



Peristaltic Pump Filler Operations Manual

V1.2

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1.1 SAFETY

1.2 GENERAL SAFETY

Apex Filling Systems, LLC (APEX) manufactures and designs all of its products so they can be operated safely. However, the primary responsibility for safety rests with those who use and maintain these products. The following safety precautions are offered as a guide that if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment. The safety of personnel, equipment and plant facilities should be considered during equipment operation and with each changeover of product, or any machine modifications.

Only those who have been trained and delegated to do so and have read and understood this operator's manual should operate the equipment. Failure to follow the instructions, procedures and safety precautions in this manual can result in accidents and injuries.

DO NOT modify the equipment except with written factory approval. Unauthorized equipment modifications will void the warranty.

Each day walk around the equipment and inspect for leaks, loose parts, missing or damaged components, and parts out of adjustment. Perform all recommended maintenance noted in this manual.

EQUIPMENT SHOULD ALWAYS BE DE-ENERGIZED (POWER AND AIR) BEFORE MAKING MECHANICAL ADJUSTMENTS.

1.3 ELECTRICAL SHOCK

- ✓ To avoid electrical shock hazard, make sure this equipment is properly grounded.
- ✓ Dangerous voltages are present within the electrical enclosures. DO NOT operate this equipment with electrical covers open or removed.
- ✓ Keep all parts of the body, hand held tools, or other conductive objects away from exposed live-parts of the electrical system. Maintain dry footing and stand on insulating surfaces. DO NOT contact any portion of the equipment when adjusting or making repair to exposed live parts of electrical system.
- ✓ Attempt repairs only in a clean, dry, well-lighted, and ventilated area.

1.4 CONTACT MATERIALS COMPATIBILITY

APEX endeavors to make all contact parts compatible with buyer's products, if known. Because of the wide variety of possible products, Apex Filling Systems, LLC cannot be responsible or liable for ensuring compatibility of contact material with the products. Evaluate material compatibility prior to machine use. Failure to follow this procedure can result in machine damage, fire, operator injury or death




1.5 SAFETY COMPLIANCE LIABILITY

APEX endeavors to make machinery as safe to operate as possible. National, state and local laws related to safety in the workplace apply primarily to the responsibilities of the employer, and not the equipment manufacturer. The seller agrees to cooperate with the buyer in finding feasible answers to compliance problems. However, because APEX has little control of the many factors which may significantly affect the environment in which this equipment is installed, the seller does not warrant this equipment to be in compliance with OSHA or any like state or local laws or regulations. It is the buyer's responsibility to provide the modifications necessary to assure compliance with the laws and regulations at the point of installation.

A complete inspection of product is necessary until the machinery is proven to produce acceptable results. This should also be performed after every changeover.

1.6 CONVENTIONS

To ensure the safety of personnel which will install, adjust, maintain and operate this equipment, it is imperative that they understand the dangers, warnings and caution notices. It is important to understand the *signal words* that may be used throughout this manual.

| | |
|---|--|
|  | Alerts to immediate hazard, which will result in death or severe personal injury, if not avoided |
|  | Alerts to a hazard which will result in serious injury, or death in some cases, if not avoided. |
|  | Alerts to a potential hazard that may result in a serious personal injury, if not avoided. It also alerts against an unsafe practice that will permanently damage equipment or property. |
| IMPORTANT | Indicates a suggestion as to how to use or adjust the equipment for best product results. |
| NOTE | Points out a proper use that will avoid damage to the equipment, or will extend the life of the parts. |

2.1 MACHINE FEATURES & SPECIFICATIONS

2.2 INTRODUCTION

APEX peristaltic pump fillers are designed to be easy to setup and maintain, capable of providing years of reliable service. Versatile by design, APEX fillers can accommodate a wide variety of product and container configurations, often without the need for change parts. Modular design allows for fully automatic or semi-automatic systems. Tool-less adjustments are standard, and allow for easy and quick changeover for various product and container combinations. Operator controls are easily accessed via the front panel of the unit.

2.3 FEATURES & BENEFITS

- ✓ **Easy Changeover**
Simple mechanical adjustment for different bottle sizes. Quick to changeover, simple to use and easy to clean
- ✓ **Robust**
Anodized aluminum and stainless steel shells, frames, legs and housings maximize the working life of your machine, and minimize maintenance costs and downtime
- ✓ **Customizable**
Whatever the production need, APEX has a design to meet
- ✓ **Flexible**
Versatility and Simplicity are intrinsic to the design. Many container sizes and shapes, and many products can be run on one machine

3.1 INSTALLATION & START-UP

3.2 INSTALLATION PROCEDURES

The filler assembly should be placed on a solid, level foundation, with the fill head mount bar centered over the container conveyor. The main filler frame should be leveled using the threaded leveling pads. Electrical connections should be properly terminated into the main electrical enclosure by properly trained technicians, and appropriate supply voltage, proper phase and adequate supply amperage should be verified prior to powering up the equipment.

3.3 START-UP & COMMISSIONING

This manual should be read completely before powering-up the machine. Commissioning of the machine should be performed by a trained technician only after complete understanding of the machine, and with products that match samples indicated to Apex Filling Systems, LLC if supplied. After the machine is adjusted for the bottle and product combination, the machine can be put into operation with the following steps.

- ✓ Check the machine to see that guards are in place
 - ✓ Check the mechanical system for loose or missing parts
1. Ensure the E-STOP button is depressed, and the unit is clear of personnel.
 2. Remove any lock-out/tag-out devices and rotate the main power disconnect clockwise to ON



Figure 3-1
Emergency Stop



Figure 3-2
Main Disconnect

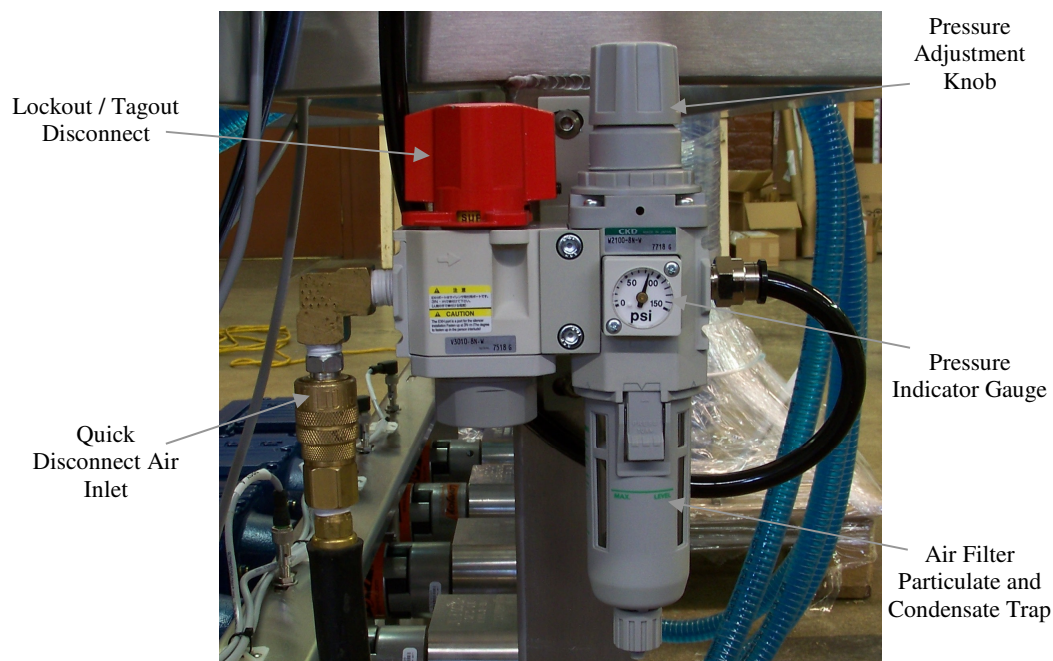


Figure 3-3
Main Air Disconnect and Filter Regulator

3. Keeping clear of any moving parts and assemblies, remove any lock-out/tag-out devices and rotate the main air disconnect clockwise to ON
4. Press the green Power Reset button to engage power to the control box
5. Verify that sufficient containers and product to be filled are available to be supplied to the filler
6. On the operator interface, press Cycle Start (or equivalent, depending upon controller used) to begin the container indexing and filling cycle.
7. If fill levels are incorrect, or machine indexing does not perform properly, refer to the appropriate mechanical adjustments (*Sec 4.1*) to rectify, or adjust the filling and indexing program timers (*see controller manual for detailed adjustments*)



Figure 3-3
Power Reset

4.1 MECHANICAL ADJUSTMENTS

4.2 THEORY OF OPERATION

Peristaltic pumps are suitable for dispensing, metering and general transfer applications. Typically, peristaltic tubing pumps offer flow rates as low as 0.0007 mL/min to 45 litres/min and are able to generate pressures up to 8.6 bar (125 psi).

Peristaltic pumps confine the media to the tubing, so that the pump cannot contaminate the fluid and the fluid cannot contaminate the pump. This contamination-free pumping makes peristaltic pumps particularly suitable for use in high purity applications, including the transfer or dosing of chemicals and additives in food, pharmaceutical and semiconductor applications.

In addition, as the media is confined to the tubing, a peristaltic pump offers easy maintenance and reduced downtime compared with other pumping technologies.

Peristaltic pumps use flexible tubing to run through rollers in the pump head. As fluid goes through the pump head, packets of fluids are formed. Flow rate is determined by the size of the packets and the speed of the rollers turning. By controlling the size of the tubing and the speed of the pump head accurate metering of the media can be achieved.

APEX peristaltic pump fillers utilize a container conveying system, typically a flat tabletop chained conveyor, to move containers into and out of the filling area. Container location is precisely controlled with the use of guide rails, and indexed using either air cylinders (commonly referred as “**gates**” or “**pins**”) to stop and release containers, or using starwheels designed per container, with pockets for container control. The fill cycle starts once the containers have been counted via an electrical sensor. Depending upon the equipped options, the drip tray retracts, the bottle neck locators extend, and a dive cylinder lowers the fill heads into the neck of the containers. The fill heads open, and the pumps begin pumping product into the containers. Dispensed volume is determined by several methods, depending upon the configuration and options installed. Simple timers are often sufficient to achieve accurate fill levels; however, more precise control can often be achieved using a “Pulse Count” method, utilizing sensors to count fractions of each pump revolution to dispense a repeatable volume of product. Fill level sensors can also be used to fill to a cosmetic level if equipped. Once the containers are full, and the fill cycle has finished, the full containers are indexed out of the fill area to down-line operations (capping, labeling, etc), and empty containers are indexed in to the fill area, ready to for the next fill cycle.

4.3 CONTAINER CONVEYING AND INDEXING ADJUSTMENTS

Utilizing a container conveyor and indexing pins, or indexed via starwheel, containers are presented to the filler in a uniform manner to achieve repeatable results. It is important that containers are allowed to move freely through the fill area, and properly located to avoid spillage.

There are three primary adjustments to note:

- CONTAINER GUIDE RAILS
- CONTAINER INDEXING GATES (PINS)
- CONTAINER POSITION SENSORS

4.4 CONTAINER GUIDE RAIL AND INDEXING GATE ADJUSTMENTS

For containers to move properly down the conveyor, guide rails must be adjusted so that containers move smoothly, without binding, in a uniform manner. Guide rails will typically be set toward the base of the container for best results. Difficult-to-control containers may require an alternate setup (multiple rails, special containment, etc) to effectively control the location of the containers. Guide rails are typically adjusted in/out and up/down with turnbuckles which hold the guide rail rods in place, as shown in *Fig 4-1*.



Figure 4-1
Guide Rails and Indexing Gates

Figure 4-1 shows a typical (left-to-right) set up of guide rails and indexing gates. Containers are situated in the fill area by the **Entry Gate** and **Exit Gate** locations. The **gates** or **pins**, are mounted in place with L-brackets mounted to a sliding mount rail as shown, and are positioned and locked into place with standard nuts and bolts.

The **exit gate** is set so that it extends over more than half of the container diameter, so the containers are positively stopped during the indexing cycle. The **entry gate** only extends far enough to hold back incoming (empty) containers from moving past it, without affecting their position when extended, as shown in *Fig 4-2*.

Air cylinders are typically equipped with air flow control valves to adjust the speed which the cylinders will operate. Turn clockwise to slow the extension or retraction, counter-clockwise to speed.

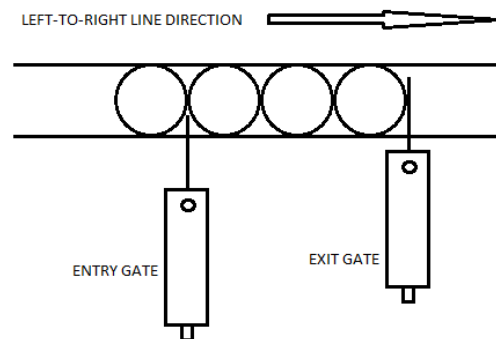


Figure 4-2
Indexing Gate Positioning

4.5 CONTAINER SENSOR ADJUSTMENTS AND LOCATIONS

Sensors are positioned along the container path on the conveyor (such as shown in *Fig 4-3*) to count and/or verify the container position. A variety of sensors can be utilized, depending upon the type of container to be sensed (clear glass, plastic bottle, metal can, etc.) Sensors located prior to the fill area count the proper number of containers entering the fill area and verify sufficient containers are available prior to the fill area. Sensors located downstream from the fill area will sense if a backup has occurred, and will pause the fill operation until the backup or jam has cleared.



Figure 4-3
Typical Container Sensor

4.6 FILL AREA ADJUSTMENTS

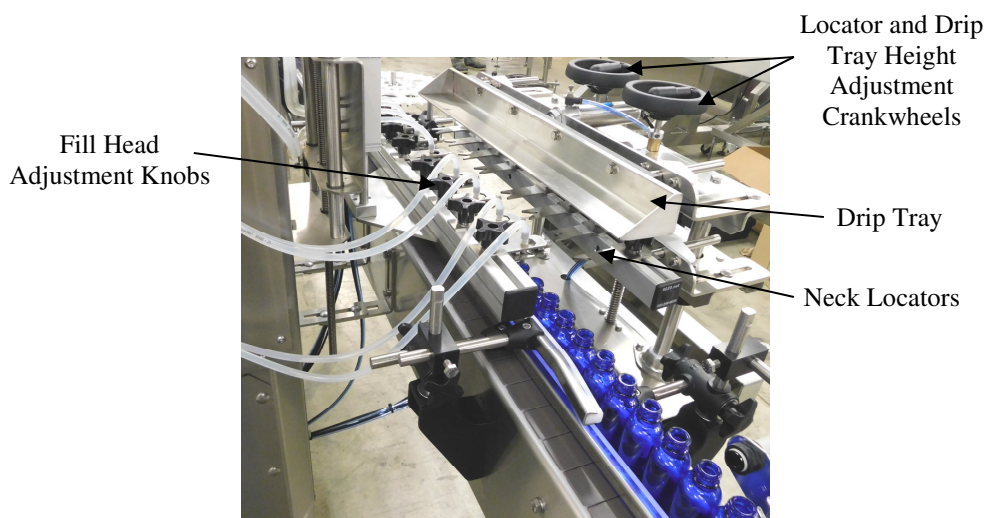


Figure 4-4
Fill Area Adjustments

The fill bar should be centered over the container conveyor so the fill heads line up above the container necks. The fill bar is adjusted forward and backward by moving the filler assembly forward or backward as needed. The drip tray and neck locator assembly, if equipped, will be mounted to the process conveyor. The fill nozzles can be adjusted side to side by simply loosening the knobs and sliding to align with the container openings.

4.7 FILL PUMPS AND TUBING

Tube Loading:

1. Be sure the pump drive is turned off.
2. Rotate the lever to the left to open the pump.
3. Load the correct size tubing. Center the tubing between the retainers.(Figure #1)
4. Rotate the lever to the right to close. (Figure #2)

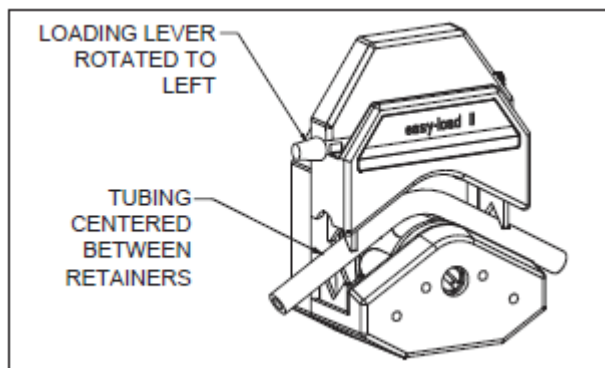


Figure #1



WARNING

Stop the drive when changing the tubing or its position in the rotor mechanism

(the rotor is partially exposed when the LOADING LEVER is in the open position)

NOTE: For optimum tubing life, keep tubing straight where it enters and exits the pump.

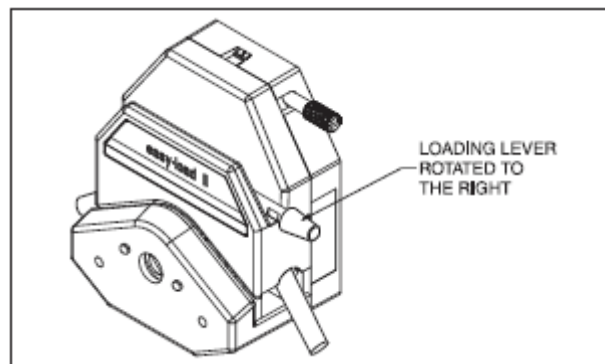


Figure #2

4.8 FILL PUMP MAINTENANCE AND CLEANING

No lubrication is required for the L/S EASY-LOAD II Pump Head.

Use a mild detergent solution to clean the pump head.

Do not immerse nor use excessive fluid.

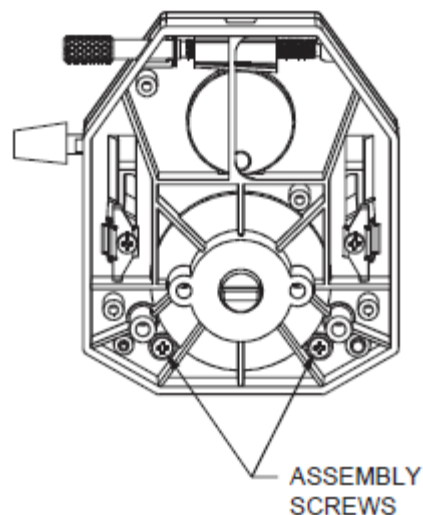
To disassemble pump head for cleaning — See REPLACING ROTOR instructions.

Repair is limited to the replacement of the rotor assembly.

Contact dealer for further repair information.

REPLACING ROTOR

1. Remove pump head from drive.
2. Remove rear cover of pump head.
3. Remove the two screws shown on the right
4. Remove rotor assembly.
5. Install new rotor assembly and secure with two screws.
6. Reinstall rear cover.



4.9 FILL BAR HEIGHT ADJUSTMENT

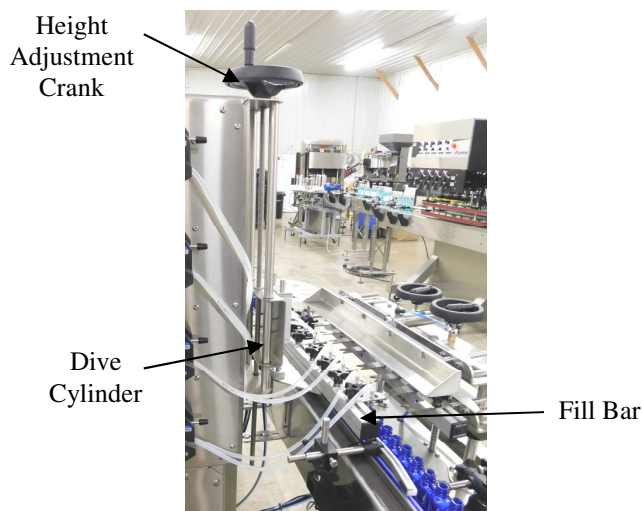


Figure 4-6
Fill Bar Height Adjustment

The height of the fillbar is adjusted up and down using the crankwheel located at the top of the diving head assembly.

5.1 LIQUID HANDLING

5.2 FLOAT SYSTEM (If Equipped)



Figure 5-1
Product Float Switches

If desired, pump filling systems can be equipped with an intermediate hopper tank from which the pumps draw product.

Inside the hopper tank is a dual float system which maintains an appropriate product level to feed the fill pumps. When the product is supplied to the hopper tank up to the level which the Main Float Switch moves to its upper stop, the product inlet will close and/or the supply pump will turn off. During normal use, only the Main Float should be used. In the event of a sensor, solenoid or valve failure which causes extra product to be provided to the hopper tank, the Backup Float should be activated, causing a fault on the operator interface, and stop the filling and indexing process, so the error can be corrected.

IMPORTANT

Float switches are reversible. If the float ball is removed, and re-installed upside-down, it will send reversed signals to the controller, causing a fault, or possibly overflowing the hopper tank. It is important to verify proper orientation after cleaning or disassembly to avoid problems.

5.3 TANK DRAIN

A manual (optional automatic/controlled) drain valve secured to the bottom of the hopper tank is available for cleanout and changeover.

6.1 ELECTRICAL

6.2 MAIN CONTROL BOX

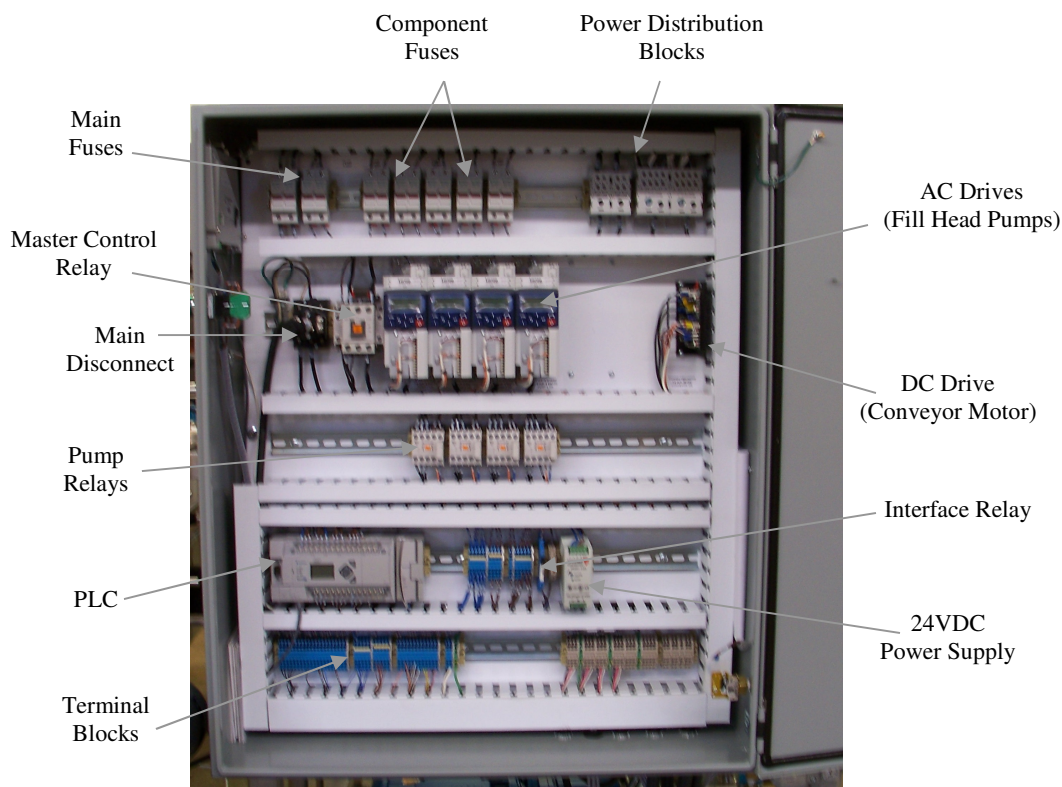


Figure 6-1
Main Control Box

A typical 4 head pump filler control box is shown in *Figure 5-1* for reference.

6.3 FRONT PANEL CONTROLS

In addition to an Emergency Stop button and the main Power Reset button/indicator, the front panel operator interface generally provides access to conveyor speed potentiometer as well.

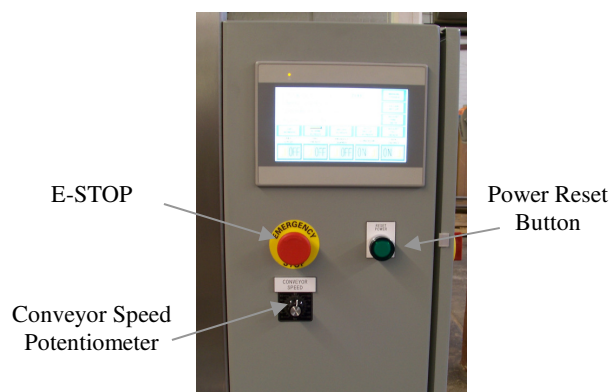


Figure 6-2
Front Panel Controls

6.4 AIR SOLENOIDS

Air solenoids, typically mounted to the side, or rear, of the main control box, provide pneumatic logic control for the machine operation. An electrical signal, sent from the PLC, activates the solenoid attached to the air valve, switching the air pressure from one port to the other, extending or retracting the connected air cylinder (indexing gates, dive cylinder, drip tray cylinder, etc)

Solenoids may be manually activated by pressing the orange button located on the face of the solenoid assembly to assist with troubleshooting.



Figure 6-3
Air Solenoids

7.1 TROUBLESHOOTING

7.2 GENERAL TROUBLESHOOTING

| SYMPTOMS | POSSIBLE RESOLUTIONS |
|------------------------------|--|
| Machine does not power-up | Verify inlet power is active |
| | Verify Main Disconnect is rotated to ON |
| | Check Main Fuses or Circuit Breakers |
| Fill levels are inconsistent | Check that float system is properly supplying the hopper tank |
| | Verify sufficient air pressure is available |
| | Check that tubing is properly contained within the pump heads |
| | Check fill head air cylinder is properly opening and closing, adjust flow control valves if needed, or replace/rebuild air cylinder. Replace cylinder and nozzle seals if worn. |
| | Verify fill nozzle has no clogs, clean if needed |
| | |

8.1 SERVICING

8.2 CLEANING PROCEDURE

It is important that the machine is kept clean of dirt, broken glass, sand, etc. as these will reduce the wear life of the air cylinders and pump seals, o-rings, etc. The machine should be cleaned with water or soap at regular intervals. Stronger detergents are often used in the food industry and can be corrosive on the machine components. Therefore, the machine should be washed down thoroughly immediately after cleaning with any harsh detergents.



WARNING: When using a high-pressure pistol with cold and hot water, or steam for cleaning, do not spray near any electrical enclosures.

If the machine is to sit dormant for more than 48 hours (or less, depending upon the product) it is good practice to completely flush the product lines, pumps, and fill heads with clean water. If solvent is needed to dissolve product effectively, it is equally important to flush with clean water after cleaning product residue. Harsh detergents and solvents can harm seals and tubing and should be cleared from the system.

9.1 FACTORY CONTACT INFORMATION

9.2 CONTACT APEX DIRECTLY

Apex Filling Systems, LLC
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Michigan City, IN 46360
(219) 575-7493
www.apexfilling.com