# Diamond Clear™

# WINDSHIELD REPAIR

## INSTRUCTION MANUAL

*Glass Repair for the 21st Century*

# CONTENTS



## NOTICE TO PURCHASER

Glass Technology quality equipment and materials are guaranteed to be free of defects in materials and workmanship for six months (180 days) from date of purchase, except for the Eliminator and VP-5000 machines, which are guaranteed for one full year (Eliminator and VP-5000 batteries are guaranteed for six months). The vacuum-pressure pumps of the VP-5000 and the Eliminator machines are guaranteed for ten (10) years. If equipment malfunction or defect occurs during the warranty period, Glass Technology shall have the option of repairing or replacing any part(s) which, in the judgment of Glass Technology, were originally defective or became so under conditions of normal usage and service, provided item(s) are returned immediately to factory. In no event shall Glass Technology be liable for any incidental or consequential damages, whether foreseeable or not, including, but not limited to, property damage, lost business, loss of profits, or inconvenience arising out of the use or inability to use this equipment. **Do not rely on this or any other manual as your sole means of windshield repair instruction.**

CAUTION: **Use of non-Glass Technology products may void your warranty.**

# SECTION I
# INTRODUCTION:
# BEGINNING A REPAIR

# WARNING
## Special Precautions When Using UV Resin

**Diamond Clear Resins have been specially formulated to work with Glass Technology windshield repair systems. Use of inferior resins may affect the effectiveness of the system and quality of your repairs.**

### Respiratory Protection

Positive fresh air exhaust should be provided in work area if working indoors.

### Eye Protection

Do not wear contact lenses. Safety glasses or goggles are recommended. If eye contact occurs, wash with large quantities of water for several minutes. Get immediate medical attention.

### Skin Protection

Prolonged skin contact with UV Resin can cause allergic reaction to one's hands. Although you may never develop sensitivity to UV Resin, we recommend taking the following precautionary measures:

Avoid direct contact with skin – if contact occurs, wash immediately with soap and water. Do not use solvents to clean hands as these may act as a carrier for chemical absorption.

**Avoid contact with painted surfaces.**

# INTRODUCTION

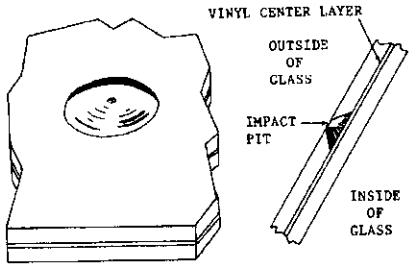
Your Glass Technology System is designed to repair stone-damaged windshields and avoid the high cost of replacement. The system is a result of years of research and development to produce a permanent, high-quality repair quickly and inexpensively. The process is intended only for repairs on dual-plate, laminated, safety-glass windshields, not single-sheet glass. Most windshield stone damages can be repaired and considerably improved in appearance. A good repair job will leave only a small dot on the outside surface of the glass, practically unnoticeable.

This manual should be read thoroughly before starting a repair. Become familiar with its contents and use it often as a reference. Each repair is a little different from the others. This manual will explain the simple steps necessary to repair damaged glass; however, there is no substitute for practice and on the job experience.

# UNDERSTANDING WINDSHIELD BREAKS

To perform quality repairs you must first understand the break. Laminated windshield glass is made up of three pieces – a thin sheet of vinyl sandwiched between two pieces of glass. When the outer layer of the glass is broken, the air space in the break creates a dark, distorted appearance. By using the Glass Technology System you can replace all the air space with synthetic glass (Diamond Clear resin). The Diamond Clear resin is optically matched to the glass, thus making the break nearly invisible.

Diamond Clear resins have been specially formulated to work with Glass Technology windshield repair systems. Using inferior resins can reduce the effectiveness of the system and the quality of the repair.




**Outside and cross section of a typical bullseye break**

# THE FOUR BASIC TYPES OF BREAKS

The following are typical breaks you will be working with:

Bullseye breaks are on the outside layer of glass that extends to the vinyl center layer. This type of break is shaped like a cone, with its tip at the outside surface of the windshield and its base at the vinyl layer. Occasionally there are small radial cracks, ¼" or less, in these breaks.

**Bullseye Break**

Partial Bullseye breaks are generally no larger than ½" and have a very small pit at the impact point.

**Partial bullseye break**

Star breaks have two or more radial cracks extending from a central impact pit.

**Star Break**

Combination breaks are a combination of both a bullseye break and a star break, with radial cracks extending out of the bullseye.

**Combination break**

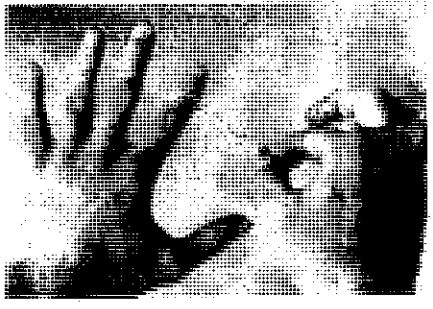
These four types of breaks are usually on the outside layer of the glass. Long cracks will be discussed later in the manual.

## WINDSHIELD REPAIR PRACTICE TOOL

This tool will make bullseye and combination breaks in the laminated windshield glass. To be used for practice or demonstrating windshield repairs on scrap glass. **Instructions:** Use on a scrap piece of laminated windshield glass or laminated plate glass. Slip tool over two fingers as shown. Hold this hand against glass over the area you wish the break to be made. Raise steel ball approximately 2" and release. You may have to raise ball more than once to achieve desired break.

A star break is created using a spring-loaded center punch.

CAUTION: **Always wear eye protection when using this tool.**



**Windshield Repair Practice Tool**

# Diamond Clear™ Resins

The quality of your resin can make the difference between quality repairs, happy customers and long-term profitability, instead of poor repairs, dissatisfied customers, and a poor business reputation.

To enhance your performance as a Glass Technology windshield repair technician, we have developed several resins to meet the varying needs in the windshield repair business.

## RECOMMENDED DIAMOND CLEAR RESIN USES

**Diamond Clear LV**

This is a low-viscosity resin designed for star breaks. It can also be used in the winter for all breaks when colder temperatures can slow repair times.

**Diamond Clear PLUS LV**

This is a low-viscosity resin as well as an acrylic acid free resin with perfect refractive index match for glass. This Diamond Clear Plus resin is designed for star breaks. It can also be used in the winter for all breaks when colder temperatures can slow repair times. It is also stronger and more weather resistant.

**Diamond Clear MV**

This is a medium-viscosity resin used with bullseye and combination breaks. Good for all repairs in warm weather.

**Diamond Clear PLUS MV**

This is a medium to low viscosity resin as well as an acrylic acid free resin. It is stronger, more weather resistant, and it has an enhanced refractive index. It is used with bullseye and combination breaks.

**Diamond Clear PLUS HV**

This high-viscosity resin is designed for use in hot weather, especially in bullseye and combination breaks. It also conceals vinyl damage caused by severe impacts. However, do **NOT** use Diamond Clear Plus HV when radial cracks exceed ¾". In such cases, use Diamond Clear MV resin.

**Diamond Clear PLUS CR**

This special crack repair resin is a medium to low viscosity resin as well as an acrylic acid free resin with dynamic holding power and high tensile strength. It is designed for use in longer cracks and it possesses an excellent refractive index. It can also be used on stars with long cracks.

**Diamond Clear PF**

The Diamond Clear pit filler is used to finish all repairs. This product completely seals off the repaired area from the elements, such as rain, snow, sun, etc. This resin also restores the pit area to a high luster. It is available in a high viscosity (which can be helpful in filling large pits), and in a medium viscosity.

# SECTION II

## PERFORMING REPAIRS WITH:
# THE ELIMINATOR

## BASIC EQUIPMENT

Your equipment is designed to perform high-quality repairs and minimize repair time. See illustration below to familiarize your self with the individual components in your kit.

**The Eliminator Windshield Repair System**

*NOTE:* The equipment displayed here may not exactly match the equipment you received in your kit. If you have purchased your equipment through one of our distributors, or if you have purchased a specially priced system, some items may have been deleted from your kit. Contact your distributor or Glass Technology representative for clarification regarding your kit's inclusions.

1. 12-volt auxiliary power cord
2. Sun shade
3. Air hose
4. 12-volt drill
5. UV lamp
6. Magnifying mirror
7. High-pressure injector
8. Standard injector
9. Filter
10. Bridge
11. Battery charger
12. Crack jack
13. Suction cup lube
14. Pen light
15. Pit probe
16. Bullseye making tool
17. Pit gloss
18. Large pit adaptor
19. Pit polishing wheel
20. Razor blades
21. Drill bits
22. Pit tape
23. Diamond Clear pit filler
24. Diamond Clear UV resin
25. Fuses
26. Spare "O" rings (seals)

## POWER CUT-OFF SWITCH

As with **any** computer, from time to time you may experience a lock-up or abnormal reaction. In the event that you do experience this, simply turn off the reset switch located on the back of your Eliminator. After approximately five (5) seconds, you can turn the reset switch back to the on position. You should now be ready to resume using your Eliminator. NOTE: **Keep the switch <u>OFF</u> when machine is not in use.**

***Go to Section VI, page 16, <u>Repairing a Break</u> for equipment setup instructions.**

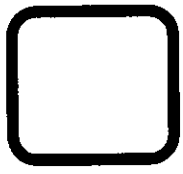
## OPERATING THE ELIMINATOR

The purpose of the Eliminator machine is to perform the various alternating vacuum and pressure cycles automatically, which will free up the operator's time and/or make the repair process very easy for an unskilled operator.

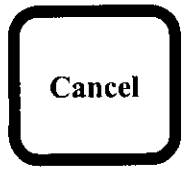
If you wish to use the machine's automatic programs, first make sure the power cut-off switch (located on the back of the machine) is on, then simply turn the machine on by pressing the on/off button as described below.

If you wish to operate the machine manually, skip to "Manual Operation" section.


Press once; machine turns on and displays battery condition for four (4) seconds, then display asks you to select program.



This is the timer. To use, de- press the button until the desired time appears, then release the button. It works in 1-minute intervals, up to 10 minutes.



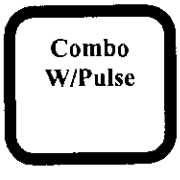

Press once to cancel any program's operation. Press twice to pause during any program operation; press to resume program operation.


Bullseye 1 program is for less complicated bullseye breaks that can be done in less time.


Bullseye 2 program is designed for larger, more complicated breaks.


Bullseye w/ pulse is for more complicated breaks that may have stubborn trapped air pockets that cannot be evacuated with the standard alternating pressure & vacuum cycles.


Combo 1 is for less complicated combination breaks that require less repair time than larger, more difficult breaks. Combo 2 is for more difficult breaks.


This program is for more complicated breaks that may have stubborn trapped air pockets that cannot be evacuated with the standard alternating pressure & vacuum cycles.


Star 1 is for star breaks that are more less complex and open in nature and require less time for resin penetration than very tight breaks.

**Star 2**

This program is designed for star breaks requiring more penetration time to completely fill with resin.

**Pulse Only**

Press once: This program is to remove stubborn trapped air pockets if they are remaining after automated programs are finished. The pulse program rapidly alternates vacuum and pressure, creating a bouncing effect to dislodge remaining trapped air.

**Up**

**Drill Speed**

**Down**

Drill Speed is regulated by this up (faster) and down (slower) button. The drill speed setting defaults to the previously used setting.

**Vacuum**

**Pressure**

When the vacuum button is pressed, the pump will run for 4 seconds and shut off. It is then holding vacuum.

When the pressure button is pressed the machine switches to the pressure cycle.

To achieve desired pressure hold button down until this is reached and release.

To "bump up" pressure, press and hold until desired pressure is reached.

If you are using one of the automatic programs, bypass the following "Manual Operation" section and continue with "after break is completely filled" in Section VII (page 20).

After any of the above programs are completed, "Finished" will be displayed for five (5) seconds, after which "select program" will display for 15 minutes, followed by the machine automatically turning off. It is advisable to turn off the machine when finished to avoid excess battery drain.

When the break is completely filled, turn the machine off and disconnect the hose from the filter, taking care not to push down too hard. Loosen the two adjusting screws and remove the bridge and injector assembly from the windshield. The suction cup can be released by lifting the edges and breaking the seal (occasionally you will need to slide something thin under the suction cup to release the vacuum).

**Do not allow resin from the injector to run into the filter.**

Go to Section VII (page 20) for information on finishing the repair.

## MANUAL OPERATION

Your Eliminator machine has the capability of bypassing the automatic programs and operating manually. The purpose of this feature is to allow the operator to control the repair process with more detail by manually operating the vacuum and pressure cycles with the touch of their corresponding buttons. The vacuum cycle is used to draw the air out of a break, and the pressure cycle is used to force the resin into the break.

To operate manually simply press the **ON** button and wait for "select program" to display. By pressing the vacuum or pressure button the machine is ready to be operated manually. However, always begin the repair with vacuum cycle to evacuate as much air as possible initially. Therefore, press the vacuum button, the machine will run for four (4) seconds then stop
to achieve maximum vacuum. Allow one to two minutes on the vacuum cycle, or until no more air is seen flowing toward and out of the pit area.

Switch to pressure by holding down pressure button until desired pressure is displayed (usually 25 to 30 psi to begin with). If the pressure goes to high, before releasing the pressure button, press vacuum to bleed air, then go back to the pressure button to desired pressure. If you should need to exceed 40 psi, make sure you are using the "High Pressure" injector (the injector with the small "O" ring), which allows you to reach 60 psi without resin leaking out between the injector seal and the windshield. The standard injector has a maximum pressure of 40 psi.

If you wish to exceed these maximum limits, simply apply sight pressure to the injector by placing your hand on the injector and pushing downward against the windshield. Never exceed 65 psi. Remember that too much pressure too quickly can cause further extension of cracks. Leave pressure on until resin has completely filled the break, including the tips of any cracks (10 to 15 minutes). **BE PATIENT.** With many breaks (such as bullseye and combination breaks trapped air bubbles will prevent the break form completely filling. (Air bubbles sometimes appear to be black specks.) If this is the case, switch back to the vacuum cycle. The air bubbles will be pulled back through the resin and removed. Allow enough time for this step (one to three minutes), as air bubbles are sometimes slow moving.

After the air has been removed, switch back to the pressure cycle. This process should be repeated as often as needed until the damage has been completely filled.

CAUTION: **ALWAYS end the repair on the PRESSURE cycle. When a break contains radial cracks (such as a star break), make sure the outer tips are filled. Some breaks require more patience than others. For curing a repair and finishing, refer to Section V.**

NOTE: When pressure is 60 psi (40 psi with standard injector), or more, you may have to hold down the injector with slight hand pressure. Also, if it appears that, after several minutes in the pressure position, the resin is not flowing into the break, be sure the machine is on the vacuum cycle and carefully slide bridge assembly away. Again drill or probe pit until you have opened the vein, then repeat above steps after putting bridge assembly back in place.

With the hose connected to the injector/filter assembly, move the toggle switch on the Maxim to vacuum, and hold it there for about five (5) seconds, or until the gauge reaches maximum vacuum. Then release the vacuum toggle switch. The needle on the gauge should stay at about 20 to 30 in. Hg depending on elevation. Allow one to two minutes on the vacuum cycle, and then move the toggle switch to pressure. Hold the switch on pressure until you reach the desired pressure (usually 30 psi to begin with), and then return the switch to the center (off) position. If the pressure goes too high, bleed the excess off by switching to vacuum until the pressure drops back to the desired level.

If you are using the standard injector, apply pressure to the injector by placing your hand on the injector and pushing down slightly. If you are using the high-pressure injector, you do not need to apply hand pressure until you reach about 60 psi (The high pressure injector will be used in about 80 percent of all repairs.) Remember that too much pressure can cause further extension of cracks.

CAUTION: **Never exceed 65 psi.**

Leave the pressure on until resin has completely filled the break, including the tips of any cracks (usually 5 to 10 minutes). **BE PATIENT.**

With many breaks (such as bullseye and combination breaks) trapped air bubbles will prevent the break from completely filling. (Air bubbles sometimes appear as black specks.) If this is the case, switch back to the vacuum cycle. The air bubbles will be pulled back through the resin and removed. Allow enough time for this step (one to three minutes) as air bubbles are sometimes slow moving. After air has been removed, switch back to the pressure cycle. This process should be repeated as often as needed until the damage has been completely filled. (A typical repair may take two to five different pressure to vacuum cycles.)

**Always end the repair on the pressure cycle.**

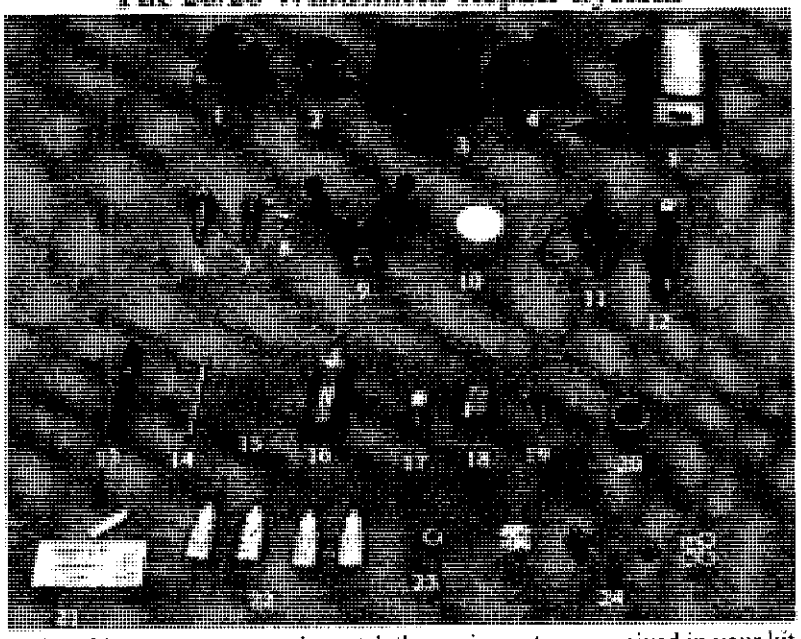
When a break contains radial cracks (such as in a star break), make sure the outer tips of the cracks are completely filled. Some breaks will require more time than others.

# SECTION IV
# PERFORMING REPAIRS WITH
# THE 20/20

## BASIC EQUIPMENT

Your equipment is designed to perform high-quality repairs and minimize repair time. See the illustration below to familiarize your self with the individual components in your kit.

The 20/20 Windshield Repair System



*NOTE:* The equipment displayed here may not exactly match the equipment you received in your kit. If you have purchased your equipment through one of our distributors, or if you have purchased a specially priced system, some items may have been deleted from your kit. Contact your distributor or Glass Technology representative for clarification regarding your kit's inclusions.

1. 10-foot extension cord
2. Magnifying mirror
3. Sun Shade
4. 12-volt drill
5. UV lamp
6. Injector plunger
7. Injector body
8. Nylon locking screw
9. Bridge
10. Suction cup lube
11. Battery adaptor
12. Crack jack
13. Pen light
14. Pit probe
15. Bullseye tool
16. Pit gloss
17. Pit polishing wheel
18. Razor blades
19. Drill Bits
20. Pit tape
21. Diamond Clear pit filler
22. Diamond Clear resin
23. Large pit adaptor
24. Spare "O" rings (seals)

**To repair a break, continue to section VI (page 16).**

# SECTION V
# EXTRA TOOLS

## DRYING THE BREAK

Occasionally, you will find a trace of water in the break, particularly in bullseye breaks. It takes some experience to detect this, so you might practice by placing a drop of water on a dry bullseye break and observe what happens. With experience and good lighting, you should be able to detect water in a break.

Water can get into a break from washing the windshield or from rain, snow, etc. Water in a break may take as long as half a day to dry out in a hot, dry climate, and longer in cold, humid conditions. To dry out a break quickly, remove surface moisture with a towel. Clean out the pit and remove any loose glass or dirt. The break will dry out faster.

**The optional Glass Technology Dryer is another excellent tool for removing moisture from windshield breaks. See the information on the Dryer in the Tips & General comments section later in this manual.**

## BATTERY CONDITION

**Eliminator:**

A new, fully charged battery will do approximately 25 repairs before displaying a "charge battery" message. The battery should be charged for 6 to 12 hours at that time. The battery will do approximately 10 repairs in the "charge battery" condition. When the battery goes too low, you can no longer use the machine. The machine will automatically shut off.

**Eliminator & MAXIM:**

Leaving the machine idle without charging for long periods will significantly drain the battery, resulting in battery damage. If your battery needs charging, plug the charger into a 110-volt wall receptacle and the other end into the receptacle marked "charger" on your machine.

As a back up, your system has a 10-foot power cord that can plug directly into the car's cigarette lighter or attach to the car's battery (with adaptor, see basic equipment).

Over-charging the battery for longer than the above recommendations can also damage the battery and void the battery warranty.

## VERTICAL GLASS ADAPTER

To use the vertical glass adapter place its "O" ring against the glass and the standard injector on top of the vertical glass adapter. The vertical glass adapter has a small offset hole, which is to be positioned at the top above the pit. Be sure to compensate for the additional thickness of the vertical glass adapter when aligning the bridge. Remove the resin

bottle cap and replace it with the vertical needle cap. Remove needle cap's protective cover. Next, insert the needle into the small hole of the vertical glass adapter, positioned at the tip of the injector, and inject resin into the opening. Continue with the repair as usual. **If using a machine do not exceed 35 psi.**

## LARGE PIT ADAPTER

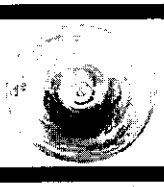
Occasionally you will find a pit where a good portion of the glass is missing. If the pit is larger than the "O" ring seal, you cannot generate enough pressure to fill the break. Should this occur, use the large pit adaptor (see below).

The large pit adapter is also used when two separate breaks are connected together, not allowing you to generate pressure to make the repair. By covering both pits, the large pit adaptor will allow you to generate the needed pressure to fill the breaks. To use the large pit adaptor, place the large "O" ring against the glass and the standard injector onto the large pit adapter, as shown. **If using a machine do not exceed 20 psi, to avoid resin leaking out the base of the injector seal.**

**Large pit adapter**

# SECTION VI
# REPAIRING A BREAK

## REPAIR GUIDE:

| Type of Break | Approx. Drill Depth | Drill Location | Injector Location |
|---|---|---|---|
|  Hole | Bullseye | 1/16"* | Impact Point | Drill |
|  Hole | Partial | 1/16"* | Impact Point | Drill |
|  Hole | Star | 1/16-3/32" | Impact Point | Drill |
|  | Combination | 1/16"* | Impact Point | Drill Hole |
|  | Trapped Air in Cured Repair | To vinyl, about 1/8" | Center of small air pocket | Drill Hole |
|  | Short Radial Crack | To vinyl, about 1/8" | 1/16" beyond end of crack | Drill Hole or Impact Point |
|  | Stress Crack from edge | To vinyl, about 1/8" | 1/16" beyond end of crack | Drill Hole |

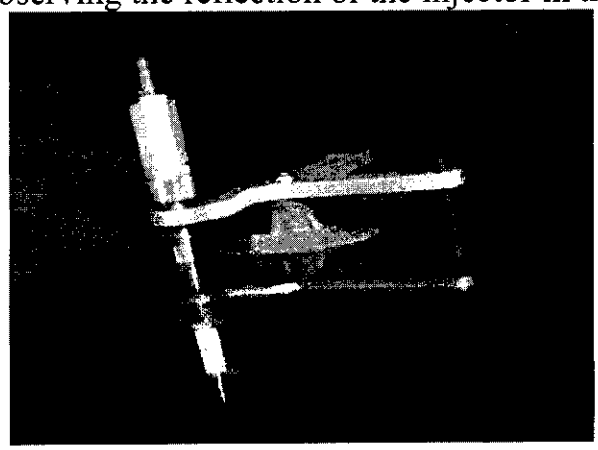
* About half the length of the teeth on the drill bit.

**Always wear safety glasses when using equipment and resin.**

Using the carbide probe, remove all dirt and loose glass chips from the impact pit and drill appropriate hole as explained in the Repair Guide. (It's not always necessary to drill the break. See "Drill Test" in "Tips" section, page 21.) Smear a thin coat of suction cup lube on the suction cup of the bridge assembly. With leveling screws backed off, place bridge so that the injector hole is directly over the impact hole of the break. Press down on the center of bridge, flattening out the suction cup enough to firmly hold down the bridge throughout the repair process.

CAUTION: **Be careful not to push down too hard as this might crack the glass further. It is usually best to mount the bridge so the injector is toward the bottom of the windshield.**

Insert the white injector seal in the bottom of the injector and screw the injector into the bridge. Sight the pit impact through the injector hole and align the injector directly over center of the break. Screw the injector all the way, until it hits the glass, then turn it an additional 2 turns. While this is a good reference point to begin with, more or less tension may be required. With the curvature of the windshield in mind, adjust the leveling screws and the injector so that the injector becomes perpendicular to the glass surface (this can best be done by first observing the reflection of the injector in the glass – see below).



**Proper alignment of the injector on the windshield**

Align the injector so that it forms a straight line with its reflection. Observe and make this adjustment while looking at the reflection from two different angles (perhaps from the side of the windshield and from the front of the vehicle).

After the injector is aligned, adjust the bridge pressure against the glass by turning the two adjusting screws and the injector equal amounts in or out until the desired tension is achieved. The bridge should be snug but not too tight. Proper adjustment is necessary because if the bridge is too tight against the glass it may tighten the break, thus slowing down the repair process. If the bridge is too loose, the resin will leak out of the seal.

CAUTION: **Do not over tighten as this can cause further extension of cracks.**

Using suction cup lube, attach the magnifying mirror to the inside of the windshield directly behind the break. This will allow you to monitor the repair from outside.the vehicle.

The resin you will use is a highly advanced ultraviolet curing Diamond Clear resin. It will not begin to cure until it is directly exposed to sunlight or a long-wave ultraviolet

lamp. For this reason, you must shade the break before starting the repair process so the resin will not cure until the job is completed. If doing the repair outside in direct sunlight (or even if cloudy), take the Sun Shade and, after applying cup lube, place it above the bridge in a manner that will shade the break area. Now, using caution not to allow sunlight to hit the resin, cup the resin bottle in your hand. Place five to seven drops of resin into the injector body. **If using the 20/20 system the plunger and needle must be removed in order to do this.**

If you look into the mirror while you are dropping the resin into the injector, you will be able to see when the resin meets the glass as it suddenly spreads out within the area of the "O" ring. When you are working on an almost vertical windshield, as with some trucks, it is important to watch for that resin to "spread out." If this doesn't happen, you may need to put in a few more drops. If you don't have any resin making contact with the pit, no repair will take place.

## With the Eliminator or MAXIM:

With a red "O" ring on filter threads, take filter and screw onto injector until snug. Connect hose to filter with quick disconnect fitting. When connecting be careful not to push down too hard as this may create further damage. When pushing down, hold the injector with your hand and pull up slightly to absorb some of the pressure. A properly connected hose should make a snap or click when connected.

Assuming your battery is charged, you are ready to begin. If your battery needs charging, see page 13.

## With the 20/20 system:

Making sure that the air release knob is backed off, carefully slide the plunger into the injector body and push it all the way down. Close the air release knob and pull up on the plunger until the groove just barely appears, and then tighten the locking screw to hold the plunger in the **Up** (vacuum) position. If you now look into your mirror, you should be able to see some tiny air bubbles as the air being drawn out of the break passes through the resin.

After two minutes on vacuum, switch to pressure. Open the air release knob one full turn and then close it again. The vacuum has now been released and the injector is ready for the pressure stroke. Loosen the locking screw, gently push down on the plunger until you feel resistance, and then re-tighten the locking screw to hold the plunger in the **Down** (pressure) position. Only experience will help you develop a feel for the exact amount of pressure you'll need to accomplish any particular repair. More or less pressure can be applied as required.

Caution: **Too much pressure can extend damage. Apply pressure with care.**

Look into the mirror again, and you will notice that the resin has started to flow into the break to replace the vacuum void that you created on the first vacuum stroke. Leave it on pressure for about two minutes.

*NOTE:* The two seals on the 20/20 plunger must be pre-lubricated with resin before inserting the plunger into the injector.

## For ALL systems:

You will probably need to alternate between vacuum and pressure several times throughout the course of a repair. Each cycle will advance the resin into the break a little further until it is completely filled. After the start of each new vacuum you should inspect the repair for completeness. Once it looks okay, you can apply the final pressure cycle for about one minute.

Bleed off the pressure and remove the injector assembly.

NOTE: The suction cup can be released by lifting the edges and breaking the seal (occasionally you will need to slide something thin under the edge of the suction cup to release the vacuum). Allow resin to drain from the pit area.

NOTE: Always store Diamond Clear resin in a cool, dry, dark place away from sunlight. Do not store a large quantity of resin in your vehicle. Take only what you will use in a few days time. Do not shake resin before use. This will create undesirable air bubbles.

CAUTION: **Some resins can cause skin and eye irritation. May contain acrylic acid and methacrylic ester. In case of eye contact, immediately flush with water for 15 minutes and get medical attention. Wash with soap and water after skin contact. KEEP OUT OF REACH OF CHILDREN.**

## With the 20/20 system:

Clean the injector body, plunger and injector needle with alcohol and a paper towel. Store parts disassembled when you are finished for the day.

**For pit finishing & curing, go to the next section (Section VII).**

## IMPORTANT NOTICE:

The suction cup lube is water-soluble. The resin is water soluble, but only until it cures. After that it is insoluble in any solvent. Clean equipment with water and a paper towel immediately after use. Wash hands with soap and water if contact occurs.

# SECTION VII
# FINISHING A REPAIR

## AFTER BREAK IS COMPLETELY FILLED:

It is important to apply the pit filler and pit tape as rapidly as possible following the removal of the injector assembly from the windshield. This will minimize the possible re-introduction of contaminates back into the damaged area. Place a drop or two of pit filler above the hole – it will run down into the pit area and push out the air bubble usually in the pit. With a one-inch piece of pit tape ready beforehand, immediately cover the pit with the tape (glossy side against glass). After covering the area with pit tape, be careful **not** to "pat" the area with your finger. The pit filler should pool under the tape and rise higher than the glass surface.

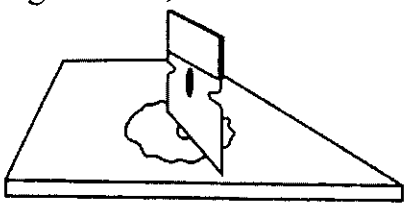
This step is very important because it not only holds the pit filler in the hole but it also aids in the curing process as the resin will not cure properly while exposed to air. If it wasn't necessary to drill a hole, simply place a drop or two of pit filler over the pit and cover with the tape. If the repair is done outside, allow sunlight to shine directly on the repair until cured (approximately three to five minutes). If you are doing the repair inside a building, attach the ultraviolet lamp directly over the repair, using suction cup lube on the suction cups. Plug the lamp into the proper outlet. Turn on the lamp for about three (3) minutes, then remove when finished.

CAUTION: **Never cure resin from inside the car because the resin will not cure properly. Also, be sure to remove the mirror from the inside of the windshield before curing.**

NOTE: The suction cup lube and the resins in their uncured state are water-soluble and can be cleaned off the windshield with water and a paper towel. Be careful not to spray water around the repair area until resin is cured.

NOTE: Clean resin from the bottom of the injector before unscrewing it form the bridge, otherwise the threads in the bridge will become clogged with resin.

After curing the repair, remove pit tape. Shave excess resin around the pit area, being careful not to cut over the pit with razor blade. Next, holding the razor perpendicular to the glass, lightly scrape or shave back and forth over the pit until it is almost flush with the glass. It is very important to hold the razor perpendicular to the windshield – not at an angle. Also, be sure the razor is sharp and clean to minimize any scratches put in the pit.



**Proper technique for shaving repair**

**CAUTION: Don't cut the resin out of the pit.**

After carefully shaving the excess resin from the pit area, insert the shaft of the pit-polishing wheel into the drill chuck and tighten. Apply a small amount of pit gloss to pit area. With the flat part of the wheel against the glass, turn drill on and begin to polish, slowly moving the wheel back and forth over the pit area until it is flush with the glass. Be careful not to polish the pit deeper than the glass surface or the pit will become much more noticeable. After polishing for about five seconds, leave the excess polish on the glass and take a paper towel and rub it briskly, using your index finger. Do not push down hard with your finger – Apply gentle pressure when polishing. Your objective is to make the pit area have the same luster as the glass while, at the same time, being perfectly flush with the windshield. Clean the windshield and equipment. Your repair is now complete

## ADVANCED PIT FILLING TECHNIQUES

Quite often the drilled hole will have a small air bubble at the bottom. This can be removed by using a straight pin or needle. After applying the pit filler, use the pin to push the pit filler to the bottom of the hole, and push out any bubbles that may exist. Repeat this step until the drilled hole is clear, then cover with pit tape and cure.

# SECTION VIII
# CRACK REPAIR

**CRACKS** The following are some helpful suggestions for repairing longer cracks:

Make sure the crack is reasonably clean and free of moisture. If you find the crack has dirt in it, it's usually best to educate the customer as to the finished result (a black muddy-looking line), and see if they want you to do the job. You must first locate the end of the crack (this is sometimes difficult, as the end of the crack is very thin and may be so tight that it has pushed all the air out and may appear invisible). To locate the end of the crack, gently flex the glass with your fingers from the inside. This will open the crack and allow the end to become visible. Be careful not to flex too hard as this may further extend the crack.

Once you have located the end, mark it with a dot and drill 1/16" beyond the exact end of the crack (drill to inner vinyl layer – about 1/8" deep). You can flex the glass until the crack extends completely into the drill hole.

Next, drill half way to the vinyl at the impact point of the original break, if a break is part of the long crack. Then take a piece of black electrical tape and cover the break. This is done to prevent any UV rays from curing resin that may enter the break during the crack repair. After you have repaired and cured the long cracks, you will repair the original break with your system

CAUTION: **Be extremely careful with flexing the glass so the crack will not miss the hole. This process will keep the crack from spreading while you are working on it. Try to keep a finger on either side of the crack as a guide while applying pressure.**

NOTE: If after drilling you find the hole missed the end of the crack or if the crack extends beyond the hole, the crack could continue to spread. So repeat the above procedure and re-drill.

Now place the crack jacks perpendicular to the crack on the inside of the windshield, using cup lube on the crack jack suction feet. Crack jacks should be placed every two (2) to three (3) inches depending on the length of the crack. (Additional crack jacks are available through Glass Technology.) The adjusting knob must be placed directly underneath the crack.

Begin tightening the crack jack to open the crack slightly. Use caution not to over tighten and cause further damage. Be sure to pre-cut the pit tape length prior to starting the repair process.

Apply a drop of Diamond Clear Crack Resin at the beginning of the crack and view the resin flow (absorption) into the crack. Continue to apply drops of resin **at** (not ahead of) the leading edge of the resin flow into the crack until it is filled. As you're applying the resin along the crack with one hand, follow with the pit tape immediately behind with the other hand. Make certain that the resin applicator stays behind the resin's leading edge as the resin flows **up** the crack. If you run ahead of the resin's leading edge, tiny air bubbles along the length of the crack may remain.

Immediately cure with UV lamp for at least 4 minutes – 4 to 6 minutes with sunlight. (Recommended use: optional 18" UV curing lamp)

After the crack repair has cured, you can remove the crack jacks. Remember, when shaving excess resin, do not dig the resin out of the crack. Shave in the same direction the crack is running not across the crack.

*NOTE:* During the repair process, make sure cracks are always shaded from direct sunlight. Longer Cracks can be repaired outside to utilize the ultraviolet rays of the sun to cure the resin. We recommend not attempting cracks beyond 12 inches in length until you've gained adequate experience. Cracks take much longer than bullseye or star breaks, so plan your time accordingly.

## CRACK JACKS

Crack jacks have a two-fold purpose: 1) to repair longer cracks (which we just discussed) and 2) to be used in conjunction with your windshield repair system on bullseyes and combination breaks. Do **NOT** use crack jacks on star breaks.

In regards to bullseye and combination breaks, crack jacks can be used to aid in flexing the glass from the inside to help remove air during the vacuum cycle. Using cup lube on the crack jack feet, place the crack jack on the inside of the windshield. The adjusting knob must be placed directly underneath the air pocket. Lightly screw down the adjusting knob until the air escapes. Be careful not to apply too much pressure, as further damage may result.

# SECTION IX
# TIPS & GENERAL INFORMATION

**Flexing Glass:**

By flexing the glass, you create movement between the small cracks, thus allowing the trapped air to work its way out under the vacuum cycle. Flexing under pressure can also help open the crack up, allowing resin to flow easier. This can be accomplished by pressing down on the injector while under pressure or vacuum, depending on your needs. In addition, use your thumb to try flexing from the inside of the glass with direct pressure.

**Curing Under Pressure:**

Occasionally you will get a repair with a small portion of it containing trapped air. If, after trying all the other steps, you still can't get the air out, turn your machine on to 40 psi and expose the problem area to UV light. This will minimize the air pocket and harden the resin around it, thus keeping it from expanding.

**Small Cracks:**

When you encounter small cracks that don't seem to be accepting resin, you can fill these using direct pressure with your carbide probe. Take the tip out of your probe, turn it around and put it back in. Using this blunt end, apply direct pressure on the crack next to the injector. This will open up the crack and allow it to fill. Be careful not to drag the probe across the glass as it could leave a scuffmark. Also, be careful not to apply too much pressure as it can cause further damage.

**Repairing a Break with a Long Crack:**

After gaining experience doing the simple repairs, you may attempt a repair with one or more long cracks. First, take a piece of black electrical tape and cover the break/impact point. This is done to prevent any UV rays from curing resin that may later enter the break. Drill a hole to the vinyl approximately 1/8" from the end of any cracks, directly in line with the direction the crack is traveling. Place crack jacks on the inside of the glass directly under the crack. Tighten the crack jacks to open the crack slightly. Use caution not to over tighten and cause further damage.

Cut pit tape to full length of the crack. Slowly begin filling the crack at one end with Diamond Clear resin using capillary action and immediately cover with pit tape and expose to light. After the crack is cured, remove electrical tape and finish the repairing the break as usual.

**Drilling:**

Never drill at too high a speed or force the drill bit into the glass. Too much pressure can damage the area further. Always hold the drill perpendicular to the glass and keep a steady hand while drilling. If you change the angle of the drill bit after you have penetrated the glass, you can break the drill bit top off in the hole. It is very important when drilling to rest or steady your hand before you start. Once you introduce the drill to the glass, apply downward pressure to avoid the drill bit walking. Ideally, you want to stop short of drilling into the vinyl with the exception of cracks. If you drill into the vinyl the drill bit may suddenly stop. If this occurs, don't move or turn off your drill. With your other hand, carefully turn the drill chuck clockwise until the drill begins to turn. Now pull

the drill out of the hole. **Drilling into uncured resin will immediately dull your drill bit.**

**Drill Test:**

It is not always necessary to drill before you repair. Place a drop of resin on the pit and notice if the resin starts to flow into the break. A very rapid clearing of the damaged area will be apparent. If this happens, there is no need to drill.

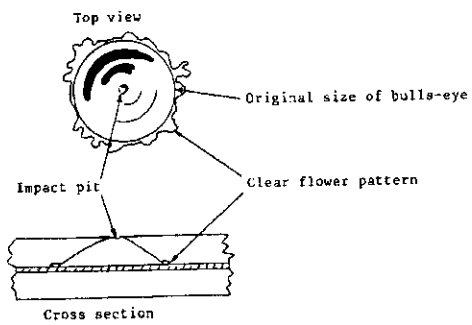
**When Unsure Repair Is Completely Filled:**

If you are not sure a repair is complete and are having trouble seeing it, you can switch to vacuum, loosen the bridge adjusting screws (approximately one full turn), and slide the bridge off the break an inch or so. Extra lube on or around suction cup is helpful. After observing repair, slide the bridge assembly back into place and continue repair if needed.

**Pressure settings in extremely hot conditions:**

When there is too much pressure combined with extremely high heat, the vinyl layer in a windshield becomes soft and "flowering" may occur. Therefore, it is always best to repair a break using as little pressure as possible. Start with a low pressure and increase pressure slowly. This will aid in preventing the flowering effect. However, you can virtually eliminate the flowering effect by using Diamond Clear HV resin. HV's chemical formula makes it the resin of choice for repairing breaks in high temperatures where vinyl damage is present. Use Diamond Clear HV when temperatures exceed 85°F.

CAUTION: **Do not use Diamond Clear HV resin on star breaks.**




**Illustrating flowering effect**

**Temperature:**

Generally, repairs can be done outdoors in temperatures between 20° to 100°F. The resin will flow slower in colder temperatures, therefore, allow more time for such a repair. However, if the windshield has been in direct sunlight on a hot day, allow it to cool in the shade before starting.

If there is no shade available, then open the vehicle windows if possible. Next, cover the break with electrical tape, and with a spray bottle and sponge cool down an area at least one foot around the break. When the windshield is cool to the touch, remove the tape and proceed with the repair. However, you should apply extra lube to the suction cup on the bridge, put the bridge on the windshield away from the break, and then slide the bridge into place. This applies the minimum amount of pressure to the break.

Caution: **Very hot windshields are more sensitive to pressure. Apply pressure with**

**great care to avoid expanding damage.**

**Patience:**

Some breaks are very tight and can take as long as 30 minutes to completely fill, so be patient.

**Radial Cracks:**

If radial cracks start to spread during the repair process, back off pressure and bridge adjusting screws.

**Refractive Index:**

The ratio of the speed of light in a vacuum to the speed of light in a medium (in this case, glass and air). Since light travels through glass and air at different speeds, they have different refractive indexes. That is why the breaks are visible.

**Tinted Glass:**

The shading of a windshield is in the vinyl layer. Since the resin is only applied to the outside layer of glass, the tint of the windshield is not a factor. Occasionally, when a break is up in the shaded strip of the windshield you will notice the area around the break is faded. This is caused by moisture or sunlight entering the break and bleaching the tint. The break can be repaired as usual, but the bleach spot will remain.

**Protect Resin:**

Diamond Clear resin must be protected from ultraviolet sunlight at all times. Store open resin out of sunlight. Store new, unopened resin in a cool, dry place out of sunlight. Always use fresh, uncontaminated Diamond Clear resin.

**When Is the Vehicle Useable?**

The vehicle can be used immediately after the repair. Avoid exposure to water for two to three hours. If chances of rain are good, tape clear plastic over the repair to protect it.

**Cleaning Equipment:**

The lube is water-soluble. The resin is also water soluble, but only until it cures; after that it is insoluble in any solvent. So clean equipment immediately after use with water and a paper towel. If spilled on hands, wash with soap and water, not solvent. Make sure both the bridge injector hole threads and the injector threads do not get resin on them, as this will make screwing down the injector difficult. Clean injector with alcohol or acetone.

**Diamond Clear resins have been specially formulated to work with Glass Technology windshield repair systems. Using inferior resins can reduce the effectiveness of the system and the quality of your repairs.**

CAUTION: **Avoid contact with skin, or breathing acetone vapors as they are both harmful. Follow precautions on acetone container.**

A gun barrel brush can be used to clean inside the injector. If you find that cured resin is on the threads, you will need a 58-18 tap to clean out bridge threads.

**Resin Leaking Around Seal:**

If resin leaks around "O" ring seal, it could be caused by: 1)Injector not centered, 2) Pit is larger than the "O" ring, 3) the injector is not perpendicular to the glass, or 4) Injector is not snug against the glass. Make the appropriate adjustments or corrections and continue the repair.

**Adjusting the Bridge:**

When adjusting the bridge, slowly screw down the leveling screws, being careful to screw down only as much as is needed. The more the adjusting screws are tightened, the greater the pressure becomes against the windshield. Be careful – too much pressure can cause cracks to extend further.

**Pressure Settings:**

It is best to repair a break with as little pressure as possible. Start with a lower pressure setting and increase pressure slowly. This will help avoid the flowering effect discussed earlier. In some cases, the slight flowering is unavoidable but this will not alter the effectiveness of the repair.

**The Glass Technology Dryer:**

The Glass Technology Dryer is designed to remove moisture from a windshield break.

To use the Dryer, first plug the Dryer into your 12-volt receptacle on your machine, or into a cigarette lighter in a vehicle (or into your 12-volt battery adaptor). Depress and hold the button on the Dryer. The heating element will turn to a hot red glow.

Hold the Dryer very close to the break (outside layer of glass only), but not touching the glass. Do this for no more than 15 seconds and let the glass cool for 60 seconds. If moisture is still present, repeat this procedure.

CAUTION: **When using the dryer in extremely cold temperatures, do not use on star breaks. Using the Dryer in these conditions may cause the radial cracks in a star to run.**

**Never leave the Dryer on for more than 30 seconds, without a 3-minutes cool down immediately afterward. Failure to let the Dryer cool may result in damage to the Dryer. Keep the hot red element away from your body, as severe burns may result. Never set the Dryer on the painted surface of a vehicle, or on any flammable material.**


# MATERIAL SAFETY DATA SHEET

## I. Physical Properties

Boiling point: Not Applicable
Vapor Pressure: 6mm Hg @ 30°C
Vapor Density: Not Determined (air = 1)
Volatiles (% by weight): 0
Specific Gravity: 1.029 (water = 1)
Solubility in water: Soluble
Appearance and Color: clear to pink liquid

## II. Health Hazard Data

As defined by NTP, ARC, and OSHA, there are no carcinogens in this formulation.
Potential Route of Entry: Inhalation? X Skin? X Ingestion? X
Symptoms of Overexposure: Inhalation: skin and eye irritation – high levels of acrylic acid vapors cause nose and throat irritation; Skin: will cause minor burns; Ingestion: will cause irritation of the mucous membranes.

**Emergency and First Aid Procedures:**

Eye Irritation: Wash eyes with copius quantities of water for several minutes. Get medical attention.
Skin Contact: Wash thoroughly with soap and water. Do not use organic solvents for cleanup as they may dry or irritate the skin and act as a carrier for chemical absorption.
Inhalation: Remove to fresh air.
Ingestion: Low toxicity; do **NOT** induce vomiting. If person is conscious, give lots of water. Get immediate medical attention.

## III. Fire and Explosion Hazard Data

Flash Point (deg F/method used): Not Determined.
Extinguishing Media: carbon dioxide, dry chemical, foam, water fog.
Unusual Fire or Explosion Hazards: Toxic fumes (oxides of carbon and nitrogen) may be evolved upon exposure to heat or open flame.
Special Firefighting Procedures: Firefighters should wear self-contained breathing apparatus.

## IV. Reactivity Data

Product is stable; hazardous polymerization will not occur.
Incompatible with strong oxidizers, amines, strong Lewis or mineral acids, thiosulfates. Considerable smoke and toxic fumes may be evolved as a result of uncontrolled exothermic reaction if large masses of material react with curing agents. Conditions to Avoid: Storage in open containers, exposure to heat and/or open flame, exposure to incompatible substances (above).

## V. Spill or Leak Procedures

For Large Spills: Dike area to prevent spreading. Absorb material with vermiculite, sand or other inert absorbing material. Put in closed container, dispose of as a chemical waste in accordance with current local, sate and federal regulations.

## VI. Special Precautions

Respiratory Protection: Positive fresh air exhaust should be provided in the work area; respiratory equipment is unnecessary in normal use. Skin Protection: Avoid skin contact. Wear gloves and impervious protective clothing if frequent direct contact is likely. Eye Protection: Do not wear contact lenses. Chemical safety glasses or goggles are recommended.

## VII. Shipping, Handling and Storage

DOT and IATA Hazard Classifications: Not Restricted Article.
Proper DOT Shipping Name: Not Applicable.
Materials should be handled and stored in a cool (50°F to 80°F), dark place. Temperatures over 120°F should be avoided for maximum shelf life. Slow polymerization, with possible heat generation, will occur in direct sunlight and at temperatures approximately 130°F or higher.