GENERAL

This chapter describes the principles of operation of the major circuit functions of the Vectorbeam BARRIER game. The system's general functional description is followed by detailed circuit descriptions. Each circuit description includes simplified circuit schematics (Appendix A) applicable to the blocks under discussion. Note that all of the schematics used are very similar to the schematics used by most industrial electronics firms. The use of the wide arrowhead paths simplify the schematic bus lines.

GENERAL DESCRIPTION

Figure 3-1 illustrates all of the major components of the Vectorbeam BARRIER game. This block diagram indicates that the logic board is separate from the monitor. It also illustrates the low voltage power supply package, the coin mechanism, the control panel and how they are interconnected.

Figure 3-2 illustrates the logic board block diagram. The dash lines indicate what is used and shared by the monitor display electronics. It also indicates that which is to be only used by the display electronics on the monitor board.

MONITOR DISPLAY

(Refer to Appendix A, Figure A-1)

All monitor electronics are self-contained on a single printed circuit board. All low voltages supplied to this board originate from the power supply package located inside the game cabinet. All troubleshooting and maintenance procedures are located in the MAINTENANCE chapter of this manual.

The Vectorbeam monitor is unlike the conventional TV monitor. It is a vector system that displays vectors (lines) generated from X-Y coordinates received from the logic board. The horizontal points are X and the vertical Y (width and height respectively). The X and Y logic signals originate from the logic board, discussed later.

The ±25 volts and 6.3 volts AC and the +25 volt spot kill originate from the low voltage power supply. The ±25 volts is a DC voltage rectified and filtered in the supply package. The 6.3 volts AC is used as the heater voltage for the CRT display. On Figure A-1, in the upper-left hand corner, voltages have been regulated by the three terminal regulator devices. For example the ±25 volts is regulated by a 7818 and a 7918 respectively down to ±18 volts used by the oscillator. Transformer T1 provides the means to supply the CRT grid and anode voltages. The +25 volts is also regulated to +5 volts used for the logic circuitry included in this drawing. The circuit connected to the primary of T1 (a high voltage transformer) form an oscillator which induces the necessary high voltage at the secondary of T1 The frequency is set by the T1 transformer characteristics

The output of the T1 is then rectified. The highest voltage winding is connected to the tripler M1 which raises the output voltage of this transformer and rectifies it to +18 K volts, for the CRT anode. At pin 6 the negative pulses are rectified and applied to a 1 megohm potentiometer FOCUS control which applies the grid bias at pin 4 of the CRT. The positive pulses are rectified at pin 7 of the T1 transformer as the grid 2 bias for the CRT whereas the CRT at pin 2 is at ground through register R108. The heater pins 1 and 8 of the CRT are connected to ground and pin 1 of the PCB respectively. The ±25 volts is also regulated down to ±15 volts for the DAC's by device U10 and U11 (7815 and 7915 respectively). The secondary of T1 (pins 5 and 8) develop the necessary voltage to produce a +90 volts DC rectified by diode CR50 and filtered by capacitor C28. This +90 volts DC is used by the modulating circuit for the CRT display.

The lower half of the drawing consists of the spot kill circuit and the intensity modulator circuit. The intensity modulating circuit is comprised of two individual circuits. One input is the high intensity and the other the normal intensity. These two inputs are connected to the high and normal intensity transistor drivers Q20 and Q21 and the hex inverter U6 (7406). Both circuits are identical.

For example, in this explanation the high intensity circuit is described: In the high intensity circuit when the input goes high at pin 1 of U6 the output at pin 2 goes low. With this low signal, Q20 is turned off from an on state, and the collector of Q20 goes high. Assume that switching transistor Q24 is turned on. The NORMAL INTENSITY input is always on when the display logic is operating properly. A low input at PCB connector (pin 12) is inverted by hex inverter 7406 which turns on transistor Q22. Device Q22 completes the current path through the intensity control (R91) to ground via resistors R78 and R79 and collector to emitter of Q22. This condition applies a voltage less than +90 volts corresponding to the setting of the intensity control, to the CRT cathode.

When a higher intensity is required the HIGH INTENSITY input (pin 14 of the Display PCB) goes low turning on Q20. With Q20 turned on the current path from the +90 volts line in through R91, diode CR39 then finally through the collector to emitter of Q20 to ground. This condition reduces the voltage at the wiper of R91, therefore increasing the intensity of the electron beam. The NORMAL INTENSITY input should always remain low providing some sort of constant electron beam.

When the —25 volts is removed, pin 9 of U6 goes high and pin 8 goes low, which immediately turns off Q14 eliminating the chance of a spot. The U6 device is an open collector evice requiring a pull up resistor such as R86 at pin 8. The high side R86 is connected to a voltage source at pin 3 of Molex connector J2. +25 volts unregulated and unfiltered.