

SJ50 Series II Value Hardware Manual
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Revision History

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Chapter 1 Product Overview

Introduction The SJ50 machine is designed to detect component errors on a Printed Circuit Board (PCB). The SJ50 is the latest in the evolution of the SJ50 machines.

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SJ50 Advantages

Best in Class AOI

The Agilent SJ50 machine is the latest evolution in Automated Optical Inspection (AOI) technology for the electronics manufacturing industry. The award-winning SJ50 is an integral part of Agilent's Intelligent Test strategy which offers customers their choice of Automated Optical Inspection, automated X-ray test, in-circuit and functional test, with integrating information software, service and support.

Functions of the SJ50

The Agilent SJ50 has been designed as a truly flexible 'best-in-class' AOI solution, to measure and characterize components and paste at multiple positions along the SMT manufacturing line. Based on the same platform and technology it provides the following functions:

- Component measurement
 - Component & paste measurement
 - Solder Joint Analysis.
-

Measurement Performance

The SJ50 delivers industry recognized best-in-class measurement performance. Using high resolution imaging hardware and precision XY gantry, the SJ50 is the most accurate and repeatable AOI system in the market. The Agilent SJ50 system focuses on simultaneously on delivering faster inspection speed and full 0201 component inspection capability.

New Generation of AOI Technology

The SJ50 incorporates a new generation of AOI technology into a high-performance system that inspects printed circuit boards at speeds up to 35 percent faster than the previous generation. The new and advanced digital camera technology enables faster image acquisition at superior image quality. The SJ50 platform builds upon the global success and customer experience with over 400 systems deployed.

Flexible System

The Agilent SJ50 provides one of the most flexible AOI solutions available on the market, where you can decide where it best fits into your SMT line. It can be deployed in a pre-reflow, mixed mode or post-reflow environment.

You have the unparalleled flexibility to switch easily between these applications, adapting to continuously changing manufacturing and business requirements.

Fault Coverage The SJ50 deploys Agilent's unique (patent-pending) sequential colour imaging technique named **MonoColour**. This technology allows the AOI system to build a colour image by combining a sequence of monochrome images of the PCB when illuminated with light of different red, green and blue colours.

MonoColour allows the AOI system to benefit from the power of full colour image processing, while utilizing the highest resolution, highest speed, monochrome camera technology. It delivers full colour 24-Bit RGB images, which allows for greater differentiation of components from substrate, than with black and white systems.

Agilent's **MonoColour** AOI technology allows the SJ50 to easily distinguish SMT component features by unlocking the full range of colour depth that is available to the human eye.

In addition to colour technology, the SJ50 deploys an innovative domed lighting head consisting of Light Emitting Diodes(LEDs) from multiple angles. This allows three-dimensional information to be extracted from solder joints. Colour 3D joint profiling is the most powerful technique used in the AOI industry for solder joint inspection providing best fault coverage.

**Benefits of
MonoColour
Technology**

MonoColour technology provides the following benefits:

- Improved algorithm performance and reliability.
 - Lower false fail and false accept rates.
 - Colour component inspection.
 - Paste inspection.
 - Best detection capability in industry while maintaining excellent accuracy and GR&R results.
 - Easier program setup and maintenance.
 - Easier program portability from system to system.
-

**Speed &
Performance**

For any given speed, the Agilent SJ50 offers the highest resolution, providing lower false call rates and a maximum of error detection.

By utilizing latest camera technology, we provide highest speed. The distortion free lens is complemented with the high precision XY gantry, which moves the camera. When combined with a stationary board this ensures that the SJ50 delivers the most accurate and repeatable results. This highly accurate system can also be used as a metrology tool.

While small pixel sizes are compulsory for 0201's and finer pitches, speed is equally critical for in-line inspection. Better resolution of acquired images leads to better inspection results giving you the best call accuracy.

Mixed Mode

Description

The SJ50 Mixed Mode provides the following:

- 2D paste measurement as well as pre-reflow component characterization. Placed between a high-speed chip shooter and a fine-pitch placement machine, the SJ50 Mixed Mode can simultaneously measure paste and components.
 - The SJ50 Mixed Mode provides exceptional return on investment by avoiding costly repairs associated with bad paste deposits for BGA and fine-pitch devices. This solution is particularly effective where the SMT line is producing high-value product.
-

Benefits of Mixed Mode Inspection

Mixed Mode inspection produces optimum results, by inspecting the two most critical parameters, which account for the highest number of defects in the process:

- Placement accuracy for small chip components.
 - Paste deposits for high-value components BGA or QFP.
-

Pre-reflow

Description The Agilent SJ50 offers the unique capability to measure and characterize components on PCBs before the reflow process. When deployed as a process control application tool, the SJ50 accurately finds defects and delivers best-in-class measurement performance.

Benefits of Pre-reflow Inspection Pre-reflow inspection has the following benefits:

- Line position providing measurement data for all components.
- Process control: Proactive approach – control the process as well as the product (X, Y Theta data).
- Yield improvement.
- Reduced repair costs – no expensive tooling required.

Post-reflow

Description The SJ50 performs fast and efficient post-solder inspection for components and solder joints. The vision software reliably determines missing or offset components, polarity and solder joint related defects.

Benefits of Post-reflow Inspection Using Post-reflow inspection has the following benefits:

- Removes the subjectivity of visual inspection.
- Reduced repair costs.
- Decreases or removes in-circuit test times.
- Decreases complex expensive debug for process failure.

SJ50 Navigation

SJ50 Co-Ordinate System

The SJ50 co-ordinate system is the same as what you see through the camera view, for example if you click the 'up' arrow (↑ or ▲) on the keyboard, the camera view moves up on the screen.

Using Keyboard keys for screen and XY table movement

Use the keyboard keys **1** to **9** (on the numeric keypad) to move the XY table by amounts of **250** microns.

The arrow keys may also be used to move the XY table by amounts of **2,500** microns

Chapter 2 Safety

Introduction This section is used to display and describe each of the safety labels associated with the SJ50.

Contents This chapter contains the following sections:

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SJ Safety Standards

Safety Requirements

The following is a list of the safety requirements for electrical equipment for measurement control and laboratory use:

- UL 3101
- CE Machinery Directive EC-98/37.
- CEI/IEC 1010-1
- CE Machinery Directive EC-98/37.

See certificate for list of relevant standards.

System Environment

The Machine is designed to operate under the following conditions:

- Operating Voltage: 100 –120V and 200 – 240V single phase 50/60Hz at 16A.
 - Indoor use.
 - Altitude up to 2000m.
 - Temperature 5°C to 40°C.
 - Maximum Relative Humidity 80% for temperature up to 31°C decreasing linearly to 50% relative Humidity at 40°C.
 - Mains Supply Voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage.
 - Pollution degree 1 in accordance with IEC 664.
-

Machine's Intended Use

In conjunction with the above environmental conditions the machine is used in a surface mount technologies (SMT) production line.

The following must be adhered to:

CAUTION!

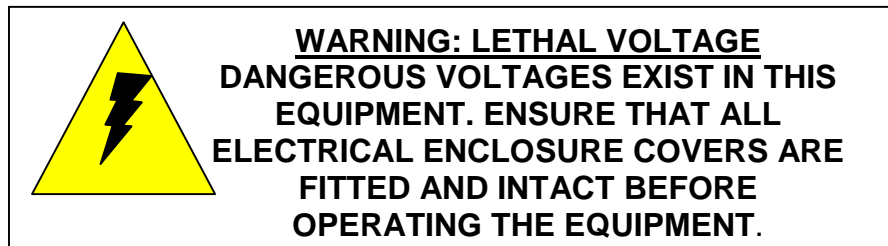
This machine must only be used with conveyors on both sides either in-line or in off-line operation.

Electrical Safety

Electrical Enclosure

Live power and control circuits are situated in various parts of the machine.

- The **Main Control Panel** is accessed through the two rear doors, which are electrically interlocked.
- When in the **Off** position the machine only has mains voltage on the primary side of the **Main Isolator**.



Emergency Stop Loop

The Emergency Stop (E-Stop) is designed according to the relevant safety standard. It is controlled using a **Pilz class IV safety relay**.

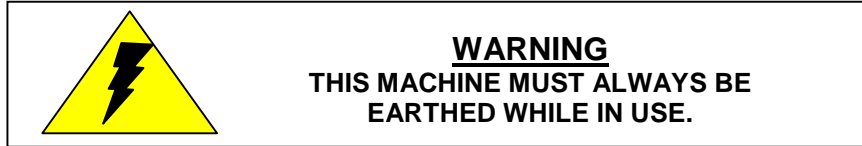
The Emergency stop circuit has the following attributes associated with it

- During an **E-Stop**, power is removed from all motors including conveyors and **XY Table**. It also causes the pneumatic circuits to lose power (except if the **Maintenance Key Switch** is turned on).
 - **E-Stop** overrides all modes of operation within the SJ-50 machine, with the exception of **Maintenance Mode**.
 - The **E-Stop** of the SJ50 machine is clearly visible and identifiable. It is a red button at the front right hand side of the machine and is activated by pushing down on it once.
 - Raising the front hood has the same effect as pressing the E-Stop.
 - When power is removed from the system the E-Stop is activated automatically and must be reset on powering the machine back up.
 - On startup, NO uncontrolled motion can occur.
-

Earth Bonding All external metal surfaces are mechanically and electrically bonded to the machine earth point.

The bonding wire used is identified by its green and yellow insulation.

Note: Never remove or cut these wires. If you find a cut or damaged connection, do not operate the machine and inform a suitable qualified person as soon as possible.



PC Safety

The PC's motherboard contains a lithium battery: **Maxell 3V**.
See explanation of warning labels.

Dangerous Voltages may exist in the PC after the electrical supply has been disconnected.

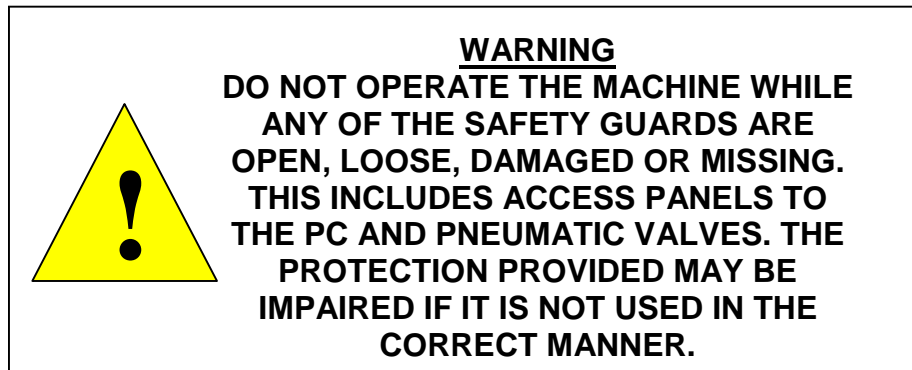
There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

Dispose of used batteries according to manufacturer instructions.

Physical Safety

Protective Guards

This machine is fitted with a set of protective guards that fully enclose any moving and electrical mechanisms that may harm you during normal use. Under no circumstances must these guards be removed.



Machine Stability

The following label warns you not to lift or tip the machine on your own as you could damage yourself or the machine (or both).

This machine weighs approximately 1,500 kg, and has a low centre of gravity.

CAUTION!

Do not attempt to lift or tip the machine at either end or side, as you could damage both the machine and yourself. Don't even do it with the help of others!

Falling Objects

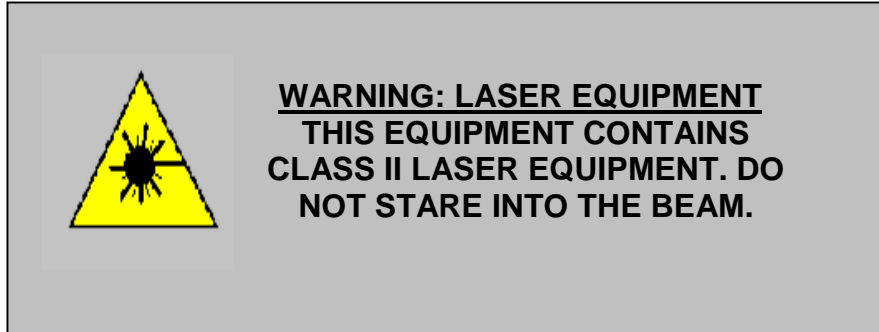
The following label warns you not to store anything on the top of the machine:

Do not store boards, equipment, stencils etc. on top of the machine.

Barcode Laser Safety

Barcode Readers

The **Microscan Barcode Readers** use a **Class II Semiconductor Laser**. It can be dangerous to stare directly into the laser beam.



Explanation of System Warning/Caution Labels

Warnings

The following are a list of warnings and their associated explanations:



Warning electrical danger.
Label located on right rear door to indicate High Voltage within.



General warning label.
Located inside PC at the lithium battery.
See Section 1.2.4



This indicates you must read the manual before operating the machine.
Label located on front right side of hood.



Warning to mind your head.
Label located on front left and right sides of hood.



Moving parts at the conveyor Entry and Exit openings (for the Board) at the sides of the machine, which could cause finger and hand damage.



Warning that hands could be crushed from below.

Location

- Top centre of rear panel.



Warning that hands could be crushed from right side.

Location:

- Rear of the top left side panel.



DANGER
230 volts



DANGER
HIGH VOLTAGE

230 Volts warning labels

Location:

PC

Warning that hands could be crushed from left side.

Location:

- Rear of the top right side panel.

Warning that maintenance switch is in an ON position.

The pneumatic air pressure is actuated.

Using the maintenance GUI, the stops and clamps can operate; therefore, caution pinch points around clamps can cause injury.

Warning of high voltage.

Location:

- Mains Terminal Trunking.

Chapter 3 Parts of the SJ50 Machine

Introduction This chapter is used to describe the different parts of the SJ50 machine and where they are located on the machine.

Contents This chapter is split into 4 different sections:

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Control Panel Error! Reference source not found.	Error! Bookmark not defined.
Parts of the SJ50	32

SJ50 System

Overview

The SJ50 system is constructed from a rigid welded base frame, which gives stability and support to the X-Y Gantry robot and houses the electrical control of the machine.

- The **Industrial PC** is behind the front access doors, and the **Pneumatics Panel** is on inside of the right rear door.
 - The **Amplifiers** (there are three for the X, Y and Z axis) are located behind the left rear door.
 - The **Facilities Panel**, mounted in the rear electrical enclosure, provides interconnections for the **2 SMEMA Cables**, the **Ethernet Cable**, and the **Serial Port**.
 - The **Electrical Mains Inlet Cable** and **System Pneumatic Power** are supplied through a cut out in the machine base-plate, which is also accessible from the rear **Electrical Enclosure**.
-

Front of the SJ50 Machine

Overview

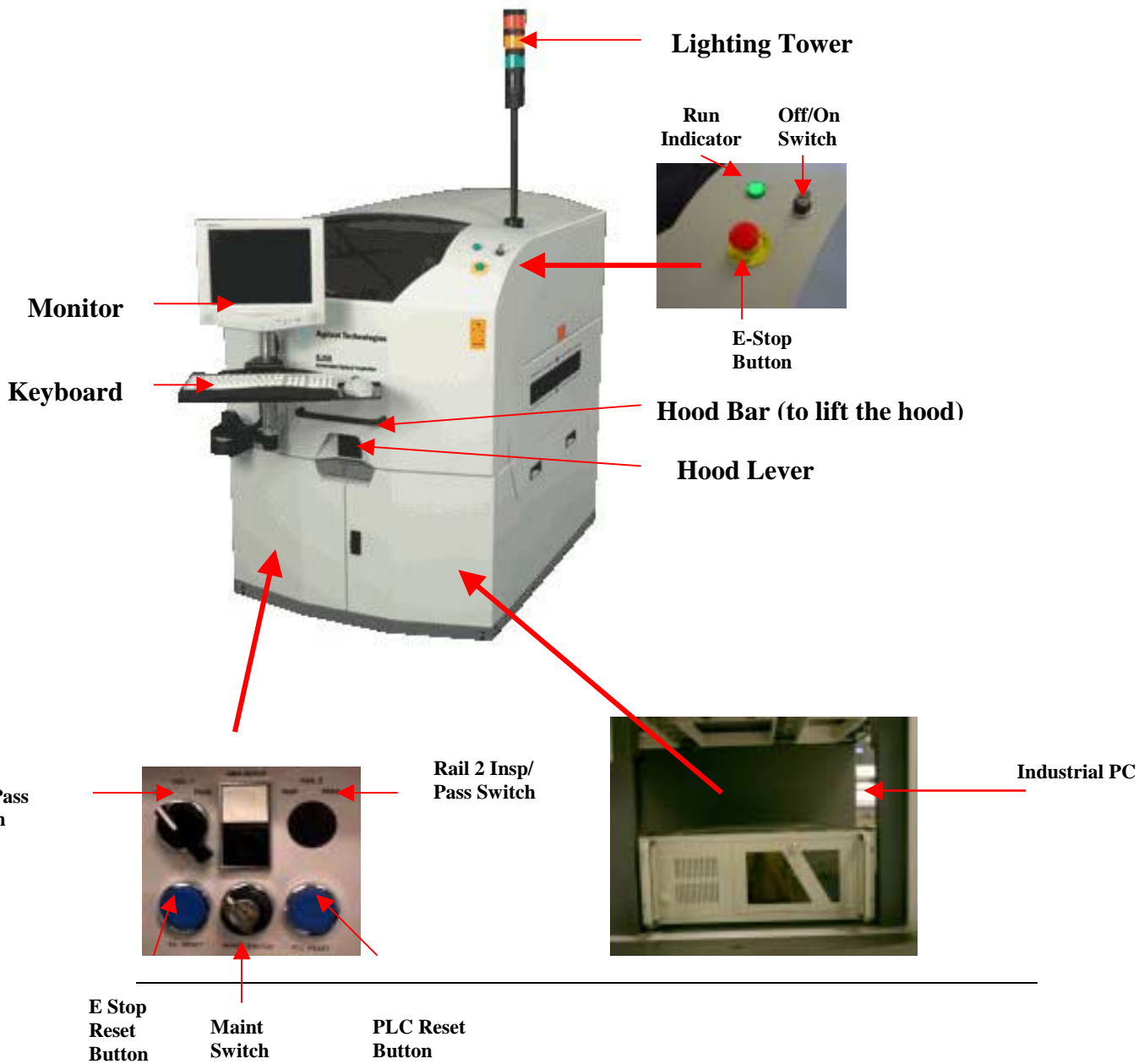
This section looks at the front of the SJ50 machine. This includes:

- [Front System View](#)
- [Front Electrical Interface](#)
- [Opening & Closing the Frame](#)

There is also information on opening and closing the frame doors.

Front System View

Front Machine Image The front of the SJ50 machine is displayed below:



Switch Plate

Description

The Switch Plate is fixed inside the lower front doors on the machine. Cable 5186-4040 is connected to the back and fed to the rear control panel where it is terminated at XB5 (see System Electrical Drawings for details).

The **Switch Plate** houses the following buttons.

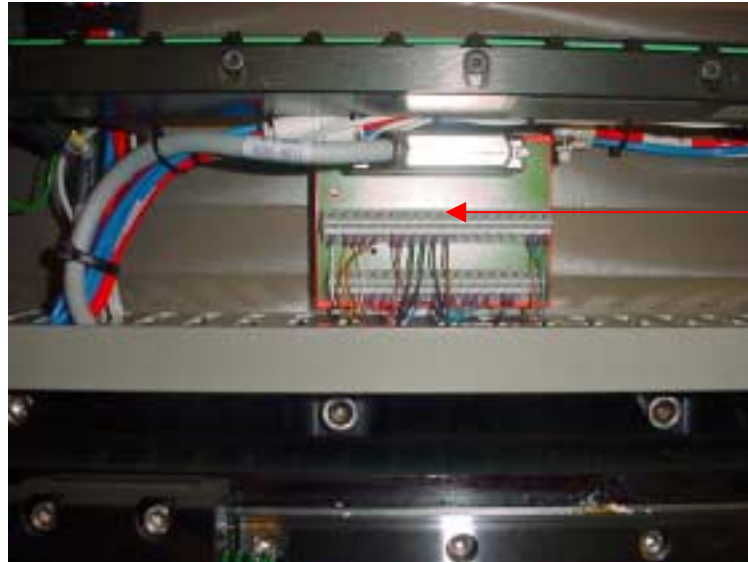
- E-Stop reset push button.
- The Rail 1 Insp/Pass switch is used to activate the pass through functionality, which allows the board to pass through the conveyor without being inspected. The default setting is Insp. (Rail2 Insp/Pass button is not applicable for this release of the machine as there is only one conveyor).
- PLC Reset button. This button is used to reset the PLC>
- Maint (Maintenance) Switch. The **Maint Switch** is used to keep a board clamped during calibration, for example, even if the hood is open.

The parts of the **Switch Plate** are illustrated below:



Front Electrical Interface

Description The **Front Electrical Interface** is shown below:



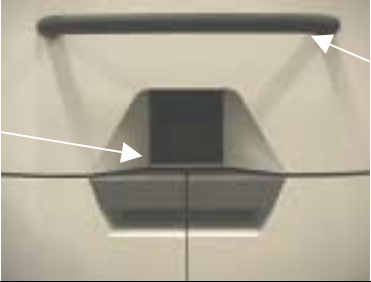


**Front
Interface**

The Front Electrical Interface Module is the electrical junction where the conveyor sensors are terminated and interfaced with cable 5186-3656. The cable is in turn fed through the base of the machine to the rear Control Panel and terminated at XB1 on the terminal rail (see System Electrical Drawings for Pin Number reference).

Opening & Closing the Frame

Steps

Use the following steps to open & close the frame:

Step	Action
1	<p>The top frame door is opened by lifting the latch handle at the front of the machine, this releases the hood and the hood rises automatically. There are springs inside the machine which make this possible. Details of the hood can be seen in the figure below.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="555 741 628 792" style="text-align: center;"> <p>Latch Handle</p> </div>  <div data-bbox="1278 719 1351 770" style="text-align: center;"> <p>Door Handle</p> </div> </div>
2	<p>When the hood is at the desired height you can keep the hood open using the hood bar as shown:</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p style="color: red;">← Hood Bar</p> </div> </div> <div style="margin-top: 10px;">  </div>
3	<p>To close the hood, remove the support of the hood bar and pull the hood down using the door handle. The hood will click back into its locked position when you close the hood down.</p>

Control Panel

Overview

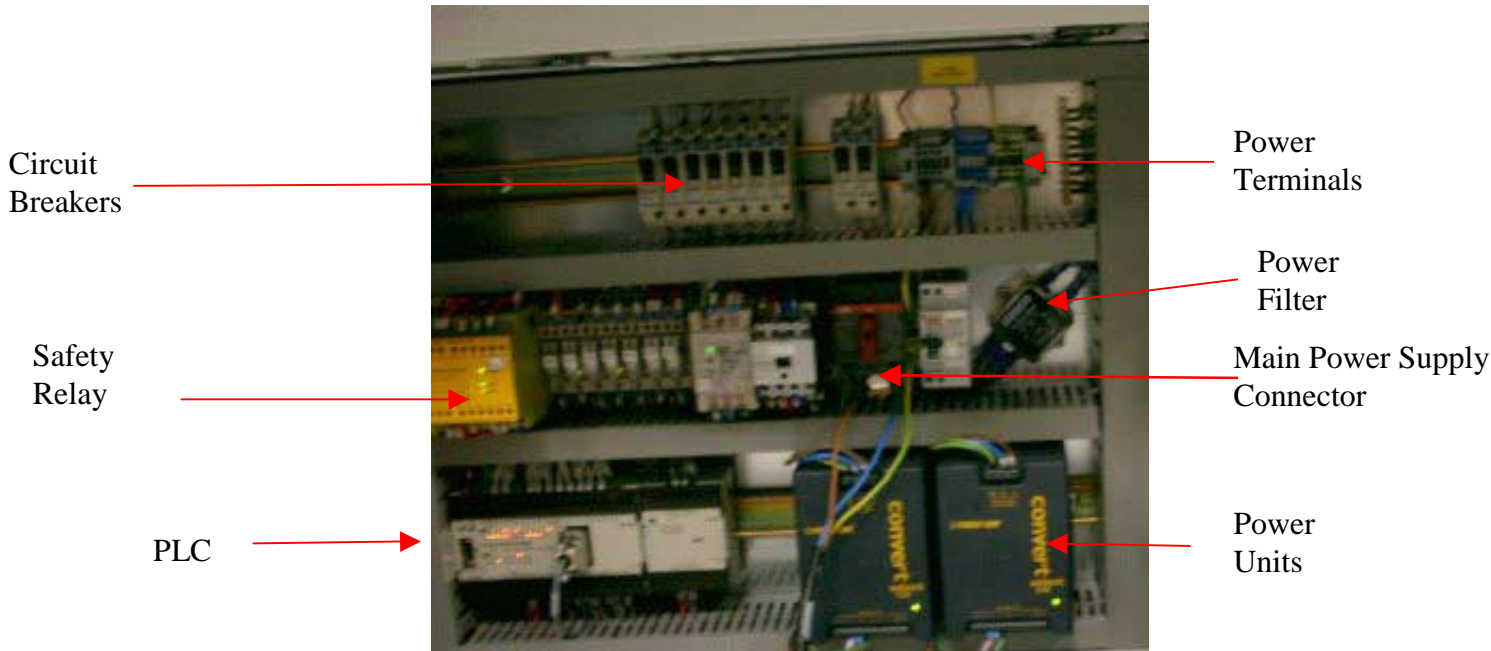
The Control Panel at the back of the machine houses the systems communications, gantry controllers, conveyor controllers, power isolators, PLC, PSU's, Pneumatics and Safety Relay.



Main Control Panel View

View

The **DC Power Supply**, main **PLC** unit and **Safety Relay** are located at the back of the machine. See details in the illustration below.



The rear of the base frame houses the majority of the systems **Electrical Controls**. These controls are secured behind a lockable door.



Note: The rear access doors cannot be opened with the **Isolator** switch in the **ON** position.

Left Door Control Panel View

Description The right panel of the machine houses the XL50 Driver:

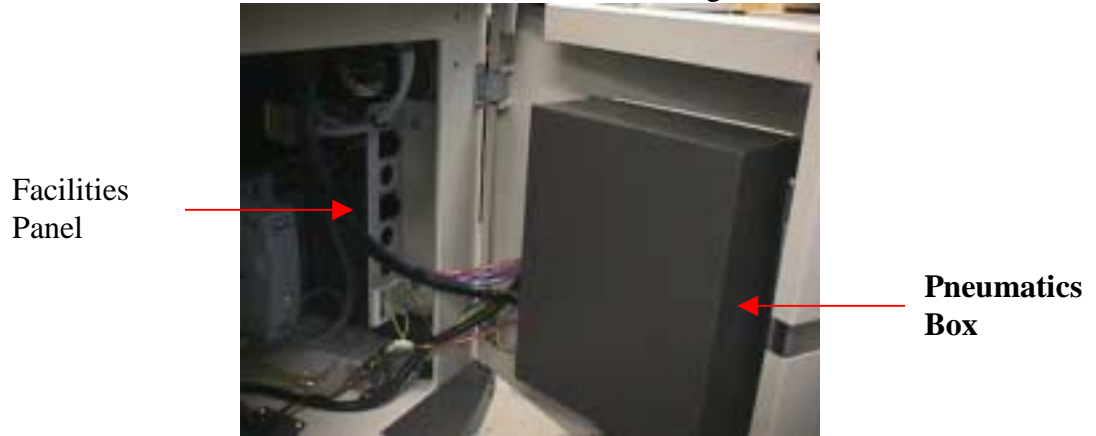


The left door Control Panel contains the Kilmorgan Amplifiers used for driving the gantry. Underneath the Amplifiers are all the associated control circuitry (for wiring information refer to the System Electrical Drawings).

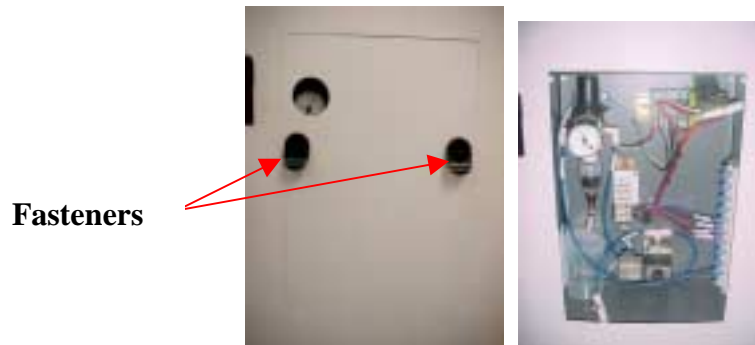
Right Rear Door Views

Back of the Rear Door

The **Pneumatics Box** is attached to the back of the right rear door as shown:



Open the **Pneumatics Box** by unscrewing the fasteners on the rear door as shown:



The main air is connected through the base of the system. Air pressure needs to be between 4 – 6 bar psi for the machine to operate successfully.

Note: You do not need to shut down the system to open the **Pneumatics Panel**.

Parts of the SJ50 Machine

Main Parts

The following is a list of the main parts of the SJ50 machine:

- PC
 - XY Table
 - Motion Controller
 - Lighting Head
 - Maintenance Key Switch
 - Board Sensors
 - PLC
 - Conveyor
 - Barcode Reader
-

Machine Accessories

The system is shipped with

- Keyboard
- Trackball
- Keyboard Support Shelf
- Anthro Arm
- Monitor
- Lighting Tower
- System Hard Drive
- Barcode Reader

They are shipped inside the machine and are wrapped in foam packing to prevent breakage. To set them up refer to [Chapter 4 Installation](#).

System PC

Type of System PC The SJ50 has **Windows 2000** compatible PC containing the application software, which is labeled. The system PC is displayed below:



The system hard drive has to be inserted into the PC during installation. For more information refer to [Chapter 4 Installation](#).

XY Table

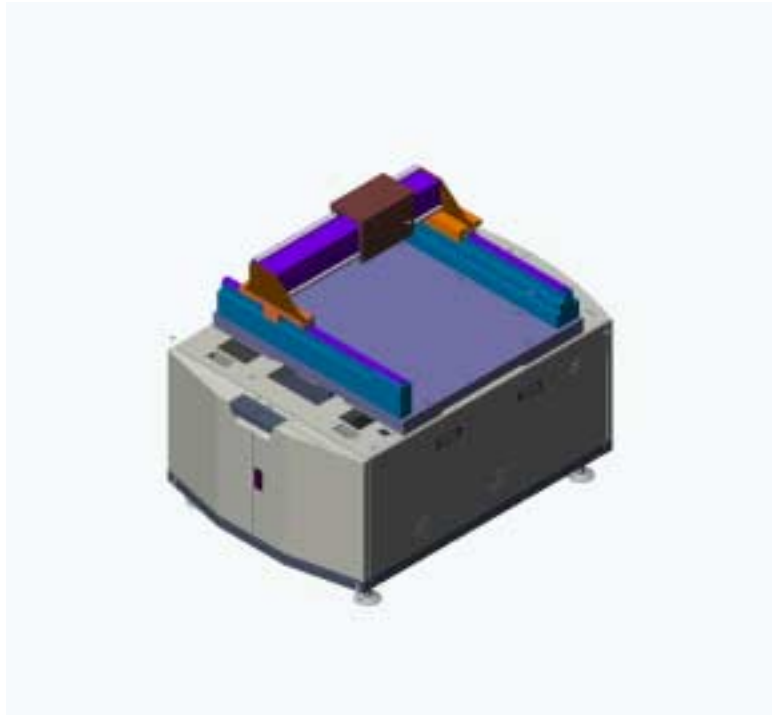
Description

The SJ50 machine is fitted with an **XY Table** linear drive system, it is housed on an aluminum base with dimensions 965mm x 914mm.

The **XY Table** consists of a gantry system:

- X-axis – this is used to move the camera forwards and backwards.
- Y-axis – this is used to move the camera from side to side.

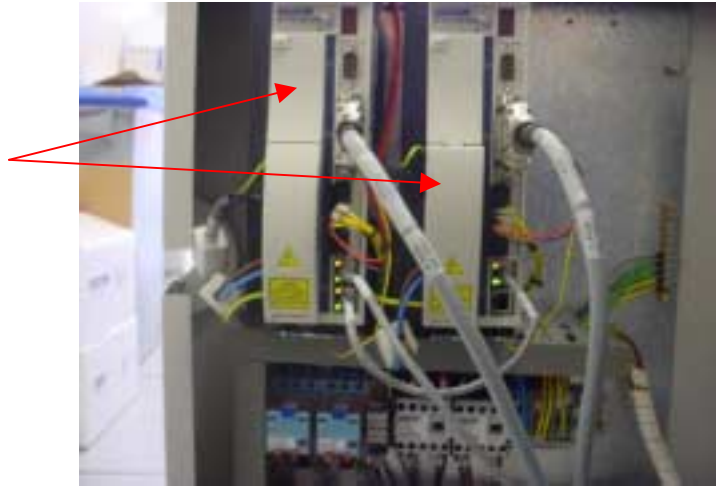
See below:



- Along the long side of the table sits the Y-axis with two aluminum risers on each side.
 - Each riser supports and locates a linear THK rail.
 - A magnet track sits along the Y-axis at the rear of the machine.
 - In the magnet track sits the Forcer (Motor) this moves along the Y-axis.
 - The X-axis travels along the Y-axis and is supported by 2 carriages, 1 mounted per linear rail.
 - The X-axis is mounted on a similar aluminum riser, which again supports 2 THK rails and a single magnet track.
 - Each axis has a travel of 510mm.
-

Motion Controller

Description The **Amplifiers** and **Control Relays** are used to run the XY axis motors. They are located behind the left rear doors as shown:

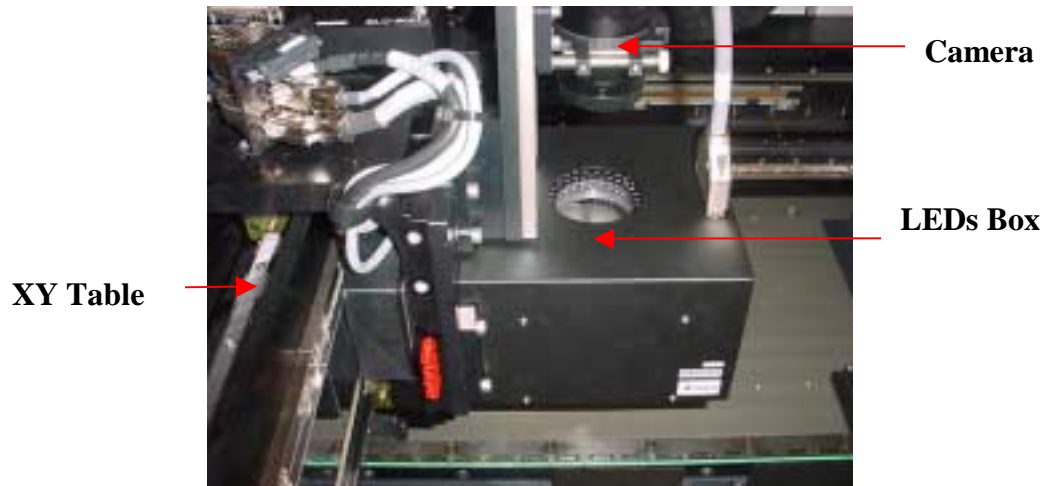


SLU- 800 Lighting Head

Description

The SLU-800 is the unified machine's new high specification Lighting Head.

The **X-Y Table** carries the camera and the Lighting Head as shown:



It delivers significant improvements in performance in several areas over the previous illumination units. The introduction of segmented lighting control is viewed as a major functional enhancement. The aluminum frame of the unit consists of 8 pillars and 2 support plates bolted together to form a rigid structure for supporting the illumination modules. The new illumination unit is made up of a two-tiered lighting scheme.

**Two-tier
Lighting
Scheme**

The Top Tier illumination assembly sits on standoffs on top of the frame. The Top Tier houses the LED's for the 90,70 & 60 rings on a large rectangular custom designed PCB. This board is populated with 5mm T-Pack LED's soldered in place. The LED's are arranged in concentric rows. All the LEDs are placed at 90° to the horizontal. This PCB is considered to be the motherboard as it holds the Power Connector for the unit and also distributes power to the Lower Tier lighting. This is achieved via eight power connectors and wiring harnesses addressing each of the segments in the Lower Tier. Power is supplied to the unit via a 25 way straight through cable.

Light from the Top Tier is directed at the appropriate angle by a custom designed Fresnel Lens. The Fresnel Lens is a sheet of plastic upon which various concentric grooves have been machined to direct the light. A sheet of diffuser material is bonded to this lens to distribute light evenly across the field of view. The lower tier houses the PCB's for the 45° coloured illumination rings. There are 4 rows at this illumination angle. The order of the colours going down are Red/Blue/Green/Red. Each ring consists of 8 small PCB boards. These boards are populated with 3mm T-Pack LED's soldered in place. The 32 PCB segments of the Lower Tier sit in respective angled grooves in the pillars. They are held in place using an O-ring for each ring. A cylindrical shaped diffuser distributes the light evenly across the field of view.

Camera

Description

The camera in the SJ50 is an Adimec camera and it is bolted to the saddle of the X-Axis. The unit consists of a Camera Lens Mount Assembly and the Adimec camera itself.

The 12V D.C. is bolted to the Camera Lens Mount Assembly. Below the Camera sits the SLU-800 Lighting Head.

This unit is used to illuminate the region of interest at different angles and colours.

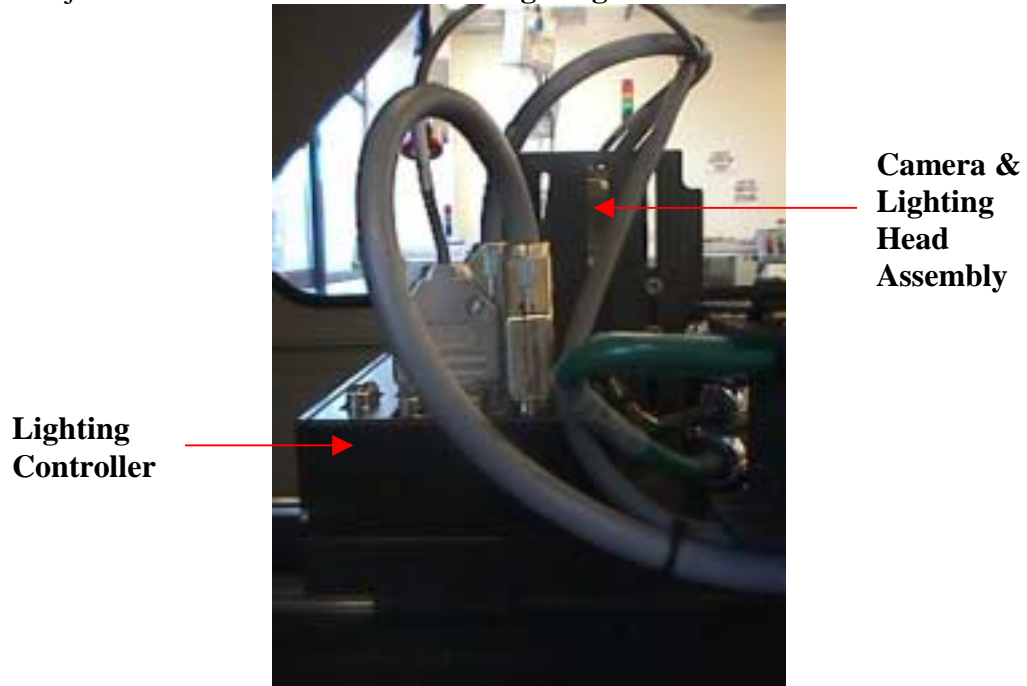
The X & Y axis moves the camera & Lighting Head in the horizontal plane around the board. The Z-Axis (if fitted) moves the complete head up and down.

Note: For more information on setting up the **Camera & Lighting Head** refer to the **Optical Setup Guide**.

SLC-800 Lighting Controller

Description

The **SLC-800 Lighting Controller** is Agilent IIO's new high specification Lighting Controller. The unit controls the switching off and on of the lighting rings on the new head. It also has the capability to program the intensity of each ring individually. The introduction of segmented lighting control is a major functional enhancement. The **Lighting Controller** is shown below:



The **Lighting Controller** is housed in a black aluminum box. It sits behind the **Camera & Lighting Head** assembly on top the **XY Table** saddle. The unit has eight configurable current output channels. The present configuration of the SLU-800 only requires seven channels so one is redundant. Each channel is matched to a separate ring on the **Lighting Head**. A special switching system permits the addressing of each one of the eight lighting segments. Communication with the PC is carried out using a RS232 Port situated on board the controller. The lighting sequence is set by sending a 4 byte Hex string to the controller. Configuration parameters and current values are also sent to the controller in a similar manner.

Lighting Controller Files

The following are files specific to the Lighting Controller:

- SLC800LightingValues.xml
 - unified_light_map.txt
 - SLC800Initialisation.xml
-

**SLC 800
Lighting Values
XML File**

The **SLC800LightingValues.xml** file is identical to **LightingConfigurationValues.xml**, which is used with the previous **Lighting Controller**.

Like the **LightingConfigurationValues.xml** file, this file contains the intensities for the various lighting rings, used to modify the brightness of the rings.

When you enter the **Lighting Controller** menu, the intensities for the current application mode are displayed on the **mA\4** column of the **Lighting Controller** menu. When you have set the intensities for the various rings in the **Lighting Controller** menu, these new intensities overwrite the intensities in the **SLC800LightingValues.xml** file.

In **SLC800LightingValues.xml** file, the following changes have been made to the LEDs:

- There are now four 45-degree rings— **45R**, **45B**, **45G** and **45L**. This is called **Quadrant Lighting** and is explained in more detail below.
- A 90-degree ring will replace the 80-degree ring.
- A 30-degree ring will also be included in the xml file but this ring will not be used for this release.

Note: There have been no changes made to the 60 and 70-degree ring.

Files for this revision are labeled **Rev3** and this label is included in the xml file as shown below. Also notice the new lighting controller type.

```
- <LightingControllerHeader>  
  <FileRevision>Rev3</FileRevision>  
  <ControllerType>SLC800</ControllerType>  
</LightingControllerHeader>  
- <PreMono>  
  <LightingRing Name="90" Current="336" />
```

**Unified
Lighting Map
Text File**

The new Lighting Head **SLU-800** now has segment and quadrant lighting capabilities (this is not obvious to the user) and because of this, a new lighting map text file is required.

This file (**unified_light_map.txt**), which is located in **C:\cpi\data**, takes into account the original working of the **light_map.txt** file and has added the new segment and quadrant lighting functionality.

The structure of the file has also changed to allow flexibility for adding new functionality in future releases.

The file is divided up into the following sections:

- Ring bits
- Application modes
- Quadrant bits
- The application mode to load the software
- The various sub modes for the corresponding application mode

Note: The **unified_light_map.txt** file is used for both colour and mono systems.

**Segmented
Lighting
Functionality**

Segmented Lighting is used to divide the 45-degree LED into four parts – 45R, 45G, 45B and 45L. The other LEDs do not have Segmented Lighting functionality associated with them.

SLC800 Initialization XML File

The **SLC800Initialisation.xml** file contains all the information needed to initialize the **SLC-800 Lighting Controller**. This information is read by the system on startup and sent to the **SLC-800 Lighting Controller**.

The minimum and maximum current output (or intensity) allowed to be sent to the Lighting Controller for each lighting ring (from the menu) is also included in this file. While in the **Tools ->Lighting Controller** menu, intensities above or below the values specified in this file are not permitted.

This following is an example of the contents of this file:

```
- <LightingControllerHeader>
  <FileRevision>Rev1</FileRevision>
  <ControllerType>SLC800</ControllerType>
</LightingControllerHeader>
<ExposureTime>ST080</ExposureTime>
<TriggerLeadingEdge>TS0</TriggerLeadingEdge>
<MaximumCurrentToController>4000</MaximumCurrentToController>
- <MinimumCurrentOutputs>
  <LightingRing Name='90' Minimum='270' />
  <LightingRing Name='70' Minimum='270' />
  <LightingRing Name='60' Minimum='270' />
  <LightingRing Name='45r' Minimum='270' />
  <LightingRing Name='45b' Minimum='270' />
  <LightingRing Name='45g' Minimum='270' />
  <LightingRing Name='45L' Minimum='270' />
</MinimumCurrentOutputs>
- <MaximumCurrentOutputs>
  <LightingRing Name='90' Maximum='4000' />
```

where:

<FileRevision>

indicates which version of the Lighting Controller is being used.

<ControllerType>

indicates which Lighting Controller is installed on the machine.

<ExposureTime>

indicates the time period that the Lighting Controller is supplying a current to the LEDS when it receives an exposure signal. The 080 number corresponds to 8 milliseconds. Therefore when the camera takes an image during the inspection the LEDS are on for 8ms.

<TriggerLeadingEdge>

<MaximumCurrentToController>

refers to the maximum current [in 1/4 milliamp units] that any channel in the Lighting Controller can deliver. Therefore each channel is limited to 1A

Maintenance Key Switch

Description

The **Maintenance Switch** is used for adjusting air pressure on the clamps and stop valves. This switch is shown below:



Note: The **Maintenance Key** is designed for use by qualified engineers only. It can only be operated when the hood is open (E-stop on). This means that all motors are de-energised.

Caution should be used when activating the Maintenance Key Switch as misuse may lead to injury.

When the **Maintenance Key Switch** is in the **I** position, **24V** is supplied to the **Pneumatic Control Panel** to allow actuation of the clamps and stop valves.

Note: Actuation of the valves is achieved through the software.

Board Sensors

Description The **Entry, Exit** and **Board in Place Sensors** have to be calibrated so that the board triggers the sensors and not the **Gantry**, which is **42mm** above the **Conveyor**.

The sensor is **80mm** below the **Conveyor**, so set the sensor so that it is activated between **80mm** and **100mm**.

Setting up the Board Sensors After installation and starting the machine and software, set up the sensors as follows:

1. Check 24V and supply is present by visually inspecting that the red indicator light is illuminated.
2. Place a **Fiducial Plate** on the **Conveyor Rails** (not on the **Conveyor Belt**) over the sensor.
3. Adjust the sensitivity until the sensor just picks up the **Fiducial Plate** (An orange indicator light on the bottom of the sensor lights when the sensor is activated).
4. Remove the board and move the **Gantry** and **Camera Head** over the sensor to ensure that they do not trigger the sensor.
5. Adjust the sensitivity of the sensor by turning the small yellow tuning screw on the sensor. This is illustrated below:



Board Sensor

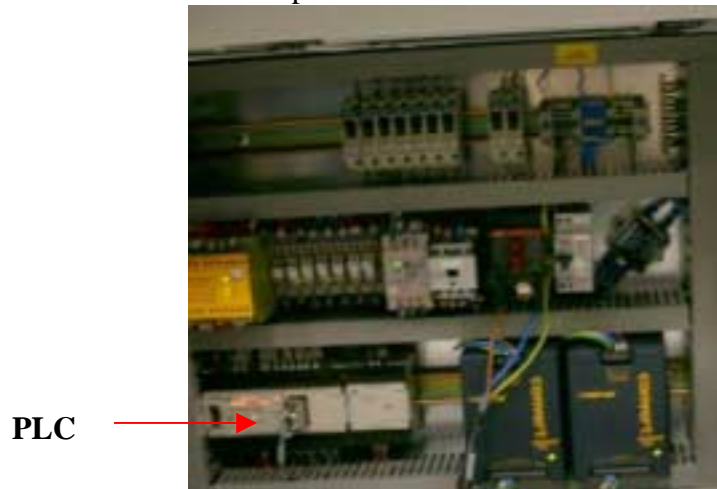
Programmable Logic Controller (PLC)

Description

The **Programmable Logic Controller (PLC)** controls the **Conveyor**, **Lighting Tree**, monitors the machine **Sensors** and acts according to the application required.

It provides communication to the **PC** and all the I/O of the machine (for example the Lighting Tree, SMEMA signals, Air on inputs etc). It is also used for driving the conveyor.

It is located in the control panel at the rear of the machine as shown:



PLC Errors

When a PLC fault occurs the **Lighting Tower** flashes red.

The software then gives a readout of what the error means and any action to be taken to remedy the fault.

The PLC can be reset through the software or manually by depressing the **PLC Reset** button beside the maintenance key switch as shown:



Conveyors

Types of conveyors

This manual is relevant to the following revisions of the single lane conveyor:

- 1.0
 - 2.0
 - 3.0
-

Conveyor Controls

The **Conveyor** is controlled by the XL50.

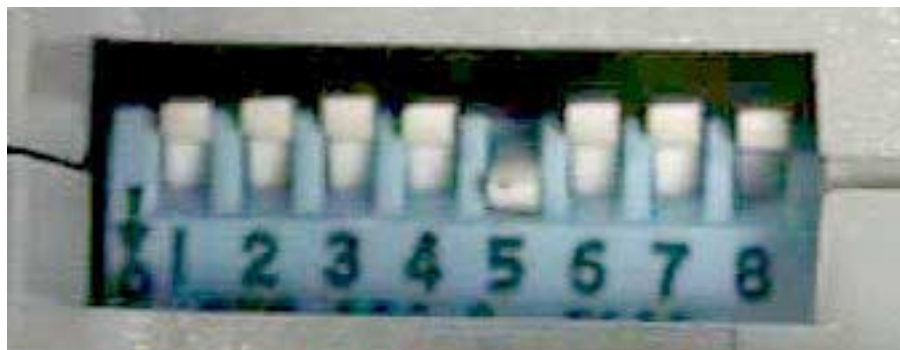
Drive Controller

There is one **Drive Controller** used for a single rail system (two **Drive Controllers** for dual rail systems) called the **XL50 Controller**.

The **XL50 Controller** runs the motors, which drives the conveyor.

The **XL50 Controller** is shown below:

The controller has dipswitch settings, **5** must be switched on to run the conveyor.



Consult System Electrical drawings for wiring details.

Barcode Reader

Description

The SJ50 barcode system has been redesigned so that you can interchange Barcode Readers. This is done by each Barcode Reader interfacing with a Breakout Box via a custom designed cable. No machine wiring is required.

There are two types of setup:

- Single Barcode Reader setup mode - no Microscan IB105 Decoder Module is required. For more information on setting up for a single Barcode Reader, refer to Programming a Single Barcode Reader.
 - Dual Barcode Reader setup mode - Microscan IB105 Decoder Boxes are required. For more information refer to Programming Dual Barcode Readers.
-

Chapter 4 Installation

Introduction This chapter is used to describe how to install the SJ50 machine.

Contents This chapter contains the following topics:

Topic	See Page
Installing the Machine	49
Unpacking the machine	50
Ensuring Facilities/Requirements are Adequate	52
Adjusting the Height of the Feet	58
Mounting the Lighting Tower	59
Fitting the Anthro Arm	60
Attaching the Keyboard Shelf	61
Connecting the Cables	62
Inserting the System Hard Drive	66
Checking Air Pressure	68
Programming a Single Barcode Reader	69
Programming Dual Barcode Readers	75

Installing the Machine - Summary

Main Steps

The following is a list of the main steps used to install the machine:

1. Unpack the machine.
 2. Ensure facilities are adequate.
 3. Adjust the height of the machine.
 4. Mount the Lighting Tower.
 5. Fit the Anthro Arm
 6. Attach the Keyboard shelf to the Anthro Arm, and place the keyboard and mouse on the shelf.
 7. Connect the mains cables, network cable and air pipes.
 8. Insert the system hard drive.
 9. Take the blocks off the gantry.
 10. Check there is adequate air pressure.
 11. Programme the Barcode Reader(s).
-

Unpacking the machine

Steps

The system is shipped in a sturdy wooden protective crate.
To remove the machine from its crate use the following steps:

Step	Action
1	Check all the Tip'n'tell Indicators, Shock Sensors etc.
2	Remove the crate top panel by unscrewing the carriage bolts at the top of the crate using the appropriate socket head driver.
3	Remove the front panel to expose the machine.
4	Remove the two screws securing each foot to the pallet. This frees the machine for lifting from its crate by use of a forklift. Please read Handling the Machine Tips , before removing the machine from its crate.
5	Remove the packaged parts from the accessories box that accompanies the machine.

Handling the Machine Tips

When handling the SJ50 machine bear in mind the following information:

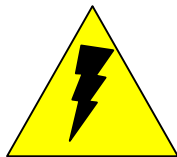
1. The system is designed for transportation and handling by either a hydraulic pallet truck or forklift.

Note: It is important to note that the lifting device used must be rated to lift and carry a 2 tonne load. The forks of the lifting device should be a minimum of 1.0 metres long with a minimum fork spacing of 0.5 metres wide at the inside of the forks.

2. The system is designed to be lifted from any of its four sides, however, when inserting the forks of the lifting device under the machine, care must be taken to ensure that the lower panels are not damaged as a result of poor handling.
3. When lowering the system from an elevated position the lifting device operator must ensure that all sides of the machine are clear from obstructions.
4. Having ensured that the correct space is available on the production line the system can be lifted and handled into position.
It is important that the machine is aligned so that the system conveyor fixed rail is in-line with the fixed rails of the conveyors on either side of the machine.

If the machine is being used outside of the production line a conveyor must be fitted both upstream and downstream for safety reasons.

5. Lower the machine gently into position.

**WARNING**

The machine must never be raised while electrical or pneumatic power is connected.

Ensuring Facilities/Requirements are Adequate

Tools List

The following is a list of required tools for SJ50 installation:

1. Set of Metric Hexagonal Allen keys; 1.5, 2, 2.5, 3, 4, 4.5, 5, 5.5, 6, 7, 8, 9, 10.
 2. Set of insulated slotted screwdrivers: 2.8, 4.0, 5.5, and 6.5.
 3. Pistol grease gun.
 4. Natural Bristle artist's brush.
 5. Lint-free cloth.
 6. Anti static cleaning spray.
 7. Dow Corning Molykote 44 grease.
 8. Fast dry precision cleaner solvent; RS#203-0716.
 9. Aerosol optical instrument cleaner; RS#217-3857.
 10. Megger BM101/4 - Insulation resistance tester.
 11. Flow-rate sensor.
 12. 20mm/46mm spanner.
-

Specification Table

Specifications are described in the following sections:

- [Software System Functional Specifications](#)
 - [Hardware System Functional Specifications](#)
 - [Supply Facilities Functional Specifications](#)
 - [Physical Dimensions Specifications](#)
-

Software System Functional Specifications

Table The specifications for the software system are provided in the following table:

Operating System	Windows 2000
User Interface	Graphical User Interface with password protected user levels.
Data Transfer Interfaces	Any ASCII file format via floppy disk or Ethernet (TCP/IP or MS Network).

Hardware System Functional Specifications

Table The specifications for the hardware system are provided in the following table:

Computer System	High Speed Pentium IV™ based PC in an industrial rack.
Host Communications	Thin wire or twisted pair Ethernet supporting TCP/IP or MS Network.
CAD File Formats	CAMCAD
Imaging Hardware	<ul style="list-style-type: none"> • Matrox Meteor-2DIG/2 • Matrox G450 32MB Dual AGP card
Camera System	<ul style="list-style-type: none"> • Adimec Camera CCD 1280 x 1024 pixels, Electronic Shutter. • Optics: Telecentric gauging lens. Field of View: 26mm x 20mm @ a Pixel Size of 20µm. • Illumination: Multi-layer LED.
X-Y Robot System	<p>Gantry robot system with linear motors and linear encoders.</p> <ul style="list-style-type: none"> • Travel: 510mm. • Velocity (x, y): 1500mm (60") /Sec. • Encoder Resolution: 0.5µm. • XY Motor Type: LC-80-240-D-NC-HET-TE
Board Clearance	<p>Depends on application:</p> <ul style="list-style-type: none"> • Top side either 28mm (as standard) or 12mm (with low-level lighting fitted). • Bottom side 50mm. • Minimum edge clearance 3.5mm. • Maximum edge clearance 6.0mm.
Conveyor System	<p>SMEMA standard conveyor supplied with speed adjustment. 20mm – 625mm per second. Conveyor length 1.0/1.2 metres.</p>
Position	<p>Depends on application:</p> <ul style="list-style-type: none"> • Post-Oven/Post-Wave/2D Paste (with h/w modifications). • Pre-Oven. • Pre-placement in the SMT manufacturing process.

Enclosure	The enclosure is designed to conform to CE Mark standards for electrical and mechanical industrial safety. Note: Auto width adjustment available as standard.
------------------	---

Supply Facilities Functional Specifications

Table

The supply facilities specifications are provided in the following table:

Electricity	100 –120V, 200 – 240V
Air Requirements	Clean filtered air at 4 -6 Bar, 50/60 Hz at 16A. 4CFM. 12 mm or 6mm input line.
Operating Temperature	5 TO 40°C

Physical Dimensions Specifications

Table

The supply facilities specifications are provided in the following table:

Foot print	994mm x 1548mm
Height	<ul style="list-style-type: none">• Approximately 2100mm including Light Tower.• Approximately 1400mm excluding Light Tower.
Weight	1400 kg (approximate).

Adjusting the Height of the Feet

Height Adjustment Steps

Once the machine has been placed roughly in the correct location, adjust the system height to ensure that boards can travel from the **Upstream Conveyor**, through the system, and on to the **Downstream Machine**.

Adjusting the 4 machine feet varies the height of the system.

Adjust the height of the machine using the following steps:

Step	Action
1	To adjust the feet, the foot-locking nut must be loosened using a 46mm spanner. With the Locking Nut loosened, the feet can be raised or lowered using a 20mm spanner on the spanner flats provided at the base of the threaded bar
2	Once the correct height has been achieved, the feet locking nuts must be retightened with the 46mm spanner.
3	Ensure that all four feet are solidly on the ground.
4	It is important to ensure that the machine weight is evenly distributed between the four feet, otherwise excessive vibration during operation may occur.

Mounting the Lighting Tower

Steps

The system's **Lighting Tower** is mounted on the roof of the machine.

After unpacking the packaged parts from inside of the machine the **Lighting Tower** can be fitted on the roof. This is done using the following steps:

Step	Action
1	Feed the cable through the mounting hole on the roof and fit the Lighting Tower , with the four screws provided and a 3mm Allen Key .
2	Fit the two connectors together inside the hood using sticky-back cable ties.
3	Attach to the Cable Connector.

Fitting the Anthro Arm

Steps


Use the following steps to fit the **Anthro Arm**:

Step	Action
1	Remove the four mounting screws. See below: 
2	The Anthro Arm is then placed on the machine and the holes in the arm mounting plate lined up with the holes in the base frame. See illustration above.
3	Put back in the three mounting screws to secure the Anthro Arm .

Attaching the Keyboard Shelf to the Anthro Arm

Fitting the Shelf Steps

Use the following steps to fit the shelf:


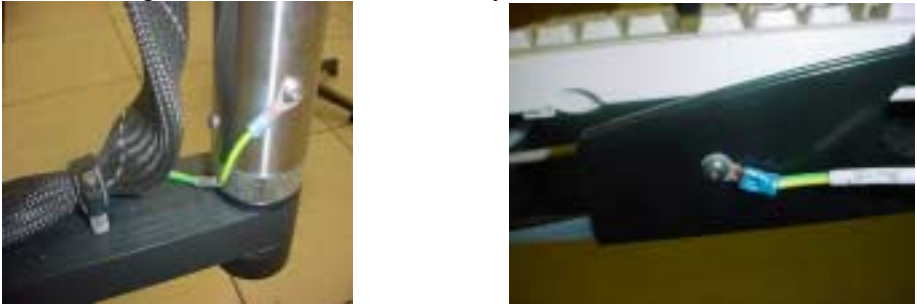

Step	Action
1	Remove the black rubber cap and the Grommet strips from the vertical tube on the Anthro Arm .
2	Slide the Shelf down the vertical tube and fix in place by tightening the Quick Release Handle , as illustrated below: 

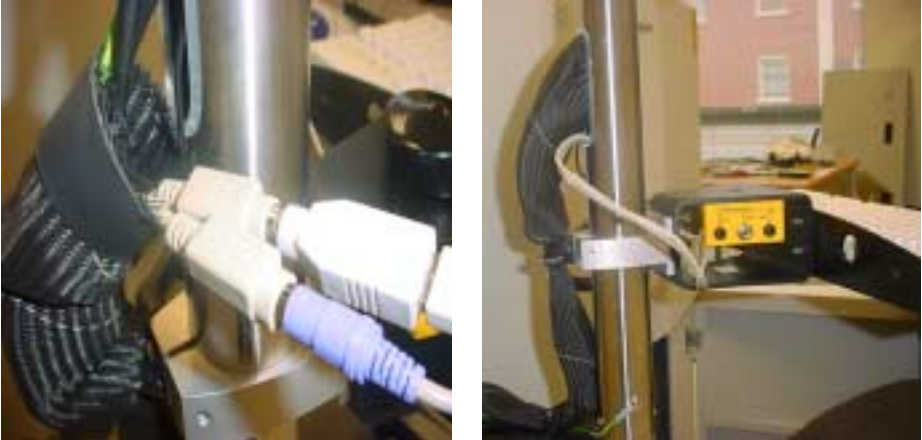

Connecting the Cables

- Types of Cables** There are two types of cables:
- Cables between the machine and the Monitor/Keyboard.
 - Mains Cables
 - Earth Cables
-

Connecting Cables Between SJ50 Machine and Monitor/Keyboard

Steps Connect the cables using the following steps:

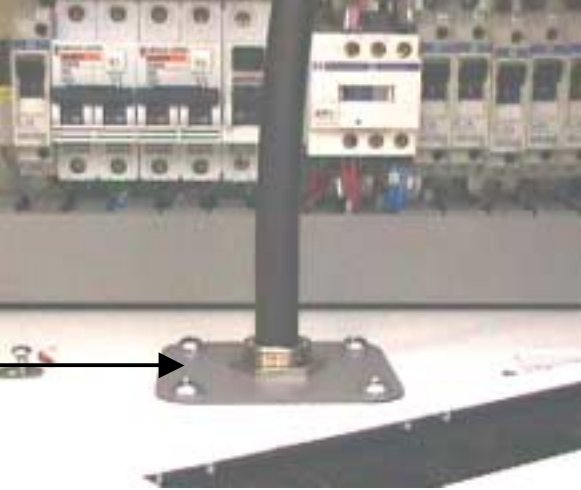
Step	Action
1	<p>Remove the Antro Arm from the accessories box and fix it in position using three M5x30 SHC.</p> 
2	<p>Feed the monitor power, monitor signal, keyboard, mouse and keyboard earth cables through the stocking. The vertical pole earth runs outside the stocking as shown. Connect the keyboard earth as shown.</p> 
3	<p>Connect the power and VGA Signal Cables to the monitor by running them through the vertical pole as shown.</p> 

4	<p>Connect the Keyboard and Trackball Cables. Leave excess cable neatly held with tie-wrap in pole.</p> 
6	<p>Replace the Grommet Strips and Rubber Cap.</p> 

Connecting Mains Cable



Steps

Connect the **Mains** cable using the following steps:

Step	Action
1	<p>Feed the Mains cable through the slot in the base of the machine into the Control Panel. The Mains cable must be fed through cable gland and securely tightened as shown:</p>  <p>Cable Gland</p>
2	Remove the trunking lid and route mains to Mains Isolator.
3	Secure terminals of each core. Live/Brown to L1. Neutral/blue to L3. Earth into yellow/green terminal.

Inserting the System Hard Drive

Steps Use the following steps to insert the **Windows 2000** operating system hard-drive:

Step	Action
1	Open the lower front doors of the machine using the key provided. This exposes the E-Stop Reset switches, industrial PC, the Motor Controller and the Pass-through switch.
2	Open the Industrial PC bay access door with the key provided. This exposes the PC ON/OFF switch, the removable Hard Drive Bay , the CD-ROM and the Floppy Disk Drive .
3	<p>The Windows 2000 hard-drive can now be gently inserted into the removable hard-drive bay and pressed home with slight pressure until the Cradle Lock engages. This is indicated by an audible click when the drive has seated in the bay. See below:</p> 
4	<p>Turn the cradle-locking key to the lock position:</p> 

4 Remove the **Hard Drive Key**.



Attention!

A designated person should hold the front and back panel and hard-drive keys.

Checking Air Pressure




Steps

Check air pressure using the following steps:



Step	Action
1	Look at the Air Pressure gage on the rear right hand door.
2	It should be between 4 – 6 bars or 58 – 87 PS1

Programming a Single Barcode Reader

Steps Set up a single **Barcode Reader** using the following steps:

Step	Action
1	<p>Install the breakout box on the SJ50 by attaching the Barcode Reader Breakout Box onto the Rear Mounting Panel using 2 M4x6 Button Heads. Ensure that the Earth is connected to one of them, as shown in picture below.</p> 
2	<p>Attach the rear mounting panel onto the back hood panel of the machine, using M6 Washers and Nuts, as shown below:</p> 
3	<p>Route the Cable 5186-0763 to the rear Control Panel and plug into position as shown below:</p> 

4	<p>Mount the MS 710 Barcode Reader on the stand and the SJ50. Attach the barcode mounting bracket to 6" MicroScan 710 Barcode Universal Stand, using 4 M5x6 button head screws, as shown below:</p> 
5	<p>Attach the MicroScan Universal Stand to MicroScan Adapter Plate using screws provided with the MicroScan Assembly, as shown below.</p> 
6	<p>Screw the Barcode Reader onto the Adapter Plate using M4x8 Counter Sinks, as shown in picture below.</p> 

7	<p>Place Barcode Clamp Bracket behind the left hand side panel, and screw the Barcode Mounting Bracket Assembly to it using both Adjustable Hand Levers. Run Microscan Cable through the Side Panel and Cable Tie to Side Panel, as shown in picture below:</p> 
8	<p>Connect the Breakout Box to the Barcode Reader. Plug Serial Cable 2003-2206/5186-0804 into Port XS42 on the Barcode Reader Breakout Box, as shown in picture below:</p>  <p>Note: The Serial Cable should be present in every machine.</p>
9	<p>Configure the Ms 710 Barcode Reader user the Scanner Configuration Tool (see Scanner Configuration Tool) or the Microscan ESP software as standard.</p>

Scanner Configuration Tool

Description The **Scanner Configuration Tool** is used to set the basic settings for the **Barcode Scanner**.

To set more advanced setting you need to use the ESP software.

Starting the Scanner Configuration Tool

Start the Scanner Configuration Tool by running the program **ScannerConfig.exe**, which is kept in the **C:\program files\config** directory. The following menu is displayed:



Scanner Configuration Tool Settings



The recommended values for each of the settings are displayed below:

Setting	Recommended Setting
Scanner Select	MS 710 Scanner
Header Select	0 or other depending on the customer.
Code Type	Code 39 or Code 138 depending on the customer
Comm Port	4

Microscan ESP Programme

Description ESP software is produced and supplied by Microscan. ESP is used for carrying out more advanced configuration of the Barcode Scanner. It can also be used for standard configuration.

Starting the ESP Software Start the ESP software using the following steps:

Step	Action
1	Start the ESP software.
2	Select the MS-710 model as shown: <div style="text-align: center;">  </div>
3	The following menu is displayed: <div style="text-align: center;">  </div>

Scanner Settings

The **Barcode Scanner** has the following settings

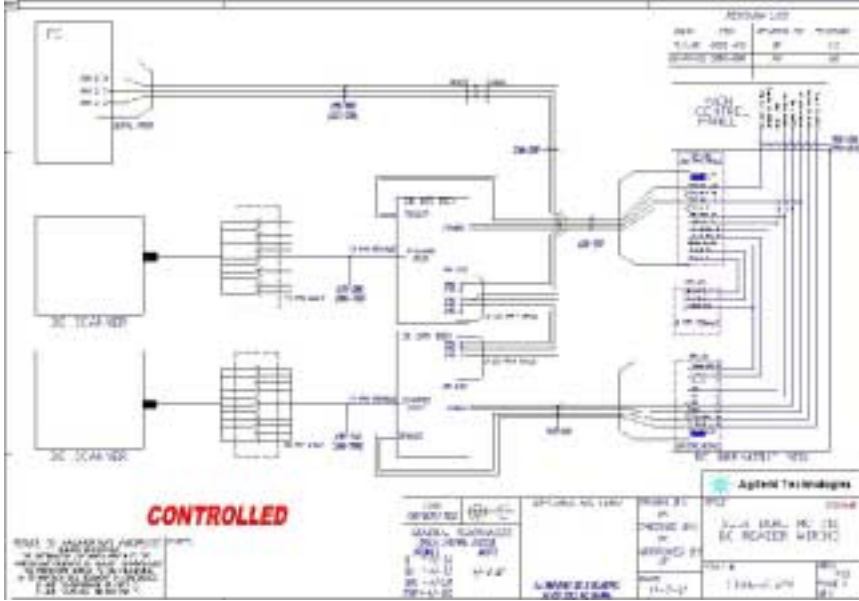
Setting	Value
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	Hardware

Saving Settings

Right click on the **Program Values** column and in the resulting popup menu option select **Save to scanner -> For Power On, not factory**.

Programming Dual Barcode Readers

Steps Programme the Dual Barcode Readers using the following steps:

Step	Action
1	<p>On an SJ50 connect the dual barcode kit as in the following diagram.</p>  <p>Magnify the picture to see the electrical drawing in greater detail.</p>
2	<p>Cable 5186-2530 has two 25 pin connectors. The first connector on the cable can be referred to as the master and the second one can be referred to as the slave. The slave connector is the last connector on the cable.</p>
3	<p>When programming each barcode reader for dual setup (using the Scanner Configuration Tool or Microscan ESP), each barcode reader is programmed with a different header, normally 0 and 1. This is done so we can differentiate between top & bottom barcode readers when a barcode is read. The header is appended to the start of each barcode.</p>
4	<p>There are two Microscan IB105 boxes in dual barcode reader setup, one is connected to each barcode reader. The master cable is used to program each barcode reader (including the Microscan IB105 box) in turn. Therefore connect each barcode reader and it's interface box in turn to the to the master 25 pin connector.</p>
5	<p>All other aspects of programming the barcode readers are standard and just like programming a single barcode reader.</p>

Chapter 5 SJ50 Power & Communications

Introduction This chapter is used to describe the power and communications used by the SJ50 machine.

Contents The following topics are covered in this chapter:

Topic	See Page
Electrical Power	77
Pneumatic	78
S.M.E.M.A Communications	79
System Connections	81

Electrical Power

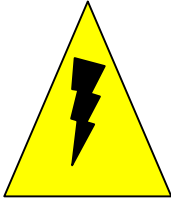
Electrical Power

Operating range of the system is 100 - 120 VAC and 200 – 240VAC.

National Wiring Code

Equipment needs to be installed according to the applicable national wiring code (NEC) and all applicable local regulations.

Main incoming protected Earth must be terminated to the base of the Earthing stud.

	<p style="text-align: center;"><u>WARNING</u></p> <p style="text-align: center;">All system sub-circuits are 230VAC. Only connect equipment rated to this voltage to the system.</p>
---	--

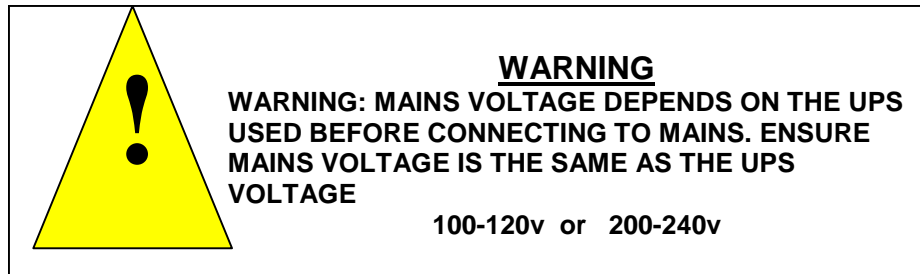
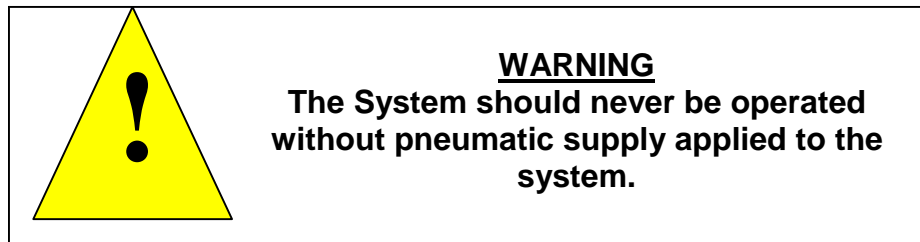
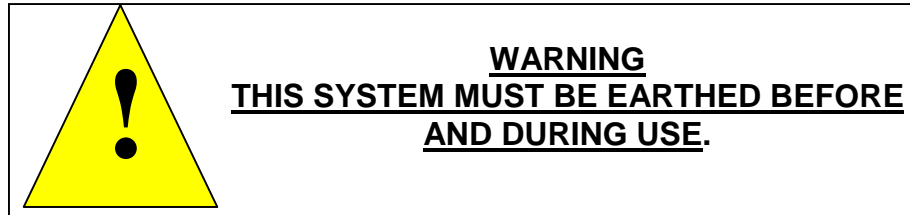
Note: The link wire must be a minimum cross-sectional area of **6mm²** (or **8AWG**).

Pneumatic Supply

Description

Pneumatic supply is supplied to the system through the **Pneumatic Inlet Port** in the rear **Electrical Enclosure**

This port is a **6mm** quick fitting connector and mates with a US standard ¼ inch fitting. The system must be supplied with 5 bar clean filtered air (4 cubic feet/minute).



S.M.E.M.A Communications

Description

A SMEMA standard is used for the machine-to-machine electrical interface, which controls the proper sequencing of boards.

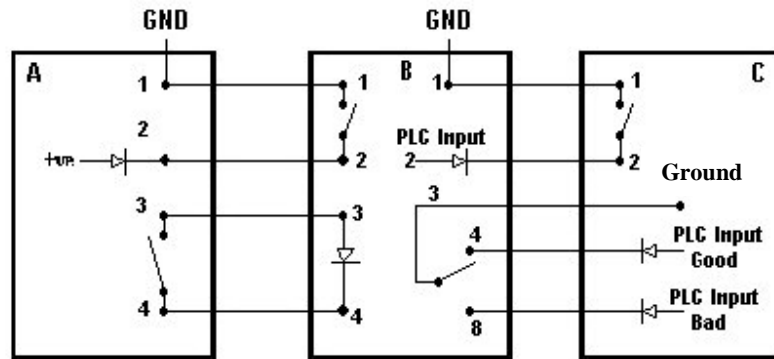
It uses two signal lines: “**Machine Not Busy**” and “**Board Available**”, to indicate when the system can receive a board and when the system has completed a board.

Signals are communicated between machines via the **14-pin SMEMA Connector**. The “**Machine Not Busy**” and “**Board Available**” signals use **Pins 1 and 2, 3 and 4** respectively.

The minimum requirements are to switch **30 V, 10 mA**.

At **10 mA** the output “**LOW**” must not exceed **0.8V**.

In the sequence outlined below, boards are transferred from **Machine A** to **B** and from **B** to **C**.



Pins 1 to 4 of SMEMA Connector

In the drawing shown above, **Machine B** is “**Not Busy**” as its **Pins 1 & 2** are open. **Machine A** has “**No Board Available**” as its pins **3 & 4** are open.

- If **Machine A** did have a board available for transfer, the board would trip its **Exit Sensor** and the machine would close contact between **Pins 3 & 4**. This would give the signal to **Machine B** that there is a “**Board Available**”.
- If **Machine B** were processing a board, it would close contact between **Pins 1 and 2** to give the “**Machine Busy**” signal to **Machine A**.

Note: Board transfer only occurs when **Machine A** has a “**Board Available**” (contact closed) and **Machine B** is “**Not Busy**” (contact closed).

**S.M.E.M.A
Connections**

The **S.M.E.M.A.** interface ports are located inside the rear electrical enclosure of the system.

The upstream and downstream connections must be made for the system to function correctly while operating **Single** or **Dual Lane**.

The system comes equipped with two **S.M.E.M.A. Cables** for each conveyor line to connect the system to equipment upstream and downstream.

- The Upstream Cable p.n. 5186-0614 must be connected to the SMEMA UP Connector on the Facilities Panel.
- The Downstream Cable p.n. 5186-0615 is connected to the SMEMA DOWN Connector.

These cables need to be routed through the base of the system using the cutout provided. These cables can also be connected in reverse.

System Connections

Network Connections

An interface connection is located in the rear electrical enclosure to provide for network connectivity of the system.

If the networking option has been supplied, please contact your system administrator for details of connecting the system to the network.

Serial Connections

A serial port connection is provided on the **Facilities Panel** to allow for the connection of miscellaneous equipment if required (for example **Barcode Readers**).

Chapter 6 Starting up the SJ50 Machine

Introduction This chapter is used to describe how to start up the SJ50 machine.

Contents The following topics are covered in this chapter:

Topic	See Page
Prerequisite Action	83
Powering up the System for the First Time	84
Powering up the Machine from the 'Mains Off' Position	85
Powering up the Machine to Restore from E-Stop	86
Machine Cycle	87

Prerequisite Action

Steps

Before turning the system on at the **Mains Isolator**, carry out the following steps:

Step	Action
1	Measure the incoming power with a Voltmeter and make sure Q1 is switched off. It should measure 100-240VAC.
2	Measure the voltage between L and Earth on the Main Isolator. This depends on supply.
3	Measure between N and Earth on the Main Isolator, this should measure at 0V.

Powering up the System for the First Time

Steps


When you are powering up for the first time carry out the following steps:

Step	Action
1	Ensure that only trained personnel have connected the electrical power to the system.
2	Measure the voltage of Q1 and ensure that this is the rated voltage of the machine.
3	Switch on all other MCBs .
4	Verify all circuit breakers are on.
5	Ensure main switch is OFF .
6	Ensure that the X-Y Table is free to move over its entire envelope before continuing. You can manually move it around its enclosure.
7	Ensure that the Conveyor is free from obstruction.
8	Ensure the Maintenance switch is in the O position.
9	Ensure that the top frame is fully closed and that the E-Stop button is depressed before continuing.
10	Close the rear doors, lock them and turn on the machine at the Main Isolator.
11	Turn the key switch at the front of the machine to the ON position.
12	Ensure the Run Light is illuminated.
13	Ensure the Pass Thru switch is set to Inspect.
14	Turn on the Monitor.
15	Release the red E-Stop push button.
16	Turn on the Industrial PC .
17	Reset the emergency stop by depressing the E-Stop reset button.

Powering up the Machine from the 'Mains Off' Position

Steps

When you are powering up the machine from the 'Mains Off' position, ensure the following:

Step	Action
1	Turn the Mains Isolator to the ON position when the rear access doors are locked.
2	Ensure the Maintenance Key Switch is in the O Position.
3	Ensure that the X-Y Table is free to move over its entire envelope before continuing. Remove any tools or equipment that may hinder the table as it moves inside the enclosure.
4	Ensure the Maintenance Switch is in the O position.
5	Ensure that the top frame hood is fully closed and the E-Stop button is pushed in before continuing.
6	Turn the key switch at the front of the machine to the ON position if not already in this position. The green indicator should light.
7	Turn on the Motor Controller unit at the ON switch.
8	Turn on the Monitor .
9	Release the E-Stop push button by pulling it up.
10	Power on the Industrial PC at its ON switch and await the log-on prompt. This can take two minutes.
11	<p>Push in the E-Stop Reset button, which is the blue button located behind the lower front doors on the machine. This is illustrated below:</p> <div style="text-align: center;">  <p>E-Stop Reset Button</p> <p>Location of E-Stop reset button</p> </div>
12	Power on the Industrial PC at its ON switch and await the Log-on prompt. This can take two minutes.

Powering up the Machine to Restore from E-Stop

Steps

When powering up the machine to restore from Emergency Stop, perform the following:

Step	Action
1	Pull out the E-Stop button until it stays up.
2	Press the E-Stop Reset switch.

Machine Cycle

Machine Cycle Steps The upstream machine provides a signal to the inspection machine by a machine interface standard called SMEMA.

1. The inspection machine has to give the upstream machine a “Not busy signal”, through the interface connector.
 2. When it receives a “Board Available Signal” from the upstream machine, the inspection system transports the board into the system.
 3. When the board is inside, the machine disables the “Machine Not Busy” signal to the upstream machine.
 4. The board travels along the conveyor over the inspection sensor, it could have passed through other segments of conveyors, depending on the configuration.
 5. When the board is detected on the board in place sensor, the pneumatic stops are activated.
 6. The board slows down to a stop.
 7. The board is clamped in position.
 8. The Programmable Logic Controller (PLC) gives a board present signal to the PC by the RS232 port.
 9. The inspection system starts by locating the board reference points, it does this by activating the relevant lighting rings while moving the X-Y table and using each image acquisition inspecting all the components on the board.
 10. When finished and the data has been processed, the PC informs the PLC that the board has passed or failed the inspection.
 11. The board is subsequently released, this de-energizes the clamps and the stop pistons,
 12. The board drops smoothly onto the conveyor and the conveyor starts running.
 13. The board will transfer to the exit sensor. If the inspection machine gets a signal from the downstream conveyor “Not busy” via the SMEMA interface connector, it will give a “Board Available” signal either good or bad depending on the inspection result.
 14. The board exits the machine and the cycle starts again.
-

Chapter 7 Changing the Conveyor Rail Width

Introduction This chapter is used to describe how to manually change the width of the conveyor rails.

Contents This chapter contains the following topic:

Topic	See Page
Manually Adjusting the Conveyor Width	89

Manually Adjusting the Conveyor Width

Description

You can manually adjust the width of the conveyor rails using the following steps:

Step	Action
1	Ensure there are no boards on the machine.
2	Press E-Stop.
3	Open the hood door.
4	Adjust the conveyor by hand and lock the conveyor rail in place using the lock nut.
5	When you are finished, close the hood door, release the E-Stop button and continue operating the machine.

Chapter 8 Lighting Automatic Calibration

Introduction This section is used to describe how the new lighting automatic calibration is used. This functionality is only available to the SJ50.

Contents This section contains the following topics:

Topic	See Page
Overview	91
Lighting Automatic Calibration Files	92
Lighting Automatic Calibration Tests	94
Using the Lighting Controller Menu	95
Setting the Location of the Calibration Plate	98
Auto Calibrating the System	100
Calibrating on Location	102
Troubleshooting Lighting Controller	103

Overview

Lighting Automatic Calibration Description

Lighting Automatic Calibration is used to automatically set the current output for each ring to a predefined value. Calibration involves:

1. Turning on all the rings one by one
2. Recording their mean grey level
3. Comparing it to each rings' corresponding target mean
4. Performing a calibration to bring the mean as close as possible (if not exact) to the target mean.

These new calculated means are referred to as **Achieved Means**. The **Achieved Means** are stored in a separate file and are displayed in the **Achieved Means** column on the **Lighting Controller** menu.

Lighting Automatic Calibration is performed on a calibration plate, which is located in the SJ machine, using a ball bearing or as a grey card as a reference point.

Note: This is applicable to the SJ50 machine only.

Lighting Automatic Calibration Files

Lighting Automatic Calibration Specific Files

The following files are required to perform lighting automatic calibration:

- **GrayCardLocation.xml**
 - **CalibratedLightingValues.xml**
 - **AutoCalibrationResults.log**
 - **Lighting Ring Image over ball bearing**
 - **Lighting Ring Image over grey area**
 - **Lighting Controller Log**
 - **LightingConfigurationValues.xml**
-

GrayCardLocation.xml

The **GrayCardLocation.xml** file is used during lighting auto-calibration to specify the location on the XY Table. The file contains the XY position of the ball bearing on the Calibration Plate. The file is created after the **Set Location** function has been carried out successfully.

The **GrayCardLocation.xml** file is located at: **C:\cpi\data**.

CalibratedLightingValues.xml

The **CalibratedLightingValues.xml** file contains the target means that were achieved after lighting automatic calibration took place and displays the same values that were displayed in the **Targets Achieved** column on the **Lighting Controller** menu.

The **CalibratedLightingValues.xml** file is divided into four subsections according to mode. They are:

- PreMono
- PreColour
- Post

This **CalibratedLightingValues.xml** file is located at: **C:\cpi\data**.

Note: Lighting Auto-calibration calculates all rings for all modes.

AutoCalibrationResults.log

This file is used to hold lighting auto-calibration results and other useful information such as current outputs sent to the LED rings and the **Achieved/Targets** information.

AutoCalibrationResults.log file is located at **C:\cpi\log**.

Note: Refer to this file when troubleshooting the calibration procedure.

Lighting Ring image over ball bearing During calibration, an image is taken of each lighting ring over the ball bearing (resulting from the ball bearing test). These images are saved in the format '**BBxx.pgm**' where xx indicates the LED ring.

For example:

BB45R.pgm

This file is stored at **C:\cpi\img\BBxx.pgm**.

Lighting Ring Image over Grey Area During calibration, an image is taken of each lighting ring over the grey area used when calibrating. These images are saved in the format '**BBxx.pgm**' where xx indicates the LED ring.

For example:

BB45R.pgm

This file is located at **C:\cpi\img**.

Note: Refer to these images when troubleshooting the lighting auto-calibration results or the lighting rings.

Lighting Controller Log After calibration has been performed, you are asked to save the current output changes from the original to the new calibrated ones.

If **Yes**, the list of currents for each ring before and after calibration is saved to this file.

This file is located at **C:\cpi\log**.

Lighting Configuration Values.xml This file contains all configuration information pertaining to lighting.

- The LED rings used for the SJ50 are reflected in this file:

Light Ring
80
70
60
45r (red)
45g (green)
45b (blue)
45l (low red)

Lighting Automatic Calibration Tests

Tests You can carry out two tests during calibration, which enable you to troubleshoot problems that may occur with the lighting rings:

- Ballbearing Test
 - Grey Area Test
-

Ballbearing test During a **Ballbearing Test** an image is taken for each LED ring over the ball bearing. This is to determine that all the Lighting Rings are working properly.

There are seven images, one for each lighting ring, in the format **BBxx.pgm**, where xx indicates the LED ring. For example: **BB45B.pgm**.

The Ballbearing Test is performed during the Lighting Automatic Calibration operation, and the images are saved to **C:\cpi\log**.

Grey Area test The **Grey Area Test** is equivalent to the **Ballbearing Test**, but the test is carried out over the grey area where auto calibration is performed.

An image is taken for each LED ring over the grey area. This determines that all the Lighting Rings are working properly.

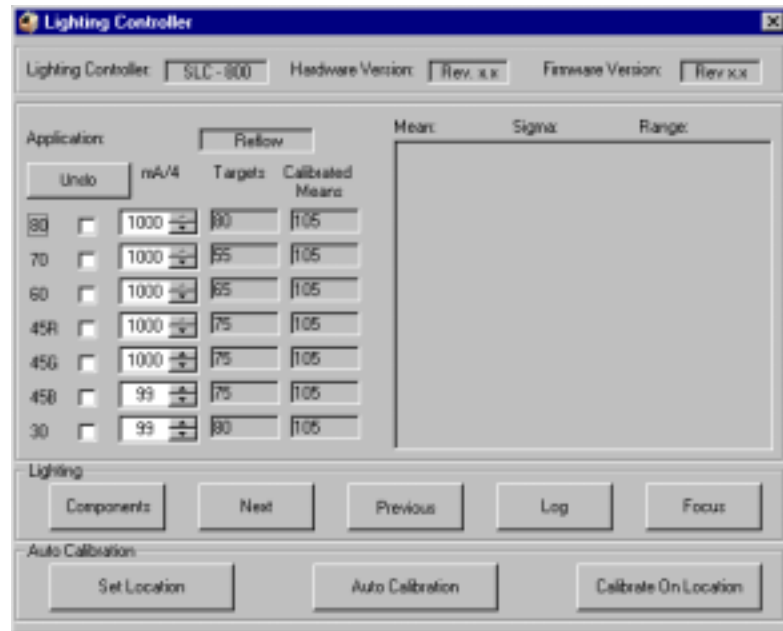
There are seven images, one for each lighting ring, in the format **Grayxx.pgm** where xx indicates the LED ring. For example: **BB80.pgm**.

Using the Lighting Controller Menu

General Information

The **Lighting Controller** menu contains the following information:

The name of the Lighting Controller (SLC-800) the hardware version of the



Lighting Rings Information

A list of the **Lighting Rings** is displayed along with the following information associated with them:

- Mean, sigma and range values.
- Current output values
- Target grey value
- Calibrated mean for each ring when auto-calibration has taken place.

Lighting Intensity Grid

When you click on the **Lighting Intensity Grid**, all the LEDs are turned on one after the other. The mean of the LEDs is compared against the target mean. The system performs a to bring the mean value up to the target value.

Note: The SJ10 does not have a **Lighting Controller** menu.

Important Note

The **Lighting Controller** is enabled by the SJ50 InstallShield and should not be disabled.

Aspects of the Lighting Controller Menu

The Lighting Controller menu is comprised of the following:

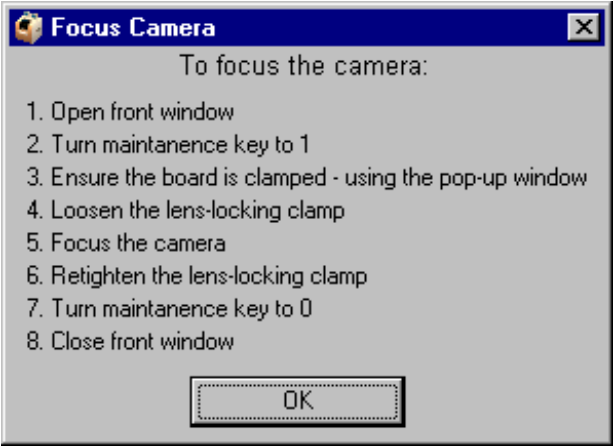
- Display parts
- Functions

- Display Parts** The following are the display parts of the Lighting Controller menu:
- List of Led rings.
 - The LED rings current output values (mA).
 - Targets for each LED ring (in mean grey level).
 - Mean, Sigma and Range values, which are displayed above the Light Intensity Grid.

Note: These values change as modifications are made to the Lighting controller menu and the changes are updated in:
C:\cpi\LightingConfiguration.xml .

- Functions** There are two types of functions available:
- Lighting
 - Automatic Calibration

Lighting The following table describes the buttons associated with the Lighting section:

Button	Function
Components	If you click Components , a component inspection begins.
Next	If you click Next , the next view is displayed.
Previous	If you click Previous , the previous view is displayed.
Log	If you click Log , then the brightness of each of the LEDs is recorded in the log file.
Focus	<p>If you click Focus, you can focus the camera with the main hood door open without the Emergency Stop warning message being displayed on the monitor. The following Focus Camera instruction window is displayed:</p> <div style="text-align: center;">  </div> <p>Focusing is performed manually and verified visually (see SJ50 Hardware Manual).</p>

**Auto
Calibration**

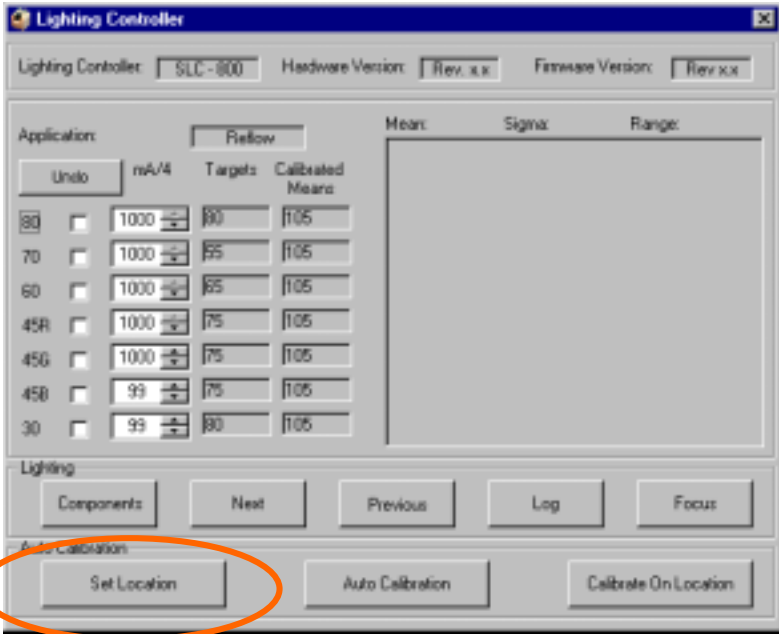
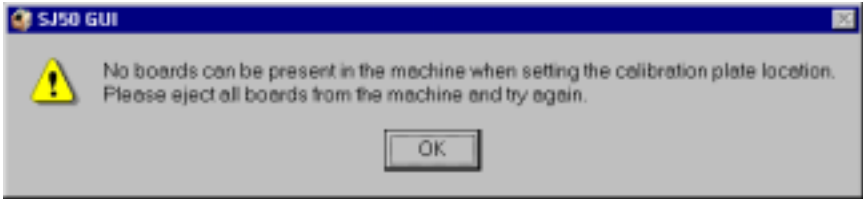
The following table describes the buttons associated with the Auto Calibration section:

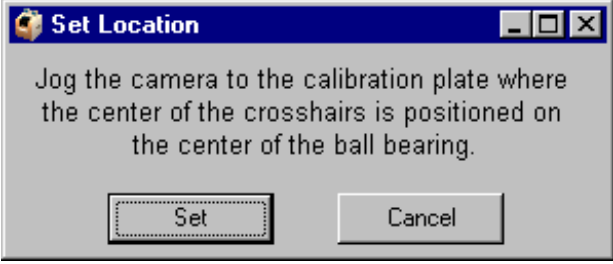
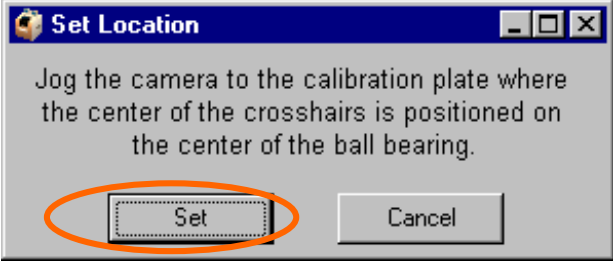
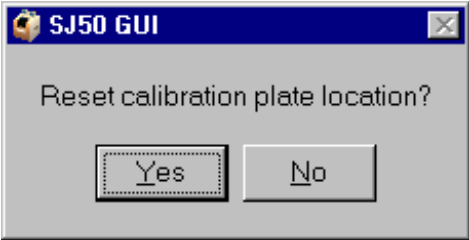
Button	Function
Set Location	This button is used for setting the calibration plate location.
Auto Calibration	This button is used to auto-calibrate the system. You have to Set Location before you can auto-calibrate.
Calibrate on Location	This button is used to manually calibrate a Fotowand grey card.

Setting the Location of the Calibration Plate

Steps

Set the location of the calibration plate using the following steps:

Step	Action
1	Open the Lighting Controller menu by selecting: Tools → Camera → Lighting Controller.
2	<p>Click the Set Location button as shown:</p>  <p>The screenshot shows the 'Lighting Controller' window. At the bottom, under the 'Auto Calibration' section, the 'Set Location' button is highlighted with an orange circle. Other buttons include 'Components', 'Next', 'Previous', 'Log', 'Focus', 'Auto Calibration', and 'Calibrate On Location'.</p>
3	<p>The PLC is queried to see if a board is present. If a Board Present signal is returned to the PLC the following message is displayed and the Set Location process is cancelled:</p>  <p>The screenshot shows an error dialog box titled 'SJ50 GUI'. It contains a yellow warning icon and the text: 'No boards can be present in the machine when setting the calibration plate location. Please eject all boards from the machine and try again.' An 'OK' button is at the bottom.</p> <p>The message informs you that you cannot have a board present in the machine when you are setting the location of the Calibration Plate.</p>
5	<p>When the conveyor is homed and if the location of the calibration plate has been previously set, the camera automatically moves over the calibration plate, the location of which is stored in the GrayCardLocation.xml file.</p>

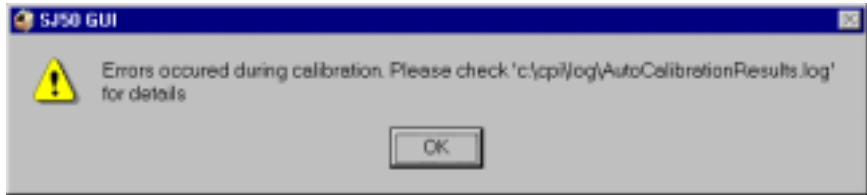
6	<p>The system turns the 80° LED ring on and the following message is displayed:</p>  <p>When the 80° LED ring is turned on, you can clearly see when the cross hair graphics on the interface are positioned at the centre of the ball bearing.</p> <p>Note: The message window is displayed while you jog to the grey card location.</p>
7	<p>When you have located the centre of the ball bearing, click the Set button as shown:</p> 
8	<p>When the system is satisfied that you have located the centre of the ball bearing, the location is saved in the GrayCardLocation.xml file.</p> <p>Note: If a GrayCardLocation.xml file already exists, a message is displayed asking you whether you want to overwrite the existing GrayCardLocation.xml file as shown:</p>  <p>If you choose Yes, the existing GrayCardLocation.xml file is overwritten.</p> <p>If you choose No the existing GrayCardLocation.xml file is retained.</p>

Note: You are now ready to auto calibrate the board.

Auto Calibrating the System

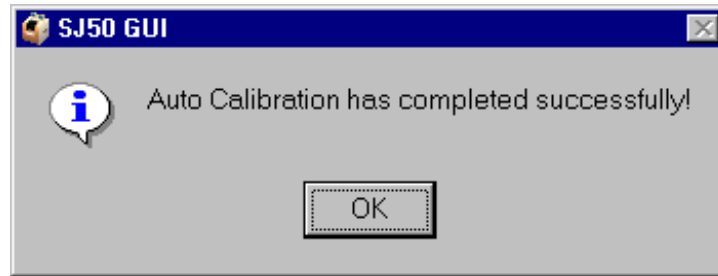
Steps

Auto calibrate the system using the following steps:

Step	Action
1	Open the Tools → Camera → Lighting Controller menu.
2	Click the Auto Calibration button.
3	If the GrayCardLocation.xml file does not exist, the message is displayed informing you that you need to set the location of the calibration plate as shown in Setting the Location of the Calibration Plate.
4	The PLC checks if there is any board present. If there is, then a message is displayed telling you to eject the board or the process will be aborted. This is described in step 3 of Setting the Location of the Calibration Plate.
5	Home the conveyor.
6	When the conveyor is homed and if the location of the calibration plate has been previously set, the camera automatically moves to the location of the calibration plate, which is stored in the GrayCardLocation.xml file.
7	A Ballbearing test is performed and an image of each lighting ring is saved in C:\cpi\img .
8	<p>If an error occurs during auto calibration, the following error message is displayed:</p>  <p>To troubleshoot calibration, check CalibrationResults.log for details and perform the auto calibration again.</p>

**Calibration
Note**

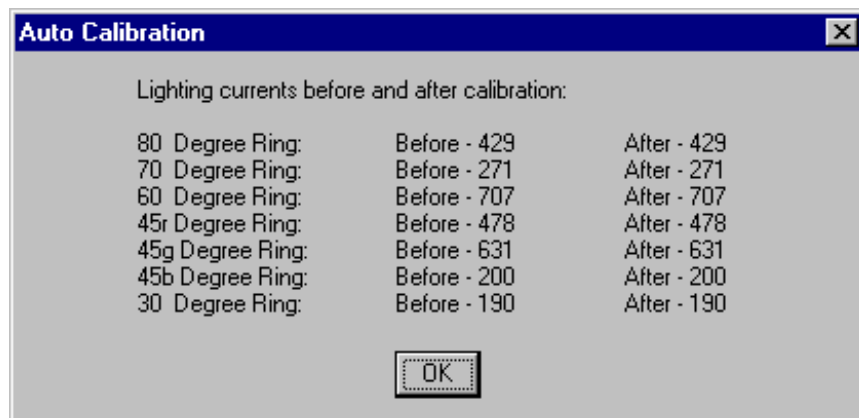
When calibration is completed successfully the following message is displayed:



The auto calibration results in new calibrated values and they are saved in **CalibratedLightingValues.xml**.

These values are also displayed in the **Achieved Targets** column in the **Lighting Controller** menu.

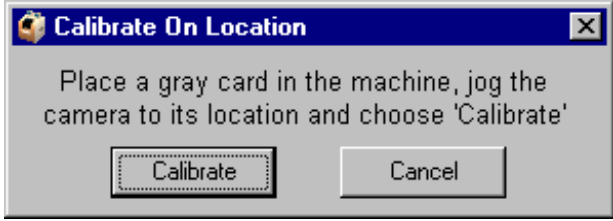
In addition, the following message appears informing you of the current outputs for each ring before and after calibration. These values are also written to **LightingController.log**.



Calibrating on Location

Steps

Perform a manual calibration using the following steps:

Step	Action
1	Open the Tools → Camera → Lighting Controller menu.
2	Click the Calibrate on Location button.
3	If there is no grey card in the machine, the following message is displayed: 
4	Insert the grey card into the machine and jog the camera over it.
5	Click Calibrate and calibration takes place at the current location. Alternatively, click Cancel to exit.
6	When calibration is complete, the new calibrated values are saved to the file CalibratedLightingValues.xml and displayed in the Achieved Targets column in the Lighting Controller menu.

Troubleshooting Lighting Controller

Problem The Lighting Controller functionality is not working

Solution Check that the Lighting Controller functionality is enabled in the Registry.

Steps If necessary, enable the Lighting Controller functionality for the SJ50 using the following steps:

Step	Action
1	Open the Registry: select Start → Run , type regedit and click the OK button.
2	Go to HKEY_LOCAL_MACHINE/SOFTWARE/MV Technology/GS-1/LightingController .
3	Double-click the Enabled option as shown: <div data-bbox="497 972 1366 1568" data-label="Image"> </div>
4	Enter the value 1 in the Value data string box as shown: <div data-bbox="663 1608 1276 1863" data-label="Image"> </div> <p>Click OK to save the setting.</p>

Chapter 10 Troubleshooting

Introduction

This chapter is intended to assist you in solving problems that you may encounter with your system. It describes the sequence to follow when the system does not function within normal operating parameters. We have concentrated on the failure modes that happen most frequently and with the greatest effect to productivity, i.e. those that would cause the line to stop. Use this chapter in conjunction with the electrical drawings issued with the document pack.

Contents

The table below lists the main headings in this chapter:

Topic	See Page
Troubleshooting System Power	105
Troubleshooting the Conveyor	106
Troubleshooting the Lighting Tower	107
Troubleshooting the 24V Supply	108
Troubleshooting the Safety Relay	109
Troubleshooting the XY Table Motor Controller	110
Troubleshooting the PC	111
Troubleshooting the Camera	112
Troubleshooting the Pneumatics	113
Troubleshooting the Monitor	114

Troubleshooting System Power

Reference For the locations of terminals, relays, PLC displays, PSUs and MCBs, refer to the system Electrical Drawings.

If power failure occurs.... Check the following:

- Is there power at the main supply?
- Is the **Main Isolator** in the 'ON' position?
- Is Q1 the main RCBO in the On position.
- Is the **Power On** light illuminated?
- Is the key switch in the **ON** position?
- Check **Q3**, the 24V PSU is **ON**
- Check **Q8 and Q9**, 24V DC Off/On Breaks **ON**
- Check the supply voltage at the main terminals.

Troubleshooting the Conveyor

Reference For the locations of terminals, relays, PLC displays, PSUs and MCBs refer to Electrical Drawings, depending on which system you are using.

If the conveyor will not run...check the following:

- Refer to the Electrical Drawings.
- Check that the conveyor is not obstructed.
- Check **MCB Q4** is **ON**.
- Check **E-Stop** is in the off position. Examine the three indicator lights on the relay and KA4 is activated.
- Check **VR1** (rail 1) or **VR2** (rail 2) are **not** turned to zero.
- Check the 'board in' sensor is functioning and that this signal is read by the PLC.
- If S.M.E.M.A is being used, ensure that a 'not busy' signal is being sent from the down stream machine.
- Check XL50 indicator lights are green.

If Conveyor 1 will not run....check the following:

- Check PLC output **10.00** is **ON** (8W Output module on right hand side of main control panel).
- Check relay **KA4** is energized by examining their indicator lights.
- Check the lights on the Paragon Drive (they shouldn't be red).

If the conveyor will not run because there is no output from PLC.....check the error codes from the PC.

Note: When an error occurs in the cycle the user interface will display a message detailing the fault and the action to be taken to remedy it.

Troubleshooting the Lighting Tower

Reference

For the locations of terminals, relays, PLC displays, PSUs and MCBs refer to Electrical Drawings, depending on which system you have.

If the Lighting Tower will not operate.....

....perform the following:

- Check that the lighting tower is plugged in?
- Go to the machine I/O menu and activate all lights in machine I/O menu.
- Check PLC is operating.
- Check connector is intact and undamaged.
- Check bulbs.

Note: Refer to the Electrical Drawings.

Troubleshooting the 24V Supply

**If there is no
24V supply...**

...check the following:

- Check 24V supply PS2 by either measuring the output of the power supply or by looking at the Indicator light (the latter solution is not as good a test as the previous solution).
 - Check **MCB Q3** is **ON**.
-

Troubleshooting the Safety Relay

If the safety relay will not reset....

...check the following:

- Check **24V** supply across the relay terminals **A1-A2**.
 - Check emergency stop and door interlock is functioning correctly. This is done by checking the continuity across terminals:
 - **XB2-15 & XB2-16**, and **XB2-7 & XB2-8** for circuit no.1.
 - **XB2-9 & XB2-10** and **XB2-17 & XB2-18** for circuit no. 2.
 - Check the indicator lights on the Safety Relay.
 - There are three indicator lights on the safety relay:
 - Top light represents power on.
 - Two bottom lights representing circuit number 1 and circuit number 2 respectively.
 - When the three lights are on this means that, the relay is functioning correctly.
 - Check that all contacts and terminations are intact.
 - Check reset circuit, activated by the hardware push/button that shorts out terminals **XB5-7** and **XB5-8** on the control panel.
 - If the emergency stop is on and there is no indication on the monitor, see PLC input **00.02**. Check the LED on the PLC is ON.
-

Troubleshooting the XY Table Motor Controller

**If the XY Table
Motor
Controller is
not
operating....**

...check the following:

- Are MCB Q11 and Q12 ON?
 - Is there an emergency stop condition?
 Examine the three indicator lights on the safety relay.
 - Check all cables are tight and in position.
 - Check safety relays KS4 and KS5 are activated.
 - Check 24V supply to Amplifiers is present.
 - Check contactors KS2 and KS3 are at the '1' position.
-

Troubleshooting the PC

If the PC is not working...

...check the following:

- Check the PC is plugged in and switched ON.
 - Check **MCB Q5** is ON.
 - If UPS installed, make sure that it is switched ON.
-

Troubleshooting the Camera

If the camera will not work...

...check the following:

- Check PC is on.
- Check cable **5186-4805** and **5186-3772** on camera to ensure they are connected correctly to the Framegrabber.
- Check software configuration.
- Check 12VDC between pins 4 and 16 on cable 5186-4702. This cable is connected to the Lighting Controller SLC-800.
- Check the 2 Amp porcelain fuse inside the PC as shown:



Troubleshooting the Pneumatics

Reference For the locations of terminals, relays, PLC displays, PSUs and MCBs refer to the system Electrical Drawings.

If there is no air supply... ...check the following:

- Check source of air.
- Check air pressure is set at 5 bar at regulator.
- Check E-stop is not pressed or safety relay is engaged.

If the dump valve will not work.... ...check the following:

- Check air pressure is set to 5 bar at regulator.
- Check emergency stop is **OFF**.
- Check for indicator light on valve.
- Check **24V** supply at terminals **XP-13** and **XP-18** in the pneumatic panel.

If the stops will not engage.... ...check the following:

- Check that the PLC outputs **11.02** (rail 1) or **11.06** (rail 2) is **ON**.
- Check solenoid valve **YV2** or **YV4** is **ON**.
- Check air supply is **ON**.
- Check dump valve **YV1** is energized examining the indicator light.
- Check for kinks in the tubes.

If the clamps will not engage... ...check the following:

- Check that the PLC output **11.07** or **11.03** is **ON**.
- Check solenoid valves **YV3** and **YV5** are **ON**.
- Check air supply is **ON**.
- Check dump valve **YV1** is energized examining the indicator light.
- Check for kinks in the tubes.

If there is no purge to XY table... ...check the following:

- Check Dump valve.
- Check air supply at the regulator.
- Check for twisted tubes.
- Check for air leaks.

Troubleshooting the Monitor

**If the monitor
is not
working...**

Check the following:

- Is the monitor switched on and plugged in?
 - Check **MCB Q6** is on. Check cables for tight connections.
 - If **UPS (Uninterruptible Power Supply)** is installed, make sure that it is switched ON.
-

Chapter 11 Maintenance

Introduction This chapter describes a maintenance schedule for the inspection system. Where possible it refers to the electrical drawing numbers that describe the circuits involved. They are contained in a separate document. This schedule must be strictly adhered to and be performed only by qualified personnel. The maintenance schedule for the SJ50 machine is divided into weekly, monthly, quarterly and yearly.

Contents The table below lists the main headings in this chapter:

Topic	See Page
Introduction	116
Weekly Maintenance	117
Monthly Maintenance	120
Quarterly Maintenance	121
Yearly Maintenance	122

Introduction

Important Notes on Lubricants

Be sure to use a clean dry, soft lint free cloth for cleaning off any dirt or dried lubricant from linear rails.



WARNING

Failure to lubricate the stage at quarterly intervals may cause damage to tails and invalidates all warranties.

Recommended Lubricants

Dow Corning's Molykote 44 is recommended.
Only use lithium based grease.
AFB grease multi purpose grease from THK.



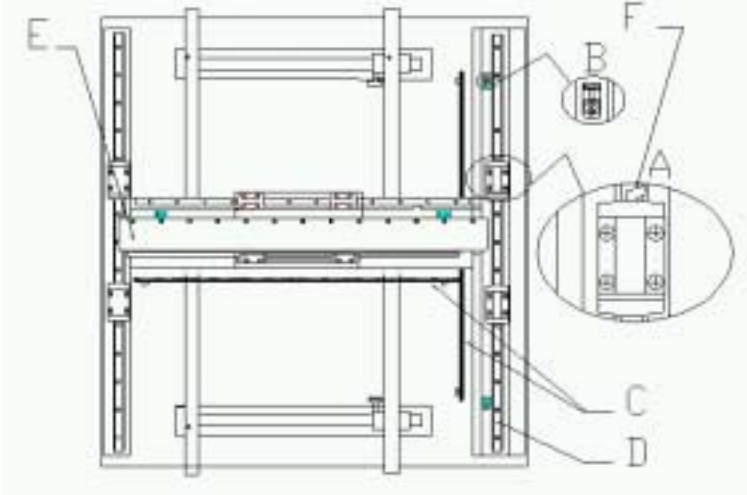
WARNING

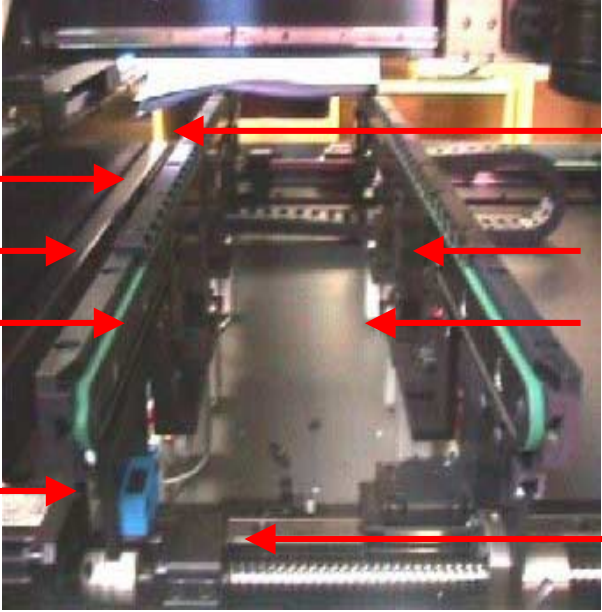
**Maintenance must only be carried out by
trained personnel.**

Weekly Maintenance

Steps

Follow the weekly maintenance steps in the table below:

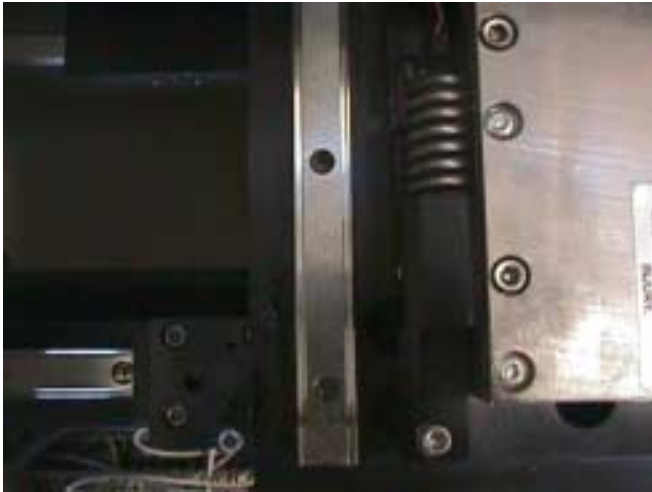
Step	Action
1	Run a board through the machine and ensure that the machine is operating correctly.
2	Clean down the machine panels.
3	Clean the PC filter, if fitted.
4	Check PC power supply fan is running. Open the PC drawer and feel the air intake at the power supply.
5	Inspect the X-Y Table and check all cables and connectors.
6	Move the X-Y Table by hand, ensure that it moves freely and is not obstructed in movement throughout its full movement envelope on both X and Y axes.
7	Test the E-Stop circuitry by opening and closing the hood while resetting the E-Stop circuit using the E-Stop Reset button at the front of the machine, repeat this using the emergency stop push/pull actuator.
8	Release the E-Stop and press the reset switch.
11	Power down the machine and switch off the X-Y stage at the controller. <div style="text-align: center;">  <p>Gantry Schematic</p> </div>
12	Ensure the bearings are kept free from dust, loose particles and moisture; see D in step 11.
13	Ensure the magnetic platens are free from debris; see E in the figure in step 11.
14	Visually examine the encoder, see step 11 (C), on each axis to ensure that there are no scratches, grease or dirt. If some grease or dirt needs to be removed, do this with a very fine lint free cloth only.
<p>Take care not to scratch gold foil, as this will greatly affect the table's accuracy.</p>	

<p>15</p>	<p>Check the small home marker contacts and end limits are intact; refer to step 11 (C) and (B). Ensure that they are free from dirt and grease.</p> <p>Note: NEVER clean the conveyor with a compressed air stream. It may cause dirt etc. to get lodged into the motor shaft. Use a vacuum cleaner to remove loose dust or dirt. NEVER disassemble the motors.</p> <p>Details on the conveyor can be seen below:</p> 
<p>16</p>	<p>Power the system back up. Check the function of the conveyor sensors by placing a sample board over them. Look at the indicator light on each of the sensors.</p>
<p>17</p>	<p>Move the lighting head over each sensor and make sure they are not activated by it.</p>
<p>18</p>	<p>Check soundness of all motor housings.</p>
<p>19</p>	<p>Wipe off edge belts with recommended cleaning agent 409 spray cleaner. An alternative is to use alcohol or equivalent.</p>
<p>20</p>	<p>Vacuum clean the base of the machine.</p>
<p>21</p>	<p>Check that the air pressure of the main pressure regulator reads 5 bar.</p>
<p>22</p>	<p>Go to the back of the machine and remove the Pneumatic Panel Cover, activate the solenoids manually by pressing the orange button. The stops and clamps should operate without obstruction.</p>
<p>23</p>	<p>Open the main hood of the machine switch the maintenance switch to I. Using the user interface, operate the stops and clamps for each rail, ensure they move without obstruction.</p>

Monthly Maintenance

Steps

Carry out the following steps on a monthly basis:

Step	Action
1	Carry out the weekly routine.
2	Carefully clean the Camera Lens . Only use a proper cleaning solution and a lint free cloth.
3	Clean and lube the gantry rails. See below. 
4	Open the Pneumatic Panel and check the terminals and solenoid valves connections.
5	Power down the PC first. Visually inspect the electrical control panel by turning off the machine at the OFF/ON switch and turning the isolator handle in the OFF position. Open the back door.
6	Inspect all electrical equipment on the machine for damaged contacts, exposed wire cores and frayed insulation.
7	Clean the conveyor Optical Sensors with a dry cloth.
8	Pull out the PC Drawer and check the cables going into the PC, ensure that they are not loose.
9	Check all connections on the Lighting Controller, Terminals and PLC Modules .
10	Check all cables on the Lighting Head and X-Y Table and ensure that no wires are loose or damaged.
11	When inspecting the connections on the gantry stage and at the controller check the integrity of the connectors at random.
12	Ensure all conveyor bearings are free running and belt tension is tight.
13	Ensure that conveyor belts are not twisted on either rail.
14	Operate the E-Stop to ensure that the dump valve is operating correctly. Ensure the Maintenance key is not being used at this time.
15	Empty the Filter Cup .

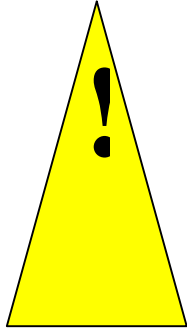
16	Ensure the pressure switch is operating by running the inspection software, removing the air from the system, the PC should indicate this on the monitor.
----	---

Quarterly Maintenance

Steps

Carry out the following steps on a quarterly basis:

Step	Action
1	Carry out monthly routine.
2	When inspecting the control panel, check the tightness of the connections at random; ensure that no wires in the terminals have become loose.
3	Push the stage to one end of its travel.
4	Remove any accumulated dust or debris from inside of the assembly.
5	Vacuum-clean the base of the table.
6	Remove any dirty or dried lubricant from the bearing guides; refer to Weekly Maintenance Step 14 D. Use a clean cloth wipe along the rails to clean the bearing guides. A cotton swab soaked in solvent will suffice to remove stubborn debris.
7	After the solvent has evaporated (if used), apply a thin, continuous film of lubricant to the bearing guides. A good quality natural bristle artist's brush is an excellent applicator for this.
8	Lubricate the four LMG Bearing Trucks on each stage, see Weekly Maintenance step 14 (A). (See Important Notes on Lubricants also).
9	Use a grease gun with a grease nipple (type UU or SS); refer to Weekly Maintenance step 14 (F).



WARNING

Failure to lubricate the stage at quarterly intervals invalidates all warranties. May cause damage to rails.

Yearly Maintenance

Steps

Carry out the following steps on a yearly basis:

Step	Action
1	Carry out the quarterly routine.
2	Isolate the SJ50 machine from the mains supply.
3	Take off bottom side panels and open rear doors to Control Panel .
4	Physically check all electrical connections on the machine. <ul style="list-style-type: none"> • Main Control Panel. • X-Y Table. • PC. • Motor Controller. • All Earth cables. • All connectors.
5	Carry out the following test to give an indication of the insulation resistance of the cables and whether the mains supply to the body of the machine is intact and complies with the relevant standards. <p>Note: Only a fully qualified technician should carry out this procedure.</p>
Step	Action
1	Power off the machine.
2	Switch off the main isolator.
3	Disconnect the mains plugs to the Monitor, PC and Motor Controller.
4	Plug out the XL50. and the power socket.
5	Disconnect the 230V side of the following Power Supply 1 (PS1), Power Supply 2 (PS2) and Power Supply 3 (PS3); and leave the loose wires apart and not touching. PS1 and PS2 are located in the back.
6	Using an insulation resistance tester check between L1 and Earth. There should be a reading of >1 M ohm.
7	Then check between N2 and Earth. It should have the same reading.
8	Check again to ensure all equipment stated above is disconnected for safety.

	9	Check the reading for Cable 11 to Earth, and then Cable 10 to Earth and finally Cable 10 to 11. Again the reading should be > 1M ohm, these cables are on KM1 off the main contactor. For more information refer to the System Electrical Drawings.
6	Check all terminal connections on the machine.	
7	Check the electrical connections at the conveyor motors. Make sure all connections are intact and securely fitted.	
8	Check all mounting screws and hardware on the machine.	
9	Systematically check all nuts, bolts and screws on rails, lifting mechanism, air cylinders, bearings and mountings for all hardware.	

Appendix: Maintenance Checklist Forms

Introduction This appendix has the forms you need to fill out when you are performing maintenance checks weekly, monthly, quarterly, and yearly.

Contents The menus which can be accessed are listed below:

Menu	See Page
Weekly Maintenance Schedule Form	125
Monthly Maintenance Schedule Form	127
Quarterly Maintenance Schedule Form	130
Yearly Maintenance Schedule Form	133

Weekly Maintenance Schedule Form

Site: _____

Completion Date: _____

System Type: _____

System Serial Number: _____

Weekly Maintenance Schedule

Performed by: _____

	Good /Bad	Comments and/or Corrective Actions (if necessary)
Electrical		
Inspect El. Control Panel		
Examine cables to PC		
Examine cables to the XY table controller		
Inspect connections to XY gantry		
Test E-Stop and door interlock		
Test clamping and stop mechanisms		
Test E-Stop reset switch		
Test System Cycle		
X-Y Table		
Examine X-Y table motion		
Examine cabling		
Inspect bearings		
Inspect magnet platten		
Inspect encoder		
Inspect limit switches		
Conveyor		
Examine moving parts		

Inspect conveyor belts		
Test all sensors		
Clean belts		
Pneumatics		
Check the systems pressure settings		
General		
Wipe down the machine panels		
Clean the PC filter		
Check operation & direction of motor controller fan		
Check operation and direction of PC fans		
Inspect and clean camera lens		
Observe one board cycling through the machine		
Overall Comments on System:		
Actions Required:		
1		
2		
3		
4		

Monthly Maintenance Schedule Form

Site: _____

Completion Date: _____

System Type: _____

System Serial Number: _____

Monthly Maintenance Schedule

Performed by: _____

	Good /Bad	Comments and/or Corrective Actions (if necessary)
Electrical		
Inspect El. Control Panel		
Clean optical sensors		
Examine cables to PC		
Examine cables to the XY table controller		
Inspect connections to XY table		
Test E-Stop and door interlock		
Test clamping and stop mechanisms		
Test E-Stop reset switch		
Test System Cycle		
Inspect pneumatic panel		
X-Y Table		
Examine X-Y table motion		
Examine cabling		
Inspect bearings		
Inspect magnet plattens		
Inspect encoder		

Inspect limit switches		
Check cable integrity		
Conveyor		
Examine moving parts		
Inspect conveyor belts		
Test all sensors		
Clean belts		
Pneumatics		
Check the systems pressure settings		
Test dump valve		
Test solenoid valves		
Test pressure sensor		
General		
Wipe down the machine panels		
Clean the PC filter		
Check direction of motor controller fan		
Check operation and direction of PC fans		
Inspect and clean camera lens		
Cycle a PCB through the machine		
Overall Comments on System:		
Actions Required:		
1		
2		
3		

4

Quarterly Maintenance Schedule Form

Site: _____

Completion Date: _____

System
Type: _____

System Serial Number: _____

Quarterly Maintenance Schedule

Performed by: _____

	Good /Bad	Comments and/or Corrective Actions (if necessary)
Electrical		
Inspect El. Control Panel		
Clean optical sensors		
Examine cables to PC		
Examine cables to the XY table controller		
Inspect connections to XY table		
Test E-Stop and door interlock		
Test clamping and stop mechanisms		
Check connections in Control Panel		
Test E-Stop reset switch		
Test System Cycle		
Inspect pneumatic panel		
X-Y Table		
Examine X-Y table motion		
Examine cabling		
Inspect bearings		
Inspect magnet plattens		

Inspect encoder		
Lubricate the guide rails		
Inspect limit switches		
Check cable integrity		
Conveyor		
Examine moving parts		
Inspect conveyor belts		
Test all sensors		
Lubricate conveyor linear bearings		
Clean belts		
Pneumatics		
Check the systems pressure settings		
Test dump valve		
Test solenoid valves		
Test pressure sensor		
General		
Wipe down the machine panels		
Clean the PC filter		
Check operation & direction of motor controller fan		
Check operation & direction of PC fans		
Inspect and clean camera lens		
Cycle a PCB through the machine		
Overall Comments on System:		

Actions Required:
1
2
3
4

Yearly Maintenance Schedule Form

Site: _____

Completion Date: _____

System
Type: _____

System Serial Number: _____

Yearly Maintenance Schedule

Performed by: _____

	Good /Bad	Comments and/or Corrective Actions (if necessary)
Electrical		
Inspect El. Control Panel		
Clean optical sensors		
Examine cables to PC		
Examine cables to the XY table controller		
Inspect connections to XY table		
Test E-Stop and door interlock		
Test clamping and stop mechanisms		
Check connections solenoid valves		
Test E-Stop reset switch		
Check connections to control panel		
Check electrical connections		
Test System insulation resistance		
Inspect connections to pneumatic panel		
X-Y Table		
Examine X-Y table motion		

Examine cabling		
Inspect bearings		
Inspect magnet plattens		
Inspect encoder		
Lubricate the guide rails		
Inspect motor controller		
Test tightness of base plate bolts		
Inspect limit switches		
Check cable integrity		
Conveyor		
Examine moving parts		
Inspect conveyor belts		
Test all sensors		
Inspect electrical connections		
Check mounting screws		
Check motor cable insulation resistance		
Lubricate conveyor linear bearings		
Clean belts		
Pneumatics		
Check the systems pressure settings		
Replace main air filter		
Test dump valve		
Test solenoid valves		
Test pressure sensor		
General		
Wipe down the machine panels		
Clean the PC filter		

Check operation & direction of motor controller fan		
Check operation & direction of PC fans		
Inspect and clean camera lens		
Cycle a PCB through the machine		
Overall Comments on System:		
Actions Required:		
1		
2		
3		
4		