

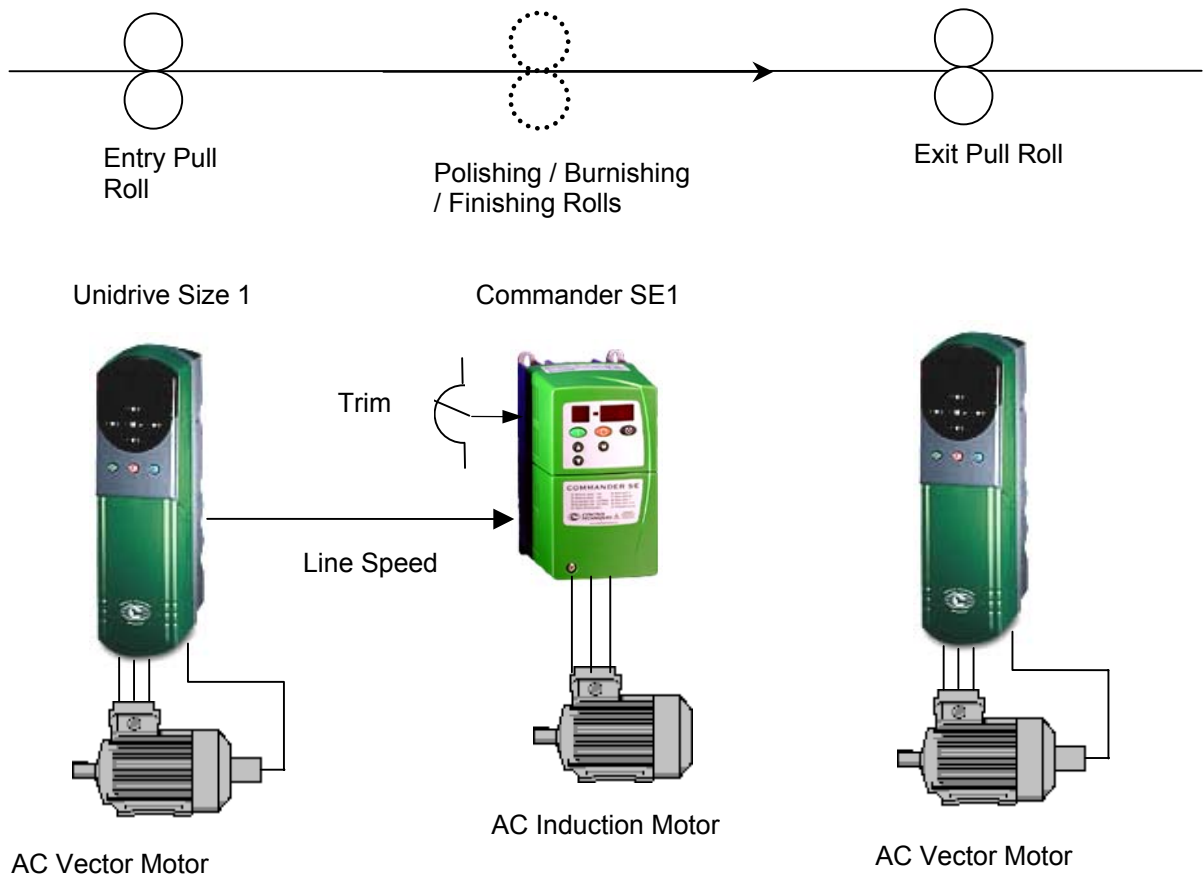
The Application Note is pertinent to the Commander SE Family

Line Speed plus Trim

A common drive application involves following a Process Line Speed and having a +/- trim. This application note will address such a function and describe how to accomplish it using inherent features within the Commander SE drive series.

Consider the application below. The application involves a product being pulled perhaps from a roll by a Master drive (Unidrive which is running a Vector motor). The downstream follower drive (being a Commander SE running a common induction motor), is to run at an adjustable speed proportional to the Master drive. There may be an exit Pull Roll which may be running in Digital Lock with the Entry Pull Roll but that's the topic of another Application Note.

Depending on the amount of overspeed (or underspeed) of the Finishing Rolls, different types of surface textures or finishes can be achieved. Some applications may require a +10% or more overspeed and yet other products may require a -10% relative speed for just the right surface finish.

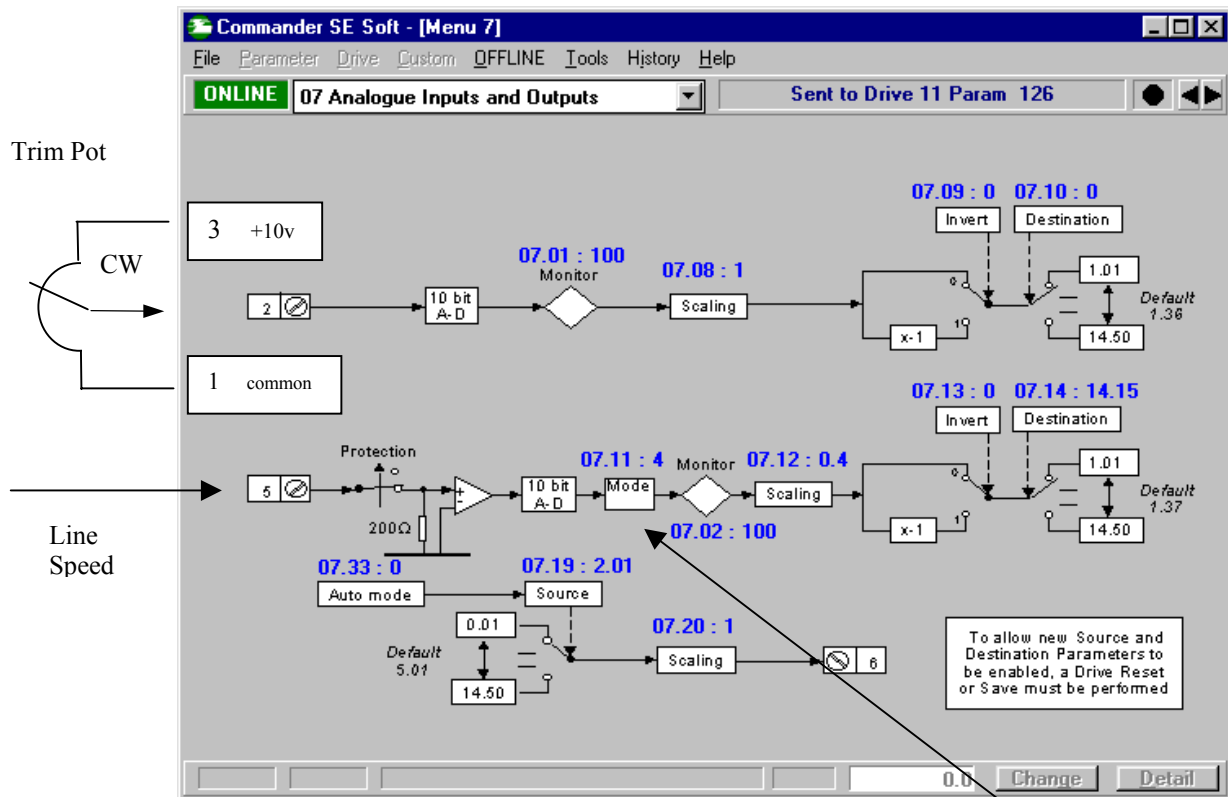


Can the Commander SE be configured to achieve this kind of application ?

Sure.

But how do we do it ?

Well, it will involve the application of Commander SE Soft (Drive configuration software available for free from our website at www.ctdrives.com/downloads). The Commander SE has 2 analog inputs available. One of which we will use to bring in an Operator adjustable TRIM pot. The other will be used to bring in the LINE SPEED signal to be followed.



Details:

The Trim pot shown above can be 5KΩ or 10KΩ (Linear Taper)

The second analog input on the Commander SE is a current signal input. It can be configured for a variety of common modes 4-20mA, 0-20mA etc. For our example, we are taking advantage of the Unidrive to output its' values as a 4-20mA signal.

Parameter 07.11 - Analogue input 2 mode

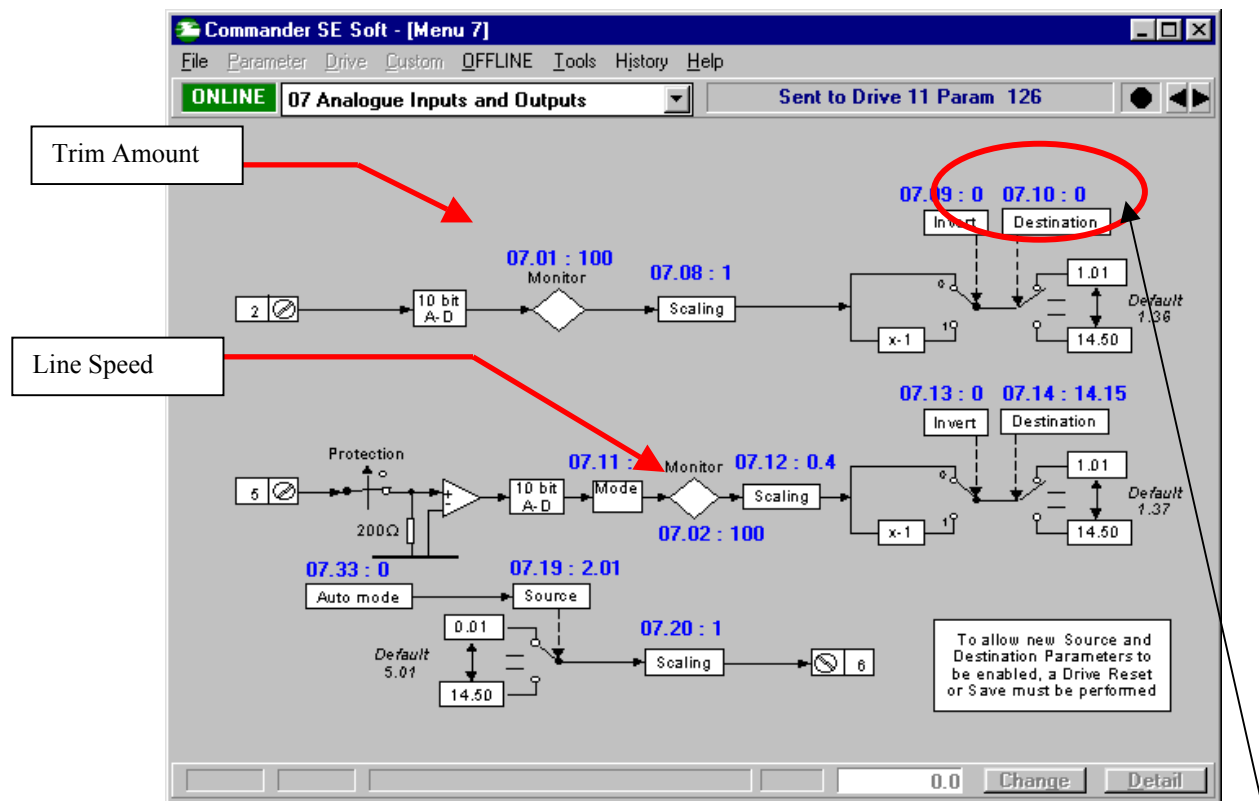
Coding: RW, U, T, P
Range: 0 - 5
Units:
Default setting: 4

Terminal 5 is a current reference input. The setting of this parameter configures the terminal for the required mode.

0	0-20	0 - 20 mA
1	20-0	20 - 0 mA
2	4-20	4 - 20 mA with trip on loss
3	20-4	20 - 4 mA with trip on loss
4	4-20	4 - 20 mA with no trip on loss
5	20-4	20 - 4 mA with no trip on loss

In modes 2 and 3 a current loop loss trip (cL) will be generated if the current input falls below 3mA. In modes 2 - 5 if the current falls below 3mA the current loop loss but will be set, see parameter #7.28.

Controlling Signals

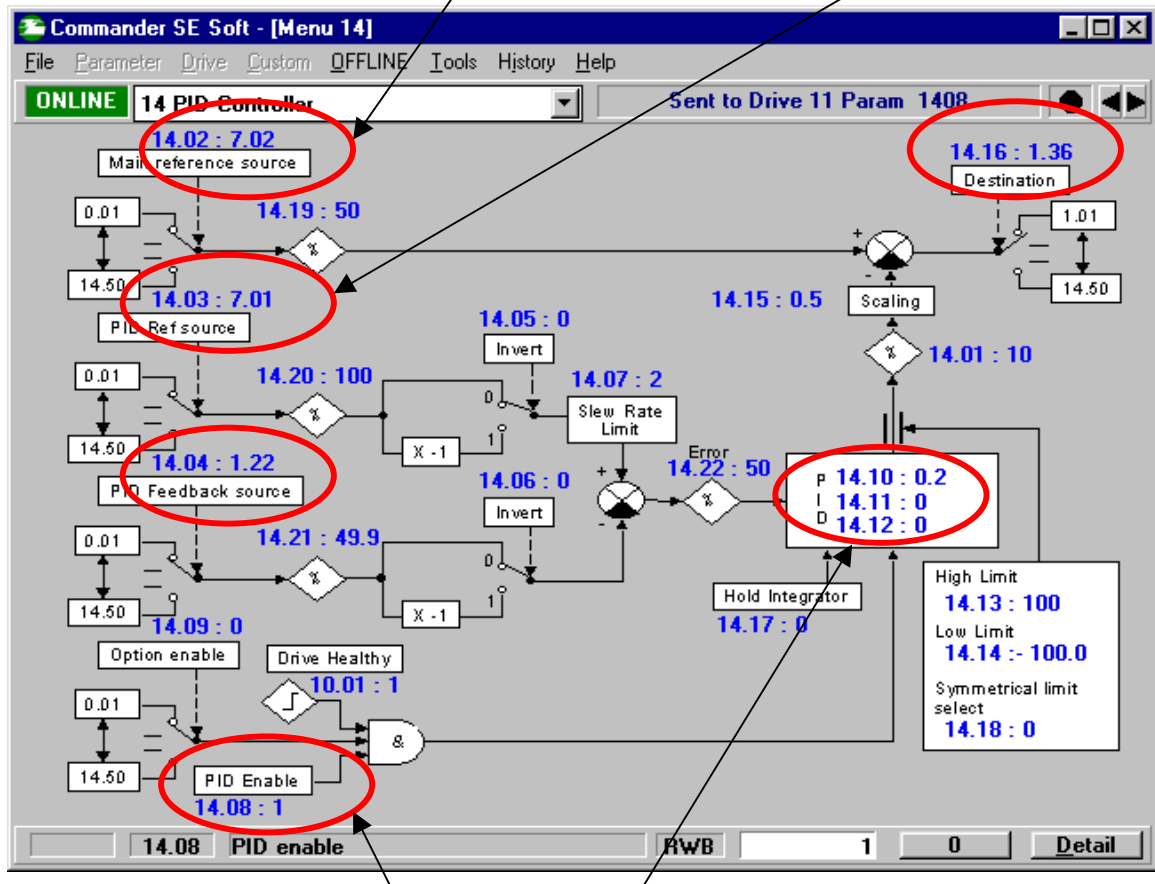


We must re-direct this input from being sent to the normal destination of #1.36 as we will be using #1.36 for the final trimmed speed. Setting #7.10= 0 will accomplish this.

Line Speed + Trim

To achieve this function we can use the features available on the built-in PID controller of Menu 14.

Since Line Speed can be found at #7.02 and the Trim Amount from #7.01 (see previous page), we can make those assignments to the PID loop source addresses.



Since we won't be needing the Integral & Derivative portion of the PID loop we will set them to 0. We will also need to enable the PID loop.

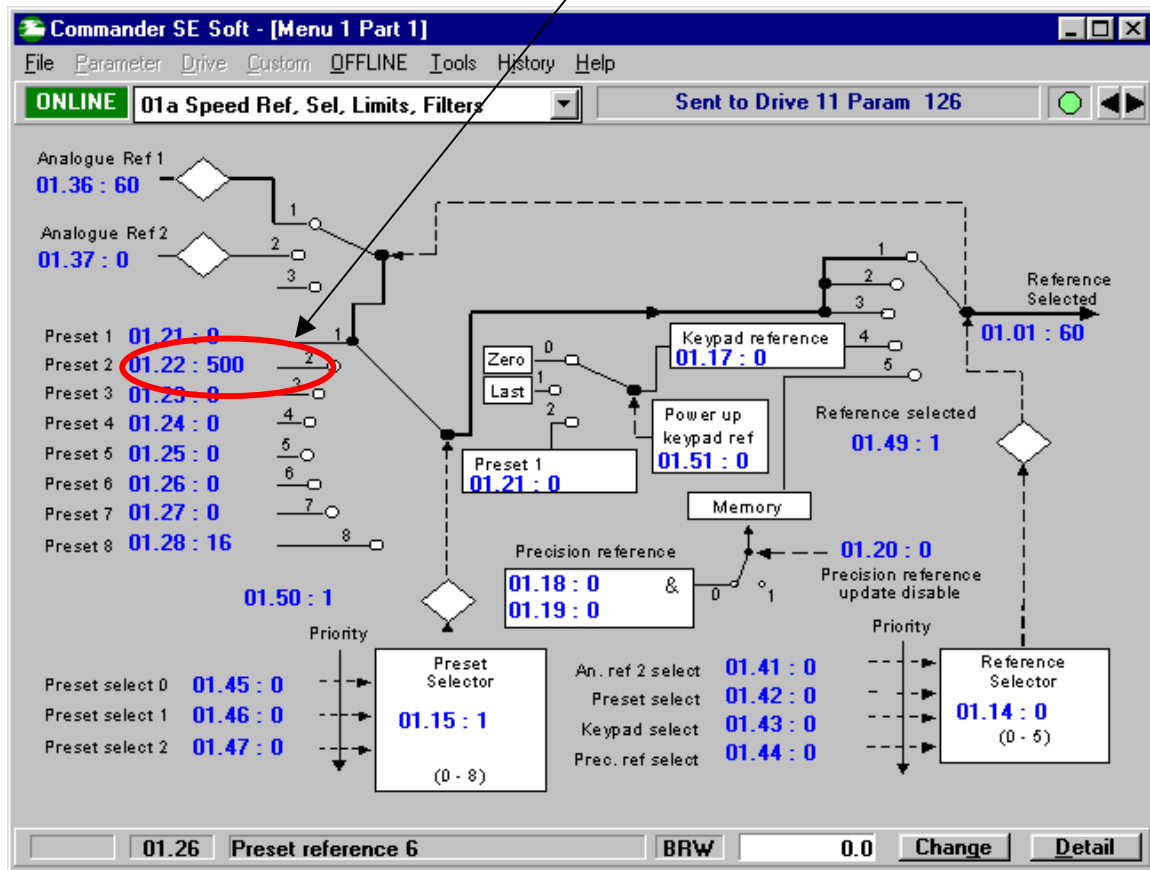
Now for the more complicated portion of this application. One must ask, " Does the Trim need to be unipolar or bi-polar ? (ie +/-xx% or only 0 to +XX%).

For this example, I have selected a bi-polar trim of +/-10%. Normally, to achieve this, one would merely connect one end of the trim pot to a + reference supply and the other to a - reference supply. The Commander SE has only a + reference supply. This is no problem, we can simply use the pre-PID loop summation to bias the incoming TRIM so that both + and - trim can be achieved. Since the trim input provides us with a 0 to 100% signal on #7.01, we can bias it with a constant -50% value so that when the pot is at full CCW it will result in -50% and at full CW yield +50% readable at #14.22 (error) .

Now as far as the scaling for +/-10%, the P term or Proportional Gain (#14.10) is set to 0.2 so that the +/-50% showing up in #14.22 (error) becomes +/-10% at maximum when it leaves the PID gain block into #14.01.

As a side note (and nice feature of the built-in PID loop), one can set in a rate for the TRIM into #14.07 to prevent abrupt Trim adjustments.

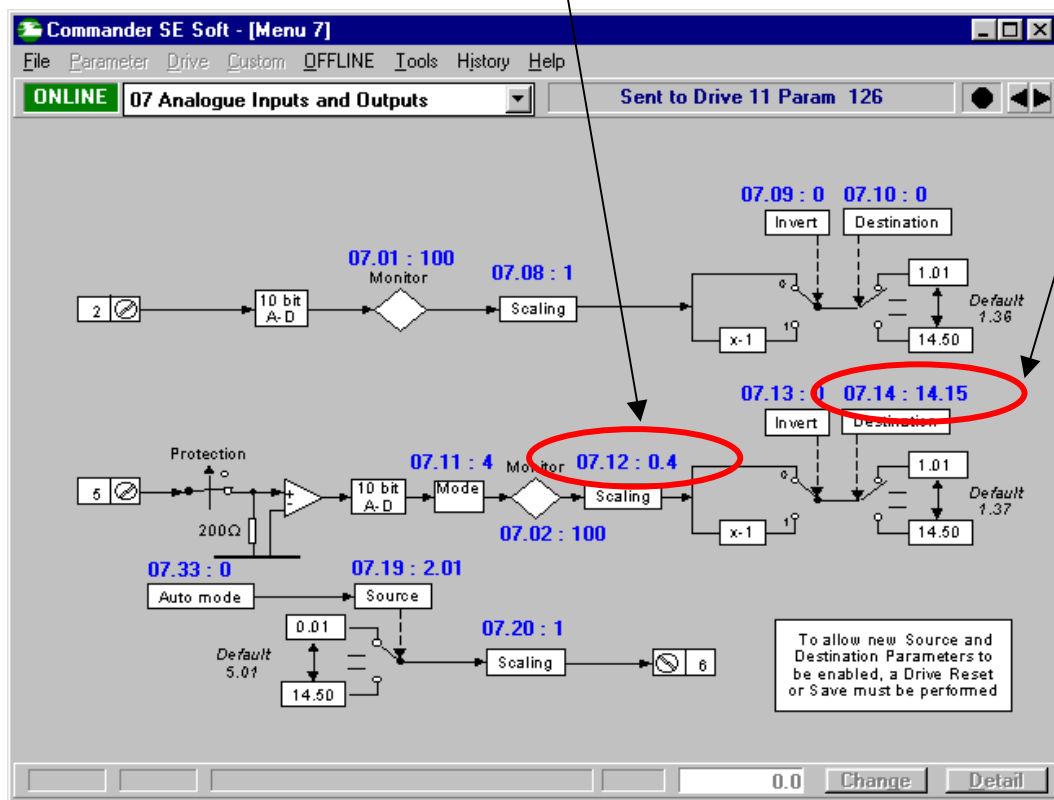
To accomplish this bias, I decided to place a value that represents 50% of maximum into an unused Preset speed register- in this example I chose #1.22. Since the CommSE can produce up to 1000Hz, a value of 500 in a speed register represents 50% of maximum.



The next tricky part is to make the Trim be proportional to the LINE SPEED. That is to say, when the LINE SPEED is 10% of max, the amount of trim will be 10% of this line speed and not 10% of Full Line Speed. To accomplish this, we can make the scaler after #14.01 (before summing with the Line Speed from #14.19) be a function of the Line Speed. (Refer to previous page for these register points)

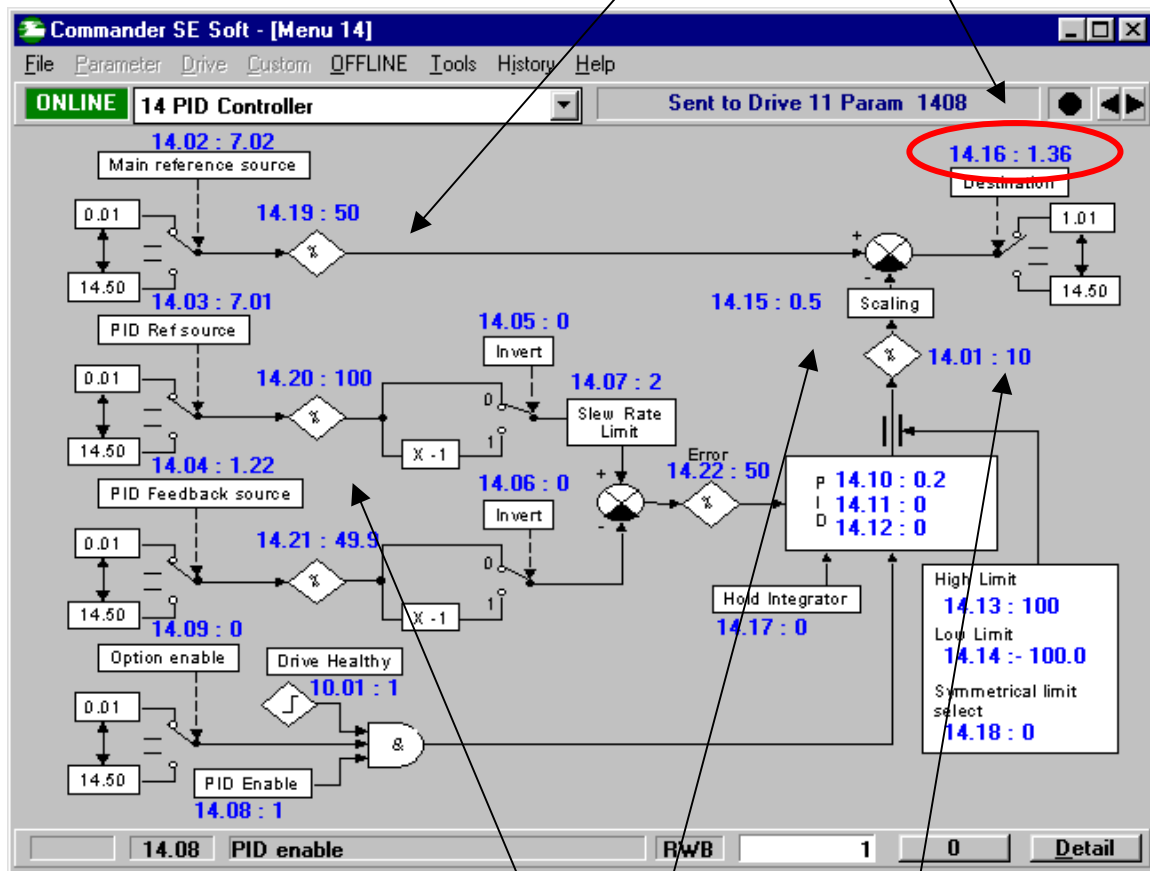
To do this we can re-direct the Line Speed signal after scaling to our scaling parameter #14.15. Since, #14.15 can be 2.5 at maximum, then the 100% at #7.02 re-directed to #14.15 would become 2.5. We don't want 2.5 but rather, 1. Therefore the scaling at #7.12 becomes

What times 2.5 = 1 or 0.4 = #7.12



This summation is then sent to #1.36 to become the Commander SE's speed reference.

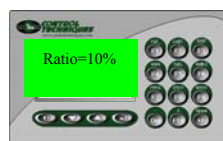
The screen shot below was taken for a Line Speed of 50% . By disabling the PID section (#14.08=0) temporarily, this would result in 900RPM on my 1800RPM motor setup.



With full +10% trim requested (see #14.20) which shows up in #14.01. But with the incoming line speed of 50%, results in 0.5 in #14.15.

Ultimately this results in 990RPM on our Polishing Drive at +10% trim and 810PRM at -10%.

Could this trim amount be set digitally and adjusted using Up/Down Arrows? *You bet!*
One could use one of our economical CTIU Operator Interface units as shown below and (in keeping with this example) even have list of preset Ratio recipe call-ups for different product finishes.



CTIU Remote
Operator Interface
Unit

RS-485
Communications



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