HTMP Vacuum Cooling
Multipass Sizing Tanks
It’s a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints and parts lists together for documentation of your equipment.

Date: 

Manual Number: UGE046-0513  

Serial Number(s):  

Model Number(s): 

**DISCLAIMER:** Conair shall not be liable for errors contained in this User Guide or for incidental, consequential damages in connection with the furnishing, performance or use of this information. Conair makes no warranty of any kind with regard to this information, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose.
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Manufacturers instructions for HTMP vacuum sizing tank components can be found in the Appendix or within the instruction packet that was shipped with this machine.

PARTS/DIAGRAMS

This section has been provided for you to store spare parts lists and wiring, plumbing or assembly diagrams.
Introduction

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Purpose of the User Guide

This User Guide describes the Conair HTMP Series and explains step-by-step how to install and operate this equipment.

Before installing this product, please take a few moments to read the User Guide and review the diagrams and safety information in the instruction packet. You also should review manuals covering associated equipment in your system. This review won’t take long, and it could save you valuable installation and operating time later.

How the Guide is Organized

Symbols have been used to help organize the User Guide and call your attention to important information regarding safe installation and operation.

⚠ Symbols within triangles warn of conditions that could be hazardous to users or could damage equipment. Read and take precautions before proceeding.

1 Numbers indicate tasks or steps to be performed by the user.

◆ A diamond indicates the equipment’s response to an action performed by the user.

☐ An open box marks items in a checklist.

• A circle marks items in a list.

.Encoding Indicates a tip. A tip is used to provide you with a suggestion that will help you with the maintenance and the operation of this equipment.

Notes Indicates a note. A note is used to provide additional information about the steps you are following throughout the manual.

Your Responsibility as a User

You must be familiar with all safety procedures concerning installation, operation, and maintenance of this equipment. Responsible safety procedures include:

- Thorough review of this User Guide, paying particular attention to hazard warnings, appendices, and related diagrams.
- Thorough review of the equipment itself, with careful attention to voltage sources, intended use and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.
ATTENTION:
Read This So No One Gets Hurt

We design equipment with the user’s safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

⚠️ WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

You should keep the area around the tank clean and free from pooling water. We recommend installing a grate or drain system beneath this equipment to prevent water from pooling around the tank.

⚠️ WARNING: Voltage hazard

This equipment is powered by three-phase alternating current, as specified on the machine serial tag and data plate.

A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in severe personal injury and erratic machine operation.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as routine maintenance. Only qualified personnel should perform troubleshooting procedures that require access to the electrical enclosure while power is on.
How to Use the Lockout Device

⚠️ CAUTION: Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

⚠️ WARNING: Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards reinstalled.

Lockout is the preferred method of isolating machines or equipment from energy sources. Your Conair product is equipped with the lockout device pictured below. To use the lockout device:

1. Stop or turn off the equipment.
2. Isolate the equipment from the electric power.
3. Turn the rotary disconnect switch to the OFF, or “O” position.
4. Secure the device with an assigned lock or tag.
5. The equipment is now locked out.
Description

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What is HTMP Tank? (High Technology Combination Vacuum/Multipass Tank)

The HTMP combination vacuum/multi-pass tank is used to size and cool flexible tubing up to 0.5 inch OD.

With the unique combination of a vacuum tank, which is sized specifically to the maximum throughput of an extruder (1.5 inch, 2.5 inch, 3.5 inch), and a multi-pass cooling tank with initial servo driven wheel, both high speed and precision extrusion is potential in minimum space.

Typical Applications

Typical applications include non-contact vacuum sizing of Flexible PVC with ranges of Durometers from 50 to 90 Shore A. Also, TPE’s and TPU’s, which are potential replacement materials for FPVC, have been very successfully processed.

A pre-skin tooling set is simply mounted to the front and rear of the vacuum chamber to allow non-contact sizing to be used. Low levels of precision vacuum are used to maintain ovality and offer small OD adjustments.

In many cases the tank has an ultra-sonic wall sensor mounted in the initial vacuum chamber to give precise wall and even OD measurements to allow total closed loop control. With the servo driven wheel extremely precise wall tolerances and OD tolerances are potential.

In most cases only three passes are necessary to adequately cool the tubing due to controlled turbulence and residence time in the tank. But, two additional non-driven rollers can be added to allow up to five passes.

Water temperature control is also a critical variable in this process, as two independent water circulation systems are utilized, each with its own heat exchanger. This allows the potential to run differential water temperatures to optimize heat transfer rates and thus better control shrinkage consistency.
Limitations

- The HTMP combination vacuum/multi-pass tank is used to size and cool flexible tubing up to 0.5 inch OD.

- Durometers above 85 Shore A should be approved by Conair Engineering due to potential slippage on the driven wheel and ability to wrap around the non-driven wheels without issues. Samples must be previously sent to Conair for evaluation and potential modifications.

**Note:** Larger OD tubes may be processed with Conair engineering approval and required modifications. Samples have been sent to Conair for evaluation and potential modifications to be made to the equipment.

Contact Conair for specific belt material recommendations for your product.
How the HTMP Tank Works

With a vacuum chamber being the initial part of this tank, non-contact sizing is used to both size the OD of the tube and maintain ovality.

With a Conair pre-skin unit mounted to the front of the tank and low vacuum level applied to the vacuum chamber, non-contact sizing is used to process flexible tubing. With water above the tube in both the pre-skin chamber and the exit water seal chamber, water becomes a hydraulic seal and thus provides sizing without contact. The pre-skin bushings typically have clearance over the actual tube of 0.050 - 0.100 inch. With this vacuum process, water level is no longer a critical issue as vacuum actually removes the weight of water from the tube and thus improves tube roundness.

Upon exit of the vacuum chamber, the tube enters the open multipass cooling chamber. This open chamber serves as the exit water seal. The tube then is wrapped around the servo driven 20 inch wheel, which is contoured to match a specific range of tube diameters. In some cases the radius may need to be machined specific to the tube for decreased ovality depending on materials and Durometers.
How the HTMP Tank Works (continued)

The tube then runs back upstream to the non-driven wheel at the upstream end of the tank. We call this, pass number two. When adjusting the external puller to optimize tube shrinkage, in line, this is the area the operator will observe when adjusting. The second, wheel (12 inches) is actually rotated by the tube being pulled around it, against the drag of the tank water, by the external secondary puller.

The third wrap is the area from this second non-driven roller back downstream to the exit of the multipass tank. Typically the tube will be under higher tension in this pass due to the roller being non driven.

The tube will exit the multipass tank after typically three passes and enter the air wipe chamber. This chamber typically uses two air wipes to insure water removal at high speeds.
How the Combination Puller/Cutter Works (continued)

1. Heavy gauge stainless steel tank.
2. Single piece, telescoping drip tray - easier to clean since there are no separate pieces to hide pyrogens or other contaminates.
4. Hinged one-half inch (12.7 mm) tempered glass tank lids.
5. One (1) 20 inch (508 mm) primary sheave.
6. One (1) 12 inch (304 mm) secondary sheaves.
7. Rock-steady, 3-axis precision position adjustment with manual 12 inch (304) longitudinal, 1 inch (25 mm) side to side and ±2 inch (51 mm) height adjustment.
8. Swivel casters with jackscrews for positive positioning.
9. PAVC and HMI controls with vacuum and water gauge.
10. Stainless steel (306) centrifugal water circulation pump and heat exchanger.
11. Full capacity stainless steel reservoir with easy access plexiglass lids.
12. Variable speed VFAC vacuum pressure blower.
13. Two water circulation pumps - cooling.
14. Two braised stainless steel heat exchangers.
   - Float valve for automatic filling and make up.
   - Adjustable water level control thermometer.
   - Variable speed vacuum blower with 130 inches water (2.8 meters water) vacuum capacity.
   - Rounded bottom for easier cleaning - eliminates corners to ease cleanout and removal of contaminates.
   - Blank product roller assemblies for vacuum tank.
   - Painted steel frame.
   - Quick change, spin off filter.
# Specifications: HTMP Vacuum Sizing Tank

## MODELS

<table>
<thead>
<tr>
<th></th>
<th>HTMP-12-3</th>
<th>HTMP-18-4</th>
<th>HTMP-24-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity (tube)</strong></td>
<td>up to .05 inch (12.5mm) dia.</td>
<td>up to .05 inch (12.5mm) dia.</td>
<td>up to .05 inch (12.5mm) dia.</td>
</tr>
<tr>
<td><strong>Compartments</strong></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Number of passes</strong></td>
<td>Up to 5</td>
<td>Up to 5</td>
<td>Up to 5</td>
</tr>
<tr>
<td><strong>Vacuum system</strong></td>
<td>0-110 in Blower - VFAC</td>
<td>0-110 in Blower - VFAC</td>
<td>0-110 in Blower - VFAC</td>
</tr>
<tr>
<td><strong>Water circulation pump (vac)</strong></td>
<td>1 Hp</td>
<td>1 Hp</td>
<td>2 Hp</td>
</tr>
<tr>
<td><strong>Water circulation pump (open)</strong></td>
<td>1 Hp</td>
<td>2 Hp</td>
<td>2 Hp</td>
</tr>
<tr>
<td><strong>Water system contacts</strong></td>
<td>Non-ferrous</td>
<td>Non-ferrous</td>
<td>Non-ferrous</td>
</tr>
</tbody>
</table>

## Dimensions inches (mm)

<table>
<thead>
<tr>
<th></th>
<th>HTMP-12-3</th>
<th>HTMP-18-4</th>
<th>HTMP-24-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A - Overall length feet (mm)</strong></td>
<td>14 (4267)</td>
<td>20 (6096)</td>
<td>26 (7925)</td>
</tr>
<tr>
<td><strong>B - Overall height</strong></td>
<td>74 (1880)</td>
<td>74 (1880)</td>
<td>74 (1880)</td>
</tr>
<tr>
<td><strong>C - Overall width</strong></td>
<td>48 (1219)</td>
<td>48 (1219)</td>
<td>48 (1219)</td>
</tr>
<tr>
<td><strong>D - Tank height</strong></td>
<td>8 (203)</td>
<td>8 (203)</td>
<td>8 (203)</td>
</tr>
<tr>
<td><strong>Vacuum chamber length feet</strong></td>
<td>6 (1829)</td>
<td>12 (3657)</td>
<td>18 (5486)</td>
</tr>
<tr>
<td><strong>Vacuum chamber width</strong></td>
<td>8 (203)</td>
<td>8 (203)</td>
<td>8 (203)</td>
</tr>
<tr>
<td><strong>Cooling chamber length feet</strong></td>
<td>12 (3658)</td>
<td>18 (5486)</td>
<td>24 (7315)</td>
</tr>
<tr>
<td><strong>Cooling chamber width</strong></td>
<td>26 (660)</td>
<td>26 (660)</td>
<td>26 (660)</td>
</tr>
<tr>
<td><strong>Air wipe chamber</strong></td>
<td>12 (304)</td>
<td>12 (304)</td>
<td>12 (304)</td>
</tr>
<tr>
<td><strong>Primary (driven) sheave dia</strong></td>
<td>20 (508)</td>
<td>20 (508)</td>
<td>20 (508)</td>
</tr>
<tr>
<td><strong>Secondary (non-driven) sheave dia</strong></td>
<td>12 (304)</td>
<td>12 (304)</td>
<td>12 (304)</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
<td>3-plane manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Centerline height</strong></td>
<td>42 +/- 2 (1066.8 +/- 50.8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Construction

<table>
<thead>
<tr>
<th></th>
<th>HTMP-12-3</th>
<th>HTMP-18-4</th>
<th>HTMP-24-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tank material</strong></td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Carbon steel</td>
</tr>
<tr>
<td><strong>Full length splash tray</strong></td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Carbon steel</td>
</tr>
<tr>
<td><strong>Tank roller brackets</strong></td>
<td>12</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td><strong>Base frame</strong></td>
<td>Carbon steel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Weight lb (kg)

<table>
<thead>
<tr>
<th></th>
<th>HTMP-12-3</th>
<th>HTMP-18-4</th>
<th>HTMP-24-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shipping</strong></td>
<td>2500 (1134)</td>
<td>3000 (1361)</td>
<td>3500 (1588)</td>
</tr>
</tbody>
</table>

## Voltage

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>460V/3 phase/60 Hz</strong></td>
<td></td>
</tr>
</tbody>
</table>

## SPECIFICATION NOTES:

- Rollers not included.
- Specifications may change without notice. Consult a Conair representative for the most current information.
Available Options

- Pre-skinning chamber with tooling inserts for flexible polymers
  - Calibrate/quench assembly for flexible materials
  - Hold-down guide rollers, contoured or non-contoured
  - Split-design air-wipe assemblies

- Additional sets of preskinner inserts for other products sizes

- Flow meter rated for 0 to 50 gal./hr. {0-189l/hr.} with pressure regulator

- Split design air wipe assembly with mounting bracket

- Additional blank product guide roller assemblies

- Contoured product guide roller assemblies
Installation

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Unpacking the Boxes

The HTMP Tank comes fully assembled in a single crate.

⚠️ CAUTION: Lifting
To avoid personal injury or damage to the puller/cutter, lift the puller/cutter using a forklift or hoist with straps that have been positioned at the puller/cutter's center of gravity.

1 Carefully uncrate the HTMP Tank and its components.

2 Remove all packing material, protective paper, tape, and plastic. Compare contents to the shipping papers to ensure that you have all the parts.

   Note: Be sure to remove any material from the lower reservoir.

3 Carefully inspect all components to make sure no damage occurred during shipping. Check all wire terminal connections, bolts, and any other electrical connections, which may have come loose during shipping. Be sure to check the float balls and make sure they are tight.

4 Record serial numbers and specifications in the blanks provided on the back of the User Guide's title page. This information will be helpful if you ever need service or parts.
Preparing for Installation

You will install the HTMP tank on the extrusion line, downstream of the extruder.

1 **Make sure the installation area provides:**
   - A source of water. City, tower or chilled water may be used.
   - A grounded 3-phase power source supplying the correct current and voltage for your HTMP tank. Check the serial tag for the correct amps and voltage.
   - Minimum clearance for safe operation and maintenance. The distance, or air gap, between the face of the die and the upstream end of the tank may be up to 12 inches (305 mm). Allow at least 12 to 24 inches (305 to 610 mm) between the downstream end of the tank and the upstream end of the puller to roll the tank away from the extruder for maintenance.

2 **Determine the correct position for the HTMP tank on the extrusion line.** There may be an additional cooling tank or an optional laser gauge/diameter gauge between the downstream end of the HTMP tank and the puller. Allow 1 to 2 feet (305 to 610 mm) between the HTMP tank and a cooling tank. Allow 1 to 3 feet (305 to 914 mm) between the HTMP tank and a laser gauge and between a laser gauge and the puller.

3 **Install v-rails.** If your tank comes with v-groove casters, you may choose to use v-rails to insure repeatable tank alignment. The overall length of the rails will be determined by equipment sharing the rails. Typically, the rails should be 2 to 4 feet (610 to 1219 mm) longer than the HTMP tank. The distance between the centers of the v-groove casters on standard HTMP tanks is 25 inches (635 mm). Optional widths may have been ordered.

**NOTE:** We recommend installing a grate or drain system below or alongside the tank to prevent water from pooling on the floor around the tank.
Setting up and aligning the HTMP Tank

⚠️ CAUTION: Lifting
To avoid personal injury or damage to the HTMP tank, lift the tank using a forklift or hoist with straps that have been positioned at the combo’s center of gravity.

1 Position the tank downstream of the extruder. Place the tank inline with the extruder. Set the tank’s v-groove casters on the v-rails, if present.

2 Mount the non-contact pre-skin tool.
Loosen and remove the wing nuts on the bolts at the upstream (extruder) end of the tank. Install the gasket between the tank and tooling. Using the bolts and bolt pattern provided, attach the calibration tool outside the first vacuum chamber.

3 Adjust the lateral (side-to-side) position of the HTMP tank. Use a plumb bob or laser and turn the hand wheel to align the unit with other components in the extrusion line.

4 Adjust the height of the HTMP tank to match the extruder’s center-line height. Use a level and turn the hand wheels to adjust height at both ends of the tank.

Maximum adjustments

- 3 in. (76 mm)
- 4 in. (102 mm)
- 12 in. (305 mm)

3 in. (76 mm)

4 in. (102 mm)
Connecting the main power

⚠️ **WARNING: Electrical hazard**
Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

⚠️ **WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.**
This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

1. **Disconnect and lock out the incoming main power source.**

2. **Open the HTMP tank’s electrical enclosure.** Turn the disconnect dial to the Off position, turn the captive screw and swing the door open.

**IMPORTANT:** Always refer to the wiring diagrams that came with your HTMP tank before making electrical connections. The diagrams show the minimum size main power cable required for your tank, and the most accurate electrical component information.

3. **Connect the power and ground wires** to the terminals indicated on the wiring diagram that came with your machine.

4. **Check every terminal screw** to make sure wires are secure. Gently tug each wire. If a wire is loose, use a screwdriver to tighten the terminal.
Connecting the water supply

The standard HTMP tanks are designed for use with city, tower or chilled water supplies. You may choose to treat the water to prevent algae build-up.

⚠️ **WARNING:** Do not use deionized water, brine or other corrosive water mixtures for the main water supply unless your tank has been specially designed for such mixtures. Consult a water treatment specialist for the best way to prevent algae build-up without damaging the equipment.

1. **Connect the main water supply** to the 1-inch NPT fitting on the open reservoir.
2. **Connect hoses and NPT hose barb fittings to the main 3-inch drain/overflow line.** You also may choose to install drain hoses and ball valves in the bottom of the open and closed reservoirs, as long as they are not tied together. Open and closed reservoirs must have separate valves and hoses installed. The couplings are shipped from the factory with pipe plugs installed.
3. **Position the top of each float ball** in the reservoirs about 2 to 3 inches below the top rim and make sure screws and nuts are tight.

**IMPORTANT:** Do **NOT** connect the drain ports located at the bottom of the open and closed reservoirs together, doing so will not allow the tank to operate properly and may cause damage to the vacuum tank. Failure to comply will void the factory warranty.
Connecting a chiller

You can connect a chiller to the tank’s two heat exchangers to remove heat from the extrudate more efficiently. The 1.25 inch inlet and outlet of the heat exchangers can be used for the chiller.

For maximum cooling efficiency: (always plumb cooling water in the opposite direction of process water)
Connect the chiller “To Process” and “From Process” lines to the 1.25 inch NPT fittings on the plate heat exchanger.

![Diagram of Single Plate Heat Exchanger](image-url)
Testing the installation

1 Check the pump(s) for proper rotation before filling the tanks. Be sure to run the pumps for no more than 30 seconds to check rotation. Running the pumps for an extended amount of time without water can damage the seals.

2 Turn water supply on and fill the reservoirs. Make sure the water level in the reservoir is above the pump input before proceeding.

   • Water pours into the reservoir.
   • The floats rise with the water level.
   • When the water level reaches 3-4 inches below the top rim of the reservoir, the float valves close.

3 Open the 1/2 inch water manifold valves one-third. The valves open fully with one-quarter turn.

4 Turn water pumps on. Press #1 REC START. Press #2 REC START for second water pump. Both pumps are running.

   • The pumps draw water from the open and closed reservoir through the heat exchangers and into the upper tanks.
   • Some water is circulated back to the reservoirs through a bypass valve to prevent cavitation.
Testing the installation

5 Close the 1.50 inch plastic ball dump valves on the bottom of each upper tank chamber to stop any water from draining from the tanks.

6 Close the lids. For a better seal, wet the surface of the lid gasket before closing the tank lid.

7 Open vacuum adjustment valves. If you have the 10-turn potentiometer or the PAVC control, turn the potentiometer counterclockwise to the zero position. If you have a PAVC control, push the coarse up arrow to open the automatic vent valve.

8 Press the VAC start button to start the vacuum pump. You will hear the vacuum pump come on and will notice the lid pulling down as the vacuum is increased. If you have a PAVC control, push the coarse down arrow to close the automatic vent valve.

9 Slowly close vacuum adjustment valves.
   • If there are no leaks in the system, the vacuum will go to the maximum level of 9.9 inches of mercury or 135 inches of water on units with a 1.7 Hp blower.

10 The test is over. If the vacuum sizing tank performed as indicated in the test, you can go to the Operation section. If the tank did not perform as indicated, see the Troubleshooting section of this manual.
Operation

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How to navigate the Control Screens

Introduction
The Combination Cooling Tank / Puller have a Human Machine Interface (HMI) for operator control. The HMI is a Red Lion 8 inch Color Touch screen (Kadet series). The operator may view and alter parameters pertaining to the operation of the machinery with this device. The status of the equipment is also shown. Recipes may be set and retrieved. The Capstan Wheel in the Tank is used to pull material from the extruder. The Puller follows the Tank at a similar speed and feeds this to the Cutter (typically the Puller runs slightly slower than the Tank Capstan Wheel due to material shrinkage).

Power Up Sequence
At Power up the Welcome Page shows for a short time, followed by the Main Page.

Figure 1 - Welcome Page

Conair information is shown on the Welcome Page. For Service or Parts please use the toll free number (in USA this will be toll free, the call will be chargeable from other countries).
Main Page

The Main Page is split into two sections – Tank Wheel and Puller. If the E-Stops have not yet been reset a “Faulted” Message will appear in the top right-hand corner. To clear this message reset E-Stops for the line. “Faulted” may be caused by other issues. Press the message to go directly to the faults page for further details.

Figure 2 - Main Page

Puller Section
Recirculation Pump - Start and Stop Buttons, with Status Indication
Start and Stop buttons are available for the Water recirculation pump. A message “Stopped” (on a red background) or “Running” (on a green background) is situated above the buttons.

Speed
To set a speed for the Capstan wheel press the preset and type in a value. A keypad appears so that a new value may be entered. Any value between zero and maximum may be entered.
Under the Speed set point preset is the actual speed (actual uses maroon red color).

Start Speed
A Speed preset is available for Start. This value is used when starting the line. Use a Start Speed value for a controllable speed which is easy for an operator to thread the line.
In the example, Start Speed is set to 20 FPM. Any value may be set. This is an operator preference value.
Control Function Flow Charts:
Menu Page

![Diagram of Control Function Flow Charts]

- **Operation 4**
  - **Menu Page**
  - **Recipes**
    - **Save recipe!**
    - This will save the current parameters to the selected recipe file.
    - **ARE YOU SURE?**
    - Yes
    - No
    - **Delete recipe!**
    - This will delete the selected recipe file.
    - **ARE YOU SURE?**
    - Yes
    - No
    - **Load recipe!**
    - This will overwrite the current parameters with the selected recipe file.
    - **ARE YOU SURE?**
    - Yes
    - No
Control Function Flow Charts: Menu Page
Control Function Flow Charts:
Menu Page

- Operation

- Analog Input
  - Measured: 0.003 volts
  - Scaled: -0.9998
  - Expected minimum: 0.000 volts
  - Expected maximum: 10.000 volts

- Control Status
  - E-stop program: Running
  - Main program: Running
  - Local/Remote - Ethernet program: Stopped
  - Local/Remote - Analog program: Stopped
  - Updates program: Stopped

- Drive Status
  - Drive ok: ON
  - Power supply ready: ON
  - Power stage enabled: ON
  - Drive enable (M/C on): ON
  - Drive enable (M/C off): OFF
  - Shunt active (RMS): 0.6 %
  - Breaker active (RMS): 0.3 %
  - Faulted:
    - Drive led code: P
    - Bus Voltage: 14.1 V
    - Torque cmd: 0.2 %
    - Following error: 0.000

- Drive Status
  - Drive ok: ON
  - Drive fault code: 0000-0000-0000-0000-0000-0000-0000-0000
  - No faults
  - Module fault code: 0000-0000-0000-0000-0000-0000-0000-0000
  - No faults
  - Torque cmd: 0.3 %
  - Following error: 0.0001
Control Function Flow Charts:
Menu Page

Ramps
- Acceleration: 20 fpm/sec
- Deceleration: 20 fpm/sec

Feed Constant
- Wheel diameter: 19.750 in
- Product diameter: 0.250 in
- Feed constant: 0.2300 ft/rev
- Motor direction cw
- Motor direction ccw

Tuning
- Following error: -0.002 ft
- Inertia ratio: 0.0:1
- Response: 50 Hz
- Friction: 0.0%
- Integral time: ON
- Feedback (RMS: 0.3%)
- Integral (RMS: 0.0%)

Analog Input
- Measured: 0.033 volts
- Scaled: -0.9999
- Expected minimum: 0.000 volts
- Expected maximum: 10.000 volts

Analog Output
- Velocity
  - Analog 1 output: 0.01 volts
  - Analog 1 max: 10.000 volts
- Torque
  - Analog 2 output: 0.03 volts
  - Analog 2 max: 10.000 volts

Remote Scrolls
- Speed scroll: +/- 0.05 fpm
- Analog ratio scroll: +/- 0.0005 - 1
- Scroll delay: 0.600 secs
Control Function Flow Charts:
Menu Page

Menu

Feed Constant

Wheel diameter: 19.750 in
Product diameter: 0.250 in
Feed constant: 0.2800 ft/rev

Motor direction cw
Motor direction ccw

Feed Constant

Wheel diameter: 19.750 in
Product diameter: 0.250 in
Feed constant: 0.2800 ft/rev

Motor direction cw
Motor direction ccw

Input Status

ON
Drive input 1: (Not EStop, 15R on)
Drive input 2: (Recirc pump #1 not OL, 1CB)
Drive input 3: (Servo system ready, 1PM)
Drive input 4: (4CB not tripped, 4CB aux on)
Module input 1: (Remote start)
Module input 2: (Remote stop)
Module input 3: (Remote speed up)
Module input 4: (Remote slow down)
Module input 5: (Recirc pump #2 not OL, 2CB)
Module input 6: (Vacuum Vfd Ok)
Module input 7: (Spare)
Module input 8: (Digital pot)

OFF

Analog Output

Velocity
Analog 1 output: 0.01 volts
Analog 1 min: 0.000 volts
Analog 1 max: 10.000 volts

Torque
Analog 2 output: 0.03 volts
Analog 2 min: 0.000 volts
Analog 2 max: 10.000 volts
Control Function Flow Charts:
Menu Page

Remote Scrolls
- Speed scroll: +/- 0.05 fpm
- Analog ratio scroll: +/- 0.0005 : 1
- Scroll delay: 0.500 secs

Tuning
- Following error: -0.0002 ft
- Inertia ratio: 0.0 : 1
- Response: 50 hz
- Friction: 0.0 %
- Integral time: Off On 50 msec
- Feedforwards: Off On
- Feedback (RMS: 0.3 %)
- Stirnt (RMS: 0.0 %)
Control Function Flow Charts:
Menu Page

Menu

Master Setup
- Master distance: 30.4800 in
- Per
- 10,000 counts
- Master speed: 0.000 fpm

Output Status
- ON: Drive output 1: (Recipe pump #2)
- OFF: Drive output 2: (Remote selected)
- OFF: Drive output 3: (Tank drive running)
- OFF: Module output 1: (Spare)
- OFF: Module output 2: (Spare)
- OFF: Module output 3: (Spare)
- OFF: Module output 4: (Spare)
Control Function Descriptions

Main Page

Nudge / Scroll
When the line is running Nudge may be used to gradually bring the line to final working speed. In the example, Nudge is set to 10.00 MPM. If the “+” button is pressed speed will increase in increments of 10-MPM. Likewise, a press of the “-” button will decrease the speed by 10-MPM.

Tank Wheel - Start and Stop Buttons, with Status Indication
Start and Stop buttons are available for the Tank Drive Wheel. A message “Stopped” (on a red background) or “Running” (on a green background) is situated above the buttons.

Counter
A counter is provided to record the amount of material produced. Set the On / Off switch to On for the Counter to begin. Use the Reset button to zero the count when entering production.

Master or Secondary Slave Puller Section
The Secondary Slave Puller has some similar controls to the Tank Wheel. Use the Start and Stop buttons to enable / disable the Puller. Use the Speed preset to change speed.
Control Function Descriptions
Menu Page

Press the Menu button to view the Menu. The Menu provides access to other sections – Setup parameters, recipes and diagnostics.

Menu and Faulted
The Menu button is available on most pages. On the Menu Page the button is replaced by “Main” for access back to the Main Page. For some secondary pages (pages with additional information) there will be a “Close” button. Menu, Main or Close is always in the same place for every page. It appears in the top left corner.
If a fault has occurred, “Faulted” will show at the top right corner of every page. If no fault exists Date and Time and the loaded recipe number will show instead.

Figure 4 – Menu

There are many pages accessible from the Menu Page. It should not be necessary to access most pages for normal use. These are typically provided for set up, recipe and diagnostics purposes.
Control Function Descriptions
Ramps Page

Figure 6 - Ramps Page

Separate acceleration and deceleration values are provided. The value is the rate of change per second. For example, if deceleration is set to 50MPM/Sec a speed change of 50 MPM will be made every second. So if the Tank is set to 50MPM/Sec and had been running at 150MPM it would take 3 seconds to stop… time = speed / ramp (150/50 = 3).
Control Function Descriptions
Analog Input Page

Figure 7 - Analog Input Page

This page is provided for Analog modes of operation. Analog (0 to 10 volts) could be used to run the machinery. In this model Analog mode is not available.

Minimum and Maximum voltages can be set by using the “Set max to measured” or “Set min to measured” buttons. When using these buttons the voltage is sampled and is then used as the max or min for that control.
Control Function Descriptions
Analog Output Page

Figure 8 - Analog Output Page

Analog outputs for speed and torque are available. These may be used for logging purposes – chart recorder - oscilloscope.

Maximum and minimum values are available to scale the analog outputs.
Remote Scroll Settings Page

Remote Scroll is available for raise and lower signals that would typically be provided by diameter measuring gauges. Values for Speed Up and Slow down are available for the various modes (most are not used in this system).

Raise and Lower remote buttons could be used to raise and lower the line speed. For example, the Tank Local Speed shown in the above image is set to +/- 0.10 FPM. If the raise input is closed speed will increase by 0.1 FPM (or MPM if set to metric).
The tuning of the motors has been completed at the factory. There should be no need to retune the motors. Values are provided here in case a replacement motor is needed.

Motors should be tuned to give a good balance of small errors (follow error) and reasonable low torque. A motor can be over tuned in which case it draws more amps but is very accurate. An under tuned motor will use less power but would be too sluggish and cause large errors.

Please work with Conair service if you have the need to change a motor as the correct motor definition file is also required. If fitting a similar motor tuning could be as before.
Control Function Descriptions

Feed Constant Page

Figure 12 - Feed Constants Page

This page is important for setting Feed Constants (scaling). The values here will affect calibration. When scaling the Tank Wheel or Puller it is best to do this at a fast speed. Set a speed then measure the exact value. Rescale if necessary.

The Tank wheel is the diameter inside the groove. Added to that is the product diameter. Together they provide the exact diameter of the wheel (product center to product center of the wrap of product around the wheel).
Two listings of User Units are available. One list is intended for Imperial (English) sizes, the other is for metric. There should be no need to change any values on this page.
Control Function Descriptions

Input Status Page

The Inputs Page is provided for diagnostics purposes. It displays the state of the Digital Inputs that are wired to the drive or program module. Use the information on this page in conjunction with the electrical schematics of the machine to diagnose faults such as broken connections. Some connections could be from external sources.

An input that is on is 24 volts DC. The display should show „On” using green text on a black background.

An input that is off is 0 volts DC. The display should show „Off” using red text on a black background.

Figure 14 - Inputs Status Page
Control Function Descriptions

Output Status Page

The Outputs Page is provided for diagnostics purposes. It displays the state of the Digital Outputs that are wired to the drive or program module. Use the information on this page in conjunction with the electrical schematics of the machine to diagnose faults such as outputs that do not appear to be turning on as expected.

An output that is on will show “On” using green text on a black background. An output that is on should be at 24 volts DC.

An output that is off will show “Off” using red text on a black background. An output that is off should be at 0 volts DC.
Control Function Descriptions

Drive Status Page

Figure 16 - Drive Status Page

The drive status page shows all settings that could cause a drive not to run. When all status values are green the machine is good to run.

Drive LED Code
In the example above the drive LED code is “P”. “P” means the program is running. The drive LED code is the same character that appears on the drive. This is also known as the diagnostics character. Most of the time this character should be „d“ for drive disable, „R“ for ready or „P“ for program is running. Other values may be shown here. For example, if a fault has occurred a code relating to that fault may appear instead. The drive booklet lists faults and their associated faults codes. Please refer to the drive booklet for more information, causes and possible fault reset methods.

Bus Voltage
Bus voltage is the AC supply voltage that has been converted to DC within the drive. The Tank is a 460 volts 3-phase machine. The Puller is 460 volts single phase machine that has the voltage dropped to 230 volts via a transformer.

Faulted
If a fault occurs a Fault message will show. Press the “view fault bits” button for the drive that has the fault to access the associated Fault Bitmaps Page.
Control Function Descriptions
Fault Codes Page

Figure 17 - Tank Fault Codes

Figure 18 - Puller Fault Codes

When no fault exists all fault bits in the faults bit array will be zero, as shown. When a fault exists the corresponding bit associated with the fault will be set.
Control Function Descriptions

Control Status Page

Figure 20 - Control Status Page

The Control Status Page lists all programs and shows those that are running as “On” on a black background. Those that are not running appear as “Off” on a black background. The first two programs – E-Stop and Main are usually running. Only one mode program may be running at a time.
Control Function Descriptions
Passwords Page

The Passwords page is provided so that the user may change their password. The current password must be entered, followed by the new password. Some Menu pages require a user to log in.

At present there are two user names and passwords

User Name          Description
admin               Administrator access
user1               User rights 1
user2               User rights 2
user3               User rights 3
user4               User rights 4

Note: The User Name and Password are initially the same.

Logoff
The person that is logged in will be logged out automatically after one hour. To log off sooner press the Logoff button on the Menu page.

Touch Calibration Page
A series of square boxes will appear on the screen. Touch each in turn in order to calibrate the touch screen. Touch panels use a resistive element. This resistance may drift over time.
Control Function Descriptions
Recipes Page

The Up and Down buttons are used to scroll through the list of Recipes. Type in a meaningful name for a recipe as this will make it easier to find a recipe later.

When loading, saving or deleting a file an “Are You Sure?” message appears. Press Yes, if you wish to continue, otherwise press No.

Figure 22 - Recipes Page

Figure 23 - Load Recipe Confirm
Control Function Descriptions
Recipes Page

Figure 24 - Save Recipe Confirm

Figure 25 - Delete Recipe Confirm
HTMP Tank Control Features

You will use a number of valves to control water flow and vacuum pressure to the HTMP vacuum sizing tank.

Each vacuum chamber on a manual control model has a vacuum pressure gauge, a 1/2-inch medium vacuum adjustment valve, and a 3/8-inch fine adjustment valve for independent vacuum control.

If you have an 10-turn potentiometer on HMI or PAVC control, you don’t have these manual valves. You will use the potentiometer for medium and fine adjustment of vacuum levels. The potentiometer changes vacuum levels by controlling an automatic vent valve and vacuum pump RPM.
HTMP Tank Control Features
(standard 10-turn potentiometer control)

Button positions on the control panel vary depending upon the options selected. The REC buttons control the water recirculation pump. The VAC buttons control the vacuum pump.

The dual-water pump system, you will have an additional set of REC start and stop buttons. REC #1 serves the vacuum chamber. REC #2 serves the open multipass cooling section.

Vacuum Pump Start
Press the blue #1 VAC START button to start the vacuum pump.

Water Pump Start
Press the blue #1 REC START button to start the water recirculation pump and fill the tank.

Vacuum Pump Stop
Press the red and white #1 VAC STOP button to stop the vacuum pump. This action does not stop the water pump.

Water Pump Stop
Press the red and white #1 REC STOP button to stop the water pump. A safety interlock feature shuts off the vacuum pump so the system does not run dry.

Reset
Press the yellow RESET E-STOP button to activate the control panel after an emergency stop.

Emergency Stop
Press the EMERGENCY STOP button to shut down all pumps at once and disable the control panel. To resume operation, pull the EMERGENCY STOP button outward until it clicks, then press the yellow RESET E-STOP button.

10-turn Potentiometer (standard)
The potentiometer will be on the control panel. The 10-turn potentiometer replaces the medium and fine vacuum adjustment valves on the standard HTMP tank. Rotate the 10-turn potentiometer dial clockwise to increase vacuum pressure. Rotate the dial counterclockwise to decrease vacuum pressure. If you have the dual-vacuum system, your control panel has a second 10-turn potentiometer.

NOTE: If you have an optional Precision Automatic Vacuum Controller (PAVC), see the PAVC User Guide for operating features and instructions. The 10-turn potentiometer also will be present on the PAVC model.
Preparing for Operation

After the HTMP Tank is properly installed, you can prepare for operation. Basic tasks are outlined here. Step-by-step instruction can be found in the rest of the OPERATION section.

1 Determine the vacuum and cooling mode you will use. See VACUUM MODES and COOLING MODES.

2 Make sure the extruder and puller are ready. The extruder should be discharging melt or extrudate that is up to the correct temperature. Set the extruder and puller at minimum speed, or the speed that makes starting up easiest.

3 Center the tank with the extrudate. During installation, you aligned the tank with the extrusion line. Before each operation of the tank, however, you must fine tune the height and side-to-side position of the tank to align it with the center of the extrudate.

4 Turn on the water supply to fill the reservoirs. Make sure reservoirs are at least half full before proceeding.
   • Two automatic float valves direct water into the open and closed reservoirs.
   • The floats rise until the water level reaches 3-4 inches below the top of the reservoir rim. Then the float valves close.

5 Fill the water manifolds. Open the 1/2-inch manifold valves halfway. Press #1 REC START to turn on the water pump. Press #2 REC START so both pumps are running.
   • The pump draws water from the closed reservoir through the heat exchanger and into the upper tank.
   • Some water is circulated back to the reservoirs to prevent cavitation.

6 Thread the extrudate through the tank.

7 Position the immersion rollers to prevent the tube or profile from sinking or floating. Slide each roller up or down to the desired position. The best position for the rollers depends upon your material, process, cooling mode and vacuum mode. Tighten the wing nuts to hold the rollers at the correct height.
Centering the Tank with extrudate

1 Adjust the side-to-side tank position. Looking down from above the tank, turn the small handwheel to move the tank toward or away from the operator side until it aligns with the center of the extrudate as it exits the die. The adjustment rate is 5 turns per inch (25 mm).

2 Adjust the tank height. Kneeling at the upstream end of the tank at eye level with the die, turn the large, spoked wheel to adjust the tank height until it aligns with the center of the extrudate. The adjustment rate is 8 turns per inch (25 mm).
**Threading the extrudate**

1 **Move the tank downstream from the die.** Use the large linear actuator hand wheel to slide the tank about 4-8 inches downstream from the die. The adjustment rate is 5 turns per inch.

2 **Cut the extrudate and ball up the end.** Cut the extrudate off close to the die face and ball up the end using a soft-metal spatula or scraper.

3 **Walk the extrudate through the system.** Thread the extrudate through the water ring, calibration tool, vacuum tank chambers, tank exit and into the puller.

4 **Move the tank back upstream for normal operation.** Turn the linear actuator handwheel to move the tank upstream to within 1 inch of the extruder die face.

5 **Recheck the tank alignment.** With the extrudate threaded, verify that the tank is precisely aligned with the center of the extrudate. If not, go to Section 4, CENTERING THE TANK WITH THE EXTRUDATE.
Starting the HTMP tank with a 10-turn Potentiometer

You can start operating after you have filled the reservoirs and manifolds, turned on the water pump and threaded the extrudate through the tank.

1 Turn water pump on. Press #1 REC START and press #2 REC START so both pumps are running.
   - The pump draws water from the closed reservoir through the heat exchanger and into the upper tank. If you have the profile water manifold it fills as well.
   - Some water is circulated back to the reservoirs through a bypass valve to prevent cavitation.

2 Gradually increase line speed. Raise extruder rpms slowly until extrudate is close to the product desired.

3 Set the 10-turn potentiometer at zero. Turn the potentiometer counterclockwise to the zero position. When the vacuum pump comes on, the open valves keep the pressure low to prevent the water from being sucked out of the tooling.

4 Wet tank rim lightly and close lid. Dip fingers into tank water and wet the tank rim to improve the seal. Close the lid. Repeat for each chamber.

5 Turn vacuum pump on. Press #1 VAC START. If you have additional vacuum pumps, press the additional VAC START buttons to start them.
   - The vacuum pump starts.
   - Vacuum pressure gauges display very low vacuum levels because bleeder valves are open.
Starting the HTMP tank with a 10-turn Potentiometer (continued)

6 Adjust vacuum pressure. Slowly turn the optional 10-turn potentiometer clockwise. Stop turning the potentiometer when the gauges start to reach the level of vacuum that you want. One turn of the potentiometer changes the vacuum pump power by one hertz, increasing the pump RPMs.

- Vacuum gauges reflect a rise in pressure as you close the valves. The appropriate vacuum pressure depends upon your material and process. In general, the vacuum pressure is approaching the correct level when the product is close to the desired size, tolerance and surface finish.

7 Adjust water flow and water levels. Water flow is controlled by 1/2-inch ball valves in the built-in water manifold. The vacuum chamber contains an auto level and a quick-dump valve. The best water flow rates and levels depend upon your material, process, cooling and vacuum modes.
Adjusting the water flow

Water flow throughout the tank is controlled by 3/4-inch ball valves on the water manifold in the drip tray. The number of valves depends on the number of compartments on your tank. The number of valves in use on the optional profile manifold depends on your calibration tool.

The first upstream ball valve on the manifold adjusts water flow to the vacuum calibration well. The second adjusts water flow to the spray ring in the first chamber. Two additional valves per compartment control water flow to the spray bars.
Stopping the HTMP Tank

HTMP Tank operation with the standard 10 turn potentiometer or the optional PAVC controls are stopped by pressing the VAC STOP button, then pressing the REC STOP button. Extrudate will continue to move through the tank unless the entire extrusion line is shut down. A typical shutdown procedure is given below.

1 Move the tank downstream. While material is still running, turn the large handwheel to move the tank away from the extruder die.

2 Lower extruder rpms.

3 Cut the material off at the die with a soft metal spatula or scraper.

4 If equipped with the optional 3-way ball valve, remove vacuum pressure from the chamber. Rotate the 3-way ball valve clockwise until the water flow is diverted from the closed reservoir line to the drip tray and open reservoir.

5 Cover the vacuum tank entrance hole to limit water spillage when you stop the pump.

6 Turn the water pump off.

For HTMP Tanks with the standard 10-turn potentiometer or optional PAVC controls: Turn the vacuum pump off by pressing the #1 VAC STOP button and then press #1 REC STOP. If you have a dual-water pump system, stop the second pump as well.

NOTE: The Emergency Stop should NOT be used as an ON/OFF switch. Drives do not shut down properly when the emergency stop is pushed. Only use the emergency stop for an emergency.
7 Drain the tank and reservoirs if the tank will not be used or requires water system maintenance. Open the quick-dump valve located in each chamber to drain the tank.
Maintenance

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Adjusting the floats ................................ 5-8
Inspecting electrical connections .................. 5-9
Preventative maintenance schedule

Normal operation of the HTMP tank involves extended exposure of many components to minerals and other water system contaminants. These minerals and contaminants can produce deposits, scales, slime or algae that will reduce sizing tank performance.

To maintain the best performance, you should follow this maintenance schedule and develop an effective water treatment program.

• Daily
  ☐ Inspect vacuum chamber gaskets.
  Gaskets between the vacuum chambers and at the ends of the tank must be in good condition to maintain vacuum stability. Replace any gaskets that are excessively worn, cracked or torn.

• Weekly, or as often as needed.
  ☐ Clean the coarse suction screens.
  Remove the screens from the open reservoir and rinse. Replace if torn or damaged.

  ☐ Clean the filter cartridge.
  Remove the cartridge and rinse. You may need to clean the cartridge more often than weekly, depending upon the quality of your water supply.

  ☐ Drain and clean the vacuum tank.
  Remove any particles and wipe all surfaces thoroughly.

• Monthly
  ☐ Lubricate all threads, shafts, sliding components, linear actuator and bearings.
  Lubricate not only the grease fittings but coat shafts and other sliding surfaces with a seize-resistant bearing compound to prevent corrosion. You may need to lubricate more often than monthly.

  ☐ Drain and clean the reservoirs.
  Remove any particles and wipe all surfaces thoroughly.

  ☐ Clean the spray bars.
  Remove particles and clear any clogs in holes.

  ☐ Inspect the lid gaskets.
  Damaged gaskets decrease vacuum stability. Replace any gaskets that appear torn or cut or do not seal properly.

  ☐ Check reservoir float adjustment.
  Floats should be 2 to 3 inches (51 to 76 mm) below the top of the reservoir rim when fully closed. Tighten any loose screws.
Preventative maintenance schedule
(continued)

• Monthly
  ☐ Clean the plate heat exchanger.
   The plate heat exchanger is a sealed unit and can only be cleaned by backflushing. Depending on the quality of your water supply, you may want to backflush the heat exchanger more frequently. Once the unit becomes fouled with deposits, you must replace it.

• Every three months
  ☐ Lubricate water pump bearing frame, motor and coupling.
   Refer to manufacturer’s instructions. Recheck pump alignment after performing any maintenance that requires moving the unit.

• Every 6 months
  ☐ Inspect power cords, wires and electrical connections.
   Check for loose wires, burned contacts, and signs of overheated wires. Check exterior power cords to the main power source and from the electrical box to the pumps. Check the ground wire. Replace any wire that appears damaged or has worn or cracked insulation.
Inspecting gaskets

A tight compartment seal is essential to stable vacuum pressure. Leaks between vacuum chambers, through the lids or at the ends of the tank reduce vacuum pressure stability.

1. **Drain the upper tank.** Open the quick dump valves located on the bottom of each section of the tank.

2. **Open the tank compartment lids.**

3. **Inspect each lid gasket thoroughly for cuts, tears or other damage.**

4. **Inspect the vacuum chamber gaskets.** Examine the gaskets between chambers and at the ends of the tank for cuts tears or other damage.

5. **Replace a gasket if you see evidence of damage or notice hissing during operation.**

Replacing gaskets

To replace a lid gasket:

1. **Remove the damaged gasket, and glue a new one in place.** We recommend 3M Scotch Grip #4475 Plastic Adhesive for stainless steel lids or 3M Scotch Grip #4799 Glass Industrial Adhesive for glass lids. Follow the application and curing instructions on the tube of adhesive.

To replace vacuum chamber or end gaskets:

1. **Remove the retaining rings.** Loosen the wing nuts and lift off the ring that holds the gasket in place.

2. **Remove the damaged gasket and slide a new gasket over the studs.** No sealant is required.

3. **Reassemble.** Slip the retaining ring over the studs to cover the gasket. Tighten the wing nuts.
**Cleaning the filter cartridge**

The filter cartridge removes particles from the water before it passes to the vacuum tank. Water contaminants can also leave deposits or algae in the filter. You may need to clean the filter cartridge more often than weekly, depending upon the quality of your supply water.

1. **Remove the cartridge and screen.** Twist the cartridge counterclockwise and pull it out. Lift the filter screen up and out of the cartridge cover.

2. **Clean the filter screen.** Rinse the filter screen thoroughly using water. Replace the screen if it is damaged or cannot be cleaned.

3. **Lubricate the cartridge o-ring.** You can use a thin layer of petroleum jelly to help prevent the o-ring from drying and cracking. A slight leak could cause water pump cavitation.

4. **Reassemble by repeating the steps in reverse order.**

---

**Cleaning the suction screens**

A 2-inch suction screen covers each opening between the open and closed sides of the reservoir. The screens prevent large particles from being drawn into the float valves and the water pump. You may need to clean the suction screen more often than weekly, depending upon the quality of your water supply.

1. **Inspect and clean the screens.** Wipe each screen with a clean cloth to remove any particles. Check the screen for damage or excessive deposits.

2. **Remove any damaged or clogged screens.** Rotate the screen counterclockwise and remove it. Rinse it thoroughly. If you cannot unclog the screen or it is damaged, replace it.

3. **Return the screens to the valve fittings.** Make sure the screens fit securely over the openings. Tighten the screen by hand.
Lubricating tank components

Normal operation of the HTMP tank creates many wet surfaces. We recommend generous monthly lubrication of any threaded or sliding components involved in positioning the tank. Those components include the positioning mechanisms such as the up/down vertical support shafts, side-to-side cross thread, and the linear actuator. You may need to lubricate more often than monthly.

1 Locate the vertical support shaft grease fittings.

2 Lubricate the shafts and fittings. Apply bearing compound to the fittings until it overflows. Apply a coating of the compound to the shafts as well.

3 Lubricate threads and fittings. Apply bearing compound to the fittings until it overflows. Apply a coating of the compound to the thread as well.

4 Lubricate the linear actuator according to manufacturer’s instructions.

Cleaning vacuum tank

The vacuum tank chambers should be thoroughly cleaned weekly to remove particles that can accumulate.

1 Drain the tank. Open the quick-dump valves in each chamber to release water to the drip pan and open reservoir.

2 Clean the tank. Remove particles from the tank chambers and wipe thoroughly.

3 Check the quick-dump valves for any signs of leakage. Scratches or other damage can cause vacuum leaks.

4 Close all quick-dump valves.
Cleaning the vacuum tank and reservoirs

The open and closed reservoirs should be drained and cleaned monthly to remove bits of plastic, garbage and other residue.

1 **Drain the reservoir.** Remove the drain plugs in the bottom of the reservoirs and allow the water to run out. If you have installed drain valves in the bottom of the reservoirs, open the valves fully.

2 **Clean the reservoir.** Remove any particles and wipe thoroughly.

3 **Close drains.** Make sure you refill the reservoirs completely from the water supply before turning the pumps back on.

Cleaning vacuum tank

Each tank chamber contains spray bars that can become clogged with residue. Clean the spray bars monthly.

1 **Open the chamber lid.**

2 **Remove the spray bars.** Twist each spray bar counterclockwise and pull it out.

3 **Clean the spray bars.** Flush each bar with water. Use a soft brush to remove any particles clogging the small holes.

4 **Reassemble by repeating the steps in reverse order.**

5 **Repeat the procedure for each chamber.**
Adjusting the floats

Floatation valves maintain the proper water level in the reservoirs. Over time, the screw that holds the float in place may become loose allowing the float position to change. Check the screws and float positions monthly.

The number of floats in your system depends upon your pump configuration. For clarity, we identify floats by location and size.

1 Inspect the position of the 1-inch float in the open reservoir. When the valve is closed, the water level should be at least 2 inches above the top of the 2-inch suction screens to prevent cavitation. If necessary, loosen the tiny screw at the base of the float arm. Reposition the float properly, then tighten the screw.

2 Remove the closed reservoir lid.

3 Inspect the position of the 1-inch float in the closed reservoir. When the valve is closed, the bottom of the float ball should be 6 inches from the bottom of the reservoir. If necessary, loosen the tiny screw at the base of the float arm. Reposition the float properly, then tighten the screw.

4 Inspect the position of the 2-inch float in the closed reservoir. When the valve is closed, the top of the 8-inch float ball should be 3 inches down from the top of the reservoir rim. If necessary, loosen the tiny screw at the base of the float arm. Reposition the float properly, then tighten the screw.

5 Replace closed reservoir lid.
Checking Electrical Connections

Normal operation of the HTMP Tank produces many wet surfaces. We recommend that you carefully check all electrical wires for signs of damage that could result in a serious shock.

1 Stop the HTMP Tank.

2 For HTMP tanks with the standard 10 turn potentiometer or optional PAVC controls: Press the VAC STOP button then the REC STOP button(s) on the control.

3 Disconnect and lock out the main power source. Turn the disconnect dial on the electrical enclosure to the O or off position.

4 Open the electrical enclosure. A safety device prevents you from opening the door unless the power is shut down. (on tanks with the standard 10 turn potentiometer or optional PAVC controls.)

5 Inspect the wires and connections. Look for loose wires, burned contacts, and signs of over-heated wires. Have a qualified electrician make any repairs or replacements necessary.

6 Close the electrical enclosure door.

7 Inspect the exterior power cords. Carefully check the power cords from the electrical enclosure to the pumps. Cords should not be crimped, exposed or rubbing against the frame. Also check the power cord to the machine. If the main power cord runs along the floor, make sure it is not positioned where it could rest in pooling water or could be run over and cut by wheels or cast
Troubleshooting

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Before Beginning

You can avoid most problems by following the recommended installation, operation and maintenance procedures outlined in this User Guide. If you have a problem, this section will help you determine the cause and tell you how to fix it.

Before you begin troubleshooting:

- Find any wiring, parts, and assembly diagrams that were shipped with your equipment. These are the best reference for correcting a problem. The diagrams will note any custom features or options not covered in this User Guide.

- Verify that you have all instructional materials related to the puller. Additional details about troubleshooting and repairing specific components are found in these materials.

- Check that you have manual for other equipment connected in the system. Troubleshooting may require investigating other equipment attached to, or connected with the puller.

A Few Words of Caution

⚠️ **WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed and adjusted by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

⚠️ **WARNING: Electrical hazard**

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.
Identifying the Cause of a Problem

The Troubleshooting section has been divided into:

- **HTMP Tank Operation Problems**, which focuses on problems that are clearly related to the operation of the water, vacuum or electrical/control systems of the sizing tank.

- **Plastic Product Quality Concerns**, which deals with product characteristics that may be related to the HTMP tank operation. Of course, other sections of the extrusion line also influence the quality of the extruded product. This section does not provide solutions to problems that originate with other equipment on the extrusion line.

Additional troubleshooting help can be found in manuals supplied by manufacturers of tank components and included in this instruction package.
# Water System Problems

## Symptom

The water pump will not start.

There is no or low water flow, even though the pump is running.

## Possible cause

**Is the correct power reaching the pump?**

**Has the pump motor overload tripped?**

**Is the pump damaged?**

**Is the pump rotating in the wrong direction?**

**Is the path of the water flow blocked?**

## Solution

- Check all connections and voltages. See **Checking Electrical Connections**.

- Make sure the emergency stop is disabled. If necessary, pull out the Emergency Stop button, then press the Reset button on the control panel.

- Check the trip indicator on the pump overload module. If necessary, manually reset the overload. Verify the overload is set to 125% of the full load amps specified on the motor data plate. See **Checking and Resetting Motor Starters**.

- If the correct power is reaching the pump but it does not run, refer to the pump instructions found in the **APPENDIX**.

- If the pump is turning opposite the arrow stamped on its housing, turn off and lock out the main power supply. Open the electrical enclosure door, and reverse any two leads connecting the main power to the vacuum sizing tank.

- Locate the blockage:
  - Check the filter cartridge and suction screens. See **Cleaning the Filter Cartridge** and **Cleaning the Suction Screens**.
  - Check water piping and the heat exchanger for blockages. Clean or backflush, as needed.
  - Check for a restriction in the spray bars. Clean, if necessary.
## Water System Problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is no or low water flow, even though the pump is running. (continued)</td>
<td>Is the makeup water supply on?</td>
<td>The system may have run dry. Check the water level in the open reservoir. Make sure the makeup water supply is on.</td>
</tr>
<tr>
<td>The closed reservoir is flooding.</td>
<td>Are the float valves set incorrectly?</td>
<td>Drain the closed reservoir until the water level is normal, or about half full. Check the position of the 8-inch and 4-inch floats. Readjust the float position to make sure the closed reservoir remains about half full.</td>
</tr>
<tr>
<td>Are the float valves working correctly?</td>
<td></td>
<td>Drain the closed reservoir until the water level is normal, or about half full. Verify that each float valve turns on when the float drops below the level at which it was set. The valve should turn off when water raises the float to the level at which it was set. If a float valve is not working properly, replace the valve.</td>
</tr>
</tbody>
</table>
Vacuum System Problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum pump will not start.</td>
<td>Is the water pump off?</td>
<td>A safety interlock prevents the vacuum pump from starting if the water pump is off. Turn on the water pump.</td>
</tr>
<tr>
<td></td>
<td>Is the correct power reaching the vacuum pump?</td>
<td>Check all connections and voltages. See Checking Electrical Connections. Make sure the emergency stop is disabled. If necessary, pull out the Emergency Stop button, then press the Reset button on the control panel.</td>
</tr>
<tr>
<td></td>
<td>Did the overload to the AC frequency controller trip? (10-turn potentiometer and PAVC models only)</td>
<td>Check the frequency controller overload and fault indicators. Refer to the frequency controller manual in the APPENDIX.</td>
</tr>
<tr>
<td></td>
<td>Is the vacuum pump damaged?</td>
<td>If the correct power is reaching the pump but it does not run, refer to the pump instructions in the APPENDIX.</td>
</tr>
<tr>
<td>The vacuum pump is running, but there is no vacuum.</td>
<td>Is the pump rotating in the wrong direction?</td>
<td>If all pumps are turning opposite the arrows stamped on their housings, turn off and lock out the main power supply. Open the electrical enclosure door, and reverse any two leads connecting the main power source to the tank. If only one pump is rotating the wrong direction, turn off and lock out the main power supply. Then reverse any two leads connecting the pump to the power supply.</td>
</tr>
<tr>
<td></td>
<td>Is the optional 10-turn potentiometer working properly?</td>
<td>See Checking and Replacing the 10-turn Potentiometer.</td>
</tr>
<tr>
<td></td>
<td>Is the AC frequency controller working properly? (units with optional 10-turn potentiometer and PAVC models only.)</td>
<td>Check the frequency controller fault indicators. Refer to the frequency controller manual in the APPENDIX.</td>
</tr>
</tbody>
</table>
Vacuum System Problems

Problem
Vacuum pump is running, but cannot attain the desired vacuum level.

Possible cause
Is there a leak in the vacuum system?
Are the correct valves or devices being used to adjust the vacuum level?
Is the automatic vent valve working properly? (10-turn potentiometer and PAVC models only.)
Is the AC frequency controller set up properly? (10-turn potentiometer and PAVC models only.)

Solution
☑ Verify that all lids, including the lid on the closed reservoir, are seated correctly to allow for a seal.
☑ Check for holes or tears in all gaskets. Replace any damaged gaskets.
☑ Make sure the gross bleeder valve on the vacuum pump has not been opened.

For 10-turn potentiometer only:
Make sure the coarse adjustment valve has not been adjusted. This valve has been set at the factory to the correct position. Use only the 10-turn potentiometer to adjust vacuum levels.

The automatic vent valve may be dirty or stuck open. Remove it and clean it. See Cleaning the Automatic Vent Valve.

Verify that the Hz or pump RPMs increase as you increase vacuum. If they do not, verify that the drive parameters for the AC frequency controller are correct. See the frequency controller manual and the default parameter tables in the Appendix.

(Continued)
# Electrical Problems

## Problem
Pump turns on, but won’t stay on.

## Possible cause
- Has the overload tripped?
- Is the pump overheating?

## Solution
- See Checking and Resetting Motor Starters.
- Check power, amps and connections to the pump. If you have a PAVC control, also check the drive parameters.

## Product Quality Problems

## Problem
Outside dimensions of the extruded product are wrong.

## Possible cause
- Has the vacuum level drifted?
- Is the vacuum level too high?
- Is the water well pressure too high?
- Is the extrudate rubbing or dragging against the calibration tool?
- Are air bubbles adhering to the extrudate surface, causing uneven cooling?

## Solution
- Check the vacuum level. Adjust as necessary. See Vacuum System Problems if the desired vacuum level cannot be maintained.
- If the vacuum level is too high, die swell can occur leading to chatter marks.
- Reduce the water well pressure.
- Check alignment.
- Increase spray ring flow.
- Increase agitation in the first chamber.
- Add mineral or baby oil at the water well.
- Add an anti-static agent to the water.
- Add non-sudsing soapy water at the water well.
Checking electrical connections

DANGER: Voltage hazard.
Troubleshooting the electrical system of this equipment requires use of precision electronic measuring equipment, as well as access to the electrical enclosure while power is on. Exposure to potentially fatal voltage levels is unavoidable. These troubleshooting procedures should be performed only by qualified electrical technicians who know how to use this precision electronic equipment and who understand the hazards involved.

DANGER: Shock hazard.
Make sure that a properly-sized ground wire runs from the incoming power supply to the chassis ground terminal in the electrical enclosure.

IMPORTANT: Always refer to the wiring diagrams that came with your unit to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

There are several types of problems that may be present within the electrical system: improper grounding; loose connections, incorrect voltages, and defective components. This procedure addresses the first three. Defective components are usually identified by a process of elimination, followed by testing of the suspect component.

Loose connections

1 Disconnect and lockout power.

2 Reattach and tighten all electrical connections.

3 Verify the electrical disconnect switch is turned on.

4 Check fuses and breakers in the disconnect. Replace or reset as required. Identify the cause of the ground fault and correct it.

Incorrect voltages

1 Verify that the voltage of the incoming power supply at the disconnect matches the voltage specified on the nameplate.

2 Verify 110VAC at the input and 12VDC at the output of the DC power supply.

3 Verify line voltages at T1, T2, and T3 of the pump motor starter. If the expected voltage is not present, check for defective components or loose electrical connections.
Checking and resetting the motor starters

The pump motor starters are located in the electrical enclosure. If the motor starter overload has tripped, the dial will be pointing to the O or off position.

To reset the motor starter:

1. Disconnect and lockout the main power source.
2. Open the electrical enclosure.
3. Locate the motor starter.
4. Turn the dial to the I or on position.
5. Close the electrical enclosure.
Cleaning the automatic vent valve (PAVC)

The optional automatic vent valve controls the vacuum by regulating the amount of air that is allowed to enter (leak into) the vacuum system. It consists of a movable metal disc with a teardrop-shaped opening inside a plastic body. As the disc rotates, the size of the opening changes and more or less air is allowed to enter the system. A small motor (controlled by the 10-turn potentiometer) controls the position of the disc.

As air flows through the automatic vent valve, dust and contaminants may collect in it and cause sticking or stalling. The automatic vent valve assembly (the automatic vent valve, the motor, and a mounting bracket) can be removed from the electrical enclosure for cleaning.

1 Locate the automatic vent valve assembly in the electrical enclosure.

2 Disconnect the bleed line and unplug the electrical wires from the connectors on the valve assembly.

3 Remove the valve assembly from the electrical enclosure by removing two nylon insert nuts and washers that attach the mounting bracket to the electrical enclosure.

4 Open the valve assembly and remove the mounting bracket by removing four hex screws near the vacuum line fitting.

5 If necessary, remove the metal disc. It is held to the gear box shaft by a set screw. Loosen the set screw just enough to allow the shaft to slide out. If necessary, use a 12VDC supply to power the valve motor to bring the screw head into an accessible position.

6 Clean plastic and metal parts. If necessary, use isopropanol (rubbing alcohol) to remove dirt and debris.

7 Reverse the procedure to reassemble the valve and replace it in the electrical enclosure.

If the valve was not dirty, or the valve still doesn’t work after cleaning, the motor/gear box has probably failed. Contact Conair Service.

⚠️ WARNING: Lockout and disconnect the main power source before troubleshooting or performing repairs.
Fault Codes Page

Following are the lists of fault bits and their meanings…

**Drive Faults 32-Bit Bitmap**
This parameter is a 32-bit register that holds all of the drive fault status bits.
Following is a list of all drive faults and their associated bit numbers:
0 = Encoder state fault
1 = Encoder hardware fault
3 = Drive power module fault
4 = Low DC bus fault
5 = High DC bus fault
8 = Drive internal fault 1
9 = Drive trajectory fault
10 = Drive internal fault 2
16 = Drive watchdog timer fault
19 = Drive over speed fault
20 = Drive invalid configuration fault
21 = Drive power up self test fault
24 = Drive RMS shunt power fault
25 = Motor overtemperature fault
All other bits are not used. A "1" in these bit locations indicates the specific fault is active, and a "0" is inactive.

**Module Faults 32-Bit Bitmap**
This parameter is a 32-bit register that holds all of the module fault status bits.
Following is a list of all module faults and their associated bit numbers:
0 = Module watchdog timer fault
1 = Module invalid configuration fault
2 = Module NVM invalid fault
3 = Module power up self test fault
4 = Module following error fault
5 = Module travel limit plus fault
6 = Module travel limit minus fault
7 = Module program fault
8 = No Program Loaded fault
9 = Module DeviceNet Connection Timeout fault
10 = Module DeviceNet BusOff Interrupt fault
11 = Module DeviceNet Duplicate Mac ID fault
12 = Module trajectory fault
13 = Module Profibus parameterization fault
14 = Module Profibus watchdog fault
15 = Module Profibus configuration fault
All other bits are not used. A "1" in these bit locations indicates the specific fault is active, and a "0" is inactive.
We’re Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call...

If you do have a problem, please complete the following checklist before calling Conair:

☐ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.

☐ Make sure power is supplied to the equipment.

☐ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.

☐ Check the troubleshooting guide of this manual for a solution.

☐ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.

☐ Check that the equipment has been operated as described in this manual.

☐ Check accompanying schematic drawings for information on special considerations.

NOTE: Normal operating hours are 8:00 am - 5:00 pm EST. After hours emergency service is available at the same phone number.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee.
**Equipment Guarantee**

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair’s guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

**Performance Warranty**

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications. Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)

- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.

- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair’s Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid. Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

**Warranty Limitations**

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.
Comander SE Control Techniques Start-up

Step 1  Insure drive is the correct voltage for the unit. Also check phase 2 or 3.

Step 2  Power up unit and press the \( M \) button. This will allow you to set parameters. See note below.

Step 3  Refer to parameter set up sheet Appendix B-2.

Step 4  Drive must be enabled to autotune.

Step 5  Once Autotune is complete set parameter 5 to pad and enable the drive.

Step 6  Check motor rotation by pressing the \( 1 \) button to start the drive. Next, press the \( \Delta \) button to start the motor turning. Once rotation is determined press the \( 0 \) button to stop the drive.

Step 7  Re-enter A1, A2 in parameter 5.

**NOTE:** To change a parameter first access parameters by pressing the \( M \) button. Once parameters are accessed you can scroll to the parameters with the \( \Delta \) and \( \nabla \) buttons. To change a value press the \( M \) button until the parameters value is flashing. Then use the \( \Delta \) or \( \nabla \) buttons to scroll to the desired value. Once the desired value is reached press the \( M \) button to get back to parameter view, now the parameter number will be flashing. Once all of the parameters are set press and hold the \( M \) button until the drive resets.

To change views when the unit and vacuum motor is running press and hold the \( M \) button.

One view you will see Fr in the left view window and the actual motor frequency in the right window. It should read about 6.8 with the motor stopped. The other view you will see A in the left view window and the actual motor current in the right window. This is the AC current of the motor.

Before shipping be sure that the view is set to Fr.

Each time a parameter is adjusted you must reset the drive to lock the value you entered. Press and hold the \( M \) button to reset the drive.
## Commander SE Control Techniques Parameter Setup

<table>
<thead>
<tr>
<th>Parameter Number</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.8</td>
</tr>
<tr>
<td>2</td>
<td>60 (may need to adjust per unit)</td>
</tr>
<tr>
<td>3</td>
<td>1 sec</td>
</tr>
<tr>
<td>4</td>
<td>3 sec</td>
</tr>
<tr>
<td>5</td>
<td>A1, A2</td>
</tr>
<tr>
<td>6</td>
<td>motor FLA nameplate</td>
</tr>
<tr>
<td>7</td>
<td>motor rpm nameplate</td>
</tr>
<tr>
<td>8</td>
<td>voltage of unit</td>
</tr>
<tr>
<td>9</td>
<td>motor power factor</td>
</tr>
<tr>
<td>10</td>
<td>must be L2 to access parameters 11-44</td>
</tr>
</tbody>
</table>

**NOTE:** After testing set to L1

| 16               | needs set only if using input AZ terminal 5 |
| 22               | A |
| 23               | Fr |
| 26               | OFF |
| 30               | 1 |
| 31               | 1 |
| 32               | OFF |
| 33               | 0 |
| 34               | ON |
| 36               | Fr |
| 38               | Once all parameters are set enter value of I and enable drive to autotune. Wait until the autotune is complete before starting drive. |
| 39               | unit Hz - 50 or 60 determined by rpm of motor |
| 40               | low rpm - 1759 = 4 pole high rpm - 3250 = 2 pole |