APR

ADVANCED PACKAGE REWORK

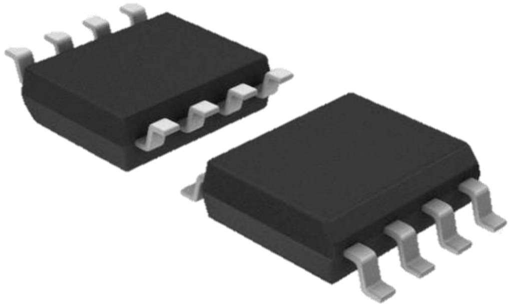
SCORPION REWORK SYSTEM – PRODUCT OVERVIEW

What Is APR?

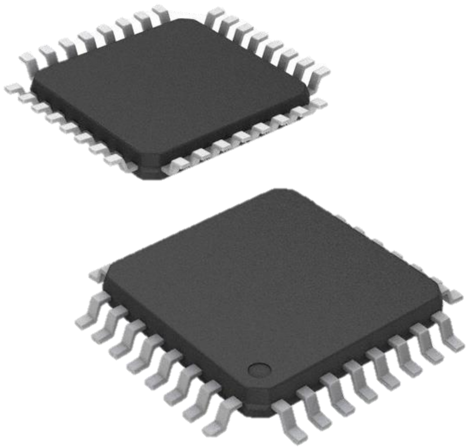
- DII brand for convection rework machines used to remove and install bottom terminated components such as BGA, QFN, and CGA

What Is It For?

- Examples of SMD packages with leads

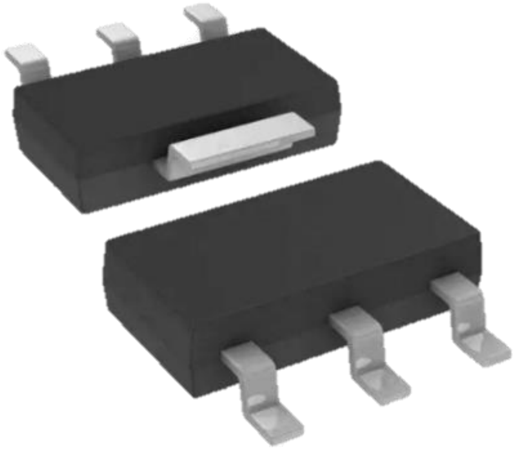


SOIC-8



TQFP

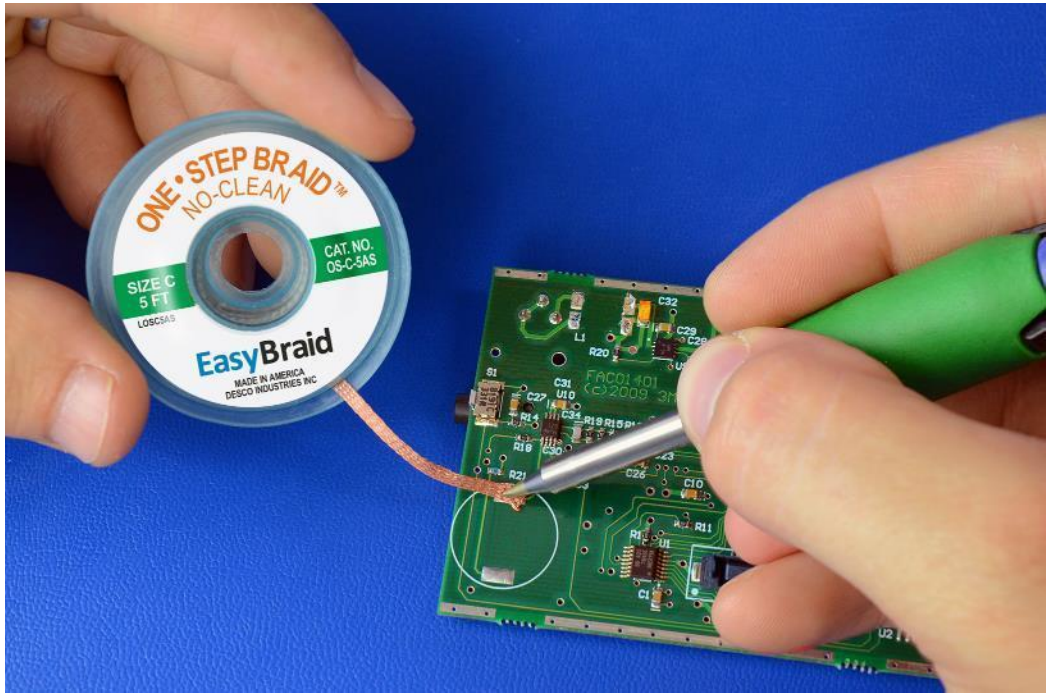
SOT-23-6

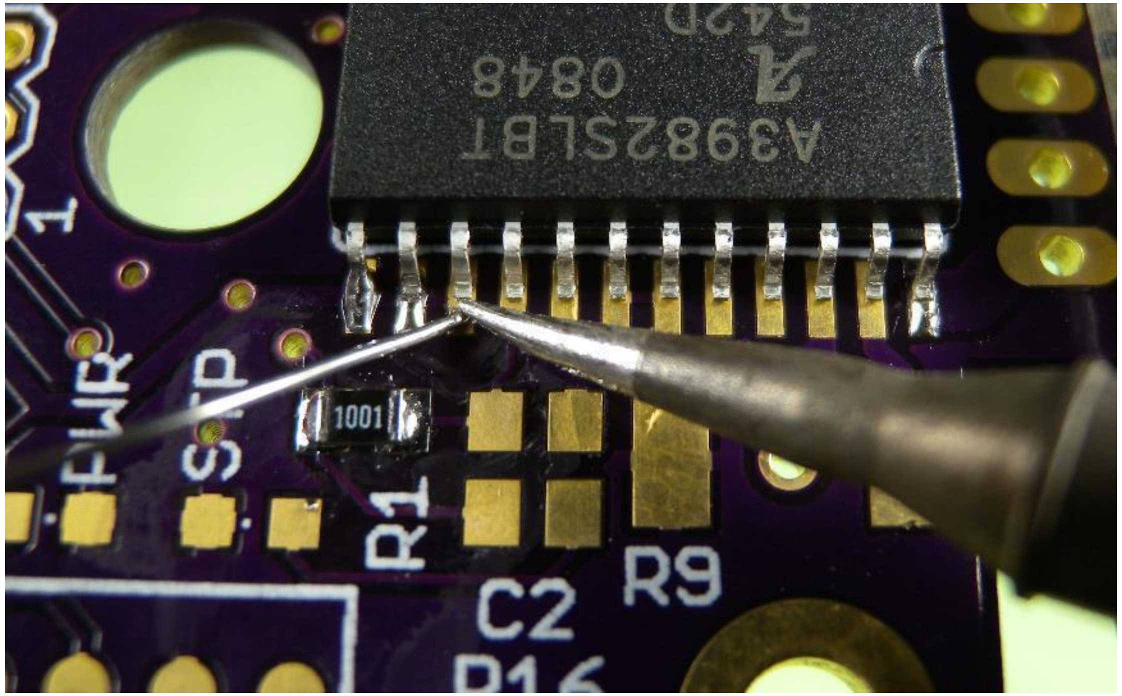


SOT-223

What Is It For?

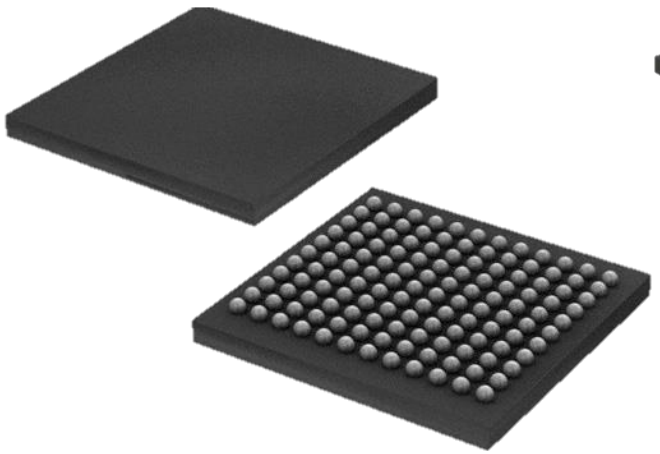
- SMD packages with leads can often be reworked by hand



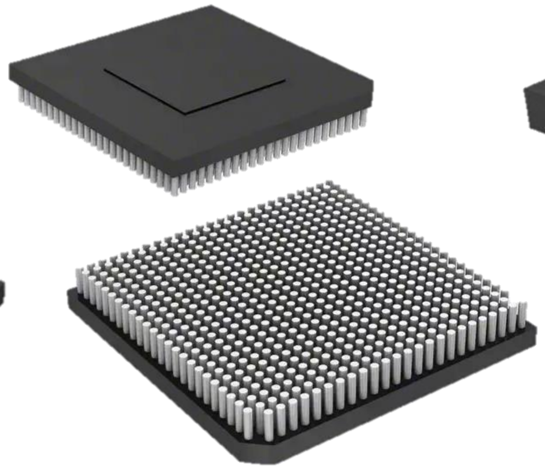


What Is It For?

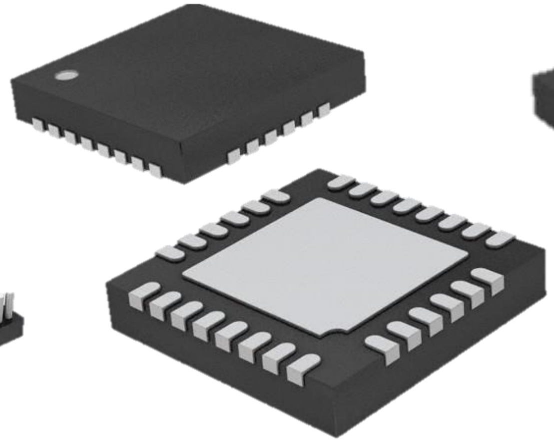
- Examples of SMD packages with bottom terminated leads



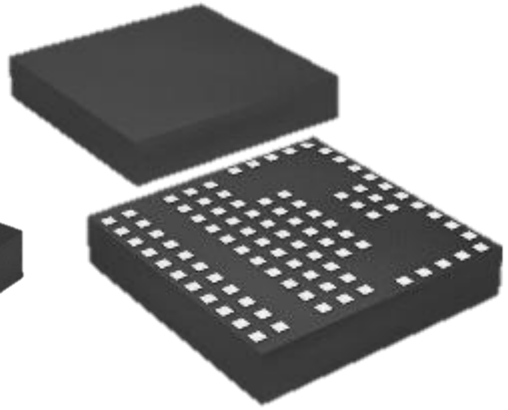
BGA



CGA



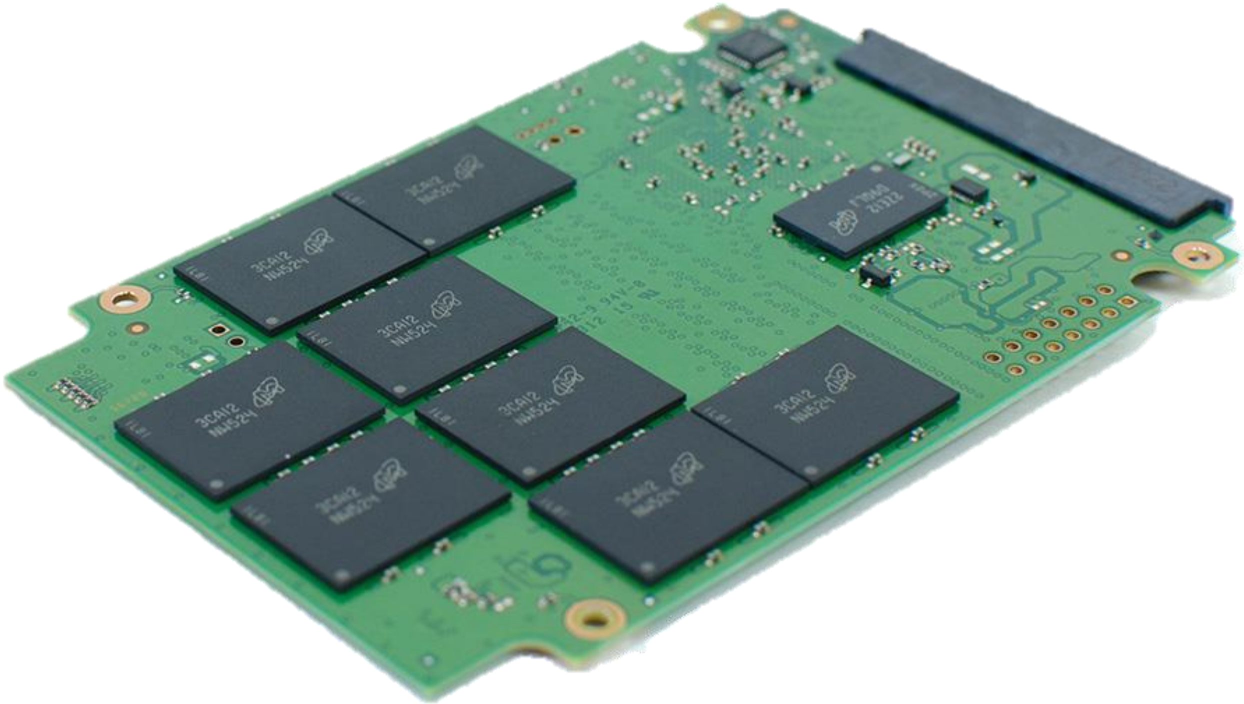
QFN



LGA

What Is It For?

- How would you rework a board that looks like this?



Scorpion Rework System

Scorpion Rework System - Features

HARDWARE

- **550W Top Reflow Heater with Variable Airflow**
  Focuses convection heat to the targeted component without reflowing other nearby parts
- **2800W Bottom Pre-Heater**
  Dual-zone convection heating simultaneously warms a wide area of the PCB and a focused region directly underneath the targeted component

Scorpion Rework System - Features

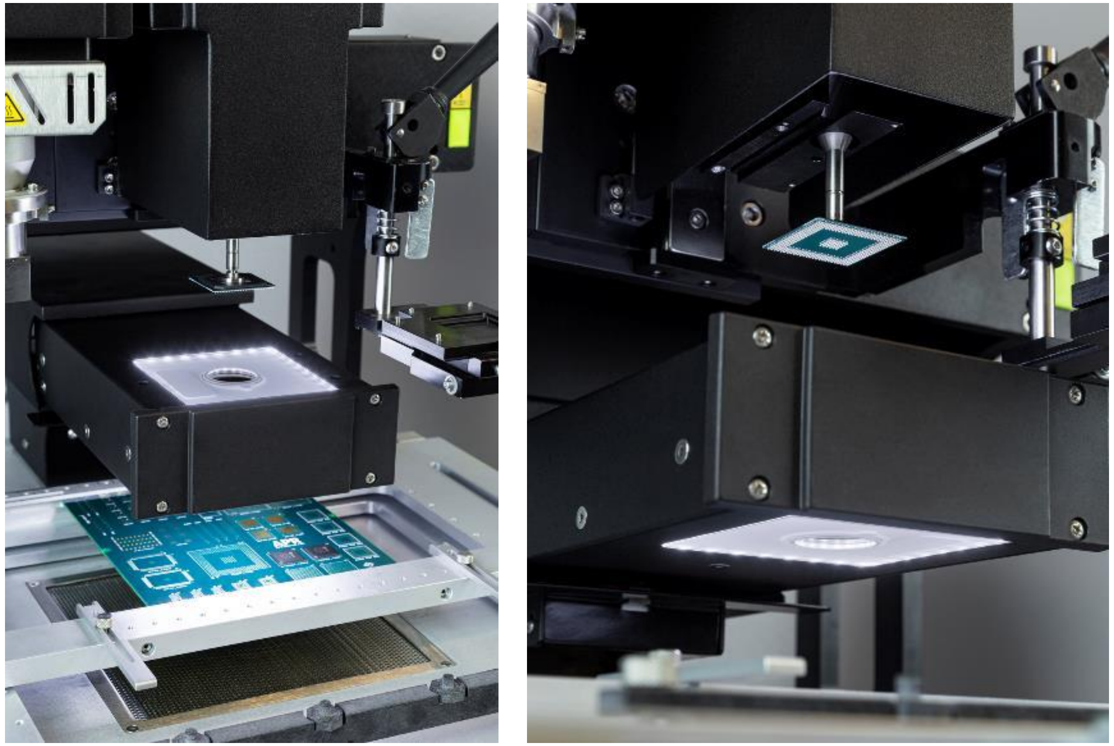
HARDWARE

- **Workbench Sized System with 200-240VAC Voltage Input**
  Encases the CPU, pumps and compressors into a single enclosure and operates with standard electrical systems
- **Embedded Linux CPU**
  Spares the system from software bugs commonly created after Windows OS updates

Scorpion Rework System - Features

CAMERA

- **Dual Camera Assembly**
  Utilizes two cameras for improved optical alignment and less maintenance
- **Selectable Views for Top and Bottom Cameras**
  Makes locating targeted components and landing pads easier



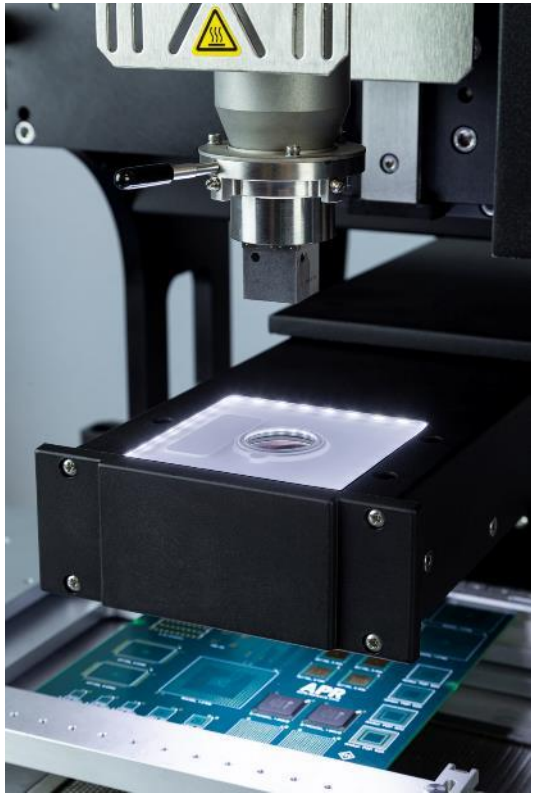
Scorpion Rework System - Features

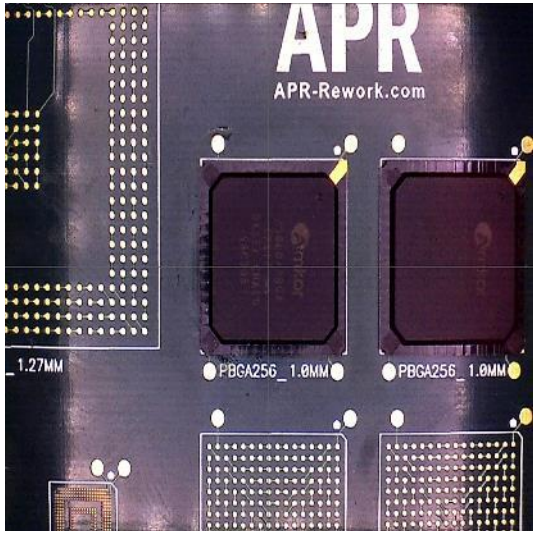
CAMERA

- **Diffused LED Lighting**
  Illuminates component terminals and landing pads without casting shadows
- **High Definition Zoom Levels**
  Aides in the alignment of components with small dimensions or fine pitches

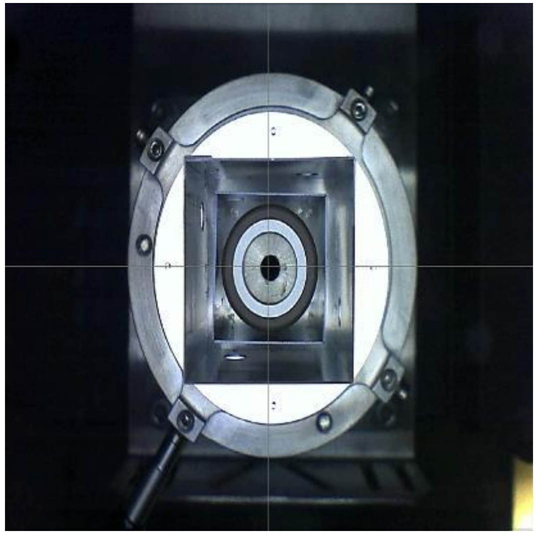
Scorpion Rework System - Features

CAMERA - REFLOW

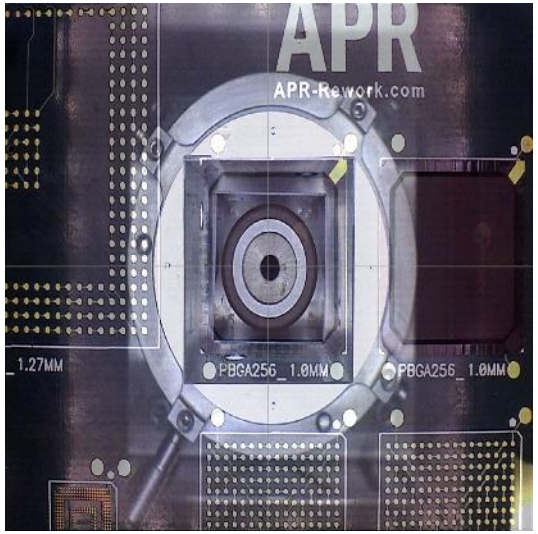




Bottom Camera



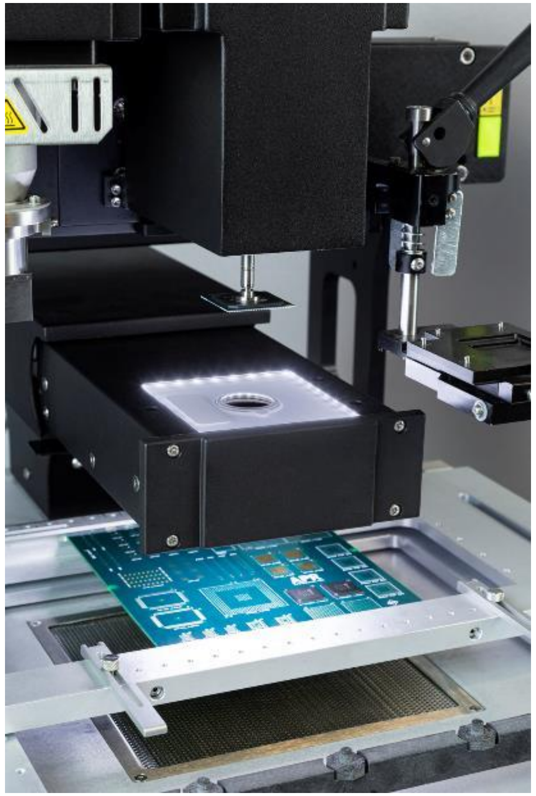
Top Camera

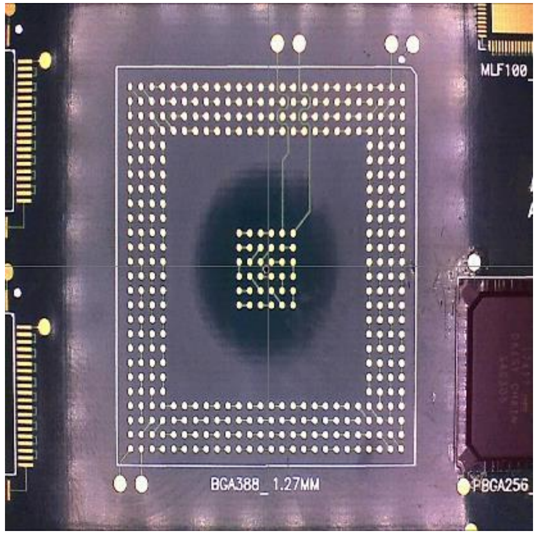


Overlapped Image

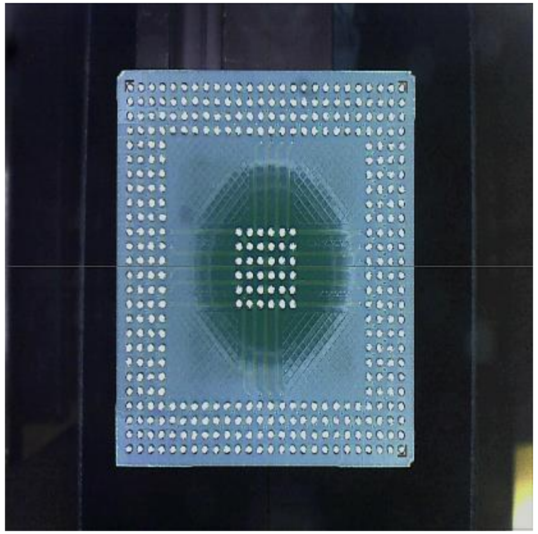
Scorpion Rework System - Features

CAMERA - PLACEMENT

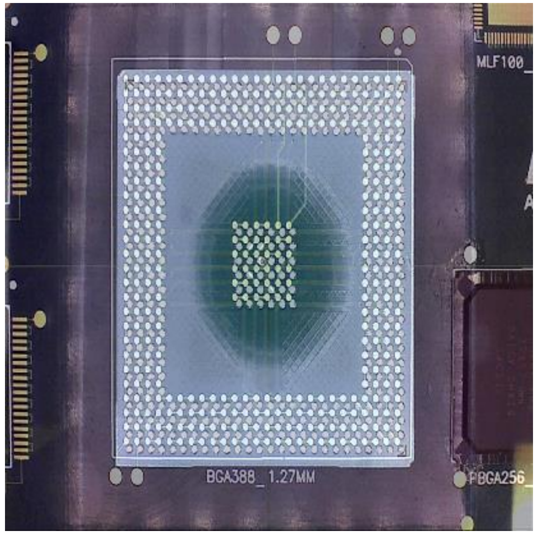




Bottom Camera



Top Camera



Overlapped Image

Scorpion Rework System - Features

SOFTWARE

- **On-the-Fly Thermal Profile Management with Live Solder Joint Temperature Display**
  Enables operators to build successful thermal profiles in minimal attempts
- **Password Protected User Levels**
  Protects saved thermal profiles from being modified by unqualified personnel
- **12 Different Language Settings**
  Provides worldwide operator flexibility

Time	0	120	120	207	207	234	234	301	301							
Reflow	66	1.2	167	0.5	209	1.8	257	-0.7	210							
Small	-	1.2	160	0.5	202	1.9	253	-0.5	220							
Large	-	2.3	302	0	300	0	299	-0.2	284							
R	-	-	-	-	-	-	-	-	-							
TC1	-	1.1	150	0.5	190	1	217	0	220							
TC2	-	-	-	-	-	-	-	-	-							
TC3	-		-		-		-		-							

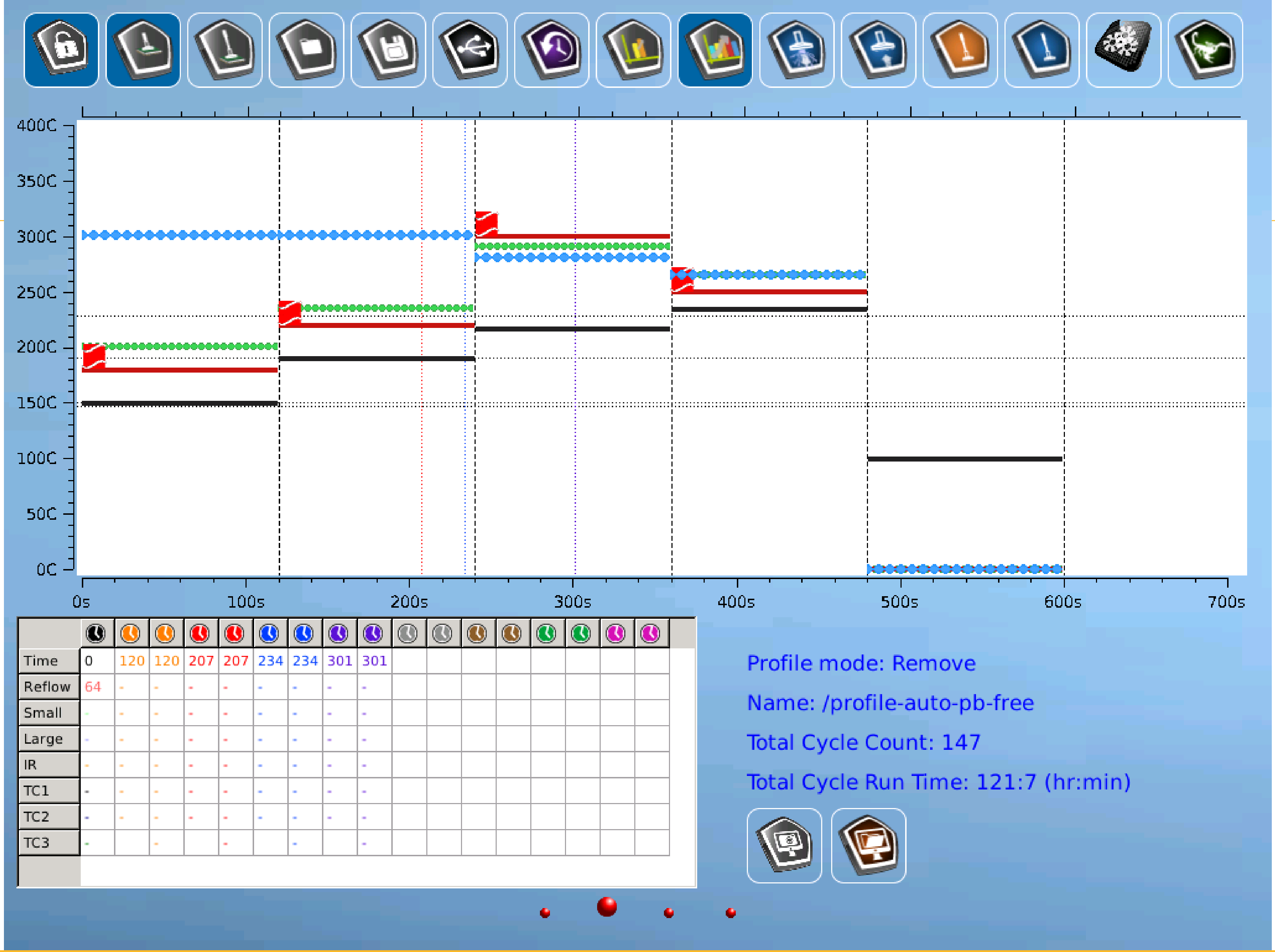
Profile mode: Remove

Name: /profile-auto-pb-free

Total Cycle Count: 147

Total Cycle Run Time: 121:7 (hr:min)

APR



Time	0	120	120	207	207	234	234	301	301								
Reflow	64	-	-	-	-	-	-	-	-								
Small	-	-	-	-	-	-	-	-	-								
Large	-	-	-	-	-	-	-	-	-								
IR	-	-	-	-	-	-	-	-	-								
TC1	-	-	-	-	-	-	-	-	-								
TC2	-	-	-	-	-	-	-	-	-								
TC3	-		-		-		-		-								

Profile mode: Remove

Name: /profile-auto-pb-free

Total Cycle Count: 147

Total Cycle Run Time: 121:7 (hr:min)

APR

APR-Rework.com

Time	0	120	120	207	207	234	234	301	301							
Reflow	66	1.2	167	0.5	209	1.8	257	-0.7	210							
Small	-	1.2	160	0.5	202	1.9	253	-0.5	220							
Large	-	2.3	302	0	300	0	299	-0.2	284							
IR	-	-	-	-	-	-	-	-	-							
TC1	-	1.1	150	0.5	190	1	217	0	220							
TC2	-	-	-	-	-	-	-	-	-							
TC3	-		-		-		-		-							

Profile mode: Remove

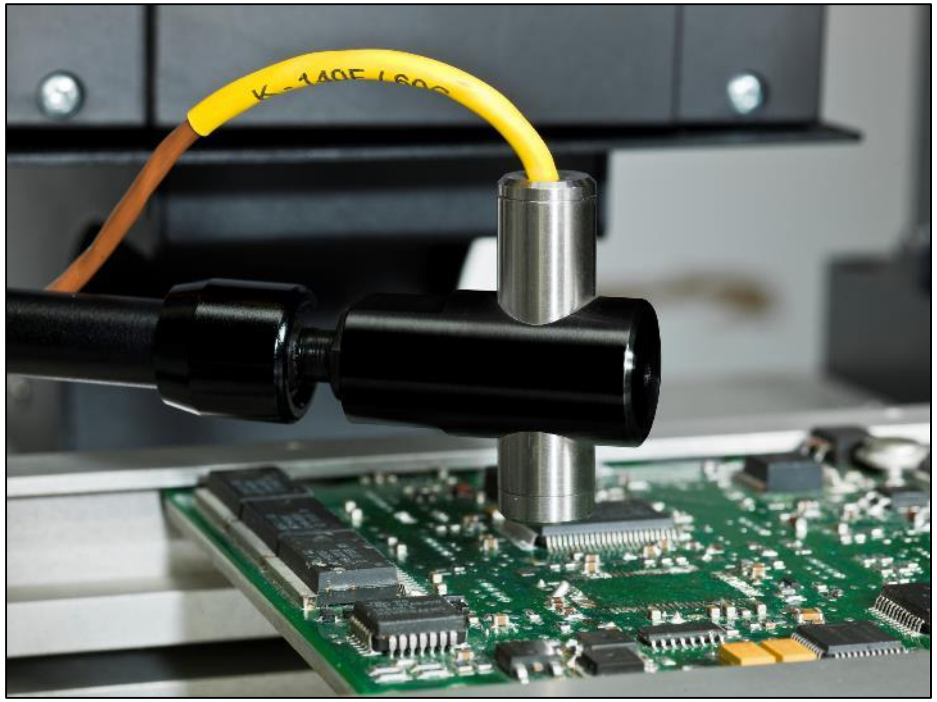
Name: /profile-auto-pb-free

Total Cycle Count: 147

Total Cycle Run Time: 121:7 (hr:min)

IR Pre-Heat Sensor Accessory

Item # APR-SRS-UK2

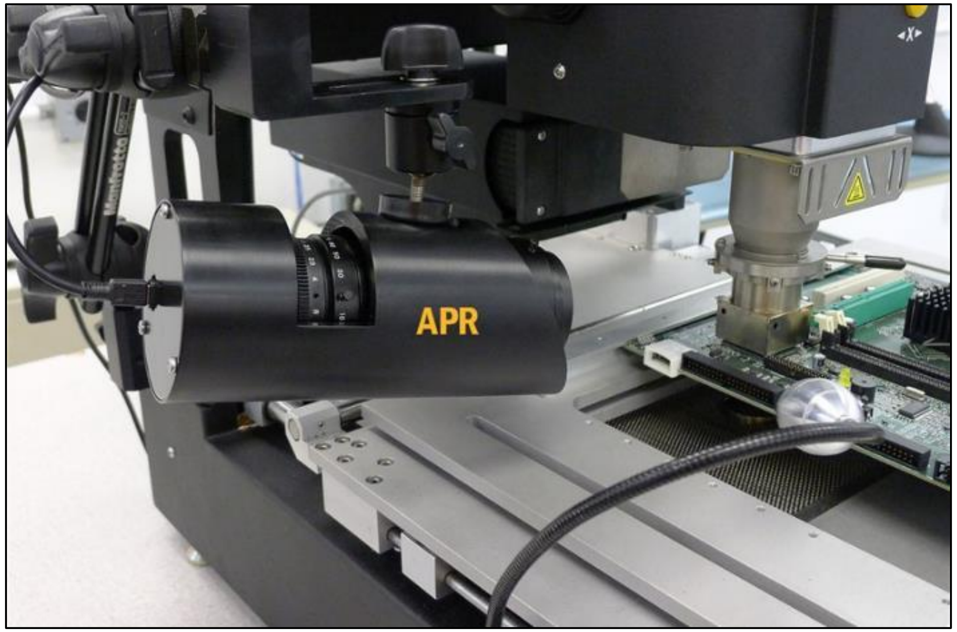


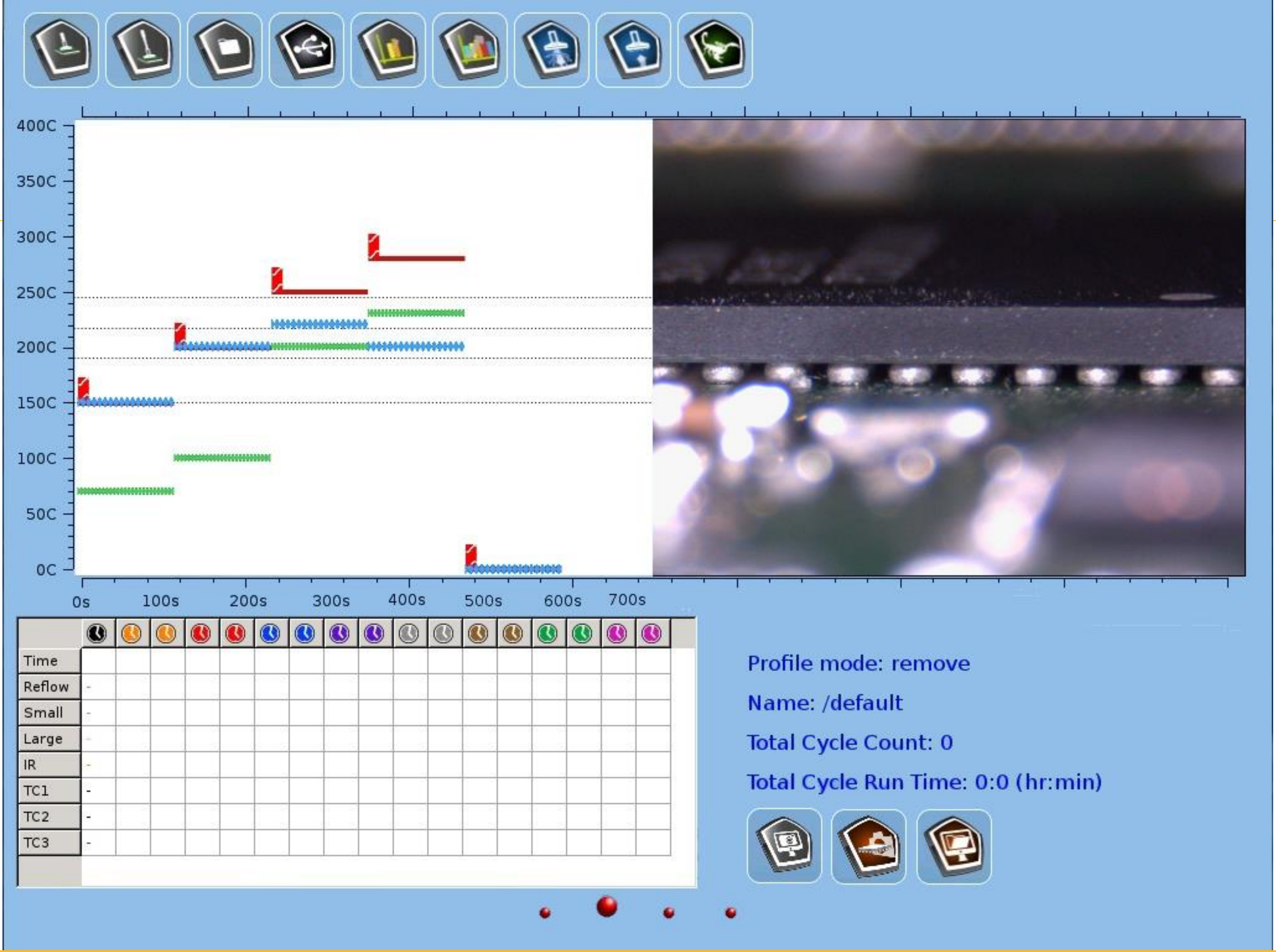
- Sets a targeted pre-heat temperature for the PCB to reach prior to starting the thermal profile for consistent start temperatures no matter the environment

Side-View Camera Accessory

Item # APR-SRS-UK3

- Aides the operator in building a successful thermal profile by providing a visual of the solder's reflow
- Outputs picture-in-picture display onto the Scorpion software – no need for a second monitor
- Mounts to the Scorpion using a double articulated arm





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

Profile mode: remove

Name: /default

Total Cycle Count: 0

Total Cycle Run Time: 0:0 (hr:min)

APR

APR-Rework.com

Scorpion Rework System – Models

APR-1200-SRS
Manual Placement Head

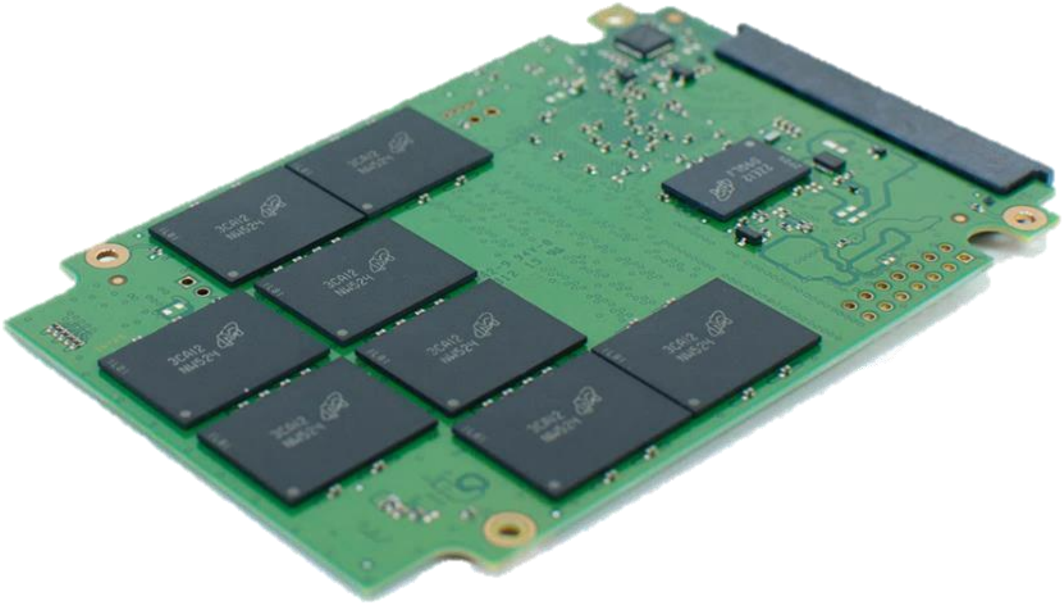
Controller

APR-1200A-SRS
Motorized Placement Head

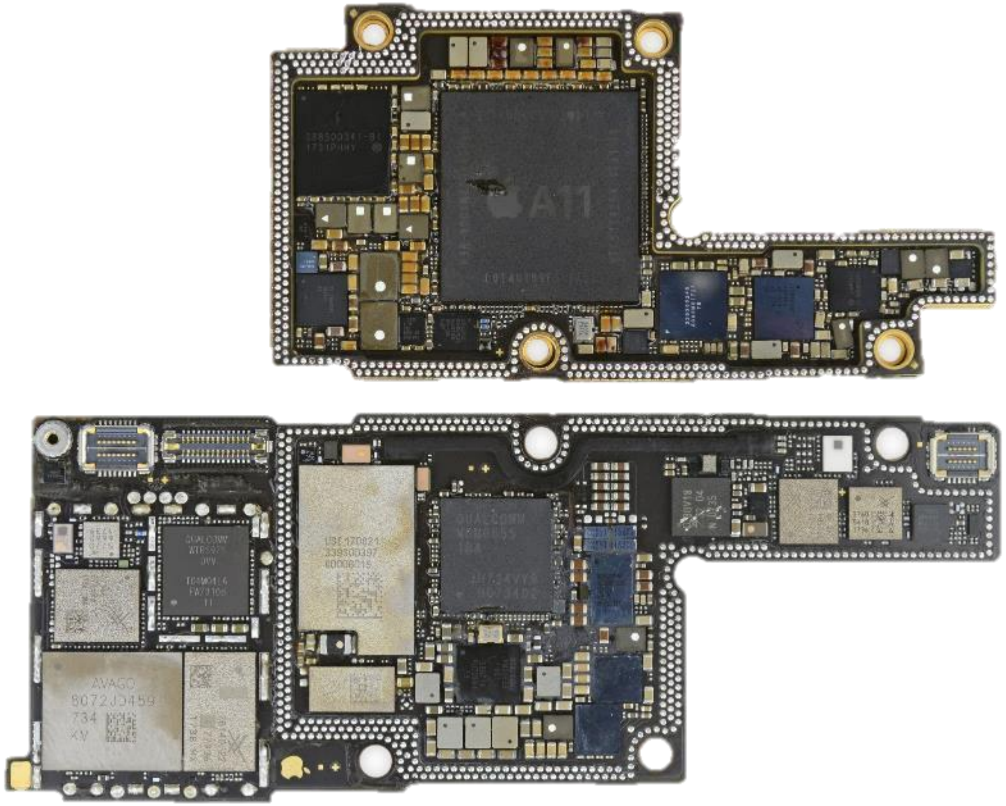
Controller

Scorpion Rework System – MOB Models

Common PCB



High Density PCB



Scorpion Rework System – MOB Models

	Standard Models	MOB Models
Camera Field-of-View	45 mm x 57 mm	25 mm x 25 mm
Camera Resolution	720p + 1080p	1080p
Max PCB Size	343 mm x Open	305 mm x Open
Monitor Size	19 in.	22 in.

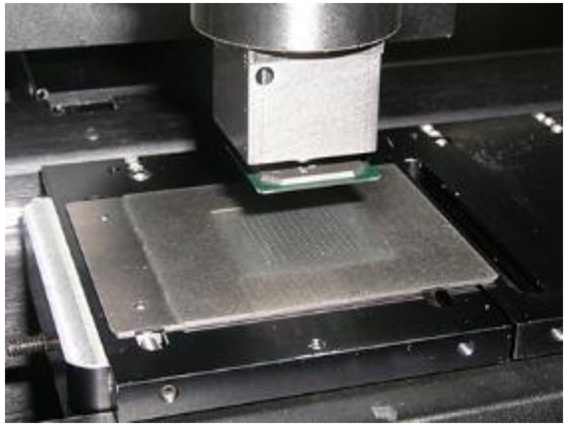
- APR-1200-SRS-MOB
  Manual Placement Head, for High Density PCBs
- APR-1200A-SRS-MOB
  Motorized Placement Head, for High Density PCBs

Scorpion Selection Guide

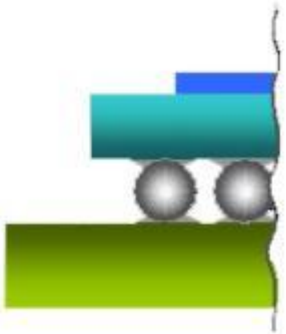
	APR-1200-SRS	APR-1200-SRS-MOB	APR-1200A-SRS	APR-1200A-SRS-MOB
Rework Application	Standard	High Density	Standard	High Density
Placement Head	Manual	Manual	Motorized	Motorized
Placement Force Sensor	No	No	Yes	Yes
Placement Accuracy	0.0254 mm	0.0254 mm	0.0254 mm	0.0254 mm
Minimum Component Size	0.51 mm x 0.25 mm	0.51 mm x 0.25 mm	0.51 mm x 0.25 mm	0.51 mm x 0.25 mm
Minimum Component Pitch	0.3 mm	0.3 mm	0.3 mm	0.3 mm
Max PCB Size	343 mm x Open	305 mm x Open	343 mm x Open	305 mm x Open
Max PCB Thickness	6 mm	6 mm	6 mm	6 mm
Camera Field-of-View	45 mm x 57 mm	25 mm x 25 mm	45 mm x 57 mm	25 mm x 25 mm
Camera Resolution	720p + 1080p	1080p	720p + 1080p	1080p
Monitor Size	19 in.	22 in.	19 in.	22 in.
Remote Control	Analog	Analog	Digital	Digital

Tooling – Reflow Nozzles

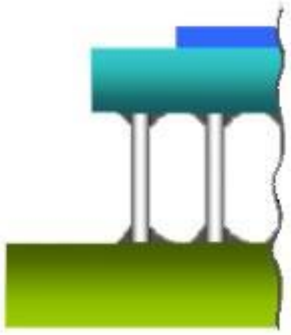
Standard



for CGA

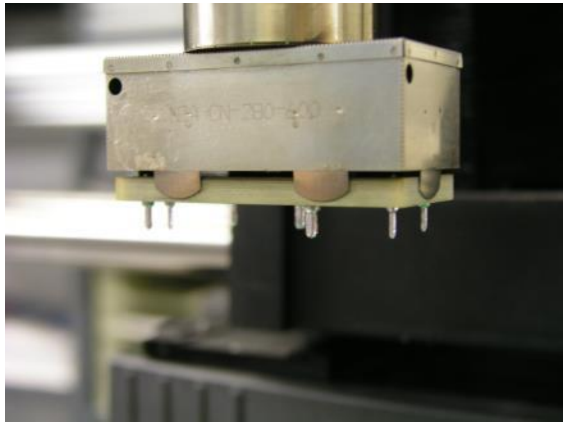


BGA side-view

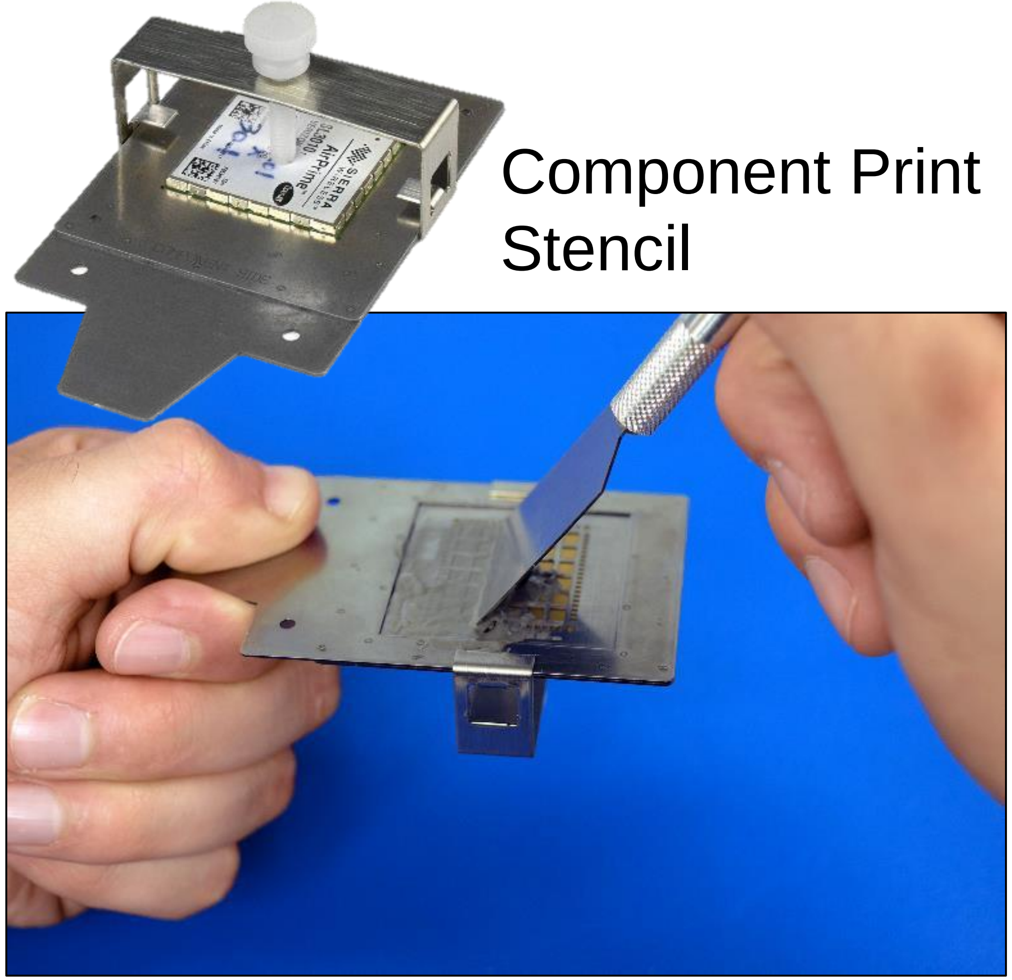


CGA side-view

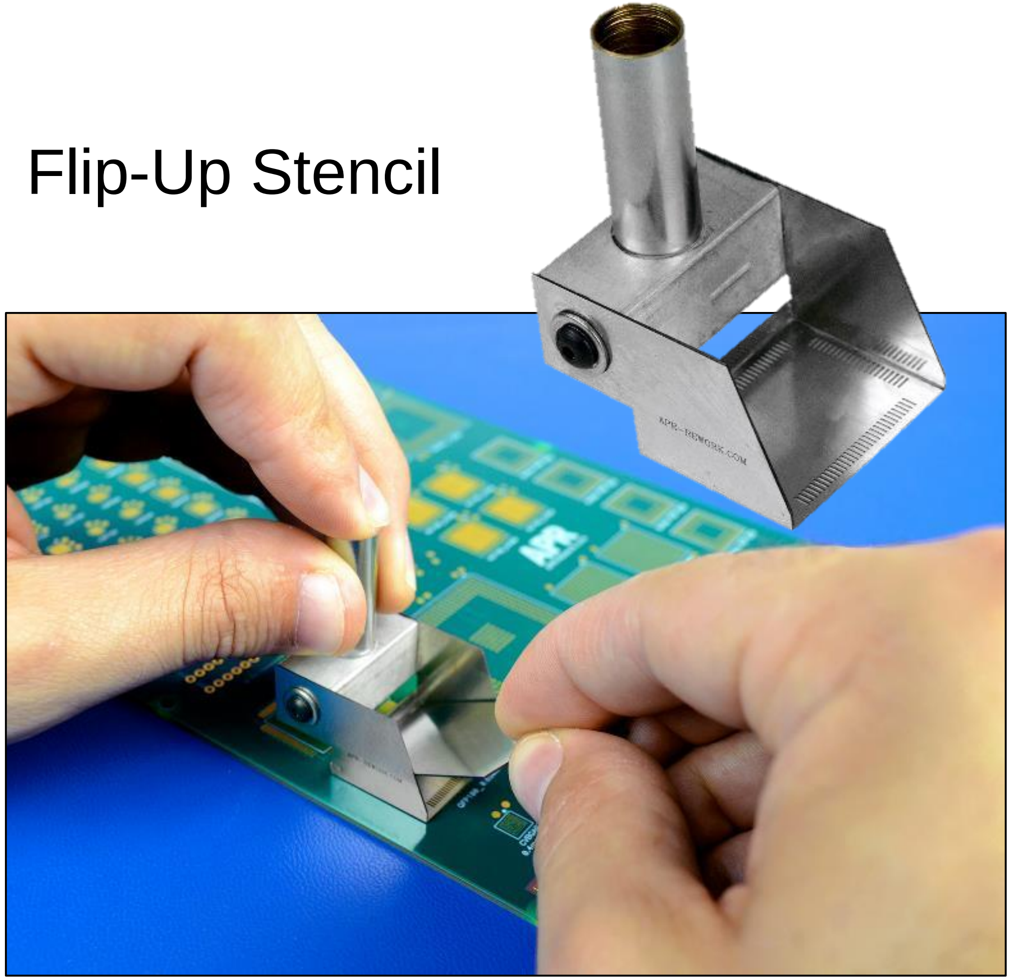
with Tweezers



Tooling – Stencils



Component Print Stencil



Flip-Up Stencil

Tooling – What Info Do We Need?

Data sheet

BMI160

Small, low power inertial measurement unit

Bosch Sensortec

BOSCH
Invented for life

BMI160 – Data sheet

Document revision	0.8
Document release date	February 10th, 2015
Document number	BST-BMI160-DS000-07
Technical reference code(s)	0 273 141 187
Notes	Data and descriptions in this document are subject to change without notice. Product photos and pictures are for illustration purposes only and may differ from the real product appearance.

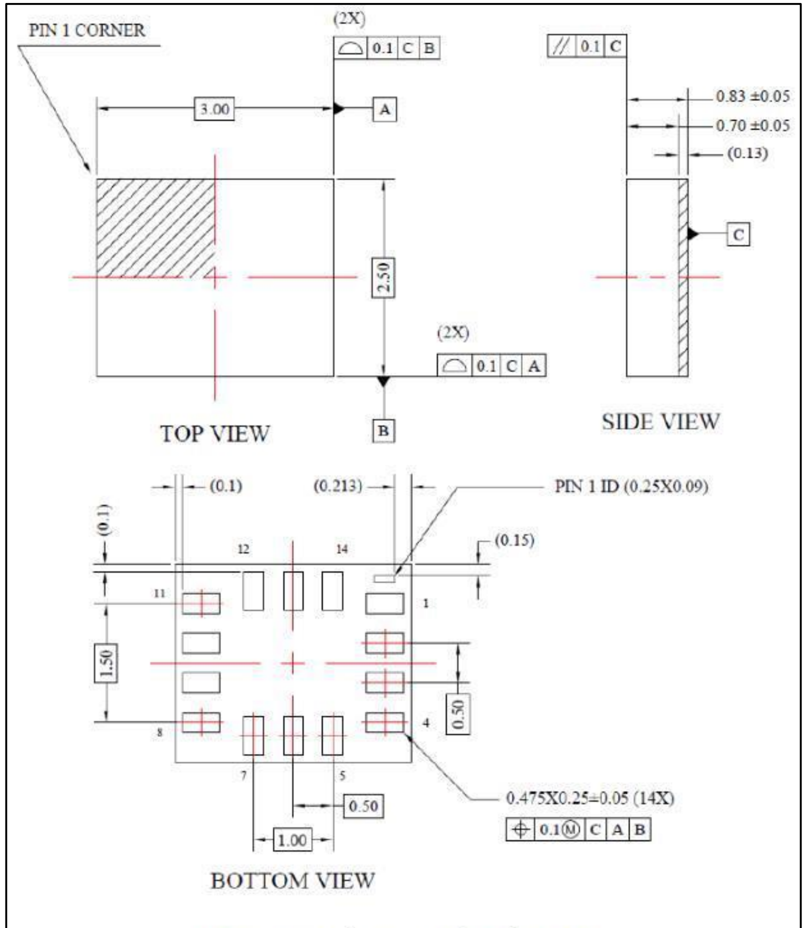
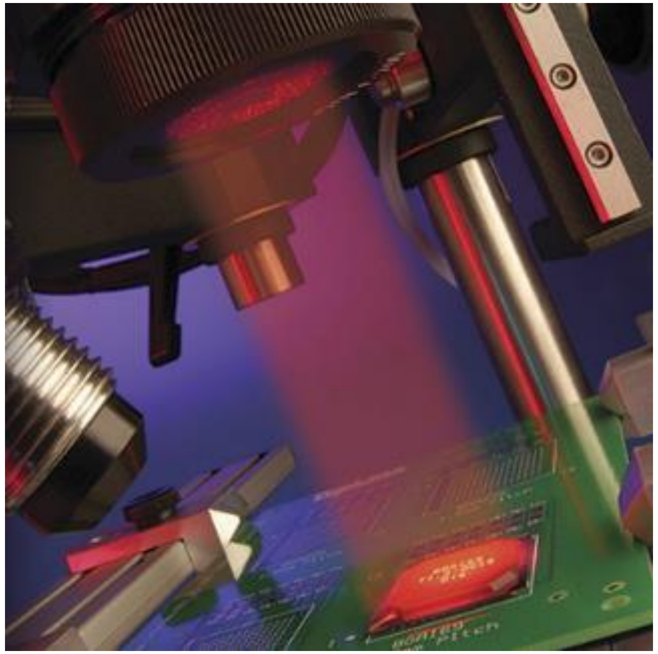


Figure 41: Packaging outline dimensions

Rework Machine Technologies

- **Infrared Radiation (IR)**
  Emits electromagnetic waves to heat the targeted object

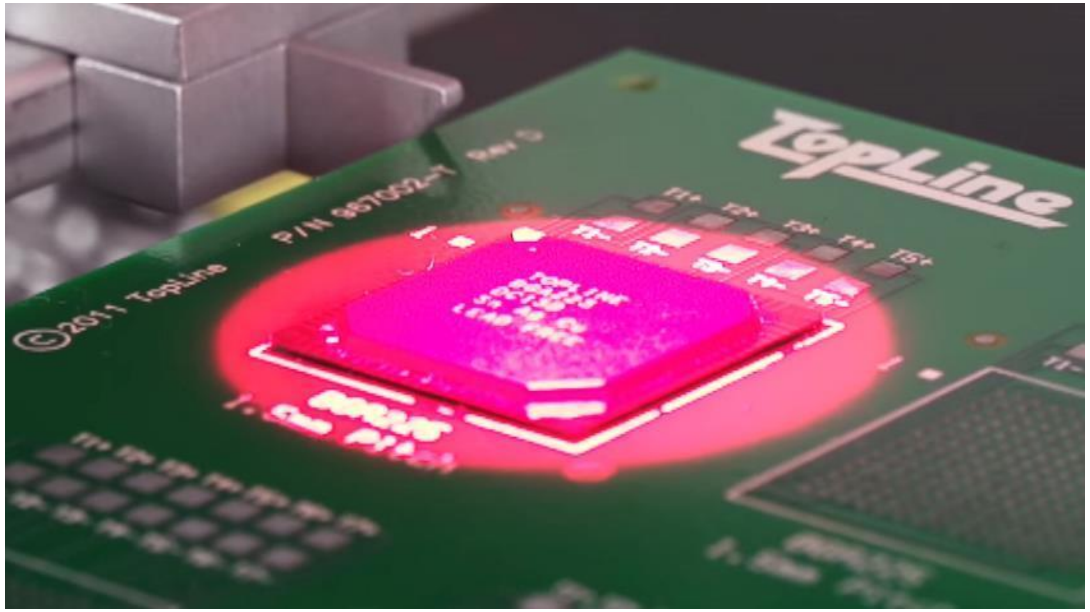


- **Convection**
  Emits hot air to heat the targeted object

IR Disadvantages

- Red light is generated through a lens and focused into a red dot that covers the targeted component

- The red dot often heats adjacent components since its shape does not match the component

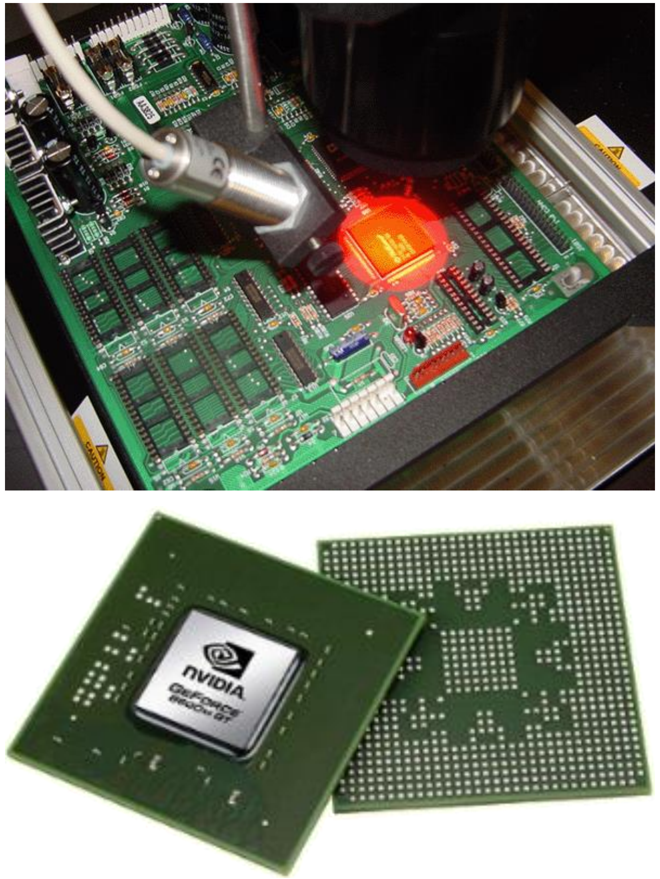


IR Disadvantages

- Profiles have to be re-adjusted as the lamp deteriorates
- The lamp and lens assembly can have short lifespans

IR Disadvantages

- Emissivity – rate at which heat is absorbed into a material from an IR emitter
- Black components have the highest emissivity
- BGA with reflective dyes reflect IR heating differently than convection heating
- IR heaters would not uniformly heat BGA chips like the one shown to the right



Convection Advantages

- The same thermal profile will work no matter the component's color; emissivity is not a factor
- The preferred technology for reflow ovens in assembly lines
- Convection heating is a more uniform heating method
- Temperature across the complete PCB is more accurate and responsive

Technical Support

SERVICES OFFERED

- Troubleshooting via e-mail and phone
- On-site maintenance

CALIBRATION

- Calibration is recommended annually
- Calibration kits may be purchased or rented
- On-site calibration service also available

Questions?

APR

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