15	Apply Top Coat *				







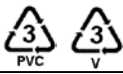

* Polyethylenes cannot be painted without special preparation. Go to www.polyvance.com for complete instructions.

IDENTIFY PLASTIC & DETERMINE REPAIR METHOD

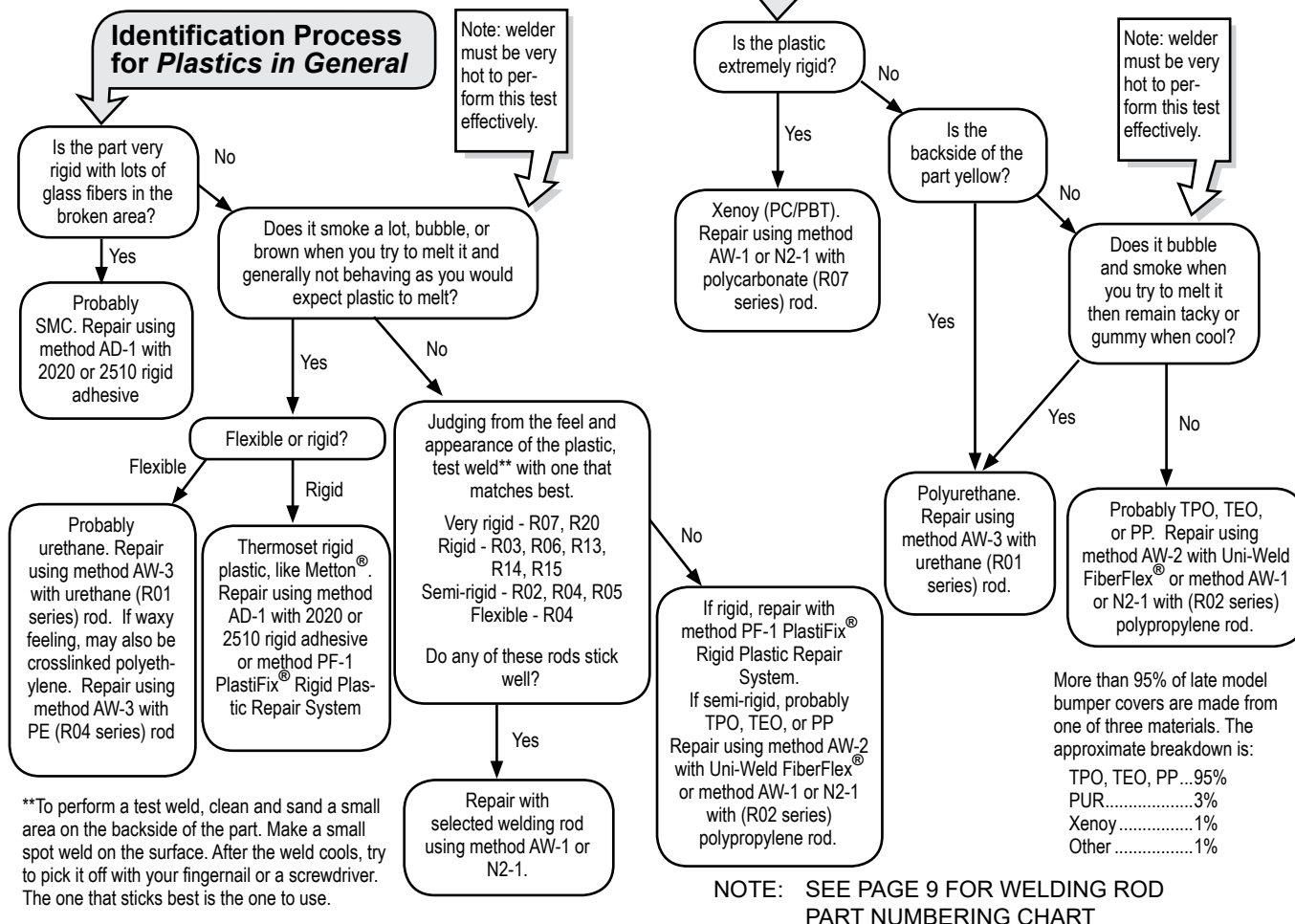
800.633.3047

Page 3

Identify the type of plastic by looking for the plastic ID symbol on the backside of the part. Match the symbol on the part with the table below. The recommended repair method is listed first. See the next page for tips when the identification symbol or abbreviation is missing.

	Recycling Symbol	Symbol & Type	Description/ How to Identify	Typical Applications	Suggested Repair Method	Repair Tips
Thermoset		PUR, RIM, RRIM Thermoset Polyurethane	Usually flexible, may be yellow or gray, bubbles & smokes when attempting to melt.	Flexible bumper covers (esp. on domestics,) filler panels, rocker panel covers, snowmobile cowls.	Method AW-3 w/ urethane (R01) rod or method AW-2 with Uni-Weld FiberFlex	Don't melt base material! Melt rod into v-groove like a hot melt glue.
		SMC, UP, FRP Fiberglass	Rigid, polyester matrix reinforced with glass fibers, sands finely.	Rigid body panels, fenders, hoods, deck lids, header panels, spoilers.	Method AD-1 Two-part adhesive repair with fiberglass reinforcement	Use backing plate over holes, layer in fiberglass cloth for extra strength.
		DCPD, Metton®	Rigid material, no fibers, gray in color.	Large truck and tractor panels and hoods.	Method AD-1 w/ 2510 PlastiFix two-part methacrylate adhesive	Use backing plate over holes, layer in fiberglass cloth for extra strength.
		XPE, XLPE, PE-Xb, PEX, Crosslinked Polyethylene	Semi-flexible, waxy or greasy feel, softens when heated but does not melt.	Gas tanks, kayaks, canoes, trash cans, use is declining	Method AW-3 with polyethylene (R04) rod, use as hot melt adhesive	Applying filler or painting is difficult or impossible. Browns when heated.
Thermoplastic		ABS Acrylonitrile Butadiene Styrene	Rigid, often white but may be molded in any color, sands finely.	Instrument panels, grilles, trim moldings, consoles, armrest supports, street bike fairings, canoes, aircraft wing tips and interiors.	Method AW-1 or N2-1 w/ ABS (R03 series) rod or methods PF-1 or AD-1	PlastiFix® is an optimal repair method. Weld repairs may be backed with epoxy for extra strength.
		PBT Polybutylene terephthalate (polyester)	Semi-rigid or rigid, sands finely.	Automotive panels, electrical connectors, under-hood parts	Method AW-1 or N2-1 with slivers cut from scrap	Crystalline type plastic. Has low coefficient of friction. Use heavy pressure and reinforce with 2045 mesh.
		PA, PA-6 Polyamide (Nylon)	Semi-rigid or rigid, sands finely.	Radiator tanks, head lamp bezels, exterior trim parts, mirrors, plastic engine parts.	Method AW-1 or N2-1 w/ nylon (R06 series) rod	Preheat plastic with heat gun before welding, mix completely with base mat'l.
		PC + ABS Pulse (Polycarbonate & ABS)	Rigid, sands finely, usually dark in color.	Door skins (Saturn), instrument panels, street bike fairings.	Method AW-1 or N2-1 w/ PC+ABS (R20 series) rod or methods PF-1 or AD-1	Preheat plastic with heat gun before welding.
		PC + PBT Xenoy (Polycarbonate blend)	Very rigid, sands finely, usually dark in color.	Bumper covers (84-95 Ford Taurus, Aerostar, some M-B and Hyundai).	Method AW-1 or N2-1 w/ PC (R07 series) rod or methods PF-1 or AD-1	Preheat plastic with heat gun before welding.
		HDPE Polyethylene	Semi-flexible, melts & smears when grinding, usually semi-translucent, waxy or greasy feel.	Overflow tanks, inner fender panels, ATV fenders, RV water storage tanks, gas tanks, kayaks canoes, playground equipment	Method AW-1 or N2-1 with high density polyethylene (R12 series) rod	Applying filler or painting is impossible.
		PE/LDPE Polyethylene	Semi-flexible, melts & smears when grinding, usually semi-translucent, waxy or greasy feel.	Overflow tanks, inner fender panels, ATV fenders, RV water storage tanks, gas tanks, kayaks, canoes, trash cans	Method AW-1 or N2-1 with polyethylene (R04 series) rod	Applying filler or painting is impossible.
		PP Polypropylene	Semi-flexible, melts & smears when grinding, waxy or greasy feel, usually a bit stiffer than PEs.	Bumper covers (usually blended w/ EPDM), inner fenders, radiator shrouds, gas tanks, battery cases, pallets	Method AW-1 or N2-1 w/ (R02 series) or method AW-2 with (R10 series) Uni-Weld FiberFlex	Use 1060FP Filler Prep before applying two-part epoxy filler.
		PPE, PPE+PS Polyphenylene Ether	Semi-rigid, sands finely, usually off-white or black in color.	Fenders, exterior trim, rear hatch panels.	Method AW-1 or N2-1 w/ PPE+PS (R08 series) rod or AD-1 or PF-1	Preheat plastic with heat gun before welding.
		PPO+PA, PPE+PA Noryl GTX (Nylon blend)	Semi-rigid, sands finely, usually off-white in color.	Fenders (Saturn & GM), exterior trim.	Method AW-1 or N2-1 with GTX (R15 series) rod or nylon (R06 series) rod	Preheat plastic with heat gun before welding.
		PVC Polyvinyl chloride	Rigid, sands finely. Usually white or gray but can be made any color.	Pipe, siding, window frames, decking, gutters, speed bumps	Method AW-1 or N2-1 with PVC (R09 series) welding rod or AD-1 or PF-1	
		TPE Thermoplastic Elastomer	Semi-flexible, usually black or gray, melts & smears when grinding.	Bumper covers, filler panels, underhood parts.	Method AW-2 with (R10 series) Uni-Weld FiberFlex	Use 1060FP Filler Prep before applying two-part epoxy filler.
		TPO, TEO, PP/EPDM, TSOP Thermoplastic Olefin	Semi-flexible, usually black or gray, melts & smears when grinding.	Bumper covers, air dams, grilles, interior parts, instrument panels, snowmobile cowls.	Method AW-1 or N2-1 w/ PP (R02 series) rod or TPO (R05 series) rod or method AW-2 w/(R10 series) FiberFlex rod.	Use 1060FP Filler Prep before applying two-part epoxy filler.
		TPU, TPUR Thermoplastic Polyurethane	Flexible, sands finely.	Bumper covers, soft filler panels, gravel deflectors, rocker panel covers.	Method AW-3 w/ (R01 series) rod or method AW-2 with (R10 series) FiberFlex rod	
		PETE, PET Polyethylene Terephthalate	Flexible, strong.	Soda bottles, various yarn fibers, headliners, fuse boxes, door panels	Method AW-1 or N2-1 with PET (R13 series) rod	Can't make as strong as original part; manufactured in crisscrossed layers and can't be duplicated.

If you can't find the Plastic ID Symbol...



PREPARING PLASTIC FOR ALL REPAIRS

Clean Surface

In order to maximize strength any repair, thoroughly clean contaminants from the surface in the damaged area.

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

Step 2. Spray 1000 Super Prep or 1001-4 EcoPrep Plastic Cleaner onto the surface 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, Remove Dents and Deformation

If the plastic is distorted, heat with a 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 6148 Bumper Rollers or other appropriate tool, then cool the area with a damp cloth. Stretched areas can be shrunk with the bumper cold. Keep working until smooth, then sand overall with 80 grit to help identify remaining low spots. Push out remaining low spots and repeat the process.

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.

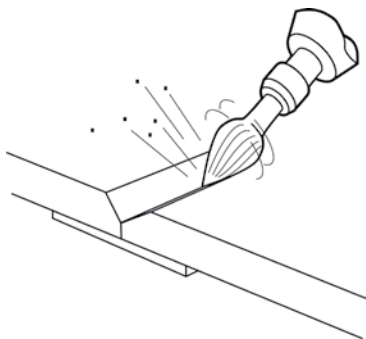
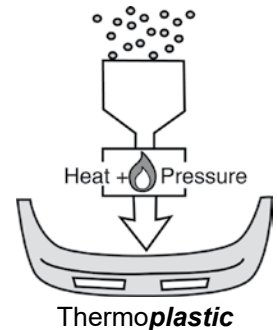
If the part is cut or torn to the edge, align the cosmetic surface with 6482 or 6485 Aluminum Body Tape and begin the repair process on the back. By aligning the outer surface, you minimize the amount of filler required to restore the proper profile to the part.

Repairing Thermoplastics with Fusion Welding using Airless Plastic Welder

Excluding urethane bumpers, all bumpers, and nearly all other plastics on automobiles and nearly everything else made of plastic, are made of thermoplastic materials. This means they can be melted with the application of heat. Thermoplastic parts are made by melting pellets of plastic and injecting the melted material into a mold, where it cools and solidifies. This means that thermoplastic parts can be melted.

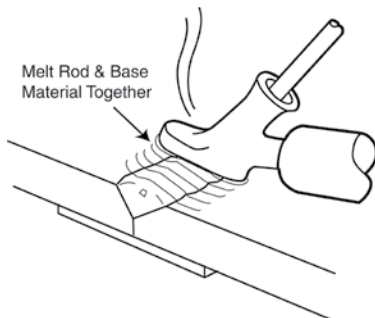
The most common thermoplastic automobile bumper material is TPO. TPO is fast becoming the most popular material for all sorts of interior and underhood plastics as well. TPOs can be welded using the fusion technique described on this page, but our FiberFlex® rod often makes an easier and stronger repair on TPO (see Repair Method AW-2, Page 6). The strongest way to repair any thermoplastic is with our nitrogen welding process (see Repair Method N2-1, Pages 9 - 12).

The least common bumper material, Xenoy, is best repaired using the following thermoplastic fusion technique.



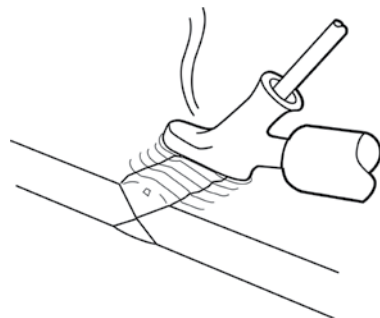
V-Groove Damaged Area

- Line up the outer surface of the tear with 6482 or 6485 Aluminum Body Tape or with clamps.
- V-groove halfway through the part with either the 6121-T Teardrop Cutter Bit and a rotary tool or the sharp edge of the plastic welding tip.
- Remove the paint in the area surrounding the v-groove and radius into the v-groove with coarse sandpaper.



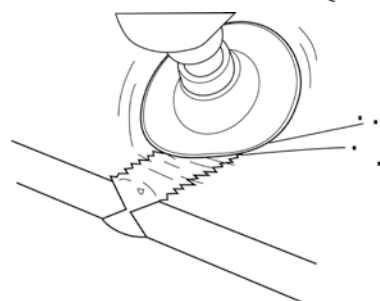
Melt the Rod Together with the Base Material

- 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 filler application. (Page 15)

Repairing with Uni-Weld FiberFlex® Universal Rod

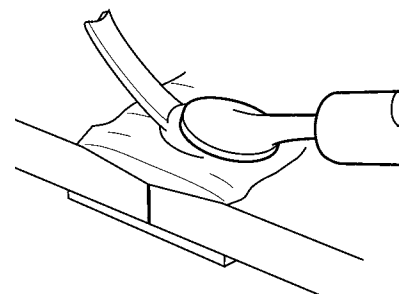
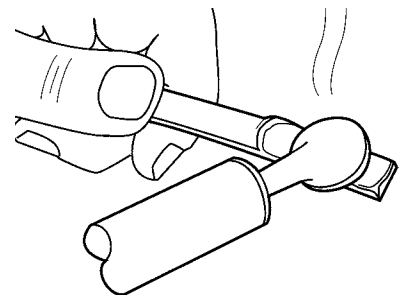
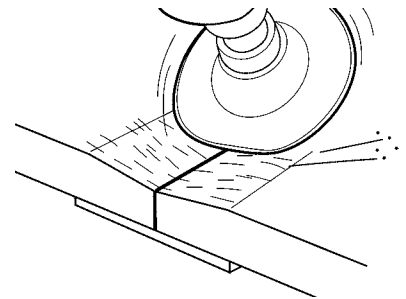
Uni-Weld FiberFlex® is a unique repair material in that it sticks to any plastic substrate. It is not a true welding rod, but rather a thermoplastic or hot-melt adhesive. When you do a repair with the FiberFlex®, you will actually be using the heat of the welder to apply an adhesive. FiberFlex® has a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

FiberFlex® is a popular 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 TPO (R05 series) welding rod will not match any TPO exactly.

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 FiberFlex®.

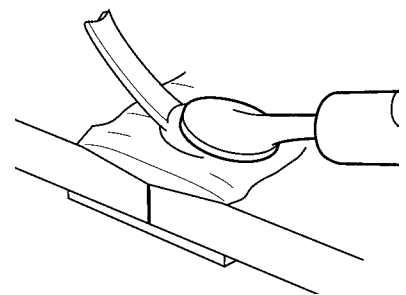
V-Groove Damaged Area

- Line up the outer surface of the tear with 6482 or 6485 Aluminum Body Tape or with clamps.
- Grind away plastic into the shape of a broad V-groove halfway through the backside of the part using a die grinder with the 6122 Heavy Duty Round Burr, 6125 Heavy Duty Tapered 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, feather back 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 6031 Teardrop Welding Tip to melt the (R10-04) FiberFlex® welding rod onto the surface. Best adhesion is achieved by pre-melting 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 FiberFlex® is similar to a brazing process.

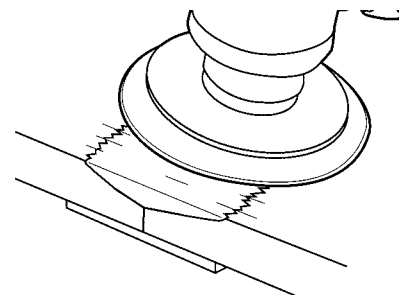


V-Groove and Weld Opposite Side

- 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

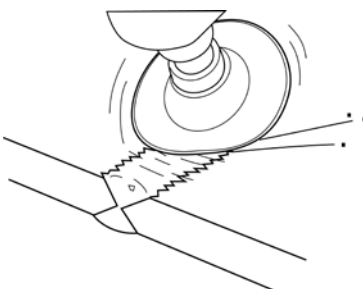
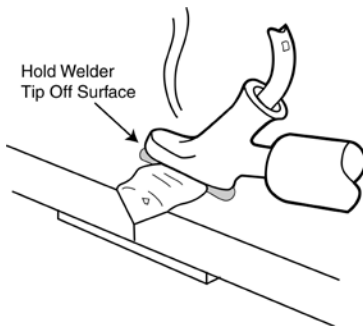
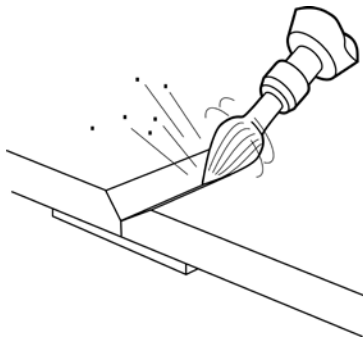
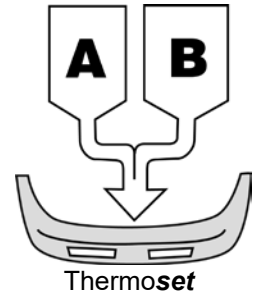
- After allowing the FiberFlex® to cool completely, sand with 80 grit paper in a DA sander at low speed. Progress to finer grits, ending with 320 grit.
- Fill any low spots with more FiberFlex® or with a skim coat of 2000 Flex Filler 2 or 2020 Hardset filler.



Repairing Thermoset Urethanes

Automotive urethane, or PUR, is a “thermoset” material. Similar to what happens when mixing body filler and cream hardener, thermoset plastic is formed when two liquid chemicals come together in the mold to form a solid. The importance of this is that if polyurethane is “melted” the plastic decomposes and prevents adhesion of repair materials. **DO NOT TRY TO MELT URETHANE BUMPERS WITH THE WELDER!**

A positive way to identify urethane bumpers is to press a HOT welding tip into the backside of the bumper. If it's a urethane, the plastic will liquefy, bubble and smoke. (Note: welder must be extremely hot for this to happen). After the heated area cools off, it will remain gummy or tacky. This is an indication that the heat 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 brazing rather than a true fusion weld.



V-Groove Damaged Area

- Line up the outer surface of the tear with 6482 or 6485 Aluminum Body Tape or with clamps.
- V-groove halfway through the back side of the part with the 6121-T Teardrop Cutter Bit or the 6125 Tapered Burr. You cannot use a hot tool to melt the v-groove into urethane because it will decompose.
- Sand the v-groove with coarse sandpaper (80 grit or coarser) to put “tooth” into the plastic. Also, remove the paint in the area surrounding the v-groove and radius the edges of the v-groove for extra strength.

Melt the Rod into the V-Groove

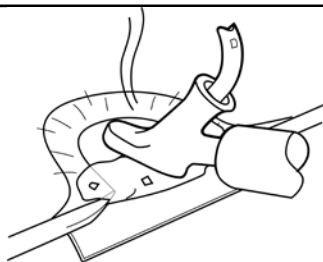
- Turn the temperature of your airless plastic welder to the “R01” rod setting. Using the (R01 series) urethane welding rod, the rod should come out of the bottom of the welder’s shoe completely melted and clear, not discolored or bubbling. Turn your welder up or down as needed, until you get this result.
- Holding the welder’s tip slightly 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 meltable!
- 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 well. You can touch the bumper with the welding tip, but keep the tip moving so you don’t overheat the base material.

V-Groove and Weld Opposite Side

- After the weld on the back side cools, repeat the V-groove and welding process on the cosmetic side. V-groove deep enough to penetrate the welding rod on the back side.

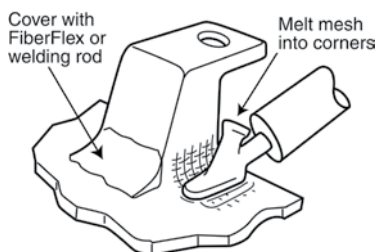
Grind Weld to a Smooth Contour

- Using coarse sandpaper, grind the weld to a smooth contour. The urethane welding rod will not feather very well, so it will need to be covered with 2000 FlexFiller 2™ epoxy filler to refinish completely. Grind the weld slightly below flush so that filler can cover the welded area completely. Follow instructions for filler application. (Page 13)



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 6482 or 6485 Aluminum Body Tape to create a bridge across the torn mounting hole. Melt (R01 series) urethane welding rod into the area. Drill out hole when finished.

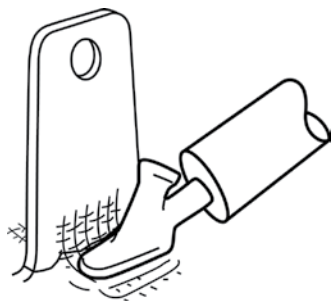


Repairing Flexible Tabs on TEO Plastics

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 sandpaper 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.



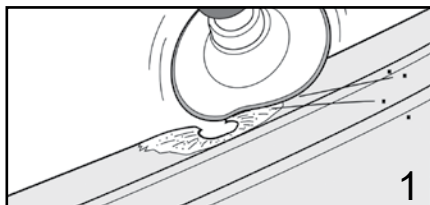
Repairing Torn Tabs

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. 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 7). After you've melted the mesh into the plastic, scuff the melted plastic with coarse sandpaper to remove the gloss.

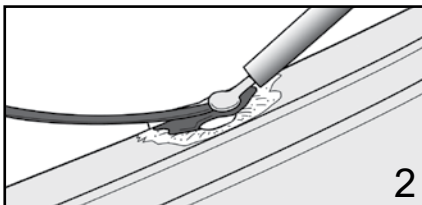
Melt either the FiberFlex® or the matching standard plastic rod over the mesh. If using the standard rod, keep the heat on the plastic to make sure the rod melts thoroughly with the base material. Keep adding more rod to make a bigger fillet and increase strength.

Repairing Torn Bolt Holes in TPO with FiberFlex®



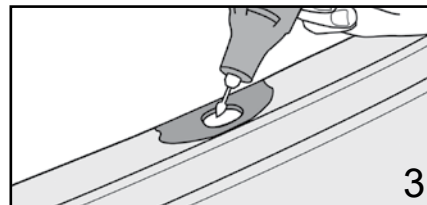
Taper both side of plastic to a point with a coarse sandpaper disc. Grind and taper around the edges of the entire bolt hole. Taper back about 1 inch on all sides. Remove paint and radius into taper with 80 grit in a DA.

Apply aluminum tape across the gap to support the melted rod while it's hot.



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.

Apply FiberFlex® to area using the instructions on Page 6. After cooling, remove aluminum tape and repeat on opposite side.



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.

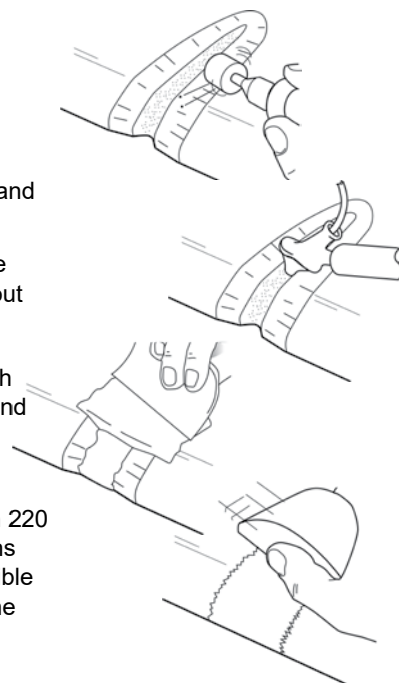
Padded Dash Repair

Clean the damaged area with 1000 Super Prep Plastic Cleaner or 1001-4 EcoPrep Plastic Cleaner. Bevel the edges of the area to be welded with a drum sander on an 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.

Using the R01 urethane or R10 FiberFlex® 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".

After allowing the weld area to cool, grind the weld area smooth with a drum sander. 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.

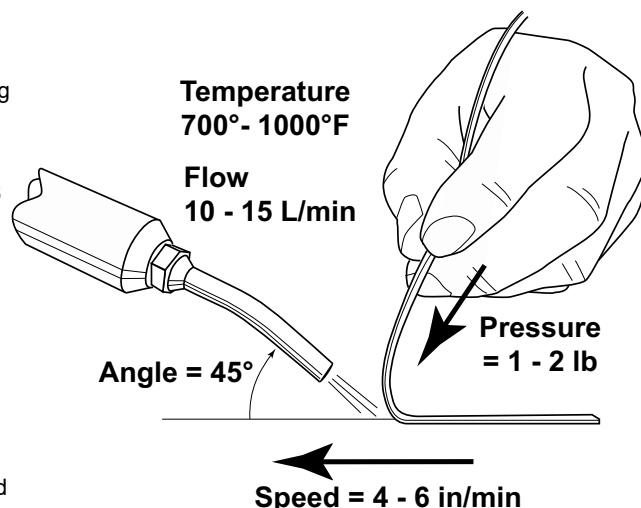
Allow the filler to cure at least 15 minutes, then sand to a smooth contour. Finish sand with 220 grit paper. Retexture the panel with 3804 Flextex VT texture material according to directions on the can. Do not try to spot retexture. Retexture and blend the leading edge or most visible area of the pad all the way across. If there is a noticeable difference in texture, retexture the entire pad.



Basic nitrogen welding process

Welding with nitrogen involves the coordination of both hands, one controlling the torch and the other feeding the rod. When you weld, you just want to melt the bottom surface of the rod and the top of the bumper. You don't "puddle" the rod like you do in metal welding. This makes for a stronger repair because it leaves the basic structure of the rod intact. When you're making your weld, make sure you melt both the bumper and the rod at the same time and fuse them together with the downward pressure on the rod. Remember the five important factors for plastic welding: "T.F.A.P.S.", an acronym for Temperature, Flow, Angle, Pressure, and Speed.

- For **temperature**, set the temperature on the nitrogen welder's dial to the proper setting. For example, the PP/TPO setting will generate an air flow of about 700°-800°F.
- The **flow** should be set between 10 to 15 liters per minute depending on the plastic's thickness; less for thinner plastics, more for thicker.
- An **angle** of 45° between the torch and the bumper is optimum. Aim the stream of hot air a little in front of the rod; for thick rod like the 06 profile, focus a little more heat on the rod.
- Put as much downward **pressure** on the rod as possible to help the rod fuse with the bumper. Keep a steady downward pressure on the rod and keep the rod moving slowly. Don't overheat the rod and let it fold over backwards.
- The **speed** of your weld should be about 4 to 6 inches per minute. With thin rod like the 03 profile, it's difficult to go this slow. With thick rod like the 06 profile, it may go even slower. The important thing is to move steadily while keeping proper downward pressure on the rod while making sure the bumper and the bottom surface of the rod are both melted before they come together.



Welding Rod Part Numbering System

R02

Material

01









Rod Profile[§]
03

Package Size/Qty

BK

Color

R01	Urethane
R02	Polypropylene
R03	ABS
R04	Polyethylene
R05	TPO
R06	Nylon
R07	Polycarbonate
R08	PPE+PS
R09	PVC
R10	FiberFlex®
R11	PBT
R12	HDPE
R13	PET
R14	ASA
R15	PA+PPE (GTX)
R16	POM
R17	Acrylic/PVC
R18	PP+GF15
R19	HDPE+GF15
R20	PC+ABS

01		1/8"
02		3/16"
03		7/16" x 1/16"
04		3/8" x 1/16"
05		5/8" x 1/16"
06		1/2" x 3/32"
07		13/64" x 1/16"
08		1/4" x 1/4"

[§] Not all rod profiles are available in all plastic types

01	5 ft.
03	30 ft.
04	1 lb.
05	Small spool
08	Bulk*

* Sold by the pound. (10 lb min.)

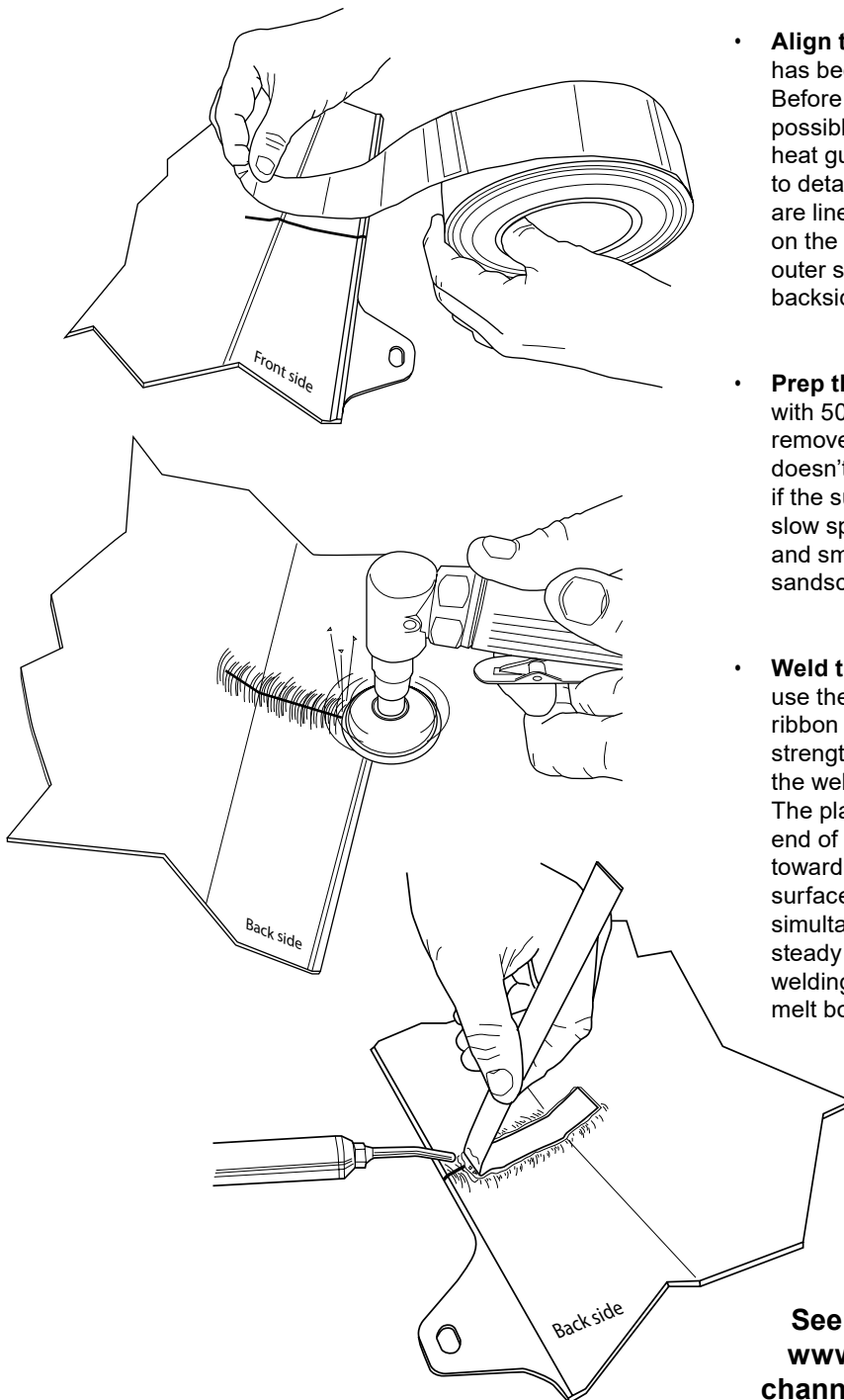
BK	Black
BL	Blue
GN	Green
GY	Gray
NT	Natural*
OR	Orange
RD	Red
TN	Tan
WH	White
YL	Yellow

* No pigment added.

Repairing a cracked bumper with a nitrogen plastic welder

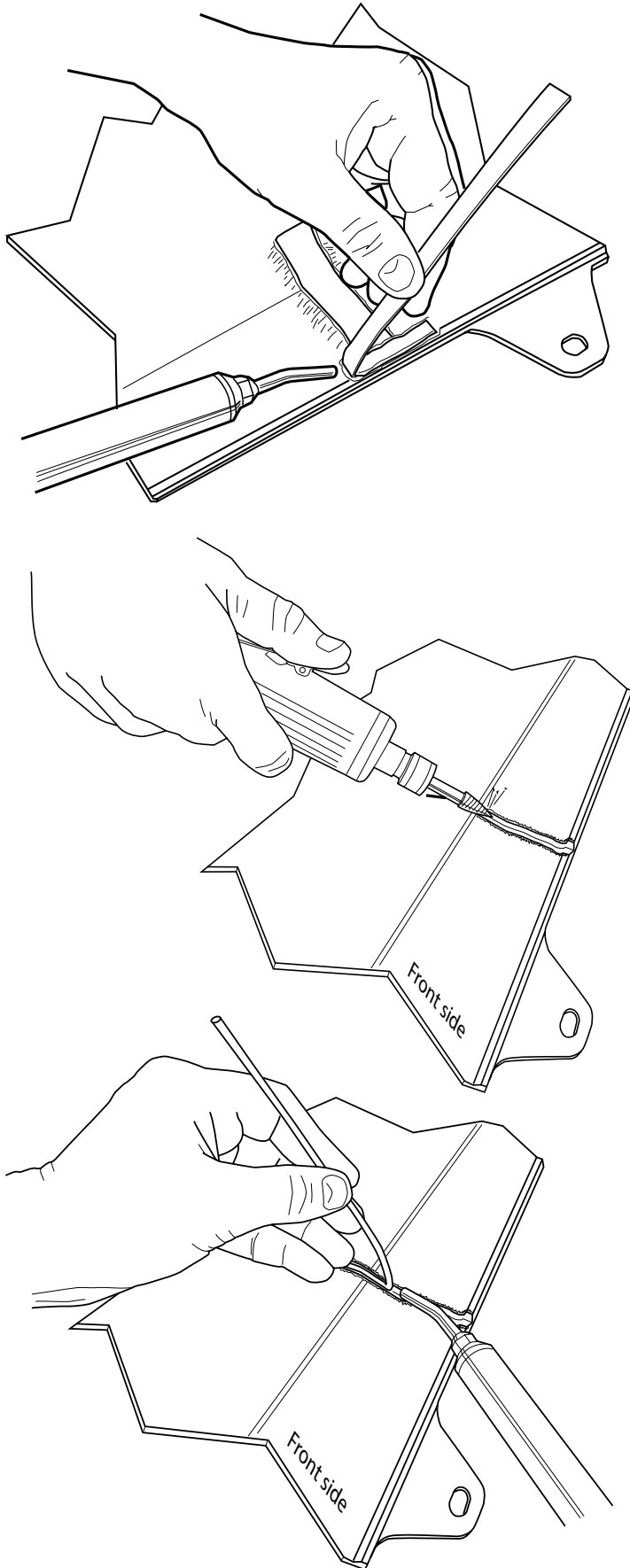
Let's assume you have a PP/TPO bumper torn to the edge. This section will take you through the whole process—cleaning, prepping, and welding. This describes the basic repair technique that can be adapted to other speciality repairs on tabs and mounting holes.

- **Clean the bumper before you grind it.** Before you touch the bumper with sandpaper or a die grinder, make sure it's clean first. First, clean the entire bumper by washing with soap. Use a red scuff pad to spread the soap and scuff the plastic. This will put small sanding scratches into the bumper to help further improve adhesion. Rinse the soap off and allow the bumper to dry. Once dry, clean the bumper with Polyvance 1000 Super Prep Plastic Cleaner or 1001-4 EcoPrep Plastic Cleaner. This will remove all solvent-soluble contaminants like silicone, wax, mold release agents, etc. Spray on in a heavy, wet coat, let it sit on the surface for a few seconds, then wipe dry with a clean paper towel before it evaporates. Don't just soak a rag and wipe it around, that only moves the contamination around on the surface and does not remove it.



- **Align the outer (cosmetic) surface.** Often the plastic has been stretched or distorted in the damaged area. Before you weld, get the crack aligned as closely as possible. If the plastic is dented or stretched, heat with a heat gun and push the plastic back into position referring to detailed instructions on Page 4. Once the plastic pieces are lined up, use Polyvance's 6485 Aluminium Body Tape on the outer (cosmetic) surface. It's best to line up the outer surface to minimize the need for filler and weld the backside of the crack first.
- **Prep the backside of the crack.** Grind the back side with 50 to 80 grit sandpaper to roughen the surface and remove any paint overspray. Grind the surface flat if it doesn't need to be smooth on the back. Grind a v-groove if the surface needs to be flat when finished. Grind at a slow speed; if you go too fast the friction heat will melt and smear the plastic. You want to put a good, rough sandscratch in the plastic, not melt it.
- **Weld the backside of the crack.** For maximum strength, use the R02-05 wide ribbon on the backside. This wide ribbon spreads the load over a large area for maximum strength. To do the weld, start by preheating the end of the welding rod and the bumper at the end of the crack. The plastic will start to turn glossy. At this point, push the end of the ribbon rod down into the plastic and bend it toward the welder. Make your pass by melting the bottom surface of the rod and the top surface of the bumper simultaneously, forcing the melted plastics together with steady downward pressure on the welding rod. The proper welding pace is 4" to 6" per minute. It is most important to melt both the rod and the bumper at the same time.

See our plastic repair training videos at www.polyvance.com or on our YouTube channel www.youtube.com/urethanesupply.



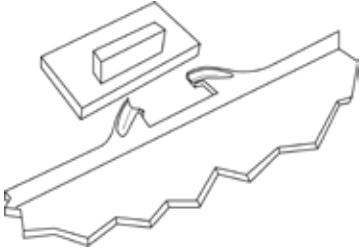
- **Weld a “tee”.** Upon completing the weld down the crack, it is advisable to make another cross stitch weld at the end of the crack along the edge to reinforce the repair. Use the R02-04 ribbon for the edge reinforcement. Because the original extruded structure of the ribbon is not disrupted in the welding process, trying to tear the bumper is like trying to tear the rod in two. As long as the rod is welded solidly to the bumper, this will provide a lot of extra strength.
- **Prep the front side for welding.** After the backside weld is cool, peel the aluminum tape off the front side. Using a 6121-T or 6125 cutter bit in a rotary tool, grind out a v-groove down the crack in the plastic about 1/16” to 3/32” deep. The width of the v-groove should match the kind of rod you want to use on the front side. Most of the time the R02-01 1/8” diameter round rod is the best choice because it is easier to finish being a narrow rod. In this case, grind the v-groove about 1/8” wide. For stressed areas or anywhere you want some extra strength, you may choose to use a ribbon on the frontside. In that case, grind the v-groove a little wider than the width of the ribbon. Sand off the paint immediately adjacent to the v-groove with 80 grit in a DA sander.
- **Weld the front side of the crack.** Using your selected welding rod or ribbon, perform the weld in the prepared v-groove the same way you did on the back side. Refer to the basic nitrogen welding process on Page 9 for complete info.
- **Finish the weld.** Once the weld is completely cool, sand with 50-80 grit paper in a grinder or DA. Be careful not to sand too fast; this will just melt and smear the plastic. It’s best to use a sharp, new piece of paper and slow the sander down a bit to keep the plastic from melting. Sometimes the repair may be finished out and feathered with the welding rod, but most often you’re going to need some filler to fill in the low spots. Refer to Page 15 in this book for more information on how to apply filler on plastic parts.

Inquire about our I-CAR® Industry Training Alliance® courses on nitrogen plastic welding for hands-on training in your shop, on-line or at Polyvance!



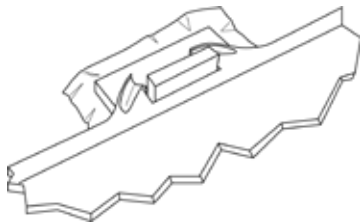
Welding a broken bumper slot tab with a nitrogen plastic welder

Because of the strength provided by the nitrogen welding system, you can make strong repairs even when you don't have a lot of surface area to weld to. "Slot tabs" are a common feature on bumpers which are difficult to repair with two-part adhesives or FiberFlex®. This repair sequence shows how to repair a broken slot tab with the nitrogen plastic welder and Polyvance's 6146 Bumper Pliers Kit.



1. Find Matching Die

Find the forming die which most closely matches the width of the broken rectangular slot tab. Select the matching numbered die and pick the pliers that match the forming die. Prepare the plastic for welding by cleaning with 1000 Super Prep or 1001 EcoPrep then taper each side with a grinder or sander at least 1/2" back from the broken edges.



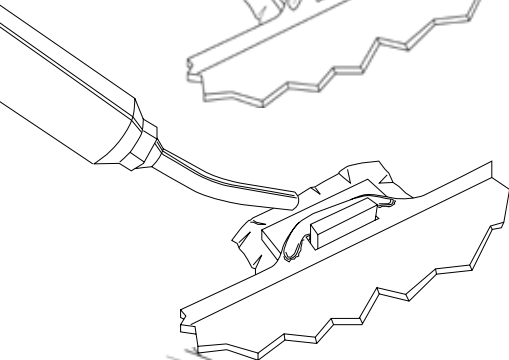
2. Tape Forming Die Into Position

Insert the selected forming die into the broken hole and line up the outer edges of the tab and slot. Tape into position with a piece of 6485 aluminum tape.



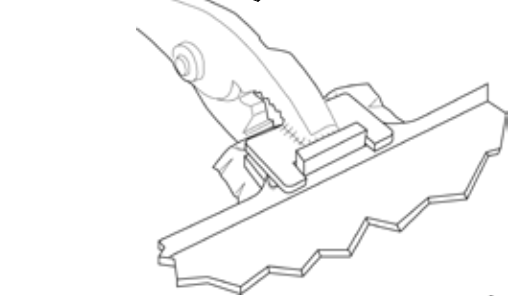
3. Weld

Use your preferred plastic welding rod and weld from one side to the other in a continuous pass, locking the plastic welding rod into the bumper on both sides. As always, make sure to melt both the substrate and the plastic welding rod at the same time. A second, or even third pass of welding rod is often needed to fill out the missing plastic.



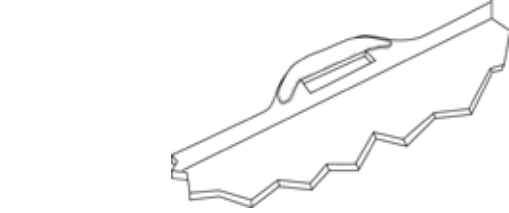
4. Reheat

Immediately after welding, reheat the welding rod using hot nitrogen gas until the plastic turns translucent (or glossy black if you are welding with the black welding rod).



5. Flatten With Pliers

Immediately squeeze the melted plastic with the matching forming pliers. Apply gentle pressure and hold for about 10 seconds to cool plastic. This will flatten the weld on top, pinch it to the same thickness as the original flange, and quench the heat out, so when you remove the pliers, you will see the finished shape. If you have any remaining low spots, apply more welding rod to fill them.

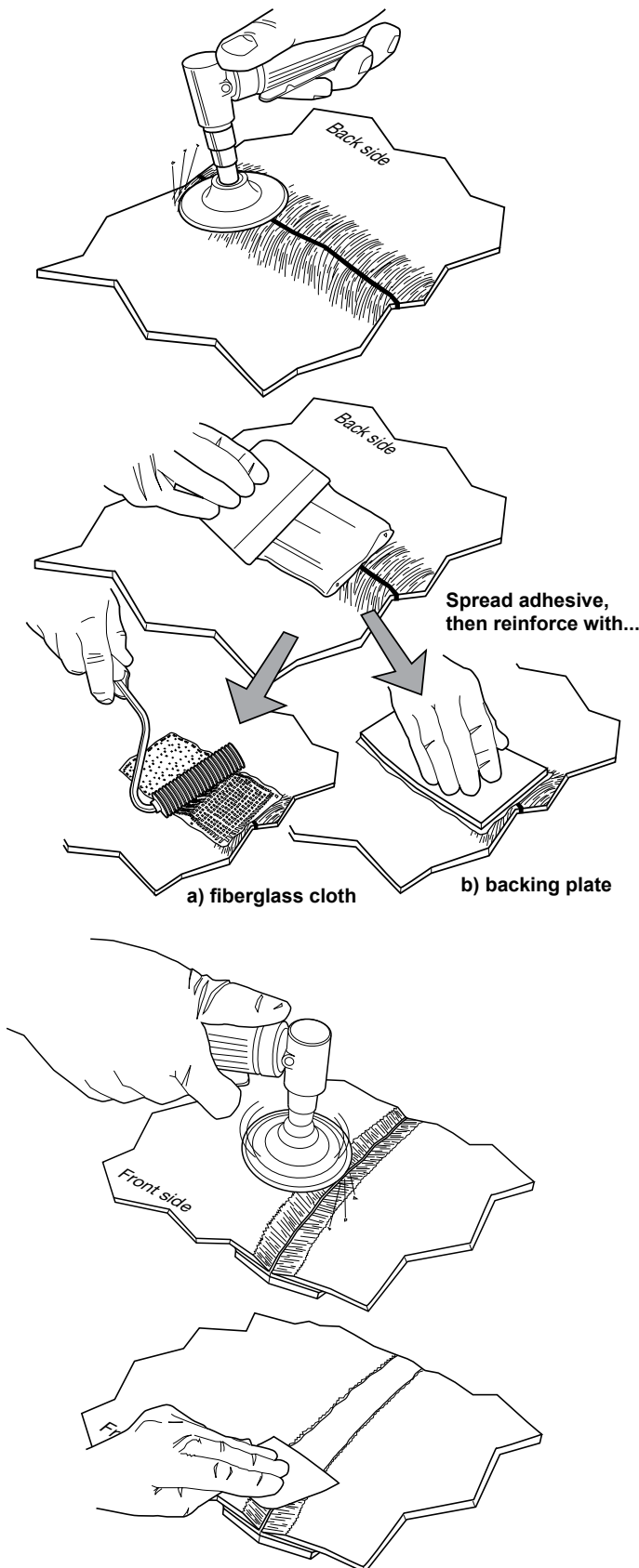


6. Remove Die, Shape as Needed

Allow the die to cool completely, then remove aluminum tape and push the die out of the hole. Shape the repaired area as needed with the airless plastic welder, utility knife, grinder, and/or sander until desired dimensions are restored.

See video of this process at:
www.polyvance.com/video/products-tools

Repairing Plastics with Two-Part Adhesives



- Clean both sides of the plastic in the damaged area with 1000 Super Prep Plastic Cleaner or 1001-4 EcoPrep Plastic Cleaner. Fixture the front side with clamps or aluminum tape to hold the part together while the adhesive on the backside cures.
- Sand the backside of the area to be repaired with 50 grit sand paper or coarser. A v-groove is not required unless you need to sand the backside flat for cosmetic reasons. Remove paint in the surrounding area with 80 grit in a DA. Heavy grooving of the plastic is desirable to maximize the mechanical strength of the bond. Blow dust free with clean, dry compressed air.
- If the material is TEO, TPO or PP, apply 1060FP Filler Prep or 1050 Plastic Magic Adhesion Promoter. Brush or spray onto the sanded area and allow to flash off.
- Choose a two-part adhesive system to match the hardness of the substrate per the table:

Adhesive	Substrate
2000 Flex Filler™	Flexible substrates, polyurethane, soft TPO
2020 Hardset Filler	Rigid substrates, semi-rigid TPO, SMC, fiberglass
2510 PlastiFix® two-part	Rigid substrates, Metton®, SMC, fiberglass, metals

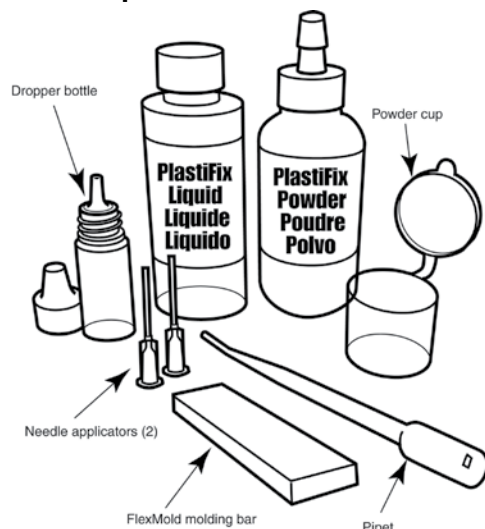
- Select a reinforcing method for the backside of the part. For flat areas, it is often easiest to cut a backing plate out of scrap material. For contoured areas, use fiberglass cloth or drywall tape.
- Prepare reinforcement by cutting 1 to 3 pieces of glass cloth to cover the damaged area about 2"-4" wide. If using a backing plate, make sure it extends at least 2" beyond damage in all directions. Rough grind the side of the backing plate that will be applied to the surface.
- Mix the two-part adhesive according to package directions. Spread a generous amount on the backside with a body spreader. If using a backing plate, press the plate firmly into the adhesive, allowing a small amount of adhesive to squeeze out from the edges. If using fiberglass cloth, lay the cloth into the adhesive and wet the fibers using a 2042-R Saturation Roller. Apply more adhesive over the area and embed another layer of fiberglass cloth if desired.
- Once the adhesive on the backside is cured, peel the aluminum tape off the front and grind a v-groove about 1"-2" wide with a die grinder and/or a coarse sanding disc. Sandscratch the inside of the v-groove coarsely. Round off any sharp edges and feather the paint back with 80 grit in a DA.
- If the material is TEO, TPO, or PP, apply adhesion promoter as was done on the backside.
- Mix the two-part adhesive and apply into the v-groove with a body spreader. Slightly overfill the v-groove so that it can be sanded flush when finished.
- When the adhesive on the front side is fully cured, sand with 80 grit in a DA sander, then progress to finer grits to finish.

Repairing Plastics with PlastiFix® Rigid Plastic Repair Kit

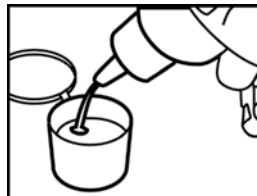
The PlastiFix® Rigid Plastic Repair Kit is a revolutionary plastic repair system that allows you to repair cracks, fill gaps, rebuild tabs, and fix stripped threads. The most unique feature of the PlastiFix® Rigid Plastic Repair Kit is the FlexMold™ flexible molding bar. The FlexMold™ bar allows you 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 is *ideal* for ABS, acrylic, polycarbonate and other hard plastics, however it does not work on olefinic plastics like PE, PP, or TEO.

See our PlastiFix® training videos at www.polyvance.com/video/plastifix.

Kit Components:



Getting Ready



Dispense powder into cup.

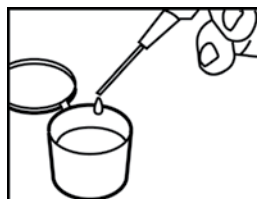


Use pipet to dispense liquid into the dropper bottle.

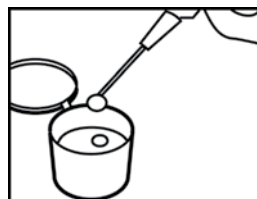


Insert dropper tip into bottle and place applicator needle onto dropper tip.

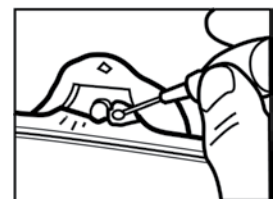
Application



Squeeze one drop of liquid into the powder.



Pick up liquid/powder mix with tip of needle.

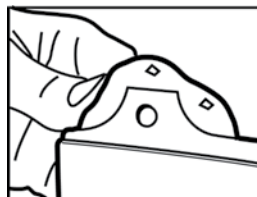


Squeeze bottle to apply liquid/powder mix to repair area.

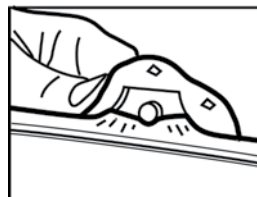
FlexMold™ Molding Bar Use



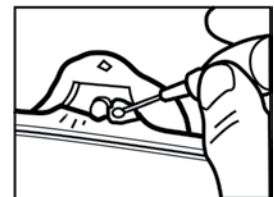
Place FlexMold™ bar in very hot water until it softens.



Shape FlexMold™ bar over pattern. Caution! Very hot!

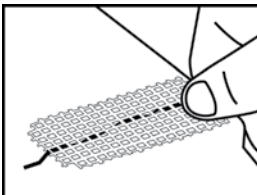


When FlexMold™ bar cools, position in repair area.

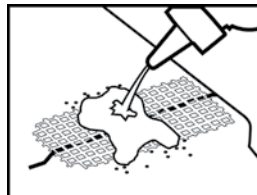


Fill mold with PlastiFix® powder/liquid mix, allow to cure 30 min., remove mold.

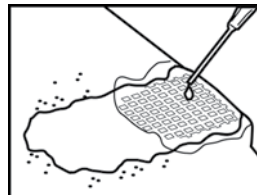
Reinforcing



Cut fiberglass cloth to cover damage on backside.



Cover fiberglass cloth with thin layer of PlastiFix® powder.

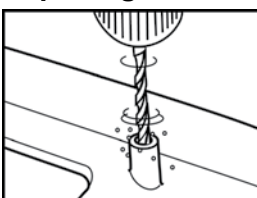


Saturate powder with PlastiFix® liquid.

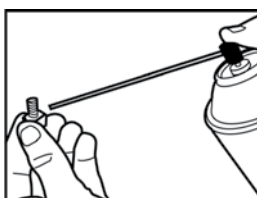


Cover with plastic sheet, press to shape, allow to cure.

Repairing Threads



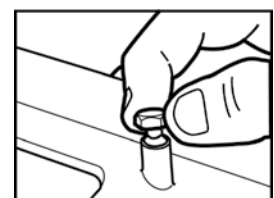
Drill or file threads from hole.



Apply lubricant to screw threads.










Apply PlastiFix® powder/liquid mixture to screw threads.







While adhesive is wet, insert into hole.

To complete the plastic repair after performing a plastic weld, the part must be refinished. The following instructions provide an overview of the products and processes required to restore your PP/EPDM or TPO plastic bumper fascia back to its original appearance.

1. Sand Weld	After allowing the plastic weld to cool completely, sand the welding rod slightly flush with 80 grit sandpaper. Feather the paint back with 180 grit. Blow dust free with clean, dry compressed air.	
2. Adhesion Promoter	Before applying filler, apply adhesion promoter on PP/TPO substrates. (1050 Plastic Magic is National Rule-compliant; 1051 is California-compliant)	  1050 Plastic Magic 1051 Low VOC Plastic Magic
3. Filler	Apply a skim coat of flexible or rigid filler over the repair area. Allow to cure completely, then sand with 80 and 180 grit paper.	  2000 Flex Filler (epoxy based) 1047 Putty Flex (polyester based) 2020 Hardset Filler (epoxy based)
4. Adhesion Promoter	Before spraying primer, apply adhesion promoter again over any exposed raw plastic areas (same products as used in Step 2).	
5. Primer-Surfacer	Spray a high-build waterborne primer-surfacer over the repair area. Allow to dry completely. (All of our waterborne primer surfacers are 50-state VOC-compliant.)	  3041 All Seasons E-Z Sand Light Gray 3043 All Seasons Black Jack
6. Spot putty, sand, and prime again	Apply spot putty over any visible imperfections. Allow to dry, then sand the repair area with 220 and 320 grit paper. Prime again and repeat process until desired appearance is obtained.	
7a. Apply your topcoat system	Apply your shop's color coat system to complete the refinish of smooth, painted plastics.	
7b. Apply Texture Finish	If the bumper is textured, apply Flextex VT flexible texture coating to simulate the original texture. (3804 Flextex VT Low VOC is 50-state VOC-compliant.)	 3804 Flextex VT LowVOC Texture Coating

Many new OEM replacement bumpers come from the factory in raw PP/TPO with no primer coat. Examples include most bumpers from Toyota, Nissan, Kia, Hyundai, and Subaru. Polyvance's Bumper & Cladding Coat™ Adhesion Primer has been proven since 2003 to provide adhesion that will not peel under the force of a pressure washer. See the product information sheet for complete application instructions.

1. Clean plastic	Spray a heavy wet coat of 1001-4 EcoPrep or 1000 Super Prep Plastic Cleaner; wipe off with a clean cloth to remove mold release agents. No scuffing or sanding required.	 
		1000 Super Prep Plastic Cleaner 1001 EcoPrep Plastic Cleaner
2. Apply Bumper & Cladding Coat™ Adhesion Primer	Spray one medium coat of Bumper & Cladding Coat™ Adhesion Primer to hide. Allow to dry completely. Available in white, light gray, and dark gray.	 
		3601 Bumper & Cladding Coat™ Adhesion Primer 3611 Bumper & Cladding Coat™ Low VOC Adhesion Primer
3. Topcoat	Topcoat with approved base-clear system. Adhesion to raw PP / TPO substrates is guaranteed by Polyvance.	

MORE INFORMATION ABOUT PLASTIC REPAIR



Smartphone App - The Polyvance app is designed to help technicians quickly identify plastics and the best way to repair them. There are four main sections of the app: Plastics Identification, Standard Operating Procedures, Videos, and Welder Companion.

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 tons of instructional videos, the latest edition of The Book of Automotive Plastic Repair, MSDS's, and many other resources.

YouTube - Subscribe to our YouTube channel to get notifications every time we upload a new instructional video. Go to www.youtube.com/urethanesupply.

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!

Social Media - Sign up on one or all of our social media accounts for the latest product information and repair tips! Our "friends" get the latest information first!



Polyvance

ADVANCING POLYMER REPAIR

**Technical Support & Ordering
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