Agilent SJ50

The most flexible In-line AOI system

SJ50

Hardware Manual

Agilent Technologies

SJ50 Single Lane Hardware Manual

Revision 1

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Chapter Contents

Revision History

Revision	Nature of Change	Description	Author	Date
1.0	First release.	SJ-50 Hardware Manual – Standard Single Lane Conveyor	John Wildes	September 2001

Chapter 1

Safety

Chapter Contents

Summary

This chapter describes the various safety features that are incorporated into the machine to provide a safe environment for the operator. The machine is designed so that during the course of normal operation the user is never required to work in or have exposure to areas where they could cause harm to themselves or others.

1.1 Machine Safety Standards

1.1.1 Machines standards

The machine has been designed to the following standards.

CEI/IEC 1010-1

Safety requirements for electrical equipment for measurement control and laboratory use.

UL 3101

Electrical equipment for laboratory use.

CE Machinery Directive EC-98/37.
See cert for list of relevant standards.

1.1.2 System Environment

The Machine is designed to operate under the following conditions:

1 Operating Voltage 100V-120V~ @ 40A Single or two phase supply 50/60Hz Protection class 1.

2 Operating Voltage 200V-240V~ @ 25A Single or two phase supply 50/60Hz Protection class 1.

3 Indoor use.

4 Altitude up to 2000m.

5 Temperature 5ºC to 35ºC.

6 Maximum Relative Humidity 80% for temperature up to 31ºC decreasing linearly to 50% relative Humidity at 40ºC.

7 Mains Supply Voltage fluctuations not to exceed ±10% of the nominal voltage.

8 Pollution degree 1 in accordance with IEC 664.

1.1.3 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!

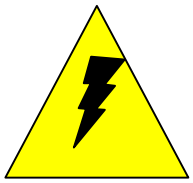
This machine must only be used with conveyors on both sides either in-line or in off-line operation.

1.2 Electrical Safety

1.2.1 Electrical Enclosure

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

- The Mains Transformer is situated at the side of the machine and should not be accessed unless the power to the machine is isolated.
- The Main Control Panel is accessed through the two rear doors, which are electrically interlocked.
- When in the Off position the machine will only have mains voltage on the primary side of the main isolator.



WARNING: LETHAL VOLTAGE
DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. ENSURE THAT ALL ELECTRICAL ENCLOSURE COVERS ARE FITTED AND INTACT BEFORE OPERATING THE EQUIPMENT.

1.2.2 Emergency Stop Loop

The Emergency Stop (E-Stop) is designed according to the relevant safety standard. The Emergency stop circuit has the following attributes associated with it, it is controlled using a Pilz class IV safety relay.

- 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 SJ-50 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.

1.2.3 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.

WARNING
THIS MACHINE MUST ALWAYS BE EARTHED WHILE IN USE.

1.2.4 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.

1.3 Physical Safety

1.3.1 Protective Guards

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

WARNING

DO NOT OPERATE THE MACHINE WHILE ANY OF THE SAFETY GUARDS ARE OPEN, LOOSE, DAMAGED OR MISSING. THIS INCLUDES ACCESS PANELS TO THE PC AND PNEUMATIC VALVES. THE PROTECTION PROVIDED MAY BE IMPAIRED IF IT IS NOT USED IN THE CORRECT MANNER.

1.3.2 SJ-50 Machine Stability

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!

1.3.3 Falling Objects

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

1.4 Barcode Laser Safety

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

WARNING: LASER EQUIPMENT
THIS EQUIPMENT CONTAINS CLASS II LASER EQUIPMENT. DO NOT STARE INTO THE BEAM.

1.5 Explanation of System Warning/Caution Labels.

	**Warning electrical danger. Label located on both left and right side panels also on right rear door to indicate High Voltage within.**
	**General warning label. Located inside PC at the lithium battery. See Section 1.2.4**
	**The operator 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.**
	**230 Volts warning labels on the PC, Motor controller, Transformer cover, Top of front electrical box, Mains terminal trunking cover And Mains filter.**
	**Warning label hands could be crushed from below. Location on top center of rear panel.**
	**Warning label hands could be crushed from right side. Location on rear of the top left side panel.**
	**Warning label hands could be crushed from left side. Location on rear of the top right side panel.**

	**Warning when maintenance switch is in 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 Transformer cover, mains filter and on mains terminal trunking.**

Chapter 2

Installation

Chapter Contents

Summary

This chapter provides instructions for setting up and installing the inspection and measurement systems.

2.1 Receiving the Machine

2.1.1 Unpacking the System

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

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 section **2.1.2 'Handling the system'**, before removing the machine from its crate.
5. Remove the packaged parts from inside the system by removing the lower right panel with a **4mm** hexagonal Allen Key. The packaged parts (**Lighting Tower**, **Hard Drive** and **Documentation**) can then be removed and the panel replaced and secured.
6. Remove the **Anthro Arm** package from inside the machine by opening the hood of the machine (see section **2.1.3 'Opening and Closing of Frame**').

2.1.2 Handling the system

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 meters wide at the inside of the forks.

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.

When lowering the system from an elevated position the lifting device operator must ensure that all sides of the machine are clear from obstructions.

Lower the machine gently into position.

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

2.1.3 Opening and Closing of Frame

1. The top frame door is opened by lifting the latch handle at the front of the machine, this unlocks the hood. Details of the hood can be seen in the figure below.

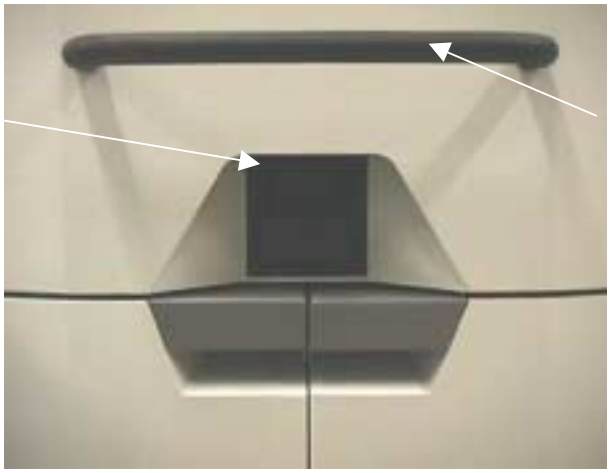


Figure 2.1 Latch and Door Handle

2. Lift the **Hood** with the door handle and raise it to the desired position, the **Ratchet Locks** hold the door open.
3. To close the door with the door handle, lift the door to its full extent. This causes the Ratchet Locks to release and the door can be lowered down and latched closed. (The pull handles can be used to bring the door down until the door handle can be reached) See fig 2.2.

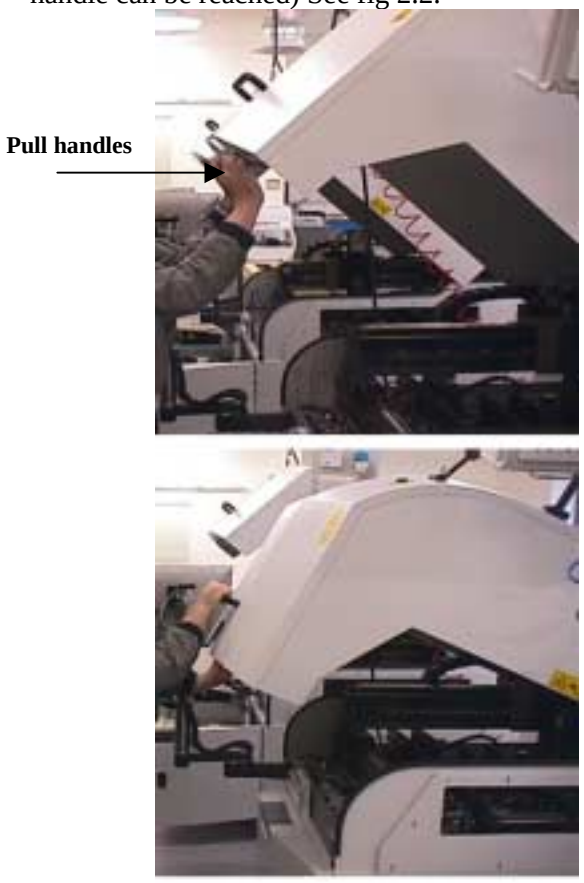


Figure 2.2 Closing of frame

2.2 System Overview

The SJ-50 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.

2.2.1 Machine Layout

- In the machine the **Industrial PC** and **DR600** (**Motor Controller**) are behind the front access doors, and the **Pneumatics Panel** is in the 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**.

2.2.1.1 Rear System View

The main control panel of the machine is housed in the rear electrical enclosure. See detail in figure below.

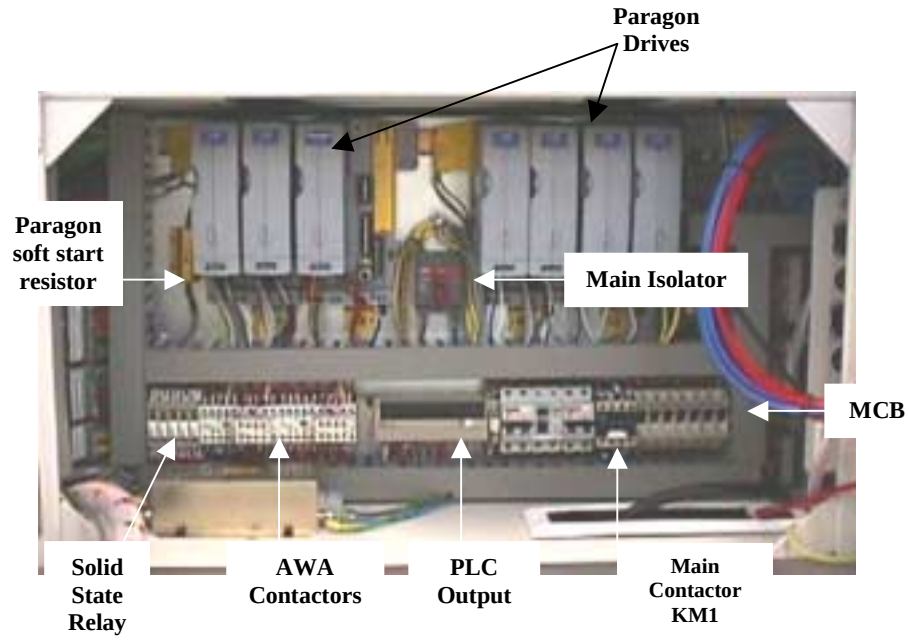


Figure 2.3 Rear Electrical Enclosure

The Facilities panel and terminal blocks are to the sides of the main control panel. See details in the figure below.

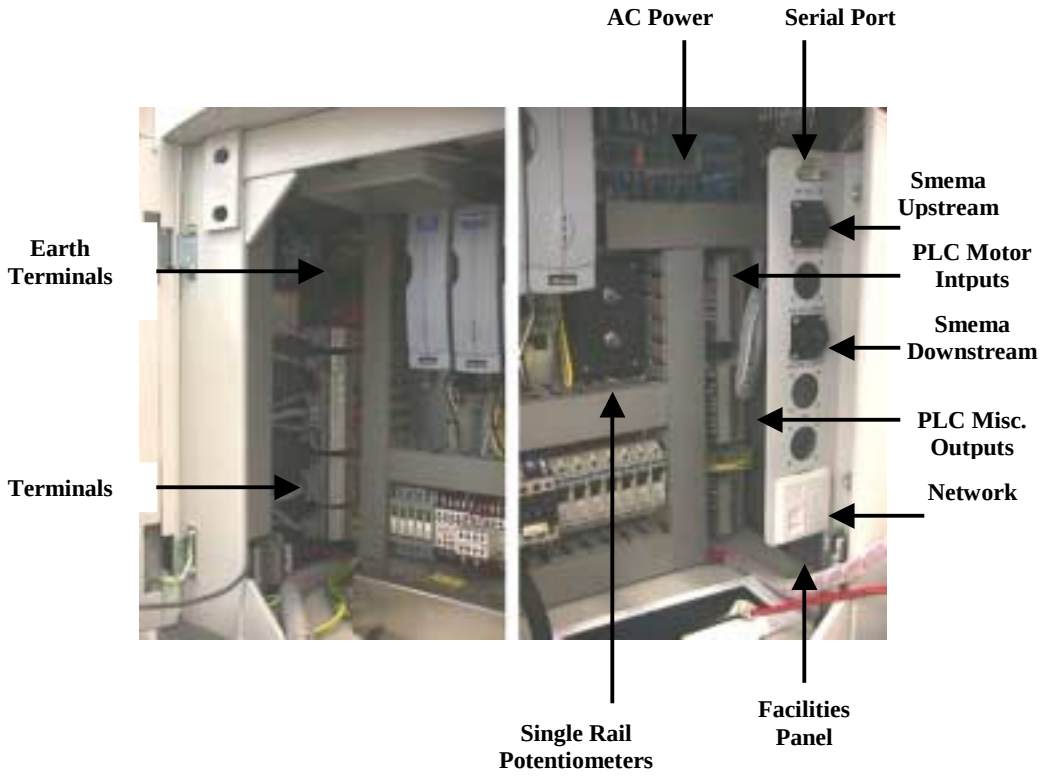


Figure 2.4 Rear Enclosure Detail

The DC Power supplies, main PLC unit and safety relay are mounted on the inside of the rear door. See details in figure below.

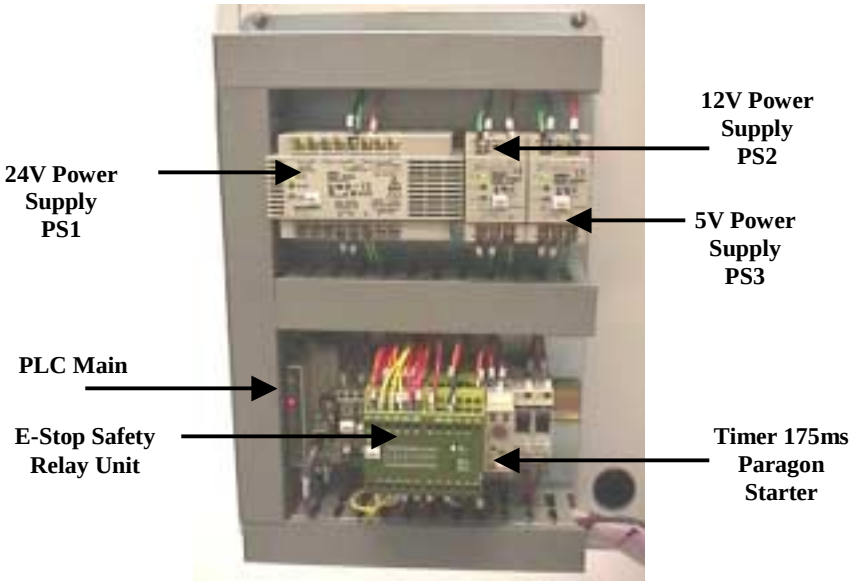


Figure 2.5 Rear Control Panel View

- The rear of the base frame houses the majority of the systems **Electrical Controls**. These controls are secured behind a lockable door. The rear access doors also include the **Mains Isolator Switch**, which can be locked in the **OFF** position to prevent accidental start up.

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

2.2.1.2 Front System View

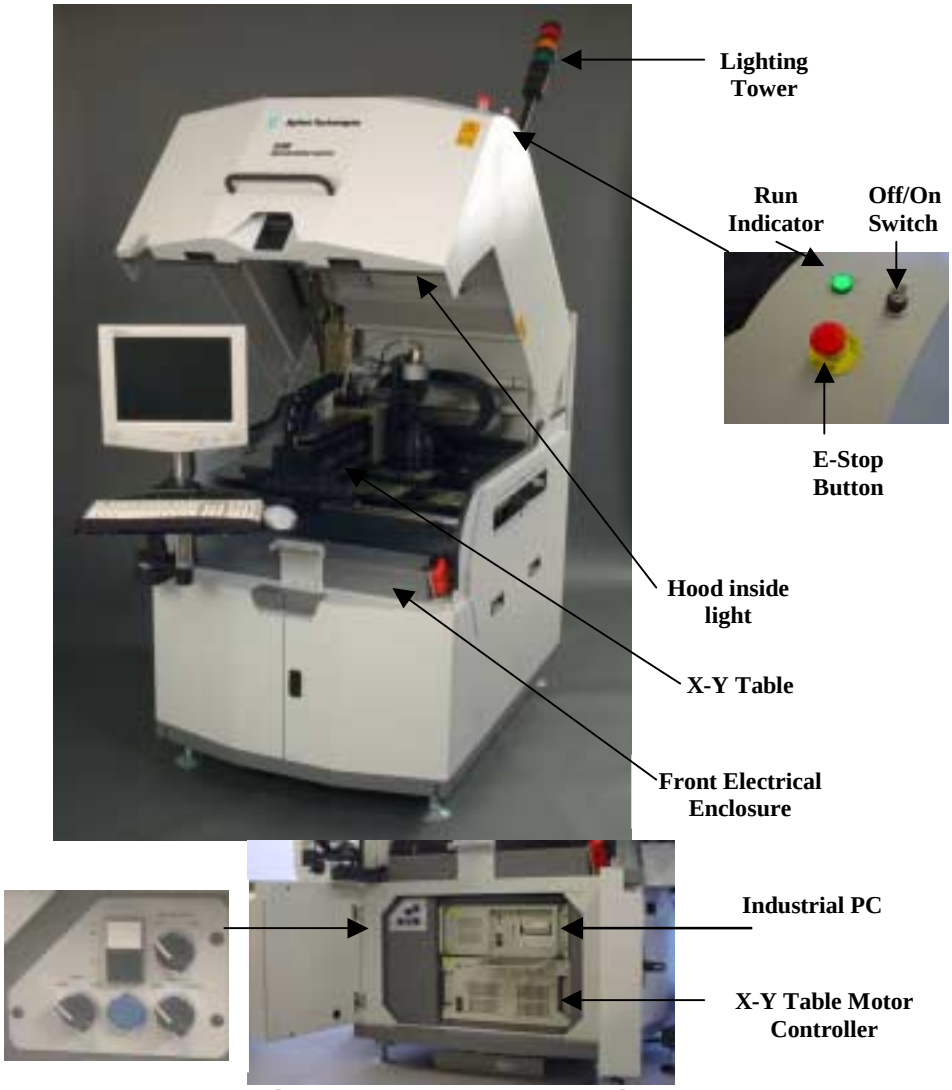


Figure 2.6 System Front View

2.2.2 Switch plate

The Switch plate houses the following buttons.

- E-Stop reset push button.
- The pass through switch (when activated it allows the board pass through the machine without being inspected).
- The Auto width adjust manual override.
- The in and out push buttons.

This is illustrated in the image below.

Figure 2.7 Switch Plate Detail

2.2.3 Front Electrical Enclosure

The front Electrical Enclosure contains the Lighting Controller and PLC IO Blocks for conveyor wiring. See figure below.

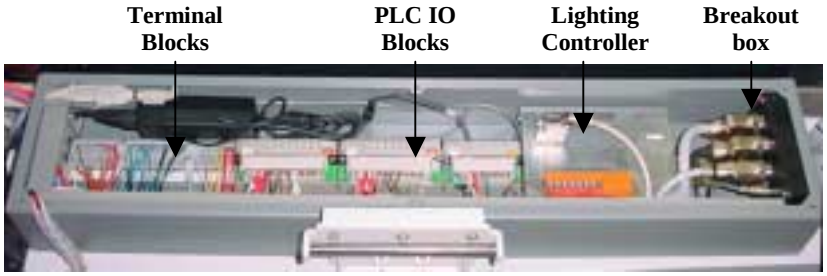


Figure 2.8 Front Electrical Enclosure

The cover panel for this enclosure houses the maintenance switch, as illustrated in the image below.

Figure 2.9 Maintenance Switch

The pushbutton is for the conveyor reset, this will allow the operator to remove a board while the PLC is in a certain instance of the program, by pushing the pushbutton this will reset the PLC to the start of its cycle.

- The Transformer Guard Panel protects against unauthorized access to the systems Mains Transformer. See fig 2.10.

Warning

Only trained personnel should remove the Transformer Guard Panel.

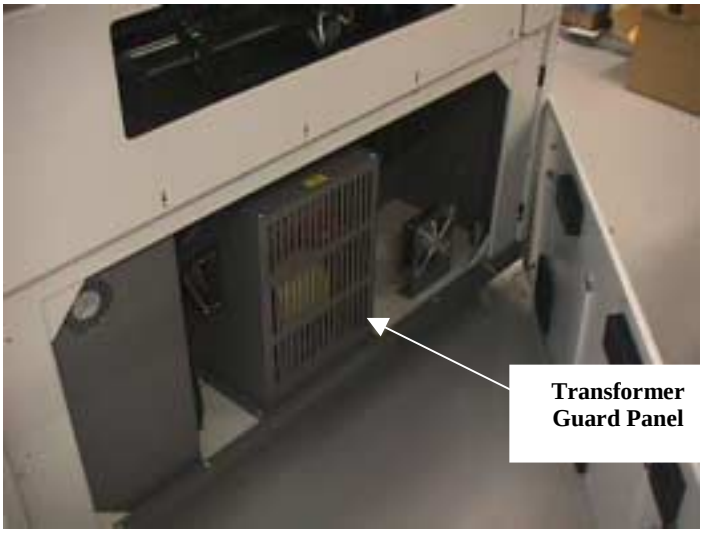


Figure 2.10 Transformer Guard Panel

- The Facilities Panel houses the systems communications interfaces. The system's power is fed in through the base of the machine.
- The final two panels on the system base are the lower-right access panel and the lower-left access panel. These panels need only be removed when access is required to internal system wiring.

2.2.4 P.L.C.

The PLC (programmable logic controller) controls the conveyor, monitors the machine sensors and acts accordingly to the application required.
It also provides communication to the PC and all the I/O of the machine (for example the lighting tree, SMEMA signals, Air on inputs etc).

2.2.5 Conveyor

See also section 2.8 Conveyor.

For the purpose of board transfer a conveyor is situated on the X-Y aluminum base along the Y direction of the machine, this allows the boards to be positioned on the conveyor under the inspection envelope.

Different types of conveyors are used to adjust to the different demands placed on Agilent by customers.
Each type of conveyor uses the same basic materials, which are as follows.

On each conveyor or segment is a belt carrying the board along the conveyor.
This belt is made from Acrylonitrille-Butadine-Rubber (NBR).
A Stepper motor on each rail rotates the belts.
These motors are powered in series by a Paragon L50 controller (UL E194158), The stepper motors are in series so that they are synchronized, ensuring both belts run at the same speed.

The width of the conveyors can also be adjusted.

This is done by stepper motors rotating a screw drive system which move the conveyor along a THK rail in the X direction of the machine.
The width adjust is controlled by a Paragon L50i drive.
The L50i is an intelligent controller, which can be controlled through software by a RS232 port in the PC allowing the user to move the conveyor to the required width by inputting a value using a graphical user interface.

In the event of software failure there is a manual over ride switch, (see fig 2.11) which allow the operator to jog the conveyor in and out.

Figure 2.11 Switch Plate Detail

During an E-Stop condition, the power to the motor is removed for both the conveyor rotation and the auto width adjust, and the 24V power is also removed from the control circuit.
This removes all motive power from the conveyors and renders them safe.

On each conveyor there are two stop cylinders, which activate when a board is entering the inspection envelope of the machine.
When the board has stopped in position another group of cylinders are activated to clamp the board to the clamping lips.
Each group of cylinders is activated by a solenoid valve situated in the Pneumatic panel on the rear left door of the machine.

2.2.6 System Frame

- The systems **Base Frame** is covered by a folded and welded top frame which is designed to protect personnel against the motion of the **X-Y Gantry Robot**, and to provide for mounting of control interfaces.
- The systems **Top frame Hood** gives access to the machine internals
- The **Lighting Tower** is mounted on the system roof.
- The systems Pneumatic panel is in the rear door. See following figures.

Figure 2.12 System Rear Door Mounted Pneumatics

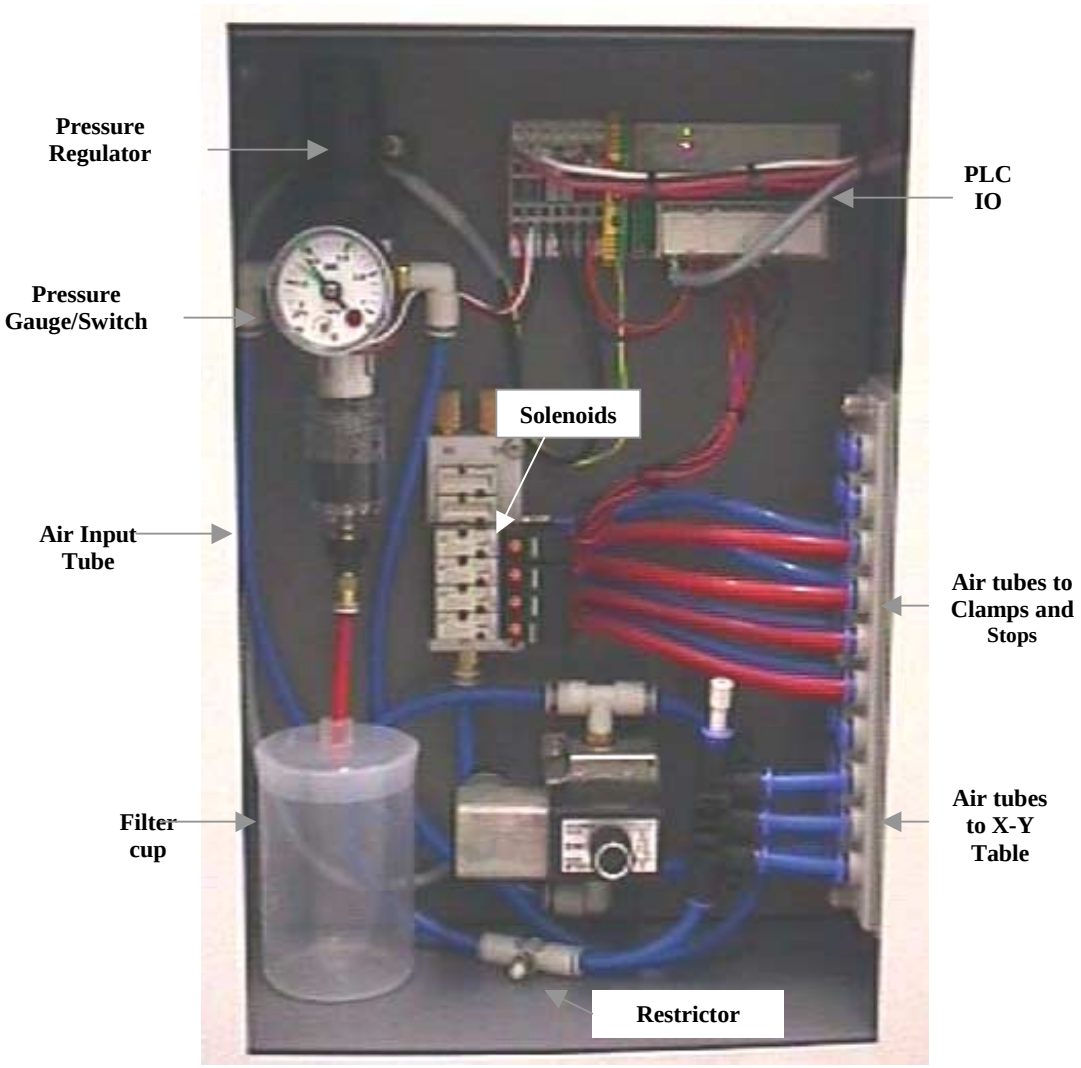


Figure 2.13 SJ50 Pneumatics Panel

2.2.7 Machine Cycle

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.

2.2.8 Lighting Tower indication

On the top of the machine is a lighting tower this is to indicate to the user different events that occur during the operation of the machine.

- Green — Inspecting
- Red — Board Failed
- Amber — Waiting for Board
- Red+Green+Amber — E-Stop On
- Amber Flash — AWA On
- Red Flash — PLC Error

2.3 Machine Assembly

The system is shipped with

- **Keyboard,**
- **Trackball,**
- **Keyboard Support Shelf,**
- **Anthro Arm,**
- **Monitor,**
- **Lighting Tower,**
- **System Hard Drive.**

They are shipped inside the machine and are wrapped in foam packing to prevent breakage.

The following steps are a brief overview of the sequence of events when setting up the machine (more detailed information is provided in subsequent sections):

1. To remove the packages, open the main hood door of the machine and remove the strap holding the foam box in place, the box can now be carefully removed.
2. The Lighting Tower and System Hard Drive are packaged together and stored behind the left hand side base panel.
3. The main **Anthro Arm** will be on top in the foam box and is the first to be removed and fitted on the machine.
4. Fit the **Keyboard Tray**.
5. Set up the **Monitor**.
6. Set up the cabling for the **Monitor**, **Keyboard**, and **Trackball** (see figure 2.14).
7. Set up the **Lighting Tower**.
8. Insert the **System Hard Drive**.

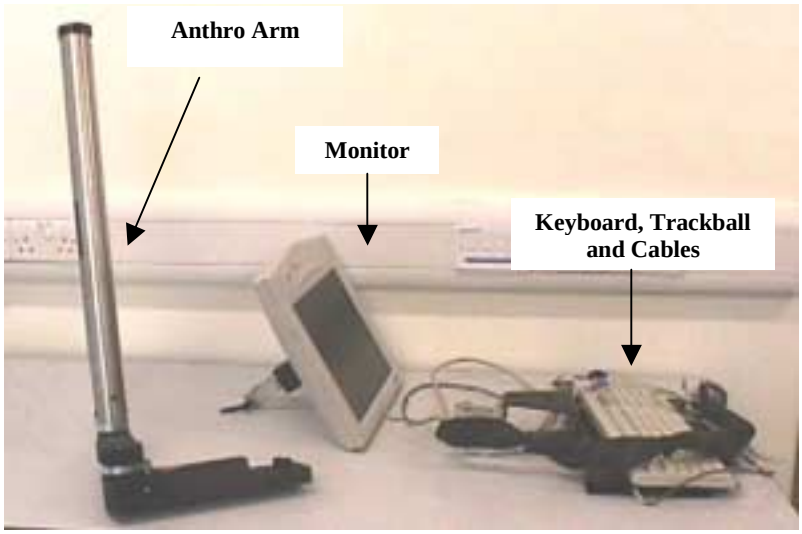


Figure 2.14 Equipment Packed in Machine

2.3.1 Anthro Arm

The anthro arm is used to mount the **Monitor**, and **Keyboard Shelf**. The **Keyboard** can then be placed onto the **Keyboard Shelf** and you can set up the cabling for the **Keyboard**, **Trackball** and **Monitor**. The **Anthro Arm** is shown in Figure 2.15.

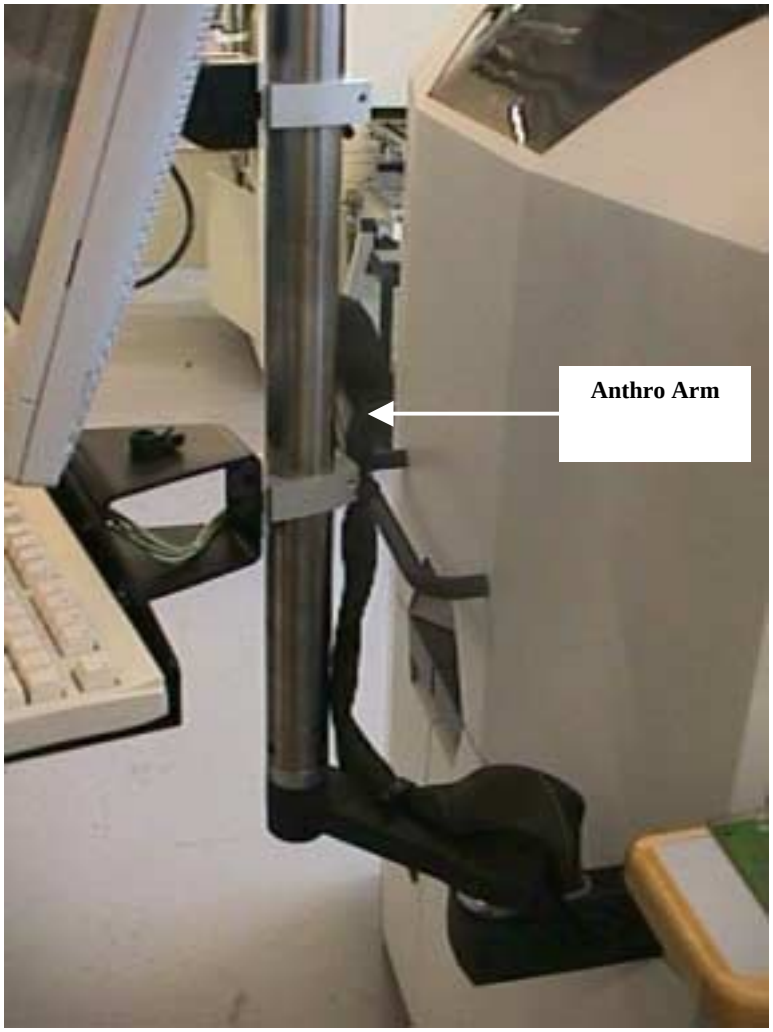


Figure 2.15 Anthro Arm

2.3.1.1 Fitting the Anthro Arm

1. Remove the four mounting screws. See fig 2.16.

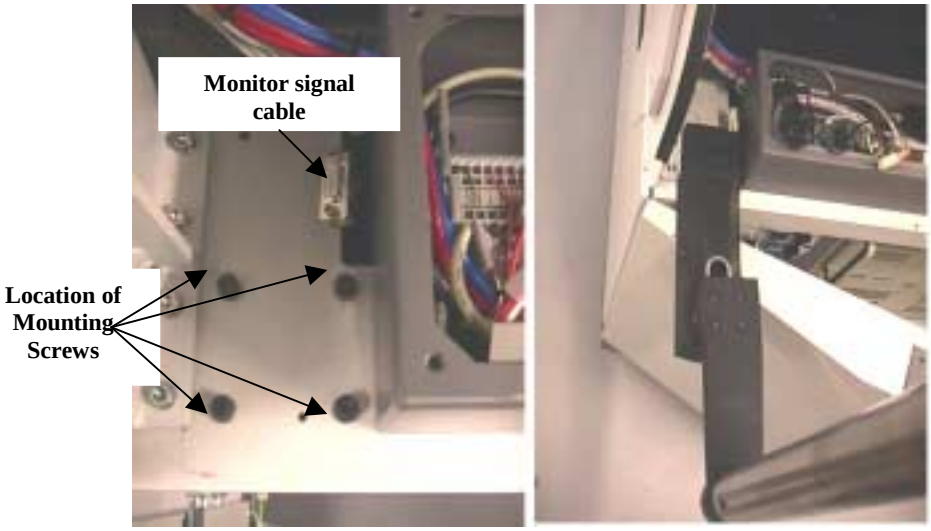


Figure 2.16 Remove the Mounting Screws

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 fig 2.16.
3. Put back in the four mounting screws to secure the **Anthro Arm**.
4. Replace the Ø10mm Dowel into the **Anthro Arm** assembly.

2.3.2 Keyboard, Trackball, Keyboard & Trackball Shelf

The **Keyboard & Trackball Shelf** is used to hold the **Keyboard** and **Trackball**.

2.3.2.1 Fitting the Keyboard & Trackball Shelf

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

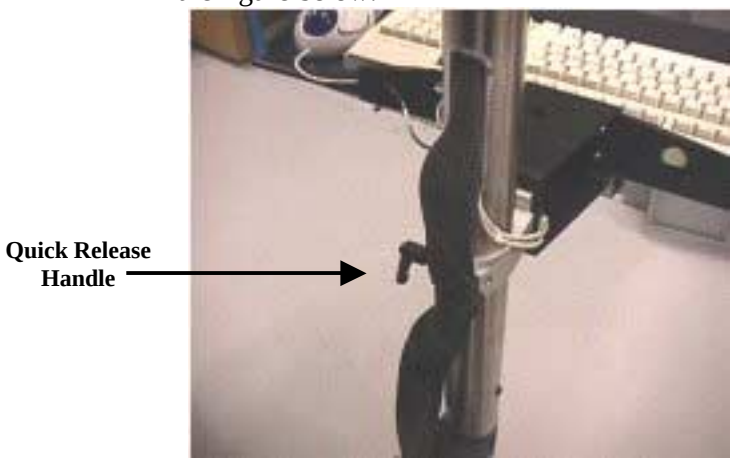


Figure 2.17 Quick Release Handle

2.3.3 Monitor

The system is supplied with one **15-inch Monitor.**
This monitor is provided with both a **Power Cable** and a **VGA Signal Cable**, which are routed through the **Anthro Arm** and through the front of the machine.

2.3.4 Connecting Cables

The cables that come attached to the **Keyboard Tray** should be assembled as follows:

1. Run the cables from the machine to the **Anthro Arm** and fix in place using the **cable fixing plate** and cable cleats as shown in Fig 2.18

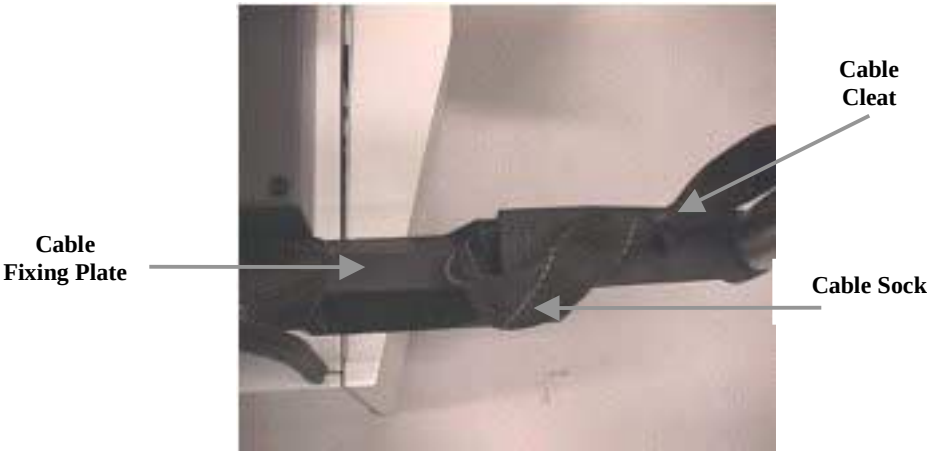


Figure 2.18 Cable Fixing Plate and Cable Sock

2. Feed the cables through the vertical tube.
3. Connect the power and signal cables to the monitor.
4. Connect the Keyboard and Trackball Cables.
5. Connect the **Earth Cable**.
   See fig 2.19 for cable locations.

WARNING
Under no circumstances should the monitor cables be connected while power is applied to the system.

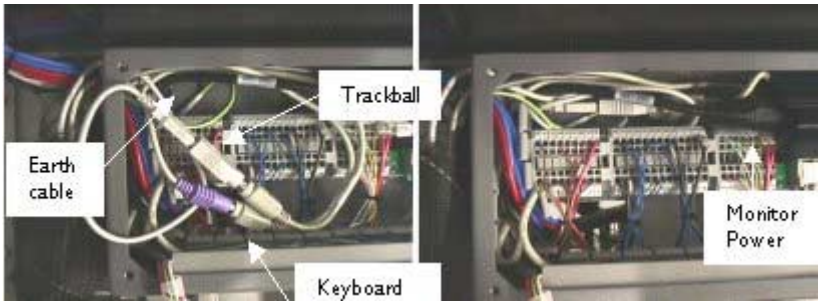


Figure 2.19 Cable Location

6. Replace the Grommet Strips and the Rubber Cap.

2.3.5 Lighting Tower

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:

1. Remove the long panel from inside the roof of the hood with a **2.5mm Allen Key,** revealing a 9-way connector and the hole for the **Lighting Tree** cable.
2. Feed the cable back through the mounting hole on the roof and fit the **Lighting Tower,** as shown in Figure 2.20, with the four screws provided and a **4mm Allen Key**.
3. The two 9-way connectors can now be fitted together inside the hood and the long panel replaced to cover them.

Remove Long panel **Connect plugs and fit cable back**

Figure 2.20 Fitting the Connectors

2.3.6 System Hard Drive

The system is shipped with a **System Hard Drive**. The **Windows NT 4** compatible hard-drive containing the application software is labeled.

2.3.6.1 Inserting the System Hard Drive

Use the following steps to insert the **Windows NT 4** operating system hard-drive:

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. The **Windows NT 4** 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 figs 2.21 and 2.22.

Figure 2.21 Hard Drive Not Locked in Hard Drive Bay

4. Turn the cradle-locking key to the lock position:

Figure 2.22 Hard Drive Locked in Hard Drive Bay

5. Remove the Hard Drive Key.

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

2.3.7 X-Y Table

The Machine is fitted with a X-Y Table linear drive system, it is housed on an aluminum base with dimensions 965mm x 914mm.

The X-Y Table consists of a gantry system with:

- An X-axis, and
- A Y-axis.

See fig 2.23.

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, (there can be two magnet tracks on some machines).
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 mounted on the linear rails.
The X-axis is mounted on a similar aluminum riser which again supports a THK rail and a single magnet track.

Each axis has a travel of 500mm.

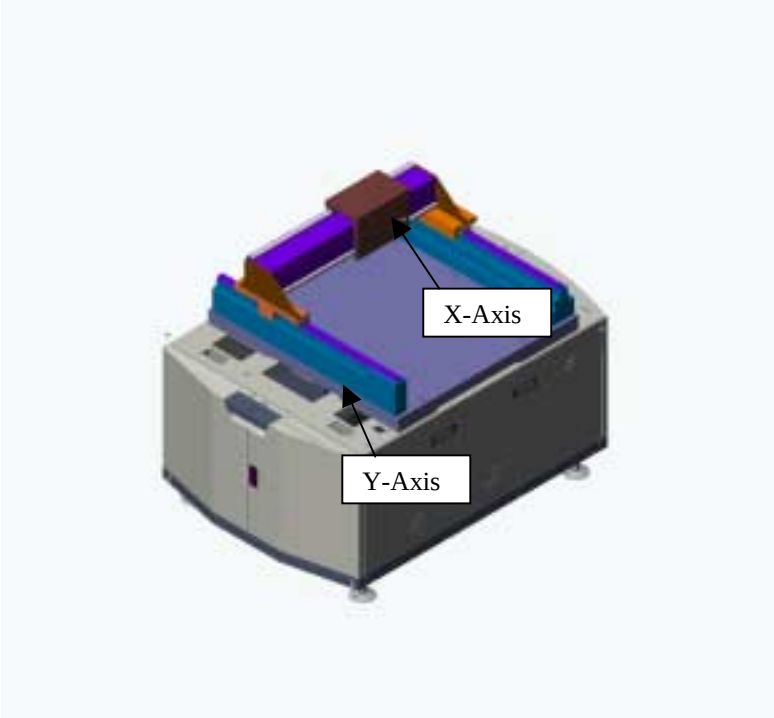


Figure 2.23 X-Y Table Diagram

The controllers and the required equipment is enclosed in a DR600 controller chassis (See following figure).
Inside the chassis a safety relay supplies mains power to the controllers.
When a E-Stop is on or the Gull wing roof is opened power is removed from the controllers.

Figure 2.24 Motor Controller

2.3.8 Camera and Lighting Head

The X-Y table carries the camera and the lighting head. See figure below. The 12V digital camera is mounted over a bank of 8 circular lighting rings that are used to light up the image area at different angles and colours.

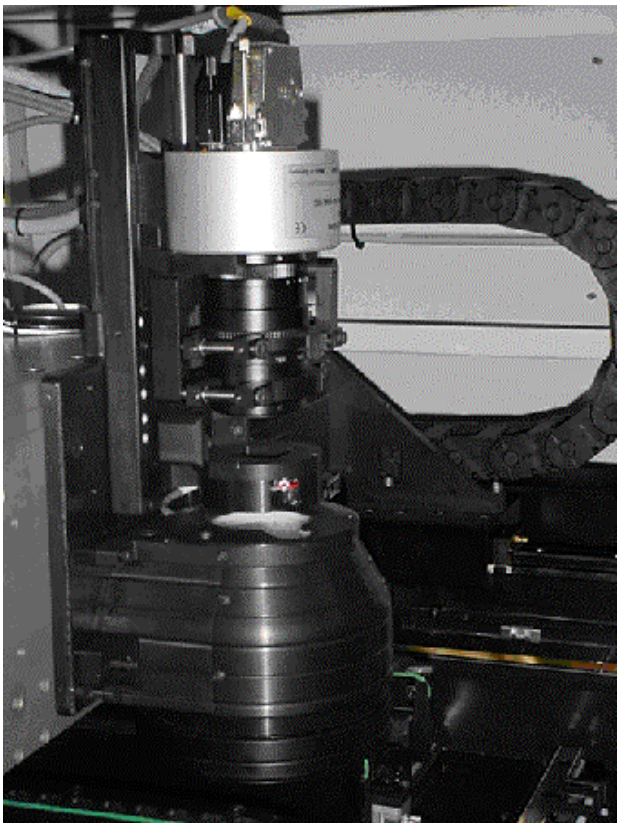


Figure 2.25 Camera and Lighting Head

2.4 Machine Installation

Having ensured that the correct space is available on the production line the system can be lifted and handled into position as described in section 2.1.2

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.

2.4.1 Height Adjustment

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.

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.
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.

2.4.2 Power up the System

2.4.2.1 Electrical Power

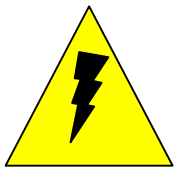
All sub-circuits in the system operate at **230V**.
The system can be set to accept a number of mains voltages (normally **210-240V 25A** …**100-120V 40A**).
It achieves this by using a universal transformer. See Figure 2.26.

The primary voltage is manipulated to achieve the secondary output voltage of **230V**. See Figure 2.27 or the **Primary Terminal Wiring** set-ups for most common electrical supplies from **100** – **120VAC** to **200-240VAC**.

The user is responsible for the supply and installation of the main power cable to the system.
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.

The user must secure **N1** (**Neutral 1**) and **L1 (Live 1)** to the correct terminals, see section 2.4.2.2.

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



WARNING
All system sub-circuits are 230VAC. Only connect equipment rated to this voltage to the system.

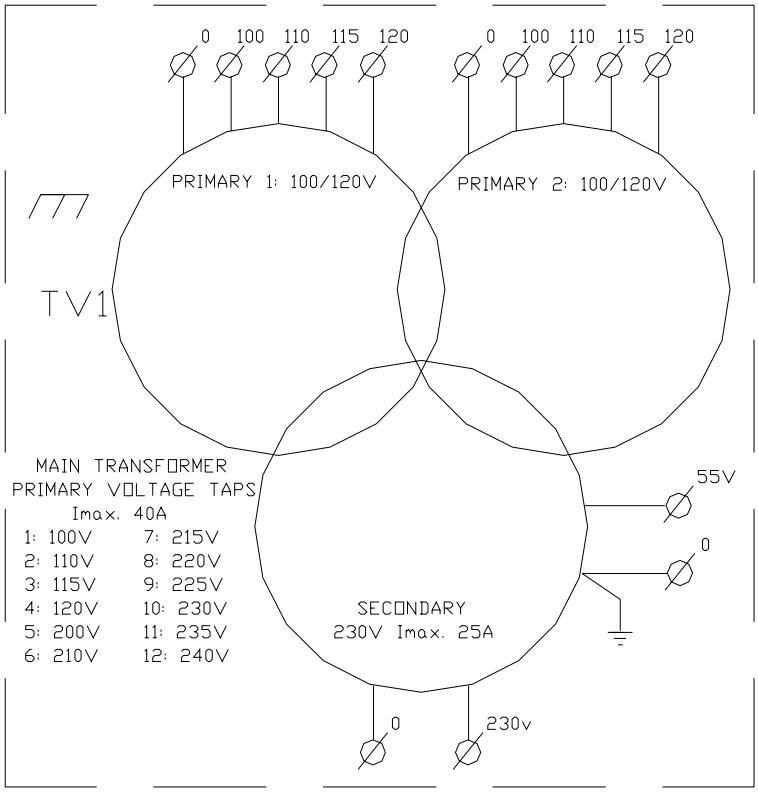


Figure 2.26 Universal Transformer Wiring Diagram (General)

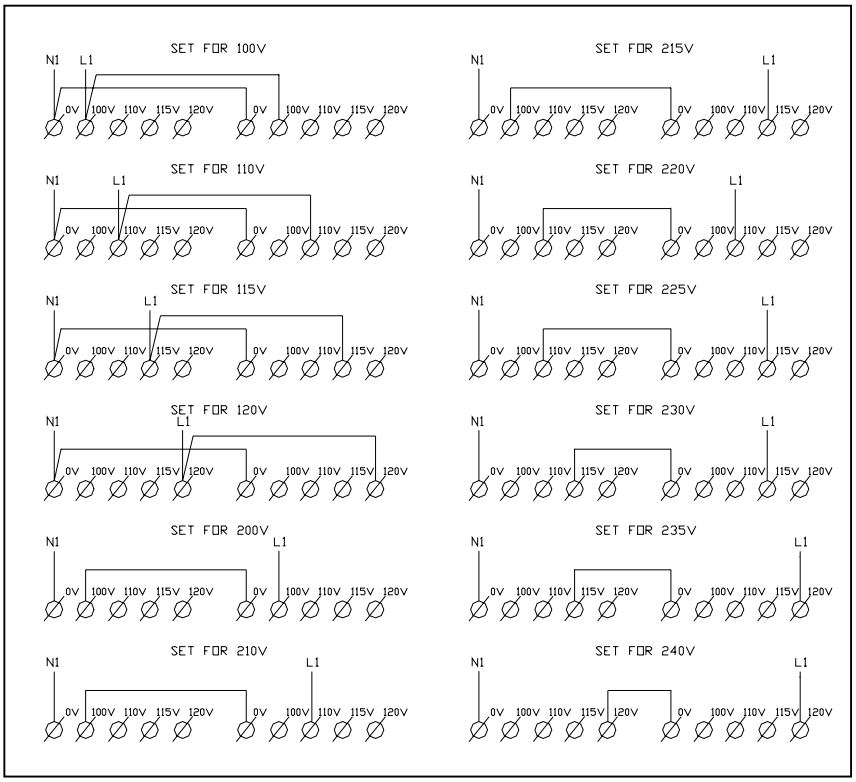


Figure 2.27 Primary Terminal Wiring Set-ups For Most Common Electrical Supply

The system should be protected by a circuit breaker of not more than the maximum current carrying capacity of the mains cable. For example this should be of a minimum of 25A for voltages 200-240 or 40A for 100-120V.

2.4.2.2 Connecting the Mains Cable

1. 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. See fig 2.28.
2. The Dust Guard should then be replaced. See fig 2.29.

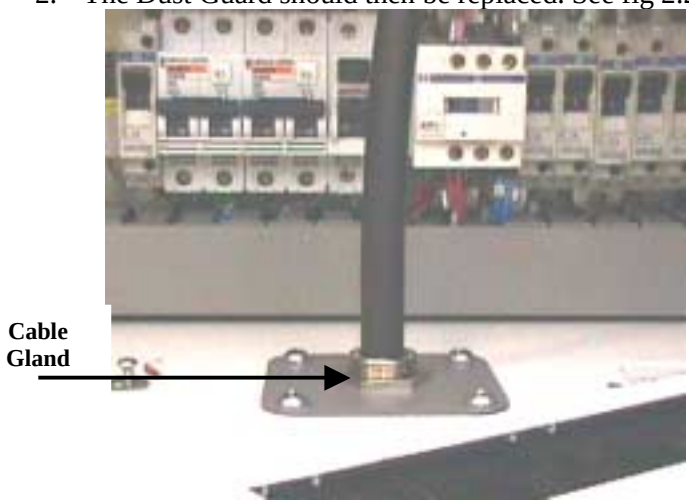


Figure 2.28 Cable gland detail

Figure 2.29 Dust Guard detail

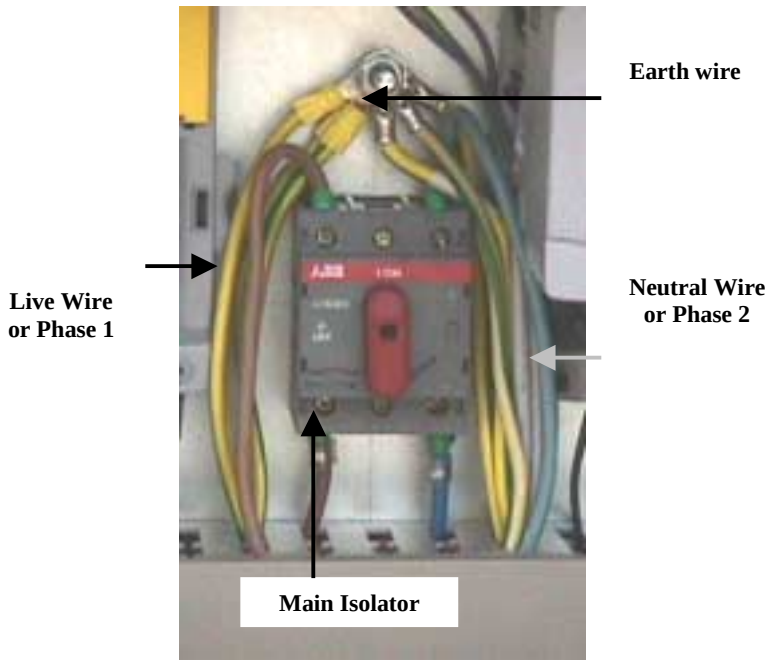


Figure 2.30 Connecting the Mains Cable

3. Secure the terminals of each core (**Live/Phase1** and **Neutral/Phase 2** terminated with **Boot Lace Ferrules** and the **Earth Wire** with an **Eyelet Ferrule**) firmly in place and tidy the cable into the trunking so that it can't be accidentally pulled. See fig 2.30.

The Earth Wire Eyelet must be placed on the base of the Earth Stud, this means all other Earths will have to be removed to allow termination.

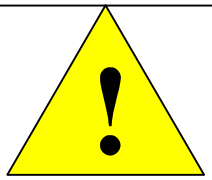
Before turning the system on at the Main Isolator, carry out the following steps:

1. Measure the incoming power with a **Voltmeter** and make sure **Q1** is switched off.
2. Adjust the **Transformer** as shown in Figure 2.26. **It is the responsibility of the installation personnel to ensure the correct voltage is selected.**
3. Measure the voltage at the secondary side of the transformer (terminals **L2** & **N2**) after switching on **Q1**. Ensure that this is **230V±10%** only, if not adjust primary settings accordingly (see Figure 2.27).
4. Measure the voltage between **L** and **Earth** on the **Main Isolator**. This should measure at **230V**.
5. Measure between **N** and **Earth** on the **Main Isolator**, this should measure at **0V**.

2.4.2.3 Pneumatic Power

Pneumatic Power 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).

WARNING
THIS SYSTEM MUST BE EARTHED BEFORE AND DURING USE.



WARNING

The System should never be operated without pneumatic power applied to the system.

2.5 Communications

2.5.1 S.M.E.M.A. Communications

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**.

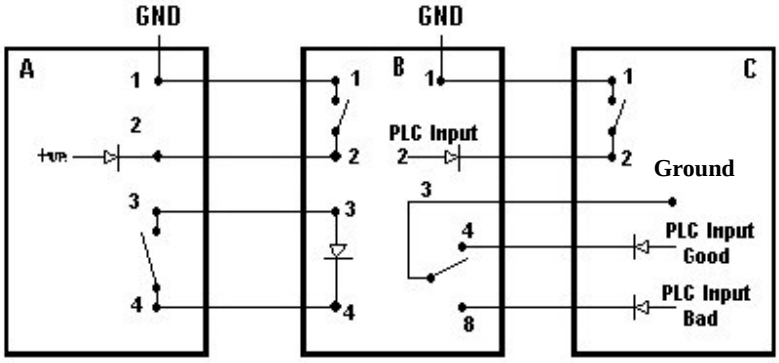


Figure 2.31 Pins 1 to 4 of SMEMA Connector

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).

2.5.1.1 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. 2003-0024 must be connected to the SMEMA UP Connector on the Facilities Panel.
- The Downstream Cable p.n. 2003-0025 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.

If an Agilent RS-1 is upstream from the system, connect **SLC 28** (S.M.E.M.A cable) downstream.

2.5.2 System Connections

2.5.2.1 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.

2.5.2.2 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**).

2.6 Machine Operation

2.6.1 Powering up Sequences

2.6.1.1 Powering up the Machine for the first time

1. Ensure that only trained personnel have connected the electrical power to the system.
2. Measure the voltage of Q1, ensure that this is the rated voltage of the machine.
3. Turn on Q1, measure the voltage between L2 and N2, this is the secondary voltage of the transformer and should always be at 230V AC±10%.
4. Switch on Q2.
5. Switch on all other MCBs.
6. Check the indicator lights on all power supplies (PS1, PS2& PS3) are on.
7. Verify all circuit breakers are on.
8. Ensure main switch is **OFF**.
9. Ensure the Motor controller is switched **OFF**.
10. Ensure that the **X-Y Table** is free to move over its entire envelope before continuing. You can manually move it around its enclosure.
11. Ensure that the conveyor is free from obstruction.
12. Ensure the Maintenance switch is in the **O** position.
13. Ensure that the top frame is fully closed and that the **E-Stop** button is depressed before continuing.
14. Close the rear doors, lock them and turn on the machine at the Main Isolator.
15. Turn the key switch at the front of the machine to the **ON** position.
16. Ensure the Run light is illuminated.
17. Ensure the **Pass Thru** switch is set to **Inspect**.
18. Turn on the Motor controller unit at the **ON** switch.

19. Turn on the **Monitor**.
20. Release the red **E-Stop** push button.
21. Turn on the Industrial PC.
22. Reset the Emergency stop by depressing the E-stop reset button (see figure 2.32).

2.6.1.2 Power Up Sequence from 'Mains Off' Situation

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 run 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 Push in the **E-Stop Reset** button, which is the blue button located behind the lower front doors on the machine. See fig 2.32.

Fig 2.32 Location of E-Stop reset button

12 Power on the Industrial PC at its **ON** switch and await the Log-on prompt. This can take two minutes.

2.6.1.2 Power Up Sequence to Restore from 'E-Stop' Situation

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

2.6.1.3 Maintenance Key Switch

The Maintenance Key Switch is used for adjusting air pressure on the clamps and stop valves for checking the AWA sensors. See next figure.

Figure 2.33 Maintenance Switch and Conveyor Reset

1 The maintenance key switch (fig 2.33) is designed for use by qualified personnel only.

2 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 Key Switch as misuse may lead to injury.

3 When the Key Switch is in the **I** position, 24V will be supplied to the pneumatic control panel to allow actuation of the clamps and stop valves and to the Paragon drives to allow checking of the AWA sensors.

4 Actuation of the valves is achieved through the software.

2.6.2 Starting the Application Software

After the system is powered up and in **Pass Thru** mode, the user must log into the main application account in Engineer mode. The following are the username and password for the account:

User **cpi**
Password **cpi602**

Note: The user name and password are case sensitive.

For more information refer to the **SJ-10 Engineering Mode Manual**.

Following log in, the system automatically goes through an initialization procedure. This includes the following:

1. Start X-Windows.
2. Initializes the hardware components such as the **X-Y Table**, **Lighting Controller** communications with the PLC, and the **Framestore**.
3. The **X-Y Table** is homed and moved to the **Fiducial 1** location for the default PCB. The default PCB is the last PCB that was inspected by the system before it was last shut down.

Note: If the system is being cold started, the user should watch the initialization procedure on screen to ensure that all the sub-systems start successfully.

2.7 Board Sensors

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 **20mm** above the **Conveyor**; the sensor is **80mm** below the **Conveyor**, so set the sensor so that it is activated between **80mm** and **100mm**.

2.7.1 Setting up the Board Sensors

The sensors are set up as follows:

1. Place a **Fiducial Plate** on the **Conveyor Rails** (not on the **Conveyor Belt**) over the sensor.
2. Adjust the sensitivity until the sensor just picks up the **Fiducial Plate** (A red indicator light on the sensor lights when the sensor is activated).
3. Remove the board and move the **Gantry** and **Camera Head** over the sensor to ensure that they do not trigger the sensor.
4. Adjust the sensitivity of the sensor by turning the small yellow tuning screw on the sensor. This is illustrated in Figure 2.34:

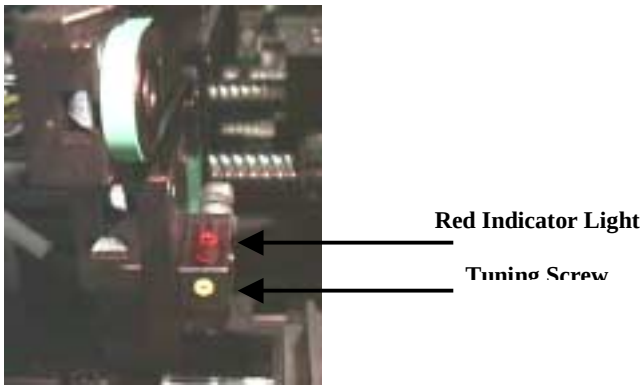


Figure 2.34 Board Sensor

2.8 Conveyor

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

- 1.0
- 2.0
- 3.0

The conveyor is controlled by the PLC, which gives inputs to a **Drive Controller**. The Auto Width Adjust feature controls the width of the conveyor. This can be from the GUI, or via a manual selector plate on the machine.There are two Drive Controllers:

- Paragon L50 Controller
  The **Paragon L50 Controller** runs the motors, which drives the conveyor. The controller has dip switch settings, which must all be set to **OFF**.
- Paragon L50i Controller
  The **Paragon L50i Controller** is used in the operation of Auto Width Adjust. It has dipswitch settings, set to switch **3** to**ON**, and all others **OFF** as shown in fig 2.35.

Figure 2.35 Switch Dipswitch 3 On

These Paragon Drive controllers are illustrated in Figure 2.36. Consult System Electrical drawings for wiring details.

Figure 2.36 Paragon L50 and Paragon L50i Drive Controllers

Communications between the Drive Controllers and the PC is accomplished using the **Easi Tools** application (which is supplied by the Paragon Drivers manufacturers).

A terminal executable file is used then to test the inputs and outputs between the paragon drivers and the PC. More information on this topic is provided in section 2.8.2.1‘setting up the Sensors and Flags’.

Once the machine has been positioned inline or off line, the width of the conveyor needs to be changed. This is done with either an **Auto Width Adjust Graphical User Interface (AWA GUI)** or by manual powered width adjustment. More information on AWA is provided in section 2.8.2.

2.8.1 Using the Easi Tools Application

The **Easi Tools** application is used to arm the Paragon Drive L50i Controller. This is done using the following steps:

- Download the **Awa122.prg** file program from: **C:\Parker\easitool\examples\Awa122.prg**
- Arm the Paragon Drive Controllers using the **Easi Tools** terminal.

2.8.1.1 Download the Awa122.prg Program

1. Start the **Easi Tools** application by selecting: **Start -> Programs -> Easi Tools Application-> Easi Tools**
2. The **Easi Tools** main toolbar is illustrated in Figure 2.37:

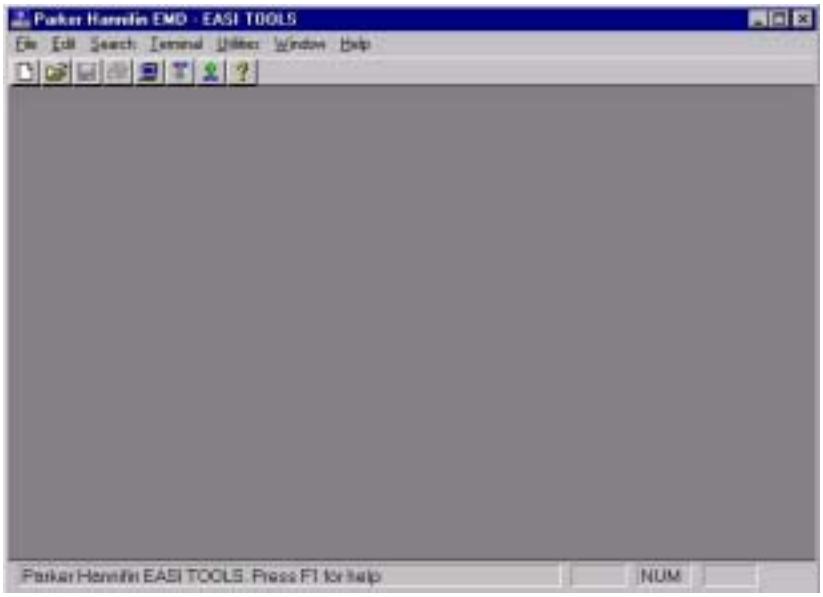


Figure 2.37 Easi Tools Main Toolbar

3. Open the latest revision of the **Paragon Drive** code (**Awa122.prg**) by:
    a. Selecting **File -> Open** as shown in figure below:

Figure 2.38 File -> Open

    b. Select **C:\Parker\easitool\examples\Awa122.prg** as shown in Figure 2.39.

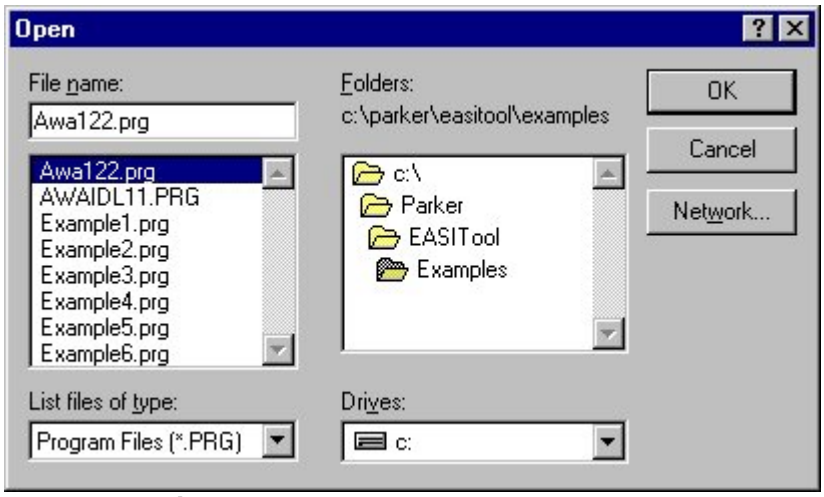


Figure 2.39 Open Awa122.prg

c. Click **Ok**.

4. Download the program by clicking on the red down arrow as shown in Figure 2.40.

Figure 2.40 Click on the Red Down Arrow

5. Download progress is recorded on a progress bar as the process runs. This is illustrated in the figure below.

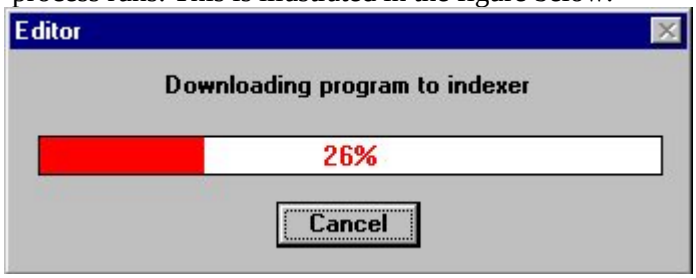


Figure 2.41 Progress Bar

6. When the download is complete, the drive must be armed. This is done using the **Easi Tools Terminal**.

2.8.1.2 Arm the Drive Controller Using the Easi Tools Terminal

1. To open a **Terminal** session, click the computer terminal icon on the **Easi Tools** main toolbar as shown in Figure 2.42:

Figure 2.42 Click the Terminal Icon

2. To arm the drive, type the following commands in the **Terminal**:

1ARM1	<Enter>
1SV	<Enter>
1Z	<Enter>

Note: The commands are case-sensitive, in this case all letters are capitals.

3. The drive is now armed and reset as shown in Figure 2.43:

Figure 2.43 Paragon Drive Armed

4. Close the **Easi Tools** application.

Once the Paragon functionality has been verified and the wiring correct, the parameters in the GUI must be set up for operation.

2.8.2 Auto Width Adjust (AWA)

The principle of **AWA** is that the Operator can adjust the conveyor width without opening the front door of the machine.

The **Conveyor** has **3** sensors on it for **Automatic Width Adjust** (**AWA**) control. The sensors are for minimum width, maximum width, and alignment.
The width is powered by two **DC Stepper Motors**, which are powered together to be used when moving to the required width. The right **DC Stepper Motor** runs on its own so that the conveyor can align itself, i.e. the entry width is the same as the exit width.

2.8.2.1 Setting Up the Sensors and Flags

The AWA sensors used to keep the board within its bounds are the

- **Left Minimum Width** sensor. (**Left Min**).
- **Right Minimum Width** sensor. (**Right Min**).
- **Left Maximum Width** sensor. (**Left Max**).

Flags mounted on the rails trigger these sensors. The flags and sensors are illustrated in Figure 2.44.

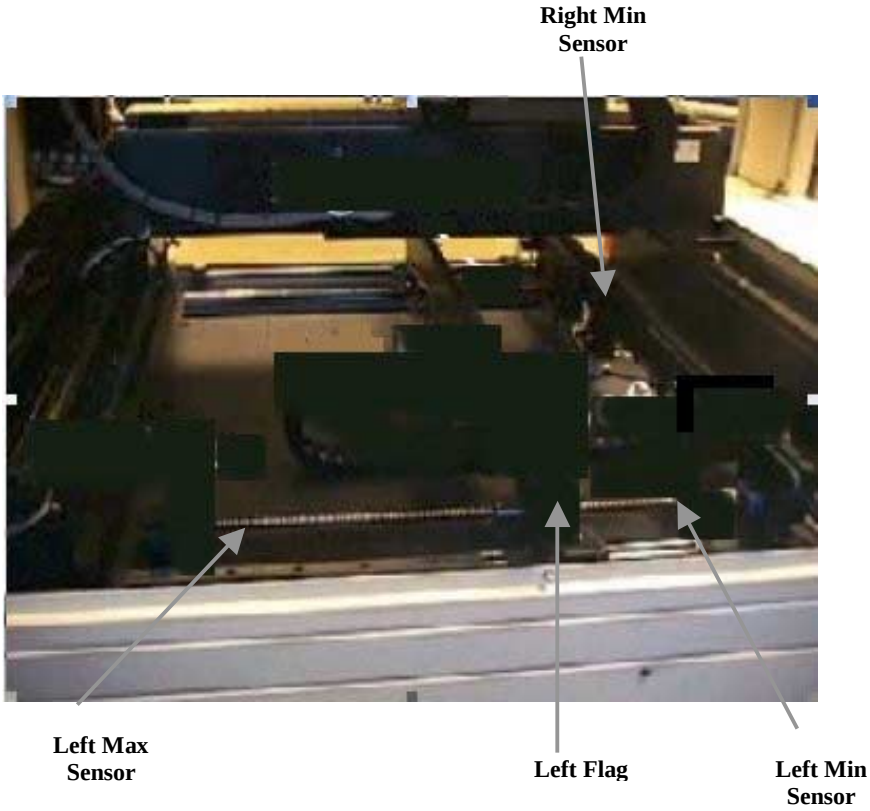


Figure 2.44 AWA Flags and Sensors

The sensors are installed so that each sensor is triggered when the rails are a specific distance apart. This is not the same for all type of conveyors:

- For revision **1.0** and **2.0** conveyors, the rails should be able to move in to **65mm** width or less.
- For revision **3.0** conveyors, the rails have to be able to move in to **54mm** width or less.

This is done for the **Left Min** and **Right Min** sensor:

- The **Left Min** sensor is installed so that it triggers when the rails can move in to 65mm or less(or 54 mm for the 3.0 conveyor) apart.
- The **Left Max** is installed so that it triggers when the rails are a distance of approximately **490mm** (approximately 2mm less than the maximum travel distance).

Note: The minimum width between the rails can be reduced to **50mm** for **the 3.0** conveyors by reducing the edge clearance by **2mm** on both the adjustable and fixed rail

2.8.2.2 Test the Inputs and Outputs Using the Terminal Program

To test the inputs and corresponding outputs, use the following steps:

1. Open the Terminal executable **C:\AutoWidthAdjust\terminal.exe.**
2. Go to file, Open and open the file **C:\AutoWidthAdjust\AWATest.trm** provided with the **AutoWidthAdjustv2.1.1**
3. Check that the correct comm port (Connector) and Baud Rate (9600) are selected.

This is done by clicking **Settings -> Communications**. The following menu is displayed in Figure 2.45.

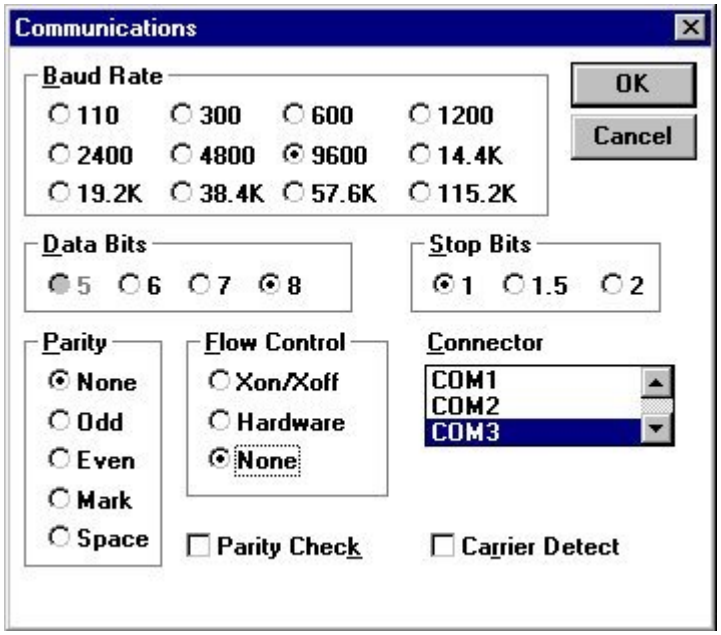


Figure 2.45 Terminal Communications settings

4. Open the machine hood and switch the Maintenance switch ON. This causes the Paragon Drive to automatically reset, giving a message similar to the one in fig 2.46. The response from the drive will indicate a drive fault by the text “Drive Flt”. This is due to 55V not being connected to the drive. This is OK!

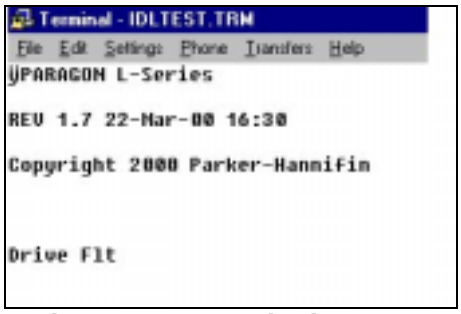


Figure 2.46 Terminal Startup

The Terminal Main Interface is illustrated in the figure below:

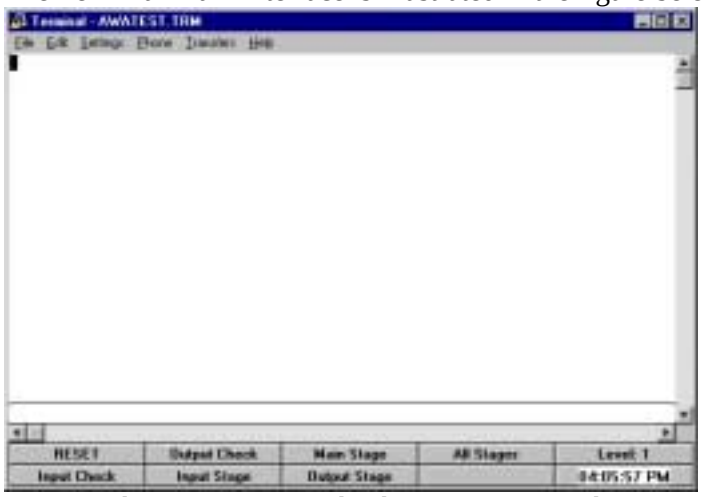


Figure 2.47 Terminal Program Level 1

When you click the Level 1 tab (Figure 2.47), ‘Level 2’ is displayed. See fig 2.48.

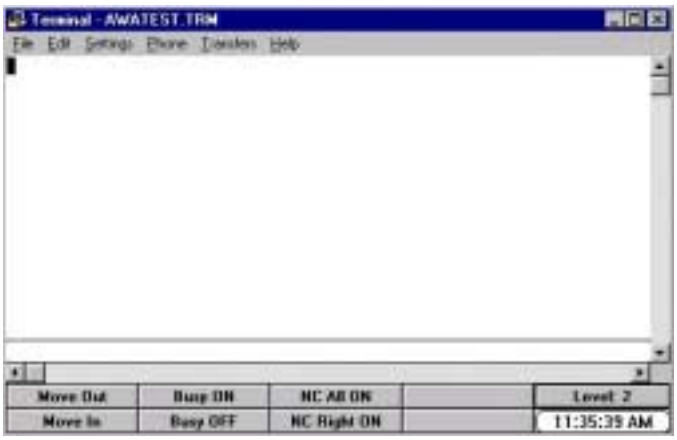


Figure 2.48 Terminal Program Level 2

5. The program **awatest.trm** has pre-encoded commands to make debugging the conveyor easier. The tabs in this terminal program are:

   - RESET
     Resets the drive - This generally causes the drive to output some startup text to the screen when in communication with the PC.

   - Input Check
     Checks the Input state of the drive. Each bit (**1** or **0**) corresponds to that input being **ON** or **OFF** respectively.

   - Output Check:
     Checks the output state of the drive. Each bit (**1** or **0**) corresponds to that input being **ON** or **OFF** respectively.

   - Input Stage:
     Sets **Output 5 ON** so that the **Input Stage** can be controlled alone. This also enables the sensors for the input stage to be read by the drive.

- Main Stage:
  Sets **Output 4 ON** so that the **Main Stage** can be controlled alone. This also enables the sensors for the main stage to be read by the drive.

- Output Stage:
  Sets **Output 7 ON** so that the **Output Stage** can be controlled alone. This also enables the sensors for the output stage to be read by the drive.

- All Stages:
  Sets **Output 8 ON** so that the all three stages can be controlled together. This also enables the sensors for the main stage to be read by the drive. These are the only sensors read when **All Stages** is set.

- Level 1:
  Makes the next set of buttons visible on the screen. These buttons include the following:

- Move Out:
  Moves the conveyor out **5mm** (for which ever stage is enabled).

- Move In:
  Moves the conveyor in **5mm** (for which ever stage is enabled).

- Busy On:
  Sets output 6 ON. This connects to the PLC and tells the PLC that the conveyor wants to move.

- Busy Off:
  Switches OFF the Busy On signal.

- NC All On:
  Switches on Output 1 of the AWA drive, which energizes both motors in parallel.

- NC Right On:
  Switches On output 3 ONLY so that the right motor can move on it's own.

2.8.2.3 Check Inputs

1. Trigger the **Left Min/Home** sensor by breaking the beam with a piece of paper (the red light on the sensor should go off).
2. Click **Input Check**.
3. Response should be***0100000110** (inputs 8 & 9).
4. Trigger the **Left Max** sensor.
5. Click **Input Check.**
6. Response should be ***0100000001** (input 10).
7. Trigger the **Right Minimum** sensor.
8. Click **Input Check.**
9. The response should be ***0100010000** (input 6).

2.8.2.4 Test Outputs

1. Click **Level 1**.
2. Click **NC All ON** - **Relay 1** should be **ON** & **Relay 2** should be **OFF**.
3. Click **NC Right ON** - **Relay 1** should be **OFF** and **Relay 2** should be **ON**.
4. Click **Level 2**.
5. Click **RESET** - This Resets the drive to **All Motors On** (default).

2.8.2.5 Test Motors

1. Switch Maintenance switch OFF.
2. Close Hood.

3. Reset E-Stop.
4. Click **Level 1**.
5. Click **Move Out** - both Rails should move out together (**5mm**).
6. Click **Move In** - both rails should move in together (**5mm**).
7. Click **NC Right On**.
8. Click **Move Out** - right side ONLY should move out.
9. Click **Move In** - right side ONLY should move in.
10. Click **Level 2**.
11. Click **RESET**.

2.8.2.6 Test PLC Communication

1. Click **Level 1** tab.
2. Click the **Busy ON** tab. The conveyor should run for 2 seconds and then switch **OFF**.
3. Click the **Busy OFF** tab.
4. Click the **Level 2** tab.
5. Trigger the input sensor so that the conveyor starts to move.
6. Click the **Input Check** tab. The response should be ***0100000000**.

2.8.2.7 Check Working of Manual Functionality

1. Switch the AWA manual **Switchplate** to the **ON** position. This should cause the drive to output **MAN** to the screen.
2. Press the manual **IN** button. This should cause the rail to move in and output **NegMan** to the screen.
3. Check that the rail moves in and stops automatically at the **Home** sensor.
4. Press the manual **OUT** button. This should cause the rail to move out and output **PosMan** to the screen.
5. Check that the rail moves out and stops automatically at the **Left Maximum** sensor.
6. Set the manual AWA switch back to **OFF**.

2.8.2.8 Install the AWA GUI

Use the following procedure to install the **AWA GUI**:

1. Open the file **AutoWidthAdjustv2.1.1.zip** file on the CD provided with the system.
2. Click **Install**.
3. Follow the on-screen options.

2.8.3 Using the AWA GUI

Before using the AWA GUI the conveyor rails must be set up as follows.

1. Manually align the rails with vernier calipers so that they are parallel.
2. When the GUI is fully installed, go to:

Start -> Programs ->SJ-50 GUI -> AutoWidthAdjustv2.1.1

When the GUI starts, it attempts to communicate with the drive. If this attempt is unsuccessful, go to the **Advanced** screen; change the **Comm** port setting to **3**, and make sure that the **Baud** is set to **9600**.

3. Click the **Advanced** tab, the password to access the **Advanced** menu is **autowidth** and it is case-sensitive.
4. Enter into the parameters **Home Width Main Stage** and **Min Width Position**, the distance at which the **Left Min** sensor is triggered. Enter into the **Max Width** parameter the distance at which the **Left Max** sensor is triggered.
5. Ensure that **Speed** is set at **2**, and **Acc/Dec** is set to **300**.
6. Run calibration.
7. When calibration is complete, click **OK** on the **Advanced** screen.
8. Home the conveyor.
9. Run the conveyor to **100mm** – check the width with calipers.
10. Run the conveyor to **150mm** – check the width with calipers.

11. Run the conveyor to **200mm** – check the width with calipers.

Note: All measurements are in millimeters, except the **Acc/Dec** and **Speed** settings, which are in revolutions per second. The lead screw of the conveyor is **5mm** pitch so 1 revolution per second gives a linear speed of 5mm per second.

The AWA GUI main menu is illustrated in Figure 2.49:

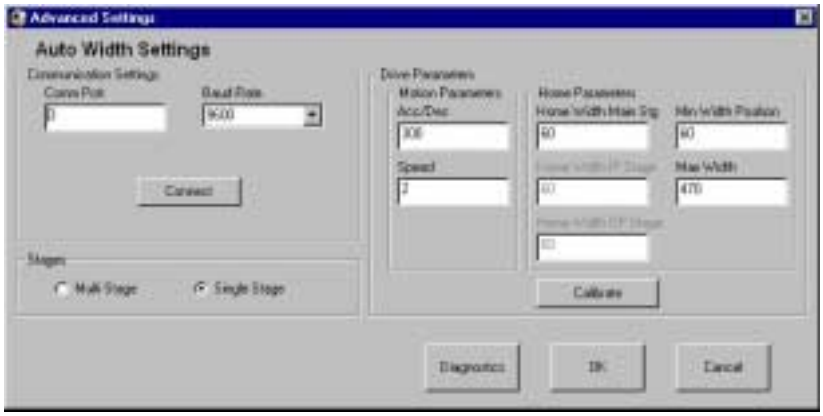


Figure 2.49 AWA GUI

The following are descriptions of the parameters and settings on the main AWA GUI

Home:
The **Home** function is used to return the rails to a known position and ensure that they stay parallel. This should be used if the machine has been switched off for a while or if any work has been done on the inside of the machine.

Go/Stop:

The **Go** button moves the conveyor to the required width, and the **Stop** button stops the motion if the conveyor is in the middle of a move.
These functions are disabled while the machine is homing.

Jog:
The **Jog** functionality allows you to jog the rails in or out within the bounds of the sensors.
To use this functionality, tick the checkbox **Jog Enable** when required, and deselect it when finished.
No other functions are available when **Jog** is enabled.

1. Click on the **Jog In** button to move the conveyor in. Release the button to stop.
2. Click on the **Jog Out** button to move the conveyor out. Release the button to stop.
3. If the conveyor triggers the sensor while moving, the conveyor stops and displays a warning message. Click **OK** and the conveyor will move off the sensors.

Status:
The **Status** gives the following status displays:

- AXIS NOT HOMED
- AXIS HOMING
- AXIS HOMED
- AXIS MOVING TO INPUT WIDTH
- AXIS STOPPED

Enter Width:
This is where you enter the desired width for the conveyor to move. Either press **<Enter>** on the keyboard or press **Go** on the GUI.

2.8.3.1 Advanced Screen

The **Advanced** settings screen (See fig 2.50) is where the parameters of the drive are set. It is password protected. The password is **autowidth**.

If the **Advanced** parameters are not accurately recorded and set, the AWA will not work properly or with the desired accuracy.

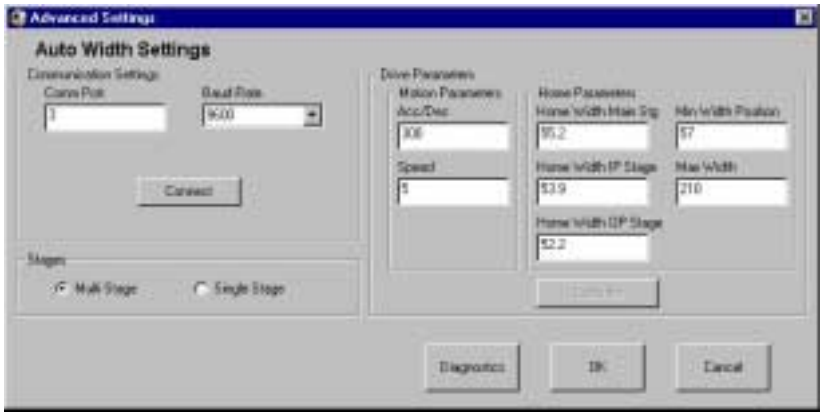


Figure 2.50 AWA Advanced Settings

Communication Settings

Comm Port:

This is the communications port on the PC through which the PC communicates with the AWA drive. The AWA setting is **3**.

Baud Rate:

Standard is **9600** bps.

Connect:
When the **Baud Rate** and **Comm Port** have been set, clicking **Connect** will set the GUI to use these new communications settings.

Motion Parameters
Acc/Dec:
This is the variable, which defines the acceleration and deceleration of the drive when stopping and starting.
It is measured in revolutions of the lead screw per second.

Speed:
This is the rotational speed of the AWA motor. This is limited to a maximum of **5**. Attempts to enter a higher value will give a warning and then set the value at **5**.

Stages
Set this to **Single Stage** for single lane conveyors.

Home Parameters
Home Width Main Stage:
This is the width of the conveyor when the **Left Min** sensor is triggered. This is a reference point for the AWA Conveyor.

Home Width IP Stage:
Not used for this release.

Home Width OP Stage:
Not used for this release.

Min Width Position:
This is to be set to the same value as Home Width Main Stage.

Max Width:
This is the width of the conveyor when the Left Max sensor is triggered.

Note: The values for the conveyor widths may be displayed in microns, as a result of a previous version of the AWA GUI being used. These should be changed to the proper units of millimeters.

Calibrate:
The **Calibrate** functionality is used to determine if there is any offset in the positioning of the **Left Min** and **Right Min** sensors. This value is used to maintain parallelism between the rails when they are homed. This is done using the following procedure:

1. Align rails, making sure they are parallel using **Vernier Calipers**.
2. Close Hood.
3. Reset E-Stop.
4. Click the **Calibrate** button.
5. The conveyor moves and determines the offset between the **Left Min** and **Right Min** sensors.
6. If calibration is completed successfully the following message is displayed:

Figure 2.51 Calibration Complete Message

7. If the sensors are offset by more than **10** mm, calibration fails and the following message is displayed:

Figure 2.52 Calibration Failed Message

8. In this instance, align the sensors more accurately using **Allen keys**, and repeat the process.
9. The ideal value reported for the offset is **0**. The closer to this value the better.

2.8.3.2 Position Memory after E-Stop

The AWA GUI remembers its last position and continually writes this to the file:
C:\AutoWidthAdjust\AWApos.txt.

The position is maintained in the event of an Emergency Stop, or if the GUI is shut down. This means that the AWA does not have to be HOMED after each E-Stop, however it should be HOMED after any work on the internal mechanism of the machine, or if it has not been used in a long time.

2.8.3.3 PLC Interface

The AWA GUI interfaces on a basic level with the PLC to provide the following functionality:

- Conveyor width does not change while conveyor is running.
- Conveyor width does not change while there is a board in the machine.
- Conveyor does not run while the AWA is in motion.

If a move is attempted while the conveyor is busy, the following message appears:

Figure 2.53 Conveyor is Busy Message

2.9 PLC Faults

When a PLC fault occurs The Lighting Tower will Flash Red (see section 2.2.8).
The Software should give 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 conveyor reset button beside the maintenance key switch. See fig 2.54.

Figure 2.54 Maintenance Switch and Conveyor Reset

Chapter 3

Maintenance

Chapter Contents

Summary

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.

3.1 Introduction

Maintenance is divided into weekly, monthly, quarterly and yearly schedules. It is also divided into five main sections, each covering an area on the machine. These areas are as follows:

- Electrical Maintenance.
- X-Y table Maintenance.
- Conveyor Maintenance.
- Pneumatic Maintenance.
- General Maintenance.

WARNING
Maintenance must only be carried out by trained personnel.

3.2 Electrical Maintenance

3.2.1 Weekly

Make sure the computer has been shutdown correctly before this is done.

1. 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.
2. Inspect all electrical equipment on the machine for damaged contacts, exposed wire cores and frayed insulation.
3. Ensure there are no items in front of the transformer panel; i.e. check that the vent is kept clear of obstruction. Clean vent if necessary.
4. Clean the **Optical Sensors** with a dry cloth.
5. Pull out the **PC Drawer** and check the cables going into the PC, ensure that they are not loose.
6. Pull out the **Motor Controller Drawer** and check the cables going into the Motor Controller chassis. Check that they are not loose.
7. Inspect the **X-Y Table** and check all cables and connectors,
8. 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.
9. Power back up the machine and start the SJ50 software.
10. 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.
11. Release the **E-Stop** and press the reset switch.
12. Cycle boards through the machine and watch its operation for any faults.
13. Start the AWA application.

14. Home **Auto Width Adjust**, move to **100mm**, measure both sides of conveyor to ensure that calibration of AWA is good.
15. Remove the front electrical panel cover as shown previously, and check all connections on the **Lighting Controller**, **Terminals** and **PLC Modules**.
16. Check all cables on the **Lighting Head** and **X-Y Table** and ensure that no wires are loose or damaged.

3.2.2 Monthly

1. Carry out the weekly routine.
2. Open the **Pneumatic Panel** and check the terminals and solenoid valves connections.

3.2.3 Quarterly

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. Clean and lube the gantry rails.

3.2.4 Yearly

1. Isolate the SJ-50 machine from mains supply. Take off bottom side panels and open rear doors to Control Panel, physically check all electrical connections on the machine.
    - Main Control Panel.
    - X-Y Table.
    - PC.
    - Motor Controller.
    - Pneumatic Control Panel.
    - Transformer.
    - All Earth cables.
    - All connectors.

2. Check the insulation resistance of the mains voltage supplies. Follow this procedure carefully.

Only a qualified technician should carry out the following test.

This test will give an indication that the insulation resistance of the cables and mains supply to the body of the machine is intact and complies with the relevant standards.

1. Power off the machine.
2. Switch off the **Main Isolator**.
3. Disconnect the mains plugs to the **Monitor**, **PC**, **Motor Controller**, plug out the Paragon Drives and the power socket.
4. Plug out the power plugs supplying the conveyor and **AWA Motor Paragon Drives**. See fig 3.1.

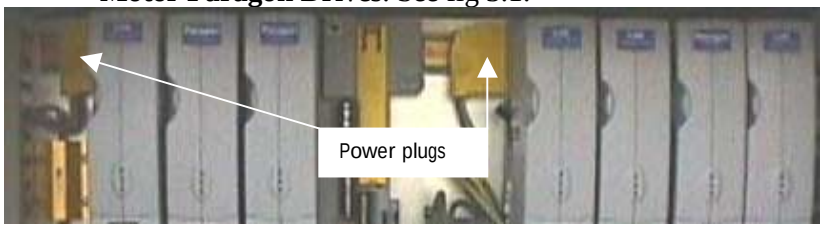


Figure 3.1 Plug out the Power Plugs

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 Door Control Panel**.
6. Using an insulation resistance tester (Note that this is **500V DC**) check between **L1** and **Earth**. There should be a reading of **>1 M ohm**.
7. Then check between **N1** and **Earth**. It should have the same reading.
8. Check again to ensure all equipment stated above is disconnected for safety.

9. Check resistance between **L2** and **Earth**, disconnect earth bonding wire number **2003-2014** at the main **Earth** point on the **Control Panel**, leave this in free space. Check between **N2** and **Earth** and between **L2** and **N2**, all resistance readings should be **>1M Ohm.**
10. Check the reading for **Cable 14** to **Earth**, and then **Cable 13** to **Earth** and finally **Cable 13** to **14**. Again the reading should be **> 1M ohm**, these cables are on **KM1** off the main contactor. For more information refer to Electrical Drawings 2005-0327.
11. Open the transformer panel and check the condition of the transformer. Examine it for any of the following:
    - Discoloured, blistered or cracked transformer coating.
    - Cable and crimp integrity.
    - Broken or chipped terminals.
    - Blackening of transformer guard.
12. Check all terminal connections on the machine and complete the monthly routine.
13. Check DC power supply unit outputs. PS1 (24V), PS2(12V) and PS3(5V).

3.3 X-Y Table Maintenance

3.3.1 Weekly

1. Power down the machine and switch off the X-Y stage at the controller.
2. Inspect the X-Y Table, by moving the stage manually from one end of the axis travel to the other.
3. Check that all cables on the stage are free and not obstructing its movement.
4. Ensure the bearings are kept free from dust, loose particles and moisture; see Figure 3.2 (D).
5. Ensure the magnetic platens are free from debris; see Figure 3.2 (E).
6. Run the machine and press the **E-Stop** to ensure that it operates as normal.
7. Visually examine the encoder, see Figure 3.2 (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.

Take care not to scratch gold foil, as this will greatly affect the table's accuracy.

8. Check the small home marker contacts and end limits are intact; refer to Figure 3.2 (C) and (B). Ensure that they are free from dirt and grease.

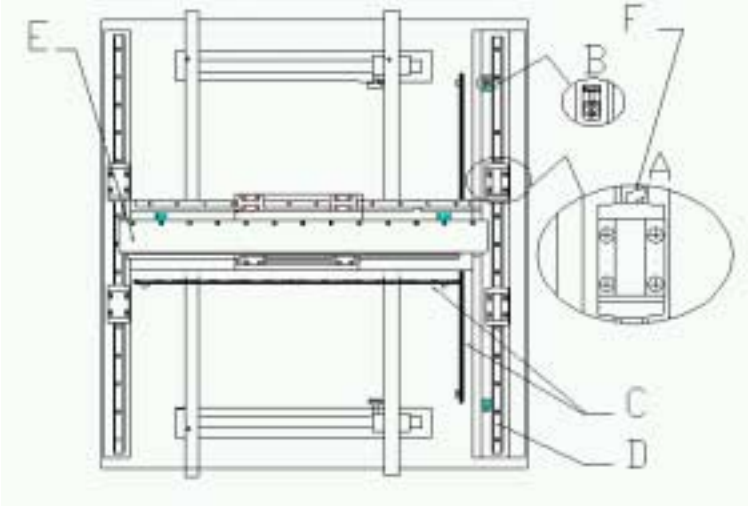


Figure 3.2 Gantry Schematic

3.3.2 Monthly

1. Carry out weekly routine.
2. When inspecting the connections on the stage and at the controller check the integrity of the connectors at random.

3.3.3 Quarterly

- Carry out Monthly routine.
- Carry out the following procedure for lubricating and cleaning of the stage.

1. Turn off controller and activate the **E-Stop**.
2. Drive the stage to one end of its travel.
3. Open the hood.
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 Figure 3.2 (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, Figure 3.2 (A). (See Important notes on lubrication). Use a grease gun with a grease nipple (type **UU** or **SS**); refer to Figure 3.2 (F).
9. Close the hood.
10. Restore power to the machine.

WARNING
Failure to lubricate the stage at quarterly intervals invalidates all warranties.

3.3.4 Yearly

1. Carry out quarterly routine.
2. Take off the cover of the motor controller and check the interior for loose connections. Ensure that the internal fan is functioning.
3. Using a **8mm Allen key,** ensure that the securing bolts on the table have not become loose. (Tighten to **77 Nm**)

Important Notes on Lubrication

Be sure to use a clean dry, soft lint free cloth for cleaning.
Take the time to inspect the linear motor drives for wear and signs of damage.
Further disassembly of the stage is NOT recommended, since proper setting and calibration can only be carried out at the factory.

Recommended Lubricants

1. **Dow Corning's Molykote 44** is recommended.
2. Only use **lithium** based grease.

3.4 Conveyor Maintenance

3.4.1 General Warnings

NEVER clean 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.

Details on the conveyor can be seen in the figure below:

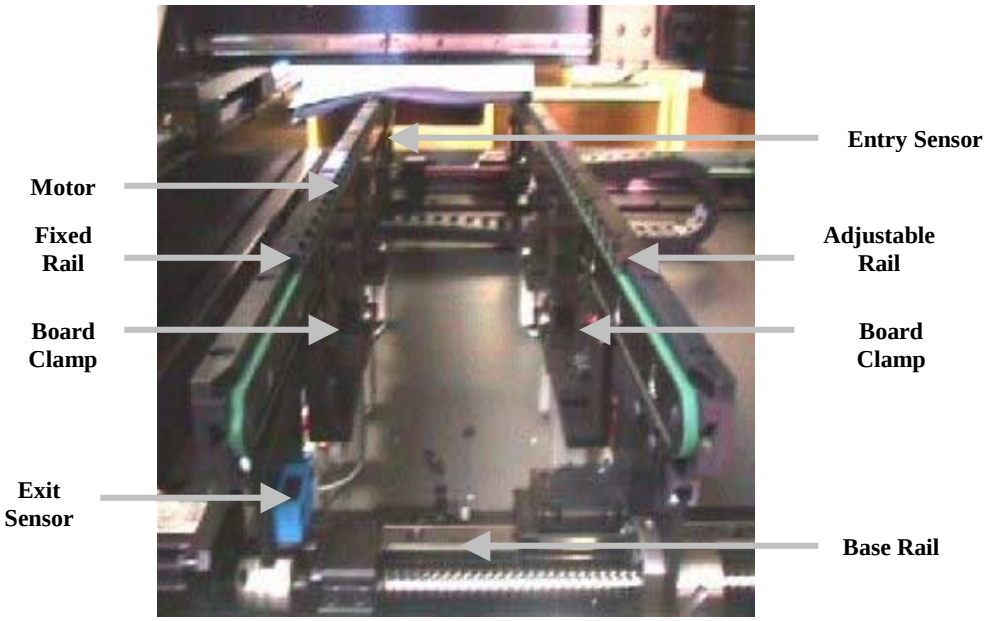


Figure 3.3 Conveyor Components

3.4.2 Weekly

1. Check the function of the sensors by placing a sample board over them. Look at the indicator light on each of the sensors.
2. Move the lighting head over each sensor and make sure they are not activated by it.
3. Check soundness of all motor housings.
4. Wipe off edge belts with recommended cleaning agent 409 spray cleaner. An alternative is to use alcohol or equivalent.
5. Vacuum clean the base of the machine.

3.4.3 Monthly

1. Carry out the weekly maintenance routine in full.
2. Ensure all bearings are free running and belt tension is tight.
3. Ensure that conveyor belts are not twisted on either rail.

3.4.4 Yearly

1. Carry out monthly maintenance routine in full.
2. Check the electrical connections at the conveyor motors and in the front electrical enclosure. Make sure all connections are intact and securely fitted.
3. Check all mounting screws and hardware on the machine.
4. Systematically check all nuts, bolts and screws on rails, lifting mechanism, air cylinders, bearings and mountings for all hardware.

3.4.5 Two Yearly

1. Lubricate the conveyor bearings with **THK AFB** lubricant.
2. Use a grease gun with a grease nipple (type **UU** or **SS**)
3. Care should be taken so as not to over lubricate the bearings.

3.5 Pneumatic Maintenance

3.5.1 Weekly

Check the air pressure of the following.

- Main pressure regulator should read 5 bar.
- 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.
- 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.

3.5.2 Monthly

1. Operate the **E-Stop** to ensure that the dump valve is operating correctly. Ensure the Maintenance key is not being used at this time.
2. Manually operate the control solenoid valves and ensure that the stops and the clamping are operating correctly. Ensure that they are not sticking. This is done by switching on the Maintenance key and using the software.
3. Empty Filter Cup.
4. Ensure the pressure switch is operating by removing the air from the system, the PC should indicate this on the monitor.

3.5.3 Yearly

- Carry out the monthly routine as above.
- Ensure the air purge to the X-Y Table is operating and that the restrictor is fully open. See fig 3.4.

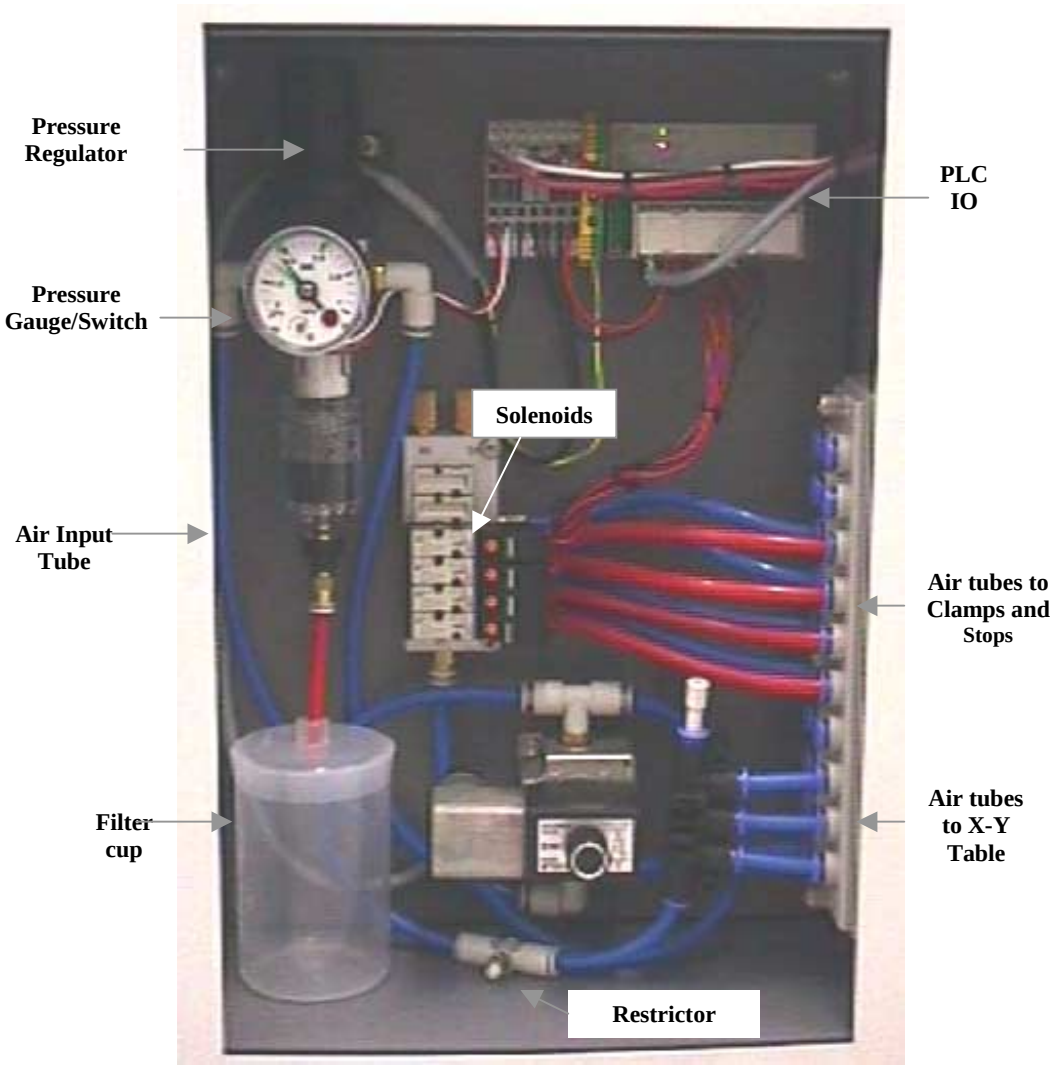


Figure 3.4 SJ50 Pneumatics Panel

3.6 General Maintenance

3.6.1 Weekly

1. Clean down the machine panels.
2. Clean the PC filter, if fitted.
3. Check fan on the **DR600 Motor Controller**, you should hear it running when the drawer is pulled fully out.
4. Check PC power supply fan is running. Open the PC drawer and feel the air intake at the power supply.
5. Check PC CPU fan is running, if fitted. The fan is located at the rear of the PC.
6. Run a board through the machine and ensure that the machine is operating correctly.

3.6.2 Monthly

- Carefully clean the Camera Lens. Only use a proper cleaning solution and a lint free cloth.

Chapter 4

Troubleshooting

Chapter Contents

Summary

This chapter is intended to assist the user to solve problems that they may encounter with their 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.

4.1 System Power

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

4.1.1 Power failure or no Power Response

- Is there power at the main supply?
- Is the **Main Isolator** in the '**ON**' position?
- Are **Q1** and **Q2,** the main RCD 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 **Q10,** 24V DC Off/On Breaker is **ON**
- Check the supply voltage at the main terminals.

4.1.2 Mains Transformer is not Working

- Check **MCB Q2** is **ON**.
- Check main **MCB Q1** is **ON**.
- Ensure there is the customer-selected voltage at terminals **L1** and **N1**.
- Ensure there is **230V** at terminals **L2** and **N2**, and **55V** at terminals **L3** and **N3**

WARNING: Ensure machine is first isolated from the Mains supply.

- Check transformer resistance **(>1 ohm**), at terminals **L1** and **N1**.
- Check transformer resistance **(>1 ohm**), at terminals **L2** and **N2**.
- Check cables and terminals at transformer are intact.

4.2 Conveyor

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

4.2.1 Conveyor will not run

Refer to Electrical Drawings.

- Check that the conveyor is not obstructed.
- Check **MCB Q9** is **ON**.
- Check **E-Stop** is in the off position. Examine the three indicator lights on the relay.
- 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.
-

4.2.1.1 Conveyor 1

- Check PLC output **11.00** is **ON** (8W Output module on right hand side of main control panel).
- Check relay **'KA3** and **KA4'** are energised by examining their indicator lights.
- Check the lights on the Paragon Drive (they shouldn't be red).

4.2.1.2 Conveyor Will Not Run (no Output from PLC)

Check Error codes from PC.
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.

4.2.1.3 No Connection to AWA Drive from GUI

- Check serial cable is plugged into the Paragon Docking Station. See fig 4.1

Fig 4.1 Serial cable plugged into docking station

- Check **E-Stop** is reset.
- Check power to **Paragon Drive**, look for indicator lights on the **Paragon Drive**.
- Check **24V DC** power to **Paragon Drive**.
- Check output of transformer (**TV2**) is **55V AC** between L3 and N3 terminals on the back Electrical Control Panel.
- Check **Q9** is **ON**.
- Check the **Paragon Drive** coms are set up correctly. For more information refer to 2.8.3. These settings should be set to:

Baud Rate	9600
Stop Bits	1
Data Bits	8
Com	This can be one of the following values: 1 - Lighting Controller

2 - PLC
3 - AWA
4 – barcode Reader

- Check AWA Manual switch is in the off position.

4.2.1.4 Drives Won't Move/ Home/ Move to a Given Width.

- Check that motors are not slipping on their coupling.
- Check the position of the AWA Manual switch.
- Check that there is nothing obstructing the conveyor.
- Check **E-Stop** is reset.
- Check power to the **Paragon Drive**, look for indicator lights on the **Paragon Drive**. The middle LED should be green or orange.
- Check **24V DC** power to **Paragon Drive**.
- Check output of transformer (**TV2**) is **55V AC between L3 and N3.**
- Check **Q9** is **ON**.
- Check **KP1** on **Single rail** is on to energize all motors. This is done by checking if the green LED is lit.
- Check that the PLC is not allowing the move. The PLC may not allow the moves if there is a board in the machine or some of the sensors are triggered.
- Ensure that PLC output **10.10** is **OFF**. The PLC output should be 10. See fig 4.2.

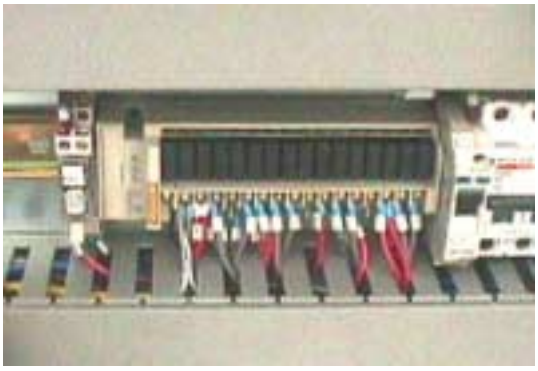


Fig 4.2 PLC Output module

- Check that the 3 AWA sensors are working by checking that the indicator lights are on.
- Check cabling of motors is okay.

4.2.1.5 Manual Powered Width Adjust will not Work

- Check that motors are not slipping on their coupling.
- Check **Q9** is on.
- Check that there is nothing obstructing the conveyor.
- Check **E-Stop** is reset.
- Check that the **Selector Switch** for **AWA** is in the **ON** Position
- Check that the **IN** and **OUT** pushbuttons are operating by pushing them in.
- Check the inputs to the **Paragon Drive**, consult electrical drawings.
- Check power to **Paragon Drive**; look for indicator lights on the **Paragon Drive**. The middle and top LED should be green or orange. **The LEDs should not be red.** **55V** on the yellow connector is required for power.
- Check **24V DC** power on two-way connector to the **Paragon Drive**.
- Check output of transformer is **55V AC** between **L3** and **N3**

- Check **KP1** on **Single rail** is on to energize all motors.
- Check that the PLC is not allowing the move. The PLC may not allow the moves if there is a board in the machine or some of the sensors are triggered.
- Ensure that PLC output **10.10** is off.
- Check cabling of motors is okay.

4.2.1.6 Rails not Aligning Properly

For more information, refer to Chapter 2.8.2

1. Perform AWA calibration.
2. Check that the left minimum sensor and the right alignment sensor are in line.
3. Check all sensors are working by placing something, for example a piece of card, at various parts of the rail to see if it triggers the associated sensor/input.
4. Ensure that when the AWA software is executing the aligning operation, the relay KM4 is activated so as to allow the right side motor to be moved.
5. Check cabling of motors is okay.

4.3 Other Electrical Troubleshooting

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

4.3.1 Lighting Tower will not Operate

Refer to Electrical Drawings.

- Is it 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.

4.3.2 No 24V Supply

Refer to Electrical Drawings.

- Check 24V supply PS1 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**.
- Check **MCB Q11** is **ON** (24V control MCB).

4.3.3 Safety Relay will not Reset

Refer to Electrical Drawings.

- 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:
  XB6-1 & **XB6-2**, and **XB2-7** & **XB2-8** for circuit no.1.
  XB2-9 & **XB2-10** and **XB6-3** & **XB6-4** for circuit no. 2.
- 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 PLC output **10.04**. This is done by checking if the corresponding LED on the PLC module is on.
- 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 module 00 is on.

4.3.4 X-Y Table Motor Controller not Operating

- Is **MCB Q6** on?
- Is the local on/off switch in the ON position? This is the main power switch on the front of the **DR600 Motor Controller**.
- Is there an emergency stop condition? Examine the three indicator lights on the safety relay.
- Are the safety circuit contacts functioning correctly? To do this, disconnect cable **2003-2005** going into the motor controller. There are three pairs of pins. With the emergency stop off, check that there is continuity between these pins.
  Pins 2 and 10 Pins 11 and 12 Pins 13 and 14.
- Check all cables are tight and in position.

4.3.5 Monitor is not Operating

- Is the monitor switched on and plugged in?
- Check **MCB Q8** is on. Check cables for tight connections.

- If **UPS** (**Uninterruptible Power Supply**) is installed, make sure that it's switched on.

4.3.6 PC is not Operating

- Is the PC plugged in and switched on?
- Check **MCB Q7** is on.
- If UPS installed, make sure that it's switched on.

4.3.7 Camera will not Operate

1. Check **12V PSU**.
2. Check **MCB Q4** is **ON**.
3. Check **12V DC** at terminal **XB4-6** & **XB4-7**. This is located at the back of the Control Panel.
4. Check cable **2003-0416** and **2003-0417** on camera to ensure they are connected correctly.
5. Check all connections to and from the camera. Ensure there is continuity between the ends of the co-axial signal cable form the camera to the framegrabber card at the back of the PC.
6. Check software configuration

4.4 Pneumatics

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

4.4.1 No Air Supply

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

4.4.2 Dump Valve will not Function

1. Check air pressure is set to 5 bar at regulator.
2. Check emergency stop is **OFF**.
3. Check for indicator light on valve.
4. Check **24V** supply at terminals **XBP-5** and **XBP-6** in the pneumatic panel.

4.4.3 Stops will not Engage

- Refer to Electrical Drawings.

1. Check that the PLC outputs **13.00** (rail 1) or **13.02** (rail 2) is on.
2. Check solenoid valve **YV2** or **YV4** is **ON**.
3. Check air supply is **ON**.
4. Check dump valve **YV1** is energized examining the indicator light.
5. Check for kinks in the tubes.

4.4.4 Clamp will not Engage

- Refer to Electrical Drawings.

1. Check that the PLC output **13.01** or **13.03** is **ON**.
2. Check solenoid valves **YV3** and **YV5** are **ON**.
3. Check air supply is **ON**.
4. Check dump valve **YV1** is energised examining the indicator light.
   - Check for kinks in the tubes.

4.4.5 No purge to X-Y Table

1. Check Dump valve.
2. Check air supply at the regulator.
3. Check for kinked tubes.
4. Check for air leaks.

Chapter 5

System Specifications

5.0 System Specifications

Chapter Contents

Summary

This chapter is intended to outline the systems specifications. It includes the physical specs like footprint and electrical and pneumatic inputs as well as the software operating system. These are accurate at the time of printing and are liable to change. We recommend that you contact your sales contact or Local Support representative for the latest functional specifications.

5.1 SJ-50 Functional Specifications

Software System	
Operating system	Windows NT™ V4.00.
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	
Computer System	High Speed Pentium III™ 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	Matrox Meteor-2DIG/2 Matrox G450 32MB Dual AGP card.
Camera System	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	Gantry robot system with linear motors and linear encoders. Travel: 590mm x 490mm or 490mm x 490mm. Velocity (x, y): 1500mm (60”) /Sec. Encoder Resolution: 1µm.

Board Clearance	Depends on application: Top side either 28mm (as standard) or 12mm (with low-level lighting fitted). Bottom side 50mm.
Conveyor System	SMEMA standard conveyor supplied with speed adjustment.
Position	Depends on application 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. Auto width adjustment available as standard.
Supply Facilities	
Electricity	• 208-240V 25A …100-110V 40A.
Air Requirements	• Clean filtered air at 6 Bar,4CFM • 12 mm or 6mm input line.
Operating Temperature	• 10 to 35° C.
Physical Dimensions	
Footprint	• 994mm x 1548mm.
Height	• Approx. 2100mm including Light tower. • Approx. 1400mm excluding Light tower.
Weight	• 1400 kg (approximate).

Appendix I Requirements Listing

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.

Appendix II Maintenance Checklists

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		
Inspect mains transformer		
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 and 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		

Site_____ **Completion Date:**_____

System Type:_____ **System Serial Number:**_____

Monthly Maintenance Schedule

Performed by:_____

	Good /Bad	Comments and/or Corrective Action (if necessary)
Electrical		
Inspect El. Control Panel		
Inspect mains transformer		
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

Site:_____ **Completion Date:**_____

System Type:_____ **System Serial Number:**_____

Quarterly Maintenance Schedule

Performed by:

	Good /Bad	Corrective Action (if necessary)
Electrical		
Inspect El. Control Panel		
Inspect mains transformer		
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		

Check Connections in control panel		

X-Y Table		
Examine X-Y table motion		
Examine cabling		
Inspect bearings		
Inspect magnet plattens		
Inspect encoder		
Inspect limit switches		
Check cable integrity		
Lubricate the guide rails		

Conveyor		
Examine moving parts		
Inspect conveyor belts		
Test all sensors		
Clean belts		
Lubricate conveyor linear bearings		

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 and 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

Location:_____ **Completion Date:**_____

System Type:_____ **System Serial Number:**_____

Yearly Maintenance Schedule

Performed by:_____

	Good /Bad	Comments and/or Corrective Action (if necessary)
Electrical		
Inspect El. Control Panel		
Inspect mains transformer		
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		
Check connections solenoid valves		

Inspect connections to pneumatic panel		
Check connections to control panel		
Check electrical connections		
Test system insulation resistance		
Inspect transformer		
Test terminals		

X-Y Table		
Examine X-Y table motion		
Examine cabling		
Inspect bearings		
Inspect magnet plattens		
Inspect encoder		
Inspect limit switches		
Check cable integrity		
Lubricate the guide rails		
Inspect motor controller		
Test tightness of base plate bolts		

Conveyor		
Examine moving parts		
Inspect conveyor belts		
Test all sensors		
Clean belts		
Lubricate conveyor linear bearings		
Inspect electrical connections		
Check mounting screws		
Check motor cable insulation resistance		

Pneumatics		
Check the systems pressure settings		
Test dump valve		
Test solenoid valves		
Test pressure sensor		
Replace main air filter		

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		
Observe one board cycling through the machine		
Overall Comments on System:		
Actions Required:		
1		
2		
3		

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