



PowerTools Pro Application Note
PTAN #6, rev. 1, 3/30/2009
Applicable Products: Epsilon EP-P, FM4E,
SM EZMotion, Digitax ST-Z

**Dynamic Use
of
Cam Tables**



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Introduction

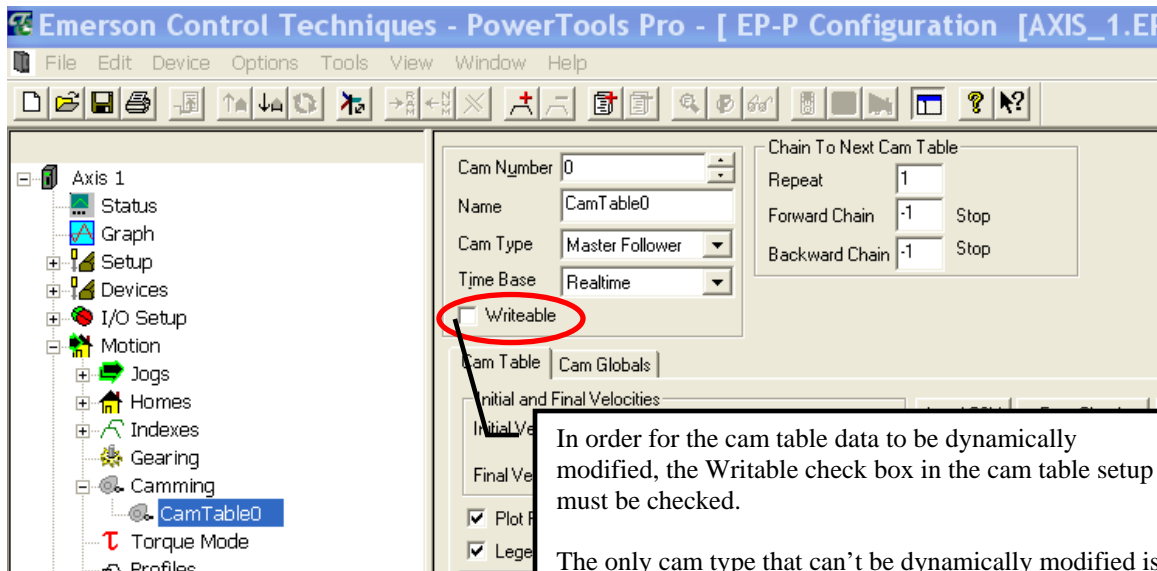
This application note shows how to use the dynamic cam tables within PowerTools to perform the following common functions

1. Change cam data dynamically
2. Use the cam tables as generic arrays
3. Use the cam tables as data collection registers
4. Reading and limiting the size of the cam table

All of these functions use the same basic methods of dynamically manipulating cam table data.

Dynamically modifying cam data

Cam data tables are typically static data loaded into the drive via PowerTools Pro software; however the data can be modified by a user program under certain conditions. Modifications to the table data are easily accomplished with a few user program commands.

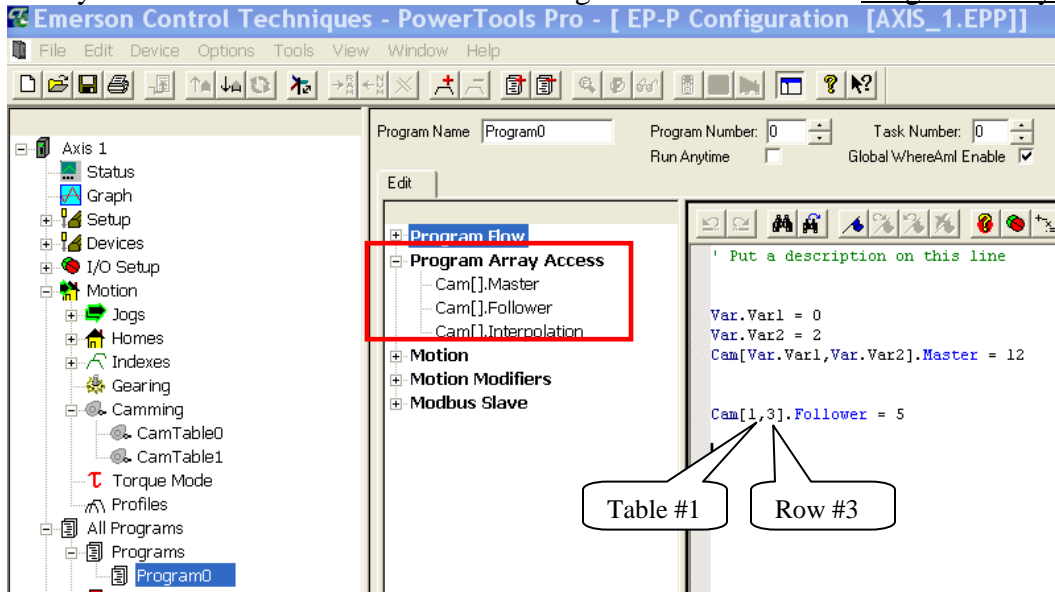


In order for the cam table data to be dynamically modified, the Writable check box in the cam table setup must be checked.

The only cam type that can't be dynamically modified is the Cubic Spline type, and its Writable check box is hidden.

Program commands to modify table data

In order to modify table data in a user program, certain syntax commands must be used. The syntax commands are located in the Program Edit view under Program Array Access



Drag and drop the Cam[] command into the program view. Two field control boxes will open and need to be populated. The two fields represent the cam table number and the row number. The column is specified by the .Master, .Follower or .Interpolation in the syntax.

1. The Follower data's decimal point is fixed by the User Units decimal location.
2. The Master data's decimal point is fixed by the Master User Units decimal location. If the cam's time base is set to real time, the Master's decimal point will be fixed at 6
3. The Interpolation value in the drive is a 16 bit integer; PowerTools also displays a text field in the Interpolation column for aid in determining what type of interpolation the integer represents. The user program will simply read/write an integer value.

MFI-Inc	Delta Master (s)	Delta Follower (r)	Interpol
0	0.000000	0.0000	0 Linear
1	2.000000	4.0000	0 Linear
2	2.000000	4.0000	0 Linear
3	2.000000	4.0000	0 Linear



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The assignment Cam[Var.Var1, Var.Var2].Master =12 would cause Cam Table 0, second row, master column value to become 12. Because Var.Var1 = 0 and Var.Var2=2.

The assignment Cam[1, 3].Follower =5 would cause Cam Table 1, third row, follower column value to become 5.

```
Var.Var1 = 0  
Var.Var2 = 2  
Cam[Var.Var1,Var.Var2].Master = 12  
  
Cam[1,3].Follower = 5
```

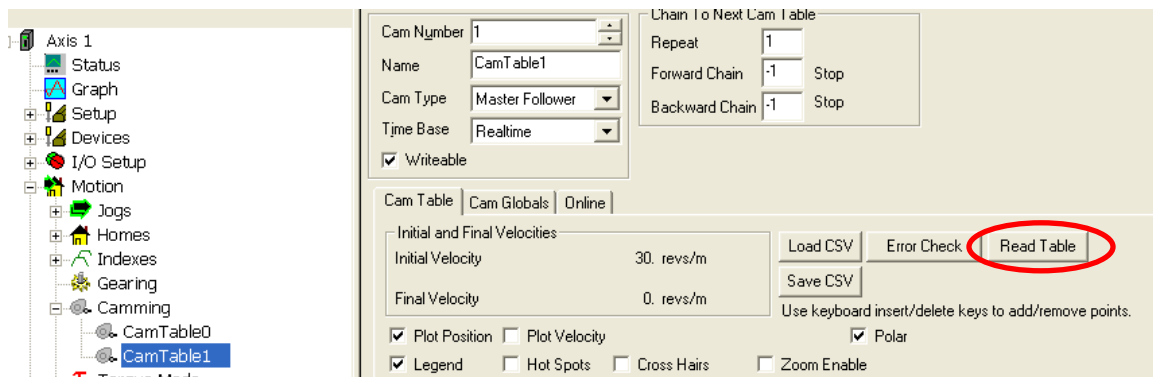
Cam table 0			Cam Table 1			
MF-Abs	Master (s)	Follower (revs)	MF-Abs	Master (s)	Follower (revs)	Interpol
Start	0.000000	0.0000	Start	0.000000	0.0000	Initial
1	2.000000	1.0000	1	2.000000	1.0000	0 Linear
2	4.000000	2.0000	2	4.000000	2.0000	0 Linear
3	6.000000	2.0000	3	6.000000	2.0000	0 Linear

The dynamic values only exist in the drive's memory and will not be reflected in the PowerTools file or what is viewed within PowerTool's cam table.

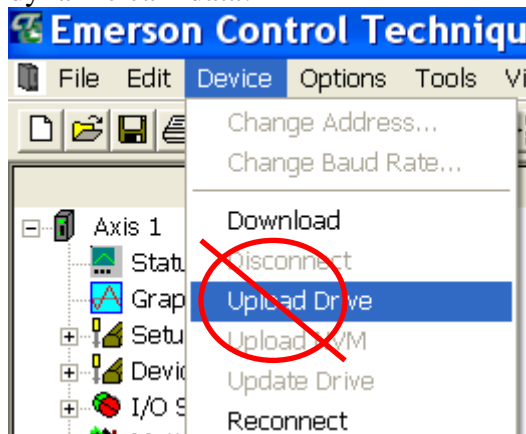
These dynamically modified values in the drive are not saved through a power cycle!
Use the Setup NVM under Setup to save values through a power cycle.

PowerTools will not display dynamically changed data unless a Read Table is performed.

To upload the dynamic table data into the PowerTools cam table, click on the Read Table button. The drive's table data will be read into PowerTools and populate the cam table. The PowerTools file can then be saved to disk or downloaded back to the drive to save the new values.



Using the Upload Drive button under the Device drop down menu will not upload dynamic cam data!

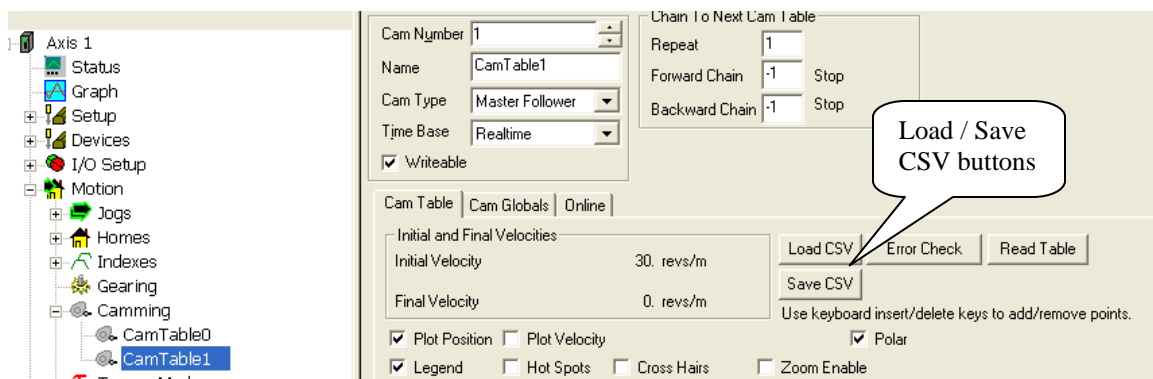


Cam Table Information

The cam data tables must be dimensioned (defining the number or rows) within PowerTools and downloaded to the drive. The table size cannot be increased dynamically. The table can be reduced dynamically by setting a parameter within the user program to limit the size of the table.

The easiest way to dimension the table size is to simply click on a cell in the table and then add more rows by hitting the INS key. Likewise the DEL key will remove rows.

If the application requires a large number of rows, then use the Save CSV button to save the existing cam table to disk as a template. Open the CSV file using a spreadsheet program and increase the table size in the spreadsheet, then save the file in CSV format. The file can now be imported into PowerTools using the Load CSV button. The entire drive's memory has a table limit of 12,000 rows.



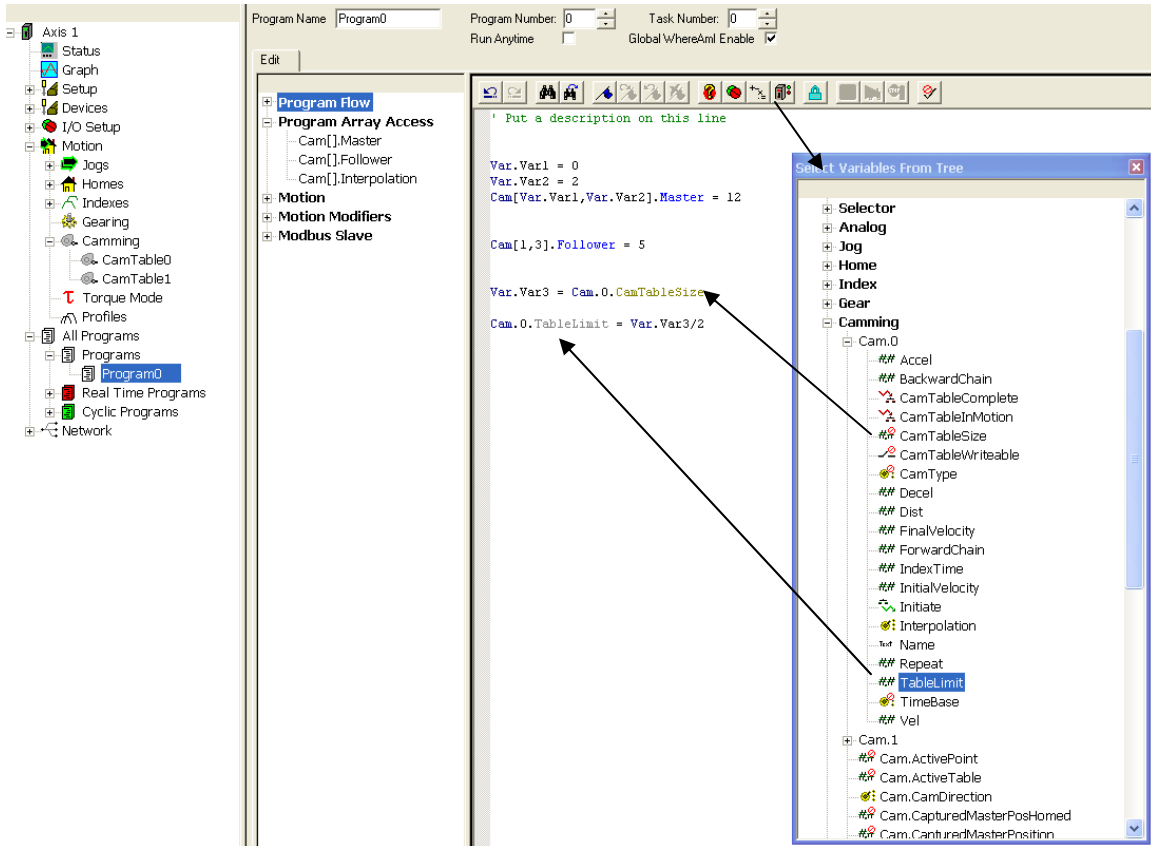
The header of the CSV file has a [] delimiter informing PowerTools what type of cam the data represents. Do not change the delimiter line. You can add lines above the delimiter line. Any text following a semicolon (;) will be ignored by the import procedure.

```
; Control Techniques PowerTools Pro CAM Table
; Number of points in table = 11
; Table is formatted as a Master-Follower
; MF interpolation is fixed at line
[MF] ; Table Format Type definition
```

Delimiter
Specifies the cam
table as an MF type
cam

```
<Master>          <Follower>
0                  0
2                  1
4                  2
```

Reading and limiting the cam table size



Cam.x.CamTableSize can be used to inform the program how many rows the cam table x contains.

Cam.x.TableLimit tells the drive how many rows of cam table x to use. This parameter is mainly used for running cams, where the end of the cam table determines the end of the cam motion.

Both of these commands are used in the sample program above.