Overview

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- FT Demonstration
  - Calibration
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- Questions

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Background

- Feature Targets (FT) were developed to reduce the targeting and data reduction time of measurements.

- They are useful to measure features such as edges, corners, circles and planes without having to resort to extensive targeting.

- The desired features are automatically added to the 3D file by V-STARS.

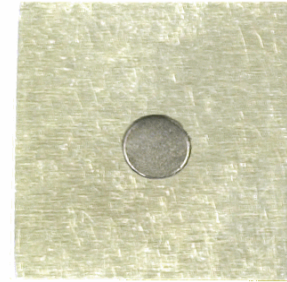- They are also a useful way to bypass the need to probe points for users without probes.

Concept

- FTs are used to measure features such as planes, lines, circles directly.

- They are based on "coded targets".

- The relationship of the coded target to the feature is determined by a one-time calibration.

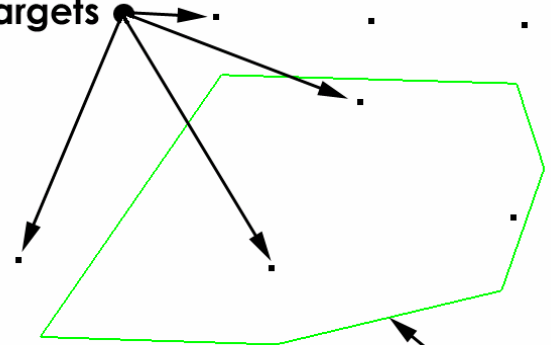- This relationship is stored in a normal 3D file.
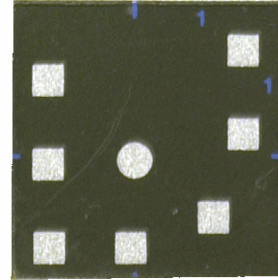
Top View   Rear View

Side View

Face Targets

Local Plane

Feature Target Types

- Four main types of FTs. These are the building blocks that are used to create the more complex features.

- The primary types are :
  - Plane FT
  - Edge FT
  - Corner FT
  - Circle FT

- Individual FTs can be combined to produce complex features that have non-orthogonal faces.

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Feature Target Types - Plane

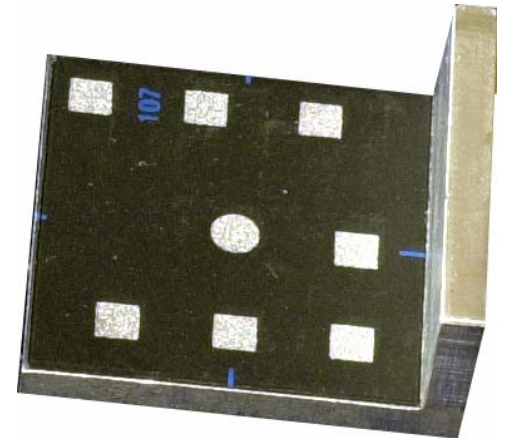- Plane FTs - The contact plane is defined.
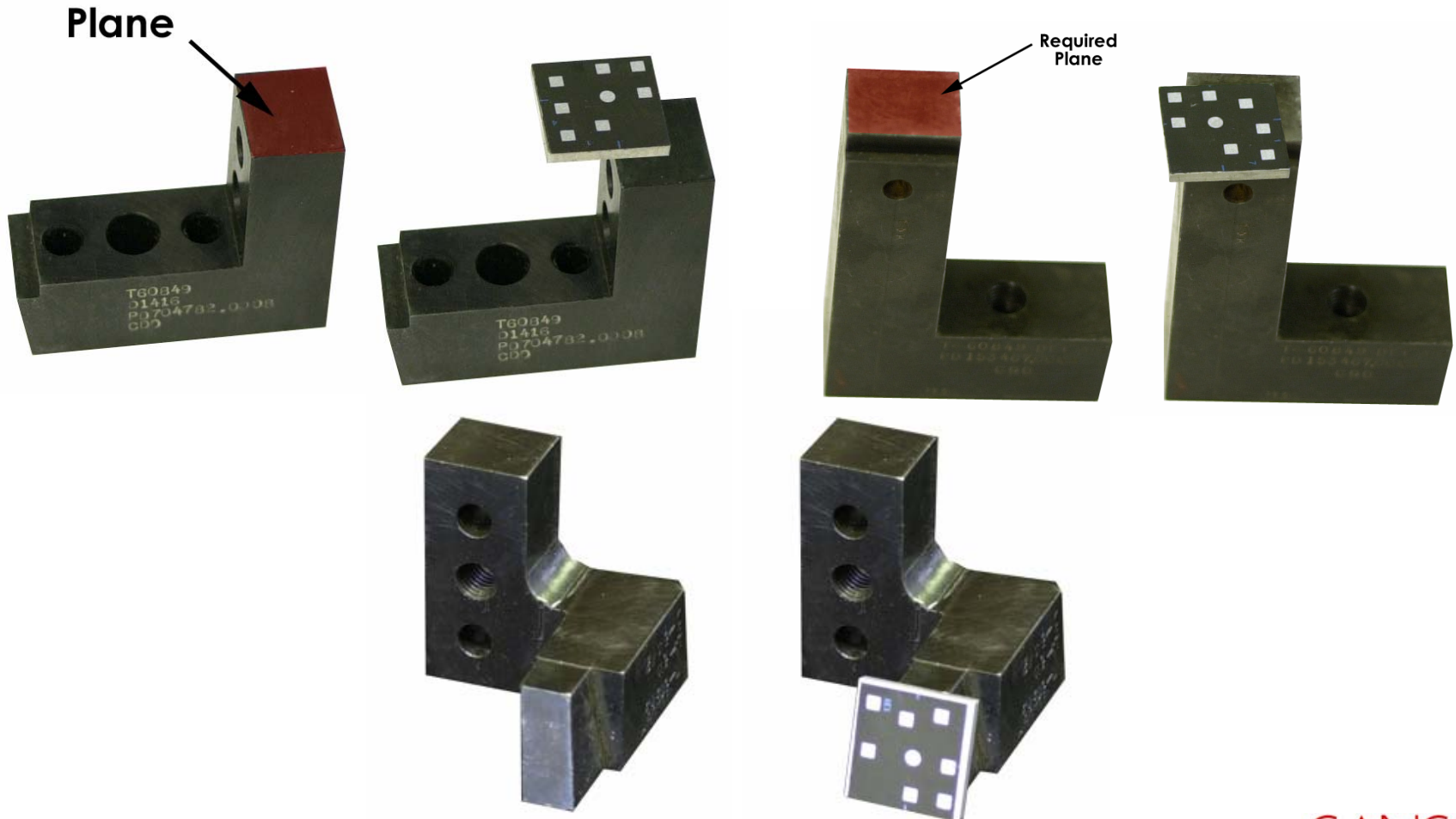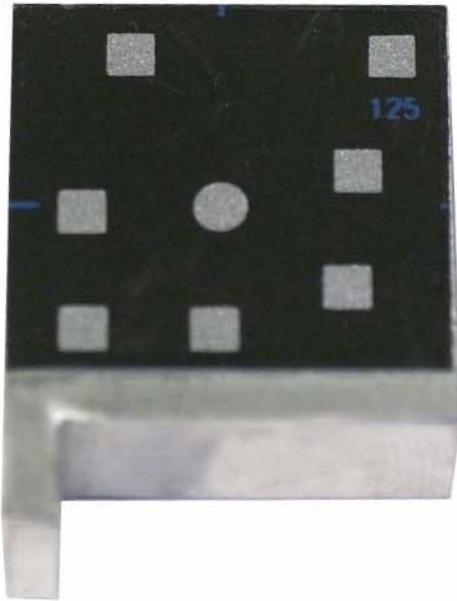- A variety of orientations are available.
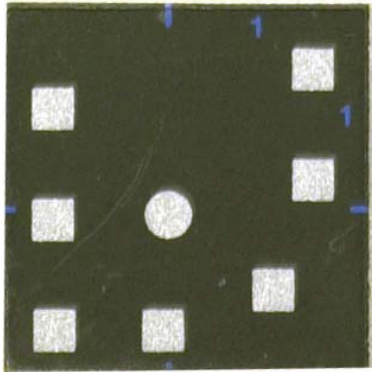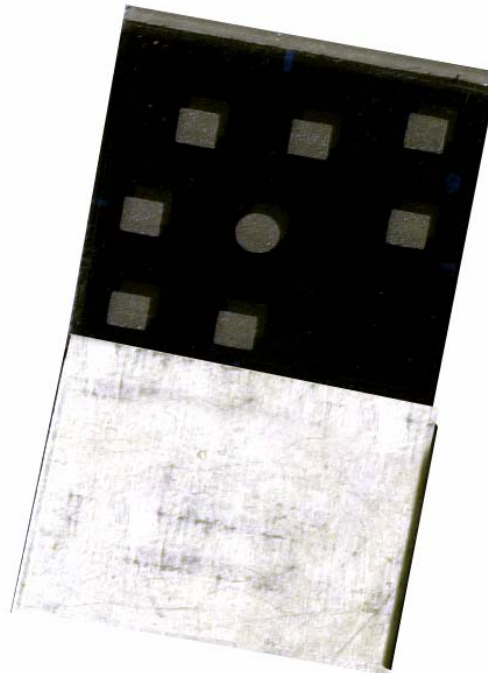
0°   45°   90°

Feature Target Types - Plane

- Examples of plane FTs.
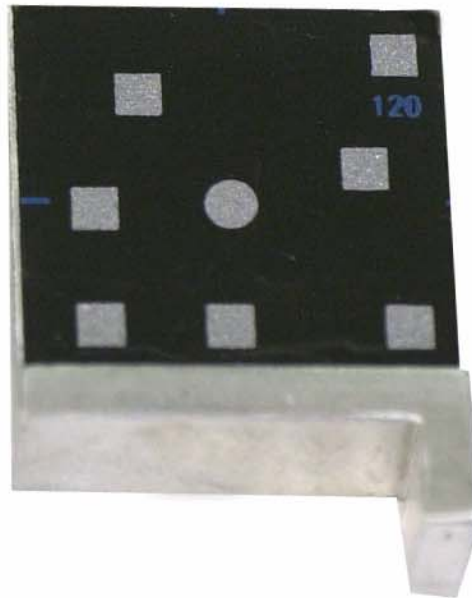

Plane

Required Plane

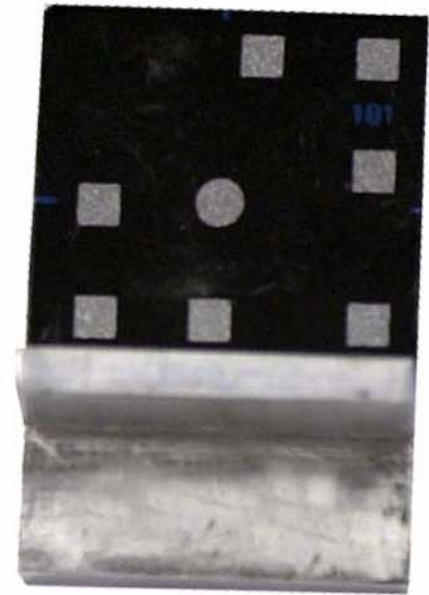# Feature Target Types - Edge

• Edge FTs - Two contact planes and the edge derived by their intersection are defined.
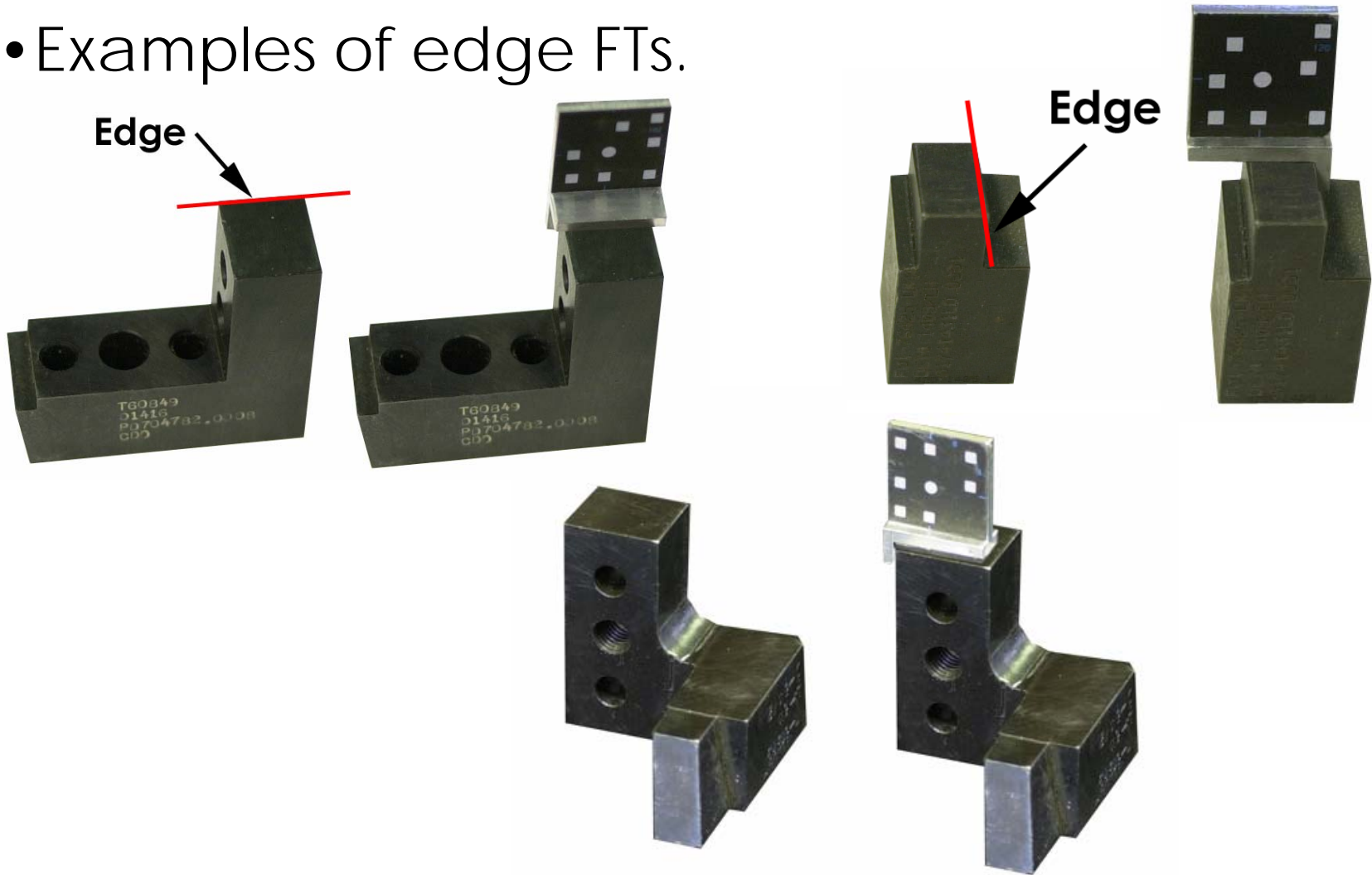

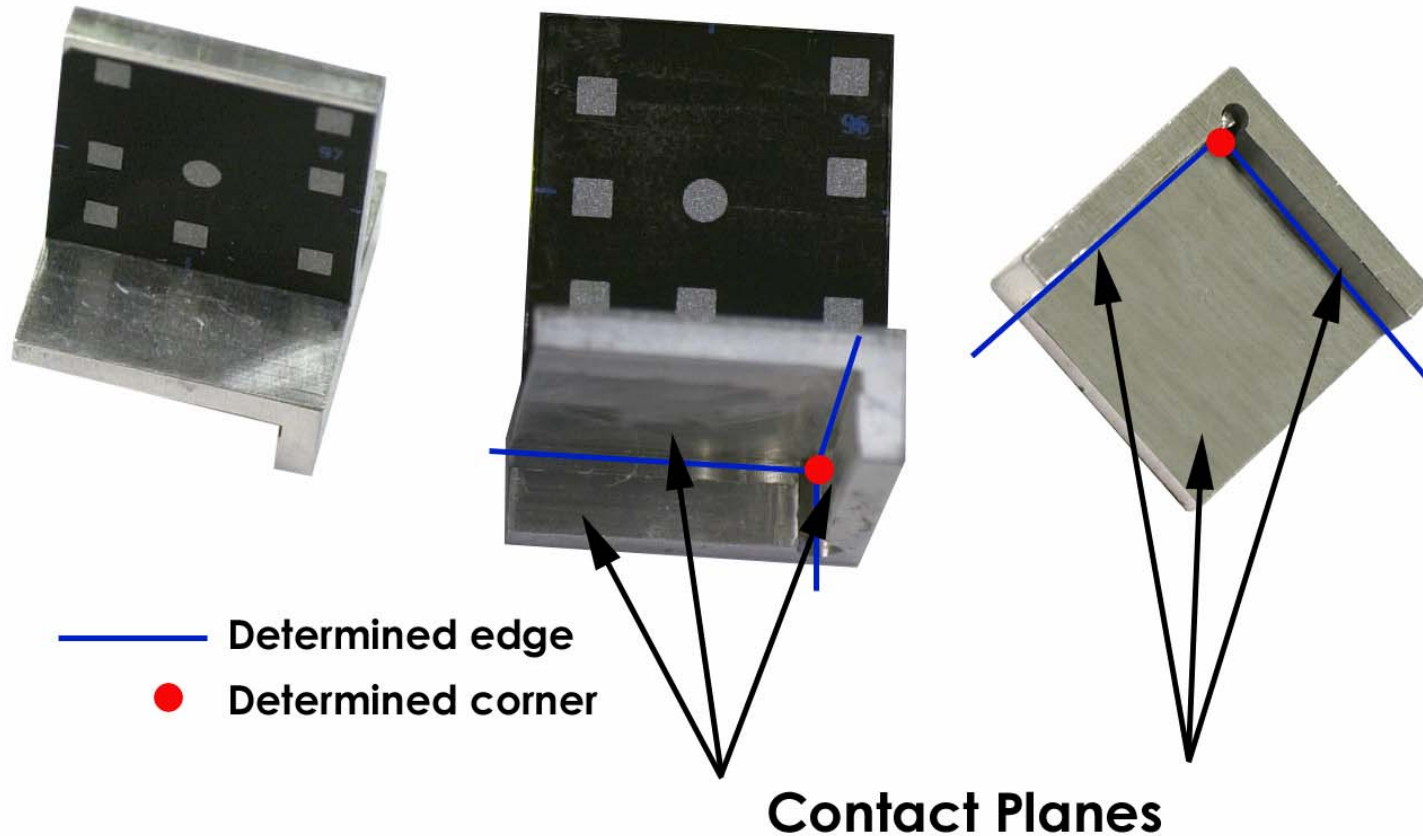Left facing

Right Facing
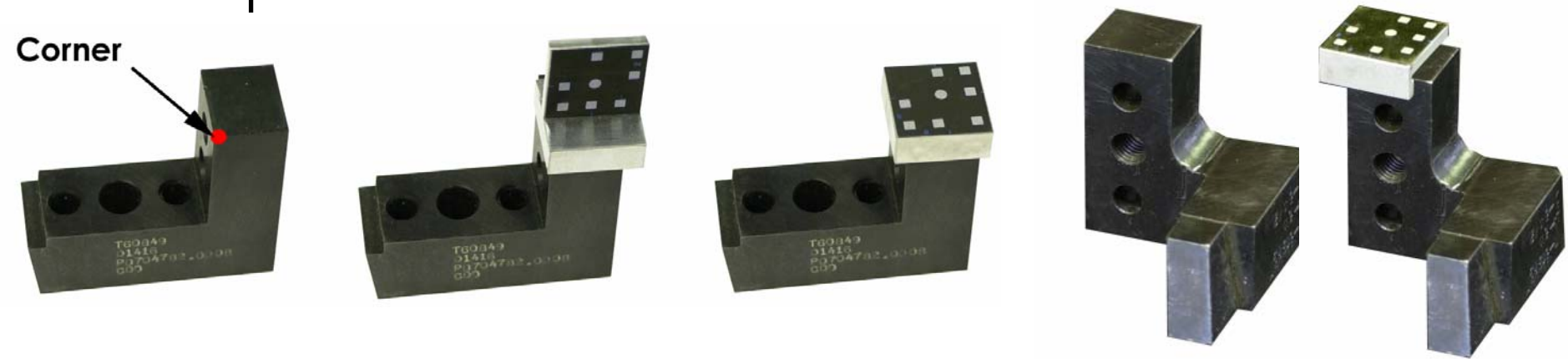
Back Edge

Feature Target Types - Edge

- Examples of edge FTs.

Feature Target Types - Corner

- Corner FTs - Three contact planes, two edges and the corresponding corner are defined.

— Determined edge
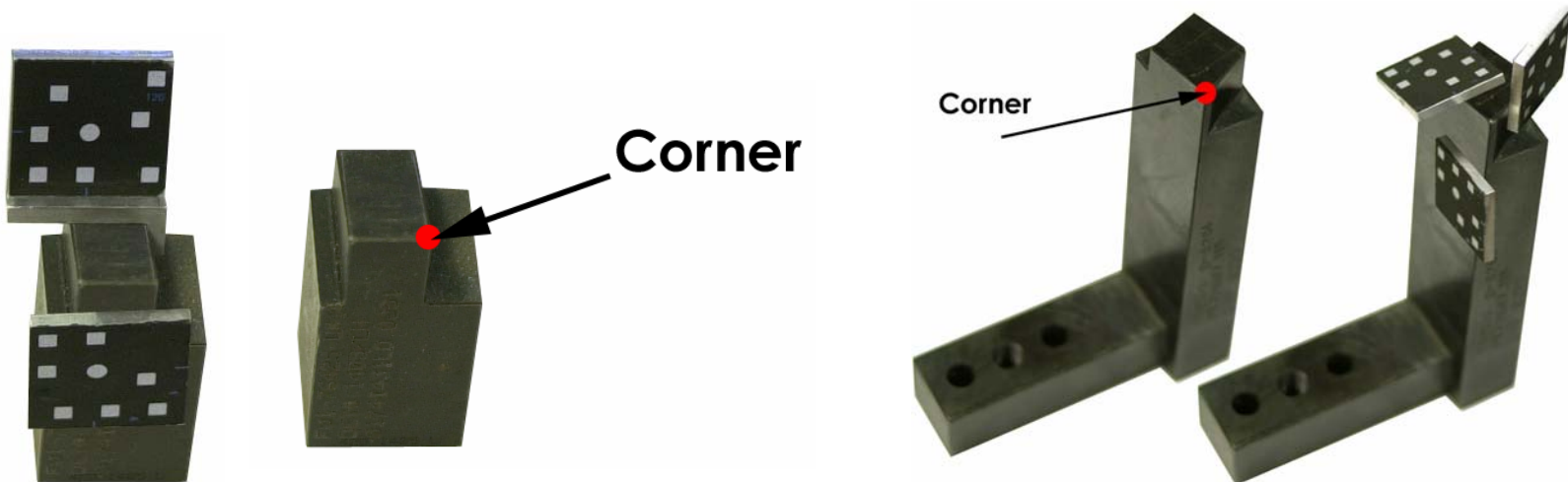● Determined corner

Contact Planes

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Feature Target Types - Corner
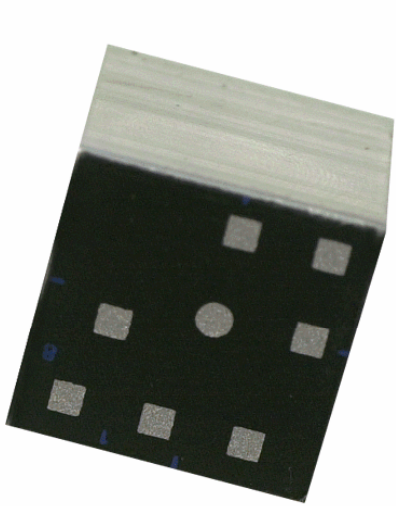
- Examples of corner FTs.
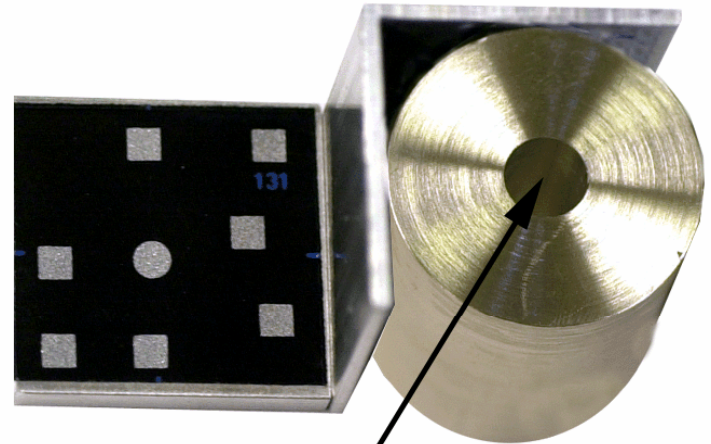

- Examples of combination corner FTs

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Feature Target Types - Circle

• Circle FTs - The center point of a circle with known radius is defined.
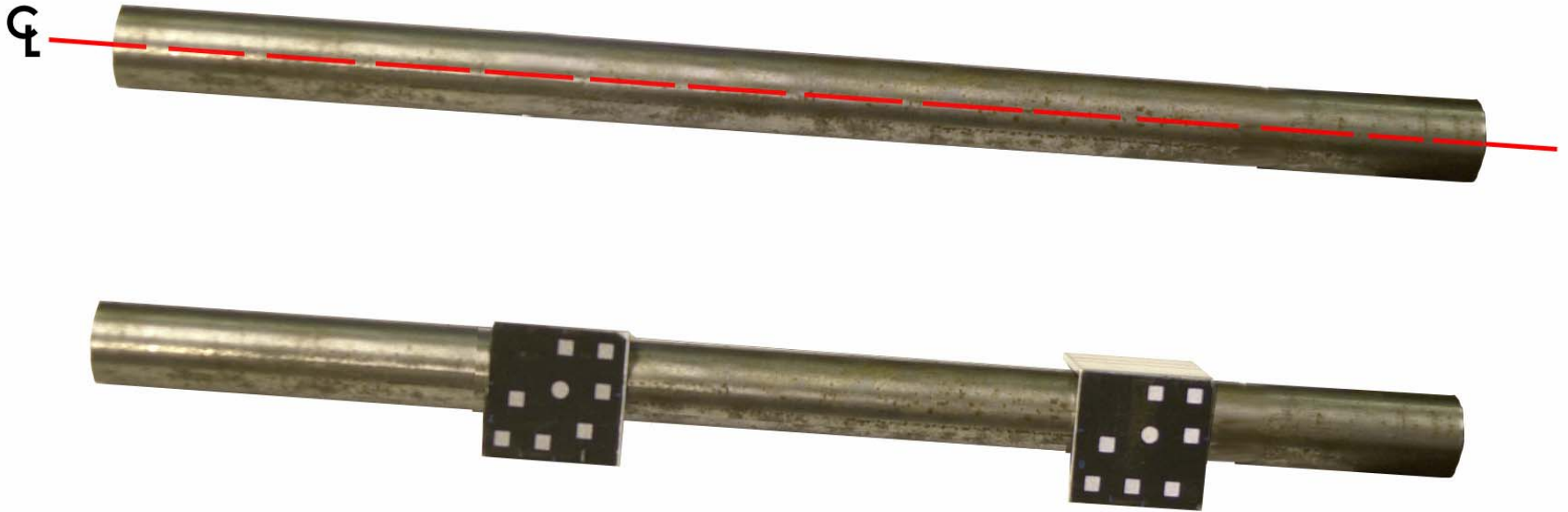

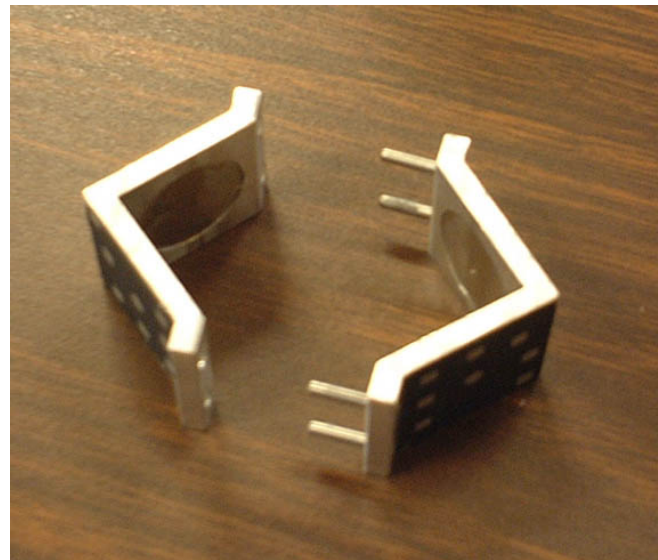**Tangent Points**

Center Point

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Feature Target Types - Circle

- Example of Circle FTs.

Feature Target Types - Circle

• Circle FTs - The center point of a circle with an unknown radius is defined.

• The two right angle FTs move in and out together and are used to determine both the center point of the circle and the circle radius.

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Calibration – Preparation

- Establish calibration field on a Granite block or similar object.

- Granite suited due to its flat surface.

- Add a 2″ gage cube to the granite surface.

2" Block

Calibrate location of all sides, edges and corners realative to granite plate targets.
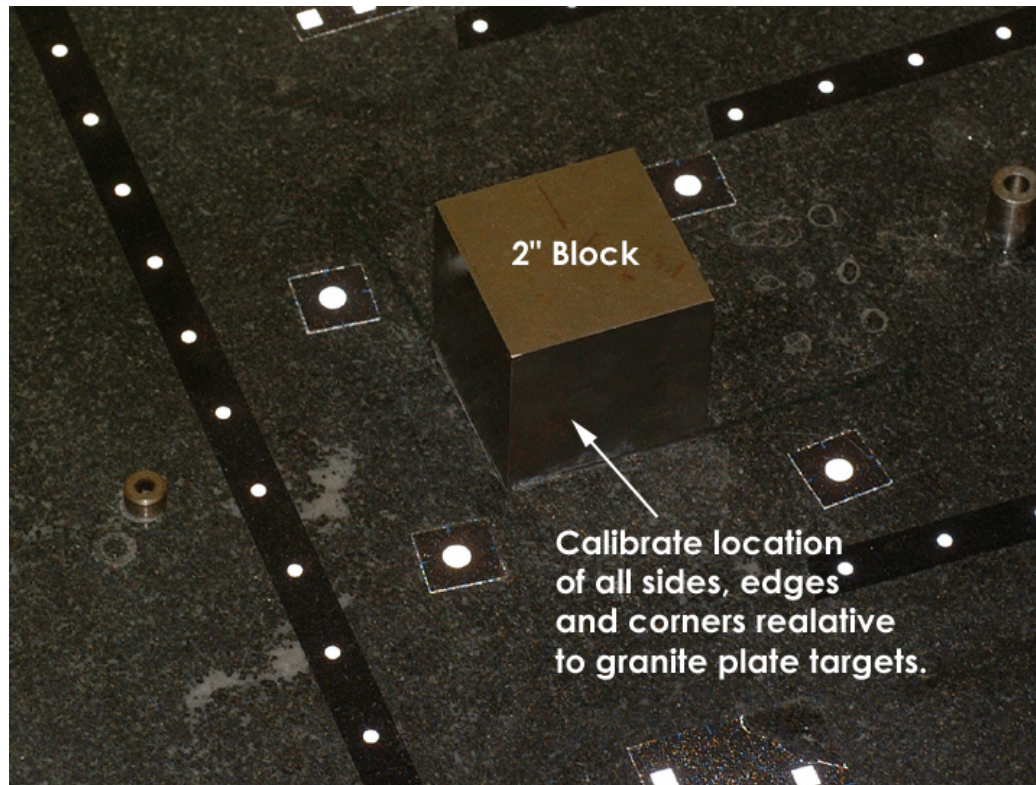
Calibration – Preparation

- Apply targets to each side of the gage cube.

- Measure targets (including codes) and locate the gage cube.

- This becomes the Granite driver file and will be used to calibrate the FTs.

- The file will look similar to the one shown.

Granite Driver

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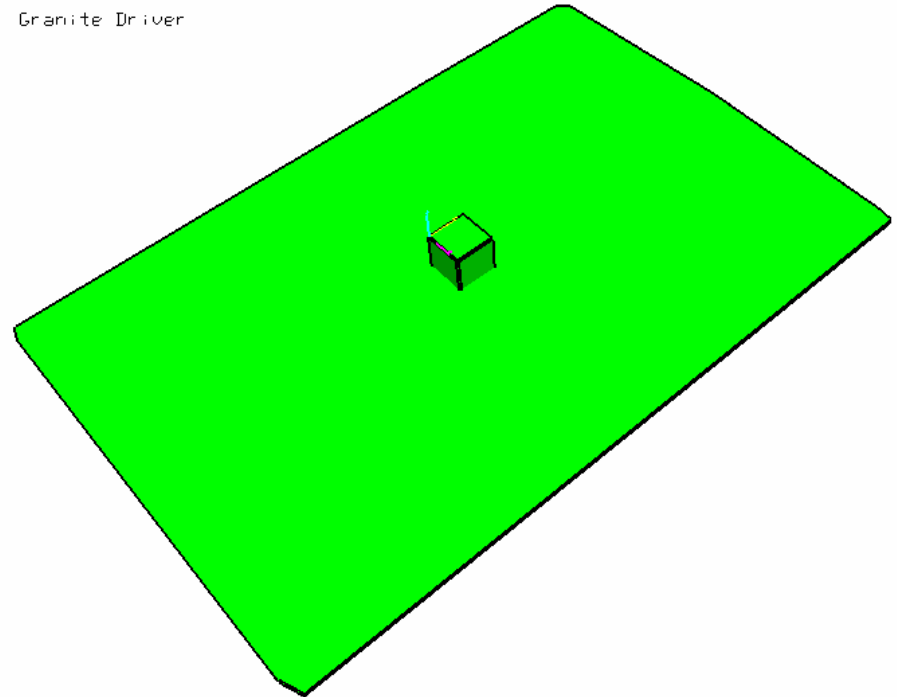
Calibration – Plane Feature Target

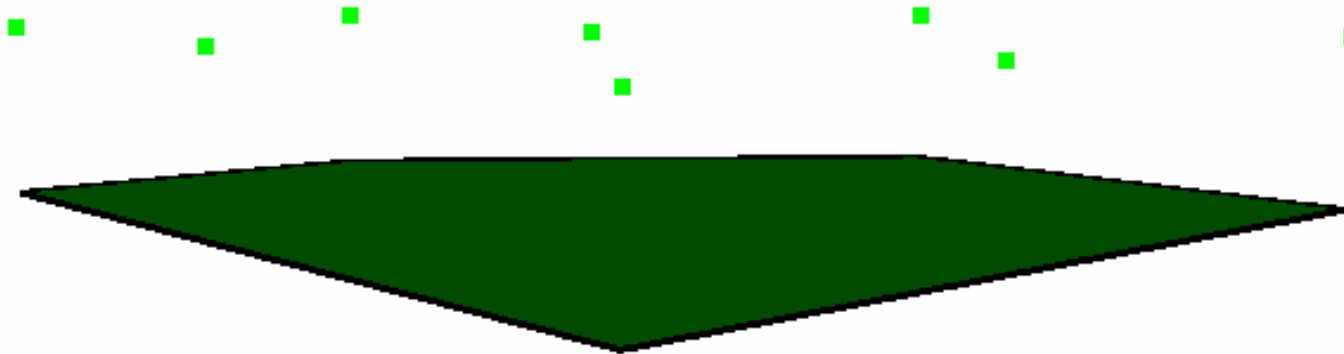- Place FT in area surrounded by normal retro targets.

- Complete photography as normal.

- Determine coded target nuggets.
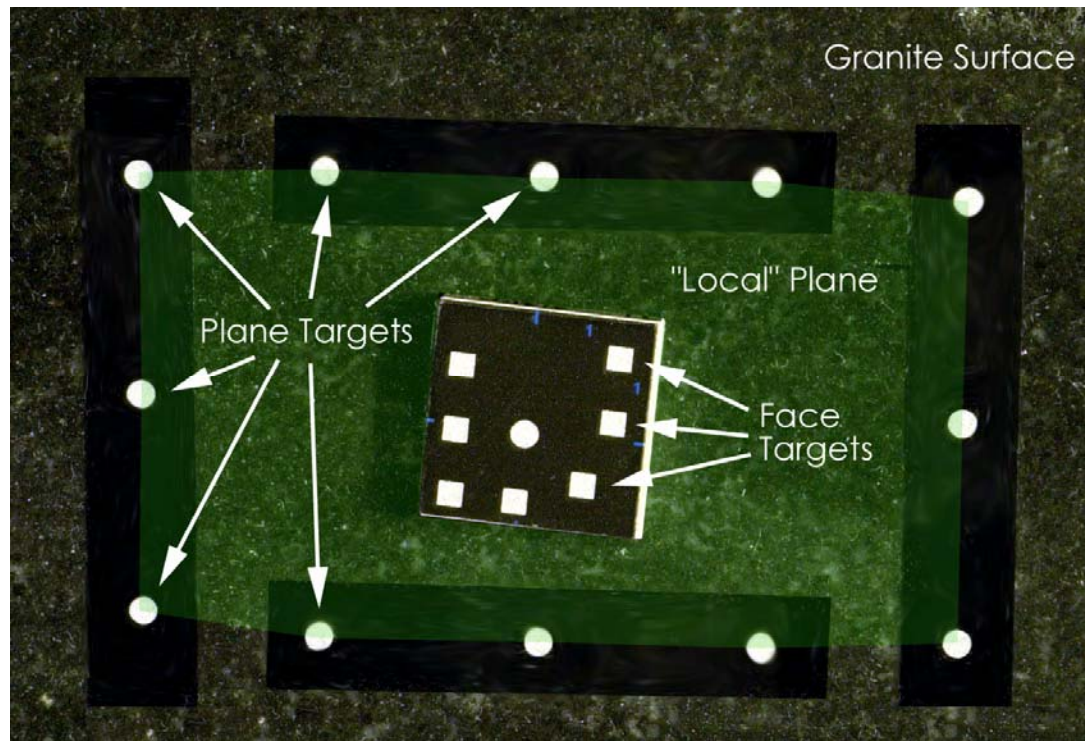
Calibration – Plane Feature Target

- Compute "local" plane. Offset plane by target thickness.

- Copy 3D file and delete everything other than the plane and the coded target points.

- A FT 3D file is shown below.

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Calibration – Plane Feature Target

• Each FT will have its own 3D file. These should be stored in a directory in the GSI system area.

• The file should be given a name that makes it easy to determine the code number used and the type of FT, for example CODE1_PLANE.3D or CODE1_CORNER.3D

• It is possible to have the same code number for different types of FTs. However, you can't use the same number in the one project and you need to make sure that you note which type was used in the measurement.

Calibration – Plane Feature Target

- Multiple plane FTs can be calibrated at the same time.

- To check calibration place targets on a planar surface and verify deviations to surface.


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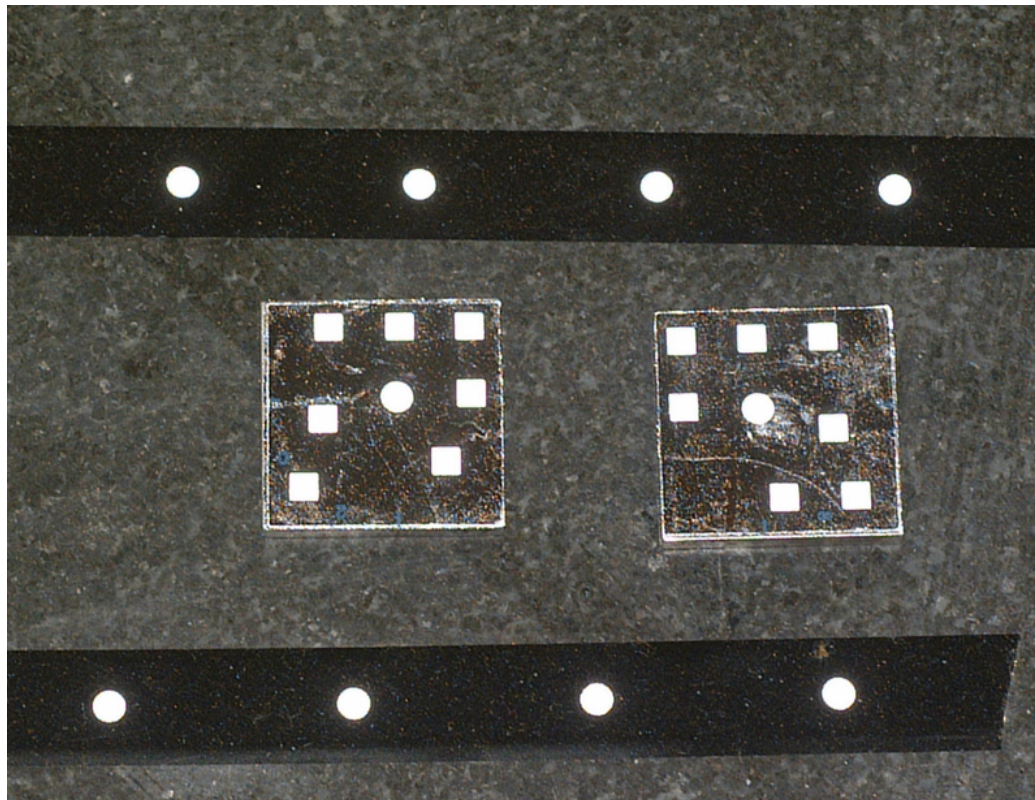
Calibration – Edge Feature Target

- Place FT on coordinated gage cube.

- Complete photography as normal.

- Use Granite surface coordinate file as driver.

- Determine coded target nuggets.

- Copy 3D file and delete everything other than the edge and the coded target points on the FT.

- Circle FTs are calibrated like Edge FTs, but instead of an edge the two contact planes are determined.

- These planes are used to construct the circle.

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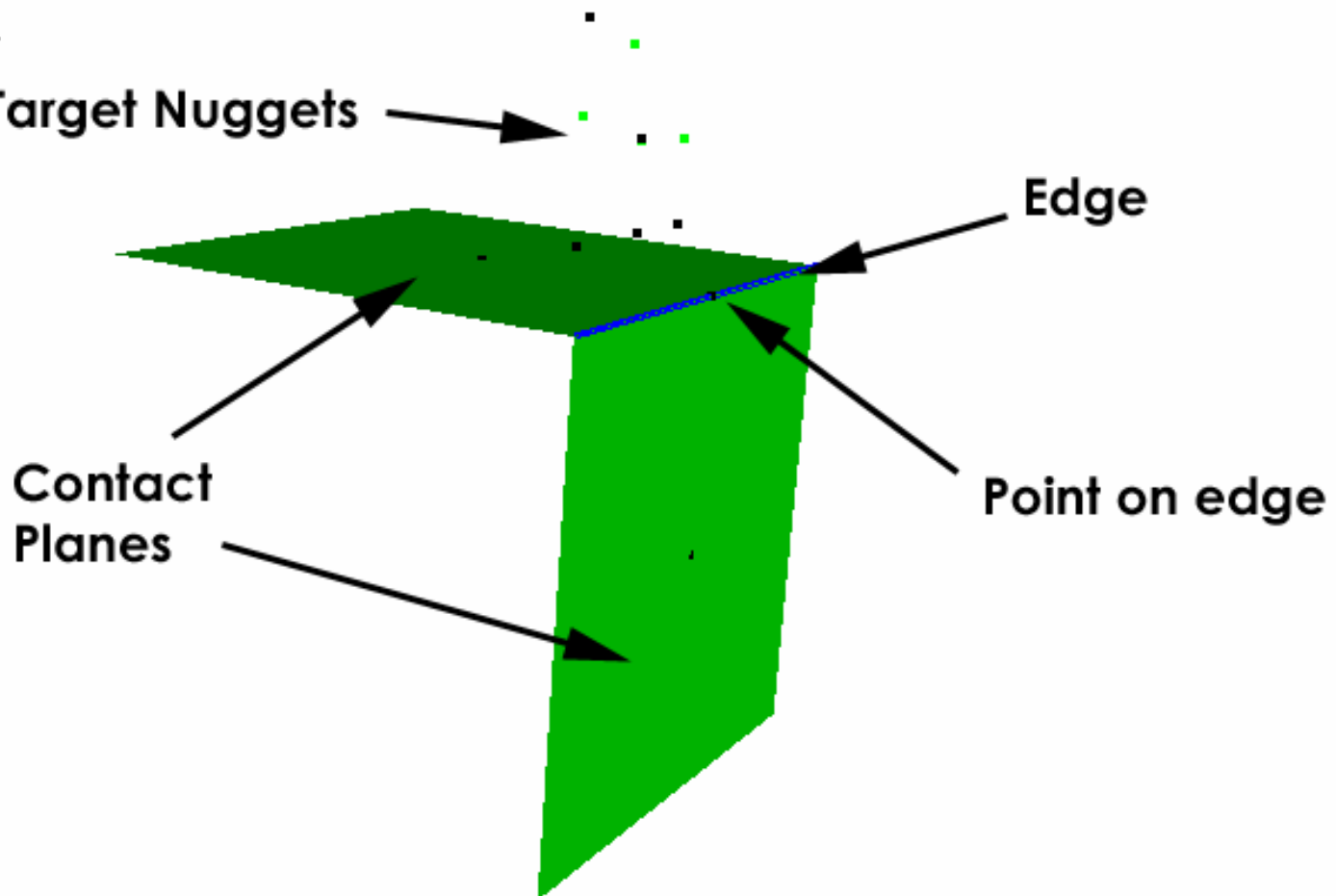# Calibration – Edge Feature Target

- FT Placement will vary depending on the orientation of the target.
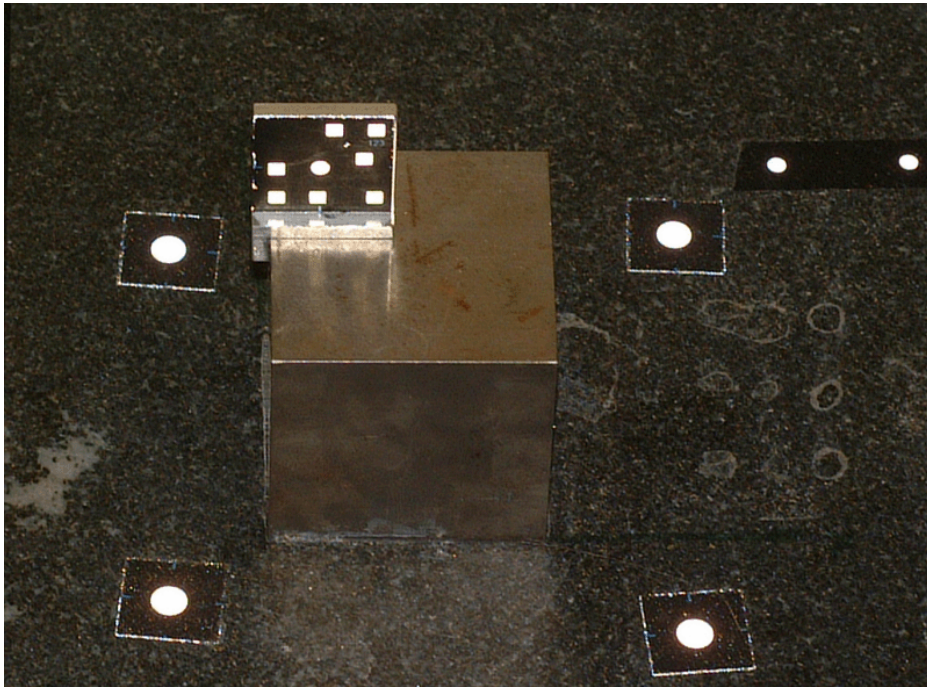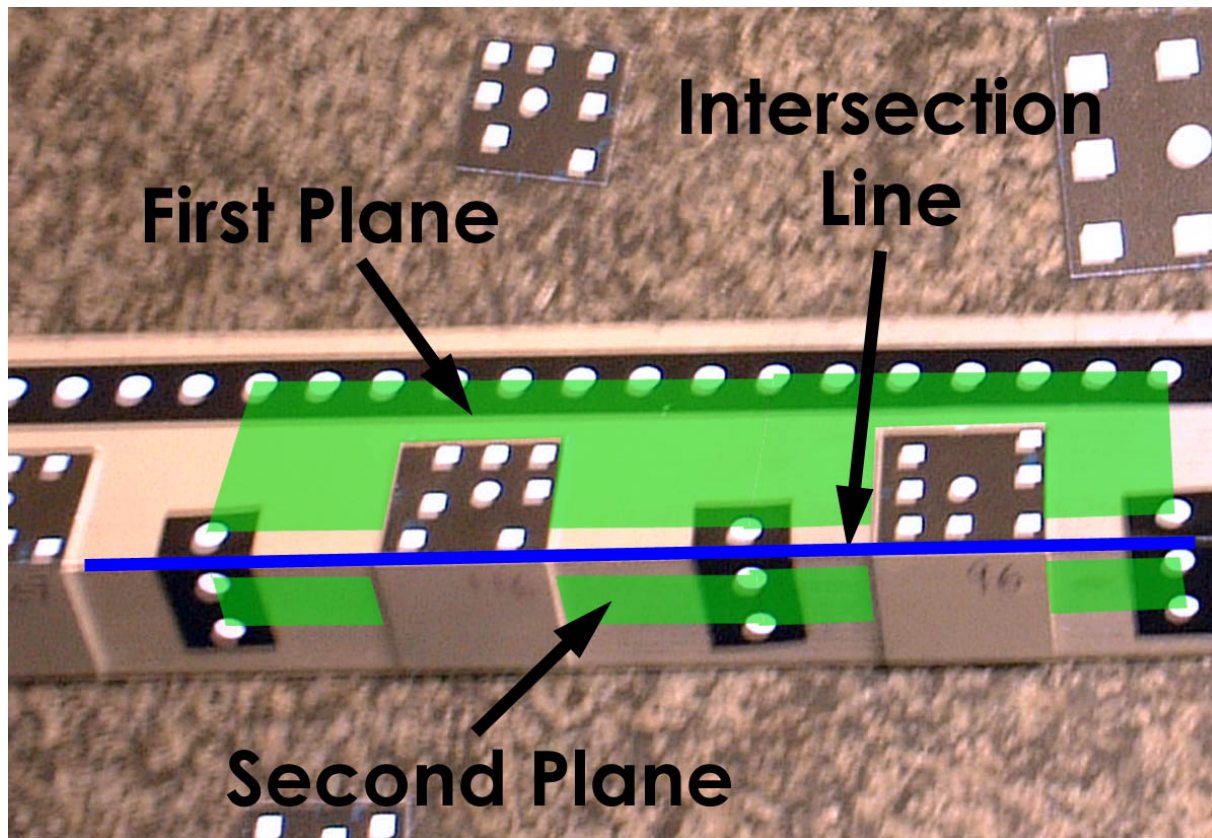
Calibration – Edge Feature Target

- A typical Edge 3D file after calibration us shown below.

Coded Target Nuggets
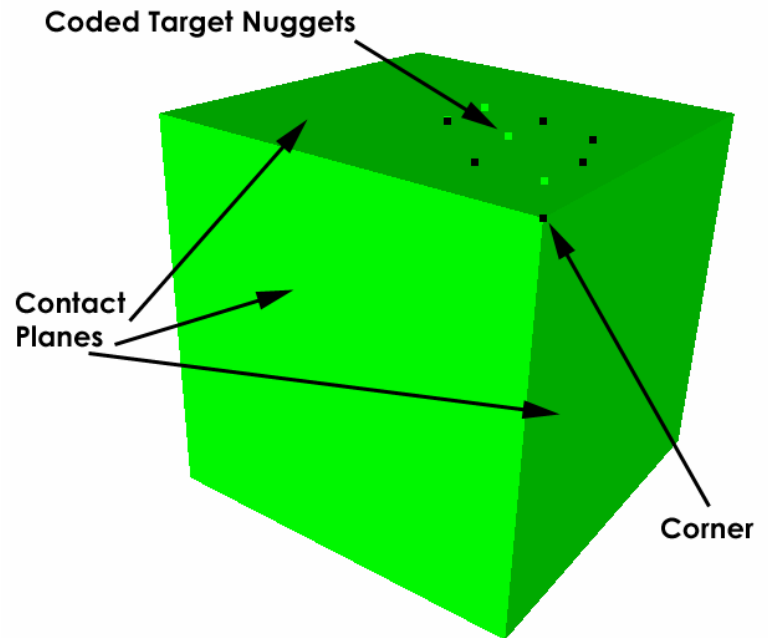
Edge

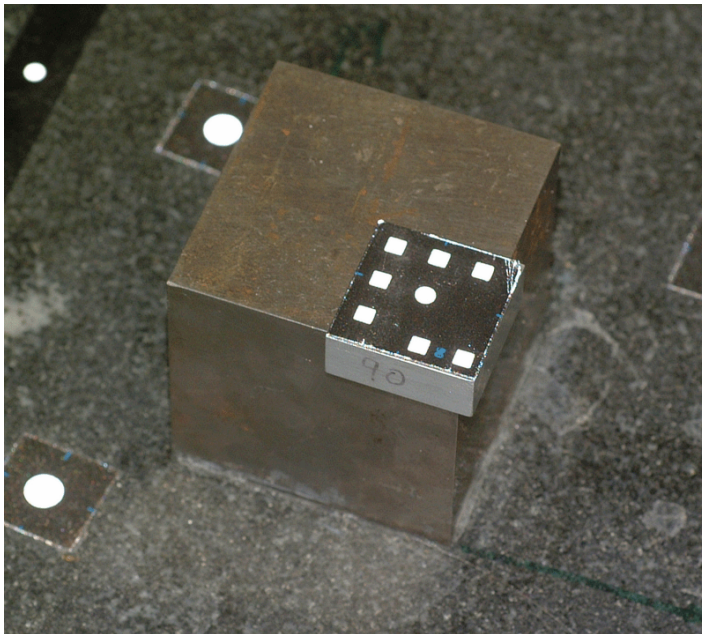Contact Planes

Point on edge

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Calibration – Alternate Method

- A right angle edge can be used to calibrate multiple targets at once.

Calibration – Corner Feature Target

- Corner FTs calibrated like Edge FTs.

Implementation - Targeting

1. Locate the FTs that you are going to use on the features you wish to measure.

2. Keep track of the FT code number that you use.

3. Ensure that you don't use any regular coded targets that have the same code number as the FTs that you have used. This is very **IMPORTANT**!

4. Shoot the photography as you would normally.

5. Take care to capture all the coded targets used.

Implementation - Targeting

To process the FTs.

- Start a new V-STARS project.

- Import each of the FT 3D files that you used. These are imported just like any other 3D file.

- In V-STARS 4.2 and higher, the coded target nuggets are automatically switched on for the codes that are marked as Feature Targets.

- In versions before 4.2 you need to switch the nuggets on prior to processing the images.

Implementation - Processing

- Mark the FT 3D files as Templates by selecting them and then right clicking and selecting "Template File". The 3D icon will change to a T icon.

- Process the images as you would normally.

- After the bundle each of the FT constructions will appear in the current 3D file.
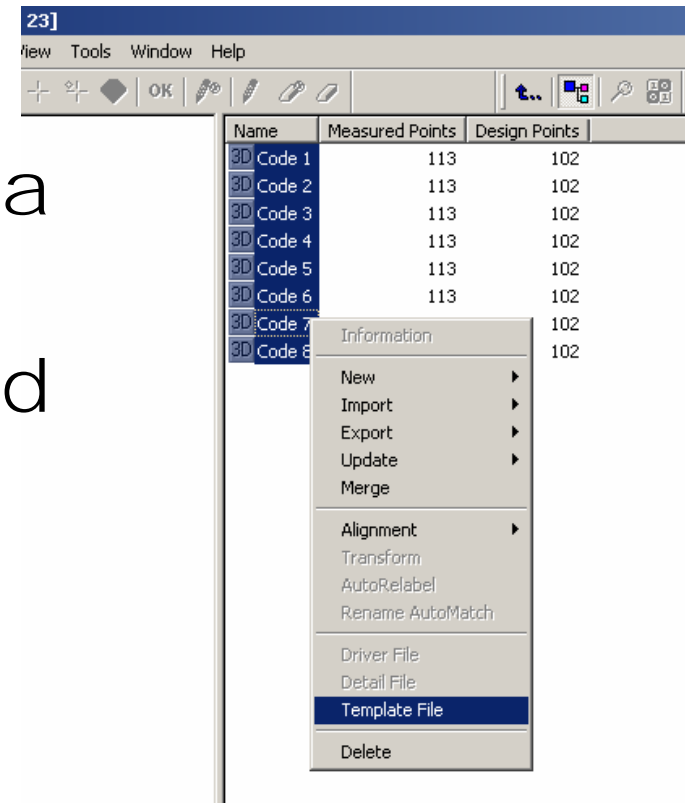
Feature Target – Calibration Demonstration
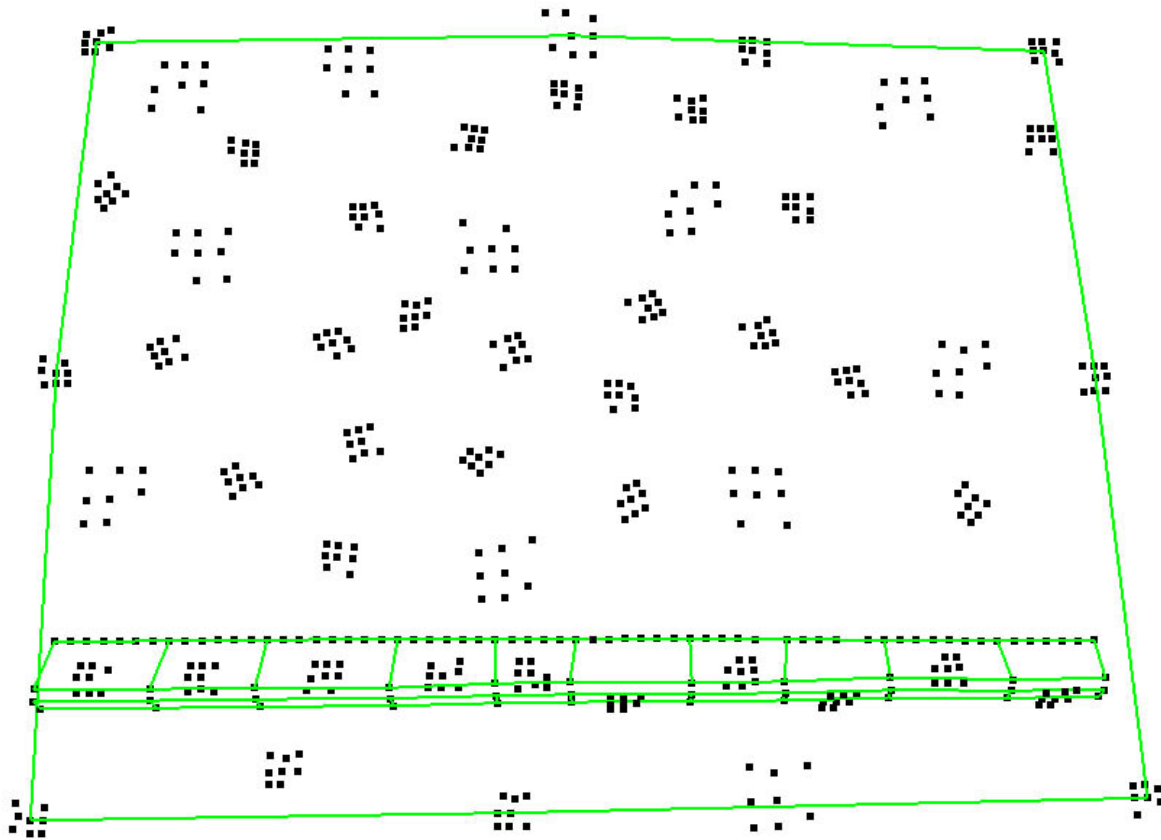
Feature Target – Calibration Demonstration

- Calibration of 15 Plane FTs (red circles)
- Calibration of ten Edge/Circle FTs. (yellow circles)
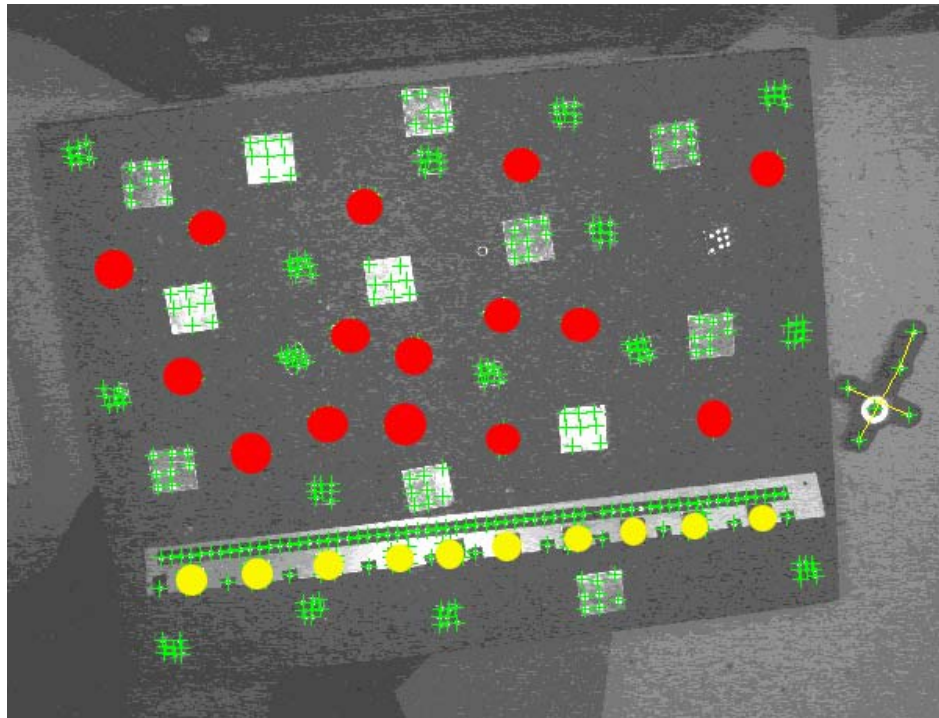
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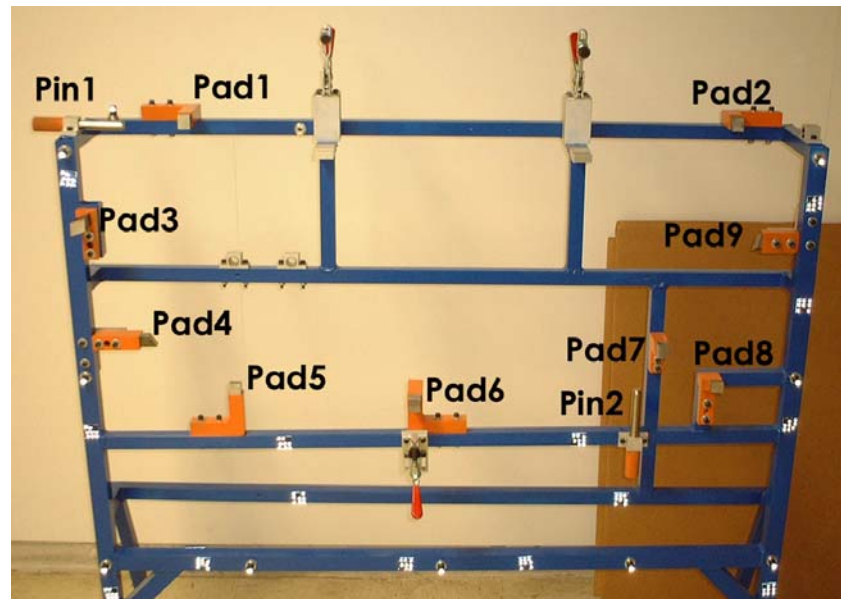# Feature Target – Calibration Demonstration

Feature Target – Calibration Demonstration
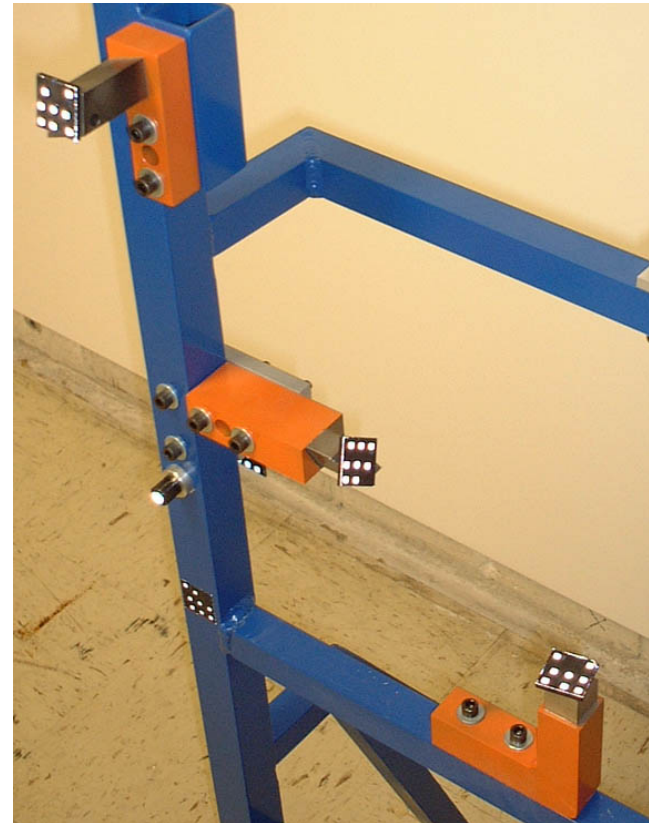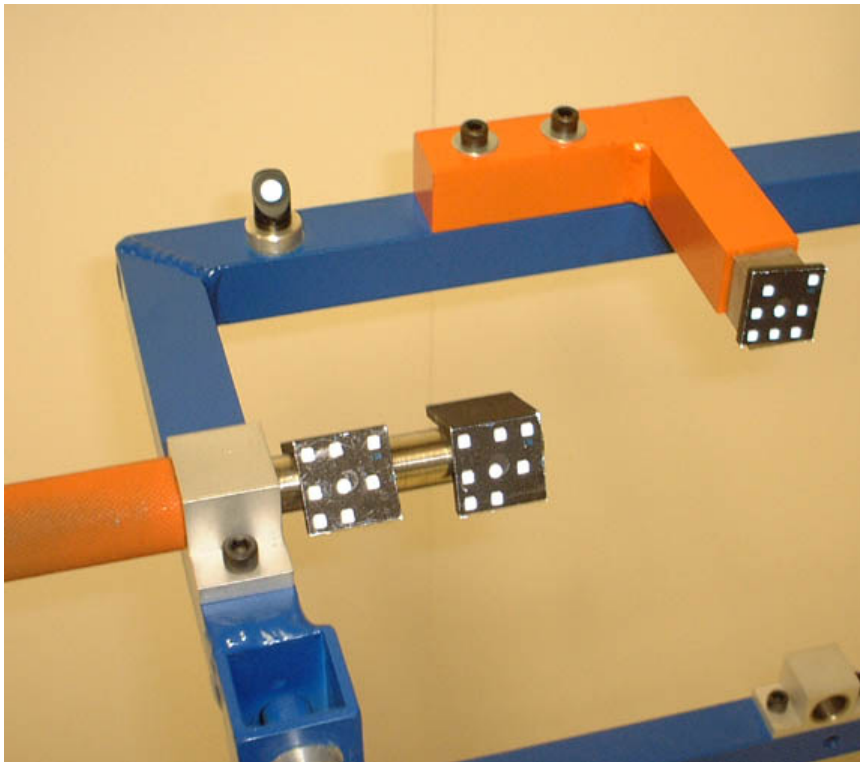
Feature Target – Demonstration

Feature Target – Demonstration

- Object is a mock door holding fixture.
- Task to measure nine pads (planes) and two pin centerlines. Shown in image.

Feature Target – Demonstration

- Feature targets added to pads and pins that need to be measured.

Feature Target – Demonstration

- Images collected and processing completed.
- Pads and circle points then automatically created.

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