

## SRS-CALKIT

### Description

The APR SRS-CALKIT is a thermal calibration kit for the APR Scorpion Rework System. It is compatible with the following item numbers:

Item	Description
APR-1200-SRS	Scorpion Rework System with Manual Placement Head
APR-1200-SRS-MOB	Scorpion Rework System with Manual Placement Head, for High Density Boards
APR-1200A-SRS	Scorpion Rework System with Motorized Placement Head
APR-1200A-SRS-MOB	Scorpion Rework System with Motorized Placement Head, for High Density Boards
670050	Scorpion XL Rework System with Manual Placement Head
670051	Scorpion XL Rework System with Motorized Placement Head

### Packaging

Qty	Description	Application
1	Thermal Calibration Fixture	Top and bottom heater calibration
1	Thermocouple Simulator	Top and bottom heater calibration
1	Thermocouple Probe	Top and bottom heater calibration
1	Airflow Meter (Anemometer)	Airflow measurement
1	Airflow Box Fixture, Pre-Heater	Airflow measurement, pre-heater
1	NZA-SRS-CAL Airflow Nozzle	Airflow measurement, top heater
1	NZA-490-490 Reflow Nozzle, 49.0 x 49.0 mm	Top heater calibration



Thermal Calibration Fixture



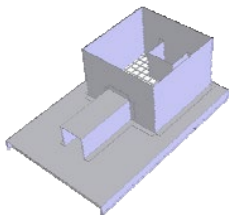
Thermocouple Simulator



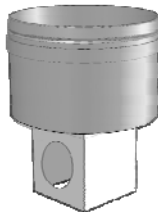
Thermocouple Probe



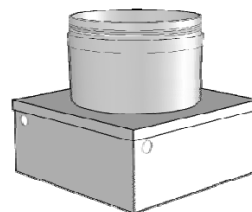
Airflow Meter (Anemometer)



Airflow Box Fixture, Pre-Heater



NZA-SRS-CAL Airflow Nozzle



NZA-490-490 Reflow Nozzle

## 10.0 Thermal Calibrations

### 10.1 Airflow Calibration

**Note: The mouse scroll (center) wheel is used to increase or decrease airflow settings.**

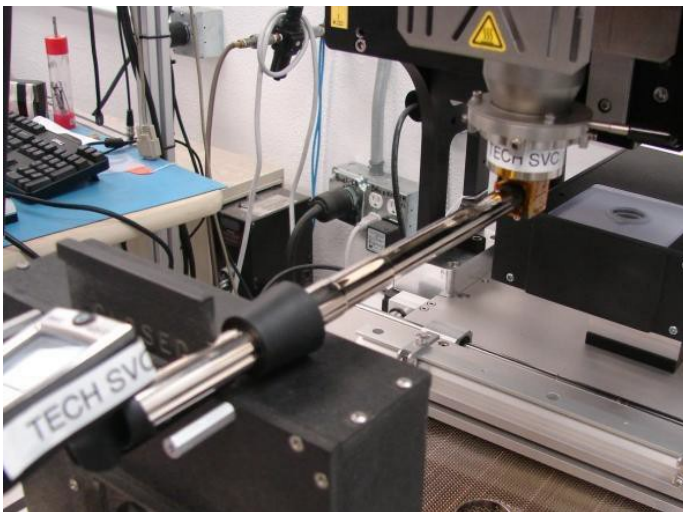
#### 10.11 Reflow Head

##### Materials & Equipment Needed:

**Testo Airflow Meter—Part Number 5400-0020**

**Airflow Nozzle (with Bored Testo Hole)—Part Number NZA-SRS-CAC  
Flashdrive**

1. Go to the System Configuration Menu (see Image 57).
2. Attach the **NZA-SRS-CAC**
3. Place the Testo Airflow Meter in the Nozzle (see Image 41) with arrow at the end of rod pointing down (the Testo Airflow meter should be perpendicular to the reflow head).
4. Left mouse click (“on”) the Reflow Head Airflow icon (see Image 57, Row 2, A).
5. Right mouse click the Reflow Head Airflow icon (see Image 57, Row 2, A) until “Low Setting” is displayed.
6. Measure the Low Setting airflow with the Testo Airflow Meter (see Image 41).
7. Adjust voltage by rolling the center button of the mouse until Airflow value is  **$3.4 \pm 0.2$  m/s.**



**Image 41.** Reflow Head Airflow Measurement

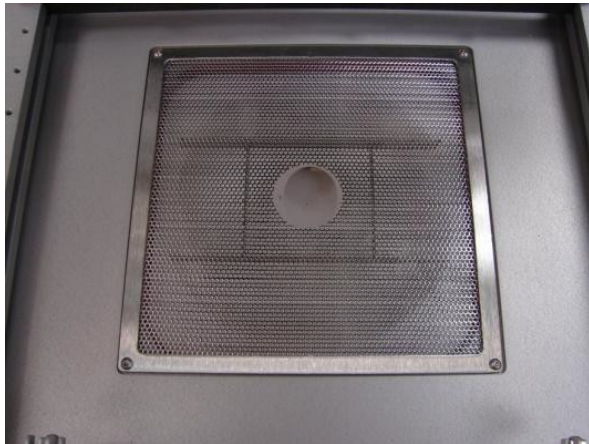
8. Repeat step 4.
9. Left mouse click the Reflow Head Airflow icon (see Image 57, Row 2, A) until “Medium Setting” is displayed.
10. Measure the Medium Setting airflow with the Testo Airflow Meter (see Image 41).

11. Adjust voltage by rolling the center button of the mouse until Airflow value is **4.2 ± 0.2 m/s**.
12. Repeat step 4.
13. Left mouse click the Reflow Head Airflow icon (see Image 57, Row 2, A) until “High Setting” is displayed.
14. Measure the High Setting airflow with the Testo Airflow Meter (see Image 41).
15. Adjust voltage by rolling the center button of the mouse until Airflow value is **5.0 ± 0.2 m/s**.
16. Repeat step 4.
17. Left mouse click the Reflow Head Airflow icon (see Image 57, Row 2, A) until “Cooling Setting” is displayed
18. Adjust cooling zone until it is 0.5 v above the set voltage point of the high setting ( the voltage point of step 15)

#### 10.12 Small Preheater

**Note: ONLY perform steps 1, 2, and 3 if the Preheater Funnel is not installed.**

1. Remove the Preheater Screen (see Image 42).



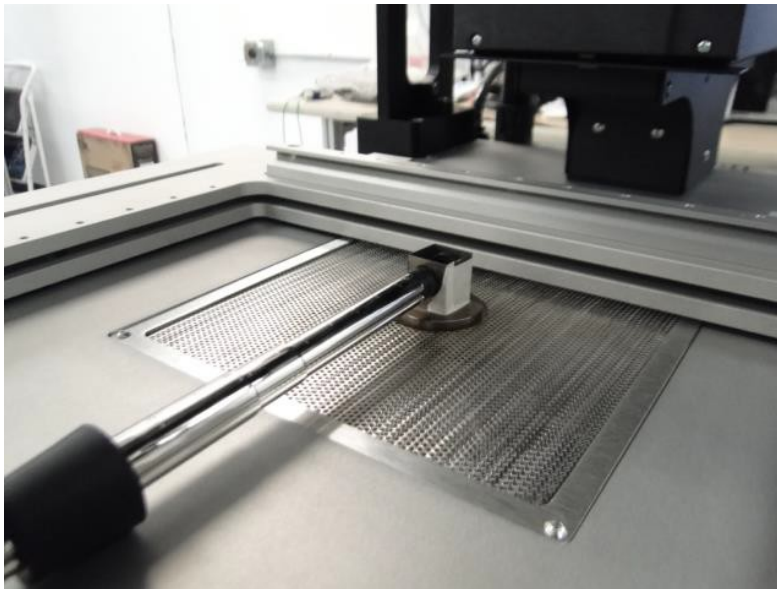
**Image 42.** Preheater Screen

2. Ensure that the Scorpion Funnel is placed flush in the bowl (Image 43).



**Image 43.** Flush Preheater Funnel

3. Reinstall the Preheater Screen.
4. Power the Scorpion on.
5. Go to the System Configuration Menu (see Image 57).
6. Left mouse click the Small Preheater icon (Image 57, Row 2, B).
7. Right click icon until “normal setting” is displayed.
8. Place NZA-SRS-CAL into the hole in the preheat screen
9. Insert the Airflow Testo Meter into the hole on the nozzle with the arrow on the back of the shaft pointing up
10. Make sure the meter is flush against the backside of the nozzle hole and perpendicular to the reflow head (see image 44).



**Image 44.** Small Preheater Airflow Measurement

11. Adjust voltage accordingly until Airflow Testo Meter reads **6.0 ± 0.1**.
12. Left click small preheater icon until “cooling setting” is displayed.

13. Adjust cooling zone until it is 0.5 v above the set voltage point of the normal setting (0.5V above the voltage point of step 11)

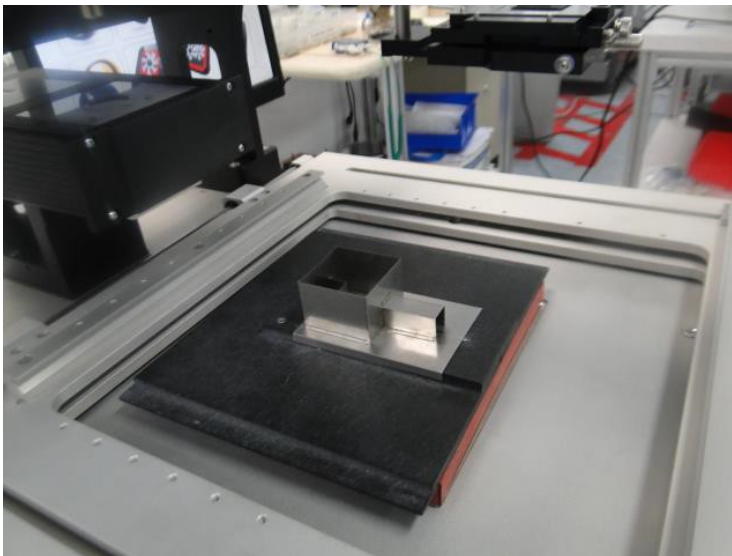
### 10.13 Large Preheater

1. Place the metal disk over the funnel opening (see Image 45).



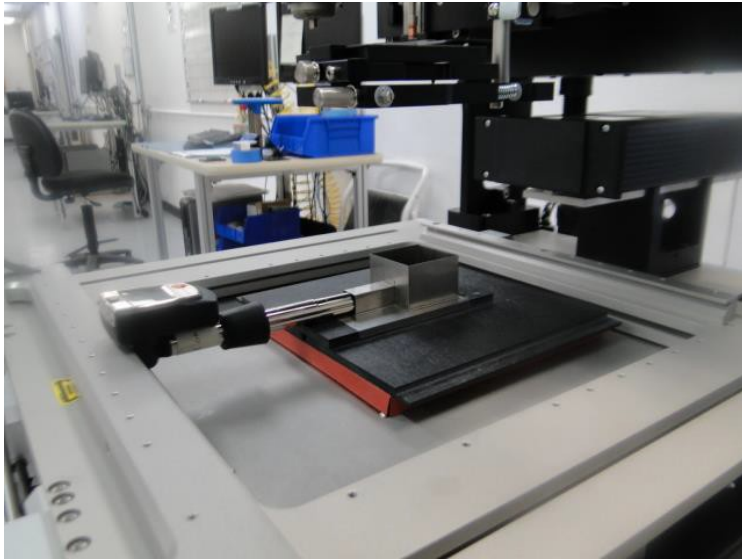
**Image 45.** Small Preheater Disk Cover

2. Place the Preheater Airflow fixture over the funnel with the fitting attached (see Image 46).



**Image 46.** Preheater Fixture Setup

3. Go to the System Configuration Menu (see Image 14).
4. Left mouse click the Large Preheater icon on (see Image 17, Row 2, C).
5. Right click until normal setting is displayed.
6. Place the Testo Airflow Meter into the fixture (see Image 47) with the arrow on the end of the shaft pointing up perpendicular to reflow head.



**Image 47.** Testo Meter & Large Preheater Measurement

7. Adjust voltage accordingly until Airflow Testo Meter reads  **$2.0 \pm 0.1$** .
8. Left click the Preheater icon until the “cooling setting” is displayed.
9. Adjust cooling zone until it is 0.5 v above the set voltage point of the normal setting (0.5V above the voltage point of step 7).

## ***10.2 Thermocouple (TC) Calibrations***

### **Materials & Equipment Needed:**

**TC Simulator—Part Number 5300-0019**

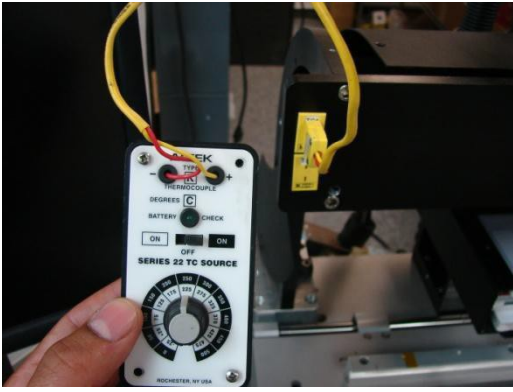
**Warning: TC Calibration must be performed prior to Thermal Calibrations and Verifications**

### **10.21 TC1, TC2, TC3, IR Calibration**

1. Obtain the K-Type Thermocouple Tester.
2. Set the K-Type Thermocouple tester to 250° C.
3. Go to the System Configuration screen (see Image 14).
4. Left click the thermocouple calibration icon (see Image 17, Row 3, D).

**Note: The current temperature of the TC will be displayed.**

5. Plug the TC lead into the external TC socket. (see Image 48)



**Image 48.** TC connected to a TC socket

6. Inject 250° C into the TC by a single right click on the TC Calibration icon.
  7. Left click the thermocouple calibration icon to navigate to the next TC
- Note: The software will indicate that the TC Temperature is saved**
8. Repeat steps 4 through 6; calibrate all four TCs.
  9. Plug the K-Type TC Tester into the corresponding external TC socket and confirm the reading is as injected.

### **10.3 Heater Calibrations & Verifications**

**Warnings: 1) TC Calibration must be performed PRIOR TO Heater Calibrations & Verifications. 2) Airflow Calibrations must be performed prior to Heater Calibrations & Verifications**

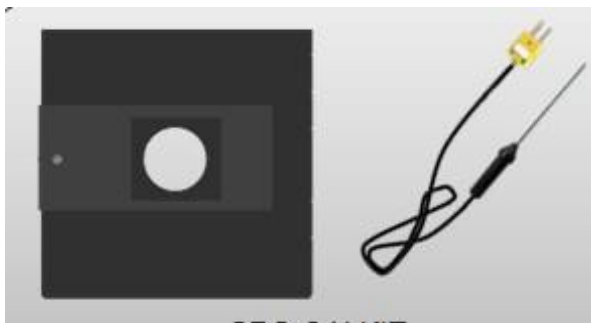
#### **Materials & Equipment Needed:**

**NZA-490-490 Reflow Head Heater Nozzle**

**SRS-CALKIT Scorpion Heater Calibration Kit**

#### **10.31 Reflow Head Calibration**

1. Obtain the Scorpion Heater Calibration Plate (see Image 49)



**Image 49.** Scorpion Calibration Plate & Probe

2. Place the TC probe end into the Scorpion Heater Calibration Plate, center the probe tip TC in the opening and tighten the thumbscrew (see Images 50 & 51).



**Image 50.** TC of Probe Centered



**Image 51.** TC Probe thumbscrew

3. Set and lock the TC Scorpion Heater Calibration Plate (with the centered Probe) in the center of the PCB Board Holder—over the Preheater Funnel.
4. Connect the Scorpion Heater Calibration Plate Probe TC lead into TC1 on the Scorpion (see Image 52).



**Image 52.** TC1 and Fixture Probe Connection

5. Attach the NZA-490-490 Nozzle to the Reflow Head.
6. Close the window on the calibration fixture
7. Press the Reflow Head Z-axis button and lower the Reflow Head/Nozzle into position flush against the Scorpion Heater Calibration Plate nozzle cutout.

**Note: Center the Nozzle to the Calibration Fixture**



8. Start the Reflow Calibration Profile by left clicking the Calibration Profile Icon (see Image 17, Row 3, A).
9. Go to the Profile Screen (see Image 13) and wait for the calibration to complete.
10. Check profile to make sure it is  $\pm 5^{\circ}\text{C}$  on reflow

### **10.32 Reflow Head Verification**

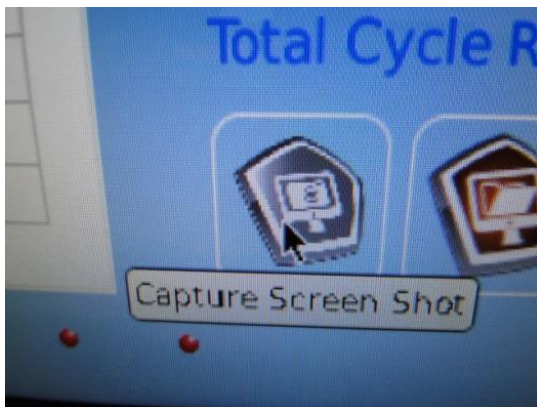
1. Place the Scorpion Heater Calibration Plate in the PCB Holder in same position as during calibration.
2. Center the Scorpion Heater Calibration Plate probe TC to the center hole of the plate and tighten the setscrew (see Images 50 & 51).
3. Lock the PCB Holder into position over the Small Preheater funnel.
4. Connect the probe thermocouple lead into TC1.
5. Attach the NZA-490-490 Nozzle to the Reflow Head.
6. Close the window on the calibration fixture
7. Lower the Reflow Head flush with the Scorpion Heater Calibration Plate in the square cutout.
8. Navigate to the Profile screen (see Image 13) and create the following profile settings (4 zones):
  - a. Z1: 150 °C/180 seconds
  - b. Z2: 200 °C /180 seconds
  - c. Z3: 250 °C /180 seconds
  - d. Z4: 300 °C /180 seconds
9. In each zone, click approximately 2 seconds before the 180 second interval lines to create new dashed lines
10. Drag the small and large preheater lines (green and blue) to the bottom of the graph.
11. Run the profile by left clicking the top right corner icon (see image 53).



**Image 53. Run profile**

12. Save a screenshot (with markers at every zone) by left clicking the bottom left icon (see image 54) and save it to a flash drive with the following naming convention:

- a. [mmyyddRHCaVerif]

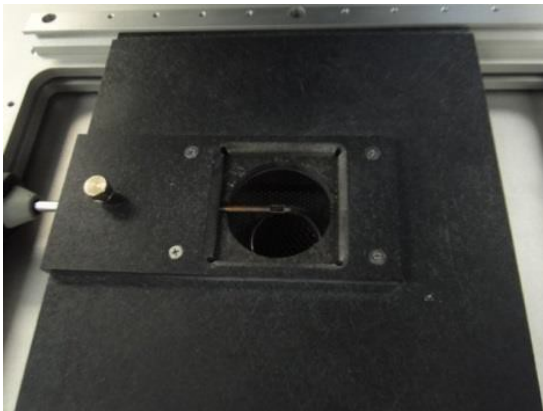


**Image 54. Screen shot**

13. Ensure that the temperature is stable through the end of the zones and that it is  $\pm 5^{\circ}\text{C}$  of the target temp.
14. Ensure that the fixture cools to less than  $40^{\circ}\text{C}$  (approx. 20 minutes) before starting another profile.
15. Remove calibration fixture
16. Create 1 zone that ranges from 0 to 300 seconds.
17. Create and run a Reflow Head profile with the heater set to  $350^{\circ}\text{C}$
18. Ensure that the temperature is stable through the end of the zones and reaches  $350^{\circ}\text{C}$  by 100 seconds.
19. Save a screenshot (with the marker at 100 seconds) with the following naming convention:
  - a. [mmyyddRH400CVerif]

### 10.33 Small Preheater Calibration

1. Go to the System Configuration screen (see Image 14).
2. Place the TC Probe end into the Scorpion Heater Calibration Plate, center the probe tip TC in the opening and tighten the setscrew (see Images 50 & 51).
3. Set and lock the TC Heater Scorpion Heater Calibration Plate (with the centered Probe) in the center of the PCB Board Holder, over the Preheater Funnel with the center hole open (see image 55).
4. Insert TC connector into TC1.
5. Start the Small Preheater Calibration by left clicking the Small Preheater icon (see Image 17, Row 3, B).
6. Go to the Profile Screen (see Image 13) and wait for the calibration to complete.



**Image 55. Preheat board with open hole**

### 10.34 Small Preheater Verification

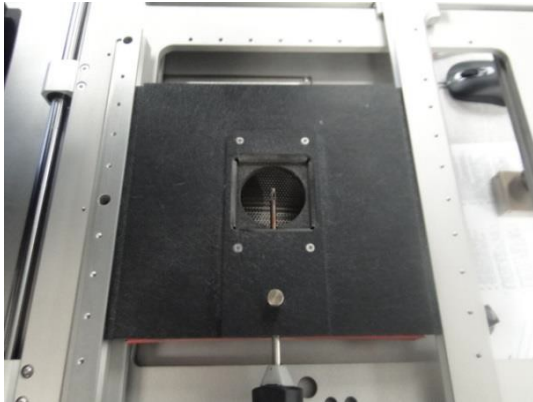
1. Place the Scorpion Heater Calibration Plate in the PCB Holder in the same orientation as during calibration.
2. Center the Scorpion Heater Calibration Plate probe TC to the center hole of the fixture and tighten the set screw. Lock the PCB Holder into position over the Small Preheater funnel.
3. Connect the probe thermocouple lead to TC1.
4. Navigate to the Profile screen and set the following profile settings (4 zones):
  - a. Z1: 100 °C/180 seconds
  - b. Z2: 150 °C/180 seconds
  - c. Z3: 200 °C/180 seconds
  - d. Z4: 250 °C/180 seconds

5. In each zone, click approximately 2 seconds before the 180 second interval lines to create new dashed lines
6. Drag the reflow and large preheater lines (red and blue) to the bottom of the graph.
7. Run the profile by left clicking the top right corner icon (see image 53).
8. Ensure that the temperature stable through the end of the zones and  $\pm 10^{\circ}\text{C}$  of the target temperature.
9. Save a screenshot (with markers at every zone) to the Flashdrive stick with the following naming convention:
  - a. [mmyyddSPHCalVerif]
10. Ensure that the fixture cools to less than  $40^{\circ}\text{C}$  (approx. 20 minutes) before starting another profile.
11. Remove calibration fixture and create 1 zone from 0 to 400 sec and a second zone from 400- 500 sec.
12. Create and run a Small Preheater profile with the heater set to  $350^{\circ}\text{C}$  for 400 seconds.
13. Ensure that Small Preheater reaches  $350^{\circ}\text{C}$  within 100 sec.
14. Save a screenshot (with the marker at 100seconds) with the following naming convention:
  - a. [mmyyddSPH350CVerif]

### **10.35 Large Preheater**

1. Go to the System Configuration screen (see Image 14).
2. Place the TC Probe end into the Scorpion Heater Calibration Plate, center the probe tip TC in the opening and tighten the setscrew (see Images 50 & 51).
3. Set and lock the TC Heater Scorpion Heater Calibration Plate (with the centered Probe) in the center of the PCB Board Holder, over the Preheater Funnel with the center whole open (see image 55).
4. Move the board holder to the bottom left corner of the Preheater Bowl making sure the TC probe is over the inside edge of the large heater bowl (see image 56).
5. Insert TC probe into TC1.
6. Start the Large Preheater Calibration by left clicking the large Preheater icon (see Image 17, Row 3, C).

7. Go to the Profile Screen (see Image 13) and wait for the calibration to complete.



**Image 56. Probe at bottom left area over the Large pre heater**

### **10.36 Large Preheater Verification**

1. Place the Scorpion Thermal Cal Kit Fixture in the PCB Holder in the same position as in calibration.
2. Center the Scorpion Heater Calibration Plate probe to the center hole of the fixture and tighten the set screw. Lock the PCB Holder into the lower left corner of the PCB Board with the center window open.
3. Connect the probe thermocouple lead to TC1.
4. Navigate to the Profile screen and set the following:
  - a. Z1: 100 °C/180 seconds
  - b. Z2: 150 °C/180 seconds
  - c. Z3: 200 °C/180 seconds
  - d. Z4: 250 °C/180 seconds
5. In each zone, click approximately 2 seconds before the 180 second interval lines to create new dashed lines
6. Drag the reflow and small preheater lines (red and green) to the bottom of the graph.
7. Run the profile by left clicking the top right corner icon (see image 53).
8. Ensure that the temperature stable through the end of the zones and **±10°C** of the target temperature.

9. Save a screenshot (with markers at every zone) to the Flashdrive stick with the following naming convention:
  - a. [mmyyddSPHCalVerif]
10. Ensure that the fixture cools to less than 50°C (approx. 20 minutes) before starting another profile.
11. Remove calibration fixture and create 1 zone from 0 to 400 sec and a second zone from 400- 500 sec.
12. Create and run a Large Preheater profile with the heater set to 350°C for 400 seconds.
13. Ensure the Large Preheater reaches 350°C within 100 seconds.
14. Save a screenshot (with the marker at 100seconds) with the following naming convention:
  - a. [mmyyddSPH350CVerif]

## Functional Checks

### 9.1 Blower Operation Checks



Image 57. System Configuration Menu

**Note: "Image 57" rows, letters, names ONLY labeled here for Production Test**

# Scorpion Calibration Data Log

## BLOWER AIRFLOW READINGS

Function / Range	As Found	Result	As Left	Result	Units
REFLOW HEATER BLOWER					
3.4 ± 0.2					m/s
4.2 ± 0.2					m/s
5.0 ± 0.2					m/s
SMALL PREHEATER BLOWER					
6.0 ± 0.1					m/s
LARGE PREHEATER BLOWER					
2.0 ± 0.1					m/s

## EXTERNAL THERMOCOUPLE READINGS

Function / Range	As Found	Result	As Left	Result	Units
TC1					
250 ± 0.2					°C
TC2					
250 ± 0.2					°C
TC3					
250 ± 0.2					°C
IR					
250 ± 0.2					°C

## INTERNAL THERMOCOUPLE / HEATER READINGS

Function / Range	Offset Before Calibration	Offset After Calibration	As Left	Result	Units
REFLOW HEATER					
150 ± 5					°C
200 ± 5					°C
250 ± 5					°C
300 ± 5					°C
SMALL PREHEATER					
100 ± 10					°C
150 ± 10					°C
200 ± 10					°C
250 ± 10					°C
LARGE PREHEATER					
100 ± 10					°C
150 ± 10					°C
200 ± 10					°C
250 ± 10					°C