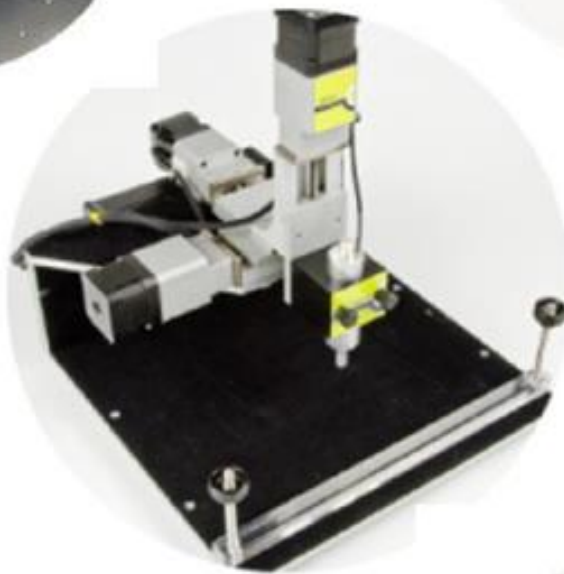
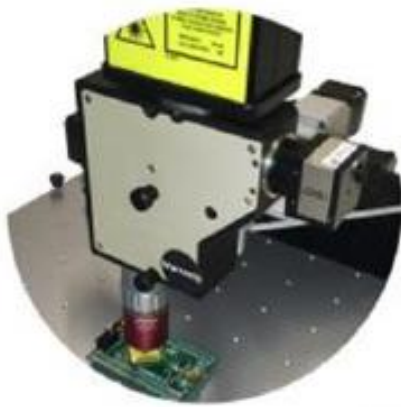


EM Probe Station 5



Why We Started It

Observations

The EM Probe Station has become the default XYZ stage for various Keysight hardware components which need accurate positioning above the device under test.

A new hardware component is the Keysight DS1103A/04A Fault Injection Laser Microscope. The EM Probe Station needs a mechanical interface for the Fault Injection Laser Microscope to be easily mounted, next to the other components like EM Probes (HS and LS), EM Capacitor Probe, and DS1121A Bidirectional Fault Injection Probe (with EM Probe Tips and BBI tips).

The resolution of these hardware components increased over time: The EM probe tips for the DS1121A Bidirectional Fault Injection Probe have become smaller, the resolution of the BBI is relatively high, and the newest addition — the Fault Injection Laser Microscope — has a resolution in the micrometer range.

We decided to upgrade the EM Probe Station to a more accurate version that can more precisely position any probe or laser spot and reproduce this position.



Figure 1. EM Probe Station 5

Improvements to EM Probe Station 5

1. Increased mechanical precision of XYZ stages.
2. Increased positioning accuracy due to driver improvements.
3. Increased accuracy by stiffer base frame with lower thermal expansion.
4. Additional mechanical interface for Fault Injection Laser Microscope.

The Challenge It Solves

Challenges that are solved with EM Probe Station 5:

1. **Precision XYZ stage:**

Precision stages need small step size, small backlash, and small yaw. Three stages with surface ground steel carriage and high precision screw pitch were selected.

2. **Improved base frame:**

The base frame allows maximum flexibility for mounting devices under test, from small smart cards to large, printed circuit boards with a significant height. At the same time the frame must hold the XYZ stages at a constant position during load and temperature changes. The stiffness and temperature extension of the base frame are improved.

3. **Driver improvement compensates backlash:**

Backlash is a common phenomenon for the interface between screw and carriage of a stage. Backlash influences the end position depending on the movement direction towards the end position. The driver improvement always enforces the same movement direction towards end position.

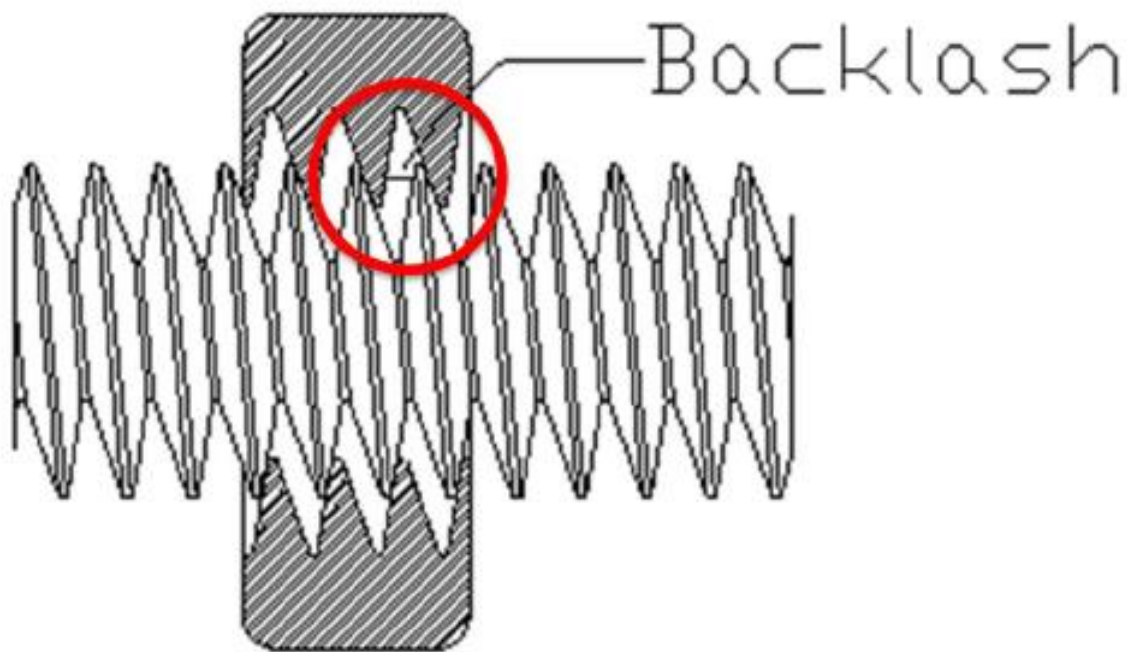


Figure 2. Backlash is a common phenomenon for the interface between screw and carriage of a stage

Use Case: Laser Fault Injection on Embedded Processor

The test scenario

1. Connect DS1180A Glitch Pattern Generator to diode laser source to set power and to trigger laser fault injection.
2. Feed trigger signal from target to Glitch Pattern Generator.
3. Power EM Probe Station 5 and connect over USB to PC. Inspector controls XYZ position of laser spot via EM Probe Station 5.
4. Inspector communicates to target over USB, rs 232, and collects target responses.

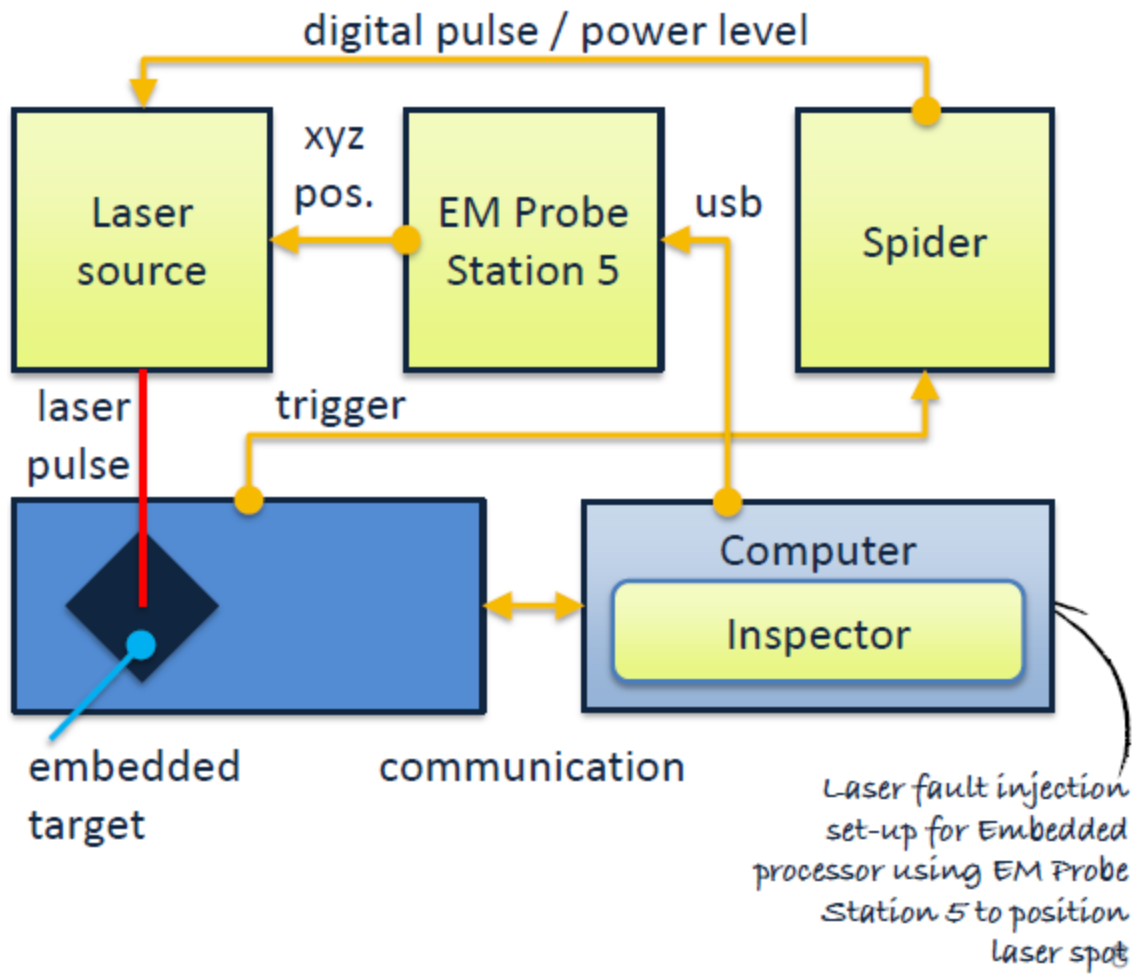


Figure 3. Laser fault injection on embedded processor

Technical Specifications

XYZ stage

- Step size: 0.3 μm @ 64 micro steps.
- Repeatability: < 2 μm .
- Range: 50 mm.

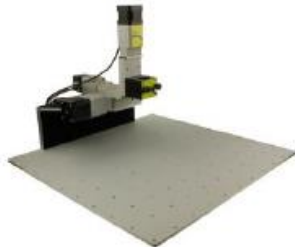
Controller

- Power: 24 V DC.
- USB connector.
- Software driver implemented in Inspector.
- "TMCL Reference and Programming Manual" provided for driver development.

Mounting interfaces

- EM Probe (HS and LS).
- EM Capacitor Probe.
- DS1120A Unidirectional Fault Injection Probe (with EM probe tips or BBI probe tips).
- DS1103A/04A Fault Injection Laser Microscope.

Package

Quantity	Description	Photo
1	EM Probe Station 5	
1	Power supply units (Phisong) 24V DC 0A .. 3A Input 100 V .. 240 V AC, 50 .. 60 Hz Power cable (country specific) included	
1	USB connection cable	
1	Set of fixing accessories: 4 x Adjuster Bracket Square 4 x Adjuster Bracket Round 1 x Adjuster Bracket Support 15 x Thumb Screw M5 x12 1 x Hexagonal Wrench M4	
1	This "EM Probe Station 5" data sheet	

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