

CHAPTER 2

OPERATOR'S CONTROLS AND INDICATORS

This chapter describes the keys, knobs and switches associated with operator controls on the milling machine. Descriptions include the location and purpose of each control.

2.1 OPERATOR CONTROLS

There are four groups of operator controls.

1. Front Panel Control
2. Power & Control/Axis Drive
3. Tape Reader Adapter/Remote Serial Interface
4. Lube and Pneumatic Control

2.1.1 Front Panel Control

The control keys and operating switches are color coded on the Front Panel in the following groups:

1. Machine Controls
2. EMERGENCY STOP
3. SET UP
4. RUN
5. Manual Data Input (MDI) and MDI STORE
6. Display Screen
7. Status LEDs

The groups mentioned above are shown in Figure 2-1.

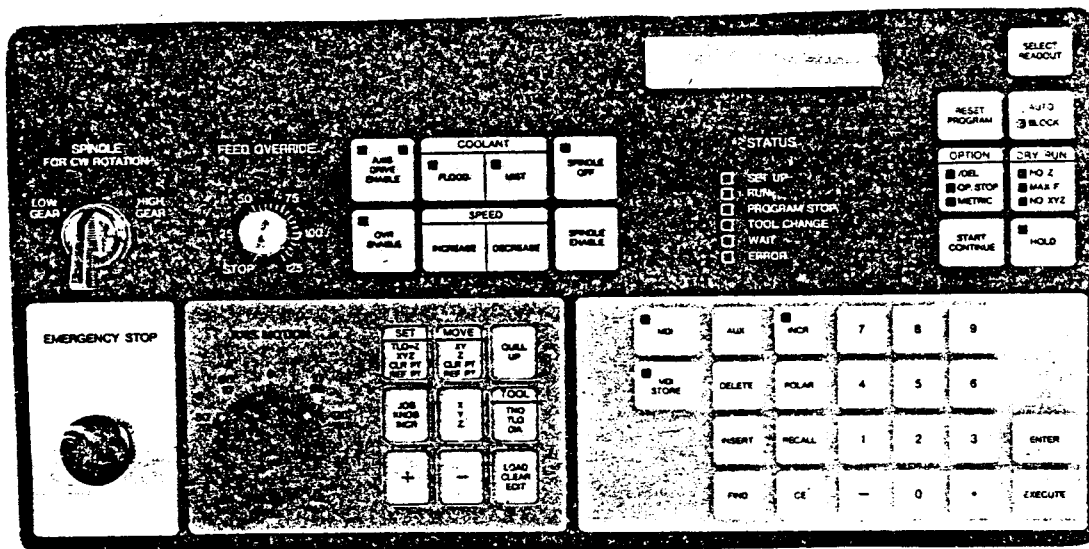


Figure 2-1: Operator's Front Panel

NOTE

All 48 keys on the Operator's Front Panel are pressure sensitive. You must apply slight, but firm, pressure for activation.

2.2 FRONT PANEL

This is the color coded panel containing 48 pressure sensitive keys, 24 LED indicators, 4 manual switches and a 40 character alphanumeric LCD screen. The panel is located on the front of the head assembly.

2.2.1 Machine Controls

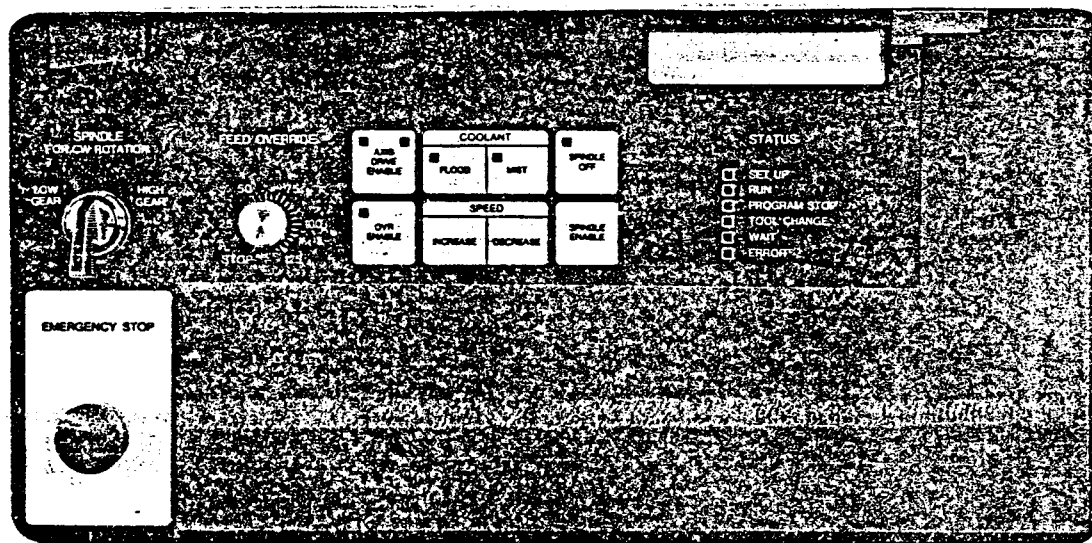


Figure 2-2: Machine Controls

Spindle Controls

1. **SPINDLE OFF:**
The green LED will be on when spindle is OFF; this is the safe condition. When the spindle is running, pressing SPINDLE OFF will stop the spindle.
2. **SPINDLE ENABLE:**
Simultaneously pressing the SPINDLE ENABLE key and moving SPINDLE FOR CW ROTATION lever to either HIGH GEAR or LOW GEAR will turn the spindle ON (SPINDLE OFF LED will be off).
3. **SPINDLE FOR CW ROTATION:**
This is a selector switch with two gear positions: HIGH and LOW. The switch is used to select the direction of spindle rotation (CW or CCW) in conjunction with the speed range lever (located on the right side of the head assembly, see Figure 2-3).

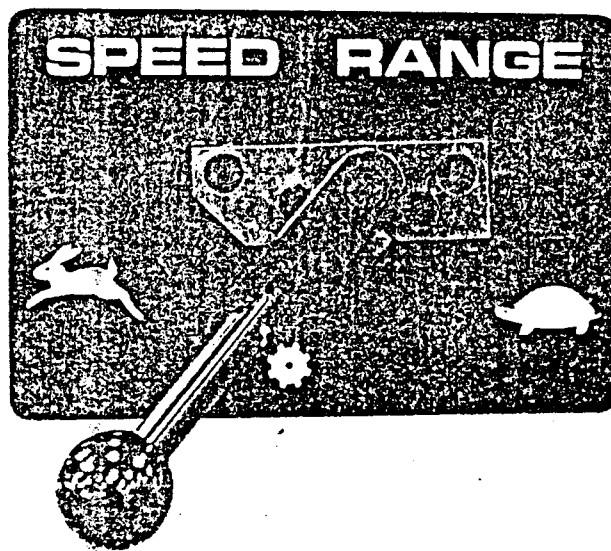


Figure 2-3: Speed Range Control

With the GEAR LO/SPEED LO or GEAR HI/SPEED HI, the spindle will rotate in the clockwise direction; other combinations, GEAR HI/SPEED LO, or its complement, will cause counterclockwise rotation.

4. **SPEED INCREASE/DECREASE Key:**
 - This allows increases or decreases to the spindle speed only while the key is pressed. It will not operate unless the spindle motor has been turned on. Releasing the key stops further action in the direction selected, and speed remains at the level reached when the button was released. Spindle speed is indicated by the speed dial located at the center of the head assembly, see

Figure 2-4.

NOTE

The S value in a part program is displayed for information only and has no effect on the actual spindle speed.

5. AXIS DRIVE ENABLE:

This key enables power to the axis drives. When pressed after power up, any error messages displayed at this time will reflect the condition of the battery backed up memory and the internal communications or axis drive system. The red LED in this key when lit will show a successful test but no power to the axis drives. The green LED shows power to the axis drives.

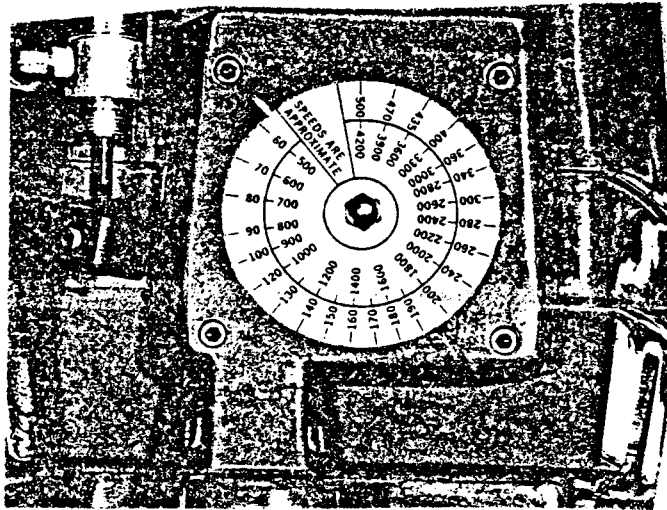


Figure 2-4: Speed Dial R2E3

Feed Override Knob

1. FEED OVERRIDE:

This knob allows the operator to modify the feedrate entered via the part program by a factor of 10% to 125%. Below 10%, the system goes into a feed hold condition, even if OVERRIDE is not enabled.

2. OVR ENABLE:

Pressing this key will enable the FEED OVERRIDE control at the immediate left.

NOTE

In the Set Up, Block Run and MDI modes, the FEED OVERRIDE control affects the rapid traverse rate as well as the feedrate. In Auto Run it only affects the feedrate.

COOLANT

The FLOOD and MIST keys operate the optional coolant devices available for the machine. When in use (LED on) the coolant operations are active with the spindle.

EMERGENCY STOP

This is a red mushroom button. When pressed, it stops the spindle motor and axes drives. Program execution is terminated and the system is set in the System Start Up mode.

When EMERGENCY STOP is pressed the part program and TLOs are not destroyed, but axis position is lost. To recover from EMERGENCY STOP, first pull out the button, then execute the AXIS DRIVE ENABLE sequence which returns each axis to the Home position.

NOTE

This button should be used only when safety is threatened. In normal use, the HOLD button should be used to interrupt axis motion.

2.2.2 SET UP

Set Up is intended for use in the initial preparation of the milling machine, before operation of the part program. This includes the loading of tool length offset values, tool diameters, axis Reference Points and the Clearance Point. Set Up is also used when employing the full edit capability, loading paper tape or EZ-LINK part programs and clearing part program data from the text buffer. The Set Up keys are located in the dark green section of the Front Panel. Several of these light green keys are multifunction and must be pressed more than once to activate the desired function.

SET key

The SET key is a multifunction key which allows the operator to

establish Tool Length Offset (TLO) values, establish a part program reference system (XYZ), a Clearance Point (CLR PT), and Machine Reference Points (REF PT) for X and Y. Scrolling through the menu by repeated operation of the key will display the various selections.

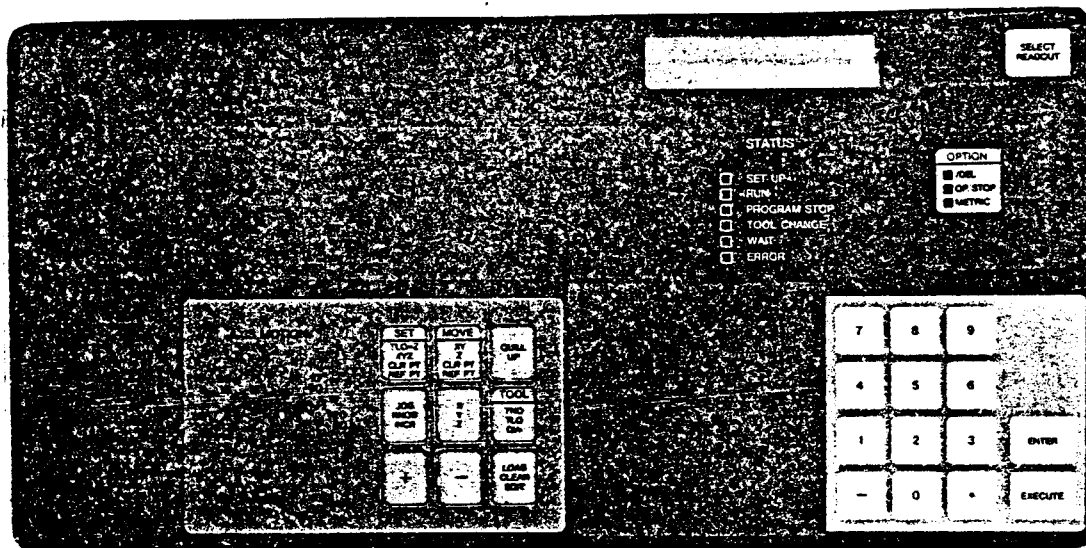


Figure 2-5: Set Up Mode Controls

MOVE Key

MOVE is a multifunction key which enables the operator to move to any keyed in X, Y and Z coordinate value, Clearance Point, or Reference Point. Repeated operation of the key will cause each new display to appear.

QUILL UP

Pressing this key will enable Z axis motion to the Home position. EXECUTE will initiate the Z motion. The display will show:

```

-----
| Q U I L L   U P           E X E C |
| - - - - - | - - - - - | - - - - - | - - - - - | - - - - - |
|                               M Z           1 . 5 0 0 0 |
-----

```

NOTE

During QUILL UP, the Z display will show the distance from the Z mechanical reference point (machine zero), not the Z axis part program coordinate value.

JOG/KNOB/INCR Key

The JOG key together with the associated key functions (XYZ, "+", "-", and AXIS MOTION knob), allows the operator to move each axis to any desired location in increments as small as .0001 inch/jog.

TOOL Key

Repeated pressing of the TOOL key will scroll through each of the 24 tools currently in the tool buffer. The ENTER key will scroll the screen display through T, TLO and DIA inputs for each tool.

LOAD/CLEAR/EDIT Key

This multifunction key will enable loading part program text, clearing system data from various buffers, and editing or entering part program text. Each time the key is pressed the screen display advances through LOAD, CLEAR or EDIT.

2.2.3 RUN

Run assumes that a part program exists in the text buffer. If no program exists, it will be necessary to load one. Part programs can be entered from remote computer terminals, DNC LINK, or through the EZ-CAM via serial Port B or Port A using the Editor. A paper tape reader may be used via the port marked C.

During part program Run, the LCD screen will display the current program block information. The axis position data will be in part program coordinates. Run LED in the status column under the LCD screen will be on.

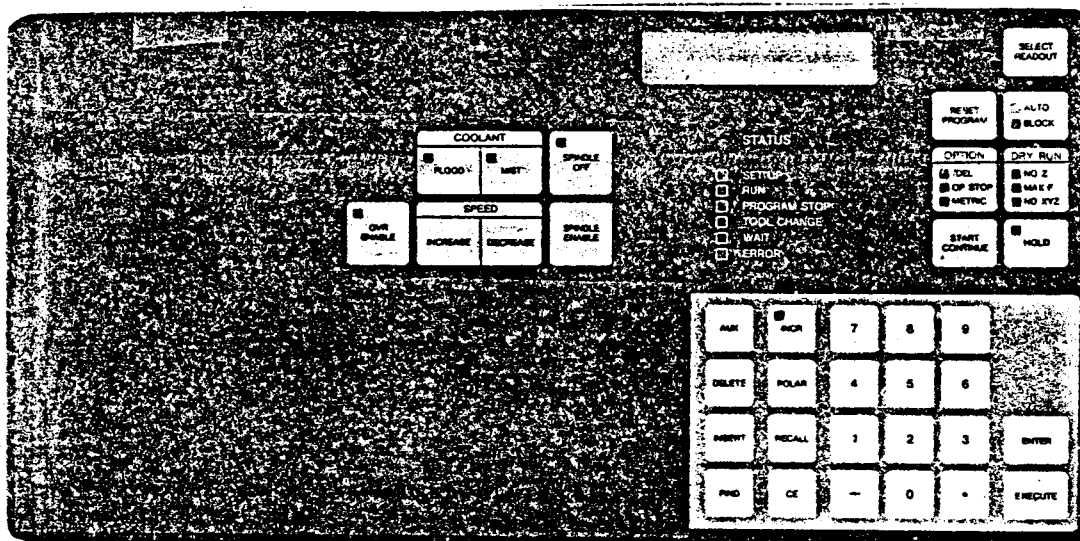


Figure 2-6: Run Mode Keys

SELECT READOUT Key

During part program execution and when part program coordinates are being displayed the SELECT READOUT will cause the axis positions displayed on the screen to toggle between the X and Y axes or the Z axis.

RESET PROGRAM Key

This will return the part program to the beginning of the text, initialize run registers and display the first 20 characters in the first data block.

AUTO/BLOCK Key

Pressing the AUTO/BLOCK key will enable the system to run in either AUTO, automatic execution of a part program or BLOCK, block-by-block execution of a part program.

2.2.4 Special Operations

OPTION Key

OPTION is a multifunction key which allows the operator to choose options such as /DEL, OP.STOP, METRIC, BOSS 8 I/BOSS 4-7, and BAUD.

START/CONTINUE Key

START begins operation of the part program (after enabling by the AUTO/BLOCK key) either at the top of the text, or at a specified sequence number. CONTINUE resumes execution after an interruption such as PROGRAM STOP or system HOLD.

NOTE

It is not necessary to press this key twice to use continue.

HOLD

This key stops part program execution and interrupts axis motion without loss of the program position. All axes will decelerate to a smooth stop.

NOTE

In RAPID TRAVERSE (GO), motion may continue up to 0.2 inches after HOLD is pressed. The unused portion of the active registers are not lost. To continue, press START/CONTINUE.

PPRINT

There is no key labeled PPRINT, but the term is included to represent the effect of a program stop command embedded in the part program (M00, M01, M06). When this command is reached, the display will exhibit a comment statement from the program between quotation marks (' '). Comments beyond 40 characters will only display the first 40 characters. An example of a possible comment is shown below:

```

-----
| I N S E R T   T O O L   1 = |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
|   . 5 0 0   D I A       E N D   M I L L |
-----

```

NOTE

When using a teletype 43 or another device which does not have the straight quote, |, the slanted quote, , must be used.

2.2.5 MDI - Manual Data Input

MDI enables the operator to enter additional part program blocks from the Front Panel Keypad, see Figure 2-7. When entering additional blocks the input format is determined by the G preparatory function code. The LCD screen will provide dialogue information (menu) requests, as determined by the G code, in an interactive exchange with the operator. MDI results in no addition to the text buffer. For details see Chapter 7.

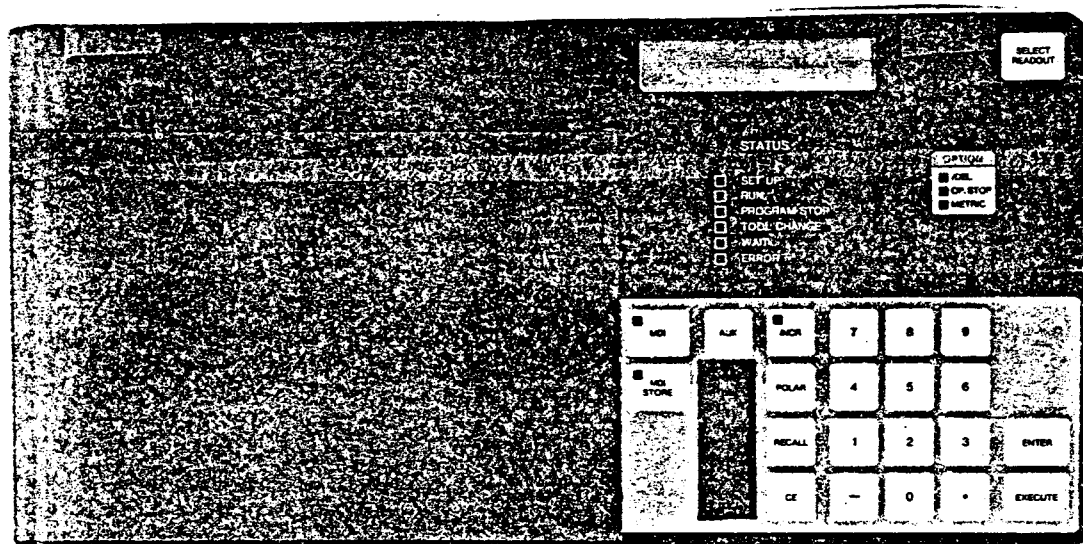


Figure 2-7: MDI Mode - Application Keys

MDI STORE Key

This key enables the operator to build a part program , execute blocks and store them at the end of the program text. When MDI STORE is pressed, the screen will exhibit DEF in the top display. After a part program number is entered, the operator is given the opportunity to enter tool parameters for the program. Data entry is performed in the same manner as in the MDI mode, however, EXECUTE will now store the data in the text buffer.

Quick Edit Keys

FIND - To search for N, T or (part program number)
 INSERT - To enable the entry of new text
 DELETE - To delete a part program block
 RECALL - To backup the edit pointer by one block
 AUX - To enable MDI entry of S, T or M codes

For details see Section 5.2.

INCR

Use of this key in MDI, MDI STORE, or INSERT allows the operator to specify the incremental dimensioning system for future axis moves. When the LED in the INCR key is off, pressing INCR will cause a G91 to be inserted in the part program and the LED will go on. The INCR key will also work independently of the MDI mode without modifying the part program buffer. The LED will reflect the status of the machine.

NOTE

When not in MDI, MDI STORE, or INSERT the INCR key will change the current operation of the system without any addition to the part program.

POLAR

POLAR input enables replacement of X, Y input with R, A, I, J, where R is the polar radius, A is angular distance from the +X axis, and I & J are the pole centers. The POLAR function is available in MDI, MDI Store, or Insert mode only.

"0 - 9", "." (Decimal)

Numerals as needed for data input.

"-" (Minus Sign)

Minus sign is required for entering negative data, absence of this sign assumes a positive value. It is not used for a JOG negative move.

- o Dual receptacles are powered with 115/1/60 each fused at 4A. It is interlocked with the spindle motor so that power to the receptacle is on when the spindle is on, and off when spindle is off. This is used to drive the flood coolant pump when this accessory has been purchased for the machine.
- o Dual receptacles are powered with 115/1/60 and fused for a standard machine light, a Tape Reader or EZ-FILE. When the Main Disconnect switch is on, these receptacles will be on and are NOT affected when the EMERGENCY STOP button is pushed.
- o Another receptacle is available for the spray coolant option when this accessory is purchased for the machine. It is also fused at 115/1/60.

2.4 PORT A/PORT B INTERFACE SUBSYSTEM

The Communications Panel, see Figure 2-8, is located on the left side of the Power Control Panel (operator facing the machine). This panel is configured to accept three types of communication interfaces:

PORT A provides the interface for communications terminal (CRT or TTY) for part program editing. Both 20 ma current loop and RS-232 are provided on this port, see Appendix C for pin-outs.

PORT B is provided for remote loading and down loading of part programs. There are two communication protocols provided for this remote interface, RS-491 level 2 (EIA standard for numerical control) and Bridgeport's EZ-LINK protocol. The EZ-LINK protocol is supported by both EZ-CAM and EZ-FILE systems, see Optional Equipment. RS-232 and RS-422 are both available on Port B, see Appendix C for pin-outs.

PORT C is provided for the Remex paper tape reader.



Figure 2-8: Tape Reader Input Port & the Serial Interfaces

2.5 RESET SWITCH

Pressing the RESET switch will cause the R2E3 to go into system start up. Refer to Section 3.6.2.

2.6 LUBE & PNEUMATIC CONTROL SUBSYSTEM

The lubrication and pneumatic controls, are located together in an enclosure on the left side of the column (operator facing machine), see Figure 2-9. The operator is limited to checking, filling oil reservoir levels, air pressure checks and adjustments.

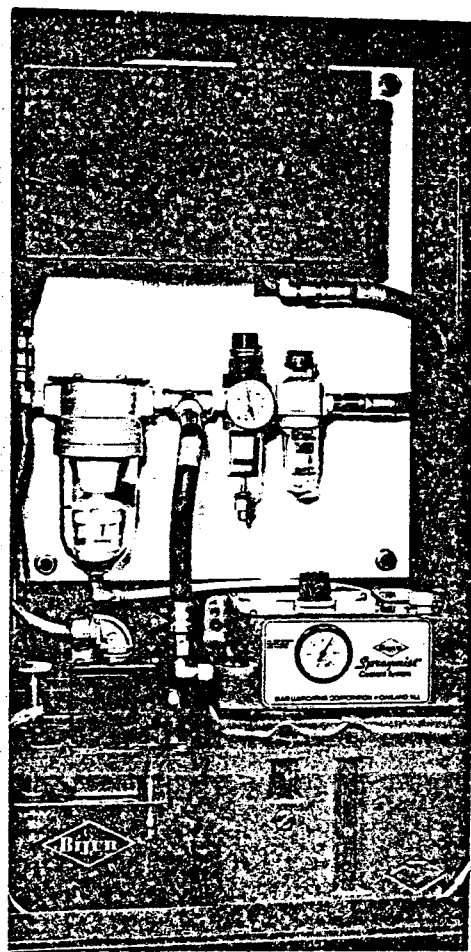


Figure 2-9: Lube & Pneumatic Controls

2.6.1 Lube Assembly

The automatic lubricating system distributes oil to all sliding mechanical surfaces in the machine. The primary component of this system is the Bijur tank. The operator should periodically inspect the level of oil (Sunoco Waylube #1180 or equivalent) and refill if the level is low.

An interlock is built into the lubricator which will prevent the SPINDLE ENABLE from working if the oil level is too low.

NOTE

Low oil level will not stop a job in progress but will prevent the spindle from being started for the next job.

2.6.2 Pneumatic Assembly

Supply pressure of the pneumatic system is 100 psi. Normal pressure on the indicator should be maintained at 80 psi, see Figure 2-9. The inlet side of the pressure regulator contains an air filter; the pressure indicator is between the two glass reservoirs followed by the air lubricator. The oil level in this glass should be checked daily and kept between the indicated marks.

NOTE

The knurled screw over the air filter will adjust the air pressure to the desired level.