CHAPTER 8

FEED FUNCTION (F FUNCTIONS)

8.1 OVERVIEW

F codes consist of the address F followed by the numeric value of
the desired feedrate. No sign of direction (+ or -) can be in a
feedrate word.

Programmed F-words express feedrate in inches per minute if G70
is active, and in millimeters per minute if G71 is active.
F-words are modal; that is, the active programmed feedrate
remains active until the control executes another F-word.

8.2 RAPID TRAVERSE FEEDRATE

A G0 (rapid traverse) command is given to cause rapid motion
between points. G0 will override the set feedrate. However, if
a subsequent G1, G2 or G3 block is programmed, the feedrate
previously in effect will resume. If the data block contains X,
Y and Z data and the Z move is negative (quill down), the XY move
will occur first, then the Z move. If the Z move is positive
(quill up), the Z move up will occur first, then the XY move. XY
motion will be approximately linear at the rapid traverse rate
within a tolerance band of .01 inch.

The rapid traverse rates are as follows:

XY Axis	250 ipm (6350 mm/m)
Z Axis	200 ipm (5080 mm/m)

In Block mode and in Setup, override can be applied to the rapid
traverse rate using the feedrate override knob with override
enabled.

8.3 CUTTING FEEDRATE

The following is the range of input feedrate commands:

G70 (Inch)	.1 to 100.0 ipm
G71 (Metric)	1. to 2540. mm/m

The feedrate is clamped to the upper limit value. The system will maintain constant vector velocity in the feed range for both 3 axis linear and 2 axis circular interpolation, regardless of the slope of cut.

NOTES

1. Feed is inhibited until the spindle has been turned ON.

2. Decimal point programming <u>must</u> be used for feedrates except if the system is in the BOSS 4-7 Compatibility mode. Not using the decimal point will cause an ERROR condition.

3. Automatic acceleration will occur at the start of every move, deceleration at the end of every move. Deceleration in a particular block of data can be eliminated by programming a G99 code in the block. This technique is useful if subsequent motion is approximately tangential within 20 degrees and if the next move is greater than .05 inch.

8.4 FEEDRATE OVERRIDE

The active feedrate can be increased or reduced using the FEEDRATE OVERRIDE knob and the OVERRIDE ENABLE key. When override is enabled, rotating the FEEDRATE OVERRIDE knob enables the operator to vary the input feedrate from 10 to 125%. Rotating the knob to 0% will cause a feed HOLD condition and axis motion will be inhibited.

8.5 CONSTANT SURFACE FEED

A G45 command enables mofifying the feedrate during cutter compensated circular moves to maintain constant surface feed.

A G44 command will cuase normal input feedrates. G45 is the initialized reset program condition.

When programming feedrates for circular cuts, the ratio of the cutter path radius to the part surface radius affects the cutting rate, since the vector velocity is that at the center of the cutter, not at the surface of the material. This means that, in order to maintain a constant chip load when machining the outside of an arc, the feedrate should be increased according to the following:

$$\frac{PR+CR}{PR} \text{ multiplied by (programmed feedrate) = modified feedrate}$$

PR = Part radius
CR = Cutter radius

Referring to the example below: Arc #1 (Block N11)

Desired Feedrate = 10 IPM

PR=1.5"
CR= .5"

$$\frac{PR+CR}{PR} (10) \text{ IPM = Programmed Feedrate}$$

$$\frac{1.5 + .5}{1.5} (10) = 13.3 \text{ IPM};$$ Therefore, to maintain constant surface feed the feedrate should be increased to 13.3 IPM.

Conversely when maching the inside of an arc, the feedrate should be decreased according to the following:

$$\frac{PR-CR}{PR} \text{ multiplied by (desired feedrate) = modified feedrate}$$

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Referring again to the example below: Arc #3 (Block N13) and
                                        Arc #4 (Block N14)

Desired Feedrate = 10 IPM

$$PR=1.25" \quad \frac{1.25 - .5}{1.25} \quad (10) = 6 \text{ IPM}; \quad \text{modified feed}$$
$$CR= .5"$$

$$PR=8.5" \quad \frac{8.5 - .5}{8.5} \quad (10) = 9.4 \text{ IPM}; \quad \text{modified feed}$$
$$CR= .5$$


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;G41 ON, G45 ON
N11G2G90G99X1.414Y2.I1.414J1.414F10.
N12G99Y0J2.
N13G3G99X4.164Y.-.751.75
N14G99X9.82Y1.594J8.
N15G1X11.82Y3.594
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I DIA. CUTTER

.586

1.414

1.414

ORIGIN X=OY=0

75 RAD

2.344

PART SURFACE

5.656

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