Introduction

This app note describes how to set up a profiled position move with velocity, acceleration, and deceleration limits.

Note: *This document is intended for use with AN-006, which provides examples on how to configure and send target commands in various drive modes.*

The Command Limiter

The Command Limiter is the tool for configuring profiled position moves. Turn on the Command Limiter in DriveWare by clicking the Accel/Decel radio button in the *Drive > Configuration 0* window in the System Browser, or through the RS232 interface using index D1h.
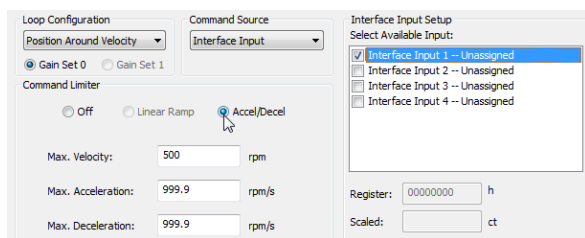

Figure 1 – Command Limiter in DriveWare

The following objects are used to set maximum velocity, acceleration and deceleration limits when operating in position mode.

3C.18h
Controlled Accel/Decel Maximum Speed
This parameter sets the maximum speed for a profile.

3C.1Ch
Controlled Accel/Decel Maximum Acceleration
This parameter sets the maximum acceleration used for a profile.

3C.1Eh
Controlled Accel/Decel Maximum Deceleration
This parameter sets the maximum deceleration used for a profile.

Drive Units

To convert from physical units to drive units, start with velocity in counts/sec, then acceleration and deceleration in counts/sec² based upon feedback resolution, and then multiply by the scaling factor in Table 1.

Drive Unit Type	Physical Units	Scaling Factor
Accel/Deccl	counts/s²	$DA3 = 2^{28}/K_{ms}K_S$
Max Speed	counts/s	$DS3 = 2^{33}/K_s$

Table 1 - Drive Unit Scaling Factors

In order to convert to drive units, the following information in the table below must also be known.

Constant	Value
K_{ms}	Maximum profiler speed (in counts/s) for an Accel/Decel command profile.
K_S	Switching frequency of the drive in Hz. This is found on the drive datasheet.

Table 2 - Drive Quantities
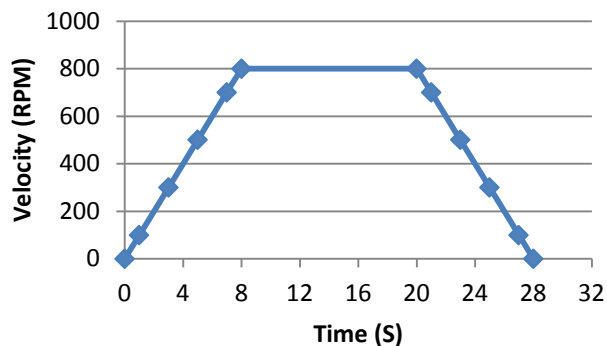
Example Profiled Move

Figure 2 - Total Move = 2,133,333 counts

Write a maximum velocity of 800 RPM to 3C.18h given a motor with a 2000 line encoder using a drive with a 20KHz switching freq.

$$800 \, ^{rev}\!/_{min} \times 8000 \, ^{counts}\!/_{rev} \times 1 \, ^{min}\!/_{60 \, sec} = 106{,}667 \, ^{cnts}\!/_{sec}$$

$$106{,}667 \, ^{cnts}\!/_{sec} \times \frac{2^{33}}{20{,}000} = 45{,}812{,}984{,}490.668$$

ADVANCED MOTION CONTROLS

Serial Example for Velocity Mode Using Command Profiler

Round to the nearest whole number and convert to hex.

45,812,984,491 = AAAAAAABh

Write an acceleration and deceleration limit of 100 RPM/s to 3C.1Ch and 3C.1Eh given a motor with a 2000 line encoder using a drive with a 20KHz switching freq.

Convert 100 RPM/s to counts/sec², then multiply by the scaling factor.

$$100\,^{rev}/_{min \cdot s} \times 8000\,^{counts}/_{rev} \times 1\,^{min}/_{60sec} = 13,333.33$$

The calculated maximum velocity is substituted for the K_{ms} value.

$$13,333.33\,^{cnts}/_{sec^2} \times \frac{2^{28}}{20,000*106667} = 1,677.72$$

Round to the nearest whole number and convert to hex.

1,678 = 68Eh

Note: *Make sure you have write access to the drive. If not, write an Fh to object 07.00h.*

Sending RS232 Messages.

To write the maximum velocity, send the following command:

SF	DA	CB	Ind.Off		L	CRC	
A5	3F	02	3C	18	04	5C	CC

Data								CRC	
AB	AA	AA	AA	0A	00	00	00	28	FB

Reply:

SF	DA	CB	S1	S2	L	CRC	
A5	FF	00	01	00	00	CF	B6

To set the acceleration and deceleration values send this data. Acceleration is at index 3C offset 1C. Deceleration is at index 3C offset 1E.

Acceleration:

SF	DA	CB	Ind.Off		L	CRC	
A5	3F	02	3C	1C	02	F0	CE

Data				CRC	
8E	06	00	00	CD	C2

Deceleration:

SF	DA	CB	Ind.Off		L	CRC	
A5	3F	02	3C	1E	02	96	AC

Data				CRC	
8E	06	00	00	CD	C2

Note: *Changing max speed will require recalculating accel/decel values.*

Drive Status – At Command

To verify that the position has been reached, read the At Command in 02.04h. When high, this indicates that the measured position is within the "At Position Window" of the Position Target. The At Position Window is the desired tolerance on the measured position and can be set within DriveWare (Position Limits).

Verify position has been reached by reading bit 1 of object 02.04h

Command a position move of 2,133,333 counts. The move begins immediately and the total time is 28s. Then, read object 02.04h as shown below.

Send:

SF	DA	CB	S1	S2	L	CRC	
A5	3F	01	02	04	01	0F	0F

Reply:

SF	DA	CB	Ind.Off		L	CRC		Data	CRC	
A5	FF	02	01	00	01	32	FF	C7	00	8F	C3

Convert the data read from object 2.04h to binary.

00C7h = 00000000110001**11**

At Command is active, indicating that the measured position has reached the target of 2,133,333 counts.