

# Programming the Wheel/Roller/Marking Tool for the Murata Machinery USA Turret Punch Press

September 15, 2005

This document provides instructional information for programming wheel and sheet marking type tools. Due to the variety of tools and applications this document is only intended to provide general guidelines. Refer to the tool manufacturers' documentation for specific tool information. Questions for specific tool applications should be directed to Murata or the tool manufacturer.

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# 1 Tooling Installation Setup

- 1.1 It is important to recognize the orientation of the wheel when loading it into an auto-index station. Programming is based on this orientation. Improper setup could cause the wheel to run sideways and the wheel can be damaged. Unless the station or holder restricts direction of installation, it is recommended to load the tool at 0°. This means the tool is installed so that it is able to run in the plus or minus X direction when the C-axis is at 0°. If the wheel is to be used in a fixed station it must be orientated to the angle of use.
- 1.2 When using the Rolling Pincher and Shear tools the dies must be free to compress downward. If used in an auto-index station where the retaining ring holds the die on the upper portion, it should not be tightened down on the die. The upper portion of the die must be able to compress downwards to expose the tool for cutting.
- 1.3 The wheels should be removed from the turret after each program if it is not to be used again. Leaving a wheel in the auto-index station can damage the wheel and possibly cause the operator to punch with the wheel in another program. Punching with the wheel will be detrimental to the wheel.
- 1.4 Always start the wheel on the material. Never off the edge of the sheet or in a punched hole.
- 1.5 Never crossover holes with the wheel as it can cause the wheel to be damaged.
- 1.6 If using Spring Style tooling, verify that the overall tool length of is around 8.20” (208mm). If the tool is too short, the machine may not have enough stroke to adjust the tool down using the punch press control.
- 1.7 Define the tool in the Custom Tool Table on the control. Tool data required is based on the type of tool used and the capabilities of the machine.

## 2 Tool Orientation

It is important to understand how the wheel tool indexes when commanded in a certain direction or angle. PDR/ and PDL/ setup how the wheel will be controlled. Each is 180° different from the other. This chart shows the basic four directions. The starting angle of the index station can be at any angle and this will apply.

Direction of program movement	Index Tool rotation movement	
	PDR/	PDL/
+X: right @ 0°	-90°	+90°
+Y: up @ 90°	0°	180°
-X: left @ 180°	+90°	-90°
-Y: down @ 270°	180°	0°

These are perfectly horizontal or vertical moves. Movements at other angles will result in corresponding changes in rotational degrees. A 45° move with PDR/ will cause the tool to rotate -45°. A PDL/ will be 180° different from the PDR/ and result in a +135° C-Axis movement.

**If a wheel is oriented at 0° in the I/T station, the wheel tool NC code should always start with a C90 orientation of the tool.** Using PDR/, the tool angle will always reference in the direction it is programmed. A form going from left to right will run with the tool at C0. A form going from bottom to top will run with the tool at C90. This makes it a little easier to verify tool direction when checking a program. For an offset tool, use PDL/ to run the tool 180° in the opposite direction.

**If a wheel is oriented at 90° in the I/T station, the wheel tool NC code should always start with a C0 orientation of the tool.** Using PDR/, the tool angle will always reference the correct direction for forming, but displays 90° off on the display from the programmed direction.

**Each time the tool is raised (PED/) and before it is lowered again, the tool must be reoriented as described above.**

## 3 Safety Zone Data

These are the zone sizes on all Motorm and Vectrum machines. Add the usual .55" (13.5mm) if touch switches are used on the machine. These sizes have to be larger than most tool safety zones to allow the machine to stop axis movement at high speed before interference with the workholders occur. Because the machine doesn't move to a position and punch, but is continuously at BDC, this is necessary. The Workholder Override button will disable the safety zone check if the operator determines it is safe. The V5058 will use the same safety zones as the KL stations.

**M2 & V3: X = 4.921" (125.00mm) Y = 3.661" (93.00mm)**      **V5: X = 5.000" (127.00mm) Y = 3.819" (97.00mm)**

## 4 Tooling Library Setup

### 4.1 *Sheetmarker and Wheel type tools without ramping.*

Machines that don't have the ramping capability must define tools this way. Machines that allow ramping can define tools this way or as described in the next section, even if ramping is not used.

- 4.1.1 Define the tool as a standard Forming "Forming" or "Marking" type tool.
- 4.1.2 Use only the **BDC ADJ** field to control the tool stroke. Always start with the tool high by setting the value to a **-.200" (-5.00mm)**. Gradually increase this number (lowering the tool) until the desired form or mark is achieved. If this is not possible, the tool may have to be lengthened or mechanically shimmed. Start the procedure over again if this is done.

### 4.2 *Wheel type tools using ramping.*

If ramping is not used, this same procedure can be used, but the Hover Height Adjust does not need to be set.

- 4.2.1 The tool definition in the tool parameter screen must be defined as a Forming "Special" tool (ie 5. **F: Forming Tool**, then select **9. Special** type)
- 4.2.2 Set the **BDC ADJ** to adjust the stroke to BDC, the bottom of the ramping stroke. Start with a value of **-.300" (-8.00mm)** and increase the value with small increments after each test run. Always start negative and work your way towards zero. The valid range is from **-.300"** to **.200"** (-8.00mm to 5.00mm).
- 4.2.3 Set the **HH ADJ** to adjust the ram height where the ramping will start. Start with a value of **+.400" (+10.00mm)** and decrease the value in relationship to the BDC position until desired ramping distance is achieved. Use this to keep the top of the ramping position **.100"** (2.5mm) or less above BDC. The closer the tool starts to the material, the better the results will be and a shorter X/Y ramping movement will be needed. The valid range is from **-.200"** to **.400"** (-5.00mm to 10.00mm).

## 5 General Programming Rules

- 5.1 An **M321** M-code must be used prior to selecting the wheel tool and an **M320** M-code is used to turn off the wheel tool mode. If a M321 is not used, it will punch with the wheel.
- 5.2 If ramping is used, **M323** is used prior to the down ramp movement. **M324** is used prior to the up ramp movement. The M323 must be used each time the tool is raised and is lowered back on the material if ramping is required.
- 5.3 If a Sheetmarker Tool is used, M321 is still used to initiate “wheel mode”. Then **M326** is used to identify the tool as a Sheetmarker type tool. **M325** then takes it out of Scribing Mode. M320 is still used end “wheel mode”. **The M326 is also used for a wheel tool in a fixed station if a PDR/PDL will be used to control feedrate or if ramping is required.** Without the M326, the machine will try to index the fixed station resulting in an alarm.
- 5.4 When using a wheel tool in an auto-index station, a dummy command must be given prior the PDR/PDL command to orient the wheel before it comes down on the material. Only a short move distance of .010” to .100” (.25mm to 2.5mm) is needed. This dummy command needs to be tangential to the path. Even with ramping it is a good idea to follow this practice so the wheel orients itself before it gets anywhere near the material.
- 5.5 A PDR/PDL command is the starting point for the wheel. If ramping is not used, this is where the tool will come down on the material. The “F” feedrate should be stated on this line. If ramping is used, the ramp down position starts here. The tool must overlap the start area when finishing to make an even form. Feedrate is controlled internally or with a feedrate on the following line (see examples).
- 5.6 A PED command raises the wheel up. The wheel should be raised up at sharp intersections or moves to other locations on the sheet. **When moving to a new location, a tool in the indexing station must be re-oriented before lowering it back onto the material.**
- 5.7 Radiuses and material thickness should be used within the tool limitations. See the manufacturers’ specifications for this and other tool specific data.
- 5.8 If possible, program so that the tool is moving away from the clamps. This will help minimize sheet distortion.
- 5.9 Grip the sheet on its longest side. The closer you can program to the clamps, the better and more accurate the results will be.

## 6 Ramping Programming Tips

### 6.1 Ramping Control

Example:

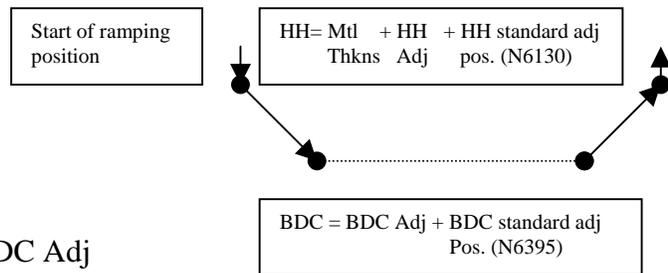
Mtl Thkns = .048

HH Adj. = .200

BDC Adj. = -.100

N6130 & N6395 usually set to zero

$$\begin{aligned}\text{Ramp Height} &= \text{Mtl Thkns} + \text{HH Adj} + \text{BDC Adj} \\ &= .048 + .200 - .100 \\ &= .148''\end{aligned}$$



### 6.2 Ramping Down

The ramping function allows a smooth form to be made without the pinch mark that occurs if the tool drops directly onto the sheet and starts moving. This is especially noticeable when a form comes back together at the same location. The best results are achieved with a slow downward movement of the ram axis and a faster X/Y axis movement. The downward movement of the ram is controlled internally by the machine. The X/Y ramping speed can be controlled either through an internal default value, or programmed through the NC code.

Based on the material and tool, the ramp height will have to be adjusted to create the best results. A ramping height of .100" to .150" (2.5mm to 3.8mm) is a good place to start. The ramp height needs to be just near the top of the material when starting. Starting too far above the material requires a longer ramping distance and if too excessive, could cause a "Ram Access Error" alarm on the Vectrum machines.

Based on the ramping height and table speed, the X/Y ramping distance will vary. If the ramping distance is too short, the tool will drop to its BDC position at the end of the ramping distance and cause pinch marks. If it is too long, the table will travel at the ramping feedrate longer, possibly slowing production.

If the form comes back together, overlap far enough to cover the initial ramp down area.

For some tools ramping down may not be wanted. A shear tool that needs to start shearing at specific spot will have to drop directly on the material and begin shearing. A ribbing tool that has a defined start and ending point should also start forming without the ramping function.

### 6.3 Ramping Up

The ramping up function has limited usefulness and in general is probably not needed for most forms. Once a form is completed, pulling the tool straight up doesn't affect the formed shape unless a gradual reduction in the form is needed at the end of the form. One case that this may prove useful is when using a shear tool. The ramping up will allow the tool to roll free of the material and eliminate some grabbing of the tool by the material.

## 7 Wheel Tool Commands

Command	Function	Example
PDR/ PDL/	This command either lowers the tool to the cutting / marking height or is the start of the ramp down movement. The X, Y, DX, and/or DY positions are the initial position of the tool. <b>NOTE:</b> A wheel type tool requires a dummy move prior to this command to orient the tool in an auto-index station <b>before</b> it lowers down. (see examples)	PDR/Xnn.nnn Ynn.nnn PDL/DXnn.nnn DYnn.nnn
PED/	This command raises the tool back to TDC. This is needed when ending use of the tool or moving to a new start location on the part.	PED/
X, Y DX, DY	Linear commands are controlled by either absolute or incremental values	Xnn.nnn Ynn.nnn; DXnn.nnn DYnn.nnn;
CIR/	This command is used to program circles and/or arcs where the center of the circle and/or arc is known. The X coordinate of the center, the Y coordinate of the center, and the degree of the arc from the starting point. <b>NOTE:</b> There is no X or Y stated in the commands. The example shows the center of the circle at X25.5 Y12.25 with a radius of 360 degrees.	CIR/p1 p2 p3  CIR/25.5 12.25 360
LCI/	This Laser Circle command is an alternate method to program arcs < 360°. p1= R : clockwise, L : counter clockwise p2= X position of end point p3= Y position of end point p4= radius, +r: arc < 180°, -r: arc > 180°	LCI/p1 p2 p3 p4  LCI/R 10 20 5

## 8 Wheel Tool M-Codes

M-Code	Description
M320	Wheel Tool Mode End
M321	Wheel Tool Mode Start
M322	Return to TDC (not normally used, automatic in the PED/)
M323	Wheel Tool Ramp Down
M324	Wheel Tool Ramp Up
M325	Scribing Tool Mode End
M326	Scribing Tool Mode Start

## 9 Wheel Tool Example NC Code

The tool stations should be setup in the tool parameters prior to running the wheel. When running the wheel for the first time, it is recommend that you run the sample programs without the wheel die assembly or material. Verify the ram height and tool orientation until you feel comfortable with the code. This will also prevent any accidental punching of the wheel assembly and running the tool sideways. The examples with auto-index assume the tool is installed at 0°.

### Sample program to run a straight line, X1 -> X25 (in I/T station) w/o ramping:

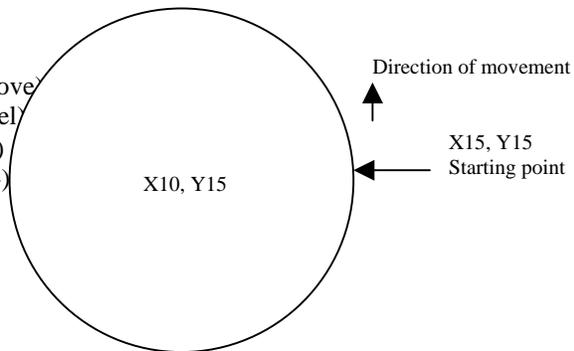
```
O1111
MAT/B1 H.048 X48 Y48
M321
X1-.010 Y26 T01 C90 M03      (This offset allows tool to rotate before lowering.)
PDR/X1 Y26 F2000             (Specify the start point and feedrate)
X25
PED/
M320
C0                            (Reset C-axis if another tool isn't used)
X78.74 Y60.039 M30          (V3046α load position)
%
```

### Sample program to run a straight line (in a standard station) w/o ramping:

```
O2222
MAT/B1 H.048 X48 Y48
M83                            (If not using PDR/ or PDL/, use M80 – M83 to control feedrate)
M321
X1 Y26 T02
X25
PED/
M320
M80
X78.74 Y60.039 M30          (V3046α load position)
%
```

### Sample program to run a 5" radius arc from 0° to 360° (in I/T station) w/ ramping:

```
O3333
MAT/B1 H.048 X48 Y48
M321
M323
X15 Y15-.01 T01 C90 M03 (Setup orientation move)
PDR/X15 Y15              (Ramp using default vel)
CIR/10 15 10             (Ramp down 10°, ~2")
CIR/10 15 360 F2000      (Complete circle over-)
M324                     (lapping ramp area)
CIR/10 15 5              (Ramp up 5°)
PED/
M320
C0
X78.74 Y60.039 M30      (V3046α load position)
%
```



This example expects the tool to be installed at 0° in the index station. By commanding the C90 below, the wheel is pre-orientated so that the initial +X move rotates it -90° to 0° again. This results in the C axis running at 0° in the +X direction, 90° in the +Y, and so on. Using a PDL/ would result in 180° difference in orientation. Note that a feedrate is used in the ramp down movement overriding the default feedrate. Using a faster X/Y feedrate than the default will help improve the form, but a longer ramping distance is probably required

This program produces a shape similar to below.



**With ramping:**

```
O4444
MAT/B1 H.048 X48 Y48
M321 (Wheel Mode)
M323 (Ramp Down Mode)
X15-.01 Y20 T01 C90 M03 (Start position for wheel orientation)
PDR/X15 Y20 (Start ramp position with wheel oriented for +X)
X18 F1000 (Ramp down to this position with commanded feedrate)
X20 F2000 (Straight move, must have "F" feedrate)
CIR/20 25 180 F1000 (180° arc, 5" radius, feedrate may need to decrease on small arcs)
X15 Y30 F2000 (Straight move)
CIR/15 25 180 F1000 (180° arc)
X18 (Overlap beginning ramp in area)
M324 (Ramp Up Mode)
DX0.5 (Ramp up to this position)
PED/ (Move ram to TDC)
M320 (End Wheel Mode)
C0 (Reset axis orientation)
X49.213 Y49.213 M30 (M2044 load position)
```

**Without ramping:**

```
O5555
MAT/H.048 B1 X48 Y48
M321 (Wheel Mode)
X15-.01 Y20 T01 C90 M03 (Start position for wheel orientation)
PDR/X15 Y20 F2000 (Start position with wheel oriented for +X)
X20 (Straight move)
CIR/20 25 180 F1000 (180° arc, 5" radius, feedrate may need to decrease on small arcs)
X15 Y30 F2000 (Straight move)
CIR/15 25 180F1000 (180° arc)
PED/ (Move ram to TDC)
M320 (End Wheel Mode)
C0 (Reset axis orientation)
X49.213 Y49.213 M30 (M2044 load position)
```

## 10 Scribing Mode Example NC Code

This example shows a Sheetmarker Tool used in a fixed station. The M326 will allow arcs without trying to rotate the tool. This would also be true in an index station. On smaller arcs the feedrate will have to be slowed down or deformation in the arcs will occur. When line length or arc radius is less than 0.250" (6.35mm), the feedrate needs to be less than 60 inch/min (1525mm/inch).

O6666	
MAT/B1 H.048 X48 Y48	
M321	(Wheel Mode)
M326	(Scribing Mode)
X15 Y20 T02 M03	(Position and command tool)
PDR/X15 Y20 F5000	(Identify feedrate and start scribing)
X20	(Straight move)
CIR/20 25 180 F2000	(180 degree arc, 5" radius)
X15 F5000	(Straight move)
CIR/15 25 180 F2000	(180 degree arc)
PED/	(Move ram to TDC)
M325	(End Scribing Mode)
M320	(End Wheel Mode)
X49.213 Y49.213 M30	(Load position for M2044)

## 11 Multiple Pass Programming

Except for the Rolling Shear tool, it is sometimes recommended or required that more than one pass be made with a tool to get good results. Special setup and programming will be needed to do this on both the Motorum and Vectrum machines.

Multiple passes require the second and any following passes to be deeper than the previous. To do this, an entry will have to be made in the Custom Tool Table for each pass. For each entry, the BDC ADJ field should increase the depth of BDC until the required form is made. If ramping is used, corresponding changes to the HH ADJ field should also be made.

The multiple passes will then have to be programmed in the NC code. An efficient way to do this may be to program the tool movement in a pattern command (PAT/). Note, PAT1/ will be processed the first time through unless parameters have been changed to allow single part testing of a Macro Grid (MGR/). To access the different entries in the Tool Table, the **M1nnn** M-code is used. The “nnn” of this code corresponds to the three-digit tool number entry in the Tool Table. Use the M1nnn code on a line by itself to active the Tool Table entry for the pass being made. Use **M1000** to cancel the last M1nnn code used. This is required to allow any following tool changes to process correctly.

This function can be used so the same tool will make different forms on the same sheet. In an automated system, the same tool can be setup for multiple material types and thickness. M1nnn can be used with all standard and forming tools in a similar fashion.

This example uses data from Tool Table entries 295, 296, and 297. Entries don't have to be sequential, but may make setup easier. M1295 will use of data from entry 295.

```
O7777
MAT/B1 H.048 X48 Y48
M321 (Wheel tool mode)
M1295 (Activate entry 295)
PAT1/
M323 (Ramp down mode)
X15 Y15-.01 T01 C90 M03 (Setup orientation move)
PDR/X15 Y15 (Ramp using default velocity)
CIR/10 15 10 (Ramp down 10°, ~2")
CIR/10 15 360 F2000 (Complete circle overlapping ramp area)
M324 (Ramp up mode)
CIR/10 15 5 (Ramp up 5°)
PED/
END1
M1296 (Activate entry 296)
PAT1 (Do circle again)
M1297 (Activate entry 297)
PAT1 (Do circle again)
M320 (Cancel wheel tool mode)
M1000 (Cancel M1nnn processing)
C0
X78.74 Y60.039 M30 (V3046α load position)
```

## 12 Common NC Parameter Data

Verify and update these NC Parameters for all machines.

[SYSTEM] + <PARAM>

Address	Data	Description
1006.0 C	1	Rotation Axis Data
1006.1 C	0	Rotation Axis Data
1430 X	80000	Max cutting feedrate
1430 Y	80000	Max cutting feedrate
1430 C	21600	Max cutting feedrate
1710	99	Automatic corner override data
1711	91	Automatic corner override data
1712	100	Automatic corner override data
1713	50	Automatic corner override data
1714	50	Automatic corner override data
5003.1	1	SUV
5480	4	Number of axis to control normal direction
5481	10800	Rotation speed of normal direction control axis
5482	1	Limit value
5483	1	Limit value
9927.6	1	
9930.3	1	Helical interpolation
9937.5	1	Normal direction control
16001.7	1	PF control w/ G01, G02, G03
16052.3	1	Feed rate control
16363.1	1	Normal direction control

## 13 Motorum Software and Parameter Data

The M2044 and M2048 with 18iP controls are the only Motorums currently that will run the wheel with ramping and scribing tools in fixed stations. Type II Motorums with 16PB controls can run wheel tools without ramping and scribing tools in an indexing station. All M2048LT and M2044EZ machines have been prepared and will support wheel tool operations.

16PB: NC Software: B7A1-M3  
 Ladder Software: 2M29CE  
 Custom Software: 13 1F

18iP: NC Software: All  
 Ladder Software: 2M741E (M2044)  
 2M742E (M2048)  
 Custom Software: 1A 2C

Custom Option Bits: [CUSTOM] + <◀> + <OPTION> + <BIT>

D9.7 = 1 (Enable Index Tool Rotation at Hover Height)  
 D27.6 = 1 (Wheel Tool Option Enable)

Custom Option Parameters (for ramping): [CUSTOM] + <◀> + <OPTION> + <D-WORD>

(Use value based on which mode machine is setup for.)

Address	Inch Data (x 0.1inch/min)	Metric Data (x 10mm/min)	Description
D584	400	100	X, Y Axis Ramping Feedrate

Address	Data (deg/min)	Description
D588	50	Ram Axis Ramping Feedrate

NC Parameters: [SYSTEM] + <PARAM>

Address	Data	Description
16555	16800	X Safety Zone data for Wheel Tool
16556	16400	Y Safety Zone data for Wheel Tool

Custom Parameters: [CUSTOM] + < ◀ > + <CUSTOM>

Parameter	Data	Description
3095	6	RAM pattern No.
3310	100	V1 Ram pattern speed
3311	100	V2 Ram pattern speed
3312	100	V3 Ram pattern speed
3313	100	V4 Ram pattern speed
3314	100	V5 Ram pattern speed
3315	100	V6 Ram pattern speed
3316	100	V7 Ram pattern speed
3317	100	V8 Ram pattern speed
3318	100	V9 Ram pattern speed
3319	100	V10 Ram pattern speed
6395	0	BDC standard adjust position
6396	5	BDC compensation amount (Default 5)

Custom Parameters (for ramping): [CUSTOM] + < ◀ > + <CUSTOM>

Parameter	Data	Description
6130	0	HH standard adjust position for ramping
6133	-600	Minimum internal BDC Adj. allowed (for Forming Special tool)
6336	-500	Minimum HH Adj. – Metric, x 0.01mm (for Forming Special tool)
6337	1000	Maximum HH Adj. – Metric, x 0.01mm (for Forming Special tool)
6338	-800	Minimum BDC Adj. – Metric, x 0.01mm (for Forming Special tool)
6339	500	Maximum BDC Adj. – Metric, x 0.01mm (for Forming Special tool)
6376	-200	Minimum HH Adj. – Inch, x 0.001” (for Forming Special tool)
6377	400	Maximum HH Adj. – Inch, x 0.001” (for Forming Special tool)
6378	-300	Minimum BDC Adj. – Inch, x 0.001” (for Forming Special tool)
6379	200	Maximum BDC Adj. – Inch, x 0.001” (for Forming Special tool)

## 14 Vectrum Software and Parameter Data

The wheel tool can be run on all V3 $\alpha$  and V5058 machines except Type I and Hybrids.

16PB: NC Software: B7A1-M3 or B7A1-14  
 V3 Ladder Software: 3V22EE  
 V5 Ladder Software: 5V00RE  
 Custom Software: 1A 2C

18iP: NC Software: All  
 V3 Ladder Software: 3V613E  
 V5 Ladder Software: 5V703E  
 Custom Software: 1A 2C

Custom Option Bits: [CUSTOM] + <OPTION PARAM> + <BIT>

D9.5 = 1 (Enable Index Tool Rotation at Hover Height)

Custom Option Parameters: [CUSTOM] + <OPTION PARAM> + <D-WORD>

(Use value based on which mode machine is setup for.)

Address	Inch Data (x 0.1inch/min)	Metric Data (x 10mm/min)	Description
D584	750	190	X, Y Axis Ramping Feedrate

**V3 $\alpha$  Only** - NC Parameters: [SYSTEM] + <PARAM>

Address	Data	Description
16527	16800	X Safety Zone data for Wheel Tool
16528	16400	Y Safety Zone data for Wheel Tool

Ram Axis Programs: [CUSTOM] + [AXIS PARAM] + [AXIS PROG]

External Axis Program for Wheel Tool

Block	Program (Page) No. 6				
	1	2	3	4	5
N1	6	6	0	0	0
N2	0	0	0	0	0
N3	133	151	0	0	0
N4	136	154	211	2	0
N5	133	158	0	0	0
N6	0	0	0	0	0
N7	0	0	0	0	0

External Axis Program for Ramping Down

Block	Program (Page) No. 9				
	1	2	3	4	5
N1	9	9	0	0	0
N2	0	0	0	0	0
N3	132	151	213	0	0
N4	136	154	211	2	0
N5	133	158	0	0	0
N6	0	0	0	0	0
N7	0	0	0	0	0

External Axis Program for Ramping Up

Block	Program (Page) No. 10				
	1	2	3	4	5
N1	10	10	0	0	0
N2	0	0	0	0	0
N3	133	151	0	0	0
N4	136	154	211	2	0
N5	132	158	0	0	0
N6	0	0	0	0	0
N7	0	0	0	0	0

Custom List Parameters: [CUSTOM] + <PARAM EDIT> + <LIST>

Parameter	Data	Description
3095	6	Ram Axis Program Pattern No. For Wheel Tool
3098	9	Ram Axis Program Pattern No. For Ramping Down
3099	10	Ram Axis Program Pattern No. For Ramping Up
3310	100	Wheel Tool speed data
3311	100	Wheel Tool speed data
3312	100	Wheel Tool speed data
3313	100	Wheel Tool speed data
3314	100	Wheel Tool speed data
3315	100	Wheel Tool speed data
3316	100	Wheel Tool speed data
3317	100	Wheel Tool speed data
3318	100	Wheel Tool speed data
3319	100	Wheel Tool speed data
3340	100	Ramping down speed data
3341	100	Ramping down speed data
3342	100	Ramping down speed data
3343	3	Ramping down speed data
3344	100	Ramping down speed data
3345	100	Ramping down speed data
3346	100	Ramping down speed data
3347	3	Ramping down speed data
3348	100	Ramping down speed data
3349	100	Ramping down speed data
3350	10	Ramping up speed data
3351	100	Ramping up speed data
3352	100	Ramping up speed data
3353	10	Ramping up speed data
3354	100	Ramping up speed data
3355	100	Ramping up speed data
3356	100	Ramping up speed data
3357	10	Ramping up speed data
3358	100	Ramping up speed data
3359	100	Ramping up speed data
3534	320	PFIN output point for punching
3536	10	Offset for PFIN output point during wheel tool mode
6130	0	HH standard adjust position for ramping
6133	-600	Minimum internal BDC Adj. allowed (for Forming Special tool)
6336	-500	Minimum HH Adj. – Metric, x 0.01mm
6337	1000	Maximum HH Adj. – Metric, x 0.01mm
6338	-800	Minimum BDC Adj. – Metric, x 0.01mm
6339	500	Maximum BDC Adj. – Metric, x 0.01mm
6376	-200	Minimum HH Adj. – Inch, x 0.001”
6377	400	Maximum HH Adj. – Inch, x 0.001”
6378	-300	Minimum BDC Adj. – Inch, x 0.001”
6379	200	Maximum BDC Adj. – Inch, x 0.001”
6395	0	BDC standard adjust position for ramping
6396	5	BDC compensation amount (Default 5)