

The Application Note is pertinent to the Unidrive Family

### UD78 High Precision Analog Input Module

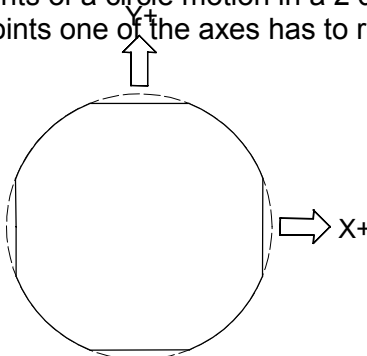
#### Introduction

High performance positioning applications using a Unidrive in either Servo or Closed Loop Vector mode with an analog speed reference may require a higher precision analog input than those provided on the standard drive. The UD78 was introduced to meet this application need, but when is it likely to be required? This application note will outline those application types where it use may need to be considered.

#### Applications

##### Multi-axis positioning systems using interpolation and requiring high precision

These systems will use some kind of external motion controller such as the **Axima** Emerson Motion Controller or a machine tool CNC system. The standard Unidrive offers several analog inputs with resolution that is more than adequate for most all general purpose Industrial (non-servo) applications. Highly accurate positioning quite often requires a higher precision if controlling via analog sources. The resolution of the Unidrives standard analog inputs may exhibit a dead band around zero volts sometimes as high as 5 mV. Although this miniscule amount would mean nothing to most industrial applications ( which by the way can be nulled out in uni-directional applications), this amount of offset may be excessive for positioning applications. The effect that one might observe due to this offset might be flattening of the four quadrant points of a circle motion in a 2 drive x-y application for instance. This occurs because at these points one of the axes has to reverse direction through zero speed.



The drawing illustrates this, if you take the quadrant point marked Y+ above for example it can be seen that:

- The X axis will be moving at maximum speed
- The Y axis reverses but due to the dead band at zero volts it stops early and restarts late resulting in flattening of the top of the circle. The illustration attempts to show this effect in an exaggerated form in the interest of clarity.
- The extremely high resolution and low offset characteristics of the UD78 analog input eliminates this effect.

### **Applications which require highly stable and precise position control at zero speed:**

These may be either Servo or Vector based. For example a machine tool spindle may be required to orient and hold position for a tool change. If the UD78 is not used for this, the dead band of the standard drive analog inputs can cause instability as described below:

- a) The position feedback to the motion controller drifts by 1 or more encoder counts.
- b) The position controller attempts to correct by outputting a small voltage to the drive speed reference input.
- c) The drive does not respond due to the dead band and continues to drift.
- d) The position controller sees this and outputs more voltage.
- e) When the voltage from the position controller overcomes the drive analog input dead band the drive will now overcorrect.
- f) The result is that the controlled axis continually hunts for position.

An application may well have to run at fairly high maximum speeds and this will magnify the instability caused by the above effect.

For example if the drive was set up to run 1500 rpm at 10 volts, the 5mv dead band would equal

$$(0.005/10) * 1800 = 0.75 \text{ rpm}$$

A typical machine tool spindle may well need the drive to be set up to run the motor at 6000 rpm with a 10 volt reference. In this case the dead band would result in

$$(.005)/10 * 6000 = 3 \text{ rpm}$$

It should be noted that while the use of a UD78 will correct instability due to this effect it will not remove the need for correct tuning of the speed and position loops of the system.

### **Secondary Features of the UD78**

1. The UD78 supplies an RS485 communication port. This port can be used for basic RS485 multi-drop networking or for basic drive setup using UniSoft or DriveCom.
2. If connected to an external 24VDC supply, the UD78 will maintain power to the drive logic and 5V encoder supply even when the main 3 phase power is off. This can be used to eliminate the need to re-home a positioning system when main power is removed from the drive.

**Questions?** Ask the Author:

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