

SECTION 4

PRINCIPLES OF OPERATION

4.1 INTRODUCTION

The heater control unit in the Model 9152 enclosure consists of the following functional blocks.

- a) Temperature Control - consisting of a sensor, oscillator, amplifier, detector and heater.
- b) Temperature Monitor - consisting of a sensor and a resistance bridge.
- c) Overtemperature Circuit
- d) Power Supply

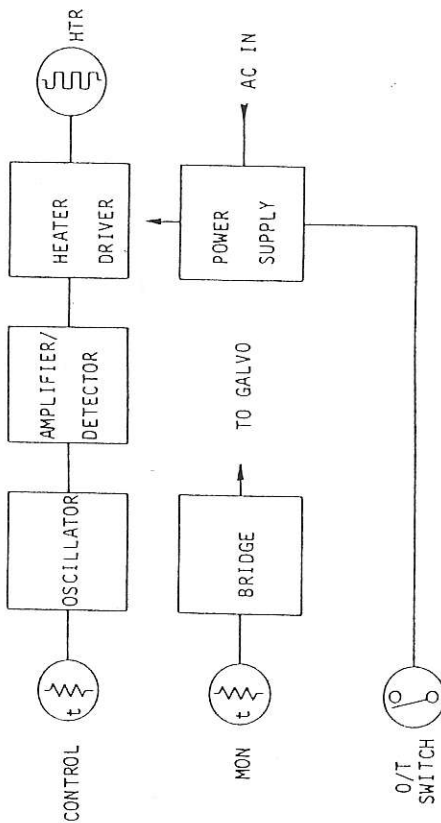


FIGURE 4-1 - HEATER CONTROL UNIT

4.2 TEMPERATURE SENSITIVE OSCILLATOR

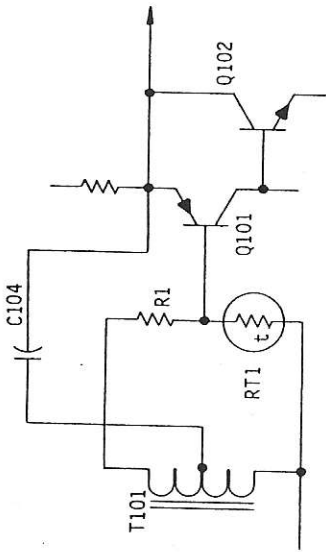


FIGURE 4-2 - TEMPERATURE SENSITIVE OSCILLATOR

Temperature changes are sensed by the thermistor RT1 connected with R1. across the 1:2 ratio autotransformer T101. As the temperature decreases, the thermistor resistance increases and the voltage divider output to the base of Q101. As soon as this voltage exceeds half the transformer output the circuit gain becomes greater than one and oscillation occurs.

4.3 AMPLIFIER AND DETECTOR

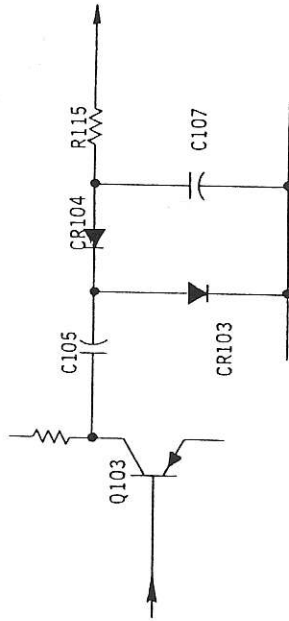


FIGURE 4-3 - AMPLIFIER AND DETECTOR

The output of the oscillator is amplified by Q103 and rectified by a voltage doubler consisting of C105, CR103, CR104 and C107. The resistor R115 gives current limiting protection for the next stage.

4.4 HEATER DRIVER

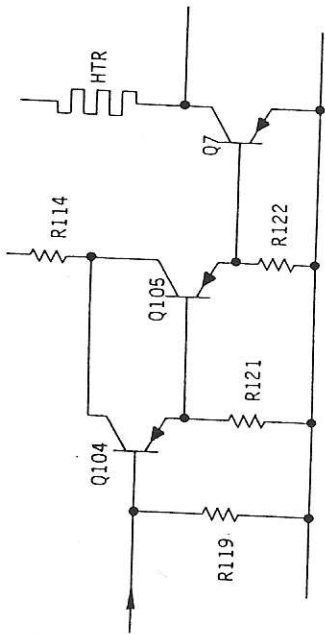


FIGURE 4-4 - HEATER DRIVER

The voltage across C107 causes base current in the emitter follower Q104 which in turn drives another emitter follower Q105. This produces base current to switch on transistor Q7 which controls the heater current. The resistors R119, R121 and R122 ensure that Q7 is not conducting when there is no output from the oscillator.

4.5 OVERTEMPERATURE CIRCUIT

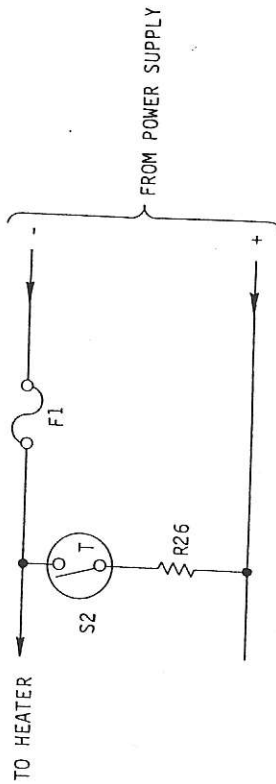


FIGURE 4-5 - OVERTEMPERATURE CIRCUIT

If the temperature in the enclosure exceeds 35 C°, switch S2 closes. The load provided by R26 is sufficient to blow the fuse F1 and disconnect all power to the heater.

4.6 POWER SUPPLY

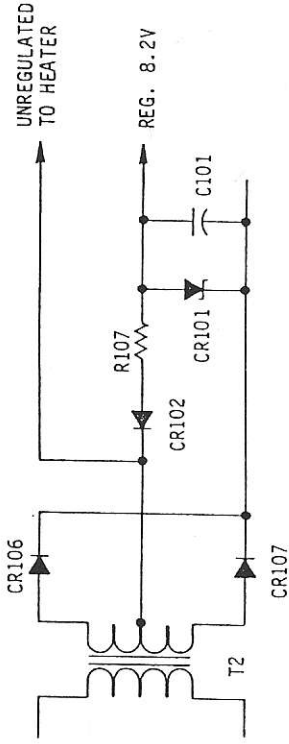


FIGURE 4-6 - POWER SUPPLY

A universal power transformer T2 which allows for operation of the instrument from 115 or 230 volts, 50 or 60 Hz, feeds a full-wave rectifier. The heater is fed from the unregulated output and the control circuit is fed from a regulated consisting of R107, CR102 and C101.