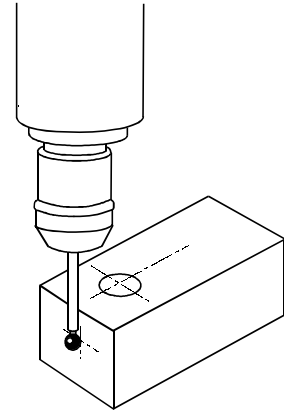


Teaching a Part with MachineMate

This simple procedure enables the operator to teach a part to the CNC. The operator will move across a part and use input switch(es) to indicate the points on the part. The CNC generates a program from the points that were recorded as directed by the operator inputs.

This procedure allows for different levels of teaching points in a program, including points on the part, points off the part, points on an arc/circle, collection of points along a profile. Not all of the input buttons defined here have to be provided for the teaching procedure but the optional inputs enable a better definition for the teaching process of a part.



The PLC can monitor the following input buttons:

STO_B	start the output part program (open the output file)
END_B	end of the teaching so conclude and close the output part program
PFB_B	profile beginning button (this point and those that follow are G01 moves)
PFE_B	profile end button (this last point is saved in G01 moves)
ACB_B	arc/circle beginning button (this first point starts the G2/G3)
ACE_B	arc/circle end button (this last point ended the G2/G3; the circle center is calculated from at least 3 points so just 2 points will result in an error)
CCW_B	button to indicate whether the active arc/circle is counter-clockwise or not (off = CW or G02, on = CCW or G03)
PT_B	point on part is recorded (includes an intermediate point in profile or arc/circle)
OP_B	point off the part is recorded (so the output retracts off the part to this position)
SP_B	sample points on the part during any motion, at the defined time interval
NCO_B	insert a numbered comment into the output program (to help with later edits)

In practice, only the PT input button is required when SP is not used. All the other buttons are optional if no sampling is required.

Upon a control reset during an active teach, the END activity will finish the part program. If the END is provided, then this control reset behavior can be disabled.

If the PT is the first button pushed, the STO activity will occur first.

If the ACB or PFB button is pushed when either one of these is in process, then that previous process is concluded (so the ACB starts a new or another arc/circle while the PFB ends the current arc/circle) so it is possible to teach arcs and profiles without either PFE or ACE buttons. The PFE and ACE buttons provide a clear end point definition for each sequence. If the CCW input is missing, then all arcs and circles will be G02. The circle center is calculated from the points and the CW or CCW is not taken into account (so for example if a small 90° arc is taught but with the wrong CW/CCW indication, the output program will not correct that CW/CCW command for the large 270° arc that is calculated).

If the OP button is pushed when either the PFB or ACB was in process, then that other process is concluded first (so an active ACB is ended at the last point recorded).

If the PT is pushed before either ACB or PFB, the PFB is assumed since the simplest teaching is just a general part profile (or a series of lines between points).

The SP ignored until a PFB or ACB has defined the start of sampling. Upon the PFE or ACE the sampling will stop. The sampling will record only changes in axis positions so hesitations in the axis motions during teaching will not affect the output program. If the SP is turned off after an ACB but before the ACE, the circle is still not concluded as the procedure expects the ACE to define the circle end point.

Teaching a Part with MachineMate

The output part program requires minimal editing, usually just the programmed feed rates and the programmed spindle activity (e.g., either clockwise or counterclockwise at which programmed speed and perhaps in which gear range).

As with any MachineMate® part program, the generated part program is simple ASCII and can be edited with any text editor (like Notepad with Windows).

The feature is easily enhanced. If a spindle start and stop pair of buttons is required, they are easily added to the framework. A coolant on and off pair of buttons is also easily added.

This teaching procedure requires the following configuration parameters:

- P201 – the output part program number (Pxxxxxx) generated by this teaching process
 - P202 – whether the teaching is done in inch (= 0) or metric (= 1)
 - P203 – sampling interval (as number of milliseconds; lowest limit depends on CNC model)
 - P204 – whether this teaching will be in the middle of another program (0 = No, 1 = Yes)
 - P205 – the number of the old program (if applicable, as Pxxxxxx)
 - P206 – the number of the block in the old program to start the new teaching.
 - P207 – probe length to be offset (in Z) from the actual probe contact point (can be = or > 0.0)
 - P208 – the reference / approach plane at the start of each G1 series in the output program
- P204-P206 are not supported at this time. That capability will be a future enhancement.

Operator Options:

With a MM Visualizer display overlay or with a Visual Basic overlay, it is possible for certain actions to result in an operator dialog to fill in an entry. Neither overlay is provided with this feature. Either overlay will interact with the teaching process as it was designed. For example, for any PFB or ACB, a dialog could be provided to obtain the desired feedrate. Alternately, a feedrate dialog button could be added to the framework so that only at that time is this dialog presented.

If spindle start and stop pair of buttons were added, then upon the spindle start button action a dialog could be provided to obtain the desired spindle speed. If the spindle direction is not always the same, its prompt could be presented in the same dialog for the spindle start button.



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