Tormach CNC with PathPilot

Quick Start

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Overview

This class will cover the basics of using the Tormach 1100 Series 3 CNC milling machine running PathPilot software. It is assumed that you are already familiar with the following:

1) **Shop safely procedures including eye and ear protection, proper clothing.**
2) **Operation of manual milling machine.**
3) **Best work holding practices.**
4) **Use of CAD software such as Solidworks or Autocad Fusion and generating toolpaths.**
5) **Experience with selection of feeds, speeds and coolant for your cutting tools and work materials.**

These prerequisites are critical for your safety and the safety of others around you, for preventing damage to the machine, and for successful use of the Tormach CNC.

WARNING! The machine is not designed to operate unattended. Never leave machine unattended during operation. When machine is not in use, turn the main disconnect off. Failure to do so could result in death, serious injury, and/or machine damage.

1) Familiarize yourself with the machine

Essential safety controls: E-Stop and Main Disconnect
Emergency stop is engaged by pressing the E-Stop button in. This will turn off the spindle and stop all movement of the machine. Turn the E-Stop button clockwise one quarter turn to release it from the emergency stop position.

Machine Control

Machine control consists of two main interfaces, the Control Panel and the PathPilot interface
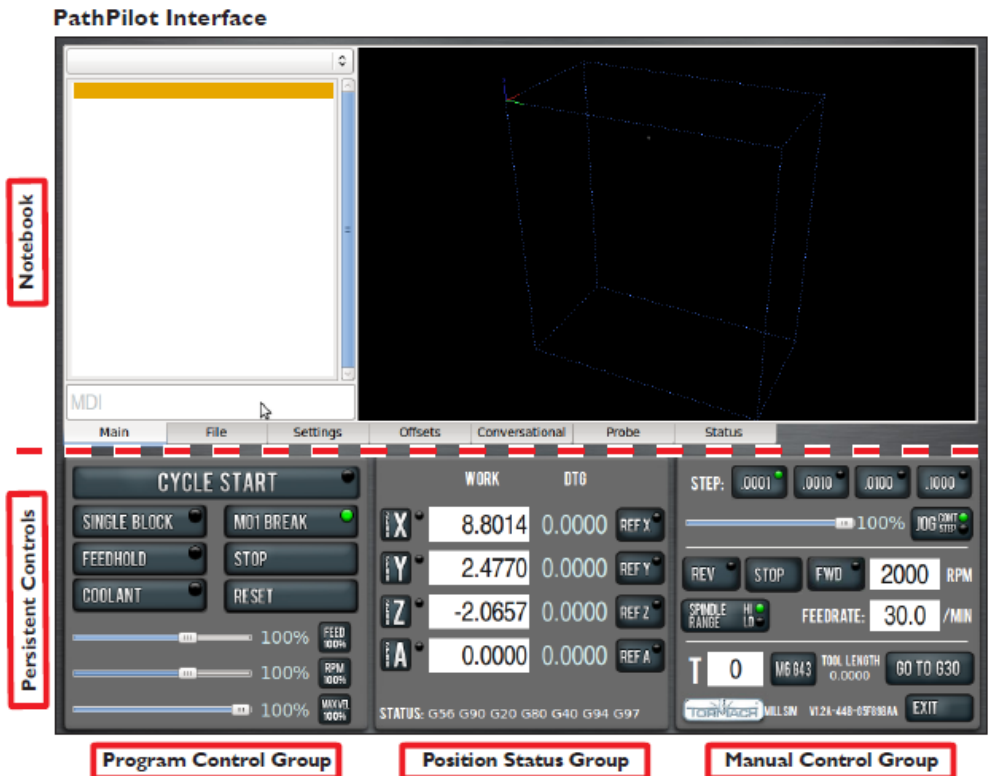
Control Panel:

The main operator control panel contains the following physical buttons:

- Spindle Lockout Key (spindle will not turn unless key is in on position)
- Start
- E-stop
- Controller On/Off
- Coolant On/Off/Auto
- Spindle Manual/Auto
- Spindle Start/Stop
- Spindle Forward/Reverse
- Spindle RPM

Note that some of these buttons apply only for manual operation of the machine.

PathPilot Interface:

PathPilot Interface

The PathPilot interface runs on the computer monitor located on the right side of the milling machine. Power to the computer must be turned on using the Controller switch on the Control Panel. In addition, the main power switch must be in the on position. You may also have to turn the computer's power switch on. Once the computer is booted, make sure PathPilot is running.

2) Starting and Stopping the machine

It is important to follow correct start procedure to ensure that machine control is in place before applying power to the spindle or axes motors.

IMPORTANT! *Do not power on motors and drives via the green Start button before powering on the controller that oversees their operation. Make sure that the controller is on and the PathPilot interface is loaded before powering on the mill. Likewise, make sure to depress the red E-stop before powering off the controller using the Exit button on the PathPilot interface (see **Figure 3.17**). Confirm that the mill powers off and on correctly using the procedure detailed in this section.*

Powering On:

1) **Turn on Main Power Disconnect**
2) **Ensure computer is on and PathPIlot is running**
3) **Press Green Start Button**
4) **Click Reset on PathPIlot Program Control screen**

Powering Off:

5) **Push the E-Stop button in**
6) **Exit PathPilot and click 'Power Off'**
7) **Turn off Main Power Disconnect**

3) Reference the Machine

The axes should be referenced to their home limit switches before performing any operations on the mill. Reference each axis by pressing the REF buttons on PathPIlot. The mill will move to its limit positions. It is advised to reference the Z-axis first to raise the head as far as possible from the work piece.

4) Set Work Offsets

After the machine is referenced to its limit switches as above, we must locate of the origin of the work coordinate system. The work coordinate system is determined when you design your toolpaths in your CAD program. Usually the origin is set at the top center or the top back left corner of the part, but this is not necessary. We will assume you have set your work coordinate system at the top left back corner of the stock. You must set the work coordinate system on the machine to correspond to the work coordinate system set in the toolpath. There are many ways to do this, however we will outline the most convenient method here.

Enter 0 in the PathPIlot tool readout and press the M6 G43 button:

Set the Z work offset

With no tool in the spindle, manually jog the Z position to touch off the face of the spindle on the face of the workpiece. You can use a piece of paper between the spindle and workpiece to sense the position. With the spindle face at the zero position, press the Zero Z button on the position digital readout (DRO).

Set the X and Y work offsets

Insert an edge finder into the tool holder and install in the spindle. Jog the X axis until the edge finder contacts the left face of the stock. Raise the spindle above the part and move it half the diameter of the edge finder. Press the Zero X button on the position digital readout (DRO). Repeat the procedure for the Y-axis.

Set the Tool Offset

You can now install your tool and touch off the workpiece to get the tool offset. Type 1 (or whatever tool number you have assigned in your toolpath) in the Tool DRO and click the M6 G43 button. Jog the tool down to touch off the tool.

Now switch to the Offsets tab. Enter 0 and click the Touch Z button.
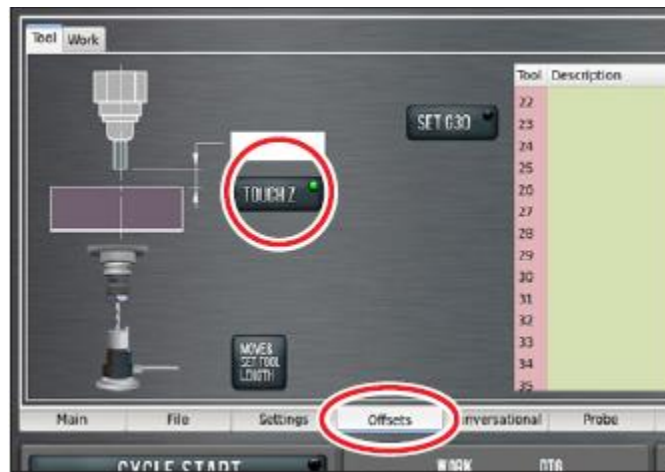
Verify the tool length in the tool description table and enter the tool diameter.

5) Load your G-Code

Insert your USB key. And switch to the File Tab. On the Hard Drive Window, navigate to the location where you want your file to be placed. Select your file on the USB window, and click COPY FROM USB. Don't forget to eject your USB key.

Select your file on the Hard Drive Window and click Load G-CODE.

6) Air Pass and Cycle Start

It is highly advised that you run an **air pass** prior to your first cutting cycle. Manually raise the spindle a set distance (e.g., 2 inches) above its zero position. Click Zero-Z on the position DRO to temporarily set the work coordinate system above the work piece. Press Cycle Start and observe the machine operation. If the operation is correct, lower the spindle back to the workpiece and re-zero the work coordinate system. Make sure you are back at the start of your G-Code file and click Cycle Start. Be prepared to click the STOP button on PathPIlot or to hit the E-Stop if things don't go as expected.