

Requirements: Acorn CNC12 version v4.20 or higher.

Provided here are several working examples of Rack Mount ATC Macros for use with an ACORN CNC system. Rack Mount Tool changers commonly only require a Macro for operation with no or minimal PLC program editing. We have provided several common Rack Mount ATC Macro examples, editing of these macros is required to work properly on your specific Rack Mount ATC. The Macros are commented to provide guidance so, instructions on how to modify them are contained within the Macro itself. While most users with a standard Rack Mount ATC can simple edit one of the examples provided, some user may want to further customize their Tool Change macro in that case detailed information on Macro programming is provided here "Introduction to Centroid Macros"

https://www.centroidcnc.com/centroid_diy/downloads/acorn_documentation/centroid_cnc_macro_programming.pdf

There are two basic types of Rack Mount Tool Changers:

- 1.) Rack Mounts that drop the tool in a "pot" (a hole) that may or may not need orientation of the tool to fit in the pot.
- 2.) Rack Mounts that use Forks (aka Fingers) to hold the tool in place that may or may not need orientation of the tool/spindle to fit the tool in the Forks

There are two common Router Rack Mount Tool Length management strategies.

- 1.) After each tool change, the machine will automatically touch the new tool in the spindle off of a TT (Tool Touch Off) device and reset the current WCS Z 0.000 (part zero position) with that tool before proceeding to run that tool.

Pros: This method is the certainly the easiest method and least prone to having newbie related issues and recommended for the newbie CNC operator. Works with collet style tool holders where the tool bit is being changed a lot and therefore is not always in the same position in the tool holder. Works with machines that don't have a lot of tool holders and/or the operator is using multiple bits in same tool holder. Pretty much a fail safe method since the machine is resetting part Z zero position with each tool being used. User doesn't have to learn anything about tool height offsets and Z reference position as they are not used in this method.

Cons: Requires a touch off cycle after each tool change

- 2.) Maintain a Tool Library with Tool Height Offsets (difference in lengths between tools)

Pros: Does not require a tool touch off after each tool change. Saves time, after each tool change the machine goes right to work and does not touch the tool off of a TT device or surface plate. Allows easy individual tool cutting depth to be tweaked via the tool library which is remembered by the CNC control from day to day. Operator only has to set tool lengths once, never have to set them again until tool bit is replaced, or the tool is worn down. Then only have to remeasure just that one tool, no need to reset the entire tool library.

Cons: Requires CNC operator to learn how to maintain a tool library. Dedicated tool holder are required to each tool (\$). Requires CNC operator to learn the difference between WCS Z 0, Z reference position and Z home position.

Using either method i recommend all Router users to set CNC12 to automatically set Z reference at the Z home position. (See CNC12 Parameter 3). It is recommended to set Parameter 3 to a value of 2 for routers (and bed mills). See Mill Operator Manual Chapter 15.3.5. This has a number of advantages. 1.) it eliminates the reference tool. 2.) Tool Height offset values are easy to understand, they simply are the distance it takes to move from Z home to the top of the Too Touch Off device for each tool.

Description of the example Rack Mount ATC m6 macro does:

- 1.) **“mfunc6 no finger.mac”**: Rack Mount Tool Change macro for use Pot style holders with spindle orientation.
- 2.) **“mfunc6 finger.mac”**: Tool change macro with finger (fork) with spindle orientation.
- 3.) **“mfunc6 finger with TT.mac”**: Tool change macro with finger (fork) with automatic tool touch off sequence to zero out WSC Z 0 with each tool, without spindle orientation.
- 4.) **“mfunc6 no finger with empty.mac”**: Rack Mount tool change macro for use with pot style holders with spindle orientation. Has a empty tool (Tool 6 in example) that when called will put away current tool then leave the spindle empty.

Installation:

1.) Modify one of the supplied mfunc6 macros to meet the individual Rack Mount ATC geometry and requirements. (Reference the Mill operators manual chapters 11 through 13, for the G and M commands you can use in your macro and “Introduction to Centroid CNC Macros”.

2.) Copy the provided mfunc18.mac into the cncm directory.

3.) Copy the modified mfunc6 macro to the cncm directory and rename it to “mfunc6.mac”.

4.) Set the following CNC12 parameters. From the main screen press F1(Setup)→F3(Config)→F3(Params).

A) Set Parameter #6 = 1 (ATC installed)

B) Set Parameter #160 = 1 (Enhanced ATC settings, see operator manual Chapter 15)

C) Set Parameter #3 = 2 (automatically sets Z reference = Z home)

D) Set Parameter #161 to maximum amount of tools of ATC.

A) Set Parameter #161 to Maximum Tools + 1 if you wish to have an empty spindle “tool”. For example if you had an 8 Tool Rack Mount, Parameter #161 would be set to 9. This allows, via some changes to the m6 macro, to allow Tool 9 to act as the no tool in spindle.

4.) Shutdown CNC12 and power cycle ACORN, restart CNC12 once you see the heartbeat.

5.) Initialize the ATC: To Initialize the ATC, F1(Setup)→F3(Config)→F6(ATC Init). This will ask you to put tool 1 into the spindle. (fyi...this initialization process is setting variable #150 to 1 (the tool number in the spindle))

Side note: If you are heavily editing the tool change M6 macro and use some other variable number (other than #150) to keep track of the Tool Number in the spindle, the M18 macro would need to also use that same tool in spindle variable number for this to work properly!

6.) Setup Correct I/O in Acorn Wizard for m6 macro. A list of inputs/outputs is listed at the top of each macro example. For the macros to function properly, the inputs and outputs need to be assigned to the correct input or output. If the m6 macro is modified, ensure all inputs and outputs that the macro requires is designated correctly within the wizard.

If using mfunc6 finger with TT.mac: The Tool touch off sequence in this macro is to reset the WCS Z coordinates for every tool change. There are two ways we can wire a device to enable this macro to work. One way is to wire an actual TT device such as a Centroid TT1 device to the acorn, or to wire something like a “movable surface touch plate” to the acorn input for use in the macro. This macro will automatically add the detector height or thickness of the plate if using a movable surface touch plate to the Z offset for each tool. This requires that the detector height value is correct under the Tool Touch Settings in the Acorn Wizard. If this feature is not desired, it can be removed by editing the following line in the m6 macro:

```
G92 Z[0+[#9071]]          ;Set Z position to 0 + detector height stored in parameter 71
to
G92 Z0                    ;Set Z position to 0
```

Reset WCS Z zero with each tool change using a TT device:

If using a Tool Change Macro that contains a Tool Touch Off sequence to reset WCS with each tool change, The Tool Touch Off device must be configured using the Acorn Wizard and tested BEFORE running the Tool Change Macro. see the Acorn Probe Setup Guide for more information on setting up a TT device.

https://www.centroidcnc.com/centroid_diy/downloads/acorn_documentation/acorn_probe_setup.pdf

The input you choose in the Acorn Wizard to install the TT device on needs to be in the Rack Mount ATC macro as well. By default the macro is set to have input 5 be the “tooltouchofftripped” signal. If the input is designated as a different input in the wizard, make the appropriate change to the macro. For example, if it is designated as input 3 instead, in the macro you will need to change the line:

```
#104 = #50005
to
#104 = #50003
```

Variable #104 is then used in the macro to tell the control what input to look at when doing the reset WCS tool cycle in the macro.

Reset WCS Z zero with each tool change using a movable surface touch plate:

If using a movable surface touch plate, wire the touch plate to an unused acorn input. This is an input that has not been assigned an input in the wizard. By default the m6 macro is looking at input 5 for tool detection. If the input is wired to another Input the following line needs to be changed, for example if we wired the touch plate to input 3 instead:

```
#104 = #50005
to
#104 = #50003
```

Variable #104 is then used in the macro to tell the control what input to look at when doing the reset WCS tool cycle in the macro.