8050/55 M,T CNC resolution, gain & following error set-up

NOTE:

This procedure goes through the axis resolution, gain and following error adjustment starting from the very beginning. It is not required to repeat it after the machine fully set-up. Although it is recommended to check the following error values after the machine components (motors, slides etc.) are moved or changed and adjust it if necessary.

step1: Get the max. rpms (revolution per minute) of the motor.
Example: **MAX. RPM** =2500 rpms

step2: Get the pitch of the leadscrew (in inch per revolution of the leadscrew)
Example: **LEADSCREW PITCH** = 0.250"/rev.lead
and number of lines per revolution of the encoder.
Example: **NPULSES** = 1000 lpr

step3: Get the gear ratio between motor **(assuming the encoder is mounted on the motor)** and the leadscrew (in revolution of the leadscrew per revolution of the motor)
note: if the encoder is mounted directly to the spindle, assume the gear ratio is 1
Example: **GEAR RATIO** = 1 rev. lead / 5 rev. of motor (encoder)
Calculate the overall pitch as the distance per revolution of the motor (encoder):
PITCH = LEADSCREW PITCH * GEAR RATIO
Example: **PITCH =** 0.250 * 0.2 = 0.050"/rev.encoder

step4: Calculate maximum linear feed allowed by the machine:
MAX. FEED = MAX. RPM * LEADSCREW PITCH * GEAR RATIO
Example: **MAX. FEED=** 2500 * 0.250 * 0.2 = 125"/min.

step5: Enter the above calculated values into machine parameter for the Axis:
P7 = PITCH = distance per revolution of motor =0.05"/rev. encoder
P8 = NPULSES = 1000 lines per revolutuon of the encoder
P38= G00FEED = 110"/min (note: less than calculated in step4)

step6: Calculate Proportional Gain for the selceted G00 feedrate:
PROGAIN=(9500mV * 39.37) / G00FEED
Example: **PROGAIN =** (9500mV * 39.37) / 110"/min= 3400mV
(39.37 is a **constant**)
Enter this value into the parameter for the axis: **P23= PROGAIN**=3400mV

step7: Set the Feed Forward Gain equal 0: **P25 = FFGAIN = 0**
If necessary use Acceleration/deceleration Time parameter (for big axis):
Example: **P18= ACCTIME =** 200 ms (milliseconds)

step8: Using the enclosed program for axis adjustment run each axis separately back and forth and use the Following Error display to monitor the following error. What you are adjusting for is to have:

0.1100" of the following error for feedrate equal to 110"/min.

For more accurate readings start with Feedrate Override Switch set to 10%. When running at 10%what you are looking for is:

.0110" of the following error for feedrate of 110"/min (10% of G00)

Use **SIGNAL POT** of the servo drive to tune the axis for appropriate value of the following error. Also you should monitor the CNC analog output voltage on the signal input to the servo drive. What you look for as far as voltage is to have:

+/-9.50 Volts for max. feedrate (100% of G00) or

+/-0.95 Volts for 10% of G00

step9: Now if the axis is almost adjusted you need to take care of the possible servo-CNC axis offset. In other words to balance (have the same value) the following error in both (+ and -) directions. Use the **BALANCE POT** of the servodrive to do this.

step10: Calculate the resolution (just for your information). Note CNC multipying factor of 4 for square wave feedback systems: **PITCH** 0.050"/rev. encoder
RESOLUTION = ---------- ---------- = 0.0000125"/pulse
NPULSES * 4 1000 lpr * 4

step11: Now Feed Forward GAIN can be set t 80, **P25= FFGAIN** = 80 to further reduce the following error.
Note: If the axis performance is acceptable Step 11 is not necessary.

NOTE:
You should adjust one axis at a time and then run both axis together as a final test.
More information about each parameter we used can be found in installation manual Chapter 3.3.2 Machine Parameters for the Axes:

THE PROGRAM TO ADJUST THE FOLLOWING ERROR:

```
%FOLL.ADJ,MX,
;--------------------------------
; X AXIS
;--------------------------------
G70 G05 G90 G00
N10 X10
G4 K5
X0
G4K5
(GOTO N10)
;--------------------------------
;Z AXIS
;--------------------------------
G70 G05 G90 G00
N20 Z10
G4K5
Z0
G4K5
(GOTO N20)
;--------------------------------
; X AND Z AXIS TOGETHER
;--------------------------------
G70 G90 G01 F100
N30 X5 Z5
G4 K5
X0 Z0
G4 K5
(GOTO N30)
```