



# 4215 Plus Polynomial Instructions

These instructions provide some of the basic operations for the 4215 Plus, from selecting the load cell to entering the coefficients. More details can be found in the 4215 Plus v5.0.6 manual.

## Setup the 4215 Plus for Polynomial Calibration

To use the Polynomial Coefficients to solve for force:

1. Plug in the load and power on the indicator.
2. Select the appropriate channel – This is done by pressing the **Item <** and the **Unit >** buttons together to bring up the menu. Once in the menu press the **Item <** or **Unit >** to scroll through the menu and find Sensor Options, hit **Enter**, then scroll to find **Select Sensor Data**. Click the **Enter** button. Select the Channel (likely A) hit **Enter**, and then press the **Item <** to scroll and find your load cell S/N and hit **Enter**.
3. If calibrated by Morehouse, the load cell S/N will be the serial number of the load cell with a C behind it for compression and T for Tension. For example, a load cell with S/N U-10234 would be programmed by Morehouse as U-10234C for the compression channel and U-10234T for the tension channel.
4. The indicator should now be in **Select Sensor Data**, hit the **ESC** button twice to return to live readings.



5. Make sure the display is set to use the polynomial formula. To do this one line must be set to **PolyA** and force units and the other line should be set to **LoadA mV/V**. This is done by using the



**Enter** button to toggle between the lines and the < and > keys to toggle units on the right side and display values on the left. The < toggles between LoadA, PeakA, Valla, Pos, Vel, Lmts, GrsA, Poly A. You want one line to be in PolyA. The > will toggle units lbf, kgf, N, Psi, MPa, Klb, kN, t (metric ton), mV/V, gf. The line that reads Poly should be in force units as shown above.

- Hit **Enter** to arrow to the second line. This line should be set to LoadA and mV/V using the < or > arrow keys.
- Once selected, the **Tare** button will zero the mV/V readings. Whatever the B0 coefficient from the calibration report is will be shown for the force readings.



Correct



Incorrect

**Note: The unit will not read zero in Poly. It will zero when in load, which will yield incorrect results. The figure above shows the correct configuration to use the polynomial equation.**



## Entering Coefficients

$$\text{Force (lbf)} = B_0 + B_1R + B_2R^2 + B_3R^3$$

where: R = Response (mV/V)

$B_0 = -7.030104E-02$   
 $B_1 = -1.200137E+03$   
 $B_2 = -4.599537E-01$   
 $B_3 = -3.135373E-02$

If Morehouse performed the calibration, then coefficients will be entered at the time of calibration. The way to verify the coefficients is to compare the force applied values on the certificate against the fitted curve values.



The quickest way to verify that the coefficients have changed is to compare what is read when the indicator is on the PolyA force units, and LoadA mV/V. The PolyA value in force units is the same as the B0 coefficient when the tare button is pressed.

To enter coefficients:

1. Power on the indicator.
2. Press **Item** < and **Unit** > at the same time to enter the setup menu.
3. Use either **Item** < or **Unit** > to scroll through the indicator to find the Calibration Menu.
4. Hit **Enter** on the Calibration Menu and then scroll > to **Polynomial Cal.**



5. Hit **Enter**, and the indicator will prompt you to select Channel A. Hit **Enter**.
6. Enter a S/N. Morehouse recommends entering the load cell S/N followed by a **C** for Compression or **T** for Tension.
7. Set the Month, day, year.
8. Select excite level to 10V by using the < and > keys unless the calibration certificate has 5 V DC called out on it.



9. Select the force units found on your certificate. Typically, it is lbf.
10. Enter the Load Cell Capacity (Rated Load) using the +, -, <, and > keys and the Polynomial Degree. The degree will be the largest B coefficient. If B3 is the last coefficient, the degree will be 3.



11. The indicator will prompt for Mantissa 0, which is the number without the exponent. In this example, it would be -7.030104. Enter 7.0 using the + or - to scroll through the numbers and move the digits using < so the display reads 07.0. Since there is a (-) sign the indicator should be **07.0** with the 0 selected. At this point, press + **Tare** and - **Reset** at the same time to display the (-) sign. The meter should now read -7.0, continue to scroll through, entering the 30104 so the display reads -7.030104. Hit **Enter**.



12. The next screen will prompt to enter the exponent. In this example, we want to enter -2. Use the + or - to toggle to 2, then use < to move so 02 is displayed. Now hit + **Tare** and - **Reset** at the same time to enter the (-) exponent.



13. Repeat steps 11-12 for each degree coefficient until the end.
14. The indicator will display No Masses Ready? Make sure the load cell is attached as this will store a shunt cal value. When complete the indicator will read Ch A Sensor Data S/N XXXXXX .
15. Hit **Esc** twice and follow the instructions above to set the indicator up to read properly.
16. Double-check numbers using a simulator and equation, or compare values against the calibration report between the force applied and predicted response.

A complete manual is available at [www.mhforce.com](http://www.mhforce.com).