Tuning the PID

Whilst there is no rule to tuning the PID values, we suggest the following (rather simple) approach:

1. In the **Advanced Motor Control** dialog, un-check the **PID Enabled** field, and set the **Max Voltage**, **Max Current**, & **Timeout** values, press the **OK** button to close.
2. Enable the motor drive circuit (press the **Disabled** button in the motor control section of the **Scanner Setup** dialog).
3. Calibrate the encoder's **Pulses per millimetre** value.
4. In the **Advanced Motor Control** dialog, set *D = 0*, *I = 0*, *P = 100*, and tick the **PID Enable** box.
5. The **Sample Rate** needs to be set with consideration of the pulses/mm given by the encoder.
    a. Less than 50 pulses/mm - 50Hz
    b. Less than 500 pulses/mm - 100Hz
    c. Less than 1000 pulses/mm - 500Hz
    d. Any other value - 1000Hz

2. Set the required Speed and Acceleration; say *25mm/s*. (we normally set the two values the same).
3. In the **Scanner Setup** dialog, set the **Current Position** to *0* (press the **Zero** button).
4. In the **Move To** field set a position you want the scanner to move to (e.g. 500), and press the **Enter** key.
5. The scanner will now move to the commanded position. However because of the initial small *P* term, and *I = 0*, the move will probably under-shoot.

Note: *If the scanner moves-off at high speed, you will need to toggle the* **Reverse Motor Drive** *field in the* **Advanced Motor Control** *dialog.*

6. Move the scanner back to zero, increase the *P* term by *50*, and repeat steps *7 through 10* until the under-shoot is less than 1mm or the ***P*** term reaches 1000.
7. The **I** term is used to dial out the under-shoot. Start with a value of say *20* and repeat moving the scanner, increasing I (by *10 or 20* each time) until you are happy.
8. If the value of **I** is too large it can cause oscillation, so we suggest a maximum value of *300*, or *60%* of *P*, whichever is the smallest.

Note: Most controllers do not have a *D* term, so its value may be left at *zero*. If however you wish to use it, we suggest making it *50%* to *70%* of *P*.Pressing **F6** on the keyboard opens a dialog that displays some details of the PID operation; the operator may find it useful.

The blue line is the *current error* value (there is a multiplier on the bottom left of the dialog so small values can be seen), and the green line is the *motor drive* value.

Interface Trigger Setup

a. Enter all the setup parameters in the **Collection Hardware Setup** windows.

b. Ensure that the velocities (including the couplant velocity) are correct. *See **How to Measure Velocity** in **Appendix B** for guidance if required.*

c. Click the **Gates** button on the **Channel** page.

d. Place the transducer in position on the wedge (for contact testing) or immerse in the couplant without a wedge for immersion testing.

e. Place **Gate 1** over the *wedge/sample* signal (contact testing) or the *couplant/sample* signal (immersion). **NOTE:** If the near surface of the test item in an immersion bath is uneven, ensure that the interface gate **(Gate 1)** encompasses all these signals. The interface signal can be verified by measuring the path between repeat signals in the water path or repeat wedge signals by enabling the **I/F Trigger Setup** check box: this changes the A-scan measurement from **Test Piece Velocity** to the **Couplant Velocity**.

f. Now enable the **I/F Trigger** check box. The first signal that breaks the Interface gate threshold is referenced as **zero**. If the signal drops below the gate threshold, a warning message, **Interface Not Detected**, appears in the A-Scan window.

g. When **Gate 1** is designated as the **Interface Trigger** (IF box checked), **Gate 2** automatically becomes the normal measurement gate.

h. Any signal that now appears between the interface signal (Zero) and the backwall signal will be measured correctly in range.