

Pump and Fan Start-up Supplement

Application Summary

This application note is a supplement for starting up AC drives. This is by no means meant to be a strict guideline to starting drives but is meant to give some suggestions as to things that should be done or looked at during start up.

Parameters:

Min/Max freq: (P1.1.1 & P1.1.2) This setting is done for the application. Depending on what controls are added and what you are running will determine these settings. Most pumps don't pump until around 30Hz so this is a common minimum setting for these applications. Sometimes this is all done in the control system so the min/max in the drive stays at the default. Fans come with a normal default min freq of 20% which works for most applications.

Ramp times: (P1.1.3 & P1.1.4) This again is very dependant on the application. The norm for fans is about 60 sec and for pumps about 20 sec. The slower you can make the ramp times normally the better off you are within reason. For fans there isn't normally a reason they have to get up to speed in a certain time but pumps will not normally start to pump until they are about half speed. Because of this you don't want to take too long to get up to speed. There may also be timers on check valve and things along that lines that you have to open in a certain amount of time or the system will fault.

Current limit: (P1.1.5) On a normal variable torque application you set this somewhere between 110-125% motor FLA. Fans are kind of the exception to this where you set the current limit normally at FLA. Normally this is set for how fast you need to get the application up to speed. The slower you ramp the closer you set this to the FLA of the motor. On constant torque applications is where you usually have to take this up to get the breakaway torque to get started or to carry through some sudden change in load. You still would prefer to keep this as close to 150% as possible on CT applications and 110% on VT applications.

Start function: (P1.4.6) For pump applications this is almost always left at the default of ramping. For fan applications the question has to be asked whether there is any chance we are going to be starting on a spinning motor. If there is the chance it is best to change this to flying start. On ramping start the drive is going to try and start the motor at zero hertz so if the motor is spinning this can either draw a lot of current or regenerate power back into the drive. With flying start the drive will pulse the output starting at max freq and work its way backwards looking for magnetizing current. Once it sees magnetizing current it knows this is where the motor is and will pick up from there. One thing to note on this is flying start does work better with a spinning motor. It is possible with a motor that is not spinning that the drive will actually slightly spin the motor backwards before spinning it in the forward direction.

V/Hz optimization: (1.6.2) Normally you leave this off unless you need it. When you turn on auto torque boost it will give the motor a little more voltage at start up to produce more breakaway torque. Some applications are hard to start and you will need to turn this on. What typically happens if you need this is when the drive starts it goes into an immediate current limit and will never get the motor going. If you need to turn this on it is normally wise to turn on the stall protection in the drive.



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Switching freq: (P1.6.9) Switching freq is another setting that will vary greatly from application to application. Industrial default freq for us is 3.6kHz. This works where audible noise is not an issue. Pumps are an application where noise will not carry to other areas. Fans you have to be conscious of the audible noise as this noise can carry down the duct work. As a general rule you want to go as low as possible without it causing too much noise. The lower the switching freq the less switch losses you have and this also helps on any DV/DT issues. If you have an output reactor you have to be aware of what the output reactor can handle. Most of them can take 8kHz and below but if you get too high you will overheat the reactor. A good rule of thumb to follow is for pumps outside fans set this between 2-4kHz and for air handler units between 5-10kHz. An exception to note is 250HP variable torque drives shouldn't have a switching freq over 2.5kHz.

Input phase protection: (P1.7.4) Turn on the input phase protection on all 3 phase drives. FR9 and below CPX drives are the exception to this leave the phase protection off on these drives.

Stall protection: (P1.7.13-16) It is a good idea to turn on the stall protection. Set the current for the stall protection a little below the current limit. The time limit for the stall protection kind of varies depending on how high you have your current limit set. The closer the current limit is to FLA the higher you normally go with this setting. Somewhere around 20 seconds is normally a good setting. Stall freq you can leave at default in most circumstances although lowering it to around 10 Hz is not a bad idea.

Parameter lock: (P5.5.2) The default for this is change enable. If you think there will be a problem with people randomly pushing buttons and possibly changing parameter it would be a good idea to change this to change disable. This way to do any changes the person doing it has to know enough to go to this spot and change this first. This is normally the best way to do this without putting in a password which can be forgotten.

Fan control: (P5.7.2) For all but CPX drives change the fan control to calc temp. What this will do is make it so that the drives main cooling fan will run when the drive temp gets to 40C and turn off when it gets back to 30C. On CPX drives change the fan control to temperature. The reason for this is that the CPX drive has external rectifiers that are cooled by the fan but the temp is not fed back to the drive. To play it on the safe side we want the fans running when the drive is running.

Installation:

Grounding: Grounding is very important for a drive. This input should be a low impedance ground to the utility ground. The output should be a low impedance ground going from the motor to the drive and only from the motor to the drive. This ground should also be one conductor size smaller than the load wires going to the motor.

Wire routing: There should be 2-4 conduits going to the drive. There should be a conduit for the input power wires, a conduit for the output motor leads, a conduit for control wires under 50V and one for control wires over 50V.

Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-326-2273 option 2, option 6.

All other supporting documentation is located on the Eaton web site at www.eaton.com/Drives

