ViTrox V510
Advanced Optical Inspection System

Hardware Manual

Thank you for using ViTrox Product……

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Notices

Revision

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A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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Revision History

Revision	Type Of Change	Date	Author
A	First Release	15th June 2009	Venus Ooi Hong Kee
B	Content Updated	3rd Dec2009	Lim Poay Sim

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1. Legal Information

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Legal Information

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2

2. Safety and Regulatory Information

This chapter holds the following sections:

Safety Information

Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. ViTrox Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

Safety Notice

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

General

This product is provided with a protective earth terminal. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE. Do not operate the product in the presence of flammable gases or flames.

DO NOT REMOVE RACK PANELS OR INSTRUMENT COVERS. Operating personnel must not remove any rack panels or instrument covers. Only qualified service personnel will allow making component replacement and internal adjustments. Products that appear damaged or defective should be made inoperative and secured against unintended operation until qualified service personnel can repair them.

The protection provided by the ViTrox V510 system may be impaired if the system is used in a manner not specified by ViTrox.

Environmental Conditions

The ViTrox V510 Advanced Optical Inspection System is designed for indoor use only. **Table 2-1** shows general environmental requirements.

Tab l e 2 -1 Environment Requirements

Environment Conditions	Requirements
Maximum Altitude	2000 meters
Temperature (Operation)	5 °C to 40°C
Maximum Relative Humidity	The test system is designed to operate in the range from 5% to 80% relative humidity (non-condensing) with 80% for temperature up to 31°C, decreasing linearly to 50% relative humidity at 40°C

⚠CAUTION

This product is designed for use in Installation Category II and Pollution Degree 2, per IEC 61010-1 and 664 respectively. The operating voltage should be in the range of 100-120 VAC/200-240 VAC, 50/60 Hz (8 A) with the Mains Supply Voltage fluctuations not to exceed ±10% of the nominal voltage.

Before Applying Power

Verify that the product is set to match the available line voltage and all safety precautions are taken. Note the external markings of the instruments described in **"Regulatory Markings".**

Ground The System

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Fuses

Use only fuses with the required rated current, voltage, and specified type (normal blow, time delay). Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

⚠WARNING

In order to avoid electrical hazards, only trained and qualified personnel will allow replace all system internal fuses.

Operator Safety Information

⚠WARNING

Module connectors and Test Signal cables connected to them cannot be operator accessible.

Cables and connectors are considered inaccessible if a tool (e.g. screwdriver, wrench, socket, etc.) or a key (equipment in a locked cabinet) is required to gain access to a conductive surface connected to any cable conductor (High, Low or Guard).

⚠WARNING

Assure the equipment under test has adequate insulation between the cable connections and any operator-accessible parts (doors, covers, panels shields, cases, cabinets, etc.)

Verify there are multiple and sufficient protective means (rated for the voltages you are applying) to assure the operator will NOT come into contact with any energized conductor even if one of the protective means fails to work as intended. For example, the inner side of a case, cabinet, and door cover or panel can be covered with an insulating material as well as routing the test cables to the front panel connectors of the module through non-conductive, flexible conduit such as that used in electrical power distribution.

Machine's Intended Use

In addition with the above environmental conditions, the machine is designed to be use solely in a Surface Mount Technologies (SMT) production line.

⚠CAUTION

This machine must only be used with conveyors on both sides either in-line or in off-line operation. This is to prevent users from accessing pinch points inside the machine.

Electrical Safety

Electrical Enclosure

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

- The **Main Control Panel** is accessed through the rear access panel, which is mechanically locked.

During the **Off** position, the machine only has main voltage on the primary side of the **Main Isolator**.

LETHAL VOLTAGE

DANGEROUS VOLTAGES (110/240 VAC) EXIST IN THIS EQUIPMENT. ENSURE THAT ALL ELECTRICAL ENCLOSURE COVERS ARE FITTED AND INTACT BEFORE OPERATING THE EQUIPMENT.

Emergency Stop Loop

The Emergency Stop (E-Stop) is designed according to the relevant safety standard. It is controlled using a Carlo Gavazzi Class IV safety relay.

NOTE

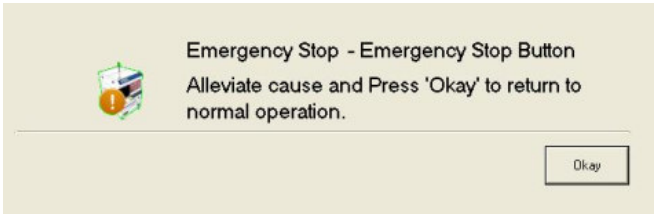
The V510 has three clearly visible and identifiable emergency stop buttons, one on the front of the machine and two on the back. To activate these buttons, push in once on the red pushbutton.

Refer to the hardware manual for E-stop locations on the V510. Opening the system's front access door also activates the E-stop system.

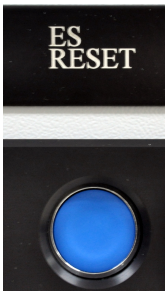
The Emergency stop circuit has the following attributes associated with it:

- During an E-Stop, power is removed from all motors including conveyors and XY Table. The only exception is that turning the maintenance key switch to the "on" position re-enables power to the clamping motors. This allows the clamping motors to be operated for engineering tests, troubleshooting or calibration.
- E-Stop overrides all modes of operation within the V510 machine.
- When power is removed from the system, the E-Stop is activated automatically and must be reset on powering the machine back up.

There are two ways to reset the E-stop. If the system software is running, click **Okay** to remove the E-stop condition. If the system software is not running, press the blue ES RESET button on the switch plate. In either case, you must first fix the condition that caused the E-stop by either closing the front door or pulling the E-stop button out.



Front Switch Panel – V510



- On startup, NO uncontrolled motion can occur.

The E-stop circuit has two channels, both of which go through all four E-stop switches and the front door switch. If either channel of the E-stop circuit is activated, an E-stop condition will result, and no motive power to the gantry or conveyor will be applied.

Resetting the E-stop circuit can only happen when both safety channels are closed.

In maintenance mode the user is permitted to operate the clamping mechanism, as described above.

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.

⚠CAUTION

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.

PC Safety

The PC's motherboard contains a lithium battery: CR2032 3V. See explanation of warning labels.

⚠CAUTION

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

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

Dispose of used batteries according to manufacturer instructions.

Physical Safety

Protective Guards

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

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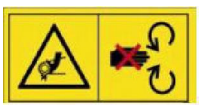
DO NOT OPERATE THE MACHINE WHILE ANY OF THE SAFETY GUARDS ARE OPEN, LOOSE, DAMAGED OR MISSING. THIS INCLUDES ACCESS PANELS TO THE PC. THE PROTECTION PROVIDED MAY BE IMPAIRED IF IT IS NOT USED IN THE CORRECT MANNER.

Pinch Hazards

The machine is fitted with safety side panels on the left and right hand sides of the platform. These panels protect the user from electrical and mechanical hazards within the work area. The user is to be aware of potential pinch hazards situated at the conveyor entry and exit openings.

To prevent pinch hazards, it is recommended to add additional guards or covers preventing access to the conveyor entry and exit openings. These guards could be preventive guards or conveyors.



Moving parts at the conveyor Entry and Exit openings situated at the sides of the machine. These can cause finger and hand damage. No attempt should be made to operate the machine while personnel are working in these areas. E-stop the machine before placing fingers or hands in these areas. It should be additionally noted that ViTrox recommends that boards should only enter or exit the V510 on a conveyor - not via hand loading.

Machine Stability

This machine weighs approximately 750 kg, and has a low center of gravity.

Do not attempt to lift or tip the machine at either end or side, as you could damage both the machine and injured yourself. Do not even attempt this with the help of others.

Falling Objects

Do not store boards, equipment, stencils, or other material on top of the machine.

System Warning / Caution Labels

The following are a list of warnings and their associated explanation.

Tab l e 2 -2 Safety Symbols

Safety symbols	Explanation
	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.
	This indicates you must read the manual before operating the machine. Label located on front right side of the hood.
	Moving parts at the conveyor Entry and Exit openings (for the Board) at the sides of the machine, which could cause finger and hand damage.
	Warning to mind your head. Label located on the front left and right sides of hood.
	Warning that maintenance switch is in ON position. The pneumatic air pressure is actuated. Using the maintenance GUI, the stops and clamps can be operated; therefore, be caution as pinch points around clamps can cause injury.
	Do not operate with guard removed. Lockout/tagout before servicing.

Regulatory Markings

Markings on the system, in manuals and on instruments provide information about compliance with international regulations. **Table 2-3** defines the markings you may find in a manual or on an instrument.

Tab l e 2 -3 Regulatory Markings

Regulatory markings	
	This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical/electronic product in domestic household waste.

Electrostatic Discharge (ESD) Precautions

Static electricity is destructive to your production process and the ViTrox V510. Careless handling and poor site planning can cause system reliability problems and reduce your product yield. The system may not be as easily damaged as the modules you will be testing, but good anti-static planning will help ensure high reliability.

The ESD symbol below indicates areas where ESD caution must be exercised. This is to prevent damage to instruments and/or test disruption.

ESD Symbol

Caution: Static Sensitive.

Electrostatic discharge in this area may cause equipment damage or test disruption.

While not an exhaustive list of anti-static precautions, Table 2-4 shows suggestions to consider as you plan your system area:

Tab l e 2 -4 Suggested Anti-Static Solutions for Site Planning

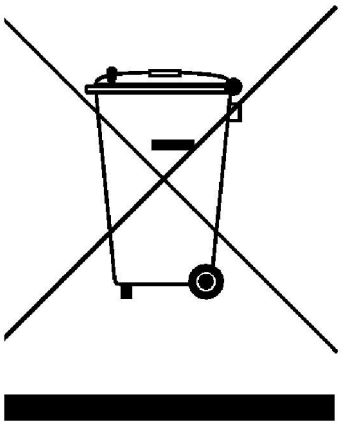
Precaution	Suggested Solution
Anti-static flooring	Plan to use an anti-static floor covering or mats.
Grounding straps	Plan for foot straps in conjunction with anti-static flooring and wrist straps for system operators.

⚠CAUTION

The system test rack is secured to the pallet of the shipping crate and wrapped with a plastic wrap. Do not move the crate or the test rack and pallet to a static sensitive area until you have removed the plastic wrap from the test rack.

End of Life: Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This product complies with the WEEE Directive (2002/96/EC) marking requirement. The affixed product label (see below) indicates that you must not discard this electrical/electronic product in domestic household waste.



Product Category:

With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a “Monitoring and Control Instrumentation” product.

Do not dispose in domestic household waste

To return unwanted products, contact your local ViTrox office. For more information, see:

http://www.vitrox.com/

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3

3. Introduction to the V510

This chapter holds the following sections:

The V510 is designed to accurately measure the position and properties of each placed component on a Printed Circuit Board (PCB). Through measurements, the V510 can detect a wide variety of placement/printing defects.

Advantages of the V510

Best in Class AOI

The V510 is the latest evolution in Automated Optical Inspection (AOI) technology for the electronics manufacturing industry.

The V510 has been designed as a truly flexible 'best-in-class' AOI solution, to measure and characterize components at multiple positions along the SMT manufacturing line. it can be configured for Solder Joint Analysis (post-reflow).

Measurement Performance

The V510 delivers industry recognized best-in-class measurement performance. Using high resolution imaging hardware and precision XY gantry, the V510 simultaneously delivers fast inspection speeds and full 01005-component inspection capability.

Fault Coverage

The V510 deploys MonoColour, ViTrox's unique sequential color imaging technique. This technology allows the AOI system to build a color image by combining a sequence of monochrome images of the PCB when illuminated with light of different red, green and blue colors.

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

ViTrox's MonoColour technology allows the V510 to easily distinguish SMT component features by unlocking the full range of color depth that is available to the human eye.

In addition to color technology, the V510 deploys an innovative domed lighting head consisting of light emitting diodes (LEDs) from multiple angles. This allows pseudo three-dimensional information to be extracted from solder joints. Color 3D joint profiling is the most powerful technique used in the AOI industry for solder joint inspection, and it provides the best fault coverage.

Benefits of MonoColour Technology

MonoColour technology provides the following benefits:

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

Speed and Performance

For any given speed, the V510 offers the highest resolution, providing lower false call rates and maximum error detection.

By utilizing the latest camera technology, high image acquisition speeds are achieved. A high precision XY gantry on which the camera/lighting assembly is mounted complements the distortion free lens. By clamping the PCB in the machine while it is being inspected the V510 delivers highly accurate and repeatable results.

Post-Reflow Inspection

The V510 performs fast and efficient post-reflow inspection for components and solder joints. The proprietary vision software reliably determines a range of errors including missing or offset components, polarity and solder joint related defects.

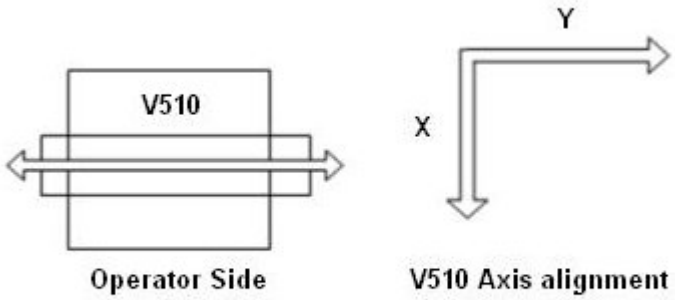
Post-reflow inspection has the following benefits:

- Removes the subjectivity of visual inspection.
- Reduces repair costs.
- Improves ICT first pass yield.
- Decreases the time taken to debug complex pre-reflow process problems.

Camera Navigation

Coordinate System

The V510 coordinate system is the same as what you see through the camera view. For example, if you press the up arrow on the keyboard, the camera view moves up on the screen (+Y axis). If you press the right arrow key, the camera view moves right on the screen (+X axis).



Moving the XY Table

Press an arrow key on the keyboard to move the XY table by 2,500 microns in the indicated direction.

You can also use the arrow keys on the numeric keypad (that is, the keys 2, 4, 6, and 8). Press once to move the XY table by 250 microns in the indicated direction.

Parts of the V510

System Overview

The V510 is constructed from a rigid welded base frame, which gives stability and support to the XY gantry robot and houses the electrical controls of the machine.

- The PC is behind the front access door.
- The gantry motor amplifiers are located at the rear of the system in the control panel. The standard V510 has two amplifiers for the X and Y-axes.
- Connections for two SMEMA cables and an Ethernet cable are provided at the rear of the system. These are located on the right side of the control panel.
- The electrical mains inlet cable is supplied through a cutout in the machine base-plate, which is accessible from the control panel.

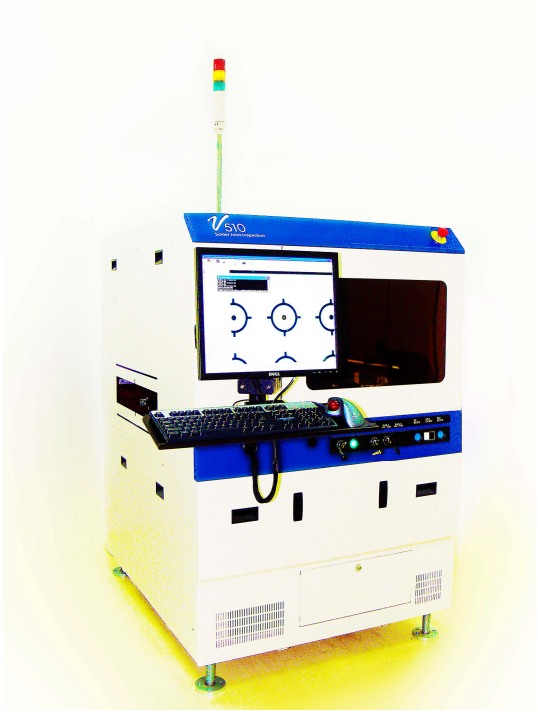


Figure 3-1: V510

Front View

Figure 3-2: Front View of V510

Switch Plate

The switch plate is located under the front access door. A cable is connected to the back and fed to the control panel where it is terminated at XB5 (see the *Electrical Drawing* document for details).

Figure 3-3: Switch Plate

Controls on the switch plate

Item	Description
START switch	The AC power control switch for the whole system after the mains isolator and residual current circuit beaker (RCCB).
RUN light	The ON indicator light for the START switch.
ES RESET button	Resets the safety relay after any E-Stop button is pressed or the front access door is opened. Pull out all E-Stop buttons and close the front access door before resetting the E-Stop circuit.
RAIL 1 INSP/PASS switch	Activates the pass-through functionality on rail 1. This allows the board to pass through the V510 without being inspected. The default setting is Insp.
RAIL 2 INSP/PASS switch	Does the same with the rail 2 conveyor. This is only present on a dual rail V510. (Figure 3-3 shows a single rail machine with only one conveyor fitted.)
AWA buttons	Allow you to manually adjust the distance between the conveyor rails. The top white button narrows the distance between the rails and the bottom black button widens it. For more information, see "Manual Width Adjust".
PLC RESET button	Resets the PLC.
MAINT. SWITCH	Allows you operate the board clamps and stops in an E-Stop condition.

Front Electrical Interface Module

The front electrical interface module is the electrical junction where the conveyor sensors are terminated and interfaced with cable**.** The cable is in turn fed through the base of the machine to the control panel and terminated at XB1 on the terminal rail. See the *Electrical Drawing* document for the pin number reference.

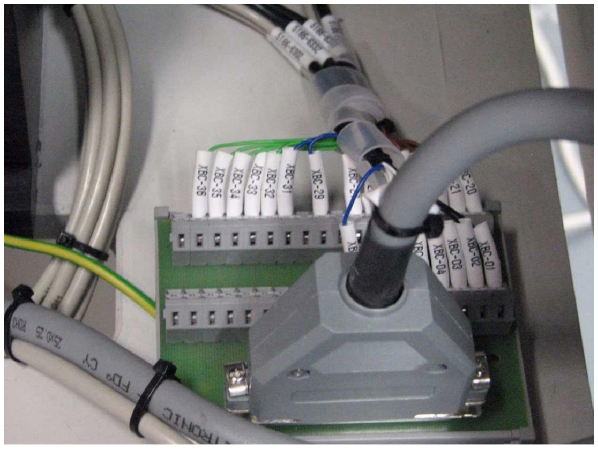


Figure 3-4: Front Electrical Interface Module

Rear View

Figure 3-5: Rear View of V510

Control Panel

The rear of the base frame houses the majority of the system electrical controls. The control panel is secured behind the rear access panel, which is lockable.

NOTE

The rear access panel cannot be opened with the mains isolator in the ON position.

Figure 3-6 shows the main electrical controls on the control panel. For more details, refer to the *Electrical Drawing* document.

Figure 3-6: Main Electrical Controls

Conveyor

The following diagrams show the motor and sensor locations for the conveyor.

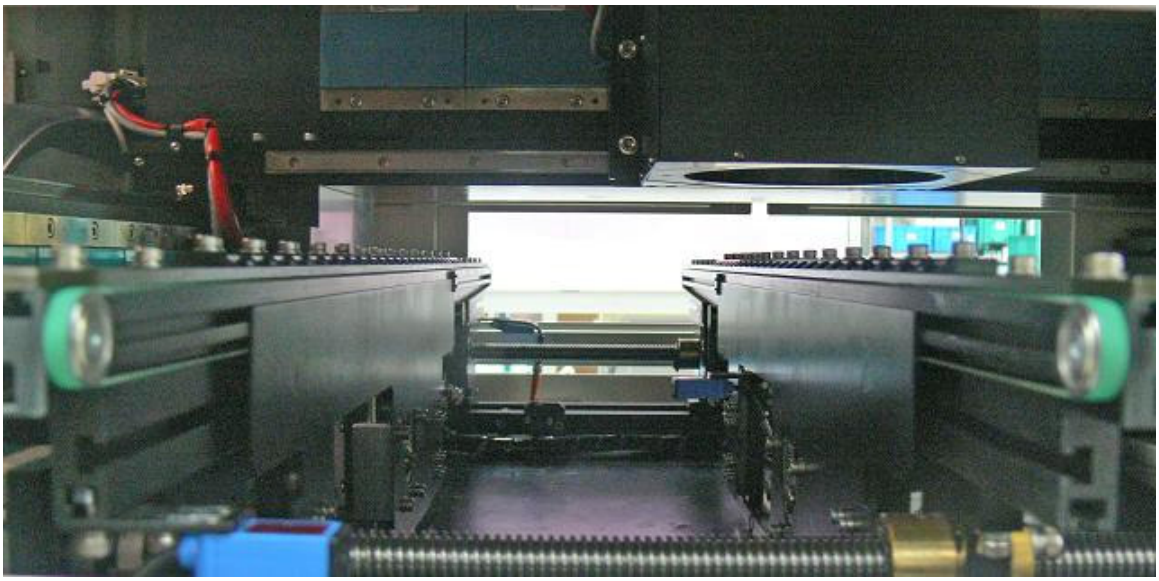


Figure 3- 7: Right Side of the Conveyor

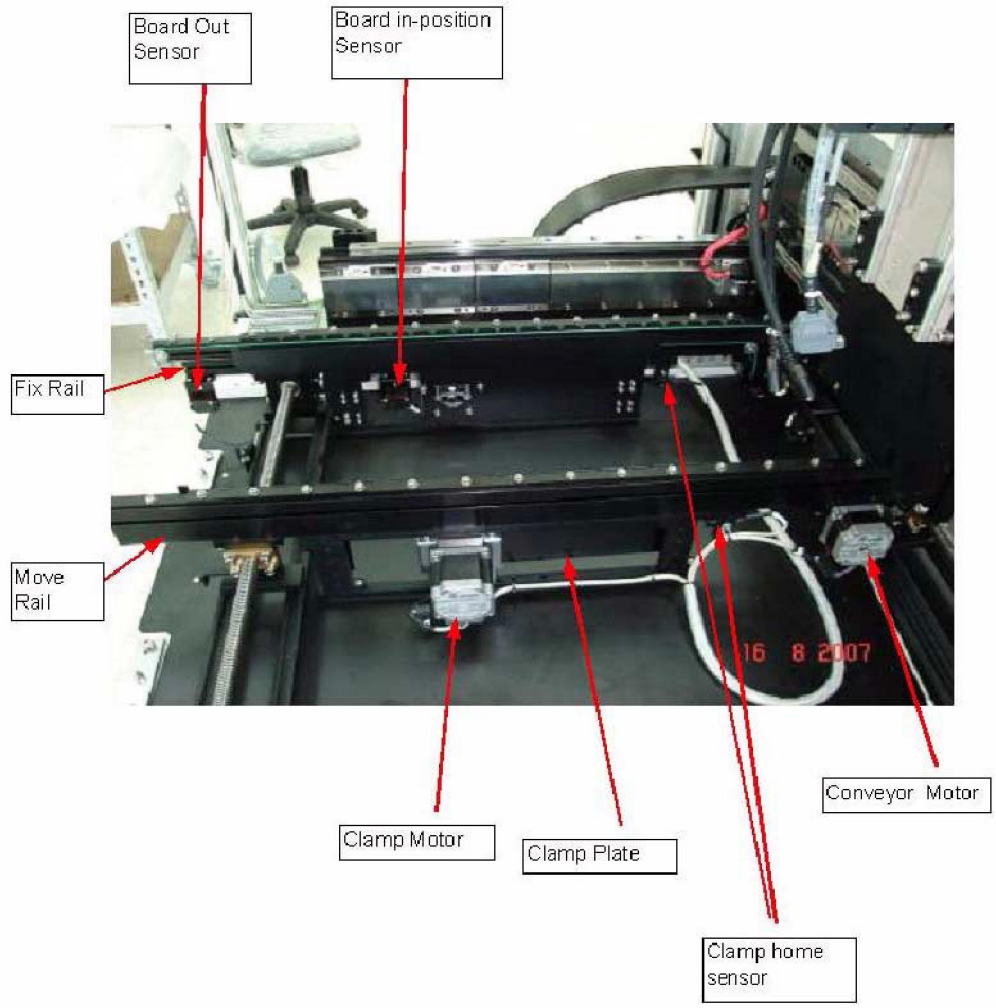


Figure 3-8: Rear of the Conveyor

Power and Communications

Electrical Power

Table Table A-3 in the appendix lists the power specifications for the V510.

The equipment must be installed according to the applicable national wiring code (NEC) and all applicable local regulations.

⚠WARNING

All system sub-circuits are 100–120 VAC and 200–240 VAC. Only connect equipment rated to this voltage to the system.

- The main incoming protected earth must be terminated at the earth terminal.
- The earth link wire must have a minimum cross-sectional area of 4 mm² (or 10 AWG).

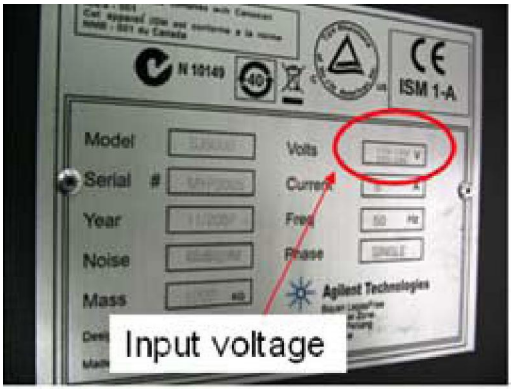
- An uninterruptible power supply (UPS) is optional. Ensure that the input voltage indicated on the UPS is same as the supply voltage.

⚠WARNING

MAINS VOLTAGE DEPENDS ON THE UPS USED. BEFORE CONNECTING TO THE MAINS, ENSURE MAINS VOLTAGE IS THE SAME AS THE UPS INPUT VOLTAGE

100–120 V or 200–240 V

DETAILS ON MACHINE PLATE



Communications

SMEMA Communications

A SMEMA standard is used for the machine-to-machine electrical interface, which controls the proper sequencing of boards. Figure 3-9 shows the wiring connection; refer to the *Electrical Drawing* document for more details.

SMEMA specifies two signal lines: 'Machine Not Busy' and 'Board Available' to indicate when a machine can receive a board and when it is ready to release a board.

Signals are communicated between machines via the 14-pin SMEMA connector. The 'Machine Not Busy' uses pins 1 and 2 and the 'Board Available' signals uses pins 3 and 4.

The output signals to downstream machines are the 'Good Board' signal for pins 3 and 4 and 'Bad Board' signal for pins 3 and 5.

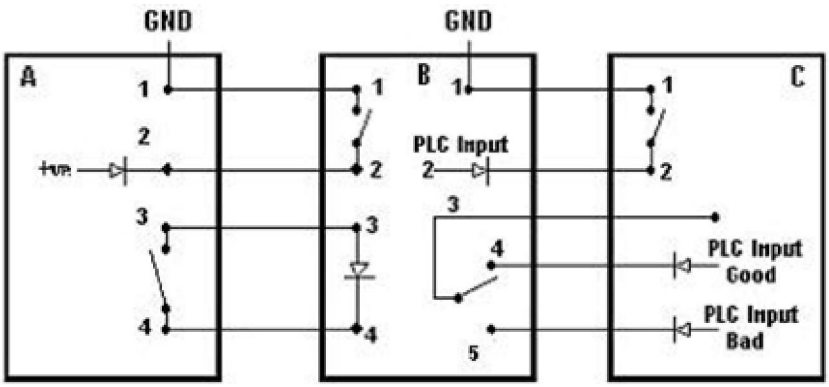


Figure 3-9: Pins 1 to 4 of SMEMA Connector

In Figure 3-9, boards are transferred from machine A to B and from B to C. Machine B are not busy as its pins 1 and 2 are open. Machine A has no board available, as its pins 3 and 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 and 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 the 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).

SMEMA Connections

The SMEMA interface ports are located inside the control panel of the V510. The V510 comes equipped with two SMEMA cables for each conveyor line to connect to equipment upstream and downstream.

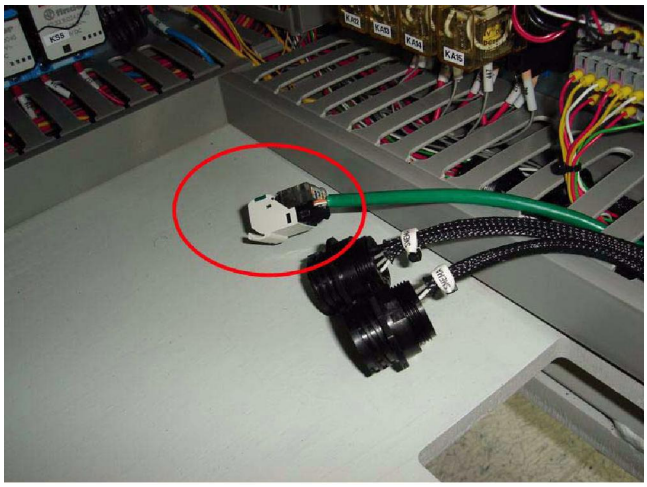
- The upstream cable must be connected to the SMEMA UP connector.
- The downstream cable is connected to the SMEMA DOWN connector.

These cables need to be routed through the cutout at the base of the system.

The upstream and downstream connections must be made for the system to function correctly while operating single or dual lane.

Network Connection (Optional)

If the networking option is included with your system, an RJ45 female connector is provided in the control panel for connecting the V510 to a network.



Contact your system administrator for details of connecting the V510 to the network.

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4. Installations

This chapter holds the following sections:

This chapter describes how to start and shut down the V510.

Checking the Facilities and Tools

Ensure that the system environment meets the specifications (see "Environmental Conditions"). Refer to the *Site Preparation Manual* for details.

Required Tools

The following tools are required for V510 installation:

- Set of metric hexagonal Allen keys: 1.5, 2, 2.5, 3, 4, 4.5, 5, 5.5, 6, 7, 8, 9, and 10
- T30 TORX key
- Set of insulated slotted screwdrivers: 2.8, 4.0, 5.5, and 6.5
- Pistol grease gun
- THK AFB+70 (lithium based) grease
- 25 mm/46 mm spanner

Unpacking the V510

The V510 is shipped on a wooden pallet with a cardboard box enclosing the system.

Unpack the V510 as follows:

Check all the Tip'n'tell indicators and shock sensors. Figure 4.1 shows their locations on the box. Refer to the details on the indicators to verify pass or failure.

If any of them are activated, the V510 may have a problem. Do not remove anything and report the situation to ViTrox.

Remove the straps holding the cardboard box in place.

Remove the cardboard edge protectors.

Remove the top of the cardboard box, and lift the remainder of the box away from the wooden pallet.

Undo the ratchet straps that hold the V510 to the wooden pallet.

The V510 can now be lifted off the pallet using a forklift and moved into position. See "Moving the V510" for important notes and instructions.

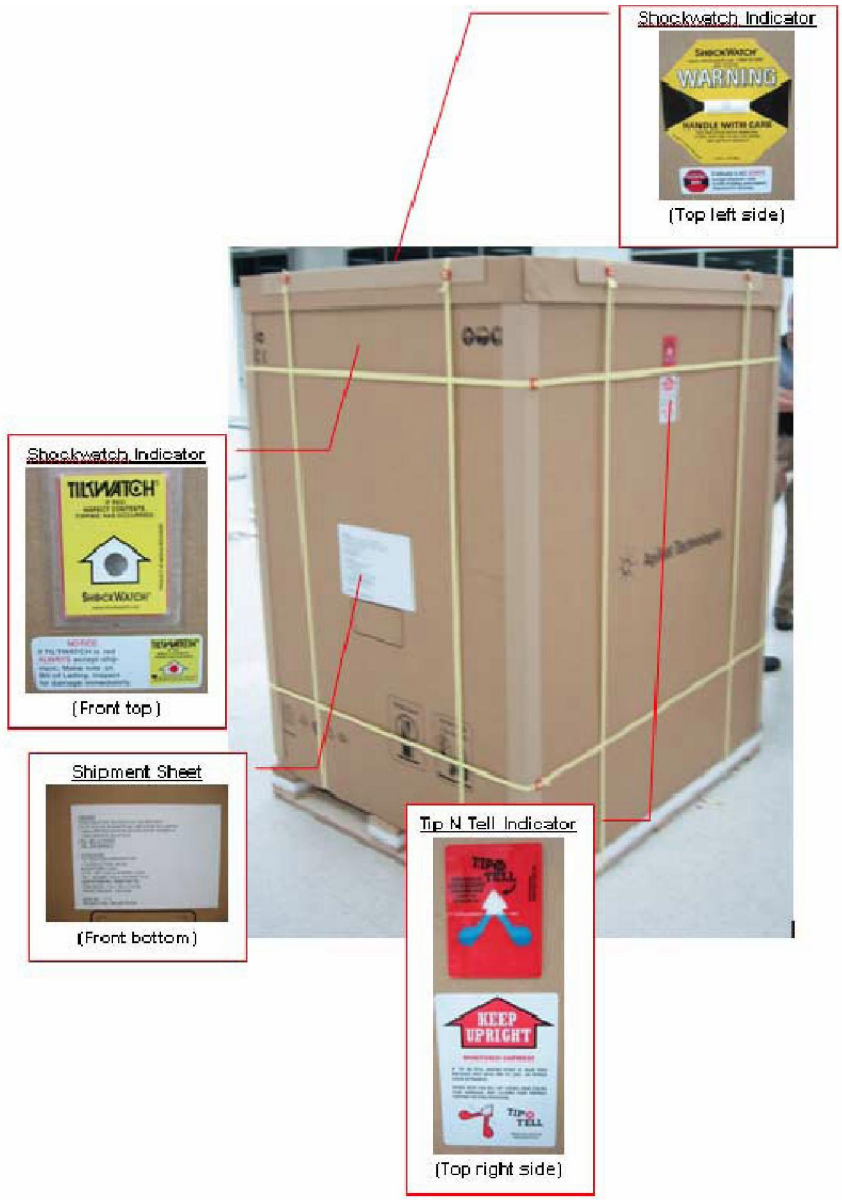


Figure 4-1: Locations of Indicators and Sensors

Moving the V510

NOTE

The lifting device used to move the V510 must be rated to lift and carry a 2 tonne load. The forks of the lifting device should be a minimum of 1.0 m in length with a minimum fork spacing of 0.5 m (the inside gap between the forks).

When handling the V510, bear in mind the following:

- The machine is designed for transportation and handling by either a hydraulic pallet truck or forklift.
- The machine 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 machine from an elevated position the lifting device operator must ensure that all sides of the machine are clear from obstructions.

Ensure that the correct space is available on the production line (see the *Site Preparation Manual*) before lifting and moving the V510 into position.

It is important that the machine is aligned so that its fixed conveyor rail is in-line with the fixed rails of the input and output conveyors.

a. Disconnect the power cord.

b. Secure the X and Y-axis with shipping clamps.

c. Use a hand truck to lift the machine approximately one inch.

d. Remove the packaged parts from under the machine.

e. Turn the four adjustable feet so that they go approximately two inches into the machine.

f. Carefully move the machine to the desired location.

g. Slowly lower the machine so that the feet are about one inch from the floor.

h. Turn the four adjustable feet out they touch the floor, and then adjust the height until the system conveyor height matches that of the input and output conveyors.

i. Once the correct height has been reached, tighten the feet locking nuts with the 46 mm spanner.

j. Ensure that all four feet are solidly on the ground.

k. Lower and remove the hand truck.

l. Remove the shipping clamps before operating the gantry.

NOTE

These steps *must* be followed every time the machine is lifted, regardless of whether it is moved from its location.

⚠WARNING

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

⚠WARNING

The machine must never be raised, lowered, or moved while electrical power is connected.

Adjusting the Height and leveling the V510

Adjusting the Height

The four adjustable feet are used to vary the height of the V510. As described in "Moving the V510", the height must be adjusted so that the system conveyor height matches that have the input and output conveyors.

Leveling the V510

After adjusting the height, level the machine as follows:

a. Loosen the feet locking nuts.

Place the level gauge on the X rail and adjust the feet until the machine is level.

Do the same way for the Y rail.

Ensure the final height is same as the input and output conveyors.

Once the correct level has been achieved, tighten the feet locking nuts.

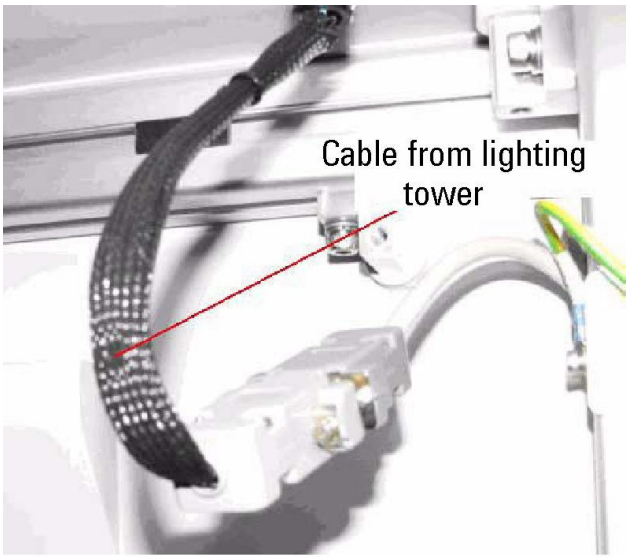
Mounting the Lighting Tower

The lighting tower is mounted on the roof of the V510.

a. Feed the cable through the mounting hole on the roof and fit the light tower with the three screws provided and a 2.5 mm Allen key.

b. Ensure that the 22 mm nut is tightened against the round mounting plate.

c. Fit the two connectors together inside the machine.



Installing the Keyboard and Monitor

a. Remove the four mounting screws at the front left of the machine below the switch plate.

b. Align the monitor/keyboard mount arm with the mounting plate on the machine and tighten the screws.

c. Place the mounting pole through the keyboard tray mount clamp and then into the monitor/keyboard mount arm.

d. Tighten the keyboard tray in place.

e. Secure the mounting pole by tightening the screw in front of the mount arm.

f. Remove the four inner screws from the back of the monitor. Align the holes with the monitor mounting plate, then insert and tighten the four screws.

g. Place the keyboard and mouse on the keyboard tray.

Next, connect the cables for the monitor, keyboard, and mouse.

a. Connect the monitor power cable and monitor signal cable to the monitor and secure them in place with the cable ties provided.

Do not secure the cables too tightly. Ensure there is enough slack so that the monitor/keyboard arm can be adjusted without straining the cables.

Feed the monitor power, monitor signal, mouse, keyboard, and keyboard earth cables along the mount arm to the inside of the system.

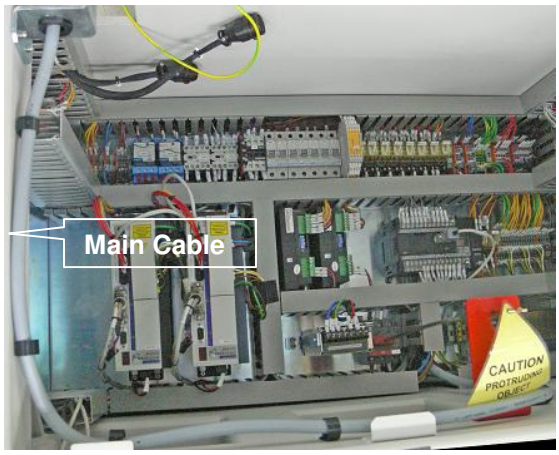
Open the front access door and connect the cables to the corresponding cables inside the machine.

Connecting the Mains Cable

⚠WARNING

The mains cable uses US or EU color-coding depending on the option purchased and no connector is provided. The connector to be used will depend on the requirements of the factory in which the V510 is being installed.

a. Route the mains cable from the mains isolator following the cleats provided.



Feed the cable through the slot in the base of the machine.

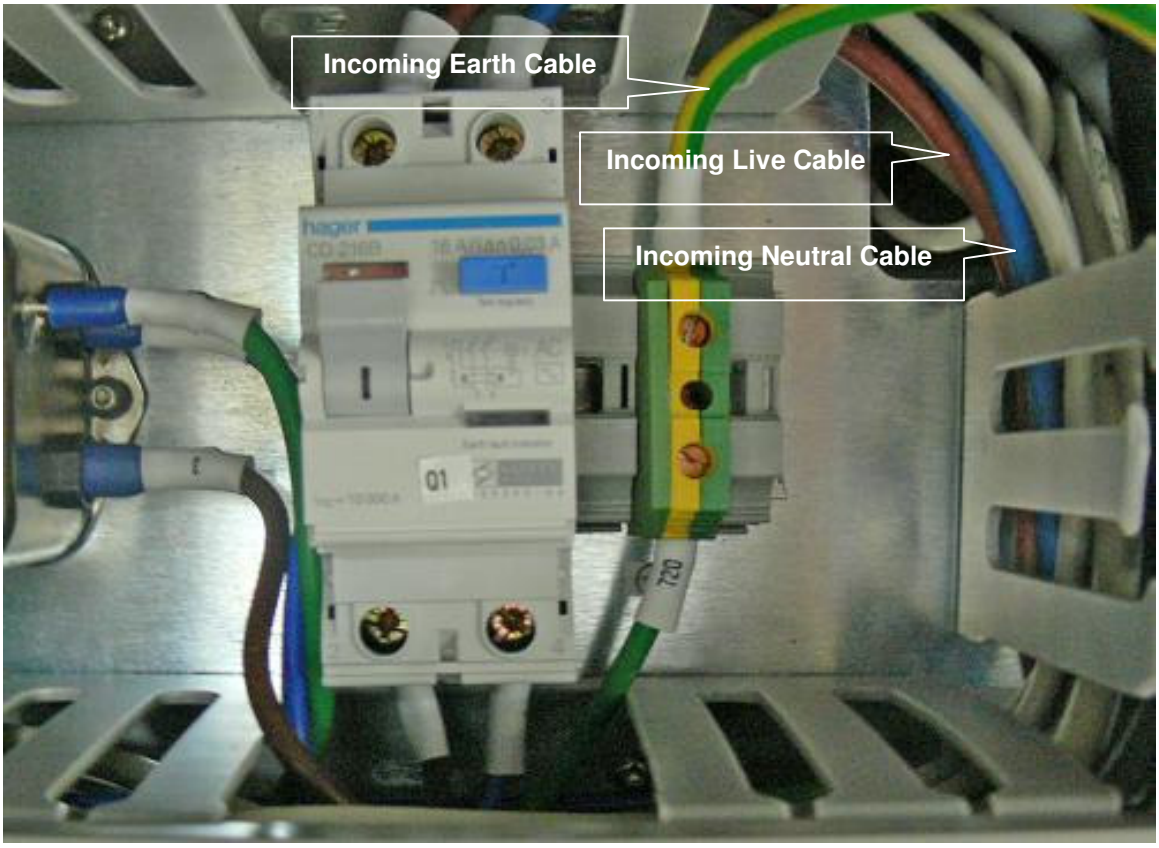
Install the connector and plug it into the factory mains supply.

Earth Cable Connection

⚠WARNING

The mains connection should only be done by qualified personnel.

The earth cable is connected to the earth terminal block as shown below.



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5. Starting Up the V510

This chapter holds the following sections:

This chapter describes how to start and shut down the V510.

Before Powering Up

Before turning the V510 on at the mains isolator, do the following:

a. Make sure the mains isolator is switched off, then remove the rear access panel.

b. Measure the voltage between live (phase 1) and neutral (phase 2) at the mains isolator. The voltage should be 100 to 120 VAC or 200 V to 240 VAC.

c. Ensure the system is correctly earthed.

Now you can power up the V510 as described in the following pages. Refer the locations of the switches and buttons to use.

Figure 5-1: Controls on the switch plate at the front of the machine

Powering Up the V510 for the First Time

When powering up the V510 for the first time, carry out the following steps:

a. Ensure that a suitably qualified person has connected electrical power.

b. Ensure that the mains isolator is in the OFF position.

c. Switch on all other MCBs.

d. Verify that all circuit breakers are on.

e. Measure the input voltage and ensure that it is the rated voltage of the machine.

f. Ensure that the XY table is free to move over its entire envelope before continuing. You can manually move it around its enclosure.

Ensure that the conveyor is free from obstruction.

Ensure that the **MAINT. SWITCH** is in the O position (off).

Ensure that the front access door is fully closed. Pull out all the E-Stop buttons before continuing.

Ensure the rear access panel is locked in position.

Turn on the V510 at the mains isolator.

Turn the **START** key switch to the ON position.

Ensure that the green **RUN** light is lit. If the **RUN** light is not lit, check the input power.

Ensure the **RAIL 1** switch is set to **INSP** (inspect).

Turn on the UPS (if installed) and turn on the monitor.

Reset the E-Stop circuit by pressing the **ES RESET** button.

Turn on the PC.

Powering Up From the Mains Off Position

To power up the V510 from the mains off position, do the following:

a. Ensure that the **START** key switch at the front of the machine and the mains isolator are in the OFF position.

b. Ensure that the XY 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.

c. Ensure that the rear access panel is locked in position and turn the mains isolator to the ON position.

d. Ensure that the **MAINT. SWITCH** is in the O position (off).

e. Ensure that the front access door is closed.

f. Turn the **START** key switch to the ON position. Ensure that the green **RUN** light is lit. If the **RUN** light is not lit, check the input power.

g. Turn on the UPS (if installed) and turn on the monitor.

h. Ensure that all four of the E-Stop buttons are pulled out.

i. Turn on the PC.

j. Press the **ES RESET** button.

Powering Up to Restore From an Emergency Stop

To power up the V510 to restore from an emergency stop, perform the following:

a. Ensure that the front access door is fully closed.

b. Pull out all the E-Stop buttons.

c. Press the **ES RESET** switch.

d. If the V510 software is running, also click the **Okay** button in the E-Stop alarm window.

Machine Cycle

The sequence of events during a **board load—inspect—eject** cycle is as follows:

- The upstream machine provides a ‘Board Available’ signal to the V510 via the SMEMA interface.
- When ready to accept a board, the V510 gives the upstream machine a ‘Machine Not Busy’ signal through SMEMA.
- If a hardware barcode reader is used, it is normally triggered at the same time as the ‘Machine Not Busy’ signal. It is possible to configure the system to trigger the reader first and await a good read before sending ‘Machine Not Busy’ — this would typically be used when integrating with a factory management system.

- When both 'Board Available' and 'Machine Not Busy' are true, the upstream machine passes a board to the V510.
- Once the board is inside (that is, seen by the Entry sensor) the V510 disables the 'Machine Not Busy' signal to the upstream machine.
- The board stops are activated once the conveyor starts to move (as a result of a board entering the machine).
- When the In-Position sensor detects the board.
    - The conveyor slows down and halts such that the board is resting against the board stops.
    - The board is clamped in position.
- When the clamps are successfully raised, the Programmable Logic Controller (PLC) gives a board present signal to the PC.
- The board is inspected.
- When inspection is complete, the PC informs the PLC that the board has passed or failed inspection.
- The board is then released:
    - The clamps and stops are lowered.
    - The board drops smoothly onto the conveyor and the conveyor starts running.
    - The board transfers to the Exit sensor.
- The V510 signals the inspection result to the downstream machine via SMEMA (pins 3 and 4 closed = Good Board Available, 3 and 5 closed = Bad Board Available)
- When the V510 gets a 'Machine Not Busy' signal from the downstream machine, the conveyor is driven until the board exits the machine and the cycle begins again.

6

6. Changing the Conveyor Rail Width

This chapter holds the following sections:

This chapter describes how to manually and automatically change the distance between the conveyor rails. The V510 allows the operator to adjust the conveyor width without opening the front door of the machine.

Sensors and Flags

Mounted on the conveyor are three sensors used to control the Auto Width Adjust (AWA). These sensors are used to detect the minimum width, maximum width, and rail alignment. The sensors are identified as follows:

- Left minimum width (Left Min) sensor
- Right minimum width (Right Min) sensor
- Left maximum width (Left Max) sensor

Each of the three sensors has a corresponding flag mounted on the moving rail of the conveyor.

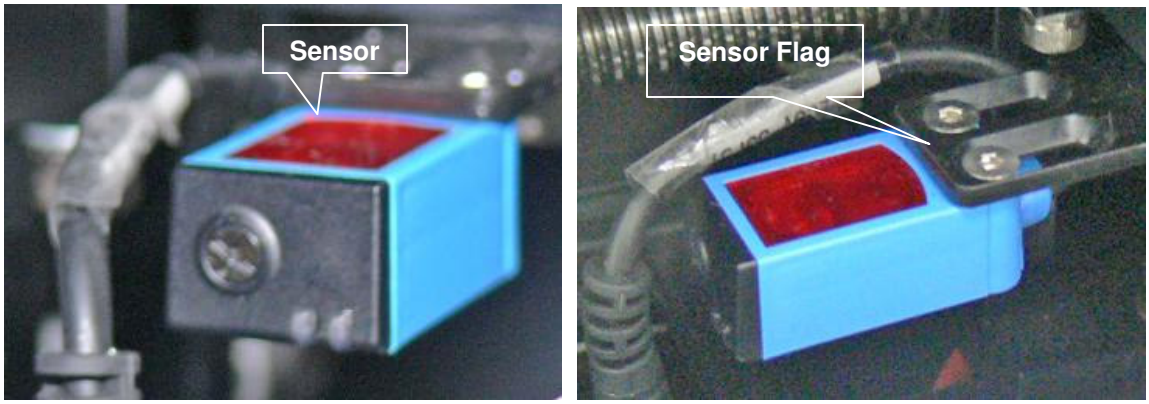


Figure 6-1: Sensors and Flags on the Conveyor

The sensors are installed so that each sensor is triggered when the rails reach a maximum or minimum distance apart (this can vary between single and dual lane conveyors).

- Minimum width the default V510 minimum rail distance is 50 mm. However, if a user adjusts the edge clearance, this may vary.
- Maximum width the maximum width for all conveyors is 510 mm (single lane). The Left Max is installed so that it triggers when the rails are 510 mm apart (approximately 2 mm less than the maximum travel distance).

Manual Width Adjust

You can manually adjust the distance between the conveyor rails using the **AWA** buttons on the switch plate at the front of the V510.

Figure 6-2: AWA IN/OUT buttons on the switch plate

a. Ensure there are no boards in the V510.

b. Ensure the E-Stop circuit has been reset.

c. To narrow the distance between the rails, press the top white button (**AWA IN/OUT**). Hold the button for at least one second to activate the movement.

d. To widen the distance between the rails, press the bottom black button (**AWA IN/OUT**). Hold the button for at least one second to activate the movement.

e. When finished, press the **PLC RESET** button.

Auto Width Adjust

You can manually adjust the distance between the conveyor rails using the V510 software.

a. Ensure there are no boards in the V510.

b. Launch the V510 software in Engineer mode.

c. In the main toolbar click the **Utilities** button.

d. Under Category, click the **Auto Width Adjust** folder.

e. You will be reminded to remove all boards from the V510. Click **Yes** to continue. (You will not be able to continue if any boards remain in the machine.)

f. In the Auto Width Adjust window, click the **Jog Out** and **Jog In** buttons to adjust the distance between the conveyor rails.

The Auto Width Adjust Window

To access the Auto Width Adjust tools, from the Utilities menu click the **Auto Width Adjust** folder.

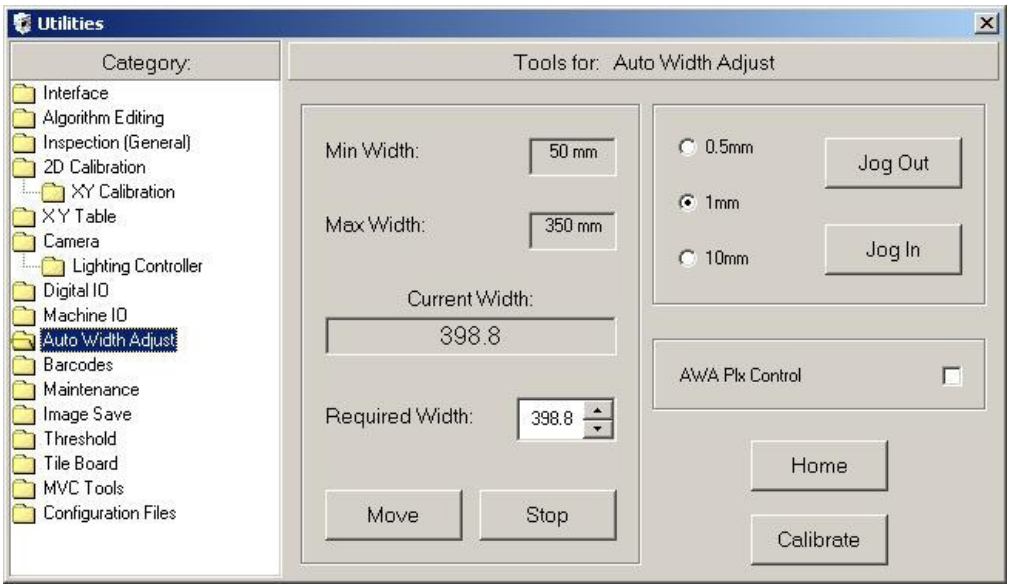


Figure 6-3: Auto Width Adjust window

Tools for Auto Width Adjust

Field/Function	Description
Min Width	Displays the minimum conveyor width allowed. If you enter a Required Width that is less than the minimum, then this value will be used instead.
Max Width	Displays the maximum conveyor width allowed. If you enter a Required Width that is greater than the maximum, then this value will be used instead.

Tools for Auto Width Adjust

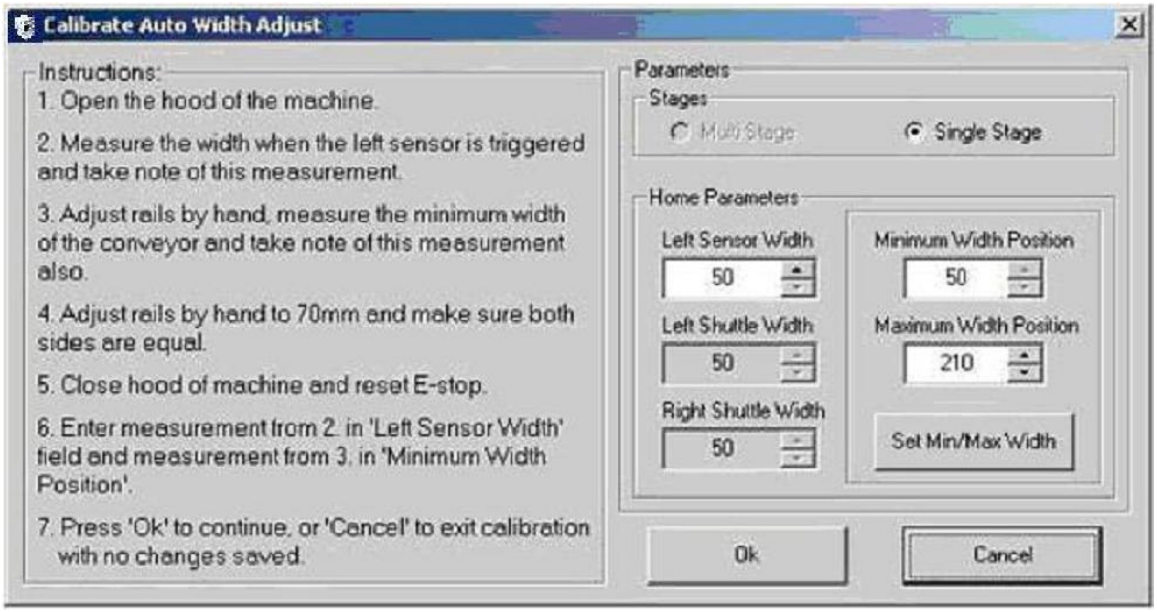
Field/Function	Description
Current Width	Displays the current distance between the conveyor rails. If the conveyor rails are moving, the message 'Axis Moving' is displayed.
Required Width	Lets you specify the desired distance between the conveyor rails. Specify a value between the minimum and maximum widths.
Move	Click **Move** to move the conveyor rails to the specified distance apart.
Stop	Click **Stop** to abort a move operation. The conveyor rails will stop moving and the Current Width shows the current distance between the rails. The move operation is also aborted when an E-Stop button is pressed.

Jog Out/Jog In	Click **Jog Out**/**Jog In** to jog the conveyor rails out or in. Each click moves the rails by the selected pulse increment: 0.5 mm, 1 mm, or 10 mm. Hold down the **Jog Out**/**Jog In** buttons for continuous movement of the conveyor rails.
AWA PLX Control	Select this option to enable automatic adjustment of the conveyor width based on the width setting in the PLX file for a board. To set the width, insert the following line in the PLX file: **W <microns>** For example, **w 125000** sets the width to 125000 microns or 125 mm.
Home	Returns the conveyor rails to a known position and ensures that they stay parallel. This should be used if the machine has been switched off for a while or if any work carried out inside the machine has caused the moving conveyor rail position to change.
Calibrate	Calibrates the automatic width adjust functionality. This will set the conveyor width and also align the conveyor rails. See “Calibration”.

Calibration

NOTE

When you click **Calibrate**, instructions for calibration appear in the following window.



Make sure the rails are parallel and the distance between the fixed and moving rails is 70 mm. The Minimum Width Position must be less than the Left Shuttle Width.

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7. Auto Width Adjust Conveyor Setup

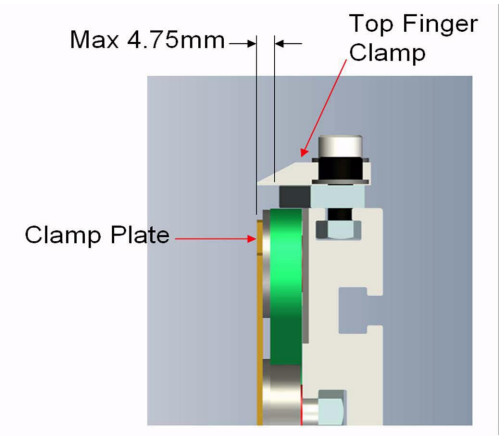
This chapter holds the following sections:

Linear Mechanical Setup

The tools required for this check are a 2 mm Allen key and an engineers steel ruler.

In order to achieve mechanical accuracy with the AWA conveyor, carry out the following setup check and make the necessary adjustments.

a. Use the steel ruler to measure the distance from the inside of the linear rail to the outside of the black lip where the outer clamp edge ends. This distance must be less than or equal to 4.75 mm along the entire the length of the rail as shown below.



If the measurement exceeds 4.75 mm, proceed with the mechanical setup described in "Conveyor Edge Clearance Adjustment".

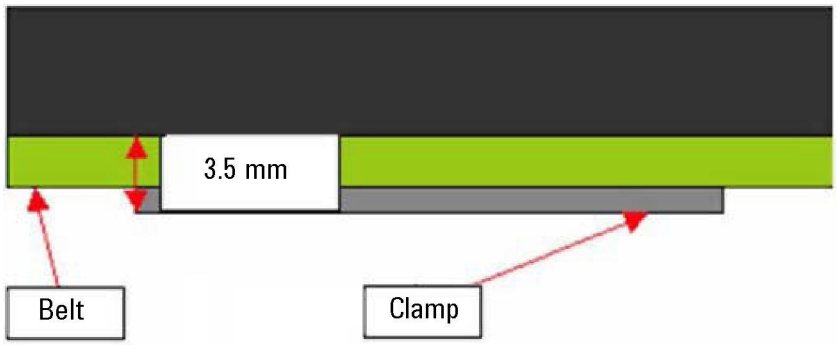
If the measurement is acceptable (less than or equal to 4.75 mm), proceed to "AWA Mechanical Setup".

Conveyor Edge Clearance Adjustment

If the conveyor edge clearance is greater than the SMEMA standard of 4.75 mm or it is to be set to something other than the SMEMA standard, follow the procedure below to adjust it.

Note that the preferred fixed position of the linear rails is at 3.5 mm but the clearance can be increased to up to 3.75 mm. Also note that the maximum clearance is 4.75 mm (this includes 1 mm for the clamp). If trying to reduce the edge clearance any further, consider carefully how much of the belt is left to carry the PCB. Care should also be taken to set the top and bottom side edge clearances such that they do not hinder board transfer and clamping.

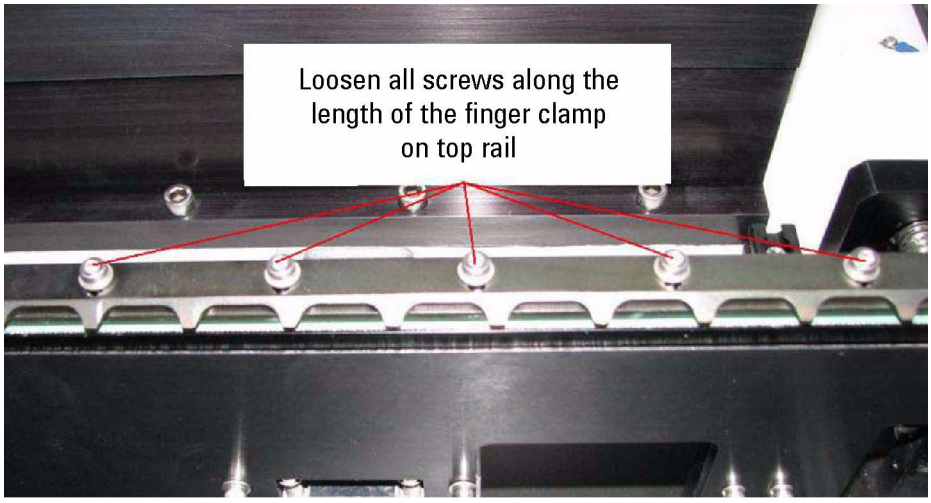
NOTE



It is assumed that the clamp is 1 mm thick. When taking measurements the fixed straight edge of the conveyor rail is used for accuracy. When re-checking the set distance, the clamp thickness is taken into account to verify that the edge clearance conforms to the SMEMA standard.

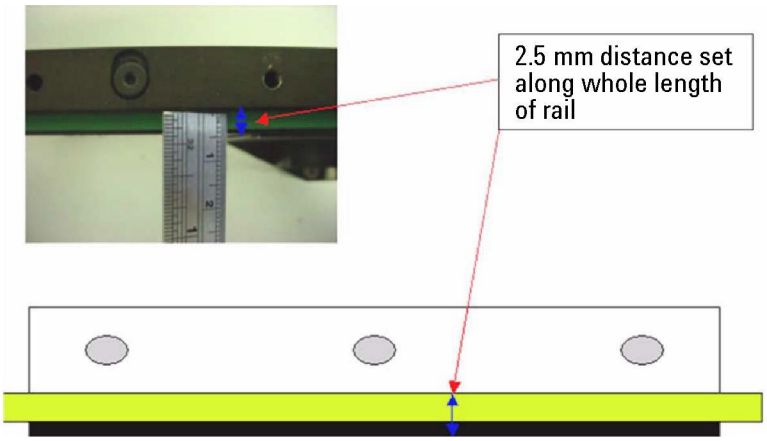
The following procedure illustrates how to set a clearance of 3.5 mm. The steps are the same when setting other clearances.

a. Loosen the screws along the length of the finger clamp using a 2 mm Allen key. Use care when loosening the screws, as they may be very tight. Remove the finger clamp.



Measure the distance from the inside of the linear rail to the outside of the black lip where the belt edge ends. When setting the clearance to 3.5 mm, this distance should be 2.5 mm.

If necessary, loosen the screws along the linear rail. Use care when loosening the screws, as they may be very tight. It may help to add a drop of oil or anti seizure solution. Adjust the distance to 2.5 mm along the whole length of the conveyor.

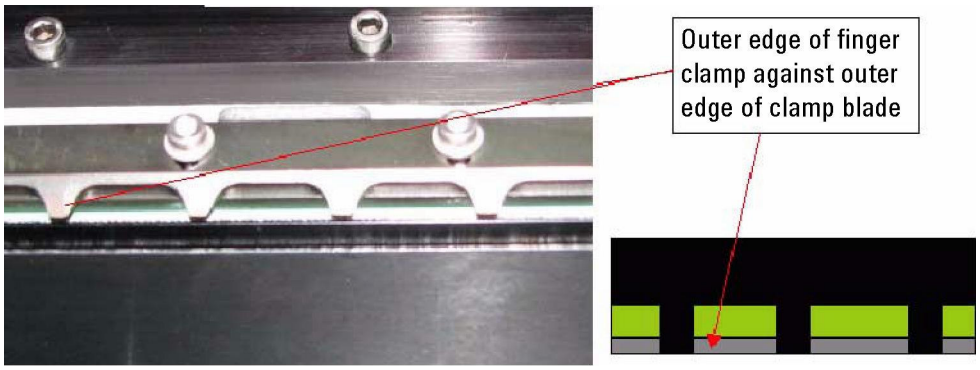


When you are satisfied that the whole rail is set at the correct distance, tighten all the screws along the linear rail.

Replace the finger clamp and ensure that it is aligned with the board clamps.

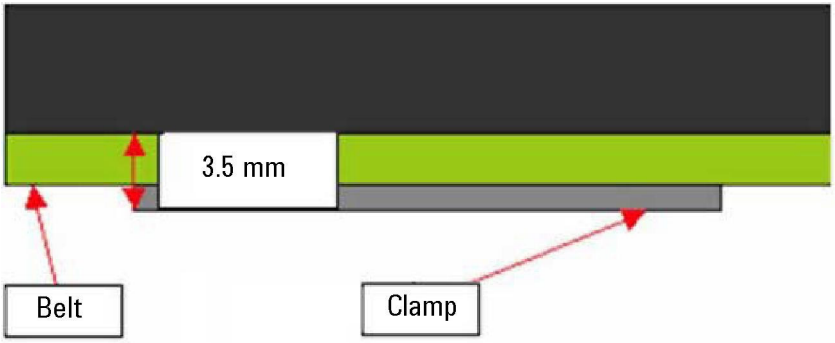
Place the finger clamp back on top of the linear rail and then align its front edge with the edge of the board clamps. Move the clamp assembly up by hand so the edges meet, making sure the clamps are parallel to each other.

Tighten all the machine screws along the finger clamp.



Re-check the full edge clearance by measuring the distance from the inside of the linear rail to the outside edge of the clamp.

Ensure that all clamps are straight, parallel and free moving. The distance must not exceed 4.75 mm (SMEMA). (This distance is set to 3.5 mm when the V510 is manufactured.)



AWA Mechanical Setup

To achieve accuracy when the conveyor homes and moves to its desired width, check the position of the maximum and minimum sensors and set them up according to the factory default.

Figure 7-1 shows the sensor distances to be set. Use a steel ruler to measure from the base to the sensor edge. If the measurements are different from those shown, loosen the sensor setting screw, adjust the sensor position, and tighten the screw to secure the sensor.

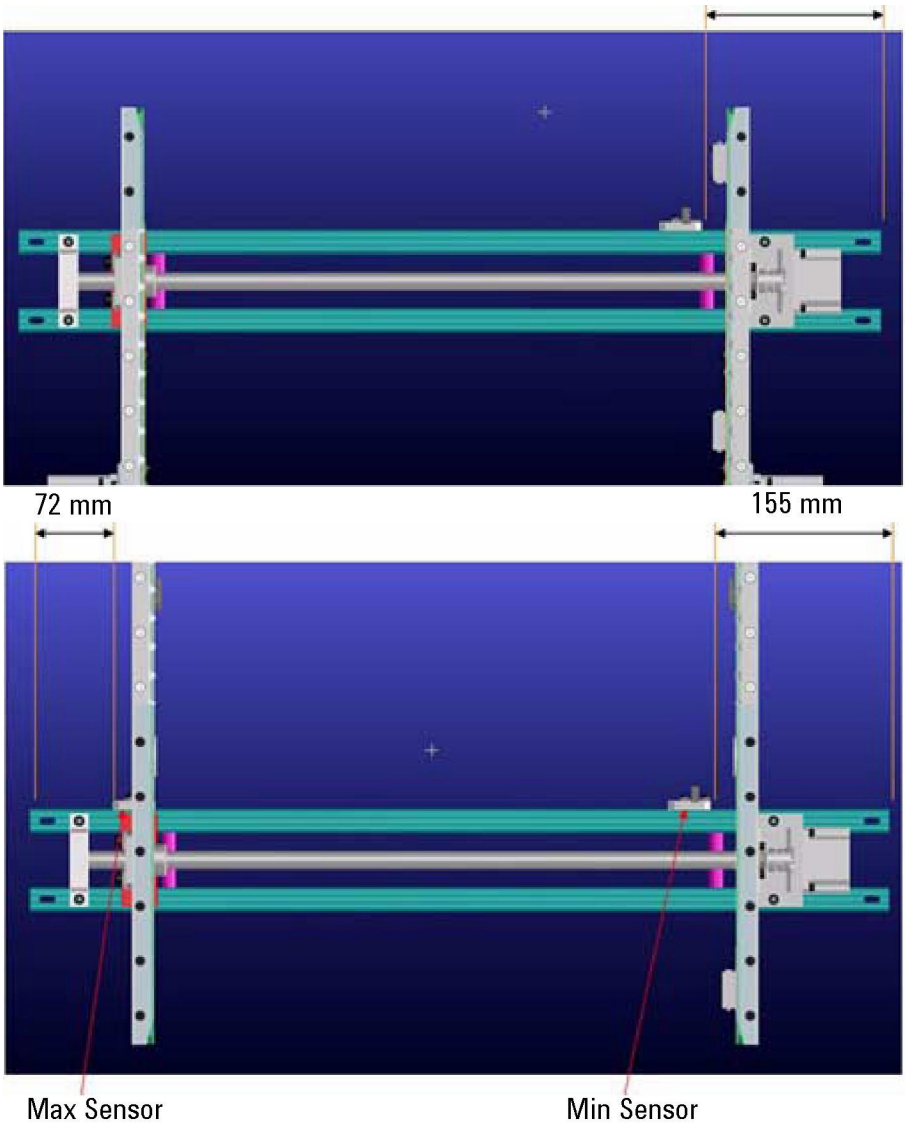


Figure 7-1: Sensor Positions

AWA Setup and Calibration

Perform the following steps:

a. Set up the sensors and flags. Refer to "AWA Mechanical Setup" for instructions. Also see "Sensors and Flags" for a description of the sensors and flags.

Ensure that all sensors and I/O are working correctly: Trigger each of the AWA sensors individually, using a small screwdriver or piece of paper to simulate the sensor triggering. You will need another person check the PLC inputs on the control panel in the rear of the machine. Verify that the PLC input LED turns on and off as you activate and deactivate the sensor.

Input	Sensor
01.0	Left Max
0	Sensor Left Min
01.0	Sensor Right

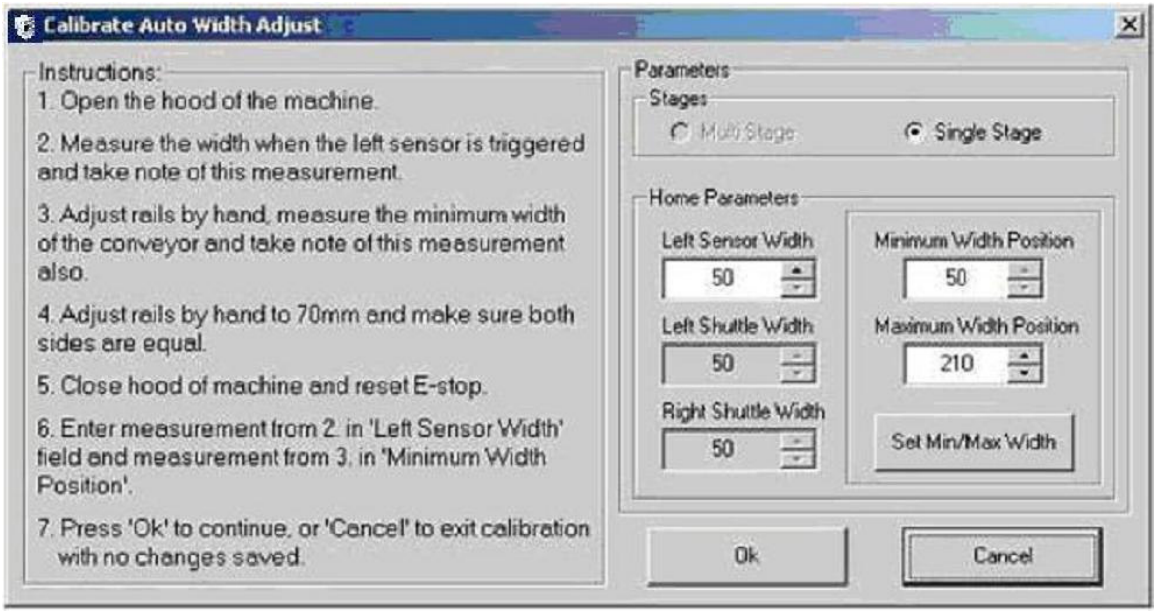
Auto Width Adjust Calibration

a. Ensure there are no boards in the V510.

b. Launch the V510 software in Engineer mode.

c. From the **Utilities** menu click the **Auto Width Adjust** folder.

d. Click Calibrate.



Open the front access door. Adjust the rails inwards until they can no longer move. (The ball screw housing rubber stops will not allow further movement.)

Move the rails outwards until the fixed and moving rails are 50 mm apart and parallel. This is the minimum width and should be measured between the inside linear rail on the fixed rail and inside the linear rail of the adjustable rail. Ensure they are parallel by measuring the rail separation at either end of the rails.

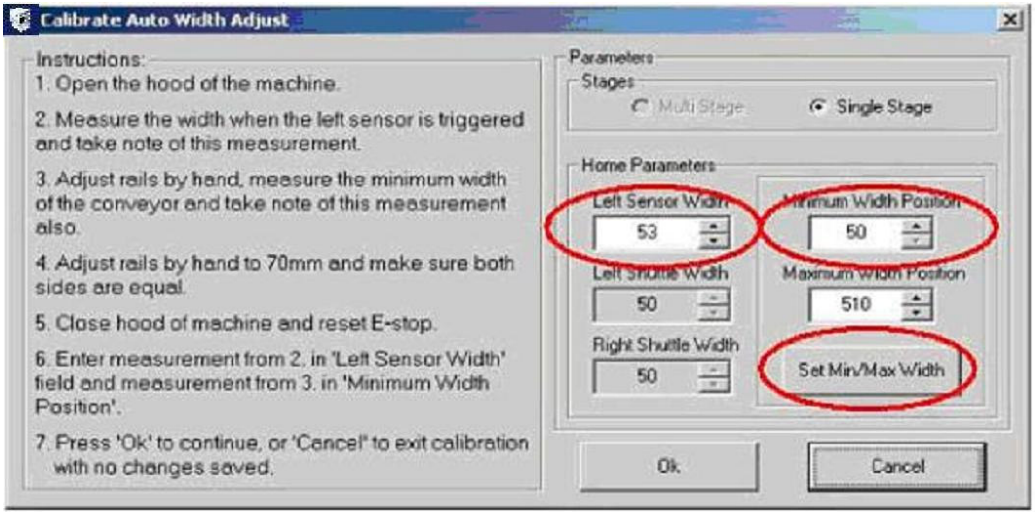
Adjust the rail outwards by hand until the Left Min sensor is not triggered. Then adjust the rail inward by hand until the Left Min sensor is triggered. Measure and take note of the conveyor width.

Adjust the rail inwards by hand until the Right Min sensor is triggered. Measure and take note of the conveyor width. Make sure that the difference between the Left Min sensor getting triggered and the Right Min sensor is approximately 1 mm. The closer it is to 1 mm, the faster the conveyor will calibrate.

Now adjust the rails outwards by hand to 70 mm, making sure the conveyor rails are parallel at either end.

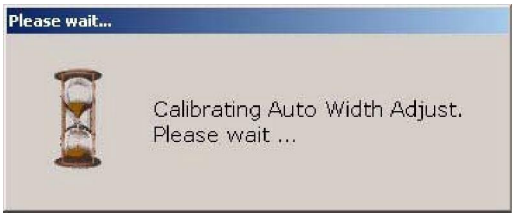
Close the front access door and reset the E-Stop circuit.

Enter the measured values noted above for the Left Min sensor (Left Sensor Width) and the minimum width. In Maximum Width Position, enter 510 mm for a standard single rail system and 216 mm for a standard dual rail system.

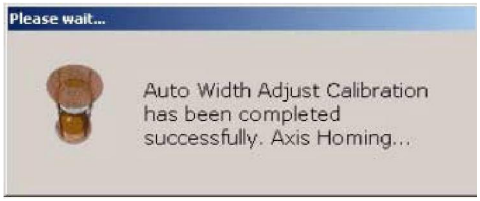


After entering the new values, Click **Set Min/Max Width** to write the new values to the PLC. Then click **Ok** to start the calibration.

During calibration the following message appears.



When calibration is finished, the conveyor will step 30 mm off the sensors and then home.



The conveyor will home. Before homing the PLC will check if the rail is on a sensor. If a sensor is triggered then the rail will move out 50 mm and then commence homing.

When homing the adjustable rail moves in until it triggers the Left Min sensor. It will then look for the Right Min sensor. If it is not found the 'Right Motor Only' will be switched on and adjusted inwards by up to 5 mm. Once the sensor is found, the 'Right Motor Only' will be switched off, and both motors will go to the minimum width position.

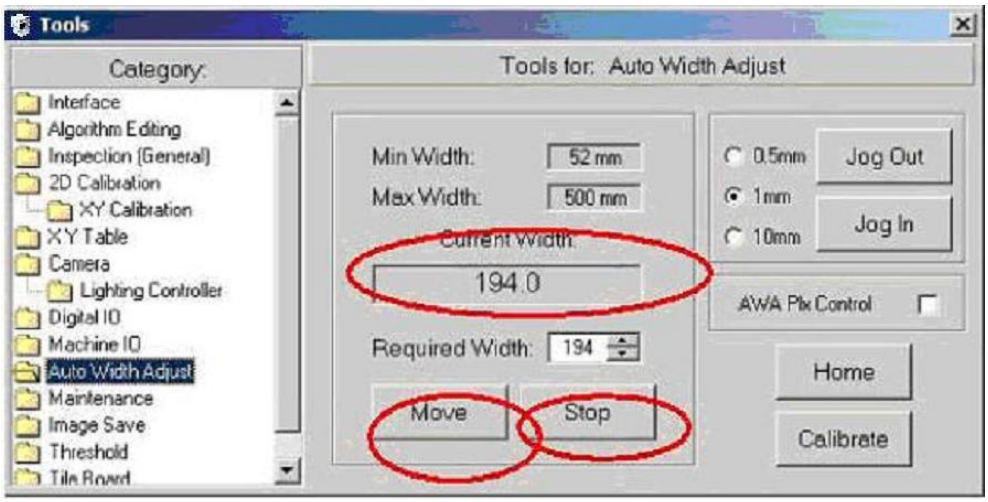
When homed the following is displayed:

If any errors are encountered during calibration or homing, an error message will be displayed. Exit the AWA function and reset the PLC from the switch plate before attempting the calibration process again.

Conveyor Width Adjustment

If calibration is successful, proceed with the following:

- Check using calipers that the distance between the conveyor rails is the same as the value in the Current Width field.
- The conveyor width can now be adjusted:
  - Enter the width required into the Required Width field and press **Enter**.
  - Click **Move** to move the conveyor rail in or out to the required width. Every time the AWA is accessed the conveyor will automatically home itself for the first move, and then move to the required width entered.



If the width entered is below or above the minimum and maximum widths respectively, the conveyor will move to either the minimum or maximum width depending on the value.

- To stop the conveyor when moving to a specified width, click **Stop** to cancel the move operation.

If any problems occur when the conveyor is attempting to move, an error message will be displayed.

Testing the Move, Stop, and Jog Functions

To test the Move function, follow the instructions below:

a. Enter 200 mm in the Required Width field and click **Move**.

b. Wait until 200 mm is displayed in Current Width.

c. Using Vernier calipers, check that the width of the conveyor is 200 mm ±0.5 mm at both ends.

d. Enter 100 mm into the Required Width field and click **Move**.

e. Wait until 100 mm is displayed in Current Width.

f. Using Vernier calipers, check that the width of the conveyor is 100 mm ±0.5 mm at both ends.

g. Exit the AWA menu, wait 5 seconds, and re-enter the AWA menu.

h. Enter 150 mm into the Required Width field. The conveyor should first home and then move to 150 mm.

i. Using Vernier calipers, check that the width of the conveyor is 150 mm ±0.5 mm at both ends.

To test the Stop function, do the following:

a. Enter 300 mm in the Required Width field and click **Move**.

b. Before the conveyor reaches this width, click **Stop**.

c. Using calipers, measure the distance between the two rails and check that it corresponds to the value in Current Width.

To test the Jog function, do the following:

a. Select a step size and click **Jog Out** or **Jog In** to jog the conveyor rails. The value in the Current Width field should increase or decrease correspondingly.

b. Using Vernier calipers, measure the distance between the two rails and check that it corresponds to the value in Current Width.

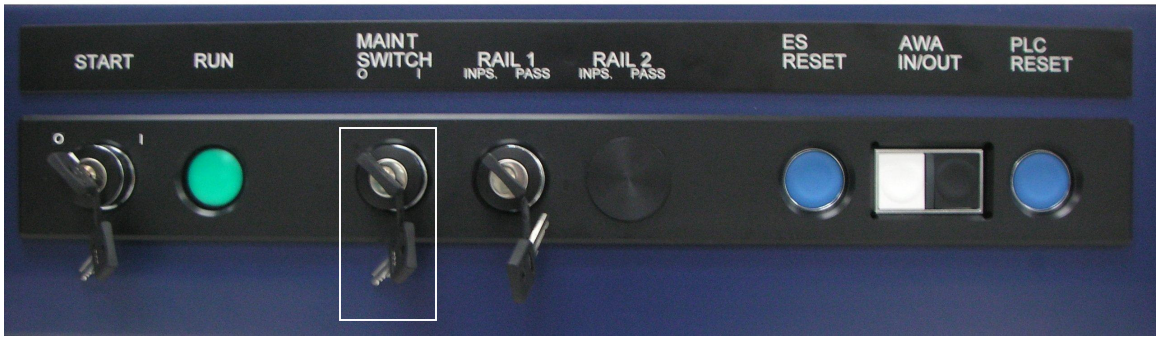
This test should be run for all three-conveyor step sizes, for both the **Jog Out** and **Jog In** buttons.

General Conveyor Checks

In order to check the clamps, stops and sensors, access to the interior of the machine is required. The **MAINT. SWITCH** is used to enable Maintenance mode for such checks. In Maintenance mode, no power or control is given to the gantry or conveyor belt motors, to safeguard personnel carrying out maintenance and calibration on the system.

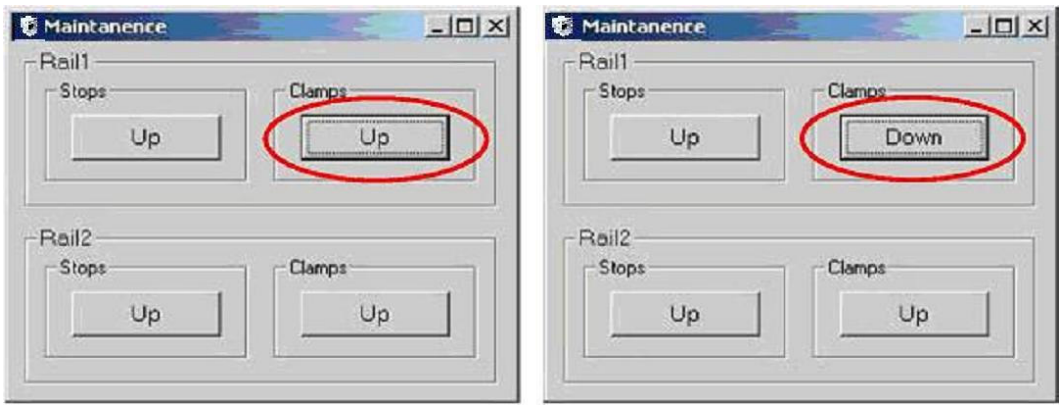
a. Remove any boards from the conveyor, and make sure the V510 software is running.

Turn the **MAINT. SWITCH** clockwise to the ON position and push the E-Stop button (the sequence is not important).



Open the front access door.

In Maintenance mode, use the **Up** and **Down** buttons in the software to control the movement of the clamps and stops.



When maintenance is completed, make sure all clamps and stops are returned to their down resting positions.

Close the front access door and turn the **MAINT. SWITCH** anticlockwise to the OFF position. The Maintenance window will be closed and normal control will be given to the machine.

Pull the E-Stop button out to reset the E-Stop circuit.

Board Sensor Checks

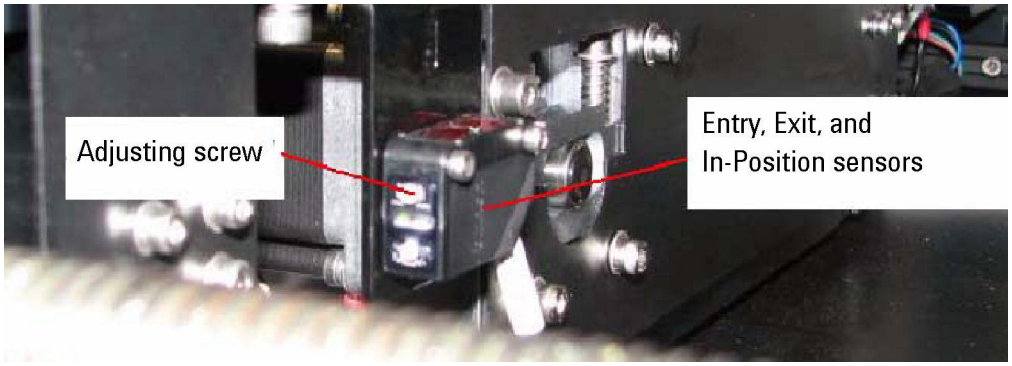
Follow this procedure adjust the triggering level for the board sensors.

a. Remove any boards from the conveyor, and make sure the V510 software is running.

b. Turn the **MAINT. SWITCH** clockwise to the ON position and push the E-Stop button (the sequence is not important).

c. Open the front access door.

d. Locate the Entry sensor. This depends on the conveyor direction (left-to-right or right-to-left); it is the first sensor the board will encounter.



Adjust the Entry sensor anticlockwise to reduce the triggering distance or clockwise to increase the distance.

When the sensor is powered, the green LED will be lit. When the sensor is triggered, an amber LED will be lit.

Adjust the screw (shown above) such that the sensor will trigger approximately 5 mm above the conveyor height. Make the adjustments using a small jewelers screwdriver and a PCB to set the distance.

Move the gantry by hand over the sensor and ensure that the lighting head and gantry do not trigger any of the board sensors.

NOTE

Do not move the gantry using the cables assembly.

Use the potentiometer at the bottom of the sensor to adjust the light to dark trigger.

Repeat this procedure for the Exit sensor and the In-Position sensor.

When finished, push a board over each sensor and check PLC input from the control panel.

Input	Sensor
00.06	Entry Sensor Rail 1
00.07	In-Position Sensor Rail 1
00.08	Exit Sensor Rail 1
01.05	Entry Sensor Rail 2
01.06	In-Position Sensor Rail 2
01.07	Exit Sensor Rail 2

AWA Conveyor Component Alignment

In order to achieve smooth operation during stopping and clamping, the stopping and clamping mechanism must be correctly assembled and aligned.

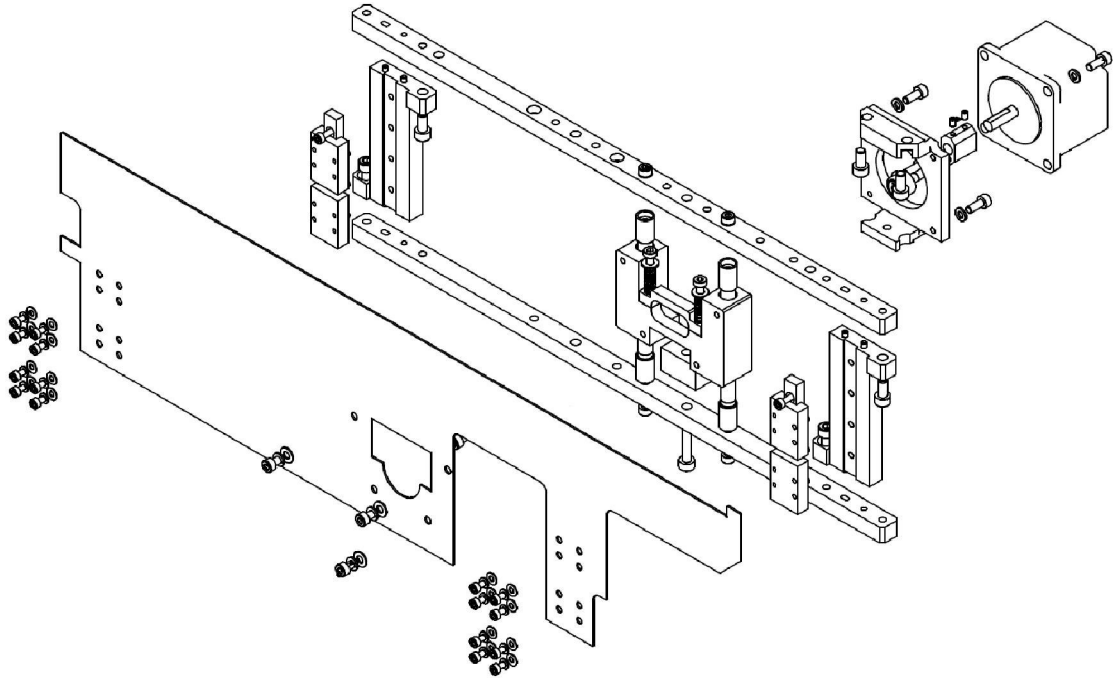


Figure 7-2: Clamping mechanisms

NOTE

The clamp up and down speed is fixed and not adjustable.

Clamp Home Sensor Adjustment

The Clamp Home sensor has to be adjusted its fit and flatness between the board and top finger clamp. Follow the steps below to adjust the sensor.

The tools required are:

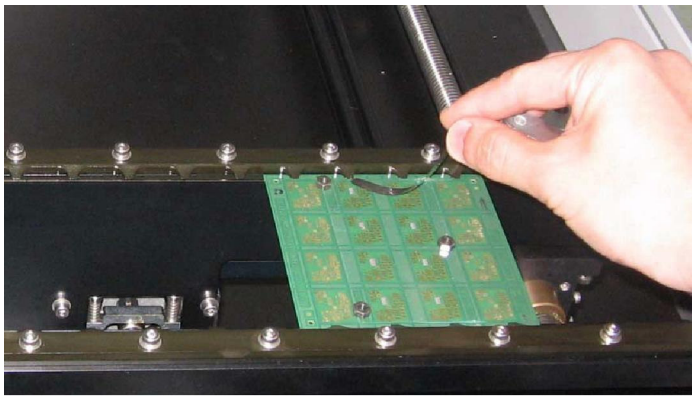
- Clamping tolerance test board
- 50 µm filler gauge
- Metric Allen keys

The board clamping plate is 510 mm in length. It is important to ensure the flatness of the plate along its length when a production board is clamped.

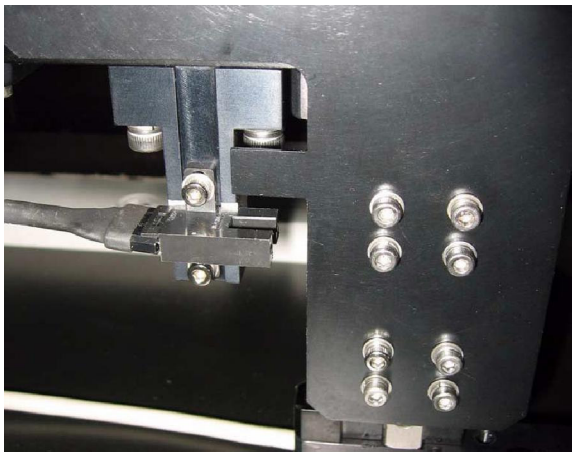
a. Activate Maintenance mode and manually insert the test board onto the clamping location.

b. Click the clamps **Up** button in the Maintenance window to clamp the board.

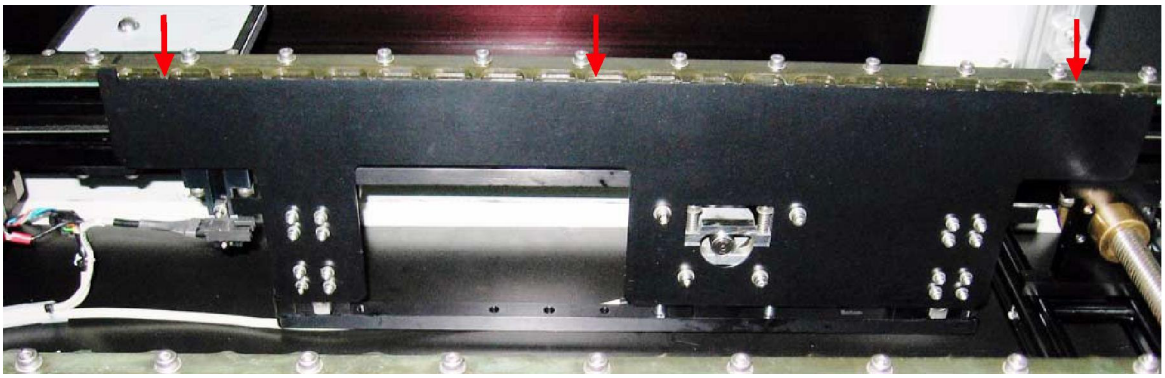
Insert the 50-µm filler gauge into every clamping tooth that is in contact with the board. To pass the test, the filler gauge should bend when you try to insert it between each clamping tooth and the board.



If the clamping mechanism fails the filler gauge test, adjust the Clamp Home sensor to enable the clamp plate to move further up and provide a firmer clamp. To do so, loosen the sensor screws, push up the sensor slightly and tighten the screws. Use caution when adjusting the Clamp Home sensor. Setting it too high may cause the clamp plate stepper motor CAM to overshoot.

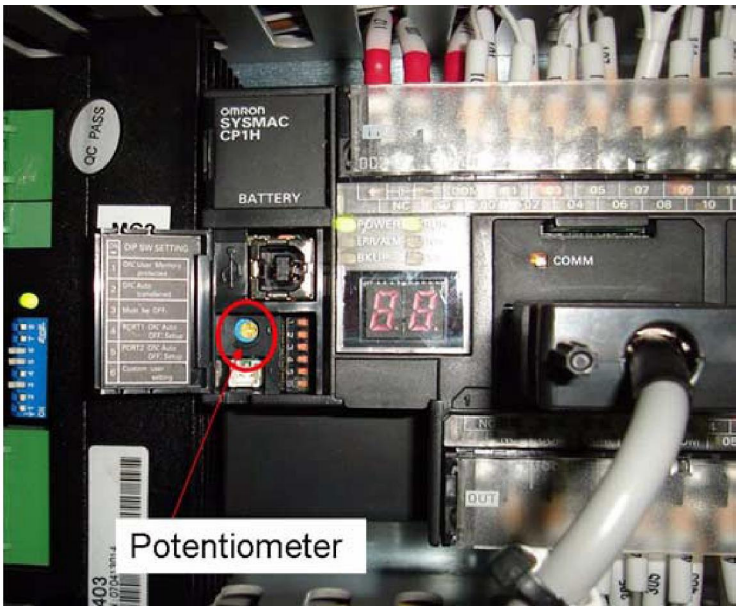


Repeat the above steps for all three locations on the clamp plate to ensure that they all meet the clamp tolerance requirement.



Conveyor Speed Adjustment

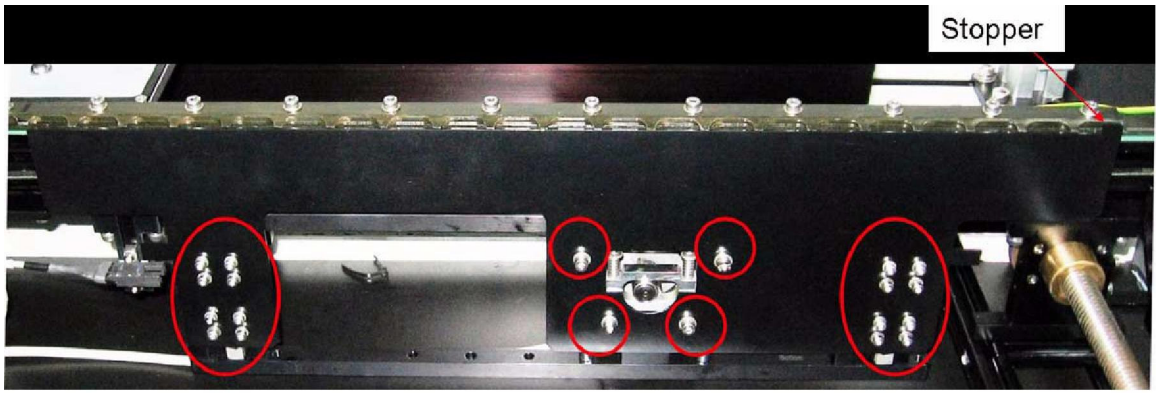
The speed of the conveyor can be adjusted by turning a potentiometer (POT) on the PLC. The POT is located behind the cover marked **Peripheral** in the control panel.



Tune the conveyor speed by using a screwdriver to turn the potentiometer.

Changing Conveyor Direction

To change the conveyor direction from a left-to-right configuration to right-to-left configuration, the clamp plates need to be dismantled and swapped. The following shows the default left-to-right configuration for the clamps.



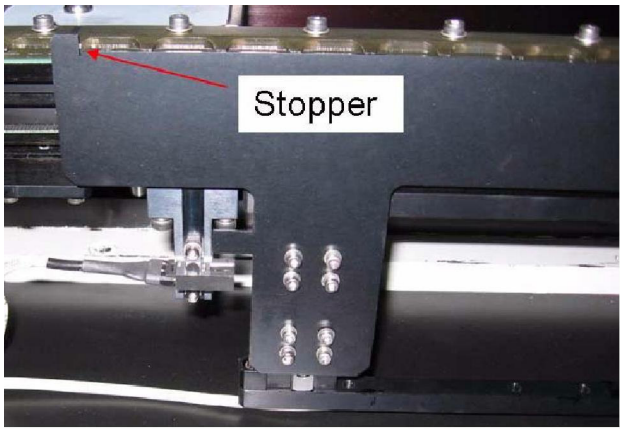
To change to a right-to-left configuration, follow these steps:

a. Remove 16 screws from the linear block and four screws from the motor block as shown above. Then remove the clamp plate.

b. Remove the other clamp plate in the same way.

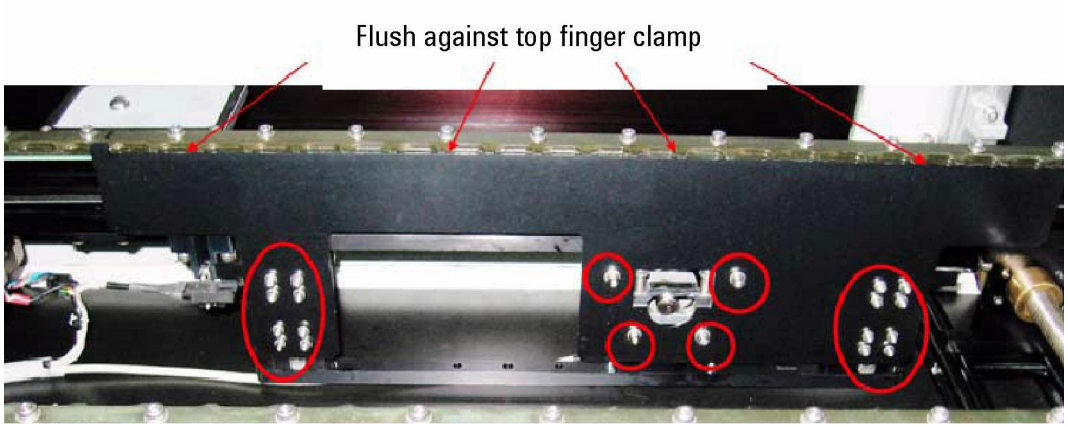
c. Swap the clamp plates.

d. Place the stopper at the left side as shown.



Replace all the screws.

Move the clamp plates up firmly against the top finger clamps and tight all the screws.



Adjust the Clamp Home sensor to ensure the clamps are able to home properly (see "Clamp Home Sensor Adjustment").

8

8. Camera and Lighting Calibration

This chapter holds the following sections:

Camera Calibration

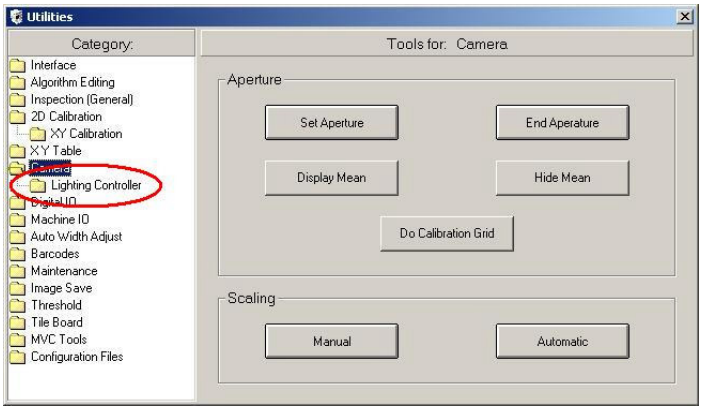
Camera calibration involves the following tasks:

- Focusing: manual adjustment of the lens so that a sharp clear image can be acquired by the camera. See "Focusing the Camera".
- Scaling: using the Auto-scale procedure to automatically determine the optical pixel size of the camera sensor. See "Auto-Scaling".

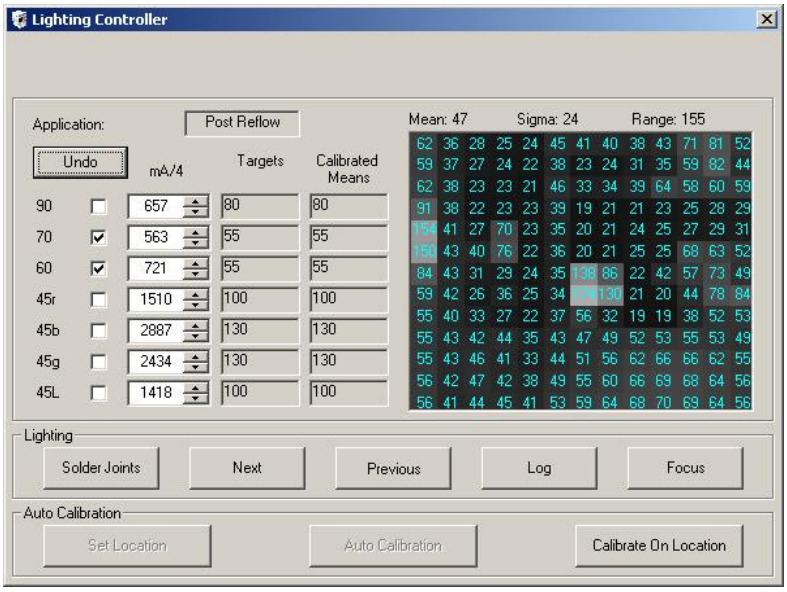
Focusing the Camera

a. Launch the V510 software in Engineer mode and load a board.

b. Open the **Utilities** menu by click the **Utilities** button on the main toolbar.



Under the Camera folder, click Lighting Controller.



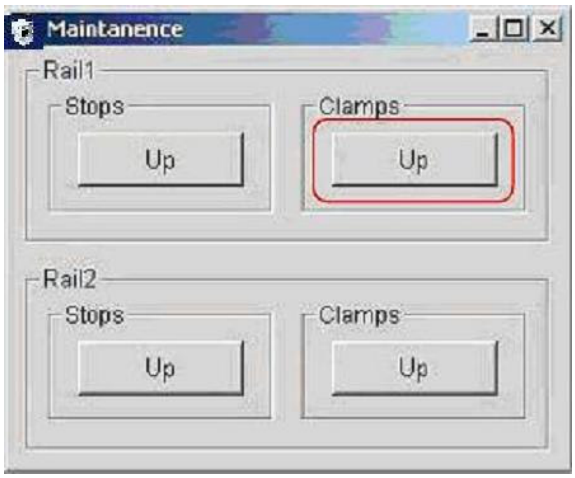
Select the lighting mode by clicking the first button in the **Lighting** area. For post-reflow, use **Solder Joints, which** consists of the 70 and 60-degree rings.

Open the front access door.

Drag the E-Stop alarm window to one side so that the camera display is visible.

Turn the **MAINT. SWITCH** on the switch plate to the ON position.

Click on clamps **Up** in the Maintenance window to clamp the board.



Once the board is clamped, minimize the Maintenance window.

Set the camera lens aperture to F-stop 5.6 (see "Setting the Lens Aperture").

Loosen the lens-locking clamp.

Turn the focus ring on the lens until the board and component leads are sharply focused on the screen.

When you have a sharp image, clamp the lens and tighten all screws associated with the camera.

Turn the **MAINT. SWITCH** back to the OFF position. This automatically closes the Maintenance window.

Close the front access door and clear the E-Stop alarm.

Click **Ok** on the Focus menu to re-enable the gantry motors.

After the camera has been focused correctly, the system scaling must be performed and the lighting calibration should be updated (see "Lighting Calibration").

Figure 8-1: Focus ring on the camera lens

Setting the Lens Aperture

To set the camera lens aperture to F-stop 5.6, do the following:

a. Unlock the lens aperture. The lock switch is located at the side of the aperture window.

Turn the aperture size to 5.6 as shown below.

Re-lock the lens aperture.

Auto-Scaling

The purpose of auto-scaling is to ensure an accurate determination of pixel size for measurement and for scaling inspection algorithms. Once set, camera scaling should not need to be adjusted. If a different scaling is required raise or lower the camera, re-focus, and then perform auto scaling.

NOTE

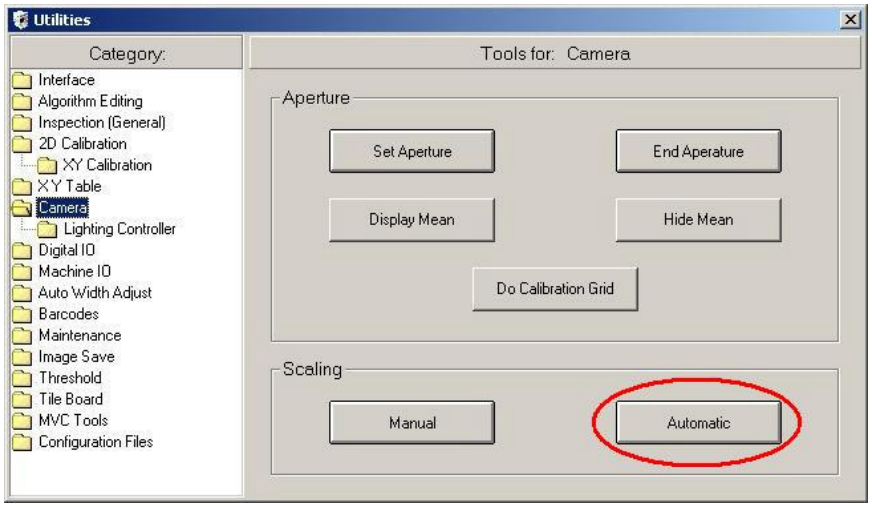
Always ensure the camera is well focused before scaling.

a. Load a board in the V510.

b. Pick a fiducial on the board whose presence score is above 900. (Refer to the *Engineering Manual* for details on fiducial training.)

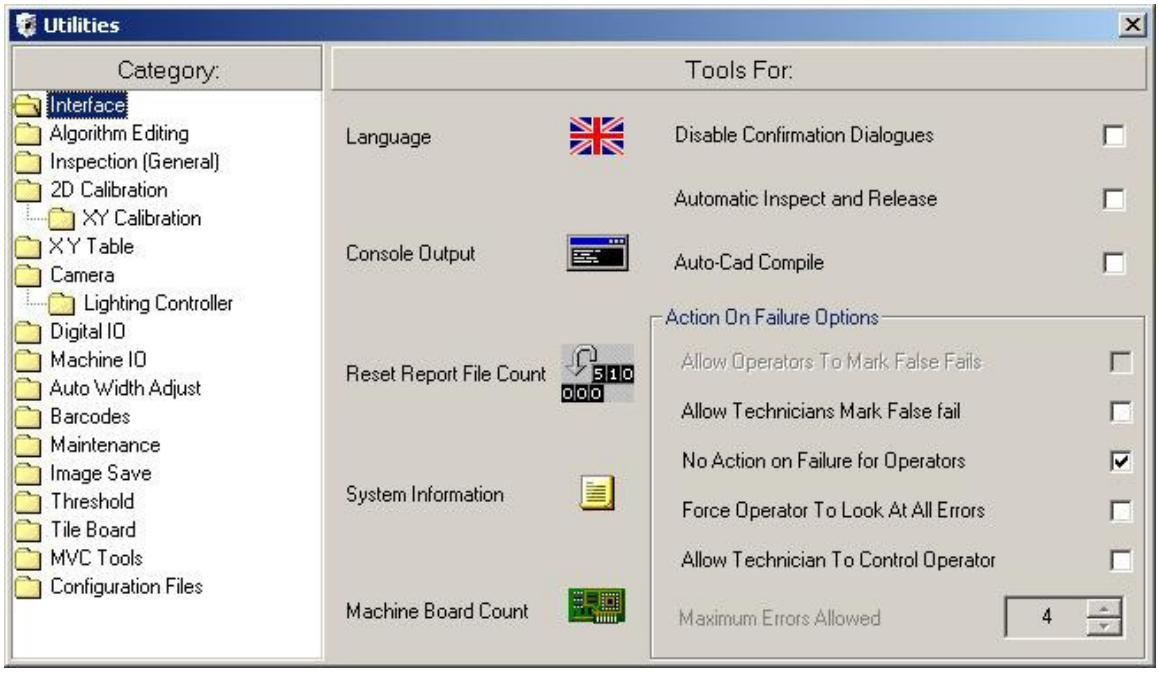
c. From the **Utilities** menu click the **Camera** folder.

d. Click **Automatic** in the Scaling area.

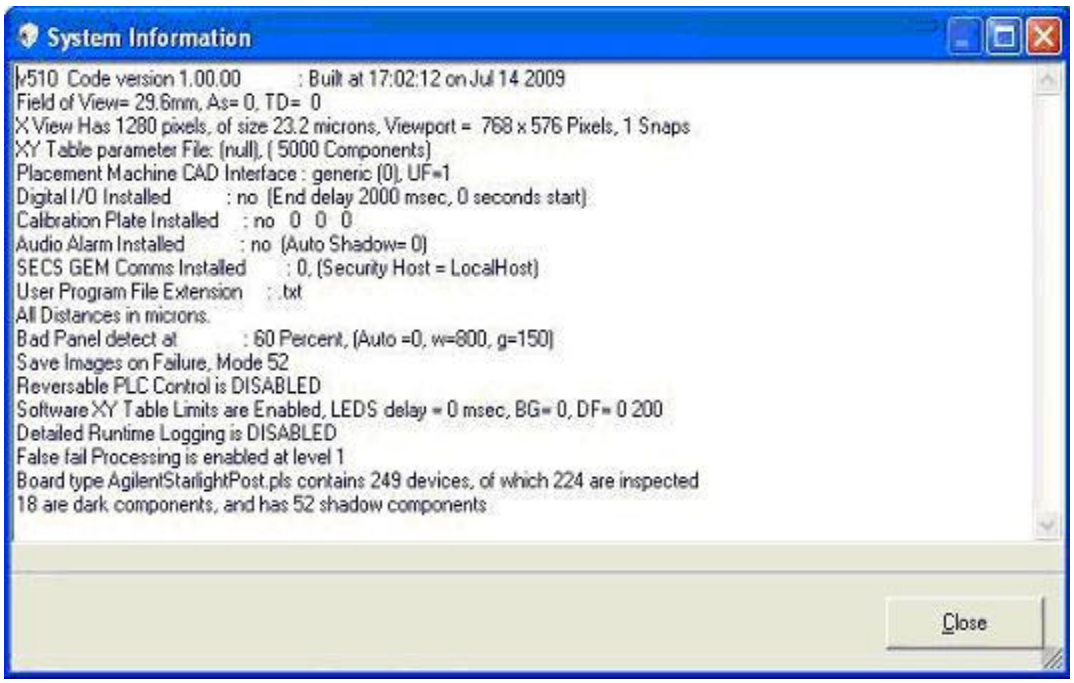


The gantry will start moving in the X and Y directions and locate the fiducial for each position it goes to. This allows the determination of the physical pixel size of the system.

When the gantry has stopped moving, from the **Utilities** menu click the **Interface** folder and click the **System Information** icon.



Verify the values for pixel size (19 microns ±1 micron for the V510) and field of view in the System Information window. These may be different for certain applications.



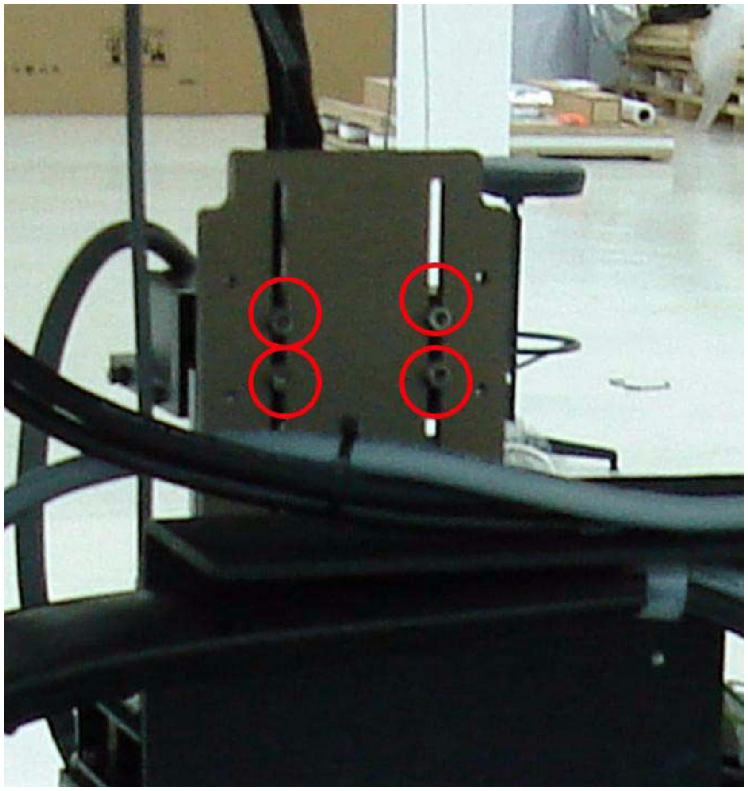
Click **Close** and then close the **Utilities** menu.

Raising or Lowering the Camera

a. Loosen the lens-locking clamp to allow the camera lens to move.

b. Hold the camera and loosen the four screws shown below. This allows you to adjust the camera by sliding it up or down in the bracket.

c. Tighten the four screws and the lens-locking clamp.



Lighting Calibration

Lighting calibration sets the current output for each lighting ring. It is performed over a gray card, which is used to calibrate the illumination evenness. The gray card is manually loaded into the V510. The system will then:

- Turn each ring on.
- Record the mean gray level intensity over the gray card.
- Compare it to a target mean intensity.
- Adjust the current output to bring the recorded mean as close as possible to the target mean.

The new calculated means are referred to as Achieved Means and are displayed in the Calibrated Means column in the Lighting Controller window.

NOTE

Lighting auto-calibration calculates all ring lighting modes available on the V510.

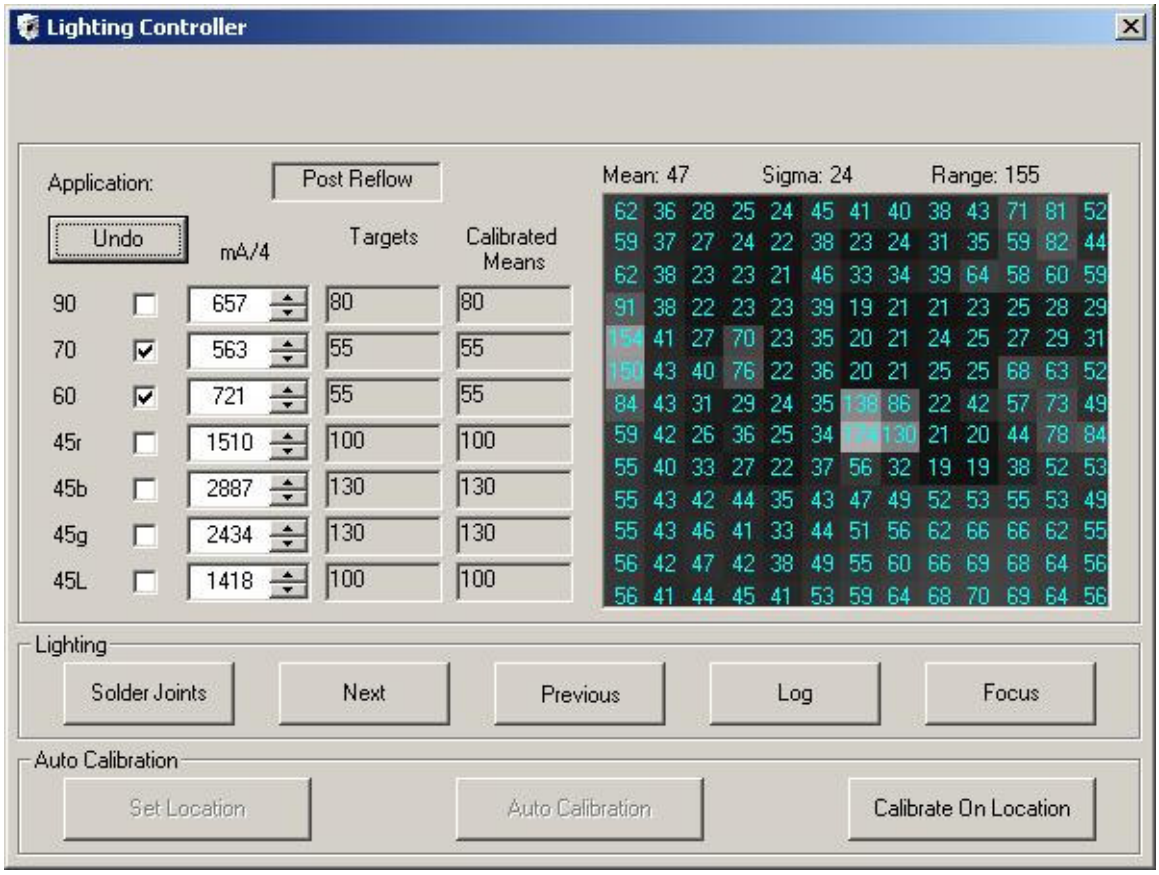
The procedures for lighting calibration are described in the following sections:

- Lighting Calibration (Manual): for manual calibration
- Auto Calibration: for automatic calibration
- Calibration on Location: at automatic calibration at specific location

The calibration functions and lighting information are accessed from the Lighting Controller window. For a summary of the features, see "The Lighting Controller Window".

Lighting Calibration (Manual)

a. From the Utilities menu, click **Lighting Controller** under the **Camera** folder to display the following window.



A lighting ring is enabled when the check box beside the ring name is selected. When a lighting ring is enabled, the corresponding current in the mA/4 column is sent to the lighting controller. Each lighting ring has a maximum current; in addition, the current that may be sent to the lighting controller must not exceed 4000 mA.

Ensure that the current for each enabled lighting ring is set to the correct value and complies with the value set in the Targets column.

To undo changes made to the output values, click **Undo**.

These values also have to be logged by clicking **Log**.

The camera will then take one image with each bank of LEDs, and puts the results in the file Intensity. log, located in the C:\Cpi\Log folder.

When changes have been made to the lighting intensities, you will be prompted to save the new current values. Click **yes** to display a summary of the changes made.

Click **OK**.

Auto Calibration

The auto calibration feature requires the use of a calibration plate (optional, not included with the V510). Before starting the auto calibration process, you must set the location of the calibration plate.

a. Ensure that there are no boards in the V510.

b. From the **Utilities** menu, click **Lighting Controller** under the **Camera** folder.

c. Click Set Location.

The system turns the LEDs on and displays the following instruction:

Jog the camera as instructed and click **Set**.

Click **Yes** to confirm.

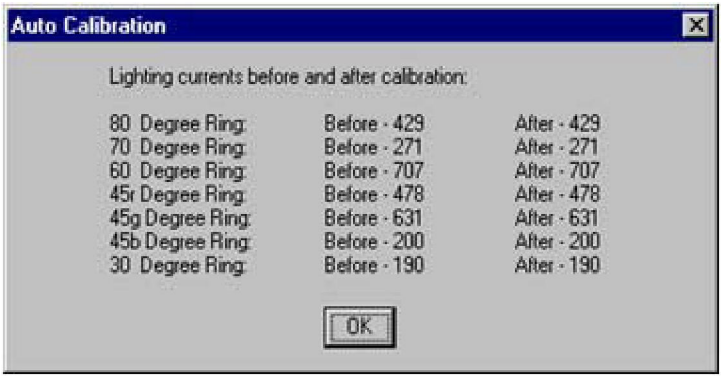
The system is now ready for lighting auto calibration.

Click **Auto Calibration**.

The camera automatically moves to the location of the calibration plate and calibration will start.

You will be informed when the calibration is successfully completed. Click **OK**.

The current outputs for each ring before and after calibration are shown. These values area also written to the file LightingController.log.



Auto calibration results in new calibrated values which are saved in CalibratedLightingValues.xml. The values are also displayed in the Achieved Targets column in the Lighting Controller window.

If any errors occur during calibration, troubleshoot with the help of the log file CalibrationResults.log and perform the auto calibration again.

Calibration on Location

The following procedure performs automatic calibration at a specific location.

a. From the **Utilities** menu, click **Lighting Controller** under the **Camera** folder.

b. Click Calibrate on Location.

c. Insert the gray card into the V510 and jog the camera over it. Click **Calibrate**.

Calibration takes place at the current location. When calibration is complete, the new calibrated values are saved and also displayed in the Achieved Targets column in the Lighting Controller window.

The Lighting Controller Window

The Lighting Controller window is accessed through the **Utilities** menu (click **Lighting Controller** under the **Camera** folder).

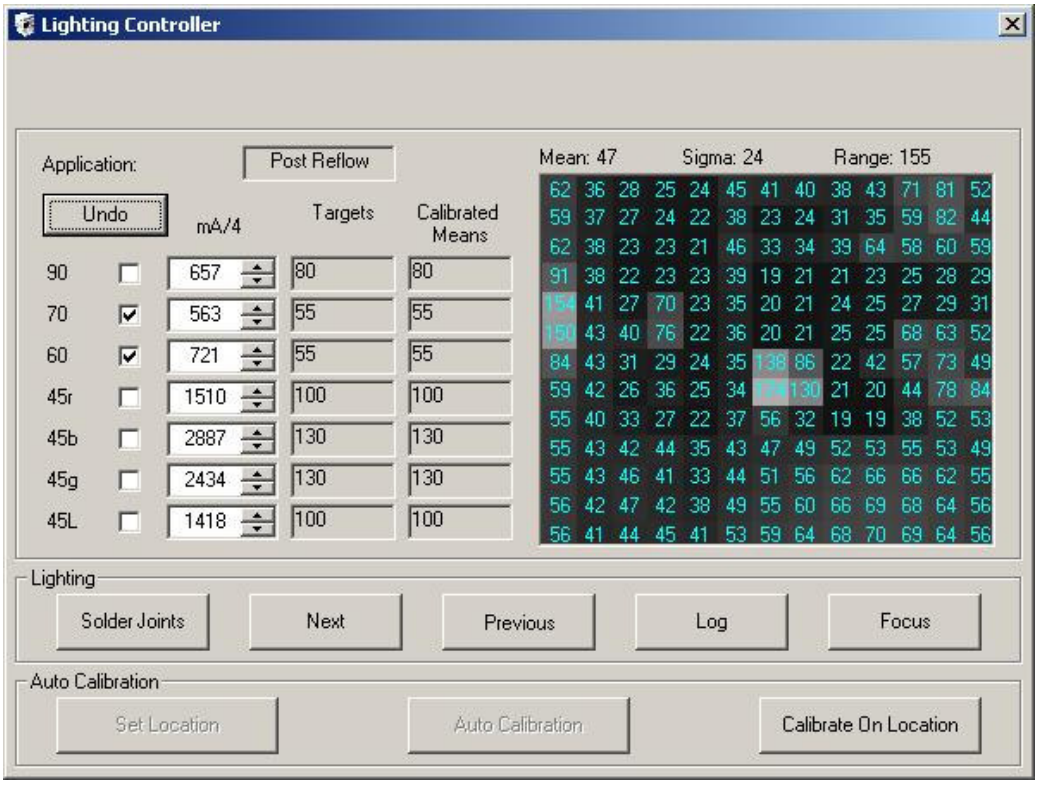


Figure 8- 2: Lighting Controller Windows

The Lighting Controller window shows the following information:

- Lighting rings information A list of lighting rings is displayed. To activate a lighting ring, select the check box next to its name. The following details are shown for each ring:
  - MA/4: When a lighting ring is enabled, this current is sent to the lighting controller. Each lighting ring has a maximum current; in addition, the current that may be sent to the lighting controller must not exceed 4000 mA.
  - Target: The average gray-level value that the lighting ring should generate over a gray card. This value is factory-set.
  - Calibrated Means: The gray-level value for the ring after the last lighting calibration.

To undo any changes made to the current values, click **Undo**.

- Lighting intensity grid

Shows the mean, sigma and range gray-level values of the lighting rings.

Table 8-1 describes the functions in the Lighting Controller window.

Table 8 -1 Functions in Lighting Controller window

Area	Buttons	Description
Lighting	**Application**	Lets you select the lighting mode. Click to toggle through the available lighting modes.
	Next	Displays the next view.
	Previous	Displays the previous view.
	Log	Records the brightness of each of the lighting rings in the intensity. Log file.
	Focus	Allows you focus the camera with the front access door open. An E-Stop alarm window will be visible and a Focus Camera instruction window displayed. Note that the system is in E-Stop and no power or control is given to the gantry or conveyor belt motors.
Auto Calibration	**Set Location**	Sets the location of the calibration plate (available as an option) used for auto calibration.
	Auto Calibration	Automatically calibrates the lighting. You must set the location of the calibration plate first. See"Auto Calibration".
	Calibrate on Location	Automatically calibrate the system with the gray card. See "Calibration on Location".

Lighting Calibration Files

Table 8-2 lists the files that are required to perform lighting automatic calibration.

Tab l e 8 -2 Lighting calibration files

File name	Description
CalibratedLightingValues.xml	Contains the target means that were achieved after lighting automatic calibration took place and displays the same values that were displayed in the Targets Achieved column in the Lighting Controller window. Located in C:\cpi\data.
AutoCalibrationResults.log	Contains lighting auto-calibration results and other useful information such as current outputs sent to the lighting rings. Located in C:\cpi\log.
Lighting Ring Image over Grey Area	During calibration, an image is taken of each lighting ring over the gray card area. These images are saved in the format 'BBxx.pgm' where xx indicates the lighting ring. For example, BB45R.pgm. Located in C:\cpi\img.

Lighting Controller Log	After calibration has been performed, and if you confirm that changes will be saved, the list of currents for each ring before and after calibration is saved to this file. Located in C:\cpi\log.
LightingConfigurationValues.xml	Contains all configuration information pertaining to lighting.

Lens Foreign Body Check

To check that the lens and camera are free from dirt, do the following:

a. Place a gray card upside down (white side up) in the conveyor, and jog the camera over it.

b. Set the aperture to F16.

c. If some dirt can be seen on the scre0en, jog the camera slightly to the left or right.

- If the dirt is still in the same position on the screen, then either the lens or the camera is dirty.
- If the dirt disappears when the camera is jogged, then the dirt is on the white side of the gray card.

Use a lint-free cloth to clean the dirt from the lens or camera.

Set the aperture back to F5.6 when finished.

9

9. Camera and Lighting Controller Testing

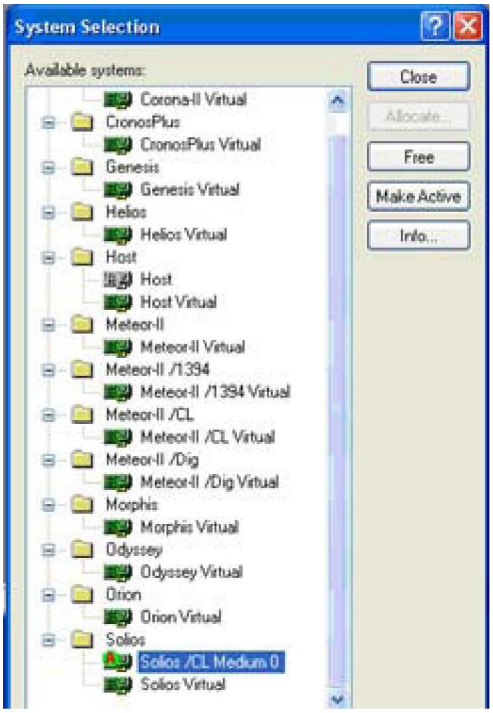
This chapter holds the following sections:

Camera Testing

To test the Dalsa camera, follow the steps below:

a. Click Start > Programs > Matrox Imaging > Intellicam > Intellicam.

b. Click the Board icon on the toolbar to display the following dialog box.



Under the Solios folder, make sure that the icon next to **Solios/CL medium 0** shows an 'A' (indicating Active).

Click the **Open** icon on the toolbar to open the file SOLIOS_4M60_10CONTINUOUS.DCF located in the C:\cpi\data folder.

Click the Camera tab and click Continuous Safe Grab.

The window that appears is the viewing screen. You can see the live image if you turn on the light.

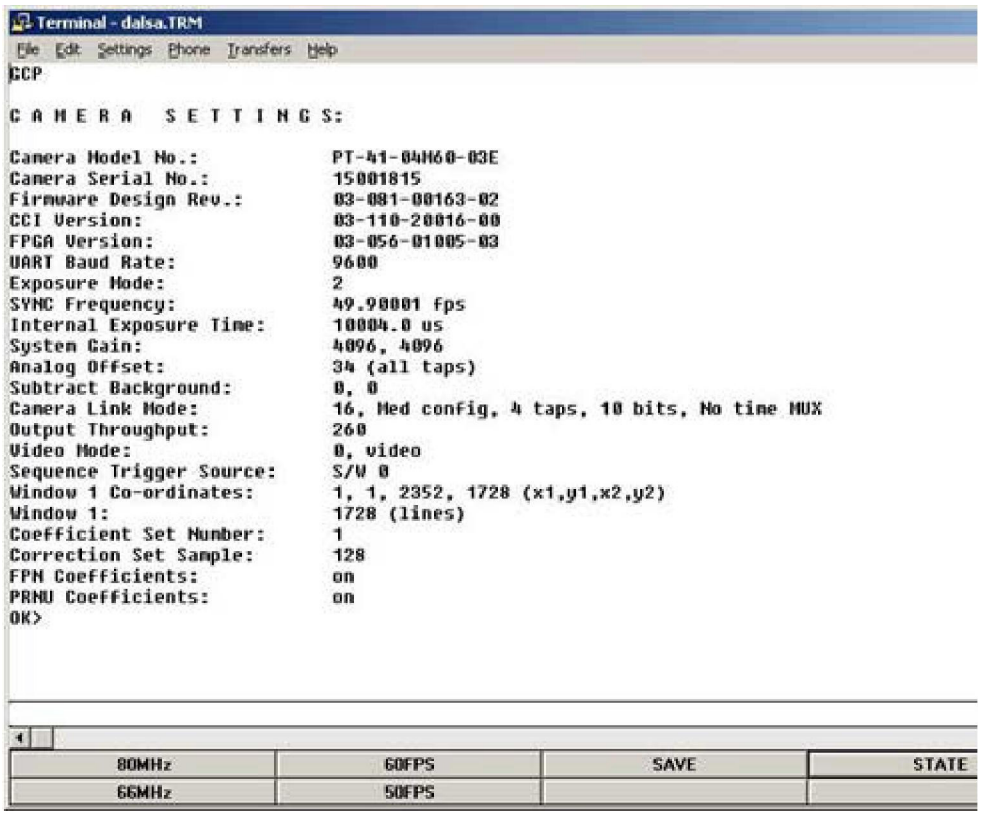
Follow these steps to check the camera settings.

a. In Windows Explorer, navigate to C:\cpi\plc\terminal and double-click terminal.exe.

b. From the Terminal window, open dalsa.trm.

c. Type `GCP` in the command line.

Check that SYNC Frequency, Internal Exposure Time, Camera Link Mode, and Video Mode are as shown in the following:



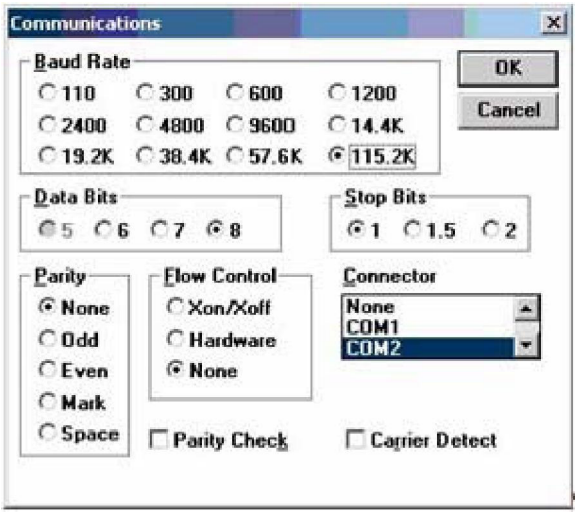
Lighting Controller Testing

To test the lighting controller (SLC-800), follow the steps below:

a. In Windows Explorer, navigate to C:\cpi\plc\terminal and double-click terminal.exe.

b. From the Terminal window, open slc800-new.trm.

c. Click Settings > Communications.



Make sure the settings are as follows, and then click **OK**:

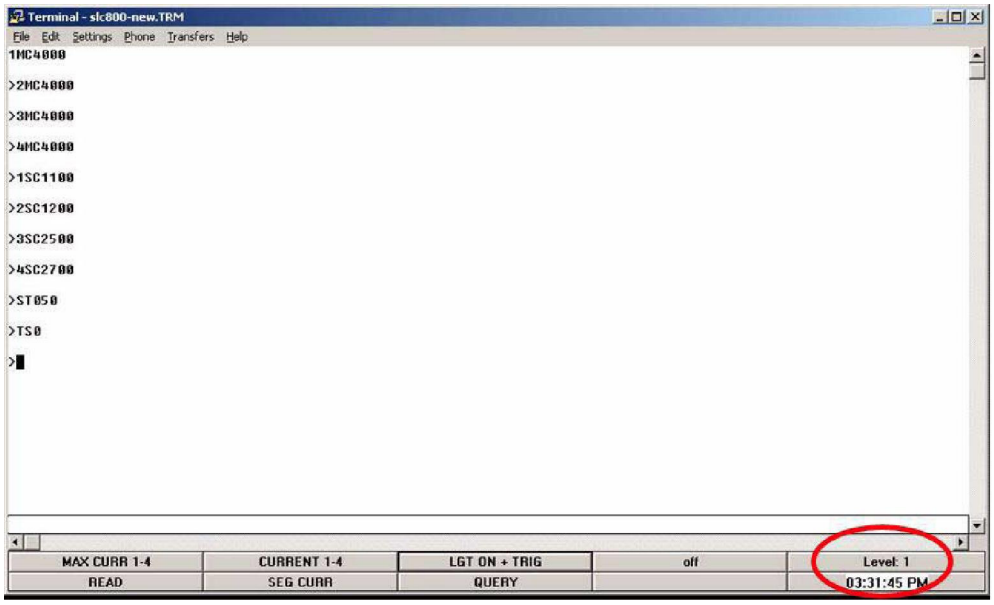
Baud Rate	115.2K
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None
Connector	COM2

Click **MAX CURR 1-4** and check that the feedback is as follows: 1MC4000 2MC4000 3MC4000 4MC4000

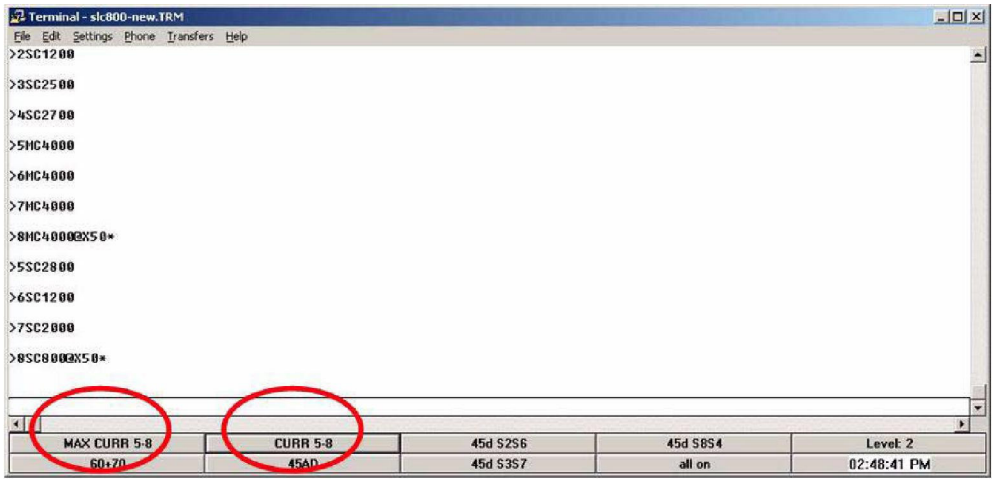
Click **CURRENT 1-4** and check that the feedback is as follows: 1SC1100 2SC1200 3SC2500 4SC2700

Click **LGT ON + TRIG** and check that the feedback is ST050TS0.

The Terminal window should now show the following:



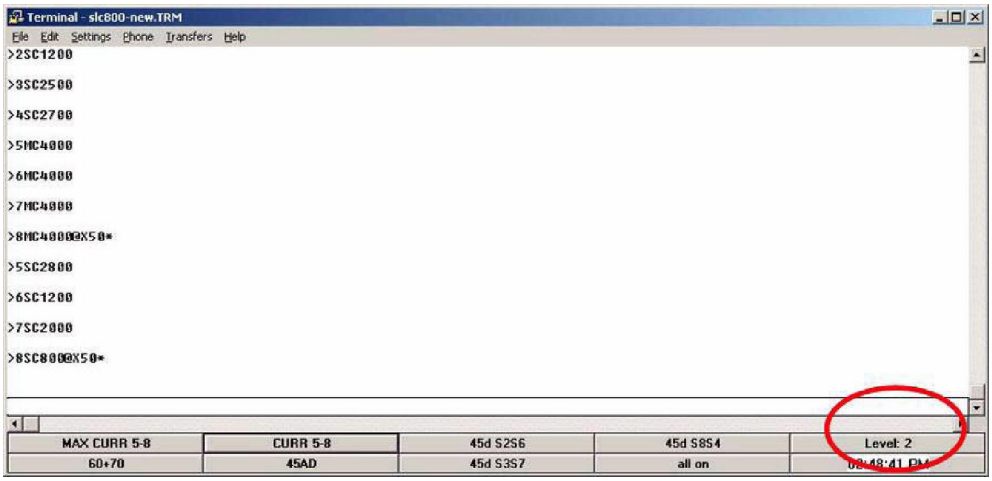
Click **Level 1** to display the Level 2 window:



Click **MAX CURR 5-8** and check that the feedback is as follows: 5MC4000 6MC4000 7MC4000 8MC4000

Click **CURRENT 5-8** and check that the feedback is as follows: 5SC2800 6SC1200 7SC2000 8SC800

The Terminal window should now show the following:



Keep clicking the **Level** button at the bottom right, until Level 1 appears.

Click **SEG CURR** and check that the feedback is as follows:
*4SS0500@M*5SS0500@M*6SS0500@M*7SS0500@M*

Type in the following:

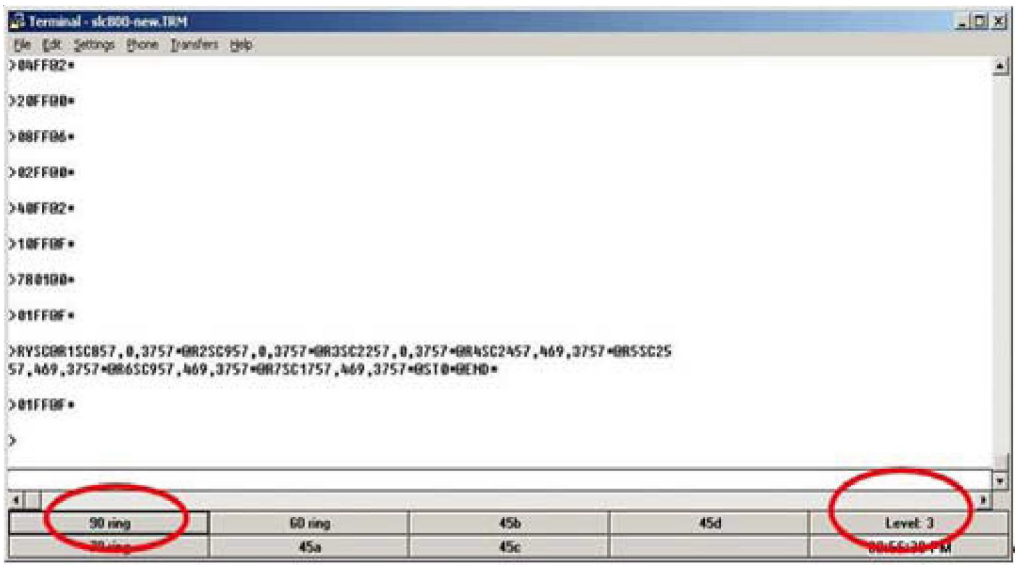
4SS469
5SS469
6SS469
7SS469

Click **Read** and check that the feedback is as follows:
'RYSC@R1SC857, 0,3757*@R2SC957, 0,3757*@R3SC22257, 0,3757*@R4SC2457, 469,3757*@R5SC2557, 469,3757*@R6SC957, 469,3757*@R7SC1757, 469,3757@END*'

NOTE

The most important feedback result is when the READ button is clicked. If there is no value in the middle of the each ring, as shown in the example 4000*@R6SC700, 0,4000, then this ring is not segmented. If the feedback is 4000*@R6SC700, 500,4000, then the ring is segmented.

Keep clicking the **Level** button at the bottom right, until Level 3 appears.



NOTE

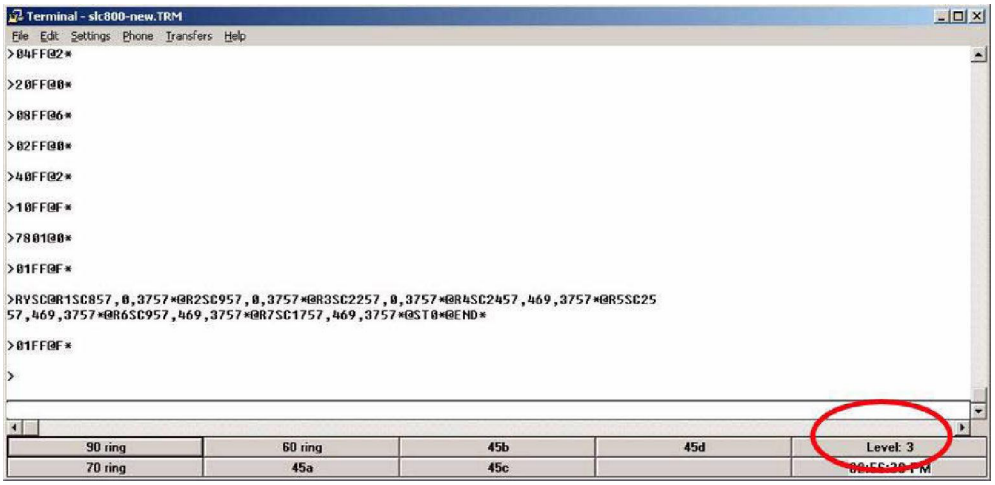
The camera must be in acquisition mode for the different lighting rings to be triggered on and off.

14 Perform the following checks:

Click this:	Check that feedback shows this:
90 Ring	01FF@F*
	The red 90-degree ring in the lighting head should turn on.
70 Ring	02FF@0*
	The red 70-degree ring should turn on and the 90-degree ring turn off.
60 Ring	04FF@2*
	The red 60-degree ring should turn on and the 70-degree ring turn off.
45a Ring	40FF@2*
	The red 45a degree ring should turn on and the 60-degree ring turn off.
45b Ring	20FF@0*
	The green 45b degree ring should turn on and the 45a degree ring turn off.

Click this:	Check that feedback shows this:
45c Ring	10FF@F*
	The blue 45c degree ring should turn on and the 45b degree ring turn off.
45d Ring	08FF@6*
	The red 45d degree ring should turn on and the 45c degree ring turn off.

The Terminal window should now show the following:



Click **Level 3** to move to level 4.

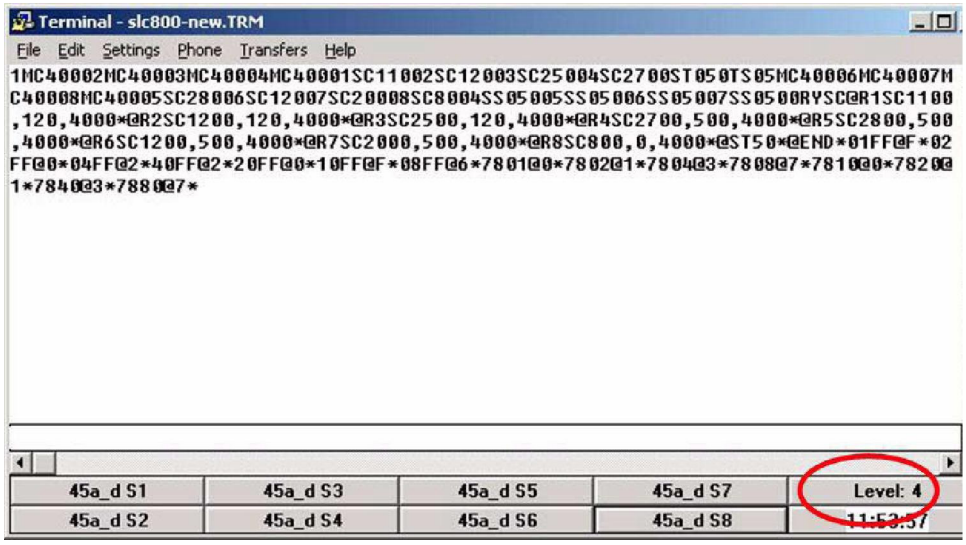
In addition to having lighting rings (such as the 90 degree ring), the lighting head is also divided into eight segments. The segments contain four rings, which are tested in level 4.

Perform the following checks:

Click this:	Check that feedback shows this:
45a_d S1	7801@0*
	A segment in the lighting head should turn on and the 45d degree ring turn off.
45a_d S2	7802@1*
	The next segment (in an anti-clockwise direction) should turn on and the previous segment turns off. As you click the following buttons, the segments should turn on (and off) in sequence.
45a_d S3	7804@3*
45a_d S4	7808@7*
45a_d S5	7810@0*
45a_d S6	7820@1*

Click this:	Check that feedback shows this:
45a_d S7	7840@3*
45a_d S8	7880@7*

The Terminal window should now show the following:



Click **Level 4, which** returns you to the level 1 window.

Click **off** and check that the feedback reads 0000@0*.

At this point none of the LEDs should be on. The lighting controller is now fully tested.

Close the Terminal window. When prompted to save changes to the terminal settings, click **No**.

10

10. Downloading PLC Programs

This chapter holds the following sections:

This chapter describes the procedure for downloading PLC programs from a PC to the V510. The procedure applies to both the V510 Single Lane and V510 Dual Lane.

Both systems use the Omron CP1H X40DT1-D PLC. This PLC is programmed using the Omron CX-Programmer Version 6.1.

The PLC programs can be downloaded using either a USB cable or serial cable (supplied with the V510) between the PC and the PLC. Downloading with a USB cable will be faster.

Downloading Using a USB Cable

If you are using a PC other than the one on the V510, it must have CX-Programmer version 6.1 installed.

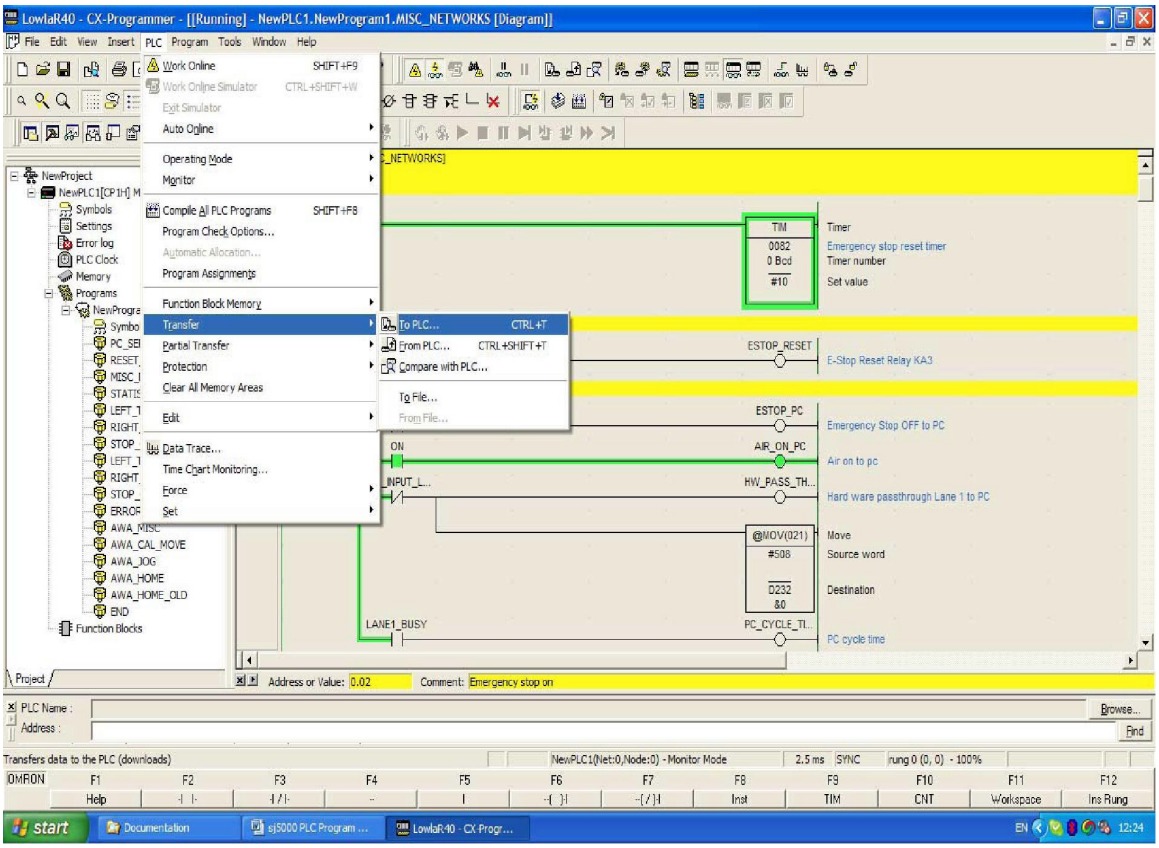


Figure 10-1: CX-Programmer version 6.1 windows

The download procedure is as follows:

a. Connect a USB cable between the PC and the USB port of the PLC.

b. Launch CX-Programmer version 6.1.

c. Click **File** > **Open** to open c:\cpi\data\PLC\V510.cxt.

d. Click PLC > Online.

The color of the program pane will change from white to gray. If this does not happen, check the cable.

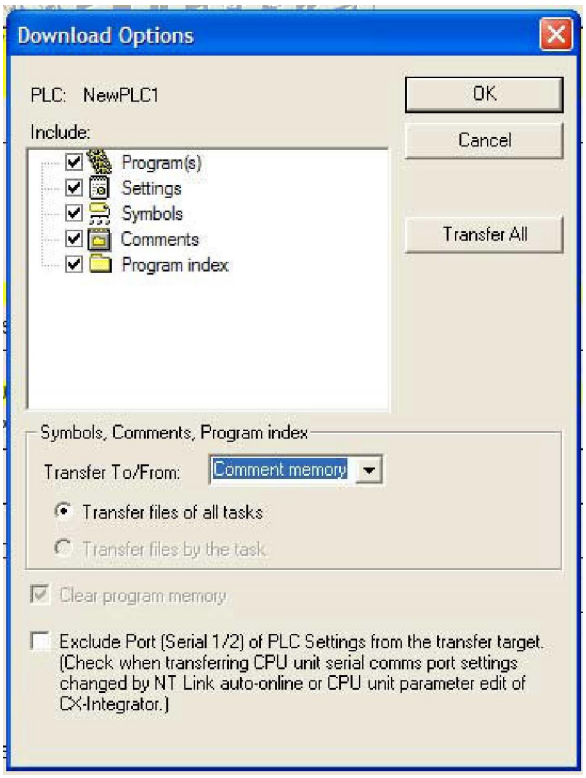
e. Click PLC > Transfer > To PLC.

In the Download Options dialog box, set the following and then click **OK**.

Select all items (Programs, Settings, Symbols, Comments, and Program Index).

Select Transfer files of all tasks.

Do *not* select Exclude Port (Serial 1/2) of PLC Settings from the transfer target.



Click **Yes** in the dialog boxes that appear.

When the Download Successful message appears, click **OK**.

Click **Yes** to return the PLC to monitor mode.

The download is now complete.

Downloading Using the Serial Cable

The RS232 cable is supplied with the V510. The download procedure is as follows:

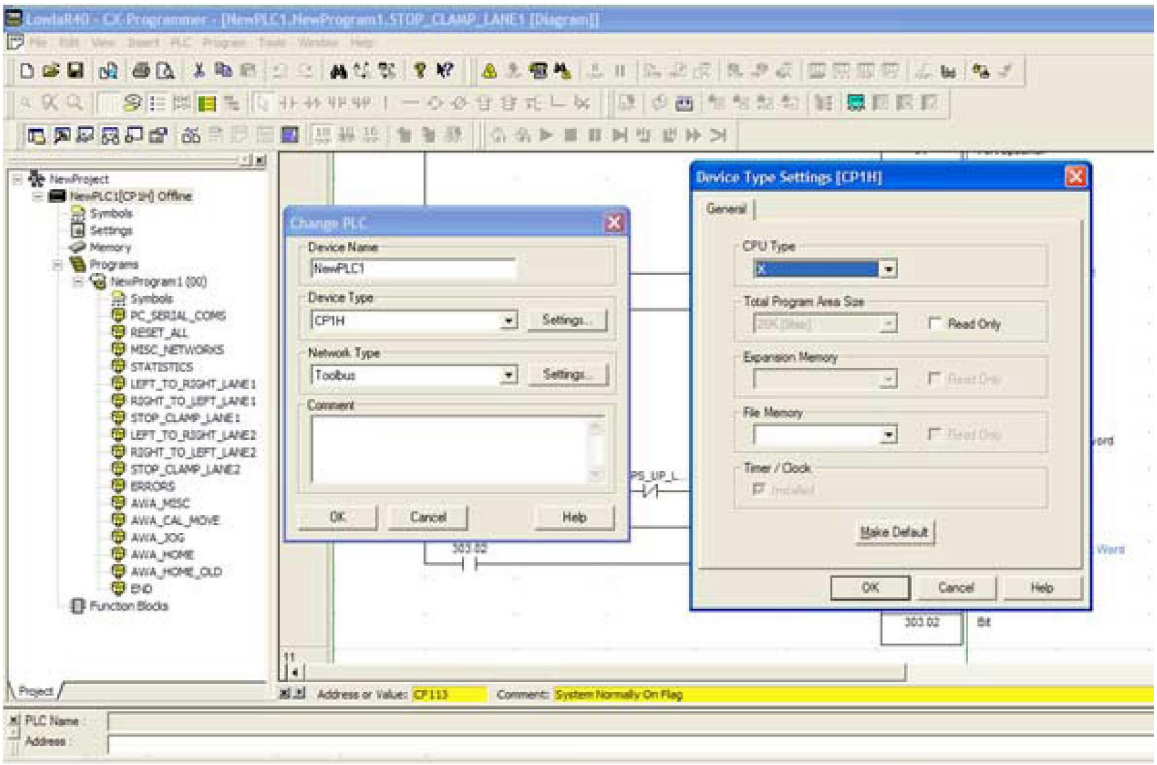
a. Connect the RS232C cable between the PC (COM port 1) and port 1 on the PLC.

b. On the control panel move PLC dipswitch 4 on. (This sets the PLC serial communications protocol to Auto.)

c. Launch CX-Programmer version 6.1.

d. Click **File** > **Open** to open c:\cpi\data\PLC\V510.cxt.

e. In the left pane, right-click **NewPLC1 (CP1H) Offline**.



In the Change PLC dialog box, set the following:

Select **CP1H** for Device Type and click **Settings**. Then in the Device Type Settings dialog box, select **X** for CPU Type and click **OK**.

Select **Toolbus** for Network Type.

Click **OK**.

Click PLC > Online.

The color of the program pane will change from white to gray. If this does not happen, check the cable.

Click PLC > Transfer > To PLC.

In the Download Options dialog box, set the following and then click OK.

a. Select all items (Programs, Settings, Symbols, Comments, and Program Index).

b. Select **Transfer files of all tasks**.

c. Do NOT select **Exclude Port (Serial 1/2) of PLC Settings from the transfer target**.

Click **Yes** in the dialog boxes that appear.

When the Download Successful message appears, click **OK**.

Click **Yes** to return the PLC to monitor mode.

Move PLC dipswitch 4 to the off position.

The download is now complete.

Selecting Dual or Single Lane Operation

To select dual lane operation, simply move PLC dip switch 6 to the on position, and press the **PLC RESET** button on the front of the machine.

To revert to single lane operation, move the dip switch back to off, and press the **PLC RESET** button on the front of the machine.

ViTrox V510 Advanced Optical Inspection System Hardware Manual <Revision B>

11

11. Setting Up Barcode Readers

This chapter holds the following sections:

⚠WARNING

Barcode readers contain laser equipment. Do not stare into the beam.

Microscan MS-4 USB Barcode Reader

This section describes how to set up one or more Microscan MS-4 barcode readers.

- Install Microscan ESP Software
- Install USB-to-Serial Virtual Com Port Driver
- Download Barcode Reader Setup File
- Set Up Multiple Barcode Readers
- Align Barcode Reader
- Test Barcode Reader Using HyperTerminal
- Configure V510 Software

Install Microscan ESP Software

The Microscan ESP software is used to set up and download the setting files into the barcode reader. It also serves as a good visual tool to align, calibrate and troubleshoot the barcode reader.

a. Insert the Microscan Tool CD into the drive. The installation software should be launched automatically.

b. Click ESP Software.

c. Click Current Version > ESP Software.

Follow the instruction on the screen to complete the installation.

Install USB-to-Serial Virtual Com Port Driver

The Virtual Com Port driver causes each connected USB barcode reader to appear as a separate COM port in the PC. The V510 reads and writes to these COM ports to trigger the barcode readers and receive barcode strings.

a. Connect the barcode readers to the USB ports on the V510
PC. Bear in mind that the driver has to be installed whenever a barcode reader is connected to the PC. If you add another barcode reader later, the driver will have to be installed again.

b. Browse the Microscan Tool CD and double-click the installation program \Accessories\VCPD\Driver\DPInst.exe.

c. In the dialog boxes that open, click **Next**, **Continue Anyway**, and **Finish** to complete the installation. Upon successful installation, all connected barcode readers will appear in the Windows Device Manger as new COM ports in the Ports category. In the following example, the MS-4 barcode reader appears as COM7.

Note down the COM port number of each barcode reader connected to the V510.

Download Barcode Reader Setup File

Use the Microscan ESP software to download the standard setup file into the MS-4 barcode reader. Make sure the MS-4 barcode reader is already connected to the USB port.

a. Launch the Microscan ESP software.

b. Select the barcode reader model (**MS-4**) and click **OK**.

When prompted to connect to the MS-4 barcode reader immediately, click **No**.

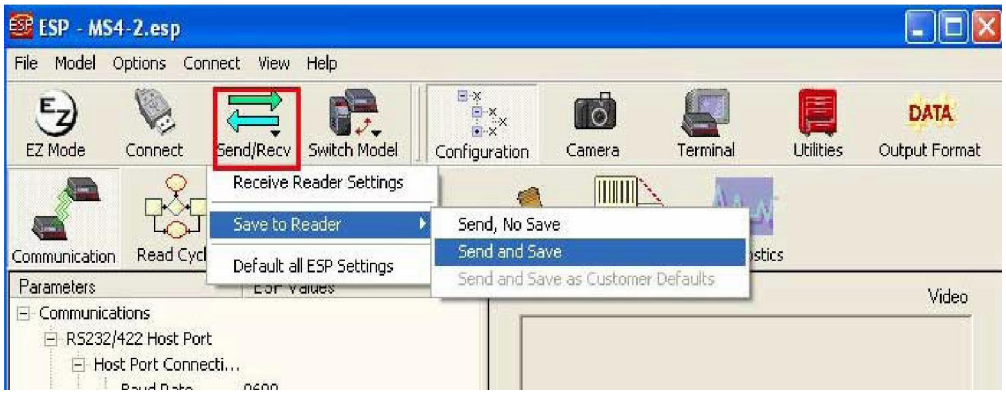
Open the standard MS-4 ESP setup file C:\Installation\Barcode\MS4-1.esp.

When asked again to connect to the MS-4 barcode reader, click **Yes**.

Select **RS232** protocol.

Select the COM port that you noted in the previous procedure, and click **Connect**.

Click **Send/Recv** > **Send to Reader** > **Send and Save**.



This will download the parameters from MS4-1.esp into the barcode reader and save them in the flash ROM permanently. The barcode reader will emit a long beeping sound, and disconnect and reconnect again. This completes the setup file download.

Set Up Multiple Barcode Readers

The header identifies each barcode reader that it sends to the V510 software upon successful barcode reading. In the standard MS-4 barcode setup file, the header is set to '0' by default. If more than one barcode reader is connected, the header will have to be incremented as described below.

Make sure all barcode readers are properly connected to the USB ports before proceeding.

a. Launch the Microscan ESP software.

b. Select the barcode reader model (**MS-4**) and click **OK**

When prompted to connect to the MS-4 barcode reader immediately, click **No**.

Open the standard MS-4 ESP setup file C:\Installation\Barcode\MS4-1.esp.

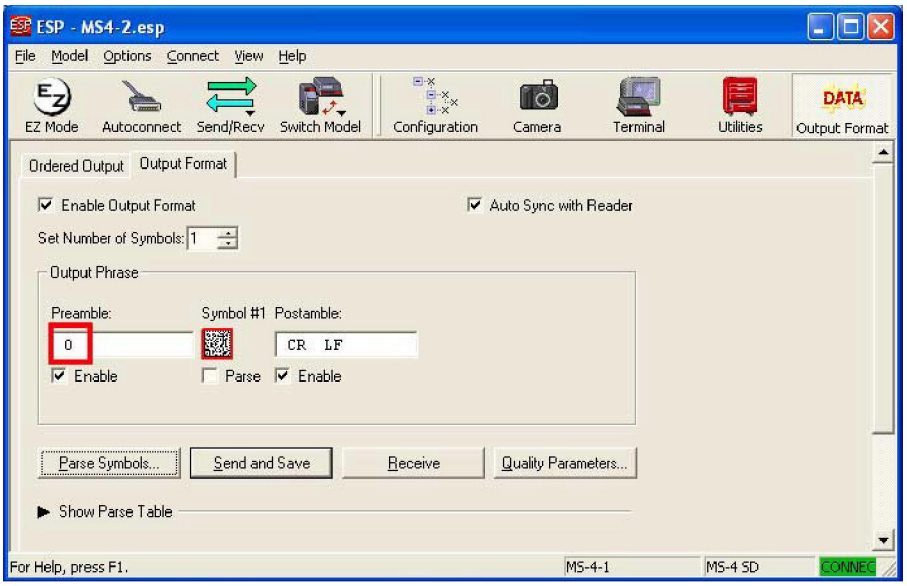
Select **RS232** protocol.

Select the COM port for each barcode reader that is connected and click **Connect**.

Click **Output Format**.

When asked whether to synchronize with the reader, click **Receive** to receive existing data output format into the screen.

For the first barcode reader connected, the preamble is set to '0'. For subsequent barcode readers, this header should be a running number starting with '1' for the second barcode reader.



Type in the correct number in the Preamble field.

Click **Send and Save** to save the new setting into the barcode readers permanently.

Align Barcode Reader

The barcode reader has to be properly aligned physically to ensure that it captures good legible images from the target. Using the Microscan ESP software, which provides a real-time visual environment for barcode alignment, can do this.

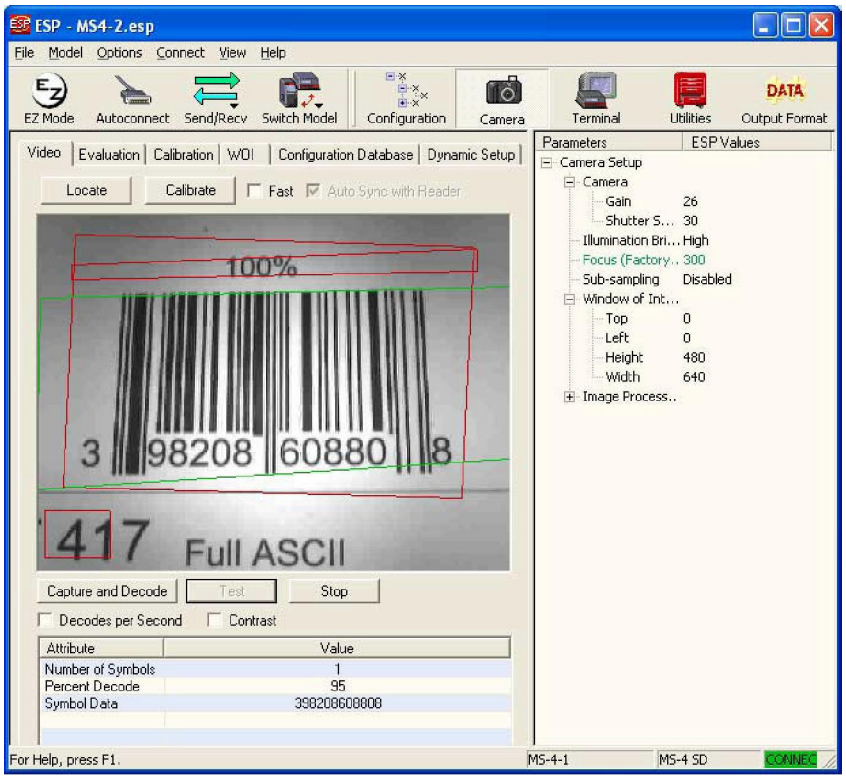
a. Load a board with a barcode in the desired location for barcode detection.

b. Launch the Microscan ESP software and go into Camera mode by clicking **Camera**.

c. Click Test.

The barcode reader will take a continuous shot and decode the barcode.

d. Adjust the barcode reader until it achieves a good reading (Percent Decode > 90%).



Fix the barcode reader position and click **Stop** to finish the test.

Test Barcode Reader Using HyperTerminal

Test all connected barcode readers one by one:

a. Open HyperTerminal and connect to the barcode reader's COM port (9600, no parity, 8 data bits, 1 stop bit, no flow control).

b. In the Terminal window press the space bar a few times (to connect).

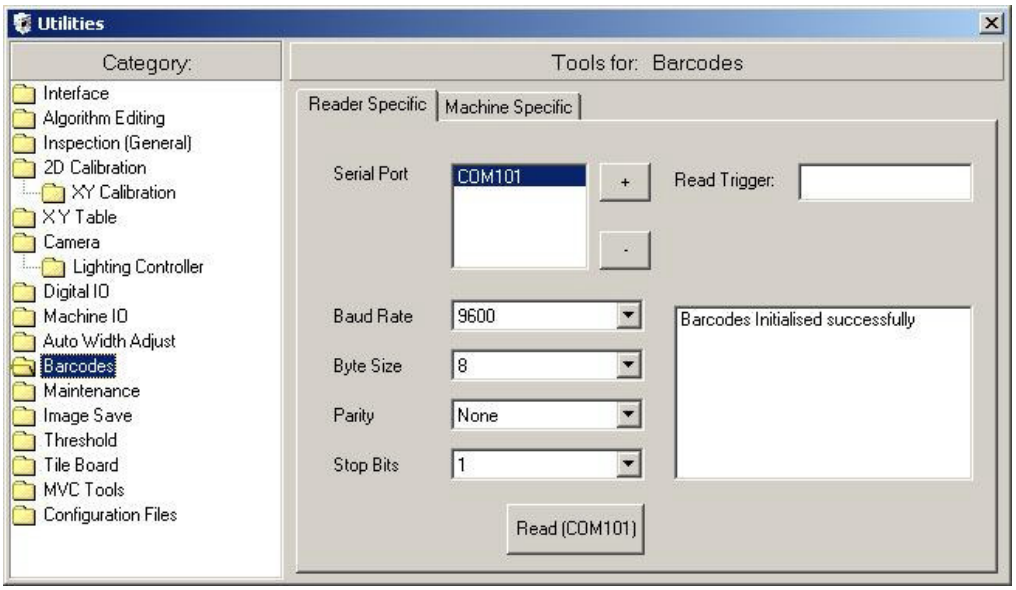
c. Type <+> in the Terminal window.

This command causes the barcode reader to scan for a valid barcode and either return a barcode string or a no-read.

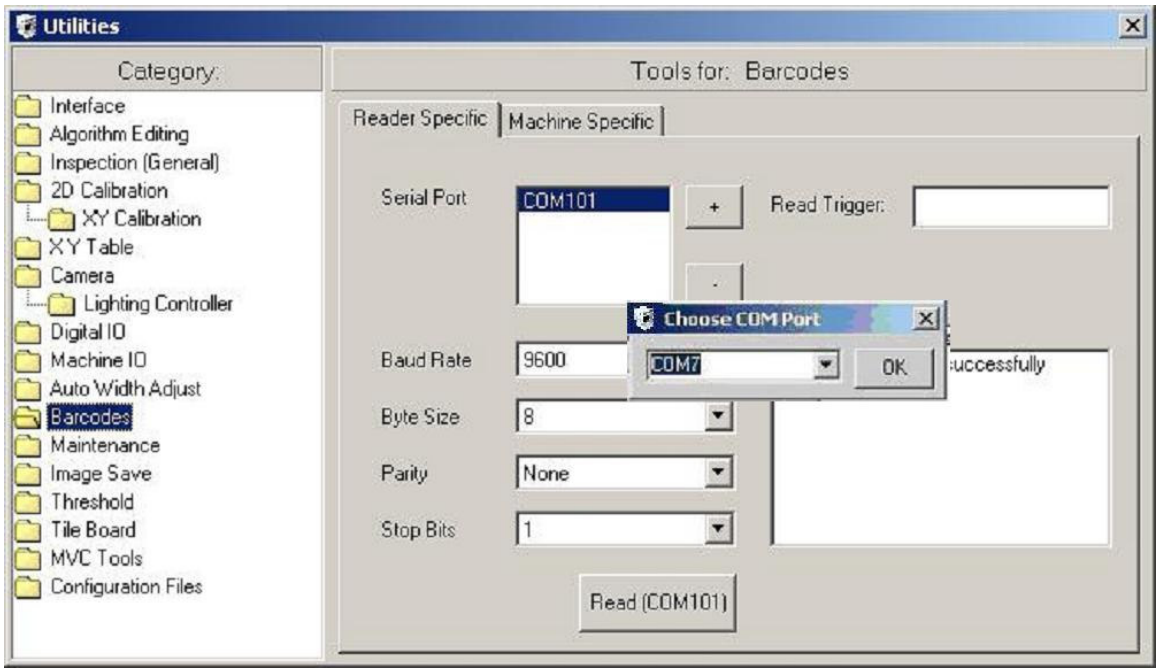
Configure V510 Software

Once the barcode readers have been tested, the V510 software has to be configured so that it knows which COM ports it should wait for barcode packets on. The read trigger string must also be configured (the string that the V510 will send to the barcode readers when it wants them to attempt to read a barcode).

a. Launch the V510 software. From the **Utilities** menu, click the **Barcodes** folder.



Add each barcode reader's COM port to the Serial Port list as follows: click the **+** button, select the COM port, and click **OK**.



If it is necessary to configure the Read Trigger string, type it in the Read Trigger field. For the Microscan USB barcode readers, the default string is <+>.

If you need to remove a COM port, select it from the Serial Port list and click the **–** button.

Microscan MS-3 Barcode Reader

Set Up Barcode Reader

Program the Barcode Reader

Install the software as described in “Install Microscan ESP Software” and do the following:

a. Start the ESP software.

b. Select **MS-3 laser** in the Select a Model dialog box and click **OK**.

c. When prompted to connect to the barcode reader, click **Yes**.

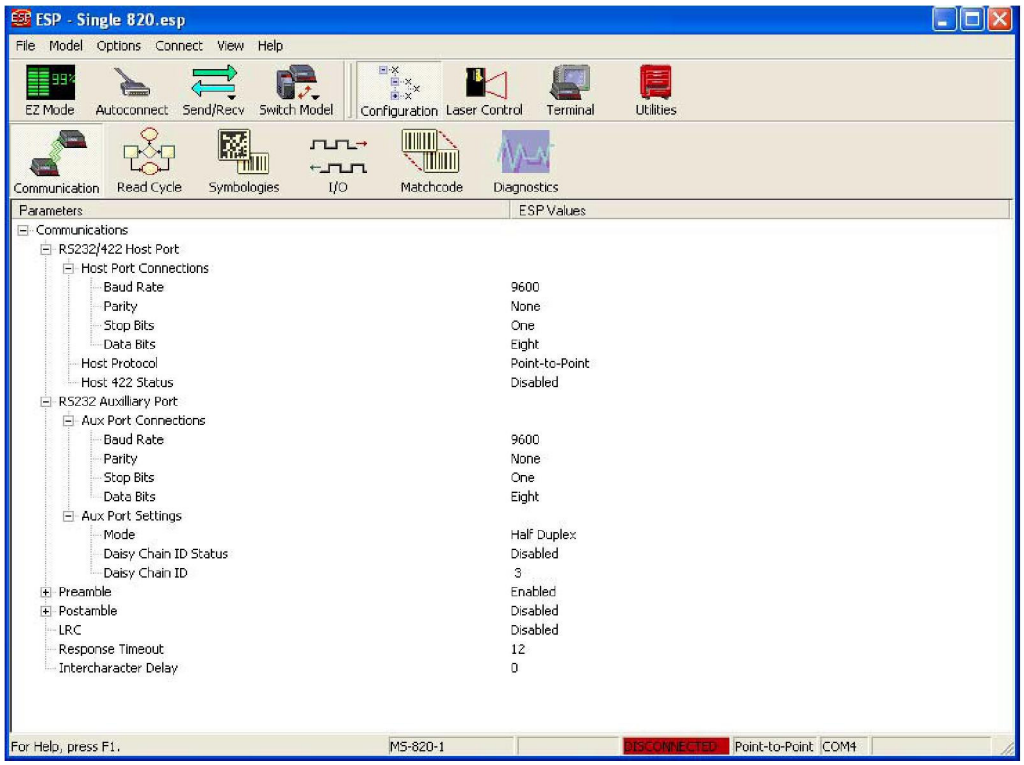
d. Ensure COM port 4 is selected and click **Start**. If unable to connect try other COM port.

e. Click App Mode.

f. Make sure that the parameters is set as example below.

g. Click Send/Recv > Send to Reader > Send and Save.

This will download the setup file to the barcode reader. The reader will emit a beep to indicate the download was successful.



To test the barcode reader, click **Terminal**.

a. Click **Enable Serial Trigger** > **Send Trigger Character**. (Alternatively, trigger the conveyor entry sensor.)

b. Scan a barcode and the decoded barcode text should appear in the Terminal window.

Close the ESP software and launch the V510 software.

From the **Utilities** menu, click the **Barcodes** folder.

Ensure that the settings are as follows:

Serial Port	4
Baud Rate	9600
Byte Size	8
Parity	None
Stop Bits	1

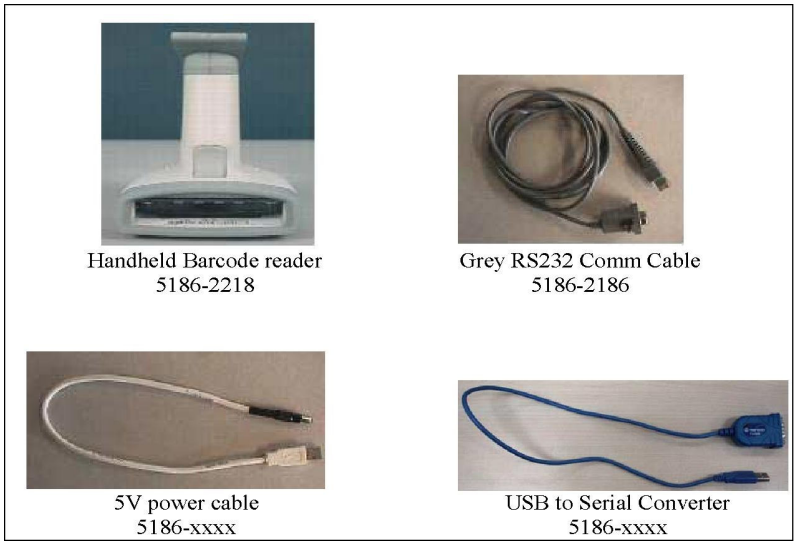
c. Click **Read** and scan a barcode with the barcode reader.

The barcode text should be displayed.

Place a board in the V510 and scan a barcode.

The barcode text should be displayed.

Handheld Barcode Reader



Install the Barcode Reader

a. Connect the gray communications cable to the handheld barcode reader, and connect the other end to the blue USB-to-Serial Converter cable.

b. Connect the blue USB connector to one of the USB ports on the PC.

c. Plug the 5 V power cable into the RS232 connector of the handheld barcode reader. Plug the other end into a free USB port on the PC.

The barcode reader will flash on and off, and then emit three beeps.

Install the USB-to-Serial driver:

a. Insert the Trendnet TU-S9 Software Installation CD into the drive.

b. Browse to the \Driver\Win98_2003 folder and double-click the Setup file. Follow the instructions on the screen to complete the installation.

Once the installation is completed, connect the blue converter cable to a free USB port on the PC.

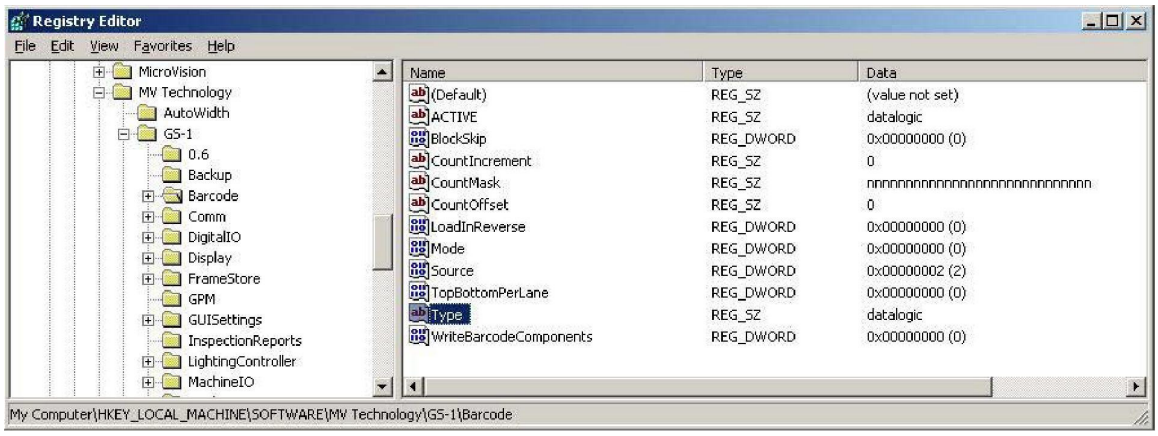
Open the file c:\cpi\data\config.txt and check that it contains the following line: Barcode 1 0 1

Click **Start** > **Run**. Type `regedit` in the command line and press **Enter**.

NOTE

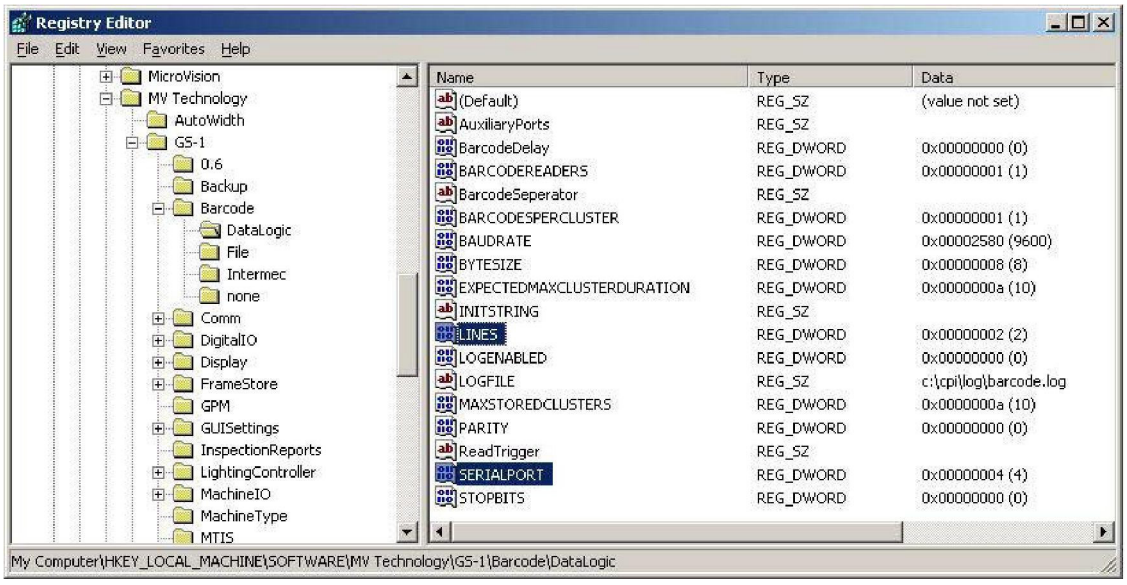
Backup any registry keys for the barcode key before editing.

a. Find HKEY_LOCAL_MACHINE\Software\MV Technology\GS-1\Barcode.



Ensure that **Intermec** appears in the Data column for both **Active** and Type string names.

b. Double-click the **Barcode** folder and then click **Intermec**.



Ensure that the Dword named **Lines** shows the value **2** in the Data column, and the Dword named **Serial Port** shows the same number in the Data column as the serial port number in the Device Manager (see "Checking the Serial Port Number in Device Manager").

c. Exit the editor and restart the PC.

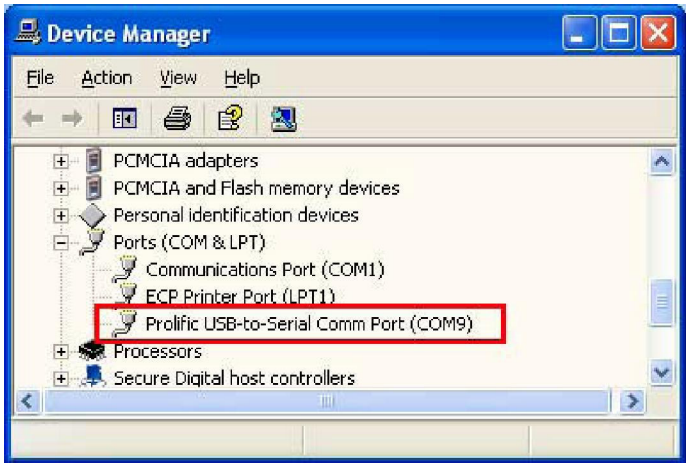
Checking the Serial Port Number in Device Manager

To find out the serial port number:

a. Make sure the barcode reader is connected.

b. Open the Device Manager by clicking Start > Control Panel > System > Hardware > Device Manager.

c. Look under Ports to find the USB-to-Serial port as shown below.



Program the Barcode Reader

To program the barcode reader, refer to the *Datalogic DLC7000 Series Manual*. Then do the following:

- Scan the barcodes **Restore Defaults**, **RS232**, and **English** from the manual with the reader. After each scan the reader should emit two audible beeps.
- Next scan **Code 39**. When Code 39 is scanned the reader should only beep once.

12

12. Troubleshooting

This chapter holds the following sections:

This chapter is intended to assist you in solving problems that you may encounter with your system. It provides troubleshooting information for the failure modes that happen most frequently and with the greatest effect on productivity, that is, those that would cause the line to stop.

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

Error Messages

Emergency Stop (E-Stop) error message

ViTrox AOI systems have four pushbutton stops and one interlock E-Stop connected to the front access door of the machine. If any one of these five hardware devices is not making contact an E-Stop condition will occur.

- If all E-Stop hardware is intact and functioning, request Troubleshooting the Safety Relay.doc from ViTrox Support. This document discusses what terminals to check for open or closed circuits and voltage, to pinpoint the exact problem.
- See the *Electrical Drawing* document for wiring details.

No barcode read in the software

- Verify that the barcode reader is working. *Do not* stare into the barcode reader; observe the manufacturer's warning. Typically the reader is working if a red laser line is present.
- Verify that the barcode reader is connected to the correct COM port at the back of the system. If the system was not purchased to work with a barcode reader, you will need additional hardware, either ViTrox supported or purchased directly from the manufacturer, to supply power and trigger to the reader. For more information, contact ViTrox Support.
- Check that the correct COM port is set in the registry.
- Verify that the barcode reader was set up with a preamble of 0 and a postamble of CR.
- The communication of the reader barcode can be verified using the V510 software (from the **Utilities** menu click the **Barcodes** folder), HyperTerminal or the manufacturer's software.

ViTrox recommends Microscan barcode readers with ESP software.

Troubleshooting the Software

- Excessive 'Missing' component failures
- V510 software crashes and will not restart
- Software crashes during inspection
- The gantry speed suddenly dropped and now the system is inspecting boards very slowly
- Solder joint false failures
- No image available when using ART station

Excessive 'Missing' component failures

If the software was running with minimal false failures previously:

- Ensure that the lighting calibration is correct (and was correct when the software was run previously).
- Check whether the board has been re-trained for presence/absence.

V510 software crashes and will not restart

If the V510 software crashed and will not restart when you try to launch it again from the desktop icon, do the following:

- Verify that the V510 software has completely shut down by opening Windows Task Manager and checking the Applications tab.

If V510.exe or AOInEngine.exe is shown, select it and close it by clicking **End Task.**

- There could be a PLX file issue that caused the problem and because the software tries to launch the last board used, it continues to crash during startup.

If this happens, delete the file c:\cpi\data\names.txt and the V510 software will start using a default program name.

- In both cases always send the log files, a board package and a snapshot of the system to ViTrox Support. Please include as much detail as you can (including screen captures if possible) to help us re-create the problem.

Software crashes during inspection

If the software crashes while inspecting a board, it is probably related to the algorithm setup or a gantry failure.

- First restart the software but run a different board program for a board of similar size but that uses a different database. The goal here is to quickly isolate the CAD program and gantry to see which is causing the system to crash.
- Review any recent changes that were made (for example, if a new database was assigned or an algorithm tweaked) and see if something stands out. Let the support team know of any recent changes or problems.
- If the gantry runs fine on the second board, try reloading the original CAD program but assign a different database. This could be any database but c:\cpi\data\vispcad may be the safest.
- If the program runs fine then try reloading the original database and rerun the program. If the program crashes in a similar place, it is an algorithm setting or something in the database that caused the problem. The problem algorithm can be identified by enabling diagnostic logging in the **Utilities** menu and then reviewing the last entries of the jmcpi or jmasal.log files.
- For additional support, send a system snapshot, board package, screen captures, and any other details of the problem to ViTrox Support immediately.

The gantry speed suddenly dropped and now the system is inspecting boards very slowly

If the system loses the XY table limits, the gantry acceleration is reduced to 0.5. This may happen following an E-Stop during inspection.

- To solve this, select the **XY Table** folder from the **Utilities** menu and click **Set Limits**. The gantry will then re-learn its limits.
- Also check the XY table acceleration settings.

Solder joint false failures

Review and follow the recommended best practices (the *Algorithm Manual*) to solve the problem. Beyond that, perform the following procedures.

- For c-type and r-type devices, set Top Plane to 'true' to reduce stray reflections from neighboring devices.
- If an s-type device is locating well and has joints well tuned, teach the individual false failing joint as good (only applicable if using JointMVC or JointSLA).
- When tuning an s-type device:
  - Make sure the lead length and location are correct
  - Shift the joint position (light blue box) away from the end of the lead. The blue box should be positioned adjacent to the lead end with minimal coverage of the actual lead.
  - Reduce the joint box length to make sure it does not extend beyond the pad.
  - Reduce or enlarge the joint box width to cover the pad width.

No image available when using ART station

The problem is the image size.

- Open the Config.txt file located in the c:\cpi\data folder and look for the line **Image_save 52 1000 1000000 –1 1**. Change 1000000 to 2000000. This will increase the image size and solve the problem.

Troubleshooting the System Power

If a power failure occurs

- Check all MCDs and RCBO for any trip.
- If there is no trip, check the incoming facilities.
- Is there power at the mains supply?
- Is the mains isolator in the on position?
- Is Q1 (the main RCBO) in the on position?
- Is the **RUN** indicator light illuminated?
- Is the **START** key switch in the ON position?
- Check that Q2 (24 V PSU) is on.
- Check Q3 and Q4 (24 V DC) are on.
- Check the supply voltage at the main terminals.

Troubleshooting the 24 V Supply

If there is no 24 V supply

- Check the 24 V 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 former).
- Check that MCB Q2 is on.
- Check the input ac voltage for the PS1.

Troubleshooting the Conveyor

- Conveyor will not load a board
- Board passes straight through the machine and will not stop for inspection
- In-Position sensor sensitivity
- Failed boards will not exit the system
- Conveyor belt(s) reverse direction unexpectedly
- Clamp motor continuously rotates
- Board is not clamped
- Inspection yields fiducial mis-reads
- Conveyor will not run
- Conveyor 1 will not run
- Conveyor will not run because there is no output from PLC
- Drives will not move/home/move to a given width
- Cannot manually adjust the width of the conveyor rail
- Conveyor rails will not align properly

Conveyor will not load a board

- The SMEMA cable may not connect. Check the connection at the upstream conveyor and the back of the V510.
- The V510 may believe there is a board already present. Check that either a board or gantry does not flag all three sensors. All sensors have sensitivity potentiometers that may be set too sensitive and are identifying the rail or other hardware as a board. This can be verified by reviewing the input PLC modules.

Board passes straight through the machine and will not stop for inspection

- The V510 is in pass through mode. Check the **RAIL** switch (es) on the switch plate and ensure it is set to **INSP** (inspect).
- The In-Position sensor is not being flagged as the board passes through the V510. This can be verified at the PLC module or by manually flagging the position sensor.

In-Position sensor sensitivity

The gantry triggers the In-Position sensor or the board does not trigger it.

- Move the gantry over the sensor and decrease the sensor sensitivity until the sensor is not triggered by any part of the gantry or camera.
- Load a board and increase the sensor sensitivity until the sensor is triggered by the board and not by the gantry.
- Adjust the sensor position to detect areas of the board where there are no holes or dark non-reflective areas.

Failed boards will not exit the system

- The downstream SMEMA cable is not connected. Check the V510 and the downstream conveyor.
- The downstream SMEMA cable does not meet ViTrox requirements. For older systems, the cable must have an additional pin 8 and for newer systems additional pin 5 for relaying the bad board signal.
- Verify that relays KA5, KA6 and KA7 are functioning for single lane machines.
- On dual lane machines, for SMEMA downstream lane 1, verify that KA 5, KA6, and KA7 are functioning. For lane 2, check KA 12, KA13 and KA14.

Conveyor belt(s) reverse direction unexpectedly

This is typically related to a bad motor cable. The cables in question routed from the main control panel in the back of the system to each conveyor motor.

- Refer to the *Electrical Drawing* document and verify that the cables at XBM3 and XBM4 are not loose, and that the cable connections at the motors are not loose or damaged.
- If necessary, replace the cables.

Clamp motor continuously rotates

- Reset the clamp home sensor.

Board is not clamped

- Check whether the clamping mechanisms are blocked. If they are, lubricate them.
- Ensure the **RAIL** switch (es) on the switch plate is set to the **INSP** (inspect) position.
- Turn the **MAINT. SWITCH** to the ON position. From the Maintenance window, force the clamps up and down. Visually check if the motor is working.
- Ensure the Disable Clamping output has not been set. (Refer to the *Engineering Manual*, Utilities Menu: Machine IO.)
- Check if the clamp drive motor is operating and verify 24 V DC power to the drive.

Inspection yields fiducial mis-reads

Typically this is a software problem that occurs when the fiducial appearance has changed. See "Fiducial Setup" in the *Engineering Manual*.

In some instances this could be a hardware setup issue where the board is not reaching the stops or is overshooting.

- Check if the board is tight in the conveyor.
- Check the belt condition.
- Check the conveyor speed.
- Check that both belts are working.
- Check the position sensor sensitivity.

Conveyor will not run

- Refer to the *Electrical Drawing* document.
- Check that the conveyor is not obstructed.
- Check that MCB Q4 is on.
- Check that all E-Stop buttons are pulled out. Examine the three indicator lights on the relay and verify that KA4 is activated.
- Check that the Entry sensor is functioning and that this signal is read by the PLC.
- If SMEMA is used, ensure that a Not Busy (PLC input 0.01) signal is sent from the downstream machine.
- Check that P404 (stepper driver) is working.

Conveyor 1 will not run

- Check that PLC output 100.00 is on. (All input and output have indicator lights on the PLC.)
- Check that relay KA4 is energized.

Conveyor will not run because there is no output from PLC

- When an error occurs in the PLC, an error message will be displayed. Check the message for the cause and the action to be taken.

Drives will not move/home/move to a given width

- Check that the motors are not slipping on their coupling.
- Check the position of the AWA sensors.
- Check that there is nothing obstructing the conveyor.
- Check that the E-Stop circuit is reset.
- Check the power to the P404 and look for indicator lights on the P404. The middle LED should be green or orange.
- Check for 24 V DC power to P404 (stepper driver).

- Check that Q2, Q3 and Q4 are on.
- Check that KA4 (on a single rail) is on to energize all motors.
- Check whether it is the PLC that is not allowing the move. The PLC may not allow moves if there is a board in the machine or some of the sensors are triggered.
- Check that the three AWA sensors are working by checking that their indicator lights are on.
- Check that the cabling of the motors is connected to the terminals above P404 (stepper driver).

Cannot manually adjust the width of the conveyor rail

- Check that motors are not slipping on their coupling.
- Check that there is nothing obstructing the conveyor.
- Check that the E-Stop circuit is reset.
- Check that the **AWA IN** and **AWA OUT** buttons are operating by pressing them. The PLC inputs for in/out are 00.04/00.05.
- Check the power to P404; look for indicator lights. The middle and top LEDs should be green or orange. The LEDs should not be red.
- Check that KA1 (on the single rail) is on to energize all motors.
- Check whether it is the PLC that is not allowing the move. The PLC may not allow moves if there is a board in the machine or some of the sensors are triggered.
- Check that the conveyor rail is not on the AWA Limit sensors.
- Check the cabling of the motors.

Conveyor rails will not align properly

- Perform AWA calibration.
- Check that the left minimum sensor and the right alignment sensor are in-line. Measuring and comparing the distance from the sensor to the structure edge can do this.
- 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.
- Ensure that when the AWA software is executing the aligning operation, the relay KA2 is activated so as to allow the right side motor to be moved.
- Check the cabling of the motors.

Troubleshooting the Camera

- Camera image is completely black
- Camera will not work
- Lighting rings will not work
- Lighting controller will not work
- Images seem darker than normal

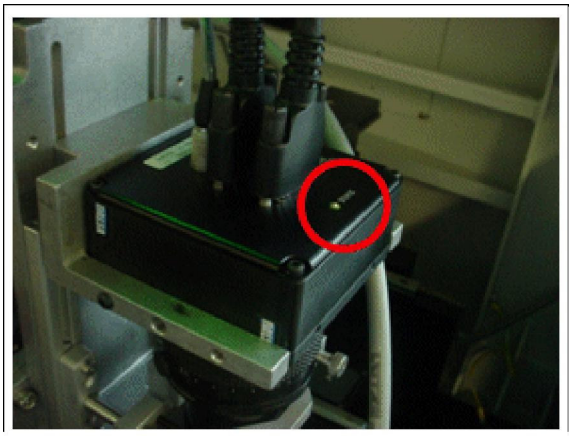
- Wrong lighting values or incorrect color in lighting menu
- Unable to auto-scale

Camera image is completely black

- Verify that the cap is not on the camera lens. Typically systems are shipped with the cap on the camera lens.
- Check that the cables are connected from the camera to the Frame Grabber.
- Check for 12 V DC on pins 4 and 16 on the cable connected to the lighting controller.

Camera will not work

- Check that the PC is on.
- Check that the cable and the two camera link cables on the camera are connected correctly to the Frame Grabber. Data1 and data2 on the camera should be connected to the upper and lower connector of the Frame Grabber respectively.
- Check that the green LED of the camera is on when the PC is on.



- Check for 12 V DC between pins 4 and 16 on the cable connected to the lighting controller.
- Check the 2 Amp porcelain fuse inside the PC.
- Check the serial connector for the lighting controller.
- Check the image for isolated odd dots. If you find these, replace the cables. Contact ViTrox Support for the detailed procedure.
- Check the image using the Intellicam software (see “Camera Testing”).

Lighting rings will not work

- Shut the system down completely and then restore power.
- Perform manual initialization by clicking individual rings in the Lighting Controller window of the V510 software (from the **Utilities** menu, click the **Lighting Controller** folder).
- Try to calibrate using a Fotowand gray card (see “Lighting Calibration”).

Lighting controller will not work

- Check that MCB Q3 and Q4 are on.
- Check that the 24 V DC power supply is on.
- Check that the LED on the lighting controller is on.

Images seem darker than normal

- Lighting rings need calibration. Lighting rings will degrade at different rates depending upon use and variations introduced during manufacturing. Therefore lighting calibration should be verified during normal maintenance schedules and more often if significant changes in the required amperage are noted.
- Lighting rings or individual LEDs could be damaged or non-functional. This can be verified using a dental mirror under the camera and checking the LEDs from the image in the Lighting Controller window. If a burned out LED is noted during maintenance procedures contact ViTrox Support immediately.
- The camera aperture may have been changed. Reset it to F5.6 (see "Setting the Lens Aperture").

Wrong lighting values or incorrect color in lighting menu

- Place the lighting head over the ball bearing and verify if each ring is complete. If not, replace the defective LED or bank of LEDs.
- Check if the right color is displayed for each ring. If not, verify the wiring to the lighting controller.
- Verify that unified_ligt_map.txt, SLC800LightingValues.xml; SLC800Initialisation.xml and LightingControllerIntensityTargets.xml are present and not corrupted. Replace any missing or corrupted files (contact ViTrox Support).
- Try to calibrate using a Fotowand gray card (see "Lighting Calibration").

Unable to auto-scale

- When fiducial 1 is too close to the maximum or minimum limits of the XY gantr y inspection range, auto-scale cannot be completed. Try auto-scaling on a different fiducial which is not close to the stage limits.

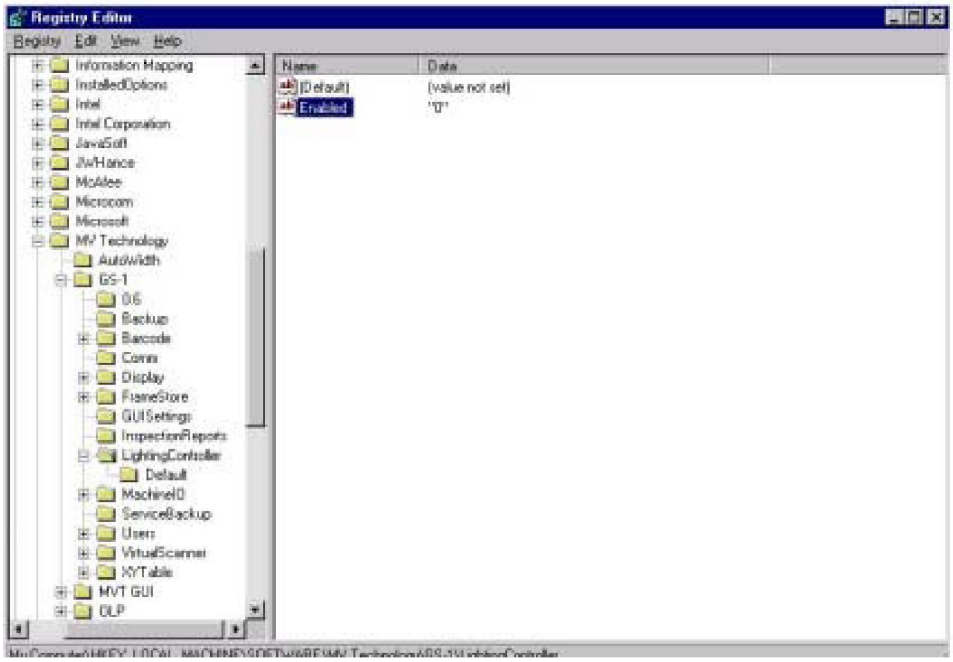
Troubleshooting the Lighting Controller

If the lighting controller is not working

Check that the lighting controller is enabled in the Windows registry.

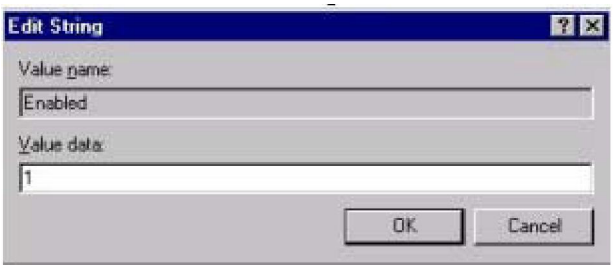
a. Click **Start** > **Run**, type `regedit` in the command line and click **OK**.

Go to HKEY_LOCAL_MACHINE/SOFTWARE/MV Technology/GS-1/LightingController.



Double-click **Enabled**.

Type `1` in the Value data field and click **OK**.



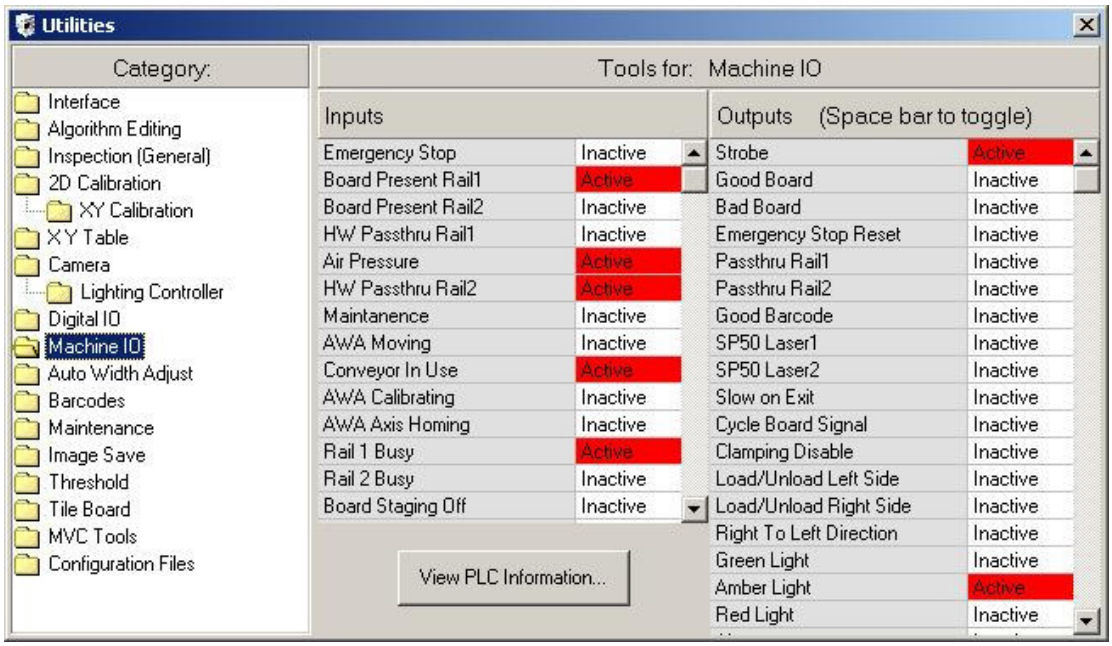
Troubleshooting the Lighting Tower

If the lighting tower will not operate

a. Check that the lighting tower is plugged in.

b. From the **Utilities** menu, click the **Machine IO** folder.

c. Activate all the lights: select any green, amber, or red light and press the space bar to activate it. Press the space bar again to deactivate.



Check that the PLC is operating.

Check that the connector is intact and undamaged.

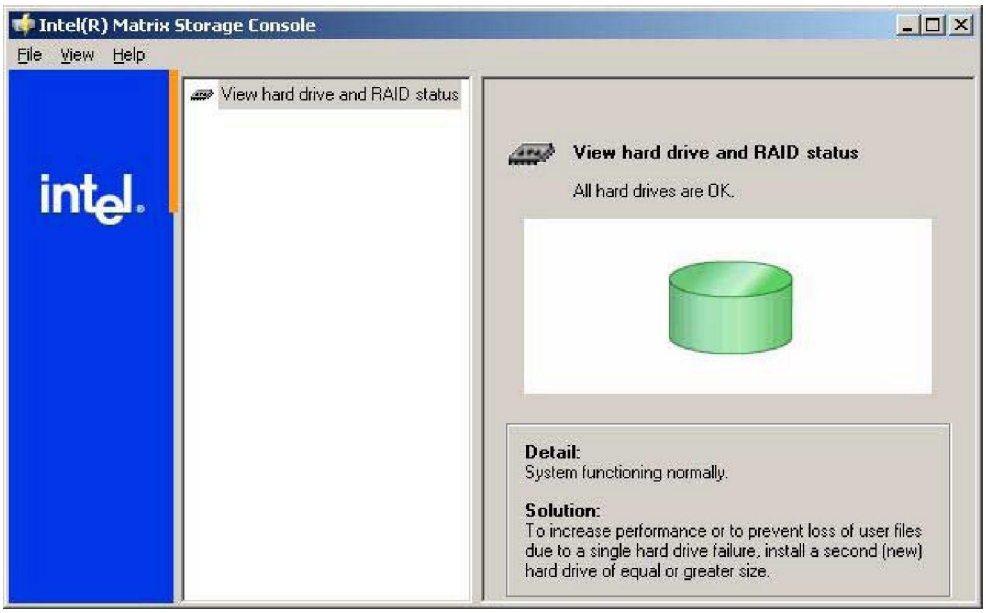
Check the LEDs.

Check the wiring.

Troubleshooting the PC and Monitor

If the PC is not working

- Check that the PC is plugged in and switched on.
- Check that MCB Q5 is on.
- If UPS is used, make sure that it is switched on.
- Determine if any hard disk is damaged using the Matrix Storage Console utility. Click **Start** > **All Programs** > **Intel Matrix Storage** > **Matrix Storage Console** to view a report on the hard drives. If a hard disk has failed, contact ViTrox Support to get a new hard disk.



- To remove a failed hard disk, open the PC cover, remove the power and SATA connectors, and pull out the hard disk.
- To install the replacement hard disk, insert it and then connect the power and SATA connectors.
- Restart the PC and check automatic rebuilding. This can take three hours.

If the monitor is not working

- Check that the monitor is connected and switched on.
- Check that MCB Q5 is on.
- Check that the cables are properly connected.
- If UPS is used, make sure that it is switched on.

Troubleshooting the Safety Relay

If the safety relay will not reset

Pressing **ES RESET** on the switch plate will reset the safety relay. After a reset, the three indicator lights on the safety relay should turn on.

If the safety relay will not reset:

- Check for 24 V supplies across the relay terminals A1-A2.
- Check that the emergency stop and door interlock are functioning correctly. This is done by checking the continuity across terminals:
  - Check S11 and S12 for continuity
  - Check S21 and S22 for continuity

- Check the three indicator lights on the safety relay. If the three lights are on, the relay is functioning correctly.The top light indicates the power is on. The two bottom lights representing circuit number 1 and circuit number 2.
- Check that all contacts and terminations are intact.
- Check the reset circuit activated by the hardware pushbutton that shorts out terminals XB5-11 and XB5-12 on the control panel.
- If the emergency stop is on and there is no message on the monitor, check PLC input 00.02. Check that the LED on the PLC is on. If the LED is not on, reset the PLC.

Troubleshooting the XY Table

When the V510 software starts, the parameters for the MEI card controller and Kollmorgen drives are downloaded automatically and the system homes the gantry. If this does not happen, check the system first. The procedures for checking the system and additional troubleshooting information are provided in this section.

Checking the System

- Check the Hardware
- Download Parameters to MEI Card and Drives
- Move the Axis

Troubleshooting

- Troubleshooting the XY table motor controller
- XY table motor controller is not operating
- Gantry will not home during software startup
- The machine seems to vibrate. How do I know if it is level?
- Motor jumps and gives Amp. Fault
- No light on encoder head
- No power on Kollmorgen drives
- Gantry makes strange noise
- Flashing c1 on the drives
- Flashing r4 (or r5 or r6) on the drives

Checking the System

Perform the following procedures in sequence:

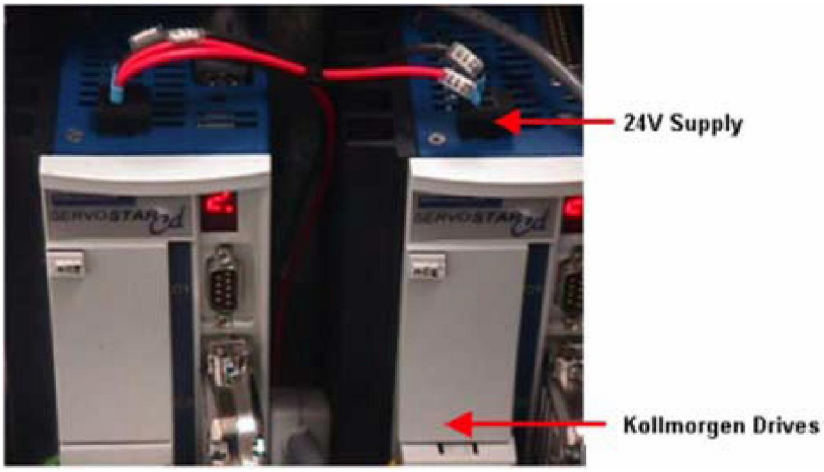
- Check the Hardware
- Download Parameters to MEI Card and Drives
- Move the Axis

Check the Hardware

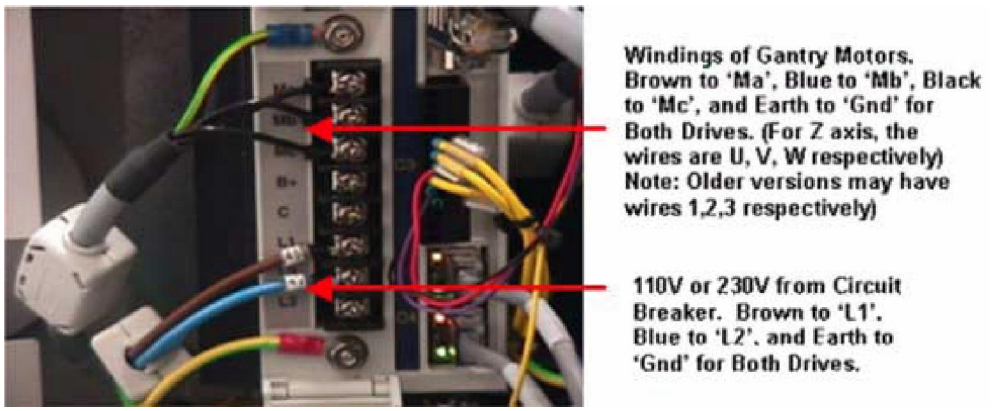
a. Reset the E-Stop circuit.

b. Remove the rear access panel. On the control panel, make sure that Q7, Q8, and Q9 (for Z-axis, if used) are switched on. These are the circuit breakers for the gantry.

Check that both the two Kollmorgen drives (also located on the control panel) have a 24 V supply going to them.



Place a multimeter between L1 and L2. It should read either 110 VAC or 230 VAC, depending on the input line voltage used.



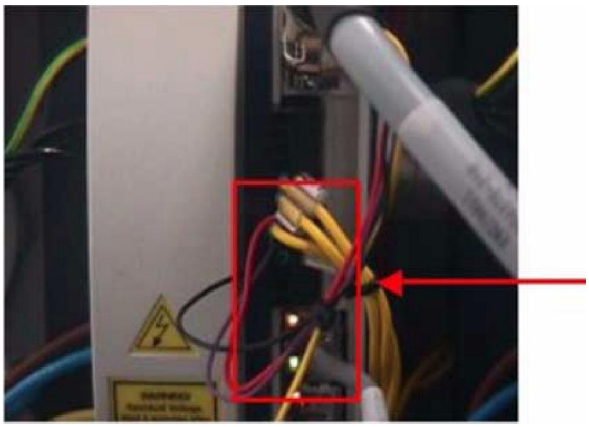
Turn off MCB Q7, Q8 and Q9.

Check the resistance between motor windings, which should read as follows: Ma and Mb = 2 ohms Ma and Mc = 2 ohms Mb and Mc = 2 ohms If the resistance is greater, it means there is a wire break somewhere.

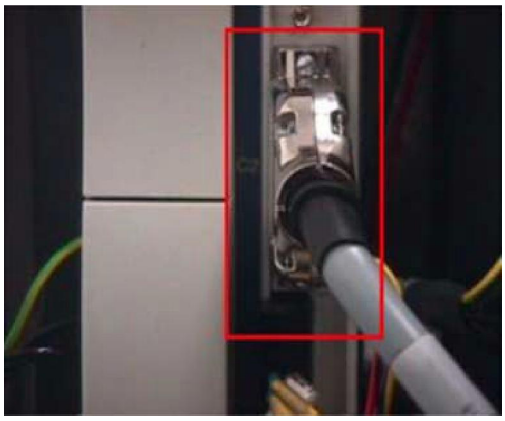
Note that the E-Stop should be off.

If everything is OK, close the cover to the Kollmorgen drives and turn on Q7, Q8 and Q9 (if Z-axis is present).

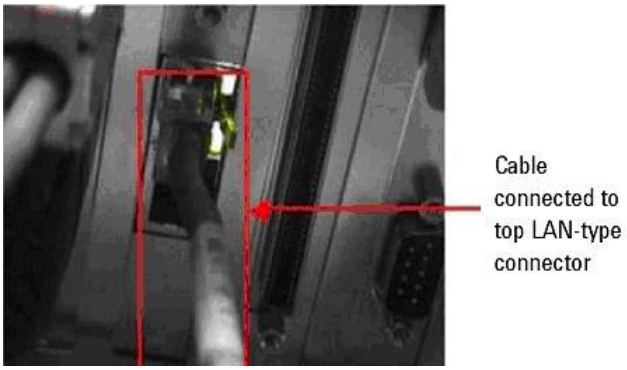
Make sure that the connector highlighted below is connected to C3 on the Kollmorgen drive. This connector relays the machine IO information (such as positive and negative limits) for the axis. Both drives should have this connector. For the wiring, refer to the *Electrical Drawing* document.



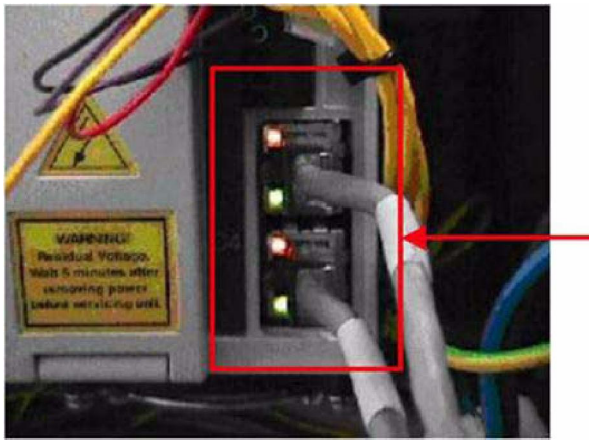
Make sure that the cable marked Halls/End highlighted below is connected to C2 on the Kollmorgen drive. This cable gives feedback on the 'Halls' and also on the gantry as it moves along the encoder strip. Again, both drives should have this cable.



At the back of the PC, check that a SyncNet cable is correctly connected to the top LAN-type connector on the motion controller card as shown below.



At the back of the PC, look at the first drive on the left, Axis 0 or X Axis. Make sure that a SyncNet cable is connected to the top LAN-type connector in C4 as shown below. The bottom SyncNet cable should be connected to the top connector in C4 on the drive 2 Axis 1 or Y Axis.



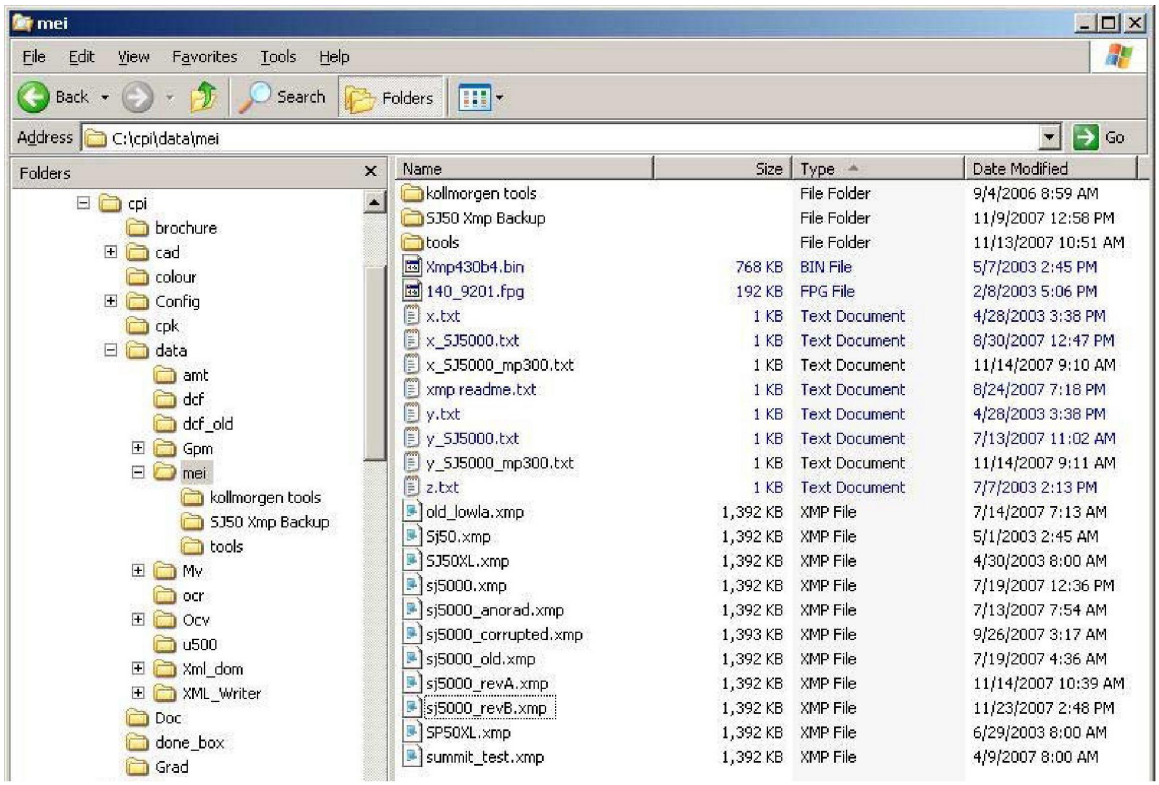
An easy way to find faults on the SyncNet cabling is by looking at the lights. There should be an amber light at the top and a green light at the bottom of each connector as shown above.

When all the hardware has been checked and found to be working correctly, check the software.

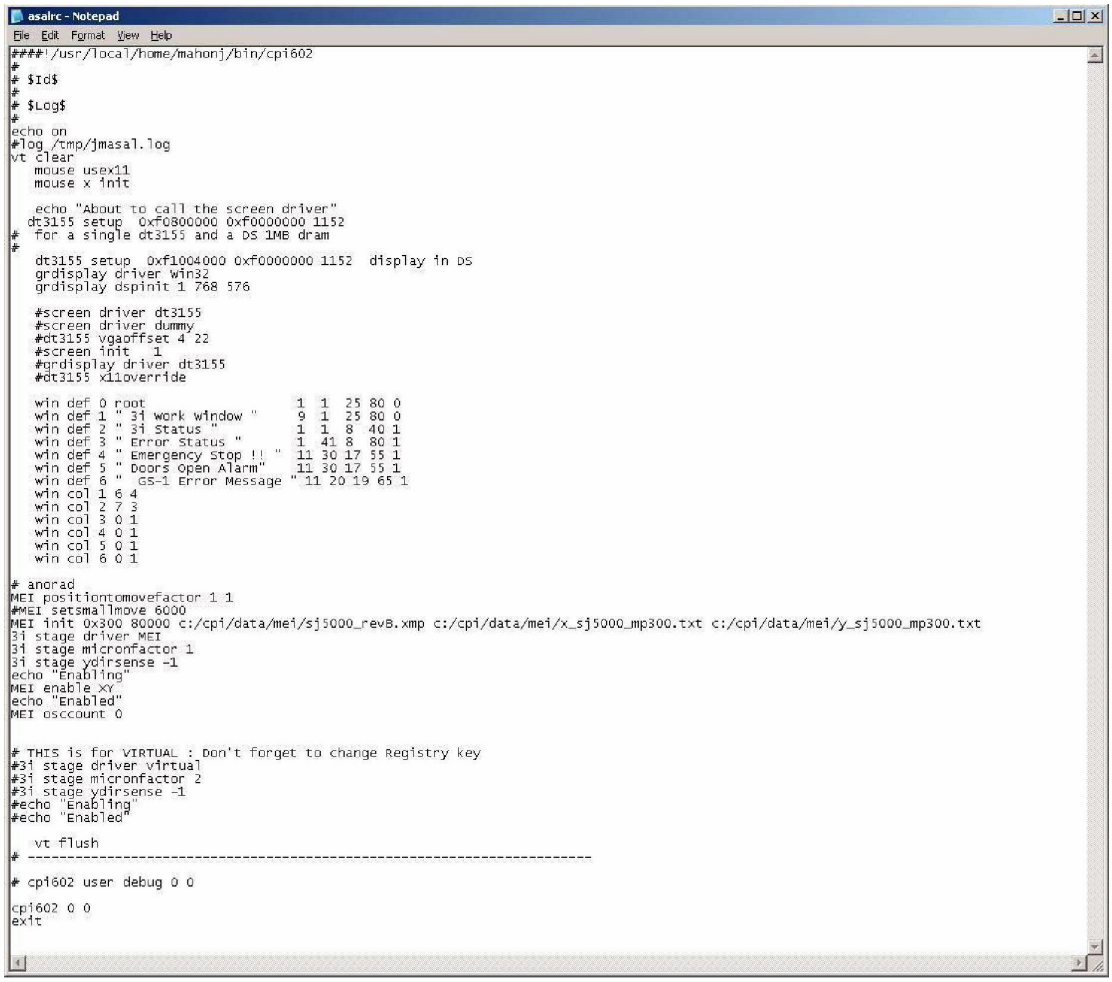
Download Parameters to MEI Card and Drives

Make sure all hardware is checked and present before performing the following procedure.

a. In Windows Explorer, locate the folder c:\cpi\data\mei and check that the following files are present:



Go to the folder C:\cpi. Open the ASALRC file with Notepad and check the content:



asalrc - Notepad

File Edit Format View Help

```
###!/usr/local/home/mahonj/bin/cpi602
#
# $Id$
#
# $Log$
#
echo on
#log /tmp/jmasal.log
vt clear
   mouse usex11
   mouse x init

   echo "About to call the screen driver"
  dt3155 setup  0xf0800000 0xf0000000 1152
#  for a single dt3155 and a DS 1MB dram
#
   dt3155 setup  0xf1004000 0xf0000000 1152  display in DS
   grdisplay driver win32
   grdisplay dspinit 1 768 576

   #screen driver dt3155
   #screen driver dummy
   #dt3155 vgaoffset 4 22
   #screen init   1
   #grdisplay driver dt3155
   #dt3155 x11override

   win def 0 root                    1  1  25 80 0
   win def 1 " 3i work window "      9  1  25 80 0
   win def 2 " 3i Status "           1  1  8  40 1
   win def 3 " Error Status "        1  41 8  80 1
   win def 4 " Emergency Stop !! "   11 30 17 55 1
   win def 5 " Doors Open Alarm"     11 30 17 55 1
   win def 6 "  GS-1 Error Message " 11 20 19 65 1
   win col 1 6 4
   win col 2 7 3
   win col 3 0 1
   win col 4 0 1
   win col 5 0 1
   win col 6 0 1

# anorad
MEI positiontomovefactor 1 1
#MEI setsmallmove 6000
MEI init 0x300 80000 c:/cpi/data/mei/sj5000_revB.xmp c:/cpi/data/mei/x_sj5000_mp300.txt c:/cpi/data/mei/y_sj5000_mp300.txt
3i stage driver MEI
3i stage micronfactor 1
3i stage ydirsense -1
echo "Enabling"
MEI enable XY
echo "Enabled"
MEI osccount 0


# THIS is for VIRTUAL : Don't forget to change Registry key
#3i stage driver virtual
#3i stage micronfactor 2
#3i stage ydirsense -1
#echo "Enabling"
#echo "Enabled"

   vt flush
# ------------------------------------------------------------------------

# cpi602 user debug 0 0

cpi602 0 0
exit
```

If the above is present, the parameters for the motion controller card and both the X and Y-axes have to be downloaded manually.

Download the parameters as follows:

a. Select Start > All Programs > Accessories > Command Prompt.

b. Type the following at the command line and press Enter:

- cd \cpi\data\mei\tools

d. Type `reset` and press Enter:

e. To download the parameters to the X axis, type the following and press Enter:

- cddriveconfig -download -node 0 -file c:\cpi\ data\mei\x.txt

To download to the Y-axis, type the following and press **Enter**:

- cddriveconfig -download -node 1 -file c:\cpi\ data\mei\y.txt

To save the parameters to the drives, type the following for the X-axis and press **Enter**:

- cddriveconfig -save -node 0 -file c:\cpi\data\ mei\x.txt

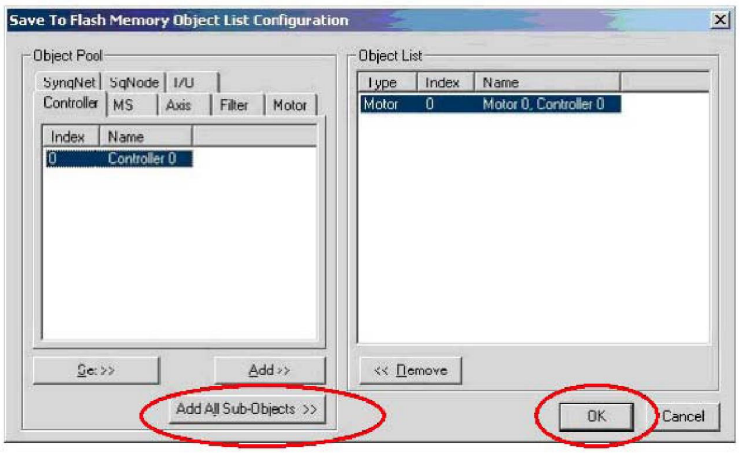
To save for the Y axis:

- cddriveconfig -save -node 1 -file c:\cpi\data\ mei\y.txt

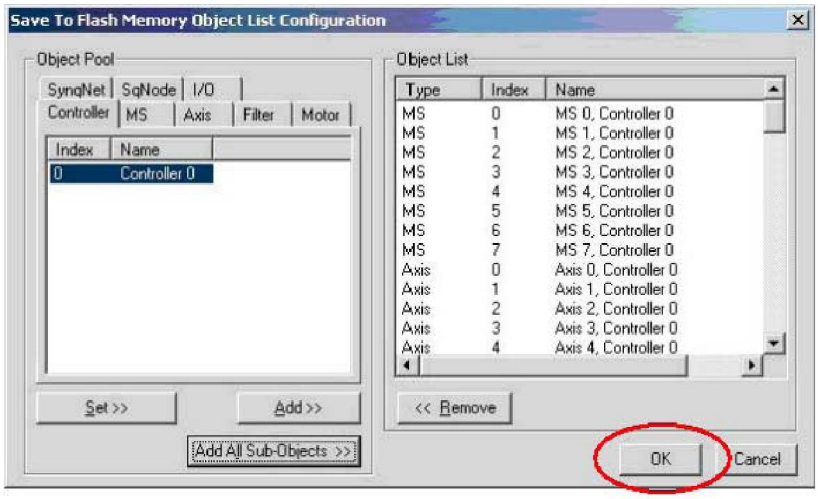
To save the parameters to the Motion Console (MoCon), launch it as follows: locate the folder C:\MEI\MOCON in Windows Explorer and double-click MC_XMP_NT.EXE.

a. If necessary, click the **M** button on the toolbar to open the Motor Summary window. On the Config tab, click the **Save to Flash** buttons.

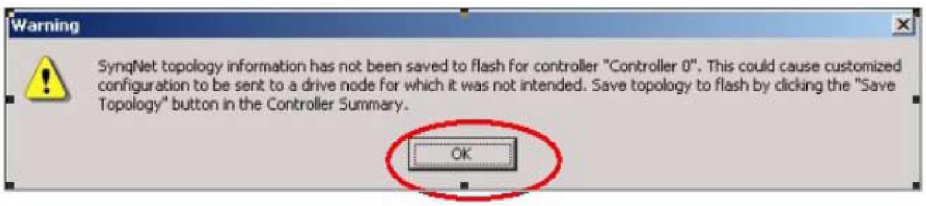
b. In the configuration window that appears, select the Controller tab. Then click **Controller 0** and click **Add All Sub-Objects**. Click **OK**.



c. You should see the following. Click **OK**.



d. Click **OK** in the warning message window.



Move the Axis

Make sure the hardware has been checked and present, and the parameters downloaded before continuing.

Launch MoCon for the following procedures. On the toolbar of the MoCon window, the following buttons will be used:

C - Controller Summary

S - Motion Supervisor Summary

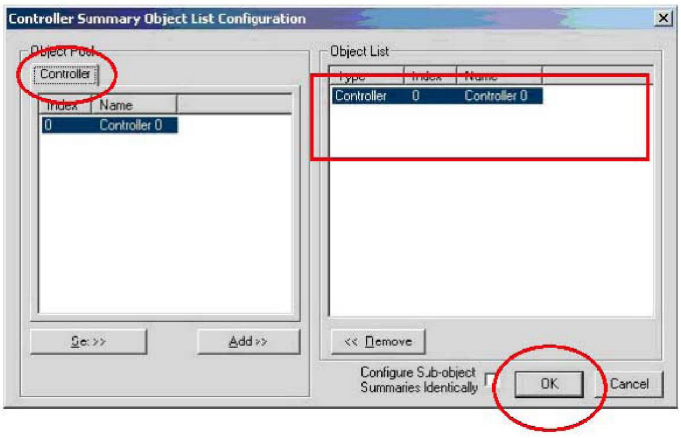
F - Filter Summary

A - Axis Summary

M - Motor Summary

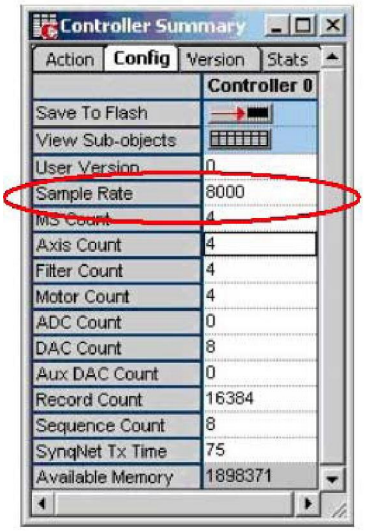
1. Click the **M** button on the toolbar.

a. On the Controller tab of the configuration window, click **Controller 0** and click **OK**.



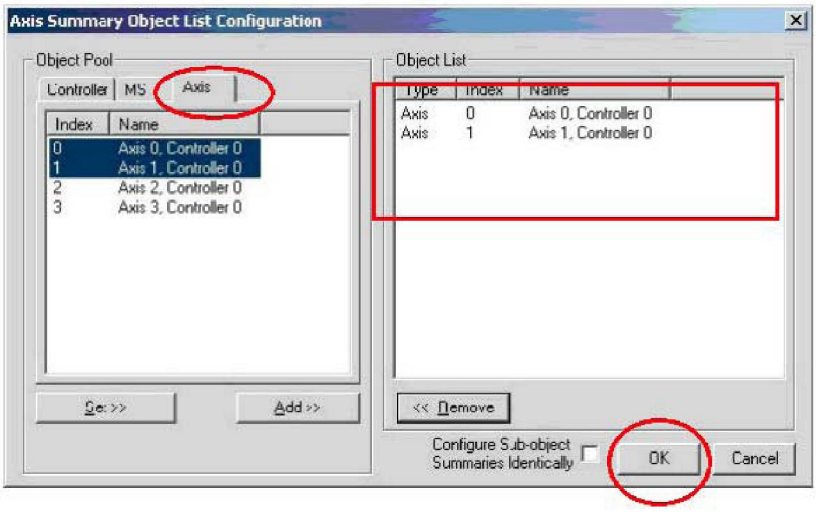
b. On the Action tab of the Controller Summary window, click the **Reset** button for Controller 0.

c. On the Config tab, make sure the Sample Rate is set to 8000. If it is not, the V510.xmp file has to be downloaded (follow the instructions in "Download Parameters to MEI Card and Drives" to do so).

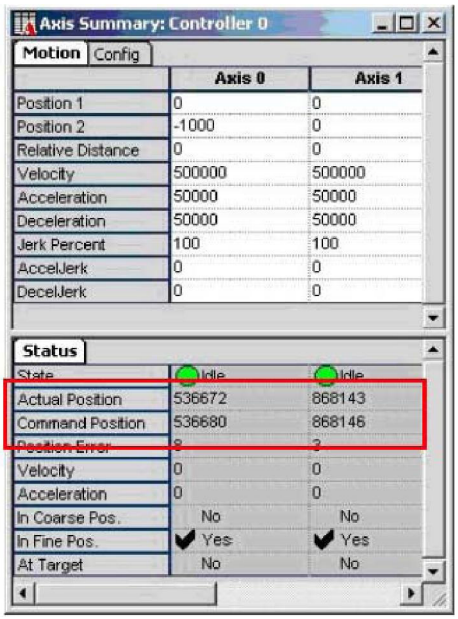


2. On the MoCon toolbar, click the **A** button.

a. On the Axis tab, make sure **Axis 0, Controller 0** and **Axis 1, Controller 0** appear in the Object List. If not, select them from the Object Pool and click **Add** to add them to the list. Click **OK**.



The following window appears:



b. Open the front access door. If the encoders on both axes are reading correctly then the following should happen:

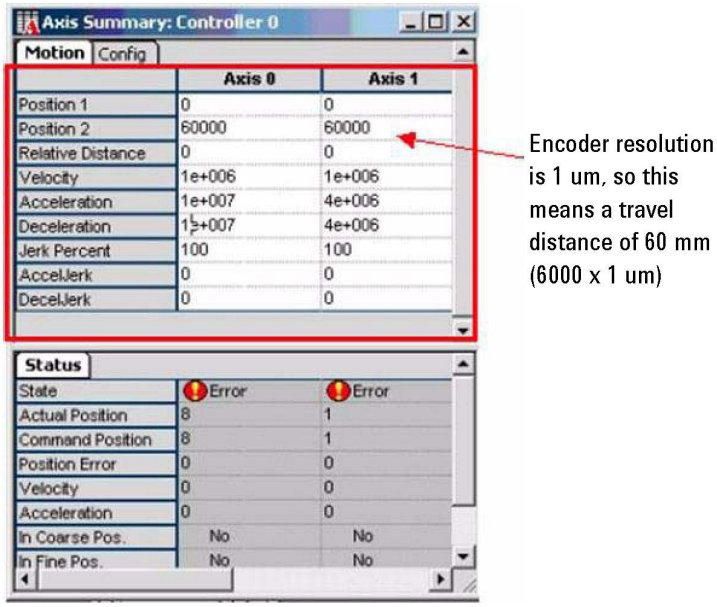
- As the X axis (Axis 0 in MoCon) is moved away from the front of the system, the numbers highlighted above should decrease.
- As the X axis is moved toward the front of the system, the numbers highlighted above should increase.

- As the Y axis (Axis 1 in MoCon) is moved to the right, the numbers highlighted above should decrease.
- As the Y axis is moved to the left, the numbers highlighted above should increase.

c. If feedback in the opposite direction is received, then the V510.xmp file has to be downloaded and saved to the MEI card again. (The encoder phase should be reversed for all motors, see the Motor Summary window.)

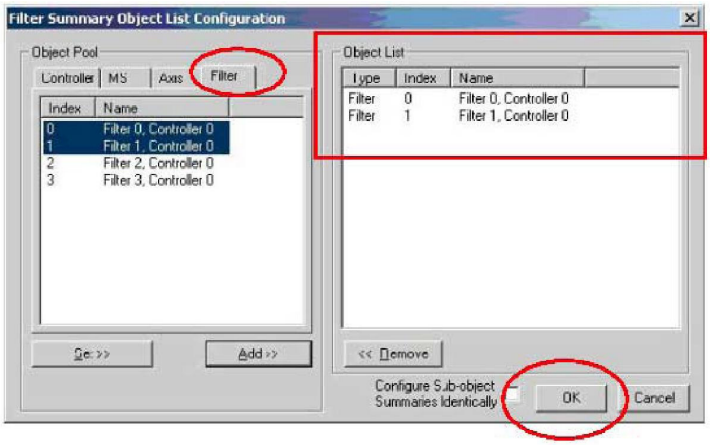
d. Make sure the both axes are in the middle of the machine. Close the front access door and reset the E-Stop circuit.

e. Enter the following values in the fields:

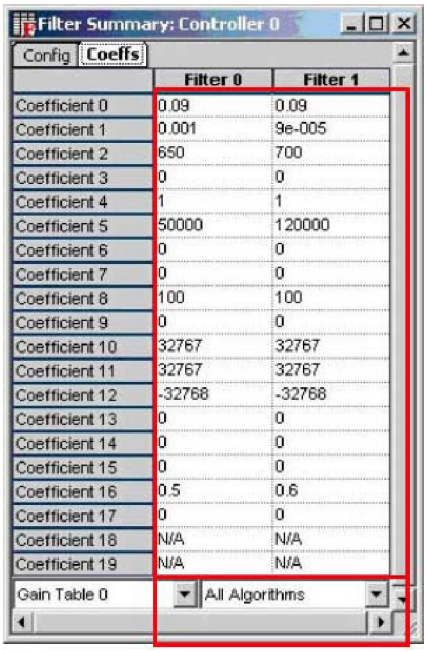


3. On the MoCon toolbar, click the **F** button.

a. On the Filter tab, make sure **Filter 0, Controller 0** and **Filter 1, Controller 0** appear in the Object List. Click **OK**

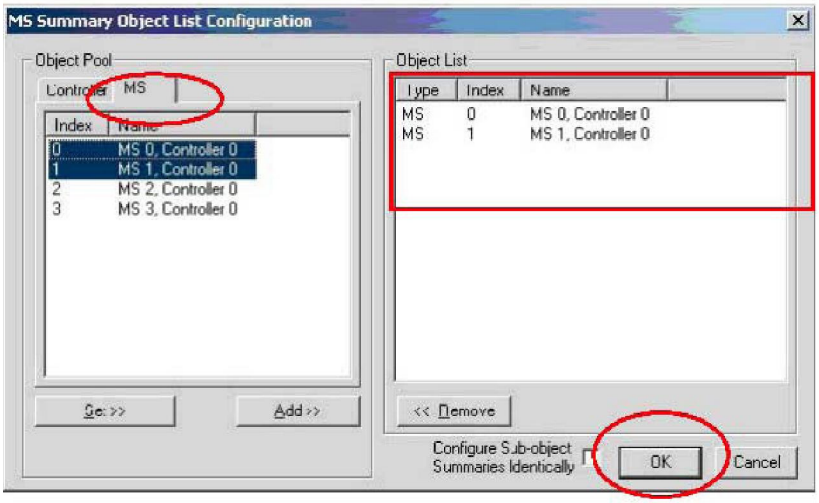


b. In the Filter Summary window, select the **Coeffs** tab. Make sure that **All Algorithms** is selected and that the values are the same as shown below.

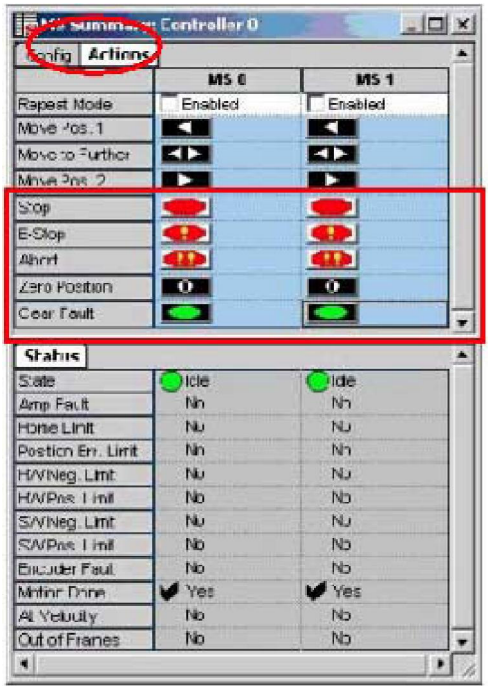


4. On the MoCon toolbar, click the **S** button.

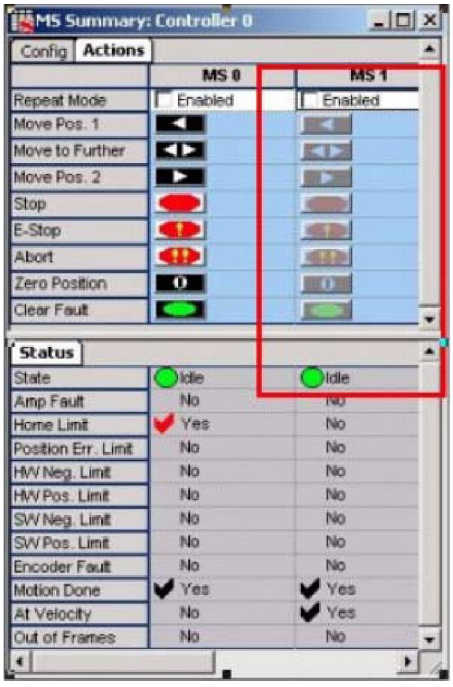
a. On the MS tab, make sure **MS 0, Controller 0** and **MS 1, Controller 0** appear in the Object List. Click **OK**



b. In the MS Summary window, select the **Actions** tab. Click the **Clear Fault** button for both the X and Y-axes, and check that the state of each axis is Idle. (If you do not see the window below, go to the next step.)

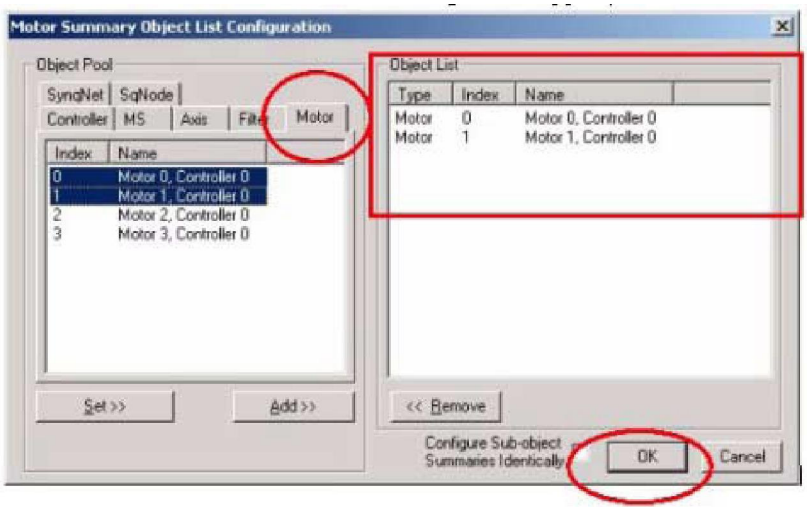


c. If you see the following window instead, the grayed out MS1 column indicates that MS0 is controlling both axes. The axes should be controlled separately; refer to "Mapping the Axes" for instructions on how to achieve this.



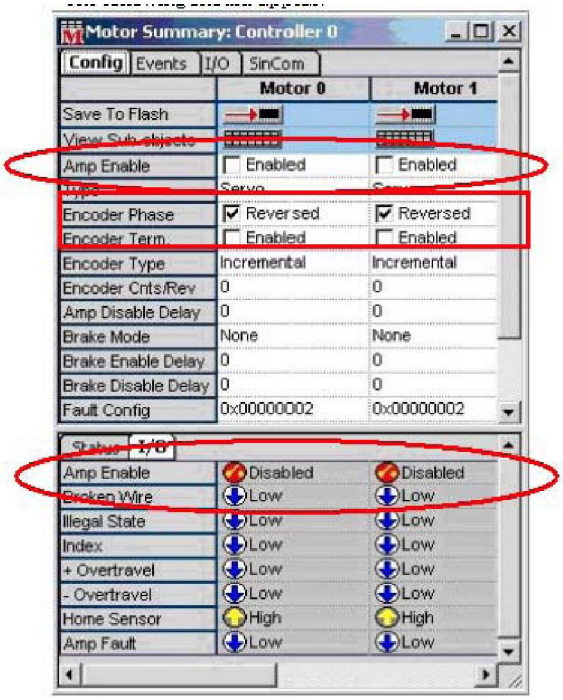
5. On the MoCon toolbar, click the **M** button.

a. On the Motor tab, make sure both **Motor 0, Controller 0** and **Motor 1, Controller 0** appear in the Object List. Click **OK**



b. In the Motor Summary window, select the **Config** tab. Select the **Reversed** option for Encoder Phase as shown below.

c. Select the **Enabled** option for Amp Enable, for both the X and Y-axes. Amp Enable in the bottom pane should show **Enabled** for both axes.

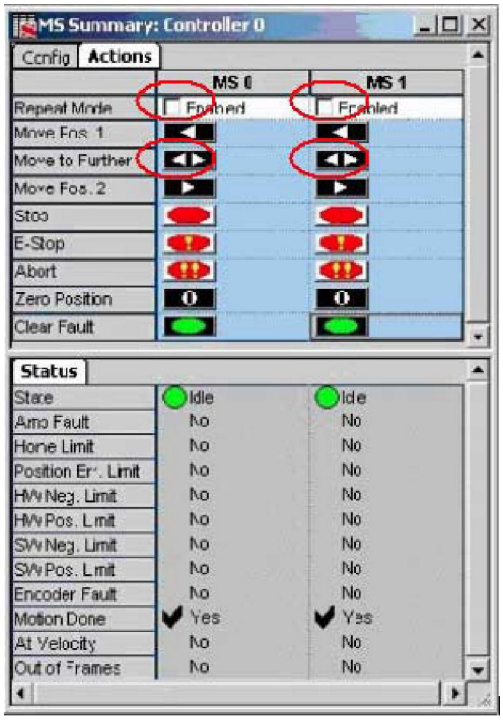


6. Check the Kollmorgen drives. The display on the drive should show **2.** This means that the drive has enabled correctly.

NOTE

Make sure the axes are in the middle of the machine.

7. Go to the MS Summary window. On the Actions tab click the **Move to Further** button. The axis should move in a positive direction. Click **Move to Further** again and the axis should move back.

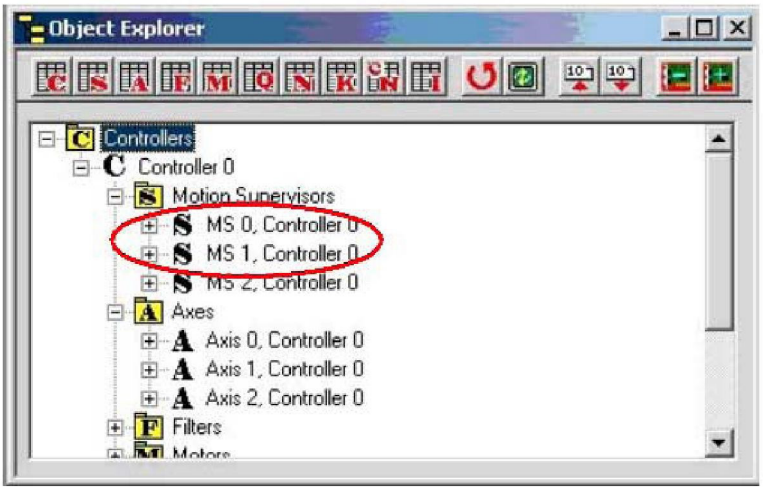


8. Do the same for Axis 1. To have the axis move back and forward continuously, select the **Enabled** option for **Repeat Mode** and than click **Move to Further**.
9. If the axes are moving, it means the system is ready for inspection. Disable the Repeat Mode, disable the motors (disable **Amp Enable** in the Motor Summary window), and close the MoCon window.

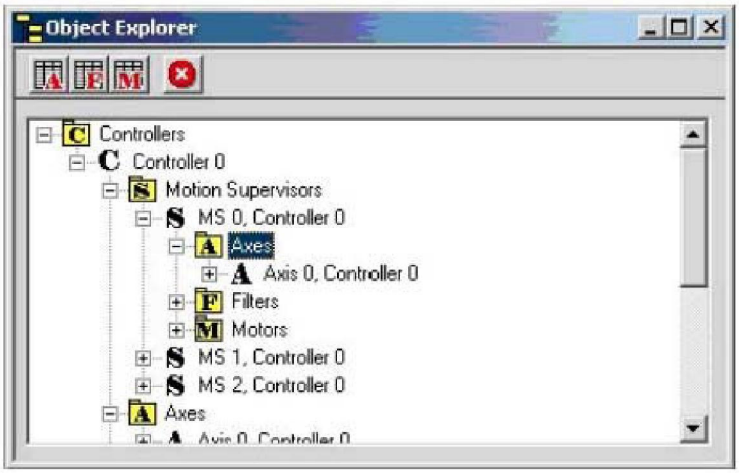
Mapping the Axes

1. On the MoCon toolbar, click the Object Controller button (to the left of the C button).

2. Open the **Controller 0** folder, then the **Motion Supervisors** and **Axes** subfolders.



3. First, remove Axis 1 from the control of MS0.
   a. Under Motion Supervisors, click **MS 0, Controller 0**. Then click **Axes**.
   b. Right-click Axis 1, Controller 0 and select Remove Axis From List.
   c. Click Yes to confirm the removal.
   d. The Object Explorer will show that Axis 1, Controller 0 is no longer under the control of MS0.



4. Now map Axis 1, Controller 0 to MS 1, Controller 0. **a** Select the axis and drag and drop it into **MS 1, Controller 0**. **b** Click **Yes** to confirm.
5. When this is completed, go to the Motor Summary window. On the Config tab, click the **Save to Flash** buttons.

Troubleshooting

Troubleshooting the XY table motor controller

- Home the X and Y axes individually, to identify and rule out any electrical cable communication issues.
- Jog the X and Y-axes individually, to identify and rule out motor and encoder communication issues.
- Manually move the gantry to activate the Home and Limit markers, to identify and rule out read head cable communication issues.

XY table motor controller is not operating

- Are MCB Q7 and Q8 on?
- Is there an emergency stop condition? Examine the three indicator lights on the safety relay.
- Check that all cables are in position and securely connected.
- Check that safety relays KS4 and KS5 are activated.
- Check that 24 V supply to the amplifiers is present.
- Check that the contactors KS2 and KS3 are at the ON position.

Gantry will not home during software startup

- The Anorad gantry has protective metal casings that cover the magnets. If the metal plate is damaged, there is a possibility that a magnet could be cracked or damaged, which would prevent gantry movement across that position.

The machine seems to vibrate. How do I know if it is level?

- Loosen the feet locking nuts and turn each of the adjustable feet slightly to verify that each is carrying some weight. If they are properly adjusted, all four feet should have similar resistance to turning.
- The leveling of the machine should be verified by placing a level gauge on the metal railing of both axes of the gantry. You can also check the level on the base of the machine.
- To verify the machine level, run a Multi GR&R using the fiducial plate from the **Utilities** menu. Review the x/y scatter plot displayed in the results screen. All of the green inspection points should be very close to the center of the target. If there is a trend toward one side, or the points are arranged in some symmetrical pattern, it is probably because the machine was not leveled correctly.

Motor jumps and gives Amp. Fault

- Check the motor connections on the Kollmorgen drive.
- Check that the encoder phase is reversed.

No light on encoder head

- Check that the 24 V DC is connected to the drives.
- Check that the connector C2 is properly connected. For wiring drawings, refer to the *Electrical Drawing* document.
- Open the front access door and check the connections of the encoder cables.

No power on Kollmorgen drives

- Reset the E-Stop circuit, launch the MoCon software and click **Reset** in the Controller Summary window.
- Check that MCB Q7, Q8 and Q9 are switched on.
- Check that the 24 V power supply is on.
- Check that contactors KS2 and KS3 are at the ON position.

Gantry makes strange noise

- Launch the MoCon software. In the Controller Summary window, select the Config tab and check that the sample rate is 8000.
- If the sample rate is different, the MEI card should be reconfigured.

Flashing c1 on the drives

- Check that cable is connected properly between the MEI card in the PC and the Kollmorgen drive.
- Reset the E-Stop circuit, launch the MoCon software and reset the drives.

Flashing r4 (or r5 or r6) on the drives

This means there is break in the encoder cable or the Halls are illegal.

- First, press an E-Stop button, open the front access door and manually move the X and Y-axes to the middle of the machine.
- Close the front access door, reset the E-Stop circuit and try to home the gantry.
- If the error persists on only one drive, physically swap the drives using the following procedure:
  a. Shut down the PC, turn off the **START** key and disconnect the mains.
  b. Remove the rear access panel and locate the drives on the control panel.
  c. Disconnect all the cables from the drives; making notes on where are they connected.

d. Physically swap the drives, and connect the cables again.

e. Power up the machine, reset the E-Stop circuit, and start the V510 software.

f. If the error is reported on the same drive, then the drive is faulty and should be replaced.

g. If the error is now on the other drive, then there is a problem with the cable or with the encoder head.

Note that there are two cables from the drive to the encoder head. Either could be faulty, so further investigation is needed to locate the problem. This requires a spare encoder head and cables.

Errors on Kollmorgen drive

Table 12-1 Error messages

Status Display	Fault Message	Possible Cause
o	Power Stage Overtime	Overload, fan malfunction, power stage failure.
p	Over Voltage	Excessive deceleration rate.
r0	Over Current	Power stage surge current.
r1	External Feedback Fault	Feedback signal through C8 not correctly detected.
r2	Resolver Line Break	Break in resolver feedback detected.
r3	RDC Error	Fault in resolver-to-digital converted detected.
r4	Sine Encoder Init Fail	Sine encoder card has not initialized properly.
r5	A/B Line Break	Break in encoder A\B input lines detected.
r6	Index Line Break	Break in encoder index line.
r7	Illegal Halls	Illegal Hall combination detected.
r8	C/D Line Break	Break in sine encoder C\D line detected.
r9	A/B Out of Range	Sine encoder A\B level out of range.
r10	Burst Pulse Overflow	Sine encoder fault.
u	Endat Communication Fault	Serial communication to the end at encoder failed.
H	Under Voltage	Bus voltage is too low.
A1	Motor Over Temperature	Motor overload caused overheating.
A2	Positive Analog Supply Fail	Failure in +12 V supply (regulated).
J	Negative Analog Supply Fail	Failure in –12 V supply (regulated).
J1	Over Speed	Velocity VOSPD.
E	Over Speed	Velocity 1.8 x VLIM.
E	EEPROM Failure	Faulty EEPROM.
F	EEPROM Checksum Fail	EEPROM checksum invalid on power-up.
d5	Foldback	System in feedback mode.
d6	Positive Over Travel Fault	PFB exceeded PMAX with PLIM = 1.
d1	Negative Over Travel Fault	PFB exceeded PMIN with PLIM = 1.
d2	Numeric Position Deviation	Internal fault.
c	Excessive Position Deviation	PE > PEMAX.
	Communication Interface	A communications fault has occurred.

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13

13. Maintenance

This chapter holds the following sections:

Overview

The maintenance schedule for the V510 consists of weekly monthly, quarterly, and yearly routines. The schedule must be strictly adhered to.

Maintenance must only be carried out by trained personnel.

When carrying out the maintenance tasks, refer to the *Electrical Drawing* document for the circuits involved. The electrical drawing numbers are provided where possible.

Important Notes on Lubricants

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

Failure to lubricate the stage at quarterly intervals may cause damage to the rails and invalidate all warranties.

Only use lithium based grease. The recommended lubricants are:

- Dow Corning's Molykote 44
- AFB grease – multi purpose grease from the manufacturer THK Japan

Weekly Maintenance

Carry out the following maintenance procedure weekly:

- Run a board through the V510 and ensure that it is operating correctly.
- Clean the machine panels.
- Clean the PC filter, if fitted.
- Check that all fans are running.
- Check that the control panel fan is running.
- Inspect the XY table and check all cables and connectors.
- Move the XY table by hand. Ensure that it moves freely and is not obstructed throughout its full range of movement on both X and Y-axes.
- Test the E-Stop circuit by opening and closing the front access door. Reset the E-Stop circuit using the **ES Reset** button at the front of the V510.
- Test the E-Stop circuit by pressing an E-Stop button. Reset the E-Stop circuit by pulling out the E-Stop button and pressing the **ES Reset** button.
- Repeat this procedure for each of the other E-Stop buttons.

- Start the AWA software and home the AWA conveyor. Move it to a width of 100 mm and measure both sides of the conveyor to ensure that the calibration is good.
- Power down the machine and switch off the XY stage at the controller.

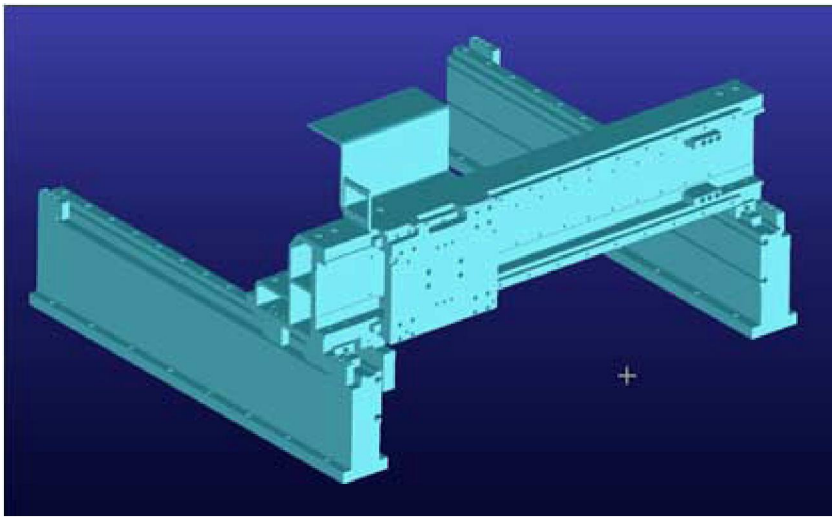

Figure 13- 1: XY Gantry

- Ensure that the bearings are free from dust, loose particles and moisture.
- Ensure that the magnetic platens are free from debris.
- Visually examine the encoders on each axis to ensure that there are no scratches, grease, or dirt. To remove any grease or dirt, use a very fine lint-free cloth.
- Take care not to scratch the XY table, as this will greatly affect the accuracy.
- Check that the small home marker contacts and end limits are intact. Ensure that they are free from dirt and grease.
- Power up the machine. Check the function of the conveyor sensors by placing a sample board over them. Look at the indicator light on each of the sensors.
- Move the lighting head over each sensor and make sure they are not activated by it.
- Check the soundness of all motor housings.
- Wipe off edge belts with 409 spray cleaner (recommended). Alternatively, use alcohol.
- Open the front access door. Turn the **MAINT. SWITCH** to the on position. From the Maintenance window, operate the stops and clamps for each rail to ensure they move without obstruction.

NOTE

NEVER clean the conveyor with a compressed air stream. It may cause dirt or other particles to get lodged in the motor shaft. Use a vacuum cleaner to remove loose dust or dirt.

NEVER disassemble the motors.

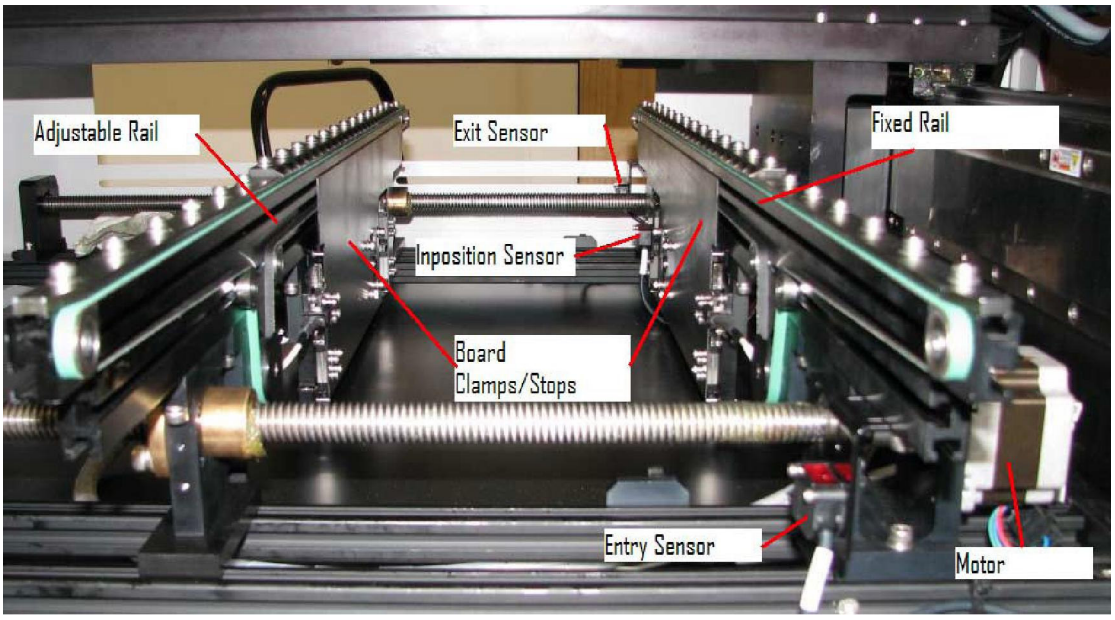

Figure 13-2: Sensors on the conveyor

Monthly Maintenance

Carry out the following maintenance procedure monthly:

- Carry out the weekly routine.
- Carefully clean the camera lens using general purpose cleaning solution and a lint free cloth.
- Clean and lubricate the gantry rails (shown below).

Power down the PC before performing the following checks.

- Turn off the V510 using the **START** key switch and turn the mains isolator to the OFF position. Open the rear access panel and visually inspect the electrical control panel.
- Inspect all electrical equipment on the machine for damaged contacts, exposed wire and frayed insulation.
- Clean the conveyor optical sensors with a dry cloth.
- Check that the cables going to the PC are tight.
- Check all connections on the lighting controller, terminals and PLC modules.
- Check all cables on the lighting head and XY table and ensure that none are loose or damaged.
- When inspecting the connections on the gantry stage and at the controller, check the integrity of the connectors at random.
- Ensure that all conveyor bearings are free running and that belt tension is tight.
- Ensure that the conveyor belts are not twisted on either rail.

Quarterly Maintenance

Carry out the following maintenance procedure every quarter:

- Carry out the monthly routine.
- When inspecting the control panel, check the tightness of several connections at random. Ensure that no wires in the terminals have become loose.
- Push the XY stage to one end of its travel.
- Remove any accumulated dust or debris from inside the assembly.
- Vacuum cleans the base of the table.
- Remove any dirty or dried lubricant from the bearing guides.
- Using a clean cloth, wipe along the rails to clean the bearing guides. A cotton swab soaked in a general purpose white spirit will suffice to remove stubborn debris.
- 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.
- Using a grease gun with a grease nipple (type UU), lubricate the four bearing trucks on each gantry axis.

Failure to lubricate the stage at quarterly intervals may cause damage to the rails and invalidate all warranties.

Yearly Maintenance

Carry out the following maintenance procedure every quarter:

- Carry out the quarterly routine.
- Isolate the V510 from the mains supply.
- Remove the bottom side panels and the rear access panel.
- Physically check all electrical connections in the following areas:
- Electrical control panel
  - XY table
  - PC
  - Motor controller
  - All earth cables
  - All connectors
- Carry out the following test which gives an indication of the insulation resistance of the cables and whether the mains supply to the body of the machine is intact and complies with the relevant standards.

⚠WARNING

This procedure should only be carried out by a fully qualified technician.

a. Power off the machine.
b. Switch off the mains isolator.
c. Disconnect the power plugs for the monitor, PC, UPS (if used) and camera.
d. Disconnect all AC power for the DC power supply, stepper drive (P403) and servo drives (Kollmorgen drives). Ensure that all the disconnected cables are not touching anything.
e. Disconnect the AC noise filter input and output cables and bypass it. Also disconnect the main AC contactor and bypass it.
f. Using an insulation resistance tester, check between L (cable #1) and earth (refer to the *Electrical Drawing* document). There should be a reading of > 1 Mohm.
g. Check between N (cable #2) and earth. It should have the same reading.
h. Reconnect all cables after the insulation test.

- Check all terminal connections on the machine.
- Check the electrical connections at the conveyor motors. Make sure all connections are intact and securely fitted.
- Check all mounting screws and hardware on the machine.
- Systematically check all nuts, bolts and screws on rails, lifting mechanism, bearings and mountings for all hardware.

A

A. System Specifications

This chapter holds the following sections:

Note that the system specifications may change during the product life of the V510. Any changes will be covered in subsequent revisions of this manual.

Table A-1 **Software specifications**

Item	Specification
Operating System	Windows XP SP3
User Interface	Graphical user interface with password protected user levels.
Data Transfer Interfaces	DVD/CD-RW, USB drives, and Ethernet

Table A-2 **Hardware specifications**

Item	Specification
Computer System	HP xw4600 workstation. Key specifications are: ➢ Intel Core 2 Duo ➢ 2 GB memory ➢ 250 GB SATA hard drive
Host Communications	10/100/1000-BaseT Ethernet; TCP/IP or MS Network (and other common XP supported networking protocols)
Imaging Hardware	Matrox Solios Frame Grabber
Camera System	DALSA Camera: ➢ 2352 x 1728 pixels, electronic shutter Optics: ➢ 75 mm lens with low chromatic distortion Illumination: ➢ Multi-layer LED ➢ Pixel size of 19 µm (factory set)
XY Robot System	Gantry robot system with linear motors and linear encoders Travel: 510 mm Velocity (x, y): 1500 mm/sec (60”/sec) Encoder Resolution: 1 µm X Motor Type: LC-50-100 Y Motor Type: LC-50-200
Board Sizes	Minimum: 50 mm x 50 mm Maximum: 510 mm x 510 mm

Board Clearance	Top side 41 mm Bottom side 50 mm Minimum edge clearance 3.5 mm

Tab l e A-2 **Hardware specifications**

Item	Specification
Conveyor System	SMEMA standard conveyor supplied with speed adjustment. 20 mm – 550 mm per second. Conveyor length 1.0 meters. Conveyor height adjustable between 821 mm and 965 mm.
Position	Depends on application: Post-Oven/Post-Wave

Tab l e A-3 **Supply facilities specifications**

Item	Specification
Electricity	100–120 V, 200–240 V 50/60 Hz Main protection to system is 16 Amps Normal Running Current: 100–120 V, 200–240 V Single Phase 50/60 Hz at 8 A The use of a branch type circuit breaker at the main distribution panel is recommended.
Operating Temperature	5ºC to 40ºC

Tab l e A-4 **Physical dimensions**

Item	Specification
Footprint	1000 mm x 1245 mm without keyboard and monitor support arm
Height	Approximately 2015 mm including light tower
Weight	Approximately 750 kg

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B

B. Reference Documents

The following reference documents are provided with the V510:

- Site Preparation Manual
- Operator Manual
- Electrical Drawing