



CNC-TS-01

CNC Tool Probe

Wiring & Application Guide



[www.vikingmachinery.co.nz](http://www.vikingmachinery.co.nz)

## 0.0 Safety Statement

All machinery, especially CNC or automated machinery, has inherent dangers and risks. It is the responsibility of the system designer to ensure that any systems built using any Viking Machinery Ltd. products are safe for use. Any technical information is provided as a reference only, and does not constitute a recommendation as to the fitness of use in any particular application.

Viking Machinery Ltd. strongly urges customers to seek expert advice when dealing with potentially dangerous electrical voltages and sources of mechanical energy. Information contained in this document does not constitute a substitute for expert advice.

Under no circumstances should this product ever be used in a safety critical application.

This tool sensor is designed to be used with zero spindle speed. Touching off with a rotating tool will damage both the sensor and tool. Moving a tool laterally while in contact with the sensor will also damage both the tool and touch off surface.

## 1.0 Product Specifications

- Supply Voltage – 5-24VDC
- Operating Current – 20mA
- Current Ripple – 10% peak to peak maximum
- Output – 2x Normally Closed (NC) contacts
- Maximum Output Voltage – 24VDC
- Maximum Output Current – 100mA
- Tool Approach MAXIMUM SPEED – 200mm/min
- Operating temperature – 5°C - 40°C
- Response Frequency – 800Hz

## 2.0 Scope of Document

This document is designed to give an overview of the wiring options for the CNC-TS-01 tool sensor. Wiring examples are given for typical CNC and microcontroller examples. These are by no means exhaustive, but are a good starting point for beginners.

## 3.0 Wire Colours & Connection

Your proximity sensor comes with a 2000mm flylead attached. This is mechanically shielded and contains four  $\varnothing 0.42\text{mm}$  wires. 1 Red, 1 Black, 1 Yellow and 1 Green.

The wire pairs for sensing are;

Red & Black – Probe Contact

Green & Yellow – Overtravel Protection



**IMPORTANT:** Before use, check the wire connections as it is possible that the factory will change the wire colours.

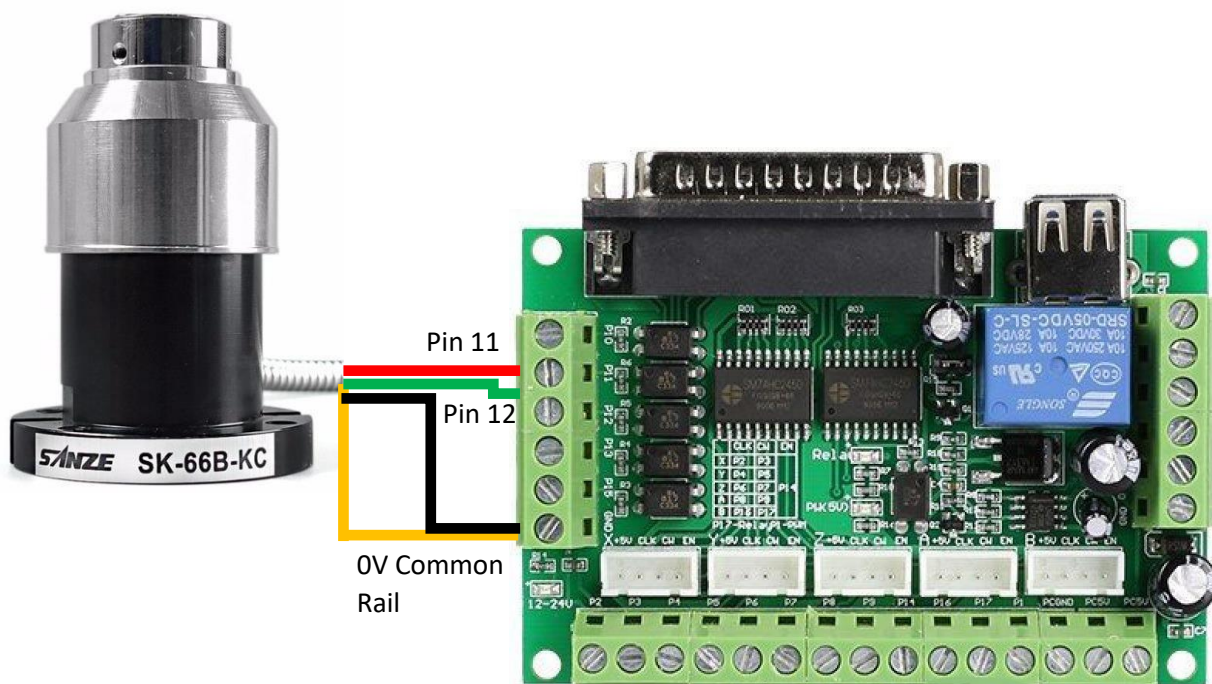
To test the switching contacts, we connect our multimeter on the Ohms -  $\Omega$  (resistance) setting between the contact wire pairs.

In its normal state the multimeter should read " $2.0\Omega$ " or very close to it. Pressing the touch off surface down will break the sensor inside the device and interrupt the continuity between the contact wire pair. Your multimeter will now read "O.L" (or however your meter shows an open circuit).

## 4.0 Wiring to a CNC B.O.B

The 5 axis CNC breakout board that Viking Machinery supplies can be wired as shown. The principle applies for other boards (like the Centroid Acorn) that take an NPN input signal.

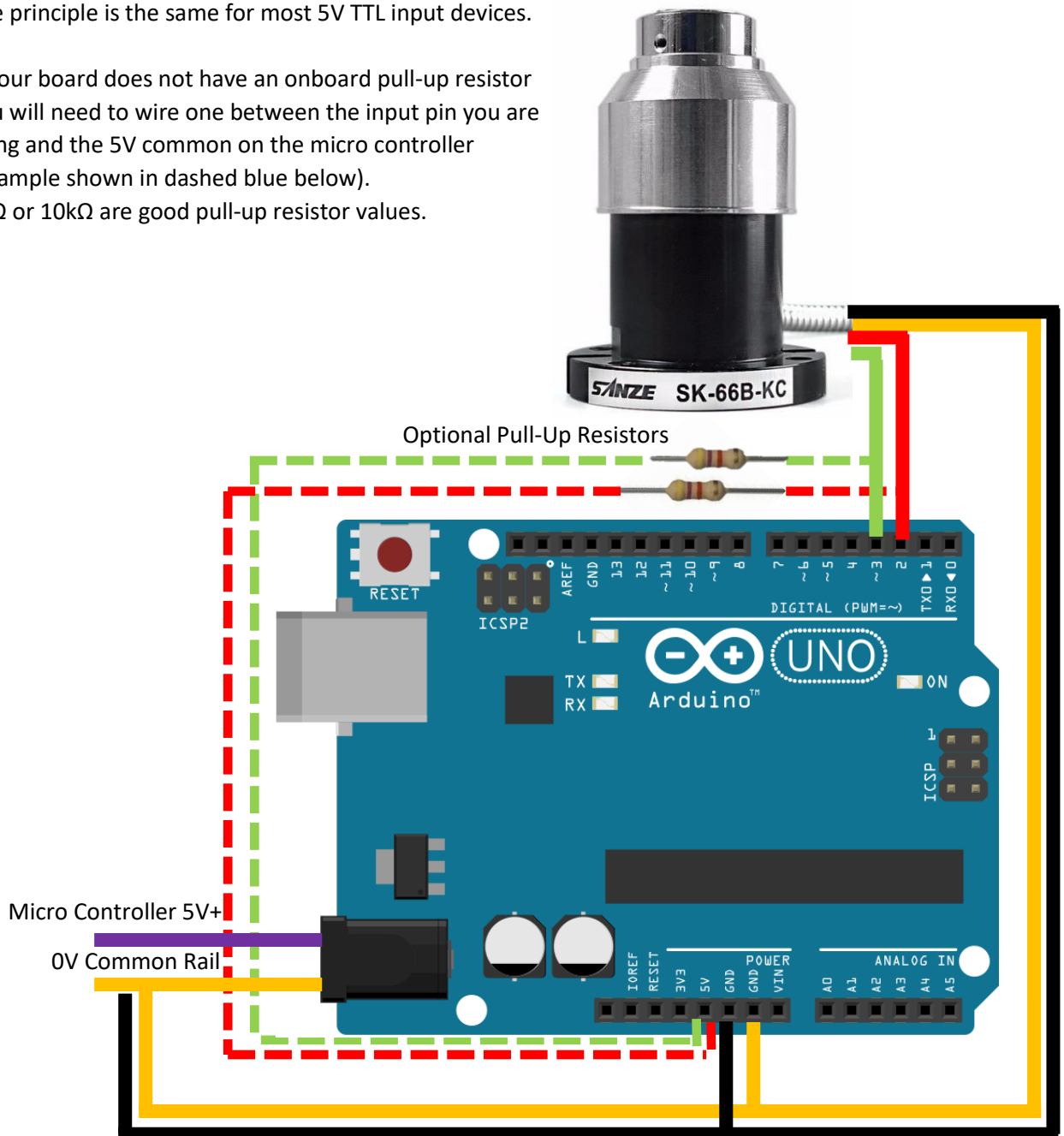
For an NPN input logic board, we need to connect the input to ground to create a signal. Your board may be different and require you to connect the green wire to a +ve voltage rail to create a signal. Please refer to your breakout boards manual and wire the contact pairs exactly as you would a normally closed limit switch.



## 5.0 Wiring to a Microcontroller

For this example, we will use the popular Arduino micro controller.  
The principle is the same for most 5V TTL input devices.

If your board does not have an onboard pull-up resistor you will need to wire one between the input pin you are using and the 5V common on the micro controller (example shown in dashed blue below).  
5kΩ or 10kΩ are good pull-up resistor values.



For this example, within the Arduino sketch, we would need to set pin 2 & 3 to INPUT (with external pull-up resistor wired) or INPUT\_PULLUP to use the onboard pullup resistor.

When the sensor is not being activated it provides a low impedance path between the Arduino pin 2 and the 0V common rail through the black and orange wires. This holds the voltage on the pin at almost 0V.

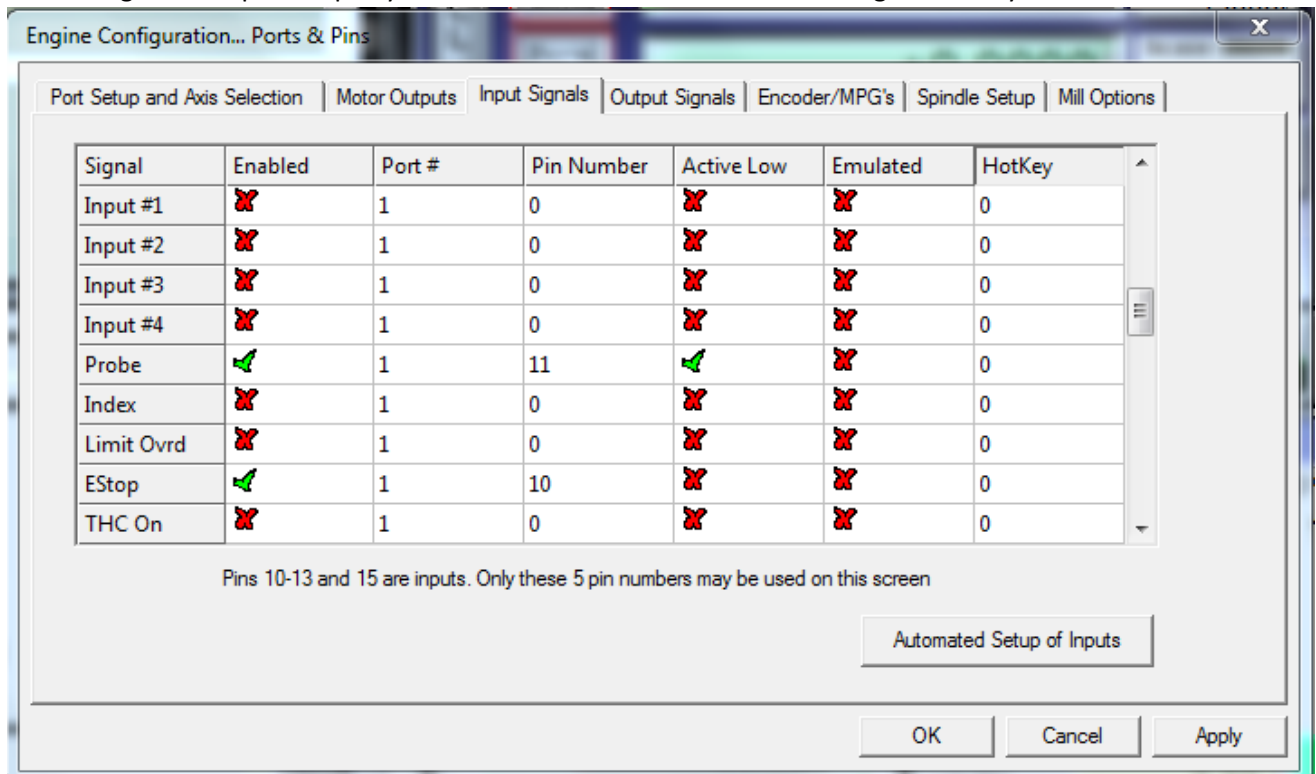
When the sensor is activated, it will block the continuity of pins 2 & 3 to 0v. The pull-up resistor now does its magic and gives us a nice clean 5V signal on the pin.

## 6.0 Tool Probing with Mach 3

There are several ways you may wish to use your tool probe with your CNC system. We will not try to cover them in detail, but will instead try to provide enough information to assist with your own DIY electrical engineering. The Centroid Acorn documentation covers this well, so we will only address Mach 3 systems here.

### 6.1 Ports and Pins

Setting the tool probe up in your software is much the same as setting a normally closed limit switch.



As you can see in this image, we have enabled the Probe input, assigned it to the port and pin number it is wired to, and selected “Active Low” as appropriate for the particular Break Out Board being used.

If in doubt don’t hesitate to use the “Automated Setup of Inputs” utility – this is a simple way to get your touch probe configured.

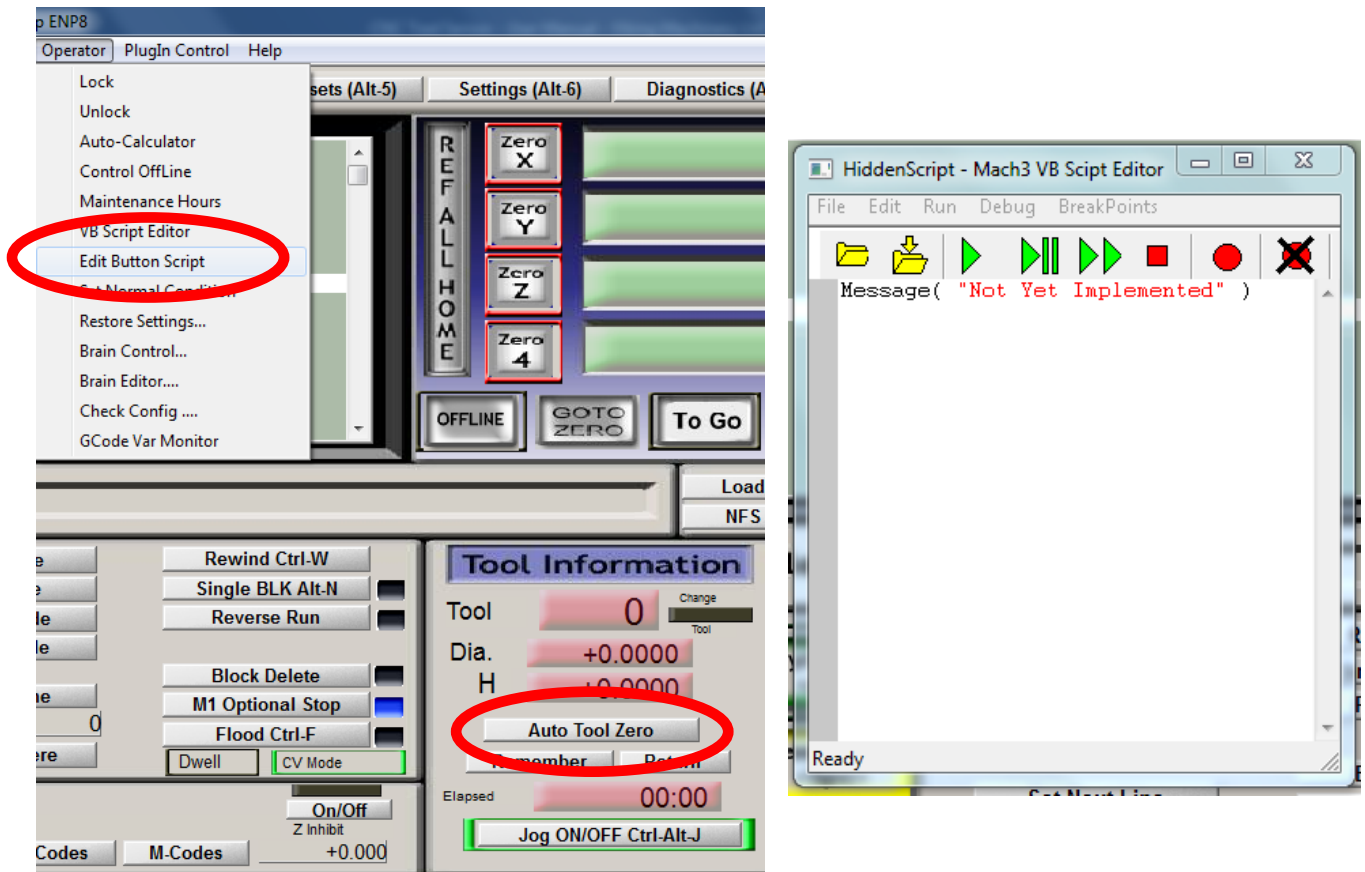
You can check that your tool sensor is working on the Diagnostics page. Simply toggle the switch on and off by hand and watch the Pin state LED’s change to reflect the input.

### 6.2 Macros, Macros and more Macros

Now you’re wired and configured, you will need a macro for Mach3 to do what you want it to with the hardware. Depending on your end goal you will need to approach your macro differently - for example, if you are planning to probe as part of a tool change to automatically update tool length offsets you may wish to insert your macro into your M6Start.m1s (tool change) macro. If you want to

use the “Auto Tool Zero” button on the 1024 screen set you will need to assign the macro VB script to it.

To modify the VB script attached to a particular button, you will need to click Operator->Edit Button Script from your menu bar. This will then cause every editable button on the screen you are in to flash. Clicking the “Auto Tool Zero” button will open the VB Script Editor window associated with that button. You will need to insert your macro into this window in the place of the existing message.



Due to wide range of screen sets, configurations, intents, and the possibility of causing damage to customers machines, we do not provide sample Macro scripts. However, you may wish to view the following links and use their examples as the basis for your coding.

<https://www.youtube.com/watch?v=uY9FloqrEW8>

<https://www.machsupport.com/forum/index.php?topic=3483.0>

<https://www.cnczone.com/forums/cnc-wood-router-project-log/36099-forum.html>

## 6.3 Programming Service

Viking Machinery is able to offer Macro Programming as a service to customers. If this is of use to you please send us an email to discuss your requirements and let us provide pricing for your project.

## 7.0 Reference Links

### Viking Machinery - Home Page

[www.vikingmachinery.co.nz](http://www.vikingmachinery.co.nz)

### Viking Machinery - TradeMe Store

<https://www.trademe.co.nz/Members/Listings.aspx?member=4906214>

### Viking Machinery - Email

[sales@vikingmachinery.co.nz](mailto:sales@vikingmachinery.co.nz)

### Viking Machinery - Social Media

<https://www.instagram.com/vikingmachinery/>

<https://www.cgtrader.com/viking-nz>

[https://www.youtube.com/channel/UCgnl\\_7dUO9MeNOyI\\_jWO5QQ](https://www.youtube.com/channel/UCgnl_7dUO9MeNOyI_jWO5QQ)

<https://www.thingiverse.com/VikingNZ/about>

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