FAQ: Can I use an AMCI Stepper Module as a Frequency Generator?

The AMCI 3202, 3204, 3401, and 3601 modules output a 50% duty cycle square wave and are designed to be the indexer in a stepper motor system. The following must be considered if you are instead planning to use any of these modules as a frequency generator.

These stepper controller modules use a discrete method of determining when to change the state of the output pulses. At lower frequencies, this discrete method is very accurate. That is, the desired frequency will be precisely output by the stepper module. However, at higher frequencies, the stepper module may output a frequency that is slightly different from the desired value, and it may not be possible to precisely change from one frequency to the next. This discrete method of outputting step signals does not affect stepper systems because the number of steps output is always accurate, and because stepper drivers typically only look for transitions on their step inputs.

AMCI stepper modules use a 40MHz internal clock to generate their output steps. This internal 40MHz clock signal has a 25ns period. This 25ns is the rate at which the stepper module is capable of turning the output steps either on or off. That is, 25ns is the minimum time required to turn the pulse on and 25ns is the minimum time required to turn the pulse off, for a total of time of 50ns. 50ns has a frequency of 20MHz and therefore the number of samples that the stepper module must make to output a desired frequency is equal to (20MHz / Desired Frequency)

Determining the next frequency that can be output by a stepper module

Number of Samples = (20,000kHz / Desired Frequency)

For example, consider that the stepper module is outputting a 50KHz signal.

Number of Samples = 20,000kHz / 50KHz = 400 samples

Because the output pulses are being generated discretely, this means that the next frequency that can be output can be derived from either 399 or 401 samples.

Frequency = 20,000kHz / Number of Samples
Frequency = 20,000kHz / 399 = 50.125kHz
Frequency = 20,000kHz / 401 = 49.875kHz

Determining the frequency output by an AMCI stepper module

1. Divide 40MHz by the desired frequency.
2. Truncate the decimal portion of the result.
3. Divide 40MHz by this truncated number. The stepper module will output this frequency.

For example, Desired Frequency = 30kHz

40,000kHz / 30kHz = 1333.333

Truncated, this number is equal to 1333

40,000kHz / 1333 = 30.008kHz