

January, 3 2022

White Paper

Limit Switch Operation

SMX 3-Axis Knee Mill Ballscrew Assembly

ProtoTRAK SMX CNC Software Version 2.0 and higher was changed to allow Z-retract to be set at the top limit switch, which allows for greater Z-axis travel.

How the software works for SMX CNC Version 2.0 and higher:

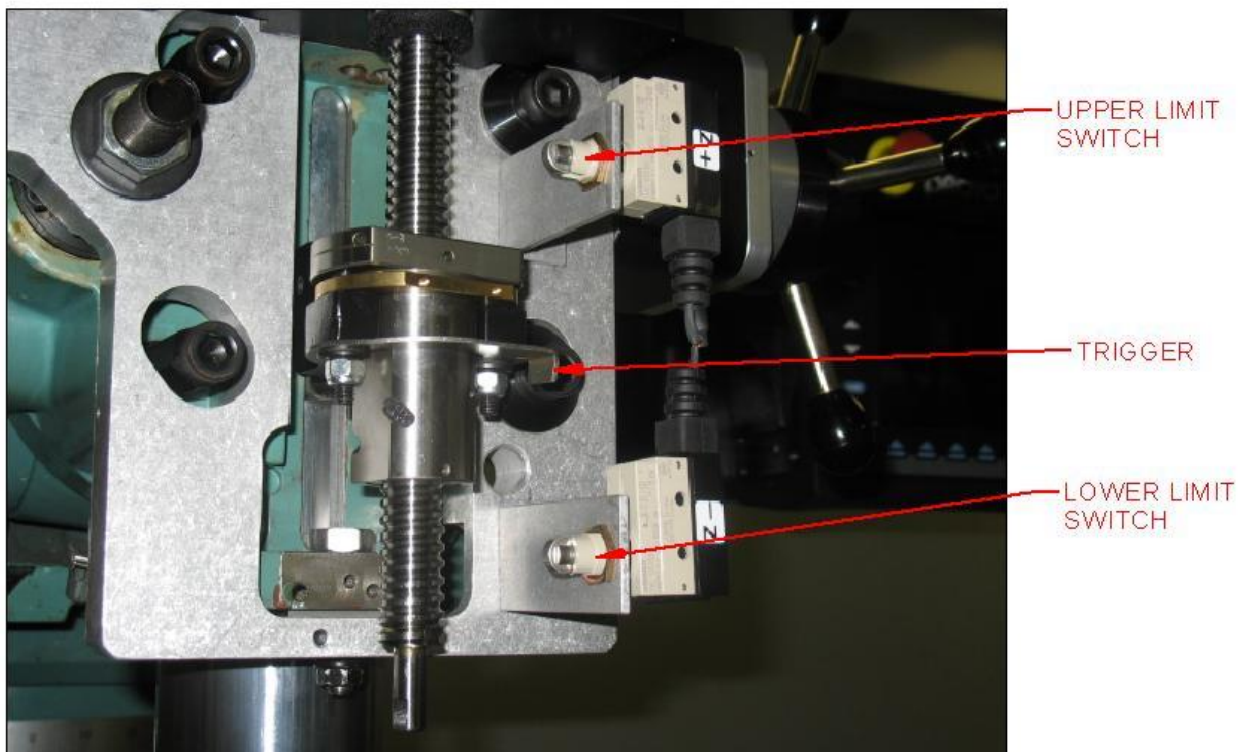
1. Limit switches are used to stop the Z-axis from traveling too far up (top limit switch) and too far down (bottom limit switch). This paper only addresses the top limit switch, which is labeled on the machine as Z+. Refer to the photo on P. 2
2. You can set Z-retract at the same position as the top limit switch, but you are **not** able to set Z-retract above the top limit switch.
3. The software ignores the top limit switch until the Z-axis reaches retract position. When the Z-axis reaches retract, the software begins to monitor the top limit switch. This allows the Z-axis to move as high as the switch, which will then be triggered.
4. Until Z-retract position is manually set, the software will use ABS ZERO as Z-retract. ABS ZERO is the current position of the Z-axis when the power is turned on. As in Step 3 above, if the Z-axis is traveling up toward ABS ZERO, the software ignores the top limit switch until the Z-axis reaches ABS ZERO.
5. Z-retract position remains constant and is not affected when a user rezeros his part. For example, if a user zeros the part 2 inches higher than his previous part, the retract position will not increment 2 inches higher.

Note: If properly installed, the Z-axis can **never** be moved above the top limit switch in normal operation.

Installation and Service. Be careful to note the following:

1. The top limit switch should be installed approximately one revolution of the ballscrew or 0.200" below the hard stop of the machine. This will ensure that the quill will not crash at rapid quill speed.
2. **Turn off the ProtoTRAK control power** if the timing belt is removed or if the motor is unplugged to avoid a possible crash. If the power is left on while the Z-axis belt is removed, ProtoTRAK could lose track of the Z position, ignore the top limit switch and crash.

3. Before booting up, the limit switch trigger on the ballnut **must** be positioned between the two limit switches. Refer to the photo on P. 2.
4. If the top limit switch is not operating properly, verify if it is being activated as follows:
 - a. Run Service Code 328. Select **#29 (3rd Axis Limit Z+)**. To test, manually depress the switch.
 - b. For Knee Mills with Program Spindle Control, you can also see if the limit switch's corresponding LED is lit in the AC Drive Module. The top limit switch is referred to as "Z Limit Plus."
5. If a limit switch is not properly connected, it will remain in a triggered state, which means that the Z-axis cannot move.



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