CHAPTER II

HGA MANUFACTURING PROCESS

2.1 What is HGA?

Head Gimbal Assembly (HGA) is a Disc drive components which its function is to read and write data from the storage device. An HGA is composed of three main components which are Slider, Flexure and Flex on suspension (FOS), Figure 2.1. Cheetah 18 is one kind of HGAs product that was developed for the High-end product.

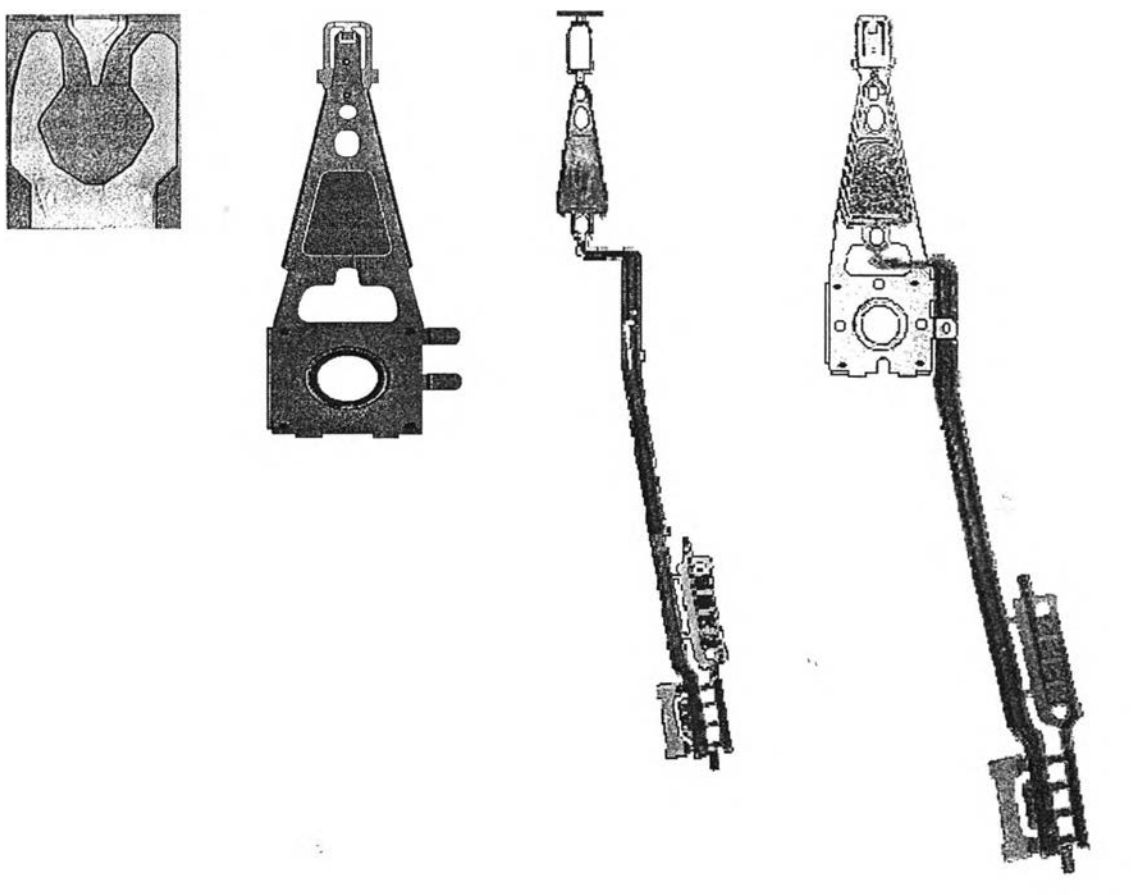

Figure 2.1 HGA Components

2.2 HGA Manufacturing Process Flow[1]

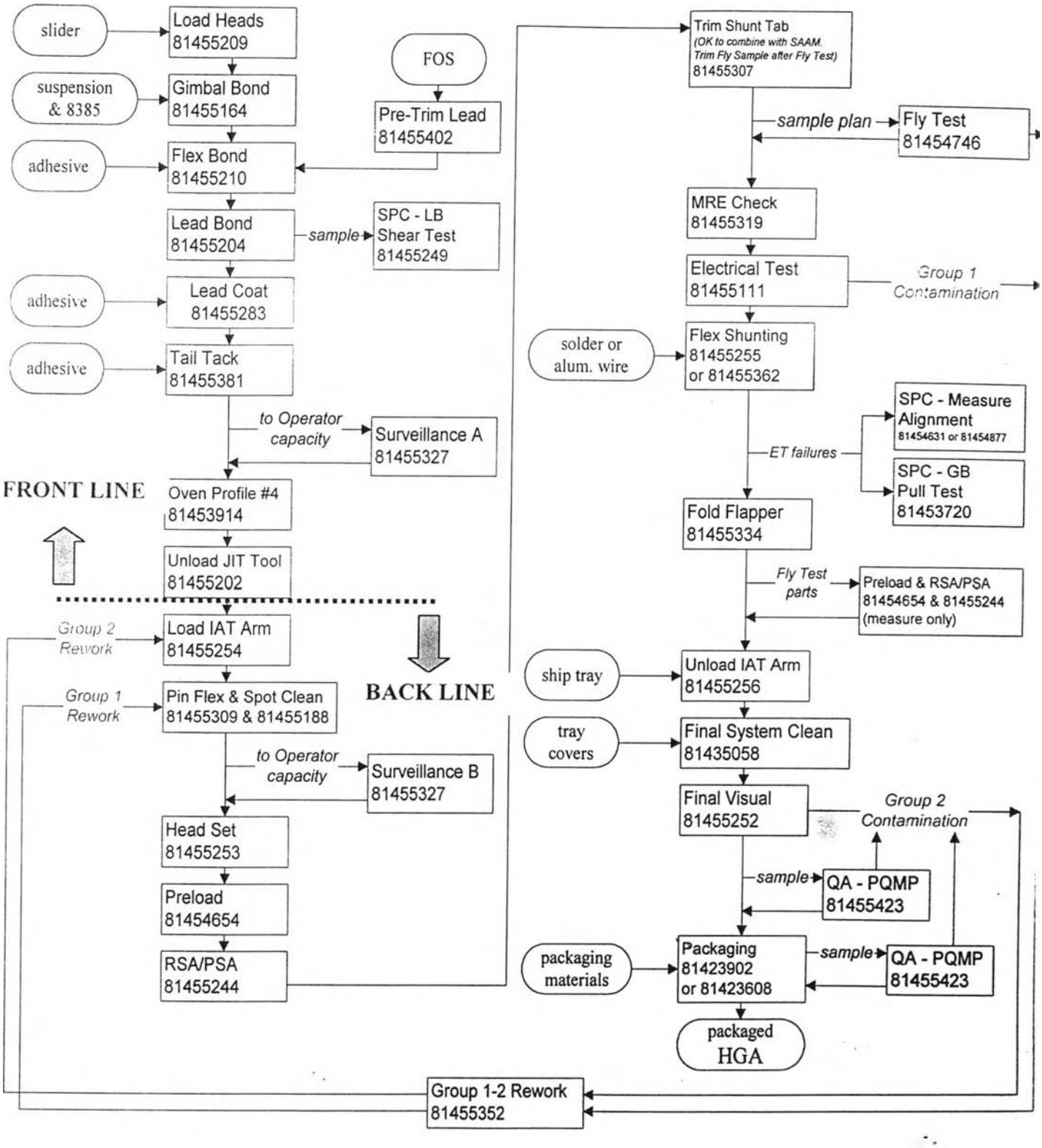

Figure 2.2 HGA Manufacturing Process Flow

[1] Process flow references from Cheetah18 HGA Manufacturing Process, (MP#81455211).

2.3 HGA Manufacturing Process[2]

HGA Manufacturing Process is the process which assemble parts, composing of Slider, FOS and Flexure, to be a HGA or Recording head. The process is operated manually which uses an adhesive to adhere the components. The description of each operation of this process is provided as below.

- *Pretrim Operation*

Pretrim Operation is the operation that is to cut the lead capture of an incoming FOS before an assembly process. Its procedure is provided as below.

1. Position the flex on the fixture insert by placing the front tooling hole and the back slot of the flex on the guiding pins
2. Cut the lead capture by pressing the blade handle
3. Remove the flex from the fixture
4. Place the flex back into the tray and stage for next operation.

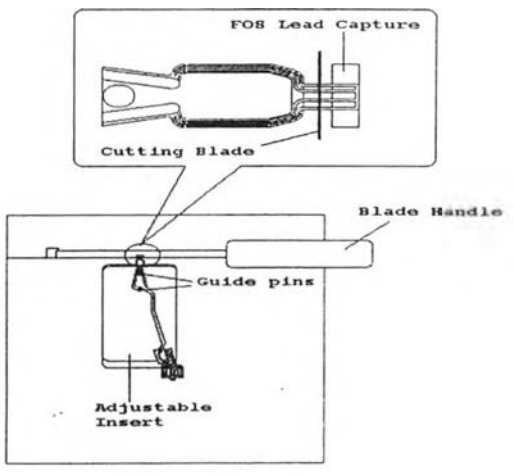

Figure 2.3 Pretrim Fixture

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[2]HGA Manufacturing process references from Cheetah18 HGA Manufacturing Process, (MP#81455211)

- *Head Load Operation*

Head load operation is the first operation of HGA assembly process that is to load slider into the jit tool which its processes is as below.

1. Turn the JIT tool upside down (suspension Clamp/Flex clamp down) and place the JIT tool in between the JIT clamp and the alignment pins. The slider pocket of the JIT tool should be on the table of the inverted head loader.
2. Actuate the toggle switch. This will close the JIT clamp and then open the template.
3. Using an ESD safe plastic tweezers, pick up a slider - ABS up- and place it into the pocket of the JIT tool
4. With the end of the tweezers apply a light pressure on the trailing end of the slider. While holding the slider in place actuate the toggle switch to clamp the slider and release the JIT clamp. This will ensure the slider is seated in the X-direction.
5. Remove the JIT tool from the inverted loader. Turn it right side up (suspension clamp/Flex clamp up) and place it in the oven tray.

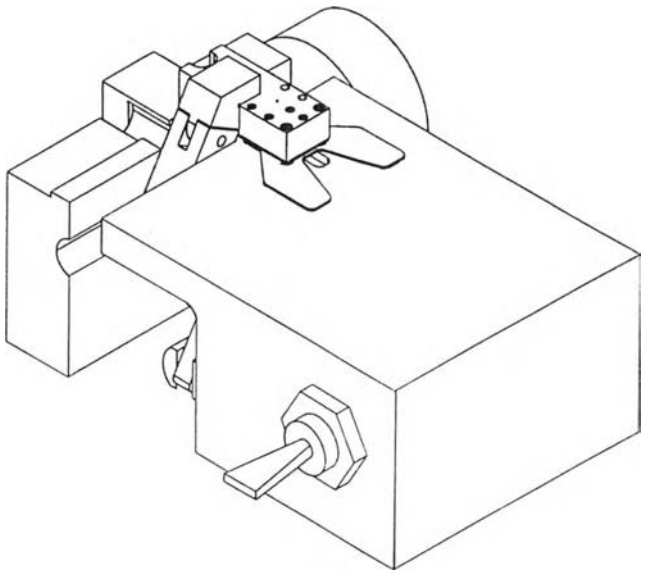

Figure 2.4 Head load components

- *Gimbal Bond Operation*

Gimbal Bond Operation is to attach slider to Flexure by using an adhesive, Ablebond 8385, as a bonder. The processes of this operation are provided as below.

1. Obtain Flexure for bonding.
2. Load JIT tool into flipper. Lock the JIT tool with the locking cam.
3. Using the vacuum tweezers only, pickup a spring and place it onto the flipper. No fingers should be used to manipulate the spring into position on the flipper.
4. Apply exactly one dot of adhesive to the center area of the bond tab, biased away from the horizontal strut. Do not spread or smear the adhesive dot.

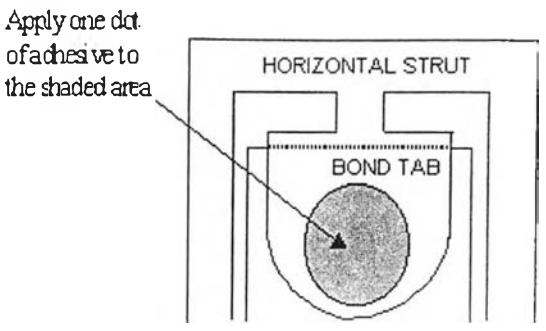

Figure 2.5 Adhesive application procedure.

- *FOS Bond Operation*

FOS Bond Operation is to adhere FOS to Flexure by using an adhesive, LD227. The procedures of this operation are as following.

1. Obtain the FOS for bonding.

2. Load JIT tool into flipper. Lock the JIT tool with the locking cam.

3. Using the vacuum tweezers only, pick up a FOS and place it onto the flipper. Do not use fingers to manipulate the FOS into position on the flipper.

4. Apply the adhesive to the correct flex locations.

- Dot 1 should be located between the tooling hole and the gimbal widow. Apply a dot of adhesive approximately 10 mils in diameter.

- Dot 2 should be located on the FOS over the vacuum hole in the FOS flipper fixture. Apply a dot of adhesive approximately 75% the diameter of the vacuum hole.

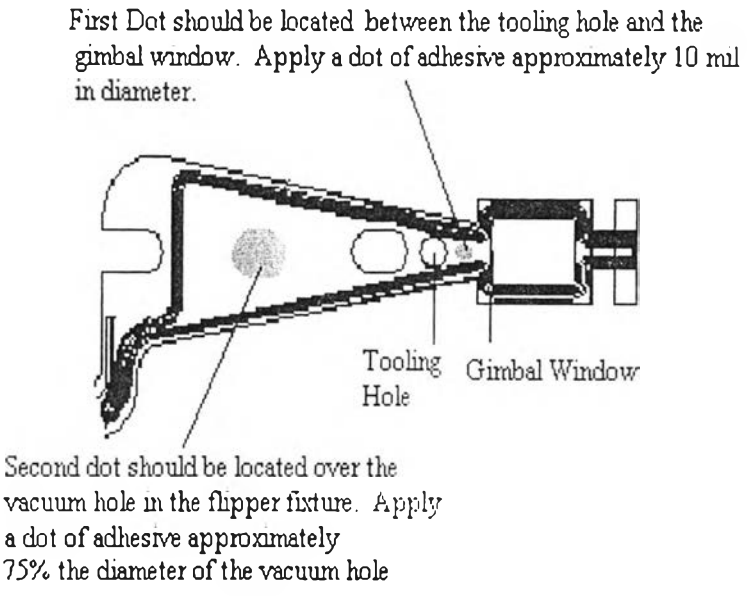

Figure 2.6 FOS Bond Procedure

5. Rotate the flipper counter-clockwise and release vacuum on the part, allowing the FOS to fall onto the alignment pins of the tool. Then rotate flipper clockwise to start position.

6. Using a pin vise place the Flex Clamp onto the spring. The correct placement of the Flex Clamp is aligned over the alignment pins on the JIT tool

7. Release the cam, remove the JIT tool and place the tool into the carrier tray.

- *Lead Bond Operation*

Lead Bond Operation is to bond lead to the slider pad by using an ultrasonic. The procedures of this operation are provided as below.

1. Install loaded JIT tool on lead bond holding fixture. Secure in place with fixture toggle switch.
2. Locate the lead form roller on top of the left holding fixture arm. Form leads by pushing it to the right.
3. With the manipulator handle, position the bonding tip completely over the lead. Locate the bond tip relative to the end of slider pad
4. Visually inspect if any leads have lifted. If none of the leads have lifted, the HGA may be sent to the next operation.
5. Release the JIT tool from the holding fixture.

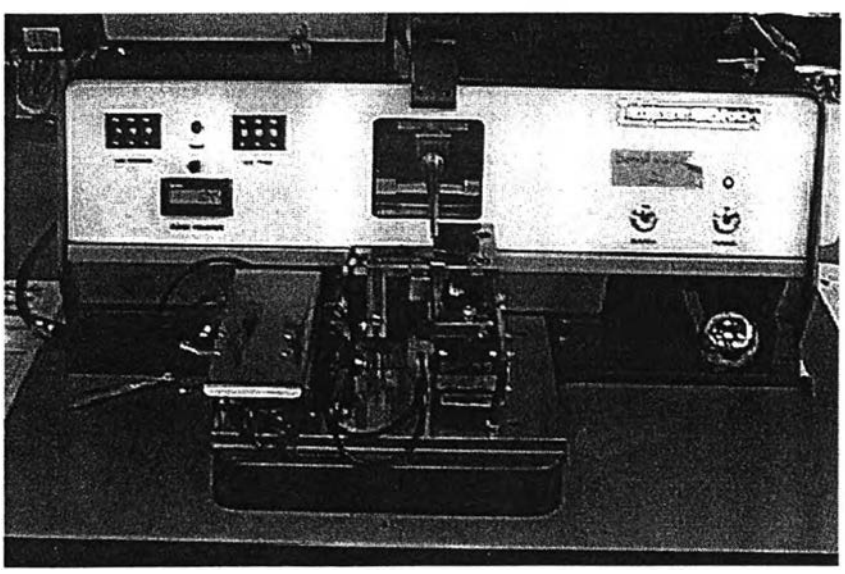

Figure 2.7 Lead Bonder

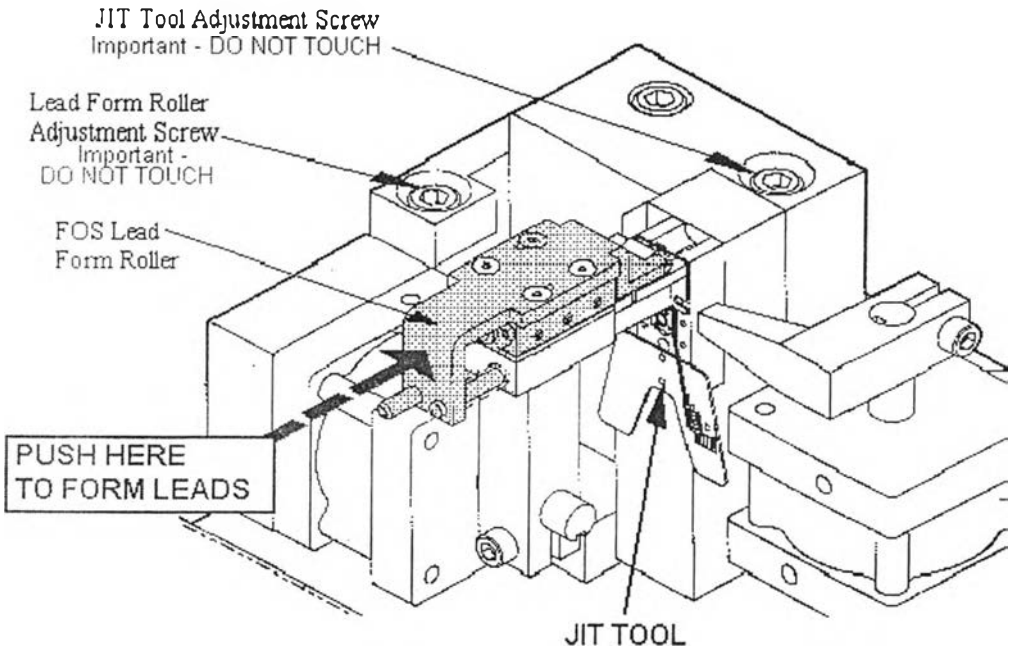

Figure 2.8 Lead Bonder components

- *Coating Operation*

Coating Operation is to coat lead after bond by using an adhesive, LD227. The coating will ensure that the lead will not lift when ships or uses by customer. The procedures of this process are described as follow.

1. Position loaded JIT tool in wire coat nest under microscope. Focus on trailing end of head.
2. Check lead bonds & gimbal bond under microscope (10X-40X). Inspect for Lifted Leads, damaged leads, bridged leads and gimbal bond adhesive on the TE.
3. Dispense and spread a thin layer of adhesive over all lead bonds (from the cross in the X to the bond heel). The adhesive must flow to the slider on both sides of the lead. The adhesive does not need to coat the end of the lead or lead tail.

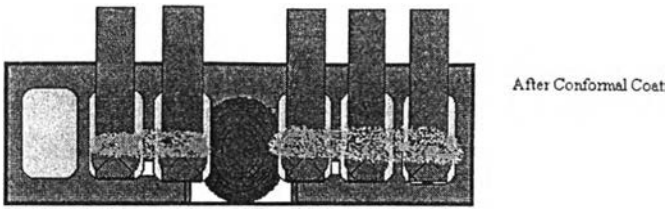

Figure 2.9 Conformal Coating

- *Tail Tacking Operation*

Tail Tacking operation is to attach FOS tail to Flexure tab by using an adhesive. LD227, as a bonder. The propose of this operation is to increase the reliability of the product when it is working at Drive or Customer level. The procedures of this process are provided as below.

1. Apply adhesive to the FOS in the area which covers the formed tab.
2. Weave the FOS with a rubber tip pin vise and a round tip tweezer under the formed tab.
3. After tail is weaved, align the FOS tail with the edge of the tab by pushing gently on the corner of the FOS.

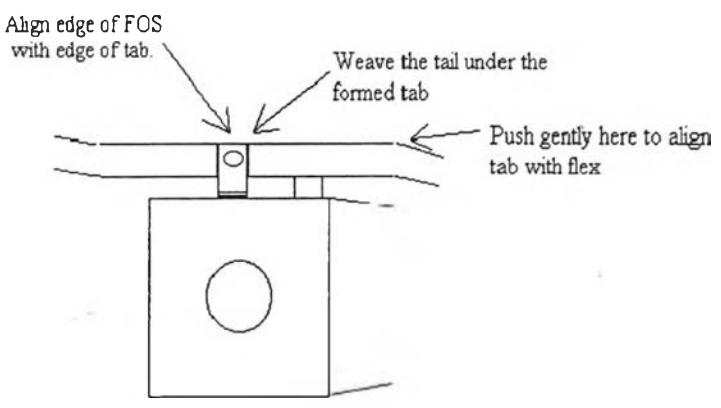

Figure 2.10 Tail tacking

- *Unload HGA operation*

Unload HGA Operation is to unload HGA from the jit tool by using a vacuum tweezer. The processes of this operation are provided as below.

1. Clamp the JIT tool using the cam-lock.
2. Actuate the toggle switch to release the slider.
3. Using a J-hook, lift up the U-Clamp/Flex Clamp, turn the U-Clamp Flex Clamp counter-clockwise until the Flex Clamp is completely off the JIT tool.
4. Raise the load beam assist.
5. Using a vacuum tweezer only, remove the HGA from the JIT tool and place in the in-process tray.

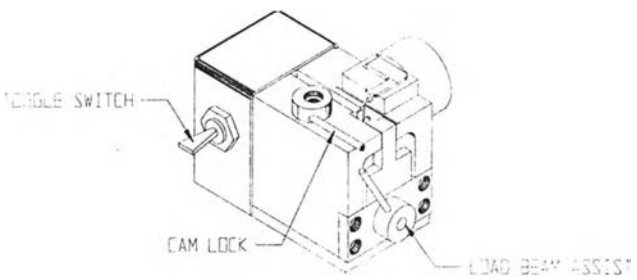

Figure 2.11 Unloading Fixture

- *Load IAT Operation*

Load IAT Operation is to prepare HGA for testing by loading HGA to the IAT arm. The procedures of this process are described as below.

1. Place the test arm on the Suspension Load Fixture with the serial number face down. Mount the suspension to the front actuated hole.
2. Open the test arm boss clamp by actuating the toggle switch to the up position.
3. Pick up the HGA from the in process tray with a duck bill tweezers. Grasp the suspension by the load beam.
4. With the HGA ABS up, slide the flex tail under the test arm wing and position the suspension locating slots over the Suspension Load Fixture Alignment pins.
5. Locate the suspension boss in the front boss clamp. Use index finger to press the suspension boss and apply light pressure to the boss until it is seated properly.
6. Close the test arm boss clamp by actuating the toggle switch to the down position.
7. Remove the Test Arm/Wing assembly and inspect the loaded HGA. Visually verify that the suspension base plate is seated along the test arm. NO GAPS, VISIBLE WITHOUT MAGNIFICATION, ARE ALLOWED.

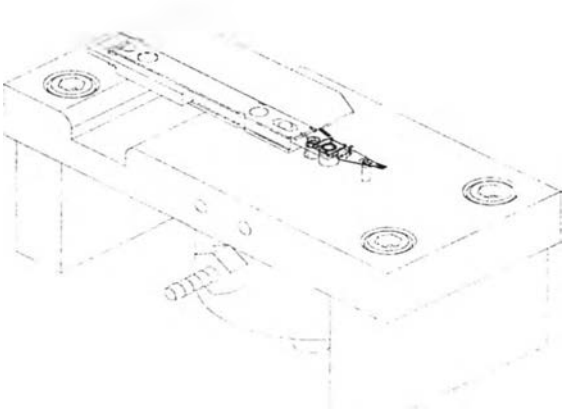

Figure 2.12 Load IAT Fixture

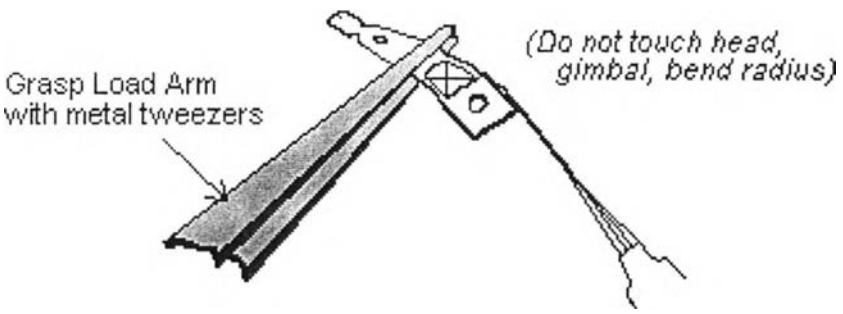

Figure 2.13 HGA Handling

- *Spot Cleaning Operation*

Spot cleaning Operation is the inspected operation which focuses on contamination on HGA, including Slider, FOS and Flexure, and Front line defect, such as Crack slider, Bent Flexure, etc. If contamination is found, it will be cleaned off by spot clean operator. For the mechanical defect, it will be reworked or rejected according to the specification. The procedures of this operation are described as below.

1. Inspect all front line defects such as Crack slider, Lifted lead bond, Bridge bond pad, etc. Rework or Reject base on the specification.
2. Inspect contamination on HGA, including Slider, FOS and Flexure. All contamination will be clean off by using cotton swab dampened in IPA.

- *Head Set*

Head Set operation is to align the magnetic direction in the slider layer. The procedures of this operation are provided as below.

1. Place test arm on the head setter track with head pointed toward the housing, ABS facing up.
2. Lay the test arm FLAT against the track slowly, DO NOT drop/slam the test arm since it will cause dimple separation.
3. Gently push slide of fixture forward until the head of HGA is encased in the head setter.
4. Slide fixture back and remove test arm assembly.
5. Place the Test Arm/Wing assembly back into the FOS Wing Tray.

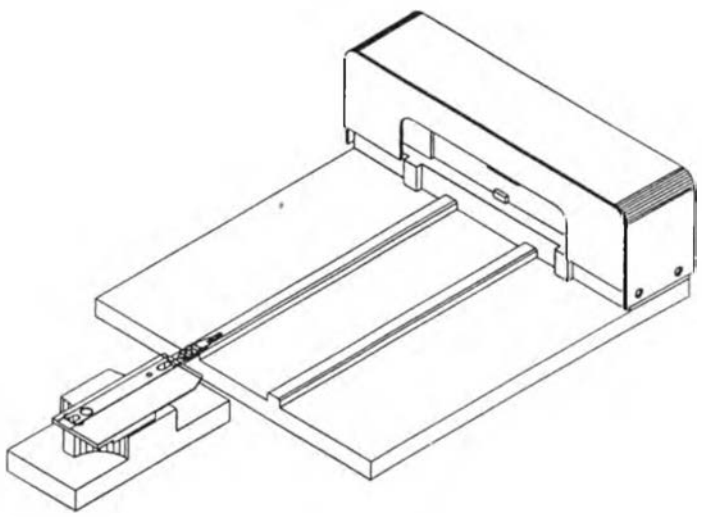

Figure 2.14 Head setter

- *Autogram operation*

Autogram operation is to measure and adjust an incoming gram of HGA to the product target or specification before Fly and Electrical testing. For Cheetah 18 product, the specification is illustrated in Table 2.1

< 1.5 grams	Reject as is, do not attempt to adjust
1.5 to < 2.53 grams	Adjust to target of 2.65 grams
2.53 to 2.77 grams	Accept as is, no further adjustment required or allowed
>2.77 to 3.5 grams	Adjust to target of 2.65 grams
>3.5 grams	Reject as is, do not attempt to adjust

Table 2.1 Gramload Specification

- *SAAM Operation*

The Static Attitude Adjust Machine (S.A.A.M.) measures and adjusts HGA static attitude. HGA static attitude is measured according to IDEMA document 194. The definitions of positive PSA and RSA are illustrated below. Positive PSA rotates the trailing edge closer to the disk. Positive RSA is counter clockwise rotation as viewed from the trailing end.

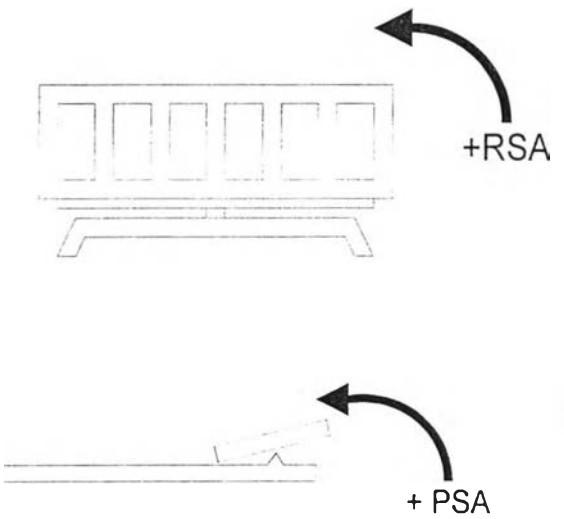

Figure 2.15 PSA/RSA illustration

For Cheetah 18 product, the specification of PSA and RSA are +/-1.0 degrees and +/-0.8 degrees, respectively.

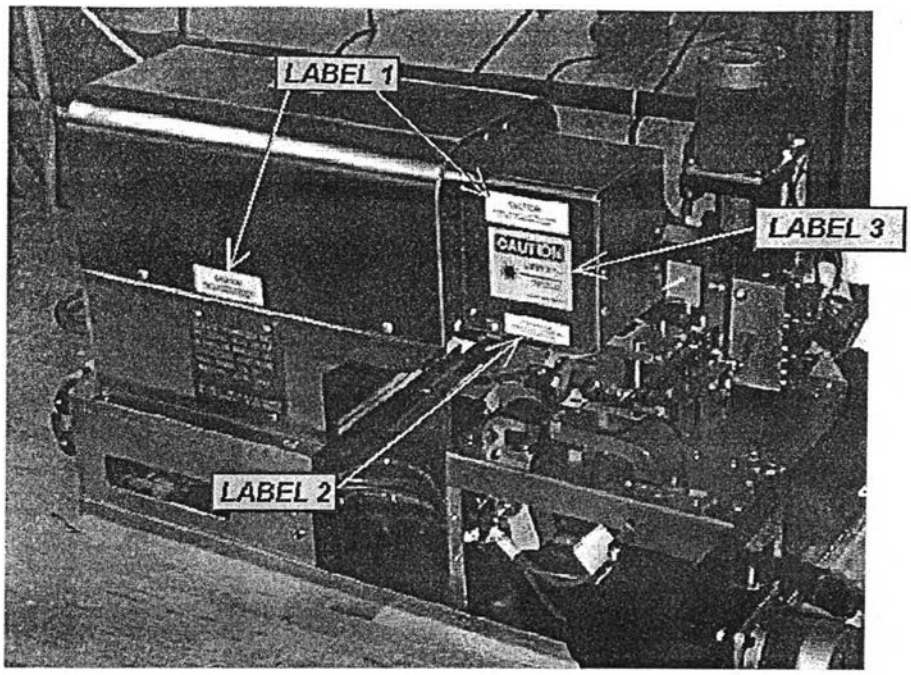

Figure 2.16 SAAM

- *Cut Shunt Operation*

Cut shunt Operation is the process that cut shunt tab at FOS tail off before testing and its procedures are as follow.

1. HGAs will be located in FOS Wing Tray.

2. Under a 30X scope, using a tweezer-scissors, trim the FOS tail off.

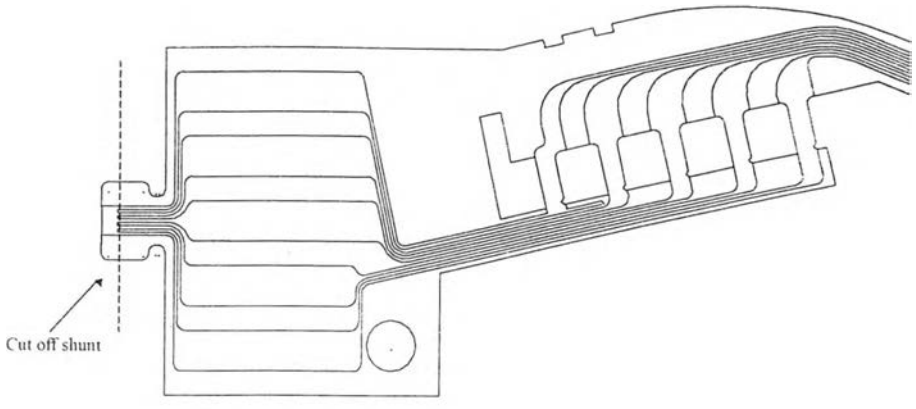

Figure 2.17 FOS trimming location

- *MRE Operation*

MRE is the operation that to test the resistance of Head which its procedures are as follow.

1. Locate the hole in the flex tail and align it with the pin of the test wing.
2. Using a metal tweezers, lock the flex tail into the test wing.
3. Place the test arm/wing assembly into the FOS/wing tray.

- ***Electrical Test Operation***

Electrical Test is a dynamic test operation that simulate for testing Read and Write performance of HGA on a media. All specification is tightening than the working condition.

- ***Fly Test Operation***

Fly test is a dynamic operation that tests the fly height performance of HGA on glass disc. Fly height unit is in micro-inch, Cheetah 18 specification is 1 micro-inch.

- ***Flex Shunting Operation***

Flex shunting operation is the process that the FOS tail is re-shunted after testing in order to ensure the problem of ESD. The process of this operation is illustrated as below.

1. Place test arm with ABS down on the FOS Tail Shunt Fixture and position the test wings tooling hole on the pins.
2. Set the soldering iron at 550 - 580 °F
3. Melt a small amount of solder on the soldering tip.
4. Under microscope (30X), apply solder in given area in product criteria

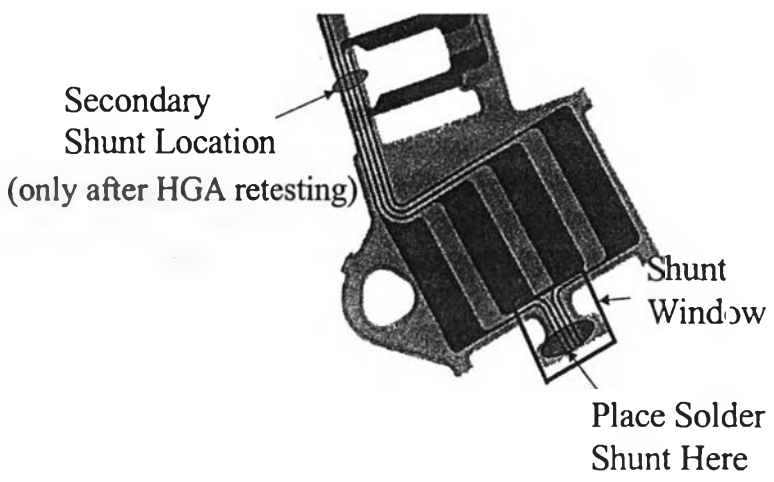

Figure 2.18 Flex shunting area

- ***Unload IAT Operation***

Unload IAT Operation is the operation that unload HGA from the IAT arm before cleaning. Its procedures are as illustrated as below.

1. Place the test arm on the Suspension Unload Fixture with the serial number face down. Mount the suspension to the front actuated hole.
2. Grasp the suspension by the load beam with a tweezers.
3. Open the test arm boss clamp by actuating to toggle switch to the up position.
4. Remove HGA from the test arm.

- ***Final system clean***

Final system clean is the automated cleaning which its propose is to clean all HGA components before shipping to customer.

- ***Final Visual Operation***

Final Visual Operation is the operation that requires to inspect all mechanical related of HGA which includes contamination, slider defects, FOS defects and Flexure defects.