

**OPERATION AND
MAINTENANCE
MANUAL FOR THE
PEMSERTER®
SERIES 2000® PRESS**

(Original instruction)

PennEngineering®



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OPERATION AND MAINTENANCE MANUAL

PEMSERTER[®] SERIES 2000[®] PRESS

MODEL SERIES 2000

FASTENER INSTALLATION PRESS

SERIAL NUMBER 20010-

20110-

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PEMSERTER® SERIES 2000® FASTENER INSTALLATION PRESS

OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

SECTION TITLES	PAGE
1. INTRODUCTION	1
2. IDENTIFYING AND LOCATING MAJOR COMPONENTS OF THE PRESS	6
3. SAFETY SYSTEM OPERATION	15
4. PRESS INSTALLATION	17
5. GENERAL FUNCTION DESCRIPTIONS	23
6. TOUCH-SCREEN CONTROLS	27
7. PNEUMATIC-HYDRAULIC SYSTEM	70
8. ELECTRICAL SYSTEM	73
9. TOOLING SET-UP	79
10. PRESS OPERATION	94
11. MAINTENANCE	97
12. TROUBLE SHOOTING	109
13. SPARE PARTS	119



Read Manual Before Operating Press!

SECTION 1

INTRODUCTION

The PEMSERTER® Series 2000® Fastener Installation Press is available in three configurations: Manual, Automatic, and as TRU-Motion® systems integrated with material handling systems such as assembly conveyors, X-Y positioning tables, and robotic arms. This manual describes the standard Automatic version of the Series 2000 press. The Manual version of the Series 2000® operates the same as the Automatic version with the same control software, except that the autofeed hardware is not available. A Manual Series 2000® can be upgraded to Automatic by adding the autofeed system components.

Features:

- Safety and Protection System, sensitive down to 0.4 mm (0.015")
- Unique high speed ram approach with energy efficient power stroke.
- Computer control system with touch screen interface. Provides simple and precise controls for the operator. Designed for easy set-up, operation, maintenance and diagnostics.
- Quick Set-up/change-over automatic feed tooling system. Provides an extensive selection of tooling for different fasteners using the same feeder bowl.

Specifications:

- Ram Force 1.8 to 71.2 KN (400 to 16,000 lbs)
- Pressure System Type Air-Over-Oil
- Air Requirements 6 to 7 BAR (90 to 100 PSI)
12 mm (1/2") dia. minimum line flow
- Throat Depth 61 cm (24")
- Height 193 cm (76")
- Width 92 cm (36")
- Depth 126 cm (49.5")
- Weight 1,135 kg (2,500 lbs.)
- Electrical (North America) 120VAC(+/-12 VAC), 60 Hz(+/-1 Hz), 5A, 1φ
- Electrical (Europe and Pacific Rim) 230VAC(+/-23 VAC), 50 Hz(+/-1 Hz), 3A, 1φ
- Air Consumption approx. 7 liters/sec air at 1 Atm (15 Scfm)
30 insertions per minute at 20 KN (4500 Lbf)
- Electrical Power Consumption approx. 250 Watts with auto feed bowl running
- Ambient Temperature 41° F to 104° F (5° C to 40° C)
- Transport / Storage Temperature -13°F to +130°F (-25°C to +55°C) and for short periods not to exceed 24 hours up to 160°F (70°C)
- Ambient Humidity 30% to 95% (Not reflective of inlet air)
- Installation Altitude Max 1000m

SAFETY

The Series 2000[®] was designed to conform to applicable ISO, ANSI, OSHA, CEN and CSA safety standards.

The Series 2000[®] is compliant to applicable European Union (EU) directives and bears the CE Mark.

The Series 2000[®] conforms to the essential requirements of the following directives:

Machinery Directive 2006/42/EC.

Electromagnetic Compatibility (EMC) Directive 2004/108/EC

Low Voltage Directive 2006/95/EC

Please read and follow the safety precautions listed below.



SAFETY PRECAUTIONS

- ◆ Always use safety goggles when operating or maintaining the press
- ◆ Ear Protection is recommended.
- ◆ Always shut off the electrical power and remove the power cord before servicing the press.
- ◆ Before using the press, make sure that a shutoff device has been fitted on the air supply line and the location is easily accessible, so that the air supply to the press can be shut off in an emergency. Make sure that surge protection is installed in the electrical supply to the press.
- ◆ Check the air hose and fittings regularly for wear.
- ◆ Use only approved parts for maintenance and repairs.
- ◆ Do not use chipped, cracked or damaged accessories and tools.
- ◆ Attach air line securely.
- ◆ Keep body parts away from moving parts.
- ◆ Never wear jewelry, loose clothing or anything that could get caught in moving parts.
- ◆ If a new user is operating the press, be sure these instructions are readily available.
- ◆ Do not use the press in any way, other than for its intended purposes.
- ◆ Do not modify the press in any way.
- ◆ Fasteners are blown at a high velocity. Tubing must always be secured before machine is operated. Check integrity of tubing before use.
- ◆ Press contains hydraulic fluid. See enclosed Material Safety Data Sheet for proper handling. Follow all applicable local safety standards.

The sound emission values (acoustic pressure level) at the operator position is 93dB(A)
Within the scope of 1 meter ,The sound emission values (sound power level) is 103 dB(A)
Within the scope of 1 meter , uncertainty K=2dB(A) .

However , If the machine is operated in a room with other machines ,the sound emission level (rated level) can be over 85 dB(A) .

If this is the case , improve the acoustics in the room . If you do not , the hearing of the operators may be damaged .



WARNING: Immediately upon receipt of your press, establish a “Maintenance Code” for your supervisor/maintenance personnel only, as it is possible, however difficult, to operate the press without the standard safeguards in place in the

Maintenance Mode. Only trained personnel should use the Maintenance Mode. PennEngineering® is not responsible for improper maintenance mode procedures, which result in a loss of operation of the press or operator safety.

Label	Definition
	<p>General Warning Label – There are items that require attention. These are specified in the operator’s manual.</p>
	<p>CAUTION: Laser Radiation. Do not stare into beam. Class 2 laser product. Per EN 60825 and ANSI Z136.1: Class 2 lasers are low power devices emitting visible radiation in the wavelength range 400nm to 700nm. Momentary viewing is not considered hazardous since the upper radiant power limit on this type of device is less than the MPE (Maximum Permissible Exposure) for momentary exposure of 0.25 second or less. Intentional extended viewing, however, is considered hazardous.</p> <p>Never aim the spotting light anywhere except at the workpiece.</p>
	<p>Eye Protection Label – Eye protection must be worn when operating the press.</p>
	<p>Ear Protection Label – Ear protection must be worn when operating the press.</p>
	<p>Hot Surface Label – Hot Surface. Do not touch.</p>
	<p>Pinch Point Label – Keep hands away from area.</p>
	<p>Electrical Shock/Electrocution Warning Label –Electrical shock hazard. Do not touch</p>

WARRANTY

PennEngineering® warrants that this product, when correctly used according to directions and under normal operating conditions, will be free from defects in material and workmanship for a period of two (2) years from the date of purchase.

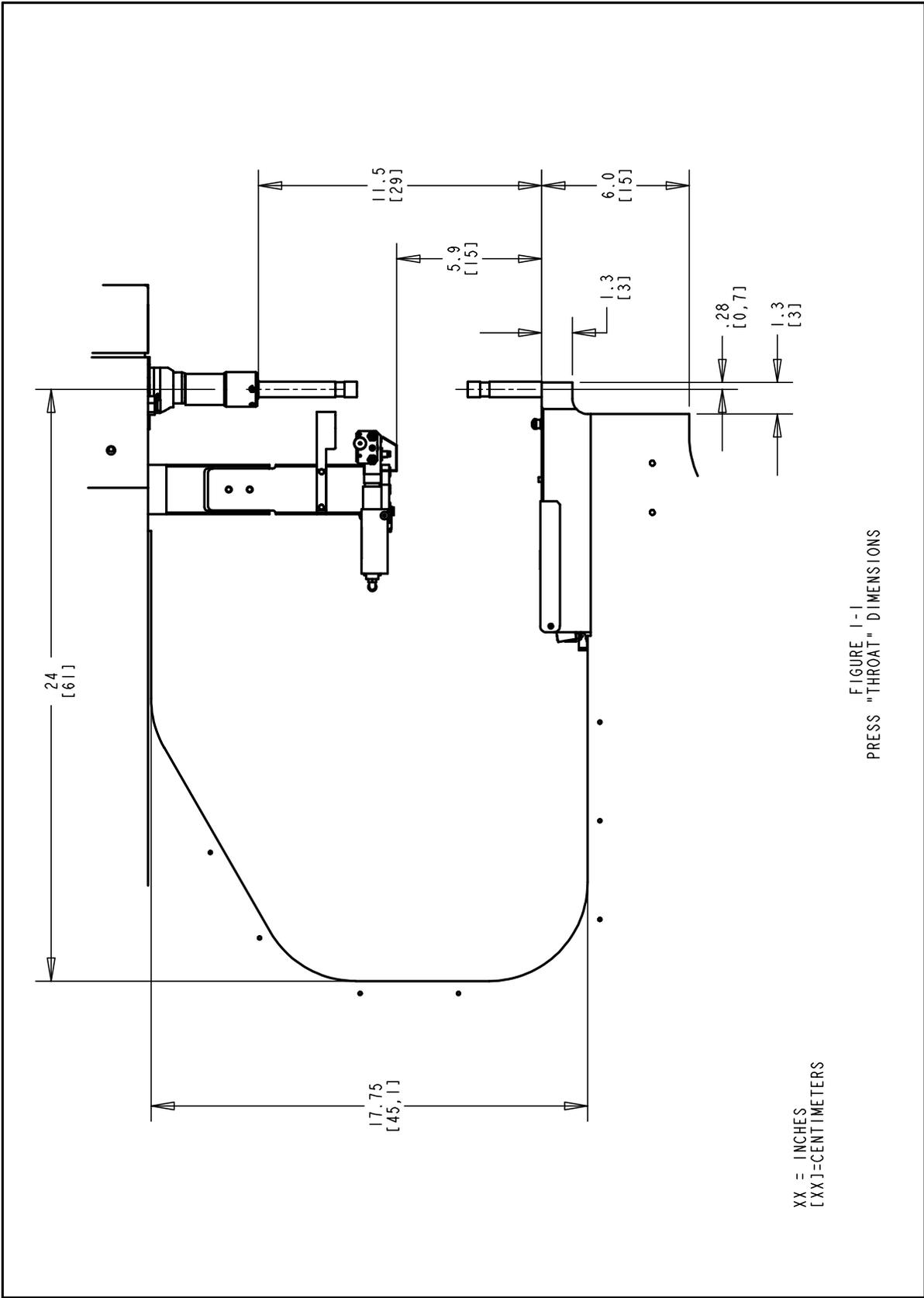
This warranty shall not apply to any product which has been altered, changed or repaired, normal maintenance excluded, except as authorized by PennEngineering®. This warranty shall not apply to any product that has been subject to misuse, negligence or accident.

The purchaser's exclusive and sole remedy shall be limited to repair, modification or replacement at the discretion of PennEngineering®. In no event shall PennEngineering® be liable for the cost of any indirect or consequential damage. In no case shall PennEngineering® liability exceed the purchase price of the product.

This warranty is exclusive and in lieu of all other warranties. No oral or written information by PennEngineering®, its employees, representatives, distributors or agents shall increase the scope of the above warranty or create any new warranty.

Should any questions or problems arise concerning your Series 2000 press, contact the PennEngineering® Service Department. **Toll-free telephone number 1-800-523-5321 (in North America) or 215-766-8853.**

Set-up, Training and Repair Service is available to you as long as you own your press. Free telephone instruction and Service is available for the lifetime of your press by calling the PennEngineering® Service Department.



XX = INCHES
[XX]=CENTIMETERS

FIGURE 1-1
PRESS "THROAT" DIMENSIONS

SECTION 2

IDENTIFYING AND LOCATING MAJOR COMPONENTS OF THE PRESS

Identifying Major Components of the Press

This section introduces the user to the major components of the press.

Frame

The frame is the structure of the press. The main section is made of solid steel with welded components that form the base and the other support sections. All parts are directly or indirectly mounted onto the frame.

Main Cylinder/Ram

The ram force of the press is exerted by a hydraulic cylinder called the Main Cylinder. It is mounted directly onto the frame surrounded by the front enclosure. Attached to the main cylinder, at the back end, is a sensor probe called a Linear Transducer, which reads the location of the main cylinder piston. Attached to the end of the main cylinder rod is the safety assembly, described in Section 3. The main cylinder rod is referred to as the Ram.

Operator Controls

All the operator controls are located on the door of the Front Enclosure except the foot pedal. These include the Touch Screen, the E-Stop button, the Power ON button, the Power OFF button, the Audible Beeper, and the Spotting Light button.

- **Touch Screen** - This is the primary interface to the press control system (the PLC). It is used for installation and automatic feed setup and configuration, feedback to the user and diagnostics. The screen displays text and graphical information and allows the operator to make selections by touching different parts of the screen as indicated by what is displayed on the screen. The touch screen is programmed with an automatic screen save mode that blanks the screen when not in use after 10 minutes. To reactivate the screen, just touch anywhere on the screen. Detailed explanations of each screen are provided in Section 6 of this manual.
- **E-Stop Button** - Pressing this button disconnects power to the quick exhaust/supply valve (see air supply inlet system on page 9). When pressure is exhausted, all pneumatic motion stops. During an E-Stop condition all outputs are turned off. The control system remains on-line and detects the E-stop.

- **Power ON Button** - If the press is on, this button is lit green. When the press is off, pressing this button will provide power to the press control system which will initialize the press, including pressurizing the press and moving the Ram to it's retracted "home" position.
- **Power OFF Button** – This button is lit amber if there is electricity connected to the press but the press is off. When the press is on, the amber light will be off. Press this button to turn the press off, power will be switched off from the control system and all moving components including the quick exhaust/supply valve.
- **Audible Beeper** - This beeper is controlled by the PLC and is used to indicate to the operator when the press or operation requires special attention. The volume can be adjusted by turning the outer ring and adjusting the aperture of the beeper.
- **Spotting Light Push Button** – Push this button to turn the spotting light on and off. This button is lit when the laser spotting light is on. Never aim the spotting light anywhere except at the workpiece and, never look directly into the spotting light.
- **Foot Pedal** - The foot pedal is used by the operator to control the start of a press cycle. It frees the operator to use his hands to manipulate the workpiece.

Pneumatic/Hydraulic Enclosure

The Pneumatic/Hydraulic Enclosure on the right side of the press houses all the major components of the Air-Oil System that control the main cylinder. These components include the computer controlled pressure regulator system, the ram valve assembly which includes the ram valve and the booster valve, the Air-over-Oil tanks, the Air-Oil booster, and the hydraulic safety valves.

Electrical Enclosure

The Electrical Enclosure, under the Pneumatic/Hydraulic Enclosure, houses the computer control system (PLC) and various electrical components and distribution terminals. Electric Power and the Foot Pedal connect to this enclosure. The door is key-locked and located on the back is the electrical on-off switch. This switch must be ON for the press to be powered on. Turning off this switch removes all power to the press. The electrical power cord plugs in next to the switch. Removing the power cord can be used to lock out all power to press when performing maintenance.

Vibratory Feeder Bowl (Automatic Fastener Feeding Component)

The Vibratory Feeder Bowl, on the left side of the press, is used for automatic feeding of fasteners. It is an electrically driven device, which holds and moves different types of fasteners. Various types of tooling components are attached to the bowl to orient the fasteners being fed out of the bowl. The vibratory bowl comes equipped with a "Universal Escapement" adapter, which is used for all nut-type tooling and some stud-type tooling. The Vibratory Feeder Bowl is controlled by a dial and a switch on the Bowl Control Box, above the bowl.

- **Bowl Amplitude Dial** - The bowl's amplitude or force of vibration is regulated by a dial control. The amplitude adjustment is used to control the feed rate and performance of the automatic feeding process.
- **Bowl Three Mode Switch** - A 3 position switch is used to select whether the bowl is always on, always off or automatically controlled by the PLC. When the switch is set to auto, the PLC turns on the bowl during run mode and during diagnostics. During run mode the PLC will turn the bowl off if there is a period of inactivity. The PLC will restart the bowl automatically when the next fastener is fed. When loading or unloading fasteners, turn the bowl ON/OFF as desired. Return the switch to AUTO when finished.

Shuttle Support Assembly (Automatic Fastener Feeding Component)

The Shuttle Support Assembly located next to the Vibratory Feeder Bowl is used to hold and actuate tooling shuttle components, route air supplies and hold the Stud-in-tube-Sensor and "Puffer" Flow Control Valve. The Shuttle Air Cylinder on the Shuttle Support Assembly actuates tooling shuttles. The shuttle receives the parts fed from the vibratory feeder bowl, singulates the parts and feeds them out to the punch/anvil area. The Shuttle Support Assembly is aligned with the vibratory feeder bowl. Proper alignment is important to the functioning of the shuttle tooling.

- **Stud-in-tube Sensor** - The PLC uses this ring sensor to monitor and control the feeding process of stud-type tooling.
- **Puffer Flow Control Valve** - This valve controls the air flow to the Vibratory Feeder Bowl tooling attachments and is used to regulate various aspects of the escapement and nutgate performance.

Slide and Gripper Assembly (Automatic Fastener Feeding Component)

The Slide and Gripper Assembly mounted to the top of the frame throat is used to hold top-feed tooling components and has two pneumatic actuators. The two actuators are a linear slide cylinder and a parallel acting gripper. The gripper is used to actuate the tooling jaws that hold fasteners. The gripper opens and closes to receive and release fasteners. The gripper is attached to the end of the linear slide. The linear slide is used to move the gripper and jaws from its retracted position out to the punch position. This system is used to feed fasteners out to tooling punches. The Slide and Gripper Assembly also holds tube extension tooling for stud-type tooling. The Slide and Gripper Assembly can be removed for special workpiece accessibility.

Anvil holder Assembly

The Anvil Holder Assembly mounted to the bottom of the frame throat is used to hold the anvil tooling components and has a single air cylinder. The Bottom Feed Cylinder is used to actuate Bottom Feed Nut Tooling Modules.

Tooling Valve/Storage Enclosure

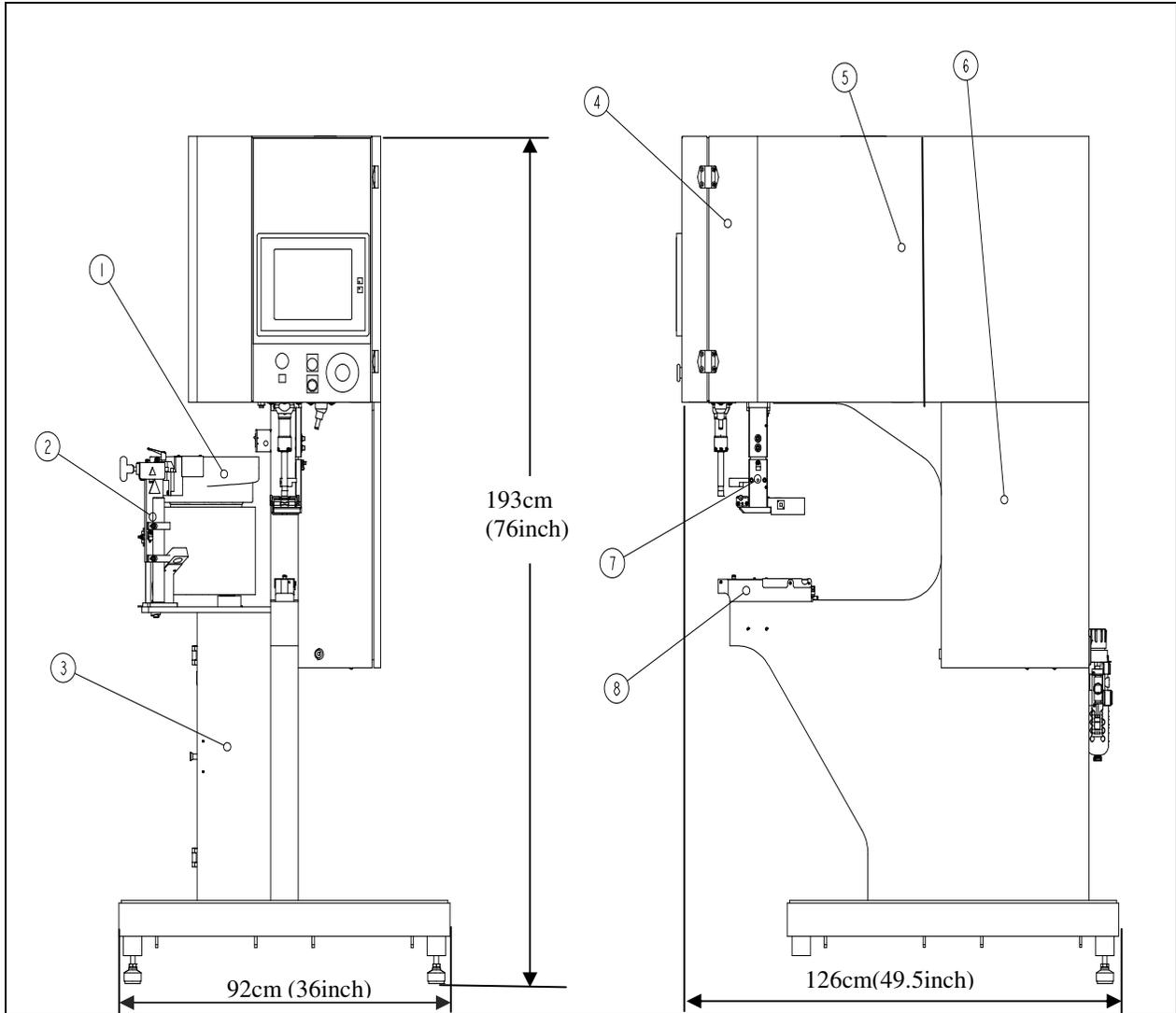
The Tooling Valve/Storage Enclosure is located underneath the Vibratory Feeder Bowl. Behind the door is another enclosure that contains the pneumatic valves that control the different tooling actuators and blowers. Under that enclosure is the Tooling Air Accumulation Tank. The tank provides a steady supply of compressed air to the tooling valves for consistent tooling feeding performance.

Air Supply Inlet System

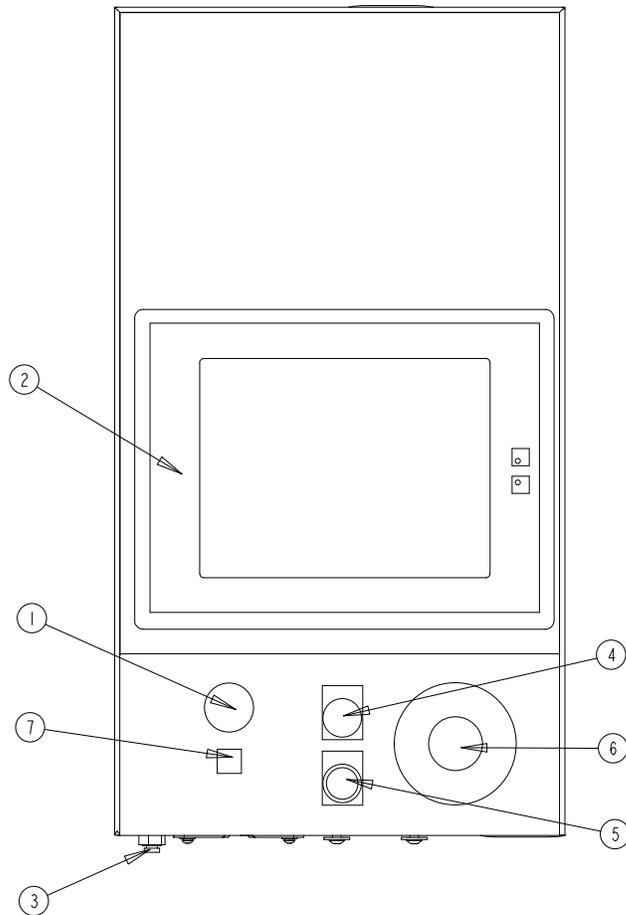
The supply of compressed air enters the press in the back through a system, which includes a filter/regulator and an electrically controlled quick exhaust/supply valve. The regulator is manually set to control the supply line pressure. Turning on the quick exhaust/supply valve supplies air to the press. When the quick exhaust/supply valve is turned off the valve closes and exhausts all downstream compressed air in the press quickly.

Tooling Storage Cabinet (Optional)

The Tooling Storage cabinet is located on the left side of the press.



ITEM	DESCRIPTION
1	VIBRATORY FEEDER BOWL
2	SHUTTLE SUPPORT ASSEMBLY
3	TOOLING VALVE/STORAGE ENCLOSURE
4	MAIN CYLINDER ENCLOSURE
5	PNEUMATIC / HYDRAULIC ENCLOSURE
6	ELECTRICAL ENCLOSURE
7	SLIDE AND GRIPPER ASSEMBLY
8	ANVIL HOLDER ASSEMBLY
FIGURE 2-1	
SERIES 2000 PRESS	



ITEM	DESCRIPTION
1	AUDIBLE BEEPER
2	TOUCH SCREEN
3	VACUUM PORT
4	POWER "OFF" BUTTON
5	POWER "ON" BUTTON
6	E-STOP BUTTON
7	SPOTTING LIGHT ON/OFF BUTTON
FIGURE 2-2 OPERATOR CONTROLS	

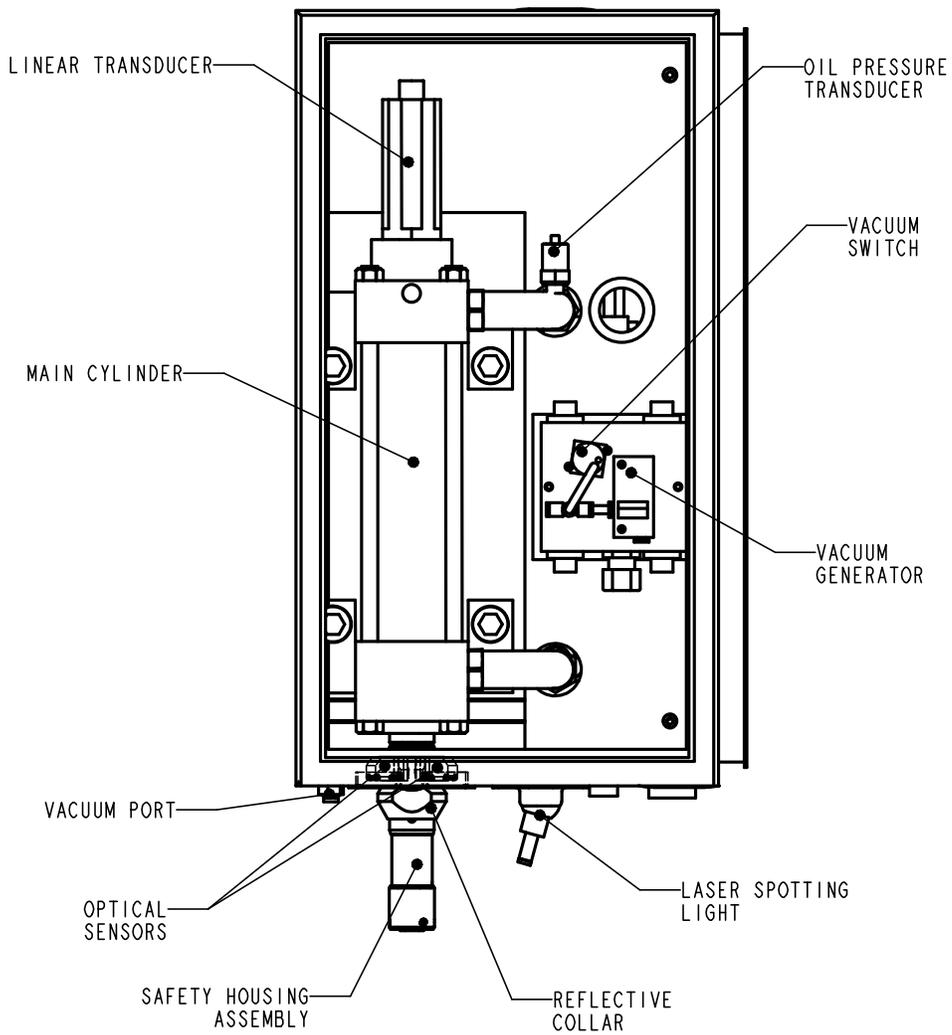
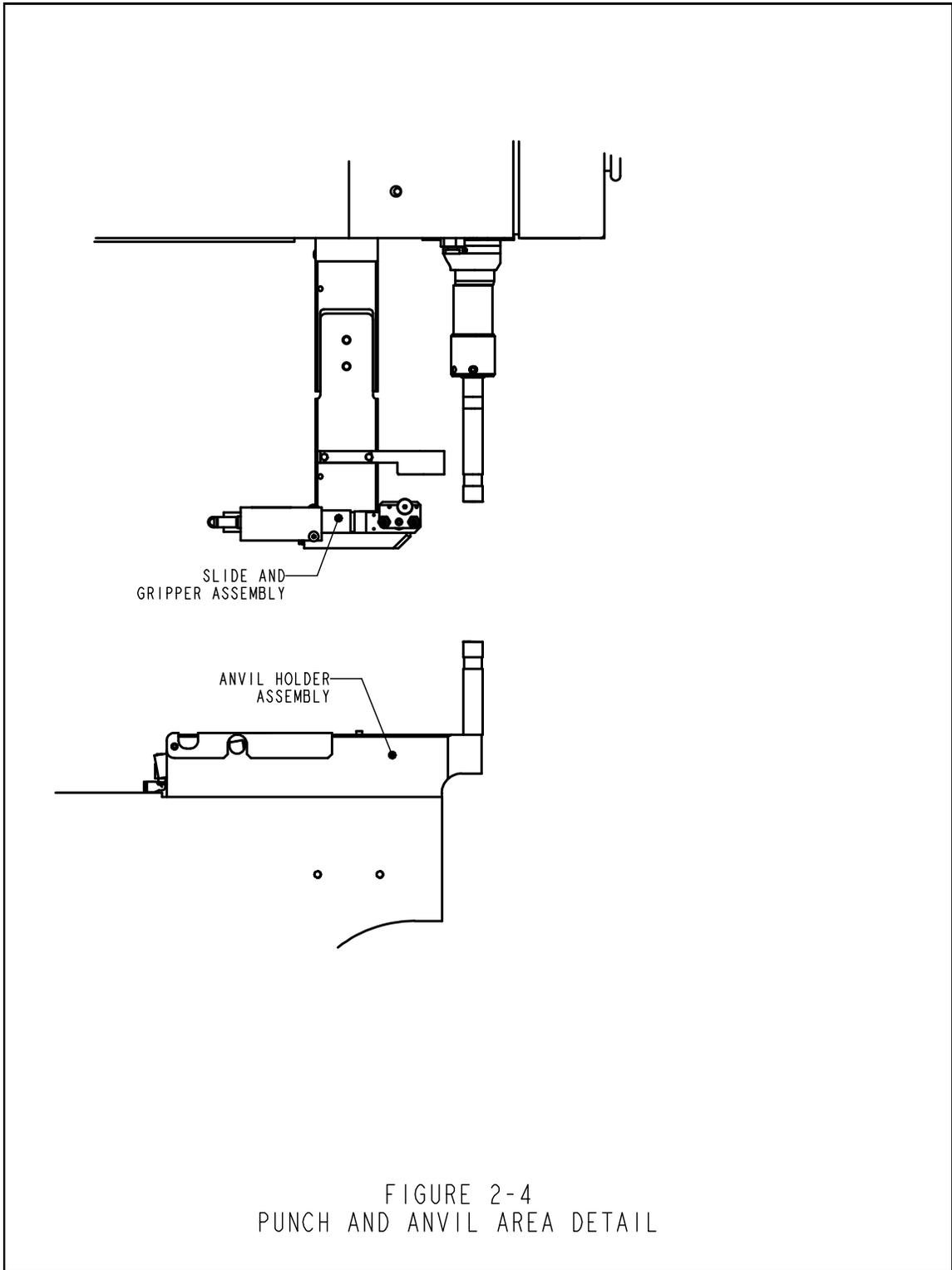


FIGURE 2-3
MAIN CYLINDER ENCLOSURE



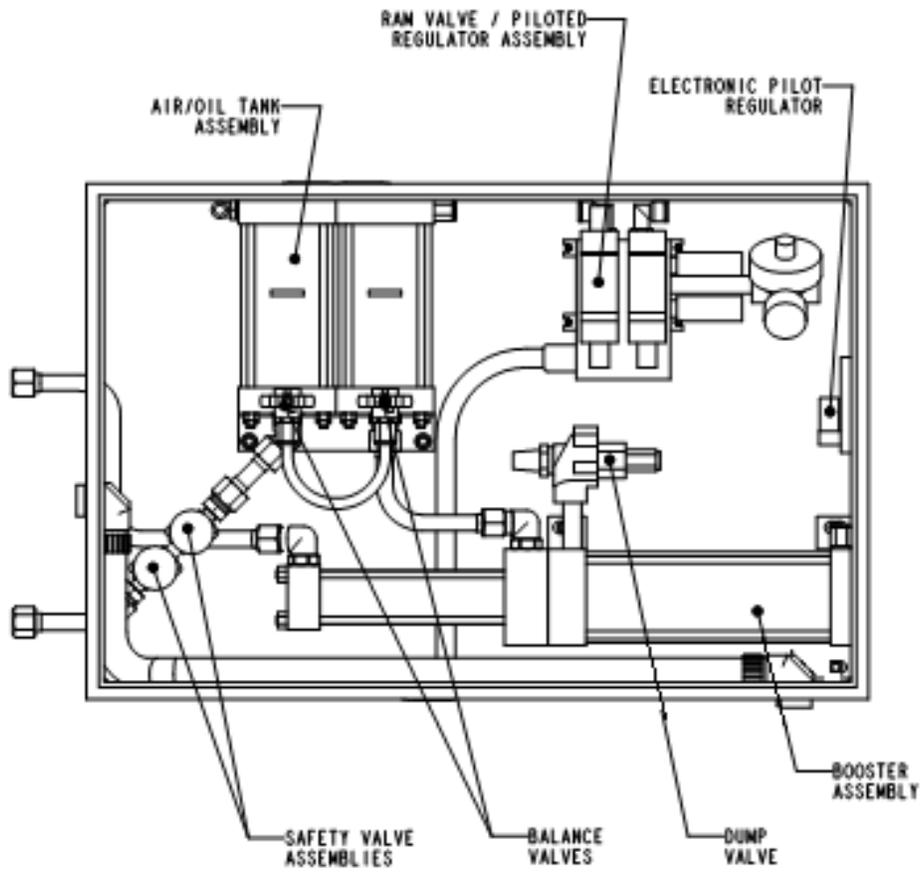


FIGURE 2-5
HYDRAULIC / PNEUMATIC ENCLOSURE

SECTION 3

SAFETY SYSTEM OPERATION



WARNINGS - To avoid injury:

1. Always shut off the electrical power, and remove the power cord, before servicing this machine.
2. Only authorized and trained personnel should maintain, repair, setup, or operate this equipment.
3. Always use eye protection when operating or maintaining the press.

SYSTEM SAFETY FEATURES

1. Shutting off the electrical power, with either the “OFF” push-button, the ON / OFF switch, or pushing the E-Stop button, will cause the electric quick exhaust/supply valve to exhaust all air pressure in the press. **WITHOUT ANY CONTAINED PRESSURE, ALL PNEUMATIC MOTION STOPS.**
2. The electrical cabinet door is key-locked to discourage unauthorized access.
3. The patented safety system can distinguish between a work piece properly set-up between the ram and the anvil, and a foreign object placed between the ram and the anvil. The safety system operates as follows:
 - A sensor called a linear transducer is installed on the top of the main cylinder. The linear transducer senses the position of the main cylinder piston and transmits that information back to the PLC.
 - A device called the "safety assembly" is installed in the bottom of the ram. The assembly consists of a fixed section called the housing and a compressible spring-loaded section called the adapter. The adapter holds the punch tooling. When the ram extends and the adapter or punch tooling contacts an object, the safety assembly compresses.
 - Two redundant pairs of optical thru-beam sensors are located inside the front enclosure, under the main cylinder. Each pair of sensors maintains an individual optical beam path that is reflected through one of two holes in the ram by the "reflective collar". When the safety assembly is compressed, part of the safety assembly inside the ram, blocks both beam paths and the sensors are triggered.
 - When the sensors are triggered, because, either the safety assembly is compressed, the reflective collar is moved, or the beam path is blocked in some other way, the PLC immediately senses the change.

- During a Setup Cycle, the PLC uses this system to "learn" where the fastener and workpiece location is by moving the ram down, compressing the safety assembly, sensing the contact and reading the Linear Transducer. The data of the contact location is saved and used for a comparison during each press/run cycle.
- During Press Cycling, the PLC determines each time it senses that the safety assembly/punch has contacted something, whether it is "legitimate" or "not legitimate". A "safety window" is used to allow for minor variations with workpiece or operator precision.
- Only if BOTH redundant signals agree and the latest contact point is within the "safety window", does the PLC allow the safety assembly to fully compress and for the air-oil system to apply the predetermined high force needed for fastener installation.

4. Three levels of access security are available, each with a different four digit pass code



WARNING: Immediately upon receipt of your press, establish a “Maintenance Code” for your supervisor/maintenance personnel only, as it is possible, however difficult, to operate the press without the standard safeguards in place in the Maintenance Mode. Only trained personnel should use the Maintenance Mode the PennEngineering® is not responsible for improper maintenance mode procedures which result in a loss of operation of the press or operator safety.

5. If the Linear Transducer or either of the ram safety sensors should develop an open or a shortfault, the entire system, including the ram, will come to an immediate stop and not operate further, until repairs are made.

SECTION 4

PRESS INSTALLATION

Moving The Press

- When using a forklift or pallet jack be sure that the forks are properly located between the fork guide tabs under the base of the press. When hoisting from above (See Fig 4-1), be sure to balance the chain or strap between the two eyebolts to prevent swinging.



WARNING: unbalanced loading of the press or sudden stops may lead to toppling of the press.

Locating The Press

- Select a well-lit clean area with a (relatively) level floor. The floor must be able to support the weight of the press.

Leveling The Press

- The press should be leveled and stabilized after it has been located. This is done by adjusting the height of each footpad then locking each footpad in position by tightening a jam nut. This task requires two 3/4" wrenches (See Fig 4-2). An adjustable wrench may also be used. Adjust the foot pad while reading the level at the tooling nut gate adapter. The universal escapement adapter must sit level for proper functioning of the feed systems.

Open Space Requirements

- PennEngineering® has no specific requirements for providing open space around the perimeter of a press. However, be sure to comply with any national or regional safety codes that may dictate otherwise. For example, In the US the National Electrical Code requires that there be at least thirty-six inches of clearance in front of the electrical enclosure. We do recommend that you at least leave enough space around the press so the various storage and maintenance enclosures can be opened fully and so the largest workpieces can be accommodated.

Original Installation Requirements

After the final installation of the press verify the continuity of the protective bonding circuit (TN-System) in accordance with EN 60204-1 Clause 18.2.2 standards.

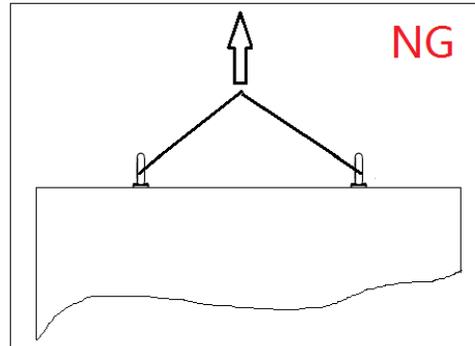
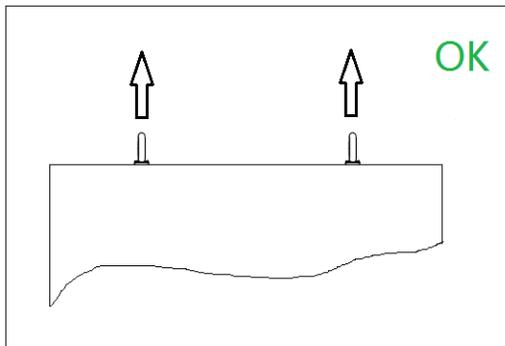
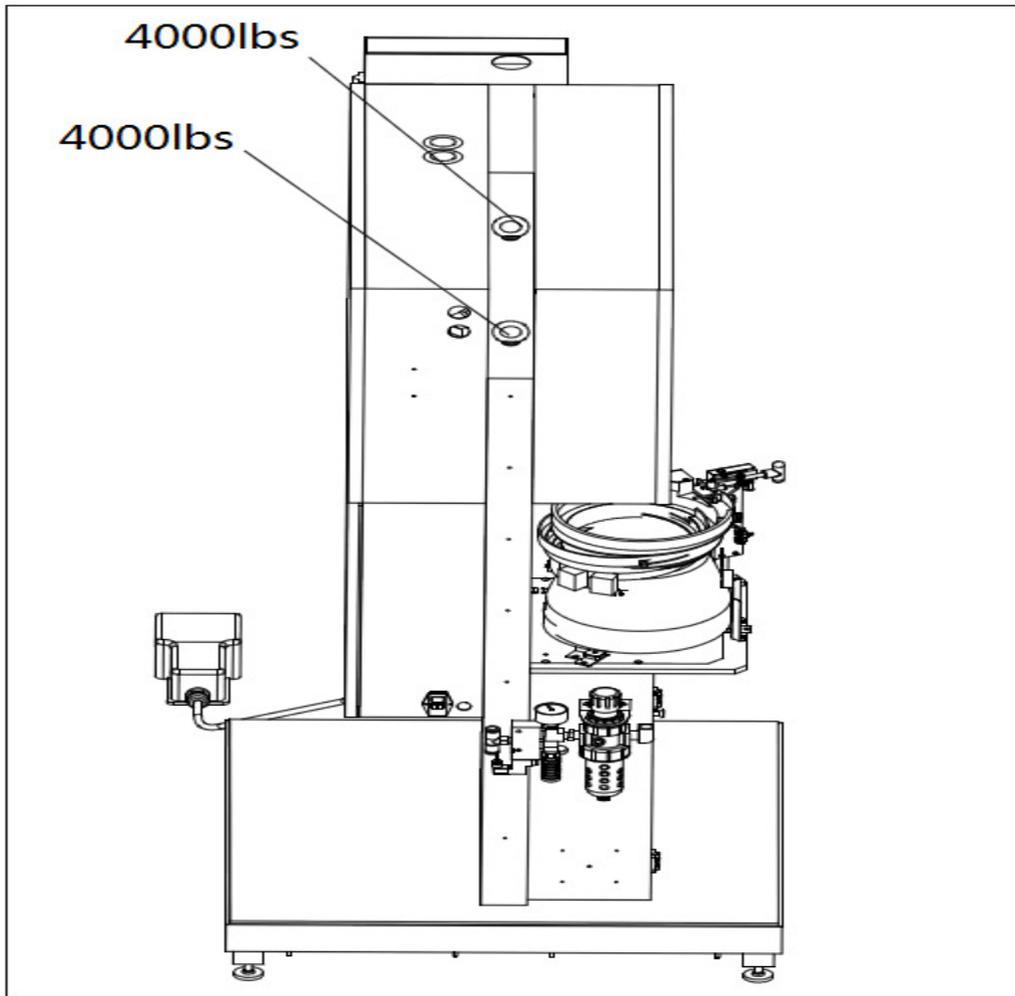


FIGURE4-1 Cable Suspension Diagram

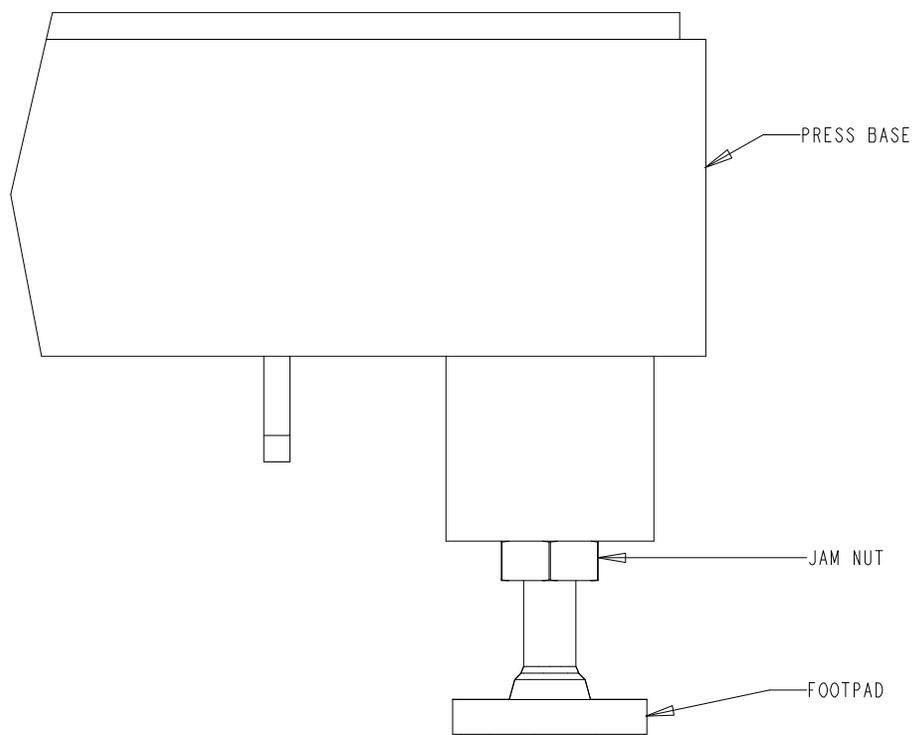


FIGURE 4 - 2
ADJUSTABLE FOOTPAD

Recommended Air Supply Hook-Up Arrangement

Proper air supply is very important to the performance and maintenance of the press. Following these simple guidelines will ensure good press performance.

- **Air Quality** - The quality of the air supply is very important. The air must be clean and dry. Moisture and debris will contaminate the oil and valve systems and lead to press performance and maintenance problems.
- **Air Supply Flow** - Use a minimum 12mm (1/2") inside diameter line and fittings from the compressed air source to the press. Shop pressure ranging between 6 to 7 BAR (90 psi to 100 psi) is acceptable. Inadequate air flow will affect press performance.
- **Air Consumption** - Air consumption in automatic mode is about 4.5 liters of compressed air per cycle. Average air consumption running at 20 KN (4500 Lbf) at 30 insertions per minute is about 7 liters/sec at 1 atm. (15 Scfm). Air Supply Flow requirements are higher than these values as air is only being consumed for half the time of each cycle.
- **Piping Installation** – Proper piping hookup will help achieve the above requirements. See figure 4-3 on the next page.
Connect to your supply line with a pipe pointing upwards that curves over and down. This arrangement will help prevent water and compressor oil from entering the press.
Connect to that drop with your supply fitting for a 12mm (1/2") or larger hose.
Continue the end of the drop to a drain valve. This will help collect additional water and oil and allow the system to be purged.
If your factory air supply falls short of the above recommendations, an air reservoir tank of an appropriate size for your location can be used.
An auxiliary filter/separator installed immediately outside the machine is recommended.

Install An Appropriate Power Cord.

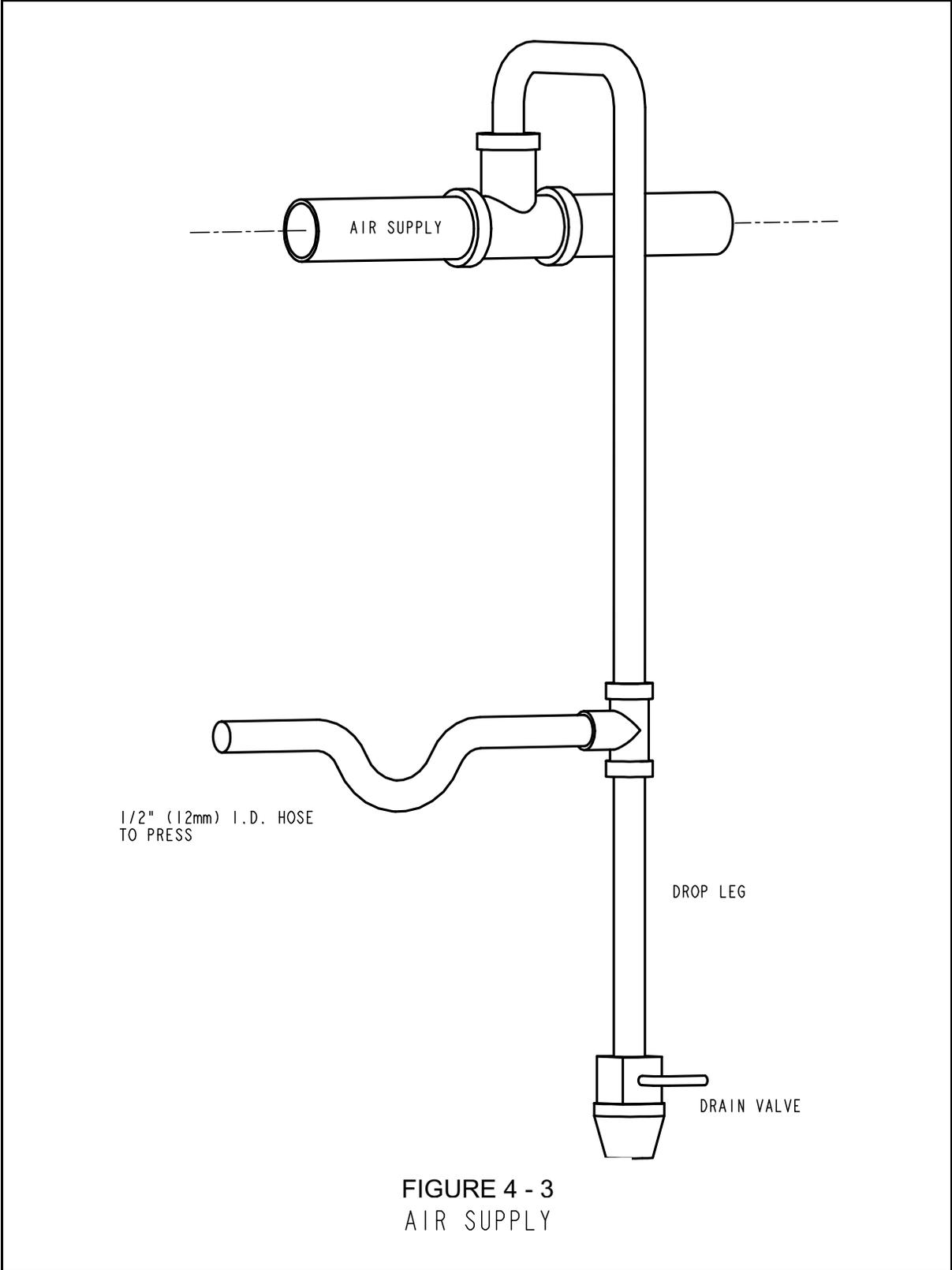
- The press is equipped with a Male IEC 320/CEE22 Universal Connector for power. Outside North America, unless special arrangements have been made, a customer supplied power cord must be installed. No other electrical system modifications are necessary. Connection should be in accordance with your local electrical code.

Install The Foot Switch

- Plug the foot switch into the receptacle located at the lower left corner of the front of the electrical enclosure.

Check The Hydraulic Fluid Level In Both Air-Oil Tanks

- Check to be sure the hydraulic fluid is level with, but not over, the fill lines on the air-oil tanks. If the fluid level is too high or too low correct the problem by following the procedures provided in section eleven of this manual.



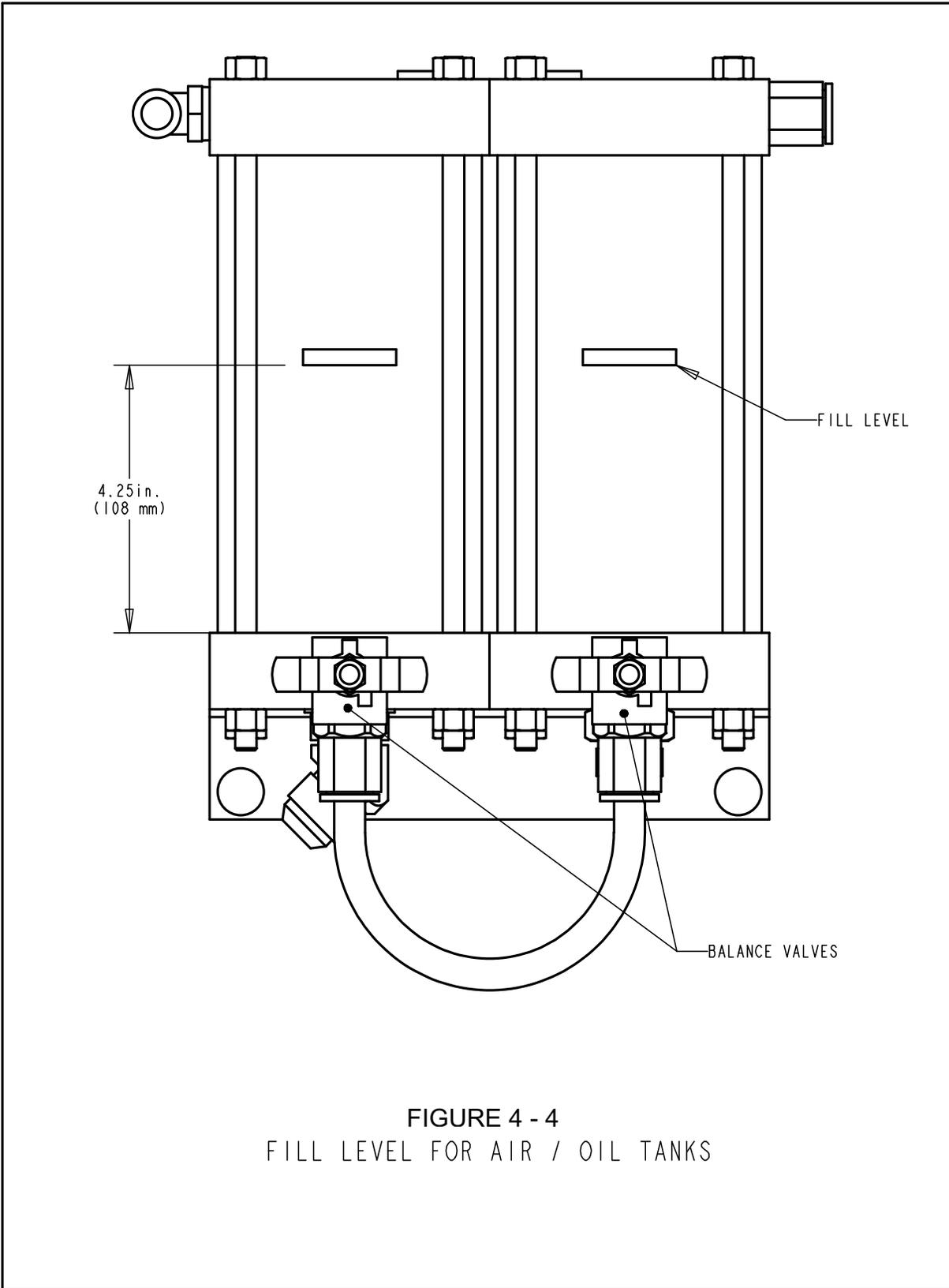


FIGURE 4 - 4
FILL LEVEL FOR AIR / OIL TANKS

SECTION 5

GENERAL FUNCTION DESCRIPTIONS

System Function:

The function of a **PEMSERTER® SERIES 2000® FASTENER INSTALLATION PRESS** is to safely, quickly and consistently install PEM® brand self-clinching fasteners in various types of sheet material. To do this the press uses:

- A patented point-of-operation safety system that controls the descent of the ram and does not allow the ram to descend if it contacts any object other than the intended fastener and workpiece.
- Automatic fastener feeding system that locates the fastener at the point of insertion, so that the operator is free to handle just the workpiece.
- Air-oil-booster system that provides quick ram travel with high installation forces at the point of insertion.
- Precise installation tools and computer controlled installation forces.

Self-clinching Fastener Installations:

PEM® self-clinching fasteners are installed into punched or drilled holes in ductile sheet material. To install a PEM® self-clinching fastener:

- The shank of the fastener is placed into the installation hole until the part of the fastener that is larger than the hole called the displacer (such as the knurls for nuts, or the head for standoffs) sits on the edge of the hole.
- A parallel squeezing force is applied to press the displacer (overhanging part) of the fastener into the sheet material.
- The force causes the sheet material to cold flow into the undercut of the fastener that is between the displacer and the shank. This traps the fastener within the sheet metal.

Setting up the Press:

The following section of the manual describes the setup process in general. For details on setting up and operating the press see the appropriate section in the manual.

Step 1 - Setup Tooling

Tooling setup consists of selecting appropriate tooling for the fastener being fed and the workpiece, installing the tooling on the press and adjusting the feed controls.

Different types of tooling that feed the same size fastener are selected for accessing different shapes and sizes of work pieces.

See the Tooling Section of this manual on selecting the right tooling.

Step 2 - Select the Setup for the Tooling and Fastener on the Touchscreen

Once the tooling is installed, the next step is to setup the press by using the touchscreen. The touchscreen setup is simple and can be done one of three ways.

- **New Tool Set-up** – Choose tooling mode, fastener size and workpiece material.
- **Recall A Job** – Select from a previously programmed Job stored in the press
- **Recall Last Job** – Run the same Job that was just run, the press remembers, even if it is turned off between jobs.

See the Touchscreen Controls section of this manual on choosing the right selections for setup.

When the selections are complete, the press automatically sets the values for operation and moves onto safety setup.

Step 3 - Safety Setup

The next step is very quick and simple but very important.

Safety Setup is the step where the press learns the position of installation called the Safety Set point. The operator positions the materials for an installation, but the press does not actually install the fastener. The ram extends and touches the fastener and workpiece. The touch point teaches the press where the proper installation point should be. The Press is ready to install fasteners.

Fastener Automatic Feed Functions:

Automatic Fastener Feeding is done from the vibratory feeder bowl to the insertion point in the workpiece. The following steps are taken:

- The vibratory feeder bowl moves the fasteners around the bowl and past a tooling component called a nutgate for nut-type tooling or an escapement for stud-type tooling.
- The fasteners are oriented in the tooling and fed into a tooling shuttle. The shuttle takes the first fastener and separates it from the rest. That fastener is blown with compressed air out of the shuttle into a plastic tube that leads to the punch and anvil area.
- Depending on the type of tooling the fastener is either fed directly into a tooling module like a stud-injector module or bottom feed nut module or into a set of jaws on the top feed slide and gripper system.
- During a top-feed tooling installation, the fastener is picked up from the jaws either by a vacuum punch or pin punch and the jaws open and pull back.
- The workpiece is placed with the installation hole onto either a fastener or tooling guide pin. When the operator has located the workpiece, the foot pedal can be depressed to begin the installation process.

Installation Process:

- When the foot pedal is depressed, the ram extends down quickly bringing the punch to the workpiece.
- When the fastener contacts the workpiece the safety sensors are tripped. The Press Control System checks that the position called the insertion point, is at the same position as the learned position at setup, the safety set point. Only if the insertion point is within a certain range of the safety set point, does the installation proceed.
- If the insertion point is good then the high installation force is applied to install the fastener and the ram returns up.

Special Features and Conditions:

- **Dwell/Force Verification (Quality Assurance System)** – Dwell time is the period of time from when the press control system starts the high force cycle to when the high force cycle ends. The Dwell software system monitors pressure feedback signals throughout the cycle to assure a quality installation.
- **Soft Touch Mode** – When running in Soft Touch Mode the press will slow down just before contacting the workpiece and fastener. This mode is slightly slower, but can insure against damage to soft and brittle work pieces.
- **Interrupted Mode** – When running in Interrupted Mode the press will slow down and stop upon contacting the workpiece and fastener. This mode is the ultimate in assurance just before installation that a workpiece or layers of work pieces are properly aligned.
- **Setpoint Tolerance** – Can be selected for Standard Tolerance or Narrow Tolerance. Narrow Set point Tolerance sets a smaller range for the allowed deviation of each installation from the Safety Set point. Narrow Tolerance is used for smaller fasteners and more precise operations to assure proper installation in the workpiece hole. This mode is less tolerant of work pieces not held level and poor hole quality or hole debris.
- **Start at Minimum Setup** – This mode changes the setup sequence. Instead of pre-selecting a force at setup, the press interrupts the dwell time of the first installation and allows the operator to adjust the force as the fastener is being installed. This function allows for the most precise installation force setup. Once the installation force is established, it can be saved within one of the Recall Job memory locations.
- **Fastener Length Monitoring (FLM)** – This mode requires optional tooling hardware to be installed. During the automatic fastener feeding process for long fasteners such as stud and long standoffs, the length of each fastener is checked to insure that it is the correct length. If a fastener is too long or short, it is rejected and not installed. During shop operation, fasteners of different lengths can become mixed. Long fastener tooling is typically designed to accept various lengths of fasteners to increase the value of the tooling and decrease the costs of installing different size fasteners. FLM Hardware and Software can be setup to check for any length fastener.
- **Safety Fault Error** - If the difference between the insertion point and the safety set point is outside the range of the set point tolerance then a safety fault error condition occurs. When a safety fault occurs the redundant safety valves close, immediately stopping downward ram motion. The ram reverses direction and retracts the punch. The safety assembly on the end of the ram never fully compresses and the boost cycle is never initiated.

SECTION 6

TOUCH-SCREEN CONTROLS

A programmable logic controller (PLC) controls the functions of the Series 2000™. The operator sends commands to the PLC and reads data from the PLC through a system of menus and information displayed on the touch screen. An operator need only touch the buttons displayed on the touch screen to make a selection.

The touch screen controls allow the operator to setup the press for operation, operate special functions and maintain and troubleshoot the press.

The following sections describe the information and functions available on each of the screens. Below each screen is a description of the information and functions available on the screen. Each button that leads to a different screen is listed with the section of this document that describes the next screen.

Number Entries (Pop-Up Key Pad Function)

In several of the screens where a number must be entered, a special feature is used, called a pop-up keypad. Each digit of the number is entered by pressing the specific number button. The Number Entry is not accepted until an Enter button is pressed. Where decimal points are a part of the number, the placement is established.

HELP Screens

Help Screens are available throughout the touchscreen system of menus. They offer immediate explanations of the functions on the screens like the ones in this document.

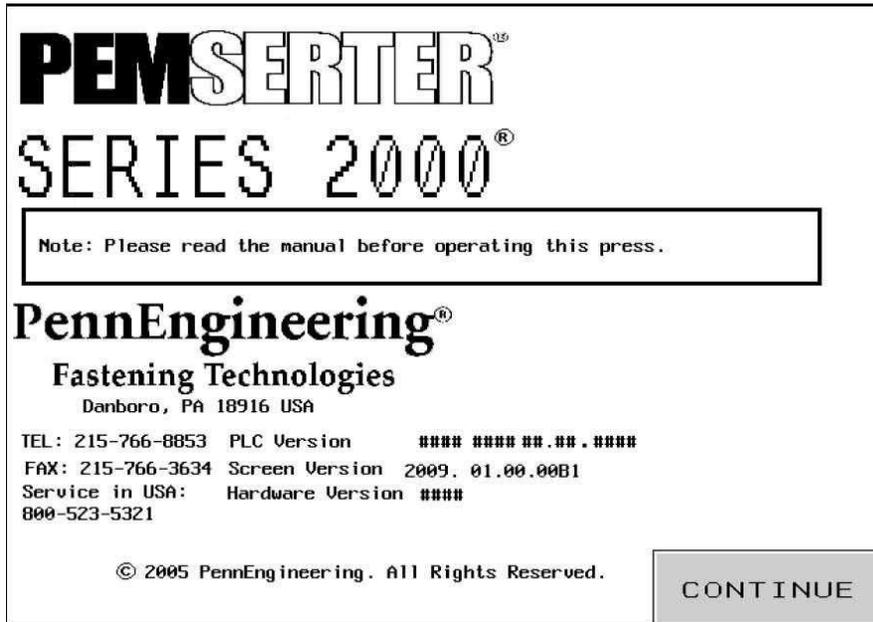
The Help Screens are online documentation. Actual pictures of the Help screens are not included in this documentation. The buttons on the Help screens all function in the same way.

[BACK] – Returns the touch screen control back to the screen where the Help Screen was originally called from.

[NEXT] – Proceeds to the next Help Screen available on the same topic. Some help buttons may have more than one page of information.

[PREVIOUS] – Returns to the previous Help Screen.

6.1 Title Screen



When the system is powered up, “Connecting to Host” appears for one second, before displaying the “PEMSERTER[®]” title screen. The Touch Screen’s “Host” is the PLC. Here you may find the PennEngineering[®] and our Sales Representative’s addresses and phone numbers.

“PLC Version” is the version number of the PLC software.

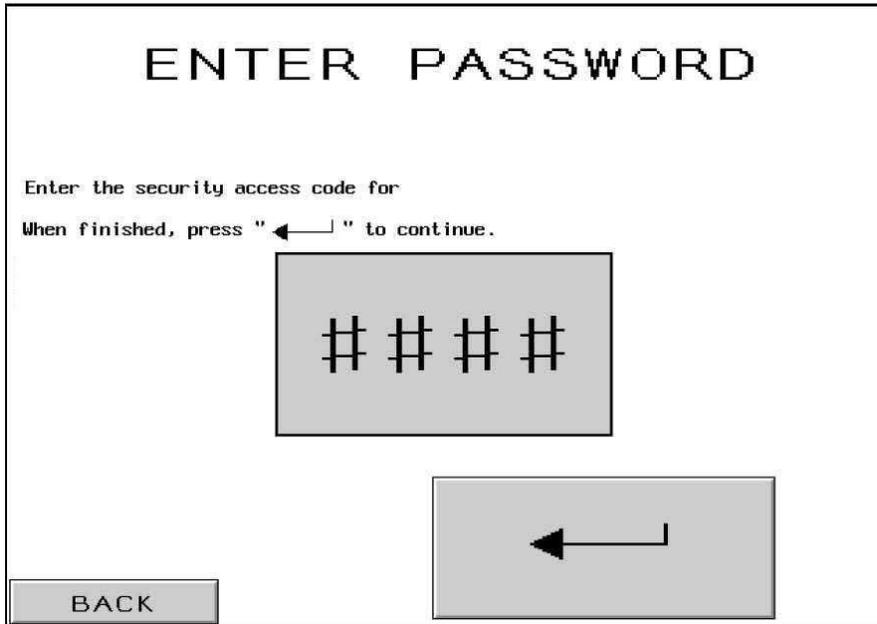
“Screen Version” is the version number of the Screen software.

“Hardware Version” is the model number of the press.

[CONTINUE] → to → 6.2 Access Code Screen

Dual Language Option: PEMSERTER[®] Presses are sold worldwide. The touchscreen menus can be ordered in different available languages. Also a single press can be equipped with touchscreen software that can display text in one of two languages by selecting on screen. If the press is equipped with a Dual Language Option, there will be two CONTINUE buttons, one for each language. The press will function identically; independent of what language the screen is displaying.

6.2 Access Code Screen



This screen appears and limits access to different levels of functions depending on which access codes have been established. See 6.20 Access Code Setup Screen. If the access code is set to 0000 then this screen will be bypassed and the touchscreen menu will proceed to the next function. This same screen appears in different places for Operator Access, Setup Access and Maintenance Access.

To proceed to the next screen:

Enter the Correct 4-digit Access Code.

[←] – Proceeds to the appropriate screen

If in Operator Access Screen – Proceeds to Mode Selection

→ to → **6.3 Mode Selection Screen**

If in Setup Access Screen - Proceeds to Run Value Change screens

→ to → **6.x Force, Dwell, Blower, or Run Parameters Screen**

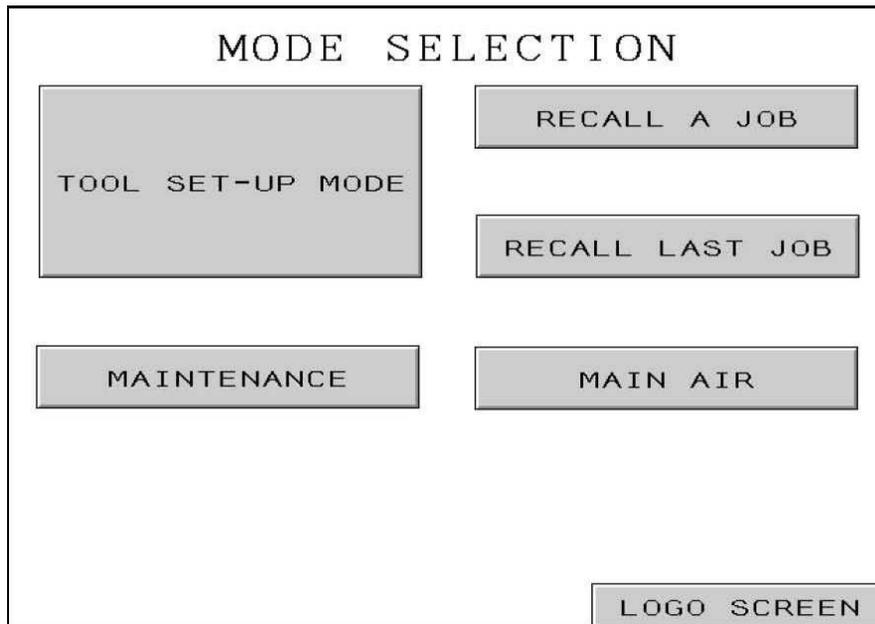
If in Maintenance Access Screen - Proceeds to Maintenance Menu Screen

→ to → **6.16 Maintenance Menu Screen**

If the code is entered incorrectly, an audible alarm is sounded.

If the access code is forgotten, call your PennEngineering® Service Representative.

6.3 Mode Selection Screen



This screen allows you to enter into a selected type of installation setup procedure or maintenance mode, and to toggle certain operations.

[TOOL SET-UP MODE] – Proceeds to a setup process, which allows the operator to select the installation mode, fastener size, material type and to change the installation force.

→ to → **6.4 Tooling Selection screen**

[RECALL A JOB] – Proceeds to a menu of previously setup jobs.

→ to → **6.14 Recall Job screen**

[RECALL LAST JOB] – Proceeds directly to safety setup of press using the values defined in the last setup, even if the press had been turned off.

→ to → **6.8 Safety Setup Procedure screen**

[MAINTENANCE] –

If the Maintenance access code has been set this button proceeds to the Maintenance Access Screen

→ to → **6.2 Access Code screen**

If the Maintenance access code has been set to 0000 this button proceeds to the Maintenance Menu Screen directly

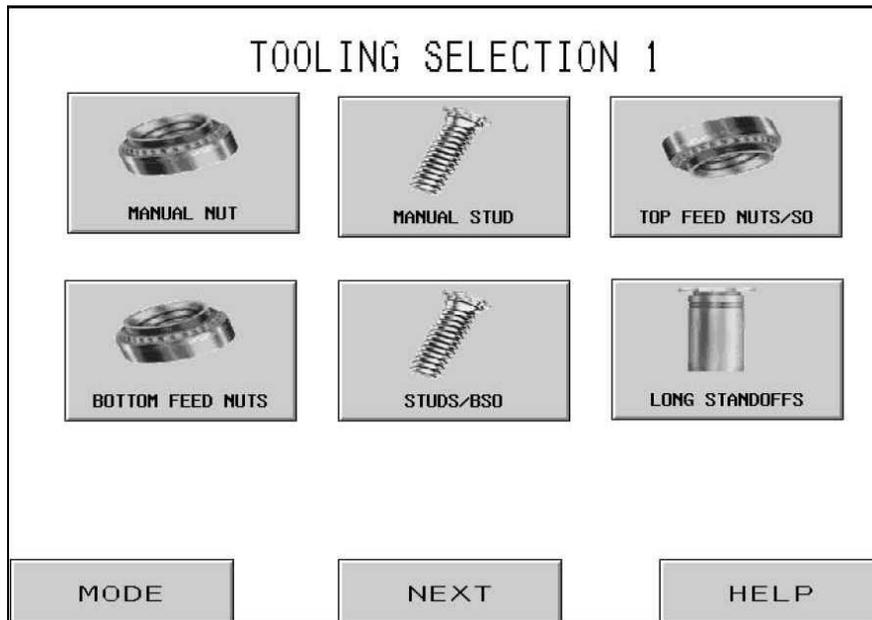
→ to → **6.16 Maintenance Menu screen**

[MAIN AIR] – Turns the main air on and off.

[LOGO SCREEN] – Returns to main title screen

→ to → **6.1 Title screen**

6.4 Tooling Selection Screen 1



There are two screens of tooling mode selections to choose from. This is the first one. It is very important to select the correct tooling mode to match the installation tools and fastener that is being installed. Selecting a different tooling mode will cause the press to operate differently. After selecting a tooling mode the control screen will automatically proceed to the proper setup screen.

[MANUAL NUT] or [MANUAL STUD] – Manual Mode means that the operator must manually place a fastener and no automatic feeding is enabled. Fastener and workpiece must be manually placed together between the tooling. Selecting Nut or Stud mode changes the recommended installation forces and the safety window tolerances.

→ to → **6.6 Size and Material screen**

[TOP FEED NUTS/SO] – Top Feed Nut and Short Standoff Mode is for automatic feeding of nuts to the Top Feed Hanger Assembly, for punch pick-up through the internal hole of the fastener. See Tooling Section for description of tools and operation.

→ to → **6.6 Size and Material screen**

[BOTTOM FEED NUTS] – Bottom Feed Nut Mode is for automatic feeding of nuts to a Bottom Feed Module Tool mounted on the anvil holder. See Tooling Section for description of tools and operation.

→ to → **6.6 Size and Material screen**

[STUDS/BSO] – Top Feed Stud and Blind Standoff Mode is for automatic feeding of studs and blind standoffs to the Top Feed Hanger Assembly, for punch pick-up by vacuum. See Tooling Section for description of tools and operation.

→ to → 6. 6 Size and Material screen

[LONG STANDOFFS] – Top Feed Long Standoff Mode is for automatic feeding of longer standoffs to the Top Feed Hanger Assembly, for punch pick-up through the internal hole of the fastener. See Tooling Section for description of tools and operation.

→ to → 6. 6 Size and Material screen

[MODE] – Returns to Mode Selection Screen

→ to → 6.3 Mode Selection screen

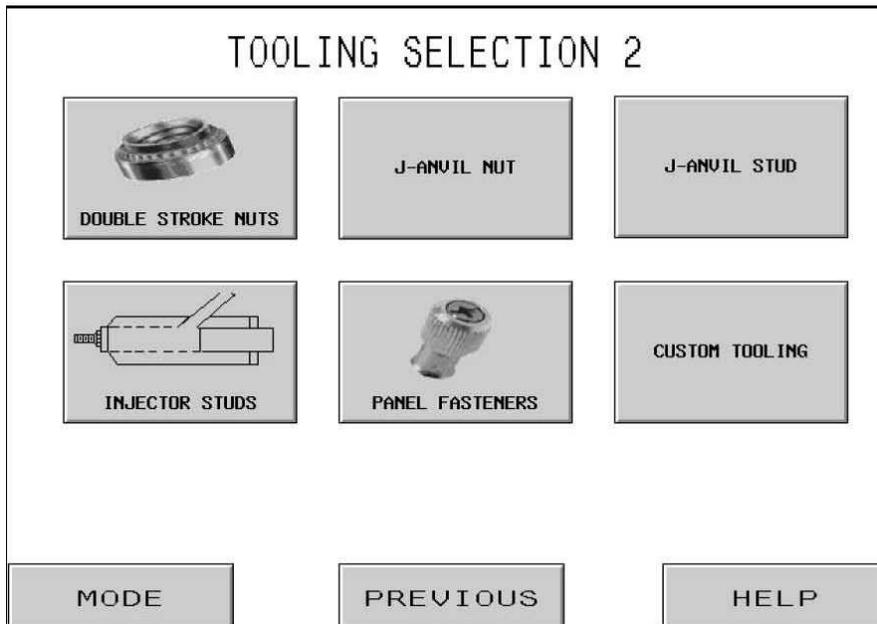
[NEXT] – Proceeds to an additional Tooling Selection Screen

→ to → 6.5 Tooling Selection Screen 2

[HELP] - Mode Selection Help Screens

→ to → Help Screens

6.5 Tooling Selection Screen 2



There are two screens of tooling mode selections to choose from. This is the second one. It is very important to select the correct tooling mode to match the installation tools and fastener that is being installed. Selecting a different tooling mode will cause the press to operate differently. After selecting a tooling mode the control screen will automatically proceed to the proper setup screen.

[DOUBLE STROKE NUTS] – Top Feed/Bottom Installation Double Stroke Nuts Mode is for automatic feeding of nuts to the Top Feed Hanger Assembly, for punch pick-up through the internal hole of the fastener and deposit onto a double stroke bottom installation anvil. See Tooling Section for description of tools and operation.

→ to → **6. 6 Size and Material screen**

[J-ANVIL NUT] or [J-ANVIL STUD] – J-Anvil Nut or Stud is a manual installation mode with the Top Mount Anvil Holder installed. See Tooling Section for description of tools and operation. Selecting Nut or Stud changes the recommended installation forces and the safety window tolerances.

→ to → **6. 6 Size and Material screen**

[INJECTOR STUDS] – Injector Studs Mode is for automatic feeding of studs to an Injector Module Tool mounted on the ram. See Tooling Section for description of tools and operation.

→ to → **6. 6 Size and Material screen**

[PANEL FASTENERS] – Panel Fastener Mode is for automatic feeding of Large Head Panel Fasteners to the Top Feed Hanger System for punch pick-up with vacuum. See Tooling Section for description of tools and operation.

→ to → **6. 6 Size and Material screen**

[CUSTOM] – Custom Mode is for special custom modes defined especially for specific fasteners and applications. See Documentation that accompanied tooling for description of tools and operation.

→ to → **6. 6 Size and Material screen**

[MODE] – Returns to Mode Selection Screen

→ to → **6.3 Mode Selection screen**

[PREVIOUS] – Returns to previous Tooling Selection Screen

→ to → **6.4 Tooling Selection Screen 1**

[HELP] - Mode Selection Help Screens

→ to → **Help Screens**

6.6 Size and Material Selection Screen

SELECT FASTENER SIZE, and

M2.5 #2	M3 #4	M3.5 #6	M4 #8
------------	----------	------------	----------

Back to Tooling Selection

M5 #10	M6 1/4	M8 5/16	M10 3/8
-----------	-----------	------------	------------

WORKPIECE MATERIAL

ALUM/COPPER	COLD-ROLLD.STL	STAINLS.STL
-------------	----------------	-------------

This screen allows the operator to select the fastener size being installed and workpiece material it is being installed into. Based on the operators selections, the Series 2000:

- 1) Limits the maximum installation force for operator safety.
- 2) Selects automatic feeding function settings
- 3) Presets a suggested installation force

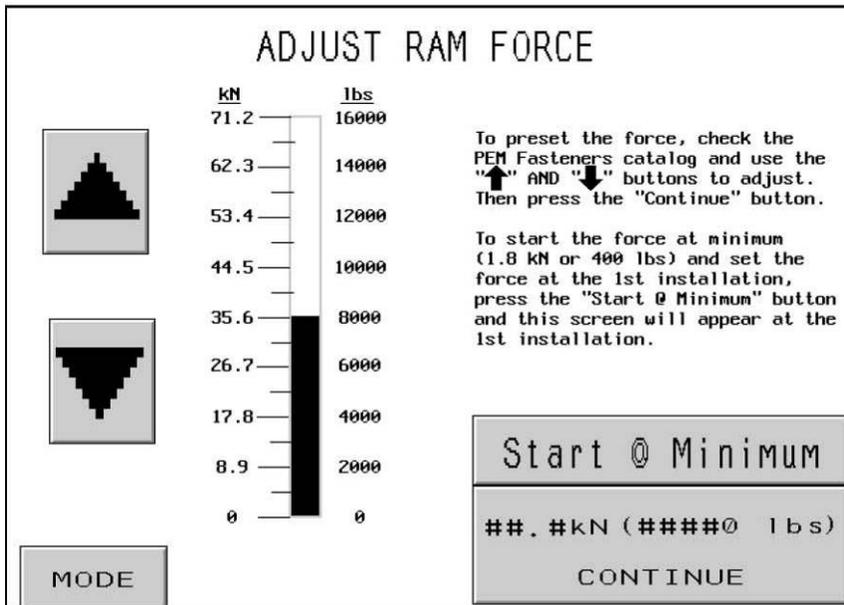
[ANY SIZE] + [ANY MATERIAL] – Select a size or material, after selecting one, the operator can change the selection just by pressing a different selection. As soon as BOTH a size and a material is selected the setup process will move onto the Ram Force Adjustment Screen.

→ to → **6.7 Ram Force Adjustment Screen**

[BACK to Tooling Select] – Returns to Tooling Selection Screen

→ to → **6.4 Tooling Selection Screen 1**

6.7 Ram Force Adjustment Screen



When this screen appears a recommended installation force will be preset. The operator can continue with the recommended setting, or adjust the value and then continue or select Start @ Minimum mode.

[↑] – Increases Force Setting up to limit imposed by fastener size and workpiece material setting.

[↓] – Decreases Force Setting down to minimum

[MODE] – Returns to mode selection screen.

→ to → **6.3 Mode Selection Screen**

[START @ MIN.] – Proceeds to the Safety Setup Screen in Start at Minimum Force mode. In this mode, at the first installation stroke ONLY, the ram will remain down. The press will display this Force Selection screen again, with the force at minimum. Using the arrows, the operator can adjust the actual installation force being applied gradually. The operator can observe the installation process and stop at the minimum force necessary for delicate operations. After the Force is set the next installation will proceed normally. The operator will still be allowed to readjust that force value from the Run Mode screen.

→ to → **6.8 Safety Setup Procedure Screens**

[CONTINUE] – Continues Setup Process or Returns to Run Mode if done setting the force at Start @ Minimum Mode.

If in Continuing with Setup the next screen will be safety setup.

→ to → **6.8 Safety Setup Procedure Screens**

If in making a force adjustment from Run Mode or START @ Minimum the screen will return to run mode.

→ to → **6.9 Run Mode Screen**

6.8 Safety Setup Procedure Screens

SAFETY SET UP PROCEDURE:		xxxx
<ol style="list-style-type: none"> 1. If there is no fastener in the ready position, press Manual Feed. 2. If not using 'Nut, Double Stroke', go to step 3. If using 'Nut, Double Stroke', with no workpiece in place, press the foot pedal. The ram will descend, collect the part, and place it on the anvil, shank up. Go to step 3. 3. For ALL BOTTOM feed applications, place the workpiece with the mounting hole over the shank of the fastener. Go to step 4. For ALL TOP feed applications, place the workpiece with the mounting hole over the pin in the anvil. Go to step 4. 4. Press the foot pedal. The ram will descend and establish the safety setpoint. The safety setpoint will be set and the system will automatically advance to the run screen. Repeat the safety setup procedure if the Attention screen appears. 		
JOB SUMMARY		
REF#	####	Force S/P: ## kN (#### @ lbs.)
Tooling:	XXXX	MANUAL Dwell #.## seconds
Workpiece:	XXXX	Blower Timer: #.## seconds
Size:	XXXX	Fasteners/Workpiece: ####
MODE		MANUAL FEED

If the press was setup in a fastener feeding mode, the system will automatically feed a fastener to the insertion area.

This screen directs the operator to check that the fastener and workpiece is properly setup for the safety position learn sequence and directs the operator to initiate the sequence. The instructional text may differ, depending on the tooling mode selected.



It is very important that the fastener and workpiece be held flat to the top of the anvil. (see Section 10)

The last step of each every sequence directs the operator to Depress The Footpedal. The Ram will extend down and touch the fastener and workpiece and return back up, without installing the fastener. The PLC uses this step to learn the position at which it is safe to install, called the Safety Setpoint.



It is very important that, at the bottom of the ram stroke when the ram contacted the fastener and the work piece, that the fastener was fully in the workpiece hole and both were flat to the anvil. If this did not occur, use the Re-setup function on the run screen to repeat the process. See 6.9 Run Mode Screen for Re-Setup details. (see Section 10)

[MODE] – Returns to mode selection screen.

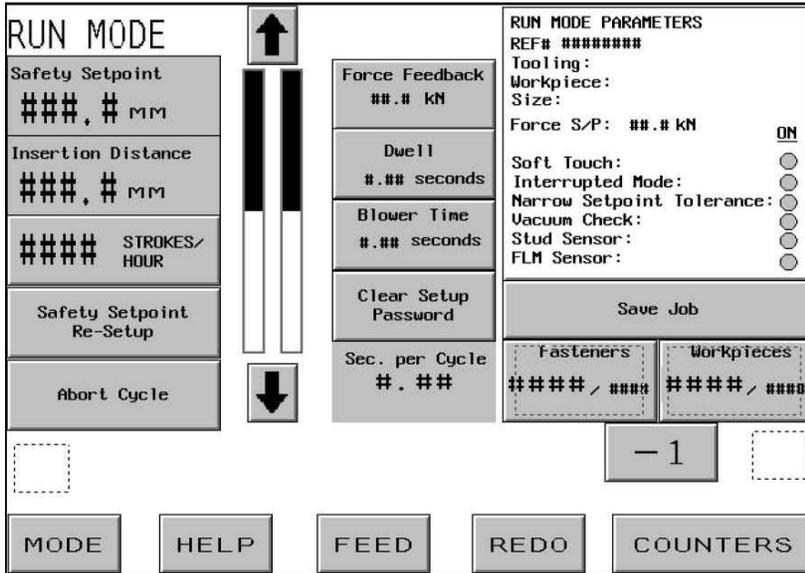
→ to → 6.3 Mode Selection Screen

[MANUAL FEED] – Initiates a feed sequence to bring a fastener into position for the safety learn sequence, if first fastener lost.

(Successful Learn Sequence) – After the operator performs a successful safety setup operation the screen will automatically move onto the Run Mode, ready to install the fastener.

→ to → **6.9 Run Mode Screen**

6.9 Run Mode Screen



This screen functions as a main control panel while the press is operating in production mode. Various buttons and displays on the screen perform the following functions:

SAFETY SETPOINT – Displays the current value of the learned touch position for a safe installation.

INSERTION POINT – Displays the value of the touch position of the last attempted installation, successful or not

[STROKES/HOUR] – Button/Display, Displays a counter of the average rate of good insertions. This value resets to zero after each setup. Press the display button to turn this feature on or off. If this feature is off, the display will be 0, all the time.

[SAFETY SETPOINT RE-SETUP] - Enables the press to learn a new Safety Setpoint, without leaving RUN mode. Touch this button and the button flashes. Depress the foot pedal and the press will perform a learn sequence and reset the Safety Setpoint to the new position. The press WILL NOT perform an insertion. (See 6.8 Safety Setup Procedure Screen)

[ABORT CYCLE] - Cancels an Interrupted Cycle at the wait point and allows the operator to start over again.

Ram Position Display Bars –

Left Display Bar – Indicates the adjusted return position of the ram. The dark bar represents the amount of extension of the ram. A white bar indicates that the ram will fully retract. A half-dark and half-white bar indicates that the ram will retract half way. The lowest setting for the return position is approximately 25mm (1 inch) above the safety setpoint. The arrow buttons on either end of the bar display are used to change the return position of the ram. This function can be used to reduce the stroke in certain modes and increase cycle rate. This function is disabled for tooling modes requiring the Top Feed System. The two arrow buttons are dark when they are enabled and light when they are disabled.

[↑] – Raises the return position of the ram.

[↓] – Lowers the return position of the ram.

Right Display Bar – Indicates real-time position of the ram. Use this for diagnostic purposes.

[FORCE FEEDBACK] – Button/Display, Displays the actual insertion force calculated from the hydraulic ram pressure. This value resets to zero at the beginning of an insertion attempt and displays the insertion force during insertion. The value at the end of insertion is locked until the next insertion attempt. Touch this button to go to the screen to adjust the preset force.

**This button is SETUP access password protected. See 6.2 Access Code Screen and 6.20 Access Code Setup Screen
→ to → 6.7 Ram Force Adjustment Screen**

[DWELL] – Button/Display, displays set total insertion dwell time. Touch this button to go to the screen to adjust the dwell time.

**This button is SETUP access password protected. See 6.2 Access Code Screen and 6.20 Access Code Setup Screen
→ to → 6.10 Smart Dwell Time Screen**

[BLOWER TIME] - Allows the blower time for automatic feed modes to be adjusted. The blower time is the duration that the air stays on to blow the fastener from the shuttle mechanism through the feed tubing to the insertion area. Touch this button to go to the screen to adjust the blower time.

**This button is SETUP access password protected. See 6.2 Access Code Screen and 6.17 Access Code Setup Screen
→ to → 6.11 Blower Time Adjustment Screen**

[CLEAR PASSWORD] – This button flashes after a SETUP access code is entered at one of the protected functions. While the button is flashing, the operator can access any of the protected functions without re-entering the SETUP access password again. Touching this button clears the SETUP access code, the button will stop flashing, and the next time a protected function is selected the access code screen (see 6.2) will appear again.

[RUN MODE PARAMETERS] – **Button/Display** displays job setup information, including mode selections. The dark filled circles indicate the mode is activated. Touch this button to go to the run mode parameter screen.

→ to → 6.12 Run Mode Parameters Screen

[SAVE JOB] – Allows the operator to save the current settings of the Run Mode into a preset memory location for Recall with the Recall Job function. The Save function will save the following settings:

Tooling Mode	Workpiece Complete Notify Setting
Fastener Size Selection	Soft Touch Mode Setting
Workpiece Material Selection	Cycle Mode (Continuous/Interrupted)
Preset Force	Setpoint Tolerance (Standard/Narrow)
Blower Time	Safety Fault Auto Reset Mode
Dwell Time	Vacuum Check Mode
Fasteners/Workpiece Count	Stud-In-Tube Sensor Mode
	Fastener Length Monitoring Mode

A summary of some of this information is displayed in the Summary Box.

Current Workpiece and Fastener Counts and Workpieces/Batch WILL NOT be saved.

Any adjustments made to the recommended values will be saved with the job. If Fasteners/Workpiece Count is set, when the job is recalled, the count will be set to zero but will be enabled and start counting. If it is desired for the counter not to be enabled for every job, set the counter to zero.

→ to → 6.14 Store Job Screen

[FASTENERS] – Display/Button, The first larger number is the current number of fasteners installed in the current workpiece. Touch and hold this button to reset the count to 0. The second smaller number is the number of fasteners per workpiece, set at the counters screen, see below. When the first number reaches the second number the workpiece will be complete and the fastener count will automatically reset to zero. The second number does not change during run.

[WORKPIECES] – Display/Button, The first, larger number is the current number of workpieces completed since the last reset of this counter. Touch and hold this button to reset the current count to 0. The second smaller number is the number of workpieces per batch, set at the counters screen, see below. When the first number reaches the second number the batch will be complete and the workpiece count will automatically reset to zero. The second number does not change during run.

[-1] – Shift Decrement Button, Touch this button and touch either the Workpieces Button or the Fasteners Button to decrement the current count by 1.

[COUNTERS] - Allows the Workpiece and Fastener Counters to be set. Touch this button to go to the screen to set both counters.

→ to → 6.15 Counters Setup Screen

[REDO] – In any automatic tooling mode, it enables the press to attempt another insertion without feeding another fastener. Touch this button and the button flashes. Depress the foot pedal and the ram will extend, insert and return again without feeding a new fastener. The Safety Window becomes set to the standard tolerance during the REDO cycle *only*, negating “Narrow Setpoint Tolerance” for just the redo stroke. If it is enabled, touching the button again will disable it. This function can be used for a restrike of a partially installed fastener or for a manual insertion during an automatic feed run without leaving the run screen.

[FEED] - By pushing this button the operator can cause the system to feed another fastener to the workpiece area, without activating the ram. This feature is used only if a fastener is lost during the standard feed process.

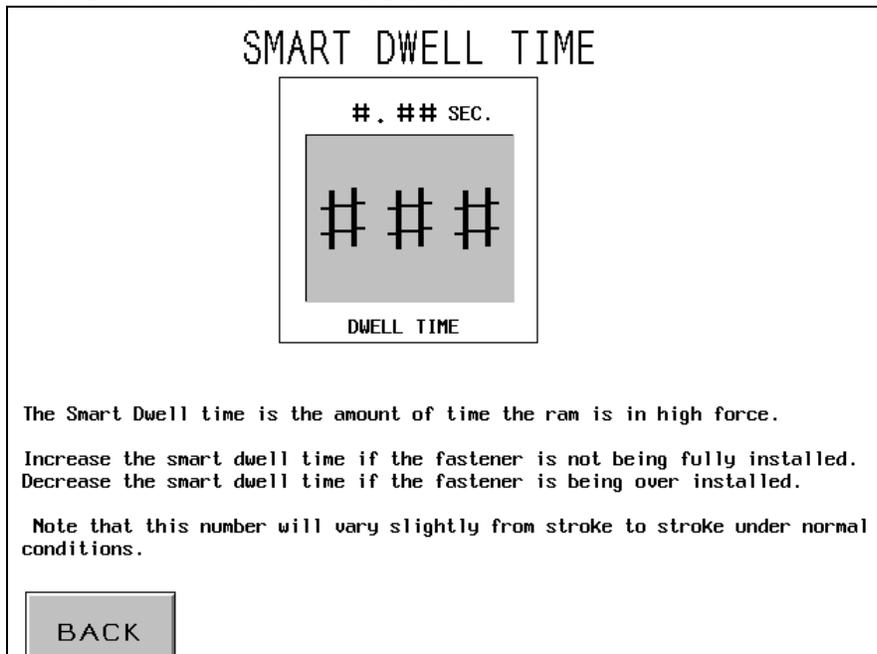
[HELP] – Run Mode Help Screens

→ to → Help Screen

[MODE] – Returns to mode selection screen.

→ to → 6.3 Mode Selection Screen

6.10 Smart Dwell Time Screen



This screen allows the operator to adjust the set dwell time.

Smart Dwell Time

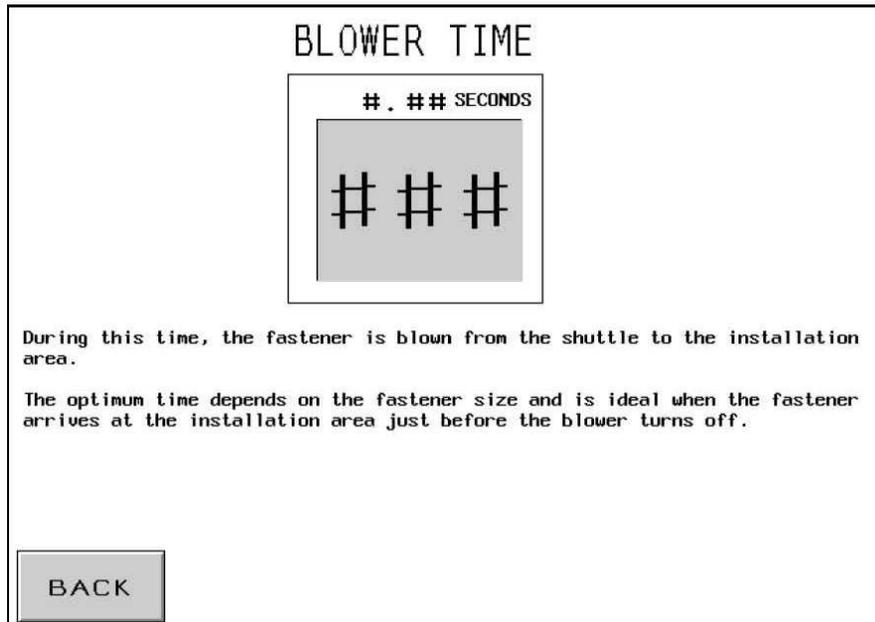
Set the value with the pop-up keypad (0.00-2.99 sec). If the dwell time is set to 0.00 the press will reach high force and end the installation stroke. If high force is not reached after 3.00 seconds the press will fault.

Example: Dwell Time = 0.25. The press will reach high force and then wait 0.25 seconds before ending the installation stroke. If high force is not achieved after a fixed time of 3.00 seconds, a “Force Too Low” alarm will occur.

[BACK] – Returns to Run Mode screen.

→ to → **6.9 Run Mode Screen**

6.11 Blower Time Adjustment Screen

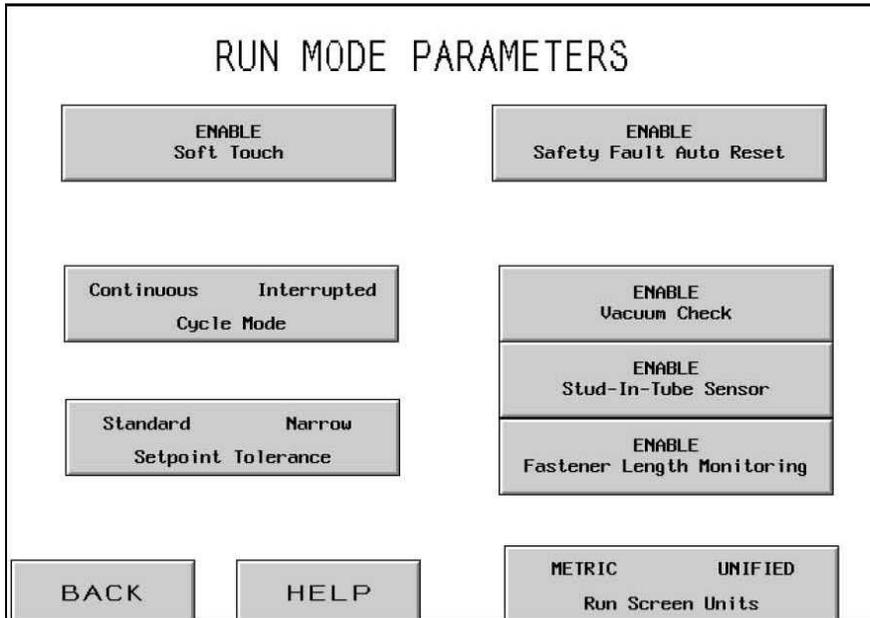


This screen allows the operator to adjust the fastener feed blower time. The initial setting of this time is preset to the suggested values based on the fastener size selection. Use the pop-up keypad to adjust each digit of the values.

Blower Time – Is displayed in seconds with a maximum setting of 2.00 sec. It is the duration that the air stays on to blow the fastener from the shuttle mechanism through the feed tubing to the insertion area. Increasing this value will insure that the fastener is properly fed to the insertion area. Decreasing this value will reduce the cycle time for each insertion.

[BACK] – Returns to Run Mode screen.
→ to → 6.9 Run Mode Screen

6.12 Run Mode Parameter Screen



This screen functions as a main control panel while the press is operating in production mode. Various buttons and displays on the screen perform the following functions:

[ENABLE SOFT TOUCH] – This button will turn the Soft Touch mode on and off. With Soft-Touch mode ON the ram will decelerate before contacting the fastener/workpiece and coast to a stop immediately before collapsing the safety housing (note that all of the safety features are still operational during this mode). Once the ram has come to a stop, the booster turns on to complete the high force installation process. Soft Touch mode is suggested when installing into soft materials (i.e. PCBs) or during applications where hard installation marks are detrimental to the workpiece.

[CONTINUOUS/ INTERRUPTED CYCLE] – Button/Display, Displays what mode the press is operating in Continuous Cycle Mode or Interrupted Cycle Mode. Touch this button to toggle between the two modes.

Continuous Cycle Mode – When the operator depresses the foot pedal, the ram will complete a full insertion cycle, extend, insert the fastener and return.

Interrupted Cycle Mode – When the operator depresses the foot pedal, the ram will extend, STOP and WAIT. When the operator depresses the foot pedal again, the ram will insert the fastener and return. This provides for some specialized applications, the opportunity to examine or adjust the fastener/workpiece positions just before the actual insertion.

[STANDARD/NARROW SETPOINT TOLERANCE] – Toggles the Setpoint Tolerance window from Standard to Narrow. Standard tolerance allows for normal variations of workpiece and fastener dimensions and operator handling of the workpiece. Narrow tolerance requires more precise dimensions and operator handling. A narrow tolerance is typically used for the most delicate workpieces with consistent thickness.

[ENABLE SAFETY FAULT AUTO RESET] – This button turns Auto Reset function on and off. In Auto Reset mode, if a safety fault occurs, the operator is not required to touch the screen to reset. These two safety faults are automatically reset:

Safety Sensors tripped ABOVE setpoint, during Run mode, the ram contacted something before it reached the minimum allowable insertion distance.

Safety Sensor tripped BELOW setpoint, during Run mode, the ram did not contact anything before it reached the maximum allowable insertion distance.

[ENABLE VACUUM CHECK] – This button will turn the Vacuum Check function on and off. If the press is operating in stud mode, this feature will check for the presence of the fastener on the vacuum punch.

[ENABLE STUD-IN-TUBE SENSOR] – Toggles whether stud-in-tube sensor is checked during stud or long-standoff mode. Dark is ON and enabled. Normally, when this sensor is enabled, if the sensor does not detect a fastener, the shuttle sequence will not blow and will automatically attempt to feed another fastener. When this sensor is disabled, no check is done and the feed blower will blow immediately.

[ENABLE FASTENER LENGTH MONITORING] – Touch this button to enable the Fastener Length Monitoring check in stud or long-standoff mode. When enabling the feature the Fastener Length Monitoring screen will display the operating instructions.

→ to → **6.13 Fastener Length Monitoring Screen**

[METRIC/UNIFIED RUN SCREEN UNITS] – Touch this button to change the display to either metric or unified units. The unit selected is displayed in dark.

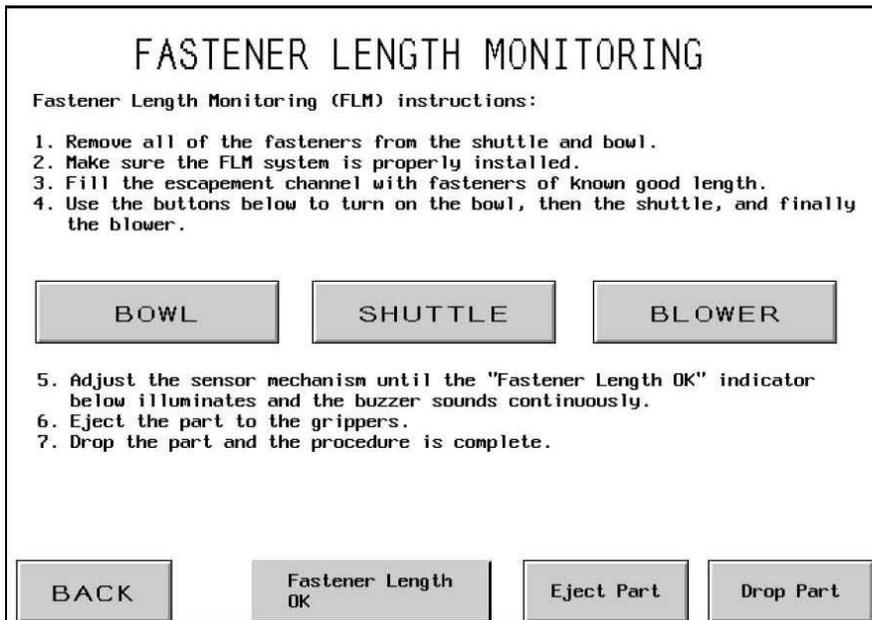
[BACK] – Returns to Run Mode screen.

→ to → **6.9 Run Mode Screen**

[HELP] – Run Mode Parameters Help Screens

→ to → **Help Screen**

6.13 Fastener Length Monitoring Screen



This screen assists the operator in setting up the Fastener Length Monitoring (FLM) System hardware for the correct length part.

Follow the step by step instructions on the screen. If the FLM System is already setup, just use the BACK button to return to the previous screen.

[BOWL] – Touch this button to turn the bowl on. This moves the fasteners around and into the shuttle. Wait for the fasteners to line up and move into the shuttle. **IMPORTANT:** Be sure that only fasteners of the correct length are in the bowl, escapement and shuttle.

[SHUTTLE] – Touch this button to move the shuttle and separate the first fastener from the line of fasteners.

[BLOWER] – Touch this button to turn on the blower that blows the fastener up and into the Fastener Length Monitoring chamber attached to the shuttle.

Fastener Length OK – This display will be dark if the FLM sensors detect a good part. An audible alarm will also sound. If the fastener length is not ok then either the FLM sensor assembly is too low, or too high, adjust until this display is consistently ON. If this display does not turn ON, check that a fastener has been blown into the chamber.

[EJECT PART] – Touch this button when the setup is done and the fastener in the chamber will be blown out to the top feed gripper/slide area.

[DROP PART] – Touch this button to drop the part, to get ready for installation.

[BACK] – Returns to Run Mode Parameters screen.

→ to → **6.12 Run Mode Parameters Screen**

6.14 Store/Recall Job Screen

Store / Recall a JOB by pressing [Job No.], then enter job # using pop-up keypad. Blinking message will indicate if job no. is occupied or not. After storing or recalling a job, chose [Back to Run], [Setup Run] or [MODE] to exit. See Section 6.14 in operation manual for detailed instructions.

JOB SUMMARY
 MODE: xxxx
 MATERIAL: xxxx
 SIZE: xxxx
 FORCE: ##.#KN (##### lbs.)
 #### Fasteners/Workpiece

#####

###

RECALL

SEARCH

Job Reference No.

Job No.

This Job # is occupied

Clearing a Job No. will delete all associated stored data.
 Do you really want to clear the displayed Job?

MODE

RUN MODE

CLEAR

This screen allows the operator to recall preset job settings or save preset job settings depending on whether this screen was accessed from the Mode Selection Screen or the Run Mode Screen.

Job Summary Box – Displays the important setup values that are stored with each job. When storing a job from Run Mode this summary will display the values that the operator was currently running, including any adjustments made at Run Mode. When recalling a job from the Mode Selection screen, the saved values for a job will appear, as the operator selects a numbered job. Dwell and Blower Times are stored and recalled but not displayed in the summary box.

Tooling Mode
 Fastener Size Selection
 Workpiece Material Selection
 Preset Force
 Blower Time
 Dwell Time
 Fasteners/Workpiece Count

Workpiece Complete Notify Setting
 Soft Touch Mode Setting
 Cycle Mode (Continuous/Interrupted)
 Setpoint Tolerance (Standard/Narrow)
 Safety Fault Auto Reset Mode
 Vacuum Check Mode
 Stud-In-Tube Sensor Mode
 Fastener Length Monitoring Mode

Job Reference No. – Displays and allows input of an optional, 8-digit reference number associated with a job. For example: This data field can be used to reference a shop work order number. This number can be entered before storing a job. Press Job Reference N^o. and a pop-up keypad will appear, enter the Job Reference N^o. and press “ENT” to continue. Operator can also recall a job using the Job Reference N^o. by pressing [SEARCH] the system will search for the job number associated with this Reference N^o. This number will also appear on the run screen summary box.

Job No. – Displays and allows input of a job N^o., from 1 to 300. In Store Mode, press Job N^o. and enter a job N^o. using the pop-up keypad, then press [STORE]. A blinking message will appear: “Job successfully stored” if the job N^o. selected is currently available. If however, the number is already occupied, a blinking message will appear: “Job N^o. is occupied”. In Recall Mode, press Job N^o. and enter a job N^o. using the pop-up keypad. If the job is stored, the information will appear in the [Job Summary] fields. If there is no job stored under the number, a blinking message will appear: “Job N^o. is not occupied”.

[CLEAR] – This function will clear all data associated with a job N^o. After entering Job N^o. to be cleared, press the [CLEAR] button. A blinking message will appear: “Clearing a Job N^o. will delete all associated stored data. Do you really want to clear the displayed job?” Press [YES] to proceed or [NO] to cancel.

[SETUP/RUN Mode] or [BACK TO RUN Mode] – In Store Mode, after selecting a memory location Storing a Job, use BACK TO RUN Mode button to return to the Run Mode. If the operator does not store the job in a memory location before returning to Run Mode then the Job values will not be able to be recalled later. In Recall Mode, after selecting a Job, use SETUP/RUN Mode button to proceed to the Safety Setup Procedure Screen to complete the setup.

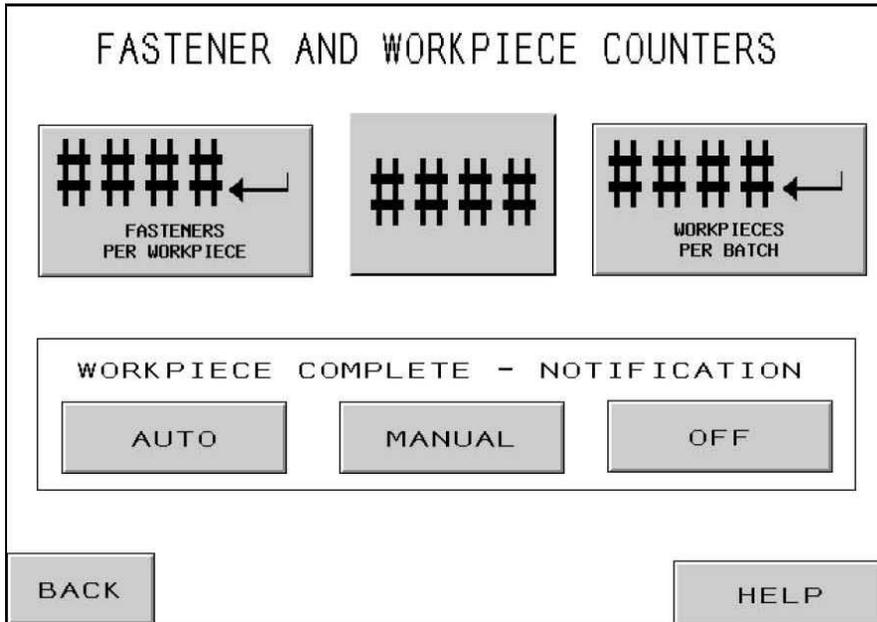
The safety setpoint is NOT saved with the Job. It must be re-learned to insure that each run is safe.

If [SETUP/RUN Mode]
→ to → **6.8 Safety Setup Procedure Screen**

If [BACK TO RUN Mode]
→ to → **6.9 Run Mode Screen**

[MODE] – Returns to mode selection screen.
→ to → **6.3 Mode Selection Screen**

6.15 Counters Setup Screen



This screen allows the operator to change the fasteners per workpiece and workpieces per batch counter presets.

Counter Pop-Up Keypad – The operator uses the pop-up keypad to set the value of each digit for either counter. The range of each counter is from 0 to 9999.

[↵ WORKPIECES per BATCH] – Touch this button to display the pop-up keypad to the preset value of workpieces per batch. If this is set to zero, the counter will be disabled. If this counter is set to a value greater than zero, completed workpieces will be counted. The workpiece count is incremented after the fasteners per workpiece count is reached. When workpiece count on the Run Mode Screen reaches this preset value, a Batch Complete warning may be displayed and the Workpiece counter will be reset to zero.

[↵ FASTENERS per WORKPIECE] – Touch this button to display the pop-up keypad to the preset value of fastener insertions per workpiece. If this is set to zero, the counter will be disabled. If this counter is set to a value greater than zero, completed insertions will be counted. The fastener count is incremented after the end of the insertion force dwell. When the fastener count on the Run Mode Screen reaches this preset value, one workpiece completed will be counted, a Workpiece Complete warning may be displayed and the Workpiece counter will be incremented by 1 and the Fastener counter will be reset to zero.

Workpiece Complete Warning Screen Selection Buttons –

[AUTO] – Toggles Workpiece Complete Warning Screen to automatically return to run screen after a brief flash and audio warning.

[MANUAL] – Toggles Workpiece Complete Warning Screen to require the operator to touch the reset button on the screen, when the Workpiece Complete Warning Message Screen appears. There is an audio warning when the screen appears.

[OFF] – Toggles Workpiece Complete Warning Screen to not appear. There is only an audible warning.

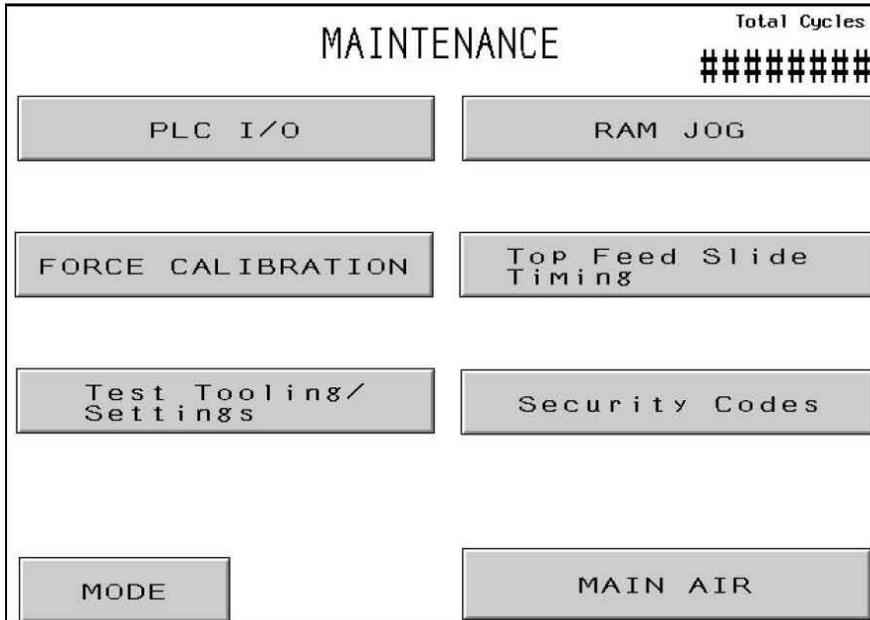
[BACK] – Returns to Run Mode screen.

→ to → **6.9 Run Mode Screen**

[HELP] – Fastener and Workpiece Help Screen

→ to → **Help Screen**

6.16 Maintenance Menu Screen



This screen allows the operator to access the maintenance functions. Here the operator can access certain setup screens, a maintenance control screen and automatic feed tooling test modes.

[PLC I/O] – Proceed to PLC Inputs/Outputs Control Screen, which allows maintenance personnel to independently control PLC Input/Output signals for diagnostic purposes.

→ to → **6.21 PLC Input/Output Control Screen**

[FORCE CALIBRATION] – Proceeds to Force Calibration Screen, which allows maintenance personnel to check and calibrate force settings.

→ to → **6.17 Force Calibration Screen**

[TEST TOOLING/SETTINGS] – Proceeds to Test Tooling / Settings screen, which allows maintenance personnel to test auto tooling and to turn On/Off sensor settings and Fastener Length Monitoring function.

→ to → **6.18 Test Tooling/Settings Screen**



WARNING: The tooling test modes must be used with care. Always install the proper tooling before operating any test mode. Failure to follow these requirements may result in damage to tools and a safety hazard.

[RAM JOG] – Proceeds to Jog Screen, allows operator to control ram position at various speeds for setup purposes.

→ to → **6.22 Ram Jog Screen**

[TOP FEED SLIDE TIMING] – Allows the Top Feed Slide Timing to be adjusted. The Top Feed Slide Timing affects the performance of the top feed automatic nut pick-up sequence. Touch this button to go to the screen to adjust the timing.

→ to → **6.19 Top Feed Slide Timing Adjustment Screen**

[SECURITY CODES] – Allows the Access and Maintenance Access Codes to be enabled and changed.

→ to → **6.16 Access Code Setup Screen**

[MAIN AIR] – Turns the main air on and off.

Total Cycles - Displays a permanent cycle counter for machine.

[MODE] – Returns to mode selection screen.

→ to → **6.3 Mode Selection Screen**

6.17 Force Calibration Screen

RAM & FORCE CALIBRATION

	UDC	kN	lbs
Force Setpoint	##.##	##.#	####0
Force Feedback	#.###	##.#	####0
Force Feedback @ 1.5 sec.		##.#	####0

JOG UP

JOG SPEED

↓

██████████

↑

██████████

###%

JOG DOWN

FORCE

↓

██████████

↑

██████████

###%

BOOST

ZERO SENSOR

Zero Offset =

####0 lbs

BACK

ZERO SENSOR

This screen allows maintenance personnel to check the calibration of the electronic pressure regulator for force and the hydraulic pressure sensor feedback. Maintenance personnel can move the ram up and down, adjust the force setting, boost to high force and check the readings.

[JOG UP] – Touch and hold this button to move the Ram Up.

[JOG DOWN] – Touch and hold this button to move the Ram Down.

JOG SPEED – Displays the ram speed % of full speed setting. This is a coarse adjustment available to reduce the rate of descent of the ram. The speed percentage is used to control the speed of the ram. [↑] – Increases Jog Speed [↓] – Decreases Jog Speed

FORCE – Displays the ram force % of full force setting. This is the same adjustment available on the run screen. This is the force setting used when the boost button is touched.

[↑] – Increases Ram Force [↓] – Decreases Ram Force

[BOOST] – Hold this button to compress the safety assembly and turn ON the booster.



WARNING: Use the **BOOST** button with care. The press will go into high force on any object between the punch and the anvil. For safety reasons, this button must be held for 1 second before it will operate.

Force Display – This display area shows the settings and actual sensor readings for the force control and feedback system.

Force Setpoint – This is the Force setting in kilonewtons and pounds-force as adjusted by the arrow buttons. The VDC box shows the intended analog signal in volts from the PLC to the electronic pressure regulator in the pneumatic/hydraulic cabinet

Force Feedback – This is the real-time Force reading in kilonewtons and pounds-force converted from the sensor reading. The VDC box shows the analog signal in volts from the hydraulic pressure sensor to the PLC.

Feedback @ 1.5 seconds – This is an instantaneous Force reading in kilonewtons and pounds-force converted from the sensor reading taken after the BOOST button has been held for 1.5 seconds. This reading provides a steady number that is more similar to an actual installation cycle.

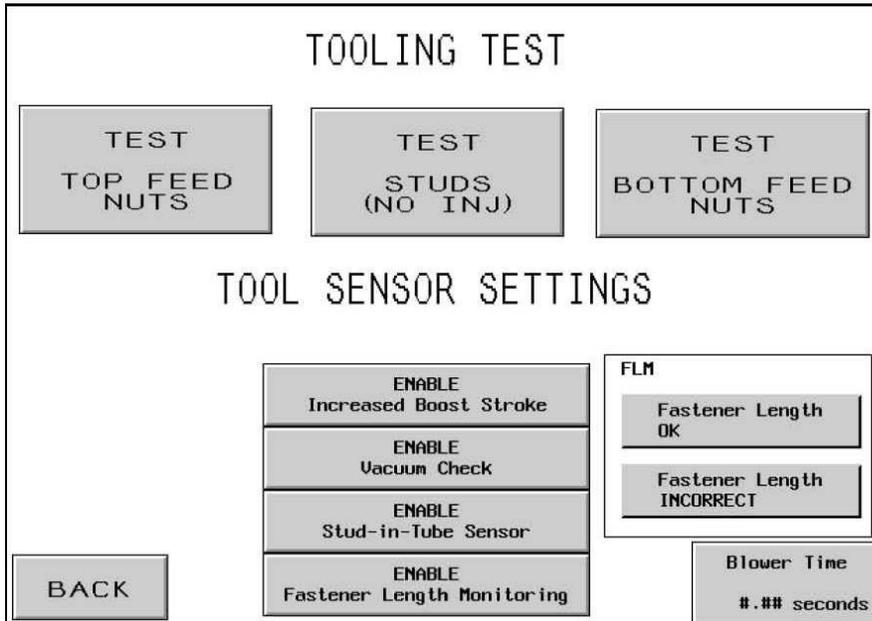
[ZERO SENSOR] – This button is used to perform a “zero” calibration of the hydraulic pressure sensor. When this button is touched. The press will automatically run steps to exhaust all air from the press, wait, and take a reading of the hydraulic pressure sensor at 0 (zero) pressure. The press will then save a new offset value for the sensor reading so that at real 0 (zero) pressure the analog signal in will be converted as 0 (zero) force.

Zero Offset – Displays the current zero offset value stored.

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.18 Tooling Test Screen



WARNING: The tooling test modes must be used with care. Always install the proper tooling before operating any test mode. Failure to follow these requirements may result in damage to tools and a safety hazard.

[TEST – TOP FEED NUT] – Runs an automatic top feed nut sequence from shuttle to top feed slide extend. This test cycle will run for most top feed nuts and short standoffs. The cycle will run indefinitely.

[TEST-STUD (NO INJ.)] – Runs an automatic top feed stud sequence from shuttle to vacuum punch. This test cycle will run for most top feed studs and standoffs. **DO NOT RUN INJECTORS WITH THIS TEST.** The cycle will run indefinitely

FLM Note: When running this test mode with the Fastener Length Monitoring System hardware installed and enabled, the slide will drop incorrect fasteners without putting them on the vacuum punch.

[TEST-BOT. FEED NUT] – Runs an automatic bottom feed nut sequence from shuttle to bottom feed module extend. This test cycle will run for most bottom feed nuts. The cycle will run indefinitely.

[ENABLE INCREASED BOOST STROKE] – The press is equipped with preprogrammed limitations for safe operation. For most application the default power stroke distance of approximately .100 in (2.5 mm) is sufficient to properly install and seat a vast array of fasteners. In some application, particularly non-fastener application, a longer power stroke distance may be required. For this purpose, the press is equipped with an Extended Boost function.

Enabling this function increases the power stroke of the ram from its default setting of approximately .100 in (2.5 mm) to .400 in (10 mm). If the preset force is not achieved within .400 in (10 mm) of power stroke the press will fault displaying error code (73) "FORCE STROKE BEYOND SAFETY LIMIT."

This function is enabled / disabled through the enable / disable button located on the tool testing screen accessed through the maintenance screen. Once enabled this function will stay enabled until one of the following occurs:

1. The function is turned off by disabling the function with the enable/ disable button located on the tool testing screen accessed through the maintenance screen.
2. The main power to the press is turned off.



CAUTION - Enabling this function allows an extended high force stroke. Care should be taken to ensure that the tooling and setup are appropriate for the force set. Extended Boost stroke at high forces can create a side loading condition which could damage tooling or cause a hazardous condition. Never use extended boost with tooling or setups not specifically design for this function. Never run the press in extended boost mode when it is not needed.

[ENABLE VACUUM CHECK] – This button will turn the Vacuum Check function on and off. If the press is operating in stud mode, this feature will check for the presence of the fastener on the vacuum punch.

[ENABLE STUD-IN-TUBE SENSOR] – Toggles whether stud-in-tube sensor is checked during stud or long-standoff mode. Dark is ON and enabled. Normally, when this sensor is enabled, if the sensor does not detect a fastener, the shuttle sequence will not blow and will automatically attempt to feed another fastener. When this sensor is disabled, no check is done and the feed blower will blow immediately. When this sensor is enabled, the Fastener Length Monitoring system will be automatically turned off.

[ENABLE FASTENER LENGTH MONITORING] – Touch this button to turn the Fastener Length Monitoring (FLM) system on and off. This feature only works in stud or long-standoff mode. When this feature is turned on at this screen the Fastener Length Monitoring Setup screen will automatically display to help setup the FLM hardware.

→ to → **6.13 Fastener Length Monitoring Screen**

Fastener Length OK – Display turns dark if the last fastener checked was correct to where the FLM hardware was set.

Fastener Length Incorrect – Display turns dark if the last fastener checked was incorrect to where the FLM hardware was set. Either the fastener was too long or too short. An audible beep is also sounded.

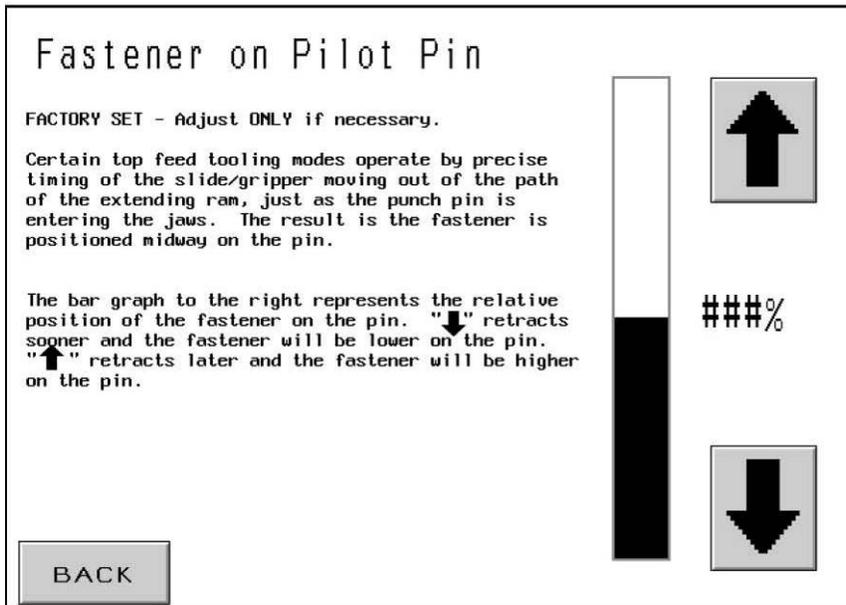
[BLOWER TIME] - Allows the blower time for automatic feed modes to be adjusted. The blower time is the duration that the air stays on to blow the fastener from the shuttle mechanism through the feed tubing to the insertion area. Touch this button to go to the screen to adjust the blower time.

→ to → **6.11 Blower Time Adjustment Screen**

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.19 Top Feed Slide Timing Adjustment Screen



This screen allows the operator to adjust the timing of the top feed slide in automatic, top feed nut and standoff mode. During the top feed nut and standoff sequence, the fastener is picked up by the punch. The pick-up is accomplished by the ram moving down, passing a pin on the punch through the hole of the fastener. As the pin is passing through the hole, the top feed jaws are opened and the slide is retracted. The timing of this process must be relatively precise, in order for the fastener to be picked-up properly. The adjustment made on this screen sets the opening of the jaws and retracting of the slide to occur earlier or later. The ideal location of the fastener is in the middle of the pin.

The top of the dark bar indicates relative position of the fastener not actual.

[↑] – Moves the relative location of the fastener on the pin higher. (Open jaws later).

[↓] – Moves the relative location of the fastener on the pin lower (Open jaws earlier).

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.20 Security Code Setup Screen

ENTER NEW SECURITY CODES

This screen is used to enter new passwords for the 3 security levels. The current password is displayed within each access button below. To modify a password, enter a number into the thumbwheel switch below and then press one of the 3 access buttons. Set the password to 0000 in order to remove that level of security.

#

OPERATOR
ACCESS

SETUP
ACCESS

MAINTENANCE
ACCESS

Operator Access - The operator will not be allowed to advance past the logo screen without this password.

Setup Access - The operator will not be allowed to change the setup parameters in the run mode without this password.

Maintenance Access - The operator will not be allowed to access the maintenance screens without this password.

BACK

This screen allows the operator to enter and change the operator access, setup access and maintenance access codes. The initial settings of the three are zero, disabling each access screen. **IMPORTANT: Upon receipt of the Series 2000 Press, immediately establish a Maintenance Access Code. The maintenance access screens allow operation of the press without the standard safeguards in place. Only trained personnel should use the functions accessible on the Maintenance Menu Screen.**

Code Pop-Up Keypad – The operator uses the pop-up keypad to set the value of each digit for either code. The code can be any 4-digit number from 0000 to 9999.

[OPERATOR ACCESS CODE] – Touch this button to activate the pop-up keypad to display the Operator Access Code. If this is set to zero, the access screen will be disabled. If this code is set to any other value, the access screen will be enabled and the code will have to be entered to operate the press.

[SETUP ACCESS CODE] – T Touch this button to activate the pop-up keypad to display the Setup Access Code. If this is set to any other value, the setup access screen will be enabled and the code will have to be entered to change the setup parameters in Run mode. The Setup Access code will be needed to change the following run mode functions:

Force Setpoint

Smart Dwell

Blower Time

Run Mode Parameters Screen:

Soft Touch (Enable/Disable)

Cycle Mode (Continuous/Interrupted)

Setpoint Tolerance (Standard/Narrow)

Safety Fault Auto Reset (Enable/Disable)

Vacuum Check (Enable/Disable)

Stud-In-Tube Sensor (Enable/Disable)

Fastener Length Monitoring (Enable/Disable)

Run Screen Units (Metric/Unified)

Save a Job

Note: after the Setup Access Code is entered once, it is active until run mode is exited or the “Clear Setup Password” button is touched.

[MAINTENANCE CODE] – Touch this button to activate the pop-up keypad to display the Maintenance Code. If this is set to zero, the maintenance access screen will be disabled. If this code is set to any other value, the maintenance access screen will be enabled and the code will have to be entered to access the maintenance functions. Access is given to the following maintenance screens:

Maintenance Menu

PLC I/O

Ram & Force Calibration

Test Tooling / Settings

Ram Jog

Top Feed Slide Timing

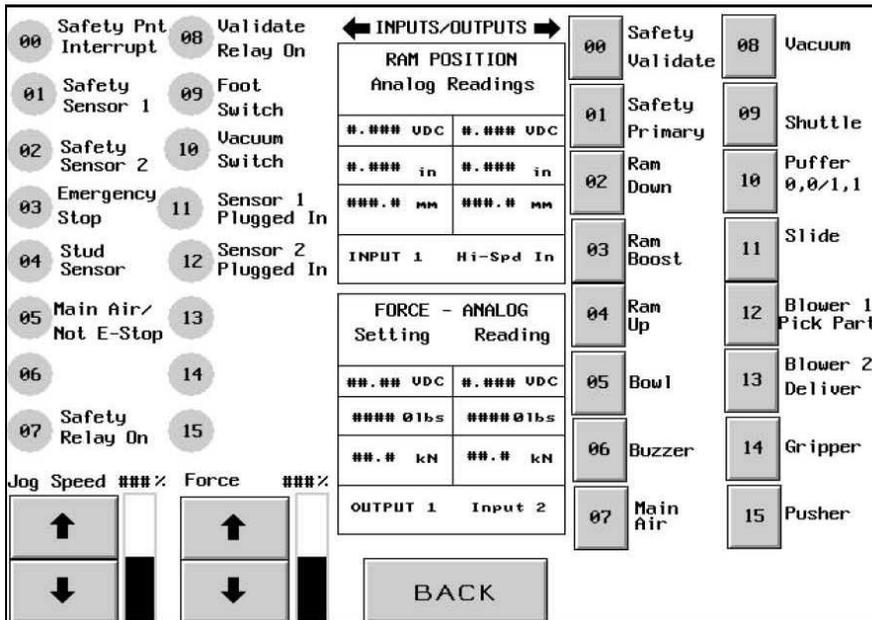
Security Codes

Note: Anyone who has access to Security codes screen (Maintenance password required) will therefore have access and can change all of the security passwords.

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.21 PLC Input/Output Control Screen



This screen allows the operator to view the status of all input signals to the PLC and control all of the output signals from the PLC. Each output button allows an output control signal to be turned on and off. The small numbers inside each display and button correspond to the wired location on the PLC. Ram Jog Speed and Force can also be adjusted from this screen. There are also display readings for the various analog signals also.

[00-15 INPUT SIGNALS] – Each Display shows the status of one input, if the button is dark, the input signal is ON.

[00-15 OUTPUT SIGNALS] – Each Button controls one output, if the button is dark, the output signal is ON. Some buttons are interlocked to function safely and properly. Also, some buttons are momentary and some are hold types for the same reason. Touch a light button to turn an output ON. Touch a dark button to turn an output OFF.

[10 PUFFER] - The one exceptional button. If the operator touches the light button, the output will cycle on and off, simulating the program cycle for nut feed modes. If the operator touches the cycling button, the output will remain steady on, simulating the program cycle for stud feed modes. If the operator touches the dark button, the output will turn off.



WARNING: Use Button [03 Ram Boost], with care. The press will go into high force on any object between the punch and the anvil. Hold this button to compress the safety and turn ON the booster. For safety reasons, this button must be held for 1 second before it will operate.

JOG SPEED % - Displays the ram speed % of full speed setting. This is a coarse adjustment available to reduce the rate of descent of the ram. The speed percentage is used to control the speed of the ram when using the [02 RAM DOWN] button.

[↑] – Increases Jog Speed [↓] – Decreases Jog Speed

FORCE % – Displays the ram force % of full force setting. This is the same adjustment available on the run screen. This is the force setting used when the [03 Ram Boost] button is used.

[↑] – Increases Ram Force [↓] – Decreases Ram Force

Ram Position (Analog Input 1) – This display area shows the sensor reading for the Position of the piston in the main cylinder in millimeters and inches from the top. The VDC reading shows the analog signal in volts from the linear transducer to the PLC.

Ram Position (Analog Hi-Spd In) – This display area shows the same sensor reading for the Position of the ram. But it is read through the Hi Speed Analog card. This reading is only updated when the Safety Sensors trip the Safety Relays. To take a reading, push up on the Safety Assembly to trip the sensors or run the ram down until the tooling contact.

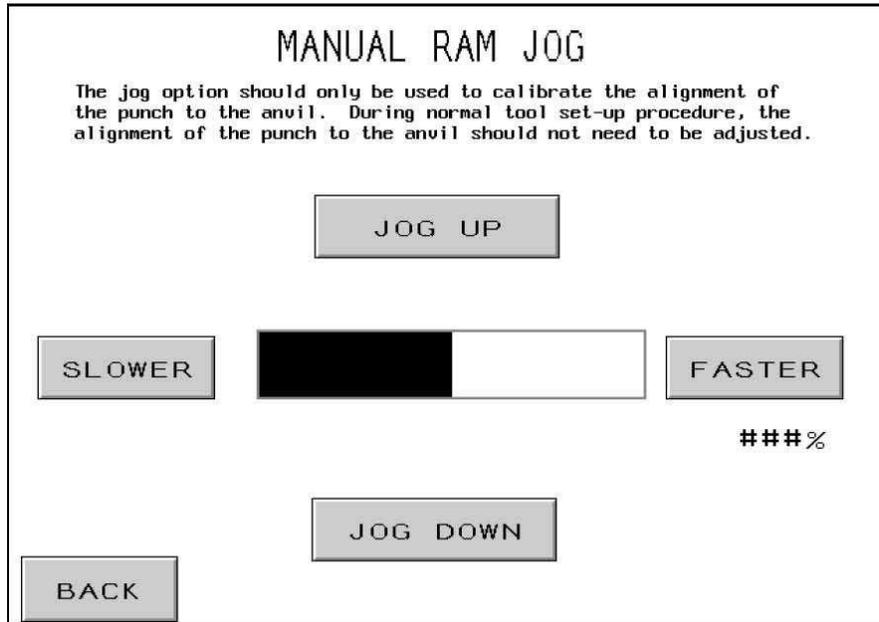
Force Setting (Analog Output 1) – This display area shows the Force setting in kilonewtons and pounds-force. The VDC setting shows the intended analog signal in volts from the PLC to the electronic pressure regulator.

Force Reading (Analog Input 2) – This display area shows the real-time Force reading in kilonewtons and pounds-force converted from the sensor reading. The VDC reading shows the analog signal in volts from the hydraulic pressure sensor to the PLC.

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.22 Ram Jog Screen



This screen allows the operator to jog the ram up and down and reduce the speed. It is used for maintenance procedures.

[JOG UP] – Touch and hold this button to move the Ram Up.

[JOG DOWN] – Touch and hold this button to move the Ram Down.

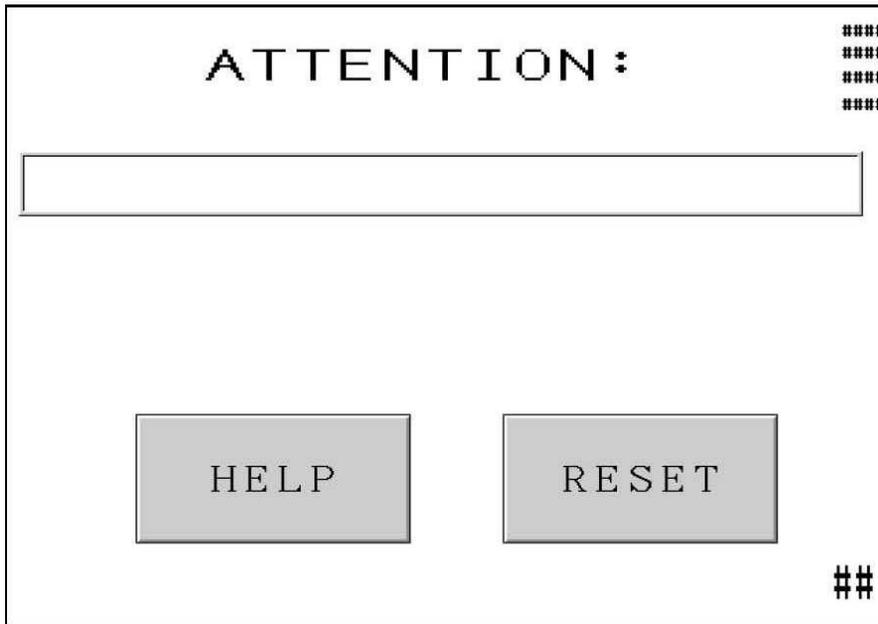
[SLOWER] – Touch this button to reduce the speed of the Ram

[FASTER] – Touch this button to increase the speed of the Ram

[BACK] – Returns to Maintenance Menu screen.

→ to → **6.16 Maintenance Menu Screen**

6.23 Attention: Message Display Screen



This screen automatically displays when the control system detects a situation that requires the attention of the operator. The appropriate diagnostic messages are displayed on the screen. Listed below are the diagnostic messages and an explanation of each situation.

[HELP] – Attention Screen Help Screen – displays listing of messages and explanations
→ to → **Help Screen**

[RESET] – Clears Attention Screen – returns to previous screen.

Two common messages can be set to automatically reset. They are:

Safety Sensor Trip outside of Window
Workpiece Complete

Attention Messages

Safety Sensors Tripped ABOVE Setpoint (#50)

Safety Sensors Tripped BELOW Setpoint (#51) – The safety sensors detected that the ram contacted an object outside the allowable window set around the Safety Setpoint.

Vacuum Switch Set Too Low (#52) – The vacuum switch input was triggered while the vacuum output was off.

No Ram Contact (#53)– The Ram extended fully without safety system detecting any contact.

Force Too High (#55) – The hydraulic pressure sensor detected a pressure that exceeded the preset force and the limits set by the fastener size selection.

Safety Setpoint Too High (#56)

Safety Setpoint Too Low (#57) - During the Safety Setup Procedure the learned safety setpoint was outside the allowable range. The ram must travel at least 63.5 mm (2.5 inches) and no more than 178 mm (7.0 inches). If in Top Mount Anvil Mode the minimum travel is 38 mm (1.5 inches).

Safety Valve Control Error (#58) – The system detected a loss of power to the safety valves when the valves should be ON.

Ram Position Error (#60) – Occurs at Mode selection, if Ram position is NOT measured as “Home” when a Setup is attempted

Sensors Unplugged / F3 Blown (#61) – The System does not detect the loopback signal from the Safety Sensors, Fuse 3 may be blown.

PLC Analog Card Error (#63) – The 2 analog ram position signals were too far apart from one another.

Lt.StreamErr1–Sensors Out of Sync (#65) - Both of the light sensors did not trip within a certain distance from one another.

Lt.StreamErr2-Collar Became Dislodged (#66) – One of the safety sensors tripped while the ram was going up and was above the top safety window setpoint.

Lt.StreamErr3-Safety Sensor Tripped (#67) – One of the safety sensors tripped while the ram was in the “Home” position.

Air Gap Between Punch and Anvil (#69) – In Interrupted mode, an air gap was detected between the punch and anvil prior to boosting.

Safety Setpoint Error (#70) – The safety setpoint self-adjusting average is now outside the allowable limits.

Force Too Low (#71) – The booster was on for the maximum boost time and the required pressure was not achieved.

Stud Sensor Tripped Prematurely (#72) – An object is blocking the stud sensor or when using the Fastener Length Monitoring system, an improper length fastener is located in the chimney mechanism.

Force Stroke Beyond Safety Limit (#73) – During boost, the ram traveled more than the maximum allowable insertion distance.

Ram Too Far Away to Install Fastener (#74) – In Soft-Touch mode, the ram did not reach the proper installation position. The “coasting” distance is self-calibrating and adjusts each stroke. Run more strokes to self-calibrate the deceleration point.

Pressure Sensor Not Calibrated (#75) – The pressure sensor must be calibrated before operating the press for the first time. The Maintenance Menu allows the operator access to the Force Calibration screen, then press the Zero Sensor button, the pressure will automatically calibrate.

Vacuum Lost (#76) – The vacuum input signal was lost during the down stroke.

Fastener Length Monitoring System Error (#77) – The system detected 5 consecutive bad fasteners.

Stud-in-Tube System Error (#78) – The system failed to detect a fastener on 5 consecutive tries.

Feed System Compatibility Problem (#79)– The system received fastener sensing signals on Input 04 that were inconsistent with the hardware mode selected at the Run Mode Parameters. (Stud-In-Tube Disabled / Enabled / Fastener Length Monitoring Enabled).

Safety Stop Distance Fault (#81) – During a safety fault or setup, the ram traveled too far. Possible causes include air in the oil system or a signal error in the safety circuit. Contact your service representative to report the problem and receive further assistance.

Safety Sensor Circuit Error (#82, #83, #84, #85) – Signal error. Record fault number and contact your service representative to report the problem and receive further assistance.

SECTION 7

PNEUMATIC-HYDRAULIC SYSTEM

A. THE PNEUMATIC SYSTEM

Initial Air Entry

- Your factory air supply should be clean, dry and, ideally, have a high flow capability. Airline feeds smaller than 12mm (1/2") will increase cycle time.
- Factory compressed air, set between 6 and 7 BAR (90 to 100 psi), enters the system through a manually adjusted filter/regulator which is mounted on the back of the machine.
- After passing through the filter/ regulator, the air is distributed into three areas.
- 1) The 1/4" (6mm) line which leaves the manifold is used for various machine functions, which manipulate, transport, and position fasteners. It supplies an 8-valve manifold located under the Feeder Bowl. See section nine for additional information.
- 2) The 1/2" (12mm) line which leaves the manifold first supplies a piloted pressure regulator. With this regulator the operator or setup person can adjust the fastener insertion force from the touch screen.
- From the regulator, the air is routed to the right valve of the "Ram Valve" assembly, a two position, four way valve, which switches it to move the Booster cylinder. It is sometimes referred to as the "high pressure" valve because the pneumatic energy is converted into mechanical energy which is used to create the ram's high pressure squeezing force.
- 3) The 1/2" (12mm) line then supplies the left valve of the Ram Valve assembly. This 3-position, 4-way valve switches the air to both Air-Oil tanks. The *upper* coil, when energized (note indicator light), supplies the left tank, causing the ram to retract (up). The *lower* coil supplies the right tank, causing the ram to extend (down). When neither coil is energized, the valve exhausts both tanks, relieving the oil system of residual pressure.

Air Exit

- Air exiting the air-oil tanks is routed to an air/oil separator, which is located at the bottom rear of the press.
- The purpose of the separator is to collect any oil vapor suspended in the air stream. Oil collects in the reservoir, which is emptied as necessary.

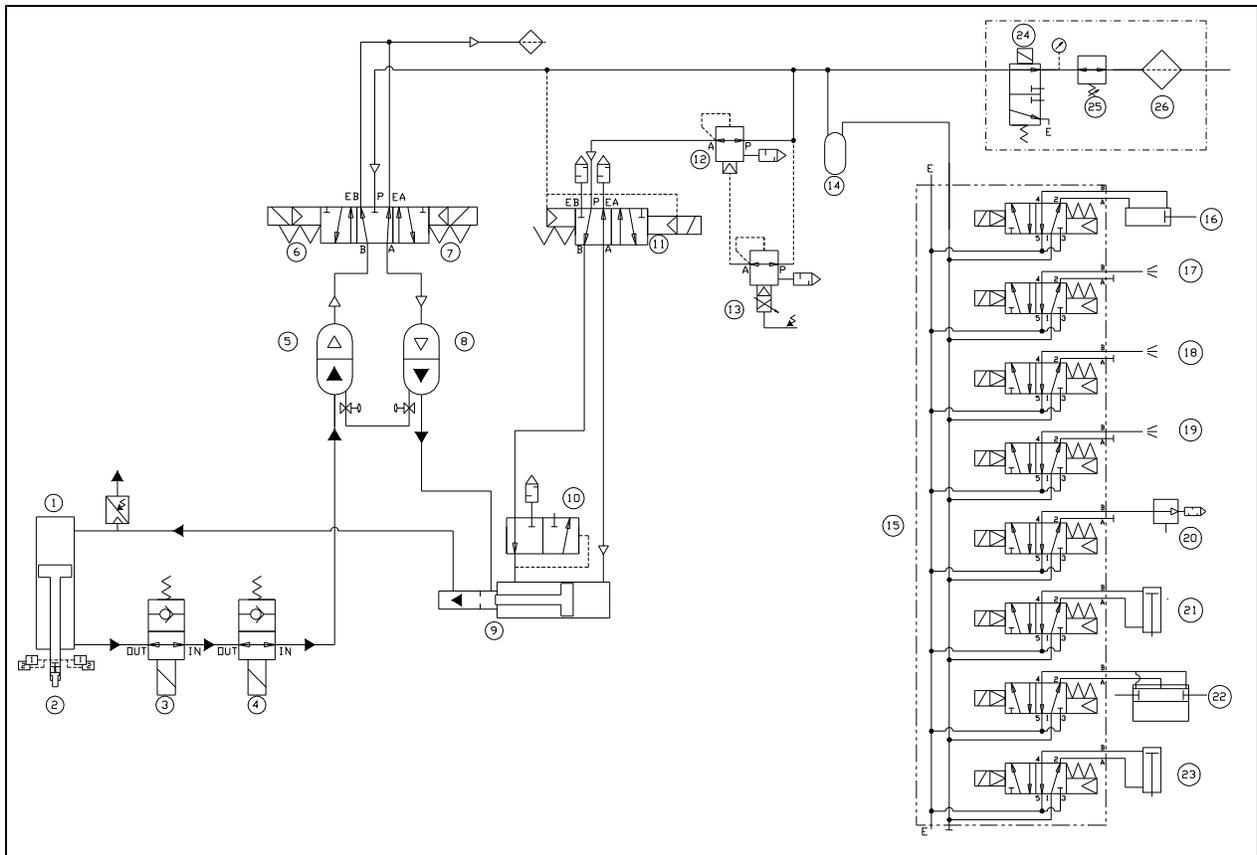
B. THE HYDRAULIC SYSTEM

Pushing The Ram Down

- As pressurized air flows into the right (extend) tank, it causes hydraulic fluid, at air pressure, to flow into the top of the ram cylinder, forcing the ram down.
- As the ram comes down it forces the unpressurized hydraulic fluid below the ram back into the left (retract) tank.
- With the ram *safely* in the down position, the hydraulic pressure, which forced the piston (ram) down, is increased by the air-powered booster to provide the insertion force.

Pushing The Ram Up

- Booster (air) pressure is removed by the right hand Ram valve assembly (high pressure booster valve), and the booster retracts.
- As pressurized air flows from the left Ram valve, into the left (retract) tank, it causes hydraulic fluid, at air pressure, to flow into the bottom of the ram cylinder, forcing the ram up.
- The left valve on the Ram valve assembly also exhausts the air pressure from the extend tank, thereby allowing the hydraulic fluid on top of the ram to become unpressurized. As the ram comes up, this unpressurized fluid is pushed back into the tank.



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	RAM	14	ACCUMULATION TANK
2	SAFETY SENSOR	15	TOOLING VALVE MANIFOLD
3	SAFETY VALVE A	16	SHUTTLE CYLINDER
4	SAFETY VALVE B	17	PUFFER
5	AIR-OIL TANK UP	18	BLOWER 1
6	RAM UP	19	BLOWER 2
7	RAM DOWN	20	VACUUM ASPIRATOR
8	AIR-OIL TANK DOWN	21	SLIDE CYLINDER
9	BOOSTER	22	GRIPPER CYLINDER
10	QUICK EXHAUST	23	PUSHER CYLINDER
11	BOOST	24	"DUMP" VALVE
12	PILOTED REGULATOR	25	REGULATOR
13	ELECTRONIC REGULATOR	26	FILTER

**FIGURE 7-1
HYDRAULIC / PNEUMATIC DIAGRAM**

SECTION 8

ELECTRICAL SYSTEM



WARNING: 1. The **PEMSERTER® SERIES 2000® FASTENER INSTALLATION PRESS** uses high voltage electrical power. Only trained and authorized personnel may attempt to maintain, service, or repair its electrically powered subsystems, components or parts.

When performing maintenance on the machine, the hydraulic door should be closed before opening the electrical enclosure.

After powering the press down using the off button, be aware that shock dangers still exists due to the power filter is still electrified.

The electrical panel enclosure requires a special key to open. The purpose of this feature is to protect the machine from unauthorized persons tampering with the system and to help prevent unauthorized and untrained personnel from receiving an electrical shock. We suggest the key be kept by a manager/supervisor who will properly control its use.

AC Power Distribution:

The press is protected by a two-pole main circuit breaker.

The inline AC power entering the press is routed to the following 2 areas:

- A DC power supply, that powers the PLC (Programmable Logic Controller), and other related electronic devices.
- The vibratory bowl driver controller.

DC Power Distribution:

- The DC power from the power supply feeds the power supply serving the PLC. Through various sub-circuits, it also feeds the sensors and other inputs, the Touch Screen, and the output card of the PLC which uses the power to turn various loads (outputs) on and off.
- The controller of the press electronics system is the PLC. The PLC receives input from sensors located throughout the machine which tell it the status of operations at any point. The PLC controls air valves which, in turn, control most of the machine's activities, including the tooling which transports and positions the fasteners.
- There are 3 DC fuses. They protect (1) the Touch Screen, (2) the sensors, and (3) the air pressure regulator.

ELECTRICAL/ELECTRONIC COMPONENTS

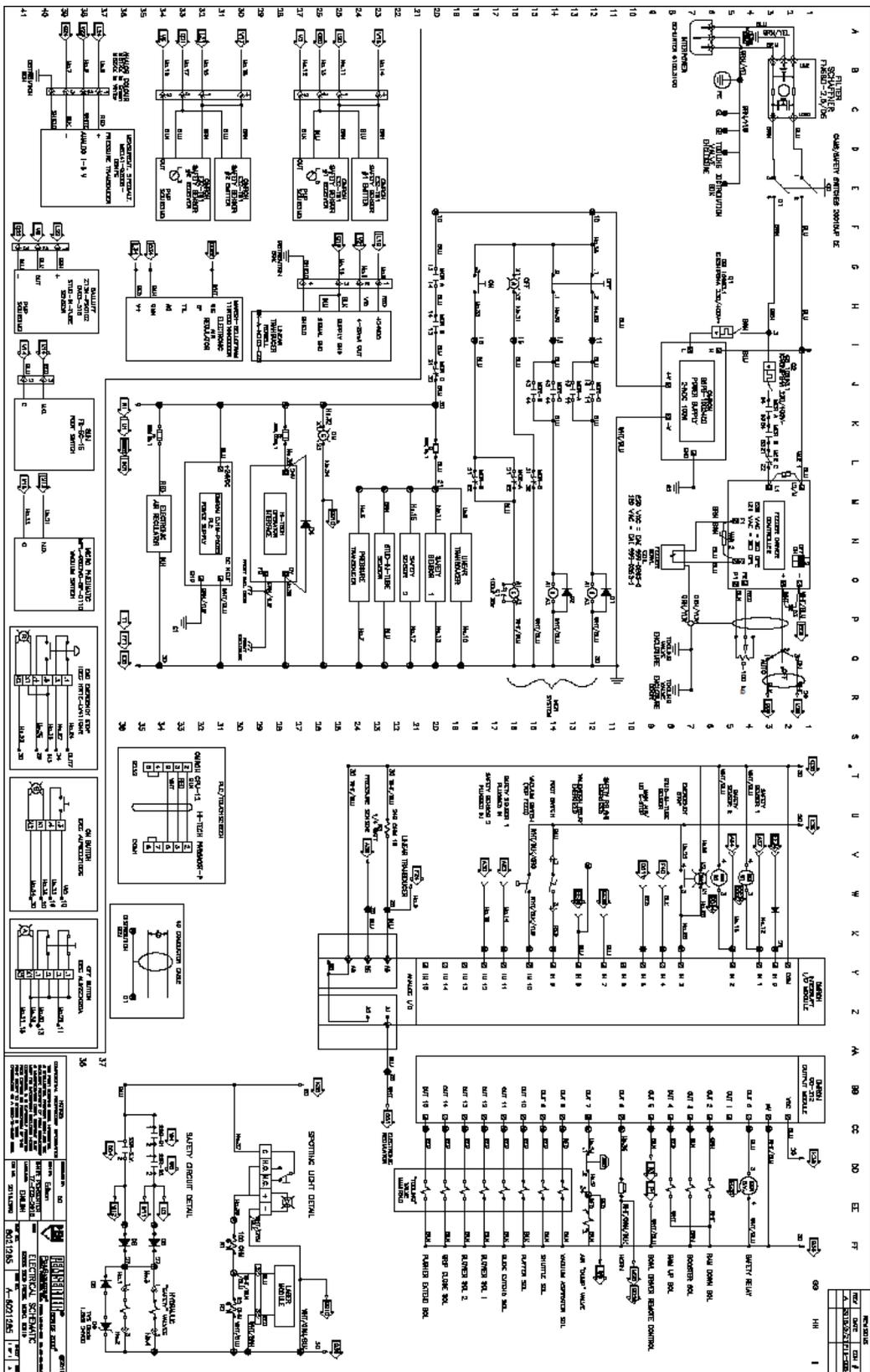
(Note: Most of the items mentioned below are illustrated in section two of this manual.)

Name	Location	Purpose
PLC INPUTS:		
Emergency Stop (Input 0)	Emergency Stop Circuit	Detects that the Emergency Stop button has been pressed and stops the program.
Safety Sensor 1 (Input 1)	Left side of ram, under cylinder inside front enclosure.	An optical beam sensor which tells the PLC when the ram's "safety" has made contact with an object. Depending upon where, along the ram's travel, contact was made, the PLC will "decide" whether to proceed, or to stop and retract the Ram.
Safety Sensor 2 (Input 2)	Right side of ram under cylinder inside front enclosure.	Another optical beam sensor which tells the PLC when the ram's "safety" has made contact with an object. (For redundancy)
Fastener Sensor (Input 4)	Attached to the tooling near the bowl. (Used for Stud-In-Tube and FLM sensors.)	Stud-In-Tube ring sensor turns ON when a long fastener enters the tubing and is ready to be blown to the insertion tooling. FLM System sensor turns ON when a fastener that matches the setup length is blown into the staging chamber on the shuttle.
Safety Relays ON (Input 7)	Electrical Enclosure	Checks that DC power is ON to hold the safety valves open when the safety sensors are clear and ON. Checks that DC power is OFF to close the safety valves when the safety sensors are blocked and OFF.
Validate Relay ON (Input 8)	Electrical Enclosure	Checks that DC power is ON to hold the safety valves open during a valid installation. Checks that DC power is OFF to close the safety valves during a safety fault.
Foot Switch (Input 9)	Floor	When pressed, the foot switch initiates an insertion cycle.
Vacuum Switch - Top Feed (Input 10)	Inside the main cylinder enclosure to the right of the main cylinder.	When using top feed tooling, the vacuum switch informs the PLC that a fastener is ready for insertion. The switch is activated when a fastener is being held on the bottom of the ram punch, due to the vacuum created by the vacuum generator.

Name	Location	Purpose
PLC INPUTS: (Continued)		
Sensor 1 Plugged In (Input 11)	Sensor 1 Plug/ Front Enclosure	Loopback verifies that Safety Sensor 1 is plugged in.
Sensor 2 Plugged In (Input 12)	Sensor 2 Plug/Front Enclosure	Loopback verifies that Safety Sensor 2 is plugged in.
PLC OUTPUTS:		
Safety Validate (Output 0)	Amongst a group of 4 safety-related relays under the PLC.	Enhances redundancy of control of safety valves.
Safety Primary (Output 1)	In the hydraulic enclosure between the left air / oil tank and the main ram cylinder	Always held open allowing hydraulic fluid to flow to the top of the main cylinder and move the ram down. In case of a safety fault, the valves close very rapidly to shut off the oil flow, causing the ram to stop its downward movement.
Ram Valve Down Solenoid (Output 2)	In the hydraulic enclosure, at the lower left side of the Ram valve assembly.	A solenoid that flows air into the down tank (the right side hydraulic fluid reservoir). This forces oil from the tank, through the booster, through the safety valve, to the main ram cylinder to move the piston/ram down.
Ram Valve Booster Solenoid (Output 3)	In the hydraulic enclosure, on the right side of the Ram valve assembly.	A solenoid which allows air from the electric pressure regulator to flow to the booster cylinder. The air in the booster creates the ram's high "squeezing" force.
Ram Valve Up Solenoid (Output 4)	In the hydraulic enclosure, at the top left side of the Ram valve assembly.	A solenoid that flows air into the up tank (the left side hydraulic fluid reservoir). This forces the oil from the tank, under the main cylinder's piston. This action, in turn, pushes the piston/ram up.
Bowl Control (Output 5)	Inside the cover of the enclosure under the vibratory bowl.	Enables the PLC to turn the bowl on and off.
Audio Beeper (Output 6)	Located under the touchscreen.	The adjustable audio signal is used to inform the operator that a work piece is finished and/or that a batch has been completed, or of a Safety Fault.
Main Air (Output 7)	Part of air inlet system at rear of press.	Exhausts any air pressure, capable of causing any motion of the Ram or Tooling components.

Name	Location	Purpose
PLC OUTPUTS (Continued):		
Vacuum Solenoid (Output 8)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to a vacuum generator which creates the vacuum used to hold a fastener against the punch. The punch is installed on the bottom of the ram.
Shuttle Solenoid (Output 9)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to the shuttle cylinder to move back and forth to acquire a fastener and then deposit it at the mouth of the tube.
Puffer Solenoid (Output 10)	Part of the “tooling” valve assembly installed under the vibratory bowl.	The air is used to help align fasteners with the bowl escapement tooling, and to create a vacuum used to pull the correctly oriented nuts into the escapement.
Slide Extend Solenoid (Output 11)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to the Slide cylinder to extend or retract the slide from under the punch
Blower Solenoid One (Output 12)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Used for Stud type feeding, to blow a fastener up into a receiving area prior to the shuttle moving back for the next fastener. Once the Shuttle has moved, the fastener drops into the mouth of the tube.
Blower Solenoid Two (Output 13)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to blow fasteners through the tubing to the punch/anvil area (front tooling).
Gripper Close Solenoid (Output 14)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to the gripper assembly during top feed operations. The gripper assembly rides on the slide assembly. Its jaws will be closed in order to hold a fastener in position under the punch. The jaws will open when the punch is able to hold the fastener.
Pusher Extend Solenoid (Output 15)	Part of the “tooling” valve assembly installed under the vibratory bowl.	Flows air to the Pusher cylinder in the bottom feed module. The module pushes the fastener out to the anvil point, in position for insertion.

Name	Location	Purpose
ELECTRICAL COMPONENTS :		
Linear Transducer Input Module	In the electrical enclosure, a card installed on the PLC rack.	An analog to digital converter which accepts current (4-20 mA) from the Linear Transducer. It is used to read the ram cylinder position.
PLC Power Supply	In the electrical enclosure the module installed on the bottom din rail of the PLC rack.	Accepts 24 VDC from the DC power supply then converts the voltage into the voltages necessary for all internal PLC functions.
Sixteen Point Output Module	In the electrical enclosure, a card installed on the PLC rack.	A card with sixteen discrete 24 VDC outputs. The outputs are used to turn various (see schematic) 24 VDC loads Off and ON.
CPU / Analog I / O / Input Module	In the electrical enclosure, a module installed on the PLC rack next to the power supply.	The CPU (Central Processing Unit). It incorporates sixteen inputs for sensors, and other switches. It also accepts analog data from the linear transducer and oil pressure transducer, as well as provide variable analog output control of air pressure (for insertion force)
Linear Transducer	Top of ram cylinder.	A device which constantly monitors and provides the PLC data on the Ram position.
Oil Pressure Transducer	Extend (Inlet) port at top of main cylinder	An analog device which continuously reads and converts oil pressure into a signal for the PLC to calculate Ram Force.
DC Power Supply	In the electrical enclosure	This power supply accepts AC voltages and provides all the power in the press, except to the vibratory bowl.



Electrical Schematic with SSR Flyback Diode-HUNTER

SECTION 9

TOOLING SET-UP

Tooling

The PEMserter® Series 2000® Fastener Installation Press can be equipped with interchangeable tooling in order to properly install numerous types of PEM® fasteners. Series 2000™ Tooling refers to components that are installed onto the press that are specific to automatically feed and install different types of fasteners in different ways.

Manual versus Automatic Tooling

Manual tooling refers typically to the punch and anvil set that is used to install the fasteners. Placement of each fastener into the workpiece hole is done by the operator. Only moving the ram down and the installation stroke is controlled by the press. Automatic tooling refers to the set of specific components that orient the fasteners feeding from the vibratory bowl to the automatic punch and anvil that allow the operator to locate the workpiece properly and carry the fastener into the workpiece hole. The press handles the entire sequence. In Automatic Feed Mode the operator only handles the workpiece.

Manual Tooling

The two tooling components that exert the installation squeezing force are called the Punch and Anvil. Typically the punch is the moving element, installed in the end of the safety adapter at the end of the ram. The anvil is the stationary element installed in the anvil holder at the bottom of the press throat. In a typical installation, the punch pushes the displacer into the workpiece and the anvil supports the other side of the workpiece and provides the reaction force.

Different Punches and Anvils are selected for different types, sizes and materials of fasteners. The shape of the punch and anvil differ to account for the different shapes in fasteners. However, for many fastener applications a flat surface punch is used. Anvils are more varied. For instance, for studs, an anvil with a hole in the middle is used to accept the long body of the stud. An anvil with a different diameter hole is needed for each different size of the stud in order to support the material properly.

Specific tooling is sometimes required to accommodate different sizes and shapes of workpieces. There are different length punches and anvils to reach or accommodate workpieces. There are different diameter or special featured punches and anvils to accommodate different workpiece material and thickness.

Automatic Tooling Set Selection

There are different types of automatic feed tooling to feed different types, sizes and materials of fasteners. There are even different types of automatic feed tooling to feed the same fasteners.

PEMSERTER® Series 2000® Automatic Tooling consists of a number of basic types.

- Top Feed Tooling - feeds the fastener to the Slide/Gripper Assembly at the top of the throat. The workpiece is located and the hole centered on an automatic feed anvil. When the press is actuated the fastener is put on the end of an automatic feed punch and carried down to the waiting workpiece for insertion. This type of tooling is available for various nuts, studs and standoffs, as well as special fasteners.
- Double Stroke Bottom Feed Nut Tooling - is for nut-type similar to Top Feed Tooling except that the workpiece is not placed on the anvil before the press is actuated. During this mode the fastener is fed to the Slide/Gripper Assembly. When the foot pedal is pressed the first time the nut is carried down to the anvil and deposited on the anvil, shank up. Then the workpiece is placed onto the fastener shank. When the foot pedal is pressed the second time the installation process is started. This type of tooling is used when the installation side of the workpiece is not accessible by the punch and the anvil length and shape is required to accommodate the workpiece.
- Injector/Bottom Feed Module Tooling - does not feed the fastener to the Slide/Gripper Assembly. Instead the fastener is fed directly into a punch or anvil module. For stud-type fasteners this is called an Injector Module and it is installed in the safety adapter. The stud is fed out to the injector module, the workpiece is located on a top-feed type anvil and the stud is carried down by the injector module and inserted. For nut-type fasteners a Bottom Feed Nut Module is installed on the anvil holder. The nut is fed out to the Bottom Feed Nut Module, the module is actuated by the Bottom Feed Cylinder and the fastener is pushed out into place. The workpiece is located on the shank of the fastener like Double Stroke Bottom Feed Nut Tooling. The punch comes down and does the insertion. These types of tooling are used for applications where the shape or size of the workpiece can be accommodated by the type of module tooling.

Tooling Mode Selection on the Touch Screen

During the setup selection process of the press, the tooling mode must be selected on the touch screen. The tooling modes available are:

[MANUAL NUT]
[MANUAL STUD]
[TOP FEED NUTS/SO]
[BOTTOM FEED DOUBLE STROKE]
[BOTTOM FEED NUTS]
[STUDS/BSO]
[STUDS INJECTOR]
[LONG STANDOFFS]
[PF]
[TOP MOUNT ANVIL - NUT]
[TOP MOUNT ANVIL – STUD]
[CUSTOM]

NOTE: For Standoff Fasteners different tooling modes are selected based on size and type. Choose:

[LONG STANDOFFS] - if the standoff length is long like a stud and the tooling components have a stud-type shuttle with round tubing and a pin punch

[TOP FEED NUT/SO] - if the standoff length is short and looks like a nut and the tooling components have a nut-type shuttle with rectangular tubing

[STUDS/BSO] - if the standoff is long or blind (no thru hole) and the tooling components have a stud-type shuttle with round tubing and vacuum punch Top Feed Nut Tooling

Tooling Component Installation

Stud Escapement and Nut Gate

- The purpose of an escapement is to properly align the fasteners so that other tooling can deliver and position them at the ram/anvil area, properly positioned for insertion. Escapements are installed on the outside/top part of the vibratory bowl.
- The escapements used with nuts have two parts: (1) the first part of the escapement is called the nut gate adapter. The nut gate adapter is placed upon the escapement adapter with two positioning pins. (2) The second piece is called the nut gate. The nut gate provides a “fastener-specific” machined channel which will funnel only properly aligned nuts to the shuttle. The nut gate is positioned on top of the nut gate adapter with the same two positioning pins and is secured in place with one thumb screw.

- The escapements used with studs are “stud specific”. The escapement is mounted onto the “escapement adapter” with the nut gate adapter removed.
- After mounting an escapement, push the “puffer” air hose into the escapement air intake connector. The puffer has two functions: (1) to blow excess and misaligned fasteners off the top part of the bowl’s ramp, back into the bowl and; (2) to create a slight vacuum (only when inserting nuts) which helps pull the nuts into the escapement channel.
- Adjust the puffer air pressure by turning the puffer’s flow-control knob. Excess/Misaligned nuts and studs should be blown back into the bowl, while correctly oriented nuts should be gently drawn into the channel. This knob is located below the escapement mounting area.

Shuttle And Tube

- The purpose of a shuttle is to move the fasteners, one at a time, from the escapement to the mouth of its mated plastic tube which will then transport the fasteners to the punch/anvil area.
- To prevent fasteners from becoming misaligned, each shuttle and each tube is designed to be part specific. For this reason the shuttles are typically left attached to their mated tubes and handled as one assembly.
- When installing a shuttle: (1) attach it to the shuttle air cylinder. This air cylinder is mounted on the same bracket that will support the shuttle after it is installed. The function of this air cylinder is to push and pull the shuttle’s slide back and forth. To attach the air cylinder to the shuttle, slide the shuttle’s clevis over the tip on the end of the cylinder rod; (2) position the shuttle over the two positioning pins then secure it in place with its one tee handle. Be sure to maintain a gap of about 1mm (.040”) between the shuttle and the escapement.

Tube Extension, Jaws, Punch

- Slide the punch into the bottom of the safety housing and secure it by tightening the two setscrews.
- Slide the anvil into the anvil holder and tighten its mounting screw to hold it in position.
- Install the set of jaws on the gripper assembly. Locate each jaw using the two positioning pins provided, then secure it by tightening its thumbscrew.
- For nut insertion, twist the tubing 180 degrees (so the nut will be positioned shank-side down) and slide the end of the tube over the fitting on the left jaw
- For studs, slide the tube extension onto the end of the fastener delivery tube then insert the tube extension into the tube hanger, (the tube hanger is part of the tool support assembly). Be sure stud tubing *always* runs through the Stud-in-Tube sensor.

Injector Module

- Slide the top of the injector assembly into the bottom of the safety housing. Tighten the two setscrews to secure it.
- Slide the anvil into the anvil holder then tighten the setscrew to hold it securely.
- Install the fastener delivery tube by sliding it over the injector intake.

Bottom Feed Nut Module

- Attach the bottom feed tooling module to the top of the anvil holder. This is done in three steps: (1) place the hole in the bottom feed tooling module's slide, over the pin on the end of the cylinder rod; (2) place the hole in the bottom of the tooling module over the positioning pin on the anvil holder; and (3) tighten the two setscrews on the sides of the bottom tooling module to hold it in position.
- Only if you encounter fast/slow module performance adjust the air flow going to the cylinder assembly (located on the back end of the anvil holder), by turning the air flow control knob. The knob is on the end of the cylinder assembly.
- Slide the end of the fastener delivery tube over the intake at the rear of the bottom tooling module.

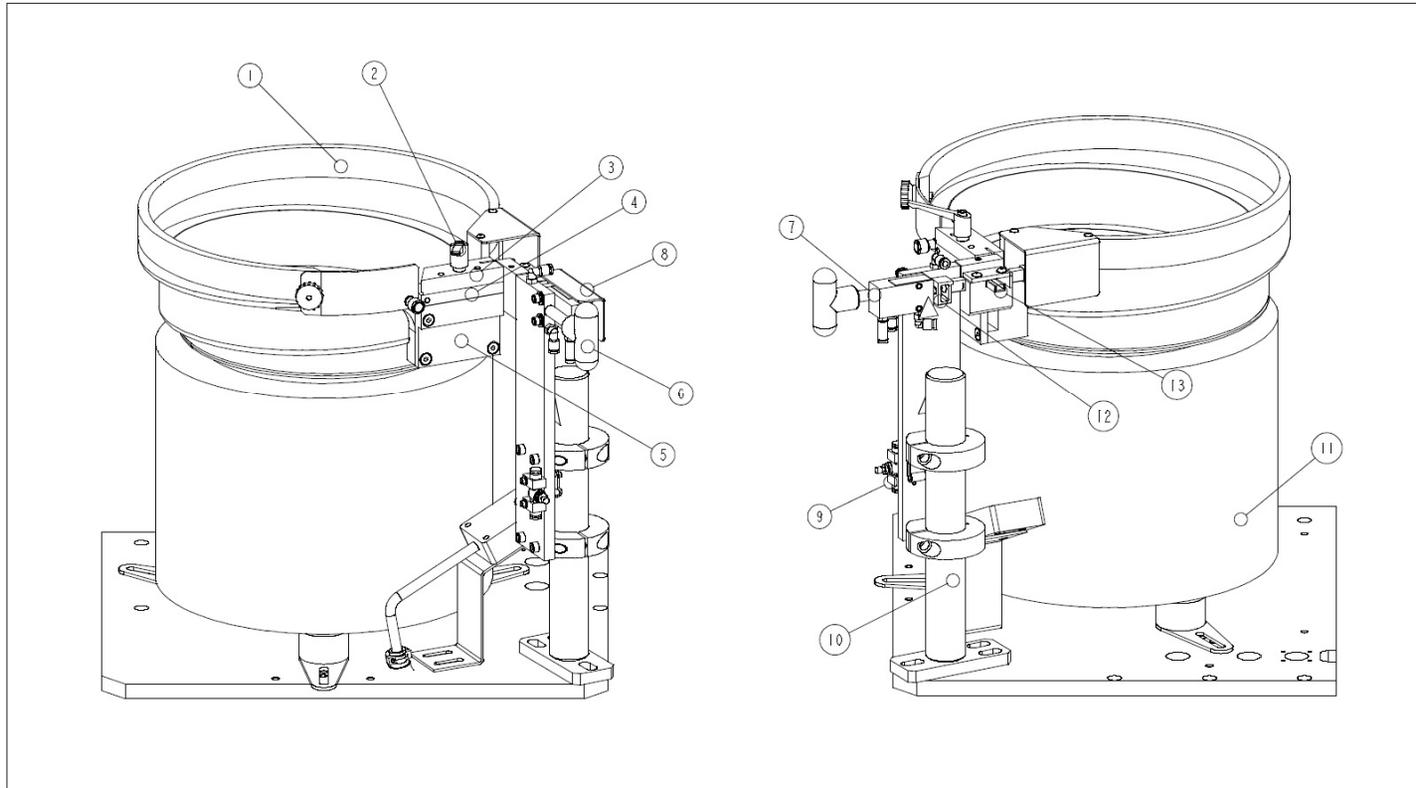
Top Mount Anvil Holder (OPTION)

- The top mount anvil module is for manual applications requiring 9000 lbs. (4082.4 kg.) or less. The geometry of this anvil permits installation of parts into workpieces which need clearance underneath the anvil to be positioned properly.
- Remove standard punch and anvil.
- Remove the gripper hanger assembly from the frame by unscrewing the four (4) socket head cap screws with a 3/16" Allen wrench.
- Remove the wall mount pipe clamp closest to the hanger assembly by unscrewing one (1) socket head cap screw with a 9/64" Allen wrench.
- Use four (4) 1/4"-20 bolts to secure the top and bottom portions of the mounting block (P/N 8004280 and 8004281 respectively) to the frame using a 3/16" Allen wrench. Do not tighten.
- Reinforce top and bottom mounting blocks by screwing 1/2"-20 bolts into the frame. Do not tighten.
- Unscrew the rosette style lock knob found on the left side of the mounting block assembly so the pin provides clearance for insertion of the anvil holder. **Insert the anvil holder until it stops.** Hand tighten the rosette knob to secure the anvil holder in place.
- Install 1/4" anvil (P/N 975200722025) and 1 1/2" punch (P/N 8004414). The punch length should not exceed 2." In the Maintenance Mode, accessed from the 2000 touchscreen, jog the punch on top of anvil and physically line up, then tighten. Jog ram down to confirm alignment between punch and anvil. Jog ram to home position.

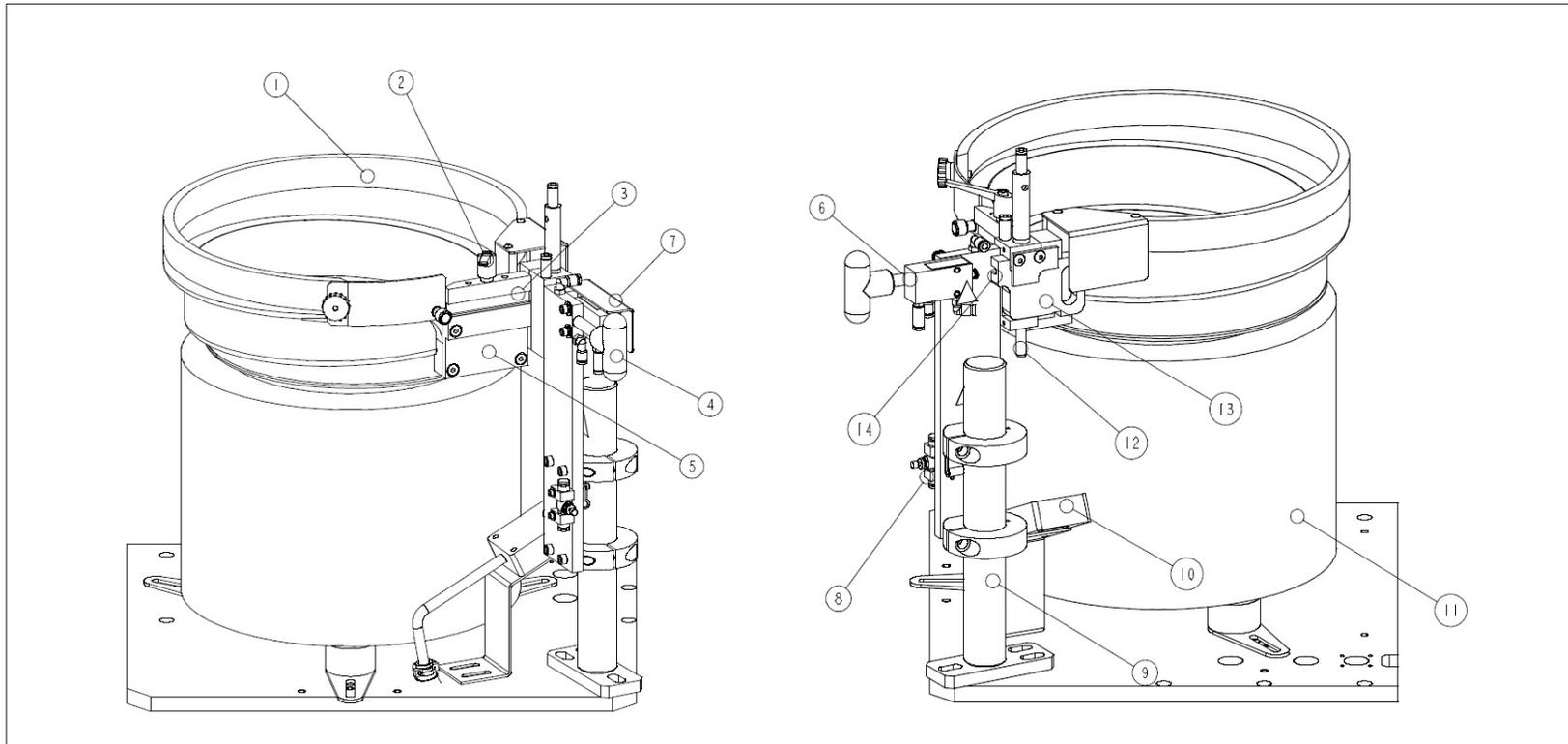
- Once aligned torque all bolts to 150 foot-pounds (203.4 N/m). Jog ram down to ensure alignment after tightening.
- The mounting block of the top mount anvil holder is designed to mount the gripper hanger assembly for automatic feeding, thus eliminating the need to remove the mounting block.
- The anvil must be removed to install the hanger assembly. Unscrew the rosette style knob to disengage the pin from the anvil allowing it to slide.
- Remove the anvil.
- Mount the hanger assembly to the mounting block and secure it with one (1) SHCS with a 3/16" Allen wrench.
- Follow the alignment procedure for the hanger assembly outlined in Document P/N 8006092, Pemsrter[®] Series 2000[®] Alignment Procedure for Gripper/Slide Hanger Assembly (P/N 8010944) and Anvil Holder.

Fastener Length Monitoring System (OPTION)

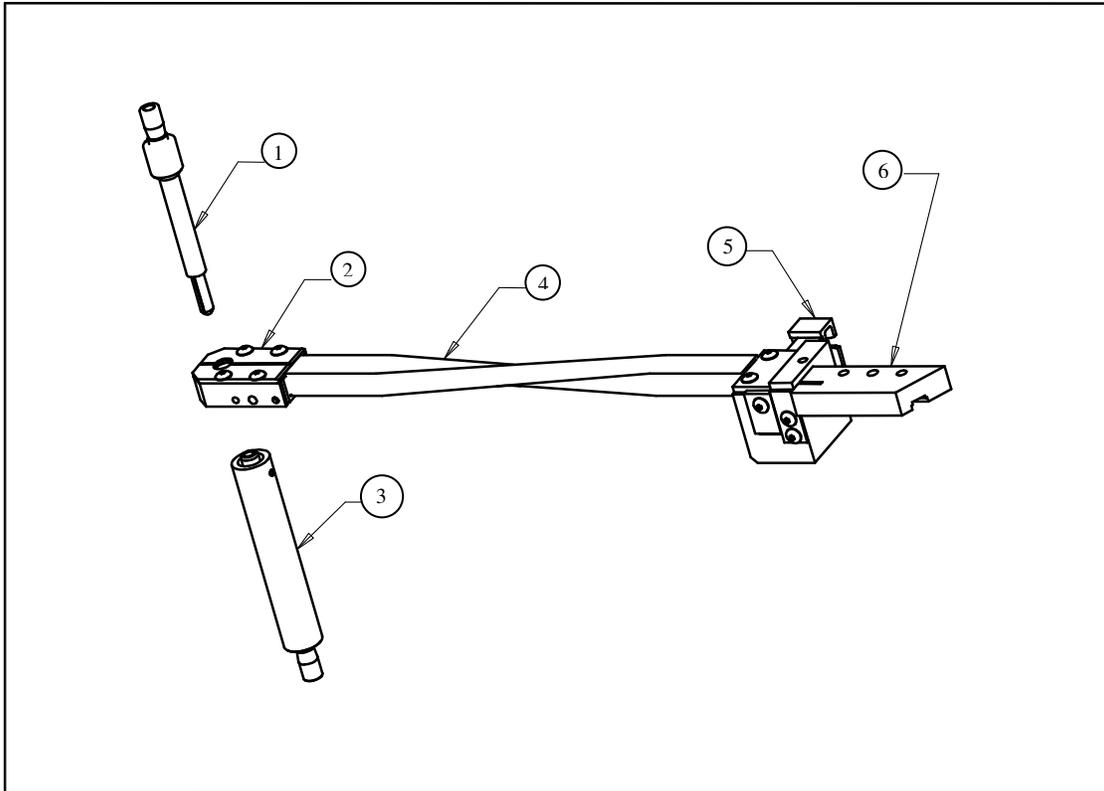
- The Fastener Length Monitoring (FLM) System is a system that checks the length of stud-type fasteners such as studs and long standoffs and only installs fasteners that passes the check. The system attaches to stud-type shuttles and plugs in the port on the vibratory bowl plate in place of where the Stud-In-Tube sensor plugs in.
- The FLM system consists of a sensing unit that uses two sets of optical sensors that look at the end of the fastener when it is staged in the shuttle for feeding out to the installation area of the press. If the sensors do not receive the correct combination of signals for a correct fastener then the press control system, feeds the fastener out to the top feed slide and gripper system and drops the part instead of installing it. The press control system then attempts to seek a new correct fastener.
- The FLM hardware can be set-up to any standard length fastener.



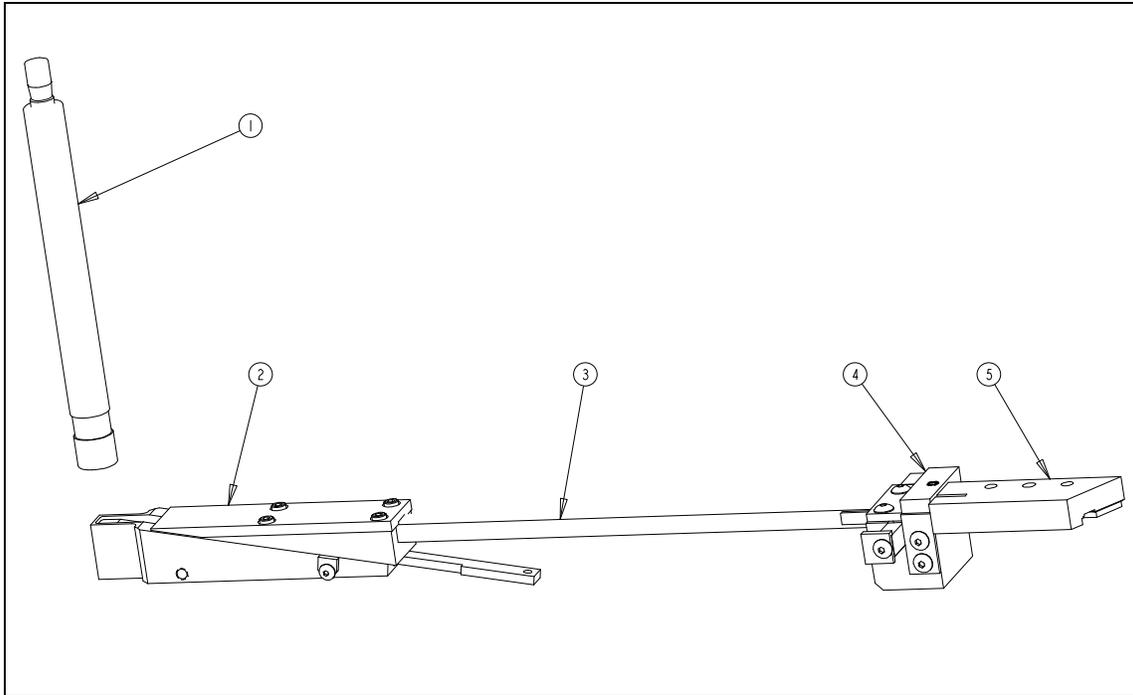
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	FEEDER BOWL	8	TRANSPARENT SHUTTLE GUARD
2	RETAINING HANDLE	9	“PUFFER” FLOW CONTROL VALVE
3	NUT GATE	10	SHUTTLE SUPPORT ASSEMBLY
4	NUT GATE ADAPTER	11	FEEDER BASE
5	ESCAPEMENT ADAPTER	12	CLEVIS
6	HANDLE	13	TUBING ADAPTER
7	SHUTTLE AIR CYLINDER		
FIGURE 9-1 FEEDER BOWL SYSTEM WITH NUT TOOLING			



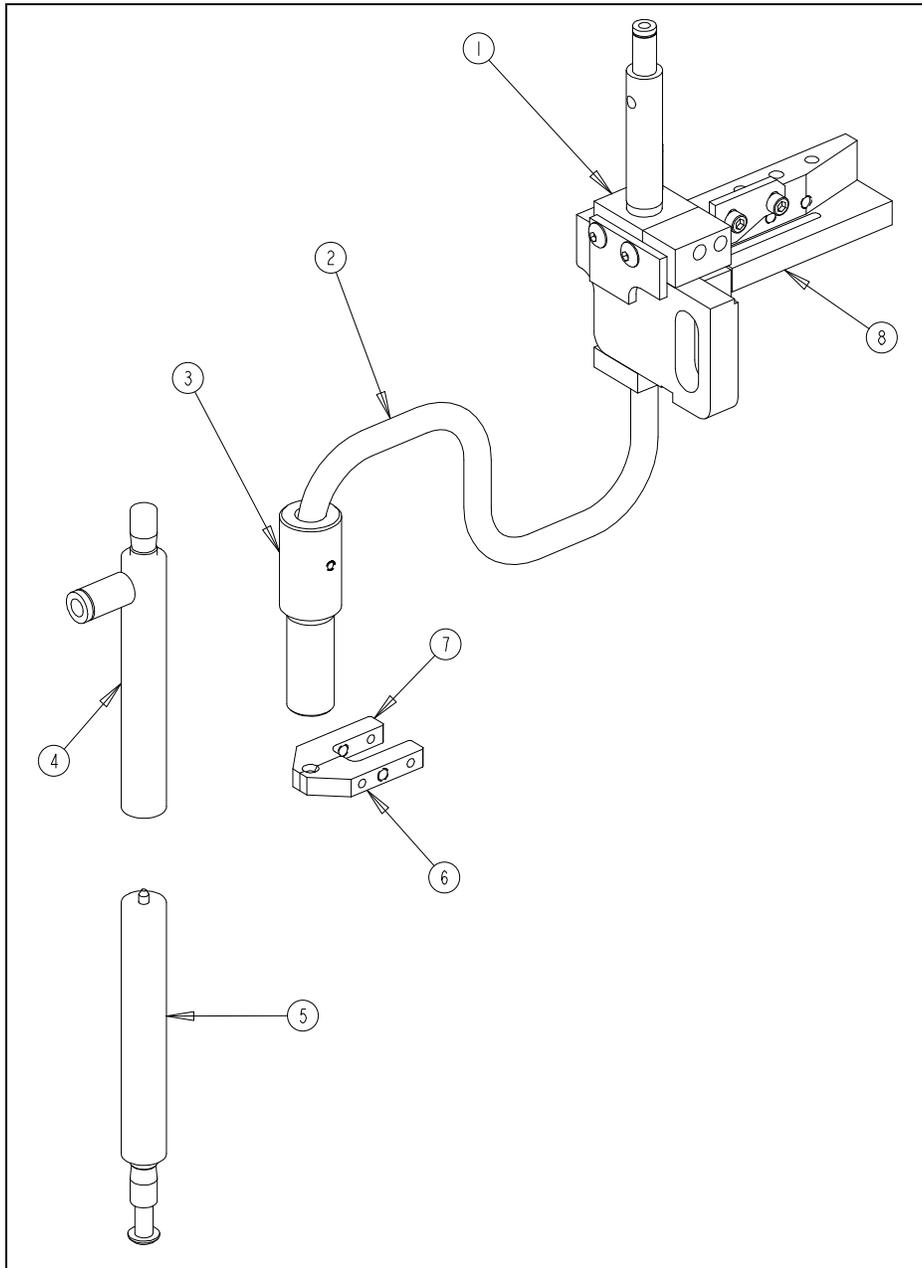
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	FEEDER BOWL	8	"PUFFER" FLOW CONTROL VALVE
2	RETAINING HANDLE	9	SHUTTLE SUPPORT ASSEMBLY
3	STUD ESCAPEMENT	10	RING SENSOR
4	HANDLE	11	FEEDER BOWL BASE
5	ESCAPEMENT ADAPTER	12	TUBING ADAPTER
6	SHUTTLE AIR CYLINDER	13	STUD SHUTTLE ASSEMBLY
7	TRANSPARENT SHUTTLE GUARD	14	CLEVIS
FIGURE 9-2 FEEDER BOWL SYSTEM WITH STUD TOOLING			



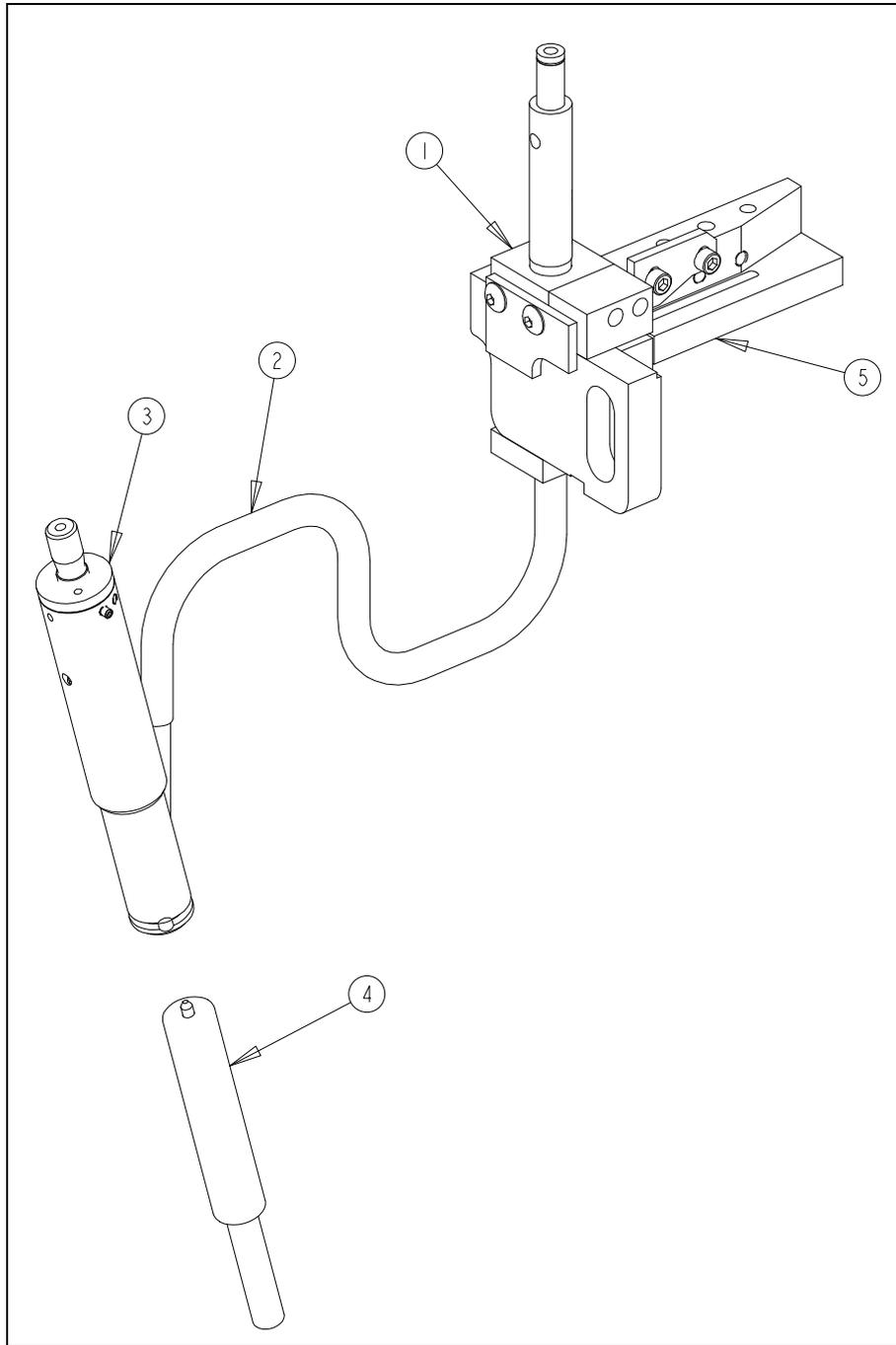
ITEM	DESCRIPTION
1	PUNCH ASSEMBLY
2	JAW ASSEMBLY
3	ANVIL ASSEMBLY
4	TUBING
5	SHUTTLE ASSEMBLY
6	NUT GATE
FIGURE 9-3 TOP FEED NUT TOOLING PACKAGE	



ITEM	DESCRIPTION
1	PUNCH ASSEMBLY
2	MODULE ASSEMBLY
3	TUBING
4	SHUTTLE ASSEMBLY
5	NUT GATE
FIGURE 9-4 BOTTOM FEED NUT TOOLING PACKAGE	

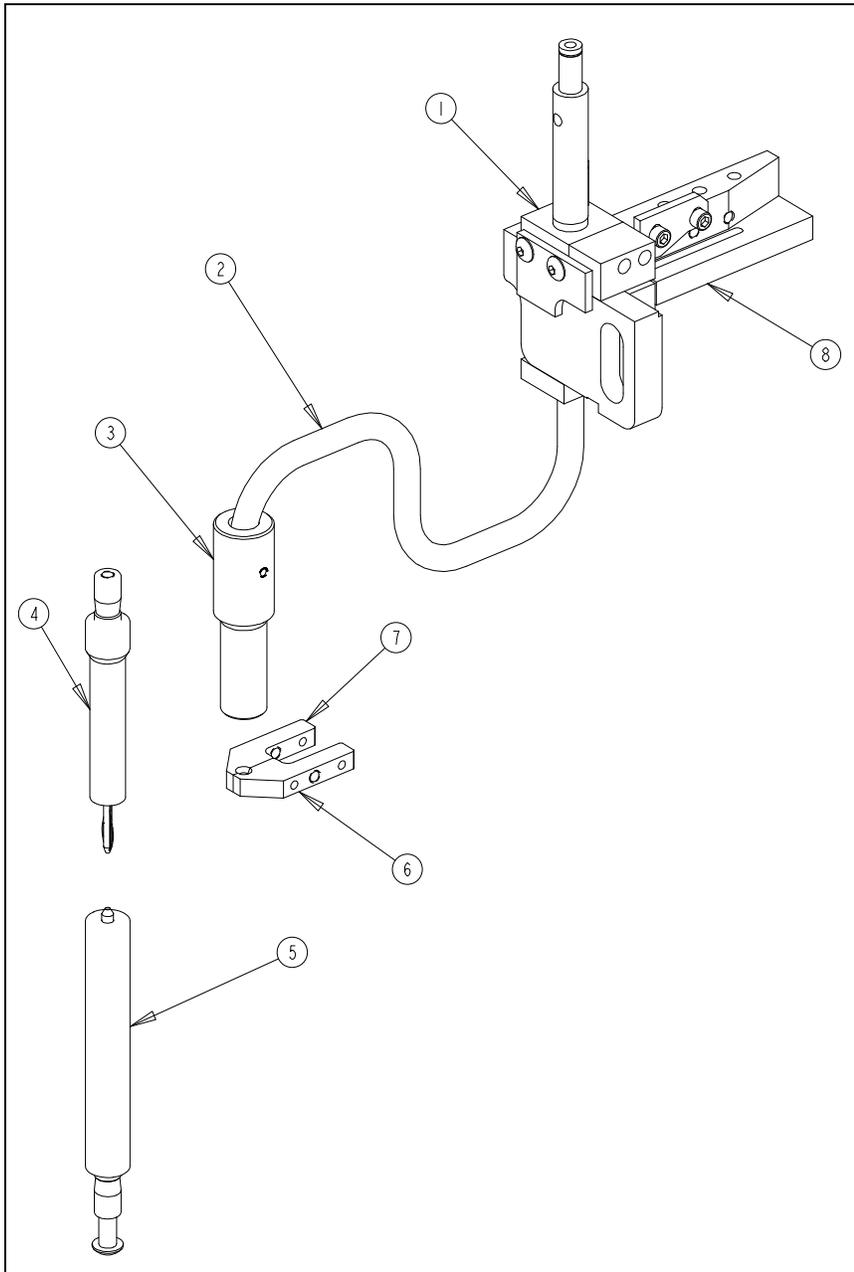


ITEM	DESCRIPTION
1	SHUTTLE ASSEMBLY
2	TUBING
3	TUBE EXTENSION
4	PUNCH ASSEMBLY
5	ANVIL ASSEMBLY
6	RIGHT HAND JAW
7	LEFT HAND JAW
8	STUD ESCAPEMENT
FIGURE 9-5	
TOP FEED STUD/STANDOFF TOOLING PACKAGE	



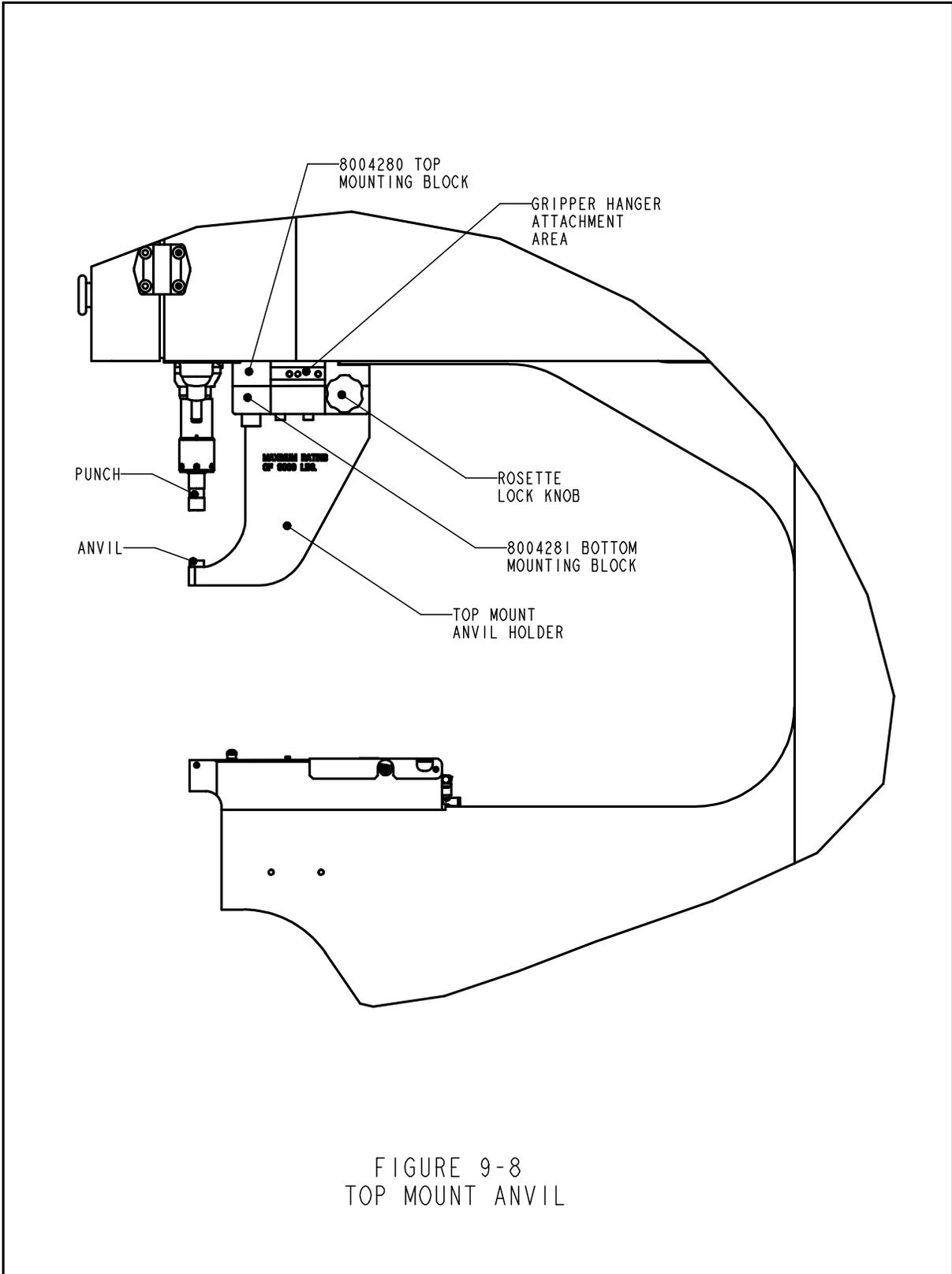
ITEM	DESCRIPTION
1	SHUTTLE ASSEMBLY
2	TUBING
3	INJECTOR TOOLING MODULE
4	ANVIL ASSEMBLY
5	STUD ESCAPEMENT

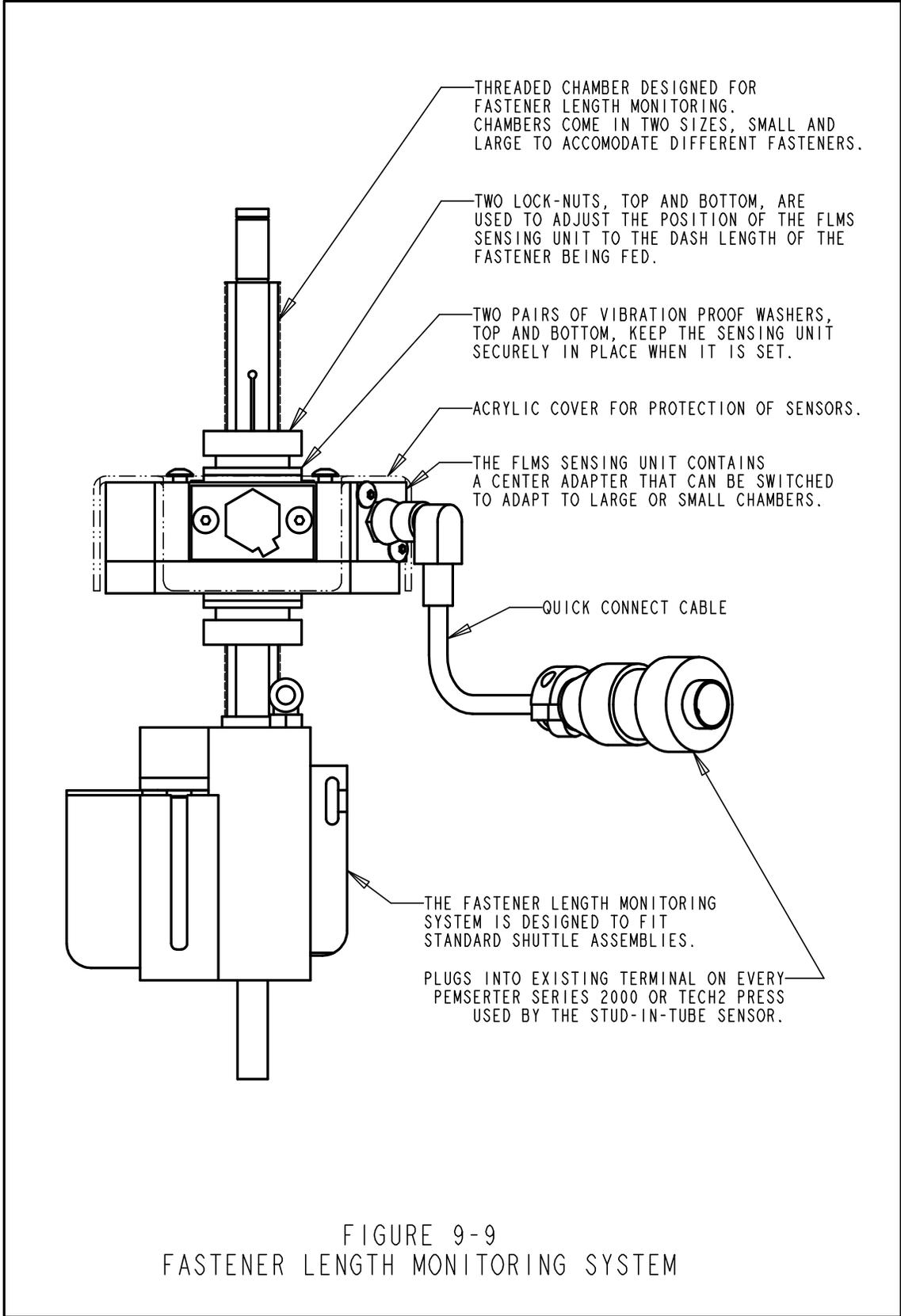
**FIGURE 9-6
INJECTOR STYLE TOOLING PACKAGE**



ITEM	DESCRIPTION
1	SHUTTLE ASSEMBLY
2	TUBING
3	TUBE EXTENSION
4	PUNCH ASSEMBLY
5	ANVIL ASSEMBLY
6	RIGHT HAND JAW
7	LEFT HAND JAW
8	STUD ESCAPEMENT

**FIGURE 9-7
TOP FEED STANDOFF PIN TYPE TOOLING PACKAGE**





SECTION 10

PRESS OPERATION



Before running the press:

- **Install the tooling** (See Tooling Section 9).
- **Check air supply** – be sure it is connected and that the pressure is between 6 and 7 BAR (90 to 100 psi)
- **Check electrical power supply** – be sure the ON/OFF switch in the back is in the ON position. (indicated by red illuminated “off” button on the front of the press)
- **Always wear eye protection when operating the press.**
- **Always keep all body parts as far away from moving parts as possible.**
- **Test the safety system every day**



Testing the Safety System:

- **Install Tooling** - any punch and anvil set can be used. Standard flat punch and anvil for a Series 2000 are 16mm (.625”) in diameter and 102mm (4.0”) long.
- **Turn On the Press** – push the green ON button.
- **Access the Setup** – press [CONTINUE] on the touchscreen.
- **Select Setup Type** – press [TOOL SETUP]
- **Select Tooling Type** – select a [Manual] tooling mode
- **Select Fastener Size and Workpiece Material** – select any size and material
- **Select Force** – press [CONTINUE] to accept the default force.
- **Perform Safety Setup** – With NO fastener or workpiece between the punch and the anvil. Step on the foot pedal, the ram will extend and the punch and anvil will touch and "learn" the safety setup position. The ram will return up and the run screen will appear.
- **Test Safety System** - Test that the safety system is functioning properly. Use the following test:
 - a) After completing the safety setup step with nothing between the punch and the anvil. Place a wooden lead pencil on the anvil.
 - b) Wear eye protection, keep body parts away from moving parts, as far as possible.
 - c) Step on the footpedal.
 - d) The ram will extend, the punch will contact the pencil and the press will indicate a safety fault.
 - e) If the wood of the pencil is broken, the press has failed the safety test.
 - Turn the press off.
 - Remove and Lock out the power and air supply.
 - Contact your service representative.

Wood Lead Pencil - 6.3mm-7.6mm (.250-.300”) flat-to-flat hexagon (6-sided) cross section.

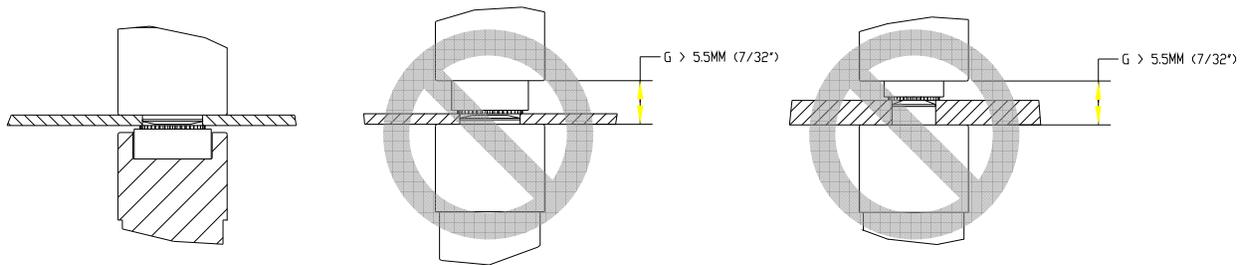
Running the press:

(The instructions given are for a standard new job setup. For the different options see Section 6 Touchscreen Controls.)

- **Turn On the Press** – push the green ON button.
- **Access the Setup** – press [CONTINUE] on the touchscreen.
- **Select Setup Type** – press either
[TOOL SETUP] – to setup a new job
[RECALL A JOB] – to select a job from a pre-saved list
[RECALL LAST JOB] – to select the same job that was last run, even if the press was turned off.
- **Select Tooling Type** – press selection
- **Select Fastener Size and Workpiece Material** – press selections
- **Select Force** – adjust force or accept default then press [CONTINUE]
- **Perform Safety Setup** - Follow the instructions on the screen. If in automatic feed mode a fastener will be fed. Position the workpiece properly, flat on the anvil or fastener. Step on the foot pedal, the ram will extend and touch the fastener and workpiece and "learn" the safety setup position. The fastener will not be installed.



IMPORTANT: The ram must contact the fastener fully in the workpiece (but not installed) and both the fastener and workpiece must be flat to the punch and anvil. The gap between the punch and the anvil must not exceed 5.5mm (7/32") to conform to internationally recognized safety standards. This means that the stacked height of the fastener and the workpiece before installation must not exceed 5.5mm (7/32").

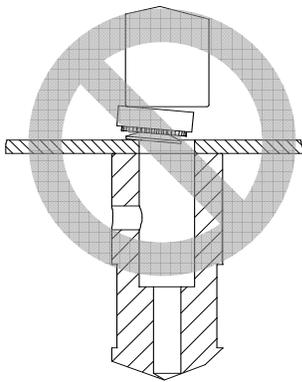
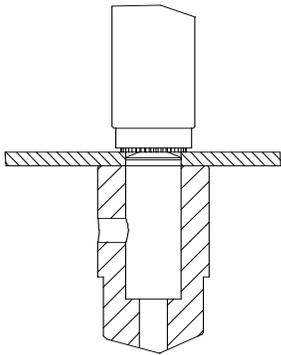


See drawings on next page for examples of proper and improper setup.

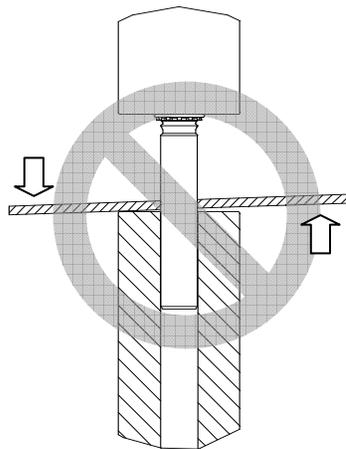
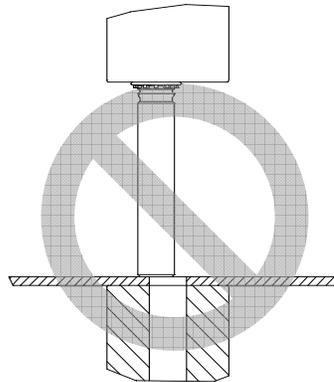
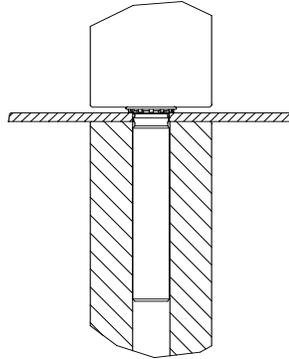
- **Install Fastener** – Position the workpiece properly, flat on the anvil or fastener. Step on the foot pedal. The ram will extend and install the fastener. The press will then get ready to install the next fastener.

EXAMPLES:

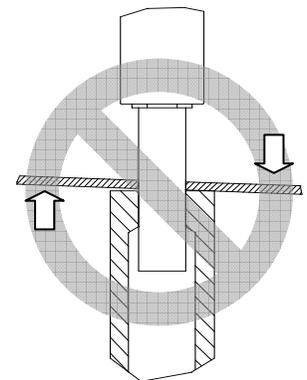
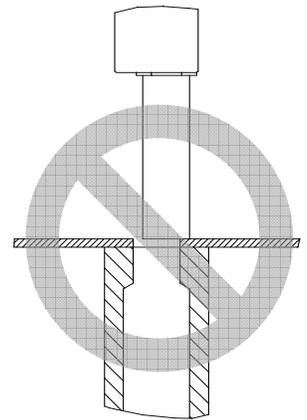
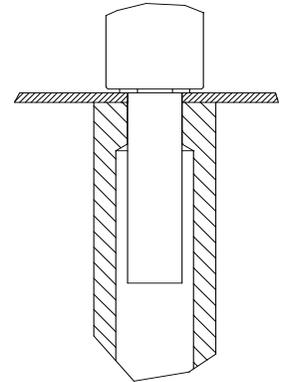
Nut Setup



Stud Setup



Standoff Setup



SECTION 11

MAINTENANCE

The most important element of maintaining your PEMSERTER® Series 2000® Press is to ensure that the compressed air supply is clean and dry. Do not use lubricated air.

Following the maintenance schedule below will also help maintain your press in good running order.



IMPORTANT: Only qualified individuals should perform maintenance procedures. Unless otherwise specified, perform all maintenance with the press disconnected from air and power. Follow safe practices and obey all local safety regulations.

Maintenance Schedule – PEMSERTER® Model 20010/110

Daily Inspection

<ul style="list-style-type: none">• Check oil condition and level in air/oil tanks.	<ul style="list-style-type: none">• If the oil is foamy or pink in color, there is excessive air or water contamination. Follow air bleed procedures and recheck. If the oil continues to foam or stays pink, it is contaminated and must be changed. The source of the contamination must be eliminated to avoid reoccurrence of the problem.• If the oil level is off the marks, the oil must be leveled. Follow air bleed procedures and recheck. If the oil is still out of level, balance tanks and add oil as necessary.
<ul style="list-style-type: none">• Check tooling	<ul style="list-style-type: none">• DO NOT USE tooling that is cracked, chipped or otherwise damaged.• Check that all retracting pins move freely.
<ul style="list-style-type: none">• Check footpedal cord	<ul style="list-style-type: none">• Repair or replaced any broken, frayed or otherwise damaged cord.
<ul style="list-style-type: none">• Check Safety Stop Distance	<ul style="list-style-type: none">• Perform Safety Stop Distance Check Procedure (“Pencil Test”)

Weekly Inspection

<ul style="list-style-type: none"> • Check all filters and mufflers <ul style="list-style-type: none"> • Reclassifier/muffler • Electronic regulator filter • Booster valve mufflers 	<ul style="list-style-type: none"> • Some oil at the reclassifier/muffler in back is normal, empty or change filter as oil collects. If reclassifier/muffler is excessively wet, there may be oil problems. Recheck oil and observe tanks while the press is running. Look for foaming. If oil rises to the top of the tank, it may be blowing out through the valves. Follow air bleed procedures, recheck and change oil if required. • Change electronic regulator filter as needed. If filter becomes dirty quickly, it may indicate contaminants in the air that need to be eliminated, because it may lead to other problems. • If mufflers become dirty quickly, it may indicate contaminants in the air that need to be eliminated, because it may lead to other problems. • If mufflers show red oil, it may indicate a leak in the booster system. Call PennEngineering[®] Service.
<ul style="list-style-type: none"> • Check Lightstream Collar 	<ul style="list-style-type: none"> • If plastic lens is dirty, clean with optical cleaning solution and soft cloth.
<ul style="list-style-type: none"> • Clean Press 	<ul style="list-style-type: none"> • Wipe clean any build up of possible grime, oil mist or other material from room air. This will assist in detecting actual problems with the press systems.

Monthly Inspection and Maintenance

<ul style="list-style-type: none"> • Check Tooling Alignment 	<ul style="list-style-type: none"> • Check Punch and Anvil alignment • Check Jaw to Punch alignment • Check Bowl to Shuttle alignment
<ul style="list-style-type: none"> • Check Lightstream operation 	<ul style="list-style-type: none"> • Remove any punch and anvil tooling and in Maintenance Mode on the Touchscreen, jog the ram all the way down to the end of its stroke. Check to make sure that the Safety Sensor LED's do not change or flicker along the entire stroke.
<ul style="list-style-type: none"> • Check Safety Assembly Operation 	<ul style="list-style-type: none"> • Push on the Punch Adapter of the Safety Assembly by hand and make sure that it moves freely and smoothly along the entire spring-loaded stroke.
<ul style="list-style-type: none"> • Check Actuator Movement 	<ul style="list-style-type: none"> • Check Shuttle Cylinder moves freely • Check Slide moves freely • Check Gripper moves freely • Check Bottom Feed Cylinder moves freely.

Monthly Inspection and Maintenance (Continued)

<ul style="list-style-type: none"> • Check Vibratory Bowl 	<ul style="list-style-type: none"> • Check for dirt, powder, or any other material in bowl, clean as needed. • Check the inside surfaces of the bowl, the surfaces should have an even sand blasted finish. If parts of the bowl become polished and shiny, the bowl surface should be sand blasted.
<ul style="list-style-type: none"> • Check Tooling Adapter 	<ul style="list-style-type: none"> • Check the surface of the tooling nutgate adapter plate. The top surface should have an even sand blasted finish. If areas of the plate become polished and shiny, the plate should be sand blasted.

Annual Maintenance

<ul style="list-style-type: none"> • Clean Air Valves (optional) 	<ul style="list-style-type: none"> • If contaminant build up occurs, clean the pneumatic valves annually.
<ul style="list-style-type: none"> • Change Oil (optional) 	<ul style="list-style-type: none"> • If contaminants enter the oil system, flush and change the oil annually.
<ul style="list-style-type: none"> • Clean Vacuum Generator (optional) 	<ul style="list-style-type: none"> • If contaminant build up occurs, clean the vacuum generator annually.
<ul style="list-style-type: none"> • Check Vibratory Bowl Magnet Gaps 	<ul style="list-style-type: none"> • Gap between magnetic coils and striker plate should be 0.9 to 1.0 mm (.035”-.040”) and parallel. Adjust with screws as needed. Be sure to keep coils and plates parallel.
<ul style="list-style-type: none"> • Check Air Accumulation Tank 	<ul style="list-style-type: none"> • Be sure air and power is disconnected. Pull the tubing from the air accumulation tank and check for water or other contaminants. If Tank is installed with fittings at the top, remove and reinstall with fitting on the bottom. Longer replacement tubing may be required.

3 Year Maintenance

<ul style="list-style-type: none"> • Rebuild Cylinder and Booster (optional) 	<ul style="list-style-type: none"> • Contact PennEngineering® Service Department.
<ul style="list-style-type: none"> • Replace PLC Battery 	<ul style="list-style-type: none"> • A low battery indicator function exists in the software. Changing the battery can avoid an accidental loss of the program. When changing the battery the press should be powered on to make sure the program is not lost.

PEMSERTER® Series 2000®, Model 20010/110 Maintenance Procedures

Testing the Safety Stop Distance (“Pencil Test”)

Purpose: To check that the safety system is operating properly.

Why: The safety system of the press is the most important system. It is designed to be self-diagnosing and so no single component fault will compromise the system. However, a check should always be done as a final test of the system.

How Often: Perform Daily

Tools Needed: Wooden Lead Pencil

(Any standard pencil will do but the one commonly used is a wooded lead pencil with a 6.3mm-7.6mm (.250-.300”) flat-to-flat hexagon (6-sided) cross section.)

- **Install Tooling** - any punch and anvil set can be used. Standard flat punch and anvil for a Series 2000 are 16mm (.625”) in diameter and 102mm (4.0”) long.
- **Turn On the Press** – push the green ON button.
- **Access the Setup** – press [CONTINUE] on the touchscreen.
- **Select Setup Type** – press [TOOL SETUP]
- **Select Tooling Type** – select a [Manual] tooling mode
- **Select Fastener Size and Workpiece Material** – select M2.5/#2 size and Aluminum
- **Select Force** – press [CONTINUE] to accept the default force.
- **Perform Safety Setup** – With NO fastener or workpiece between the punch and the anvil. Step on the foot pedal, the ram will extend and the punch and anvil will touch and "learn" the safety setup position. The ram will return up and the run screen will appear.
- **Test Safety System** - Test that the safety system is functioning properly. Use the following test:
 - a) After completing the safety setup step with nothing between the punch and the anvil. Place a wooden lead pencil on the anvil.
 - b) Wear eye protection, keep body parts away from moving parts, as far as possible.
 - c) Step on the footpedal.
 - d) The ram will extend, the punch will contact the pencil and the press will indicate a safety fault.
 - e) If the wood of the pencil is broken, the press has failed the safety test.
 - Turn the press off.
 - Remove and Lock out the power and air supply.
 - Contact your service representative.

Bleeding Air from the Oil System

Purpose: To remove air from the oil system.

Why: Air in the main cylinder above the piston will increase the dwell time of the installation. Excessive air in the main cylinder below the piston will affect the Safety Stopping Distance.

How Often: Check Daily, Perform as needed.

Tools Needed: 46mm or 1-7/8" open end wrench or large enough adjustable wrench.
Rag or towel to catch and clean some oil.

- Before performing procedure allow press to sit for at least an hour after last cycle.
- Remove Punch and Anvil Tooling.
- In Maintenance Mode on the Touchscreen, Jog the Ram Done at 100% Speed. Observe the Left Tank, check for bubbles or foam.
- If bubbles or foam observed, allow the press to sit powered on but idle until the oil in the left tank is clear and dark.
- With the ram still down, turn the press off and disconnect power and air from the press.
- Disconnect the linear transducer from the electrical connection box in the front enclosure. Run the cable out the top of the enclosure so that it can twist freely.
- Loosen the linear transducer probe, do not begin to unscrew it.
- Slowly unscrew the linear transducer ½ turn and stop. Check for oil at the connection wait for 10 seconds.
- Repeat ½ turns to unscrew the linear transducer until a steady ring of oil is seen around the connection, then quickly reinstall the transducer.
- If no oil comes out and the transducer is entirely unscrewed, then there is not enough oil in the system. Reinstall the transducer one turn in. Open the balancing valves between the two tanks. Oil will move from the Left Tank to the Right Tank and out the transducer port. Watch carefully and finish installing the transducer as soon as oil is seen at the connection. Close the balancing valves between the two tanks.



IMPORTANT: Never leave the balancing valves open without locking out the power and air to the press. If the press is turned on and actuated with the balancing valves open, the oil from the tanks will be ejected out the back of the press.

- Tighten the linear transducer, maximum 9.6 N·m (70 ft-lbs) and, reconnect the transducer.
- Reconnect power and air to the press.
- Turn on the press and in Maintenance Mode, Jog the Ram back up.
- Run the Ram Up and Down and observe the tanks for air bubbles and foam. If Air persists, repeat the process for the tank with the air. If there is air in the left tank, continue to run the ram all the way down and allow the press to settle. If there is air in the right tank repeat the bleed process at the transducer port.

Leveling the Oil in the Tanks

Purpose: To maintain the optimum levels of oil in the tanks.

Why: If the oil levels are too low or too high, the oil may approach too close to the tops or bottoms of the tanks and either exhaust oil into the air system or collect air in the oil.

How Often: Check Daily, Perform as needed.

Tools Needed: none

- Before performing procedure allow press to sit for at least an hour after last cycle.
- Remove Punch and Anvil Tooling
- Check for Air in the oil in the left tank, under the piston side.
In Maintenance Mode on the Touchscreen, with the ram already in the up position:
 - Press the Ram Up button on the PLC I/O Screen and hold.
 - While observing, the oil level in the left tank, release the Ram Up button.
 - If the oil level rises, that is an indication of air being compressed and uncompressing on that side of the system.
 - If the level movement observed is more than 3mm (1/8 in.) then follow bleed procedure.
- Check for Air in the oil in the right tank, above the piston side.
In Maintenance Mode on the Touchscreen.
 - Press the Ram Down button on the PLC I/O Screen until the ram is fully extended and hold.
 - While observing the oil level in the right tank, release the Ram Down button.
 - If the oil level rises, that is an indication of air being compressed and uncompressing on that side of the system.
 - If the level movement observed is more than 3mm (1/8 in.) then follow bleed procedure.
- After completing the air checks, return the ram to the top.
- Turn the press off and disconnect power and air.
- Open the balancing valves between the tanks.



IMPORTANT: Never leave the balancing valves open without locking out the power and air to the press. If the press is turned on and actuated with the balancing valves open, the oil from the tanks will be ejected out the back of the press.

- When the levels of both tanks are equal, shut the balancing valves.
- Check that the levels are at the marked levels on the tanks. The marks should be at 108 mm (4.25 in.) from the bottom. Add oil from the top if necessary.
- Check that the balance valves are closed and the fill ports are secure.
- Reconnect power and air to the press.

After 50,000 cycles, the operator will be prompted to check the tanks for proper level. If the tanks are not out of level, simply press the “OK” button and resume normal press operation. If the tanks are not level, this procedure should be followed.

Adding Hydraulic Fluid to the System

Purpose: To maintain the optimum levels of oil in the tanks.

Why: If the oil levels are too low, the oil may approach too close to the bottoms of the tanks and collect air in the oil.

How Often: Check Daily, Perform as needed.

Tools Needed: 5/16" Hex Wrench, Ladder, ATF Oil

- Make sure the ram is in the fully retracted position
- Disconnect air and power from the press.
- Remove the caps on top of the pneumatic/hydraulic system enclosure over the air-oil tanks.
- Remove the fill plugs on top of the air-oil tanks needing the additional fluid.
- Using a funnel with a filter, such as one used for paint, pour ATF fluid into the top of the air-oil tanks up to the fill lines. The optimum level of oil for both tanks is 108 mm (4.25 in.) from the bottom.
- Use Automatic Transmission Fluid – ATF

PennEngineering® recommends WOLF'S HEAD® ATF

It is a multi-functional fluid, which meets or exceeds the following performance requirements or manufacturers' specifications:

- DEXRON® -III (GM 6297-M)
- MERCON® (Ford M2C185A)
- Allison Type C-4
- Caterpillar TO-2

It also passed Foam Test ASTM D-892-74 No Foam (0-0-0)

- Replace the fill plugs on top of the air-oil tanks and fully tighten.
- Replace the caps on top of the pneumatic/hydraulic system enclosure.



WOLF'S HEAD LUBRICANTS

Safety data sheet
according to 1907/2006/EC (REACH),
1272/2008/EC (CLP), and GHS

Page 1/9

Revision: 07.17.2015

1 Identification of the substance/mixture and of the company/undertaking
<ul style="list-style-type: none">- 1.1 Product identifier- Trade name: WOLF'S HEAD DX III-H/M ATF- Application of the substance / the preparation Lubricating Oils- 1.3 Details of the supplier of the Safety Data Sheet- Manufacturer/Supplier: WOLF'S HEAD LUBRICANTS 1801 McCloskey Boulevard Tampa, FL 33605 U.S.A. Phone: 813-569-8108- 1.4 Emergency telephone number: ChemTel Inc. (800)255-3824, +1 (813)248-0585
2 Hazards identification
<ul style="list-style-type: none">- 2.1 Classification of the substance or mixture- Classification according to Regulation (EC) No 1272/2008 The product is not classified according to the CLP regulation.- Classification according to Directive 67/548/EEC or Directive 1999/45/EC Not applicable.- Information concerning particular hazards for human and environment: The product does not have to be labeled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.- Classification system: The classification is according to the latest editions of the EU-lists, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.- 2.2 Label elements- Labeling according to Regulation (EC) No 1272/2008 N/A- Hazard pictograms N/A- Signal word N/A- Hazard statements N/A- Hazard description:- WHMIS-symbols: Not hazardous under WHMIS.

(Contd. on page 2)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; padding: 2px;"> <ul style="list-style-type: none"> · HMIS Long Term Health Hazard Substances </td> <td style="width: 20%; text-align: right; padding: 2px;">(Contid. of page 1)</td> </tr> <tr> <td colspan="2" style="padding: 2px;">None of the ingredients is listed.</td> </tr> <tr> <td colspan="2" style="padding: 2px;"> <ul style="list-style-type: none"> · 2.3 Other hazards · Results of PBT and vPvB assessment · PBT: Not applicable. · vPvB: Not applicable. </td> </tr> </table>		<ul style="list-style-type: none"> · HMIS Long Term Health Hazard Substances 	(Contid. of page 1)	None of the ingredients is listed.		<ul style="list-style-type: none"> · 2.3 Other hazards · Results of PBT and vPvB assessment · PBT: Not applicable. · vPvB: Not applicable. 				
<ul style="list-style-type: none"> · HMIS Long Term Health Hazard Substances 	(Contid. of page 1)									
None of the ingredients is listed.										
<ul style="list-style-type: none"> · 2.3 Other hazards · Results of PBT and vPvB assessment · PBT: Not applicable. · vPvB: Not applicable. 										
3 Composition/information on ingredients										
<ul style="list-style-type: none"> · 3.2 Mixtures · Description: Mixture of substances listed below with nonhazardous additions. 										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3" style="padding: 2px;">Dangerous components:</td> </tr> <tr> <td style="width: 30%; padding: 2px;"> CAS: 64742-54-7 EINECS: 265-157-1 Index number: 649-467-00-8 </td> <td style="width: 50%; padding: 2px;"> Distillates (petroleum), hydrotreated heavy paraffinic substance with a Community workplace exposure limit Carc. Cat. 2 </td> <td style="width: 20%; text-align: right; padding: 2px;">81%</td> </tr> <tr> <td style="padding: 2px;"> CAS: 64741-89-5 EINECS: 265-091-3 Index number: 649-455-00-2 </td> <td style="padding: 2px;"> Distillates (petroleum), solvent-refined light paraffinic Xn R65 Carc. Cat. 2 Asp. Tox. 1, H304 </td> <td style="text-align: right; padding: 2px;">10%</td> </tr> </table>		Dangerous components:			CAS: 64742-54-7 EINECS: 265-157-1 Index number: 649-467-00-8	Distillates (petroleum), hydrotreated heavy paraffinic substance with a Community workplace exposure limit Carc. Cat. 2	81%	CAS: 64741-89-5 EINECS: 265-091-3 Index number: 649-455-00-2	Distillates (petroleum), solvent-refined light paraffinic Xn R65 Carc. Cat. 2 Asp. Tox. 1, H304	10%
Dangerous components:										
CAS: 64742-54-7 EINECS: 265-157-1 Index number: 649-467-00-8	Distillates (petroleum), hydrotreated heavy paraffinic substance with a Community workplace exposure limit Carc. Cat. 2	81%								
CAS: 64741-89-5 EINECS: 265-091-3 Index number: 649-455-00-2	Distillates (petroleum), solvent-refined light paraffinic Xn R65 Carc. Cat. 2 Asp. Tox. 1, H304	10%								
<ul style="list-style-type: none"> · Additional information: <p style="margin: 0;">Note L: The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346 'Determination of polycyclic aromatics in unused lubricating base oils and asphaltene free petroleum fractions - Dimethyl sulphoxide extraction refractive index method', Institute of Petroleum, London. This product meets these requirements.</p>										
4 First aid measures										
<ul style="list-style-type: none"> · 4.1 Description of first aid measures · General information: No special measures required. · After inhalation: Supply fresh air; consult doctor in case of complaints. · After skin contact: Immediately wash with water and soap and rinse thoroughly. If skin irritation continues, consult a doctor. · After eye contact: Remove contact lenses if worn. Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor. · After swallowing: Rinse out mouth and then drink plenty of water. Do not induce vomiting; call for medical help immediately. · 4.2 Most important symptoms and effects, both acute and delayed No further relevant information available. 										
(Contid. on page 3)										

Safety data sheet
according to 1907/2006/EC (REACH),
1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 2)

- **4.3 Indication of any immediate medical attention and special treatment needed**
 No further relevant information available.

5 Firefighting measures

- **5.1 Extinguishing media**
- **Suitable extinguishing agents:**
 Carbon dioxide
 Water haze or fog
 Foam
 Fire-extinguishing powder
- **For safety reasons unsuitable extinguishing agents:** Water with full jet
- **5.2 Special hazards arising from the substance or mixture**
 In case of fire, the following can be released:
 Carbon monoxide (CO)
 Under certain fire conditions, traces of other toxic gases cannot be excluded.
- **5.3 Advice for firefighters**
- **Protective equipment:**
 Wear self-contained respiratory protective device.
 Wear fully protective suit.

6 Accidental release measures

- **6.1 Personal precautions, protective equipment and emergency procedures**
 Ensure adequate ventilation
 Wear protective equipment. Keep unprotected persons away.
- **6.2 Environmental precautions:**
 Do not allow to enter sewers/ surface or ground water.
 Prevent from spreading (e.g. by damming-in or oil barriers).
- **6.3 Methods and material for containment and cleaning up:**
 Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
 Send for recovery or disposal in suitable receptacles.
 Do not flush with water or aqueous cleansing agents
- **6.4 Reference to other sections**
 See Section 7 for information on safe handling.
 See Section 8 for information on personal protection equipment.
 See Section 13 for disposal information.

7 Handling and storage

- **7.1 Precautions for safe handling** Avoid the formation of oil haze.
- **Information about fire - and explosion protection:** No special measures required.
- **7.2 Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by store rooms and receptacles:** No special requirements.

(Contd. on page 4)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 3)

- **Information about storage in one common storage facility:**
 Store away from foodstuffs.
 Store away from oxidizing agents.
- **Further information about storage conditions:** Store in cool, dry conditions in well sealed receptacles.
- **7.3 Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.

8.1 Control parameters

- **Ingredients with limit values that require monitoring at the workplace:**

64742-54-7 Distillates (petroleum), hydrotreated heavy paraffinic

PEL (USA)	5 mg/m ³
TLV (USA)	Short-term value: 10 mg/m ³ Long-term value: 5 mg/m ³

- **Additional information:** The lists valid during the making were used as basis.

8.2 Exposure controls

Personal protective equipment:

General protective and hygienic measures:

The usual precautionary measures are to be adhered to when handling chemicals.
 Keep away from foodstuffs, beverages and feed.
 Avoid contact with the eyes.

Respiratory protection:

Not necessary if room is well-ventilated.
 Use suitable respiratory protective device in case of insufficient ventilation.

Protection of hands:



Protective gloves

Oil resistant gloves

Material of gloves

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

Eye protection:



Safety glasses

Goggles recommended during refilling

(Contd. on page 5)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 4)

9 Physical and chemical properties					
<ul style="list-style-type: none"> · 9.1 Information on basic physical and chemical properties · General Information · Appearance: <table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">Form:</td> <td>Oily</td> </tr> <tr> <td style="padding-left: 20px;">Colour:</td> <td>Amber coloured</td> </tr> </table> · Odour: Characteristic · Odour threshold: Not determined. 		Form:	Oily	Colour:	Amber coloured
Form:	Oily				
Colour:	Amber coloured				
· pH-value:	Not determined.				
· Change in condition					
Melting point/Melting range:	Undetermined.				
Boiling point/Boiling range:	Undetermined.				
· Flash point:	190 °C (374 °F)				
· Flammability(solid, gaseous):	Not applicable.				
· Ignition temperature:					
Decomposition temperature:	Not determined.				
· Self-igniting:	Product is not self-igniting.				
· Danger of explosion:	Product does not present an explosion hazard.				
· Explosion limits:					
Lower:	Not determined.				
Upper:	Not determined.				
· Vapour pressure:	Not determined.				
· Density at 20 °C:	0,86 g/cm ³				
· Relative density	Not determined.				
· Vapour density	Not determined.				
· Evaporation rate	Not determined.				
· Solubility in / Miscibility with water:	Not miscible or difficult to mix.				
· Partition coefficient (n-octanol/water):	> 2,0 log POW (Estimate)				
· Viscosity:					
Viscosity Index:	180				
Kinematic at 40 °C:	33 cSt (7,2 cSt @ 100 °C)				
· Solvent content:					
Organic solvents:	0,0 %				
· 9.2 Other information	No further relevant information available.				

(Contd. on page 6)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 5)

10 Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
- **10.3 Possibility of hazardous reactions** Reacts with strong oxidizing agents.
- **10.4 Conditions to avoid** Store away from oxidizing agents.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Possible in traces.
Sulphur oxides (SO_x)
Nitrogen oxides (NO_x)

11 Toxicological information

- **11.1 Information on toxicological effects**
- **Acute toxicity:**
- **LD/LC50 values relevant for classification:**

Oral	LD50 >2000 mg/kg (rat)
Dermal	LD50 >2000 mg/kg (rabbit)
- **Primary irritant effect:**
- **on the skin:** Slight irritant effect on skin and mucous membranes.
- **on the eye:** Slight irritant effect on eyes.
- **Sensitization:** Sensitizing effect by skin contact is possible by prolonged exposure.
- **Additional toxicological information:**
The product is not subject to classification according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version.
When used and handled according to specifications, the product does not have any harmful effects to our experience and the information provided to us.

12 Ecological information

- **12.1 Toxicity**
- **Aquatic toxicity:** The material is harmful to the environment.
- **12.2 Persistence and degradability** Not easily biodegradable
- **12.3 Bioaccumulative potential** May be accumulated in organism
- **12.4 Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**
Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water
Danger to drinking water if even small quantities leak into the ground.
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

(Contd. on page 7)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 6)

- 12.5 Results of PBT and vPvB assessment
- PBT: Not applicable.
- vPvB: Not applicable.
- 12.6 Other adverse effects No further relevant information available.

13 Disposal considerations

- 13.1 Waste treatment methods
- Recommendation
 Must not be disposed together with household garbage. Do not allow product to reach sewage system.
 Can be reused after reprocessing.
 Delivery of waste oil to officially authorized collectors only.
- Uncleaned packaging:
- Recommendation: Disposal must be made according to official regulations.

14 Transport information

- | | |
|--|-----------------|
| - 14.1 UN-Number | |
| - DOT, ADN, IMDG, IATA | N/A |
| - 14.2 UN proper shipping name | |
| - DOT, ADR, ADN, IMDG, IATA | N/A |
| - 14.3 Transport hazard class(es) | |
| - DOT, ADR, ADN, IMDG, IATA | |
| - Class | N/A |
| - 14.4 Packing group | |
| - DOT, ADR, IMDG, IATA | N/A |
| - 14.5 Environmental hazards: | |
| - Marine pollutant: | No |
| - 14.6 Special precautions for user | Not applicable. |
| - 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable. |
| - UN "Model Regulation": | - |

(Contd. on page 8)

Safety data sheet
 according to 1907/2006/EC (REACH),
 1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contd. of page 7)

15 Regulatory information

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

- Section 355 (extremely hazardous substances):

None of the ingredients is listed.

- Section 313 (Specific toxic chemical listings):

None of the ingredients is listed.

- TSCA (Toxic Substances Control Act):

All ingredients are listed.

- Proposition 65 (California):

- Chemicals known to cause cancer:

None of the ingredients is listed.

- Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed.

- Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed.

- Chemicals known to cause developmental toxicity:

None of the ingredients is listed.

- Carcinogenic Categories

- EPA (Environmental Protection Agency)

None of the ingredients is listed.

- IARC (International Agency for Research on Cancer)

None of the ingredients is listed.

- TLV (Threshold Limit Value established by ACGIH)

None of the ingredients is listed.

- MAK (German Maximum Workplace Concentration)

None of the ingredients is listed.

- NIOSH-Ca (National Institute for Occupational Safety and Health)

None of the ingredients is listed.

- OSHA-Ca (Occupational Safety & Health Administration)

None of the ingredients is listed.

- Canada

- Canadian Domestic Substances List (DSL)

All ingredients are listed.

- Canadian Ingredient Disclosure list (limit 0.1%)

None of the ingredients is listed.

(Contd. on page 9)

Safety data sheet
according to 1907/2006/EC (REACH),
1272/2008/EC (CLP), and GHS

Trade name: WOLF'S HEAD DX III-H/M ATF

(Contid. of page 8)

Canadian Ingredient Disclosure list (limit 1%)

None of the ingredients is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases

H304 May be fatal if swallowed and enters airways.

R65 Harmful: may cause lung damage if swallowed.

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

ATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labeling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

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This document was authored and reviewed by the technical and scientific staff at ChemTel Inc. Descriptions, classifications and calculations are based upon data provided by manufacturer and augmented by published data in conjunction with expert analysis by degreed scientists.

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SECTION 12

TROUBLESHOOTING

<p>Note: If an internal PLC problem should develop, call a PennEngineering® service technician. Clients in the USA, please call 800-523-5321. International clients, please call (215) 766-3801.</p>		
SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
<p>A. Whole System Malfunctions</p>		
<p>1. The press will not start. (OFF light not lit)</p>	<p>a. Electrical disconnect turned off. b. No power to the press. c. DC Power Supply failure.</p>	<p>a. Turn on. b. Check main fuses. c. Check DC Power supply, replace if faulty.</p>
<p>The press will not start (ON light is lit)</p>	<p>a. OFF button is “open”. b. ON button is not closing. c. MCR(Main Control Relay) system failure.</p>	<p>a. Check button, replace if faulty. b. Check button, replace if faulty. c. Check the wiring continuity, replace if faulty.</p>
<p>2. The press will not cycle.</p>	<p>a. Safety sensor inputs 1 & 2 are on. b. Footpedal is not making the proper PLC input.</p>	<p>a. The reflector is not in proper position for “lightstream” process. b. Check the footpedal & wiring. Replace if faulty.</p>
<p>3. SAFETY FAULTS: Sensors tripping above/ below the safety window.</p>	<p>a. Misalignment of punch/ gripper/ anvil. b. Slide/gripper require maintenance/cleaning. c. Safety housing spring damaged.</p>	<p>a. Check alignment. b. Clean/lube shafts as necessary. c. Check spring/replace if faulty.</p>

SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
B. Electrical/Electronic Malfunctions		
1. The touch screen will not work but the power button is lit.	a. Fuse F2 is open.	a. Analyze and repair the touch screen related circuitry then replace the fuse. b. Replace the touch screen if faulty.
2. None of the PLC lights come on.	a. Check to see if the PLC power supply is receiving 24 volts. b. Check the fuse in the PLC power supply. c. Check to see if the PLC power supply has failed.	a. If not receiving power check fuse F2 b. Replace the fuse in the power supply. c. Replace the power supply.
3. The sensors are not functioning.	a. Check to see if fuse F3 is open. b. Check all sensors to see if one has a “short.” c. Check the DC input module.	a. If open, investigate the circuitry and replace fuse three. b. Repair the “short” problem and/or replace the sensor. c. If faulty, replace the DC input module.
4. The pilot regulator is not functioning. (Power is on, but no pressure is on the gauge at the ram valves.)	a. Check to see if fuse F4 is open. b. Check pilot pressure at the regulator.	a. If open, investigate the electrical regulator and relevant circuitry, then replace the fuse. b. If there is pilot pressure replace the regulator. If not replace electronic regulator.
5. The DC power supply is not functioning.	a. Check the main power fuses. b. Check for line voltage at the supply terminals.	a. Replace if blown. b. Check the wiring between the power inlet module and the supply. c. Replace the power supply.
6. The press will not power-up.	a. Check to see if there is incoming power. b. Check to see if the main disconnect is shut off. c. Check MCR’s wiring.	a. Provide the power. b. Turn to the ON position.

SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
7. The press will not power-down.	a. Check to see if the OFF button is faulty. b. check MCR's /wiring.	a. Replace if faulty.
8. No voltage at a particular solenoid.	a. Check for a shorted coil. b. Check the related PLC output voltage.	a. Repair or replace. b. Replace the output card if faulty.
C. Ram Malfunctions		
1. The ram does not move up and down smoothly.	a. Check the main cylinder assembly. b. A Safety valve is dirty/sticking/damaged	a. Replace the main cylinder assembly if faulty. b. Clean, rebuild, or replace if faulty.
2. Oil is leaking out of the main cylinder.	a. The main cylinder assembly is faulty..	a. Replace the main cylinder assembly.
3. The ram will not go down.	a. Check to see if either safety valve is stuck in the closed position. b. Check to see if output lights one and two are on. c. Check to see if either safety sensor has opened. d. Check to see if the Linear Transducer has failed.	a. Clean, rebuild, or replace if faulty. b. The PLC has determined that the Linear Transducer /Safety states are not right. Fix conditions. c. Replace if faulty. d. Replace if faulty.
4. The ram will not go up.	a. Check to see if output light 1&2 have gone off and if output light 4 is on. b. Check to see if output light 3 is off, then see if the booster has retracted.	a. The PLC has determined that the conditions are not right. Fix conditions. b. Repair or replace the booster if faulty.
5. The ram will not stop quickly.	a. Air trapped in the bottom of the main cylinder b. Check both safety valves.	a. Remove the punch and anvil from the ram, and cycle the ram full stroke, down and up, waiting for air to rise out of the oil, between strokes. b. Clean, rebuild, or replace if faulty.
6. The safety assembly tip is wobbly.	a. Check the set screws holding the punch.	a. Tighten the set screws.

SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
7. There is insufficient insertion force.	a. Check to see if the force level was set too low. b. Check the electric regulator for air pressure level. c. Check to see if the booster is stuck in the retracted position.	a. Reset the force level via the touch screens. b. Reset the electric regulator. c. Repair or replace the booster.
D. Pneumatic/Hydraulic System Malfunctions		
1. White foam and/or sludge has collected in the air-oil tanks.	a. Water has gotten into the system because of “dirty” air entering the press.	a. If a small amount of foam and/or sludge is in the tanks, clean out the tanks. If a large amount of foam and/or sludge is in the tanks, dismantle and thoroughly clean every pneumatic/hydraulic components, then replace the hydraulic fluid (oil).
2. Hydraulic fluid (oil) does not come up to the fill lines on the tanks.	a. Check for fluid leaks.	a. Repair any leaks then see Section 11 for system refilling and balancing instructions.
3. No vacuum at the punch.	a. Check that PLC output light number 8 is lit and the module is putting out 24V. b. Check the vacuum aspirator solenoid.	a. If not putting out 24V replace the output module. If putting out 24V and the solenoid is not working replace the solenoid. b. Replace if faulty
4. No air is entering the press.	a. Check to see if the manually operated regulator is closed. b. Check the quick exhaust/supply valve.	a. Open the regulator. Replace if faulty. b. Replace if faulty.
5. No compressed air “dumping” noise is heard when the press is shut down.	a. Check the quick exhaust/supply valve for incoming pressure.	a. Replace if faulty.

SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
E. Tooling Malfunctions		
1. If : <ul style="list-style-type: none"> • The puffer is not working properly. • Blower 1 is not working properly. • Blower 2 is not working properly. • The shuttle is not sliding back and forth. • The upper front tooling slide does not extend. • The bottom feed nuts are not being pushed out to the anvil. • The gripper assembly is not functioning. 	a. Check the output module to see if the respective LED is lit and that the module is putting out 24V to the solenoid.	a. Replace the output module if it is not putting out 24V or, if it is putting out 24V, replace the solenoid.
2. The injector has failed.	a. Check for a stuck stud or standoff. b. Check for broken spring	a. Remove the stuck fastener. b. Replace the spring
3. The shuttle is jammed.	a. A fastener is jammed.	a. Clear the fastener.
4. Nuts or studs are not being drawn through the escapement properly.	a. The escapement is out of alignment.	a. Realign the escapement.
5. The long lengths of studs are jamming in the tube.	a. Bends in tube are too tight	a. Redress tube to bend toward the frame and then through the tube clips on the frame.
6. Shuttle vibrates with the bowl.	a. Shuttle is too close to the escapement.	a. Maintain a gap of about .040" (1mm) between the shuttle and the escapement.

SYMPTOMS	DIAGNOSTICS & PROBABLE CAUSE(S)	PROBABLE SOLUTION(S)
F. Vibratory Bowl Malfunction		
1. The bowl does not vibrate.	a. Check the bowl driver controller fuse. b. Check to see if PLC output light 5 comes on. c. Check the bowl driver controller internal circuitry.	a. Check for a shorted winding on both magnets. Repair the short then replace the bowl driver controller fuse. b. Replace and reprogram the PLC if faulty. c. Replace parts, or the controller, as necessary.

SECTION 13 SPARE PARTS

PART DESCRIPTION	PFT PART NUMBER	QTY	MANUFACTURER	MANUFACTURER'S PART NUMBER
Level One Spare Parts (Maintain this minimum inventory of parts for standard mechanical wear items on the press.)				
Auto Transmission Fluid-Dextron II	9800391484	4 QTS		
SAFETY VALVE ASSEMBLY	8004636T	1	PennEngineering®	
VALVE, BOOSTER CYLINDER	8002228	1	SMC	NVFR3100R-5FZ
VALVE, MAIN CYLINDER	8002229	1	SMC	NVFR3400-5FZ
SENSOR, SAFETY	8009715	1	OMRON	E3Z-T81
VALVE, 4 WAY 2 POSITION	8003211	1	SMC	VQZ2151-5LO
AIR CYL. (SHUTTLE)	8000680	1	COMPACT AIR	BFH12X1
AIR CYL. (PUSHER)	8000467	1	COMPACT AIR	BFH12X2
GRIPPER	8006257	1	PennEngineering®	
LINEAR SLIDE	8006258		PennEngineering®	

Level Two Spare Parts (Add these items to the spare parts in inventory when no downtime can be tolerated.)				
CPU	8017455	1	OMRON	CJ2M-CPU12
POWER SUPPLY RACK	8011319	1	OMRON	CJ1W-PD025
ANALOG LVDT INPUT	8011346	1	OMRON	CJ1W-MAD42
SIXTEEN (16) POINT DC OUTPUT MODULE	8011345	1	OMRON	CJ1W-0D212
POWER SUPPLY, 24V, 100W	8013935	1	OMRON	S8VS-12024
ELECTRONIC PILOT REGULATOR KIT	8018522	1	MARSH-BELLOFRAM	110TE0G100D0000R