







# Plastic Repair Quick Reference Chart

Step		AW-1	N2-1	AW-2	AW-3	AD-1	PF-1
1	<a href="#">Identify Plastic</a>	ABS, HDPE, LDPE, PA-6 (nylon), PBT, PC, PP, PVC, TEO, TPE, TPO	ABS, HDPE, LDPE, PA-6 (nylon), PBT, PC, PP, PVC, TEO, TPE, TPO	PP, TPO, TEO, TPE, PE, or other	Thermoset Polyurethane (RIM or RRIM)	SMC, UP, FRP, Fiberglass, Metton	ABS, Acrylic, SMC, Fiberglass, PC Blend
2	<a href="#">Clean</a>	Clean part with soap & water and Plastic Cleaner.					
3	Repair	<a href="#">Thermoplastic Airless Welding.</a> 	<a href="#">Nitrogen Welding</a> 	<a href="#">Uni-Weld FiberFlex</a> 	<a href="#">Thermoset Urethane Weld</a> 	<a href="#">Two-Part Adhesive</a> 	<a href="#">PlastiFix Rigid Plastic Repair Kit</a> 
4	Fill	Grind, then apply filler that matches the hardness of the substrate.					
5	Prime	Prime.					
	Prime	Apply Top Coat.					

## Plastic Identification

This table shows the plastic **most often used in automotive applications**. Don't see the symbol on this table? [Click here](#) for a more complete listing.

The plastics with the **yellow background** are thermoset plastics.

Symbol & Type	How to identify	Typical Usage	Suggested Repair Method	Repair Tips
PUR, RIM, RRIM Thermoset polyurethane	Usually flexible, maybe yellow or gray, <a href="#">bubbles and smokes</a> when attempting to melt.	Flexible bumper covers (esp. on domestics), filler panels, rocker panel covers, snowmobile cowls.	<a href="#">Method AW-3</a> w/ urethane (R01) rod or <a href="#">Method AW-2</a> with Uni-Weld FiberFlex	<b>Don't try to melt the base material!</b> Just melt the rod into the 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	<a href="#">Method AD-1</a> - two-part epoxy repair with fiberglass reinforcement.	Use backing plate over holes, layer in fiberglass cloth for extra strength.
DCPD, Metton	Rigid Material, no fibers, dark gray in color.	Large truck and tractor panels and hoods	<a href="#">Method AD-1</a> 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	<a href="#">Method AW-3</a> with polyethylene (R04) rod. Use as a hot melt adhesive.	Applying filler or painting is difficult or impossible. Browns when heated.
ABS (Acrylonitrile Butadiene Styrene)	Rigid, often white but may be molded in any color, sands finely. Very pungent odor when heated.	Instrument panels, grilles, trim moldings, consoles, armrest supports, street bike fairings.	<a href="#">Method AW-1</a> or N2-1 w/ ABS rod (R03), or <a href="#">Method AD-1</a> Two-Part epoxy repair	PlastiFix is an optimal repair method. Weld repairs may be backed with epoxy for extra strength.
PBT Polybutylene terphthalate	Semi-rigid or rigid, sands finely.	Automotive panels, electrical connectors, under-hood parts.	<a href="#">Method AW-1</a> 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, PA Polyamide (Nylon)	Semirigid or rigid, sands finely	Radiator tanks, headlamp bezels, exterior trim finish parts, mirrors, plastic engine parts	<a href="#">Method AW-1</a> with nylon (R06 series) rod.	Preheat plastic with heat gun before welding, mix rod completely with base material.
PC + ABS Pulse (Polycarbonate & ABS)	Rigid, sands finely, usually dark in color	Door skins (Saturn), instrument panels, street bike fairings	<a href="#">Method AW-1</a> or N2-1 with Polycarbonate rod (R07 series), or <a href="#">Method AD-1</a> adhesive repair	Preheat plastic with heat gun before welding.
PC + PBT Xenoy (Polycarbonate blend)	Rigid, sands finely, usually dark in color	Bumper covers (primarily Ford products, 84-95 Taurus, Aerostar, some Mercedes and Hyundai's)	<a href="#">Method AW-1</a> or N2-1 with polycarbonate rod (R07 series), or <a href="#">Method AD-1</a> adhesive repairs.	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, water storage tanks, gas tanks, kayaks, canoes, playground equipment.	<a href="#">Method AW-1</a> or N2-1 with high density polyethylene rod (R12 series)	Applying filler or painting is nearly impossible.
PE / LDPE Polyethylene	Semi-flexible, melts & smears when grinding, usually semi-translucent, waxy or greasy feel. Smells like a candle when melting.	Overflow tanks, inner fender panels, water storage tanks, gas tanks, kayaks, canoes, playground equipment, trash cans.	<a href="#">Method AW-1</a> or N2-1 with high density polyethylene rod (R04 series)	Applying filler or painting is nearly impossible.
PP Polypropylene	Semi-flexible, melts & smears when grinding, waxy of greasy feel, usually a bit stiffer than PE's	Bumper covers (usually blended with EPDM), inner fenders, radiator shrouds, gas tanks, battery cases, interior panels, gas tanks	<a href="#">Method AW-1</a> or N2-1 with (R02 series) or method <a href="#">AW-2</a> with (R10 series) Uni-Weld FiberFlex	Use <a href="#">1060FP Filler Prep</a> adhesion promoter when 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 <a href="#">AW-1</a> or N2-1 with slivers cut from scrap or <a href="#">AD-1</a>	Preheat plastic with heat gun before welding.
PPO + PA Noryl GTX (Nylon blend)	Semi-rigid, sands finely, usually off-white in color.	Fenders (Saturn & GM), exterior trim	Method <a href="#">AW-1</a> 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 <a href="#">AW-1</a> or N2-1 with PVC (R09 series) welding rod	
TPE Thermoplastic Elastomer	Semi-flexible, usually black or gray, melts & smears when grinding.	Bumper covers, filler panels, underhood parts.	<a href="#">Method AW-2</a> with Uni-Weld FiberFlex (R10 series)	Use <a href="#">1060FP Filler Prep</a> adhesion promoter before applying two-part epoxy filler.
TPO, EPM, TEO Thermoplastic Olefin	Semiflexible, usually black or gray in color, melts & smears when grinding	Bumper covers, air dams, grilles, interior parts, instrument panels, snowmobile cowl.	Method <a href="#">AW-1</a> or N2-1 w/ PP (R02 series) rod or TPO (R05 series) rod or method <a href="#">AW-2</a> w/ FiberFlex (R10 series) rod.	Use <a href="#">1060FP Filler Prep</a> adhesion promoter when applying two-part epoxy filler
TPU, TPUR - Thermoplastic Polyurethane	Flexible, sands finely	Bumper covers, soft filler panels, gravel deflectors, rocker panel covers	Method <a href="#">AW-3</a> w/ (R01 series) rod or Method <a href="#">AW-2</a> with (R10 series) FiberFlex rod.	
PETE, PET Polyethylene Terephthalate	Flexible, strong	Soda bottles, various yarn fibers, headliners, fuse boxes, door panels	Method <a href="#">AW-1</a> 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.



PETE



HDPE - high density polyethylene



PVC - polyvinyl chloride



LDPE - low density polyethylene



PP - polypropylene

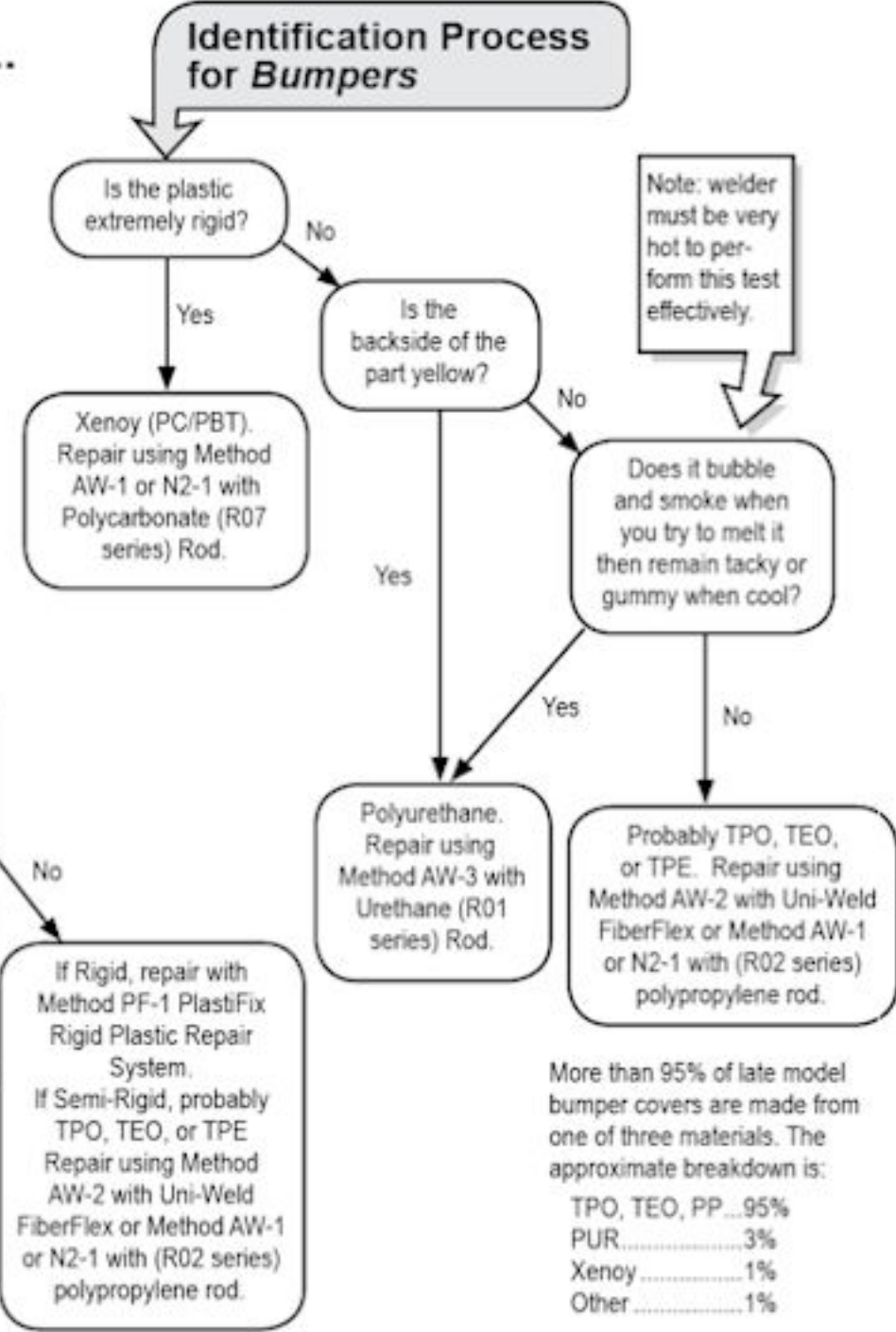
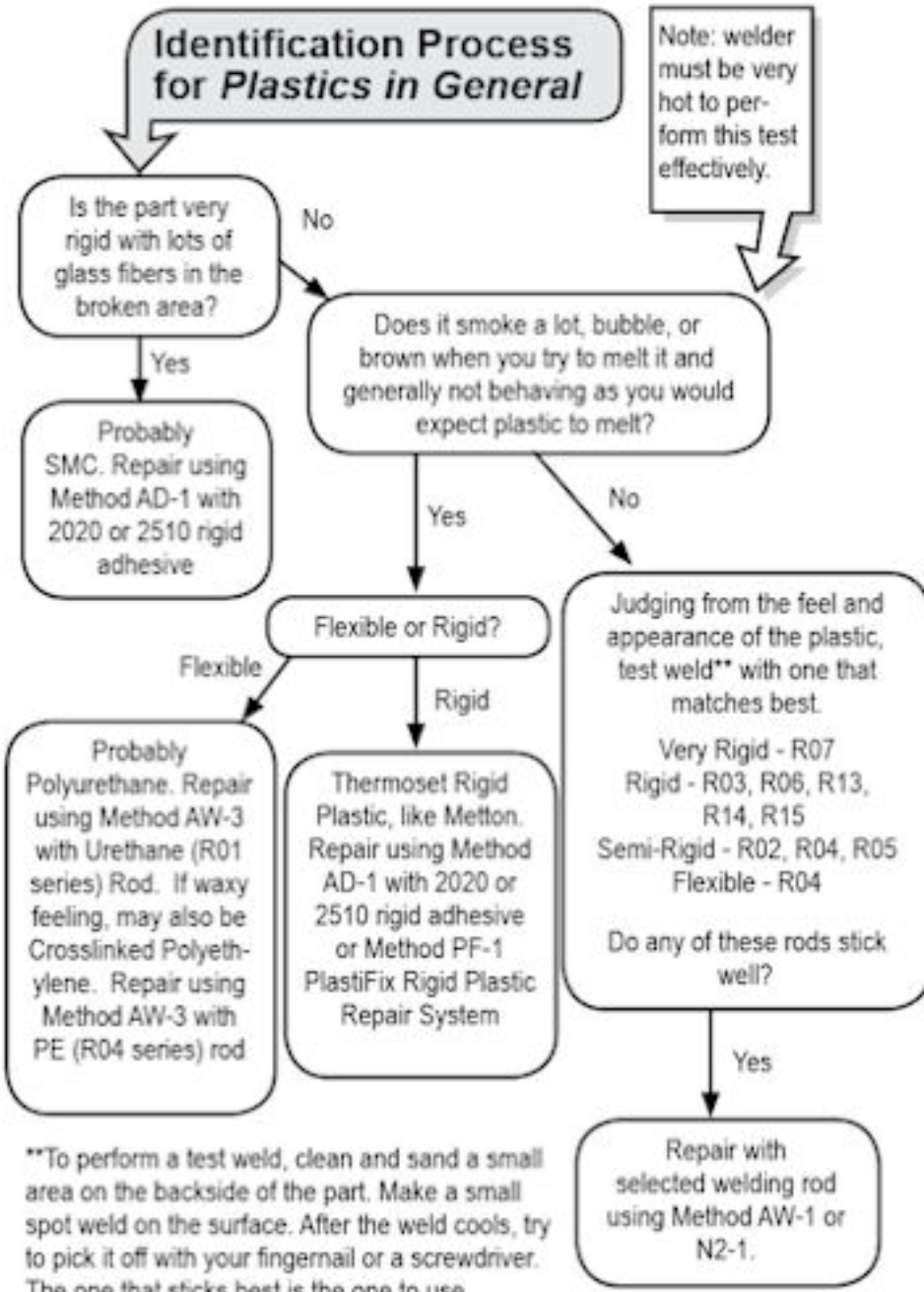


PS - polystyrene



Resins not mentioned above, or a combination of plastics.

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



# Plastic ID Symbols

Symbol	Material	Common Location	Notes
<b>AAS</b>	Acrylonitrile acrylic rubber styrene	Trim panels, side marker lamps, door, outside mirror	Avoid gas and solvents
<b>ABS</b>	Acrylonitrile butadiene styrene	Grille, garnish molding, speaker grill, vent louver, trim panel	Avoid gas and solvents
<b>ABS + PC</b>	Acrylonitrile butadiene styrene + polycarbonate	Instrument panels, Saturn door panels	Brand name is Pulse
<b>ABS + PVC</b>	ABS/Vinyl (soft)	Headrest skins, trim moldings, trim panels	
<b>AES</b>	Acrylonitrile ethylene styrene	Grille	Avoid gas and solvents
<b>A/MMA</b>	Acrylonitrile Methyl Methacrylate		
<b>A/S/A</b>	Acrylonitrile/Styrene/Acrylate		
<b>CA</b>	Cellulose Acetate		
<b>CAB</b>	Cellulose Acetate Butyrate		
<b>CAP</b>	Cellulose Acetate Propionate		
<b>CF</b>	Cellulose Formaldehyde		
<b>CMC</b>	Carboxynethyl Cellulose		
<b>CN</b>	Cellulose Nitrate		
<b>CS</b>	Casein		
<b>CP</b>	Cellulose Propionate		
<b>CPE</b>	Chlorinate Polyethylene		
<b>DCPD</b>	Dicyclopentadiene	Kenworth hoods, snowmobile hoods, combine doors	Brand name is Metton
<b>EC</b>	Ethyl Cellulose		
<b>EEBC</b>	Ether Ester Block Copolymer	Rocker cover moldings, fender extensions (91-96 Deville)	Brand name is Lomod
<b>EP</b>	Epoxy	Fender extensions, hoods, roofs, decklids, instruments housings	
<b>E/P</b>	Ethylene Propylene	Bumper covers, valance panels, fascias, air dams	
<b>EMA</b>	Ethylene Methacrylate Acid	1995-1999 Dodge Neon Bumper Covers	Brand name is Bexloy "W"
<b>EPDM</b>	Ethylene propylene rubber	Bumper impact strip	Gas and most solvents are harmless (wipe quickly)
<b>EVA</b>	Ethylene Vinyl Acetate	Headrest skins, crash pads, trim moldings, trim panels	
<b>FRP</b>	Fiber reinforced plastics	Headlamp cover	Gas and most solvents are harmless
<b>PA</b>	Polyamide (nylon)	Exterior finish panel, radiator tank	Gas and most solvents are harmless
<b>PA + PPE</b>	Polyamide + Polyphenylene Ether	Saturn fenders, exterior trim	Brand name is GTX
<b>PAE</b>	Polyarylether		
<b>PAR</b>	Polyaramid		

<b>PAS</b>	Polyarylsulfone		
<b>PB</b>	Polybutene		
<b>PBT</b>	Polybutylene terephthalate		
<b>PBTP + EEBC</b>	Polybutylene Terephthalate + Ether Ester Block Copolymer	Rocker cover moldings, fascias	Brand name is Bexloy "M"
<b>PC</b>	Polycarbonate	Instrument panel, lens, grille, bumper covers	Avoid gas and solvents
<b>PC + PBT</b>	Polycarbonate + Polybutylene Terephthalate	Bumper covers	Brand name is Xenoy
<b>PE</b>	Polyethylene	Fender skirt, interior trim, headliner, valance, spoiler, sill cover	Gas and most solvents are harmless
<b>PEI</b>	Polyetherimide	Foglight housing	
<b>PEOX</b>	Polyethylene Oxide		
<b>PESU</b>	Polyether Sulfone		
<b>PET</b>	Polyethylene Terephthalate + Polyester	Chrysler LH fenders	Brand name is Bexloy "K"
<b>PIB</b>	Polyisobutylene		
<b>PF</b>	Phenol Formaldehyde	Ashtrays	
<b>PMP</b>	Polymethylpentne		
<b>PMMA</b>	Polymethyle methacrylate	Lens	Avoid gas and solvents
<b>POB</b>	Poly-Poxybenzoate		
<b>POM</b>	Polyoxymethylene formaldehyde		Avoid battery acid
<b>PP</b>	Polypropylene	Instrument panel, interior trim, grille, center console, scuff plate, exterior trim, fender skirt, heater/evaporator case, bumper covers, coolant tank	Gas and most solvents are harmless
<b>PPC</b>	Polypropylene composite	Center console box	Gas and most solvents are harmless
<b>PPE</b>	Polyphenylene Ether	Chromed plastic pards, headlamp doors, ornaments, bezels	Avoid gas and solvents
<b>PPE + PA</b>	Polyphenylene Ether + Polyamide	Saturn fenders, exterior trim	Brand name is GTX
<b>PPO</b>	Polyphenylene oxide	Grille, headlamp, door, bezel, ornament (chrome)	Avoid gas and solvents
<b>PPYO</b>	Poly phenoxy polyarl oxide		
<b>PPOX</b>	Polypropylene oxide		
<b>PPS</b>	Polyphenylene Sulfide		
<b>PPSU</b>	Polyphenylene Solfone		
<b>PS</b>	Polystyrene	Dash panels, door panels	Avoid gas and solvents
<b>PTMTP</b>	Poly Tertramethylene Terephthalate		
<b>PTFE</b>	Polytetraflouroethylene	cookware	Brand name is Teflon
<b>PUR</b>	Thermoset Polyurethane	Bumper covers, dually fenders, fenders, filler panels	Gas and most solvents are

			harmless (wipe quickly)
<b>PSU</b>	Polysulfone		
<b>PVC</b>	Polyvinyl chloride	Headliner, interior trim, side protect molding, safety pad	Avoid gas and solvents
<b>RIM (RRIM)</b>	Reaction Injection Molding (Thermoset Urethane)	Bumper covers	
<b>SAN</b>	Styrene acrylonitrile	Instrument panel gauge lens	Avoid gas and solvents
<b>SMC</b>	Sheet molding compound (polyester)	Body parts, fenders, tailgates	Avoid gas and solvents
<b>TEEE</b>	Thermoplastic Ether Ester Elastomer	Bumper facias (Bonneville SSE, Park Ave.)	Brand name is Bexloy "V"
<b>TPE</b>	Thermoplastic Elastomer	Bumper covers, fender flares, mudguard	Gas and most solvents are harmless
<b>TPO</b>	Thermoplastic olefin	Bumper covers, fender flares, mudguard	Gas and most solvents are harmless. Now called TPE.
<b>TPR</b>	Thermoplastic rubber		
<b>TPU</b>	Thermoplastic urethane	Bumper covers, gravel deflector, soft filler panel	Avoid gas and solvents
<b>UP</b>	Unsaturated Polyester (fiberglass)	Fender extensions, hoods, roofs, decklids, instruments housings	

**IMPORTANT NOTE:** In order to maximize strength and adhesion of the repair, it is important to thoroughly clean all contamination from the surface in the damaged area.

Clean both sides with soap and water... or even better, use Scuff Magic. Dry off with a clean cloth or compressed air.

Spray on 1000 Super Clean Plastic Cleaner, let it soak in for a few seconds, then wipe off while wet with a clean, lint free cloth. Wipe in one direction to avoid spreading contaminants back over the clean area.

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 wet cloth.

Thermoset urethanes 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 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 profile to the part.

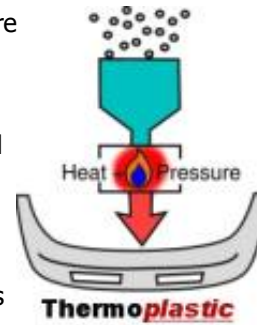


# Repairing with Fusion Welding

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.

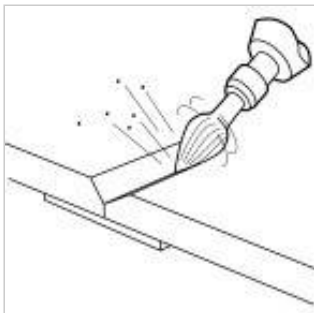
The most common thermoplastic automobile bumper material is TPO. TPO is fast becoming the most popular material for all sorts of interior and underhood plastics as well.



**IMPORTANT NOTE:** TPO has been **renamed** to TEO. If you have a part with the TEO symbol, repair it **exactly** the same way that you would repair a TPO part.

- TPO - **Thermo Plastic Olefin**
- TEO - **Thermo Elastic Olefin**

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. 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.
- V-groove halfway through the backside of the part with either the 6121-T Teardrop cutter bit or melt a v-groove in by turning the tip of the welder at an angle.
- Remove the paint in the area surrounding the v-groove and radius into the v-groove with coarse sandpaper.



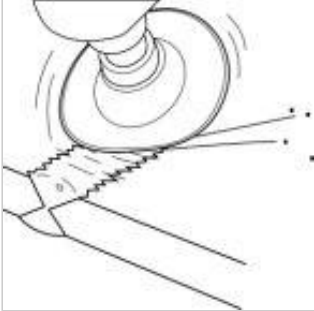
## Melt the Rod Together with the Base Material

- 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**

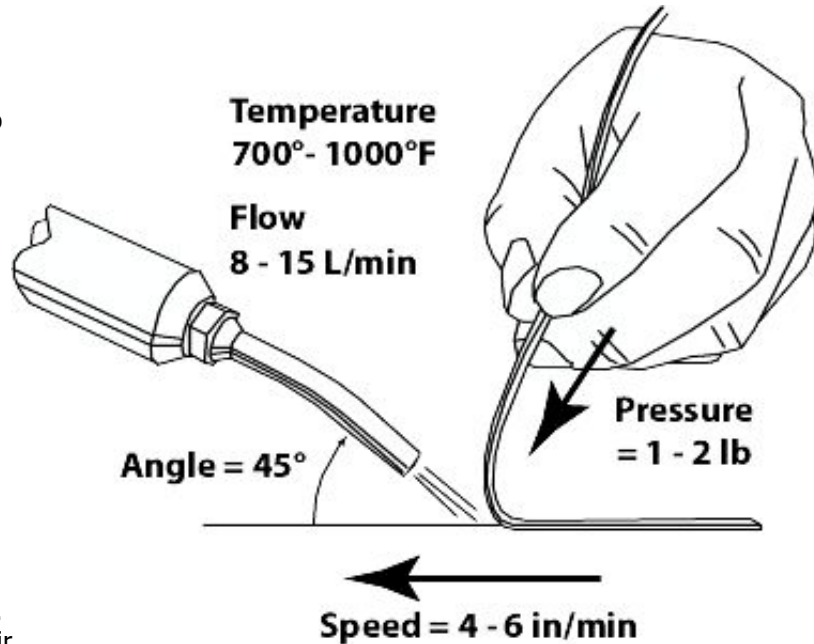
- If you need to refinish the plastic, grind weld to a smooth contour with coarse sandpaper. Grind the weld slightly flush so that filler can cover the welded area completely. Follow instructions for Step 4 for filler application.

# Nitrogen Plastic Welding

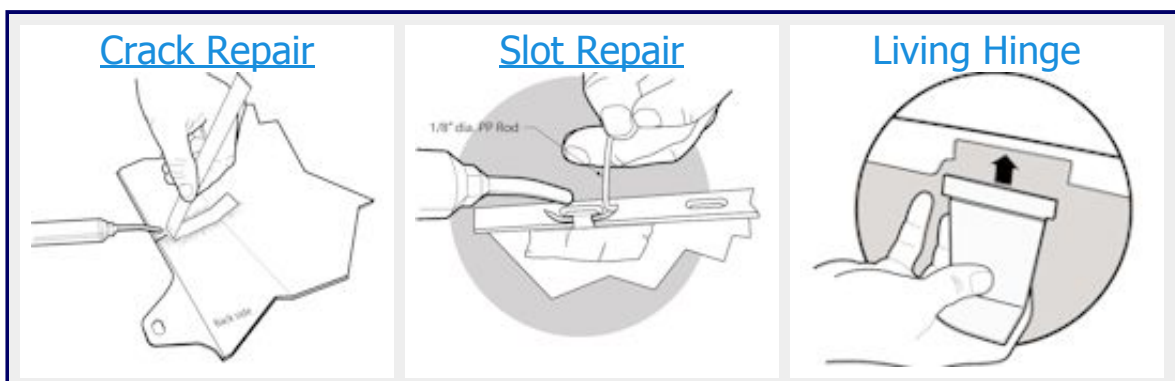
## Basic Nitrogen Plastic Welding Process

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 four important factors for plastic welding: "**T.F.P.A.S.**", an acronym for Temperature, Flow, Pressure, Angle, 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 (370° - 425°C).
- The **flow** should be set between 8 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 (10 to 15 cm) 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.



## Nitrogen Welding Tips



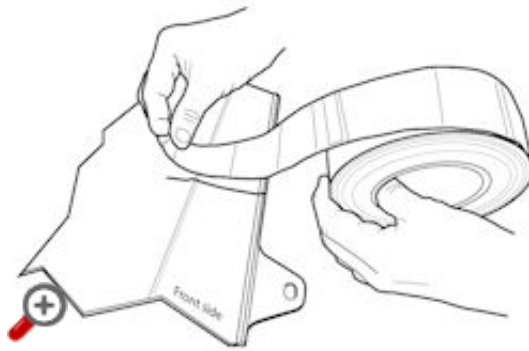
# Repairing a Cracked Bumper with the Nitrogen Plastic Welder

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.

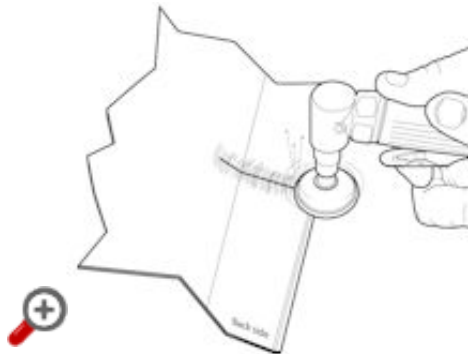
**Clean the bumper before you grind it.** Before you touch the bumper with sandpaper or a die grinder, make sure it's clean first. First, clean the entire bumper by washing with 1020 Scuff Magic soap using a red scuff pad to spread the soap and scuff the plastic. This will put small sanding scratches into the bumper to help further improve adhesion. Rinse the soap off and allow the bumper to dry. Once dry, clean the bumper with Urethane Supply 1000 Super Clean plastic cleaner or 1001 EcoClean. 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)

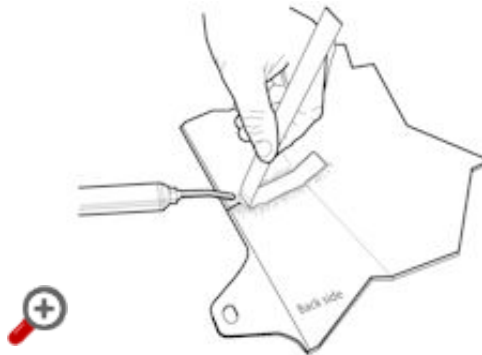
**surface.** Often the plastic has been stretched or distorted in the damaged area. Before you weld, get the crack aligned as closely as possible. If the plastic is dented or stretched, heat with a heat gun and push the plastic back into position referring to detailed instructions on Page 4. Once the plastic pieces are lined up, use Urethane Supply's 6481-1 or 6485 aluminium 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.

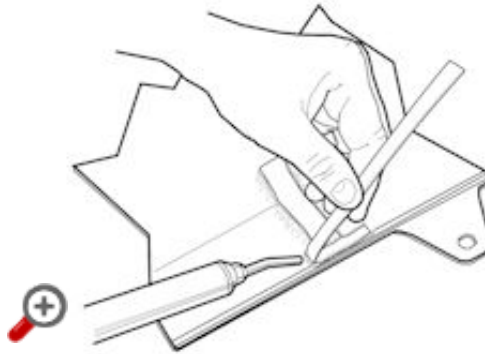


**Weld the backside of the crack.** For maximum strength, use the R02-05 wide ribbon on the backside. This wide ribbon spreads the load over a large area for maximum strength. To do the weld, start by preheating the end of the welding rod and the bumper at the end of the crack. The plastic will start 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 inches to 6 inches (10 cm to 15 cm) per minute.

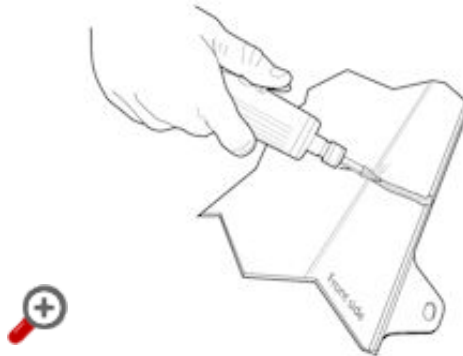


It is most important to melt both the rod and the bumper at the same time.

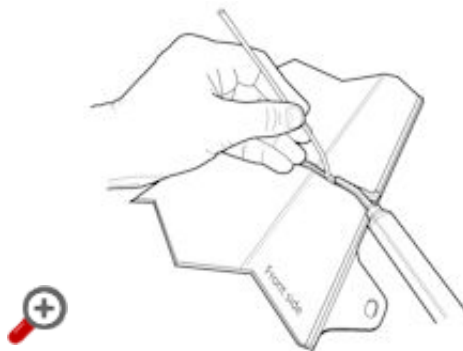
**Weld a "Tee".** Upon completing the weld down the crack, it is advisable to make another cross stitch weld at the end of the crack along the edge to reinforce the repair. Use the R02-04 ribbon for the edge reinforcement. Because the original extruded structure of the ribbon is not disrupted in the 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 R01-01 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.



**Finishing 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 more than likely you're going to need some filler to fill in the low spots.

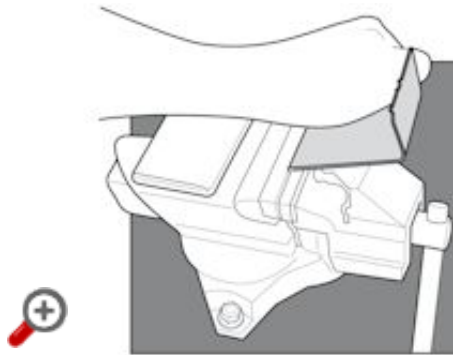
# Recreating a tab with a "living hinge"

Many times you'll see bumpers that have a flexible tab, usually at the bottom of the bumper. These tabs have a "living hinge", which is a thin line in the plastic where it naturally wants to flex. These living hinges are very weak and are easy to tear. You can't repair it at the hinge line because it won't be flexible there anymore. To do this, you need to recreate the tab using our polypropylene sheet using the following method.

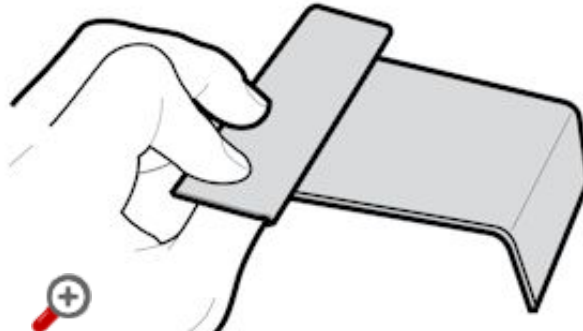
**Trace out the tab in the polypropylene sheet.** If you have the old tab, lay it down on the 5010 polypropylene sheet and trace the edges and any holes with a marker. Put a dotted line where the hinge line is supposed to be. Then create a notch back into the bumper about 1/2 inch (1.25 cm) deep and extend the tab about 1/2 inch (1.25 cm) on each side of the tab. Cut the tab out of the PP sheet with a jigsaw, and drill out the mounting hole.



**Create hinge line.** To create the hinge line, put the tab in a vise and fold it back and forth several times along the dotted line you drew on the tab. Take it out of the vise, then fold it over double a few times to make it more limber. This is flexible and much stronger than the original bumper's hinge. If there's a hook or fold in the tab, you can create it by folding it in the vise one time.



**Notch back the bumper.** Place the new tab in position on the bumper and mark the cut line on the bumper with a black marker. Cut out the notch with a jigsaw.



**Prep the bumper** by removing paint and applying sanding scratches the bumper on the backside.

**Tape the tab in position** using 6481-1 or 6485 aluminum tape on the outer surface.

**Weld the backside of the tab** using the R02-04 or R02-05 profile PP rod. Start by focusing the stream of hot nitrogen about 1/2 inch (1.25 cm) beyond the tab until the bumper turns glossy. Stab the rod down and start making your pass using the same technique as described earlier.



**Prep the outer surface** by grinding a shallow v-groove about 3/8" wide along the seam. Feather back paint and put down some sand scratches with 80 grit in a DA. Blow dust free.

**Weld the front side of the**

**bumper** with the R02-04 profile PP rod. Lay one strip down along the long seam, then weld each end and wrap the welding rod around the edge. If you have an airless welder, you can melt and burnish everything down and make it easier to sand flush.

**Let cool and finish the repair** by sanding smooth with 80 grit in a DA. Use filler if necessary to fill out any low spots, then sand with 180 and 320 grit to prepare for primer.



# Welding a Broken Bumper Slot

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 on which to weld. A perfect example is the slots on the edge of the bumper where the bumper snaps into the quarter panel, like on a Honda bumper. These often seem to break out when the bumper is removed. There's not enough surface area to make a good repair with either a two-part system or with the FiberFlex. Here's how you fix a torn-out bumper slot.

## **V-groove or taper the edges.**

Depending on the design of the flange, you can use the -01 profile round rod or the -07 profile narrow ribbon. The round rod needs to be used on bumpers where the flange is contoured around the slots. For straight flanges, like the one shown here, you can use the -07 ribbon since it doesn't have to curve. In either case, use a 6121-T or 6125 die grinder bit to grind a channel into the bumper at least 1/2 inch (1.3 cm) long on both sides of the broken slot. Taper the plastic down almost to a point at the broken-out area. Remove any paint in the immediate area with sandpaper

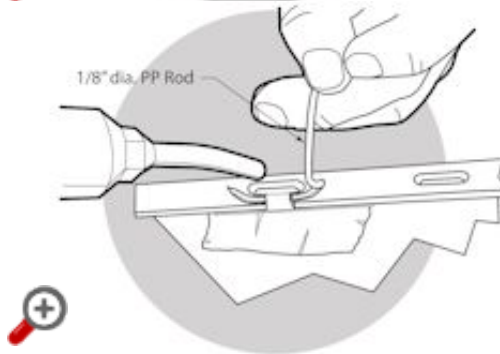


## **Apply tape to support rod during weld.**

Use the 6481-1 or 6485 aluminum body tape underneath the hole to support the melted plastic welding rod. You can also clamp a strip of sheet metal or wood along the edge if that works better.



**Weld across the gap.** Use the R02-01 1/8 inch (3 mm) diameter polypropylene welding rod. Starting on one side, preheat the bumper and the end of the welding rod at the start of the prepared v-groove. When both plastics are preheated, touch the end of the rod down to the bumper and apply downward pressure to fold the rod toward the torch. When you get to the gap, continue heating the rod just as if you were melting to the bumper. Continue at the same pace, spanning across the gap and picking up the process on the other side. Continue welding until you reach the end of the prepared v-groove, at which point focus the hot nitrogen on the rod and twist the rod to break it.



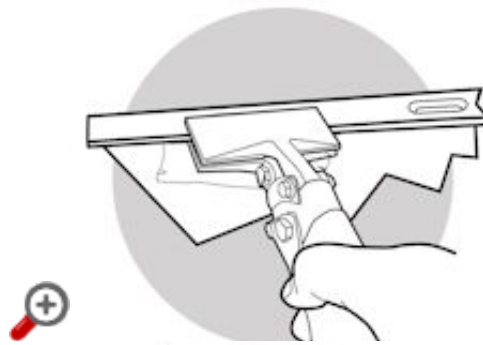
## **Heat until rod turns clear then**

### **compress with a hand seamer.**

If you're using our white polypropylene rod, you can see that it turns clear when it gets to the proper melting temperature. Heat up the ribbon you just laid down with the nitrogen welder until it all turns clear. (If you're using the black rod, heat it until it



all turns glossy black). Immediately use the 6145 hand seamer to gently press the melted ribbon down into the plastic. This also aligns the repaired section with the rest of the bumper. If necessary, weld another pass to build up the plastic's thickness.



**Restore slot dimensions.** Let the weld cool and remove the tape or metal support. Restore the original slot dimensions using either a rotary tool with a 6120 or 6123 straight burr, an airless plastic welder, or a utility knife. This is easier to do when using the white rod as you can see the underlying plastic's original profile.



**Weld opposite side.** For maximum strength, repeat the welding process on the opposite side. Usually the tape or metal support is not needed, but it can make the process easier. After welding, press the repaired area flat and straight again using the hand seamer.

**Restore slot dimensions and finish repair.** After letting the weld cool, restore the final dimensions of the slot and bumper edge using a rotary tool, airless welder, or knife. Finish sand the outer surface with 180 then 320 grit paper to prepare it for paint.

# Repairing with FiberFlex Universal Rod



[Click here to watch video of Bumper Repair with FiberFlex](#)

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.

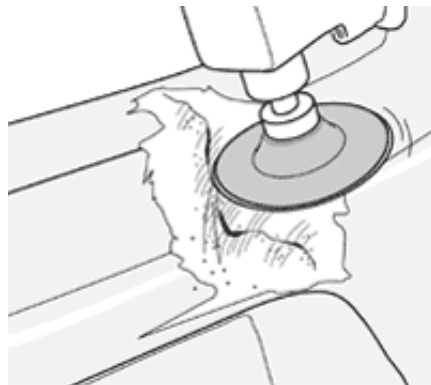
When you do a repair with the FiberFlex, you will actually be using the heat of the welder to apply an adhesive. FiberFlex has a very strong bond and is reinforced with carbon and glass fibers for outstanding strength.

FiberFlex is a very popular way to repair TPOs (a.k.a. TEO, PP/EPDM), the most common automotive bumper material. The reason is that there are no two TPOs that are exactly alike. As a result, our R05 series TPO 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 the FiberFlex.

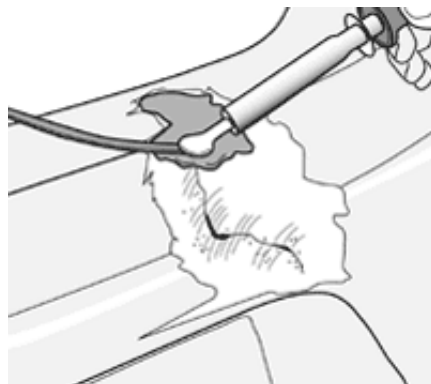
## V-groove Damaged Area

- Line up the outer surface of the tear with 6481 Aluminum Body Tape or with clamps.
- 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 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.



## Apply FiberFlex

- With the airless plastic welder set to the highest temperature setting, use the 6031 Pointy Tip to melt the R10 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.



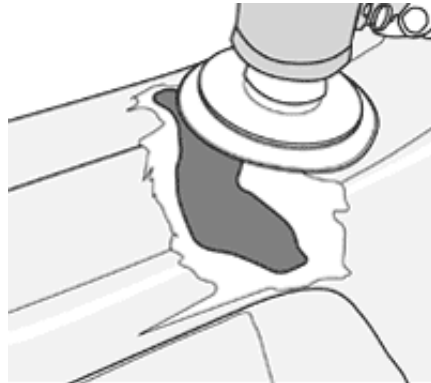
Do not attempt to melt the base material together with the FiberFlex. Repairing with Fiber-Flex is similar to a brazing process.

## V-Groove and Weld Opposite Side

- After the FiberFlex cools on the backside (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.

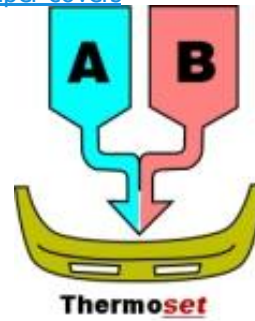


# Repairing thermoset plastics



[Click here to watch a video on how to create missing tabs on urethane bumper covers](#)

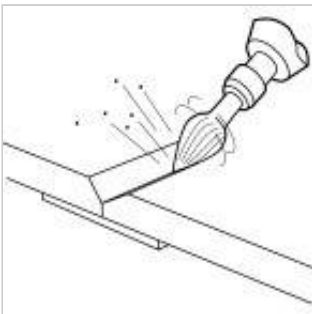
Automotive urethane, or PUR, is a **thermoset** material. Similar to what happens when you mix body filler and cream hardener, it is formed when two liquid chemicals come together in the mold to form a solid. The point of telling you this is to say that you cannot melt urethane bumpers with the welder. 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.

[Click here](#) to see what I am talking about.



## V-Groove Damaged Area

- Line up the outer surface of the tear with Aluminum Body Tape or with clamps.
- 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 thermoset urethane 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.



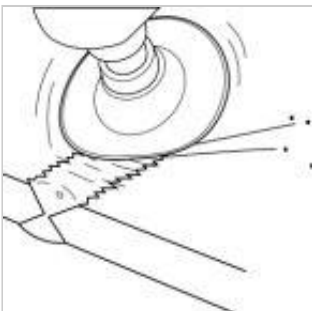
## Melt Rod into the V-Groove

- Set the temperature setting of your airless plastic welder to the urethane rod setting. Using the R01 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 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 weld. Don't overheat the base material.

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.



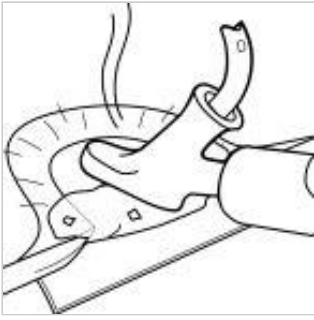
## Grind Weld to Smooth Contour

- 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 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.

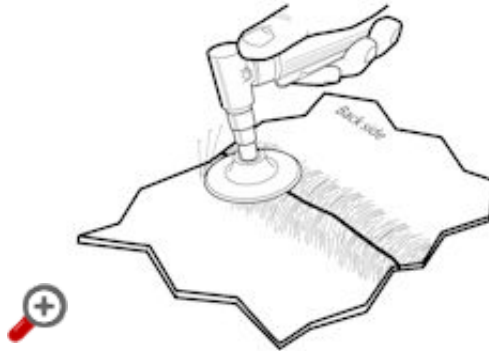


- Use 6481 Aluminum Body Tape to create a bridge across the torn mounting hole. Melt R01 polyurethane welding rod into the area. Drill out hole when finished.

# Repairing Plastics with Two-Part Adhesives

Clean both sides of the plastic in the damaged area with 1000 Super Clean or 1001-4 EcoClean 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.



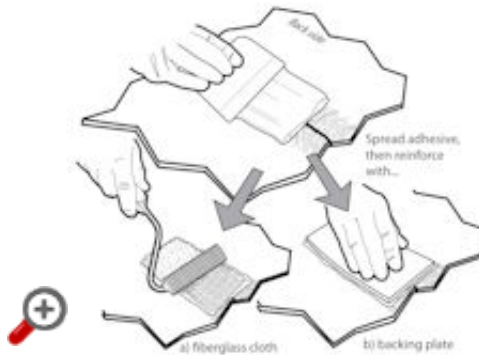
If the material is TEO, TPO or PP, apply 1060FP Filler Prep or 1050 Plastic Magic Adhesion Promoter. Brush or spray onto the sanded area and allow to flash off.

Choose a two-part adhesive system to match the hardness of the substrate according to the following table:

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

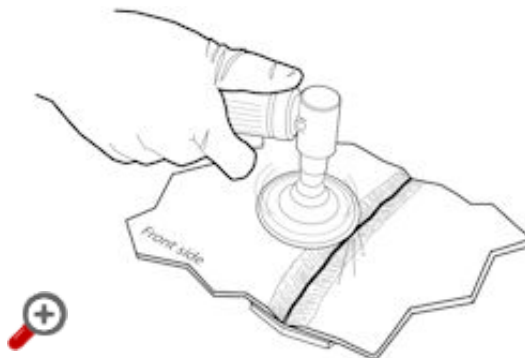
Select a reinforcing method for the backside of the part. For flat areas, it is often easiest to cut a backing plate out of scrap material. For contoured areas, use fiberglass cloth or drywall tape.

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.

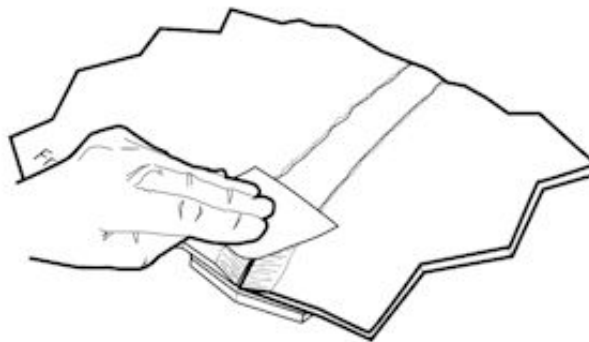
Once the adhesive on the backside is cured, peel the aluminum tape off the front and grind a v-groove about 1"-2" wide with a die grinder and/or a coarse sanding disc. Sandscratch the inside of the v-groove coarsely. Round off any sharp edges and feather the paint back with 80 grit in a DA.



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.



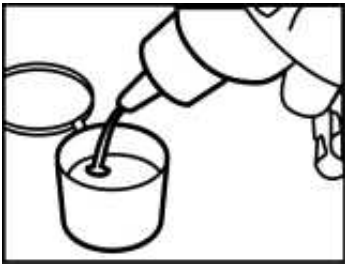
# Repairing Plastics with PlastiFix

## Rigid Plastic Repair Kit

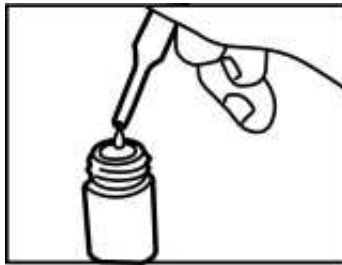
The PlastiFix Rigid Plastic Repair Kit is a revolutionary plastic repair system that allows you to repair cracks, fill gaps, rebuild tabs, and fix stripped threads. The most unique feature of the PlastiFix Rigid Plastic Repair Kit is the FlexMold flexible molding bar. The FlexMold bar allows you to replace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



### Getting Ready



Dispense powder into cup

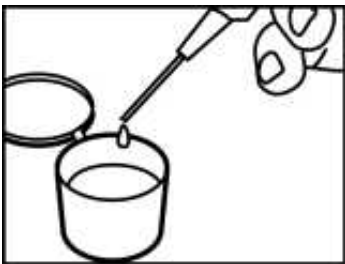


Use pipete to dispense liquid into the dropper bottle.

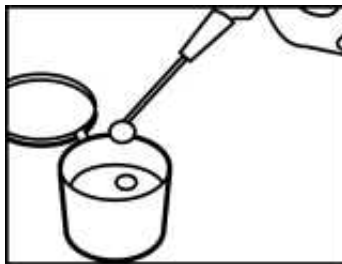


Insert dropper tip into bottle and place applicator needle onto dropper tip.

### Application

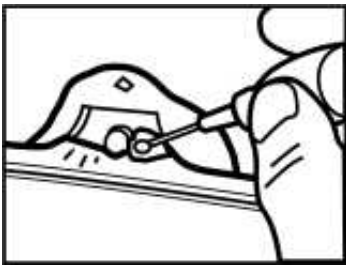


Squeeze one drop of liquid into powder.



Pick up liquid/powder mix with tip of needle.



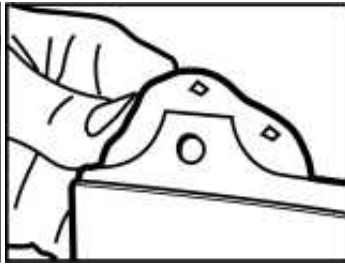


Squeeze bottle to apply liquid/powder mix to repair area.

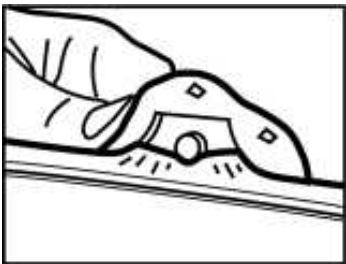
## FlexMold Molding Bar Use



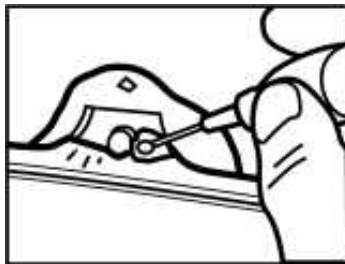
Place FlexMold bar in very hot water until softens.



Shape FlexMold bar over pattern. Caution! Very Hot!

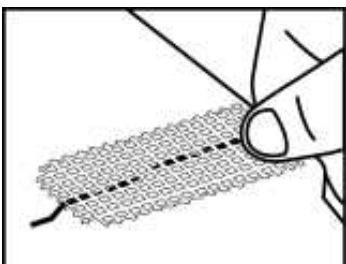


When FlexMold bar cools position in repair area

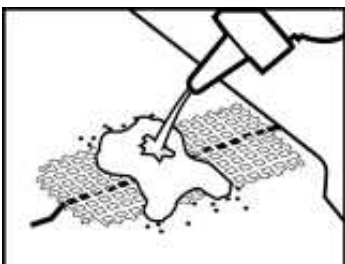


Fill mold with PlastiFix powder/liquid mix, allow to cure, remove mold

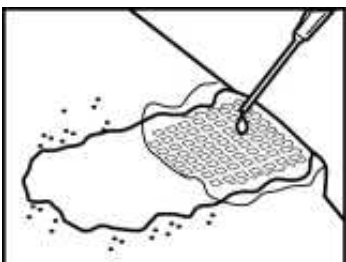
## Reinforcing



Cut fiberglass cloth to cover damage on backside.



Cover fiberglass cloth with thin layer to PlastiFix powder.



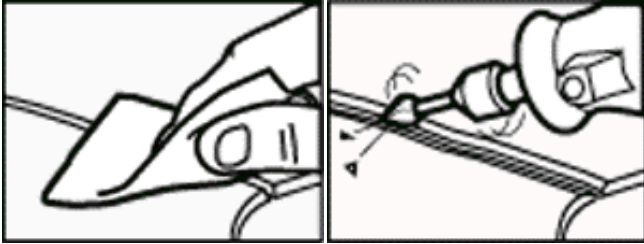
Saturate powder with



Cover with plastic sheet,

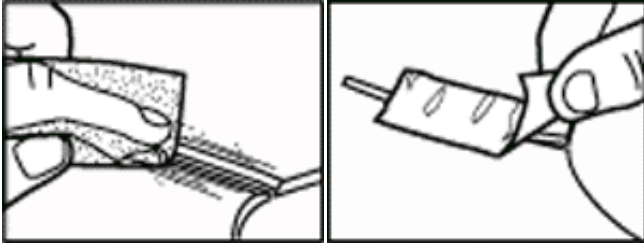
PlastiFix liquid. press to shape, allow to cure.

## Repairing a crack with PlastiFix



Sand away the paint surrounding the crack

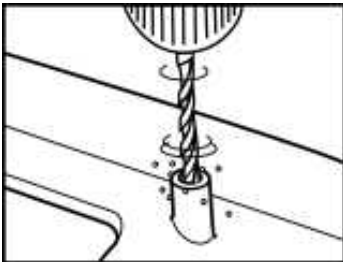
V-groove along the crack line using a Dremel tools



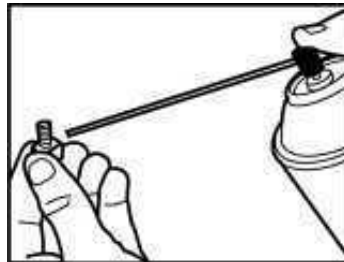
Smooth out sharp angles with sandpaper

Apply aluminum tape to the backside to prevent PlastiFix from flowing out.

## Repairing Stripped 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.

# Retexturing Plastic



[Click here](#) to see a video of this procedure.

## Step 1

This fender flare had a gouge that was repaired. In the process of repairing, the texture was sanded away. Microtex will create a texture that closely resembles the original texture.



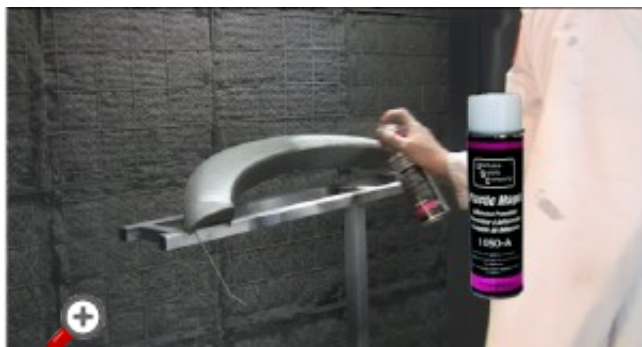
## Step 2

Here is a close-up of the repair area. You can better see that the texture has been sanded away.



## Step 3

Since this fender flare is TPO, an adhesion promoter must be applied before Microtex is applied. Clean the plastic with Super Clean plastic cleaner then apply Plastic Magic adhesion promoter and allow time for the adhesion promoter to dry.



## Step 4

Stir 2% by weight of 3104 catalyst into the desired amount of Microtex. Using a 1.3mm HVLP gun, apply 2 to 3 light coats as needed to achieve the desired texture allowing the paint to flash between coats. Allow 2 hours to dry.



## Step 5

Using a scuff pad, lightly scuff the texture to remove any high spots.



## Step 5

Hold up the Bumper and Cladding Coat Color Chart against an unfaded portion of the part. (On this part, the backside did not show any signs of fading.) Find the color that best matches the original.



## Step 6

Apply Bumper and Cladding Coat. A light coat is all that is needed. You only need to apply enough for hide. Applying too much will fill in the texture.



## Step 7

The fender flare looks new again.



Here is a close-up of the original texture and the sprayed-on texture.





# How to Apply PermaShine



[Click here](#) to see the video of this process.

This Jeep Grand Cherokee's bumper and cladding are faded and chalky. It is in desperate need of PermaShine.



You want to remove anything that will prevent PermaShine from sticking. Clean the plastic with soap and water. To remove contamination that cannot be removed with soap and water, use Super Clean Plastic Cleaner. This will remove tar, sap, bugs, etc.



Mask off any areas where you don't want to apply PermaShine.



Pour PermaShine into a paint tray and use a foam roller to apply PermaShine to large flat areas. If you get any bubbles in the PermaShine, roll over the bubbles until they disappear. You may need several rollers as PermaShine may cause swelling of the foam.



Use a foam brush to apply PermaShine into tight spaces and grooves. If you get any bubbles, roll over them with the roller until they disappear. You may need several

foam brushes as PermaShine may cause swelling of the foam.

After the PermaShine dries, remove the masking tape and you are finished.



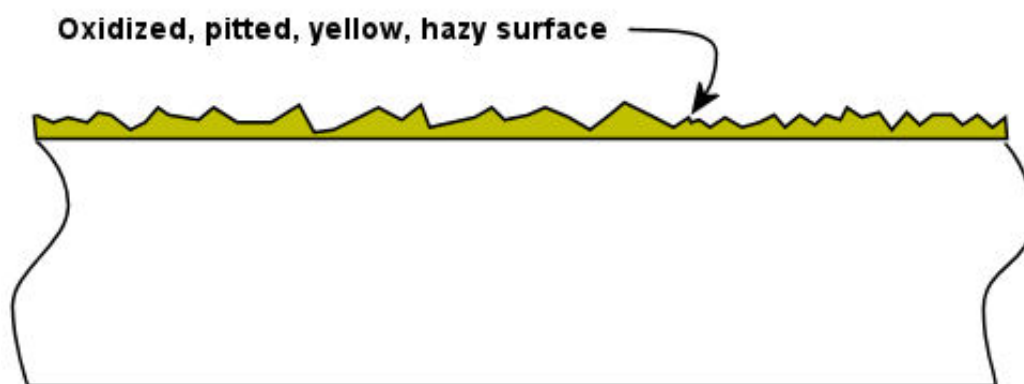
# Headlight Magic Headlight Restoration Kit



Headlight Magic allows anyone to restore foggy, hazy, yellow headlights to like-new condition. The best part is that anyone can do it in about 20 minutes.

## Why do headlights turn yellow and foggy?

Over time, your headlights are exposed to the sun's rays, flying debris, bug guts, salt... you name it. Your headlights become scratched, pitted, and oxidized. The great part is that it is only on the surface and is easy to remove.





## How do you restore the headlights?

Restoring headlights is not rocket science. All you have to do is remove the yellow, foggy, crusty surface. **You could even restore your headlights without buying Headlight Magic** Headlight Restoration Kit. All you need is several grades of sandpaper and some polishing compound.

Sure, you could go to the hardware store and buy all the different grades of sandpaper that you need. You could also go to the auto parts store and buy some polishing compound. But you need to **ask yourself...** "What is my time worth?" Compare the following scenario and decide which you would rather do.

Buy Materials at Your Local Hardware Store	Buy Headlight Magic Headlight Restoration Kit Online
<ul style="list-style-type: none"><li>• Waste Gas driving to the hardware store <b>(expensive)</b></li><li>• Get stuck in traffic <b>(frustrating)</b></li><li>• Buy large packages of each grade of sandpaper that you need. Way more sandpaper than you need for the job. Add sales tax too! <b>(expensive)</b></li><li>• Drive to another hardware store because the first hardware store didn't have all the grades that you need. <b>(time consuming, frustrating, and expensive)</b></li><li>• Drive to the auto parts store to get way more polishing compound than you will need for the job. <b>(time consuming and expensive)</b></li><li>• Attempt to restore headlight not knowing for sure if you bought exactly what is needed to do the job right. <b>(paranoia)</b></li></ul>	<ul style="list-style-type: none"><li>• Click "Add to Cart" Button <b>(quick)</b></li><li>• Enter credit card and shipping information <b>(easy)</b></li><li>• Have Headlight Magic headlight restoration kit delivered to your home in just a few days. <b>(ahhh!)</b></li><li>• Restore headlight knowing that you have every thing that you need to do the job right <b>(peace of mind)</b></li></ul>

## Is it easy to restore headlights?

Yes. Just watch the following two videos to see how easy it is to restore your headlights in about 20 minutes.

Video 1

Video 2

