CNC Milling

Typical work configuration

- bar stock, cut to length
- gripped in step jaw

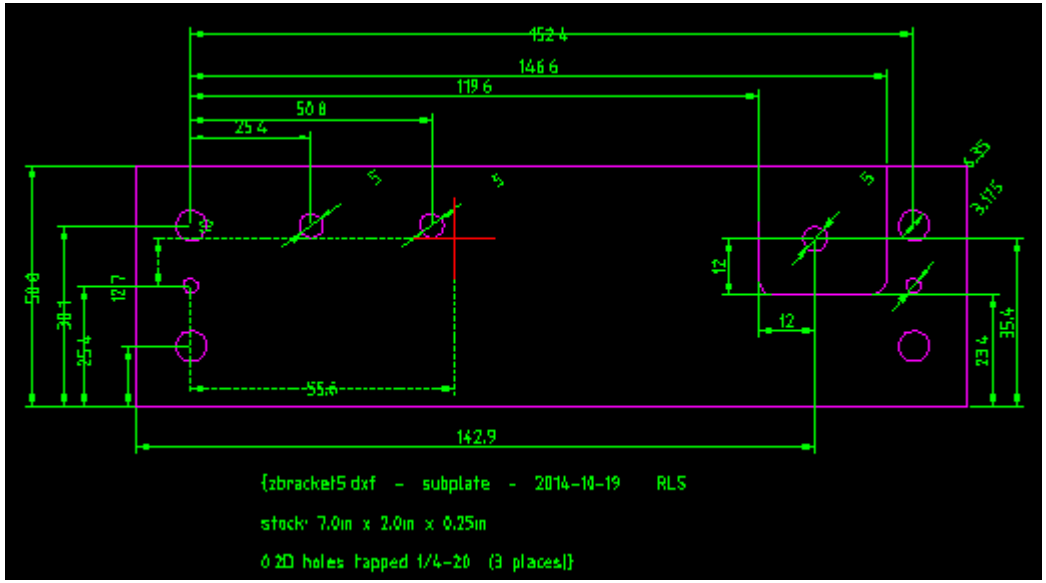
Typical machining process

- face top
- profile edge
- machine top features
- flip part, face bottom
- machine bottom features
- flip part to edges needing machining ops

CNC Milling

Simple bracket machining

- rectangular bar stock, sawed to length
- no facing or profiling
- spot and drill holes
- machine pockets and bores



CNC Programming for Mill

- Example CNC program – drills four holes
- Haas manual at:
  k:\class\engr\480\haas\usermanual.pdf or at
  http://engr.wallawalla.edu/engr480/docs/Haas

G-Codes for Milling

G00	Rapid positioning
G01	Linear interpolation (feeding)
G02	CW Circular interpolation
G03	CCW Circular interpolation
G04	Dwell
G20	Inch system
G21	Metric system
G28	Return to reference point
G43	Tool Length Compensation

G-Codes for Milling

G54-G59	Select work coord system
G65	Macro call
G70	Bolt circle cycle
G81	Drill canned cycle
G83	Peck drill canned cycle
G84	Tapping canned cycle
G90	Absolute coordinates
G91	Incremental coordinates
G98	Initial point return

M-Codes for Milling

M00	Program Stop
M01	Opt. Program Stop (panel controlled)
M03	Start spindle (normal rotation)
M04	Start spindle (reverse rotation)
M05	Stop spindle
M06	Tool change
M08	Start coolant
M09	Stop coolant
M30	Program end

Example Program

```
%
O01001
(DRILL EXAMPLE - 2013-04-05)
(OP1- TOP SIDE)
(STOCK- 2IN X 2IN X 1/4IN)
(G54 ZERO- LEFT FRONT TOP)

G54
G00 G40 G90 G17 G20
(SPOT DRILL HOLES)
T7 M6
G43 H7
S2000 M3
M8
G0 X0.50 Y0.50 Z0.1
G81 Z-0.1 R0.1 F10.; (CANNED DRILL CYCLE)
X0.50 Y1.00
X1.00 Y1.00
X1.00 Y0.50
G80 G00 Z0.1;(CANCEL CANNED CYCLE)

M9
M5
```

```
(DRILL 1/4IN HOLES)

T9 M6
G43 H9
S2000 M3
M8
G0 X0.50 Y0.50 Z0.1
G83 Z-0.35 Q0.1 R0.1 F10.0
X0.50 Y1.00
X1.00 Y1.00
X1.00 Y0.50
G80 G00 Z0.1

G00 Z6.0

M9
M5

M30
%
```

Loading CNC Program

- Copy to K:\class\engr\cnc as haascode.txt
- Press List Prog
- Type program number (O01234)
- Press RECV RS232