

## SECTION II

### PROGRAMMING FORMAT SUMMARY

#### 2.1 REFERENCE STANDARDS

EIA RS-227A	One Inch Perforated Tape.
EIA RS-267A	Axis and Motion Nomenclature for Numerically Controlled Machine Tools.
EIA RS-274C	Interchangeable Perforated Tape Variable Block Format for Positioning, Contouring and Contouring/Positioning Numerically Controlled Machines.
EIA RS-281A	Electrical and Construction Standards for Numerical Machine Control.
EIA RS-358	Subset of USA Standard Code for Information Interchange for Numerical Machine Control Perforated Tape.
USAS X3.4-1967:	USA Standard Code for Information Interchange.

The Bridgeport CNC control utilizes a word address, variable block length tape format conforming to EIA RS-274C. If columnized listing is desired, tab characters may be included between words, but will be ignored and removed by the control system during the storage process. Leading zeros may be omitted from any words in the format. As a programmer's option, trailing zeros after a specified decimal point may be omitted from axis motion data. Multiple G functions are permitted in any one block.

#### 2.2 LETTER ADDRESSES

The following letters are used to address registers.

N	-	Sequence Number
G	-	Preparatory Function
X	-	X axis command
Y	-	Y axis command

- 701
- Z - Z axis command
  - R - Radius from specified center BOSS 5 and 6
  - A - Angle, position is measured ccw from a +X vector BOSS 5 and 6
  - I - X axis arc center offset
  - J - Y axis arc center offset
  - K - Z axis arc center offset
  - F - Feedrate
  - S - Spindle Speed (Ref)
  - T - Tool Select
  - M - Miscellaneous Function

NOTE: Although words within a block may follow any convenient sequence, it is recommended that the above order be maintained.

If redundant letter addresses are used, the last word with its address will apply. The exceptions to this constraint are G - codes, which may be multiple per block and X Y Z A when they appear within a canned cycle.

Non-functional characters other than those defined (Figure 4-4) as valid by USAS X3.4-1967 including EIA RS-358 will be ignored by the control.

## 2.3 PROGRAM ENTRIES

### Rewind Stop

%

### 2.3.1 Definition Block

•

### 2.3.2 Slash Code:

/ (delete code and value separation)

### 2.3.3 Sequence Number Letter Address: N

Range: N0 to N19999

### 2.3.4 Preparatory Function Letter Address: G

Maximum Number of Digits: 2

T.0005

15  
60

Codes:

- G00 - (Modal) Rapid Traverse, point-to-point positioning 120. IPM
- G01 - (Modal) Linear Interpolation, Feed .2 - 32.0 IPM
- \*G02 - (Modal) Circular Interpolation Arc CW
- \*G03 - (Modal) Circular Interpolation Arc CCW
- G04 - (Modal) Dwell
- G17 - (Modal) XY Plane
- G18 - (Modal) ZX Plane
- G19 - (Modal) YZ Plane
- G30 - (Modal) Cancel Sign Reversal
- G31 - (Modal) Reverses Programmed Direction of X axis
- G32 - (Modal) Reverses Programmed Direction of Y axis
- G40 - (Modal) Cutter Diameter Compensation OFF BOSS 5 and 6
- G41 - (Modal) Cutter Compensation Left BOSS 5 and 6
- G42 - (Modal) Cutter Compensation Right BOSS 5 and 6
- G70 - (Modal) Select Inch Dimension System
- G71 - (Modal) Select Metric Dimension System
- G72 - (Modal) Transformation Off BOSS 5 and 6
- G73 - (Modal) Transformation On *Rotation scaling Reduce or increase* BOSS 5 and 6
- G74 - (Modal) Circular Interpolation
- G75 - (Modal) Multiquadrant Circular Interpolation BOSS 5 and 6
- G77 - (Non-Modal) Facing Cycle
- G78 - (Non-Modal) Pocket Mill Cycle
- G79 - (Non-Modal) Rough Bore Milling Cycle
- G80 - (Modal) Fixed Cycle Cancel
- G81 - (Modal) Drill Cycle
- G82 - (Modal) Spot Facing Cycle *use decimal point at beginning of line.*
- G83 - (Modal) Deep Hole Drilling Cycle *remove chips*
- G84 - (Modal) Tapping Cycle *needs tapping head.*
- G85 - (Modal) Boring Cycle
- G86 - (Modal) Boring Cycle *spindle stop before with drawing tool*
- G87 - (Modal) Chip Breaking Deep Hole Drilling Cycle *Break chip. approx. 0.50*
- G89 - (Modal) Boring Cycle *Dwell time needed G4*
- G90 - (Modal) Absolute Programming Mode *Measuring from a point of origin.*
- G91 - (Modal) Incremental Programming Mode *point to point movement.*
- G92 - (Non-Modal) Preset Absolute Registers
- G99 - (Non-Modal) Deceleration Override for 2.8 ipm and above

$\frac{1.18}{2.000} \cdot \frac{24}{60} = .18$

*Z and F values. but no X Y if it is a defn.*  
*X*  
*signed*  
*line cancels the start*

**\*Non-Modal in G75 Multi-Quadrant Circular**

**2.3.5 X Axis Command: X**

Range: Inch X 000.0001 to ± 999.9999 (in)  
Metric X 0000.01 to ± 9999.99 (mm)  
(See departure limitations in certain operations)

**2.3.6 Y Axis Command: Y**

Range: Inch Y 000.0001 to ± 999.9999 (in)  
Metric Y 0000.01 to ± 9999.99 (mm)  
(See departure limitations in certain operations)

**2.3.7 Z Axis Command: Z**

Range: Inch Z 000.0001 to ± 999.9999 (in)  
Metric Z 0000.01 to ± 9999.99 (mm)

2.3.8 Arc Center Offset (X Axis): I

Range: Inch I 000.0001 to 999.9999 (in)  
Metric I 0000.01 to 9999.99 (mm)

2.3.9 Arc Center Offset (Y Axis): J

Range: Inch J 000.0001 to 999.9999 (in)  
Metric J 0000.01 to 9999.99 (mm)

2.3.10 Arc Center Offset (Z Axis): K

Range: Inch K 000.0001 to 999.9999 (in)  
Metric K 0000.01 to 9999.99 (mm)

2.3.11 Feedrate Letter Address: F

Range: IPM F2 to F510 increments of .1 ipm (BOSS 6)  
IPM F2 to F320 increments of .1 ipm (BOSS 4 and 5)  
(MMPM) F5 to F812 in increments of 1 mm/min

Note: If a value greater than 320 is input, the feed will default to F320. (F510 BOSS 6)

2.3.12 Spindle Speed Letter Address: S

Range: S10 to S9999 representing 10 RPM to 9999 RPM for display purposes only. (Display will drop last digit.)  
Input of S 1554 will display 155.

2.3.13 Tool Select Letter Address: T

Range: T1 to T24

2.3.14 Miscellaneous Function Letter Address: M

Maximum Number of Digits: 2

Miscellaneous Function action relative to axis move in same block of data.

<u>Code</u>	<u>Before</u>	<u>After</u>	<u>Non-Modal</u>	<u>Function Action</u>
*M00	X	X	X	Program Stop <i>for adjusting or check</i>
*M01	X	X	X	Optional Stop <i>only when tape reader is set</i>
*M02	X	X	X	End of Program & Rewind
*M06	X	X	X	Tool Change
M25	X			Z Axis home <i>3 movements to avoid hitting a boss or clamp</i>

\*Stops spindle before Axis Motion.

2.3.15 Rewind Letter Address: E (Paper Tape Rewind Only)

E (used only when loading 80 ft. of tape or less)

Must follow the last line of program data:

N250 G0 X-4.0Y4.0M2 (CR) (LF)  
E(CR)