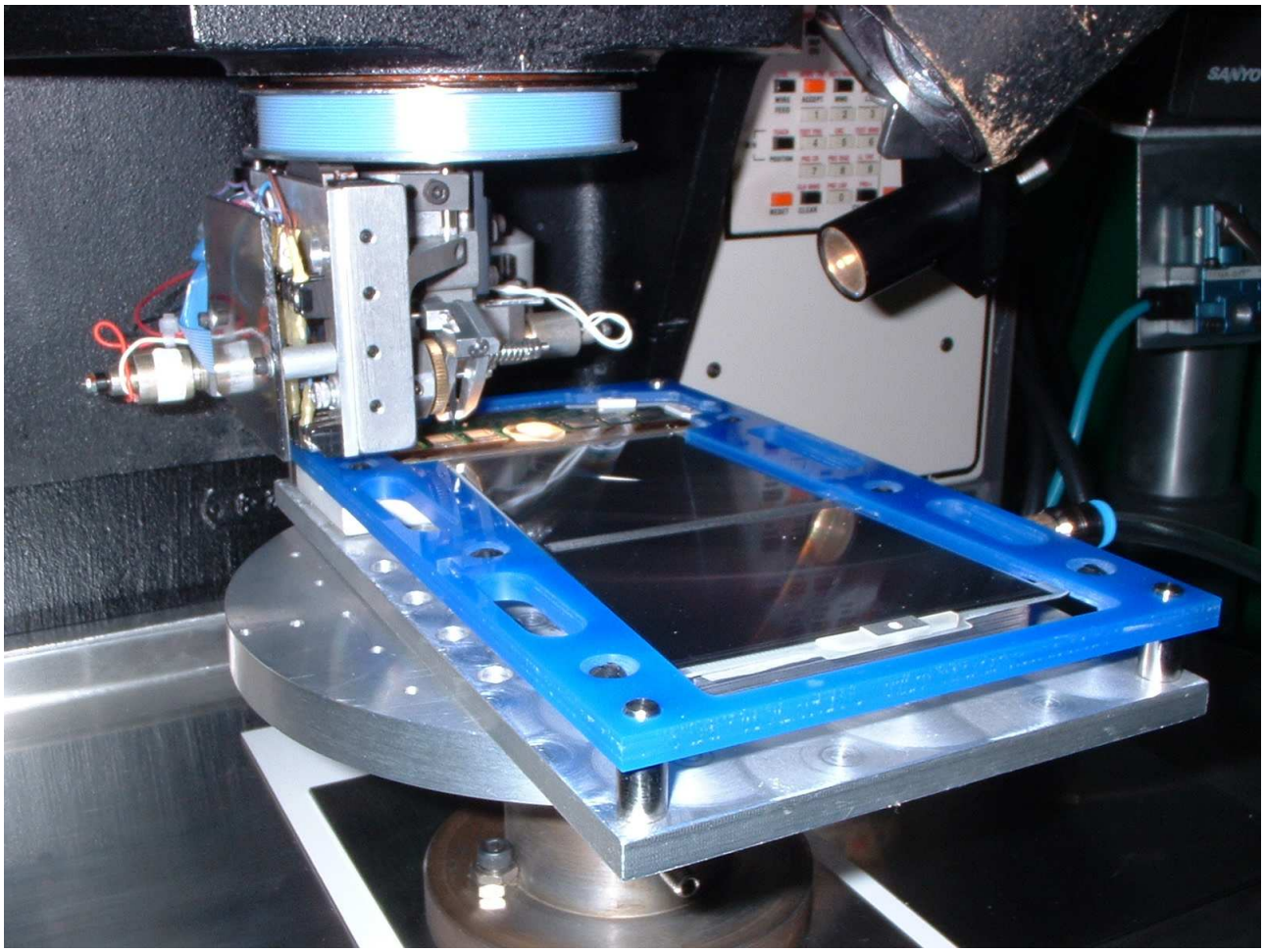
UNIVERSITY
of
GLASGOW

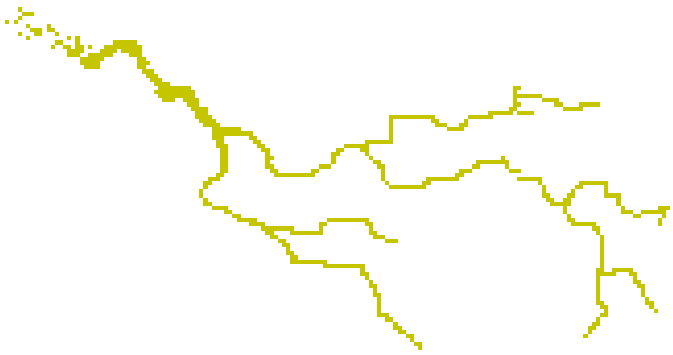
Atlas Module bonding in Glasgow



Outer Module

john.j.melone@physics.gla.ac.uk

ESD Protection Instructions.



Wear wrist-strap connected to ground guard.

Ensure ground guard shows green LED illuminated.

Unpack devices on dissipative surface.

Ensure visitors observe the same instructions.

General Overview

STAGE 1: Acceptance of Module.

- 1.1 Database. (See Database Entry document)
- 1.2 Inspection. (See Visual Inspection Document)

STAGE 2: Module Mounting.

STAGE 3: Mounting onto the K&S 1470.

STAGE 4: Wirebonding.

- 4.1 1470 Bonding Program Map and Progress Card.
- 4.2 Detector to detector [Top Face].
- 4.3 Detector to fan-in [Top Face].
- 4.4 Bias: - hybrid to fan-in [Top Face].
- 4.5 ABCD3T to fan-in [Top Face].
- 4.6 Module Bottom Face.

STAGE 5: Module dispatch.

- 5.1 Database. (See Database Entry Document)
- 5.2 Inspection. (See Visual Inspection Document)
- 5.3 Dispatch.

MODULE TIMEWALK:

The following operating procedure is written to be used with a K&S 1470 wire bonding machine. The calibration of this bonder is assumed to be such that the crosshairs are at the bondfoot. Any deviation from this should be taken into consideration when aligning the reference points.

Stage 1: Acceptance of Module.

1.1 Database.
Upon receipt of a module the database should be updated by the designated person. This ensures that the institute accepts delivery and becomes the owner of the module until such time that the module is forwarded to the disk assembly institute (Liverpool).

1.2 Inspection.
Prior to wirebonding, modules must be inspected to determine whether there has been any surface damage to the detectors or damage to the hybrid wirebonding during module assembly. See Visual Inspection Documnet for full inspection instructions.

Stage 2: Module Mounting

The module is held, by six clips, into the bonding frame and protected by a top and bottom plate.
Cleanroom paper is used on the vacuum surfaces of the bonding jig to protect the detector faces.
Remove the module, in the bonding frame and carefully align the four corner holes with the four corner posts. Lower the frame onto the vacuum faces and apply vacuum. Check that the vacuum supplied to the jig can hold the module with a force of at least 10 grams. Lightly clamp the hybrid using the four PTFE slide clamps and screws. The hybrid must be tightly gripped, ensure there is no vacuum leakage as a poorly gripped hybrid will result in poor bond quality.

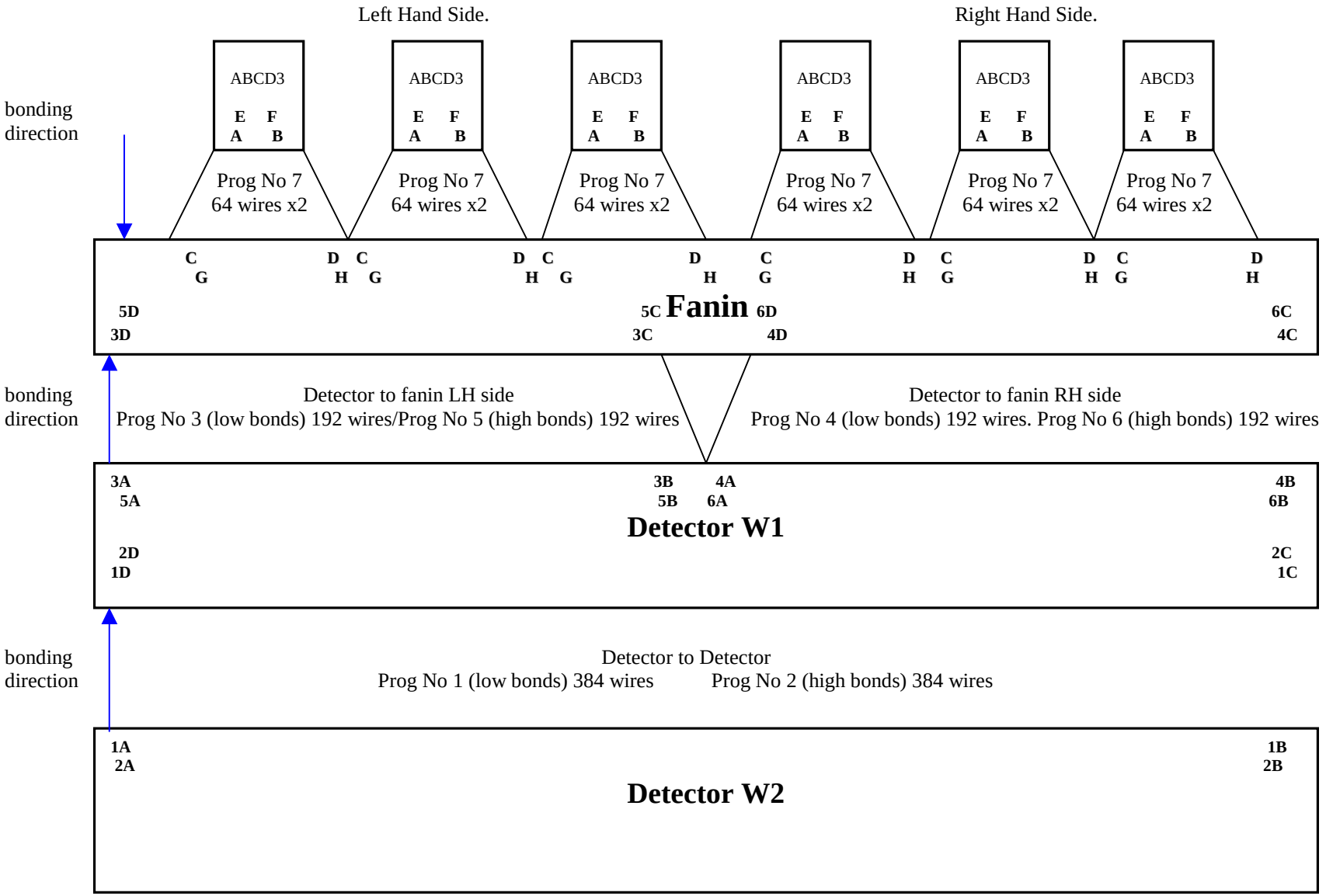
Stage 3: Mounting onto K&S 1470

The module bonding jig is mounted directly onto the 1470 slideclamp is mounted onto the K&S 1470 work-holder. Locate the bonding jig onto the two dowel pins of the work-holder, with the module hybrid near the bonder. The two dowel pins will make the XYO settings of the bonder uniform for all modules.
Once the module bonding jig is secure on the work-holder attach the vacuum pump and proceed to the next stage.

Stage 4: Wirebonding.

4.1 1470 Bonding Program Map and program list

Module bonding program map.



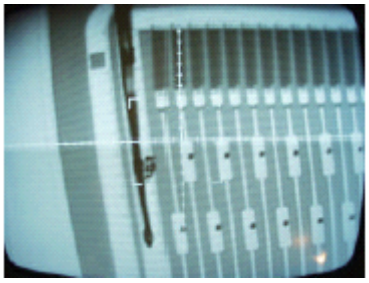
4.1.1 1470 Program List.

Program No	1	Detector to Detector Low
	2	Detector to Detector High
	3	Detector to Fanin L-hand side Low
	4	Detector to Fanin R-hand side Low
	5	Detector to Fanin L-hand side High
	6	Detector to Fanin R-hand side High
	7	ABCD3DT to Fanin Low and High

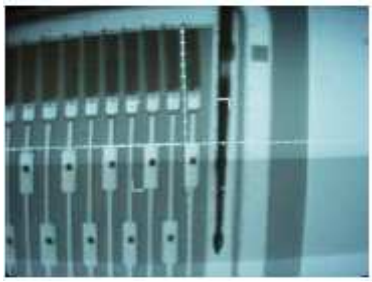
4.2. Detector to Detector [Inner Row].

1. Load 1470 program No 1 [Atlas Forward Module Middle; Det-Det; Inner row].
2. Move module under bondhead so that the left-hand side detector to detector is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2. The reference points correlate to the position points viewable on the Program Map 4.1

Program No 1

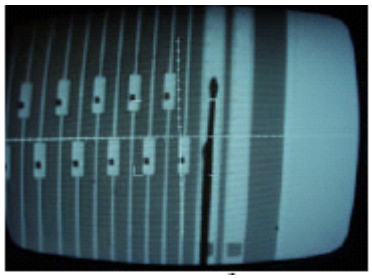


Ref. 1.1. Position 1A



Ref. 1.2. Position 1B

Ref. 2.1. Position 1C



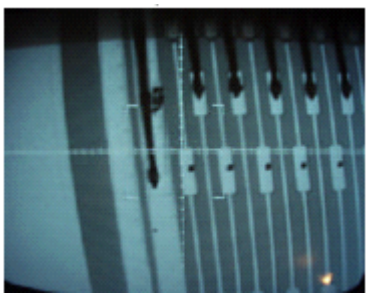
Ref. 2.2. Position 1D

6. Check CVL5=CVL2=3
7. Check Loop Height=60 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.1
9. Step through bond sequence to check position of bond foot to bond pad. The first and last two bonds of this program are the high voltage Bias lines. All other Bias lines must be bonded manually
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Detector and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 384 wires and record bond quality parameters, for program No 1 inner row, on the module progress card .

4.2.1 Detector to Detector [Outer Row].

1. Load 1470 program No 2 [Atlas Forward Module Middle; Det-Det; Outer row].
2. Move module under bondhead so that the left-hand side detector to detector is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector).
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

Program No 2



Ref. 1.1. Position 2A

Ref. 1.2. Position 2B

Ref. 2.1. Position 2C

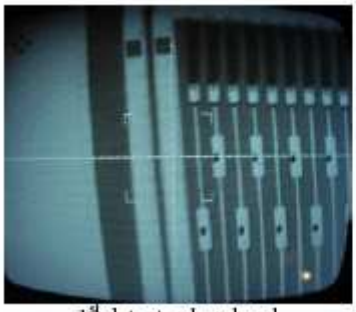
Ref. 2.2. Position 2D

6. Check CVL5=CVL2=3
7. Check Loop Height=80 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.1
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Detector and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 384 wires and record bond quality parameters, for program No 2 inner row, on the module progress card.

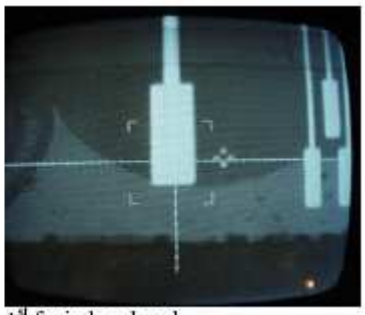
4.3 Detector to Fanin [Top Face].

4.4.1 Bias

1. Select Manual Mode.
2. Move the module such that the left-hand detector to fanin is under the bond head.
3. Set CVL5=CVL2=3
4. Set Loop Height to 60 (Variable depending on fanin height) in LHT mode.
5. Bond one wire from detector bias pad to fanin bias pad.

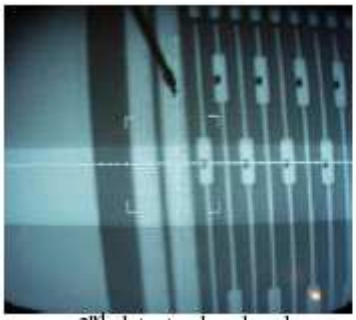


1st detector bond pad.

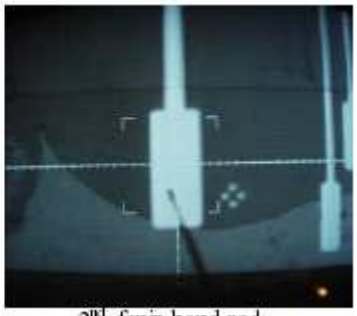


1st fanin bond pad.

6. Set Loop Height to 80 in LHT mode.
7. Bond second wire from detector bias pad to fanin bias pad.

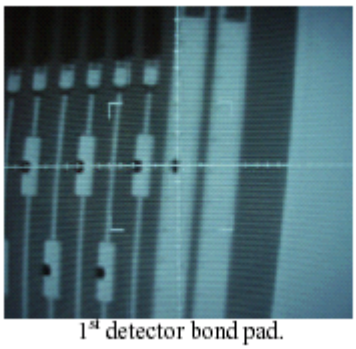


2nd detector bond pad.

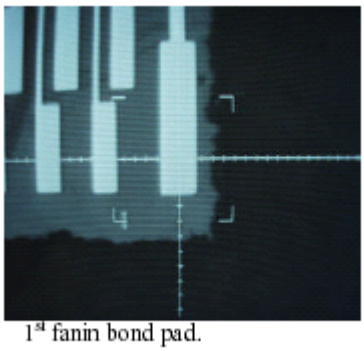


2nd fanin bond pad.

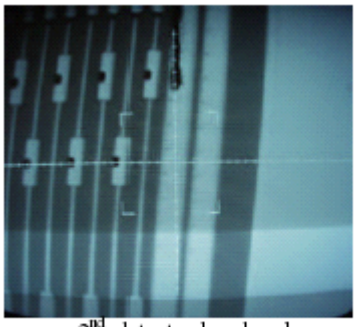
8. Move module so that the right hand side detector to fanin is under the bondhead and repeat from 4.



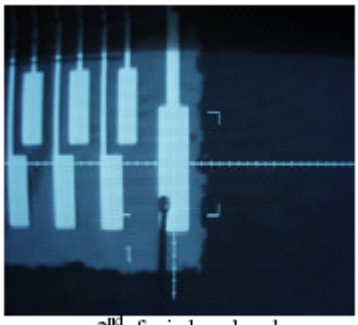
1st detector bond pad.



1st fanin bond pad.



2nd detector bond pad.

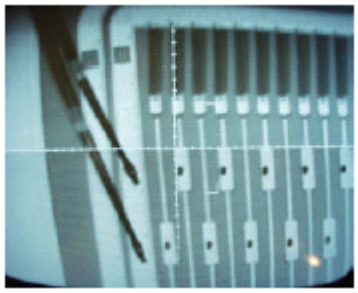


2nd fanin bond pad.

4.3.1 Detector to Fanin [LH Side 1st Row].

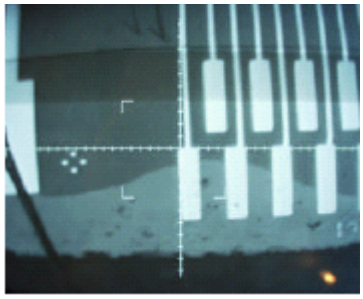
1. Load 1470 program No 3 [Atlas Forward Module Middle; Det-Fanin; 1st Row LH Side].
2. Move module under bondhead so that the left-hand side detector to fanin is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

Program No 3

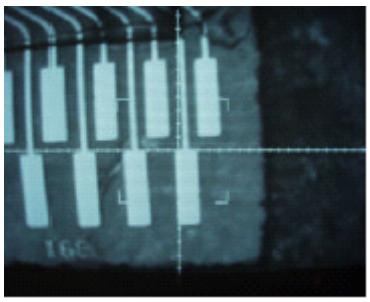


Ref. 1.1. Position 3A

Ref. 1.2. Position 3B



Ref. 2.1. Position 3C



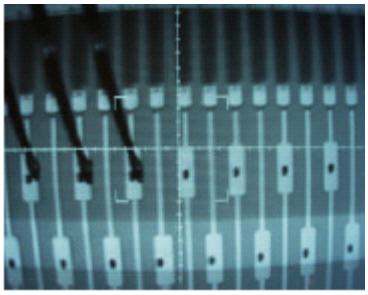
Ref. 2.2. Position 3D

6. Check CVL5=CVL2=3
7. Check Loop Height=60 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.3
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Fanin and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 192 wires and record bond quality parameters, for program No 3 Top Side, on the module progress card.

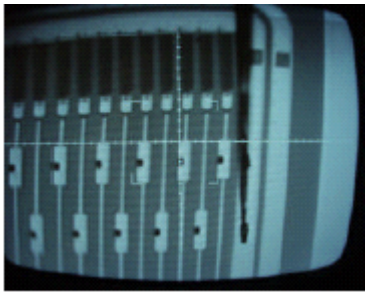
4.3.2 Detector to Fanin [RH Side 1st Row].

1. Load 1470 program No 4 [Atlas Forward Module Middle; Det-Fanin; 1st row RH Side].
2. Move module under bondhead so that the right-hand side detector to fanin is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

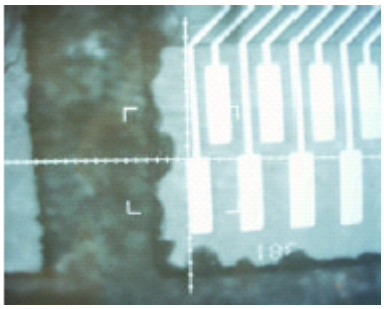
Program No 4.



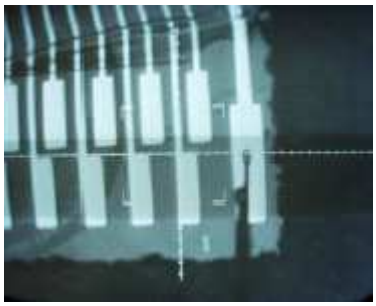
Ref 1.1. Position 4A



Ref 1.2. Position 4B



Ref 2.1. Position 4C



Ref 2.2. Position 4D

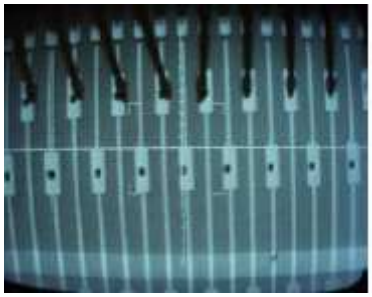
6. Check CVL5=CVL2=3
7. Check Loop Height=60 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.3
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Fanin and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 192 wires and record bond quality parameters, for program No 4 Top Side, on the module progress card.

4.3.3 Detector to Fanin [LH Side 2nd Row].

1. Load 1470 program No 5 [Atlas Forward Module Middle; Det-Fanin; 2nd row LH Side].
2. Move module under bondhead so that the left-hand side detector to fanin is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

Program No 5.

Ref. 1.1 Position 5A



Ref. 1.2. Position 5B

Ref. 2.1. Position 5C

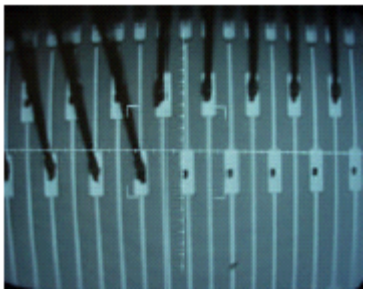
Ref. 2.2. Position 5D

6. Check CVL5=CVL2=3
7. Check Loop Height=80 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.3
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Fanin and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 192 wires and record bond quality parameters, for program No 5 Top Side, on the module progress card.

4.3.4 Detector to Fanin [RH Side 2nd Row].

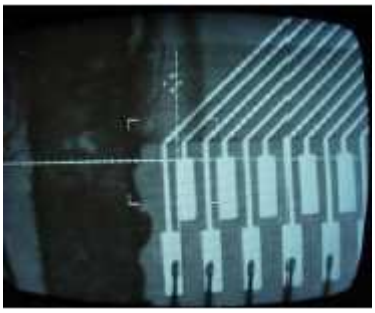
1. Load 1470 program No 6 [Atlas Forward Module Middle; Det-Fanin; 2nd row RH Side].
2. Move module under bondhead so that the left-hand side detector to fanin is positioned for bonding.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on Detector)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

Program No 6

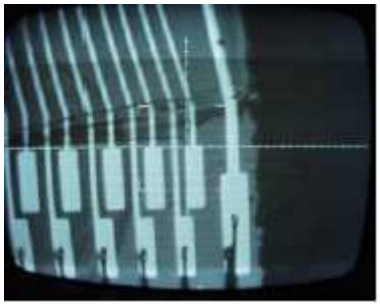


Ref. 1.1. Position 6A

Ref. 1.2. Position 6B



Ref. 2.1. Position 6C

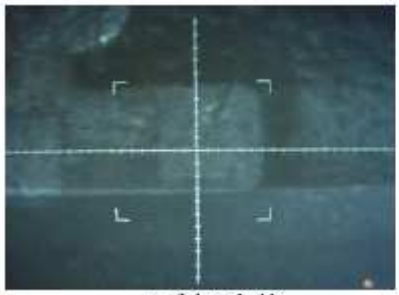


Ref. 2.2. Position 6D

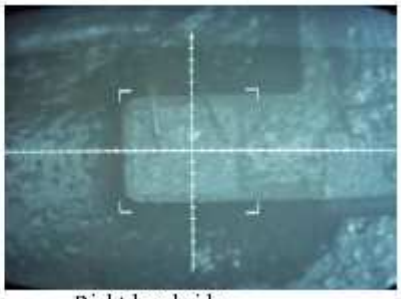
6. Check CVL5=CVL2=3
7. Check Loop Height=80 and in LHT mode.
8. Set 1st bond power to 2.1 and 2nd bond power to 2.3
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from Detector to Fanin and as such the bonding operation can be observed using the stereo microscope. Observe throughout the bonding process, stop the program if there are any problems by pressing RESET.
12. Bond all 192 wires and record bond quality parameters, for program No 6 Top Side, on the module progress card.

4.4 Bias: - Hybrid to Fanin [Top Face].

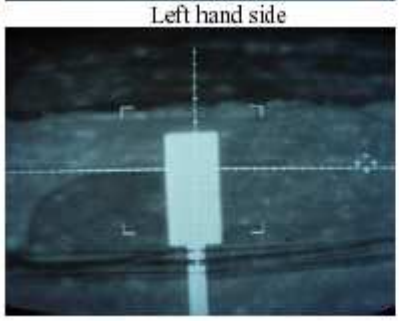
1. Select Manual mode.
2. Set 1st bond power to 2.1 and 2nd bond power to 2.3
3. Set CVL5=CVL2=3
4. Set Loop Height to 60 in LHT mode.
5. Bond two wires from hybrid bias pad to fanin bias pad at both left hand and right hand sides of the module.

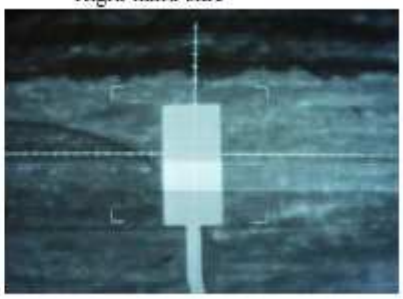


Left hand side



Right hand side



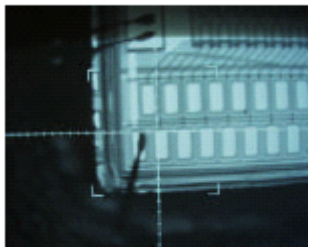


4.5 ABCD3T to Fanin [Top Face].

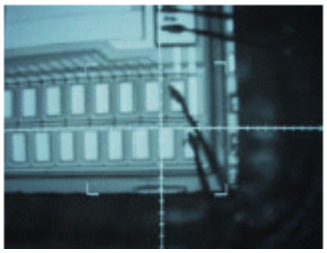
4.3.1 First row.

1. Load 1470 program No 7 [Atlas Forward Module Middle; ABCD3T - Fanin]
2. Move module under bondhead so that E5 is the first chip to be bonded.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on ABCD3T chip)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

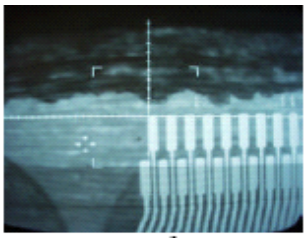
Program No 7



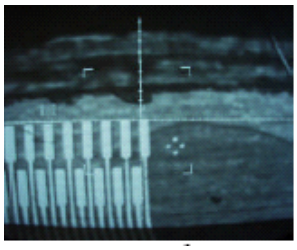
Ref. 1.1 Position A



Ref. 1.2. Position B



Ref 2.1. Position C



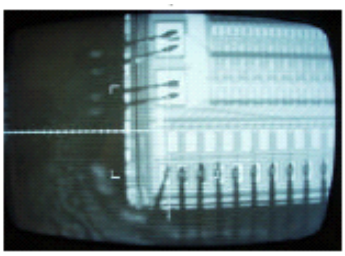
Ref. 2.2. Position D

6. Check CVL5=CVL2=3
7. Check Loop Height=50 and in LHT mode.
8. Set 1st bond power to 2.2 and 2nd bond power to 2.5
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from ABCD3T to Fanin and as such the bonding operation cannot be observed using the stereo microscope until all 64 channels have been bonded. Therefore it is worth stopping every 20 wires to ensure bond quality is good.
12. Bond all first row channels of each device and note on the module progress card the bond quality parameters for the last 64 wires on completing chips E5 to M0.

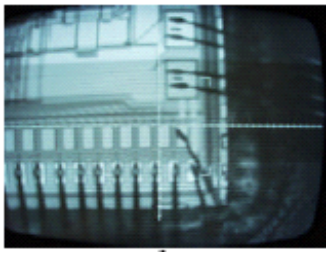
4.5.1 Second row

1. Load 1470 program NO 7 [Atlas Forward Module Middle; ABCD3T - Fanin]
2. Move module under bondhead so that S8 is the first to be bonded.
3. Select SEMI-AUTO mode.
4. Set XY0 and Ref. 1.1 (same point on ABCD3T chip)
5. Set Ref. 1.2, Ref. 2.1 and Ref. 2.2.

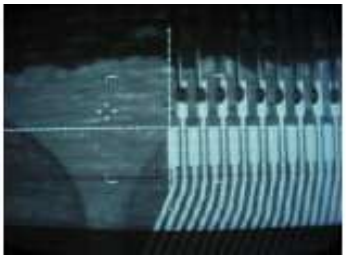
Program No 7



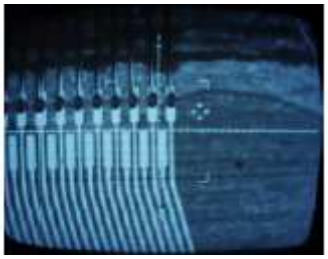
Ref. 1.1. Position E



Ref. 1.2 Position F



Ref. 2.1. Position G



Ref. 2.2 Position H

6. Check CVL5=CVL2=3
7. Check Loop Height=80 and in LHT mode.
8. Set 1st bond power to 2.2 and 2nd bond power to 2.5
9. Step through bond sequence to check position of bond foot to bond pad.
10. When satisfied, select AUTO.
11. The bond direction is from ABCD3T to Fanin and as such the bonding operation cannot be observed using the stereo microscope. Until 64 wires are bonded, and the missing wire is operational, it is worth stopping every 20 wires and observing that the bonding is correct.
12. Bond all second row channels of each device and note on the module progress card the bond quality parameters for the last 64 wires on completing chips E13 and M8.

4.6 Module Bottom Face.
1. Move module to safe area and disconnect vacuum.
2. Lift frame off module vacuum jig and turn over.
3. Reposition module over the four corner posts and lower into place on the vacuum jig.
4. Reconnect vacuum and ensure vacuum holds module to correct spec. See Stage 4.

4.6.1 Hybrid to Fanin Bias.
1. Repeat section 4.2.

4.6.2 ABCD3T to Fanin.
1. Repeat section 4.3 completing Module Wirebonding Progress Card after wirebonding chips S10 and E13

4.6.3 Detector to Fanin.
1. Repeat section 4.4 completing Module Wirebonding Progress Card after wirebonding each of the four regions.

4.6.3 Detector to Detector.
1. Repeat section 4.5 completing Module Wirebonding Progress Card after wirebonding both the inner and outer rows.

MODULE TIMEWALK.

To be confirmed.