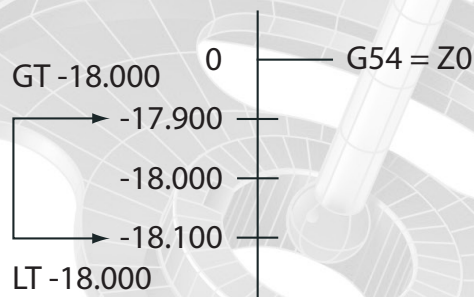


Using Logic

This module illustrates how to use the If...Then, Elself and Else Logic functions which are used to create controlling conditions, and how to use a G-Code block to implement an error message on the controller.

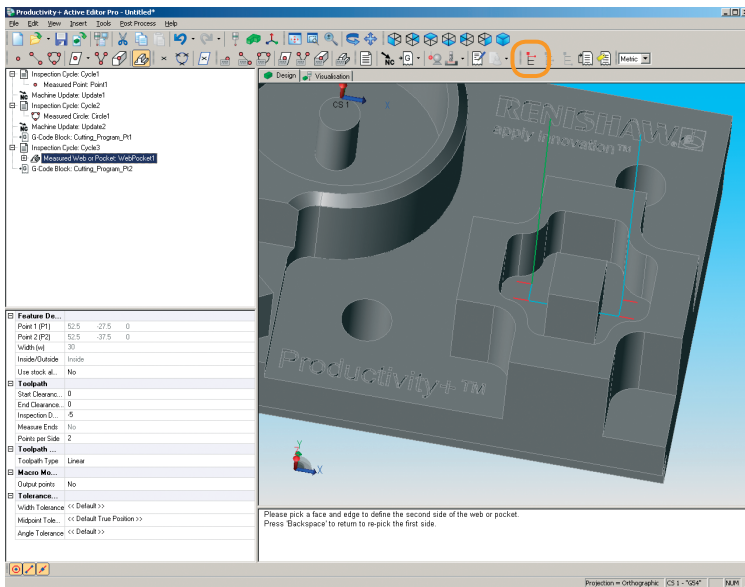
These features can help to make your process more stable and inform you of any errors.

Note: Exercise caution when using negative Greater Than or Less Than values: in such instances, although the number is increasing, the value is reducing (it is becoming more of a minus value).



Having completed this module you will be able to:

- Create Logic statements and integrate them into your machining program



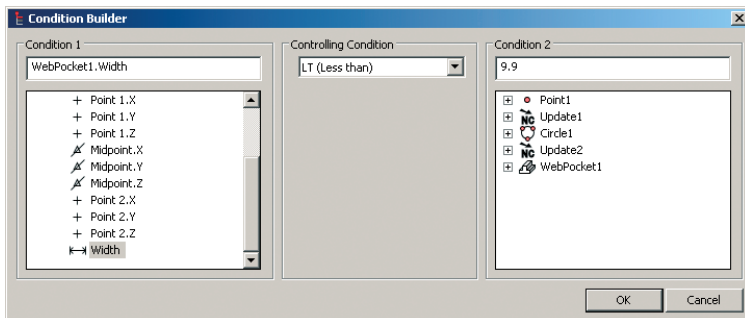
The program in this example probes the component to set-up G54 in X, Y and Z, and contains a cutting program which is split by a Measured Web/Pocket feature.

The following section shows you how to interrogate the measured Web/Pocket feature using Logic functions to determine if it is the correct size, and instruct the machine to continue the cutting program (second G-Code block) or halt machining depending on the result.

Logic, commonly referred to as in-process control, can be used to interrogate any feature created with Productivity+™ Active Editor Pro.

In the process tree select the feature you want to interrogate and select the required Logic icon. A condition builder dialog box will open.

From the first field of the dialog box (Condition 1) select the characteristic of the feature that the Logic statement will relate to: in this instance WebPocket1.Width. Then select a Controlling Condition: in this instance LT (Less than).

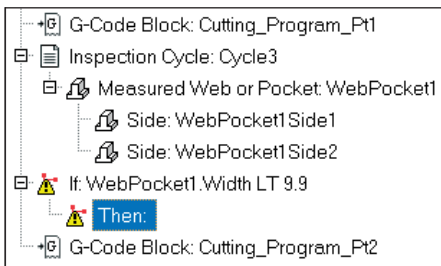


Now add the lower tolerance limit to the Condition 2 field. For this example the feature size is 10 mm ±0.1 mm, so the lower tolerance limit is 9.9: there is no need to add the unit of measurement.

Select OK to add this control condition to the process tree.

The logic added so far effectively says: 'If the 10 mm wide web feature is actually under 9.9 mm then ...'. The software must now be told what to do.

In the example, if the feature is less than 9.9 mm wide the machine will be instructed to stop and display a message on the control screen to let the operator know what is wrong. This is done using a G-Code block.

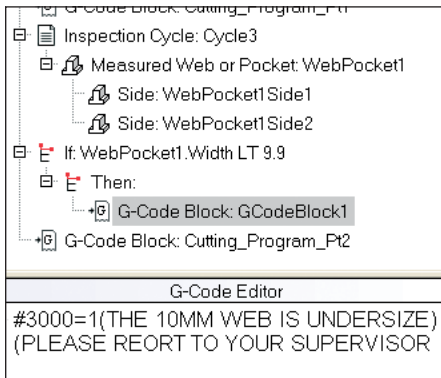


Highlight the Then element in the process tree and select the G-Code Block icon.

The process tree now contains elements to:

- Machine a web
- Inspect the web
- Instruct the machine that if the web is under size to stop on an alarm

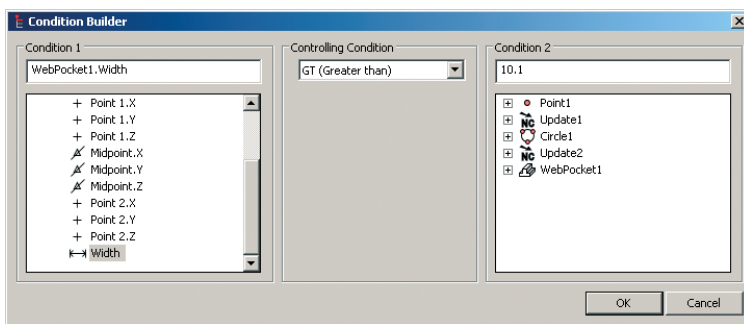
You can add more information to the alarm if necessary using the G-Code Editor window.



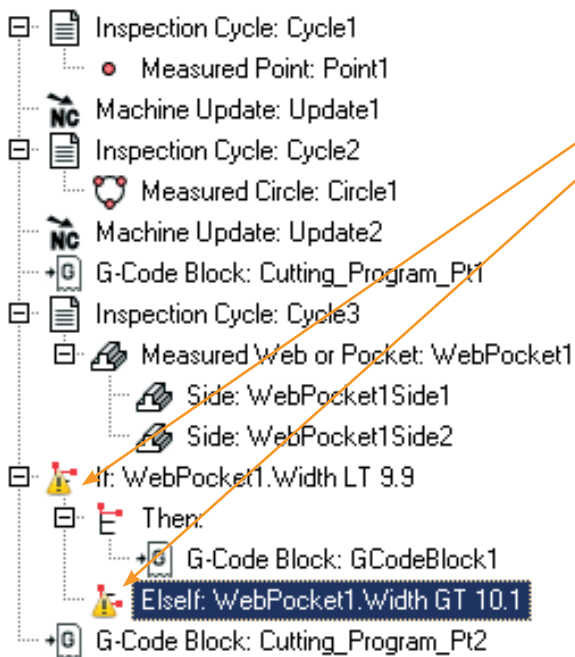
This screenshot contains an example of an alarm code.

A condition is also required to check if the feature is over size. An Else... If logic statement is used for this.

Highlight the Then element in the process tree and select the Else... If icon.



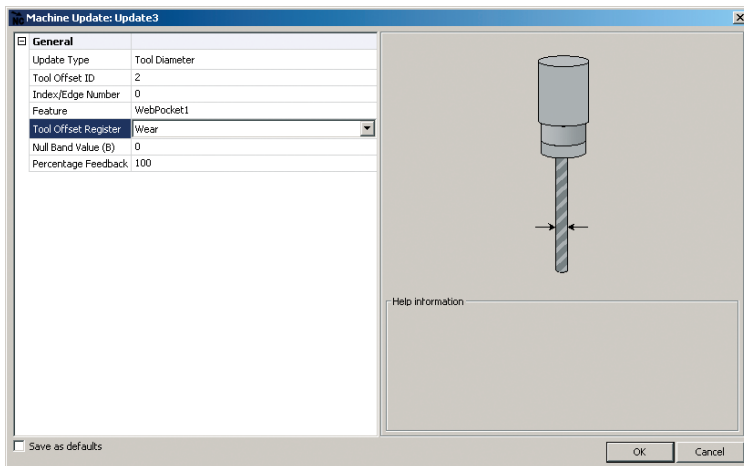
This opens a second Condition Builder dialog box. Complete the fields to check if the web is over size (GT Greater than)) the upper tolerance limit (10.1 mm). Select OK when all fields are complete.



Warning triangles in the process tree indicate that something is incorrect or incomplete with the controlling condition as it currently stands: the machine needs to be told what to do if the web feature is over size.

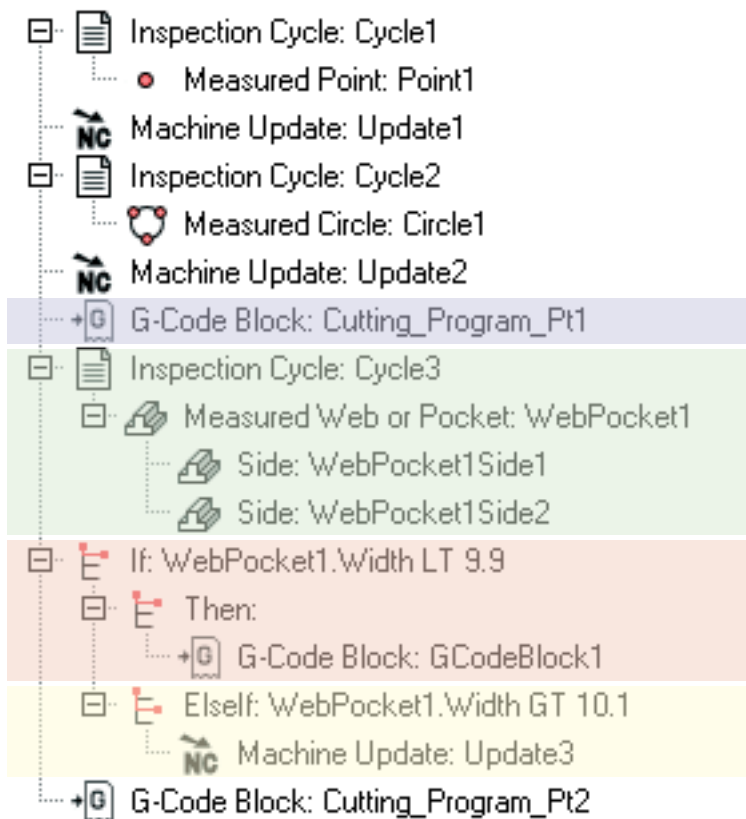
A feature may be under size due to an incorrectly set tool diameter, so the machine will be instructed to perform a machine update to check the tool diameter before looping back to the cutting program and re-machining the feature with the updated diameter offset.

Warning(s):
1) Empty control statement - this item has no children.



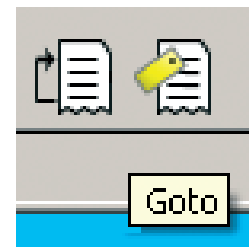
Highlight the Elself element in the process tree and select the Machine Update icon. Complete the resulting dialog box with the necessary information:

- Tool offset number
- Feature (i.e. Web/Pocket1)
- Tool offset register (geometry or wear)



The process tree now contains elements to:

- Machine a web
- Inspect the web
- Instruct the machine that if the web is under size to stop on an alarm
- Instruct the machine that if the web is over size, update T2 diameter



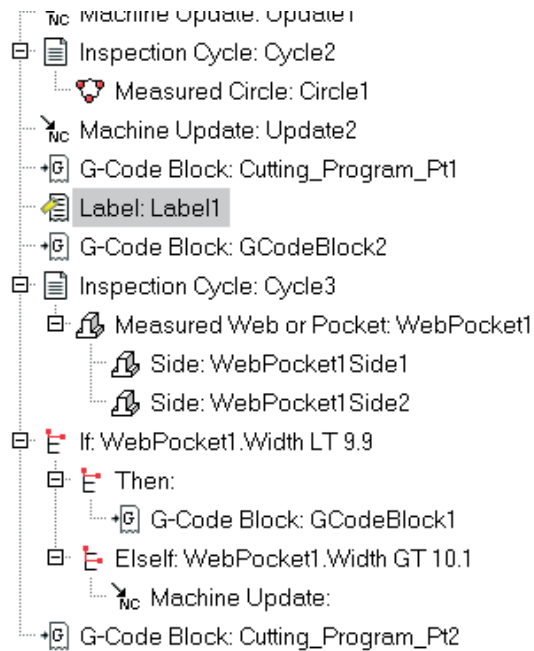
```

G-Code Editor
(CS#2 - A90)
N188G90G0X1.0119Y1.0119A90.
N189G81G99X1.0119Y1.0119Z-.0787R.0984F9.84
N190X-1.0119Y-1.0119
N191G80G0Z.0984N178M9
N179G91G28Z0.M19
N180M1

N181T2M6
(OP16_FINISH 10MM WEB)
(A0 FEATURES)
(TOOL 2, 6. FINISH_END_MILL)
(CS#2 - A90)
N182G55G90G0X-.7934Y.7934A90.S3000M3
N183G43Z9.0689H2M8
N192G90G0X-1.0119Y1.0119A90.
N193G81G99X-1.0119Y1.0119Z-.0787R.0984F9.84
N194X1.0119Y-1.0119
N195G80G0Z.0984
N196M9
N197G91G28Z0.M19
N198M1
    
```

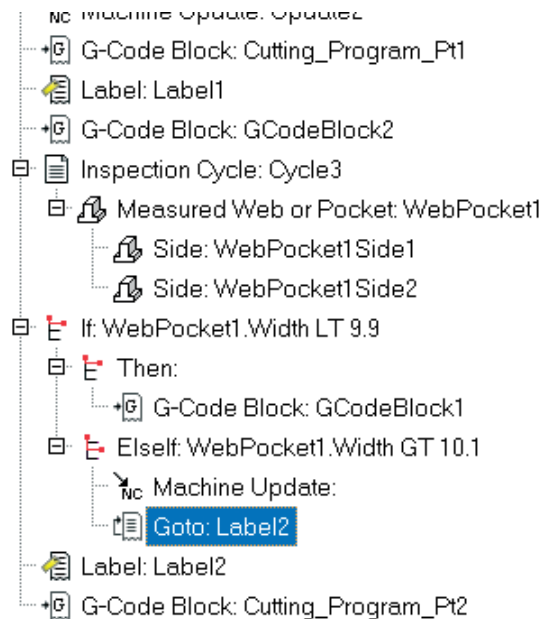
A GoTo element will complete the logic loop. This element will comprise a reference point (a label element) within the G-Code and an instruction to 'go to' that reference.

In the G-Code block, find the beginning of the final finishing cut of the web feature being measured and insert the cursor (left mouse click). Select the Label icon to insert a label element at this position. This will split the G-Code block.

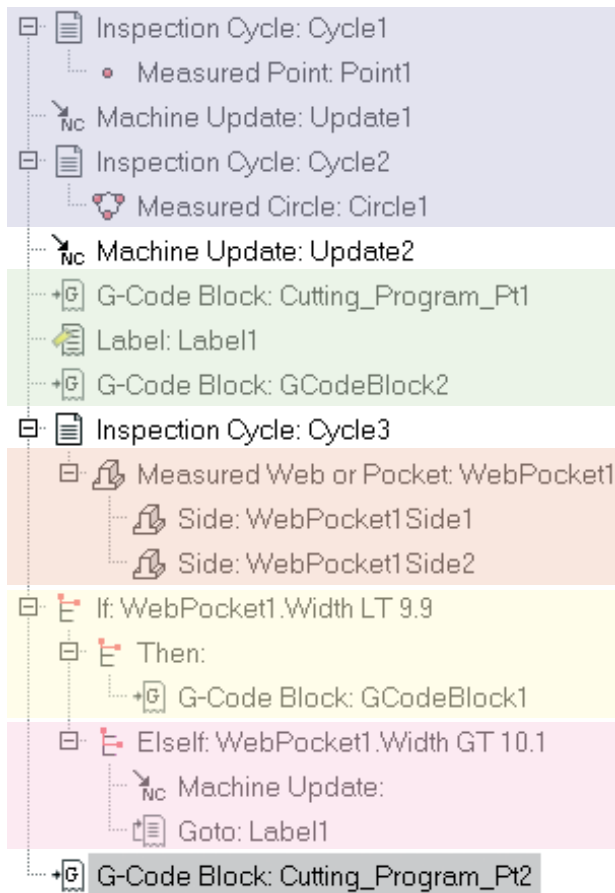


Now this reference point has been created, a GoTo element can be added after the machine update (tool diameter) element.

Highlight the machine update element from the process tree, and select the GoTo icon.



This creates two new elements: Goto:Label2 and Label:Label2. As a label element has already been created, this Label2 element is not required, so can be deleted. Red crosses now appear in the process tree as there is no Label2 to go to. Rename the GoTo element to GoTo:Label1 to correct this error.



The process tree now contains elements to:

- Set-up the component
 - Machine a web
 - Inspect the web
 - Instruct the machine that if the web is under size to stop on an alarm
 - Instruct the machine that if the web is over size, update T2 diameter by the amount of error found and loop back to the finishing cut to re-machine the component to the correct size
- If the web is within tolerance, the machine will continue running to the end of the cutting program.

Example of a posted program with built-in logic

| | |
|---|---|
| <pre> (_RENGCODE_END) N507 (_RENGCODE_START0028) N181T2M6 (OP16_FINISH 10MM WEB) (TOOL 2, 6. FINISH_END_MILL) IF[#109 LT 9.9]GOTO509 IF[#109 GT 10.1]GOTO508 GOTO510 N508 Comes to this line if LT 9.9 G65P8151A5.B109.C2.D1.E100.F0.I1.J1.K1. GOTO507 N509 (_RENGCODE_START0017) #3000=1(THE 10MM WEB IS UNDERSIZE) (PLEASE REPORT TO YOUR SUPRVISOR) (_RENGCODE_END) N510 (_RENGCODE_START0022) N199T3M6 (OPERATION 17, HOLES) (A90 FEATURES) </pre> | <p>This is the label that you inserted at the top of the finishing cut</p> <p>Cutting program for finishing the web feature</p> <p>Inspection of the web feature</p> <p>First logic statement</p> <p>Second logic statement</p> <p>This line will be read if the measured feature is within tolerance</p> <p>T2 diameter update</p> <p>Instruction to loop back and re-machine the web feature</p> <p>Comes to this line if the feature is less than 9.9</p> <p>The #3000 alarm to be displayed if the measured feature is under size</p> <p>If all measured features are within tolerance the program will come to this point and continue machining the component</p> |
|---|---|

Logic can be applied to any type of feature using the same procedure as illustrated in this module.

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