**This Application Note is pertinent to the Unidrive Family**

Analog Ratio Applications

This application note discusses the use of the programmable analog inputs within Unidrive to accomplish simple analog ratioing schemes.
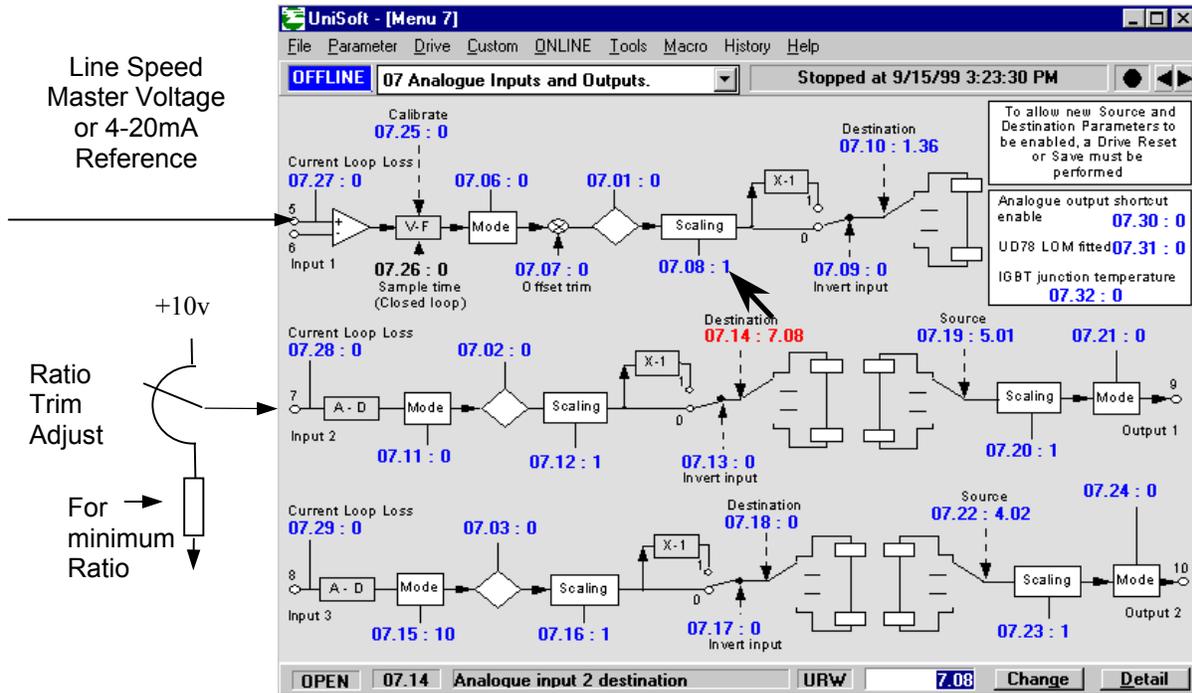
Example 1

The Unidrive analog inputs supports a feature that was not possible with Mentor II analog inputs.   That is, the ability to control an analog inputs' scaling via another analog input. This capability allows simple ratio systems to be realized.

Ratio
0 - 4.000

Ratio
0 - 4.000

Ratio
0 - 4.000

Master Analog Line Speed Reference
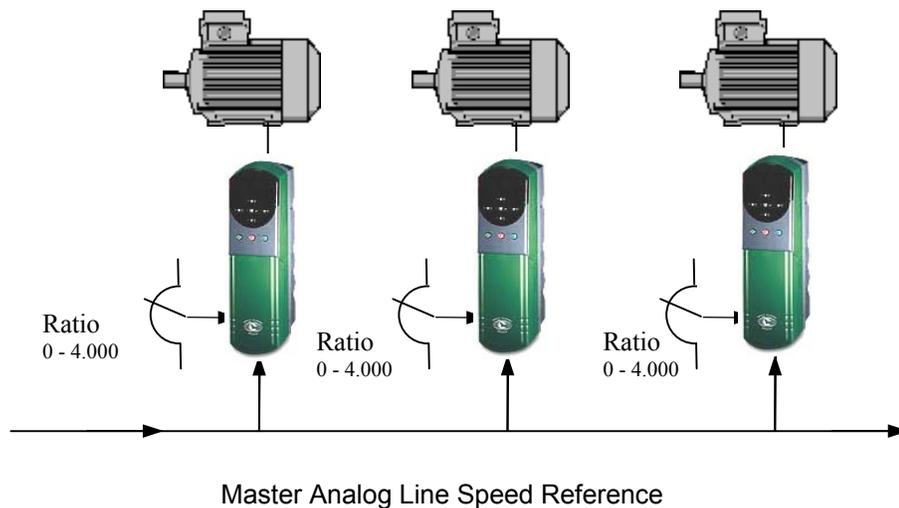
The next page outlines the configuration required.

This kind of scenario was not possible with the Mentor II analog input structure as it would not allow the analog destination to be directed to an analog input scaling parameter.

Line Speed
Master Voltage
or 4-20mA
Reference

+10v

Ratio
Trim
Adjust

For
minimum
Ratio

UniSoft - [Menu 7]

File Parameter Drive Custom ONLINE Tools Macro History Help

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If Ratio Increase/Decrease pushbuttons are desired instead of a potentiometer, then the built-in MOP (motor operated pot) function located in menu 9, could be used to adjust the Ratio (scaler) in a similar manner.   See MOP Application Note CTAN #114 for more details.
Click on this link   **CTAN114**

Ratio
Inc
Dec

Ratio
Inc
Dec

Ratio
Inc
Dec

Master Analog Line Speed Reference
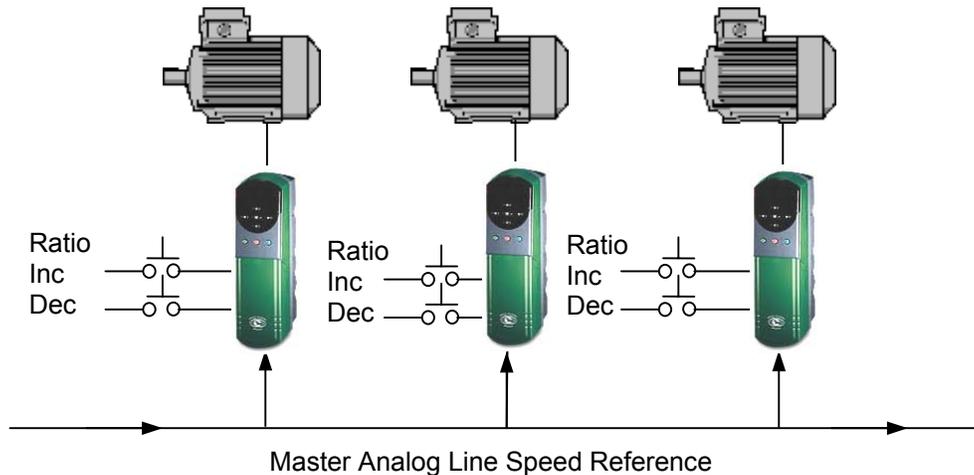
Simple Analog Ratio Trimpot Using Digital Locking

In the case where you are applying the built-in Digital Locking feature by invoking Menu 13,   It may be desirable to change the actual Ratio register (parameter 13.07) using an analog input.   For example, if one were to place a pot on the analog input as shown below,   this would cause #7.02 to span 0 to 100%.   By directing this analog input to #13.07 (the ratio register),   this would cause the ratio to span 0.000 to 4.000. We may not want this entire range. Often, ratios must be limited to a minimum and maximum range.
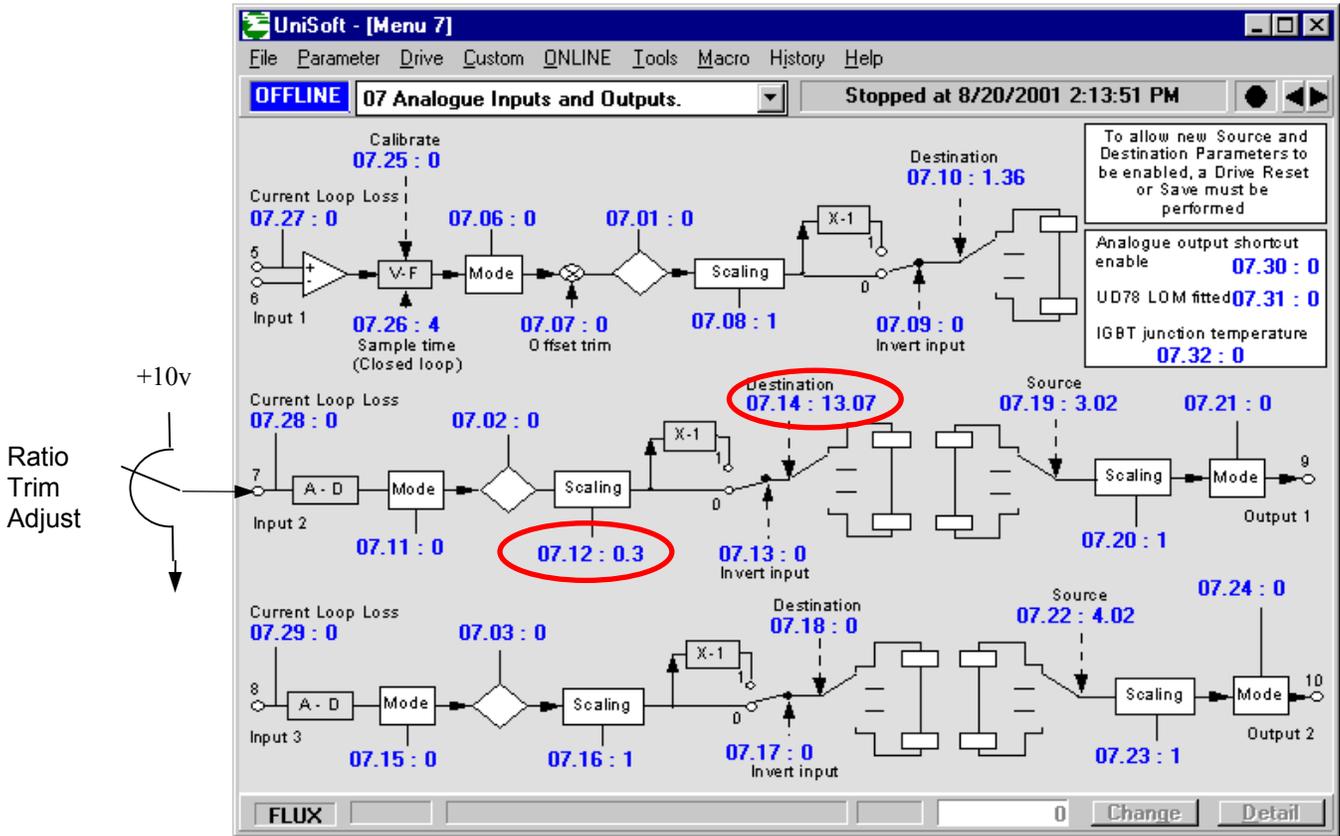
Note: Either of the analog inputs on Pins 7 or 8 could be used for this purpose.

For more details on **Digital Locking with our Unidrive,** click on the link below or consult
CTAN118

Ratio Range Limits

For example, if we wanted to give the Operator a Ratio range of adjustment from 0.8 to 1.2 we would do the following.

First of all we need to scale the maximum ratio for 1.2 not 4.0. Therefore the scale factor would become:

$$\text{Scale Factor} = \frac{\text{Max Ratio}}{4.000} = \frac{1.2}{4.000} = \mathbf{0.3}$$

This is the number that you would place into the scaling multiplier for that analog input used.

As far as the minimum ratio, the easiest way to achieve this would be to put a fixed resistor on the low end (counter clockwise CCW) of the pot (or put a trim pot there also).

If the minimum ratio is to be 0.8 , this would mean the :

$$\text{Minimum Voltage} = \frac{\text{Min Ratio}}{\text{Max Ratio}} = \frac{0.8}{1.2} = 0.667 * 10v = \underline{6.67v}$$

If we were to use a 5K Operator pot for the adjustable ratio what value of resistor would we need ?

+10v

5K Ratio
Trim
Adjust Pot

6.67v @ minimum

For
minimum
Ratio
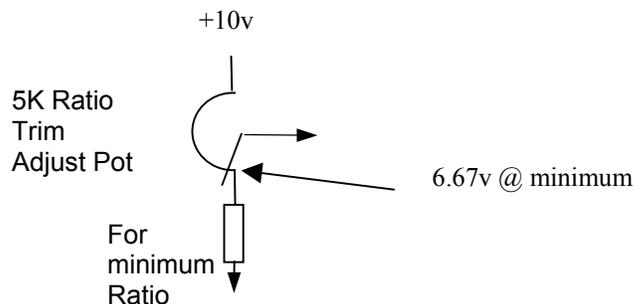
Using Kirchoff's law, and knowing that we want the wiper of the pot to see 6.67 volts when it is rotated fully CCW , the voltage across the pot would be 10v-6.67 or 3.33v. Using Ohm's Laws, this voltage of 3.33v across a 5K pot would mean there is 3.33/5000 or 0.667mA flowing. Therefore, the minimum ratio resistor would be 6.67v/0.667mA or 10K ohms. This would keep the Ratio bounded between 0.8 and 1.2.

Alternate Method of Achieving an Adjustable Minimum Ratio

The previous method of using a fixed resistor to develop a voltage division is simple but would not be easily adjustable (unless we were to use a trim pot). By placing 6.67v on the CCW end of the pot and connecting the CW end to 10v, we can see how we could span between our desired ratio limits.

We could use one of the programmable analog outputs to develop 6.67v for the CCW end of the pot instead of using voltage division. To accomplish this, we could use one of the free registers residing up in menu 18 and 19- specifically 18.11 – 18.30 or 19.11 – 19.30.   These registers hold a number from 0-32000. By attaching one of the D/A converters to one of these registers, one could adjust the D/A output to span between 0 to 10v. In our case for the above minimum ratio example, we want 6.67v. To accomplish this we would place the following number in one of these free registers:

$$\frac{\text{Desired Voltage}}{10v} \times 32000 = \frac{6.67}{10} \times 32000 = \mathbf{21333}$$

Since any register within the range mentioned above can be used I'll pick #18.11 in which to place this number. With the Ratio pot at minimum, one could adjust this value for the appropriate desired minimum.   Don't forget to store !
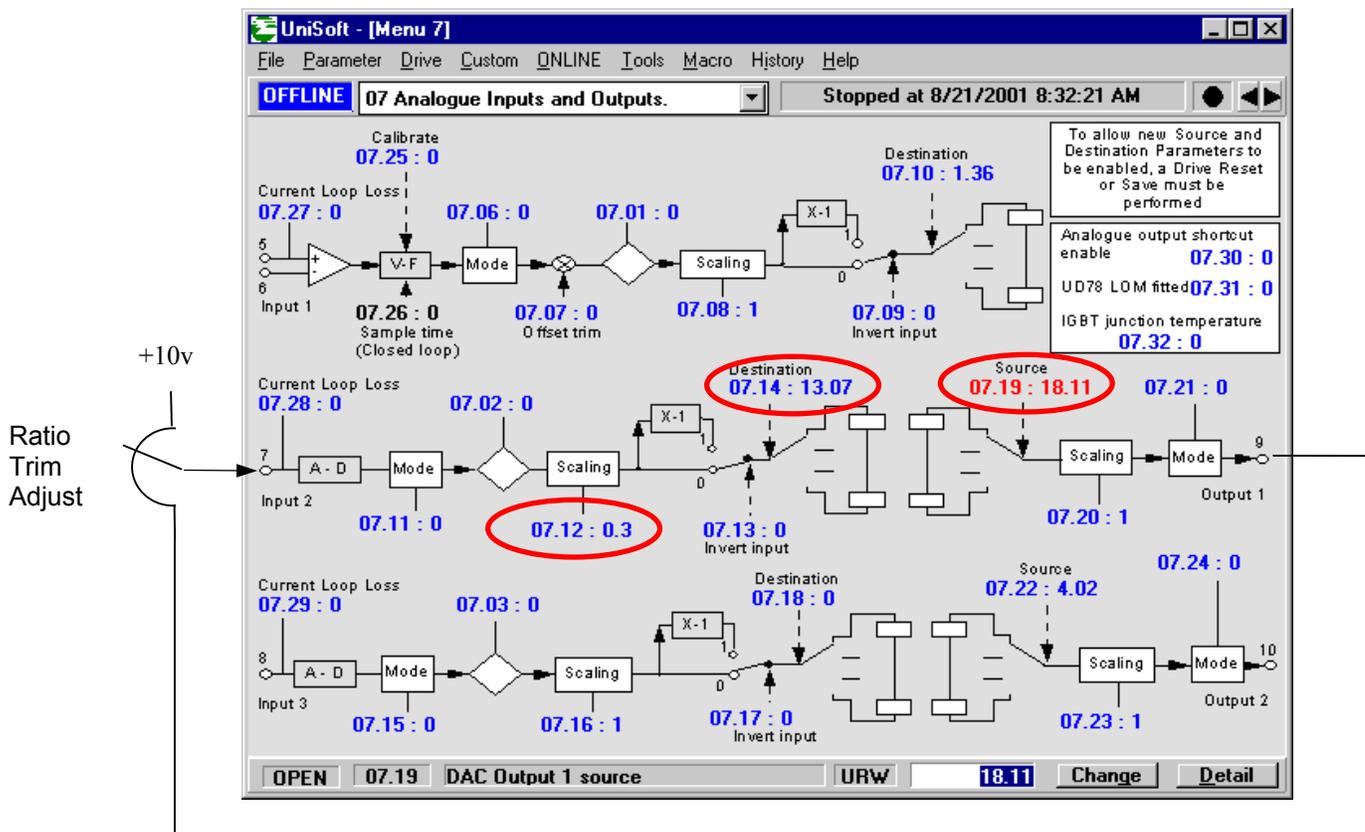
Note: Either of the analog outputs on Pins 9 or 10 could be used for this purpose.

Questions ?? Ask the Author:

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