1.5 OPEX Automated Workstation Operator Manual

Read, understand, and follow the information in the *Operating Instructions* for your machine, either the OPEX Infinity® or Perfect Pick®, before attempting to operate, service, or troubleshoot this equipment.

Keep instructions for future use!

About OPEX Corporation

OPEX Corporation is more than a manufacturer of machines. We continuously reimagine technology to power the future for our customers.

With an innovative approach, we engineer unique automated solutions that support our customers so they can solve the most pressing business challenges for both today and tomorrow. Our scalable Warehouse, Document, and Mail Automation solutions improve workflow, accelerate change, and drive efficiencies in infrastructure.

We are a family-owned and operated organization with more than 1600 committed employees who innovate, manufacture, install, and service products that are helping transform industry every day. We listen to our customers, respect each other, and work together to help reimagine the future through automated solutions.

At OPEX, we are Next Generation Automation.

Contacting OPEX

For technical support:

Please have the model name and serial number of the product ready.

- Americas: 1 800-673-9288 or 856-727-1950
- EMEA: +1 800-673-9288
- Australia: +1 800-945247
- service@opex.com

For other inquiries:

OPEX® Corporation
305 Commerce Dr.
Moorestown, NJ 08057-4234 USA

Tel: +1 856.727.1100

Fax: +1 856.727.1955

opex.com

If you find errors, inaccuracies, or any other issues or concerns with this document, contact GroupWATechwriters@opex.com.

For help with opexservice.com issues, contact dshelp@opex.com.

Document History

Rev	Date	Changes
A	November 2023	Original revision

Contents

1. Introduction

1.1 Foreword

This chapter contains information about the OPEX Automated Workstation that is essential to the proper and safe handling of the machine.

> Read, understand, and follow the information in the *Operating Instructions* for your particular machine, either an OPEX Infinity® or Perfect Pick®, before attempting to operate, service, or troubleshoot this equipment.
>
> Keep instructions for future use.

The *Operating Instructions* were written in accordance with the Machinery Directive 2006/42/EC. It is an integral part of the machine.

Follow the instructions carefully to avoid damage.

Illustrations in these instructions are simplified schematic diagrams that show the basic functionality or structure of an assembly. These illustrations might not represent the latest design.

These instructions describe the basic components and functions that are required to understand how the system works.

These instructions are not subject to any automatic revision service. Be sure to retain the latest electronic release of the *Operating Instructions* for your reference. The latest release can be downloaded in PDF format at www.opexservice.com (authorized, registered users only).

1.2 Warranty conditions

The warranty is linked to the correct and careful observance of the information in the Operating Instructions. OPEX Corporation only permits the use and configuration of the machine as described in the following chapters. All other uses and settings are not permitted unless they have been agreed in advance and are attached to the Operating Instructions.

OPEX Corporation assumes no responsibility for damage arising from:

- Failure to follow the instructions in this manual
- Incorrect transport and storage of the machine
- Improper assembly, commissioning, operation, and maintenance of the machine
- Operating the machine with defective safety devices or safety and protective devices that are not installed properly or are not working
- Performing unauthorized changes/modifications to the machine
- Unauthorized structural changes to the machine
- Unauthorized changes to the electrical control
- Unauthorized/improperly performed repairs
- Inadequate monitoring of machine parts that are subject to wear

- Use of non-original or non-approved spare parts
- Improper use of the machine
- Disasters caused by foreign bodies and force majeure

OPEX Corporation's "General Terms and Conditions of Sale and Delivery" apply. The customer can view these after contract conclusion. Warranty and liability claims for personal injury and damage to property are excluded if they are due to one or more causes listed above.

If the machine is sold to a second buyer by the first buyer, the responsibility of OPEX Corporation regarding the machine described here expires.

If the machine is sold to a buyer in another country with a different language, the responsibility for handing over a carefully and correctly translated copy of these *Operating Instructions* lies with the first buyer.

1.3 Safety message conventions

1.3.1 General information

These instructions use safety message conventions to alert you about safety hazards associated with certain procedures and situations.

Machine and system-specific hazards can always occur in combination and in mutual interactions with one another.

1.3.2 Structure

Safety messages are structured as follows:

> ⚠ **SIGNAL WORD**
>
> **Nature of hazard**
>
> *Consequence of interaction with the hazard.*
>
> ▶ Avoidance procedures.

1.3.3 Signal words

The following signal words are used in these Safety messages:

⚠ **DANGER**

Indicates a hazardous situation that, if not avoided, results in death or serious injury. The use of this signal word is limited to the most extreme situations.

⚠ **WARNING**

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ **CAUTION**

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

SAFETY INSTRUCTIONS

Indicates specific safety-related instructions or procedures.

1.3.4 Symbols and other graphics

The following symbols and graphics are used in these instructions:

⚠️	This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
📖	This symbol signifies that the instruction manual/booklet must be read.
ℹ️	This symbol provides important information on how to use the machine properly and gives you application tips or particularly useful information. Failure to follow these instructions results in malfunctions on the machine or in the surrounding area. These instructions help you to use all the functions on your machine optimally.
⚡	This symbol indicates hazardous voltage. It calls your attention to components or operations that could be dangerous to you and other persons. Read the message and follow the instructions carefully.
▶	Hazard avoidance procedures.

1.4 Target audience

1.4.1 General safety information

> ⚠ **DANGER**
>
> **Insufficient qualification**
>
> *Insufficient qualification and improper use can lead to significant personal injury and damage to property.*
>
> ▶ Only Qualified Persons are allowed to operate the system.
>
> ▶ Adhere to the skill and qualification levels indicated throughout these instructions.

> **SAFETY INSTRUCTIONS**
>
> The employer is responsible for properly supervising and monitoring employees. If the employees do not have the necessary knowledge, then the employer must provide training. It is the employer's responsibility to ensure that employees fully read and understand the Operating Instructions.

1.4.2 Skills and qualifications

The skill and qualification levels are defined as follows:

- **Supervisor** – Appointed by the purchaser and responsible for occupational safety on site.
- **Operator** – A qualified person of at least 18 years who possesses extensive knowledge and training and has successfully demonstrated the ability and skills to operate or use a machine or equipment. The person has received safety training to identify and avoid the hazards involved. The person has received safety training to identify a machine, equipment, or area where servicing or maintenance is being performed under lockout/tagout.
- **Purchaser** – Responsible for the following tasks:
  - Proper and safe operation of the equipment
  - Occupational health and safety
  - Adherence to the preventive maintenance schedule
  - Contacting OPEX® Corporation for repair maintenance
- **Authorized Personnel** – Manufacturer's personnel or personnel trained and certified by the manufacturer to perform a specific type of duty. The person locks out and tags out machines or equipment to perform servicing or maintenance on the machine or equipment. The person recognizes and avoids possible hazards due to her or his technical training, knowledge, and experience.
- **Mechanically Qualified Personnel** – A person who (in jurisdictions where governmental authorization is required) is granted authorization to perform work on or around mechanical systems and components. The person locks out and tags out machines or equipment to perform servicing or maintenance on mechanical systems of the machine or equipment. The person recognizes and avoids possible hazards due to her or his technical training, knowledge, and experience.
- **Electrically Qualified Personnel** – A person who (in jurisdictions where governmental authorization is required) is granted authorization to perform work on or around energized circuits or equipment. The person locks out and tags out machines or equipment to perform servicing or maintenance on electrical systems of the machine or equipment. The person recognizes and avoids possible hazards due to her or his technical training, knowledge, and experience.
- **Super User** – A direct employee of the purchaser who has been trained and certified by OPEX in the following tasks:
  - Fundamental operating aspects of the Infinity Automated Workstation, Infinity machine, and Cortex software
  - Performance of basic jam clear tasks
  - Appropriate management of totes and containers used in the Inifinty Automated Workstation and Infinity Present Station
  - Required safety procedures as applicable, including but not limited to:
    - Proper entry into the Infinity
    - Use and operation of the Infinity safety interlock system

1.4.3 Qualification matrix

The target groups that can interact with the machine are in Table 1.1: Qualification Matrix on page 8 below.

> ⚠ **DANGER**
>
> **Inadequate qualification level.**
>
> *Disobeying qualification levels poses a risk of serious injury or death. It also poses a risk of machine damage and production failure.*
>
> ► Read and understand Skills and qualifications on page 7 before attempting to interact with this equipment.
>
> ► Adhere to the qualification level indicated in the qualification matrix.
>
> ► The purchaser is responsible for the qualifications of the personnel or contacting OPEX for service.

Table 1.1: Qualification Matrix

Person/Task	Operator	Super User	Electrically/Mechanically Qualified Personnel	Authorized Personnel
Packing/Transport				X
Installation				X
Commissioning				X
Operation	X	X		
Troubleshooting				X
Fault Elimination				X
Working on Power Enclosure				X
Inspection/Cleaning		X	X	X
Preventive Maintenance		X	X	X
Repair Maintenance				X
Decommissioning				X
Disassembly				X

2. Safety

2.1 General Information

The information provided in this chapter educates you on various safety issues regarding the operation and maintenance of the OPEX equipment described in these instructions.

	Read this chapter thoroughly before using this equipment.
⚠️	Failure to do so can result in serious injury or death.
	Faults that impair safety must be eliminated immediately.

2.2 Occupational health and safety

⚠️ **WARNING**

Automated warehouses.

Working in automated warehouses can pose physical, mental, and social health and safety hazards.

- ▶ Implement proper Lockout/Tagout procedures.
- ▶ Properly train employees.
- ▶ Follow local law and regulations.
- ▶ Observe the safety messages throughout these instructions.

Repetitive action.

Operators may not be mentally focused due to repetitive action.

- ▶ Instruct operators regularly on residual risks.

Unforeseeable events.

Fainting of operator, outbreak of fire, explosion.

- ▶ The purchaser must define the role and responsibilities of an emergency first aider in the job description.
- ▶ Employees shall receive training for the proper use of fire-fighting equipment (e.g. fire extinguisher) as part of an emergency action plan.

Slippery surface.

Stepping on unsecured flat machine surfaces (e.g. for maintenance / repair work).

▶ Before stepping on flat surfaces, clean them of debris, dust, etc. Secure hazardous areas with safety barriers.

▶ Wear proper footwear.

Dismantling protective covers.

Crushing and shearing hazards. Body parts can be trapped or drawn into the machine when dismantling maintenance / protective covers or panels (e.g. side panels).

▶ Servicing the machine shall only be performed by Authorized Personnel or, if indicated, Mechanically/Electrically Qualified Persons.

▶ The system must be at a standstill (main switch OFF and locked-out) when dismantling any covers or panels.

▶ Always keep doors, panels, and maintenance covers closed when operating the machine.

Working at height.

Falling hazards when working at height.

▶ Use only safe climbing aids and working platforms.

▶ Do not use machine parts as climbing aids.

▶ Wear fall protection when working at height.

▶ Check with local law and the specific job site. Follow the work at height requirements accordingly.

Falling objects.

Falling hazards when working at height.

▶ Ensure that totes are always present.

▶ Never reach inside a tote while iBOTs are moving.

▶ Head protection required!

▶ Ensure that products do not stick above the tote.

Uneven surfaces.

Tripping hazards can occur due to uneven surfaces.

▶ Be alert and watch your step. Safety labels provide visibility to step edge.

Dust inhalation and chemical exposure.

Installation and maintenance procedures (e.g. drilling holes) can produce dust.

▶ Wear safety glasses.

▶ Wear a dust mask.

Inhalation of potentially toxic cleaning liquid.

Cleaning liquid can spill in the aisle and pose health hazards.

▶ Wear the appropriate Personal Protective Equipment.

Sharp edges.

Shearing hazards. Sharp edges can pose skin cuts and abrasions (e.g. sheet metal).

▶ Be alert and watch your fingers.

▶ Wear protective gloves during maintenance work.

Consequential damage caused by unhealthy posture, incorrect lifting, or exertion.

This can cause damage to the musculoskeletal system.

▶ Lift correctly and use suitable lifting equipment if necessary.

▶ Always test the weight of the object before attempting to lift.

▶ Check with local law and the specific job site. Follow the weight lifting requirements accordingly.

Poor lighting.

Insufficient light at work can lead to eyestrain, fatigue, headaches, stress, accidents, and low productivity.

▶ Observe the lighting standards and codes applicable at the location of use.

2.3 Workplace requirements

⚠ **WARNING**

Disregarding workplace requirements.

Failure to follow the workplace requirements can pose health and safety hazards.

▶ Always follow workplace requirements.

The use of substances.

The use of substances (e.g. drugs, alcohol, prescription medication) may cause altered states of awareness.

▶ Do not use substances while working on machinery.

Age and job-specific requirements.

Failure to follow age-specific and job-specific requirements can cause severe workplace injuries.

▶ The age-specific and job-specific requirements must be followed for each workplace.

Unauthorized individuals who do not meet the requirements are unaware of possible hazards in the workplace.

▶ Keep unauthorized individuals away from the work area.

▶ If in doubt, ask individuals to leave the work area.

▶ Do not continue operating or servicing the system until unauthorized individuals have left the work area.

2.4 Personal protective equipment

The required personal protective equipment (PPE) may be provided by your employer.

The following protective equipment must be worn when working on the system or components of the system:

- Head protection
- Eye protection
- Respiratory protection (required for special maintenance and cleaning work)
- Hand protection
- Foot protection
- Hearing protection
- Body protection

SAFETY INSTRUCTIONS
PPE should not move around or fall off while you work and should not be too tight or constricting. Too-loose PPE could get caught in machinery and draw you in or provide an inadequate seal to block out the hazards.

Note: With regular wear and use, PPE may lose its effectiveness. You can prolong its life and prevent unnecessary damage by properly storing, cleaning, and inspecting it. If it is damaged, replace it.

(i)	Check with local law and the specific job site to find out what additional PPE is required before starting.

2.5 Ergonomics

As in any occupation that requires you to perform the same motion repeatedly during your work, it is important to consider how you perform your task. Listed below are some guidelines to help you minimize the risk of physical discomfort and injury while operating the equipment.

ℹ️	Always observe the following guidelines when operating the system.

When at the workstation:

- Maintain an upright body posture.
- Occasionally change the angle of your posture for greater comfort.
- Avoid operating the machine for longer than 10 hours each day, or what the local laws allow, whichever is less.
- If possible, stretch between breaks.

2.6 Moving parts of machinery

⚠️ **WARNING**

Moving machinery parts.

Moving machinery parts have the potential to cause severe workplace injuries, such as crushed fingers or hands, amputations, burns, or blindness.

▶ Keep loose objects away from any exposed, moving parts of the machine.

Robots and peripheral devices.

Robots and peripheral devices are capable of high-energy movements through a large volume of space and can hit or trap you.

▶ Never stay within safety fences or soundproof cabins while the system is running.

Mechanical motion.

Draw-in hazards. Mechanical motion can force body parts into a dangerous position.

▶ Keep hands, hair, loose clothing, jewelry, and other foreign objects away from any moving parts of the machine.

▶ Do not attempt to clean the machine while it is running.

► Never use a cloth (or similar material) to clean moving parts. The use of such material on moving mechanisms can result in damage to the machine or severe personal injury. Only clean parts while the machine is locked and tagged out and parts are stationary.

Deceleration of electrical motors.

There is a risk of crush hazards when the electrical motors decelerate.

► Keep hands, tools, and other objects away from moving parts.

2.7 Machine safety precautions

SAFETY INSTRUCTIONS
Familiarize yourself with the locations of machine Emergency Stop switches and keep all areas around the machine clear of obstacles.

The Operating Instructions must be kept near the machine. All safety regulations of the responsible trade association must be observed and the rules and regulations for injury prevention and environmental protection applicable at the location of use must be observed.

⚠ **WARNING**

Disregarding safety precautions.

Failure to follow the safety precautions can pose health and safety hazards.

► Always follow safety precautions.

► Follow the safety precautions on all labels when operating the machine.

► Make sure that everyone is safely away before starting the machine.

Illegible safety labels on the machine.

Safety labels provide critical information to prevent injuries.

► Replace safety labels andwarning signs as soon as they have any wear or damage.

Unexpected start-up of the system.

Manipulating the machine can cause a sudden start-up and severe workplace injuries.

► Adhere to the intended use of the system.

► Train employees regularly.

Flammable, high pressure "canned air."

Fire hazards due to the prohibited use of flammable, high pressure "canned air" to clean dust and debris from the machine.

▶ Air duster spray cans contain flammable chemicals, making them unsafe to use around powered equipment and other sources of ignition.

▶ Canned air may cause foreign body damage to eye.

2.8 Maintenance safety

> **SAFETY INSTRUCTIONS**
>
> **Only Authorized Personnel or, if indicated, Mechanically / Electrically Qualified Personnel or Super Users are permitted to service and maintain the machine:**
>
> 1. Stop the machine before attempting to open or remove exterior panels.
>
> 2. Shut down and lock out the machine before doing any servicing or troubleshooting. Refer to the "Lockout/Tagout (LOTO) Procedures" described in the *Operating Instructions* for your machine.
>
> 3. When working on exposed energized components, set up limited approach boundaries and wear proper PPE.

⚠ **WARNING**

Maintenance work.

Failure to follow the safety instructions below can pose health and safety hazards during maintenance work.

▶ Machine maintenance, particular repairs, replacements, and all adjustments, whether mechanical or electrical, shall be carried out by persons authorized to do so in accordance with a safe system of work.

▶ Do not attempt to service or move the machine while power is connected.

▶ Maintain the machine in proper working condition at all times. When performing maintenance, service, or repairs:

- Maintain the machine according to the scheduled preventive maintenance procedures provided in these instructions.

- Follow applicable service / repair procedures provided in these instructions.

▶ Check connection bolts for tightness.

Tool safety.

Safe tool use contributes to a safer, more efficient work environment. Misusing tools is dangerous and can pose severe workplace injuries and property damage.

▶ Use and maintain tools properly, according to manufacturer's instructions.

▶ Remove tools and other loose items from the machine before applying power.

Falling objects.

Impact hazards due to falling objects.

▶ Adhere to the intended use of the machine.

▶ Wear a hard hat.

Elevated platforms and floor levels.

Falling hazards due to maintenance work on elevated platforms and floor levels.

▶ Follow the country-specific accident prevention regulations (e.g. working on ladders, elevated platforms, lifts, etc.).

▶ Employees are obligated to wear protective hats.

Defective components.

Hazards due to defective components.

▶ Repair or replace defective components.

2.9 Arc-Flash and Electrical Safety

The owner of this equipment is responsible for developing and maintaining safe work policies and practices to minimize employee exposure to arc flash and electrical shock hazards. These practices shall be in accordance with applicable workplace safety codes and shall include:

- Evaluation of the equipment for arc flash and electrical shock hazards,
- and proper labeling of the equipment to alert employees to the hazards, arc-flash boundaries, and PPE requirements.

For more information, refer to applicable electrical safety publications of the country or region where the equipment is operating:

Table 2.1: Safety Publications per Country

Region	Standard	
USA	NFPA 70E & NFPA 79	Standards for Electrical Safety in the Workplace
Canada	CSA Z462-15	Workplace Electrical Safety
Europe	EN 50110-1:2013	Operation of Electrical Installations - General Requirements
UK	BS EN 50110-1:2013-04-30	Operation of Electrical Installations - General Requirements

2.9.1 Electrical Hazards

⚠️ **DANGER**

Live parts.

Live parts inside terminal blocks (e.g. terminals) pose a risk of electric shock, arcing, and short circuits.

▶ Provide source power information and ensure machine specific Lockout/Tagout procedure is created.

Electrical wires.

Electrical wires can easily be damaged. Damaged wires and cables can lead to malfunctions and charge parts, which can cause short circuits or electric shocks.

▶ Only Electrically Qualified Persons, wearing proper PPE are permitted to work on electrical systems.

▶ Wires inside protective tubes, cable ducts, and under protective covers must be routed to protect them from damage.

▶ Check electrical systems of the machine regularly.

▶ Remove loose wire connections and scorched wires immediately.

▶ Lay the cable to provide sufficient cable excess to compensate for thermal expansion.

▶ For moving machine parts, lay the wires so that there is sufficient cable excess to reach the maintenance positions.

▶ Wires shall not cause trip hazards.

▶ Always keep the main control panel locked.

▶ Access to the main control panel is only permitted to Electrically Qualified Persons with a key or tool.

▶ Adhere to the general rule when working on the electrical system, components, or wires: De-energize the machine!

> **SAFETY INSTRUCTIONS**
>
> **Apply the five safety rules (see DIN VDE 0105-1/DIN EN 50110-1) when working on electrical systems:**
>
> 1. Disconnect completely.
>
> 2. Secure against re-connection.
>
> 3. Verify that the installation is discharged/zero voltage.
>
> 4. Carry out earthing and short circuiting.
>
> 5. Provide protection against adjacent live parts.

2.10 Noise emission

The sound level emanating from the machine is approximately 64 - 69 dB(A).

Depending on the local conditions, a higher sound level can occur. This can result in hearing impairment or hearing loss. The employer is responsible to provide personal protective equipment and ensure that all protective measures are taken.

> ⚠ **CAUTION**
>
> **Noise**
>
> *Loud noise could result in hearing impairment, hearing loss, fatigue, or stress.*
>
> ► Always wear hearing protection when higher sound levels occur (8-hour average exposure of 85 dB).

2.11 Fire-Fighting Measures

When fighting fires, be sure to switch off the machine at the main power switch so that electrical fires can be fought effectively.

Firefighting in case of electrical fires: CO_2 extinguishers are to be preferred!

Firefighting in case of fuel-related fires: CO_2 extinguishers are to be preferred!

> **SAFETY INSTRUCTIONS**
>
> Only those trained to use a CO_2 extinguisher may do so!
>
> Do not use water to extinguish the fire!

3. Overview

3.1 Overview of OPEX conveyance

The OPEX conveyance and automated workstations are designed to work with several types of machines, such as the OPEX Infinity® and Perfect Pick®. This chapter describes the layout of a large Infinity machine and shows how the workstations fit into that layout. The general principles apply to different sizes and types of machines.

As the operator at a workstation, you do not necessarily need to understand the entire OPEX conveyance system. However, you should have an overview of the conveyance and understand how it affects the flow of containers and orders at your workstation.

3.1.1 OPEX conveyance and the customer's conveyor system

The OPEX conveyance system consists of two separate sections, one for the front side and another for the back side of the machine. On each side, a scan tunnel is located at the beginning of the OPEX conveyance, which moves containers along the entire length of the machine. OPEX's Cortex software controls the movement of containers throughout the conveyance.

The customer's warehouse conveyor system connects to the beginning and end of the OPEX conveyance on each side. The customer's conveyors are controlled by the customer's Warehouse Management System (WMS) in conjunction with the Cortex system.

- At the beginning of the OPEX conveyance, the customer's conveyor delivers incoming containers used for the various pick and putaway operations. To maintain a balanced workload for each side of the machine, the customer's WMS automatically divides the incoming containers between the two sides.

    Note: At some sites, containers may be delivered manually on a pallet. Then site personnel place the containers onto the OPEX conveyance.

- At the end of the OPEX conveyance, after the orders are fulfilled, the conveyance delivers the containers to the customer's outbound conveyor system. The containers then move to the next step in the customer's order processing, such as the pack area or other area as determined by the WMS.
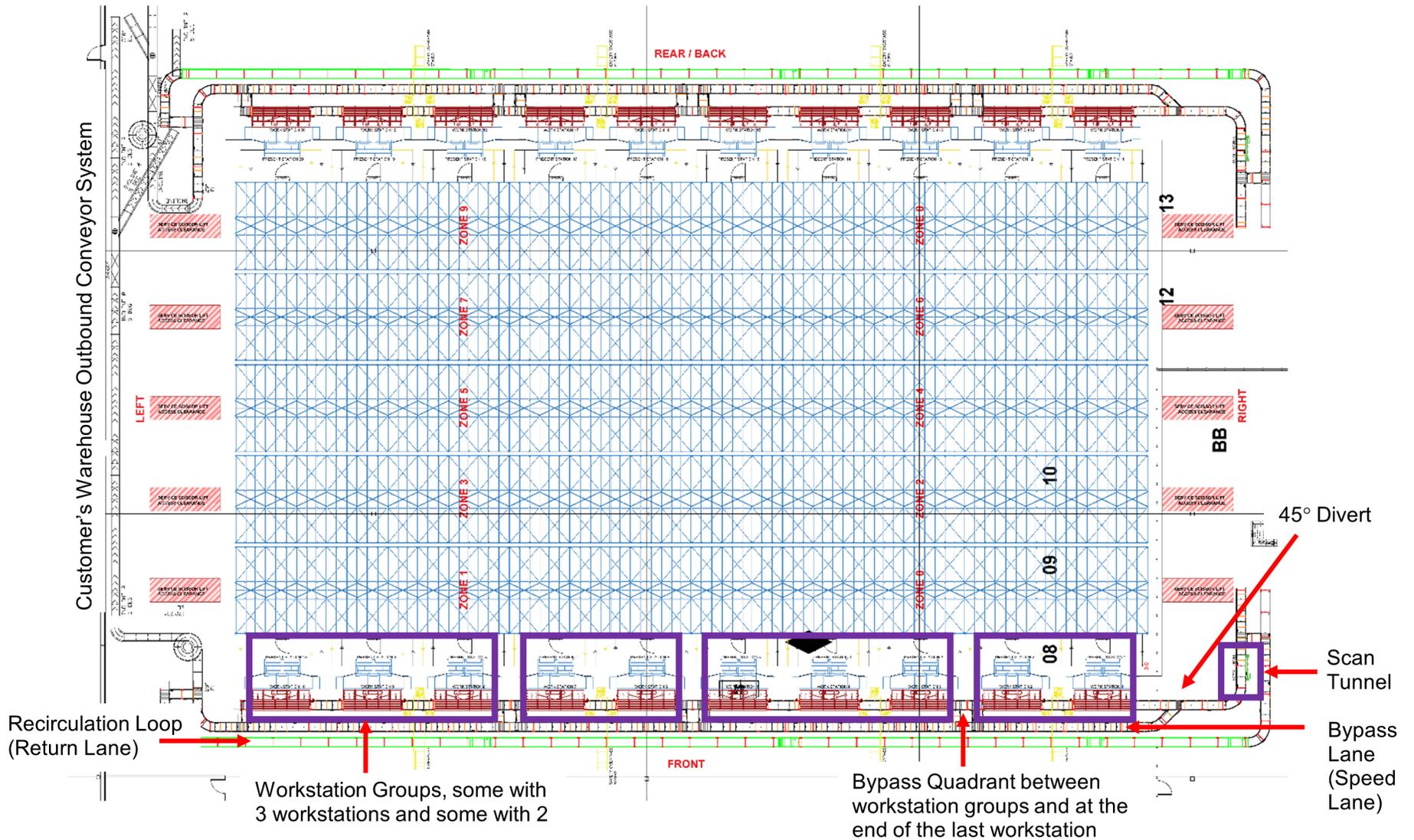
Figure 3-1: Layout of a large Infinity machine and conveyance

3.1.2 Scan tunnel

When a container enters the OPEX conveyance, it passes through a scan tunnel. The cameras in the scan tunnel read the barcode on the License Plate Number (LPN) label attached to the container. The LPN associates that container to a corresponding order in the Cortex database.
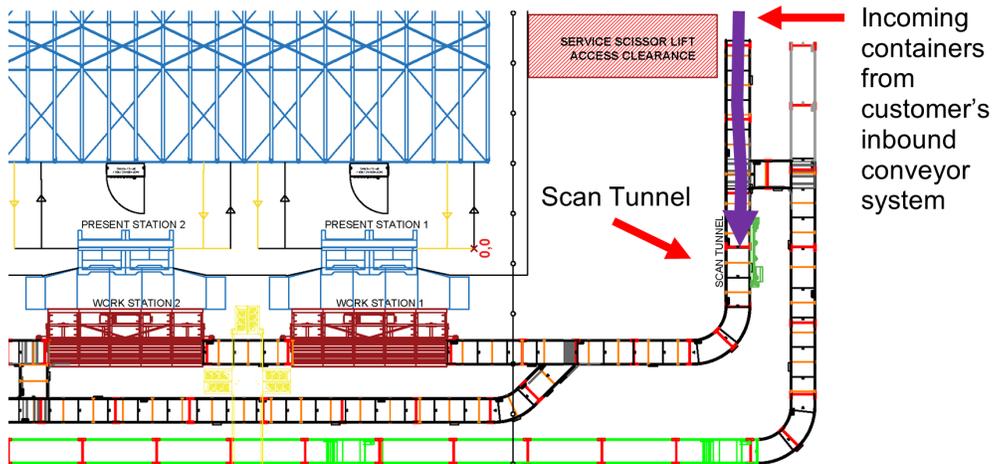
Figure 3-2: Scan tunnel at beginning of conveyance

The Cortex Router and Planner determine how to route the container to a particular workstation where an operator can fulfill the order. For more information, refer to .

3.1.3 Bypass lane

As the container approaches the first workstation group, it may or may not enter the group.

Figure 3-3: Bypass lane

- If the container has been assigned to a workstation in that first group, it continues on the conveyor into the group.
- Otherwise, the container uses the 45° diverter to travel onto the bypass lane, which moves the container past this workstation group to another group farther down the line.

3.1.4 Workstation groups

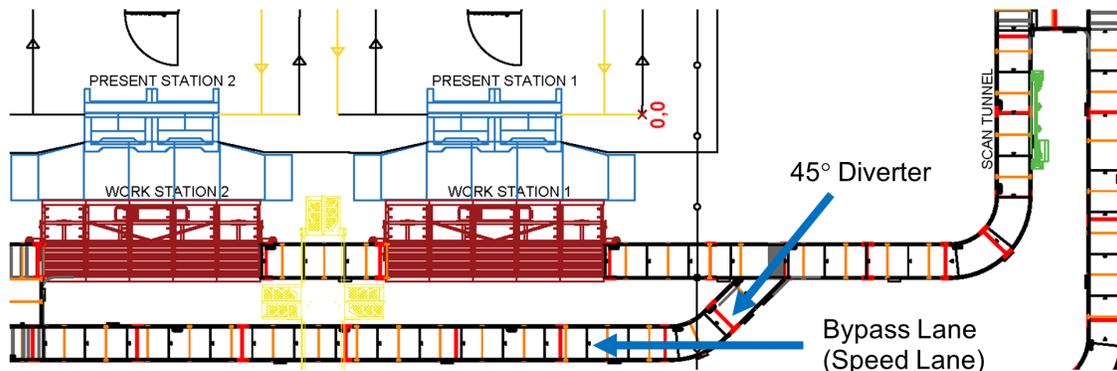After a container passes through the scan tunnel, Cortex routes it to a specified workstation where an operator fulfills the order. Cortex distributes the containers throughout the available workstations to spread the workload efficiently.

Depending on the site's configuration, two or more workstations may be grouped together and treated as a single unit. A single conveyor passes through each workstation in the group. These groups help the system isolate a problem that may occur at one workstation so it affects only that group, instead of every workstation on that side of the machine.

When a container enters a workstation group, it must pass through each workstation in the group, even though it typically stops for a pick or putaway at only one workstation. Because the next bypass quadrant is located at the end of the group, a container cannot exit the middle of a group and transfer to the bypass lane.
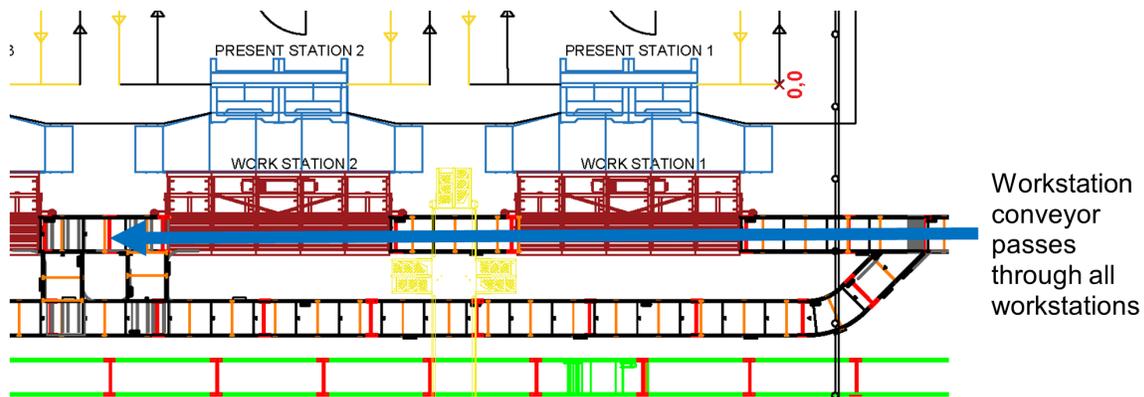

Figure 3-4: Workstation group

Note: In normal operation, Cortex routes containers only to online workstations where an operator is logged in. A container can travel through an offline workstation's conveyor in route to another location, but it does not stop at an offline workstation for a pick or putaway.

After a container reaches its specified workstation, it moves into a position where the operator can perform the pick or putaway. Refer to How containers move through the workstation on page 40.

3.1.5 Bypass quadrants

A bypass quadrant is located at the end of each workstation group. Bypass quadrants use F-RAT tables to make right-angle turns. (Refer to Workstation zones, sensors, and roller/F-RAT tables on page 34.) At a bypass quadrant, a container can either:

- Leave a workstation group and move to the bypass lane.
- Leave the bypass lane and move to the workstation conveyor, where the container can then move into the next workstation group.

In special situations, the bypass quadrant enables a container to leave one workstation group and continue straight ahead into the next group.

When a container leaves its assigned workstation

In most cases, an order is fulfilled at a single workstation. When the container leaves that workstation group, the bypass quadrant transfers it to the bypass lane, where it continues to the outbound end of the conveyance.
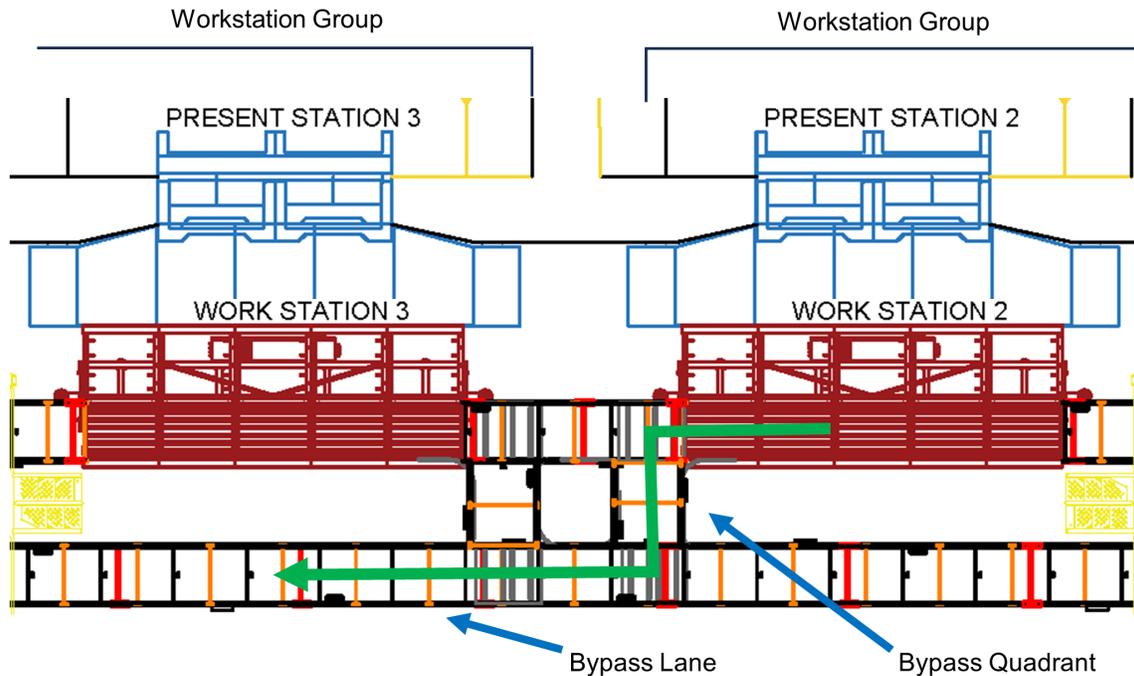
**Figure 3-5: Container leaves first group,
uses bypass quadrant to move to bypass lane**

When a container is assigned to a wokstation that is not in the first group

In this case, the incoming container is initially placed on the bypass lane and remains there until it reaches its assigned workstation group. Then the bypass quadrant at the beginning of the group transfers the container to the workstation conveyor, where it moves to its assigned workstation.

**Figure 3-6: Container bypasses the first 2 workstation groups
and moves into the third group**

When there is a problem at the assigned workstation group

On rare ccasions, a problem may occur at the workstation group where a container is being processed, and the container may be assigned to a different group. Assuming the current group is still operational, Cortex either:
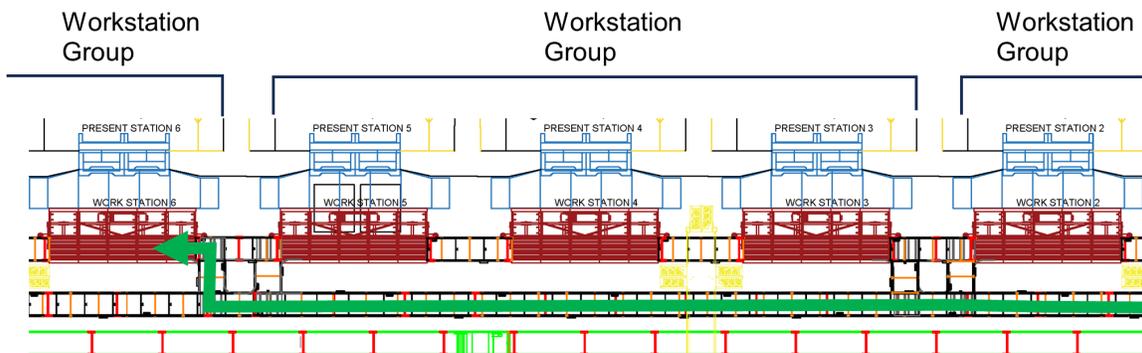
- Moves the container directly into the next workstation group.
- Moves the container to the bypass lane where it can continue to another workstation group farther down the line. Then the bypass quadrant at the beginning of that group transfers the container to the group's workstation conveyor.

3.1.6 Recirculation loop (end of conveyance)

If the order is fulfilled

If the order is fulfilled after passing all the workstations, the container moves to the customer's warehouse outbound conveyor, where it then moves to an area determined by the customer's WMS.
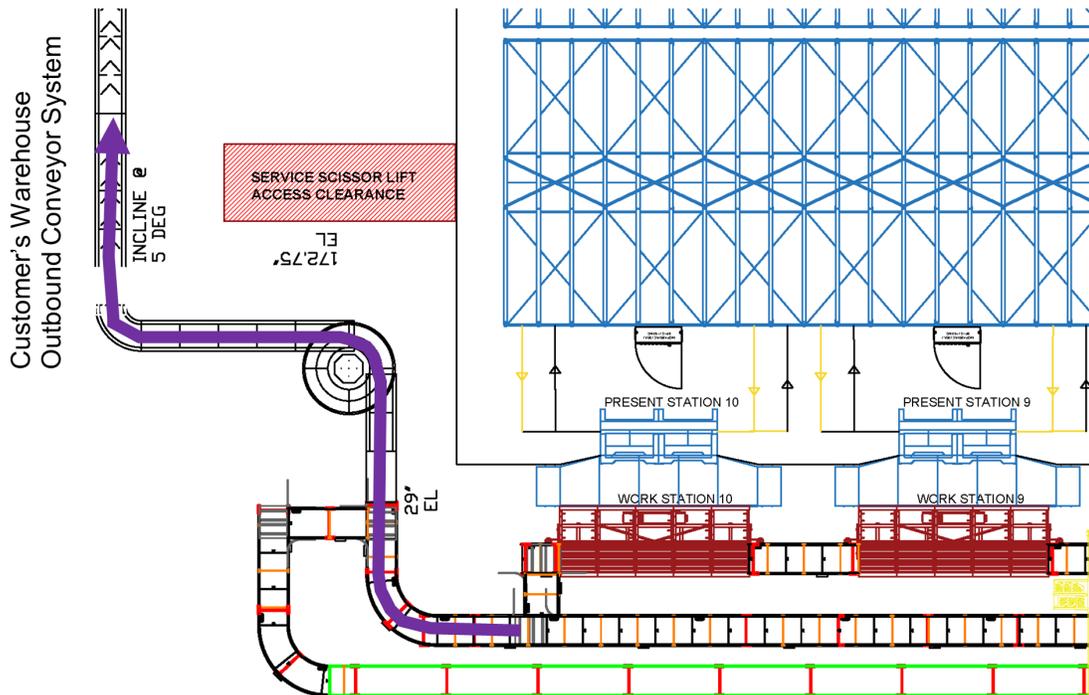
Figure 3-7: Fulfilled container moves to customer's conveyor

If the order is not fulfilled

If the order is not fulfilled (for several possible reasons), the container moves to the recirculation loop, where it returns to the scan tunnel at the beginning of the OPEX conveyance system.
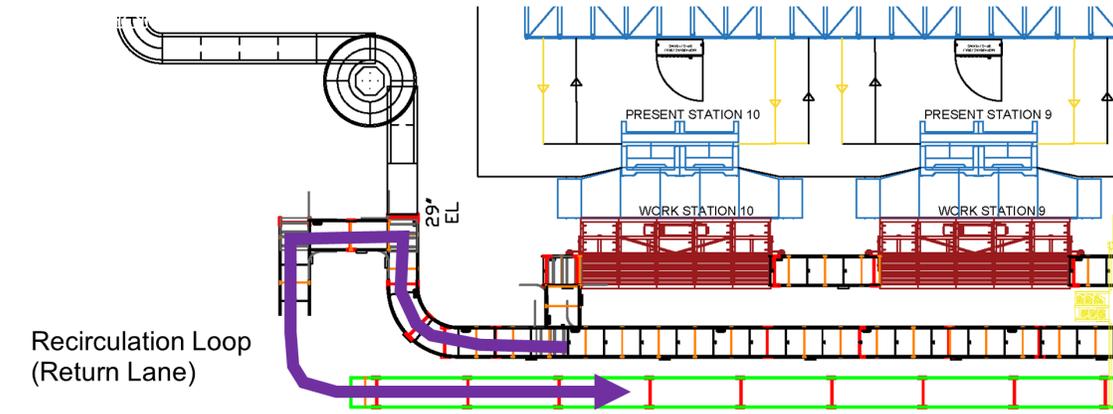
Figure 3-8: Unfulfilled container moves to recirculation loop
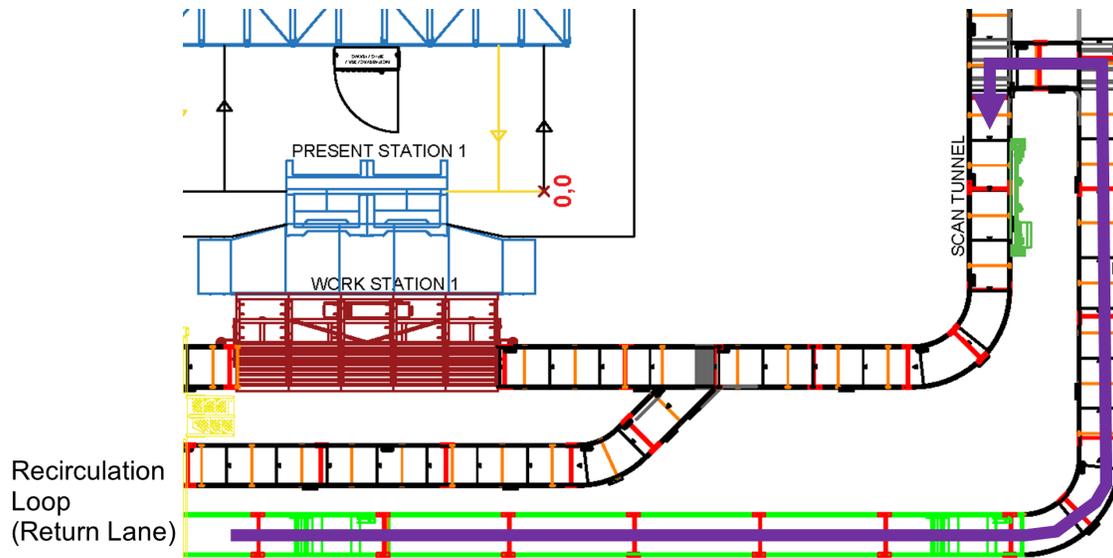
Figure 3-9: Unfulfilled container returns to scan tunnel

The scan tunnel reads the LPN on the container and checks the corresponding order in the Cortex database. Cortex determines which items are not fulfilled and then routes the container to a workstation for those items.

3.2 Overview of an automated workstation

Each Present Station has its own dedicated workstation. All workstations on one side of the machine have a single workstation conveyor that carries containers in one direction along the back (non-operator side) of the workstation.
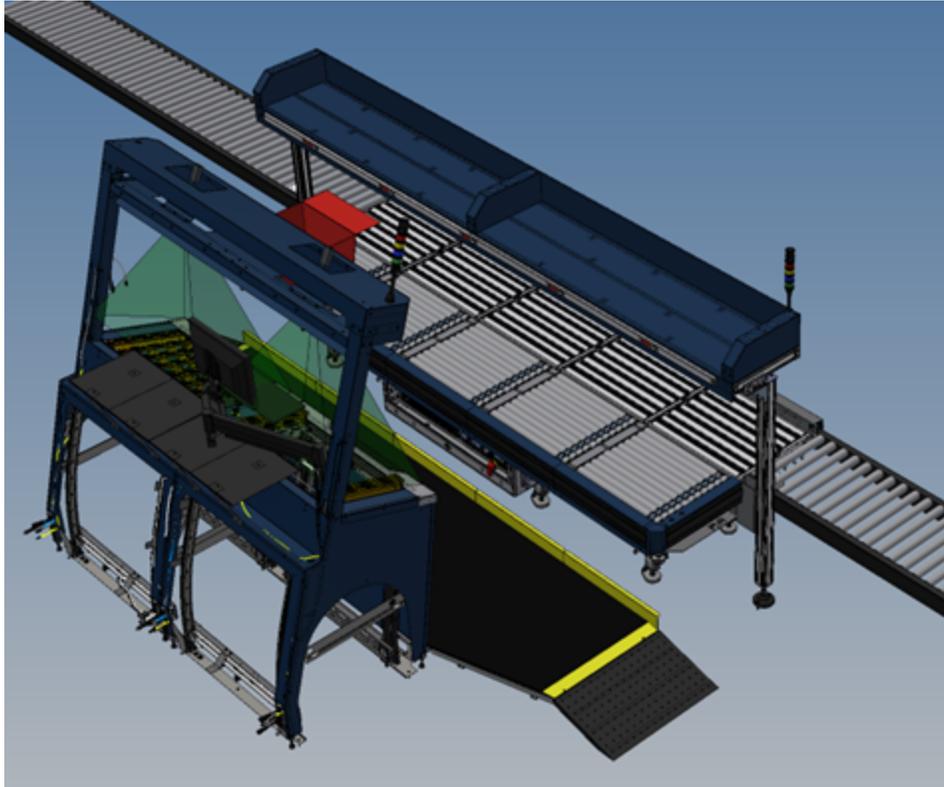

Figure 3-10: Workstation and Present Station

After the Cortex software routes incoming containers to their assigned workstations, they move to one of the Pick-to-Light (PTL) zones along the front row of the workstation. The system delivers the appropriate totes from the storage rack to the Present Station. Depending on the type of order associated with each container, the operator can either pick items from the tote and place them into the container or put away items from the container and place them into the tote.
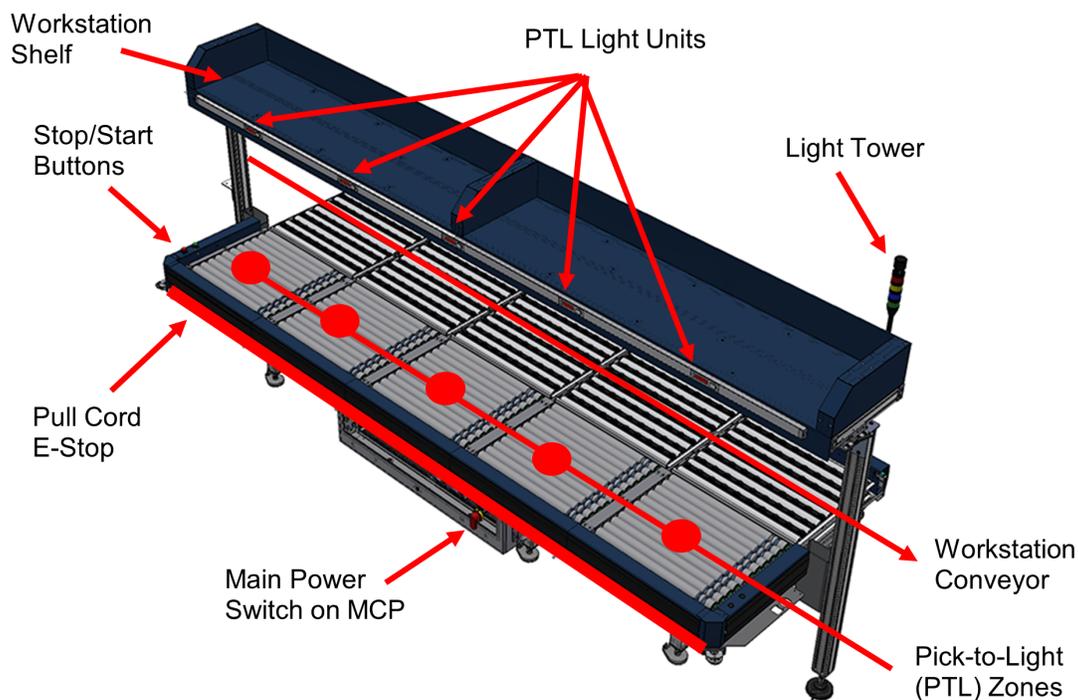
Figure 3-11: Workstation components

Workstation conveyor

The workstation conveyor may move containers left to right or right to left through the workstation, depending on the site configuration and which side of the machine the workstation is located on. For more information, refer to How containers move through the workstation on page 40.

Workstation shelf

The workstation shelf is a convenient location for storing supplies used by the operator during normal operations. These may include plastic bags used for small items such as screws and washers, tape, or an optional printer.

Pick-to-Light (PTL) zones

The PTL zones are where containers are delivered if the operator needs to pick or put away one or more items for this order. The container remains at the PTL zone until the operator completes all picks or putaways for the order. Then the container moves automatically back to the workstation conveyor and exits the workstation.

PTL light units

A PTL light unit is mounted on the workstation shelf directly above each PTL zone.

Digital
Display

PTL Light
and Button

Figure 3-12: PTL unit above container on workstation

The PTL unit:

- Lights up to indicate which container the operator should use for the current pick or putaway operation as shown on the Present Station's WUI monitor. The light is color-coded to match the color shown on the WUI monitor.
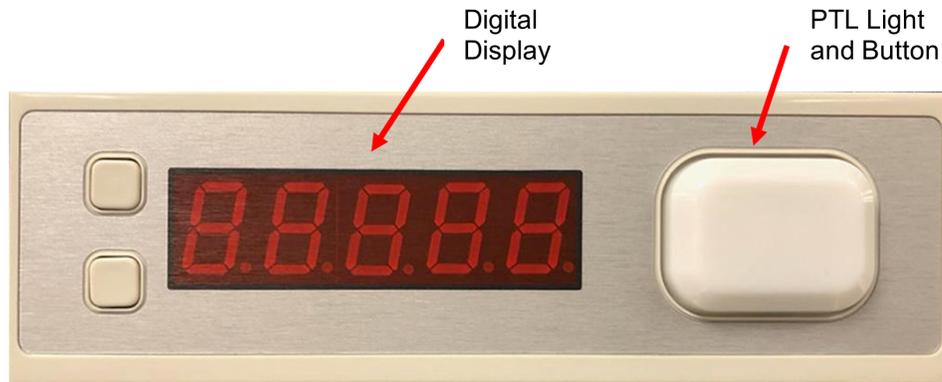- Has a digital display that shows how many of the current item the operator needs to place into the container (for a pick) or remove from the container (for a putaway).

The light is also a button. After placing or removing the current item in the container, the operator can press the button to tell Cortex that the current operation is complete. If the container's order still has additional items, the container remains in place while the Present Station awaits the tote for the next item. If the order is complete, Cortex automatically moves the container to the back conveyor so it can exit the workstation.

Note: Pressing the PTL button does not necessarily mean that the entire pick or putaway operation is complete, only that the current item is complete.

Note: Instead of pressing the PTL button, the operator can also press the corresponding container icon on the WUI monitor.

Light tower

A light tower is mounted at the end of the workstation to indicate the status of the workstation and the machine itself. It is located at the top-right of the workstation and is easily visible by all personnel in the area.

The colored bands on the light tower indicate the workstation/machine status:

No lights – Machine is stopped or turned off.

Red – Interlock or E-Stop is tripped. System is interrupted.

Yellow flashing – Machine is starting (accompanied by an audible beeping).

Blue – Machine is jammed or maintenance is required.
Blue flashing – Machine is in Maintenance mode.

Green – Machine is running normally.
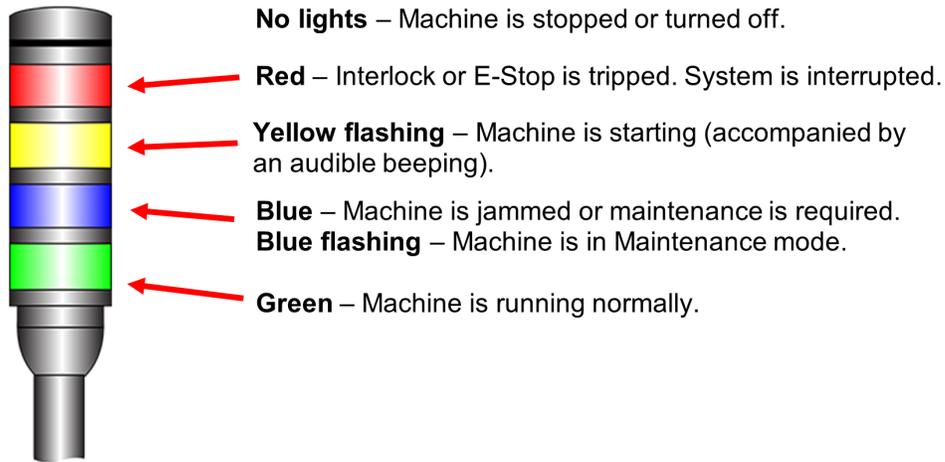
Figure 3-13: Light tower

Note: Because all workstations in a group are linked, their statuses are also linked. Each light tower in the same group shows the same light color. The workstation's lights are the same as the light tower on the Present Station.

Pull cord for Emergency Stops (E-Stops)

A pull cord runs along the front and sides of the workstation. In an emergency, an operator can pull the cord to immediately stop the workstation. An E-Stop halts all movement on the workstation, as well as movement on all other workstations in the same workstation group.

Stop and Start buttons

The **Stop** and **Start** buttons are located on the left side of the workstation.

Figure 3-14: Stop and Start buttons

- **Stop button** - Stops this particular workstation but does not stop all workstations in the group. The workstation conveyor along the back row remains in operation so incoming containers can continue to pass through the workstation without causing a bottleneck. However, the workstation does not accept new pick or putaway operations.

  *Note: The **Stop** button is not an emergency stop. An E-Stop immediately removes power to all workstations in the group. To initate an emergency stop, pull the red E-Stop cord that runs along the front and sides of the workstation.*

- **Start button** - Restarts this workstation if you previously stopped it by pressing **Stop**.

In normal operation, you may never need to press **Stop**. For situations that requre the workstation to stop (not an emergency stop), the system typically stops it automatically. Then, after the error is resolved, the workstation restarts automatically. However, if it does not restart automatically, press **Start**.

Main power switch on MCP

The main power switch is located on the Main Control Panel (MCP) beneath the workstation. The red handle turns the workstation power on and off.

Figure 3-15: Main power switch on workstation MCP

Typically, you should not turn off the main power switch. If an emergency occurs that requires all power to be removed from the workstation, pull the E-Stop cord.

Note: For troubleshooting, technical support or an onsite OPEX resource may ask you to reboot the workstation by turning the main power switch off and then back on. Remember that this refers to the red handle on the workstation's MCP, not the MCP for the machine's Present Station. For an Infinity machine, the Present Station MCP is inside the safety fence.

3.2.1 Workstation zones, sensors, and roller/F-RAT tables

3.2.1.1 Zones

The surface of the workstation consists of 10 separate tables, each of which is called a zone.

- Odd-numbered zones are at the front, operator side of the workstation. These are the PTL zones where containers are delivered so the operator can perform a pick or putaway.

- Even-numbered zones are at the back. These zones are part of the workstation conveyor that runs along the back of every workstation on this side of the machine.

Figure 3-16: Workstation zones

Note: Although most workstations have 10 zones, some sites may have larger or smaller workstations with a different number of zones.

Typically, all workstation zones are numbered 1 - 10, regardless of the conveyor zone numbers leading into and out of the workstation. Cortex tracks any discontinuities in zone numbers between the workstation and the conveyor.

Figure 3-17 shows an example Cortex conveyor view. On an Infinity, the workstation's PTL zones are shown across the top of the screen. Notice that each zone shows two numbers. On the workstation:

- The top numbers (Zone 1 - 10) are the workstation's zone numbers for the front PTL and back conveyor zones.
- The bottom numbers (248 - 239 in this example) are the corresponding numbers for zones 1 - 10 and indicate where those zones fit into the overall conveyor layout. These numbers vary depending on your site and which particular workstation is displayed.
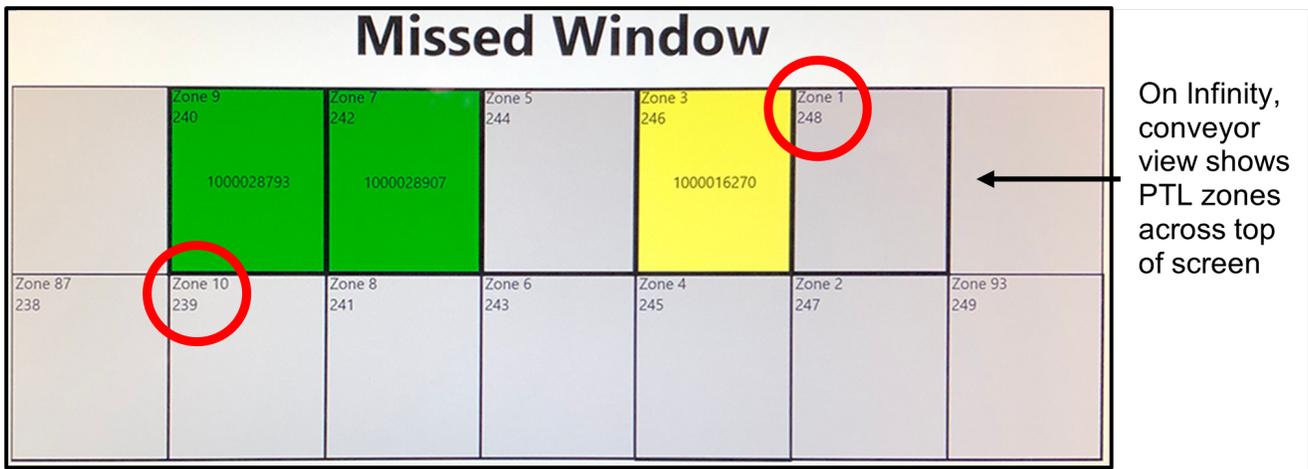

On Infinity, conveyor view shows PTL zones across top of screen

Figure 3-17: Cortex conveyor view, with zone numbers

Note: *At sites that use workstation zone numbers other than 1 - 10, the Cortex conveyor view shows the appropriate numbers.*

Zone sensors

Each zone on the back workstation conveyor has 2 sensors:

- An entry sensor on the incoming edge of the zone
  (The next adjacent zone also has an entry sensor, which acts as an exit sensor for the first zone.)
- A stage sensor at the middle of the zone

Each PTL zone on the front has 2 sensors:

- A stage sensor at the middle of the zone
- A center entry sensor that faces upward between the back and front zones

Figure 3-18 shows the locations of the sensors for a pair of back and front zones. Two adjacent back zones share the entry sensor that is located between them.
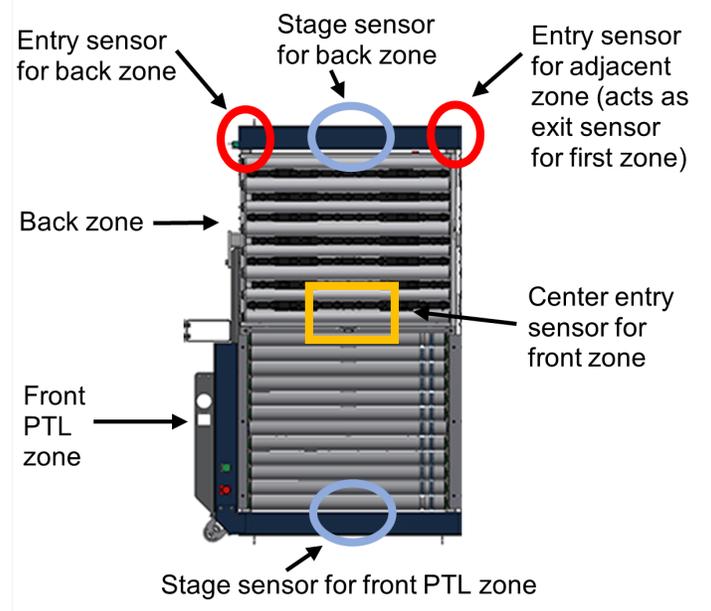
Figure 3-18: Front and back zones and their sensors

Each sensor emits a short-range infrared beam that is blocked and unblocked as containers move past it.

Entry sensors at the edge of a zone

Entry sensors are mounted at the left and right edges of the back conveyor zones. These sensors check to see if a container is straddling two zones. If either one of a zone's entry sensors is blocked, a container is either in-transit or is jammed between zones:

- If an entry sensor is blocked and then unblocked, the container has passed successfully from one zone to the next.
- If an entry sensor remains blocked beyond a reasonable time, the container is jammed.

Note: Front PTL zones do not have entry sensors at their left or right edge because these zones have only back/front rollers. A container cannot move left or right in a PTL zone.
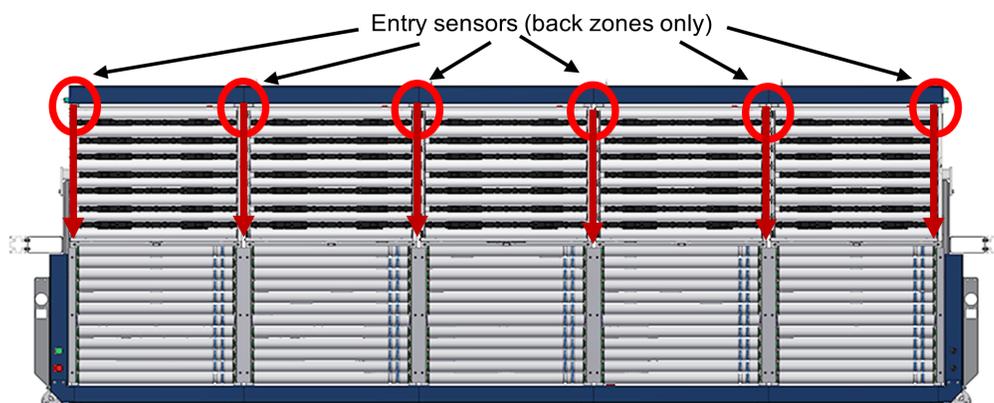

Figure 3-19: Entry sensors on back zones

Stage sensors in the middle of a zone

A stage sensor is mounted in the middle of all zones:

- If a stage sensor is blocked and the entry sensors are unblocked, a container is entirely within the zone.
- If a stage sensor is blocked and an entry sensor is also blocked, a container is transitioning between two zones or is jammed.

Stage sensors for back zones
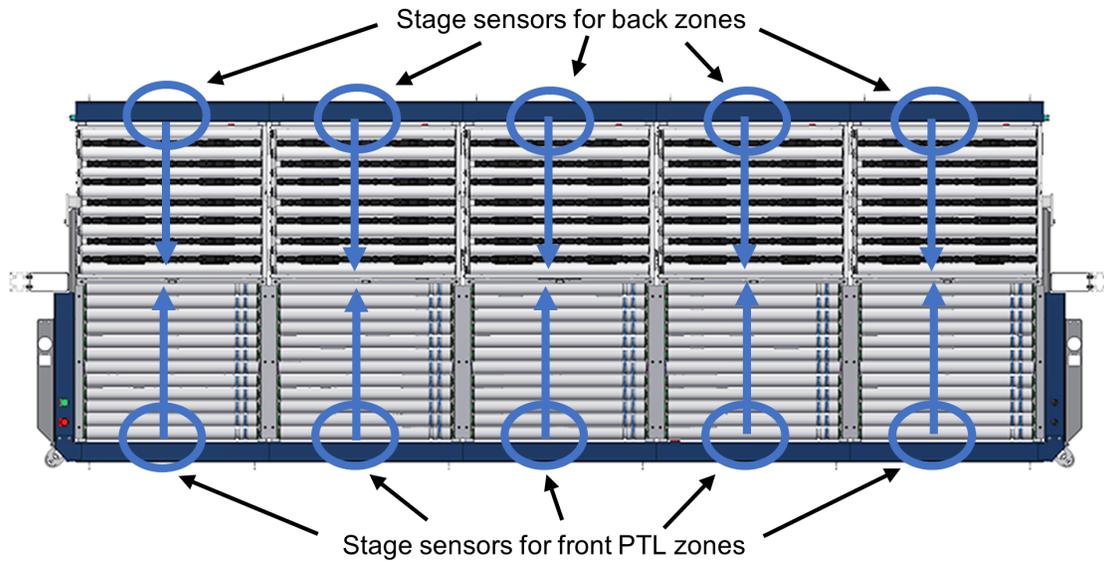
Stage sensors for front PTL zones

Figure 3-20: Stage sensors

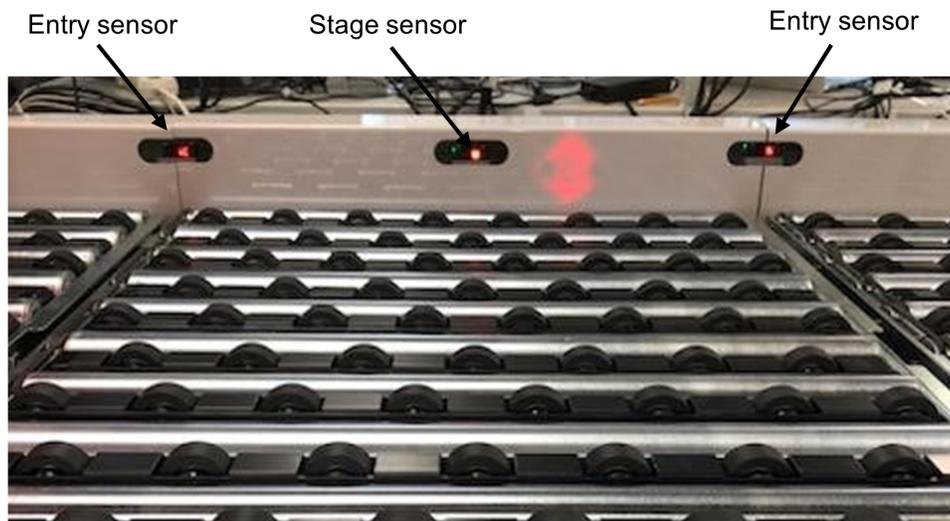Entry sensor   Stage sensor   Entry sensor

Figure 3-21: Entry sensors and stage sensor

Notice that two adjacent back zones share an entry sensor.

Center entry sensors between front and back zones

Each pair of back and front zones has a center entry sensor facing upward from the gap between the two zones:

- If the center sensor is blocked and then unblocked, a container has passed successfully from the back-to-front or front-to-back zone.
- If the center sensor remains blocked beyond a reasonable time, a container is jammed between the back and front zones.
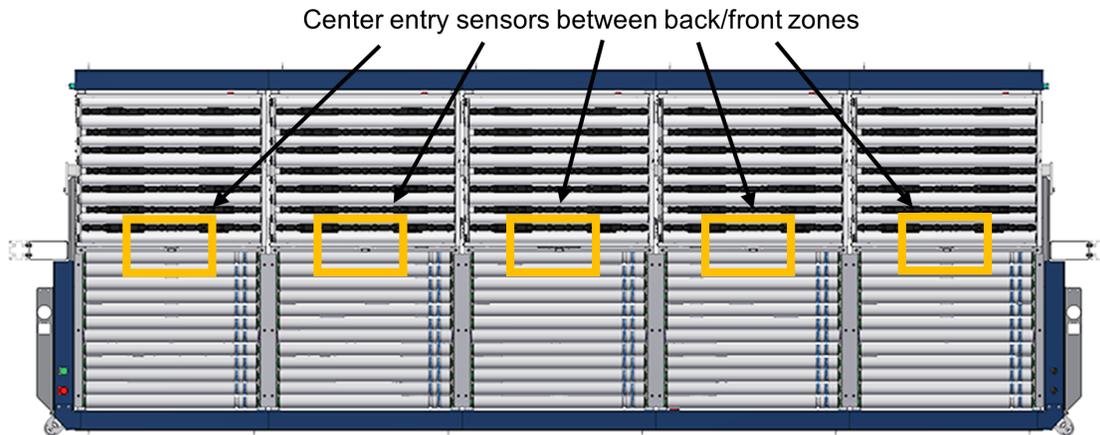
Center entry sensors between back/front zones

Figure 3-22: Center entry sensors between front and back zones

Back Zone

Center Entry Sensor

Front PTL Zone

Figure 3-23: Close up view of entry (center) sensor

Roller and F-RAT tables

Each zone consists of a roller table or an F-RAT table:

- All front PTL zones are roller tables that move containers only between the front and back rows.
- All back zones, which are part of the workstation conveyor, are F-RAT (flat-right angle transfer) tables that combine rollers and wheels to move containers to the front and back as well as right and left. The front/back rollers move containers to and from the operator's front PTL zones.

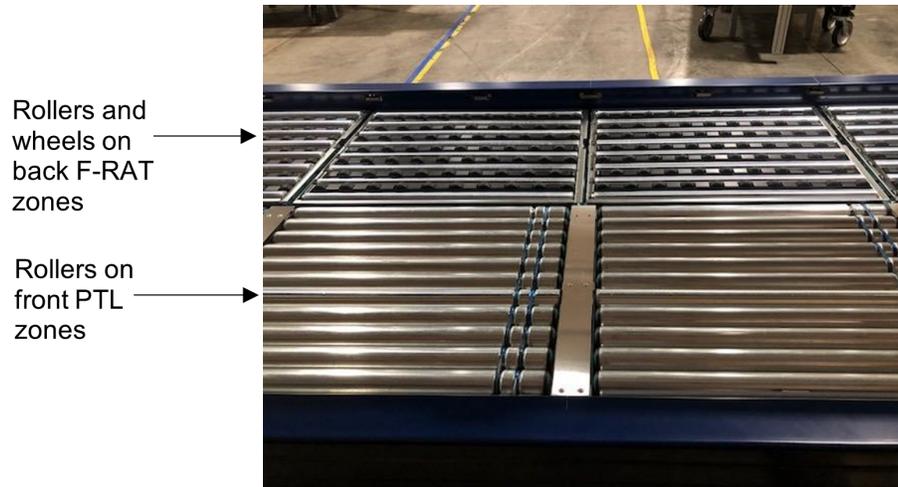Rollers and wheels on back F-RAT zones

Rollers on front PTL zones

Figure 3-24: Rollers and F-RATs on front and back zones

In an F-RAT table, the rollers and wheels are arranged in alternating bands. To move a container:

- Right or left – The wheels rise above the rollers.

Figure 3-25: Containers move right or left when wheels are higher

- Front or back – The rollers rise above the wheels.

Figure 3-26: Containers move front or back when rollers are higher

3.2.2 How containers move through the workstation

Containers move along the workstation conveyor that runs through the back of every workstation. The containers move left-to-right or right-to-left, depending on your site's configuration and which side of the machine the workstation is on. When a container is presented to an operator for a pick or putaway, it moves to an open PTL zone on the front row.

By default, Cortex attempts to fill a workstation's PTL zones starting at the middle and then moving outward to the left and right. In the following example, the two rightmost zones are occupied and the next incoming container moves to the middle PTL zone.
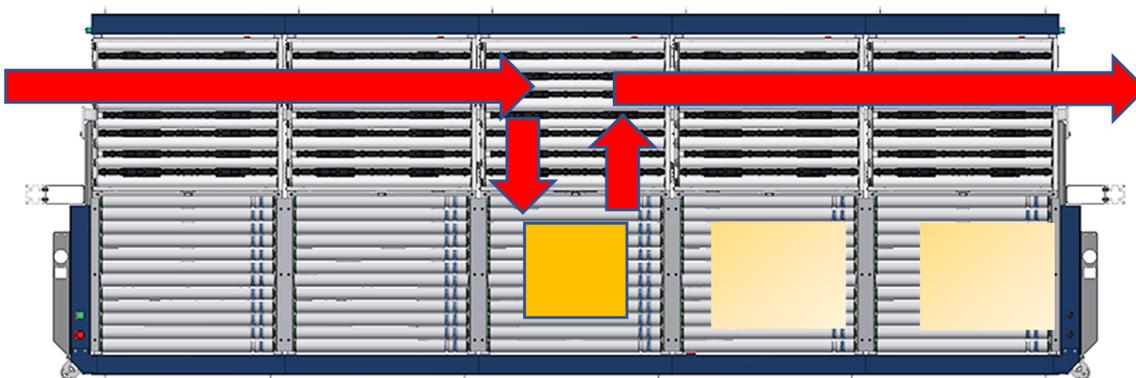

Figure 3-27: Typical container flow

As containers move through the workstation, Cortex expects the various sensors to be blocked and unblocked in sequence as described in the following sections.

Note: When sensors are not blocked and unblocked in the proper sequence or within predetermined time frames, Cortex interprets this as an error and displays an interruption screen or message.

3.2.2.1 Movement along the back conveyor

Some containers move along the back conveyor without stopping:

- When the container moves into a zone, it blocks the first entry sensor. Cortex knows a container has arrived at that zone.
- When the leading side of the container reaches the middle of the zone, it blocks the stage sensor. Depending on the container's size, it typically blocks the first entry sensor and the stage sensor at the same time.
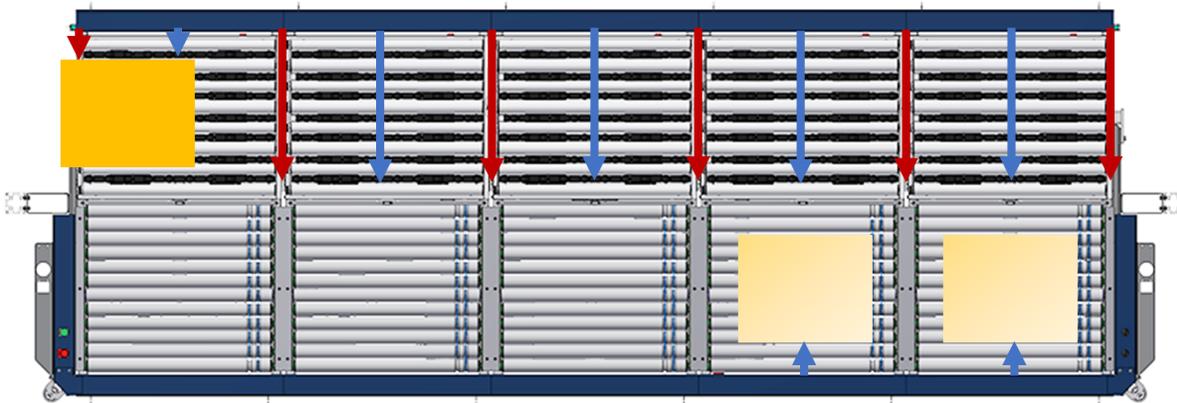

Figure 3-28: Container enters, blocks first entry sensor and stage sensor

- As the container continues, the first entry sensor is unblocked and only the stage sensor is blocked. Cortex knows the container is completely in the zone.
- When the container reaches the other side of the zone, it blocks the second entry sensor. Again, depending on the container's size, it typically blocks the stage sensor and the second entry sensor at the same time.
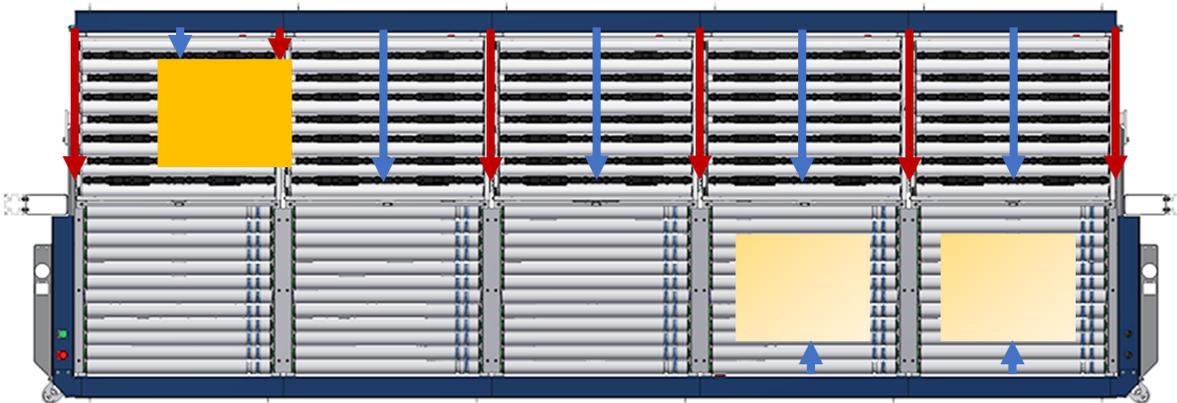

Figure 3-29: Container exits, blocks stage sensor and second entry sensor

- As the container continues, the stage sensor is unblocked and only the second entry sensor is blocked.

- As the container moves completely out of the zone and unblocks the second entry sensor, Cortex knows the zone is empty.

This pattern continues until the container leaves the workstation.

Note: Typically, a container moves completely out of a zone before the next container enters. However, if the containers are close together, the outgoing container may block the second entry sensor while the incoming container blocks the first entry sensor. These overlapping sensors do not cause a problem unless the overlap continues longer than an acceptable time. Then an error may occur.

3.2.2.2 Movement between the back and front rows

For a pick or putaway, a container must move from the back conveyor to an open PTL zone on the front row:

- On the back conveyor, the container reaches a position where the stage sensor is blocked but both entry sensors are unblocked. The container is approximately in the middle of the zone, where it stops.
- The back zone is an F-RAT (right-angle transfer), where the container changes direction and moves to the front zone.

    Note: All front PTL zones have only rollers because containers on the front row only move back-to-front or front-to-back. They do not move left or right.

- While the container is in transit between the back and front rows, it blocks the entry (center) sensor between the rows.

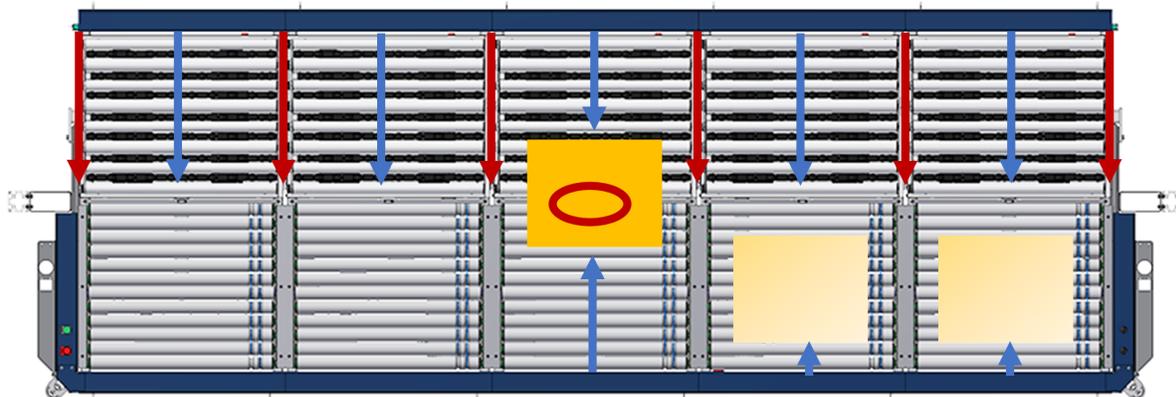**Figure 3-30: Container moves to front, blocks stage sensor and entry (center) sensor**

- As the container rolls completely into the front PTL zone, the entry (center) sensor is unblocked.

Figure 3-31: Container moves to front, blocks only front stage sensor

Similarly, the sensors are blocked and unblocked as the container moves from the front to the back and then exits the workstation.

3.3 Scan tunnel and LPNs

When incoming containers move onto the OPEX conveyance system, they pass through a scan tunnel. Each side of the OPEX conveyance has its own scan tunnel.

Scan tunnels are available in different types and sizes, so your scan tunnel may vary by site. Regardless of type and size, all scan tunnels serve one basic function. The cameras in the scan tunnel read the barcode on the License Plate Number (LPN) label attached to the incoming container.

Figure 3-32: Scan tunnel

Figure 3-33 shows an example barcode on an LPN label.

Figure 3-33: LPN label barcode on container

3.3.1 How Cortex uses the barcode information

The barcode is associated with an order number in the customer's WMS. Cortex analyzes the information on the order to determine:

- If the container is for a pick or putaway
- How many items are on the pick or putaway order
- Where those items are located in the storage racks

Based on this information, Cortex routes the container to a particular workstation and instructs the iBOTs to retrieve the necessary totes and deliver them to the Present Station at that workstation.

When the container reaches a workstation and moves to a PTL zone, the operator can perform the pick or putaway. The Cortex screen on the operator's WUI monitor shows exactly which items and quantities to pick or putaway and which container to use.

4. Optional Hardware

4.1 Digital counting scale

Optionally, a workstation may be equipped with a digital counting scale. operators can use the digital counting scale to compute the average number of pieces or items on the digital counting scale based on the total weight of items placed on it. The digital counting scale is useful for counting small objects such as:

- Screws
- Nuts
- Bolts
- Washers
- Ball bearings

The digital counting scale interfaces with the Workstation User Interface (WUI) as part of the Cortex® Workstation. The digital counting scale can:

- Zero calibrate with a tare
- Save unit weights for a few items
- Update tare and item weights
- Weigh items up to 50 lb with a resolution of at least 0.001LB
- Allow for archive transactions and exporting data (preferably to CSV)

Note: The digital counting scale must have Ethernet capabilities to function as a server.

The digital counting scale can configure profiles for workstation and extend databases to store items and their weights.

Figure 4-1: ZK840 Avery Weigh-Tronix digital counting scale

4.1.1 Capturing piece weight

- Ensure that the digital counting scale is calibrated for the item that the operator wants to measure. The operator can calibrate the digital counting scale with a fixed number of items in a tare. For example, 100 items in an enclosed bag.
- Have a larger calibration sample (100 pieces versus 5 pieces) to produce more accurate results.
- Set the digital counting scale to zero with the tare weight to accurately measure any additional items.
- The digital counting scale divides the total weight by the number of pieces entered to compute the average piece weight. To accurately divide the total weight, the items must have the same piece weight without any significant variations.

4.1.2 Digital counting scale connectivity and use

Cortex integrates with the WUI and the digital counting scale to allow automatic item counting for picks, replenishments, and cycle counts. This greatly reduces the time needed to count items with large or obscure quantities.

If the Cortex database has confirmed an item's piece weight:

- Cortex automatically sends the data to the digital counting scale and displays a check mark on the digital counting scale image on the WUI.
- The operator can place items on the digital counting scale for an accurate item count.

If the Cortex database has not confirmed an item's piece weight:

- Cortex displays a **?** icon over the digital counting scale image on the WUI.
- The operator performs a manual operation on the digital counting scale to set the piece weight.
- Cortex captures the piece weight for future use, and then the operator can use the digital counting scale for counting items.

4.1.3 Capturing unconfirmed piece weight

The WUI displays a scale icon and Scale button at the bottom right of any work tab if the digital counting scale is enabled. To perform a manual operation for capturing an unconfirmed piece weight, the operator can press the Scale button to open the **Scale - Capture** window and update or set the piece weight of the current item.

To capture an unconfirmed item's piece weight:

1. Open any tab in Cortex. The following image appears when Cortex presents a tote for an item that does not have a piece weight in the database.
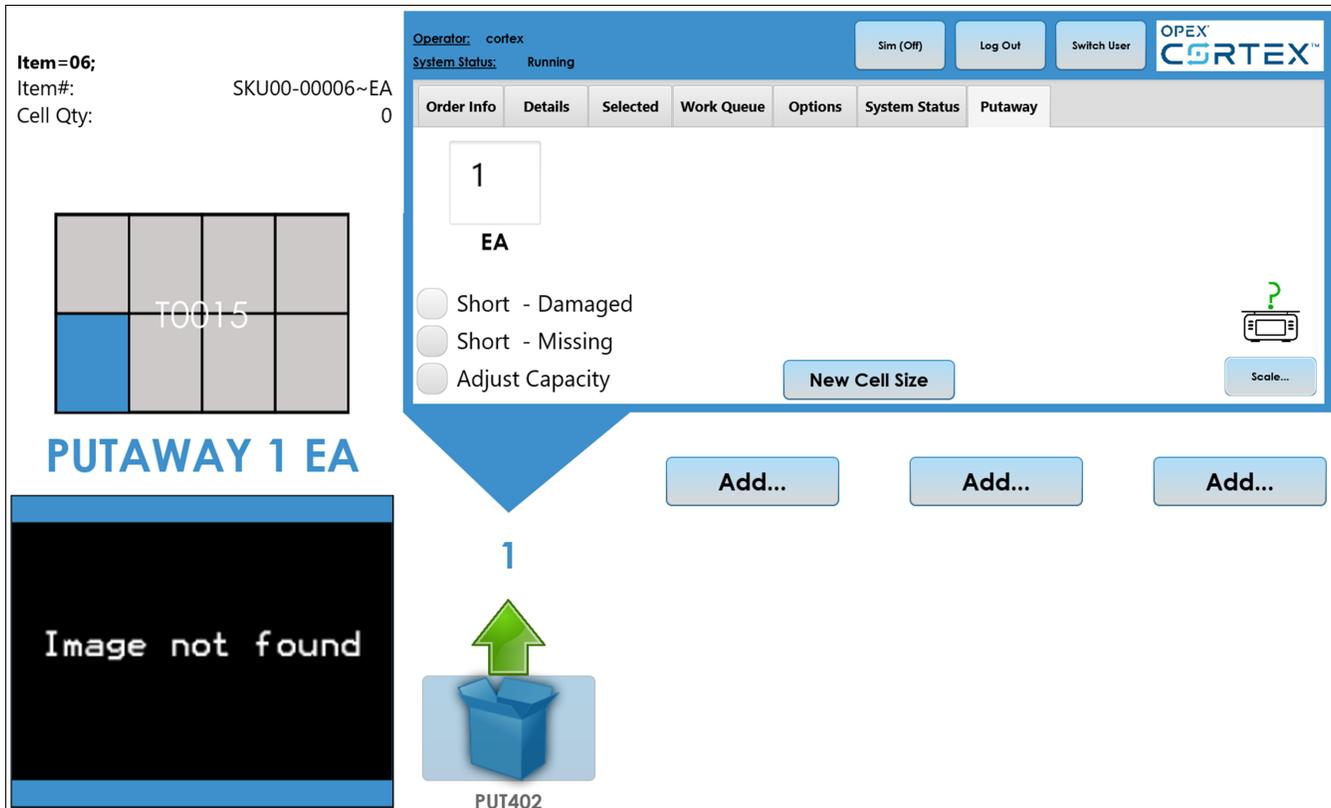
Figure 4-2: Cortex tab with scale icon and button

2. Press the **Scale** button. The **Scale - Capture** window opens.

Figure 4-3: Scale - Capture window

3. To confirm the piece weight of an item, press **Sample** on the digital counting scale.

4. After pressing **Sample**, add 5 of the items to measure on the digital counting scale.

5. After adding the items to the digital counting scale, press **Capture** on the **Scale - Capture** window.
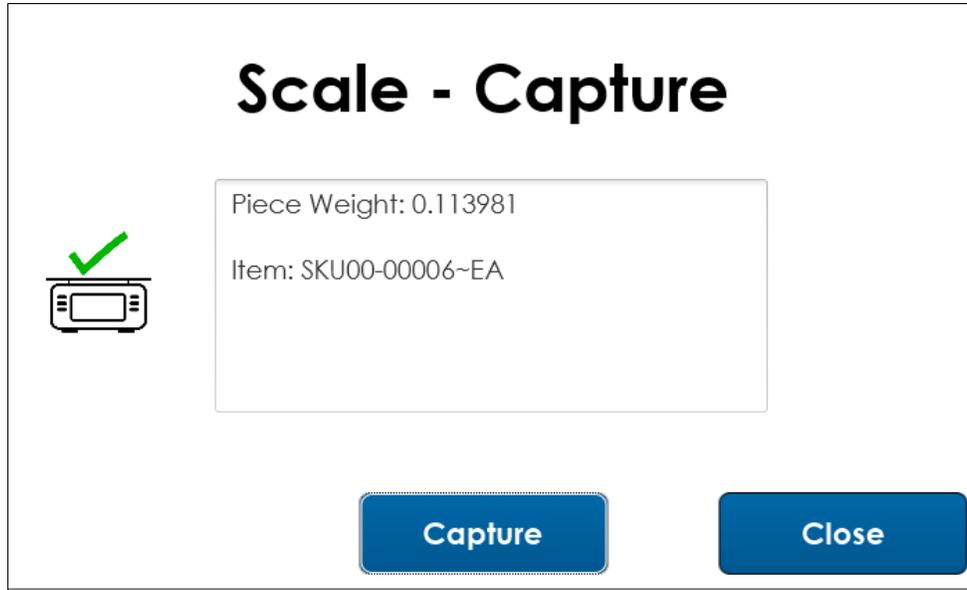

Figure 4-4: Capturing piece weight

6. To close the **Scale - Capture** window, press **Close**. The WUI work tab displays the check mark above the scale icon to indicate the confirmed piece weight.
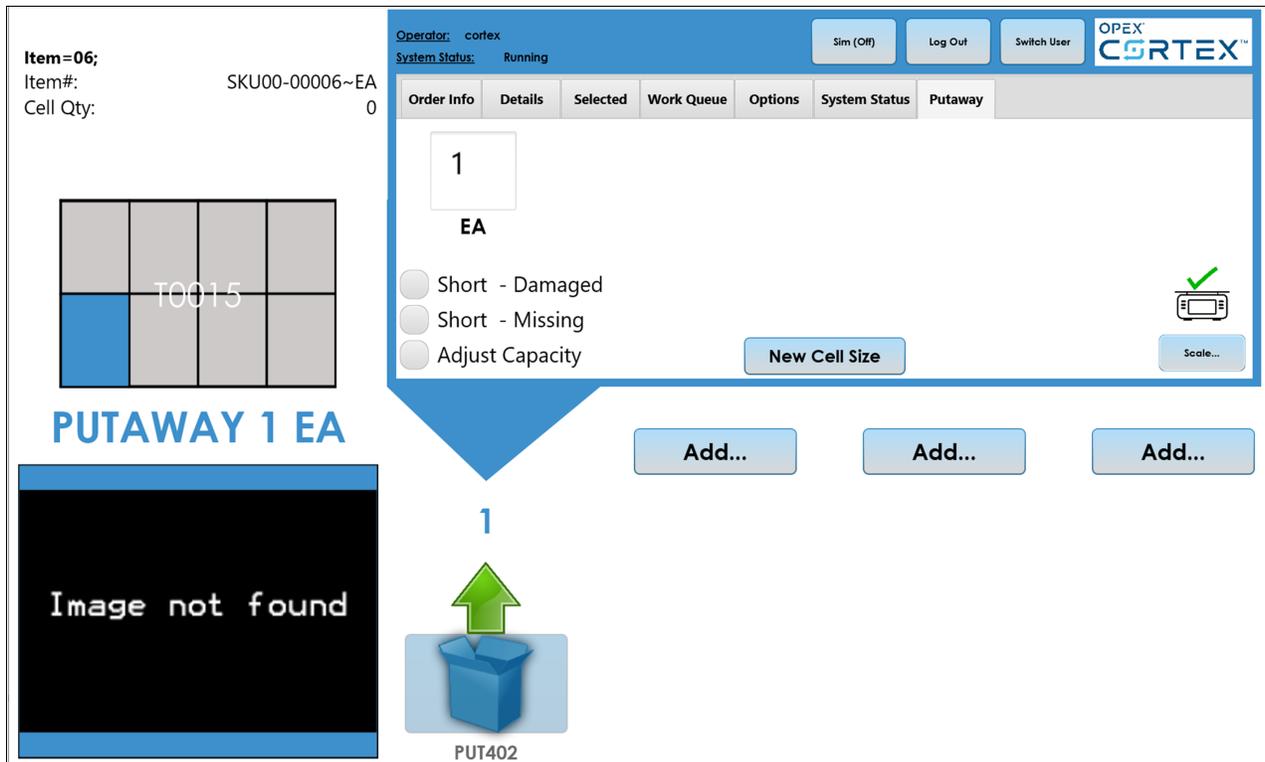

Figure 4-5: Scale icon check mark

Note: *If there are connectivity issues with the digital counting scale , the WUI work tab displays a yellow exclamation point above the scale icon. Cortex also disables the **Scale** button. This does not affect the putaway process.*
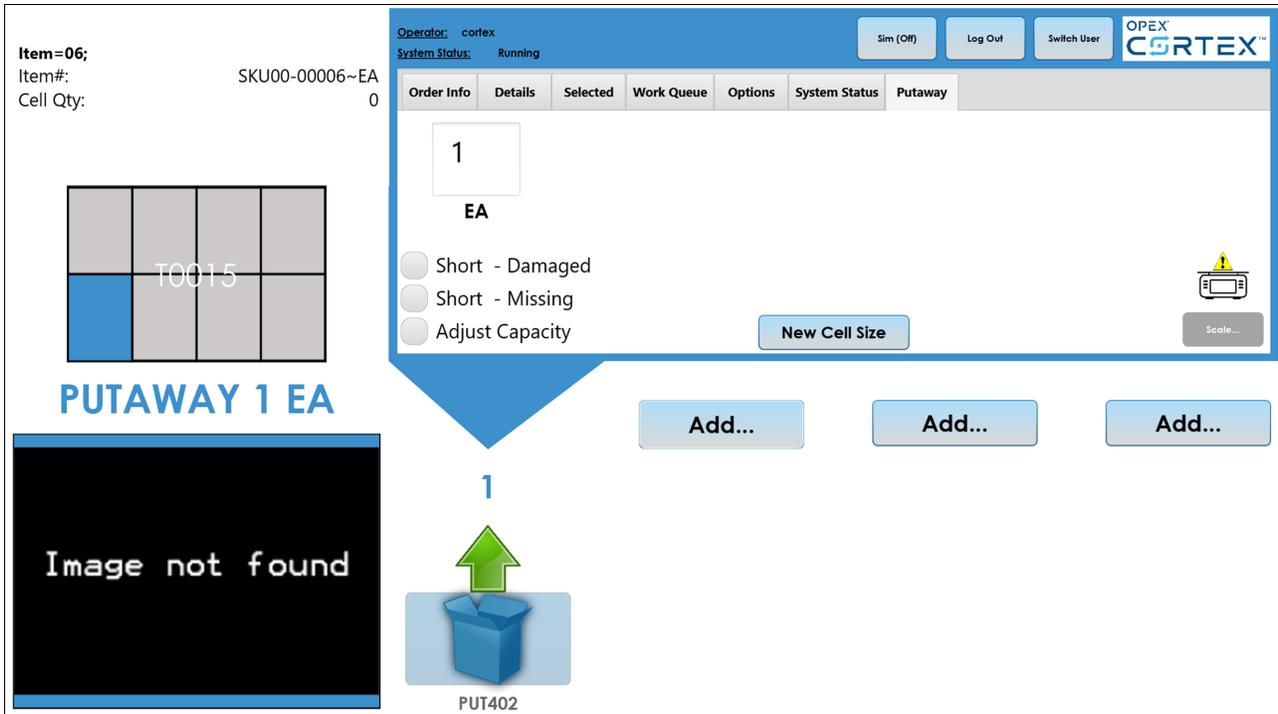

Figure 4-6: Scale icon yellow exclamation point

5. Operation

OPEX Automated Workstation Operator Manual

5.1 Starting Cortex

Typically, the WUI computer at each workstation is already running Cortex. When an operator is logged in, Cortex routes containers to the workstation for pick and putaway operations. When an operator is not logged in, the workstation is offline and no containers are routed to it. (Refer to If the station controller is disconnected on page 57.)

5.1.1 Logging in to Cortex

When an operator is not logged in, the WUI monitor at the Present Station shows the login screen:

Figure 5-1: Cortex login screen

1. Enter your **User Name** and **Password**.

2. Click **Login**.

3. On the Present Station, press the green **Start** button.

5.1.2 Logging out of Cortex

You should log out if:

-   You need to leave the Present Station/workstation area. If you leave without logging out, an unauthorized person could access the system.

    Note: In some cases, you may want to pause the workstation instead of logging out (refer to Pausing the workstation on page 56).

-   You are starting on a break or your work shift is ending.

On a pick or putaway screen:

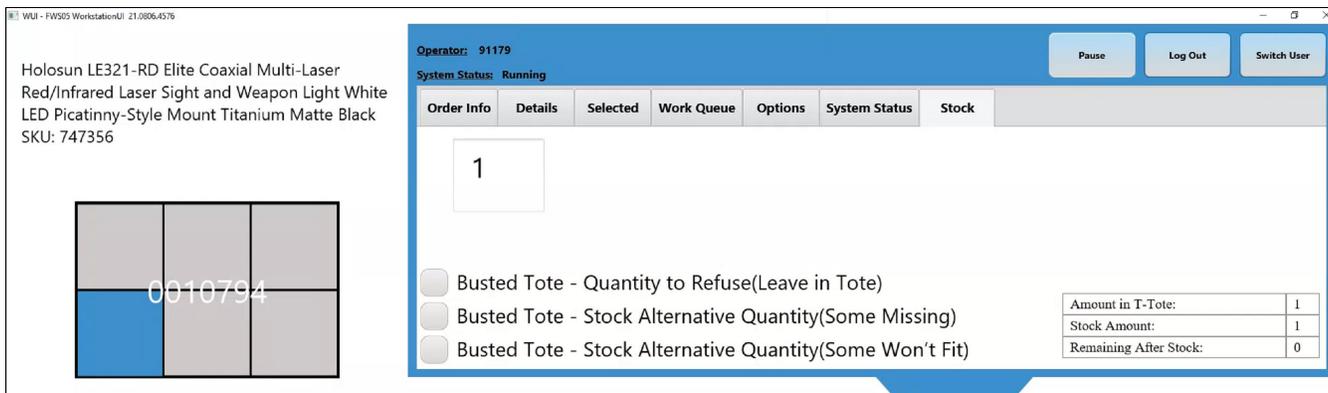➢ Click **Log Out** in the upper-right corner.

Figure 5-2: Log Out button in upper-right corner

The WUI monitor shows the Cortex login screen, waiting for an operator to log in.

5.1.2.1 What happens when you log out?

If an iBOT is in a Present Station port, it exits and returns its tote to storage. Other iBOTs that are in route to the workstation return their totes to storage. All containers currently on the workstation are dismissed, meaning:

- The orders associated with the dismissed containers remain active, but the containers leave the PTL zones and move back to the workstation conveyor, where they then move to the end of the OPEX conveyance.

- At the end of the conveyance, the dismissed containers move to the recirculation loop and return to the scan tunnel at the beginning of the OPEX conveyance.

    Note: Although the dismissed containers are not complete, they do not move directly to another workstation to continue filling the order.

- The scan tunnel rescans the containers' LPNs to determine which items still need to be picked or putaway. Cortex then routes each container to a Present Station/workstation to continue the pick or putaway.

5.1.3 Switching users

If the current user is leaving and a new user is ready to continue using the workstation, use the Switch User feature. Unlike logging out, all current containers remain on the workstation and any presenting iBOTs remain in the Present Station. The WUI monitor continues to show the same information.

On a pick or putaway screen:

1. Click **Switch User** in the upper-right corner.

    The login window opens.

2. The new user must:

    a. Enter a **User Name** and **Password**.

    b. Click **Login**.

The new user can now continue the current picks or putaways from where the previous user left off.

Note: Use this feature only when another user is ready to switch. If you delay, the order time increases unnecessarily while you wait for the new user.

NOTICE

Switching users.

iBOTs could jam if you do not switch users in a timely manner.

► The new operator should log in promptly while the presenting iBOT still has power.

5.1.3.1 What happens when you switch users?

Everything remains exactly as it was, while Cortex waits for a new user to log in.

- All containers on the workstation remain where they were.
- The orders associated with the containers remain active.
- Any iBOTs in the Present Station remain in the port (unless that pick or putaway item was completed before the switch).
- Any iBOTs in route to the Present Station are not affected.

5.1.4 Pausing the workstation

If you need a short break but are not leaving the area, pause the workstation instead of logging out. All current containers remain exactly as they were, but no new containers are loaded onto the workstation.

On a pick or putaway screen:

1. Click **Pause** in the upper-right corner.

    The **Pause** button changes to **Resume** and flashes red.

2. When you are ready to continue, click **Resume**.

5.1.5 If the station controller is disconnected

If Cortex is not running on the WUI computer, a message appears on the monitor:

Station Controller disconnected.

Attempting to reconnect...

After the Station Controller is reconnected the WUI will restart.
Please give the WUI a few seconds to start again.
Select "Close WUI" to shut down immediately.
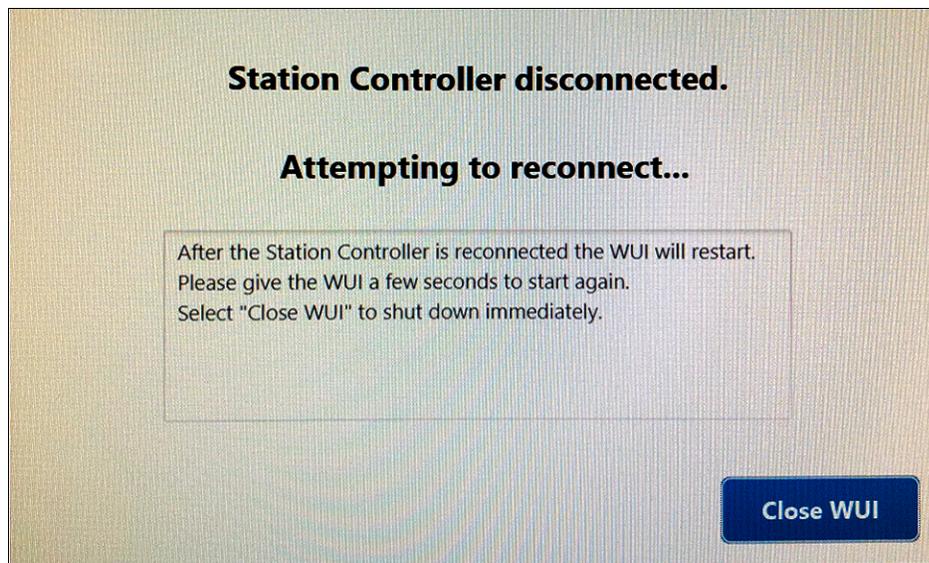
Close WUI

Figure 5-3: Station Controller disconnected

This occurs when the communication link is disrupted between the Present Station's WUI computer and the station controller software in the Infinity server cabinet. The system automatically attempts to reconnect the station controller and restart the WUI display.

If the station controller does not reconnect automatically, you can attempt to reconnect manually:

1. Click **Close WUI** on the error message.

2. On the WUI monitor's desktop, double-click the **WUI-Restart** icon.

WUI-Restart

Figure 5-4: WUI-Restart desktop icon
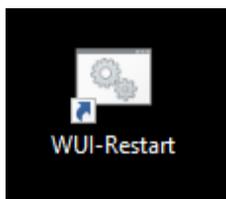
If the station controller reconnects, the Cortex login screen appears. In most cases, however, the station controller software is experiencing a problem that needs to be corrected by Authorized Personnel. Running the WUI-Restart application does not correct the problem. Generally, Authorized Personnel must use the Router UI to start or restart the station controller processes.

5.2 Overview of Pick and Putaway screen

In typical day-to-day operations, operators perform pick and putaway operations using the WUI (Cortex) screen in Figure 5-5.

• Item #
• Description
• Qty in tote cell

Tote #
(arrow indicates
left or right port in
Present Station)

PICK or PUTAWAY,
and item qty

Picture of item
(if available)

Select button lets you select
any container to show
information about it

Containers on workstation (or in virtual work
queue) and their LPN #s
• Containers visually indicate the percentage
  picked or putaway
• Container and screen are color-coded to match
  PTL light above container on workstation

• Operator info
• System status
• Pause
• Log Out/In
• Switch User

Tabs:
• Order Info
• Selected
• Work Queue
• Options
• System Status
• Details
• Pick (or Putaway)

Quantity of items to
pick or putaway (can
change if problems)

Exceptions
 (if problems)

• Quantity to pick or putaway
• Down arrow (into container) for Pick
• Up arrow (out of container) for Putaway

Note: Details and Pick (or Putaway) tabs
appear only during a Pick or Putaway.

Figure 5-5: WUI (Cortex) screen used for picks and putaways

5.3 Pick operations

A pick operation lets you fill an order by picking the appropriate items from the machine's storage rack and placing them in a container on the workstation. When the container passes through the scan tunnel, Cortex reads the container's LPN and determines that the container is for a pick order. When the container reaches a workstation, Cortex automatically sends iBOTs to retrieve the totes associated with the items in the order.

5.3.1 Picking an item from a tote

When a tote is delivered to the Present Station:

- The WUI screen shows **PICK** and highlights the appropriate container icon at the bottom of the screen. Each container is shown in a different color.
  - An arrow points into the container to indicate that the picked item needs to be placed into this container.
  - The number above the arrow and on the **Pick** tab shows the quantity of the item that needs to be picked.
  - The tote diagram on the right side of the screen highlights the cell that contains the item.
- The cell projector above the Present Station shines a color-coded light into the corresponding cell in the tote.
- The workstation PTL unit at the container lights up in the same color as on the WUI screen. The PTL display shows the quantity for this item.
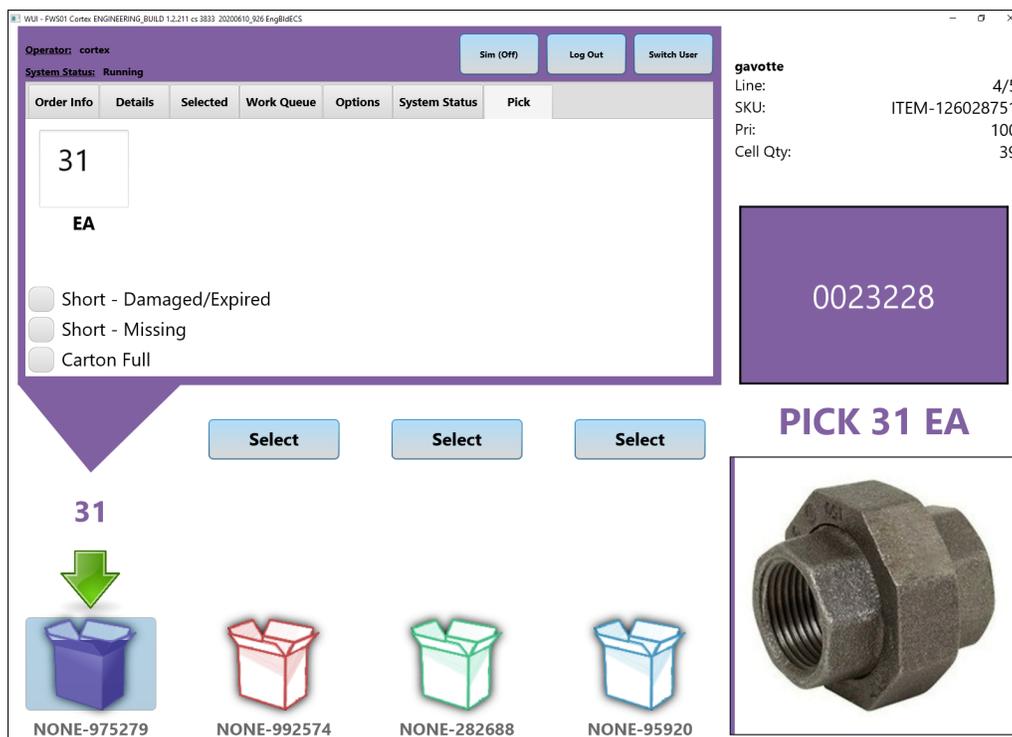

Figure 5-6: Pick screen

When the Present Station presents the tote:

1. Pick the indicated item from the tote cell. Be sure to pick the number of items shown by the quantity on the WUI screen.

2. Place the items into the container indicated by the PTL light on the workstation.

3. Press either the:

   - PTL light on the workstation
   - Highlighted container icon on the screen

4. If this was the last item for the container, it moves to the back row of the workstation and then exits the workstation.

5. If additional items need to be picked, the container remains in place and the tote for the next item is delivered to the Present Station. In this case, repeat the process until all items on the order are in the container.

5.3.2 Pick exceptions

5.3.2.1 If product is damaged and needs to be removed

In some cases, items in the tote cell may be damaged and there are not enough undamaged items to fill the orderline.

1. On the **Pick** tab, click **Short - Damaged/Expired**.
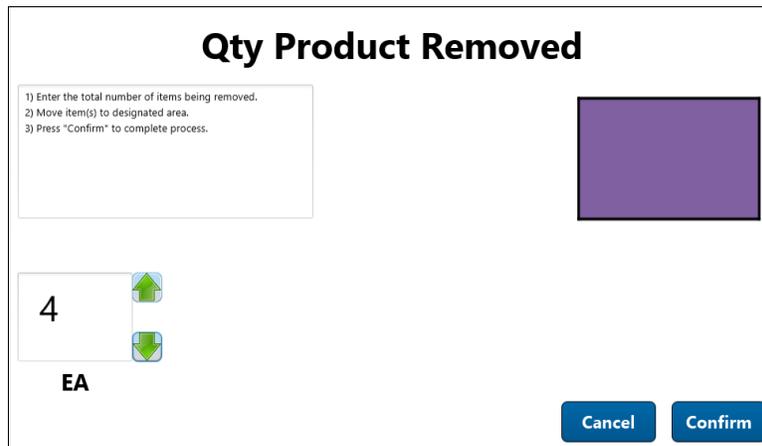
   The window in Figure 5-7 opens.

Figure 5-7: Qty Product Removed window

2. Specify how many damaged items are being removed from the order. In the text box, type the number or use the green up and down arrows.

3. Move the damaged items to a designated area, where warehouse personnel can dispose of the items properly.

4. Click **Confirm**.

5. Either click the container icon on the screen or press the PTL light for the container on the workstation.

5.3.2.2 If product is missing

In some cases, the tote cell may not contain enough items to fill the orderline. A descrepancy exists between the number of items that Cortex thinks is in the cell and the actual quantity.
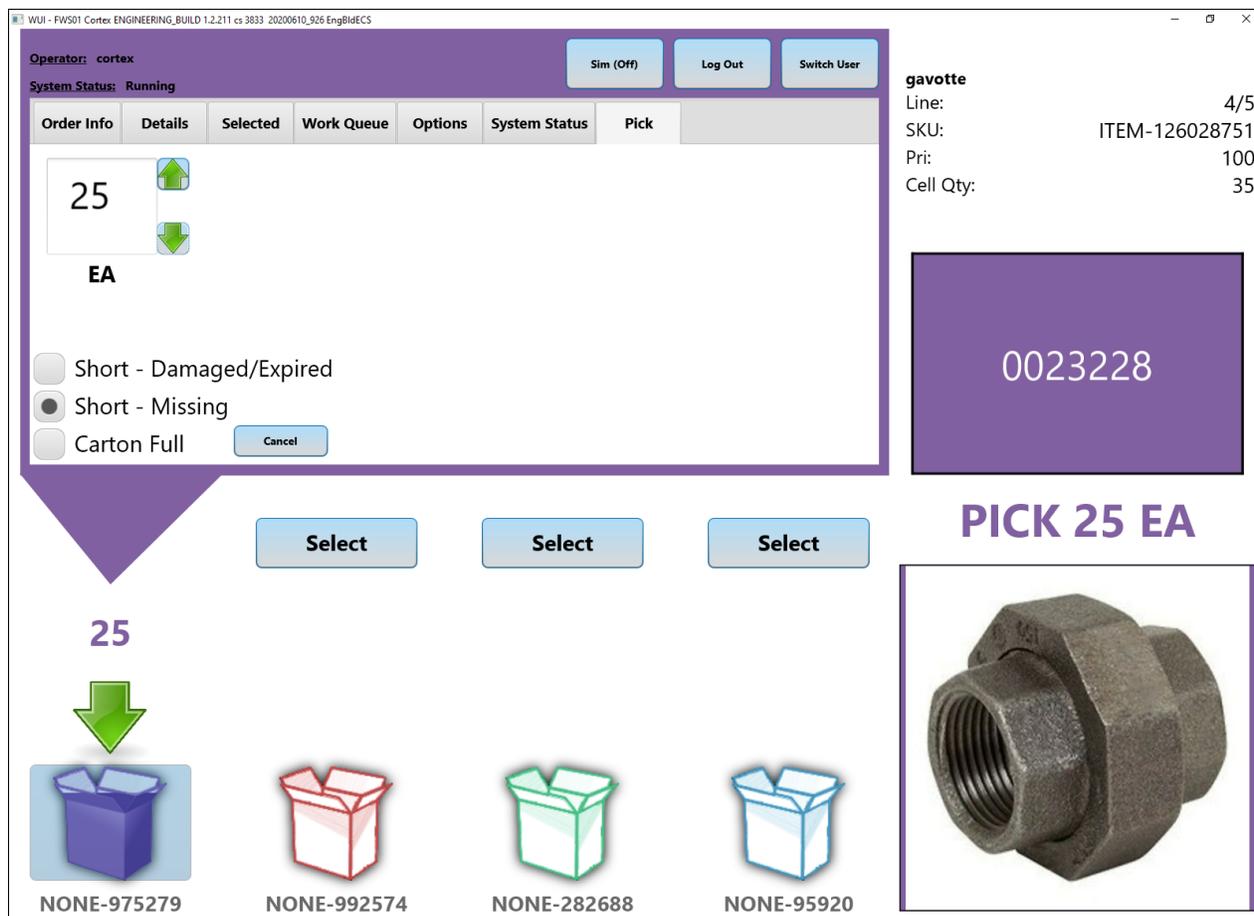
1. On the **Pick** tab, click **Short - Missing**.

Figure 5-8: Product missing

2. Specify how many items you are actually placing into the container. In the text box, type the number or use the green up and down arrows.

3. You may be prompted to re-count the remaining items in the tote if a discrepancy is noted from the amount of inventory that Cortex is showing in that tote.

4. Either click the container icon on the screen or press the PTL light for the container on the workstation.

5.3.2.3 If the container (carton) is full

In some cases, the orderline may call for more items than can fit in the container.

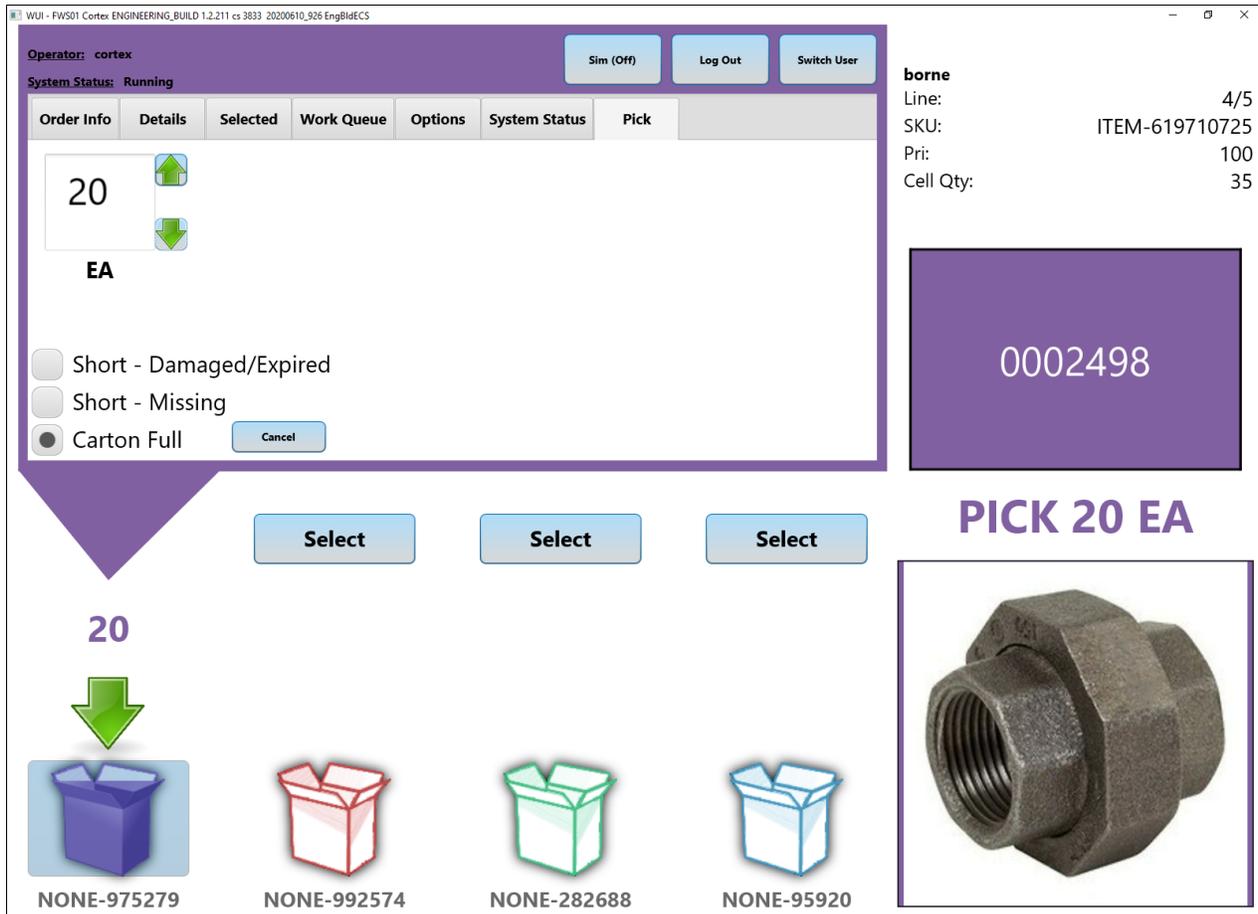1. On the **Pick** tab, click **Carton Full**.

Figure 5-9: Product will not fit

2. Specify how many items actually fit in the container. In the text box, type the number or use the green up and down arrows.

   Example: If the orderline calls for 20 items but only 18 can fit, specify 18.

3. Either click the container icon on the screen or press the PTL light for the container on the workstation.

5.3.3 Confirm inventory left

After you pick the last item in a cell, some sites require you to confirm that the cell is actually empty. This helps ensure that the item quantities stored in the Cortex database remain synchronized with the actual number in the cell.

If your site requires confirmation, the **Confirm Inventory Left** window opens automatically when Cortex thinks the cell is empty.
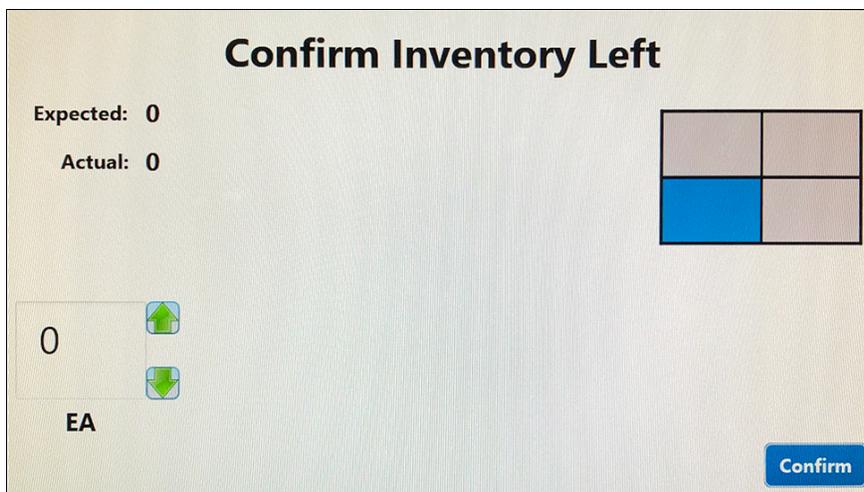
Figure 5-10: Confirm Inventory Left window

After picking the specified quantity of items:

If the cell:	Then:
Is empty	Press **Confirm** in the lower-right corner of the window
Still contains one or more items	1. In the text box in the lower-left corner, specify the number of remaining items. Either type the number in the box or use the up and down arrows. 2. Press **Confirm**.

5.3.4 Item scan validation

Some sites require you to scan every individual item after you pick it from a tote cell. This helps ensure that the item quantities stored in the Cortex database remain synchronized with the actual number of items in the cell.

If your site requires validation, the **Item Scan Validation** window opens automatically.
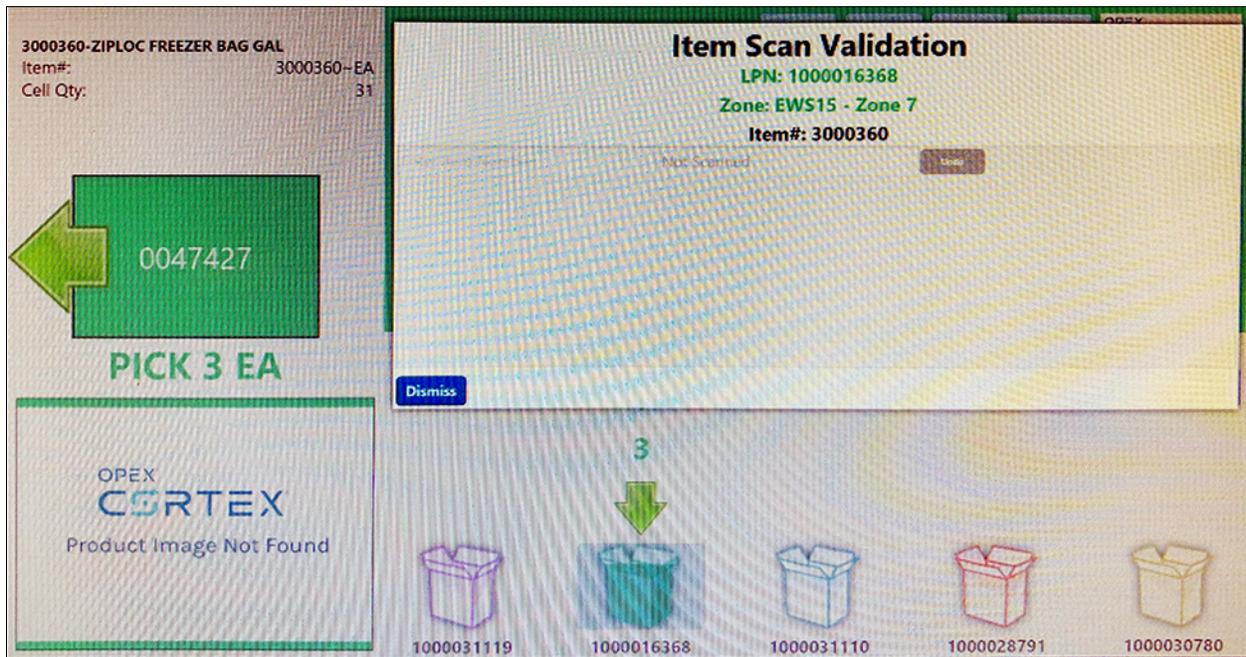

Figure 5-11: Item Scan Validation window

Using the scanner at the Present Station, scan the barcode on each picked item.

Note: If you pick multiple quantities of this item (3 in the example above), scan all 3 items.

5.4 Putaway operations

A putaway operation lets you replenish or restock inventory by removing items from a container on the workstation and placing them into the appropriate tote in the machine. When the container passes through the scan tunnel, Cortex reads the container's LPN and determines that it is a putaway order. When the container reaches a workstation, Cortex automatically sends iBOTs to retrieve the totes in which the items will be stored.

5.4.1 Putting items from a container into a tote

When a tote is delivered to the Present Station:

- The WUI screen shows **PUTAWAY** and highlights the appropriate container icon at the bottom of the screen. Each container is shown in a different color.
  - o An arrow points out of the container to indicate that an item needs to be removed from the container and put into the tote.
  - o The number above the arrow and in the **Putaway** tab shows the quantity of the item that needs to be transferred from the container to the tote.
  - o The tote diagram on the side of the screen highlights the cell into which the items must be put away.
- The cell projector above the Present Station shines a color-coded light into the corresponding cell in the tote.
- The workstation PTL unit at the container lights up in the same color as on the WUI screen. The PTL display shows the quantity of this item that needs to be removed from the container.

In Figure 5-12, 90 items need to be removed from the container and put away into the tote. The tote diagram on the side of the screen shows that this tote contains only 1 cell (purple).
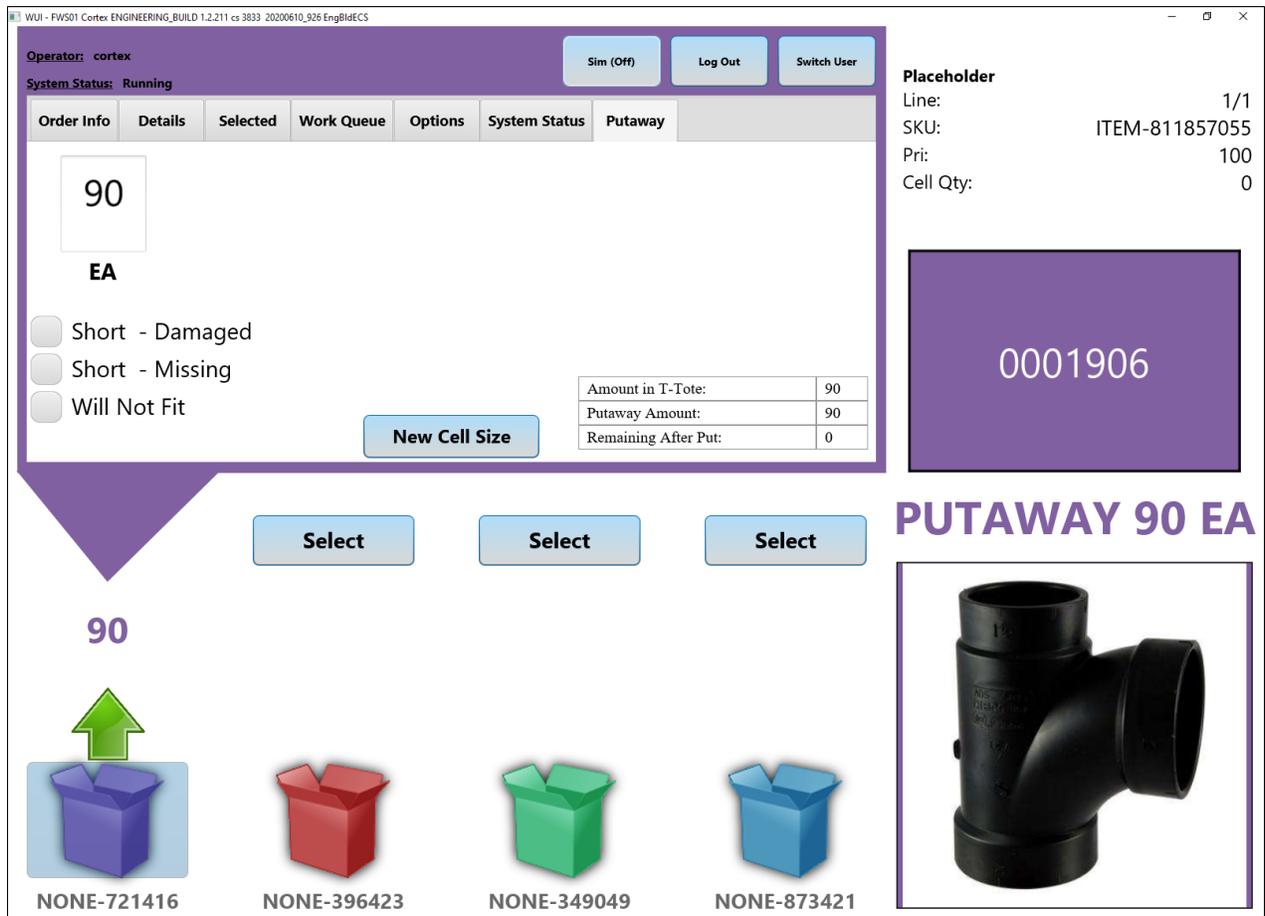

Figure 5-12: Putaway screen, tote with 1 cell

In Figure 5-13, 162 items need to be removed from the container and put away into the tote. The tote diagram on the side of the screen shows that this tote has 8 cells and the 162 items need to be added to the top-left cell (blue).
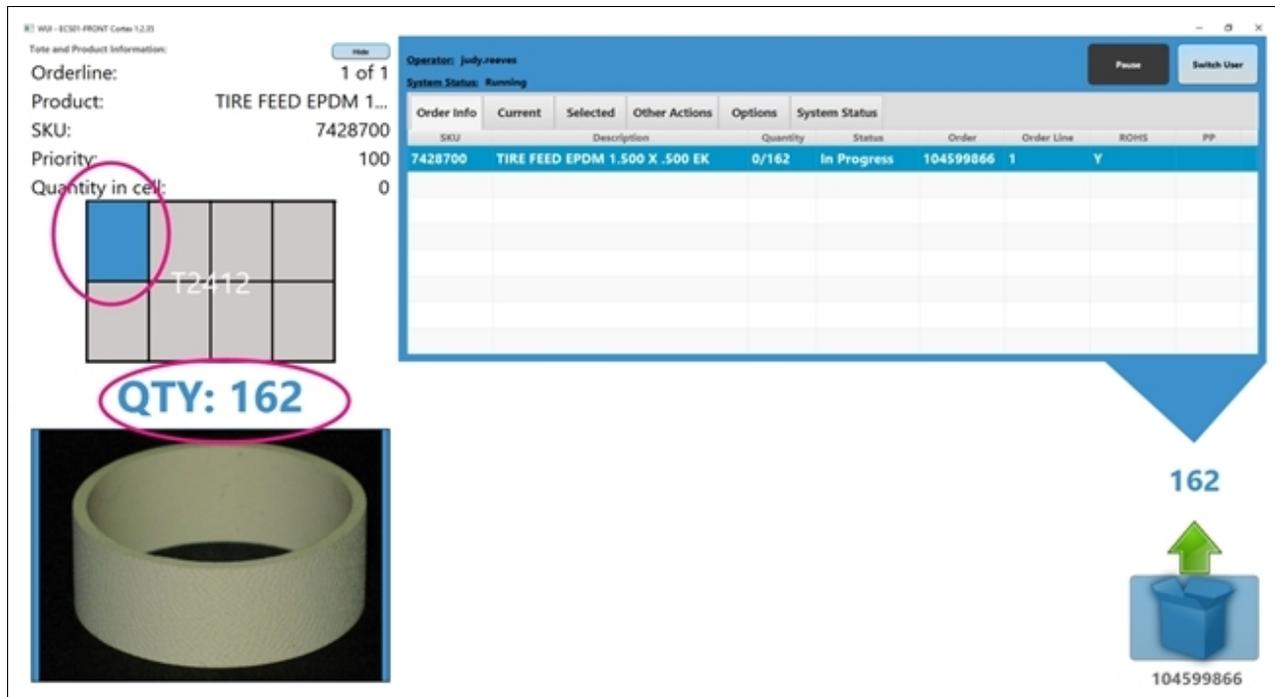

Figure 5-13: Tote with multiple cells

When the Present Station presents the tote:

1. Remove the specified quantity of items from the container and place them in the indicated tote cell.

    Note: Never restock a tote with items piled higher than the top of the tote. Overfilling the tote may cause overheight jams in the machine, or items may spill out of the tote into the machine. If a tote is overheight, the accordion doors on the port cannot close.

2. After adding the items to the tote, press either:

    - The container icon on the WUI screen.
    - The PTL button for that container on the workstation

    The tote leaves the Present Station and returns to the storage racks.

3. What happens next depends on the putaway order:

    - If the container has additional items that need to be put away, the system sends an iBOT to retrieve the next tote. When the tote arrives, the WUI screen shows the next items to be putaway.
    - If all items are put away and the container is empty, the container moves to the back of the workstation and then exits on the conveyor.

5.4.2 Putaway exceptions

5.4.2.1 If the container does not have enough items

In some cases, the WUI screen indicates that you need to put away more items than are available in the container.

1. On the **Putaway** tab, click **Short - Missing**.

2. In the number field, specify the actual number of items that you added to the tote. In the text box, type the number or use the green up and down arrows.
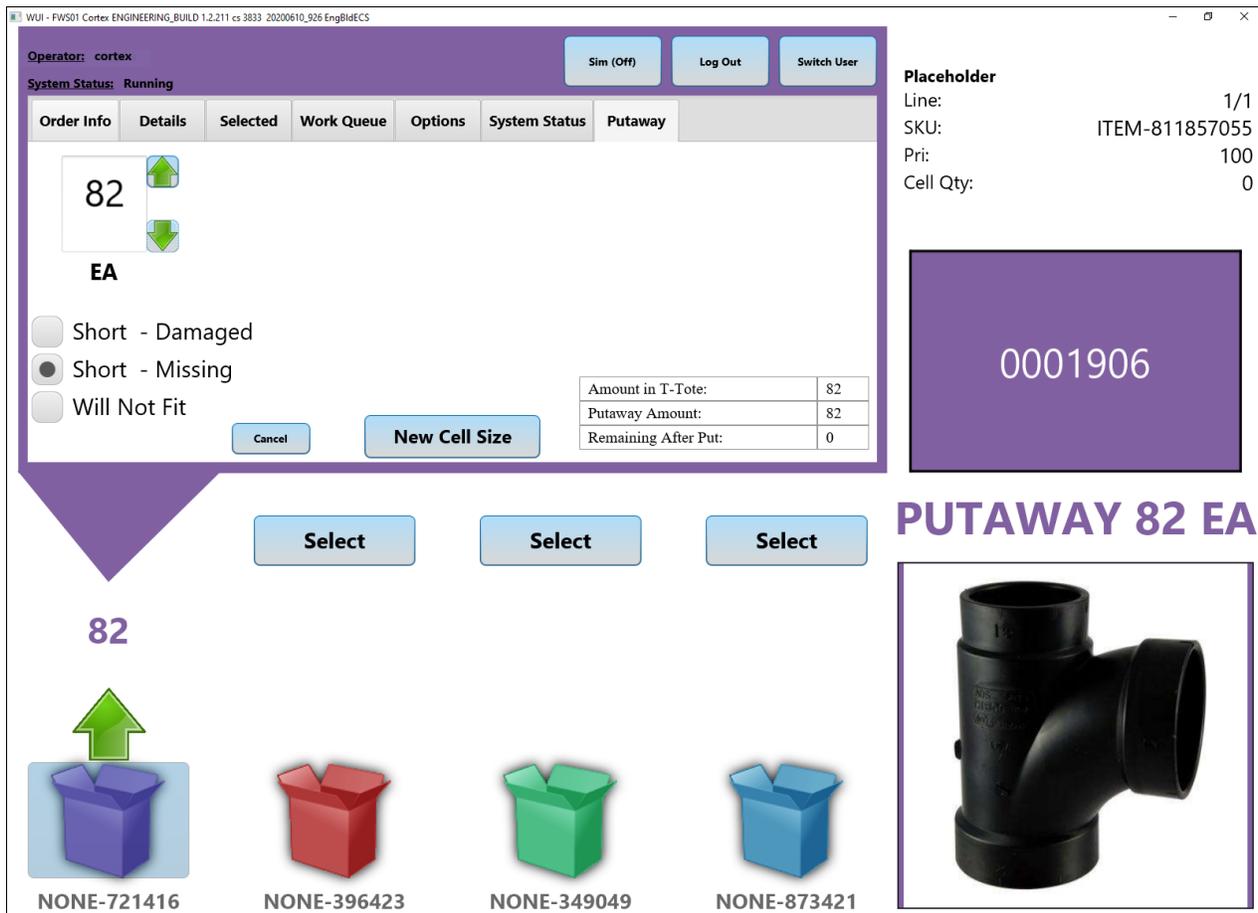

Figure 5-14: Product missing

3. Either click the container icon on the screen or press the PTL light for that container on the workstation

5.4.2.2 If some items are damaged

In some cases, items in the container may be damaged.

1. On the **Putaway** tab, click **Short - Damaged**.

    The window in Figure 5-15 opens.

Figure 5-15: Qty Product Removed window

2. In the number field, specify the number of items that are damaged and are being removed from the order. In the text box, type the number or use the green up and down arrows.

3. Click **Confirm**.

5.4.2.3 If all the items do not fit in the tote

In some cases, all of the specified quantity may not fit in the tote cell, either due to bulging or an overheight problem.

1. On the **Putaway** tab, click **Will Not fit**.

2. In the number field, specify the number of items that will not fit. In the text box, type the number or use the green up and down arrows.
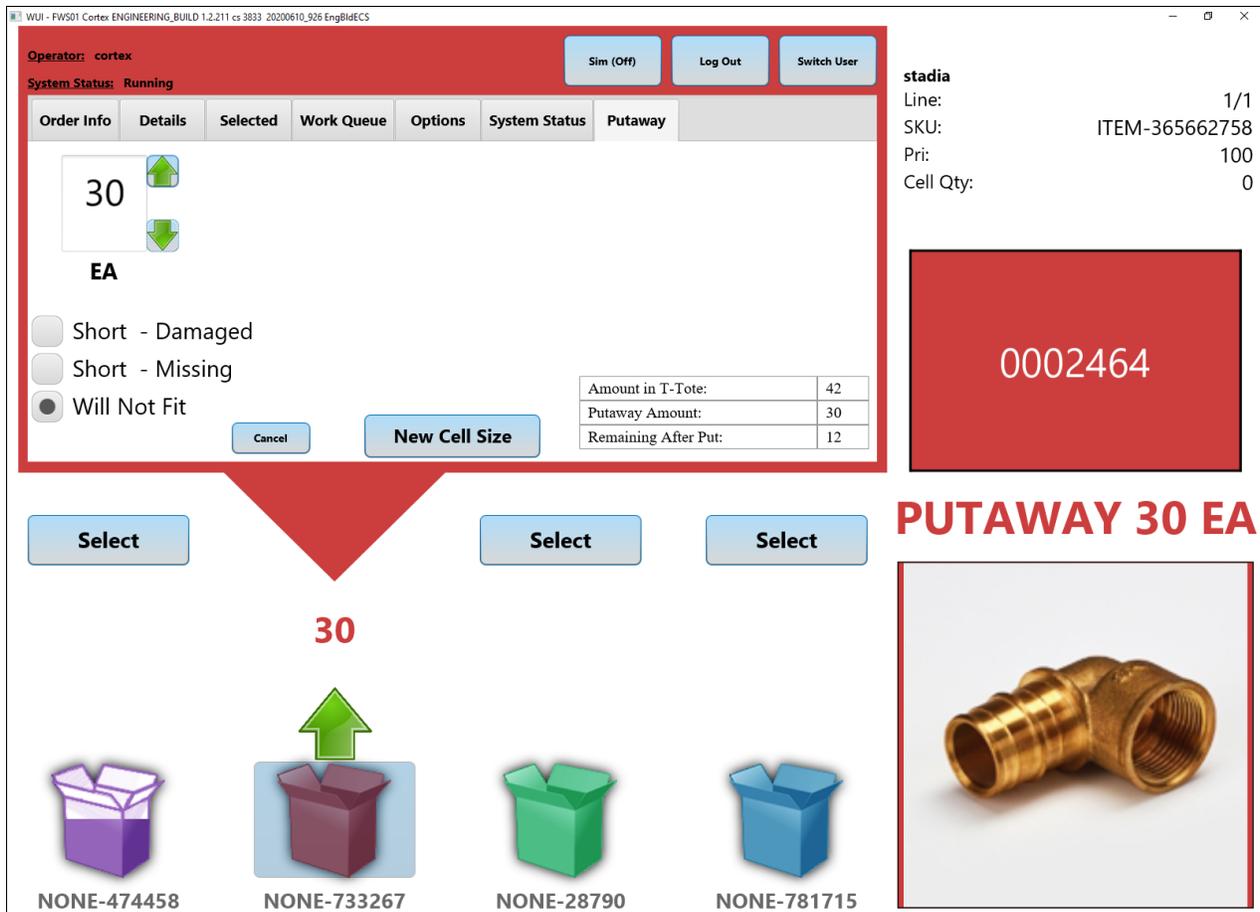

Figure 5-16: Product will not fit

3. Either click the container icon on the screen or press the PTL light for that container on the workstation

5.5 Other WUI tabs

During normal order processing, you use the **Pick** and **Putaway** tabs on the Cortex screen extensively. However, the other WUI tabs are very useful when needed.

5.5.1 Order Info tab

The **Order Info** tab shows line-by-line details about the selected order. For each item, details include:

- Item number and description
- Quantity to be picked or put away
- Status of the item (is it already picked/putaway or not)
- Order line number
- CTN ID of the container (not the tote ID that contains the item in the storage rack)
- Date and time of the pick or putaway

Note: *The exact details may depend on your site configuration.*
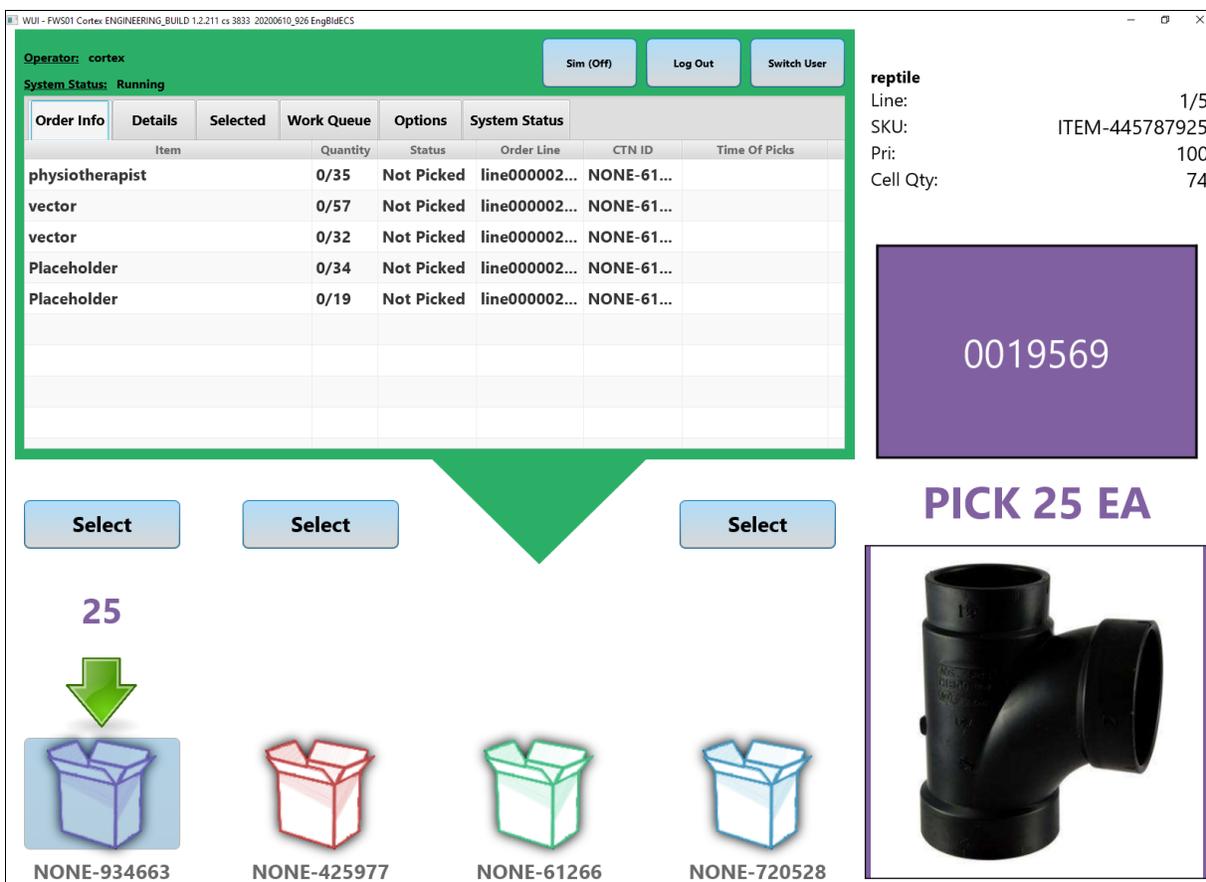

Figure 5-17: Order Info tab

By default, the selected container is the one currently being processed. At any time, however, you can select any container on the screen.

To view the order for a container other than the one being processed:

1. Click **Select** above the container whose order you want to view.

2. Click the **Order Info** tab.

5.5.2 Details tab

The **Details** tab is not currently implemented.

5.5.3 Selected tab

The **Selected** tab lets you dismiss a selected container, which suspends any work that is planned for this container. The container exits the workstation and moves to the end of the conveyance, where it uses the recirculation loop to return to the scan tunnel for reassignment to another workstation.
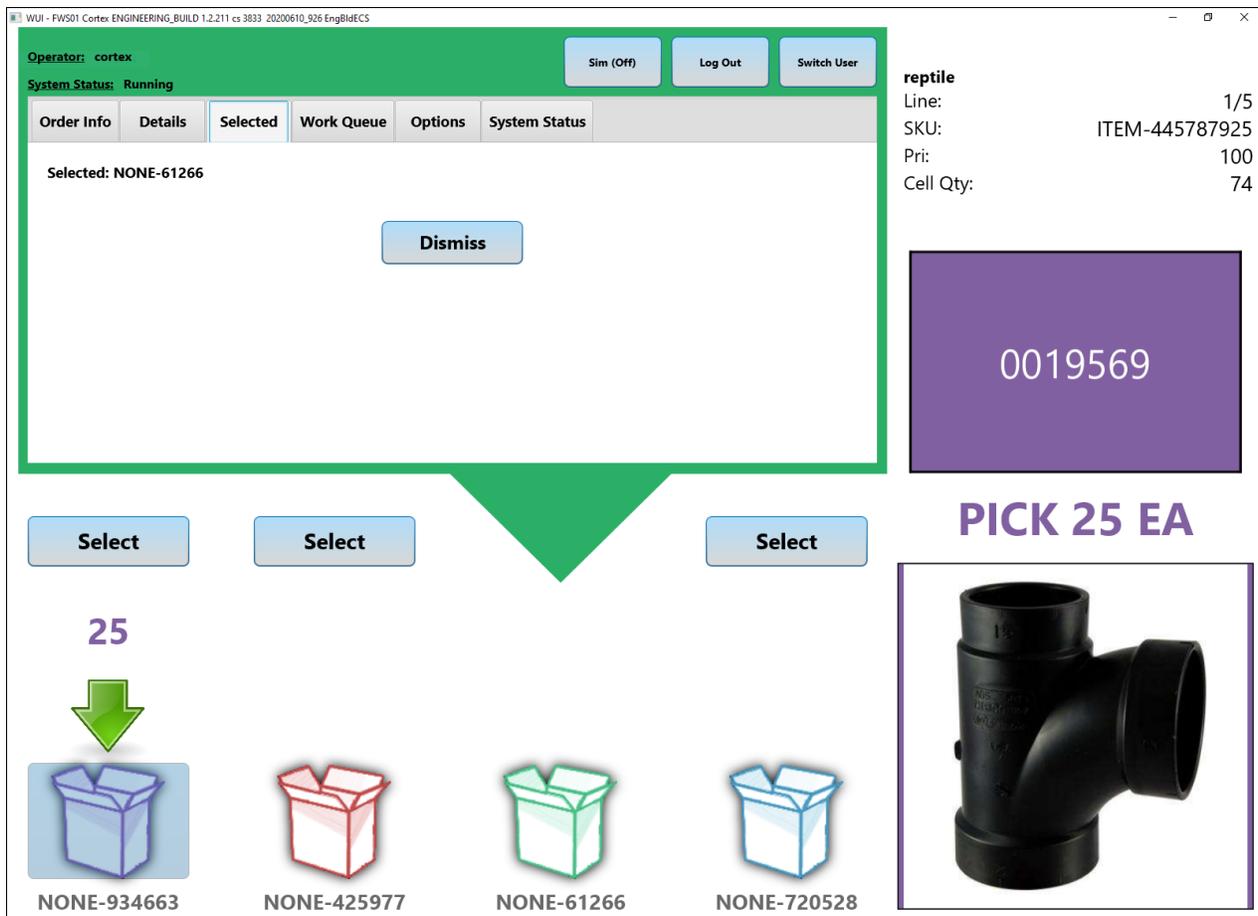

Figure 5-18: Selected tab

By default, the selected container is the one currently being processed. At any time, however, you can select any container on the screen.

To dismiss a container other than the one being processed:

1. Click **Select** above the container you want to dismiss.

2. Click the **Selected** tab.

3. Press **Dismiss**.

5.5.4 Work Queue tab

The Work Queue tab lets you create hot actions and store them in the virtual work queue. You also use this tab to process any orders that are stored in the virtual work queue.

For information about using this tab to create and process various types of hot actions, refer to Hot actions on page 76,

*Note: If the **Work Queue** tab has red text, the virtual work queue contains orders that need to be processed.*
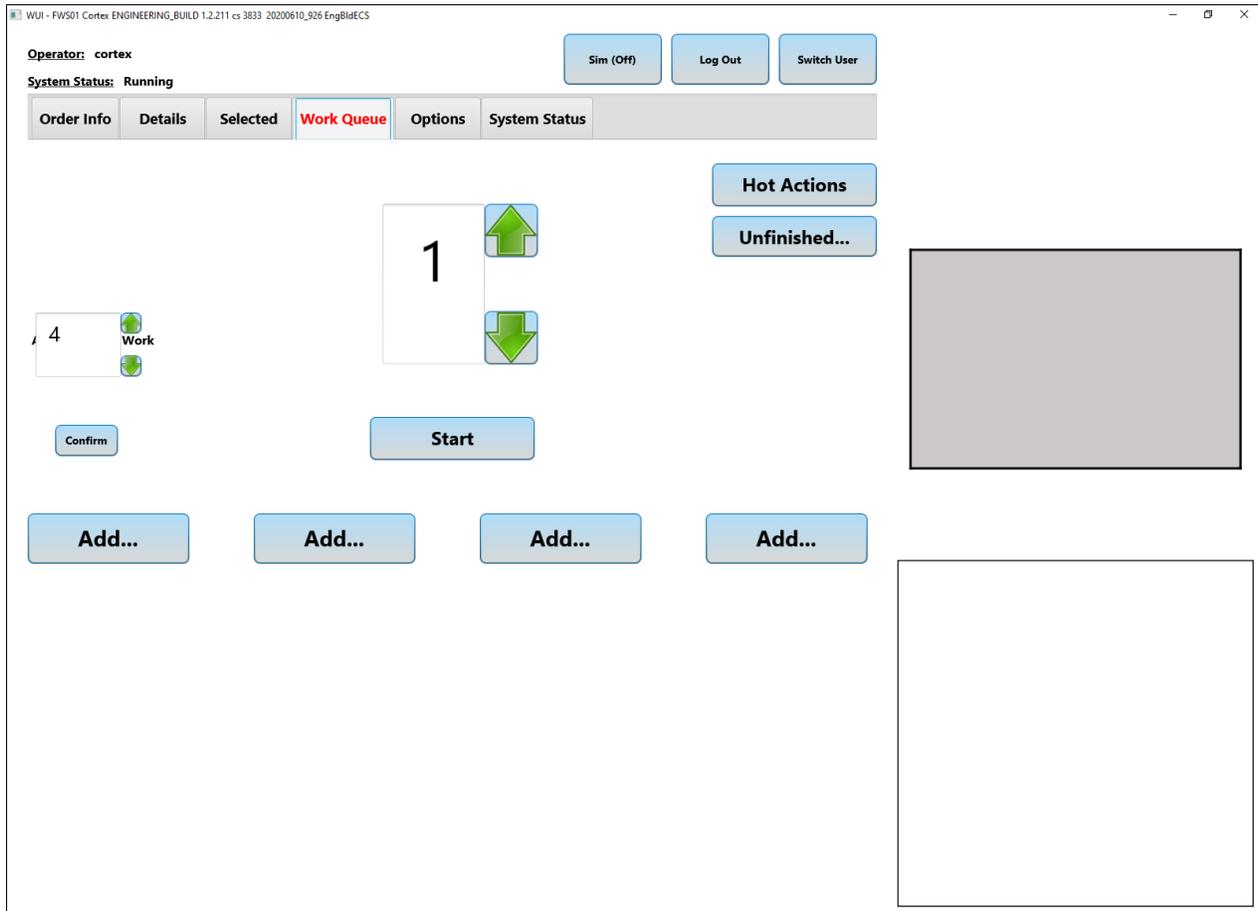
Figure 5-19: Work Queue

5.5.5 Options tab

The **Options** tab lets you set the language displayed on the screen. You can also view the log file and the version number of the WUI software.
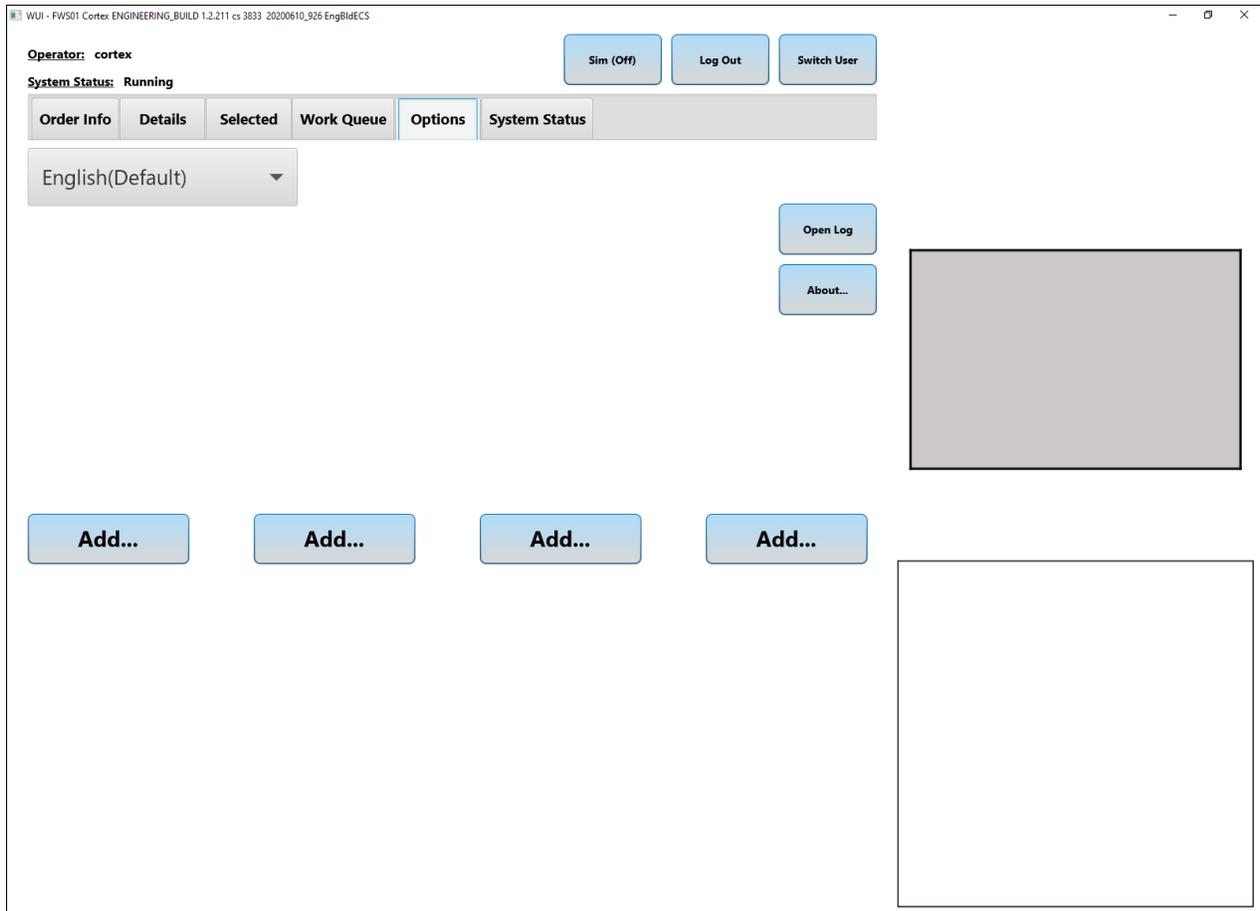
Figure 5-20: Options tab

To set the language:

1. Press the **Language** drop-down button in the upper-left corner below the tabs.

2. Select the appropriate language.

To view the log:

➢ Press **Open Log**.

To view the software version number:

➢ Press **About**.

5.5.6 System Status tab

The **System Status** tab shows the current status of all connected systems including the:

- Infinity or Perfect Pick machine
- Workstation conveyor
- Database
- PTL zone
- Whether orders are still awaiting processing on the workstation

Figure 5-21 shows an example from a Perfect Pick machine.
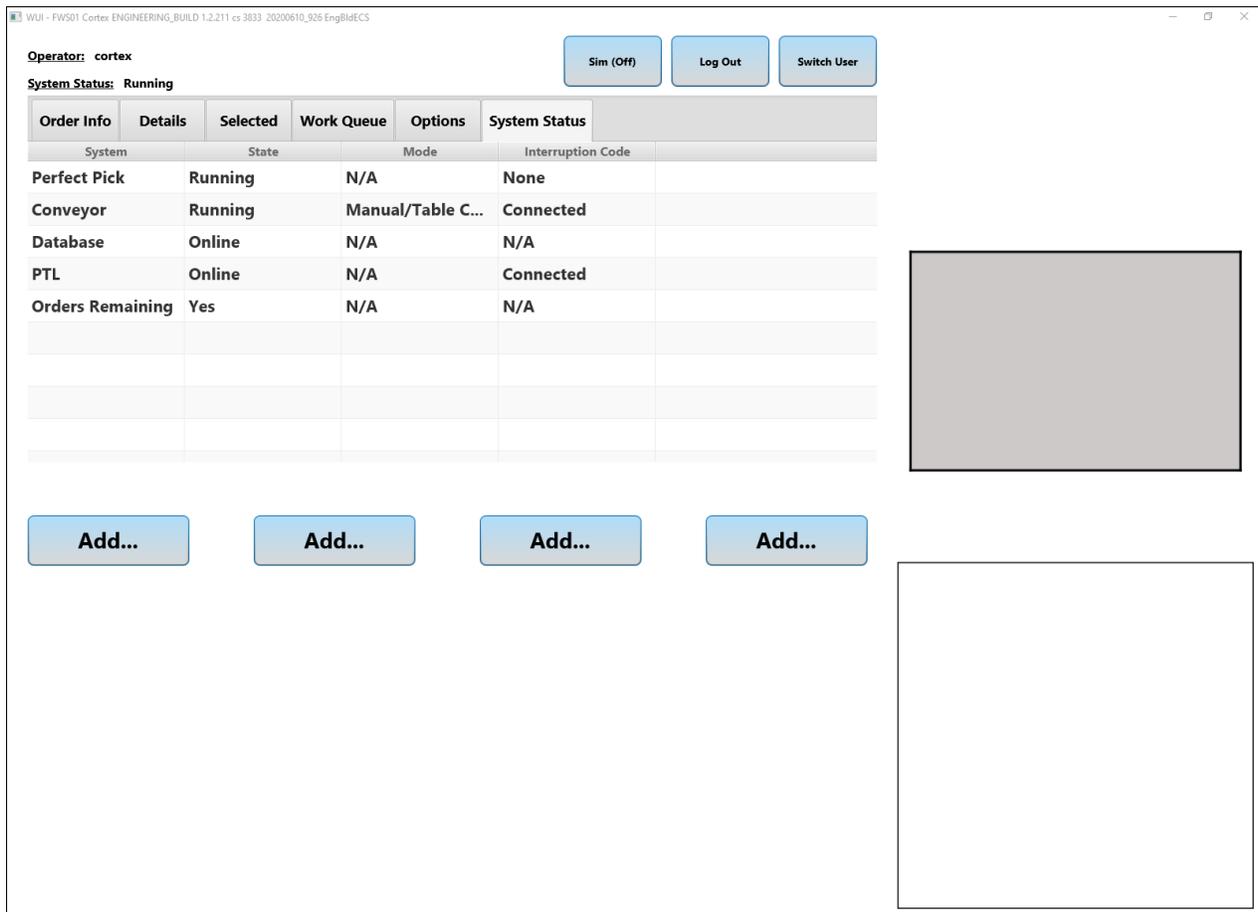
Figure 5-21: System Status

5.6 Hot actions

Hot actions are "on the fly" operations that you can create at any time from the Cortex screen on the Present Station's WUI monitor. They are not necessarily associated with a physical container on the workstation.

Many hot actions are a 2-step process:

1. Open the Cortex Console window to create a hot action as a virtual work order. The orders are placed automatically into the virtual work queue.

2. Start the virtual work queue, where you can then process the hot-action orders.

Note: After you start the virtual work queue, hot actions take priority over the normal orders generated by the customer's WMS.

5.6.1 Opening the Cortex Console (Hot Actions) window

From the main Cortex screen:

1. Click the **Work Queue** tab, and then click the **Hot Actions** button.

Figure 5-22: Hot Actions button on Work Queue tab

The Cortex Console shows tabs for the available hot actions.

Note: Not all hot actions are available at every site. For example, if your site does not support Hot Pick or Hot Put, those tabs are not shown.
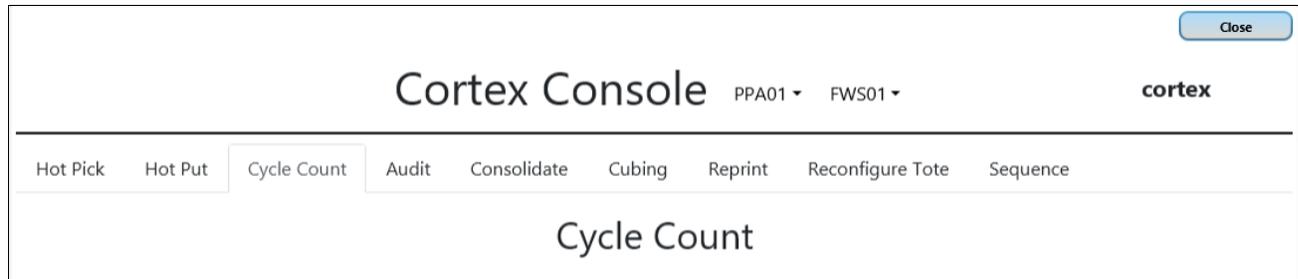

Figure 5-23: Hot action tabs on the Cortex Console

2. Click a hot action tab:

- **Hot Pick** – Lets you pick one or more items without having a pick order generated by the WMS.
- **Hot Put** – Lets you store one or more items in the machine without having a putaway order generated by the WMS.
- **Cycle Count** – Lets you count the total number of a specified item throughout the machine. You can also count all the items in a specified tote.
- **Audit** – Similar to Cycle Count but uses only the totes affected by a specified order.
- **Consolidate** – Lets you move identical items from one tote to another to free up cells for new items.
- **Cubing** – Lets you set an item's cubing values, which specify which cell types can be used to store the item and the maximum number of items that the cell types can hold.

  Note: Typically, a cubing hot action is performed only when an error (such as Putaway 0 or Qty 0) occurs and Cortex mistakenly thinks that the item cannot be stored in any cell. Cubing errors can also cause Cortex to think that more items can be stored in a cell than it can actualy hold.

- **Reprint** – Available only at sites with printers. The format of the printed label depends on how the Reprint function is defined at your site.
- **Reconfigure Tote** – Lets you rearrange the cells in a tote to use the space more efficiently.
- **Sequence** – Lets you prioritize the sequence of orders in the virtual work queue.

For details about creating individual hot actions, refer to the appropriate section later in this chapter.

5.6.2 Starting the virtual work queue

Orders for hot actions are placed in the virtual work queue in the order they are created. They remain in the work queue until an operator starts the virtual work queue. The first order that starts processing is the first order in the queue.

1. On the main Cortex screen, click the **Work Queue** tab.

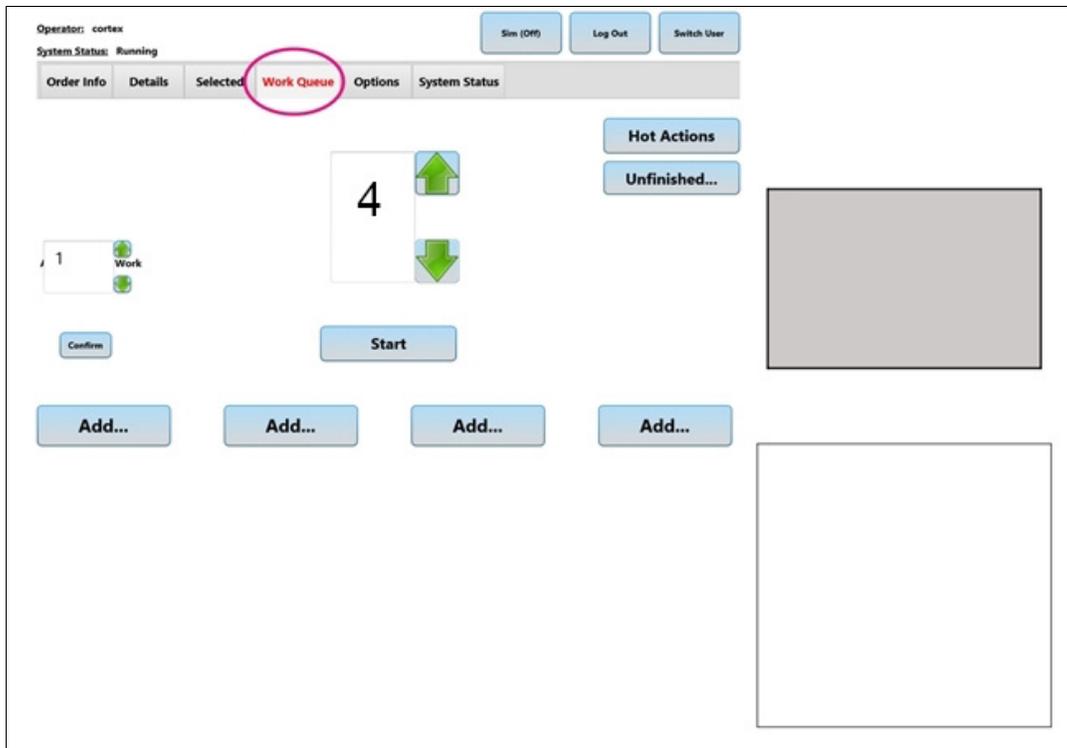   If the text on the **Work Queue** tab is red, the queue contains one or more virtual orders.

Figure 5-24: Starting the virtual work queue

2. Above the **Start** button, click the green up and down arrows to specify how many orders you want to load from the queue. The default is 4.

   If the queue contains additional orders, they remain in the queue until one of the current orders is complete.

3. Click **Start**.

   The first orders in the queue appear as virtual containers on the screen and are ready for processing.

   These orders may or may not be your hot action. For example, if your order is 6th in the queue, you need to process the first 5 before your order runs.

   Note: Do not dismiss the orders that precede yours. Whoever created those orders would have to recreate them, and they may not even know you dismissed them.

After you complete each order, the next order in the queue moves to the **Work Queue** tab.

The virtual orders on the screen may not process in sequence. Depending on the items involved, the active order may switch from one slot on the screen to another depending on which items are delivered to the Present Station.

5.6.3 Stopping the virtual work queue

When you start the virtual work queue, it continues sending orders to the **Work Queue** tab until all orders in the queue are processed or on the tab. If the queue contains many orders, you may not want to continue after you run your hot action.

To stop the virtual work queue:

1. Press **Stop**. (After you press the **Start** button, it changes to **Stop**.)

    Cortex stops sending new orders to the **Work Queue** tab when a current order is complete.

2. Continue processing all the orders currently on the tab until the tab is empty.

*Note: After you process your hot action, you may be tempted to press **Stop** and dismiss any other orders on the tab. However, you should process all the remaining orders on the tab. If you dismiss them, they will need to be re-entered as new orders.*

5.6.4 Using the on-screen keyboard

For windows that require you to enter numeric or text data, you can use a physical keyboard at the workstation or the on-screen keyboard at the bottom of the display.
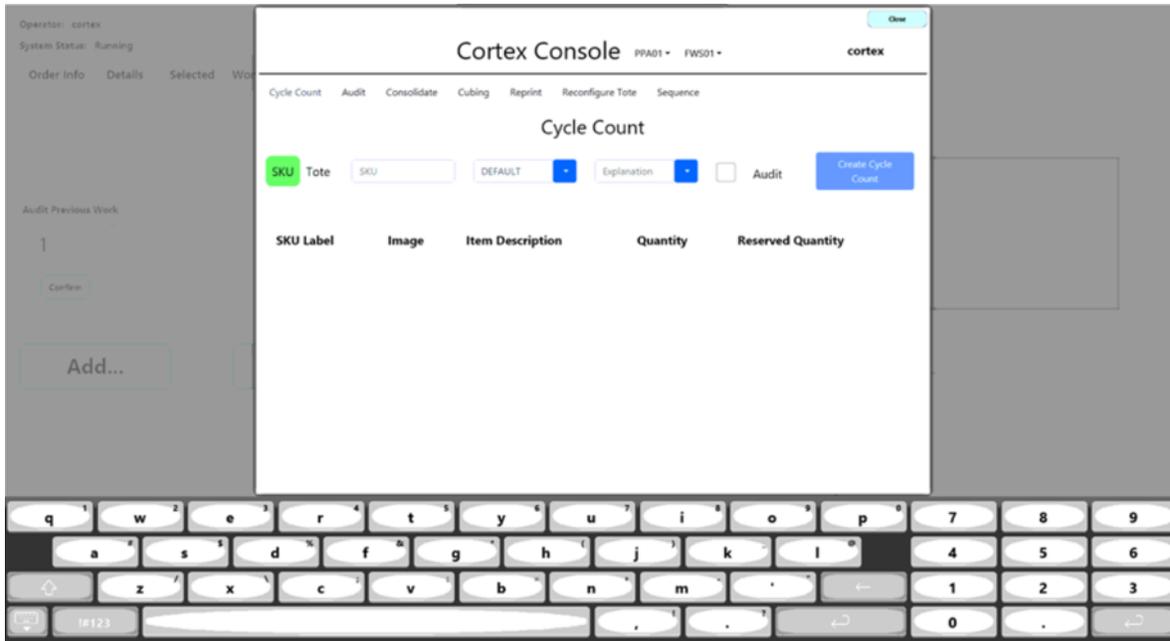

Figure 5-25: On-screen keyboard

5.6.5 Hot Pick tab

A hot pick lets you pick a specified item out of a tote without having a WMS order or a container on the workstation.

Note: You can pick only one item at a time, although you can pick a specified quantity of the item. To pick additional items, create separate hot pick orders.

5.6.5.1 Creating a hot pick order

From the Cortex Console window (refer to):

1. Click the **Hot Pick** tab.

2. Specify the item to pick:

    - **SKU** – Type the item number.
    - **Quantity** – Type the quantity of that item.
      (This field becomes active after you type a valid item number.)

    Cortex searches for all Units of Measure (UOM) stored for that item. For example, an item may be stored as individual items (EACH), boxes (BXS), or cases (CS). If it has more than one UOM, the **SKU** field becomes a drop-down that lists the UOMs.

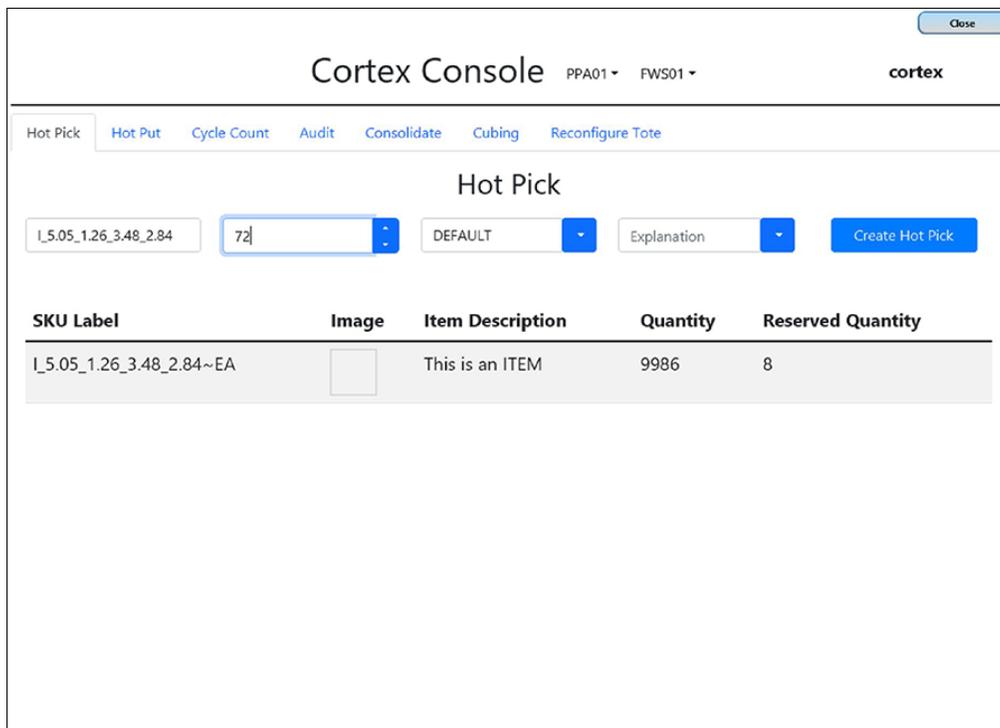3. Select the appropriate UOM from the **SKU** drop-down list.

Figure 5-26: Hot Pick window

*Note: You can pick as many of the items as needed, but the total number remaining in the machine cannot fall below the **Reserved Quantity**.*

4. Click **Create Hot Pick**.

5. When prompted, click **Create**.

6. When prompted for confirmation, click **OK**.

   Cortex creates a virtual order for the hot pick and places it in the virtual work queue.

7. In the upper-right corner of the Cortex Console, click **Close**.

5.6.5.2 Processing a hot pick order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to .)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: Your hot pick may not be the first order that runs. If not, process the preceding orders until your hot pick starts.

When the hot pick order starts:

The tote that contains the specified item and UOM is delivered to the Present Station. The Cortex screen highlights the appropriate cell and shows the quantity to pick. The Present Station's overhead cell projector shines a color-coded light into the cell.

1. Pick the indicated quantity from the cell and place the items in a designated area.

2. Press the virtual container on the screen to signify that the items have been picked.

The tote returns to the storage rack.

5.6.6 Hot Put tab

A hot put lets you put away a specified item without having a WMS order or a container on the workstation.

Note: *You can put away only one item at a time, although you can put away a specified quantity of the item. To put away additional items, create separate hot put orders.*

5.6.6.1 Creating a hot put order

From the Cortex Console window (refer to):

1. Click the **Hot Put** tab.

2. Specify the item to put away:

    ●   **SKU** – Type the item number.
    ●   **Quantity** – Type the quantity of that item.
        (This field becomes active after you type a valid item number.)

    Cortex searches for all Units of Measure (UOM) stored for that item. For example, an item may be stored as individual items (EACH), boxes (BXS), or cases (CS). If it has more than one UOM, the **SKU** field becomes a drop-down that lists the UOMs.

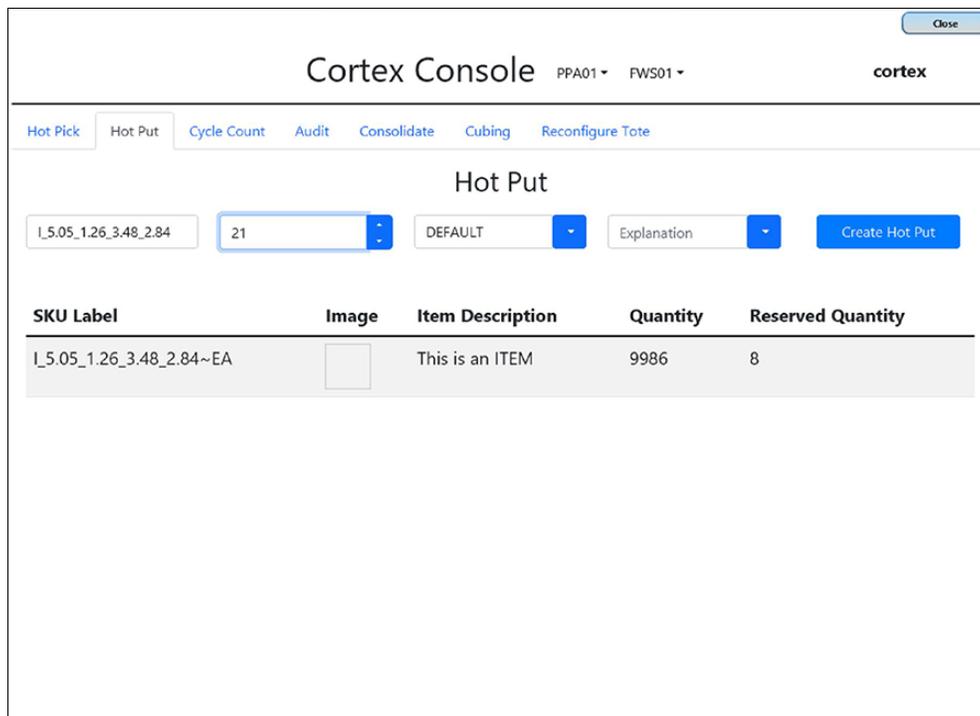3. Select the appropriate UOM from the **SKU** drop-down list.

Figure 5-27: Hot Put window

4. Click **Create Hot Put**.

5. When prompted, click **Create**.

6. When prompted for confirmation, click **OK**.

   Cortex creates a virtual order for the hot pick and places it in the virtual work queue.

7. In the upper-right corner of the Cortex Console, click **Close**.

5.6.6.2 Processing a hot put order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to .)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: Your hot put may not be the first order that runs. If not, process the preceding orders until your hot put starts.

When the hot put order starts:

The tote used to store the specified item and UOM is delivered to the Present Station. The Cortex screen highlights the appropriate cell and shows the quantity to put away. The Present Station's overhead cell projector shines a color-coded light into the cell.

1. Place the indicated quantity into the cell.

2. Press the virtual container on the screen to signify that the items have been put away.

The tote returns to the storage rack.

5.6.7 Cycle Count tab

A cycle count is an inventory-confirmation action that lets you verify whether the actual number of items in the machine matches the quantity that Cortex thinks is in the machine. You can perform a cycle count for a specific item in all totes or for all items in a specific tote.

Note: *The customer's WMS can also create a cycle count and place it into the virtual work queue, where you can then process it as a hot action.*

5.6.7.1 Creating a cycle count order

From the Cortex Console window (refer to):

1. Click the **Cycle Count** tab.

2. Select either:

    - **SKU** – For a specified item, counts the total quantity of that item stored in all the totes in the machine.
    - **Tote** – For a specified tote, counts all the items in every cell in the tote.
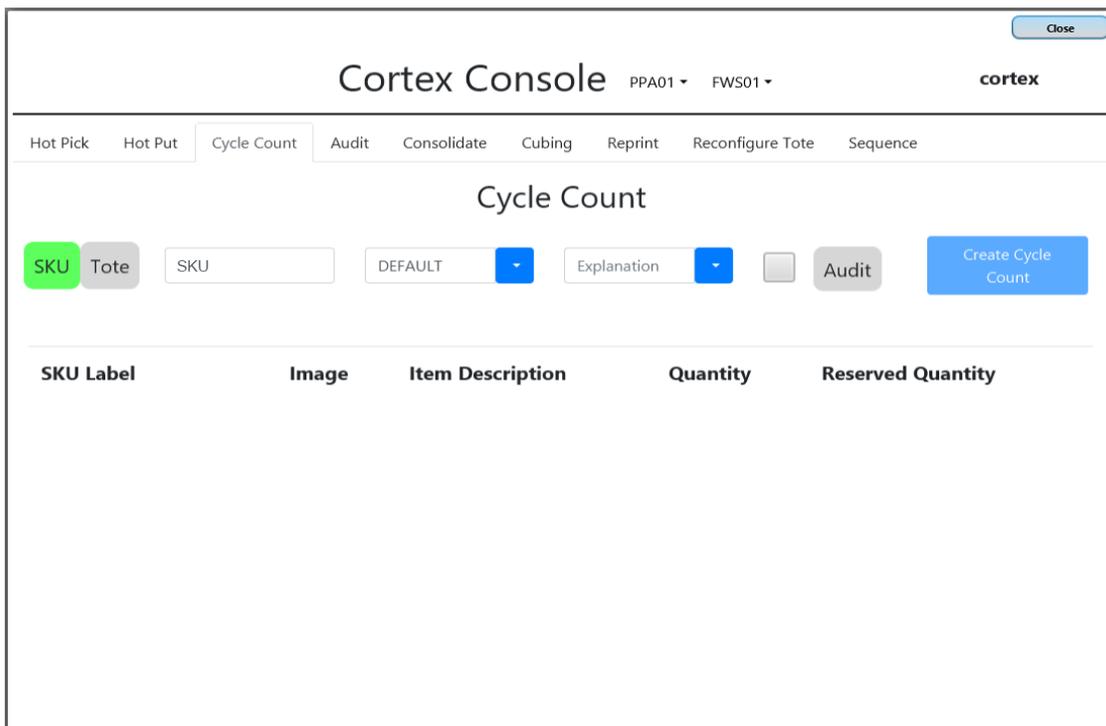
Figure 5-28: Cycle Count

3. If you selected **SKU**:

  a. Type the item number.

    Note: When the entry field is active, you can use the hand scanner to scan the item number.

    Cortex searches for all Units of Measure (UOM) stored for that item. For example, an item may be stored as individual items (EACH), boxes (BXS), or cases (CS). If it has more than one UOM, the **SKU** input field becomes a drop-down that lists the UOMs.

  b. Select the UOM.

    Note: Be sure to select the correct UOM. For example, if you select EACH but many of the items are stored in a box, the cycle count only counts the individual items and ignores the boxed items.

The **Quantity** field shows how many of these items with the specified UOM are supposed to be in the machine according to the Cortex database.
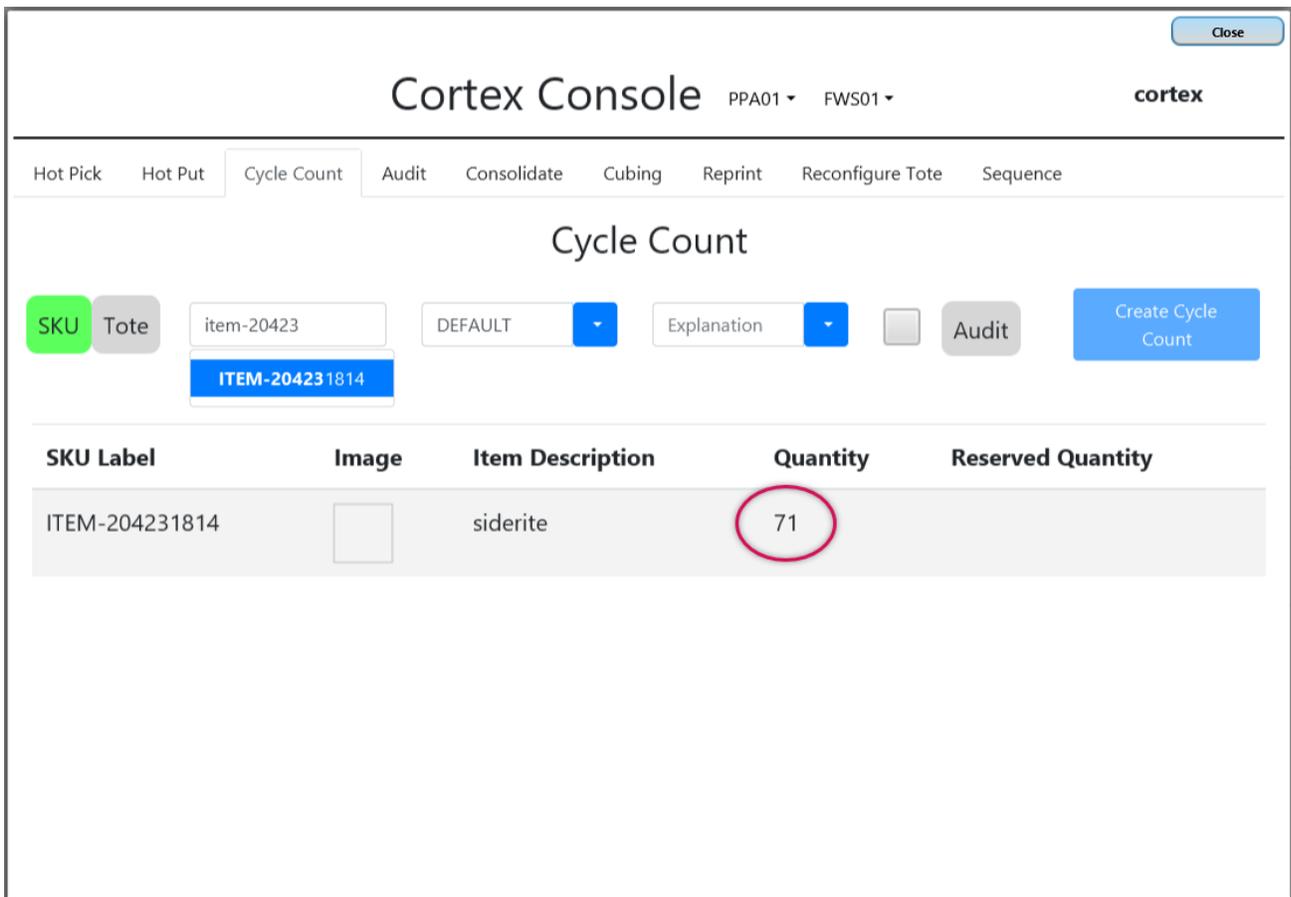

Figure 5-29: Item number entered

*Note: To mark this cycle count as an audit in the database log, click the **Audit** button. This is not the same as performing an audit hot action described in*
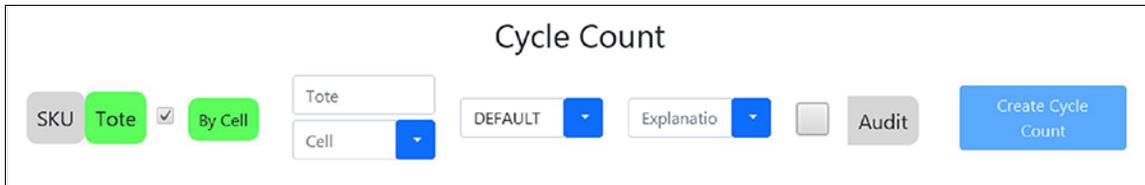
4. If you clicked **Tote**:

   a. Type the tote number.

     By default, every cell in the tote is counted.

   b. To count only a specified cell, click **By Cell**.

     A drop-down lists all the cells in the tote, such as AA and AB for a 2-cell tote.

     ➢ Select the cell you want to count.

Figure 5-30: Select a tote cell from the list

5. Click **Create Cycle Count**.

6. When prompted, click **Create**.
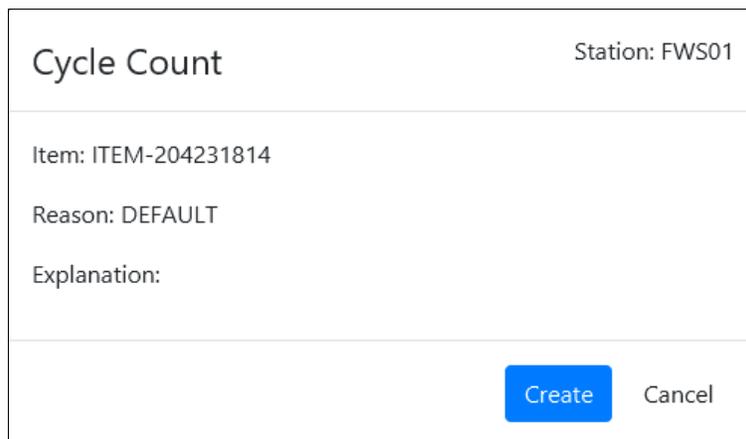
Figure 5-31: Create Cycle Count

7. When prompted for confirmation, click **OK**.

   Cortex creates a virtual order for the cycle count and places it in the virtual work queue.

8. In the upper-right corner of the Cortex Console, click **Close**.

5.6.7.2 Processing a cycle count order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to Starting the virtual work queue on page 78.)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: Your cycle count may not be the first order that runs. If not, process the preceding orders until your cycle count starts.

When the cycle count order starts:

If you specified an SKU

The first tote that contains the item number and UOM is delivered to the Present Station.

On the Cortex screen, a circular arrow appears above the virtual container that represents the cycle count. The number above the circular arrow shows the quantity that Cortex thinks is in the tote.
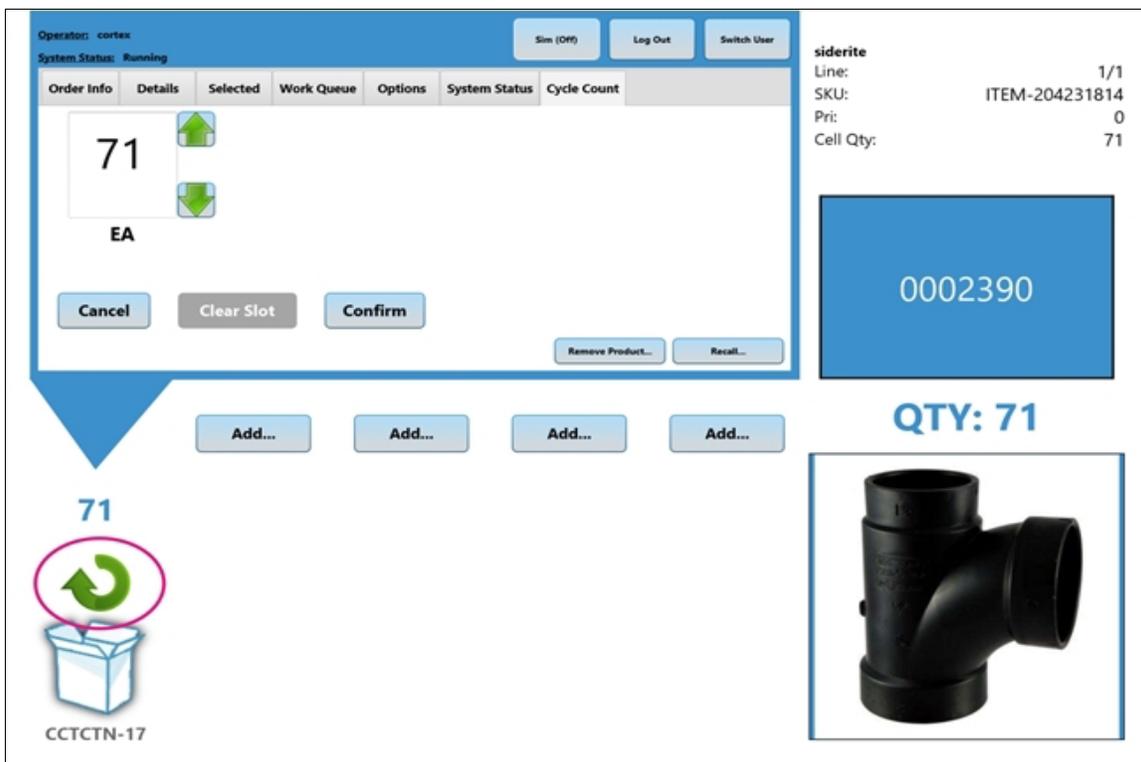

Figure 5-32: Circular arrows indicate a cycle count

Note: For a tote with multiple cells, the Cortex screen highlights the cell that contains the item. The Present Station's overhead projector shines a light into the corresponding tote cell.

1. Manually count the number of items in the cell.

2. Compare your count to the quantity on the screen.

If your count:	Do this:
Matches the screen	Click **Confirm**.
Is greater than or less than the screen	Use the green up and down arrows to specify your count, and then click **Confirm**. A message asks you to recount the items. If your recount is the same, click **Confirm** again.

3. If other totes contain the same item, the system retrieves the next tote for counting. When no other totes contain the item, the cycle count is complete.

If you specified a tote

The tote is delivered to the Present Station. On the Cortex screen, a circular arrow appears above the virtual container that represents the cycle count.

-   If you are counting the items in every cell, the Cortex screen highlights the first cell and displays information about that item. The Present Station's overhead cell projector shines a light into the corresponding cell.
-   If you are counting only a specified cell, that cell is highlighted.

The **Quantity** field shows the number of items that Cortex thinks is in the cell.

1. Manually count the number of items in the cell.

2. Compare your count to the quantity on the screen.

If your count:	Do this:
Matches the screen	Click **Confirm**.
Is greater than or less than the screen	Use the green up and down arrows to specify your count, and then click **Confirm**. A message asks you to recount the items. If your recount is the same, click **Confirm** again.

3. If you are counting every cell, the system highlights the next cell. Repeat the previous 2 steps for each remaining cell.

After you click **Confirm** for the last cell, the cycle count is complete and the tote returns to the storage rack.

5.6.7.3 If product needs to be removed during a cycle count

In some cases, you may need to remove an item from the system. This is not a pick operation because you are not picking the item for an order; you just need to remove it. A cycle count lets you find the item. Depending on the situation, you then need to remove all the items or only a certain quantity of the item.

To remove one or more of the specified item during a cycle count:

1. On the Cortex screen's **Cycle Count** tab, click **Remove Product**.

Figure 5-33: Remove Product button

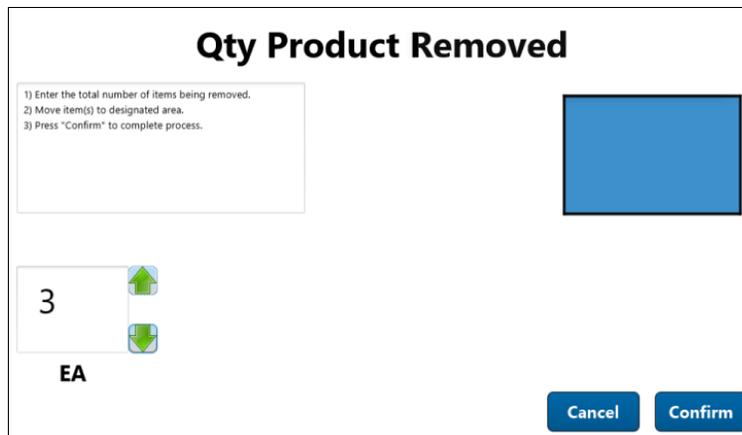The following window opens:

Figure 5-34: Product Removed window

2. Use the green up and down arrows to specify how many items you are removing.

3. Remove the specified quantity of items from the highlighted cell, and place them in a designated area.

4. Press **Confirm**.

5. Repeat for any additional totes that contain the item.

5.6.7.4 If an item has a recall

In some cases, an item may have a recall notice that requires all of the items to be removed from the machine. A cycle count lets you find the recalled item.

To recall the specified item during a cycle count:

1. On the Cortex screen's **Cycle Count** tab, click **Recall**.
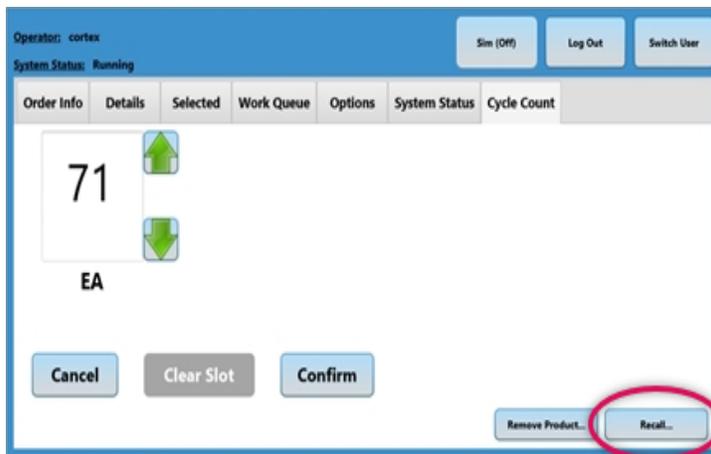

Figure 5-35: Recall button
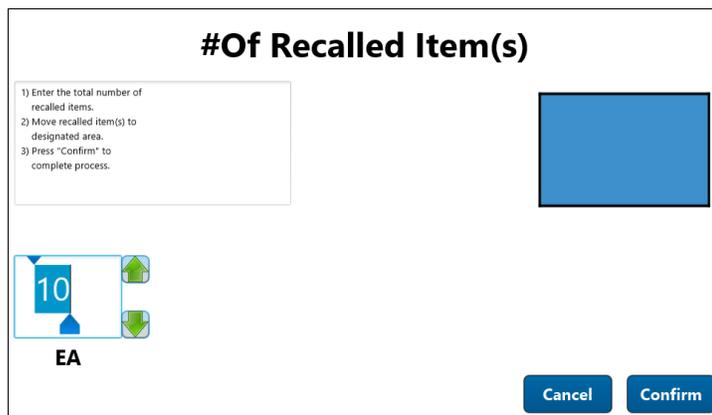
The following window opens:

Figure 5-36: Recalled Items window

2. Use the green up and down arrows to specify how many items you are removing.

3. Remove the specified number of items from the highlighted cell, and place them in a designated area.

4. Press **Confirm**.

5. Repeat for any additional totes that contain the item.

5.6.8 Audit tab

An audit is similar to a cycle count. Unlike a cycle count that checks every tote that has a specified item, an audit checks only the totes that were used to fill a specified LPN, order number, or orderline.

Note: Typically, an audit is performed when a discrepancy occurs between the number of items in the order and the number actually found in the shipping container. An audit can verify whether the correct number of items were picked from the tote. For example, an orderline has a quantity of 10 items but only 9 are in the shipping container. By running an audit, you can verify whether the tote has 1 more item than it should.

5.6.8.1 Creating an audit order

From the Cortex Console window (refer to Opening the Cortex Console (Hot Actions) window on page 76):

1. Click the **Audit** tab.

2. Click one of the following:

   - **LPN** – Counts all items referenced by a specified LPN.
   - **Order** – Counts all items on a specified order.
   - **Line** – Counts the items in the tote cell used to fill a specified orderline. (An orderline number is unique and identifies the order number.)

3. Specify the LPN number, order number, or line number, as appropriate.

   Note: When the entry field is active, you can also use the hand scanner to scan in the number.
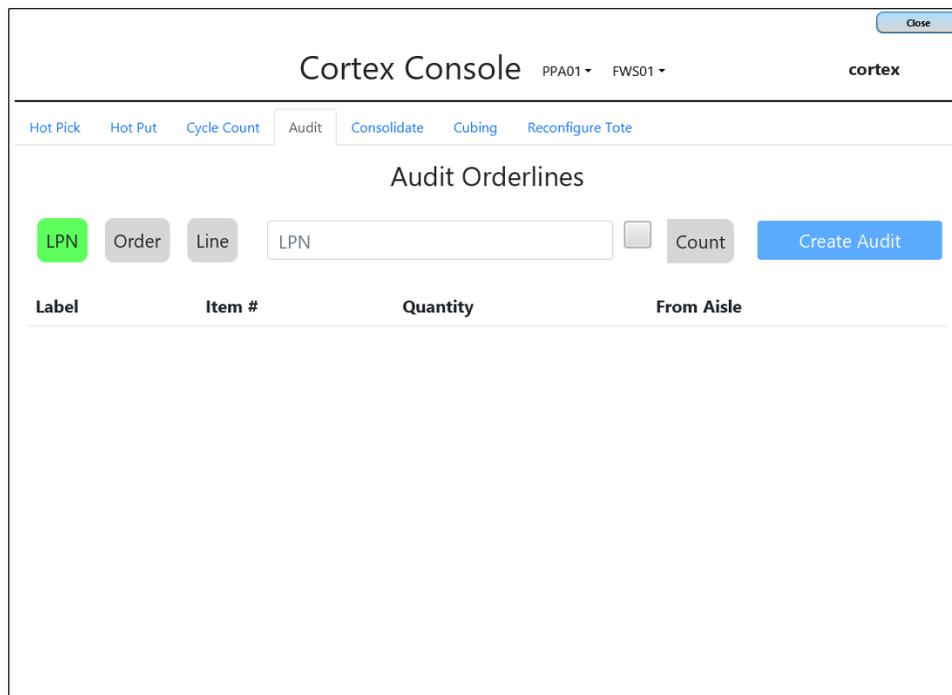

Figure 5-37: Audit tab

>   ***Note:*** *To mark this audit as a cycle count in the database log, select the checkbox beside the* ***Count*** *button, and then click* ***Count****.*

4. Click **Create Audit**.

5. When prompted, click **Create**.

   Cortex creates a virtual order for the audit and places it in the virtual work queue.

6. In the upper-right corner of the Cortex Console, click **Close**.

5.6.8.2 Processing an audit order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to .)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: *Your audit may not be the first order that runs. If not, process the preceding orders until your audit starts.*

When the audit order starts:

According to the LPN, order, or orderline you specified, the system delivers the appropriate tote to the Present Station.

- If you specified an LPN or order, the system delivers all the totes that provided every item on the order.
- If you specified an orderline, the system delivers only the tote that provided the item.

The Cortex screen highlights the appropriate cell and displays information about the item. A circular arrow appears above the virtual container that represents the audit.

The **Quantity** field shows the number of items that Cortex thinks is in the cell.
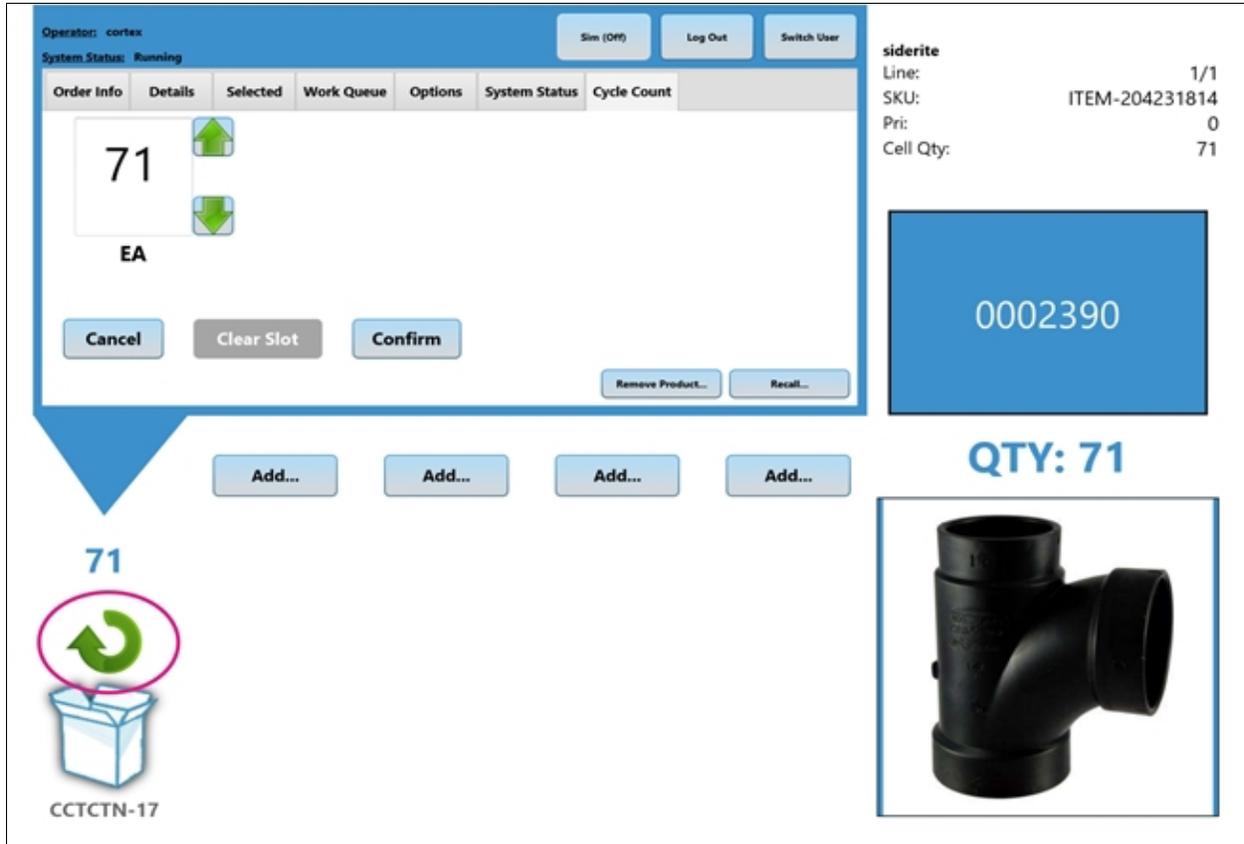
Figure 5-38: Circular arrow indicates an audit

1. Manually count the number of items in the cell.

2. Compare your count to the quantity on the screen.

If your count:	Do this:
Matches the screen	Click **Confirm**.
Is greater than or less than the screen	Use the green up and down arrows to specify your count, and then click **Confirm**. A message asks you to recount the items. If your recount is the same, click **Confirm** again.

3. If the current tote provided additional items for an LPN or order, the Cortex screen and the cell projector highlight the next cell, where you repeat the previous 2 steps.

4. If an LPN or order used items from other totes, the system retrieves each additional tote, where you repeat the previous 3 steps.

After you click **Confirm** for the last item in the order, the audit is complete and the tote returns to the storage rack.

5.6.9 Consolidate tab

Consolidation is useful when the same item is distributed among multiple cells in different totes, particularly when some of the cells contain only a few items and are far from being full. By consolidating the item into fewer cells, you can free up storage space so more cells are available for other items.

5.6.9.1 Consolidation restrictions

If the system tracks items by:	Then:
Lot number	You cannot consolidate items from one lot with items from a different lot.
First-in First-out (FIFO)	You may not be able to consolidate them.
Expiration date	You may not be able to consolidate them.

5.6.9.2 Creating a consolidation order

From the Cortex Console window (refer to):
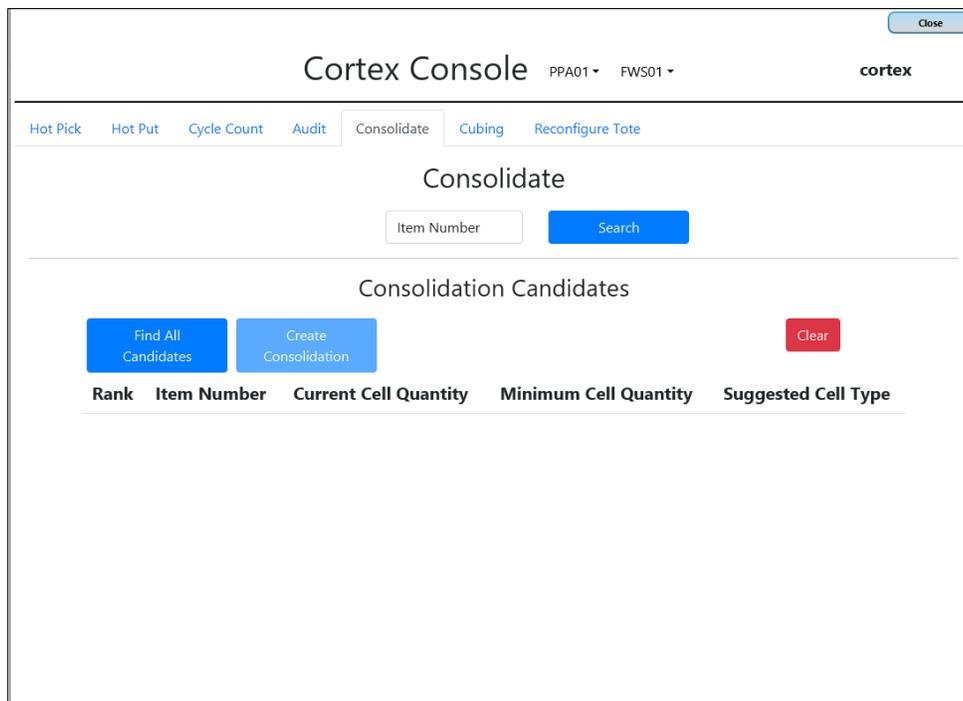
1. Click the **Consolidate** tab.

Figure 5-39: Consolidate tab

2. Enter the item number that you want to consolidate, and then click **Search**.

    Cortex searches the database to locate that item.

3. Click **Find All Candidates**.

Cortex searches the database for totes that contain the item in quantities that are candidates for consolidation.
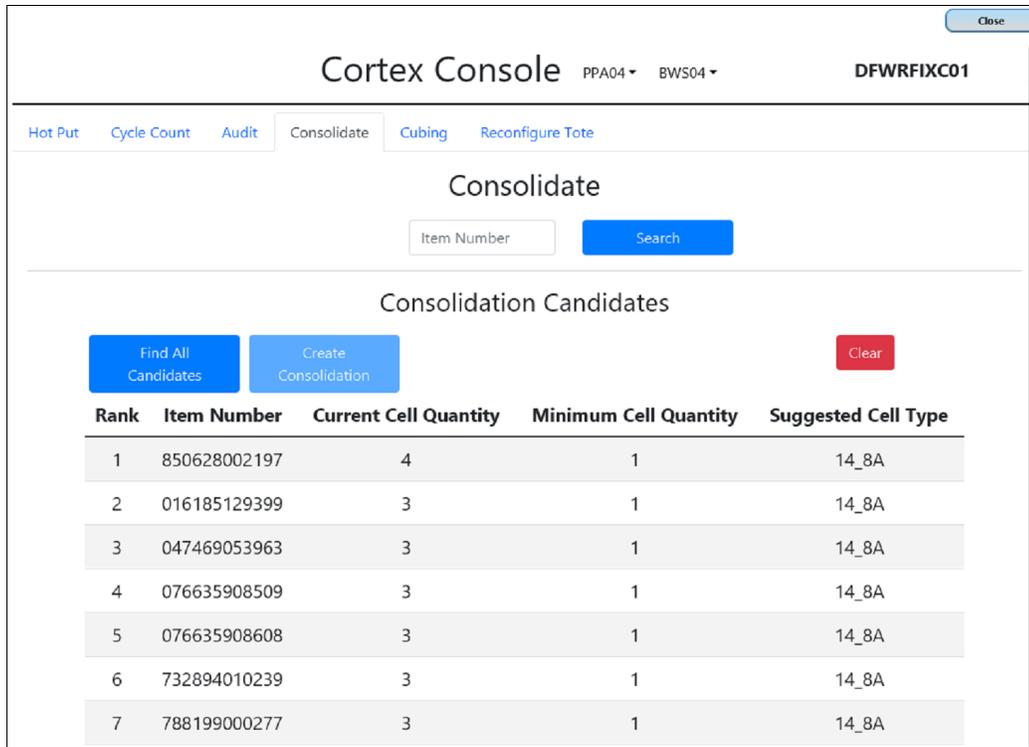
Figure 5-40: List of candidates for consolidation

4. Click each row that contains items you want to consolidate. (To deselect a row, click it again.)

You may need to scroll through the list to see all candidates.

5. Click **Create Consolidation**.

6. In the upper-right corner of the Cortex Console, click **Close**.

The Consolidation order is added to the virtual work queue.

5.6.9.3 Processing a consolidation order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to Starting the virtual work queue on page 78.)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: Your consolidation may not be the first order that runs. If not, process the preceding orders until your consolidation starts.

When the consolidation order starts:

The system presents the first "source" tote. The cell projector highlights the appropriate cell.

1. Remove all the items from the highlighted cell and put them in a designated area.

2. On the screen, press the virtual order container to indicate the items are removed.

   The source tote returns to the storage rack, and the "destination" tote is delivered. The Cortex screen and the cell projector highlight the appropriate cell.

3. Take the items you removed from the previous tote and place them into this destination cell.

4. Count the items in the cell and compare it against the quantity on the screen. If your count is different, enter your count to update the database.

5. Press the virtual order container on the screen to confirm that the items have been added to the tote.

The tote returns to the storage rack.

5.6.10 Cubing tab

Cubing lets you change the cubing values that Cortex assigned to a particular item. The cubing values specify information about the totes and cells that can be used to store the item:

- **Cell Type** – Identifies the tote sizes and cell configurations. For example, a cell type of 8_2A specifies an 8-inch tote divided into 2 cells with an A configuration.
- **Calculated Qty** – Shows the maximum number of items that Cortex thinks can be stored in the cell type.

For most items, the assigned values are correct and do not need to change. In some cases, however, the values are incorrect and Cortex thinks that the item cannot fit into any cell (Putaway 0 or Qty 0), which causes an error during a putaway operation. For example:

- The item is 9 inches tall, but Cortex mistakenly assigned it to an 8-inch tote or a cell that is too small. Cortex does not think the item can be put away into any of the assigned cells.
- The assigned cell type is correct and can hold 48 items, but someone mistakenly entered 0 as the maximum quantity during a previous putaway.

Similarly, an incorrect cubing value could cause Cortex to think that fewer items can be stored in a cell than can actually be stored, which wastes space.

Note: With cubing, you do not create a virtual order. The new values take effect after you enter them.

5.6.10.1 Identifying a cubing problem

Typically, when you perform a putaway for an item that has an incorrect cubing value, the screen shows **PUTAWAY 0** and an error message. The message is similar to "No destination for remaining work", "No room for remaining work", or "No room in aisle".

To confirm the item number causing the error, look at the **Order Info** tab on the Cortex screen.

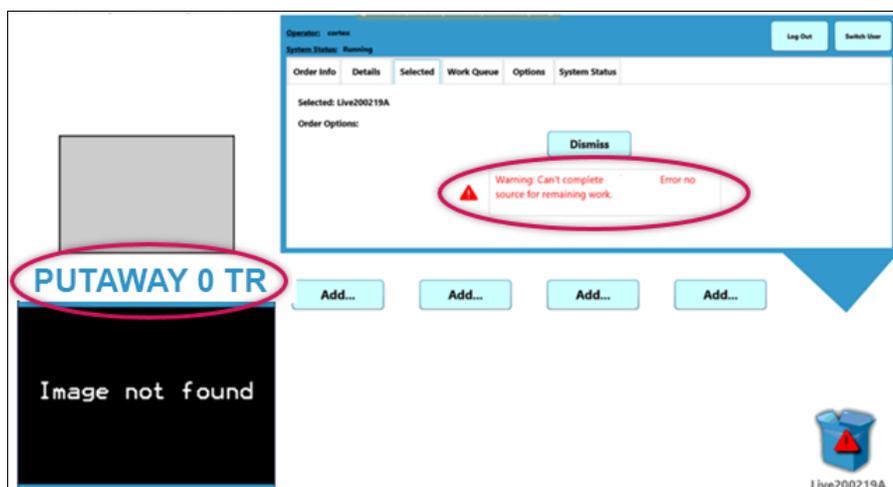**Figure 5-41: Cubing error message**

5.6.10.2 Changing the item's cubing values

From the Cortex Console window (refer to):

1. Click the **Cubing** tab.

Figure 5-42: Cubing window

2. Type the item number, and click **Wizard**.

The system searches the database for the specified item and shows a list of tote and cell types that Cortex has assigned to hold this item.
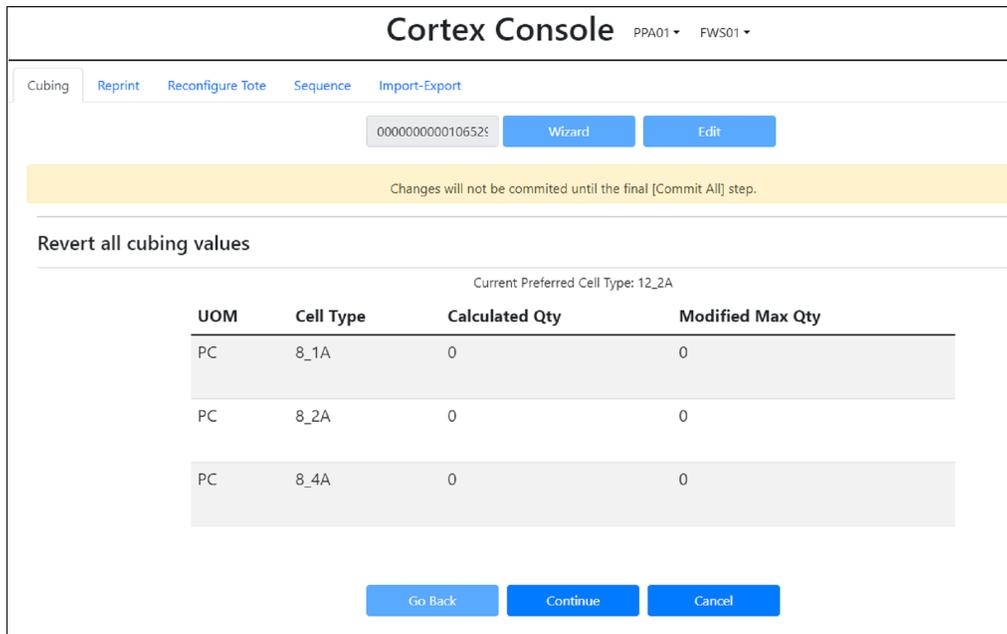
Figure 5-43: Cubing Quantity settings

3. If the listed tote and cell types are incorrect:

   a. Click **Continue**.

   b. Select the correct tote and cell type.

   c. Click **Commit**.

4. If the listed tote and cell types are correct but the calculated quantity is incorrect:

   a. Click **Edit**.

   b. In the **Modify Max Qty** field, type the maximum number of items that can fit in the specified cell type.

Figure 5-44: Cubing Quantity edit

   c. Click **Commit**.

5. When complete, click **Close** in the upper-right corner of the Cortex Console.

   After making these changes, you need to dismiss the current putaway order so the database can update its information properly.

6. On the Cortex screen for the putaway order, click the **Selected** tab and then click **Dismiss**.
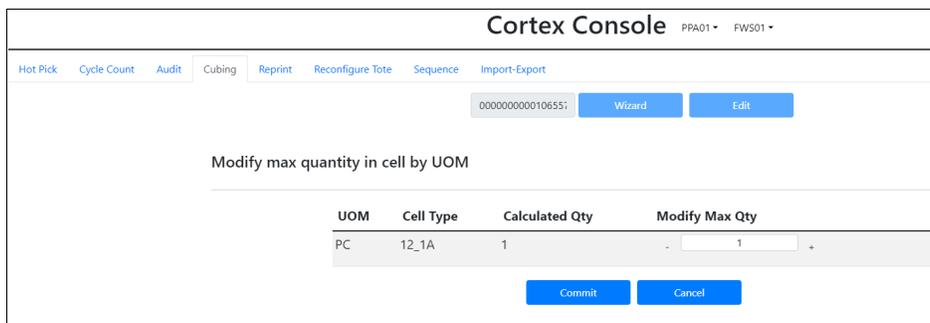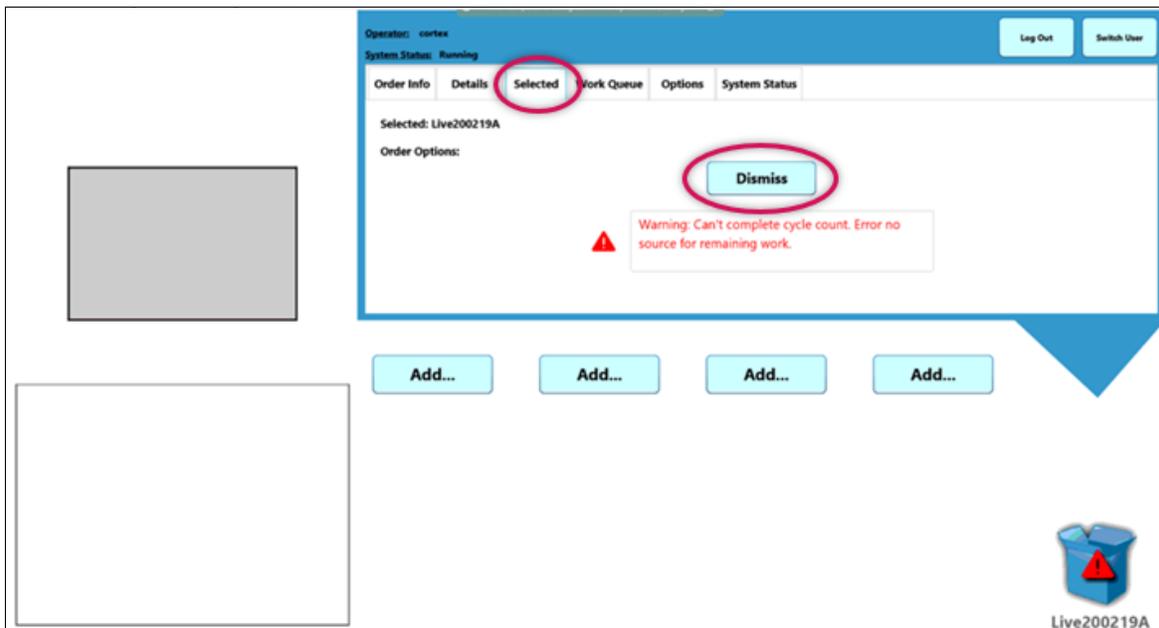

Figure 5-45: Dismiss the order

The dismissed order is no longer active. The next steps depend on the customer's setup. See your supervisor for the correct procedure:

- The workstation may automatically move the container to the outbound conveyor and transfer it to a designated area for dismissed orders.
- You may need to physically remove the container from the workstation and place it in a designated area.
- You may be able to use a hand scanner to re-scan the container's LPN barcode, where Cortex automatically re-establishes the putaway order.
- The customer's WMS may need to request a new putaway order.

When the system processes the new, corrected putaway order, the Putaway 0 quantity error is resolved and the order processes normally.

5.6.11 Reprint tab

Reprint is used only for sites with printers at the workstation. The contents and format of the reprinted label depends on how the Reprint function is configured for your site. For example:

- If the original LPN barcode on a container is damaged or unreadable, your site may print a new LPN label.
- If you place picked items in plastic bags, your site may print individual labels for each item in the order.

*Note: For Reprint, you do not create a virtual order. The label prints as soon as you click **Complete***.

From the Cortex Console window (refer to):

1. Click the **Reprint** tab.

2. Click either:

   - **Order** – Uses the order number to determine the LPN barcode.
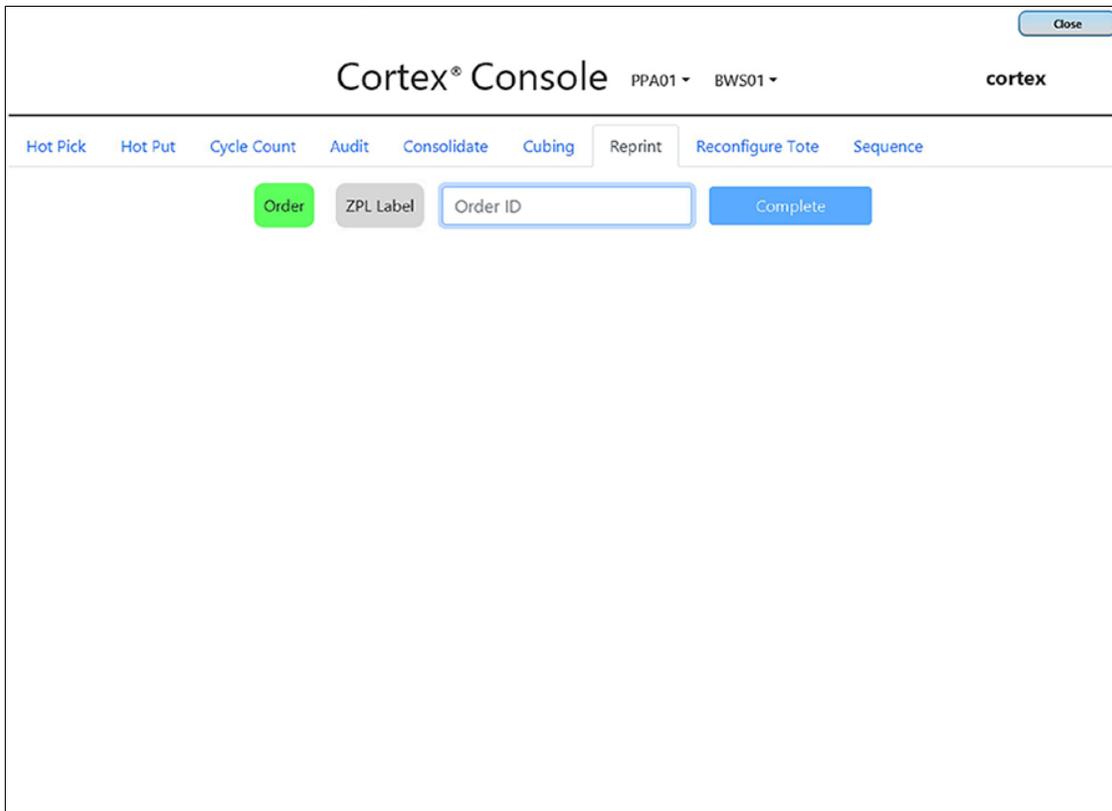   - **ZPL Label** – Uses the LPN number.

Figure 5-46: Reprint tab

3. Type the appropriate number.

4. Click **Complete**.

5. In the upper-right corner of the Cortex Console, click **Close**.

 The labels are printed according to the Reprint format for your site.

Note: If you reprinted an LPN label for a container, apply the new label over the top of the old one. Be sure none of the old label's barcode is visible.

5.6.12 Reconfigure Tote tab

Reconfigure Tote lets you change a tote's cell configuration by adding, rearranging, or removing its cell dividers. For example, you can reconfigure a 4-cell tote into a 2-cell tote. The reconfiguration typically depends on the type, size, and weight of the items stored in the tote.

5.6.12.1 Before reconfiguring a tote

The tote must be empty. As necessary, you can use hot actions to consolidate the items into other totes or perform hot picks to remove the existing items.

5.6.12.2 Creating a reconfigure tote order

From the Cortex Console window (refer to Opening the Cortex Console (Hot Actions) window on page 76):

1. Click the **Reconfigure Tote** tab.

2. Type the tote number, and then click **Confirm**.

Figure 5-47: Enter the tote number

3. When prompted, click **Create**.

Figure 5-48: Create the order

The **Create** button changes to **OK**.

4. Click **OK** to confirm the reconfiguration.

Figure 5-49: Continue the reconfiguration

Cortex creates a virtual order for the reconfiguration and places it in the virtual work queue.

5. In the upper-right corner of the Cortex Console, click **Close**.

5.6.12.3 Processing the reconfigure tote order

After orders are placed in the virtual work queue, you must start the work queue to process them. (For details, refer to Starting the virtual work queue on page 78.)

On the main Cortex screen:

1. Click the **Work Queue** tab.

2. Specify how many orders you want to load, and then click **Start**.

Note: Your reconfiguration may not be the first order that runs. If not, process the preceding orders until your reconfigure starts.

When the reconfigure tote order starts:

The system delivers the specified tote to the Present Station.

1. Lift the tote from the iBOT and place it on a firm surface.

2. Remove or add cell dividers for the new configuration.

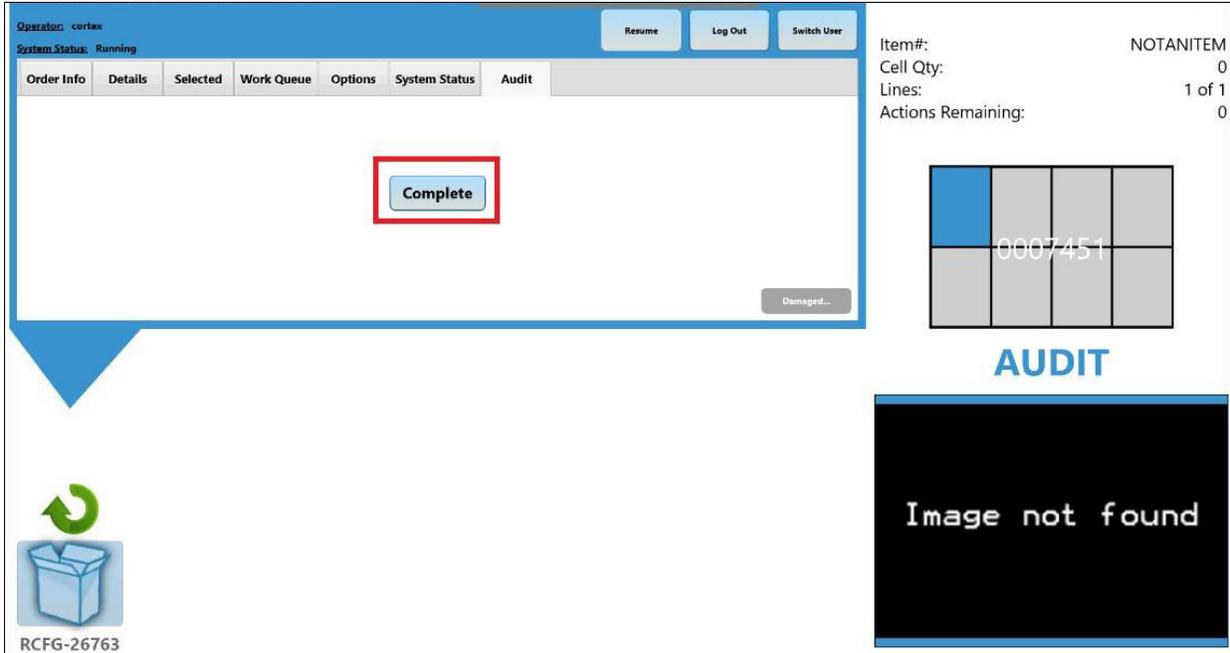3. Place the tote back on the iBOT.

4. Click **Complete**.

Figure 5-50: Complete

The **Select New Config** window opens.

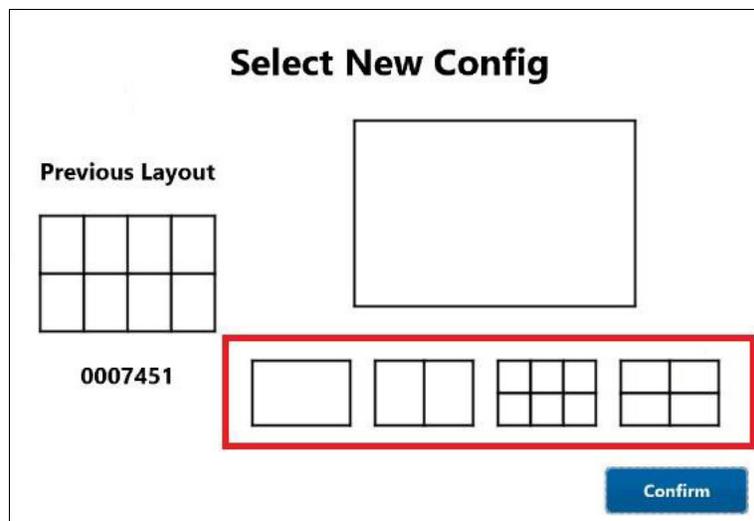5. Click the appropriate configuration, and then click **Confirm**.

Figure 5-51: Select layout of new configuration

5.6.13 Sequence tab

Sequence lets you prioritize the orders in the virtual work queue based on your specified criteria.

*Note: When specifying a sequence, you do not create a virtual order. Your entry takes affect as soon as you close the Cortex Console (although it does not affect orders that are already on the **Work Queue** tab).*

From the Cortex Console window (refer to):

1. Click the **Sequence** tab.

2. In the drop-down list, select one of the following:

   - **Most Orderlines** – Orders with the most orderlines have the highest priority.
   - **Least Orderlines** – Orders with the least orderlines have the highest priority.
   - **Shared Picks** – Orders with shared picks have the highest priority.
   - **Default (Order Priority)** – Orders are prioritized in the order they were created and entered into the virtual work queue, which is the default setting.

   *Note: A shared pick is where multiple orders need the same item. Normally, after you pick the item for the first order, the tote returns to the storage rack where it is retrieved again later for another order. With **Shared Picks**, groups of orders that share the same item are prioritized together so you can pick the item for all the orders at the same time.*
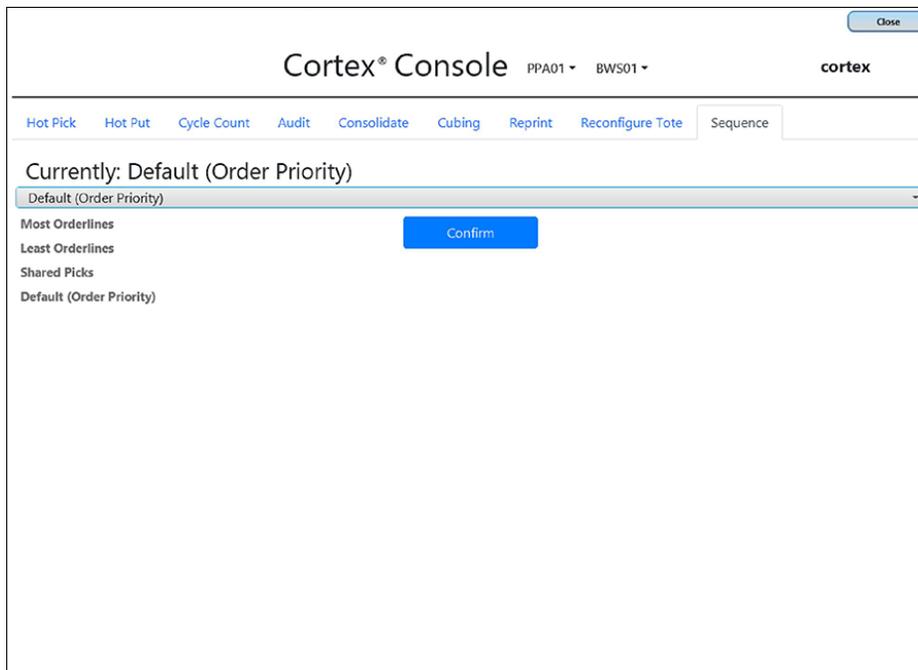

Figure 5-52: Sequence tab

3. Click **Confirm**.

4. In the upper-right corner of the Cortex Console, click **Close**.

5.7 Initiating an emergency stop

In an emergency situation, you can immediately shut down the motor power to all workstations in the workstation group. An emergency stop (E-Stop) prevents any containers from moving along the workstations until power is restored. Communication/logic power for feedback and control components such as sensors and I/O modules is not affected. This enables the Cortex software to retain the current container positions and order processing status during the E-Stop.

To initiate an E-Stop:

➢ Pull the red E-Stop cord that runs along the front and sides of the workstation.

*Note: Do not push the **Stop** button on the left side of the workstation. This **Stop** button is not an E-Stop.*

One end of the E-Stop cord is attached to an E-Stop mechanism mounted on the side of a conveyor at the end of the workstation. Pulling the cord automatically depresses the **E-Stop** button on the mechanism.
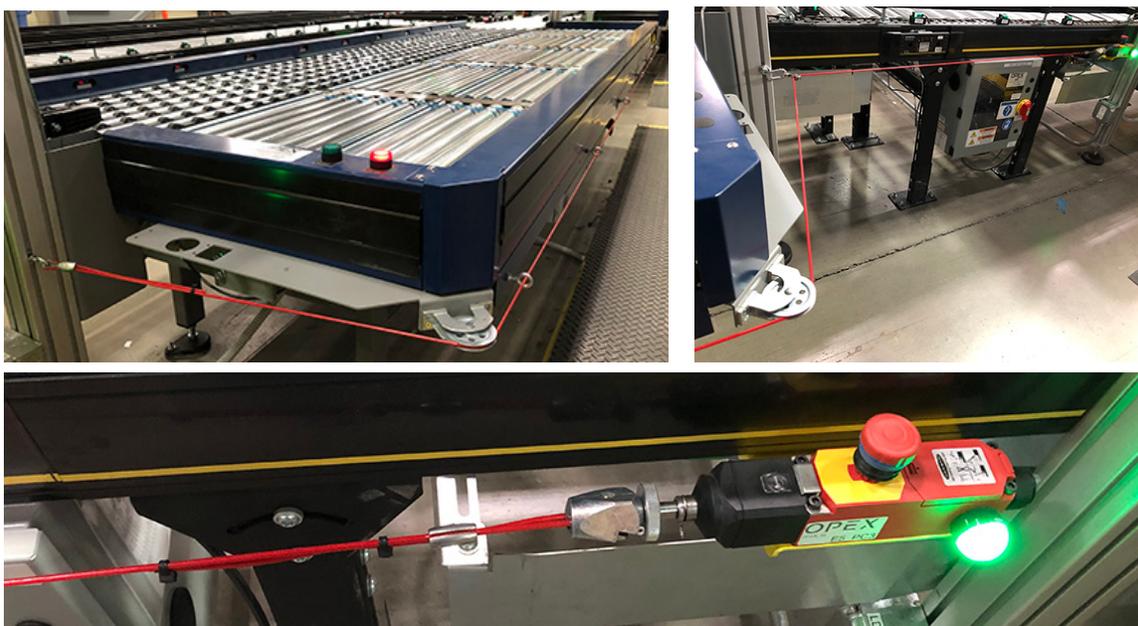
Figure 5-53: Pull cord around workstation to E-Stop mechanism

Note: During an E-Stop, do not move any containers from their current locations. If you do, the system cannot process them properly when power is restored. You would then need to reconcile those changes in Cortex (which is not described in this manual) before anything can continue.

To reset an E-Stop:

1. Be sure the situation that caused the E-Stop is resolved.

   Note: Because the E-Stop affects all workstations in the group, check with the other workstation operators to confirm they are ready for a restart.

2. At the E-Stop mechanism, pull up on the **E-Stop** button to reset it.

3. On the Safety DPS (dual power supply) for the workstation group, press the blue **Reset** button.

   Each workstation group has multiple DPS units mounted underneath segments of the conveyors. These units provide power to the conveyors. However, each workstation group has only one Safety DPS unit that has a **Reset** button.

Figure 5-54: Safety DPS unit with blue Reset button

After the E-Stop is reset successfully, order processing should continue on as before the E-Stop.

6. Troubleshooting and Preventive Maintenance

6.1 Common workstation interruptions

This chapter describes the most common issues that cause the Cortex system to stop. It also shows you how to resolve those issues. The conveyor view helps identify where and why the stoppage occurred. The screen shows each zone on the workstation and its status. The Conveyor view opens automatically when an error occurs on the workstation.

To open the conveyor view manually at any time:

➢ Click the **Options** tab and then click **View Conveyor**.
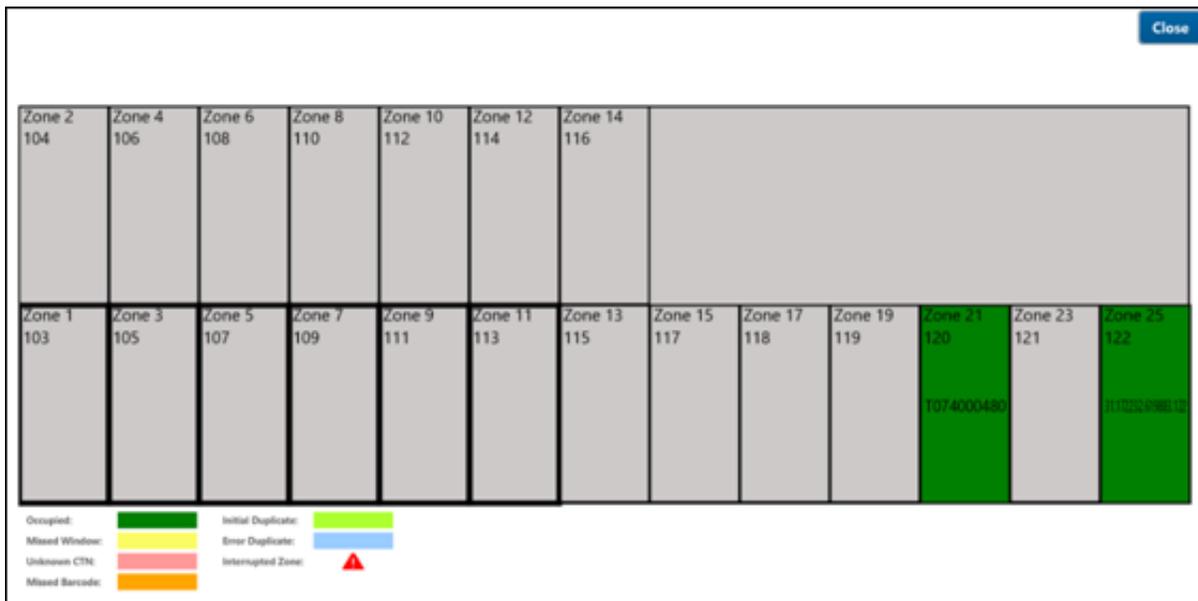
Figure 6-1: Conveyor view

The conveyor view highlights the zones that cause a stoppage. The color of the zone indicates the reason for the stoppage or interruption. The legend in the lower-left corner of the screen identifies the reason.

Note: The conveyor view images in this chapter may not represent the latest design. Also, the images show the interruption screens as displayed on a Perfect Pick machine.

Figure 6-2: Interruption legend

6.1.1 Interrupted zone - stage sensor blocked

In normal operation, the stage sensor is blocked when a container is in the middle of the zone. The system knows which container is in the zone based on its LPN.

The Stage Sensor Blocked interruption occurs when the system thinks the zone should be empty but something is blocking the stage sensor. The workstation stops automatically, and the light tower shows red.

Common problems include:

The workstation stops automatically, and the light tower shows red.

- Someone placed a hand over the sensor, or an object is sitting on the edge of the workstation and a portion of it is hanging over the side.
- Debris on the rollers is blocking the sensor, or debris or dust is on the sensor itself.

In some cases, a container may actually be in the zone but the system has lost track of its LPN number.
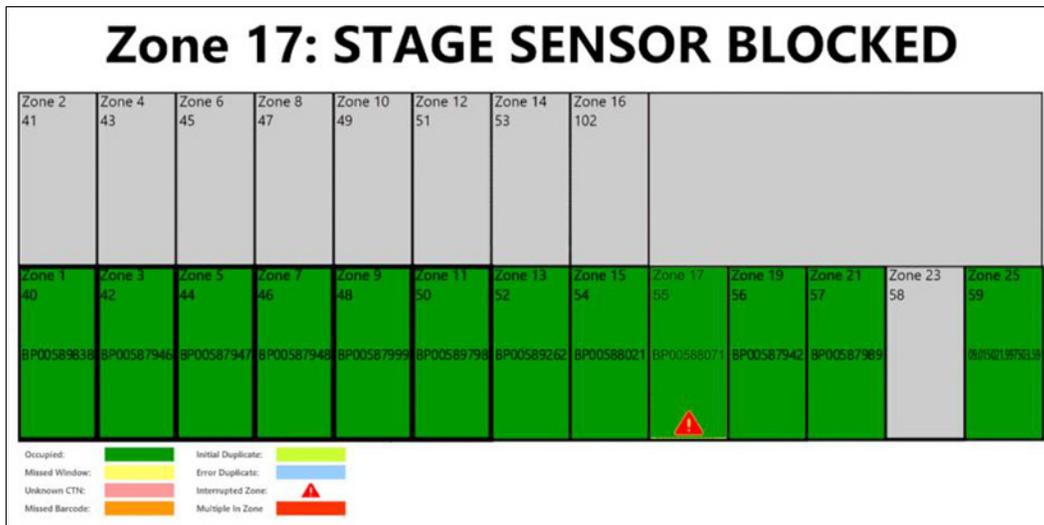
Figure 6-3: Stage sensor blocked, Perfect Pick

Resolution:

Check to see if an object is blocking the sensor. If so, remove it.

Otherwise, when all occupied zones are green, make sure the containers in and around the interrupted zone (⚠) are seated squarely and are centered in their zones.

1. Inspect the affected zone.

2. Ensure the container is not skewed or blocking adjacent zones.

   Note: Do not pick up a skewed container off the workstation. If you do, the system could lose track of the container. Instead, slide the container along the surface of the rollers to center it in the zone.

3. Check the adjacent zones for skew. If needed, slide the container to center it in the zone.

The workstation restarts automatically. The light tower shows a solid green.

*Note: If the workstation does not restart automatically, press the **Start** button on the workstation.*

6.1.2 Missed window

In normal operation, as a container moves from one zone to another, the zone sensors are blocked and unblocked in a particular pattern and within a predetermined time period.

A Missed Window interruption occurs when a container moves erratically and a sensor did not see the container it was expecting. The zone changes to yellow on the conveyor view. The system thinks a container should be in that zone but the sensors did not verify that the correct container arrived properly.
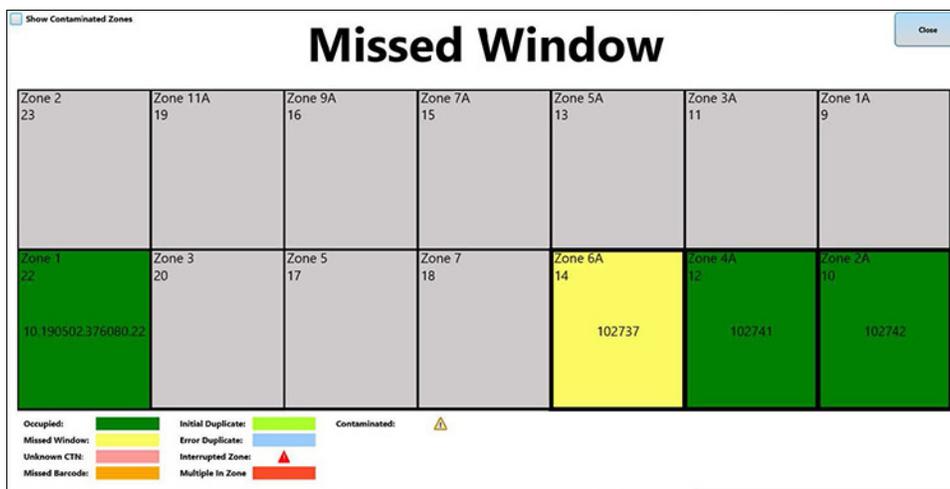
Figure 6-4: Missed window, Perfect Pick

Resolution:

1. Confirm whether a container is or is not in the yellow zone.

2. Check the barcode number on the container's LPN label to ensure it matches the number on the monitor.

3. If the container number is correct, lift it up for 1 second and then set it back down centered in the zone.

   The workstation restarts automatically.

4. If the container number is not correct or the workstation does not restart, you must remove the container from the system:

   a. Remove the container from the workstation and make sure the zone is clear.

   b. Click the yellow "missed window" zone on the monitor.

      The **Box must be removed from conveyor/workstation** window opens, with a prompt to keep or remove the missed window.

   c. Click **Remove**.

   d. Click **Dismiss**.

e. Return the container to the beginning of the conveyance (before the scan tunnel). After the scan tunnel scans its LPN label, the container is reassigned to a workstation for processing.

6.1.3 Interrupted zone with missed window

An interrupted zone occurred alonside a missed window. The light tower displays blue and red.
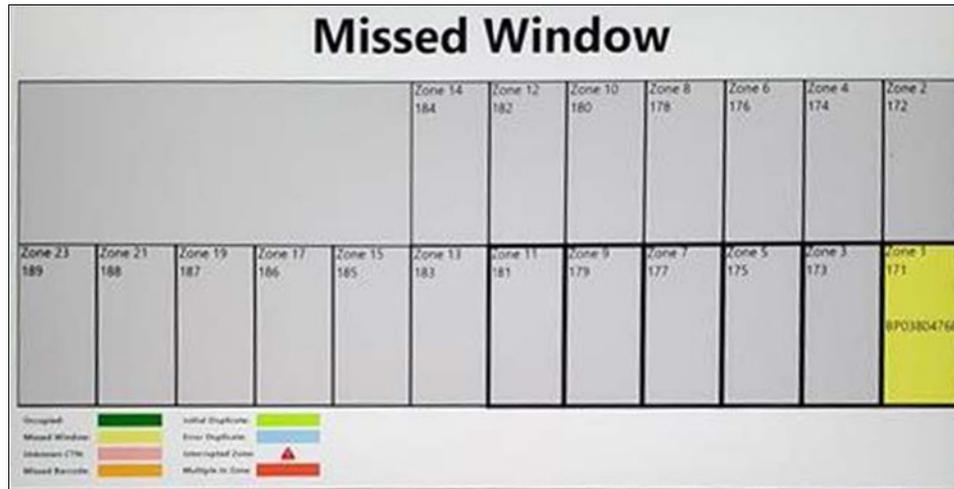

Figure 6-5: Interrupted zone with missed window, Perfect Pick

Resolution:

1. Locate any skewed containers in or around the interrupted zone.

2. Slide any skewed containers to center them in the zone.

   Note: Do not pick up a skewed container off the workstation. If you do, the system could lose track of the container. Instead, slide the container along the surface of the rollers to center it in the zone.

The workstation restarts automatically, clearing both the missed window and the interrupted zone.

Note: If the workstation does not restart automatically or if a ⚠ *symbol appears in the zone, press the* ***Start*** *button on the workstation.*

6.1.4 Missed barcode read

The system cannot read the barcode on a container's LPN. Blemishes, dust, vibration, and bad angles can prevent the scan tunnel's camera from scanning the barcode. To enable the system to track the container as it moves along the conveyor and workstation, Cortex assigns a random number to the container. However, the random number must be corrected when the container reaches a workstation.

Note: This interruption occurs mainly on a Perfect Pick macine, where a scan tunnel is located before each workstation. On an Infinity, the scan tunnel is not directly associated with a particular workstation.

The light tower shows blue and green, indicating the workstation and conveyor are still running but an operator action is required.
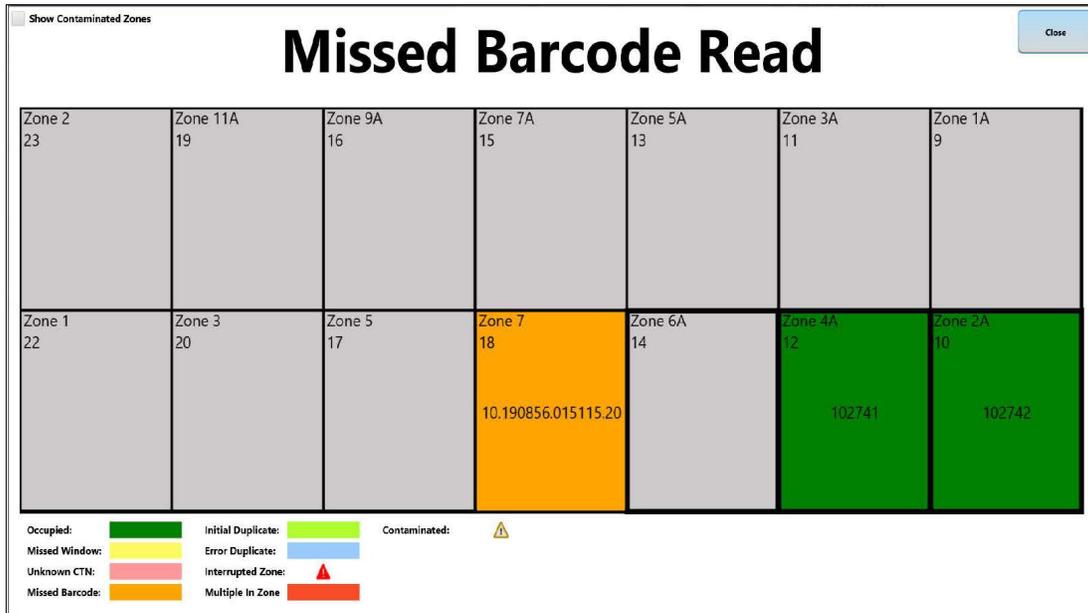

Figure 6-6: Missed barcode read, Perfect Pick

Resolution:

1. Click the orange zone, which has the container with the missed barcode.

The **Missed Barcode Read** window opens.
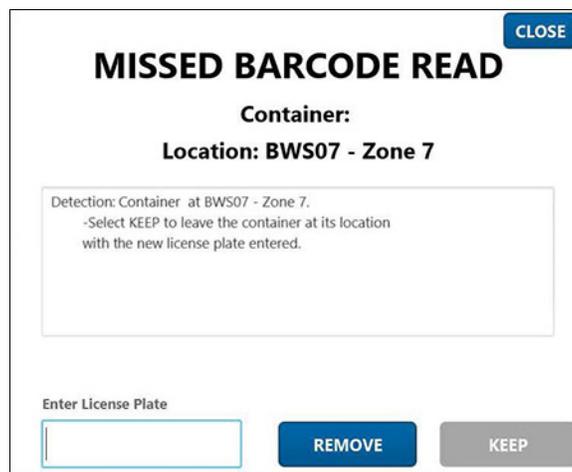
Figure 6-7: Enter barcode

2. In the **Enter License Plate** field, either type the LPN number or scan the LPN barcode using a hand scanner.

3. Click **Keep**.

6.1.5 Unknown container

A container is blocking a sensor, which indicates the zone is occupied, but the system cannot confirm the identity of the container.
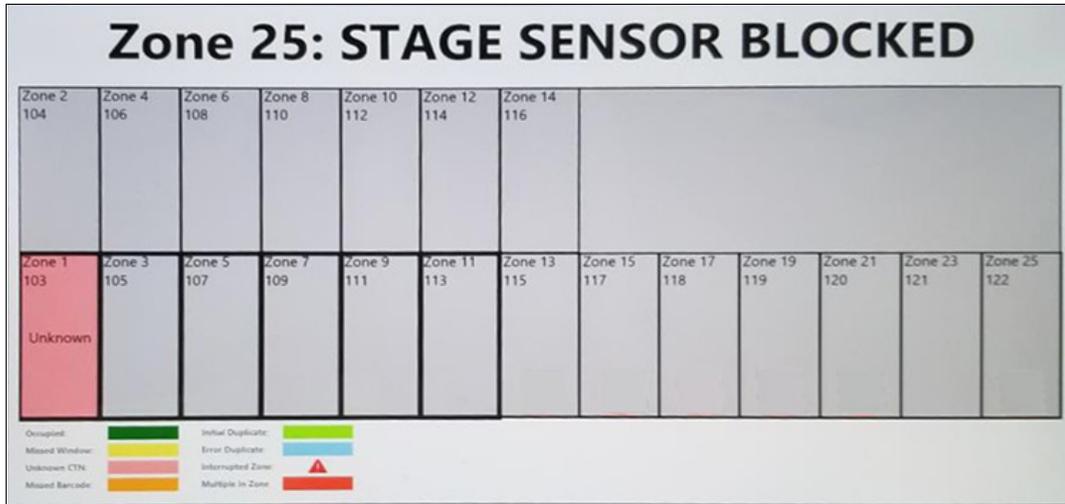
Figure 6-8: Unknown container, Perfect Pick

Resolution:

1. Remove the unknown container from the highlighted zone.

2. Click the highlighted zone.

   The **Unknown Container** window opens, prompting you to identify the container.
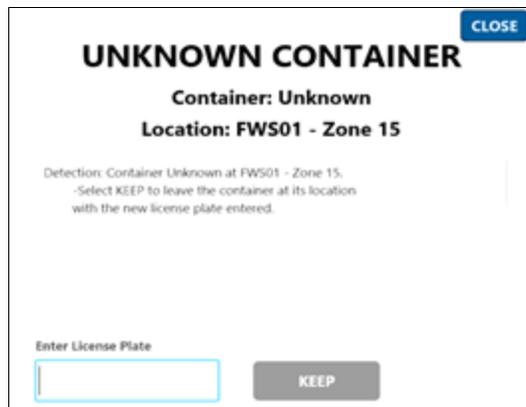
Figure 6-9: Unknown Container

3. In the **Enter License Plate** field, either type the container's LPN number or scan the LPN barcode using a hand scanner.

4. Set the container back into the zone, making sure it is centered and square.

5. Click **Keep**.

The workstation restarts automatically.

6.1.6 Duplicate scan

Sometimes a large order is divided between two or more containers. Because they are parts of the same order, they have the same LPN barcode. These containers must be placed on the incoming conveyance so they are spaced sufficiently far apart. The same LPN cannot be on the workstations or conveyors at the same time.

A Duplicate Scan interruption occurs when containers with duplicate LPNs are placed on the conveyors too soon and they end up on the workstation at the same time.


Figure 6-10: Duplicate Scan, from Perfect Pick

Resolution:

1. Remove the container in the light blue Duplicate Scan zone.

2. Click the Duplicate Scan zone, and then click **Dismiss**.

3. Allow sufficient time for the first container with that LPN to finish processing, and then return the second container to the beginning of the conveyance (before the scan tunnel).

6.1.7 Container collision

Occasionally a container slips and stops too soon or slides and stops too late. In either case, the container may enter a zone where another container already exists, resulting in a container collision. The containers may or may be in physical contact, but the zone sensors are blocked improperly.

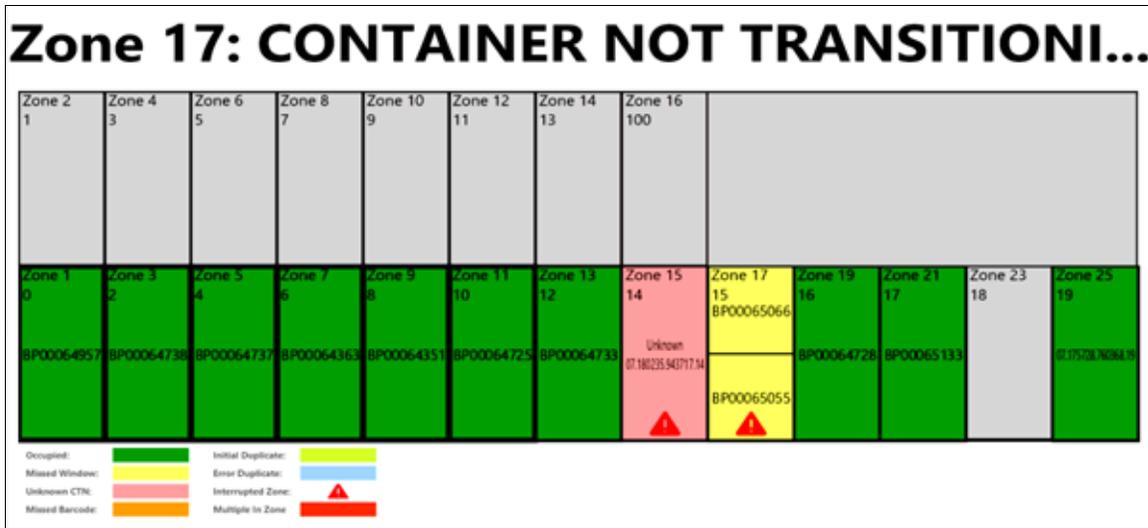In Figure 6-11, the yellow container with the interruption moved into zone 17, which already had a container.

Figure 6-11: Container collision, Perfect Pick

Resolution:

1. Place the yellow container with the interruption back into the zone where it belongs.

    The **Unknown Container** window opens, prompting you to identify the container that you moved
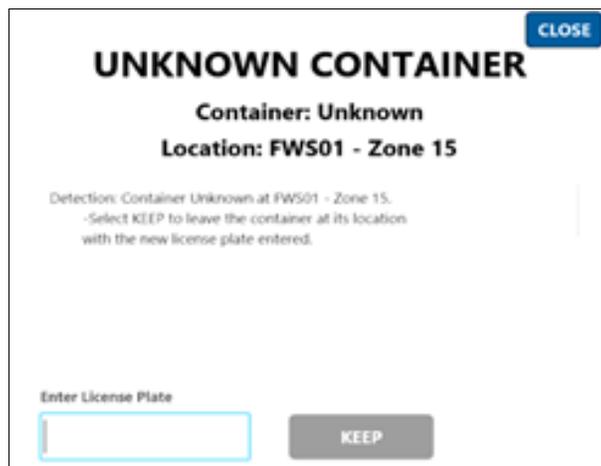

Figure 6-12: Rescan container

2. In the **Enter License Plate** field, type the container's LPN or scan the barcode with a hand-scanner.

3. Click **Keep**.

6.1.8 All interrupted zones

An Interlock Tripped interruption usually means an E-Stop (emergency stop) was activated. This occurs when someone pulls the E-Stop cord that runs along the edge of the workstation. The light tower changes to red.
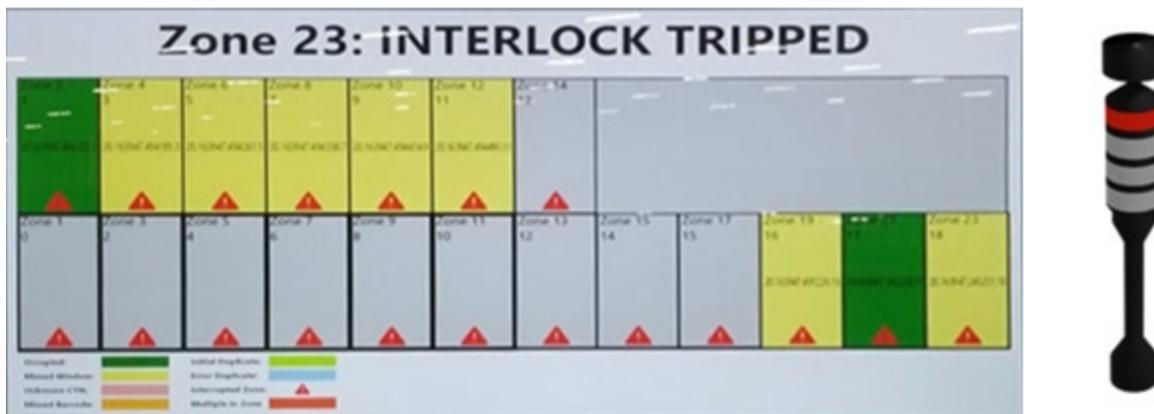

Figure 6-13: Interlock tripped, Perfect Pick

Resolution:

1. Confirm that the situation that caused someone to activate the E-Stop has been corrected.

2. Reset the E-Stop. (For information about resetting the E-Stop, refer to Initiating an emergency stop on page 107.)

The workstation restarts automatically.

*Note: If the workstation does not restart automatically, press the **Start** button on the workstation. If the workstation still does not restart, contact OPEX Technical Support.*

6.2 Preventive maintenance

6.2.1 Mirrors

Once a month, wipe off the mirrors on the OPEX scan tunnel with a clean, lint free cloth.

6.2.2 Sensors

- Twice a year, wipe off the workstation sensors.
- Once a year, wipe off the conveyor sensors.

Note: *The specific time intervals for wiping off the mirrors and sensors depend on the environment at the site.*

7. Glossary

7.1 List of acronyms and terms

Automated workstation—Where order containers are automatically brought and removed from the pick area.

Barcode—Bars that convert to numbers that can be associated with an orderline.

Cell—Subsections of a tote. Dividers are placed in the tote to create multiple cells, which enable a single tote to store different types of items.

Cell projector—Optional overhead projector that shines into a particular cell in a tote to indicate where a product is located. This enables an operator to quickly identify which cell to pick an item out of or to put an item into.

Cycle count—Inspection of items stored in the machine for inventory alignment and verification. Items are physically counted in a tote, and discrepancies are noted in the WUI.

First-in First-out (FIFO)—The first items stored in a cell are the first items picked. This is particularly useful with perishable items because it ensures that the oldest item does not remain in the cell while a newer item is picked.

Hot actions—Ad-hoc method to trigger or build up a work queue of manual picking or replenishment.

iBOT—Robot in the Infinity or Perfect Pick system that retrieves totes and brings them to the operator.

License Plate Number (LPN)—Unique identifier for a container into which items will be picked from or from which items will be replenished. An LPN label is affixed to each container. The scan tunnel reads the barcode on the label and associates it with an order in the customer's WMS.

Main Control Panel (MCP)—Unit attached to the underside of the automated workstation. This unit supplies power to the workstation.

Order Creation Interface (OCI)—API used by customers to send orderlines to Cortex. Implemented using database-to-database message transfers.

Orderline—Fulfillment operation or inventory-verification operation for a quantity of a single SKU.

Pick-to-Light (PTL)—Modules that visually indicate the location of a fulfillment container and the quantity of items to pick or put away. The PTL displays the same colors as the WUI and cell projector lights.

Printer—Device used to produce tags, LPNs, packing lists, and other documents. Setups can have printers that solely print labels.

Tote—Box that stores content within the machine.

Units of Measure (UOM)—Type of packaging used by an item in the storage totes. For example, items may be stored individually (each) or in a box that contains multiple items.

Warehouse Management System (WMS)—Customer's software system that manages its warehouse inventory and operations.

Warehouse Real-Time Controller—Software that drives automation components at a Cortex workstation, such as sensors, conveyors, PTL modules, and other devices.

Work Queue—A queue of all work items to be completed at a workstation. Can include work associated with a physical LPN (picking and replenishing) and a logical LPN (cycle counts).

Workstation User Interface (WUI)—Graphical user interface shown on a Cortex workstation screen.

NEXT GENERATION
AUTOMATION

OPEX®