



VarioStack™

SIEMENS

Operation Manual

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Important: Prior to operating any of the equipment or performing any of the maintenance procedures described within this manual, it is strongly recommended that the operator and maintenance technician read the information provided within the applicable sections of this manual. All personnel shall pay particular attention to the notes, cautions, warnings, and dangers presented in this manual and posted on or in the area of the equipment. This equipment has been designed for use by trained and qualified operators. Every possible effort to prevent injury to the operator or maintenance personnel has been taken in the preparation of this manual. Damage to the equipment is possible when the procedures contained within this manual are not followed.

Revisions

Revision	Date(yyyy/mm/dd)	Description
A	2019/08/13	Initial Release
B	2019/09/11	Updated with latest HMI screens. Updated system messages and messages type table. Updated Figure 8. Removed interlock references to back-side doors. These are not interlocked. Grammar correction on page 40 for E-Stop instructions. Typo correction on page 13 at the end of section 1.7.2.1.

Revision	Date(yyyy/mm/dd)	Description
C	2020/06/29	Updated for VarioStack™ Updated images and procedures to reflect revised system configuration

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1 Safety

1.1 Introduction

Siemens is a world leader in the design and manufacture of material handling systems. We continually invest in the safety of Siemens products and safety education.

This manual contains basic guidelines for material handling safety, lockout/tagout procedures, safety design features, product features, and other general operational and maintenance safety information. Its purpose is to improve safety and safety education in the workplace. The safety section is not intended to cover all situations or circumstances and is not a regulatory publication. Much of the information in this manual comes from the ASME B20.1 - Safety Standards for Conveyors and Related Equipment accredited by American National Standards and sponsored by the American Society of Mechanical Engineers (ASME). To request copies of the publication contact: American National Standards Institute, 3 Park Avenue, New York, NY 10016-5990, Phone: 212-591-8500, Fax: 212-591-8501.

1.2 Philosophy of Safety

The philosophy of safety is best described in the following manner:

- Design engineering controls to remove or separate the hazard from people.
- Use administrative controls to separate the hazard from personnel by time or distance.
- Utilize PPE as a final protective measure.
- Warn against the hazard.

The most preferred method of negating a hazard is to design it out of the equipment or installation. Engineering controls, such as guarding, is one of many possible controls against hazards.

- Guards: these are physical barriers that prevent contact. They can be fixed, interlocked, adjustable, or self-adjusting.
- Devices: these limit or prevent access to the hazardous area. These can be presence-sensing devices such as light curtains, pullback or restraint straps, safety trip controls, two-hand controls, or gates.
- Administrative Controls: machine location or distance. This method separates the hazard from the operator's work area.

- Personal Protective Equipment (PPE): if engineering and administrative controls fail to fully remove the hazard, the final protective measure is PPE.
- Posted warning signs and labels shall be used to remind personnel of the potential hazards. Warnings should also be used to protect against dangerous practices.

When installing material handling equipment, take time to review the application and be sure that proper safety devices are in place and properly adjusted.

Belts and chains moving over pulleys, pulleys, and sheaves create pinch and nip points which must be guarded. These points present a risk of injury if not guarded properly.

Siemens equipment is furnished with safety guards and warning labels. However, when this equipment is applied at the facility, additional guards and warnings may be required because specific applications might create hazards that could not be anticipated at the time of design of the equipment. Therefore, you must examine the installation and provide any additional guarding, personnel barriers, warnings, etc., as required.

- Ensure that all barriers and warning signs are in place to warn personnel about equipment that cannot be guarded.
- Review the procedure for starting and stopping powered equipment, including the use of emergency stops.
- Do NOT operate equipment with guards or safety devices removed.
- Operate the equipment with TRAINED personnel ONLY.
- Do NOT perform service or maintenance until all power is disconnected and locked out.

1.3 Training

In addition to the initial training of personnel (when equipment is first placed into operation), continuous training is required on a scheduled and periodic basis. The purpose of continuous training is to reinforce the importance of safe work practices by ALL employees, including all new hires and transfers working with or around the equipment.

The employer is responsible for providing trained employees knowledgeable in the safe operation and maintenance practices of the material handling equipment.

1.4 Maintenance Safety Procedures

This section describes safety precautions that should be followed before, during and after maintenance and troubleshooting tasks. Since voltages encountered in

this equipment can cause lethal shock if mishandled, these safety instructions should be strictly adhered to.

1.4.1 Safety Tips Prior to Servicing

- Follow OSHA Control of Hazardous Energy Procedure – Lock Out Tag Out, before servicing any equipment or machines.
- Utilize OSHA compliant lockout/tagout devices at all pertinent disconnect switches.
- Inform personnel in the area that maintenance tasks are being performed.
- **ALWAYS** stop machines or equipment before attempting to clear jams.
- Hot work on electrical equipment is highly hazardous and should only be performed by properly trained personnel familiar with hot electrical work and arc flash protection processes.
- Secure proper tools and wiring diagrams. Be sure that an adequate test instrument is available.
- **READ** any instructions or test procedures **BEFORE** attempting them.



Orange wires in a control cabinet remain hot even when the disconnect switch is turned “OFF. Use extreme caution when servicing a control cabinet with an outside power source.

- **NEVER** “ride” or walk on energized conveyors.

1.4.2 Safety Tips during Servicing

While working never forget that other pieces of equipment can be involved when a particular START or STOP pushbutton is pressed. For example, a conveyor in a remote area may be energized by a particular operation. Before energizing **ANY** element of the system, it is essential that you be sure to:

- Inform all affected personnel in that area.
- Confirm that all other systems are **STILL** disabled.
- Stay clear of all chain drives, motor couplings, and belts during equipment operation, especially if guards have been removed.
- Wear personal protective equipment appropriate for the task at all times when performing maintenance duties.
- **NEVER** wire or tape down limit switches.
- **ALWAYS** observe the signals of the warning lights.
- Be alert to any deficiency of the equipment.
- **NEVER** “ride” or walk on a conveyor.

- **DO NOT** leave tools or parts where they may be a safety hazard or obstruction.
- Be absolutely certain that **ALL** personnel are clear of any moving parts before starting the system.
- Report all accidents resulting in personal injury or damage to the equipment to the Supervisor.



In the unlikely event of electrocution, do not touch the victim until the high voltage circuit is broken.

1.4.3 Safety Tips after Servicing

- Follow OSHA Control of Hazardous Energy Procedures for the removal of Lock Out Tag Out devices.
- When servicing is complete, replace all guards and safety devices, remove test equipment and tools. Remove and properly dispose of any damaged components and close all panels.
- **DO NOT** leave tools or parts where they may be a safety hazard or obstruction.
- Finally, remove all lockout/tagout equipment and inform all affected personnel in the area that servicing is completed before restarting equipment.



Never attempt to operate the system if all guards and access doors are not replaced and secured. “

1.5 Control of Hazardous Energy – Lockout/Tagout

The primary purpose for a lockout/tagout procedure is to protect workers from injury caused by the *unexpected* energization or start-up of equipment.

Occupational Safety and Health Administration (OSHA) standard 29CFR 1910.147, Appendix A, outlines the minimum requirements for the control of hazardous energy in general industry. It is the opinion of Siemens that this standard applies to all workplaces utilizing powered conveyors. The OSHA standard centers on the control of potentially hazardous energy and how to secure it to prevent harm to employees. The rule requires that energy sources for equipment be turned off or disconnected, and that the switches be locked or labeled with a warning tag. This ensures that the equipment has been shut down for servicing or maintenance and will not reactivate while employees are working on it. The regulation defines servicing and maintenance as covering “lubrication, cleaning or unjamming of machines or equipment... where the employee may be

exposed to the unexpected energization or startup of the equipment..." among other things.

We are bringing this to your attention in the event you are not aware of the standard. We urge you to review the applicability and requirements of the standard with respect to your facilities. The lockout/tagout procedure is considered to be just one element of the control procedures for hazardous energy. The employer is responsible for providing procedures that include de-energization of equipment, isolation of energy sources, verification that equipment has been de-energized, and complete diffusion of stored energy.

The standard requires the employer to create an ongoing program of control procedures, equipment specific Lockout/Tagout procedures for each piece of equipment and employee training by the employer (regardless of training provided by the equipment vendor at the time of sale) to ensure that the purpose and functions of energy controls are understood and applied.

For information regarding the Control of Hazardous Energy - lockout/tagout requirements in the General Industry, refer to 29 CFR 1910 Section 147.

- Lockout/tagout should take place before any service or maintenance work begins. Alert affected personnel of power disconnection. Isolate the power source.
- Attach lockout tags to each lock indicating name of service person, date, contact phone number, and purpose of the lockout.
- Use padlocks with only one key for all lockout purposes. If duplicate keys exist, keep them under strict management supervision.
- Check for stored energy. Test the equipment to be sure that it will not operate. Before beginning work, ensure that power is actually removed by checking various points to ground with test meter. Even though power to the device being serviced is removed, some points of the device may be energized due to interconnections with other equipment. Such areas are appropriately marked.

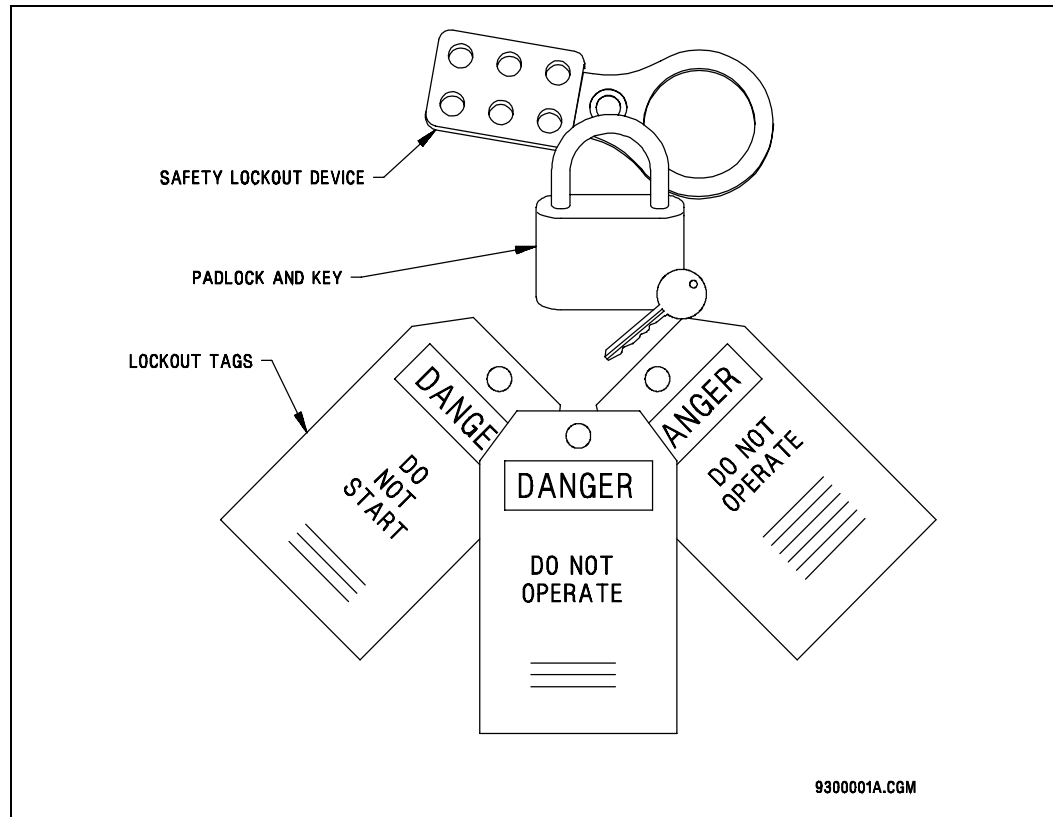


Orange wires in a control cabinet remain hot even when the disconnect switch is turned "OFF. Use extreme caution when servicing a control cabinet with an outside power source.

- The service person who locks and tags a machine must be the one who unlocks it.
- Never remove a lock or tag that is not yours.
- Never lockout or tag equipment for another person.
- If a lock or tag needs to be left on during a shift change, the individual who initiated the lockout shall transfer the lockout/tagout responsibility to an authorized employee of the oncoming shift. If a lockout is left in place by a previous shift and no transfer of responsibility has taken place, assume the

equipment is locked or tagged for a good reason; do not remove the lockout. Contact your supervisor or manager who will make the decision on how to proceed.

- Before removing a lockout and energizing the equipment, communicate to all affected personnel in the area that the system is about to be reactivated.



1.6 Basic Safety Rules



Package Conveyors



 <p>Do Not Climb, Sit, Stand, Walk, Ride, or Touch the Conveyor at Any Time</p>	 <p>Do Not Perform Maintenance on Conveyor Until Electrical, Air, Hydraulic and Gravity Energy Sources Have Been Locked Out or Blocked</p>	 <p>Operate Equipment Only With All Approved Covers and Guards in Place</p>
 <p>Do Not Load a Stopped Conveyor or Overload a Running Conveyor</p>	 <p>Ensure That All Personnel Are Clear of Equipment Before Starting</p>	 <p>Allow Only Authorized Personnel To Operate or Maintain Material Handling Equipment</p>
 <p>Do Not Modify or Misuse Conveyor Controls</p>	 <p>Keep Clothing, Body Parts and Hair Away from Conveyors</p>	 <p>Remove Trash, Paperwork and Other Debris Only When Power is Locked Out</p>
 <p>Ensure That ALL Controls and Pull Cords are Visible and Accessible</p>	 <p>Know the Location and Function of All Stop and Start Controls</p>	 <p>Report All Unsafe Conditions</p>

POST IN PROMINENT AREA

1.6.1 Basic Maintenance Safety Rules

The maintenance staff also plays a key role in the overall safety of the material handling equipment. Creating and practicing a preventive approach to safety helps establish an effective safety program.

- Lockout/tagout must take place before any service or maintenance work begins or when a periodic or start-of-shift inspection is performed per section 1.5 Control of Hazardous Energy – Lockout/Tagout.
- All maintenance or service is to be performed by qualified, trained personnel only.
- Always report unsafe conditions or anything out of the ordinary to the supervisor.

1.6.2 Electro-Static Discharge (ESD)



Some equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation.

ESD control techniques must be followed any time that you are handling electronic components. When two objects separate, static builds up on their surfaces. Control the buildup of static on yourself, objects you touch, and objects near you by:

- Touching a grounded object to discharge potential static
- Wearing an approved grounding wrist strap and ensuring it works properly
- NOT touching connection or pins on component boards
- NOT touching circuited components inside the equipment
- Using a static-safe workstation or dissipative rubber mat work surface, if available
- Storing the equipment in appropriate static-safe packaging when not in use
- Keeping objects away from sensitive components
- Grounding all personnel, surfaces, and components to drain off any charges that are created

1.6.2.1 Causes

Conductors are items that can generate charges: people, tools, keys, carpet, etc. Insulators are items that can hold charges for an extended period of time: paper, Styrofoam, plastic, etc.

People develop a charge when walking on tiled floors, waxed floors, or carpeted floors with standard footwear. Leather soles generally charge the least; soft rubber or crepe soles the most.

When your finger comes close to a doorknob or your computer screen, you may feel a slight shock.

1.6.2.2 Effects

- Sometimes the results of an ESD event will not show up for weeks or even months in electrical components.
- You may feel nothing, but every time that you touch an electronic piece of equipment a sensitive electronic component could either be destroyed or become unstable.

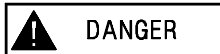
1.6.3 Electric Arcs

Make sure that power is removed or the area is non-hazardous before proceeding otherwise an electrical arc can occur. This could cause an explosion in hazardous location installations. An electrical arc can occur if, for example:

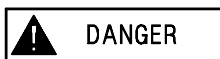
- A memory card is inserted or removed
- A controller is inserted or removed while backplane power is on
- A serial cable is connected or disconnected with power applied to the module or the serial device on the other end of the cable

1.7 VarioStack™ Specific Safety Rules

1.7.1 Safety Tips during Operation



Do not climb, sit, stand, walk, ride, or touch the conveyors or totes during operation. The only exceptions are operators at the designated operator stations who are allowed to add or remove totes from their respective stations.



Improper use of the VarioStack may lead to an accident causing death or serious injury.

Operators must remain at their respective operator station at all times during operation. Operators should, at the beginning of each shift, inspect the VarioStack for unusual noises or damage during normal operation. If any problems are found, contact maintenance immediately.

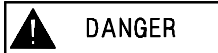
The VarioStack should only be operated by properly trained operators who fully understand the system.

Stop the system immediately if an unusual noise, abnormal smell, or other abnormality is detected. Contact maintenance to inspect and correct.

1.7.2 Safety Tips Prior to Servicing

Maintenance personnel should only enter the unit after the VarioStack is stopped, locked, and tagged out. Proper maintenance of the VarioStack is important for safe operation.

NOTE: The basic section 1.4.1 Safety Tips Prior to Servicing also applies to the VarioStack.



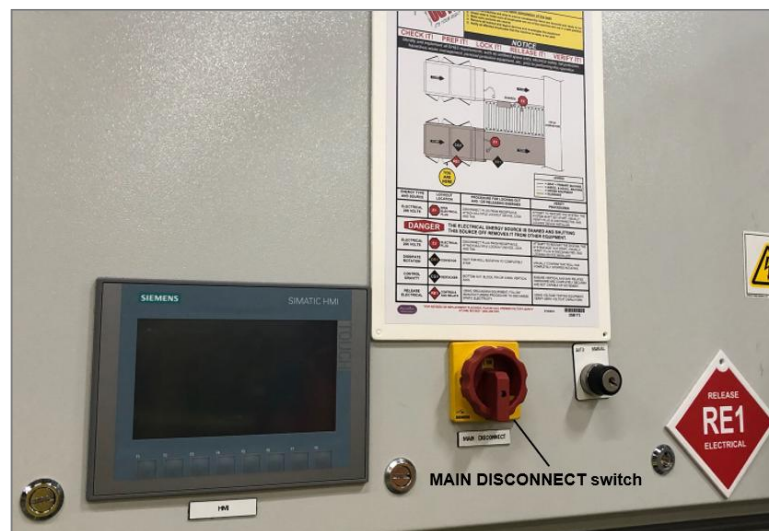
Do not perform inspections, adjustments, maintenance, or other work on this equipment without following OSHA Lock-Out/Tag-Out requirements and state and local requirements. Failure to follow these requirements may result in death or serious injury and/or equipment damage.

The following hazards should be cut off and locked out (see section 1.5 Control of Hazardous Energy – Lockout/Tagout for details) before servicing the VarioStack.

1.7.2.1 Electrical Energy

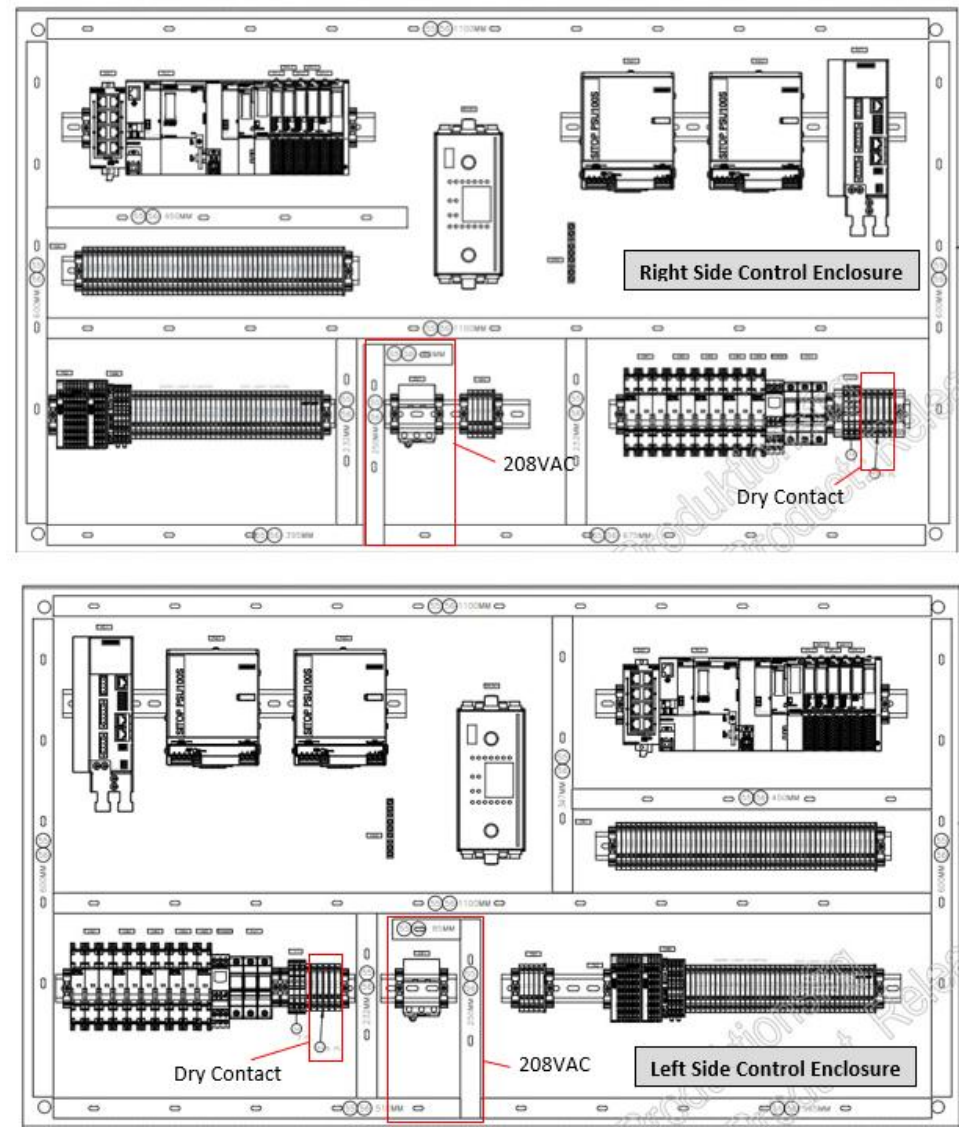
The VarioStack's safety disconnect switch located on the VarioStack's main control enclosure is used to isolate electrical energy. This switch removes 208V electricity from the VarioStack.

Figure 1 Safety Disconnect Switch



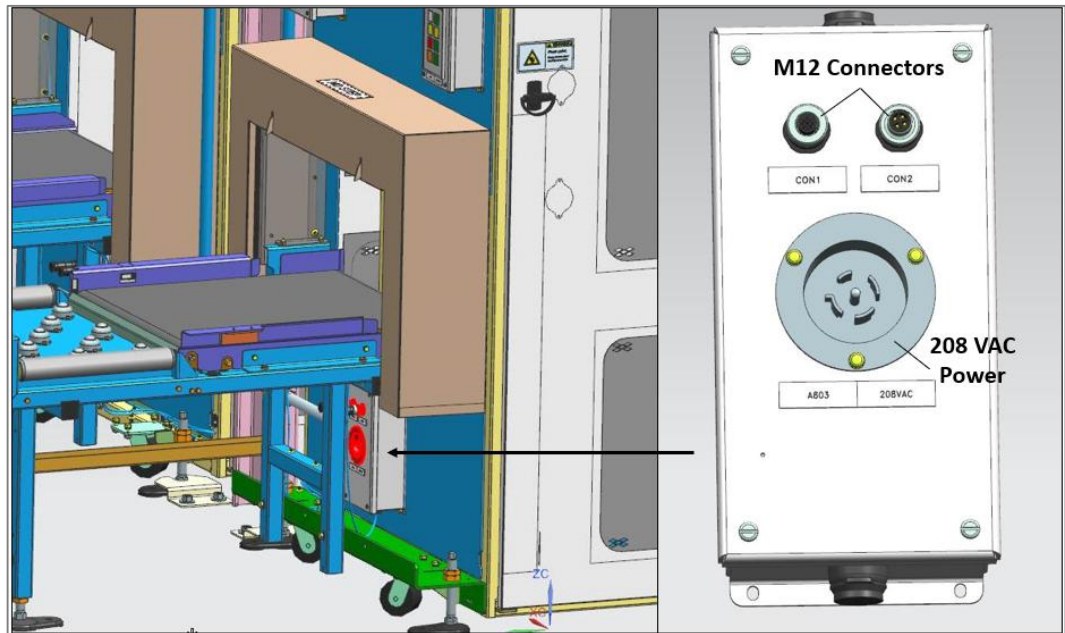
However, using the disconnect switch will not isolate all power to the cabinet. Incoming 208VAC power and a dry contact from an external connection, both shown in Figure 2, will remain energized.

Figure 2 Main Control Enclosure Energized Components after Disconnect Switch



To disconnect all incoming power, it is also necessary to unplug and lock out the 208VAC power cord and M12 connectors located under the VarioStack Exit Conveyor module shown in Figure 3.

Figure 3 Control Enclosure Energized Components



To disconnect power to the VarioStack to perform maintenance or clear a jam, disconnect and lock out the building power supply as follows:

1. Turn the disconnect switch to OFF, and lockout power at the disconnect switch.
2. Unplug the 208VAC power cord and the two M12 connectors located under the Exit Conveyor module, and then lockout the power cord and M12 connectors according to standard lockout procedures (See Figure 4).

Figure 4 Power Cord Lockout



See section 1.5 Control of Hazardous Energy – Lockout/Tagout for more information regarding Lockout/Tag Out.



Wait one minute after lockout is completed in order to allow the discharge of all capacitors in the system.



Activating the Disconnect Switch or Disconnecting the building 208 VAC Power and M12 connectors does NOT remove energy from the takeaway conveyors next to the VarioStack. These conveyors have their own set of disconnects.

Examples of items affected when the electrical energy is locked out and tagged out:

- Electrical cabinet (main control enclosure)
- VarioStack conveyor motors and lift drive motor

1.7.3 Safety Tips during Servicing

NOTE: The basic section 1.4.2 Safety Tips during Servicing also applies to the VarioStack.

- Do not expose the VarioStack to strong magnetic fields. Very strong magnetic fields can damage the hand held scanner electronics or Destacker module gripper magnets.
- If heavy components must be lifted, use an overhead or moveable crane with lifting gear capacity higher than the weight of the equipment.

1.7.4 Safety Tips after Servicing

NOTE: The basic section 1.4.3 Safety Tips after Servicing also apply to the VarioStack.

- Reconnect building power and turn the main control enclosure disconnect switch back ON to restore VarioStack power.
- Replace all guards and close all panel doors.
- Connect the 208VAC power cord and M12 connectors.
- Test for correct operation after servicing.



Never attempt to operate the system if all guards and access doors are not replaced and secured.

1.8 Safety Design Features

The VarioStack has safety design features for worker protection. Specific safety design features are outlined on the pages that follow.

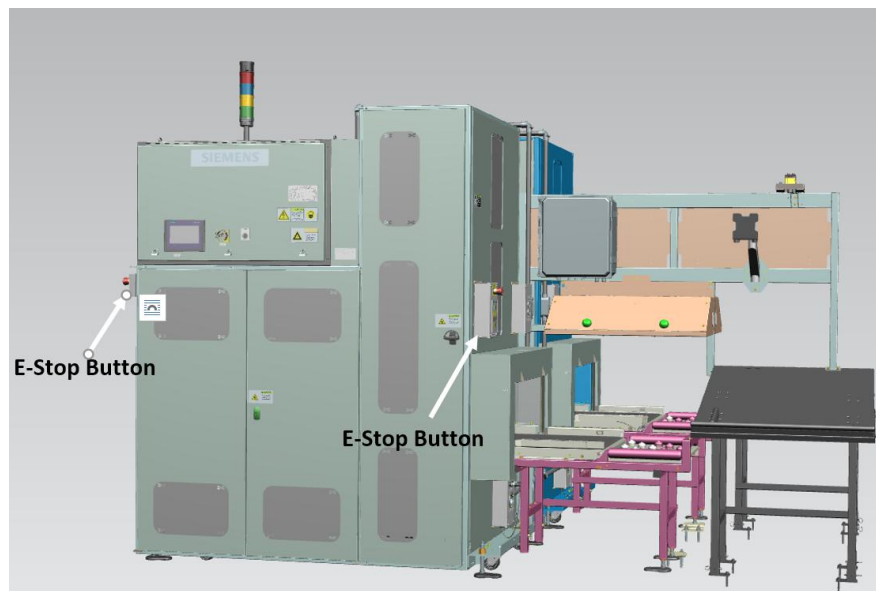
1.8.1 Emergency Stop Devices

Two illuminated red EMERGENCY STOP (E-Stop) push-pull buttons, are located on the VarioStack: one on the Main Operator Control Panel (Main OCP) and the second on the Buffer Operator Control Panel (Buffer OCP).



E-stop devices are not intended to disable equipment to provide protection for personnel in non-emergency circumstances. For example, maintenance, jam clearing, and/or other similar activities require adherence to established lockout/tagout procedures.

Figure 5 Emergency Stop Button Locations



Pressing an EMERGENCY STOP button turns off all safety outputs (conveyor motors and external dry contact) and all system motion will stop immediately. The system will not restart until the E-Stop is reset.

These inputs may also trigger the external safety output signal to be off and can potentially cause an E-Stop condition on surrounding systems (depending on site installation)

1.8.2 Emergency Stop Procedure

Emergency stop and restart the entire system as follows:

1. Push any EMERGENCY STOP button (this will stop the VarioStack equipment).
2. Fix the reason for activating the E-Stop.
3. Twist/pull out the activated EMERGENCY STOP button to reset it.

4. The Main OCP RESET button flashes blue. Press this button, and then press START.

At startup, the safety horn will sound.

1.8.3 General Guarding

When necessary for the proper protection of workers, it is required that areas be properly guarded where equipment meets or exposed moving parts present a potential hazard. It is recommended that warning and caution signs be positioned in the employees' line of sight.

Guarding shall never be removed or disabled for normal operations. Removal of guarding shall only be done in accordance with established maintenance and lockout/tagout procedures.

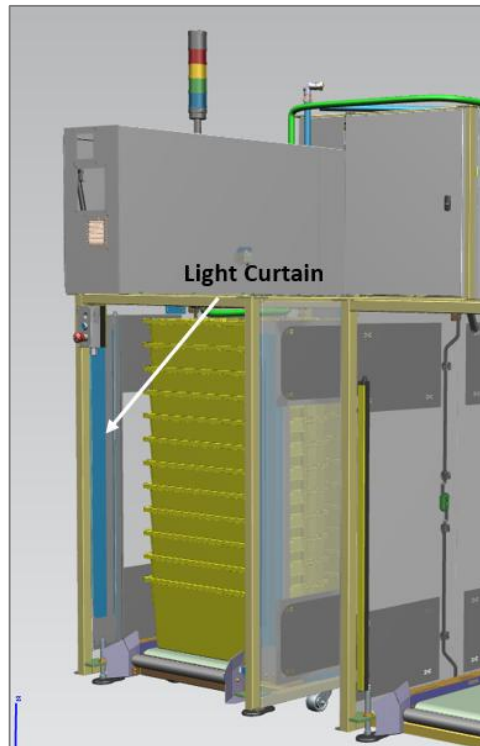
1.8.4 Safety Light Curtains

Safety light curtains are photoelectric sensors designed to detect the presence of personnel in the vicinity of moving machine components. Light curtains are typically located where operators frequently interact with moving machinery as part of routine system operation. When an operator breaches the light curtain's photoelectric beam, moving equipment stops in order to minimize the risk of injury to personnel.

1.8.4.1 Tote Entry Light Curtain

The VarioStack contains a safety rated light curtain which guards the open entry into the Buffer module. This light curtain is referred to as the tote entry light curtain. It is intended to protect operators from the vertical motion of the lift in the Destacker.

Figure 6 Tote Entry Light Curtain



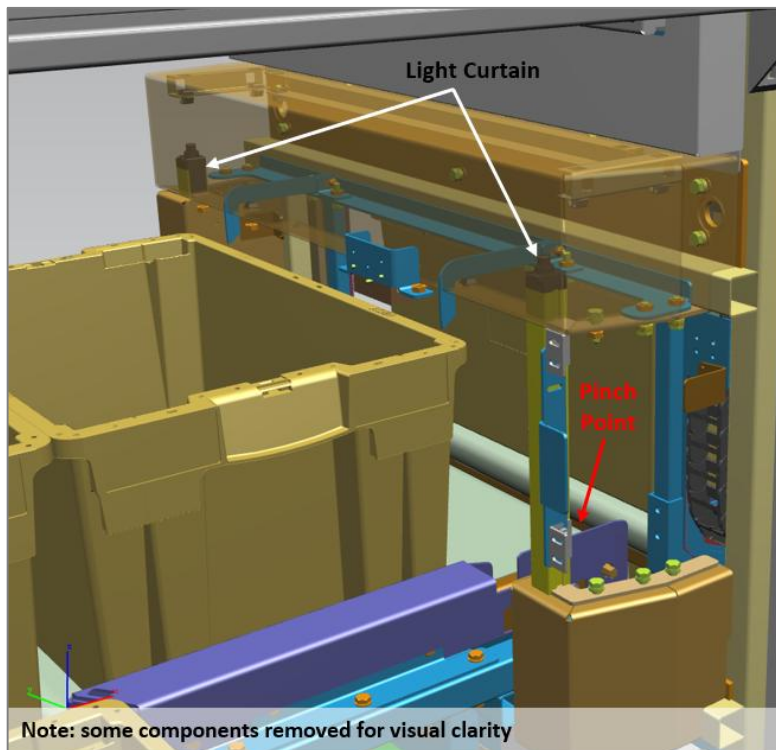
As a part of normal operation, the tote handler will regularly breach the tote entry light curtain when totes are loaded into the buffer. When this light curtain is breached, the system activates a safety stop; conveyors will remain active but the Destacker lift will not move until the condition is manually cleared and reset by the tote handler by pressing the START button on the Buffer OCP (see Section 3.2.5).

It is important for the operator to reset the system as soon as conditions are safe, to maximize utilization of the system.

1.8.4.2 Tote Exit Light Curtain

Another light curtain, the tote exit light curtain, guards the exit end of the Destacker module at the pinch point between the Destacker lift conveyor and the Exit Conveyor as shown in Figure 7. It is intended to protect operators, who may have inadvertently reached into the Destacker module, primarily from the vertical motion of the lift.

Figure 7 Tote Exit Light Curtain



As part of normal operation, totes regularly pass through this light curtain. During the time when the system is actively transferring a tote through the tote exit light curtain, the lift is disabled from moving vertically, and the light curtain is disabled. Once the tote is cleared, the light curtain is reenabled and the lift is allowed to move again.

When the Tote Exit light curtain is enabled and is breached, all conveyors and the lift are stopped. This stop is treated like an E-Stop. The operator must reset the system and restart it as described in section 3.2.8 E-Stop.

1.8.5 Safety Interlock

The VarioStack includes interlocked access doors which allow personnel access to perform maintenance and clear jams.

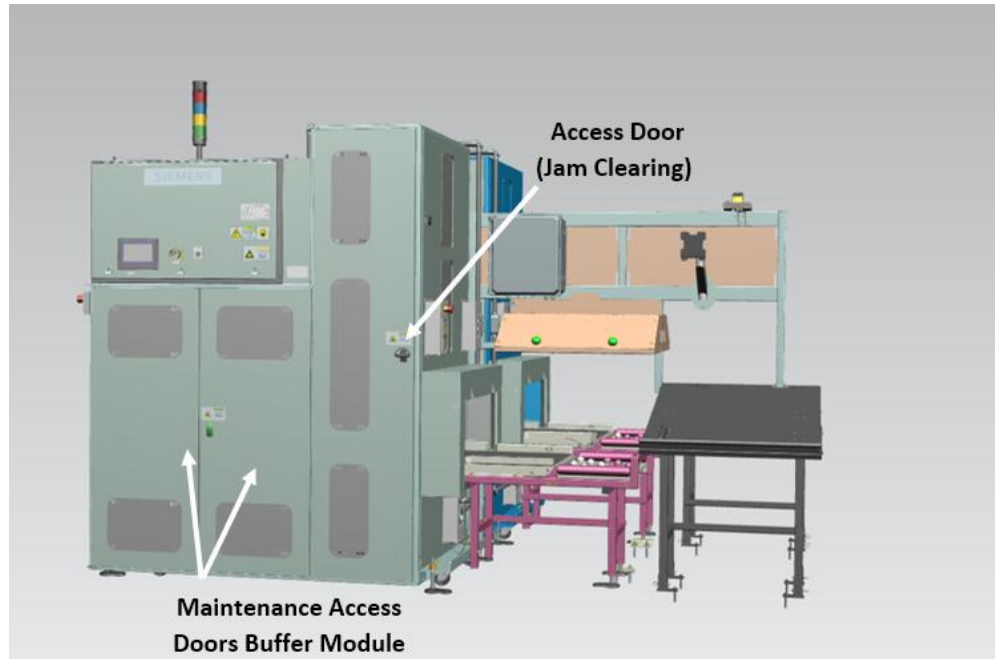
Opening any access door will activate the interlock, which will be treated by the system as an E-Stop. The system cannot operate while an access door is open. See section 3.2.8.3 for information on how to reset an E-Stop after an access door interlock has been activated.

Two interlocked maintenance access doors are located on each Buffer module. These doors are protected with a keyed lock.

In addition, one interlocked access door on the Destacker Module opens with a simple, unlocked door latch to provide access for jam clearing. See Figure 8.

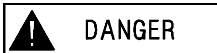
NOTE: Only authorized personnel should open the VarioStack access doors.

Figure 8 Safety Interlocks



1.8.6 Safety and Warning Labels

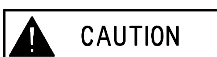
Warning and safety labels are factory installed by the manufacturer or applied after installation. Siemens equipment has safety labels attached with messages warning of potential risks. These labels are located to be useful in any application. Individual installations may have a unique need for additional labels in other mounting locations. These labels and signs may need to be supplemented by other warnings of individual design that may be obtained from local sources or nationally distributed catalogs.



DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury. The use of danger labels is limited to the most extreme situations.



WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or severe injury.



CAUTION: Indicates a potentially hazardous situation that, if not avoided, will result in minor or moderate injury. It may also be used to alert against unsafe practices.

DANGER or WARNING should not be considered for property damage accidents unless personal injury risk appropriate to these levels is also involved. CAUTION is permitted for property-damage-only accidents. Sign placement shall be in the immediate vicinity of the hazard, readily visible so the viewer can recognize the hazard and take appropriate action.

On a quarterly basis, walk through the entire system and make sure that all safety signs and labels are clearly legible and in good condition. Particularly if the system has been reconfigured, verify that the signs and labels are still in the proper locations. If there is a problem with any sign or label, replace it.

1.9 Jams

When product being handled by the system becomes lodged or jammed, it must be cleared from the system before normal operation can start.

Only authorized employees properly trained in jam clearing should be allowed to clear jams. See section 4.3 Clearing Jams.

1.10 Additional Safety References

ANSI – American National Standards Institute	B 11.19 Performance Requirements for Risk Reduction Measures: Safeguarding and other Means of Reducing Risk (AMT) B 20.1 Safety Standard for Conveyors (ASME) Z 535.1 Safety Colors (NEMA) Z 535.2 Environ. and Facility Safety Signs (NEMA) Z 535.3 Criteria for Safety Symbols (NEMA) Z 535.4 Product Safety Signs and Labels (NEMA) Z 535.5 Safety Tags and Barricade Tapes (NEMA)
CEMA – Conveyor Equipment Manufacturer's Association	102 Terms and Definitions 201 Safety Label Brochure 402 Belt Conveyors
OSHA – Occupational Safety and Health Administration	
Subpart C (1917) Cargo Handling Gear and Equipment	1917.43 Powered Industrial Trucks 1917.44 General Rules Vehicles 1917.45 Cranes and Derricks 1917.46 Crane Load and Limit Devices 1917.48 Conveyors 1917.49 Spouts, Chutes, Hoppers, Etc.
Subpart D-(1910) Walking/Working Surfaces	1910.21 Scope and Definitions 1910.22 General Requirements 1910.23 Ladders 1910.25 Stairways 1910.28 Duty to have fall protection and falling object protection 1910.29 Fall protection systems and falling object protection—criteria and practices 1910.30 Training requirements
Subpart J-(1910) General Environmental Controls	1910.144 Safety Color Codes for Marking Physical Hazards 1910.145 Specifications for Accident Prevention Signs and Tags 1910.147 The Control of Hazardous Energy (Lockout/Tagout)
Subpart N (1926) Cranes, Derricks, Hoists, Elevators, and Conveyors	1926.551 Cranes and Derricks 1926.552 Material Hoists 1926.553 Base Mounted Drum Hoists 1926.554 Overhead Hoists 1926.555 Conveyors
Subpart O-(1910) Machinery and Machine Guarding	1910.211 Definitions 1910.212 General Requirements for All Machines 1910.219 Mechanical Power-Transmission Apparatus

Subpart S-(1910) Electrical	1910.301 Introduction 1910.302 Electric Utilization Systems 1910.303 General 1910.304 Wiring Design and Protection 1910.305 Wiring Methods, Components, and Equipment-General Use 1910.307 Hazardous Locations 1910.308 Special Systems
NFPA – National Fire Protection Association	70E - Standard for Electrical Safety in the Workplace

1.11 ASME B20.1-2012 Operational and Maintenance Safety

Portions of the ANSI "Safety Standards of Conveyors and Related Equipment" (ASME B20.1-2012) relate to operational and maintenance personnel.

Introduction

Accidents resulting from the manual handling of materials have been reduced by the use of conveying and other forms of mechanical handling equipment. A further reduction in the accident rate can be gained by following safe practices in the design, construction, installation, operation, and maintenance of such equipment.

The design and installation of conveyors and conveyor systems should be supervised by qualified engineers. Likewise, the maintenance of conveyors and systems should be supervised by trained personnel.

The purpose of this standard is to present certain guides for the design, construction, installation, operation, and maintenance of conveyors and related equipment.

Those portions of this standard relating to maintenance and operation procedures are fully as important as those relating to design and installation. The best design features may be negated by faulty maintenance and operating practices. It is important that operating and maintenance personnel be instructed in recognizing hazards and pertinent safety precautions.

5.2 Maintenance (Repair)

- a. Maintenance and service shall be performed by qualified and trained personnel.
- b. Where lack of maintenance would cause a hazardous condition, the user shall establish a maintenance program to ensure that conveyor components are maintained in a condition that does not constitute a hazard to personnel.
- c. No maintenance shall be performed when a conveyor is in operation except as outlined in 5.3 and 5.4.
- d. When a conveyor is stopped for maintenance or repair purposes, the starting devices, prime movers, or powered accessories shall be locked out or tagged out in accordance with a formalized procedure designed to protect all persons or groups involved with the conveyor against unexpected restart. Personnel should be alerted to the hazard of stored energy, which may exist after the power source is locked out. See ANSI Z244.1-1982, American National Standard for Personnel Protection – Lockout/Tagout of Energy Sources – Minimum Safety Requirements and OSHA 29 CFR 1910.147 The Control of Hazardous Energy (Lockout/Tagout).
- e. All safety devices and guards shall be replaced before starting equipment for normal operations.

5.3 Lubrication

- a. Conveyors shall not be lubricated while in operation unless it is impractical to shut down for lubrication. Only trained and qualified personnel who are aware of the hazard of a conveyor in motion shall be allowed to lubricate a conveyor that is operating.
- b. Where the drip of lubricants or process liquids on the floor constitutes a hazard, drip pans or other means of eliminating the hazard shall be provided.

5.4 Adjustment or Maintenance

When adjustment or maintenance is required while equipment is in operation, only trained and qualified personnel who are aware of the hazard of the conveyor in motion shall be allowed to make the adjustment or perform the maintenance or service.

5.9.1 General Requirements of Guarding

5.9.1.3 Guarding Exceptions. Wherever conditions prevail that would require guarding under these standards but such guarding would render the conveyor unusable, prominent warnings shall be provided in the area or on the equipment in lieu of guarding.

5.9.1.4 Maintenance of Guards and Safety Devices. Guards and safety devices shall be maintained in a serviceable and operational condition. Warning signs provided in accordance with 5.9.1.3 shall be maintained in a legible, operational condition.

5.12 Operation

- a. Only a trained person shall be permitted to operate a conveyor. Training shall include instruction in operation under normal conditions and emergency situations.
- b. Where safety is dependent upon stopping devices or starting devices or both, they shall be kept free from obstructions to permit ready access.
- c. The area around loading and unloading points shall be kept clear of obstructions that could endanger personnel.
- d. No person shall ride on a conveyor, unless it is a conveyor engineered for that purpose.
- e. Personnel working on or near a conveyor shall be instructed as to the location and operation of pertinent stopping devices.
- f. A conveyor shall be used to transport only loads it is designed to handle safely.
- g. Under no circumstances shall the safety characteristics of the conveyor be altered without proper authorization from the manufacturer.
- h. Routine inspections and corrective maintenance measures shall be conducted to ensure that all guards and safety features are retained and function properly.
- i. Personnel should be alerted to the potential hazard of entanglement in conveyors caused by such items such as long hair, loose clothing, and jewelry.
- j. Conveyors shall not be maintained or serviced while in operation unless proper maintenance or service requires the conveyor to be in motion. In which case, personnel shall be made aware of the hazards and how the task may be safely accomplished.

NOTE: Contact the American Society of Mechanical Engineers at the address shown above for the complete ASME B20.1-2012.

NOTE: These excerpts are printed with the permission of ASME.

2 Model Description

The Siemens VarioStack is an automatic tote separation system used to facilitate the manual process of transferring incoming bulk packaged goods from their original packaging into empty totes that can be used for conveyance to a storage location.

The purpose of this document is to provide a detailed description of the VarioStack operation and to provide system operators with the information needed to safely and efficiently use the installed equipment to process bulk goods for storage.

This manual is developed as part of a set of documents provided for the VarioStack. Documents in this set include:

- VarioStack™ Service Manual - Siemens Doc. No: 740-01371
- VarioStack™ Operation Manual - Siemens Doc. No.: 740-01372 (This document)

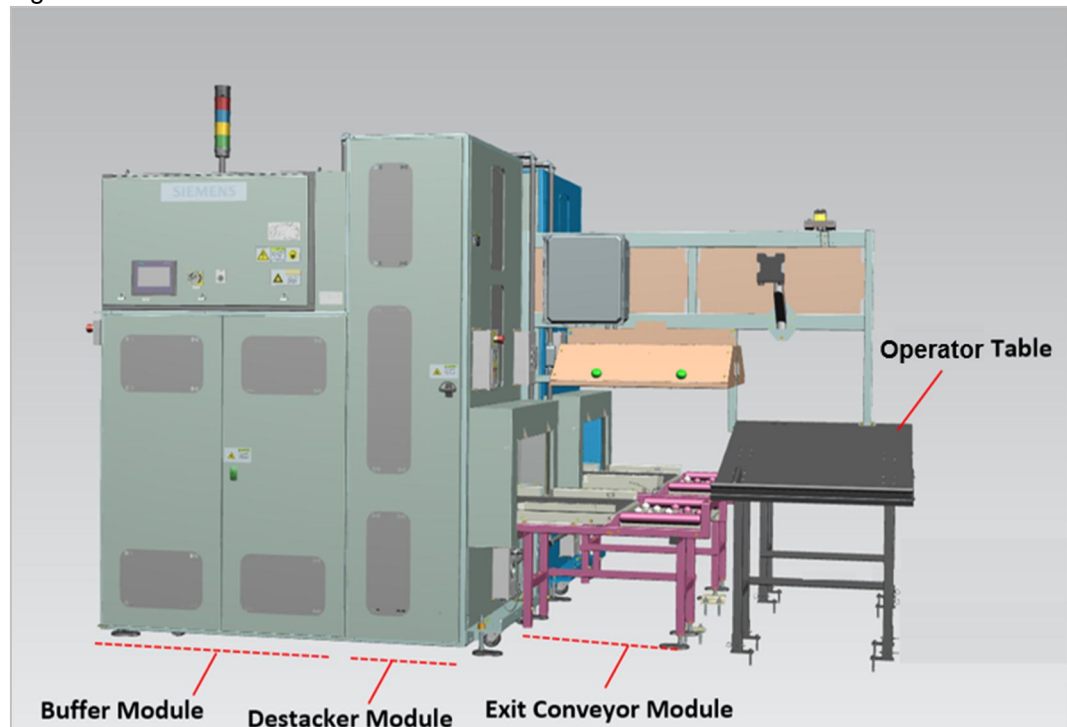
These documents are intended to be used together as a comprehensive source for information related to the operation and maintenance of the VarioStack.

2.1 Purpose of the VarioStack™

As goods enter the facility, individual items or smaller item groups are separated from their original bulk packaging and put into temporary warehouse storage within the facility until a customer order is submitted for that item. The primary purpose of the VarioStack is to facilitate the manual process of transferring these goods from the original packaging into totes that can be used for conveyance to the storage location.

The VarioStack provides operators a stable surface to place packages and also access the thin client computer, monitor and hand scanner (provided by customer). The workstation consists of multiple submodules that provide automated empty tote delivery to the operator and a manual interface to allow the operator to push filled totes onto the takeaway conveyor.

Figure 9 VarioStack



The VarioStack submodules include the Buffer module, Destacker module, Exit Conveyor module, and Operator Table. These submodules are described in the sections which follow.

Beyond the major components, the VarioStack also includes safe, intuitive operator control panels (OCP) for the machine operators and the tote handler operator, a main control enclosure for electrical components, mounting provisions for a thin client computer, monitor, and hand-scanner, and a space for takeaway conveyor between the two operators.

The takeaway conveyor is not a component of the VarioStack but is an existing facility conveyor interfaced to the VarioStack. It is a part of the downstream conveyor system and has a simple mechanical interface to the VarioStack.

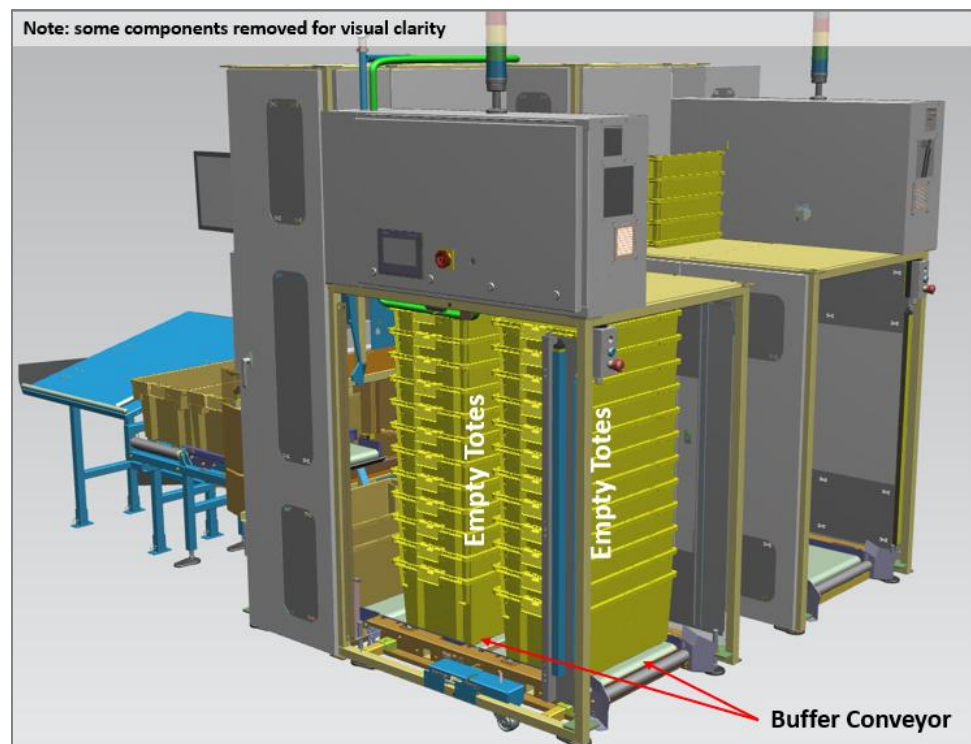
Some VarioStacks consist of two units, Unit 1 and Unit 2, which are operationally mirror images of each other, so that two machine operators can work simultaneously at one VarioStack. In this configuration, the takeaway conveyor is shared by both units. Possible configurations of the VarioStack include single-sided left, single-sided right and double-sided VarioStacks. The system shown in Figure 9 is a double-sided VarioStack.

2.1.1 Buffer Module

The Buffer module accepts stacks of incoming totes. It is typically loaded manually by an operator referred to as the *tote handler* in this document. The buffer module can hold two stacks of empty totes and each stack can include up to twelve totes.

Two belt conveyors, which are part of the Buffer module, automatically advance totes to the downstream Destacker module during operation.

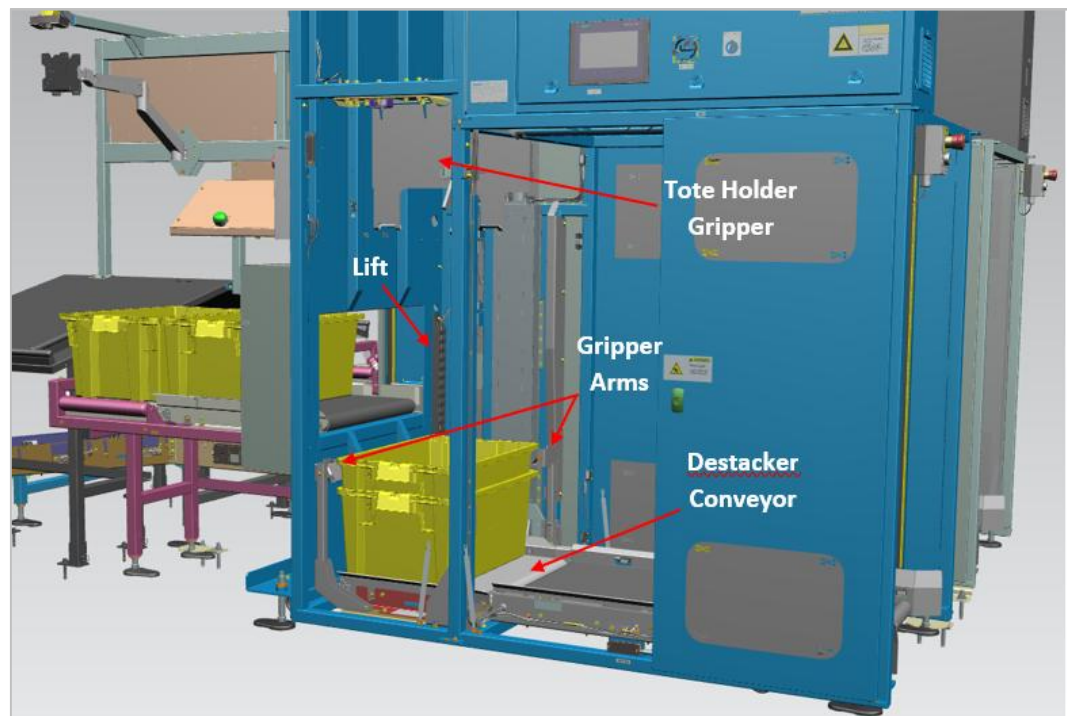
Figure 10 Buffer Module



2.1.2 Destacker Module

The Destacker module will accept a stack of totes from the Buffer module. This module consists of a lift-mounted conveyor equipped with electromagnetic gripper arms. These components work together to separate totes and convey them to the downstream Exit Conveyor module. When necessary, it will automatically pull the bottom tote from the stack and convey it to the downstream Exit Conveyor module.

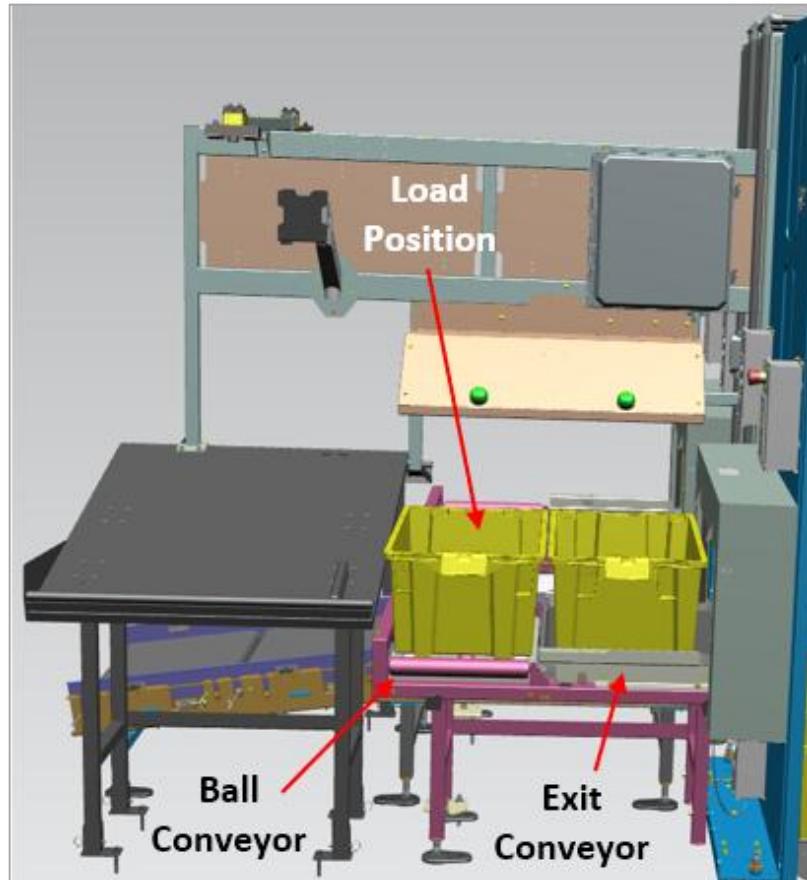
Figure 11 Destacker Module



2.1.3 Exit Conveyor Module

The Exit Conveyor module provides placement for two tote positions. See Figure 12.

Figure 12 Exit Conveyor Module



In the load position, the operator, referred to as the machine operator in this document, will place items into an empty tote. This position, which consists of a roller ball table, is ergonomically located near the operator. When the tote is full, the operator will push it over the roller balls onto the takeaway conveyor, leaving the load position open. A photoeye on the load position conveyor detects when the tote has been transferred to the takeaway conveyor.

The other tote position includes the Destacker exit conveyor. When the load position is empty, the Destacker exit conveyor automatically drives another tote into its position. The Destacker is then triggered to eject another empty tote onto the conveyor, where it is buffered until needed at the load position.

2.1.4 Operator Table

The function of the Operator Table is simply to support a package of incoming goods while the machine operator is loading the tote. The Operator Table also

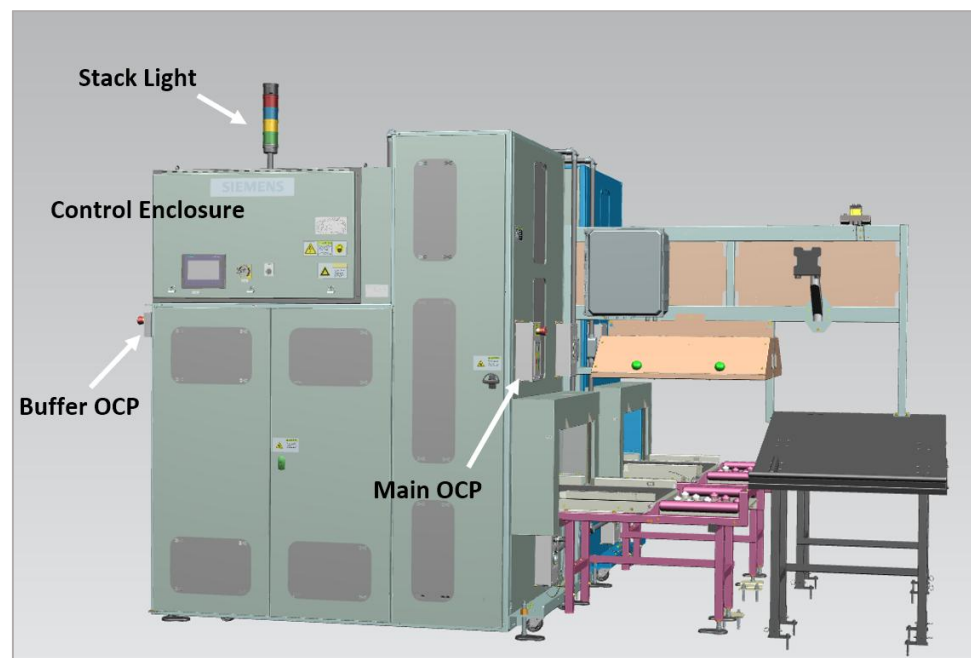
provides a location for the operator to store the handheld scanner. There are no active components on this module.

2.2 Operator Interfaces

Operator interfaces located on the VarioStack allow operator and maintenance control of the system, and also provide an indication of system status. See Figure 13. The operator interfaces include:

- Main Operator Control Panel (Main OCP)
- Buffer Operator Control Panel (Buffer OCP)
- Start/warning stack light
- Main control enclosure with Maintenance Touch Screen Human Machine Interface (HMI), disconnect switch, and AUTO/MANUAL key switch

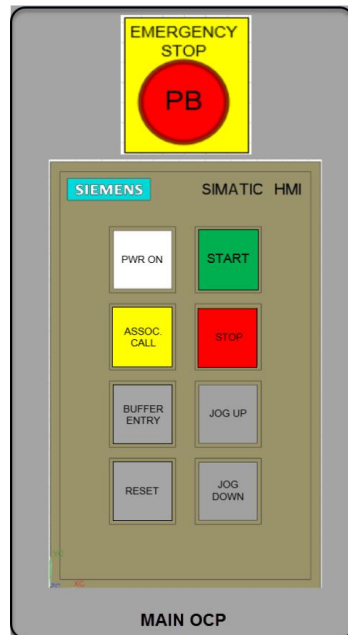
Figure 13 Operator Interfaces



2.2.1 Main Operator Control Panel (Main OCP)

The Siemens Main Operator Control Panel (Main OCP) is an 8-button interface used for operational procedures including start/stop. This interface also facilitates jam clearing and provides information about system status. An EMERGENCY STOP button is also included on this control panel to stop the system in situations where continued operation may cause injury to personnel or damage to equipment.

Figure 14 Main OCP



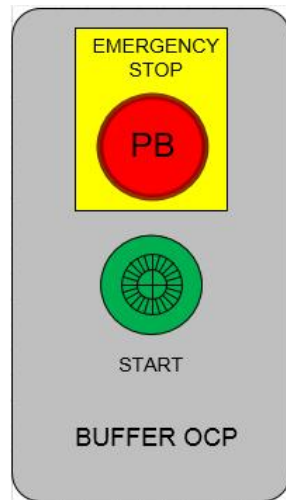
Button or Indicator	Status	Function/Indication
PWR ON Light	On – white	System is powered
	Off	System is not powered
ASSOCIATE CALL Illuminated Pushbutton	On – yellow	Press to signal help is needed from support personnel
	Flashing – yellow	Button has been pressed to signal help is needed. NOTE: Yellow stack light will also flash. Press ASSOCIATE CALL again to cancel the call and turn off the yellow stack light.
BUFFER ENTRY Light	On – green	Tote entry light curtain on Buffer module is unblocked and ready for operation.
	Flashing - green	Tote entry light curtain on Buffer module has been breached, but is now clear. Waiting for the buffer light curtain reset from the Buffer OCP.
	Off	Tote entry light curtain is blocked
RESET Illuminated Pushbutton	Flashing – blue	Fault occurred but is ready to reset. Press button to reset the fault.
	Off	No faults detected
START Illuminated Pushbutton	On – green	Machine running in Auto Mode
	Flashing – green	Ready to start. Press button to start the machine.

Button or Indicator	Status	Function/Indication
	Off	Not ready to start in Auto Mode
STOP Illuminated Pushbutton	On – red	Machine running in Auto Mode. Press button to stop the machine.
	Off	Machine not running in Auto Mode
JOG UP Illuminated Pushbutton	On - green	System is in MANUAL Mode and should only be operated by maintenance technicians. Call maintenance for support. See section 3.2.2 Maintenance Technician: When illuminated, press to slowly jog the Destacker lift upward.
	Off	During normal operation, this lamp should be off. Maintenance Technician: Manual Mode not active. Turn key switch to MANUAL or reset active faults to activate Jog function.
JOG DOWN Illuminated Pushbutton	On - green	System is in MANUAL Mode and should only be operated by maintenance technicians. Call maintenance for support. See section 3.2.2 Maintenance Technician: When illuminated, press to slowly jog the Destacker lift downward.
	Off	During normal operation, this lamp should be off. Manual Mode not active. Turn key switch to MANUAL Mode or reset active faults to activate Jog function.

2.2.2 Buffer Operator Control Panel (Buffer OCP)

The Buffer Operator Control Panel (Buffer OCP) is located near the tote loading position at the Buffer module. This control panel is an E-Stop station.

Figure 15 Buffer OCP

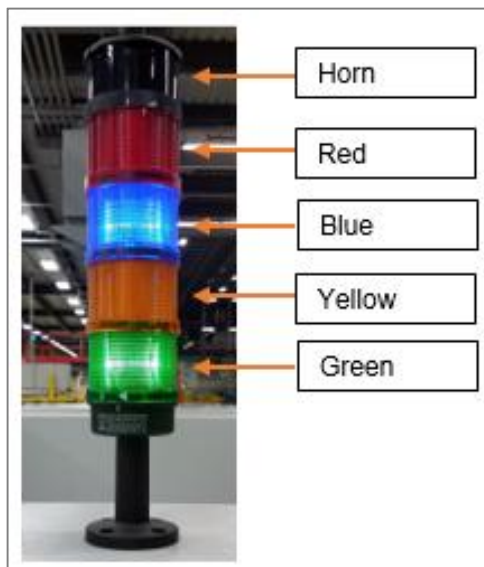


Button	Function/Indication
START pushbutton	Push to clear safety stop activated by breach of tote entry light curtain.
EMERGENCY STOP Push/Twist-pull button	Push to activate E-Stop. Twist/pull to reset.

2.2.3 Start/Warning Stack Light

A stack light with horn is located on the top of the VarioStack. It provides an audible and visible indication of the system status.

Figure 16 Start/Warning Stack Light

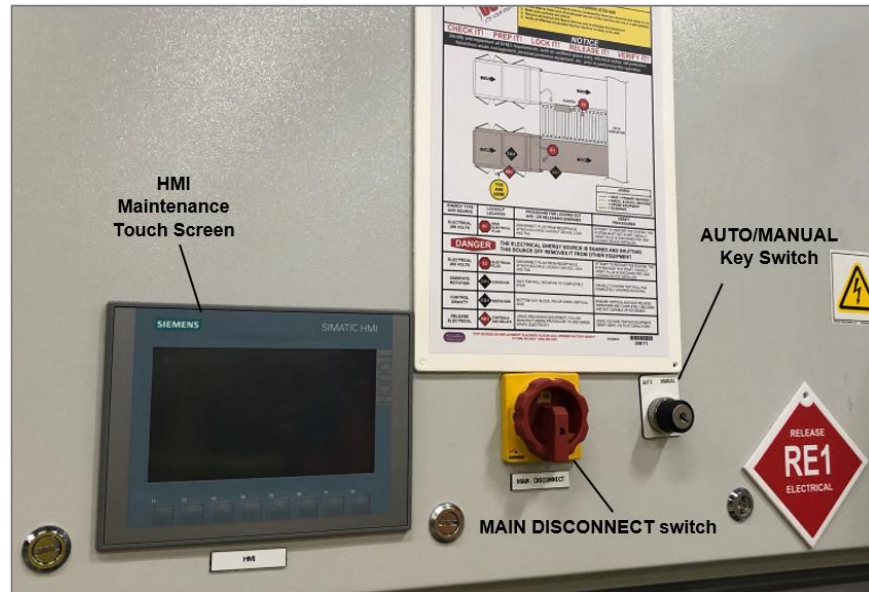


Button	Function/Indication
Horn	Beeps at start-up to warn operator that the machine is about to run. Also beeps after 30 seconds as reminder for the Buffer operator to press the Buffer OCP START button after loading stacks.
Red Flashing	E-Stop is active
Blue	Destacker Module and Buffer Module is fully loaded with tote stacks
Blue Flashing	Buffer module needs to be refilled. The light flashes more rapidly, the closer the buffer gets to being completely empty.
Yellow	Fault is present
Yellow Flashing	ASSOCIATE CALL button has been activated
Green	Machine operation is normal (no faults)
Green Flashing	Machine start-up or idle

2.2.4 Main Control Enclosure

The VarioStack main control enclosure houses the power supply, processors, and other electrical and other components which provide the power and control logic required for system operation. The exterior of the control enclosure features operator interfaces used by maintenance personnel to maintain and troubleshoot the equipment. Only authorized personnel should interact with these interfaces.

Figure 17 Main Control Enclosure



2.2.4.1 MAIN DISCONNECT Switch

The MAIN DISCONNECT is used by maintenance personnel to shut down and lockout / tag out the equipment during maintenance. During normal operation, this switch should always be set to ON. A lockout tag on this switch indicates that maintenance personnel have disabled this workstation to perform system maintenance.



Using the disconnect switch will not isolate all power to the cabinet. Incoming 208VAC power and a dry contact from an external source will remain energized. To disconnect all incoming power, it is also necessary unplug and lock out the 208VAC power cord and M12 connectors located under the VarioStack Exit Conveyor module as described in section 1.7.2.1. of this manual.

2.2.4.2 AUTO/MANUAL Key Switch

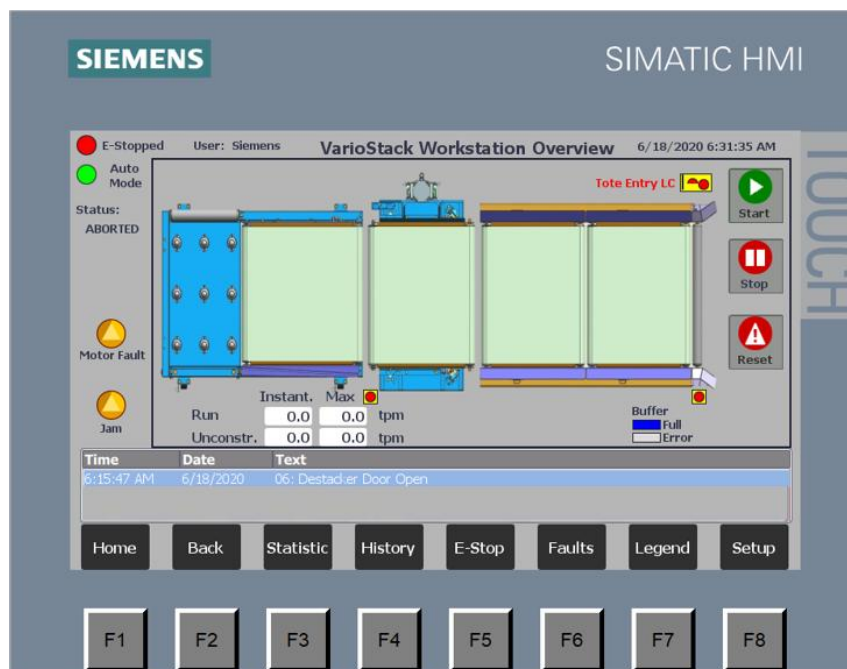
The AUTO/MANUAL key switch is used by maintenance personnel to set the system operational mode. During normal operation, this switch should always be set to AUTO.

2.2.4.3 HMI (Maintenance Touch Screen)

The HMI maintenance touch screen allows maintenance personnel to access maintenance functions used for system troubleshooting, diagnostics, and repair. This screen is protected by login credentials and should only be accessed by authorized personnel. However, operators can view the HMI to obtain information about the system status, alarms and faults. See section 4, Troubleshooting.

NOTE: Use of the Maintenance Touch Screen is covered in detail in the separate document 740-01373 VarioStack Service Manual.

Figure 18 Maintenance Touch Screen



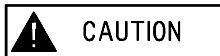
3 Operation

3.1 System Capacities and Limitations

3.1.1 Tote Size and Weight

The VarioStack is designed to handle standard Amazon yellow totes with the following dimensions:

- Length 24 inch
- Width 15.5 inch
- Height 10 inch
- Weight 4-50 lbs



CAUTION: Totes other than standard Amazon totes described above cannot be processed by the VarioStack. Only Amazon standard yellow totes should be loaded into the system.

3.1.2 Maximum Tote Stack Size

Tote stacks of up to 12 totes may be loaded into the Buffer module.

3.1.3 Processing Speeds

Totes are ejected from the VarioStack at a maximum rate of 10 totes per minute.

3.2 Operating the VarioStack

3.2.1 Operator Responsibilities

Two types of operators routinely interact with the VarioStack:

- *Machine Operators* working at the Operator Table retrieve packages from the incoming conveyor, scan items, and load empty totes.
- *Tote Handlers* load new stacks of totes into the Buffer module during operation.

3.2.2 Modes of Operation

The VarioStack has two modes of operation which can be selected using the maintenance key switch on the main control enclosure:

- *Auto Mode* is the default operational mode. When the system is in Auto Mode, all components are operated automatically, controlled by the system logic.
- *Manual Mode* is used by maintenance personnel to troubleshoot, maintain or repair the system. When Manual mode is active, the Destacker lift can be manually jogged up or down, using buttons on the Main OCP.

3.2.3 Pre-Operational Conditions

The following pre-operational conditions must be met, in order for the system to start:

- The unit's 208VAC power supply must be plugged in.
- The MAIN DISCONNECT switch must be on.
- The AUTO/MANUAL key switch must be in AUTO position.
- All E-Stops must be pulled out and the system must be RESET on the Main OCP.
- All safety interlocks must be deactivated (panel doors closed).
- Light curtains must be free from obstruction.
- On the Main OCP, verify the PWR ON light is illuminated.

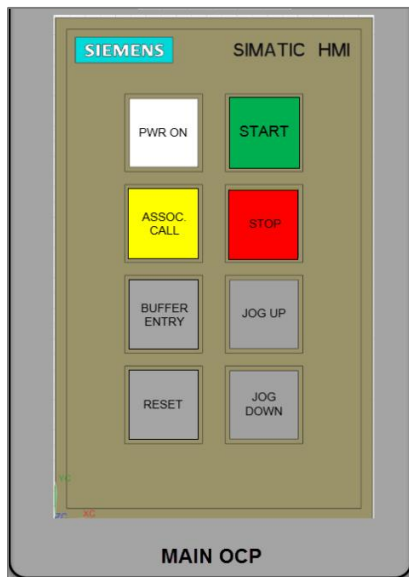
NOTE: If any of the preoperational conditions are not met, press ASSOC. CALL on the Main OCP to call maintenance for support.

3.2.4 System Startup

To start the system at the beginning of a work shift:

1. Ensure that all preoperational conditions have been met (see section 3.2.3).
2. Power up the machine:

Figure 19 Main OCP



See Figure 19.

- a) On the Main OCP, verify the START button is flashing green and verify the green beacon on the stack light is flashing.
- b) If the START button is off, the machine is not ready to start. This is likely due to a previously detected fault. This will be indicated by a flashing or solid blue RESET button and a solid yellow beacon on the stack light.
 - If the RESET button is flashing, press RESET to clear the fault. If the RESET button does not clear after being pressed, then check all E-Stops to ensure they are pulled out, and check for any light curtain obstructions. Occasionally simultaneous fault conditions may require the RESET button to be pressed twice.

NOTE: If the system will not start, see section 4.1 Troubleshooting Table. Or, press ASSOC. CALL on the Main OCP to call maintenance for support.

3. On the Main OCP, press START.

The VarioStack horn will beep to warn operators that the machine is about to run. After a brief initialization routine, the machine will start to output totes, if totes are loaded.

NOTE: The BUFFER ENTRY light on the Main OCP must be solid green (not flashing) in order for the system to output totes. If the light is off, then the Buffer light curtain is blocked and must be cleared. If the light is flashing green, then you must press START on the BUFFER OCP to start output of totes.

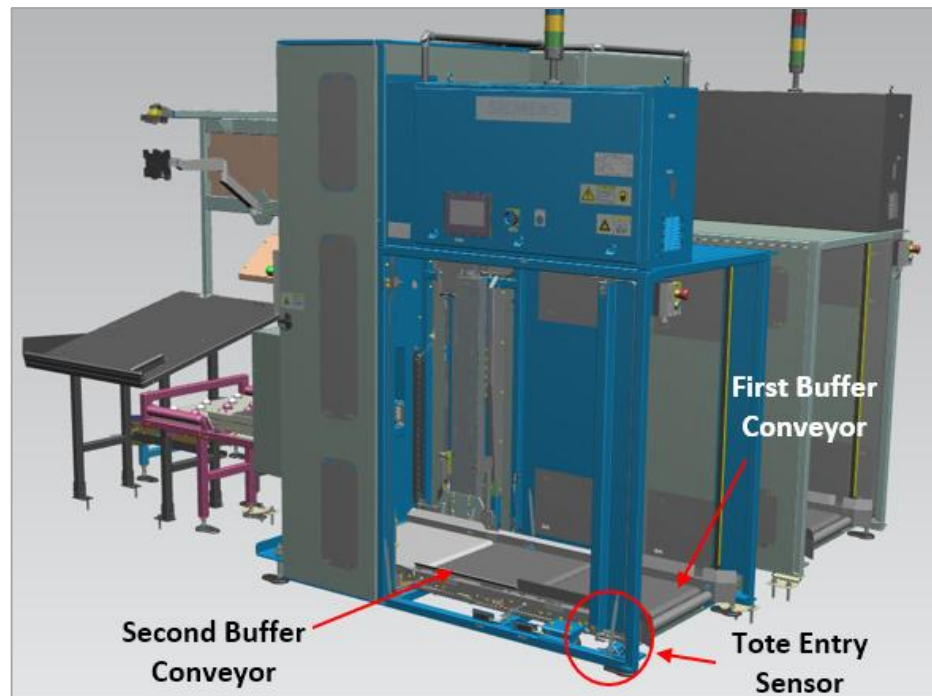
3.2.5 Buffer Module/Tote Stack Loading

The Buffer module serves as the entry point to the VarioStack for stacks of totes. The totes are then stored within the module until the downstream Destacker is ready for a new stack.

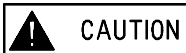
As Machine Operators process totes, the blue beacon on the stack light will illuminate, to indicate that a new stack of totes should be loaded by the Tote Handler.

See Figure 20. The Buffer module consists of two conveyors which advance the stack of totes automatically when the next downstream position is available. A tote entry sensor detects the presence of a new stack and activates the first buffer conveyor to provide loading assistance to the operator.

Figure 20 Buffer Module Side View



To load a stack of totes:



CAUTION

CAUTION: Totes other than standard Amazon yellow totes described above cannot be processed the VarioStack. Only Amazon standard yellow totes should be loaded into the Buffer module.

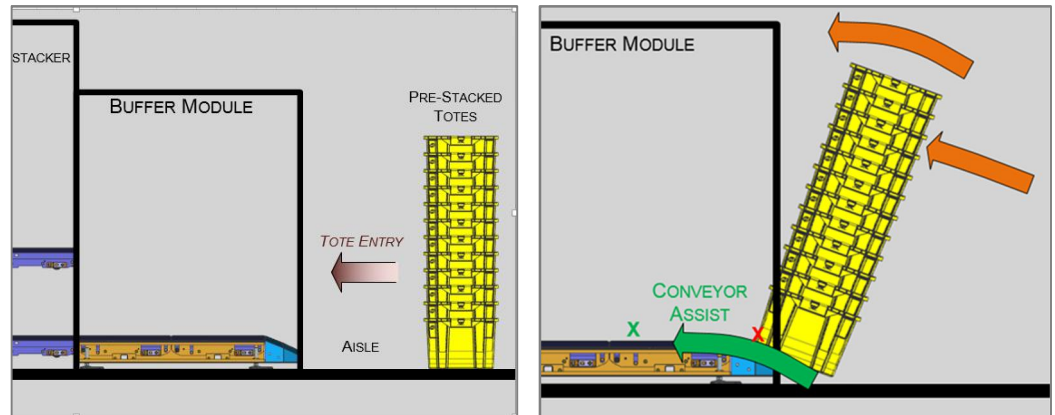
1. Pre-stack totes (maximum of 12 totes to a stack).
2. Verify the system is ready for totes to be loaded:
 - Ensure the system is started (See section 3.2.4).

- Ensure the first Buffer conveyor is free of totes.



Never step on or attempt to “ride” the conveyors in the Buffer module. The stack will be advanced automatically by the system as the Buffer module Tote Entry Sensors detect the totes. It is not necessary to enter the Buffer module to load a stack of totes.

Figure 21 Loading Stacked Totes into the Buffer Module

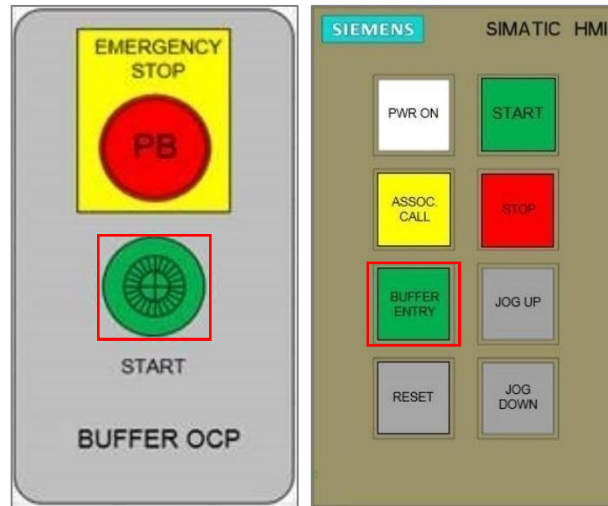


See Figure 21.

3. Tilt the stack and load the bottom of the stack onto the first buffer conveyor. When the tote entry sensor detects the presence of a tote, the first buffer conveyor will turn on to slowly assist pulling the stack onto the conveyor belt.
4. Continue pushing the stack from behind, until it fully rests on the first buffer conveyor and is rotated back to level.

NOTE: The tote entry is protected by a safety light curtain (see section 1.8.4). When the light curtain detects the presence of objects, the Destacker lift will immediately stop and the BUFFER ENTRY light on the Main OCP will flash green, to indicate a pause in operation. However, the Buffer module conveyors will continue to run in order to load the totes.

Figure 22 Tote Stack Loading



5. After the tote stack has been loaded, press **START** on the Buffer OCP (Figure 22) to restart the Destacker lift and resume normal operation.

The Main OCP **BUFFER ENTRY** button will turn solid green to indicate the machine is again fully operational, and machine operators can continue to load totes.

The system will wait until the second buffer conveyor is available and will then automatically advance the stack when the transfer to the second buffer conveyor can be made.

3.2.6 Call Associate

The **ASSOCIATE CALL** button on the Main OCP, allows the Machine Operator to call for maintenance support.

When this button is activated (pressed), the following occurs:

- The **ASSOCIATE CALL** button flashes yellow, to indicate it is active.
- The yellow stack light flashes to indicate to associates that support is needed.

To cancel the request, press the **ASSOCIATE CALL** button again. The button will stop flashing and the yellow stack light will turn off.

3.2.7 System Stop/Shutdown

System operation can be temporarily stopped and restarted from the Main OCP:

1. On the Main OCP, press the **STOP** button.
All conveyors and the Destacker module will come to a stop.
The **START** button will flash green.

2. To restart the system, press START.

The start warning will sound before the machine starts.

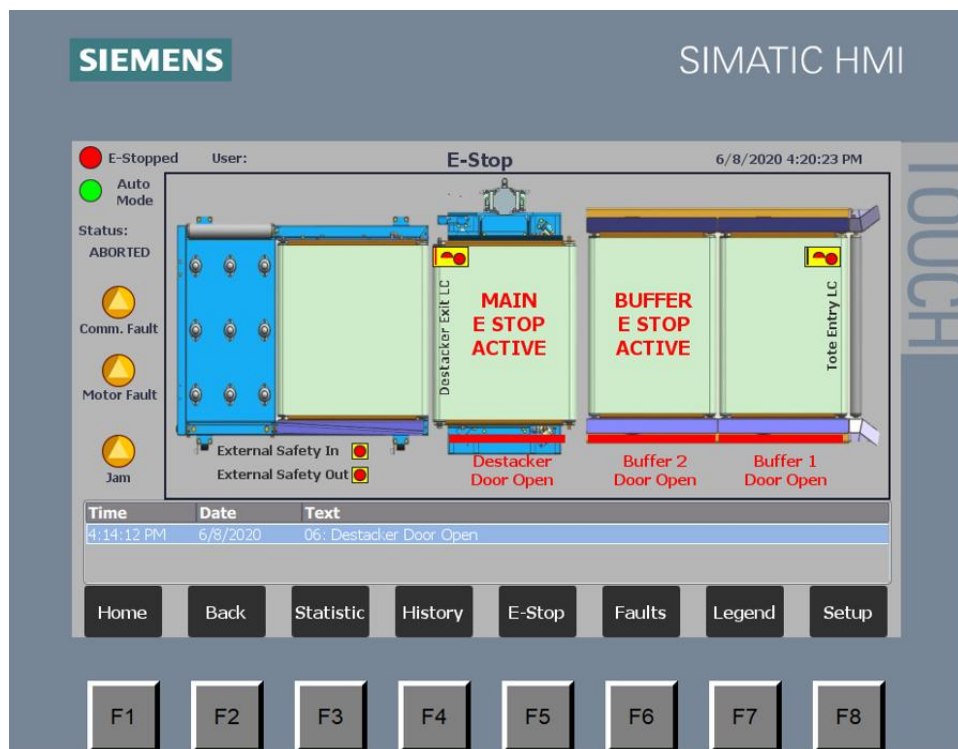
All conveyors and the Destacker module resume operation in their previous state.

3.2.8 E-Stop

EMERGENCY STOP pushbuttons are located on both the Main OCP and the Buffer OCP. Press EMERGENCY STOP when continued operation of the system may result in injury to personnel or to damage of equipment.

When an E-Stop is activated, it will appear on the maintenance touch screen. A message on the system visualization will indicate where the E-Stop occurred and provide information about the E-stop condition. The E-stop will also be displayed in red on the Alarms and Faults section of the screen.

Figure 23 HMI E-Stop Indications



NOTE: Use of the HMI is covered in detail in the separate document 740-01373 VarioStack Service Manual.

3.2.8.1 E-Stop from MAIN OCP

When an E-Stop is activated (pushed) from the Main OCP, the following occurs:

- All motors are de-energized and come to an immediate stop.

- The red stack light flashes.
- The E-Stop is indicated on the HMI

To reset the E-Stop:

1. Clear the safety violation or reason for the E-Stop.
2. Twist and pull out the EMERGENCY STOP pushbutton on the Main OCP.
The RESET button on the Main OCP flashes blue.
3. Press RESET.
The RESET button stops flashing if the condition is successfully reset.
The START button flashes green.
4. Press START.
The system restarts and the START button illuminates steady green.

3.2.8.2 E-Stop from Buffer OCP

When an E-Stop is activated (pushed) from the Buffer OCP, the following occurs:

- All motors are de-energized and all comes to an immediate stop.
The red stack light flashes.

To reset the Buffer OCP E-Stop:

1. Clear the safety violation or reason for the E-Stop.
2. Twist and pull out the EMERGENCY STOP pushbutton on the Buffer OCP.
The RESET button on the Main OCP flashes blue.
3. Press RESET.
The RESET button stops flashing if the condition is successfully reset.
The START button flashes green.
4. Press START.
The system restarts and the START button illuminates steady green.

3.2.8.3 E-Stop Due to Interlock

When an access door is opened, or if the Destacker module tote exit light curtain has been breached by an object other than a tote, the system treats this as an E-Stop, and the following occurs:

- All motors are de-energized and all equipment comes to an immediate stop.
- The red stack light flashes.

To reset an E-Stop due to interlock violation:

1. Clear the safety violation or reason for the E-stop.

The RESET button on the Main OCP flashes blue.

2. Press RESET.

The RESET button stops flashing if the condition is successfully reset.

The START button flashes green.

3. Press START.

The system restarts and the START button illuminates steady green.

3.2.9 Operator Table Operation

The Operator Table is a stationary workstation at which an operator places items from boxes into the single tote that is sitting on the Exit Conveyor module's roller ball table. Once the tote is filled, the operator pushes it onto the existing facility takeaway conveyor.

The machine operator must perform the following tasks:

1. Retrieve a package from an incoming conveyor.
2. Open the package.
3. Use a hand-held scanner to scan the license plate on the tote that items will be placed in next.
4. Scan the first item from the package and place it in the tote.
5. Repeat until the tote is full.
6. Push the full tote onto the facility takeaway conveyor.
7. Place the empty packaging onto the facility package debris conveyor
8. The VarioStack will present a new empty tote to the operator and the cycle will repeat.

This description is simply to better understand the purpose of the workstation. The actual workflow of the operator may vary based on your facility's existing operating procedures.

4 Operator Troubleshooting

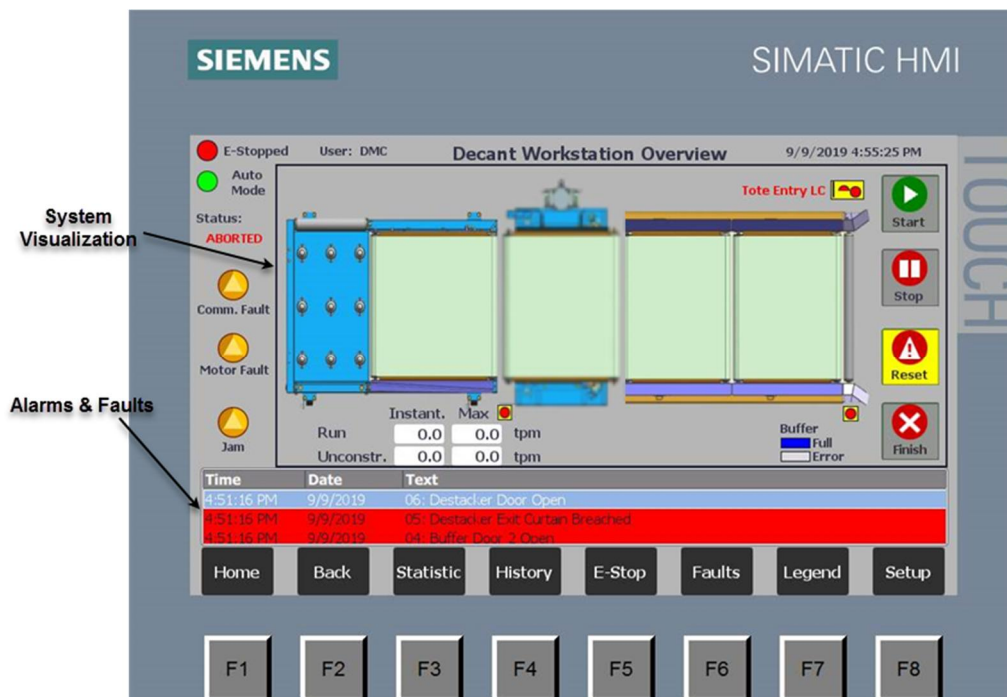
4.1 Troubleshooting Table

Trouble	Possible Cause	Corrective Action
VarioStack does not start	Power is not on or voltage is incorrect	Call maintenance
	A circuit is open or a fuse is blown	Call maintenance
	E-Stop activated by pushing E-STOP pushbutton, opening interlocked door, or tote exit conveyor light curtain has been breached	Correct E-Stop condition and reset the E-Stop as described in Section 3.2.8
VarioStack stops operating	Totes being loaded	Finish loading totes, and then on the Buffer OCP, press START
	Entry light curtain breached by foreign object	Clear the light curtain, and then on the Buffer OCP, press START
	Tote exit light curtain breached	Clear the light curtain, and then on the Main OCP press RESET
Buffer conveyor 2 running, but not releasing stack	Stack is jammed	Call maintenance to clear jam
Buffer conveyor 1 running, but stack not transferring to Buffer conveyor 2	Jam in Buffer module	Call maintenance to clear jam
Buffer conveyor 1 not advancing totes	No totes loaded	Load totes into Buffer module
Destacker lift will not lower	Unknown object blocking Destacker sensor	Call maintenance

4.2 Error Messages

During operation, system status is always displayed on the HMI maintenance touch screen. While the functions of this screen are restricted to maintenance use, operators can use the screen to view a read-out of current system messages, including E-Stop messages, current warnings, and faults.

Figure 24 HMI Error Indications



The main part of the screen displays a system visualization. The system submodules are displayed and text over the module graphic may display status messages.

The bottom of the screen displays a list of current system messages. Possible system messages and message type are provided in the table below.

NOTE: Use of the HMI maintenance touch screen is covered in detail in the separate document 740-01373 VarioStack Service Manual.

No	Name	Message	Message Type
01	EStopFlag_0	01: Keypad E-Stop Pressed	E-Stops
02	EStopFlag_1	02: Buffer E-Stop Pressed	E-Stops
03	EStopFlag_3	03: Buffer Door 1 Open	E-Stops
04	EStopFlag_4	04: Buffer Door 2 Open	E-Stops

No	Name	Message	Message Type
05	EStopFlag_5	05: Destacker Exit Curtain Breached	E-Stops
06	EStopFlag_6	06: Destacker Door Open	E-Stops
07	AxisFaults_2	07: Lift Motor Lost Communication	E-Stops
08	Spare_ES_1	08: SPARE E-Stop	E-Stops
09	Spare_ES_2	09: SPARE E-Stop	E-Stops
10	Spare_ES_3	10: SPARE E-Stop	E-Stops
11	Spare_ES_4	11: SPARE E-Stop	E-Stops
12	Spare_ES_5	12: SPARE E-Stop	E-Stops
13	Spare_ES_6	13: SPARE E-Stop	E-Stops
14	Spare_ES_7	14: SPARE E-Stop	E-Stops
15	Spare_ES_8	15: SPARE E-Stop	E-Stops
16	Spare_ES_9	16: SPARE E-Stop	E-Stops
17	AxisFaults_0	17: Lift Servo Error	Faults
18	AxisFaults_3	18: Lift Position Mismatch	Faults
19	AxisFaults_4	19: Lift Hardware Limit Reached	Faults
20	Buffer1_0	20: Buffer 1 Conv Drive Fault	Faults
21	Buffer1_1	21: Unexpected Object/Debris at Buffer 1 HES Sensor	Faults
22	Buffer1_4	22: Buffer 1 Conv Failed to Move When Commanded	Faults
23	Buffer2_0	23: Buffer 2 Conv Drive Fault	Faults
24	Buffer2_1	24: Unexpected Object/Debris at Buffer 2 HES Sensor	Faults
25	Buffer2_4	25: Buffer 2 Conv Failed to Move When Commanded	Faults
26	SequenceFaults_0	26: Destack Failed - Retry Limit Exceeded on Destack Confirmation PE	Faults
27	SequenceFaults_1	27: Collision Detection: Stack Misaligned on Destacker. Check Alignment PEs	Faults
28	SequenceFaults_2	28: Stack Transfer Error: Failed to Arrive at Destacker	Faults
29	SequenceFaults_3	29: Object Under Lift	Faults
30	SequenceFaults_4	30: Servo Drive Failure During Homing	Faults
31	SequenceFaults_5	31: Unexpected Tote Loss While Destacking	Faults
32	SequenceFaults_6	32: Collision Detection: Stack Too High. Check Entry High PE Alignment	Faults
33	SequenceFaults_7	33: Object/Debris Between Buffer 2 and Lift	Faults
34	DestackerConv_Faults_0	34: Destacker Conv Drive Fault	Faults

No	Name	Message	Message Type
35	DestackerConv_Faults_1	35: Unexpected Object/Debris at Destacker HES Sensor	Faults
36	DestackerConv_Faults_4	36: Destacker Conv Failed to Move When Commanded	Faults
37	LeftGripFaults_0	37: Front Upper Gripper Close/Extend Jam	Faults
38	LeftGripFaults_1	38: Front Gripper Feedback Missing	Faults
39	LeftGripFaults_2	39: Front Gripper Feedback Missing	Faults
40	LeftGripFaults_3	40: Front Gripper Feedback Error	Faults
41	LeftGripFaults_4	41: Front Gripper Feedback Error	Faults
42	LeftGripFaults_5	42: Front Gripper Failed to Engage	Faults
43	RightGripFaults_0	43: Right Upper Gripper Close/Extend Jam	Faults
44	RightGripFaults_1	44: Back Gripper Feedback Missing	Faults
45	RightGripFaults_2	45: Back Gripper Feedback Missing	Faults
46	RightGripFaults_3	46: Back Gripper Feedback Error	Faults
47	RightGripFaults_4	47: Back Gripper Feedback Error	Faults
48	RightGripFaults_5	48: Back Gripper Failed to Engage	Faults
49	EmptyTote_0	49: Tote Conv Drive Fault	Faults
50	EmptyTote_1	50: Unexpected Object/Debris at Tote Conv HES Sensor	Faults
51	EmptyTote_4	51: Tote Conv Failed to Move When Commanded	Faults
200	General_0	200: Machine in Manual Mode	Warnings
201	General_1	201: Reset Statistics	Warnings
202	General_2	202: Machine Reset	Warnings
203	General_3	203: Machine Started	Warnings
204	General_4	204: Machine Stopped	Warnings
205	General_5	205: PLC Startup	Warnings
206	General_6	206: Machine Starved	Warnings
207	General_7	207: Machine Starvation Ended	Warnings
208	General_8	208: Buffer Entry Curtain Breached	Warnings
209	General_9	209: Buffer Entry Curtain Breached 30s Timeout	Warnings
210	AxisFaults_1	210: Lift in Maintenance Mode	Warnings
211	Buffer1_2	211: Stack Transfer Error: Failed to Arrive at Buffer 1	Warnings
212	Buffer1_3	212: Stack Transfer Error: Failed to Send from Buffer 1 to Buffer2	Warnings
213	Buffer2_2	213: Stack Transfer Error: Failed to Arrive at Buffer 2	Warnings
214	Buffer2_3	214: Stack Transfer Error: Failed to Send from Buffer 2 to Destacker	Warnings

No	Name	Message	Message Type
215	DestackerConv_Faults_3	215: Stack Transfer Error: Failed to Send from Destacker to Tote Conv	Warnings
216	LeftGripFaults_6	216: Grippers Not Responding	Warnings
217	EmptyTote_2	217: Stack Transfer Error: Failed to Arrive at Tote Conv	Warnings
218	EmptyTote_3	218: Stack Transfer Error: Failed to Send from Tote Conv to Ball Table	Warnings

4.3 Clearing Jams

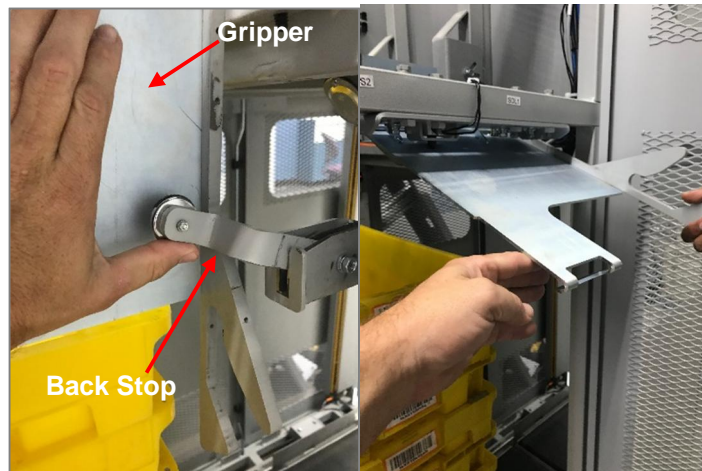
NOTE: Only authorized employees properly trained in jam clearing should be allowed to clear jams.

4.3.1 Clearing Jams from the Destacker

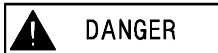
To clear most jams from the Destacker module:

1. Observe the cause of the jam, and report it to the appropriate supervisor. Often jams occur because totes are of poor quality or equipment requires maintenance.
2. If the system has not come to a stop, press an EMERGENCY STOP button.

Figure 25 Raise the Back Stop and Lift the Gripper



3. Open the Destacker access door and raise the back stop to release the gripper. Then lift the gripper to release the totes. See Figure 25.



DO NOT climb in or on the equipment at any time.

Figure 26 Pulling out the Stack

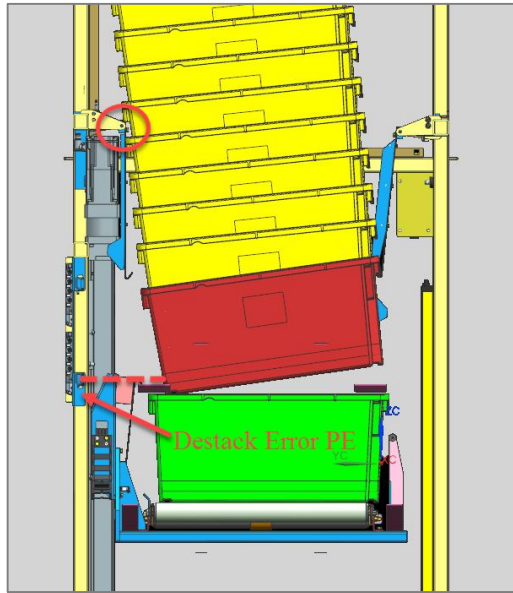


4. With the gripper moved out of the way, pull out the stack, as shown in Figure 26.
5. Remove any spilled materials from the VarioStack before restarting and, if necessary, clean as thoroughly as possible to prevent damage to belts or equipment.
6. Inspect all grippers for obvious failure. Look for warped, misaligned or broken grippers. If broken or damaged grippers are found, do not continue operation of the system. Call maintenance personnel for support.
7. After the jam is cleared, close the Destacker access door and restart the system using the E-Stop restart procedure described in section 3.2.8.

4.3.2 Clearing Totes after Failure of the Upper Grippers

Failure of the upper grippers to properly support the stack above the bottom tote can lead to a jam condition as shown in Figure 27, where the stack tilts due to being supported from only one side, as the Destacker pulls the bottom tote from the bottom.

Figure 27 Failure of Upper Grippers in Destacker Module



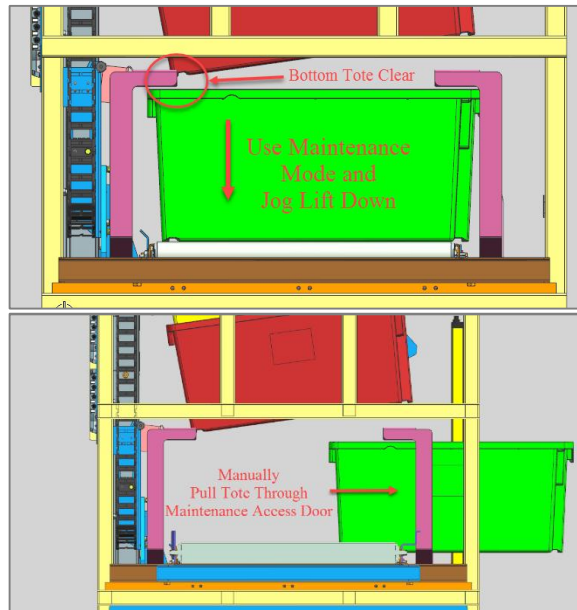
A typical cause of this condition is a broken handle on a tote that prevents one gripper from using it to support the stack. Section 4.3.2.1 describes how this jam can be cleared.

4.3.2.1 Recovery

The most likely scenario is that the bottom tote has become severely misaligned with the tilted stack above. If this error has occurred, use the following procedure to clear the totes from the Destacker.

1. Ensure all operator and maintenance doors are closed, and light curtains are cleared.
2. On the main control enclosure, turn the AUTO/MANUAL key switch to MANUAL to put the VarioStack in Manual Mode.

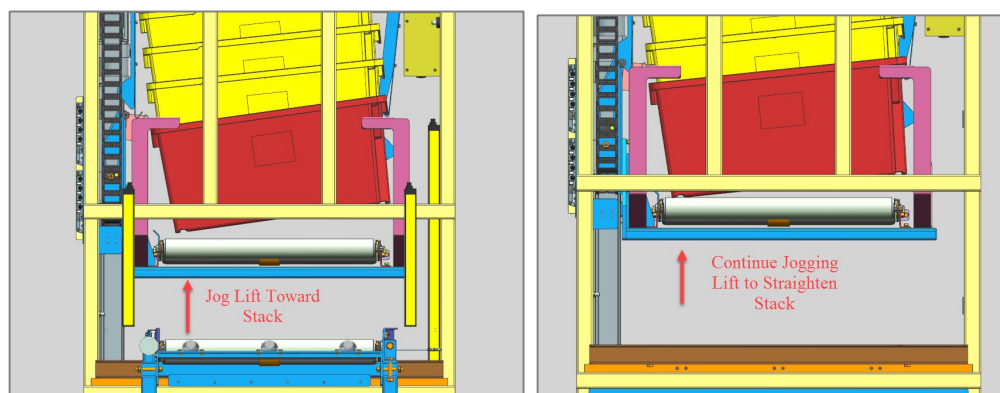
Figure 28 Clear Bottom Tote



3. On the Main OCP, press UP and DOWN as needed to clear the bottom totes from the stack above, and remove them through the front buffer maintenance access door. See Figure 28.

NOTE: Manual mode will only allow the Destacker lift to move when all safety interlocks are engaged, including the maintenance access door. You can view tote motion through the windows in the door. To safely remove a tote, use a pole, or other object to pull the tote out, without reaching into the machine.

Figure 29 Jog the Lift to Straighten Stack

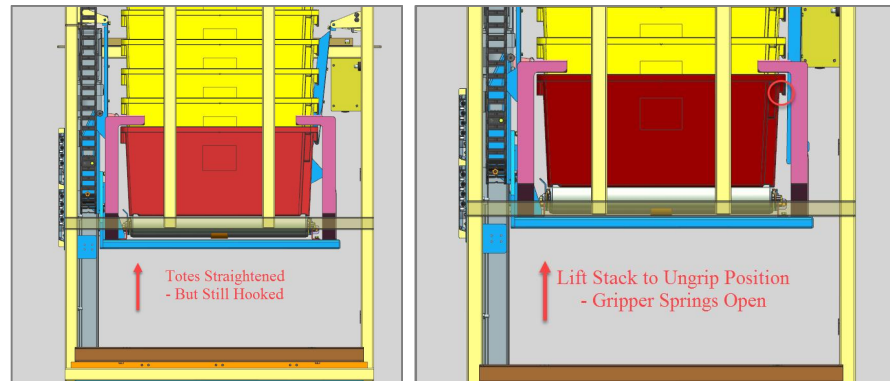


4. Close the buffer maintenance door, and on the Main OCP, press UP to jog the Destacker lift up to begin supporting the load of the tilted stack above as shown in Figure 29.
5. Once the lift contacts the tilted stack, continue raising the lift until the stack is straightened. The lower friction belt on the Destacker conveyor should

allow the bottom tote corner to slide across, as the stack is pushed upward from the failed gripper side.

NOTE: Take care when executing this step. If the stack does not straighten up as the lift is raised, then the lift should stop being raised to avoid damaging components. Lower the lift slightly to relieve pressure. The stack can likely be straightened manually and re-hung on the upper gripper that was not engaged or disconnected from the gripper that remains engaged. This will straighten out the stack.

Figure 30 Tote Straightened and Lift Stack to Ungrip Position



When the lift corrects the tilted stack, it should slightly raise the stack to allow the right gripper (the one that successfully hooked onto the tote handle) to release.

At this point, the full weight of the stack is supported by the lift and the grippers are safely retracted away. The lift can now be jogged down until the stack is low enough to be pulled through the door.

Figure 31 Latch Gripper to Open Position



6. Open the Destacker access door, and rotate the nearside upper gripper and latch it to open position, to provide clearance to pull the full stack of totes through the doorway
7. Correct the condition that caused the jam, including removing any broken totes or possibly repairing the upper gripper that failed to actuate.
8. Inspect all grippers for obvious failure. Look for warped, misaligned or broken grippers. If broken or damaged grippers are found, do not continue operation of the system. Call maintenance personnel for support

After the jam is cleared, restart the system using the E-Stop restart procedure described in section 3.2.8.