5 AXIS PROGRAMMING
OVERVIEW

• Haas Control
• 5-Axis Theory
• 5-Axis Control
• CAD-CAM Programming
  – Tool Paths and Geometry
  – Tool Axis Control
• Feed Rates
• Posting
• Troubleshooting G-Code
• Machine Set-up
### HAAS CONTROL

#### Work Zero Offset

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**X Position:** -9.0000  Write  Add/F1  Set/Offset Toggle

Jogging X Axis Handle .01
Configurations

- Head-Head
- Head-Head
• Head-Head
• Head-Head
• Head-Table
• Head-Table
• Head-Table
• Table-Table
• Table-Table
• Table-Table
• Table-Table
Simultaneous Dual Axis Rotary and Linear Motion

- Rotary Axis Brakes
  - Unclamp - M11-4th, M13-5th
  - Clamp - M10-4th, M12-5th

- Calculating Rotary and Linear Speeds
  - \( \pi \times D/360 = \text{Inches per degree} \)
    - \( D = \text{Diameter (Distance from rotation centerline to tool tip, multiplied by 2)} \)
    - \( \pi \times D = \text{Circumference} \)
    - \( 3.14 \times 4./360 = 0.035''/\text{deg.} \)
  - \( \text{IPM/Inches per degree} = \text{degree per min.} \)
    - \( 75/0.035 = 2143 \text{ degrees per min.} \)
    - Maximum feed on the VF6TR is 2000deg/min
    - Max feed on the VR series is 600 deg/min
Simultaneous Dual Axis Rotary Linear Motion

• Inverse Time - G93
  ➢ F = Strokes per minute
    ○ F = Inches per minute / stroke length
  ➢ If F=120., each stroke takes 60/120=.5 seconds to complete
  ➢ An F value is required for each interpolated motion
Parameters and Settings

- Parameter 104/165 - In Position Limit
- Parameter 302 - Feed Acceleration
- Parameter 303 - Feed Time Constant
Parameters and Settings (cont)

• Parameter 314 - Feed Delta V
• Setting 85 - Max Corner Rounding
  ➢ G187 - Accuracy Control
5-Axis Programming

• Tool Paths and CAD Geometry
• Tool Axis Control
• Feed Rates - Inverse Time
• Posting the G-Code
• Troubleshooting bad programs
  – Non-uniform rotary and/or linear output
Mastercam Demonstration

- Toolpath and CAD Geometry
- Tool axis control
- Posting the G-code
- Inverse time feed rates
Troubleshooting Bad Programs

• Troubleshooting bad code
  – Non-uniform rotary and/or linear output
Machine Set-up

• Setting up the Trunnion
• Finding the Centerline of Rotation
• Setting Machine Offsets
  ➢ Trunnion
  ➢ VR series
• Setting Tool Offsets
  ➢ Trunnion
  ➢ VR series
• Dry Run
Tool Length Offsets
VR Series
Tool Length Offsets
VR Series
Offsets
Trunnions

Use indicator and sweep Platter to align Trunnion
Tool Length Offsets
Trunnions

Z Offset from Centerline of Rotation to Fixture

Tool Offset to Fixture
Offsets (cont)

Trunnions

Use indicator to find center of Bore for X and Y Offsets

Touch Tools to Fixture