Getting the most out of the Edge Finder script 2019/09/27

The new HiddenScript file (HiddenScript_190927.m1s) for Mach3 has 15 built in functions all accessed through the **Auto Tool Zero button**. Each of the functions scripts was designed to help find a surface on the work piece. Four of the functions (1, 6, 8, & 9) do not ask for additional information simply because it is not needed. The other functions need to know the tool diameter, and if you are touching to the edge finder or to the work piece directly.

CAUTION: Because the edge-finder is not heavy, it will need to be held in place during the seek process. Usually the easiest way to do this is to use your finger to hold it. This means that you will be in close proximity to the cutting tool, and it will be possible to injure yourself. Before trying this tool live, make sure the edge-finding software is functioning properly, and that you have practiced the process several times. To start, use masking (or similar) tape to tape the edge-finder to the table, in a place, where there are no obstructions and you can then test the process without breaking bits and cutting your fingers.

When performing these functions, make sure the X0, Y0, and Z0 initial settings are set to safe values. It is important that the machine not crash. The functions use Z0 as a reference for providing clearance over the work-piece. Be sure to set Z0 to be above the work-piece surface. it is usually best to calibrate Z last.

Functions:

- **1, 8, & 9 Find the center of a circular hole.** This function set locates the center of a circular hole. When using the edge finder, the circle center will be directly over the corner of the work-piece, and X0, Y0 will align with the edges of the work-piece. The process first moves the probe in the negative X direction, then the Positive X direction, and zeros X. The code then hunts for negative Y, followed by positive Y, and then zeros Y. This process is repeated to attempt to get as accurate as possible. Also, the operator is given the opportunity to observe the DROs and see just how balanced the readings are. When finished, the probe should be centered over the hole with the DRO set to X0, Y0, and Z=unchanged. Functions 8 & 9 are identical to function 1 except 8 sets only the X axis to zero, and function 9 sets only the Y axis to zero.

  Setup: This function requires the operator to position the probe inside the hole such that it doesn't touch the hole and doesn't touch the bottom. The operator does not need to zero the DROs, but it is encouraged to set the DROs to zero, at this time. The function can be repeated by simply touching the "Go-To Zero" button and repeating function 1 again.
- **2, 3, 4, & 5.Find XL YL XH YH.** These four functions do nearly the same thing, but each on a different edge of the work-piece. XL and YL locate the work-piece near edges (the ones that are usually used to find X0 and Y0 respectively). XL and YL functions set the appropriate DRO to zero when finished. XH and YH are used to find the far edges of the work-piece. The DROs values are not modified and indicate their position from X0 or Y0**.**

  Setup: Move the probe to be near the desired surface to touch (less than 1" or 25mm). Select the appropriate function, tool size, and finally type of touch (0=**edge-finder** or 1=**work surface).** The operation will take at least two readings to get a pair of matching readings. When finished, the tool will position itself centered over the selected edge.
- **6. Find Z surface**. This finds the top surface of the edge finder. This process moves the probe down seeking a touch, and after the touch, it will rise up to safe_Z and seek the surface at least one more

time to get a pair of matching readings. The probe will pause for a moment to show on the DRO the difference between the two readings. The DRO-Z will be set to Z0, and the probe will rise to 1" (25.4mm).

Setup: Move the probe to be within 1" above the Z surface to touch.

- **7, 17, & 27. Find Z, X, & Y Surfaces.** This function attempts to find Z0, X0, & Y0 using the outside sides of the edge finder, all in one function. Function 17 and 27 are identical to Fcn 7 except that they assume that you are using your favorite tool and Edge finder, and that you don't want to answer a set of options each time you use it. Fcn 17 assumes that you will touch off to a conductive (metal) work-piece and that there are no offsets except the tool diameter. Fcn 27 assumes that you are using the edge-finder for with its standard offsets, and your favorite probe. The function will first find Z0, then X0, and Y0 of the work-piece.
  Setup: Move the probe to be within 1" (closer the better) above the Z surface to touch and within 1 inch of the X0, Y0 corner.
- Functions 11 through 15 are similar to functions 1 through 5. They are **inverse functions**. Where there is a set-to-zero in the lower numbered functions the higher numbered functions will only report the offset without zeroing it. Where there is a report offset in the lower numbered functions the higher numbered functions will set- to-zero.

General rules:

1. There must always be a functioning probe circuit. Test circuit continuity before every run. The indicator on the 1024A.set screen is for this purpose.
2. Always make sure the spindle motor is disabled. If it should start during the process, or before the probe wire is removed, someone may get hurt. And always remove the wire to the probe immediately after each use. I have recently started using a magnet to connect to the probe, and this seems to work well. Should one start the spindle with the magnet still attached, it tends to pop off harmlessly.
3. A function selection of 0 (zero) will abort the process. The **STOP** or **RESET** button will abort the edge-finding process.
4. The Edge finding script requires that the probe not be touching the edge finder before it will start. It is recommended that you use the supplied 1024A.set screen to replace the Mach3 1024.set screen. The new screen has a very handy touch indicator on the screen. You can easily return the original 1024.set screen if you don't like it.
5. Function 1 attempts to start in the safest possible way by moving away from the work piece in order to give you the time to realize that you didn't connect the wire to the probe.
6. All of the functions require you to manually set the Z height before running the function.
7. The slower the probe's approach to the touch surface, the more accurately it can measure the position. The preset seek speed is set to 100mm/min (4 inches/min). The return speed is defaulted at 10 times the seek speed.
8. The program is configured with three preset tool diameters. The defaults are 3/32", 1/8", and 1/4". These can be changed by editing the button script.
9. All of the presets are easily changed in the script file.

G-CODE and GRBL CODE

The G-code and the GRBL code are different in that Mach3 and GRBL use a different g code for the touch probe process. Also Mach3 uses G52 and GRBL uses G92 for relative positioning. They both do the same thing (temporarily move the XYZ reference), but do it in very different ways. The sample code for both types was written to only find the center of the circle. After finding the center, The G52/G92 commands are used to temporarily move the X and Y DRO positions as desired (usually to be zero). It is possible to run the sample g-code either by itself, or as a part of the project G-code.

By running the center finding G-code by itself, the operator can find the X & Y edges and manually set the DROs to zero or any other desired offset. The G52/G92 commands will not be necessary.

If the operator chooses to attach this code to the beginning of his project code, the G52/G92 commands will temporarily move the DRO references to the corner of the work piece, or to any other position the operator chooses to start the milling.

Universal G-Code Sender

The GRBL code set is usually run on the **Arduino** processor and is controlled by the popular **UNIVERSAL G-CODE SENDER** (UGS) program. UGS uses Arduino input **A5** for the probe input. On the **Arduino Shield**, the probe input is on the **SCL** pin. To use the probe, you will need to load the Probe Manager Plugin from Tools/Plugins. Once loaded, the UGS program has a set of commands for finding the various edges and setting offsets. The probe input is activated when it touches signal common (ground, GND, 0VDC).

Repeatability with the Edge Finder

If for some terrible reason, you lose your reference, as in the work piece moved, then you will need to reset the work piece and the DROs so that you can continue. The edge finder can help you to do just that. To relocate the reference, the operator must first have a known reference. Usually the best place for that is the X0 Y0 position with respect to one edge (X or Y axis) of the work piece.

Before starting any job, the operator should create a fully repeatable reference point. If the work piece is not butted up against an established straight reference, then a straight edge reference should be established from the work piece itself. This should be done by making sure two points along either the X or Y axis are parallel to the machine axis. The more accurately this is done the more reliable your reference will be. This is usually accomplished by using a dial gauge attached to the Z axis spindle assembly, and adjusted to allow measuring how parallel the work piece is to the axis. By making the work piece parallel to within one or two thousands over the entire length of the work piece, a decent chance of recovering your original reference becomes possible. Note the entire edge does not have to be that flat, but at least two points along the edge need to be repeatable, and preferable to be as far apart as possible.

Once the work piece is parallel to the axis, it will be necessary to establish a repeatable corner reference. Usually the X0 Y0 corner is the best place to do that. The corner does not have to be square or smooth, so long as, the edge finder is stable on the corner for a repeatable measurement.

After establishing a repeatable reference, it is possible to continue using the original work piece for your project.