CCD Manual Mode: Tip/Tilt/Z (class tipTiltZCCD)

Goal:

Orient the CCDs such that the surface is tangent to the aspheric surface and is in focus.

Since we have drawings of the CI and have the equation of the aspheric surface, we know the nominal CS5 positions of an equilateral triangle centered at the center of the CCD. Thus, we can measure the tip/tilt/Z of the CCDs and instruct the user to make any needed adjustments to the CCD positions.

Module Sudo Code:

1) Ask user which CCD they would like to measure.
2) Tell user to move CMM to CS5 nominal (x,y) of the CCD center.
3) Tell user to move CMM to point A/B/C on an equilateral triangle surrounding the nominal center.
4) Prompt user to create focus curve at A/B/C.
5) Report A/B/C measured best focus and A/B/C nominal best focus.
6) Prompt user to make mechanical adjustments to the A/B/C TTF screws such the CCD is moved to its nominal position on the aspheric surface:

   Z:

   $Z(Center)\_measured = Z(Center)\_nominal$

   $A(Z)\_measured = A(Z)\_nominal$

   $B(Z)\_measured = C(Z)\_measured = B(Z)\_nominal = C(Z)\_nominal$

   Tip:

   $A(Z)\_measured = A(Z)\_nominal$

   $B(Z)\_measured = C(Z)\_measured = B(Z)\_nominal = C(Z)\_nominal$

   North, West, South, and East CCDs:

   $A(Z)\_measured > B(Z)\_measured$ && $C(Z)\_measured$ (by a known distance)

   Center CCD:

   $A(Z)\_measured = B(Z)\_measured = C(Z)\_measured = A(Z)\_nominal$

   $= B(Z)\_nominal = C(Z)\_nominal$

   Tilt:

   $A(Z)\_measured = A(Z)\_nominal$

   $B(Z)\_measured = C(Z)\_measured = B(Z)\_nominal = C(Z)\_nominal$

Verification:

7) Prompt user to move to the nominal CCD center
8) Prompt user to create focus curve of nominal CCD center to verify that the CCD center is at the proper Z.
9) Report:
   a) CCD tip/tilt/Z
   b) A(Z)/B(Z)/C(Z)
   c) Z_errors
   d) Z_tolerances
   e) CI_rotation(Z)
   f) CCD Center image row and column information
   g) CCD origin row and column position relative to CMM probe location