Tech Tip - Quick Level and Plumb

The requirement to align objects to Gravity (Plumb & Level) in Large Volume Metrology is common, particularly for large Aerospace Tooling. The process is accomplished using many different types of Measurement Devices such as Optical/Digital Levels, Transits, Theodolites, Total Stations, and Laser Trackers.

To Plumb and Level an object in Verisurf, first the measurement device must have "Tilt Sensors" and be "Oriented to Gravity" through the Verisurf Device Interface (VDI). This process will vary depending on which type device is connected to Verisurf.

Level an Object

To quickly align the measurement device using points on the object and the Gravity Vector of the active Device:

1. Measure points on the object plane to be leveled. These point locations should be "repeatable" to speed the leveling process.

Note: Measurements above jacking points provide greater control during the adjustment process.

2. From the **Alignment Toolbar** select **Feature Align:**

   In the **Feature Align** dialog box the *Primary Plane and Align Axis* must be set to **NONE.** Verisurf then defaults the alignment axis to the Z+ standing axis of the Device that was previously leveled to gravity in the VDI.

   Verisurf automatically sets the point with the *highest Z value* as the Alignment Origin.

   The operator needs only to select **OK** and proceed to leveling the object using a Digital Readout (DRO) from the Device Manager (below right).

3. In the **Device Manager,** select **DRO** from the Toolbar, to open a Digital Readout, using ONLY the Z value, adjust the object until Z is close to 0.0000 within the expected tolerance.

   Using the **Custom** dropdown, the operator may customize the DRO to display 'Z' only.
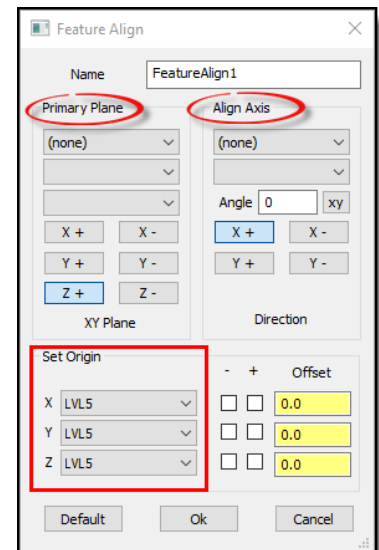
Note: Accuracy and repeatability measurements can be affected by vibration, air movement, instrument instability and large temperature changes.
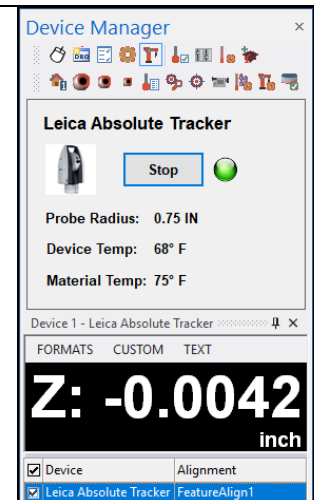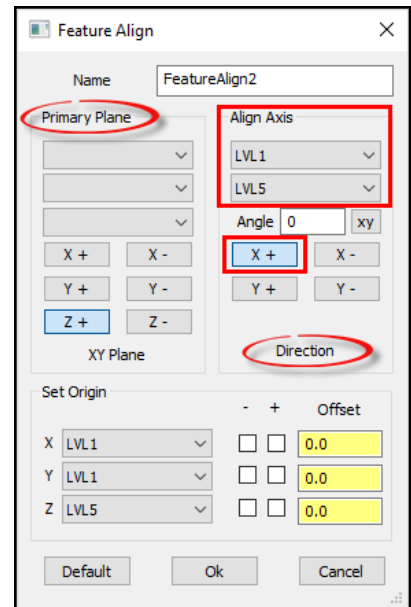

Add Plumb

To "Plumb" means to make vertical relative to gravity. In Verisurf, this capability is enabled by making one adjustment to the **Feature Align** to make it easy to understand for the operator performing the task of "Plumbing". The operator must measure two points at the base of the vertical plane to be "Plumbed". Choose "Align Axis" to create a Working Coordinate System (shown below).

1. The measurement device properly oriented to gravity using the Verisurf Device Interface.

2. Measure the points to be used for leveling the object.

3. Measure Two Points that are parallel to the direction the object must be "Plumbed," these two points will be used to align the Secondary Axis providing direction for the "plumbing" process.

4. From the **Alignment Toolbar** select **Feature Align:**

   In the **Feature Align** dialog box the *Primary Plane* must be set to **NONE.** This defaults the Z+ axis to the Device Z+ standing axis that was previously leveled to gravity in the Verisurf Device Interface.

   In the *Align Axis* group define the Axis that is parallel to the surface/features to be "plumbed". The actual "Level" conditions of these points are not critical as Verisurf uses the "Standing Axis" of the Measurement device to determine the "True" Vertical Axis (in this example Z+). Using the secondary Axis merely provides directional information for the Alignment to aid in the "Plumbing" process.

5. Select **OK** to save the Alignment.

6. In the **Device Manager,** select **DRO** from the Toolbar, to open a Digital Readout. Using the **Custom** dropdown, the operator may customize the DRO to display 'Y' only.

7. To **'Plumb'** the object (using example shown), adjust the 'Y' value until it is close to 0.0000 within the required tolerance to 'plumb' the part.

Please note accuracy and repeatability of measurements can be affected by vibration, air movement, instrument instability and large temperature changes.

NOTE: If the part being Leveled and Plumbed requires significant adjustment, re-measuring and re-aligning may be required to meet the required tolerances. Typically, adjusting an object for Level first is the easiest method, as 'Plumb' will often times be very close after the object has been properly leveled.