PRODUCT NOTE
SERVO PRODUCT ENGINEERING GROUP

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Subject: Setting Multi-Turn Limit for Absolute Encoder

Product: Sigma II w/ Absolute Encoder

Summary: When using a Sigma II motor with absolute encoder, it is important to ensure that the multi-turn setting (Pn205) is set properly. If it is not set correctly, the encoder data read on power-up may be erroneous.

Description of the Situation:

The absolute encoder has an electronic multi-turn counter that keeps track of the number of revolutions that the motor has gone away from it's "home" revolution. There is a limit to the maximum number of revolutions that the absolute encoder can count. By default, the encoder will count up to 32767 revolutions. At the next revolution, the counter will "wrap" to –32768.

In some circumstances, it may be necessary change the multi-turn limit setting so that the encoder "wraps" correctly. This change is only necessary when the 32768 revolutions that the motor turns by default is not an even number of machine cycles. Usually, the following must be true for this change to be necessary:

- Application moves in one direction only
- Application has gear reduction (although gear ratios of 2^n:1, where n is a positive integer, should work with the default settings as well)

Setting the Multi-Turn Limit:

If the application moves in only one direction and has a gear reduction, the Multi-Turn Limit Setting (Pn205) must be set. This setting changes the "wrap" point so that partial-cycle revolutions will not cause difficulties in the application. Set Pn205 according to the following equation:

(Mechanical Gear Ratio * n) – 1

Where n is any integer such that the total does not exceed 32768 (the maximum setting for Pn205). The parameter must be set to an integer, so if the gear ratio is non integer (i.e. not n:1), then the gear ratio must first be made an integer. For example, if the mechanical gear ratio is x:y, then first multiply the ratio by y (the result is still a multiple of the gear ratio, so the above equation still works) and then subtract 1. See Example 2 below for an example.

Example Settings:

Example 1: If the mechanical gear ratio is 1000:1, then Pn205 can be set to 999, 1999, 2999, etc.

Example 2: If the Mechanical gear ratio is 15:62, then Pn205 can be set to:

- **14** ($15 \div 62 \times 62 - 1$)
- **29** ($15 \div 62 \times (62 \times 2) - 1$)
- **44** ($15 \div 62 \times (62 \times 3) - 1$)