

# CHAPTER 4

## POWER DISTRIBUTION

### 4.1 INTRODUCTION

This chapter discusses the power distribution throughout the control and electromechanical interface. Power is traced from its entry point at the Main Disconnect switch, through all of the transformers and power supplies to its end use. Figure 4-1 shows this power distribution in block diagram form. Refer to the diagram when reading the text. The System Wiring Diagram, (3-193-8313) is located at the end of this chapter, followed by duct wiring diagrams for control serial numbers marked thereon.

### 4.2 SYSTEM OVERVIEW

All incoming power enters at the Main Disconnect switch on the Power Equipment Enclosure. Maximum allowable line voltage is 480 volts AC. The customer has the option of selecting the following incoming line voltages from the available voltage frequency kits offered by Bridgeport.

|         |       |
|---------|-------|
| 208 VAC | 60 Hz |
| 230 VAC | 60 Hz |
| 480 VAC | 60 Hz |

This is a 4-wire system (three phases and a ground).

After power enters the Power Equipment Enclosure, it passes through a disconnect switch and fuses FU1, FU2 and FU3 before it is applied to the system for power distribution.

The incoming power is distributed into four branches as follows:

- **Line voltage distribution** — Line voltage is wired through a reversing/starting contactor for the spindle motor. When the contactor is activated, voltage is switched to the spindle motor.
- **115 VAC single phase distribution** — Incoming power is fed to transformer T1. T1 steps the line voltage down to 115 volts AC single phase. This voltage is used by the Logic Power Supply and provides primary power to the 24 volt DC power supply located within the Drive Power Supply.
- **90 VAC** — Line voltage is fed to transformer T2. T2 is a single-phase, multiple tap step down transformer. This transformer supplies 90 VAC to the axis drive power supply and 115 VAC to the duplex receptacles, flood and mist coolant, lube motor, three fans and three control relays. The Drive Power Supply provides 128 VDC to the motor drive modules.

The two main power supplies, the Drive Power Supply and the Logic Power supply, deliver DC voltages to the following items:

Logic Power Supply provides:

- + 5 VDC to the logic boards
- $\pm$  12 VDC to FMDG and EAF boards

Drive Power Supply provides:

- + 24 VDC to EAF, Limit Switches, and Pneumatics
- $\pm$  128 VDC to Axis Drives

### 4.3 LINE VOLTAGE DISTRIBUTION BRANCH

This branch connects line voltage directly to the spindle motor. Contactors MF and MR switch incoming power from the line to the spindle motor.

#### 4.3.1 Spindle Motor Protection

The spindle motor is a 3-phase 2 HP AC motor. It operates on 208, 230 or 480 VAC. Through high and low gearing and motor reversal, variable speed operation is available. Reversing contactors MF and MR changes the spindle motor's direction.

Three heaters protect the spindle motor against excessive currents. If the current caused by the load is excessive, the overload heaters will stop current to the spindle motor by opening contactor 1 MOL. After cooling, the heaters must be reset before the spindle motor can be restarted; see Table 4-1.

Table 4-1. Overload Heaters

| Line Voltage | Clark No. | Code No.   |
|--------------|-----------|------------|
| 208V         | 2441      | 3-150-4090 |
| 230V         | 2438      | 3-150-3857 |
| 480V         | 2431      | 3-150-4240 |
| 200V         | 2441      | 3-150-4090 |
| 220V         | 2438      | 3-150-3857 |
| 380V         | 2434      | 3-150-3388 |
| 416V         | 2433      | 3-150-3324 |
| 575V         | 2430      | 3-150-3325 |

### 4.4 115 VAC DISTRIBUTION BRANCH

The 115 VAC output from T1 and T2 feed the following :

- Logic Power Supply
- Lube Motor
- Three Fans
- Duplex Receptacles
- Coolant
- EAF Board

### 4.5 DRIVE POWER SUPPLY

The Drive Power Supply provides +24 VDC power for general purpose switching and control functions. The 24 VDC from the Drive Power Supply is used by the following devices:

1. **Pneumatics** — A pneumatic cylinder clamps a mechanical brake against the spindle whenever the

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