ULTRA OPTICS

44R OPERATION AND MAINTENANCE MANUAL

Introduction

This manual is intended for use by Ultra Optics customers. It is important to read and understand the information in this manual before installing or operating the system. This manual is provided by Ultra Optics to its customers as a courtesy and, except as expressly provided in this manual, **ULTRA OPTICS MAKES NO WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONTENTS IN THIS MANUAL. ULTRA OPTICS ASSUMES NO RESPONSIBILITY FOR ANY OUTCOMES AS A RESULT OF USING THIS MANUAL.**

Any information contained in other manuals for equipment supplied by third party manufacturers (including, but not limited to the PLC, robot, motors, etc.) shall take precedence over information contained within this manual with respect to that third party equipment.

Thank You

The employee-owners of Ultra Optics wish to thank you for your business. The 44R and the Ultra Care Program is Ultra Optics' latest innovation in a rich history of designing and manufacturing the most accurate and robust lens coating machines available. If, after reading this manual, you are not confident in carrying out any task, please call Ultra Optics' technical service team at 763.488.6030 between the hours of 7:00 am – 7:00 pm cst, Monday - Friday.

Symbols

Symbols and statements used throughout this manual include:

 Text following this symbol needs extra attention.

NOTE: Text like this is extra information that may be helpful to the situation.

CAUTION: Text like this is information to help avoid personal injury and/or property damage.

 **WARNING!**: **Text like this is information to help avoid serious personal injury or death and/or property damage.**

Service

The 44R automated back-side coating unit was designed and manufactured for many years of safe and dependable operation. In the event service is required, please contact Ultra Optics at:

Ultra Optics
9200 Wyoming Avenue North, Suite 360
Brooklyn Park, MN 55445
www.ultraoptics.com
763.488.6030

Design Modification

DO NOT use this product in any manner not consistent with the instructions outlined in this manual!

NEVER alter the design, or perform service that is not consistent with the instructions outlined in this manual, without the prior written approval of Ultra Optics.

ALWAYS refer to the manual supplied by the component manufacturer for the most accurate and current information regarding that item and its particular use. Any information in the component manufacturer's manual shall take precedence over information contained in this manual.

Additional Copies

Additional copies of this manual are available by contacting Ultra Optics by phone at 763.488.6030. No part of this document may be reproduced or copied in any form, or by any means, without the prior written permission of Ultra Optics.

Safety

SAFETY FIRST!

The 44R is a complex piece of equipment that contains various safety hazards. Some of these hazards include, but are not limited to:

- Ultra Violet light – UV-light is used to cure the coating on the lens. Exposure to this light can damage the eyes. The UV-light also produces extreme heat and high temperatures. These temperatures could cause skin burns. All flammable materials, including cleaning agents, must be kept away from these temperatures due to risk of fire.
- High pressure hot water wash – hot water (~140°F) is sprayed at high pressure to provide a thorough cleaning of the lens. This water could cause burns or injury if directed on bare skin.
- Air jet drying – compressed air is blown at the lens surface to dry it after being washed. This compressed air could entrain particles and cause damage to the eyes.
- Moving components – the machine contains several moving components that could cause pinch points.
- Chemicals[1] – the chemicals used can cause skin and eye irritation and damage clothing.

Because of these issues, it is important that only trained and qualified technicians operate and work on these machines. When doing so, in addition to following the guidelines in this manual, appropriate personal protective equipment (PPE) should be worn. The PPE may include, but is not limited to safety glasses, protective gloves, lab coat or smock.

[1] All Safety Data Sheets (SDS) for Ultra Optics coatings are available by visiting our website at www.ultraoptics.com

WARNING! **This machine uses high voltage electrical power. The access panel to the electrical control panels should only be opened and worked in by a qualified technician. Failure to take proper precautions could result in serious injury or death.**

WARNING! **This machine uses hot water at high pressure. The water heater could burn the skin if the surface is touched. Extreme caution should be used when performing any work or maintenance on or around the wash components.**

WARNING! **An extremely intense ultraviolet light source is used to cure the coating on the lenses. Service work should not be performed on the 44R while this lamp is energized. Direct exposure to the lamp could result in severe or permanent vision loss. The ultraviolet light source also produces extremely high temperatures. Touching objects in this area (above or below the deck) could result in a burn. All flammable materials (such as alcohol) MUST be kept away from these temperatures due to risk of fire.**

WARNING! **The coating chemicals applied in this machine could cause significant health risks if ingested or if it gets into the eyes. The SDS for the coatings being used can be found at www.ultraoptics.com.**

Table of Contents

Required Utilities

The following facility utilities are required to operate the 44R. The provisions for these facilities are the responsibility of the customer and are not included in the scope of supply for this machine.

Electrical Power: 220 VAC, single phase, 4-wire (NEMA L14-30), 30 amp circuit.

Compressed Air: 80 psig, 18 cfm. The connection on the machine is a 1/4" quick connect

Deionized Water: Consumption of 7.6 L/hr at periodic rates of 0.3 L/min of deionized water flow rate with ≥ 1 megaohm resistivity. The connection on the machine is 3/8" barbed fitting.

Water Drain: Accessible floor drain required within 30 feet of machine.

System Overview

General Overview

The 44R is the latest back-side hard coat machine from Ultra Optics and represents the state-of-the-art solution for the optical industry. The system's basic functions are based on the highly-touted robustness of our MR3. The MR3 has been reliably coating lenses for customers for over 15 years.

In addition to the MR3's well-proven coating process technology, the 44R brings system automation. This innovative system utilizes an industrial standard robotic arm to automatically load/unload lenses from the trays into the coating machine. The lenses, while still on the block, are brought to the machine in the standard trays via a conveyor system. The incoming trays have a work ticket with a bar code that the 44R system will read. This barcode will dictate to the machine whether or not to coat the lens as well as making sure each lens is returned to its respective tray. The automated loading process reduces work handling, increases through-put, and lowers over-all operating costs.

The yield of the process is improved by incorporating the advances recently introduced as part of our Ultra OTB coating machine. These process improvements include:

- **Hot water wash** – using hot water to wash the lens improves the system's ability to remove any contaminants such as dirt, dust or residual polish material. A completely clean lens is a fundamental requirement to obtaining a successful coating application.
- **Water quality monitoring** – our many years of experience have taught us that if the quality of the de-ionized water starts to diminish, so does the effectiveness of cleaning the lens. Rather than wait for evidence of poor water to show up in the form of lens

breakage, the 44R system continuously monitors the quality of the wash water and alerts the user when problems start to arise. This allows servicing the equipment before the issue gets worse and the production yield goes down.

- **Measured UV light intensity** – the coating applied to the lens will only properly cure if it has received sufficient energy from the UV light source. It is well understood that the intensity of the UV light source diminishes over time. The 44R actively monitors this intensity level and will alert the user when the intensity is getting too low to produce reliable curing of the coating.
- **Enhanced compressed air filtration** – a well cleaned lens can quickly be spoiled if it is dried with contaminated air. In order to reduce lens breakage during the drying step of the process, the 44R makes use of multi-stage air filtration to deliver ultra-clean air during the drying of the lens.

Lens Conveyor

The front of the 44R machine contains a 6-foot long section of automated conveyor. This section is designed to take incoming trays and feed them into the staging area of the machine. A motor-driven belt I used to advance the trays across the front of the machine. There are several stop locations for the trays to wait, and they are controlled by stop pins mounted beneath the trays. These stop pins are controlled pneumatically by the system PLC.

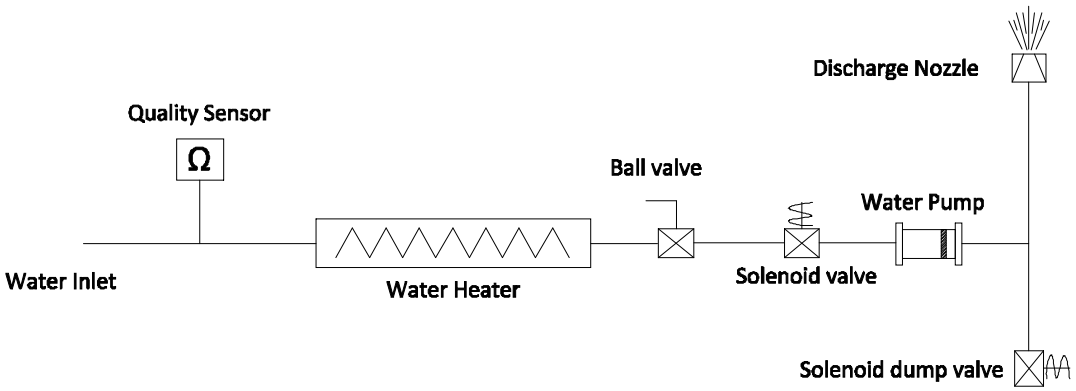
Lens Load/Unload

Lenses are loaded and unloaded into the machine by making use of a robotic arm. The motion of the arm is controlled by the robot's controller, utilizing input communication from the main system PLC. As the system's PLC controls the over-all process, it sends commands to the robot controller, which in turn manipulates the arm of the robot to the desired location and action. The end-of-arm tooling on the robot has been designed to flip 180 degrees with proper suction cups to facilitate picking and placing lenses into the processing portion of the machine and the carrying trays. The robot will always load/unload lenses into the first, or front, station of the processing portion of the machine. The machine's arm assembly will transport the lens from one processing station to the next (i.e. from the wash station to the dray station, etc) without any action required from the robot. The lenses are processed directly from the tray, while still mounted to the block. It is not necessary to de-block the lens prior to entry into the 44R machine. The lenses are picked and held by use of vacuum pressure at each of the suction cups.

While the lens is being processed, the suction cup is applying vacuum to the block, not the lens directly, reducing the amount of stress on the lens during processing. Further, the mass of the block provides heat dissipation during the curing stage, reducing the temperature of the lens during curing. The benefit of these design considerations is significant reductions in lens warping during processing.

Wash process

The lens is washed with high pressure, heated deionized water. As shown in the schematic below, the deionized water passes through a water heater where it is heated to approximately 140°F. The hot water then flows through a manual ball valve and a solenoid valve into the pneumatically driven pump. The pump increases the pressure of the water to 2000 psig. The hot, high pressure water is then sprayed through a nozzle onto the back-side of the lens. The lens is spinning during the wash process to help assure a complete surface cleaning. The spent water is collected in the bottom of the wash bowl and drained through a tube to the pump-out box. At the end of the wash cycle, the water pump stops, and any residual water downstream of the pump is emptied through the dump valve.

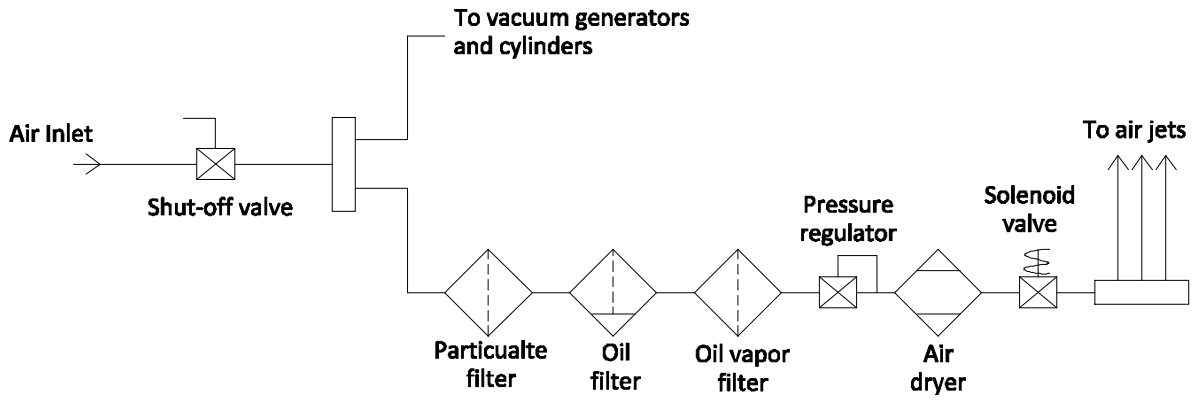


The system PLC actively monitors input from the water quality sensor and all system sequencing to control the water pump and solenoid valves. The water heater is controlled by a thermostat which is mounted directly to the water heater and is pre-set at the factory.

Dry process

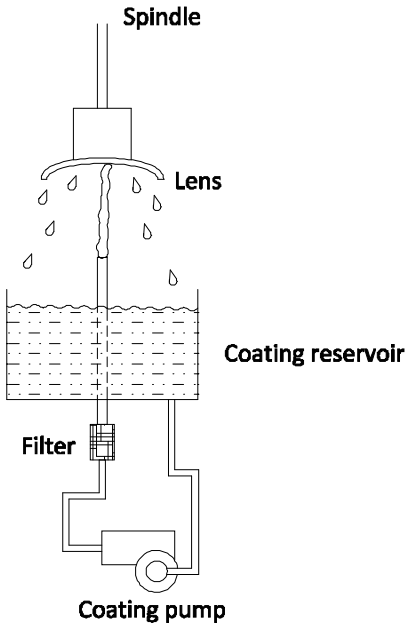
After the wash process is complete, the machine will transport the lens to the drying station. The lens is dried by use of compressed air. In the drying station the air nozzle is articulated in a manner that ensures a complete drying of the entire lens surface. Similar to the wash process, the lens is spun while in the drying station to help remove all of the water.

As shown in the diagram below, the air that is used for drying the lens passes through several filtration and drying stages to obtain the clear and dry air that is used for the drying process. The timing of the drying process is controlled by the system PLC.



Coating application

With the lens down in the coating application station, the coating pump draws coating material from the reservoir and pumps it through a filter, up to the surface of the lens. The lens is being spun during the time of application to ensure a sufficient amount of coating is applied to the entire surface. After the coating has been applied, the pump will stop and the spin speed of the lens changes to a new value which will generate the proper film thickness of coating, based upon the specific coating being used. The timing and spin speeds are controlled by the system PLC. This process is shown schematically in the following diagram.



Cure process

The 44R is designed to cure Ultra Optics' line of UV-based coatings. After the lens has completed the coating application cycle, the lift cylinder will raise the arm assembly, which will then rotate 90° and then drop down into the curing station. An ultra-violet lamp resides in the

curing station. The radiation energy from this lamp is used to effectively cure the coating to the lens with the proper characteristics of adhesion, hardness, etc. The PLC monitors the intensity of the lamp and the timing of the curing process based on the known performance and requirements of Ultra Optics' coatings.

WARNING! **An extremely intense ultraviolet light source is used to cure the coating on the lenses. Service work should not be performed on the 44R while this lamp is energized. Direct exposure to the lamp could result in severe or permanent vision loss.**

WARNING! **The ultraviolet light source produces extreme temperatures. Any work on the machine should be done with the ultraviolet lamp turned off. Leaving the lamp turned on causes risk of burning and injuring the employee.**

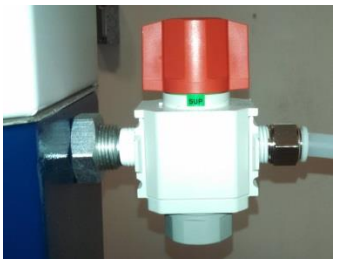
WARNING! **Do NOT use alcohol of any kind to wipe/clean the machine with the ultraviolet lamp turned on. The extreme temperatures of the lamp could cause the alcohol to ignite and start a fire**

System Operation

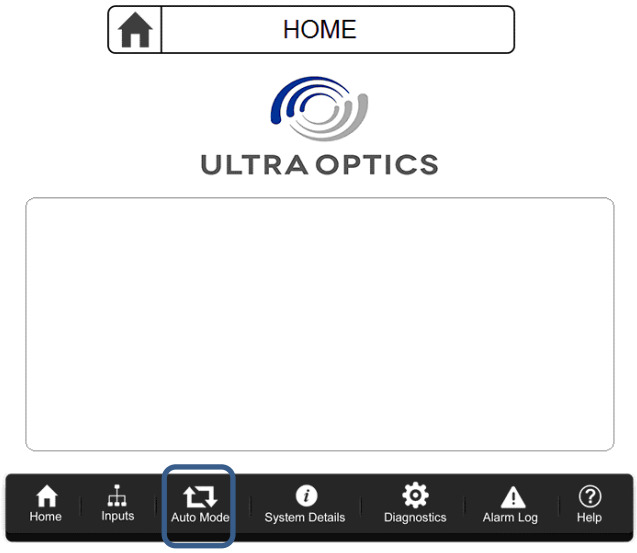
Start-up Procedure

The following procedure should be followed after the 44R has been shut-down, but not completely powered down. An example of this situation would be when the machine has been shut-down at the end of the day. This procedure does not apply to the first time the machine is powered-up. Specifically, the following procedure should be followed the next time the system is to be run after it was previously shut-down by turning off the air supply and pressing the Power button near the touchscreen.

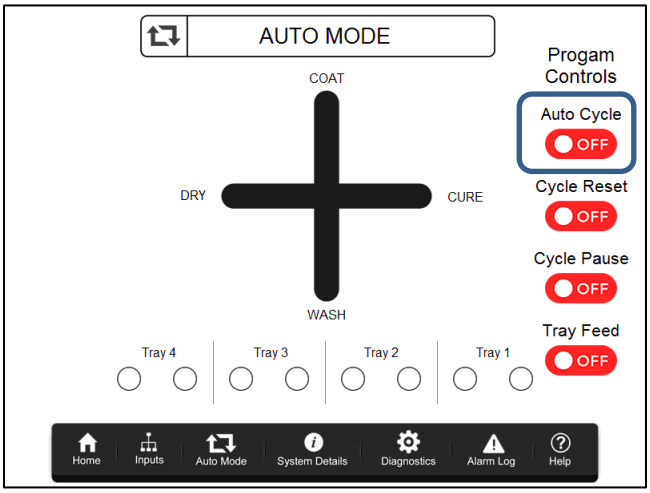
1. Perform all of the daily activities listed in the Scheduled Maintenance section of this manual (see page 19).
2. Turn on the air supply to the machine.



3. Turn the power switch to “ON” at the Operator Interface Terminal (OIT).
4. Wait for the system to warm up the UV lamp. This process can take five to 15 minutes. If it takes 15 minutes, the system will produce an alarm. In this case, please see page 43 of this manual for further instruction.
5. Go to the Production screen by touching the Auto Mode button.



6. Touch Auto Cycle to ON.



7. Begin feeding trays to the system.

Communication With Lab Management System

The 44R is designed to integrate into the lens manufacturing system by communicating with the Lab Management System (LMS). Each job tray will have a work ticket containing a barcode. As the tray enters the 44R, the barcode on the ticket will be scanned. Once the bar code is scanned, the 44R controller will communicate with the LMS software to determine how the job should be processed. After passing the job identification number to the LMS, a code which resides in the CPID field will be returned to the 44R. This code will then determine if the 44R should simply wash and dry the lens, or if it should also apply and cure the back-side hard coat.

The 44R communicates with the LMS via an Ethernet cable. It is suggested to use a cat6 cable. The cable should connect to the connector on the back of the machine, as shown in the picture below:

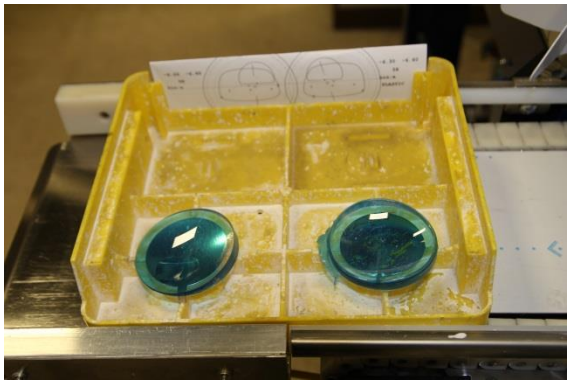
It is necessary for the Lab Manager to ensure the CPID field is being populated for all jobs running through the 44R. If there is not a code in this field, the 44R will not be able to process the job.

The codes to be used are as follows:

CPID Code	44R Action
0 (or no code returned)	Error
1	Pass the lenses through the system untouched by 44R
2	Wash and dry the lens, do not apply coating
3	Wash, dry and coat the lens

Work Feed into the Machine

Work will be fed into the machine in the standard lens trays. The blocked lenses need to rest in the tray with the backside (concave) facing up, and the block resting down in the tray. The tray needs to have the work ticket in place by double-folding it and placing it into the tray as shown in the following picture:



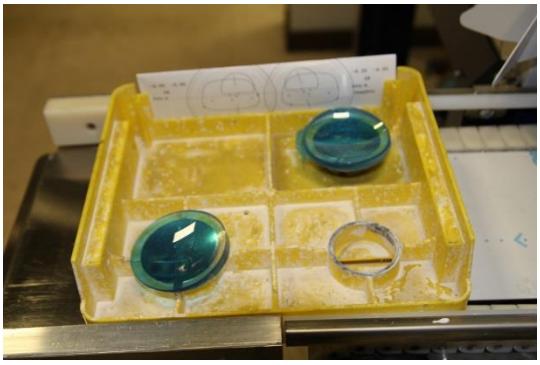
The work ticket/paperwork needs to be in the tray, double folded with the bar code facing away from the lenses. If the paperwork is not double folded, it will interfere with the robotic arm

and be separated from the tray. If the bar code is facing the wrong direction, the system will not be able to properly process the work.

The conveyor on the front of the 44R will pull trays into the machine as space permits. The system controller will monitor the presence of trays and allow them to move forward by actuating stop pins located on the bottom of the conveyor.

Loading Re-Work

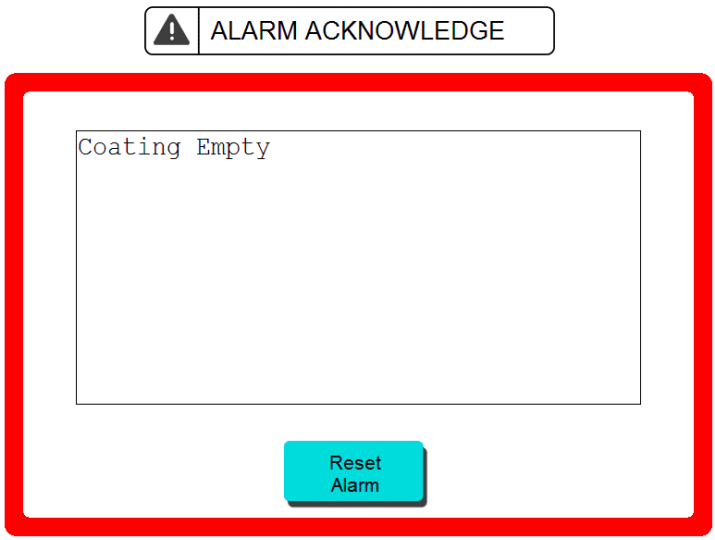
If the need arises to coat just one lens out of a pair on a particular job, simply place the lens that does not need to be coated onto the opposite side of the tray and keep the lens that does need to be coated in one of the standard locations on the tray as shown in the following picture. This allows the processing of a single lens from a pair, without the two lenses being physically separated and risk of misplacement.



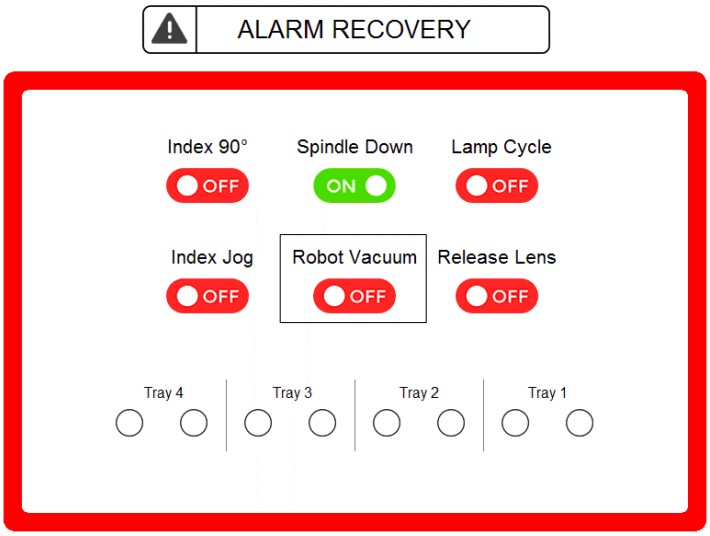
Recovery from Alarm Fault

The following procedure should be followed if the system experiences an alarm condition that causes the machine to stop processing lenses:

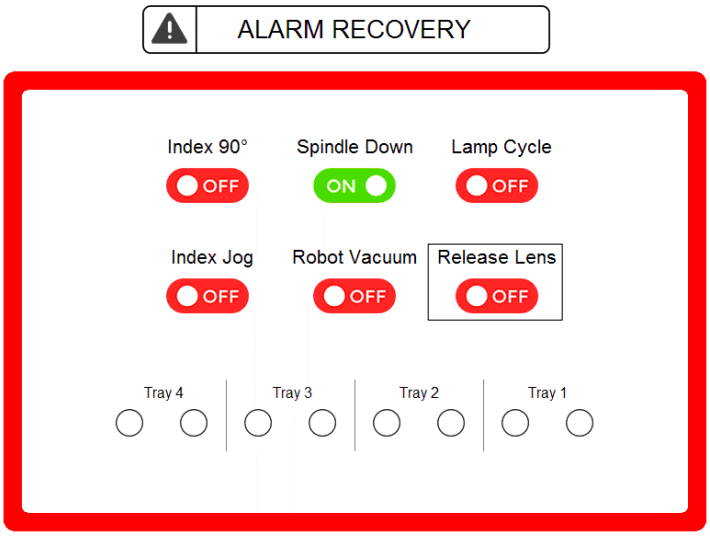
1. Press Reset Alarm



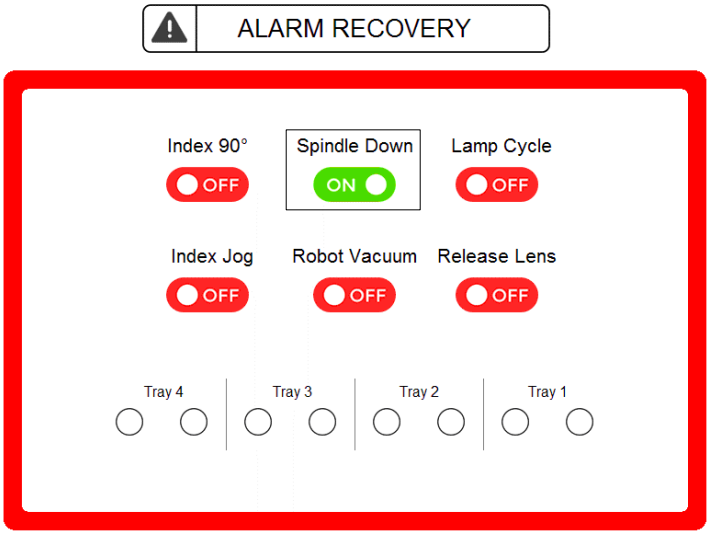
2. If lens is still on the robot, open door and grab the lens.
3. Press the Robot Vacuum button and this will release the lens on the robot suction cup



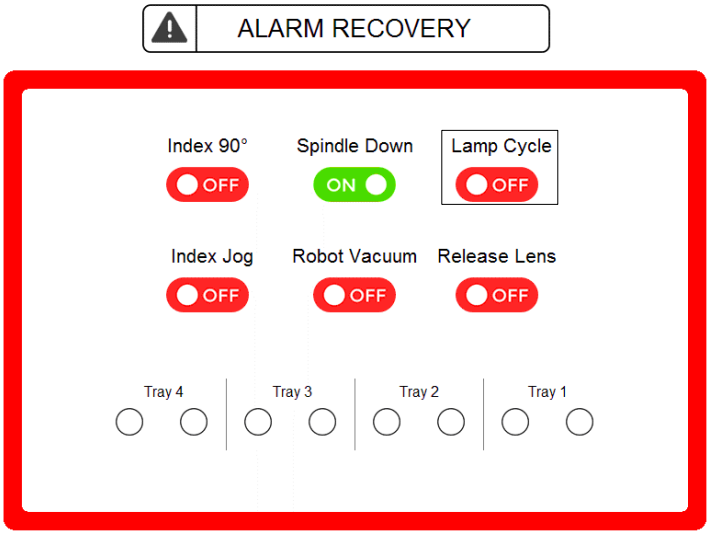
4. Return the lens to its correct tray positon as shown on the recovery screen.
5. If there is a lens in the load/unload postion, grab the lens and press the Release Lens button.



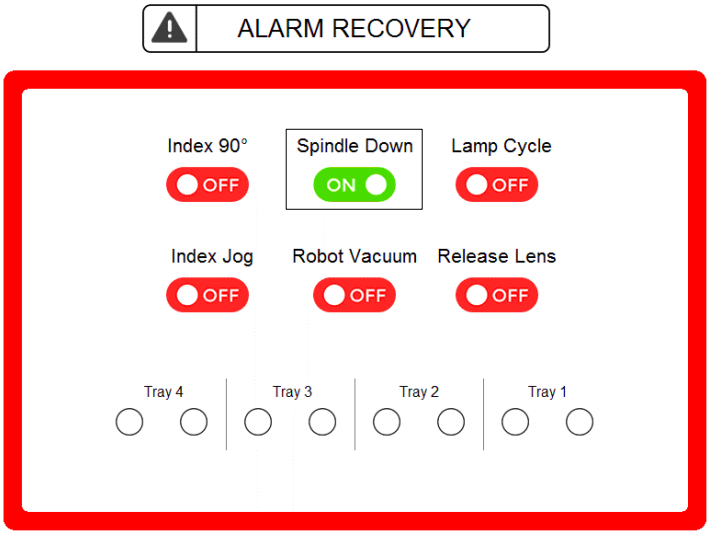
6. Return the lens to its correct tray position as shown on the recovery screen.
7. If there is a lens over the Cure position, close the door and press the Spindle Down button.



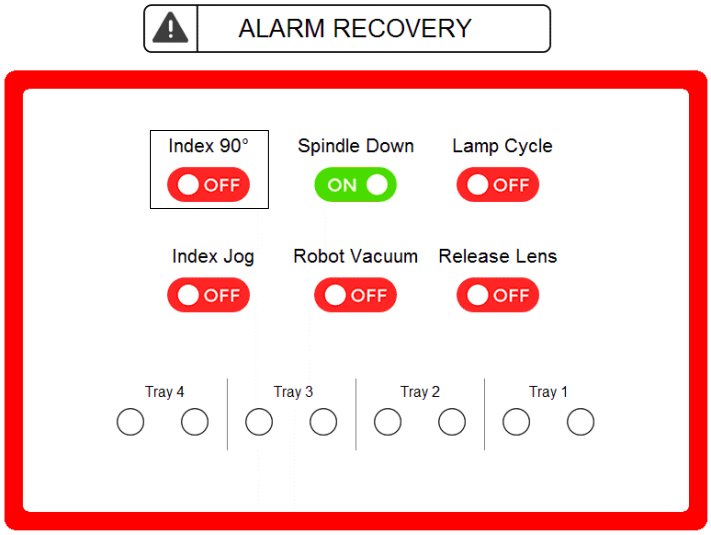
8. Once spindle is down, press the Lamp Cycle button. This will cure the coating on this lens.



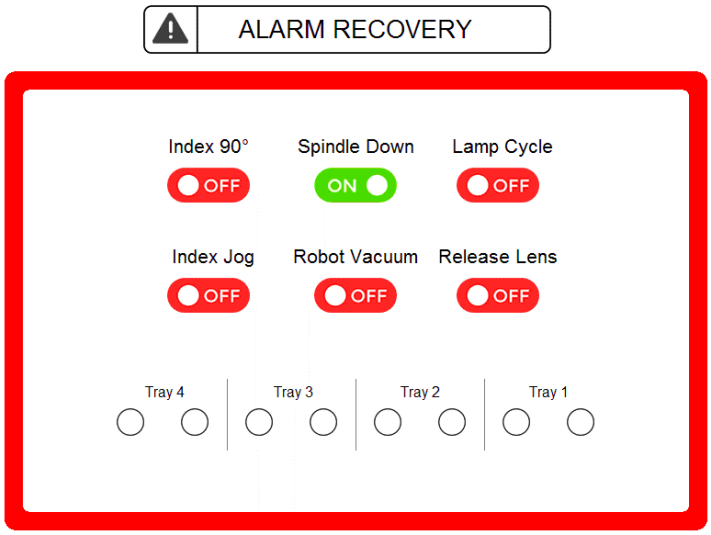
9. When the lamp cycle button turns from green to red, the cycle is complete.
10. Press the Spindle Down button again and this will return the spindles to the up position.



11. If there is no lens in the load/unload position, press the Index 90 degree until there is a lens in the load/unload position.

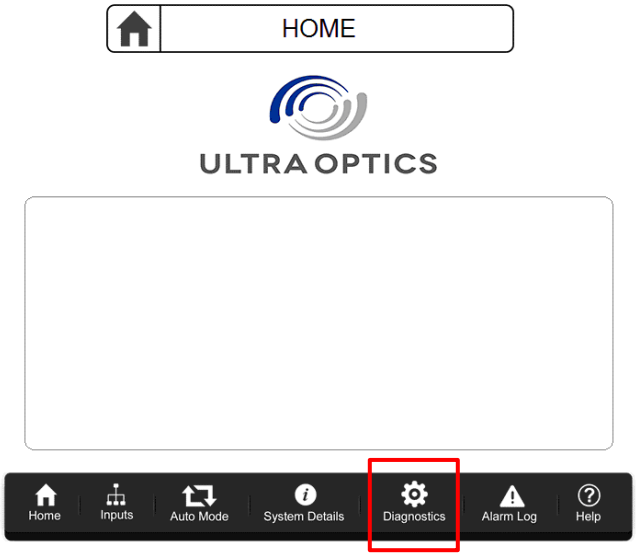


12. Open the door and grab the lens in the load/unload position, then press Release Lens button.
13. Return the lens to its correct tray positon as shown on the recovery screen.

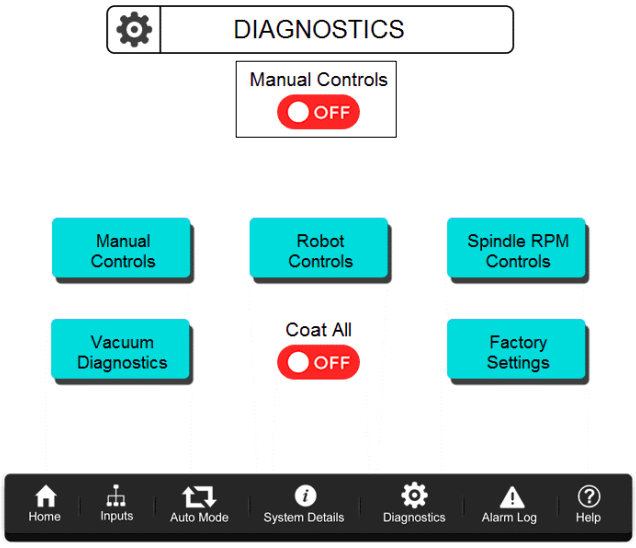


14. Unload any remaining lenses that are in the machine using the proceeding instructions and place into the trays in their correct positons shown on the recovery screen.
15. Once all lenses are in cleared out and in their tray positions, the recovery screen will disappear.

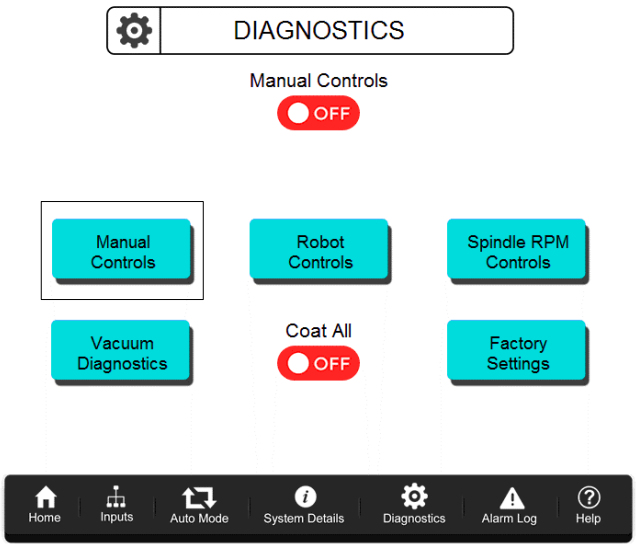
16. Press Diagnostics tab.



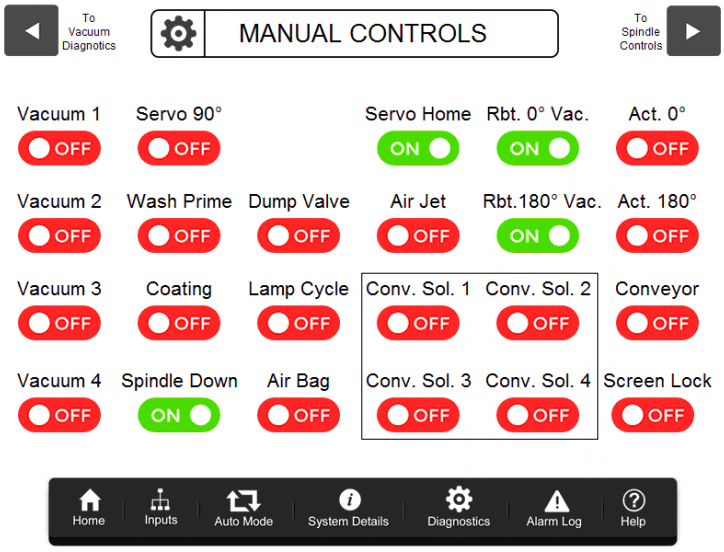
17. Press Manual Controls on/off button to turn on manual controls.



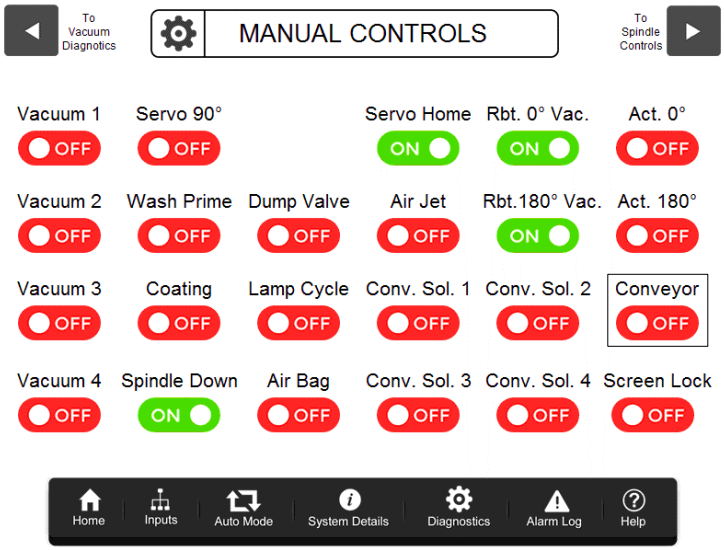
18. Press Manual Controls screen button.



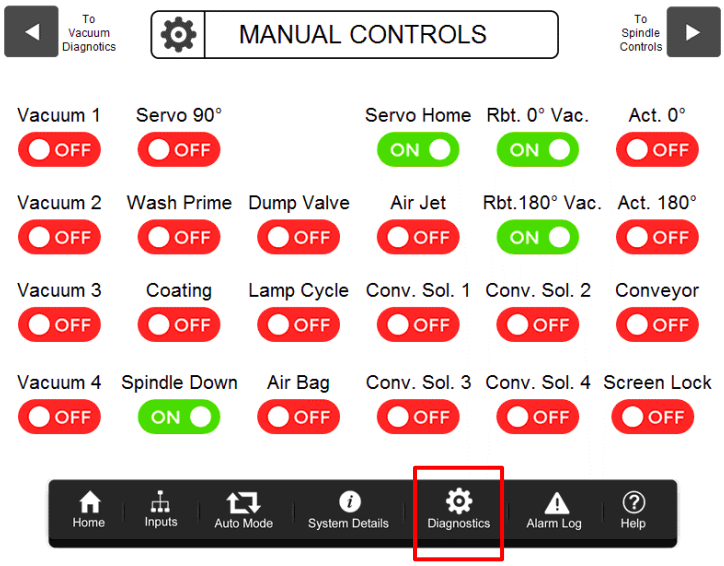
19. Turn Conv. Sol. 1,2,3, and 4 buttons on.



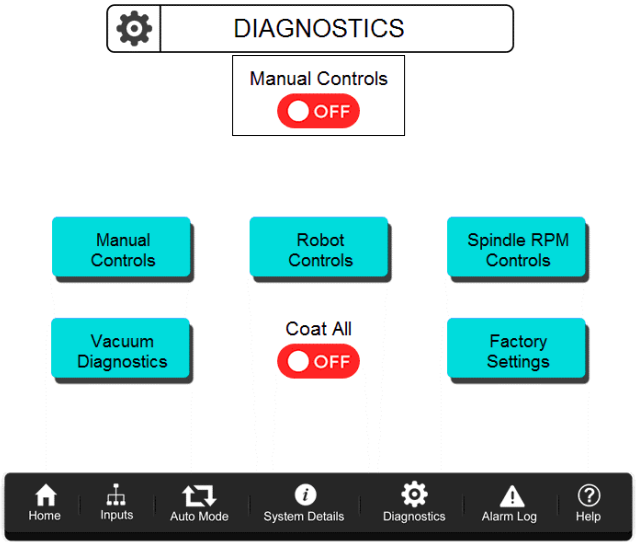
20. Press Conveyor button to turn on conveyer. This will clear all trays from the machine.
21. Press Conveyer button again to turn off conveyer once all trays are out.



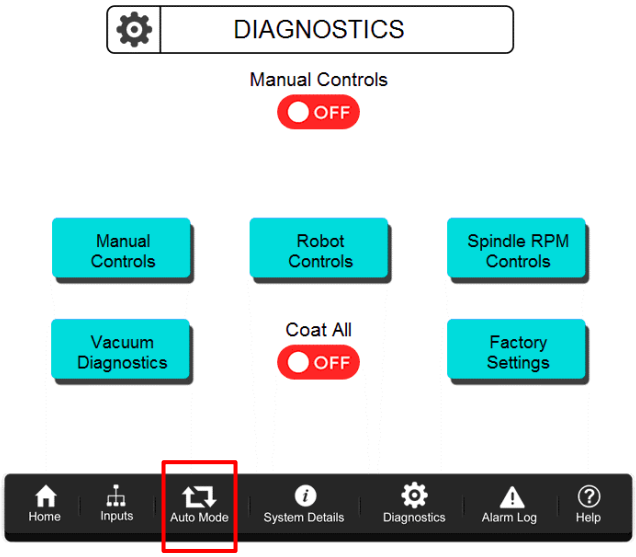
22. Reload trays that have uncoated lenses to the infeed conveyor of the machine.
23. Press Diagnotics tab.



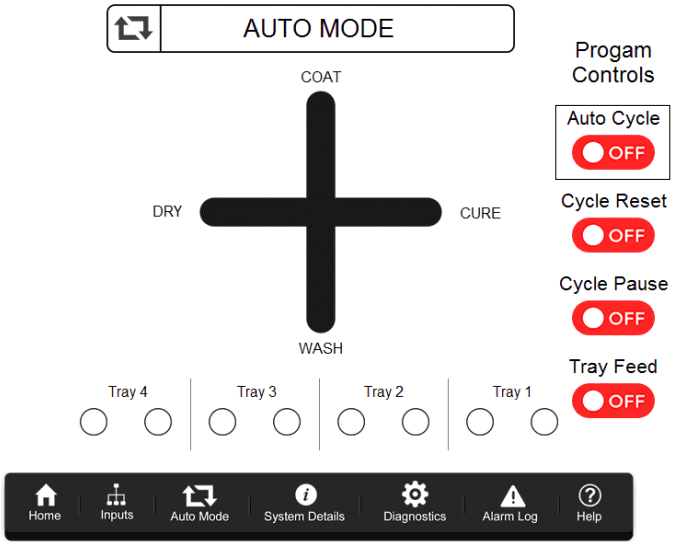
24. Press Manual Controls on/off button to turn off manual controls.



25. Press Auto Mode tab.



26. Press Auto Cycle button to start production.



Maintenance

The 44R system is designed to provide many years of reliable and efficient processing of ophthalmic lenses. Its ability to provide this service is significantly enhanced with proper maintenance. Due to the many integrated systems within the 44R, it is highly recommended that service and maintenance is only done by trained technicians. Failure to do so could result in damaged equipment, increased down time, or injury of personnel.

Scheduled Maintenance

The following table should be used as a guide for performing regular preventative maintenance on the 44R to maintain ultimate system efficiency and up-time. It is expected that the user of this machine is capable and performs the following maintenance items at the scheduled intervals.

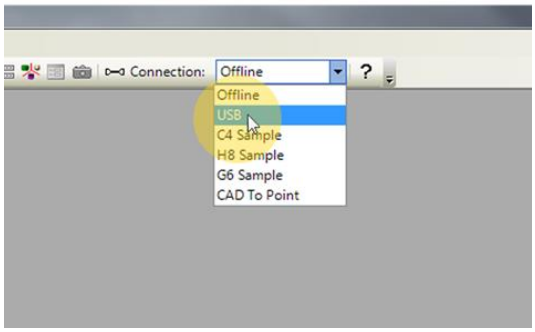
Frequency	Maintenance Item	Description
Daily	Wipe wash bowl and drying station bowl deck.	Dampen a clean cloth with Ultra Optics ClearView lens cleaner and clean out the inside of the wash bowl. **WARNING Turn ultraviolet lamp off and allow machine to cool before cleaning with any flammable material such as IPA or others.**
	Wipe inside of coating bowl	Use a lint-free rag dampened with acetone or IPA to wipe out the inside of the coating bowl and clean the screen.
	Empty drain tee and clean screen	On bottom of wash bowl is a tee trap. Remove the bottom plug and clean out any debris from the trap.
	Check coating level in reservoir	Refill as needed such that the coating level is above the halfway mark.
	Check coating fountain height	Fountain should come up to the top edge of coating bowl.
	Check lamp hours and intensity	Lamp should be replaced every 1000 hours or if intensity is less than 70%.
	Confirm wash pump is properly primed	During a wash cycle, count the number of audible “beats” by the wash pump. It should “beat” 34 times.

Weekly	Inspect suction cups for debris or deterioration	Replace as necessary
	Check spindle speeds	Refer to setting spindle speed procedure on page 37 of this manual.
	Check lamp cycle time	Should be at 25 seconds
	Check air pressure regulator	Both regulators should be adjusted to read 80 psig.
	Clean out top Hepa filter housing	Replace top pre-filter as needed using a 10” x 10” x 2” filter. • P/N 3923T999
	Check vacuum pressure	Go to *Vacuum Diagnostic* screen on HMI.
	Inspect complete vacuum chuck assembly for dried coating or debris	Clean as needed.
	Check air dryer filters	Replace all three if: • needle points to “change” • filters are moist/dirty • every six months
Monthly	Replace coating filter	P/N 4404
	Check capacitors	Primary capacitor to read 20 µf
	Ensure positive air flow	Hold tissues over openings and confirm the tissue blows out, away from the machine. Hepa fans should be on high setting at all times.
	Replace suction cups	Robot (blue) P/N VC-32W 1/8MPT Spindle (yellow) P/N VC-415 5/8-18
	Clean barcode reader	Wipe the surface of the barcode reader with warm water or Ultra Optics lens cleaner to prevent incorrect scans.
Yearly	Change robot battery	Consult factory

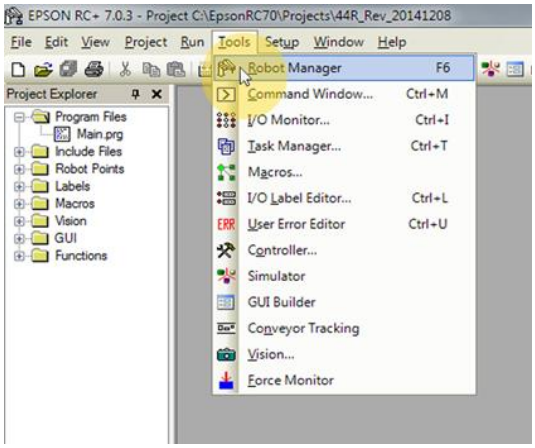
Robot Pick and Place Point Calibration

Over time, as the robot moves and turns, the pick and place points may drift out of calibration. As a result, it is necessary to re-calibrate these points to ensure secure handling of the lenses through the system. This procedure may also be required if the system gets inadvertently adjusted and no longer properly picks or places lenses into the machine or the trays. The following procedure should be used to safely re-calibrate the robot positioning:

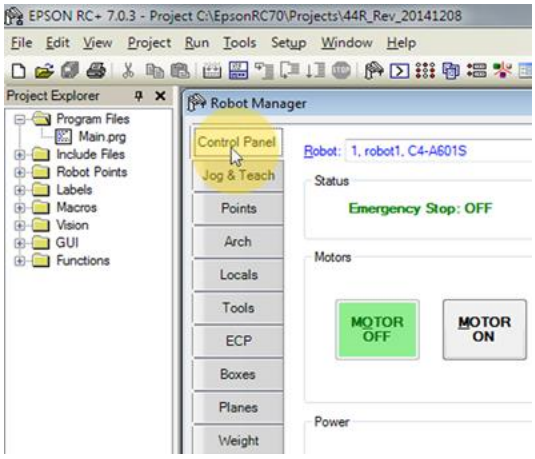
1. Under the Connection drop down, select the option for USB.



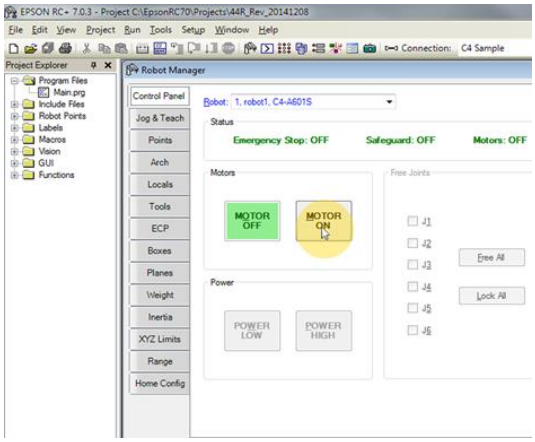
2. Under the Tools tab, select the option for Robot Manager.



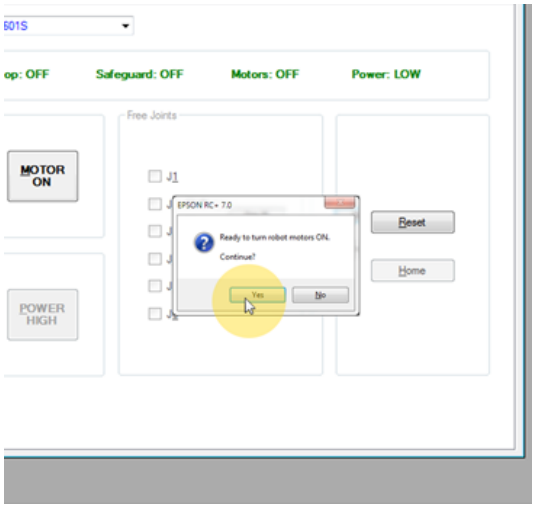
3. Select the Control Panel tab on the Robot Manager window



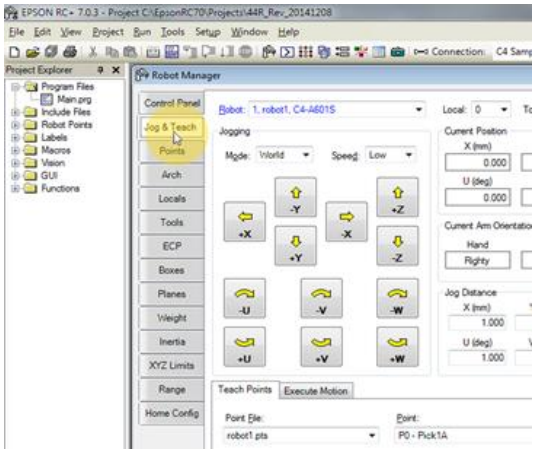
4. Select the Motor On option



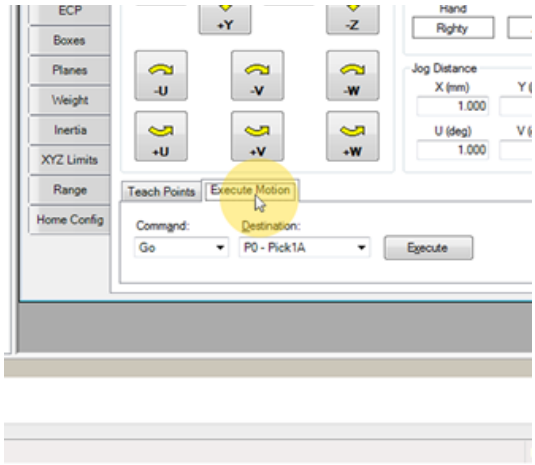
5. Click Yes to confirm



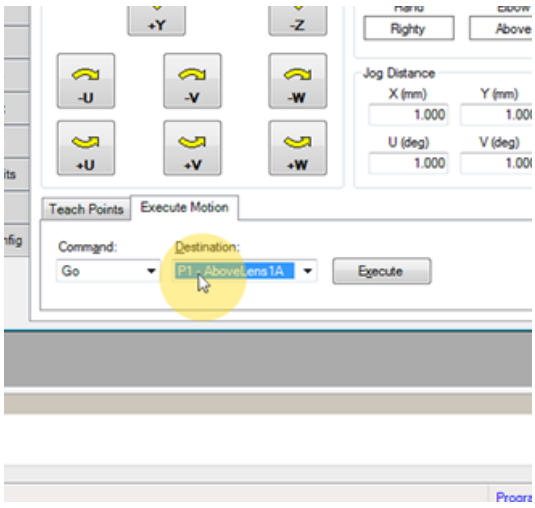
6. Select the tab for Jog & Teach



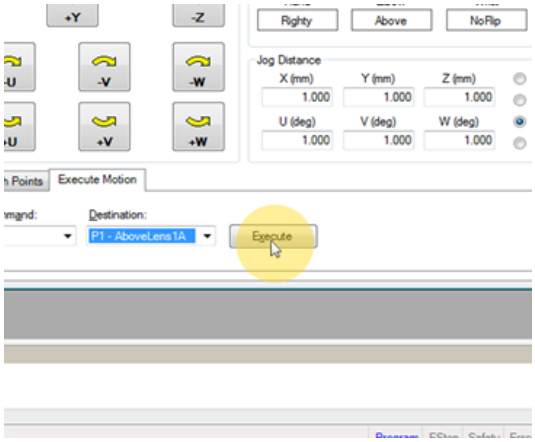
7. Select the Execute Motion Tab



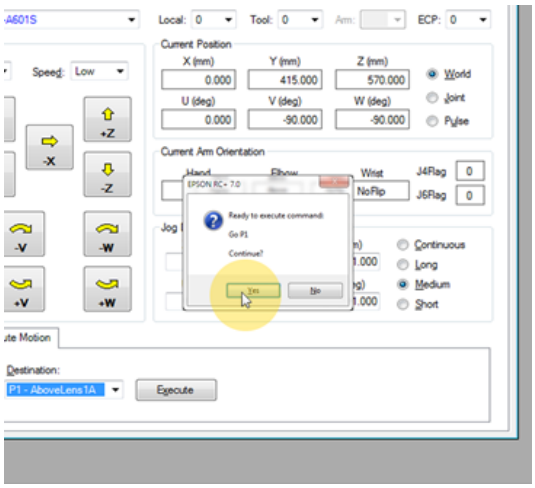
8. Select Point 01 (if machine operates left to right) or Point 23 (if machine operates right to left) from the Destination drop menu



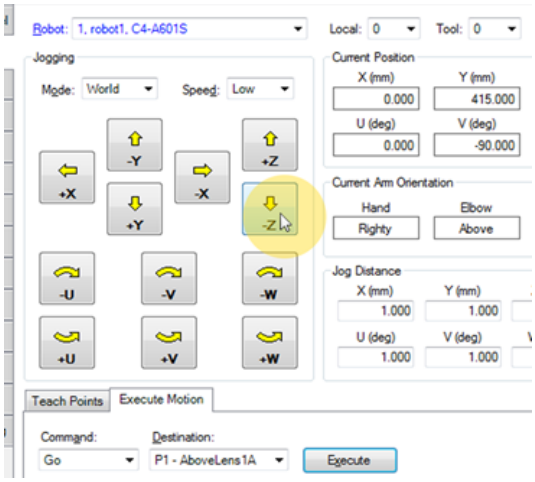
9. Select Execute



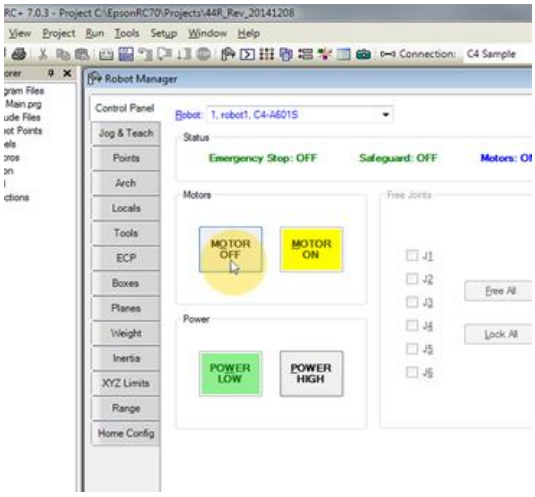
10. Select Yes to confirm



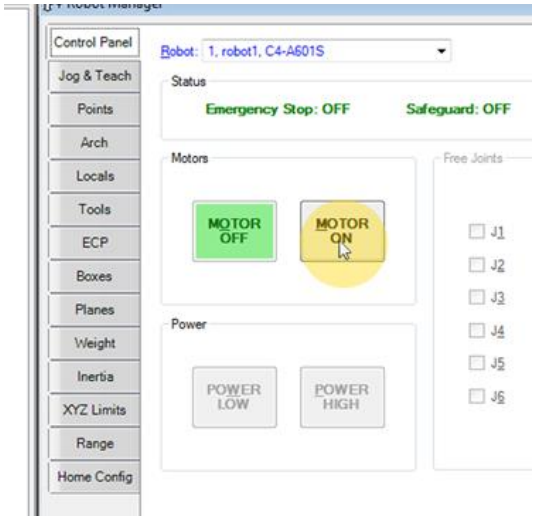
11. Move –Z Axis Until aligning pin is just above calibration tool



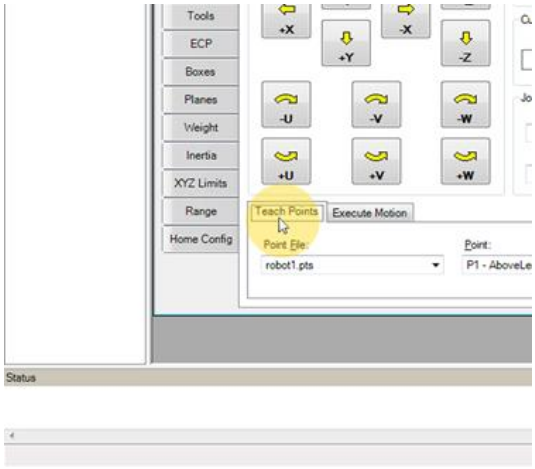
12. If pick point needs calibration, go to Control Panel tab and turn Motor Off



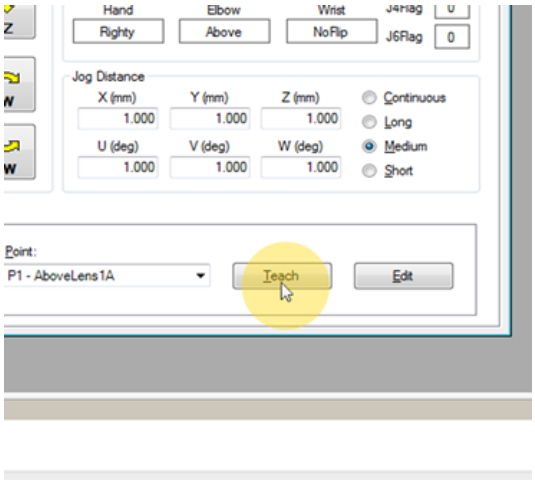
13. With Motor Off selected, depress the white button next to Motor Indicator light
14. Move aligning pin into the hole in the calibration tool until it is at the mark
15. While holding the robot in calibration position, select Motor ON



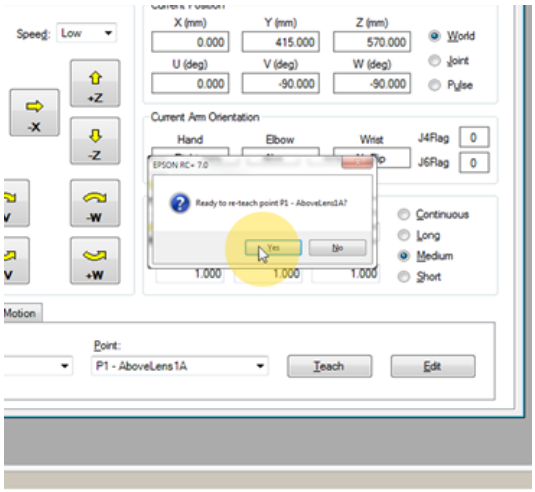
16. Select Jog & Teach tab, then select the Teach Points tab



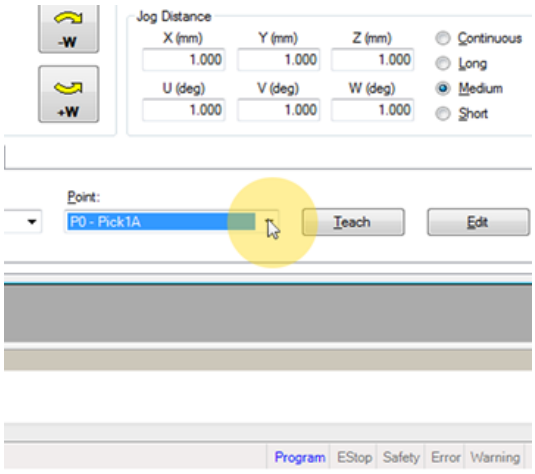
17. Select the Teach option



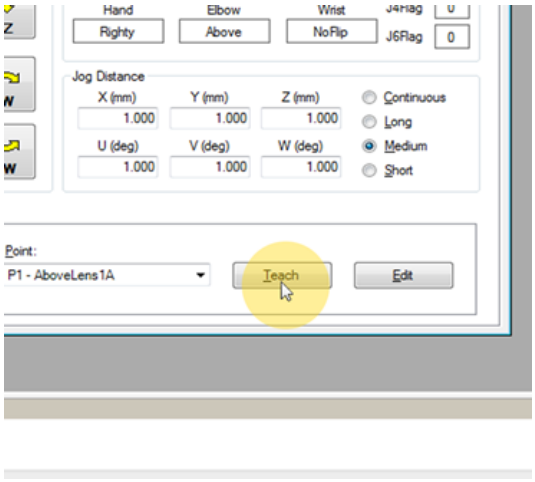
18. Select Yes to Re-Teach Point 01 (if machine is left to right) or Point 23 (if machine is right to left).



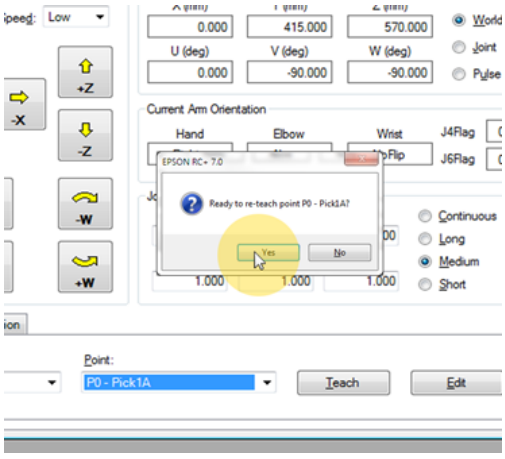
19. Select Point 00 (if machine is left to right) or Point 22 (if machine is right to left) from the Point drop down menu.



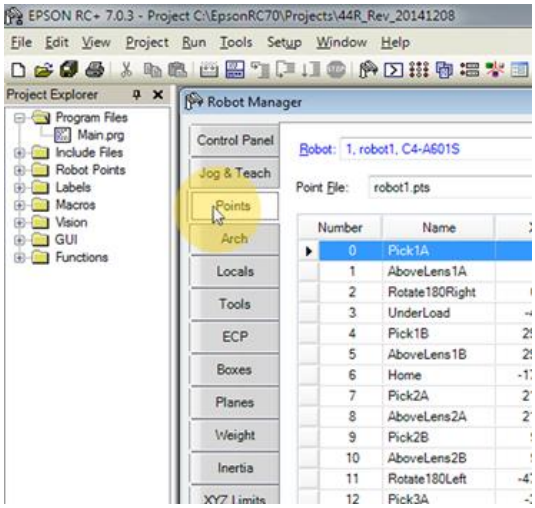
20. Select the Teach option



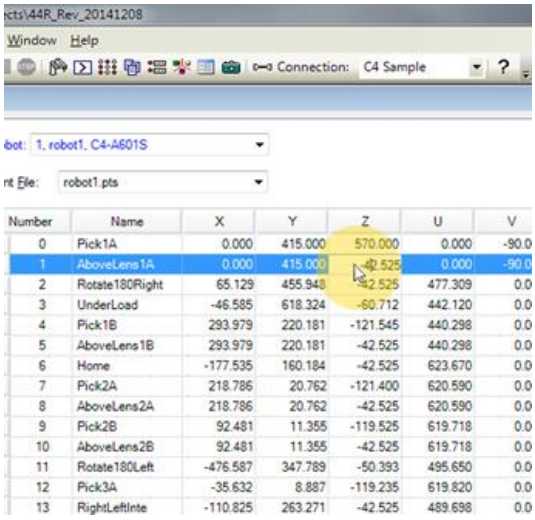
21. Select Yes to Re-Teach Point 00 (if machine is left to right) or Point 22 (if machine is right to left).



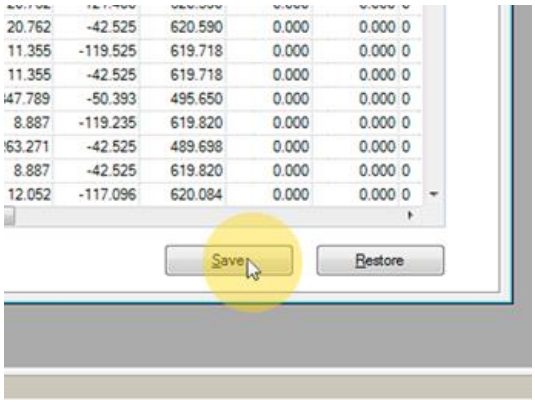
22. Select the Points tab



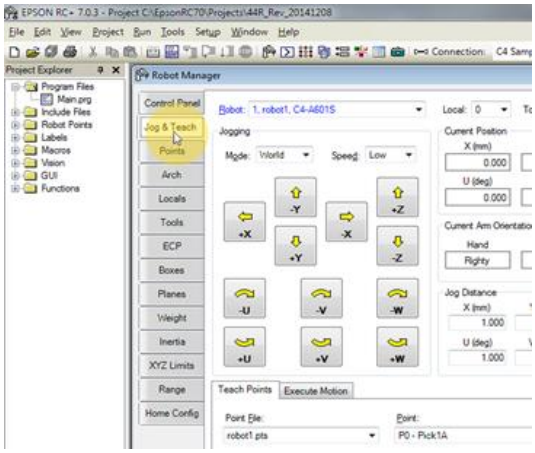
23. Change the Z axis for AboveLens1A to –42.525



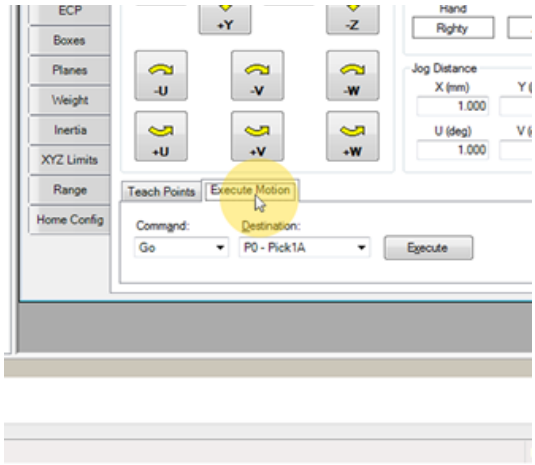
24. Select Save to save new value



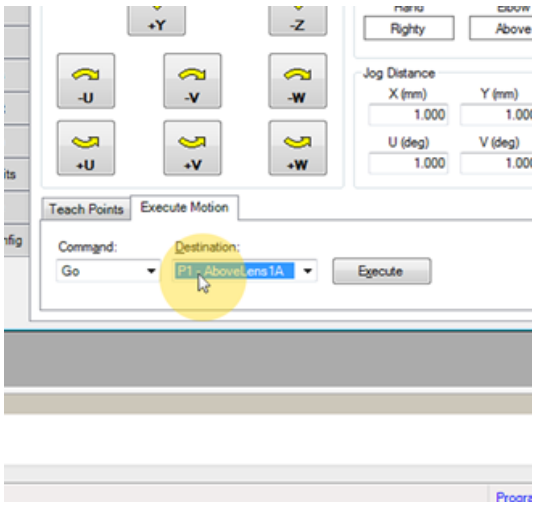
25. Select the tab for Jog & Teach



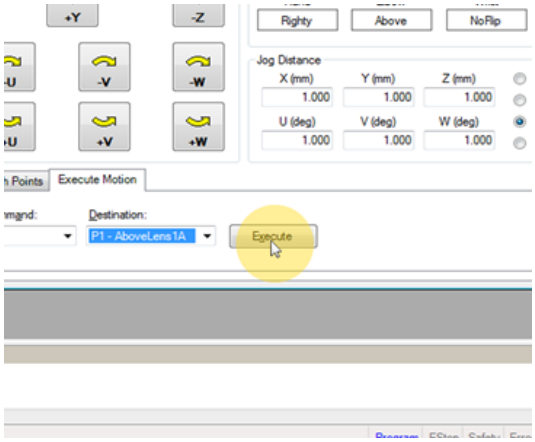
26. Select the Execute Motion Tab



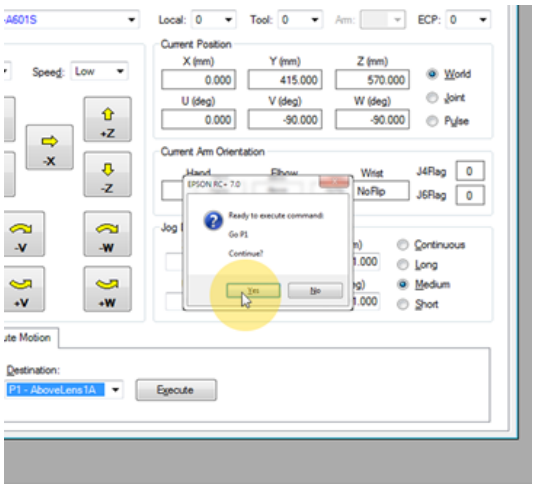
27. Select Point 01 (if machine is left to right) or Point 23 (if machine is right to left) from the Destination drop menu.



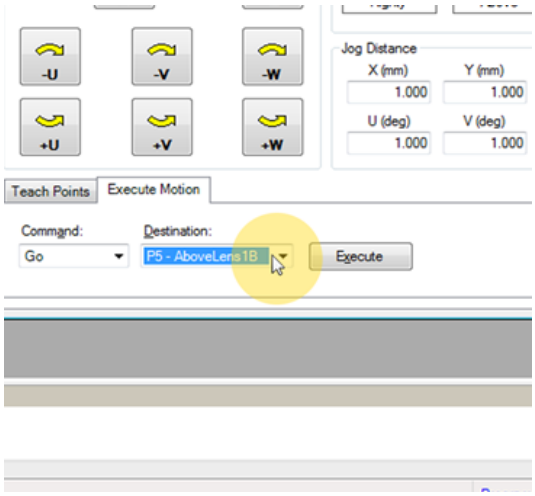
28. Select Execute



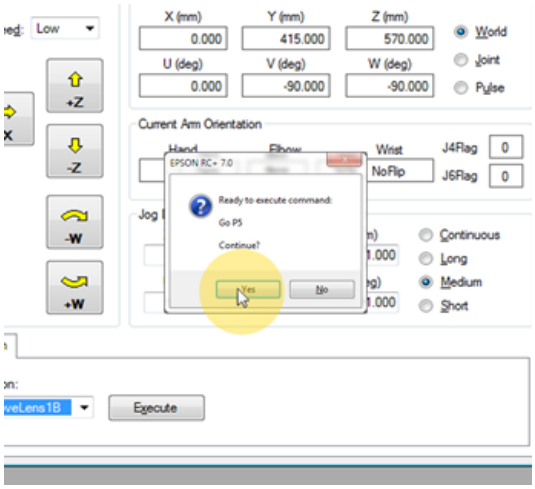
29. Select Yes to confirm



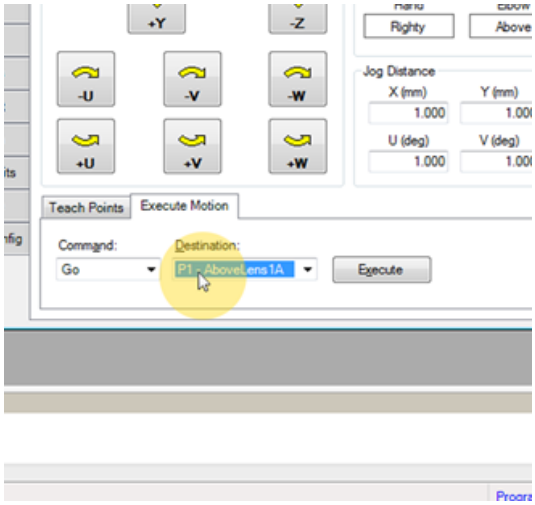
30. Select AboveLens1B from the Destination drop down menu



31. After selecting Execute, Select Yes to confirm



32. Repeat steps 9-22 for Point 03 and Point 02 (if machine is left to right) or Point 25 and Point 24 (if machine is right to left).
33. Select AboveLens1A from the Destination drop menu



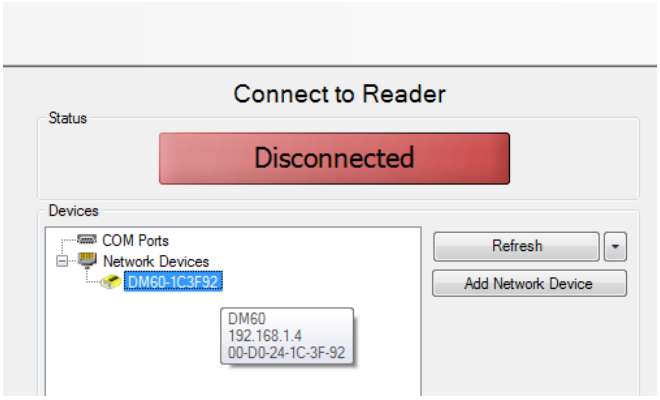
34. Remove the tray and calibration tools from Tray Position 1 and place in Tray Position 2 and repeat calibration steps

Calibrating the Cognex barcode scanner

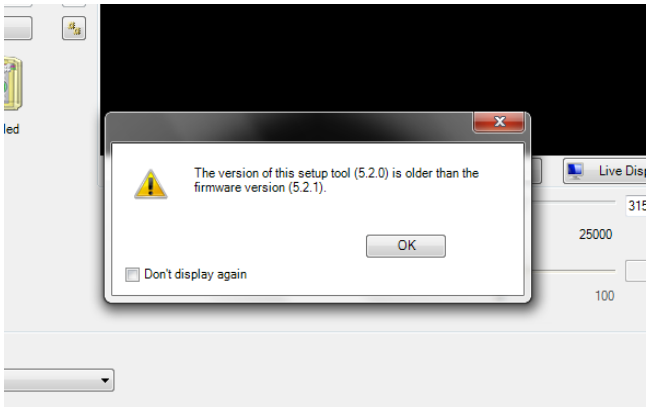
From time to time it may be necessary to re-calibrate the barcode scanner. This may result from the scanner getting bumped out of position, vibration issues, etc. If there are issues with the scanner reading properly, please follow this procedure to be sure it is properly configured and calibrated:

1. Open the current version of Dataman software (provided on initial machine start-up and training).

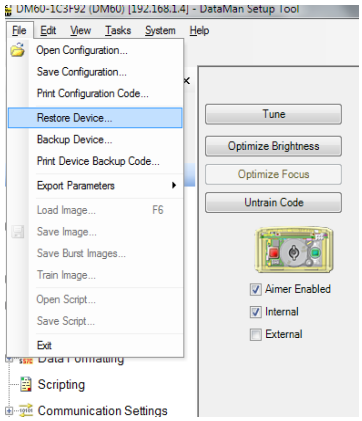
2. Double click on the DM60 device.



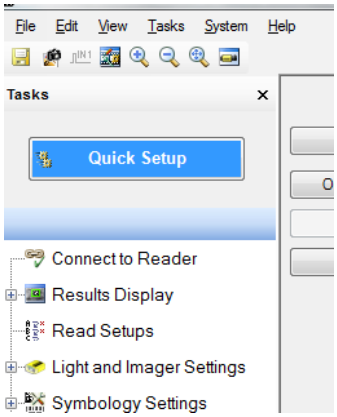
3. Click OK if this warning pops up.



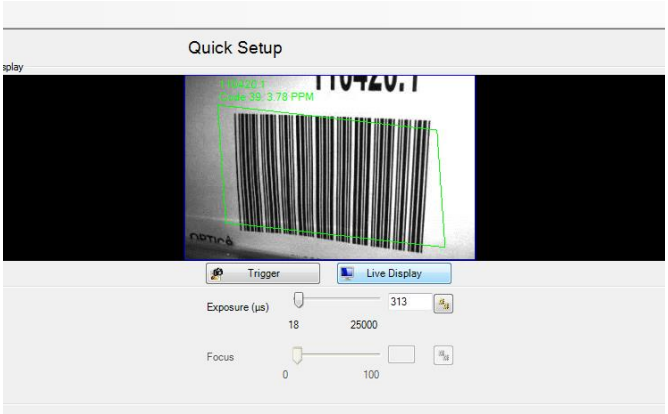
4. Under File, select Restore Device



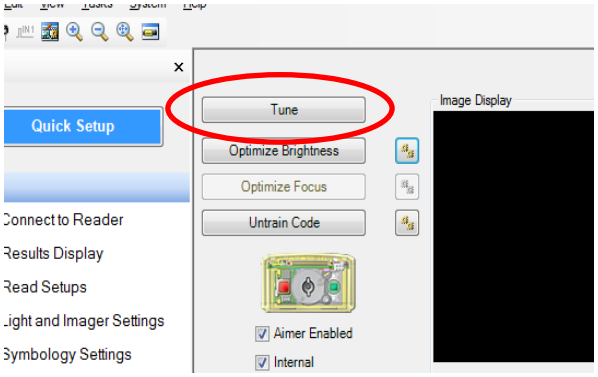
5. Click on Quick Setup



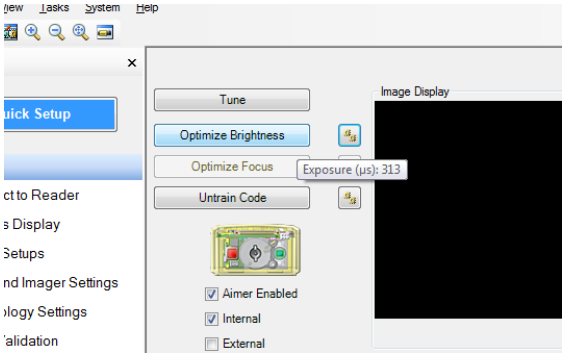
6. Click on Live Display



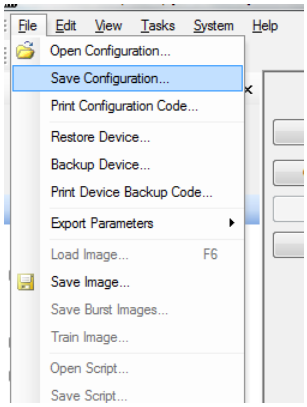
7. With a barcode in front of the reader, click on Tune



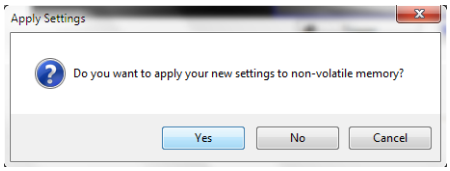
8. Click on Optimize Brightness



9. Under File, Select Save Configuration



10. Select Yes to save to non-volatile memory.



11. Close Software

Replacing Consumable Parts

It is expected that the user be capable of changing out the following consumable parts.

Hepa Pre-filter

1. Replace with new filters monthly

Hepa Filter

1. Disconnect power cable from filter unit to the top of the machine
2. Remove filter unit from machine
3. Remove 4 self-tapping screws holding filter onto filter unit
4. Place sealing foam around top edge of new HEPA filter
5. Place filter unit on top of new HEPA filter
6. Screw in self-tapping screws through filter unit into new HEPA filter
7. Place filter unit into machine
8. Connect power cord to top of machine

Light Module

1. Remove light side panel from machine
2. Open cure station door
3. Remove mounting screws from light module
4. Pull out old light module by the handle
5. Insert new light module
6. Insert mounting screws into new light module
7. Close cure station door
8. Attach light side panel to machine

Spindle Suction Cups

1. Put machine into manual mode
2. Enter manual control screen
3. Index spindles until the one you want to change is over the drying station
4. Open water side door
5. Hold clocking trip dog at top of spindle and unscrew bad suction cup
6. Screw on new suction cup
7. Tighten disc and coupler
8. Close water side door
9. Index spindles until the next suction cup to be changed is over the drying station
10. Repeat steps 4 through 8 until all suction cups are changed

Robot Suction Cups

1. Put machine into manual mode
2. Enter “robot controls” screen
3. Press “Rbt. Motor” button to turn on motor
4. Press “cup change” button
5. Open water side door
6. Unscrew bad suction cup from robot actuator
7. Screw new suction cup onto robot actuator

8. Close water side door
9. Press “home” button
10. Press “Rbt. Motor” button

Air Filter Packs

1. Turn air to the machine off
2. Press up on the bottom of the air filter canister and turn clockwise
3. Unscrew plastic retainer at the base of filter and remove old filter
4. Install new filters marker “DX” “BX” “000” in this order
5. Screw on plastic retainer
6. Reattach air canister pressing up and turning counter clockwise

Replacing sensors

Prox Sensors Index, Spindle Clocking and Lamp Home and Extend

1. Disconnect Signal cable
2. Loosen jam nut
3. Unscrew sensor
4. Replace with new sensor and jam nut
5. Adjust sensor depth until it is 2mm away from flagging mechanism
6. Tighten jam nut
7. Reconnect signal cable

Conveyor position proximity sensor

1. Two people need remove front cover of machine
2. Remove the 12 screws holding the conveyor plate to the spacers
3. Disconnect Signal cable
4. Loosen jam nut
5. Unscrew sensor
6. Replace with new sensor and jam nut
7. Adjust sensor depth until it is 2mm away from flagging mechanism
8. Tighten jam nut
9. Reconnect signal cable

Coating sensor

1. Disconnect signal cable
2. Mark the position of the top and bottom of the sensor on the coating reservoir
3. Cut zip ties and bad remove sensor
4. Loosely attach new sensor with zip ties
5. Attach signal cable
6. Slide sensor to top of coating bowl above the coating in the reservoir
7. Press in left button and hold for 3-5 seconds until the light flashes twice
8. The light should be off when you release button

9. Slide sensor down to the marks made before removing bad sensor DO NOT tighten zip ties at this point
10. The light on the new sensor should turn on when it is in position
11. Check the input on the touch screen for a check mark
12. If there isn't a check mark start over at step 6
13. When there is a check mark tighten zip ties

UV sensor

1. Remove screw that holds bracket to cure tube
2. Disconnect signal cable
3. Remove screw that hold bracket to sensor box
4. Replace with new sensor box
5. Attach to cure tube
6. Return bad sensor and box to Ultra Optics
   THERE IS A CORE CHARGE FOR THIS SENSOR AND BOX

Conveyor blocked sensor

1. Disconnect signal wire
2. Remove bad sensor from bracket
3. Attach new sensor
4. Do not adjust dials on this sensor

Water sensor

1. Turn off water
2. Disconnect power and signal cables to the sensor
3. Unscrew nut at base of sensor DO NOT REMOVE coupler from metal tee
4. Remove bad sensor
5. Install new sensor and hand tighten nut at base of sensor do not over tighten
6. Connect power and signal cables
7. Turn water on

Lift cylinder up and down sensor

1. Make a mark on the lift cylinder at the top and bottom of bad sensor
2. Disconnect signal cable from sensor
3. Loosen set screw on sensor
4. Slide bad sensor to the bottom of groove to remove bad sensor
5. Insert new sensor and slide into position between markings
6. Tighten set screw on sensor
7. Reconnect signal cable

Vacuum Sensor

1. Disconnect air tubes going into sensor
2. Disconnect signal cable
3. Connect signal cable to new sensor
4. Connect air tubes to new sensor
5. Program sensor as per instructions

Replacing the Spindle Motor Assembly

1. Remove the suction cup.
2. Disconnect the spindle motor power cable from the back of the spindle.
3. Disconnect the vacuum tubing from back of the spindle.
4. Loosen the bolt on the front tip of the spindle swing arm.
5. Pull old assembly out through the top of the arm.
6. Remove the vacuum elbow.
7. Reattach the vacuum elbow onto the new assembly.
    a. Add Teflon tape to threads if needed.
8. Slide the new assembly in to the arm making sure to line up the bottom of the vacuum elbow with the bottom of the spindle swing arm.
9. Tighten the bolt on the front tip of the spindle swing arm.
10. Reconnect the vacuum tubing to the back of the spindle.
11. Reconnect the spindle motor power cable on the back of the spindle.
12. Reattach the suction cup.

Replacement/Adjustment of the Robot 180 Degree Actuator

1. Turn off machine power and air.
2. Remove the sensor retaining thumb screw.
3. Label and unplug both sensors.
4. Label and unplug both orange air lines.
5. Remove both flow control elbows.
6. Remove the four bolts on the top of the actuator mounting bracket.
7. Loosen the four bolts on the suction cup tool to separate the tool from the actuator.
8. Slide the new actuator into the suction cup tool and retighten all four bolts.
9. Align the actuator into the mounting bracket and reinsert all four bolts.
10. Reinstall both flow control elbows.
    a. Add Teflon tape on the threads if needed.
11. Reattach both orange air lines according to how they were labeled.
12. Reattach both sensors according to how they were labeled.
13. Lock sensors in place by reattaching the retaining thumb screw.
14. Turn machine power and air back on.
15. Use the two flow controls elbows to adjust the speed of rotation if needed.

Adjusting Speed Settings

Conveyor

1. Put machine into manual mode
2. Enter “manual Control” screen
3. Remove small access panel from water side panel
4. Locate conveyor potentiometer
5. Press “Conveyor” button to turn on conveyor
6. Turn potentiometer clock wise to increase speed counter clockwise to decrease speed
7. Press “Conveyor” button to turn off conveyor
8. Attach small access panel to water side panel

Spindles

1. Remove small access panel on left side of the 44R and locate the wash, coat, and spin off potentiometers.

2. On the touchscreen, press the Diagnostics tab.
3. Turn on Manual Controls.
4. Press the Spindle RPM Controls menu button.
5. Press the Index 90 degree till the desired spindle is over the Drying bowl.
6. Attach a small sliver of reflective tape on to the suction cup.
7. Turn on the Spindle Coat option for the spindle being tested.
8. Use the tachometer to test the Coat speed for 400 RPM
9. If adjustment needs to be made, use adjustment knob in right panel labeled Coat.
10. With the Spindle Coat option still on, turn on Coat Spin Off.
11. Use the tachometer to test the Coat Spin Off speed for 2000 RPM for UN-NV coating or 1600 RPM for AST-1 coating.
12. If adjustment needs to be made, use adjustment knob in right panel labeled Coat Spin Off.
13. Turn the Coat Spin Off option off.
14. With the Spindle Coat option still on, turn on Wash Speed.
15. Use the tachometer to test the Wash Speed for 1800 RPM.
16. If adjustment needs to be made, use adjustment knob in right panel labeled Wash.
17. Turn off Wash Speed.
18. Turn off Spindle Coat.
19. Repeat for each spindle.
20. Note that when making a change on one spindle with the adjustment knobs that all the spindles will change.
21. Replace access door.

Lamp

1. Remove small access panel on left side of the 44R and locate the lamp potentiometer.
2. On the touchscreen, press the Diagnostic tab.
3. Turn on Manual Controls.
4. Press the Manual Controls menu button.
5. Turn on Lamp Cycle and time the movement of the lamp.
6. One complete cycle should be 25 seconds.
7. To adjust lamp cycle time turn the lamp potentiometer left to increase cycle time, right to shorten.
8. Replace access door.

Air Regulator Adjustment

1. Take off the large removable panel on the left side of the 44R.
2. Locate either of the air regulator mounted on the inner well.
3. Check that the air gauges on the regulators are reading 80 PSI.
4. If an adjustment needs to be made, pull down on the regulator adjustment cap and turn until the air gauge reads 80 PSI.
5. Push adjustment cap back up to lock in place.

Replacement/Adjustment of the Conveyor Drive Belt

1. Remove the drive belt housing cover.
2. To replace belt
   a. Loosen the tension pulley using the top bolt.
   b. Pull old belt off of the assembly.
   c. Attach the new belt on to the assembly
3. To tighten
   a. Loosen the tension pulley using the top bolt.
   b. Put pressure towards the belt on the bottom bearing side of tension pulley.
   c. Tighten bolt on top of tension pulley while maintaining pressure on belt to lock tension in place.
4. Reattach cover to drive belt housing.

Alarm Codes

PLC Tag	Alarm Message	Cause
R0184	Coating Empty	This alarm occurs when 1000 lenses have been coated since the coating low warning first appeared. Until coating is added machine will not run any more lenses.
R022F	E-Stop	Emergency stop button has been pressed.
R0176	Failed To Load Lens Spindle 1	Robot was unsuccessful in loading a lens into spindle 1. Two attempts were made. Check robot pick points for calibration, servo motor indexing for calibration, vacuum readings on spindle 16 or higher with lens, suction cup in good shape. Lenses are in correct tray position.
R0185	Failed To Load Lens Spindle 2	Robot was unsuccessful in loading a lens into spindle 2. Two attempts were made. Check robot pick points for calibration, servo motor indexing for calibration, vacuum readings on spindle 16 or higher with lens, suction cup in good shape. Lenses are in correct tray position.
R0186	Failed To Load Lens Spindle 3	Robot was unsuccessful in loading a lens into spindle 3. Two attempts were made. Check robot pick points for calibration, servo motor indexing for calibration, vacuum readings on spindle 16 or higher with lens, suction cup in good shape. Lenses are in correct tray position.
R0187	Failed To Load Lens Spindle 4	Robot was unsuccessful in loading a lens into spindle 4. Two attempts were made. Check robot pick points for calibration, servo motor indexing for calibration, vacuum readings on spindle 16 or higher with lens, suction cup in good shape. Lenses are in correct tray position.
R0182	Indexing Stopped Out Of Position	Spindle arm is not in position after indexing stopped. Check spindle alignment prox and absence of servo "in position" signal (x302). Either will cause this alarm.
R004A	Lens Processing Stalled	Machine has been processing lenses for too long (60 sec). One or more processes (wash, dry, coat, cure) are likely stalled.
R0028	Machine Request For Rbt. Interaction Failed	Robot has been requested to load, unload, or swap lenses; but hasn't been available to follow through on the request for the past 30 seconds. Check orange power light is lit on robot.
R0008	No Rbt. Ack. Of Load Lens Cmd.	Robot did not acknowledge the PLC's request to load a lens. Is communication cable connected? Check orange power light is lit on robot. Check robot status for any alarms (e-stop) or that enable I/O remote was

		not activated on Epson software when a laptop was connected to controller.
R000C	No Rbt. Ack. Of Unload Lens Cmd.	Robot did not acknowledge the PLC's request to unload a lens. Is communication cable connected? Check orange power light is lit on robot.
R000A	No Rbt. Act. Of Swap Lens Cmd.	Robot did not acknowledge the PLC's request to swap lenses. Is communication cable connected? Check orange power light is lit on robot.
R0009	Rbt. Failed To Exe. Load Lens Cmd.	Robot did not send confirmation that the load lens command has been completed. Is communication cable connected? Check orange power light is lit on robot.
R000B	Rbt. Failed To Exe. Swap Lens Cmd.	Robot did not send confirmation that the swap lens command has been completed. Is communication cable connected? Check orange power light is lit on robot.
R000D	Rbt. Failed To Exe. Unload Lens Cmd.	Robot did not send confirmation that the unload lens command has been completed. Is communication cable connected? Check orange power light is lit on robot.
R016C	Robot Failed to Pick New Lens	Robot was unsuccessful in picking a lens. Check robot suction cups, robot pick height, and robot vacuum.
R0237	Robot Lost Lens	Robot has lost vacuum signal. Check robot vacuum, should be over 16 with lens on suction cup, suction cup for tears or damage, and actuator rotation speed.
R012C	Robot Not Ready	The robot "ready" signal to the PLC is not energized. This check occurs when system is starting -up. Check robot status for any alarms (e-stop) or that enable I/O remote was not activated on Epson software when a laptop was connected to controller.
R0007	Robot Not Starting	The robot "running" signal to the PLC is not energized. This check occurs when system is starting -up. Check robot status. Check robot status for any alarms (e-stop) or that enable I/O remote was not activated on Epson software when a laptop was connected to controller.
R000E	Robot Pick Ack. Failed	Robot did not acknowledge the PLC's request to pick the next lens. Is communication cable connected? Check orange power light is lit on robot.
R000F	Robot Pick Cmd. Failed	Robot did not send confirmation that the pick lens command has been completed. Is communication cable connected? Check orange power light is lit on robot.
R0010	Robot Place Ack. Failed	Robot did not acknowledge the PLC's request to place the finished lens. Is communication cable connected?
R0015	Robot Place Cmd. Failed	Robot did not send confirmation that the place lens command has been completed. Is communication cable connected?

R0048	Servo Faulted	The servo drive has faulted. Check the servo drive status and wiring from the servo drive. This is a fail-safe connection; if the circuit opens, fault will also occur.
R004F	Servo Homing Failed	The servo drive has not homed within two minutes of trying. Check spindle alignment prox since those are also read by the servo drive to determine home position.
R0051	Servo Lost Home Position	The servo drive has lost its home position. Check servo drive status and the wiring of the Absolute Position Valid signal from the servo drive to the PLC.
R017D	Spindle 1 Lost Lens	Check spindle vacuum, should be over 16. Check vacuum tubing connections, blocking for incomplete sealing area for suction cup, bad vacuum gauge, or bad wiring connection at vacuum gauge.
R019C	Spindle 1 No Spin	The lens orientation sensor did not read anything. Check that motor is turning, orientation sensor is properly adjusted, and that sensor is working. Will read any steel or magnet.
R017E	Spindle 2 Lost Lens	Check spindle vacuum, should be over 16. Check vacuum tubing connections, blocking for incomplete sealing area for suction cup, bad vacuum gauge, or bad wiring connection at vacuum gauge.
R019D	Spindle 2 No Spin	The lens orientation sensor did not read anything. Check that motor is turning, orientation sensor is properly adjusted, and that sensor is working. Will read any steel or magnet.
R017F	Spindle 3 Lost Lens	Check spindle vacuum, should be over 16. Check vacuum tubing connections, blocking for incomplete sealing area for suction cup, bad vacuum gauge, or bad wiring connection at vacuum gauge.
R019E	Spindle 3 No Spin	The lens orientation sensor did not read anything. Check that motor is turning, orientation sensor is properly adjusted, and that sensor is working. Will read any steel or magnet.
R0180	Spindle 4 Lost Lens	Check spindle vacuum, should be over 16. Check vacuum tubing connections, blocking for incomplete sealing area for suction cup, bad vacuum gauge, or bad wiring connection at vacuum gauge.
R019F	Spindle 4 No Spin	The lens orientation sensor did not read anything. Check that motor is turning, orientation sensor is properly adjusted, and that sensor is working. Will read any steel or magnet.
R0114	Spindle Alignment Error	Spindle arm is not properly aligned when trying to send a down-spindle command. Check spindle alignment prox and/or servo drive programming.
R003B	Spindle Down Cmd. Failed	Spindle down command failed. Spindle was sent down; but the down position prox was never detected. Check the down position prox switch. If cylinder is still in up position check voltage on X5 output on PLC,

		solenoid down valve. Also check machine has air pressure.
R0183	Spindle Down Sensor Failed	Spindle down sensor did not detect the spindle being in the down position for the entire time the machine was processing lenses (wash, dry, coat, cure). Sensor may have flickered. Sensor is usually adjusted to high. Cylinder activates sensor and then goes past.
R0219	Spindle Out Of Sequence	Spindle arm indexed to an unexpected position. Check spindle alignment prox and/or servo drive programming.
R0181	Spindle Up Cmd. Failed	Spindle up command failed. Spindle was sent up; but the up position prox was never detected. Check the up position prox switch. If cylinder still down check PLC output X4 for voltage, and up solenoid valve. Also check machine has air pressure.
R0191	Spindle Up/Down Prox On	Spindle up & down sensors are both on at the same time. The sensor that is activated that should not be is stuck on.
R018C	Tray 1 Failed To Move	Check that tray 1 is not blocked from moving. Tray stop 1 actuator is working; tray 1 sensor is not stuck on.
R018B	Tray 2 Failed To Move	Check that tray 2 is not blocked from moving. Tray stop 2 actuator is working; tray 2 sensor is not stuck on.
R018A	Tray 3 Failed To Move	Check that tray 3 is not blocked from moving. Tray stop 3 actuator is working; tray 3 sensor is not stuck on.
R0189	Tray 4 Failed To Move	Check that tray 4 is not blocked from moving. Tray stop 4 actuator is working; tray 4 sensor is not stuck on.
R0197	UV Lamp Extended Prox Failed	Failed to detect the "extended" prox when cycling the lamp. Check the "extended" prox switch. Adjust prox switch to read lamp.
R0192	UV Lamp Home Prox Failed	Failed to detect the "home" prox when cycling the lamp. Check the "home" prox switch. Adjust prox switch to read lamp.
R0193	UV Lamp Lost Power	UV lamp intensity did not meet/exceed set point during curing cycle. Check UV lamp and sensor.
R0208	UV Lamp Not Moving	The lamp is not moving off of the prox switch. Check both prox switches. Also check that lamp motor is moving.
R0039	UV Lamp Test Failed	UV lamp has failed to reach proper intensity during start-up on 10 consecutive attempts. Check UV lamp and sensor.