This guide describes the visual inspection process for used Pyramid Probe cores. A Pyramid Probe core is considered “Used” once it has touched down on a wafer. Visual inspection should be performed first visually, and then with a microscope. The recommended procedure employs two microscopes:

When saving photos, be sure to include the serial number in the file name.

Use the Pyramid Probes Certificate of Conformance to verify the following:

- The serial number on the core frame matches the Pyramid Probes Certificate of Conformance.
- The product name on the Pyramid Probes Certificate of Conformance matches the product to be tested.

**Step 1: Edge Sense Inspection**

Pyramid Probes used on manual probe stations have an edge sense type mechanical switch installed. This step applies only to manual probe stations.

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<table>
<thead>
<tr>
<th>Inspection Area</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Edge Sense</strong></td>
<td><strong>Are there cracks in the glass pad?</strong> Contact local support for instructions.</td>
</tr>
<tr>
<td><em>(if glass pad is installed)</em></td>
<td><strong>Is the glass pad securely in place?</strong> Contact local support for instructions.</td>
</tr>
<tr>
<td></td>
<td><strong>Is the needle touching the glass pad, and roughly centered?</strong> Contact local support for instructions.</td>
</tr>
</tbody>
</table>

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Low-magnification microscope
(with a large working space)

- Commonly used for PCB inspection and soldering stations
- Used for inspecting the entire probe, core window, components and membrane wing
- Magnification range should be approximately 7x to 90x

High-magnification microscopes

- Used for inspecting the probe face, probe tips and beams
- Recommended microscope objectives include 5x, 20x, and 50x
## Step 2: Low Magnification Microscope Inspection

<table>
<thead>
<tr>
<th>Inspection Area</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| Membrane        | Are there any tears noted anywhere on the membrane?  
A membrane tear is defined as a torn membrane caused by mishandling or equipment malfunction. Tears on a new core that have been repaired by the factory are acceptable, as long as the repaired patch does not exceed 1000μm.  
Tears resulting in signal damage to a critical trace cannot be repaired.  
Cores with tears that do not include critical traces should be returned for repair to prevent propagation.  
A torn trace can be waived by Engineering if it is not critical to the test program.  
Has the membrane come off the alignment pin?  
WARNING: Do not install in a box or board until repaired.  
Contact local support for instructions.  
Is there any damage to the membrane?  
Escalate to a higher magnification inspection to determine if there is a failure.  
Is the probe face clean of any debris?  
Follow the procedure in Pyramid Probe Core Off-line Cleaning With Brush to clean the face after incoming inspection is complete. |
| Plungers        | Are there any cracks noted in the plunger beams from the tester side?  
If cracks are noted, contact local support for instructions.  
Are there any cracks in the plunger beams from the wafer side?  
Skip this step if the core is installed in a PCB.  
If cracks are noted, contact local support for instructions. |
### Components

**Is there any damage to installed components?**

- Small scratches from the assembly process are acceptable.
- Cracked solder joints, cold solder joints or lifted component pads are unacceptable at any time in the core’s life.
- Damaged components can be waived by Engineering if the electrical signal is not affected.
- Note any damage that indicates incorrect handling during installation of the core and provide feedback to engineering.

![Low-magnification photo of wing on VLSR core. Burnt trace verifies test failure for open. It has been damaged by high current.](image1)

![Low-magnification photo of wing. These two traces would fail electrical test as open circuits. They were damaged by high current.](image2)

### Traces

**Is there any high current damage to traces?**

- The pass/fail criteria is the test program.
- Provide feedback to Engineering to check program for current protection on this signal.

### Step 3: High Magnification Microscope Inspection

**Inspect Core Using the 5x Objective**

1. Place the core on a high-magnification fixture with the probe tips up.
2. Inspect the core using the 5x objective.

<table>
<thead>
<tr>
<th>Inspection Area</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe Face</td>
<td>Are there any scratches on the probe face?</td>
</tr>
<tr>
<td>Membrane</td>
<td>Are any particle hits visible on the membrane?</td>
</tr>
<tr>
<td></td>
<td>An indentation in the membrane surface is not a failure. Use the criteria</td>
</tr>
<tr>
<td></td>
<td>for damage to traces to determine pass/fail.</td>
</tr>
<tr>
<td></td>
<td>Are there any particles embedded in the membrane?</td>
</tr>
<tr>
<td></td>
<td>The following criteria describe unacceptable embedded particles:</td>
</tr>
<tr>
<td></td>
<td>• Large or deeply embedded particles that cause shorts between traces or</td>
</tr>
<tr>
<td></td>
<td>layers</td>
</tr>
<tr>
<td></td>
<td>• Large embedded particles that cause open traces</td>
</tr>
<tr>
<td></td>
<td>• Tall, embedded particles that contact the wafer (maximum particle</td>
</tr>
<tr>
<td></td>
<td>height is difficult to define; there are many variables, such as</td>
</tr>
<tr>
<td></td>
<td>probe tip height, overtravel, membrane design, surface flatness, etc.)</td>
</tr>
<tr>
<td>Is there any repeatable diagonal indentation in the membrane?</td>
<td>This is caused by a particle on the cleaning media.</td>
</tr>
<tr>
<td></td>
<td>Follow the pattern of indentations to verify that a probe tip is not</td>
</tr>
<tr>
<td></td>
<td>damaged.</td>
</tr>
<tr>
<td></td>
<td>Use the pass/fail criteria for scratches to evaluate the indentations.</td>
</tr>
<tr>
<td>Are there any tears in the membrane at the corners of the probe face</td>
<td>Tears on the probe face cannot be repaired.</td>
</tr>
<tr>
<td>Are there any tears along the edges of the wings?</td>
<td>• Fail if a signal is damaged electrically.</td>
</tr>
<tr>
<td></td>
<td>• Return for repair to prevent propagation of tears that do not include</td>
</tr>
<tr>
<td></td>
<td>a signal trace.</td>
</tr>
<tr>
<td>Is there any adhesion loss noted on the probe face between the</td>
<td>Adhesion loss causing the membrane to bulge is unacceptable. Focus on</td>
</tr>
<tr>
<td>membrane and plunger stack?</td>
<td>the membrane surface to verify the bulge is not taller than the probe</td>
</tr>
<tr>
<td></td>
<td>Adhesion loss appears near the corner of the membrane.</td>
</tr>
<tr>
<td></td>
<td>This is acceptable because there is no large bulge.</td>
</tr>
</tbody>
</table>
3. Inspect the core using the 20x objective.

<table>
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</table>
| **Tips**        | Do all tips appear uniform in size and shape?  
On a used core, missing, tilted or crushed tips can be waived by Engineering if they are a redundant contact like ground or power, or if they still have electrical continuity.  
Is there any high current damage to the signal trace evident around the probe tip?  
The pass/fail criteria is the test program.  
Provide feedback to Engineering to check program for current protection on this signal. |
| **Electrical Traces** | Are any anomalies present that affect the electrical trace metal?  
An anomaly is something different, abnormal, peculiar or not easily classified.  
Anomalies greater than 50% of an electrical trace width are acceptable on used cores if the core passes electrical test.  
Anomalies affecting the ground grid are acceptable. |
| **Surface Layer Cracks** | Cracks may be present in the surface layer of the polyimide.  
- Cracks originating from the beam are acceptable  
- Cracks parallel to an electrical trace, but not within 20 µm of the beam are acceptable.  
Cracks originating from beam  
Cracks parallel to trace |
### Middle Layer Polyimide

**Are there any cracks in the Middle Layer Polyimide that do not come to the surface?**

This type of crack is acceptable unless it is causing other damage to the membrane, such as separation between the layers or cracks through the entire membrane.

![Acceptable](image1.png)  ![Not acceptable. Membrane is cracked and has some separation.](image2.png)

### Stress Cracks

**Are there any cracks in the surface layer of the membrane where it bends at the edge of the face?**

These cracks are not in the metal. They are in the polyimide. Change the focus of the microscope to confirm the cracks are in the polyimide. If cracks also appear in the electrical traces, refer to the appropriate criteria in Electrical Traces on page 5.

![Acceptable](image3.png)  ![Not acceptable. Membrane is cracked and has some separation.](image4.png)

### Membrane Surface

**Were any particles created or formed below the membrane (poly2) surface during the thinfilm fabrication process?**

Internal encapsulated particles are acceptable as long as they pass all other specifications.

![Acceptable](image5.png)  ![Acceptable](image6.png)

Polyimide may appear rough and discolored around the beams, component attachment pads, or any other plated metal area forming part of the membrane surface:

- On the probe face, this is acceptable up to 200µm radius around the beams or other plated metal area forming part of the membrane surface.
- On the wings and the interface area, this is acceptable in all areas.
4. Inspect the core using the 50x objective. The primary goal at this magnification is to inspect the surface of the probe tip.

<table>
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| **Probe Tips**  | **Is there any organic buildup or fibers on tips?**  
Fibers are not acceptable on used probe tips.  
Used cores will have small amounts of organic contamination from probing or cleaning that might not be completely removed by off-line cleaning.  
To remove contamination, see the procedure in *Pyramid Probe Cores Off-line Cleaning With Brush*.  
**Is there any metal present on the probe tips?**  
Metallic buildup on the tips is acceptable if the core passes electrical test.  
If there is aluminum or solder contamination covering more than 25% of the probe tip surface, provide feedback to Engineering to evaluate the online cleaning parameters and the cleaning film.  
**Are the probe tips textured?**  
Probe tips for gold pads do not need texture, but can have a textured tip surface.  
Probe tips for probing all other metals, must have texture on 25% of the tip surface.  
**Do the probe tips meet height and diameter dimensions?**  
For used cores, the criteria for tip height is to pass functional test.  
For used cores, the criteria for tip diameter is device-specific to the passivation opening.  
**Do adjacent probe tips have a height difference greater than 2μm?**  
A height difference greater than 2μm on a used core is acceptable if electrical contact is made at production overtravel. |
Pyramid Probes: Used Core Inspection

Example Images

Low Magnification Scope

Entire Probe
Core Window
Entire Membrane

High Magnification Scope

Beams @ 50x
Probe Tips @ 50x

Probe Face
Wing North and East
Wing South and West

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