G AND M CODES

Chapters 7, 8, & 9
Review

- Program Planning
  - How, who, and when to program

- Program structure
  - Character
  - Word
  - Block
  - Program
Objective

- Gain working knowledge of Program terminology and structure
- Gain working knowledge of G codes and functions
- Gain working Knowledge of M codes and functions
Format

- New controls will read X, Y, and Z in any order
- G or M codes can also go anywhere on a line
- Some controllers will let you put more than one M code on a line

For consistency and ease of troubleshooting we will always keep
  - X, Y, then Z
  - G codes at the beginning
  - Only on M code per line or on its own line
Format

- Positive Signs may be omitted for any dim. Value
  - $X+25 = X25$

- Leading zeros could be omitted but trailing cannot
  - $M1 = M01$ and $G0 = G00$
  - $M1$ IS NOT $M10$

- For consistency and ease of troubleshooting we will always keep
  - Leading zeros
Format

- G = Preparatory command
- M = Miscellaneous function
- D = Offset number (milling)
- X, Y, Z = Coordinate word
- N = Sequence number
- H = Tool length offset
- S = Spindle speed
- F = Feedrate
- T = Tool Function
- / = Skip block
- B = indexing function
PREPARATORY COMMANDS
Preparatory Functions

- Preparatory Functions are G codes that make the machine do a specific function
- Some G code are MODAL – they are used until replaced by a code in the same group
  - All except Group 00
- Some G codes are NON-Modal – they are only active for one block
  - These are Group 00

- NOTE: if two G codes are given in the same line the LATTER one is used
  - N10 G01 f10 G00 X1 Y1
  - This will move at a rapid feed!
Common G Codes

- G00 – Rapid traverse
- G01 – Linear interpolation at feed rate (F)
- G02 – Move in an arc in a CW direction at feed rate (F)
- G03 – Move in an arc in a CCW direction at feed rate (F)
- G81, G82, G83, G84, G85 – are all fixed cycles for drilling tapping and boring
MISCELLANEOUS FUNCTIONS
Miscellaneous Functions

- Miscellaneous functions – M codes – identifies a machine function

- There are literally too many to name or remember

- They will typically not make the machine move in any axis rather they control the machine

- They are typically at the end of the block but will function logically
  - *Type A operate at the start of a axial move*
  - *Type B operate at the end of an axial move*
Miscellaneous Functions

- Miscellaneous functions that control machine related functions such as
  - Spindle rotation
  - Tool change
  - Pallet change
  - Coolant
  - Tailstock

- Miscellaneous functions that control program related functions such as
  - Feed rate override
  - Clamping
  - Subprogram call or end
  - End of program
Common M Codes

- M00 – Program stop
- M01 – Optional stop
- M02 – End of program
- M03 – Spindle CW
- M04 – Spindle CCW
- M05 – Spindle stop
- M06 – Tool Change
- M08 – Coolant on (pump)
- M09 – Coolant off (pump)
- M30 – Program end with reset and rewind
OTHER COMMANDS
Other Important Modal Commands

■ F – Feed – Modal command is expressed as
  - *Mill* – *inches per minute*
  - *Lathe* – *Inches per revolution*

■ S – Speed – Modal Command is expressed as RPM

■ Both remain in effect until changed by another Speed or Feed command
Others

- **N** – Number – used to keep program in order
- **/** – Skip – Skips block if selected on control panel
- **H** – Height offset for tools
Homework

- Will be given at the end of Lab tomorrow

- Look for QUIZ coming soon to a classroom near you
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