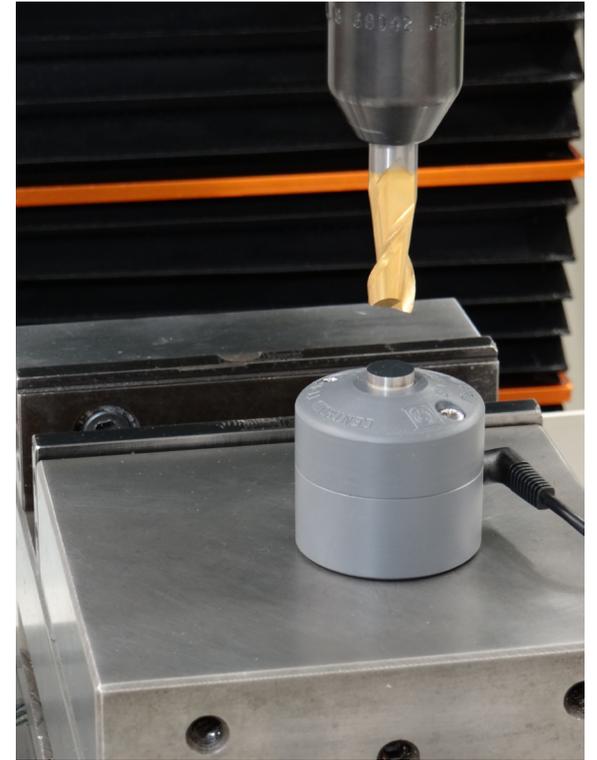




### Centroid Acorn CNC12 Probe Setup Guide

CNC Software version: CNC12 V.4.20.1+

Models: Acorn CNC



Supported Probe Types **2**

NC and NO Probe Type Definition **3**

Probe Detection Explained **4**

Probe Hookup Examples **5**

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Probe Run Out and Alignment **20**

Lathe Tool Touch Off **24**

## Centroid CNC12 software version v4.14+ Probe Support Definitions

- 1.) Normally Open (NO) Touch Probes and Tool Touch Off devices are supported with and without a detection circuit.
- 2.) Normally Closed (NC) Touch Probes and Tool Touch Off devices are supported but are required to have a Probe Detection input circuit.  
NC probes without a detection circuit are not supported in v4.14+
- 3.) Only Normally Closed (Input is active when probe is plugged in) Probe Detection signals are supported for the Probe Detect and Tool Touch Off Detect inputs.
- 4.) Normally Open (NO) probe detection circuits are not supported.
- 5.) Probes and Tool Touch Off's using the same triggered input is supported as long as both probes are the same type (either NO or NC)
- 6.) Probes and Tool Touch Off's using individual triggered inputs is supported.
- 7.) Probes and Tool Touch Off's using the same Detection input is not supported.
- 8.) Probes and Tool Touch Off's of either tripped type using individual tripped inputs is supported. For example a (NC) touch probe can be used in conjunction with a (NO) Tool Touch device as long as they are using separate tripped inputs and the (NC) touch probe is using a detect circuit.

**Definitions: TP = Touch Probe, TT = Tool Touch Off device**

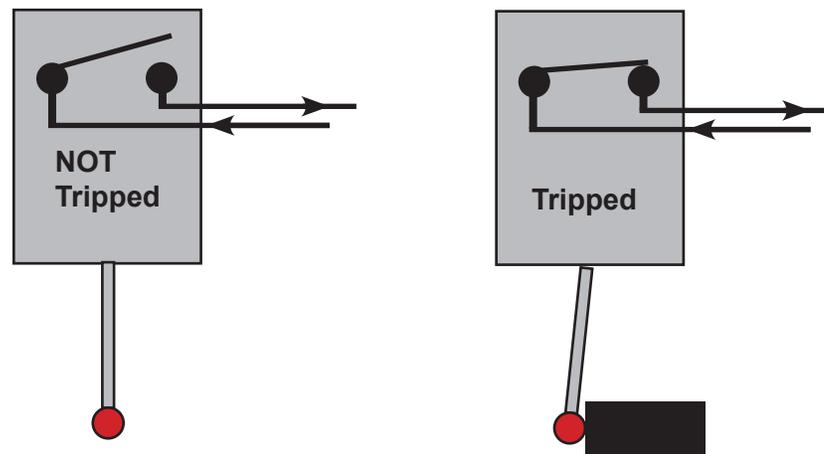
Centroid Touch Probes the DP-4, DP-7, TT-1 and TT-2 are configured and shipped as “Normally Open” probes, which to Centroid, is the standard way probes should operate. This means that when the probe is triggered (touches something) the input is Closed.

Centroid Touch Probes use a “Normally Closed” Detection circuit that lets the CNC12 software know that a probe is in use and evokes Software Probe Protection. There is only one type of TP and TT device Detection circuit supported and that is a Normally Closed detection circuit.

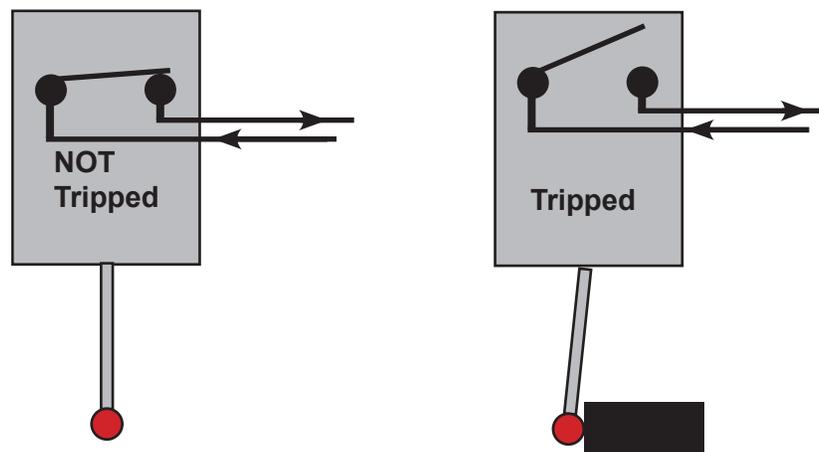
Many entry level mechanical probes are the opposite of the Centroid probes in this regard, this means they open the input when triggered. And many of them do not have detection circuits. This is ok as this document will show you how to use probes of this type.

Conductive Probes of all types are by definition Normally Open (the probe and tool are the switch itself) so, when a conductive probe triggers it will close the input.

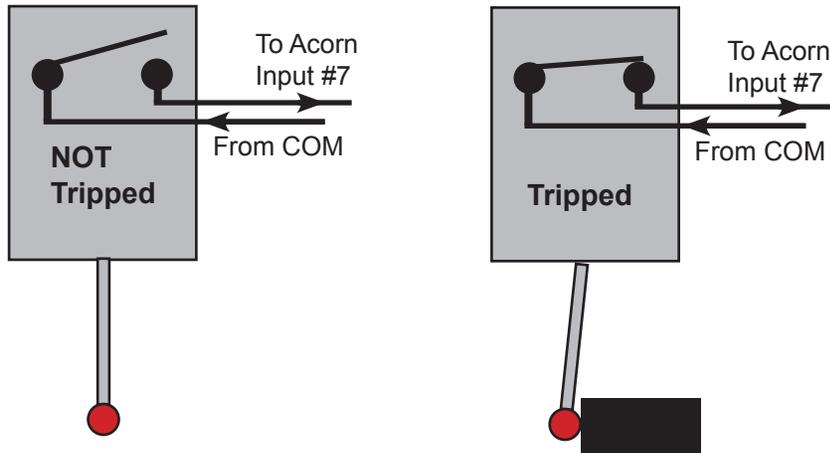
### A “Normally Open” Probe CLOSES the Input when tripped



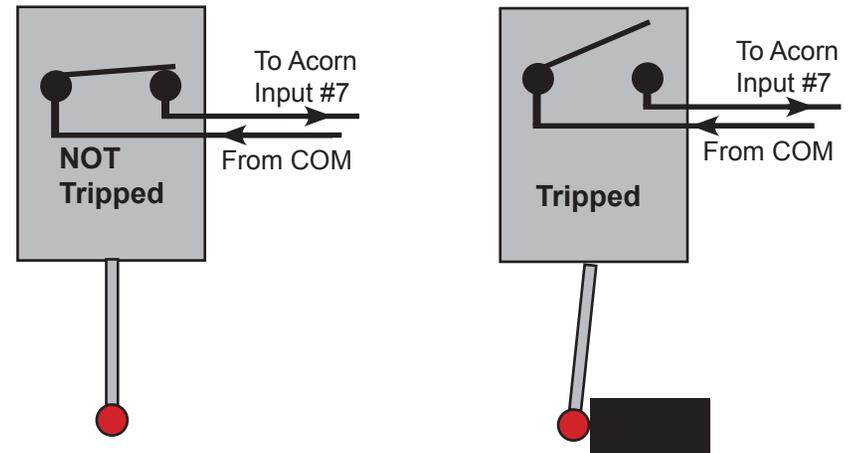
### A “Normally Closed” Probe OPENS the Input when tripped



**A “Normally Open” Probe CLOSES the Input when tripped**

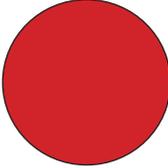
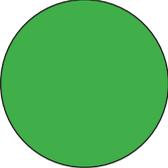
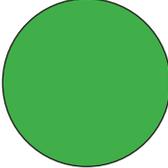
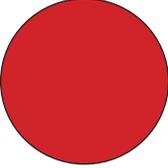


**A “Normally Closed” Probe OPENS the Input when tripped**



**Step 1.) Determine the Probe Input State when tripped.**

- Perform this procedure **Before** using the Wizard Probe Setup menu to configure the field for “Probe Input State when Tripped”.
- Wire the Touch Probe switch to Common and Input #7 on the Acorn board.
- Use the CNC12 PLC Diagnostic screen and the chart below to determine what type probe is being employed. Press <Alt i> keyboard hot key (both “Alt” and the letter “i” key at the same time) at the main menu of CNC to enter the PLC diagnostic screen. The Virtual input LED’s give a visual representation of the state of the input. Red is open and Green is closed.

	<Alt i> “ProbeTripped” INPUT LED when probe is <u>NOT Tripped</u>	<Alt i> “ProbeTripped” INPUT LED when probe is <u>Tripped</u>
<p><b>NO Probe “ProbeTripped” LED when using a Normally Open Probe.</b></p> <p>When a NO Probe is tripped the Probe Input State is “CLOSED”.</p>	 <p>Probe is <u>not triggered</u>, input is in a OPEN state</p>	 <p>Input is in CLOSED state while probe is <u>Triggered</u></p>
<p><b>NC Probe “ProbeTripped” LED when using a Normally Closed Probe.</b></p> <p>When a NC probe is tripped the Probe Input State is “OPEN”.</p>	 <p>Probe is <u>not triggered</u>, input is in a CLOSED state</p>	 <p>Input is in OPEN state while probe is <u>Triggered</u></p>

## Step 2.) Set the Probe Trigger State in the Wizard Probe Setup Menu.

a.) Choose Probe Type, DP-4, Conductive, or Mechanical. Note: The Probe Input State when Tripped for DP-4 and Conductive Probes is by definition “Closed”. Selecting Mechanical Probe type will allow the choice of “Probe Input State when Tripped” of “Open” or “Closed”.  
 If setting up a mechanical probe that is a NC probe (Tormach style), Choose “Mechanical” and set the “Probe Input State when Tripped” to “OPEN”  
 If setting up a mechanical probe that is a NO probe, Choose Mechanical and set the “Probe Input State when Tripped” to “CLOSED”

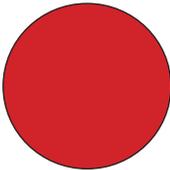
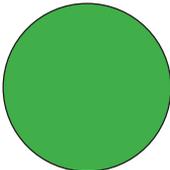
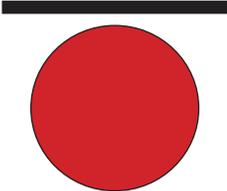
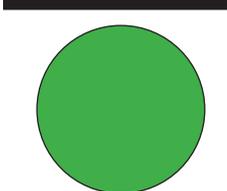
### Probe Configuration

Probe PLC input	Input 7
Probe type	Mechanical ▼
<span style="border: 2px solid yellow; border-radius: 50%; padding: 2px;">Input state when tripped</span> <small><a href="#">*Probe Setup Documentation (PDF)</a></small>	<span style="border: 2px solid yellow; border-radius: 50%; padding: 2px;">*Open ▼</span>
Probe tool number	10
Fast probe rate	10
Slow probe rate	3

b.) Press “Write Settings to CNC Control Configuration”, shut down CNC12 using the Shutdown menu and then restart CNC12

c.) Retest Probe Input State using the Alt i PLC diagnostics screen.

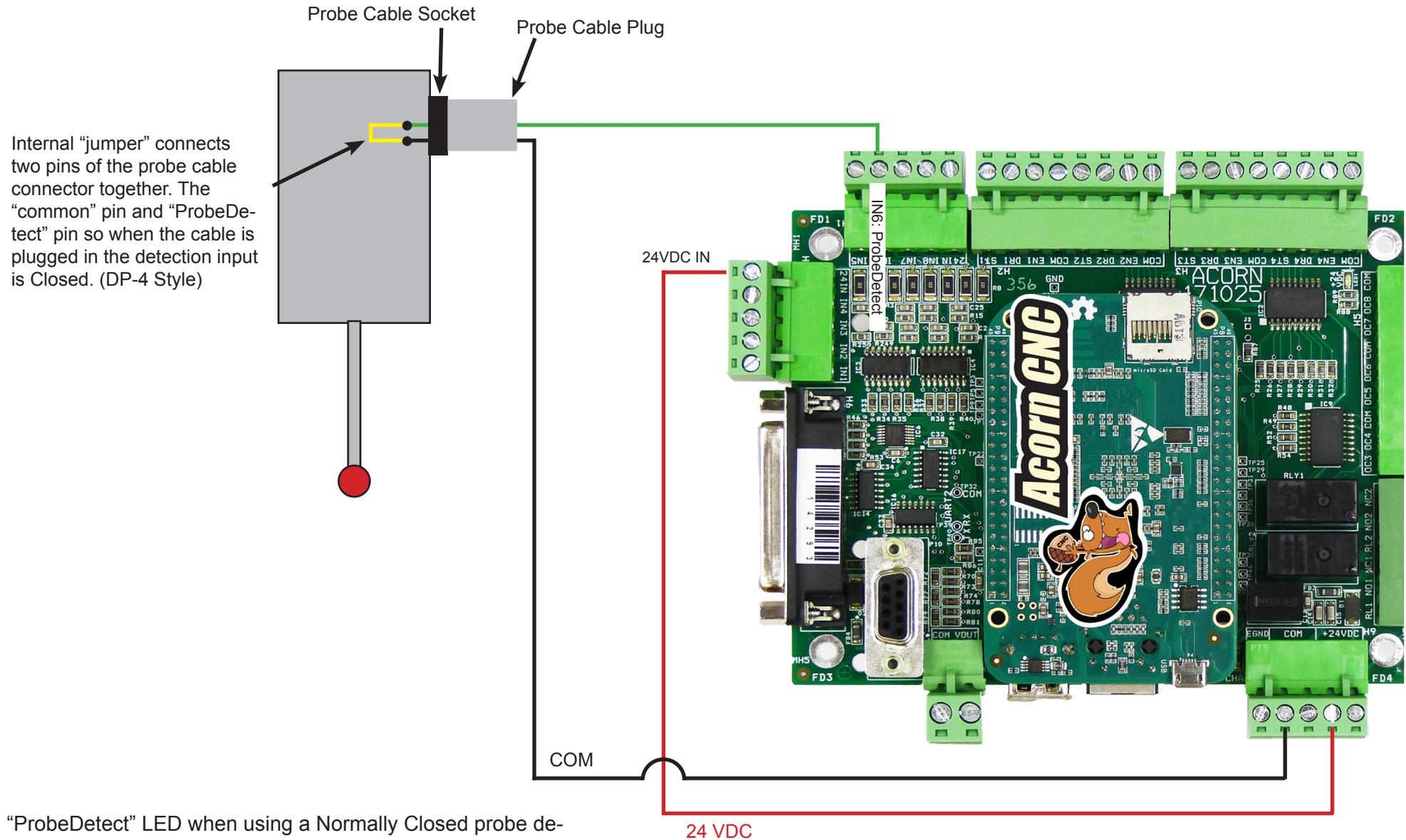
### Probe Input Virtual LED's AFTER setting up Probe Input State when Tripped properly using the Wizard Probe setup menu

	<Alt i> “ProbeTripped” INPUT LED when probe is <u>NOT</u> Tripped	<Alt i> “ProbeTripped” INPUT LED when probe <u>is</u> Tripped
<p><b>NO Probe “ProbeTripped” LED when using a Normally Open Probe.</b></p> <p>When a NO Probe is tripped the Probe Input State is “CLOSED”.</p>	 Probe is <u>not triggered</u> , input is in a OPEN state	 Input is in CLOSED state while probe is <u>Triggered</u>
<p><b>NC Probe “ProbeTripped” LED when using a Normally Closed Probe.</b></p> <p>When a NC probe is tripped the Probe Input State is “OPEN”.</p>	 Probe is <u>not triggered</u> , input is in a CLOSED state	 Input is in OPEN state while probe is <u>Triggered</u>

## Probe Detection Input Circuit:

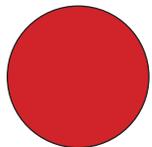
A “Normally Closed” Probe DETECTION Circuit CLOSSES the Input when Probe is plugged in, this is required method.

Some probes such as the Centroid DP-4 have a simple Probe Detection Circuit built into the probe which when the probe is plugged in by the operator lets CNC12 know that a probe is active and in use. This detection input tells CNC12 to start activate Probe Protection. For instance, the spindle will be disabled so the user can not turn on the spindle with the probe plugged in, probe protection will also stop all movement if a probe is tripped unexpectedly to try and prevent crashing of the probe. After CNC12 sees an “unexpected probe contact” ( a probe trigger event not during a probing cycle) it will only allow the user to jog in the opposite direction that the probe was moving when the contact occurred to prevent the user from accidentally moving the probe further into the contact direction causing damage to the probe. So, you can see it is important to use a Probe Detection input. If your probe is not equipped with a probe detection circuit you can wire up a simple switch to the probe detect input that acts as the probe detection circuit. It is up to the operator to throw that switch to the closed positions before using the probe to let CNC12 know that a probe is in use so probe protection is activated. A “Poor man’s” probe detection circuit.



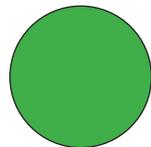
“ProbeDetect” LED when using a Normally Closed probe detection circuit. Typically Input #6 is used for Probe detection.

<Alt i> “ProbeDetect” INPUT LED when probe is NOT Plugged in



Probe is not plugged in  
input is in a OPEN state

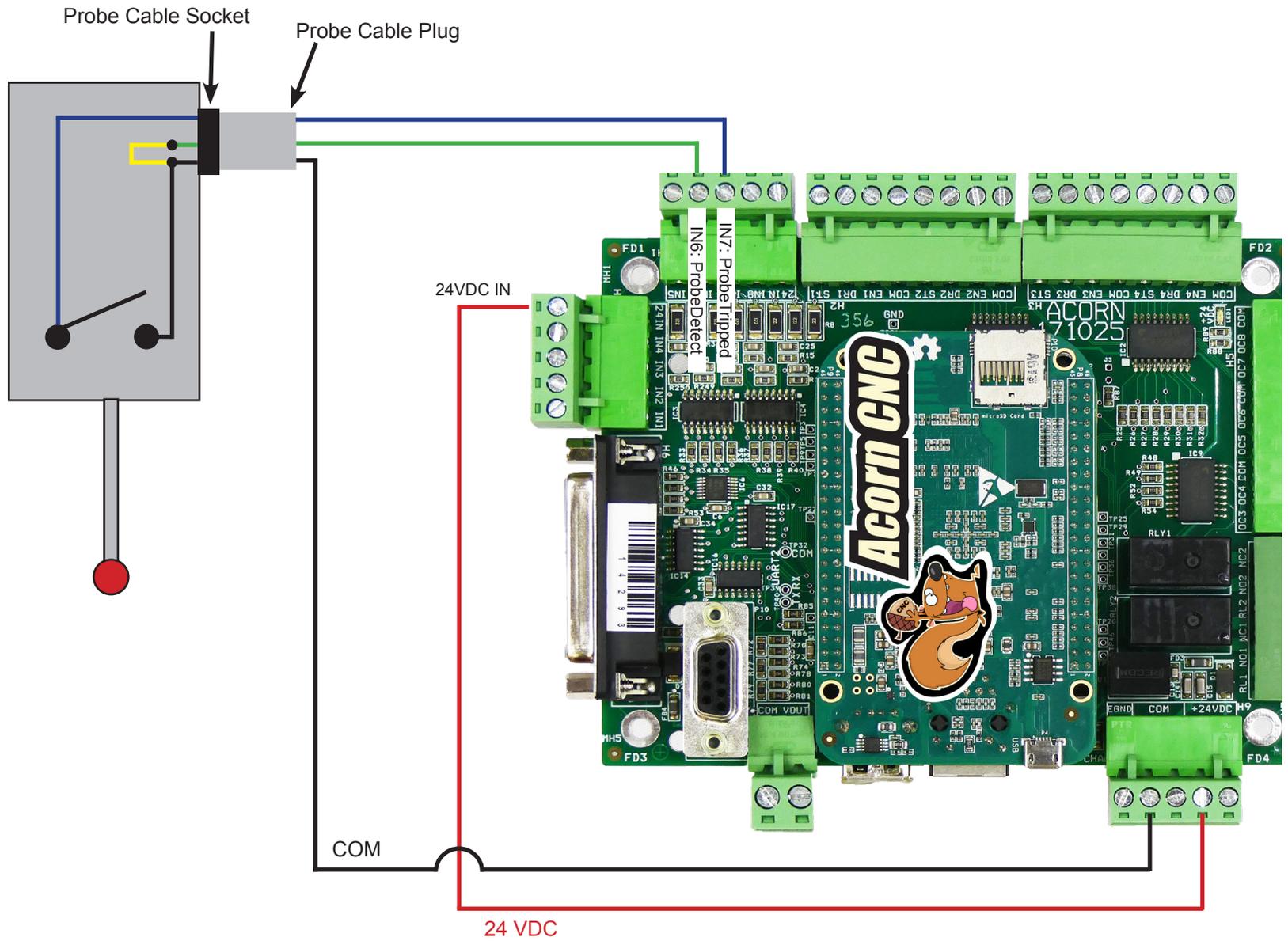
<Alt i> “ProbeDetect” INPUT LED when probe is Plugged in



Input is in CLOSED state while probe is Plugged in and being used.

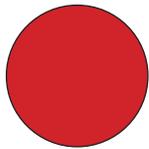
Note: When a NC Probe Detection Circuit is used (Plugged in = the input is CLOSED) Use Positive Probe CNC12 parameter values.

# Normally Open Probe with Normally Closed Probe detection circuit (DP-4 style)



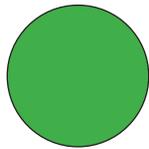
## Probe Tripped Input LED

<Alt i> "ProbeTripped" INPUT LED #7 when probe is NOT Tripped



Probe is not tripped, input is in a OPEN state

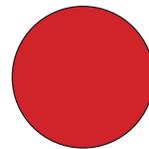
<Alt i> "ProbeTripped" INPUT LED #7 when probe is Tripped



Input is in CLOSED state while probe is tripped

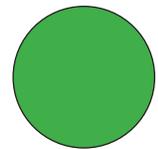
## Probe Detect Input LED

<Alt i> "ProbeDetect" INPUT LED #6 when probe is NOT Plugged in



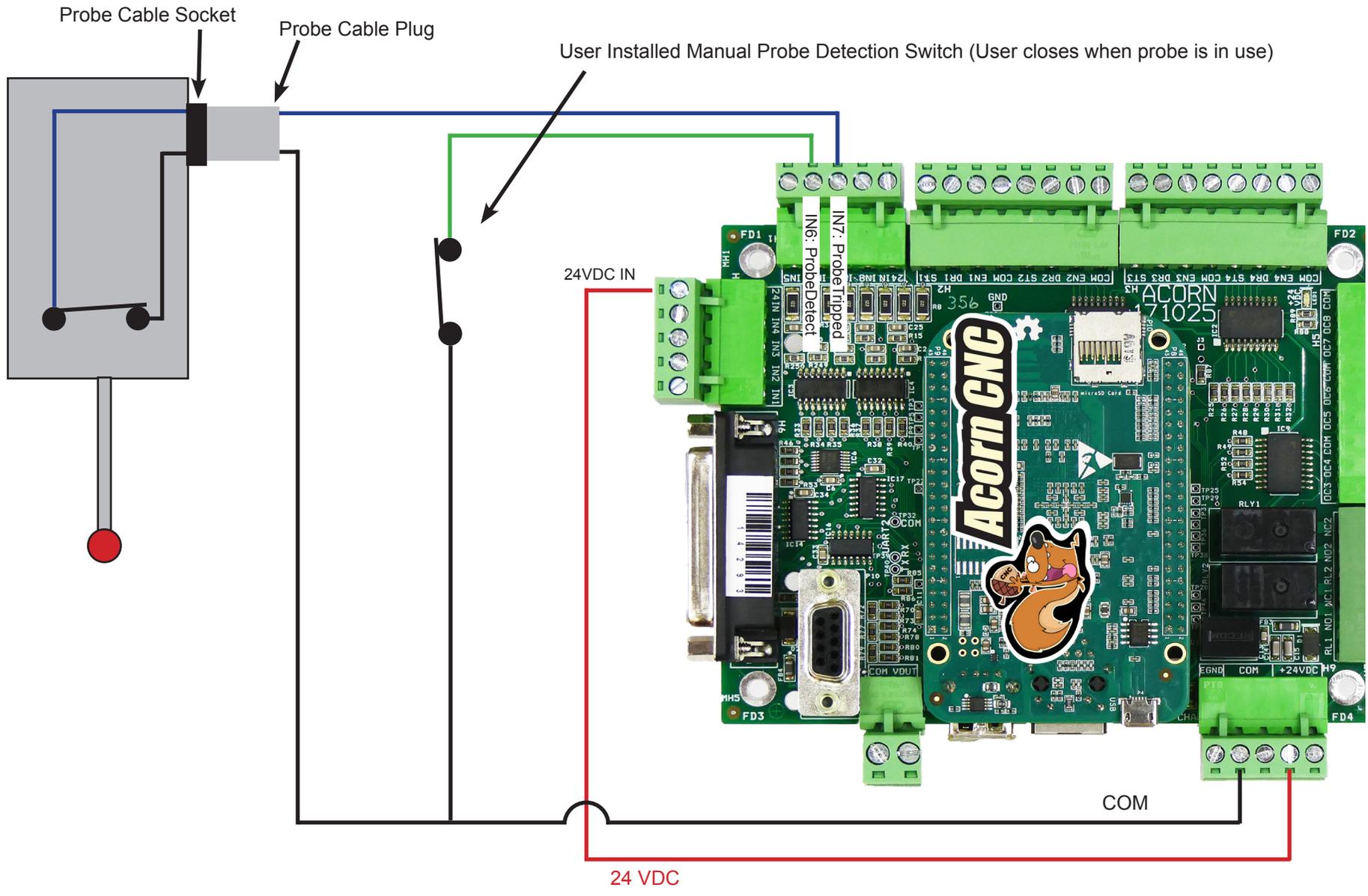
Probe is not plugged in input is in a OPEN state

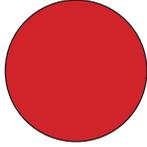
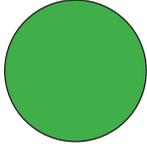
<Alt i> "ProbeDetect" INPUT LED #6 when probe is Plugged in

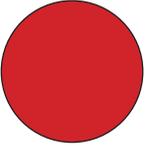
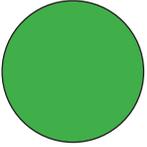


Input is in CLOSED state while probe is Plugged in and being used.

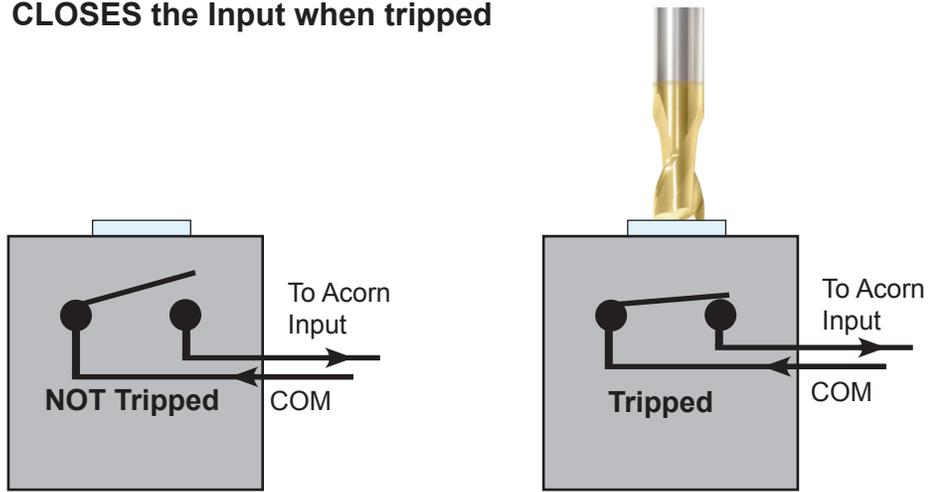
Normally Closed Probe with “Poor Man’s” Manual Detection Switch method for when using a Probe that does not have a built in detection circuit (Tormach style) using Normally Closed Probe detection circuit style.



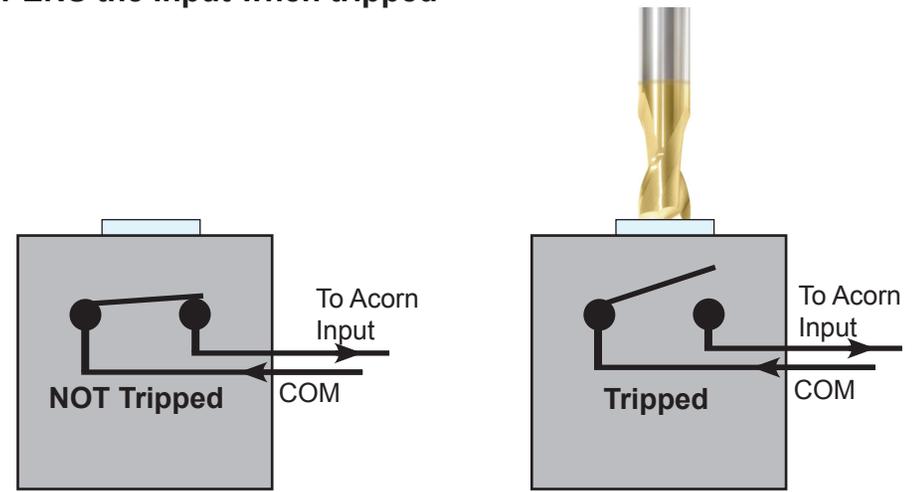
Probe Tripped Input LED	
<Alt i> “ProbeTripped” INPUT LED #7 when probe is <u>NOT</u> Tripped	<Alt i> “ProbeTripped” INPUT LED #7 when probe <u>is</u> Tripped
	
Probe is <u>not</u> tripped, input is in a CLOSED state	Input is in OPEN state while probe is <u>tripped</u>

Probe Detect Input LED	
<Alt i> “ProbeDetect” INPUT LED #6 when probe is <u>NOT</u> Plugged in	<Alt i> “ProbeDetect” INPUT LED #6 when probe <u>is</u> Plugged in
	
Probe is <u>not</u> plugged in, input is in a OPEN state	Input is in CLOSED state while probe is Plugged in and being used.

A "Normally Open" Tool Touch Off  
CLOSES the Input when tripped



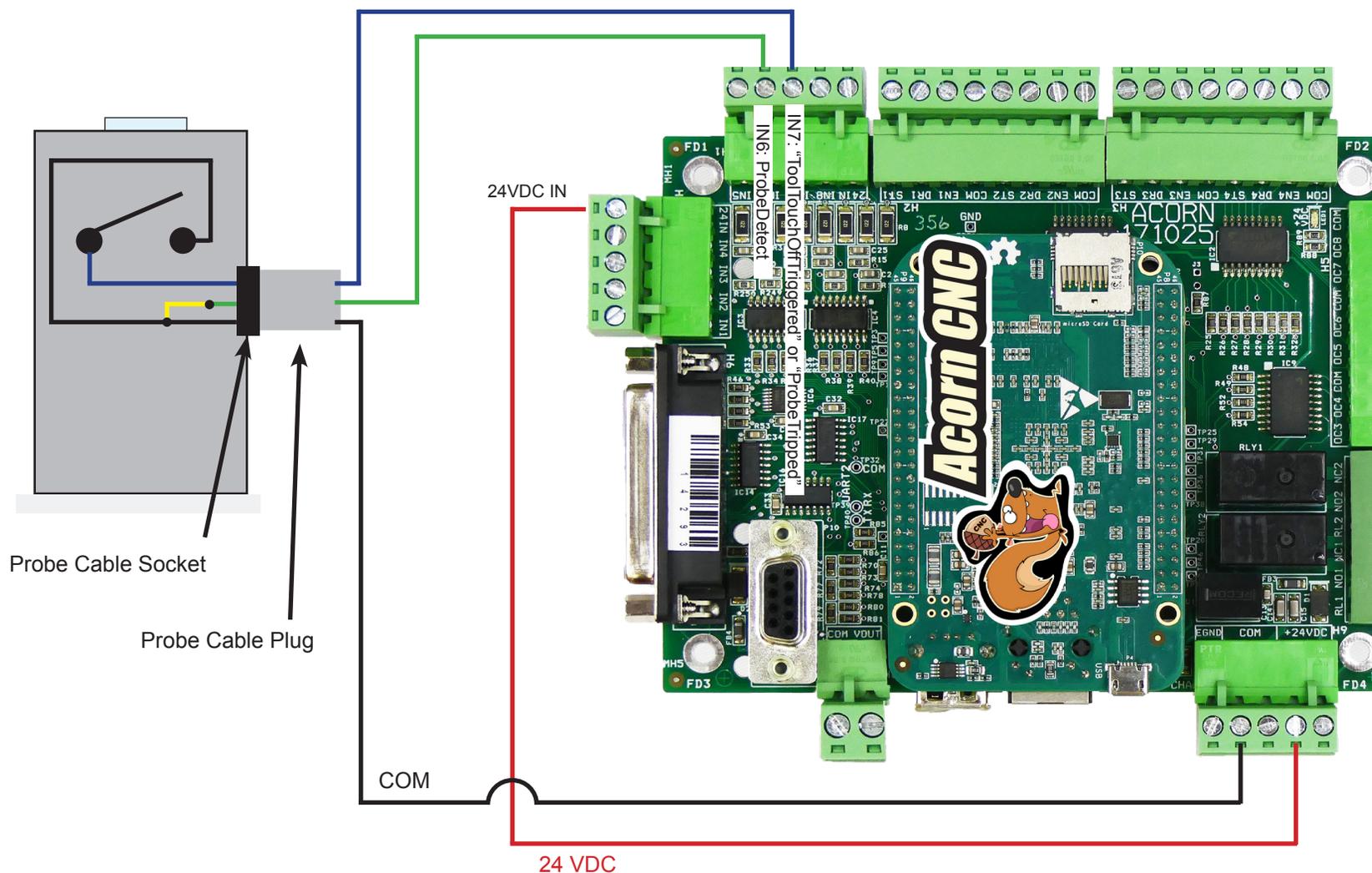
A "Normally Closed" Tool Touch Off  
OPENS the Input when tripped



CNC12 PLC Diagnostic menu <Alt i>, Input LED's visual representation when Tool Touch Off setup is correct for both types of probes..

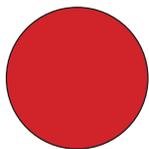
	<Alt i> "ToolTouchOffTriggered" IN-PUT LED when TT is <u>NOT Triggered</u>	<Alt i> "ToolTouchOffTriggered" INPUT LED when TT is <u>Triggered</u>
<p>NO Tool Touch Off "ToolTouchOffTriggered" LED when using a Normally Open Probe.</p> <p>When a NO TT is tripped the input is CLOSED. (Wizard uses positive Probe CNC12 parameter values.)</p>	<p>NO TT is <u>not triggered</u>, input is in a OPEN state</p>	<p>Input is in CLOSED state while NO TT is <u>triggered</u></p>
<p>NC Tool Touch Off "ToolTouchOffTriggered" LED when using a Normally Closed Probe.</p> <p>When a NC TT is tripped the input is OPEN. (Wizard uses negative Probe CNC12 parameter values.)</p>	<p>NC TT is <u>not triggered</u>, input is in a CLOSED state</p>	<p>Input is in OPEN state while NC TT is <u>triggered</u></p>

# Normally Open TT with Normally Closed Probe detection circuit (TT-2 style)



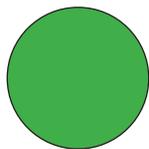
## Tool Touch Off Triggered Input LED

<Alt i> "ToolTouchOffTriggered" or "ProbeTripped" INPUT LED #7 when probe is NOT Triggered



TT is not triggered, input is in a OPEN state

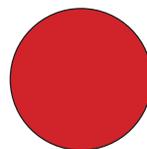
<Alt i> "ToolTouchOffTriggered" or "ProbeTripped" INPUT LED #7 when probe is Triggered



Input is in CLOSED state while TT is triggered

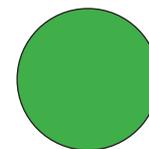
## Tool Touch Off Detect Input LED

<Alt i> "ToolTouchOffDetect" INPUT LED #6 when probe is NOT Plugged in



TT is not plugged in input is in a OPEN state

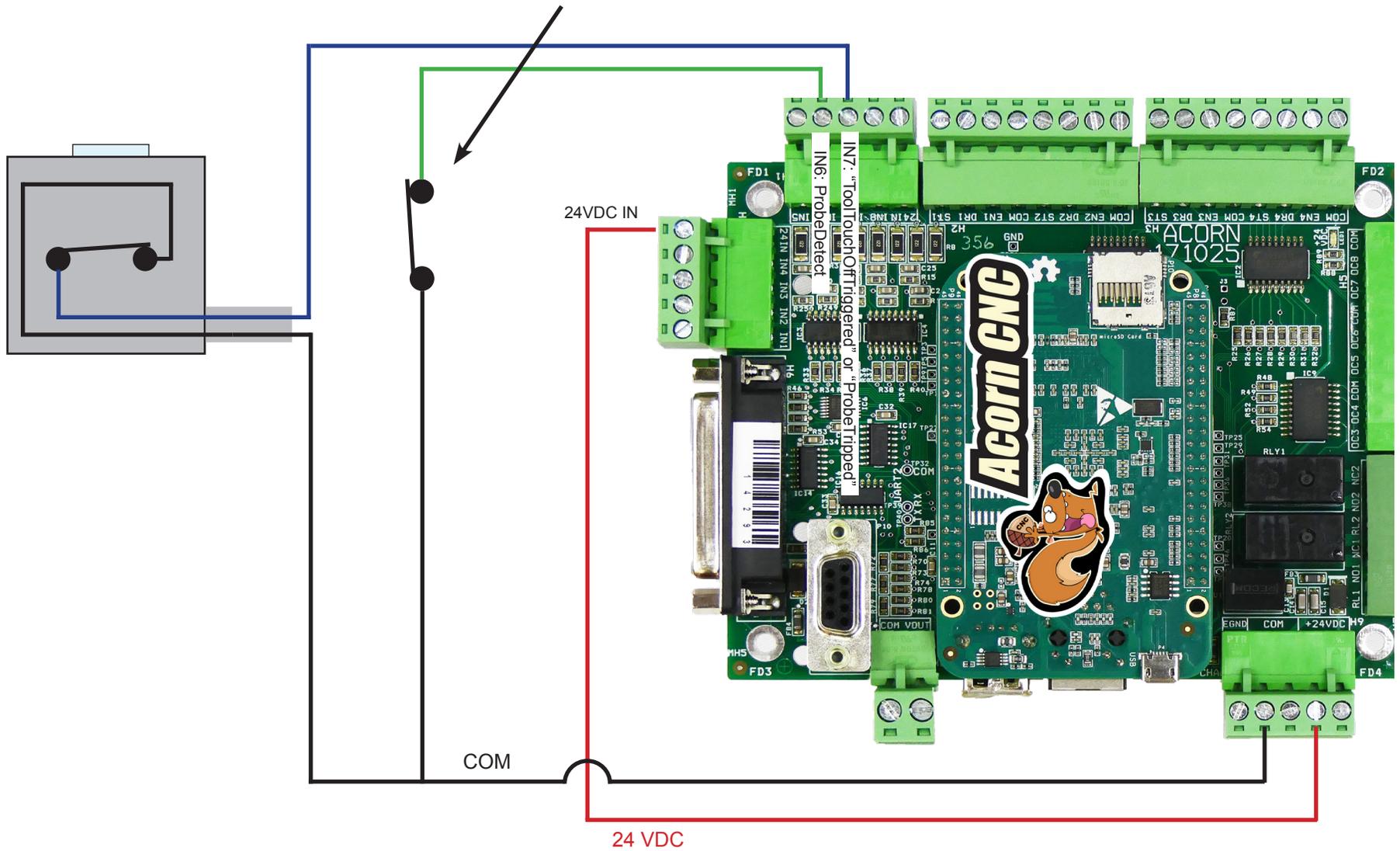
<Alt i> "ToolTouchOffDetect" INPUT LED #6 when probe is Plugged in



Input is in CLOSED state while TT is Plugged in and being used.

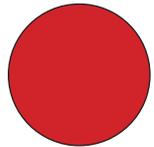
Normally Closed TT with “Poor Man’s” Manual Detection Switch method for when using a TT that does not have a built in detection circuit (China TT’s) using a Normally Closed Probe detection circuit.

User Installed Manual Probe Detection Switch (User closes when TT is in use)



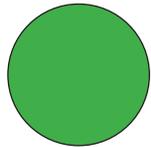
### TT Triggered Input LED

<Alt i> “ToolTouchOffTriggered” or “ProbeTripped” INPUT LED #7 when TT is NOT Triggered



TT is not triggered, input is in a OPEN state

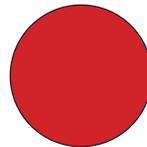
<Alt i> “ToolTouchOffTriggered” or “ProbeTripped” INPUT LED #7 when TT is Triggered



Input is in CLOSED state while TT is tripped

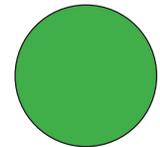
### TT Detect Input LED

<Alt i> “ToolTouchOffDetect” INPUT LED #6 when TT is NOT Plugged in



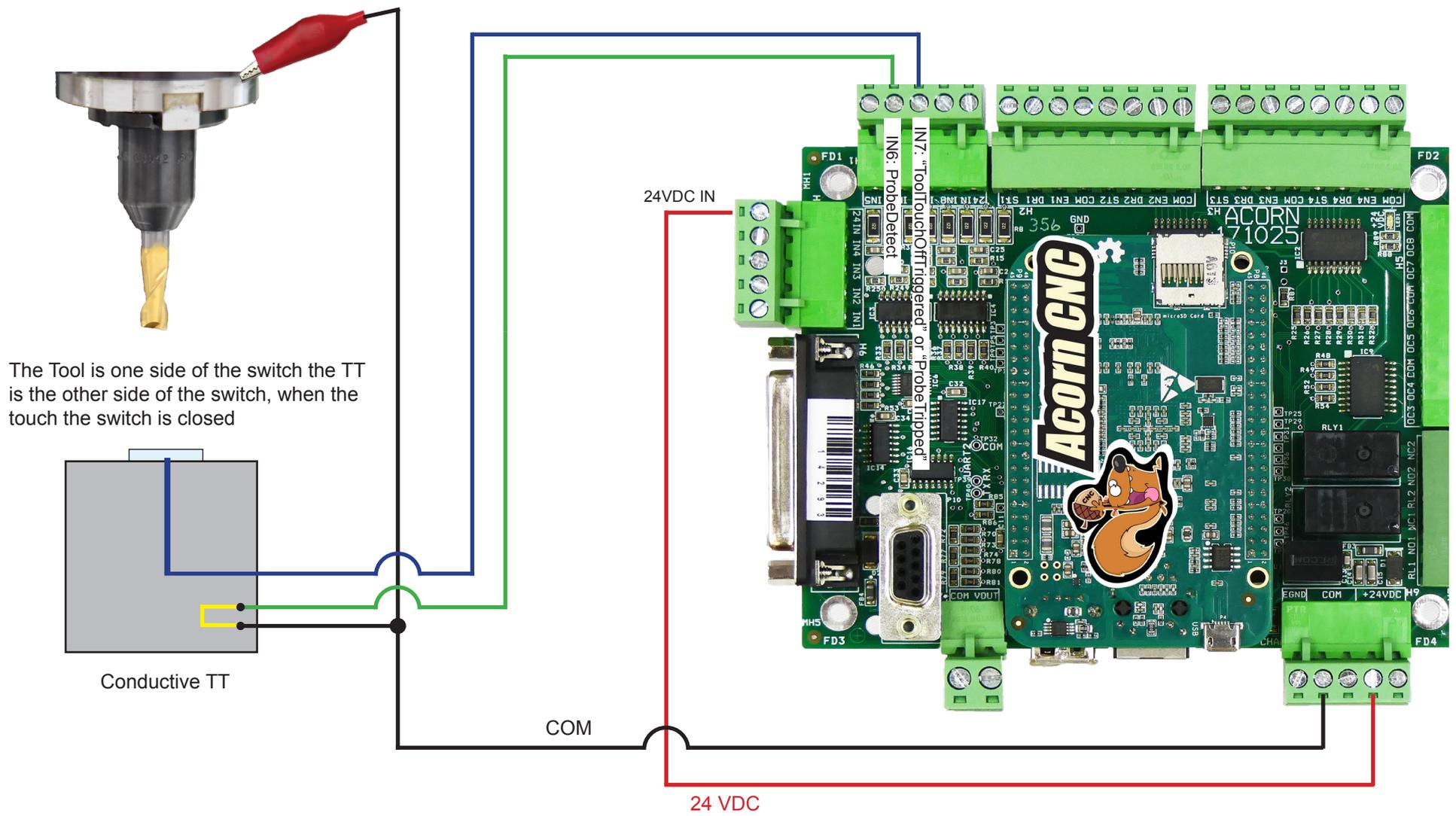
TT is not plugged in input is in a OPEN state

<Alt i> “ToolTouchOffDetect” INPUT LED #6 when TT is Plugged in and being used.



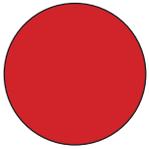
Input is in CLOSED state while TT is Plugged in and being used.

## Normally Open Conductive TT with Normally Closed Probe detection circuit (Centroid TT-1B style)



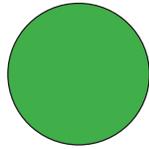
### Tool Touch Off Triggered Input LED

<Alt i> "ToolTouchOffTriggered" or "ProbeTripped" INPUT LED #7 when TT is NOT Triggered



TT is not triggered, input is in a OPEN state

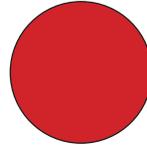
<Alt i> "ToolTouchOffTriggered" or "ProbeTripped" INPUT LED #7 when TT is Triggered



Input is in CLOSED state while TT is triggered

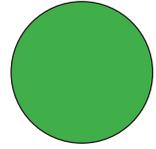
### Tool Touch Off Detect Input LED

<Alt i> "ToolTouchOffDetect" INPUT LED #6 when TT is NOT Plugged in



TT is not plugged in input is in a OPEN state

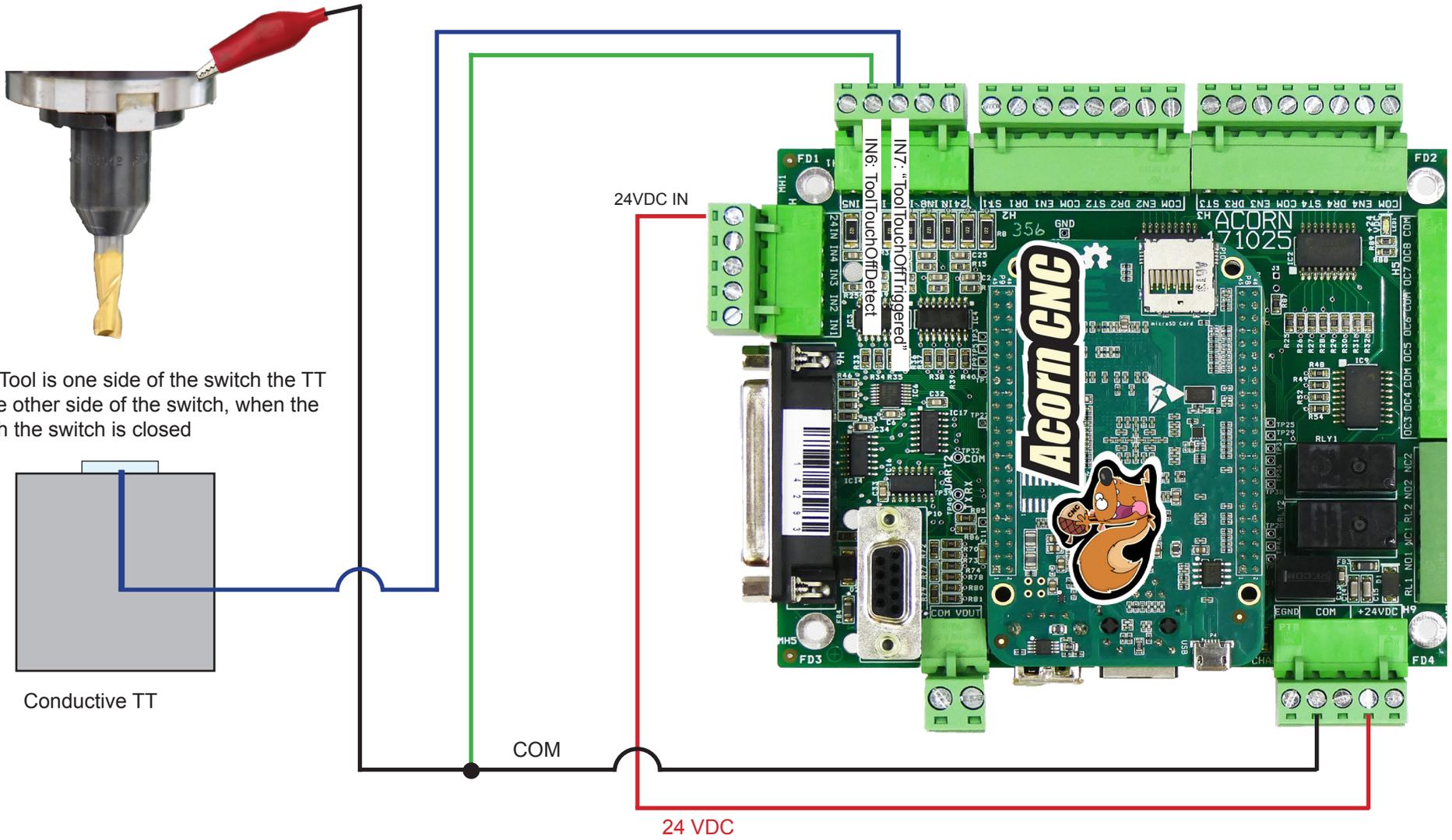
<Alt i> "ToolTouchOffDetect" INPUT LED #6 when TT is Plugged in



Input is in CLOSED state while TT is Plugged in and being used.

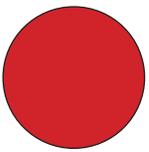
# Normally Open Conductive TT without a built-in detection circuit with Normally Closed Manual Probe detection circuit

Typical “hard wired” Tool Touch Off device configuration commonly used on a CNC Router



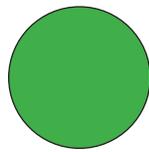
## Tool Touch Off Triggered Input LED

<Alt i> “ToolTouchOffTriggered” or “ProbeTripped” INPUT LED #7 when TT is NOT Triggered



TT is not triggered, input is in a OPEN state

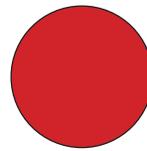
<Alt i> “ToolTouchOffTriggered” or “ProbeTripped” INPUT LED #7 when TT is Triggered



Input is in CLOSED state while TT is triggered

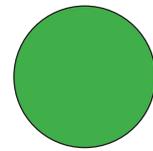
## TT Detect Input LED

<Alt i> “ToolTouchOffDetect” INPUT LED #6 when TT is NOT Plugged in



TT is not plugged in input is in a OPEN state

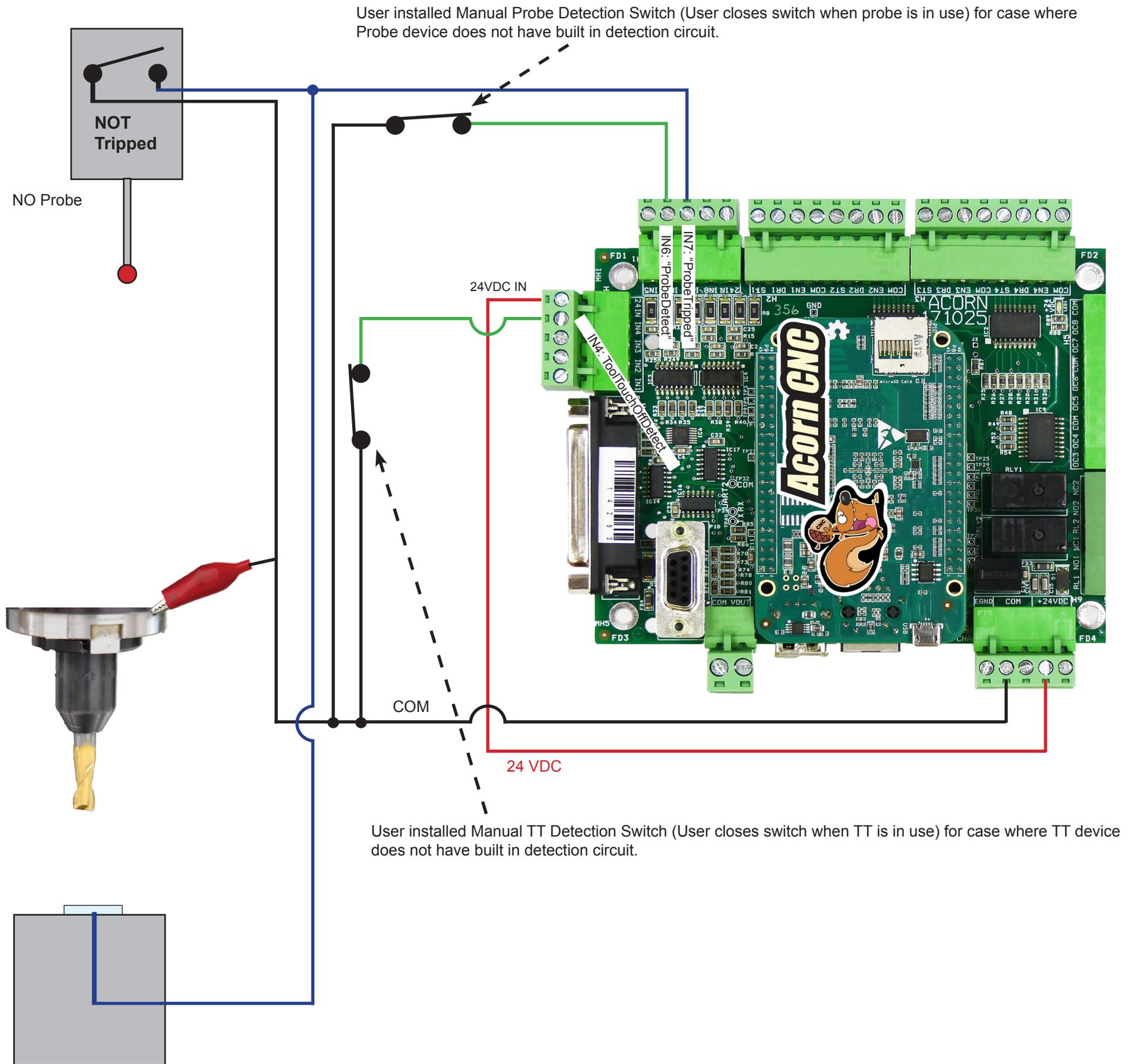
<Alt i> “ToolTouchOffDetect” INPUT LED #6 when TT is Plugged in



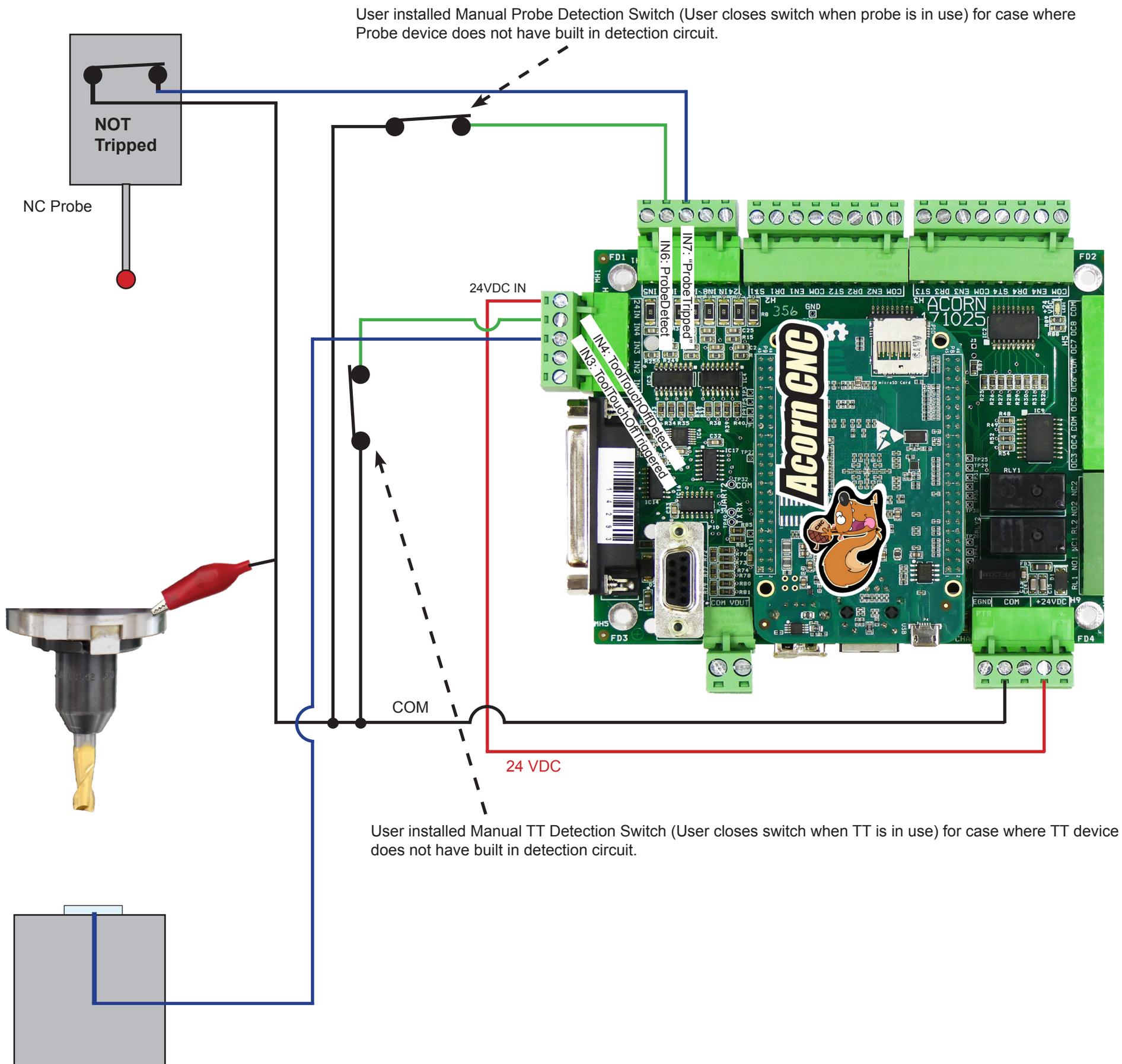
Input is in CLOSED state while TT is Plugged in and being used.

## Normally Open Touch Probe in conjunction with Normally Open Conductive TT using same "Tripped" input

While it is preferred to use individual inputs for each probe tripped signal this method of using the same input for both probe tripped signals can be used to "save" an input for other uses.



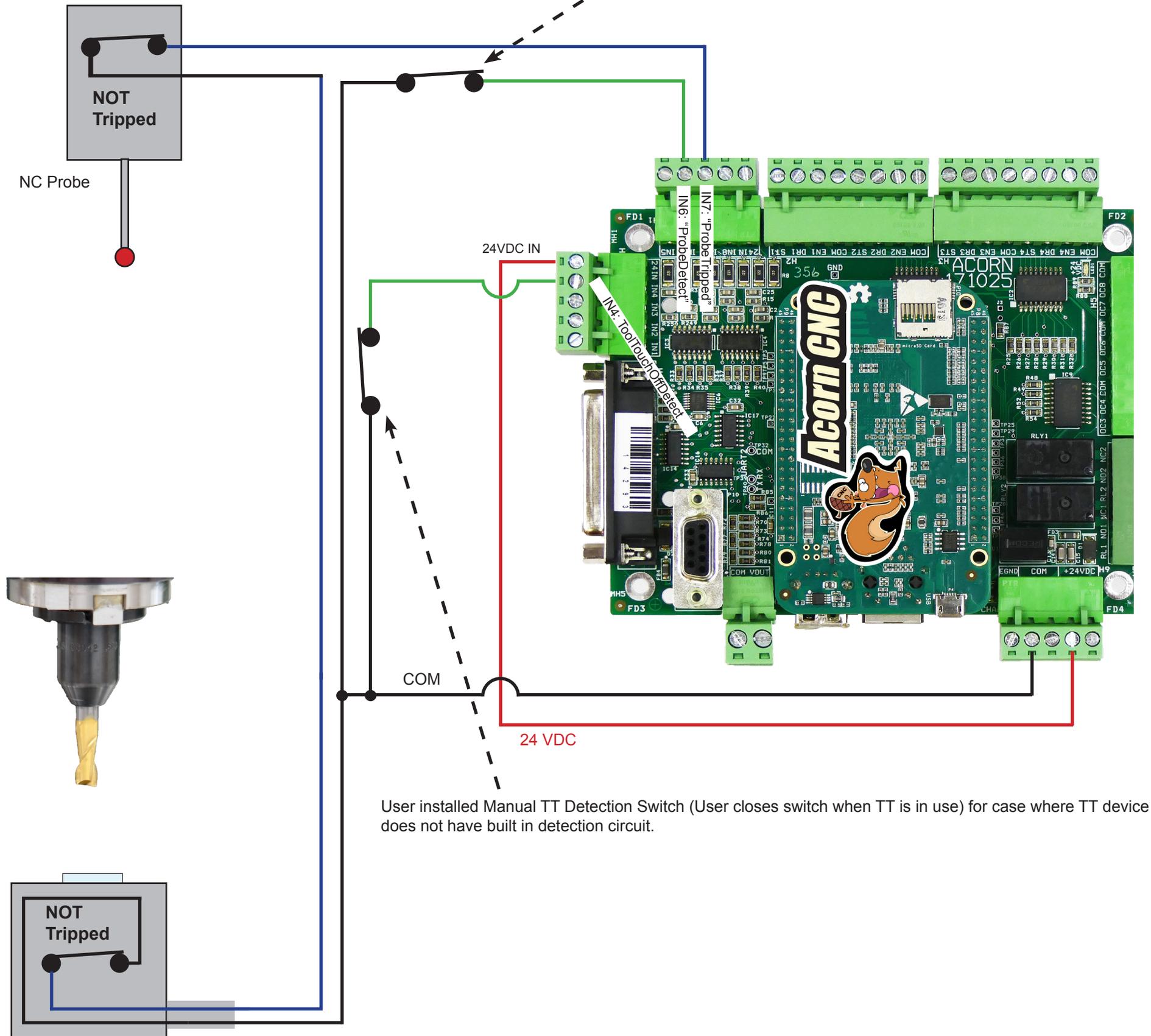
# Normally Closed Touch Probe in conjunction with Normally Open Conductive TT using dedicated trigger inputs



## Normally Closed Touch Probe in conjunction with Normally Closed TT using same input

While it is preferred to use individual inputs for each probe tripped signal this method of using the same input for both probe tripped signals can be used to “save” an input for other uses.

User installed Manual Probe Detection Switch (User closes switch when probe is in use) for case where Probe device does not have built in detection circuit.



User installed Manual TT Detection Switch (User closes switch when TT is in use) for case where TT device does not have built in detection circuit.

## Probe Protection and Unexpected Probe Contacts.

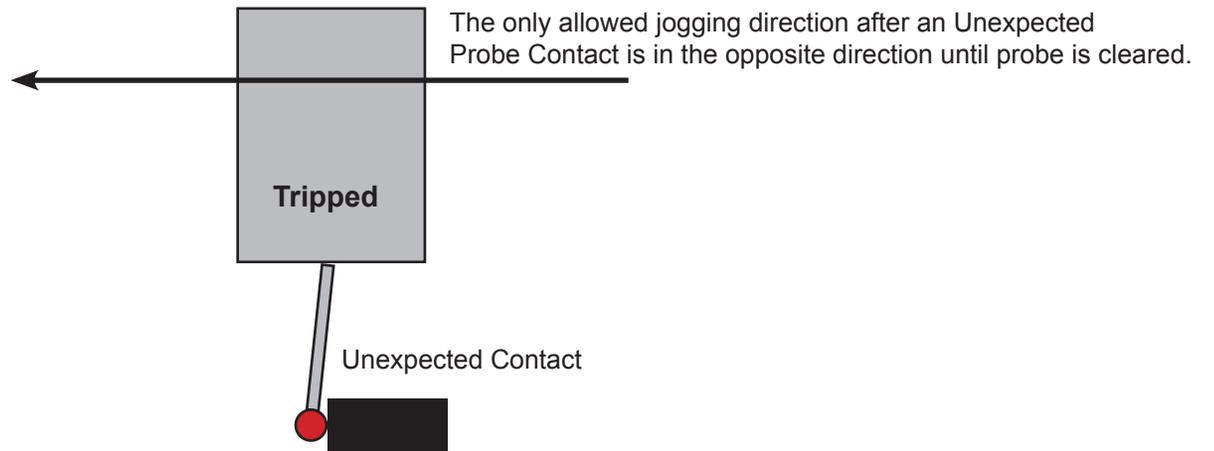
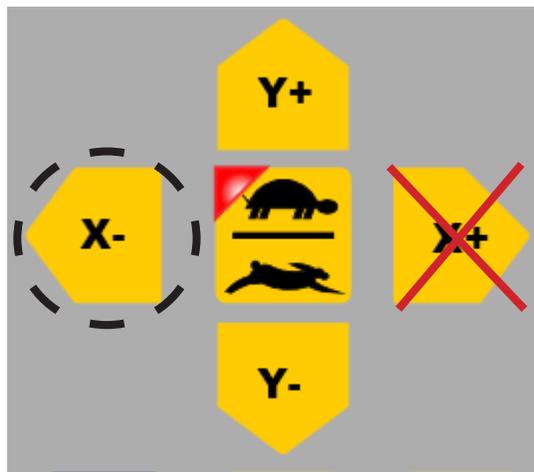
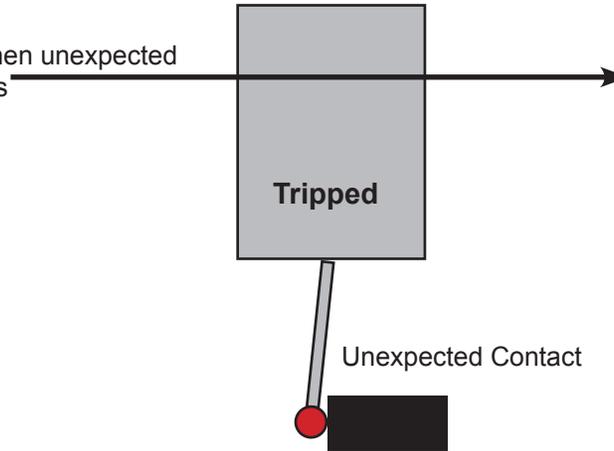
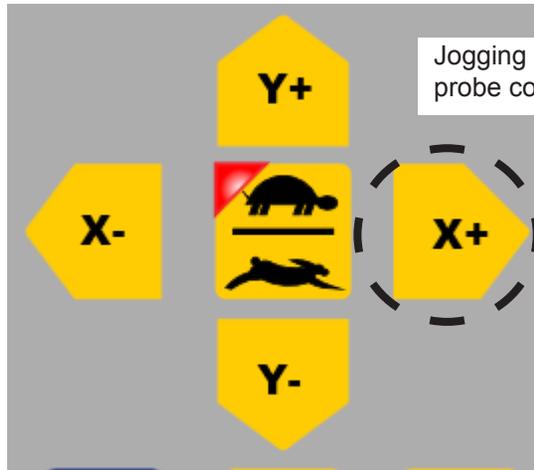
Using a probe detection circuit wired into the probe detection input on the Acorn board facilitates a CNC12 feature called Probe Protection.

CNC12 “looks” at the Detection input to determine if a probe is in-use or not, when a probe is in-use CNC12 activates Probe Protection.

Probe Protection will attempt to prevent damage from occurring to the probe when the user crashes the probe. While Probe Protection can in many cases save a Probe from being destroyed there are limitations to its effectiveness such as extreme cases such as when rapiding a probe into the work table at 1000 ipm. In this case CNC12 probe protection is not going to save the probe from being destroyed. However, in many other typical cases Probe Protection will save the day and prevent damage to the probe. A common example would be, while jogging the probe into position in preparation for a probing cycle the operator accidentally jogs too far (or the wrong direction) running the probe into the vise etc... In this case the speed of the crash is relatively slow so, Probe Protection will stop all machine tool movement immediately when it sees an unexpected probe contact and save the probe from being destroyed.

Definition: An “Unexpected Probe Contact” is when during movement by either Jogging or G-code CNC12 sees the probe being tripped when CNC12 was not expecting to see the probe make contact with anything.

When a probe with a detection circuit is plugged-in, the spindle is inhibited from turning on automatically (or manually), CNC12 monitors the Probe Tripped input during G-code moves, Operator Control Panel moves (Jogging) and MPG moves for unexpected probe contact. At any point when an unexpected probe contact is observed CNC12 will stop all motion immediately. At this point it is up to the operator to clear the unexpected contact by cycling the Estop (or the “Reset” button on the VCP) and then CNC12 will allow the operator to slow jog in the opposite direction to clear the probe from the unexpected probe contact without risking damage by moving further into the contacted material (same direction as the initial contact). Z minus jogging moves are also inhibited until the probe input is “cleared”



Tool Touch Off probe protection will not inhibit the spindle but will stop motion if the TT device is triggered unexpectedly (while jogging) and inhibit any Z minus jog movement until the TT device input is cleared. Note: use <Alt i> on the main screen of CNC12 to “see” the Acorn inputs as a debug tool.

## Probe Protection and Unexpected Probe Contacts with the wireless MPG.

When jogging with the MPG, probe protection and clearing an unexpected probe contact different rules apply compared to using the VCP. When using the MPG, the MPG is allowed to move the machine in any direction after an unexpected probe contact when the MPG is set on the x1 increment. So, after an unexpected probe contact event, you can use the MPG to clear a probe unexpected contact by selecting x1 on the jog increment knob and then use the MPG wheel to move the probe away from the direction of contact to clear the probe. **Put another way, there is no Probe Protection applied when the MPG is set to x1 increment.** There is Probe Protection applied when the MPG increment selection is set to X10 or X100. Neither x10 or x100 can be used to clear a probe from an unexpected probe contact. Note: it is required when using a NC probe to have a NC detection input as well for MPG Probe Protection to function properly.



Probe Protection is active when increment selector knob is on x10 or x100

Probe Protection is NOT active when increment selector knob is on x1

To clear an unexpected probe contact using the MPG, the increment selector knob must be set to x1

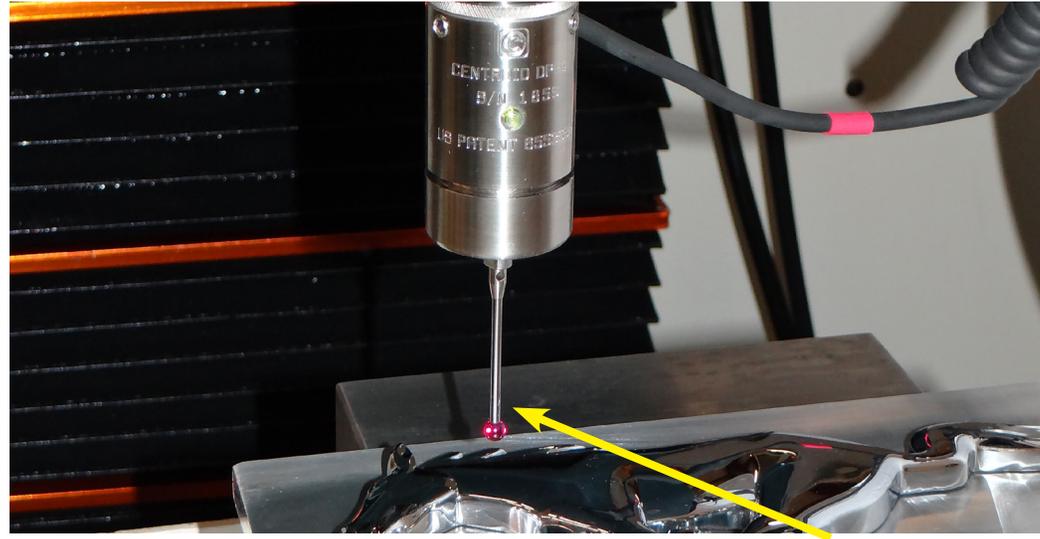
Unlike the axis jog buttons on the VCP the MPG will allow by design probe movement in both directions when set to x1 after an unexpected probe contact. Use with caution.

### Testing Probes before each use.

It is a good practice to get in the habit of always manually checking the probe to confirm that it is functioning BEFORE running a probing cycle to prevent a Probe crash.

#### To manually test a Touch Probe

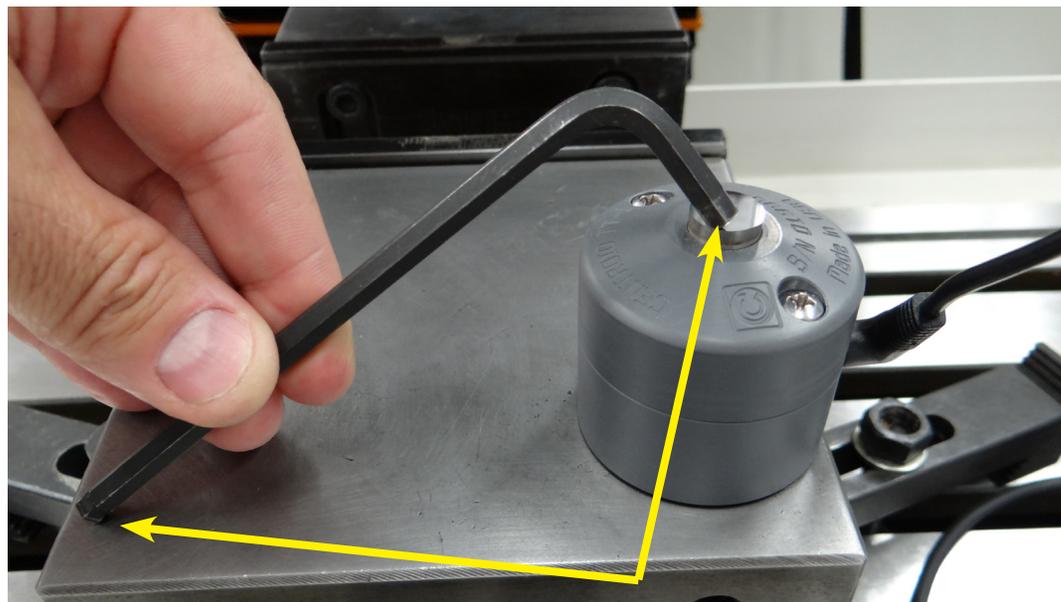
- 1.) Turn down the Feed Rate Override 10 or 20%.
- 2.) Position the Touch Probe in the center of the X Y travel of the machine tool.
- 3.) With the Touch Probe in clear space start the Center of Bore probing cycle, the probe will begin to move to seek out the edges of the bore at the quadrants, at this slow speed you'll have plenty of time to trip the probe with your fingers to verify that it is working. No need to complete the probing cycle, cancel at anytime once the probe functionality has been verified.



Gently trigger with finger while running a probing cycle in air to test probe before using the Touch Probe

#### To manually test a Tool Touch Off device

- 1.) Send the Z axis to the Home position with Tool Check
- 2.) Turn down the Feed Rate Override 10 or 20 %
- 3.) Start the Automatic Tool Height Offset measurement Tool Touch Off probing cycle, the Tool will begin to move in the negative Z direction to seek out the Touch Off Device, at this slow speed you'll have plenty of time to trip the Tool Touch Off with your fingers (or use anything conductive if the TT is a conductive Tool Touch Off device see image below) to verify that it is working before beginning to use the Tool Touch Off device.



Touch a conductive probe with anything conductive that is also touching the machine while running an automatic tool measurement cycle in air.

## Acorn Wizard Probe Setup Menus

The default Wizard i/o map puts the Probe Tripped input on input 7 and the Probe Detect input on input 6. These are the recommended inputs to use but any input can use selected for probe related duty. Use the drop down menu for each input to set its function.

The screenshot shows the 'Mill CNC Control Configuration Wizard' interface. On the left, a navigation tree includes 'Primary System', 'Axis', 'Spindle', 'Touch Devices', 'Control Peripheral', 'DB25 Connector', and 'Preferences'. The 'Input Type' dropdown is set to 'Probe'. A red circle highlights this dropdown, and a red arrow points to the 'Probe' option. Below the dropdown, a text box reads: 'Drag "ProbeDetect" and "ProbeTripped" to input 6 and 7 respectively.' The 'Acorn Integrated Inputs 1-8' table is shown with the following definitions:

NC	NO	Definition
1		IN1
2		IN2
3		IN3
4		IN4
5		IN5
6		IN6
7		IN7
8		IN8

Below the table, instructions state: 'Click and Drag an Input function definition from list to the Input number Definition box to assign a function to an input.' and 'Click the Input number circle to toggle the input state from NC to NO. Note: Probe Input states are determined in the Probe setup menus.'

While the Input number is selectable in the Wizard i/o map for any probe trigger or detection, both the Touch Probe and Tool Touch Off Input Types are not selectable in the Wizard i/o map. The probe input types are set in the Probe setup menus.

The 'Probe Configuration' dialog box is shown with the following settings:

- Probe PLC input: Input 7
- Probe type: Mechanical
- Input state when tripped: Closed\*
- Probe tool number: 10
- Fast probe rate: 300
- Slow probe rate: 125
- Recovery distance: 1.27
- Maximum probing distance: 254
- Probe Protection when using VCP Jog Buttons: Yes
- Inhibit the spindle from moving when probing: Yes

Red circles highlight the 'Input state when tripped' dropdown and the 'Closed\*' option. A red arrow points from the text 'Input state when tripped' to the 'Closed\*' option.

## Probe Configuration

Probe PLC input	<input type="text" value="Input 7"/>
Probe type	<input style="background-color: #ffffcc; border: 1px solid black;" type="text" value="Mechanical"/>
Input state when tripped	<input style="background-color: #c8e6c9; border: 1px solid black;" type="text" value="Closed*"/>
<a href="#">*Probe Setup Documentation (PDF)</a>	
Probe tool number	<input type="text" value="10"/>
Fast probe rate	<input type="text" value="300"/>
Slow probe rate	<input type="text" value="125"/>
Recovery distance	<input type="text" value="1.27"/>
Maximum probing distance	<input type="text" value="254"/>
Probe Protection when using VCP Jog Buttons	<input checked="" type="checkbox"/> Yes
Inhibit the spindle from moving when probing	<input checked="" type="checkbox"/> Yes

**Probe PLC Input:** The Acorn input number used as the ProbeTripped input, as set in the i/o map

**Probe Type:** Choose the Type of Probe being used. Centroid DP4, or 3rd party Mechanical or Conductive. (Centroid Probes Close the input when triggered)

**Input state when tripped:** The state of the input when the Probe is Tripped, refer to Probe Setup Guide for more info.

**Probe Tool Number:** The Tool number assigned to the Touch Probe, used to look up the length offset and tip diameter of the probe from the CNC12 tool library.

**Fast Probe Rate:** Used for positioning moves and initial surface detection, this parameter is determined by machine response and permitted probe deflection as well as desired accuracy tolerance. Default is 10 ipm (30 to 10 inches per minutes is good for milling machines and 20 to 40 inches per minutes for most CNC routers, adjust as needed.)

**Slow Probe Rate:** Used for final measuring moves for maximum accuracy, this parameter value is determined by speed/accuracy trade off. Default is 3 ipm. Warning: setting this parameter to very slow numbers will often cause issues with double triggers. Idea is to have the probe do the final touch off at a speed which is slow for accuracy but not too slow to cause double hits. 3 inches per minute (or 75 mm/min) is a good starting place for milling machines, routers can run faster.

**Recovery Distance:** The additional distance the probe moves off of a surface after contact is broken, before attempting to traverse parallel to the surface.

**Maximum Probing Distance:** The Maximum distance that a probing cycle “searches” for a surface in a given direction if not travel limits have been entered.

### Tool Touch Off Configuration

Touch Off Tool PLC input	<input style="width: 100%;" type="text" value="Input 7"/>
Tool Touch Off type	<input style="width: 100%;" type="text" value="Mechanical"/>
Input state when triggered <a href="#">*Probe Setup Documentation (PDF)</a>	<input checked="" type="checkbox"/> Closed* <input type="checkbox"/>
Subtract height of Tool Touch Off device	<input type="checkbox"/> No <input type="checkbox"/>
Tool Touch Off device height	<input style="width: 100%;" type="text" value="0"/>
Use Tool Touch Off device to set Z Reference	<input type="checkbox"/> No <input type="checkbox"/>
Inhibit the spindle from moving when probing with Tool Touch	<input type="checkbox"/> No <input type="checkbox"/>

**Tool Touch Off PLC input being used:** The Acorn input number used as the ToolTouchOffTriggered input, as set in the i/o map.

**Tool Touch Off Type:** Choose the Type of TT being used. Centroid TT-1, TT-2 or 3rd party Mechanical or Conductive. (Centroid Probes Close the input when triggered)

**Input state when triggered:** The state of the input when the Tool Touch Off Device is Triggered, refer to Probe Setup Guide for more info.

**Subtract height of Tool Touch Off device:** When using Auto Part Z zero Probing cycle with the TT device, subtract the height of the TT device to set the Z part zero at the position the TT device sits on top of.

**Tool Touch Off device height:** This value is taken into account when the TT device is being utilized with the Auto Part Z zero location probing cycle. This height value is typically the distance from the top of the TT device to the bottom of the TT device

**Use Tool Touch Off device to set Z reference:** Use the top of the TT device as the Tool Height measurement reference location when measuring tool heights automatically. Do not use with Knee Mill applications. Set to “Yes” to use the top of the TT as a fixed Z position to measure all tool heights from, commonly used for routers and bed mills.

## Touch Probe Run Out and Angular alignment

Probe “run-out” is the amount the probe tip moves an indicator as the spindle is rotated. Run Out adjustment (also called “Dialing-in”) is necessary to ensure that the center of the probe tip is aligned with the center of the spindle rotation axis. This eliminates any undesired off-sets between the probe and the cutting tool centers when digitizing or doing automated part set-up.

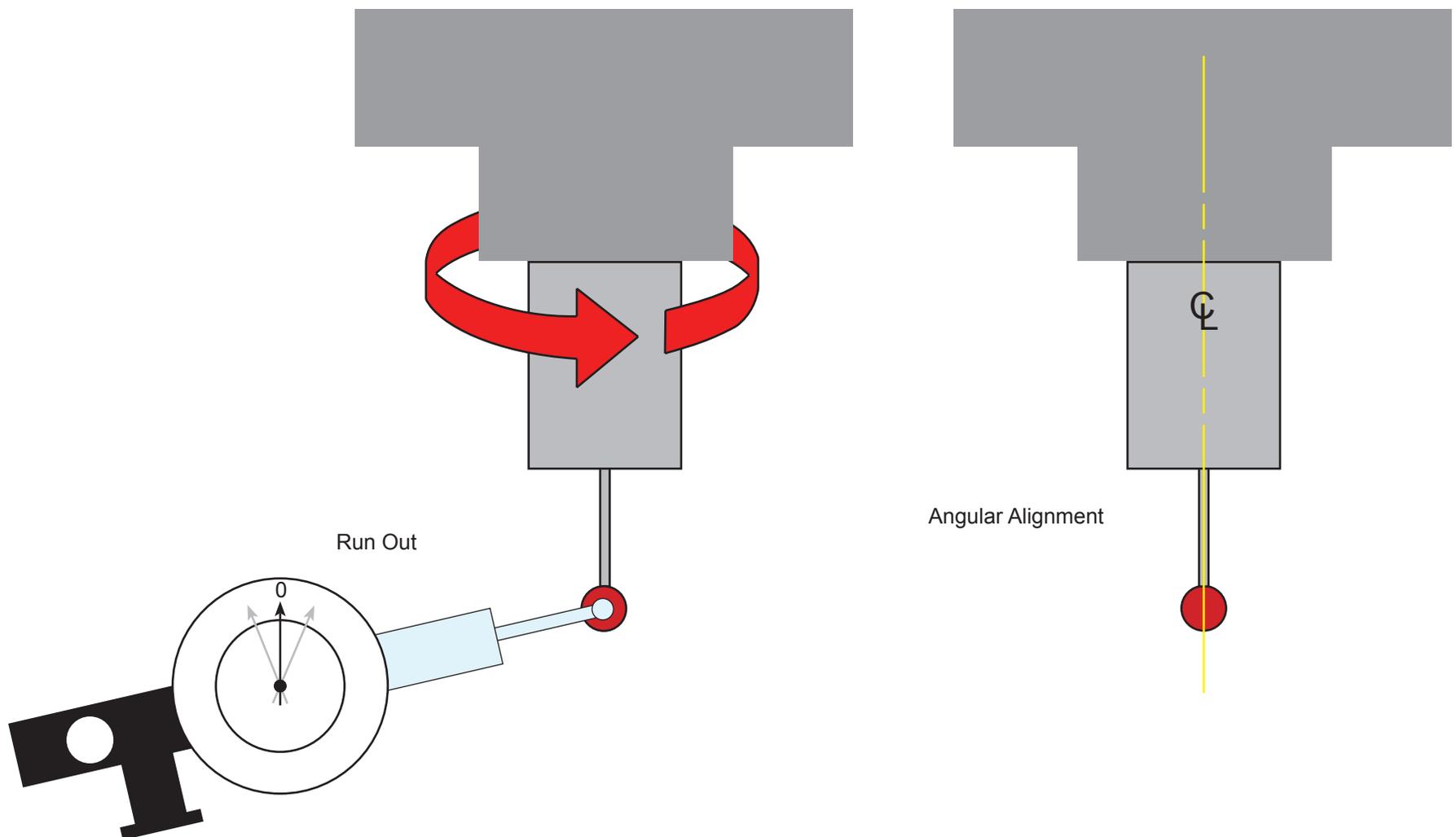
### When to Check Probe Run Out:

Any time the probe is removed from its holder, the stylus is changed or the probe is used in a different machine, the alignment procedure should be repeated to ensure accuracy. The user should also repeat the alignment procedure if the unit is dropped or receives any sudden external shock. It is good practice to periodically check alignment for quality control and to establish a base line maintenance schedule.

### Angular Alignment:

Angular alignment is the relation of the spindle center line to the stylus stem center line. This adjustment provides for equal clearance all around the stylus stem. When the stylus tip and stem are nearly the same diameter this adjustment is critical to keep the stem from contacting a vertical surface before the tip. This adjustment is also convenient to adjust parallelism when flat disc or block stylus types are used. The angular alignment and run-out adjustments are not the same thing but are interdependent. It will be necessary to repeat each several times to achieve significant results. When completed, the run-out at the stylus mount end of the stylus stem should be nearly the same as the runout at the tip. Adjust the stylus tip run-out last.

To check the angular alignment begin by completing the “Dialing-in” procedures for the probe tip. Measure the run-out at the base of the stylus stem (the end away from the tip) with the dial indicator. If the run-out is greater than the difference between the tip diameter and stem diameter then it will be possible for the stem to contact a vertical surface before the tip (also called “shanking out”). The angular alignment is accomplished by first performing a “Dialing-in” procedure on the stem base using the run-out adjustment set screws. Next, the tip is dialed-in using the angular adjustment set screws in the end cap of the probe. These two steps are repeated until the difference in run-out between the tip and stem base is acceptable. Be sure all set screws are equally tight when finished.



### **Touch Probe “Pre-Travel” stylus diameter calibration procedure.**

Calibrate the probe stylus diameter for the tool library. Just entering these value of the probe tip diameter in the tool library will not produce accurate results unless they are corrected for stylus pre-travel.

Pre-travel is the amount of deflection of the stylus tip before the probe detects the surface. This value varies depending on the length of the stylus and the speed and direction that the stylus tip is moving when it makes contact with the surface being probed or digitized. Pre-travel variation amount should be stated in probe specifications relative to stylus length and direction of travel limitations. A probe that has small pre-travel variation with no restriction on stylus length and direction of travel will be quite expensive. Machine characteristics including lash and input latency also contribute to the need to calibrate the stylus diameter.

In order to achieve optimal results when probing or digitizing each Stylus tip size must calibrated to compensate for the sum of the effects previously mentioned.

The following procedure is the quickest way to determine the calibrated diameter.

### **Stylus diameter calibration procedure.**

1.) Fixture a precision ring gauge on the machine tool. The ring must lie flat on the work table/vise with the center line of the bore aligned with the center line of the probe stylus/spindle.

2.) Jog the probe over the center (roughly) of the ring gauge, and then slowly jog the Z-axis down until the tip of the probe is inside the bore and not touching anything.

3.) From the main screen of CNC12, press <F1-Setup>, then <F1-part>, then <F4-Probing>, Set the probe diameter to 0.000 in the field provided and press enter, then <F1-Bore>,and finally <Cycle Start>. The control will jog the stylus to and probe each quadrant of the bore. It will then return to the center of the bore.

A message box will appear on the screen that will display the measured diameter of the bore.

Subtract this number from the known diameter of the gauge bore. The resulting number will be the calibrated diameter of the probe stylus tip.

For example with a 1” ring gauge and a .25” probe tip. The measured diameter in step 3 is displayed as: .76”

$1.000'' - .760'' = .240''$  The calibrated probe tip diameter with probe pretravel compensated for is .240”

4.) Test the result. Press <F4-Probing>, Enter the calibrated probe diameter in the field provided and press enter, then <F1-Bore>,and finally <Cycle Start>.

The control will move the stylus and probe each quadrant of the bore. The message box will appear on the screen displaying the measured bore diameter.

Adjust tip calibration diameter and repeat as needed to obtain as close a measurement as possible to the actual ring gauge diameter.

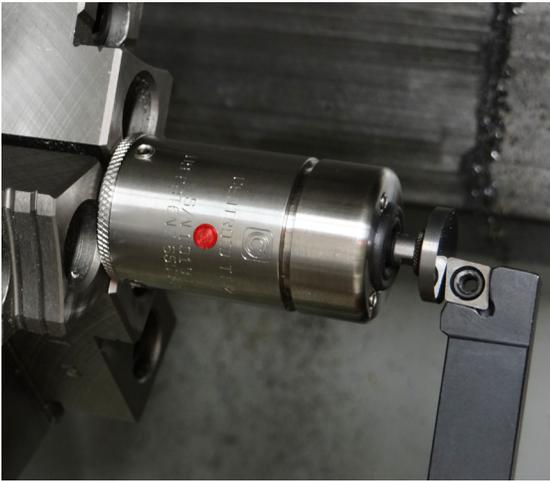
Assuming the machine has low backlash and the probe is accurate, it is possible to obtained +/- .0002” repeatability when measuring the ring gauge diameter with a good probe and a machine in good condition.

5.) Go to the Tool Library and enter the calibrated diameter for the probe stylus in the tool# location you assigned to the probe in the Wizard.

The Probe Stylus Calibration is now complete. Probe is ready for probing and digitizing!

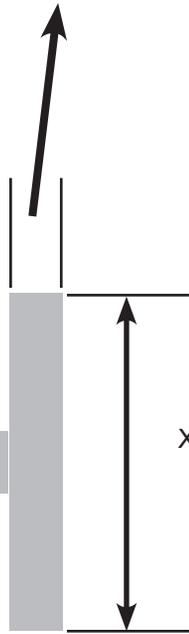
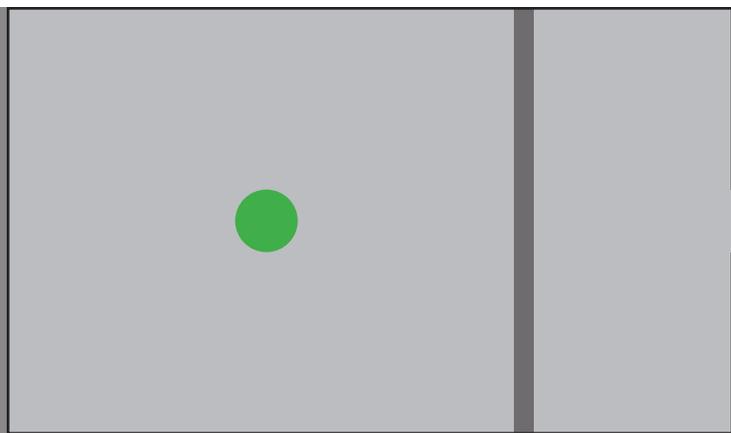
Each different Stylus will have a different pretravel compensated calibration diameter. Do this procedure for each stylus. Make a table and record the calibrated diameter values for each stylus. Be sure to update the Probe Diameter in the Tool Library to match the stylus being used when swapping out to a new stylus!

## Lathe Wizard Tool Touch Off and Probe Setup



Tool Touch Off Configuration	
Touch Off Tool PLC input	Input 4
Tool Touch Off type	Mechanical
Input state when triggered <a href="#">*Probe Setup Documentation (PDF)</a>	Closed*
X Stylus size	.125
Z Stylus size	.75
Auto Tool Touch Off safety clearance distance	.25

“Z Stylus size” = Thickness of Stylus



X Stylus size = Diameter of Stylus

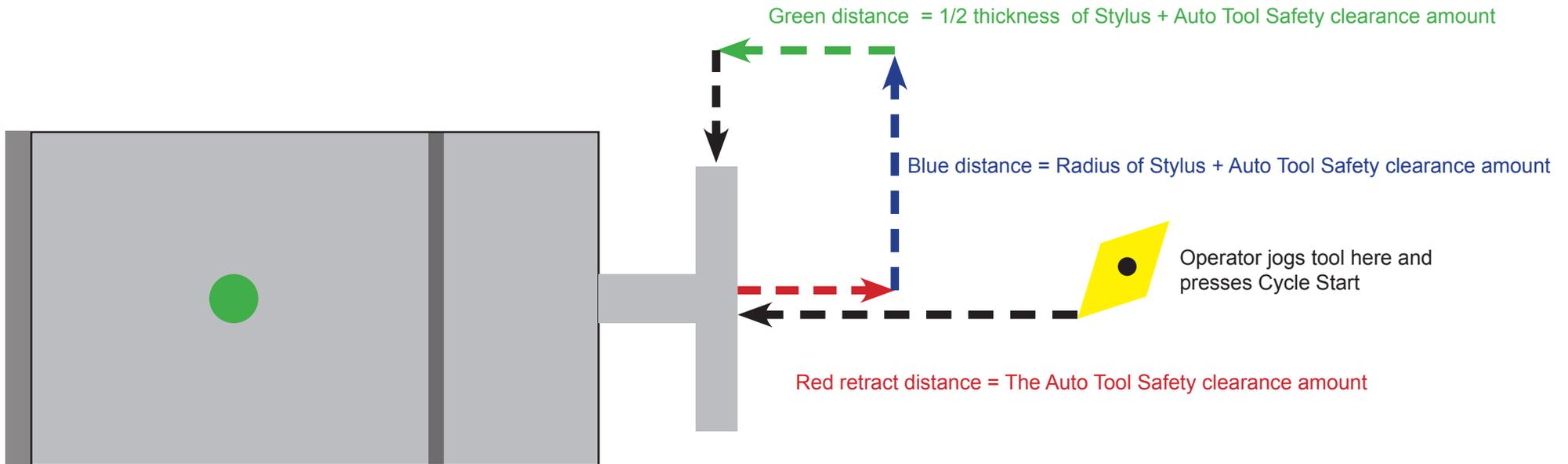
Please refer to Chapter 5 of the Centroid CNC12 Lathe Operators manual for details on how to setup tool offsets and how to run the various Auto Tool Measurement cycles.

## Lathe Wizard Tool Touch Off and Probe Setup

The Auto Tool Touch Off safety clearance is only used during the combination X and Z Auto Tool probing cycle. (During individual X auto tool measure and Z auto tool measure events this safety clearance amount is not used or needed. )

Auto Tool Touch Off safety clearance distance	<input type="text" value=".25"/>
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Auto Tool Touch Off safety clearance is used to safely move the tool automatically around the tool touch off device during the auto X Z cycle. During the X Z auto tool measurement cycle, The operator position the tool close to the TT device, then starts the auto X Z cycle, Z touches off first, then the tool is retracted away from Z by the Auto Tool Safety clearance amount, X is then moved the radius of the stylus plus the Auto Tool Safety clearance amount



Be sure to set/check the Probing feedrates and maximum probing distance in the Wizard "Probe" menu as well. These Fast and Slow probing rates are used for both Tool Touch Off cycles and for Probing/Digitizing Cycles. Default feedrates are 10 ipm (or about 250 mm/min) and 3 ipm (about 75 mm/min)

Probe tool number	<input type="text" value="0"/>
Fast probe rate	<input type="text" value="10"/>
Slow probe rate	<input type="text" value="3"/>
Recovery distance	<input type="text" value="0.05"/>
Maximum probing distance	<input type="text" value="10"/>

## Future Probe Features

Individual Probe Jogging Speed controls are located in the CNC12 setup menu under the “Jog Parameters” menu. Enter into the Probe Jogging Speed setup menu by pressing “F8” from the Jog Parameters menu. Individual Probe Jog Speeds are user definable for Slow Jog speed for each axis and Fast Jog speed for each axis and direction.

These speeds are the speed in which CNC12 will allow the Probe to be jogged while using the Operator Control Panel, the VCP or the MPG.

Fine Tuning these settings to each particular machine tool is recommended for instance setting it is advisable on most all machine tool to set the Z axis Z minus fast rate to a low speed value so its less likely to accidentally damage the probe by operator error.

**WCS #1 (G54)    Current Position (Inches)**

<b>X</b>	-0.1972
<b>Y</b>	-2.9293
<b>Z</b>	-1.0000
<b>A</b>	-1.409°
<b>B</b>	+0.000°

Job Name: pistolgrip2.cnc  
 Tool: T---H1  
 Feedrate: 100% 0.0 ipm  
 Spindle: 0 A

302 Moving...  
 916 Unexpected probe contact  
 453 Jogging while probe detected  
 302 Moving...  
 916 Unexpected probe contact  
 453 Jogging while probe detected

Press CYCLE START to start job

**Jog Parameters**

Axis	Probe Slow Jog (in/min)	Probe Fast Jog (-) (in/min)	Probe Fast Jog (+) (in/min)
1	25	425	425
2	25	425	425
3	25	425	425
4	250	3350	3350
5	250	1250	1250
6	25	200	200
7	25	100	100
8	25	100	100

Machine  
Jog  
F8

Save  
F10