

ACH580 override using multiple constant frequencies

Configure up to six constant frequency settings using six discrete digital inputs

Override strategies often require the VFD to be controlled to multiple constant frequency setpoint(s) determined by the Fire Alarm/Life Safety system or as commanded from the fire alarm control panel (FACP). The ACH580's Override mode can be programmed to control up to six constant frequencies. Configuring the drive with a minimum frequency the drive would support 7 discrete constant frequency settings.

Typically, the application only requires a single constant frequency setpoint, however, more complex applications and smoke removal strategies require the VFD to operate at multiple different constant frequency values. For example, smoke purge fans that serve multiple floors and/or large atriums may need to be commanded to any one of multiple, pre-defined frequencies to create the correct exhaust CFM.

This technical note will focus on applying the ACH580 to support multiple, constant frequencies using discrete contact closure requests from the Fire Alarm (FA) system.

ACH580 Override modes

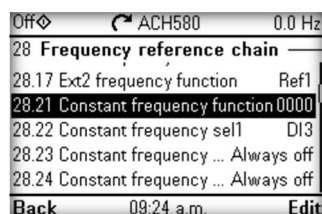
The ACH580 Override feature is very flexible and can be easily configured to provide the right mode to control the fan speed required by the application. The Override modes available are:

- *Constant frequencies* select from multiple, up to six, constant frequencies using discrete digital inputs.
- *Constant frequencies* select up to seven constant frequencies using a three digital input matrix.
- *AI1 directly or AI2 directly* as the Analog Input speed reference to the drive in Override mode.
- *Override frequency* commands the drive frequency setpoint to a single preprogrammed value.
- *Floating point* uses two, user selected DIs to increase or decrease the drive frequency.
- *Force Stop* on Override condition the drive stops. Drive follows the defined stop mode.
- *PID, set1* controls the drive frequency using the output value of the process PID set 1 controller.

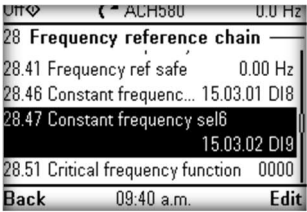
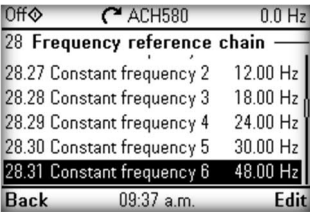
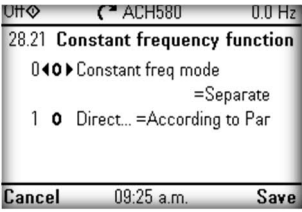
Constant frequencies using the *Group 28 Frequency reference chain*

Let's explore the multiple, constant frequencies mode using discrete digital inputs and see how they can be configured. We will look at configuring parameters in the *Group 28 Frequency reference chain*.

In order to configure the individual constant frequency selection points, we need to Edit the Constant frequency function and set the <1> *Constant freq mode = Separate*.



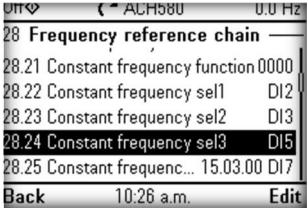
The ACH580 supports six constant frequency using selection points. The *28.21 Constant frequency function*, when selected for *<0> Constant freq mode = Separate*, provides for up to six constant frequencies that can be activated from six discrete digital inputs associated with six constant frequency selection points; *Constant frequency sel1* through *Constant frequency sel6*.



The actual constant frequency values are set in parameters 28.26, 28.27, 28.28, 28.29, 28.30, and 28.31.

Each of the six constant frequency selection points defined by parameters 28.22, 28.23, 28.24, 28.25, 28.46, and 28.47 have a dedicated constant frequency; *Constant frequency 1* through *Constant frequency 6*.

The magnitude of each of these frequencies is completely adjustable and can be increasing or decreasing in their relative values. This allows for flexible solutions when programming the application.



This is important when you consider what frequency setting should prevail if more than one of the selecting DIs is turned on at the same time (see Conflict Rule below).

If they are ascending, then the system will use the relatively lower constant frequency value. If the frequency values are descending, then the system will use the higher constant frequency value that is associated with the lower "sel" number.

Conflict Rule

If more than one of the "sel" points are activated at the same time. In case of conflict between two or more selections while operating in *Separate* mode there is a "Conflict rule" to determine which frequency value is used as the reference setpoint for the VFD. The constant frequency associated with the smaller "sel" number takes priority.

For example, if both *Constant frequency sel3* and the *Constant frequency sel2* inputs are selected at the same time the *Constant frequency 2* value is used as the setpoint for the VFD because it is associated to *Constant frequency sel2* which is the smaller "sel" number.

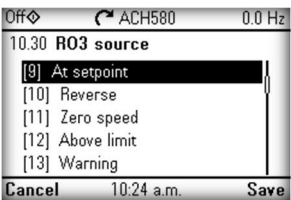
Minimum frequency

It is important to note that the minimum frequency value defined in parameter 30.13 Minimum frequency will be effective even in Override mode.

Caution: If the selected constant frequency value is less than the minimum frequency value, then the minimum frequency value is used as a lower limit. The drive reference value will be limited and not go below the Minimum frequency value. If used the minimum frequency value should be lower than the lowest desired constant frequency.

The Minimum frequency can be used to establish a seventh frequency (speed). By making the Minimum frequency value less than the lowest constant frequency it becomes the first fan speed. The constant frequency selection points Sel1 through Sel6 can then be triggered to call for Constant frequencies 1 through 6.

"At setpoint" indication



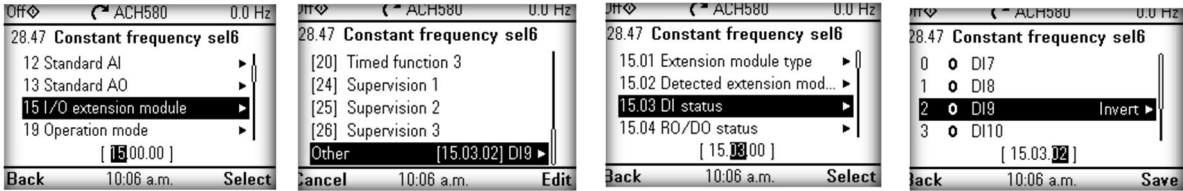
For specifications and applications requiring a hardwired indication of the system operating "At setpoint", the relay output source can be configured in Group 10 to supervise the [9] At setpoint drive signal.

This signal is true when the VFD's actual frequency value equals the drive's reference frequency value (setpoint). The relay output N.O. contacts would then be hardwired into the FA system to provide the "At setpoint" status.

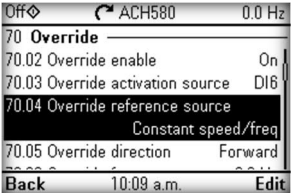
Note: The minimum frequency is not a setpoint, so when the VFD is operating at the minimum frequency the At setpoint condition is not true unless the value happens to be the same as the selected reference value.

Using the I/O extension module to add Digital Input points to the VFD
Supporting both Normal operation and Override mode may require additional DIs beyond the standard six digital inputs that come standard. The CHDI-01 optional 115/230 V digital input extension module provides an additional six digital inputs that can be associated to DI7 through DI12.

The *Constant frequency sel#* parameters can be associated to the DIs on the CHDI-01 extension module by highlighting [15] *I/O extension module* for the constant frequency selection point and pressing Select. Highlight Other and Edit. Select, the *15.03 DI status*. Highlight the digital input, DI7 through DI12, you want to use and Save.



Override functions are easily configured using *Primary settings*
Parameter *70.04 Override reference source* will need to be selected as [0] *Constant speed/freq*. The Override function would need to be enabled in parameter *70.02 Override enable* and have a defined activation source configured using parameter *70.03 Override activation source*.



You can use the *Primary settings> Override* menus to easily select and configure these values.

Summary

The Constant frequency function is a very common application for the VFD operation. Having multiple constant frequencies with assignable activation points will provide flexibility in both Normal and Override operation modes.

The “At setpoint” confirmation of the system frequency command being achieved provides critical feedback to the first responder commanding the building systems from the FACP.

While you can configure the drive for multiple constant frequencies using a three digital input matrix or truth table, most FA systems do not have the flexibility to program the extra logic needed to support truth tables. In most cases the matrix approach requires adding external relay logic.

Having the six constant frequency selection points simplifies the design and adds flexibility and reliability to the Override solution.