

The Application Note is pertinent to:

**UnidriveSP / Commander SK / Commander HSK / Affinity Drives
Mentor II and Quantum III
(And retired drives -- Unidrive / UnidriveVTC / Commander SE & GP)**

4-20mA Current Loop Control

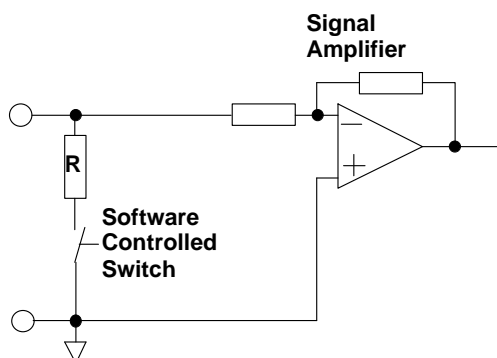
All of the current Control Techniques drives have the ability to accept a 4 to 20 milliamp signal as a reference input. With the exception of Commander SE, these inputs can be programmed as either a voltage or a current source input. This is a great asset in providing a drive with flexible analog inputs. This programmability can in some applications cause unforeseen problems. In general, 4-20 ma signals are a common output for various process control transducers; pressure, flow rate and fluid level sensors to mention a few. In order to properly apply these sensors, it is necessary to have an understanding of why current loops have been historically used and the actual input analog input circuitry in the drive.

The advantages of a 4-20ma reference signal as compared to a 0 to 10vdc reference signal are:

1. It is not sensitive to supply voltage variations- relatively noise tolerant
2. It is not sensitive to wiring resistance changes- tolerant to long wire runs
3. It can be "looped" through multiple drives.
4. Signal loss is easily detected.

In most cases, the reason for using a 4-20 milliamp signal is to have the same signal sent to multiple drives and to be able to detect a "break" in the signal path. Typical applications are fan and pump drive systems.

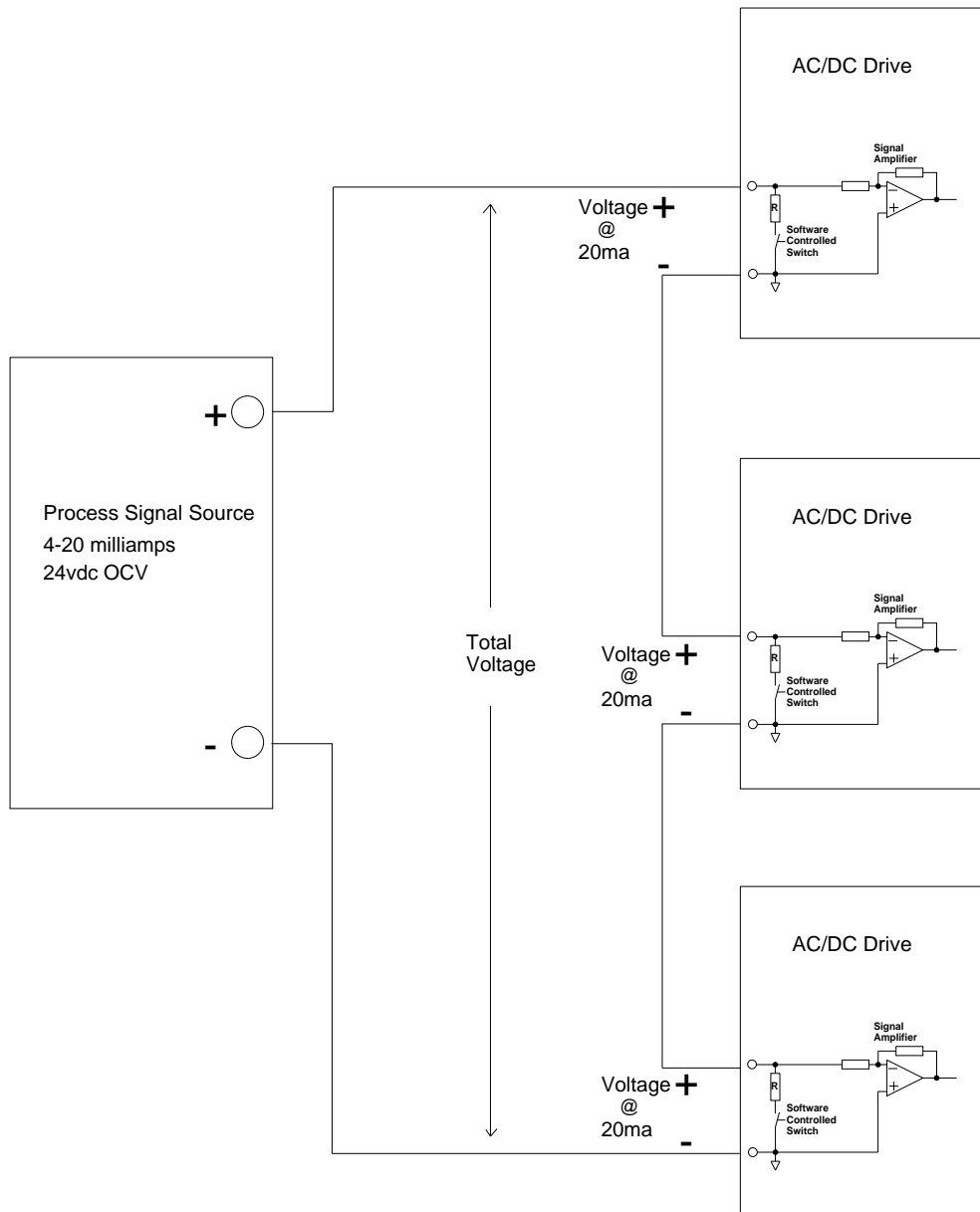
The Control Techniques Unidrive Series AC Drives (and its' derivatives) and the Mentor II / Quantum III DC Drive provide the ability to program the analog inputs as either 0 to 10vdc or 4-20 milliamp input via a bit parameter in software. This basically is achieved by "switching in" a loading resistor across the input of the analog voltage input amplifier. The diagram below shows this scheme. The value of the resistor switched in and the voltages generated by the 4-20ma signal are given in the following table.



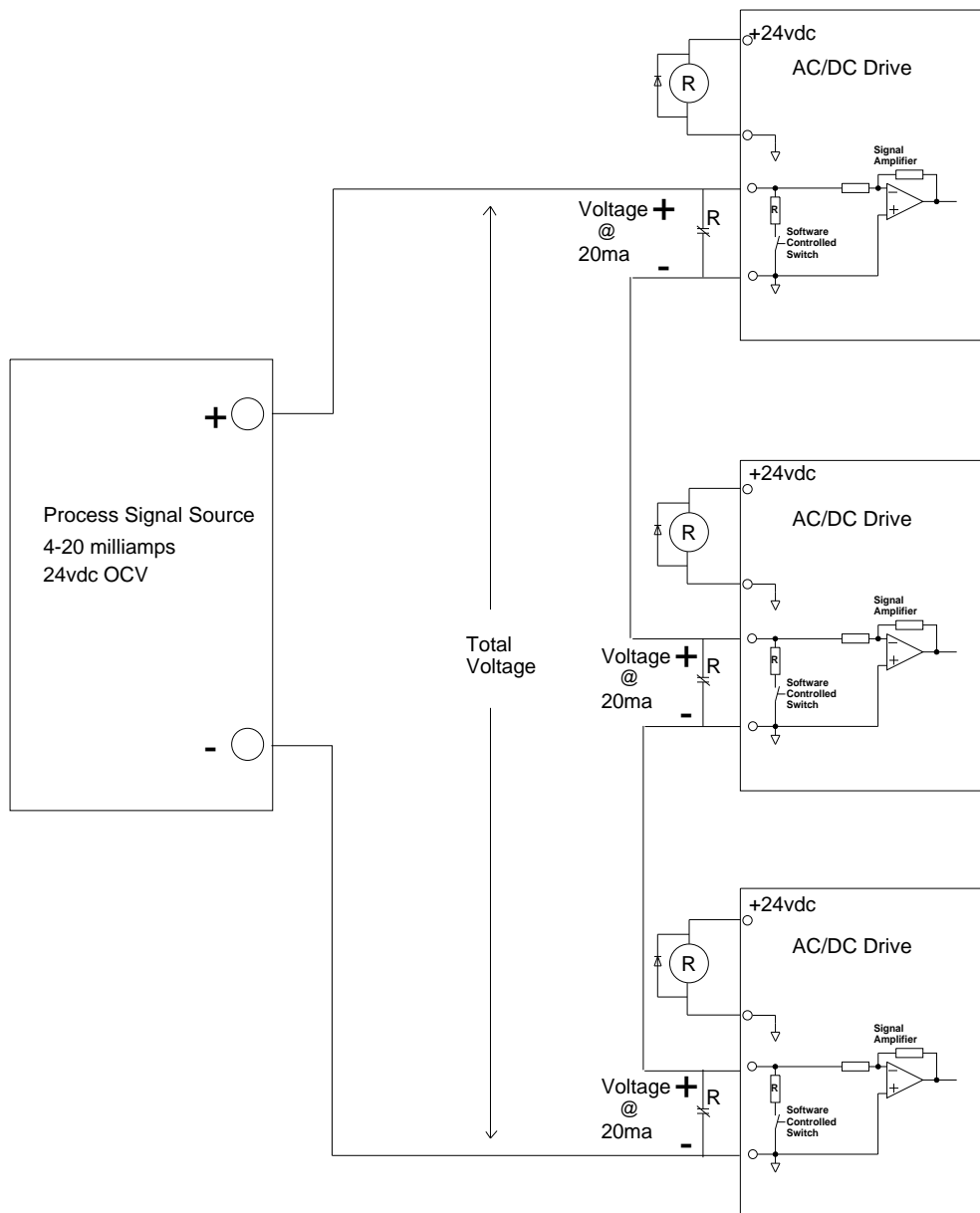
Drive Model	Resistance	Voltage @ 4ma	Voltage @ 20ma
Commander SE / SK / HSK	200 ohms	0.8vdc @ 4ma	4.5vdc @ 20ma**
Mentor II / Quantum III	100 ohms	0.4vdc @ 4ma	2vdc @ 20ma
Unidrive / UnidriveSP / Affinity	100 ohms	0.4vdc @ 4ma	2.5vdc @ 20ma**

**** These drives also have a diode in series with the resistor**

In applications that involve multiple drives in a loop, the process current source must be capable of providing enough voltage to force the 20ma signal through all of the connected loads. Typically, current sources will have a supply voltage (also known as open circuit voltage, OCV) ranging from 12 to 24vdc. The maximum number of allowable drives can be determined by totaling up all of the voltages produced by each of the 4-20ma inputs of each drive, adding 2 volts dc and comparing this voltage to the supply voltage for the current source being used. As long as the total voltage is less than the supply voltage for the current source, you are ok. The table on the previous page gives the voltage levels for all of the current Control Technique drive at 20ma. The diagram below shows this arrangement with multiple drives.



Since the “burden” resistor for the drives have a software controlled switch in series with them, a problem arises in the event that a drive in the system is not powered up; the loop for the current source “breaks” causing a loss in signal to all drives. A simple solution is shown on the next page.



In the above example, if any of the drives are de energized, the 24vdc relay will drop out causing the connection to the drive to be bypassed. For additional information on current source types, click on the following link **CTAN251** or please refer to our web site Application Notes at :
http://www.emersonct.com/support_usa/appNotes_intro.htm



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