TSR2000 SERIES
DISPENSING ROBOTS
SMART SOFTWARE

USER GUIDE

7000-6490_A

CONTENTS

12. LIMITED WARRANTY

OK International warrants this product to the original purchaser for a period of one (1) years from date of purchase to be free from material and workmanship defects but not normal wear-and-tear, abuse and faulty installation. Defective product or subassembly and components under warranty will be repaired or replaced (at OK International's option) free of charge. Customer with defective product under warranty must contact the nearest OK International office or distributor to secure a return authorization prior to shipping the product to the assigned OK International authorized service center. For nearest OK International office or distributor contact information, please visit www.techconsystems.com. OK International reserves the right to make engineering product changes without notice.

Congratulations on the purchase of a Techcon Systems Automated Dispensing Robot Upgrade Kit.

Now that your dispensing system is ready to use, please take a few moments to get to know the parts of your dispensing system and software. This Quickstart Guide is designed to help you use the robot with the TSR Upgrade Kit as quickly as possible.

We here at Techcon Systems hope you find this product beneficial. If you have any questions, please do not hesitate to contact us at one of the resources listed below:

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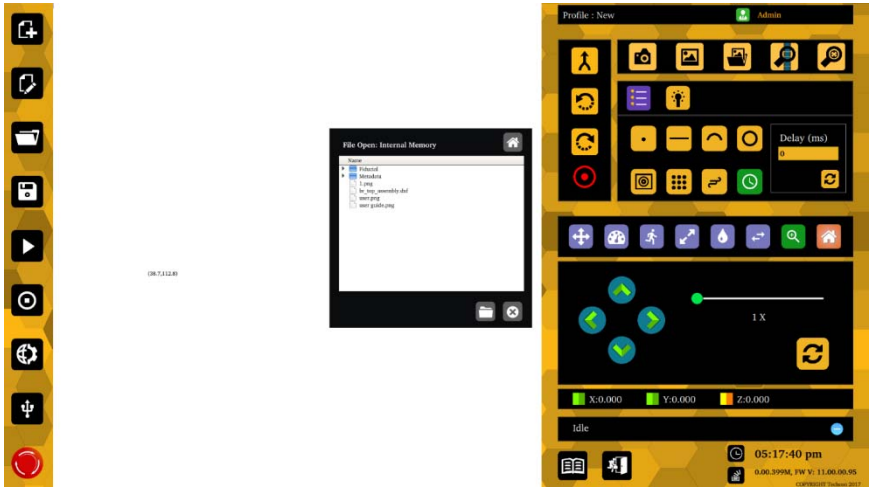
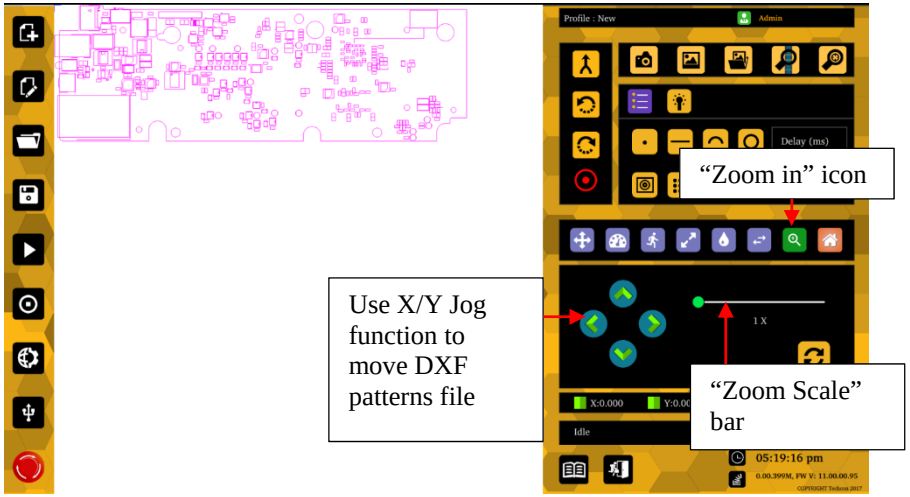
Or visit www.techconsystems.com

WARNING! CALIBRATION IS REQUIRED BEFORE USING ANY SMART SOFTWARE FEATURES. FAILURE TO DO SO MAY RESULT IN DAMAGE TO UNIT



4. The patterns in the DXF file will appear in the working envelope as shown in example screen below.

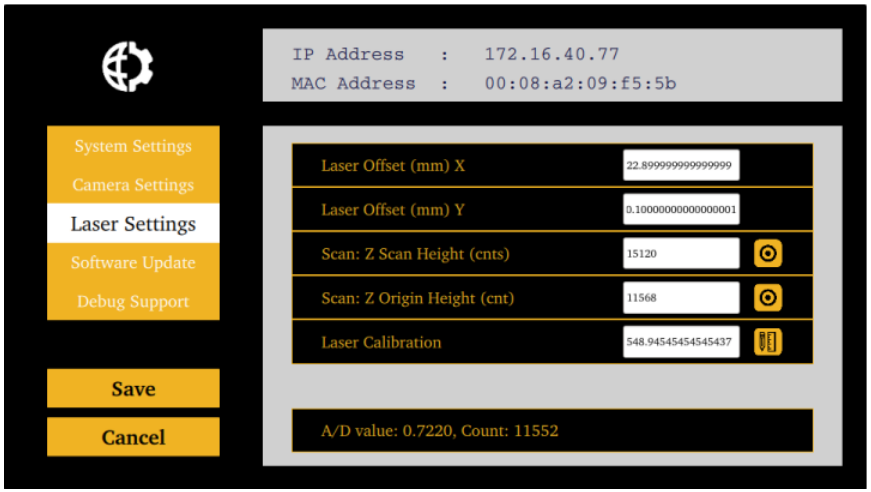


5. Proceed to do programming by following the path of the desired dispense pattern

Note: The pattern can be enlarged for easy programming by using the Zoom in function.

1. Touch the "Zoom In" icon to activate this function
2. Slide the "Zoom Scale" bar to increase the size
3. Touch the X/Y jog icons to move patterns around if required

14. Touch the “Record” icon in the “Scan: Z Origin Height (cnt)” box 



Note: For optimal laser scanning, choose the slowest transition speed permissible for the application, as this will allow for a larger sample of height data to be scanned.

15. Proceed to create desired dispense pattern profile
16. When the “run” command is activated, the unit will automatically scan the areas in which dispensing is to take place prior to any dispensing. The laser icon must be active for the laser reading to take place.

11. DXF FILE IMPORT

DXF file can be imported to the robot for programming purposes. Follow instructions below for loading and programning from these files:

1. Insert USB stick that contain the DXFfile to the robot
2. Touch the “Open Image” icon 
   Note: The DXF file can also be loaded by right click (mouse user) on the working envelope.
3. Select the desired DXF file from the listing to load, then click the “File Open” icon 

1. SAFETY

1.1 Intended Use:

WARNING: Use of this equipment in ways other than those described in this User Guide may result in injury to persons or damage to property. Use this equipment only as described in this User Guide.

OK International cannot be responsible for injuries or damages resulting from unintended applications of its equipment. Unintended uses may result from taking the following actions:

- Making changes to equipment that has not been recommended in the User Guide
- Using incompatible or damaged replacement parts
- Using unapproved accessories or auxiliary equipment

1.2 Safety Precautions:

- Do not operate this unit more beyond maximum ratings/settings
- Always wear appropriate personal protection equipment.
- The fluid being dispensed may be toxic and/or hazardous. Refer to Material Safety Data Sheet for proper handling and safety precautions.
- Do not smoke or use open flame when flammable materials are being dispensed
- This equipment is for indoor use only

2. SPECIFICATIONS

FEATURES	TEACH PENDANT ROBOT	ROBOT WITH SMART ADD-ON FEATURES
Operating System	Teach Pendant	Smart SBC based Software with Touch Screen Interface
Power Supply	100V - 240V AC	
Power Consumption	80 W	
Number of Axes	3	
Dimensions (W x D x H)	303/377/521mm * 418/513/521mm** 518/613/521mm***	353/497/525mm 474/641/525mm 523/738/525mm
Maximum Working Area (X/Y/Z)	TSR2201: 200/200/100mm TSR2301: 300/300/100mm TSR2401: 400/400/100mm	
Maximum Speed (X/Y/Z)	X/Y: 600mm/second; Z: 200mm/second	
Repeatability	0.02mm	
Resolution	0.01mm	
Workpiece Payload	TSR2201: 6 Kg TSR2301/TSR2401: 8 Kg	
Tool Payload	TSR2201: 2 Kg TSR2301/TSR2401: 5 Kg	
Storage for Teaching Files	999 files or 60,000 bytes	9,000 files or 9.5GB
Storage for Processing Files	255 files	9,000 files or 9.5GB
Working Temperature	0 - 40°C	
Relative humidity	20 - 90%	
Touch Screen Interface	None	1920 x 1080 (Optimal Resolution)
Camera Type	None	CMOS (2048 x 1536 Resolution, 3.2 Megapixels)
Height Sensor	None	Laser sensor Resolution: 7µm; Detection Range: 100 ±35mm
General Purpose I/O	4 inputs / 4 outputs (Available option: 16 I/O)	

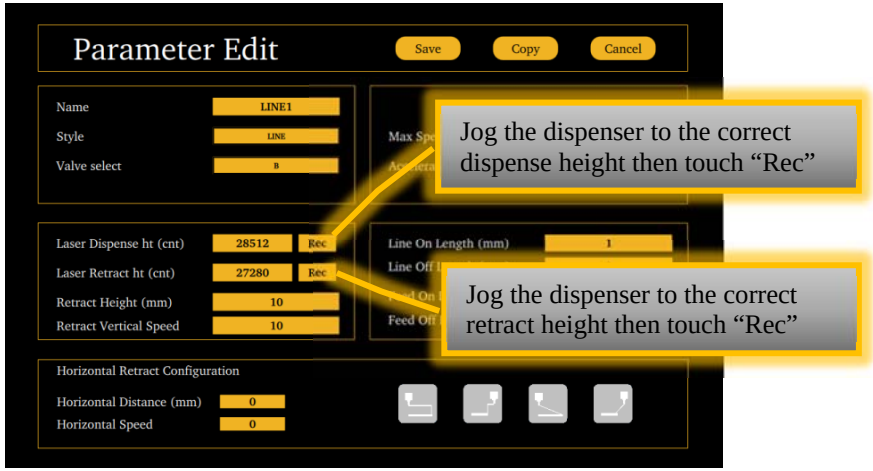
4. Touch the “Save profile” icon to save the program 

10. LASER HEIGHT SENSOR

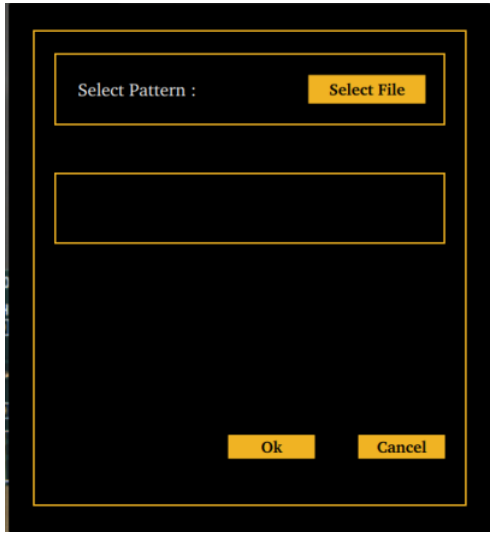
The laser heigh sensor can detect variation in height on the work piece surface and automatically adjust the tip dispensing height.

Before using this function, make sure the laser height sensor has been calibrated, if not please follow instructions in section 6.2 Laser Calibration

1. Touch the “Laser” icon to turn on the laser 
2. Select a desired pattern to be created (dot, line, circle…)
3. Jog the dispenser to the dispense first dispense location with the correct dispense height
4. Open the parameter table and select parameter to be edited (or create a new parameter) 
5. Touch the “Rec” icon in the “Laser Dispense ht (cnt)” box
6. Jog the dispenser to the desired retract height then touch the “Rec” icon in the “Laser Retract ht (cnt)” box
7. Touch the “Save” icon to save the setting
8. Touch the “Close” icon to close the parameter table



9. Touch the “Global setting” icon
10. Select “Laser settings”
11. Jog the dispenser to clear the tallest object on the work piece
12. Touch the “Record” icon in the “Scan: Z Scan Height (cnts)” box 
13. Jog the dispenser to the origin Z location (0)



11. Touch the “Select file” icon and select the desired template that created in Step #1
12. Touch “OK” icon to complete the insert pattern process
13. To delete unwanted pattern, touch the “Delete pattern” icon then select pattern to delete
14. Touch the “Save profile” icon to save the program 

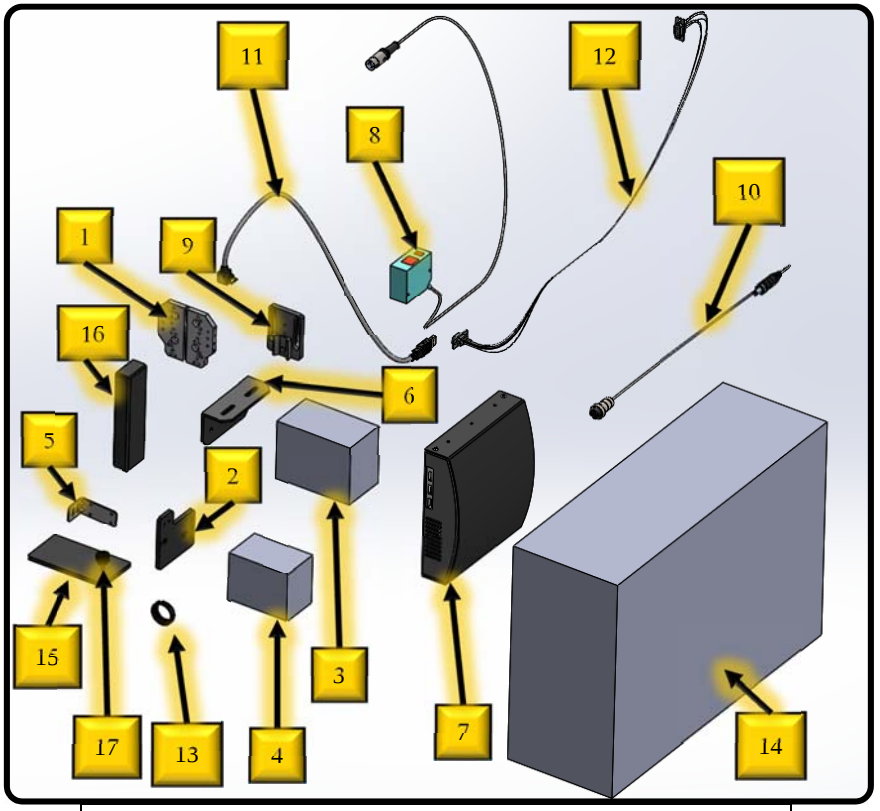
Notes: If additional patterns need to be created, repeat step 1 to 13. To merge all patterns in one program, follow below steps

1. Touch the “Merge” icon  and the below screen will appear

2. Touch the “Select file” icon to select file to merge pattern
3. Touch the “Insert” file to complete the merge process

3. SETUP

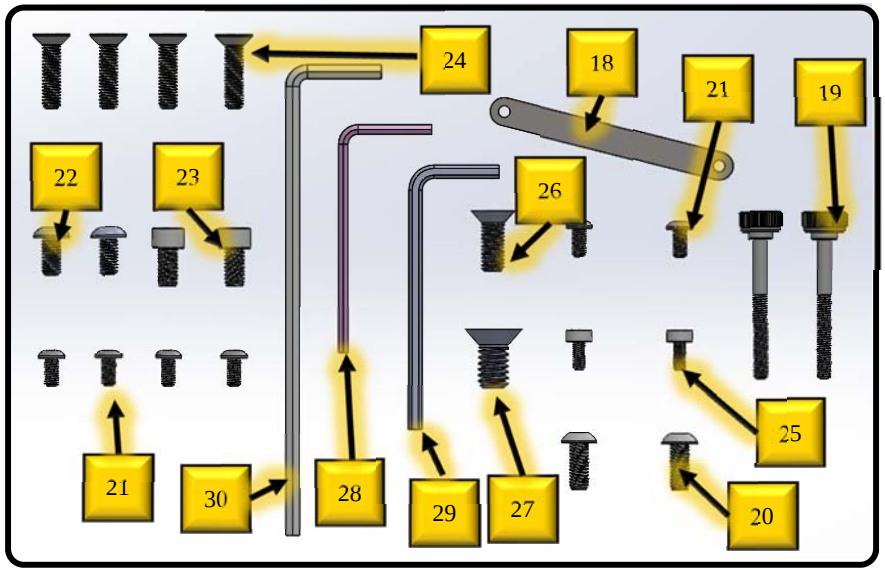
3.1 Components



TSR-STVHKIT		
Item	Description	Qty.
1	Valve Bracket Mounting Block	1
2	Height Sensor Mounting Bracket	1
3	Computer Vision Lens	1
4	3.2 Megapixel Computer Vision Camera	1
5	Camera Mounting Bracket	1
6	Controller Box Mounting Bracket	1
7	Controller Box	1
8	Height Sensing Laser	1
9	General Valve Mounting Bracket	1
10	Controller Box Power Cable	1
11	USB 3.0 Male A – 90° RA Micro, 6.5’	1
12	Communication Cable	1
13	Lens Adapter Ring	1
14	Touch Screen Display Kit	1

TSR-CALKIT		
Item	Description	Qty.
15	Calibration Plate	1
16	Laser Height Gauge Block	1
17	Thumb Screw	1

Included Hardware



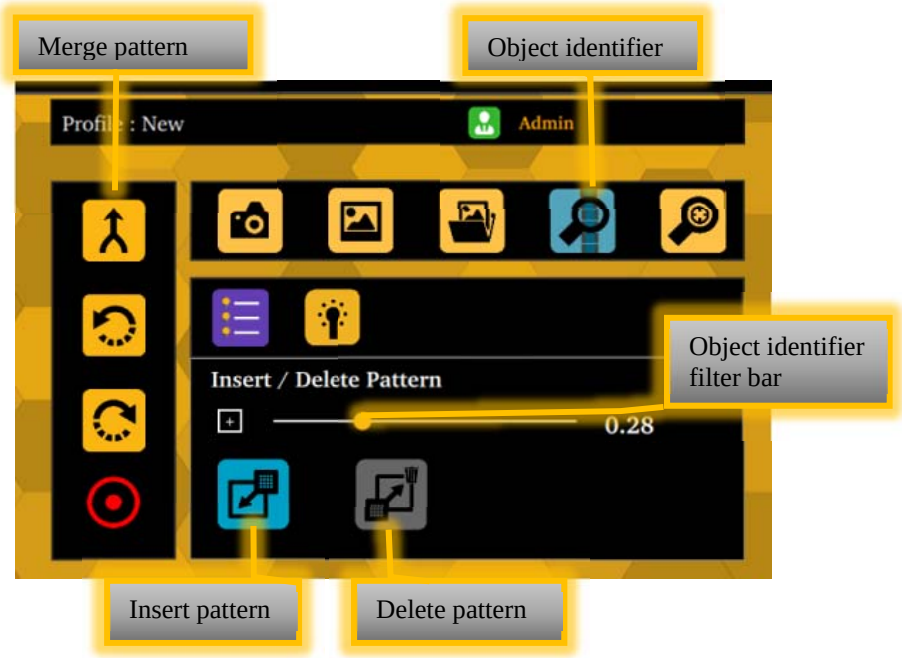
Item	Description	Qty.
18	Laser Mount Nut Plate	1
19	Laser Thumb Screws	2
20	M4 x 10mm Icon Head Cap Screw	2
21	M3 x 6mm Icon Head Cap Screw	6
22	M4 x 8mm Icon Head Cap Screw	2
23	M4 x 8mm Socket Head Cap Screw	2
24	M4 x 16mm Flat Head Socket Cap Screw	4
25	M3 x 6mm Socket Head Cap Screw	2
26	10-32 x ½" Flat Head Screw, Phillips Drive	1
27	¼-20 x ½" Flat Head Screw, Phillips Drive	1
28	2mm L-Wrench Hex Key	1
29	2.5mm L-Wrench Hex Key	1
30	3mm L-Wrench Hex Key	1

Note:

a) All similar patterns on the work piece will be highlighted.

b) If the work piece surface is too reflective, the room light can affect the pattern recognition. You can use the object filter bar to minimize this light effect. Move the bar to the left to remove unwanted pattern. Move the bar to the right to add more pattern.

9. Use the "Object Identifier filter" bar to fine tune the pattern selection (The + icon allows for gradual increase)



10. Touch the "Insert pattern" icon  and the screen below will appear

9.2 Pattern Recognition

Pattern recognition function quickly identify features on the work piece and allows user to insert desired pattern for the given features.

1. Follow instructions in section 7.2 to create a pattern template.
   Notes:
   - ***a) The pattern template must match the pattern to be created by pattern recognition function. For example: if the pattern to be created is the line pattern then the line template needs to be created. If the pattern to be created is the circle pattern then the circle template needs to be created and so on.***
   - ***b) The program created by pattern recognition will be inserted in this template, therefore the area of the pattern template must be bigger than the pattern to be inserted.***

     For dot template: create a dot in the middle of the working envelope

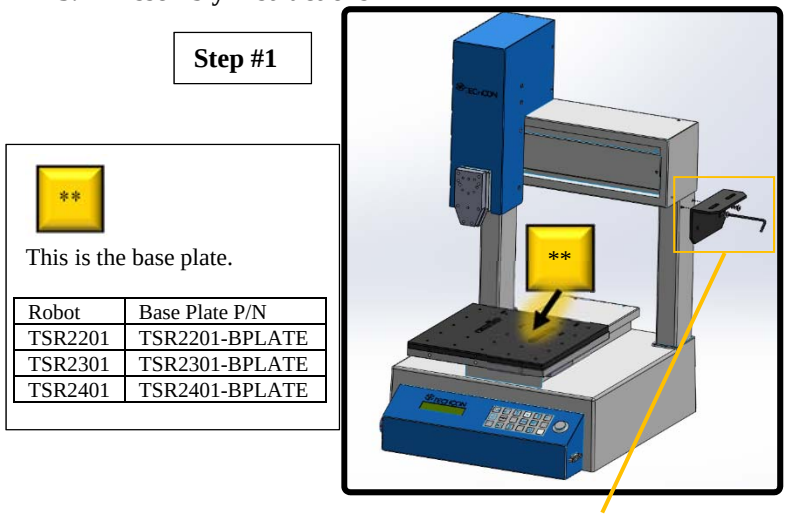
     For line template: create a line starting at (0,100,0) for the TS2201 or (0, 150, 0) for the TSR2301 or (0, 200, 0) for the TSR2401

     For the circle/arc template: create the circle/arc with radius to cover the entire working envelope.

   - ***c) These templates can be saved for future used.***
2. Touch the “Camera” icon to turn it on 
3. Touch the “Screen Shot” icon to take a snap shot of the object 
   Note: Do not move (jog) the dispense head at this point.
4. Save the screen shot image
5. Turn off the camera
6. Open the screen shot image 
7. Touch the “Object Identifier” icon 
8. Select the desired pattern to be recognized by click and drag from the top left corner of the pattern

3.2 Assembly Instructions

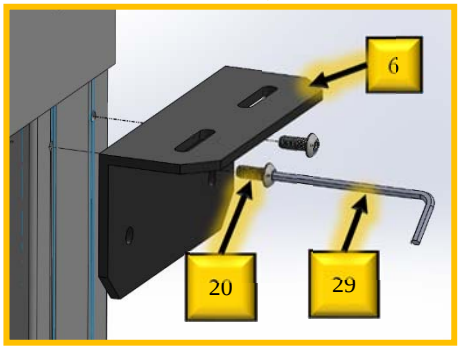
Step #1



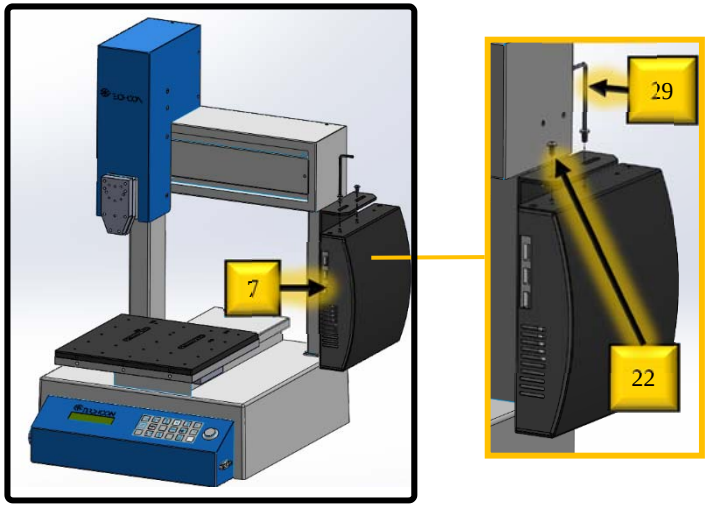
**

This is the base plate.

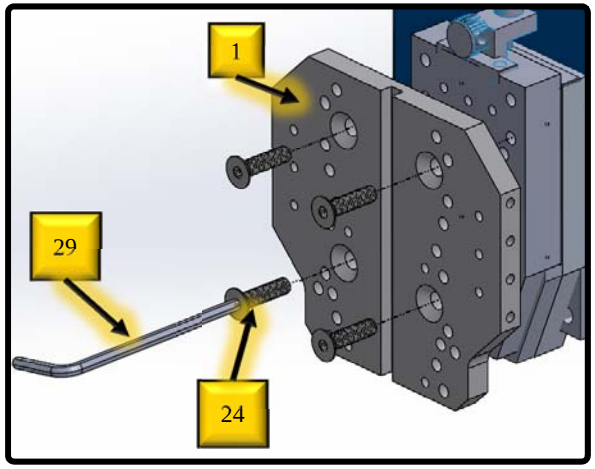
Robot	Base Plate P/N
TSR2201	TSR2201-BPLATE
TSR2301	TSR2301-BPLATE
TSR2401	TSR2401-BPLATE

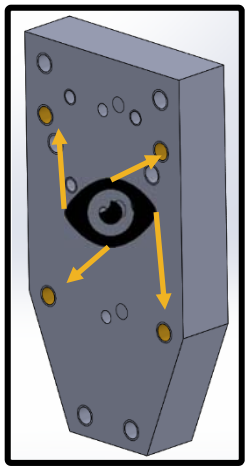


Step #2

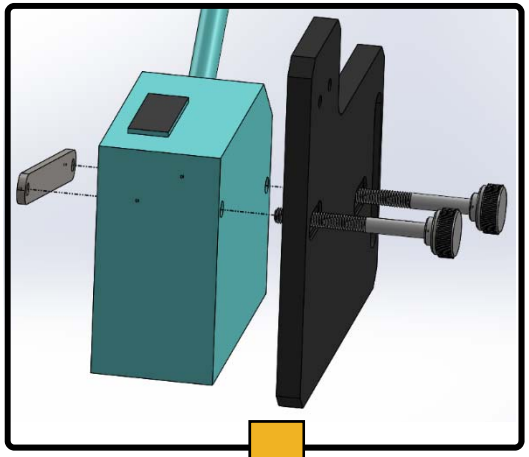


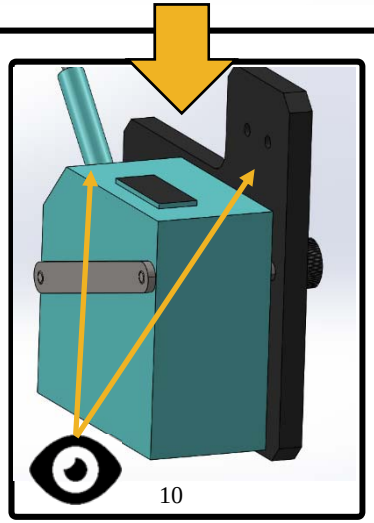
Step #3





Step #4





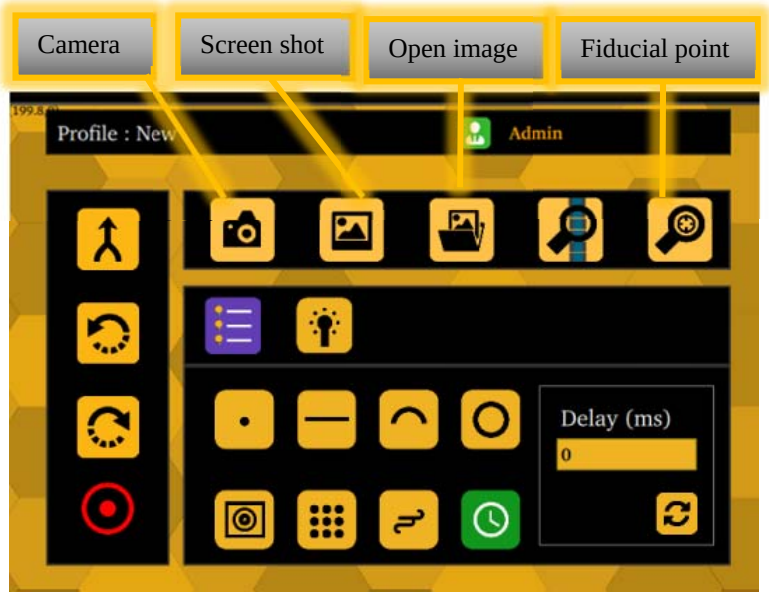
9. Select the second Fiducial point by click and drag from the top left corner of the fiducial point

   Note: Best practice is to select the second fiducial point furthest apart from the first fiducial point.

   A dialog box with two selected fiducial points will appear. If these fiducial points are correct then touch ok to save. If not, touch cancel and restart the process.
   Note: Once these points have been programmed, it is ok to jog the dispense head.

10. Create the desire dispense program on the save image
11. Save the program

Fiducial points setup is completed. The camera will look for these fiducial points and will make alignment correction if needed.



9. VISION SYSTEM

The vision system provide two important functions to the robotic system: Setup Fiducial points and Pattern Recognition.

Note:

a) Camera must be calibrated to use these functions. If this has not been completed, please go back to section 6.0 to complete the calibration procedures.

b) The following factors can affect the efficiency of this feature:

- The lighting condition surrounding the work piece – Make sure position the lighting to reduce the shadow as much as possible. If the lighting cannot be repositioned, repositioning of the robot location may be required.
- Surface finish of the work piece – If the surface finish is too reflective, reduce the intensity of the lighting.

9.1 Fiducial Points

This function uses two user defined fiducial points to check the XY orientation of the part. The robot will adjust the program to compensate for any changes in the orientation.

This function only needs to be performed once per profile.

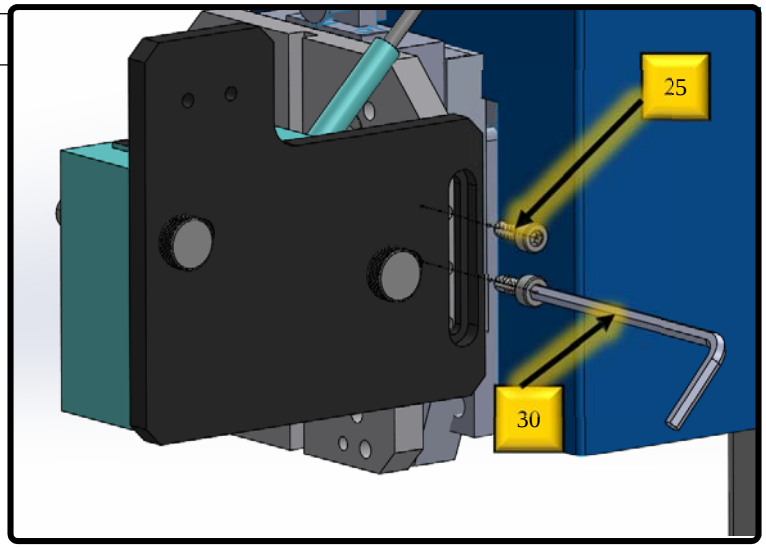
1. Touch the “Camera” icon to turn it on 
2. Position the camera to make sure both intended fiducial points are in the field of view
3. Touch the “Screen Shot” icon to take a snap shot of  the object

Note: Do not move (jog) the dispense head at this point.

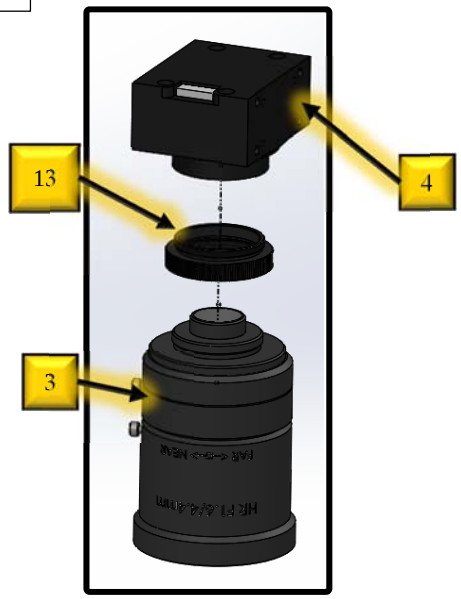
4. Save the screen shot image (Name the image)
5. Turn off the camera
6. Open the screen shot image 
7. Touch the “Set Fiducial Point” icon 
8. Select the first Fiducial point by click and drag from the top left corner of the fiducial point.

Note: Make sure to pick the fiducial point that is distinctively different from the other images on the work piece.

Step #5

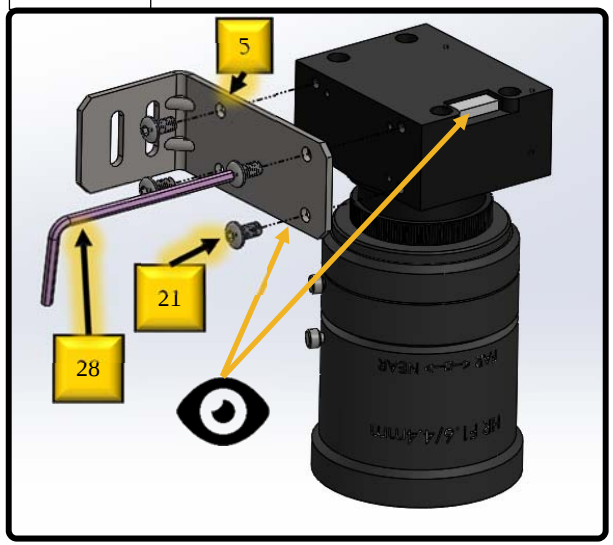


Step #6



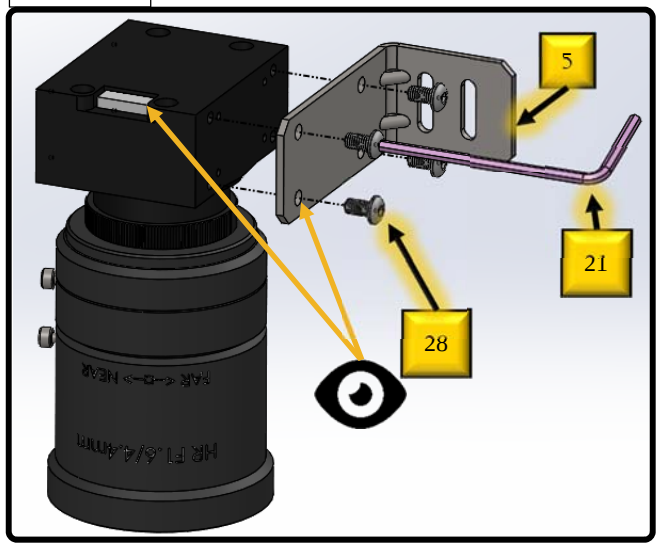
For TSR2201 robot follow Step #7a:

Step #7a



For TSR2301 and TSR2401 robot, follow step #7b:

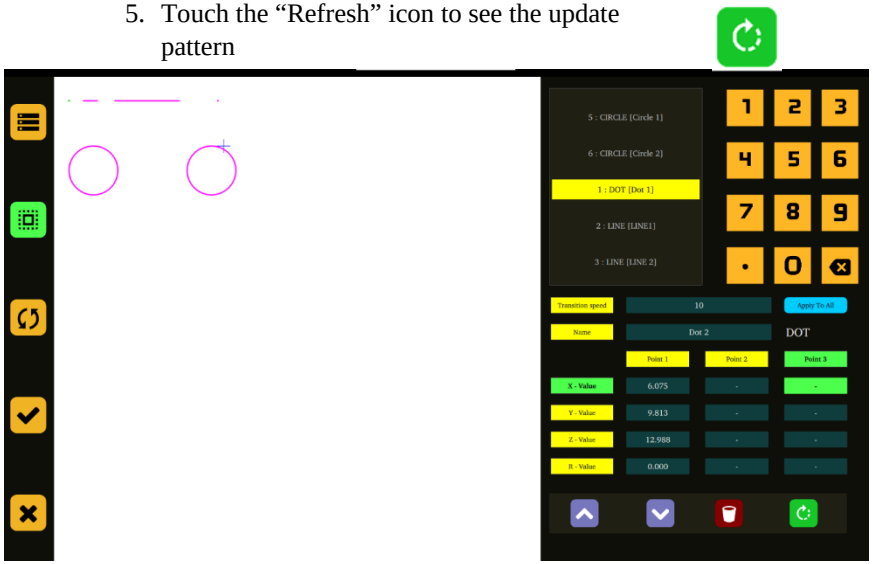
Step #7b



1. Highlight a desired pattern to delete
2. Touch the “Delete” icon

3. Touch the “Save” icon to save the change

5. Touch the “Refresh” icon to see the update pattern



B. Changing Transition (Move) Speed

Note: The transition speed of the first and last pattern cannot be changed in this screen. This change can be done easily on the main screen. See section 7.1.4

1. Select a desired pattern to change the transition speed (Example: To change the transition speed between pattern profile 3 and 4, select pattern #4 to make the change.)
2. Touch the “Transition Speed” box, touch the “Delete” icon on the screen key board to clear the value
3. Enter new speed
4. Touch the “Save” icon to save changes

5. If the speed is to be applied to all parameters, touch the “Apply to All” icon.

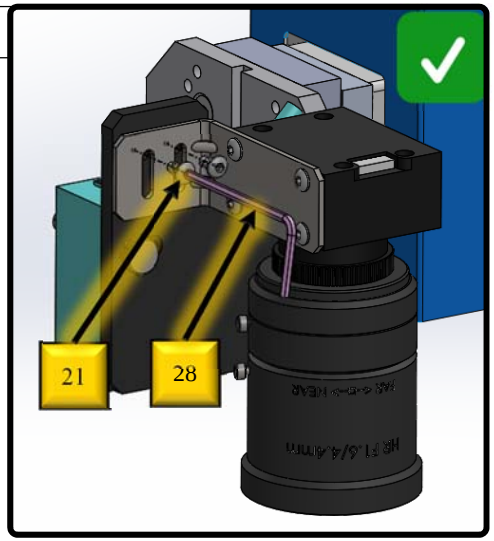
C. To Change the Pattern Profile Order
This function allow user to change the execution order of each pattern within a profile.

1. Select a desired pattern to move
2. Touch the “Move Pattern Up” or “Move Pattern Down” icon to change the pattern order

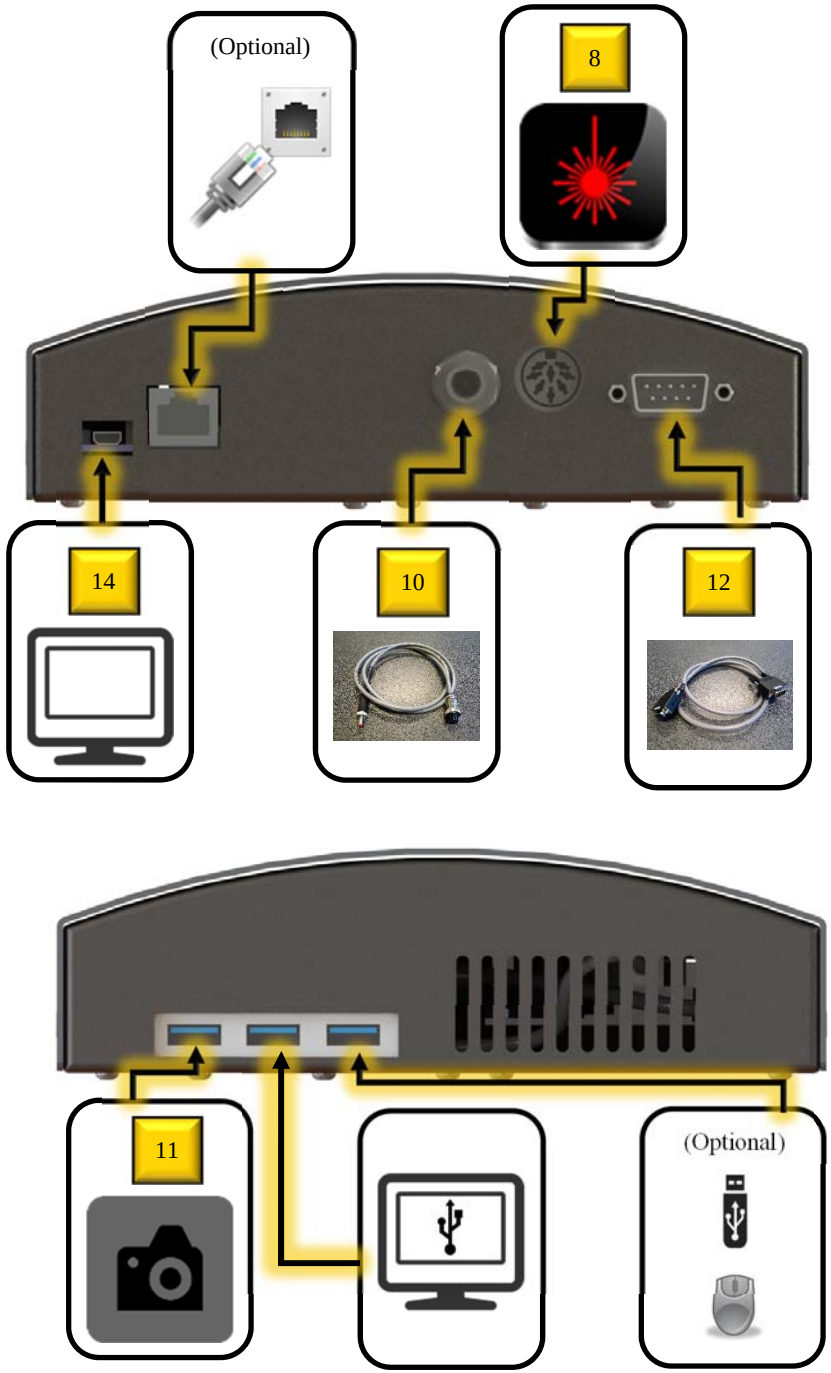
3. Touch the “Save” icon to save changes

D. Deleting A Pattern

Step #8



3.3 Connection



When to use: Use this feature when the valve tends to have excessive material build up at the dispense tip after the valve shut off or the fluid is very stringy. This feature allows the excess fluid to be deposited evenly at the end of the line.

3. **Feed On Delay:** Enter the time for the valve to turn on for a period of time before the dispense head begins movement.

   When to use: Use this feature when the valve has been stationary for a period of time which cause the fluid (fluid with high thixotropic index) slowly to flow out. This feature allows the fluid to flow and deposit correct amount at the beginning of the line. If no delay is applied, the dispense amount will be samller then the rest of the line.

4. **Feed Off Delay:** Enter the time for the valve to turn off before the dispense retracts.

   When to use: Use this feature when valve tends to have excessive material build up at the dispense tip after the valve shut off or the fluid is very stringy. This feature allows the excess fluid to be deposit on the work piece.

8.2.2 Modifying/Editing Profile (Changing Pattern Location)

Touch the “Edit Pattern Parameter” icon to open the screen 

Note: The following parameters can be changed in this screen: Pattern coordinate (X,Y,Z), Pattern hierachy, Transitional speed (move speed) and delete Pattern.

A. Changing Pattern Coordinate
   1. Select a desired pattern to edit
   2. Select the box with the value to be changed
   3. Proceed to make necessary changes on the coordinate
      a. Touch the “Delete” icon on the screen keyboard to clear the value 
      b. Enter new value
   4. Touch the “Save” icon to save changes 

A. To edit parameters

1. Select a desired profile to edit
2. Proceed to change any parameter display on the screen
3. Touch the “Save” icon  (on the left side of the screen) to save changes

B. To add new parameter profile

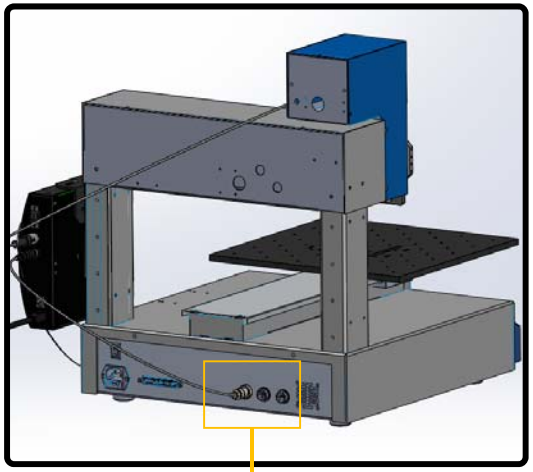
1. Select an existing parameter profile to copy
2. Touch the “Copy” icon to clone the parameter profile  (This will create parameter with the same name.)
3. Make necessary changes on the “clone” parameter profile
4. Change the profile name
5. Touch the “Save” icon to save changes 

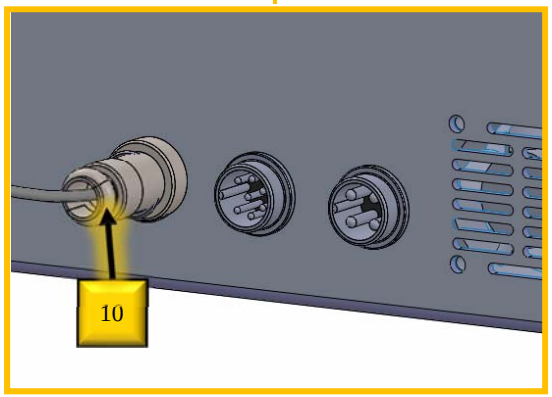
C. Delay Parameter Definition

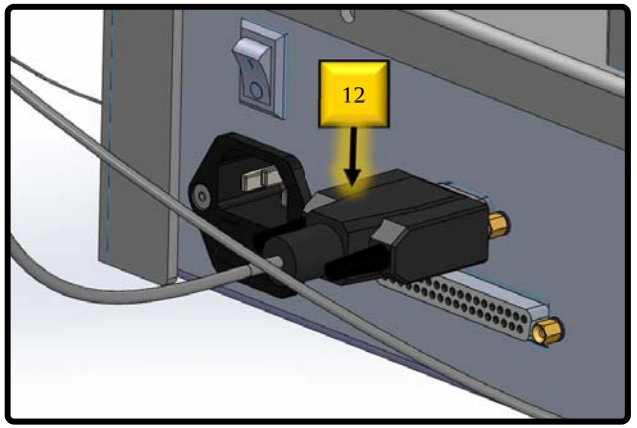
1. **Line On length:** Enter the distance (in mm) for the dispense head to travel before the turning the valve on.

   When to use: Use this feature when a valve (such as a Jet valve) tends to trigger very quickly which can cause too much fluid to deposit at that beginning of the line.

2. **Line Off length:** Enter the distance (in mm) for the valve to turn off before the dispense head reaches the end of the programed line.







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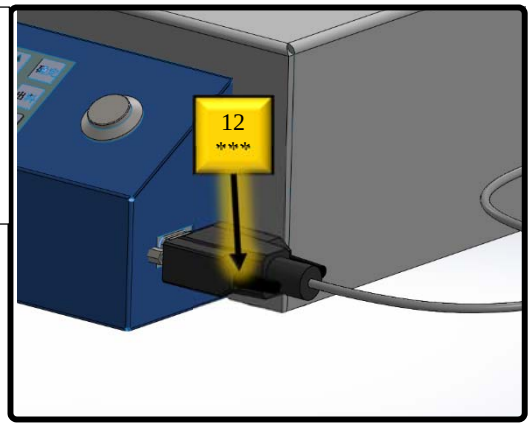
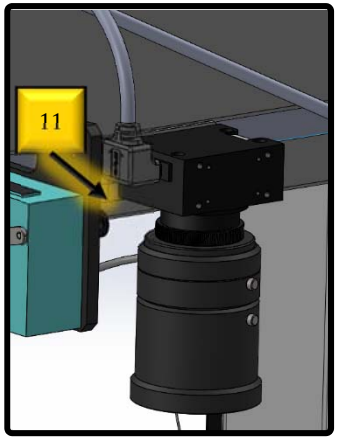
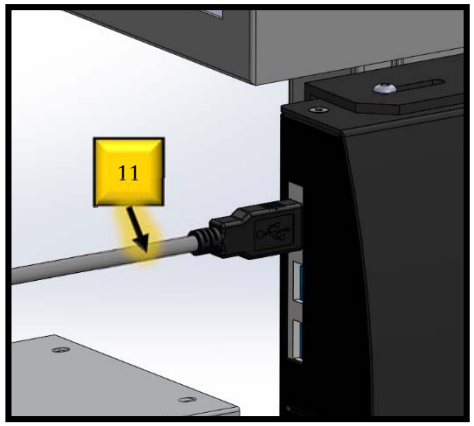
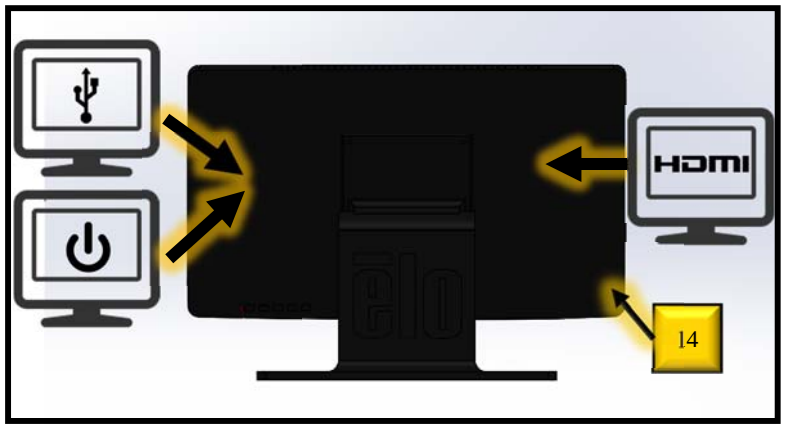
The connection port is located in the back panel for newer models.







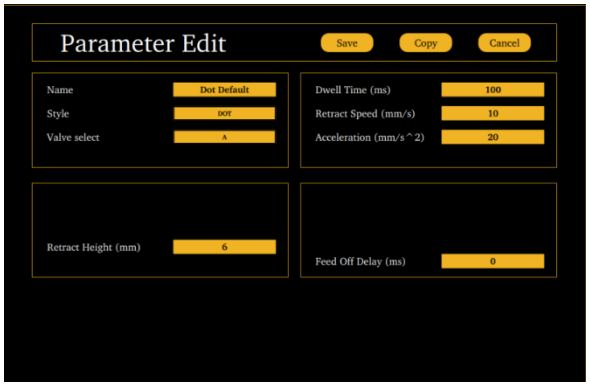


Parameters for dot include: Dwell time (valve open time), Retract Speed, Acceleration, Retract Height and Feed Off Delay and Valve select.

Parameters for line, arc and circle include: Max Speed, Acceleration, Line On Length, Line Off Length, Feed On Delay, Feed Off Delay and Retract options.

8.1.2 Setup parameters

1. Select a desired pattern profile to setup by highlighting the pattern profile icon.
2. Touch the “Parameter Table” icon to open the parameter table
3. Select a profile in the table by double touching or double clicking the profile name.
4. Enter desired setting value in each of the fields
5. Touch the “Save” icon to save the changes
6. Touch the “Close” icon to close the table



8.2 Editing Function

After the program has been created, all parameters can be changed in the editing screen.
Touch the “Edit Profile” icon to open the editing screen

8.2.1 Changing Parameters

Touch the “Edit Profile Parameter” icon to open the screen

Note: The following settings can be changed in this editing screen: Speed, Acceleration, Feed On/Off delay, Line On/Off Length, Laser Dispenser Height, Laser Retract Height, Retract Mode and Valve Type.

8. EDITING

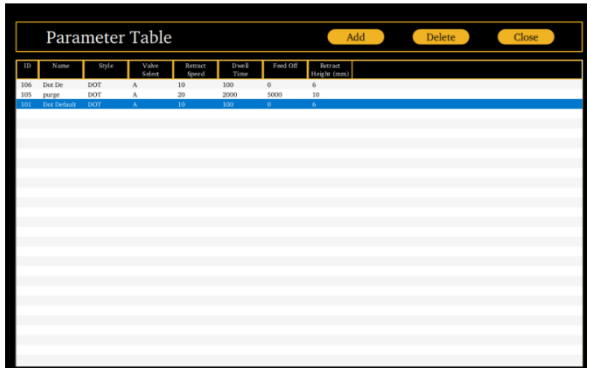
8.1 Parameter Tables

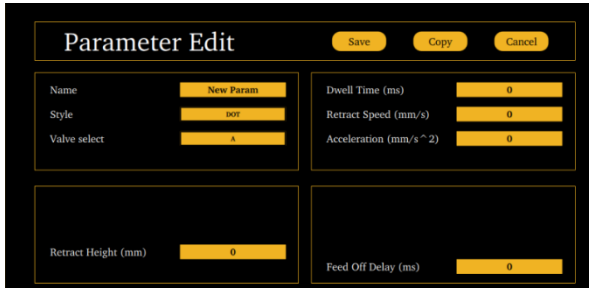
The parameter table is available for all pattern profiles (dot, line, arc, cirle). It lists all user defined parameters.

New parameter profile can be created and existing parameter profile can be deleted

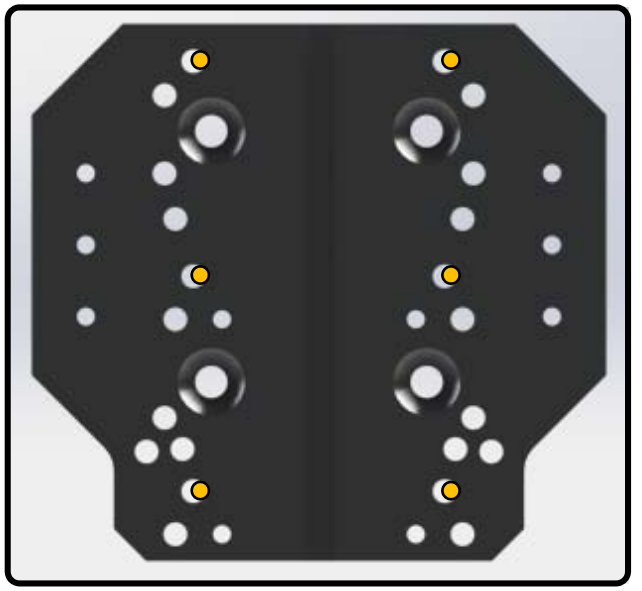
8.1.1 Add/Delete/Copy Parameter profile

1. Touch the desired pattern to set paramters
2. Touch the “Parameter Table” icon
3. Touch the “Add” icon for add new paramter profile
4. Proceed to enter parameter profile Name, Style and others parameters then touch the “Save” icon
5. To delele a parameter profile, highlight desired parameter then simply the “Delete” icon
6. To copy and existing parameter profile, simply touch the “Copy” icon (This is useful when the two desired parameters have silimar values).

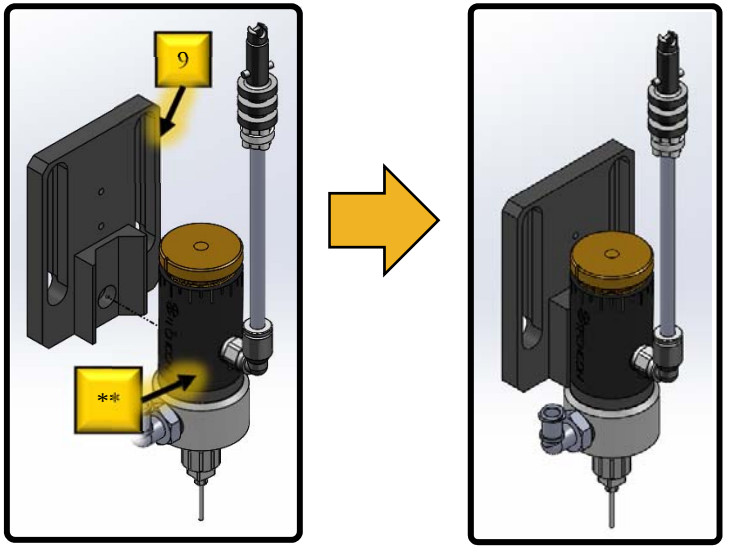




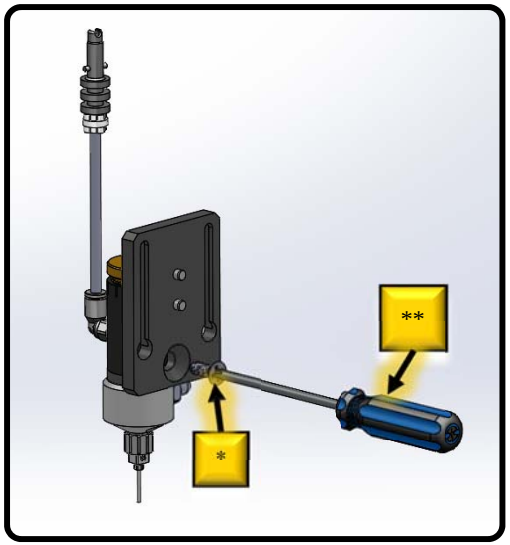
3.4 Valve Bracket Assembly

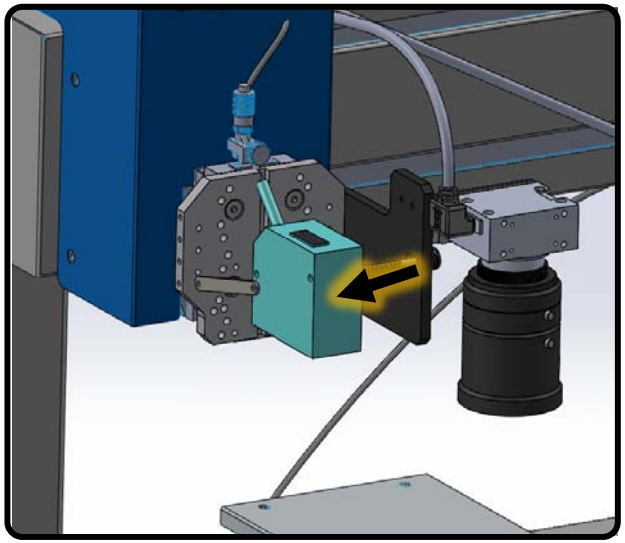


Available Mounting Locations for General Valve Mounting Bracket (Shown in Yellow)



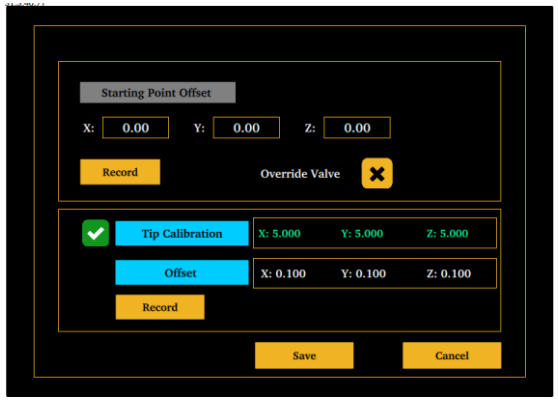
** This example is showing how to mount a Diaphragm valve. The valve is not included with the robot.





*	Item 26 or 27, dependent on valve
**	Not Included

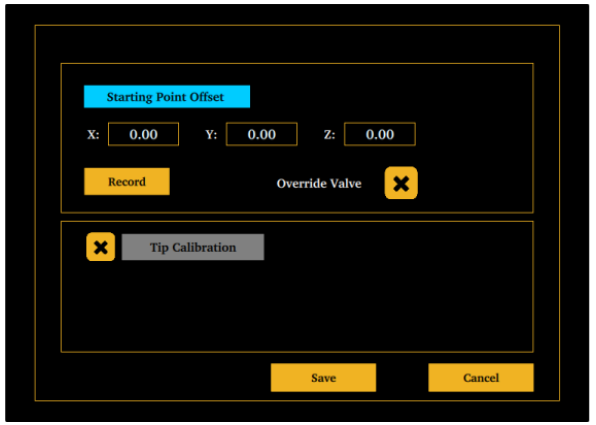
Example:
The below screen show the original tip calibration point is set at (5, 5, 5). When the dispense tip is replaced, the new tip forced the user to adjust 0.1mm in each direction. The offset box show the X, Y, Z offet distance of 0.1mm.



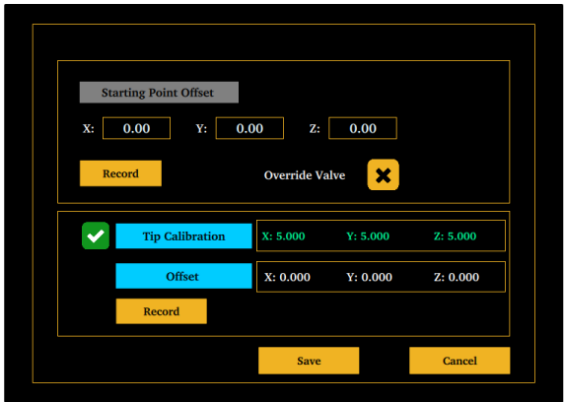
7.4.2 Starting Point Offset

The starting point offset function is another method for tip calibration. However, it is typically used for alignment of the new work piece to the existing tip.

1. Touch the “Go to Start Location” icon to move the dispenser to the first point of the program
2. Verify the dispense tip aligment to the first point of the program is in the correct starting location on the work piece
3. If adjustment is required, touch the “Offset” icon
4. Jog the dispenser to the new location
5. Touch the “Record” icon to register the new starting point
6. Touch the “Save” icon to save this new location.



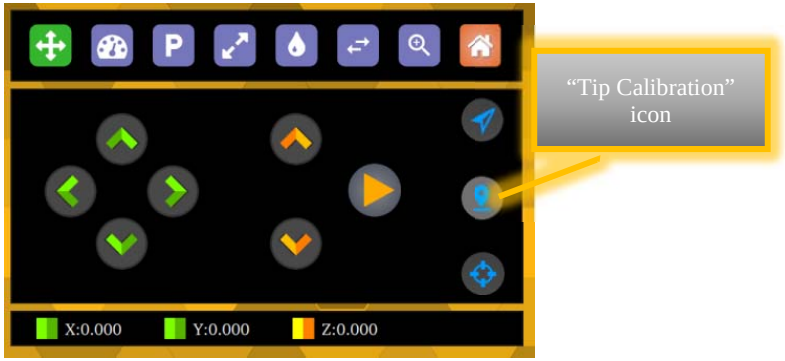
6. Touch “OK”
7. Touch the “Save” icon to save and exit



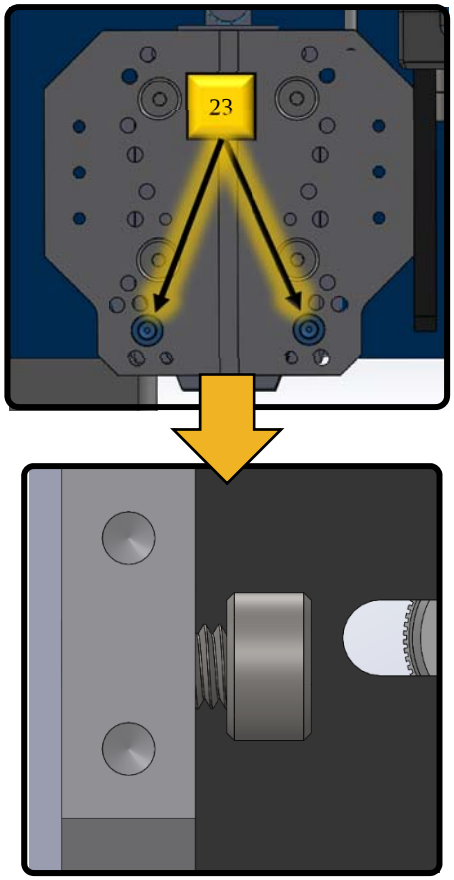
The above screen show the Tip Calibration point is set at (5, 5, 5)

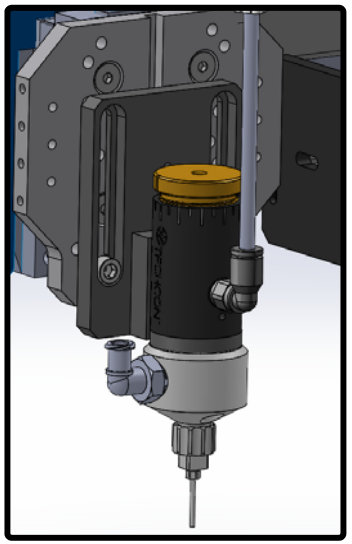
Notes: Before running the program for the first time, it is good practice to move the dispenser to the tip calibration point to check for location accuracy. To do so, complete the following steps

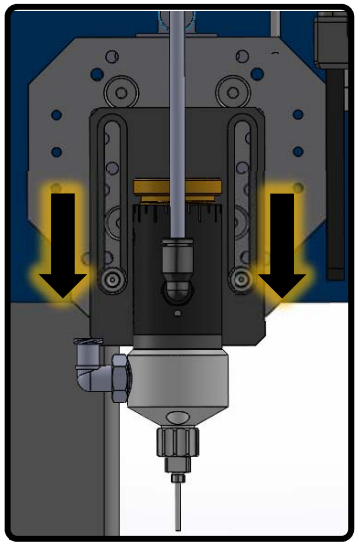
8. Touch the “Tip Calibration” icon to move the dispenser to the tip calibration point

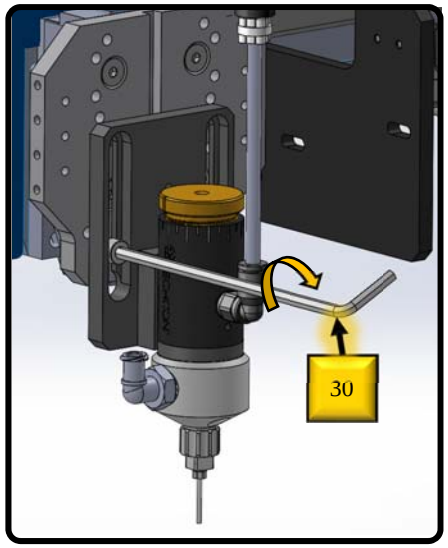


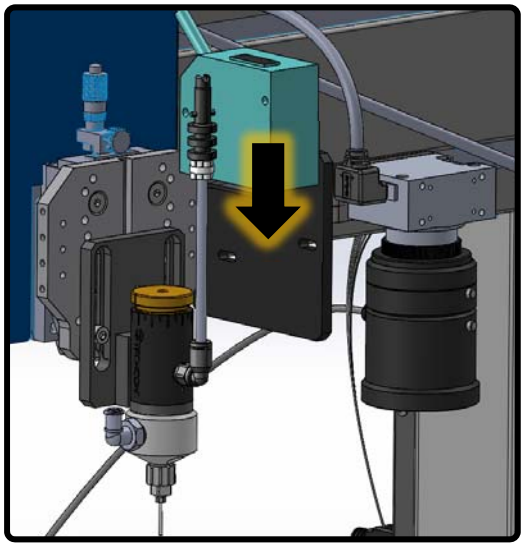
9. Check the tip position for location accuracy; If adjustment need to be made, repeat step 1 – 7 and retest with step 8.



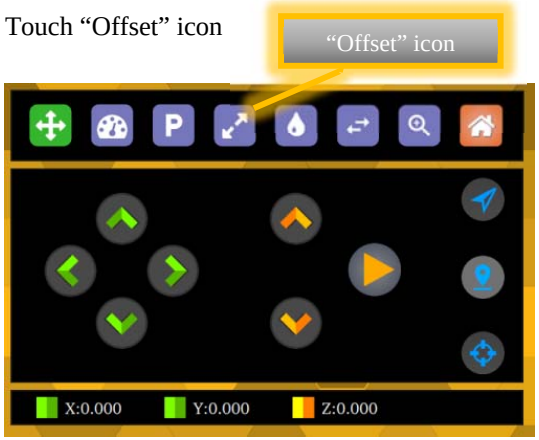




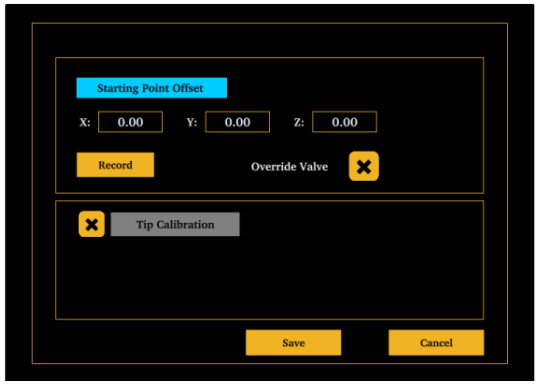




1. Touch “Offset” icon

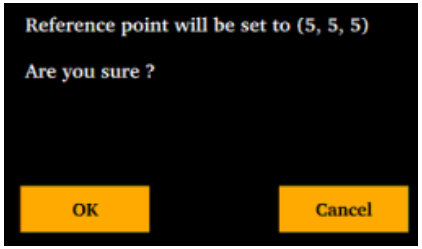


2. The below screen will appear.
3. Touch the “X” icon next to the “Tip Calibration” box



4. Set the Tip Calibration point by jogging the dispenser to the desire location or enter the X, Y, Z value in the absolute move box.
5. Touch the “Record” icon in the Tip Calibration box to record this Tip Calibration point

The pop up will open with the following message:



7.3.4 Test run in Teach screen

During the programing process in the Teach screen, the program can be run at any time for verification.

1. Touch “Wet run” or “Dry run” icon to run the program
2. The dispenser will stop at the last point of the program. To send the dispenser to the home postion, just touch the “Home” icon.

7.4 Calibrate the Dispense Tip

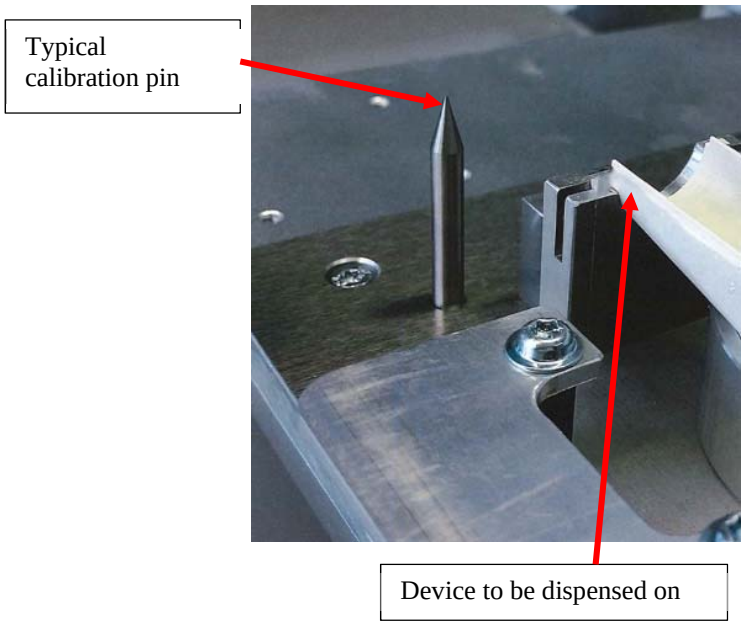
When a dispense tip is changed, or the valve is removed from the robot, it is normal for the tip/valve to be slightly out of the original position when reattached. By creating a physical calibration point, on the device or fixture, the program can be adjusted to suit the new tip position. This change will only affect the current program and not other programs stored in the memeory. All programs can have their own unique calibration position.

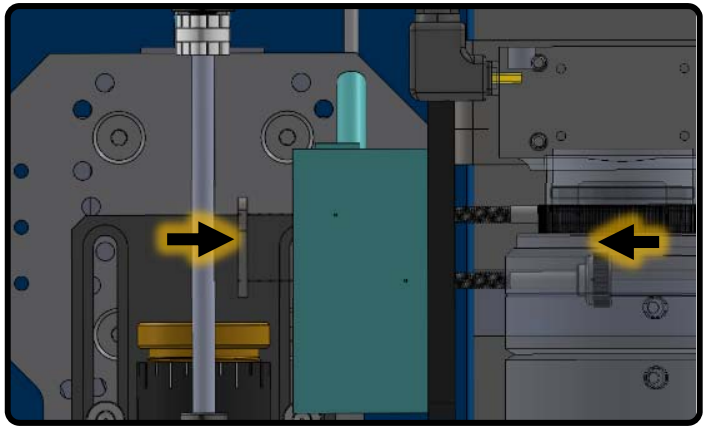
There are 2 ways to achieve this calibration in the x, y and z axis: Tip Calibration Point or Starting point Offset.

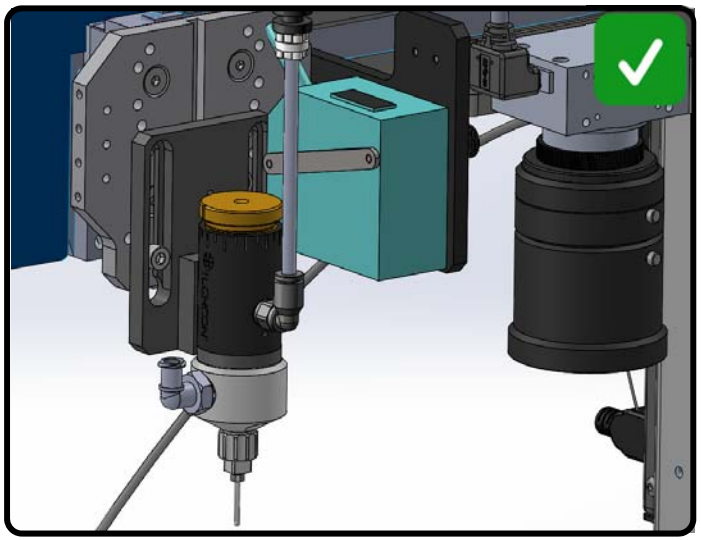
The point is set at a specific location buy the user, such as a pointed stick or a cross-hair mark on the holding fixture.

7.4.1 Tip Calibration Point

This point is set at a specific location by the user, such as a calibration pin or a cross-hair mark on the holding fixture.







4. LOGINS

4.1 User Login Levels:

a. Admin- has all access privileges (only one Admin per system)
- Default profile on box
  - Admin will be required to create a login for any additional users (Engineer & Operator)
- Can add/delete users
- Ability to view login history
  - Includes timestamp
  - Can customize length of login history (minimum of last 5 login entries)
- Selects time zone in which robot is being used in

b. Engineer-has access to all functions
- Ability to change to personalized password

c. Operator – has limited access to:
- Change password
- Open profile
- Run
- Clear profile
- Help menu
- Cannot copy files from USB to conversion box.
- Cannot delete existing profiles

4.2 First Time Login

1. The default password = 1000
2. Enter 1000 in the password box and touch the login icon to enter the main screen.

7.2.8 Adding a "Delay" function

Delay funtion can be inserted in any location of the program. This function will pause the dispenser movement for the time that program in the delay function.

1. Touch the "Delay" icon 
2. Enter the delay time (in millisecond) in the delay time box
3. Touch the "Record" icon to save

7.3 Running a Program

7.3.1 Wet Run

The entire program will run with the outputs enabled. The dispenser will turn on and off as programmed within the profile

Touch the "Wet Run" icon to run the profile with the dispenser on 

Touch the "Pause" icon to pause the wet run anytime 

7.3.2 Dry Run

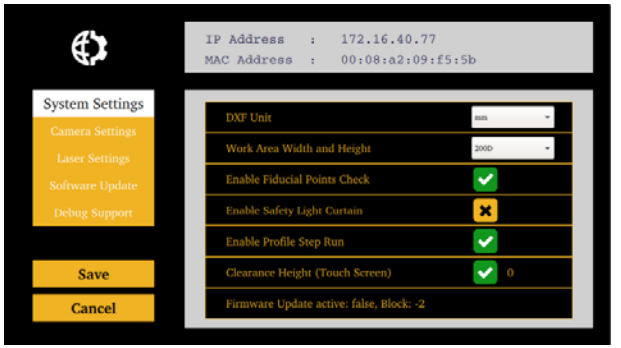
The entire program will be run with the outputs disable. The dispenser will stay closed during the run process.

Touch the "Dry Run" icon to run the profile with the dispenser off 

7.3.3 Step Run

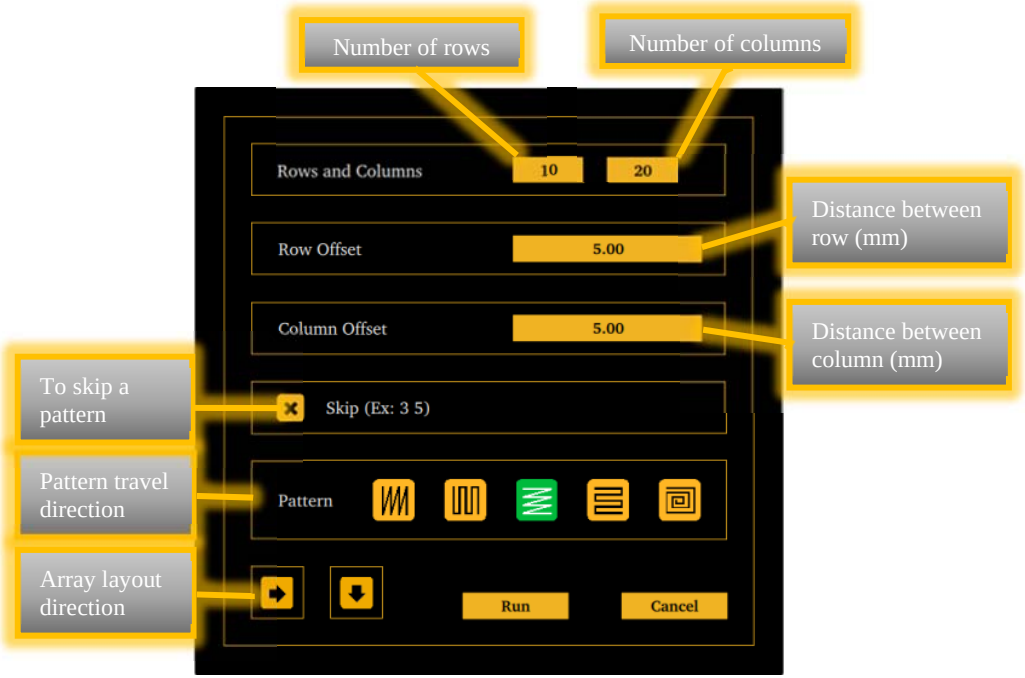
Use step run function to run each pattern in the program one step at a time.

1. Touch the Global setting icon
2. Select System Settings
3. Select Enable rofile Step Run
4. Touch the "Save" icon to save the setting
5. The program is now set to run one step a time. Touch the "Wet run" of "Dry run" to run



7.2.7 Creating Array Pattern

1. Touch the “Array” icon  to initiate array function
2. Proceed to create desire dispensing pattern to be included in the array
3. Touch the “Array” icon again to input array data; see example screen below

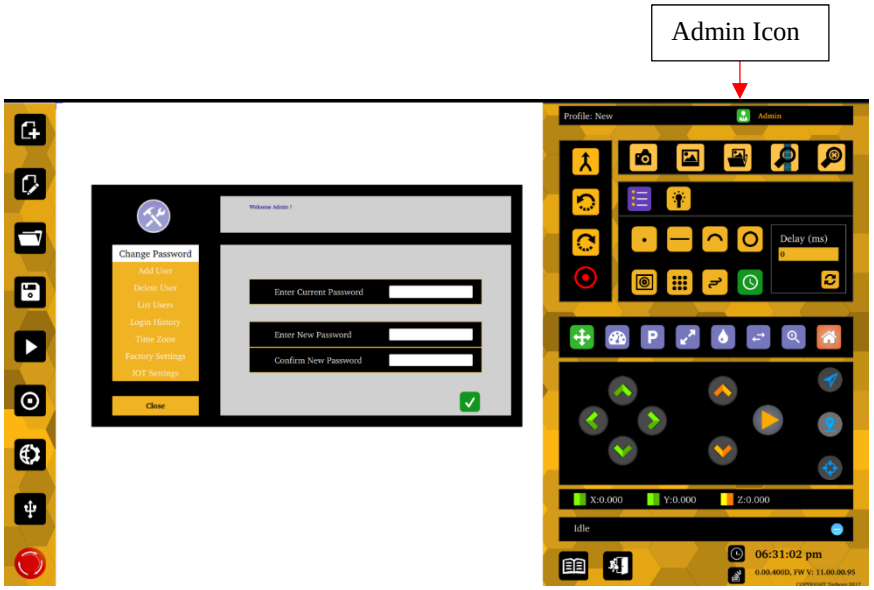


- Row and Column: Enter the number of rows and columns
- Row Offset: Enter the distance between rows in mms
- Column Offset: Enter the distance between columns in mm
- Skip: Enter any pattern in the array to be skipped; If more than one pattern to be skipped, put a space between each pattern.
- Pattern: Select desired pattern travel direction in the array
- Array layout direction

 Patterns in array to be layout in X+ and Y+ direction

4.3 Change Password

1. Touch the Admin icon to enter the “create new password” screen
2. Enter current password
3. Enter new password
4. Re-enter new password
5. Touch the check mark icon to save new password



5. ICON DESCRIPTION

Hover the cursor over any icon and the description will appear.

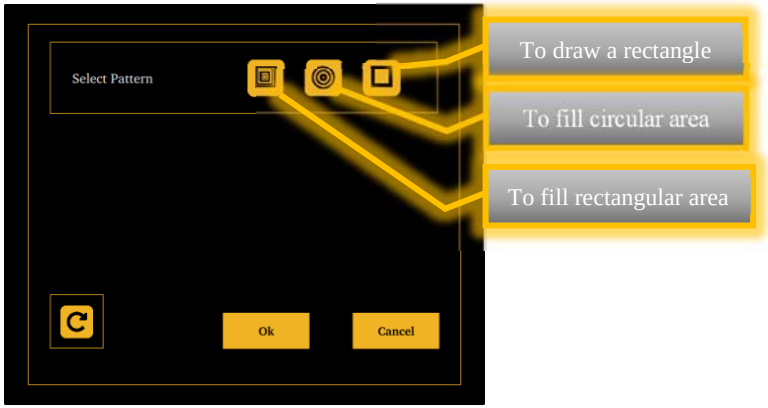
5.1 Dispense Command Icons

Icon	Icon Name	Function
	Dispense Dot	Register the location as a Dot profile
	Dispense Line	Register the location as a Line profile
	Dispense Arc	Register the location as an Arc profile
	Dispense Circle	Register the location as a Circle profile
	Dispense Poly Line	Register the location as a Poly line profile
	Array Pattern	To generate array pattern
	Spiral Pattern	To fill an area
	Delay Time	Add time delay in the program
	Input/Output Signal	Send/Received a selected signal
	Purge	Move valve on to selected location to purge
	Record	Save a selected command
	Undo	Removes last entered command
	Redo	Restores last removed command
	Square Reverse Retract	Move the dispense tip up and in the – Y direction
	Square Forward Retract	Move the dispense tip up and in + Y direction
	Angle Forward Retract	The dispense tip move forward at an angle
	Angle Reverse Retract	The dispense tip move reverse at an angle
	Wet Run	Run program with valve on
	Dry Run	Run program with valve off

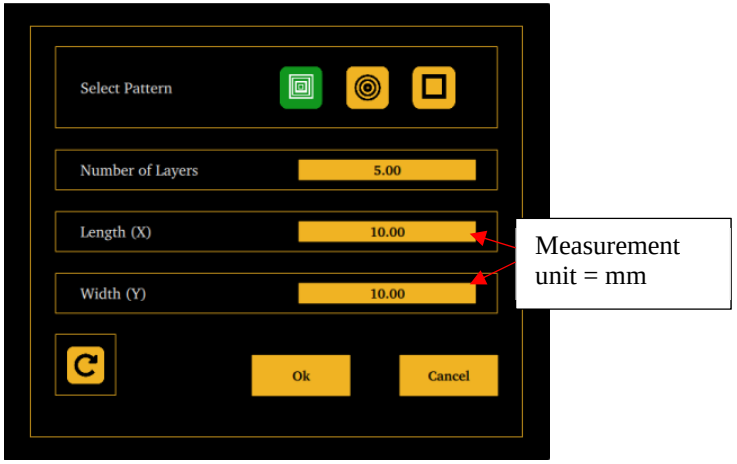
7.2.6 Creating Area Fill Pattern (Spiral Pattern)

This function allows user to quickly create a pattern to fill areas

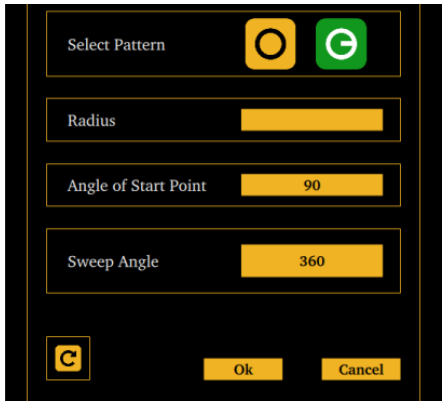
1. Touch the “Spiral Pattern” icon to select area fill pattern option 



2. Touch one of the fill option to activate the area fill pattern
3. If the “Rectangular Spiral” is selected, enter the data in the inquiry box then touch “OK”
4. Jog the dispenser to the starting location then touch the “record” icon



4. If “Radius Circle” is selected, the below screen will appear.
5. Enter the radius, Angle of Start Point and Sweep Angle then touch the “OK” icon



7.2.5 Creating Polyline Pattern

Use Polyline function when a profile requires a continuous dispensing pattern that includes mulitiple line, arc and circle patterns. The dispenser will continously dispensing from start to finish without Z retract.

1. Touch one of the “Line” or “Arc” or “Circle” icon to select desired pattern to start
2. Touch the “Polyline” icon to activate the Polyline 
3. Jog the dispenser to a desired location point then touch the record icon
4. Continue to jog the dispenser to other desired locations then touch the record icon

5.2 Navigation and Jog Icons

Icon	Icon Name	Function
	Fine Jog Control	Control absolute jogging
	Coarse Jog Control	Control relative jogging
	Jog X+	Move dispenser in X+ position
	Jog X-	Move dispenser in X- position
	Jog Y+	Move dispenser in Y+ position
	Jog Y-	Move dispenser in Y- position
	Jog Z+	Move dispenser in Z+ position
	Jog Z-	Move dispenser in Z- position
	Absolute Move	To move a position by entering X, Y, Z coordinate
	Emergency-Stop	Stops the robot movement
	Speed Menu	Set jogging and running speed
	XY Speed	Set speed for X and Y travel
	Z Speed	Set speed for Z travel
	Transition Speed	Set transition speed (X, Y and Z combine)
	Zoom	To zoom in an object
	Offset	To adjust X, Y and Z coordinate of a profile
	Go to (Park) location	To set Park location
	Home	To send Robot to Home location (0,0,0)
	Tip Calibration	To calibrate new dispense tip
	Go to Start Location	Send Robot to first location of a program

5.3 Camera and Laser Height Sensor Icon

Icon	Icon Name	Function
	Camera	To turn on/off camera
	Fiducial Point	To establish fiducial points
	Object Identifier	To select a region around an object for pattern recognition
	Snap shot	To take snap shot of the work piece
	Open Image	To open directory of Images
	Insert Pattern	To insert pattern in a template
	Delete Pattern	To remove a pattern
	Merge Pattern	To merge active patterns
	Camera Scale	To perform camera scaling
	Camera Offset	To perform camera Offset
	Camera Calibration	To perform camera calibration
	Laser Height Sensor	To turn on/off laser height sensor input
	Laser Calibration	To perform laser calibration

5.4 Program Icon

Icon	Icon Name	Function
	New Program	To create new program
	Open Program	To an existing program
	Save	To save a program
	Global Settings	To open global setting menu
	Remove External Device	To remove external device

7.2.1 Creating Dot Pattern

1. Touch the “dot” icon to initiate the Dot pattern
2. Jog the dispenser to the desire location and touch the “record” icon

7.2.2 Creating Line Pattern

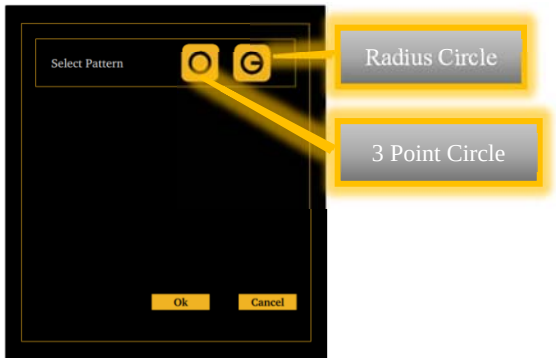
1. Touch the “Line” icon to initiate the Line pattern
2. Jog the dispenser to the desired start location and touch the “record” icon
3. Jog the dispenser to the desired second location and touch the “record” icon.
4. Continue with step #3 if the there are more than one line segment.

7.2.3 Creating Arc Pattern

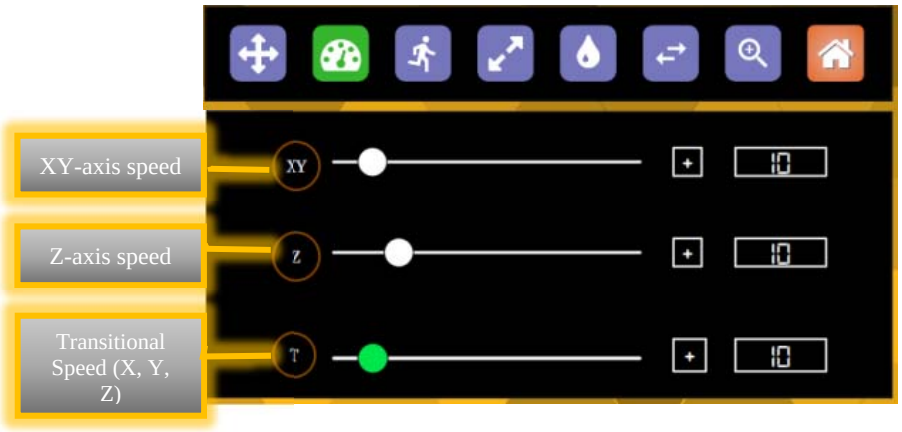
1. Touch the “Arc” icon to initiate the Arc pattern
2. Jog the dispenser to the desired start location and touch the “record” icon
3. Jog the dispenser to the desired second location and touch the “record” icon.
4. Jog the dispenser to the desired third location and touch the “record” icon.

7.2.4 Creating Circle Pattern

1. Touch the “Circle” icon to initiate the Circle pattern
2. Select “3 Point Circle” or “Radius Circle” option shown below
3. If “3 point circle” is selected, jog the dispenser to each of the point and touch the record icon



1. Touch the Jog Speed icon to activate the speed control screen

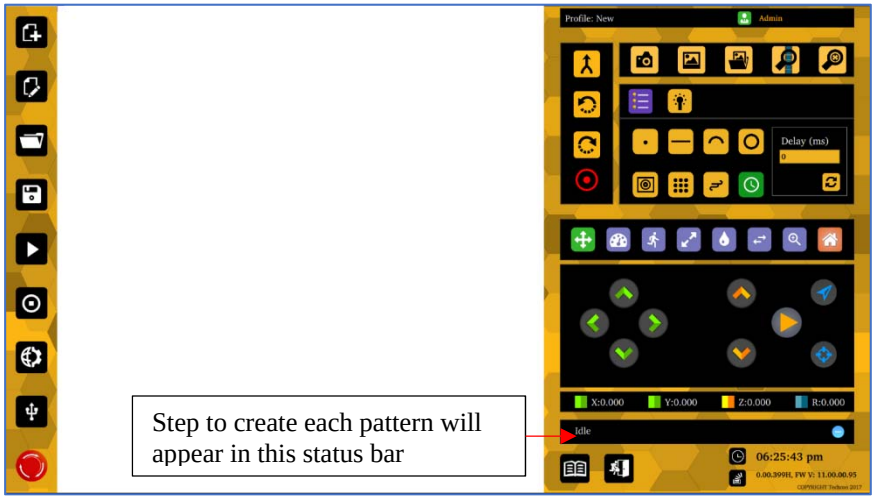


2. Slide the speed bar to the right to increase the speed and slide the speed bar to the left to decrease the speed

3. For the fine adjustment, touch the + icon

7.2 Creating A Program

1. Touch the “Create New” icon to start a new program.
2. Touch an applicable icon to select a desire dispensing patterns (Dot, Line, Arc, Circle, Polyline)



5.4 Editing Icon

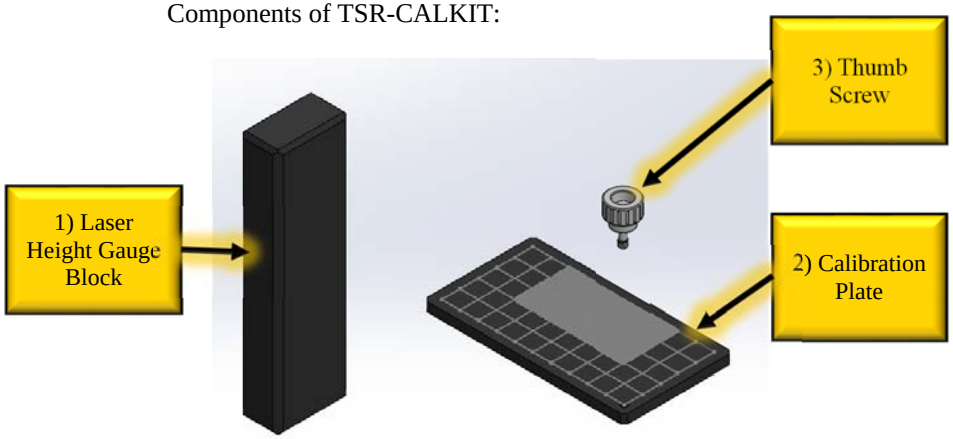
Icon	Icon Name	Function
	Edit Profile	To open editing screen
	Parameter Table	List of available user defined settings of parameters
	Edit Profile Parameters	To edit parameters in profile
	Edit Patterns Parameters	To edit pattern parameters (coordinate, order, speed and delete)
	Reload Original Profile	To reload original profile
	Save	To save changes make in edit screen
	Cancel	To cancel changes, make in edit screen
	Move Pattern Up	To move the pattern up in profile execution order
	Move Pattern Down	To move the pattern down in profile execution order

6. CALBIBRATION

6.1 Calibration Kit

The TSR-CALKIT is needed to perform the calibration procedures.

Components of TSR-CALKIT:



1. Laser Height Gauge
   Used to adjust valve bracket assembly to proper height for optimal laser scanning in the following kits:

   - **TSR-STHKIT**
   - **TSR-STVHKIT**
   - **TSR-SHKIT**

2. Calibration Plate
   Calibration Plate has multiple functions. It is used measure the valve to laser point offset for the kits listed above. The Calibration Plate is also used in the calibration of camera offset and image scaling in the following kits:

   - **TSR-STVKIT**
   - **TSR-SVKIT**

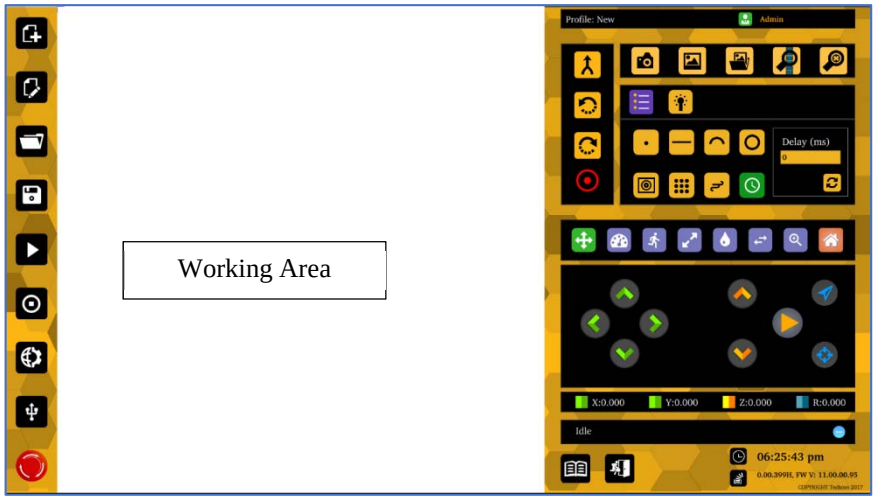
3. Thumb Screw
   Used to secure Calibration Plate to the following Top Plate Kits:

   - **TSR2201-BPLATE**
   - **TSR2301-BPLATE**
   - **TSR2401-BPLATE**

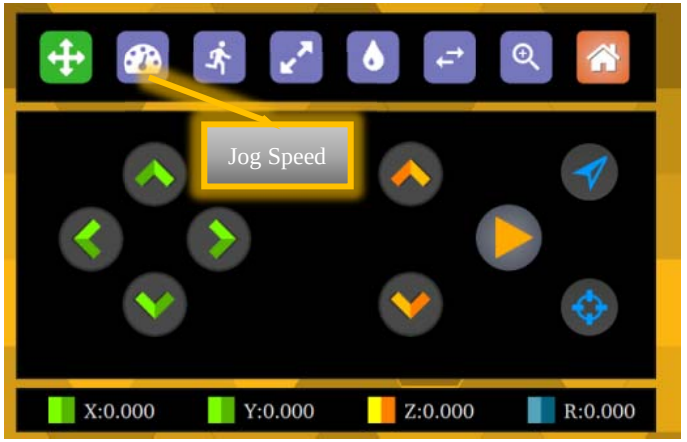
   All detailed calibration procedures can be found within each respective Upgrade Kit User Manual.

7.1.3 Jogging in Working Area

1. Touch a desired location inside the white working area to move the dispenser to a specified X-Y coordinate
2. Touch the Z-axis up and down icon to move the dispenser to a specified Z coordinate



7.1.4 Jogging Speed

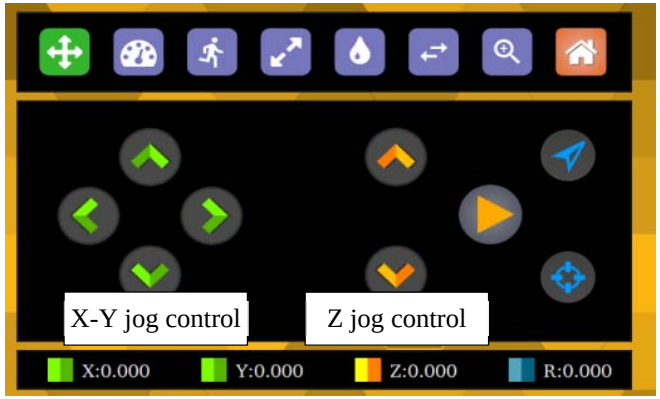


7. PROGRAMMING

7.1 Jogging

7.1.1 Continuous Jogging:

The screen shown below shown a continuous jogging screen. Touch and hold on each jog icon to move the dispenser to a desired location.



7.1.2 Incremental Jogging

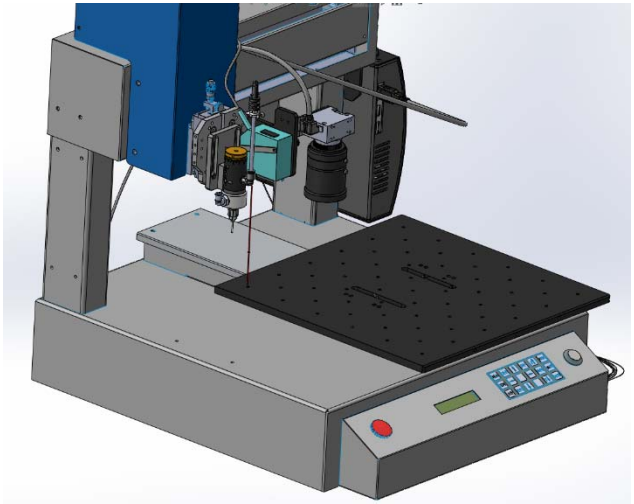
Incremental jogging is recommended when the dispenser is close to the desired location.

Touch the Jog Control icon to switch to incremental jogging screen as shown below:

6.2 Laser Calibration

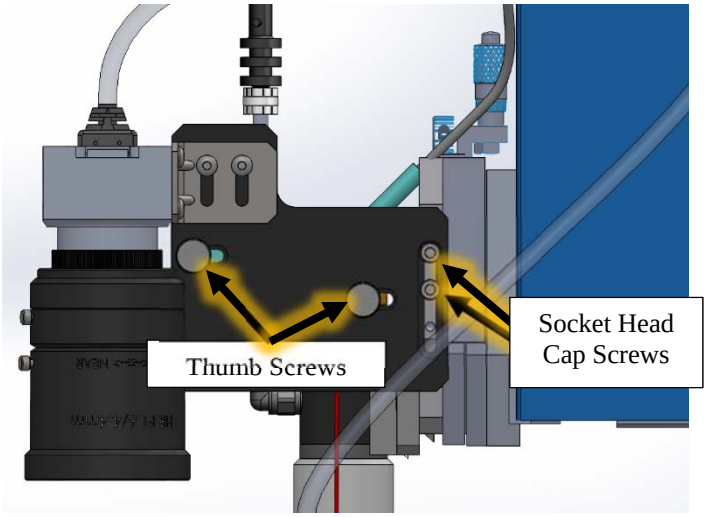
1. Touch the home icon to home the unit.

2. Adjust top plate such that the laser point is visible on top plate then tighten screws in place.

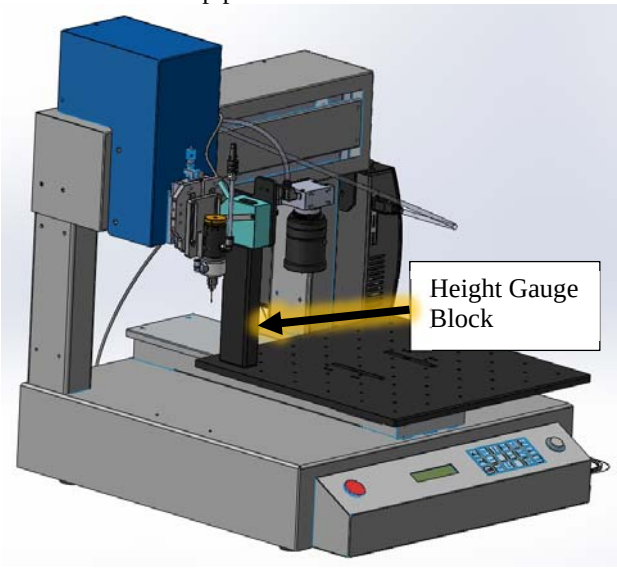


Note: The laser will not emit a beam as shown. This is strictly done for instructional purposes. The laser emitted will appear as a dot on the work surface.

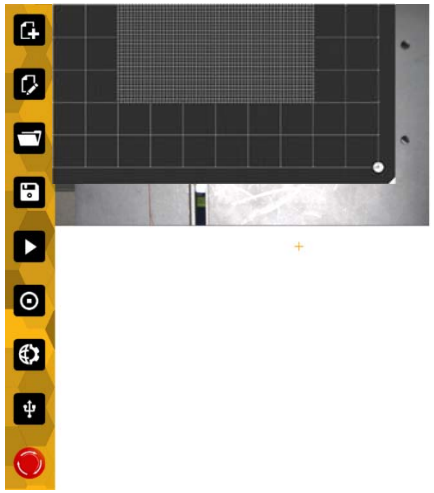
3. Slightly loosen thumb screws and socket head cap screws but do not remove.



4. Place the gauge block underneath laser such that the block is flush with the laser and the top plate.



6. Again, without adjusting any value, click on the "Next" icon 



7. Set the Fine tune adjustment increment value as needed
8. Use the fine-tune adjustment jog control to enter the offset value found in section 6.3.2 Verify the Camera Calibration.
   Example: Assuming the offset valule found in section 6.3.2 is:
   X = 0.5, Y = 1.0
   Set the fine tune adjustment increment = 0.5
   Touch the fine tune jog control arrow in the X + direction 1 time and Y + direction 2 times.
9. Click Save once fine-tuning is complete 

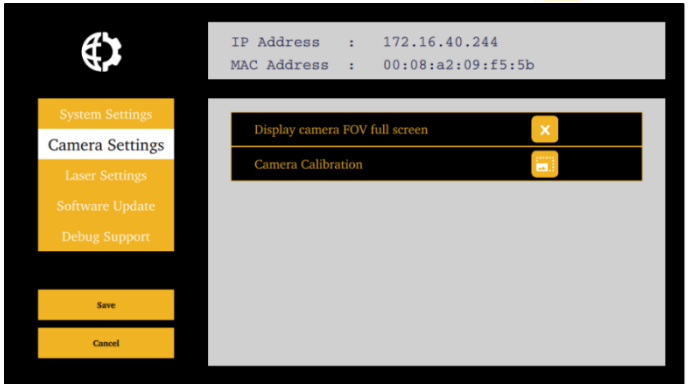
10. This procedure be done as many times as necessary until the location is accurate.

23. Once positioned, touch the “Save Calibration” icon 

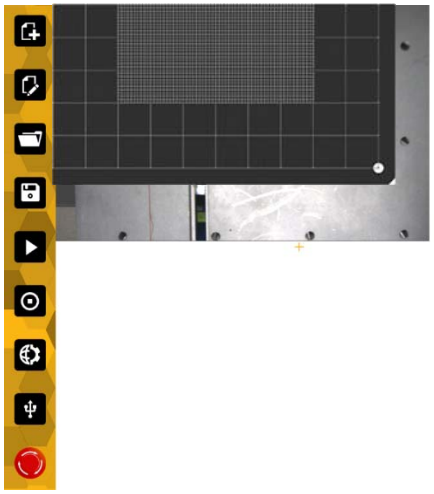
<u>You have now successfully calibrated the camera with an offset.</u>
<u>Go to section 6.3.1 To verify camera calibration</u>
<u>If fine tuning is needed go to section 6.3.3</u>

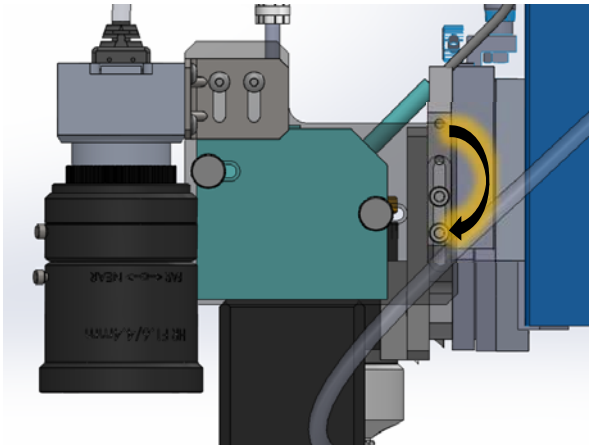
6.3.3 Fine tune the camera calibration without having to redo the entire calibration process

1. Touch the “Camera” Icon 
2. Touch the “Global Settings” icon 
3. Select the “Camera Settings” Menu
4. Touch the” Camera Calibration” Icon 



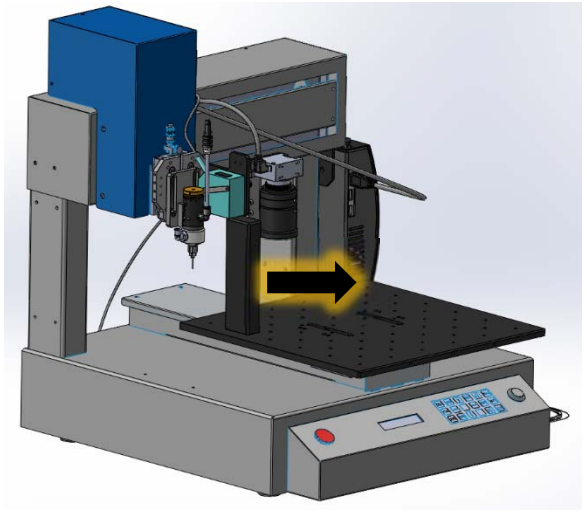
5. Without adjusting any values, touch the Next icon 





Note: The socket head cap screws may need to be removed in order to move assembly up further or drop the assembly lower, depending on the last laser configuration. If this is the case, only remove one screw at a time until the correct height is achieved.

5. Tighten all screws once at the correct height
6. Carefully remove the gauge block by sliding it out (as shown below)



7. To confirm height, the following value (-34.30 ±1mm) should be displayed on the laser:

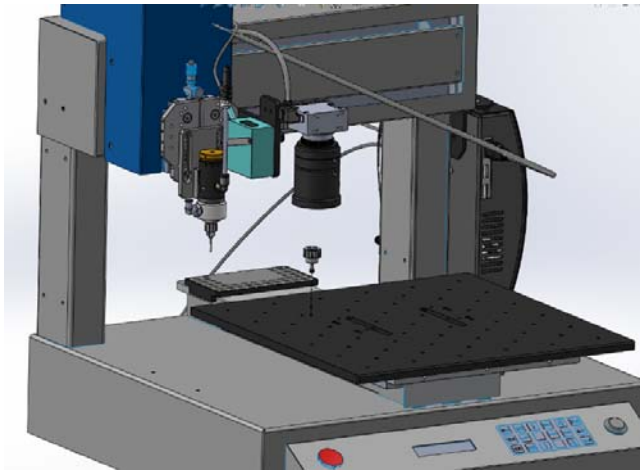
8. If the following error is displayed, check the assembly and verify the laser is still emitting on the top plate.

If this is the case, reconfirm with height gauge block

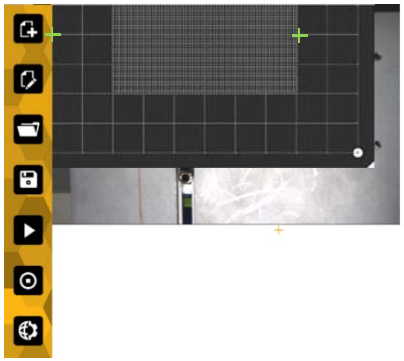
a. Clear any obstructions from laser emitter
b. Confirm the laser is level with top plate

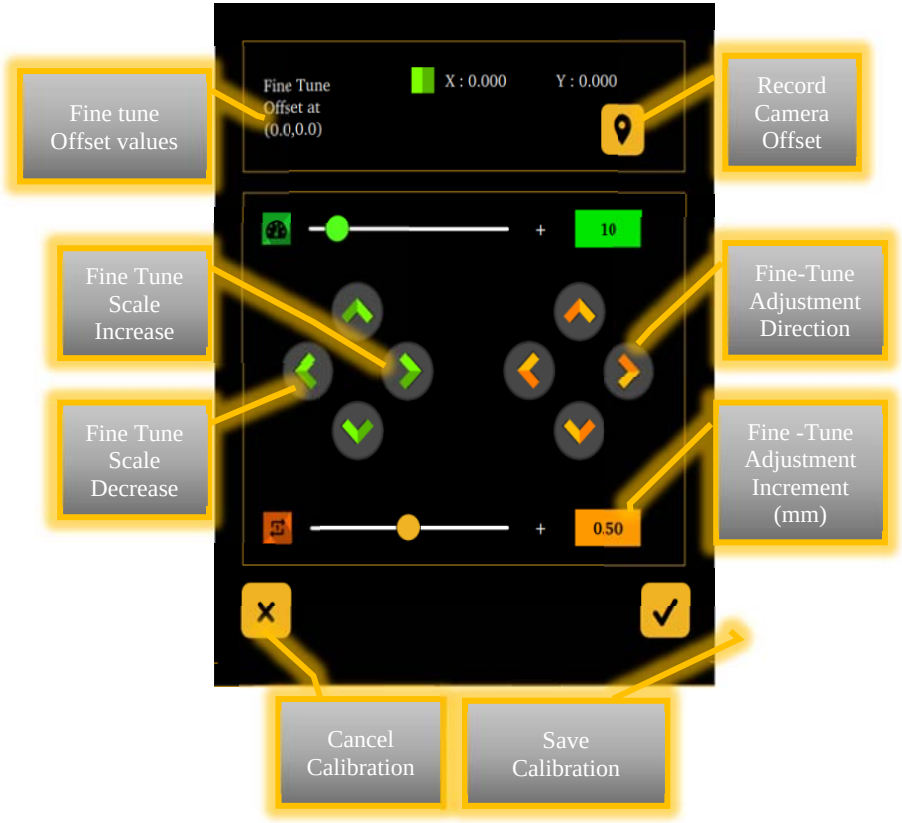
9. Install the calibration plate on the top plate then jog the head down (carefully) to adjust the top plate so that the needle is positioned at the (0,0) point of the Calibration Plate (located at the top left corner of the Calibration Plate.)

a. If positioning at (0,0) cannot be achieved, adjust top plate such that the needlepoint is at an easily discernable location.



22. The objective is to shift the image via the fine-tuning controls so the left crosshair appears at the location established in step 6. In the ongoing example, use the fine tune jog control to adjust the green crosshair so that it is directly on (0,10)

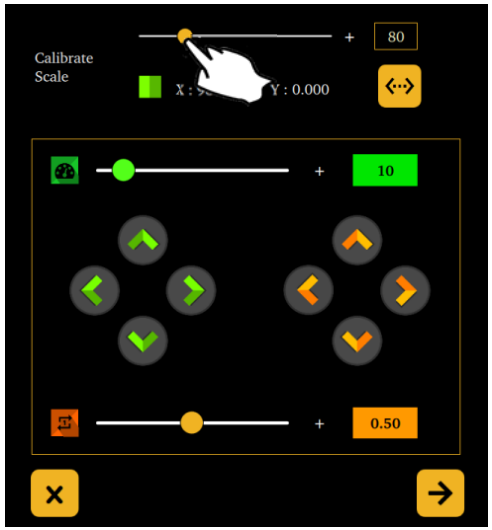




17. Set the distance on the calibrate scale slide bar. This is distance in the X axis.

    Depending on operator's preference and the location of the calibration point (set in step 6), this value can be adjusted as needed. For example, if the calibration point selected in step 5 is at (30, 30), the operator could only choose a maximum scaling value of 70mm as the grid of the Calibration plate is 100 mm x 50mm in the X and Y respectively.

    In this example, the slide bar will be adjusted to 80mm (see next image) as the calibration point selected was at (0,10).

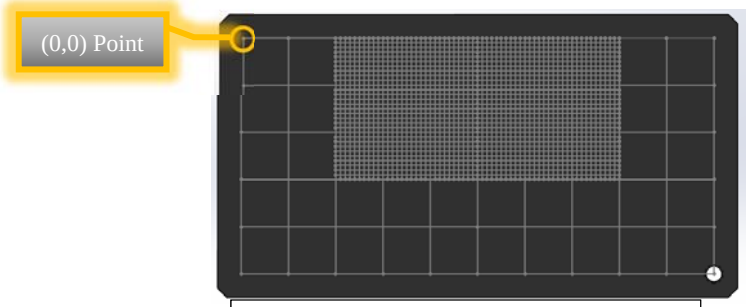


18. Position the cursor to the X = 80 mark on the calibration plate then touch this location. The dispenser will move to this location.

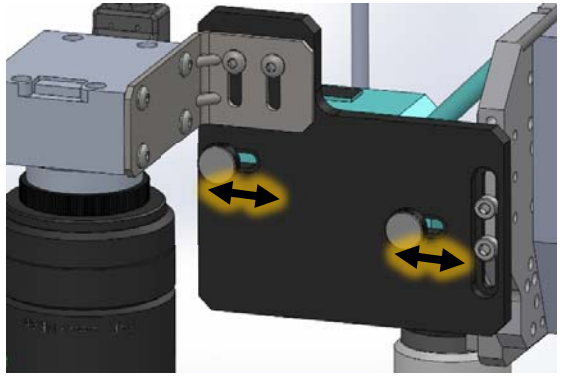
19. Touch the "Set Camera Scale" icon 

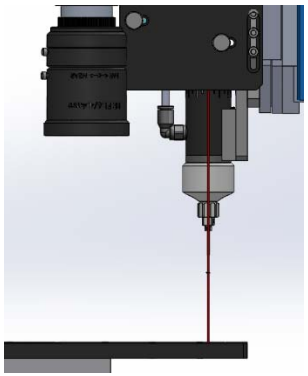
20. Touch the "Next" icon to proceed 

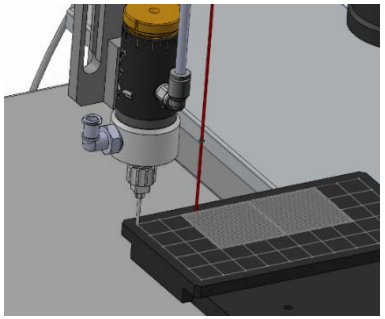
21. As the software enters the fine-tuning menu, two green crosshairs will appear on the screen with the same distance that was set on the slide bar in step 17. (In this example it is 80mm apart with the left crosshair appearing at the location set in step 6).



10. The laser can be adjusted by loosening thumb screws and adjusting the laser forward or backward (as needed.) The objective is to minimize the offset to maximize the effective working area of the laser.



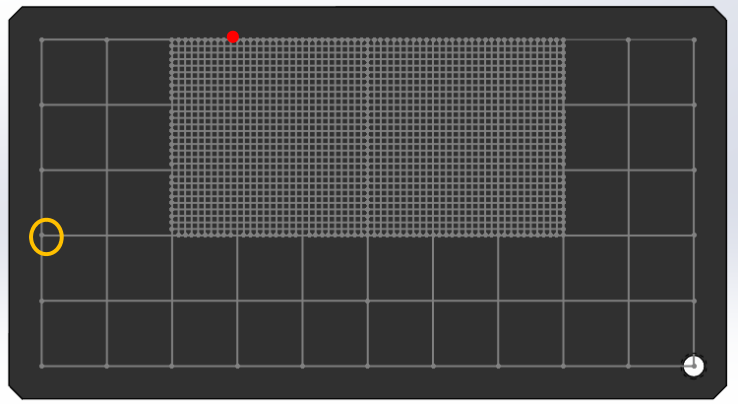




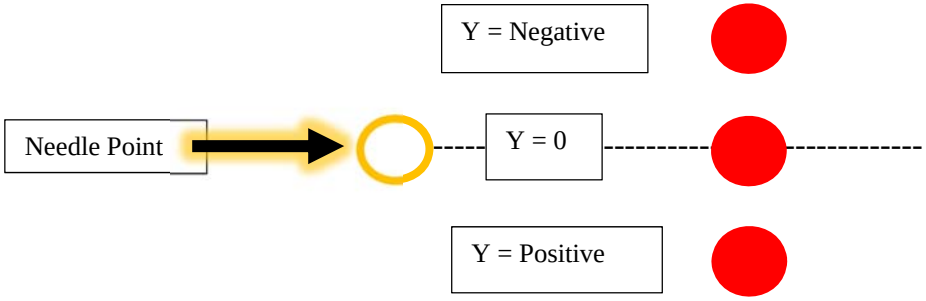
Note: The image above shows the ideal laser alignment. Both the needle and laser are on the same line of the Calibration plate.

11. Measure the X & Y offset between needle and laser point by counting the squares on the calibration plate

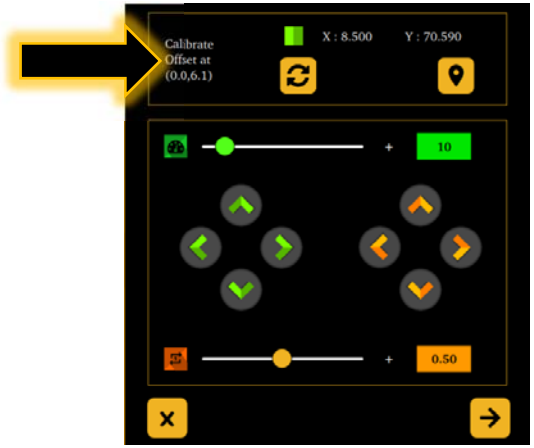
Note: Depending on the valve selected for dispensing, the laser point may end up off the calibration plate. For valves that fall under this condition, adjust the top plate such that the laser point falls on the calibration plate. In doing so, the needle will be moved from the origin (0,0) to a point where the laser can be measured. See example below with the yellow circle as the needle and the red dot as the laser.



Note: Cases such as the one above requires that the offset value in the for the Y-Axis be entered as a negative. (See diagram below.)

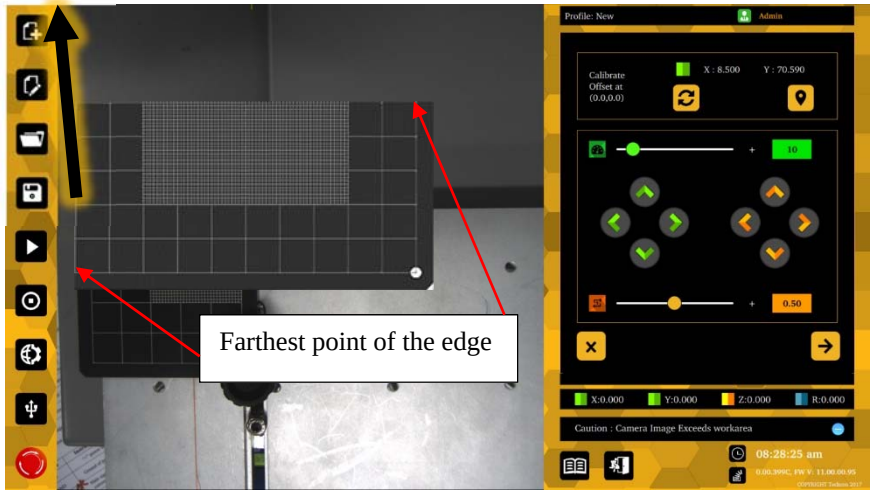


12. Touch the "Enable Laser" icon. The icon will illuminate green once activated



13. Touch the "Reset" icon to clear any previous calibration

14. Using the jog controls and find adjustment, align the point (0,10) of the white gride line on the calibration plate to the origin of the work space on the screen. (This is the point that setup in step 6)



Note: Due to curvature effect of the camera lense, it is normal to see the edges of the calibration plate not to line up perfectly with the work screen. Proceed to line up the farthest point of each edges to the work screen.

15. Touch the "Record Camera Offset" icon

16. Touch the "Next" icon

7. Once the location has been determined, move head up in the Z-Axis ONLY until the Z value has reached Z = 0.

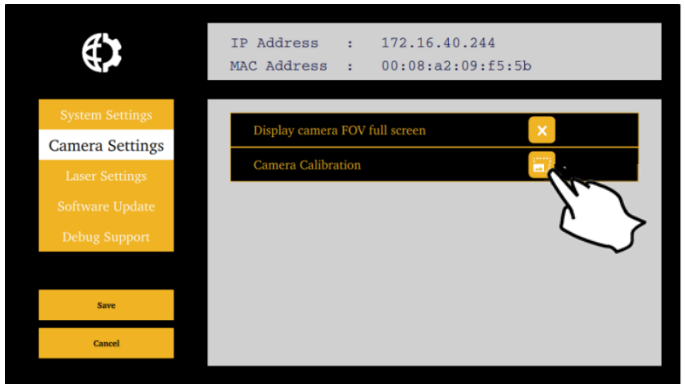
WARNING: Failure to do this step will result in an incorrect calibration.

8. Touch the “Camera” icon 

9. Touch the “Global Settings” icon 

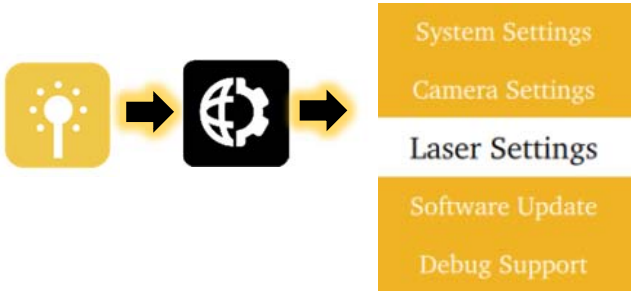
10. Select the Camera Settings Menu

11. Touch the “Camera Calibration” icon 

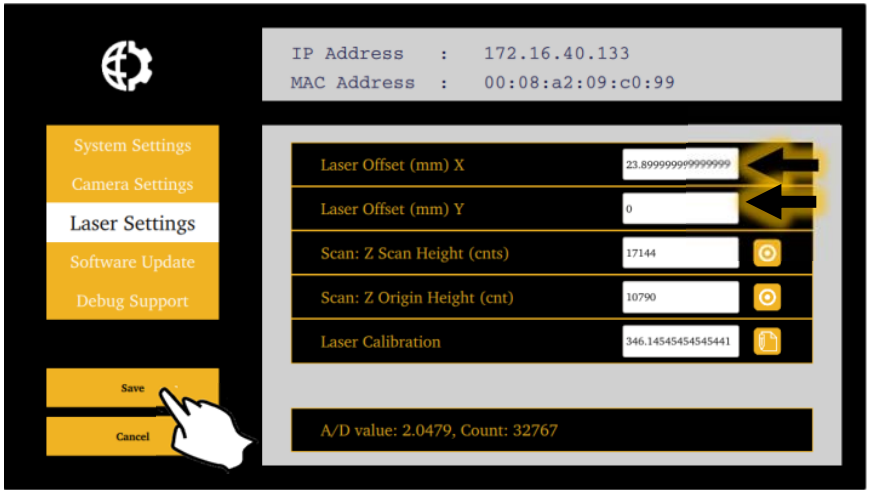


12. Now when opening the camera calibration, a value is listed in the Calibration Offset section. This value will be displayed rounded up to the nearest tenth of a millimeter although internally the measurement will be registered down the 1000th of a millimeter.

13. Touch the “Global settings” icon  then select the Laser Settings menu



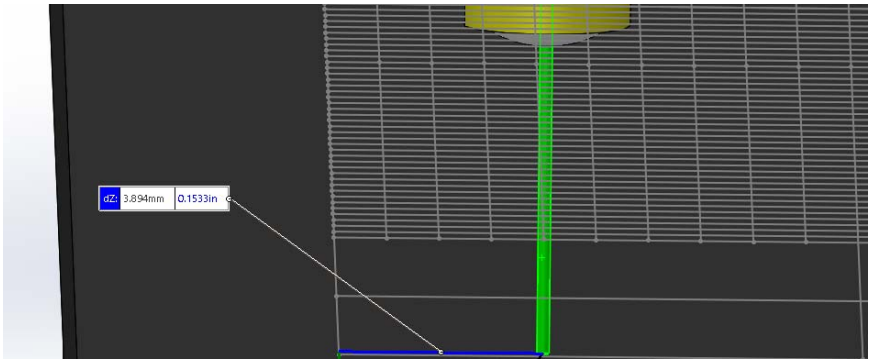
14. Enter X & Y offset values measured in step 11 in their respective locations (indicated by the arrows) and then touch “Save” icon



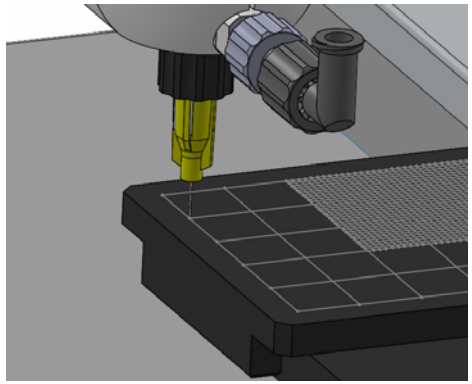
15. Touch the E-Stop Icon to reset robot and ensure settings are saved.

16. Remove the calibration plate

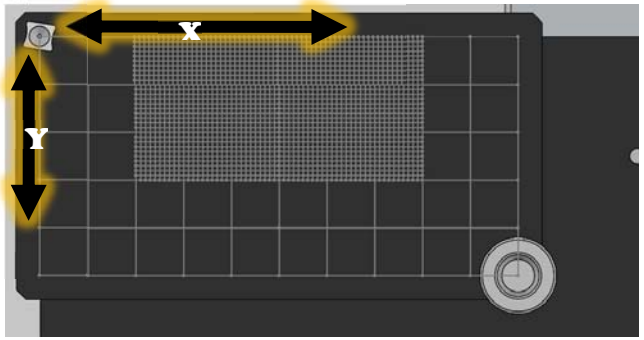
5. In this example, we see that our offset is 3.894mm from the origin.

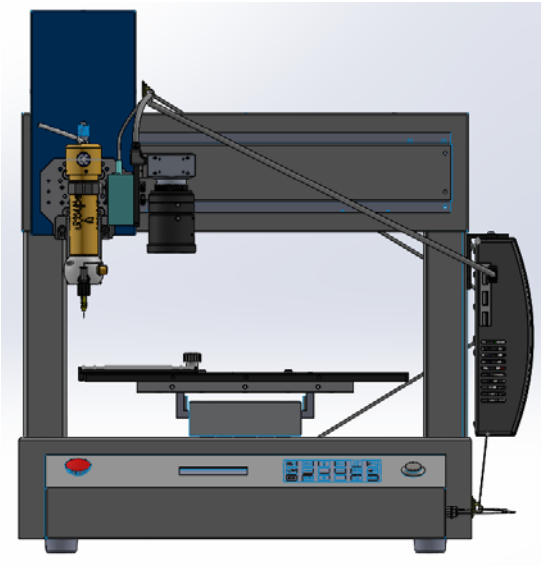


6. However, there is no way to determine this value to this precision. For this reason, jog the head to a location in which the value is easily discernable. In this example, the head was jogged to (0,10)

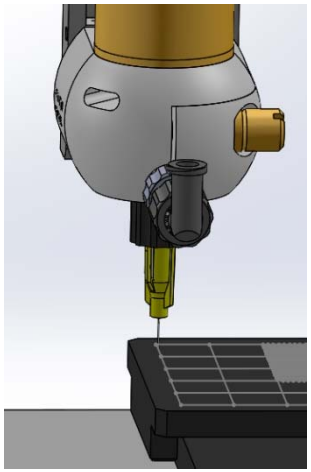


a. To confirm alignment of the top plate, jog the head in the X-direction and the Y-direction over various lengths. If the needle point deviates from the line during the jog, loosen screws of top plate and adjust accordingly.



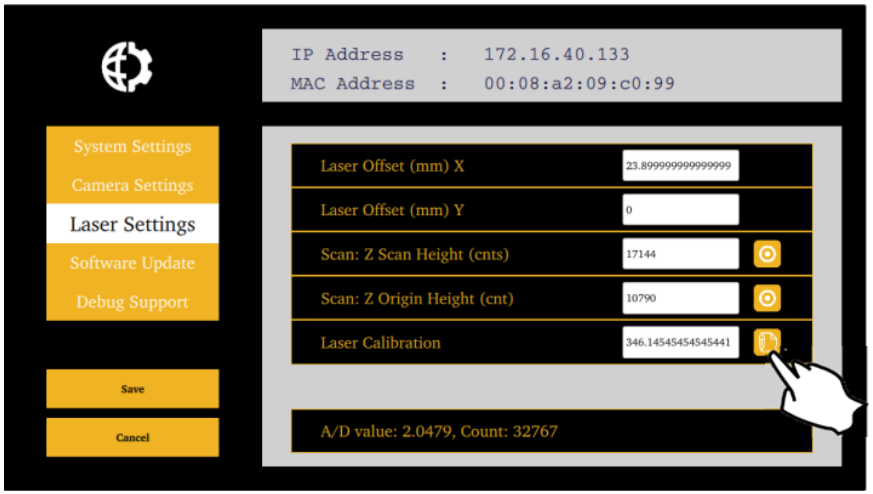


4. Align top plate to get needle point as close to (0,0) as possible
   This is done to minimize the amount of offset.



17. Return to the click on the Global Settings Icon and return to the laser settings.

18. Touch the Laser Auto-Calibration icon to start the calibration process.

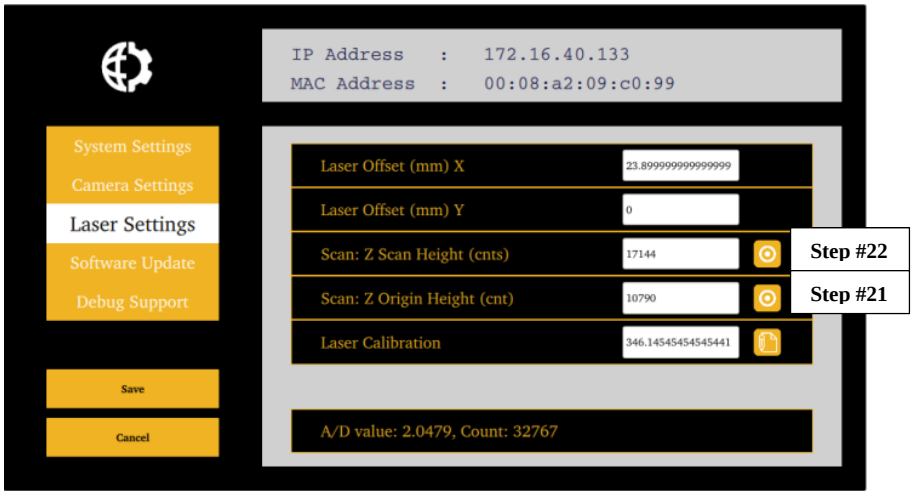


The system will automatically run through a laser calibration. Wait for calibration to be completed.

19. Touch the “Home” icon to home the unit

20. Touch the “Global Setting” icon 
21. Press the “Z Origin Height” icon
22. Jog the head down in the Z axis to 5mm then touch the “Z Scan Height” icon
23. Touch “Save” to exit

Note: Scan height can be adjusted up or down as desired by user, dependent of the height of the workpiece.



6.3 Camera Calibration

1. Install the calibration plate.
2. Touch the “Home” icon to home the unit. 

3. Set the needle position to 0,0 (at the top left corner of the calibration plate) mechanically. Do NOT use software to perform this action.

   Jog head in Z-Axis toward calibration plate; As the needle point nears the calibration plate, touch the jog control icon to switch to fine movement jogging. 

6.3.2 Camera Calibration with offset

This section will describe how to calibrate the unit with an offset. This is only necessary in the event the needle point cannot be mechanically adjusted to the (0,0) point of the calibration grid. This could happen for the following valves are used:

- TS5000 Disposable Material Path (DMP) Rotary Microvalve
- TS7000 Interchangeable Material Path (IMP) Rotary Valve
- TS9000 Piezo Jet Tech Valve
- TS9200D Jet Tech Valve
- TS1212 Pneumatic Pinch Tube Valve

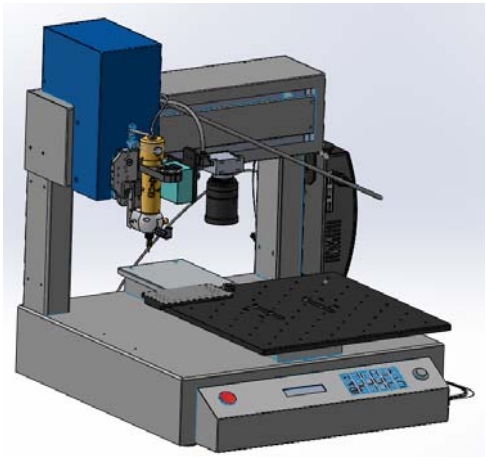
This also could happen if:

- Mechanical assembly of end effector prevents alignment to (0,0) on calibration grid.
- User requires that plate be in a fixed location at all times

1. Install the Calibration Plate and the appropriate top plate

2. Touch the “Home” icon 

3. Use the Z-Axis jog controls to bring the needle point as close to the calibration plate as necessary to distinguish the needle points position on the calibration plate.



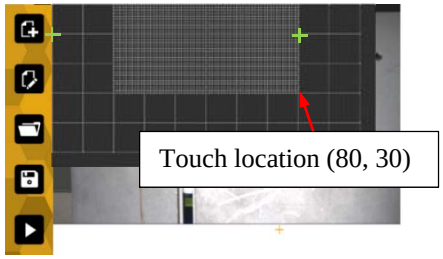
6.3.1 Verify the Camera Calibration

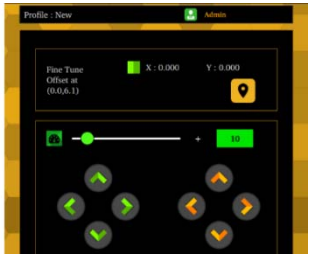
To make sure the camera calibration is done correctly, touch any discernable location on the calibration kit area and check to see if the needle actually moves to this location.

For for location accuracy purpose, it is recommended to use saved image of the calibration plate for this purpose. Following steps below:

1. Touch the “camera zoom in” icon and zoom in 2X or 3X 
2. Use the jog control to move the calibration plate in the field of view of the camera
3. Touch the “snap shot” icon to take the image of the calibration plate. 
4. Save the calibration plate image
5. Load calibration plate the image
6. Touch a discernable location on the calibration image
7. The dispenser will move to the selected location.

   Example below show location (80,30).

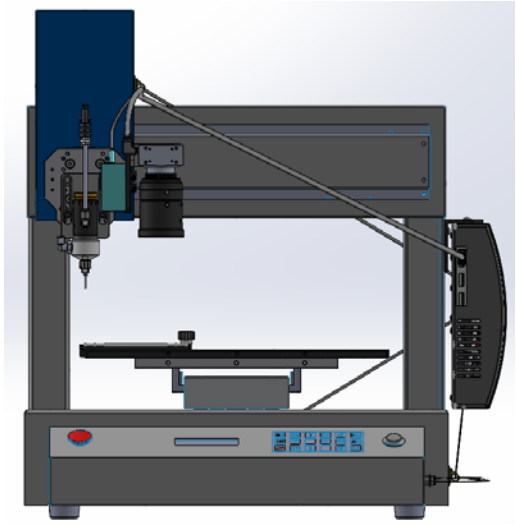




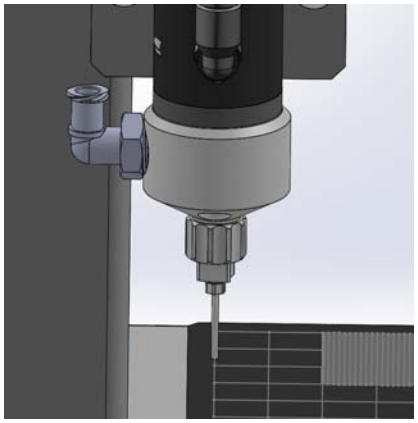
Jog the dispenser down (in the Z axis). The needle should be very close to the calibration plate surface to check for location accuracy.

The needle should be at the selected location (80, 30).
If the needle is not at the selected location, measure the offset values then continue the with the fine-tuning process in 6.3.3.

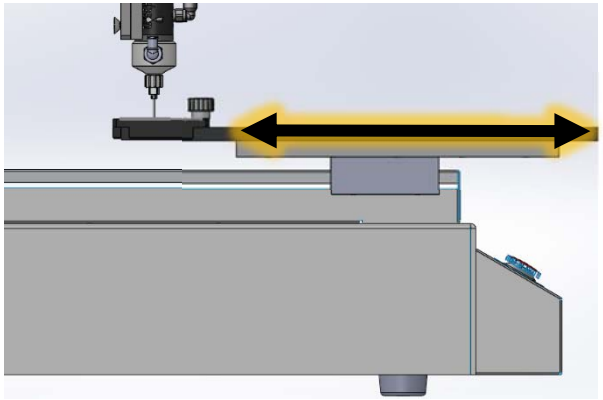
The measure offset value will be used in the fine-tuning process.

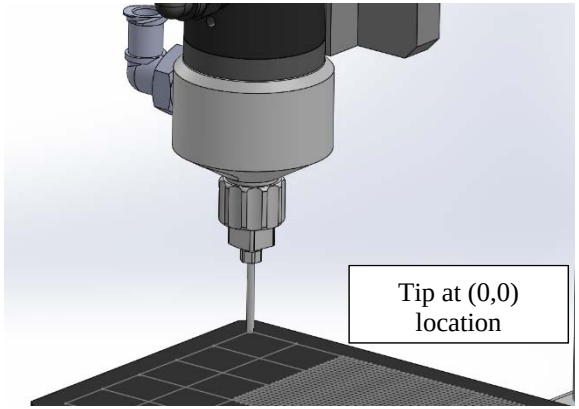


Continue to slowly jog head down until the needle point is close enough to the calibration plate to determine its position.



4. Loosen the four M4 x 12 screws and adjust the base plate forward or backward as needed until the needle tip is at the (0,0) position. Once in the appropriate location, torque screws into place.





Note: The following valves will not be able to be adjusted completely in the Y-Axis:

- ***TS5000 Disposable Material Path (DMP) Rotary Microvalve***
- ***TS7000 Interchangeable Material Path (IMP) Rotary Valve***
- ***TS9000 Piezo Jet Tech Valve***
- ***TS9200D Jet Tech Valve***
- ***TS1212 Pneumatic Pinch Tube Valve***

If the plate cannot be adjusted to (0,0), the calibration can still take place. The software will compensate for any offset, although the ideal location would be to calibrate at (0,0). If the valve in the process of being calibrated is listed above, skip to section 6.3.1

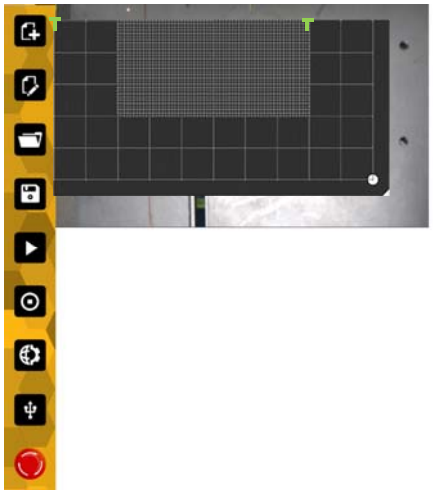
To confirm alignment of the top plate, jog the head in the X-direction and the Y-direction over various lengths. If the needle point deviates from the line during the jog, loosen screws of top plate and adjust accordingly.

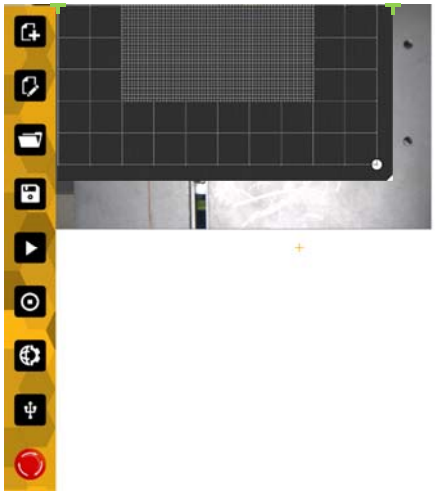
Note: Step 19 is not required and can be skipped by touching the Save Calibration icon

If step 19 is skipped but the user would like to fine tune the calibration at a later time, see section 6.3.2

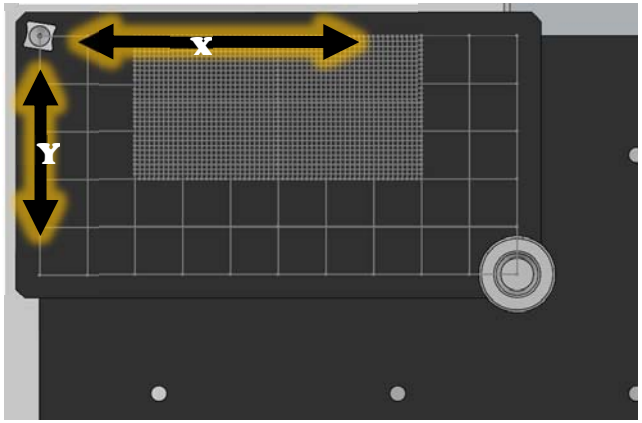
<u>You have now successfully calibrated the camera!</u>
<u>Go to Section 6.3.1 to verify the camera calibration</u>

20. As the software enters the fine-tuning menu, two green crosshairs will appear on the screen that are 80mm apart with the left crosshairs appearing at the location set in step 3. The objective is to shift the image via the fine-tuning controls so the left and right crosshairs appear on (0,0) and (80,0) of the Calibration Plate respectively.



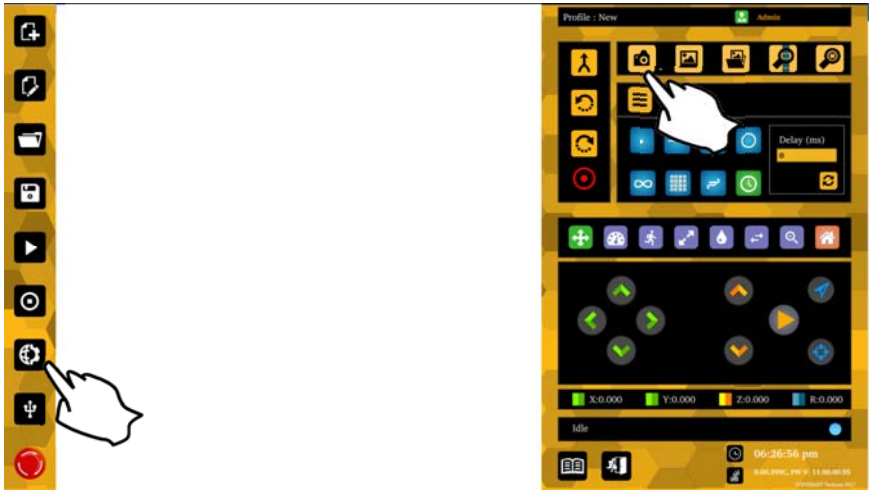


Note: Because Coarse adjustment is not necessary for calibration, the left and right arrows serve the new functions as listed below.



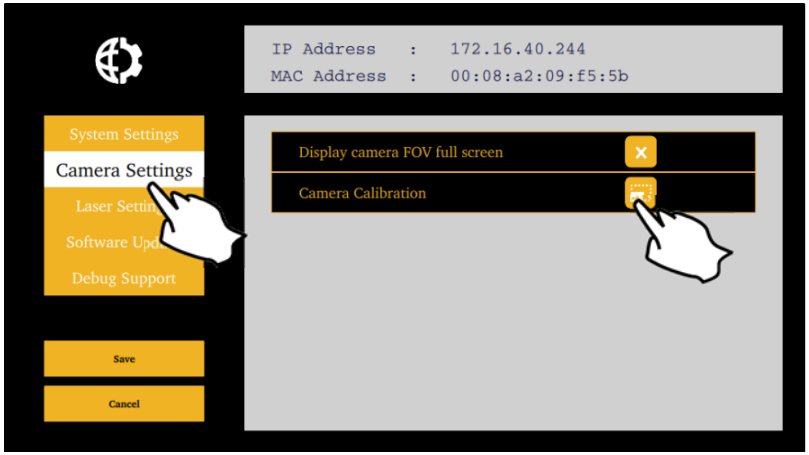
Note: In some rare cases, inability to align the needle point to (0,0) may be caused by misalignment of end effector of robot. To compensate for this offset, skip to section 6.3.1 or contact technical support for alignment troubleshooting.

5. Touch the “Home” icon.
6. Touch Camera icon to turn on Camera 

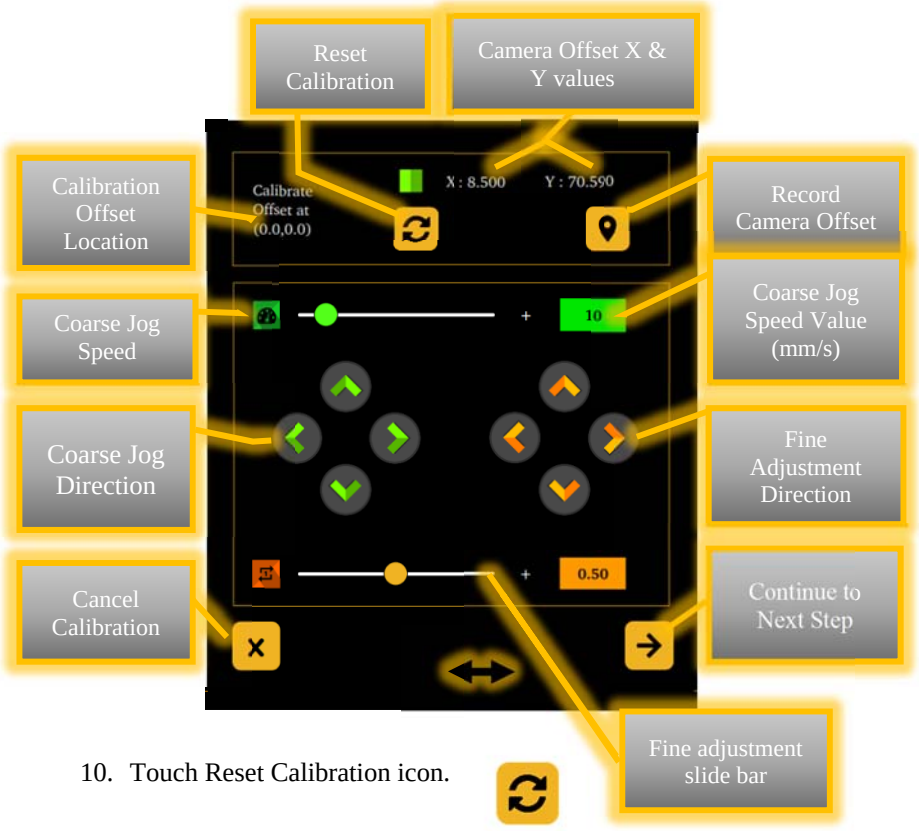


7. Touch the Global Settings Icon 

8. Touch Camera Setting Menu

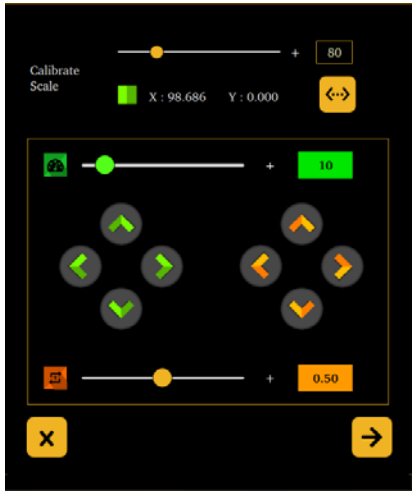


9. The diagram below describes the functions used for camera calibration.



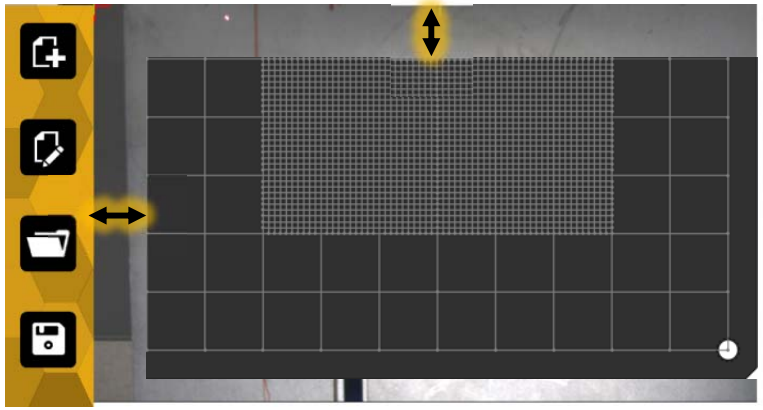
10. Touch Reset Calibration icon.

18. Click the “Next” icon to proceed to the next step.



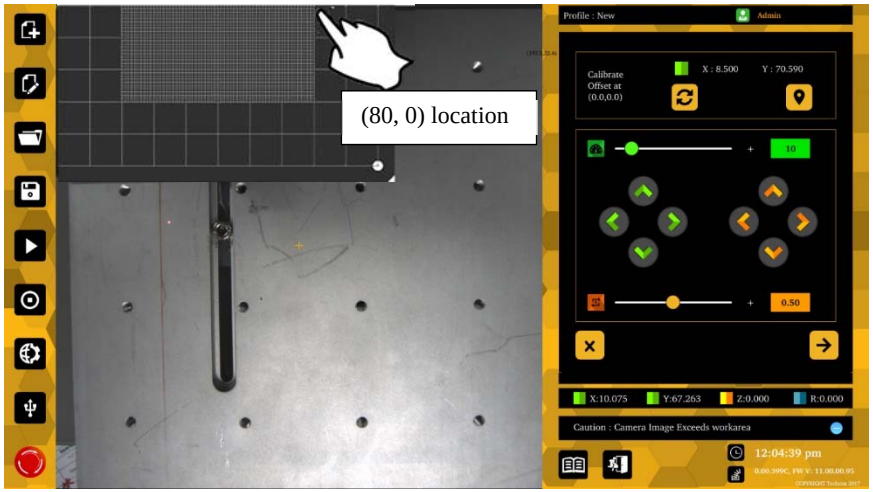
Note: The robot will automatically return to the home position. The image is now scaled. This means the user can select a distance on the screen and the robot will then execute the command with complete accuracy. If a ruler were placed under the camera and the 2-cm mark were selected, the robot would move 20mm.

19. After the scaling has been completed, the software allows for fine tuning. This allows users to dial in a position in the event the previous steps were not done precisely. When the image is scaled, a gap may appear between the borders of the work area and the Calibration Plate grid (indicated by the arrows.) This would indicate that fine tuning is necessary.
Note: A gap can appear on the left border, top border or both to indicate need for fine tuning.

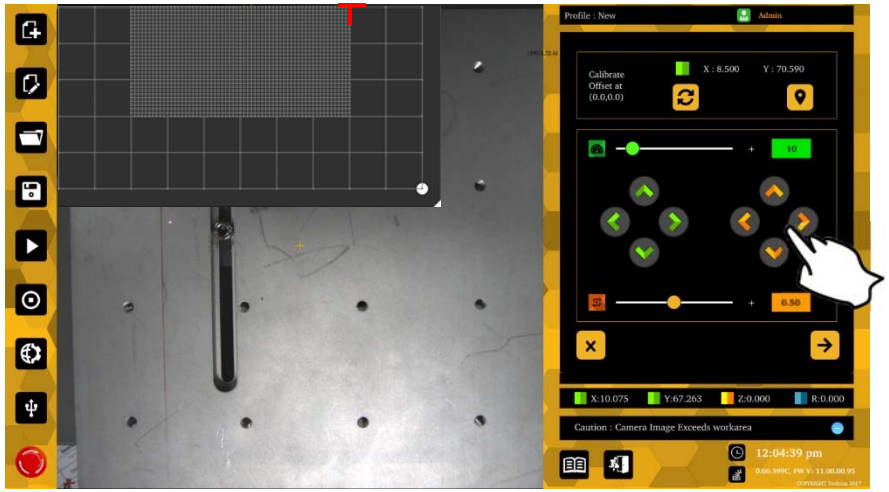


b. Touch the “Next” icon to continue onto the next step

15. On the working area, touch on the point between the 1mm square boxes and the 10mm square boxes. This is the 80,0 location.

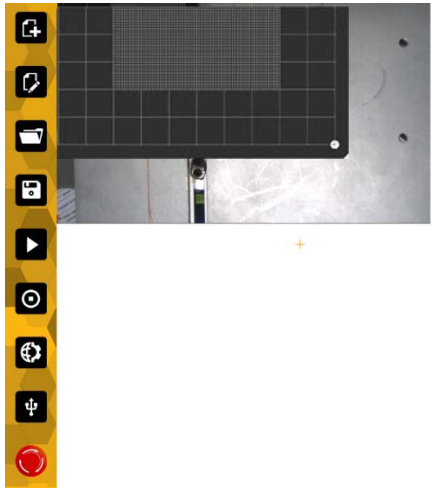


16. Use the fine adjustment directional arrows to place the red crosshair directly on the (80, 0) mark of the grid of the calibration plate.



17. Touch the “Record Camera Scale” icon to save this location

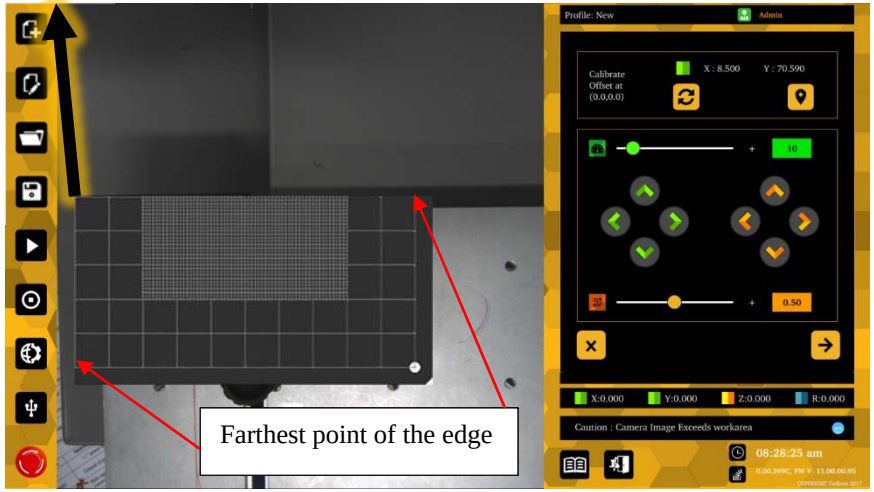
This will clear the existing calibration offset and scale. Origin will not be established and scale is reset to 1:1.



Note: This instantaneously resizes the image to fill the complete work space with camera stream.

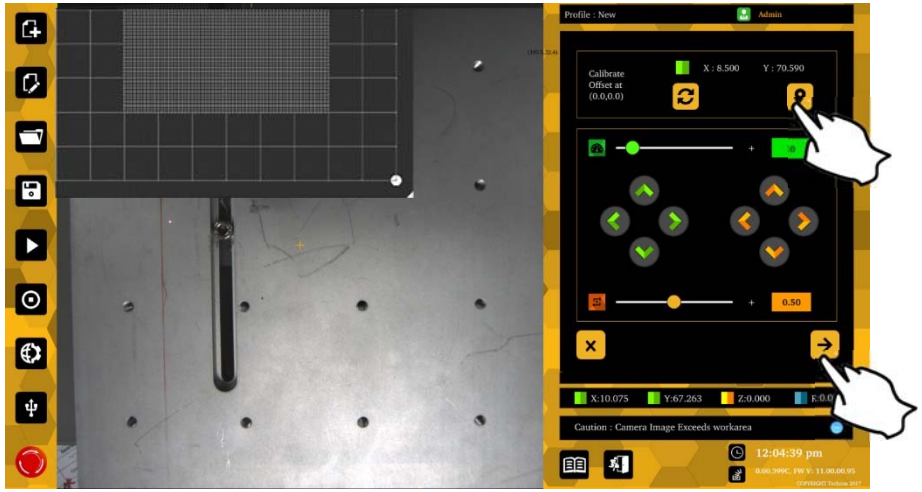
Warning: Resetting calibration without completing the entire calibration will result inaccurate movement when using the workspace to jog to a location.

11. Using the jog controls and fine adjustment, align the origin (top left corner) of white grid line on the Calibration Plate to the origin of the work space on the screen.



Note: Due to curvature effect of the camera lense, it is normal to see the edges of the calibration plate not to line up perfectly with the work screen. Proceed to line up the farthest point of each edges to the work screen.

12. Touch the “Record Camera Offset” icon to indicate the origin of Calibration Plate has been placed in the proper location. (The screen now becomes a still image.)



13. Touch the “Next” icon to continue onto the next step

Note: the total grid line area on the calibration plate is 100 mm (X) x 50 mm (Y). The nex step is to pick a location as far as possible to the 0, 0 location on the calibration plate. Location 80, 0 was choosen becase it is at the border of the small grid and the big grid.

14. Adjust the slide bar left or right until 80mm has been reached
    a. For fine adjustment in the postitive direction touch the + icon