LATHE COORDINATES – GENERAL OVERVIEW

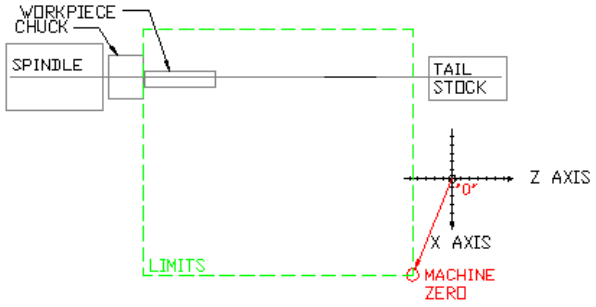
Mach lathe provides three coordinate displays namely:
- Machine Coordinates
- Part Coordinates
- Program Coordinates

The following is a general description of each.

MACHINE COORDINATES

Machine Coordinates are absolute distances from a fixed point, namely “0”. For the X axis the DRO (DIGITAL READ OUT) displays in terms of radii. For CNC machining the + or – are indicative of the direction as related to the distances from the fixed point of “0”.

The CNC controller (Mach) does not know where “0” is initially so when the controller is turned on it monitors axis movement starting from a “0” value for each axis and displays the movement. The user must define to the controller where “0” is relative to a user defined boundry of available movement. The user defined envelope of available movement is called LIMITS. The defined point within or on the limits is then called MACHINE ZERO. Machine Zero can be anywhere but usually it is set at an extreme location of the limits.

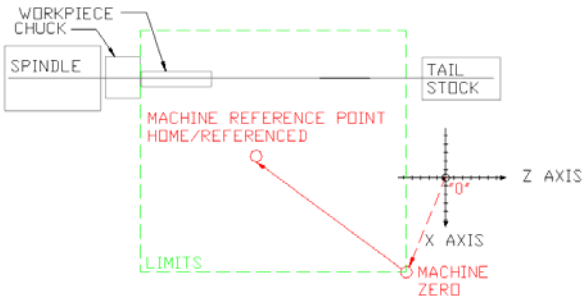


Machine Zero can be defined by the user a number of different ways.
- Clicking the World X & Z buttons will define the current location as Machine Zero.
- Switches, an device used to indicate on or off / opened or closed condition, can be used to automate the act of moving the axes to Machine Zero based on how the limits are configured.
- Soft Limits are simply software / controller limits defined by the user where no switches or devices are used to automatically find Machine Zero. Thus the term “soft”.

Simplistically the controller just needs to know where Machine Zero is before relating Machine Zero to other lathe positions, coordinates, and specific reference points.

One lathe position is called Home. Home is an absolute distance away from Machine Zero and the distance / coordinate value can be positive, negative, or even zero. The user must define home to the controller. Thus when the axes are moved away from

Machine Zero to some desired location the user would define that position to the controller by some action, and the machine is said to be Referenced. This reference position is used many times as a place to change tools or just to set the machine to a particular coordinate position. The machine is now said to be Homed / Referenced / at Machine zero.

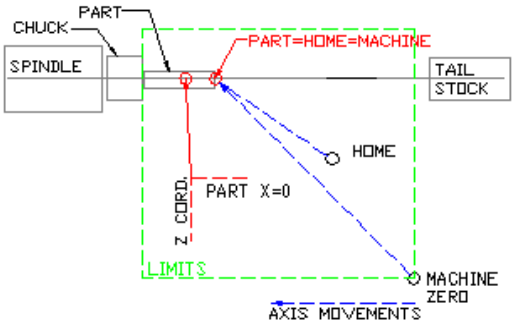


The home position is set by the user a number of different ways.
- Clicking the Set Home X & Z buttons
- Clicking The Ref All Button
- The position is automatically set based on configuration of the switches via Home Off setting.
- Soft limits are used to return from a start up position other than home via homing routines.

NOTE: The above descriptions were used in the context for understanding of machine coordinates. Specific reference points will be defined later as they relate to the machine coordinates.

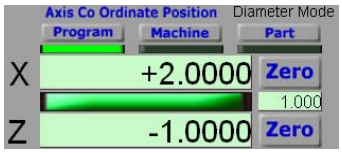
PART COORDINATES

Part Coordinates are distances from a fixed point which was defined in Machine Coordinates. For the X axis the DRO displays in terms of radii or diameter based on the users lathe configuration. The controller needs to know where the part is relative to machine coordinates. Part is the piece in the headstock to be machined as discussed here. The part zero can be located anywhere along the z axis. The part has coordinates associated with it and normally the center of the part is on the lathe X=0 axis. The software can't properly control the machining of the part if it doesn't know where the part is. Part coordinates can be equal to or even the same as Machine Coordinates. Thus defining the part location is very dependant on how a user sets up a job including how the gcode program was created. So part coordinates are used to relate or define where the part is relative to the machine coordinates.



PROGRAM COORDINATES

The “Program” contains all the Gcode instructions for machining. The controller uses the program instructions to control axis movement and additionally other associated hardware. The Program Coordinates “DRO” shows were the tool is relative to the part. There will be no difference between the program and part coordinates if there are no tool offsets or work offsets called for in the program. Additionally if there is no tool compensation. *…….need additional specific info.……..*



COORDINATE SUMMARY

There are three different coordinate systems, each related to a specific point, but all are related to each other “after” setup. When alternately selecting one of the DRO’s the controller will show the differences (if there are any) or relationship between them. Lathe setup and use defines to the controller how they are related.