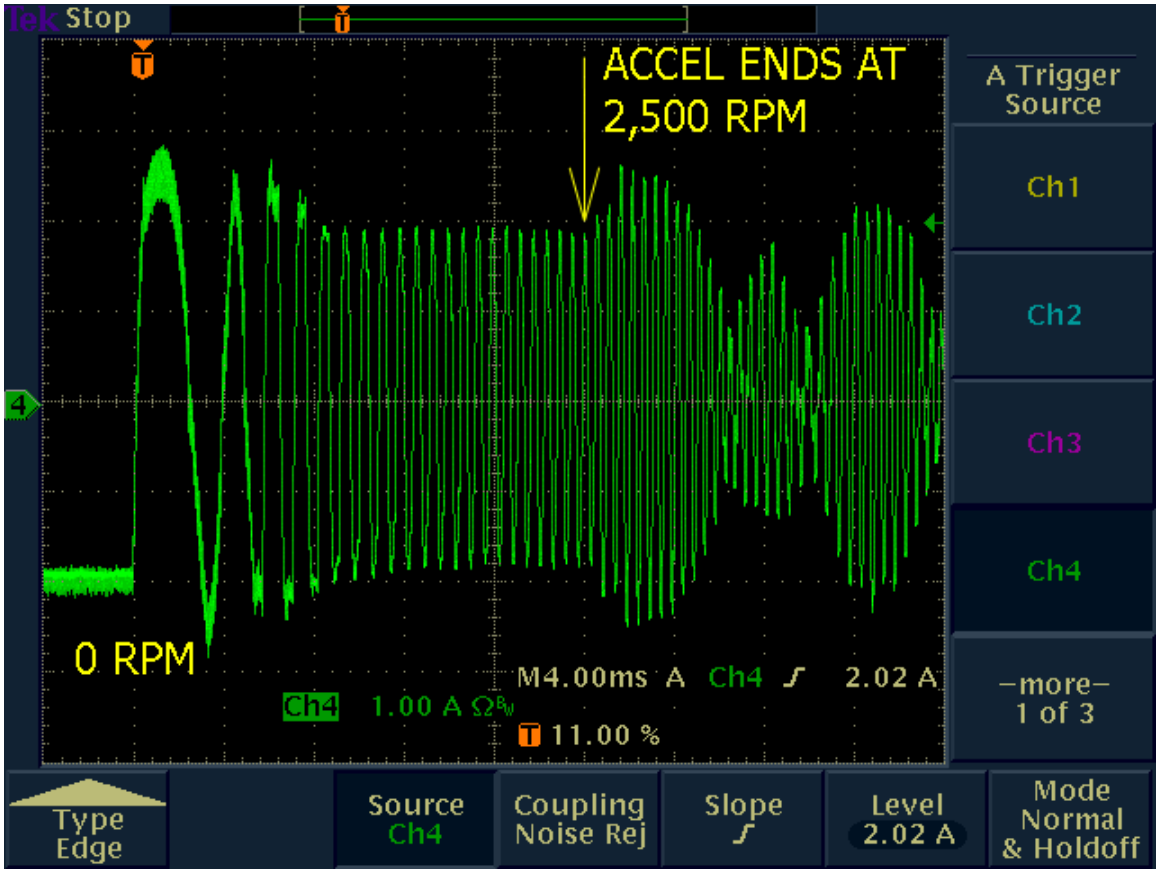
Step Motor Servo Acceleration Time



The above figure shows a 3A per phase NEMA-23 step motor driven by a G203V with a 40VDC power supply voltage. The motor is equipped with a 500-line encoder. A Rabbit RCM3720 closes the loop around the motor. A function generator is set to 83 kHz that results in a 2,500 RPM servo command speed.

The 83 kHz step rate is gated-on (unaccelerated) marked by the scope's trigger start point at 4ms. The motor begins accelerating and reaches its servo command speed of 2,500 RPM 20ms later. The averaged acceleration rate is 13,000 rad/sec^2 and the motor displacement is 158 degrees from the start of acceleration until 2,500 RPM is reached. This calculated by counting the number of waveform cycles, each cycle being 7.2 degrees of motor rotation.

The abrupt cessation of acceleration is marked by motor "ringing". The motor phase current amplitude is modulated at the 90Hz ringing frequency (period of 11ms). The mechanical angular amplitude of this ringing is servo-constrained to a +/-0.09 degrees limit.

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