CHAPTER 6

OPERATION IN RUN MODE

6.1 OVERVIEW

The Run mode is entered when a part progarm is in memory, ready for operation. If no program exists, one must be entered by any one of the following methods:

1. A paper tape reader
2. MDI STORE entered blocks
3. EZ-FILE
4. A local keyboard using the full edit capability
5. The EZ-CAM

The R2E3 operates in either Automatic (continuous operation of the part program), or in Block (Block-By-Block operation). In Block, the operations are resumed after each block by pressing START/CONTINUE.

6.2 NORMAL OPERATION

Pressing the AUTO/BLOCK key will alternate between the Automatic and Block-By-Block modes. If AUTO is in effect and BLOCK is activated, the control will finish the current block, go on to the next one and then stop. In Block, the program will be halted and axis movement interrupted at the end of every block that has axis motion. Non-motion blocks such as; G91, G90, G71, G70, G41 (Dwell), G96, G97XY, etc., on lines by themselves will change LED status and update axis registers but the program will not halt at the end of Non-motion blocks.

For example:

In Block Mode N50 G0X3.Y2. Machine stops execution at the end of the Rapid move. N55 G91 Machine will change mode to incremental and execute next block. N60 G1X2.Y2.F10. Machine stops execution at the end of the feed move.

NOTE

A loop call or a macro call is considered an executable block. A macro subroutine definition is nonexecutable.

6.2.1 Pre-Start

Check the oil level and lift the plunger two or three times on the automatic lubricator before starting the machine to ensure an adequate supply of lubricant to each way. Press the AUTO/BLOCK key to enable the Run mode.

Note the readings on the X and Y absolute registers. Make any necessary moves to place the tool in the correct position relative to the work piece by using the JOG/INCR controls. SELECT READOUT allows you to alternate between the X, Y or Z axis.

Turn on the spindle.

6.2.2 Starting The Spindle

Refer to Section 2.2, under Spindle Controls.

The steps required to initiate spindle motion are summarized below.

1. Select the speed range, HI or LO, with the lever found on right side of the ram head.

2. Press SPINDLE ENABLE while simultaneously moving the SPINDLE FOR CW ROTATION lever (on the Front Panel Control) to the HI or LO position. The spindle will turn on.

NOTE

If SPEED HI and SPINDLE HI, or SPEED LO/SPINDLE LO is chosen, the spindle will turn in clockwise rotation. If SPEED LO/SPINDLE HI, or its complement is chosen, the spindle will turn counterclockwise.

3. Turn the spindle off by pressing the SPINDLE OFF key (green LED will come on).

6.2.3 Program Run

The first time through the part program in AUTO or BLOCK the RESET PROGRAM must be used to initialize the various control registers. This sets the part program in the text memory to sequence number 0. The program will then advance to the first executable sequence number and proceed.

If an M0, M1 or M6 code is programmed in the middle of a part program, the operation will be interrupted. To resume, press START/CONTINUE. The first block of a part program could be:

N1G0G90X0Y0T1M6

This block of code will initialize the various programming registers. The M6, tool change, will cause the program to stop the quill move to the Home position, and move the XY slides to the coordinate stated. The LED in TOOL CHANGE will be on. START/CONTINUE will restart action.

NOTE

If the operator forgets to turn on the spindle, rapid traverse (G0) moves will be executed. Operation will be interrupted at the first FEED block, and the ENABLE SPINDLE message will be displayed. To resume operation, turn the spindle on, press START/CONTINUE.

At the end of a run, a program M2 command resets the program block pointer to the first programmed block. Press START/CONTINUE to start execution.

The program can be interrupted at any time by pressing the HOLD button. The program then can be resumed without error by pressing START/CONTINUE. During execution of the part program,

SELECT READOUT will cause the current axis positions (displayed on the screen) to toggle between either X and Y, or Z.

NOTE

When the HOLD key is in use, the FIND, DELETE, INSERT, and RECALL keys will be inaccessible. To discontinue the HOLD condition press the START/CONTINUE key.

6.2.4 AUTO/BLOCK Operation

Pressing the AUTO/BLOCK key will run a part program in either AUTO, automatic execution of the part program or BLOCK, block-by-block execution of part program. The default AUTO screen is:

```
-----------------------------------------
|N 1 0 0 0 T 0 0 0    S 2 4 0 0 F 2 0 0|
|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|
|X 1 . 7 5 0 0     Y 0 . 7 5 0 0        |
-----------------------------------------
```

N designates the sequence number of the current block being executed, T equals the Tool Number. The S and F alphanumerics represent the spindle speed and feedrate respectively, and X and Y the current positional coordinates of the X and Y axes with respect to part program zero.

Pressing START/CONTINUE will start program execution. Enabling the Run mode with the AUTO/BLOCK key will not change the position of the part program block line pointer.

6.3 SPECIAL OPERATIONS

6.3.1 The OPTION Key

```
-----------------------------------------
|O P T                  / D E L         |
|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|-|
|                                       |
-----------------------------------------
```

Pressing the OPTION key will cause the /DEL message to appear in the top right portion of the screen and EXECUTE causes the option and the LED associated with that option to come on. If EXECUTE is pressed a second time, the LED and the option will go off.

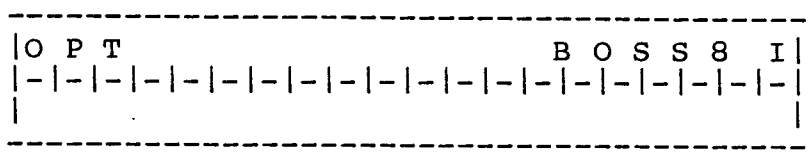
- /DEL - Activation of this function will cause the executive software (BOSS 8 I) to ignore any instruction contained in a programmed block preceeded by a slash (/).

- OP.STOP - Enabling this function allows a programmed optional stop (M1) to occur.

- METRIC - This option will run all input dimensions in the metric system during the operation of the part program.

In addition to the options listed on the key, 2 additional options will be displayed on the LCD screen but with no associated LED indicator. The first of these options provide the operator with the means to set baud rates. See section 4.7.1.

The second unlisted option is to provide compatability with part programs written for previous Bridgeport CNC machines; BOSS 4 through BOSS 7 systems. Initially, the following screen will appear:



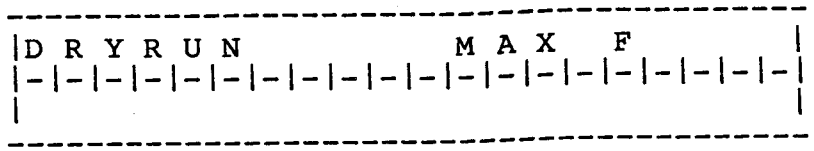
Once this option is reached, repeated activation of EXECUTE causes the screen message to toggle between BOSS 8 I and BOSS 4-7; EXECUTE enables the option currently on the screen. BOSS 8 I is the default condition following startup or reset.

NOTE

The OPTION key will be inactive during an MDI HOLD.

6.3.2 DRY RUN Key

The DRY RUN key enables a newly entered part program to be executed without tooling or workpiece to establish the program validity. Each time the key is pressed, the screen will advance from NO Z, MAX F, NO XYZ and a fourth unlabeled function on the key, BRKPT (Breakpoint). Any combination of these functions may be used.



As with the OPTION key, each listed choice can be enabled as it appears on the screen through EXECUTE.

NOTE

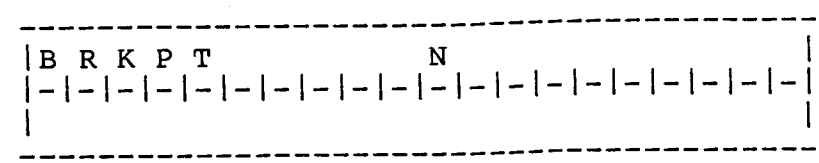
The DRY RUN keys will be inactive during an MDI HOLD.

- NO Z - Part programs can be "proven" with no Z axis movement, except for a tool change where the spindle will move up to "Home" position and establish a new NO Z plane of operation.The Z-axis can be brought down to a more convenient NO Z plane in SETUP without turning off the NO Z operation. In AUTO, the option must be terminated for the Z-axis to move from the home position.

- MAX F - Complete operation of the part program can be undertaken with maximum feedrate to examine program accuracy.

- NO XYZ - Dry runs without any axis movement are possible.

To use BRKPT, press the EXECUTE key. This will show a number prompt, then enter a sequence (N) number followed by EXECUTE. The program will stop before the designated sequence number is executed. The following screen will be displayed:



The BRKPT feature is used to allow the operator to stop at a convenient point in the program with the spindle on. When the BRKPT is reached, the display will read the first 40 characters on the block and the PROGRAM STOP LED will be on. The breakpoint register will then be cleared. The START/CONTINUE key will resume program execution at the breakpoint.

6.4 SPECIAL CONDITIONS

6.4.1 Travel Limit Switch

If a motion takes place which causes a travel limit switch to be reached, program operation will stop and the system will be cleared except for the content of the X, Y, Z absolute registers, the tool length offset registers, and the part program storage. Power to the drives will be disabled.

NOTE

The axes could have "lost" up to .1 inch with reference to the absolute register since the stop was abrupt and without deceleration.

To resume operation:

1. Press AXIS DRIVE ENABLE to restore power to the motors. Then use the various JOG options to move off the limit switch.
2. Home the machine. Correct the problem.
3. Using the FIND key search for a convenient restart point, preferably a tool change position.

6.4.2 EMERGENCY STOP

If the EMERGENCY STOP button is pushed, or power fails during part program execution, or the operator inadvertently switches the spindle off while a feed move is taking place, then the system will stop and be cleared. To resume, repeat steps 2 & 3.

6.4.3 Spindle Feed Hold

If a programmed feed block is transferred from buffer to active registers and the spindle has not been turned on, the system will go into a "Hold" condition, and the ENABLE SPINDLE message will come up. To resume operation, turn the spindle on and press the START/CONTINUE key.

NOTE

If the START/CONTINUE key is pressed before turning the spindle on, the HOLD LED will go out. To continue, turn spindle on, then press START/CONTINUE.

6.4.4 Feed Override

Feedrates may be overridden from 10% to 125% with the FEED OVERRIDE knob. Below 10% the system will be in a feed HOLD condition. Rapid traverse rates are not modified by the FEED OVERRIDE knob in the Run mode.

6.4.5 Hold

Program execution may be interrupted by depressing the HOLD button. The axis will be brought to a controlled stop. When in a HOLD condition the following keys will be ignored:

ALL YELLOW KEYS except; FIND, INSERT, RECALL, DELETE OPTION DRY RUN HOLD ALL SETUP KEYS AXIS DRIVE ENABLE RESET PROGRAM EM STOP

Following keys will perform their current functions:

OVERRIDE ENABLE COOLANT SPINDLE SPEED SPINDLE OFF/OFF SELECT READ OUT AUTO/BLOCK START/CONTINUE

6.4.6 Screen Error Messages

Errors detected by the system are displayed on the screen as a HEX code. The HEX code is listed in Appendix A.