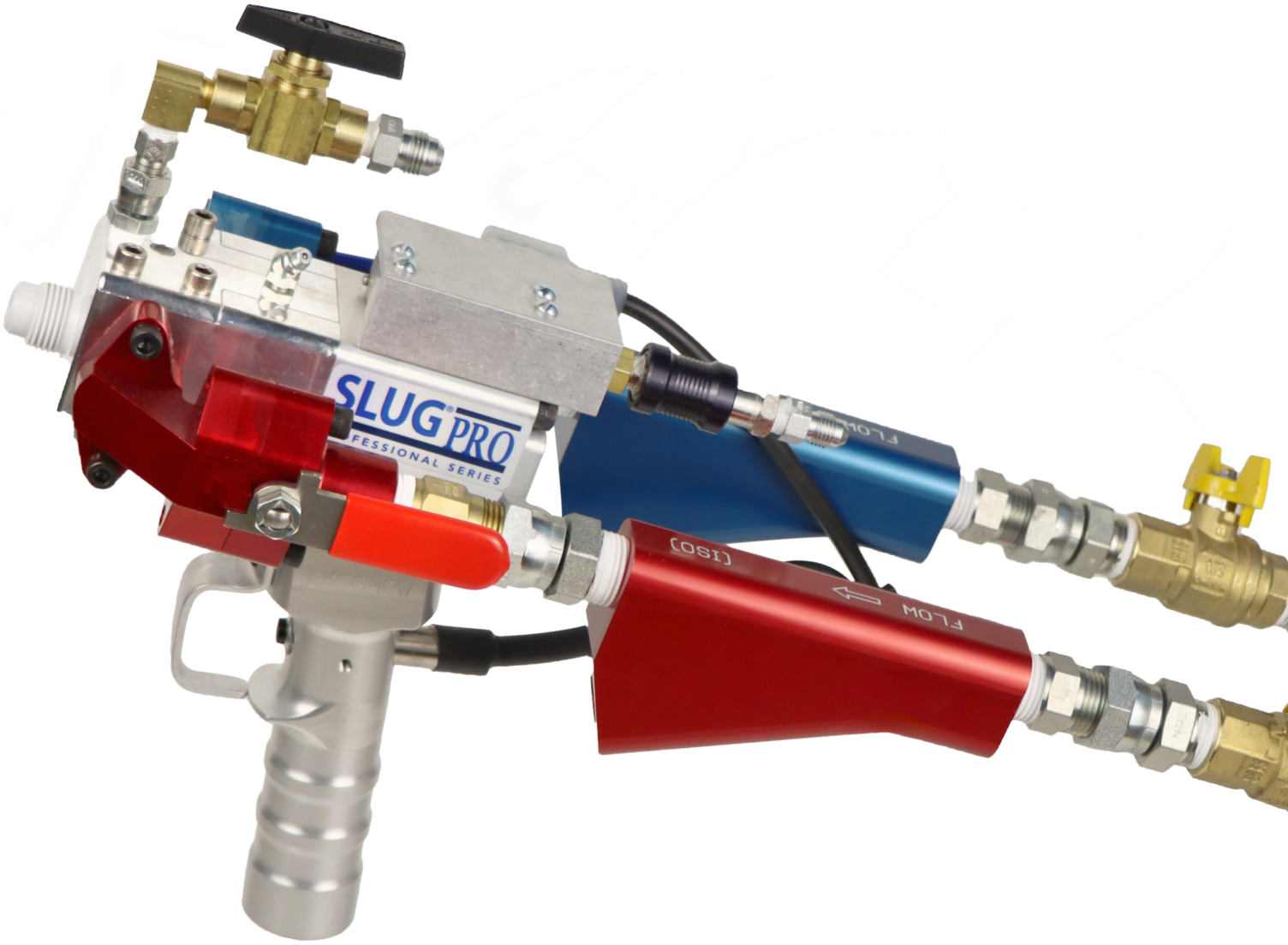
SLUG® PRO

PROFESSIONAL SERIES

OPERATIONS MANUAL



A WORLD LEADER IN
POLYURETHANE TECHNOLOGY
AND SOLUTIONS

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This manual is designed to provide the necessary information for the installation, operation, and service of FSI foam dispensing units. It is important to read it thoroughly and to use it for reference whenever necessary.

Familiarity with this manual will allow you to obtain maximum operating results, and will provide continuous assurance of quality polyurethane foam. Several of the procedures covered in this manual are also demonstrated in Equipment Videos on our website at www.fsi.co/slug-pro.

The FSI foam equipment you have is relatively simple to operate in comparison to other urethane foaming equipment, when operated and maintained in accordance with this manual. It provides for manual or automatic dispensing of urethane foam by the liquid-blown or froth methods.

Process Description

Rigid polyurethane foams are formed by the reaction of certain isocyanate compounds with hydroxyl bearing polyols. Isocyanate (ISO) and polyol (Resin) chemically react to form multi-branched polymer chains when mixed together in the presence of catalysts and other additives. The generic chemical name for these compounds is polyurethane.

FSI produces polyurethane chemical systems for use in the manufacturing of cellular plastics (polyurethane foams). These are two-component systems normally designated “A” and “B”. The “A” component (ISO) is an MDI polymeric isocyanate. The “B” component (Resin) consists primarily of polyol, necessary additives, catalysts and a blowing agent.

THE PROCESS AND THE REACTION

In the FSI foam process, the two basic components (the A-SIDE and the B-SIDE) are pressurized in separate vessels. The chemical systems have blowing agents blended into one or both components. The two chemicals are then fed through a dispensing tube in a controlled ratio and dispensed. Once dispensed, the exotherm and sudden decrease in pressure initiate the formation of polyurethane foam.

The foam continues to expand as heat is generated from the chemical reaction of the isocyanate and polyol. The foam expands until the polymer has obtained sufficient strength to withstand the pressures of the expanding gases. The final product is a homogeneous cellular product composed of many tiny closed cells. The percent of closed cells, usually 90 to 96%, determines the efficiency of the foam.

THE TEMPERATURE

Temperature is of utmost importance in processing urethane chemicals. It is essential to control the reaction by controlling chemical temperatures because this assists in maintaining productivity and efficiency. Lack of control over chemical temperature results in loss of time, lower productivity, higher cost, and in some cases, loss of product.

Generally the chemical should be maintained at 80°F (±5°F) throughout the year, unless otherwise specified by FSI. All SLUG PRO guns must have heated hoses. Hoses should be kept off cold floors. Whenever possible, heated fixtures should be utilized. If heated fixtures are impractical, the creation of a heated area of at least 80°F is beneficial. Refer to Product Data Sheet (PDS) for specific operating chemical temperatures for your system.

LIQUID-BLOWN AND FROTH SYSTEMS AND EQUIPMENT

FSI liquid-blown and froth chemicals are contained in pressurized cylinders with the isocyanate component labeled A-component, or A-SIDE, and the polyol component labeled B-component, or B-SIDE. The color code for the A-SIDE is RED. The color code for the B-SIDE is BLUE. F-6000 (350-gallon) and F-5000 (303-gallon) cylinders are color coded on the top rings of the cylinder. Detailed cylinder schematics and descriptions are given later in this manual.

Liquid-blown and froth systems are dispensed through specifically designed equipment and do not require pumps or any mechanically driven parts. The chemicals are shipped at 25 p.s.i. or 75 p.s.i. For safety, each cylinder is equipped with a pressure relief valve set at 275 p.s.i. The cylinders should be placed in an area (typically a "conditioning room") where the chemical can be maintained at proper temperatures. Operating nitrogen pressure for the cylinders and equipment is 240 to 245 p.s.i.

> **!** **IMPORTANT:** CYLINDERS MUST BE BROUGHT TO RECOMMENDED TEMPERATURE BEFORE ADDITIONAL PRESSURE IS ADDED.

The 240 to 245 p.s.i. blanket is maintained through a regulator unit(s) from bulk or bottled nitrogen. This pressure drives the chemical through a cylinder-to-hose connection (Stratoflex fitting, filter assembly, hoses, & SLUG PRO gun body) on both the "A" and "B" side. (NOTE: FSI DOES NOT supply nitrogen. Nitrogen must be secured from an outside supplier.) The chemical streams impinge in the SLUG PRO Mix Cartridge at approximately 120 p.s.i. The combined chemicals pass through an FSI mix tube and into the desired part to be foamed.

FIXTURE DESIGN

When designing fixtures, extreme care should be taken to avoid creating a heat sink, a condition in which the fixture and surrounding mass draws heat from the chemical reaction. Remember that excess heat or cold is devastating to the chemical reaction and subsequently to production. Keep in mind the differences in pressures between pour systems and froth systems. Pressure differentials should be taken into consideration when designing fixtures, molds, and parts for manufacturing. Historically, fixtures have been designed to withstand 20-30 p.s.i.

Equipment Description

Equipment Description

FSI manufactures the liquid-blown and froth foam dispensing equipment to exacting standards. The SLUG PRO gun is a precision instrument designed for dispensing polyurethane foam systems. Although extremely durable, reasonable care in handling should be exercised to prevent abuse. Cleaning and maintenance should be done on a regular basis to insure proper function and longevity of the equipment.

The complete unit consists of the following basic components:

Mix Probe Assembly
Slug Pro Gun Head
Flow Control Assembly
Hoses
Stratoflex Assembly
Nitrogen Regulator(s)
Heat Control Units
Timing Units

MIX PROBE ASSEMBLY

The isocyanate and polyol chemicals complete the mixing process by passing through a specific size mix element. Mixing action is accomplished by sub-dividing the stream of chemicals into many different layers so thin that the chemicals are literally blended together. Mixing is further increased by air nucleation.

Mix tubes are size-specific for the 6, 15, 30, 45 & 60-PPM (Pound Per Minute) dispensing units. The tubes consist of a polypropylene tube and a polypropylene, butterfly-style-mixing element. The mix tube attaches to the gun by the threads on the mix cartridge.

SLUG PRO GUN HEAD

The main body of the SLUG PRO gun consists of an air-open/air-closed cylinder, mix cartridge, rod, and handle. All are machined from the 2024T6 hardened aircraft aluminum. This allows for minute tolerances and easy interchangeability. These parts are the same for all of the different gun outputs. The right and left wings bring the two chemical streams together into the SLUG PRO mix cartridge. The air cylinder and wings allow the unit to operate without solvent. The gun head also consists of ball valve units for chemical supply streams, a trigger switch, a constant-flow air purge valve, nitrogen supply slide safety valve, and an air-solenoid air-block assembly.

FLOW CONTROL ASSEMBLY

The flow controllers are the center of the mechanical system. Flow controllers maintain the ratio of the isocyanate and polyol components. Flow controllers are size-specific for the 6, 15, 30, 45 & 60-PPM gun outputs.

HOSES

The equipment has two chemical supply hoses. The hoses are made of braided stainless steel and are Teflon-lined. Each hose is made to withstand pressures well above the SLUG PRO gun operating pressure. This adds to the safety of the gun since operating pressures should not exceed 245 p.s.i. Hoses are either heated by cal-rod units or by heat tape depending on the length of the hose. 25 ft. hoses are heated by cal-rod mechanisms. 45 ft. hoses and greater are heated by heat tape. Each hose is color-coded, red on isocyanate (A-SIDE), and blue on polyol (B-SIDE).

STRATOFLEX ASSEMBLY

Stratoflex assemblies consist of a filter and temperature gauge. Stratoflex assemblies are located at the end of the hose assemblies. Temperature gauges on the Stratoflex assemblies are color coded like the cylinders (Red = A-SIDE, Blue = B-SIDE). A Stratoflex (Strat) assembly is the device that connects to the chemical cylinder. Each Strat assembly indicates temperature of chemical and filters possible contaminants. Optimal operating temperature for most FSI chemical systems is 80°F(±5°F). Temperature readings should be taken while, or soon after, chemical is flowing to indicate accurate chemical temperature. Refer to your specific system for temperature parameters located on page 13.

Two Stratoflex sizes exist (½" and 1¼"). Typically ½" Strats are used with F-1000 or smaller cylinders. Both ½" and 1¼" Strats can be used with F-6000 and F-5000 cylinders. When using 1¼" Strats it is impossible to connect the SLUG PRO gun to the chemical cylinders incorrectly. This is due to the reverse fitting system between the gun and cylinders. A reverse fitting system does not exist when ½" Strats are utilized. Therefore, it is important to use extreme caution when connecting ½" Strats to chemical cylinders because connecting incorrectly ("crossing-over") is possible. Follow the color coding, matching the A-SIDE (Red to Red) and the B-SIDE (Blue to Blue) tape depending on the length of the hose. 25 ft. hoses are heated by cal-rod mechanisms. 45 ft. hoses and greater are heated by heat tape. Each hose is color-coded, red on isocyanate (A-SIDE), and blue on polyol (B-SIDE).

IMPORTANT: IF COLOR-CODING IS IGNORED, CROSSOVER WILL OCCUR AND THE ENTIRE SLUG PRO GUN UNIT, HOSES, AND CYLINDERS WILL BE RUINED! CONTACT FSI IF UNCERTAIN HOW TO CONNECT GUN TO THE TANKS!

NITROGEN REGULATOR(S)

The regulators are the energy source which operate the entire dispensing unit. SLUG PRO equipment regulator systems typically consist of two high-pressure regulators. The first high-pressure regulator is connected to only one chemical cylinder. The second high-pressure regulator is connected to one chemical cylinder and the ¼" air cylinder line. Some 6 & 15-PPM users are able to use one regulator to pressurize both chemical cylinders and the air cylinder.

HEAT CONTROL UNITS

FSI utilizes two different types of heating units, an HB-01 (Single Digital Heat) Unit and a HB-02W (Dual Digital Heat) Unit. The HB-01 is used in conjunction with heat tape for 45 ft. and longer gun units. The HB-02W is used in conjunction with two heat cables (cal-rods) on 25 ft. gun units. Both heating units are designed so hook up is simplistic.

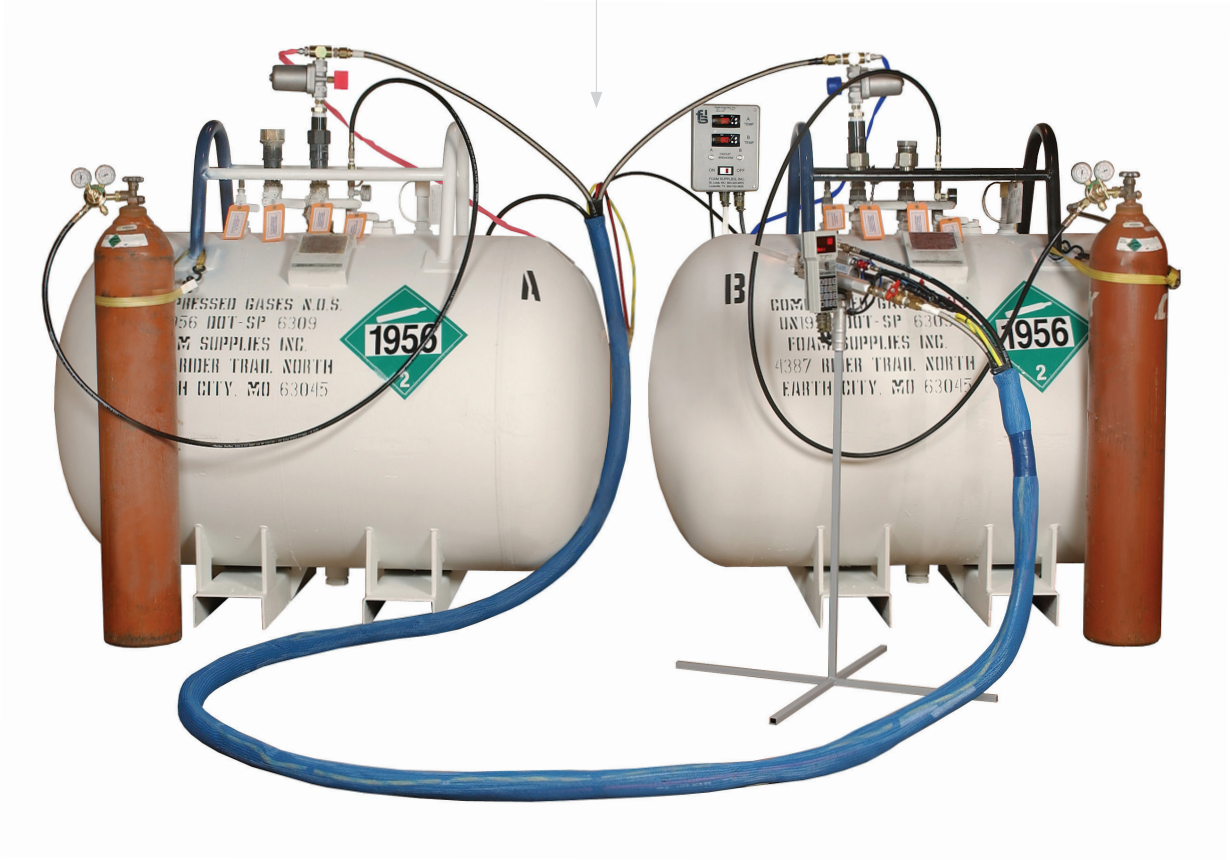
TIMING UNITS

FSI utilizes several different types of timing units to adapt to various production methods and schedules. Timing units allow for manual operation if specific timed shots do not suit the application. Timing units are also designed so hook up is simplistic.

TIMING UNITS



STANDARD UNIT



Chemical Preparation, Storage, & Handling

TEMPERATURES

Temperature is critical when dispensing urethane foam. To ensure proper processing and productivity, FSI chemical systems should be preheated and maintained at 80°F(±5°F). With use of F-1000 cylinders, temperature conditioning takes approximately 12–24 hours in an 85°F heat-controlled room. When F-6000 and F-5000 cylinders are used, temperature conditioning takes approximately 24–48 hours in an 85°F heat- controlled room. Temperature might vary from the above parameters on special urethane systems. Operation outside desired range will affect ratio and reactivity of foam system.

CYLINDER STORAGE AND CONDITIONING

FSI chemical systems should not be stored at temperatures below 50°F or above 90°F. Chemical temperature conditioning should be done slowly to insure even temperature throughout the mass. Remember temperature conditioning can take from 12-48 hours depending on cylinder size.

SHELF LIFE

Liquid-blown and froth systems have a shelf life of approximately six months, dependent upon the system. Orders for chemical systems should be placed to maintain inventory for a period not to exceed sixty days. A variety of cylinder sizes are available to accommodate individual requirements. Refer to product information sheets for specifics.

IMPORTANT: NEVER APPLY DIRECT HEAT TO ANY CYLINDER!
(Example: Drum, Band and Queen Bee heater should never be used.)

IMPORTANT: TEMPERATURE CONDITIONING OF CYLINDERS MUST BE COMPLETED PRIOR TO PRESSURIZING!

IMPORTANT: WHEN HEATING OR RE-HEATING A CYLINDER WITH THE FILTER ASSEMBLY CONNECTED, IT IS IMPERATIVE THAT THE CHEMICAL BALL VALVE ON THE TANK BE OPEN! THIS WILL PREVENT DAMAGE TO FILTER ASSEMBLY!

Refer to Product Data Sheet (PDS) for specific operating chemical temperatures for your system.

SOLVENT

Use only DK 817 (Dipropylene glycol monomethyl ether, also known as glycol ether) as the cleaning agent. Any other solvent used is done so at the user's risk, bearing in mind that considerable damage could result. Use of other solvents could damage the equipment. Solvents should only be stored, used, transferred, or disposed of in well-ventilated areas. DO NOT allow solvent vapors to accumulate in areas near open flames, electric heaters or hot surfaces. **NO SMOKING** should be observed while using or handling any solvents. Refer to your SDS for proper handling and disposal.

NITROGEN

USE ONLY CLEAN, DRY NITROGEN supplied from pressurized bottles, cylinders, or bulk to pressurize the chemical cylinders and operate the SLUG PRO dispensing equipment. To maintain and control pressures, use only the regulator(s) supplied with FSI equipment. The regulator(s) should be set at 240–245 p.s.i. in order to pressurize the A-SIDE and B-SIDE chemical cylinders. The regulator(s) also supply the SLUG PRO gun air cylinder.

When properly used, one 220 cubic foot nitrogen cylinder will service approximately 500 lbs. of FSI foam.
(NOTE: FSI DOES NOT supply nitrogen. Nitrogen must be secured from an outside supplier.)

> **IMPORTANT:** CHEMICAL CYLINDERS MUST BE CONDITIONED TO OPERATE TEMPERATURE BEFORE PRESSURIZING TO 240-245 p.s.i. NEVER INCREASE TEMPERATURE TO CYLINDERS AFTER PRESSURIZING TO 240-245 p.s.i.

CYLINDER SIZES

FSI owned and maintained cylinders are available in a variety of sizes, including bulk, for maximum flexibility. The cost of handling and the proper disposal of used drums can be avoided by using FSI refillable cylinders.

FSI cylinders have been manufactured in accordance with the standard of American Society of Mechanical Engineers (ASME) and Department of Transportation (DOT). Cylinders are designed to operate at a working pressure of 240–245 p.s.i. and are automatically vented to exhaust at a pressure less than twenty percent above the operating pressure.

Each fitting port on cylinders is fitted with both automatic self-sealing couplings and manual positive shut off valves except the safety pressure relief valve (PRV) which according to Federal Regulations must have direct, uninterrupted access to the cylinder interior.

CYLINDER DIMENSIONS

F-6000 6½'L x 3½'W x 5'H with built-in metal pallet.
F-5000 6½'L x 3¼'W x 5'H with built-in metal pallet.
F-1000 Approximately 2' Dia. x 4'H.

ALL CYLINDERS ARE MARKED WITH ORANGE TAGS WHICH READ AS FOLLOWS:

TAG #1: "CYLINDER MUST BE DEPRESSURIZED TO 75 P.S.I. FROTH/25 p.s.i. LIQUID-BLOWN BEFORE SHIPPING."
TAG #2: "CHEMICAL IN CYLINDERS MUST BE BROUGHT TO OPERATING TEMPERATURES BEFORE PRESSURIZING TO 240 P.S.I."
TAG #3: "USE ONLY DRY NITROGEN TO PRESSURIZE CYLINDERS."

DELIVERY OPTIONS



Installation & Assembly

It is imperative that the following information is read thoroughly and understood before connecting the SLUG PRO gun to the chemical cylinders, and any initial assembly, disassembly, or maintenance of the FSI foam unit.

CYLINDER PREPARATION AND CONNECTION

Ensure that A-SIDE (Isocyanate) and B-SIDE (polyol) chemical cylinders are placed together in the same environmental temperature. Chemical component temperatures should be at a minimum of 70°F and a maximum of 90°F. Keep in mind that the temperature restrictions are parameters. Ideal temperature is between 75–85°F. Chemical cylinders should be brought to proper operating temperatures before connecting to the SLUG PRO gun.

PROCEDURE FOR CONNECTING CYLINDERS

1. Make sure that all ball valves on the chemical cylinders are in the OFF position.
2. Remove hexagon shaped sealing caps from the top of each cylinder. For A-SIDE cylinder, thoroughly remove protective grease from Stratoflex coupling and place in A-SIDE cap before connecting. Apply a thin film of petroleum jelly to the thread area before connecting the corresponding female or male assembly.



Remember: Always match color-coded Strat assembly with color-coded cylinders before connecting. A-SIDE = Red, B-SIDE = Blue.

3. Make sure that the fittings on the Stratoflex assemblies are cleaned with DK 817 solvent (do not use acetone).
4. Connect B-SIDE Strat assembly to B-SIDE (Polyol) chemical cylinder. Connect A-SIDE Strat assembly to A-SIDE (Isocyanate) chemical cylinder. Make sure that the ball valves are held in place and do not turn during connection.
5. Tighten Stratoflex fittings until fully engaged. Make sure that the ball valves are held in place and do not turn during connection.

NOTE: When fully engaged, the Strat assembly will not rotate.

NITROGEN CONNECTION

Attach nitrogen (N2) regulator(s) to N2 supply source(s). Make sure that connection between the N2 supply source(s) and regulator(s) are tight and not leaking. N2 regulator connections are as follows:

2 Hoses: From regulator 3/8" N2 supply lines connect to corresponding N2 connectors on chemical cylinders.

1 Hose: From gun unit ¼" hose connects to JIC fitting on regulator. (Hose supplies solenoid and air cylinder)

AIR PURGE CONNECTION

1 Hose*: Attach 3/8" air line from foam gun unit to DRY IN PLANT AIR for air purge. Maximum 50°F/10°C dew point air, minimum 100 p.s.i./6.9 bars.

**Hose can be connected to dry or pure nitrogen.*

HEATING UNIT CONNECTION

1. Attach heat cables or heat switch cord amphenols into the heating device (typically a HB-01 or HB-02W unit).
2. Make sure the temperatures on the read out reach the set points.

TIMING UNIT CONNECTION

1. Connect gun switch cord to 3-prong amphenol.
2. Connect air solenoid switch cord to 2-prong amphenol.
3. Plug timer into 110-volt outlet.

NOTE: Timers are precision instruments and extreme care should be taken to prevent abuse.

TIMER TEST PROCEDURE

This is the point to test the operation of the timer without dispensing chemical.

1. Turn timer power switch to the ON position.
2. Set timer to AUTO position.
3. Set timer for 10 seconds.
4. Make sure that the slide safety valve is in the OFF (or back) position and that all SLUG PRO gun ball valves are in the closed position.
5. For DT Timer, press trigger button once. At this point the timer should start and stop counting after 10 seconds. If not, the timer and/or connections are not functioning properly. For MT Timer, press trigger button once. Pre-set shot time will be displayed. Press trigger button a second time to begin shot sequence.
6. Press trigger again, but before the timer counts down 10 seconds, press the trigger again to stop the count. If the count does not stop, the timer and/or connections are not functioning properly.

THE FSI FOAM UNIT IS NOW READY FOR TEST AND OPERATION!

Production & Quality Control

Production & Quality Control

Quality Control (Q.C.) procedures are of utmost importance in manufacturing operations. Following the procedures will assure the quality of urethane foam in the product. The procedures are as follows:

1. SLUG PRO START-UP PROCEDURE
2. RATIO PROCEDURE
3. THROUGHPUT PROCEDURE
4. REACTION PROFILE
   a) String-Gel
   b) Tack-Free
   c) Density
5. SHOT TIME PROCEDURE
6. SHUT DOWN PROCEDURE

The following items are needed:

- Stopwatch
- Gram scale
- 30-gallon plastic bags
- Thin wire (e.g. coat hanger)
- Calculator

IMPORTANT

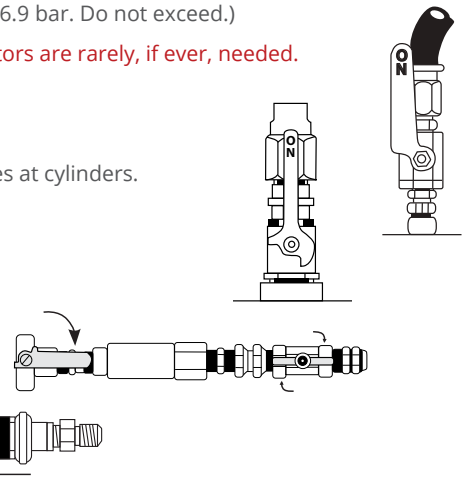
Read through all the steps before starting procedure. Please refer to the appropriate SDS for proper safe handling including the use of safety glasses, protective gloves, and respirator protection where needed.

For any reason if you do not understand, or are uncertain of any or all procedures and instructions given to you by FSI and its representatives, please contact our Application Specialist before attempting procedures. We will be happy to assist.

PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

1. Check chemical cylinders.
   - **a)** Check level gauge on A and B cylinders to ensure sufficient chemical supply.
   - *It is recommended to change chemical cylinders when chemical level reaches 5%. (10% for Pipe Systems.)
   - **b)** Check temperature gauge on filter assembly. 80°F (21°C) is minimum operating temp.

2. Turn on nitrogen (N2) cylinder.
   - **a)** Check reserve. (Minimum 500 p.s.i./34.5 bar required.)
   - **b)** Check for leaks.
   - **c)** Check regulator pressures. (Set Point is 240-245 p.s.i./16.5-16.9 bar. Do not exceed.)
   - *Regulators are set during initial setup. Adjustments to regulators are rarely, if ever, needed.



3. SLOWLY open nitrogen ball-valves at cylinders to pressurize.
4. Once cylinders are at pressure, SLOWLY open chemical ball-valves at cylinders.
5. Turn timer and heat box ON.
6. Connect air hose to air supply. Turn air supply ON.
7. Grease SLUG PRO unit through grease zerk (1-2 pumps).
8. Open all four ball-valves at dispensing head.
9. Push slide-safety valve forward to ON position.

IMPORTANT: AT THIS POINT THE EQUIPMENT IS READY TO DISPENSE CHEMICAL!

10. Perform quality control procedures.
    - **a)** Perform and check ratio.
    - **b)** Connect mix tube. Take 6 or 10 second bag shot for throughput.
    - **c)** Fill out quality control sheet.

11. Begin production.

RATIO PROCEDURE

RATIO: The weight comparison of the output of ISO (A) to the output of POLYOL (B).

Necessary items:

- 30 gallon or larger plastic bag
- Gram scale
- Calculator

RATIO PROCEDURE

1. Ensure the mix tube is not attached to the mix cartridge. Open both the ISO (A) and POLYOL (B) ball valves, take a "short shot" (2–3 seconds) to clear the lines. Reset timer.
2. Close the POLYOL (B) ball valves and keep the ISO (A) ball valves OPEN. Take a 10-second shot of ISO into a plastic bag and tie shut immediately.
3. Reopen POLYOL (B) ball valves and take a second "short shot". Reset timer.
4. Close the ISO (A) ball valves and keep the POLYOL (B) ball valves OPEN. Take a 10-second timed shot of POLYOL into a plastic bag and tie shut immediately.
5. Open the ISO (A) ball valves, take a third "short shot". Reset timer.
6. Place gun on stand, attach muffler and air purge for 30 seconds.

RATIO CALCULATION:

(Gram weight is necessary for accuracy.)

Ratio: = ISO (A) : POLYOL (B)

Formula:

$$\frac{\text{ISO (A) Weight x 100}}{\text{ISO (A) Weight}} : \frac{\text{POLYOL (B) Weight x 100}}{\text{ISO (A) Weight}}$$

Gun Size	Shot Time
6-PPM	10 seconds
15-PPM	10 seconds
30-PPM	10 seconds
45-PPM	6 seconds
60-PPM	5 seconds

Example: 10 second shot:

ISO (A) weight = 1350 g

POLYOL (B) weight = 1260 g

$$\frac{1350\text{g x 100}}{1350\text{ g}} : \frac{1260\text{g x 100}}{1350\text{ g}}$$

1 x 100 : 0.93 x 100

100 ISO (A) : 93 POLYOL (B)

THROUGHPUT PROCEDURE

THROUGHPUT: The number of pounds per minute (PPM) dispensed from the SLUG PRO dispensing unit. It is the weight of foam from a 10 or 6 second timed shot expressed in lbs./min.

Necessary items:

- 30 gallon or larger plastic bag
- Scale
- Calculator

THROUGHPUT PROCEDURE:

1. Attach mix tube and secure with mix tube collar.
2. Take a timed shot into a plastic bag, as follows:
   10 second shot for 6-PPM, 15-PPM or 30-PPM
   6 second shot for 45-PPM
   5 second shot for 60-PPM
3. After shot, place gun on stand, attach muffler and air purge for a minimum of 5 minutes.
4. Wait 5 minutes to allow foam to cure on a warm flat surface.
5. Weigh the foam bag on a gram scale and record weight.

CALCULATIONS: (Gram weight is necessary for accuracy.)

454 grams = 1 pound

Formula:

a) $\frac{\text{Weight in grams}}{454} = \text{Weight in lb.}$

b) $\frac{\text{Weight in lb. x 60}}{\text{10 seconds}} = \frac{\text{Weight in lb.}}{\text{1 minute}}$

c) Throughput = Weight in lb./min

Example:

A 10-sec. shot from a 15-PPM gun unit weighs 1135 grams.

a) $\frac{1135\ g}{454} = 2.5\ lb.$

a) $\frac{2.5\ lb. \times 60}{10\ seconds} = 15\ lb./min$

c) Throughput = 15 lb./min (0.25 lb./sec)

REACTIVITY PROCEDURE

REACTION PROFILE: The sequential stages, that is, the string-gel and tack-free times, from the time the ISO (A) and POLYOL (B) are mixed/dispensed until the urethane reaction is complete.

REACTION PROFILE Q.C. – Measuring, recording and comparing the stages and comparing to the specific system Product Data Sheet. For daily production purposes, string-gel measurement is the focus and suggested minimum Q.C. check.

STRING-GEL – The duration of time from the moment when the chemical is mixed/dispensed until the foam adheres to a thin wire (approximately 1/16" in diameter, similar diameter to a wire coat hanger) and becomes "stringy" like bubble gum.

Necessary items:

- 30 gallon or larger plastic bag
- Scale
- Calculator

STRING-GEL MEASUREMENT PROCEDURE: (6-PPM, 15-PPM, OR 30-PPM SLUG PRO)

1. Dispense a 10 second shot into a plastic bag and simultaneously start stop watch.
2. 10 seconds prior to the specific system STRING-GEL, provided on the Product Data Sheet, begin poking 4"–12" deep into the rising foam with wire. Repeat at 5 second intervals into a fresh foam surface until the foam sticks to the wire and reaches a "stringy" bubble-gum like consistency.
3. Record time when foam reaches "stringy" consistency.

STRING-GEL MEASUREMENT PROCEDURE: (45-PPM+ SLUG PRO)

1. Dispense a 6 second shot into a plastic bag and simultaneously start stop watch.
2. 10 seconds prior to the specific system STRING-GEL, provided on the Product Data Sheet, begin poking 4"–12" deep into the rising foam with wire. Repeat at 5 second intervals into a fresh foam surface until the foam sticks to the wire and reaches a "stringy" bubble-gum like consistency.
3. Record time when foam reaches "stringy" consistency.

SHOT TIME PROCEDURE

Shot times are determined from three factors:

1. VOLUME of void to be filled.
2. Desired IN-PLACE DENSITY.
3. Gun THROUGHPUT.

PROCEDURE:

1. Calculate VOLUME of object to be foam filled.

   Example: Volume of Cube = Length x Width x Height

2. Determine desired IN-PLACE DENSITY.

3. Calculate # LBS. REQUIRED to FILL OBJECT (Volume multiplied by the in-place density).

   Example: Volume = 4 cu. ft., In-Place Density = 2.3 lb./cu. ft.

   # lb. required to fill part = 4 cu. ft. x 2.3 lb./cu. ft.

   # lb. required to fill part = 9.2 lb.

4. Calculate SHOT TIME (# lb. required divided by the throughput).

   Example: Throughput = 30 lb./min., # lb. required to fill = 9.2 lb.

   Convert throughput from lb./min. to lb./sec.

   Throughput = 30 lb./min ÷ 1 min./60 sec. = .5 lb./sec.

Example: $\frac{9.2 \text{ lbs.}}{.5 \text{ lbs./sec.}} = 18.4 \text{ seconds}$ | Shot time = 18.4 seconds

Daily QC **Chemical System:** **Ratio Range:**

Daily	Daily	Daily	Daily		Daily		Daily	Daily			Once A Week			Daily	Daily		Daily	Daily	Daily
Date	Ambient Temp.	Conditioning Room Temp.	Cylinder #		% Chemical Level In Cylinder		Nitrogen Reserve	Tank Pressures		10 sec. Ratio Shot In Grams		Overall Ratio: A = 100 Always B = (B/A) *100		10 sec. Bag Shot Weight	Filter Temperature		Bag shot within 5% of Ratio weight Yes or No	Good Mix Yes or No	User's Initials
			A	B	A	B		A	B	A	B	A	B		A	B			
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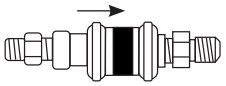
IMPORTANT

Read through all the steps before starting procedure. Please refer to the appropriate SDS for proper safe handling including the use of safety glasses, protective gloves, and respirator protection where needed.

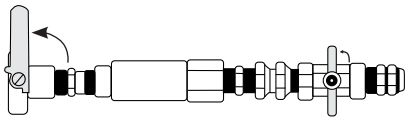
For any reason if you do not understand, or are uncertain of any or all procedures and instructions given to you by FSI and its representatives, please contact our Application Specialist before attempting procedures. We will be happy to assist.

PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

1. Push the slide-safety valve to OFF (BACK) position.



2. Close all four ball-valves at dispensing head.



3. Turn air supply OFF.

4. Remove mix tube collar and mix tube.

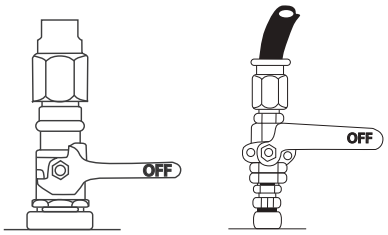
5. Lubricate.

6. Grease SLUG PRO unit through grease zerk (1-2 pumps).

7. Turn timer and heat-box OFF.

8. Close chemical and nitrogen (N2) ball-valves on chemical cylinders.

9. Turn nitrogen (N2) supply OFF.



Changing Chemical Cylinders

On all F-6000 and F-5000 cylinders, a level gauge located on top of each cylinder indicates the chemical level. Cylinders should be disconnected when one of the gauges indicates 5% or 10% if using pipe system. Always change both A-SIDE and B-SIDE cylinders at the same time. The chemical cylinders are filled such that both should run empty at approximately the same time. Cylinders should not be disconnected until new cylinders have been "conditioned" (brought to proper operating temperatures).

CYLINDER DISCONNECT/RECONNECT PROCEDURE:

1. Close nitrogen ball valves and disconnect nitrogen hoses from depleted A-SIDE and B-SIDE chemical cylinders.
2. Close the chemical ball valves on depleted A-SIDE and B-SIDE cylinders. Marked as #2 or #3 on diagram.
3. Disconnect the Stratoflex assembly from the depleted chemical cylinders.
4. Clean Stratoflex assemblies with DK 817 (do not use acetone) and lubricate with petroleum jelly or grease. It is important to keep the disconnected Strat assemblies clean and lubricated, especially on the threaded areas.
5. Clean chemical fittings on depleted cylinders. Replace grease in fitting on A-SIDE depleted cylinder.
6. Reconnect Stratoflex assemblies to a full set of heated chemical cylinders.

Remember: Always match color-coded Strat assembly with color-coded cylinders before connecting. A-SIDE = Red, B-SIDE = Blue. New chemical cylinders should be brought to operating temperatures before reconnecting.

NOTE: Reconnecting follows procedures for initial connecting.

7. Make sure that all ball valves on the chemical cylinders are in the OFF position.
8. Remove hexagon shaped sealing caps from the top of new cylinders. For A-SIDE cylinder, thoroughly remove protective grease from Stratoflex coupling and place in A-SIDE cap before connecting. Apply a thin film of petroleum jelly to the thread area before connecting the corresponding female or male assembly.

Remember: Always match color-coded Strat assembly with color-coded cylinders before connecting. A-SIDE = Red, B-SIDE = Blue.

9. Make sure that the fittings on the Stratoflex assemblies are clean. Clean with DK 817 solvent (do not use acetone).
10. Connect B-SIDE Strat assembly to B-SIDE (Polyol) chemical cylinder. Connect A-SIDE Strat assembly to A-SIDE (Isocyanate) chemical cylinder. Make sure that the ball valves are held in place and do not turn during connection.
11. Tighten Stratoflex fittings until fully engaged. Make sure that the ball valves are held in place and do not turn during connection.

NOTE: When fully engaged, the Strat assembly will not rotate.

12. Prepare depleted cylinders for return to FSI. (See pages 29-30)

Changing Chemical Cylinders

CYLINDER BLOW DOWN PROCEDURE FOR F-6000 & F-5000

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved to 75 p.s.i. froth systems or 25 p.s.i. for liquid-blown systems.

EAR PROTECTION IS REQUIRED DURING BLOW DOWN DUE TO EXCESS NOISE!

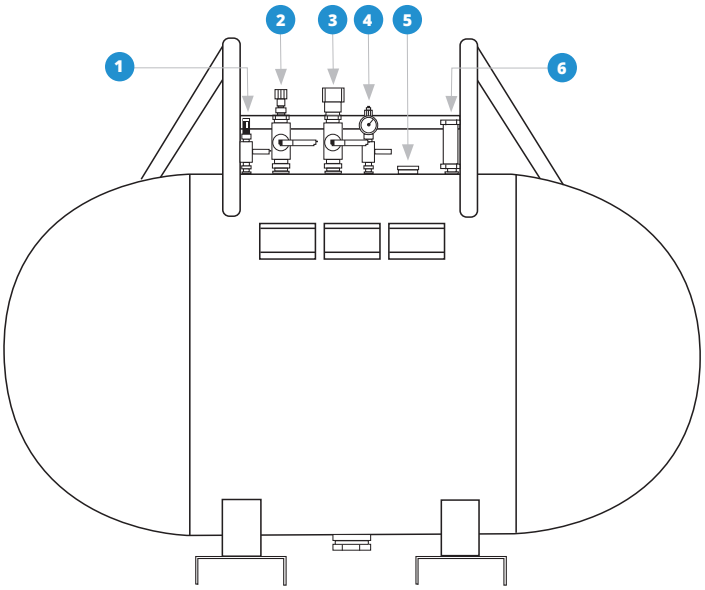
WELL VENTILATED AREA, PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

1. Make sure all ball valves are in the closed position.
2. Disconnect nitrogen supply lines. Marked as #4.
3. Disconnect chemical supply lines at the Stratoflex fittings. Clean Stratoflex fittings and move cylinders to well ventilated area.
4. Read pressure gauge on cylinder marked #4.
5. Slowly open blow-down ball valve marked as #1 while watching pressure gauge until it reads 75 p.s.i. for froth and 25 p.s.i. for liquid-blown systems. #4 must be open to do this.
6. If chemical starts to discharge from the blow-down ball valve marked #1, close valve and stop the blow down procedure! **CALL APPLICATION SPECIALIST FOR ASSISTANCE!**
7. Close all ball valves.

IMPORTANT: DO NOT REMOVE CYLINDER FITTINGS! REMOVAL OF FITTINGS COULD RESULT IN VIOLATION OF FEDERAL LAWS SUBJECT TO PENALTIES AND FINES, AND WILL RESULT IN CHARGES FOR THE COST AND LABOR TO REPLACE FITTINGS.

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved. For cylinders being shipped as UN3500 the pressure should be at 75 p.s.i. This procedure is necessary in preventing possible contamination in the cylinder fittings. For liquid-blown blown systems the pressure must be reduced to 25 p.s.i. or lower in order to be considered non-hazardous. Failure to do so is a violation of federal regulations and can result in fines and penalties by DOT and/or OSHA.

1. Manual Relief Valve
2. 1/2" Stratoflex
3. 1-1/4" Stratoflex
4. Nitrogen Intake Ball Valve
5. Level Gauge
6. Safety PRV



CYLINDER BLOW DOWN PROCEDURE FOR F-1000 & F-300

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved to 75 p.s.i. froth systems or 25 p.s.i. for liquid-blown systems.

EAR PROTECTION IS REQUIRED DURING BLOW DOWN DUE TO EXCESS NOISE!

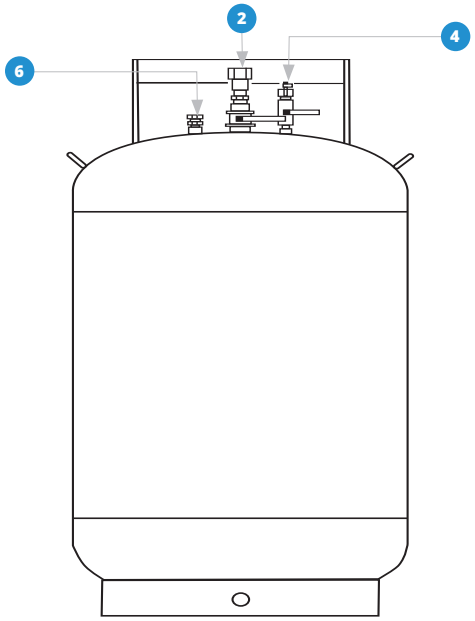
WELL VENTILATED AREA, PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

1. Make sure all ball valves are in the closed position.
2. Disconnect nitrogen supply lines. Marked as #4.
3. Disconnect chemical supply lines at the Stratoflex fittings. Clean Stratoflex fittings and move cylinders to well ventilated area.
4. Read pressure gauge on cylinder marked #4.
5. Slowly open blow-down ball valve marked as #1 while watching pressure gauge until it reads 75 p.s.i. for froth and 25 p.s.i. for liquid-blown systems. #4 must be open to do this.
6. If chemical starts to discharge from the blow-down ball valve marked #1, close valve and stop the blow down procedure! **CALL APPLICATION SPECIALIST FOR ASSISTANCE!**
7. Close all ball valves.

IMPORTANT: DO NOT REMOVE CYLINDER FITTINGS! REMOVAL OF FITTINGS COULD RESULT IN VIOLATION OF FEDERAL LAWS SUBJECT TO PENALTIES AND FINES, AND WILL RESULT IN CHARGES FOR THE COST AND LABOR TO REPLACE FITTINGS.

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved. For cylinders being shipped as UN3500 the pressure should be at 75 p.s.i. This procedure is necessary in preventing possible contamination in the cylinder fittings. For liquid-blown blown systems the pressure must be reduced to 25 p.s.i. or lower in order to be considered non-hazardous. Failure to do so is a violation of federal regulations and can result in fines and penalties by DOT and/or OSHA.

2 1/2" Stratoflex
4 Nitrogen Intake Ball Valve
6 Safety PRV



SEALING EMPTY CYLINDERS FOR RETURN

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved to 75 p.s.i. for froth systems and 25 p.s.i. for liquid-blown systems. This procedure is necessary in preventing possible contamination in the cylinder fittings.

EAR PROTECTION IS REQUIRED DURING BLOW DOWN DUE TO EXCESS NOISE!
WELL VENTILATED AREA, PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

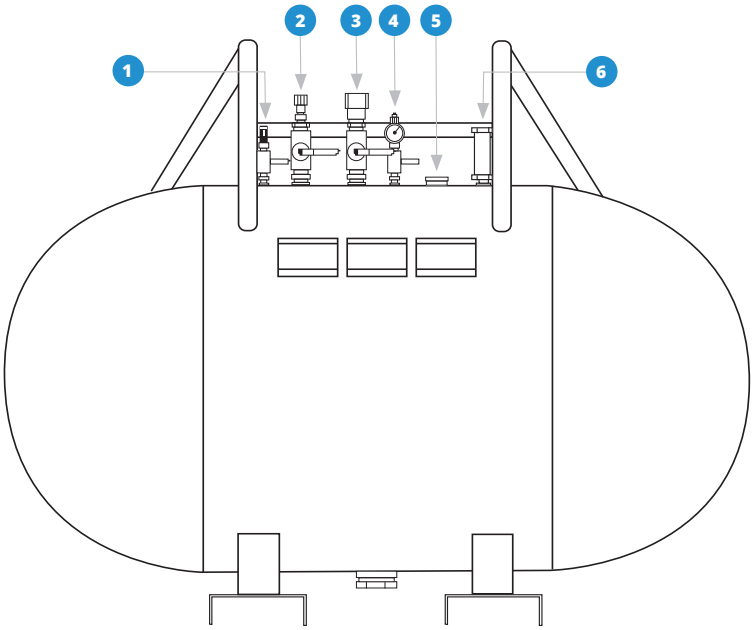
1. Make sure the threads and ball valves of all fittings are clean and well lubricated with petroleum jelly, grease or mineral oil. Marked as #2 or #3 on diagram below.

NOTE: A-SIDE CYLINDER IS THE ONLY ONE WHICH REQUIRES LUBRICATION INSIDE STRATOFLEX FITTING.

2. Replace Stratoflex caps on cylinders. Marked as #2 or #3.
3. Replace sealing dust caps onto the fittings. Marked as #2, #3, #4 and #6.
4. Failure to seal the empty cylinders on return will result in additional servicing and additional charges.

IMPORTANT: DO NOT REMOVE CYLINDER FITTINGS! REMOVAL OF FITTINGS COULD RESULT IN VIOLATION OF FEDERAL LAWS SUBJECT TO PENALTIES AND FINES, AND WILL RESULT IN CHARGES FOR THE COST AND LABOR TO REPLACE FITTINGS.

Empty cylinders being returned to FSI for refilling must be sealed and the pressure relieved. For cylinders being shipped as UN3500 the pressure should be at 75 p.s.i. This procedure is necessary in preventing possible contamination in the cylinder fittings. For liquid-blown blown systems the pressure must be reduced to 25 p.s.i. or lower in order to be considered non-hazardous. Failure to do so is a violation of federal regulations and can result in fines and penalties by DOT and/or OSHA.



Maintenance

Maintenance

ALWAYS WEAR PROTECTIVE EYEWEAR AND GLOVES WHEN PERFORMING ANY MAINTENANCE. MAINTENANCE OF THE SLUG PRO GUN SHOULD BE PERFORMED ON ONLY ONE SIDE (A-SIDE or B-SIDE) AT A TIME. FOR EXAMPLE, PERFORM MAINTENANCE ON THE A-SIDE ONLY AND PUT BACK TOGETHER BEFORE WORKING ON THE B-SIDE.

The most important part of maintenance is keeping the equipment clean. Care should be taken to prevent foam or the individual A-SIDE and B-SIDE from hardening on the gun body, flow controllers, ball valves, etc. Overall cleanliness of the SLUG PRO gun will reduce excessive maintenance, replacement of parts, and costs.

MIX TUBES

The Mix tubes should be replaced and/or cleaned on a regular basis. It is highly dependent on the usage as to the life of the mix tube.

MIX TUBE CHANGE OUT PROCEDURE

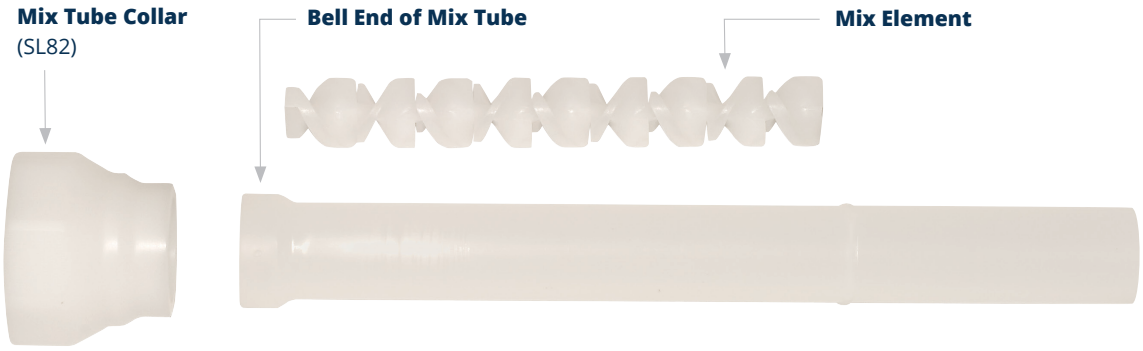
1. Unscrew and remove mix tube collar.
2. Remove used mix tube and set aside for cleaning or throw away.
3. Clean and lubricate insert threads.
4. Replace mix tube collar. Again, hand tight is sufficient.

MIX TUBE CLEANING PROCEDURE

1. Mix tubes should be set aside until foam hardens.
2. Use 12”L x 3/8” diameter carriage bolt to knock the mix element out of the bell (closest to block) end of the mix tube.
3. Remove foam from mix element.
4. Clean and remove remaining foam from mix tube.
5. Replace cleaned mix element into the bell end of the mix tube as far as possible.

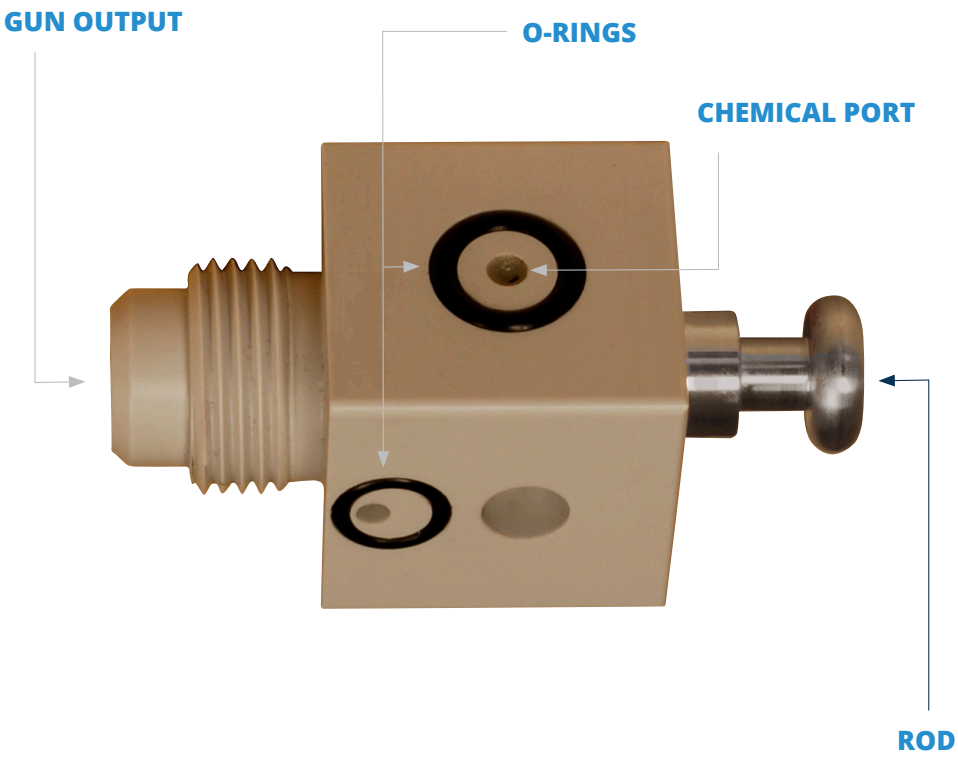
Note: It is best to store SLUG PRO gun facing down.

MIX TUBE



SLUG PRO MIX CARTRIDGE

The SLUG PRO mix cartridge should be cleaned and greased at start-up/shut-down and all breaks.



MIX CARTRIDGE REPLACEMENT PROCEDURES

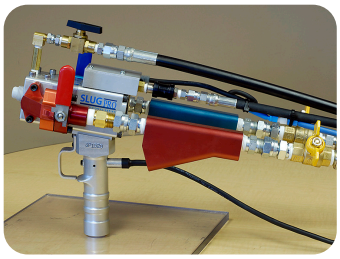
IMPORTANT

Read through all the steps before starting procedure.

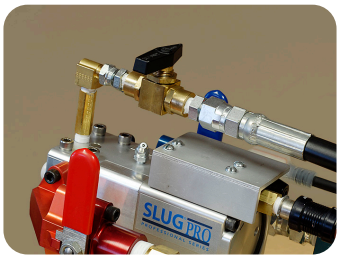
For any reason if you do not understand, or are uncertain of any or all procedures and instructions given to you by FSI and its representatives, please contact our Application Specialist before attempting procedures. We will be happy to assist.

PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

1. Disconnect air line from source. Close all 4 chemical ball valves.



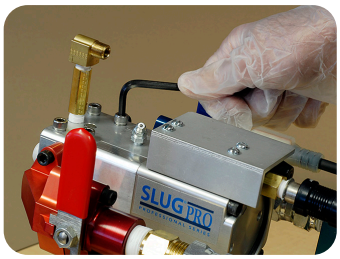
2. Close air purge line ball valve.

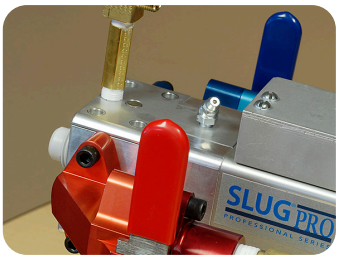


3. Disconnect air purge line at dispensing head.

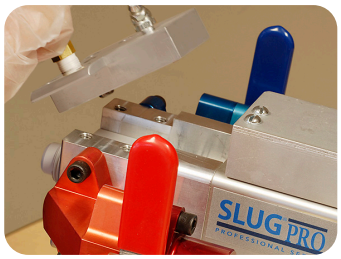


4. Remove 4 bolts from T-cap with 3/16" hex key. (Keep for re-use.)





3. Remove T-cap. (Keep for re-use.)

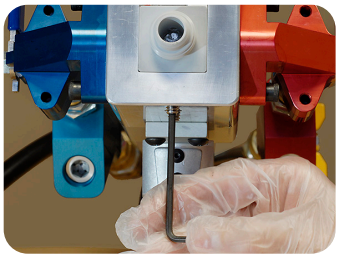


6. Remove mix cartridge assembly.

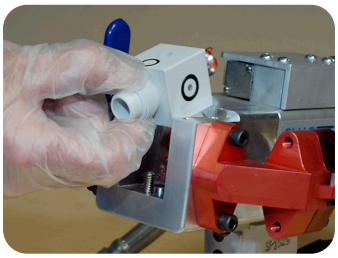
a. Use 1/8" hex key to turn set screws clockwise to push mix cartridge up.

b. Once loosened, remove mix cartridge.

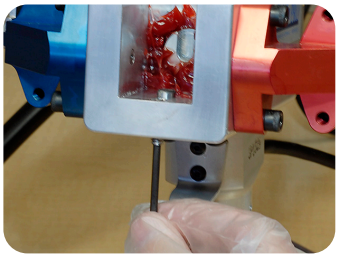
c. Retract set screws by turning counter clockwise. Make sure set screws are below the bottom of aluminum receiver (U-frame) so new mix cartridge can seat properly. Failure to do so can result in damage to new mix cartridge.



6a



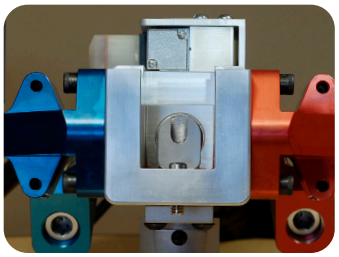
6b



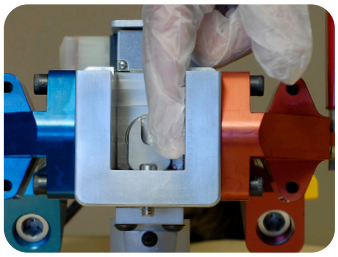
6c

MIX CARTRIDGE REPLACEMENT PROCEDURES (continued)

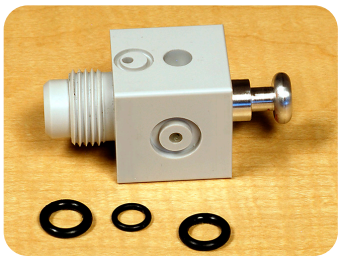
7. Remove old grease with rag.
No need to use spray cleaner.

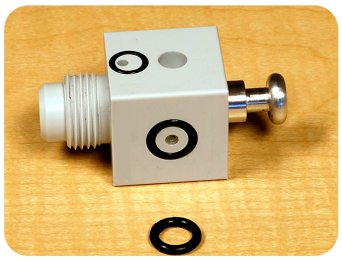


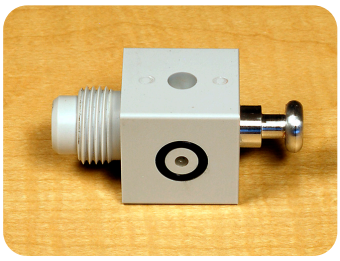
8. Apply Vaseline or lithium grease to receiver (U-frame) walls.



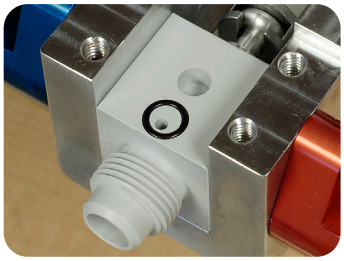
9. Inspect new mix cartridge. Make sure all three O-rings are installed and not damaged (smaller O-ring on top and larger O-rings on each side).



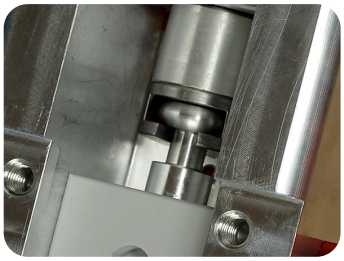




10. Insert new mix cartridge.
- **a.** Locate small O-ring and make sure it is aligned on top when placed in receiver (U-frame).
- **b.** Align mix cartridge guide hole (on bottom of mix cartridge) with corresponding guide pin inside receiver. (U-frame)
- **c.** Align valving rod with corresponding piston slot inside receiver (U-frame).
- **d.** Once mix cartridge is aligned, press firmly into place.
- **e.** Check that new mix cartridge is flush with bottom of receiver (U-frame).



10a/b



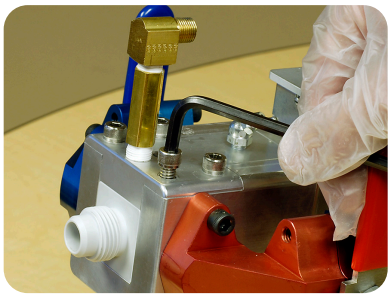
10c



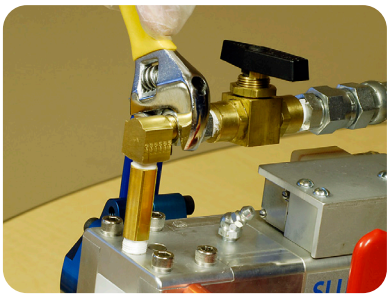
10d/e

MIX CARTRIDGE REPLACEMENT PROCEDURES (continued)

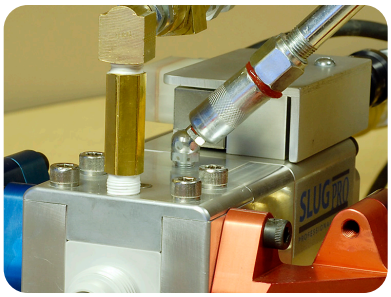
11. Re-install T-cap and 4 bolts.

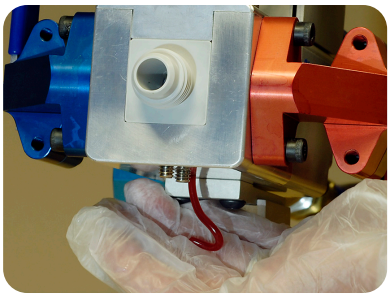


12. Re-attach air line.

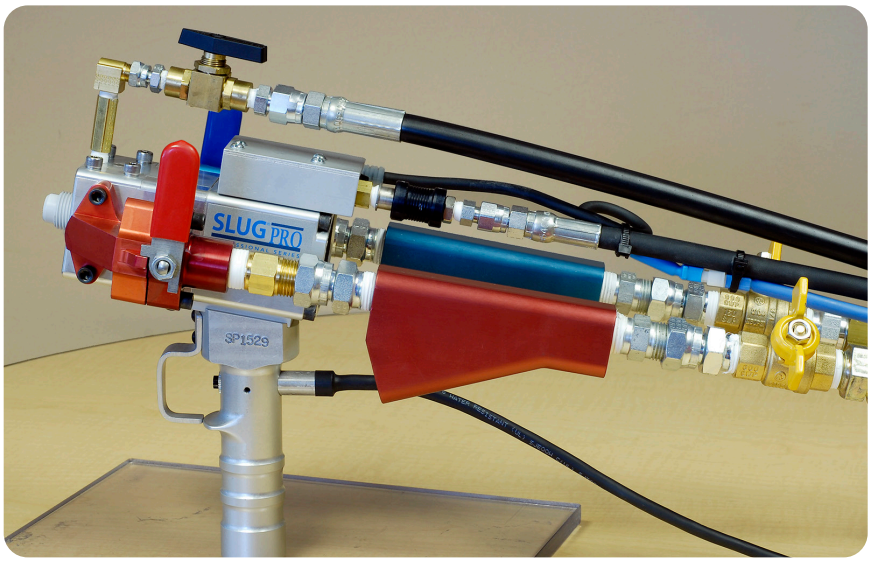


13. Grease gun through grease fitting until it flows from weep hole under receiver (U-frame).

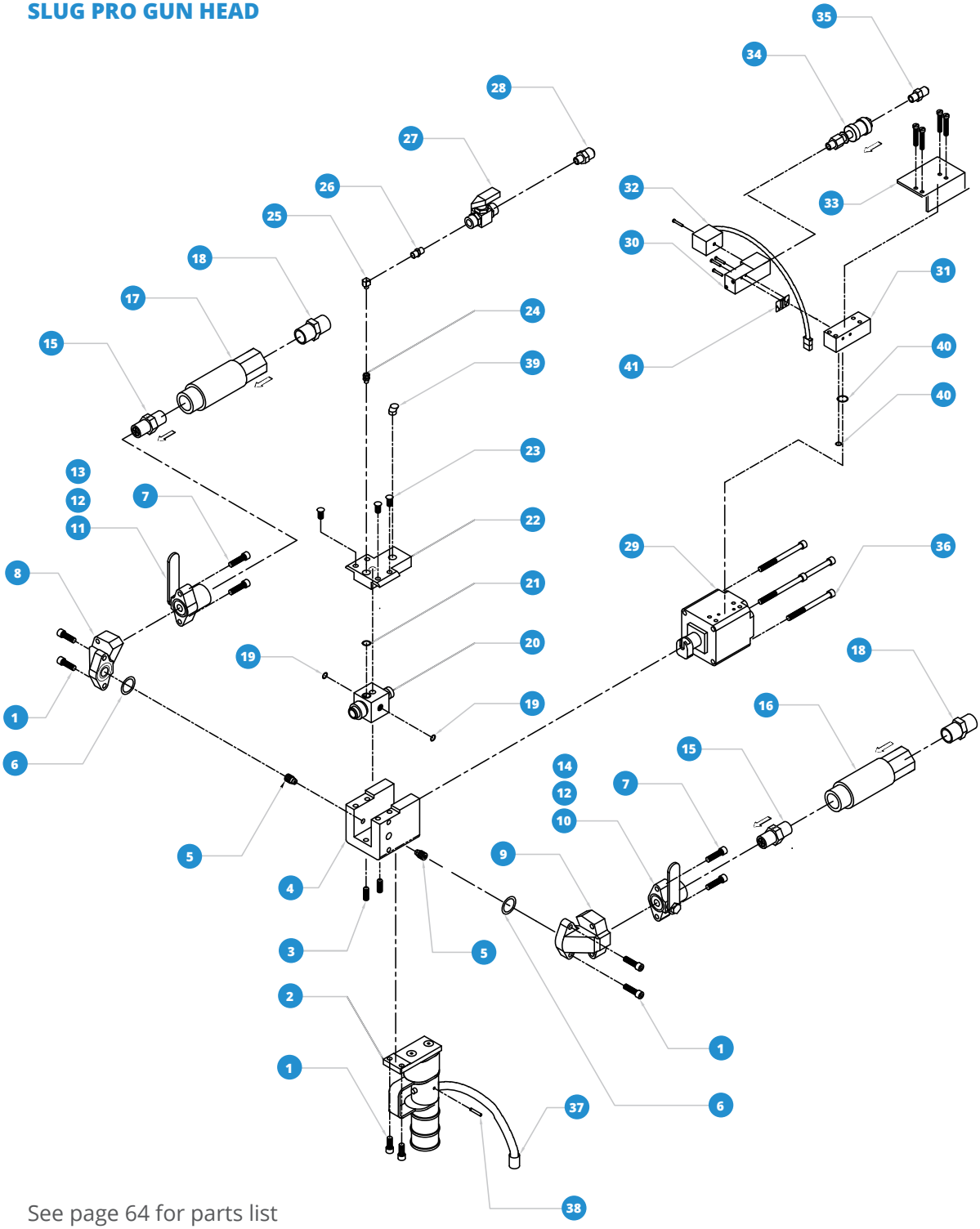




14. SLUG PRO is now ready for quality control process.



SLUG PRO GUN HEAD



See page 64 for parts list

CHECK VALVES

Check valves are used to prevent reverse chemical flow. Reverse chemical flow can occur from backpressure and crossover. Inside the check valve is a spring and a ball. To test the function, depress the ball. The ball should move freely with slight resistance and spring back. If a one-way check valve fails to function properly, it should be replaced. The arrow on the check valve indicates the desired direction of chemical flow. Check valves cannot be repaired or rebuilt.

IMPORTANT: BEFORE INSPECTING CHECK VALVES, BE SURE ALL BALL VALVES ARE CLOSED.

FLOW CONTROLLERS

When removing or replacing flow controllers be sure to use two wrenches to prevent turning or breaking of adjacent parts and fittings. Thoroughly clean flow controller with DK 817 solvent after removing from the gun. Check piston orifice for clogs. Check the flow controller by depressing the piston. Use a small blunt probe to check the action of the piston. A pencil eraser or wood dowel works well. Be careful not to distort the orifice or piston face. The piston should have resistance and spring back. If the piston does not move freely or "hangs up", the flow controller should be replaced. Flow controllers cannot be rebuilt.

IMPORTANT: BEFORE INSPECTING FLOW CONTROLLERS, BE SURE ALL BALL VALVES ARE CLOSED.

HOSES

While no maintenance on hoses is possible, hoses must be handled carefully, especially when not under pressure because the hose has a tendency to kink. When under pressure this is less likely to happen. The hoses must not be subjected to bending radii less than nine inches. Hoses must not be permitted to lie on plant floors because of the heat sink effect and potential damage from other equipment. Constant scraping of stainless steel braid on concrete also has a damaging effect.

STRAT ASSEMBLIES

Within the Strat assemblies are filters. The filters are canister type with removable filter screen barrels. It is rare that filters need replacement but replacement can occur. The SLUG PRO gun must be depressurized before servicing or replacing the filters. Contact FSI for assistance with depressurizing any equipment and replacement of filters. Filters CANNOT be used interchangeably.

Troubleshooting

Troubleshooting

This manual cannot identify and answer all questions or problems. It is strictly a guide and starting point for the most common problems encountered. We suggest that you read this section carefully before you begin installation or operation of the equipment. If problems cannot be corrected using this guide, please contact FSI's Application Specialist at **+1 314-344-3330**.

This section has been divided into the following categories:

1. Chemical Flow Characteristics
2. Leaks
3. Foam Characteristics

CHEMICAL FLOW CHARACTERISTICS

Problem: No chemical flow.

Probable Causes:

1. Ball valves in the OFF (Closed) position.
2. Stratoflex fittings not properly connected.
3. Chemical cylinders empty.
4. Mix tube or gun head assembly is plugged.
5. Flow controller is plugged or frozen.
6. Check valve plugged or frozen.
7. Lack of nitrogen pressure.

Corrective Actions:

1. Make sure that all ball valves are in the ON (Open) position.
2. Disconnect Stratoflex fitting. Make sure grease and debris is cleaned out of fitting. Reconnect and make sure Strat is tightened all the way down.
3. Check float level gauge on chemical cylinders to make sure adequate chemical is present and continue operation.
4. Remove mix tube and inspect for clear passage. Install new mix tube if needed. Inspect gun head assembly and remove contamination if possible. Replace mix cartridge if necessary. Replacement of mix cartridges will be routine.
5. Remove flow controller, clean and inspect for contamination in the port area. Make sure piston moves freely. If piston is frozen, the flow controller must be replaced.
6. Disconnect check valve. Examine check valve by depressing the ball. The ball should spring back. If not, replace and reassemble.
7. Turn on nitrogen at 240–245 p.s.i.

Problem: Crystals continually plug A-SIDE flow controller.

Probable Causes: A-SIDE has plated on the inside of the chemical line due to moisture contamination.

Corrective Actions: Replace A-SIDE chemical hose. Contact FSI for assistance.

Problem: Erratic chemical flow.

Probable Causes:

1. Chemical temperature too cold.
2. Chemical temperature too cold in chemical lines due to low ambient temperature or damaged insulation on chemical lines.
3. Low operating pressure.
4. Incorrect nitrogen hook up.
5. Partial restriction in controller orifice.
6. Stratoflex fittings not properly connected.
7. Partially plugged filter. Call FSI Application Specialist before correcting.

Corrective Actions:

1. Inspect temperature gauge. If temperature is below operating pressure, depressurize cylinders, bring to operating temperature and re-pressurize.
2. Run approx. 6–8 lbs. of chemical through gun in order to obtain warm chemical from cylinders.
3. Examine nitrogen regulator to make sure that sufficient quantities are present to give the minimum of continual 240–245 p.s.i. Replace nitrogen source if needed.
4. Examine quick connects from the nitrogen lines connected to the nitrogen cylinder to make sure that they are properly secured and are connected to the in-put nitrogen fitting.
5. Remove flow controller and inspect for contamination. Replace or clean as required.
6. Disconnect Stratoflex fitting. Make sure grease and debris is cleaned out of fitting. Reconnect and make sure Strat is tightened all the way down.
7. Remove, clean, inspect and replace filters on Strat assemblies. Call FSI Technical Service Dept. before correcting.

LEAKS

Problem: Chemical leakage at fittings.

Probable Causes:

1. Fittings not tight.
2. Cracks or leaks in chemical lines. Call FSI Application Specialist before correcting.

Corrective Actions:

1. Tighten fittings firmly.
2. Replace cracked or damaged hose. DO NOT USE OTHER HOSES APART FROM THOSE SUPPLIED BY FSI. The hoses are special high-pressure hoses. Call FSI Technical Service Dept. before correcting.

Problem: Nitrogen regulator leaks.

Probable Causes:

1. Quick-connect from nitrogen regulator assembly not fully engaged.
2. O-ring defective in quick-connect fitting.
3. Nitrogen hose fittings not firmly tightened and secured.
4. Nitrogen regulator assembly not fully engaged into nitrogen bottle.

Corrective Actions:

1. Firmly secure all quick-connect fittings at the end of the hose assembly.
2. Replace O-ring in quick-connect fitting.
3. Firmly tighten all hoses and fittings on nitrogen regulator assembly.
4. Firmly secure nitrogen regulator assembly to nitrogen bottle.

Problem: Chemical cylinder leaks.

Probable Causes:

1. Ball valve open.
2. Stratoflex remains partially open when chemical lines are disconnected.

Corrective Actions:

1. Close ball valve.
2. When disconnecting chemical or transfer lines, make sure that the flow of chemical around the swivel nut has stopped before fully disengaging filter assembly. Make sure that the cavity surrounding the pocket in the cylinder Stratoflex is clean and free. This can then be treated with a light lubricating oil to keep it from further sticking.
1. Replace O-ring in Strat.

FOAM CHARACTERISTICS

Problem: Foam is rubbery or spongy to the feel after curing.

(System is off ratio. B-SIDE high in proportion to the A-SIDE)

Probable Causes:

1. Flow restricted on A-SIDE line or cylinders.
2. Poor mix.
3. Too much B-SIDE flow.

Corrective Actions:

1. A-SIDE restricted flow has many causes.
   a) Ball valves closed on the A-SIDE. Check that all A-SIDE ball valves on gun and tanks are open.
   b) Temperatures too cold on the A-SIDE. Bring chemicals up to correct operating temperatures after reducing nitrogen pressure to 150 p.s.i.

c) Low pressure on the A-SIDE chemical cylinder. Adjust to correct operating pressure range.
d) High pressure on B-SIDE chemical cylinder. Adjust to correct operating pressure range.
e) Mix tube restricted causing excess backpressure. Change mix tube.
f) The most common cause is the A-SIDE chemical port of the Mix Cartridge is clogged. Close all ball valves, disconnect A-SIDE wing, retract rod, and clear out hole with correct drill bit. Replace mix cartridge if needed.
g) Other restrictions on A-SIDE. Inspect wing, check valve and flow controller for clogs and debris. Clean or replace as needed.
h) B-SIDE flow controllers are stuck in maximum flow position.
i) Disconnect A-SIDE Stratoflex and ensure that grease is removed. Reconnect Stratoflex ensuring that it is fully engaged.

NOTE: Most of the corrective actions for the above problem have been covered in preceding sections and should be reviewed.

Problem: Foam is crusty or exhibits surface friability.

(System is off ratio. A-SIDE high in proportion to B-SIDE)

Probable Causes:

1. Flow restricted on B-SIDE line or cylinders.
2. Too much A-SIDE flow.
3. Poor mix.

Corrective Actions:

1. B-SIDE restricted flow has many causes.
   a) Ball valves closed on the B-SIDE. Check that all B-SIDE ball valves on gun and tanks are open.
   b) Temperatures too cold on the B-SIDE. Bring chemicals up to correct operating temperatures after reducing nitrogen pressure to 150 p.s.i.
   c) Low pressure on the B-SIDE chemical cylinder. Adjust to correct operating pressure range.
   d) High pressure on A-SIDE chemical cylinder. Adjust to correct operating pressure range.
   e) Mix tube restricted causing excess of backpressure.
   f) B-SIDE chemical port of block is clogged. Close all ball valves, disconnect B-SIDE wing, retract rod, and ream out hole with correct drill bit. Replace block if needed.
   g) Other restrictions on B-SIDE. Inspect wing, check valve and flow controller for clogs and debris. Clean or replace as needed.
   h) A-SIDE flow controllers are stuck in maximum flow position.
   i) Ensure B-SIDE stratoflex is fully engaged.

Problem: Cured foam is streaked or has excessively coarse or "glassy" cell structure.

Probable Causes:

1. A-SIDE and B-SIDE chemicals are too cold for operation.
2. Poor mix.
3. Water or solvent in air purge line or residual solvent in gun head.

Corrective Actions:

1. Reduce pressure to 150 p.s.i. in cylinders and bring to proper operating temperature. Chemical cylinders should be in area where temperature maintained is a minimum of 80°F(±5°F) and preferably at recommended operating temperature for the specific system. After cylinders are at operating temperatures, re-pressurize cylinders. (See p. 27)
2. Check and make sure mix tube is unclogged. Add a slight amount of air for mixing.
3. Attach water trap to air system. Check airline for dryness and blow out excessive water before foaming desired part. Verify air dew point is 50°F or less. Verify refrigerant dryer is working properly.

Problem: Foam collapses or fails to "cure" or become "tack-free."

Probable Causes:

1. Chemical flow problem indicating a drastic off-ratio condition.
2. Chemical is too cold.

Corrective Actions:

1. See previous problems on restrictions from one side (A or B) at a time. Review and take corrective actions.
2. Reduce pressure to 150 p.s.i. in cylinders and bring to proper operating temperature. Chemical cylinders should be in area where temperature maintained is a minimum of 80°F(±5°F) and preferably at recommended operating temperature for the specific system. After cylinders are at operating temperatures, re-pressurize cylinders. (See p. 31)

Problem: Foam density is excessively high.

Probable Causes:

1. Chemical is too cold.
2. B-SIDE flow restricted from cylinder.
3. Ambient temperature excessively cold.

Corrective Actions:

1. Reduce pressure to 150 p.s.i. in cylinders and bring to proper operating temperature. Chemical cylinders should be in area where temperature maintained is a minimum of 80°F(±5°F) and preferably at recommended operating temperature for the specific system. After cylinders are at operating temperatures, re-pressurize cylinders. (See p. 28).
2. Check ratio and examine mix cartridge, B-SIDE and A-SIDE check valves, and flow controllers.
3. Warm foaming area with space heater. DO NOT APPLY DIRECT HEAT TO CYLINDERS.

TECHNICAL SERVICE

If you require assistance, please contact your FSI Application Specialist or your Sales Representative. **+1 314.344.3330**

Please have the following information before calling FSI Application Specialist. Having the following information will expedite the correction of problems:

1. Chemical system.
2. Cylinder No. for A-SIDE and B-SIDE cylinders.
3. Chemical level.
4. Chemical temperatures at tanks while dispensing.
5. Ambient temperature.
6. Individual A-SIDE and B-SIDE weights of 10 second shot (6 seconds for 45-PPM users or 5 seconds for 60-PPM users).
7. Throughput weight of 10 second shot (6 seconds for 45-PPM users or 5 seconds for 60-PPM users).

The above information is needed before FSI can attempt to evaluate and solve problems. Again this information will allow FSI to assist you more quickly and save YOU time. It is in FSI's best interest and yours to cooperate and solve problems together.

We appreciate your business and look forward to working with you.

TROUBLESHOOTING CHECKLIST FOR FSI CHEMICAL SYSTEMS AND EQUIPMENT

CHEMICAL SYSTEM _____

SHIP DATE _____

NATURE OF ISSUE _____

NITROGEN PRESSURE IN CYLINDERS _____

CHEMICAL LEVELS IN TANKS _____
FOR F-5000 and F-6000, check level gauge. For F-300 and F-1000, check total number of seconds shot or weight of cylinder on scale.

TEMPERATURE AT FILTERS (DURING OR IMMEDIATELY AFTER DISPENSING) _____

5, 6 OR 10 SECOND A-SIDE WEIGHT _____

5, 6 OR 10 SECOND B-SIDE WEIGHT _____

5, 6 OR 10 SECOND BAG SHOT WEIGHT (WITH MIX TUBE ATTACHED) _____

IS THIS THE FIRST TIME THIS SET HAS BEEN USED? _____

IF NO, WHEN WAS THE LAST TIME THIS SET WAS USED? _____

ONCE THIS INFORMATION IS ACQUIRED CONTACT YOUR APPLICATION SPECIALIST FOR ASSISTANCE IN DIAGNOSING ANY PROBLEMS. IF YOUR APPLICATION SPECIALIST IS UNAVAILABLE, CONTACT +1 314.344.3330 AND ASK FOR TECHNICAL SERVICE.

Safety & Handling

ALWAYS OBSERVE START UP AND SHUT DOWN PROCEDURES!

SAFETY CONSIDERATIONS

Safety in the use and maintenance of equipment and chemicals requires observance of ALL PROCEDURES for handling the chemical components and equipment. Consideration must be given to the fact that the chemical cylinders and equipment are under pressure.

GENERAL

- Do not point assembled dispensing unit at anyone.
- Always have unit pointed away from you when servicing.
- Keep equipment clean.
- Use extreme caution when performing maintenance on equipment.
- Minimize the exposure of A-SIDE components to atmosphere.
- Always contact FSI for assistance in relieving pressure on cylinders and equipment.
- DON'T GUESS! If unsure of anything, don't hesitate to call for assistance. FSI is dedicated to helping its customers.

CLOTHING

- Wear protective eyewear (safety glasses).
- Wear protective gloves.
- Wear safety shoes when moving or handling heavy items.
- Avoid contact with foam chemicals or curing foam.
- Vapor concentrations of isocyanate (A-SIDE) and other volatile chemicals, including solvents used in solvent cleaning, must be maintained below the current limits established by the Occupational Safety and Health Administration, United States Department of Labor, and by state or local government agencies having jurisdiction.
- Wear an approved respirator or forced air-fed mask when foaming is carried out in enclosed and poorly ventilated areas. Occupational Safety and Health Act regulations should be consulted regarding the use of respirators.

CYLINDERS

- Do not attach any member to the cylinder by welding, drilling, tapping, screwing or by any other method which would affect the cylinder surface.
- Report any dents, scratches, rubs or other accidents that appear to have affected the cylinder, especially in the welded areas.
- Do not remove any fittings or hardware from the cylinders.
- Do not alter configuration of fittings and hardware.
- Do not apply heat to any cylinder by direct contact (i.e. band heaters, etc.).
- Do not heat cylinders above the ambient temperature without depressurizing cylinder to 150 p.s.i. Heating of cylinders should take place prior to pressurizing.
- Do not store cylinders in direct sunlight.

STRATS (FILTERS)

- The Strat assembly has canister type filters with removable filter screen barrels.
- The filters CANNOT be used interchangeably.
- Equipment must be depressurized before servicing or replacing filters. Contact FSI for assistance.

HOSES

- Hoses must be handled carefully, especially when not under pressure, because the Teflon tubing can kink easily. When under pressure this is less likely to happen.
- Hoses must not be subjected to bending radii less than nine inches.
- Hoses must not be permitted to lie on plant floors because of the heat sink effect and potential damage from other equipment. Constant scraping of stainless steel braid on concrete also has a detrimental effect.

BALL VALVES

- Ball valves are used in many parts of the FSI equipment. Ball valves have been selected to allow the best flow and the least pressure drop. Ball valves are made with special seals to prevent the reactive chemicals from damaging their function.
- Always open ball valves SLOWLY! This minimizes hydraulic shock and possible damage to equipment.
- Handles should not be removed from valves. The position of the valve handle indicates if the valve is open or closed. Regardless of the shape of the handle, if its long axis is in line with the valve, it is open. If the long axis is across the valve, it is closed.
- Equipment should be depressurized prior to the removing of any ball valves. Contact FSI for assistance with depressurizing system and equipment.

SPILL & DISPOSAL PROCEDURES – ISOCYANATE (ISO or A)



PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

IMPORTANT

Read through all the steps before starting procedure. Please refer to the appropriate SDS for proper safe handling including the use of safety glasses, protective gloves, and respirator protection where needed. For any reason if you do not understand, or are uncertain of any or all procedures and instructions given to you by FSI and its representatives, please contact our Application Specialist first before attempting procedures. We will be happy to assist.

SPILLS/LEAKS: Refer to SDS.

1. Evacuate and ventilate spill area. Notify appropriate personnel. ⚠ DO NOT USE WATER.
2. Wear appropriate protective equipment during clean up. See SDS.
3. Dike spill to prevent entry into water or sewage system.
4. May present a slipping hazard.

MAJOR SPILL

1. Call FSI at **+1 314-344-3330**
2. For spills in transit, call CHEMTREC:

   Inside USA **1.800.424.9300** Outside USA **1.703.527.3887**

3. Large quantities should be pumped into closed but NOT SEALED containers for disposal.

MINOR SPILL

1. Absorb the spill with dry sawdust, floor-dry, or other suitable absorbent material.
2. Shovel into open top containers. ⚠ DO NOT SEAL! DO NOT MAKE PRESSURE-TIGHT!
3. Clean up floor areas. Attempt to neutralize using a decontamination solution:

   Formula 1: Sodium Carbonate 5-10%; Liquid Detergent 0.2%; Water 89.8%-94.8%.

   Formula 2: Concentrated ammonia solution 3-8%; Liquid Detergent 0.2%, Water 91.8%-96.8%.

   If ammonia formula is used, good ventilation is required to prevent exposure to vapor.

DISPOSAL METHOD

1. Follow all Federal, State and Local regulations.
2. Contact a licensed hazardous waste disposal contractor for neutralization and proper disposal of isocyanate, neutralizing or rinsing liquids, and containers.
3. Obtain certification and receipts of proper disposal from contractor.

SPILL & DISPOSAL PROCEDURES – POLYOL (B)



PROTECTIVE EYEWEAR AND GLOVES REQUIRED!

IMPORTANT

Read through all the steps before starting procedure. Please refer to the appropriate MSDS for proper safe handling including the use of safety glasses, protective gloves, and respirator protection where needed. For any reason if you do not understand, or are uncertain of any or all procedures and instructions given to you by FSI and its representatives, please contact our Application Specialist first before attempting procedures. We will be happy to assist.

SPILLS/LEAKS: Refer to SDS.

1. Evacuate and ventilate spill area. Notify appropriate personnel.
2. Wear appropriate protective equipment during clean up. See SDS.
3. Dike spill to prevent entry into water or sewage system.
4. May present a slipping hazard.

MAJOR SPILL

1. Call FSI at **+1 314-344-3330**
2. For spills in transit, call CHEMTREC:

   Inside USA **1.800.424.9300** Outside USA **1.703.527.3887**

3. Dike chemical and divert flow if possible. Large quantities should be pumped into closed containers for disposal.
4. See Minor Spill for clean up procedure.

MINOR SPILL

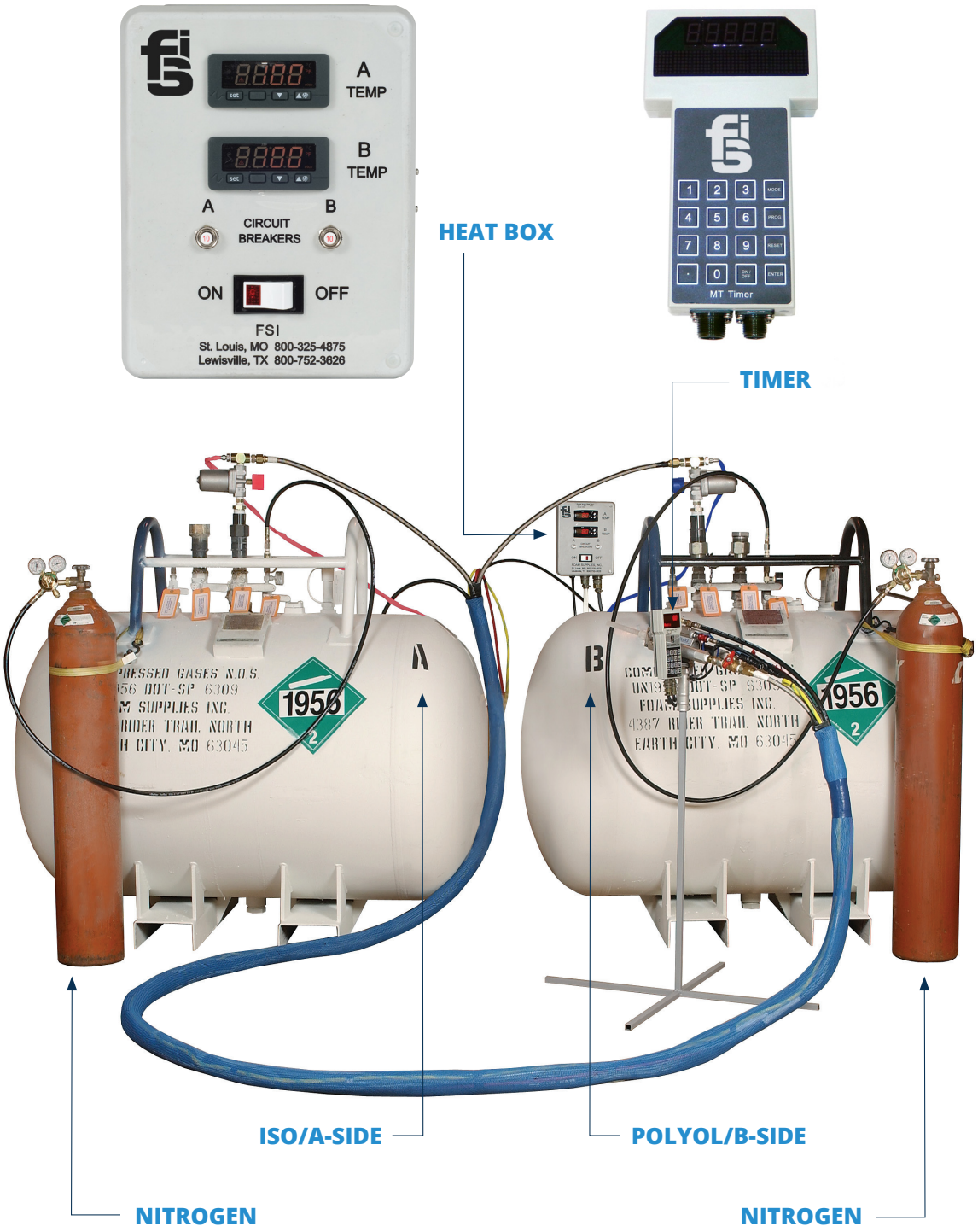
1. Absorb with dry sawdust, floor-dry, sand, clay soil, or other suitable absorbent material.
2. Remove and store in containers. Label as required.

DISPOSAL METHOD

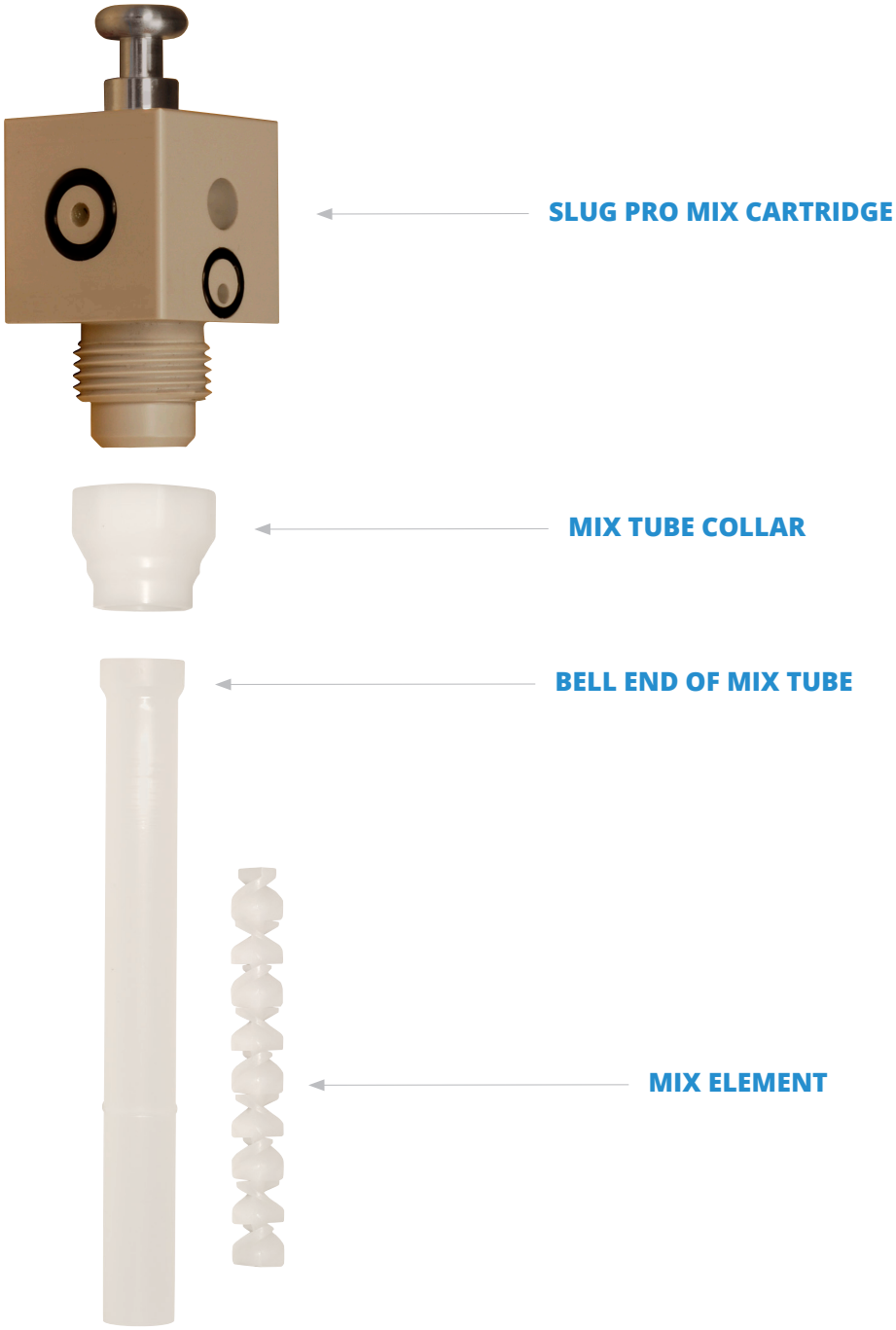
1. Follow all Federal, State and Local regulations.
2. Contact a licensed hazardous waste disposal contractor for proper disposal.
3. Obtain certification and receipts of proper disposal from contractor.

Equipment Drawings & Parts

STANDARD UNIT



MIX TUBE ASSEMBLY

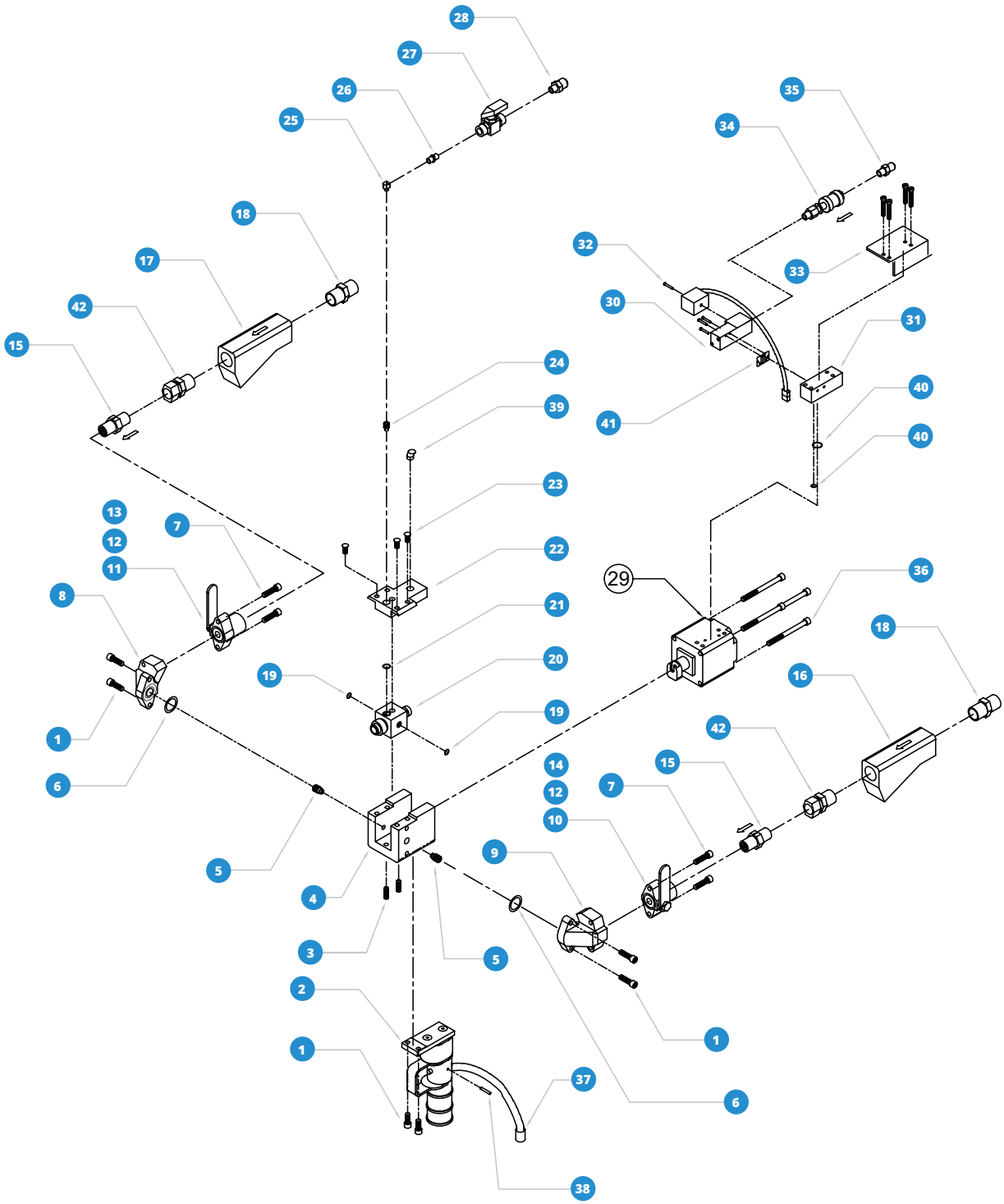


MIX TUBE ASSEMBLY

PART #	QUANTITY	DESCRIPTION
SL82	1	Mix Tube Collar
SL90-3FT	25	3’ Mix Tube
6LMT	100	10” x 6-PPM Mix Tube
15LMT	100	10” x 15-PPM Mix Tube
30LMT	100	10” x 30-PPM Mix Tube
45LMT	100	10” x 45-PPM Mix Tube
60LMT	100	10” x 60-PPM Mix Tube

Size of mix element and length of tube can vary. Please order carefully.

SLUG PRO GUN HEAD
Y-STYLE FLOW CONTROLLERS



SLUG PRO GUN HEAD PARTS (Y-STYLE FLOW CONTROLLERS)

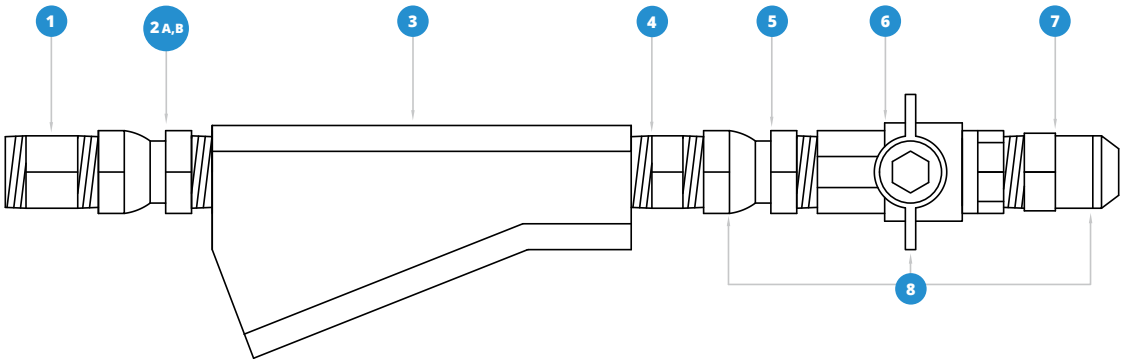
ITEM	DESCRIPTION	QTY	P/N
1	Socket Head Cap Screw 1/4-20 x 3/4	6	SL2-30
2	Gun Handle with Trigger Guard	1	SL2-16
3	Set Screw 1/4-20 x 3/4	2	SL2-SS
4	U-Frame Body	1	SL2-U-Frame
5	Removable Orifice	2	SEE CHART
6	Wing O-Ring	2	SL29
7	Socket Head Cap Screw 1/4-20 x 1	4	G-6-1
8	B-SIDE Wing-Blue	1	SL14
9	A-SIDE Wing-Red	1	SL13
10	Iso Ball Valve Assembly - Red	1	SEE CHART
11	Poly Ball Valve Assembly - Blue	1	SEE CHART
12	Ball Valve Handle	2	SL15
13	Blue Handle Cover	1	SL21
14	Red Handle Cover	1	SL22
15	Check Valve	2	SEE CHART
16	Iso Flow Controller	1	SEE CHART
17	Poly Flow Controller	1	SEE CHART
18	Hex Nipple	2	SEE CHART
19	O-Ring for Female Snap-Tite	2	N-11R
20	Insert w/ O-Rings and SL2-RFD	1	SL2-10C
21	Air Purge O-Ring	1	SL2-12R
22	T Cap	1	SL2-TC
23	Socket Head Screw SS 1/4-20 x 1/2	4	SL2-CS
24	Swivel Fitting for Air	1	SL2-41SW
25	Brass 90-degree Fitting	1	SL2-39A
26	1/8" Hex Nipple	1	CSA-2
27	1/8" Air Valve	1	SL41
28	3/8" JIC X 1/8" MPT	1	DG-5
29	New Air Cylinder	1	SL2-20
30	Solenoid	1	SL45
31	Air Block Includes SL49R O-Ring	1	SL49
32	Solenoid Cord	1	SL53
33	Solenoid Cover (Includes Screws)	1	SL48
34	Slide Safety Valve	1	SL26
35	1/8" MPT X 1/4" JIC	1	CSA-6
36	Socket Head Cap Screw 1/4- 20 x 3	4	SL2-35
37	Trigger Cord	1	G11-E
38	8-32 Set Screw	1	G-18
39	Grease Fitting	1	SL114
40	Air Block O-Ring Set	1	SL49R
41	Air Solenoid Gasket	1	SL46G
42	JIC Swivel	2	SEE CHART

SLUG PRO GUN HEAD PARTS (Y-STYLE FLOW CONTROLLERS)

GUN SIZE	ISO FLOW CONTROLLER	POLY FLOW CONTROLLER	MIX CARTRIDGE	ORIFICE	ORIFICE SIZE	CHECK VALVE	HEX NIPPLE	ISO BALL VALVE	POLY BALL VALVE	JIC Swivel
6 PPM	SL2-FCR6	SL2-FCB6	E000002	SL2-OR15	#43	C42	C14	G5A	G5B	NU11-2
15 PPM	SL2-FCR15	SL2-FCB15	E000002	SL2-OR15	#43	C42	C14	G5A	G5B	NU11-2
30 PPM	SL2-FCR30	SL2-FCB30	E000002	SL2-OR30	#31	C12	TF60005	G4A	G4B	NU11
45 PPM	SL2-FCR45	SL2-FCB45	E000003	SL2-OR45	#27	C12	TF60005	G4A	G4B	NU11
60 PPM	SL2-FCR60	NONE	E000003	N/A	#25	C12	TF60005	G4A	G4B	NU11

FLOW CONTROL ASSEMBLY (Y-STYLE)

OUTPUT OF FLOW CONTROLLER CAN VARY. PLEASE ORDER CAREFULLY.



60-PPM FLOW CONTROLLER

ITEM #	PART #	DESCRIPTION
1	C12	½" Check Valve
2	NU11	½" FPT Swivel x ½" MPT
2	SL2-FCR60	Y Flow Controller (ISO) Red
3	SL2-FCB60	Y Flow Controller (Poly) Blue
4	TF60005	½" Hex Nipple
5	NU11	½" FPT Swivel x ½" MPT
6	SL18	½" Ball Valve
7	M29	½" MPT x 3/4
8	SL33	Includes Item #5, #6, #7

45-PPM FLOW CONTROLLER

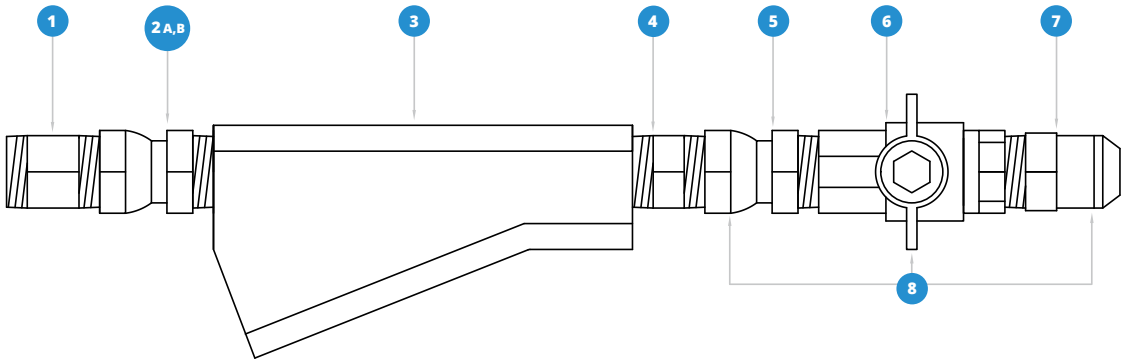
ITEM #	PART #	DESCRIPTION
1	C12	½" Check Valve
2	NU11	½" FPT Swivel x ½" MPT
2	SL2-FCR45	Y Flow Controller (ISO) Red
3	SL2-FCB45	Y Flow Controller (Poly) Blue
4	TF60005	½" Hex Nipple
5	NU11	½" FPT Swivel x ½" MPT
6	SL18	½" Ball Valve
7	M29	½" MPT x 3/4" JIC
8	SL33	Includes Item #5, #6, #7

30-PPM FLOW CONTROLLER

ITEM #	PART #	DESCRIPTION
1	C12	½" Check Valve
2	NU11	½" FPT Swivel x ½" MPT
2	SL2-FCR30	Y Flow Controller (ISO) Red
3	SL2-FCB30	Y Flow Controller (Poly) Blue
4	TF60005	½" Hex Nipple
5	NU11	½" FPT Swivel x ½" MPT
6	SL18	½" Ball Valve
7	NU10	½" MPT x 5 /8" MJIC
8	SL32	Includes Item #5, #6, #7

FLOW CONTROL ASSEMBLY (Y-STYLE)

OUTPUT OF FLOW CONTROLLER CAN VARY. PLEASE ORDER CAREFULLY.



15-PPM FLOW CONTROLLER

ITEM #	PART #	DESCRIPTION
1	C42	3/8" Check Valve
2	NU11-2	3/8" FPT Swivel x ½" MPT
2	SL2-FCR15	Y Flow Controller (ISO) Red
3	SL2-FCB15	Y Flow Controller (Poly) Blue
4	C14	½" x MTP x 3/8" MPT Nipple
5	C51	3/8" x MTP x 3/8" FPT Swivel
6	C52	3/8" Ball Valve
7	C53	3/8" MPT x 5/8" MJIC
8	C50	Includes Item #5, #6, #7

6-PPM FLOW CONTROLLER

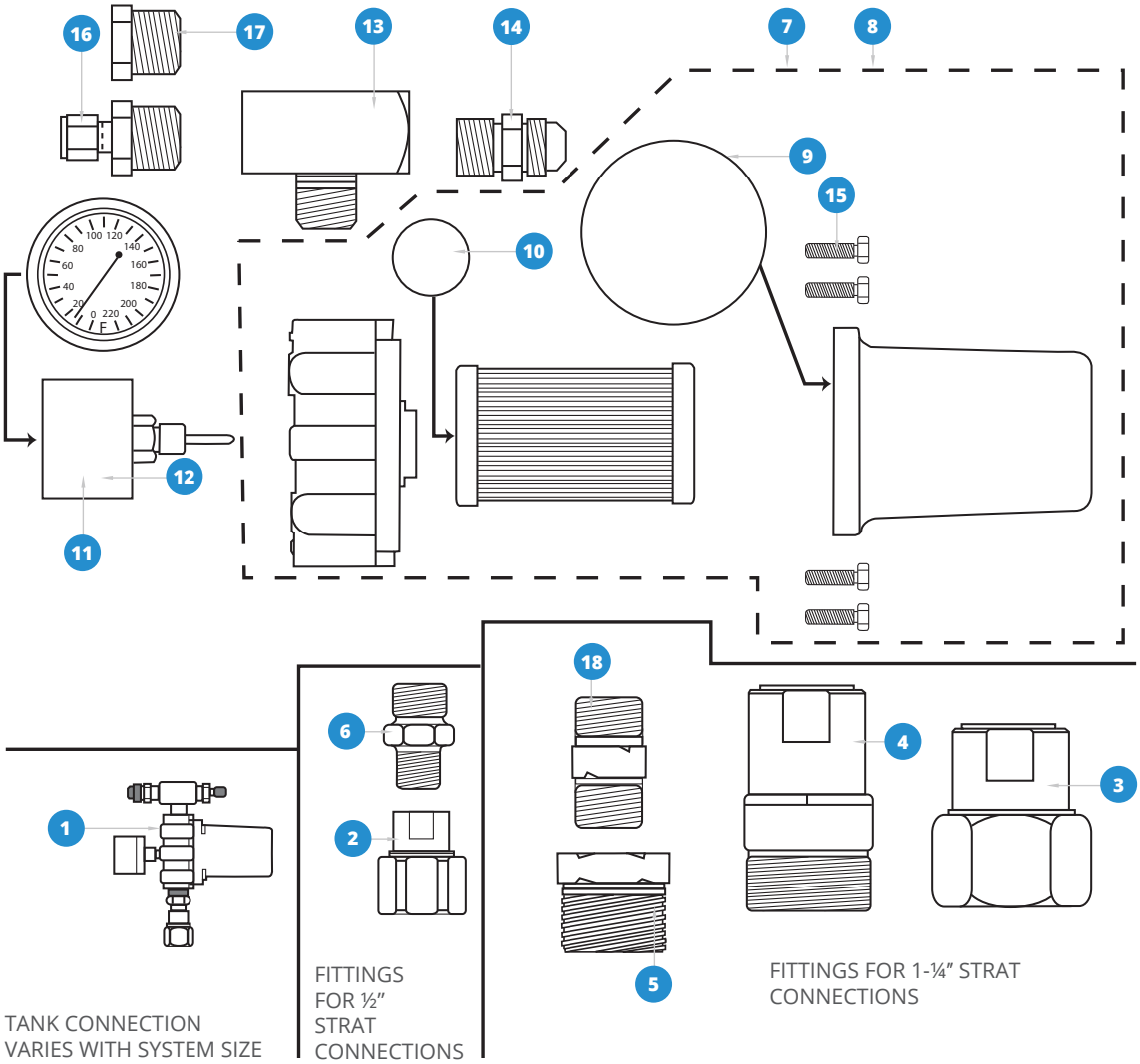
ITEM #	PART #	DESCRIPTION
1	C42	3/8" Check Valve
2	NU11-2	3/8" FPT Swivel x ½" MPT
2	SL2-FCR6	Y Flow Controller (ISO) Red
3	SL2-FCB6	Y Flow Controller (Poly) Blue
4	C14	½" x MTP x 3/8"MPT Nipple
5	C51	3/8" x MTP x 3/8" FPT Swivel
6	C52	3/8" Ball Valve
7	C53	3/8" MPT x 5/8" MJIC
8	C50	Includes Item #5, #6, #7

SINGLE NITROGEN REGULATORS



ITEM #	PART #	DESCRIPTION
1	N2	High Pressure Regulator
2	NA2	0-400 p.s.i. Gauge
3	NA3	0-4000 p.s.i. Gauge
4	N3	¼" Run Tee
5	N6	¼" MPT x ¼" JIC Male Adapter
6	H910	3/8" x 10' Synflex Hose
7	DG4	3/8" JIC x ¼" MPT
8	N14	3/8" JIC x ¼" FPT
9	N10	¼" Check Valve
10	N11R	O-Ring for Female Snap-tite Coupler
11	N11	¼" Female Snap-tite Coupler

FILTER ASSEMBLY



6 LB SLUG PRO GUN BASIC SPARE PARTS

ITEM #	PART #	DESCRIPTION
1	FA2	1¼" A-SIDE STRATOFLEX ASSEMBLY
2	FAB3	½" FEMALE STRATOFLEX FITTING
3	FA4	1¼" FEMALE STRATOFLEX FITTING
4	FB4	1¼" MALE STRATOFLEX FITTING
5	FAB5	1¼" MPT x ¾" MPT
6	FAB6	¾" MPT x ½" MPT
7	FA7	¾" FILTER ASSEMBLY
8	FA7-1	1" FILTER ASSEMBLY
9	FAB8	FILTER SCREEN
9	FAB10	FILTER HOUSING O-RING
10	FAB11	FILTER SCREEN O-RING
11	FA12	A-SIDE TEMPERATURE GAUGE
12	FB12	B-SIDE TEMPERATURE GAUGE
13	FAB17	¾" MPT x ¾" FPT TEE
14	FAB14	¾" MPT x ¾" MJIC
15	G6-1	¼" x 20 x 1 ALLEN BOLT
16	FAB19	¾" MPT x 3/8" I.D. SWAGELOK (INCLUDES NUT AND FERRULES)
17	FAB20	¾" MPT PLUG (FOR 45'L SLUG GUNS W/ HEATTAPE)
18	FAB5-1	¾" HEX NIPPLE

15 LB SLUG PRO GUN BASIC SPARE PARTS

QUANTITY	PART #	DESCRIPTION
1	SL107T	GREASE TUBE (14oz)
4	SL29	WING O-RING
1	SL41	1/8" AIR VALVE W/.015 HOLE WITH WASHER
2	GRK	BALL VALVE REPAIR KIT
2	C42	3/8" CHECK VALVE
1	DK 817	CLEANER/LUBRICANT (CASE QTY: 12)
4	G6-1	1/4"x 20 x 1" ALLEN BOLT
1	SL53	SOLENOID CORD
1	SL49R	AIR BLOCK O-RING SET
1	15LMT	10" 15-PPM BELL SLUG MIXER (BOX QTY: 100)
1	H95	5' WHIP 3/8" BLACK HOSE
2	N11R	O-RING FOR FEMALE SNAP-TITE COUPLER
1	SL45	SOLENOID
1	SL2-FCR15	15PPM Y FLOW CONTROLLER ISO
1	SL2-FCB15	15PPM Y FLOW CONTROLLER POLY
1	SL1PV	PIN VISE
1	SL95-43	#43 DRILL BIT (FOR CHEMICAL PORTS ONLY)
4	SL82	MIX TUBE COLLAR
2	E000002	MIX CARTRIDGE WITH O-RINGS AND SL2-RFD ROD
4	SL2-30	SOCKET HEAD CAP SCREW (1/4" x 20 x ¾")
4	SL2-CS	T CAP SCREW (1/4" x 20 x ½") SOCKET CAP
2	SL2-OR15	REMOVABLE ORIFICE 6/15-PPM #43

30 LB SLUG PRO GUN BASIC SPARE PARTS

QUANTITY	PART #	DESCRIPTION
1	SL107T	GREASE TUBE (14oz)
4	SL29	WING O-RING
1	SL41	1/8" AIR VALVE W/.015 HOLE WITH WASHER
2	GRK	BALL VALVE REPAIR KIT
2	C12	1/2" CHECK VALVE
1	DK 817	CLEANER/LUBRICANT (CASE QTY: 12)
4	G6-1	1/4" x 20 x 1" ALLEN BOLT
1	SL53	SOLENOID CORD
1	SL49R	AIR BLOCK O-RING SET
1	30LMT	10" 30-PPM BEL SLUG MIXER (BOX QTY: 100)
1	H95	5' WHIP 3/8" BLACK HOSE
2	N11R	O-RING FOR FEMALE SNAP-TITE COUPLER
1	SL45	SOLENOID
1	SL2-FCR30	30PPM Y FLOW CONTROLLER ISO
1	SL2-FCB30	30PPM Y FLOW CONTROLLER POLY
1	SL1PV	PIN VISE
1	SL95-31	#31 DRILL BIT (FOR CHEMICAL PORTS ONLY)
4	SL82	MIX TUBE COLLAR
2	E000002	MIX CARTRIDGE WITH O-RINGS AND SL2-RFD ROD
4	SL2-30	SOCKET HEAD CAP SCREW (1/4" x 20 x ¾")
4	SL2-CS	T CAP SCREW (1/4" x 20 x ½") SOCKET CAP
2	SL2-OR30	REMOVABLE ORIFICE 30-PPM #31

45 LB SLUG PRO GUN BASIC SPARE PARTS

QUANTITY	PART #	DESCRIPTION
1	SL107T	GREASE TUBE (14oz)
4	SL29	WING O-RING
1	SL41	1/8" AIR VALVE W/.015 HOLE WITH WASHER
2	GRK	BALL VALVE REPAIR KIT
2	C12	1/2" CHECK VALVE
1	DK 817	CLEANER/LUBRICANT (CASE QTY: 12)
4	G6-1	1/4" x 20 x 1" ALLEN BOLT
1	SL53	SOLENOID CORD
1	SL49R	AIR BLOCK O-RING SET
1	45LMT	12" 45-PPM BELL SLUG MIXER (BOX QTY: 100)
1	H95	5' WHIP 3/8" BLACK HOSE
2	N11R	O-RING FOR FEMALE SNAP-TITE COUPLER
1	SL45	SOLENOID
1	SL2-FCR45	45PPM Y FLOW CONTROLLER ISO
1	SL2-FCB45	45PPM Y FLOW CONTROLLER POLY
1	SL1PV	PIN VISE
1	SL95-27	#27 DRILL BIT (FOR CHEMICAL PORTS ONLY)
4	SL82	MIX TUBE COLLAR
2	E000003	MIX CARTRIDGE WITH O-RINGS AND SL2-RFD ROD
4	SL2-30	SOCKET HEAD CAP SCREW (1/4" x 20 x ¾")
4	SL2-CS	T CAP SCREW (1/4" x 20 x ½") SOCKET CAP
2	SL2-OR45	REMOVABLE ORIFICE 45-PPM #27

60 LB SLUG PRO GUN BASIC SPARE PARTS

QUANTITY	PART #	DESCRIPTION
1	SL107T	GREASE TUBE (14oz)
4	SL29	WING O-RING
1	SL41	1/8" AIR VALVE W/.015 HOLE WITH WASHER
2	GRK	BALL VALVE REPAIR KIT
2	C12	1/2" CHECK VALVE
1	DK 817	CLEANER/LUBRICANT (CASE QTY: 12)
4	G6-1	1/4" x 20 x 1" ALLEN BOLT
1	SL53	SOLENOID CORD
1	SL49R	AIR BLOCK O-RING SET
1	60LMT	10" 60-PPM BELL SLUG MIXER (BOX QTY: 100)
1	H95	5' WHIP 3/8" BLACK HOSE
2	N11R	O-RING FOR FEMALE SNAP-TITE COUPLER
1	SL45	SOLENOID
1	SL2-FCR60	60PPM Y FLOW CONTROLLER ISO
1	SL2-FCB60	60PPM Y FLOW CONTROLLER POLY
1	SL1PV	PIN VISE
1	SL95-15	#15 DRILL BIT (FOR CHEMICAL PORTS ONLY)
4	SL82	MIX TUBE COLLAR
2	E000003	MIX CARTRIDGE WITH O-RINGS AND SL2-RFD ROD
4	SL2-30	SOCKET HEAD CAP SCREW (1/4" x 20 x ¾")
4	SL2-CS	T CAP SCREW (1/4" x 20 x ½") SOCKET CAP

MISCELLANEOUS PARTS

ITEM #	PART #	DESCRIPTION
1	E4-40	40’ TIMER SWITCHCORD (FOR 25’ GUNS)
2	SL4740	40’ SOLENOID CORD EXTENSION (FOR 25’ GUNS)
3	E4-60	60’ TIMER SWITCHCORD (FOR 45’ GUNS)
4	SL4760	60’ SOLENOID CORD EXTENSION (FOR 45’ GUNS)
5	SL106	GREASE GUN
6	SL107T	GREASE TUBE (14OZ.)
7	SL1PV	PIN VISE
8	SCALE	OHAUS SCALE MODEL CS5000 W/ POWER ADAPTER
9	SL299-6	6-PPM TOOL BOX
10	SL299-15	15-PPM TOOL BOX
11	SL299-30	30-PPM TOOL BOX
12	SL299-45	45-PPM TOOL BOX
13	SL299-60	NEW SLUG 60-PPM TOOL BOX
14	R1	BLOW DOWN
15	H95	3/8“ x 5’ SYNFLEX HOSE (WHIP)
16	H910	3/8” x 10’ SYNFLEX HOSE
17	H920	3/8” x 20’ SYNFLEX HOSE

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