

The Application Note is pertinent to the
Mentor II/Quantum III, Unidrive, Unidrive SP, Affinity
Commander SE, SK and GP20 Families

Creating Custom & Power-Up Displays

A common customer question when applying our drives is:

[Can the drive be made to display something of my choosing ?](#)

Yes, the displays on our current family of digital drives can be made to display and even “power-up” displaying a quantity that the User selects. Typically, people like to see the Drive display Motor RPM, %Load, or Motor Amps. Sometimes what they may want to see is a quantity that relates more to their actual application or process such as % Speed, %Load, FPM (Feet/Minute), GPH (gallons/hr) or similar for example. This Application Note will address this issue and provide some examples on how to create various scaled displays.

Please click on drive family of interest



Commander SK



**Unidrive SP, Affinity, and
Commander GP20**



Unidrive Classic



Commander SE



Quantum III/ Mentor II

Commander SE, SK

The Commander SE and SK drive can be programmed to display output Frequency (Hz), Speed (RPM), %Load, Amps or Customer Defined (Cd) unit. The default display is Fr (frequency) which can be changed to Load by holding in the mode button for 2 seconds. The load display can be displayed as either %Load (default) or motor Amps.

The following table defines the selections.

Parameter	Selections (note 1)	Comments
#23	Fr SP Cd	Displays motor frequency in Hertz Displays motor speed in RPM Displays machine in customer defined units (see Note 2)
#22	Ld A	Displays percent motor load Displays actual motor Amps
#24	0.0 to 9.999 CommSK 0.0 to 9.99 CommSE	Scaling based on #5.04 Motor Speed Readout which is a function of motor Synchronous Speed (#of poles & rated freq)

Note 1: The designations in this column will be displayed on the drive while the drive is active

Note 2: The scaling for the customer-defined units is set by parameter #24 based on #5.04 or Pr87 in SK

Someone might desire to see Speed and Load or Frequency and Amps or maybe all four items. If you'd like to see a Video showing what this would look like on the drive click the following link:

[CTVI116](#) and/or refer to [CTSL005](#)



Commander SE, SK con't

Example 1: Suppose one wants to display Parts/Min where this machine produces 400PPM at 1800 motor rpm and the drive is set up to run the motor up to 1800. The scaling of the Customer Defined units is based off the motors speed which is based on the #of Motor poles (Pr40), the rated Frequency (Pr39) and the Maximum Frequency (Pr02). So for a 4 pole 60Hz motor this would be 1800rpm at 60Hz.

With motor running at 1800 RPM, #5.04 (or Pr87 CommSK) would read 1800 but we want to see 400PPM. We would set #23= Cd and adjust the Scale Factor (Pr24) to be $= 400/1800 = 0.222$ or 0.223

Example 2: Suppose one wants to display Parts/Min where this machine produces 400PPM at 1600 motor rpm and the drive is set up to run the motor up to 1750rpm. Therefore at 1750rpm we should see:

$$\frac{1750}{1600} \times 400 = 437.5 \text{ or } 437-438 \text{ PPM}$$

The scaling of the Customer Defined units is based off the motors speed which is based on the #of Motor poles (Pr40), the rated Frequency (Pr39) and the Maximum Frequency (Pr02). So for a 4 pole 60Hz motor this would be 1800rpm at 60Hz.

We would set out drive up to limit the maximum output frequency to create 1750rpm. So instead of setting up for 60Hz as max (which would create 1800rpm) we will set the Max Frequency (Pr2) to $\frac{1750}{1800} \times 60 = 58.3\text{Hz}$

With motor running at 58.3Hz, #5.04 (or Pr87 CommSK) would read 1750 but we want to see 437PPM. We would set #23= Cd and adjust the Scale Factor (Pr24) to be $= 437/1750 = 0.2497$ or 0.250

It should be noted that one could replace Parts/Min in the above examples with FPM or any other quantity that is linear with motor speed.

Example 3: Suppose one wants to display Feet/Min where this machine produces material at the rate of 2000FPM when the motor is running at 1800 rpm. If we have a 4pole 60Hz motor we would have it set for a Max Frequency (Pr 2) of 60Hz. We would normally see 1800rpm but we want to see 2000 to be interpreted as 2000FPM. We would set #23= Cd and adjust the Scale Factor (Pr24) to be $= 2000/1200 = 1.111$.

Example 4: Suppose one wants to display Feet/Min where this machine produces material at the rate of 2000FPM when the motor is running at 1700 rpm. If we have a 4pole 60Hz motor we would have it set for a Max Frequency (Pr 2) $1700/1800 * 60 = 56.67\text{Hz}$. We would normally see 1700rpm but we want to see 2000 to be interpreted as 2000FPM. We would set #23= Cd and adjust the Scale Factor (Pr24) to be $= 2000/1700 = 1.176$

Example 5: Suppose one wants to display Feet/Min where this machine produces material at the rate of 2000FPM when the motor is running at 1200 rpm. If we have a 6pole 60Hz motor we would have it set for a Max Frequency (Pr 2) of 60Hz. We would normally see 1200rpm but we want to see 2000 to be interpreted as 2000FPM. We would set #23= Cd and adjust the Scale Factor (Pr24) to be $= 2000/1200 = 1.667$.

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Unidrive SP, Affinity and Commander GP20 Families

The Unidrive SP family can also be programmed to display a variety of selections upon power up.

For additional flexibility, the Unidrive SP offers parameters #11.20 and #11.21. If the parameter that is set into #11.20 is Read Only, a scale factor can be applied from 0.000 to 4.000. That scaled register can then be observed/displayed at #0.30. If desired, one could then place #0.30 into location #11.22 so that it becomes the parameter to be displayed upon application of power. **Note:** The factory default for #0.30 location (defined by #11.20) is #11.42 which is a Parameter Cloning function. If this re-assignment is performed Parameter Cloning can still be accomplished by the 3xxx, 4xxx etc from location 0.00.

Example #1:

Suppose you wish to display **FPM** (Feet per Minute) for your process line. Your motor runs at 1800rpm at top speed. At this speed your process line runs 1200FPM. Your scale factor is:

$$\frac{1200 \text{ FPM}}{1800 \text{ RPM}} = 0.666 \quad \text{which you would place into \#11.21}$$

The parameter that you wish to scale is the actual motor speed(RPM) or #3.02 (Closed Loop Mode- In Open Loop one could reference #5.04), so you would place that parameter number into #11.20. The scaled value of #3.02 will then appear in #0.30. If you wish, this can become the default power up display by placing #0.30 into #11.22.

Example #2:

Suppose you wish to be running an Extruder with the Unidrive and wish to display actual **Screw RPM** for your process line. Your motor runs at 1800rpm at top speed and your extruder gearbox has a 25:1 ratio.. Your scale factor in this case is simply the reciprocal of the gear-in ratio or 1/25 which is 0.04 so you would place 0.040 into #11.21.

The parameter that you wish to scale is the actual motor speed(RPM) or #3.02 (Closed Loop Mode- In Open Loop one could reference #5.04), so you would place that parameter number into #11.20. The scaled value of #3.02 will then appear in #0.30. If you wish, this can become the default power up display by placing #0.30 into #11.22.

Example #3:

Suppose you wish to display **%Load** as the default power up displayed value. Parameter #4.20 in the Unidrive provides the value of %Load Torque. By setting 4.20 into #11.20 and placing 1.000 into the scaler #11.21, this can become the default power up display by placing #0.30 into #11.22.

Example #4:

Suppose you wish to display **%Speed** for your process line. Your motor runs at 2000rpm at top speed. At this speed your process line runs 100% speed. Your scale factor is:

$$\frac{100\%}{2000 \text{ RPM}} = 0.05 \quad \text{which you would place into \#11.21}$$

The parameter that you wish to scale is the actual motor speed(RPM) or #3.02 (Closed Loop Mode- In Open Loop one could reference #5.04), so you would place that parameter number into #11.20. The scaled value of #3.02 will then appear in #0.30. If you wish, this can become the default power up display by placing #0.30 into #11.22.

After these assignments, one would need to perform a basic STORE.

For an alternate method that does not use parameter #0.30 and can be filtered to reduce display jitter consult

[CTAN322](#)

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Mentor II/Quantum III Drives

Mentor II and Quantum III Drives power-up to display parameter 0.00 which is one of the special locations where storing or the internal security code can be entered. Having this pop up whenever the drive powers up however, is not very useful. One could simply set parameter #11.18 (named Boot-up parameter) with the parameter location that one desires and save it away. For example, the table below lists a few popular registers that one might want to select as the power up display.

Variable	Parameter Location	Comments
Armature Voltage	#3.04	Displays actual armature voltage
% Speed	#3.02	Shows 0 to 1000=100.0% Speed
Armature Amps	#5.02	Can be in Amps if 5.05 set right
AC Line Voltage	#7.06	
Motor/Machine Speed	#3.03	Can be in User Units (see below)

For example, if one wanted Armature Voltage to be displayed upon power up, they would just need to set parameter 11.18 = 304 and save.

Machine Speed

Example 1) One can calibrate parameter #3.16 so that actual machine speeds can be read from location #3.03. For example suppose you have an **Extruder** that when the drive is displaying 1000 (100% speed) at #3.02 the actual extruder screw is turning at 120 Screw RPM. To make this happen you would simply place 120 into #3.16.

Example 2) You have a **Melt Pump** that puts out 500# / Hr at full speed of the motor. Simply set #3.16=500 and location #3.03 will read out lbs/ Hour based on the motor speed.

In short, any machine quantity that is linearly proportional to motor speed can be read out on parameter #3.03 with the proper scaling factor in #3.16. ie. FPM, YPM, Bottles/Min etc

Example 3) Suppose you wish to display %Load for a particular motor.

Your drive is a Quantum III running off 480vac, model number 9500-8307 to run a 125HP motor with an FLA of 230A. The drive current limits have been set to limit the current to 150% of the motor and the Timed Overcurrent point was set at 101%. The value of parameter #5.01 is proportional to the armature current the drive delivers and will read 1000 at 150% of the **drive** rating not the motor rating. Therefore, if the drive were to deliver 150% of its' rating that would be 383A.

$$\text{Drive FLA } 255 \times 1.5 = 383$$

Of course, current limit setting for the 230A motor would never let that happen but that is what the scaling is based on. If we were to place a 150 into the Current Readout Scaler, parameter #5.05, it would readout 150 for 150% at 383A but what percentage would this represent for the motor.

$$383/230 = 166\%$$

So, we could put 166 into the Current Readout Scaler, parameter #5.05, and it would readout the actual %Load your motor is experiencing.

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Unidrive Classic Family

The Unidrive Classic family can also be programmed to display a variety of selections upon power up. The User can select any of the locations specified in Menu 0 by placing his/her selection into parameter 0.38.

Variable	Parameter Location	Comments
Motor Speed	#0.10	Displays actual or estimated RPM (mode dependent)
Frequency Output	#0.12	Displays post ramp frequency in Open Loop

Menu 0 selections can be changed by the User to permit other variable of interest to be displayed upon power up. If what you want is not currently in Menu 0 you can redefine these for your purposes using Menu 11.01 to 11.20.

For additional flexibility, the Unidrive offers parameters #11.20 and #11.21. If the parameter that is set into #11.20 is Read Only, a scale factor can be applied from 0.000 to 4.000. That scaled register can then be observed/displayed at #0.30. If desired, one could then place 0.30 into location 0.38 so that it becomes the parameter to be displayed upon application of power.

Example #1:

Suppose you wish to display **FPM** (Feet per Minute) for your process line. Your motor runs at 1800rpm at top speed. At this speed your process line runs 1200FPM. Your scale factor is:

$$\frac{1200 \text{ FPM}}{1800 \text{ RPM}} = 0.666 \quad \text{which you would place into \#11.21}$$

The parameter that you wish to scale is the actual motor speed(RPM) or #3.02 (Closed Loop Mode- In Open Loop one could reference #5.04), so you would place that parameter number into #11.20. The scaled value of #3.02 will then appear in #0.30. If you wish, this can become the default power up display by placing 0.30 into #0.38. **Note:** If you want % Speed , your scale factor would be 100/Max Motor RPM.

Example #2:

Suppose you wish to were running an Extruder with the Unidrive and wish to display actual **Screw RPM** for your process line. Your motor runs at 1800rpm at top speed and your extruder gearbox has a 25:1 ratio.. Your scale factor in this case is simply the reciprocal of the gear-in ratio or 1/25 which is 0.04 so you would place 0.040 into #11.21.

The parameter that you wish to scale is the actual motor speed(RPM) or #3.02 (Closed Loop Mode- In Open Loop one could reference #5.04), so you would place that parameter number into #11.20. The scaled value of #3.02 will then appear in #0.30. If you wish, this can become the default power up display by placing 0.30 into #0.38.

Example #3:

Suppose you wish to display **%Load** as the default power up displayed value. Parameter #4.20 in the Unidrive provides the value of %Load Torque but unfortunately is not one of the menu 0 parameters that can readily be selected for power up display by parameter 0.38. However, by setting 4.20 into #11.20 and placing 1.000 into the scaler #11.21, this can become the default power up display by placing 0.30 into #0.38.

After these assignments, one would need to perform a basic STORE.

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