This Application Note is pertinent to the H300 Drive Series
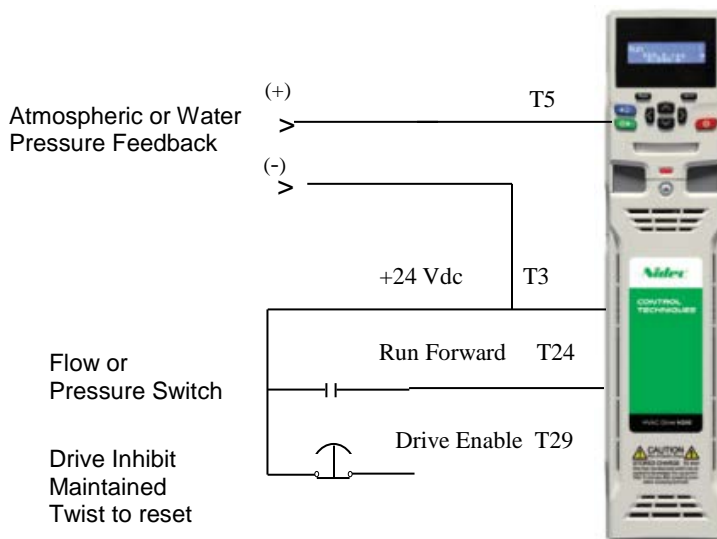
Fan & Pump with PID Loop Control

      This application note will describe a way to utilize the H300 in a Non-bypass application to regulate the atmospheric or water pressure in a building by using the H300 PID Loop control in Normal mode. The H300 will be programmed to Start/Stop upon pressure demands and regulate pressure to a specific setpoint level using its built-in PID Control Loop function (of course a pressure feedback transducer is required). If using an H300 Electronic Bypass System, please contact Tech Support for programming, since the drive is programmed to operate with Bypass.

      Many system schemes use a rather simplistic method whereby if there is no demand for water, the pressure in the system will typically hold by running the pump at a low speed (or zero speed). This is not good for the pump or the pump motor and is not good for overall energy efficiency either. By using the H300's built in Sleep/Wake mode, the drive will be placed in either RUN (Wake) or STANDBY (Sleep) based on Frequency/Speed Reference in parameter #1.01 (typically minimum speed of pump or pump motor). For set up and test purposes, the drive can be run in keypad mode (Hand mode).
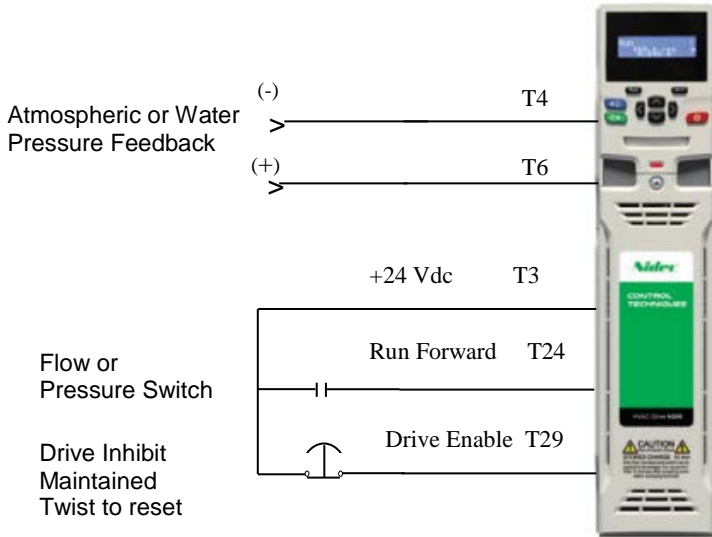
      This application note shows how to configure the drive to run with PID control. HVAC Connect, (KI-485-Adaptor and CT Comms Cable) or (SI-Ethernet and Ethernet patch cable) are recommended and needed to program the drive with a computer. CTScope is also useful in tuning the system. All software is complimnetary. For convenience all required parameter changes (except motor map parameters) are given both graphically and in table form.

Choose the Analog Input Type

Analog Input 1 with 4-20 mA Feedback Sensor:

Analog Input 2 with 0-10 Volt Feedback Sensor:

Atmospheric or Water Pressure Feedback

(-)   T4

(+)   T6

+24 Vdc   T3

Run Forward   T24

Flow or Pressure Switch

Drive Enable   T29

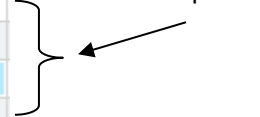Drive Inhibit Maintained Twist to reset

Programming

Before making any changes to the drive for the specific application, the drive should be able to run using the drives Hand mode (which is the default configuration) to verify proper operation of the drive and motor. This involves entering the basic motor information. The key parameters are listed below. In this set up, the drive is controlled by the front keypad controls.

Per your motor nameplate

Parameter	Caption	Categories	Value
00.018	**Rated Voltage**		**230 V**
00.019	**Rated Speed**		**1800 rpm**
00.020	**Rated Current**		**0.700 A**
00.021	**Rated Frequency**		**60.0 Hz**

Once the drive has been successfully run, the PID can be set up. Below are the block diagrams of the H300 PID Loop. All of the block diagrams are screen shots from HVAC Connect.

Basic PID Loop Setup
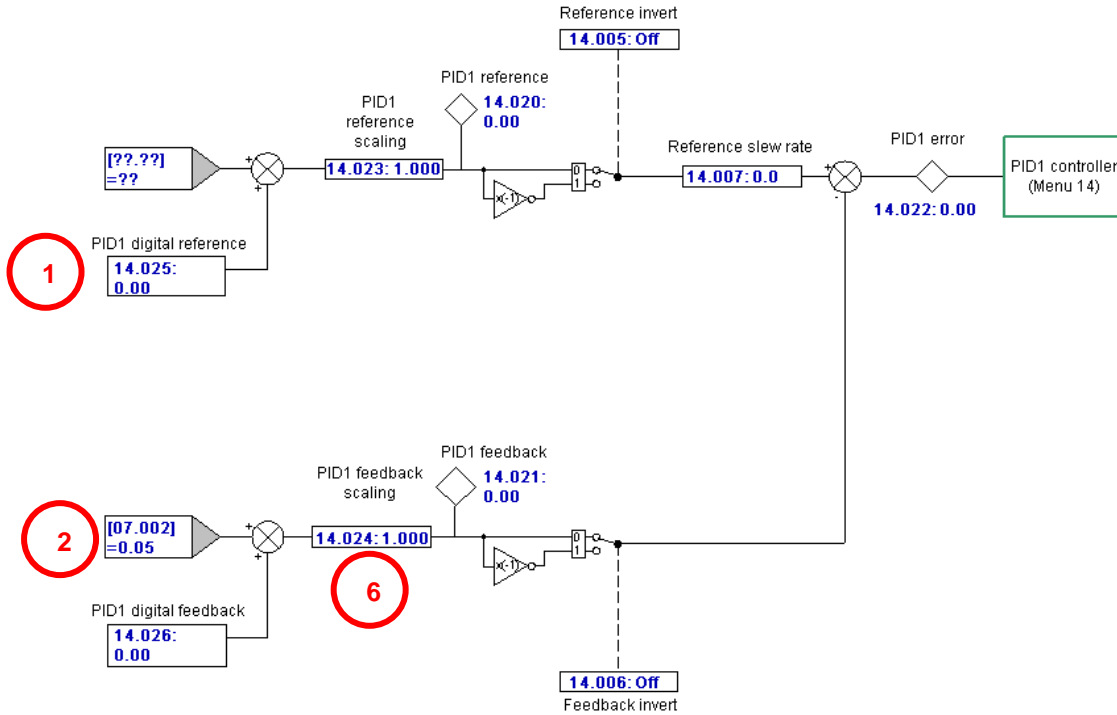
Figure 1.1

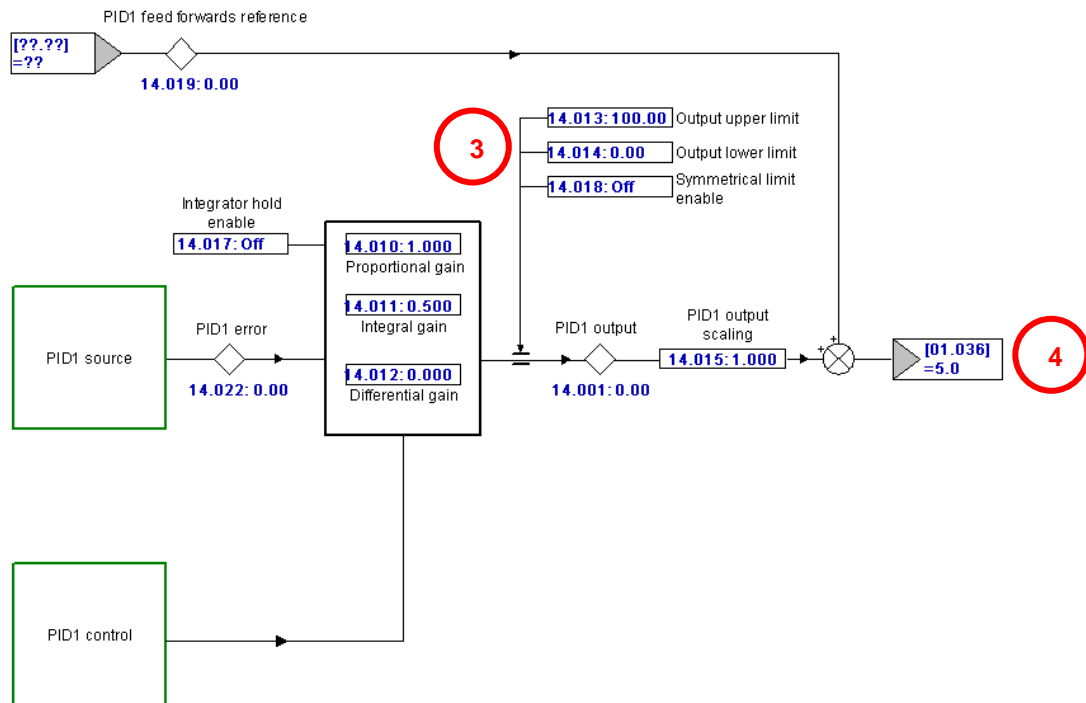PID1 Reference, Feedback and Error
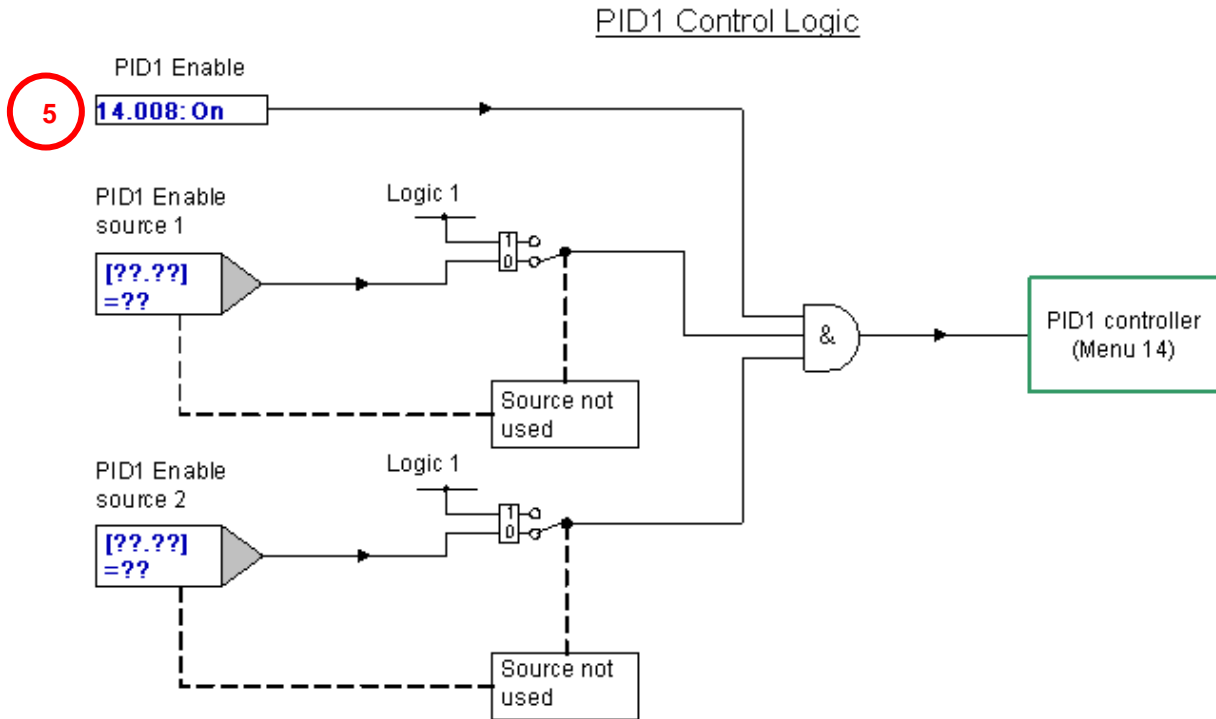

Figure 1.2

PID1 Controller

Figure 1.3

PID1 Control Logic

Figure 1.4

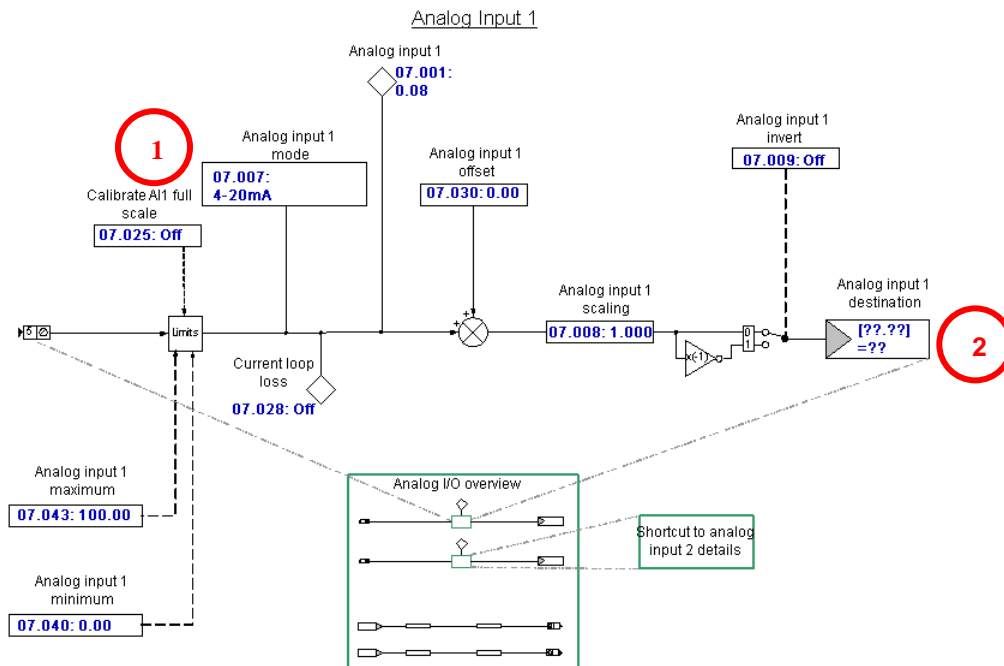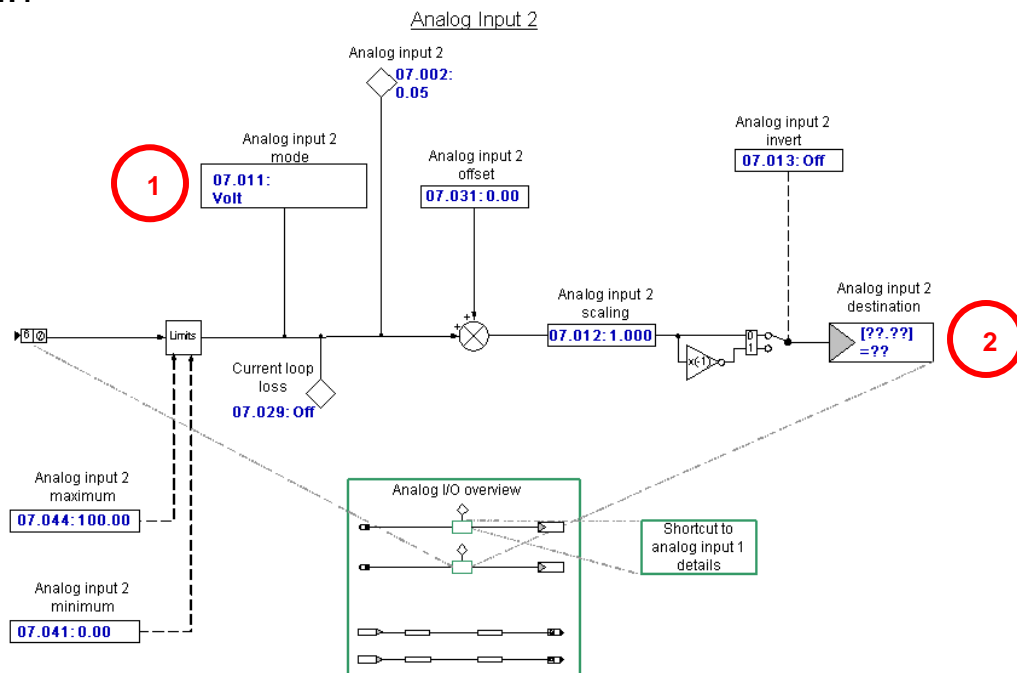|	Parameter #	Value	Description
1	14.025	0.00 to 100.00	Pressure set point in percent
2	14.004	7.001	Analog Input 1 (Terminal 5) is the pressure feedback (or)
2	14.004	7.002	Analog Input 2 (Terminal 7) is the pressure feedback
3	14.014	0%	PID is limited to forward (positive) speeds only
4	14.016	1.036	Output of the PID is sent to Analog Input 1
5	14.008	On	PID circuit is enabled
6	14.024	0.000 to 4.000	Transducer Scaling if needed
	1.014	A1.A2	Drive will get the speed reference from #1.036

Analog Input 1 or 2

Analog Input 1

Figure 1.4

Analog Input 2

Figure 1.5

	Parameter #	Value	Description
1	#7.007	4-20 mA	4-20 mA feedback signal from pressure sensor (or)
1	#7.011	Volt	0-10 Vdc feedback signal from pressure sensor
2	#7.010 and #7.014	0	Analog Input Destination parameters are set to 0

Display Setup

The keypad can be setup to display the percent set point and percent feedback. To do this set parameter #11.018 to 7.001 (analog 1) or 7.002 (analog 2) depending on which analog input you decided to use. Then set parameter #11.019 to 14.025. This will display the feedback on top of the set point on the keypad. To adjust the set point from menu zero set parameter #22.006 to 14.025. This will allow you change the set point, #14.025, from parameter #0.006.

Sleep/Wake Mode for Automatic Start/Stop

Most applications that require a Sleep/Wake function need an external processor that would put the drive in a sleep or wake state. The H300 has a built-in Sleep/Wake mode, which allows the user to put the drive in a sleep (standby) or wake (run) state. The Sleep/ Wake mode is *only* for low end speed range, which works out nice for pump and pump motors that have a minimum low speed range.

The sleep/wake mode monitors the Frequency/Speed reference Parameter #1.001 to determine when to sleep or wake. When there is an increase in demand and Frequency/Speed Reference exceeds the Sleep/Wake threshold (#6.053), the drive will automatically go into RUN and maintain the atmospheric/water pressure setpoint. Once the frequency falls below the Sleep/Wake threshold (#6.053), the unit will shut down depending on the Sleep delay time (#6.054).

For example, a pump manufacturer recommends the pump should not run below 30 Hz for more than 5s. Since we know the manufacturer recommendations, then the Sleep threshold (#6.053) will be set for 30 Hz. The Sleep delay time (#6.054) and Wake delay time (#6.055) to 5s. This will follow the manufacturer recommendations and prevent the pump from running all the time at a minimum speed, which will cause more wear and tear in the long run.

Figure 1.6 illustrates this by using CTScope. In the circle to the left, you will notice the time it took after reaching 30 Hz before going into a Sleep Mode.

Fig.1.6

Please use updated reference material (Software and Manuals) while working.

Resources: can be found on our website: www.controltechniques.com
For help contact techsupport.cta@mail.nidec.com, or
call Technical Support at 952-995-8000, 24/7/365