

Section 36

Repeat Event

Topics Covered in this Section:

- Introduction
- Repeat Event Data
- Repeat Event Programming Examples

| | | | | | | |
|---|---|-----------------|--------------------|--------------------|--------------------|--|
| PROGRAM MODE N1800 0-POSITION SET UP 1-LINEAR MILL 2-ARC MILL X 3-FRAME MILL Z 4-CIRCLE MILL 5-BOLT CIRCLE P 6-REPEAT I 7-SUBROUTINE J 8-DWELL 9-M FUNCTION A B C-CAVITY MILL E-EIA F G-GRAPHICS G M-MACRO CALL T P-PROBE W R-ROTATE M S-SET UP L T-TEXT | <div style="border: 1px solid black; padding: 5px; text-align: center;"> <h3>Repeat Event</h3> <hr/> <p>N10 N20 N30 N40 N50 N60 N70 N80 (6) F20 T4 N90</p> </div> | | | | | |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">DEMOPART</div> | VIEW 1 OF 1 | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">FRONT END GRAPHICS</td> <td style="padding: 2px;">DELETE EVENT</td> <td style="padding: 2px;">COPY/ STORE</td> <td style="padding: 2px;">PROGRAM DISPLAY</td> <td style="padding: 2px;">RUN CALC ASSIST</td> </tr> </table> | FRONT END GRAPHICS | DELETE EVENT | COPY/ STORE | PROGRAM DISPLAY | RUN CALC ASSIST | |
| FRONT END GRAPHICS | DELETE EVENT | COPY/ STORE | PROGRAM DISPLAY | RUN CALC ASSIST | | |

REPEAT EVENT - INTRODUCTION

The Repeat event can reduce programming effort and memory storage by allowing multiple repetitions of a series of program events. The range of events to be repeated begins with a specified N number and is concluded by the Repeat event. This event may program as many as 999 repetitions.

If desired, you can program a preparatory position move, usually incremental, that will occur before each repetition. The step may be programmed with Cartesian or polar coordinates. Alternately you can program axis rotation that will occur before each repetition. A Rotate event must designate the center of rotation before any Repeat event axis rotation occurs.

REPEAT EVENT DATA

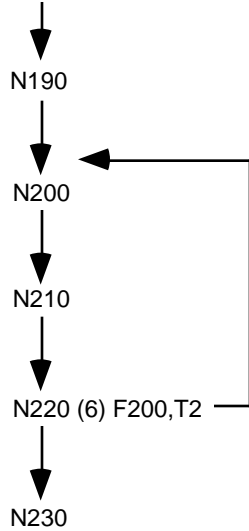
| Parameter | Description | Entry |
|-----------|------------------------------------|--|
| N | Sequence Number | Required |
| F | First Event to be repeated | Required |
| T | Number of Repetitions | Required |
| X or X/ | Preparatory Step, X | Cartesian Step Optional (See Text) |
| Y or Y/ | Preparatory Step, Y | Optional (See Text) |
| Z or Z/ | Preparatory Step, Z | Optional (See Text) |
| P | Plane Select (P0=XY, P1=YZ, P2=ZX) | Polar Step Default to P0 |
| V | Vector Angle, Preparatory Step | Optional |
| D | Distance, Preparatory Step | Optional |
| | | Rotation |

C

Preparatory axis Rotation

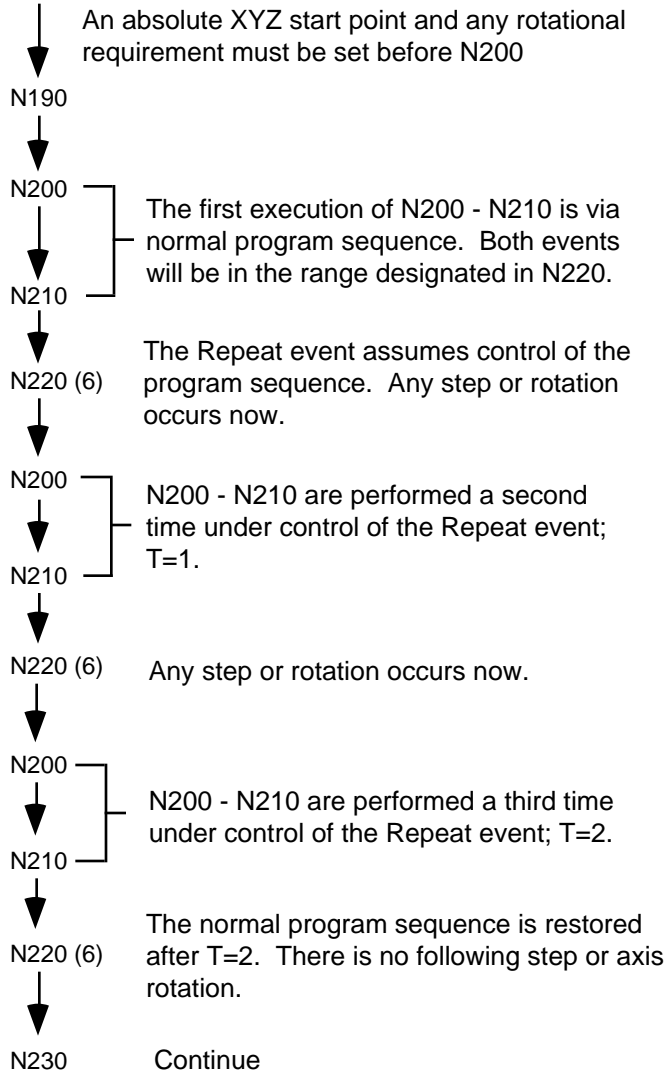
Optional (See Text)

**REPEAT EVENT
RECALLS N200-N210**



The Repeat event may also program a step or axis rotation.

EXECUTION ORDER



F - FIRST EVENT TO BE REPEATED

F defines the first N Number in the repeat sequence. The last event in the repeat sequence is the Repeat event. Event F must precede the Repeat event in the part program. On execution the control will command any preparatory¹ step or rotation, then execute all events from F to the “calling” Repeat event. F may identify a range of one or more events immediately prior to the Repeat event. All Repeat events must complete this entry.

T - NUMBER OF REPETITIONS

T specifies the number of times that a range of events will be repeated. The range of events always executes once in the normal program sequence and then T times under control of the Repeat event for a total of T+1 executions. From 1 to 999 repetitions may be programmed. All Repeat events must complete this entry.

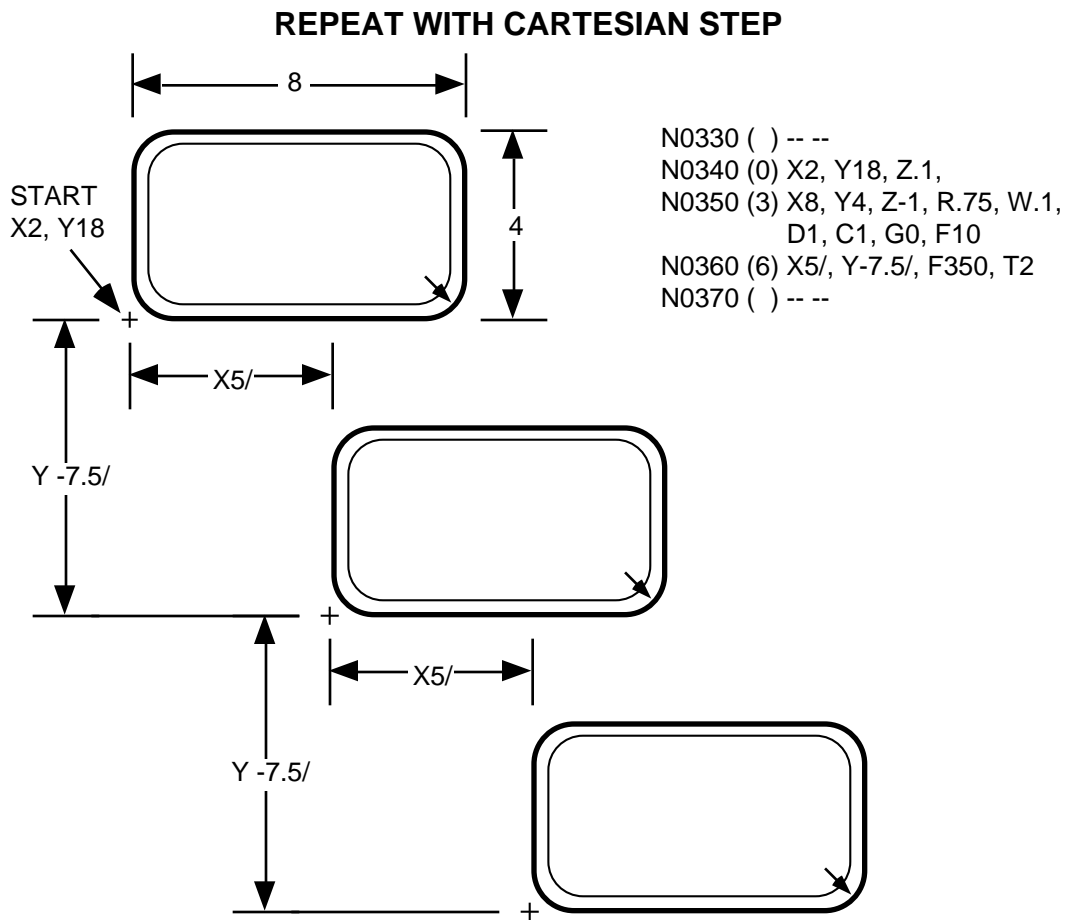
PREPARATORY STEP

You can program a positioning step with Cartesian or polar coordinates, or axis rotation that will occur before each repetition. The preparatory step is commanded by the control as a position event with G cycles turned off. Refer to the Position event section for further information. Rotary increment C **may not** be programmed when a Cartesian or polar step has been entered.

All events within the Repeat event's F range should program relocatable incremental entries. An absolute XYZ start point should be programmed prior to the sequence.

X, Y, Z - CARTESIAN PREPARATORY STEP

Enter dimensions for each axis which must preposition before each repeat sequence begins. Signed incremental or signed absolute entries are permitted, but absolute entries are usually illogical when T exceeds one repetition. The example **below**, uses incremental Cartesian (XY) coordinates to step between three Frame Mill events. Recall that the tool's position at the start of the Frame Mill event determines the location of the frame's lower left corner.



P, V, D - POLAR PREPARATORY STEP

P - PLANE SELECT - POLAR EVENT

Plane select establishes the plane of motion for a preparatory polar move. When not programmed, P defaults to P0, which programs motion in the XY plane. You must program P1 or P2 to program a polar move in the respective YZ or ZX plane.

This entry also specifies the plane to rotate when a preparatory axis rotation is programmed in this event.

V, D - PREPARATORY STEP - POLAR EVENT

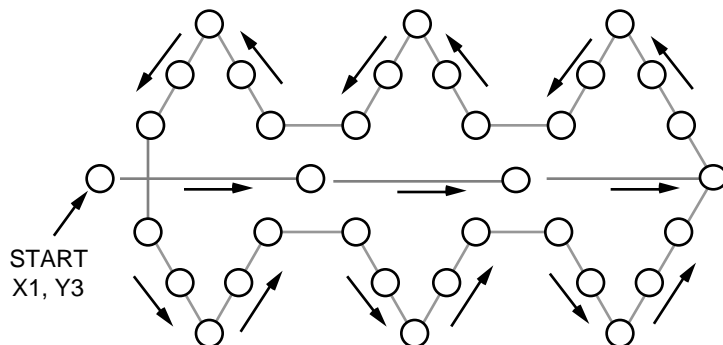
The tool moves distance D in the direction of angle V from its last position in the selected plane to complete the step before the F sequence is repeated.

Note: The letter "V" is programmed with the letter "J" if your control is equipped with an auxiliary axis that is programmed with the letter "V". Refer to Section 2.

The example **below**, uses several polar steps between repetitions to program linear drill arrays in a diamond pattern.

REPEAT WITH POLAR STEP

| | |
|------------------------------|---|
| N0030 () -- -- | |
| N0040 (0) X1, Y3, Z.1, G0 | - position to start point, G cycles off |
| N0050 (0) X0/, G1, W.1, F5 | - drill a hole at current XY position |
| N0060 (6) V0, D3, F50, T3 | - polar move and repeat N50 3 times |
| N0070 (0) V120, D1,G0 | - position in XY, G cycles off |
| N0080 (0) X0/, G1 | - drill a hole at current XY position |
| N0090 (6) V120, D1, F80, T2 | - polar move and repeat N80 2 times |
| N0100 (0) G0 | - turn off G cycles, hole already drilled |
| N0110 (0) X0/ | - if G cycle is not off, drill at present XY position |
| N0120 (0) G1 | - turn on drill G cycle, (no motion) |
| N0130 (6) V240, D1, F110, T2 | - polar move and repeat N110 - N120 2 times |
| N0140 (6) V180,D1, F80, T1 | - polar move and repeat N80 - N130 2 times |
| N0150 (0) V270, D1.732, G0 | - position in XY, G cycles off |
| N0160 (0) X0/, G1 | - drill a hole at current XY position |
| N0170 (6) V300, D1, F160, T2 | - polar move and repeat N160 2 times |
| N0180 (0) G0 | - Turn off G cycles, hole already drilled |
| N0190 (0) X0/ | - if G cycle is not off, drill at present XY position |
| N0200 (0) G1 | - Turn of drill cycle (no motion) |
| N0210 (6) V60, D1, F190, T2 | - polar move and repeat N190 - N200 2 times |
| N0220 (6) V0, D1, F160, T2 | - polar move and repeat N160 - N210 2 times |
| N0230 () -- -- | |



ROTATE PREPARATORY STEP

When a Repeat event programs axis rotation in plane P, the range of events to be repeated will usually describe a machining sequence that is radially oriented about a predetermined center of rotation. The sequence will characteristically repeat itself after a uniform angular interval.

A Rotate event must initially designate a center of rotation for the machining sequence. This Rotate event will establish a C absolute orientation for an initial run through the sequence prior to execution of the Repeat event. This initial Rotate event must also **precede** the range of events to be repeated, otherwise it would reset rotation each time it is repeated. The Rotate event's C orientation will also serve as an initial reference for the Repeat event's C incremental entry. The Repeat event's C incremental entry makes an adjustment to the last rotation angle prior to each repetition.

The rotary increments are cumulative and the last axis orientation will remain active following the last repetition T of the Repeat event. A Rotate event **must program C0** to reset the normal axis orientation after the Repeat event.

C - ROTATE INCREMENT

C assigns the rotation angle before each repetition occurs. When Repeat event rotation occurs, the tool immediately rapids to its last assigned coordinates, but relative to the current axes orientation. C may be programmed as a signed incremental entry that is referenced from the last active axis orientation, or as a signed absolute entry, referenced from the zero degree reference line. An absolute entry is usually illogical when T exceeds one repetition.

Note: This entry is programmed with the letter "H" if your control is equipped with an auxiliary axis that is programmed with the letter "C". Refer to Section 2.

Refer to the Rotate event for further discussion of axis rotation.

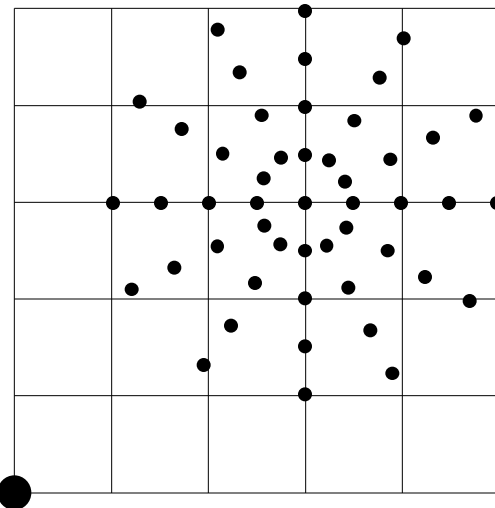
RADIAL DRILL PATTERN

The example **below**, shows a radial drill pattern. N350 sets the initial rotation center to X3, Y4. N360-380 drills the 5 hole array. N390 rotates 30° incremental (about X3, Y4) and repeat the 5 hole array 11 times. The drill moves to the center of rotation prior to each repeat to avoid tool motion as a result of the rotation.

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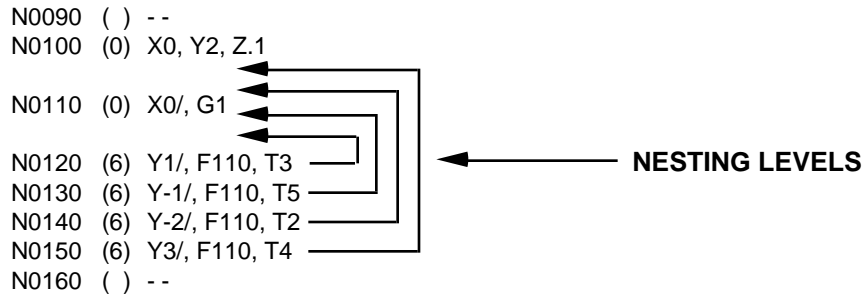
N330 ( ) - -
N340 (0) X3, Y4, Z.1, G0
N350 (R) X3, Y4, C0
N360 (0) X0/, Z-1, G1, W.1, F5
N370 (6) X.5/, F360, T4
N380 (0) X3, G0
N390 (6) C30/, F370, T11
N400 (R) X3, Y4, C0
N410 ( ) - -

```



NESTING

4 levels of Repeat nesting is allowed. This means that 3 Repeat loops may be programmed inside of a main Repeat event. In the example **below**, Repeat event N0120 is nested (contained within) Repeat events N0130, N0140 and N0150. The sequence below will execute N110 360 times.



HEXAGONAL POCKET

The example **below**, shows a hexagonal pocket created by an incremental scale and repeat. An XY scale factor of .1 is set, then incrementally enlarged until the last repeat pass mills the shape with a scale of 1.0.

```

N200 ( ) --
N220 (0) X3, Y2, Z.1, G0
N230 (S) X.1
N240 (1) V90, D1.5, F10
N250 (1) Z-1
N260 (1) V0, D1.5
N270 (1) V315, D2.1234
N280 (1) V225, D2.1234
N290 (1) V180, D3
N300 (1) V135, D2.1234
N310 (1) V45, D2.1234
N320 (1) V0, D1.5
N330 (0) Z.1
N340 (1) V270, D1.5
N350 (S) X.1/
N360 (6) F240, T9
N370 (S) X1
    
```

