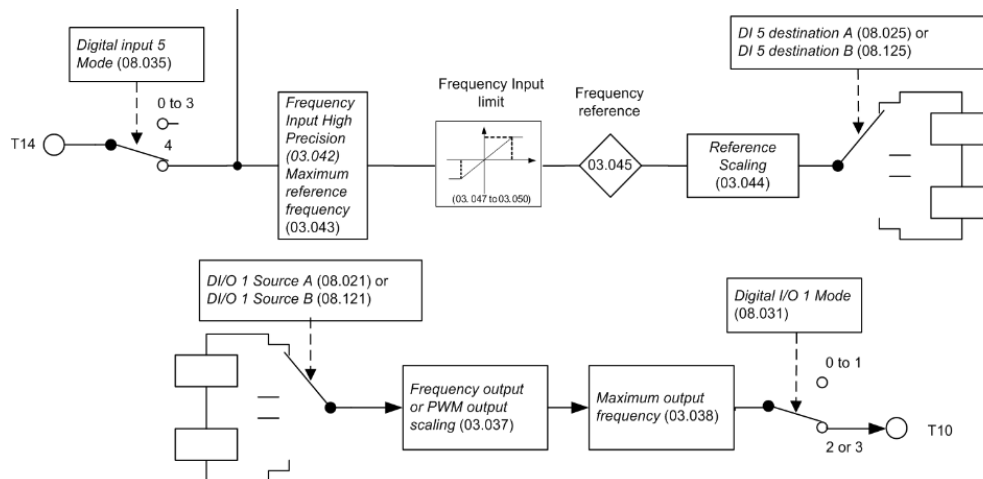# Frequency Input/Output

Most applications of the Commander C use either an analog voltage (0-10Vdc) or analog current (4-20mA most commonly) signal to provide a speed reference to the drive. However, the Commander C general purpose drives also provide a third signal option for sending/receiving a speed reference. These drives can use a specific digital I/O terminal to send a frequency output in which information is encoded in frequencies inside of an interval acceptable to the drive or receiving device. In models C200 through C300, another terminal is used to receive a frequency input which can be used for following a frequency-based speed reference.

*Block diagrams of the frequency input and frequency output in an C200 drive.

Terminal 10: Frequency Output

In models C200 to C300, this terminal is known as Digital I/O 1. Although typically set up as a digital output (sending a zero frequency signal) by default, this can also be set up as a frequency output in Menu 8. Change the mode of Terminal 10 by setting Pr. 08.031 = Frequency (or "Fr"). Use Pr. 08.021 to set up the source of this output.

Menu 3 has additional settings for frequency reference manipulation for sending and receiving drives. For outputting purposes, Pr. 03.038 determines the maximum clamp

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for outputting frequencies. Thus, the drive will output frequencies from 0Hz through the selected value in Pr. 03.038.

Terminals 14 and 15: Frequency Input

For the C200 and the C300, terminal 14 (Digital Input 5) can be used as a frequency input terminal. In Menu 8, set Pr. 08.035 = Frequency (or "Fr") to change the input mode of terminal 14. Use Pr. 08.025 to change the destination parameter for this frequency input.

For the M400, terminal 15 (Digital Input 6) is used for a frequency input. In Menu 8, set Pr. 08.036 = Frequency to change the input mode of terminal 15. This parameter affects both terminals 15 and 16, however it will dummy out terminal 16 (Digital Input 7) when set to a mode of Frequency Input. Terminal 16 will only actually do anything when used as a Digital Input or AB Encoder input. Lastly, remember to use Pr. 08.026 to set up the destination parameter for the frequency input.

Menu 3 Frequency Reference (Input) Settings

For drives that are receiving a frequency input, use Pr. 03.043 to determine the upper frequency reference clamp. Unlike the list of options found in the maximum output clamp parameter, this parameter can be set to any writable value from 0Hz to 100kHz. So use this parameter to define what the drive perceives to be a 100% input signal. The user can monitor the received signal "strength" by monitoring Pr. 03.045, which shows a percentage value based on the setting of Pr. 03.043.

Example: Basic Drive to Drive Configuration

In this example, we'll have an M400 output its Torque Producing Current (Pr. 04.002) signal to a receiving C200 drive to provide it a speed reference.
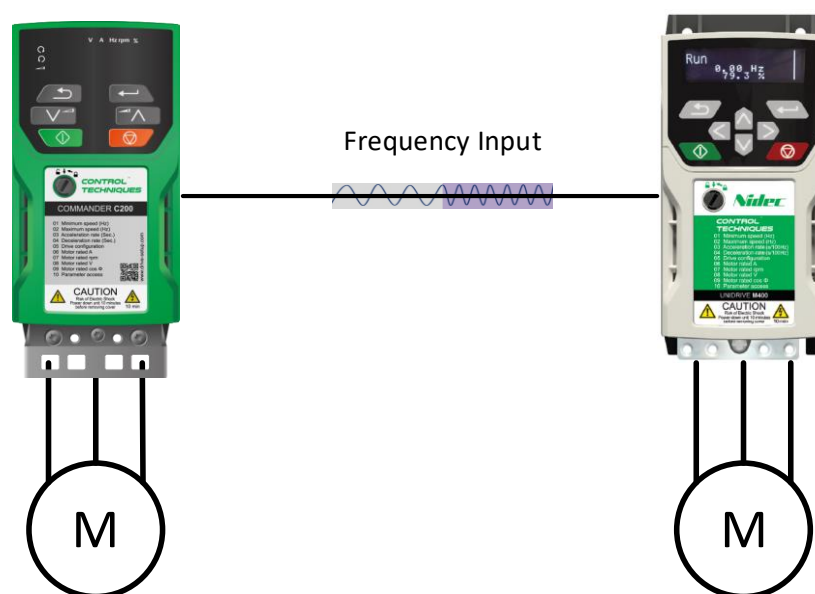


For the M400 (outputting drive):

1. Set Pr. 08.031 = Frequency.
2. Set Pr. 08.021 = 4.002.
3. Set Pr. 03.038 = 10kHz (by default, this is set halfway to what a receiving drive expects).
4. Save parameters.
5. Connect a wire to terminal 10 of the M400.

For the C200 (receiving drive):

1. Set Pr. 08.035 = Fr.
2. Set Pr. 08.025 = 1.021.
3. Set Pr. 01.014 = PrESEt.
4. Make sure Pr. 03.037 = 10kHz.
5. Save Parameters.
6. Connect the wire to terminal 14 of the C200.

This setup should allow the C200 to follow a speed reference determined by the M400's Torque Producing Current. This received signal can be used in other functions of the C200 as well, such as Threshold Detectors or any of the Logic Functions.

Additional Menu 3 Settings: Scaling and Mapping

Fig. 3.3: Frequency Input limit and scaling
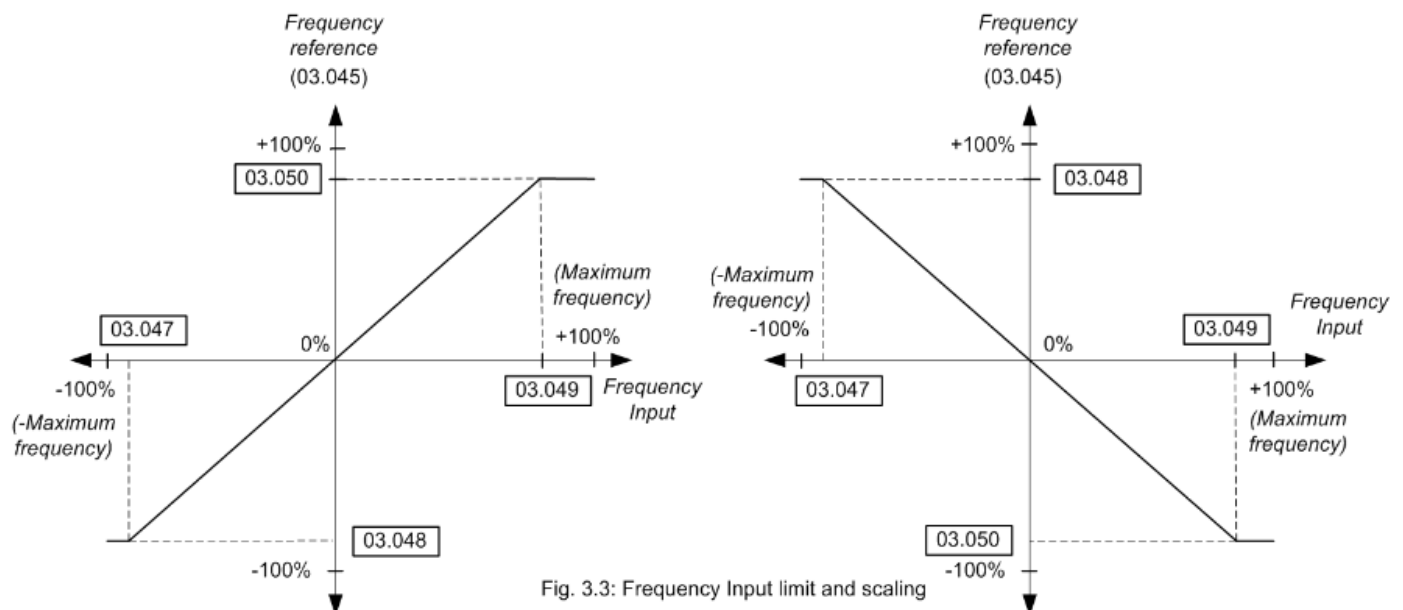
To change scaling and reference mapping of the received frequency input, use Pr. 03.047 through Pr. 03.050. Both of the aptly labelled "Two Point Minimum" and "Two Point Maximum" parameters (Pr. 03.047 and Pr. 03.049) determine how much of the *actual* frequency input is going to be used. This is also dependant on what you defined as the "maximum" frequency input in Pr. 03.043, as discussed previously. The Two-Point Maximum (Pr. 03.049) by default is set to 100%, can be set to a lower value in order to clamp Pr. 03.045 to no higher than that value. Although the Two-Point Minimum (Pr. 03.047) is set to -100% by default, the drive typically would not receive signals with negative frequency, the natural minimum is 0kHz.

The "Drive Reference at Minimum Frequency" and "Drive Reference at Minimum Frequency" parameters help to linearly map the interval in which Pr. 03.045 can modulate. The displayed value of Pr. 03.045 is clamped by these two parameters, and the order of the clamps can reverse the direction of frequency reference change. These two parameters can thus effectively scale (and invert) Pr. 03.045.

For example, setting Pr. 03.048 = 50% and Pr. 03.050 = 75% will make sure Pr. 03.045 (and the associated destination of this reference indicated in Pr. 08.021) can ONLY modulate in a closed interval of 50% to 75%. Ramping up the *actual* frequency input will increase Pr. 03.045 up to 75%. However, swapping these parameter values will create the opposite effect, where ramping up the *actual* frequency input will decrease Pr. 03.045 down to 50%.

*To emphasize, these changes only affect the drive receiving a frequency input.

PWM Output

Parameter 08.031 for models C200 to C300 also allows the option of a PWM output. This means that signal strength from the source parameter is encoded in the duty cycle of pulse train coming out of the drive. The drives do not support this kind of signal as an input.