

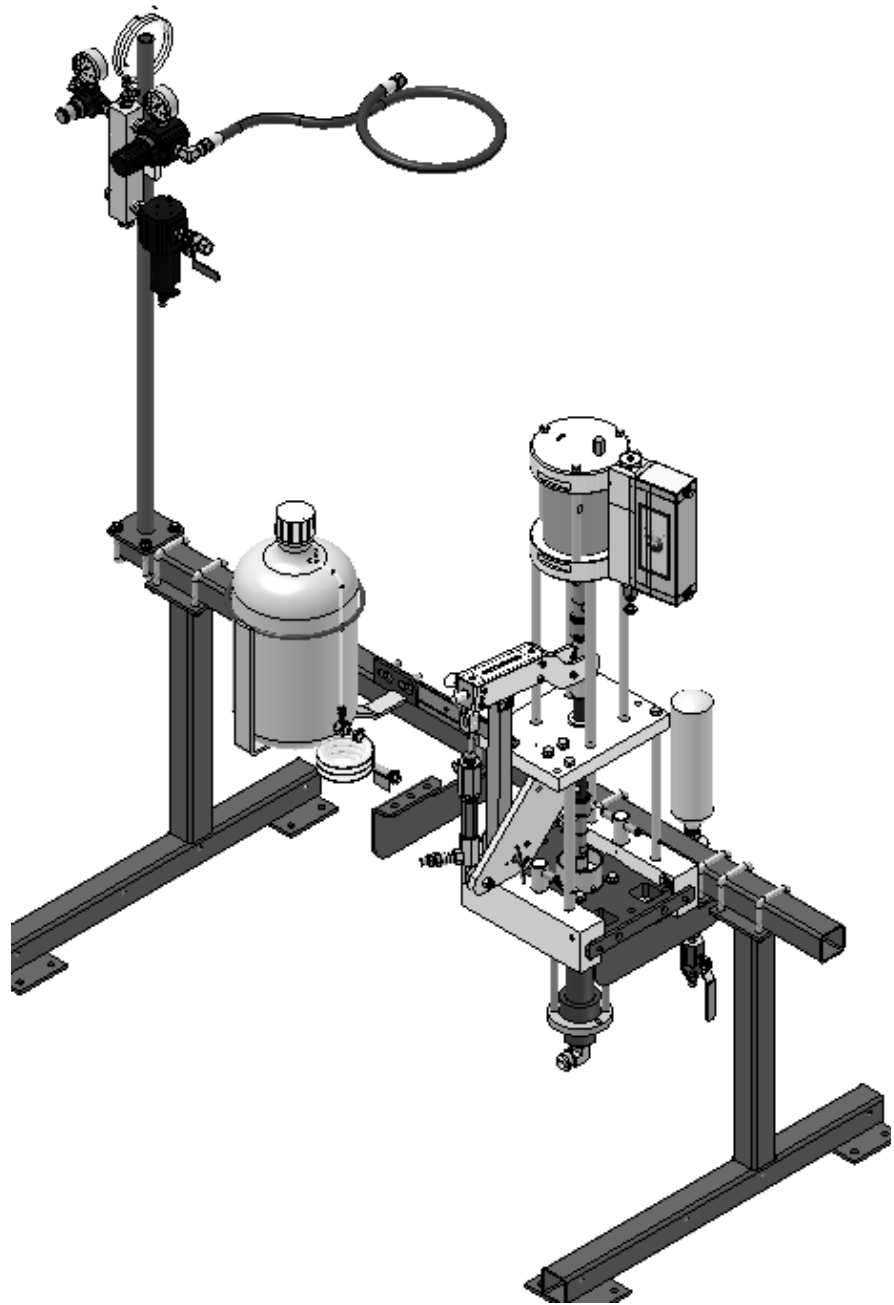
UltraMax Multi-Color Gelcoater

Operations Manual

This manual is applicable to the following models:

- MVE-1400-x-1
- MVG-1400-x-1

Note *The x placeholder in the system number corresponds to the number of fluid sections (available colors) for the unit. The maximum number of colors available per unit is 6.*



Rev. December 2018



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Use of this product confirms that Magnum Venus Products, Inc.'s standard terms and conditions of sale apply.

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Safety & Warning Information

Warnings

Due to the vast number of chemicals that could be used and their varying chemical reactions, the buyer and user of this equipment should determine all factors relating to the fluids used, including any of the potential hazards involved. Particular inquiry and investigation should be made into potential dangers relating to toxic fumes, fires, explosions, reaction times, and exposure of human beings to the individual components or their resultant mixtures. MVP assumes no responsibility for loss, damage, expense or claims for bodily injury or property damage, direct or consequential, arising from the use of such chemical components.

The end user is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used and that all documentation is adhered to.

Recommended Occupational Safety & Health Act (OSHA) Documentation:

- 1910.94 Pertaining to ventilation
- 1910.106 Pertaining to flammable liquids
- 1910.107 Pertaining to spray finishing operations, particularly paragraph (m), Organic Peroxides and Dual Component Coatings

For Additional information, contact the Occupational Safety and Health Administration (OSHA) at <https://www.osha.gov/about.html>.

Recommended National Fire Protection Association (NFPA) Documentation:

- NFPA No.33 Chapter 14 Organic Peroxides and Dual Component Materials
- NFPA No. 63 Dust Explosion Prevention
- NFPA No. 70 National Electrical Code
- NFPA No. 77 Static Electricity
- NFPA No. 91 Blower and Exhaust System
- NFPA No. 654 Plastics Industry Dust Hazards

Fire Extinguisher – code ABC, rating number 4a60bc using Extinguishing Media –Foam, Carbon Dioxide, Dry Chemical, Water Fog, is recommended for this product and applications.

The following general warnings and guidelines are for the setup, use, grounding, maintenance, and repair of equipment. Additional product-specific warnings may be found throughout this manual as applicable. Please contact your nearest MVP Technical Service Representative if additional information is needed.

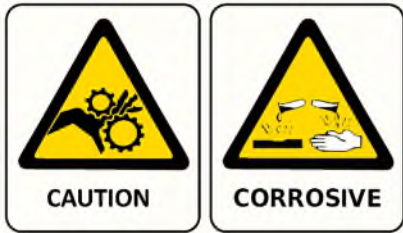
Safety Precautions

- Avoid skin contact and inhalation of all chemicals.
- Review Material Safety Data Sheet (MSDS) to promote the safe handling of chemicals in use.
- Restrict the use of all chemicals to designated areas with good ventilation.
- Chemicals are flammable and reactive.
- Noxious fumes released when combusted.
- Operate equipment in a ventilated environment only.
- Uncured liquid resins are highly flammable unless specifically labeled otherwise.
- Cured laminate, accumulations of overspray, and laminate sandings are highly combustible.
- Do not operate or move electrical equipment when flammable fumes are present.
- Ground all equipment.
- If a spark is seen or felt, immediately halt operation. Do not operate the equipment until the issue has been identified and repaired.
- Contaminated catalyst may cause fire or explosion.
- Containers may explode if exposed to fire / heat.
- Use and store chemicals away from heat, flames, and sparks.
- Do not smoke in work areas or near stored chemicals.
- Do not mix Methyl Ethyl Ketone Peroxide (MEKP) with materials other than polyethylene.
- Do not dilute MEKP.
- Keep food and drink away from work area.



Physical Hazards

- Never look directly into the spray gun fluid tip. Serious injury or death can result.
- Never aim the spray gun at or near another person. Serious injury or death can result.
- Chemical compounds can be severely irritating to the eyes and skin.
- Inhalation, ingestion, or injection may damage internal organs and lead to pulmonary disorders, cancers, lymphomas, and other diseases or health conditions.
- Other potential health effects include: irritation of the eyes and upper respiratory tract, headache, light-headedness, dizziness, confusion, drowsiness, nausea, vomiting, and occasionally abdominal pain.
- Eye contact: Immediately flush with water for at least 15 minutes and seek immediate medical attention.
- Skin Contact: Immediately wash with soap and water and seek immediate medical attention.
- Inhalation: Move the person to fresh air and seek immediate medical attention.
- Do not remove shields, covers, or safety features on equipment that is in use.
- Never place fingers, hands, or any body part near or directly in front of the spray gun fluid tip. The force of the liquid as it exits the spray tip can shoot liquid through the skin.
- Keep hands and body parts away from any moving equipment or components.
- Do not stand under plunger
- An improperly loaded drum may lead to an imbalance, causing a unit to tip over



Personal Protective Equipment (PPE)

- MVP recommends the use of personal safety equipment with all products in our catalog.
- Wear safety goggles, hearing protection, a respirator, and chemical resistant gloves.
- Wear long sleeve shirts or jackets and pants to minimize skin exposure.
- PPE should be worn by operators and service technicians to reduce the risk of injury.



For Additional information, contact the Occupational Safety and Health Administration (OSHA). <https://www.osha.gov/about.html>

Symbol Definitions



Indicates the risk of contact with chemicals that are hazardous, which may lead to injury or death.



Indicates the risk of contact with voltage / amperage that may lead to serious injury or death.



Indicates that the materials being used are susceptible to combustion.



Indicates the risk of contact with moving components that may lead to serious injury or death.



Indicates that the system or component should be grounded before proceeding with use or repair.



Indicates the use of lit cigarettes or cigars is prohibited, because the materials being used are susceptible to combustion.



Indicates that the materials and/or the process being performed can lead to ignition and explosion.



A recommendation for the use of Personal Protective Equipment (PPE) before using or repairing the product.

Polymer Matrix Materials: Advanced Composites

Potential health hazards associated with the use of advanced composites can be controlled through the implementation of an effective industrial hygiene and safety program.

https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_1.html#t_iii:1_1

Resins		
Composite Component	Organ System Target (Possible Target)	Known (Possible) Health Effect
Epoxy resins	Skin, lungs, eyes	Contact and allergic dermatitis, conjunctivitis
Polyurethane resins	Lungs, skin, eyes	Respiratory sensitization, contact dermatitis, conjunctivitis
Phenol formaldehyde	Skin, lungs, eyes	As above (potential carcinogen)
Bismaleimides (BMI)	Skin, lungs, eyes	As above (potential carcinogen)
Polyamides	Skin, lungs, eyes	As above (potential carcinogen)
Reinforcing materials		
Composite Component	Organ System Target (Possible Target)	Known (Possible) Health Effect
Aramid fibers	Skin (lungs)	Skin and respiratory irritation, contact dermatitis (chronic interstitial lung disease)
Carbon/graphite fibers	Skin (lungs)	As noted for aramid fibers
Glass fibers (continuous filament)	Skin (lungs)	As noted for aramid fibers
Hardeners and curing agents		
Composite Component	Organ System Target (Possible Target)	Known (Possible) Health Effect
Diaminodiphenylsulfone	N/A	No known effects with workplace exposure
Methylenedianiline	Liver, skin	Hepatotoxicity, suspect human carcinogen
Other aromatic amines		
Composite Component	Organ System Target (Possible Target)	Known (Possible) Health Effect
Meta-phenylenediamine (MPDA)	Liver, skin (kidney, bladder)	Hepatitis, contact dermatitis (kidney and bladder cancer)
Aliphatic and cyclo-aliphatic amines	Eyes, skin	Severe irritation, contact dermatitis
Polyaminoamide	Eyes, skin	Irritation (sensitization)
Anhydride	Eyes, lungs, skin	Severe eye and skin irritation, respiratory sensitization, contact dermatitis

Catalyst - Methyl Ethyl Ketone Peroxide (MEKP)

MEKP is among the more hazardous materials found in commercial channels. The safe handling of the “unstable (reactive)” chemicals presents a definite challenge to the plastics industry. The highly reactive property which makes MEKP valuable to the plastics industry in producing the curing reaction of polyester resins also produces the hazards which require great care and caution in its storage, transportation, handling, processing and disposal. MEKP is a single chemical. Various polymeric forms may exist which are more or less hazardous with respect to each other. These differences may arise not only from different molecular structures (all are, nevertheless, called “MEKP”) and from possible trace impurities left from the manufacture of the chemicals, but may also arise by contamination of MEKP with other materials in its storage or use. Even a small amount of contamination with acetone, for instance, may produce an extremely shock-sensitive and explosive compound.



WARNING

Contamination with promoters, materials containing promoters (such as laminate sandings), or with any readily oxidizing material (such as brass or iron) will cause exothermic redox reactions which can be explosive in nature. Heat applied to MEKP or heat buildup from contamination reactions can cause the material to reach its Self-Accelerating Decomposition Temperature (SADT).

Researchers have reported measuring pressure rates-of-rise well over 100,000 psi per second when certain MEKP's reach their SADT. For comparison, the highest-pressure rate-of-rise listed in NFPA Bulletin NO.68, “Explosion Venting”, is 12,000 psi per second for an explosion of 12% acetylene and air. The maximum value listed for a hydrogen explosion is 10,000 psi per second. Some forms of MEKP, if allowed to reach their SADT, will burst even an open topped container. This suggests that it is not possible to design a relief valve to vent this order of magnitude of pressure rate-of-rise. The user should be aware that any closed container, be it a pressure vessel, surge chamber, or pressure accumulator, could explode under certain conditions. There is no engineering substitute for care by the user in handling organic peroxide catalysts. If, at any time, the pressure relieve valve on top of the catalyst tank should vent, the area should be evacuated at once and the fire department called. The venting could be the first indication of a heat, and therefore, pressure build-up that could eventually lead to an explosion. Moreover, if a catalyst tank is sufficiently full when the pressure relief valve vents, some catalyst may spray out, which could cause eye injury. For this reason, and many others, anyone whose job puts them in an area where this vented spray might go, should always wear full eye protection even when laminating operations are not taking place.

Safety in handling MEKP depends to a great extent on employee education, proper safety instructions, and safe use of the chemicals and equipment. Workers should be thoroughly informed of the hazards that may result from improper handling of MEKP, especially regarding contamination, heat, friction and impact. They should be thoroughly instructed regarding the proper action to be taken in the storage, use, and disposal of MEKP and other hazardous materials used in the laminating operation. In addition, users should make every effort to:

- Store MEKP in a cool, dry place in original containers away from direct sunlight and away from other chemicals.
- Keep MEKP away from heat, sparks, and open flames.
- Prevent contamination or MEKP with other materials, including polyester over spray and sandings, polymerization accelerators and promoters, brass, aluminum, and non-stainless steels.

- Never add MEKP to anything that is hot, since explosive decomposition may result.
- Avoid contact with skin, eyes, and clothing. Protective equipment should be worn at all times. During clean-up of spilled MEKP, personal safety equipment, gloves, and eye protection must be worn. Firefighting equipment should be at hand and ready.
- Avoid spillage, which can heat up to the point of self-ignition.
- Repair any leaks discovered in the catalyst system immediately, and clean-up the leaked catalyst at once in accordance with the catalyst manufacturer's instructions.
- Use only original equipment or equivalent parts from Magnum Venus Products in the catalyst system (i.e.: hoses, fitting, etc.) because a dangerous chemical reaction may result between substituted parts and MEKP.
- Catalyst accumulated from the purging of hoses or the measurement of fluid output deliveries should never be returned to the supply tank, such catalyst should be diluted with copious quantities of clean water and disposed of in accordance with the catalyst manufacturer's instructions.

The extent to which the user is successful in accomplishing these ends and any additional recommendations by the catalyst manufacturer determines largely the safety that will be present in his operation.

Clean-Up Solvents and Resin Diluents



WARNING

A hazardous situation may be present in your pressurized fluid system! Hydro carbon solvents can cause an explosion when used with aluminum or galvanized components in a closed (pressurized) fluid system (pump, heaters, filters, valves, spray guns, tanks, etc.). An explosion could cause serious injury, death, and/or substantial property damage. Cleaning agents, coatings, paints, etc. may contain Halogenated Hydrocarbon solvents. Some Magnum Venus Products spray equipment includes aluminum or galvanized components and will be affected by Halogenated Hydrocarbon solvents.

There are three key elements to the Halogenated Hydrocarbon (HHC) solvent hazard.

- | | | |
|----|---|--|
| 1. | The presence of HHC solvents. | 1,1,1 – Trichloroethane and Methylene Chloride are the most common of these solvents. However, other HHC solvents are suspect if used; either as part of paint or adhesives formulation, or for clean-up flushing. |
| 2. | Aluminum or Galvanized Parts. | Most handling equipment contains these elements. In contact with these metals, HHC solvents could generate a corrosive reaction of a catalytic nature. |
| 3. | Equipment capable of withstanding pressure. | When HHC solvent contact aluminum or galvanized parts inside a closed container such as a pump, spray gun, or fluid handling system, the chemical reaction can, over time, result in a build-up of heat and pressure, which can reach explosive proportions. When all three elements are present, the result can be an extremely violent explosion. The reaction can be sustained with very little aluminum or galvanized metal; any amount of aluminum is too much. |

- The reaction is unpredictable. Prior use of an HHC solvent without incident (corrosion or explosion) does NOT mean that such use is safe. These solvents can be dangerous alone (as a clean-up or flushing agent) or when used as a component or a coating material. There is no known inhibitor that is effective under all circumstances. Mixing HHC solvents with other materials or solvents such as MEKP, alcohol, or toluene may render the inhibitors ineffective.
- The use of reclaimed solvents is particularly hazardous. Reclaimers may not add any inhibitors. The possible presence of water in reclaimed solvents could also feed the reaction.
- Anodized or other oxide coatings cannot be relied upon to prevent the explosive reaction. Such coatings can be worn, cracked, scratched, or too thin to prevent contact. There is no known way to make oxide coatings or to employ aluminum alloys to safely prevent the chemical reaction under all circumstances.
- Several solvent suppliers have recently begun promoting HHC solvents for use in coating systems. The increasing use of HHC solvents is increasing the risk. Because of their exemption from many state implementation plans as Volatile Organic Compounds (VOCs), their low flammability hazard, and their not being classified as toxic or carcinogenic substances, HHC solvents are very desirable in many respects.



WARNING

Do not use Halogenated Hydrocarbon (HHC) solvents in pressurized fluid systems having aluminum or galvanized wetted parts. Magnum Venus Products is aware of NO stabilizers available to prevent HHC solvents from reaction under all conditions with aluminum components in closed fluid systems. HHC solvents are dangerous when used with aluminum components in a closed fluid system.

- Consult your material supplier to determine whether your solvent or coating contains Halogenated Hydrocarbon solvents.
- Magnum Venus Products recommends that you contact your solvent supplier regarding the best non-flammable clean-up solvent with the heat toxicity for your application.
- If, however, you find it necessary to use flammable solvents, they must be kept in approved, electrically grounded containers.
- Bulk solvent should be stored in a well-ventilated, separate building, 50 feet away from your main plant.
- You should only allow enough solvent for one day's use in your laminating area.
- NO SMOKING signs must be posted and observed in all areas of storage or where solvents and other flammable materials are used.
- Adequate ventilation (as covered in OSHA Section 1910.94 and NFPA No.91) is important wherever solvents are stored or used, to minimize, confine and exhaust the solvent vapors.
- Solvents should be handled in accordance with OSHA Section 1910.106 and 1910.107.

Catalyst Diluents

Magnum Venus Products spray-up and gel-coat systems currently produced are designed so that catalyst diluents are not required. Magnum Venus Products therefore recommends that diluents not be used to avoid possible contamination which could lead to an explosion due to the handling and mixing of MEKP and diluents. In addition, it eliminates any problems from the diluent being contaminated through rust particles in drums, poor quality control on the part of the diluents suppliers, or any other reason. If diluents are absolutely required, contact your catalyst supplier and follow his instructions explicitly. Preferably the supplier should premix the catalyst to prevent possible “on the job” contamination while mixing.



WARNING

If diluents are not used, remember that catalyst spillage and gun, hose, and packing leaks are potentially more hazardous since each drop contains a higher concentration of catalyst and will therefore react more quickly with overspray and the leak.

Cured Laminate, Overspray and Laminate Sandings Accumulation

- Remove all accumulations of overspray, Fiberglass Reinforced Plastic (FRP) sandings, etc. from the building as they occur. If this waste is allowed to build up, spillage of catalyst is more likely to start a fire; in addition, the fire would burn hotter and longer.
- Floor coverings, if used, should be non-combustible.
- Spilled or leaked catalyst may cause a fire if it comes in contact with an FRP product, oversprayed chop or resin, FRP sandings or any other material with MEKP.

To prevent spillage and leakage, you should:

- | | |
|--|---|
| 1. Maintain your Magnum Venus Products System. | Check the gun several times daily for catalyst and resin packing or valve leaks. REPAIR ALL LEAKS IMMEDIATELY. |
| 2. Never leave the gun hanging over or lying inside the mold. | A catalyst leak in this situation would certainly damage the part, possibly the mold, and may cause a fire. |
| 3. Inspect resin and catalyst hoses daily for wear or stress at the entry and exits of the boom sections and at the hose and fittings. | Replace if wear or weakness is evident or suspected. |
| 4. Arrange the hoses and fiberglass roving guides so that the fiberglass strands DO NOT rub against any of the hoses at any point. | If allowed to rub, the hose will be cut through, causing a hazardous leakage of material which could increase the danger of fire. Also, the material may spew onto personnel in the area. |

Toxicity of Chemicals

- Magnum Venus Products recommends that you consult OSHA Sections 1910.94, 1910.106, 1910.107 and NFPA No.33, Chapter 14, and NFPA No.91.
- Contact your chemical supplier(s) and determine the toxicity of the various chemicals used as well as the best methods to prevent injury, irritation and danger to personnel.
- Also determine the best methods of first aid treatment for each chemical used in your plant.

Equipment Safety

Magnum Venus Products suggest that personal safety equipment such as EYE GOGGLES, GLOVES, EAR PROTECTION, and RESPIRATORS be worn when servicing or operating this equipment. Ear protection should be worn when operating a fiberglass chopper to protect against hearing loss since noise levels can be as high as 116 dB (decibels). This equipment should only be operated or serviced by technically trained personnel!



CAUTION

Never place fingers, hands, or any body part near or directly in front of the spray gun fluid tip. The force of the liquid as it exits the spray tip can cause serious injury by shooting liquid through the skin. NEVER LOOK DIRECTLY INTO THE GUN SPRAY TIP OR POINT THE GUN AT OR NEAR ANOTHER PERSON.



DANGER

Contaminated catalyst may cause fire or explosion. Before working on the catalyst pump or catalyst accumulator, wash hands and tools thoroughly. Be sure work area is free from dirt, grease, or resin. Clean catalyst system components with clean water daily.



DANGER

Eye, skin, and respiration hazard. The catalyst MEKP may cause blindness, skin irritation, or breathing difficulty. Keep hands away from face. Keep food and drink away from work area.

Treatment of Chemical Injuries



CAUTION

Refer to your catalyst manufacturer's safety information regarding the safe handling and storage of catalyst. Wear appropriate safety equipment as recommended.

Great care should be used in handling the chemicals (resins, catalyst and solvents) used in polyester systems. Such chemicals should be treated as if they hurt your skin and eyes and as if they are poison to your body. For this reason, Magnum Venus Products recommends the use of protective clothing and eye wear in using polyester systems. However, users should be prepared in the event of such an injury.

Precautions include:

1. Know precisely what chemicals you are using and obtain information from your chemical supplier on what to do in the event the chemical gets onto your skin or into the eyes, or if swallowed.
2. Keep this information together and easily available so that it may be used by those administering first aid or treating the injured person.
3. Be sure the information from your chemical supplier includes instructions on how to treat any toxic effects the chemicals have.

**WARNING**

Contact your doctor immediately in the event of an injury. If the product's MSDS includes first aid instructions, administer first aid immediately after contacting a doctor.

Fast treatment of the outer skin and eyes that contact chemicals generally includes immediate and thorough washing of the exposed skin and immediate and continuous flushing of the eyes with lots of clean water for at least 15 minutes or more. These general instructions of first aid treatment may be incorrect for some chemicals; you must know the chemicals and treatment before an accident occurs. Treatment for swallowing a chemical frequently depends upon the nature of the chemical.

Emergency Stop Procedure

In an emergency, follow these steps to stop a UPS System:

1. The ball valve located where the air enters the power head of the resin pump, should be moved to the "OFF" or closed position.

Note **The "open" or "on" position is when the ball valve handle is parallel (in line) with the ball valve body. The "closed" or "off" position is when the ball valve handle is perpendicular (across) the ball valve body.**

2. Turn all system regulators to the "OFF" position (counter-clockwise) position.
3. Verify / secure the catalyst relief line, located on the catalyst relief valve.
4. Verify / secure the resin return line, located on the resin filter.
5. Place a container under the resin pump ball valve to catch ejected resin.
6. Locate the ball valve on the resin pump.
7. Rotate the ball valve 90 degrees to the "On" or open position.

Grounding

Grounding an object means providing an adequate path for the flow of the electrical charge from the object to the ground. An adequate path is one that permits charge to flow from the object fast enough that it will not accumulate to the extent that a spark can be formed. It is not possible to define exactly what will be an adequate path under all conditions since it depends on many variables. In any event, the grounding means should have the lowest possible electrical resistance.

Grounding straps should be installed on all loose conductive objects in the spraying area. This includes material containers and equipment. Magnum Venus Products recommends grounding straps be made of AWG No.18 stranded wire as a minimum and the larger wire be used where possible. NFPA Bulletin No77 states that the electrical resistance of such a leakage path may be as low as 1 meg ohm (10 ohms) but that resistance as high as 10,000 meg ohms will produce an adequate leakage path in some cases.



CAUTION

Whenever flammable or combustible liquids are transferred from one container to another, or from one container to the equipment, both containers or container and equipment shall be effectively bonded and grounded to dissipate static electricity. For further information, see National Fire Protection Association (NFPA) 77, titled “Recommended Practice on Static Electrical”. Refer especially to section 7-7 titled “Spray Application of Flammable and Combustible Materials”.

Introduction

This manual provides information for the operation, maintenance, and simple repair of the MVP UltraMax Multi-Color Gelcoater. The following procedures are included:

- Step-by-step assembly and disassembly
- Installation, start-up, and shut-down instructions
- Step-by-step operation instructions



Please read this manual carefully and retain for future reference. Follow the steps in the order given, otherwise you may damage the equipment or injure yourself.

Component Assemblies

MVP's UltraMax Multi-Color Gelcoater can be configured several different ways. The unit is available with either external or internal mix option, and can be customized with up to 6 color options by adding fluid sections. The major components (gun, fluid section, powerhead, and catalyst pump) will vary depending on the configuration of your unit. Each component has its own detailed manual and drawings. For complete repair and maintenance instructions, refer to the appropriate manuals.

Major Components

- POWERHEAD - MPH_VPH-4250 SERIES MANUAL
- FLUID SECTION – VLS-2400 FLUID SECTION (MCPA-2500, MCPA-2500-1)
- CATALYST PUMP – VHPC-2000 METERING PUMP

Gun Options

- ATG-3500 GELCOAT REPAIR & MAINTENANCE MANUAL
- TALON EXTERNAL MIX GELCOAT GUN
- CLASSIC PRO GUN REPAIR MANUAL

- TALON INTERNAL MIX GELCOAT GUN

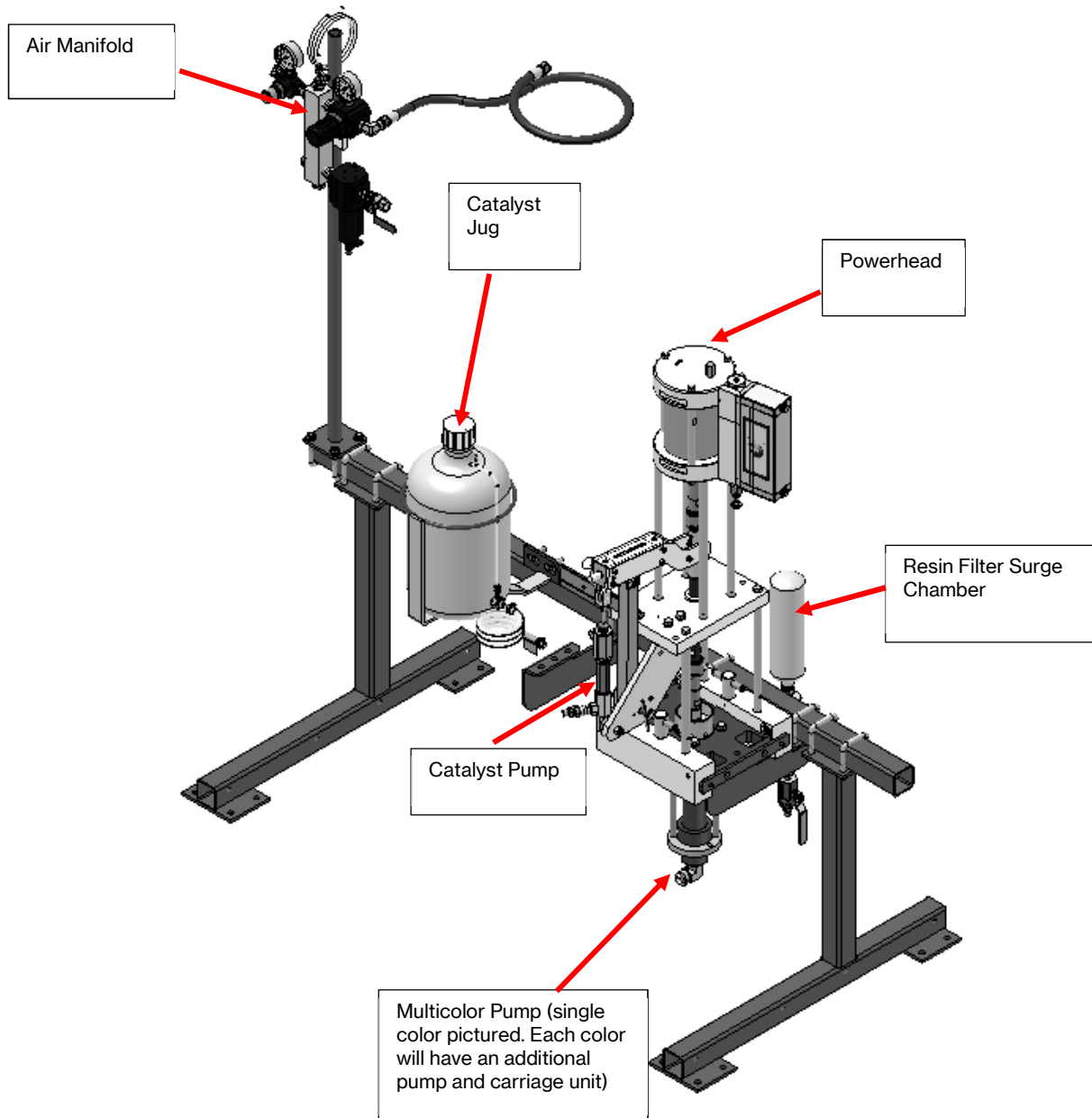
Optional Items

- MAGNAPAC FLUID SECTION – MCPA-2500-MP, MCPA-2500-1-MP
- 5" POWERHEAD & TRACK ASSEMBLY – MCTA-5000
- VLS-4600 FLUID SECTION – MCPA-4600
- HIGH VOLUME FLUID SECTION – MCPA-HVLS

Most operation procedures will be the same for all of the configurations. If there are differences, they will be noted in this manual.

Unit Overview

Below helps identify the main components and controls the operator needs to know for proper operation for the unit.



Getting Started

1. Unpack unit and components.
2. Assemble frame as needed.

Note *If your unit is configured with a mobile option kit, refer to the installation instructions included with the kit for set-up.*

3. Install the carriage assembly to the pump module assembly.
4. Install the catalyst jug.
5. Install the gelcoat filter and surge chamber assembly.
6. Install the air manifold and manifold air hose to the powerhead.
7. Attach hose fittings to the gelcoat pump, catalyst pump, and gun air.
8. Attach pickup hoses to the inlet of the pump.
9. For internal mix units, place the flush tank in the holder and attach the air hose from manifold, then connect the yellow flush tube from the gun to the flush tank.
10. Double check all hose fittings and connections to make sure they are tight.

Note *If your unit is configured with heaters, refer to the installation instructions provided with the heater when you reach this stage of the set up.*

Note *If your unit is configured with a catalyst alarm, refer to the catalyst alarm manual when you reach this stage of the set up.*

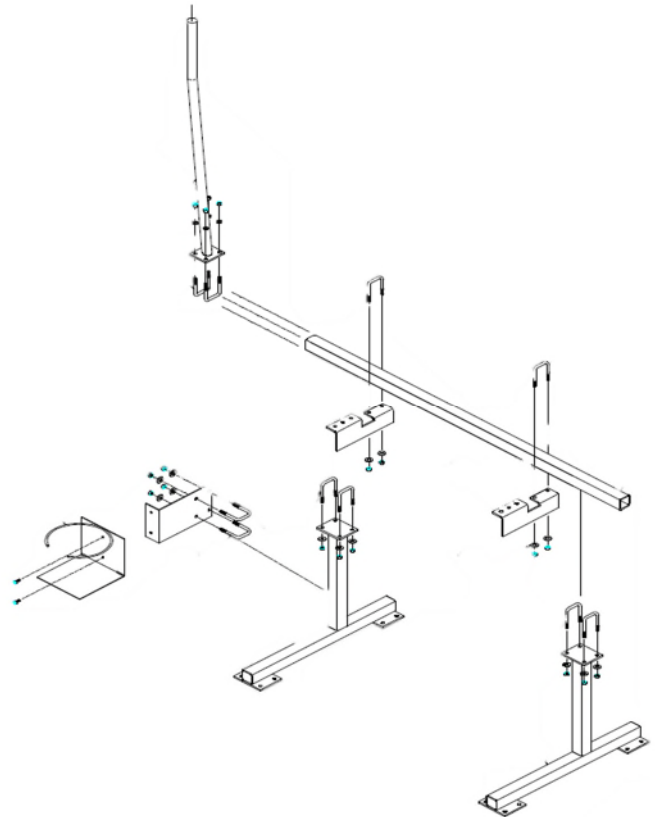


Figure 1. Frame Assembly

Connect to Air Supply

11. Connect a minimum ½ inch air hose to supply the system, and at least 18 CFM (510 L/min) at 90 – 100 psi (6 – 7 bar).
12. Open the incoming air supply ball valve all the way.

Note *The main air supply ball valve is a safety ball valve and must be all the way open or all the way closed. When the ball valve is closed the air pressure remaining in the air manifold and air system will be released.*

13. Check that the system air is set to 90 – 100 psi.

Changing Between Colors

1. Trigger the gun or use the priming button to move the pump so that it is at the bottom of the stroke (lowest position).
2. Prepare the gun as follows:
 - *External Mix:* Brush gelcoat spray tip and catalyst tip with solvent.
 - *Internal Mix:* Flush mix chamber with solvent.
3. Turn the air motor regulator knob counterclockwise to lower the air pressure to zero.
4. If a return hose is not installed, place an appropriate container under the ball valve.
5. Open the ball valve at the bottom of the resin filter housing to relieve resin pressure to the supply drum or container.

Note ***Do not release fluid pressure from the hose until it is no longer in use.***

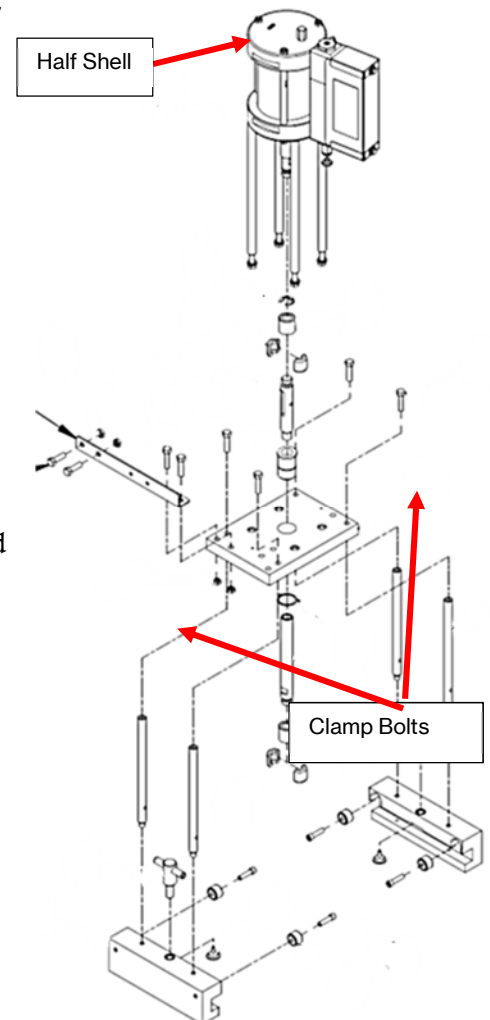
6. Release the pressure in the gel coat accumulator by pushing a small dull rod (such as an Allen wrench) into the top of the accumulator charging valve.
7. Rotate the ball valve on the catalyst manifold to the open position; this will relieve catalyst pressure to the supply jug as the air motor is operated to release or connect to a color pump.
8. Close the ball valve at the quick disconnect end of the resin hose assembly.
9. Disconnect the current resin hose assembly (or color) from the gun assembly and clean the quick disconnect fittings with solvent.

Note ***It is important to keep the quick disconnect fittings clean so that the O-ring the female quick disconnect does not become damaged and leak.***

10. Connect the gelcoat hose assembly for the new color to the gun assembly and open the ball valve at the quick disconnect end of the gelcoat hose.
11. Push up on the sleeve holding the coupling half shells in place and remove the coupling half shells from the rod ends.
12. Turn the two clamp bolt assemblies counterclockwise to loosen.
13. Slide the carriage assembly to the approximate center of the desired fluid section and align the shafts.

Note ***The air motor shaft or fluid section shaft may need to be moved up or down to allow proper alignment.***

14. When the shafts are properly aligned and touching end to end, push the sleeve and reinstall the two coupling half shell connectors.
15. Turn the clamp bolt knobs clockwise to retighten.



16. Charge the gelcoat accumulator (if applicable to the system).
17. Close the ball valve at the bottom of the gelcoat filter body.
18. While pressing the pump prime button, adjust the pump regulator to the desired air pressure.
19. Close the ball valve on the catalyst manifold.
20. Using the catalyst drive, hand prime the catalyst pump pressure and replace the pivot pin into the slide drive assembly.
21. Adjust the spray pattern as desired.

Testing and Adjusting

Establishing a Good Fan Pattern

To make the most of MVP's low-pressure pumping systems and airless, internal mix guns, the operator must understand how to adjust the system for maximum efficiency.

Note ***Because conditions and materials vary widely, these are not specific instructions, but guidelines and tests so that you can tune your MVP equipment to meet your needs.***

Use just enough pressure to the power head to establish a spray fan and no more. If more material is required, use a spray tip with a larger orifice. If a wider spray fan is required, use a tip that provides a wide fan.

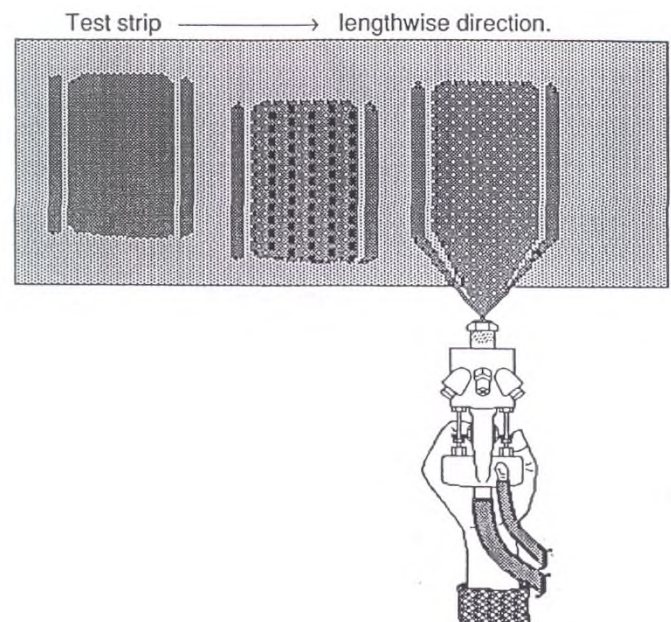
1. Lay out a strip of material such as paper or cardboard for the test.
2. Adjust the main pump pressure regulator until the operating pressure is 20 psi.
3. Do a short test spray on the test material.

Tip ***To save material and make identification easier, spray lengthwise across the material strip.***

4. Flush the gun into an appropriate container after each test shot.
5. If the first test shot had an established fan pattern, back off 5 psi and shoot another pattern.

Note ***It is unlikely that 20 psi will be adequate pressure to establish a fan pattern.***

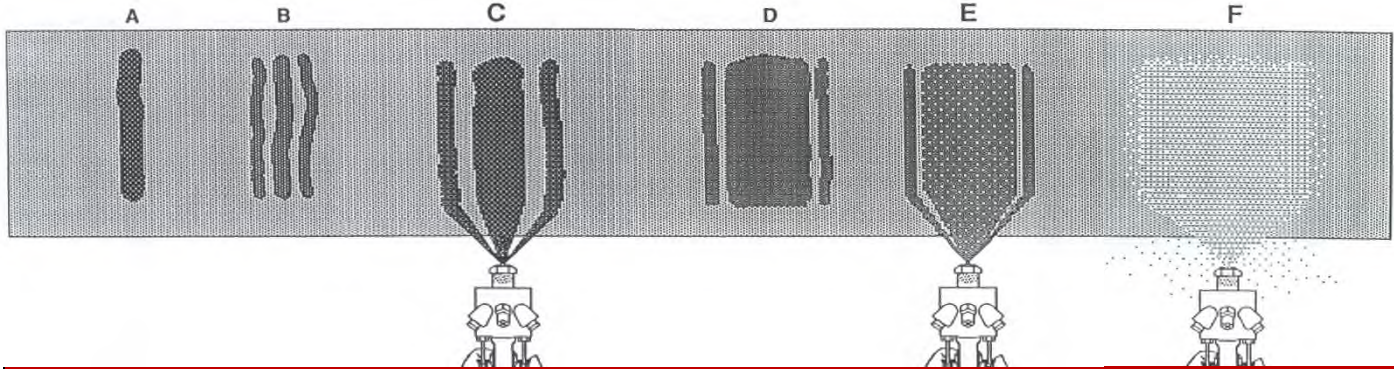
6. Keep backing off pressure until the unit no longer produces a fan, then slowly increase the operating pressure until there is just enough to form a soft-looking spray fan.
7. If the pressure was not adequate to form a well-defined fan pattern, increase the main pump



pressure by 5 psi and do another short test spray.

8. Repeat step until a well-defined spray pattern is obtained, then return to step .

Adjusting



What to look for in test shots:

If you see	Cause / Description	Adjust as follows:
One narrow stream (A)	The operating pressure is very low for the material you are using	Increase the operating pressure Increase the material temperature Use a smaller nozzle
Three heavy fingers (B)	Horns are beginning to develop, but the operating pressure is still very low	Increase the operating pressure Increase the material temperature Use a smaller nozzle
Middle of the stream is wider (C)	Horns are developing but it is still not the full width it should be for the nozzle	Increase the operating pressure Increase the material temperature
Pattern is at or near full width but with clearly defined fingers (D)	There are well-defined fingers, but it is not yet a usable fan	Slightly increase operating pressure Slightly increase material temperature
Pattern is nearly full width (E)	The fingers are barely visible and the material is starting to fill into the whole spray pattern	Slightly increase operating pressure Slightly increase material temperature
Pattern is full width (F)	The fingers are no longer visible and the whole spray pattern is constant and even.	This is optimal pressure to provide the most efficient fan; no adjustment needed.
Pattern is too wide	Heavy misting is seen and smelled, there is significant overspray (material laid down beyond the main pattern), and heavy frothing may appear	Decrease the operating pressure until the fan pattern fails, then add 5 psi and continue testing until you get the proper fan pattern back. Note Too much pressure is the most common mistake when running MVP equipment.

Priming the Unit

Prime Solvent (Internal Mix Systems Only)

1. Open solvent tank lid and fill $\frac{3}{4}$ full.
2. Install lid on tank and close the relief valve located on the top of the lid.
3. Set flush tank pressure at 50 – 60 psi (3.5 – 4 bar).
4. Check for leaks and fix as necessary.
5. Push the flush valve on the side of the gun block to test solvent flush.

Select Gelcoat Pump Color

6. With the carriage assembly connected to the desired gelcoat fluid section, connect the accompanying gelcoat hose assembly to the gun.
7. Open the ball valve at the quick disconnect end.

Prime Catalyst to Gun

8. Prepare the gun as follows:
 - *External Mix:* Remove the catalyst and spray tip from the front of the gun.
 - *Internal Mix:* Tighten the packing nuts on the gun and trigger 10 to 15 times. Snug packing nuts again and repeat gun triggering three to four times total. Remove nozzle and mixer from the mix chamber.
9. Tighten the catalyst packing nut $\frac{1}{8}$ to $\frac{1}{4}$ of a turn to snug packing.
10. Fill the catalyst jug $\frac{3}{4}$ full, then purge the air out of the catalyst feed line by slightly tilting the catalyst jug.
11. Open the recirculation valve on the catalyst manifold.
12. Remove the pivot pin for the catalyst drive linkage.
13. Using the catalyst drive, hand prime catalyst back to the jug through the recirculation valve until there is no air in the tube.
14. Close the recirculation valve on the catalyst manifold.
15. Lock or hold the gun in the open position over an appropriate container.
16. Remove the pivot pin from the catalyst drive linkage and use the catalyst drive to hand prime catalyst out to the gun until a steady stream is achieved.

Note ***Do not reinstall the pivot pin at this time. Open the recirculation valve at the catalyst manifold to prevent over pressurizing the catalyst system.***

Prime Gelcoat to Gun

Note ***The resin pump was tested using oil. You may need to run up to ½ gallon (1 - 2 liters) of gelcoat through the unit to purge any remaining oil from the system.***

17. Fill the packing nut cavity $\frac{3}{4}$ full with throat seal oil (TSL).
18. Clamp or tape both ends of the resin return hose in place from the bottom of the inline filter and to the return wand.
19. Insert the gelcoat suction wand into a container of gelcoat.
20. With the gun locked in the open position, slowly increase pump regulator pressure until the pump is running at a slow but steady rate.
21. Allow the pump to run until a steady stream of gelcoat is being dispensed, then close the gun.
22. Clean the gun as follows:
 - *External Mix:* Brush the front of the gun head with solvent until clean.
 - *Internal Mix:* Flush the mix chamber clean.
23. Slowly increase gelcoat pump pressure to 100 psi (7 bar).
24. Allow the unit to set under static load for 15 to 30 minutes to seat the resin packing set.
25. Turn the pump regulator to zero.
26. Slowly open the ball valve at the bottom of the resin filter to drain the fluid pressure.
27. Perform steps 20 to 26 to prime each fluid section/color individually.

Charge Gelcoat Surge Chamber (if Applicable)

28. Open the ball valve below the inline resin filter.
29. Use the air hose with the female quick disconnect (charging hose) and insert over the male quick disconnect at the top of the resin surge chamber.
30. Push down on the female quick disconnect for 5 to 10 seconds and disengage.
31. Close the ball valve below the inline filter.

Pressurize Fluid

The gelcoat unit is standard with a safety override valve that automatically opens and closes the air supply to the pump air motor. The safety valve opens when someone opens the gun trigger or pushes the priming button.

Note ***On the air manifold, the blue valve is the safety override. The small brass button next to the valve is the priming button.***

32. Remove the catalyst pivot pin before pressurizing gelcoat to the pump.
33. Push the priming button and slowly increase the gelcoat pump pressure to about 40 to 50 psi (as a starting point).

34. Move the catalyst drive arm slowly up and down to pressurize the catalyst pump as follows:
 - *External Mix:* Prime a little pressure, but there is no gauge on the system to determine exact pressure.
 - *Internal Mix:* Prime to 200 – 400 psi. There should be a gain in pressure on both the up and down strokes indicated on the catalyst pressure gauge.
35. Pin the catalyst drive into the pivot arm at the desired catalyst percentage.

Setup Gun – Internal Mix

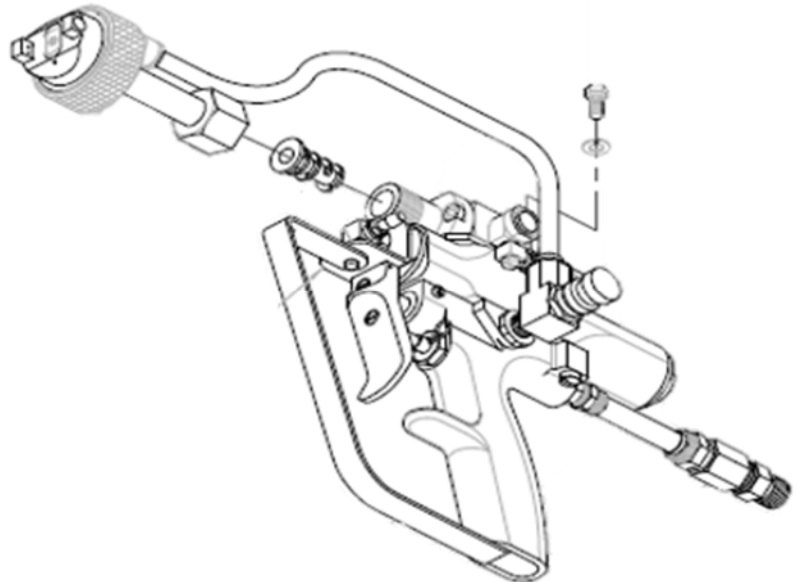
36. If your unit is configured with an external mix gun, skip to .
37. Use a little red grease on the O-rings and threads, then install the spray tip, catalyst tip, and retainer.
38. Install turbulent mixer into the mix chamber.
39. Insert static mixer and spray tip onto the air assist housing.
40. Screw air assist onto the gun mix housing.

Note ***For longer turbulent mixer life, do not overtighten the air assist nozzle housing.***

41. Attach air assist tube from needle valve on side of gun handle to air assist head.
42. Spray a test pattern following the guidelines in the section until a fairly uniform pattern is achieved.
43. Skip to .

Setup Gun – External Mix

44. Use a little red grease on the O-rings and threads, then install the spray tip, catalyst tip, and retainer.
45. Install the gelcoat spray tip into the front of the gun block.
46. Install the catalyst tip over the spray tip, using caution not to damage the O-rings in the front of the gun block.
47. Install the retainer to secure the catalyst tip and spray tip in place.
48. Spray a test pattern following the guidelines in the section until a fairly uniform pattern is achieved.



Performing Daily Tasks

Daily Startup – External Mix

1. Check all hoses for damage.
2. Check all material supplies and fill or replace as needed.
3. Open the recirculation valve on the catalyst manifold.
4. Open the main air inlet air valve on the manifold.
5. Remove the pivot pin from the catalyst drive.
6. Manually pump the catalyst pump with the catalyst drive until the catalyst stream returning to the jug is air free.
7. Close the recirculation valve on the catalyst manifold.
8. Manually pump the catalyst pump with the slave arm drive until the catalyst pressure reaches operating pressure of about 100 psi.
9. Check the pump pressure; if adjustment is needed, press and hold the priming button while adjusting the air pressure slowly until it reaches operating pressure.
10. Replace the pivot pin into the catalyst pump drive.
11. Check atomizing air pressure and adjust as necessary.
12. Lubricate the nozzle O-rings, stud O-rings, and gun front threads.
13. Install the nozzle, catalyst tip, and retaining ring onto the front of the gun.

Daily Shutdown – External Mix

14. Wipe the face of the nozzle and catalyst tip with solvent.
15. Turn off the main air ball valve at the air manifold.
16. Remove the nozzle and catalyst tip and clean with solvent.
17. Wipe the gun face clean with a rag or brush and solvent.
18. Hang the gun with the gun block exit holes facing down.

Daily Startup – Internal Mix

19. Check all hoses for damage.
20. Check all material supplies and fill or replace as needed.
21. Close the flush tank relief valve.
22. Open the recirculation valve on the catalyst manifold.
23. Open the main air inlet valve on the manifold.
24. Remove the pivot pin from the catalyst drive.
25. Manually pump the catalyst pump with the catalyst drive until the catalyst stream returning to the catalyst jug is air free.

26. Close the recirculation valve on the catalyst manifold.
27. Manually pump the catalyst pump with the slave arm drive until the catalyst pressure reaches operating pressure of about 100 – 200 psi.
28. Check pump pressure; if adjustment is needed, press and hold the priming button while adjusting air pressure slowly.
29. Replace the pivot pin into the catalyst pump drive.
30. Insert the distribution ring into the mix chamber locating rim.
31. Place the mix housing seal into the mix chamber locating rim.
32. Insert the catalyst injector and injector seal into the aperture in the distribution ring (the spring goes into the gun block).
33. Place the mix chamber and catalyst injector onto the front of the gun and secure it with the 2 screws.
34. Apply a small amount of red grease to the threads of the mix chamber.
35. Install the mixer, seal, and air assist assembly onto the mix chamber.

Daily Shutdown – Internal Mix

36. Flush the mix housing and air assist with solvent.
37. Wipe the face of the air assist nozzle after flushing.
38. Turn off the main air ball valve at the air manifold.
39. Release the solvent flush tank pressure.
40. Disassemble the air assist and clean it with solvent.
41. Remove the mix housing and clean.
42. Wipe the gun block face with a clean rag.
43. Hang the gun with the gun block exit holes facing downward.

Maintaining System

Daily Maintenance

1. Drain the water trap.
2. Remove the air-assist tip and static mixers from housing and clean.
3. Remove turbulent mixer and mix chamber from gun and clean.
4. Lightly dampen a rag with solvent and wipe down the gun head, handle, and actuator.

Note ***Do not soak the gun in solvent.***

5. Clean the resin hose assembly quick disconnects.

Weekly Maintenance

Gelcoat Pump Packing Set

6. Check gelcoat pump piston rod oil reservoir and inspect for gelcoat bypassing packing set.
7. Turn pump regulator to zero.
8. Open ball valve at gelcoat filter to release gelcoat pressure.
9. Insert a rod or Phillips screwdriver into one of the holes in the gelcoat packing nut.
10. Turn the packing nut $\frac{1}{8}$ to $\frac{1}{4}$ turn. Do not overtighten.

Gun

11. Turn the pump regulator pressure to zero.
12. Open the ball valve at the filter to relieve gelcoat fluid pressure.
13. Open the catalyst recirculation valve at the catalyst manifold to relieve catalyst fluid pressure.
14. Snug the gun packing nuts lightly and trigger the gun on and off to seat the resin and catalyst seals.
15. Repeat a second time.
16. Close the catalyst recirculation valve at the catalyst manifold.

Filter and Accumulator

17. Turn gelcoat pump regulator to zero.
18. Open the ball valve at the gelcoat filter to relieve gelcoat fluid pressure.
19. Cover a small diameter rod with a rag, then insert into the check valve on top of the resin accumulator and depress to bleed off the charge.
20. Remove the return hose from the ball valve.
21. Unscrew the resin filter and clean the filter screen.
22. Use red grease on the filter housing threads.
23. Unscrew the gelcoat accumulator.



WARNING

If accumulator is difficult to unscrew by hand, it may still be charged. Gently push a rod into the resin filter body and push up on the poly ball to relieve the charge from the accumulator. Only unscrew the accumulator when the charge is fully relieved.

24. Clean the accumulator, poly ball, and thread on the nipple.
25. Inspect the O-ring for wear and replace as needed.
26. Coat the nipple, the O-ring, and the poly ball with red grease.

Catalyst Pump

27. Inspect the catalyst pump packing nut on top of the catalyst pump for catalyst leaking through the packing set.
28. Tighten the packing nut no more than $\frac{1}{8}$ of a turn at a time, as needed.
29. Wipe catalyst pump piston rod off with a clean dry towel.

Six Month Maintenance

Flush Tank

30. Turn pump pressure regulator knob counterclockwise until the gauge reads zero ("0").
31. Flush the gun into an appropriate container.
32. Use a clean towel to wipe the inside of the tank clean.
33. Wipe out any solid debris.
34. Inspect the flush tank O-ring for cracking or other damage; replace as needed.

Hose Set

35. Inspect the hose set for any kinks or wear and replace hoses as needed.

Note *Replace the flush hose once a year.*

Catalyst Jug and Feed Hose

36. Drain catalyst from jug.
37. Wash the jug out with distilled water and drain.
38. Repeat rinsing with distilled water.
39. Replace the feed and return hose as needed.

The following components should be rebuilt after six months of full time use (8 hours a day, 5 days a week).

For this component	Minimum rebuild should include:
Catalyst Pump	<ul style="list-style-type: none"> • All O-rings • All balls • Piston seal • Packing set
Gelcoat Pump	<ul style="list-style-type: none"> • Packing set • Piston cups • Cylinder O-rings
Gun	<ul style="list-style-type: none"> • All seals • All O-rings