



**SE 300 Ultra
Hardware Reference**

The SE 300 Ultra™ is a measuring device intended for use in an industrial or a laboratory environment. Use of this equipment in a manner not specified in the operating instructions may impair safe operation.

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SE 300 Ultra Hardware Reference
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Preface

This SE 300 Ultra Hardware Reference is intended to provide comprehensive information about the SE 300 Ultra system. If you have any questions that are not answered by this guide, please contact CyberOptics Customer Service and Support (see “*Technical Support*” on page viii).

Prerequisite Knowledge

- Moderate computer experience
- Moderate Windows® experience
- Prior knowledge of solder paste inspection process

Documentation

Documentation for the SE 300 Ultra solder paste inspection system consists of the following information:

- *SE 300 Ultra Hardware Reference*
Provides an overview of SE 300 Ultra components, instructions for how to install and maintain the SE 300 Ultra system, parts replacement information, and system specifications.
- *Solder Paste Inspection Online Help*
Provides task-based, step-by-step procedures and descriptions of the software controls.
- *Solder Paste Inspection Control Online Help*
Provides task-based, step-by-step procedures and descriptions of the software controls.

Technical Support

If you have problems operating the SE 300 Ultra system, first check the product documentation for more information.

If you still need help with the SE 300 Ultra system, or you discover problems with documentation, please telephone, send e-mail, or fax CyberOptics Service and Support.

- Include your serial numbers in all e-mail messages and faxes.
- Have the product serial numbers ready when you telephone CyberOptics.

Telephone Support

Use the Customer Service 800 number, which is toll-free in the USA: Call (800) 526-2540 to speak to a representative or leave a voice-mail message.

- The 800 number is answered from 8 AM to 5 PM Central Time (USA), Monday through Friday.
- Outside of these hours, you can call the 800 number and leave a voice-mail message. CyberOptics guarantees that all voice-mail messages will be responded to during the next CyberOptics business day.

For calls outside the United States, call the CyberOptics Minneapolis Office (USA) at (763) 542-5000.

Fax Communication

You can fax service issues or problem descriptions to CyberOptics Service and Support staff. CyberOptics guarantees that all fax transmissions received by Service will be responded to during the next CyberOptics business day.

Send your fax (attention: Service) to the CyberOptics Minneapolis Office (USA) at (763) 542-5100.

Internet Communication

You can use the internet to send service issues or problem descriptions to CyberOptics Service and Support staff. CyberOptics guarantees that all messages received by Service will be responded to during or before the next CyberOptics business day.

- Send e-mail to:
service@cyberoptics.com
- Visit the CyberOptics home page on the World Wide Web:
<http://www.cyberoptics.com>

1 Safety

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Safety Guidelines

The SE 300 Ultra system is a measuring device intended for use in an industrial or laboratory environment. Use of this equipment in a manner not specified in the operating instructions may impair safe operation which can cause serious injury or death.

General Guidelines



- Read and follow instructions provided with all other manufacturer's documentation.
- Be alert and use common sense when operating any machinery.
- Be sure that you understand the safety considerations and follow the regulations in your manufacturing facility.
- Do not place liquids or heavy objects on the SE 300 Ultra unit, safety enclosure, or near the conveyor.
- Always wear a static control wristband to prevent damage due to static electricity. The SE 300 has an electrostatic discharge plug on the front of the machine by the power buttons.
- Be sure the SE 300 Ultra is properly grounded through the power connection. To avoid electric shock, provide an earth ground connection.
- Do not lean on the safety enclosure or the safety enclosure frame.
- Do not remove the safety enclosure or disable the safety interlock mechanisms.
- Do not run the system with side panels removed.
- Do not attempt to disassemble or repair any SE 300 Ultra component without first contacting your CyberOptics representative.
- Use the SE 300 Ultra system only indoors.
- To avoid electrical shock, always turn off the power using the AC main circuit breaker before servicing the unit.



Caution: Lithium batteries are included on both computer cards. There is danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type battery recommended by the manufacturer (CR2032). Dispose of used batteries according to the manufacturer's instructions.

Emergency Stop

Stop all movement on the SE 300 Ultra system by using the emergency manual override (EMO) button. Motion will also stop when a safety interlock is disengaged.

Using the Emergency Manual Override (EMO)

When the EMO button is pushed all motion in the system will stop and the middle conveyor section and sensor can be moved by hand. See Figure 14 on page 14 for the location of the EMO button.



Note: Air is still supplied to the conveyor panel lifter and the conveyor clamps when you press the EMO button.

➤ To operate the EMO

1. Push the red EMO button on the front, left side of the SE 300 Ultra unit to stop conveyor and stage movement. A message appears in the Output palette on the monitor.
2. Pull the EMO button out, then press the green ON button to reengage the system.
3. Close the Output palette (optional).

Reengaging the Safety Interlock

The SE 300 Ultra is equipped with a safety interlock switch on the top enclosure (hood). When the hood is not securely closed, all motion is disabled. See Figure 16 on page 16 for the location of the safety interlock.

➤ To reengage the safety interlocks

1. Close the safety enclosure.
2. Press the green ON button to reengage the system.
3. Close the Output palette (optional).

Indicator Lights

In both the Teach and Solder Paste Inspection software applications, you can specify the conditions that cause the indicator lights on the SE 300 Ultra light pole to turn on. See the online Help for these procedures. Refer to Safety of Machinery EN 60204-1:1998, section 10.3 Indicator lights and displays, Table 3 for standard indicator light definitions.

The lights also indicate that the power up sequence for the system is complete. See “Turning on System Power” in Chapter 4.

Safety and Conformity Labeling

- Pinch points are clearly labeled on each side of the machine near the conveyor openings. The label text says:
WARNING! Moving parts can crush and cut. Do not operate with guard removed. Lockout/tagout before servicing.



Figure 1. Pinch Point Warning Label

- The AC input rating label is located on the AC mains disconnect box.

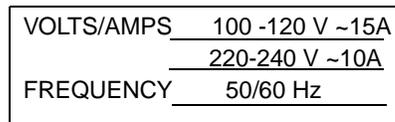


Figure 2. AC Input Rating Label

- The pressurized device label is located near the air regulator. The maximum air regulator pressure is 100 psi. The label text says:
CAUTION! Pressurized device. Release air pressure before servicing.



Figure 3. Pressurized Device Label

- The hazardous voltage label is located on the front of the electronics drawer and on the plastic safety cover over the fuses inside the electronics drawer. The label text says:
WARNING! Hazardous voltage. Risk of electric shock or burn. Turn off and lock out system power before servicing.

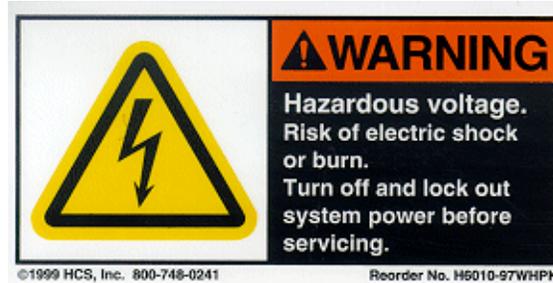


Figure 4. Hazardous Voltage Label On Electronics Drawer

- The read technical manual label is located on the front of the electronics drawer. The label text says:
WARNING! To avoid injury, you MUST read and understand technical manual before servicing this machine.



Figure 5. Read Manuals Label

- The protective earth ground label is located on the inside of the electronics drawer and inside the AC mains disconnect box.



Figure 6. Protective Earth Ground Label

- The hazardous voltage label is located on the AC mains disconnect box. The label text says: WARNING! Hazardous voltage inside. Disconnect power before opening.



Figure 7. Hazardous Voltage Label On Fuse Cover

- Each SE 300 Ultra unit is labeled with the appropriate agency approvals for that unit; for example, the European Conformity label is on approved units that are shipped to European Union member nations. The label is located inside the safety enclosure on the cast polymer granite base near the conveyors.

In addition, a printed EU Declaration of Conformity is shipped with each system. If a new copy is required, contact CyberOptics Customer Service.



Figure 8. CE Conformity Label

Manufacturing Information Conformance

The Manufacturing Information and CFR Conformance label is located inside the safety enclosure on the cast polymer granite base near the conveyors.

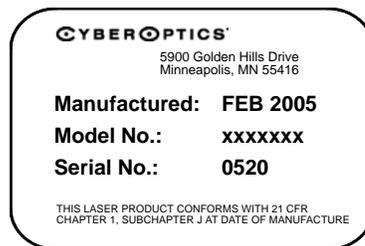


Figure 9. Manufacturing Label

Laser Safety



Caution: Read this laser safety information carefully and follow all safety precautions. Not following safety precautions could result in hazardous radiation exposure to your eyes.

CyberOptics conforms to laser safety regulations set forth by the Center for Devices and Radiological Health (CDRH). CyberOptics also conforms to the 825 laser safety regulations set forth by the International Electrotechnical Commission (IEC).

- SE 300 Ultra sensor meets Class II CDRH standards.
- SE 300 Ultra sensor meets Class 2 IEC-825 European standards.



Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Table 1. Laser characteristics

Wavelength	640-670 nm
Maximum Output Power	1.0 mW

Laser Safety Precautions

SE 300 Ultra sensor laser energy is not dangerous to exposed skin. You only need to be concerned with protecting your eyes from laser energy.

Laser energy is dangerous when it is viewed directly from the laser source or from a reflection off a specular (mirror-like) surface.

You must take these safety precautions when using the SE 300 Ultra:

- Only experienced personnel should operate the laser product.
- Do not stare directly into the laser source or point the laser at another's eye.
- Do not view the laser beam or its specular reflection directly with optical equipment that is insufficiently filtered.
- Wear proper eye protection if the laser beam or a specular reflection creates a potential eye hazard.
- Do not place specular (mirror-like) surfaces within the laser beam path.

Obtaining More Laser Safety Information

ANSI specification number Z136.1-1993 can be obtained from the Laser Institute of America. The Laser Institute of America also offers other booklets and information on laser safety.

The Engineering Technology Institute also offers information about the ANSI laser safety specifications and training classes on lasers, laser safety or optics.

Contact CyberOptics for additional laser safety information.

Laser Safety Labels

- Laser safety labels on the SE 300 Ultra sensor indicate compliance with CDRH and IEC-825 regulations.

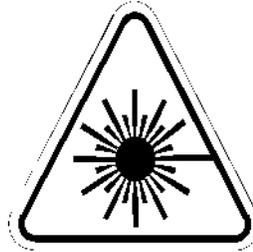


Figure 10. *Caution! Laser Symbol*

- The laser radiation label text says:
Laser radiation. Do not stare into beam. Class 2 Laser product. IEC 825 (1993)

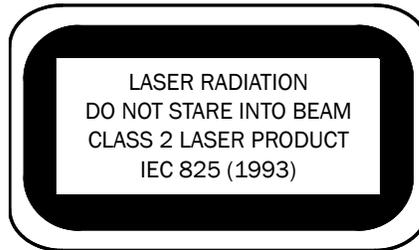


Figure 11. *Laser Radiation Label*

- The laser power label text says:
CAUTION Laser radiation. Do not stare into beam. 1.0 mW max power. 640-670 nm wavelength. Class II laser product.

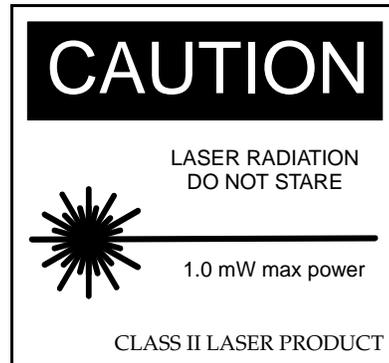


Figure 12. Laser Power Label

- The avoid exposure label text says:
Avoid Exposure. Laser radiation is emitted from this aperture.



Figure 13. Avoid Exposure Label

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Introduction

The SE 300 Ultra is an in-line solder-paste inspection system that inspects solder pads intended for passive components, Integrated Circuits (ICs), Quad Flat Pack (QFPs) and Ball Grid Arrays (BGAs). The SE 300 Ultra prevents production problems on screen-printed panels by intercepting defective prints before components are placed on the board. Because of its accuracy and repeatability, the SE 300 Ultra also can help to establish process tolerances.

SE 300 Ultra System Components

The SE 300 Ultra system contains the components described in the following table and shown in Figures 14 through 16.

Table 2. SE 300 Ultra System Components

Component	Figure	Description
Air Regulator	15	Regulates compressed air for pneumatic control of the conveyor lift and clamp.
Conveyor	16	Comprised of left, middle, and right sections. The middle conveyor section moves forward and backward along the Y-axis.
Conveyor Direction Switch	15	Controls the direction of the conveyor motion: left to right or right to left.
Digital Input/Output Connector	15	Connection for an external device such as a separate conveyor.
Electronics Drawer	15	The electronics drawer contains the computers and other electronics that control the system. See page 17 for more details.
Emergency Manual Override (EMO)	14	Stops all of the system's moving parts.
Ethernet Connector	15	Connection to local area network (10Base-T or 100Base-T network configurations).
Junction Box	15	This box contains the main circuit breaker; AC power is connected inside the junction box.
Keyboard and Trackball	14	Placed on a tray that is mounted on a pivoting arm attached to the machine frame.
Leveling Feet	14	Adjustable to level the unit.
Monitor	14	15-inch flat-panel display mounted on a pivoting arm attached to the machine frame.
Panel Sensors	Not shown	Two sensors detect the presence of the panel in the middle conveyor section. Two additional sensors detect the presence of the panel in the left conveyor section and the right conveyor section. A fifth sensor mounted on the center conveyor section can be used to detect small panels.
Power Buttons	14	The green ON and red OFF buttons turn power on and off to entire system with the exception of the safety power supply.

Table 2. SE 300 Ultra System Components (Continued)

Component	Figure	Description
Safety Enclosure	14	The hood on the safety enclosure is protected with a safety interlock that prevents SE 300 Ultra operation when the hood is open. The front door of the machine provides access to the computer, SMEMA connectors, air regulator, power connections, and electronics drawer.
Sensor	16	Measures the height, volume and area of the solder pads defined for a given location. The sensor moves along the X-axis stage.
Serial Connector	15	Connection for a serial device such as a barcode reader.
Signal-Light Pole	14	Indicates the SE 300 Ultra system status based on user configuration.
SMEMA Connectors	15	Connected to upstream and downstream equipment for conveyor control.

SE 300 Ultra Unit

Figures 14 through 16 show the SE 300 Ultra system components described on the previous pages.

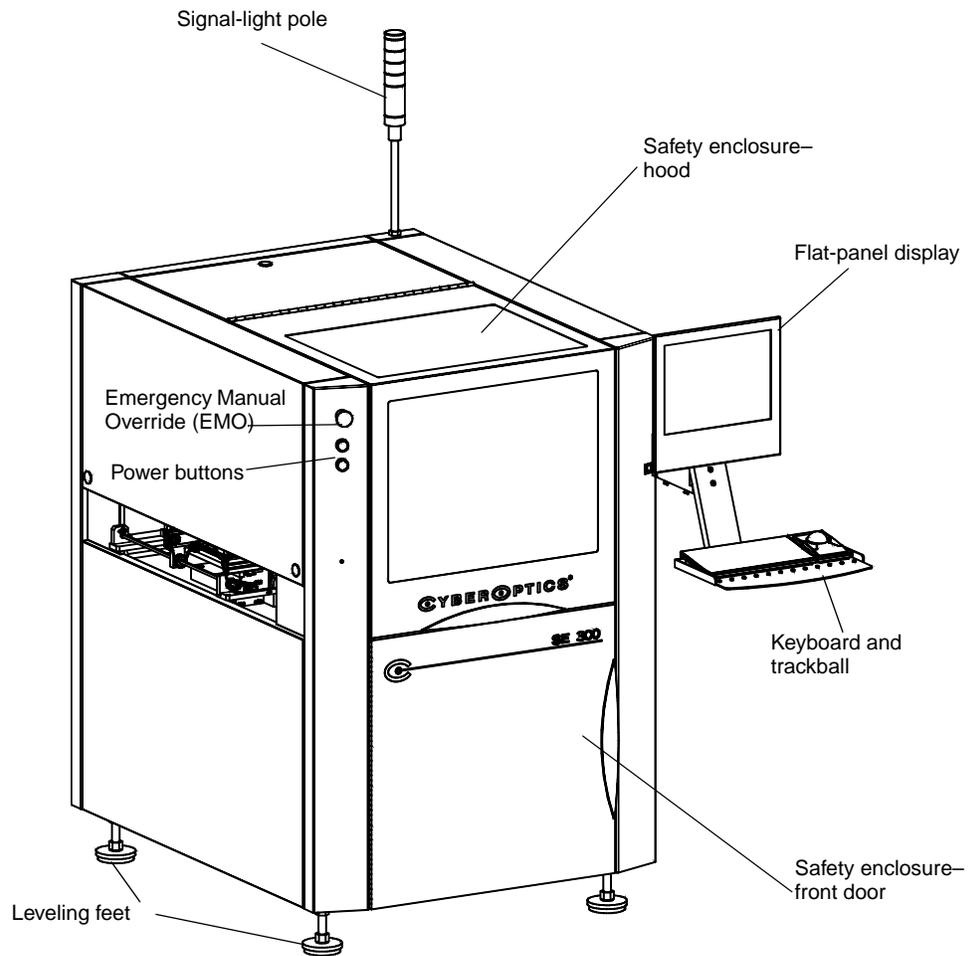


Figure 14. SE 300 Ultra Front View

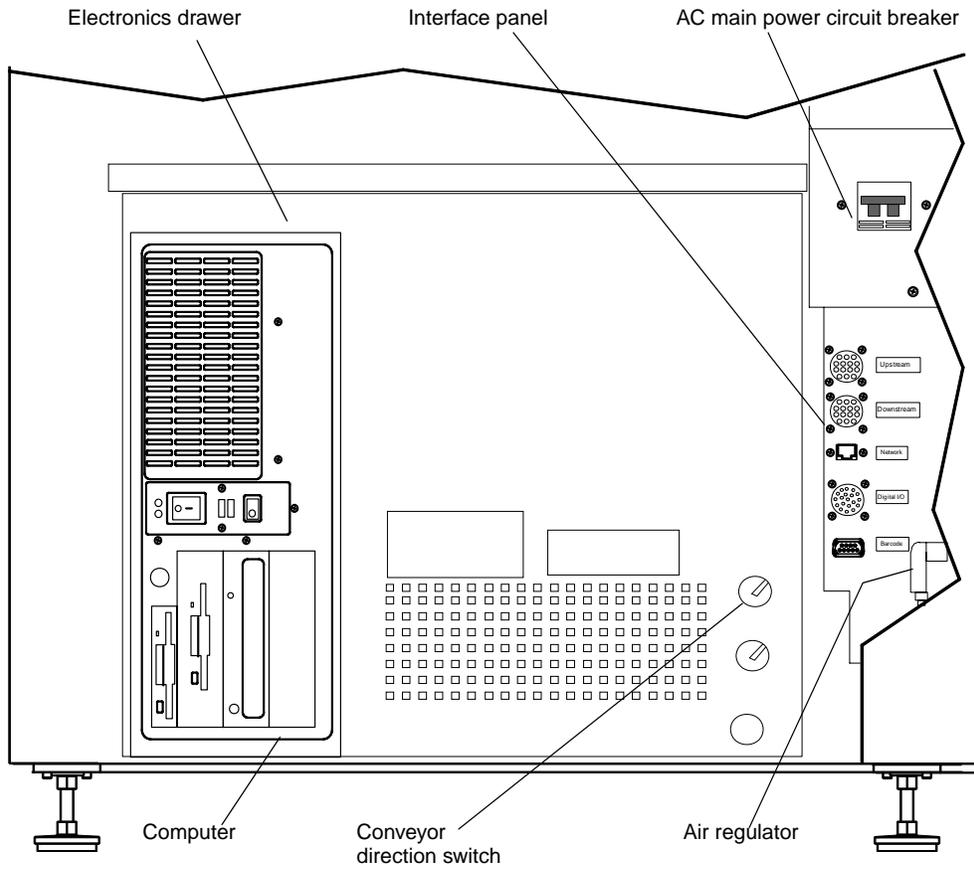


Figure 15. SE 300 Ultra Inside Front Door

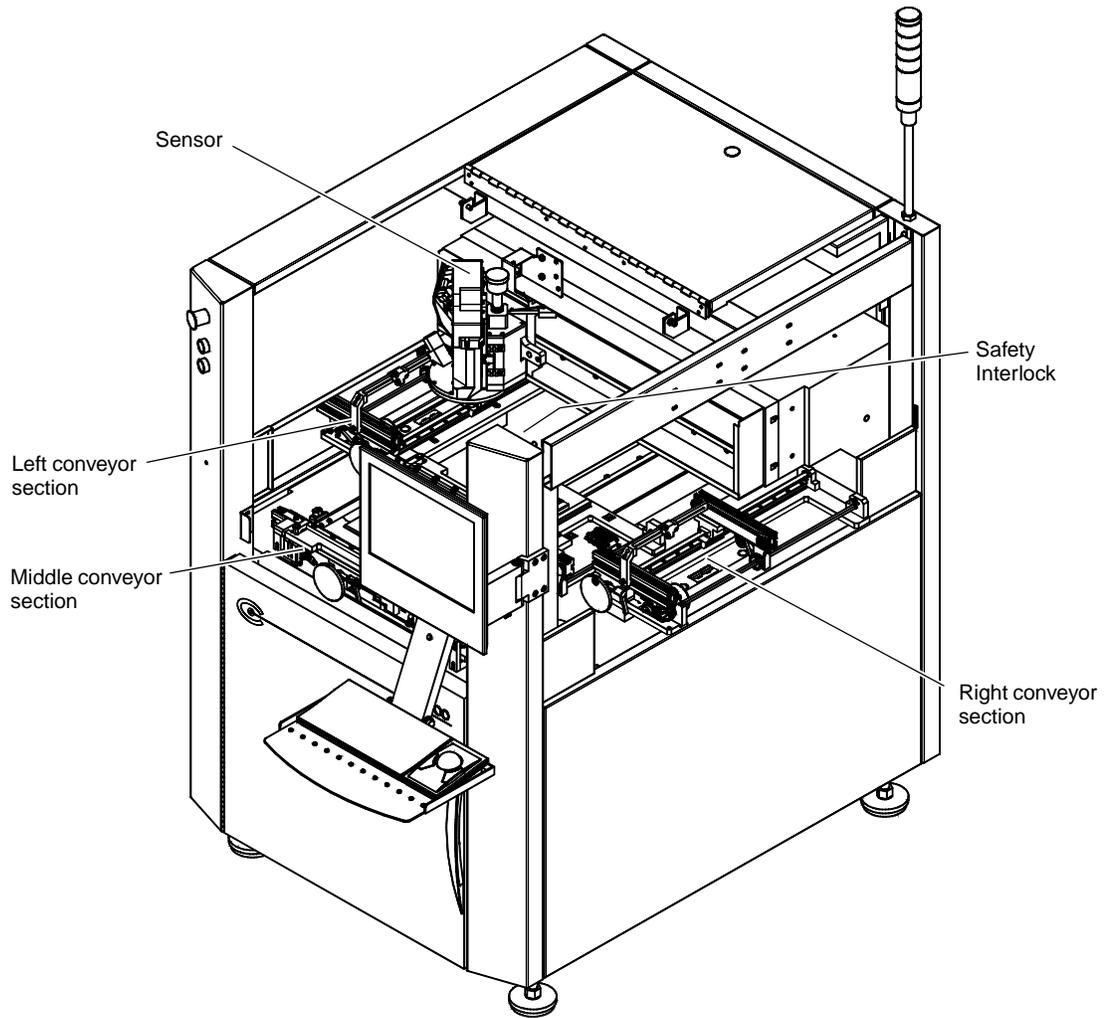


Figure 16. SE 300 Ultra Sensor and Conveyor

SE 300 Ultra Electronics Drawer

The electronics drawer in the SE 300 Ultra contains the components described in the following table and shown in Figure 17.

Table 3. Electronics Drawer Components

Component	Description
AC Distribution Board	Distributes AC power to the subsystems through fuses on this board.
AC Filter	Provide uniform AC power to system components.
Cable Breakout Board	Provides interface for auto-width conveyor cabling.
Computer	Real-time (RT) – Pentium® 4-based microprocessor that controls the mechanical system, interfaces with the sensor, and computes measurement results. Windows® – Pentium 4-based microprocessor that provides the user interface. The computer contains a CD-ROM R/W drive and two 3.5 inch disk drives. The computer provides parallel, serial, USB, and network connections.
Conveyor Speed Control	Used to set the inbound (load) and outbound (unload) conveyor speeds to match your line speed.
Digital Input/Output Modules and Rack	Provides isolation for digital I/O signals.
Distribution Board	Distributes logic signals to system components.
Fans	Cool the electronics in the system.
Pneumatic Solenoids	Controls air used to the lift and clamp assemblies.
Power Supplies	Provide power and auxiliary power to the sensor, relay board, and monitor.
Relay Board	Contains safety circuit relays and provides general power distribution.
X- and Y-Axis Motor Controllers	Provide signal amplification and control for the X- and Y-axis motors.

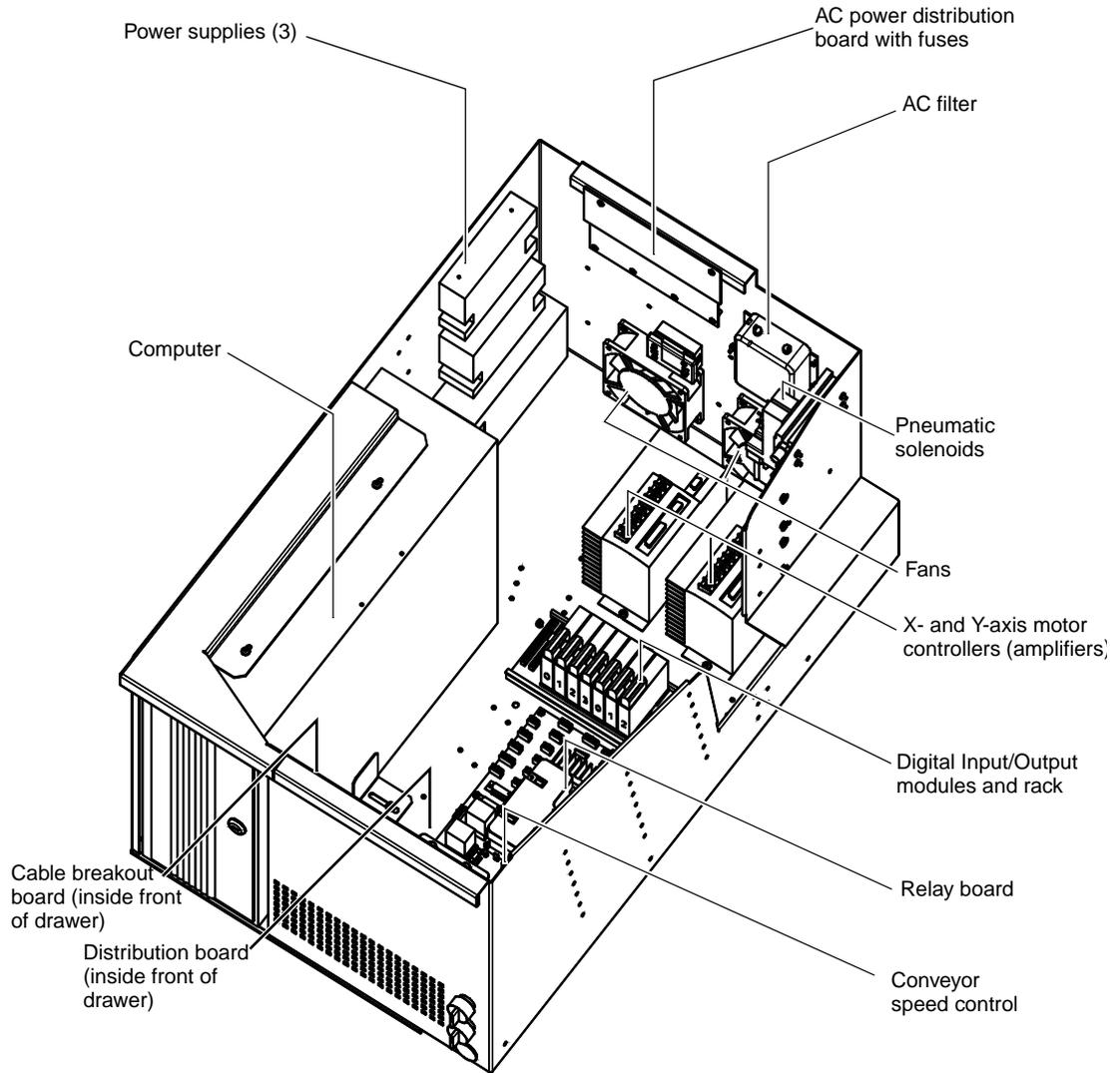


Figure 17. Electronics Drawer

System Specifications

Table 4. System Specifications

SE 300 Ultra Dimensions	
Unit Height	200 cm (79 in.) including signal-light pole and leveling feet
Unit Width	98 cm (38.4 in.)
Unit Depth	125 cm (49 in.) 185 cm (73 in.) including keyboard/trackball tray
Distance from fixed front rail to back of machine	79 cm (31 in.) or 90 cm (35.5 in.)
Conveyor Height	889 to 990 mm (35 to 39 in.)
Weight	860 kg (1900 lbs.)
Panel Specifications	
Panel Size Capacity <ul style="list-style-type: none"> ● Maximum ● Minimum 	508 × 508 mm (20 × 20 in.) 101 × 35 mm (4 × 1.375 in.)
Board Thickness	0.5 to 5.05 mm (0.02 to 0.2 in.)
Board Edge Clearance (mechanical) <ul style="list-style-type: none"> ● Top ● Bottom 	2.5 mm (0.10 in.) 3 mm (0.12 in.)
Underside Component Clearance	25.4 mm (1 in.)
Maximum Board Weight	1 kg (35 oz)
Maximum Board Warp	< 2% of PCB diagonal or 6.35 mm (0.25 in.) total
Operational Specifications	
Conveyor Speed Range	150–450 mm/sec (5.9–17.7 in./sec)
Maximum Inspection Area	508 × 503 mm (20 × 19.8 in.)
Field of View	10 × 20 mm (0.39 × 0.79 in.)
Maximum Pad Size in FOV	5 × 10 mm (197 × 394 mils)
X and Y Pixel Size	40 microns (1.6 mils) High-speed 20 microns (0.79 mils) High-resolution
Height Resolution ^a	0.125 microns (0.005 mils)
Paste Height Range	50–300 microns (2–12 mils)
Temperature Range Warm Up Time (for repeatability and accuracy specifications)	25 degrees Celsius, ± 2 degrees Celsius 30 minutes
Airborne Noise Emissions	65 dBA
Hardware Specifications	
Processors <ul style="list-style-type: none"> ● Real-time (RT) ● Windows 	Intel® Pentium® 4 or better Intel® Pentium® 4 or better
Interfaces	SMEMA, Ethernet, parallel, RS-232, air, power

^a Height equivalent of the least significant bit.

Performance Specifications

The most current performance specifications are found on the product page of the CyberOptics web site: <http://www.cyberoptics.com>

Computer Requirements

You can run the Teach application on a desktop computer that meets the following minimum requirements:

Table 5. Desktop Computer Minimum Requirements

Processor	Intel® Pentium® 4 processor
RAM	256 MB recommended
Disk Space (available)	1 GB (to accommodate quilt image for 20 x 20 in. panel)
Video card <ul style="list-style-type: none">● Minimum● Recommended	32 MB memory 64 MB memory, OpenGL acceleration
Monitor (resolution)	1024 x 768, 24-bit color
Operating System	Windows® XP recommended

System Requirements

Table 6. System Requirements

Humidity	30–90% non-condensing
Temperature <ul style="list-style-type: none"> ● Operating ● Storage 	5–40° C (40–100° F) -20–70° C (-4–158° F)
Altitude	Up to 2000 m
Insulation Coordination	Pollution degree 2
Installation Category (overvoltage category)	Category III
Power Requirements (Hard-wired, single phase)	100–130 VAC, 15 amp, 60 Hz/50 Hz 220–240 VAC, 10 amp, 60 Hz/50 Hz
Permitted Voltage Drops	90 V for 100–130 VAC 200V for 220–240 VAC
Peak Operating Current	12 amps
Compressed Air	Clean, dry air, 80–100 psi (@4 cfm); Quick-disconnect connection
Internal Branch Circuit Fuses	Nine, 6.3 amp One 3A 250V

Dimensions

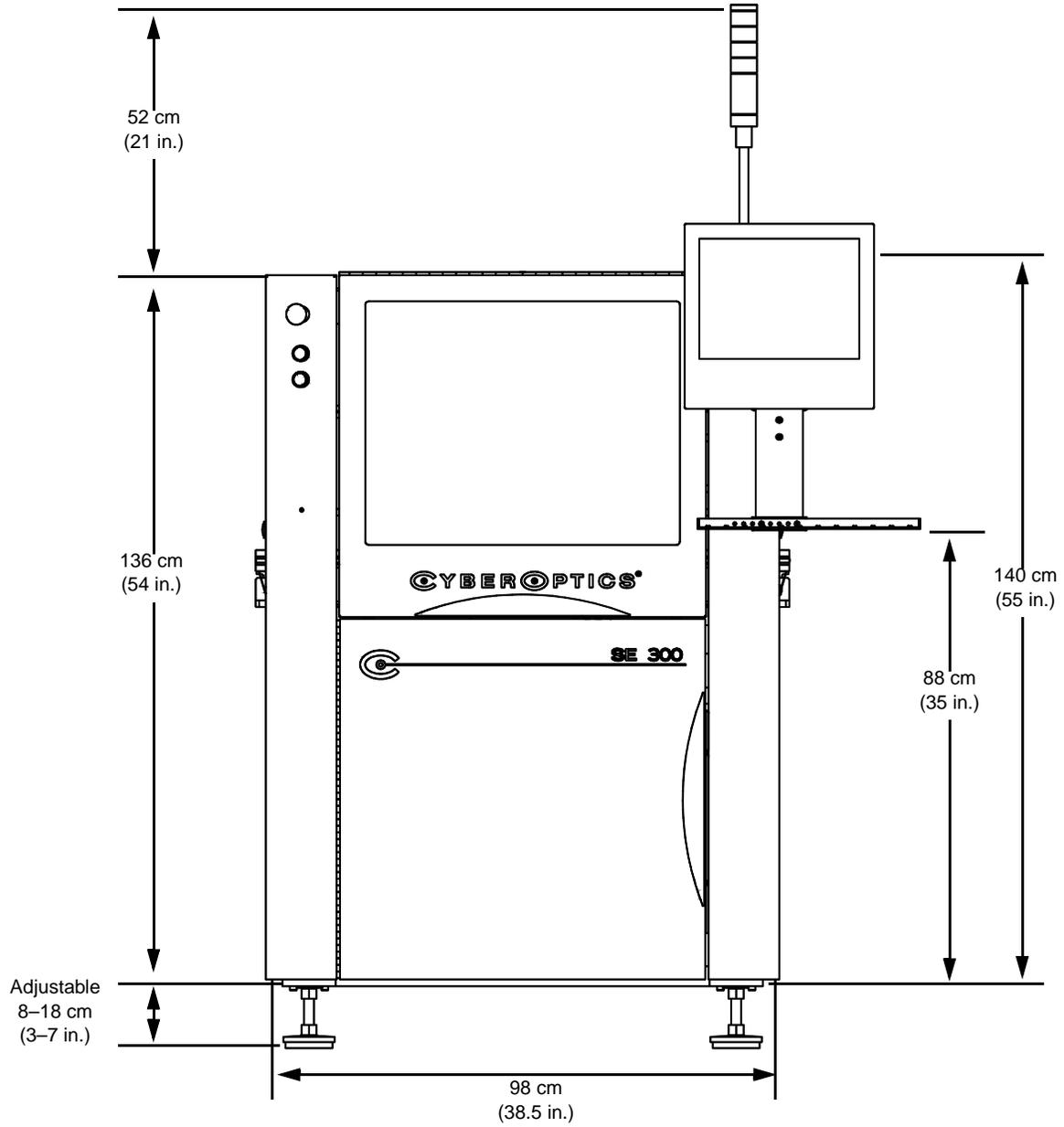


Figure 18. SE 300 Ultra Front View

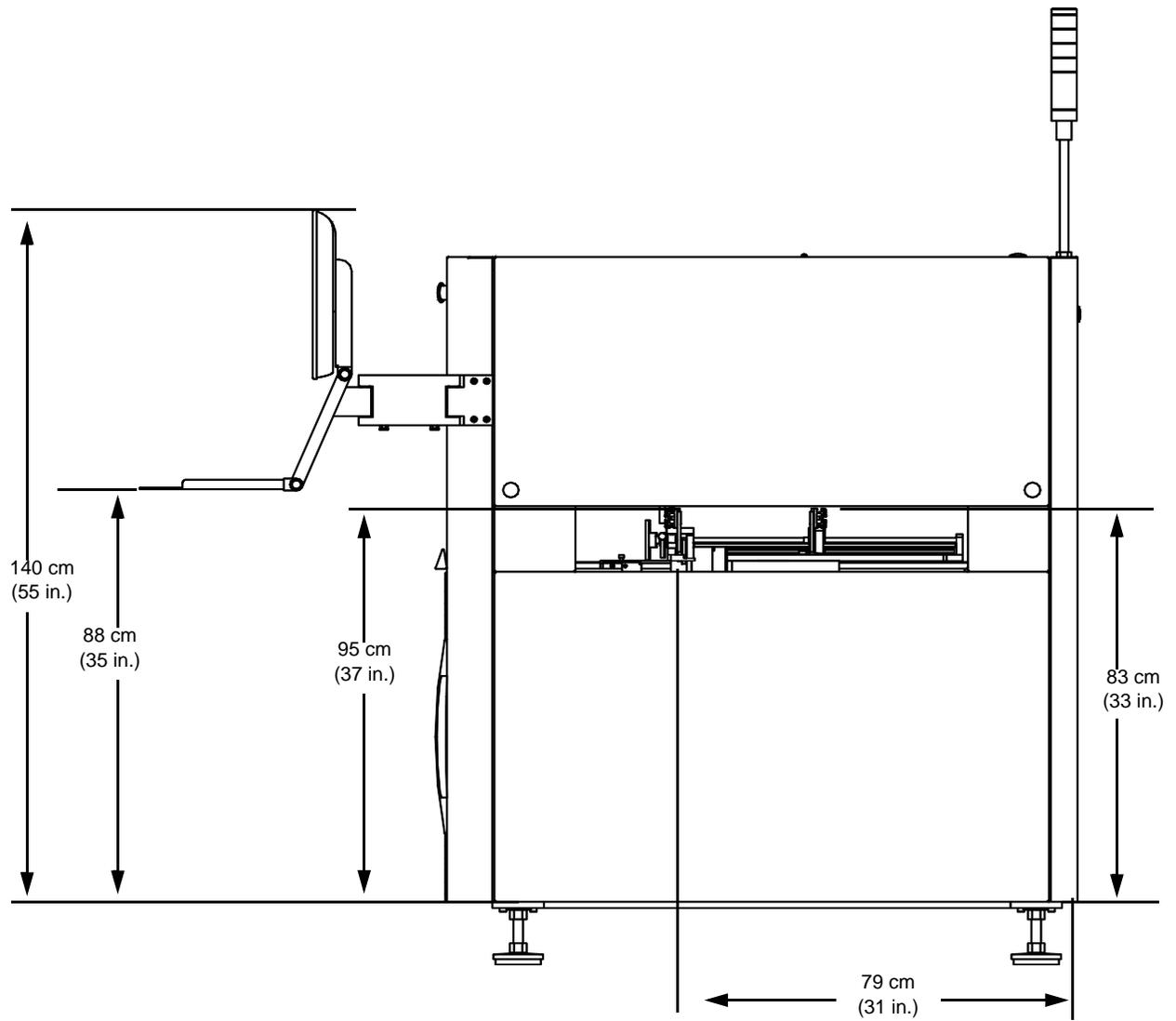


Figure 19. SE 300 Ultra Side View

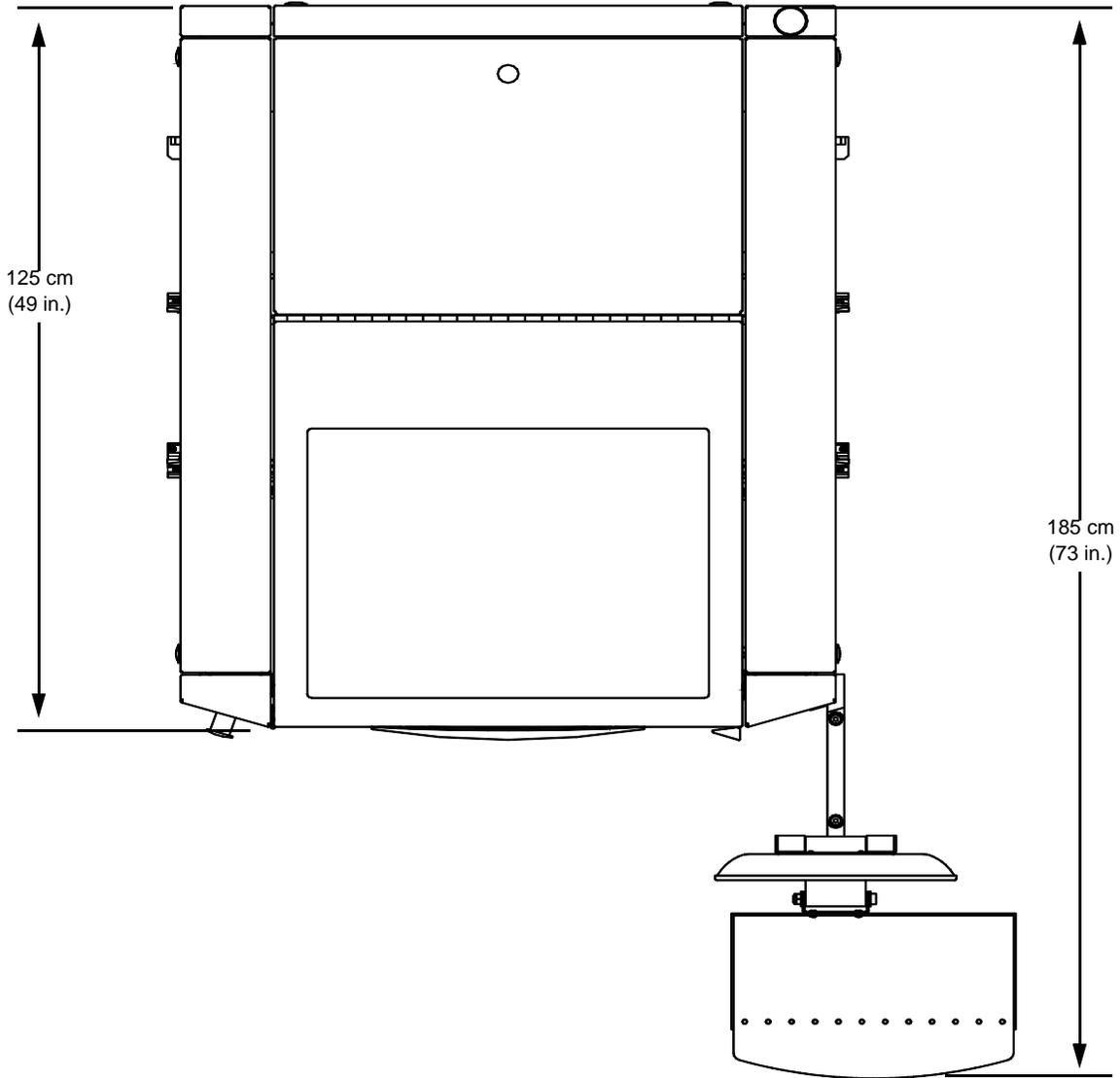


Figure 20. SE 300 Ultra Top View

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Unpacking the SE 300 Ultra System

These instructions describe how to unpack the SE 300 Ultra system from the wooden crate. We recommend that you save crate and all of the packing materials in case you need to ship the system back to CyberOptics.

➤ **To unpack the SE 300 Ultra system**

1. Check the shock sticker on the side of the crate for damage.
2. Loosen and remove the 16 bolts located around the side panel of the crate. The bolts are marked with blue paint.



Figure 21. SE 300 Ultra Packing Crate

3. Pry off the side panel from the crate where you removed the bolts.
4. Remove the packing foam and unload the accessory boxes.
5. Loosen and remove the 10 bolts around the bottom perimeter of the crate. The bolts are marked with blue paint.
6. Slide the crate off the platform.
7. Remove the bolts from the lock-down plate located at each of the system's leveling feet.
8. Remove any remaining packing plastic from around the system.
9. Use a forklift to move the system off the platform to the desired location.

Note: The tines of the forklift or pallet jack need to securely hold both cross beams under the system. Otherwise the tines may damage the electronics drawer.

Choosing a Location

The SE 300 Ultra system must be level and aligned with incoming and outgoing conveyor sections to allow for smooth movement of the panel.

Choose a location for SE 300 Ultra where:

- Conveyor movement is smooth
- Conveyor is level
- System is not exposed to extreme ambient vibration
- System has easy access to power and compressed air

Installing the System



Caution: The SE 300 Ultra is a precision measurement system. To ensure optimum performance of your SE 300 Ultra, we recommend that a trained CyberOptics service representative install or assist in the installation of your system.

Installing the SE 300 Ultra system consists of the general steps listed below. Each step is described in more detail on the following pages.

- Attach the light pole
- Position and level the system with conveyor
- Attach the keyboard/trackball tray
- Attach the monitor
- Connect the air supply
- Connect SMEMA cables
- Install the sensor
- Wire the system for power

Installing the Light Pole

➤ **To install the light pole**

1. Place the light pole in an upright position and insert the threaded end of the pole into the hole on top of the enclosure.
2. Open the safety enclosure and tighten the bolt inside the enclosure so that the light pole is firmly attached to the unit.
3. Connect the light pole cable to the available cable connector tied to the frame.

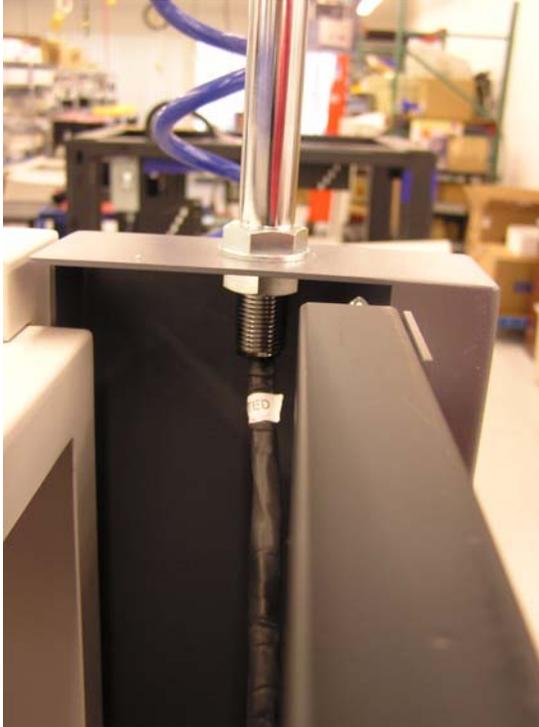


Figure 22. Light Pole Installation

Positioning the SE 300 Ultra System

Adjust the height of the system to align with incoming and outgoing conveyor sections. Use the fixed front rail conveyor on the SE 300 Ultra for alignment.



Note: Do not bolt the SE 300 Ultra conveyors to incoming and outgoing conveyor sections. Vibrations from other machines may impact SE 300 Ultra performance.

➤ To align the system with other conveyors

1. Ensure that the floor is free of debris and the area provides adequate clearance on all sides of the unit.
2. Push the SE 300 Ultra unit into position, lining up the front rails of the incoming and outgoing conveyor sections.
3. To adjust the leveling feet loosen the locking nut with a wrench and then turn the adjustment nut.
 - Turn the nut clockwise to raise the unit
 - Turn the nut counter-clockwise to lower the unit

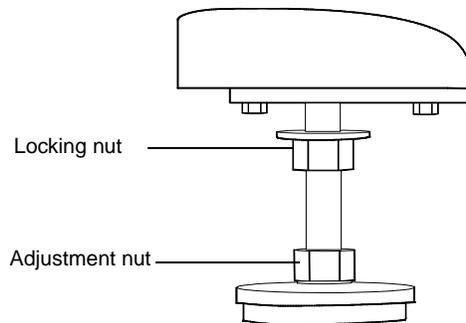


Figure 23. Leveling Foot

4. Use a level or machine height measurements to make sure that the system is level.
5. Manually slide a panel through the incoming and outgoing conveyor sections to make sure that the SE 300 Ultra conveyor rail is properly aligned. The panel should pass from the upstream conveyor through the SE 300 Ultra system and on to the downstream conveyor without any resistance.
6. After adjusting the leveling feet, tighten the locking nuts.

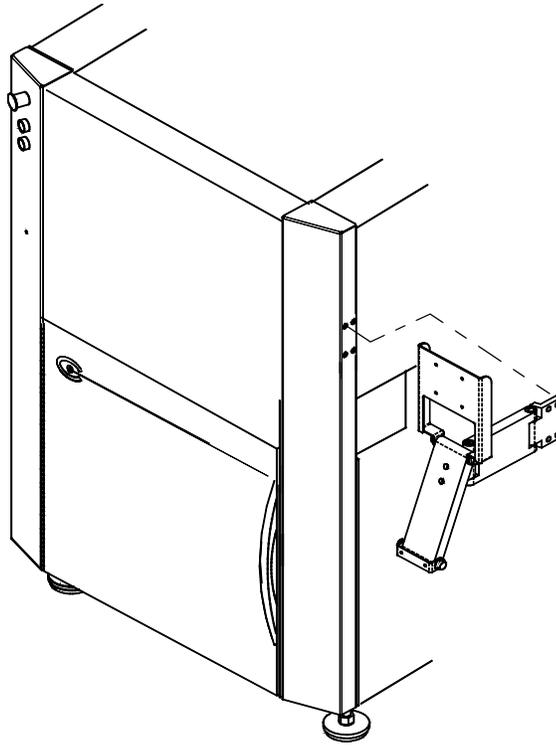


See page 140 for information about replacing damaged leveling feet.

Install the Computer Hardware

➤ To install the keyboard mounting arm

1. Attach the keyboard mounting arm to the right side of the frame using four M6 x 1.0 x 16 socket head screws.



2. Attach the tray to the mounting arm using two M5 x 6 screws.
3. Attach the Monitor to the plate on the mounting arm using four M4 x 0.7 x 10 button-head screws.

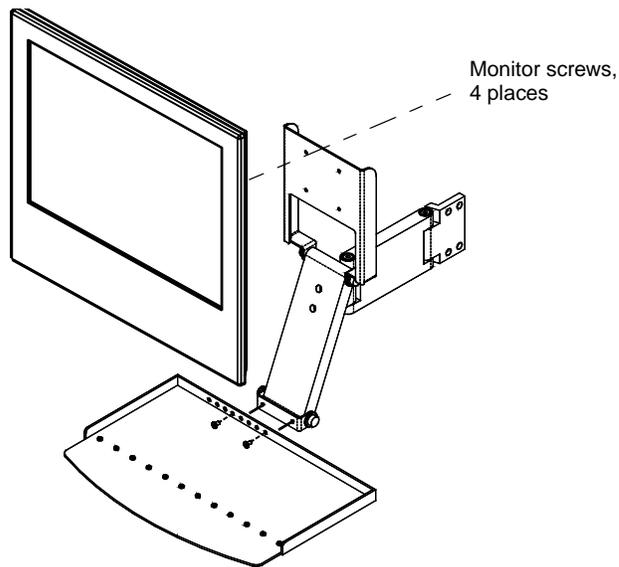


Figure 24. Keyboard/Trackball Mounting Hardware

4. Place keyboard and trackball on the tray.
5. Connect the video and DC power cables to the monitor.
6. Position the keyboard and trackball cables so that they run along the bottom of the pivoting arm.
7. Bundle the cables and secure them to the bottom of the mounting arm with cable ties and anchors.

Connecting the Air Supply

➤ To connect air supply to SE 300 Ultra

1. Make sure that the air line to the SE 300 Ultra is unpressurized.
2. Open the front door of the safety enclosure and locate the air regulator.

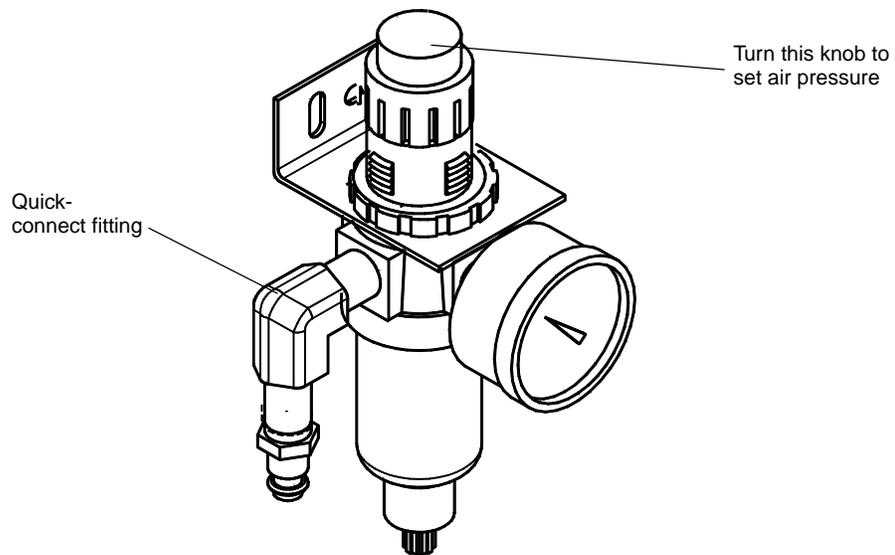


Figure 25. Air Regulator

3. Push the air hose connector onto the air regulator quick-connect fitting.
4. Turn the knob at the top of the air regulator to set the air pressure to 90 psi (80 psi min., 100 psi max.).

Connecting SMEMA Cables

➤ **To connect SMEMA cables**

1. Open the front door of the safety enclosure.
2. Locate the SMEMA connectors on the interface panel located on the lower right side of the machine.

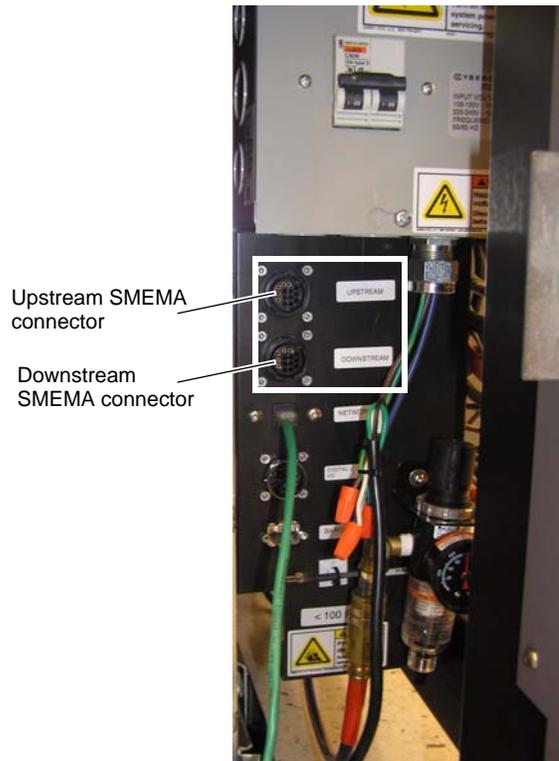


Figure 26. SMEMA Connectors

3. Route the SMEMA cables through the bottom of the SE 300 Ultra unit.
4. Connect the upstream cable to the upper connector.
5. Connect the downstream cable to the lower connector.

Installing the Sensor



Caution: Make sure the SE 300 Ultra system power is off before you install the sensor. The sensor will be damaged if you connect it to the system when power is on.

➤ **To install the sensor**

1. Slide the sensor onto the bottom pin of the mounting plate located on the Z-stage.
2. Pivot the sensor to align with the top pin of the mounting plate.

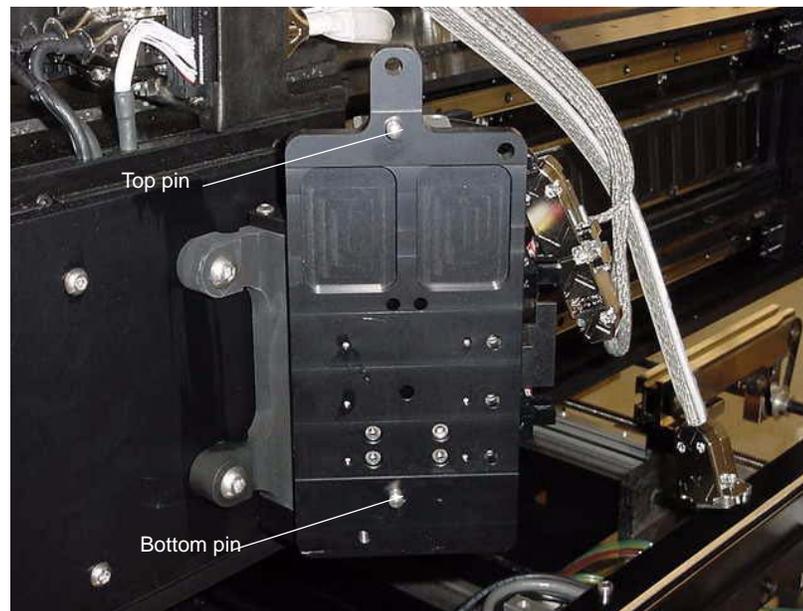


Figure 27. Mounting Plate on the Z-stage

3. Secure the sensor onto the plate using one 6 mm screw on the front and two on the rear.

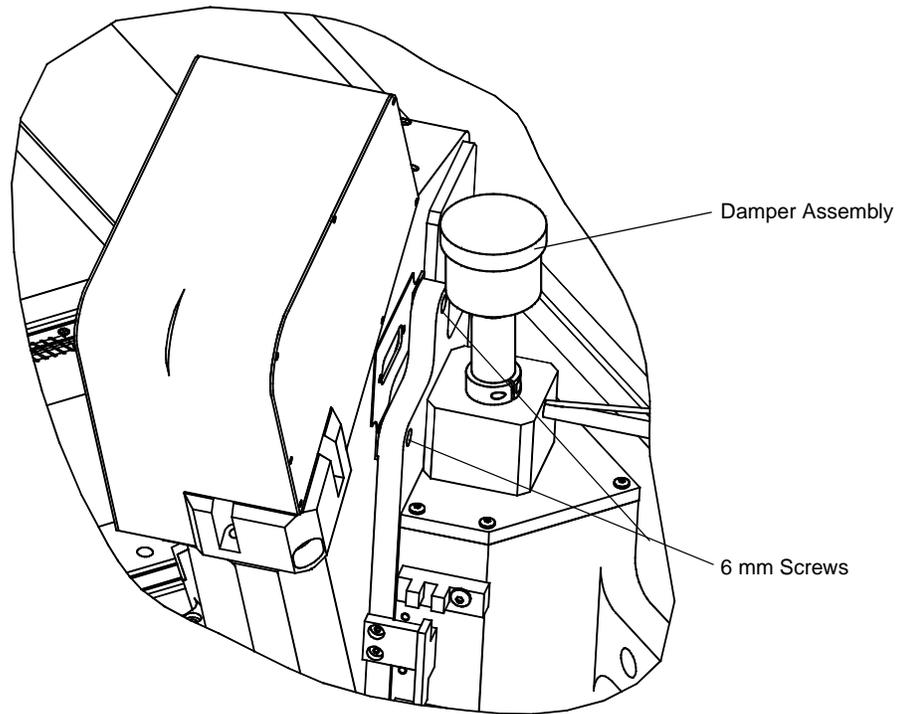


Figure 28. Back Plate Screws and Cable Connection

4. Connect the sensor cable to the connector on the back of the sensor and tighten the two small screws.

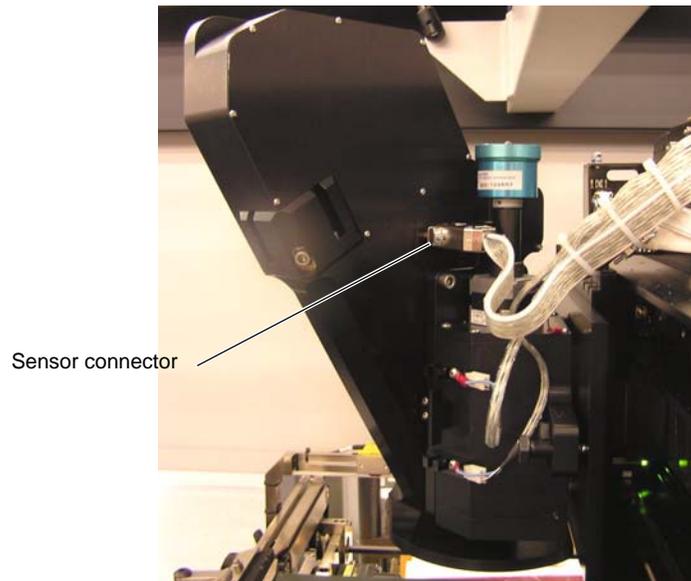


Figure 29. Sensor Installed

Wiring SE 300 Ultra for Power

The SE 300 Ultra system must be hard-wired into your AC main power. Have a certified electrician wire the system.



Caution: Prior to wiring the system, make sure that the AC main power supply is turned off and locked off.



Notes:

- You must have a readily accessible AC main disconnect and a protective device in the fixed wiring for the permanently connected SE 300 Ultra system. The disconnect and any protective device must be rated at 15 amps maximum.

➤ **To locate wire and earth ground connections**

1. Open the front door of the safety enclosure.
2. Locate the Junction Box inside the front door of the safety enclosure above the air regulator on the right side of the unit.

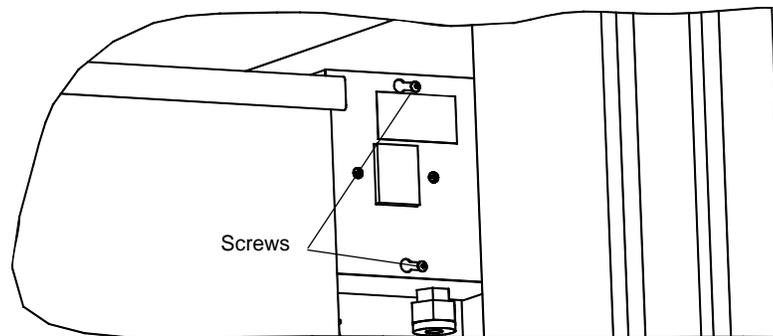


Figure 30. Location of Junction Box

3. Loosen two screws on the front of the box.
4. Slide the Junction box cover to the right to remove it.

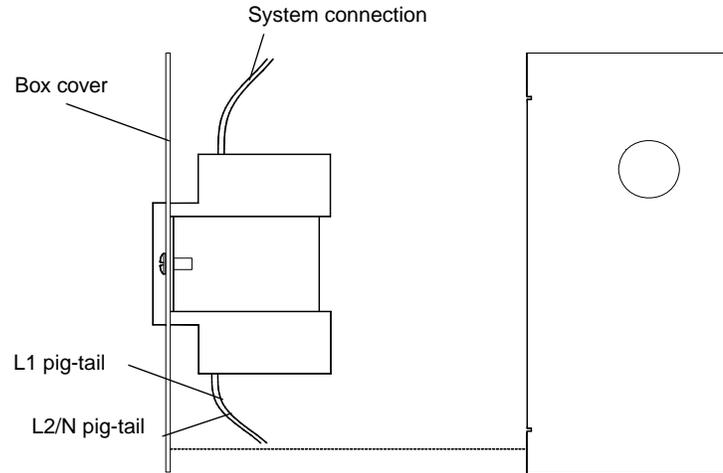


Figure 31. Junction Box Cover (side view)

5. Loosen the strain-relief nut at the bottom of the box.
6. Feed the incoming power, ground, and L1 and L2/N lines up through the strain-relief.
7. Connect L1 and L2/N to the pig-tail wires on the junction box cover.
8. Connect the ground wire to the ground bar located at the back of the Junction box.



Caution: If the ground is not properly connected, the entire machine chassis will float at half the supply voltage.

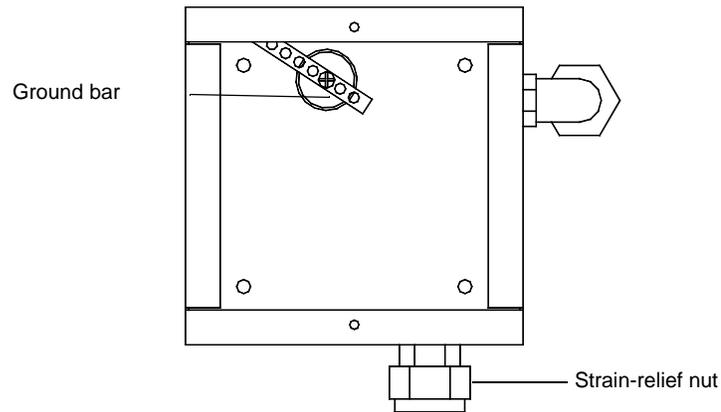


Figure 32. Junction Box - Cover Removed (front view)

9. Replace the Junction box cover.
10. Tighten the two screws on the front of the box.

Turning on System Power

CyberOptics recommends a 30 to 60 minute warm up time to ensure the most accurate system measurements.

➤ To turn on the system

1. Turn the AC main circuit breaker to ON to turn on power to the entire system.
The breaker is located on the junction box to the right of the electronics drawer.
2. Push the green button on the front of the unit to turn on the power to all system hardware.
3. Turn on the power to the monitor.



Note: Do not open the Solder Paste Inspection application until after the lights on the signal light pole have turned on and then off. When you first start up the SE 300 Ultra system, the internal computer initializes the system. After approximately two minutes the lights turn on, and then several seconds later they turn off, indicating that the initialization is complete.



Figure 33. AC Main Circuit Breaker Location

Connecting to a Network

Connect the SE 300 Ultra system to an appropriate network using the network port on the interface panel. The network port can be used for 10Base-T or 100Base-T installations. You will need assistance from your network administrator to complete this procedure.

These procedures describe how to:

- Connect the SE 300 Ultra system to a Local area network (LAN)
- Determine which Ethernet card should be configured for LAN connection
- Configure the correct Ethernet card for LAN connection



Caution: Do not disconnect the Windows/Real-time Ethernet connection. The system will not operate without this connection in place.

➤ To connect the SE 300 Ultra system to a network

1. Open the front door of the safety enclosure.
2. Connect the network cable to the Ethernet connection on the front of the interface panel located to the right of the electronics drawer.

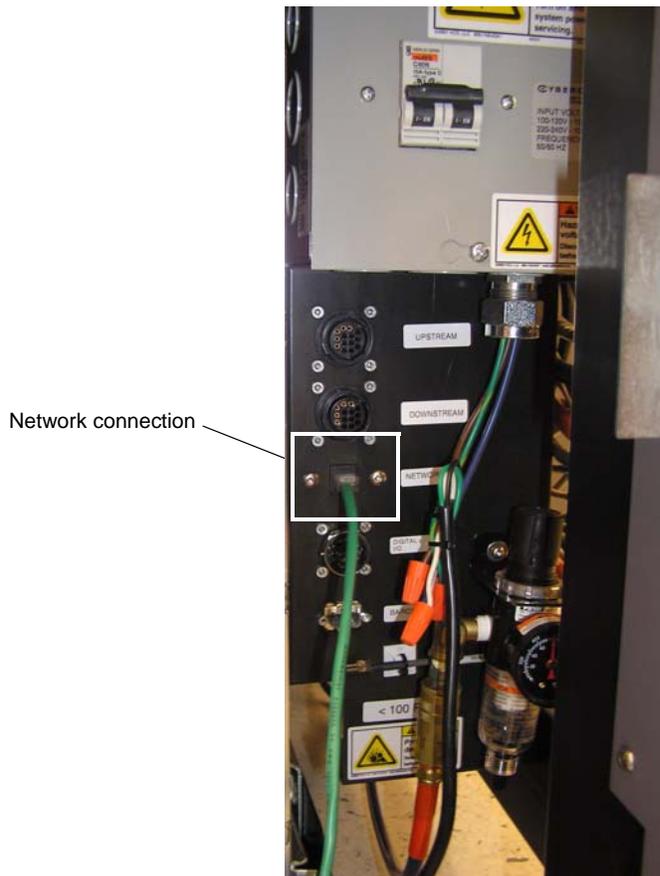


Figure 34. Network Connection

➤ **To determine which Ethernet card should be configured for LAN**

Look at the TCP/IP settings for each network adapter to determine which is the adapter for the Realtime computer:

1. Right-click on **My Network Places** and select **Properties**.
2. Check each network adapter by right-clicking on the adapter and selecting **Properties**.
3. In the General tab select the Internet Protocol (TCP/IP) connection and click **Properties**.

The adapter with the following IP address is used for the Realtime computer:

- IP Address: 10.10.10.1
- Subnet mask: 255.255.255.252

If the TCP/IP properties are set to obtain an address automatically, or is not set to the address above, you can use this adapter for your LAN.

Configuring the LAN Connection

Use the Windows network tools to complete the Ethernet configuration. This is typically done by a network administrator and includes:

- Adding the protocol
- Assigning the IP address
- Configuring the Domain Name System (DNS).

Adjusting the Panel Sensors

You can adjust the position of the panel sensors along the Y-axis up to 6.5 in. (165 mm) to accommodate a particular board. For example, adjust the sensors to avoid reading a board cutout as no board present.



Note: Do not move the panel sensor along the X-axis. Movement along the X-axis affects system calibration.

➤ To adjust panel sensor Y-axis position

1. Clip the cable ties securing the sensor cables.
2. Loosen the mounting screws on the side of the panel sensor.

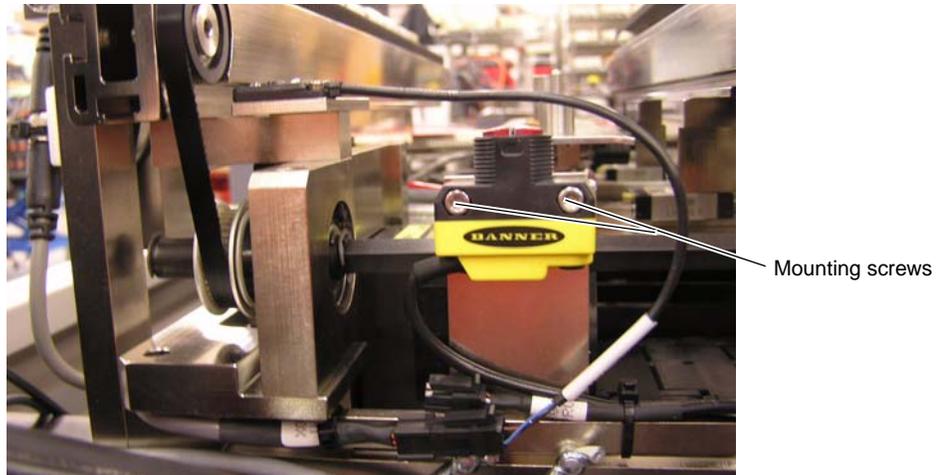


Figure 35. Middle Conveyor Section Panel Sensor



Figure 36. Right and Left Conveyor Section Panel Sensor

3. Slide the panel sensor along the rail (in the Y-axis) to the preferred position, then tighten the screws.
4. Secure the cables with cable ties so that they do not drag during X- and Y-axis motion.

Adjusting the Panel Lifter

For thinner, more flexible panels which can sag between the rails during transport and inspection, use the panel lifter and support pins to hold the panels more securely and improve the accuracy of the registration measurements. Use of the panel lifter is recommended when sag exceeds the values listed in the following table.

Panel Width	Maximum Sag
100 mm (3.9 in.)	1.7 mm (0.07 in.)
200 mm (7.87 in.)	2.4 mm (0.095 in.)
300 mm (11.8 in.)	3.0 mm (0.118 in.)
400 mm (15.75 in.)	3.4 mm (0.134 in.)
500 mm (19.69 in.)	3.8 mm (0.15 in.)



Note: For intermediate panel widths, use the panel lifter when:

$$\text{Maximum sag} > 1.7 * \sqrt{\text{panel width}}$$

Significant amounts of panel warp can have a negative impact on the accuracy of the registration measurements. For best results, program local fiducials using the Panel Options properties in the SRF file to improve the measurement accuracy. However, programming local fiducials will increase the inspection time by approximately 1 to 2 seconds per fiducial.

You can adjust the position of the panel lifter or remove it to accommodate a particular panel. You may need to remove the panel lifter to adjust the conveyor section for boards less than 5 inches (127 mm) wide (see “Adjusting the Conveyor For Small Panels” on page 46).

➤ **To adjust panel lifter position**

1. Loosen the knob located on the right edge of the base of the panel lifter.

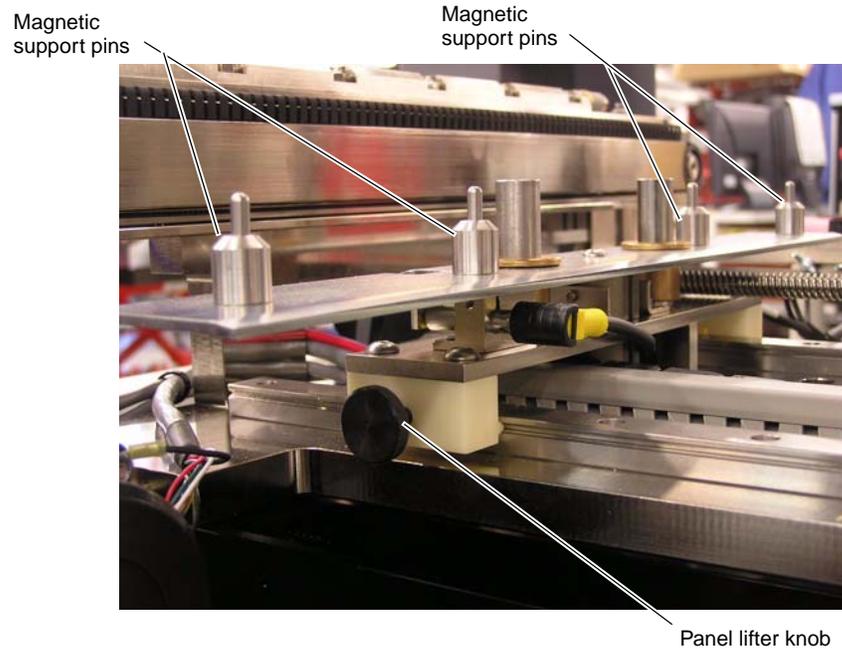


Figure 37. Panel Lifter (Viewed from Rear)

2. Move the panel lifter to the preferred position, then tighten the knob.

Notes:



Use magnetic support pins to support large panels. Position the pins so they contact the board on a clear area.

Panel lifter pins must not be positioned within 5 mm of a panel cutout; otherwise the system might rescan the panel frequently to adjust for changes in panel warp. If the system rescans panels more frequently than expected, check the panel lifter pin positions and adjust them as necessary. If the rescanning continues, use the Teach application to turn off the Cache Raster Data setting in the Panel Option property window for the SRF.

Manually Adjusting the Conveyor

If the system conveyor is not equipped with automatic width adjustment, adjust the conveyor width to fit the boards to inspect. Check the alignment between the three conveyor sections to ensure that the panel moves smoothly through all of the sections.

If the system conveyor is equipped with automatic width adjustment:

- The conveyor will adjust to the width specified in the SRFF when the file is opened.
- You can adjust the conveyor manually by adjusting the center section as described below. If you make adjustments to the center section, the end sections will adjust to the same width automatically. If you make adjustments to the end sections, they will return to the width of the center section.
- If you make manual adjustments, the system will prompt you whether to save the new width to the file when the SRFF is closed.



Note: If you are running a narrow board that requires the panel lifter to be removed, see “Adjusting the Conveyor For Small Panels” on page 46.

➤ To adjust conveyor width

1. Open the top cover of the safety enclosure.
2. Locate the conveyor adjustment dials on the front conveyor rail.
3. Slide the conveyor locking mechanism on the middle and one of the two side conveyor sections to prevent the middle section from sliding back and forth while you adjust the width.

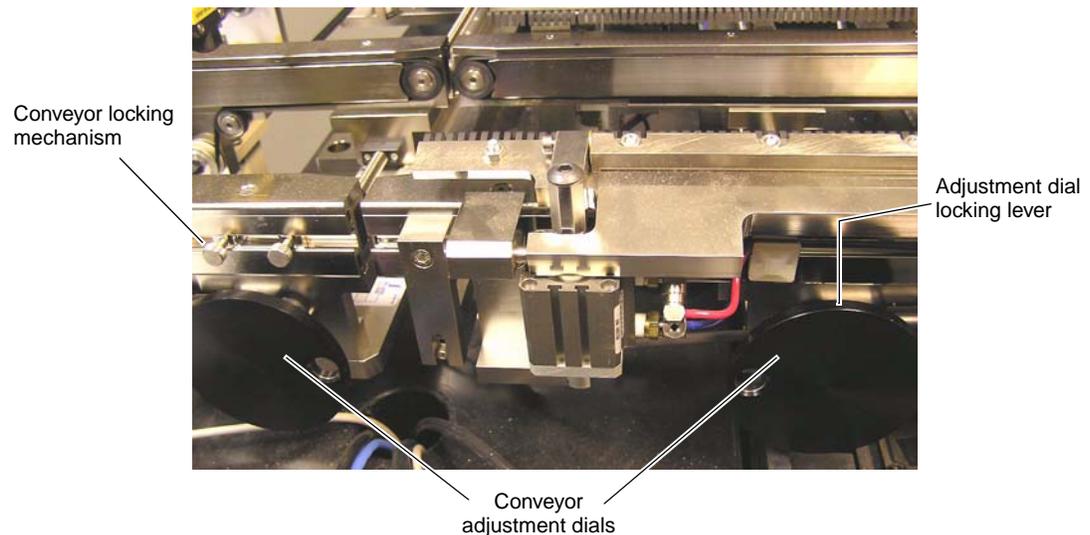


Figure 38. Conveyor Adjustment Dials

4. On the adjustment dial, flip the locking lever counter-clockwise to unlock the dial.
5. Turn the dial counter-clockwise to make the rails wider. Turn the dial clockwise to make the rails narrower.

6. When the rails are in the preferred position, flip the locking lever down on the adjustment dial to lock the rail into position.
7. Repeat steps 3 through 5 for each conveyor section.



Note: Make sure that you remove the conveyor locking mechanism when you finish adjusting the conveyor width.

➤ **To check conveyor alignment**

1. Place a panel on either the left or right conveyor section.
2. Manually slide the panel along all three conveyor sections.
3. Readjust the width of the rails if the panel does not move smoothly along all of the conveyor sections.

➤ **To set conveyor direction**

1. Open the front door of the safety enclosure.
2. Locate the conveyor direction switch on the front section of the electronics drawer.

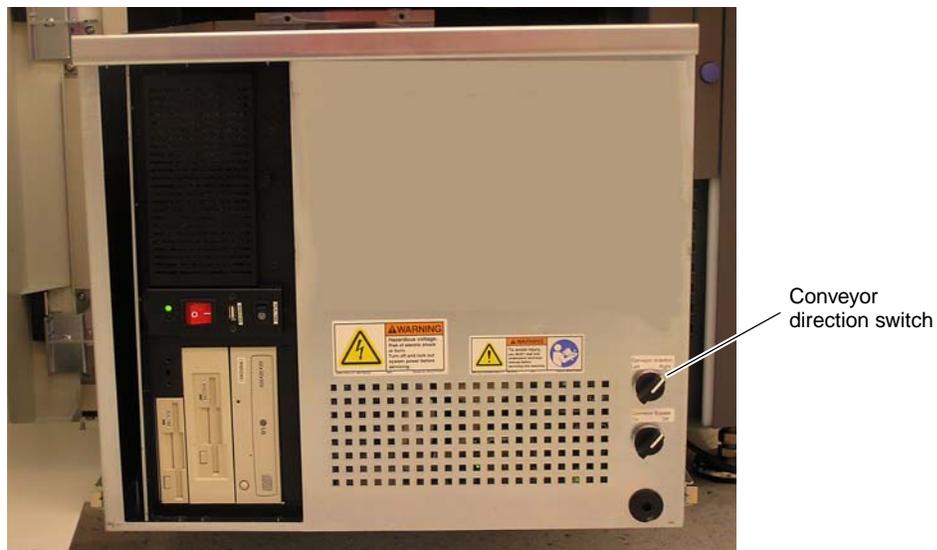


Figure 39. Conveyor Direction Switch

- Turn the switch to the LEFT position to set conveyor direction right-to-left.
 - Turn the switch to the RIGHT position to set conveyor direction left-to-right.
3. Restart the Real-time computer to activate the new conveyor direction.

Adjusting Conveyor Speed

Use the SE 300 Ultra conveyor speed control to specify inbound (load) and outbound (unload) conveyor speeds to match your line speed.

Conveyor Configuration	Left Control	Right Control
Right-to-Left	Unload speed	Load speed
Left-to-Right	Load speed	Unload speed

➤ To adjust conveyor speed

1. Open the front door of the safety enclosure.
2. Open the electronics drawer and locate the conveyor speed control on the Distribution board.

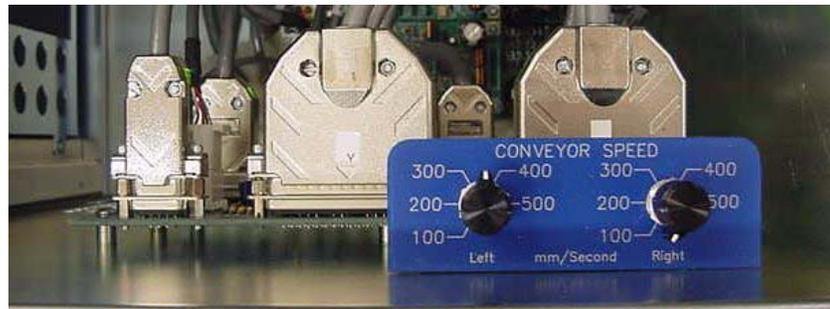


Figure 40. Conveyor Speed Control

3. Set the Left and/or Right control knobs to match your conveyor line speeds, from 100 to 450 mm/second.
Use the Left control to match the speed of the external conveyor on the left side of the SE 300 system. Use the Right control to match the speed of the external conveyor on the right side of the system.
4. Close the electronics drawer and the front door of the safety enclosure.
5. Slide the panel lifter support under the back rail of the conveyor.
6. Reconnect the cable track to the panel lifter support.
7. Place the panel lifter support on the bearing rail and re-attach the plastic bearing block on the left side of the panel lifter support.
8. Replace the panel lifter plate. Make sure that the tab on the lifter plate lines up with the inductive sensor on the right side.

Adjusting the Conveyor For Small Panels

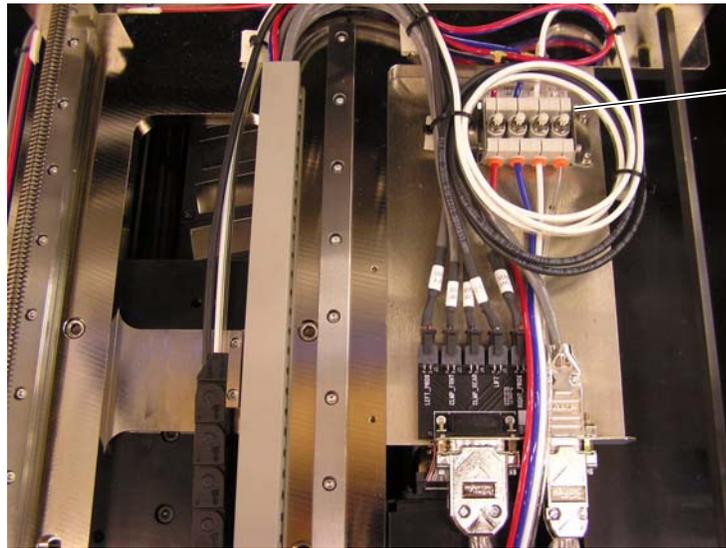
The auto-width conveyor can accommodate panels as small as 35 mm (1.4 in.). If the conveyor is equipped with auto-width capabilities, adjusting the conveyor for small panels requires removing the panel lifter and connecting a different opto for the center conveyor section.



Note: Removing the panel lifter and the sensor attached to it requires recalibrating the conveyor to a different opto. Contact CyberOptics before adjusting your conveyor for small panels.

➤ **To remove the panel lifter**

1. Turn off the air flow to the panel lifter (Lift Up/Lift Down).



Air flow controls - Lift Up/
Lift Down on right side

Figure 41. Air Flow Controls

2. Lift the top plate of the panel lifter.

3. Disconnect the air hoses from the panel lifter cylinder.

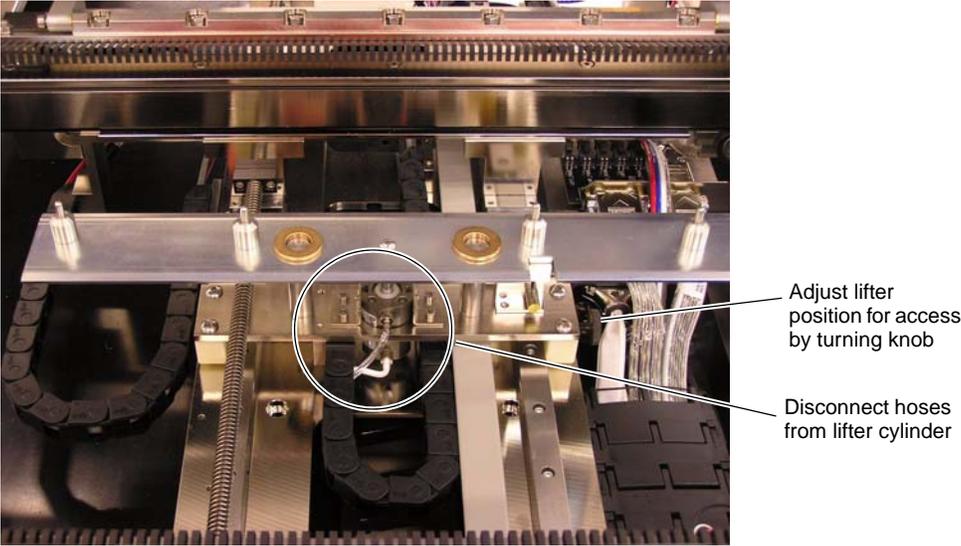


Figure 42. Panel Lifter

- 4. Clip the inductor sensor cable tie.
- 5. Loosening the bracket screw and remove the sensor from the bracket.

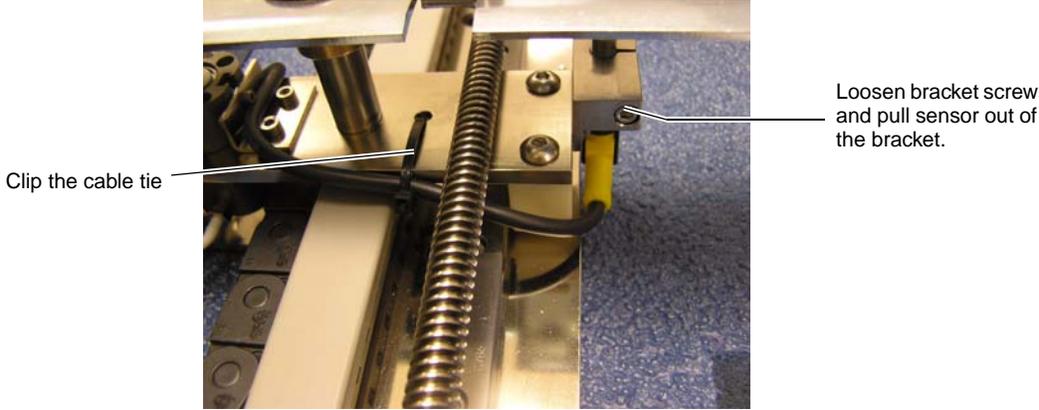


Figure 43. Inductive Sensor

6. Loosen two bracket screws and remove bracket from the lifter.

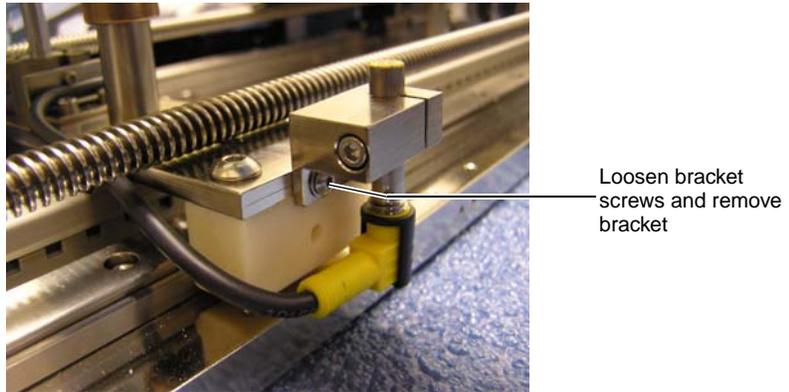


Figure 44. Inductive Sensor Bracket

7. Disconnect the cable track by loosening the screw that secures the bracket to the panel lifter support.

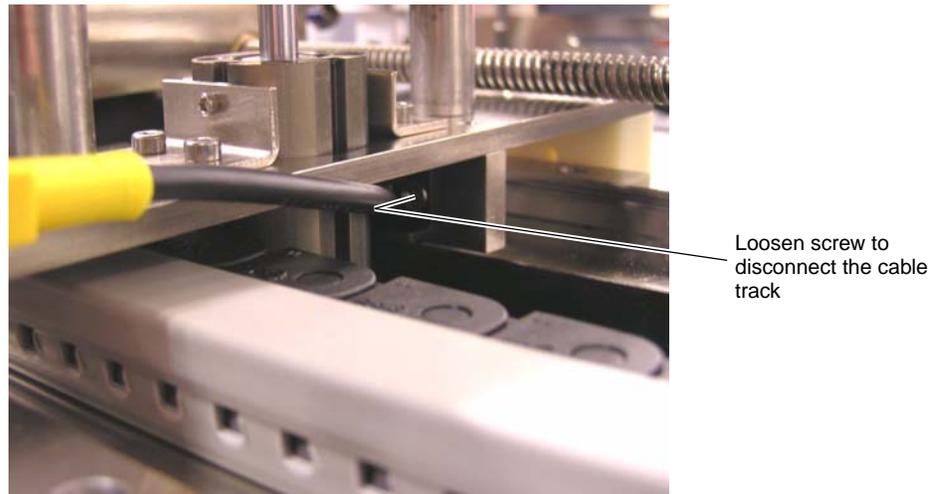


Figure 45. Cable Track Connection (Rear View of Panel Lifter)

8. On the left side of the lifter, loosen the screws that secure the plastic bearing block to the support plate. Loosen the block enough to work it off of the rail and out from underneath the lead screw.

Loosen these screws
enough to work the support
bar and block out from
underneath the lead screw.

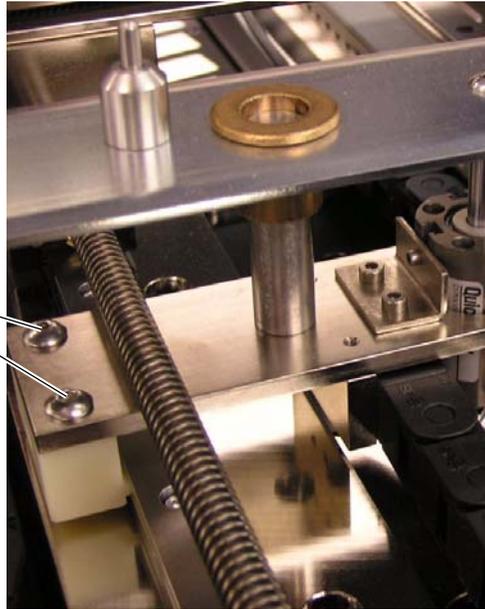


Figure 46. Plastic Bearing Block Screws

9. Remove the entire panel lifter assembly from the conveyor.
10. Use a cable tie to secure the loose cable track near the point where the air flow tubes enter the cable track.

➤ **To connect the new opto**

1. Disconnect the sensor located on the right side of the center conveyor section. The cable connection is labeled RIGHT PROX.
2. Connect the RIGHT PROX cable to the sensor mounted on the conveyor rail.



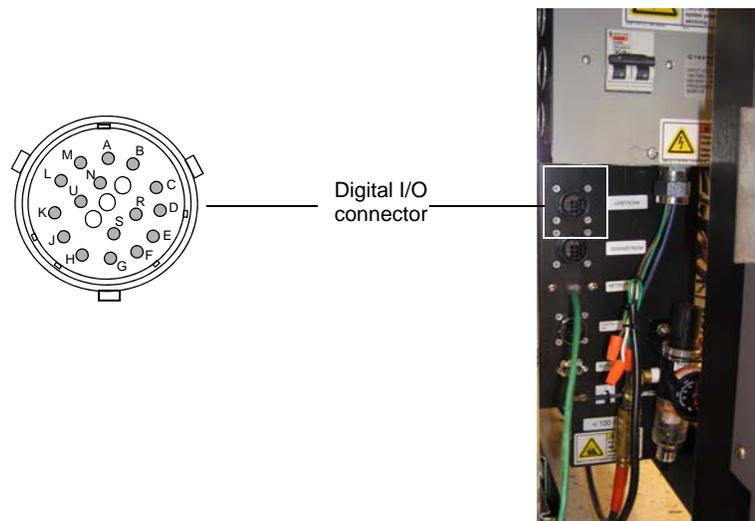
Figure 47. Right Proximity Sensor

Connecting to an External Device

This section describes the hardware and software procedures to connect a device such as a separate conveyor to the SE 300 Ultra system. CyberOptics provides a 19-pin digital I/O connector to interface with the external device. The connector pins correlate to the Solder Paste Inspection output signals and the Output Modules in the electronics drawer as described in Figure 48.

➤ To connect external device to SE 300 Ultra

1. Shut down Windows from the Start menu, then push the red button on the front of the unit.
2. Open the front door of the SE 300 Ultra unit.
3. Turn the AC main circuit breaker to OFF to shut down power to the entire system.
4. Open the front door of the safety enclosure.
5. Connect the external device to the digital input/output connection on the front of the interface panel on the right side of the electronics drawer.



SPI Output	+/-	Output Module ^a	I/O Connector Pin	Wire Color
Output 1	+	Module 6, channel 3	F	White/Blue
	-		E	Blue/White
Output 2	+	Module 6, channel 4	A	White/Orange
	-		B	Orange/White
Output 0	+ sink	Module 5, channel 4	J	White Green
	ground		K	Green/White

^a Located inside electronics drawer.

Figure 48. Digital Input/Output Connector

6. Close the front door of the safety enclosure.
7. Turn the AC main circuit breaker to ON to turn on power to the system. If the EMO button is pushed in, pull it out, then press the green ON button to engage the system.

The following procedures describe how to set up the SE 300 Ultra system to turn on the Output #1 signal in the event of a panel failure, and how to turn off the Output #1 signal after the next panel is loaded.

➤ **To turn on Output #1 as a response to a panel failure**

1. In the Teach application, select the Panel Description in the panel tree and open the properties dialog box.
2. In the properties dialog box, select Panel Description, click Add Properties and select Panel Event Group.
3. Select Panel Event Group, click Add Properties and select Panel Failure.
4. Select Panel Failure, click Add Properties and select Response Group.
5. Select Response Group, click Add Properties and select Outputs Response.
6. Select Outputs Response and set Output #1 and to ON.
Note: Outputs #0, 1, and 2 can conduct current (current rating 0.25 amp), but only Outputs #1 and 2 have over-current protection.
7. Save and close the SRFF file.

➤ **To turn off Output #1 after a new panel is loaded**

1. In the Solder Paste Inspection, open the SRFF file.
2. Select Tools>Options to open the Options dialog box.
3. Select the System tab.
4. Select System Event Group, click Add Properties and select the system event you want to use to turn off the output response to the external device, for example, Panel Loaded.
5. Select Panel Loaded, click Add Properties and select Response Group.
6. Select Response Group, click Add Properties and select Outputs Response.
7. Select Outputs Response and select OFF for Output #1.
8. Save the file.

Setting Up System Security

The SE 300 Ultra software contains a security feature used to control access to certain features. SE 300 security applies a system of Groups and Users to determine which logon names can access a given function. The default security setup includes the following groups:

- Supervisors
- Engineers
- Lead Operators
- Operators

The default security system includes the following user logons:

- Supervisor
- Engineer
- Lead Operator
- Operator

Any person using the SE 300 Ultra can use one of the default logons (password *CyberOptics*). The default setup allows full access to all SE 300 Ultra features for all users except for the Security Setup feature. Only the Supervisor logon has rights to change the Security Setup by default.

The default setup also includes an Auto logon feature, so that when any of the default system logons are used, a separate SE 300 Ultra logon is not required.



Note: If the security feature is not a requirement in your facility, use the default logons for the least amount of setup.

If you are logged on as a Supervisor (or user with Supervisor rights) you can change the security setup at any point to allow access to certain features depending on the system logon (see pages 56 and 57).

Adding Users to the System

You can add individual users to the SE 300 Ultra system in one of two ways:

- Windows system User Accounts: to add a few users to a system.
- SE 300 secAccounts.bat Utility: to add many users to one system or to add the same users to multiple SE 300 systems.

The following procedure describes how to use the SE 300 secAccounts.bat utility to add multiple users. The process includes:

- Creating system user text files
- Running the utility to transfer the information from the text files into the SE 300 Ultra security system.

➤ To create system user text files

To create individual user accounts on the SE 300 Ultra security system, create two separate text files, one that contains system user names and passwords, and one that associates the system user name with a group as described below.

1. Navigate to the Security Utilities directory and locate the two sample text files provided (passwords.txt and groups.txt). The pathname to this directory is:
c:\Program Files\CyberOptics\SE 300 System Software\Security Utilities\
2. Open the passwords.txt file in a text editor.
3. Replace the sample names and passwords with your system login names and passwords. Use the comma (,) as a delimiter. For example:

```
Weston,CyberOptics
Frankie,CyberOptics
Leslie,CyberOptics
"Barbara Ann",CyberOptics
```



Note: When a user name or group name contains a space, make sure that you enclose the user name in quotes as shown for Barbara Ann above.

Both the password and groups text files must reside in the Security Utilities directory.

4. Save the file in text format, named:
passwords.txt
5. Open the groups.txt file in a text editor.
6. Replace the sample names and groups with your system login names and the SE 300 group with which they are associated. Use the comma (,) as a delimiter. For example:

```
Weston,Supervisors
Frankie,Engineers
Leslie,"Lead Operators"
"Barbara Ann",Operators
```

You can list a user multiple times to add them to multiple groups.

7. Save the file in text format, named:
groups.txt

➤ **To import system user information**

1. Select Run from the Windows Start menu.
2. Type in or navigate to the following pathname:
c:\Program Files\CyberOptics\SE 300 System Software\Security Utilities**secAccounts.bat**

3. Select **OK** in the Run dialog box.

The program runs two separate batch files (**secPwords.bat** and **secGroups.bat**) to load the user names and passwords into the appropriate groups. No user intervention is required.

➤ **To add the same user information to additional systems**

1. Copy the modified **passwords.txt** and **groups.txt** files to the next system's security directory (c:\Program Files\CyberOptics\SE 300 System Software\Security Utilities\).
2. Run the **secAccounts.bat** file as described above to import the system user information.

Assigning Secure Areas

Each of the following Secure Areas must be assigned to one of the four SE 300 groups (Supervisor, Engineers, Lead Operators, Operators). Each group inherits the rights assigned to the group(s) below it. You assign Secure Areas from within the SE 300 Ultra applications.

Instructions for how to assign these Secure Areas are given on the next page.

Table 1. Secure Areas

Secure Area	Description	Application Where Used
Auto Logon	Group members are not required to log on to the application if their system account or profile includes an SE 300 group membership.	Teach and Solder Paste Inspection
Control: Pass-through	Allows group members to select Pass-through mode.	Solder Paste Inspection
Control: Reset Status	Allows group members to clear any active alarms resulting from measurement failures.	Solder Paste Inspection
Control: Reset Alarms	Allows group members to reset the current inspection values in the status pane and also clear the data displayed in all open data views.	Solder Paste Inspection
Fiducial View: Apply	Allows group members to apply changes to the fiducial illumination using the Fiducial View.	Solder Paste Inspection
Fiducial View: Locate	Allows group members to identify an inspection area in which to search for a fiducial.	Solder Paste Inspection
File: Save	Allows group members to save changes to the panel (SRFF) file and the Standard Definition Library (DEF) file.	Teach and Solder Paste Inspection
Security: Secure Assignments	Allows group members to change the Secure Area assignments.	Teach and Solder Paste Inspection
Status Bar: Units Change	Allows group members to change the units using the right-click menu in the status bar.	Solder Paste Inspection
Tools: Options	Allows access to the Options window from the Tools menu. The Options window includes Data handling, Debug, System (events and responses), and Unit of Measure options.	Solder Paste Inspection
Tools: Scan Image	Allows group members to scan the entire panel to create a bitmap image.	Solder Paste Inspection
View: Display Options	Allows group members to customize the level of detail shown in a Panel view, Image view, or Fiducial view.	Teach and Solder Paste Inspection
Valid Reference Scan Choice	Allows group members to choose whether to perform a reference scan when a valid reference scan exists. This option enables both the Yes and the No buttons in the Reference Scan dialog box.	Solder Paste Inspection
Invalid Reference Scan Choice	Allows group members to choose whether to perform a reference scan when the reference scan is invalid. This option enables both the Yes and the No buttons in the Reference Scan dialog box.	Solder Paste Inspection

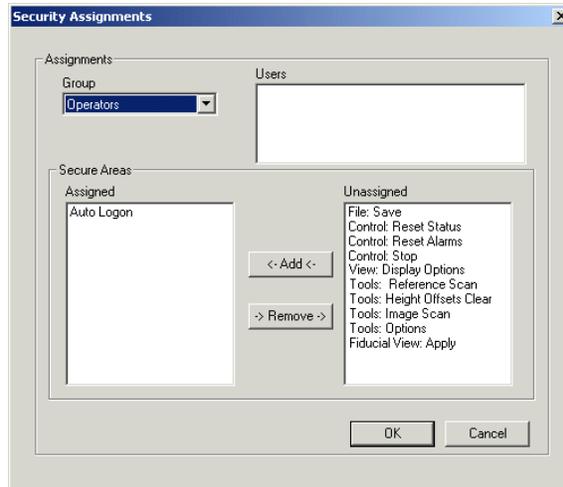
➤ To assign access to groups

Notes:



- You must be included in the group that has the Security Setup Secure Area assigned to it in order to make changes to Security Assignments.
- You assign Secure Areas from within the both Solder Paste Inspection and Teach applications.
- All Secure Areas must be assigned to a group.

1. From the Security menu, select **Secure Assignments**.



2. In the Secure Assignments window, select a Group from the list. You should have the following four groups from which to choose: Supervisors, Engineers, Lead Operators, and Operators.
3. To add access to a Secure Area, select the name from the Unassigned list and click **Add**.
4. To change access to a Secure Area, select the name from the Assigned list and click **Remove**. Then add the Secure Area to a different group as described in steps 2 and 3 above.
5. Click on **OK** to save your changes or **Cancel** to close the window without making changes.

When you click OK, your changes are saved to a file named SE300.sec located in the default security directory. The settings in the security file are loaded each time the application starts.

Verifying System Accuracy

Use the SE 300 Ultra certification tool to certify the accuracy of height measurements made by the SE 300 Ultra system. For example, you may periodically verify the accuracy of the system to comply with regulations and requirements at your manufacturing facility. Please note that area and volume measurements are not certified.

CyberOptics specifies the following accuracy for the SE 300 Ultra:

Height Accuracy	High-Speed	High-Resolution
Typical components ¹	10 microns (0.39 mils)	5 microns (0.19 mils)
CSPs ²	15 microns (0.59 mils)	8 microns (0.31 mils)

1) Traditional component types including QFPs and BGAs (>= 20 mil diameter pads).

2) CSP components with pads from 8 to 18 mils in diameter.

Certification Tool Kit Contents

- SE 300 Certification Tool
- CyberOptics Certificate of Traceability
- 3.5-inch disk with SRFF file

SE 300 Certification Tool

The SE 300 certification tool is shipped in a hardwood box that should be used for permanent storage. Each tool is engraved or marked with a serial number.

Hold the certification tool by the edges as you use it, and keep it free of oils, dirt, grease and dust.



Note: If you need to clean the certification tool, use alcohol and a soft, nonabrasive cloth. Make sure the surface is free of any lint or dust particles. *Do not clean the fiducials.*

CyberOptics Certificate of Traceability

CyberOptics provides a certificate of traceability with each certification tool. The certificate includes the serial number and the certified measurements for the certification tool.

CyberOptics can recertify the certification tool and issue a new certificate of traceability as needed for your equipment requirements. To re-certify your certification tool, contact CyberOptics Service and Support.

➤ **To verify accuracy of your SE 300 Ultra system**

1. Install the disk in the floppy disk drive in the SE 300 Ultra system.
2. Copy the file **cert_<serial #>** to the system hard drive (for example, drive D). This file performs both high resolution and high speed inspections.
3. Open the Solder Paste Inspection application.
4. Open the cert file.
5. Click  to run the inspection. Place the certification tool on the conveyor as you would a board.
6. Click  to open the Failure Report and monitor the feature level results.

If the inspection results appear in green in the Panel View and there are no failures in the Failure Report, the SE 300 Ultra system is accurate within specification.

If any of the inspection results appear in red in the Panel View and there are failures in the Failure Report, the SE 300 Ultra system is not measuring accurately. Call CyberOptics Service and Support.



Note: If you want to perform repeatability testing, please contact CyberOptics Service and Support. We can provide you with the methodology we used to meet our specifications.

Shutting Down the System

➤ **To shut down the system**

1. Use the Start menu to shut down the Windows computer.



Caution: Turning off power without first shutting down Windows may cause a loss of data.

2. Push the red button on the front of the unit. This removes power between the AC main circuit breaker and the system hardware.
3. Open the front door of the safety enclosure and set the AC main circuit breaker to OFF to shut down power to the entire system (including the internal computer).

Moving the SE 300 Ultra System



Caution: The SE 300 Ultra unit weighs approximately 860 kg (1900 lbs.). To avoid injury, always use a forklift or a pallet jack to move the unit. The tines need to securely hold both cross beams under the unit. Otherwise the tines may damage the electronics drawer.

Disconnecting the System

Use the following procedure as a checklist to make sure that all of the external connections to the SE 300 Ultra system are disconnected before you move the system.

➤ **To disconnect the system**

1. Shut down the SE 300 Ultra as described on page 60.
2. Disconnect the AC wiring from the junction box.
3. Release air pressure on the air line.
4. Disconnect any additional external connections to the computer, such as printers.
5. Disconnect external connections to the interface panel, such as the network, SMEMA, or I/O cables if used.
6. Disconnect the air line from the air regulator.
7. Make sure the safety enclosure is closed so that the door does not swing open when you move the system.

Bypassing the SE 300 Ultra System

The SE 300 Ultra Conveyor Bypass kit allows you to run the system conveyors continuously in the event of an RT or Windows computer failure or other system failure. These procedures describe how to pass the SMEMA signal through the machine and set up the conveyors to run continuously.

Kit Contents

- SMEMA bypass cable
- 2 conveyor bypass connectors (one left-to-right and one right-to-left)

➤ To pass SMEMA signal through the SE 300 Ultra

1. Shut down Windows, then push the red button on the front of the unit.
2. Open the front door of the safety enclosure and pull the electronics drawer open.
3. Turn the AC main circuit breaker to OFF to shut down power to the entire system.
4. Unplug both SMEMA cables from the interface panel.

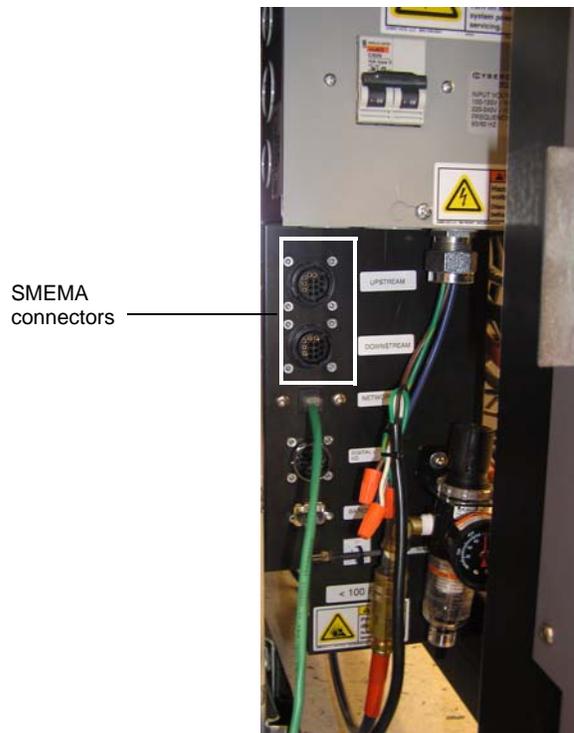


Figure 49. SMEMA connectors

5. Plug the two SMEMA cables into the SMEMA bypass cable.

➤ **To set up conveyors to run continuously**

1. Open the electronics drawer.
2. On the distribution board, locate connector C1 in the upper right-hand corner.
3. Disconnect the conveyor control cable (P/N 8001978) that is plugged into connector C1.

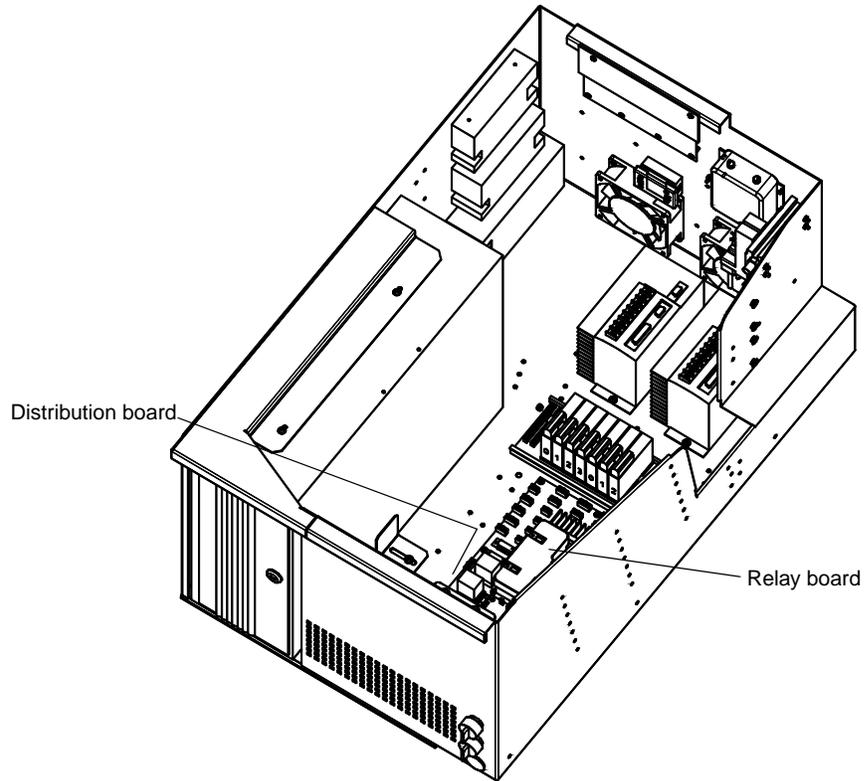


Figure 50. Electronics Drawer

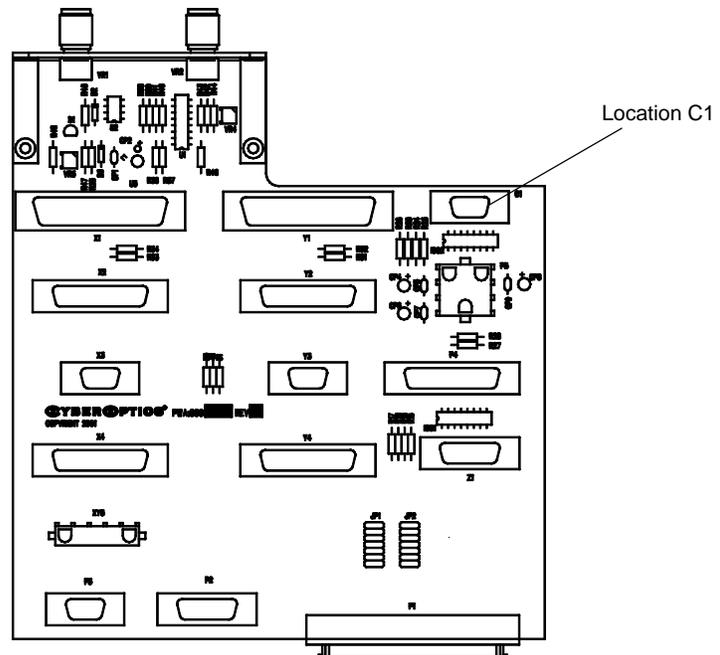


Figure 51. Distribution Board - C1 Location

4 Running an Inspection

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Setting Up an Inspection



Prior to starting an inspection, you may need to adjust the panel lifter or conveyor, or change Solder Paste Inspection application settings. Many of these functions are performed using the full Solder Paste Inspection application. In the Solder Paste Inspection Control window, click on the Solder Paste Inspection button to open the full application.

- Adjust the panel lifter if necessary (see “*Adjusting the Panel Lifter*” on page 41).
- Adjust the conveyor width if necessary (see “*Manually Adjusting the Conveyor*” on page 43). If your conveyor is equipped with the automatic conveyor adjustment, you do not need to adjust the conveyor manually.
- Set up the SE 300 Ultra to save inspection results. You can view inspection results on the SE 300 Ultra or remotely using CyberOptics Process Insight or other third-party SPC tools. Inspection data can be saved as XML, HTML, text, or comma-delimited (CSV) text files to support remote monitoring and analysis.
- Set up responses to system events, such as clearing alarms when a panel is loaded.
- Change the units for measurement data.



Note: Software settings are typically changed by a technician or engineer and may be password-protected. See the online Help for instructions to complete them.

Changing the Interface Language

Solder Paste Inspection Control can be run in Simplified Chinese, Traditional Chinese, Korean, or Japanese languages. To change the language of the user interface:

1. Press Ctrl-Shift-L.
2. Select one of the supported languages from the list.

The selected language will be used even if the application is restarted.

Keyboard Shortcuts

The following keyboard shortcuts are currently implemented for changing the user interface language:

- Ctrl-Shift-J: Japanese
- Ctrl-Shift-K: Korean
- Ctrl-Shift-T: Traditional Chinese
- Ctrl-Shift-S: Simplified Chinese
- Ctrl-Shift-E: English (US)

Opening an SRFF File

➤ To open a file from the main window

1. Click  in the Control window.
2. From the Open dialog box, navigate to and select the SRFF file for the panel to be inspected.
3. Click Open.

Note: SRFF file names end with the extension **srf**.

If your conveyor is equipped with automatic conveyor width adjustment, a prompt appears asking if you want to adjust the conveyor.

4. If you are using the auto-width conveyor, make sure that the conveyor locks are disengaged and then click **OK**.

➤ To open a file using the handheld barcode reader

1. Make sure that the SRFF folder is identified in the **Tools>Options>File Handling** tab.
2. Scan **Open SRFF File** or select **Scan** from the **File** menu.
3. Scan the barcode(s) for the panel and lot number. These barcodes are provided in the work order. In some cases, the panel description (SRFF file) may already be entered. Scan the Tab code to skip over an entry and/or move between fields in the barcode entry window.
4. Scan the **OK** code.

If your conveyor is equipped with automatic conveyor width adjustment, a prompt appears asking if you want to adjust the conveyor.

5. Click **OK** to proceed.

Starting an Inspection

➤ **To start an inspection**

- After opening an SRFF file in the Solder Paste Inspection Control window, click . When the SE 300 Ultra receives “Board Available” SMEMA signal from the upstream machine, it moves the panel into position, clamps it, and begins the inspection process.

Stopping an Inspection

➤ **To stop an inspection**

- Click  in the Control window to stop the SE 300 Ultra after the current panel is inspected and hold the panel. The system stops until you click  or .
- Click  in the Control window to pass panels through the SE 300 Ultra without inspecting them.

Using Defect Review

The Defect Review window opens automatically when the system detects a failure. Use this window to review defects, save an image of the Defect Review window, pass a panel, or fail a panel. The basic parts of the Defect Review window are identified below and described on the following pages. For more information, see the Solder Paste Inspection Control online help.

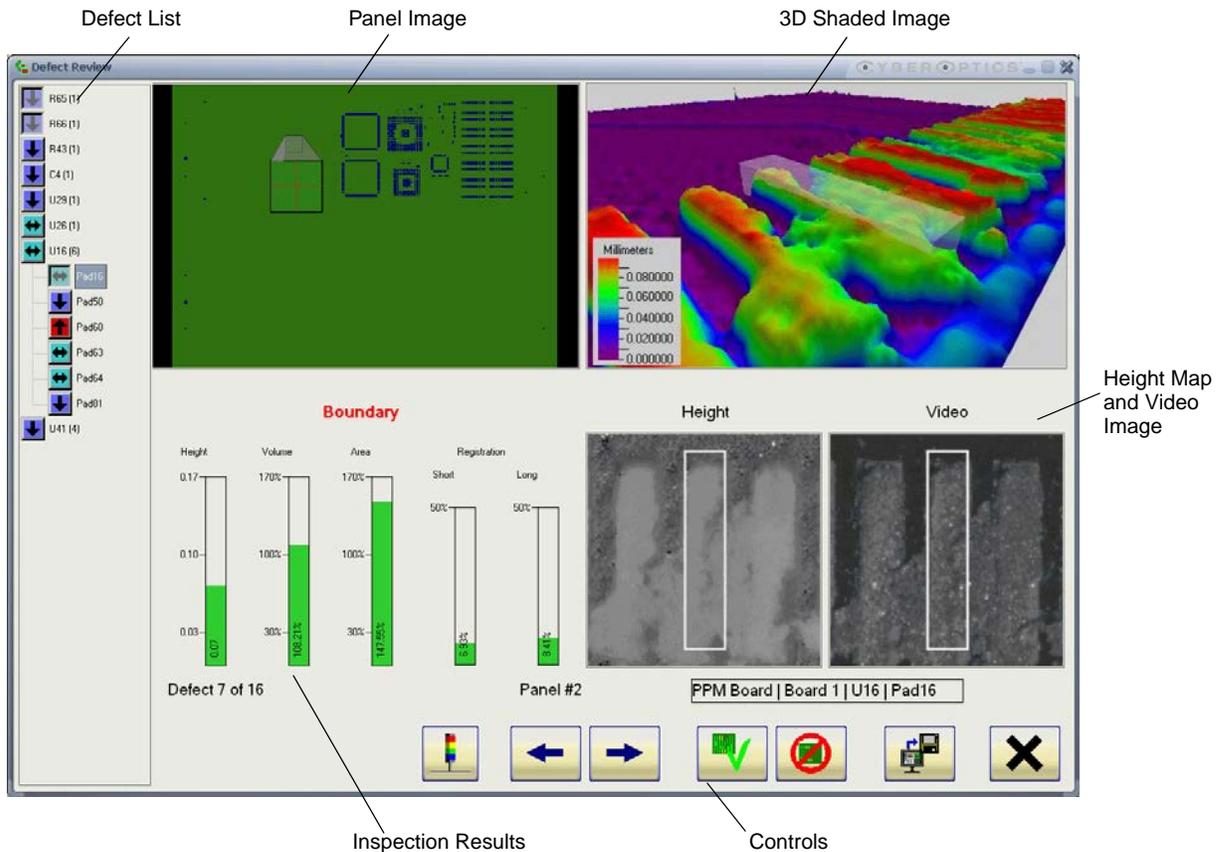


Figure 53. Control Window – Defect Review

Defect Review Window Controls

	Reset Alarms Clears any active alarms that are due to measurement failures. For example, if the red light is flashing because a panel failed, clicking this button turns off the red light. Resetting alarms does not clear any output signal responses.
	Previous Defect Displays the previous defect.
	Next Defect Displays the next defect.
	Pass Board Passes the board and returns to the Main Window.
	Fail Board Fails the board and returns to the Main Window.
	Save Defect Image Saves an image of the current window to the images directory within the SRFF file structure.
	Close Closes the Defect Review window and returns to the Main Window.

Defect Review Window Areas

Defect List

The Defect List shows failed locations on the panel. Clicking on a location expands the list to show individual feature failures.

Each defect is categorized as high, low, or registration. These defect categories are represented by the following icons:



High: Paste height, volume, and/or area are too high.



Low: Paste height, volume, and/or area are too low.



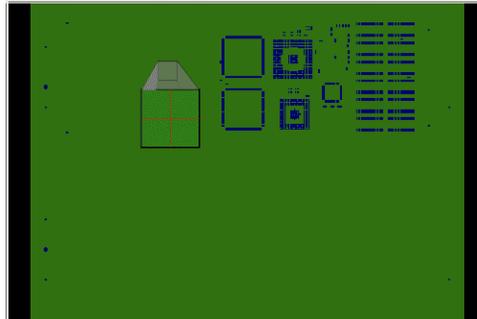
Registration: Registration, bridging, and/or boundary violation.

When there is more than one defect:

- If a location has more high categories than low, the high icon is displayed.
- If a location has more low categories than high, the low icon is displayed.
- If a location has no high or low categories, the registration icon is displayed.
- If a location has mix of categories with the same number of high or low results, a grey box is displayed.

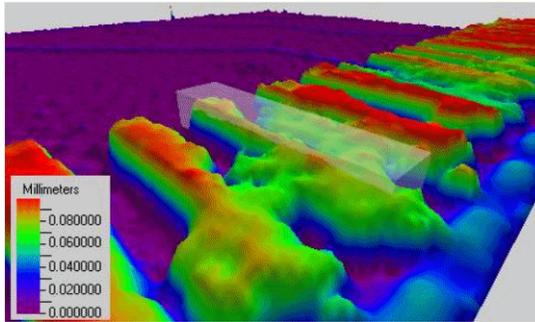
Panel View

Shows an image of the panel with the item selected in the defect list highlighted. The panel view updates at the end of each inspection.

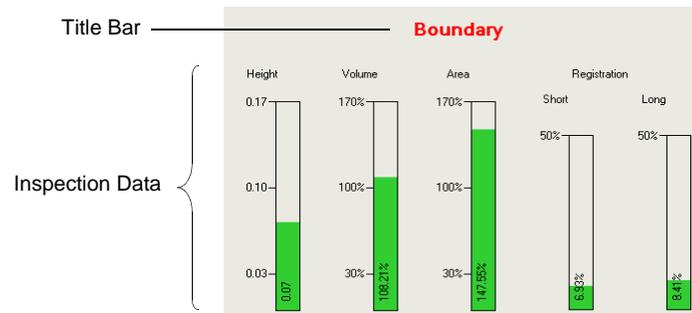


3-D Shaded Image

The 3D Shaded Image uses a shaded perspective image and color variations to show the paste shape. A color key in the lower left portion of the window correlates the colors in the image with paste height. The color key automatically scales to the paste heights found in the current field of view. A transparent cube covers the selected feature showing the optimum paste coverage.



Inspection Results



Title Bar

The title bar provides a summary of defect categories for the current pad:

- Height (low or high)
- Volume (low or high)
- Area (low or high)
- Boundary

A boundary violation occurs when the measured height of the solder paste extends beyond the border of the pad. For boundary defects, review the height map or video data to confirm the defect.

Inspection Data

Inspection results are shown in either data or graphical view. Within the display:

- Red indicates fail
- Yellow indicates warning
- Green indicates pass

Toggle between the views by clicking on the inspection data area.

Data View

The Data view shows data for the following:

- Height: measured height, target height, low fail, and high fail.
- Volume: measured volume, target volume, low fail, and high fail.
- Area: measured area, target area, low fail, and high fail.
- Bridging: measured bridging, target, and high fail.
- Registration: shows registration (short and long) as a percentage of the target registration limit. The terms short and long refer to the short and long sides of a pad.

Graphical View

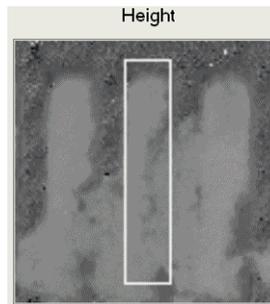
The Graphic view shows:

- Height: shows the measured height compared to the target height.
- Volume: shows the measured volume as a percentage of the target volume.
- Area: shows the measured area as a percentage of the target area.

- Registration: shows the measured registration (short and long) as a percentage of the target registration.

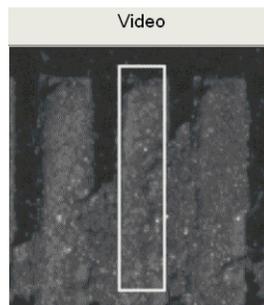
Height Map

The Height Map is a representation of height values across the entire panel. In the height map, light areas indicate relatively higher paste values and dark areas indicate relatively lower height values.



Video Image

The Video Image shows a grayscale image of the field of view on the current panel captured by the system sensor. The field of view includes the selected feature.



Using the Full User Interface

The full Solder Paste Inspection application provides tools such as the Reference Scan and charting and defect information that can be used to set up and monitor the system. However, if you need to use the full Solder Paste Inspection application:

- Click  to go to the full Solder Paste Inspection application.
 - To return to Solder Paste Inspection Control, *minimize* the Solder Paste Inspection application.
 - Select Solder Paste Inspection Control from the task bar.

Performing a Reference Scan



Note: This procedure is typically performed by a technician or an engineer using the full Solder Paste Inspection application.

To make sure the SE 300 Ultra takes the most repeatable and accurate measurements for every inspection run, it is highly recommended that you have the system perform a reference scan of a bare panel (no components or solder paste) before starting an inspection run.

During a reference scan, the system measures and stores the height of the surface of the bare panel. If the Collect Offsets option is set for the SRFF file (default setting), the system also measures the distance between the surface of the bare panel and the height of the copper and stores this as an offset value. Offsets are subtracted from the overall solder paste height for a more accurate measurement of actual paste height.

➤ To perform a reference scan

1. In the full user interface, open the SRFF file if not done already.
2. From the **Tools** menu select **Reference Scan**.
3. Feed an unpasted panel into the SE 300 Ultra conveyor. This must be an unpasted version of the panels you will be inspecting.
4. Click .

The system performs a reference scan of the bare panel, then puts the system in Stop mode. If the system cannot perform a reference scan, the Reference Scan Failure dialog box opens. Review the scan options (see page 76) and click **OK** to proceed.
5. Click .

The system enters pass-through mode and releases the panel from the conveyor.
6. Remove the panel from the conveyor.
7. When you are ready to start the inspection run with pasted panels, click .

Reference Scan Failures

Reference scan failures can occur when you first open the SRFF file or after you attempt to run a reference scan. For some reference scan failures, the system cannot perform the scan nor can you perform a reference scan from the Tools menu until the condition causing the failure is fixed.

In some cases, you may be able to continue with the inspection, either using reference scan data from a previous run or using no reference scan data. The dialog box that opens for a reference scan failure indicates the cause of the failure and whether reference scan data exists for the current SRFF file.

Causes

Reference scan failures that occur when you open an SRFF file can be the result of one of the following conditions.

- **The system cannot generate a valid reference scan schedule:** Click **OK** to close the dialog box. You can either run the inspection without reference scan data or use existing reference scan data (if found).
- **System is not ready to run a reference scan:** the system is in pass-through mode or is not yet initialized. Click **OK** to close the dialog box. When the system is initialized and ready, perform a reference scan by selecting **Reference Scan** from the **Tools** menu.

Failures that appear when you attempt to run a reference scan result in the following message.

- **The system was unable to complete a reference scan:** Click **OK** to close the dialog box. You can either run the inspection without reference scan data or use existing reference scan data (if found).

Using Existing Reference Scan Data

The system searches for existing reference scan data for the current SRFF file. If found, the data can be used; however, it is always best to run a new reference scan when possible.

- **Valid reference scan found:** Clicking **OK** closes this dialog box. You can proceed with the inspection using the existing reference scan data.
- **Valid reference scan not found:** Clicking **OK** closes this dialog box. You can either run the inspection without using reference scan data, or you can fix the cause of the failure and begin again.

Monitoring Inspection Results

You can monitor the inspection results on the SE 300 Ultra system using the following features in the full Solder Paste Inspection application:

- Panel view
- Failure report
- Trend charts
- Defect Review

Panel View

The Panel view shows which pads passed, failed or fell below the warning tolerances. The colors of the features change as a panel is inspected. Before an inspection, the features appear in dark red. After an inspection, the features appear:

- **Green** if they pass
- **Red** if they fail
- **Yellow** if they fall above or below the warning tolerances

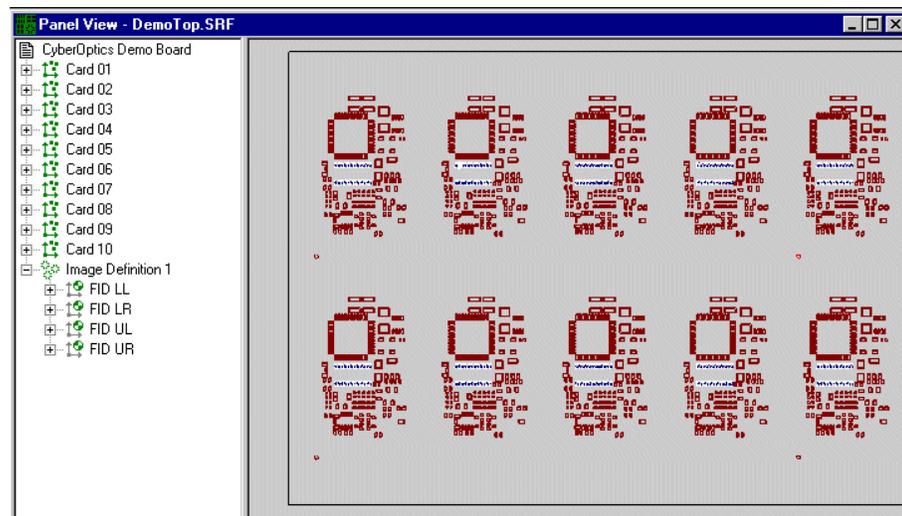


Figure 54. Panel View

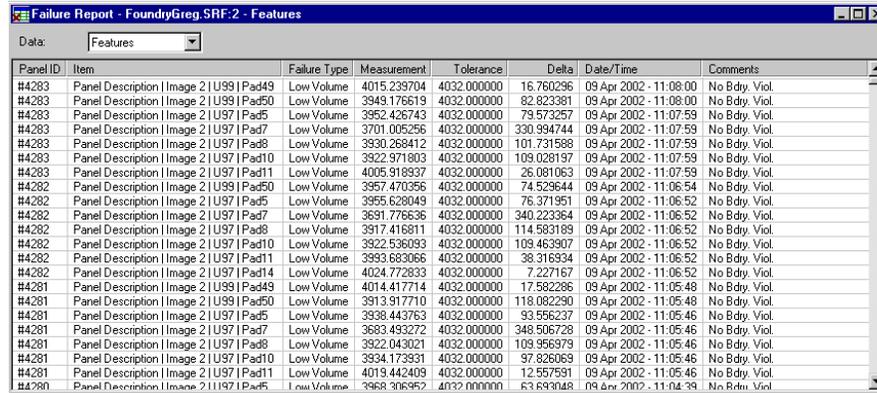
Failure Report

Use the Failure Report to check details about the failures that have been detected, either since the current inspection began or since the inspection was reset. Failure reports include up to 1000 lines, after which the oldest data is deleted, 100 lines at a time.

➤ **To monitor the inspection using a Failure report**

1. Click 

Select feature, location, or image from the Data list. The data columns in the report vary with the selected element.



Panel ID	Item	Failure Type	Measurement	Tolerance	Delta	Date/Time	Comments
#4283	Panel Description Image 2 U99 Pad49	Low Volume	4015.239704	4032.000000	16.760296	09 Apr 2002 - 11:08:00	No Bdy. Viol.
#4283	Panel Description Image 2 U99 Pad50	Low Volume	3949.176619	4032.000000	82.823381	09 Apr 2002 - 11:08:00	No Bdy. Viol.
#4283	Panel Description Image 2 U97 Pad5	Low Volume	3952.426743	4032.000000	79.573257	09 Apr 2002 - 11:07:59	No Bdy. Viol.
#4283	Panel Description Image 2 U97 Pad7	Low Volume	3701.005256	4032.000000	330.994744	09 Apr 2002 - 11:07:59	No Bdy. Viol.
#4283	Panel Description Image 2 U97 Pad8	Low Volume	3930.268412	4032.000000	101.731588	09 Apr 2002 - 11:07:59	No Bdy. Viol.
#4283	Panel Description Image 2 U97 Pad10	Low Volume	3922.971803	4032.000000	109.028197	09 Apr 2002 - 11:07:59	No Bdy. Viol.
#4283	Panel Description Image 2 U97 Pad11	Low Volume	4005.918937	4032.000000	26.081063	09 Apr 2002 - 11:07:59	No Bdy. Viol.
#4282	Panel Description Image 2 U99 Pad50	Low Volume	3957.470356	4032.000000	74.529644	09 Apr 2002 - 11:06:54	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad5	Low Volume	3955.628049	4032.000000	76.371951	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad7	Low Volume	3691.776636	4032.000000	340.223364	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad8	Low Volume	3917.416811	4032.000000	114.583189	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad10	Low Volume	3922.536093	4032.000000	109.463907	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad11	Low Volume	3993.683066	4032.000000	38.316934	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4282	Panel Description Image 2 U97 Pad14	Low Volume	4024.772833	4032.000000	7.227167	09 Apr 2002 - 11:06:52	No Bdy. Viol.
#4281	Panel Description Image 2 U99 Pad49	Low Volume	4014.417714	4032.000000	17.582286	09 Apr 2002 - 11:05:48	No Bdy. Viol.
#4281	Panel Description Image 2 U99 Pad50	Low Volume	3913.917710	4032.000000	118.082290	09 Apr 2002 - 11:05:48	No Bdy. Viol.
#4281	Panel Description Image 2 U97 Pad5	Low Volume	3938.443763	4032.000000	93.556237	09 Apr 2002 - 11:05:46	No Bdy. Viol.
#4281	Panel Description Image 2 U97 Pad7	Low Volume	3683.493272	4032.000000	349.506729	09 Apr 2002 - 11:05:46	No Bdy. Viol.
#4281	Panel Description Image 2 U97 Pad9	Low Volume	3922.043021	4032.000000	109.956979	09 Apr 2002 - 11:05:46	No Bdy. Viol.
#4281	Panel Description Image 2 U97 Pad10	Low Volume	3934.173931	4032.000000	97.826069	09 Apr 2002 - 11:05:46	No Bdy. Viol.
#4281	Panel Description Image 2 U97 Pad11	Low Volume	4019.442409	4032.000000	12.557591	09 Apr 2002 - 11:05:46	No Bdy. Viol.
#4280	Panel Description Image 2 U97 Pad5	Low Volume	3968.306952	4032.000000	63.693048	09 Apr 2002 - 11:04:39	No Bdy. Viol.

Figure 55. Failure Report

2. Right-click in the column header area to open a show/hide dialog box where you can choose which columns to show in the report.

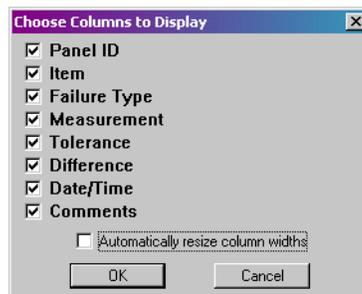


Figure 56. Show/Hide Dialog

Trend Charts

Use trend charts to monitor inspection results for consistency and to spot trends indicating that the measurements are drifting out of specification.

➤ To monitor the inspection using trend charts

1. From the Panel view, select the element to view.
2. Click on  in the toolbar.
3. Select the type of data to view in the trend chart from the Data list. The options that are available depend on the type of object selected. See “Data Options Table” on page 80.

The trend chart may include up to three reference lines:

- Upper failure limit—for a given measurement. If a measurement exceeds this limit, it is considered a failure.
- Nominal value—If the trend chart represents pad height, volume or area, this is the target value for a given measurement.
- Lower failure limit—If the trend chart represents pad height, volume or area, this is the lower tolerance for a given measurement. If a measurement is below this limit, it is considered a failure.

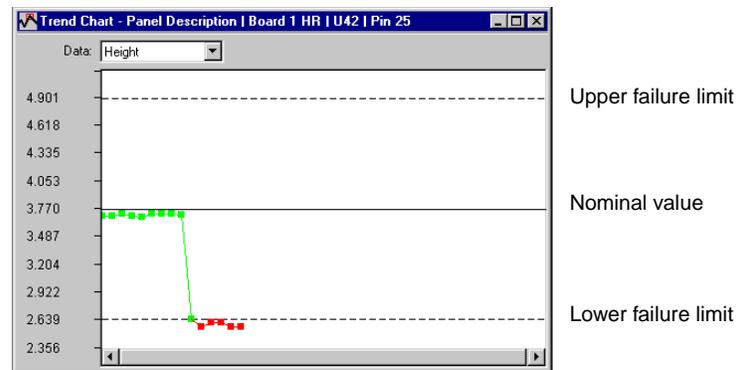


Figure 57. Trend Chart



Note: When the data does not have tolerances (for example, some registration data), then the upper and lower failure limits and the nominal value are not shown.

Data Options Table

Measurement Type	Object Type
Area	Features only
Area Range	Locations only
Average Area	Locations only
Average Height	Locations only
Average Volume	Locations only
Bridge Length	Features only for bridging measurements
Failed Features Bridging	Panels, images and locations for bridging
Failed Locations Bridging	Panels and images for bridging
Failed Images Bridging	Panels only for bridging
Failed Features H/A/V	Panels, images and locations
Failed Locations H/A/V	Panels and images
Failed Images H/A/V	Panels only
Failed Features Reg	Panels, images and locations for registration
Failed Locations Reg	Panels and images for registration
Failed Images Reg	Panels only for registration
Height	Features only
Height Range	Locations only
Offset Long Dim	Features only
Offset Short Dim	Features only
Offset X	Panels, images and features for registration
Offset Y	Panels, images and features for registration
Rotation	Panels, images and features for registration
Volume	Features only
Volume Range	Locations only

Defect Review

The Defect Review window contains a failure pane that lists inspection defects for the current panel and an image pane that shows where defects were found. The system clears the report each time a panel is loaded.

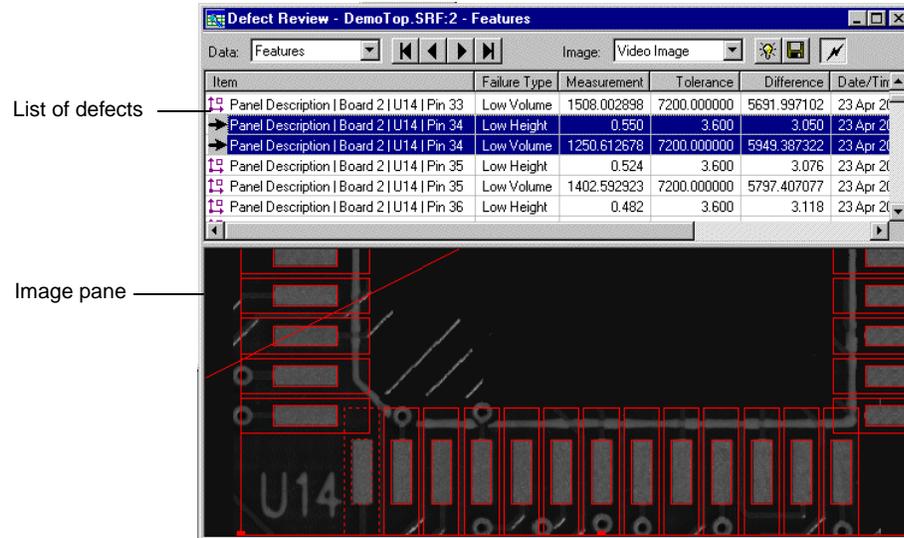


Figure 58. Defect Review Window

Measuring Registration

Registration measurements provide information about how closely the centroids of the solder paste deposits align with the centroids of the stencil aperture (as programmed in the SRFF file). The values reported by the SE 300 represent the amount of shift between the two, or the amount of *misregistration*. A reported value of 0.0 would indicate that the paste is perfectly aligned on the panel.

The SE 300 Ultra measures the registration of each feature (or pad) and then calculates registration of the overall component location, image, or panel. Failures are reported under the following circumstances:

- At the feature level for registration measurements that fall outside dimensions that are set up in the Teach application.
- At the feature level for boundary violations on two sides of a feature.
- At the location, image, and panel level when accumulations of failure counts exceed values set in the Teach application.

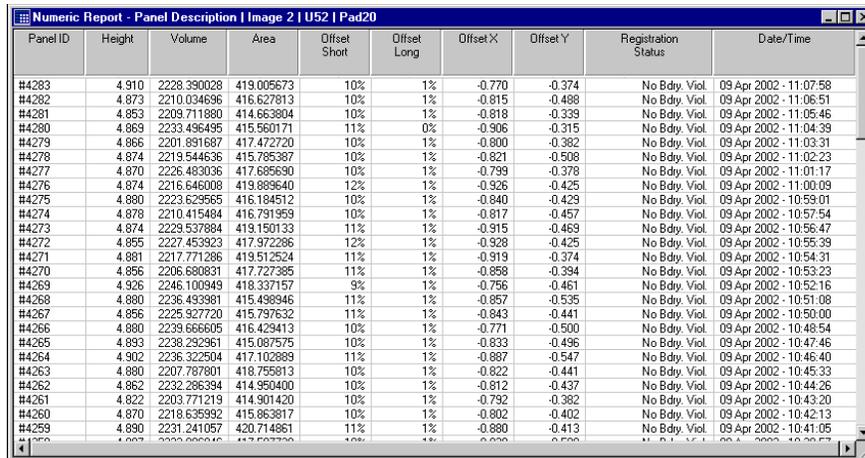
Location, image, and panel data are displayed for analysis only in the Solder Paste Inspection application and do not cause failures, but can be used to diagnose registration problems. Registration data can also be logged to a data file.

Checking Paste Registration

Check the solder paste printer setup by viewing registration measurements on a representative panel. You can view registration measurements for individual features to focus on specific problem areas or view data that describes the overall registration at the panel level. To view registration measurements, you must set up registration tolerances in the SRFF file using the Teach application.

➤ To review registration measurements

1. Click on  to stop the system after the inspection is complete.
2. Click on  to open the Numeric Report.
3. Drag the Panel element into the Numeric Report. (To view feature-level measurements, drag the Feature element into the report.)



Panel ID	Height	Volume	Area	Offset Short	Offset Long	Offset X	Offset Y	Registration Status	Date/Time
#4283	4.910	2228.390028	419.005673	10%	1%	-0.770	-0.374	No Bdy. Viol.	09 Apr 2002 - 11:07:58
#4282	4.873	2210.034696	416.627813	10%	1%	-0.815	-0.488	No Bdy. Viol.	09 Apr 2002 - 11:06:51
#4281	4.853	2209.711890	414.663804	10%	1%	-0.818	-0.339	No Bdy. Viol.	09 Apr 2002 - 11:05:46
#4280	4.869	2233.456495	415.560171	11%	0%	-0.906	-0.315	No Bdy. Viol.	09 Apr 2002 - 11:04:39
#4279	4.866	2201.891687	417.472720	10%	1%	-0.800	-0.382	No Bdy. Viol.	09 Apr 2002 - 11:03:31
#4278	4.874	2219.544636	415.785387	10%	1%	-0.821	-0.508	No Bdy. Viol.	09 Apr 2002 - 11:02:23
#4277	4.870	2226.483036	417.685690	10%	1%	-0.799	-0.378	No Bdy. Viol.	09 Apr 2002 - 11:01:17
#4276	4.874	2216.646008	419.889640	12%	1%	-0.926	-0.425	No Bdy. Viol.	09 Apr 2002 - 11:00:09
#4275	4.880	2223.629665	416.184512	10%	1%	-0.840	-0.429	No Bdy. Viol.	09 Apr 2002 - 10:59:01
#4274	4.878	2210.415484	416.791959	10%	1%	-0.817	-0.457	No Bdy. Viol.	09 Apr 2002 - 10:57:54
#4273	4.874	2229.537884	419.150133	11%	1%	-0.915	-0.469	No Bdy. Viol.	09 Apr 2002 - 10:56:47
#4272	4.855	2227.453923	417.972286	12%	1%	-0.928	-0.425	No Bdy. Viol.	09 Apr 2002 - 10:55:39
#4271	4.881	2217.771286	419.512524	11%	1%	-0.919	-0.374	No Bdy. Viol.	09 Apr 2002 - 10:54:31
#4270	4.856	2206.680831	417.727385	11%	1%	-0.858	-0.394	No Bdy. Viol.	09 Apr 2002 - 10:53:23
#4269	4.926	2246.100949	418.337157	9%	1%	-0.756	-0.461	No Bdy. Viol.	09 Apr 2002 - 10:52:16
#4268	4.880	2236.493981	415.498946	11%	1%	-0.857	-0.535	No Bdy. Viol.	09 Apr 2002 - 10:51:08
#4267	4.856	2225.927720	415.797632	11%	1%	-0.843	-0.441	No Bdy. Viol.	09 Apr 2002 - 10:50:00
#4266	4.880	2239.666605	416.429413	10%	1%	-0.771	-0.500	No Bdy. Viol.	09 Apr 2002 - 10:48:54
#4265	4.893	2238.292961	415.087575	10%	1%	-0.833	-0.496	No Bdy. Viol.	09 Apr 2002 - 10:47:46
#4264	4.902	2236.322504	417.102889	11%	1%	-0.887	-0.547	No Bdy. Viol.	09 Apr 2002 - 10:46:40
#4263	4.880	2207.787801	418.755813	10%	1%	-0.822	-0.441	No Bdy. Viol.	09 Apr 2002 - 10:45:33
#4262	4.862	2232.286394	414.950400	10%	1%	-0.812	-0.437	No Bdy. Viol.	09 Apr 2002 - 10:44:26
#4261	4.922	2203.771219	414.901420	10%	1%	-0.792	-0.382	No Bdy. Viol.	09 Apr 2002 - 10:43:20
#4260	4.870	2218.635992	415.863817	10%	1%	-0.802	-0.402	No Bdy. Viol.	09 Apr 2002 - 10:42:13
#4259	4.890	2231.241057	420.714861	11%	1%	-0.880	-0.413	No Bdy. Viol.	09 Apr 2002 - 10:41:05

Figure 59. Data for Pad 20 on Location U52

4. Right-click in the column header area to open a show/hide dialog box where you can choose which columns to show in the report.

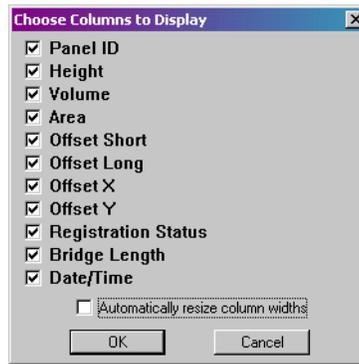


Figure 60. Show/Hide Dialog

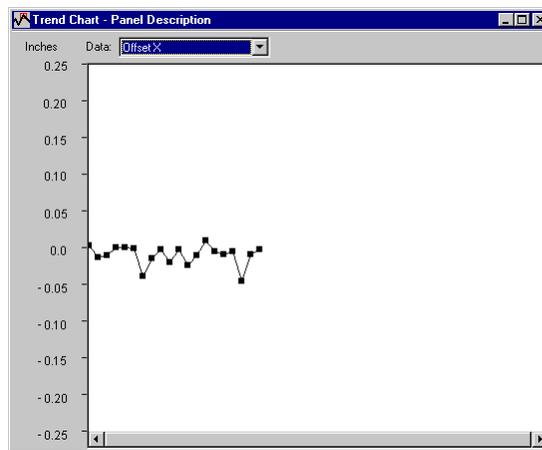
5. When the inspection finishes, analyze the registration measurements in the Numeric Report and adjust the printer as necessary. See *“Using Registration Data to Adjust the Printer”* on page 85 for more information.

Monitoring Paste Registration

Monitor trends in the printing process by viewing registration measurements in the Trend Chart. Measurements that do not have tolerances are drawn with a black line. If registration tolerances are set up in the Teach application, then the Trend Chart uses green and red to indicate whether the measurement is within specifications. Registration tolerances can only be set at the feature level for long and short offset values.

➤ To monitor results using a Trend Chart

1. Click on  to open a Trend Chart.
2. Drag the element to monitor, typically the panel element, into the Trend Chart window.
3. Select the registration data type of interest, such as **Offset X**, **Offset Y**, or **Rotation**.
4. Watch for data trending out of specification as the inspection runs.



Registration data at the panel level does not have tolerances, so the trend chart shown above does not include upper and lower limits. The points on the graph are registration measurements calculated for the overall panel based on the measurements of individual features.

5. Based on the trend chart results for Offset X or Y, or Rotation, adjust the printer as needed and re-run the inspection. See *“Using Registration Data to Adjust the Printer”* on page 85.

Using Registration Data to Adjust the Printer

Use the following data types from the Numeric Report (at the Panel element level) to adjust your screen printer or to determine if the artwork is registered correctly.

Rotation

Defined as the amount of skew across the feature, location, image, or panel. This value is calculated from feature-level measurements and is expressed in the angle units of the SRFF file such as degrees.

- Positive values indicate a counter-clockwise shift
- Negative values indicate a clockwise shift

If this value is significantly positive or negative, adjust the stencil rotation on the screen printer, then print another panel to verify the correction before adjusting the X and Y offset.

Offset X and Offset Y

Defined as the amount of shift in registration across the feature, location, image, or panel measured in the X (horizontal) or Y (vertical) directions. These values are calculated from feature-level measurements and are expressed in the units of the SRFF file.

- Positive X values indicate a shift to the right
- Negative X values indicate a shift to the left
- Positive Y values indicate an upward shift
- Negative Y values indicate a downward shift

If these values are significantly positive or negative, use the offset values to adjust the stencil X- and Y-coordinates on the screen printer.

Scaling (Stretch or Shrink)

Defined as the amount of stretch in registration across the location, image, or panel. This value is calculated from feature-level measurements and is expressed as a percentage of the horizontal dimension of the panel.

- Positive values indicate a stretched pattern
- Negative values indicate a contracted pattern

If this value is significantly positive or negative you should reject the lot of panels and return them to your vendor because the stencil will never match the panel.

Resetting an Inspection

Between inspection runs you can reset the current inspection values to restart the panel and failure count.



Note: This feature may be password protected (grayed-out) depending on how your system security is configured.

➤ To reset an inspection

- Click  on the control toolbar or select **Reset Status** from the Control menu.
This resets the current inspection values and clears the data displayed in all open data views.

Clearing Alarms



Note: This feature may be password protected (grayed-out) depending on how your system security is configured.

➤ To clear an alarm

- Click  on the control toolbar or select **Reset Alarms** from the Control menu.
This clears any alarms that were triggered due to measurement failures. For example, if the red light is flashing due to a panel failure, click this button to turn off the red light.
The reset alarms button does not reset output signal responses. This means, for example, that if the system is configured to flash a signal light and turn on a diverter conveyor when a failure is detected, clicking the reset alarms button only turns off the signal light. The diverter conveyor remains on until a separate event (such as panel loaded) resets the response.

Running the System in Pass-Through Mode

Use the Pass-through mode to pass panels through the SE 300 Ultra conveyor to the downstream equipment without inspecting them.



Note: This feature may be password protected (grayed-out) depending on how your system security is configured.

➤ To run system in pass-through

- Click  on the control toolbar or select **Pass-Through** from the Control menu.
The system stops the current inspection and goes into pass-through mode.

Adjusting Nominal Height Values



Note: This procedure has been included for operator background. It is typically performed by a technician or an engineer.

You can use Solder Paste Inspection data generated during an inspection to set the nominal values for your solder paste tolerances. For best results, generate data using three to five different panels with good paste application.

The Solder Paste Inspection data file is named the same as the SRFF file with additional extensions. For example, if the SRFF file is named *Panel1.srf*, the Solder Paste Inspection data file will be named *Panel1.srf.spi.csv*. Make sure that there is not a previous SRFF file with the same name, or the data from the good panels will append to that file.

After inspecting the good panels, import the data into the Teach application where the nominal values are re-calculated.

➤ **To import nominal solder paste values**

1. Open the SRFF file in Teach.
2. On the File menu, select **Import**, and then **Solder Paste Inspection Data**.
3. Navigate to and select the data file. It must have the same name as the current SRFF file with the extension *.spi.csv*.

Teach imports the data file and saves a report named *SPIDataLog.txt* in the SE 300 System Software folder. Teach also displays the results in the SPI data tab of the Output palette. The report may contain a combination of error information and data import information, depending on the result of the import.

5 Maintenance

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Periodic Hardware Maintenance

Perform the maintenance procedures in this section approximately every six months.



Caution: To prevent the risk of injury, shut down all electrical power to the SE 300 Ultra before starting any maintenance operations.



Note: CyberOptics Service and Support can provide Limited and Extended Warranties on SE 300 Ultra units. Contact CyberOptics Service and Support for more information.

Inspecting the Safety Enclosures

Follow these precautions whenever inspecting the top cover or front door.



Cautions:

- Do not lean on the top safety enclosure (hood) or place objects on top.
 - Do not force the hood or front door open.
 - Do not allow the hood to fall shut.
 - Do not disable the safety interlock switches.
-

➤ **To inspect the safety enclosure**

1. Inspect interlock switch function.
2. Verify that hood opens easily.
3. Check for stress or cracks at hinges.

➤ **To fully open the hood**

The hood is designed to open to an angle of 75° which should be adequate for most maintenance or service. It can be opened fully if necessary by removing the hood spring on each side:

1. Open the hood.
2. Locate the connection where the hood spring attaches inside the hood, toward the front of the machine (see Figure 61).
3. Use a screw driver to pry open one side of the metal clip that fits over the ball joint.
4. While supporting the hood, pry the ball joint open and release the hood spring from the socket.
5. Repeat on the other side of the hood.
6. Lift the hood open and gently rest it on the rear of the machine.

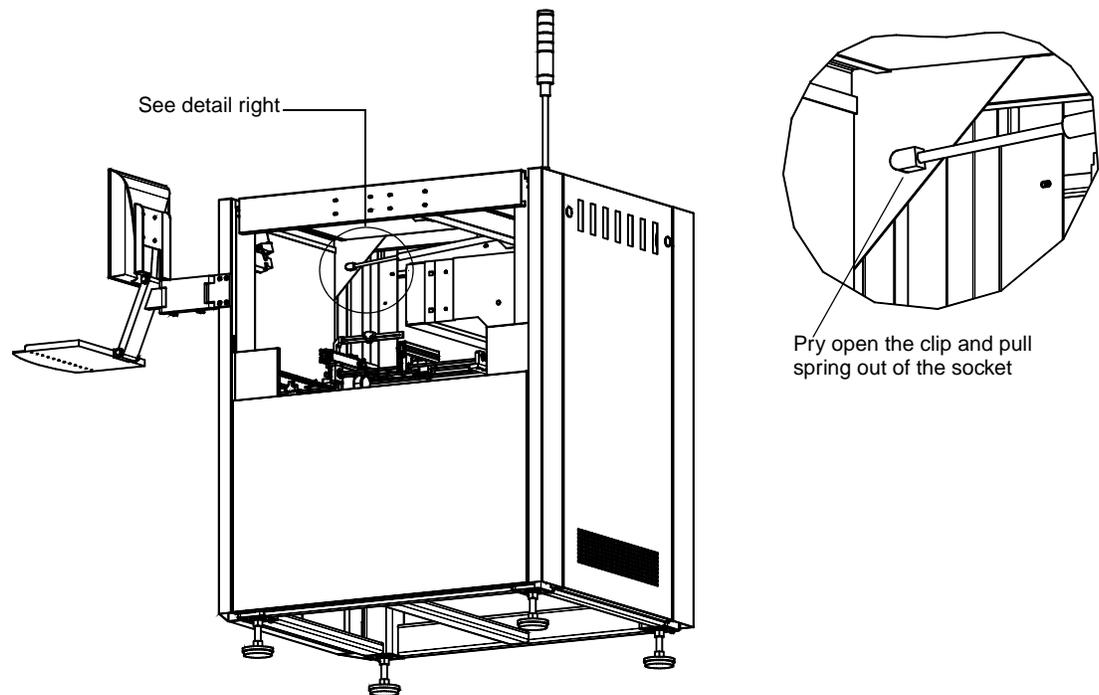


Figure 61. Hood Spring Attachment

Replacing Conveyor Wear Strips

Each conveyor section has two wear strips: one on the front section and one on the rear section. Check these strips for wear and replace as necessary.

➤ **To replace a conveyor wear strip on the left or right section of the conveyor**

1. Loosen the screws that secure the wear strip.
2. Pry the wear strip off of the conveyor rail.
3. Attach a new wear strip using the original screws.

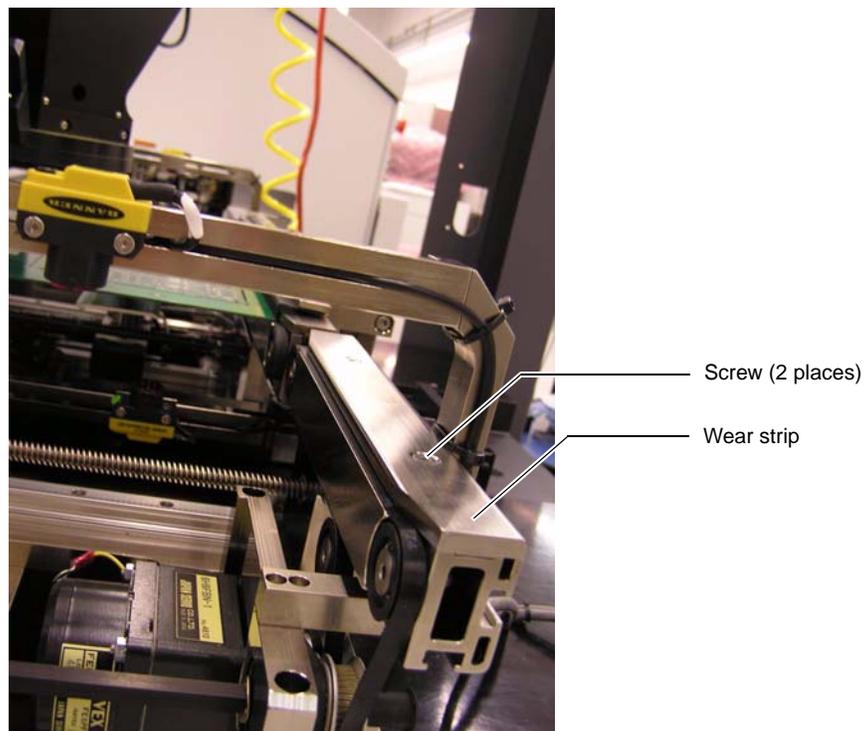


Figure 62. Conveyor Wear Strip – Front, End Section

➤ **To replace a conveyor wear strip on the center section of the conveyor**

1. To access the wear strip on the center conveyor section, remove the conveyor clamp spring fingers by removing nine nuts (see also page 118).

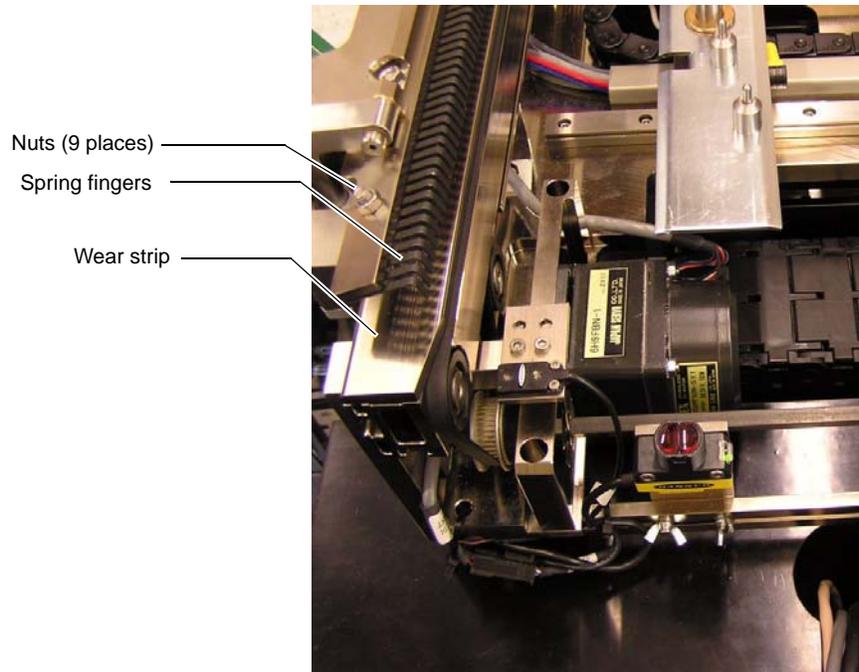


Figure 63. Center Conveyor Section

2. Insert a wrench into the hole vacated by the nuts removed above and loosen the five screws that secure the wear strip.
3. Pry the wear strip off of the conveyor rail.
4. Attach a new wear strip using the original screws.
5. Assemble and secure the spring fingers back into the conveyor clamp.

Lubricating the X-, Y- and Z-axes

Use a general-purpose, No. 2 lithium-based grease for lubrication.

➤ **To lubricate the X-axis bearing rails**

1. Open the top cover of the safety enclosure.
2. Locate the grease fittings on the X-axis stage motor plate (Figure 64).

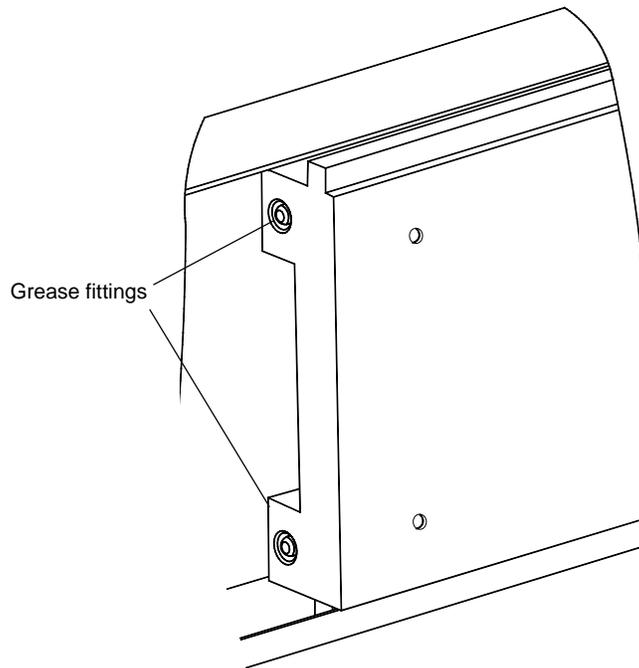


Figure 64. Grease Fittings

3. Pump grease into each fitting using a grease gun with a tapered nozzle fitting.
4. Stop pumping when the grease overflows on the opposite side.
5. Slide the X-axis stage back and forth manually.
6. Wipe off grease overflow.

➤ **To lubricate the Y-axis bearing rails**

1. Open the top cover of the safety enclosure.
2. Push the middle conveyor section to one end of the Y-axis.
3. Apply grease to the length of the Y-axis bearing rails (Figure 65).



Figure 65. *Y-axis bearing rails*

4. Push the middle conveyor section to the other end of the Y-axis. Apply grease to the remaining length of the bearing rails.
5. Slide the middle conveyor section back and forth manually.

➤ **To lubricate the Z-axis lead screw**

1. Open the top cover of the safety enclosure.



Caution: Make sure that the SE 300 Ultra system power is off before you remove and the sensor.

2. Disconnect the sensor cable on the back of the sensor.
3. Remove the bolt from the front of the sensor.
4. Remove the two bolts from the back of the sensor mounting plate.
Note: If the system has a damper installed, only one bolt holds the sensor on the back of the mounting plate.
5. Slide the sensor off of the two mounting pins.
6. Using a cotton swab stick, apply a small amount of grease to the lead screw through a hole in the center of the sensor mounting plate (Figure 66).

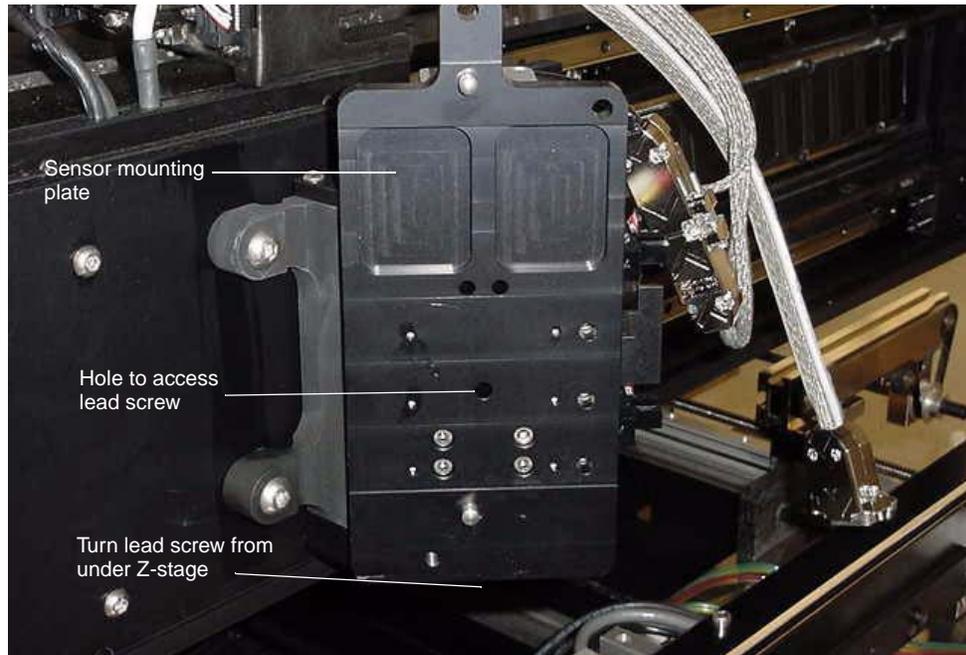


Figure 66. Z-axis Lead Screw

7. Move the Z-stage up and down manually:
 - If the damper is installed, turn the damper to move the stage.
 - If the damper is not installed, turn the lead screw from underneath the Z-stage using a flat-tip screw driver.
8. Slide the sensor onto the bottom pin of the mounting plate.
9. Pivot the sensor to line up with the top pin of the mounting plate.
10. Insert the bolt(s) through the back of the mounting plate to the back of the sensor. Tighten them to 8 nm (70 in. lbs.).
11. Insert the remaining bolt through the front of the sensor. Tighten it to 8 nm (70 in. lbs.).
12. Re-connect the sensor cable on the back of the sensor and tighten the two small screws.

Lubricating the Conveyor Lead Screws

➤ To lubricate conveyor lead screws

1. Open the top cover of the safety enclosure.
2. Locate the lead screw on the conveyor section (Figure 67).

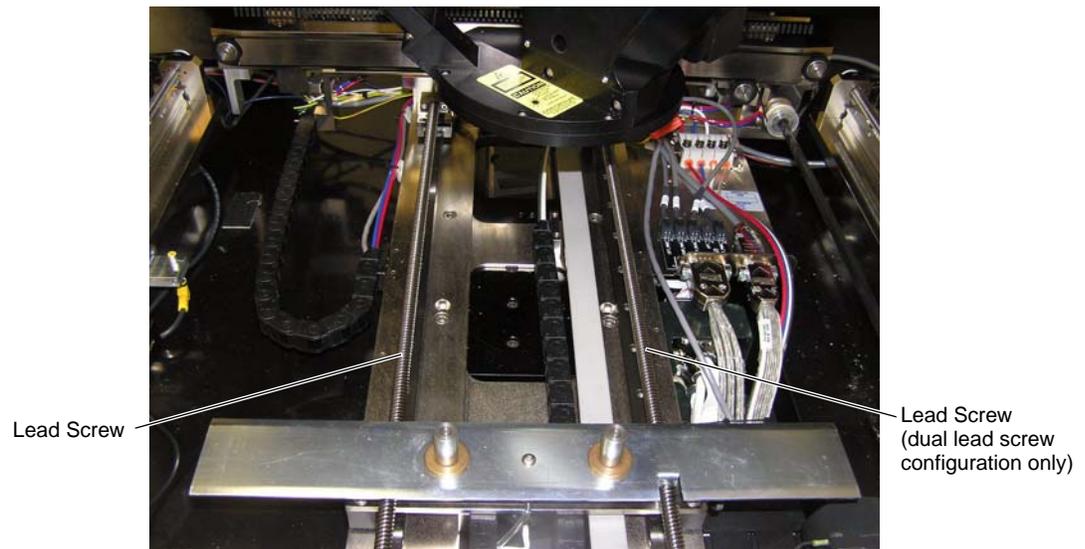


Figure 67. Center Conveyor Section Lead Screw

3. Adjust the width of the conveyor to the narrowest setting.
4. Use your fingers to apply a small amount of grease to the portion of the lead screw behind the back rail.
5. Adjust the width of the conveyor to the widest setting.
6. Apply a small amount of grease to the portion of the lead screw between the front and back rails.
7. Repeat this procedure for each conveyor section.

Cleaning Air Intakes

➤ **To clean air intakes**

1. Remove the back panel of the safety enclosure by turning the two large, black quick-connects and lifting the panel off.
2. Locate the air intakes on the back of the electronics drawer.



Figure 68. Air Intakes

3. Remove the layer of dust covering the air intakes and wipe off remaining dust with a damp cloth.
4. Replace the back panel of the safety enclosure.

Cleaning Air Regulator Filters

➤ **To clean air regulator filters**

1. Open the front door of the safety enclosure.
2. Locate the air regulator inside the SE 300 Ultra on the lower right side of the unit.

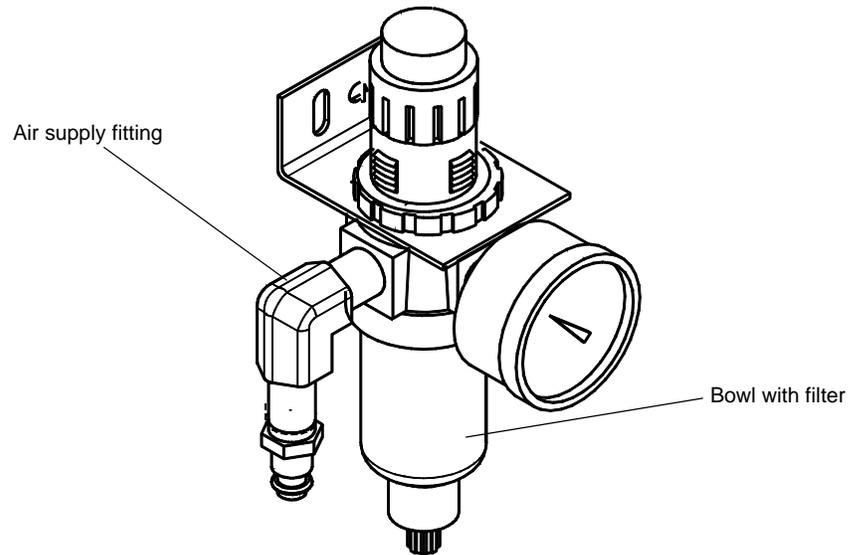


Figure 69. Air Regulator

3. Disconnect the air supply.
4. Unscrew bowl at the bottom of the regulator and take out the filter.
5. Rinse the filter in warm water and let it air dry.
6. Replace the filter and the bowl at the bottom of the regulator.

Cleaning Encoder Strips

Encoder strips are located on the X-axis (sensor motion) and the Y-axis (middle conveyor section motion).



Caution: The encoder strips can be damaged by abrasive substances and solvents. Follow the procedure below to avoid scratches or other damage to the encoder strips.

➤ **To clean the encoder strips**

1. Open the top cover of the safety enclosure.
2. Locate the encoder strips on the X- and Y-axes (Figure 70).

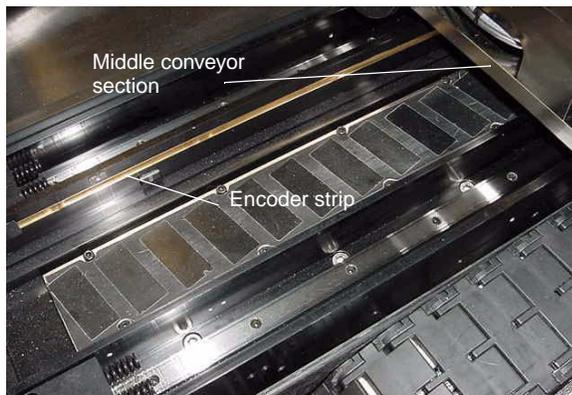


Figure 70. Y-axis Encoder Strip

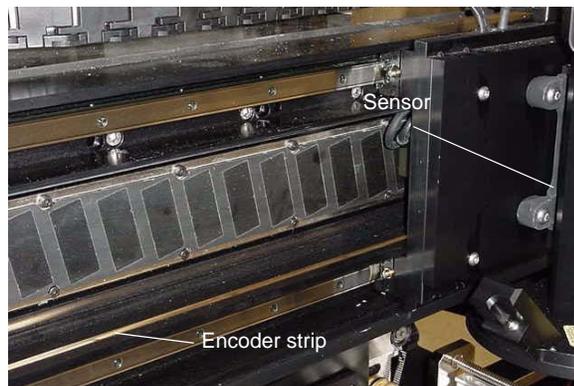


Figure 71. X-axis Encoder Strip

3. Remove any coarse or abrasive particles with clean, dry air.
4. Wet a clean cloth or swab sparingly with isopropyl alcohol.
5. Gently wipe the encoder strip with the cloth or swab.

Cleaning the Panel Sensor Lenses

To make sure the panel sensors function properly, clean the lenses on the panel sensor LEDs.

➤ **To clean the panel sensor lenses**

1. Open the top cover to the safety enclosure.
2. Locate the four panel sensors near the conveyor inside the top cover of the safety enclosure (Figure 72 and Figure 73).



Figure 72. Right And Left Conveyor Section Panel Sensor



Figure 73. Middle Conveyor Panel Sensor

3. Dampen a soft cloth with household glass cleaner.

Note: Do not use solvents or abrasives to clean the panel sensor lenses.

4. Gently wipe the panel sensor lenses.

Sensor Maintenance

The SE 300 Ultra sensor is maintenance-free. The life of the sensor is determined by the duration and amount of use.



Warning: Do not open the sensor case. Opening the sensor case may cause electrical shock and will void the CyberOptics warranty.

If you have problems with the sensor or you suspect that the sensor needs to be replaced, call your CyberOptics Service and Support representative.

Software Upgrades

The SE 300 Ultra software can be upgraded or re-installed from CD-ROM. Keep all software media in a safe and accessible place.

➤ **To install software**

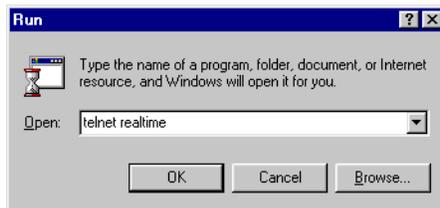
1. Place the installation CD in the CD-ROM drive.
2. Navigate to and double-click on the **Setup.exe** file located on the CD-ROM.
3. Follow the prompts on the screen to install the System Software.
4. After installing the software, press the Reset button on the computer to restart the RT computer.

Checking RT Computer Status

Use the Telnet application to check the status of the RT computer.

➤ **To start Telnet**

1. From the Start menu select Run.
2. In the Run dialog box, type **telnet realtime** and click **OK**.



3. At the login prompt, type **root** and press Enter.
4. To see if the RT computer is running, type **sin** and press Enter.

The list of processes should include several occurrences of Realtime. If not, the Realtime system is not running. Check networking connections or call CyberOptics for more information.

6

Replacing Components

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Electronics Drawer Components

This section contains procedures for replacing the components in the electronics drawer:

- Relay board
- Conveyor amplifiers
- EMO relays
- Distribution board
- Power supplies
- Fans
- Fuses



Warning: To prevent the risk of injury, turn the AC main circuit breaker to OFF to shut down all electrical power to the SE 300 Ultra before starting any replacement operations. See “Shutting Down the System” on page 60 for this procedure.

Replacing the Relay Board

The relay board is located on the bottom of the Electronics drawer.

Parts

8007112 Relay Board



Caution: The Relay board contains components that can be damaged by static electricity. Use a ground strap when handling the board to prevent damage to sensitive components.

➤ To replace the relay board

1. Disconnect the cables on the relay board.
2. Unscrew the 13 M4 × 10 screws.
3. Remove the faulty relay board and replace it with a new board.
Note: Inspect the components and jumpers on the new board to make sure that nothing was damaged in transport.
4. Secure the board with 13 M4 × 10 screws.
5. Reconnect the cables. Figure 74 shows the cable connections (by cable part number) on the relay board.

Replacing the Motor Controller Board (Conveyor Amplifiers)

Parts

8006131 Motor Controller (contains conveyor amplifier)



Caution: The Relay board contains components that can be damaged by static electricity. Use a ground strap when handling the board to prevent damage to sensitive components.

➤ To replace motor controller boards

1. Locate the motor controllers on the Relay board (see Figure 75).
2. Remove the four screws holding the motor controller board to the Relay board.
3. Gently pull the motor controller board from the Relay board connectors.
4. Insert the new motor controller board and press it firmly into the Relay board connectors.
5. Secure the four screws.

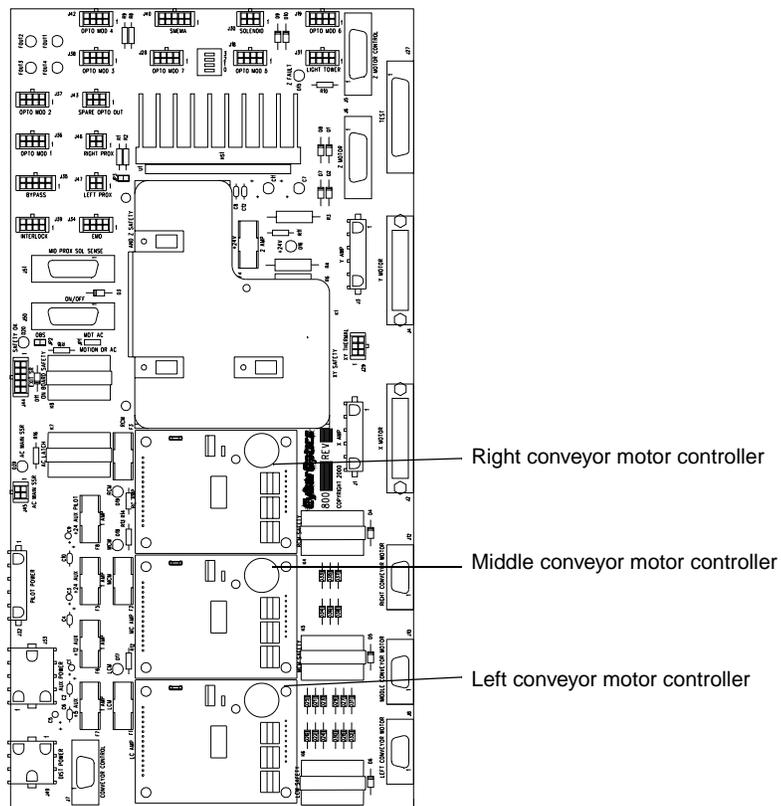


Figure 75. Motor Controllers on Relay Board

Replacing the Distribution Board

The Distribution board is located on the right side of the front panel in the Electronics drawer.

Parts

8004581 Distribution Board



Caution: The Distribution board contains components that can be damaged by static electricity. Use a ground strap when handling the board to prevent damage to sensitive components.

➤ To replace the distribution board

1. Disconnect the cables from the Distribution board.
2. Remove the Distribution board by unscrewing the nine M4 × 6 screws holding the board in place.
3. Secure the new board in place using nine M4 × 6 screws.
4. Reconnect the cables. Figure 77 shows the cable connections (by cable part number) on the Distribution board.

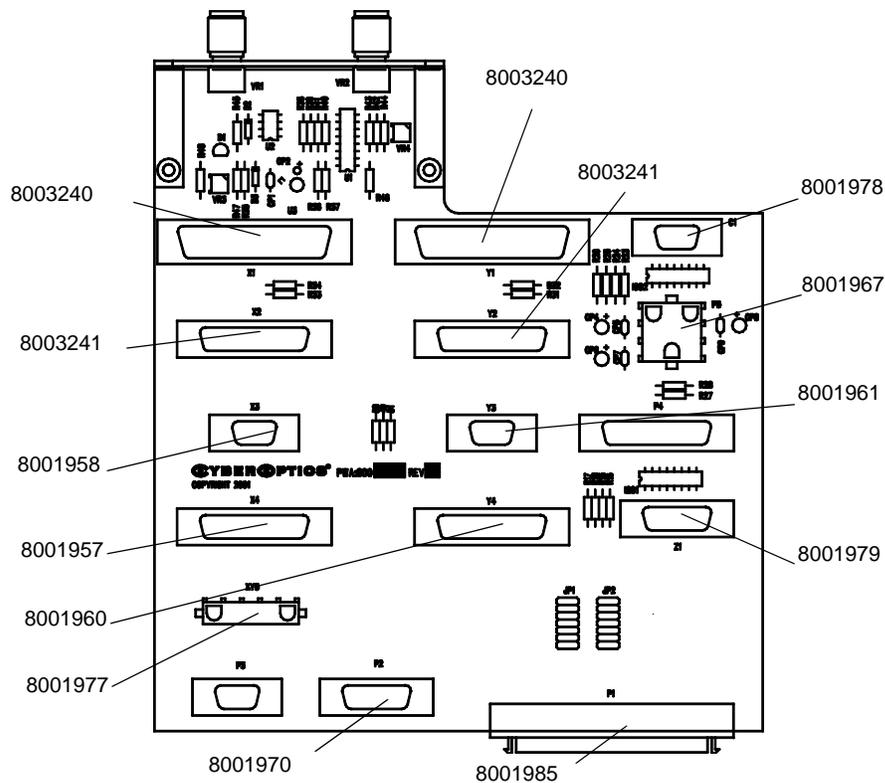


Figure 77. Distribution Board Cable Connections

Replacing the Auto-Width Distribution Board

When installed, the Auto-Width Distribution board is located next to the main Distribution Board inside the Electronics drawer.

Parts

8010536 Auto-Width Distribution Board



Caution: The Auto-Width Distribution board contains components that can be damaged by static electricity. Use a ground strap when handling the board to prevent damage to sensitive components.

➤ To replace the auto-width distribution board

1. Disconnect the cables from the Auto-Width Distribution board.
2. Remove the Distribution board by unscrewing the four M4 ×10 screws holding the board in place.
3. Secure the new board in place using nine M4 ×10 screws.
4. Reconnect the cables. Figure 78 shows the cable connections (by cable part number) on the Distribution board.

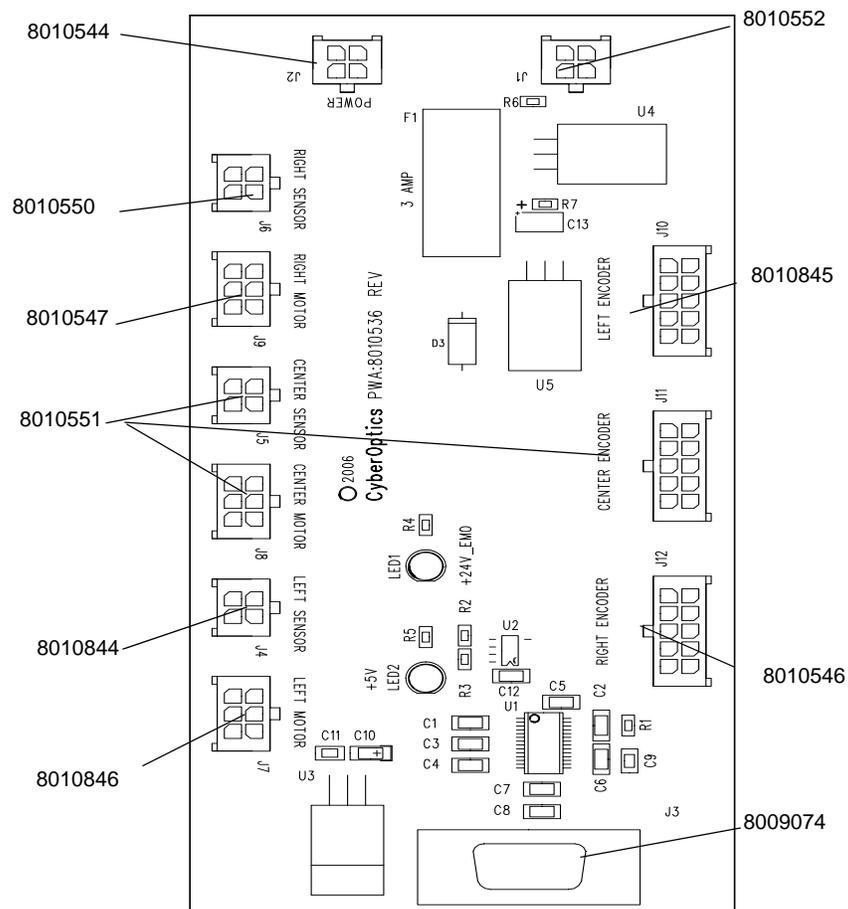


Figure 78. Auto-Width Distribution Board Cable Connections

Replacing a Power Supply

Parts

8001545 Power Supply	25W, located on top, provides power to the relay board.
8001544 Power Supply	60W, located in the middle, provides power to the sensor and the Pipeline Processor Module (PPM) card.
8001542 Power Supply	125W, located on the bottom, provides power to the monitor and auxiliary power for the relay board.



Caution: The Power Supplies contain components that can be damaged by static electricity. Use a ground strap when handling the board to prevent damage to sensitive components.

➤ To replace a power supply

1. Disconnect the dc power output cable from the power supply.

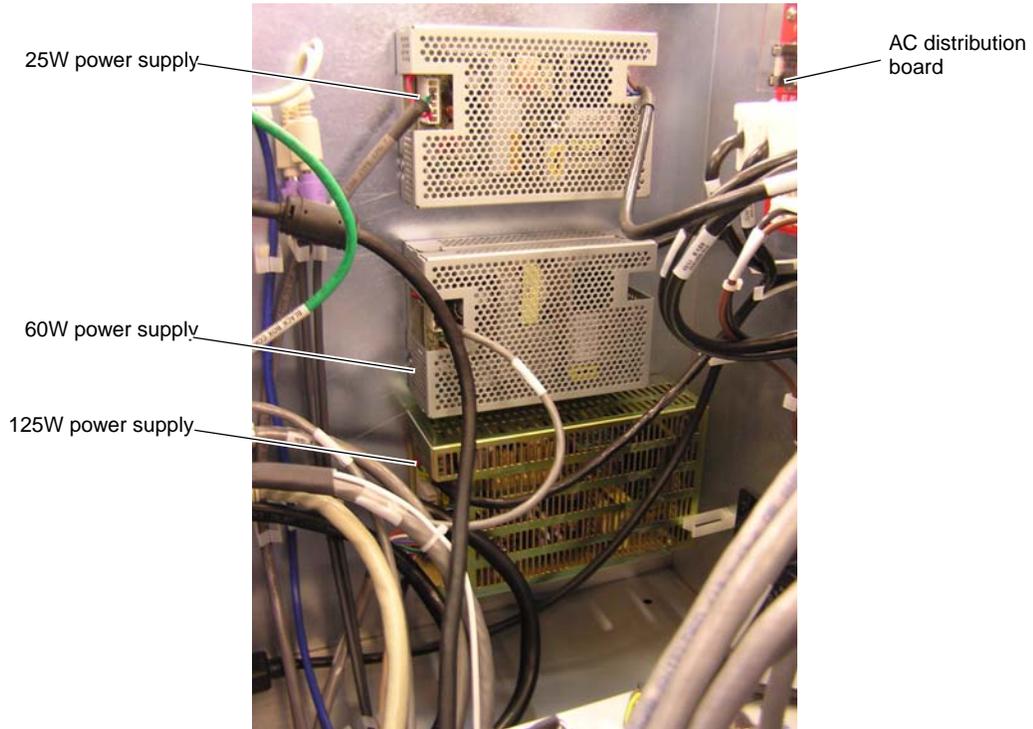


Figure 79. Power Supplies

2. Disconnect the ground lug next to the connector.
3. Disconnect the ac power cable from the AC Distribution board as needed:

Power Supply	AC Distribution Board Connector
25W (top)	J9
60W (middle)	J3
125W (bottom)	J4

4. Close the electronics drawer.
5. To access the left outer side of the electronics drawer, take off the left side panel of the safety enclosure (remove screw and lift panel off).
6. On the left side of the electronics drawer, loosen four screws on the power supply to replace (see Figure 80).

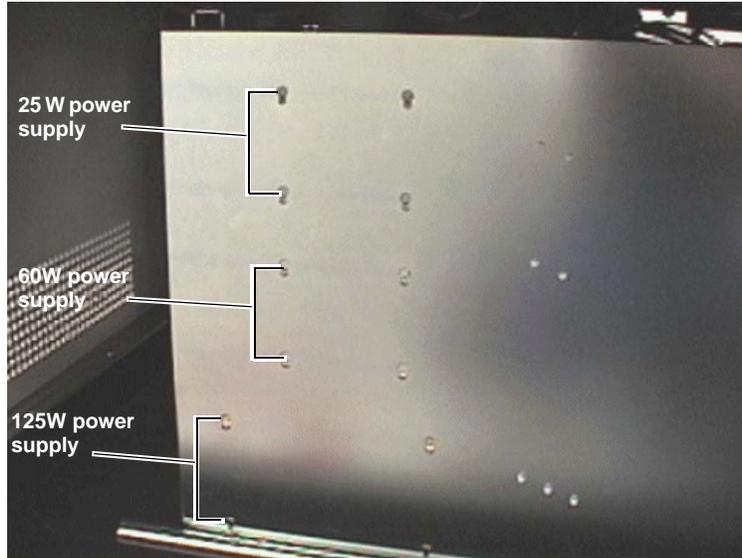


Figure 80. Power Supply Screws

7. Open the electronics drawer.
8. Lift up the power supply and slide it off of the screw-head slots.
9. Remove two screws on the side of the case and open the case cover.
10. Disconnect the input power cable from the power supply.
11. Remove the four screws that secure the power supply in the case.
12. Install the new power supply and secure in place with four screws.
13. Connect the ac input power cable to the power supply.
14. Connect the dc output cable to the supply.
15. Secure the power supply case cover with two screws.
16. Secure the ground lug next to the connector.
17. Attach the power supply to the chassis by sliding the two screw heads into the slots.
18. Shut the drawer and on the outer left side of the electronics drawer, tighten the four screws.
19. Reconnect the ac power cable to the appropriate connector on the AC Distribution board.

Power Supply	AC Distribution Board Connector
25W (top)	J9
60W (middle)	J3
125W (bottom)	J4

Replacing Fans

Parts

8001546 Fan

➤ To replace a fan

1. Locate the fans on the back wall of the electronics drawer.



Figure 81. Location Of Fans

2. Disconnect the power cable.
3. Slide an Allen wrench through the hole in the upper corner of the fan case to loosen the screws.
4. Remove the fan.
5. Disconnect the cable from the fan.
6. Connect the new fan to the cable.
 - Make sure that the label on the fan and the electrical connector are facing the inside of the electronics drawer.
 - Make sure that the wires are routed through the fan case.
7. Secure the fan in place with the screws.
8. Reconnect the power cable.

Replacing Fuses

Parts

3202051 6.3A, 250V Fuse (AC power distribution board)

3202038 2.0A 250V Fuse (Relay board)



Caution: Before replacing a fuse, make sure that the AC main power is turned off and locked off.

➤ To replace a fuse on AC power distribution board

1. Remove the plastic safety cover.



Figure 82. AC Distribution Board

2. Using a flat-tip screw driver or a fuse puller, gently pry out the fuse.
3. Install the new fuse.
4. Install the plastic safety cover.

➤ **To replace a fuse on relay board**

1. Locate the fuses on the Relay board.

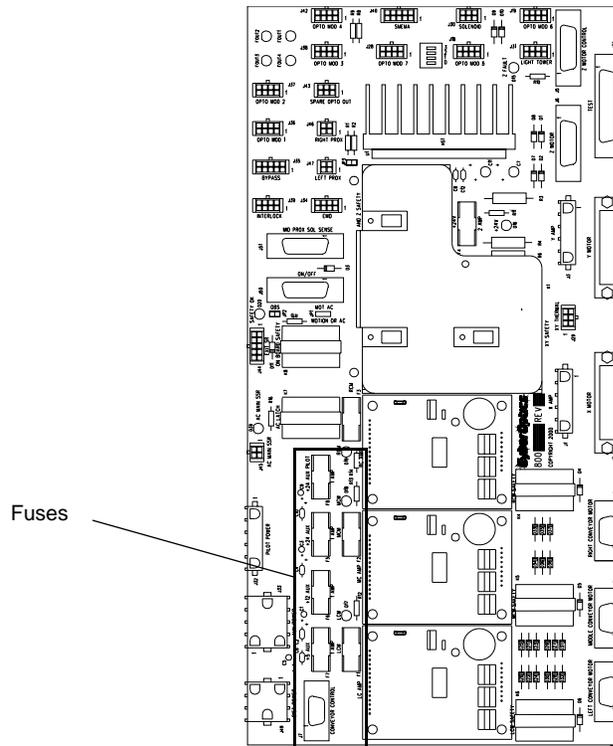


Figure 83. Fuse Locations

2. Using a flat-tip screw driver or a fuse puller, gently pry out the fuse.
3. Install the new fuse.

Computer Components



Caution: Turn the AC main circuit breaker to OFF to shut down all electrical power to the SE 300 Ultra before starting any replacement operations. See “*Shutting Down the System*” on page 60 for this procedure.

Replacing Cards

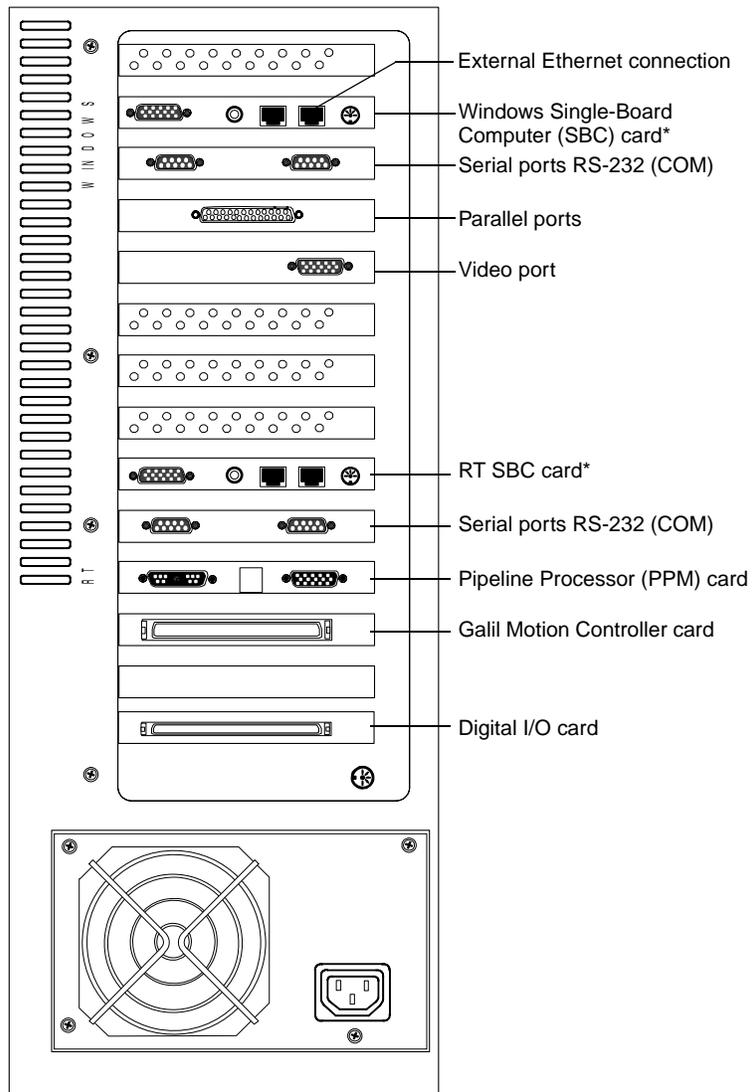
Use the following procedure to replace circuit cards in the computer. Refer to Figure 84 for circuit card locations.



Caution: The circuit cards contain components that can be damaged by static electricity. Use a ground strap when handling the cards to prevent damage to sensitive components.

➤ General card replacement procedures

1. Remove three screws on the upper left side of the electronics drawer and one screw from the front to release the computer from the drawer.
2. Gently slide the computer forward out of the electronics box, being careful not to strain the cable connections on the rear of the computer.
3. Remove computer cover by sliding the cover plate back toward the rear connectors.
4. Disconnect connectors to the card.
5. Remove the screw holding the card to the computer case.
6. Gently slide the card out of the computer case.
7. Slide the new card into the computer case, gently pushing it into place so that it is firmly seated in the backplane connector.
8. Secure the card in place with one screw.
9. Reconnect connectors to the card.
10. Slide the computer back into the electronics drawer and secure it with three screws on the side and one screw on the front.



* The Windows and Real-time Single-Board Computer (SBC) cards are the same type of card. See Figure 85 for the location of connectors on the computer circuit cards.

Figure 84. Card Locations in Computer

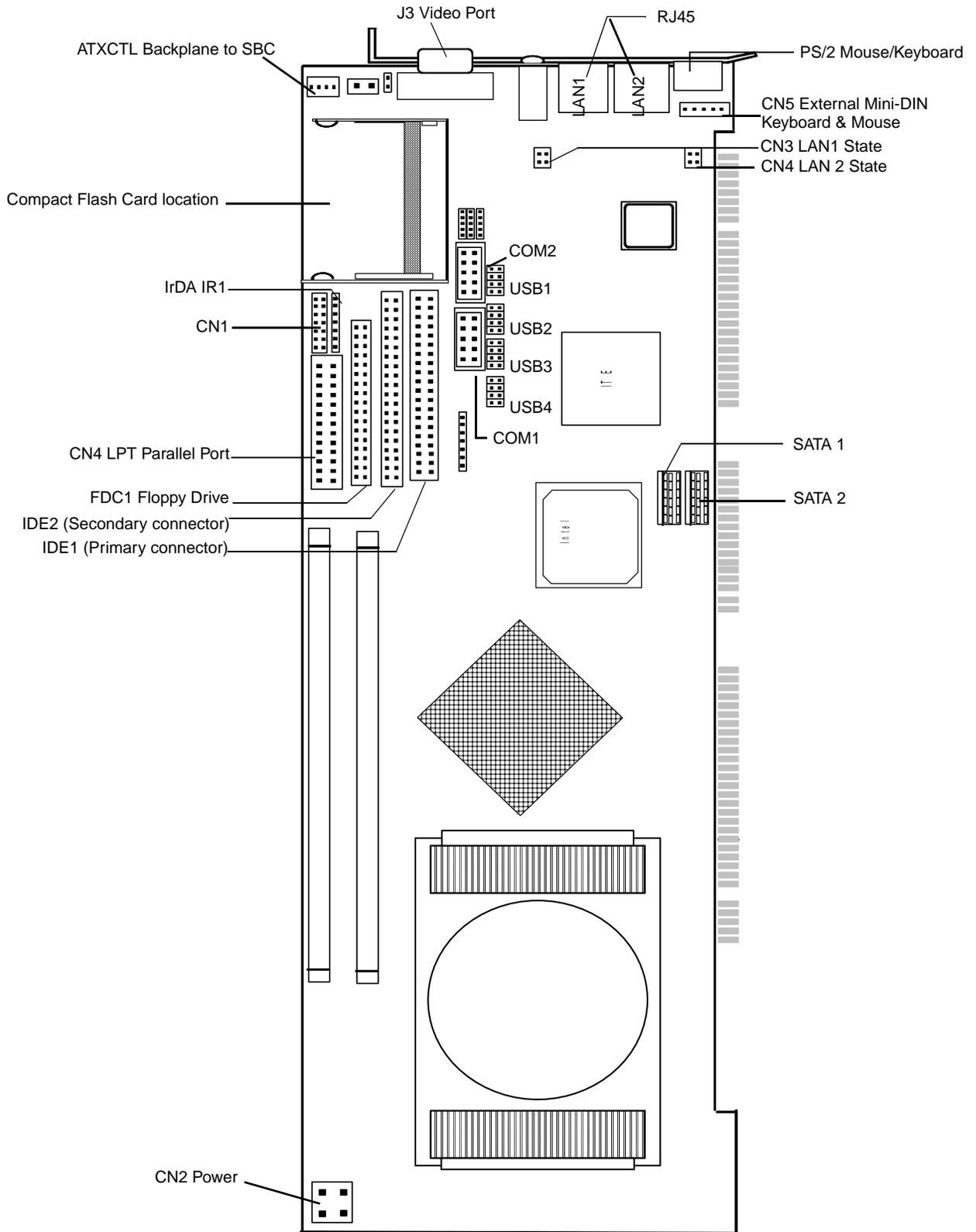


Figure 85. SBC Card Connections

Conveyor Components

This section contains procedures for replacing the components for the conveyor:

- Conveyor clamp spring fingers
- Conveyor clamp air fittings
- Conveyor clamp hall effect switch
- Conveyor clamp cylinder
- Conveyor motors
- Tension pulleys and conveyor belts
- Panel sensors
- Panel lifter inductive sensor
- Panel lifter cylinder



Caution: Turn the AC main circuit breaker to OFF to shut down all electrical power to the SE 300 unit before starting any replacement operations. See “*Shutting Down the System*” on page 60 for this procedure.

Replacing the Conveyor Clamp Spring Fingers

Use this procedure to replace the clamp spring fingers on the front or back conveyor rail.

Parts

8005240 Conveyor Spring Fingers

➤ To replace the conveyor spring fingers

1. Turn off all electrical power to the system.
2. Remove the nine M5 nuts on the top of the conveyor clamp.

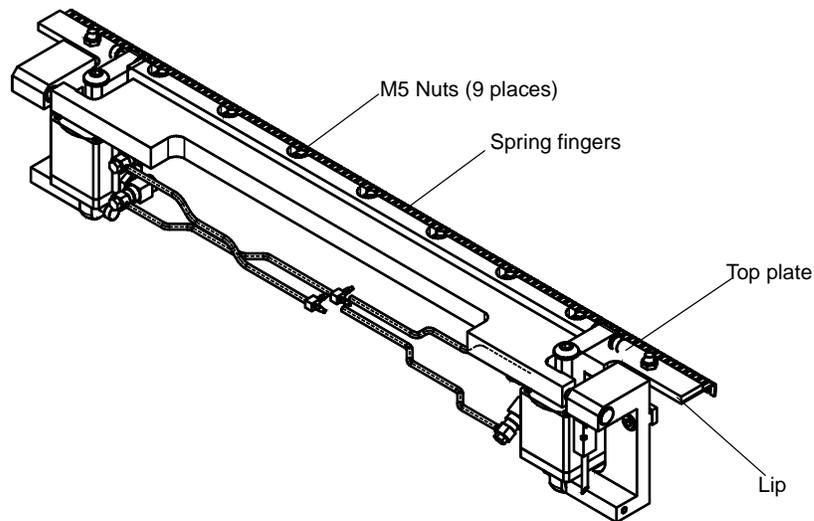


Figure 86. Conveyor Clamp Spring Fingers

3. Remove the spring fingers.
4. Slide in the new spring fingers, lining up the bolts with the holes on the top plate.
5. Push the spring fingers back so its edge abuts the lip on the underside of the clamp top plate.
6. Apply a thread-locking sealant to the spring finger bolts.
7. Re-attach the nine M5 nuts beginning with the ends and working toward the center.

Replacing the Conveyor Clamp Air Fittings

Use this procedure to replace the air fittings located on each of the four conveyor clamp cylinders.

Parts Required

- 8005740 Elbow
- 8005735 Exhaust
- 8005739 Reducer
- 8000517 Teflon Thread Tape (½ in.)

➤ To replace an air fitting assembly

1. Turn off air to the conveyor clamp by tightening the screws on the CLMP UP and CLMP DOWN flow controls located toward the back of the unit on the center conveyor section (Figure 87). If your system does not have flow controls on the unit, turn off the air pressure at the air regulator.

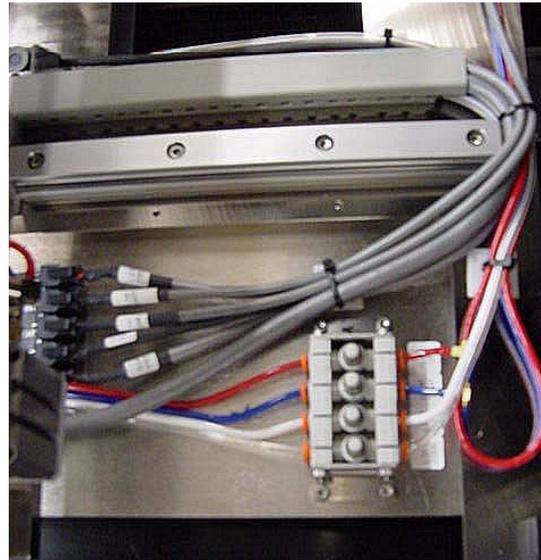


Figure 87. Air Flow Controls

2. Disconnect the air hose from the air fitting assembly.
3. Disconnect the air fitting assembly from the side of the conveyor clamp cylinder.

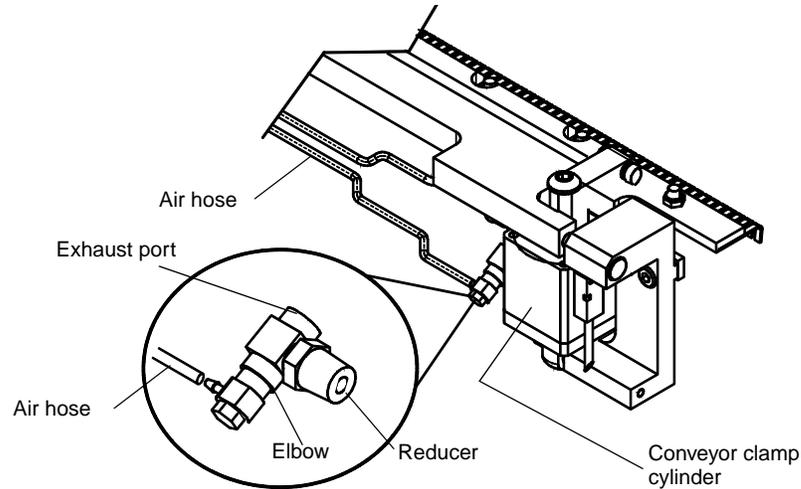


Figure 88. Conveyor Clamp Air Connections

4. Connect the fitting parts: elbow, exhaust port and reducer, creating an air fitting assembly as shown in Figure 88.
5. Wrap teflon tape twice around the brass end of the reducer leaving the first thread exposed.
6. Attach the air fitting assembly to the conveyor clamp cylinder, tightening the nut on the brass portion of the fitting. Position the assembly so it does not extend beyond the top or sides of the conveyor clamp cylinder.
7. Reconnect the air hose to the new air fitting assembly.
8. Turn on air to the conveyor clamp by loosening the screws on the flow controls or turning on the air supply at the regulator.

Replacing the Conveyor Clamp Hall Effect Switch

Use this procedure to replace the Hall Effect switch on each of the conveyor clamp cylinders.

Parts

8005755 Hall Effect Switch

➤ To replace the hall effect switch

1. Make a reference mark on the side of the conveyor clamp cylinder to indicate the switch position.
2. Loosen the screw that attaches the switch to the conveyor clamp cylinder.

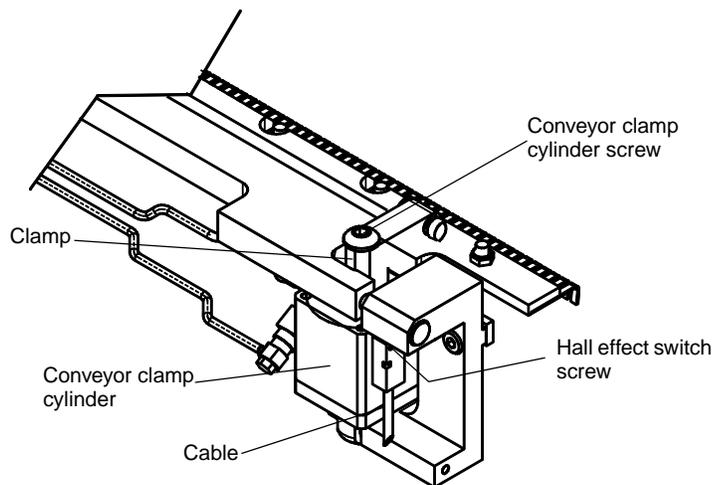


Figure 89. Conveyor Clamp Hall Effect Switch

3. Remove the screw from the top of the conveyor clamp cylinder using a 5/16" allen wrench. Support the clamp surrounding the screw with a ½ in. wrench to avoid bending the shoulder screw.
4. Flip the conveyor clamp cylinder away from the conveyor rail.
5. Slide the switch out of the groove on the side of the cylinder.
6. Unscrew the switch cable connector.
7. Slide the new switch into the groove on the side of the cylinder.
8. Flip the cylinder back up to the conveyor rail.
9. Reattach the screw on the top of the cylinder, using a ½ in. wrench to support the clamp.
10. Position the switch on the side of the cylinder using the reference mark and tighten the screw.
11. Connect the cable connector.

Replacing the Conveyor Clamp Cylinder

Use this procedure to replace the clamp cylinders located on the right and left sides of both the front and back conveyor rails.

Parts

8005753 Conveyor Clamp Cylinder

8000517 Teflon Tape

➤ To replace the conveyor clamp cylinder

1. Turn off air to the conveyor clamp by tightening the screws on the CLMP UP and CLMP DOWN flow controls located toward the back of the unit on the center conveyor section (Figure 90). If your system does not have flow controls on the unit, turn off the air pressure at the air regulator.

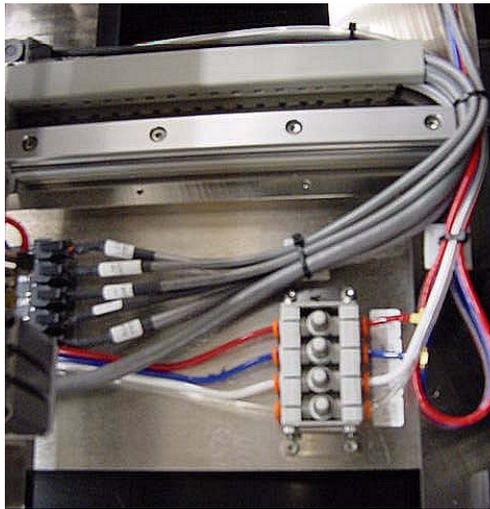


Figure 90. Air Flow Controls

2. Disconnect the two air fitting assemblies from the side of the conveyor clamp cylinder.

Note: Mark the connection placement for each of the assemblies.

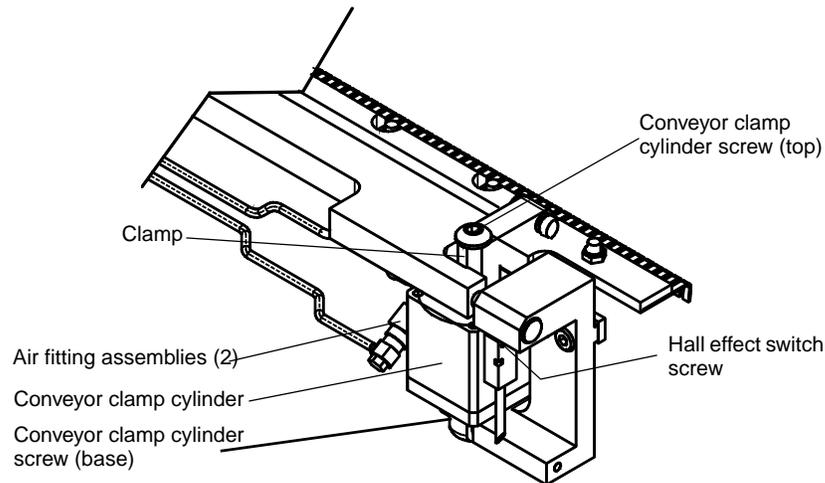


Figure 91. Conveyor Clamp Cylinder

3. Remove the screw from the top of the conveyor clamp cylinder using a 5/16" allen wrench. Support the clamp surrounding the screw with a ½ in. wrench to avoid bending the cylinder screw.
4. If the conveyor clamp cylinder has a hall effect switch attached, measure the position of the switch relative to the conveyor clamp cylinder.
5. Remove the hall effect switch.
6. Remove the screw at the base of the cylinder.
7. Slide the cylinder out.
8. Install the new cylinder and reattach the screw at the base using a thread-locking sealant on the screw.
9. Reattach the hall effect switch if removed in step 4. Use the measurements taken in step 4 to attach the switch as near the same position as possible.
10. Wrap teflon tape twice around the brass ends of the air fitting assemblies leaving the first thread exposed.
11. Attach the air fitting assemblies to the conveyor clamp cylinder, tightening the nut on the brass portion of the fitting. Position the assemblies so they do not extend beyond the top or sides of the conveyor clamp cylinder.
12. Reattach bolt on the top of the cylinder, using a ½ in. wrench to support the clamp.
13. Turn on air to the conveyor clamp by loosening the screws on the flow controls or turning on the air supply at the regulator.

Replacing the Conveyor Drive Motors and Pulleys

Use this procedure to replace drive motors and pulleys on all three conveyor sections. For auto-width motors, see page 128.

Parts

8003640 Conveyor Motor

➤ To replace the conveyor motors and drive pulleys

1. Remove the two bolts on each side of the conveyor top clamp assembly.

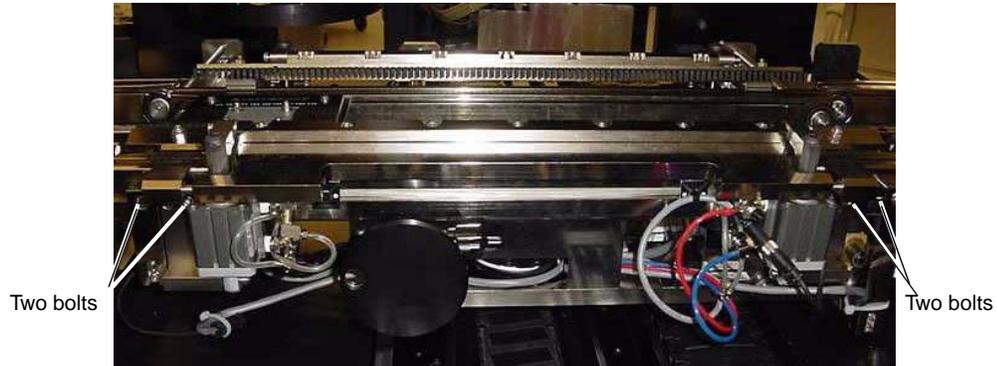


Figure 92. Conveyor Top Clamp Assembly Bolt Locations

2. Lift the top clamp assembly off of the frame and place it on the granite base.
3. Locate the conveyor motor on the front rail of the conveyor section (left, middle, or right).
4. Loosen the four motor mounting screws and slide the motor to loosen the drive belt.
5. Remove the drive belt.

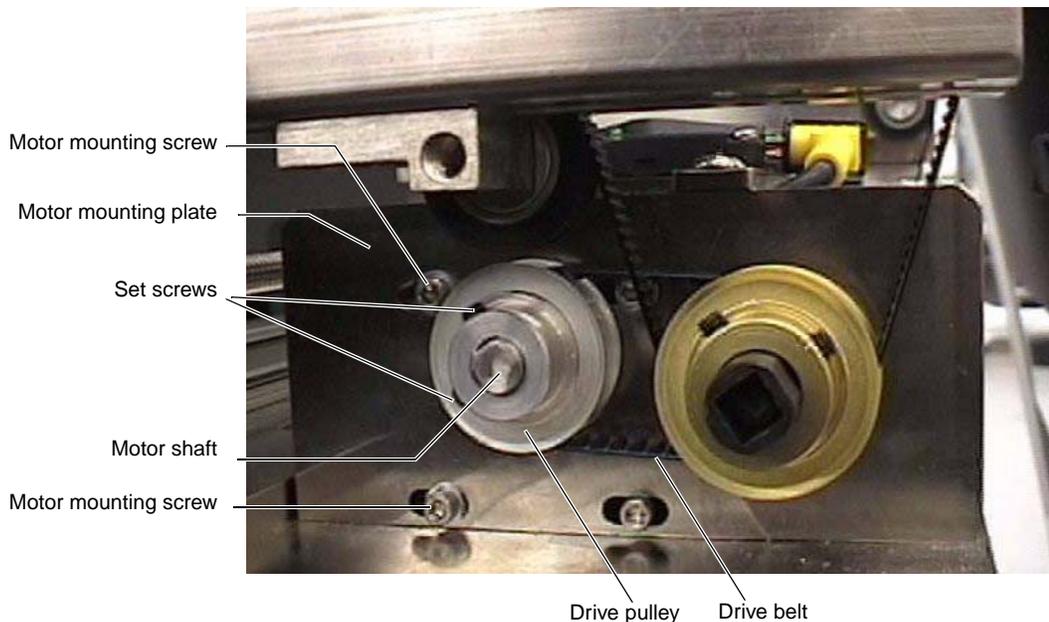


Figure 93. Drive Pulley And Drive Belt

6. Disconnect the motor cable and unscrew the ground wire.

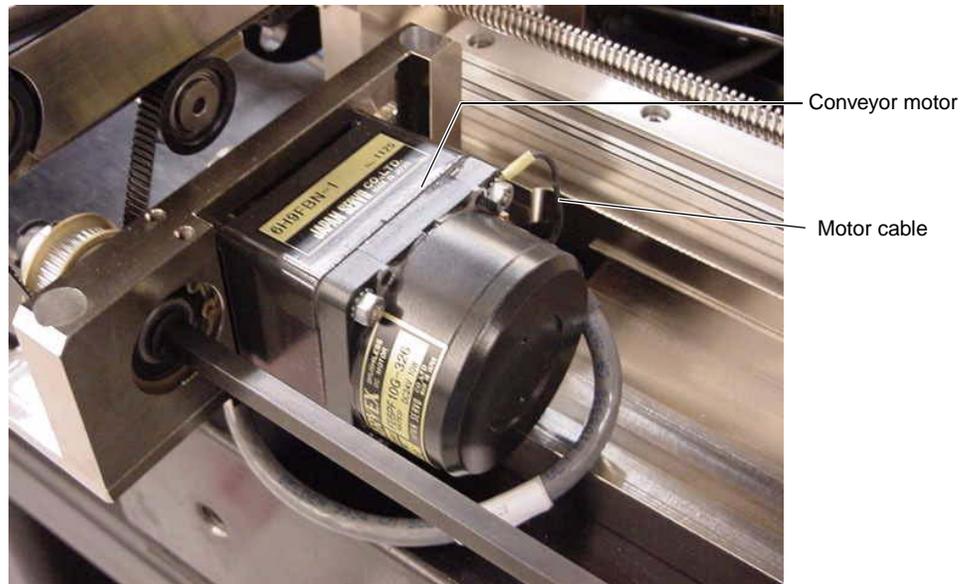


Figure 94. Conveyor Motor

7. Remove the four motor mounting screws and nuts.
8. Remove the conveyor motor.
9. Attach the replacement motor with four mounting screws and nuts; do not tighten.
10. Reconnect motor cable and ground wire.
11. Place the drive pulley on the motor shaft. Position the drive pulley close to, but not rubbing against the motor mounting plate.
12. Place the drive belt on the drive pulley.
13. Slide motor to take up slack in the drive belt. Make sure that the teeth on the drive belt align with the grooves on the drive pulley.
14. Reattach the conveyor top clamp assembly.

Replacing Tension Pulleys and Conveyor Belts

Use these procedures to replace the front rail tension pulley and conveyor belts.

Parts

- 8002799 Long Conveyor Belt
- 8002800 Medium Conveyor Belt
- 8009384 Short Conveyor Belt (drive belt)
- 8003333 Tension Pulley

➤ To replace the front rail tension pulley

1. Remove the top clamp assembly (see steps 1 and 2 on page 124).
2. Loosen the two screws on the front rail tension pulley and slide the pulley under the front rail to loosen the conveyor belt.

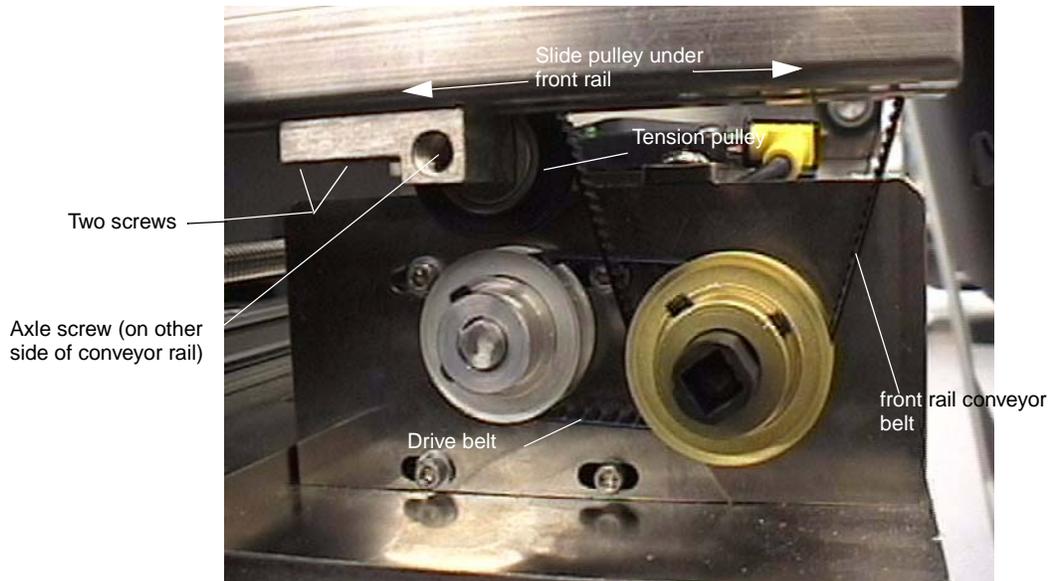


Figure 95. Tension Pulley And Front Conveyor Belt

3. Loosen the axle screw on the tension pulley located on the back side of the front rail.
4. Remove and replace the tension pulley.
5. Slide the tension pulley into position under the front rail.
6. Secure the pulley with two screws.

➤ To replace the conveyor belts

1. Remove the top clamp assembly (see steps 1 and 2 on page 124).
2. Loosen the four motor mounting screws and slide the motor to loosen the drive belt.
3. Remove the front conveyor belt and remove the drive belt.
4. Assemble the belts onto the pulleys.
5. Slide the motor back into position and tighten the motor mounting screws.
To replace the back rail conveyor belts continue with the next procedure.

➤ **To replace back conveyor belts**

1. Remove the top clamp assembly (see steps 1 and 2 on page 124).
2. Loosen the set screws on both of the square shaft pulleys on the front conveyor rail.

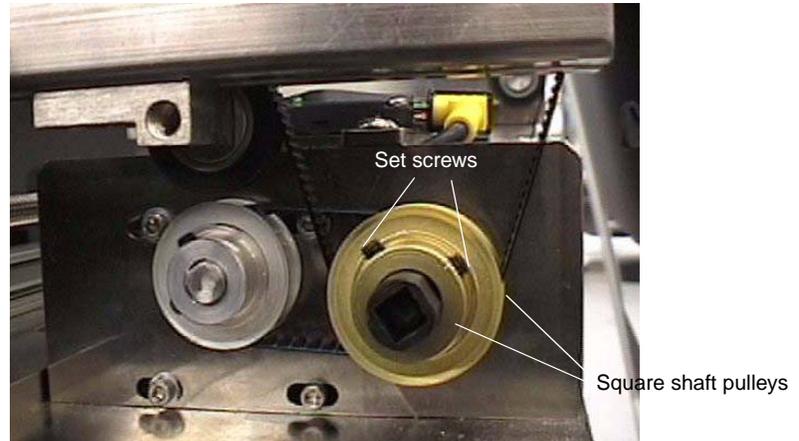


Figure 96. Square Shaft Pulleys

3. Remove pulleys from square shaft.
4. Remove the square shaft retaining ring at the back conveyor rail.
5. Push the square shaft to the back of the machine.

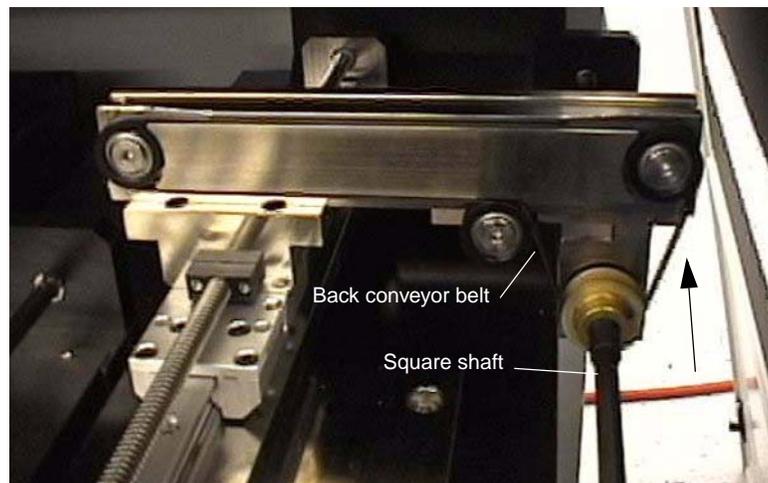


Figure 97. Belt Configuration On Back Rail

6. Remove the back conveyor belt.
7. Assemble the new belt onto the pulleys.
8. Reposition the square shaft and replace the square shaft retaining rings.
9. Reconnect the pulleys on the square shaft and tighten set screws.

Replacing Auto-Width Conveyor belts and Motors

Use this procedure to replace auto-width conveyor motors and belts on all three conveyor sections. For drive motors, see page 126.

Parts

- Auto-Width Motor (center section)
- Auto-Width Motor (left section)
- Auto-Width Motor (right section)



Note: The auto-width motors are not interchangeable. Each motor contains software specific to its location on the conveyor.

➤ To replace the auto-width belt on the center section

1. Loosen two tensioner screws on each side of the motor bracket and push down on the tensioners.
2. Slide the belt off of the pulleys.

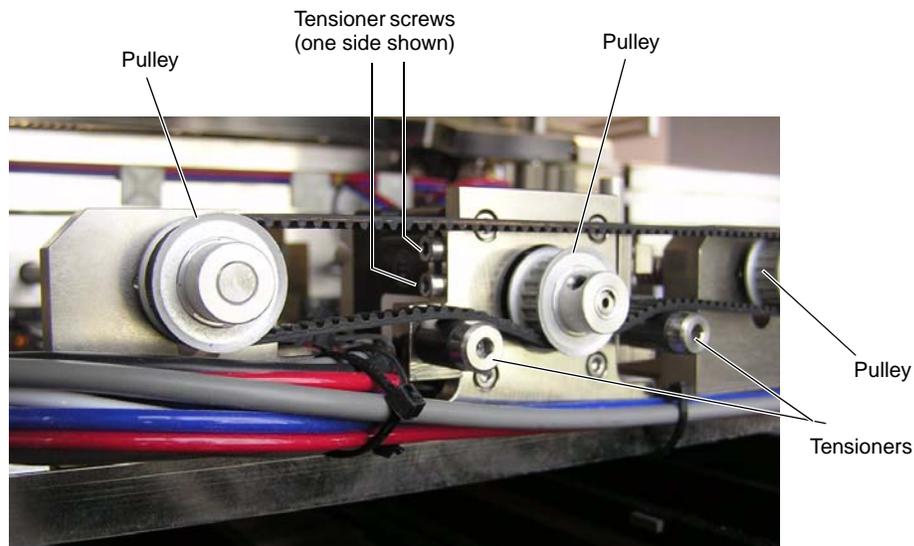


Figure 98. Auto-Width Motor Belt – Center Section

3. Thread the new belt onto the pulleys and over the tensioners.
4. Slide the tensioners up to apply pressure onto the pulley, increasing the belt tension to approximately 1/4" play in the belt when you press downward on it.
5. Tighten the tensioner screws on each side of the motor bracket.

➤ **To replace the center auto-width motor**

1. Remove the belt as described on page 129.
2. Loosen the set screws on the motor pulley.
3. Slide the pulley off of the motor shaft.
4. Remove the four mounting screws that secure the motor to the bracket.

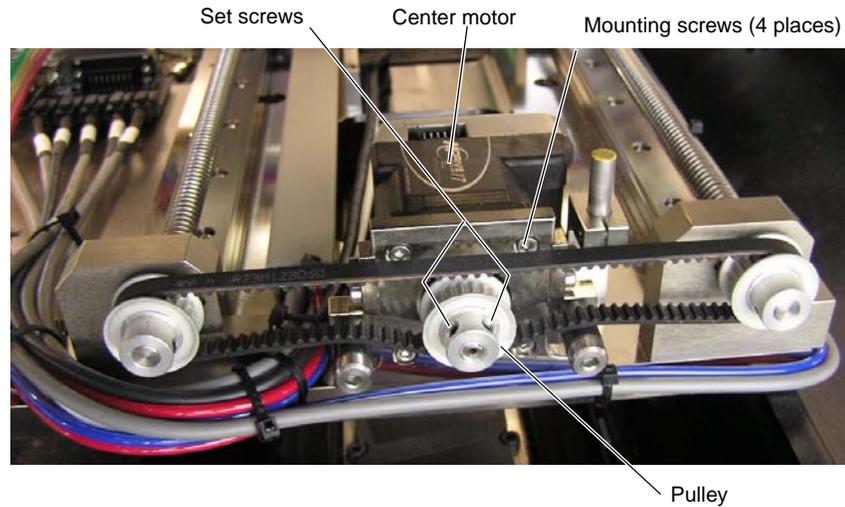


Figure 99. Auto-width Motor – Center Section

5. Replace the motor and reinstall the mounting screws.
6. Slide the pulley onto the motor shaft until the shaft is about flush with the pulley surface.
7. Slide the tensioners up to apply pressure onto the pulley, increasing the belt tension to approximately 1/4" play in the belt when you press downward on it.
8. Tighten the pulley set screws.
9. Reinstall the belt as described on page 129.



Note: The auto-width motor for the center section contains different software than the auto-width motors for the end sections; the center and end motors are not interchangeable.

➤ **To replace the auto-width belt on the end sections**

1. Loosen the tensioner screw on the side of the motor bracket and push down on the tensioner.
2. Slide the belt off of the pulleys.

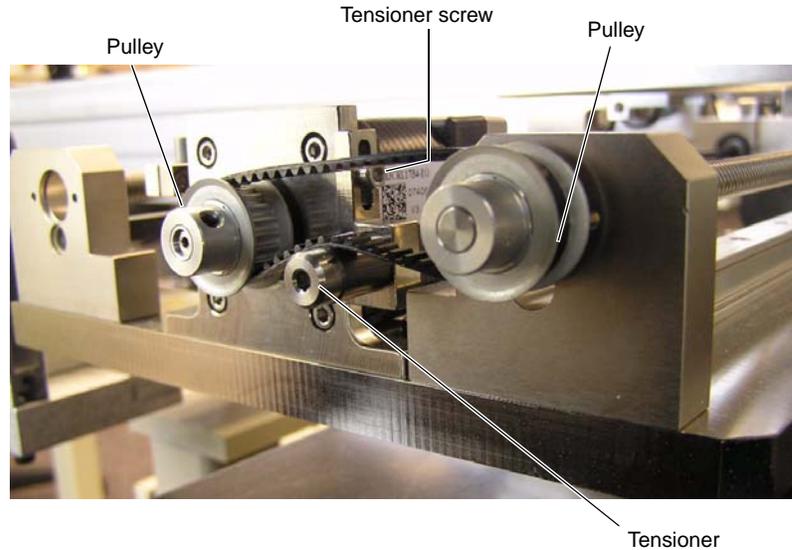


Figure 100. Auto-Width Motor Belt – End Section

3. Thread the new belt onto the pulleys and over the tensioners.
4. Slide the tensioner up to apply pressure onto the pulley, increasing the belt tension to approximately 1/4" play in the belt when you press downward on it.
5. Tighten the tensioner screw on the side of the motor bracket.

➤ **To replace the end auto-width motor**

1. Remove the belt as described on page 130.
2. Loosen the set screw on the motor pulley.
3. Slide the pulley off of the motor shaft.
4. Remove the four mounting screws that secure the motor to the bracket.

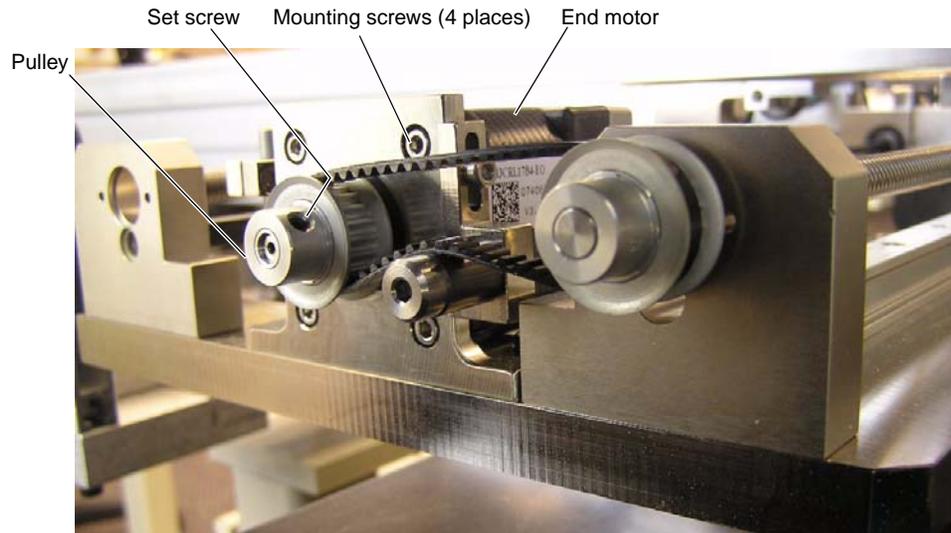


Figure 101. Auto-width Motor – End Section

5. Replace the motor and reinstall the mounting screws.
6. Slide the pulley onto the motor shaft until the shaft is about flush with the pulley surface.
7. Slide the tensioner up to apply pressure onto the pulley, increasing the belt tension to approximately 1/4" play in the belt when you press downward on it.
8. Tighten the pulley set screw.
9. Reinstall the belt as described on page 130.

Replacing the Panel Sensors

Two panel sensors are mounted on the middle conveyor section and one panel sensor is mounted on each left and right conveyor section. A fifth, smaller sensor is mounted near the motor on the right side of the center conveyor section.

Parts

8004227 Panel Sensor

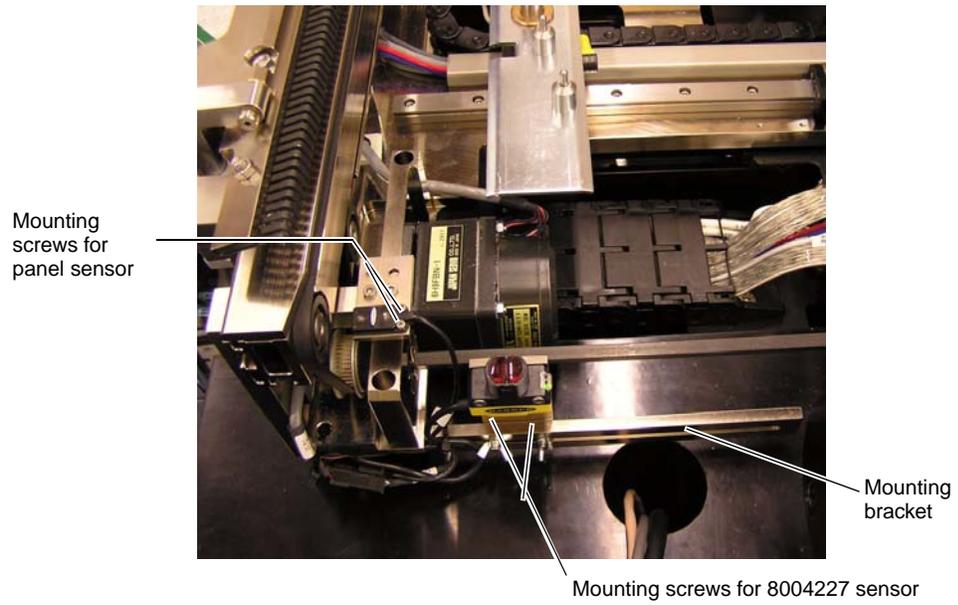
8009281 Panel Sensor



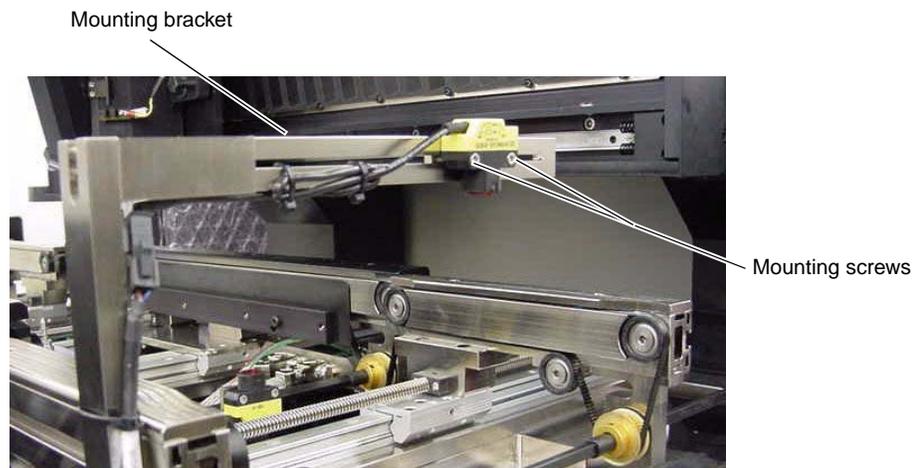
Note: Take care not to move the panel sensor along the X-axis. Movement along the X-axis will affect system calibration.

➤ To replace the panel sensors

1. Remove the two mounting screws and nut plate on the panel sensor (see Figure 102).
2. Clip the cable ties to free the panel sensor cable from the conveyor.
3. Disconnect panel sensor cable and remove the panel sensor.
4. Attach new panel sensor to the mounting bracket and secure with two screws.
5. Connect panel sensor cable.
6. Secure the cable ties so that the cables do not drag during X- or Y-axis motion.



Middle Conveyor Section



Left and Right Conveyor Sections

Figure 102. Panel Sensors on Conveyor

Replacing the Panel Lifter Inductive Sensor

Use this procedure to replace the inductive lift sensor for the panel lifter.

Parts

8002802 Inductive Sensor

➤ To replace the inductive sensor

1. Disconnect the inductive sensor cable by gently pulling the cable away from the sensor.
2. Loosen mounting screw and pull the inductive sensor from its mounting hole.

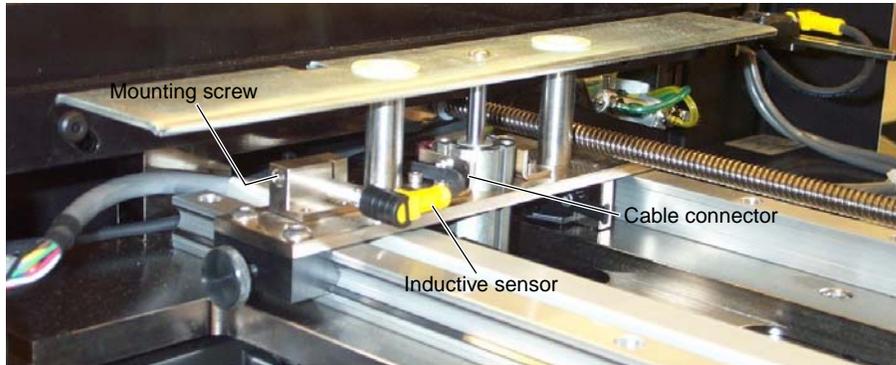


Figure 103. Inductive Sensor In Panel Lifter

3. Place the new inductive sensor in the mounting hole so that it is flush with the far side of the mounting hole. Position the sensor so it sees the tab on the lift plate.
4. Tighten the mounting screw.
5. Reconnect the inductive sensor cable.
6. Check the inductive sensor for mechanical interference by manually moving the lifter:
 - a. Disconnect the system air supply and lift the panel lifter.
 - b. Watch digital I/O module number 4 inside the electronics drawer. Channel number 2 should light up when the panel lifter is up.

Replacing the Panel Lifter Cylinder

Use this procedure to replace the cylinder for the panel lifter.

Parts

8003336 Panel Lifter Cylinder

➤ To replace the panel lifter cylinder

1. Turn off air to the conveyor clamp cylinder by tightening the screws on the CLMP UP and CLMP DOWN flow controls located toward the back of the unit on the center conveyor section (Figure 90). If your system does not have flow controls on the unit, turn off the air pressure at the air regulator.
2. Locate the screw in the center of the panel lifter plate.
3. Use an allen wrench to remove the screw. Hold the cylinder shaft under the plate with an open-end wrench to prevent the shaft from rotating.

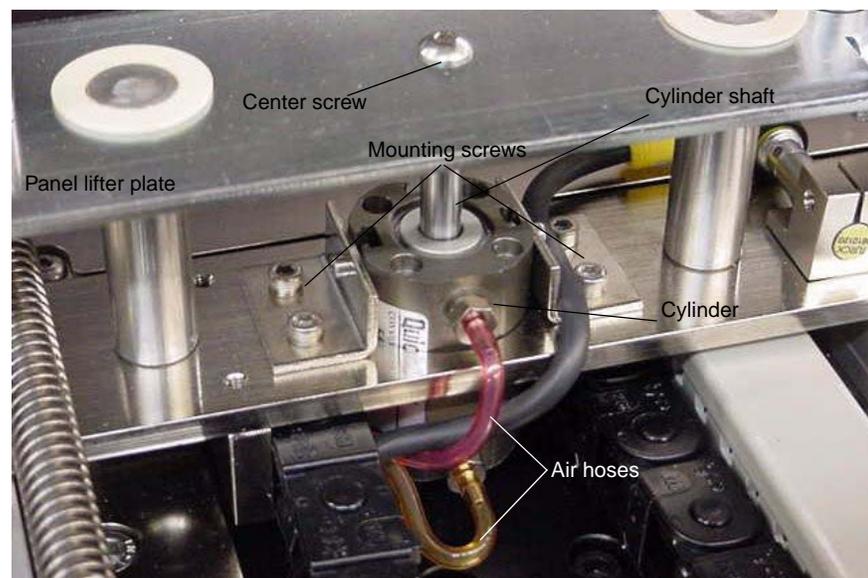


Figure 104. Panel Lifter Cylinder

4. Lift up on the panel lifter plate to remove it.
5. Disconnect the two air hoses.

Note: Mark the air hoses for proper installation. Air connections are not interchangeable.
6. Note the height of the cylinder in reference to its mounting bracket for later placement.
7. Loosen two mounting screws and lift the cylinder out of the mounting bracket.
8. Slide the cylinder into the mounting bracket.
9. Adjust the height in reference to the mounting bracket.
10. Tighten the two mounting screws.
11. Reconnect the air hoses.
12. Install the panel lifter plate and secure with a screw in the center of the plate, holding the cylinder shaft under the plate with an open-end wrench to prevent the shaft from rotating.
13. Turn on air by loosening the screws on the flow controls or turning on the air supply at the regulator.

Other Components

This section contains procedures for replacing the following SE 300 Ultra system components:

- Safety Interlock Switch
- Air Regulator
- AC Main Circuit Breaker
- Leveling Feet



Caution: Turn the AC main circuit breaker to OFF to shut down all electrical power to the SE 300 unit before starting any replacement operations. See “*Shutting Down the System*” on page 60 for this procedure.

Replacing the Safety Interlock Switch

Parts

8001901 Safety Interlock Switch

8001902 Safety Interlock Key

➤ To replace the safety interlock switch

1. Open the SE 300 Ultra hood.
2. Turn two latches on the lower section of the right panel to remove the panel from the machine and gain access to the switch.

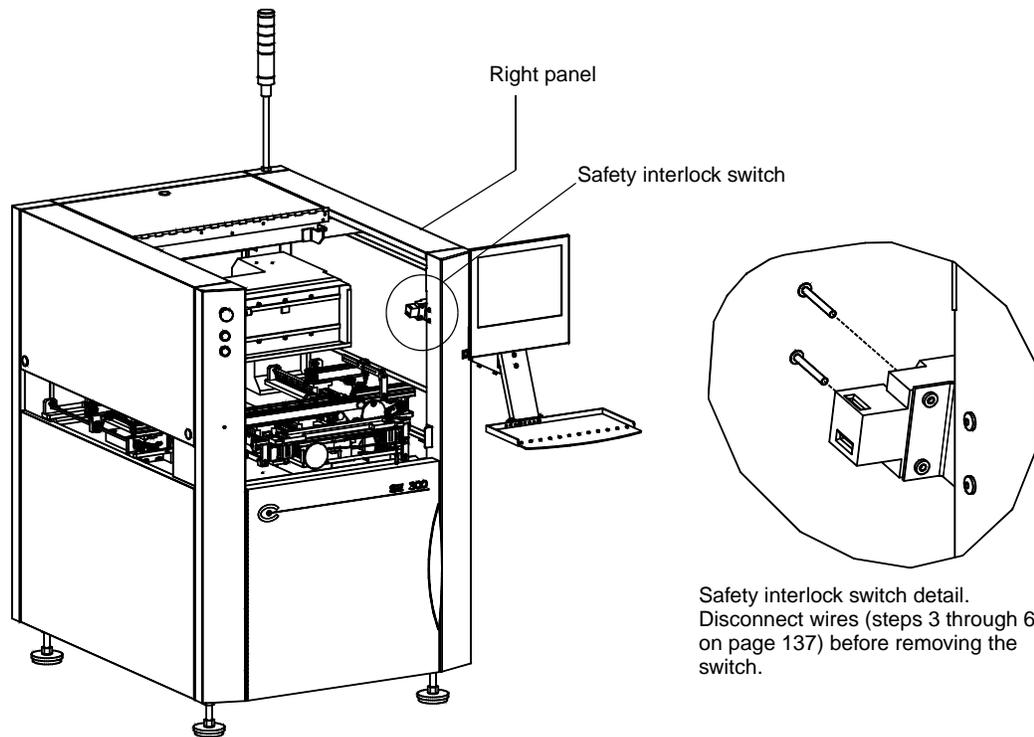
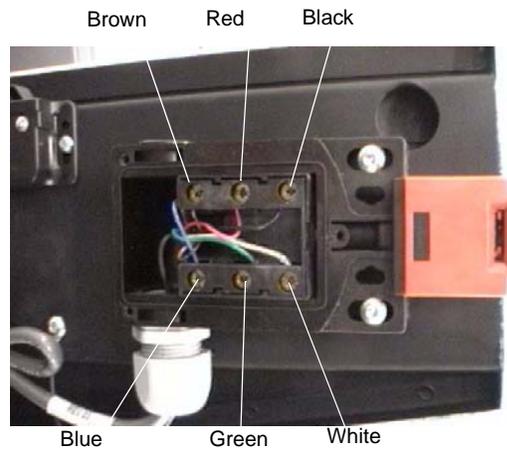


Figure 105. Safety Interlock Switch Access

3. Remove three screws to take off the cover to the safety interlock switch.
4. Disconnect the six wires in the box.
5. Remove the strain relief nut and pull the cable out of the switch.
6. Remove two screws at the top and remove the safety interlock switch.
7. Loosely attach the new safety interlock switch onto the bracket with two screws.
8. Re-insert the cable through the strain-relief nut.
9. Reconnect six wires. See Figure 106 for color coding.
10. Install the cover onto the safety interlock switch.



Color	Signal
Black	Safety relay coil
White	Safety relay coil
Red	Safety relay coil
Green	Ground
Brown	+24V pilot
Blue	Interlock signal

Figure 106. Safety Interlock Switch

➤ To align safety interlock switch

1. Press the green ON button to turn on system power.
2. Close the hood to make sure the pin is lined up with the safety interlock switch socket. To check the alignment:
 - Re-engage the EMO.
 - Observe the safety circuit relays inside the electronics drawer. The LEDs should be turned on.
3. Adjust the switch as necessary for correct alignment and tighten the mounting screws.

Replacing the Air Regulator

Parts

8002136 Air Regulator Assembly

➤ To replace the air regulator

1. Turn off and disconnect air supply.
2. Unscrew the plastic ring at the top of the air regulator.

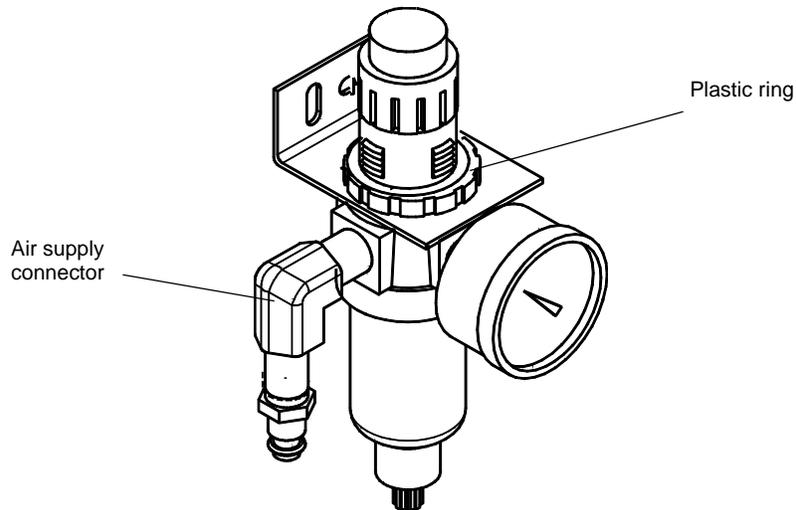


Figure 107. Air Regulator

3. Gently pull the air regulator down to remove it.
4. Install the new air regulator.
5. Turn the knob at the top of the air regulator to set the air pressure to OFF before reconnecting air.
6. Screw on the plastic ring at the top of the air regulator.
7. Reconnect and turn on the air supply.
8. Turn the knob at the top of the air regulator to set the air pressure to 90 psi (80 – 100 psi).

Replacing the AC Main Circuit Breaker

Parts

8001909 AC Main Circuit Breaker



Warning: Hazardous voltages may be present. Make sure that power is disconnected before replacing the AC Main circuit breaker.

➤ To replace the AC main circuit breaker

1. Turn the AC main circuit breaker to OFF to shut down all electrical power to the SE 300 unit before starting any replacement operations. See *“Shutting Down the System”* on page 60 for this procedure.
2. Verify that AC main power is off and locked off. Use a voltage meter to check that power is off.
3. Loosen the two screws on the front cover of the AC main Junction box.
4. Slide the Junction box cover to the right to remove it.
5. Remove two screws on the front cover of the Junction box to remove the mounting bracket.
6. On the front of the circuit breaker, loosen four screws.

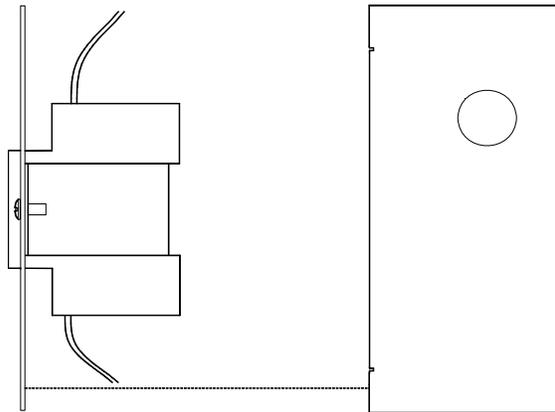


Figure 108. Circuit Breaker

7. Gently pull out the wires to disconnect the outside line power (L1 and L2/N) and the system power.
8. Replace the circuit breaker.
9. Reassemble the mounting bracket using two screws.
10. Reconnect the wires for outside line and system power. Tighten the four screws.
11. Slide the cover back onto the Junction box and secure in place with two screws.
12. Turn the AC main circuit breaker to ON.

Replacing Leveling Feet

➤ **To replace leveling feet**

1. Support the SE 300 Ultra frame on an appropriately-sized jack.
2. Remove the two M8 screws that secure the plate and foot assembly to the frame.
3. Replace the damaged part(s).
4. Reassemble the foot assembly onto the frame.
5. Adjust the leveling foot as needed to align the SE 300 Ultra with the conveyors (see page 29 for details).

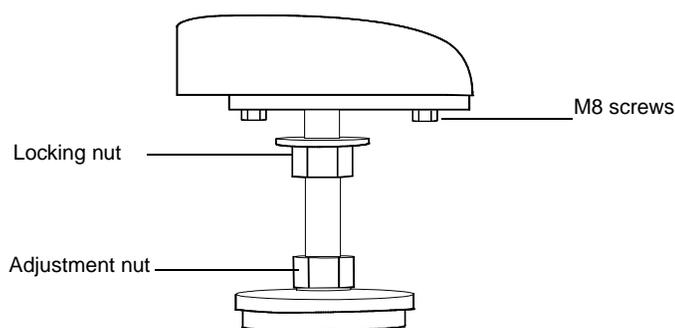


Figure 109. Leveling Foot

7

Warranty and Spare Parts

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Limited Warranty

Subject to the limitations discussed in *Limitation of Remedy and Liability*, and except as otherwise expressly provided in this warranty, CyberOptics warrants that the firmware will execute the programming instructions provided by the buyer, and that the goods manufactured or services provided by CyberOptics will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty periods.

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If the buyer discovers any warranty defects and notifies CyberOptics about the defects, in writing, during the applicable warranty period, CyberOptics shall, at its option, promptly:

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CyberOptics reserves the right to determine the need for on-site parts repair or replacement. CyberOptics also reserves the right to determine the need for software maintenance. To do this, CyberOptics first identifies the problem via telephone, fax or e-mail.

Emergency services are available on an as-required basis.

Parts or software that you install are normally shipped second-day air. If the need is urgent, overnight air shipment can be used where available.



Note: CyberOptics provides a Returned Material Authorization (RMA) number and a return shipping label for the return of the defective part.

When on-site service is required, CyberOptics-approved personnel will visit your site, examine the problem and make the necessary repairs or replacements. When on-site repairs are not possible, CyberOptics will provide a prompt solution to the problem.

You must telephone, fax or e-mail CyberOptics for a written estimate on all non-warranty service events. For on-site service, you are required to have a purchase order number before service is scheduled.

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A contract service organization may be employed for on-site repairs. In these instances, CyberOptics schedules the repair, with final confirmation taking place directly between you and the service contractor.

Extended Warranty Options

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Warranty Questions

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CyberOptics offers these services and packages:

- On-site maintenance
- Software upgrades and releases
- Hardware upgrades
- Factory repair service
- Preventive maintenance
- SE 300 Ultra certification
- SE 300 Ultra calibration
- Spare parts kits
- Maintenance training
- Software training
- Additional documentation

For prices and scheduling information, or if you have any questions about how CyberOptics can help you to maintain and use the SE 300 Ultra system, call, E-mail or fax CyberOptics Service and Support staff.

Spare Parts Lists

The SE 300 Ultra system is shipped with a set of spare parts for the conveyor. You also can purchase the recommended spare parts listed below. Additional replacement parts covered in the manual are listed on page 151. Call CyberOptics Service and Support for more information.

Conveyor Parts Shipped With System

Part Number	Description
8009384	Short conveyor belt
8002800	Medium conveyor belt
8002799	Long conveyor belt

Recommended Spare Parts Kit

Part Number	Description
8001942	Cable, NT/RT
8003335	Cylinder clamp
3202051	Fuses 6.3A, 5x20, 250V amp (on the AC power distribution board)
8002234	Input module
8004922	Line filter
8002182	Motion controller card
8002235	Output module
8003336	Panel lifter cylinder
8003950	Pipeline processor board
8001545	Power supply, 25W (small)
8001544	Power supply, 60W (medium)
8001542	Power supply 125W (large)
8007112	Relay board
8001538	Relay, solid state, power on (located in electronics drawer)
8002166	Solenoid
8009385	8.5 "Wear strips, conveyor (end sections)
8009386	22 "Wear strips, conveyor (center section)

Additional Replacement Parts

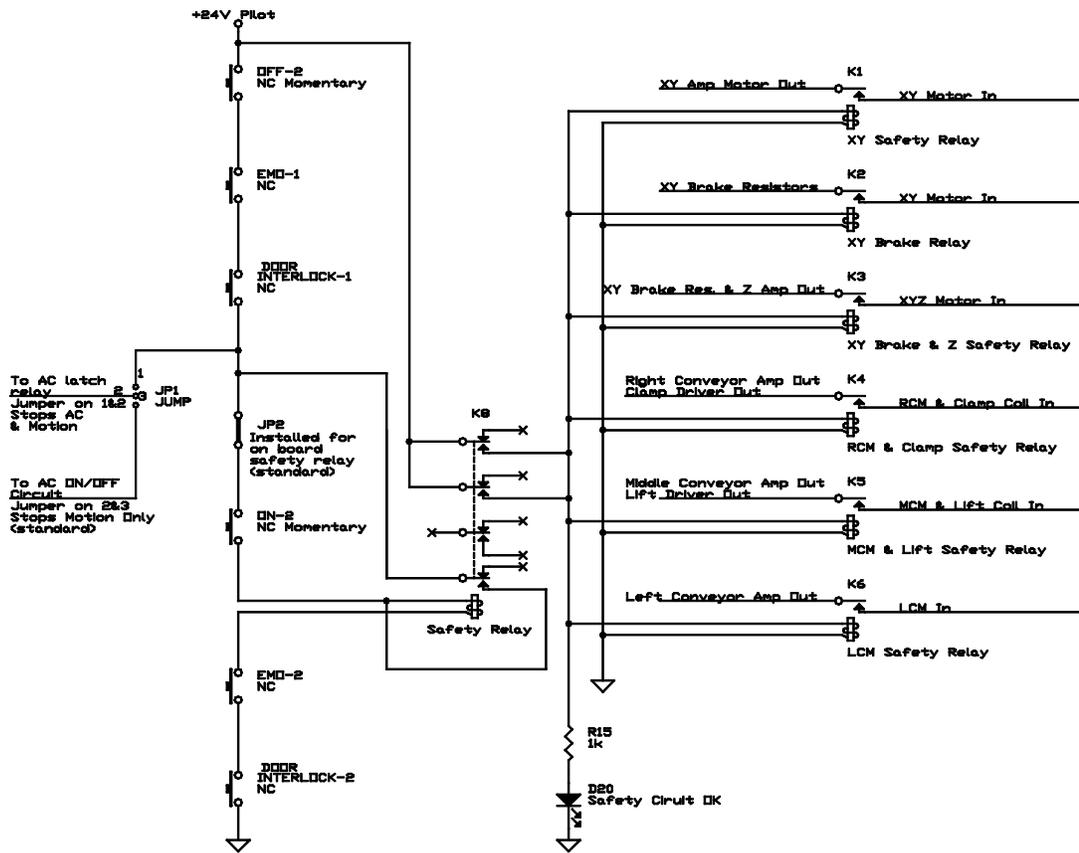
Part Number	Description
8001909	AC main circuit breaker
8005740	Air fitting elbow
8005735	Air fitting exhaust
8005739	Air fitting reducer
8002148	Air hose
8002136	Air regulator assembly
8005753	Conveyor clamp cylinder
8005240	Conveyor clamp spring fingers
8003333	Conveyor idler wheel with bearing (tension pulley)
8003640	Conveyor motor (10w)
8006131	Conveyor motor controller (contains conveyor amplifier)
8003334	Conveyor square shaft ball bearing
8004581	Distribution board
8001546	Fan
3202038	Fuse, 2.0A 250V (on Relay board)
8005755	Hall effect switch
8002184	I/O controller card
8002802	Inductive sensor
8001857	Leveling foot, 3/4"
8004227	Panel sensor
8009281	Panel sensor (for small panels)
8001777	Relay, Z Safety/Brake (K2, K3)
8001778	Relay, XY Safety (K1)
8001902	Safety interlock key
8001901	Safety interlock switch
8008878	Sensor shelf pak
6300582	SMEMA cable
6400372	Trackball

8

Diagrams and Error Messages

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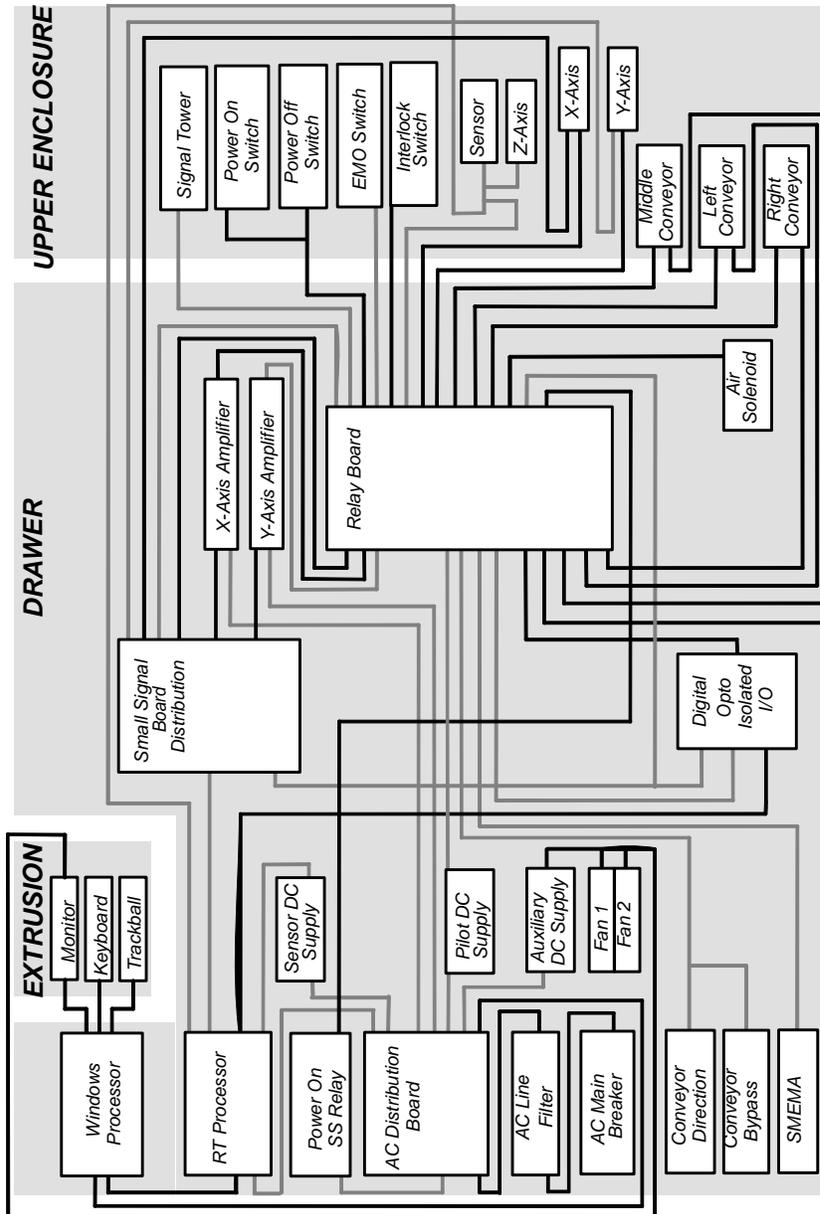
Safety Circuit Block Diagram



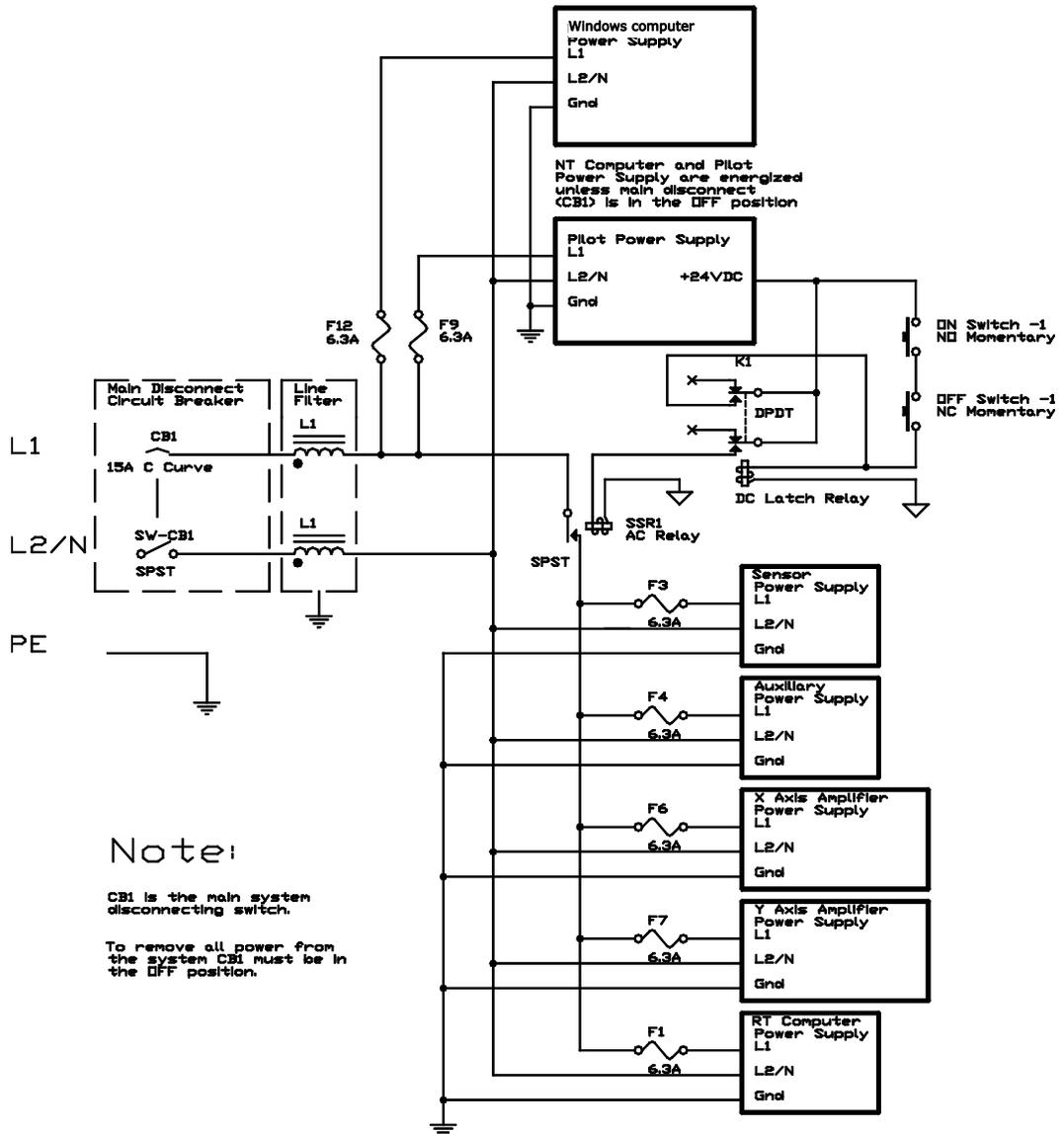
Note:

1. JP1 can be installed in 2 different positions. One position only stops all motion if the EMO is pushed or the door is opened. (standard configuration) The alternate position stops all motion and instantly kills AC power to the entire machine with the exception of the safety (pilot) power supply and the NT computer.

Electrical System Block Diagram

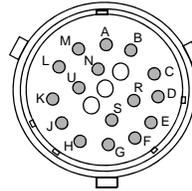


AC Wiring Functional Diagram



Digital I/O Connector Pinout

The digital I/O cable connects to currently unused channels in the I/O modules. See page 158 for a list of I/O module channel indicators.

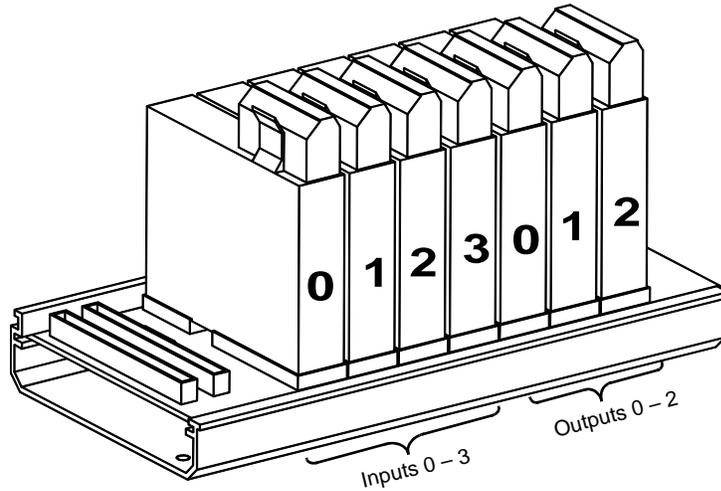


SPI Output	+/-	Output Module ^a	I/O Connector Pin	Wire Color
Output 1	+	Output 2, channel 3	F	White/Blue
	-		E	Blue/White
Output 2	+	Output 2, channel 4	A	White/Orange
	-		B	Orange/White
Output 0	+ sink	Output 1, channel 4	J	White Green
	ground		K	Green/White

^a Located inside electronics drawer.

Digital I/O Indicators

Digital I/Os are located inside the electronics drawer. The indicators on each I/O show system status as described below.



Channel #	Indication (when lit)	Channel #	Indication (when lit)
Input 0		Output 0	
1	EMO pushed in	1	Clamp activated
2	Safety interlock switch activated	2	Panel lifter is up
3	Safety circuit is OK	3	Light tower – red light on
4	Conveyor bypass activated	4	Light tower – yellow light on
Input 1		Output 1	
1	NT/RT jumper installed	1	Light tower – green light on
2	Not used	2	Light tower – blue light on
3	Conveyor direction – right to left	3	Alarm on
4	Front clamp unclamped	4	Available output (0); contact closed
Input 2		Output 2	
1	Rear clamp unclamped	1	SMEMA Upstream Ready
2	Panel lifter down	2	SMEMA Downstream Available
3	Left panel sensor lit	3	Available output (1); contact closed
4	Left – center panel sensor lit	4	Available output (2); contact closed
Input 3			
1	Right–center panel sensor lit		
2	Right panel sensor lit		
3	SMEMA Upstream Available		
4	Downstream SMEMA Ready		

System Error Messages

The System tab on the Output palette displays any hardware-related messages and errors resulting from copying or clearing system files. These messages may help you troubleshoot problems related to the hardware or the internal software. The messages in this tab are retained until you shut down system power.

System Error Message Format

System messages are displayed in the following format:

```
<date> <time> <xyz> <text-message>
```

where <xyz> is a 3-digit error code and <text-message> describes the nature of the error. When reporting these types of errors to CyberOptics, be sure to make a note of any error codes displayed.

Example:

```
04-Mar-2003 09:26:20 510 StopRun communications failed (StopRun)
```

Error Code Format (<xyz>)

The error codes are intended for use primarily by CyberOptics personnel to troubleshoot internal system related errors, but a basic understanding of the error code format can give you clues about the severity of the error and the source of the problem.

First digit (x): Disposition

The first digit indicates the severity of the error and gives you an idea of what you should do about it, if anything.

- | | |
|-------------|---|
| 1. Notice | A minor problem occurred, but the system continued to operate without interruption |
| 2. Warning | A moderate problem occurred, but the system continued to operate without interruption. Warnings may be written to the system log. Examples of problems that may trigger warnings: <ul style="list-style-type: none"> ● Fiducial alignment out of tolerance ● Dark images ● System resources nearly overrun ● Data corruption in non-critical data |
| 3. Reserved | Not used |

- | | |
|--------------------------------|--|
| 4. Transient error | An action cannot be performed due to a temporary bottleneck or correctable problem. The system will generally retry an action when a transient error occurs. Examples of transient errors: <ul style="list-style-type: none">● Communication timeout● Disk or queue full● Timeout waiting on sensor data |
| 5. User or system intervention | Something that should have worked failed for unknown reasons. The operator must restart the system to clear the error, unless the system restarts itself. Examples of problems that may require intervention: <ul style="list-style-type: none">● Hardware communications failed● Motion stalled● An action was retried but was still unsuccessful |
| 6. Permanent error | A serious program error occurred that requires that you restart the system. Report these types of errors to CyberOptics. Examples of permanent errors: <ul style="list-style-type: none">● Schedule file errors● Data corruption in critical data● Non-existent feature |
| 7. Reserved | Not used) |

Second digit (y): Classification

The second digit identifies the apparent source of the error, as detected by the SE System.

- 0 Syntax or parameter error
- 1 Communication error
- 2 File system error
- 3 Image processing error
- 4 Sensor error
- 5 Motion error
- 6 Conveyor error
- 7 Operating system error
- 8 Reserved (not used)
- 9 Other

Third digit (z): Specific Error

The third digit identifies the specific error and generally corresponds to the accompanying text message.

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