

Doc No.: TN20-57
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Subject: Creating Moves with Smooth Deceleration. (S-Ramp)

Application Note

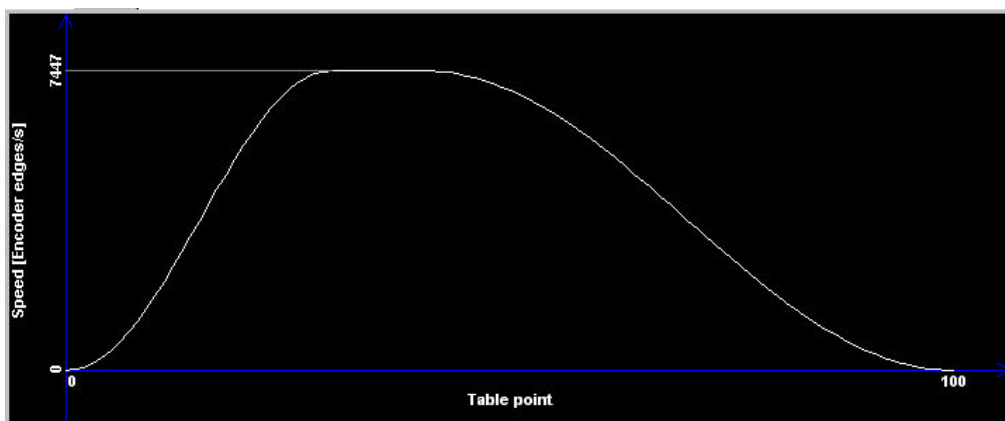
1. Background:

Although the Motion Coordinator Series 2 has a SRAMP function, this acts equally on the accel and decel parts of the move. Sometimes it is desirable to have a fast sharp accel and a smoothed decel, and vice versa. This note describes how to achieve a tightly controlled profile using the CAM command.

2. Setting up the Profile:

The easiest way to set up a profile for the CAM or CAMBOX command is to use the Trio Motion Technology CamGen package. This is a free download from the Trio website at www.triomotion.com.

First select the most appropriate profile type. In this example we are using the sine+const curve because this allows the selection of different rates for acceleration and deceleration. Next, in the Move tab, set the distance to the same as the UNITS for the axis, set the lead-in and lead-out phases as required, (we have chosen 30% and 60% respectively) and select "no move". Now go to the Table tab and select "fixed values" and 101 points. You can choose more points if you want more resolution, but generally 100 or so is usually enough.



Click the Apply button and you will see the following program segment which you can then save or copy and paste into your Trio BASIC program on the Motion Coordinator.

```
'Start CamGen Sector1
'->ProfileClass=SinConstCurve
'->OutputType=Points
'->TableLength=101
'->MoveDistance=4096
'->LeadIn%=30
'->LeadOut%=60
'->MoveType=None
' set the variables
points = 101
' store the table points
TABLE(tablestart,0,0.068,0.5433,1.8285,4.3176,8.3913,14.4129,22.7244,33.6427)
TABLE(tablestart + 9,47.4561,64.4214,84.7605,108.6587,136.2619,167.6759)
TABLE(tablestart + 15,202.9644,242.1486,285.2074,332.0768,382.6514,436.785)
TABLE(tablestart + 21,494.2925,554.9518,618.5062,684.6674,753.1186,823.5176)
TABLE(tablestart + 27,895.5012,968.6887,1042.6862,1117.0909,1191.5636)
TABLE(tablestart + 32,1266.0364,1340.5091,1414.9818,1489.4545,1563.9273)
TABLE(tablestart + 37,1638.4,1712.8727,1787.3455,1861.8182,1936.2739)
TABLE(tablestart + 42,2010.6276,2084.7775,2158.6226,2232.0623,2304.9976)
TABLE(tablestart + 47,2377.3305,2448.9648,2519.8063,2589.7629,2658.7449)
TABLE(tablestart + 52,2726.6652,2793.4398,2858.9876,2923.2312,2986.0965)
TABLE(tablestart + 57,3047.5132,3107.415,3165.7399,3222.43,3277.4319)
TABLE(tablestart + 62,3330.6971,3382.1816,3431.8463,3479.6572,3525.5852)
TABLE(tablestart + 67,3569.6066,3611.7027,3651.8603,3690.0713,3726.333)
TABLE(tablestart + 72,3760.6482,3793.0248,3823.4761,3852.0208,3878.6827)
TABLE(tablestart + 77,3903.4907,3926.479,3947.6865,3967.1572,3984.9399)
TABLE(tablestart + 82,4001.0877,4015.6586,4028.7147,4040.3221,4050.5513)
TABLE(tablestart + 87,4059.4761,4067.1743,4073.7267,4079.2174,4083.7336)
TABLE(tablestart + 92,4087.3648,4090.2032,4092.343,4093.8805,4094.9135)
TABLE(tablestart + 97,4095.5412,4095.864,4095.983,4096)

'Stop CamGen Sector1
```

3. Using the CAM command:

The syntax of the CAM command is:

CAM(table_start, table_end, multiplier, distance)

Table start and table end refer to the above table and will depend on where in the Motion Coordinator's table memory that you have placed the data. We will assume that the table used is 200 to 300 inclusive. (101 points)

Multiplier simply takes the value of the distance to move, in user units, because we arranged for the final table value to be the same as UNITS for the axis. In this example we will assume that 4096 is the number of counts for one revolution, so therefore the value placed in multiplier will be the number of Revs that we want to move.

Distance needs a little more explanation. This parameter and the SPEED parameter for the axis will determine how long the move takes. The time taken to execute the CAM will be **time = distance / SPEED**. The actual maximum speed of the profile will be determined by the points in the table. It is possible to calculate this speed by looking at the value given in the speed chart in CamGen (which is 7447 in this example) and

using the formula:

```
Max_speed = 7447 * multiplier / time
```

There are just two more parameters to consider and then we can program some moves. The ACCEL and DECEL parameters for the axis will affect the way the CAM command runs. These must be set to 1000 times the SPEED value selected in order to ensure that they have no effect. If SERVO_PERIOD is not 1 msec, then the ACCEL and DECEL must be set to ensure that SPEED is achieved in one servo period. I.e. instant acceleration.

4. Example TrioBASIC programs:

```
` 1.
` set up the axis parameters to use distance parameter as "time taken"
UNITS = 1
SPEED = 1000 ` this will mean that the 4th parameter is in msecs
ACCEL = 1000000
DECEL = 1000000

` move 5 revs in 1.5 seconds
CAM(200, 300, 5.0, 1500)
WAIT IDLE

` move -8.5 revs in 4.3 seconds
CAM(200, 300, -8.5, 4300)

` 2.
` Use SPEED to control the axis speed
UNITS = 4096
max_speed_value = 42
ACCEL = max_speed_value * 1000
DECEL = max_speed_value * 1000

` move 20 revs at 15 revs per second (average)
SPEED = 15.0
CAM(200, 300, 20.0, 20.0)

` move -9.2 revs at 26 revs per second (average)
SPEED = 26.0
CAM(200, 300, -9.2, 9.2)

` (peak speeds will be higher, determined by cam profile)
```