APR

Scorpion Rework System

User Guide

Contents

Safety and Regulatory Information

WARNING

- TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE SYSTEM TO MOISTURE.
- TO PREVENT FIRE OR SHOCK HAZARD, DO NOT USE FLAMMABLE SOLVENTS NEAR OR ON THE SYSTEM WHILE CONNECTED TO A POWER SOURCE.
- TO PREVENT POSSIBILITY OF INJURY OR DAMAGE TO THE SYSTEM, DO NOT OPERATE WITH ANY COVERS OR PANELS REMOVED.
- CHANGES OR MODIFICATIONS MADE TO THIS PRODUCT WITHOUT EXPRESS APPROVAL FROM APR COULD VOID THE USERS AUTHORITY TO OPERATE THE EQUIPMENT.

 CAUTION

- Read and understand the entire Operator's Manual before installation or operation of the Scorpion Rework System. Heed all warnings on the system and in the operating instructions.

- Use of the Scorpion Rework System is intended only for the removal and placement of electronic components on to printed circuit boards by properly trained personnel. If you are not familiar with the proper and safe operation of the unit, do not operate it until proper training has been obtained.

- The unit should be operated only from the type of power source indicated on the serial number label.

- Use only the supplied power cord. Avoid damage to the power cord.   If damage should occur, replace it with the approved APR replacement power cord.

- This CAUTION symbol on the equipment refers the user to the user guide for additional information. This symbol appears next to the relevant information in the manual.

- This HOT symbol on the equipment warns the user of a hot surface and potential injury if touched. Please refer to the Operator's Manual for additional information. This symbol appears next to the relevant information in the manual.

- This HEAVY LIFTING symbol on the packaging warns the user to team lift the Scorpion Rework System during removal from packaging and installation on the workbench. Please refer to the user guide for additional information. This symbol appears next to the relevant information in the manual.

- This PINCH POINT symbol on the equipment warns the user of a potential injury. This symbol appears next to the relevant information in the manual.

When operating this equipment, please exercise caution. If this unit is used in a manner which it is not intended for, serious personal injury may occur. Please read this user guide thoroughly prior to use.

- **The main power cord is a means for disconnecting the equipment from an operating energy source. Equipment must not be positioned in a way that impedes the disconnection of the main power cord in case of an emergency.**

- **Mandatory use of a grounding strap is required when operating the equipment.**

Other Safety Tips
- Unplug the unit before cleaning. Clean the exterior of the system with a damp cloth. Do not use solvent-based cleaners.
- Slots and openings in the system are provided for ventilation and to ensure reliable operation and protection from overheating. The openings should never be blocked or covered.
- Do not overload power outlets and extension cords. This can result in fire or electric shock.

The Scorpion Rework System is safety certified by TÜV SÜD, and it complies with UL, CSA, and CE standards.

Description

Thank you for your purchase of a Scorpion Rework System. Each unit has been inspected thoroughly by APR prior to shipment, and with proper maintenance will give you years of reliable performance.

This user guide is a valuable resource. It explains the systems options, features, specifications and the correct operation of your Scorpion Rework System. If any problems should occur during setup or operation of your system, contact APR's Technical Service Department or you may contact your local Representative or you may email us at Service@APR-Rework.com.

The Scorpion Rework System provides both accurate component placement and specifically tailored reflow profiles (through APR patented single component Micro Oven™) in one user friendly, single platform rework system.

The challenges of array package rework, and the inability to easily inspect placement accuracy (with BGAs in particular), call for a solution that allows for simultaneous viewing of PC board pads and component pads or balls for accurate placement. The Scorpion Rework System fills this need with quick, accurate placement through the use of the patent pending SmartPlace Technology vision system employing dual image overlay technology. The image of the BGA solder balls is overlaid with that of the PC board pattern with magnification from 20X to 50X. The image is viewed on the computer monitor and fine adjusted with micrometers on the board holder. Finally, the part is placed and the vacuum is released.

After accurate component placement is achieved, the vacuum pickup tube is retracted and the reflow nozzle is lowered into place. At this point, the component is subjected to a user-customizable multi-zone, full convection reflow profile, specifically tailored to the requirements of that particular PCB, device and solder paste. Accurate duplication of original oven reflow parameters is achieved.

During the course of the reflow profile, source temperatures and time intervals can be modified "On the Fly", eliminating the need to wait for the current profile to terminate before modifications can be made. Precise solder joint temperatures are measured and displayed on a real time graphical display, thus providing the necessary data to accurately and easily establish the optimum reflow profile for each particular application within minutes.

The Scorpion Rework System is available in the following item numbers:

Item	Description
APR-1200-SRS	Scorpion Rework System, with Manual Placement Head
APR-1200A-SRS	Scorpion Rework System, with Motorized Placement Head
APR-1200-SRS-MOB	Scorpion Rework System, with Manual Placement Head, for Mobile Devices
APR-1200A-SRS-MOB	Scorpion Rework System, with Motorized Placement Head, for Mobile Devices

Packaging

APR-1200-SRS

Qty	Item	Description
1	-	Scorpion Rework System
1	-	Scorpion Power Cord (male plug not included)
1	SPT-RC	Remote Control with DB9 Cable, for APR-1200-SRS
1	FP-19	19" LCD Monitor with HDMI Cable and U.S. Power Cord
1	-	Optical Mouse
1	FSL-SRS-3	PCB Spring Finger, Long (3 pack)
1	FSS-SRS-3	PCB Spring Finger, Short (3 pack)
1	UBS-SRS	Underboard Support
3	-	Thermocouple, 40 Gauge, 36"
1	VNZ-ORINGK	O-Ring Kit (assortment, qty 5 for each of the 4 sizes)
1	VNZ-12	Vacuum Nozzle, 12 mm O.D.
1	VNZ-08	Vacuum Nozzle, 8 mm O.D.
1	VNZ-05	Vacuum Nozzle, 5 mm O.D.
1	VNZ-01	Vacuum Nozzle, 1 mm O.D.
1	AC-RP	Nozzle Removal Pad
1	APR-20987	Adjustable Component Nest, CSP
1	APR-19782	Adjustable Component Nest, BGA
1	KAP-100	Pre-cut Kapton Tape (100 pack)
1	SRS-OVK	Optical Verification Kit
1	PNZ-07	Placement Nozzle, .7 mm O.D.
1	PNZ-24	Placement Nozzle, 2.4 mm O.D.
1	PNZ-60	Placement Nozzle, QF, 12.7 mm
1	PNZ-AD	Placement Nozzle Adapter

APR-1200-SRS-MOB

Qty	Item	Description
1	-	Scorpion Rework System
1	-	Scorpion Power Cord (male plug not included)
1	SPT-RC	Remote Control with DB9 Cable, for APR-1200-SRS
1	FP-22	22" LCD Monitor with HDMI Cable and U.S. Power Cord
1	-	Optical Mouse
1	FSL-SRS-3	PCB Spring Finger, Long (3 pack)
1	FSS-SRS-3	PCB Spring Finger, Short (3 pack)
1	UBS-SRS	Underboard Support
3	-	Thermocouple, 40 Gauge, 36"
1	VNZ-ORINGK	O-Ring Kit (assortment, qty 5 for each of the 4 sizes)
1	VNZ-12	Vacuum Nozzle, 12 mm O.D.
1	VNZ-08	Vacuum Nozzle, 8 mm O.D.
1	VNZ-05	Vacuum Nozzle, 5 mm O.D.
1	VNZ-01	Vacuum Nozzle, 1 mm O.D.
1	AC-RP	Nozzle Removal Pad
1	APR-20987	Adjustable Component Nest, CSP
1	APR-19782	Adjustable Component Nest, BGA
1	KAP-100	Pre-cut Kapton Tape (100 pack)
1	SRS-OVK	Optical Verification Kit
1	PNZ-07	Placement Nozzle, .7 mm O.D.
1	PNZ-24	Placement Nozzle, 2.4 mm O.D.
1	PNZ-60	Placement Nozzle, QF, 12.7 mm
1	PNZ-AD	Placement Nozzle Adapter

APR-1200A-SRS

Qty	Item	Description
1	-	Scorpion Rework System
1	-	Scorpion Power Cord (male plug not included)
1	SPT-RCA	Remote Control with DB9 Cable, for APR-1200A-SRS
1	FP-19	19" LCD Monitor with HDMI Cable and U.S. Power Cord
1	-	Optical Mouse
1	FSL-SRS-3	PCB Spring Finger, Long (3 pack)
1	FSS-SRS-3	PCB Spring Finger, Short (3 pack)
1	UBS-SRS	Underboard Support
3	-	Thermocouple, 40 Gauge, 36"
1	VNZ-ORINGK	O-Ring Kit (assortment, qty 5 for each of the 4 sizes)
1	VNZ-12	Vacuum Nozzle, 12 mm O.D.
1	VNZ-08	Vacuum Nozzle, 8 mm O.D.
1	VNZ-05	Vacuum Nozzle, 5 mm O.D.
1	VNZ-01	Vacuum Nozzle, 1 mm O.D.
1	AC-RP	Nozzle Removal Pad
1	APR-20987	Adjustable Component Nest, CSP
1	APR-19782	Adjustable Component Nest, BGA
1	KAP-100	Pre-cut Kapton Tape (100 pack)
1	SRS-OVK	Optical Verification Kit
1	PNZ-07	Placement Nozzle, .7 mm O.D.
1	PNZ-24	Placement Nozzle, 2.4 mm O.D.
1	PNZ-60	Placement Nozzle, QF, 12.7 mm

APR-1200A-SRS-MOB

Qty	Item	Description
1	-	Scorpion Rework System
1	-	Scorpion Power Cord (male plug not included)
1	SPT-RCA	Remote Control with DB9 Cable, for APR-1200A-SRS
1	FP-22	22" LCD Monitor with HDMI Cable and U.S. Power Cord
1	-	Optical Mouse
1	FSL-SRS-3	PCB Spring Finger, Long (3 pack)
1	FSS-SRS-3	PCB Spring Finger, Short (3 pack)
1	UBS-SRS	Underboard Support
3	-	Thermocouple, 40 Gauge, 36"
1	VNZ-ORINGK	O-Ring Kit (assortment, qty 5 for each of the 4 sizes)
1	VNZ-12	Vacuum Nozzle, 12 mm O.D.
1	VNZ-08	Vacuum Nozzle, 8 mm O.D.
1	VNZ-05	Vacuum Nozzle, 5 mm O.D.
1	VNZ-01	Vacuum Nozzle, 1 mm O.D.
1	AC-RP	Nozzle Removal Pad
1	APR-20987	Adjustable Component Nest, CSP
1	APR-19782	Adjustable Component Nest, BGA
1	KAP-100	Pre-cut Kapton Tape (100 pack)
1	SRS-OVK	Optical Verification Kit
1	PNZ-07	Placement Nozzle, .7 mm O.D.
1	PNZ-24	Placement Nozzle, 2.4 mm O.D.
1	PNZ-60	Placement Nozzle, QF, 12.7 mm

Scorpion System Components - APR-1200-SRS

APR-1200A-SRS & APR-1200A-SRS-MOB

Front

Back
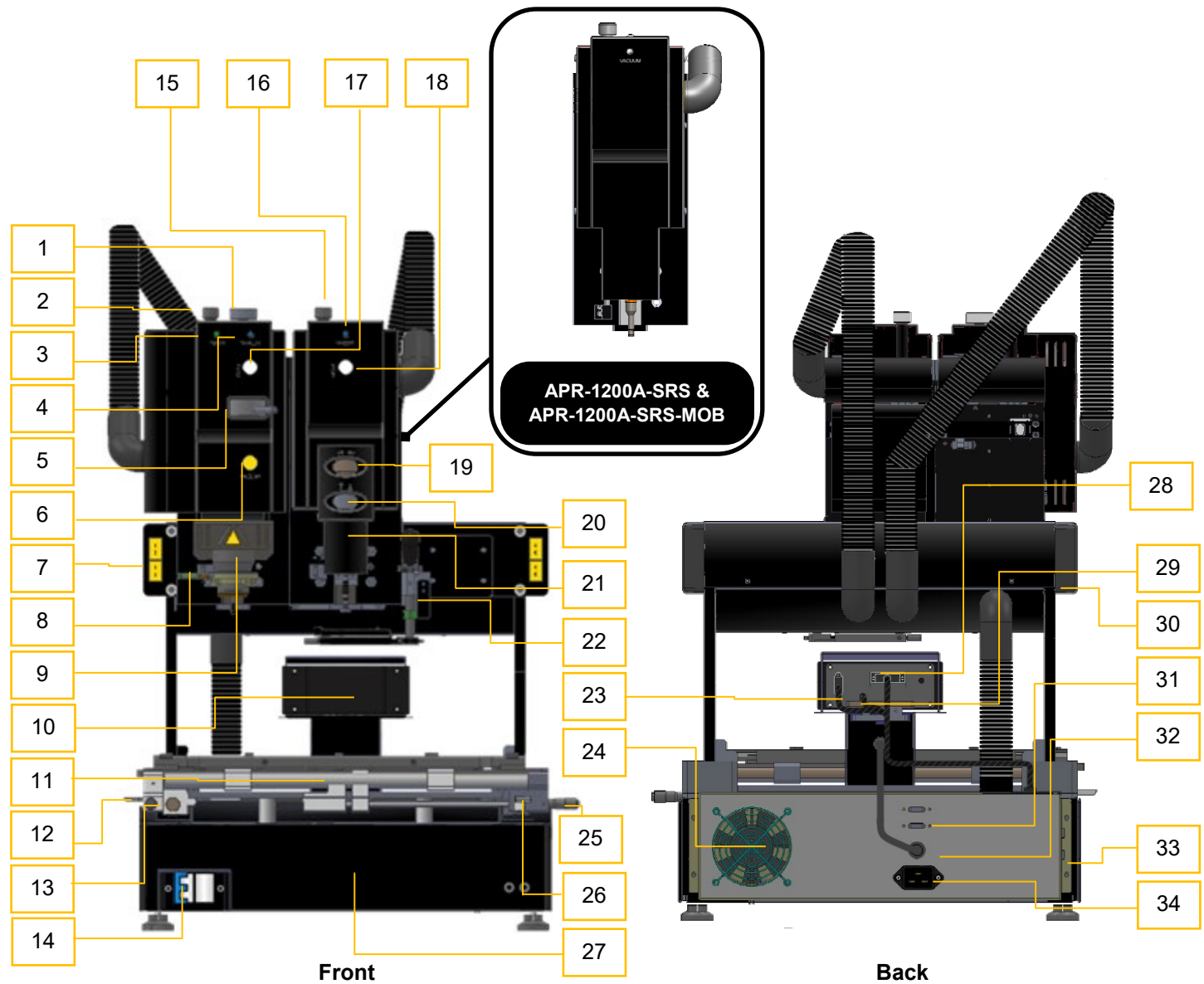
#	Component	#	Component
1	Fine "Z" axis adjustment	19	Theta adjustment
2	Travel adjustment	20	Fine "Z" axis adjustment
3	Power "On" LED	21	Precision Placement Head
4	Vacuum Seal indicator	22	Component placement assembly
5	Component Theta control	23	Remote control connector
6	"X" axis release button	24	Chassis Fan
7	External Type K thermocouple	25	"X" Axis micrometer
8	Travel dampener	26	"X" Axis lock
9	Reflow head	27	Preheater Chassis assembly
10	SmartPlace Technology Vision System	28	Camera DVI connector
11	Board holder assembly	29	Camera power connection
12	"Y" lock	30	Gantry assembly
13	"Y" Axis micrometer	31	USB connectors
14	Circuit breaker	32	SmartPlace power cable
15	Travel Adjustment	33	HDMI monitor connector
16	Vacuum Seal Indicator	34	Power cable
17	"Z" Axis release		
18	"Z" Axis release		

The main unit is very heavy. Please uncrate the unit with 2 people.

DO NOT LIFT THE MAIN UNIT BY THE PCBA BOARD HOLDER. LIFTING BY THE BOARD HOLDER WILL DAMAGE THE ASSEMBLY!

Before setting up your equipment

- Ensure your Scorpion Rework System has arrived complete
- Provide a location that allows the user to operate this machine in a comfortable, well-spaced environment

Every Scorpion Rework System has been factory assembled and calibrated.

- **Recalibration is not necessary after initial setup.**
- **Verifying calibration and product functionality is strongly recommended prior to initial use**

Power-up Sequence

- Attach an appropriate power plug to the stripped end of the power cord. Use recommended power plugs:
  - Nema 6-20
  - Nema L6-20
  - IEC 60309
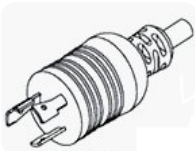
Use the following diagrams together with the manufacturer's recommended procedure for hooking up wires to a power plug
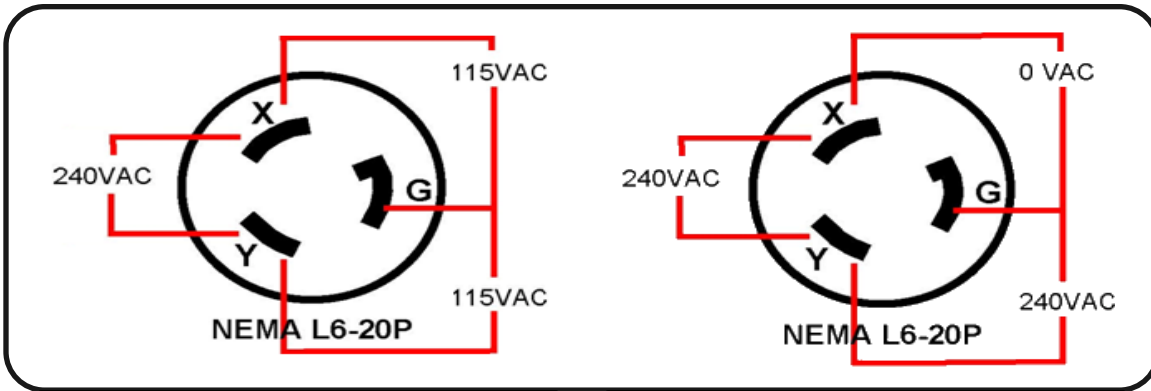
Configuration 1

- Measure from **X** to **Y**. This measurement should always be 200VAC to 240VAC
- Measure from **G** to **X**. This measurement will be 110VAC-125VAC
- Measure from **G** to **Y**. This measurement will be 110VAC-125VAC

Configuration 2

- Measure from **X** to **Y**. This measurement should always be 200VAC to 240VAC
- Measure from **G** to **X**. This measurement will be 0 VAC
- Measure from **G** to **Y**. This measurement will be 200VAC-240VAC

Cable Connections

★ **SPT-RCA --- APR-1200A-SRS & APR-1200A-SRS-MOB**

SPT-RC/SPT-RCA

APR SCORPION REWORK SYSTEM

MODEL	APR-1200-SRS
INPUT LINE VOLTAGE	208-240VAC
INPUT LINE FREQUENCY	50/60 Hz
INPUT POWER MAX	2800W
OPERATING TEMP.	50-104°F (10~40°C)
SERIAL NUMBER	1815001
MANUFACTURE DATE	2018-04-11

CAUTION
TO PROVIDE CONTINUED PROTECTION AGAINST RISK OF ELECTRIC SHOCK, CONNECT TO PROPERLY GROUNDED OUTLETS ONLY
NE BRANCHEZ L'APPAREIL QUE SUR LES PRISES CORRECTEMENT RELIÉES À LA TERRE POR ÉVITER LE RISQUE DE CHOC ÉLECTRIQUE
APR-Rework.com | Made in America | DESCO INDUSTRIES INC

REMOTE

MONITOR

Insert the power cord plug into a recepticle
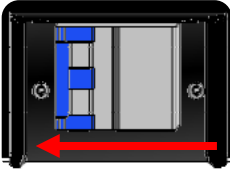
Set the circuit breaker switch to the "on" position

When the title screen, appears your Scorpion Rework System is ready for operation!

Click the log-in icon.

• The system has three levels of permissions; operater, engineer, and administration modes.
• Enter the approprripate password for the user level with the onscreen keyboard.
• Default Operator password=operator
• Default Engineer password=engineer
• Default Administration password=guru

©**DESCO INDUSTRIES, INC.**, All rights reserved.
Software Revision 1.14

DESCO INDUSTRIES, INC.

The Scorpion user interface offers two options for navigation.

- Each dot corresponds to a different screen. Select a screen by left-clicking on the appropriate dot.
- The first dot it the title screen, the second dot is the profile window, the third dot is system configuration window, and the fourth dot is the factory administration window.

System Operation

Reflow Head:

Precision Placement Head Operation: APR-1200-SRS

Travel Adjustment
- ↻ increase
- ↺ decrease

Fine Z axis adjustment
- ↻ increase
- ↺ decrease

Power Indicator
- ✿ System On

Vacuum Seal Indicator
- ✿ Positive Seal

X Axis Release
- Press to release

Z Axis Release
- Press to release

Θ Adjustment
- 30° Reflow Head
- 360° Precision Placement Head

Nozzle Θ Adjustment

Fine Z axis adjustment
- ↻ decrease
- ↺ increase

Board Holder Operation

Adjustable Board Holder
- 🔓
- 🎧
- 🔒

Y Axis Adjustment
- 🔓
- Adjust
- 🔒

X Axis Adjustment
- 🔓
- Adjust
- 🔒

Y Axis Fine Adjustment
- 🔒 X Axis
- ↺,⮃Y
- ↻,🎧Y

X Axis Fine Adjustment
- 🔒 X Axis
- ↺,⮂X
- ↻,⮃X

SmartPlace Camera Remote Operation: APR-1100-SRS & APR-1200-SRS

Zoom
- 5 step digital zoom

Ratio
- Top & Bottom Cameras
- Bottom Camera Only
- Top Camera Only

Top Camera Lighting
- ↺,🎧
- ↻,⮃

Bottom Camera Lighting
- ↺,🎧
- ↻,⮃

APR SCORPION

MADE IN AMERICA DESCO INDUSTRIES INC

3651 WALI   -9980 • APR-Rework.com
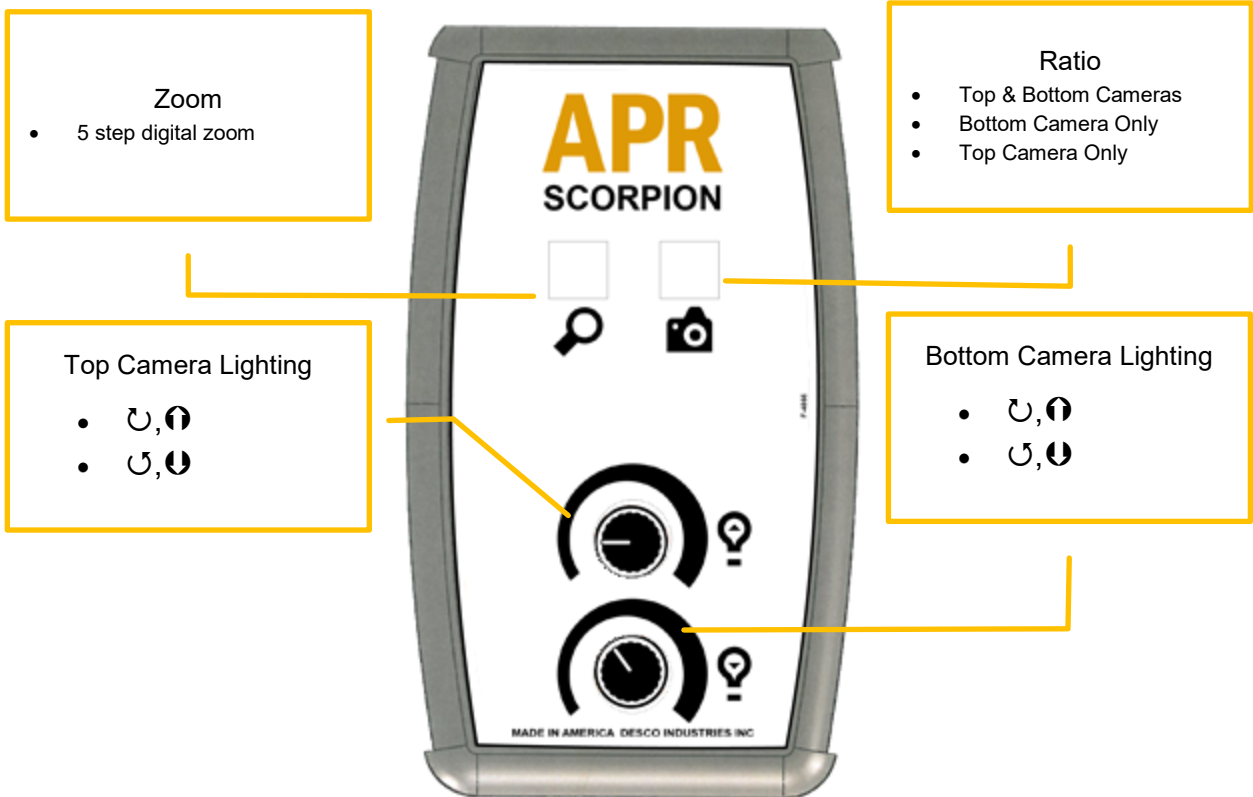
SmartPlace Remote Operation: APR-1200A-SRS & APR-1200A-SRS-MOB

Bottom Camera Color Selection
Red - White - Blue

Ratio
- Top & Bottom Cameras
- Bottom Camera Only
- Top Camera Only

Zoom

APR
SCORPION

Top Camera
Lighting

Bottom Camera
Lighting

Reserved for Future Use

Program Start Button
Program Stop Button

MADE IN AMERICA
DESCO INDUSTRIES INC.

Z axis adjustment

Θ Adjustment

Icon	Description	Icon	Description
	Login		Locked / Unlocked
	New Removal Profile		Vacuum Shaft Retract, Reflow Head
	New Placement Profile		Vacuum Shaft Retract, Precision Placement Head
	Open/Import Profile		Vacuum On-Off
	Save/Export File		Puff-Off
	Start Profile		Reflow Blower
	Auto Profile		Focus Blower
	Cycle Advance		Surround Blower
	Add Zone		Reflow Heater Calibration / Calibration in Progress
	Screen Capture		Focus Heater Calibration
	Open Screen Shot / Close Screen Shot		Surround Heater Calibration
	Language Select		Preheater Preset Off / Preheater Preset On
	Back-up & Restore		Thermocouple Calibration
	Restore Factory Settings		Unmount USB Drive
	User Guide		Side-view Camera On/Off
	Software Shutdown		

User Guide

- Hover the cursor over the user guide icon

- Left click the icon to activate
- Left click again to deactivate

Software Shutdown

- Metcal recommends shutting down the software prior to removing power to the unit. This will minimize the risk of file corruption to the computer's memory card.

- Hover the cursor over the software shutdown icon

- Left click the icon to activate.

Tool Tip language select.

- Hover the cursor over the tool tip language select icon.

- Right click on the mouse button to access the language options box.

⬛ 🇺🇸 English	
⬛ 🇨🇳 简体中文	• The language option box displays showing the current language setting.
⬛ 🇩🇪 Deutsch	

- Use the scroll wheel to the language.

- Right click the mouse button to save changes.

- Left click the icon to activate
- Left click again to deactivate

Profile Window

- displays the temperature profile and data table.

Profile Window Overview

Operator Mode

Icon Menu Bar: displays available icons based on level of access

Active Profile Area: displays the time and temperature settings for the selected profile.

Profile Data Table: displays time, temperature, and ramp rate data of the active profile.

Profile Information area: displays the profile mode, profile name, total cycle count, total cycle run time.

Screen Capture Area: displays screen capture controls

Profile mode: remove
Name: /default
Total Cycle Count: 0
Total Cycle Run Time: 0:0 (hr:min)

Time	
Reflow	-
Small	-
Large	-
IR	-
TC1	-
TC2	-
TC3	-

Edit Profile

- Changing profile information requires the profile to be unlocked.

- Left click the Lock icon

- The profile is open for editing.

Active Profile Area

	Temperature Settings (°C)
	Reflow heater and Airflow Settings
	Surround Preheater Setting
	Focus Preheater Setting
	Profile Marker (Performance)
Profile Marker (Measurement)	**Time Settings (seconds)**

Changing Profile Values

Changing airflow
- Left click on the box area to change airflow.
- 3 available settings, low (1 bar), medium (2 bars), and high (3 bars).

Changing temperature
- Each line corresponds to a different heater
- Temperature can be changed in two ways.
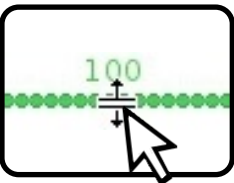
Changing temperature - Method 1
- Left click the desired heater. The cursor will change to double arrows. Drag & drop to the desired temperature.

Changing temperature - Method 2
- Right click the desired heater. The temperature adjust dialog box will appear. Use the up and down arrows to select the desired temperature. Click"ok" to enter the desired temeperature.

Changing Time Zones

- The default configuration is 4 heating zones and 1 for cooling. An additional 4 zones of heating and 1 of cooling can be added.
- The duration of each zone can be changed in two ways.
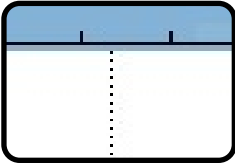
Adding additional time zones

- Hover the cursor over the time zone bar area located at the top of the graph. The cursor will change to the "zone" icon. Left click to add an additional zone.
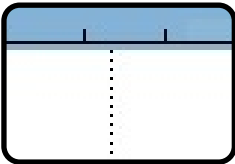
Removing time zones

- Hover the cursor over the time zone bar area located at the top of the graph. The cursor will change to the "zone" icon. Right click to remove a zone.
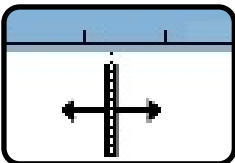
Changing time zone duration - Method 1

- Left click the desired zone. The cursor will change to double arrows. Drag & drop to the desired time.

Changing time zone duration - Method 2

- Right click the desired zone. The time adjust dialog box will appear. Use the up and down arrows to select the desired time. Click"ok" to enter the desired time.

Profile Markers (Performance)

- 8 markers are available
- Markers provide time, temperature, and ramp rate information at user defined intervals
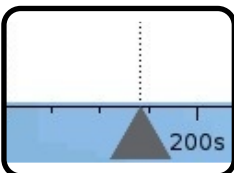
Adding Profile Markers

- Hover the cursor over the time zone bar area located at the bottom of the graph. The cursor will change to the "marker" icon. Left click to add a marker. Markers are color-coordinated with the clocks displayed in the time and temperature table.
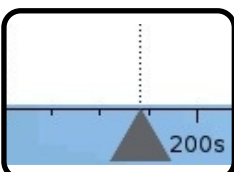
Removing Profile Markers

- Hover the cursor over the time zone bar area located at the bottom of the graph. The cursor will change to the "marker" icon. Right click to remove a marker.

Profile Data Table

- 1 System Performance information
- Displays 8 user-defined profile markers (performance)
- Provides temperature and ramp rate data

System Performance information

Internal Thermocouple; Reflow, Focus, & Surround

Profile Marker time (seconds)

Profile Marker temperature data (°C)

Profile Marker ramp rate data

Time		129	129	142	142						
Reflow		0	-	0	-						
Small	-	0	-	0	-						
Large	-	0	-	0	-						
IR	-	0	-	0	-						
TC1	-	0	-	0	-						
TC2	-	0	-	0	-						
TC3	-			-							
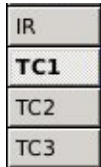
Repeatability verification:

- If external thermocouple plots were saved as part of a previous run.
- Left click "Real Time" data box on the appropriate external TC1,2,3 to enable / disable a comparison plot for the next run.
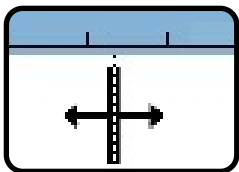
Changing Profile Marker location - Method 1

- Left click the desired profile marker. The cursor will change to double arrows. Drag & drop to the desired time.

Changing Profile Marker location - Method 2

- Right click the profile marker. The time adjust dialog box will appear. Use the up and down arrows to select the desired time. Click"ok" to enter the desired time.

▶ Profile Markers (Measurement)

- Markers provide a reference line during profile operation
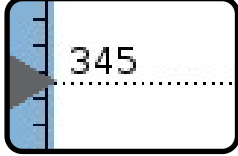
Adding Profile Markers

- Hover the cursor over the temperature zone bar area located on the left of the graph. The cursor will change to the "marker" icon. Left click to add a marker.

Removing Profile Markers

- Hover the cursor over the temperature zone bar area located on the left of the graph. The cursor will change to the "marker" icon. Right click to remove a marker.
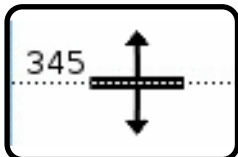
Changing Profile Marker location - Method 1

- Left click the desired profile marker. The cursor will change to double arrows. Drag & drop to the desired time.

Changing Profile Marker location - Method 2

- Right click the profile marker. The time adjust dialog box will appear. Use the up and down arrows to select the desired time. Click"ok" to enter the desired time.

Profile Information Area

Profile mode: remove

Name: /default

Total Cycle Count: 14

Total Cycle Run Time: 2:17 (hr:min)

Displays the current mode(remove, place, or calibration), profile name, and system cycle count and run time.

Removal Sequence, Reflow Head

- Position the reflow head over the preheater in the up position.
- Fit the appropriate vacuum cup and nozzle
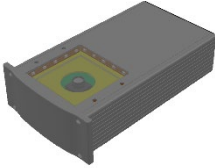
When equipped with the SmartPlace Technology Vision System

- Pull out the camera
- Adjust the fine "Z" axis until the edge of the vacuum cup or reflow head is in focus.
- Using the camera, to view the nozzle or vacuum cup ensures alignment over the part under rework
- Return camera to the home position
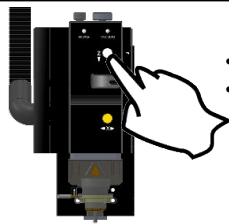
- Press the reflow head release button
- Using the fine "Z" axis adjustment knob, adjust the head to be within 2mm of the PCB surface. For applicaitons that require the protection of adjacent, sensitive components, lower the nozzle to board level.

Start the reflow profile by presing the start icon

- Vacuum is activated through the profile. The vacuum indicator lights when a vacuum seal is obtained.
- The vacuum shaft will automatically retract in the last zone of the reflow profile.

At the end of the profile...

- raise and lock the head in the up position
- automatic puff-off of the part will occur 30 seconds after the end of the profile
- manual puff-off is now available

Place Sequence, Reflow Head
- Position the reflow head over the preheater in the up position
- Fit the appropriate vacuum cup and nozzle

- Place the component into the component tray.
- Place the component tray onto the placement arm.
- Turn on the vacuum and place the component on the vacuum cup.
- Rotate the placement arm counterclockwise, positioning the componet under the vacuum nozzle.
- Pull down on the placement arm to raise the component into position
- The vacuum indicator will LED will light with a postive seal.

When equipped with the SmartPlace Technology Vision System
- Pull out the camera
- Adjust the fine "Z" axis until the component is in focus
- Use the "X" and "Y" board holder adjustments to center the part to the pads.
- Return camera to the home position

- Press the reflow head release button
- Lower the head to the PCB using the fine "Z" axis adjustment.

- Click on the puff-off icon to place the component to the board

Start the profile...
- At the end of the profile, raise the head to the up position.

Place Sequence, Reflow Head and Precision Placement Head

- Position the placement head over the preheater in the up position
- Fit the appropriate nozzle into the reflow head
- Fit the appropriate vacuum nozzle into the Precisions Placement Head
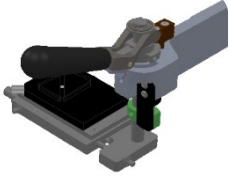
• Place the component into the component tray.
• Place the component tray onto the placement arm.
• Turn on the vacuum and place the component on the vacuum cup.
• Rotate the placement arm counterclockwise, positioning the component under the vacuum nozzle.
• Pull down on the placement arm to raise the component into position
• The vacuum indicator will LED will light with a positive seal.
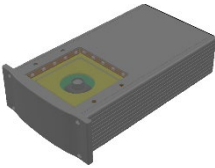
When equipped with the SmartPlace Advantage Vision System

- Pull out the camera
- Adjust the fine "Z" axis until the component is in focus
- Use the "X" & "Y" board holder adjustments and the Theta head adjustment to center the part to the pads.
- Return camera to the home position

- Press the Precision Placement Head release button
- Lower the part to the PCB using the fine "Z" axis adjustment.

- Click on the puff-off icon to place the component to the board which also retracts the vacuum nozzle
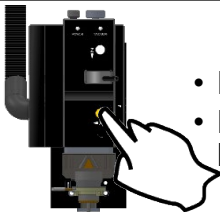
- Raise the Precision Placement head into the up position.
- Press the "X" axis release button and center the reflow head.

Follow the Place Sequence, Reflow Head instructions.

Place Sequence, Automatic Placement Head

- Position the placement head over the preheater in the up position
- Fit the appropriate nozzle into the reflow head
- Fit the appropriate vacuum nozzle into the Automatic Placement Head
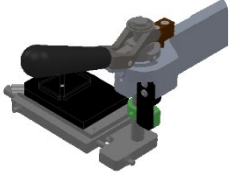
---

- Place the component into the component tray.
- Place the component tray onto the placement arm.
- Rotate the placement arm clockwise, positioning the componet under the vacuum nozzle.
- Press the ⬡ icon.
- Press the ✅ button on the remote control. The vacuum nozzle will into contact with the part a 🔵 light will indicate a positive vacuum seal.
- Press the 🟢 button to retract the vacuum nozzle.
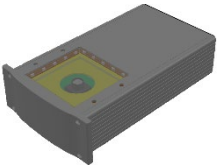
With the SmartPlace Advantage Vision System

- Pull out the camera
- Adjust the fine "Z" axis using the ⬆ & ⬇ icons until the component is in focus
- Use the "X" & "Y" board holder adjustments and the ↻ & ↺ icons to center the part to the pads.
- Return camera to the home position
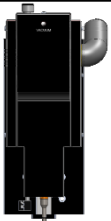
- Press the reflow head release button ⚪ to lower the automatic placement head
- Press the 🟢 button on the remote control to lower the vacuum nozzle & component into contact with the board.
- Press the ⬡ icon to activate the puff-off function.
- Press the 🟢 button to retract the vacuum nozzle to the start position.

- Raise the Precision Placement head into the up position.
- Press the "X" axis release button and center the reflow head.

Follow the Place Sequence, Reflow Head instructions.

Open/Import Profile

- Hover the cursor over the open/import icon

- Left click the mouse button to open a remove profile
- Right click the mouse button to open a place profile

- Select the file from the subdirectory box.

Subdirectory:	Select Profile
	default
	profile-cal-Focus
	profile-cal-Reflow
	profile-cal-Surround
	test profile
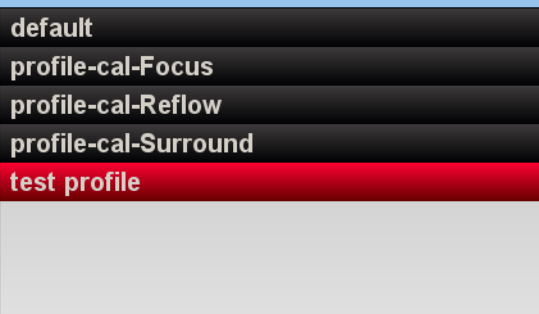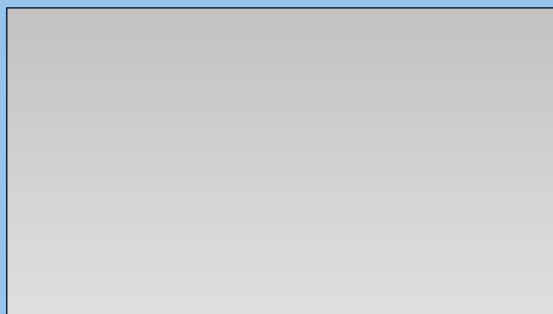
OK   Cancel

- Select and highlight the desired profile then press the OK button.
- Press the Cancel button to return to the profile page.

Saving/Exporting a New Profile

- Hover the cursor over the save icon

- Left click the mouse button & the profile naming dialog box displays.

Subdirectory: Enter Profile Name

| ! 1 | @ 2 | # 3 | $ 4 | % 5 | ^ 6 | & 7 | * 8 | (9 |) 0 | - | + = | ← |

Q q | W w | E e | R r | T t | Y y | U u | I i | O o | P p | { [| }] | \ |

caps | A a | S s | D d | F f | G g | H h | J j | K k | L l | ; | " ' |

Z z | X x | C c | V v | B b | N n | M m | < , | > . | ? / |

OK   Cancel   Create Dir

- Enter the desired profile name, select the save location from the subdirectory box, & press the OK button.
- To create a new directory enter the name and left click the Create Dir button.
- Press the Cancel button to return to the profile page.

Creating/Deleting a New Folder

- Hover the cursor over the save icon

- Left click the mouse button & the profile naming dialog box displays.

Subdirectory:
Enter Profile Name

! 1	@ 2	# 3	$ 4	% 5	^ 6	& 7	* 8	(9	) 0	- -	+ =	←
Q q	W w	E e	R r	T t	Y y	U u	I i	O o	P p	{ [	}]	\	
caps	A a	S s	D d	F f	G g	H h	J j	K k	L l	: ;	" '
Z z	X x	C c	V v	B b	N n	M m	< ,	> .	? /
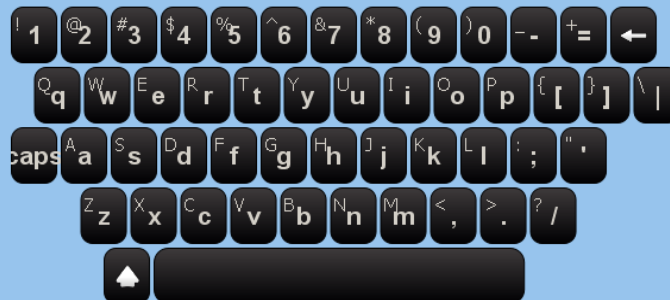
[OK] [Cancel] [Create Dir]

- To create a new directory enter the name and left click the Create Dir button.
- To delete a directory, select the directory, & press the Delete button.
- Press the Cancel button to return to the profile page.

Auto-profile

- A tool used to assist in the creation of thermal profiles.
- A thermocouple trigger is used to control the actions of the Scorpion.
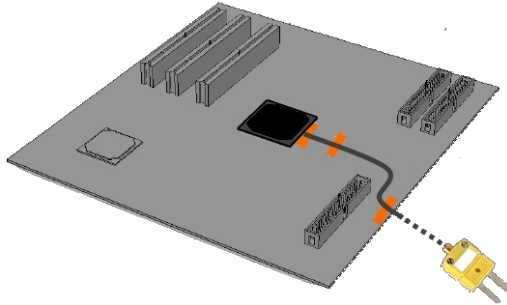
Example PCBA

- Place a K type thermcouple (TC) under the component part.
  - 36 gauge TC with component stand-off heights > .5mm
  - 40 gauge TC with component stand-off height of <.5mm
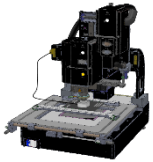
- Place the board into the board holder.
- Lower the reflow head into position over the component
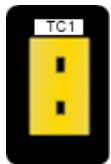
- Connect the K type thermocouple to TC1.

- Hover the cursor over the Auto-profile icon.

- Left click once for a lead-free Auto-profile .
- Left click twice for a lead Auto-profile.
- Left click three times to turn off Auto-profile.

Auto-profile set points

Pb Free Profile set points
- Zone 1 – 150°C
- Zone 2 – 190°C
- Zone 3 – 217°C*
- Zone 4 – 235-245°C max
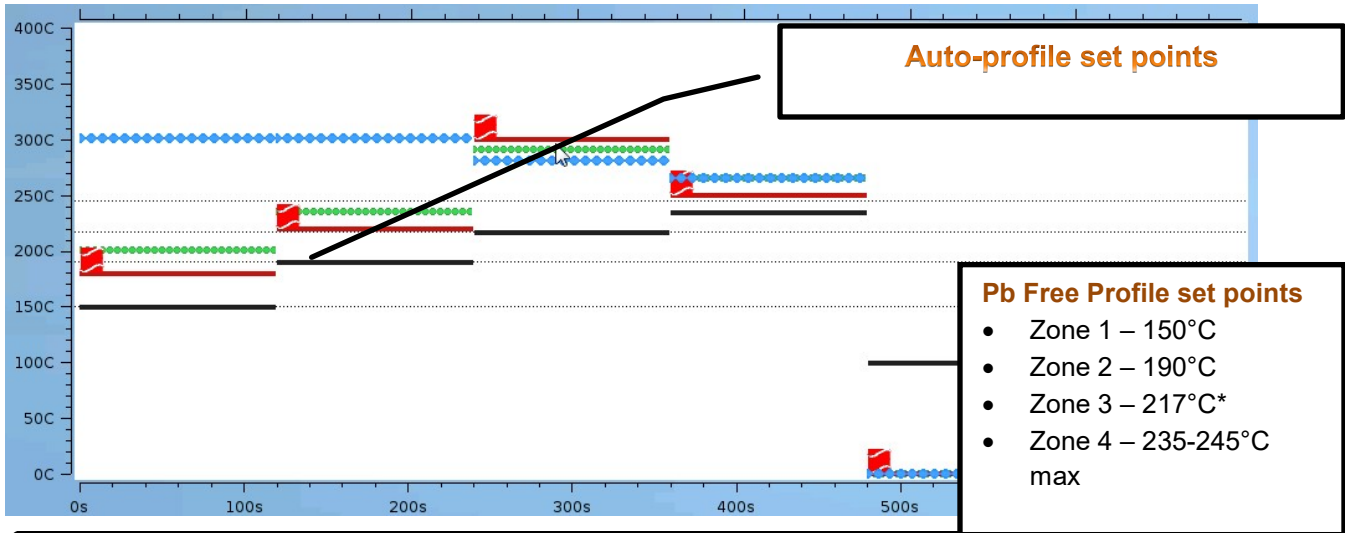
- Hover the cursor over the Scorpion start profile icon.

- Left click the Scorpion icon to run the profile.
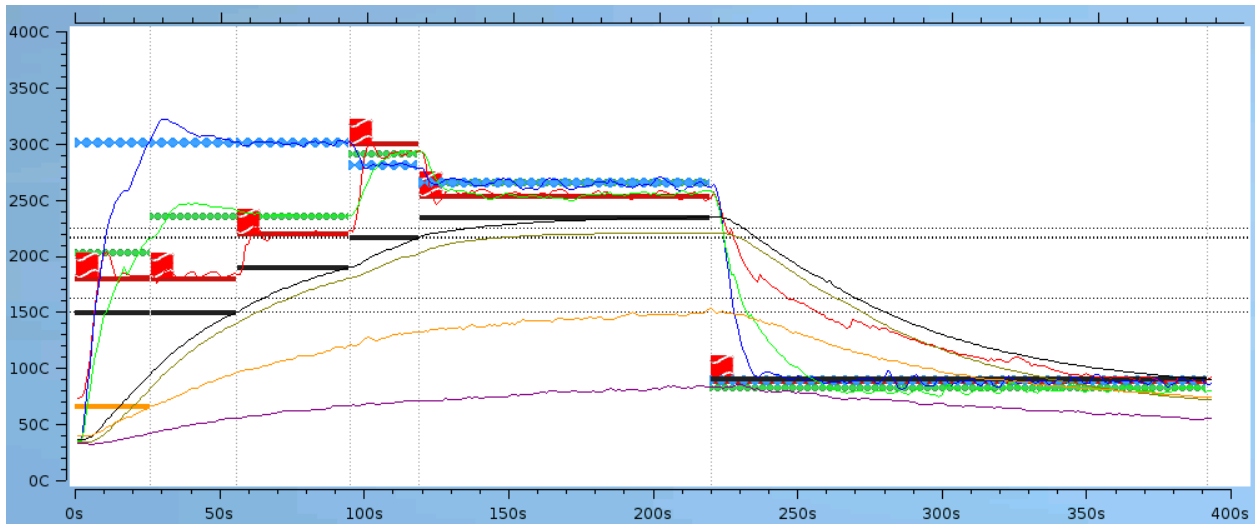
Lead-free Auto-profile Desktop PCBA

Puff-Off Time Adjustment

- Hover the cursor over the puff-off icon.

- Right click on the mouse button to access the puff-off time adjustment box.

Enter Value: 250

- The puff-off time adjustment box displays showing the current puff-off setting in milliseconds.

- Use the scroll wheel to adjust the puff-off time to the desired level.

- Right click the mouse button to save changes.

3651 WALNUT AVENUE, CHINO CA 91710 • PHONE (909) 664-9980 • APR-Rework.com

Activating the Preheater Preset.

- The preheater preset requires the use of the optional IR thermocouple kit, APR-SRS-UK2.

- Attach the optional IR thermocouple to the IR thermocouple connector .
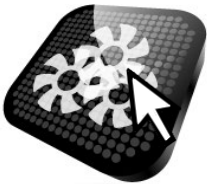
- Hover the cursor over the preheat temperature icon.

- Left click the preheat temperature icon.
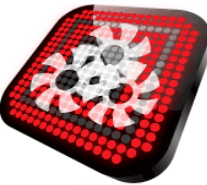
- The preheat temperature function is now active.
- This feature only works when used with the optional IR thermocouple.
- Left click the icon to disable.

Changing the Preheater Preset.

- Hover the cursor over the preheater preset icon.

- Right click on the mouse button to access the preheat temperature adjustment box.

Current Setting: 50

- The preheat temperature adjustment box displays the current airflow setting.

- Use the scroll wheel to adjust the preheat temperature to the desired level.

- Right click the mouse button to save changes.

Data Backup

- Insert a USB flash drive with a 2GB or greater capacity into the USB connector.

- Hover the cursor over the data backup icon.

- Left click the data backup icon.

Backup data to USB drive?

Yes   No

Backup in process, please wait.

Backup success

OK

Data Restore

• Insert a USB flash drive with a 2GB or greater capacity into the USB connector.
• The flash drive must contain files from a previous backup.

• Hover the cursor over the data backup icon.

• Right click the data backup icon.

Restore data from USB drive?

Yes   No

Are you sure? This may overwrite profiles currently on the machine.

Yes   No

Restore in process, please wait.

Restore success

OK

Capture Screen Shot

- Hover the cursor over the screen capture icon

- Left click the mouse button & the naming dialog box displays.
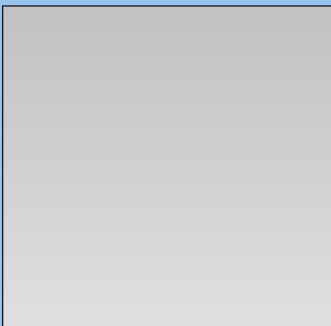
Subdirectory: Enter Name

[on-screen keyboard]

OK   Cancel   Create Dir

- Enter the desired name, select the save location from the subdirectory box, & press the OK button
- To create a new directory enter the name and left click the Create Dir button.
- To delete a directory, select the directory, & press the Delete button.
- Press the Cancel button to return to the profile page.

Display Screen Shot

- Hover the cursor over the screen capture icon

- Left click the mouse button & the select dialog box displays.

Subdirectory:	Select screenshot:
scorpion screen capture	capture 2012-01-16
	capture 2012-01-17
	capture 2012-01-17_2
	board 56235, 25mm BGA
	board 7842 test

OK   Cancel
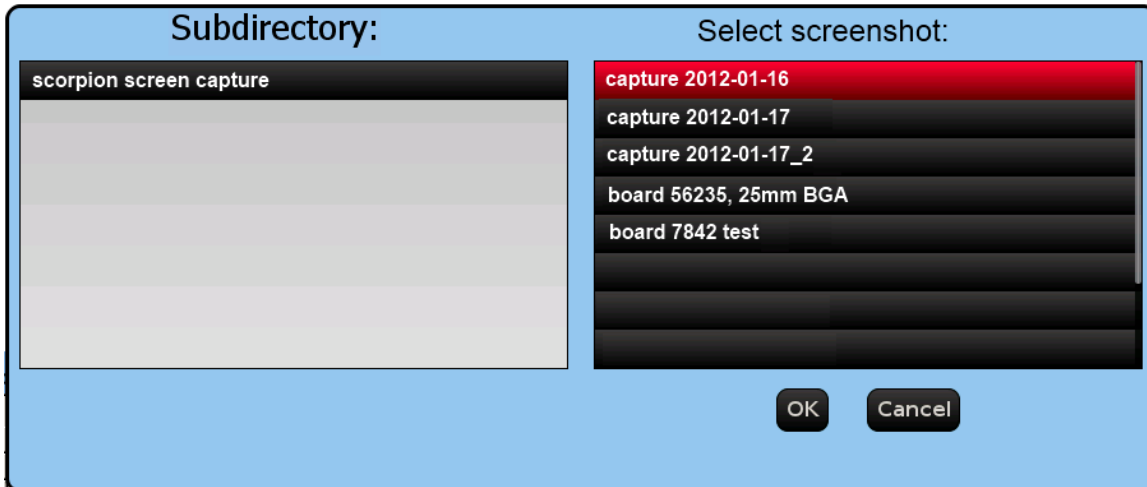
- Select the desired screen shot, the name of the screen shot highlights in red. Press OK.

- Left click the close screen capture icon to return to the profile screen.

Maintenance Schedule

External Thermocouple Calibration

- Required:
  - K type thermocouple simulator
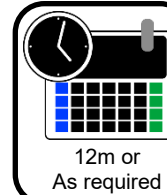
12m or As required

K type thermocouple tester

Set knob to 250°C

ON   ON

- **Left click the thermocouple calibration icon**
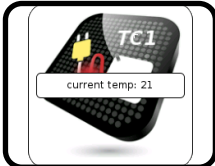
- **The current temperature will be displayed**

current temp: 21

- **Plug the K type thermocouple tester into the matching external thermcouple connector**

TC1

- Right click the thermocouple to calibrate calibration
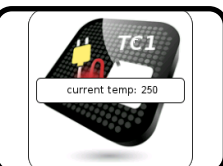
current temp: 250

- The current temperature will be displayed
- Repeat until each thermocouple has been calibrated.

Reflow Blower Setup

- Required:
  - Heater Calibration Kit; SRS-CALKIT

5400-0020
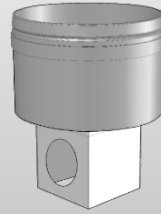
NZA-SRS-CAL

1
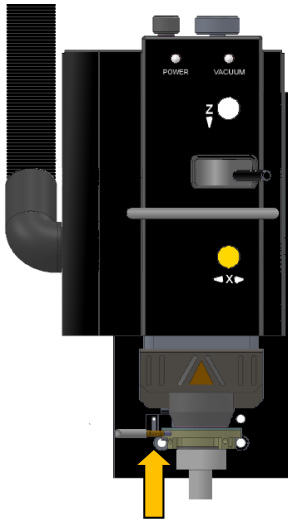
2
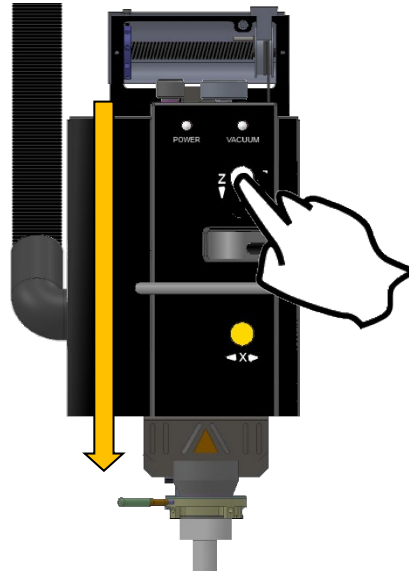
3
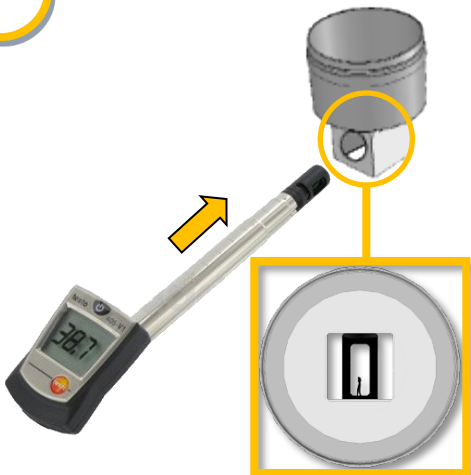
Reflow Blower Setup, continued

- The reflow blower has four settings: low, medium, high, and cool.

- Hover the cursor over the reflow blower calibration icon.

- Left click the mouse button to select the desired setting. The appearance of the icon will change based on the setting.

- Right click on the mouse button to access the airflow adjustment box.

Low Setting: X.X

- The airflow adjustment box displays showing the current airflow setting.

- Use the scroll wheel to adjust the airflow to the desired level. Low = 3 m/s, Medium= 4 m/s, High= 5 m/s, Cool=5.5 m/s; ± 0.2.

- Right click the mouse button to save changes.

Focus Blower Setup

- Required:
  - Heater Calibration Kit; SRS-CALKIT

5400-0020
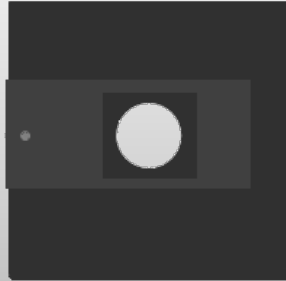
9025-9000
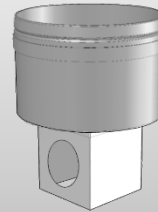
NZA-SRS-CAL

1

2
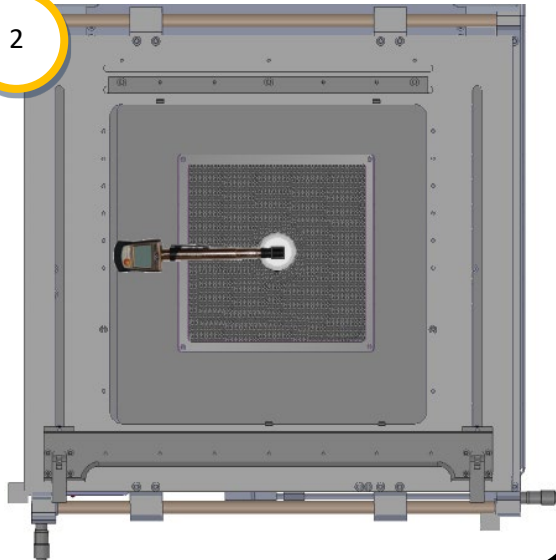
Focus Blower Setup

- The focus blower has a single setting.

- Hover the cursor over the focus blower calibration icon.

- Right click on the mouse button to access the airflow adjustment box.

Setting: 2.7

- The airflow adjustment box displays showing the current airflow setting.

- Use the scroll wheel to adjust the airflow to the desired level. Adjust the airflow setting until the meter reads 6.0 m/s +/- 0.1.

- Right click the mouse button to save changes.

Surround Blower Setup

- Required:
  - Heater Calibration Kit; SRS-CALKIT

5400-0020
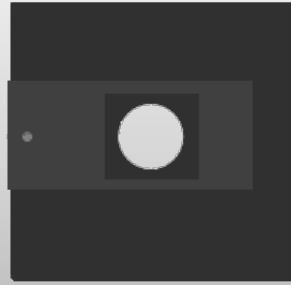
9025-9000
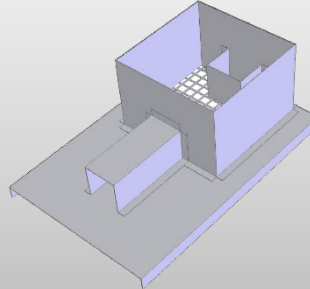
7050-2262

1
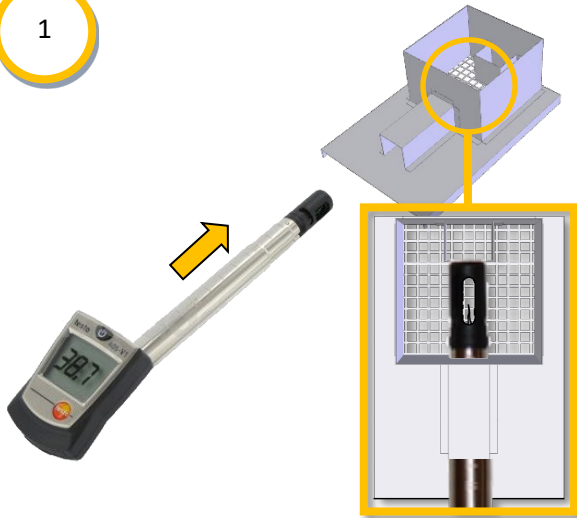
2
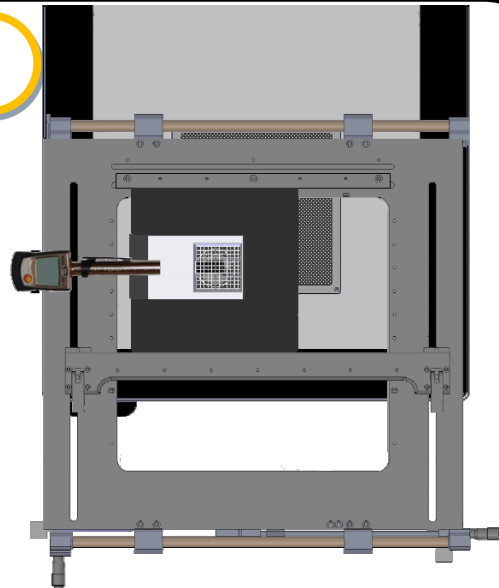
Surround Blower Setup

- The surround blower has a single setting.

- Hover the cursor over the surround blower calibration icon.

- Right click on the mouse button to access the airflow adjustment box.

Setting: 3.0

- The airflow adjustment box displays showing the current airflow setting.

- Use the scroll wheel to adjust the airflow to the desired level. Adjust the airflow setting until the meter reads 2.0 m/s +/- 0.1.

- Right click the mouse button to save changes.

Reflow Heater Calibration

- Required:
  - Heater Calibration Kit; SRS-CALKIT
  - Nozzle NZA-490-490

12M or
As required

SRS-CALKIT

NZA-490-490

1

↻ 🖐

2

3

TC1

4

5

6

Calibration
in Process

(Icon animates)
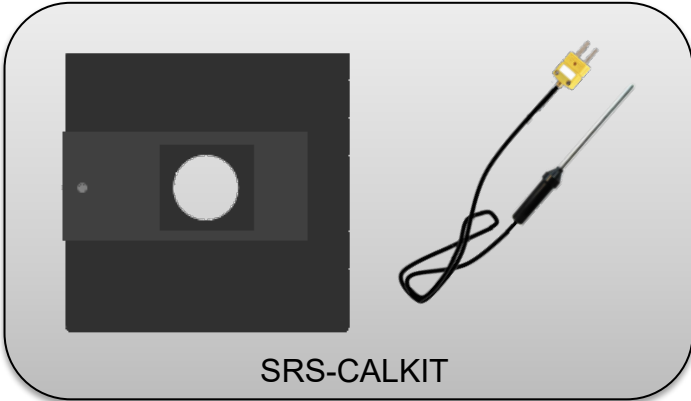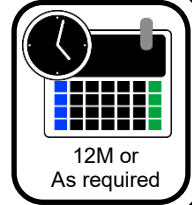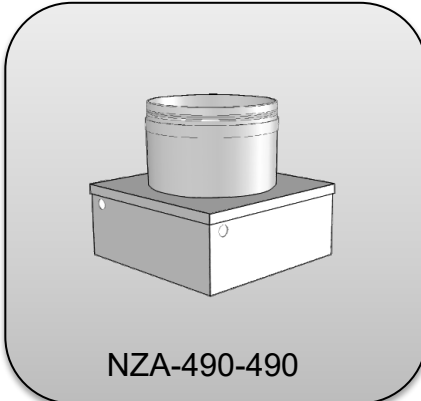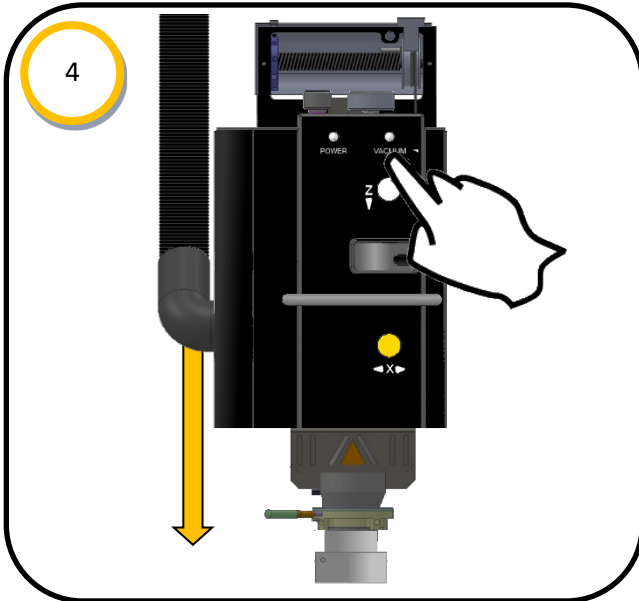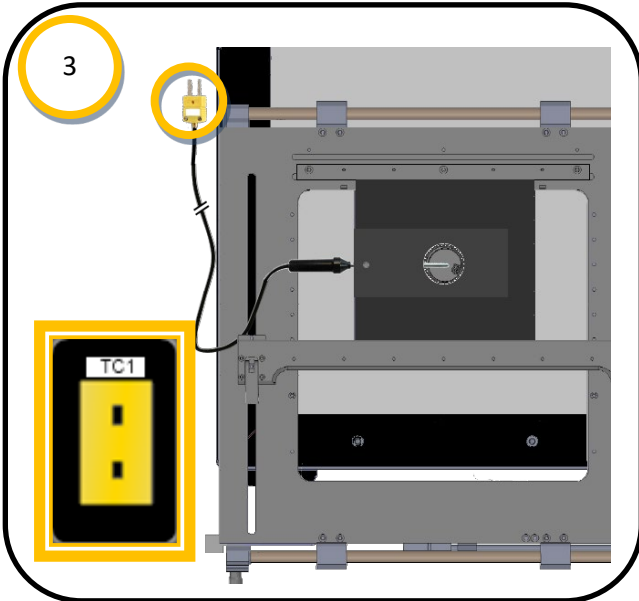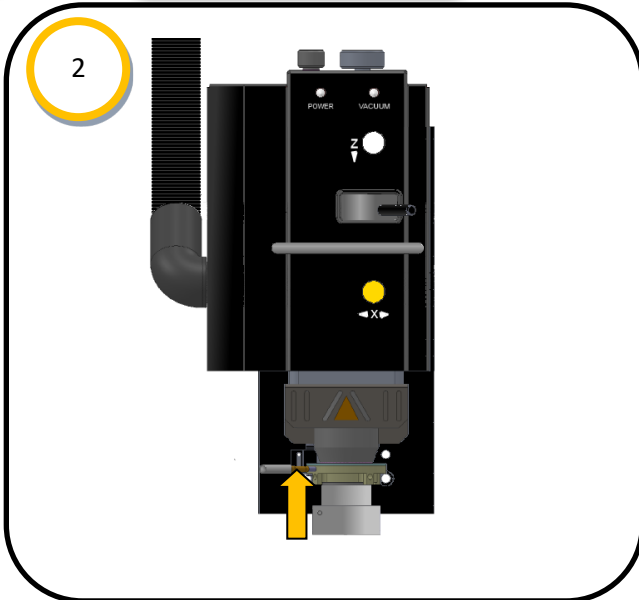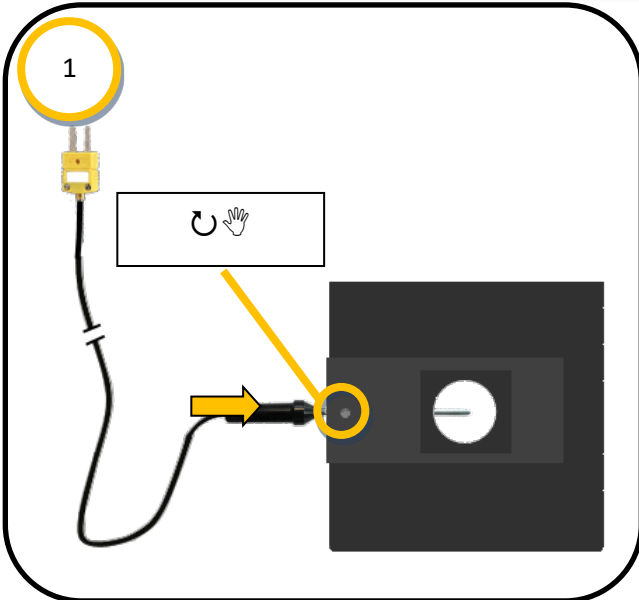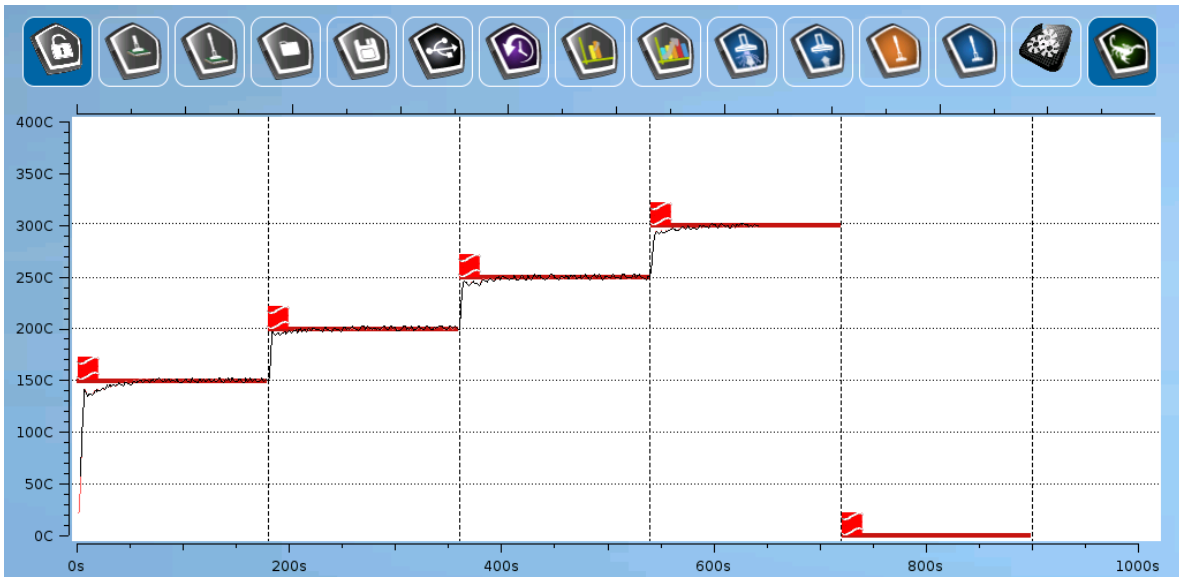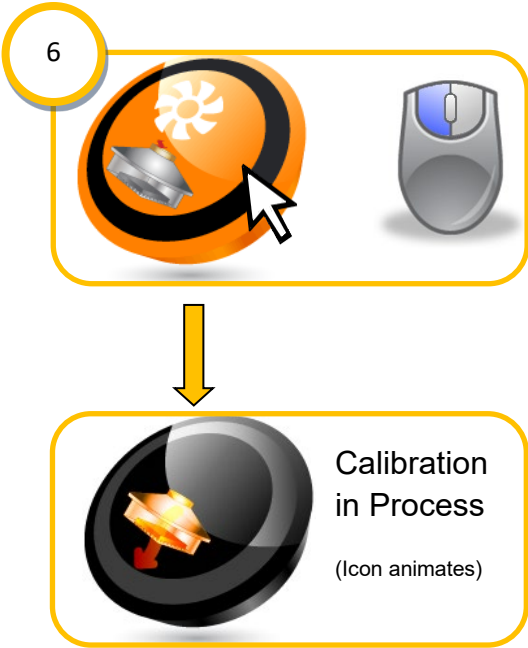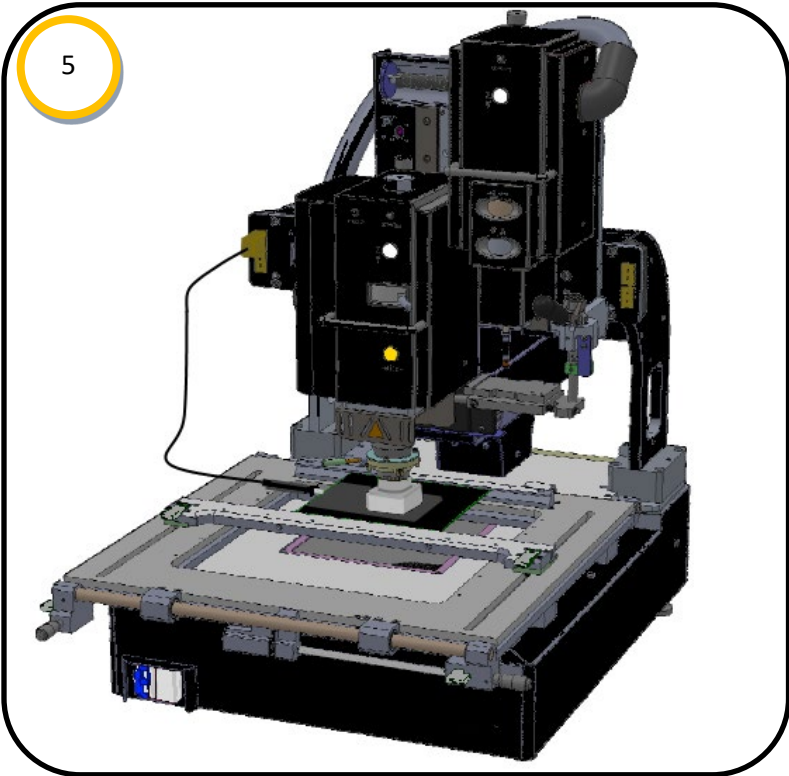
Example - Reflow Heater Calibration Profile Plot

Save the new settings
when complete

Focus Heater Calibration

- Required:
  - Heater Calibration Kit; SRS-CALKIT

12M or
As required

SRS-CALKIT

1

2

TC1

3

Calibration
in Process

(Icon animates)

TC1

Save the new settings
when complete
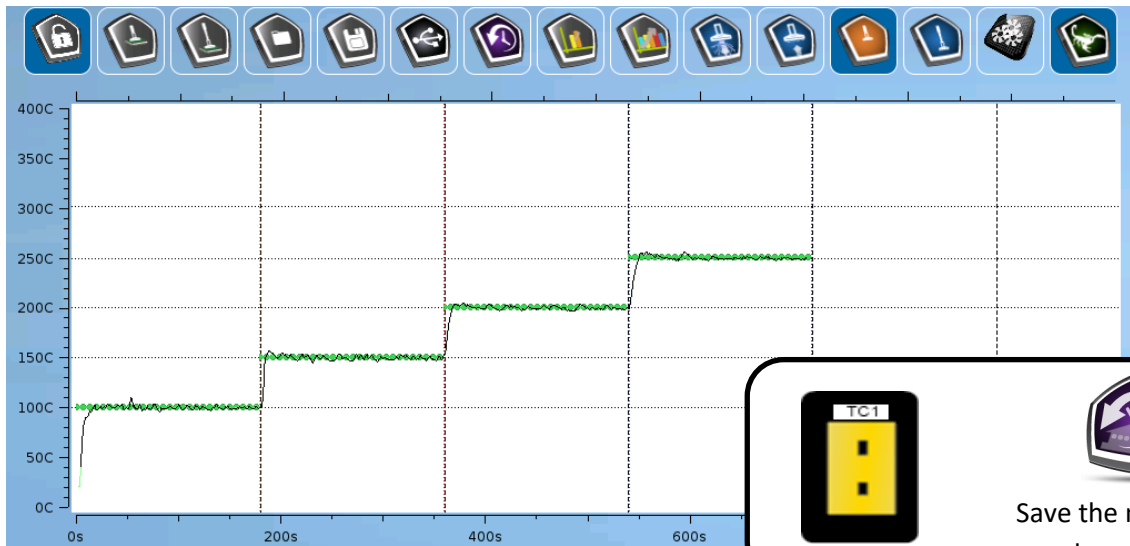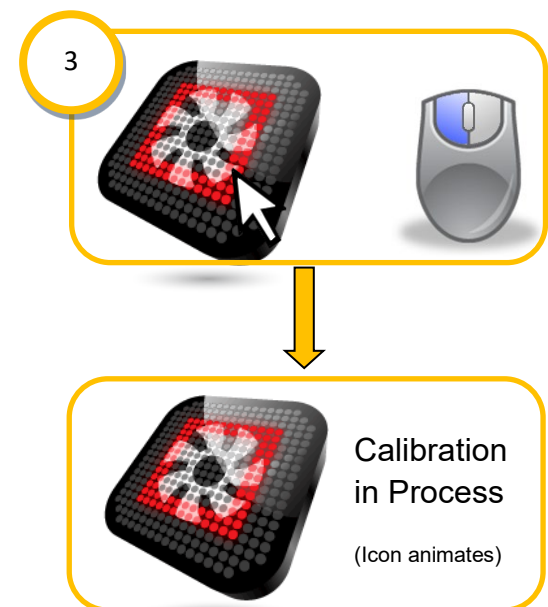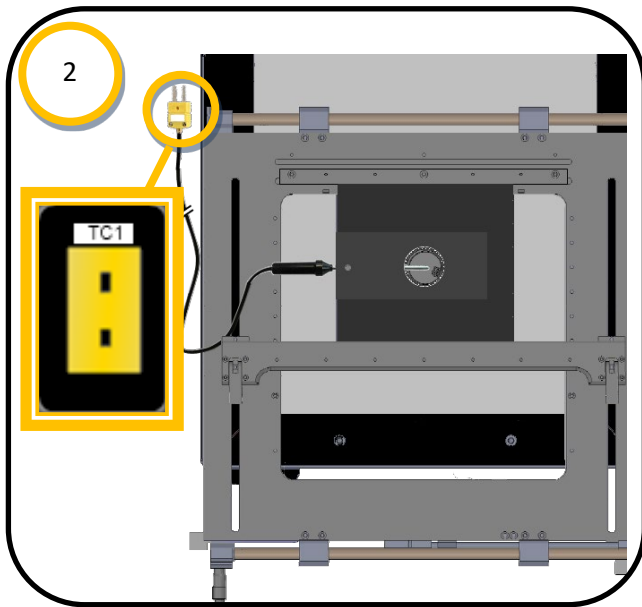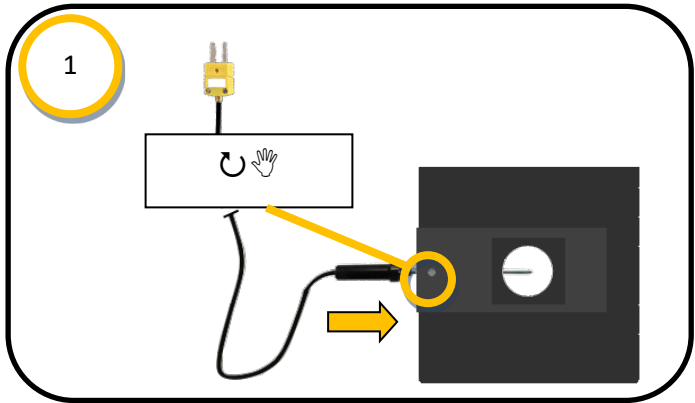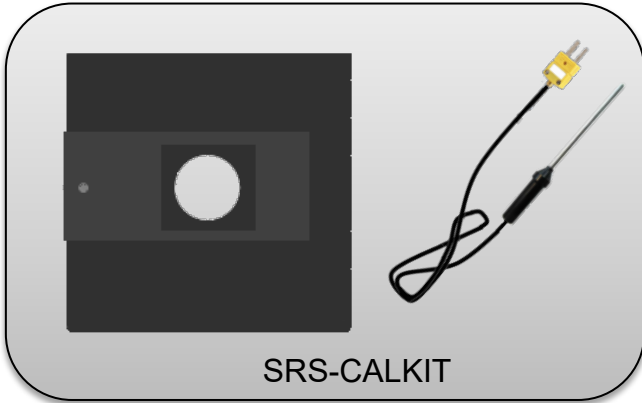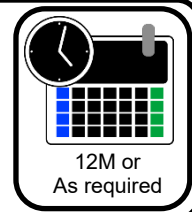
Example –Focus Preheater Calibration Profile Plot

Surround Heater Calibration

- Required:
  - Heater Calibration Kit; SRS-CALKIT

12M or
As required

SRS-CALKIT

1

2

TC1

3

Calibration
in Process

(Icon animates)

Save the new settings
when complete

TC1
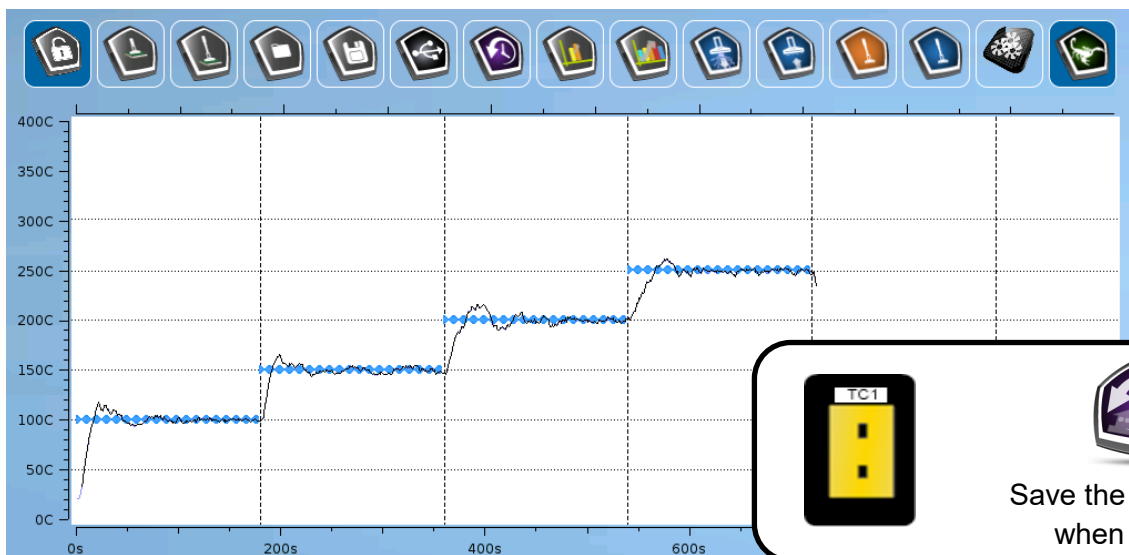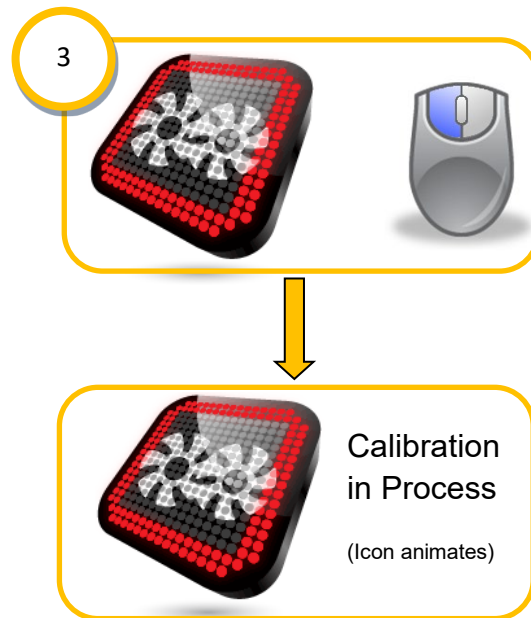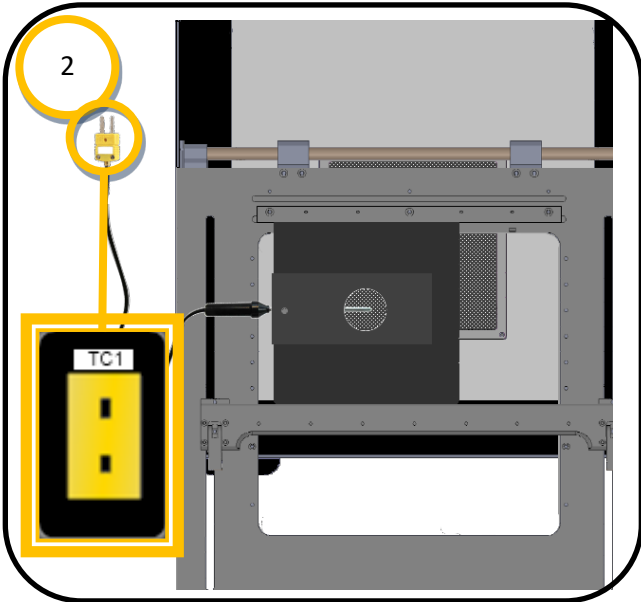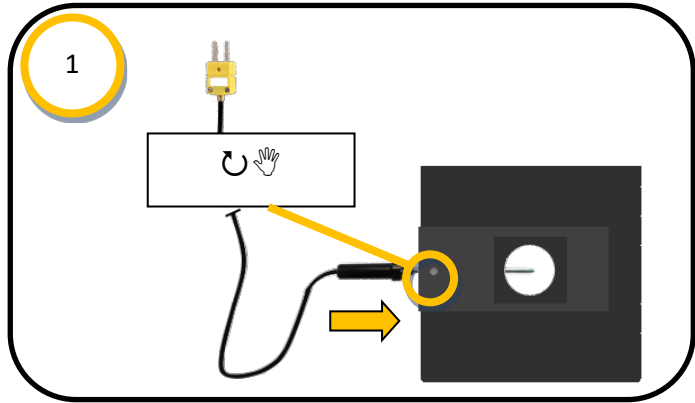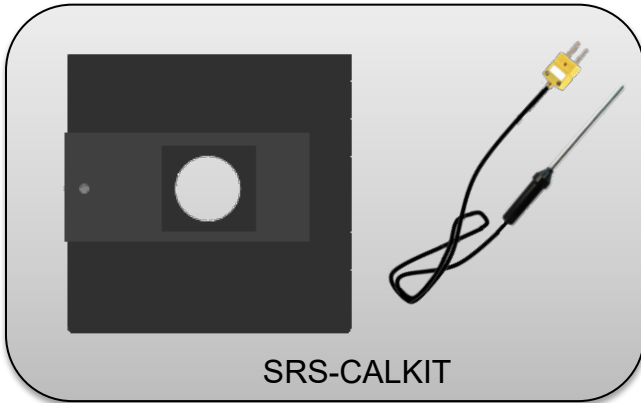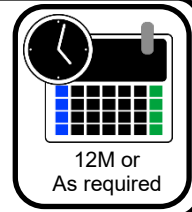
Example – Surround Preheater Calibration Profile Plot

Display Calibration Settings

• Reflow, Focus, and Surround heaters.

• Hover the cursor over a calibration icon.

• Right click to display the heater calibration offsets.

Reflow heater calibration offsets:
(cal temp -> offset)
150 ->-11.08
200 ->-17.32
250 ->-24.61
300 -> -32.59

OK

Example

• Left click the OK button to close the heater calibration offset dialog box.
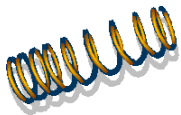
Elevator Torsion Spring Adjustment

• Adjusts the rate of travel of the head assembly

6M or
As required

1 ↻2.5M⬡

2

3 + Tension

- Tension

4

5 ↻2.5M⬡
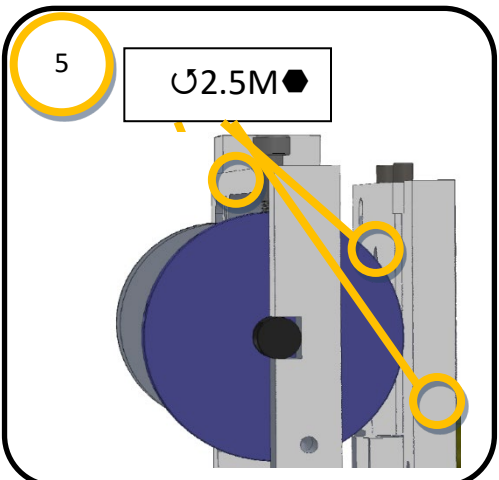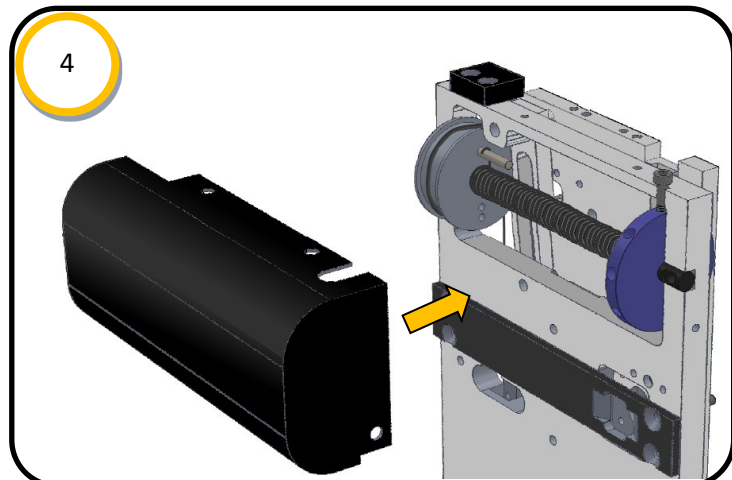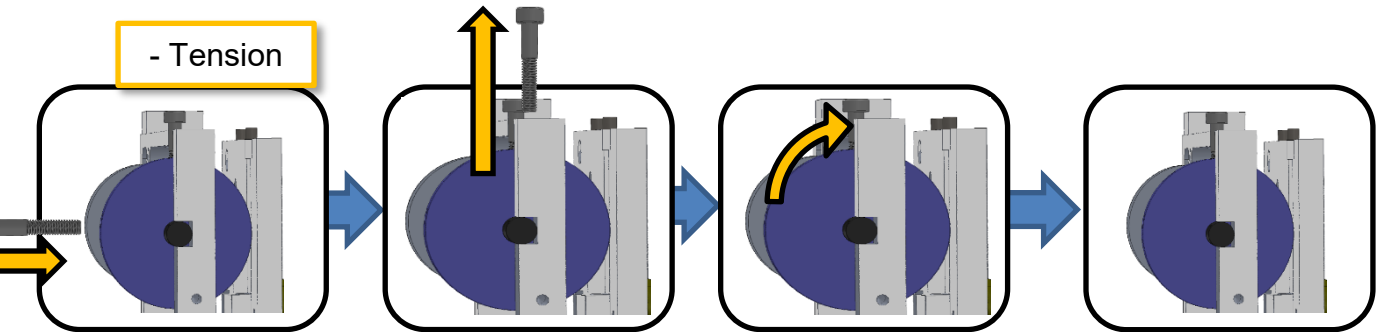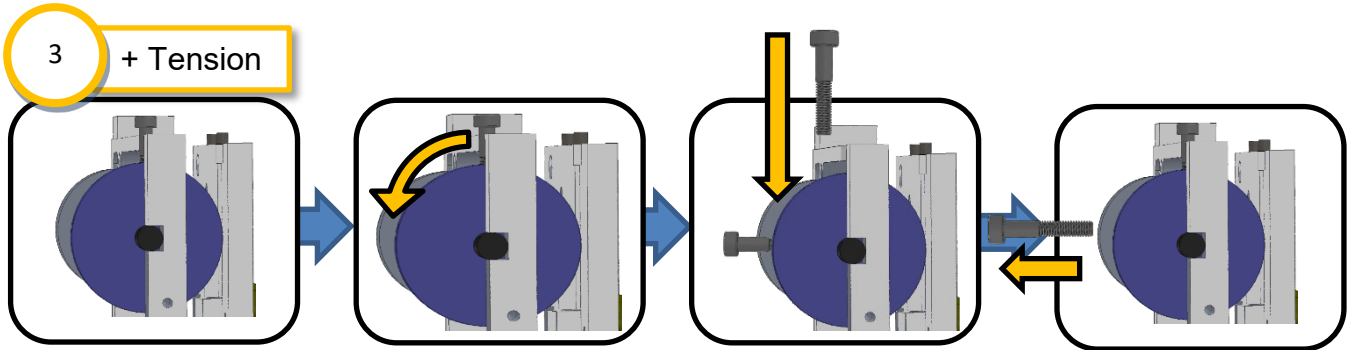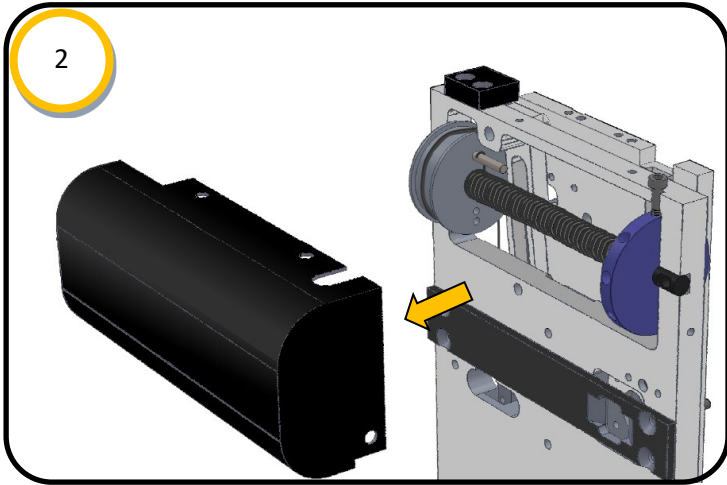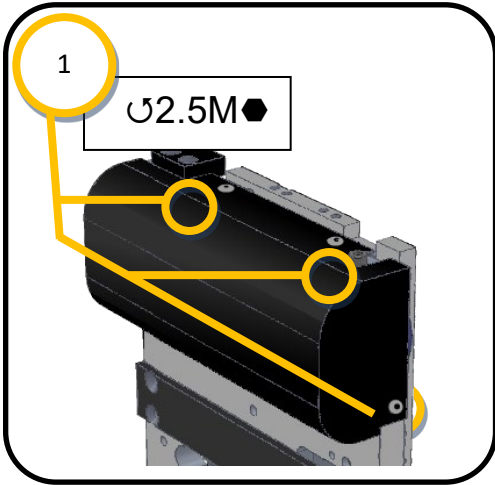
Scorpion Head Pitch Adjustment

12M or
As required

1 Remove

↺2.5M⬡
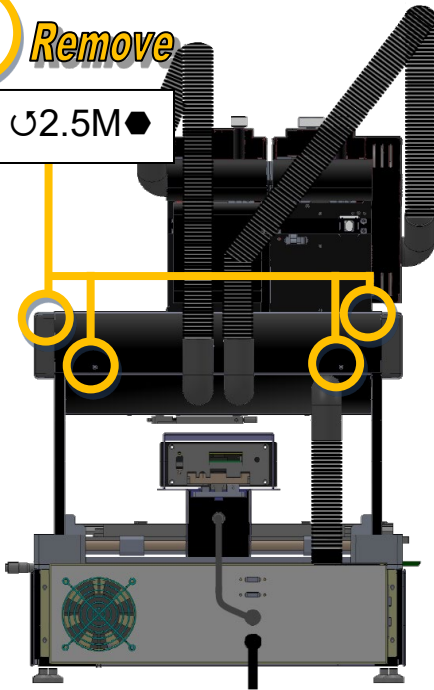
2 Remove

↺2.5M⬡
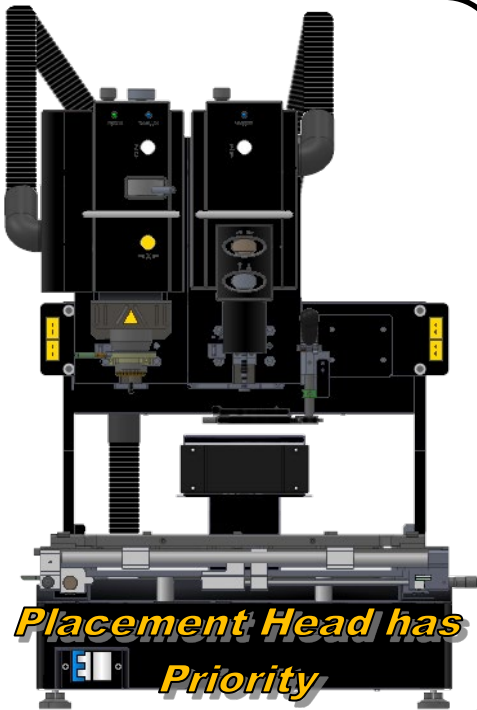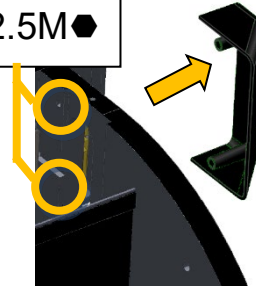
Placement Head has Priority
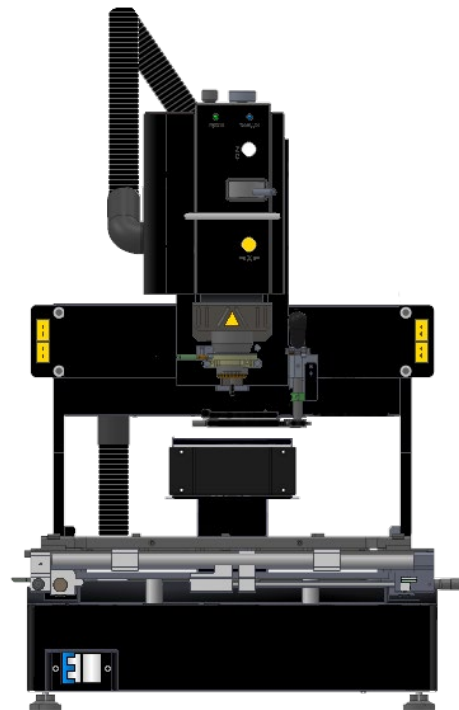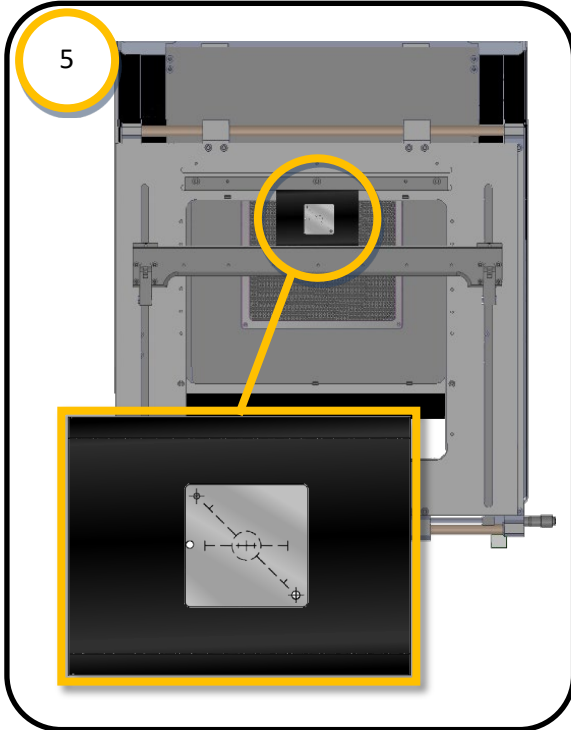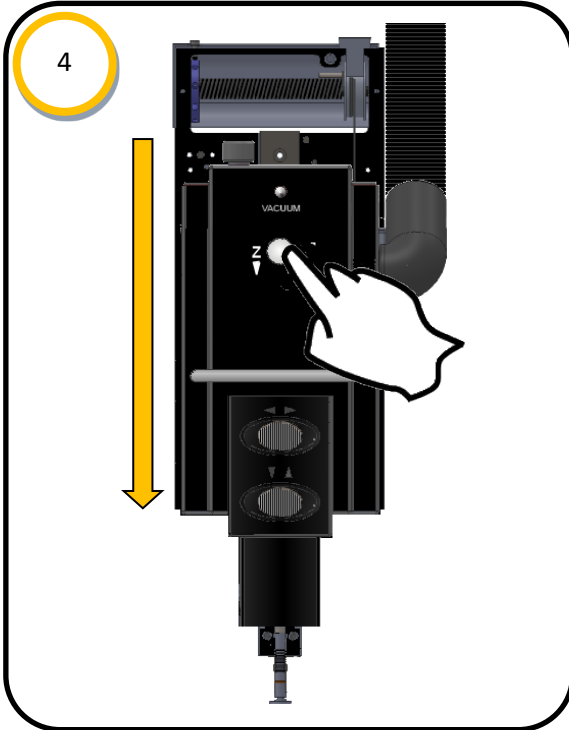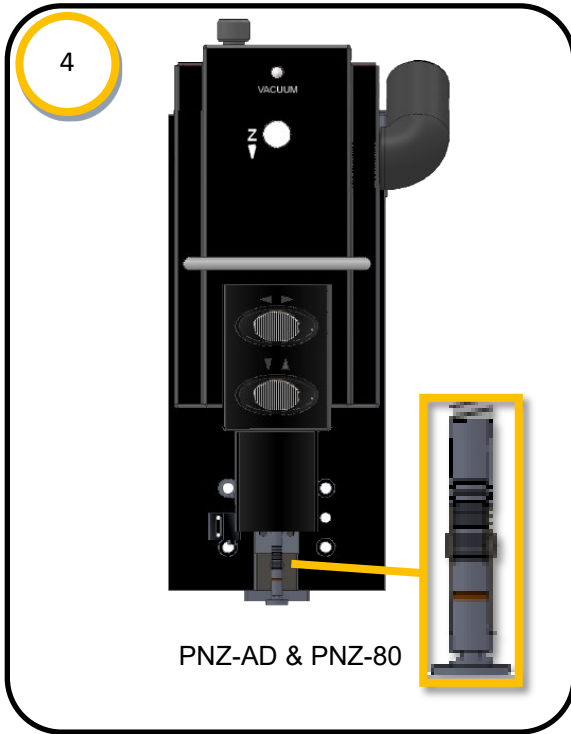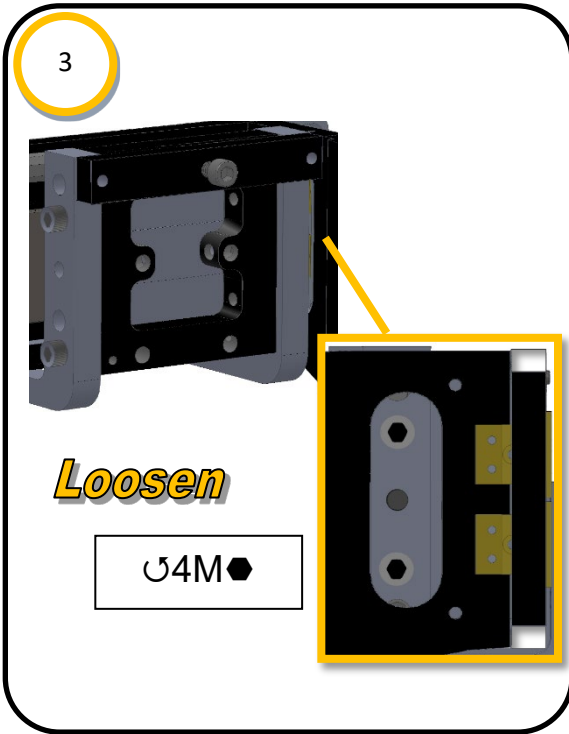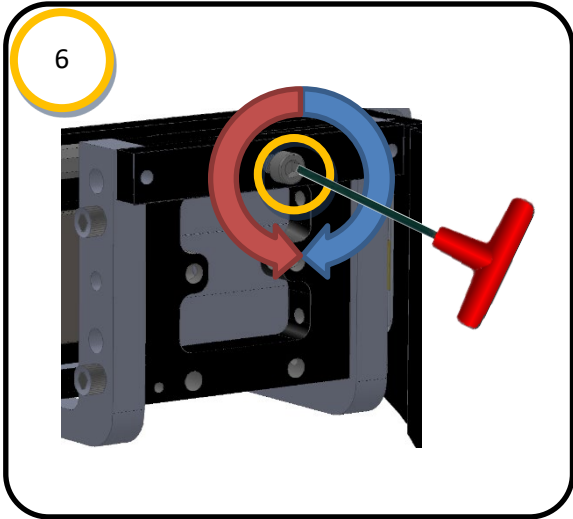
3

Loosen

↺4M⬡

4

PNZ-AD & PNZ-80

4

5

6

Activate the vacuum pump
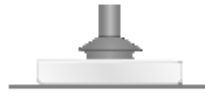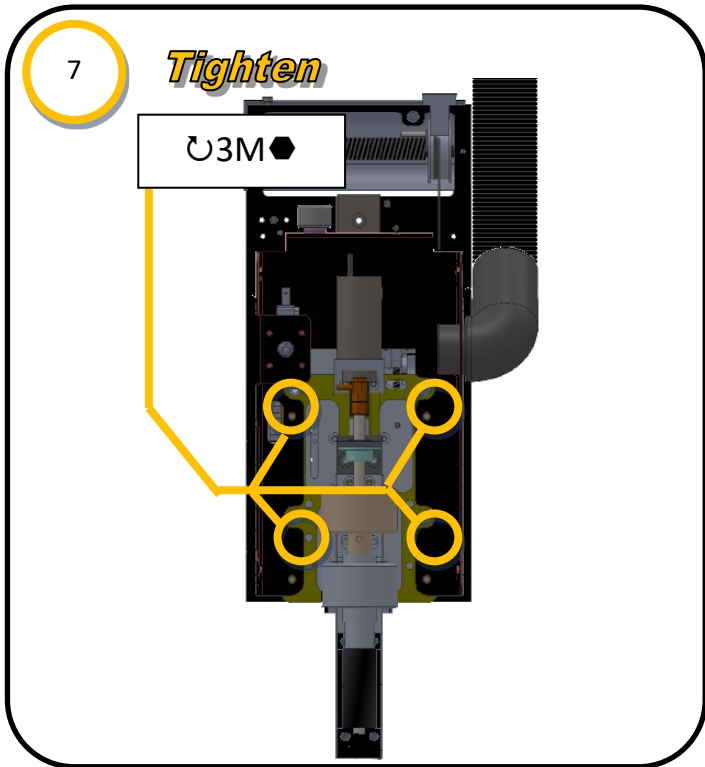
Pick up the alignment plate
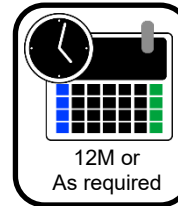with the vacuum nozzle
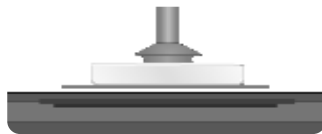
Insert M3⬡

Raise the alignment head
2-3mm from the nest

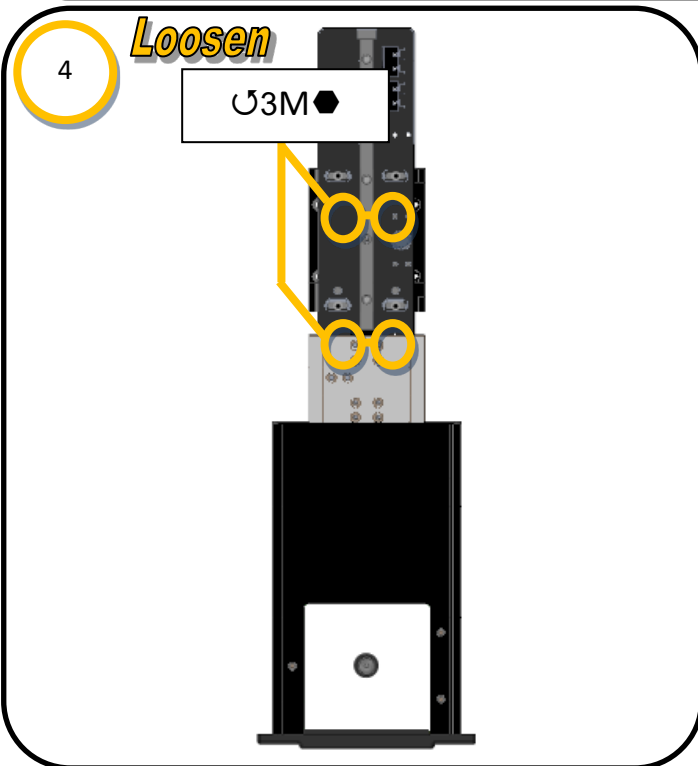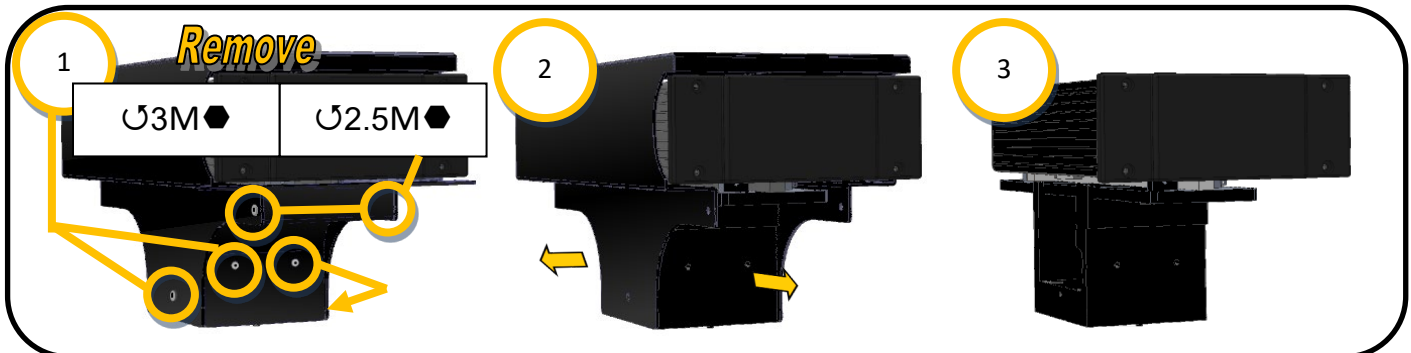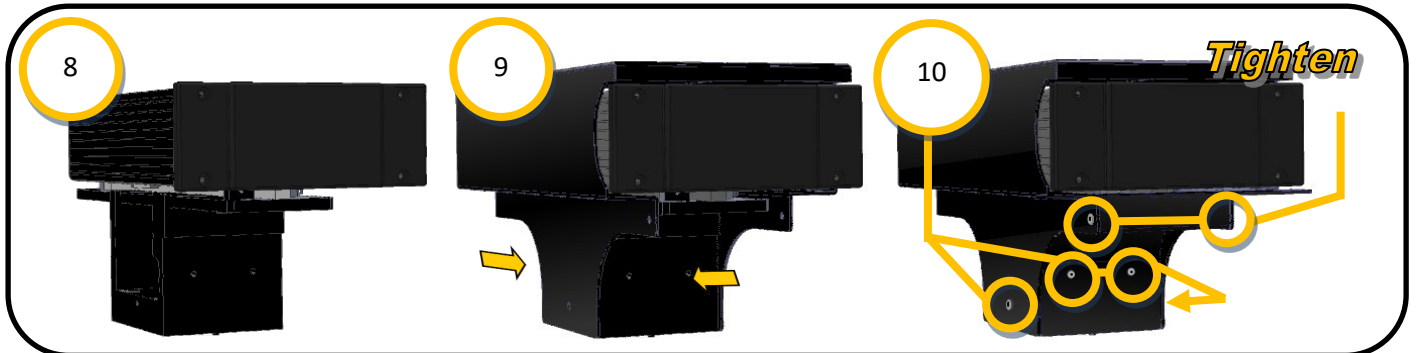Adjust the alignment plate until it
is parallel with the nest

7

↻4M⬡

8

Tighten

↻2.5M⬡

9

Tighten

↻2.5M⬡
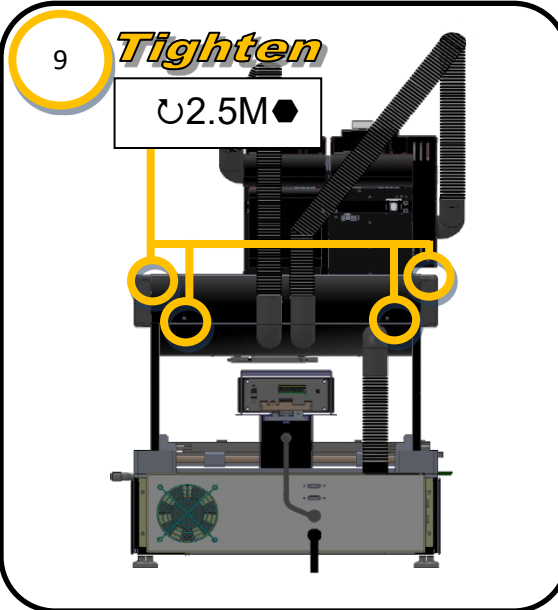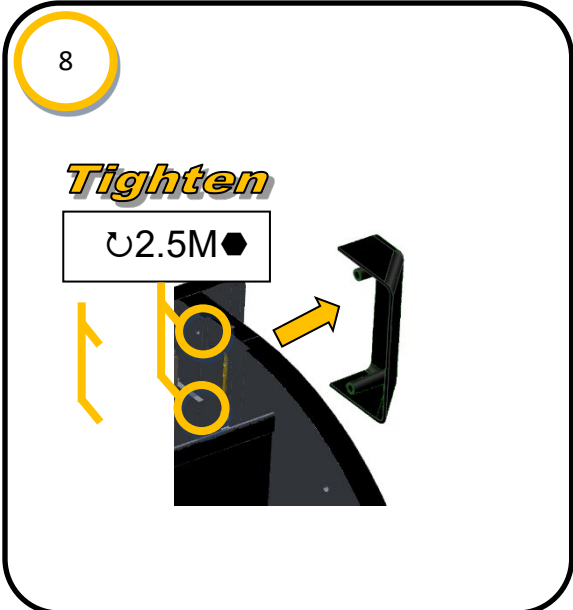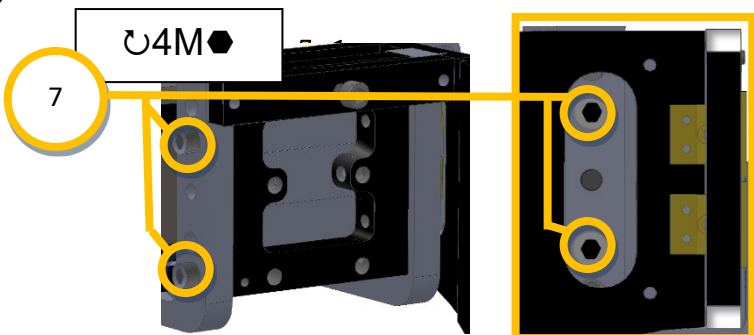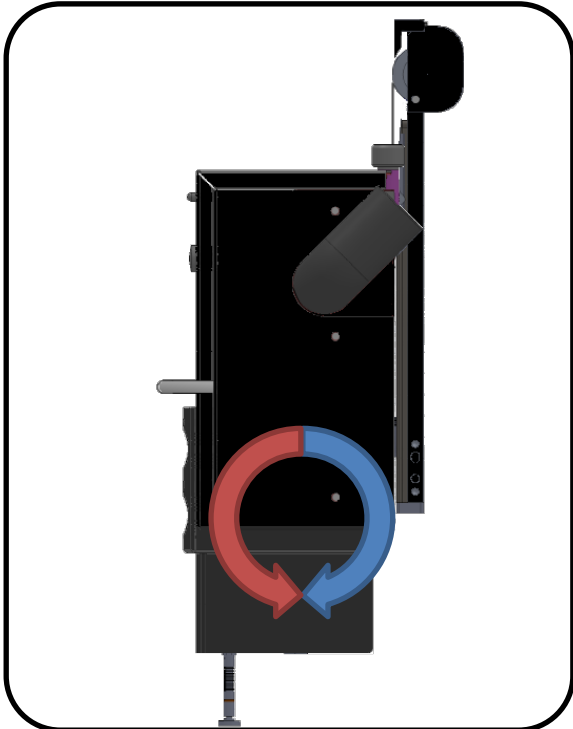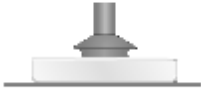
Reflow Head Yaw Adjustment
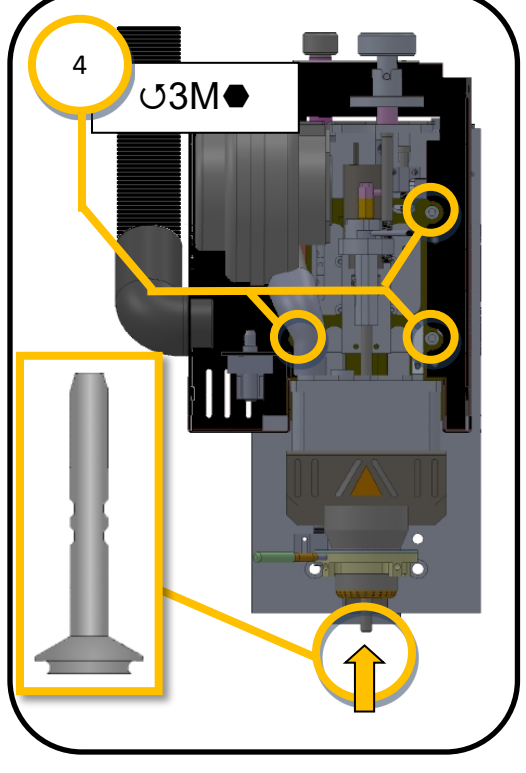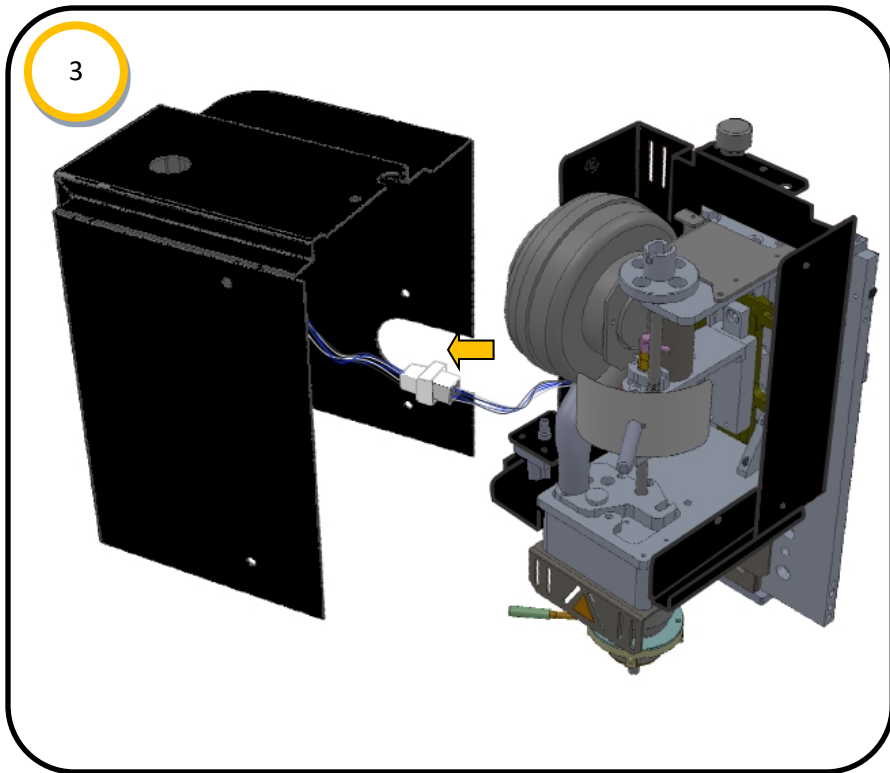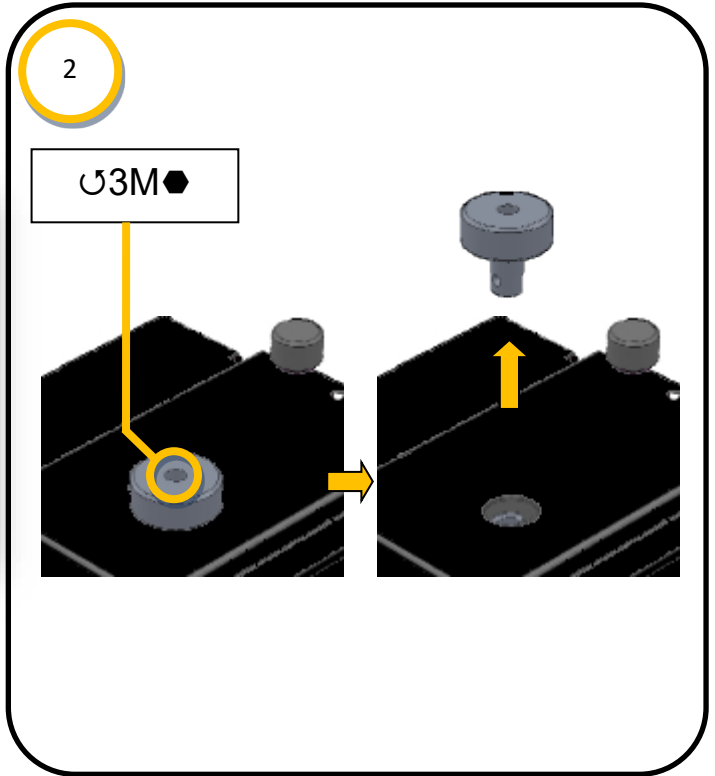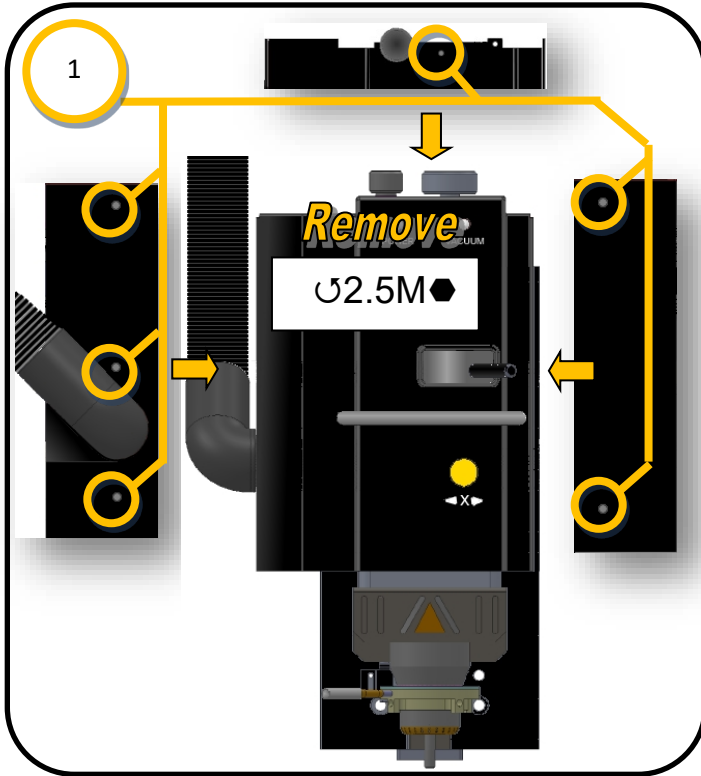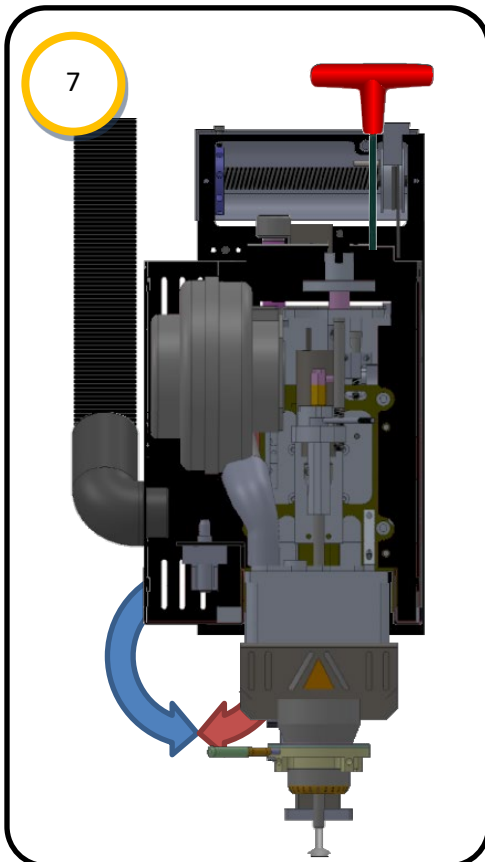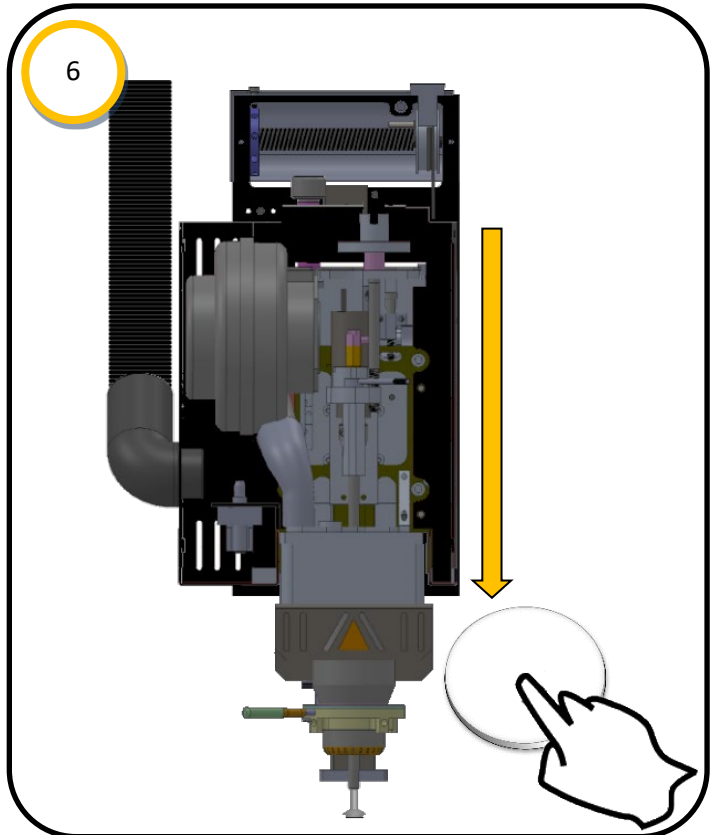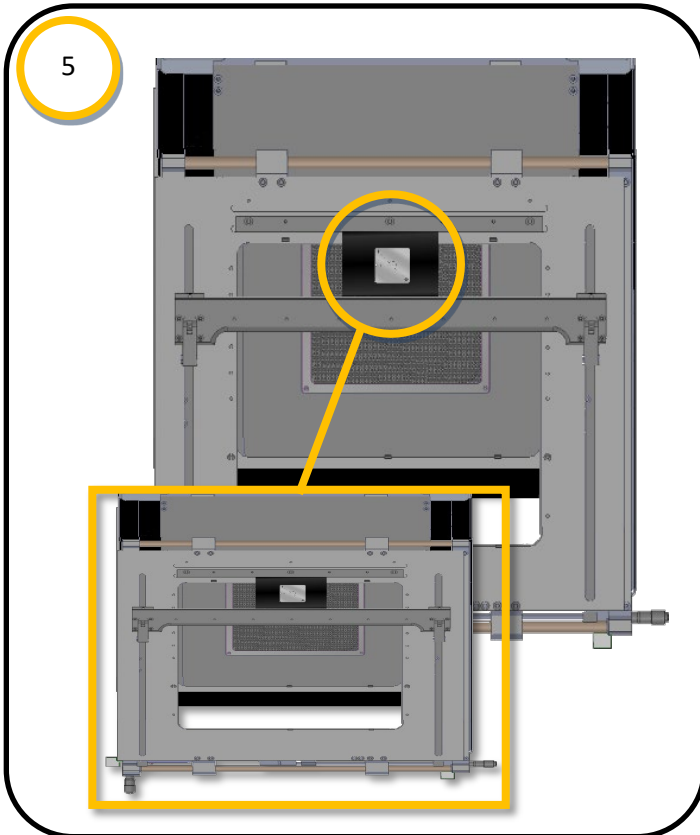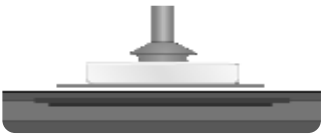
1

Remove

↺2.5M⬡

2

↺3M⬡

3

4

↺3M⬡

5

6

7

 Activate the vacuum pump

 Pick up the alignment plate with the vacuum nozzle

 Insert M3⬡

 Raise the alignment 2-3mm from the nest

 Adjust the alignment plate until it is parallel with the nest

↻3M⬢

Tighten

↻3M⬢

POWER   VACUUM

Z

◄ X ►
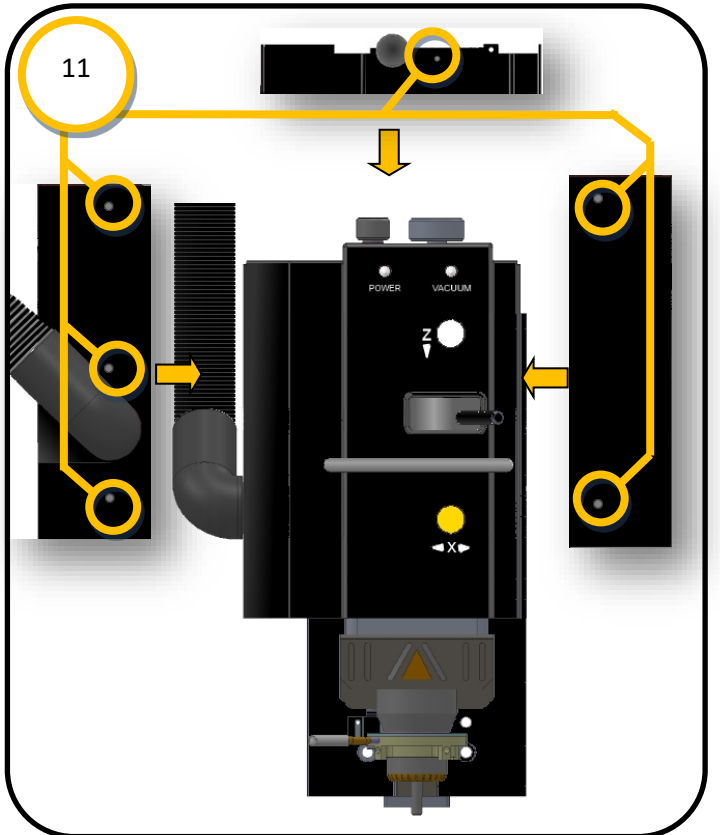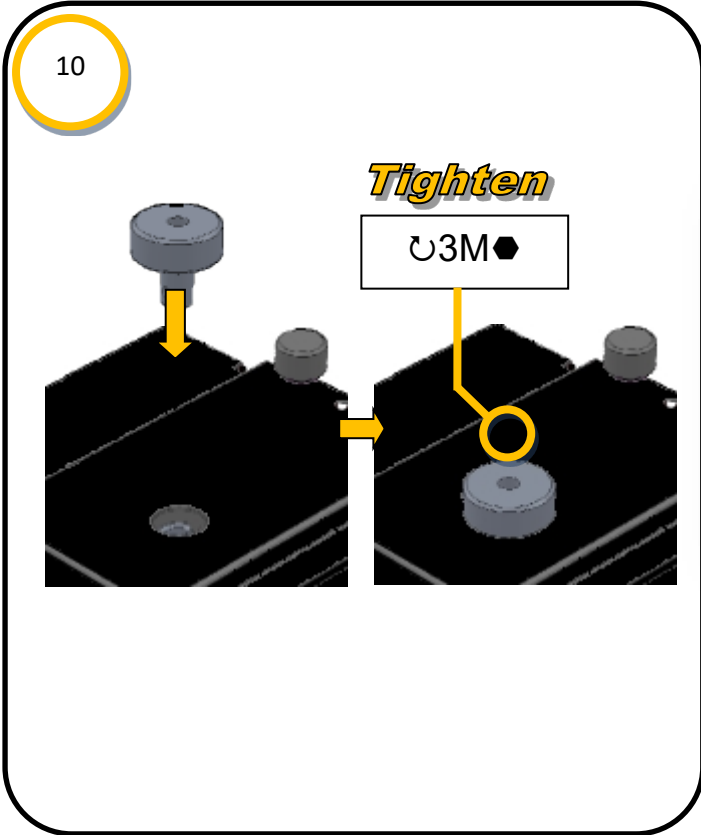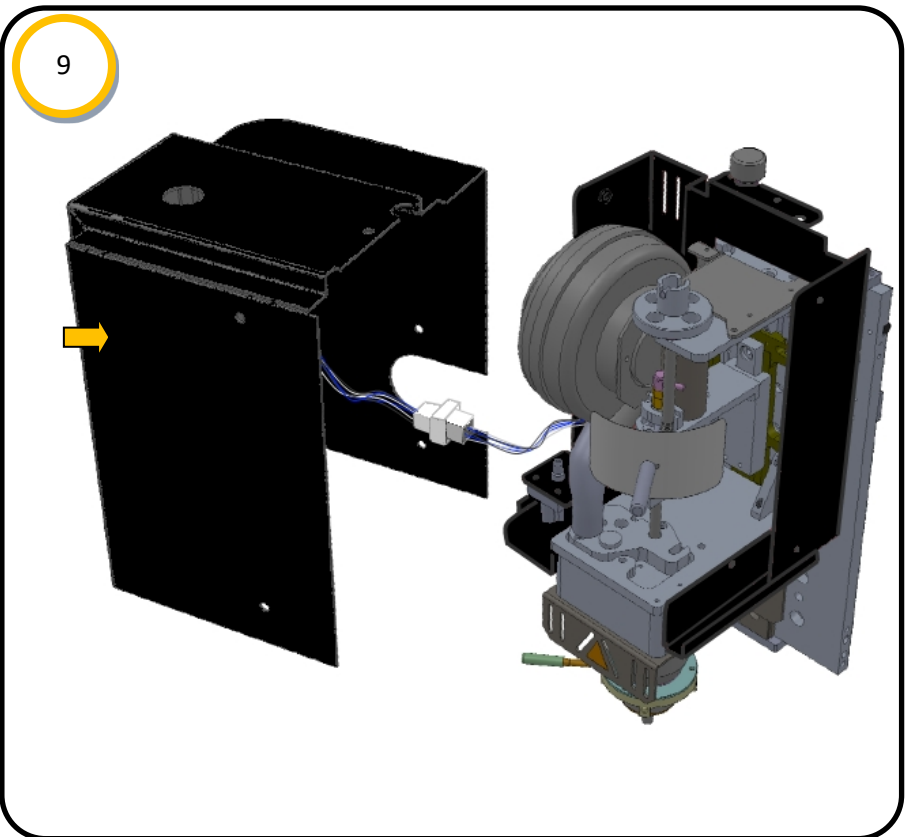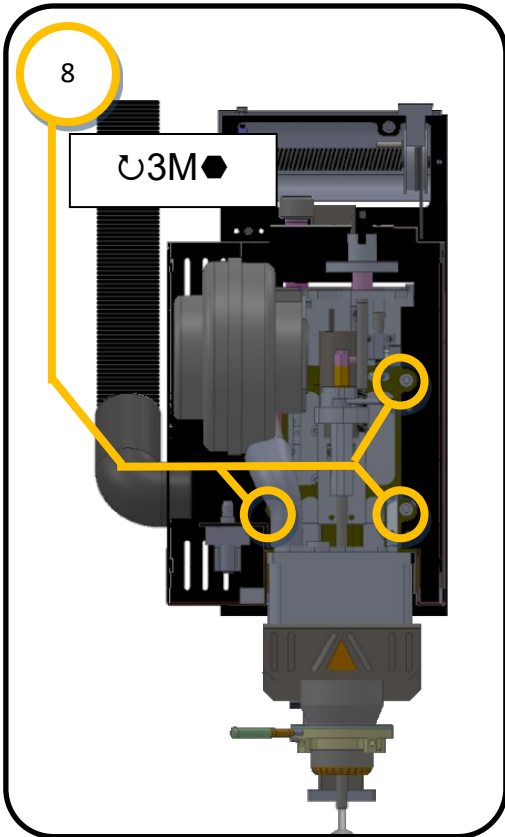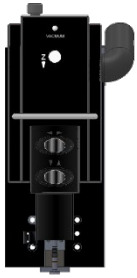
Precision Placement Head
Yaw Adjustment

12M or
As required
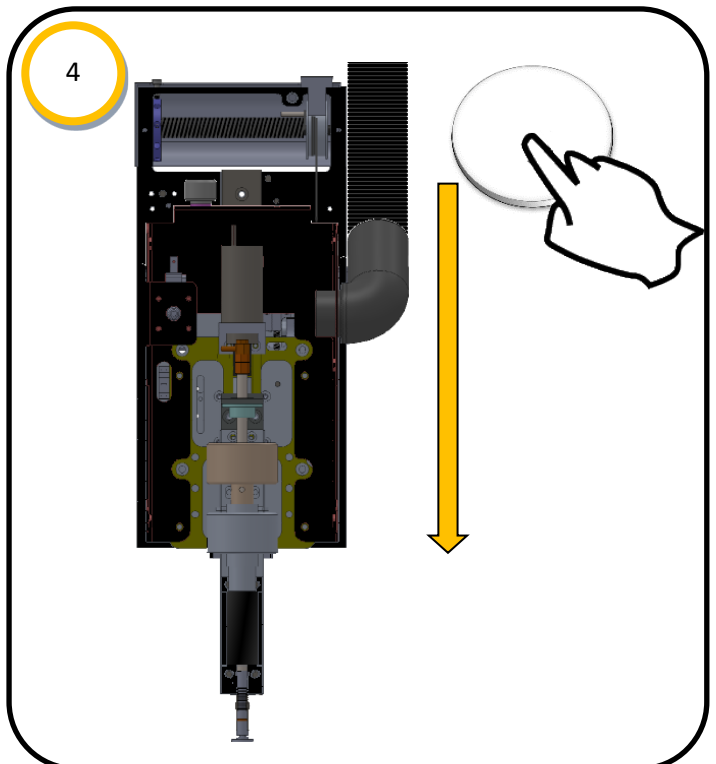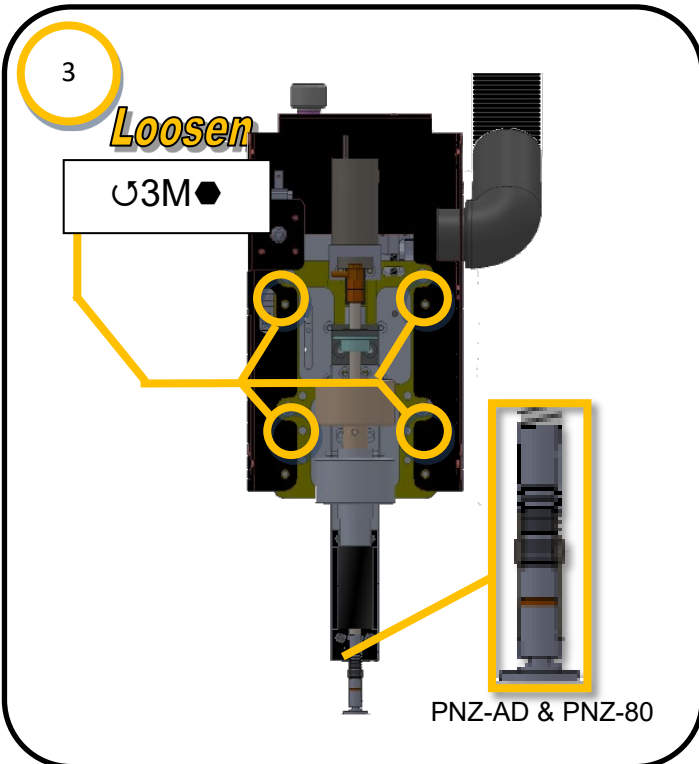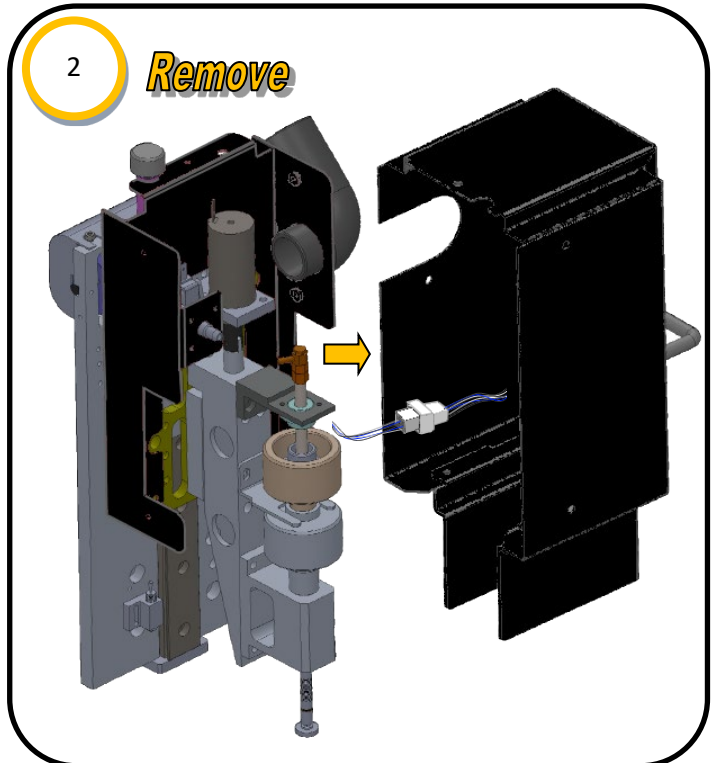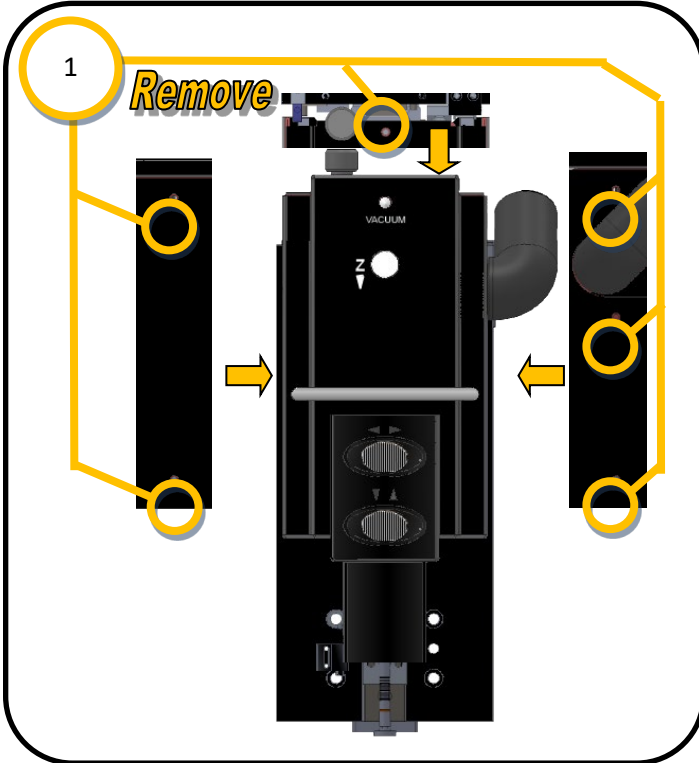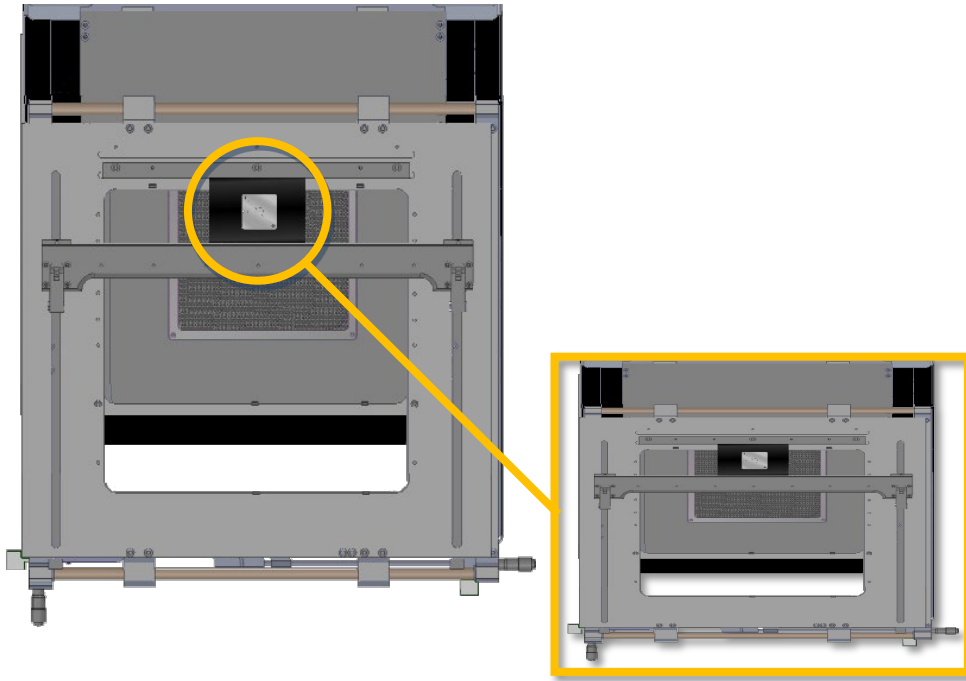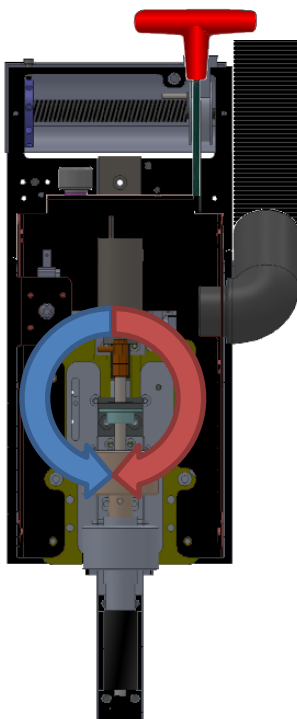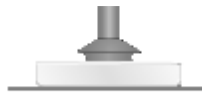
1 *Remove*

VACUUM

2 *Remove*

3 *Loosen*

↺3M⬡

PNZ-AD & PNZ-80

4

5

6

Activate the vacuum pump

Pick up the alignment plate with the vacuum nozzle

Insert M3⬡

Raise the alignment 2-3mm from the nest

Adjust the alignment plate until it is parallel with the nest

7 *Tighten*

↻3M⬡

8

9 *Tighten*

VACUUM

Z
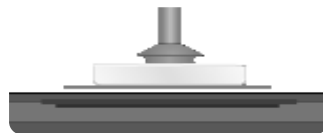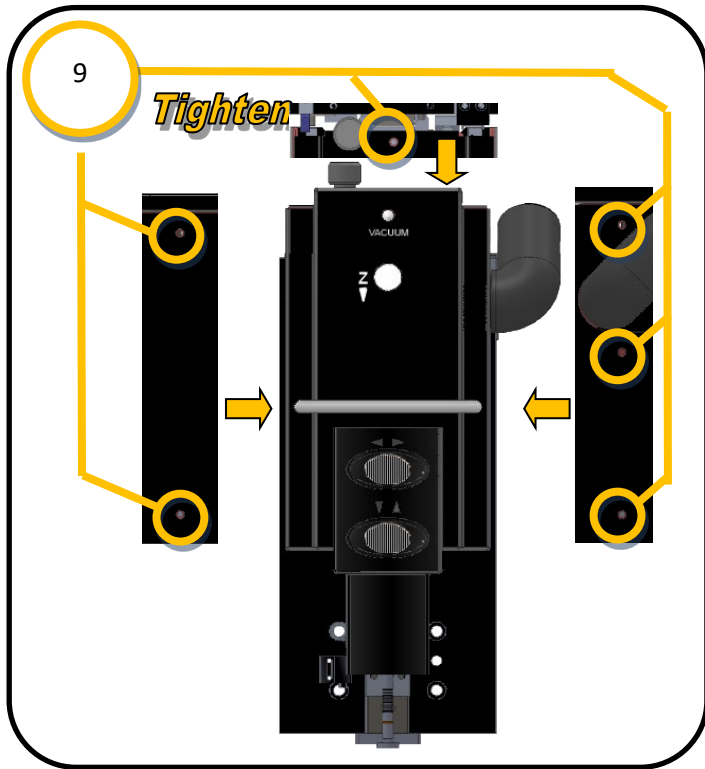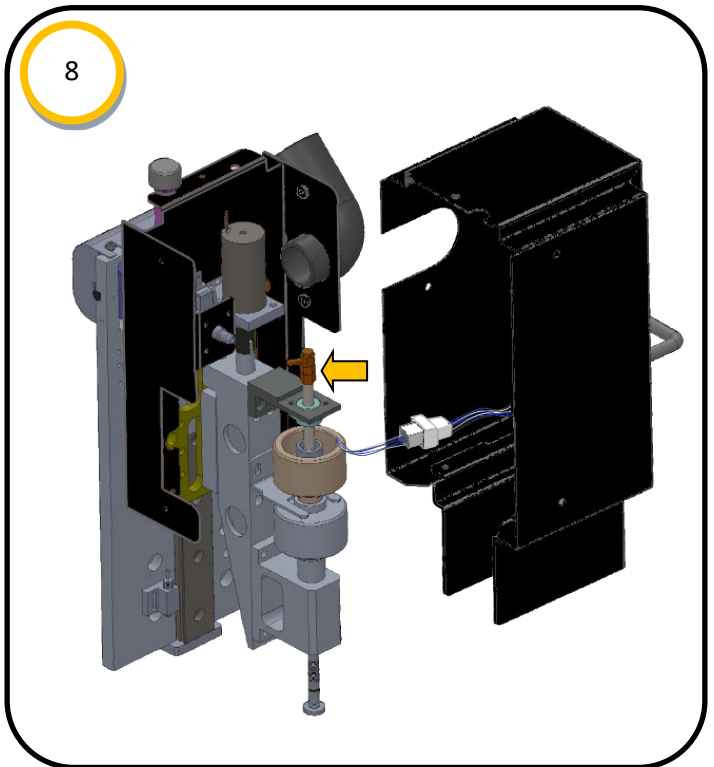
SmartPlace Technology
Camera Mount Adjustment

12M or
As required
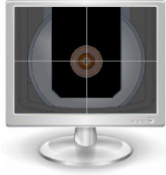
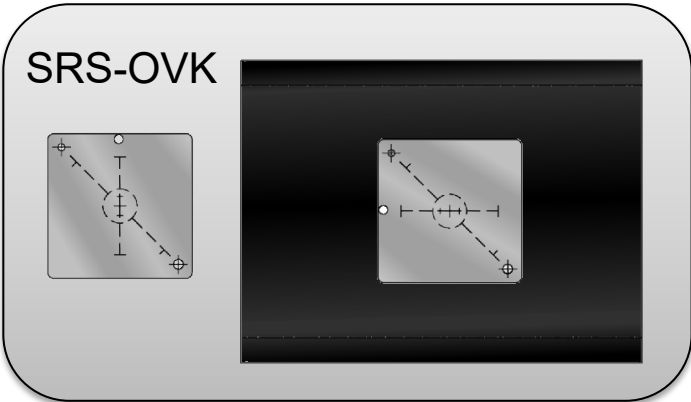- The end of the vacuum shaft should intersect the on screen camera crosshairs.

1 Remove

↻3M⬡   ↻2.5M⬡

2

3

4 Loosen

↻3M⬡

5

6

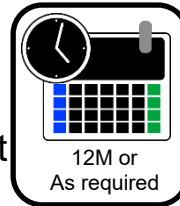*Tighten*

↻3M⬡

7

8

9

10

Tighten
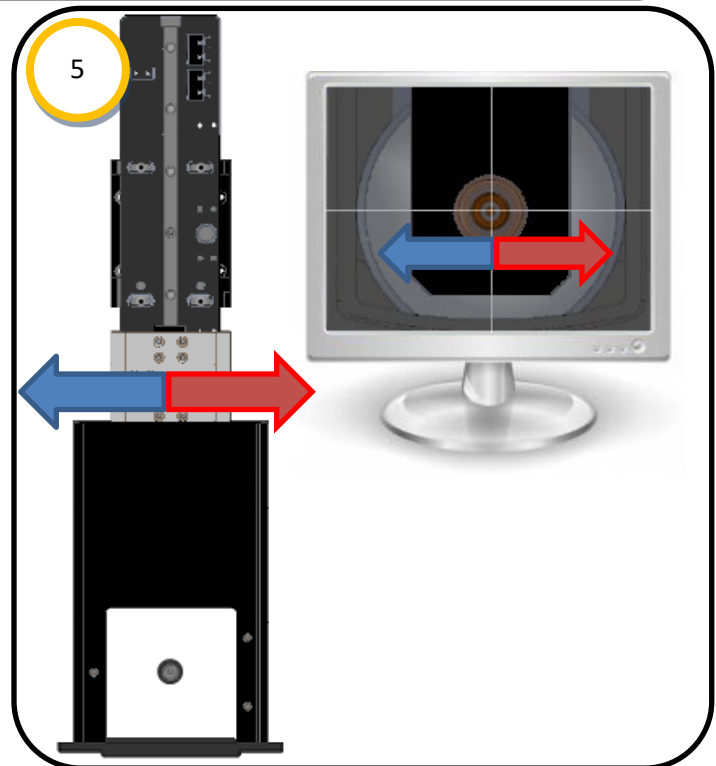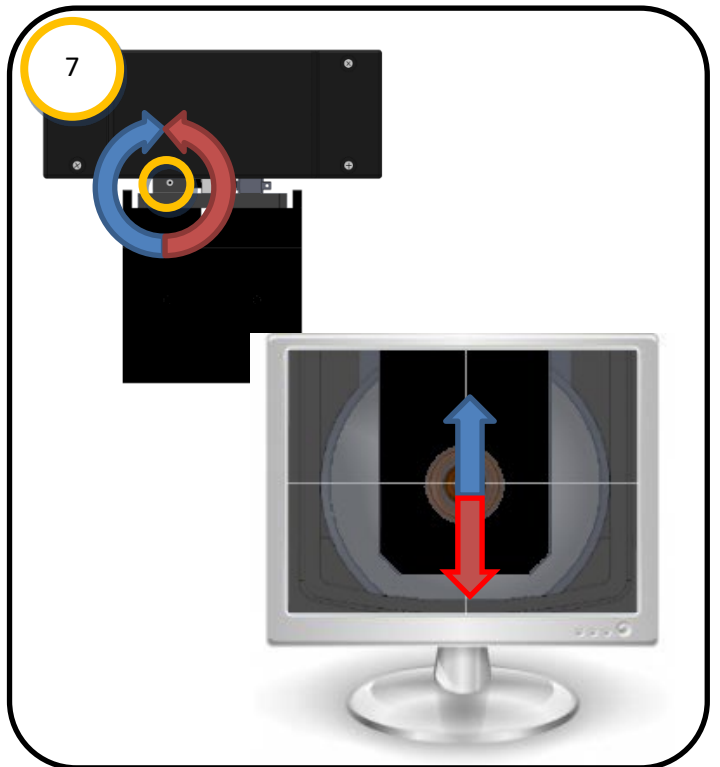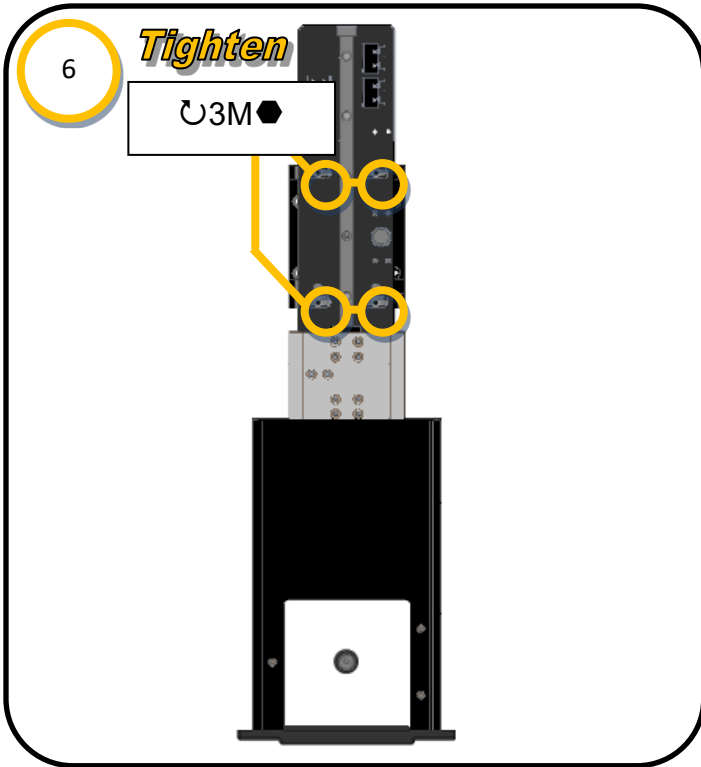
SmartPlace Technology

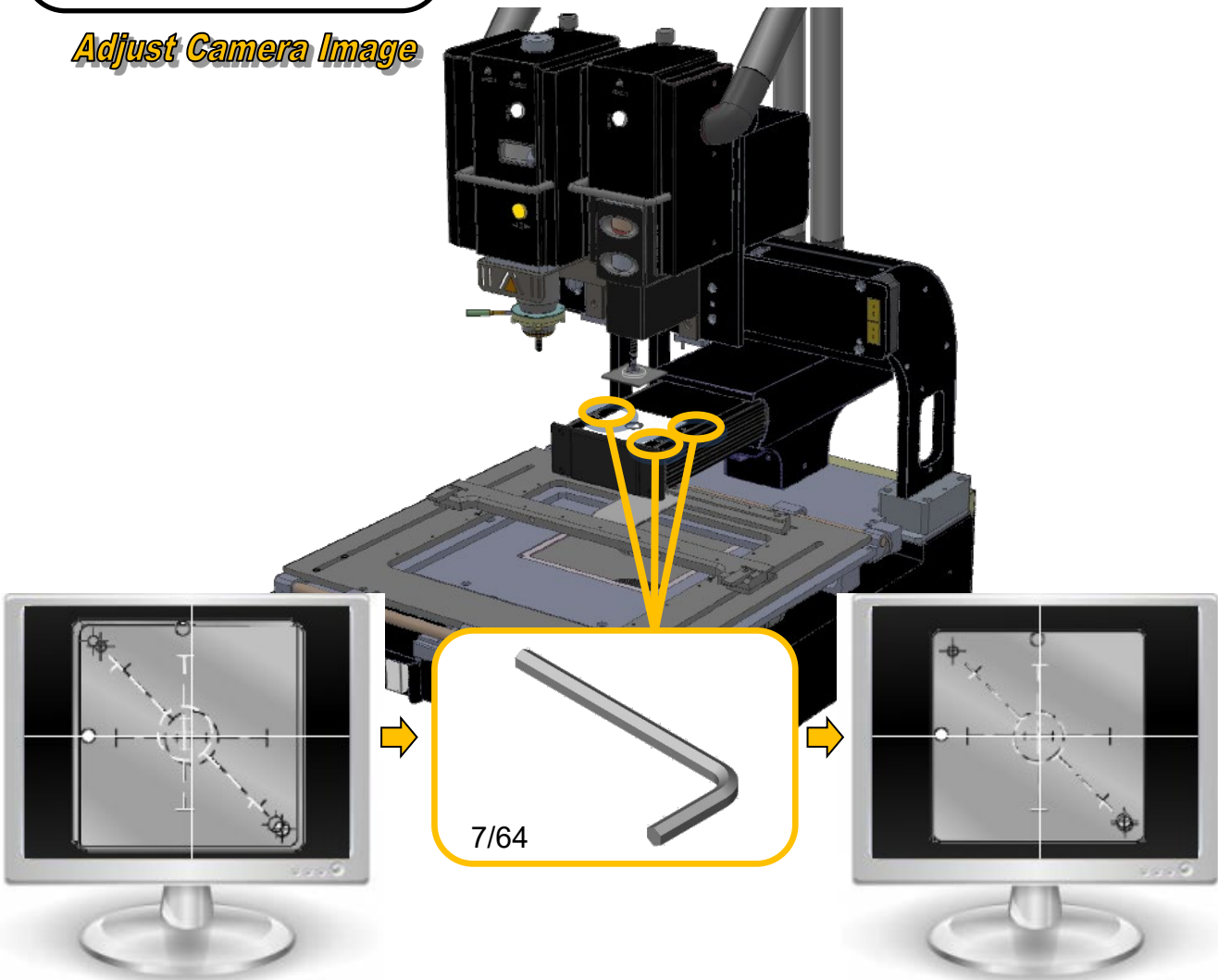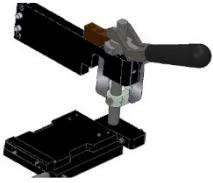## Camera Sensor to Optical path alignment

12M or
As required

SRS-OVK

1

4MM
7/64

2

4MM

③

VACUUM

Z ▼

Adjust Camera Image
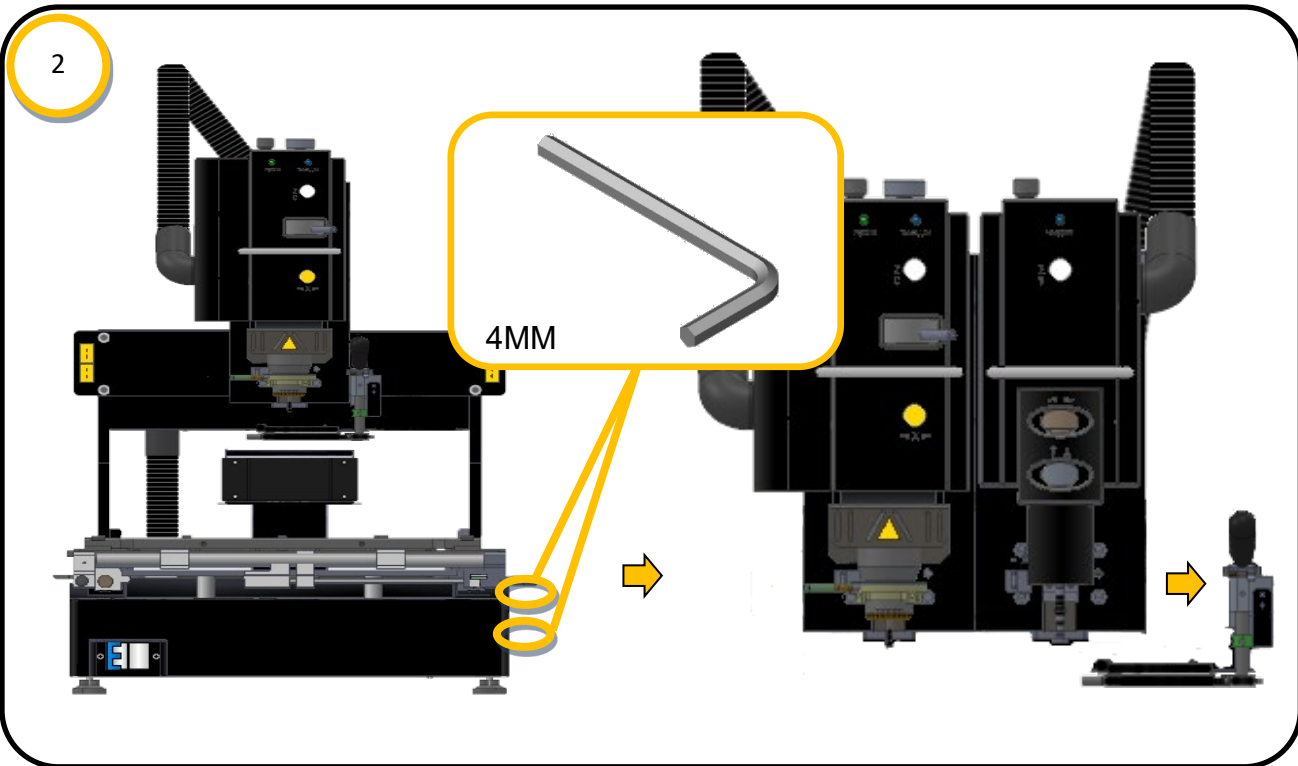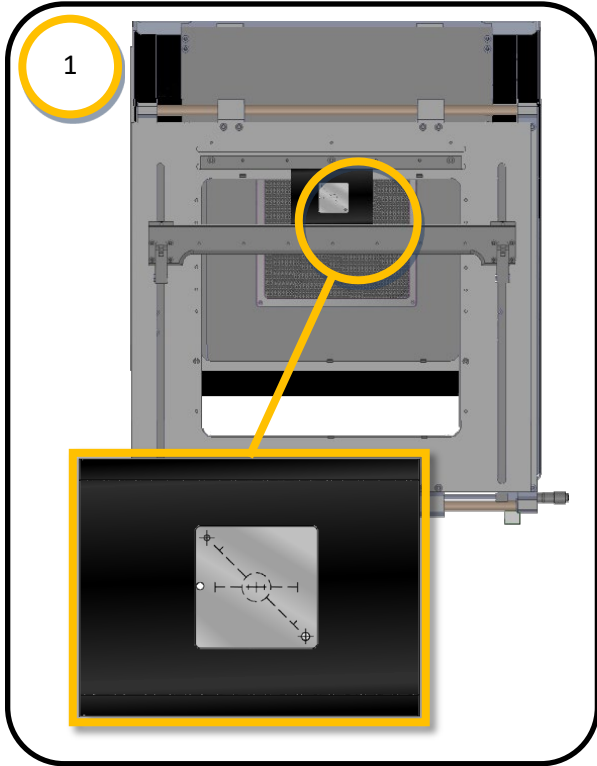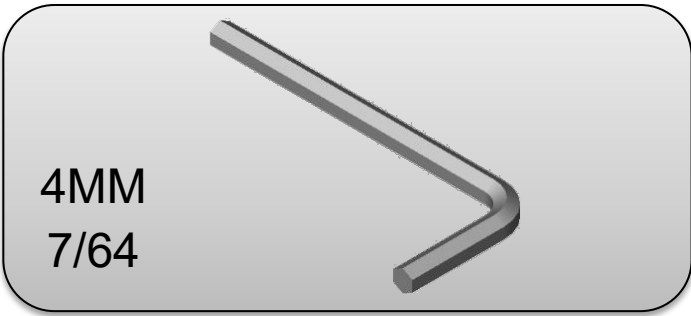
Activate the vacuum pump

Pick up the alignment plate with the vacuum nozzle from the mating part.
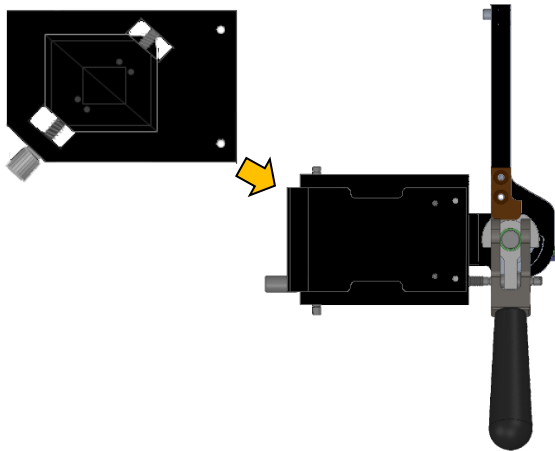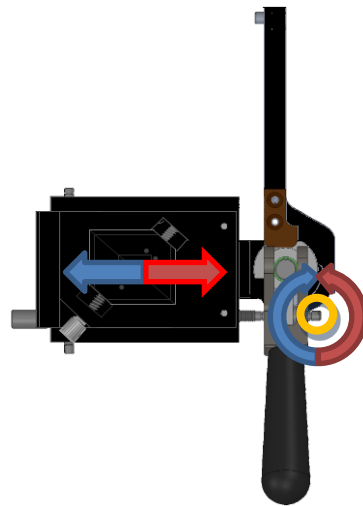
7/64

Component Arm Adjustment

- Adjust the component tray arm until the component tray is centered on the vacuum tube.

2.5M⬡
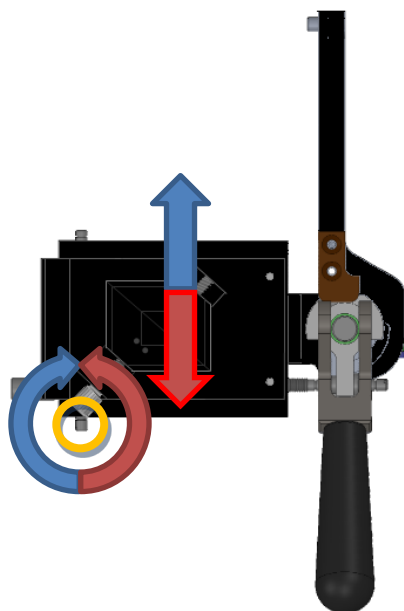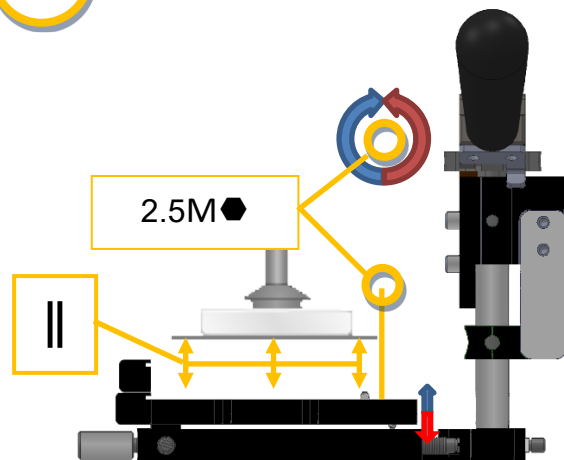
Vacuum Filter Replacement

12M or As required
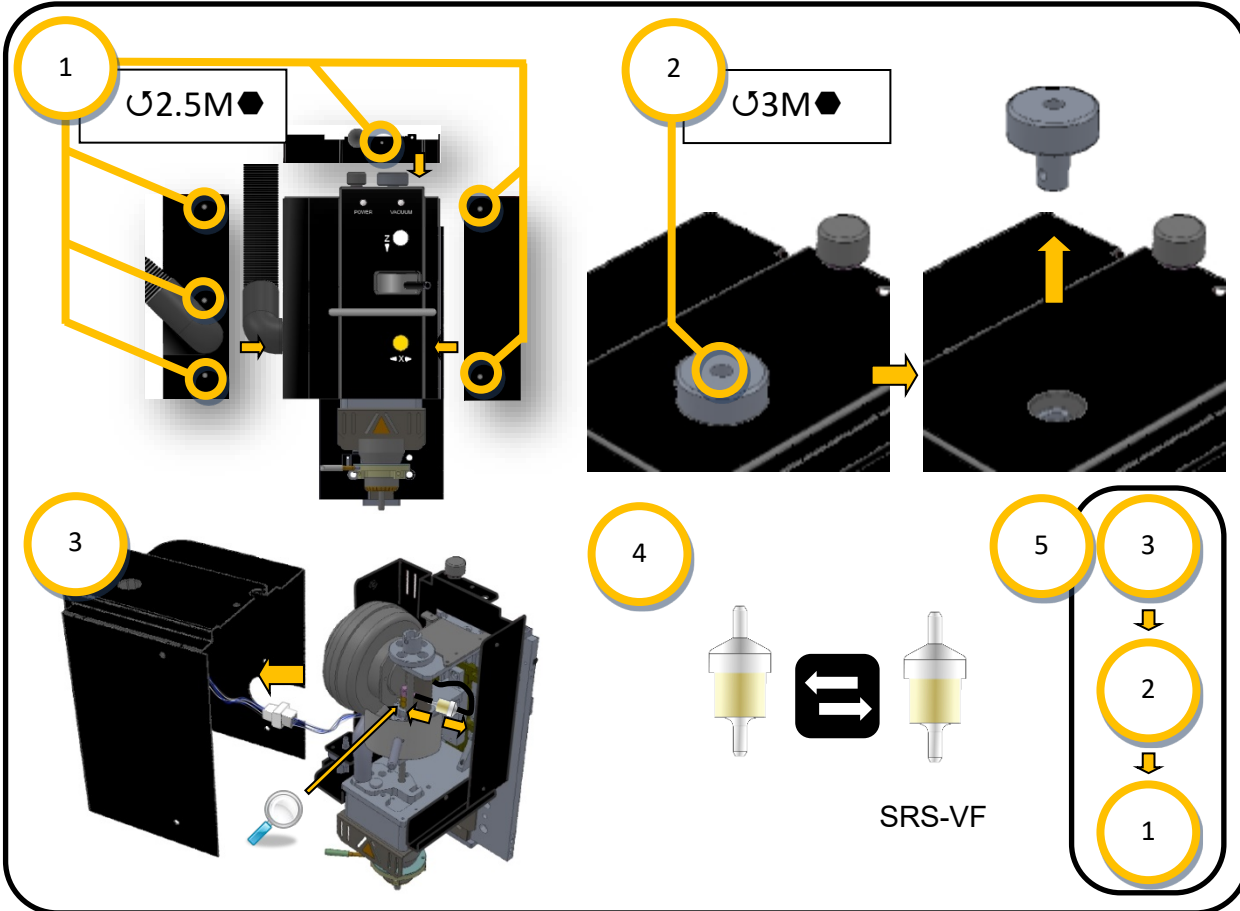
(Top panel)

1 ↺2.5M⬡

2 ↺3M⬡

3

4

SRS-VF

5 **3**
2
1

(Bottom panel)

1 ↺2.5M⬡

2

3

SRS-VF

4 **2**
1
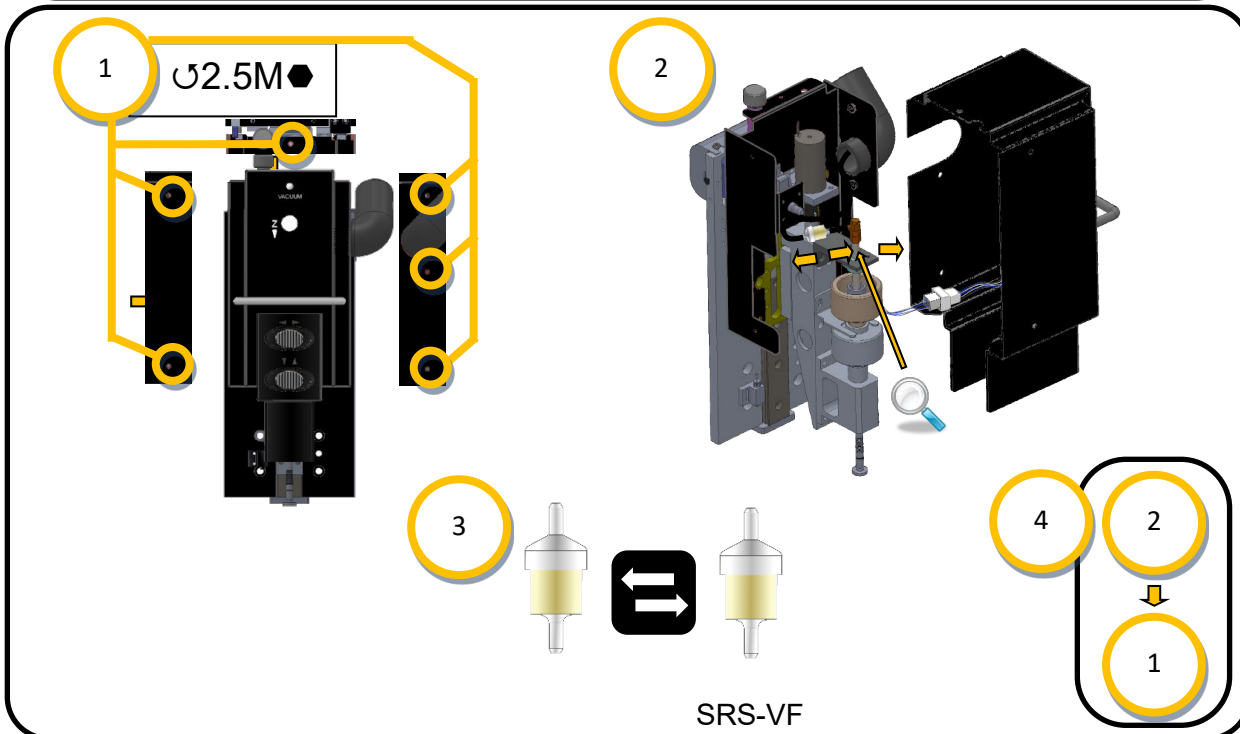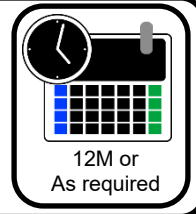
Scorpion Software Installation

- Download the latest version of the Scorpion software from

  http://apr-rework.descoindustries.com/Software-Downloads.aspx

- Transfer the downloaded file to an USB Flash drive with a 2GB or greater capacity.
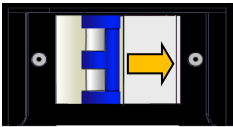
- Turn the power off to the Scorpion.
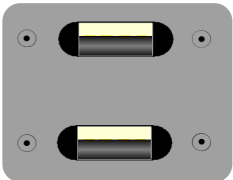
- Insert the USB flash drive with the software into an available USB port.
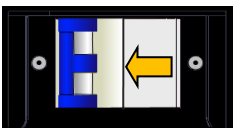
- Turn the power on to the Scorpion.

- The system will automatically detect and install new software. Unmount and remove the USB flash drive when complete.

Factory Restore

- Hover the cursor over the factory restore icon

- Left click the factory restore icon to restore saved settings.

Save Factory Default

- Hover the cursor over the factory restore icon

- Right click the factory restore icon to save the settings.

Specifications

|	
Input Voltage	200-240VAC, 50/60Hz, 15 Amp Single Phase
Power Consumption	
System Total	2800W (average)
Inner Pre-Heater	900W (rated)
Outer Pre-Heater	1800W (rated)
Reflow Heater	550W (rated)
Operating Temperature	41 to 104°F (5 to 40°C)
Maximum Relative humidity	80% at 88°F (31°C) decreasing linearly to 50% at 104°F (40°C)
Maximum Altitude	6500 ft. (2 km)
Pollution Degree	2 per IEC 644
Insulation category	II
Temperature Control Type	Closed-Loop Control (Thermocouple)
Maximum Source Temperature	
Reflow Head	400°C (752°F)
Pre-Heater (Inner/Outer)	350°C (662°F)
Airflow	
Control	Low, Medium, & High
Supply	Embedded 24 VDC Blower
Component Handling	
Placement Accuracy	0.0254 mm
Maximum Field of View	1.77" x 1.77" (45 x 45 mm)
Minimum Size	0.020" x 0.010" (0.51 x 0.25 mm)
Maximum Weight	1.94 oz. (55 g)
PCB Handling Capability	
Maximum Size	13.5" x open (343 mm x open)
Maximum Thickness	0.25" (6 mm)
Board Holder Range of Motion (from center position)	3.0" (76 mm) Left 3.0" (76 mm) Right 4.75" (121 mm) Toward the Operator
Dimensions	
Crated	27" W x 33" D x 31" H (686 x 838 x 787 mm)
Uncrated	18" W x 24" D x 28" H (457 x 610 x 711 mm)
Weight	
Crated	190 lbs. (86.2 kg)
Uncrated	140 lbs. (63.5 kg)
Certifications	TÜV SÜD
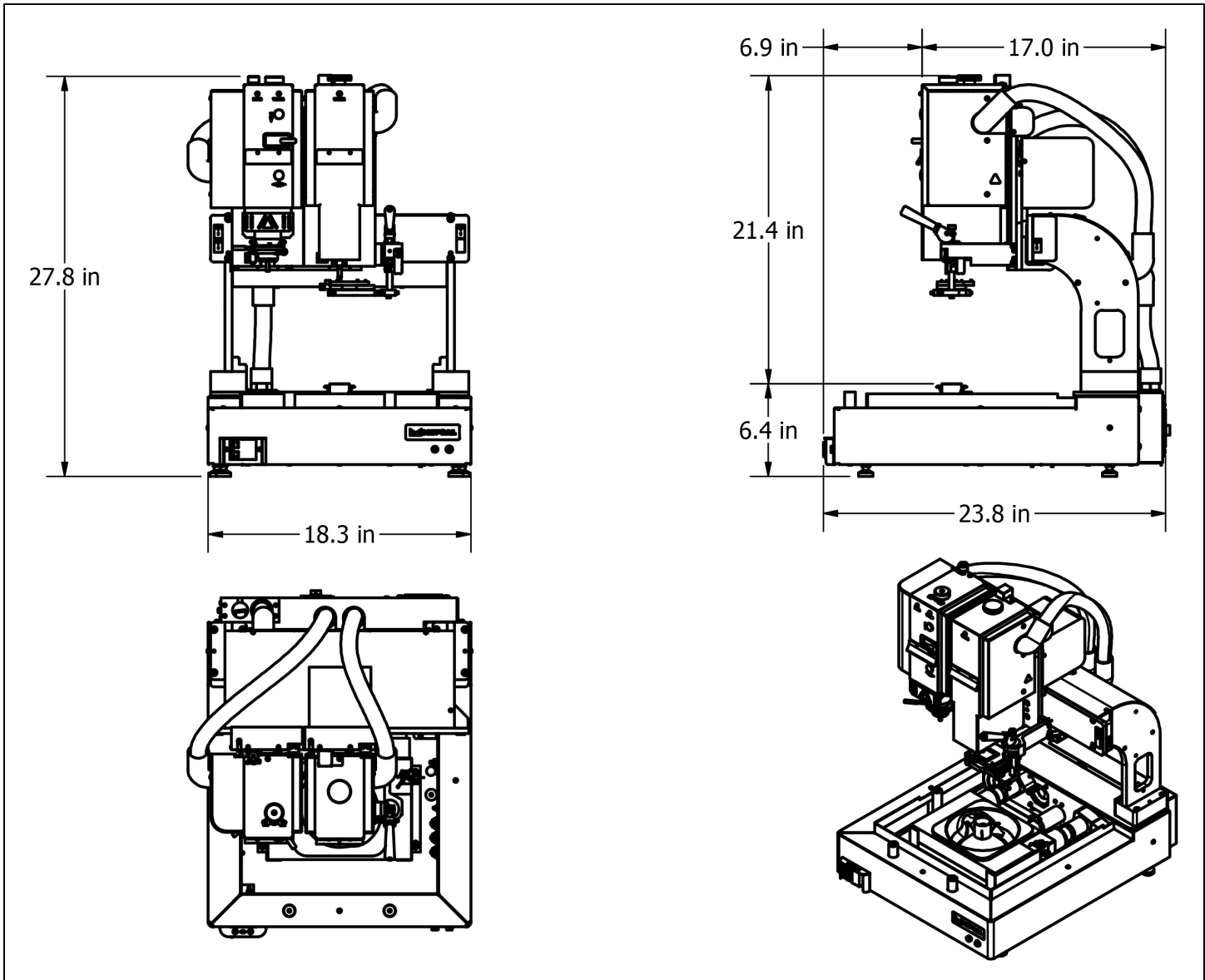
General dimensions of the Scorpion Rework System

Reflow Nozzles

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Reflow-Nozzles/

Vacuum Nozzles

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Vacuum-Nozzles/

Placement Nozzles

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Placement-Nozzles/

Pre-Heater Nozzles

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Pre-Heater-Nozzles/

Accessories

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Accessories/

Calibration Kits

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Calibration-Kits/

Replacement Parts

APR-Rework.com/APR-Catalog/APR-Scorpion-Series/Replacement-Parts/

Customer Service

Service@APR-Rework.com

Limited Warranty

APR-Rework.com/Limited-Warranty.aspx