

The Application Note is pertinent to the Unidrive Classic Family of AC Drives

4-20mA Control Input Guidelines

In many control systems, 4-20 milliamp signals are quite often used for command reference and feedback signals and there are sound reasons to do so.

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

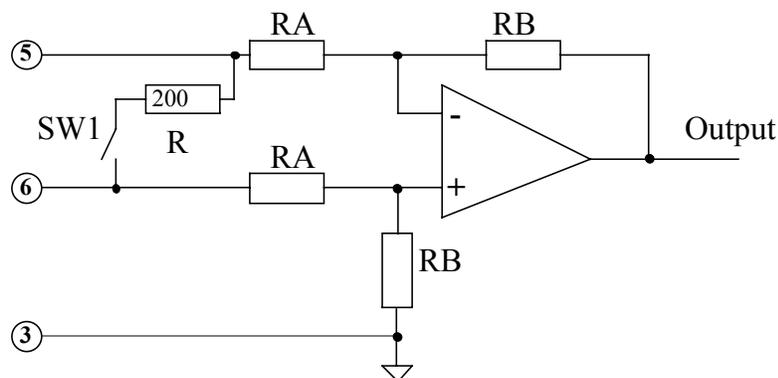
1. It is not sensitive to supply voltage variations- relatively noise tolerant
2. It is not sensitive to wiring resistance changes- tolerant to long wire runs
3. It can be “looped” through multiple drives.
4. Signal loss (wire break) is easily detected.

Advantage 3 above permits the reference signal to be “daisy chained” or series connected two or more drives off the same reference. In order to use this type signal successfully, one must understand the characteristics of the drive’s 4-20 ma input and the configuration / type of 4-20 ma transmitter circuitry.

Background

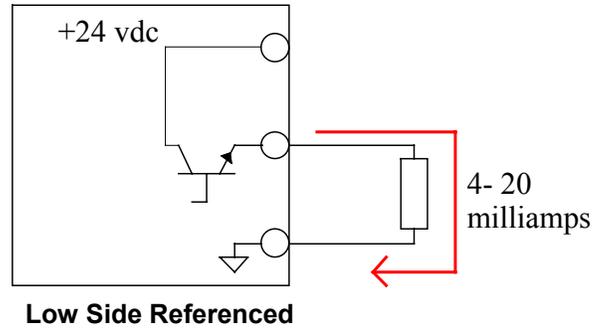
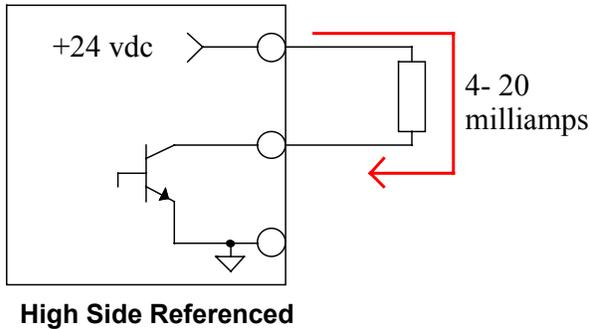
The figure below gives a fairly good representation of the analog input of the Unidrive Classic, which is electronically switched (via software) to a current input by closing SW1.

Note: refer to [CTAN 160](#) for additional information (series connection of current source inputs).

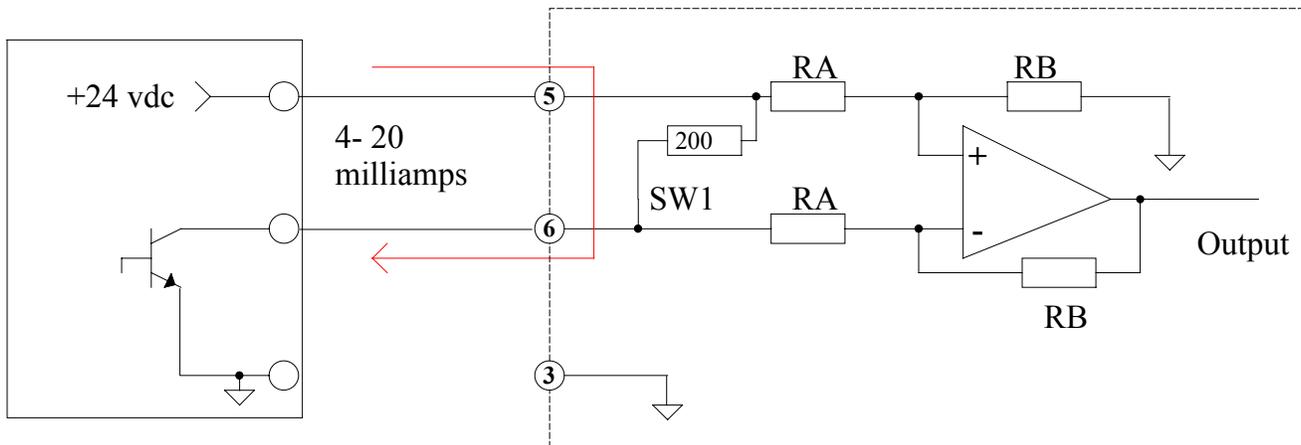


The important characteristics of this circuit is the resistance value “R” and the allowable common mode voltage between any input to signal common. The resistance value “R” sets the voltage that will be generated with a 20 milliamp input ,4 vdc in this case. The common mode voltage is the maximum allowable voltage that can be applied to any input terminal (#5 or #6) with respect to common (#3) where the amplifier will operate correctly. This voltage level is +/- 12vdc.

There are two types of 4-20 milliamp transmitters, namely *high side* and *low side* referenced. A diagram of each is shown below.

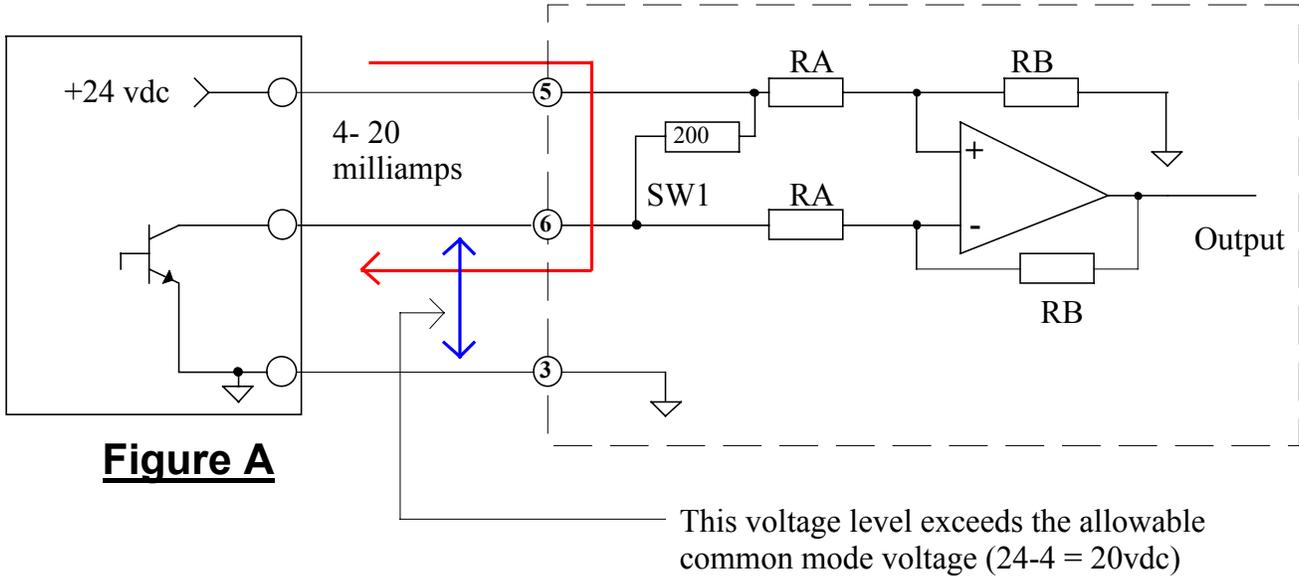


High Side Referenced Current Transmitter connections



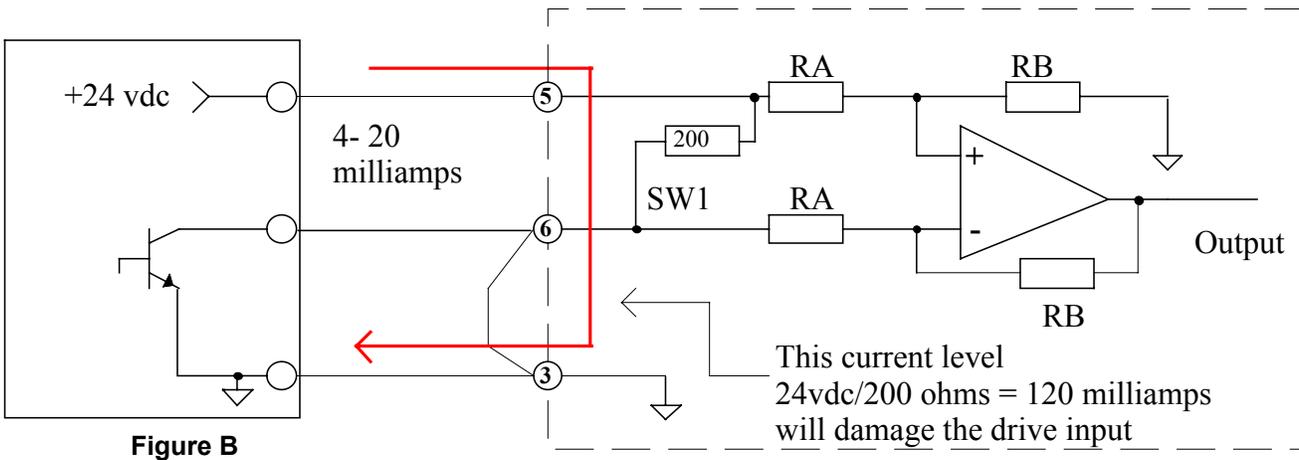
In the above case, as long as the +24vdc supply of the current transmitter is isolated and is not connected to the drive in any manner, the system will work. The common of the current transmitter should **NOT** be earth grounded, leakage current from the drive can cause the current transmitter to malfunction.

Below are other connection schemes that will not work correctly (Figure A) and will damage the drive input (Figure B).



In Figure A, the voltage at terminal #5 with respect to drive common is 24vdc and the voltage at terminal #6 would be 23.2vdc at 4 milliamps and 20vdc at 20 milliamps. Both levels exceed the maximum allowable common voltage of 12vdc and will cause the amplifier to act erratically.

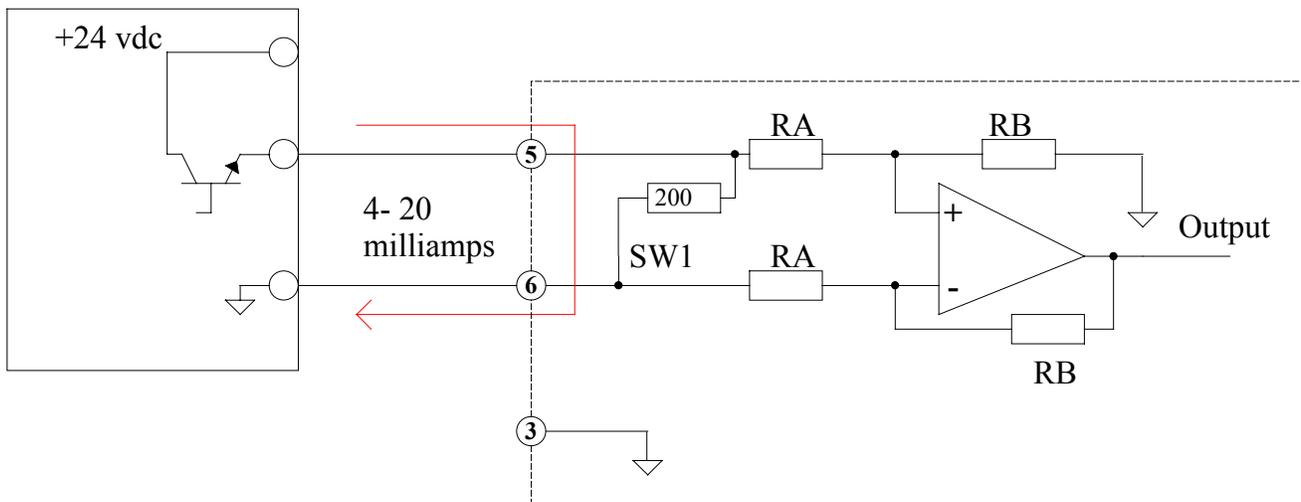
Figure B



In Figure B, it is clear that the 24vdc supply will be shorted directly through the 200 ohm resistor in the drive, causing it to fail.

Note that the main problem, when a high side referenced current source is used, is caused by the common connection to the drive. Keep in mind that in many cases the current transmitter is sometimes an additional card added to a PLC. In this case all of the power supply 0 volt commons are typically tied together and connected to earth ground. These PLC's may also be controlling logic inputs to the drive which requires the drive common to be connected to PLC common.

Low Side Referenced Current Transmitter Connections



This arrangement is the best configuration. Terminal #3 and #6 may or may not be tied together. The Current transmitter may be earth grounded if required.

Questions ?? Ask the Author:

Author: Steve Zaleski
(716)-774-0093

Email to: steve.zaleski@emersonct.com