TURBO LINER Inc.

POLYUREA ELASTOMERIC COATINGS

Training Manual 2010

TURBO LINER Inc.
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www.turboliner.com

Dear Customers and Students:

Welcome to Turbo Liner, advanced spray-in bedliner training program. We have created this curriculum to give you the advantage of a comprehensive working knowledge in this industry.

Each day will bring into focus new techniques for the competent application of plural component materials. We hope that you will take the time to complete the questionnaires provided. This will help us to help you and those students attending future training programs. In addition, if you require something not provided or not covered in this course, feel free to ask your instructor for additional information.

The basis of Turbo Liner's business policy is service, service, and service. We want you to be completely satisfied with all of our products and equipment. We also want to provide you with the best technical support in the industry. If you require any assistance after this course is completed feel free to contact our technical staff at any time.

Good luck and best wishes for a prosperous future.

Vince Self,
Marketing Manager
Turbo Liner

Turbo Liner Training Agenda

1. Orientation

2. Safety

- **MDI's & 7 Important points when working with MDI's**
- **PPE & Model Respiratory Protection Program**

3. Chemicals

- **The basics of Polyurea**
- **Polyurea Spray Coatings Systems**
- **Support Chemicals**
- **How to use Cil Bond 41 and NMP for repairs**
- **Remember This**

4. Technical Training

- **Spray guns (setup and usage)**
- **Watch DVD on Probler and Probler P2 guns**
- **Machines (Pneumatic, Hydraulic setup, usage & Troubleshooting)**
- **Transfer pumps (setup and usage)**
- **Start-up and shut-down**
- **Troubleshooting the spray system.**

5. Liner shop

- **Watch How to Spray A Bedliner DVD**
- **Using string line tape**

6. Review

- **Question & Answer (lets talk about what we just went over)**

7. Technical support

- **Other technical documents (related to pumps, hoses, guns & machines)**
- **All of our tech support staff Vinny, Johnny or Mark can be reached at 877-678-8726 ext. 1 or by cell phones.**
- **Vinny 208-755-1714**
- **Johnny 208-755-2934**
- **Mark 208-755-2958**
- **If you need assistance please call.**

COURSE OBJECTIVE

1. Understand the basic chemicals and how they work.
2. Using plural component materials correctly.
3. Learn the proper troubleshooting procedures to avoid costly mistakes and downtime.

You are the manufacture of the completed product!
You are responsible for the proper application of the finished product!

OUR SUGGESTION TO IMPROVE YOUR ABILITIES

1. Follow start up and shut down procedures.
2. Keep the troubleshooting guide in this book and equipment manuals as a reference.
3. Understand the project and its requirements before proceeding.
4. Never begin the application until the gun and equipment are operating normally.
5. Fill out a log for each day. Keep track of your materials.
6. Never start to spray without doing a test shot first. Check that the material sets up correctly and check your gauges, heat and material supply.

GETTING THE MOST FROM THIS COURSE

Answer the following questions for yourself and make sure you get those answers before you leave.

1. Why are you here? Really.
2. What problems have you had that were never solved or not dealt with fully?
3. Is your gun operating like it did when it first came out of the box?
4. Is your machine operating as it did when it was new?
5. What heat and pressure settings do you use, and are they correct?
6. What is the minimum storage temperature for your material?
7. What is the first thing you should do when an off ratio problem occurs?
8. Do you throw everything in the truck and go home at the end of the day without cleaning and maintaining your equipment?

SAFETY

RESPIRATORY PROTECTION AND SAFE HANDELING PRACTICES

1. Avoid breathing vapor without proper protection as sensitization can occur.
2. Use a spray suit with a hood.
3. Use your full faced fresh air mask.
4. NO SMOKING
5. Take every precaution to avoid contact with skin.
6. KEEP THE CHEMICALS OUT OF YOUR BODY!
7. Have a copy of all MSDS sheet readily available in case of an emergency.
8. Remove all waste materials (test spray patterns) and solvents from the work area when done.
9. Use solvents compatible with Aluminum. **DO NOT USE HALOGENATED SOLVENTS** (i.e., Methylene-chloride)!

ABSLOUTELY NO OPEN FLAMES – Display placards

SEVEN IMPORTANT POINTS FOR WORKING WITH MDI LINER MATERIALS

Here are seven important points you will want to know when applying spray-on truck bed liner (TBL) products containing MDI (methylene diphenyl isocyanate) and/or polymeric MDI (PMDI).
The Alliance for the Polyurethanes Industry (API), prepared this guide to help remind professionals like you about important health and safety aspects of working with MDI during spray-on truck bedliner applications. Although MDI is a commonly used material in truck bed liner systems, it is not the only material in the system that may be potentially harmful to your health; therefore, it also is important to read all the information contained in your supplier's Material Safety Data Sheets (MSDS) for the particular TBL product you are using. MSDS sheets are the primary sources of extensive and specific information on MDI, PMDI and other TBL system ingredients.
This guidance document is intended to help truck bed liner companies educate its workers and provide appropriate worker protection related to MDI/PMDI. Neither API nor its member companies are responsible for worker protection, or worker protection programs, for truck bed liner companies.

1. WHAT IS MDI? The acronym MDI was derived from one of the chemicals many names, methylene diphenyl diisocyantate. Polymeric MDI is a mixture of monomeric MDI and polymeric MDI and is a brownish liquid at room temperature. MDI/PMDI is one component used in the application of polyurethane and polyurea coatings, which are used in truck bed lining (TBL) products; typically referred to as the "A-side" or the "iso-side" of the system. Although the spray application of these products protects the truck bed, the actual spraying of the truck bed liner requires special handling and care.
2. RECOGNIZING POTENTIAL HEALTH HAZARDS Contact with excessive amounts of MDI can be harmful to your health. When MDI is sprayed, you may be overexposed by:• Breathing high airborne concentrations of MDI • Getting MDI on your skin• Getting MDI in your eyes• Swallowing MDI In addition to what is identified in the product's MSDS, here are some examples of the effects of overexposure and some recommended first-aid procedures: Inhalation: If MDI is sprayed or heated, there is a chance of overexposure. MDI can irritate your nose and lungs. With overexposure, you may feel tightness in your chest and have difficulty breathing. If you continue to be overexposed, you may become sensitized (i.e., allergic) to MDI. Once sensitized, the effects

may start as soon as you begin to work with the product, or later on in the day after you've stopped working with the product (e.g., when you've left work). If you are sensitized you may experience health effects even when airborne MDI levels are very low and may be at risk for experiencing an asthma attack. If this happens, DO NOT CONTINUE TO WORK WITH MDI; asthma attacks can be life-threatening. If you start to feel any of the symptoms listed above, let your supervisor know immediately and seek medical attention. If you suspect someone has become overexposed, remove the person to an area with fresh air, and try to keep them calm and warm, but not hot. If they are having difficulty breathing, a qualified person may provide oxygen. If they stop breathing, have trained first aid personnel give artificial resuscitation. Seek emergency medical attention. Skin Contact: Getting MDI on your skin may result in allergic sensitization. In addition, animal tests have indicated that skin contact, followed by an inhalation exposure, may result in lung sensitization. If these symptoms occur seek immediate medical attention. Repeatedly getting MDI on your skin may cause discoloration, redness, and swelling or blistering; this also could lead to skin sensitization. It is best, therefore, to conduct your work to avoid skin contact, but if you get MDI on your skin, wash it thoroughly with soap and flowing water as soon as possible after exposure. Eye Contact: Getting MDI in your eyes can be painful and could cause tearing and irritation. If you get MDI in your eyes, wash them immediately with a continuous flow of lukewarm, low pressure water, preferably from an eyewash fountain, for at least 15minutes. Seek immediate medical attention. Ingestion: Swallowing MDI can cause irritation. If you swallow MDI, do not induce vomiting. Wash out the mouth with water. The person affected should be made to rest and seek immediate medical attention. Additional information about these potential health hazards is available through the product's MSDS and in literature on the API website at www.polyurethane.org.

3. PROTECTING YOURSELF FROM MDI EXPOSURE With proper precautions and the use of personal protective equipment (PPE), you can protect yourself from overexposure to MDI during the application of your TBL system.

A: For tasks that do not involve spraying (such as cleaning equipment), but where you may have direct contact with MDI liquid (at room temperature), you should use:
•Safety glasses or goggles
•MDI-resistant chemical gloves (i.e., nitrile)
•MDI-resistant clothing (i.e., apron or coveralls)
•Safety shoes or boots

B: When spraying a truck bed liner system, you should use:
•An approved supplied air respirator (as outlined in your company's Respiratory Protection Program)*
•Safety goggles (where applicable)
•MDI-resistant chemical gloves (i.e., nitrile)
•MDI-resistant long-sleeve coveralls or full body suit with hood
•MDI-resistant fitted boots/booties
For other tasks where there is the potential for exposure to MDI vapor/mist, follow the guidelines suggested in Point 3B. Workers not wearing the correct PPE should not enter the spray enclosure until the airborne MDI levels are below the allowable limits. Additional information to help protect you is available through the product's MSDS and in literature on the API website at www.polyurethane.org.

4. WEARING A RESPIRATOR According to the Occupational Safety and Health Administration's (OSHA) Respiratory Protection Standard, you are required to have a medical evaluation and receive medical approval before using a respirator. After approval is given, a fit test is required. The fit test is conducted using the respirator you will be wearing on the job. Each time you use a tight-fitting facepiece, you must conduct a 'user seal check'. However, tight-fitting facepiece respirators are not permitted for use if:

•You have facial hair that interferes with either the sealing surface of the respirator and the face,or interferes with the valve function;
•You wear corrective glasses/goggles or if other personal protective equipment interferes with the seal of the facepiece; and,
•Any other condition interferes with the facepiece seal.

Respirators should be regularly cleaned and disinfected according to the instructions provided by the respirator manufacturer. Deteriorated parts must be replaced prior to equipment use. Respirators should be inspected regularly for:

•Cracks, tears, holes, facemask distortion, cracked or loose lenses/face shield
• Breaks, tears, broken buckles/clasps, over-stretched elastic bands in head strap
• Residue/dirt, cracks or tears in valve and absence of valve flap; and,
• Breathing air quality/grade, condition of supply hoses, hose connections; settings on regulators and valves.

Defective respirators or those with defective parts should be taken out of service immediately. Notify your supervisor about all respirator defects. Additional information about respirators is available through the product's MSDS, in your company's Respiratory Protection Program, and in literature on the API website at www.polyurethane.org.

5. CONTAINING THE OVERSPRAY Appropriate ventilation, combined with a properly designed spray enclosure, is needed in the TBL industry to help minimize exposure to MDI. The use of a ventilated enclosure helps to contain spray mists and vapors that develop during TBL application. Further, exhaust ventilation systems with efficient filters help to capture the spray mist, which reduces the potential exposure to people outside the building. While there is no "set " standard as to which truck bed liner enclosure design is most effective at controlling MDI vapors/mists, here are some guidelines that are known: 1) the enclosure should maintain a negative pressure with respect to the outside environment(i.e., the air should be pulled into the enclosure not pushed out of the enclosure); 2) it should be sized to allow the truck bed to fit, while giving you space to move safely within the enclosure; and 3) as previously mentioned in Point #3, you should wear the appropriate level of personal protective equipment. A preventive maintenance program for the ventilation system will help you to know when to change filters, check the airflow, etc. A truck bed liner should not be sprayed until the ventilation system is operating properly and the right level of PPE is being used. Workers needing to enter the enclosure while an applicator is applying a bed liner, or shortly after the application has stopped, also should wear the appropriate level of PPE.
6. COMPLETING THE JOB PPE should be removed only after exiting the spray booth and completion of cleanup. PPE also should be worn while cleaning MDI-contaminated equipment and while handling any containers with MDI (i.e.,drums, buckets, etc). The type of PPE needed should follow the guidelines presented in Point #3.It is a good work practice to keep all work clothing at work. Any clothing contaminated with MDI should be removed and properly disposed of or cleaned. Leather items cannot be decontaminated. Any contaminated leather items including shoes, belts, and watch bands or clothing, which have beenexposed to MDI, should be properly discarded.MDI is a reactive chemical; therefore, the MDI container should be kept sealed to reduce

contamination. However, resealing MDI containers contaminated with water or polyol can cause a buildup of pressure in the container due to the generation of carbon dioxide. A pressurized container may rupture. MDI can self-react in a fire or at very high temperatures and release carbon dioxide. Carbon dioxide can build pressure in sealed containers sufficient to cause rupturing of the container. Additional information to help protect you is available through the product's MSDS and in literature on the API website at www.polyurethane.org.

7. RESPONDING TO EMERGENCIES Fires, spills, and other emergencies involving MDI require an immediate response by trained and knowledgeable personnel. If you have not been trained to respond to an emergency, leave the area immediately and notify the appropriate emergency response personnel. If you need additional guidance, call CHEMTREC® at 1-800-424-9300.CHEMTREC® operators are available 24 hours a day, seven days a week. CHEMTREC® is a communication center dedicated to assisting emergency responders handling incidents involving hazardous materials.

The seven important points in this guidance document are not all-inclusive and do not identify all the safety measures or legal requirements that may apply to your particular worksite. Consult the supplier's MSDS for additional information. This document is not designed or intended to provide, define or create legal advice, rights or obligations. API, part of the American Chemistry Council, does not make any warranty or representation, either express or implied, with respect to the accuracy or completeness of the information contained in this document; nor does API assume any liability of any kind whatsoever resulting from the use of or reliance upon any information, conclusions, or opinions contained herein.

The next section is a Model Respiratory Protection Program for you to take back to your shop for review only. These types of programs are a good tool to make sure that everyone that will be in the area where our linings are being sprayed will be protected properly.

More information can be found in our Health & Safety manual.

Respiratory Protection Program

RESPIRATORY PROTECTION PROGRAM

For

_____

(Company Name)

_____

(Street Address)

_____

(City, State, Zip code)

As required by (29 CFR §1910.134)

Preface

Truck bed lining products have protected vehicles from wear and tear over many years through the application of polyurethane, polyurea or polyurea hybrid systems. Though the spray application of these products protects the truck bed, the actual spraying of the truck bed liner (TBL) requires specific handing and care. Virtually all truck bed lining products use methylene diphenyl diisocyanate (MDI), a material that belongs to the class of chemicals known as diisocyanates. Diisocyanates such as MDI have been known to cause irritation of the eyes, nose, throat, lungs and skin. MDI also may cause allergic reactions (sensitization) of the skin and lungs. When sprayed, the potential for exposure is even higher; therefore, in such environments, respirators are necessary. Where respirators are necessary to protect the health of employees, the Occupational Safety and Health Administration (OSHA) requires a respiratory protection program (29 CFR §1910.134). The purpose of this document is to describe the elements of a model respiratory protection program for the TBL industry.

Though not exhaustive, the information provided in this document may assist TBL application facilities in the development of a respiratory protection program. Be aware that there may be other federal, state, and local regulations that apply to the operations at your worksite beyond those mentioned in this document. Respiratory protection, however, is only one element of a worker protection program for TBL application facilities. Respirators, coupled with other protective measures such as appropriate ventilation and additional personal protective equipment, can help minimize the risk of exposure to MDI while applying spray-on truck bed liners.

RESPIRATORY PROTECTION PROGRAM

For:

_____

(Company Name)

Table Of Contents

I. Purpose and Scope

The purpose of this program is to protect _____ (company name) employees from respiratory hazards, so as to be in compliance with the Occupational Safety and Health Administration's (OSHA's) requirements for a respiratory protection program, as identified in the Respiratory Protection Standard (29 CFR §1910.134).

Engineering controls, such as an enclosure (i.e., a contained application room) with ventilation, is the first line of defense towards the protection of an employee's safety and health during spray-on TBL operations. However, these controls may not be completely effective in controlling airborne hazards. When effective engineering controls are not feasible a respirator, in combination with other types of personal protective equipment, must be used. The tasks requiring respirator use, which are associated with the preparation and application of spray-on TBLs, are outlined in Table 1.

A. Mandatory Use of Respirators

(29 CFR §1910.134(c)(1)) "In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the employer, the **employer shall establish and implement a written respiratory protection program** with worksite-specific procedures. The program shall be updated as necessary to reflect those changes in workplace conditions that affect respirator use. The employer shall include in the program the following provisions of this section, as applicable:"

_____ (company name) has determined that employees tasked with the preparation and application of TBLs are potentially exposed to respiratory hazards. All employees performing these tasks, therefore, must wear the designated equipment, or equipment providing greater or equivalent protection.

Situations or tasks that may potentially expose workers to respiratory hazards include:

- During specific routine work practices/processes or tasks as identified in Table 1;
- Other situations where there is exposure to air contaminants above a specific exposure limit;
- If respirators or PPE are necessary to protect employee health;
- During some non-routine or emergency operations (for example, clean-up of hazardous chemical spills).

In all cases, employees participating in this program do so at no cost to themselves. The expenses associated with training, medical evaluations, and equipment will be covered by the company.

TABLE 1
Required Respirator Use

Respirator Type	Task	Respiratory Hazard*/ Permissible Exposure Limit (PEL)
Full-Face Supplied Air Respirator (tight fitting facepiece)	Applying a spray-on TBL	MDI PEL-C[1]/ 0.02 ppm
Full-Face Supplied Air Respirator (loose (helmet/hood) fitting facepiece)	Applying a spray-on TBL, if sprayer has facial hair or condition preventing seal of respirator against face	MDI PEL-C1/ 0.02 ppm
Air-Purifying Cartridge Respirator (e.g., organic vapor cartridge)	Solvent wipe for cleaning surfaces; applying UV topcoats	Solvents (e.g., acetone/1000 ppm or isopropyl alcohol/400 ppm)
Filtering Facepiece (e.g., dust mask)	Sanding of the TBL surface	Particulates not |otherwise regulated (e.g., nuisance dust)

* This field will need to be adapted/expanded so as to account for the potential regulatory hazards that are specific to your TBL system.

[1] The PEL for MDI is 0.02 ppm as a Ceiling Limit or Ceiling Value. A Ceiling Limit is not to be exceeded at any time during the work day (29 CFR (symbol for section) 1910.1000(a)(1))

B. Voluntary use of respirators

If an employee desires to wear a respirator during certain operations in a non-hazardous environment (i.e., voluntary use), the request will be reviewed on a case-by-case basis. In any event, an employee may use the respirator provided or may provide his/her own respirator for voluntary use, if; (1) doing so does not jeopardize the employee's health or safety, or that of his/her co-workers and/or (2) the equipment itself does not create a workplace hazard and the company has approved the use. In addition, the employer must provide employees voluntarily using tight-fitting respirators with a medical evaluation, as well as the cleaning, maintenance, and storage procedures provided for in this program (29 CFR §1910.134; Appendix D).

Employees voluntarily wearing dust masks (filtering facepiece) or escape-only respirators are not subject to the program's medical evaluation. However, per OSHA requirements their equipment must be clean and free of contamination, and not interfere with the employee's ability to work safely.

II. Program Administration

A. Program Administrator Responsibilities

(29 CFR §1910.134(c)(3)) "The employer shall designate a program administrator who is qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness."

_____ **is the Program Administrator**
(Program Administrator's name)
responsible for administering the Respiratory Protection Program including reviewing and updating this plan as necessary.

The Program Administrator's duties include the following:

- Identifying work areas, processes, or tasks that require workers to wear respirators, and evaluating the associated hazards; routine operations and reasonably foreseeable emergency situations associated with the operations are considered when assessing where respiratory protection is necessary
- Selecting appropriate and approved respiratory protection options

- Monitoring respirator use to ensure that respirators are used in accordance with their certifications
- Arranging for and/or conducting training
- Ensuring proper storage and maintenance of respiratory protection equipment
- Conducting qualitative fit testing
- Administering the medical surveillance program
- Maintaining required program records
- Evaluating the respiratory protection program; and
- Updating the written program, as necessary

B. Supervisor Responsibilities

Supervisors are responsible for seeing that the Respiratory Protection Program is implemented in their work areas in accordance with OSHA standards. In addition to being knowledgeable about the program requirements for their own protection, supervisors also must see that the program is understood and followed by the employees under their supervision.

Supervisory duties include the following:

- Seeing that supervised employees (including all new hires) receive appropriate annual training, fit testing, and appropriate medical evaluations
- Making available appropriate respirators and accessories
- Being aware of tasks requiring the use of respiratory protection
- Enforcing the proper use of respiratory protection
- Directing that respirators are properly cleaned, maintained, and stored in
- accordance with the program
- Monitoring work areas and operations with sufficient frequency to identify respiratory hazards and select proper equipment
- Coordinating with the Program Administrator on how to address respiratory hazards or other concerns regarding the program

C. Employee Responsibilities

Each employee must wear his or her respirator when and where required, under the conditions specified by this program. An employee is obligated to use the equipment according to the training procedures for each model. Each employee also is responsible for the following:

- Being familiar with this program
- Caring for and maintaining the respirators as instructed, and storing them in a clean and sanitary location
- Informing the Supervisor if the respirator no longer fits well, and requesting a new one that fits properly
- Informing the Supervisor or Program Administrator of any potential respiratory hazards or other concerns regarding the program

III. Program Elements

A. Medical Evaluation

(29 CFR §1910.134(e)) "Medical evaluation. Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. Accordingly, this paragraph specifies the minimum requirements for medical evaluation that employers must implement to determine the employee's ability to use a respirator."

Any employee who is required to wear a respirator, or chooses to wear an air-purifying respirator (APR) voluntarily, must first pass a medical evaluation and have medical approval before wearing the equipment on the job. Voluntary use of filtering facepieces (i.e., dust masks) such as _____ , and individuals
(insert type(s) of dust mask used)
equipped with escape-only respirators, are excluded from this requirement.

Employees are not permitted to wear respirators until a physician has determined that they are medically able to do so. Employees refusing the medical evaluation cannot work in areas requiring respirator use. The evaluation is conducted using the questionnaire provided in Appendix D, or an actual examination that obtains the same information. All examinations and questionnaires are to remain confidential between the employee and the physician or other licensed health care professional (PLHCP).

The medical evaluation will be conducted by: _____
(name of clinic, or name of physician/PLHCP)

Evaluation Procedures

- Every employee requiring a medical evaluation is given a copy of the medical questionnaire in Appendix D, along with a stamped envelope addressed to the physician or other PLHCP. The employee is to complete the confidential questionnaire during his/her work shift and mail it in the envelope provided.
- To the extent feasible, the company will accommodate employees unable to read the questionnaire. At an employee's request, someone other than Program Administrator may be asked to assist in reading the document. If this is not possible, the employee will be sent directly to the PLHCP for a medical evaluation.
- Follow-up medical exams are given to employees as required by the OSHA standard, or as deemed necessary by the PLHCP.
- Employees can speak with the PLHCP about their medical evaluation.
- After an employee has received approval and started using a respirator, additional medical evaluations will be conducted under the following circumstances:
    1. The employee reports signs and/or symptoms related to his/her ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing
    2. The PLHCP or Supervisor informs the Program Administrator of a reevaluation need
    3. Information from this program, including observations made during fit testing and program evaluation, indicates a need for reevaluation, or
    4. A change occurs in the workplace conditions that may result in an increased physiological burden on the employee

Determination of fitness

The Program Administrator will provide the PLHCP with a copy of this program. The Program Administrator also will provide the PLHCP with the following information for each employee requiring evaluation:

- The respirator equipment's type and weight
- Use frequency and duration
- Expected work effort
- Additional personal protective clothing/equipment to be used, and
- Estimated temperature and humidity extremes expected in the work area
- where the respirator is to be used.

The PLHCP provides an assessment of each employee's physical ability to wear a respirator and perform the assigned work. Such evaluations will be provided in writing and must include the following information:

- A determination of whether or not the employee is medically able to use a respirator
- Any limitations on respirator use related to the medical condition of the employee or to the workplace conditions in which the respirator will be used
- The need, if any, for follow-up medical evaluations

B. Respirator Selection

(29 CFR §1910.134(a)(2)) "Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall include the requirements outlined in paragraph (c) of this section."

The Program Administrator has selected respirators to be used on site based on the hazards to which workers are exposed in the TBL application process and also in accordance with OSHA standards. The Program Administrator has conducted a hazard evaluation of the TBL spray-on lining process. The results of the current hazard evaluation are the following:

1. **Prep Cleaning:** The surface is cleaned with a solvent-dampened rag. In order to minimize spillage and exposure to solvent vapors, a plunger can is used to dispense a small amount of solvent onto the rag. The cleaning step is conducted in a ventilated area; however, a conservative approach would require employees to wear air-purifying respirators (APRs) equipped with organic vapor (OV) cartridges during the solvent wipe step.
2. **Priming of Surfaces:** On certain surfaces, primer application may be required. If the use of primer is necessary, the primer can be applied by brushing, rolling, or spraying. Due to the extremely low vapor pressure of the MDI component, exposure to airborne isocyanate is only likely if the primer is sprayed. However, a conservative approach would be to require employees to wear an APR, equipped with organic vapor/P-100 cartridges, during the non-spray primer application step. If the primer is sprayed, see section 3 below.
3. **Spray Application of Lining:** During the spray application of our TBL product, the employee can be exposed to airborne mist/spray which contains MDI vapor/mist, potentially above the OSHA PEL-C of 0.02 ppm. Though ventilation controls are in place, employees are required to wear a supplied air respirator (SAR) during spraying of the TBL product. A tight fitting facepiece is recommended but, in the case of facial hair, glasses, etc., a loose fitting facepiece (e.g., hood) is acceptable.

OSHA currently assigns a SAR with a full facepiece, operated in the pressure demand mode, an Assigned Protection Factor (APF) of 1000; a loose-fitting facepiece (e.g., hood) SAR has an APF protection factor of 251.

4. **UV Topcoat Application:** UV topcoats, used to provide custom colors for the protective lining, are solvent based. Therefore, application of the UV topcoat, whether brushed, rolled or sprayed, involves exposure to solvent vapors. This step is conducted in a ventilated area. Nevertheless, to further reduce exposure to solvent vapors, employees are required to wear APRs, equipped with OV cartridges, during this step. If the topcoat is spray-applied, spray paint cartridge with particulate pre-filter should be used.

The Program Administrator will revise and update the hazard assessment as needed (based on changes to the work process or engineering controls). Further, respirators are to be certified by the National Institute for Occupational Safety and Health (NIOSH) and shall be used in accordance with the terms of that certification. Filters cartridges must be labeled with the appropriate NIOSH approval label, per OSHA requirements.

C. Respirator Fit Testing

(29 CFR §1910.134(f)) “Fit testing. This paragraph requires that, before an employee may be required to use any respirator with a negative or positive pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. This paragraph specifies the kinds of fit tests allowed, the procedures for conducting them, and how the results of the fit tests must be used.”

Fit testing is required for employees wearing respirators with a negative or positive pressure tight-fitting facepiece. The fit test is conducted using the make, model, and size of respirator the employee will be wearing on the job.

Fit testing is conducted:

- Prior to initial use of the respirator
- If a different respirator facepiece (size, style, model or make) is used
- When there are changes in the employee’s physical condition that could affect respiratory fit (e.g., obvious change in body weight, facial scarring, etc.)

A qualitative fit test (QLFT) procedure is approved for the respirators used under current conditions at _____ .
(company name)

The Program Administrator will conduct fit tests following the OSHA approved Bitrex Solution Aerosol QLFT protocol. See Appendix A for the Bitrex Respirator Fit Test Procedure and Appendix B for the Respirator Fit Test Record.

D. Respirator Use

1. General Use Instructions

Each time a respirator is worn, the wearer must conduct a 'user seal check'. Employees may select either the positive or negative pressure check. Additional PPE, combined with respirator use, may be necessary to adequately prevent exposure. The use of eye, face or skin protection may be required during certain processes. Employees should consult the process supervisor for the required equipment.

Tight fitting facepiece respirators are not permitted for use if:

- An employee has facial hair that interferes with either the sealing surface of the respirator and the face, or interferes with the valve function
- Corrective glasses/goggles or other personal protective equipment interferes with the seal of the facepiece
- Any other condition interferes with the facepiece seal.

The employee must vacate the respirator use area for the following reasons:

- To wash his/her face and respirator facepiece, as necessary to prevent respirator-induced eye or skin irritation
- If vapor or gas breakthrough is detected
- If there is a change in breathing resistance
- If there is facepiece leakage, or
- To replace the respirator or change the cartridge/canister.

2. Cleaning, Maintenance, and Storage

(29 CFR §1910.134(c)(1)(v)) Requirement: "Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators."

Respirators are to be regularly cleaned and disinfected according to the manufacturer's instructions. APR's are to be cleaned and disinfected as often as necessary. SARs and emergency use respirators are to be cleaned and disinfected after each use.

Cleaning

These steps are to be followed for cleaning and disinfecting respirators, unless the manufacturer directs otherwise:

- Disassemble respirator, removing all filters, canisters, or cartridges
- Wash the facepiece and associated parts in a mild detergent with warm water
- (Do not use organic solvents or bleach)
- Rinse thoroughly in clean, warm water
- Wipe the respirator with disinfectant wipes (70% isopropyl alcohol) to kill germs
- Air dry in a clean area or use clean disposable paper towels to blot excess moisture
- Reassemble the respirator and replace any defective parts (noting the condition of the headstraps and valve flaps)
- Place in a clean, dry plastic bag or other airtight container

The Program Administrator is responsible for providing an adequate supply of cleaning and disinfecting supplies. If supplies are low, employees must notify their Supervisor or the Program Administrator.

Maintenance

Respirators are to be properly maintained at all times so that they function properly and adequately protect the employee. Maintenance involves a thorough visual inspection for cleanliness and/or defects. Worn or deteriorated parts are to be replaced prior to equipment use. No components are replaced or repairs made beyond those recommended by the manufacturer.

The following checklist will be used when inspecting respirators:

- Facepiece: cracks, tears, holes, facemask distortion, cracked or loose
- lenses/face shield
- Head straps: breaks, tears, broken buckles/clasps, overstretched elastic bands
- Valves: residue/dirt, cracks or tears in valve material, absence of valve flap
- Filter/Cartridges: proper cartridge for hazard, approval designation, intact gaskets, cracks or dents in housing
- Air Supply Systems: breathing air quality/grade, condition of supply hoses, hose connections, settings on regulators and valves

Defective respirators or those with defective parts are to be taken out of service immediately. Employees should notify the Program Administrator about all respirator defects. The Administrator then decides whether to; (1) temporarily take the respirator out of service until it can be repaired, (2) have it repaired, or (3) dispose of it if the problem is irreparable.

Storage

APRs are to be stored in a clean, dry area, and following the manufacturer's recommendations. Employees must inspect and clean their own respirators according to the provisions of this program and see that the equipment is stored in plastic bags or airtight containers. Each bag/container is to be marked with an employee name, and only that particular employee can use it for their equipment storage.

The Program Administrator will store spare filters and spare respirator components in an appropriate place.

3. Cartridge Change-Out Schedules

Based on discussions with respirator manufacturers regarding the workplace exposure conditions for the TBL industry, employees wearing APRs with organic vapor cartridges shall change cartridges on their respirators at the end of each work week for the continued effectiveness of the respirators. However, if odors or irritation are experienced, employees are encouraged to change out cartridges immediately. Employees wearing APR with P-100 filters for protection against dust and other particulates must change their cartridges when they experience difficulty breathing (i.e. resistance).

E. Training

(29 CFR §1910.134(c)(1)(viii)) "Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance."

The Program Administrator provides training to respirator users and their supervisors on:

1. Content of our respiratory protection program
2. Responsibilities of employees and supervisors
3. Requirements of OSHA's respiratory protection standard

All training occurs prior to any respirator use in the workplace. Supervisors receive their training prior to supervising employees required to use respirators. The training program covers the following topics:

- Elements of respiratory protection program
- The information covered under OSHA Standard (29 CFR §1910.134)
- Respiratory hazards encountered at the worksite
- Proper selection and use of respirators
- Additional PPE
- Respirator limitations
- How to perform user seal (fit) checks
- Fit testing
- Emergency respirator use procedures
- Respirator maintenance and storage
- Medical signs and symptoms limiting effective respirator use

Employees are required to demonstrate their understanding of the topics covered in the training through hands-on exercises and a written quiz. The Program Administrator documents respirator training. Refer to Appendix C for a copy of the Respirator Protection Training Quiz. This documentation includes the type, model, and size of respirator on which each employee has been trained and fit tested. Employees are retrained annually, or as needed (i.e., relocation to another department using a different type of respirator).

IV. Program Evaluation

(29 CFR §1910.134(l)) “Program evaluation. This section requires the employer to conduct evaluations of the workplace to ensure that the written respiratory protection program is being properly implemented, and to consult employees to ensure that they are using the respirators properly.”

The Program Administrator will conduct periodic evaluations of the workplace to see that the provisions of this program are being implemented. These evaluations include regular consultations with both the employees using respirators and their supervisors. This is done to identify areas for improvement and to address problems. Review of records, site inspections and periodic air monitoring also assist in program review.

V. Documentation and Recordkeeping

The Program Administrator maintains the following records:

- A written copy of this Program and the OSHA standard (this information is available to any interested employee).
- Training and fit testing records. Further, these records are updated as new employees are trained; when an existing employee receives refresher training; and/or when a new fit test is conducted.
- Written recommendations from the PLHCP on an employee’s ability to use respirators.

The OSHA website hosts additional information about topics such as respiratory fit testing procedures, user seal check procedures, respiratory cleaning procedures, and the OSHA Respiratory Medical Evaluation Questionnaire. You can access OSHA's website at www.osha.gov

Appendix A
Bitrex Respirator Fit Test Procedure

1.0 Bitrex Fit Test Instructions

1.1 All Bitrex Fit Tests are to be performed as follows

1. **Purpose:** The purpose of this test is to meet OSHA Standard (29 CFR §1910.134)
2. **Scope:** The bitrex fit test is conducted so the person being fit tested can detect the taste of the bitrex sensitivity solution. Once detection is confirmed, the person is tested using the bitrex fit test solution with the respirator to detect breakthrough.
3. **Related Procedures and Other Documents:**
   - 3.1 Bitrex Qualitative Fit Test Kit Instructions Part No. 2041 Allegro Industries
   - 3.2 MSDS Sheet Bitrex Fit Sensitivity Solution #1
   - 3.3 MSDS Sheet Bitrex Fit Test Solution #2
   - 3.4 Respirator Fit Test Record (Appendix B)
   - 3.5 Respirator Protection Training Quiz (Appendix C)

2.0 Equipment

- 2.1 Fit test kit
- 2.2 Test hood
- 2.3 Nebulizer #1 (sensitivity)
- 2.4 Nebulizer #2 (fit test)
- 2.5 Sensitivity Solution
- 2.6 Fit Test Solution
- 2.7 Stopper
- 2.8 Canister cartridge

3.0 Bitrex Fit Test Solution Instructions

3.1 Remove Sensitivity Test solution and with tip pointed upward, pinch along the length of the applicator tube to crush the glass ampoule.

3.1.1 It is important to keep the applicator tip pointed upward when pinching the tube to prevent the solution from squirting out during the pinching process.

3.2 Remove the end cap from the nebulizer and insert the applicator tip into the u section opening of the nebulizer. Squeeze and transfer the solution from the applicator into the neck of the nebulizer until the applicator is empty

3.2.1 Do not remove the end tip of the applicator tube. It contains a porous filter, which is designed to filter out the crushed glass. The tip contains a hole for solution transfer.

3.2.2 Replace protective end cap on nebulizer until test is ready to be performed

3.3 Repeat operations 3.1 and 3.2 for the fit test solution ampoule using the appropriate nebulizer.

4.0 Bitrex Sensitivity Test Instructions

Note: The subject should not eat, drink or chew gum for at least 15 minutes before the test.

4.1 Place the hood over the subject without a respirator

4.2 Position the hood forward so there is about six inches between the subject's face and the window. This is important to ensure even dispersion of the aersol and clearance for the respirator during the fit test.

4.3 Instruct the subject to breath through their mouth with their tongue extended.

4.4 Using the sensitive test solution Nebulizer #1 inject the aerosol into the hood through the hole in the window.

4.4.1 Inject 10 times, fully squeezing and collapsing the bulb.

4.4.2 The nozzle is directed away from the nose and mouth of the person being tested.

4.5 Ask the subject if they can detect the bitter taste of the solution.

4.5.1 If tasted, note the number of squeezes on the Respirator Fit Test Record.

4.5.2 All testing results are in groups of 10 and should be noted on the paperwork in groups of 10 squeezes.

4.6 If the subject does not taste the sensitivity solution, inject an additional 10 full squeezes of the aerosol into the hood.

4.6.1 Repeat with 10 more squeezes

4.7 If the Bitrex is not tasted after 30 squeezes, the subject is unable to taste Bitrex and may not perform the fit test.

5.0 Bitrex Fit Test Work Instructions

5.1 Have the subject don and fit check the respirator per the manufacturers instructions.

5.1.1 Use the particulate filter provided (N95-P100 rating)

5.2 Place the hood over the subject with the respirator on

5.3 Position the hood forward so there is about six inches between the subject's face and the window. This is important to ensure even dispersion of the aerosol and clearance for the respirator during the fit test.

5.4 Instruct the subject to breathe through their mouth with their tongue extended.

5.5 Using the sensitive test solution Nebulizer #2 inject the aerosol into the hood through the hole in the window.

5.5.1 Inject 10 times, fully squeezing and collapsing the bulb.

5.5.2 To maintain an adequate concentration of aerosol during this test, inject one-half
of the number of squeezes used in step 5.5.1, every 30 seconds

5.6 Ask the subject if they can detect the bitter taste of the solution any time during the following exercises for 60 seconds each.

5.6.1 Normal breathing

5.6.2 Deep breathing…breaths should be deep and regular.

5.6.3 Turning head from side to side- movement should be complete with one turn every second.

5.6.4 Nodding head up and down- movement should be complete with one turn every second.

5.6.5 Talking, reciting the alphabet or reading aloud a prepared text. The “Rainbow Passage” (see below) is suggested.

5.6.6 Bending over- The test subject shall bend at the waist as if they were to touch their toes.

5.6.6.1 Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

5.6.7 Normal breathing

5.7 If the entire test is completed without the subject detecting the bitter taste of the Bitrex aerosol, the test is successful and the respirator fit is deemed adequate.

5.8 If the taste of Bitrex is detected the test has failed and a different respirator must be tried, and the entire procedure is repeated (sensitivity and fit tests).

5.9 Enter pass/fail on the Respirator Fit Test Record

5.10 Have subject and the trainer sign the document

6.0 The Rainbow Passage

6.1 When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Appendix B

Respirator Fit Test Record (Qualitative)

Name: _____ Date: _____

Job: _____ Glasses worn: _____

Facial hair, other: _____

Test media: ☐ Bitrex π ☐ Saccharin π

Respirator Type: A _____ **B** _____

A. Compatible with eye glasses	_____	_____
B. Test Exercises		
1. Head stationary, normal breathing	_____	_____
2. Head stationary, deep breathing	_____	_____
3. Head turning side to side	_____	_____
4. Head moving up and down	_____	_____
5. Talking (rainbow passage)	_____	_____
C. Comfort		
1. Very comfortable	_____	_____
2. Comfortable	_____	_____
3. Barely comfortable	_____	_____
4. Uncomfortable	_____	_____
5. Intolerable	_____	_____
Pass/Fail	#	#
	_____	_____

Assigned equipment: A

Manufacturer:	Model:	Size:

Assigned equipment: B

Manufacturer:	Model:	Size:

_____

Tested by (print name) Signature

_____

Signature of trainee

Appendix C
Respirator Protection Training — QUIZ

Name: _____ Date: _____

1. A positive and negative pressure check should be conducted each time the respirator is worn? True or False

2. A dust mask is adequate protection against solvents? True or False

3. Respirators should be cleaned on a daily basis? True or False

4. The only adequate protection against MDI is from the dual-cartridge respirator? True or False

5. A respirator can be borrowed from a co-worker in the event that your respirator is not available? True or False

6. In order to assure a proper fit, clean shaven skin must be in contact with all respirator skin sealing surfaces at all times? True or False

7. Air-purifying respirators (APRs) can be worn for protection against MDI vapor/mist during spray-on TBL applications? True or False

Appendix D
Medical Evaluation Questionnaire

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date:_____
2. Your name: _____
3. Your age (to nearest year) : _____
4. Sex (circle one): Male or Female?
5. Your height: Select ft. Select in.
6. Your weight: _____lbs.
7. Your job title: _____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code) : _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Select Yes or No
11. Check the type of respirator you will use (you can check more than one category):
    - ☐ a. N, R, or P disposable respirator (filter-mask, non- cartridge type only).
    - ☐ b. Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
12. Have you worn a respirator (circle one): Select Yes or No

    If "yes," what type(s):

    _____

    _____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you **currently** smoke tobacco, or have you smoked tobacco in the last month: Select Yes or No
2. Have you **ever had** any of the following conditions?
    a. Seizures (fits): Select Yes or No
    b. Diabetes (sugar disease): Select Yes or No
    c. Allergic reactions that interfere with your breathing: Select Yes or No
    d. Claustrophobia (fear of closed-in places): Select Yes or No
    e. Trouble smelling odors: Select Yes or No

3. Have you **ever had** any of the following pulmonary or lung problems?
    a. Asbestosis: Select Yes or No
    b. Asthma: Select Yes or No
    c. Chronic bronchitis: Select Yes or No
    d. Emphysema: Select Yes or No
    e. Pneumonia: Select Yes or No
    f. Tuberculosis: Select Yes or No
    g. Silicosis: Select Yes or No
    h. Pneumothorax (collapsed lung): Select Yes or No
    i. Lung cancer: Select Yes or No
    j. Broken ribs: Select Yes or No
    k. Any chest injuries or surgeries: Select Yes or No
    l. Any other lung problem that you've been told about: Select Yes or No
4. Do you **currently** have any of the following symptoms of pulmonary or lung illness?
    a. Shortness of breath: Yes/No
    b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Select Yes or No
    c. Shortness of breath when walking with other people at an ordinary pace on level ground: Select Yes or No
    d. Have to stop for breath when walking at your own pace on level ground: Select Yes or No
    e. Shortness of breath when washing or dressing yourself: Select Yes or No
    f. Shortness of breath that interferes with your job: Select Yes or No
    g. Coughing that produces phlegm (thick sputum): Select Yes or No
    h. Coughing that wakes you early in the morning: Select Yes or No
    i. Coughing that occurs mostly when you are lying down: Select Yes or No
    j. Coughing up blood in the last month: Select Yes or No
    k. Wheezing: Select Yes or No
    l. Wheezing that interferes with your job: Select Yes or No
    m. Chest pain when you breathe deeply: Select Yes or No
    n. Any other symptoms that you think may be related to lung problems: Select Yes or No
5. Have you **ever had** any of the following cardiovascular or heart problems?
    a. Heart attack: Select Yes or No
    b. Stroke: Select Yes or No
    c. Angina: Select Yes or No
    d. Heart failure: Select Yes or No

e. Swelling in your legs or feet (not caused by walking): Select Yes or No
f. Heart arrhythmia (heart beating irregularly): Select Yes or No
g. High blood pressure: Select Yes or No
h. Any other heart problem that you've been told about: Select Yes or No

6. Have you **ever had** any of the following cardiovascular or heart symptoms?
   a. Frequent pain or tightness in your chest: Select Yes or No
   b. Pain or tightness in your chest during physical activity: Select Yes or No
   c. Pain or tightness in your chest that interferes with your job: Select Yes or No
   d. In the past two years, have you noticed your heart skipping or missing a beat: Select Yes or No
   e. Heartburn or indigestion that is not related to eating: Select Yes or No
   f. Any other symptoms that you think may be related to heart or circulation problems: Select Yes or No
7. Do you **currently** take medication for any of the following problems?
   a. Breathing or lung problems: Select Yes or No
   b. Heart trouble: Select Yes or No
   c. Blood pressure: Select Yes or No
   d. Seizures (fits): Select Yes or No
8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)
   a. Eye irritation: Select Yes or No
   b. Skin allergies or rashes: Select Yes or No
   c. Anxiety: Select Yes or No
   d. General weakness or fatigue: Select Yes or No
   e. Any other problem that interferes with your use of a respirator: Select Yes or No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Select Yes or No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you **ever lost** vision in either eye (temporarily or permanently): Select Yes or No
11. Do you **currently** have any of the following vision problems?
    a. Wear contact lenses: Select Yes or No
    b. Wear glasses: Select Yes or No
    c. Color blind: Select Yes or No
    d. Any other eye or vision problem: Select Yes or No
12. Have you **ever had** an injury to your ears, including a broken ear drum: Select Yes or No
13. Do you **currently** have any of the following hearing problems?
    a. Difficulty hearing: Select Yes or No
    b. Wear a hearing aid: Select Yes or No
    c. Any other hearing or ear problem: Select Yes or No
14. Have you **ever had** a back injury: Select Yes or No
15. Do you **currently** have any of the following musculoskeletal problems?
    a. Weakness in any of your arms, hands, legs, or feet: Select Yes or No
    b. Back pain: Select Yes or No
    c. Difficulty fully moving your arms and legs: Select Yes or No
    d. Pain or stiffness when you lean forward or backward at the waist: Select Yes or No
    e. Difficulty fully moving your head up or down: Select Yes or No
    f. Difficulty fully moving your head side to side: Select Yes or No
    g. Difficulty bending at your knees: Select Yes or No
    h. Difficulty squatting to the ground: Select Yes or No
    i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Select Yes or No
    j. Any other muscle or skeletal problem that interferes with using a respirator: Select Yes or No

Disclaimer

This Respiratory Protection Program Guidance Document has been prepared to provide helpful ideas and information for parties interested in undertaking truck bed lining (TBL) operations using products that contain methylene diphenyl diisocyanate (MDI). The respiratory protection program and guidelines provided are based on OSHA requirements under (29 CFR §1910.134), and should help a facility review and evaluate its own respiratory protection program. Many parts of this guidance document provide examples and possible text that a facility can use for its program. However, the actual terms and examples used for a facility's program are subject to each individual facility's independent review and determination.

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The ACC represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $635 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

POLYUREA BASICS

BASIC EXPLANATION

Turbo Liner Polyurea is a plural component product. Plural components are two or more components that must be combined or mixed in specific proportions to create a final product. Most applicators and manufactures in the industry refer to polyurea components as Isocyanate and Resin, they may be referred to by other names as well. Here are some examples.

Isocyanate	Resin
"A" Component	"B" Component
ISO	RES
Activator	Polyol

POLYUREA COMPONENTS

You, the **applicator**, are one of the most important components of Polyurea
You, the **applicator**, have the final responsibility for fabricating/manufacturing the final product correctly.

MIXING RATIOS OF POLYUREA

The chemist or formulator set how their polyurea systems will be mixed and is specified in the material data sheet. Polyureas usually are formulated at a 1:1 ratio; meaning equal parts of both components are mixed or blended together to make a final product. This ratio may be as 1:1 by weight or more commonly by **volume**.
Polyureas are formulated to provide proper results as long as the ratio of the "A" and "B" components are within ± 2% by volume. If the mixture contains excessive **isocyanate**, the polyurea will be lighter in color and the density of the mixture will typically be higher then the product specifications. If the mixture contains excessive **resin**, the polyurea will be darker and softer, and be lower in density than the product specifications.

VISCOSITY

Term used to define the amount of **resistance to flow** that a material exhibits, compared to water. As in motor oils, as the temperature decreases, the viscosity increases; and as the temperature increases, the viscosity decreases. Fluids that display these characteristics are said to be temperature sensitive. These fluids are measured on a centipoise (cps) scale. For example, water has a viscosity of 1 cps and flows easily; honey has a viscosity of 1000 cps and flows slowly. Turbo Liner 11's viscosity at 150-160°F (65.5-71°), Brookfield: would be 120 ± 20 cps for the Iso and 60 ± 20 cps for the Resin. All cps ratings will be associated with a temperature at which they were tested and can be found on the material datasheet for that material.

DRUM AND MATERIAL STORAGE TEMPERATURES

Drum storage has a direct effect on the final your product, it is extremely important and cannot be over emphasized. The ideal **storage temperature is 70° F** and should be maintained at this temperature or above when in storage or when in use. At temperatures below 70° F, the materials viscosity levels begin to **increase**, putting greater stress and demands on the supply system (transfer pumps and related parts). At temperatures below 50° F, **CAVITATION** will start to occur. Isocyanate freezes at temperatures below 40° F, a process called **seeding**. When this happens, little ISO crystals begin to form that can only be extracted with considerable effort. The longer the material is frozen, the more crystals that will form; to the point where they restrict and plug supply screens and gun screens of filters. They may be removed with heat but this takes time, great effort and, depending on how long the materials were frozen this may not work. The shelf life of the "A" side or ISO is generally one year from the date of production. The "B" side material does not really have a shelf life, it is recommend that if the "B" side material sits for long periods of time, mix on high speed for at least a half hour to mix in any color pigment back into the base material. If drums must be stored make sure they are stored with the lids tightly sealed out of the direct sunlight at 65-75° F.

DRUM DISPOSAL

MDI is not listed hazardous waste under the Federal Resources Conservation and Recovery Act (RCRA), and MDI manufactures state that as, as supplied, it does not exhibit and of the characteristics of a hazardous waste. However some state and local authorities may classify it differently, methylene chloride, often used as solvent, is a RARC-listed hazardous waste product. Waste diisocyanates and polyols can be reacted by a low - grade polyurethane foam that is much less hazardous to the environment than the original components.

Another way the small-quantity generator can handle waste diisocyantate is to neutralize it. A neutralization solution can be prepared by thoroughly mixing parts water with 5 – 10% sodium carbonate or 3 to 8 parts concentrated aqueous ammonia and 2 to 5 parts detergent. The neutralization solution is stirred rapidly into the waste diisocyantate in an opened (i.e.., uncovered or with all bungs removed) top drum in a well-ventilated area. The resulting mixture is allowed to sit for at least 48 hours. The liquids ad solids resulting from this procedure are not classified a hazardous waste by the federal authorities at this time.

Never seal drums containing isocyanates after adding water or neutralization solution. Diisocyanates react with water, producing carbon dioxide gas. If the drum is sealed the gas produced could cause the drum to rupture. Drum recyclers may not accept drums that have been rinsed or otherwise treated.

There are three disposal options for empty drums that contained MDI or polymeric MDI:

1. Offer the drums to DOT – certified reconditioner for recycling.
2. Dispose of the drums in a RCRA – permitted Hazardous Waste Landfill.
3. Dispose of the drums through a RCRA – permitted Hazardous Waste Incinerator.

Empty polyol drums can be recycled by sending them to a drum recycler.

Under no circumstances should empty drums be removed from a work site for personal use. Even though a drum has been cleaned there is a good possibility that material will still be inside. These drums will

always contain potentially toxic residual material. **WARNING: DO NOT CUT OR BURN OUT THESE DRUMS WITH A CUTTING TORCH.** This could easily ignite, explode, or release toxic vapors.

Drums should be disposed of properly, check with your local authorities or land fill for proper disposal of empty drums.

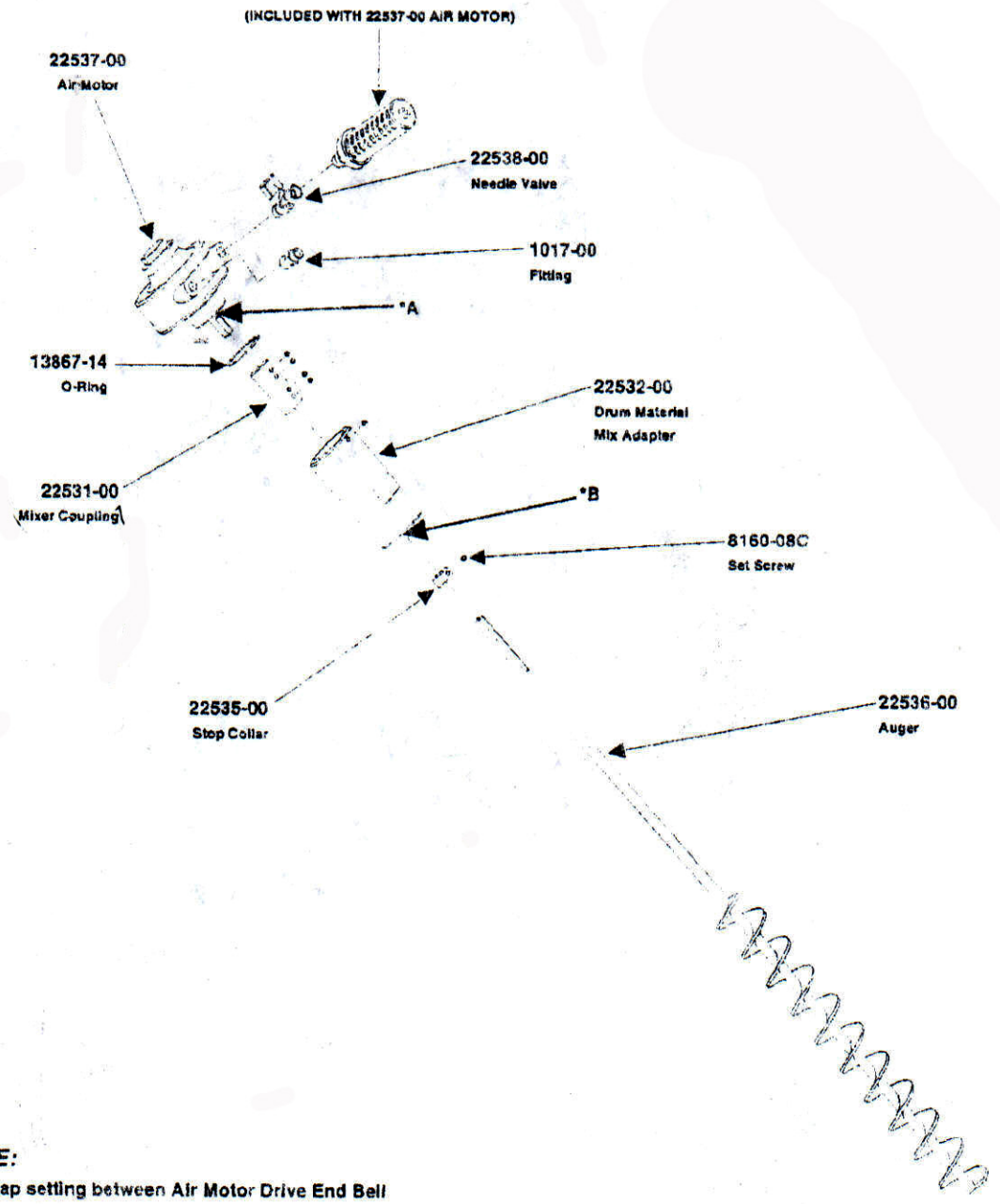
MOISTURE PROTECTION

Of the two components the “A” is most reactive to moisture (if moisture gets into the “A” side material it will cause it to react and harden). During the spray process if moisture or water droplet comes through the system or are already present on the substrate the material will encapsulate the moisture creating a bubble. If the bubble is cut open you may find some moisture, but usually it is just a dry space. The exothermic reaction of the two components will generally evaporate most if not all of the moisture, leaving just an air bubble.

AGITATION OF MATERIALS

The “A” material does not need to be agitated. The “B” side material on the other hand must be mixed continuously when the system is in use. The first document below shows an exploded view of the air mixer, the second document explains more about material agitation:

22530-00 DRUM MIXER



NOTE:

*A) Gap setting between Air Motor Drive End Bell and Mixer Coupling, P/N 22531-00 is .125".

*B) Gap Setting between Drum Material Mix Adapter, P/N 22535-00 and Stop Collar, P/N 22535-00 is .125".

REPAIR KIT: K202*

(*) Used for Air Motor P/N 22537-00

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Equipment Operation:
Importance of Material Agitation in Drums

When you receive a drum shipment of the polyurea spray elastomer systems, the resin component is packaged in a drum such that there is a center 2" bung in the lid. While many polyurea system suppliers strive to be the best in the business, this center bung is not just for looks or a second vent source. This bung serves a major importance as it is designed to accept a drum mixer for the material.

The resin blend component of the polyurea spray elastomer systems is normally the pigmented side. Solid pigments are used so as to increase the performance characteristics of the elastomeric coating produced. As is the case with all pigmented systems, the pigment will have a tendency to settle to the bottom over time. Even though a high shear dispersion technique is used for most system preparations, this can still occur.

Another alternative method suggested by some polyurea system manufacturers is the use of a re-circulation loop on the resin supply side. This works provided there is proper dispersion of the pigments in the system. This process allows the drum pump on the resin side to circulate material in the drum. A 3-position valve is used to divert the material flow to the smaller drum bunghole. The valve **must** always be placed in the machine delivery position for spray work. Use of this technique should only be at the recommendation of the system supplier.

NOTE: This technique (drum re-circulation) should **NOT** be used for drums that have sat for extended periods!

If you do not mix the material and the pigment has settled, you will still achieve the proper 1:1 volume flow to the spray equipment but the mix is not right.

Think about it! If the pigment has settled and your are delivering a 1:1 volume ratio, the high pigment level will displace the reactive resin level and yes, you guessed it,

You Will Be Shooting Off Ratio (by Equivalents)!

Remember, the drum pumps suck material from the bottom of the supply drums.

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Elgin, Texas 78621
1-512-285-4870 FAX 1-512-281-4933

This could cause a variety of problems: foaming, blister formation in the coating system, poor spray pattern, color variances and poor coating performance.

It is recommended that the following procedure be used:

- Drums **must** be mixed for a period of at least 1/2 hour before use DO NOT MIX for just 5 minutes like you do with epoxies!
- It is good practice to leave the mixer on at low speed during spraying
- The mixing shaft should have a minimum of two 8" collapsible blades and one 5-6" blade at top of shaft. This will provide the proper agitation and mix within a standard material supply drum as 8" is 1/3 the diameter of the drum.
- It should be noted that auger type mixers Must be ran daily to pull up and mix the material in the drums completely.

It should be noted that the resins themselves will not separate in the resin blend component. This mainly applies to the pigment.

Reference:

"Mixing Technology for Two-Component Coatings", **Finishing Technology**, The Sherwin-Williams Company, Spring 2000, pages 8 – 9.

POLYUREA SPRAY COATING SYSTEMS

The prospects of landing a major coatings application loomed before the contractor who could meet the requirements of the job. But how could these areas be efficiently coated/repaired in a seven-day-a-week, 10 – 14 hour-a-day, setting without some portion of the area use or daily traffic? It was clear that by preparing and installing repairs on a limited area during each work cycle, partial openings could ne installed during off hours and would be cured with minimum downtime. The needs of the customer required that the installations be not only tack free, but also have the ability to return the area to normal service.

It was early 1993 and the selection of coating materials which could meet the needed specifications was exceedingly meager. Polymer systems based modified polyurethanes, epoxies, methyacrylates, polysulfided or silicones might be products to consider except that curing times, which at best, ranged into 12 hour time zones with many in the 24+ hour zones. None of these products could fully meet the restraints of the projects.

During this time, a handful of products were being developed based on a polymer chemistry referred to as polyurea. Cure times of 1 to 3 hours were being touted with product properties for installation and repair which met or exceeded most polyurethane, epoxy and silicone based technologies. What are these new polyurea polymers for coating applications?

POLYUREA CHEMISTRY

In the early 1980's several discoveries and developments in elastomeric polymer chemistry were made based on reactive amine terminated resins and high performance isocyanate prepolymers. These resulting polymer systems were referred to as polyureas and had certain characteristics suitable for rapid process application. The major application being Reaction Injection Molding (RIM) for use in automotive body panel production. Certain characteristics of this technology could prove useful if utilized in coating applications. Some of these are:

1. Fast, consistent reactivity and cure.
2. Moisture and temperature insensitivity during processing.
3. Excellent physical properties/elastomeric qualities.
4. Very low water absorption qualities, hydrolytically stable.
5. High thermal stability.
6. Auto-catalytic, no solvents.

While this technology became very well suited for RIM applications, applying this concept to coating applications became the task at hand. The typical 2 – 3 second gel times of these polyurea RIM systems makes for very difficult conventional spray processing techniques. System modifications were required to slow the effective reactivities without compromising the unique characteristics and performance properties of these polyurea elastomer systems.

By1990, the development of polyurea spray systems had progressed to a point where possibility of use as coatings and sealants was foreseeable. The prospects of a moisture and temperature insensitive product with extremely rapid curing properties continued to lure formulators into the chemistry.

In 1993, there were several polyurea and hybrid polyurea products on the market which were generally consistent in application and performance. These products exhibited characteristics such a those set forward

previously. The pot life or working times for these coating systems is limited to 1 minute. This definitely classifies the products as technical but by using proper installation procedures and equipment, polyurea systems can be considered a viable alternative to many coating materials. Cure times ranging from 1 to 3 hours made these type of products the only possibility for the maintenance requirements of many situations. The discovery that product curing will take place in temperatures as low as 40° F without significant changes in developed properties opens many new avenues for efficient repair in cold conditions. The further discovery that the ultimate properties of the products could be varied in a controlled manner through varing the chemical makeup, without loss of the desirable qualities. This has led to the development of products for various uses ranging from high impact thermal cycling installations.

COATING SYSTEMS

The use of polyurea systems as spray coatings has been made possible through the development of proper application equipment. These polyurea systems must be processed through high pressure, high temperature impingement mix type equipment in order to achieve the optimum atomization and qualities for a coating. These systems are generally much faster in reactivity and are unaffected by changes in humidity and ambient temperature.

For coating applications, the elastomer system must have excellent mechanical properties to insure extended serviceability. These systems must also be stable to their environments. Not only is the performance of the elastomer system important, but the material should be able to easily applied in a variety of conditions and give comparable performance. The elastomer system should also be free of volatile compounds which could be released into the environment.

Turbo Liner Inc's line of fast set spray polyurea materials addresses these concerns for many coatings applications. These fast set spray materials can be applied as low as 40° F with the ability to open the area to service within 1 hour. Excellent substrate adhesion is also noted. Coated substrate service temperature can easily approach near 400° F without detrimental effects to the coating system. Polyurea coating systems are still new technology today and have a limitless degree of applications and versatility in concrete, metal and wood coatings. Other applications include flooring, decking, secondary containment, corrosion protection and moisture barrier systems. Given the fast reactivity and cure as well as the 100% solids nature of the polyurea elastomer technology, repairs can be made in food contact applications. No fugitive materials are present in the technology which would contaminate foodstuffs. Some of our products have been approved by the USDA incidental food contact applications.

THE POLYUREA ADVANTAGE

One may ask, why use the polyurea elastomer technology over conventional coating technologies? There are several reasons as mentioned in the previous section, the most important being that this technology is 100% solids. **NO VOLATILE ORGANIC COMPOUNDS (VOC'S)**. During application and once the material is applied, no vapors, fumes or chemicals are released. This makes the technology applicable for confined space applications as well as coating in food processing/ handling applications.

With respect to 100% solids, polyurea elastomer systems contain no catalyst for cure development even down to ambient temperatures of at least -20° C. Systems which require a type of catalyst for cure, i.e.

polyurethanes and some epoxies, are adversely affected by low ambient temperatures. Polyurea elastomer systems cure readily at a broad range of ambient temperature conditions.

The lack of a catalyst also gives improved performance when exposed to UV light. The catalyst in a system will promote polymer degradation when the system is exposed to high temperatures or UV light. Polyurea elastomer systems exhibit exceptional performance with only slight color changes being noted in accelerated weatherometer testing. Elastomer physical property retention is excellent. NOTE ABOUT COLORS: In real life polyureas and hybrid materials base color vs. UV situations on medium to darker colors may get a little darker over time and lighter colors will actually change colors over time. You must keep in mind polyureas are still in the end just plastics. You can however get excellent color holdout and UV stability from aliphatic polyureas, the problem with the aliphatic polyureas is that they are in most cases 3 times the price of regular polyureas.

SUPPORT CHEMICALS

Acetone:

Acetone is used as a final wash on the sanded surface. We use Acetone because of its fast evaporation time and it does not leave a residue on the surface.

Cilbond 41:

Cilbond 41 is and iso based primer that works great for small repairs. With its fast cure times Cilbond 41 is perfect for repairing holes from goose neck hitches on used trucks as well as many other repair applications.

DPM:

DPM is a basic gun cleaner, it is usually used in a squirt bottle for during the day regular cleaning of the gun.

DOP:

DOP is an ant plasticizer it is design to keep polyurea from completely getting hard on a machine surface. The DOP is used in the lube cup to keep the proportioning pump shaft from ceasing or locking up to the felt retainer in the lube cup.

NMP:

NMP is a polyurea reactivator. NMP it is used to reactivate cured polyurea if a repair is necessary. **Important note:** This product is not a solvent and under no circumstances should it ever be used as a cleaner or a soaking solution.

RS 98:

RS 98 is a solvent used to liquefy hardened poly at a rapid pace. The RS 98 can be used in a stainless ultra sonic cleaner, the ultra sonic cleaner heats the RS 98 to about 150°F and makes it work generally within a half hour. Once the ultra sonic cleaner has stopped you can pull the parts out (be careful as the parts will be hot) at this point you will see that most if not all of the material has almost fell off the part. Cool stuff!

For health and safety information on any of these support chemicals please view the MSDS sheets located in the dealer section of our website: http://www.turboliner.com/dealers_only.html

Cilbond 41 Primer Usage in Bedliner Repairs

Note: Please read the MSDS and data sheets before using this product. State and local restrictions may apply.

Cilbond 41 primer is a plastics primer that was designed for cast molded plastics market but has proven to work very well with high pressure spray polyureas.

Cilbond 41 can be applied by brush, roller or spray. In most bedliner repairs a simple disposable brush or roller is the best way to go.

Prepare the repair area as needed with a solvent wipe and scuff with 40 grit paper. Brush on a light coat of Cilbond 41 (see the data sheet for directions). Coat the affected area as needed.

All repairs will differ and a judgment call will have to be made on the best way to proceed. A combination of masking, string-line, cutting and/or sanding to remove bad material, sanding edges to blend the repair area into the existing coating, texture, etc…

Be creative, you will find that polyurea is easy to work with and repairs can be done in a variety of ways as long as the finished product looks good and makes your customer happy.

Repairing Liner Material With NMP

How To Repair Polyurea: Within 6-8 Hour Window.

The following letter contains information on repair and repair of polyurea coatings. For making a repair within the early hours after a coating has been applied, the steps are as followed:

Step (1): Cut out area to be repaired.
Step (2): Sand and wipe down the repair area with acetone.
Step (3): Mask off the area to be sprayed and string tape around the edge.
Step (4): Spray material in area to be repaired until the area is level with existing coating.
Step (5): Pull string tape and sand new material until it is level with old surface, blow the area out with air.
Step (6): Spray over the old and newly repaired section, then retexture the surface. This completes the repair for polyurea that is uncured.

How To Repair Polyurea: After 6-8 Hour Window

For making a repair after the 6 hour window has passed (using NMP to make a repair), the steps areas followed:

Step (1): Cut out area to be repaired.
Step (2): Wipe a light coat of NMP on the surface (do not soak the surface with NMP) to be repaired you will need to go beyond the actual repair areas as you will need to blend into the undamaged area.
Step (3): Let NMP sit on surface for 15-20 minutes (you cannot rush this process)
Step (4): Wash with acetone 2to3 times really well to neutralize the NMP (if you don't neutralize all the NMP it will cause bubbles when you spray over the surface. Follow steps 3 through 6 in above section to complete the repair.

REMEMBER!

YOU ARE THE FABRICATOR! WE ARE THE RAW MATERIAL SUPPLIER!

Turbo Liner MPL11™ is one of the most user-friendly, forgiving, heated plural component elastomeric products made. This fact is a double-edged sword.

Turbo Liner MPL11™ will react and set at even 25% off-ratio and may look good; but the following characteristics may be noted:

If the finished product is **ISO (A) rich**, you may observe any or all of the following:

1. Lighter in color or striations (marbling); will eventually darken with sunlight.
2. Harder surface and less flexible.
3. Higher surface glass (not always a key).
4. Firmer at higher temperatures.
5. ISO pop blisters due to CO2 generation of non-reacted isocyanate.
6. Localized foaming in slower systems (pour applications especially).
7. Lab analysis of the elastomer will show higher tensile strength, higher modulus and less elongation.

If the finished product is RESIN (B) rich, you may observe any or all of the following:

1. Darker color or striations; may turn color in some areas.
2. Softer surface and more flexible; may feel “tacky”.
3. May have incurred or liquid areas beneath the elastomer surface.
4. Lower surface gloss.
5. Softer at higher temperatures.
6. Air or liquid filled blisters between the elastomer and the coated substrate when used in a liquid containment application.
7. Lab analysis of the elastomer will show lower tensile strength, possible higher elongation, lower tear strength and higher M.V.T rating.

If the Turbo Liner MPL11™ is sprayed ON RATIO, but not effectively mixed at the gun due to lack of heat and/or pressure, or improper impingement, it may look good, but some of the above noted characteristics may be observed as well as the following:

1. Elastomer “cheesy” nature, cracks when bent.
2. Blister formulation, especially at spray overlap areas.
3. Localized foaming.

IT'S MOVIE TIME!

UNDERSTANDING THE STANDARD PROBLER AND PROBLER P2 SPRAY GUN

Now at this time you will be watching both the standard Probler and Probler P2 gun videos. Even if you never spray with the standard Probler it is very wise to watch this video. What you need to understand about these two guns is this; even though they are different guns they use the same basic principles for their operation. The information in the Probler gun video will help you troubleshooting both guns.

PROBLER P2 SPRAY GUN

SETUP AND USAGE

Section 1 - Installation: Equipment Assembly

How The Gun Works

The trigger actuates a small valve in the gun handle that controls the flow of air into the piston assembly. When the trigger is pulled, air flows through the valve to the front of the piston. Air pressures force the piston towards the rear of the gun, simultaneously closing off the purge air and moving the mixing chamber to a position where the mixing chamber orifices are aligned with the orifices in both, the side block seal and check valve assemblies.

The proper alignment of the orifices is determined by the setting of the Set Screw, p/n 17259-16F, located at the rear of the piston assembly. This set screw determines the length of travel of the air piston and has been preset at the factory and should not require adjustment. (SEE MAINTENANCE SECTION)

The two fluids (isocyanate and polyol) then flow thru the material shut-off valves, seal, and check valve assemblies and into the mixing chamber. The two fluids impinge against one another and exit the mixing chamber in a swirling, conical spray pattern.

When the trigger is released, the mixing chamber returns to its original position and purge air flows into the Mixing chamber housing, p/n 23963-00. The front tip o-ring, p/n 23974-00 keeps air purge inside the gun head, p/n 23963-00, forcing all of the air through the orifices in the mixing chamber, for a complete, total and constant purge.

This purge air continues to flow thru the mixing chamber until the air switch, p/n 16832-00 is pulled up to shut-off all air to the gun; or until the trigger is pulled again.

GlasCraft Equipment

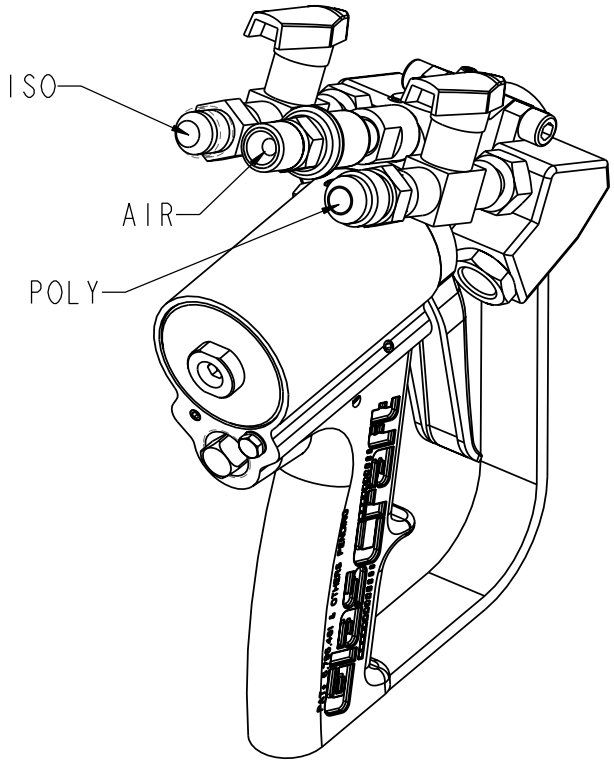
All GCI OEM fittings are as follows:

A SIDE - # 6 JIC	Hoses – Female Swivel Fitting System and Gun – Male Fitting
B SIDE - # 6 SAE	Hoses – Female Swivel Fitting System and Gun – Male Fitting

Air Hose is ¼" NPS

JIC and SAE Fittings ***DO NOT*** require the use of teflon tape.

Once the fittings are attached and tight, refer to system manuals for start-up instructions.



Installing P2 on Equipment other than GlasCraft

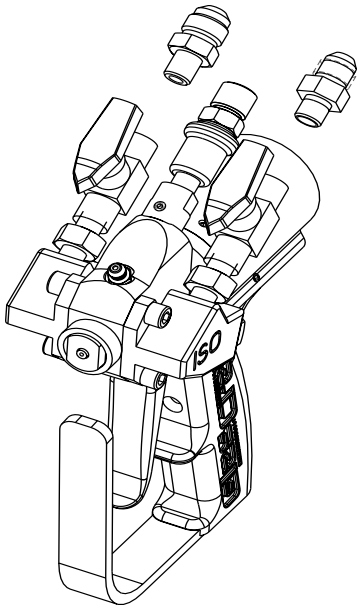
⚠

Do not place any part of the body in the path of the material spray.
Do not point the gun at or near other personnel.
Do not look into the mixing chamber orifice at any time.
Because of the hazardous materials used in this equipment, it is recommended that the operator use an air mask, goggles, protective clothing, and other safety equipment as prescribed by current regulations, recommendations of the chemical suppliers, and the laws in the area where the equipment is being used.

If original equipment does not require the use of an un-heated whip hose or isolation hose, the P2 can be directly installed on to the material hose.

1. Remove the fittings from the original gun, typically these fittings are 1/8 in. NPT male.

2. Remove GCI fittings, p/n's 8560-23,PG-13 from PG-15-01 ball valves. GCI ball valves are 1/8 in. NPT female.



3. Install the original fittings into PG-15-01 valves.

It is recommended to use a non-permanent thread lock on the 1/8 in. NPT threads to assist as a sealant and keep the fittings from twisting with gun movement.

4. Install the gun on the original Hoses.
The air slide valve, p/n 16832-00 is a ¼ in. NPSM.

⚠

Relieve ALL system fluid and air pressures according to manufacturer's instructions.

Section 2 - Operation: Start-Up Instructions

Refer to specific system user manuals for complete system installation.

Pre operation Checklist

Check that all fittings are tight and air regulators are turned to ***"zero pressure"***.

⚠

Do not place any part of the body in the path of the material spray.
Do not point the gun at or near other personnel.
Do not look into the mixing chamber orifice at any time.
Because of the hazardous materials used in this equipment, it is recommended that the operator use an air mask, goggles, protective clothing, and other safety equipment as prescribed by current regulations, recommendations of the chemical suppliers, and the laws in the area where the equipment is being used.

Operating Requirements

- 8 - 10 CFM at 90 -110 PSI
- MAXIMUM Static Fluid Pressure - 3200 PSI

⚠

The GlasCraft Probler P2 Gun is designed and manufactured to operate at a maximum static fluid pressure not to exceed 3200 psi. When attached to a GlasCraft proportioning system, this pressure will not be exceeded. However, if the GlasCraft Probler P2 Gun is installed on any other manufacturer's self-designed equipment, great care must be taken to ensure that the maximum static fluid pressure not be exceeded.

If the gun is being used for short periods of spraying, GlasCraft recommends that the purge air be left ON. The material shut-off valves, p/n PG-15-01 can be left in the OPEN position during these periods of time.

⚠

If purge air is to be turned OFF, BOTH MATERIAL SHUT-OFF VALVES, p/n PG-15-01, MUST BE TURNED TO THEIR "OFF" POSITION BEFORE TURNING "OFF" THE PURGE AIR !
Failure to follow this procedure will possibly result in the gun head becoming encased with mixed product.

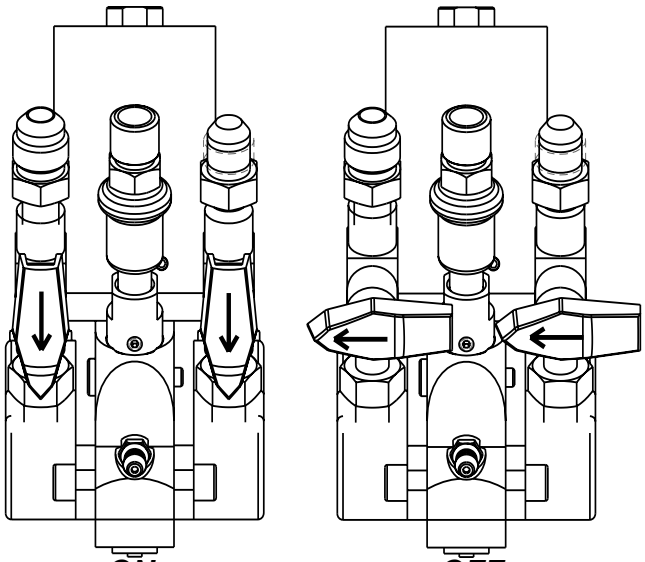
For proper purging following use, the air switch must be left OPEN for at least 15 SECONDS after the trigger has been released.

The flow of material into the mixing chamber is controlled by the ON or OFF position of the two material shut-off valves.

Both material shut-off valves must be FULLY OPEN during dispensing and must be FULLY CLOSED during service or extended shut-down periods.

⚠

BOTH MATERIAL SHUT-OFF VALVES, p/n PG-15-01, MUST BE TURNED TO THEIR "OFF" POSITION BEFORE REMOVING SCREWS, P/N 9944-16C!!
Failure to follow this procedure will possibly result in the gun head becoming encased with mixed product.



ON ***OFF***

Refer to system manuals for start-up and shut-down procedures.

Spray Technique

Always operate safely and follow all safety procedures outlined.

To achieve the optimum spray pattern for each application, the appropriate mixing chambers are available in six round and six flat spray sizes. Hardened mixing chambers are also available (see mixing chamber chart).

The standard mixing chamber supplied with your gun will be adequate for all but the smallest and largest applications.

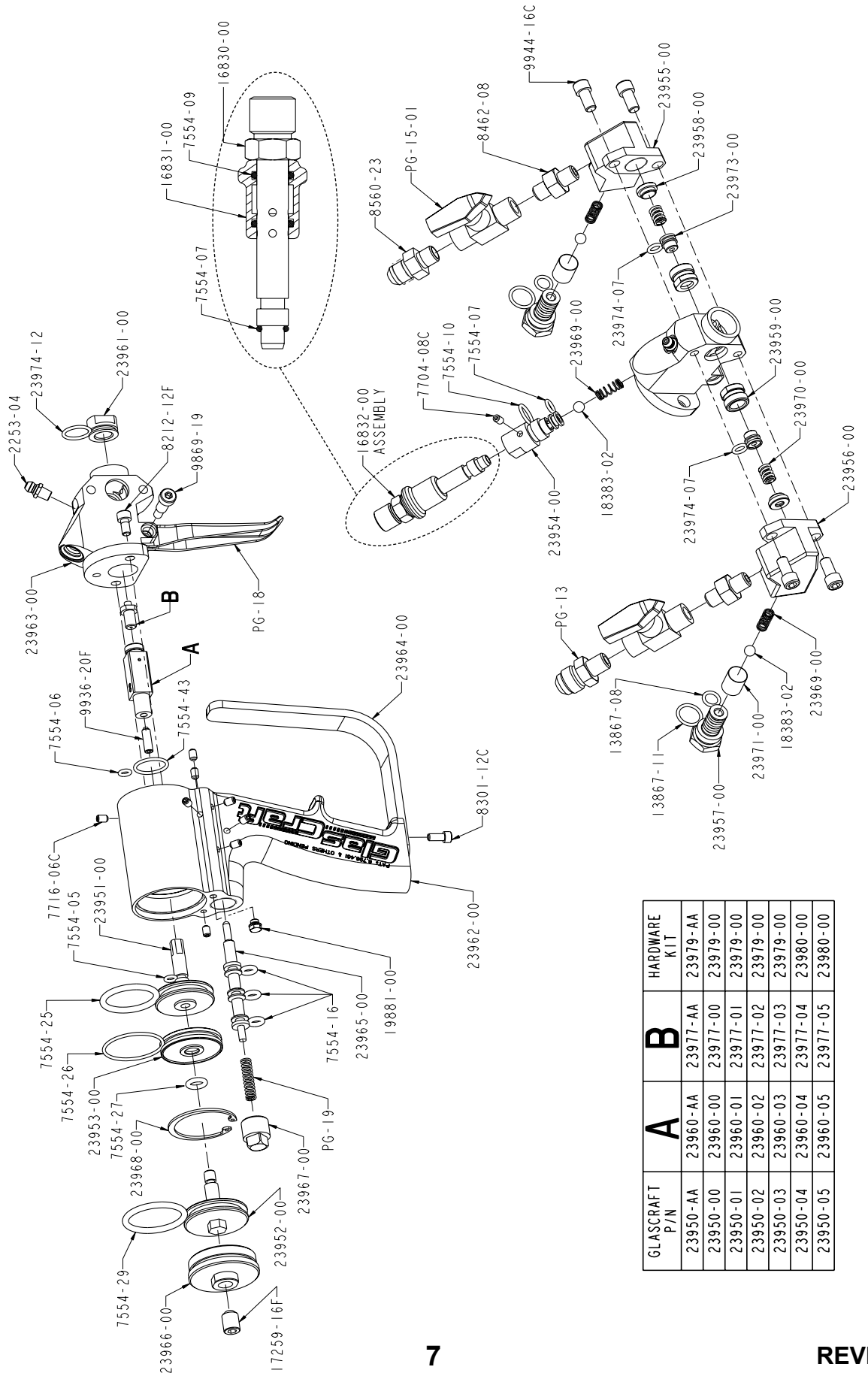
Foam rise and cure times will vary according to the material and substrate temperature. Higher material or substrate temperature will increase rise and cure times; lower material or substrate temperatures will decrease rise and cure times. Consult your chemical manufacturer's data specification sheets for their recommended spray temperatures. Under most circumstances, both components will be used at identical temperatures.

Higher pressures and temperatures may be used to increase material break-up, improve mixing and speed rise times. With hose lengths over 50 ft., or when material viscosities are high, higher material pump pressures may be necessary.

The gun air switch assembly MUST BE OPENED (down position) prior to spraying to provide air for trigger operation and purge air when the trigger is released.

When spraying, the gun trigger may be depressed continuously, or triggered at the end of each stroke. A smooth, even layer is best achieved by moving the

Gun back and forth in a slow, even motion, overlapping the previous pass about 50 to 75 percent. DO NOT SPRAY OVER RISING FOAM! The ideal gun-to-surface distance is about 18 to 24 inches. Be sure to point the gun directly at the surface to be sprayed. Spraying at an angle to the surface will cause the foam to be rough and will generate overspray.



GLASCRAFT P/N	A	B	HARDWARE KIT
23950-AA	23960-AA	23977-AA	23979-AA
23950-00	23960-00	23977-00	23979-00
23950-01	23960-01	23977-01	23979-00
23950-02	23960-02	23977-02	23979-00
23950-03	23960-03	23977-03	23979-00
23950-04	23960-04	23977-04	23980-00
23950-05	23960-05	23977-05	23980-00

Part Number	Description	Qty.
PG-13	FITTING	1
PG-15-01	2-WAY BALL VALVE	2
PG-18	PROBLER TRIGGER	1
PG-19	COMPRESSION SPRING	1
13867-08	O-RING	2
13867-11	O-RING	2
16832-00	**AIR SWITCH ASSEMBLY**	**1**
17259-16F	MACHINE SCREW	1
18383-02	1/4 DIA BALL	3
19881-00	PLUG FITTING	1
2253-04	LUBE FITTING	1
23951-00	1-3/8” AIR PISTON	1
23952-00	1-1/2” AIR PISTON	1
23953-00	CYLINDER SPACER	1
23954-00	VALVE INSERT	1
23955-00	ISO SIDE BLOCK	1
23956-00	POLY SIDE BLOCK	1
23957-00	CHECK VALVE FILTER	2
23958-00	SEAL	2
23959-00	SEAL HOUSING	2
23961-00	FRONT TIP	1
23962-00	HANDLE	1
23963-00	PROBLER P2 HEAD	1
23964-00	GUARD	1
23965-00	TRIGGER PISTON	1
23966-00	REAR CAP	1
23967-00	TRIGGER PLUG	1
23968-00	RETAINING RING	1
23969-00	SPRING	3
23970-00	SPRING	2
23971-00	FILTER SCREEN	2
23973-00	SEAL	2
23974-07	O-RING	2
23974-12	O-RING	1
7554-05	O-RING	1
7554-06	O-RING	1
7554-07	O-RING	1
7554-10	O-RING	1

7554-07	O-RING	1
7554-09	O-RING	2
16830-00	AIR SWITCH TUBE	1
16831-00	AIR SWITCH SPOOL	1

Part Number	Description	Qty.
7554-16	O-RING	3
7554-25	O-RING	1
7554-26	O-RING	1
7554-27	O-RING	1
7554-29	O-RING	1
7554-43	O-RING	1
7704-08C	SET SCREW	1
7716-06C	SET SCREW	11
8212-12F	MACHINE SCREW	2
8301-12C	MACHINE SCREW	1
8462-08	FITTING	2
8560-23	FITTING	1
9869-19	SHOULDER SCREW	1
9936-20F	SET SCREW	1
9944-16C	MACHINE SCREW	4

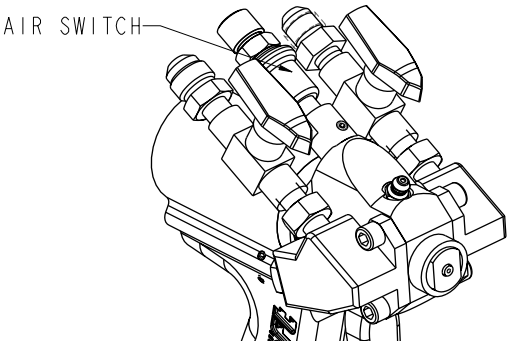
⚠
Before attempting to perform any maintenance on this gun,relieve All Fluid and Air Pressures!

- To relieve fluid and air pressures:
- Turn OFF all air supplies at system except gun trigger air.
- Trigger the gun until all fluid pressures have been relieved.
- Turn OFF the gun trigger air at the system.
- Trigger the gun until all trigger air pressure has been relieved.

Perform Gun maintenance as follows:

1. Check for leaking Seals, p/n 23973-00:

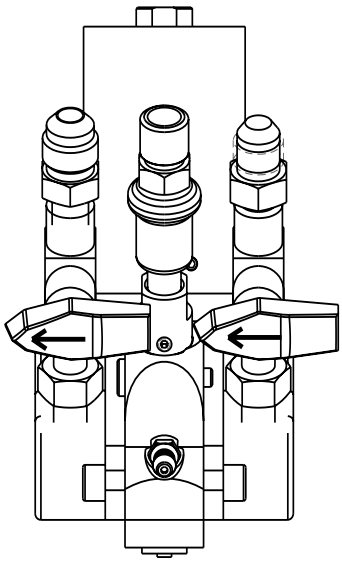
• Turn OFF the gun incoming air by closing gun air switch.



- Wait approximately 10 - 20 seconds, then turn ON the incoming air by opening Gun Air Switch.
- Repeat two or three times.
- If any material has been purged from the gun, the seals, p/n 23973-00 are leaking, or o-ring, p/n 23974-07
- Correct leaks by replacing the seals or o-rings and re-checking.

2. Check the material valves, p/n PG-15-01 for any leaks:

• Turn OFF both material valves.



• Trigger the gun several times.
• Turn OFF the gun incoming air by closing the air switch.
• Trigger the gun several times.
• If additional material is purged, the material valves are leaking.
• Correct the leaks by taking off black knobs and turning packing 1/8 in. to 1/4 in. turns at a time until the leak has stopped. Re-check.

3. Check Side Blocks

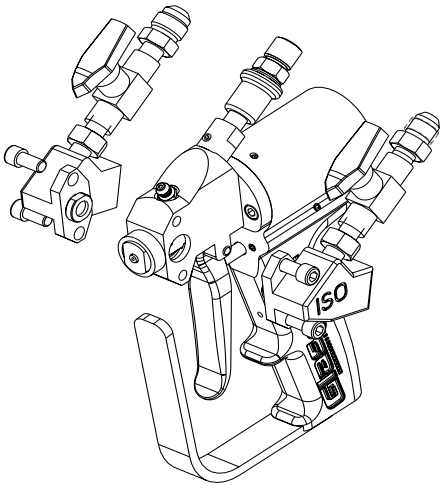
• Turn OFF the air switch on the gun.

⚠
Before removing the side blocks make certain that both material valves are in the OFF positions!

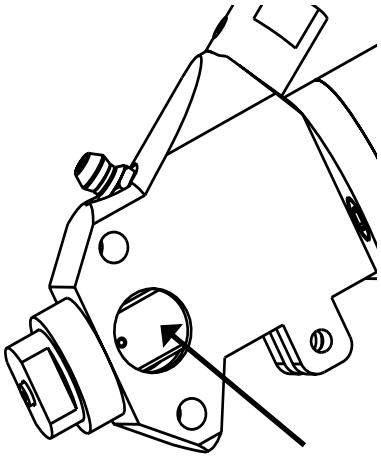
If the material valves are on when the side blocks are removed the gun will quickly become encased in urethane!

⚠
Point gun side blocks down, away from all personnel. Existing fluid pressures could cause material to exit the side blocks with considerable force.

• Take the Side Blocks off by removing screws, p/n 9944-16C.

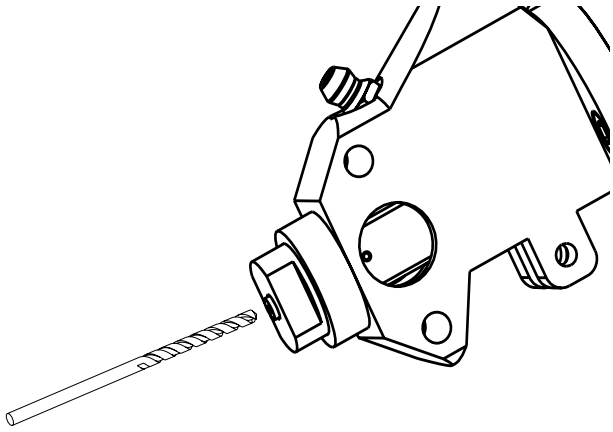


• Examine the sides of the mixing chamber, p/n 23960- for scratches and/or material build-up. Carefully, without scratching the seal surfaces (sides), remove any accumulated material. Solvent can be used to wash accumulated material off of chamber, side blocks, etc. Keep the gun Chamber tilted toward the ground so that solvent does not run back into gun. Certain solvents will attack o-rings on chamber shaft causing swelling and deterioration of o-rings.

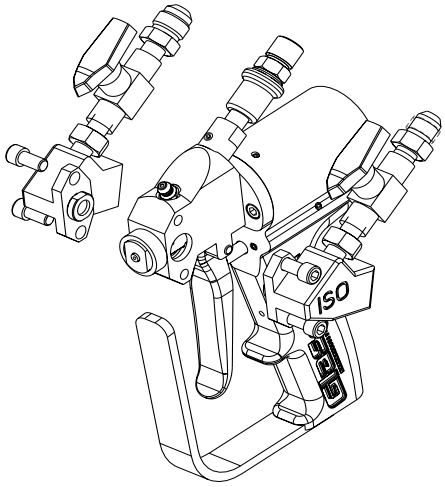


• Place generous amounts of high quality, white lithium grease in each side of the gun front housing and on the side block seals.

• Use correct size drill bit to clean out the mixing chamber exit passage. Use correct size drill bit to clean the inlet side holes of the mixing chamber taking care not to scratch the mixing chamber's polished surfaces. (refer to the chart at front of manual)



• Re-assemble the side blocks and tighten the screws. Grease should appear at the tip of the Mixing Chamber.



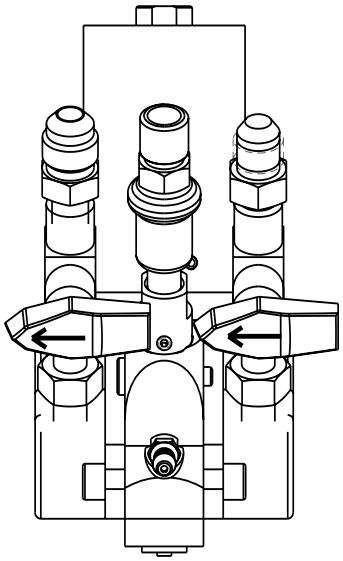
DO NOT open the air switch on the gun because this will purge grease from the Gun. The grease should be allowed to remain in the gun overnight.

Daily Shut-Down

For experienced users

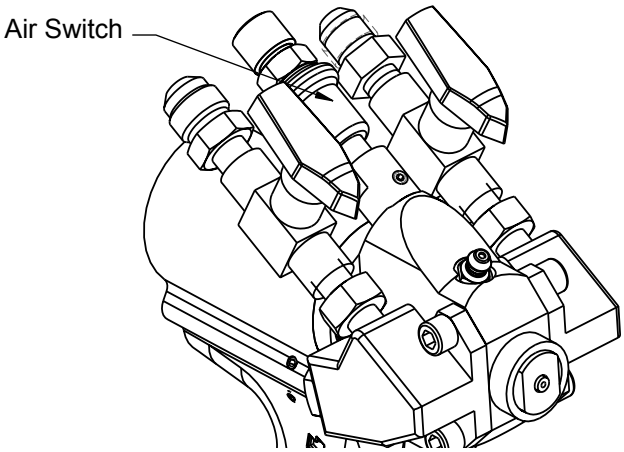
Once you have used the gun with a product and system, and you have become comfortable with techniques on how all the variables are affecting your operations and maintenance requirements, Daily, Weekly, and Monthly Maintenance requirements can be addressed specific to your operation.

1. Turn the ball valves off, p/n PG-15-01, activate and deactivate the gun 5 - 6 times to purge residual pressure.

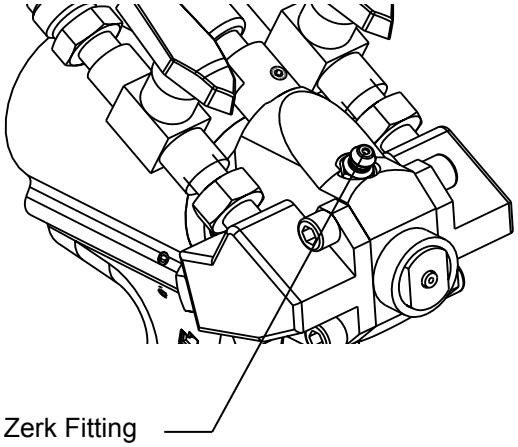


2. Drill out the chamber insert snout with correct size drill bit for insert. (see chart in front of manual)

3. Pull slide valve, p/n 16832-00 halfway back to limit the air purge.

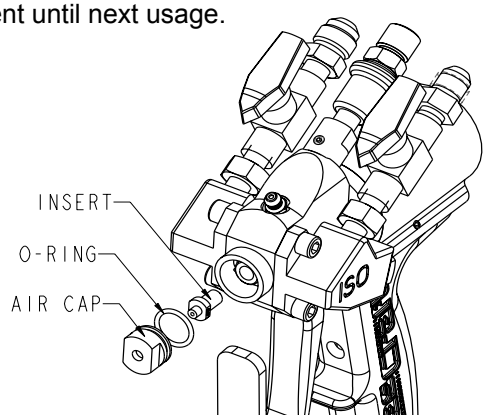


4. Inject white lithium grease into zerk fitting until a light mist of grease is purged through the snout. Shut off the air purge.



5. Remove the air cap, p/n 23961-00 and set to side. If solvent soaking is required, remove the o-ring, p/n 23974-12 before soaking.

6. Remove the insert, p/n 23977-XX and soak in solvent until next usage.



Daily Start-Up

1. Clean the snout insert, p/n 23977-XX. Be sure both, the face and bottom flat are Clean. Drill the snout bore out with the correct size bit for Snout. (see chart in front of manual)

2. Clean the inner bore of the chamber. Drill out the chamber snout inlet bore as required.

3. Install the snout insert.

4. Install the air cap, p/n 23961-00 on to the chamber. Tighten finger tight until the cap bottoms out. Snug down with a ½ in. wrench. This does not require high torque. Over tightening can result in chamber damage.

Refer to specific system user manuals for complete system installation.

Parts Replacement Procedure

⚠

Before attempting to perform any maintenance on this gun OR before removing the side blocks, make certain that both gun material valves are in the OFF positions!

If the material valves are on when side blocks are removed, the gun will quickly become encased in urethane!

1. Read each procedure entirely before beginning and refer to the illustrations as needed.
2. Flush and clean all chambers and passages as they become accessible.
3. Clean all parts before assembly.
4. Replace all o-rings and seals with new parts from the appropriate kit.
5. Inspect all parts for wear or damage and replace as required with new *genuine GlasCraft replacement parts from your authorized GlasCraft distributor.*
6. Inspect all threads for wear or damage and replace as required.
7. Tighten all threaded parts securely, but not excessively, upon assembly.
8. Lightly lubricate all o-rings and threads with lithium grease.
9. Check all springs for resilience. They should return quickly to their original (new) length.

Routine Care

⚠

Before attempting to perform any maintenance on this gun OR before removing side blocks, make certain that both Gun material valves are in the fully OFF positions!

If the material valves are on when side blocks are removed, the gun will quickly become encased in urethane!

It is recommended that the following service be performed on a daily basis.

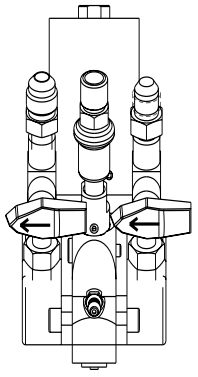
1. Clean the gun using a brush and an appropriate clean solvent.
2. Inspect the side block seals, p/n 23973-00, making certain they are clean and free of scratches, nicks or foreign material. Clean and replace as required.
3. Remove, clean or replace the filter screen, p/n 23971-00.
4. Maintain a reasonable stock level of “wear” items such as seals and o-rings. (see Service & Repair Parts Kits listed in Parts & Illustrations section.)

Piston Throw Adjustment

The P2 gun piston throw is factory set and as a rule, should not require adjustment. The piston throw refers to how far back the air piston will travel when the gun is triggered. Proper throw adjustment will align the mixing chamber side ports with the side block seal thru port. There is a set screw that determines how far the piston will travel before it stops.

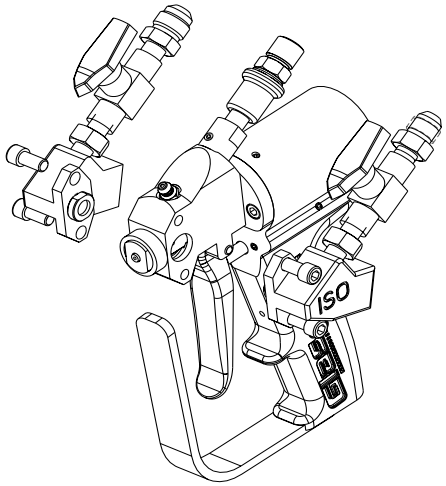
To determine if the Throw is correct:

1. Turn the material ball valves, p/n PG-15-01 to the OFF position.

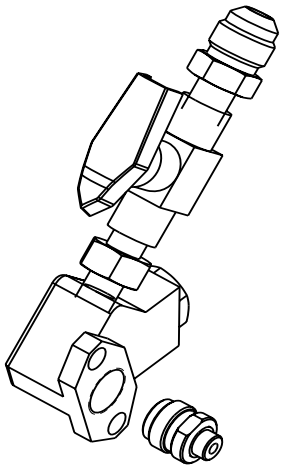


2. Trigger the gun to clear out residual pressure in Side blocks.

3. Remove the side blocks, p/n 23955-00 & 23956-00.



4. Remove one of the side block seal housings, p/n 23959-00 from side block. Leave the seal, p/n 23973-00 in housing and rinse with suitable solvent.



5. Turn the air ON to gun, pull the trigger to actuate the gun into spray position, when gun pulls back, keep in mind the purge air will not shut off. Turn air OFF at the slide valve, p/n 16832-00 before releasing trigger.

6. Place seal / seal housing assembly into gun head so the face of seal sets against the chamber. Look thru the thru port of the Seal. The side port of the Chamber should be at the center, or slightly forward of the center line. If this adjustment appears to be correct, rotate the seal housing to ensure the air cap, p/n 23961-00 is not contacting the seal housing, p/n 23959-00. There should be no contact between these two parts. Contact will result in chamber damage.

7. Adjust the set screw, p/n 17259-16F until

a. The side port of the chamber is “on center” with or forward of center of the thru port of seal.

b. The seal housing can be rotated and does not make contact with the air cap.

8. Turn the air ON and re trigger the gun, then shut the air OFF before releasing trigger. Re-check the throw.

9. If the set screw feels loose, Remove it from the rear cap, clean and apply non-permanent thread lock to threads and reinstall, set adjustment.

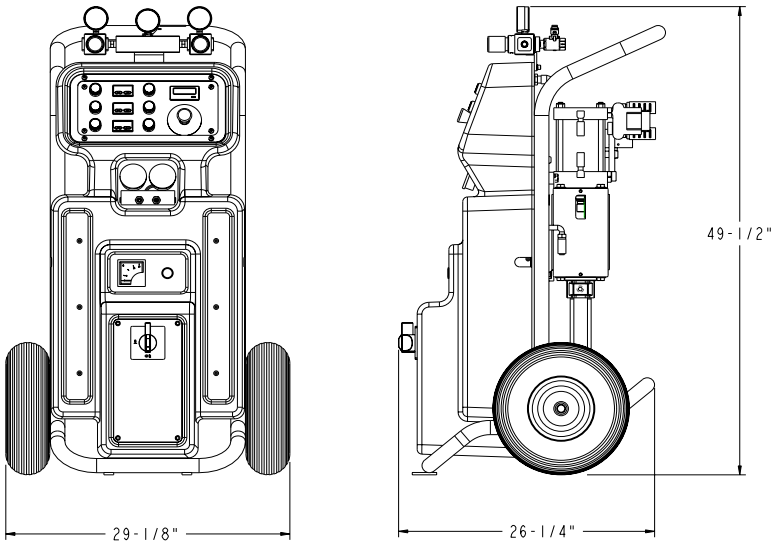
GUARDIAN A-6 6000

SETUP, USAGE & TROUBLESHOOTING

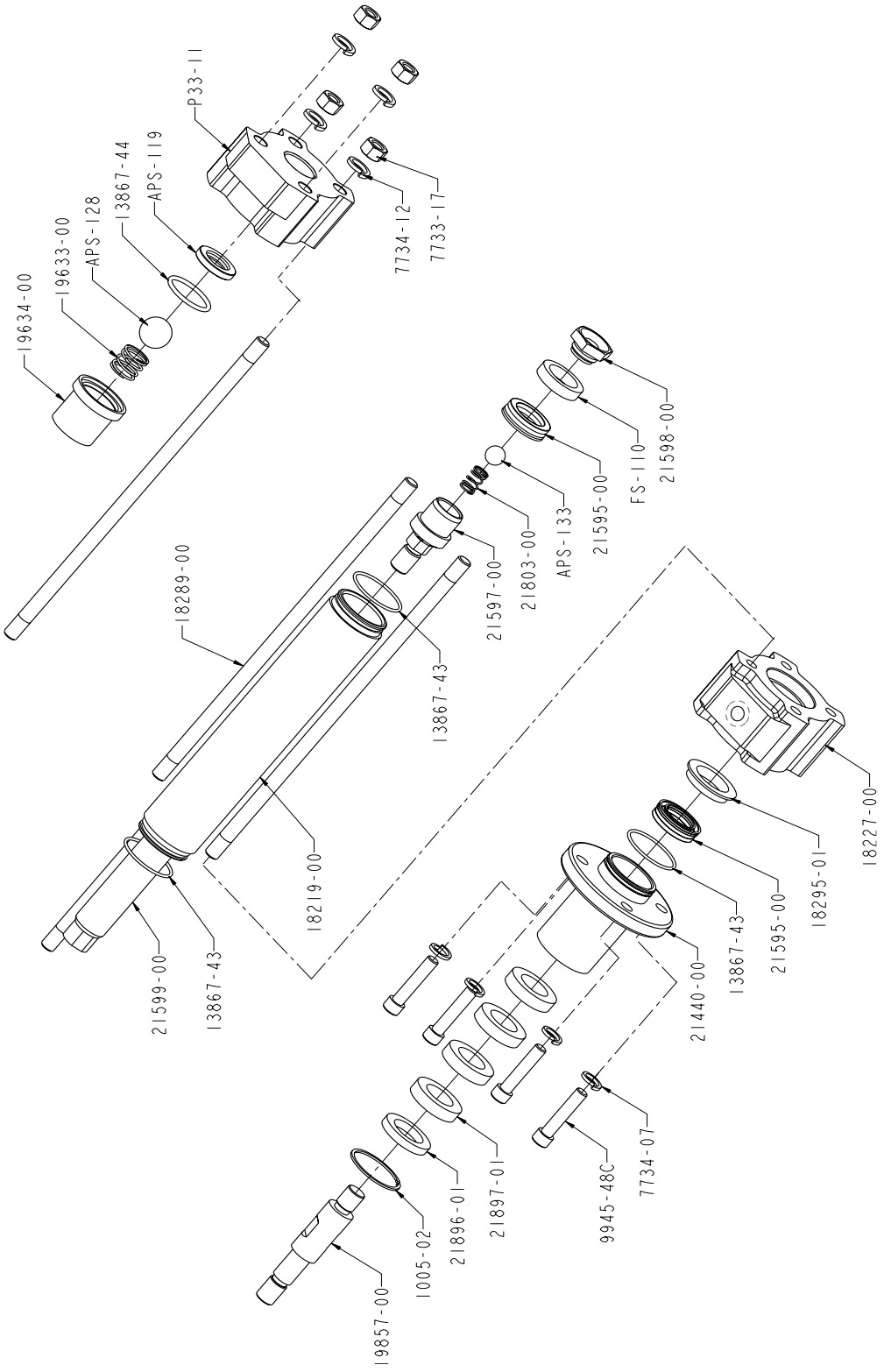
System Specifications

Material Ratio:	1:1 (Fixed)
Material Viscosity:	200- 2000 Centipoise (Cps) @ AMBIENT
Output:	Pumps Rated: .042 Galons Per Cycle .159 Liters Per Cycle
Operating Temperatures:	32º F (0º C) - 180º (82 º C)
Operating Psi:	22:1 RATIO 2200 PSI @ 100 PSI Air Max Working PSI 2420 PSI **Note: Overpressure switches are factory set at 3200 PSI.**
Purging: Constant	Automatic Pneumatic, Solvent-free, Constant
Electrical Requirements:	50 A @ 208/240 VAC,50/60 hz, Single Phase 20 A @ 208/240 VAC,50/60 hz. Three Phase 20 A @ 380 VAC, 50 hz. Three Phase
Compressed Air Requirements:	Base Unit: 1.0 GAL PER MINUTE – 24 CFM @ 100 PSI. 1.5 GAL PER MINUTE – 36 CFM @ 100 PSI. 2.0 GAL PER MINUTE – 47 CFM @ 100 PSI. **NOTE:** As output is increased, (achieved w/ chamber size on gun or spray tip), pressure drop will be greater. Heating capability will also drop.
Heaters:	6000 WATT HEATER
Maximum Hose Length:	300' (Each Section 50' x 3/8" I.D.)
Shipping Weight:	Approx. 440 Lbs.

Overall Dimensions:

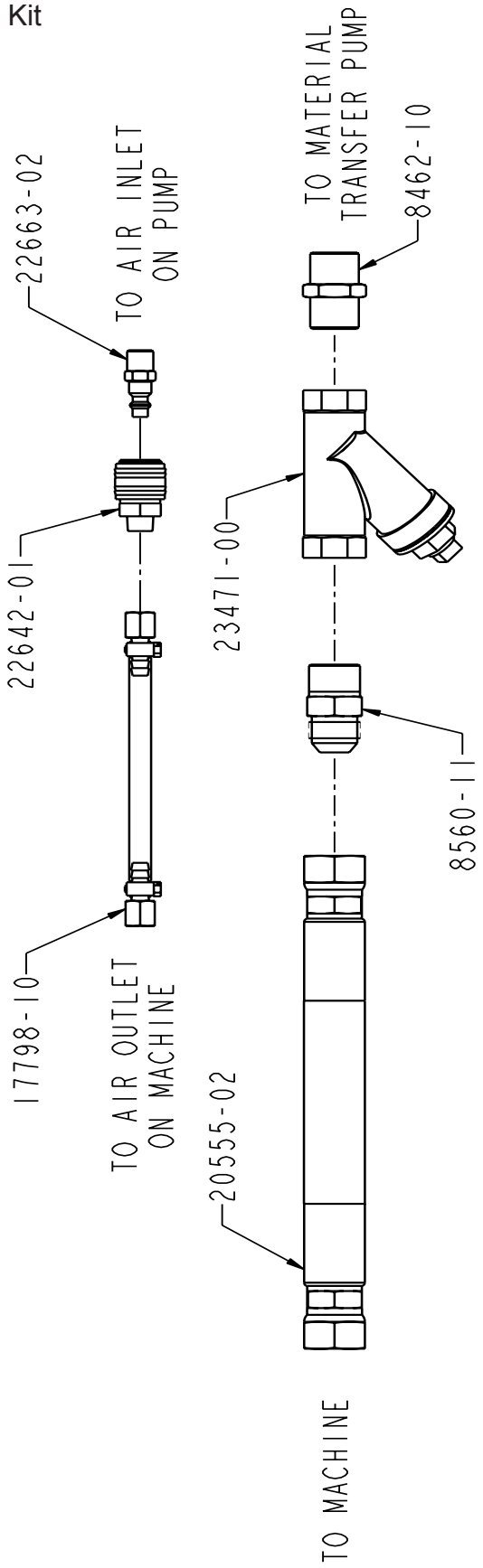


21835-00 Fluid Section



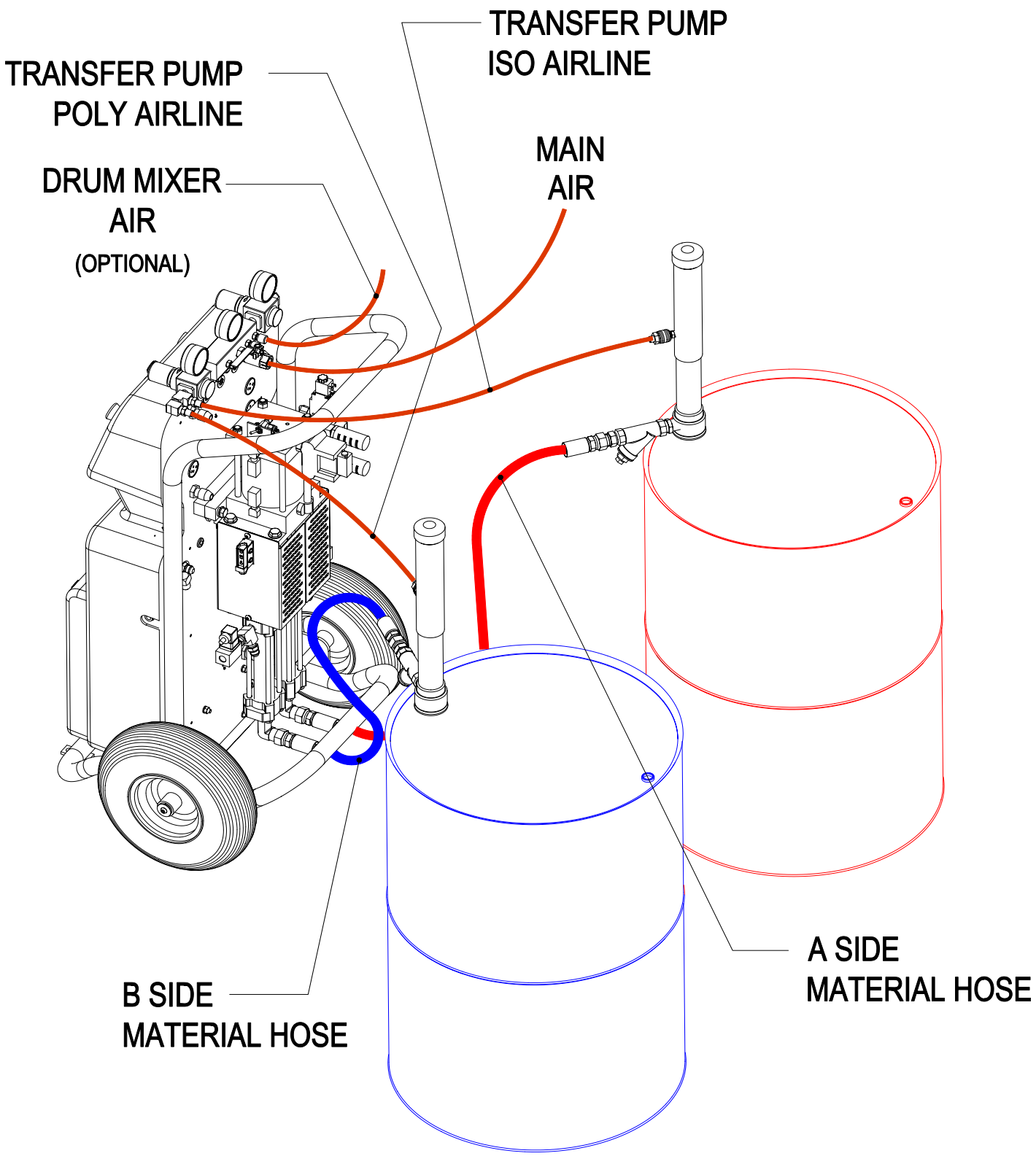
Options

17666-05 Stick Transfer Pump Kit



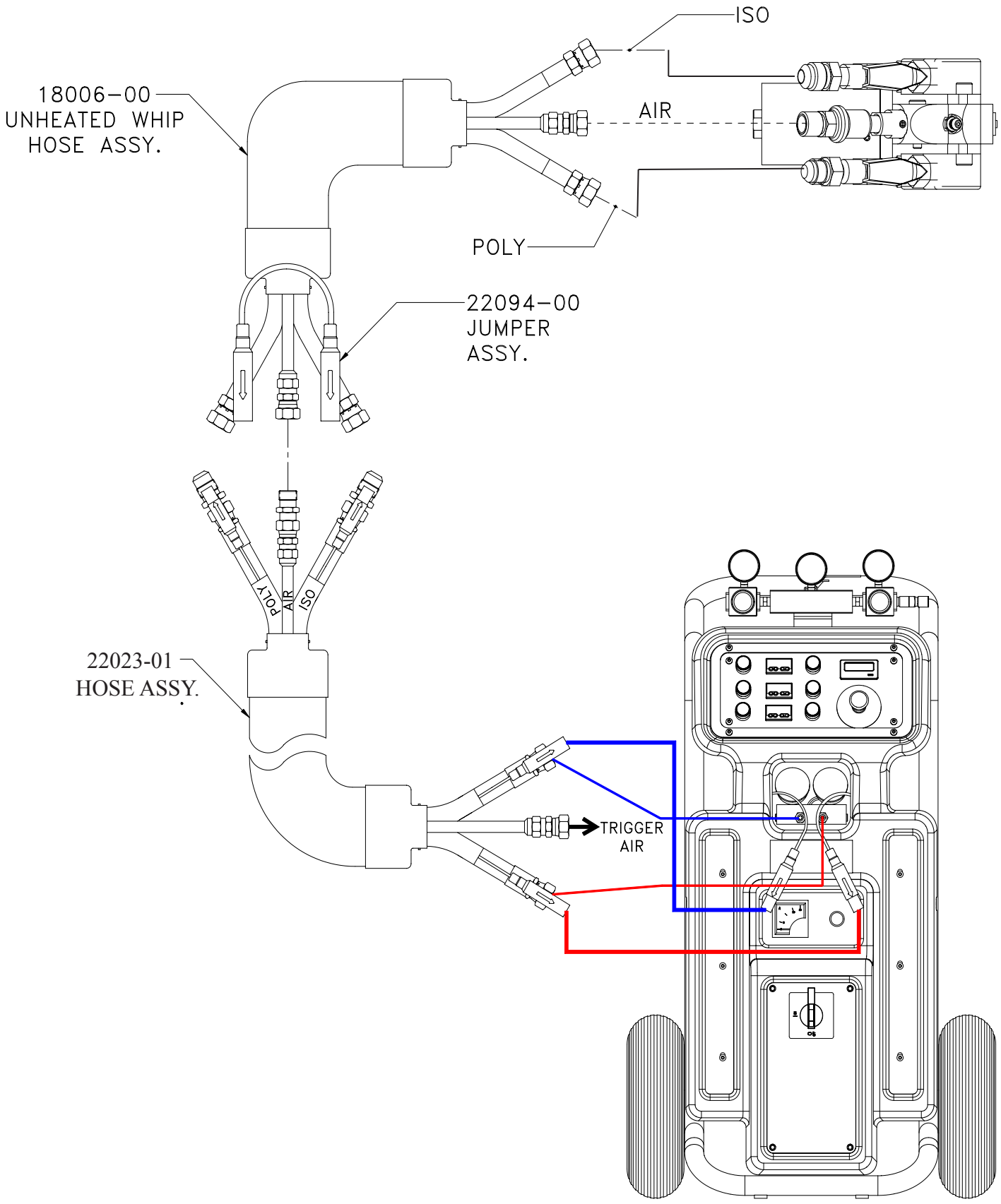
Note: The transfer kit attaches the same way for both ISO & POLY side. Use teflon tape on NPT threads.

Stick Transfer Pump Kit Connection Diagram



Optional Desiccant Dryer Kit
P/n: 23410-00 should be installed on the ISO material drum. Replacement cartridge pn: 23409-00.

Typical System Connection Diagram



Assembly Instructions

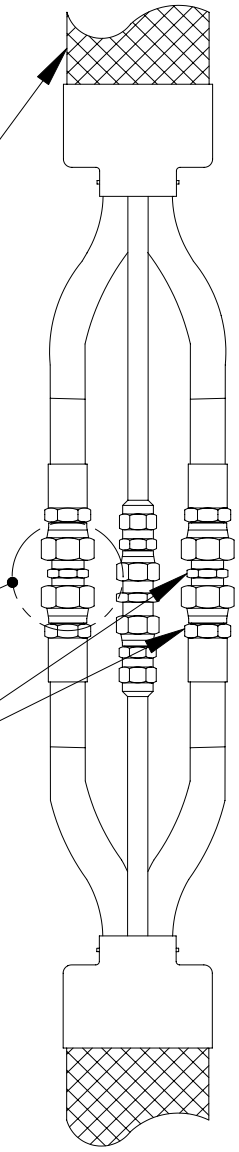
NOTE
The GlasCraft System is factory assembled. If any questions arise concerning air or electrical connections, please refer to illustrations located in the forward portion of this User Manual or contact your GlasCraft distributor.

Fluid Line Connection

The material hoses that bring Isocyanate and Poly-ol chemicals and the air from the machine to the gun should be connected as follows.

Required Tools:

Opened - end wrenches - 5/8", 3/4" , 13/16"



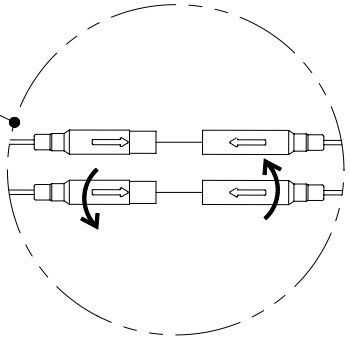
1. Lay hoses out straight.

2. Couple hoses together with supplied union fittings and tighten finger-tight.

3. a. Hold crimp fitting hex (3/4"), and union fitting together, allowing the hose to hold it's natural line.

b. Using the appropriate wrench (A-side 3/4" / B-side 13/16") tighten swivel fitting to union, not allowing crimp fitting or union to turn. Repeat on opposite side of union.

This practice is required on all connection points.
1) Hose @ machine
2) Hose @ gun
3) Adding additional hose sections



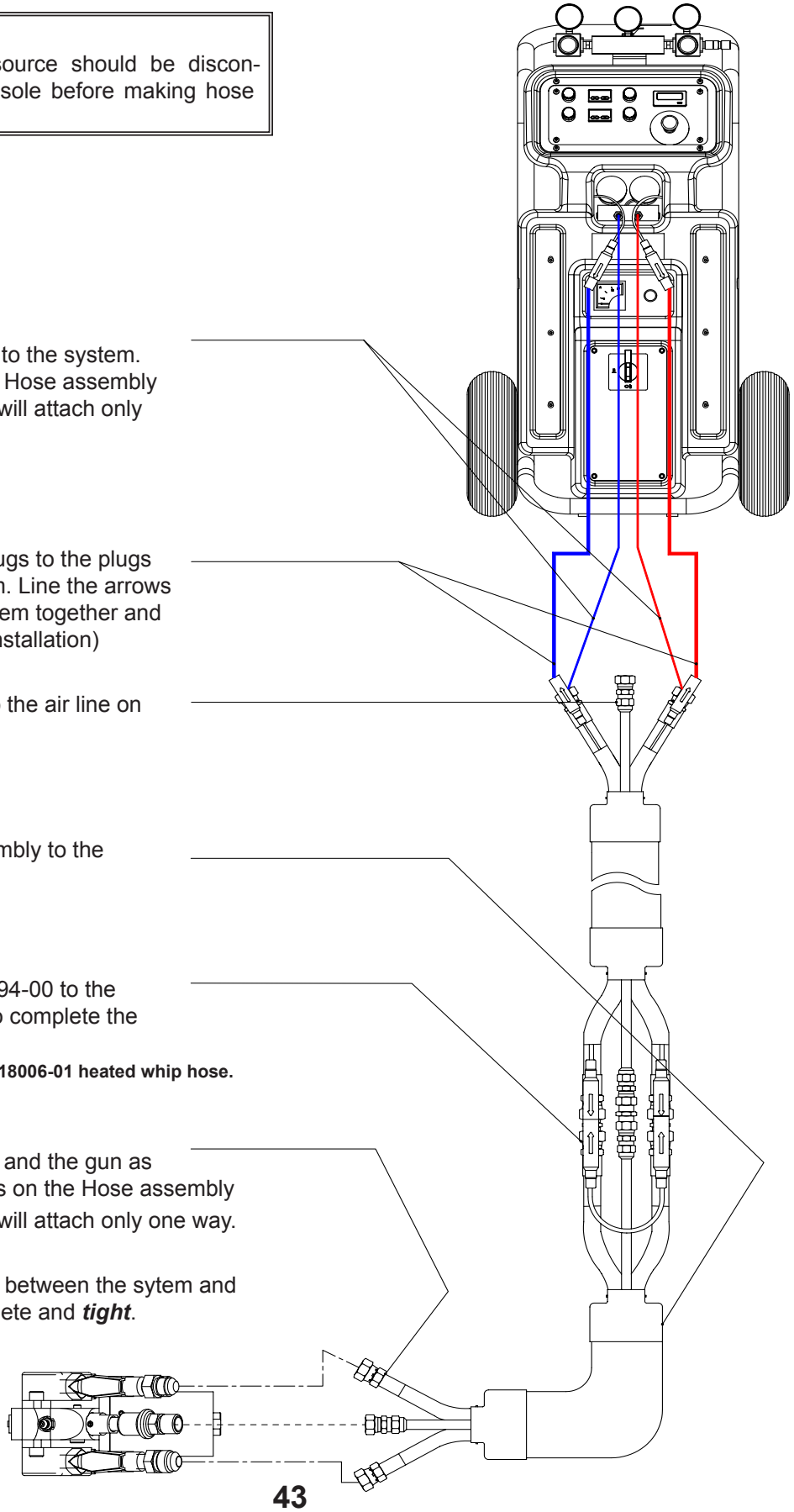
4. Plug hoses together, The TRU-FLOW hose plugs are a twist-lock design.

a. Push plugs together.

b. Twist to lock position.

Once connections are made, tape connections well enough to keep plugs from coming undone, damaged, etc.

WARNING
Main power from power source should be disconnected or turned off to console before making hose connections.



1. Connect Hose Assembly to the system. The swivel fittings on the Hose assembly are sized differently and will attach only one way.

2. Connect the twist-lock plugs to the plugs on the front of the system. Line the arrows up on each plug, push them together and twist to lock. (see hose installation)

3. Connect trigger air line to the air line on the system.

4. Connect whip hose assembly to the material hose.

5. Connect jumper p/n: 22094-00 to the plugs on material hose to complete the circuit.

Note: **Jumper not needed with 18006-01 heated whip hose.**

6. Connect Hose Assembly and the gun as shown. The swivel fittings on the Hose assembly are sized differently and will attach only one way.

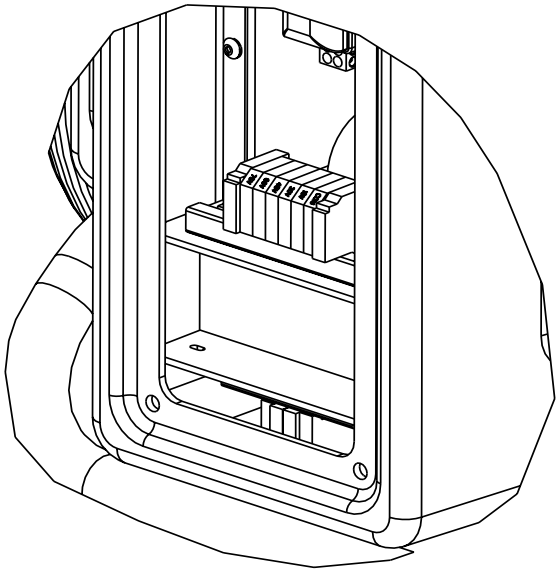
7. Fluid and air connections between the sytem and gun should now be complete and ***tight***.

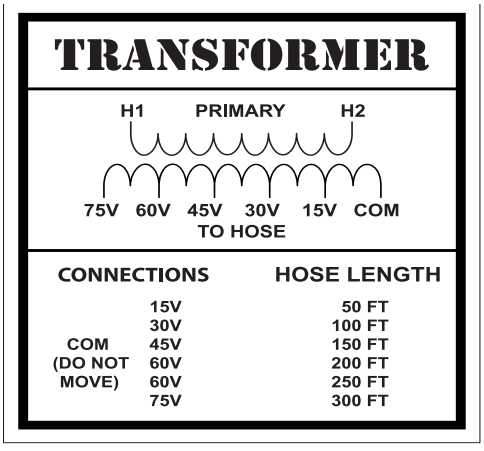
Electrical Connections

NOTE
Electrical connections must be checked on a periodic basis.

1. 208/240 volt single phase
L1 L2 GROUND
208/240 volt three phase
L1 L2 L3 GROUND
380 volt three phase
L1 (black)
L2 (brown)
L3 (black)
L4 (blue)
GROUND (green)

2. The transformer can now be set for proper hose length.





WARNING
*When Main Power to system console is on, the white and black wires in the console are **always live!** Disconnect or turn **off** Main Power source before opening console to make any repairs or before making any electrical repair of any type to the system.*

CAUTION
If you do not understand the electrical hook-up described above, consult your local GlasCraft distributor OR a qualified electrician.

Air Supply Connection

An air source which delivers a constant 25 CFM @ 90-110 PSI (708 liters @ 6.3-7.7 BAR) and does not exceed 125 PSI (14 BAR) should connected directly to the Ball Valve, P/N 21666-01, mounted on the Proportioning Unit Air Motor. (see “Typical System Connection Diagram” illustration) The air line to the Console should be a minimum 1/2 inch inside diameter (I.D.) if it is 25 feet or less in length. Should it be over 25 feet in length, the air line should be a minimum 3/4 inch I.D.

WARNING
Never leave machine unattended while system power is on or system is running.
System running is defined as: preheat cycle of the hose heat, primary heaters, or any pump operation.
Machine operators must be familiar with the component functions and operation of the machine.

Pre-Operation Check List

A. Check that all fittings are securely tight.

B. Check electrical hook-up (qualified electrician recommended).

C. Main power switch on Control Box should be switched to ***OFF*** position.

D. Air Regulator turned (counter clock-wise) to ***OFF*** position.

E. Hose Control and Primary Heater Control to ***OFF*** position.

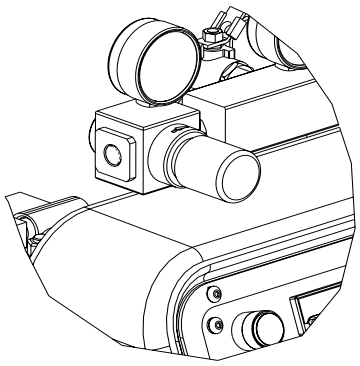
WARNING
Do not place any part of the body in the path of the material spray.
Do not point the gun at or near other personnel.
Do not look into the Mixing Chamber orifice at any time.
Because of the hazardous materials used in this equipment, it is recommended that the operator use an air mask, goggles, protective clothing, and other safety equipment as prescribed by current regulations, recommendations of the chemical suppliers, and the laws in the area where the equipment is being used.

Initial Start-Up Procedure

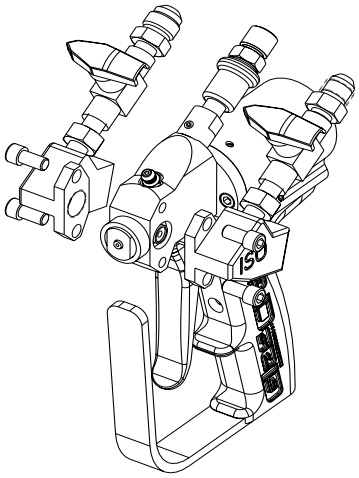
With all material and air lines connected and power cable attached, the system is now ready for start-up.

Filling The System

1. Adjust Air Regulator to 20 PSI to fill system. Air Motor will cycle slowly to fill Pumps, Heaters and Hoses and stop.

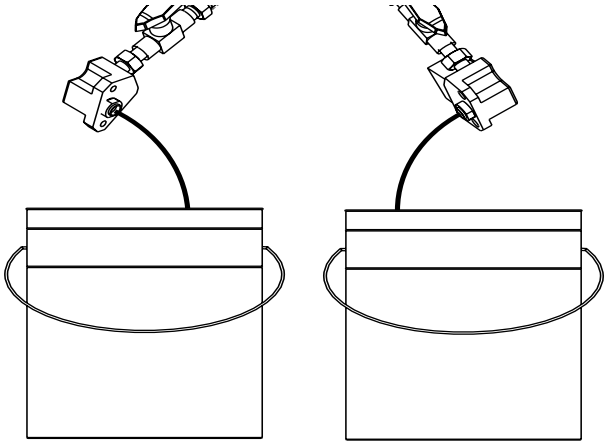


2. Remove ISO & POLY side blocks from gun.



PROBLER P2
MAKE SURE VALVES ARE OFF

3. Place separate clean containers under each indi vidual side block. **Slowly** open material valves (black arrow forward) on each side block to allow trapped air to escape the hose and material to flow into the containers until all air is purged from the material system.



NOTE
Remember to dispense one to two gallons of material to clear the system of grease and plasticizer that was used during factory testing.

4. Close manual material valves. Material pressure gauges should now register approximately equal pressure. If one side registers considerably more pressure than the other side, go to the high pres sure side and bleed off some pressure by slightly opening the manual material valve on the side block over the container. Bleed pressure until both sides are approximately the same pressure.

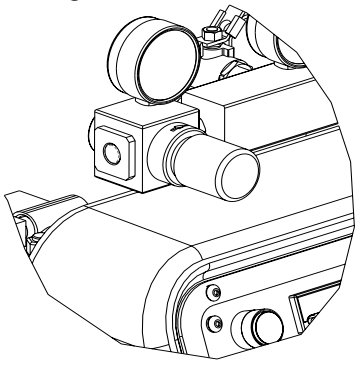
5. Dispose of waste material properly and in accor dance with chemical suppliers instructions and local, state and federal regulations.

NOTE
Before re-assembling Side Blocks, lubrication can be applied by dabbing a white lithium grease into holes inside of Gun Front Housing and wiping grease over SideBlock Seals. Grease will purge itself when air valve is turned on at Gun and Gun is triggered.

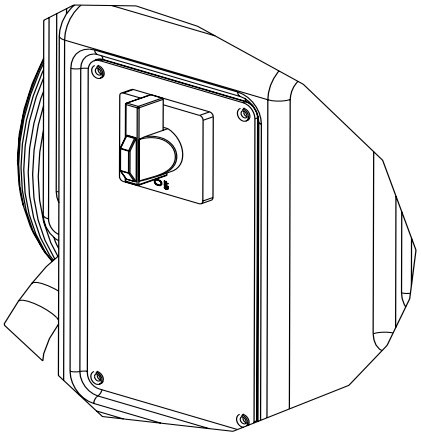
6. Clean and lubricate Side Blocks and Seals thor- oughly and re-assemble on Gun. Make certain that Side Block Screws are tighten securely.

7. Refer to material manufacturers operating instruc- tions for proper preparation of material, i.e, mixers, etc.

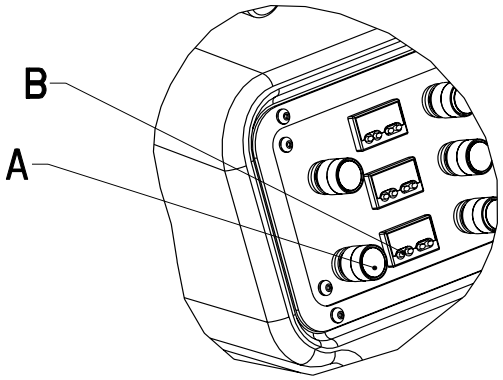
8. Leave Air Regulator at 20 PSI



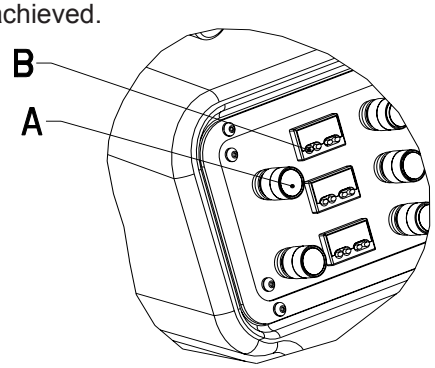
9. Turn main power Switch to ***ON*** position.



10. Turn on Hose Control:
- **a.** Push in the green power button.
- **b.** Press up or down arrow buttons on the controller until desired temperature setting is achieved.



11. Turn on the ISO & POLY Heater control:
- **a.** Push in green power button.
- **b.** Press up or down arrow buttons on the controller until desired temperature setting is achieved.

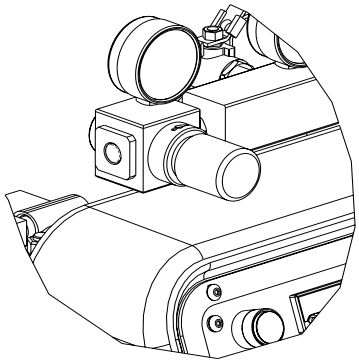


WARNING
Straighten hose out flat, to avoid uneven heating and damage to internal wiring of the Hose Assembly.

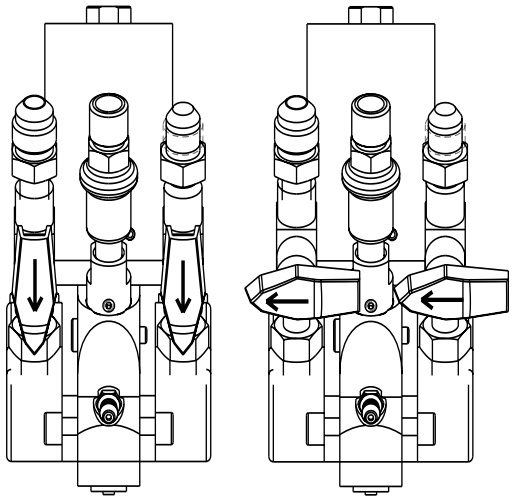
NOTE
Allow enough time for hose to warm up (approximately 15- 20 minutes). Remember that the heated hose does not have a delta rating. The heated hose's function is to maintain the heat generated by the primary heaters during system operation, and preheat material during initial start-up. The hose should be set to maintain a temperature close to the set point of the heaters.

CAUTION
Due to the expansion of urethanes when heated, it is imperative that on cold start-up of the system that the heaters be turned on and allowed to reach operating temperatures before the Main Pump Air Regulator is adjusted to the desired spray pressure. If you do not allow the heaters to reach operating temperature before adjusting air pressure, the material pressure will exceed the set point of the over pressure switches causing the system to shut down.

12. Adjust Main Air Regulator to material suppliers specifications.



13. Turn Purge Air and Material Valves ON at Gun.



ON **OFF**

14. Relieve any excess pressure by triggering the gun.

NOTE
The Emergency Stop Switch is located on the bottom right side of the control Panel, when depressed, it will shut down the power and activate the Air Dump Valve. To reset, turn handle on push button.

15. The system is now ready for operation.

WARNING
Do not place any part of the body in the path of the material spray.
Do not point the gun at or near other personnel.
Do not look into the Mixing Chamber orifice at any time.
Because of the hazardous materials used in this equipment, it is recommended that the operator use an air mask, goggles, protective clothing, and other safety equipment as prescribed by current regulations, recommendations of the chemical sup pliers, and the laws in the area where the equip ment is being used.

16. The system will dispense liquid at high pressure when Gun Trigger is activated. Read and note WARNINGS contained in this User Manual and the Probler P2 Gun User Manual, GC-1386.

CAUTION
The Polyol will expand in the Hose if any normal operating pressures are bled off whenever the material is above approximately 75 degrees F. Hot Polyol hoses should never be bled, by any method, to zero pressure for two reasons.
1. The seals in the Gun rely on high pressure to make their seal. The high pressure cannot be maintained if the pumps are attempting to apply this pressure through a hose full of expanded froth; therefore, the Gun seal may leak.
2. Re-starting immediately after hot Polyol has expanded in the system may result in spraying substantial amounts of "bad" foam. This will continue until the expanded Polyol in the primary Heater and the Hose has been completely purged.

Over Pressure System Protection

The system incorporates monitors for high pressure monitoring. These monitoring devices will prevent the system from continued operation if high pressure situations develop.

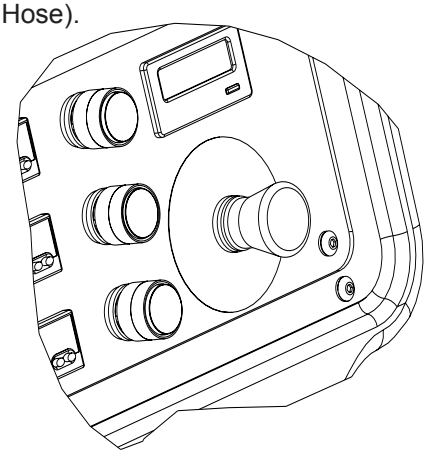
There are pressure sensors located on each propor tioning pump. The high pressure sensor is located at the outbound of the fluid section.

The high pressure monitoring sensor will engage if fluid pressure increases above 2200 psi.

If a high pressure situation develops, the sensor will detect this and immediately engage the hold-in circuit.

This will disengage power to the air motor and will also turn the heaters off.

On the control box panel, there are three yellow lighted push buttons marked over pressure. One of these push buttons will be illuminated after the monitoring sensor engages, indicating where the problem is located (ISO, Poly, or Hose).



In the over pressure situation, the system will remain shutdown until it is manually reset.

At this point, it is necessary to determine if the problem is an over pressure situation.

When the sensor engages, the system will be frozen, giving you the pressure readings at the time the problem was detected.

Inspect the fluid pressure gauges, in an over pressure situation, one of the fluid pressure gauges will be significantly higher than the other gauge.

WARNING
When main power to unit is on, the console will have wires that are live. Disconnect or turn off main power source before opening console to make any repairs.

WARNING
Before performing any repairs on the system,
ALL AIR and FLUID PRESSURES SHOULD BE RELIEVED TO ZERO (BLEED-OFF)!

Over Pressure Problem Correction

1. Determine if the problem is high pressure related.

2. Relieve system material pressure.

3. Turn off main power.

4. Fix the problem area:
a. Potential high pressure causes:
-Restriction
-Overheating material in static position
-ISO filter at gun

5. Re-start system for operation

NOTE
Once the power has been turned off and problem solved, and the main power is turned on again, the over pressure lighted buttons will automatically be reset.

CAUTION
If you do not understand the electrical hook-up de scribed above, consult your local GlasCraft distributor OR a qualified electrician.

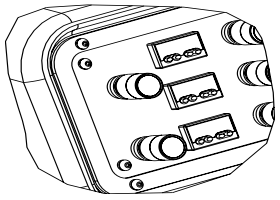
It is recommended that a qualified, licensed electrician should install power to the supply disconnect.

You should always follow all local or national electrical codes.

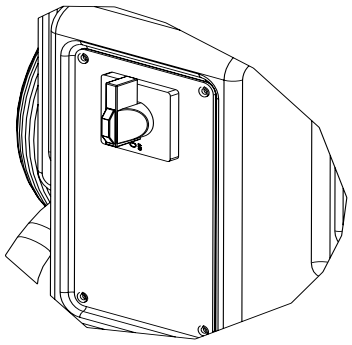
CAUTION
Disconnect power source BEFORE attempting any repairs or opening the Control Boxes. Access to internal parts is limited to qualified personnel ONLY!
Place Main Power Switch in OFF position BEFORE disconnecting power cables. This equipment is not approved for use in hazardous locations as set forth in the National Electrical Code Article 500 and Sub-Part "S" of the OSHA Standards.

Daily Shut-Down Procedure

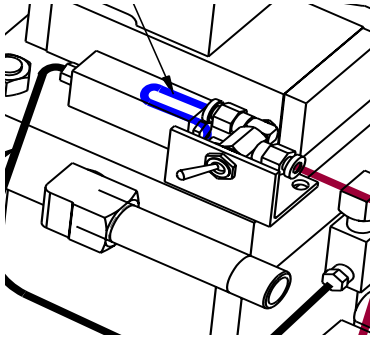
1. Turn off hose and heater controllers.



2. Turn off main power switch.

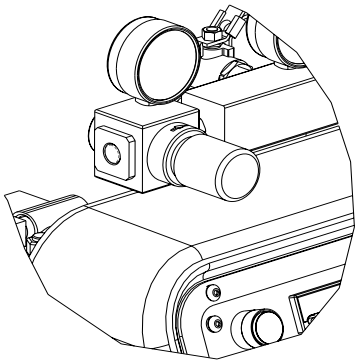


3. Flip retract switch to the "*retract position*" and trigger the gun until pumps are in the down position.



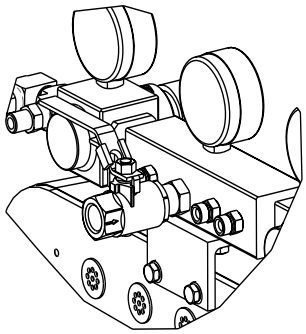
4. Perform gun maintenance. (See gun manual)

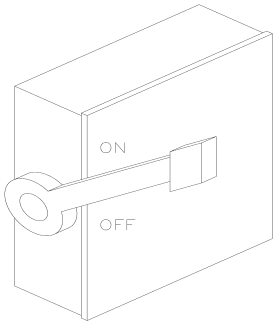
5. Reduce main air regulator pressure to zero.



6. Visually inspect the entire system for leaks.

7. Turn off main air supply and main power.

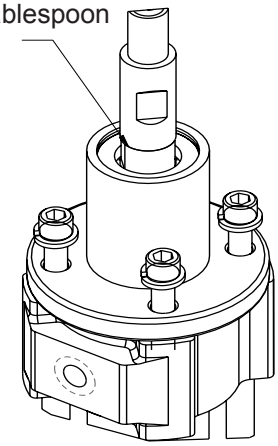




8. Coil heated hoses with a minimum four foot diameter to avoid kinking and subsequent damage to the internal electrical wiring.

9. Check and lube top of the fluid section.

Wipe off residual material and add a tablespoon of DOP,DBP



CAUTION
Do not bleed bleed fluid pressure from the system.

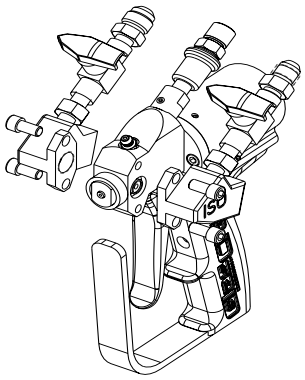
Extended Shut-Down Procedure

There are many different procedures that are being followed for extended machine shut down. Because the system is designed to be compatible with most urethane formulations, GlasCraft recommends that the system should be stored with urethanes instead of solvents, plasticizers, etc. Certain considerations have to be adhered to when an extended shut-down is being performed.

The following procedure is for long extended shut-down periods.

NOTE
Power should be disconnected and all air regulators turned down to zero.

1. Remove side blocks from the gun and relieve pressure from the system.



PROBLER P2

2. Use a suitable solvent to flush the fluid circuits. To determine the compatibility of solvents with material being used. Always check with material supplier.

3. Increase transfer pump pressure until fluid movement occurs.

Note: If fluid movement does *NOT* occur @ 100 psi of air on transfer pumps, increase main pump pressure until the main proportioner *SLOWLY* starts cycling.

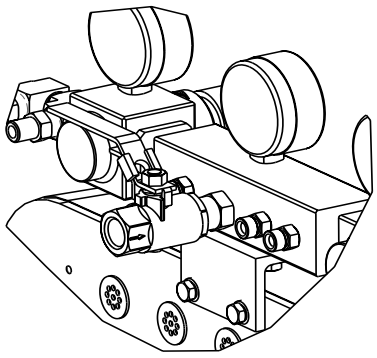
4. Once primary material is flushed from the system, reduce the main air pressure to zero or flip the retract switch to the "***retract position***" and trigger the gun until the pumps are in the down position.

5. If the solvent used to flush the system also contains placticizer, ensure that all primary material is flushed from the system and close the ball valves @ the gun.

6. Leave the pumps in the full down stroke position with approximately 200-500 psi. on the fluid gauges.

7. If plasticizer is required to chase out solvent, cycle main pumps until the system is full of plasticizer, then close valves and leave the pumps in the full down stroke position with 200-500 psi.

8. Turn off main air supply and disconnect air line from the system.



9. Generously coat the exposed transfer pump shafts with lithium grease.

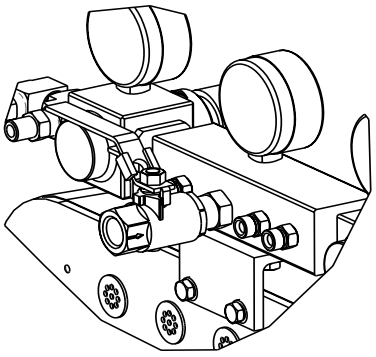
10. Coil the heated hoses with a minimum four foot diameter to avoid kinking and subsequent damage to the internal electrical wiring.

11. For gun shut down, follow the procedure from the gun manual.

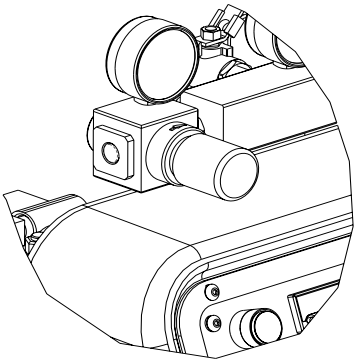
12. The length of time a system is shut down, and the climate conditions it's stored in will determine how often the system should be purged and refilled. Usually every 2 - 4 weeks the following procedure should be followed.

Purge and Refill Procedure

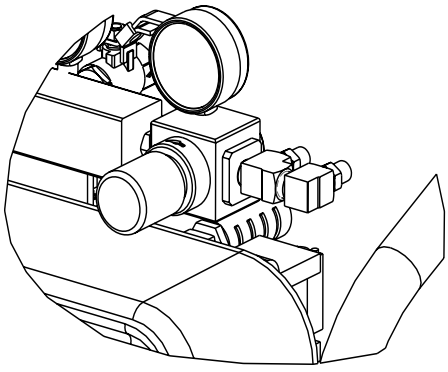
1. Connect the main air line to the system.



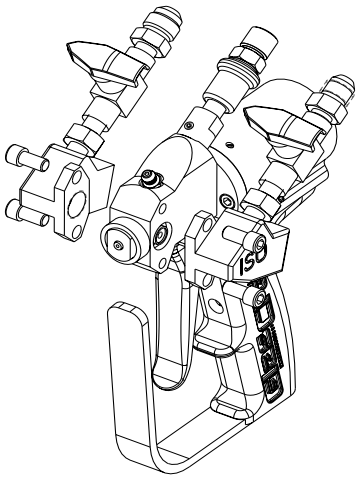
2. Adjust main air regulator to 20 psi.



3. Adjust transfer pump regulators to approximately 40 psi.

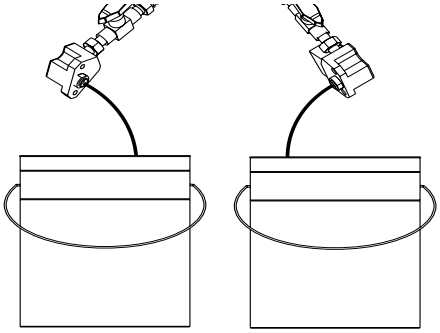


4. Remove the side blocks from the gun.



PROBLER P2

5. Open both side blocks simultaneously into seperate containers and dispense approximately 1-1/2 - 2 gallons of material from each side or until all plasticizer is purged from the system. Stop the pumps in the down position.



6. Close both side blocks simultaneously and wipe off residue from the side block seals. Regrease and attach both blocks to the gun.

7. Mix and properly dispose of purge material.

WARNING
Before performing any repairs on the system,
ALL AIR and FLUID PRESSURES SHOULD BE RELIEVED TO ZERO (BLEED-OFF)!

To relieve Air and Fluid pressures:

System Console:
1. Turn OFF valves that supply material to the Pumps.
2. Turn OFF Main Air Regulator on Air Motor.

Gun:
1. Open both Side Block Material Valves.
2. Turn ON Air Switch.
3. Point Gun into a clean, suitable container and trigger Gun until material flow stops.
4. Fluid pressure gauges must read zero (0), if not, trigger Gun until the fluid pressure gauges do read zero (0) pressure.
5. Turn OFF Side Block Material Valves.
6. Trigger Gun several more times to purge any material remaining in Gun. Turn OFF air Switch.
7. Unless system is to be returned to service at once, follow DAILY SHUT-DOWN PROCEDURE

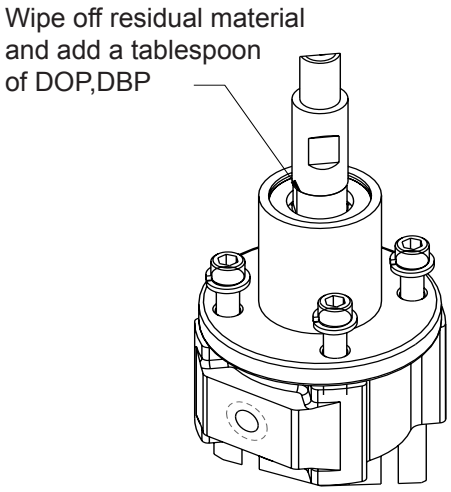
WARNING
Before performing any repairs on any part of the system,
PLACE ALL CONTROLS ON THE MACHINE AND THE MAIN POWER SOURCE IN THE OFF POSITION AND DISCONNECT THE ELECTRICAL POWER CABLE FROM THE MAIN POWER SOURCE!

Daily Routine Maintenance

1. Visually inspect the system for leaks.

2. Check desiccant dryer beads to insure they are still purple and have not changed to pink.

3. Check and lube top of the fluid section.



Weekly Maintenance

1. Place a small amount of grease on the air motor shaft.

2. See related manuals.

Material Or Mechanical Problem

Troubleshooting Procedure

By following this procedure, you should be able to locate and cure problems easily. Remember, however, that a successful operator must know:

WHAT GOOD MATERIAL LOOKS LIKE.

HOW THE EQUIPMENT NORMALLY OPERATES.

WHAT PATH THE MATERIALS FOLLOW THROUGH THE EQUIPMENT.

KNOWLEDGE OF THESE TROUBLESHOOTING PROCEDURES.

NOTE
Always start with step one, never skip any portion of these procedures. The material pressure gauges are to be used for troubleshooting purposes only. The pressures registered on one gauge will not necessarily match the other. This difference can be caused by variance in materials, temperatures, viscosities, etc.

1. Identify the missing material.

2. Check the material pressure gauge on the missing material side.

a. If the missing material gauge reads HIGHER than normal, there is a RESTRICTION problem between the gauge and the Mixing Chamber tip in the Gun.

b. If the missing material gauge reads LOWER than normal, there is a STARVATION problem between the gauge and the material supply system.

NOTE
Problems may be cyclic in that they will appear first on only one stroke of the Proportioning Pump. Check the pressure gauges during one of these bursts of missing materials and always stop spraying while you are getting a burst of good material.

3. Concern yourself only with the material pressure on the missing material side. In troubleshooting a STARVATION problem where the pressure gauge on the missing material side is LOWER than normal, start at the point farthest from the unit and work forward. Check the obvious and easy things first.

A. MATERIAL DRUMS
1. Material in drums?
2. Material temperature?
   a. If the material is to cold, especially at the bottom of the drum, it will raise the viscosity of the material and stall Transfer Pumps.

B. OPTIONAL TRANSFER PUMP(S)
1. Is it operating?
2. Is air turned on to Transfer Pump?
3. Regulated pressure where it should be?
4. Severe contamination of pump shaft on isocya nate side. This indicates that the pump shaft is not being lubricated.
5. Check Filter of Transfer Pump.
6. Before diagnosing a faulty Transfer Pump, be sure and check all items just listed under Transfer Pump.

C. FILTER ASSEMBLY
1. Check fluid filter at inlet to Proportioning Pumps if applicable.

D. PROPORTIONING PUMPS
1. Determine whether the burst appears on the Pump's up or down stroke.
   a. If burst appears on UP stroke, check UPPER Ball Seat and Cups.
   b. If burst appears on DOWN stroke, check LOWER Ball Seat

NOTE
Follow the procedures in the order given. Remember that repairs should be made as soon as possible. Don't leave the unit open to air any longer than necessary, as this will lead to further problems, such as moisture entering the system and causing the isocyanate to crystallize.
After the unit has been exposed to the atmosphere, it should be run long enough to displace the material that was in the unit when it was opened up.
NEVER inspect filter assemblies at time of shut-down!

4. In troubleshooting, a restriction problem where the material pressure gauge on the missing material side is higher than normal, start at the point farthest from the unit and work backward. Check obvious and easy things first.

WARNING
Before performing any repairs on the Gun, ALL AIR and FLUID PRESSURES SHOULD BE RELIEVED TO ZERO (BLEED-OFF)!

A. GUN
1. Side Block Material Valve turned on?
2. Bore hole of Mixing Chamber clean?
3. Filter Strainer Screen clean?
4. Side hole in Mixing Chamber clean?

B. MATERIAL TEMPERATURE
1. Too high a temperature on resin side can cause a blowing agent to pre-expand in either the Hose or the Primary Heater.

C. HOSES
1. Make sure that the Hoses are not plugged.

TROUBLESHOOTING A POOR SPRAY PATTERN

NOTE
To troubleshoot a poor spray pattern, you must understand the factors that affect the spray pattern.

A. TEMPERATURE
1. Too warm a material temperature will cause a separation (fingering) in the pattern.
2. Too cold a material temperature will cause a stream effect.

B. PRESSURE
1. Too high a pressure will cause excessive overspray and/or separation (fingering).
2. Too low a pressure will cause a stream effect.

C. CONTAMINATION IN THE MIXING CHAMBER
1. A foreign object in the Mixing Chamber will cause a poor pattern.

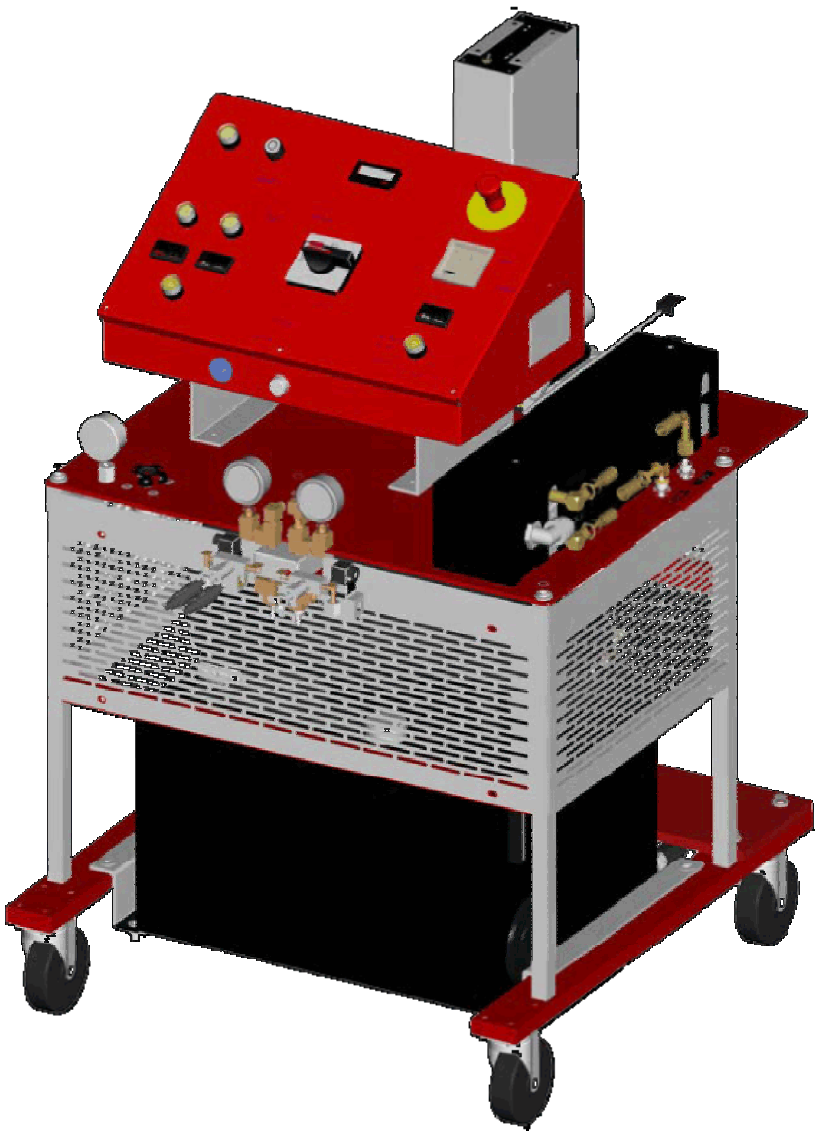
NOTE
Correct problem(s) immediately!

SUMMARY

Review, the major points or just use for notes:

MH-II

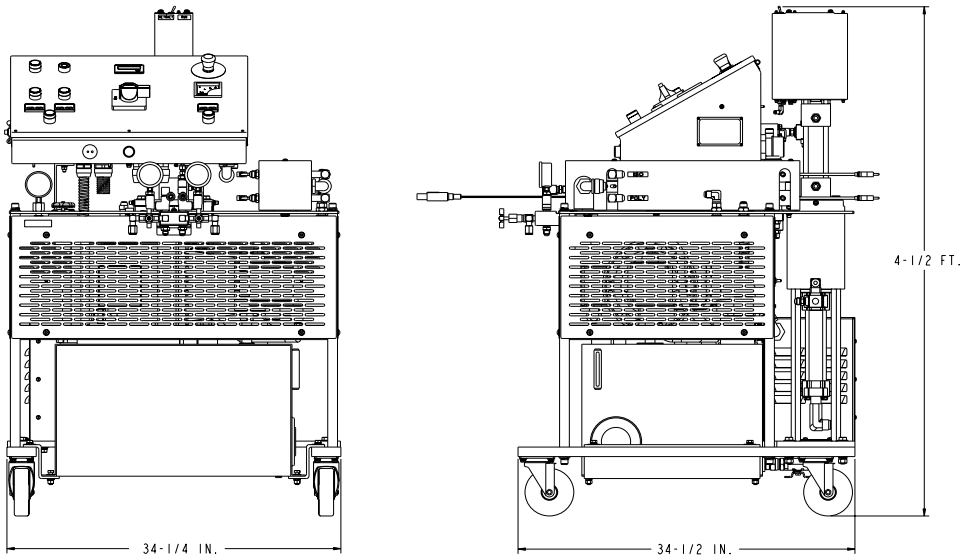
SETUP, USAGE & TROUBLESHOOTING



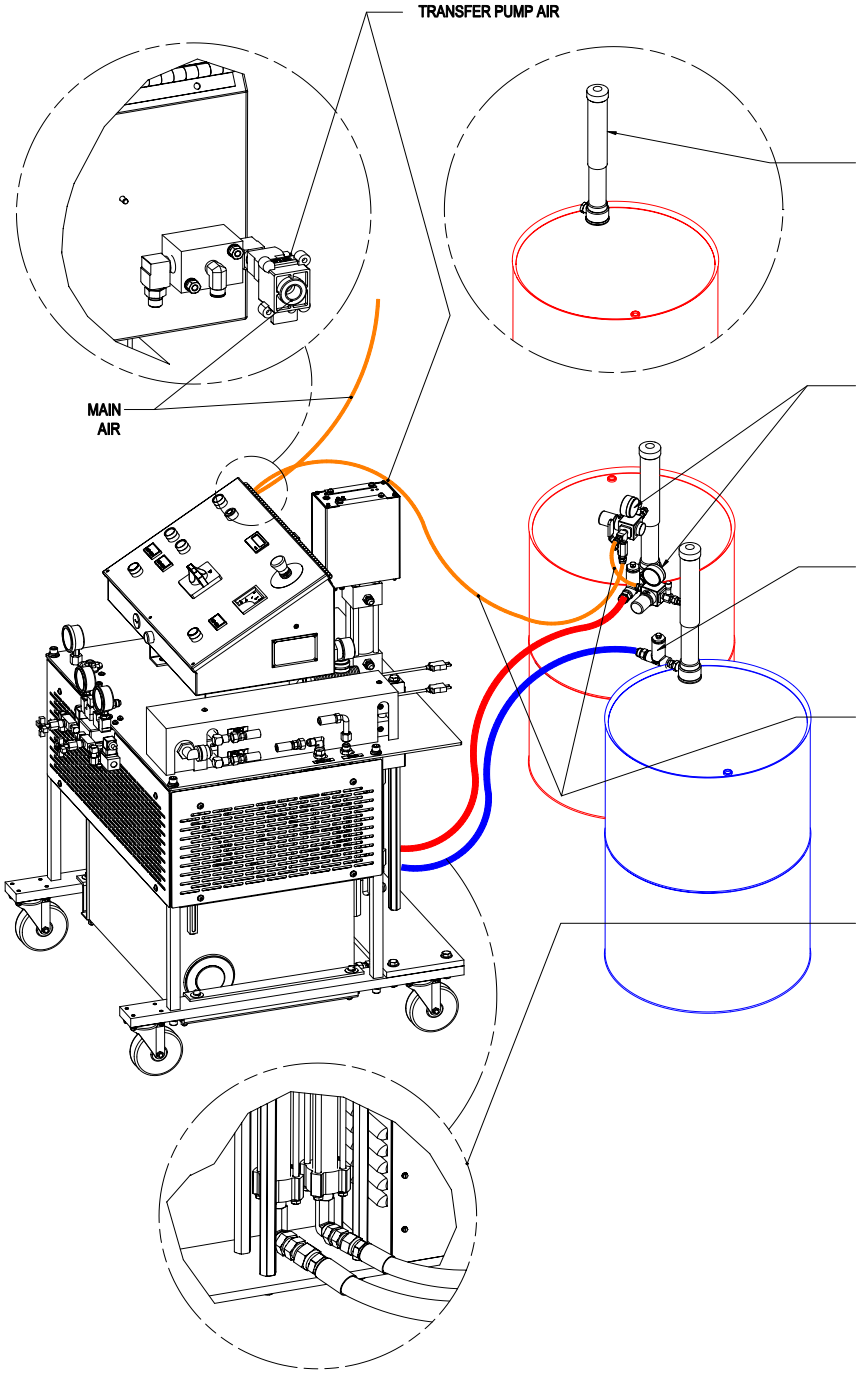
Section 1 - Installation: Specifications

Material Ratio:	1:1 (Fixed)
Material Viscosity:	200- 2000 Centipoise (Cps) At Operating Temperatures
Output:	.042 GPC .159 LPC
Operating Temperatures:	32º F (0º C) - 190º (88 º C)
Operating Psi: Hoses:	3000 Psi. Max (Over Psi Switches Set) 2200 PSI. W/ 19524-01 2600 PSI. W/ 22023-01
Hydraulic Psi To Pumps:	2:1 Ratio 1000 PSI. Hydraulic PSI. 2000 PSI. Fluid PSI. Per Side.
Purging:	Automatic Pneumatic, Solvent-free, Constant
Electrical Requirements:	74 Amps @ 208/240 Vac, 50/60 Hz Single Phase 5 HP 35 Amps @ 208/240 Vac, 50/60 Hz Three Phase 5 HP 27 Amps @ 380 Vac, 50 Hz Three Phase 5 HP
Compressed Air Requirements:	15 Cfm @ 100 Psi 425 Liters @ 6.8 Bar
Max Hose Length:	310' X 3/8 I.d. Hose Includes 10' X ¼ I.d. Heated Whip Hose
Shipping Weight:	950 Lbs

Overall Dimensions:



Optional Transfer Pump Installation
P/n: 17666-01



1. Remove large drum bunghole cover and install material transfer pump bung adapter. Carefully lower the transfer pump into the drum until it touches the bottom of the drum. Raise the pump 1/4 to 1/2 inch and tighten bung adapter securely.

2. Connect regulator assemblies to transfer pumps.

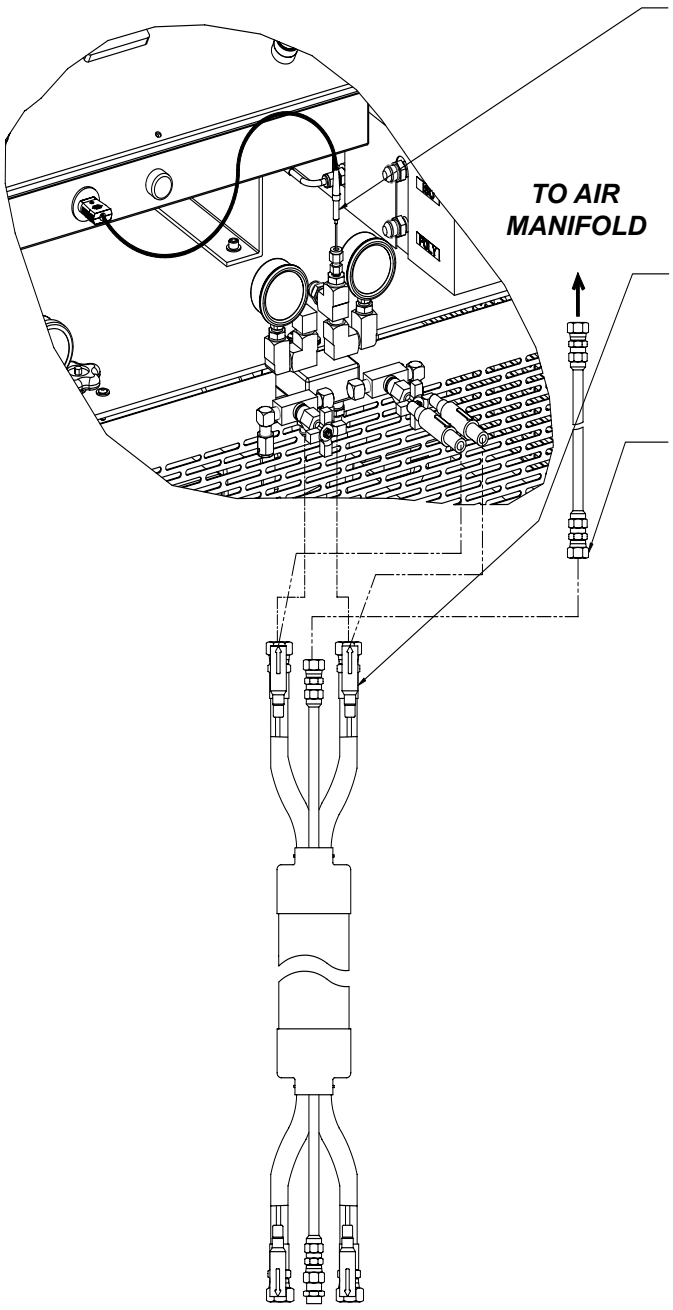
3. Connect filter assemblies to transfer pumps.
Note: **Replacement filter p/n: 17975-01. Replacement gasket p/n: 294.**

4. Connect air lines:
1) Manifold @ unit to bottom regulator port on ISO drum.
2) Side regulator port on ISO drum to air port on POLY drum.

5. Connect material hoses to material pump inlet fittings on the unit and to the outlet fittings at filter assemblies.

Optional Air Dryer Kit

P/n: 23410-00 should be installed on the ISO material drum. Replacement cartridge pn: 23409-00.



6. Install thermocouple at tee fitting.
- **a.** Feed 12' line through hose.
- **b.** Nut & Ferrules will lock into fitting.
- **c.** Tighten nut 1-1/4 turns past finger tight.
- **d.** Plug thermocouple into control box.

Note: When replacing thermocouple p/n 22074-00 use kit p/n: 21214-01.

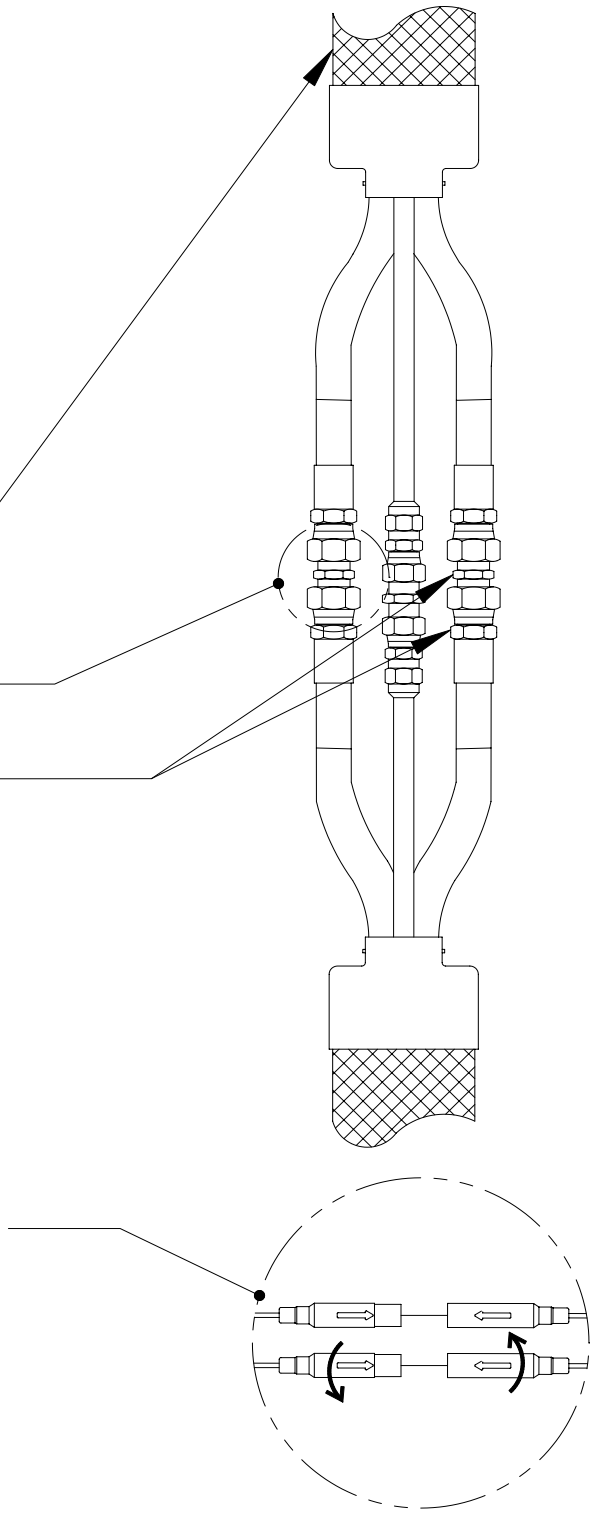
7. **a.** Connect hose assembly to the front of the unit. The fittings are sized differently and will attach only one way. (match like sized fittings).
- **b.** Connect twist-lock plugs. (see hose installation)

8. Connect supplied trigger air line to the air line on the hose assembly.

Section 1 - Installation: Equipment Assembly

9. Continue adding extra hose lengths if necessary.

Required Tools:
Opened - end wrenches - 5/8", 3/4" , 13/16"



a. Lay hoses out straight.

b. Couple hoses together with supplied union fittings and tighten finger-tight.

c. • Hold crimp fitting hex (3/4"), and union fitting together, allowing the hose to hold it's natural line.

• Using the appropriate wrench (A-side 3/4" / B-side 13/16") tighten swivel fitting to union, not allowing crimp fitting or union to turn. Repeat on opposite side of union.

This practice is required on all connection points.
1) Hose @ machine
2) Hose @ gun
3) Adding additional hose sections

d. Plug hoses together, The TRU-FLOW hose plugs are a twist-lock design.

• Push plugs together.

• Twist to lock position.

Once connections are made, tape connections well enough to keep plugs from coming undone, damaged, etc.

Section 1 - Installation: Equipment Assembly

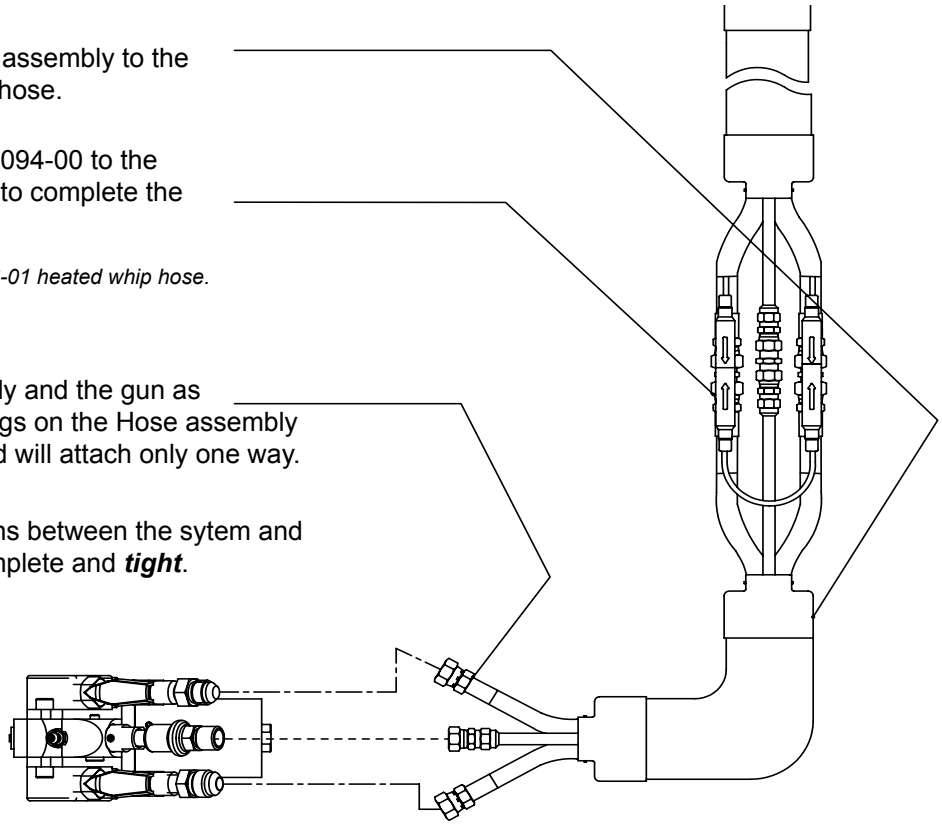
10. Connect the whip hose assembly to the last section of material hose.

11. Connect jumper p/n: 22094-00 to the plugs on material hose to complete the circuit.

Jumper not needed with 18006-01 heated whip hose.

12. Connect Hose Assembly and the gun as shown. The swivel fittings on the Hose assembly are sized differently and will attach only one way.

13. Fluid and air connections between the sytem and gun should now be complete and ***tight***.



⚠ ⚠

*When Main Power to system console is on, the white and black wires in the console are **always live!** Disconnect or turn **off** Main Power source before opening console to make any repairs or before making any electrical repair of any type to the system.*

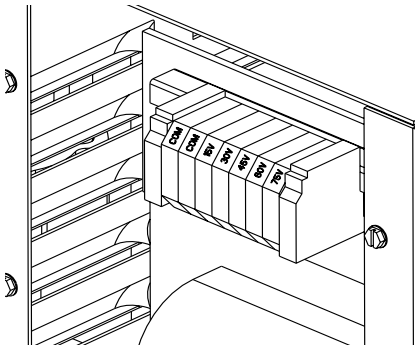
⚠ ⚠

If you do not understand the electrical hook-up described above, consult your local GlasCraft distributor OR a qualified electrician.

Electrical connections must be checked on a periodic basis.

208/240 volt single phase
L1 L2 GROUND
208/240 volt three phase
L1 L2 L3 GROUND
380 volt three phase
L1 (black)
L2 (brown)
L3 (black)
L4 (blue)
GROUND (green)

14. If more than 50 ft. of hose is used the transformer tap setting will need to be set for proper hose length. The sticker on the front cover will say which tap to move the wire to. ***DO NOT MOVE THE COMMON LEG!***



TRANSFORMER

H1 PRIMARY H2

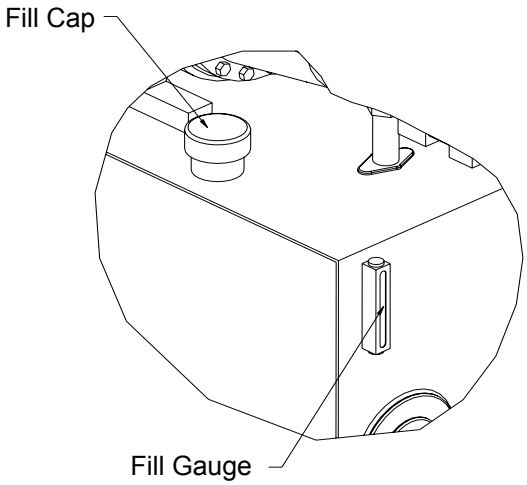
COM 15V 30V 45V 60V 75V
TO HOSE

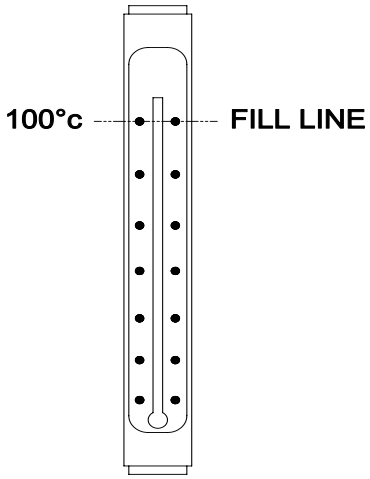
CONNECTIONS	HOSE LENGTH
15V	50 FT
30V	100 FT
COM 45V	150 FT
(DO NOT 60V	200 FT
MOVE) 60V	250 FT
75V	300 FT

15. Fill the hydraulic power pack with proper fluid.

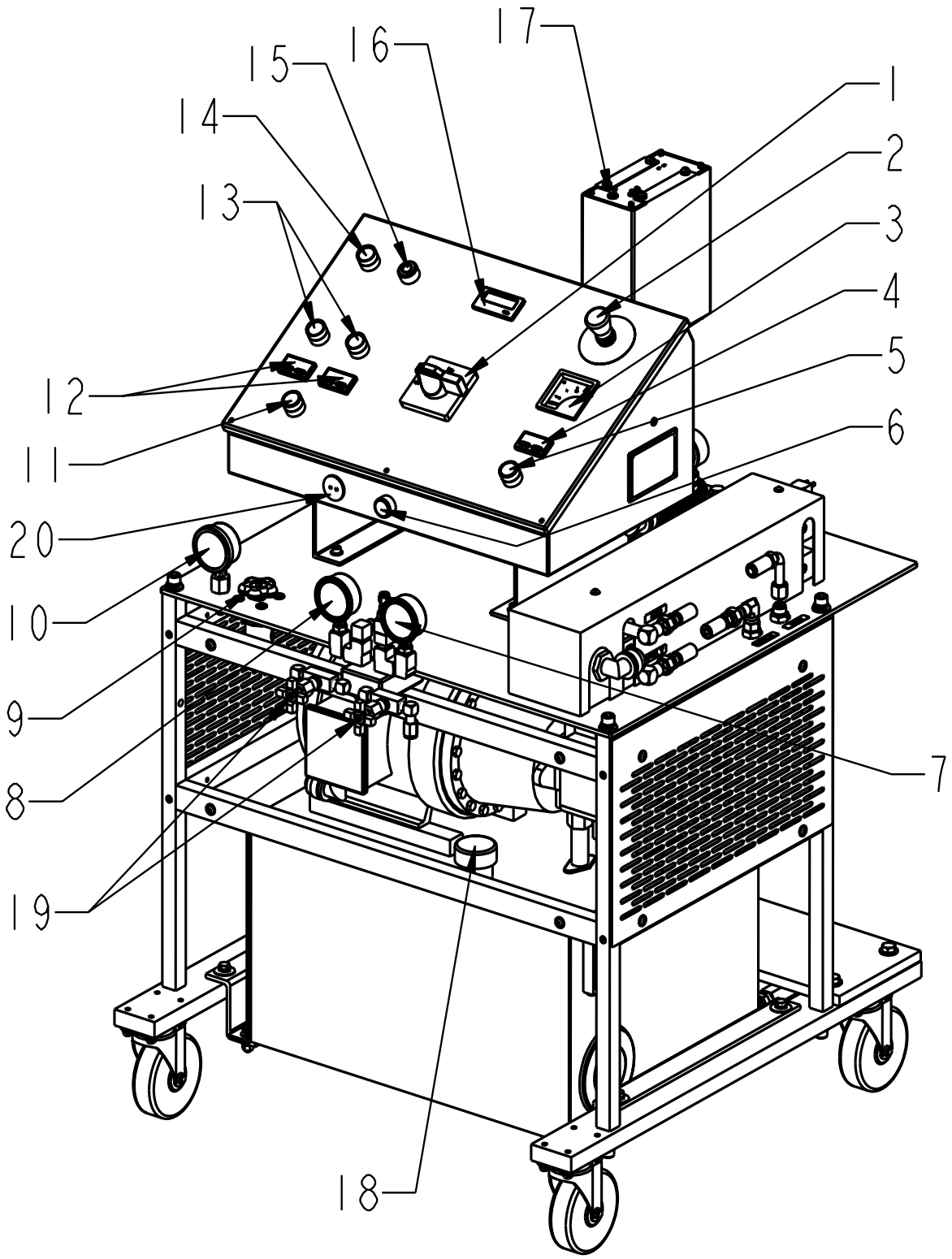
*The hydraulic pack tank is empty when shipped from GlasCraft. The tank **MUST** be filled before operation. **Tank Capacity: 20 GAL. / 75.5 Liter.***

Recommended Hydraulic Fluid: ISO grade 32, 46, or 68. Fluids containing anti-wear additives are recommended for optimum service life.





System Console



System Console

1	MAIN POWER SWITCH	Controls power and door; handle must point 1 to energize power , handle must point to 0 to open control box door. White pilot indicates when lighted, that the main power is on.
2	EMERGENCY STOP PUSH BUTTON	To stop all functions, push down on red button. To reset, turn handle on push button. All functions will remain off until main power switch has been switched off and back on
3	AMMETER	An instrument for measuring amperes to the primary side of the hose's transformer.
4	HOSE TEMPERATURE CONTROLLER	Controls temperature of liquid inside the heated hoses. To set desired temperature, press the up or down button until you reach desired temperature From this point, the temperature control is completely automatic.
5	ON PUSH BUTTON	Powers the controller. It requires 10 seconds for the Controller to respond.
6	WHITE PILOT LIGHT	Indicates power on.
7	POLY PRESSURE GAUGE	Indicates material pressure.
8	ISO PRESSURE GAUGE	Indicates material pressure.
9	HYDRAULIC PRESSURE KNOB	Increases or decreases hydraulic pressure. Turn clockwise to increase pressure. Turn counter-clockwise to decrease pressure.
10	HYDRAULIC PRESSURE GAUGE	Indicates hydraulic pump pressure
11	ON PUSH BUTTON	Powers the controller. It requires 10 seconds for the Controller to respond.
12	ISO / POLY TEMPERATURE CONTROLLER	Controls temperature of liquid inside ISO heater. To set desired temperature, press the up or down button until you reach desired temperature. From this point, the temperature control is completely automatic.
13	OVER-PRESSURE RESET BUTTONS	When over-pressure is detected, the hydraulic power pack will be shut down, and will remain off until pressure is reduced and the push button is reset.
14	ON PUSH BUTTON	Power On To the hydraulic power pack.
15	OFF PUSH BUTTON	Power Off to the hydraulic power pack.
16	COUNTER	Counts pumps cycles. .042 GPC / .159 LPC
17	RETRACT SWITCH	Retracts pumps to the full down stroke position to protect pump shafts.
18	HYDRAULIC OIL FILL CAP	Remove cap to fill tank with *recommended* hydraulic oil.
19	ISO / POLY DUMP VALVES	Relieves pressure and material from ISO & POLY side.
20	HOSE THERMOCOUPLE OUTLET	Power outlet for hose thermocouple.

⚠

Never leave machine unattended while system power is on or system is running.
System running is defined as: preheat cycle of the hose heat, primary heaters, or any pump operation.
Machine operators must be familiar with the component functions and operation of the machine.

Pre-Operation Check List

A. Check that all fittings are securely tight.

B. Check electrical hook-up (qualified electrician recommended).

C. Main power switch on Control Box should be switched to OFF position.

⚠

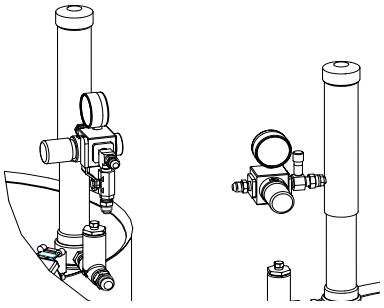
Do not place any part of the body in the path of the material spray. Do not point the gun at or near other personnel. Do not look into the Mixing Chamber orifice at any time. Because of the hazardous materials used in this equipment, it is recommended that the operator use an air mask, goggles, protective clothing, and other safety equipment as prescribed by current regulations, recommendations of the chemical suppliers, and the laws in the area where the equipment is being used.

Initial Start-Up Procedure

With all material and air lines connected and power cable attached, the system is now ready for start-up.

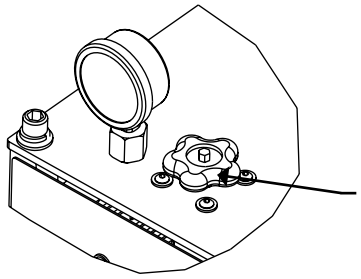
Filling The System

1. The system is now ready to be filled with material. With transfer pumps in place, adjust regulators on transfer pumps to 30-50 psi or until the pumps begin cycling, once the pumps begin loading up (cycle rate slows or stops) increase transfer pump air pressure to to 100 psi. to fill the system.

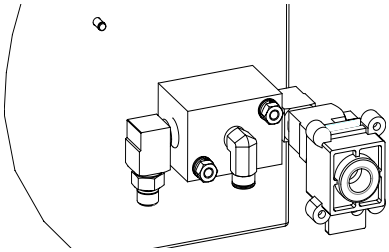


If the transfer pumps can not move material adequately enough to properly prime the system it may be necessary to start the hydraulic power pack.

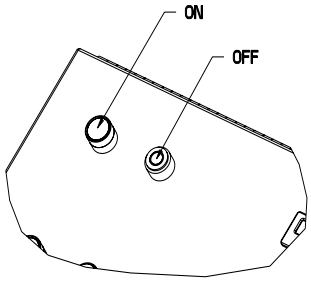
a. Ensure hydraulic pressure knob is turned completly ***counter clockwise.***



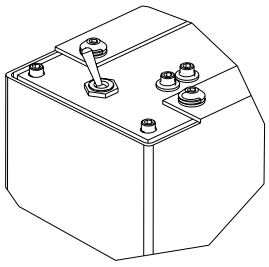
b. Main air should be on to system manifold.



c. Turn on hydraulic power pack.



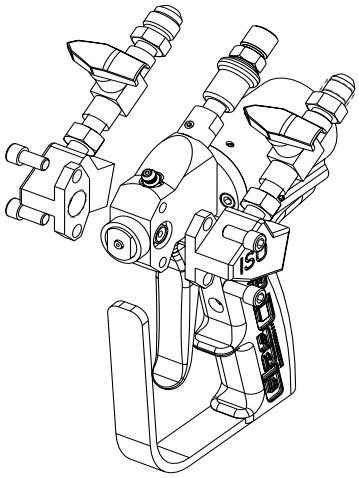
d. Flip retract switch to “run” position.



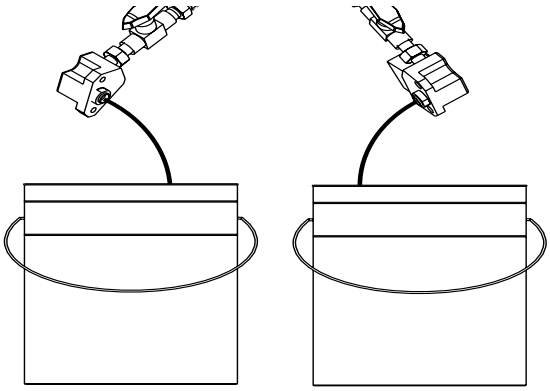
The pumps will begin cycling to completely prime the system

Section 2 - Operation: Start-Up Instructions

2. Remove ISO & POLY side blocks from gun. **MAKE SURE VALVES ARE OFF!**



3. Place separate clean containers under each individual side block. Slowly open material valves (black arrow forward) on each side block to allow trapped air to escape the hose and material to flow into the containers until all air is purged from the material system.



Remember to dispense one to two gallons of material to clear the system of grease and plasticizer that was used during factory testing.

4. Close the manual material valves. Material pressure gauges should now register approximately equal pressure.

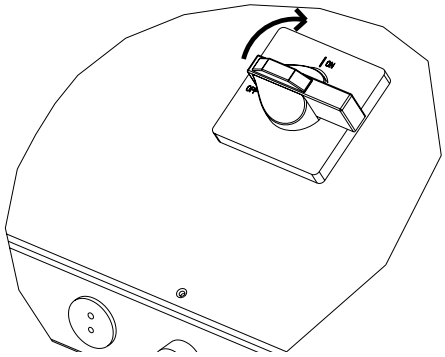
5. Dispose waste material properly and in accordance with chemical suppliers instructions and local, state and federal regulations.

Before re-assembling Side Blocks, lubrication can be applied by dabbing a white lithium grease into holes inside of Gun Front Housing and wiping grease over Side-Block Seals. Grease will purge itself when air valve is turned on at Gun and Gun is triggered.

6. Clean and lubricate the side blocks and seals thoroughly and re-assemble them to the gun. Make certain that the side block screws are tightend securely.

7. Refer to material manufacturers operating instructions for proper preparation of material, i.e, mixers, etc.

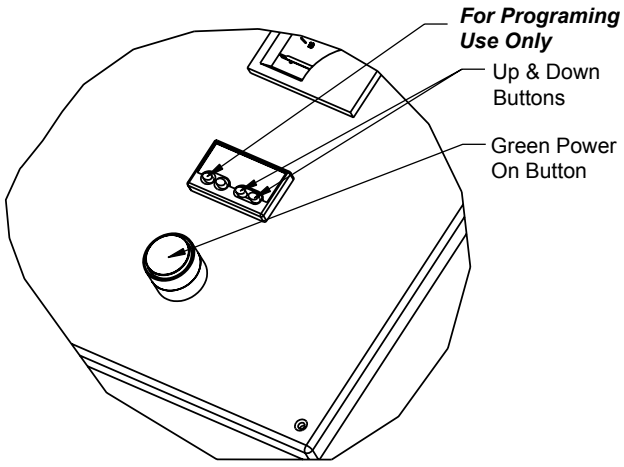
8. Turn main power Switch to ON position.



9. Turn on hose control:

a. Push in the green button.

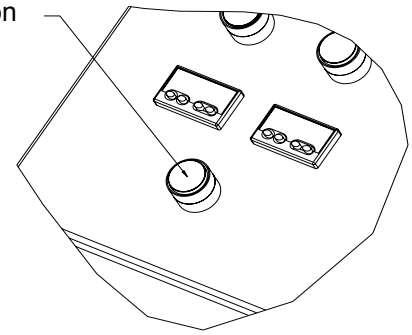
b. Press either up or down arrow buttons on the controller until desired temperature setting is achieved.



9. Turn on hose control:
- **a.** Push in the green button.
- **b.** Press either up or down arrow buttons on the controller until desired temperature setting is achieved.

10. Turn on the ISO & POLY Heaters.

Green Power Button

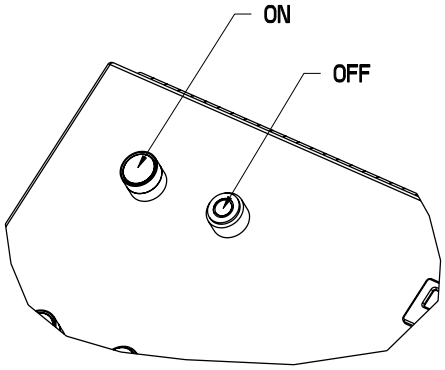


Turn transfer pump air regulator on slowly. Pumps should cycle slowly until hoses are full of material.

⚠

Straighten hose out flat, to avoid uneven heating and damage to internal wiring of the hose assembly.

11. Turn on Hydraulic Power Pack



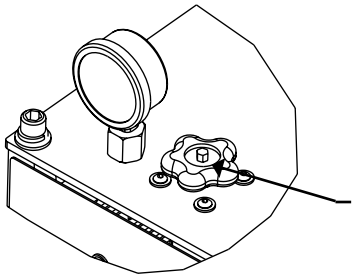
Allow enough time for hose to warm up (approx. 30 minutes). Remember that the heated hose does not have a delta rating. The heated hose's function is to maintain the heat generated by the primary heaters during system operation, and preheat material during initial start-up. The hose should be set to maintain a temperature close to the set point of the primary heaters.

To see the actual temperature of the liquid in the hose, push the blue button once and release. The actual temperature will then be displayed for 10 seconds.

12. Adjust temperature to desired setting. ISO and POLY controllers function exactly the same as the hose controller.

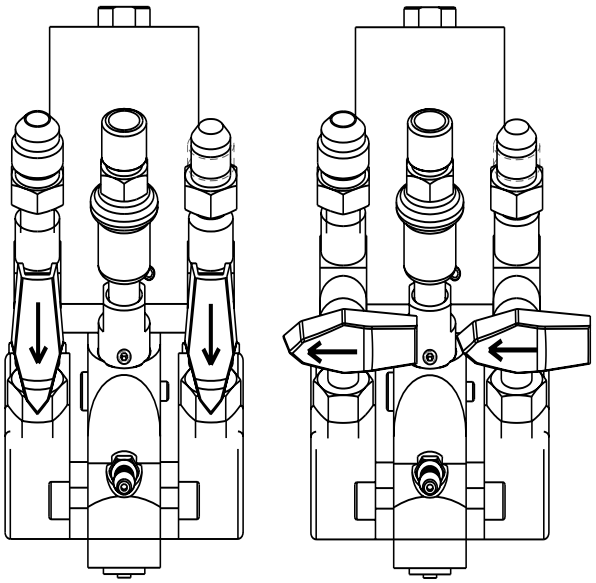
Allow enough time for the material to be heated (approximately 3-5 minutes).

13. Slowly adjust hydraulic pressure knob ***clockwise*** on the system to desired pressure.



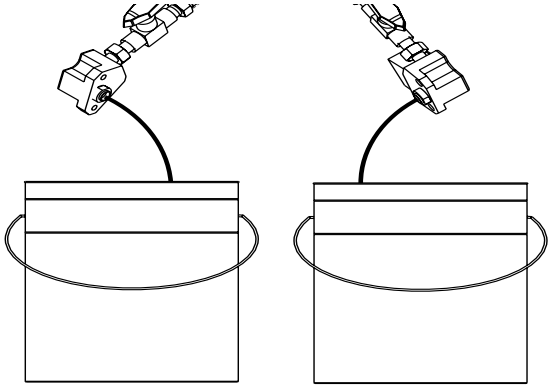
Pressure Knob

14. Turn purge air and material valves ON at the gun.



ON **OFF**

15. If one side registers considerably more pressure than the other side, go to the high pressure side and bleed off some pressure by slightly opening the manual material valve on the side block over the container. Bleed pressure until both sides are approximately the same pressure.



⚠
Material will dispense at high pressure. follow all safety precautions

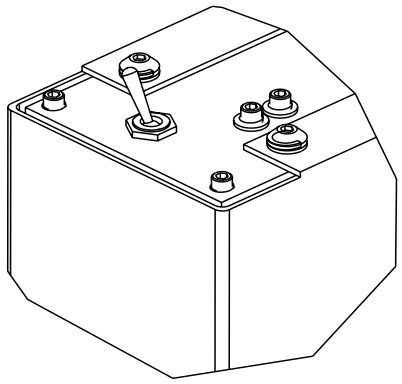
16. Relieve any excess pressure by triggering the gun.

The Emergency Stop Switch is located on the top right side of the Box Panel, when depressed, it will shut down the power to the system. To reset, turn the "red" push button.

17. The system is now ready for operation.

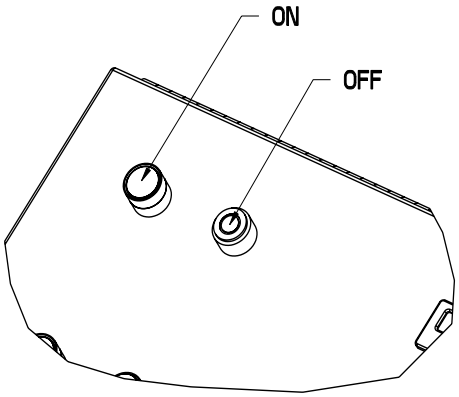
System Shut-Down

1. Flip “retract” switch from “run” position.

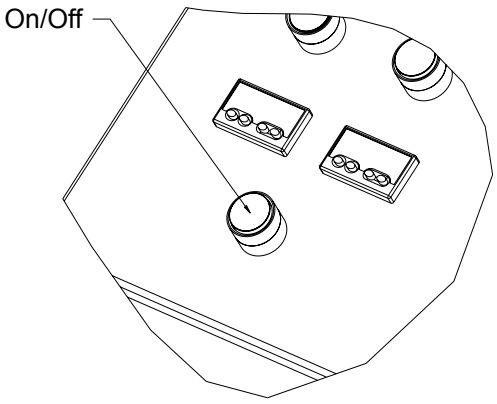


2. Trigger gun to send pumps into full downstroke.

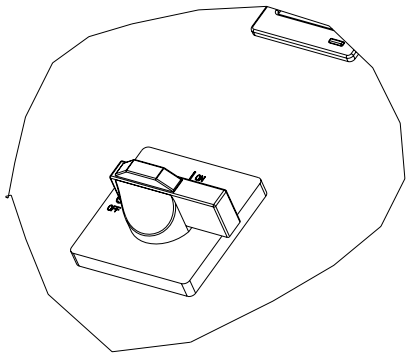
3. Turn off hydraulic power pack.



4. Turn off primary heaters.



5. Turn main power switch off.



6. Refer to gun manual for proper Gun maintenance.

7. Reduce Hydraulic Pressure Knob setting to ZERO.

8. Visually inspect entire system for leaks.

9. Turn OFF System.

⚠
Do not bleed fluid pressure from the system.

Storing The Hose

Coil the hose with a minimum diameter of 4’, To avoid kinking and subsequent damage to the internal wiring of the hose assembly.

Section 2 - Operation: Daily Start-Up Instructions

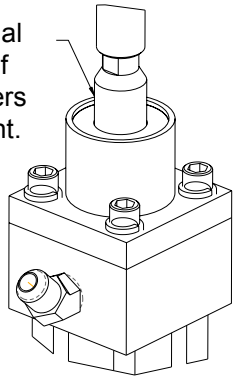
System Daily Start-Up

1. Uncoil hose.

2. Check desiccant dryer beads to insure they are still purple and have not changed to pink.

3. Check and lube top of the fluid section.

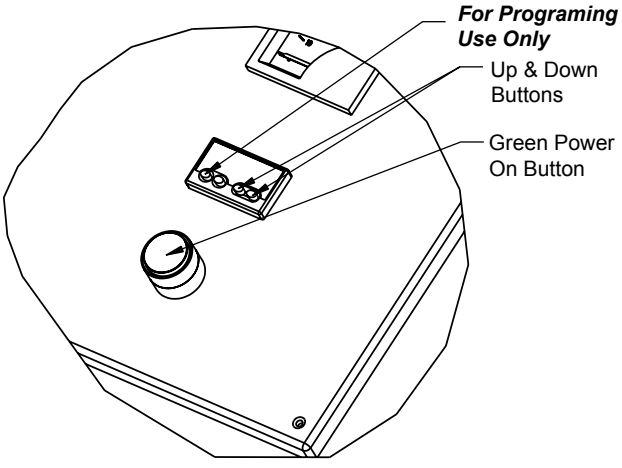
Wipe off residual material and add a tablespoon of DOP or materail suppliers reccommended lubricant.



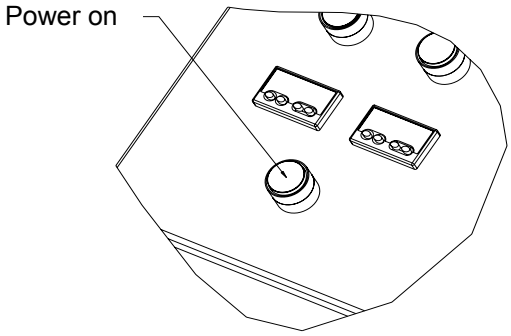
4. Check material screens at the gun and transfer pumps.

5. Start the drum mixer and it run to material suppliers specifications. (20-30 minutes)

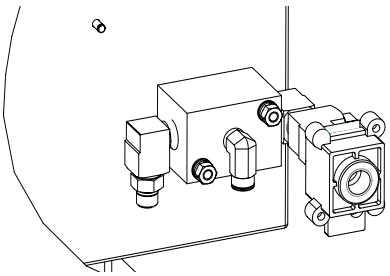
6. Turn on the hose controller and set the temperature according to material suppliers specifications.



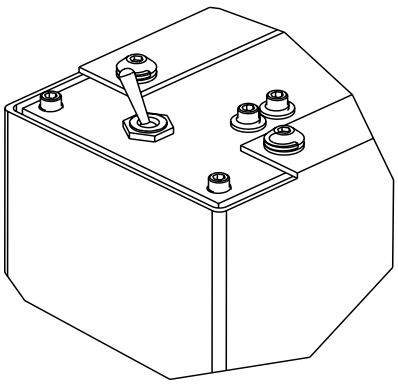
7. Once the hose temperature reaches desired set point, It's ok to turn on the primary heaters and set temperature to material suppliers specifications.



8. Depress yellow slide valve to open main air to gun and transfer pumps.

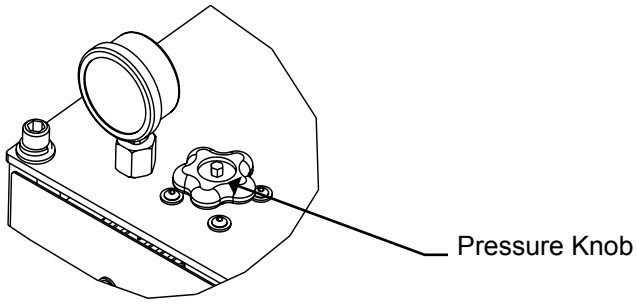


9. Flip retract switch to "run"



System Daily Start-Up

10. Increase Hydraulic pressure to desired pressure.

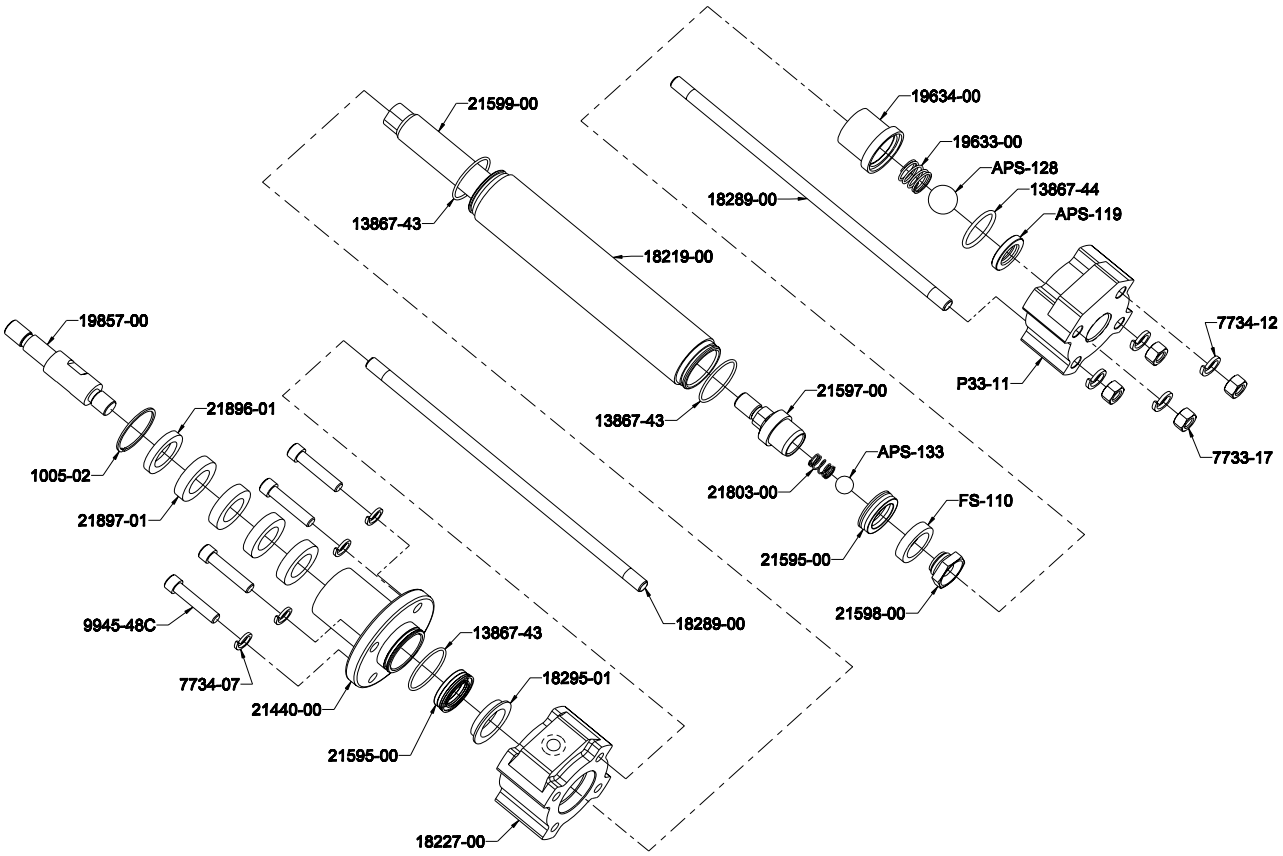


11. Perform Probler / Probler P2 side block seal integrity test.

12. Perform Probler / Probler P2 high-pressure ball valve test.

13. ***READY TO SPRAY!***

21835-00 Fluid Section Assembly



Part Number	Description	Qty.
APS-119	FOOT VALVE SEAT	1
APS-128	CHROME BALL	1
APS-133	SST BALL	1
FS-110	NYLON PISTON GUIDE	1
P33-11	PUMP BASE	1
1005-02	SNAP RING	1
13867-43	O-RING	3
13867-44	O-RING	1
18219-00	PUMP CYLINDER	1
18227-00	AIRLESS PUMP HEAD	1
18289-00	PUMP TIE ROD	4
18295-01	SUPPORT WASHER	1
19633-00	COMPRESSION SPRING	1
19634-00	FOOT VALVE HOUSING	1
19857-00	PUMP SHAFT EXTENSION	1
21440-00	SOLVENT CUP ADAPTER	1

Part Number	Description	Qty.
21595-00	PUMP SEAL	2
21597-00	TRANSFER HOUSING	1
21598-00	TRANSFER SEAT	1
21599-00	PUMP SHAFT	1
21803-00	COMPRESSION SPRING	1
21896-01	PACKING RETAINER	1
21897-01	FELT WIPER	4
7733-17	HEX NUT	4
7734-07	LOCK WASHER	4
7734-12	LOCK WASHER	4
9945-48C	SCREW	4

REPAIR KIT: 21845-00

Daily Maintenance

The wiper/lubrication cup at the top of each fluid section is designed to keep piston shaft clean and lubricate throat seal.

Weekly Maintenance

1. Wipe any residue from the mouth of the lubrication cup.

2. Add 1 teaspoon of a suitable lubricating solution.

Over Pressure System Protection

The system incorporates monitors for high pressure monitoring. These monitoring devices will prevent the system from continued operation if high pressure situations develop.

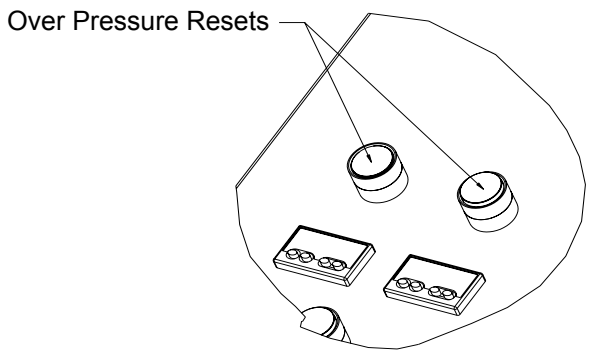
There are pressure sensors located on each side of the hose mounting block. The high pressure sensor is located at the outbound of the fluid section.

The high pressure monitoring sensor will engage if fluid pressure increases above 3200 psi.

If a high pressure situation develops, the sensor will detect this and immediately engage the hold-in circuit.

This will disengage power to the machine and it will stop cycling. It will also turn the heater off.

On the control box panel, there are two yellow lighted push buttons marked over pressure. One of these push buttons will be illuminated after the monitoring sensor engages, indicating where the problem is located (ISO or Poly).



In an over pressure situation, the system will remain shut down until it is manually reset.

At this point, it is necessary to determine if the problem is an over pressure situation.

When the sensor engages, the system will be frozen, giving you the pressure readings at the time the problem was detected.

Inspect the fluid pressure gauges, in an over pressure situation, one of the fluid pressure gauges will be significantly higher than the other gauge.

⚠
When main power to unit is on, the console will have wires that are live. Disconnect or turn off main power source before opening console to make any repairs.

⚠
Before performing any repairs on the system, ALL AIR and FLUID PRESSURES SHOULD BE RELIEVED TO ZERO (BLEED-OFF)!

Over Pressure Problem Correction

1. Determine if the problem is high pressure related.

2. Relieve system hydraulic pressure.

3. Turn off main power

4. Fix the problem area:

a. Potential high pressure causes:
- Restriction
- Overheating material in static position
- ISO filter at gun

5. Re-start system for operation

6. Once the power has been turned off and problem solved and the main power is turned on again, the over over pressure lighted buttons will automatically be reset.

For additional diagnostics refer to trouble shooting guide GC-1380

⚠ ⚠
If you do not understand the electrical hook-up described above, consult your local GlasCraft distributor or a qualified electrician. It is recommended that a qualified, licensed electricianshould install power to the supply disconnect. You should always follow all local or national electrical codes.

⚠ ⚠
Disconnect power source BEFORE attempting any repairs or opening the Control Boxes. Access to internal parts is limited to qualified personnel ONLY! Place the main power breaker in the OFF position BEFORE disconnecting the power cables. This equipment is not approved for use in hazardous locations as set forth in the National Electrical Code Article 500 and Sub-Part "S" of the OSHA Standards.

GUARDIAN A-6 6000/MH-II

PROPORTIONING PUMP REBUILD

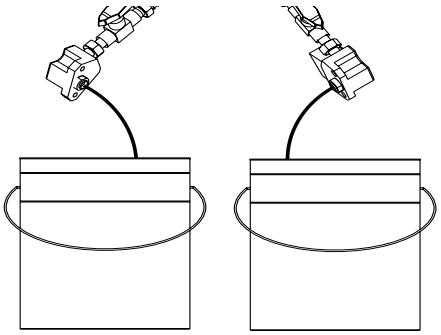
This section applies to both the Guardian A6 and the MH-II as both machines use the same proportioning pump. You can use this section as a reference when rebuilding the pump, checking for debris in the check ball or replacing the packing in the lube cup assembly.

19875-00 (-01) Pumps
21835-00 Pumps

1. Dump pressure off system

WARNING
Be sure air and power are off to system.

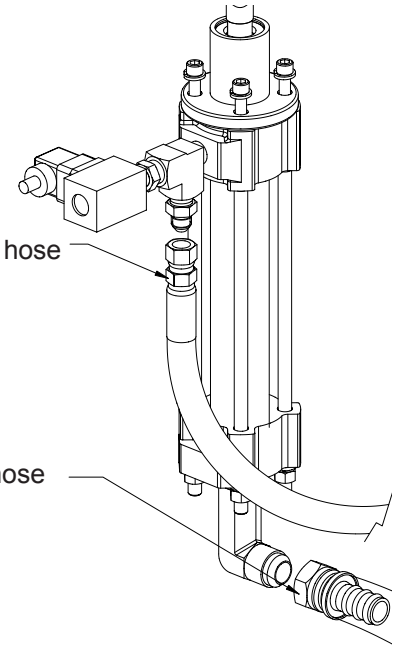
This is achieved by removing side blocks from the gun, opening ball valves and purging materials into clean containers.



2. Flush system side to be rebuilt with suitable solvent.

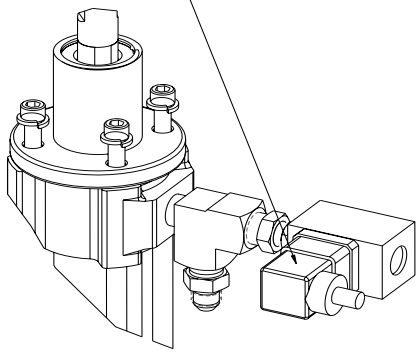
NOTE
Step three is optional, but it makes the process easier.

3. Disconnect inlet and outlet fittings from the pump.

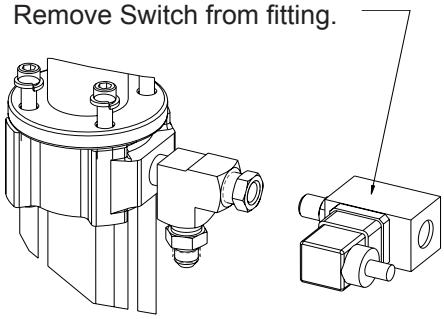


4. Disconnect the din connector from over pressure switch.

a. remove plug

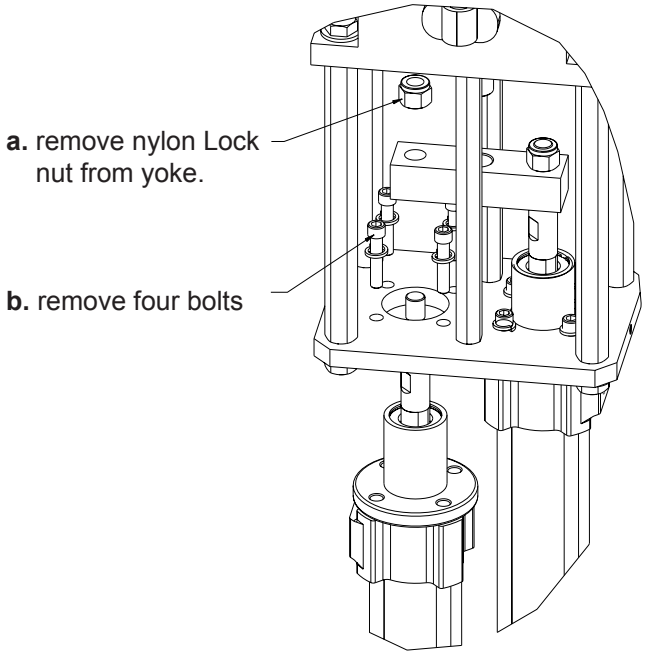


b. Remove Switch from fitting.



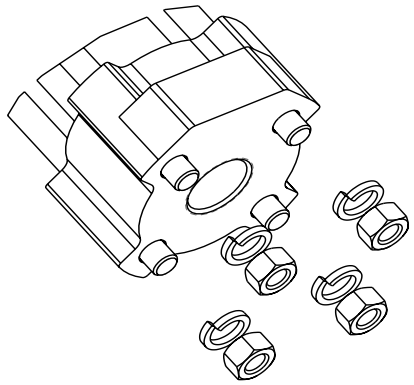
CAUTION
Do not immerse Over Pressure Valve in solvents externally. (Flushing will not affect).

5. Remove pump from base.

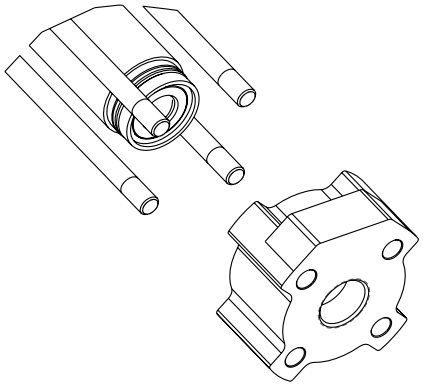


Breaking Down Pump

1. Remove four nuts at the base of pump break loose, in a criss-cross pattern.

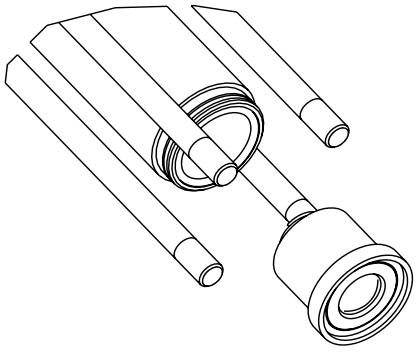


2. Remove Base from Tie Rods.

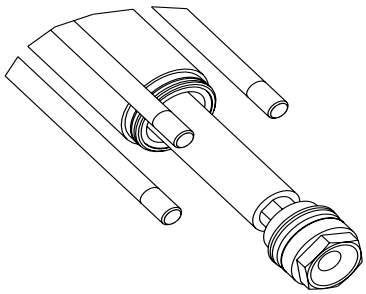


NOTE
On P/N 21835-00 pumps, watch out for APS-119, APS-128, & 19633-00. The spring will push these parts out. Observe which side of the APS-119 comes out, Keep right side up for diagnostics.

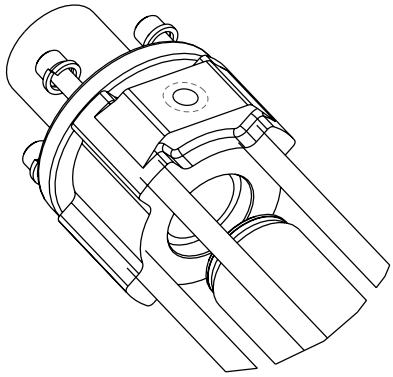
3. Remove Valve Housing from the cylinder.
P/N UF-118 on 19875-00 pump.
P/N, 19634-00 on 21835-00 pump.



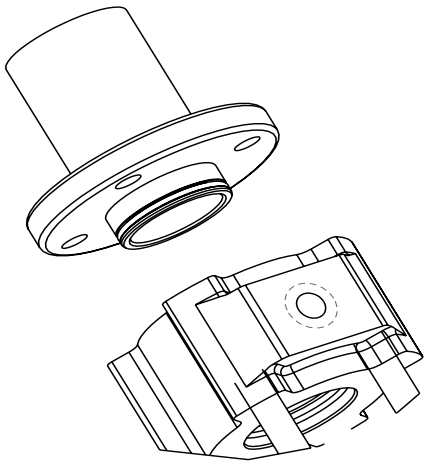
4. Using a rubber mallet, tap shaft out through the bottom of the cylinder, P/N 18219-00.



5. Remove cylinder, P/N 18219-00 from Pump Head, P/N 18227-00.



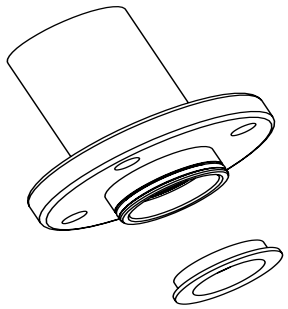
6. Remove Cup Adapter, P/N 21440-00 from Pump Head, P/N 18227-00.



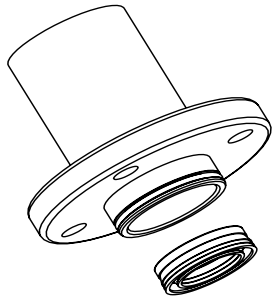
Disassemble Sub-Assemblies

1. Cup Adapter, P/N 21440-00.

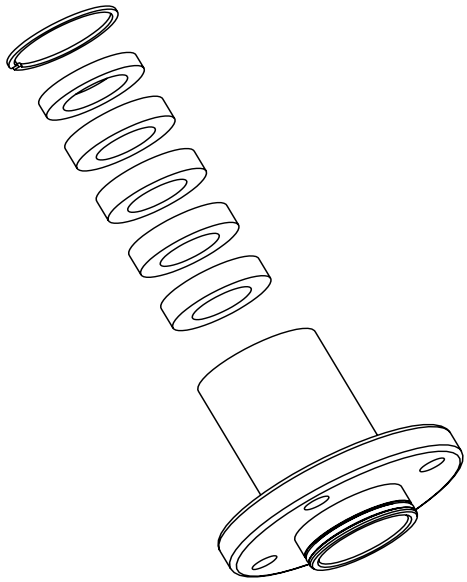
a. Remove Support Washer, P/N 18295-01.



b. Remove Seal, P/N 21595-00.

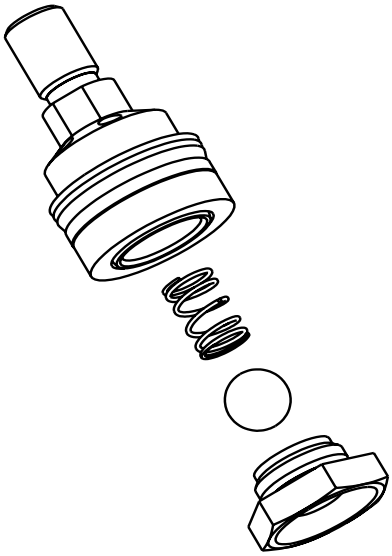


c. Remove Snap Ring, P/N 1005-02, Nylon Washer, P/N 21896-01, & Felt Wipers, P/N 21897-01.

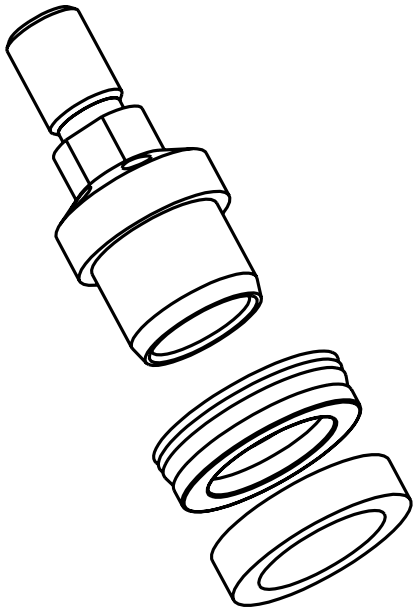


2. Shaft Assembly:

a. Remove P/N 21598-00, Transfer Seat from P/N 21597-00, Transfer Housing. Watch for P/N APS-133, Ball and P/N 21803-00, Spring. The Ball is loaded with spring tension.



b. Remove FS-110, Piston Guide and P/N 21595-00 Pump Seal.



Overhaul Procedure

Cleaning

1. Thoroughly wash all parts in suitable solvent.

2. If parts have any build-up of hardened material, it is acceptable to polish parts with fine sand paper, (1200 grit) or steel wool(000).

3. It is recommended that the cylinder be honed with a fine grit bead honer,(P/N RK5-2).

Inspection

1. The Pump Cylinder, P/N 18219-00 inner wall should be smooth. No pitting or scarring should be seen. If slight scars show in the wall, they must not be able to be felt with a finger nail.

2. The Pump Shaft, P/N 21599-00 must not have any scoring, pitting, or build up of any debris on the shaft.

3. Set the Ball, P/N APS-133 in the Seat, P/N 21598-00 and hold up to a light. Observe for light between seat surface and the ball.

NOTE
If a large sliver of light shows, check for debris or scaring on Seat or Ball.

4. P/N APS-128 & P/N APS-119 repeat the above step.

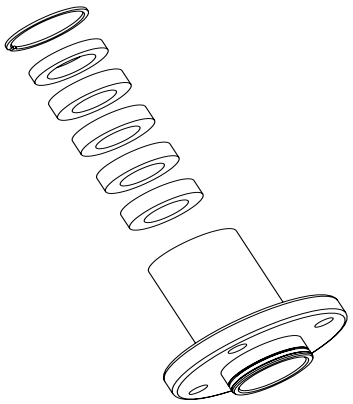
NOTE
The APS-119 is reversible, you can use either side.

Re-Assemble

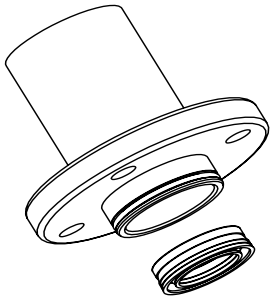
NOTE
All parts underlined are contained in Repair Kit.

1. Soak P/N 21897-01 in a light weight, non detergent oil, then install in P/N 21440-00.

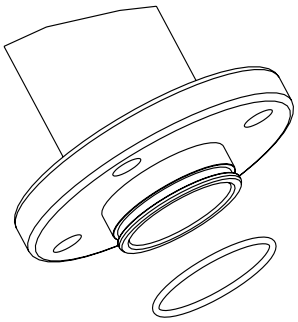
2. Install P/N 21896-01, push down and install Snap Ring P/N 1005-02 in groove.



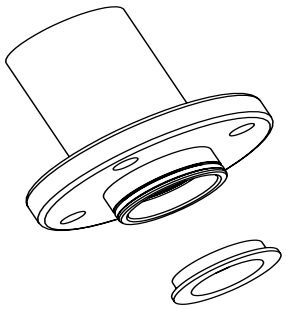
3. On bottom side of P/N 21440-00 install P/N 21595-00 so that the lip faces out



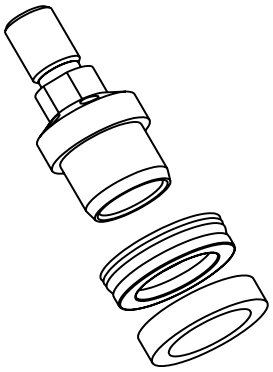
4. Lubricate and install O-Ring, P/N 13867-43 on bottom groove.



5. Install P/N 18295-01 with lip facing toward P/N 21595-00 seal.

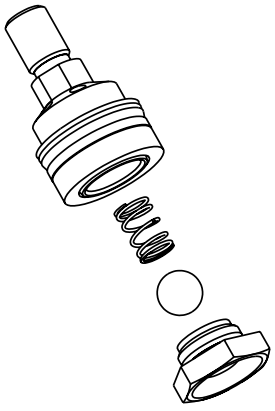


6. Place P/N 21595-00 Seal and P/N FS-110 guide on P/N 21597-00. The lips of the Seal will face away from P/N FS-110.

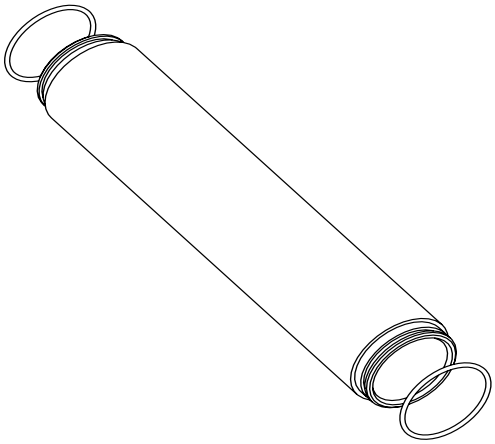


7. Set P/N 21803-00 spring in P/N 21597-00 housing and set APS-133 ball on Spring.

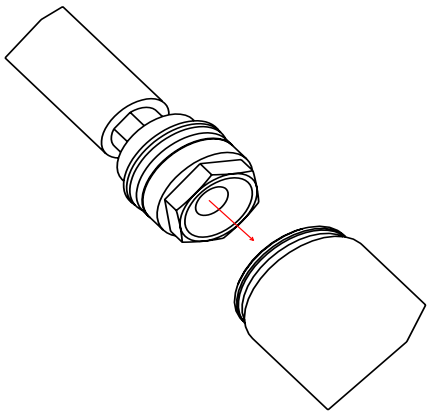
8. Apply blue lock-tite to the threads of P/N 21598-00 and install on P/N 21597-00. Tighten these two parts!



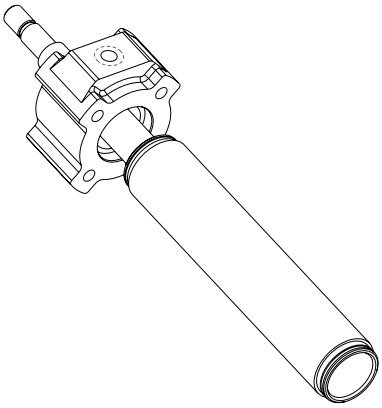
9. Lubricate and install two P/N 13867-49 O- Rings on P/N 18219-00 cylinder.



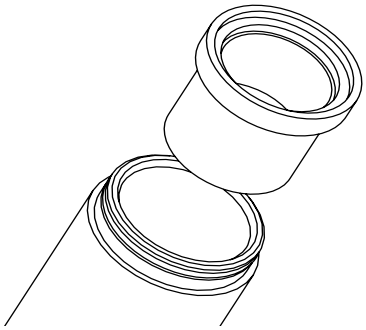
10. Using a light weight non-detergent oil, coat the seal on the shaft assembly and the walls of the cylinder, then install the shaft assembly into the cylinder, leave approximately 4” of the shaft exposed on the top side.



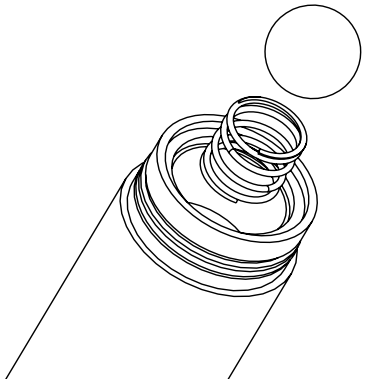
11. Install cylinder/shaft assembly into P/N 18227-00 pump Head, careful not to cut O-Ring for pump P/N 21835-00.



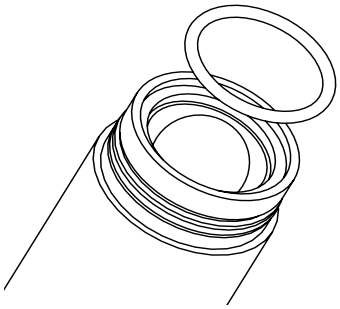
12. With the Pump Assembly upside down, (easy if clamped in a vise) install Foot Valve Housing P/N 19634-00.



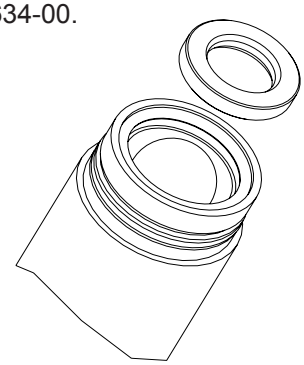
13. Set P/N 19633-00 Spring in place and set P/N APS-128 Ball on Spring.



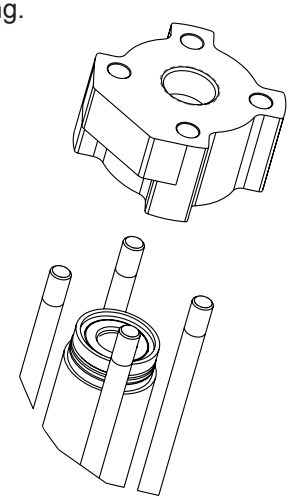
14. Lubricate and install P/N 13867-44 O-Ring in groove of P/N 19634-00.



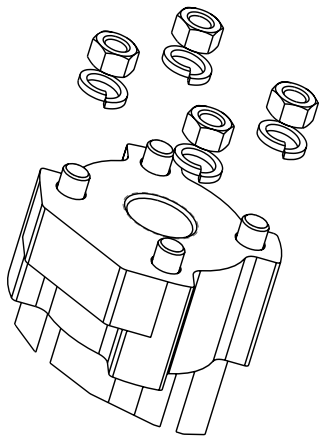
15. Lubricate the outer edge of P/N APS-119 and set top of ball, square and center flats of P/N APS-119 and P/N 19634-00.



16. Gently set P/N P33-11 through P/N 18289-00 Tie Rods and push down square and firm until it sets down over cylinder O-Ring.



17. Continue holding P33-11 down, install (4) P/N 7734-12 Lock Washers and hand thread (4) P/N 7733-17 Nuts. Tighten P/N 7733-17 in a criss-cross pattern until tight.



Overhaul Procedure

For 19875-00 Pumps:

1. Set UF-118 in cylinder.

2. Set P/N APS-128 in body.

3. Lubricate P/N 13867-44 and install in groove of UF-118.

4. Install P/N APS-119.

5. Gently set P/N P33-11 through P/N 18289-00 Tie Rods and push down square and firm until it sets down over cylinder O-Ring.

6. Continue holding P33-11 down, install 4 P/N 7734-12 Lock Washers and hand thread 4 P/N 7733-17 Nuts.

7. Tighten P/N 7733-17 in a criss- cross pattern until tight.

8. Lubricate P/N 21595-00 Seal (inside of P/N 21440-00 housing.

9. Gently push down over Pump Shaft P/N 21599-00 and set flush to P/N 18227-00 Pump Head.

10. Re-install pump in reverse order of removal.

SUMMARY

Review, the major points or just use for notes:

IP-02

2:1 RATIO TRANSFER PUMP

SETUP, USAGE & INFO

1.0 SAFETY WARNINGS

Please read and observe all warnings contained in this operations manual before any attempt to operate the equipment.

Misuse of Equipment

Misuse of the Equipment can cause serious injury. Use the equipment only for its intended purpose. Care should be taken to prevent over pressurization of the pump or accessories connected to it. Use only proper parts in good condition. Use the pump only with compatible fluids. Improper use or misuse of this equipment could result in fluid being splashed on the skin or in the eyes, serious bodily injury, property damage, fire or explosion.

Make daily check on the equipment and repair damaged or worn parts immediately.
Do not alter this equipment, doing so could cause it to function incorrectly and could cause serious injury.

Material & Fluid compatibility

Always ensure the chemical compatibility of the fluids and solvents with the wetted parts in the pump and any components. Check the fluid manufacturer's data sheets and specifications before using the fluids or solvents in this pump.

Pressurized Hoses

Because the hoses are pressurized, they present a danger should the fluid escape at high pressure. This escaping fluid pressure can spray out and cause serious bodily injury or property damage. Ensure that the hoses do not leak or rupture due to wear, misuse or damage.

The hoses should be handled properly - do not pull on the hoses to move the equipment around. Use the hoses only for fluids in which they are compatible both for the inner liner of the hose and the outer covering. Use care not to exceed the temperature rating of the hose.

Before each use, ensure that the fluid couplings are tight and that the entire length of hose is not worn or damaged. Check the entire hose for leaks, bulging cover, damage, abrasion or cuts. These conditions may cause the hose to fail that could result in splashing of pressurized fluid on the skin, or in the eyes and cause serious bodily injury or property damage.

Pressure Specification

The maximum working fluid pressure of this equipment is *180 psi (12.5bar*) at the maximum incoming air pressure of *180 psi (12.5bar).* Ensure all equipment and accessories used with this pump are rated to withstand the maximum working pressure of this pump. Never exceed the maximum working pressure of the pump or any device attached to the pump.

3.0 OPERATION

Start up and Adjustment of the Pump *(Refer figure 2, page 7)*

Ensure that installation is fully completed before proceeding to start up operations.

1. Ensure that the air control valve (K) is closed. Open the bleed-type master air valves (D). Connect the quick disconnect coupler to the male fitting.

2. Into a grounded metal container, open the dispensing valve (G) slowly. Ensure metal-to-metal contact between the container and the valve.

3. Adjust the pump air control valve (K) slowly for pressure just enough to start running the pump. This is to prime all air within the system. After a l the air has been expelled from the lines, close the dispensing valve. During the priming of the pump, the pump runs when the dispensing valve is opened and stop when the valve is closed.

4. Turn the air regulator slowly until sufficient flow from the dispensing valve is achieved. Remember to run the pump always at the lowest possible speed necessary to achieve what is desired. Never exceed the maximum working pressure of any component in the system.

5. The pump should not be left to run dry of the fluid being pumped. When running empty, the pump speed will become very fast and probably cause damage. During operation, should the pump be found to run too fast, stop it immediately and check the fluid supply. Is the fluid level in the drum too low or empty? If air has gone into the system, do a priming procedure. Ensure that all air has been expelled from the lines before beginning operations again. Flush the pump or leave it filled with a compatible solvent when not in use.

6. Always follow the Pressure Relief Procedure should the pump be put away for any period of time or during system shut off at the end of the day.

Maintenance Check

Ensure sufficient lubricant in the air lubricator.

Drain the moisture trapped in the air pressure regulator.

Clean and flush the pump thoroughly with care and appropriate cleaning fluid to obtain maximum service life of the equipment.

Procedure For Pressure Relief

In order to avoid the risk of serious bodily injury such as spraying fluid on the skin or in the yes, or risk of injury from the moving part, the following procedure should be used. This procedure should be used when shutting down the pump, servicing or repairing the pump or any part of the system, replacing or cleaning components, or if the pumping of fluid has stopped.

1. Close the air valve (D) of the pump.

2. Use the air bleed down valve (see installation instructions) to relieve the air pressure in the system.

3. Relieve the fluid pressure by holding a grounded metal pail in contact with metal part of the fluid dispense valve (G) and slowly opening the valve.

4. With a container ready to catch the fluid open the drain valve (G) (see installation instructions).

5. It is a good practice to leave the drain valve (G) open until it is time to dispense fluid again.

If you are unsure that the fluid pressure has been relieved due to a blockage in a component or a hose, relieve pressure by slowly loosening the hose end coupling to allow the fluid pressure to escape. After the pressure has been relieved, the fitting can be removed completely and any blockages removed.

7.0 TROUBLESHOOTING

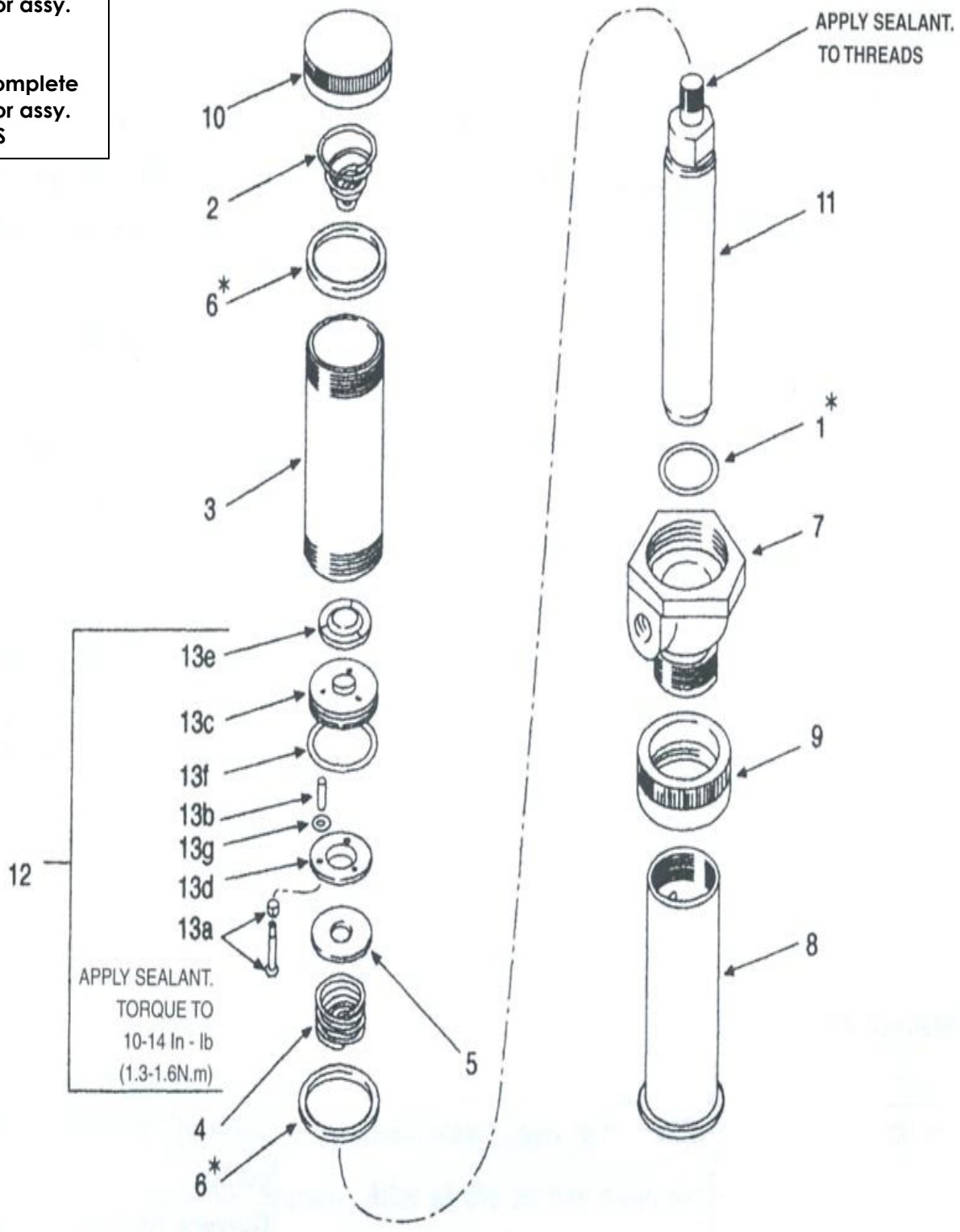
Problem	Causes	Recommended Solutions
Pump does not operate.	Air supply or pressure is inadequate. Air lines restricted. Dispensing valve is not open or clogged. Clogged fluid lines, valves, hoses or damaged air motor. Depleted or exhausted fluid supply.	Increase air pressure. Check for any restrictions in air line. Open and/or clear valve. Follow pressure relief procedure to clear obstruction. Service air motor. Replace parts as necessary. Refill fluid. Prime system or flush it.
Non-stop air exhaust.	Worn or damaged air motor gasket, packing, seal, etc	Service air motor. Replace parts as necessary.
Erratic pump operation.	Intake valve or packing worn off. Intake valve is not completely closed.	Refill fluid. Prime system or flush it. Clear obstruction and service pump. Replace parts as necessary.
Low output on upstroke.	Held open or worn intake valve.	Clear obstruction and service pump. Replace parts as necessary.
Low output on down stroke.	Held open or worn intake valve.	Clear obstruction and service pump. Replace parts as necessary.
Low output on both strokes.	Restriction in air lines or air pressure low. Closed or clogged valves. Fluid supply is insufficient or exhausted. Obstructions in fluid lines, hoses, valves, etc.	Increase air pressure or supply. Open valve or clear valve. Refill fluid. Prime system or flush it. Follow pressure relief procedure to clear obstruction.

5.0 PARTS IDENTIFICATION:

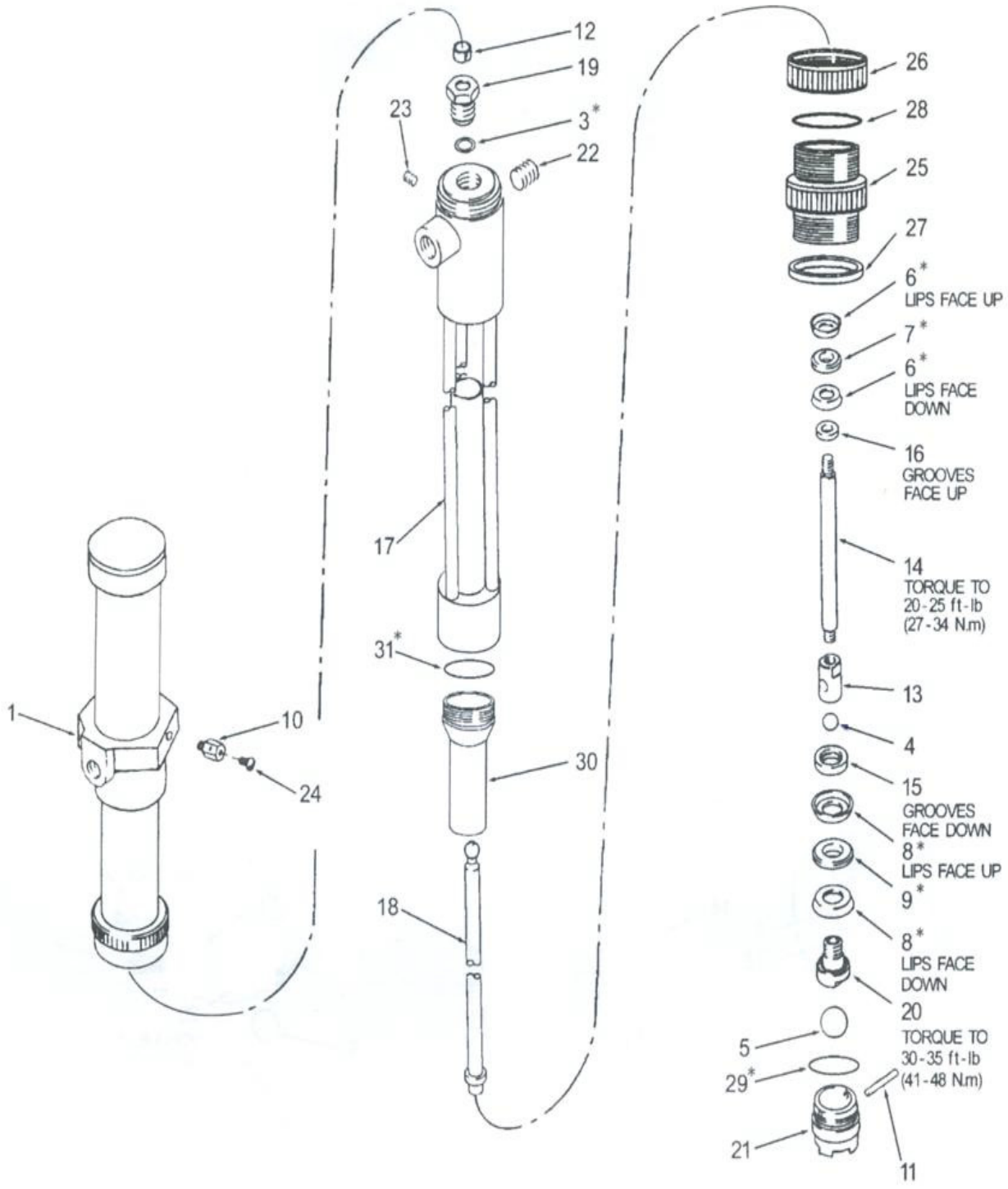
5.1 Parts Drawing for AIR MOTOR IP-02 (Drum Length)
Parts Drawing for AIR MOTOR IP02S (Stubby)

14A: Complete air motor assy. for IP02.

14B: Complete air motor assy. for IP02S



5.3 Parts drawing for IP-02 Fluid Section for C/Steel (Drum Length)



START-UP PROCEDURES

1. CLEAN AND ORGANIZE AREA.
2. CHECK SYSTEM FOR LEAKS, KINKED LINES, EXPOSED WIRES OR ANY OTHER POTENTIAL HAZARDS
3. **CHECK BARRELS FOR MATERIAL QUANTITY**!!!
4. TURN MAIN SWITCH ON.
5. TURN HOSE HEATER ON.
6. TURN AIR ON.
7. DRAIN WATER SEPARATOR.
8. TURN AIR MIXER ON HIGH SPEED.
9. TURN PRIMARY HEATERS ON 10 MINUTES PRIOR TO SPRAYING.
10. CHECK HEATERS TO MAKE SURE HEAT IS COMING UP.
11. MATERIAL MIXING AND HOSE HEATING TIME IS APPROX. 30 MINUTES

PRESPRAY CHECK LIST

1. CHECK TO MAKE SURE FRESH AIR SYSTEM IS WORKING PROPERLY AND REPLACE TEAR-OFF (IF NEEDED).
2. TURN ON HYDRAULIC SWITCH.
3. CHECK HEATER TEMPS.
4. CHECK GAUGES.
5. SWITCH FROM RETRACT TO RUN.
6. TURN ON AIR VALVE ON GUN.
7. TEST SPRAY GUN.
8. CHECK GUAGES AND LEVEL OUT PRESURES.
9. CHECK ALL MASKING.
10. SPRAY
11. **TURN OFF BALL VALVES WHEN GUN IS NOT IN USE**!!!
12. TURN AIR MIXER TO LOW SPEED AND LEAVE AT THAT SETTING UNTIL SHUTDOWN.

SHUT DOWN PROCEDURES

1. SWITCH FROM RUN TO RETRACT AND DROP PRESSURE TO PSI 500.
2. TURN OFF BALL VALVES.
3. TRIGGER GUN SEVERAL TIMES.
4. TURN OFF HYDRAULIC SWITCH.
5. TURN OFF HEATERS AND MAIN SWITCH.
6. TURN OFF AIR TO MACHINE AND PUMPS.
7. CLEAN AND MAINTAIN GUN!!!!!! OR GREASE THE TIP ON THE P2 GUN!!
8. DRAIN WATER SEPARATOR.
9. CLEAN BOOTH, MACHINE AND HOSES IF NEEDED.
10. SPRAY RELEASE AGENT (PAM COOKING SPRAY) WHERE NEEDED.
11. INSPECT AND CLEAN FRESH AIR SYSTEM.

GENERAL MAINTAINANCE

1. CLEAN A & B SIDE GUN SCREEN EVERYDAY, BEFORE YOU SPRAY *NOT* AT THE END OF THE DAY.
2. CHECK FRESH AIR FILTER EVERYDAY.
3. TEAR DOWN GUN HEAD, CLEAN AND INSPECT DAILY.
4. DOP (PUMP LUBE) THE TOP OF THE A-SIDE PROPORTIONING PUMP ONCE A DAY.
5. LUBE AIR MIXER ONCE A WEEK.
6. CLEAN T-FILTER SCREENS THEN BLEED THE AIR FROM THE LINES WHEN YOU CHANGE BARRELS OR ONCE A MONTH.
7. BLOW OUT ELECTRICAL MOTOR ON MACHINE ONCE A MONTH.
8. CHECK ALL ELECTRICAL CONNECTIONS ON MACHINE EVERY OTHER MONTH.

EQUIPMENT OPERATION AND TROUBLESHOOTING

The correct temperature and pressure of the materials contribute significantly to a proper spray pattern. A full spray pattern enables the applicator to make uniform passes of mixed material.

For a given pressure, materials that are too cold will cause a rather narrow spray pattern or stream of material and affect the spray process. If this occurs you should stop and check to see if you have both primary and hose heat. You should also consider this, did you just change a barrel or set. If the Drums are stored in an area that the temp is below 70° or the shop is very cold you may have to recirculate the material back to the drums to heat it up to its operating temperature (70° minimum).

TEMPERATURE SETTING TOO LOW

Equipment will display the following effects if you have too low temperature setting.

Problem: A stream of material will exit the spray gun, not a spray pattern.

What to do:

A: To troubleshoot this, increase the temperature as necessary. If the problem is not corrected within a reasonable time, then

B: Troubleshoot the equipment electrically.

TEMPERATURE SETTING TOO HIGH

If the materials are too hot they will react too fast causing the sprayed material to be almost dry before it hits the surface. When this happens you end up with a very sharp spiky texture.

Problem: Material appears to be drying too fast.

What to do:

A: Reduce the temperature as necessary. If this does not resolve the problem within a reasonable amount of time, then

B: Troubleshoot the equipment electrically.

INCORRECT OPERATING PRESSURE

Incorrect pressures will create incorrect mixing ratios. The equipment will produce the following effects from incorrect operating pressures, whether it is an air or hydraulic driven machine.

Problem: Not enough spray pressure or pressure drops off while spraying.

A: What are your fluid pressures at? Your machine should run at approximately 2000 psi to 2,200 psi. If your machine is dropping pressure equally on both A and B while spraying check your air supply on a pneumatic machine (you should have at least 100 psi air

pressure) and on hydraulic machines, check the hydraulic pressure (you should have at least 1000 psi hydraulic pressure)

B: Is the machine in run or retract?

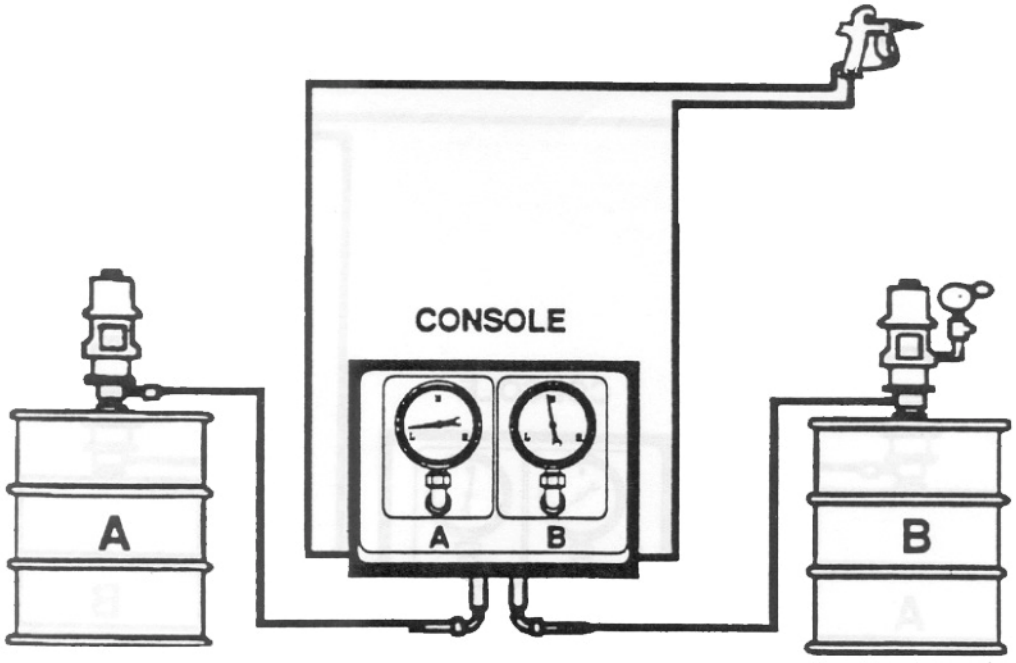
C: If your pressures are dropping and the gauges are not equal move to the next section.

RESTRICTION AND STARVATION PROBLEMS

With today's spray equipment, the applicator will not be able to develop a consistently proper spray pattern through the spray gun if the transfer pumps malfunction, or if the materials are not supplied to the proportioning pumps on a constant basis.

Short-term blockage of material in the spray gun, or momentary proportioner pump cavitation may escape detection by the applicator and will result in bad spots in the coating that will appear later if not detected right away. If the applicator should see a short break in the spray pattern, he should stop what he is doing immediately and investigate the situation.

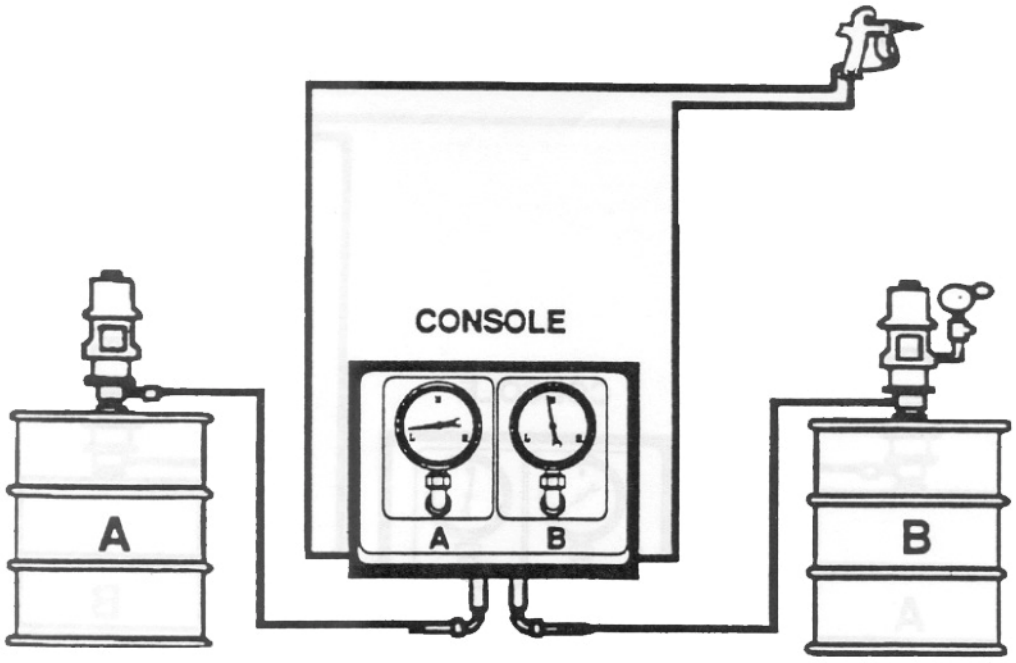
Problem 1: Momentary starvation of the equipment. The lacking Material Guage will show low pressure.



What to do:

A: To correct this problem, check from the console to the material supply system.

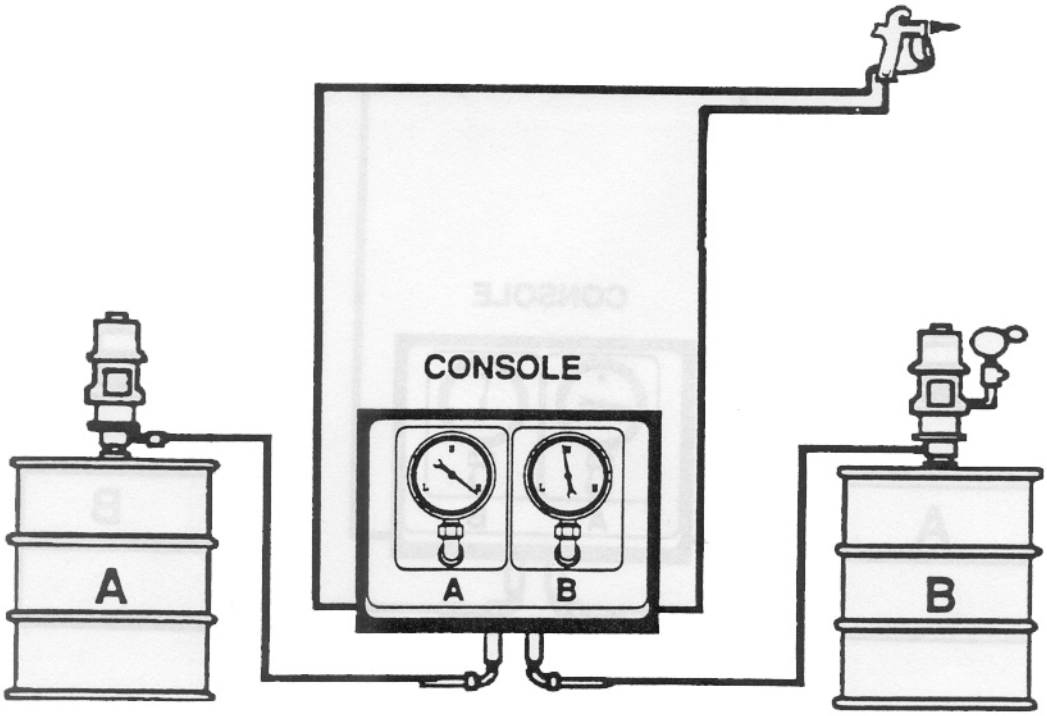
Problem 2: Cavitation momentary drop in the Lacking Material Gauge.



What to do:

A: Check from the console to the material supply system.
B: Check the transfer pump on the lacking material side.
C; Check the proportioning pump on the lacking material side.

Problem 3: Momentary restriction, the Restricted Material Gauge will show a higher pressure.



What to do:

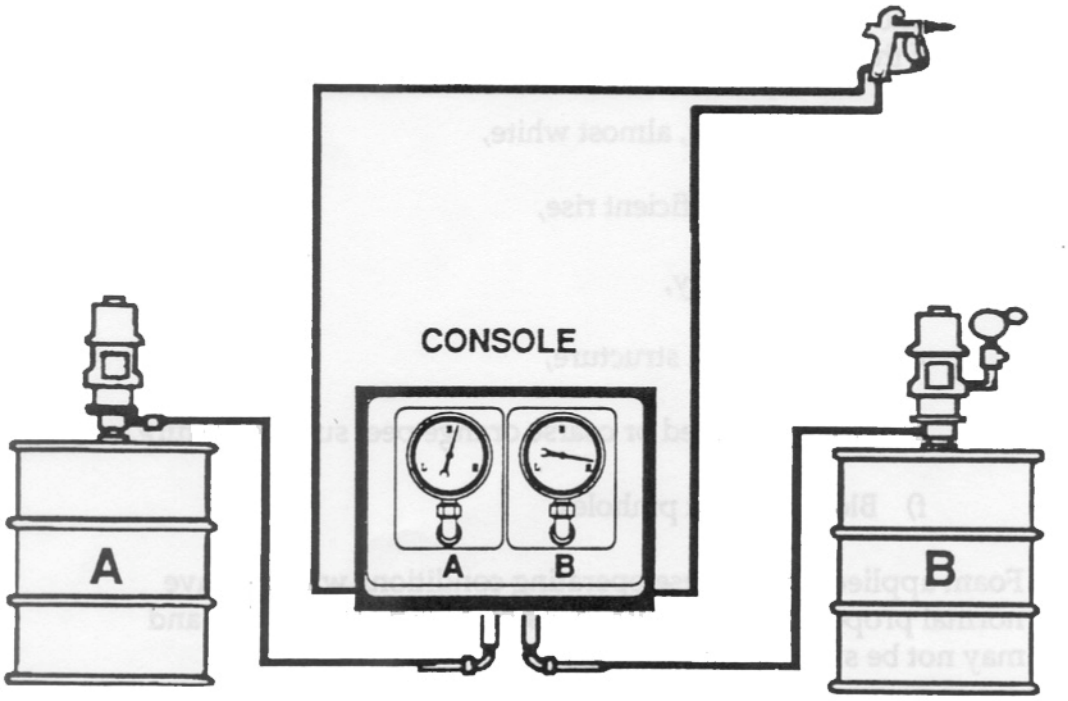
A: Check between the console and the gun for restrictions.

OFF-RATIO PROBLEMS

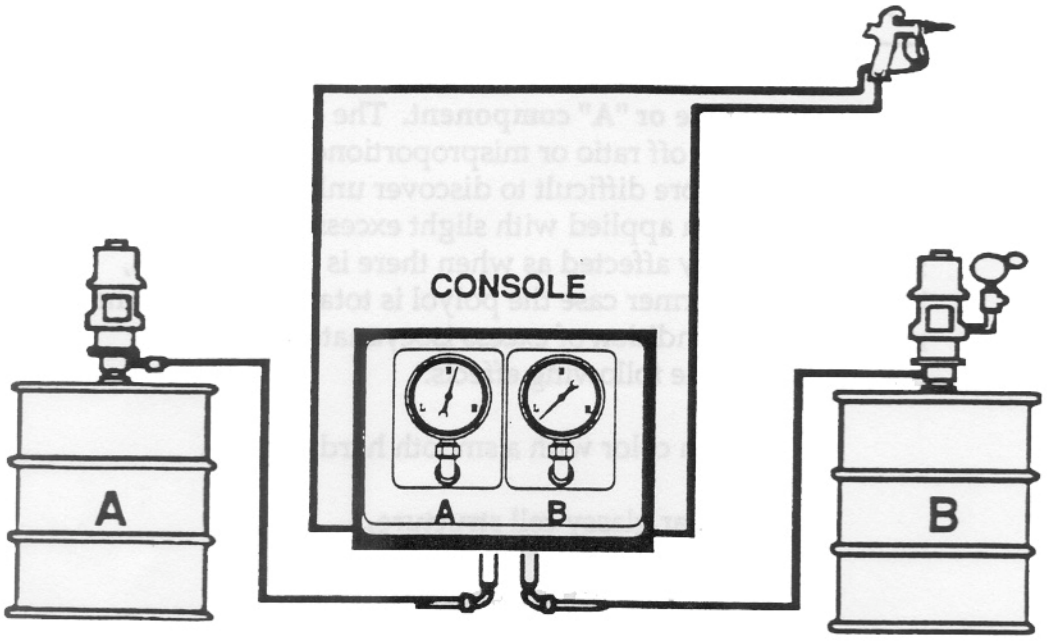
Problem 1: Excess Iso or "A" Side Component. The effects of Polyurea applied which is off ratio or misproportioned on the Iso or A-side are more difficult to discover unless the condition is extreme. Poly applied with a slight excess of Iso is not as seriously affected as when there is an excess of polyol, because in the former case the polyol is totally reacted. The more extreme condition of Iso will exhibit one or more of the following effects:

A: Yellow in appearance,
B: A more brittle material
C: In more severe cases bubbles, In this case you will not have enough poly to react with the Iso causing, you guessed it bubbles.

What to do:
These effects may be caused by either restriction or starvation.



A: When there is a restriction on the B-side, you will see high pressure on the polyol gauge. To correct, check for the restriction between the gun and the console on the B-side.



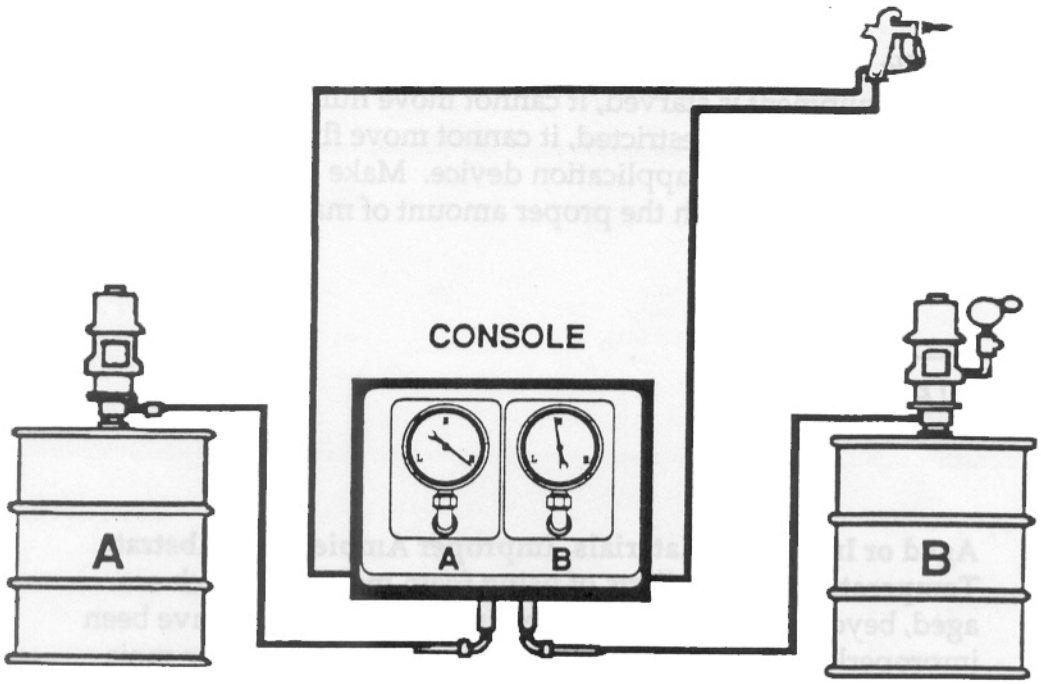
B: When there is a starvation issue, you will see low pressure on the polyol gauge. To correct this, check form the console to the material supply system.

Problem 2: Excess polyol or "B" Side Component. The effects of Polyurea that is applied off-ratio or misproportioned on the polyol side will be one or more of the following:

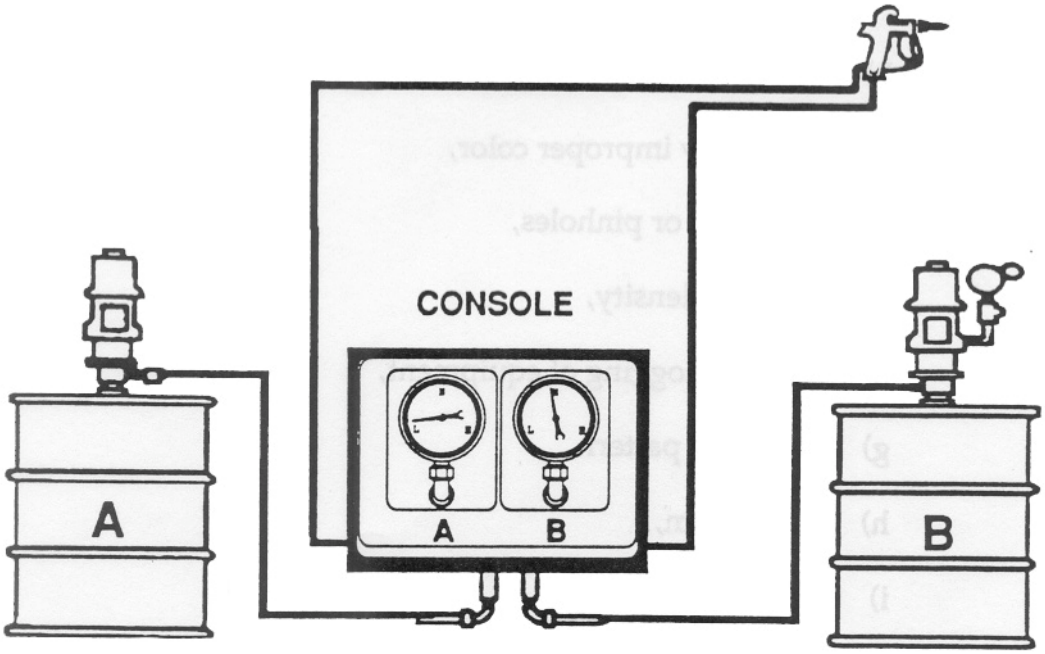
A: Material will be very soft
B: Material may be tacky or sticky to the touch
C: Material may Bubble, when bubbles are cut open you will find gooey black un cured material in them.

Material applied during either a restriction or a starvation issue will not have the normal properties and will not be suitable for a finished coating.

What to do:
These effects may be caused by either restriction or starvation.



A: When there is restriction on the A-side, you will see high pressure on the Iso or A-Side Gauge. To correct, check between the gun and machine for a restriction on the A-side.



B: When there is starvation the A-side, you will see low pressure on the Iso or A-side Gauge. To correct, check from the console to the material supply system on the A-side.

NOTE: Blockage problems of any kind must be handled quickly. If the equipment is starved, it cannot move fluid if there is no fluid there. If the equipment is restricted, it cannot move fluid it cannot get to the tip of the gun. Make sure your equipment is fed with the proper amount of material at all times.

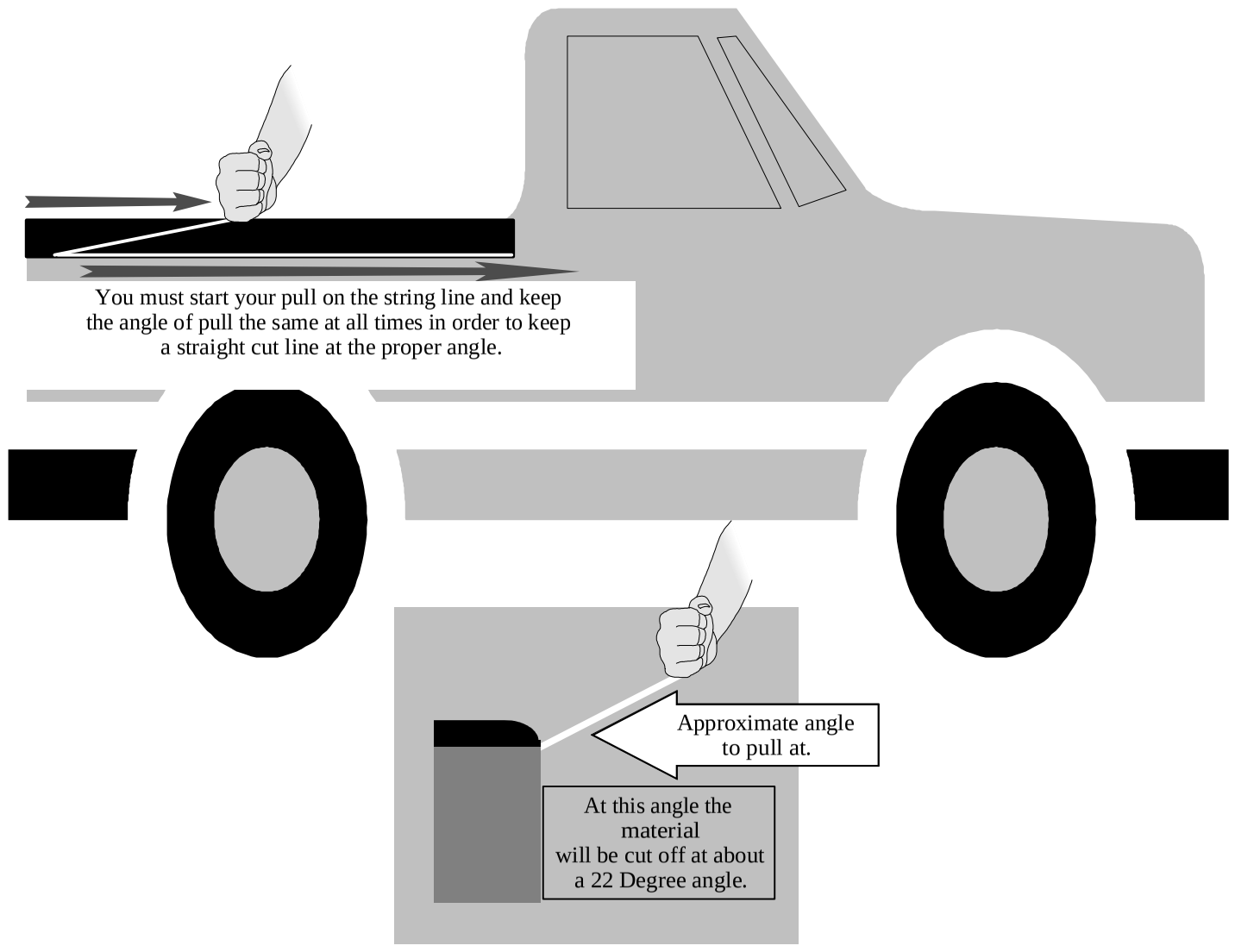
SUMMARY

Review, the major points or just use for notes:

IT’S MOVIE TIME!

HOW TO SPRAY A BEDLINER START TO FINISH

Now at this time you will be watching a video that shows a bedliner form start to finish. You will be following a spray tech through the process. In the video we will cover the basics in preparation, masking, and spraying the bedliner.


You must start your pull on the string line and keep the angle of pull the same at all times in order to keep a straight cut line at the proper angle.
Approximate angle to pull at.
At this angle the material will be cut off at about a 22 Degree angle.

REMEMBER!

YOU ARE THE FABRICATOR! WE ARE THE RAW MATERIAL SUPPLIER!

Turbo Liner MPL11™ is one of the most user-friendly, forgiving, heated plural component elastomeric products made. This fact is a double-edged sword.

Turbo Liner MPL11™ will react and set at even 25% off-ratio and may look good; but the following characteristics may be noted:

If the finished product is **ISO (A) rich**, you may observe any or all of the following:

1. Lighter in color or striations (marbling); will eventually darken with sunlight.
2. Harder surface and less flexible.
3. Higher surface glass (not always a key).
4. Firmer at higher temperatures.
5. ISO pop blisters due to CO2 generation of non-reacted isocyanate.
6. Localized foaming in slower systems (pour applications especially).
7. Lab analysis of the elastomer will show higher tensile strength, higher modulus and less elongation.

If the finished product is RESIN (B) rich, you may observe any or all of the following:

1. Darker color or striations; may turn color in some areas.
2. Softer surface and more flexible; may feel “tacky”.
3. May have incurred or liquid areas beneath the elastomer surface.
4. Lower surface gloss.
5. Softer at higher temperatures.
6. Air or liquid filled blisters between the elastomer and the coated substrate when used in a liquid containment application.
7. Lab analysis of the elastomer will show lower tensile strength, possible higher elongation, lower tear strength and higher M.V.T rating.

If the Turbo Liner MPL11™ is sprayed ON RATIO, but not effectively mixed at the gun due to lack of heat and/or pressure, or improper impingement, it may look good, but some of the above noted characteristics may be observed as well as the following:

1. Elastomer “cheesy” nature, cracks when bent.
2. Blister formulation, especially at spray overlap areas.
3. Localized foaming.

OTHER TECHNICAL DOCUMENTS

The following documents were created based upon issues we have run into with the equipment. We create these documents when we see a pattern in tech calls where we see the same issue multiple times in a row.

Turbo News

Volume 3, Issue 1, Summer 2005

TURBO LINER

FASTER, TOUGHER, BETTER

THE HOT ONE

If You Can Imagine It We Can Coat It.

Gun and Gun Cleaning Issues For The Probler & Probler P2

Problems that get over looked during the cleaning process!

The following letter contains information on issues that we have ran into with a few customers and the A-Side block assembly.
As you may or may not know there are a couple of areas on the check valve assembly that seal the side wipe seal. The first being the facing surface of the side wipe itself as seen below. Notice the light and dark spots on the surface. The light spots are normal wear, the dark spots are from two possible things. The first being a bur on the mixing chamber (mixing chamber must need to be dressed up with 1000 grit sand paper on a piece of glass) this can scratch the side wipe surface causing it to leak as soon as the manual fluid valve it turned on. The side wipe surface must be smooth and flat against the mixing chamber in order to seal when the trigger is not being pulled. Figure 1 shows a dark scratch that runs from the center hole to the outer edge of the side wipe surface. Keep in mind the material will flow to the point of least resistance. If there is a scratch along the side wipe surface this creates a path for material to travel.

Figure 1

The second thing you must look at is the check valve nut.

The nut assembly is pretty basic right, well it's not. In order for the side wipe to seal first it (the side whip seal) must be seated all the way into the nut assembly if it is not you will have a leak as soon as you turn on the manual fluid valve. Figure 2 shows the second sealing surface of the side wipe seal. These surfaces must be free and clear of all debris no exceptions. If you have even the smallest speck of material that gets into this area and you assemble the gun YOU WILL HAVE A LEAK as soon as you turn on the manual fluid valve.

Figure 2

The last and final thing is the A & B-Side blocks

Clean the threads good so there won't be a problem cross threading when you install the nut assembly. You should also check for any cracks at the top of the threaded opening on both the A & B-Side blocks figure 3. Do not clamp either block in a vice this will distort the side blocks causing sealing and surface matching problems.

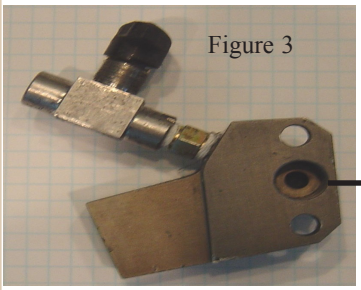


Figure 3

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Turbo News

Volume 3, Issue 1, Summer 2005

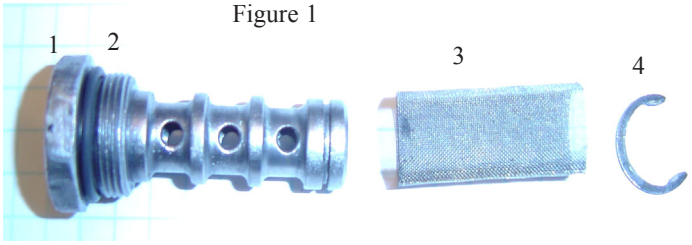
A-Side Gun Screen

Standard Probler Gun

There are 4 parts in the standard Probler gun A-Side screen assembly figure 1.

1- The screen/filter housing
2- O-ring Seal
3- Screen
4- C-clip

Figure 1

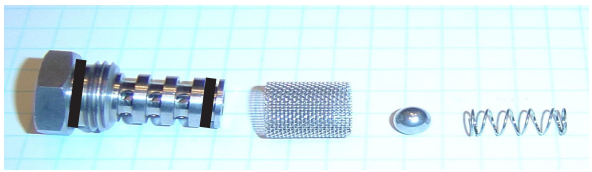


When cleaning the screen assembly you must first remove the assembly from the A-Side block using a boxed end wrench. Once removed you must pull the c-clip off the screen housing, this will enable you to remove the screen itself. Once the screen is removed you can soak it in gun cleaning solvent while you proceed. You next need to understand how the screen assembly works. The material enters the screen housing through the screen on the outside of the housing shown in figure 1 Item 3. The material then travels through the 6 holes (3 on each side) on the side of the screen/ filter housing and out through the end hole figure 2. If you have any obstructions either in the housing or the screen you will not get complete material flow. This would be called an obstruction.

Figure 2

Probler P2 Gun

There are 6 parts in the P2 A & B-Side screen assembly figure 3



1- The screen/filter housing
2- O-ring Seal
3- O-ring Seal
4- Screen
5- Check Ball
6- Check Ball Spring

The Probler P2 Gun screen assembly may look a little different but the same principal applies for material flow. The material flows in through the screen on the outside of the housing as shown in figure 3 item 4. The material then flows through the 12 side holes on the side of the screen/filter housing and out through the end hole figure 4. Neither the Standard Probler or Probler P2 guns are hard to work on but if they are not maintained and cleaned properly it can create down time and added costs not to mention frustration. Keep in mind these guns are tools of the bedliner business.

A CLEAN TOOL IS A HAPPY TOOL!

Figure 4

If You Can Imagine It We Can Coat It.

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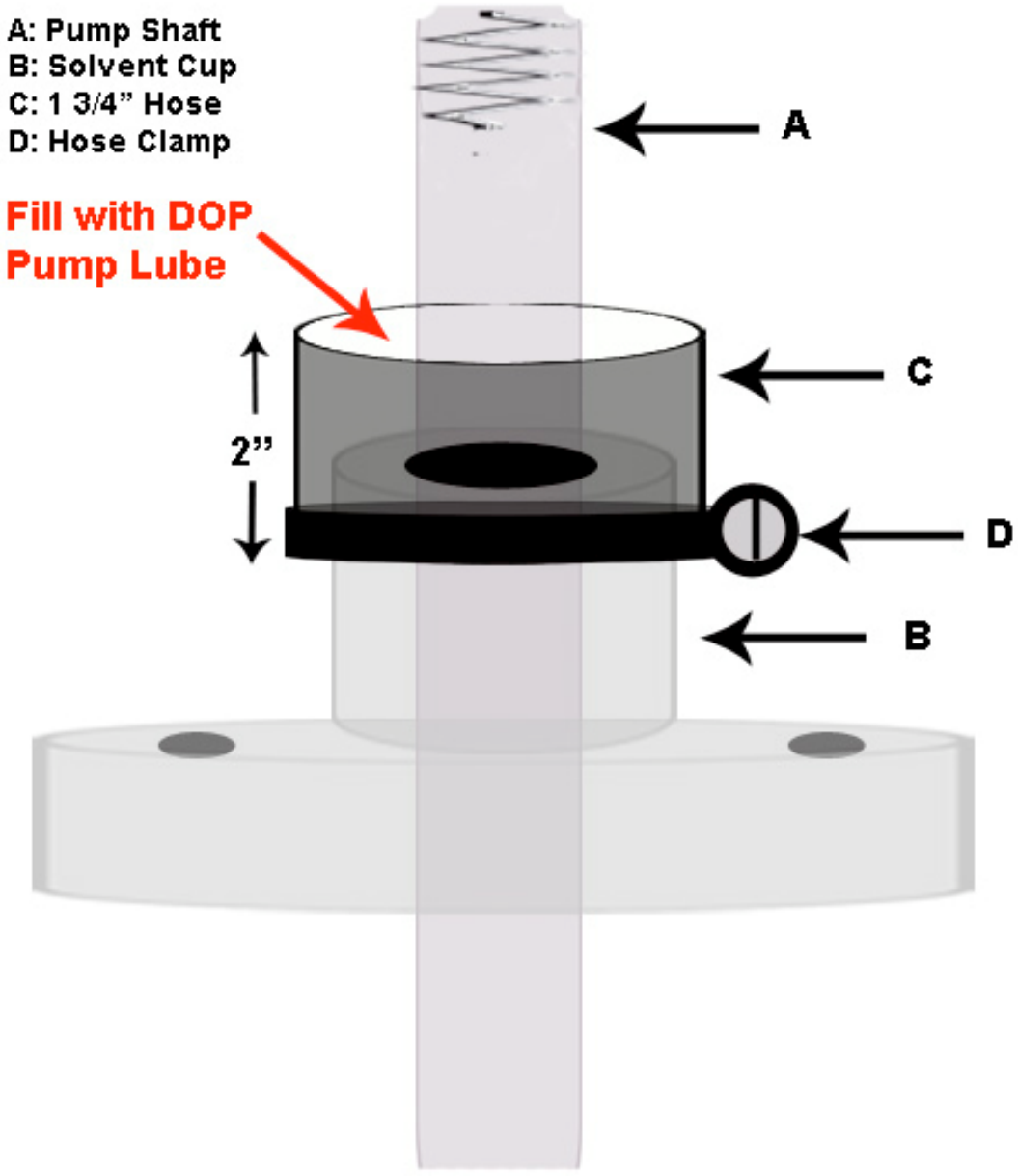
Turbo Liner News

Volume 3, Issue 4, Summer 2005

Extra Capacity Lube Reservoir For Super-Maxi & MH-II

You can increase the Solvent cap or Lube reservoir by adding a 2" piece of 1 ¾" hose and a simple hose clamp. First remove shaft nut at the top of the pump shaft (Item A) on the A-side pump from the Saddle Pump. Slide 2" piece of 1 ¾" hose (Item C) over the Solvent Cup Adapter (Item B). Install hose clamp (Item D) so that screw portion of the clamp will not interfere with anything on the machine. Reinstall pump shaft into the Saddle Pump and reinstall the nut to the top of the pump shaft. Fill with DOP PUMP LUBE.



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SERVICE BULLETIN: TURBO LINER INC.

Procedure for rebuilding the solvent cup assembly Super-Maxi, MH-II & Guardian A6 12/17/2007

CAUTION!! Before any work of any kind is performed, make sure the power and air supplies are shut off and all of the pressure has been blead off the system. Proper hand and eye protection must be worn at all times.

This document will take you through the steps for rebuilding or replacing the felt packing's and seals in and on the Solvent Cup Assembly.

The first thing is to make sure all pressure is bled of the system. Next you will need to remove any cover plates (if any) that may be present to expose the proportioning pumps. If all pressure is bled from the system it is not always necessary to remove the feed hose from the pump to perform this procedure. This procedure can be performed without removing the pump completely from the machine. Once the pump has been unbolted from the machine you can remove the solvent cup. If a buildup of A-side is present you may have to clean it off the top of the solvent cup to allow the removal of the snap ring. Once the solvent cup is removed you may start the disassembly. First lightly clamp the cup assembly in a padded vise. Using a flat tipped screw driver remove the packing retainer from the top of the solvent cup, this exposes the felt packing's. Using a #2 flat tipped screw driver in the center of the felt push down firmly (a small hammer can be used to set the screw driver into the felt) so that it penetrates the felt packing about a ¼". With a rocking motion slowly peal the felt from the inside of the solvent cup. Repeat this procedure on the next 3 felt wipers. Turn the solvent cup upside down so that the upper pump seal is exposed. Remove the o-ring from the bottom side of the housing. Use a flat screw driver to carefully pry the seal (do not scar the Solvent cup housing as this is a sealing surface) so that the seal will pop up and out of the solvent cup housing. Clean the solvent cup housing to a new like appearance, a hand wire brush will help with cleaning the outside. On the inside a red scotch bright pad may be used to clean the inside of the solvent cup. Use acetone to help clean and polish the inside of the cup. Now inspect the upper part of the pump shaft for scratches or gouges. If scratches are present you could dress them up with a scotch bright pad or ultra fine emery cloth. We would suggest that the upper pump shaft be replaced if this condition is found to avoid any issues down the road. Once all parts are cleaned you are ready for assembly. First thing you will want to do is start soaking the felt packing's in DOP/pump lube. Pour some DOP into a small cup, insert the felt packing's (see figure 2) and allow them to soak (soaking the felt packing's will help prevent them from tearing or wearing upon initial startup) while you install the upper pump seal. The upper seal is what they call a chevron seal they are designed so that when pressure is applied to them they expand outward creating a tighter seal around the shaft. With the bottom of the solvent cup facing up insert the seal with the metal side of the seal facing up (see Figure 1) press the seal into the solvent cup until fully seated into the housing. Install the o-ring in the groove around the base of the housing. Turn the solvent cup over so the top is facing up and install the 4 felt packing's and the packing retainer. Use a pair of snap ring pliers to install the snap ring in the groove at the top of the housing. You may need to press down on the plastic packing retainer to expose the snap ring groove. Now that you have rebuilt the solvent cup assembly, reassemble the solvent cup back onto the proportioning pump and reinstall the pump (don't forget the spacer) on the machine. If you did remove the pump completely from the machine and feed hose it is necessary that you purge the system (cycle the machine to get any air out of the system) this process can be found in the user manual for your machine. If you do not have a manual a copy can be downloaded form the dealers section of our web site at www.turboliner.com.

Figure 1

Figure 2

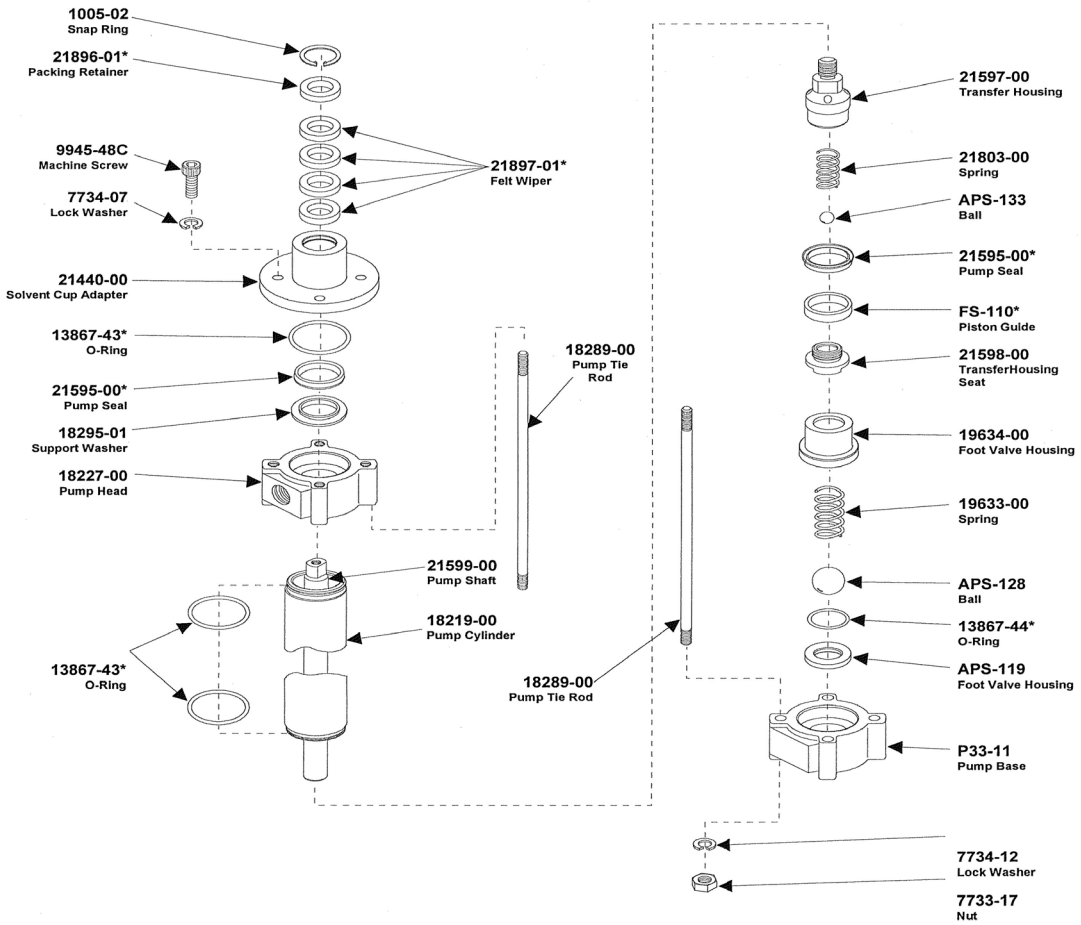
Turbo News

Volume 3, Issue 2, Summer 2005

Proportioning Pump Lubrication

Lubrication of the Proportioning pumps is one of the single most over looked maintaince proceedures there is. We all know that at times you get really busy and things like this get over looked. There is only one problem with not lubing your pumps the A-Side especially. Material will harden up around the pump shaft (Item#21599-00) at the top of the Solvent Cup Adapter (Item#21440-00) and cause the pump to lockup. The way this systems are designed Glas-Craft recommends to lube the pumps once a week. Due to issues with improper lubrication of the pumps we recommend it to be lubed daily in order to assure that the system works properly. We recommend lubing the pump before start-up and after shut-down any excess will be splashed over the side of the housing and should be cleaned off during shut-down. When DOP or Pump Lube is poured into the top of the solvent cup adapter it will flow downward into the felt packings (Item#21897-01), the packings then absorb the DOP so there will be lubrication on the shaft surface at all times of system operation, but YOU must apply the DOP to the Solvent Cup Adaptor for this to work.

If You Can Imagine It We Can Coat It.



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Turbo News

Volume 2, Issue 2, Summer 2004

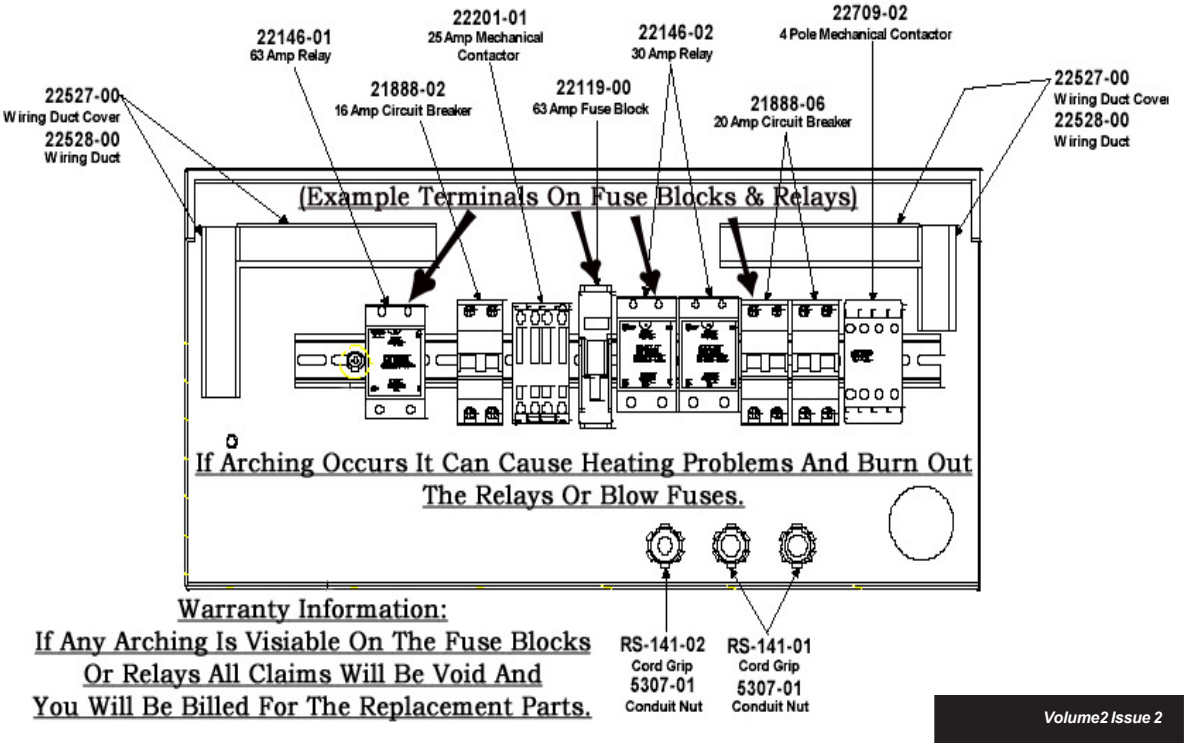
Checking You Electrical Connections

When you deal with electrical components you always must make sure you have good clean connections. (BEFORE YOU TEST ANYTHING ELECTRICAL ALWAYS TURN THE POWER OFF ON THE MACHINE) If you run into a situation where you have a heating problem like no hose heat or hose heat jumps up to high, you might be fighting a loose connection. In the diagram below is an example of what you should look for when hunting for a loose connection. The most common would be the wires running to the 63 Amp buse fuse shown in the center of the power block. You want to check these connections carefully. Be sure not to over tighten the screws and avoid stripping their treads.

If all connections are good and tight, proceed to the breakers. Flip the breakers off then on to make sure they have not been kicked. If all is good with the breakers move on to the fuses. You will need a volt ohm meter to test the fuses. Pull one fuse at a time and set the meter to ohm's and check the continuity if the meter reads 0ohms you have a blown fuse. Replace and start the machine back up. You generally dont have to check other fuses once you have found a blown one as the other fuses run different circuits of the machine.

If You Can Imagine It We Can Coat It.

(All Connectors On All Relays And Fuse Blocks Must Be Checked At Least Once A Month To Assure That No Electrical Arching Can Occur.)



Warranty Information:
If Any Arching Is Visiable On The Fuse Blocks Or Relays All Claims Will Be Void And You Will Be Billed For The Replacement Parts.

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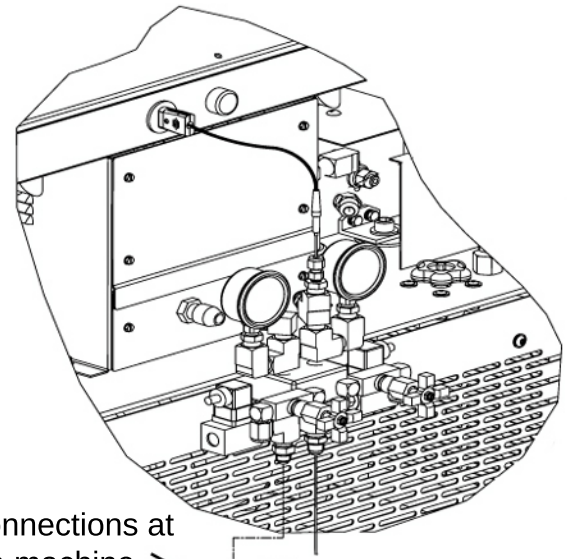
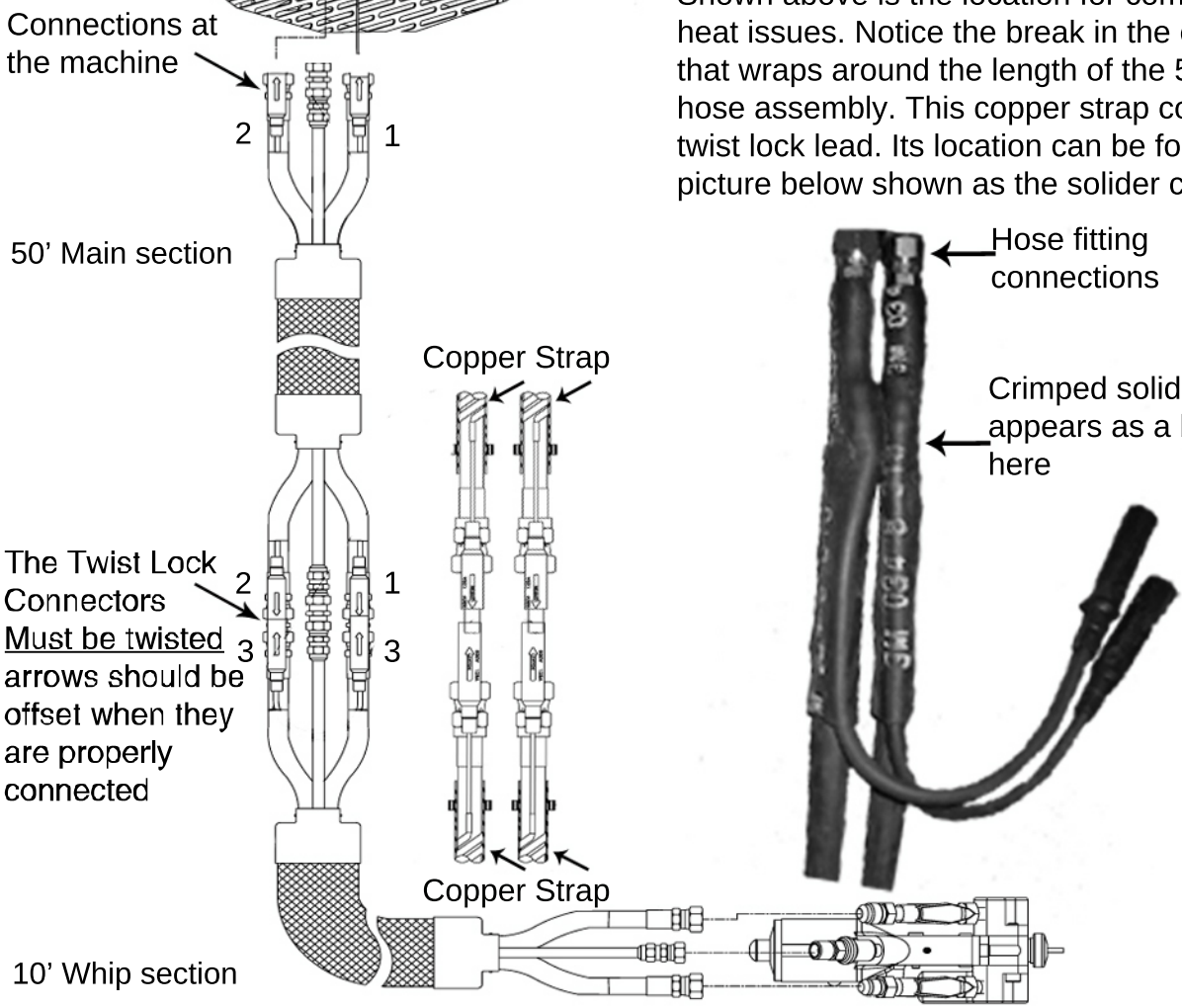
Heated hose & Whip hose splice locations



Shown above is the location for common hose heat issues. Notice the break in the copper strap that wraps around the length of the 50’ or the whip hose assembly. This copper strap connects to the twist lock lead. Its location can be found in the picture below shown as the solider connection.



CAUTION

Hose assemblies are constructed of durable, rugged materials, however they are not indestructible. To provide precisely controlled heated material, the hoses have electrical wiring wrapped between layers. Avoid dragging hoses over or around sharp, abrasive edges and corners. Exercising caution and common sense will give long, and reliable service from the hoses.

SERVICE BULLETIN: TURBO LINER INC.
For MH-II Whip Hoses produced before 12/20/05

CAUTION!! Before any work of any kind is performed, make sure that the power and air supplies are shut off and all of the pressure has been bled off of the lines. Special care must be taken when cutting the insulation back to expose these connections. MAKE SURE THAT YOU DO NOT CUT INTO THE FLUID LINES!! Also, use extreme caution when using a propane torch for soldering, DO NOT OVERHEAT OR BURN THE FLUID LINES!! Use a heat shield of some kind if necessary.

As you may or may not know there have been some problems with the Glas-Craft MH-II whip hose assembly that can cause hot spots and can result in burning through the 10' MH-II whip hose. We have been working with Glas-Craft to cure this problem and coming up with a quick fix solution that a spray technician can perform to avoid these conditions from happening to the whip you currently have in service.

The first area we will cover is the main section hose connection that adjoins the 50' material hose section. At the left you will see just what a hot spot will do to the whip hose, also shown here is an area that has been targeted as a bad wrap. If you look closely the flat copper lead that winds around the hose is folded backwards. In some cases, this positions the copper windings so they are lying against the hose like a knife edge. Over time these will cut into the hose causing a hose failure.

Our main task here is to open up the hose assembly and check all of the electrical connections in the heated whip. There are five connections in the whip. We will utilize a crimp butt connector, soldering it into place to insure a positive connection, alleviating the chance of a hot spot. Secondly, we want to isolate and insulate this connection from the hose for extra insurance.

This is a fairly simple procedure for most technicians, but if you are not comfortable performing this task, please seek the assistance of someone competent to make these upgrade repairs.

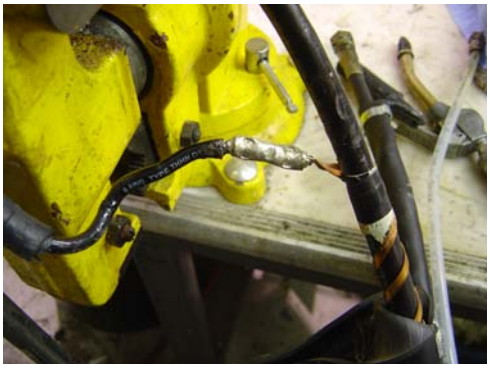
Here is what you will need: razor knife, propane torch, heavy duty side cutters, wire crimping pliers, heavy gauge non-insulated butt connectors, rosin core solder, electrical tape, cloth style electrical tape (friction tape), duct tape, zip ties and foam pipe insulation.

1) Cut and remove the metal crimp band. Carefully cut back the insulation and sheathing to expose the connections.

2) Figure 1 shows a good clean connection. If you find a connector that shows signs of heat or corrosion, replace the butt connector, trim back and /or clean up wire ends as needed prior to soldering.

Figure 1

Figure 2



NOTE: If your hose is using a two screw aluminum block connector as shown in Figure 3, remove and discard this connector and replace it with a crimp style as shown in Figure 1

3) Using a propane torch and rosin core solder, flow solder into the butt connector to make a good solid connection as shown in Figure 2.

Figure 3

Figure 4

4) Tape up the connection with electrical tape, Figure 4, then use two or three wraps of friction tape around the hose to isolate it from the connector as seen in Figure 5.

5) Tape the connector to the hose, and using the rubber sleeve that was cut open earlier, seal up the repair with electrical tape. Use a zip-tie to secure the end, Figure 6. Re-attach the heavy outer insulation using duct tape.

Figure 5

Figure 6

6) Use this procedure for the four ends of the whip. They may vary slightly but the principles apply.

7) The fifth connection is located a couple feet up from the gun end where the two hoses come together. Remove and discard the bolt and terminal connection, Figure 7. Trim one of the leads 4” to 6” shorter than the other (this will ensure that the new connection lays in-line with the hose). Crimp and solder a new connector in place, Figure 8. Tape up this connection and re-install outer insulation. Your updated hose is ready to be put to work.

Figure 7

Figure 8

Glas-Craft MH, MH2. MH3 and Guardian Machines
Hose Heat Testing and Repairs

CAUTION! Make sure that the main breaker to your machine is OFF and all of the pressure has been bled off the system before attempting any repairs. If you are not comfortable performing these tests and repairs please contact your supervisor for technical assistance.

Note: The electrical tests (fuses, breakers & relays) confirming that the machine is producing the correct power for the hose heat needs to be done prior to proceeding with the hose repairs listed in this document.

With usage over time, the hose heat on these Glas-Craft machines will fail due to a breakage in the copper winding. The breaks are usually found in a couple common spots and are easily repaired.

You will need: a multi-meter, torch and rosin-core solder, un-insulated #6 butt-connectors, razor knife, electrical and/or friction tape and duct tape.

The breaks are usually found within a few inches of the solder connection to the #6 wire for the twist-lock connectors.

Electrical currant flows from the machine to the end of the hose and back to the machine completing the circuit. On a 50 foot hose with a 10 foot heated whip there are 8 spots where the copper straps have a soldered connection to the #6 wire, these are all possible problem areas. With a couple of simple continuity tests you should be able to locate a break in the heating circuit.

Testing: unplug the twist-lock connectors at the front of the machine and also where the main hose and whip meet. Test for continuity between #1 and #1 as seen in the picture. If you have continuity then move on to test between #2 and #2 and then #3 and #3 until you find a break in the circuit. As you test, wiggle the hose/wire to help find the break as the two broken ends may be touching giving you a false reading.

(Caution! Be very careful! Do not cut into the high pressure hose!) Once you have located a fault in test 1,2 or 3 then carefully cut open the insulation at the end of the hose (about 6 inches) with a razor knife to expose the solder

connection and copper straps. The breaks will generally be either at the hose to whip area or within a foot from the gun, these are areas where the hose will see a lot of back and forth movement causing fatigue and failure. Breakage on the machine side of the hose is very rare due to limited hose movement here.

Repair: the repairs will vary but are simple. Clean and trim the ends, crimp on a butt connector, solder the butt connector for a good connection then re-tape the whole connection using electrical and duct tape.

Note: The "Twist-lock" connectors are another area where we have seen problems. Make sure that you have these connectors twisted for a secure connection then tape the connection to keep the plugs from coming undone.

If you find any of the twist-lock connectors that have heat damage or if you are un-able to open them, even with pliers, then they are probably shot from electrical arcing.

Remove and discard the burnt twist-lock connector and replace it with a soldered in butt connector then sealed up with electrical tape.

For additional information refer to these documents on the dealers section of the web-site www.turboliner.com

MH-II ELECTRICAL TROUBLESHOOTING REV.06_04
TRUE FLOW HOSE TWIST LOCK ELECTRICAL CONNECTORS 08-14-06
MH AND MHII HOSE HEAT TROUBLESHOOTING
WHIP HOSE SERVICE BULLETIN 12_23_2005

Please call Turboliner tech support if you need additional assistance.

877-678-8726 Ext 2

John Powers

Turbo News

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Warranty Parts Return & Procedure

As you can imagine no one ever wants to have problems, but in the event that a problem does occur we would like to let you know the proper procedure. In the past we have had problems with warranty parts not being returned to the proper place in a timely manner. This causes a lot of problems because if the parts are not returned within 30 days you will be billed for the parts and the warranty claim is then closed never to be reopened. This situation will cost your business money and if you have to pay for parts that should have been covered under warranty this is not a good thing.

Well here it is in a nut shell: First off the equipment warranty reads that the manufacturer warranties equipment to the original purchaser that they will repair or replace (at their sole option) any defects in workmanship or material for a period of one year from the date of installation.. The warranty shall not apply to any equipment or parts that have been altered or repaired by anyone other than the manufacturer and/or it's authorized distributor, nor defects resulting from installation, misuse, negligence, accident, or use not specified by the manufacture. Call Turbo Liner if you have an equipment problem.

Turbo Liner handles all it's own Parts and Tech Support. Any questions please call us at: 877-678-8726

Before you call for Tech support please check your gun. 90% of all our support problems end up being something plugged or warn in the gun, most of which end up being in the check valve assembly. These issues are all covered in the Probler Gun Video, this video can really help in the understanding of how the gun works and how to keep it clean and trouble free. If you don't have a copy when you call in you can order at that time. The Material Must be kept at 70 Degrees F. or it Will Not Flow Properly.

Proper Warranty Procedures:

1: If a problem occurs call for Tech Support 877-678-8726 ext.1 & 3.

2: Have this information available pressure readings from both a & b side gauges, hose temp reading's and so on.

3: If a part failure is diagnosed we will ship the replacement part to you. At the time of shipping confirmation you will receive an RMA number. This RMA number (written on outside of package) is used to return the defective part. The part must be returned within 30 days or the claim will be null and void and you will be billed for the replacement part.

Return defective parts to:

Glas-Craft, Inc. Tech Dept.
5845 West 82nd Street, Suite 102
Indianapolis, Indiana 46278

If You Can Imagine It We Can Coat It.

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