



### **Mach3 TCP Modbus**

The PC-based CNC software Mach3 possesses a TCP Modbus interface for exchanging data and commands with Input / Output devices. The standardized TCP Modbus protocol facilitates data exchange between Mach3 and other PCs connected through a common network. A special TCP Modbus Server has been implemented in the Caliper2PC software. To process the data from and to the Caliper2PC software, brains have been developed. To visualize the data coming from the encoders, a custom-made screen set is made available.

If you want to know more about this Caliper2PC feature and why this is very useful, this step by step guide is made for you!

### **Why use Mach3 with Caliper2PC?**

Most users of Mach3 are using an open loop control with step motors. The controller sends the steps, but does not verify if the steps were followed by the motors. As a result steps can be lost and you will notice it only after the work is completed.

The Caliper2PC system tracks down the precise movement of the axis. Lost steps are shown as deviation in the software. Within the Caliper2PC software you can define an allowed deviation. If this deviation is exceeded the "Feed Hold" command in Mach3 is triggered.

Please note that Caliper2PC does not facilitate a closed loop control, but is an inexpensive device monitoring your CNC.

The Caliper2PC can be run on the same PC as Mach3, or on 2 separate PCs that are connected in a network.

## Connecting Mach3 to Caliper2PC

### 1. Configure Mach3

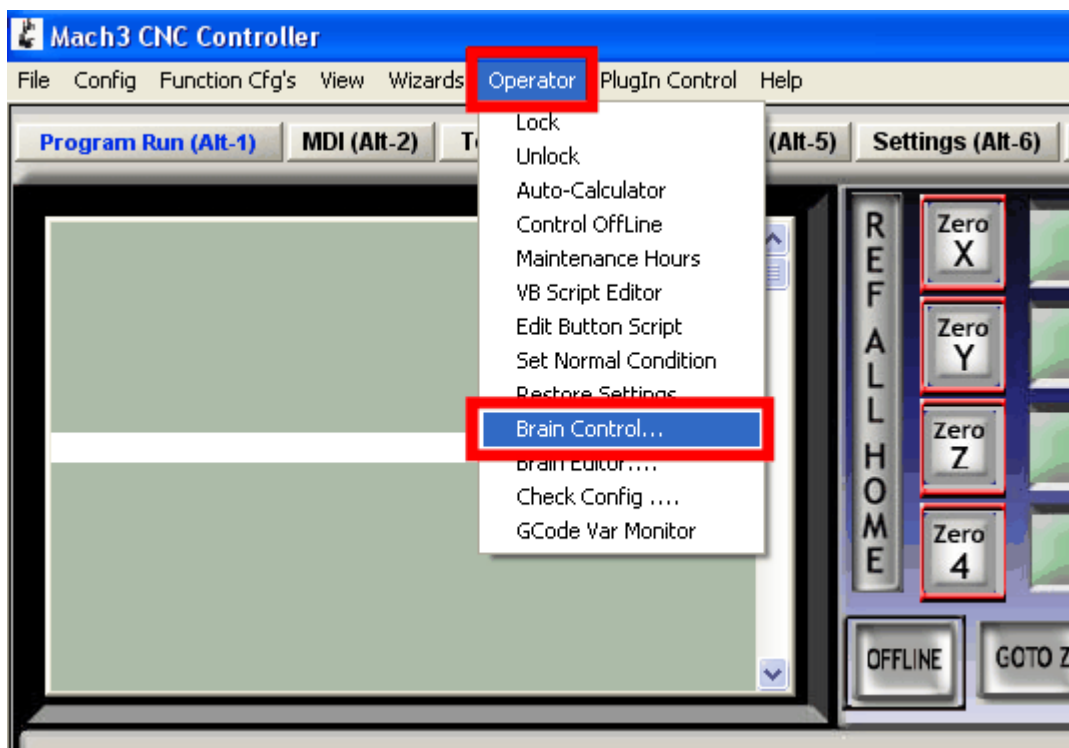
The following files are needed and can be downloaded from the Caliper2PC page:

- Caliper2PC1.brn
- Caliper2PC2.brn
- Caliper2PC3.brn
- Caliper2PC4.brn
- 1026.set

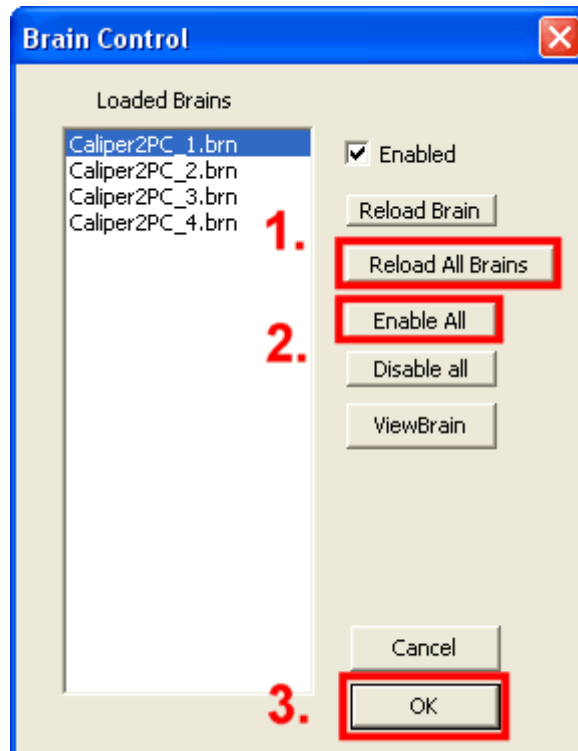
After downloading the zip-file, copy the brains *Caliper2PC1.brn*, *Caliper2PC2.brn*, *Caliper2PC3.brn*, and *Caliper2PC4.brn* to the subfolder “Brains” of your Mach3 path (for example: C:\Mach3\Brains)

Copy the screen set 1026.set to Mach3 root-folder (C:\Mach3)

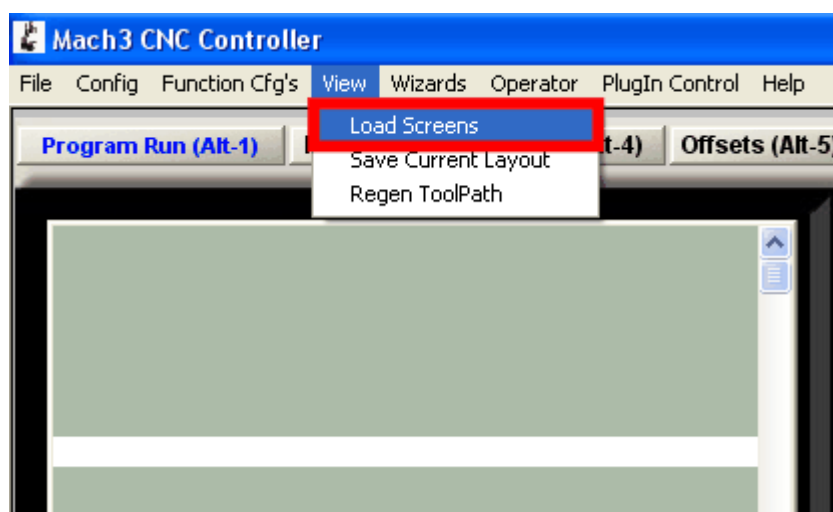
Open the Brain Control Window to enable the brains.

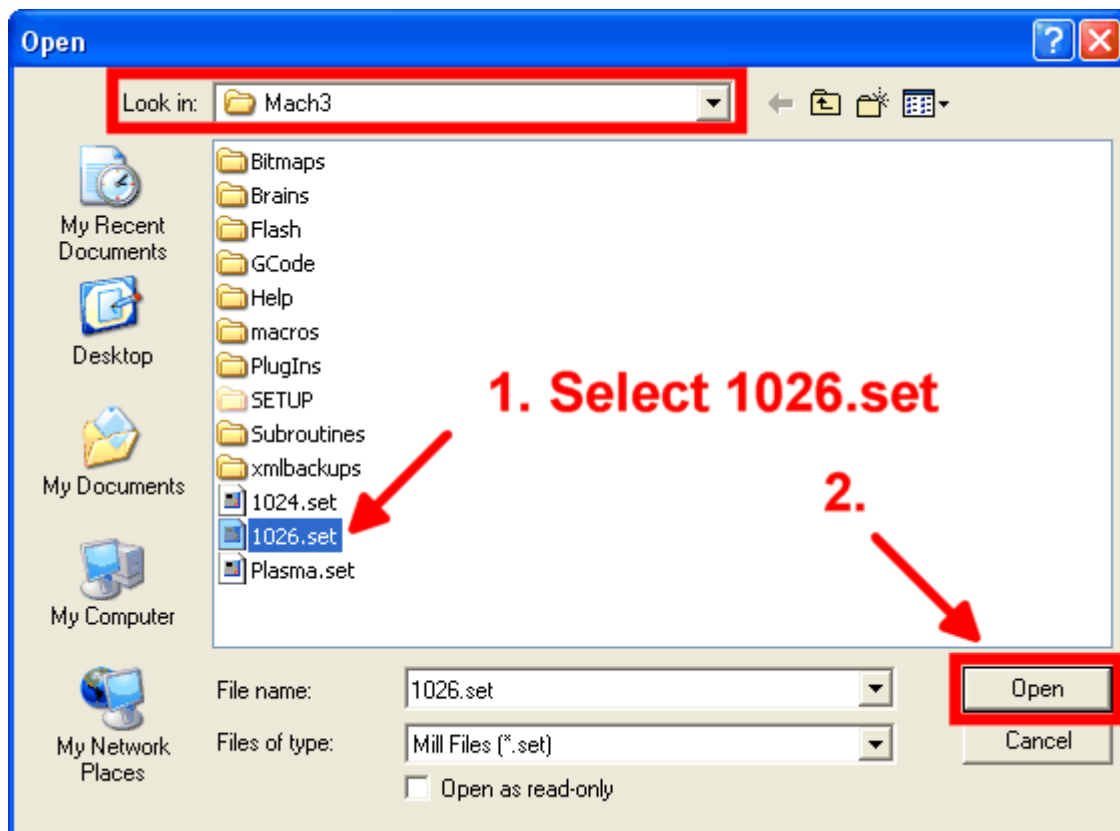


Reload and enable all brains.



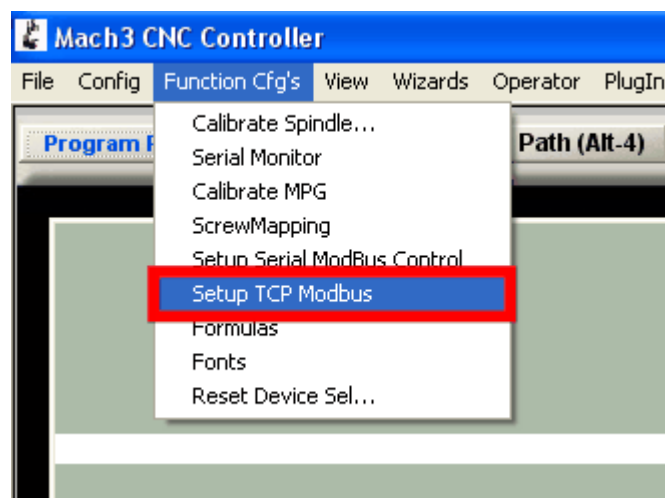
Load the 1026.set screen set to be used in Mach3.





After setting up the brains and the 1026.set screen set, please follow the next steps for setting up Mach3 TCP Modbus.

Open the TCP Modbus Setup window.

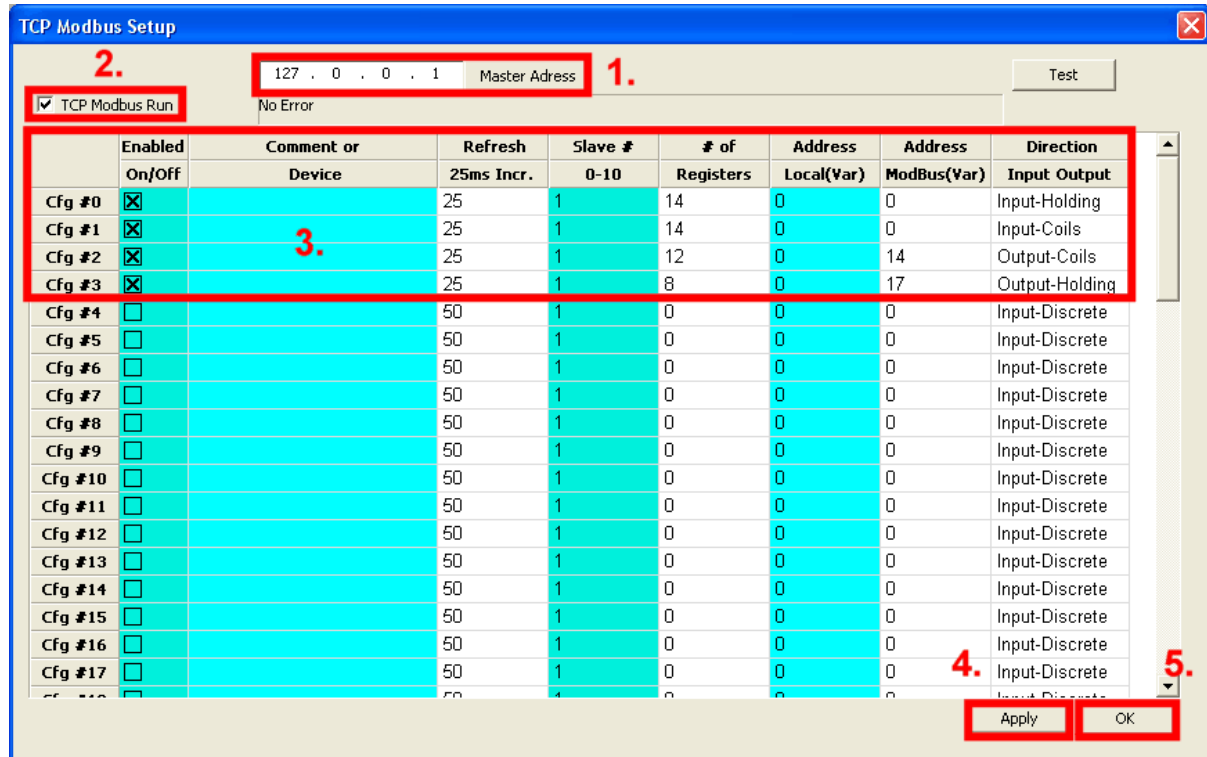


# Mach3 & Caliper2PC via TCP Modbus

## A step by step Guide



Setup the settings in the TCP Modbus Setup window as shown in the picture below.



Use the Master Address 127.0.0.1 if Mach3 and Caliper2PC run on the same PC. The setup for separate PCs will be shown at the end of this document.

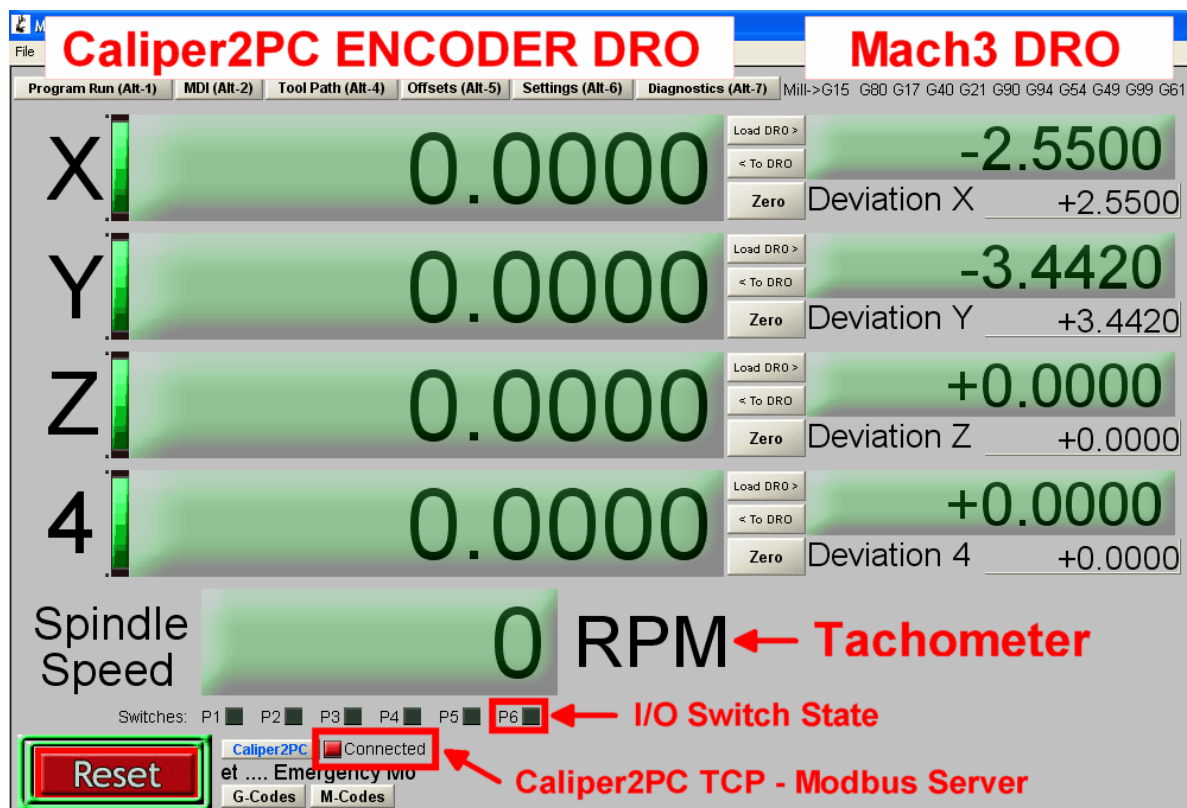
Clicking the Caliper2PC button will open the Caliper2PC screen within Mach3.



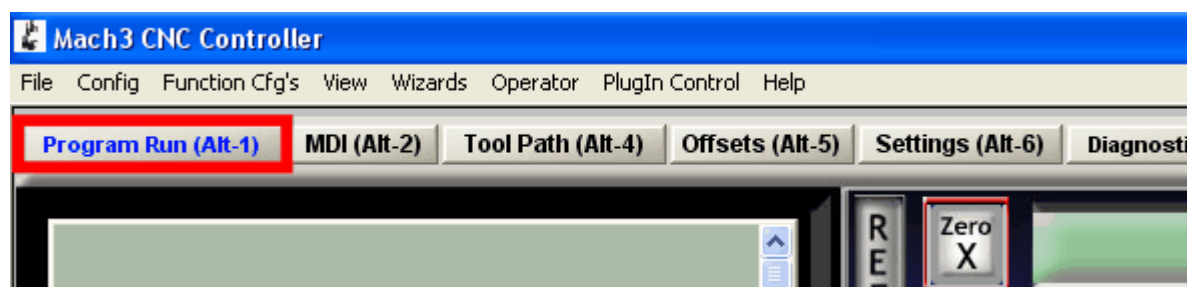
On the left side of the screen the encoder DROs for the X, Y, Z, 4 Axis with the values from the Caliper2PC software are shown. The right side contains the Mach3 DROs with the values representing the step counts for each axis. Below the Mach3 DROs, the calculated deviation is shown for each axis. The LEDs P1 – P6 indicate the switch status for the Caliper2PC input ports. A tachometer DRO is shown for reading out the spindle RPM.

# Mach3 & Caliper2PC via TCP Modbus

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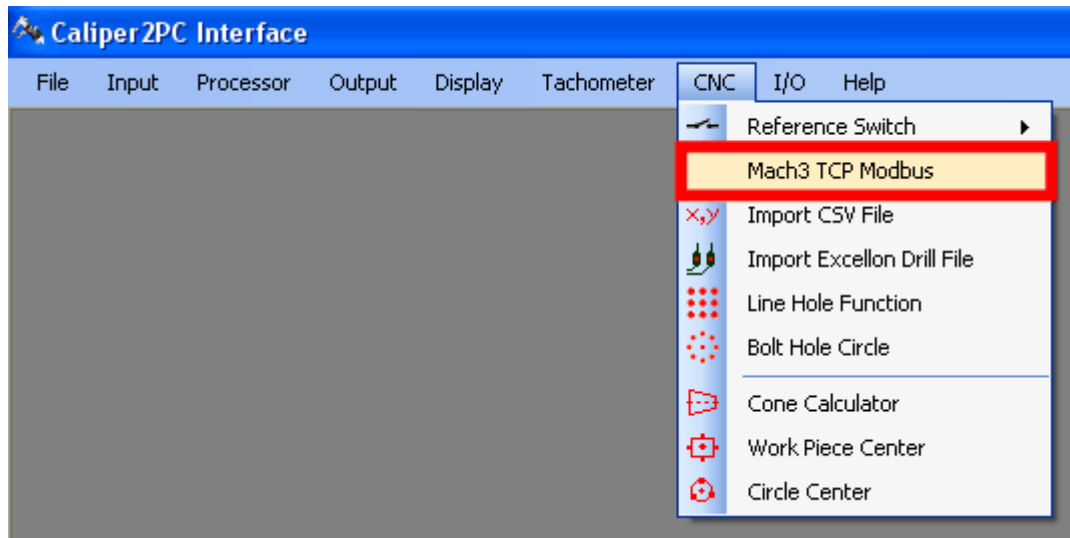
The “Modbus Server LED” indicates the connection status to the Caliper2PC Modbus server. With the “< To DRO” buttons you can set the Caliper2PC DROs values to the values of the Mach3 DROs. Alternatively, the values for the Caliper2PC DROs can be set in the Caliper2PC software with the “Control Panel” window (“Display” -> “Control Panel” -> input value in the textbox -> “Set”).



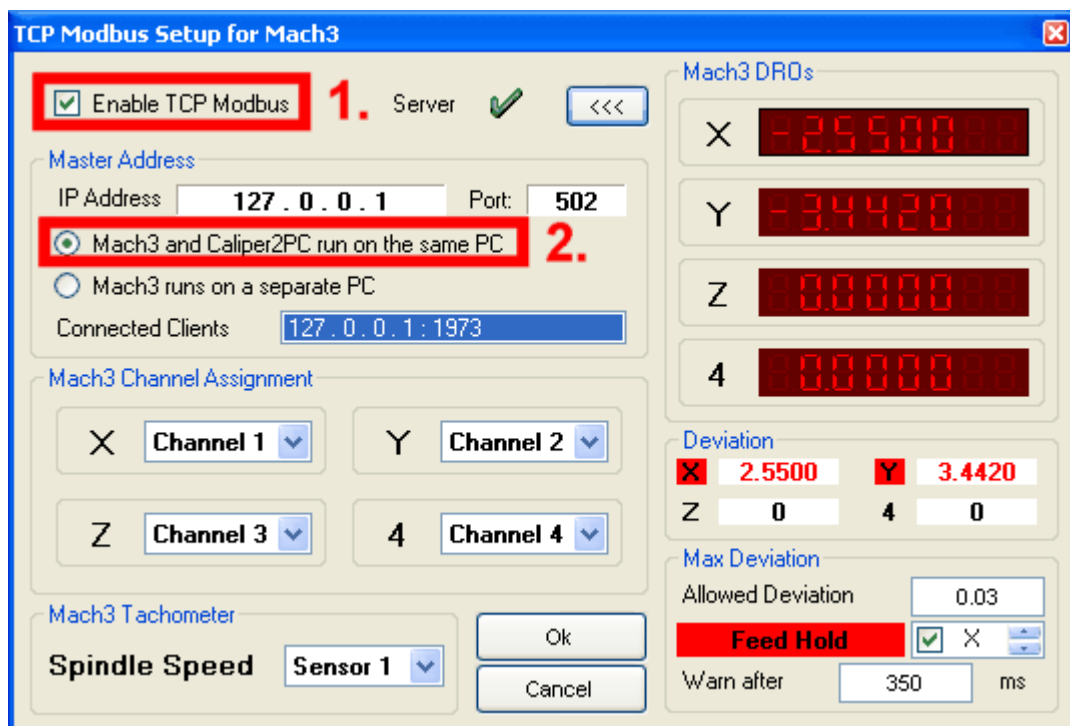
You can swap to the original Mach3 screen by clicking the “Program Run (Alt-1)” button.

## 2. Configure Caliper2PC Modbus Setup

Open the “TCP Modbus Setup for Mach3” window in the Caliper2PC software.

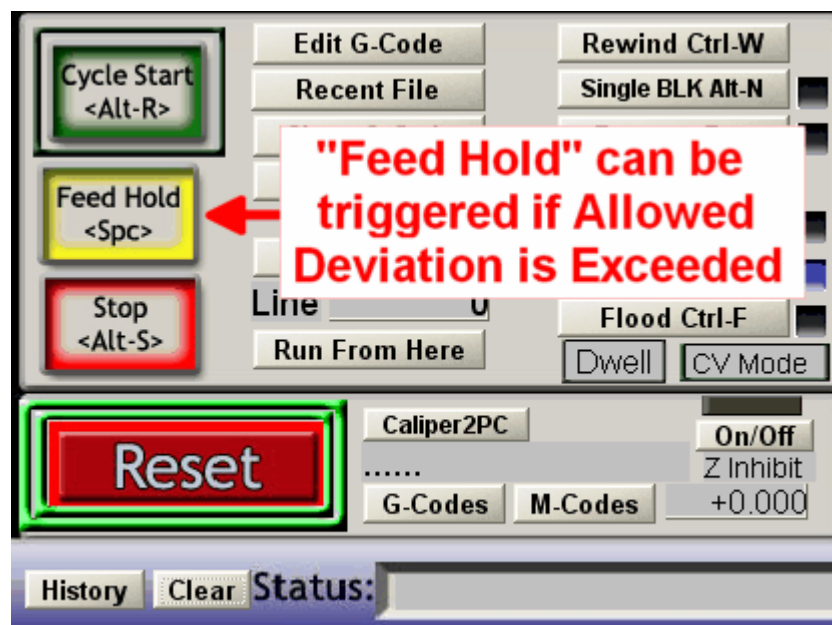


The “TCP Modbus Setup for Mach3” window can be extended by clicking the “>>>” button.



Check the “Enable TCP Modbus” checkbox and select the “Mach3 and Caliper2PC run on the same PC” option, if Mach3 and Caliper2PC run on the same PC.

The maximal allowed deviation can be defined in the “Max Deviation” textbox. For each axis the tracking can be enabled or disabled. If tracking is enabled “Feed Hold” will be triggered in Mach3 as soon as deviation exceeds the maximal allowed deviation.



Please note that the tracking of the axis’ movements is not done continuously. Depending on the encoder the data is refreshed 4 – 40 times per second. A delay in the data flow, which depends on your PC hardware and the Windows operating system, must be considered. Because of the asynchronous nature of the data, a warning delay time must be defined. Only real deviation that is caused by lost steps of the motors will persist in the system. The warning delay time can be defined (in milliseconds) in the “Warn After” textbox.

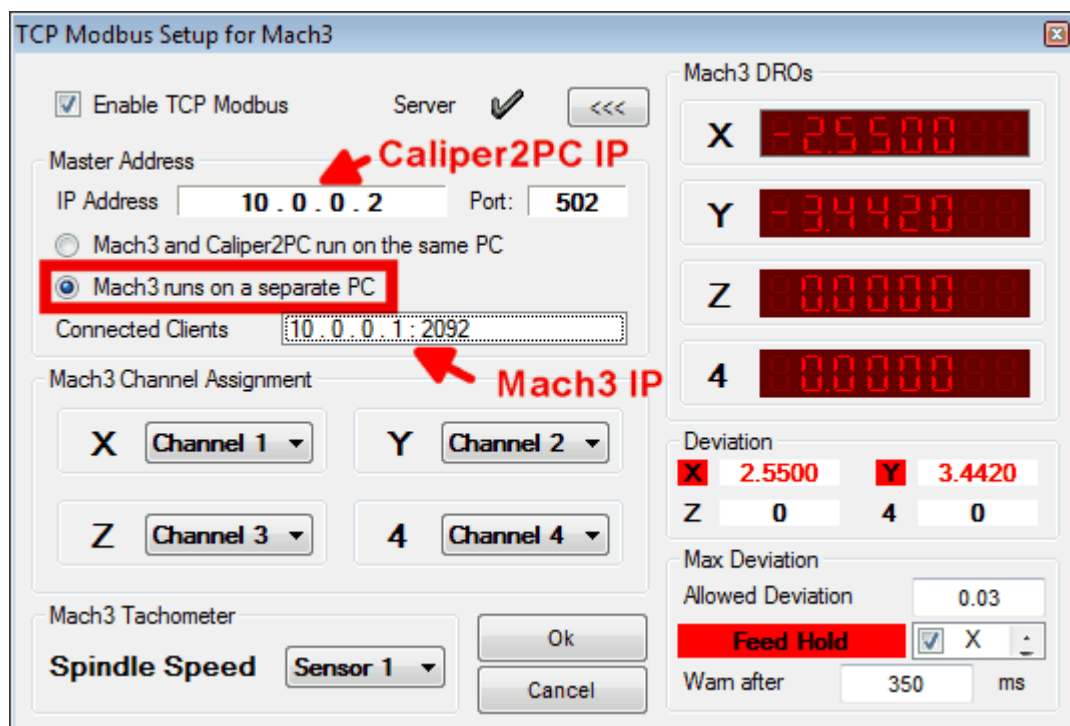
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**Important!!!** The Caliper2PC software must be launched **prior** to Mach3 (otherwise Mach3 will not find the TCP Modbus server).

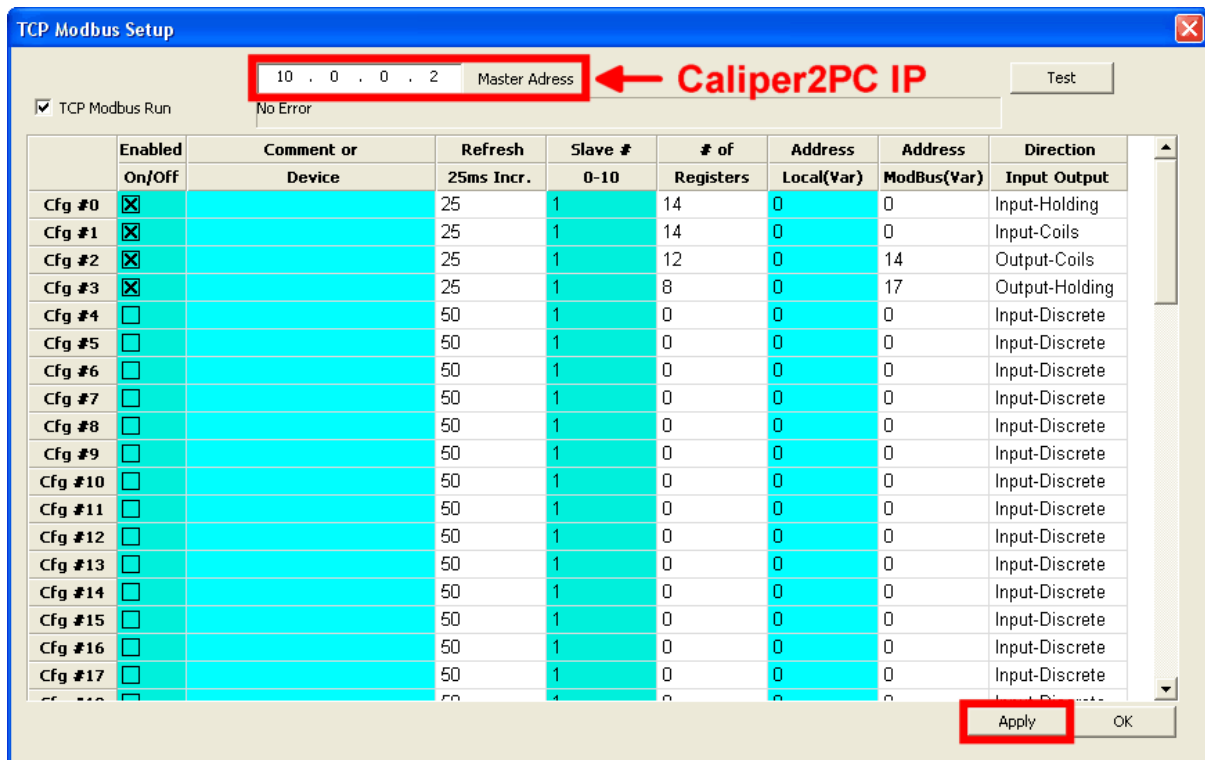
### Setting up Mach3 & Caliper2PC on separate PCs

Mach3 and Caliper2PC can be setup on separate PCs that are connected through a wired or a wireless network. In the “TCP Modbus Setup for Mach3” window choose the “Mach3 is running on a separate PC” option. The IP address of the Caliper2PC PC is the Master Address. The IP address is shown in the window (for example 10.0.0.2). This IP address must be defined in the Mach3’s “TCP Modbus Setup” window (see pictures below). As soon as Mach3 TCP Modbus is connected to the Caliper2PC Modbus server, the IP address of the Mach3 PC is listed in the “Connected Clients” list.



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### Mach3 TCP Modbus Setup

	Enabled	Refresh	Slave #	Registers	Local	ModBus	Direction
<b>Cfg #0</b>	Yes	25	1	14	0	0	Input-Holding
<b>Cfg #1</b>	Yes	25	1	14	0	0	Input-Coils
<b>Cfg #2</b>	Yes	25	1	12	0	14	Output-Coils
<b>Cfg #3</b>	Yes	25	1	8	0	17	Output-Holding