2.3.3 Type G850 SCR Motor Driver

Essentially this module is an SCR switch for the ac voltage supplied to any one of the drive motors of the TU55. The SCR switch is turned on and off twice during each cycle of the ac power. The firing point of the SCR is controlled so that it can occur at almost any point along the sinusoidal waveform of the ac power; thus controlling the amount of energy that is transmitted to the load (the motor), and thus achieving control of motor torque. A simplified schematic diagram of this module is shown in Figure 2-4, a complete schematic in DEC engineering drawing RS-B-G850.

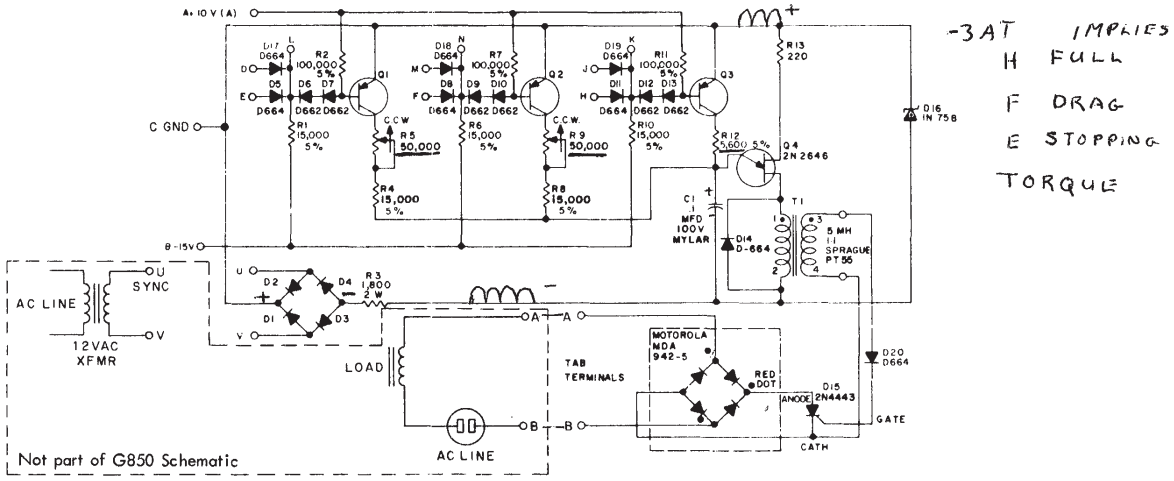

Figure 2-4 Schematic of G850 SCR Motor Driver

The SCR itself (D15), is connected into a diode bridge so that current always passes though it in the same direction (an SCR is not a bilateral device). The firing circuit for the SCR incorporates a unijunction transistor (Q4) and an RC timing network. The capacitor (C1) in this network starts to charge at the beginning of each half cycle of the ac voltage. When the voltage developed across the capacitor reaches the firing point of Q4, conduction starts and current flows in the primary of a coupling transformer (T1). Voltage induced in the secondary of T1 controls the firing of the SCR and causes the motor to operate.

Three input timing circuits determine the trigger timing of the SCR. A -3V level applied to the two-diode input of these circuits cause the SCR to trigger at a fixed rate or a variable rate determined by the setting of potentiometers R5 and R9. The fixed input circuit (Q3) triggers the SCR near the beginning of the sinusoidal wave to produce maximum torque.

A low voltage ac input is supplied to terminals U and V from the secondary at transformer T1 of the TU55 logic (not T1 of the module). This input voltage is full wave rectified and is clipped by a

Zener diode, but is not filtered. It provides the potential toward which the timing circuit attempts to charge. Being a stepped down version of the primary ac power which operates the drive motors, this voltage synchronizes the firing of the SCR to the line frequency. Since the voltage at the end of each half cycle is zero, the RC network must start charging at the end of each half cycle. Therefore, this pulsating voltage causes the SCR to fire each half cycle at a point in time measured from the zero voltage point.

CAUTION

Be very careful when handling this circuit or probing it for measurement purposes since it contains 115v ac. A short circuit caused by a probe could produce a high current. Do not tamper with this module without first disconnecting power from the back terminal.