

The Application Note is pertinent to our Digital Drive Families

### Eliminating Speed Creep- Low End Analog Drift

The Unidrive SP is used quite often for CNC machine upgrades. The Unidrive SP offers excellent speed control for High Speed Spindle motor applications. In these applications, the CNC controller typically provides our drive with a 0-10v or 0-5v speed signal. A recurring question we get with these systems is:

**“How can we stop the motor from turning when it is supposed to be still ?”**

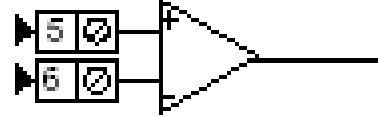
These applications are typically handled by a Vector or Servo motor. Both of these implementations use some form of actual motor shaft speed feedback. In these operating modes, the Unidrive SP is capable of holding the motor shaft rigid upon a Stop Command. Unfortunately, the original interface between the CNC Controller and Drive typically did not issue a Stop command to the drive but rather would assert a 0v speed command reference. Here is where the problem is. The drive is active at this point in time and any noise, CNC analog output offset or temperature drift will cause the precision analog input to have a reading and the motor will tend to run very slowly forward or reverse depending on the polarity of the input signal.

#### Avoiding Noise Effects:

- Low voltage signals should run in a separate conduit from high powered AC or DC power wiring.
- These low voltage signal wires must consist of a twisted pair with an overall foil shield.
- Low voltage signals should avoid long distance runs.
- When long distance runs become necessary one should consider using a Current Input Signal- a 4-20mA signal is much more robust when attempting long distance runs.

## Our Precision Analog Input

When the Precision Analog input on Terminals 5 & 6 ( on Unidrive SP and Mentor MP and Affinity drives) are used for the speed command, it is imperative that terminal 6 be connected to signal common-(terminal 3-6 or 6-11). This input is a differential analog input meant to receive an analog signal from a bonafied Differential Analog Transmitter. In practice, we rarely come across Differential Analog Transmitters. Most all outputs we've seen from CNC or PLC controllers are single ended bi-polar outputs.

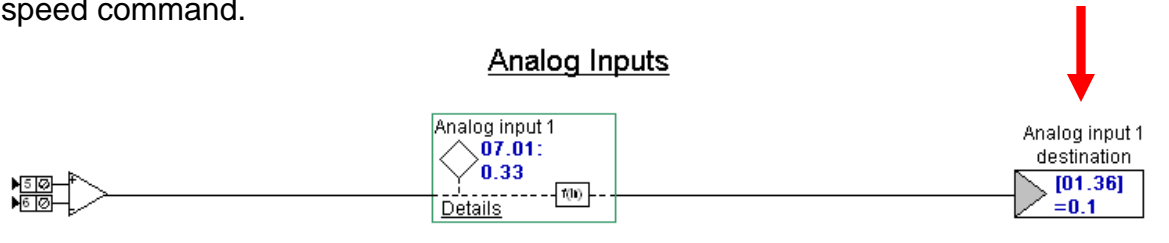


Connecting a single ended signal to this differential input will work but be subject to drift and offsets from day to day.

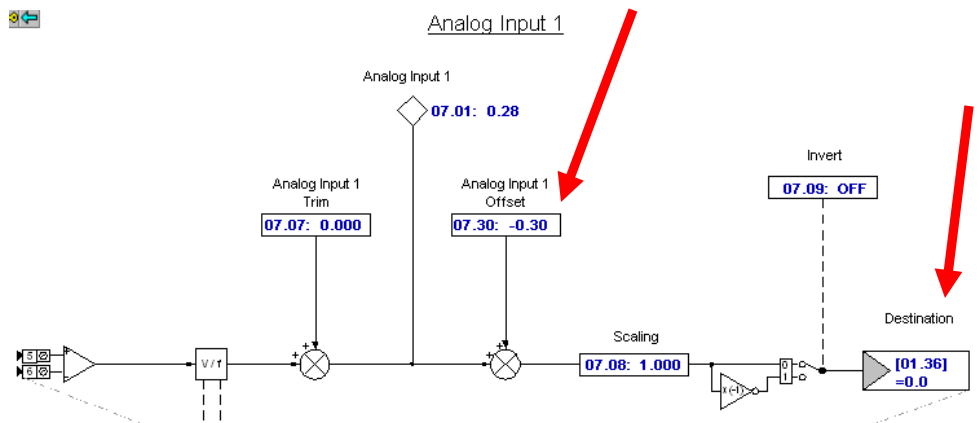
This should help the situation but regardless some drift may still exist as this is the nature of analog signals.

## Using Reference Offset

If one observes the analog input signal at parameter #7.01 when the controller is commanding a 0 speed, this register will allow you to see the result. With a zero speed command the voltage measured between terminals 5 and common should be 0v. In the case below, one can see that #7.01 is reading 0.30% (0.28% to 0.33%) which is about 30mV on the analog input which is translating to 0.1 rpm speed command.



There should be a zero offset adjust within the controller to null the signal at #7.01 to 0. If not we have an offset adjust in the drive.



## A Sure-Fire Fix

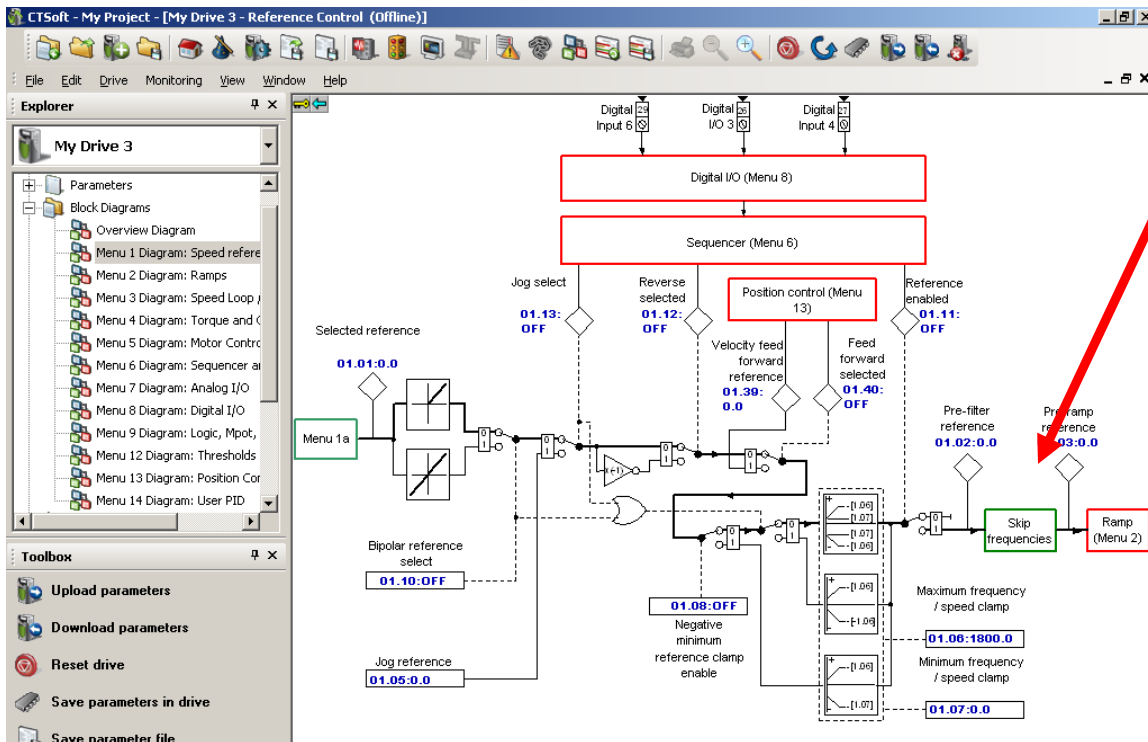
Although an offset might work today, analog offsets and temperatures drifts may allow the creep to develop again on certain occasions. In addition, with bi-polar ( bi-directional ) applications, this offset can cause a different speed in forward than reverse for the same speed command magnitude.

There is a facility in the Reference section located in Menu 1 called Skip Speeds or Skip Frequencies. It is typically used to bypass certain critical speeds within a machine where mechanical resonance may occur. Our drives contain 3 skip speed zones that are User adjustable.

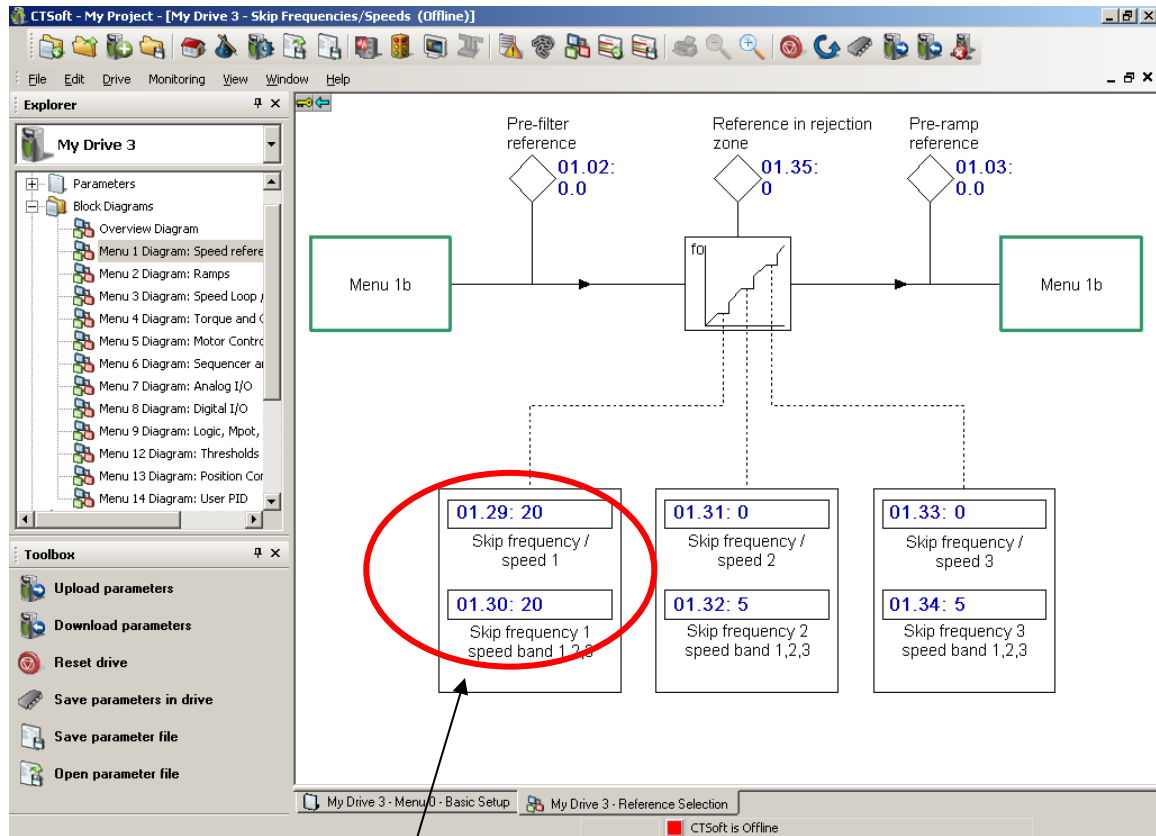
It turns out that we could use one of these skip zones to blank a “near zero” input signal. In this manner, a pure 0 reference will be enforced until a significantly large input signal be delivered by the controller- which would be considered a valid speed signal.

## Skip Zone

This can be found on Menu 1b- click on that rectangle for more details



What I would suggest is to simply place a low value in the Skip Speed and Skip Band. Select a value that can be made as large as possible thus rejecting or blocking any low input signal below a certain valid value. Setting the same value in each register will provide pure digital symmetrical blocking band around 0 and will not disturb bi-directional operation if required.



**NOTE**

It should be noted that if the drive is set for an Open Loop mode, these registers will be in Hz vs RPM. So something like 0.5 – 1Hz may be a reasonable value in this mode.

**Questions ?? Ask the Author:**

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