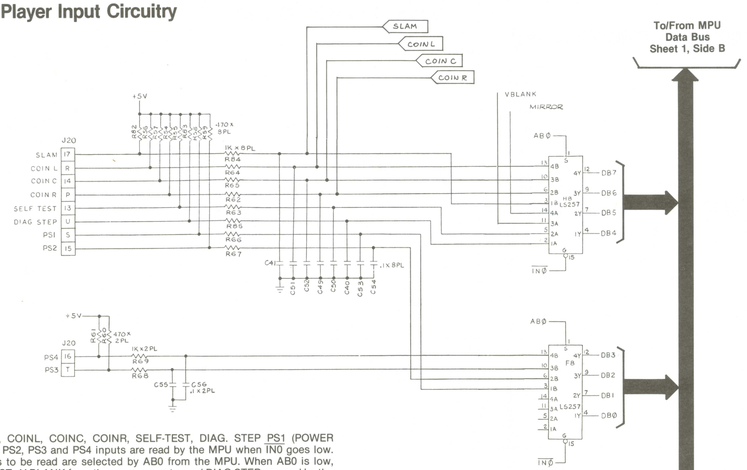
Coin and Player Input Circuitry

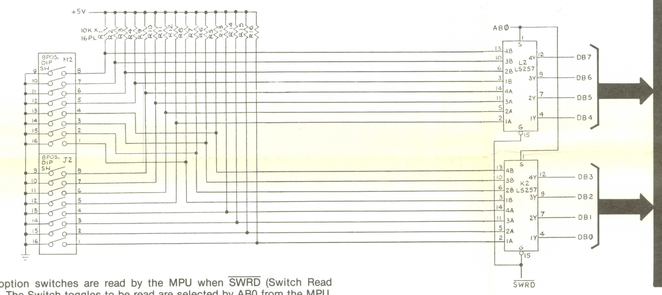


To/From MPU Data Bus Sheet 1, Side B

SLAM, COINL, COINC, COINR, SELF-TEST, DIAG. STEP PS1 (POWER STONE), PS2, PS3 and PS4 inputs are read by the MPU when IN0 goes low. Switches to be read are selected by AB0 from the MPU. When AB0 is low, SELF-TEST, V BLANK from the sync generator and DIAG STEP are read by the MPU on DB4 and DB5. When AB0 goes high, SLAM, COINL, COINC, COINR, PS1, PS2, PS3 and PS4 are read by the MPU on DB0-DB7.

Denotes a test point

Option Input Circuitry

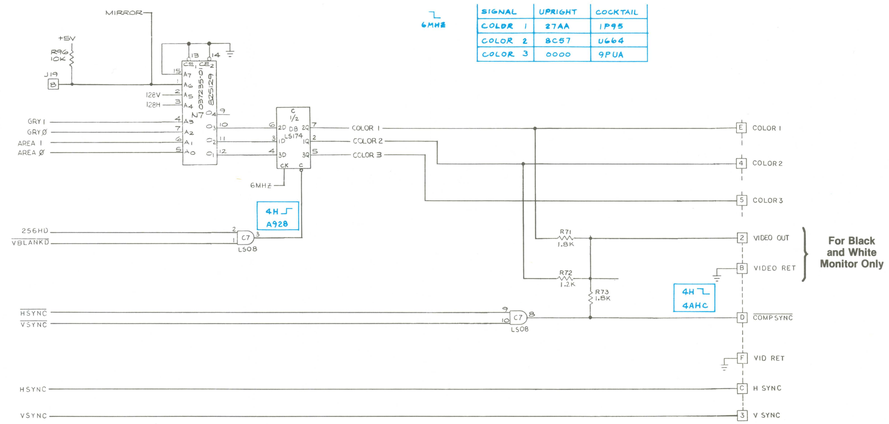


The game option switches are read by the MPU when SWRD (Switch Read Enable) is low. The Switch toggles to be read are selected by AB0 from the MPU. When AB0 is high, switch toggles 9, 10, 11, and 12 on J2 and M2 are read on DB0-DB7. When AB0 is low switch toggles 13, 14, 15 and 16 on J2 and M2 are read on DB0-DB7. Toggle inputs are "on" when pulled to ground.

Video Output

The color PROM circuitry receives playfield (AREA0-AREA1) and motion object (GRY0-GRY2) information and assigns a color or shade of gray (if using a black and white monitor) before it is sent on to the video monitor for display.

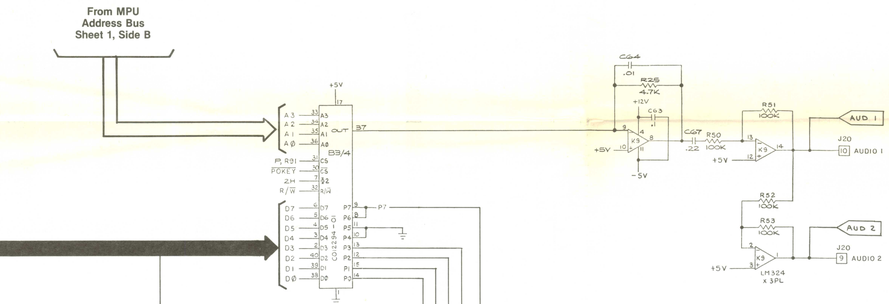
128V and 128H from the sync generator circuit determines in which corner of the monitor the active video is displayed. If 128V is high and 128H is low, the video is in the lower left corner of the monitor.

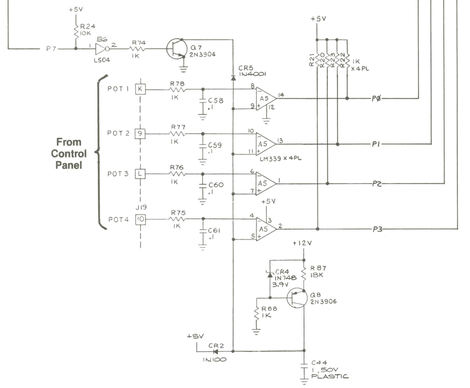


Denotes a signature

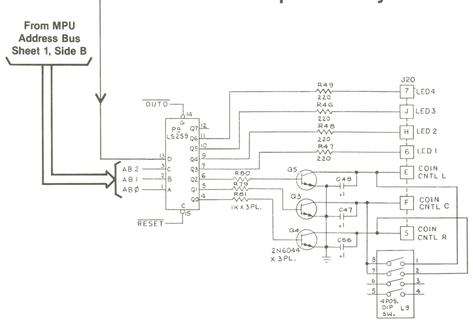
Pot Reading and Audio Circuit

The pot reading and audio output circuit receives a voltage from the control panel pots and sends it to the MPU via the custom chip for placement of the "shields" on the monitor. It also generates all the sounds in the Warlords™ game. When P7 of the pot select circuit goes low, an internal counter in the custom audio chip B3/4 begins counting. Also the base of Q7 goes high and Q7 conducts, discharging the voltage across C44. When P7 goes high, Q7 is then cut off and C44 starts to build up a charge via constant current source Q8. When the voltage on C44 is equal to the pot voltage, the comparator associated with the individual pot input changes state disabling the counter inside the custom audio chip B3/4. The MPU then reads the count for each pot input via D0-D3, and moves the "shield" to the spot on the playfield corresponding to that count.





Coin Counter Output Circuitry



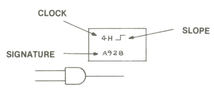
This circuit consists of coin counter drivers Q3, Q4, and Q5 and data latch P9. The circuit is addressed by the MPU on AB0-AB2 and written by the MPU on data line DB7. When the input to a driver is clocked high, its collector goes low grounding the return of the coin counter in the coin door.

Signature Analysis Procedure

1) Remove the following:
   - The electrical power from the Warlords™ game.
   - The game PCB from the cabinet. Attach extender cables between the PCB and the game wiring diagram.
   - The MPU chip at location C2 from the game PCB. Using a thin piece of wire (28 AWG), jumper pin 37 to pin 39 on the MPU socket.

2) Connect the following:
   - The CAT™ Box flex cable to the Warlords™ PCB test edge connector.
   - The three BNC to E-Z clip cables (supplied with the CAT™ Box) to the SIGNATURE ANALYSIS CONTROL START, STOP and CLOCK BNC jacks on the CAT™ Box.
   - The black E-Z clips on the three cables to a ground lug on the PCB.
   - The red E-Z clips on the START and STOP cables to the PCB at L6 pin 2.

3) The red E-Z clip on the clock cable will be moved from 4H to 6MHz and back throughout the actual signature analysis. The clock signal and slope for each signature is located on the schematic sheet above the signal. Note the example below:



4) Position the CAT™ Box switches as follows:
   SIGNATURE ANALYSIS CONTROL
   START: ⎍
   STOP: ⎍
   CLOCK: ⎍
   READ/WRITE CONTROL
   BYTES: 1024
   DBUS: ADDR
   ERROR DATA DISPLAY: GAME
   R/W: WRITE
   R/W MODE: OFF
   TESTER CONTROL
   TESTER MODE: R/W
   TESTER SELF TEST: OFF

In order to obtain reliable signatures from the Warlords™ PCB, the Playfield RAM must be addressed and a specific pattern "written" into the memory.

5) Apply power to the Warlords™ game. Turn the CAT™ Box ON/OFF switch to ON.
6) On the ADDRESS/SIGNATURE keypad enter 0400.
7) Toggle the R/W MODE switch to momentary SINGLE.
8) Set the TESTER CONTROL, TESTER MODE switch to SIG.

   If the signature to be taken is connected to the 6MHz clock (P4 pin 14), the ADDRESS/SIGNATURE will indicate 1F31.

   If the signature to be taken is connected to the 4H clock (P4 pin 11), the ADDRESS/SIGNATURE will indicate C6C3.

   If the ADDRESS/SIGNATURE display is incorrect, press TESTER RESET. If the display is still incorrect, return to step 2 and check the Cat™ Box connections to the game PCB.
9) Connect the data probe supplied with the CAT™ Box to the DATA PROBE, DATA BNC. The data probe has a black alligator clip attached to it. Connect this alligator clip to a ground lug on the PCB.

The Warlords™ game PCB is now set up to provide proper signatures.

ATARI®

Sheet 2, Side B

WARLORDS™

Coin and Player Input Circuitry
Pot Reading and Audio Circuitry
Option Input Circuitry
Coin Counter Output Circuitry
Signature Analysis Procedure

Section of 036434-01 B

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DP-175-02 1st printing