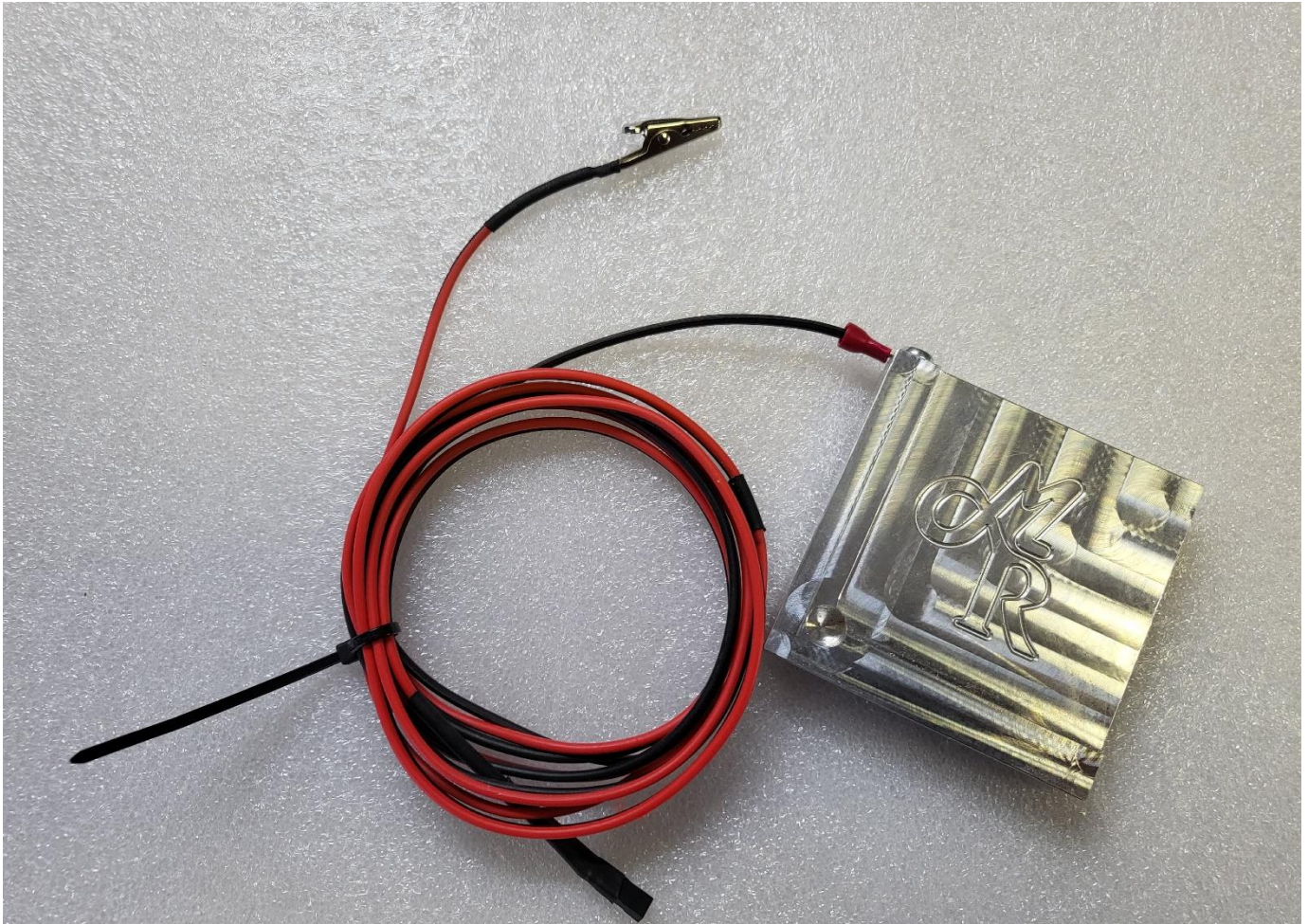


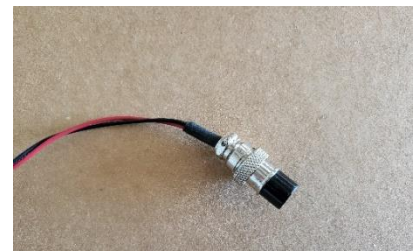
MillRight CNC Precision Zeroing Touch Plate

Our precision touch plate is a great way to set your zero! Made from 6061 aluminum with our high precision industrial machining center, this device will help find a corner and set your X, Y, and Z zero quickly and accurately.



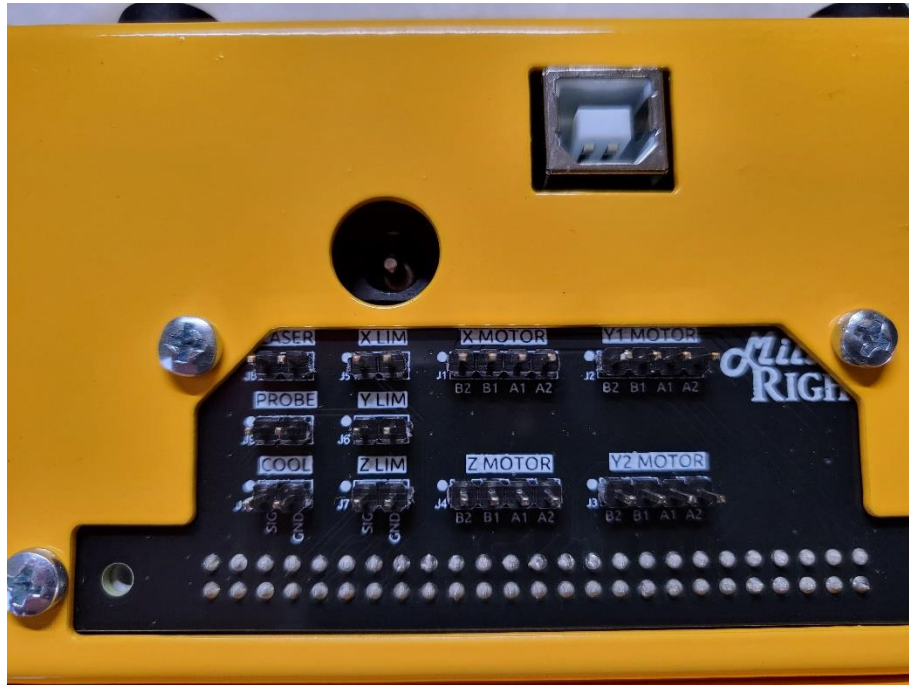
Touch Plate with 2 point Dupont Connector

This touch plate can be used with the Power Route, Mega V, or Carve King 2. The Power Route and Mega V use an aircraft style connector, whereas the Carve King 2 uses a two point Dupont connector.



Aircraft Connector

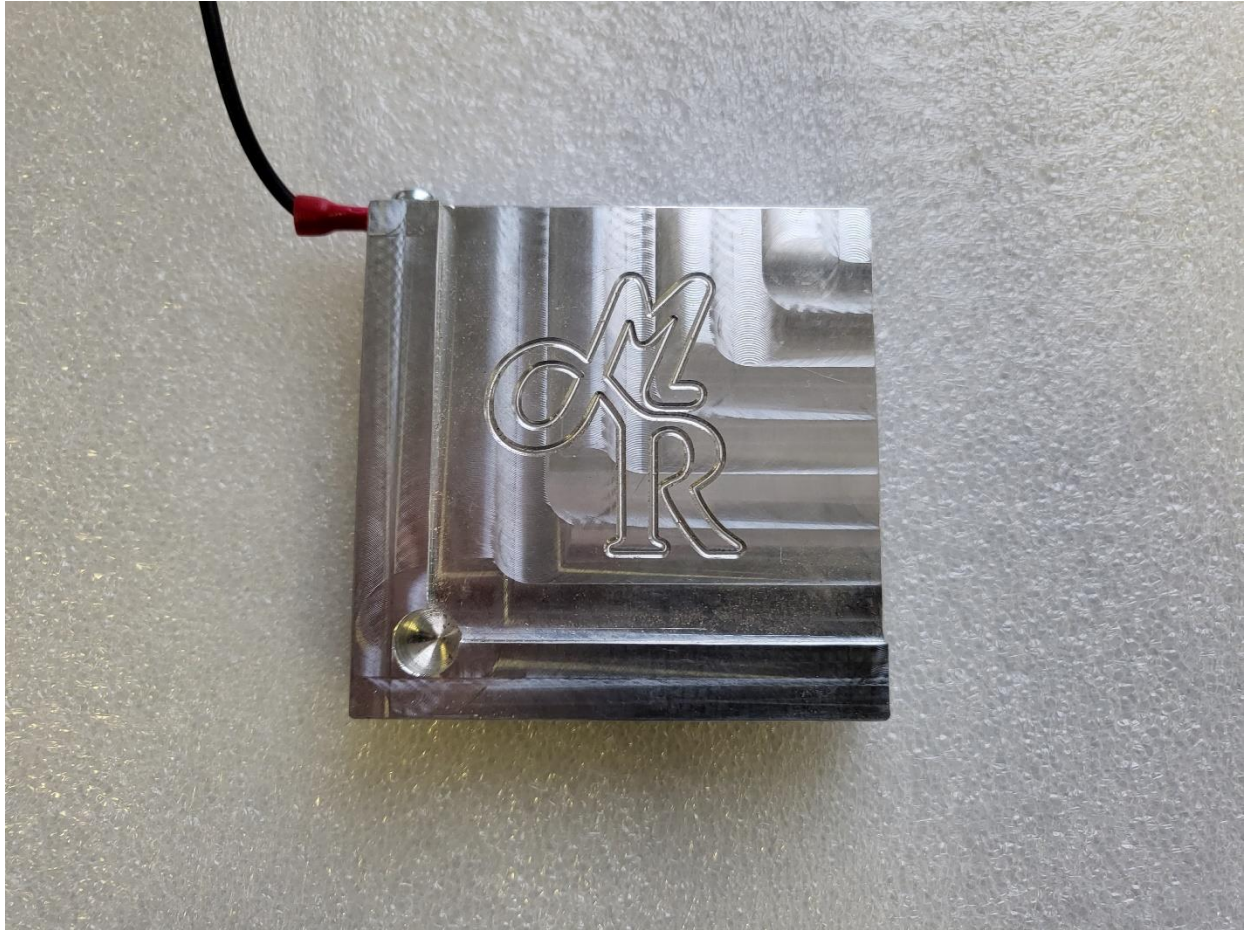
The Touch Plate will plug into the back of the electronics box of your machine. For the Carve King 2, you will plug the Dupont connector onto the 2 pins that are labeled Probe. For the Mega V and Power Route Plus, you will plug the aircraft connector into the port labeled probe.



Carve King 2

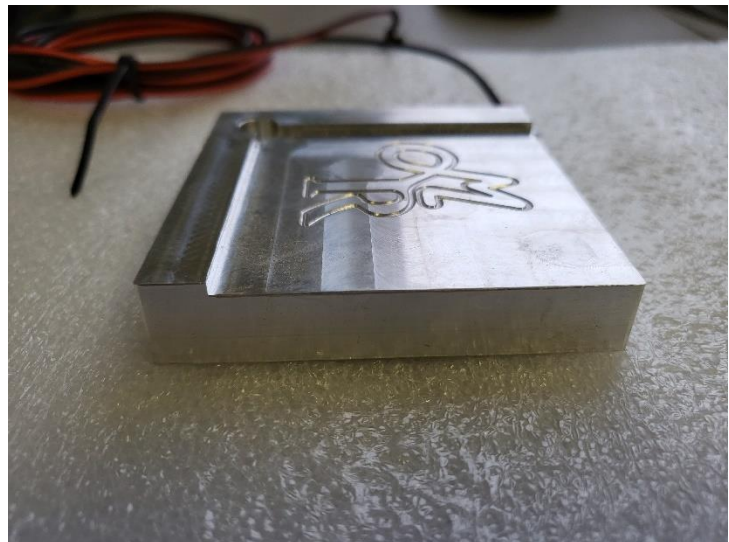


Power Route Plus & Mega V

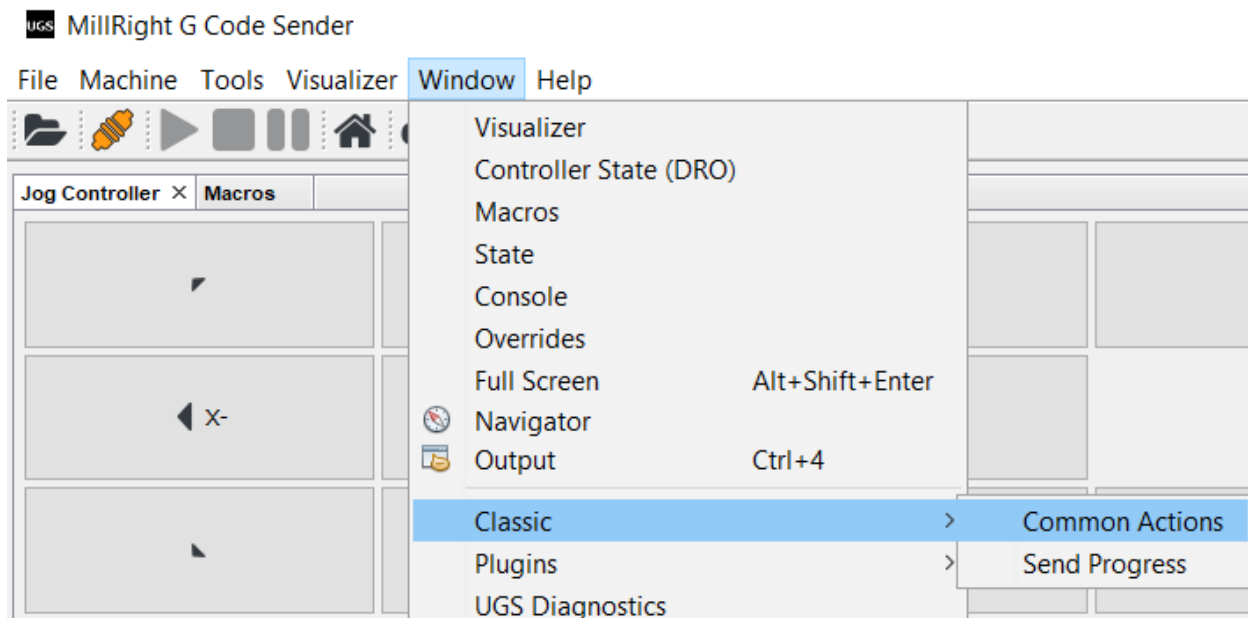
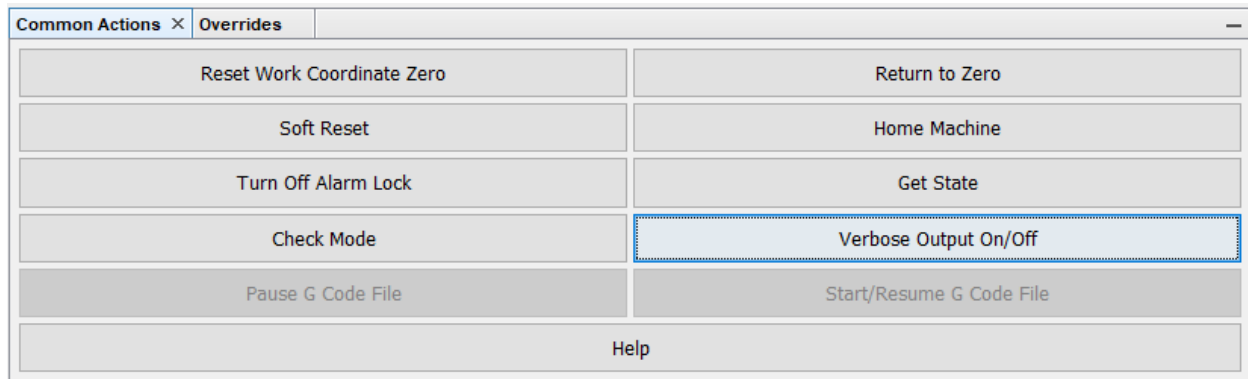


The Touch Plate Length and Width are 70mm

The Touch Plate will have a raised section along (2) edges. The raised section will be 14mm thick and extend in from the edge 10mm. The rest of the plate is 12mm thick.



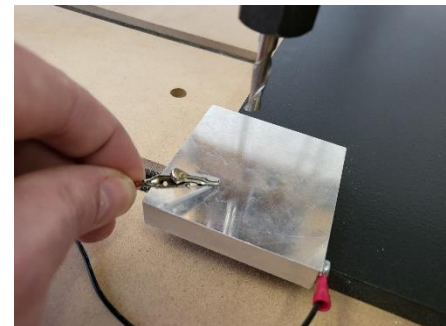
To test the Touch Plate, make sure the probe is plugged into the back of the electronics box. Open UGS and locate and click the “Verbose Output On/Off” button located in the “Common Actions” window. If the “Common Actions” window is not up, go to the “Windows” dropdown menu, go to “Classic”, and select “Common Actions” to have the window pop up.



Once you click “Verbose Output On/Off”, text should scroll continuously across the “Console” window.

```
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|WCO:0.000,0.000,142.500>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Ov:100,100,100>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Ov:100,100,100>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|WCO:0.000,0.000,142.500>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Ov:100,100,100>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>  
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
```

Touch the alligator clip to the surface of the Touch Plate. The text in the “Console” window should change to show a signal from the Touch Plate.

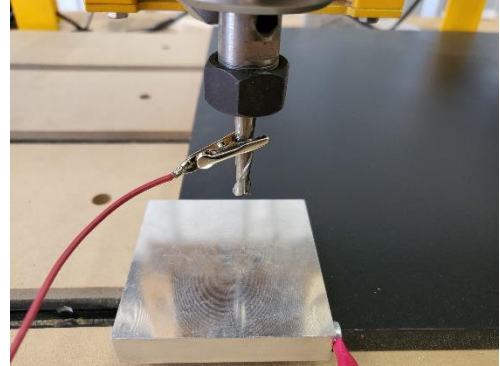


```
Console x
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Ov:100,100,100>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P|WCO:0.000,0.000,142.500>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P|Ov:100,100,100>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P|WCO:0.000,0.000,142.500>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P|Ov:100,100,100>
[verbose] <Idle|MPos:0.000,0.000,0.000|Bf:15,128|FS:0,0|Pn:P>
<
Command:
```

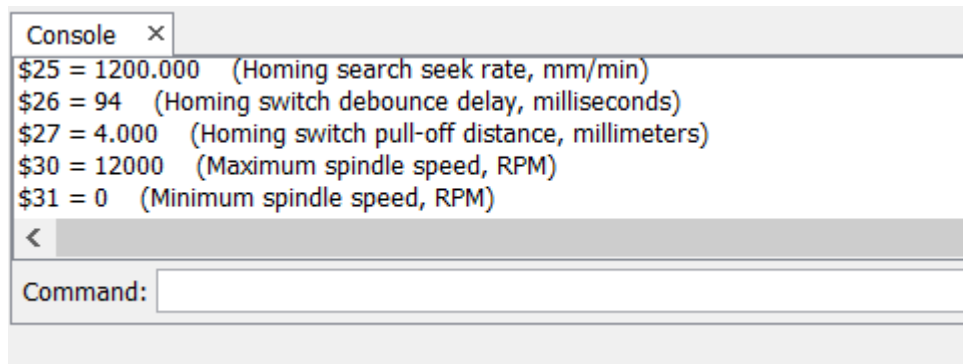
The “Pn:P” at the end of the text line shows that a signal is being received from the Touch Plate. If you do not see “Pn:P”, check to see if you are plugged into the correct port on the back of your electronics box. Email support@millrightcnc.com for any questions. Click “Verbose Output On/Off” to stop the scrolling text.

Place the Touch Plate on the edge of your stock with the MillRight logo facedown. The raised edges of the Touch Plate should butt against the edges of the stock corner. A common edge to use is the front left of the stock while looking at the front of the machine.

To probe your Z axis, jog your router over the top of your Touch Plate. Attach the alligator clip to the endmill. In the picture we are using a 1/4" Two Flute Flat End Mill. This is the tool we will be using for examples later.



You will need to type gcode commands into the “Command” line of the “Console” window to execute a probe.



The Probe gcode format is:

G38.2 (axis)(direction/length) F(rate)

Where:

G38.2 is the gcode to initiate a search probe,

(axis) designated and Axis of the machine – either X,Y, or Z

(direction/length) designates a direction on the chosen axis and a set search length

F stands for feed rate

And (rate) is the speed of the search.

In the examples below, the machine will be set to (mm)mode. All numbers will be mm, excepting the initial gcode. To follow along, make sure your machine is set to mm. You can check on the “Jog Controller” window. If set to inches, click the “INCH” button to change to mm.

Step size XY	<input type="text" value="10.008"/>	<input type="button" value="MM"/>
Step size Z	<input type="text" value="3.988"/>	<input type="button" value="Larger"/>
Feed rate	<input type="text" value="8,992"/>	<input type="button" value="Smaller"/>

In our picture above, we would need to type:

G38.2 Z-50 F60 Enter

Command:	<input type="text" value="G38.2 Z-50 F60"/>
----------	---

G38.2 initiates the probe, Z selects the axis, -50 causes the probe to search in the Z- direction (down) until the Touch Plate is detected or Z-50 is reached – whichever happens first, and F60 designates a 60mm/min search rate.

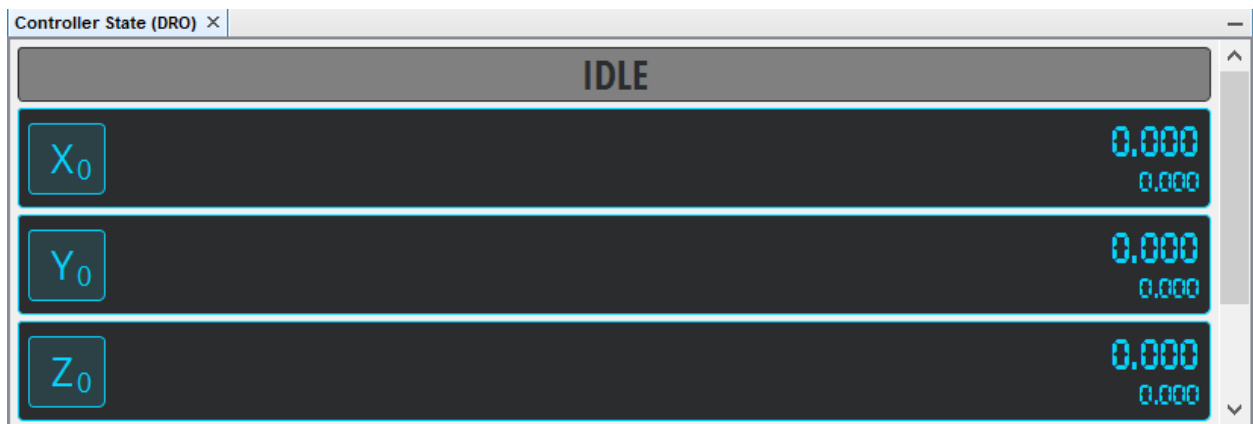
The equivalent inches code is:

G38.2 Z-2 F2.36 Enter

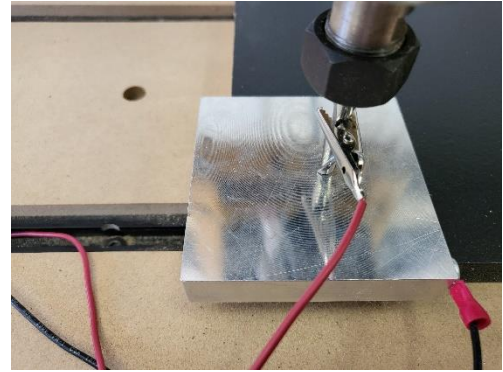
If an error occurs before the end mill contacts the Touch Plate, check your Z value on the “Controller State (DRO)” window. If the Z value is equal to or lower than -50, the machine will not complete the probe. Reset your Z by clicking the Z button shown below.



This will zero your Z value allowing the probe to be completed.



Once the end mill contacts the Touch Plate, the machine will stop. You are now a known distance from your stock top.



Enter a new gcode command in the “Command” line of the “Console” window. This command will change your work offset:

G92 Z12 Enter

Command:

This will change the current Z value to 12mm, the thickness of the Touch Plate. This will make Z0 the surface of your stock. The change can be viewed on the “Controller Start (DRO)” window.

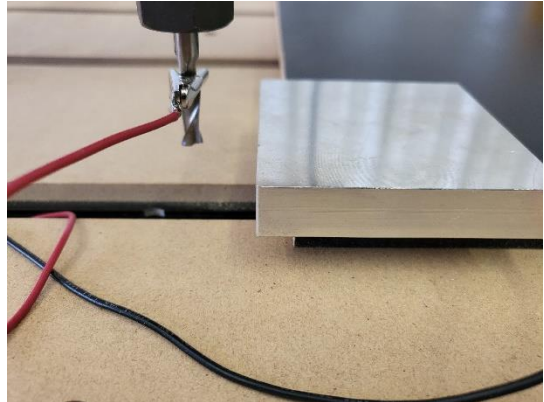


The command for Inches:

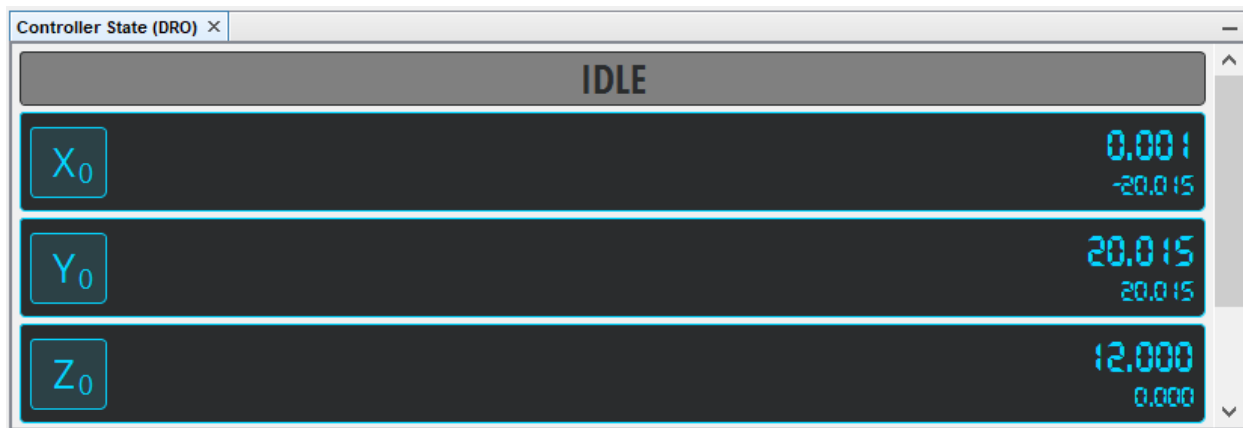
G92 Z0.4724 Enter

When probing the X and Y, the radius of the endmill must be accounted for. In the example above, a 1/4" endmill was used. The diameter of that end mill is 0.25" or 6.35mm; the radius of which is 0.125" or 3.175mm.

To probe the X, move up in Z a bit, move the router to the side (left of the Touch Plate in the example), and jog the end mill down in Z until a good section of the end mill will contact the side of the Touch Plate.



Zero out the X value in the “Controller State (DRO)” window. **The machine may move in an unexpected way if this step is skipped.**



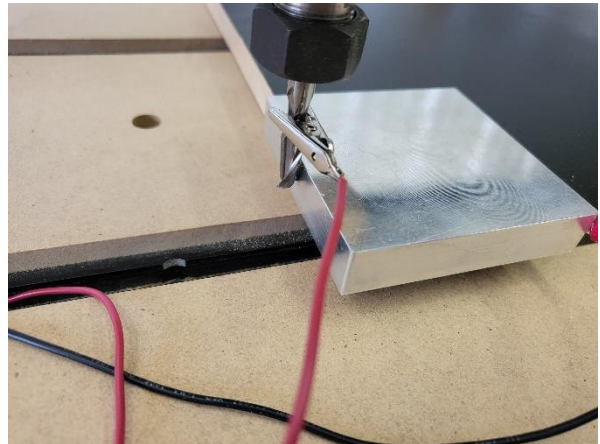
Enter the prob command in the “Command Line” of the “Console” window.

G38.2 X50 F60

G38.2 initiates the probe, X selects the axis, 50 sends the machine X positive (right), F is for feed rate, and 60 is the rate of 60mm/min.

Inches Code: G38.2 X2 F2.36

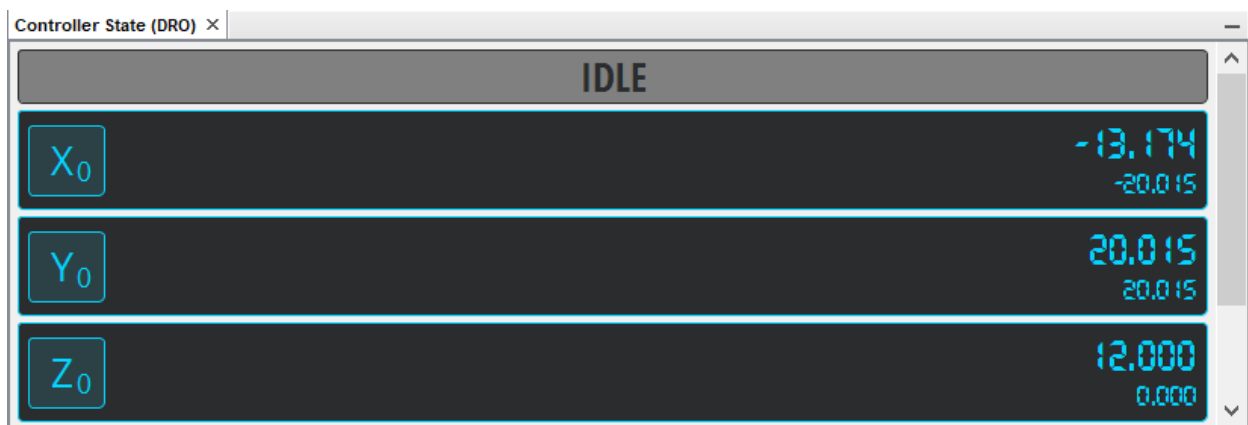
When the end mill contacts the Touch Plate, the machine will stop. You are now a known distance from the stock.



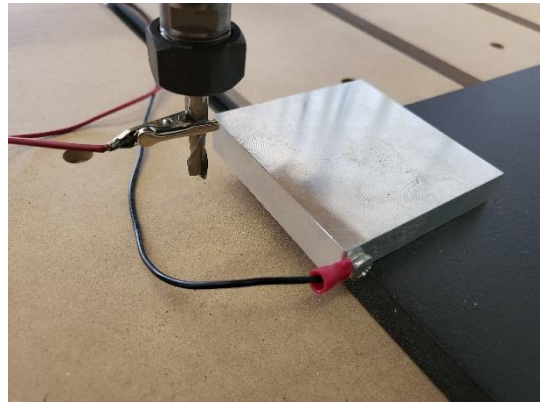
Enter a new gcode command in the “Command” line of the “Console” window. This command will change your work offset:

G92 X-13.175

This will change your X value to -13.175. The value is negative since the end mill is to the left of the stock and the edge of the stock is now 0. The 13.175 is the thickness of the raised portion of the plate that extends out from the stock (10mm) plus the radius of the end mill (1/4” end mill has a radius of 3.175mm). This puts the center of the endmill above the edge of the stock.



To probe the Y, move Z to the left, move the router in Y- (forward) past the Touch Plate, and jog the end mill right in X until the end mill is in front of the Touch Plate.



Zero out the X value in the “Controller State (DRO)” window. **The machine may move in an unexpected way if this step is skipped.**



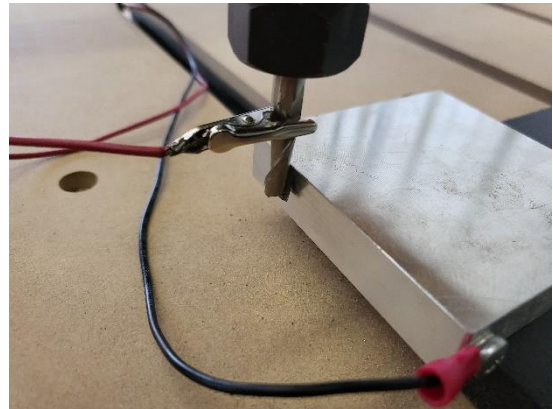
Enter the prob command in the “Command Line” of the “Console” window.

G38.2 Y50 F60

G38.2 initiates the probe, Y selects the axis, 50 sends the machine Y positive (back), F is for feed rate, and 60 is the rate of 60mm/min.

Inches Code: G38.2 Y2 F2.36

When the end mill contacts the Touch Plate, the machine will stop. You are now a known distance from the stock.



Enter a new gcode command in the “Command” line of the “Console” window. This command will change your work offset:

G92 Y-13.175

This will change your Y value to -13.175. The value is negative since the end mill is in front of the stock and the edge of the stock is now 0. The 13.175 is the thickness of the raised portion of the plate that extends out from the stock (10mm) plus the radius of the end mill (1/4” end mill has a radius of 3.175mm). This puts the center of the endmill above the edge of the stock. With the X and the Y both probed, the end mill’s center is over the corner of the front, left of the stock.



The process of probing the XYZ Datum points can be automated. A self contained program, called a Macro, can be used in Universal G Code Sender to probe and set the your work zero positions with a click of a button.

The Code will be provided below with a description of each line and it's function. Each Line of code will be separated with a semi-colon. This Macro is for a 1/4" end mill setting the front left of the stock.

g90;	Set Machine to absolute mode - essential
g21;	Set Machine to mm mode – essential for values below
g92 x0 y0 z100;	Set current location XY to Zero, Z to 100
g38.2 z-50 f150;	Initiate Finding Probe in Z- at 150mm/min
g92 z12;	Set Z position to 12mm above stock
g1 z14;	Move Z 2mm above the Touch Plate
g38.2 z-50 f60;	Initiate Measuring Probe in Z- at 60mm/min
g92 z12;	Set Z position to 12mm above stock
g0 z16;	Move Z 4mm above the Touch Plate
x-70;	Move end mill 70mm left
z4;	Move Z down 12mm
g38.2 x0 f150;	Initiate Finding Probe in X+ at 150mm/min
g92 x-13.175;	Set X position to 13.175mm left of stock edge
g1 x-14;	Move X 1mm left off of Touch Plate
g38.2 x0 f60;	Initiate Measuring Probe in X+ at 60mm/min
g92 x-13.175;	Set X position to 13.175mm left of stock edge
g0 x-15;	Move X 2mm left off of Touch Plate
z16;	Raise Z 12mm
x30 y-70;	Move end mill 30mm right and 70mm forward
z4;	Drop Z 12mm
g38.2 y0 f150;	Initiate Finding Probe in Y+ at 150mm/min
g92 y-13.175;	Set Y position to 13.175mm in front of stock
g1 y-14;	Move Y 1mm forward off of Touch Plate

g38.2 y0 f60;

g92 y-13.175;

g0 y-15;

z20;

x0 y0

Initiate Measuring Probe Y+ at 60mm/min

Set Y position to 13.175mm in front of stock

Move Y 2mm forward off of Touch Plate

Move end mill up 16mm

Move end mill to the XY zero coordinate

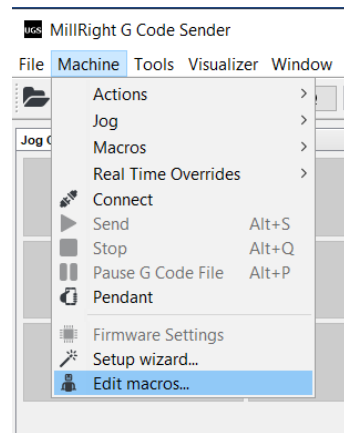
The macro should end with the end mill 20mm above the stock, over the front left corner of the stock.

We have a copy of the macro that can be downloaded and added to your copy of UGS.

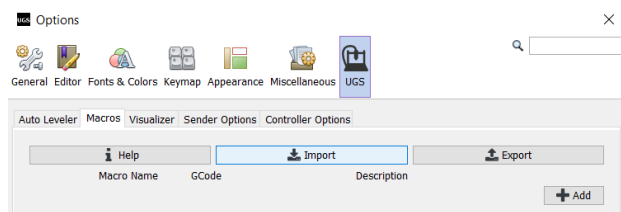
<https://s24914.pcdn.co/wp-content/uploads/2021/01/Touch-Plate-XYZ-Macro.txt>

Download a copy to your Desktop, or somewhere you can find it easily. Right click the page and select "Save as..."

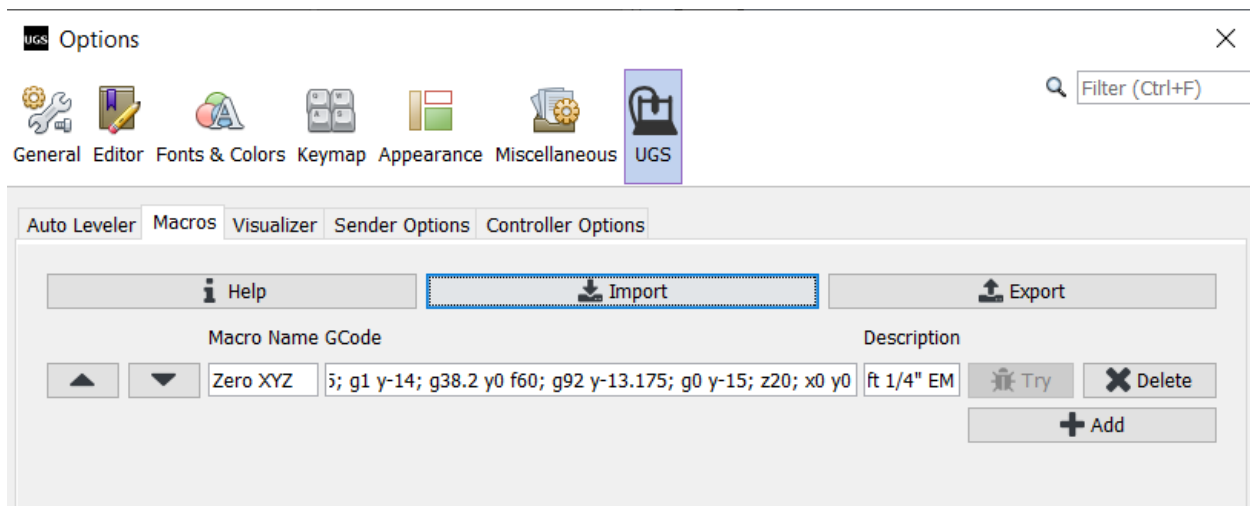
In UGS, go to Machine>Edit Macros



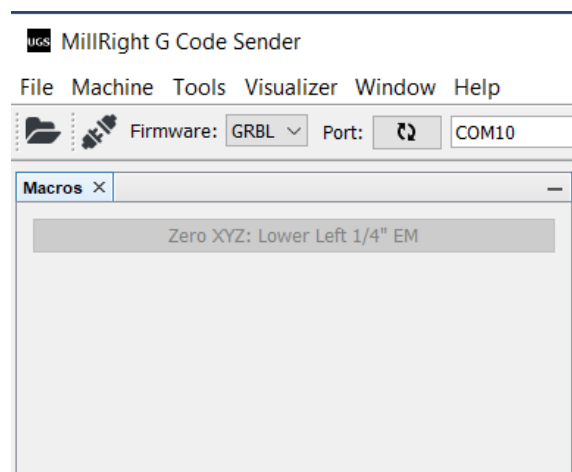
In the screen that pops up, select import.



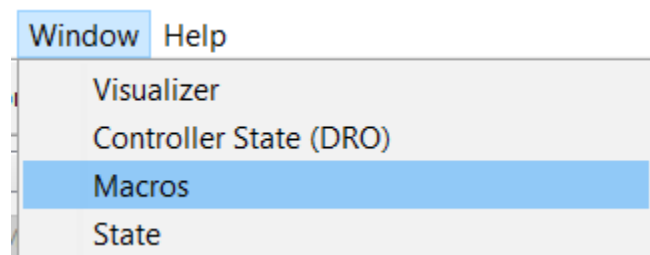
Locate the file “Touch Plate Macro” and click open. You should see the Macro now loaded on in your list. Click Apply and Close.



You can now see the Touch Plate Macro in the “Macros” window of UGS.



If you do not see the “Macros” window, click “Window” in the upper left of UGS and select “Macros”.



Position the endmill above the touch plate. Click the macro button for the Touch Plate in the “Macros” window of UGS to initiate the XYZ probe.

The Macro can be modified to work with bits of different sizes. The yellow highlights above show what numbers will need to change.

<u>Bit size</u>	<u>Radius</u>	<u>Radius (mm)</u>	<u>New Value</u>	
1/16"	0.03125"	0.79375	-10.79375	
1/8"	0.0625"	1.5875	-11.5875	
1/4"	0.125"	3.175	-13.175	
1/2"	0.25"	6.35	-16.35	-DeWalt 618 Only

The 1/2" end mill is too large for the pull-off commands highlighted in green above. Those values will have to be changed to accommodate the larger endmill or the machine will crash.

The Macro can be modified to work with inches instead of mm. Change the G21 at the start of the macro to G20. Change all the XYZ and F values to inches:

$(\text{mm value}) / 25.4 = (\text{inches value})$

If you do not adjust the XYZ and F values to appropriate inch values after changing the macro to G20, you will initiate a probe search at a rate of 150 in/min and will crash the machine hard.

We recommend using the macros in mm.

Any questions can be emailed to support@millrightcnc.com.