



# 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 one 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

The image features two large, thick black L-shaped brackets. One is positioned on the left side, with its vertical bar extending downwards and its horizontal bar extending to the right. The other is on the right side, with its vertical bar extending upwards and its horizontal bar extending to the left. These brackets frame the central text.

# 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

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# 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 an 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

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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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