

Intellispec™

Vacuum Cap Conveyor System Hardware Guide

Pressco Technology Inc.

70236 Rev. 03



Original Instructions

© 2018 Pressco Technology Inc. All rights reserved.

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose, without the express written permission of Pressco Technology Inc.

The contents of this manual are furnished for informational use only, are subject to change without notice, and should not be construed as a commitment by Pressco Technology Inc.

Written and designed at:

Pressco Technology Inc. World Headquarters

29200 Aurora Road

Cleveland, OH USA 44139-1847

TEL +1-440-498-2600

FAX +1-440-498-2615

www.pressco.com

Business Hours: Monday - Friday, 8:00am - 5:00pm Eastern Time

Customer Support:

24/ 7 Customer Support (for urgent system help): +1-440-498-2000

e-mail: Schedule a service visit: [*dispatch@pressco.com*](mailto:dispatch@pressco.com) (*mailto:dispatch@pressco.com*)

Request technical support and remote support: [*techsupport@pressco.com*](mailto:techsupport@pressco.com) (*mailto:techsupport@pressco.com*)

Customer Service Fax: +1-440-498-4761

Table of Contents

- Chapter 1 Introduction..... 5**
 - About this Manual5
 - Typographical Conventions.....5
- Chapter 2 System Overview 7**
 - Conveyor Operation.....7
 - Main Components8
 - System Specifications.....9
- Chapter 3 Safety Information and Markings 17**
 - Serial Tag.....17
 - Symbols.....18
 - Warning Devices18
 - Residual Risk18
 - Intended Use.....19
 - Prohibited Use19
 - Personal Protective Equipment19
 - Personnel Safety20
 - Lifting heavy objects21
 - Authorized Users.....22
 - Spare Parts Usage22
- Chapter 4 Installation and Setup 23**
 - Preparation for Installation.....23
 - Commissioning.....28
- Chapter 5 Machine Components and Systems 29**
 - Electrical System29
 - Machine Mounted Safety Components30
- Chapter 6 Operating the Vacuum Conveyor System 31**
 - Operator Controls31
 - Startup Sequence.....32
 - Shutdown Sequence33
- Chapter 7 Part Changeover Procedure..... 35**
- Chapter 8 Maintenance Frequency..... 37**
 - Inspect the Main Belt.....39
 - Inspect the Drive Belt.....39
 - Inspect the Bearings.....39
 - Vacuum Cap Conveyor Cabinet Lockout.....40
 - Clean the filters.....40
 - Replace the Main Belt.....41
 - Replace the Drive Belt.....43
 - Replace the Idle End Bearings.....44
 - Replace the Drive End Bearings.....45
- Chapter 9 Troubleshooting..... 47**
 - Symptoms and Possible Solutions47

Chapter 10	Wiring Diagrams.....	49
	Wiring Diagram sheet 1 - F1885E.....	50
	Wiring Diagram sheet 2 - F1885E.....	51
	Wiring Diagram sheet 3 - F1885E.....	52
	Wiring Diagram sheet 4 - F1885E.....	53
	Wiring Diagram sheet 5 - F1885E.....	54
Index.....		55

Chapter 1

Introduction

About this Manual

This manual provides operating and maintenance instructions for the Pressco Vacuum Cap Conveyor Machine. It provides the necessary information to operate a system that is properly installed and set up. This manual:

- Is considered an integral part of the machine and should be kept handy for future reference as long as the system is being used in your plant.
- Is your responsibility to keep in good condition, in a dry place, and ready for consultation by the **authorized users** (on page 22) of the system.
- Contains the technology implemented at the time of selling and supplying the system and shall not be considered inadequate in case of technological enhancements in the machine or in the manual's illustrations.

Typographical Conventions

Following is a list of typographical conventions used in this manual:

- **Bold type** indicates a topic heading or an important item or statement.
- *Italicized type* indicates emphasis.
- Names of main components and system control signals have the first letter of each word capitalized. For example: Processor Cabinet.
- Caution messages appear as shown below:



Caution - Caution messages indicate important information which must be observed to prevent: loss of data, poor system performance, or equipment damage. These messages are set off from the body text as shown here.

- Warning messages appear as shown below:



Warning - Warning messages indicate the possibility of minor injury to yourself or others. These messages are set off from the body text as shown here.

- Danger messages appear as shown below:



Danger - Danger messages alert you to specific conditions that can cause serious or fatal personal injury. Danger messages give you important information which must be observed to prevent injury. These messages are set off from the body text as shown here.

- Notes appear as shown below:
 - ❖ *Note: Notes contain special information that warrants being set off from the body text as shown here.*
- Important Notes appear as shown below:



Important - Important notes are set off from the body text as shown here.

Chapter 2

System Overview

The Pressco Vacuum Cap Conveyor system is used in conjunction with an Intellispec Vision Inspection system. See the Intellispec System Guide, Programming Guide, or Hardware Guide for more information about the inspection system.

The lighting, optics, camera, and strobe electronics for inspection are contained in a custom inspection module that is mounted to the Pressco Vacuum Cap Conveyor. (Model CP500E or CP750E)

The closure (plastic cap) is fed from a feeder to a Pressco vacuum conveyor so that the product side is pointing up. As the cap exits the feeding device trackwork it travels through a chicane cap guiding system located on the entrance end of the Pressco supplied conveyor for separation. Each cap is accelerated as vacuum assists in positively placing the cap during its conveyance. As the cap travels along the conveyor it triggers a part detect to signal the system to acquire an image of the cap. The image of the product side of the cap is acquired by the camera and solid-state strobe lighting module located above the conveyor.

Each image is acquired by the camera and processed by the Intellispec software. The software evaluates each part and makes a pass/fail decision based on the programmed specifications. If a part is acceptable, it is allowed to continue traveling down the conveyor. If a part is unacceptable, the electronics will give a properly timed output signal to the downstream Pressco-provided reject station, which will eject the defective part.

If a part is acceptable, it exits the end of the Pressco Vacuum Cap Conveyor to a customer-supplied conveying device. This conveying device could be a section of trackwork, a Gaylord, or an airveyor. The parts may have to be accelerated through any required transferred cages with a customer-supplied air assist device to assure there are no backups on the Vacuum Cap Conveyor.

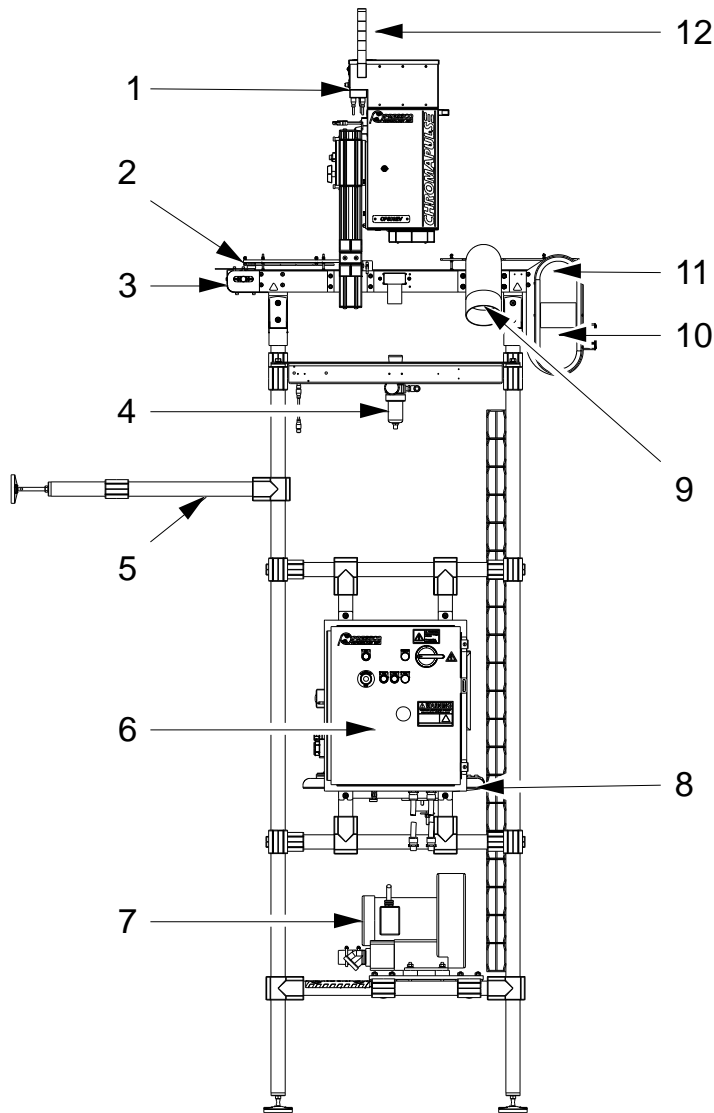
Conveyor Operation

The Pressco Vacuum Cap Conveyor system is offered in two versions: Standard (77445), and Stainless Steel (77572). To determine your version, look at the **Serial Tag** (on page 17) Electrical Diagram Wiring Index on your system.

Each version requires a **customer supplied contact** to enable the conveyor to run. After you start the conveyor at the control panel, the vacuum pump will run, creating a vacuum at the conveyor belt. However, the conveyor will not run until the customer supplied contact closes. This **Enable (Run) contact** will automatically start and stop the conveyor based on the opening and closing of the contact. Generally, the Run contact will open when the line is backed up, and close when the track is clear. This control method does not require operator intervention of pressing pushbuttons to stop and start the conveyor. For more information, see **Connection of the Customer Enable Contact** (on page 27).

Main Components

The main components of the Vacuum Cap Conveyor system are shown below.



- 1) CP500E or CP750E Inspection Module
- 2) Chicane
- 3) Conveyor
- 4) Filter/ Regulator
- 5) Optional outrigger (see **Options** (on page 12))
- 6) Electrical Control Enclosure
- 7) Regenerative Vacuum Blower
- 8) Optional User Interface mounting (opposite side)
- 9) Reject Chute (Rejecter on other side of conveyor)
- 10) Drive Motor
- 11) Encoder (not shown - mounted on opposite side)
- 12) CPxxx Module Light Tree

System Specifications

EU Declaration of Conformity - Number MS3296

Declaration	Pressco Technology, Inc. Vacuum Cap Conveyor System is in conformity with Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).
Manufacturer	Pressco Technology Inc. 29200 Aurora Road Cleveland, Ohio 44139-1847 USA
Product Name	Vacuum Cap Conveyor
Electrical Diagram	69617, 71585, 74766, 69449, 77445, 77572
Standards Used (only major standards listed)	EN ISO 12100 (2010): Safety of machinery - General principles for design - Risk assessment and risk reduction EN ISO 13849-1 (2015): Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design EN13857 (2008): Safety of Machinery – Safety distances to prevent danger zones from being reached by upper and lower limbs EN 349:1993+A1:2008: Safety of machinery - Minimum gaps to avoid crushing of parts of the human body EN ISO 4414:2010: Safety of machinery - Safety requirements for fluid power systems and their components - Pneumatics EN 1037:1995+A1:2008: Safety of Machinery - Prevention of unexpected startup EN ISO 13850:2015: Safety of machinery - Emergency stop - Principles for design EN 60204-1:2006+A1: 2009: Safety of Machinery - Electrical Equipment of Machines, Part 1: General principles for design
Technical File	MS3296
Compiler of the Technical Files	Safenet Ltd, Notified Body 1674 Denford Garage, Denford, Kettering, Northants., NN14 4EQ, U.K.
Signature of Manufacturer:	Fritz Awig, Vice President, Customer Support Engineering.
Place	Pressco Technology Inc. 29200 Aurora Road Cleveland, Ohio 44139-1847 USA
Date:	14 June 2018

EU Declaration of Conformity - Number EMC3296

Declaration	Pressco Technology, Inc. Vacuum Cap Conveyor System is in conformity with Directive 2014/30/EU of the European Parliament and of the Council of 26 February.
Manufacturer	Pressco Technology Inc. 29200 Aurora Road Cleveland, Ohio 44139-1847 USA
Product Name	Vacuum Cap Conveyor
Electrical Diagram	69617B, 71585B, 74766B, 69449B, 69617E, 71585E, 74766E, 69449E
Standards Used (only major standards listed)	EN 61000-6-2 (2005) Electromagnetic compatibility – Part 6-2: Generic standards – Immunity for industrial environments EN 61000-6-4 (2007+A1:2011) Electromagnetic compatibility – Part 6-4: Generic standards – Emission standard for industrial environments EN 55011 (2009+A1:2010) Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment EN 61800-3: 2004+A1:2012 Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods
Technical File	EMC3296
Means of Conformity:	The product is in conformity with Directive 2014/30/EU based on inspection and correct installation of previously CE marked equipment and the use of a Technical File in accordance with Article 7 of the Directive.
Signature of Manufacturer:	Fritz Awig, Vice President, Customer Support Engineering. 3/20/17
Place	Pressco Technology Inc. 29200 Aurora Road Cleveland, Ohio 44139-1847 USA
Date:	15 November 2016

System Electrical Specifications

The following are electrical specifications for different configurations of the machine:

Configuration	Specification
Voltage Range	380-480 VAC
Frequency	50/60 Hz
Current	15A @ 480 VAC, 100% Load

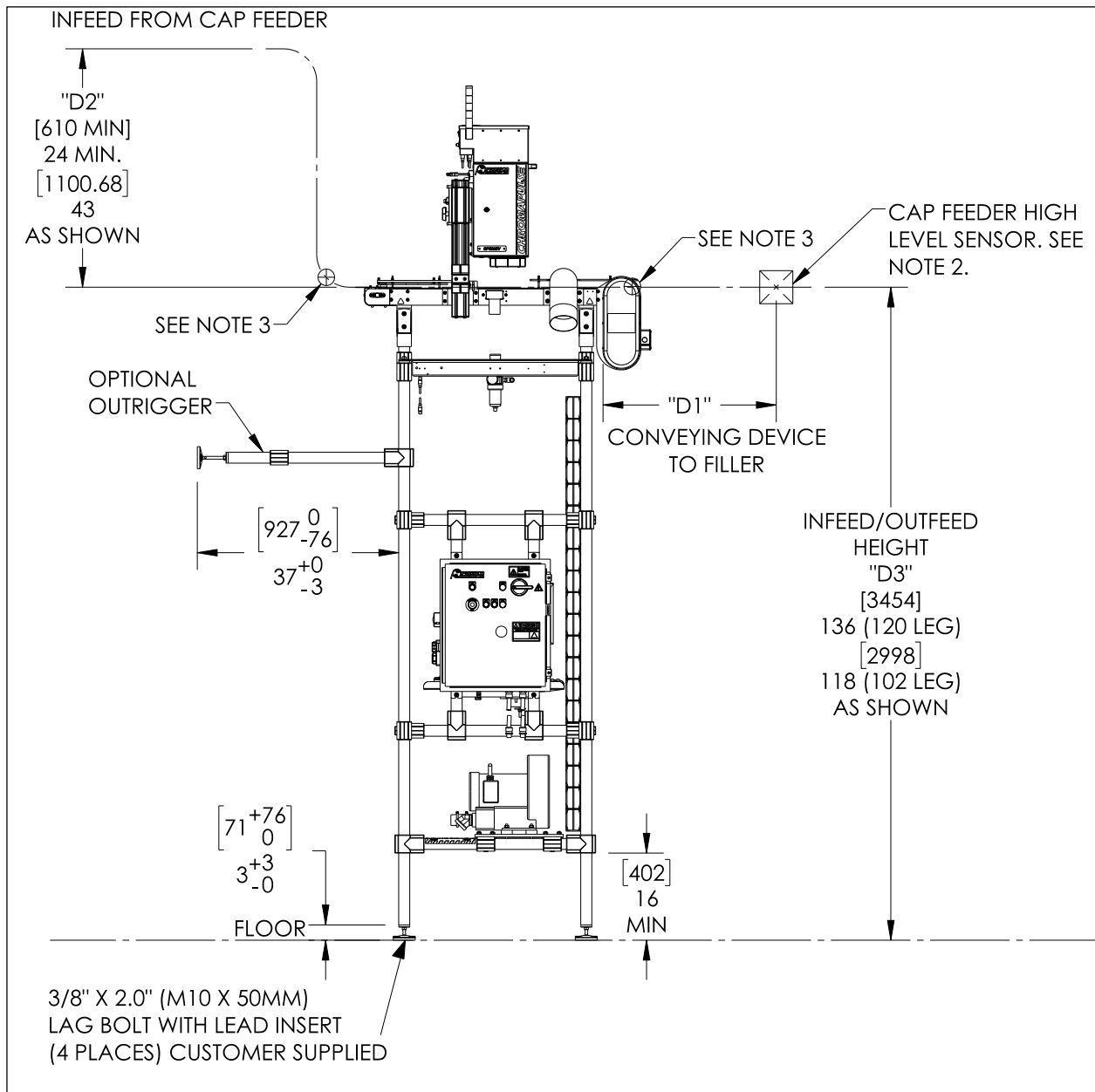
System Measurements

The dimensions of the Vacuum Cap Conveyor are illustrated below, followed by a table of dimensions.

❖ *Note: Several height options are available. See Options (on page 12).*

The following are the **maximum** weight and dimensions of the Vacuum Cap Conveyor, in normal installations.

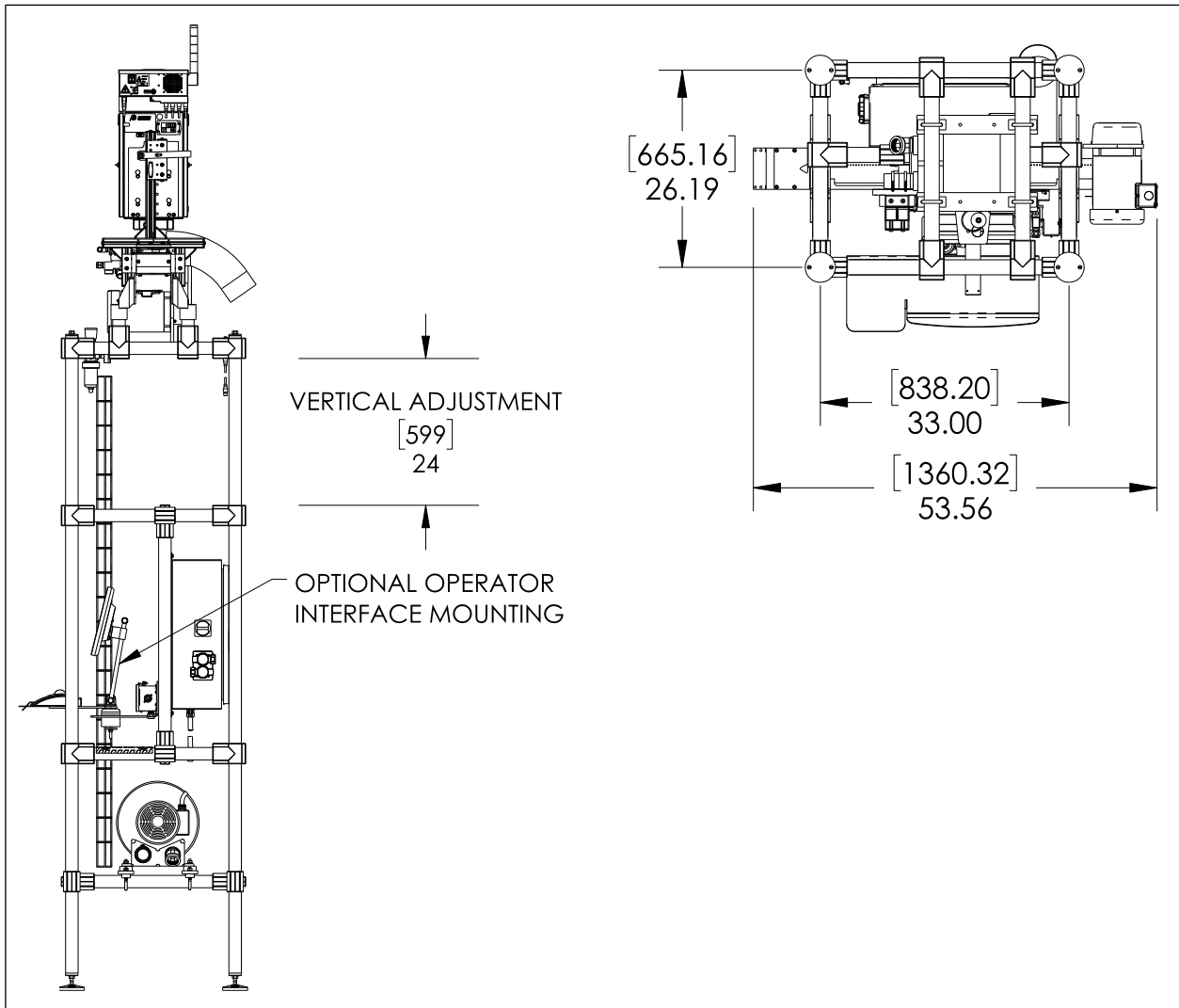
Measurement	Value
Weight (total machine)	182 kg (400 lbs)
Height (from top of conveyor to floor)	4064 mm (160 in)
Additional height (from optional light tree to top of conveyor)	914.4 mm (36 in), normal use
Depth (front to back)	762 mm (30 in)
Width (of conveyor)	1219.2 mm (48 in)
Additional width (of optional Outrigger)	1016 mm (40 in) maximum



Notes:

- 1) Dimension in brackets [] in millimeters
- 2) Sensor may be located on conveying device to filler

- 3) Customer-provided air assist (if needed)
- 4) $D1 = D2 + 24$ inches [610mm]
- 5) $D3 = \text{leg length} = 16$ inches [406mm]



Options

There are system options available based on your plant's needs.

Legs

A range of leg sizes is available to accommodate your plant's height requirements. **Contact Pressco** (on page 2) for information. See System Measurements for an illustration of the height.

Outrigger

An optional outrigger is available to stabilize the tower when the height exceeds the standard measurements. Its maximum width is 1016 mm (40 inches), including the adjustable cap.

Environmental Conditions

The Vacuum Cap Conveyor is designed to be safe in the following environmental conditions:



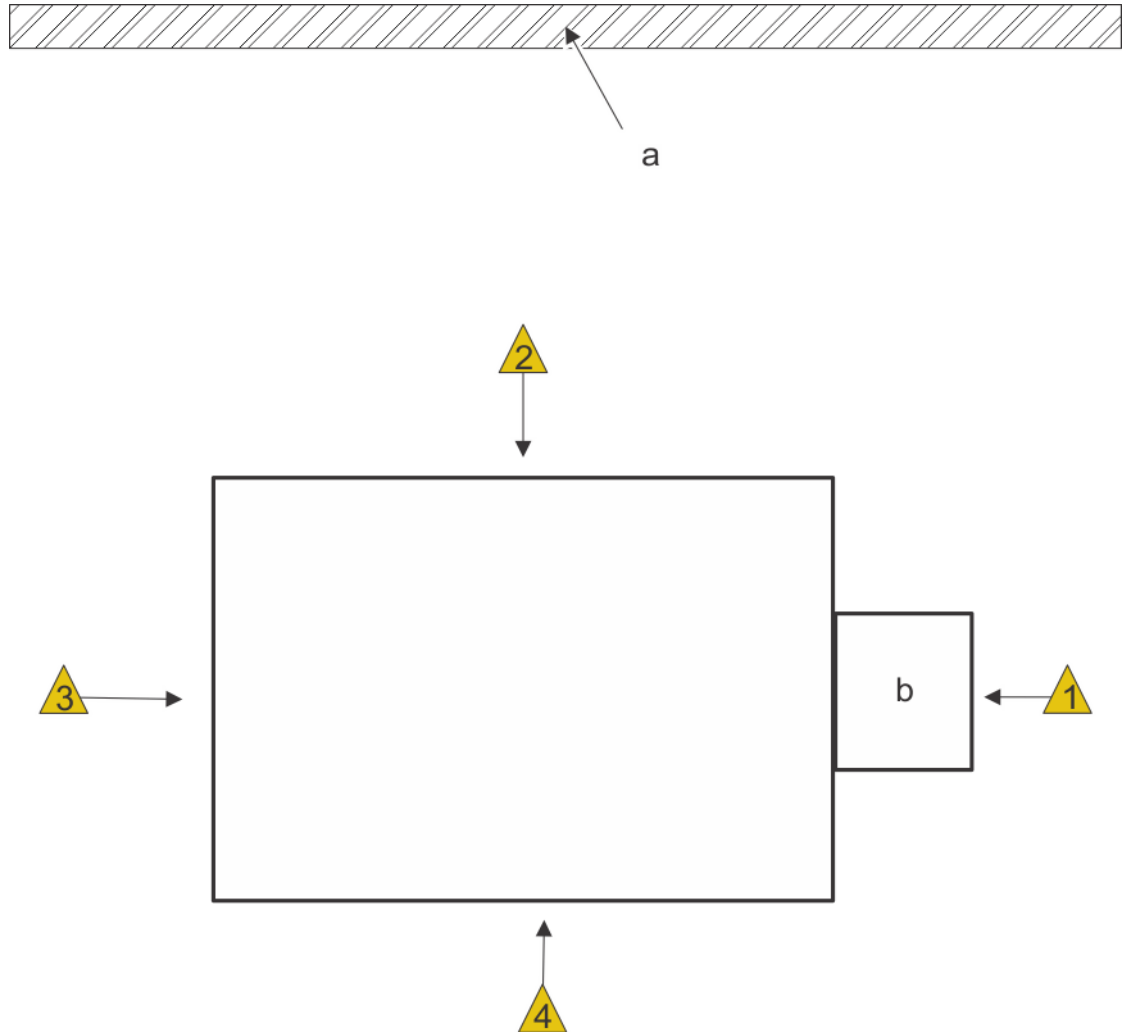
Warning - This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

❖ *Note: Please consult **Pressco Technology Inc.** (on page 2) if your environmental conditions are outside of those listed.*


Condition	Specifications
Indoor/ outdoor use	Indoor use only
Altitude	Up to 2000 meters
Operating Temperature	5 °C to 50 °C
Storage Temperature	0 °C to 70 °C
Humidity	Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 50 °C
Mains supply	Voltage fluctuations up to ± 10 % of the nominal voltage
Overvoltage protection rating	Transient overvoltage typically present on MAINS supply <i>NOTE: The normal level of transient overvoltage is impulse withstand (overvoltage) category II of IEC 60364-4-443.</i>
Rated pollution degree	This instrument is designed for use in Installation Category II and Pollution Degree 1 as per EN61010-1 and EN60664 respectively.

Sound Pressure Level

The Vacuum Cap Conveyor overall acoustics emissions exceed 70dB(A) level at 1 meter distance. Use proper hearing protection as specified by your plant safety instructions.



a	wall
b	Electrical cabinet

Acoustic Emissions Test Position (1m) 	Ambient	Emission	Limit
1	59.2	73.3	70 dBA
2	59.2	72.4	
3	59.2	73.6	
4	59.2	73.3	

Part and Part Handling Specifications

Closure Size

The range of plastic closures that the Vacuum Cap Conveyor will handle are: 25mm - 65mm Outer Diameter, depending on system configuration.

Throughput

1700 PPM (based on 28mm closure at 38.1mm (1.5 inch) gap between parts.

Backpressure

610mm (24 inches) or 17.7g (0.63 oz).

Pneumatic Requirements

Pneumatic requirements: 60 psi, 16 CFM, 3/8 NPT Inlet, and is for the purpose of rejecting parts.

Chapter 3

Safety Information and Markings

This section contains operator safety information that must be read before operating or servicing the system.



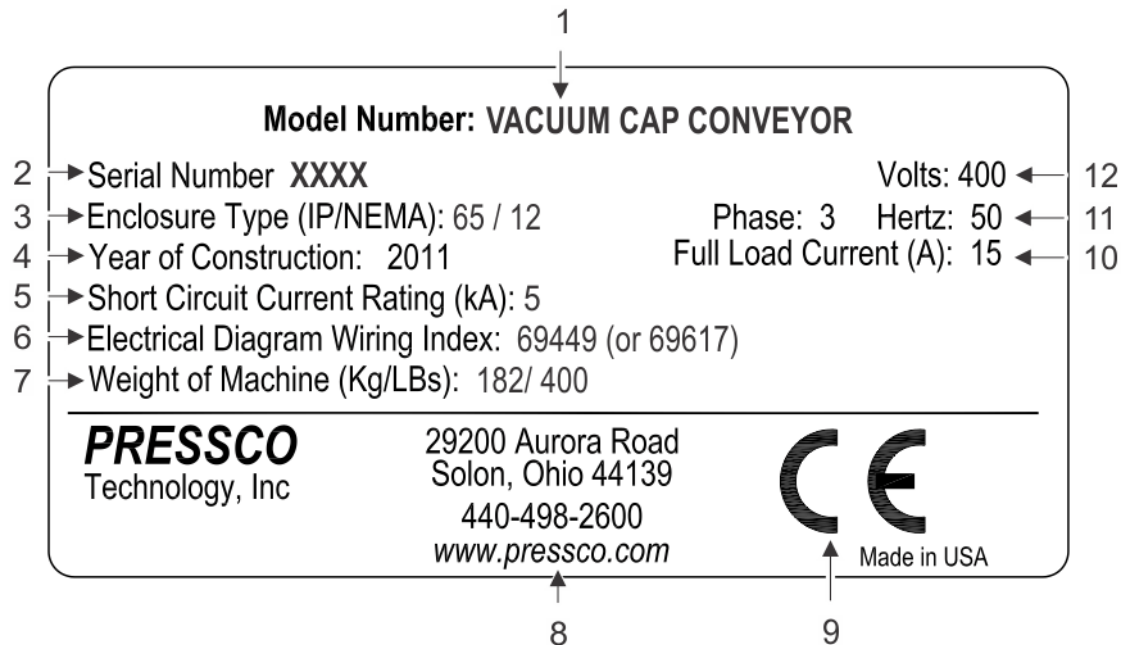
Warning - Do not, under any circumstances, tamper with sealed machine parts or devices. This could result in the removal of protections that might create potentially hazardous conditions.



Warning - This product contains no operator serviceable parts. Refer servicing to qualified personnel. To prevent electrical shock do not open cabinet doors whilst power is connected.

Serial Tag






The following illustration shows the serial tag located on the Vacuum Cap Conveyor control enclosure.



- 1) Series tag
- 2) Serial number (System number)
- 3) Enclosure type
- 4) Year of construction
- 5) Short circuit current rating
- 6) Electrical diagram wiring index
- 7) Weight of machine
- 8) Pressco contact information
- 9) Component certification
- 10) Full load current
- 11) Phase
- 12) Volts

Symbols

The following symbols are used on or near the Vacuum Cap Conveyor. Be aware of potential risk hazards.

	High voltage
 WARNING Arc Flash and Shock Hazard Appropriate PPE Required <small>Do not operate controls or open covers without appropriate personal protection equipment.</small> <small>Failure to comply may result in injury or death!</small> <small>Refer to NFPA 70E for minimum PPE requirements.</small> 	Arc flash
	Hand Entanglement/ Belt Drive
PE	Primary Protective Earthing Terminal (at incoming supply point)
	Protective Earthing Terminal
	Functional Earthing Terminal
	Hearing Protection Required
	No Step

Warning Devices

The Vacuum Cap Conveyor system has an electrical interlock signal available for monitoring by the customer. This interlock indicates “Conveyor Running.” It is a normally open dry contact and is accessible at terminals 24 and 25 of TB2. See electrical section for details: Wiring Diagram - sheet 4 (69617) or Wiring Diagram - sheet 4 (69449).

Residual Risk

The Pressco system has been designed to minimize any danger of personal injury. However, the system uses rejection devices to remove defective product from the production stream. Also, the electronics cabinets contain risk of shock if they are opened.

Observe the following safety warnings when operating the system or working near it:



Warning - Potential for projectiles to strike persons and cause injury. Keep clear of reject devices.



Warning - Sensitive electronics and High Voltages may be exposed. Keep Processor Cabinet door closed.

Intended Use

Type of Process: The Pressco system is intended to monitor container and other special manufacturing processes and identify non-conforming product.

Intended Use: The Pressco system is designed and constructed for use in an indoor industrial environment, always sheltered from the weather.

Space Required: The Pressco system and accompanying sensors must be installed in a place that will enable safe and easy installation, size changeover, user operation, and maintenance procedures.

Prohibited Use






Warning - If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must only be used in a normal condition (in which all means of protection are intact).



Important - The Pressco system should NOT be used for any purpose other than specifically indicated in the section titled **Intended Use** (on page 19).

The following uses are **not** intended:






-  Use in an explosive environment
-  Use in a flammable environment
-  Use in a damp, moist, or wet environment, except where specifically indicated

Personal Protective Equipment



Important - Always follow the safety requirements of your plant in addition to the recommendations below.

We recommend, at minimum, use of the following Personal Protective Equipment (PPE):

	Protective clothing
	Protective gloves
	Protective ear plugs or headphones
	Protective eye wear
	Protective foot wear





Personnel Safety

The following rules are recommended to ensure the safety of personnel in charge of machine operation and maintenance.







 **Do Not:**

- Open safety guards during machine operation
- Perform maintenance and repair while the system is running
- Lean on the machine
- Sit on the machine components
- Use the machine for purposes other than those listed in this manual
- Modify parts of the machine
- Allow unqualified personnel to operate or perform maintenance procedures on the machine

During machine operation:

	Only one operator is needed to operate the machine. All others must keep at a safe distance.
	Operators must be familiar with all machinery connected to the Pressco equipment and know how to use emergency stop devices. <i>Note: the emergency stop devices may not be connected directly to the Pressco equipment, but it is important to know how to use them.</i>
	Before putting the Pressco system online, the operator must ensure that all safety devices used with all connected machinery are in place and operational.
	The operator must maintain maximum focus on his work and be alert throughout his shift. If this is not the case, immediately inform the shift supervisor.

When conducting maintenance or repair work:

	Follow the Machine Maintenance Lockout Procedure.
	Before starting the machine, ensure that no person is close to the machine.
	If maintenance or repair requires the disconnection or removal of safety or protection systems, authorized personnel who ensure the prevention of personal injury or damage to the machine must supervise this operation. All machine movements must be performed with limited speed and limited movements.
	Exclusively authorized and trained personnel must carry out maintenance or repair work on electrical components. When running tests with power connected, you must strictly comply with the rules provided.
	Personnel working on higher parts of a machine must wear a harness and hook it on to a structure and must always move with extreme caution. The harness must not be connected to Pressco equipment or structure as it cannot support body weight.
	Never perform lubrication or maintenance procedures on mechanical parts with the machine running.

Lifting heavy objects



Caution - Some components are heavy. Take proper precautions to prevent personal injury or damage to equipment. If you are not capable of lifting the object alone, ask a capable person to help lift the object, or use a mechanical lifting device

The components do not have handles to lift the equipment. Be sure to:

- Lift equipment from the bottom - do not use wires, brackets, nor other protrusions
- Keep fingers away from sensor lenses to keep the equipment clean
- Proceed slowly

➤ **To safely lift equipment:**



Caution - Do not twist your body when moving the load. Instead take small steps with your feet turning until you are in the correct position.

1. Stand close to the load and center yourself over it with your feet shoulder width apart.
2. Tighten your abdominal muscles.
3. Keeping your back straight, bend your knees and squat down to the floor.
4. Get a good grasp on the load with both hands.
5. Keeping the load close to your body, use your leg muscles to stand up lifting the load off the floor.
 - Your back should remain straight throughout lifting, using only the muscles in the legs to lift the load.
6. To place the load in the appropriate spot, bend at the knees using only your leg muscles to lower the load.

Authorized Users

Trained machine operators, mechanic and electrical maintenance staff, and plant managers are considered authorized users of the Pressco system. These users should carefully read the information contained in this manual. The plant manager must ensure that the safety recommendations included in this manual are observed.



Warning - Allowing workers who are unfamiliar with the production process to operate the Pressco system could result in hazard risk.

If you are unclear about any part of this manual, **contact Pressco Technical Support** (on page 2).



Important - No worker should ever operate the system outside of his/ her own area of competence and responsibility.

Proper Operation:

Only one worker is to operate the system at any given time. The correct position for the operator is in front of the user interface monitor or control enclosure (if applicable).

Repairs:

Any repair on the system shall be carried out exclusively by Pressco Technology Inc. service personnel or by other service expressly authorized by Pressco Technology Inc.

Spare Parts Usage

The following restrictions apply to replacing parts:



Warning - Using spare parts that are not designed to Pressco's specifications can compromise the safety and effectiveness of the Pressco system.

- The use of parts that are not within Pressco's design specifications is prohibited. This prohibition applies in particular when the parts involved contain or are connected with safety devices.
- Before resuming production, make sure all safety devices are in working order.

Pressco Technology Inc. shall not be liable in any way if any of the above-described directions are not complied with.

To obtain a spare parts list, contact the customer service department at Pressco. **How to Contact Pressco** (on page 2).

Pressco's technicians are available to help customers, in their own plant, to solve any problem that might arise during use and maintenance of the system.

Chapter 4

Installation and Setup

Preparation for Installation

Recommendations prior to installation

Before the machine is installed, the Pressco installer, together with the Customer (or representative) shall check the following criteria in the environment where the machine is to be installed:

- Work required by contract for the installation of the machine has been carried out
- The plant layout drawing that describes where the machine will be installed is the final drawing agreed to by Pressco Technology Inc.
- The space and height required for installation are actually available
- Only the components included in the installation layout are present in the area where the machine is to be mounted. Ensure no machines or components have been added at a later stage that might hinder mounting or make it more difficult. Should this be the case, immediately contact Pressco's Project Engineering personnel to arrange a suitable solution to the problem.

We recommend the following prior to machine installation:

- Transport the machine in its packaging to the area where it will be installed to minimize possibility of damage
- Carefully remove the packaging material and check components for damage
- Check tightness of mechanical components, as they can loosen during transport
- Prepare the compressed air mains line. Before making final connections, ensure that the pipes are clean and free from any debris.

Shipping and Handling



Warning - Only qualified personnel must be involved in the operation of unloading, handling, and lifting the machine. Pressco Technology Inc. shall not be liable for damage to components and/or personal injury resulting from the involvement of unauthorized personnel and/or failure to comply with the directions provided in this manual in relation to lifting and transport.



Important - The site supervisor will be responsible for ensuring that all the various mounting phases are carried out safely and in compliance with current regulations.

Pressco Technology Inc. ships unassembled components in packing cases designed to protect the contents during handling and from exposure to weather.

Unless otherwise specified in the contract with the machine order, the Customer shall supply Pressco Technology Inc. with the means and equipment necessary for the unloading, lifting, and handling of machine parts. Pressco Technology Inc. deems it important to have one of their technicians supervise the process of unloading, handling, and lifting the machine. The technician can give useful advice as to the logical sequence in which the components should be unpacked and positioned for ease of assembly.

After the machine is delivered, check for any damage that might have occurred during shipping. In case of damage, contact **Pressco Technology Inc** (on page 2).

In handling the machine, always keep it close to the ground.



We recommend using a forklift truck with adequate capacity and forks to suit the weight to be lifted (machine plus packaging).

The dimensions and weight of a crate are listed below. Note that this is the maximum size and weight. The size and weight of the crate may be less depending on your configuration. You may receive multiple crates depending on your configuration.

Size	1 crate, 4013.2 mm x 1143 x 1117.6 mm (158 x 45 x 44 inches)
Weight	454.5 kg (1000 lbs.)

Ventilation

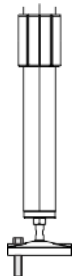
Place the Vacuum Cap Conveyor components in a position with adequate ventilation to allow proper air flow. Make sure there is room for personnel and for part removal.

Component	Spacing
Vacuum Cap Conveyor	Leave 1 meter [39 inches] in front of machine
Intellispec cabinet	Leave 100 mm clear in front of the fan and vent
Optional Transformer	Leave 1 meter [39 inches] in back and front of machine

Securing to Floor

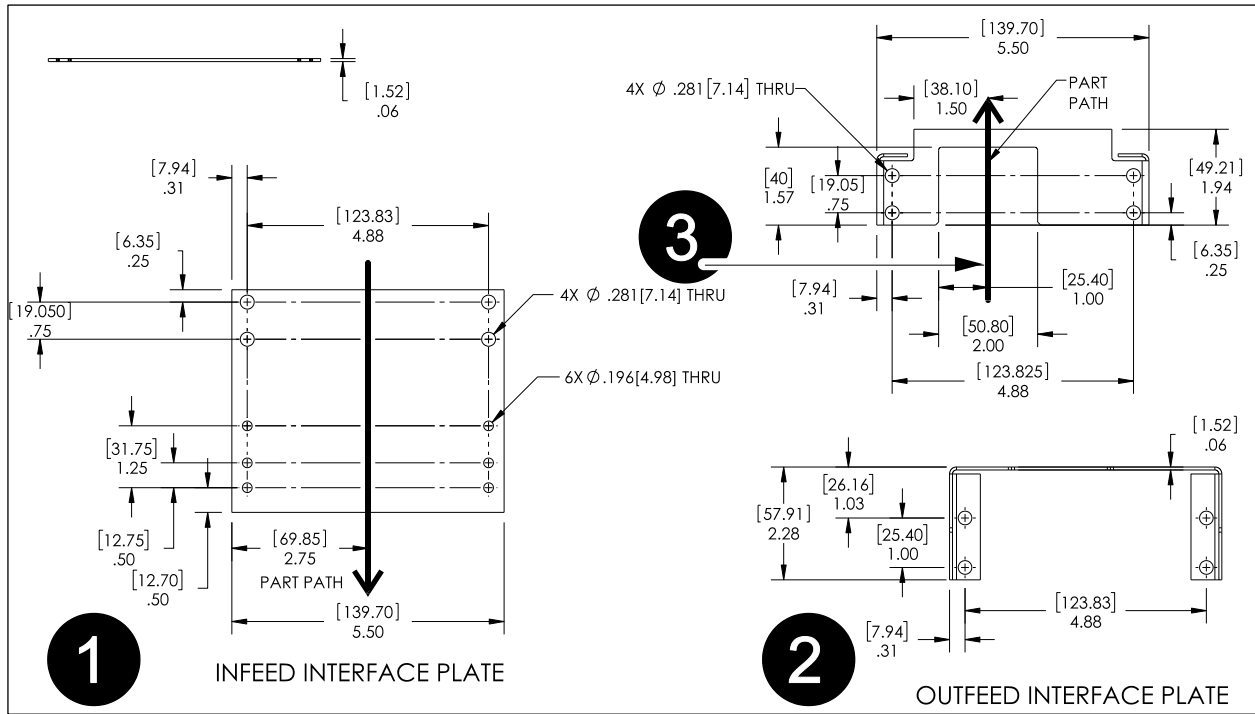
The ground under the machine must be sufficiently solid to sustain the machine mass at the support points. In addition, the floor must be free of bumps, grooves and other surface irregularities. The surface must be flat enough so that the leveling feet of the machine bear weight across their entire surface.

Attach the machine to the floor by installing M10 x 50mm (3/8 inch x 2 inch) lag bolts into the floor through the hole on the frame foot pad. Do this on one hole in each foot.



Attaching Infeed and Outfeed Plates to Trackwork

Attach the trackwork to the Infeed Interface Plate [item 1] and Outfeed Interface Plate [item 2], using the mounting dimensions shown in the illustration below. Your plant must provide a mounting flange.



1	Infeed interface plate
2	Outfeed interface plate
3	Part path

Electrical Service

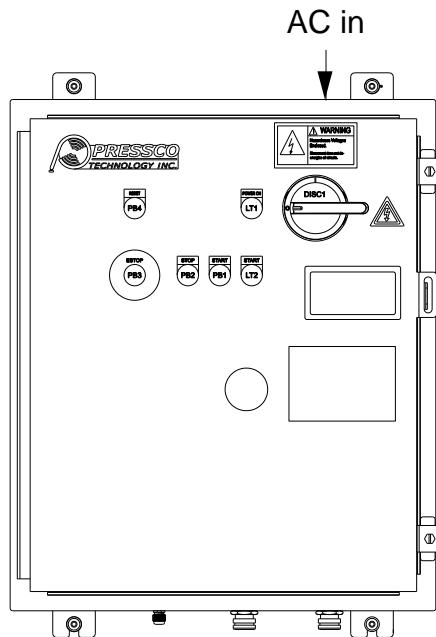


Warning - The electrical connections must meet local and national codes.

Have a qualified electrician connect the correct voltage and amperage wiring to the control box. See nameplate on electrical enclosure door.

For more information about the components in this enclosure, see **Electrical System** (on page 29).

For wiring information, see **Wiring Diagram sheet 1 - F1885E** (on page 50).



Protective Earthing



Danger - Improper connection of the equipment grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service technician if you are in doubt as to whether the product is properly grounded.

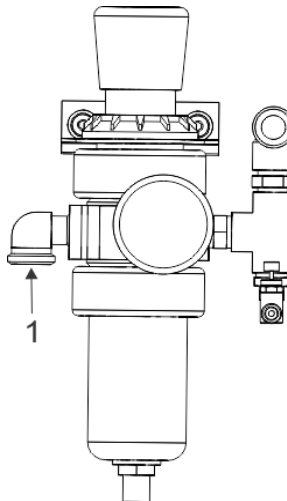
This product must be grounded (earthed). If it should malfunction or break down, grounding provides a path of least resistance for electric current to reduce the risk of electric shock.

Located close to the entry of the incoming electrical supply, a ground bus bar is provided for connection of the machine to the external protective earthing conductor. This terminal will be marked **PE**. Other ground conductors will connect to this same ground bus bar, but the external protective earthing conductor (Primary) must be terminated at the position marked with PE.

Please see **Wiring Diagram sheet 1 - F1885E** (on page 50).

Pneumatic Service

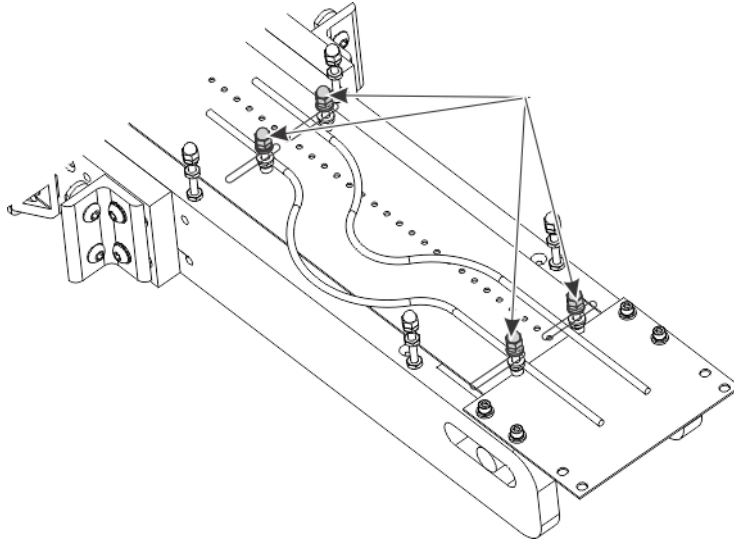
Connect plant air supply to the Filter Regulator Lubricator (FRL). Pneumatic requirements: 60 psi, 16 CFM, 3/8 NPT Inlet, and is for the purpose of rejecting parts.



1 - Air supply connection

Initial Adjustments

Adjust the chicane for part size and part rate, by loosening the appropriate nuts and moving them in their slots, then tightening the nuts.



Connection of the Customer Enable Contact

The Pressco Vacuum Cap Conveyor system is offered in two versions: Standard (77445), and Stainless Steel (77572). To determine your version, look at the **Serial Tag** (on page 17) Electrical Diagram Wiring Index on your system.

Each version requires a **customer supplied contact** to enable the conveyor to run. After you start the conveyor at the control panel, the vacuum pump will run, creating a vacuum at the conveyor belt. However, the conveyor will not run until the customer supplied contact closes. This **Enable (Run) contact** will automatically start and stop the conveyor based on the opening and closing of the contact. Generally, the Run contact will open when the line is backed up, and close when the track is clear. This control method does not require operator intervention of pressing pushbuttons to stop and start the conveyor.

For wiring information, see **Wiring Diagram sheet 3 - F1885E** (on page 52).

Commissioning

Before placing the machine into operation, make sure the following checks are completed:

Completed	Yes	No
Position components with adequate ventilation, see Ventilation (on page 24)		
Secure Vacuum Cap Conveyor to floor, see Securing to Floor (on page 24)		
Verify connection of applicable electrical service and grounding, see Electrical Service and Protective Earthing		
Connection of compressed air line to machine FRL, see Pneumatic Service (on page 26)		
Adjust the chicane for proper part size and part rate, see Initial Adjustments (on page 27)		
Verify connection of the enable contact. See Connection of the Customer Enable Contact (on page 27).		

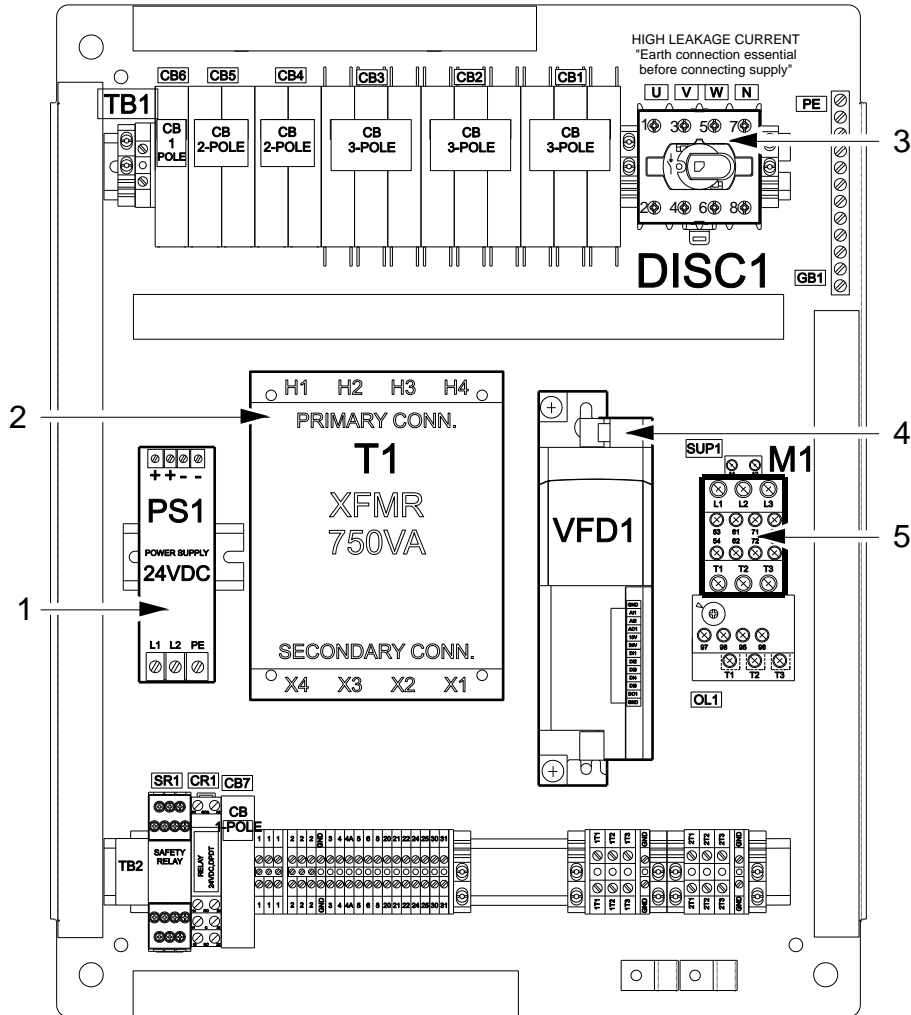
Chapter 5

Machine Components and Systems

Electrical System

To see the switches and cables on the outside of the cabinet, see *Operator Controls 2018* (see "Operator Controls" on page 31).

The electrical system is primarily located within an enclosure. Incoming three-phase power is supplied to the top of a fused disconnect, and then branches to two motor controllers, and to a 24 VDC power supply. The 24 VDC power is then used to power the rest of the machine.



- 1) 24 VDC power supply (PS1)
- 2) Transformer (T1)
- 3) Main Disconnect (DISC1)
- 4) Conveyor Drive (VFD1)
- 5) Vacuum Motor contactor (M1)

Main Disconnect (DISC1)

The main disconnect is used to lock out power to allow a technician to work in the enclosure safely.

Motor Contactor (M1)

Motor Contactor (M1) is used to power the Vacuum Blower. It is equipped with a thermal overload to shut down in the event of overheating.

Frequency Drives (VFD1)

The Variable Frequency Drive controls the speed of the vacuum cap conveyor. The speed is adjustable by pressing the up and down arrows on the front of the drive. The speed is displayed in motor RPMs. The conversion from the VFD value to the belt speed is approximately 0.4281. This ratio is linear throughout the speed range of the motor. Example: 700 RPMs is equivalent to approximately 300 ft/min of conveyor travel.

The maximum belt speed is 500 ft/min.

Interlock

The Vacuum Cap Conveyor system has an electrical interlock signal available for monitoring by the customer. This interlock indicates “Conveyor Running.” It is a normally open dry contact and is accessible at terminals 24 and 25 of TB2. For a detailed drawing of TB2, see **Wiring Diagram sheet 5 - F1885E** (on page 54).

Machine Mounted Safety Components

There is one Emergency Stop (E-Stop) push button on the machine. It is located on the front of the enclosure. There is a provision to add an additional E-Stop push button at a desired location by the end user. It should be wired to terminals 3 and 4 of TB2. The jumper should be removed. See **Wiring Diagram sheet 5 - F1885E** (on page 54).

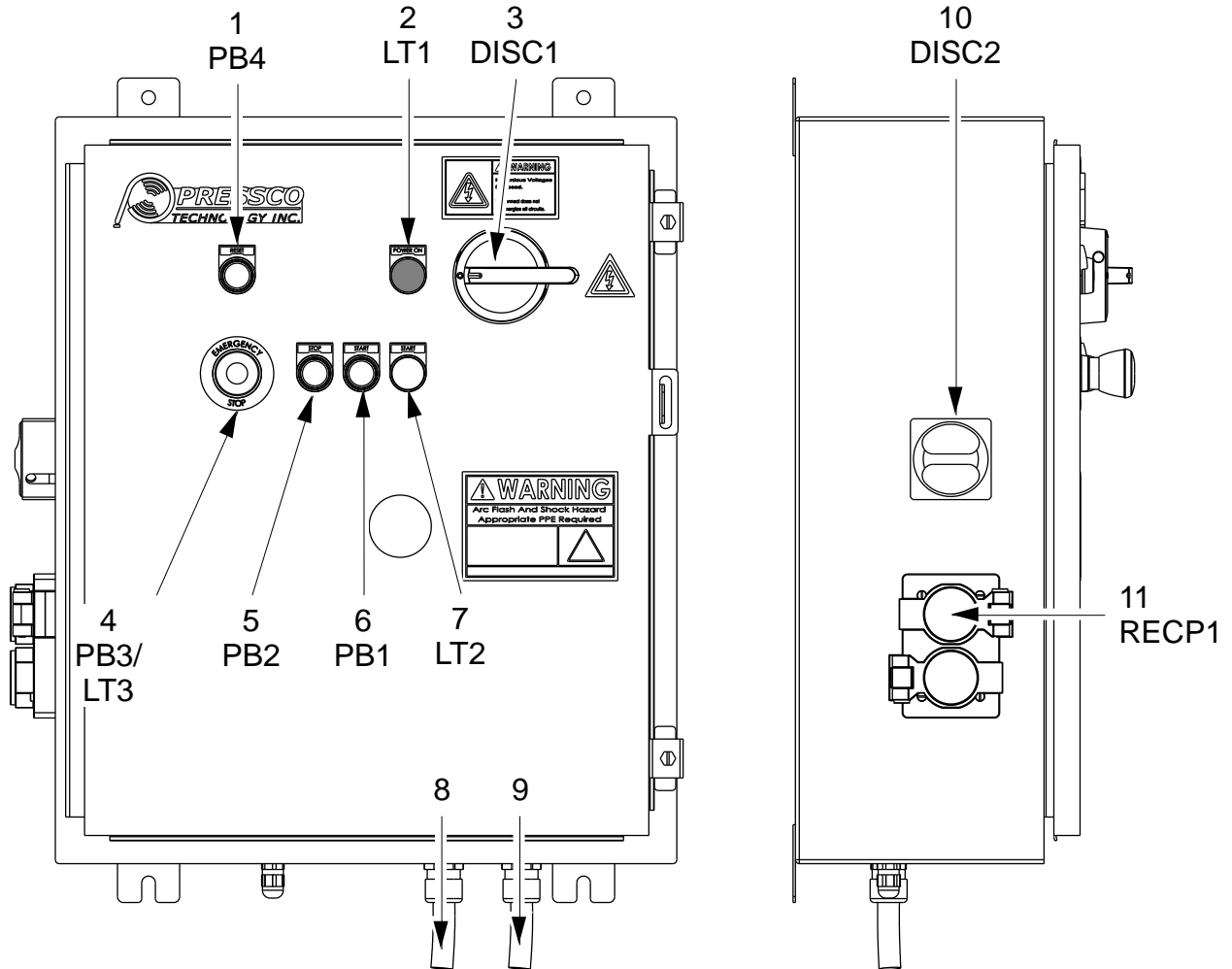
Press the push buttons to activate. Twist to release the push button.

Chapter 6

Operating the Vacuum Conveyor System

Operator Controls

Control the Vacuum Conveyor through the switches and push buttons on the outside of the electrical enclosure. Descriptions of the buttons are listed below.



- 1) Reset push button (PB4)
- 2) Power On indicator (LT1)
- 3) Main Power Rotary disconnect (DISC1)
- 4) E-stop (PB3/ LT3)
- 5) Stop push button (PB2)
- 6) Start push button (PB1)
- 7) Start indicator (LT2)
- 8) To conveyor drive motor
- 9) To vacuum pump motor
- 10) Receptacle Disconnect Switch (DISC2)
- 11) Duplex Receptacle - 120VAC, 5A (RECP1)

PB4 - Reset push button

Pressing the Reset push button is required after a power off condition, or recovering from an E-stop.

LT1 - Power On indicator

Indicates that main disconnect is in the on position, and power is connected.

DISC1 - Main power rotary disconnect

Used to disconnect main power from the machine. [Does not remove power from DISC2 and RECP1]
The rotary switch can accommodate up to three safety locks. The handle has a defeater mechanism allowing the door to be opened while power is on. To activate the mechanism, insert a screwdriver and push to the left. Mechanism is located at the bottom of the switch body.

PB3/ LT3 - E-stop

Pressing the E-stop drops out the Master Start circuit which removes power from the Vacuum Conveyor and the Vacuum Blower. You must twist the button to reset.

PB2 - Stop push button

Pressing the Stop push button drops out the Master Start circuit which removes power from the Vacuum Conveyor and the Vacuum Blower.

PB1 - Start push button

Pressing the Start push button will attempt to latch in the Master Start circuit, thus starting the Vacuum Conveyor and the Vacuum Blower. There are several conditions which could prevent the circuit from latching:

- E-stop push button pressed
- Vacuum Blower Overload Tripped
- Frequency drive in fault mode

LT2 - Start indicator

Indicates that the Master Start circuit is latched in.

DISC2 - Receptacle Disconnect Switch

Used to disconnect power to the receptacle, RECP1. [Does not remove power from main disconnect, DISC1] This is lockable in the OFF position.

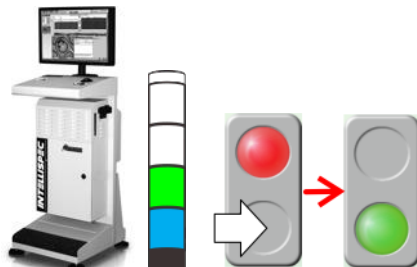
RECP1 - Duplex Receptacle

Rated at 120VAC, 50/60Hz, 5A. To be used to power Pressco inspection modules only.

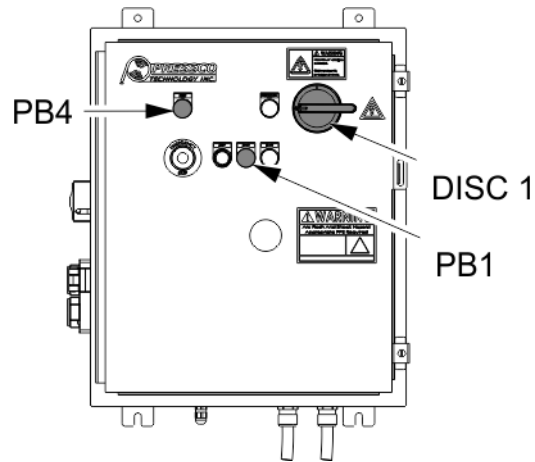
Startup Sequence

➤ To start the machine:

1. Verify the exit of the vacuum conveyor is not blocked or jammed in any way, and the proper parts are loaded and ready to feed.
2. Verify the Intellispec system is Online and ready to run. See Intellispec Programming Guide (or System Guide for Series V).



3. Power up the Vacuum Conveyor by rotating the disconnect switch (DISC1) to the ON position.



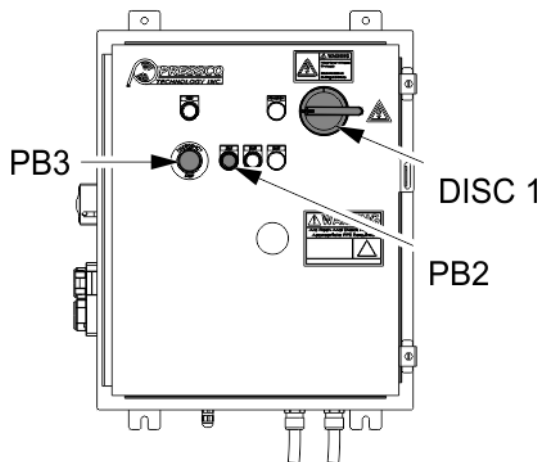
4. Press the blue Reset button (PB4) to reset the safety circuit.
5. Press the Start push button (PB1). The vacuum conveyor will begin running.

❖ *Note: It is possible that just the Vacuum Blower will start. If this is the case, then the "Customer Enable Contact" has probably opened. Check for line blockage. For more information, see [Connection of the Customer Enable Contact \(on page 27\)](#).*

Shutdown Sequence

➤ *To shut down the machine:*

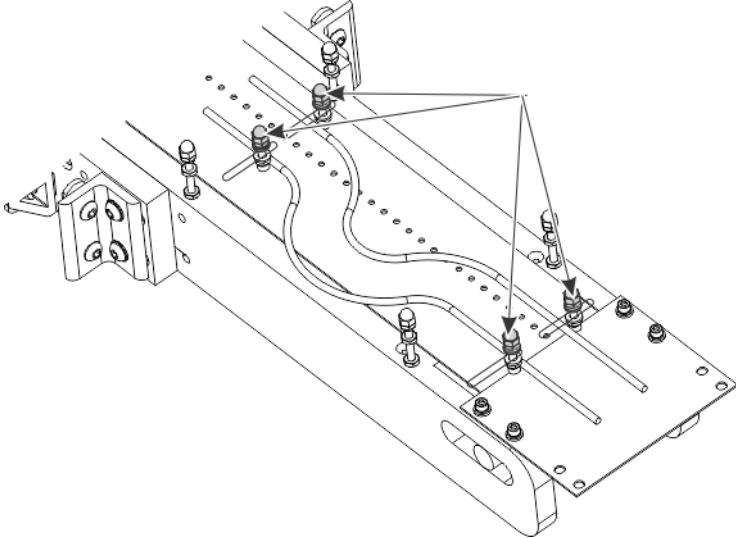
- For **extended periods of downtime or maintenance**, rotate the disconnect switch (DISC1) to the OFF position.
- For **short periods of downtime**, press the Stop push button (PB2). This will shut off the vacuum conveyor and vacuum blower. Or, you can simply push the E-Stop button (PB3).



Chapter 7

Part Changeover Procedure







Adjust the chicane for part size and part rate, by loosening the appropriate nuts and moving them in their slots, then tightening the nuts.



Chapter 8

Maintenance Frequency

When conducting maintenance or repair work:

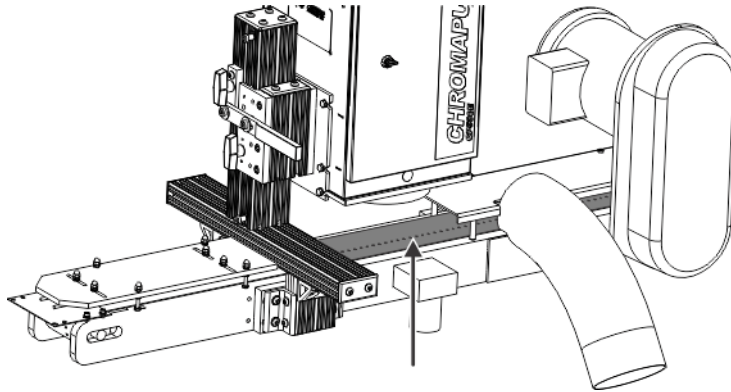
	Follow the Machine Maintenance Lockout Procedure.
	Before starting the machine, ensure that no person is close to the machine.
	If maintenance or repair requires the disconnection or removal of safety or protection systems, authorized personnel who ensure the prevention of personal injury or damage to the machine must supervise this operation. All machine movements must be performed with limited speed and limited movements.
	Exclusively authorized and trained personnel must carry out maintenance or repair work on electrical components. When running tests with power connected, you must strictly comply with the rules provided.
	Personnel working on higher parts of a machine must wear a harness and hook it on to a structure and must always move with extreme caution. The harness must not be connected to Pressco equipment or structure as it cannot support body weight.
	Never perform lubrication or maintenance procedures on mechanical parts with the machine running.

Clean components and/or replace as required. The table below lists the components that need to be maintained.

Item	Description	Pressco Part Number	Maintenance Frequency
Inspection Inspect the Main Belt (on page 39) Inspect the Drive Belt (on page 39) Inspect the Bearings (on page 39)	Inspect the conveyor belts and bearings	not applicable	Monthly
Filter/ Regulator filter Clean the filters (on page 40)	Clean filter	70068	Monthly
Regenerative Vacuum Blower filter Cleaning filters (see "Clean the filters" on page 40)	Clean or replace filter	not applicable	Monthly
Replace the Main Belt (on page 41)	Replace belt	Contact Pressco (on page 2). Have your serial number ready to identify your belt type.	Replace when excessive wear or stretching prevents proper performance, or when parts can no longer be handled properly
Replace the Drive Belt (on page 43) (270H100)	Replace belt	70069	Replace when excessive wear causes slipping of the drive mechanism
Replace the Idle End Bearings (on page 44)	Replace bearings	69887	Replace when wear causes excessive heat buildup or when excessive squeaking occurs - this indicates that the bearings are worn out
Replace the Drive End Bearings (on page 45)	Replace bearings	69888	Replace when wear causes excessive heat buildup or when excessive squeaking occurs - this indicates that the bearings are worn out
<p>NOTE: if you replace any of the bearings, we recommend that you replace the main belt at the same time, since you must remove the main belt in order to replace the bearings.</p>			

Inspect the Main Belt

Perform this inspection once per month to ensure proper operation. Inspect the belt for excessive wear, stretching, or abrasion.



Inspect the Drive Belt

Perform this inspection once per month to ensure proper operation.

1. Remove the six allen screws to remove the cover from the drive portion of the conveyor.



2. Inspect the belt for excessive wear, stretching, or abrasion.



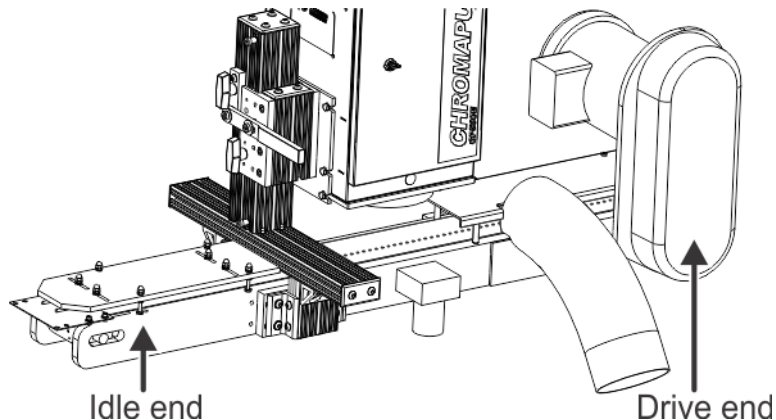
3. Replace the cover and fasten the six allen screws in place.

Inspect the Bearings


Perform this inspection once per month to ensure proper operation.

❖ **CAUTION:** Do not touch the conveyor belt.

With the vacuum conveyor running, listen for excessive squeaking or abnormal sounds on both idle and drive ends.



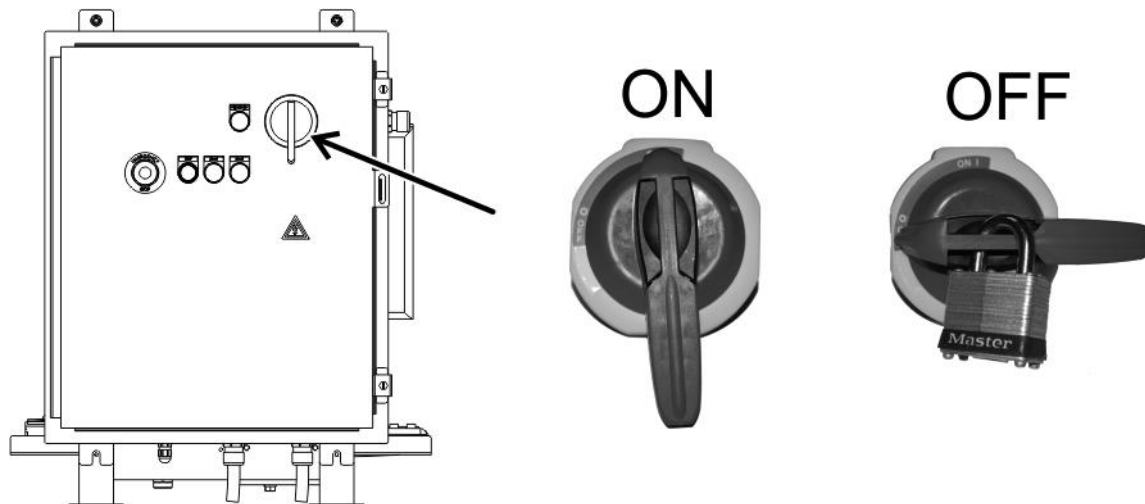
Vacuum Cap Conveyor Cabinet Lockout

 Prior to any machine maintenance that requires the operator to enter the machine, the machine must be properly locked out.

Before switching the cabinet OFF, Stop the line.

➤ **To lock out the Vacuum Conveyor system:**

1. Turn the main Disconnect switch to the OFF position.
2. Lock the switch in the OFF position by pushing the black tabs down and inserting a lock as shown below.
3. Follow the safety procedures provided by your organization to prevent accidental startup.

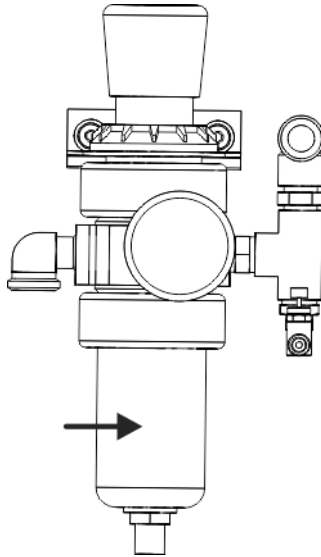


Clean the filters

To see the location of the following components, see **Main Components** (on page 8).

Filter/ Regulator

The filter in this unit is plastic. To replace, use Pressco part number 70068.

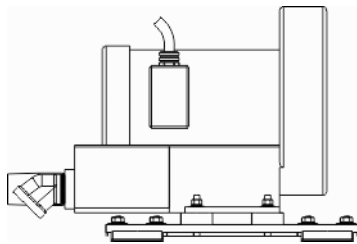


➤ To clean the filter:

1. Grab the barrel by hand, push up and twist to open.
2. Remove the filter and rinse with clean water.
3. Dry the filter completely before placing it back into the unit.

Regenerative Vacuum Blower

There is a replaceable filter inside this unit.



❖ Note: If replacement of the filter is required, locate a filter at your local hardware store.

➤ To clean the filter:

1. Unscrew and remove the air intake port.
2. Remove and rinse the filter with clean water.
3. Dry the filter completely before placing it back into the unit.

Replace the Main Belt

The main belt of the conveyor should be replaced when excessive wear or stretching prevents proper performance of the Intellispec system, or when the parts can no longer be handled properly.

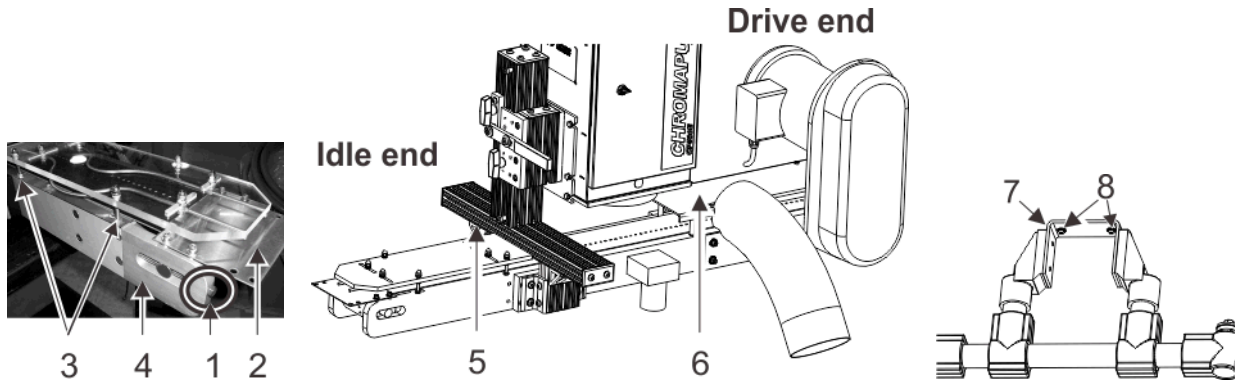


Warning - Never have all four mounting screws out of the conveyor at one time. This could cause serious injury or damage to the conveyor.

➤ To remove the main belt:

1. Loosen the belt tensioning bolts [item 1].

2. Remove both the **idle end** and **drive end** deadplates [item 2].
3. Remove the chicane by loosening the four threaded rods [item 3].
4. Remove support leg for the module mount (ONLY on rejecter side) [item 5].
5. Unplug the cables from the rejecter and the encoder.
6. Remove the dust guard [item 6].
7. Work the belt off of the **drive end** pulley.
8. Remove the two conveyor mounting screws from the **drive end** [item 8].
9. Lift the **drive end** away from the conveyor bracket and pull the belt clear of the bracket.
10. Reinstall the two mounting screws on the **drive end** of the conveyor [item 8].
11. Remove the two mounting screws from the **idle end** of the conveyor [item 8].
12. Pull the old belt clear of the conveyor mounting bracket [item 7].



If you are not installing a new belt immediately, reinstall the mounting screws on the idle end of the conveyor. Otherwise, install the new belt (described below).

➤ **To install the new belt:**

1. Remove the two mounting screws from the **idle end** of the conveyor [item 8].
2. Align the v-guide on the main belt with the guides in the pulleys and conveyor.
3. Fit the end of the belt to the idle roller, and pull it onto the conveyor body.
4. Lift the **idle end** of the belt away from the conveyor mounting bracket, and work the belt into the channel on the bottom of the conveyor.
5. Once the belt is installed past the idle end mounting bracket, reinstall the two conveyor mounting screws [item 8].
6. Remove the two mounting screws from the **drive end** of the conveyor [item 8].
7. Work the belt the rest of the way into the bottom channel of the conveyor.
8. Stretch the belt over the components on the rejecter side of the conveyor and slide it onto the drive pulley.

❖ *Note: The belt must be fully seated in the bottom channel of the conveyor before proceeding.*

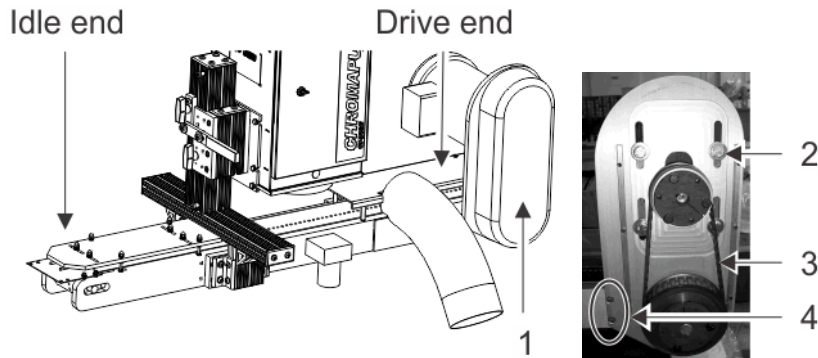
9. Reinstall the two **drive end** mounting screws into the conveyor [item 8].
10. Tighten the belt tensioning bolts [item 1] until the belt does not sag onto the channel on the bottom of the conveyor.
11. Reinstall all the removed components. Fully tighten all loosened hardware, including the conveyor mounting screws.
12. Adjust the belt tracking by adjusting the belt tensioning screws [item 1] one at a time until the belt tracks straight on the conveyor.

Replace the Drive Belt

The drive belt of the conveyor should be replaced when excessive wear causes slipping of the drive mechanism. Replace the Drive belt with belt type 270H100, or Pressco part number 70069.

➤ **To replace the drive belt:**

1. Remove the cover from the drive portion of the conveyor [item 1] by removing the six allen screws.
2. Remove the tension from the drive belt by loosening the four motor mounting bolts [item 2]. This will allow the motor to slide down in the slots.
3. Pull the drive belt over the motor pulley and then over the conveyor pulley to remove it [item 3].
4. Pull the new belt over the conveyor pulley first, and then over the motor pulley.
5. Lift the motor until the belt is tight, then tighten the four motor mounting bolts [item 2].
6. Check the tightness of the belt by squeezing the two sides together midway between the motor and conveyor pulleys. The belt should not move more than approximately 1.25 cm (1/2 inch).
7. Replace the drive motor cover.



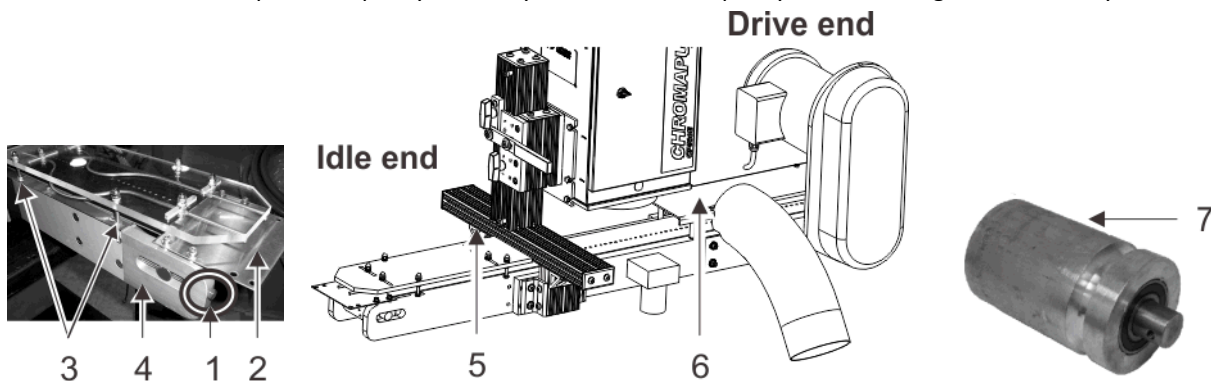
Replace the Idle End Bearings

The idle end bearings of the conveyor should be replaced when wear causes excessive heat build up or when excessive squeaking occurs - this indicates that the bearings are worn out. Replace the bearings with Pressco part number 69887.

❖ *Note: We recommend that you replace the **Main Belt** (see "**Replace the Main Belt**" on page 41) while you are replacing bearings, since you must remove the Main Belt during bearing replacement.*

➤ **To replace the idle end bearings:**

1. Completely loosen the belt tensioning bolts on the **idle end** of the conveyor [item 1].
2. Remove both the **idle end** and **drive end** deadplates [item 2].
3. Remove the chicane by loosening the four threaded rods that support it [item 3].
4. Pull the belt off the **idle end** pulley assembly and to the side.
5. Remove the **idle end** pulley mounting blocks by removing the four screws from each side of the conveyor [item 4].
6. Pull the mounting block and pulley assembly out of the end of the conveyor.
7. Completely remove the belt tensioning bolts [item 1].
8. Lift the **idle end** pulley assembly out of the conveyor end.
9. Replace the idle end pulley assembly with a new assembly [item 7].
10. Replace the pulley assembly and reinstall the pulley and mounting block assembly.



Replace the Drive End Bearings

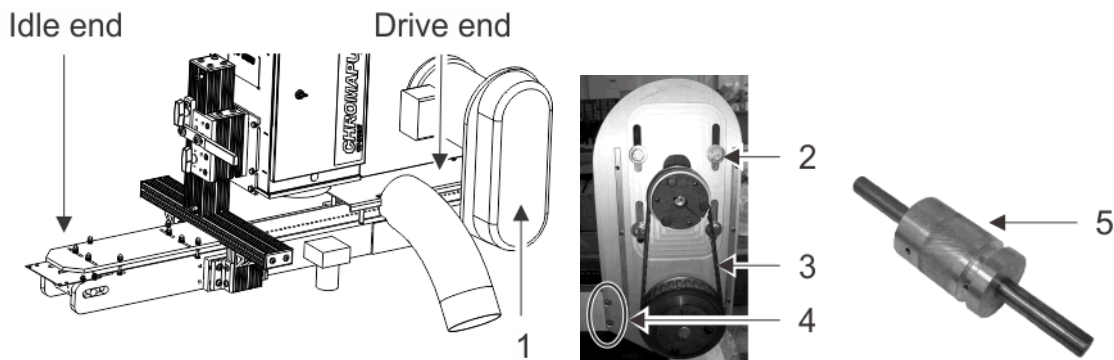
The drive end bearings of the conveyor should be replaced when wear causes excessive heat build up or when excessive squeaking occurs - this indicates that the bearings are worn out. Replace the bearings with Pressco part number 69888.

❖ *Note: We recommend that you replace the **Main Belt** (see "**Replace the Main Belt**" on page 41) while you are replacing bearings, since you must remove the Main Belt during bearing replacement.*

Remove the **Main Belt** (see "**Replace the Main Belt**" on page 41) to access the drive end bearings.

➤ **To replace the drive end bearings:**

1. Remove the cover from the drive portion of the conveyor [item 1] by removing the six allen screws.
2. Remove the tension from the drive belt by loosening the four motor mounting bolts [item 2]. This will allow the motor to slide down in the slots.
3. Pull the drive belt over the motor pulley and then over the conveyor pulley to remove it [item 3].
4. Remove the conveyor pulley from the conveyor shaft.
5. Remove the motor mount plate and the motor by removing the screws holding the plate to the side of the conveyor. [item 4]
6. Remove the bearing on the side of the conveyor that holds the motor, and replace the bearing [item 5].
7. Reinstall the motor mount plate and motor, and then reinstall the conveyor pulley.
8. Remove the encoder from the drive shaft of the conveyor.
9. Remove the shaft collar on the shaft as well.
10. Remove the two bearing keeper screws and then remove and replace the bearing.
11. Reinstall the shaft collar and the encoder.



Chapter 9

Troubleshooting

Symptoms and Possible Solutions

See the following table for a list of symptoms with possible causes and solutions. For other problems or further help, contact *Pressco* (on page 2).

For locations of components such as **VFD1**, **FU1** and **CB2**, refer to the illustration of the *Electrical System* (on page 29).

Symptom	Probable Cause	Solution
Conveyor not running	Frequency Drive (VFD1) has faulted	Locate fault code on Drive LCD window. Determine corrective action by looking in Maintenance and Troubleshooting section of supplied manual.
	Circuit breaker or blown fuse	Check FU1 and CB2
	E-Stop depressed	Reset E-stop
	Overload on Vacuum Blower	Determine cause and reset OL1 for Vacuum Blower
	Customer Enable Contact opened (electrical system 69617 only)	Check and clear condition that opened the contact. See Connection of the Customer Enable Contact (on page 27) or Conveyor Operation (on page 7).
Vacuum Blower not running	Frequency Drive (VFD1) has faulted	Locate fault code on Drive LCD window. Determine corrective action by looking in Maintenance and Troubleshooting section of supplied manual.
	Circuit breaker or blown fuse	Check FU1 and CB3
	E-Stop depressed	Reset E-stop
	Overload on Vacuum Blower	Determine cause and reset OL1 for Vacuum Blower

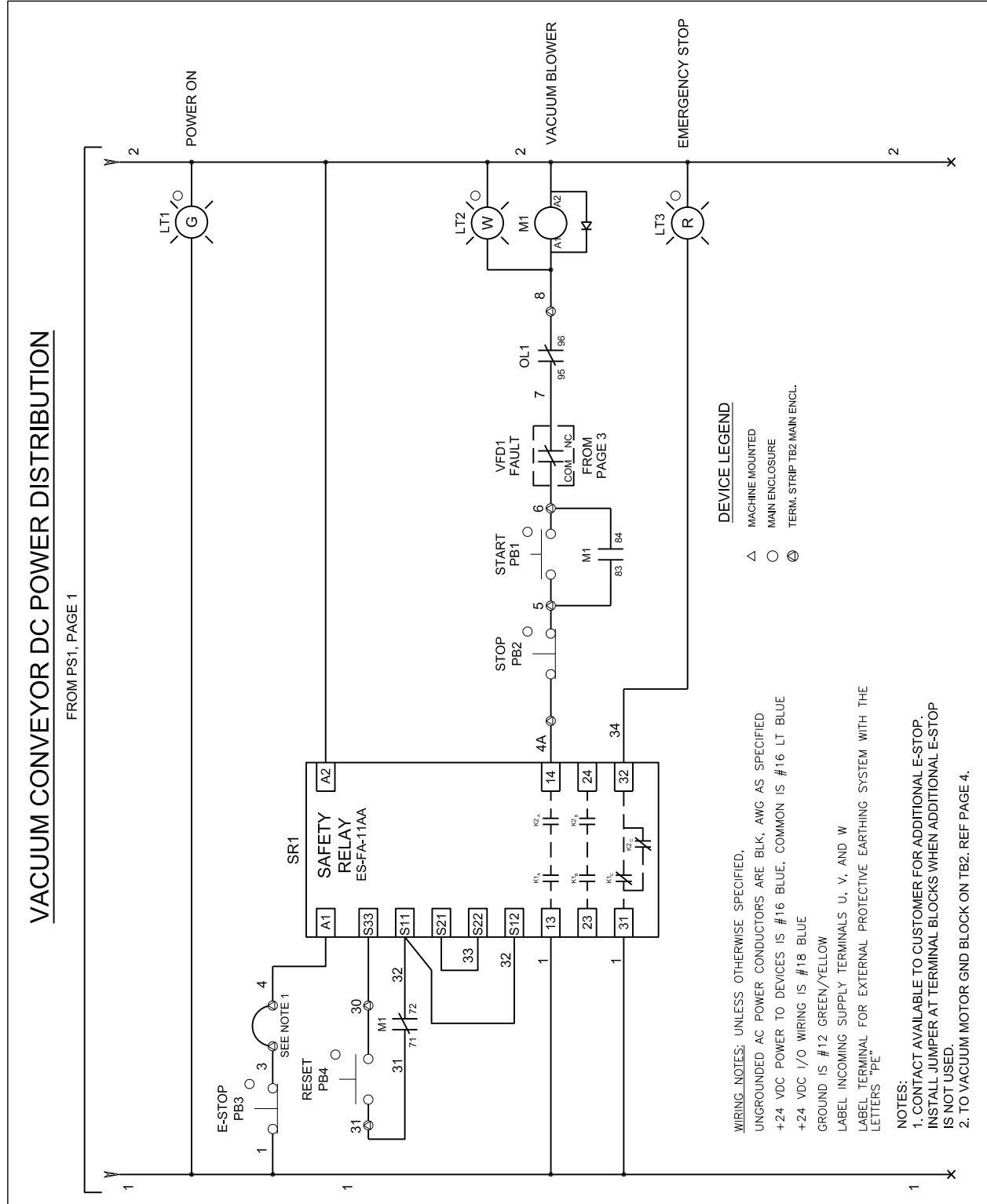
Symptom	Probable Cause	Solution
Improper part spacing	Chicane improperly adjusted	Adjust the rails of the chicane to allow for required spacing Initial Adjustments (on page 27)
Squeaking sounds	Either the idle end or drive end bearings are excessively worn	Replace either the idle end or the drive end bearings Replacing Bearings
Main belt shifts from side to side during operation	Main belt is excessively worn	Replace the Main Belt (on page 41)
Main belt slips during operation	Main belt is excessively worn	Replace the Main Belt (on page 41)
Main belt slips or does not turn while motor is running	Drive belt is excessively worn	Replace the Drive Belt (on page 43)
Parts slip on the belt during operation	Vacuum pressure has dropped	Clean or replace vacuum blower filter Clean the filters (on page 40)

Chapter 10

Wiring Diagrams

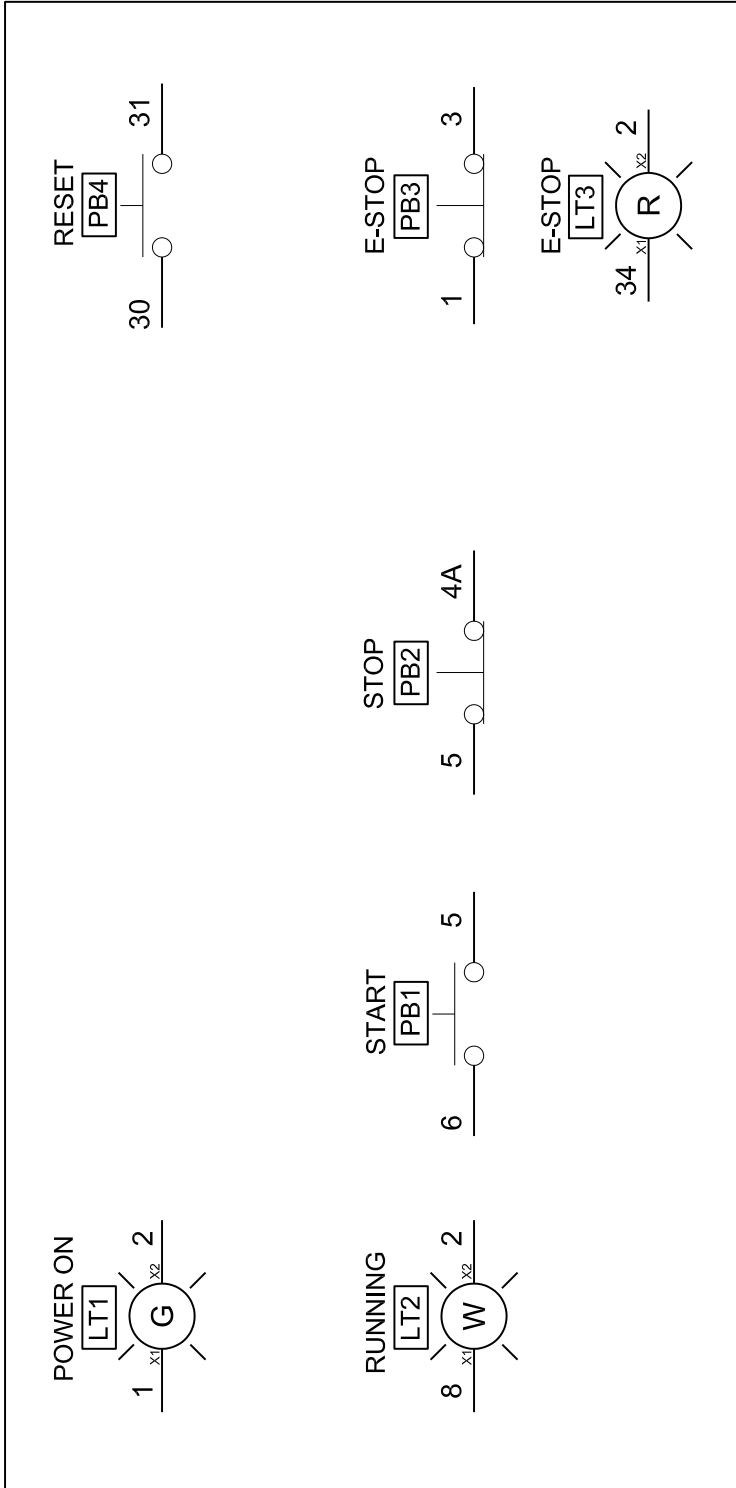
Wiring Diagrams for Main Control Enclosure (77445 and 77572)

Wiring Diagram sheet 2 - F1885E

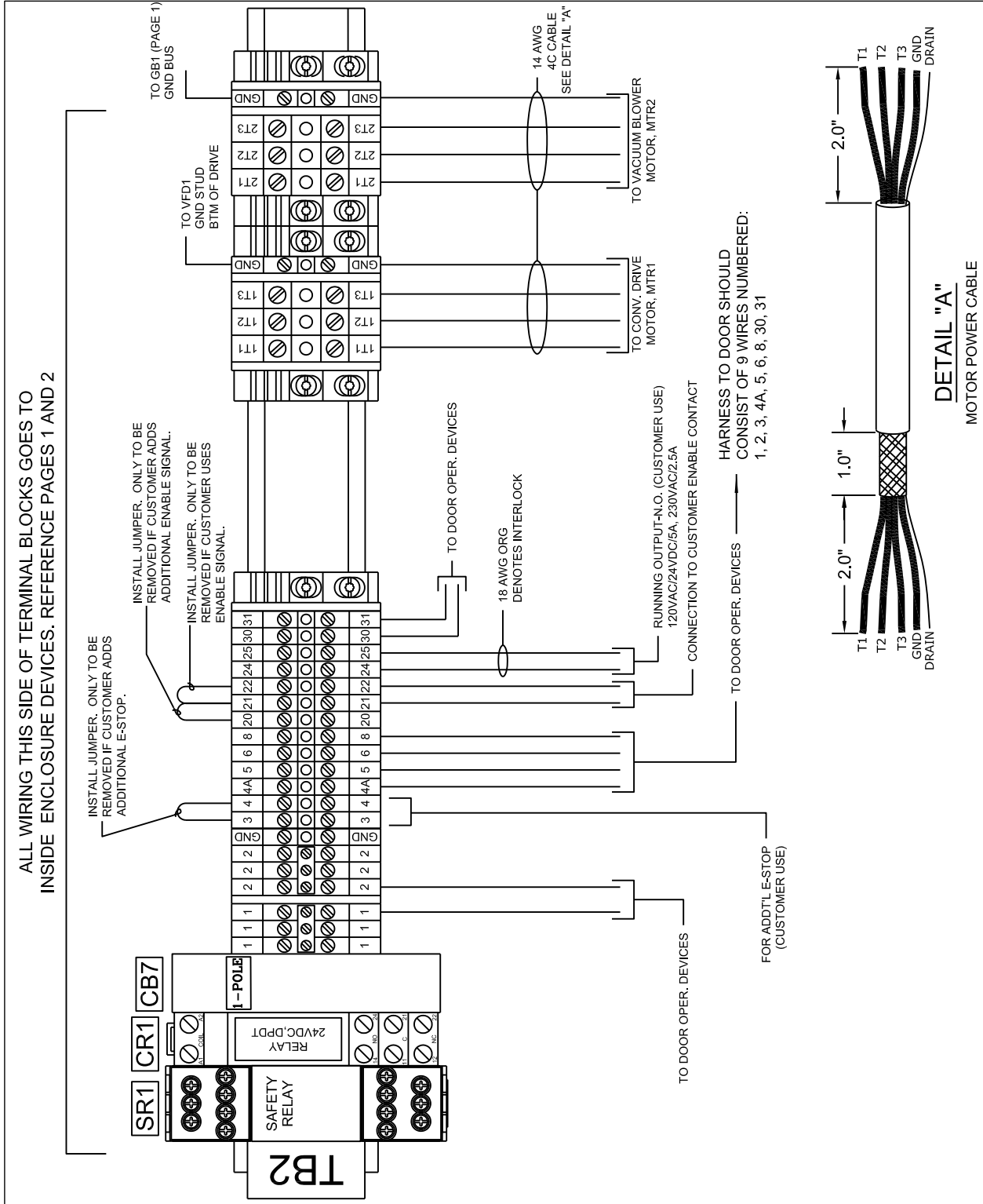


Wiring Diagram sheet 4 - F1885E

OPERATOR DEVICES AS VIEWED FROM INSIDE OF ENCLOSURE DOOR



Wiring Diagram sheet 5 - F1885E



Index

A

- ABOUT THIS MANUAL • 5
- ATTACHING INFEED AND OUTFEED PLATES TO TRACKWORK • 25
- AUTHORIZED USERS • 22

C

- CLEAN THE FILTERS • 40
- COMMISSIONING • 28
- CONNECTION OF THE CUSTOMER ENABLE CONTACT • 27
- CONVEYOR OPERATION • 7

E

- ELECTRICAL SERVICE • 25
- ELECTRICAL SYSTEM • 29
- ENVIRONMENTAL CONDITIONS • 13
- EU DECLARATION OF CONFORMITY - NUMBER EMC3296 • 10
- EU DECLARATION OF CONFORMITY - NUMBER MS3296 • 9

F

- FREQUENCY DRIVES (VFD1) • 30

I

- INITIAL ADJUSTMENTS • 27
- INSPECT THE BEARINGS • 39
- INSPECT THE DRIVE BELT • 39
- INSPECT THE MAIN BELT • 39
- INSTALLATION AND SETUP • 23
- INTENDED USE • 19
- INTERLOCK • 30
- INTRODUCTION • 5

L

- LIFTING HEAVY OBJECTS • 21

M

- MACHINE COMPONENTS AND SYSTEMS • 29
- MACHINE MOUNTED SAFETY COMPONENTS • 30
- MAIN COMPONENTS • 8
- MAIN DISCONNECT (DISC1) • 29
- MAINTENANCE FREQUENCY • 37
- MOTOR CONTACTOR (M1) • 30

O

- OPERATING THE VACUUM CONVEYOR SYSTEM • 31
- OPERATOR CONTROLS • 31
- OPTIONS • 12

P

- PART AND PART HANDLING SPECIFICATIONS • 15
- PART CHANGEOVER PROCEDURE • 35
- PERSONAL PROTECTIVE EQUIPMENT • 19
- PERSONNEL SAFETY • 20
- PNEUMATIC REQUIREMENTS • 15
- PNEUMATIC SERVICE • 26
- PREPARATION FOR INSTALLATION • 23
- PROHIBITED USE • 19
- PROTECTIVE EARTHING • 26

R

- RECOMMENDATIONS PRIOR TO INSTALLATION • 23
- REPLACE THE DRIVE BELT • 43
- REPLACE THE DRIVE END BEARINGS • 45
- REPLACE THE IDLE END BEARINGS • 44
- REPLACE THE MAIN BELT • 41
- RESIDUAL RISK • 18

S

- SAFETY INFORMATION AND MARKINGS • 17
- SECURING TO FLOOR • 24
- SERIAL TAG • 17
- SHIPPING AND HANDLING • 23
- SHUTDOWN SEQUENCE • 33
- SOUND PRESSURE LEVEL • 14
- SPARE PARTS USAGE • 22
- STARTUP SEQUENCE • 32
- SYMBOLS • 18
- SYMPTOMS AND POSSIBLE SOLUTIONS • 47
- SYSTEM ELECTRICAL SPECIFICATIONS • 10
- SYSTEM MEASUREMENTS • 10
- SYSTEM OVERVIEW • 7
- SYSTEM SPECIFICATIONS • 9

T

- TROUBLESHOOTING • 47
- TYPOGRAPHICAL CONVENTIONS • 5

V

- VACUUM CAP CONVEYOR CABINET LOCKOUT • 40
- VENTILATION • 24

W

WARNING DEVICES • 18

WIRING DIAGRAM SHEET 1 - F1885E • 50

WIRING DIAGRAM SHEET 2 - F1885E • 51

WIRING DIAGRAM SHEET 3 - F1885E • 52

WIRING DIAGRAM SHEET 4 - F1885E • 53

WIRING DIAGRAM SHEET 5 - F1885E • 54

WIRING DIAGRAMS • 49