

COMPASS "Global" Macro PolyFit

```
*****
'Routine to calculate the coefficients of multiple
'orders of polynomial fits (1-5) on the given set of data
,
'The formula is the standard least squares regression
'formula
,
'y = a0 + a1X + a2X^2 .... anX^n
,
,
'Y   array of Y axis data (typically the Reference Data in a)
'X   array of X axis data (typically DUT Test Data)
'   NOTE: This is pretty confusing since the formula is called
'         regression of Y onto X.  It actually is forcing the X
'         Data to look like the Y data.
,
'Res(4,7)   - (order, coefs) of each fit performed (see formula above)
'           (0,0)   - a0   of First order fit
'           (0,1)   - a1   of first order fit
'           (1,2)   - a2   of second order fit
'           Coefs 6,7 are always Correlation and Standard estimate
'           of error (SEE) for the fit order
,
,
'FitMode : A bitwise value that determines which fits to use
'         When this value is zero, do them all
'         Set bit 0 for 1st order, bit 2 for 3rd order ect.
'         =0  Deterime coefs for 1 - 5 order regressions
'         Set Bit 0   - First Order Fit Only (1)
'         Set Bit 1   - Second Order Fit Only (2)
'         Set Bit 2   - Third Order Fit Only (4)
'         ect...
,
'Return true if all is OK, and false other wise
,
*****
Public Function Poly_Fit(X(), Y(), Res(), FitMode )
Dim msg
Dim Y_avg
Dim X_sum
Dim Y_Sum
Dim XY_Sum      'Sum of X * Y
Dim X2_sum      'X square sum
Dim Xp(14)      'Summed Powers of X
Dim XpY(14)     'Summed Powers of X * y
Dim r, c, tot, i, j, inc
Dim Coefs(), Results(), Mat()  'value arrays
Dim rtv, pts

pts = UBound(X)
'-----
' Determine the various sums required to determine
' the supported fits
'-----
```

```

For r = 0 To pts 'loop for the number of test points
  X_sum = X_sum + X(r)
  X2_sum = X2_sum + X(r) ^ 2 'Sum squared
  XY_Sum = XY_Sum + Y(r) * X(r)

  For i = 1 To 14
    Xp(i) = Xp(i) + X(r) ^ i
    XpY(i) = XpY(i) + X(r) ^ i * Y(r)
  Next

  Y_Sum = Y_Sum + Y(r)
Next

.....
'Determine the polynomial matrices to fit the 1st - 5th order
'data and get their coefficients. The general equation set is:
,
'b0n + b1 Xsum + b2 X2_Sum ... bn Xn_sum = X0Ysum
'b0 Xsum + b1 X2_sum + b2 X3_Sum ... bn X(n+1)sum = X1Ysum
'b0 X2Sum + b1 X3_sum + b2 X4_sum ....bn X(n+2)sum = X2Ysum
','
'b0 XnSum + b1 Xn+1_sum +.....bn X(n+n)sum = XnYsum
,
'where X4_sum is X to the 4th power sum
.....
For i = 0 To 4
  If (FitMode And 2 ^ i) <> 0 Or FitMode = 0 Then
    ReDim Mat(i + 1, i + 2)
    ReDim Coefs(7)
    ReDim Results(1)

    'Build the Augmented matrix for Gauss determination
    For r = 0 To i + 1
      For c = 0 To i + 1
        Mat(r, c) = Xp(r + c)
      Next

      Mat(r, c) = XpY(r)
    Next

    If pts >= 1 Then
      Mat(0, 0) = pts + 1
      Mat(0, i + 2) = Y_Sum
      rtv = MatrixCalcGauss(Mat, Coefs)
    End If

    Coefs(6) = gINVALID
    Coefs(7) = gINVALID

    If rtv Then
      Y_Avg = Y_Sum / (pts + 1)

      If Get_Correlation(pts, i, Y, X, Y_Avg, Coefs, Results) Then
        Coefs(6) = Results(0)
        Coefs(7) = Results(1)
      End If

```

End If

For inc = 0 **To** 7

 Res(i, inc) = Coefs(inc)

Next

End If

Next

Poly_Fit = **True**

End Function