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sprint 2™

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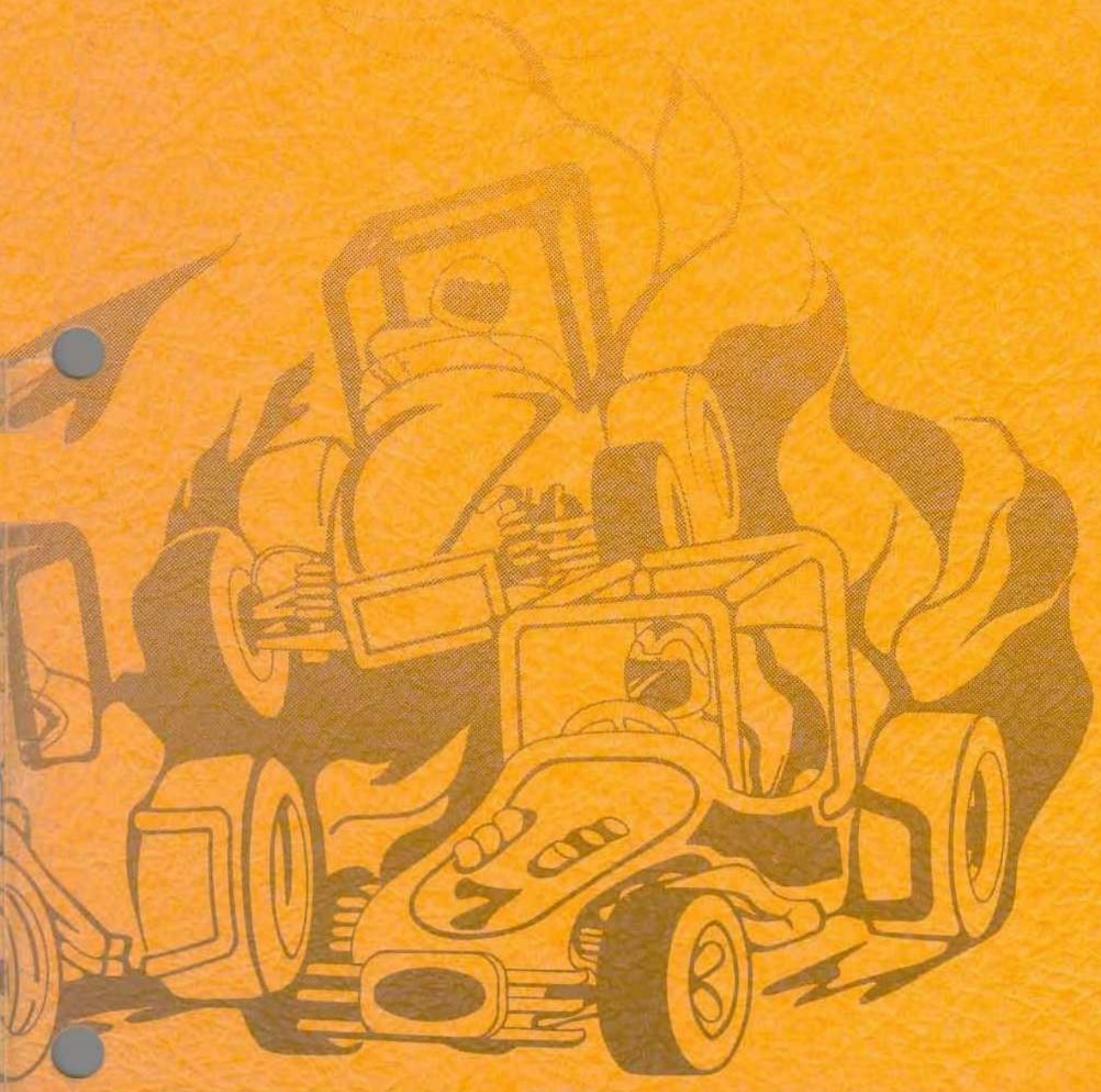
Operation, Maintenance and Service Manual



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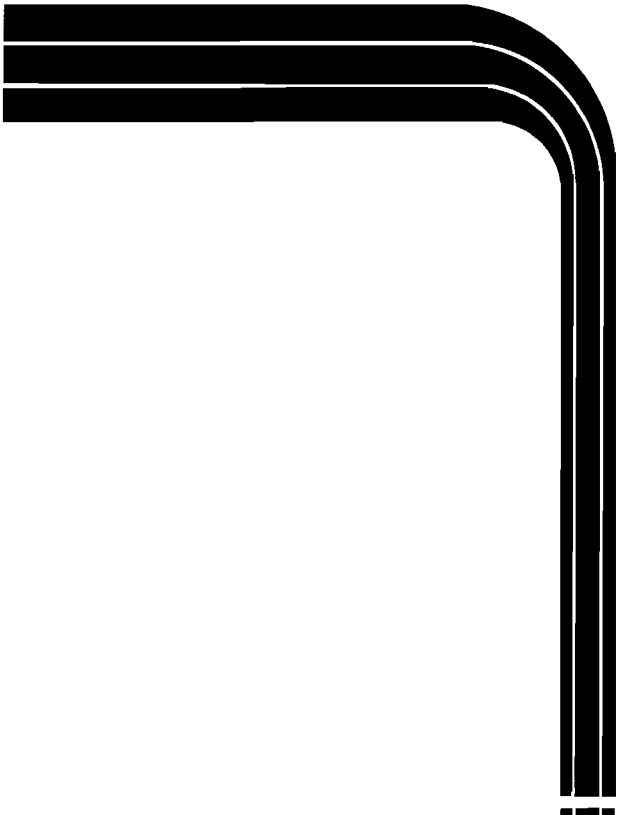

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I. INTRODUCTION

1.1 PHYSICAL DESCRIPTION OF GAME

Kee Games' Sprint 2 is a one or two player driving game. The game is packaged in its own distinctively-styled upright cabinet that rests directly on the floor. A 23-inch TV monitor is mounted in the top front of the cabinet, with the monitor viewing screen slightly tilted back from vertical. (Drawing number A006205-01, in Section IX of this manual, provides external and sectional views of the game cabinet.) The TV monitor viewing screen is covered with a plexiglas panel.

Player-operated controls are mounted side-by-side directly below the TV monitor viewing screen on the front of the game cabinet. The controls consist of two steering wheels, two four-speed gear shifters, two accelerator foot pedals, and three backlighted pushbutton switches. The switches are labeled TWO PLAYER START, TRACK SELECT, and ONE PLAYER START. A speaker mounted beneath each steering wheel provides game sound for the car controlled by that player.

Two identical coin mechanisms are mounted on the lower front center of the cabinet, below the steering and shifting controls. Either coin mechanisms can initiate play. The cash box is located behind a locked access door to the coin mechanisms.

1.2 SUMMARY OF GAME PLAY

The player's objective is to successfully keep his car in the boundaries of the race track and complete as many laps as possible before the end of game time. A single player operates the white car with the controls on the right side of the cabinet and competes with a black car and two grey cars. The black and grey cars are computer controlled. With two players, the player on the right operates the white car, the player on the left operates the black car, and the two grey cars are computer controlled.

After the proper coins have been inserted in the coin mechanism, the choice of which track to be played must be made. By pressing the TRACK SELECT pushbutton, the displayed tracks on the TV monitor screen are changed. The tracks become progressively more difficult each time the TRACK SELECT pushbutton is pressed, until the twelfth track is displayed, then the progression begins again from the easiest track.

Once the determination of the desired track is made, a player must press either the ONE PLAYER START or TWO PLAYER START pushbutton (dependent on the number of coins inserted in the coin mechanism). This begins the game play and the game timer starts counting down from 100.

Now with the left hand on the steering wheel, the right hand on the four-speed gear shifter, the right foot on the accelator foot pedal, and the sound of an idling motor, the player may begin to "drive" his car around the race track.

Acceleration is as in a real car. Start out in anything but first gear and the car accelerates slowly. Start out in first gear and the car accelerates nicely. Once the car is moving, shifting into progressively higher gears increases the speed of the car. If the car goes into a turn too rapidly, the car will go into a driver-controllable skid, with the sound of the skid on that player's speaker. Whenever a player's car comes in contact with any of the other three cars or an oil slick, the car goes into a semi-controllable skid. If a player's car makes contact with the track boundary, a crash sound will be heard and the car will stop.

By passing through check point areas on the track, a score is tallied at the top of the TV monitor screen. There are ten points awarded for the completion of each lap. However, the scoring point locations are not identified on the displayed track.

Thus the outstanding feature of Sprint 2 is that it is a highly competitive game. One player competes with himself and three "computer" controlled cars. Two players compete with themselves, each other, and with two "computer" controlled cars.

II. SPECIFICATIONS

2.1 GENERAL

Cabinet Dimensions:	Height 66¾ inches, Width 36 inches, Depth 31 inches.
TV Monitor:	Black and white, 23-inch screen, with composite video input.
Coin Mechanisms:	Two identical mechanisms, accept only quarters.
Cash Box:	Removable; located behind locked access door to coin mechanisms.
Power Cord:	Approximately 6 foot long, extending from rear of game cabinet and having grounded three-prong plug for conventional wall outlets.
ON/OFF Switch:	Hidden above the accelerator foot pedal on right side of game cabinet, for owner/operator access.
SELF/TEST Switch:	Located at the inside front of game cabinet to the immediate left of coin box.
Lighting:	One 24-inch fluorescent tube for cabinet lighting. One GE #47 lamp for coin mechanism lighting.

2.2 ELECTRICAL

Power Requirement:	Uses conventional grounded wall outlet providing 100 volts AC, 60 Hz, single phase, rated at about 200 watts.
Fusing:	All fuses accessable from rear access door of game cabinet; TV monitor has two 3AG 1-amp slow blow, 250 volt fuses and remainder of game is protected by one 3AG 3-amp quick blow, 250 volt fuses, mounted beneath the cover on the Electronics Assembly Tray.
Power Interrupt Switch:	These are safety interlock switches located inside the game cabinet rear access door. They cause the removal of AC power to the game when the access door is opened.

2.3 ENVIRONMENTAL

Operating and Storage Temperature Range:	From 32 degrees Fahrenheit to 120 degrees Fahrenheit (Ambient temperature).
Relative Humidity:	Maximum of 80% without condensation.

2.4 OWNER/OPERATOR OPTIONS FOR STRUCTURING OF GAME PLAY

Cost:	Free 25¢ for two players 25¢ per player 50¢ per player
Game length:	60 seconds 90 seconds 120 seconds 150 seconds
Extended Play:	None 30% of game length with PRO driving rating.
Miscellaneous:	No oil slicks Oil slicks Only easist track displayed during Attract Mode. Cycling of all twelve tracks during Attract Mode.

2.5 ACCESSORIES AVAILABLE ON SEPARATE ORDER

Video Probe:	Order from Atari
Universal Test Fixture:	Order from Atari, catalog no. CTF-1
Universal Test Fixture Sprint 2 Adaptor:	Buffer Board—Order from Atari, catalog no. 005822-01 Diagnostic Test Board—Order from Atari, catalog no. 005840-01

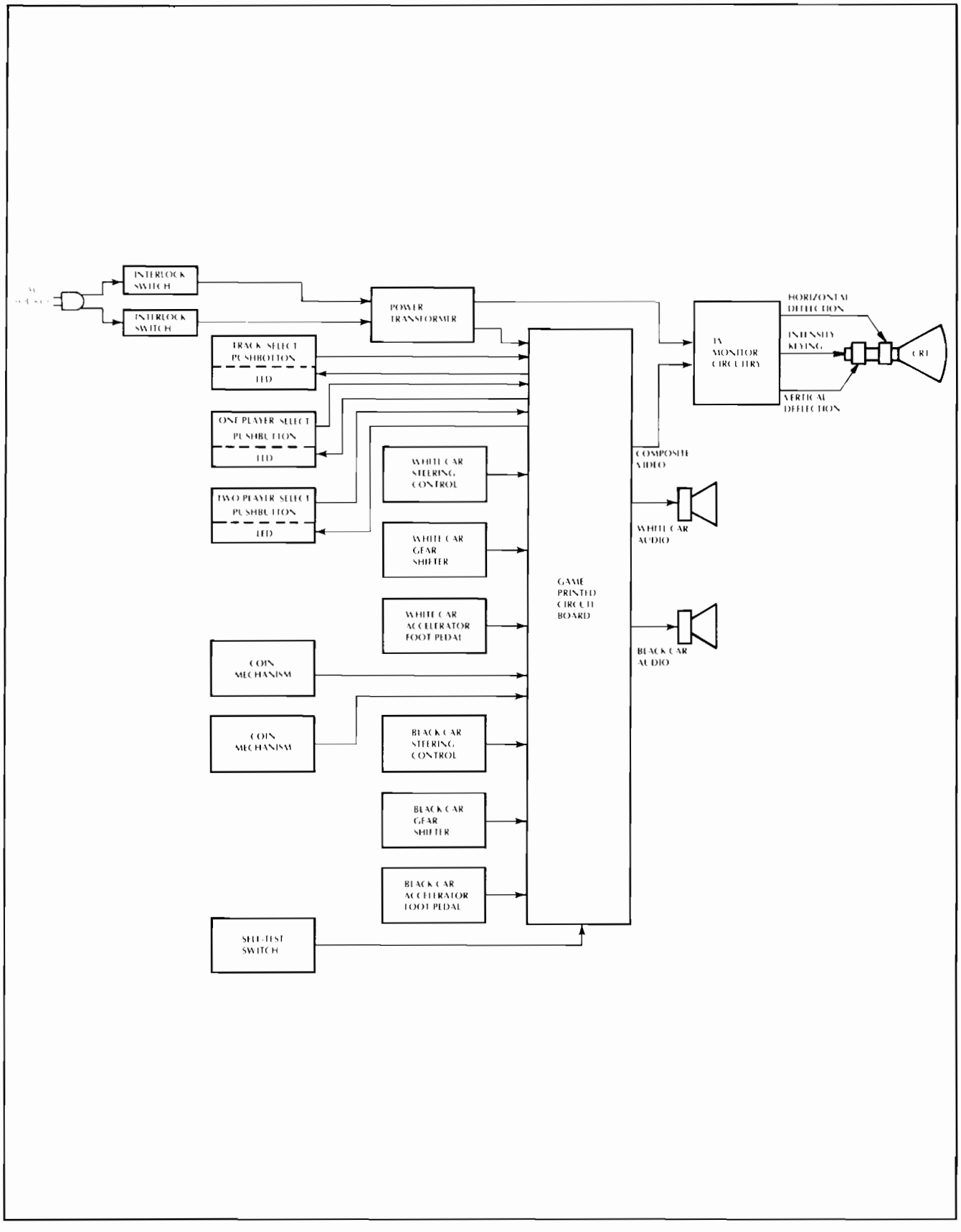


Figure 3-1 Functional Block Diagram of Sprint 2 Game

III. DESCRIPTION OF OPERATION

3.1 FUNCTIONAL DESCRIPTION OF GAME

The block diagram in Figure 3-1 illustrates the major functional parts of the Sprint 2 game. Note that the game printed circuit board (hereafter referred to as PCB) sends a composite video signal to the TV monitor and two separate audio signals to the speakers.

3.2 GENERAL INFORMATION

General information about the game in the following subparagraphs provides a background for the Installation Instructions in Section V of this manual, and the description of Game Sequence in paragraph 3.3 of this section.

3.2.1 Energizing the Game:

The game is energized by inserting the AC power plug into an active AC wall outlet that provides the specified AC power as listed in Section II, Specifications, of this manual. The Power ON/OFF" switch, hidden above the accelerator foot pedal on right side of game cabinet must be set to the "ON" position.

3.2.2 TV Monitor:

The game's TV monitor is a self-contained transistorized television monitor. Because the composite video signal sent to the monitor by the control circuitry differs in many respects from the signal derived from commercial TV broadcasts, the picture appearing on the screen is unlike that of a home TV set and the monitor does not produce any sound.

3.2.3 TV Monitor Picture:

Normally in black and white video games there are only two video levels, white and black. In Sprint 2 a grey video level is added to represent two programmed race cars. This is accomplished by using the video output summing resistors as a voltage divider during the grey car scans. The results is a decreased video output signal. Since the signal level determines the beam current of the TV monitor CRT, the result is a condition of not full on (white) and not full off (black) but somewhere between the two conditions (grey).

3.3 GAME SEQUENCE

3.3.1 Operating Modes:

During normal use, Sprint 2 can be described as operating in one of four modes; attract, ready-to-play, play, and freeze. Connecting the power cord to the proper AC source energizes the game and the game will be in the attract mode. The game remains in the attract mode until a coin has been inserted and the coins clear the coin mechanism, then the game goes into the start mode. After the desired track is selected by pressing the TRACK SELECT pushbutton, the play mode is initiated by pressing one of the player start pushbuttons; the game timer will begin counting down from 100 by one-digit increments. When the game timer reaches zero, the game goes into the freeze mode for approximately ten seconds before returning to the attract mode.

3.3.2 Attract Mode:

Figure 3-2 illustrates one of the TV monitor displays during the attract mode. During the attract mode, the four cars (one white, one black, and two grey cars) are displayed moving about the tracks as the tracks progressively change from the easiest to the most difficult (see Owner/Operator options, subparagraph 3.3.6 of this section). In this mode, there is no sound. It is normal, while the twelve tracks change, for some of the cars to "cheat" by going through some of the tracks' boundary lines. Across the top of the TV monitor one of the following will be displayed:

1 COIN PER PLAYER
2 COINS PER PLAYER
1 COIN PER 2 PLAYERS

3.3.3 Start Mode:

Figure 3-3 illustrates the TV monitor display during the start mode before the TRACK SELECT pushbutton is pressed.

The insertion of the proper coins in the coin mechanism initiates the start mode. When the coins clear the coin acceptor, the display will stop the automatic changing of the tracks and the easiest track is displayed and the cars are lined up at the starting line. Pressing the TRACK SELECT pushbutton, as instructed by the TV monitor display, will change the displayed track to the next more difficult track, until

the twelfth track is displayed. Pressing the TRACK SELECT pushbutton while the twelfth track is displayed will begin the cycle over again from the easiest track.

3.3.4 Play Mode:

The play mode is initiated by pressing the ONE PLAYER START or TWO PLAYER START pushbutton. As soon as the appropriate pushbutton is pressed, there will be a motor sound from each of the two speakers. The TV monitor display is the same as the start mode, except as follows; (1) the instruction words PUSH START BUTTON disappear from the bottom of the display; (2) the instruction words PUSH BUTTON TO CHANGE TRACKS disappear from above the track (only if the easiest track is displayed); and (3) the game timer begins counting down from 100. At the time of the initiation of the play mode, the player controls are enabled. As the player or players advance their cars around the track, a score for the player on the right is tallied beneath the word WHITE and a score for the player on the left is tallied under the word BLACK on the TV monitor display. Two points are awarded for passing each of the five checkpoint areas on the track. The five checkpoint areas are not identified on the TV monitor display.

3.3.5 Freeze Mode:

The freeze mode is initiated when the game timer reaches zero (see Owner/Operator Options, subparagraph 3.3.6 of this section). The TV monitor display is the same as in the play mode, except all car motion is "frozen," the words GAME OVER repeatedly appear and disappear across the top of the TV monitor display, and driver rating words GRANNY, ROOKIE, or PRO for each player appear at the bottom of the display. The freeze mode lasts for approximately ten seconds, then the game will go back into the attract mode.

3.3.6 Owner/Operator Options:

Options of the Sprint 2 game are available to the owner/operator for maximum player appeal for each game location. These options are listed in Table 3-1; they are preset for a certain game structure in the manufacturing process. To determine how the switches are set, place the self-test switch, located just inside and to the left of the coin mechanism of the game cabinet, to the ON position. At the end of the self-test sequence, the TV monitor will display the results of the toggle positions of switch assembly SW1, as listed in Table 3-1.

In order to change the toggle positions of the switch assembly, the Sprint 2 PCB must be removed from the RF Shield Box Assembly as described in Section VII, Dissassembly and Assembly, of this manual.

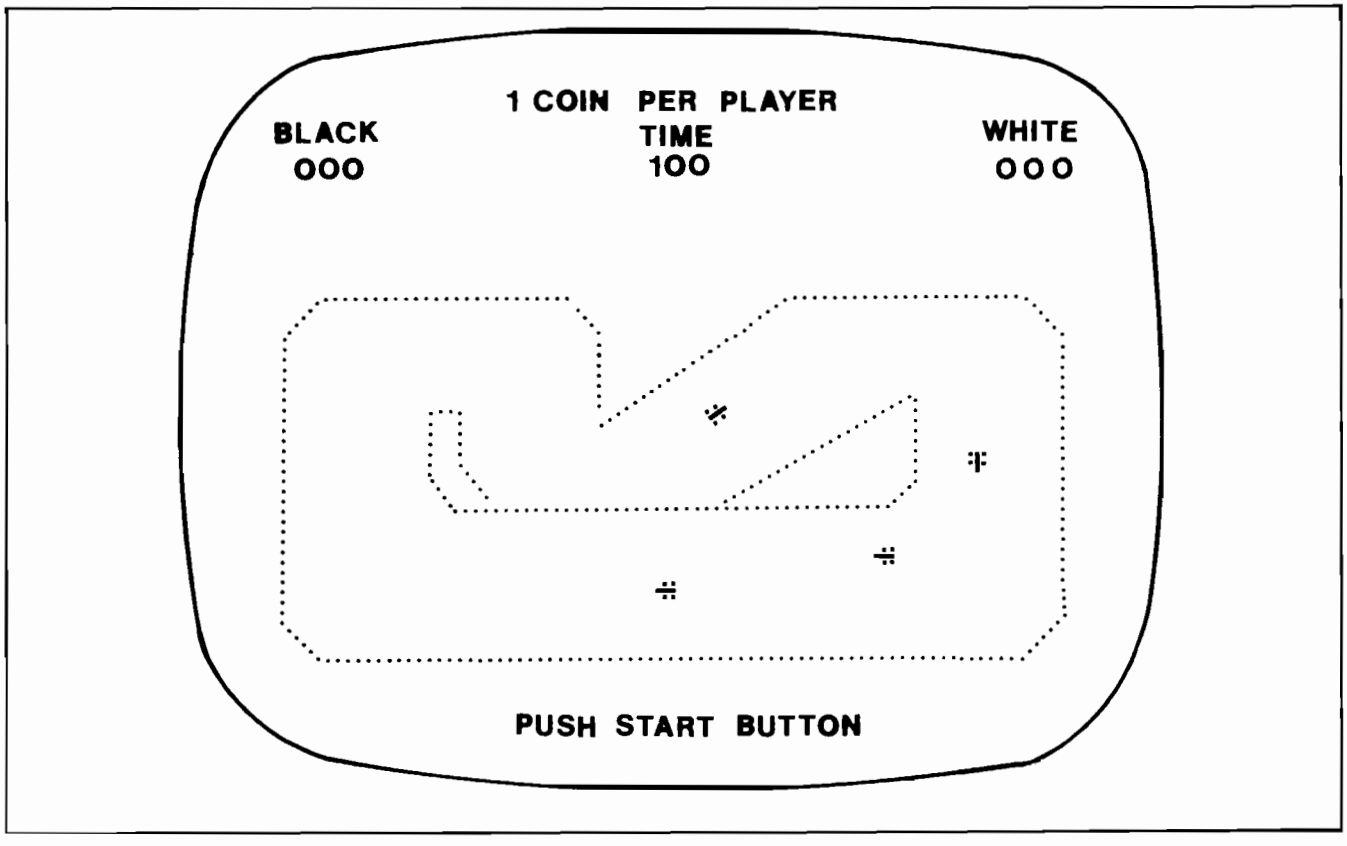


Figure 3-2 Attract Mode Display

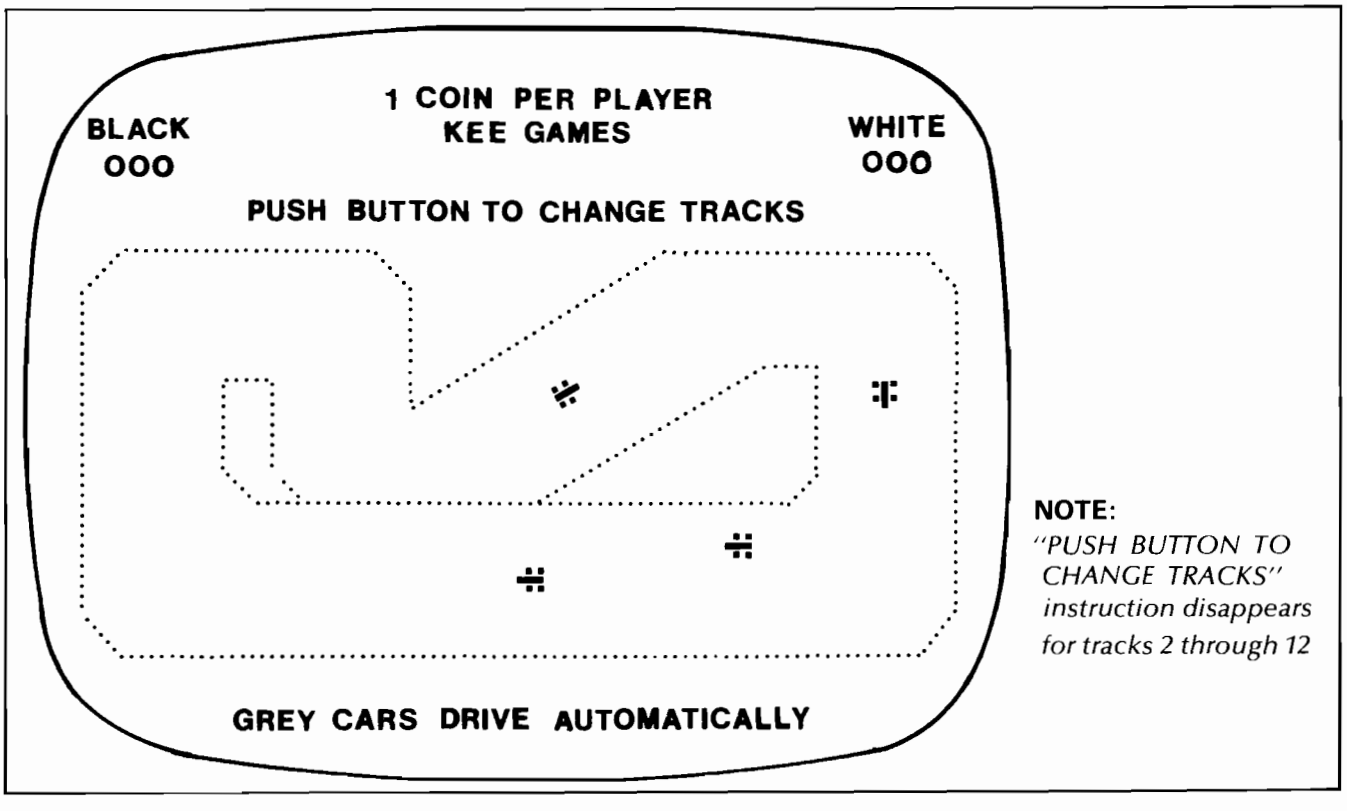


Figure 3-3 Ready-To-Play Mode Display

Table 3-1 Owner/Operator Optional Switch Settings

Switch Assembly SW Toggle Positions								TV Monitor Display	Description
1	2	3	4	5	6	7	8		
On								Oil	oil slicks added to tracks
Off									no oil slicks
	On								displays only easiest track during attract mode
	Off							Cycle	alternately displays all twelve tracks during attract mode
		On	On					1 coin per player	game cost 25¢ per player
		On	Off					2 players per coin	game cost 25¢ for two players
		Off	On					2 coins per player	game cost 50¢ for each player
		Off	Off					Demo	game is free (no attract mode)
				On				Extended play	extended play of 3/10 of time set by toggles 7 and 8, if player obtains pro rating in normal play
				Off					no extended play
					On				this toggle is not used, any position ok
					Off				this toggle is not used, any position ok
						On	On	Time 150	game time equals 150 seconds
						On	Off	Time 120	game time equals 120 seconds
						Off	On	Time 90	game time equals 90 seconds
						Off	Off	Time 60	game time equals 60 seconds

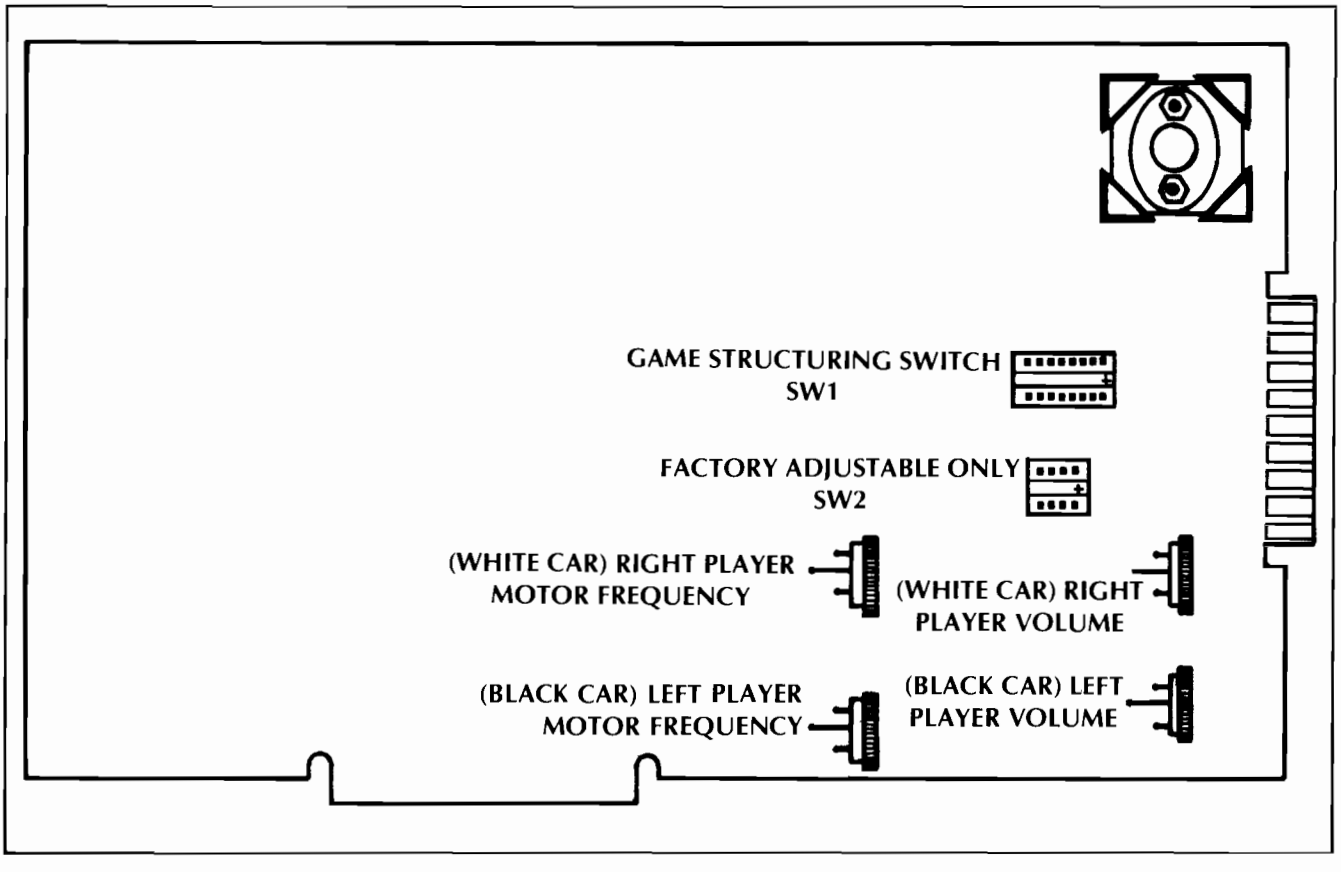


Figure 3-4 Location of Switch SW1 and Volume Controls

IV. THEORY OF OPERATION

4.1 GENERAL COMMENTS

This subsection provides a technical description of the Sprint 2 electronic circuitry. Section IX of this manual contains schematic diagrams, assembly drawings, and parts lists referred to in the following subparagraphs of this section.

On the Sprint 2 PCB schematic diagram, drawing number 005922, the symbol P (appearing at various inputs of the integrated circuits) indicates a connection to +5VDC through one of the pull-up resisters R1, R2, R4, R33, or R38.

For easy reference, the Sprint 2 PCB is divided into 126 sections. These sections are identified by letters A through R (skipping letters G, I, O, and Q because they may be easily confused with numbers 6, 1, and 0 respectively) for the short side of the PCB and numbers 1 through 9 for the long side of the PCB. For example, sheet 1 of 5 of drawing number 005922 illustrates a NAND buffer R9 at the upper left hand corner of the drawing. The component hardware of NAND buffer R9 will be found at coordinates R and 9 on the PCB.

The following circuitry discussion is separated into two sections; the microcomputer circuitry and the game circuitry. Figure 4-1 is a block diagram of the entire Sprint 2 PCB.

4.2 COMPONENTS OF THE MICROCOMPUTER SYSTEM

The microcomputer system carries out complex tasks of the game by performing a large number of simple tasks. Control of the system is the primary function of the Microprocessing Unit. The Microprocessing Unit causes the system to perform the desired operations by addressing the Program Memory for an instruction, reading that instruction, and then executing the simple task dictated by that instruction. Temporary storage of data necessary for the execution of future instructions, such as arithmetic operations, is stored into a Read/Write Memory.

4.2.1 Program Memory (Bottom Half of Schematic Sheet 3):

Program Memory consists of read-only memories (ROMs), permanently programmed by Kee Games to execute the Sprint 2 game. This memory has the capability of producing 8 bits of data for each of 8,192 combinations of ones and zeros on the 14 address inputs. In computer terminology, this is stated as a memory size of 8k x 8.

The Sprint 2 game contains one of three combinations of ROM chips to make up the Program Memory, depending on the dash number configuration of the Sprint 2 PCB. These combinations are listed in Table 4-1 and all combinations are illustrated on schematic sheet 3.

Since the data in the Program Memory is a permanent physical configuration of the ROM chips, the data is not lost when power is disconnected from the game or when the chip is removed from its socket. Since the Program consists of read-only memory, the result of an address input can only be the "reading" of data stored in the manufacturing process. It is not possible to "write" in more data.

4.2.2 Read/Write Memory (Top Half of Schematic Sheet 3):

Read/Write Memory (RAM) consists of random-access memory, which actually contains eight random-access memories (2102-1s). Data may be stored in the RAM (called "writing" the RAM), then

Table 4-1 ROM Combinations of Program Memory for Sprint 2 PCB Different Configurations

PCB Part No.	Sprint 2 PCB Location																			
	A0	C0	D0	E0	F0	F1	H0	H1	J0	J1	K0	K1	L0	L1	M0	M1	N0	N1	P0	P1
5922-01					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5922-02	X	X											X	X	X	X	X	X	X	X
5922-03	X	X	X	X																

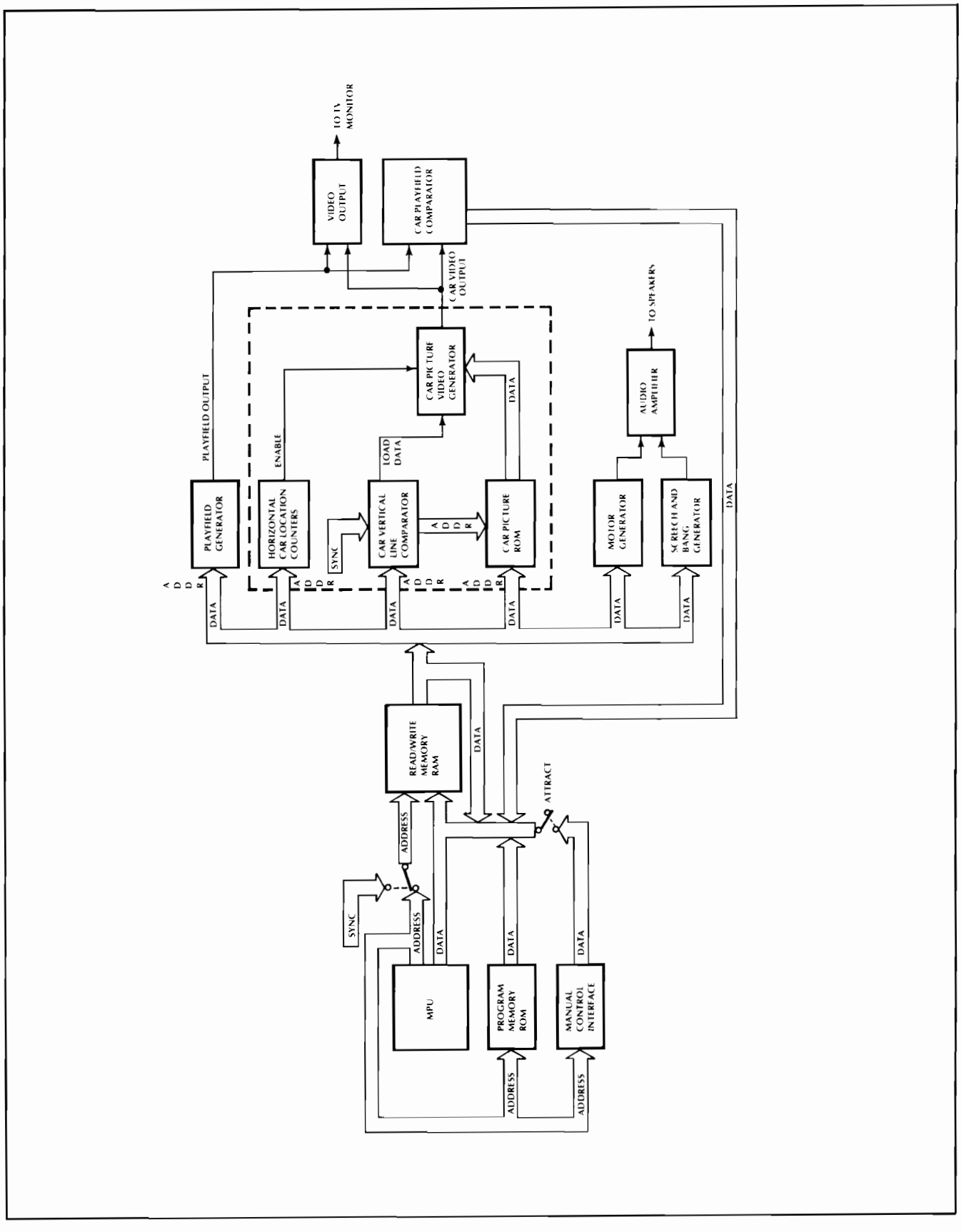


Figure 4-1 Sprint 2 PCB Block Diagram

later recalled (called "reading" the RAM). Memory size of the Read/Write Memory is 1k x 8.

In order to read from the RAM, R/$\overline{W}$ (pins 3) input of all random-access memories must be at a high logic level; to write into the RAM, R/$\overline{W}$ must be a low logic level.

As previously mentioned, data stored in the RAM is for the purpose of performing operations on data as instructed by the Program Memory. Since the RAM is a temporary storage area, removing power from the RAM chips will "erase" all stored data.

4.2.3 Microprocessing Unit:

As mentioned earlier, the controller of the microcomputer is the microprocessor (MPU). From the MPU, a sixteen-bit address bus addresses Program Memory, RAM, and an Address Decoder. An eight-bit bi-directional data bus serves as a path for transferring data from Program Memory and to and from the RAM and other interfacing devices.

4.2.4 Tri-State Devices:

Tri-state devices, such as E5 of schematic sheet 3, are capable of having normal logic output of ones and zeros when disable (pin 1) is at a low logic level. When disable is at a high logic level, the output becomes a high impedence. In other words, when disable is at a high logic level, it is equivalent to completely removing device E5 from the circuit. ROMs and RAMs are also tri-state devices. Each ROM or RAM must be enabled by a certain logic level at its chip-enable input before the device is capable of outputting or inputting data.

4.3 THE MICROCOMPUTER SYSTEM

The primary function of the Sprint 2 Microcomputer is to instruct the game circuitry for the proper TV monitor display and audio outputs for corresponding manual inputs.

4.3.1 Program Memory Enable:

With initial power applied to the Sprint 2 PCB, the MPU addresses Program Memory for an instruction by placing a 16-bit code at outputs AB0 through AB15. The address decoder, consisting of ROM E2, one-of-ten decoders D2, F2, and E8, and addressable latch A1, receives the five most significant bits of this address code (address 9 through 13) as an instruction of which part of Program Memory to access. Outputs of one-of-ten decoder F2 enable only the individual ROMs of Program Memory required for the desired instruction.

4.3.2 RAM Enable:

Now, with the Address Decoder addressed for the enabling of the desired Program Memory ROMs, and Program Memory addressed for a data instruction, the MPU receives an 8-bit data instruction from Program Memory on the data bus. If this data instruction includes the storage of information, the MPU addresses the RAM and writes the data into the memory RAMs. The procedure of writing into RAM is enabled by two signals; chip enable CE (pins 13) and R/$\overline{W}$ (read/write) (pins 3) of the RAM must be at a low logic level. The Address Decoder ROM (E2) receives an address (A9 through A13) and one-of-ten decoder D2 receives a high logic level write signal from the MPU. The results of these signals is a low logic level $\overline{DISPLAY}$ at the input of multiplexer K2 for a low logic level chip enable CE at pins 13 of the RAM. The MPU also causes the R/$\overline{W}$ (pins 3) input to the RAM to be pulsed, via the $\overline{WRITE}$ signal. When this input is pulled to a low logic level, MPU data on the data input to the RAM (pins 11) is stored into the RAM location determined by address inputs A0 through A9.

4.3.3 Phase 1 and Phase 2:

Phase 1(Φ1) and phase 2 (Φ2) are outputs of the MPU and are formed by shaping the pulse of horizontal synchronization pulse 4H by D-type flip-flop A7. The 4H input of A7 (pin 13) is fed twice through the flip-flop at a clock rate of 12.096 MHz. The output of the first flip-flop and the output of the second flip-flop is fed through an OR gate to produce a phase 0 (Φ0) signal, as illustrated in figure 4-2. The MPU provides an output of Φ2 that is exactly like Φ0, except with a slight delay, and an output Φ1 that is of an opposite phase of Φ2. Signal Φ2 is fed through AND gate N3, which acts as a buffer.

When Φ1 is positive, the address and data lines of the MPU change and stabilize for the next output. When Φ2 is positive, the MPU addresses memory on the address bus and inputs or outputs data on the data bus. In order to guarantee that the MPU data is written to external devices at the proper time, write enable (WRITE, A7 pin 10) is shaped by NAND gate A8 and D-type flip-flop A7 as illustrated in figure 4-3.

Phase 2 is also used to control the output of RAM Address Multiplexer K2, J2, and H2. The multiplexer acts as a 12-pole-double-throw-switch switched at a rate of Φ2. Again, as previously mentioned, the RAM is addressed by the MPU and data written into it when Φ2 is a high logic level. When Φ2 is at a low logic level the RAM is addressed by horintal and vertical synchronization and data is read out of the RAM.

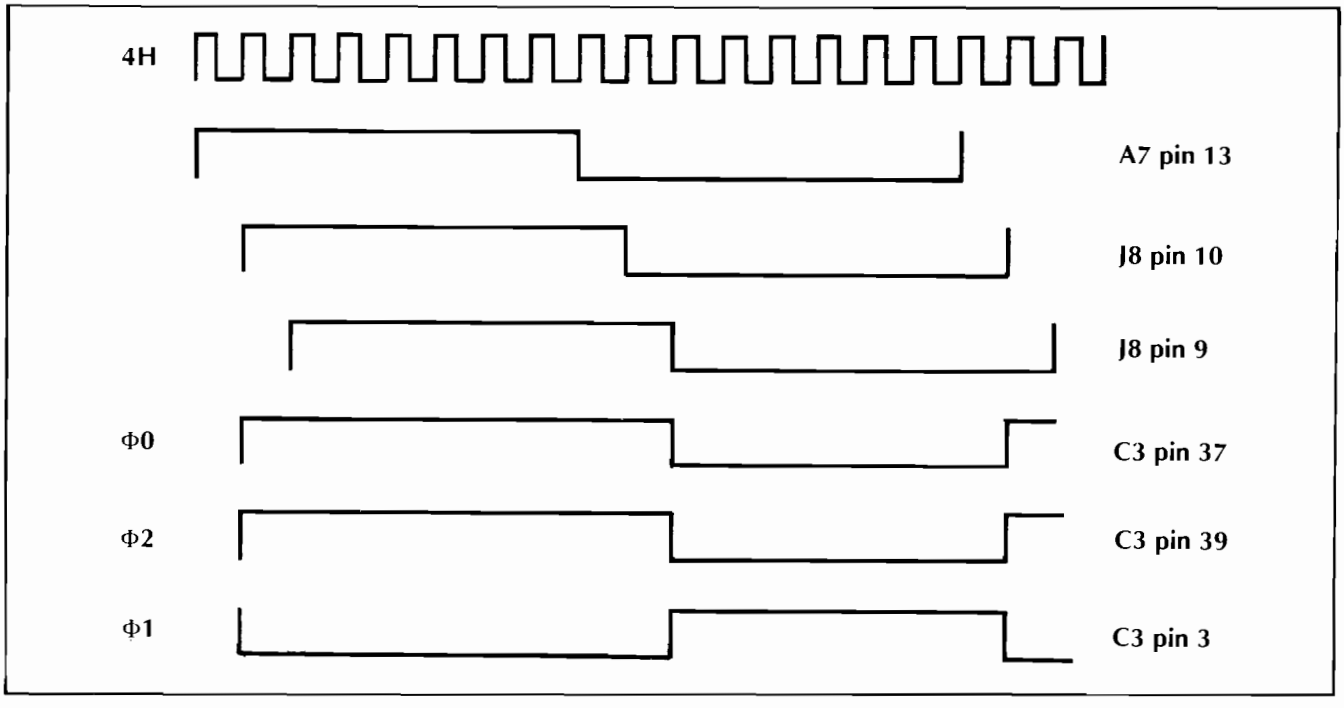


Figure 4-2 Phase 1 and Phase 2 Signal Shaping

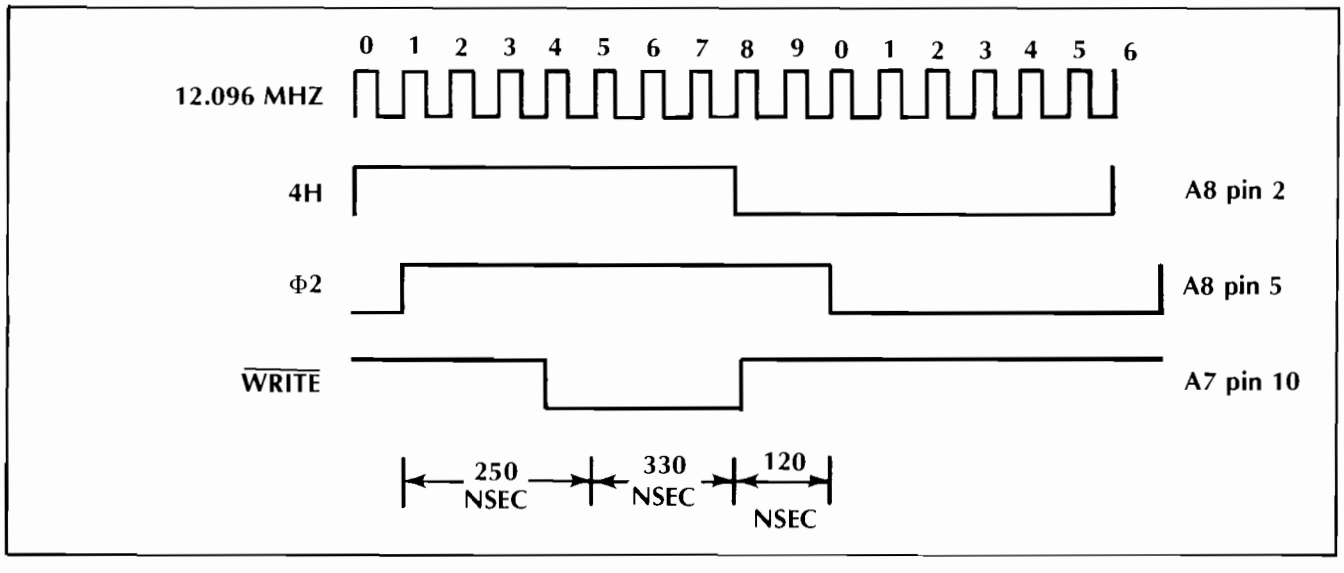


Figure 4-3 RAM Write Enable Signal Shaping

4.3.5 RAM Output:

The RAM has a second data output latch that places the RAM data at the output of D-type flip-flop F5 and L5 with the next rising edge of Φ2 (clock input of F5 and L5).

4.4 MICROCOMPUTER WATCH DOG

Watch dog is an external monitoring system that resets the Program Execution back to its initial instructions, if the program execution memory deviates from its intended sequence. This is accomplished by a watch dog statement (address code), incorporated in Program Memory, that results in a $\overline{\text{TIMER RESET}}$ pulse at the output of the Address Decoder. This reset pulse must occur before decade counter C6, 7 reaches the count of eight. Therefore if the Program Memory is functioning properly, a $\overline{\text{TIMER RESET}}$ pulse occurs within every eight frames of video.

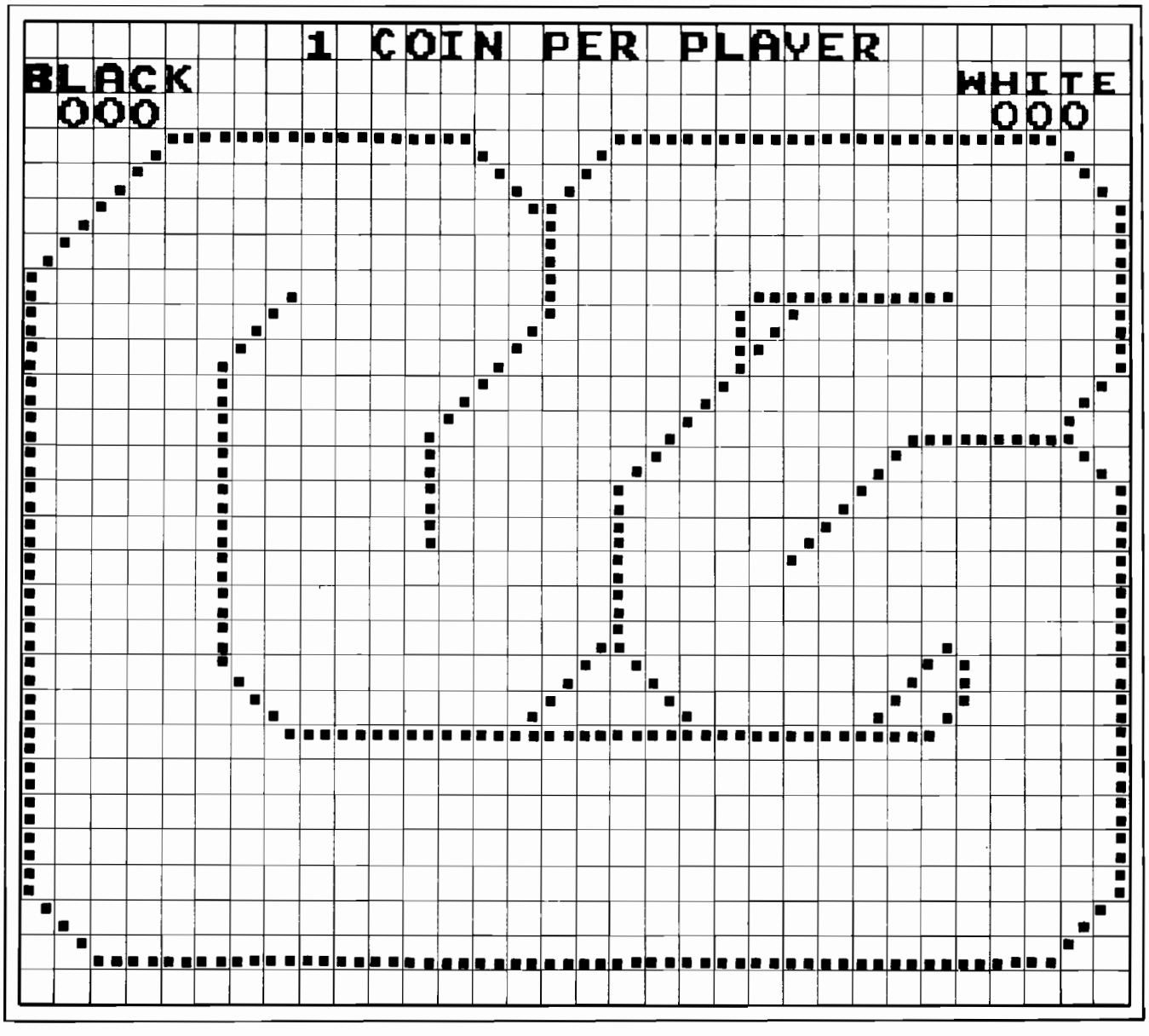


Figure 4-4 TV Monitor Playfield Display

4.5 COMPONENTS OF SPRINT 2 GAME CIRCUITRY

The game circuitry receives game instructions from the microcomputer and responds with the proper video and audio outputs. Manual controls of the game circuitry provide control information as a data input to the microcomputer.

4.5.1 System Clock and Sync Generator (Top of Schematic Sheet 1):

The crystal-controlled-clock generates a 12.096 MHz clock frequency that is used to produce all of the operating frequencies of the game. Insert 1, supplied with this manual, illustrates the horizontal and vertical sync synchronization waveforms. Note that 9-bit binary counter (R8, P8, and N8) counts from 128 to 512, accomplished by tying bit 128H (pin 5 of N8), to a pull-up resistor. Also note that the output of D-type flip-flop N2 is controlled by Sync PROM M2 (programmable read only Memory programmed by Kee Games for the desired output) for an output as illustrated by insert 1.

The horizontal and vertical synchronization signals are used to produce a TV monitor raster made up of 262 horizontal lines at a horizontal frequency of 15,750 Hz (256H). Synchronized with line 224 is a vertical blanking pulse that occurs for the duration of 38 more horizontal scans, resulting in the total number of 262 lines per frame.

4.5.2 Playfield Generator (Left Bottom of Schematic Sheet 1):

The Playfield Generator generates both the playfield and all alpha/numeric video for the TV monitor display. This is accomplished by the playfield ROM (consisting of ROMs P4 and R4 for a memory size of 512 x 8), shift register R3, and binary counter R2.

As illustrated in figure 4-4, the TV monitor display is made up of thirty-two horizontal by twenty-eight vertical grid sections. For each grid section, there is a byte of data (one byte equals eight bits D0 through D7) in the microcomputer RAM. During the Φ2 cycle, the RAM is addressed by the MPU, at which time the desired byte of data is transferred from Program Memory to the data input of the RAM. Then, during the Φ1 cycle, the horizontal and vertical synchronization signals can access each of these bytes of data as that particular grid is to be displayed. The RAM then outputs six bits of data (DISPLAY 0 through DISPLAY 5) that address any of the sixty-four different alpha-numerics and playfield characters stored in the Playfield ROM.

The Playfield ROM is programmed by Kee Games to provide eight bits of data for each of 512 addresses. The least significant addresses are from vertical synchronization 1V, 2V, and 4V and the 504 most significant addresses are DISPLAY 0 through DISPLAY 5 from the microcomputer RAM. For each of the 512 addresses, there is one of sixty-four grid pictures, each being eight scan lines high.

The top of figure 4-5 illustrates the letter "C" as it would be "traced" on the TV monitor display. The RAM would provide one six-bit address to the Playfield ROM for the letter, while vertical synchronization 1V, 2V, and 4V would complement the RAM address for each of the horizontal scan lines. The bottom of figure 4-5 illustrates the output of shift register R3 for each horizontal scan.

Note the letter "C" in grid section horizontal 11, vertical 1 in figure 4-4. In order to generate this character in this location, the microcomputer RAM would output a data code at the time this part of the display is being scanned. This six-bit code (DISPLAY 0 through DISPLAY 5) would contain the Playfield ROM address for the letter "C." Vertical synchronization 1V, 2V, and 4V would determine which of the eight lines of the character was being scanned at that time.

Shift register R3 then loads the actual playfield or alpha/numeric data from the playfield ROM and shifts it out in serial video (R3 pin 13).

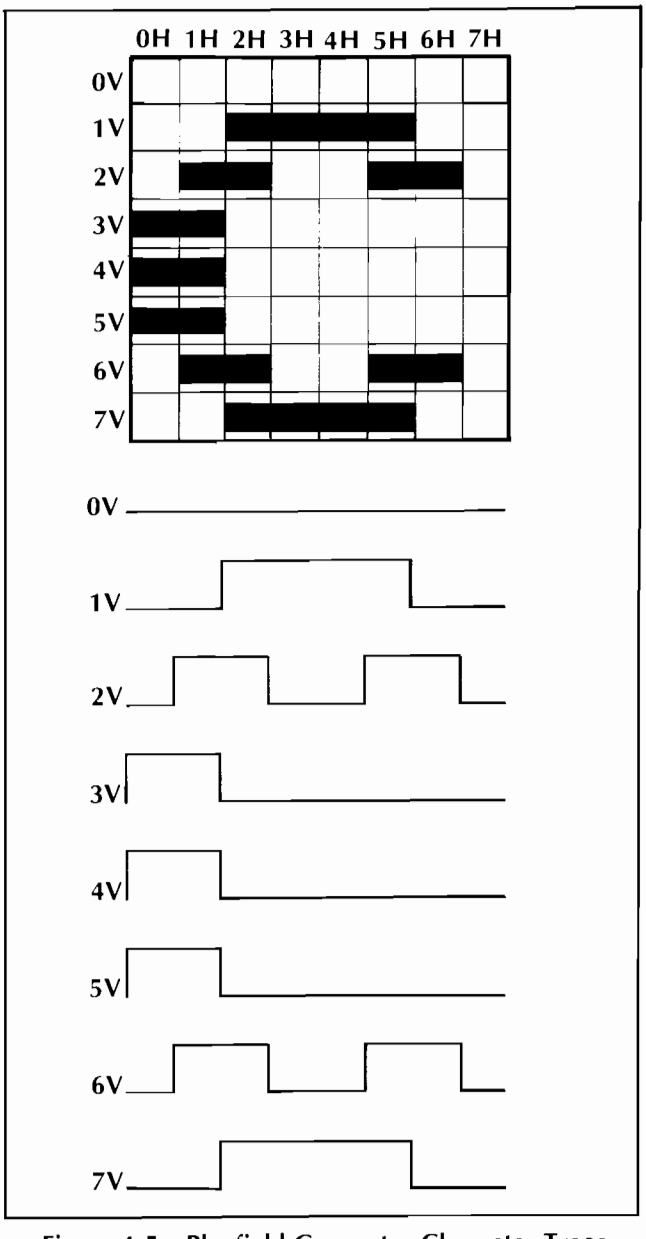


Figure 4-5 Playfield Generator Character Trace

Binary counter R2 latches data DISPLAY 7, from the microcomputer RAM. This results in the selection of white playfield video if DISPLAY 7 is a high logic level or black playfield video if DISPLAY 7 is a low logic level. In actuality, only some alpha/numerics and all oil slicks are represented in black video, while all of the racetrack boundary (playfield) is represented in white video.

Binary counter R2 is also used to produce the COMP SYNC*, COMP BLANK*, and a 256H* signal that are all delayed one character's width from their original timing. This delay is used to center the playfield on the monitor's horizontal scan.

4.5.3 Motion Generator (All of Schematic Sheet 2):

The motion generator generates the video for the four cars, which are the only moving objects of the Sprint 2 game. The car picture ROM (consisting of ROMs J6 and K6, for a memory size of 512 x 8) is programmed by Kee Games to provide sixteen bits of data for each of the eight lines of each of the thirty-two different states of rotation of a car.

The microcomputer RAM provides three words (bytes) of data for the display of each car picture. The first byte determines the vertical location of the car, the second determines the proper rotation picture of the car, and the third determines the horizontal location of the car. The accessing of these bytes of RAM data is done during the horizontal blanking period ($\overline{256H}$).

Vertical position data is received by Vertical Line Comparator M4 and L4. Take for example, the data code for a car to be displayed beginning on line 120. The RAM byte data code of 01111000 would be loaded into the comparator. When the vertical line comparator reaches the count of 01111000, and 8H, 64H, $\overline{256H}$, and $\Phi 2$ are all at a high logic level, the conditions are met for a low logic level at the output of NAND gate N4 (pin 8). One $\Phi 2$ clock pulse later, a low logic level appears at the Q3 (pin 7) output of latch L5 (clock input for L5 is located on schematic sheet 3). This initiates the eight vertical load pulses as illustrated in Insert 1, supplied with this manual.

The RAM byte data code that controls car rotation is capable of addressing any of thirty-two different car pictures. The five bits of data code necessary to do this (DISPLAY 3 through DISPLAY 7) are applied directly to the address input of the Car Picture ROM J6 and K6. The least significant address lines applied to the Car Picture ROM (inputs A0, A1, A2, and A3) complement the rotation data code by determining which of the eight lines of the car is being described by the ROM data output, and whether it is the first half (right) or second half (left) of the car to be displayed. When $\Phi 2$ is a high logic level, the video data output (VID 0 through VID 7) from the Car Picture ROM is timed with load vertical pulse LDVxB. Load vertical pulse LDVxB enables shift register M7 (K7, H7, or E7) to load the video data from the Car Picture ROM. This data is for the right half of the car.

When $\Phi 2$ is a low logic level, the video data output (VID 0 through VID 7) from the Car Picture ROM is timed with load vertical pulse LDVxA. Load vertical pulse LDVxA enables shift register N7 (L7, J7, or F7) to load the video data from the Car Picture ROM. This data is for the left half of the car.

Now to review, the Motion generator has received a RAM data code for where the car is to be displayed vertically and a RAM data code for the proper picture of the car. The final instruction needed is for the horizontal placement of the car. The RAM byte that determines this is received by the car horizontal location counter.

The car horizontal location counter R5 and R6 (P5 and P6, N5 and N6, or M5 and M6) is loaded each horizontal line by a load horizontal pulse LDHx as illustrated in Insert 1, supplied with this manual. The counter is preset to a given count by the RAM data code (DISPLAY 0 through DISPLAY 7) during horizontal blanking. At the end of horizontal blanking, 256H goes to a high logic level, and the counter is enabled to begin counting up at a clock rate of six MHz.

4.5.4 Video Output (Schematic Sheet 1):

The Video Output circuit receives all video signals and gates them together through summing resistors R48, R49, and R50. Cars 3 and 4, the grey cars, are gated through a parallel path to produce a positive signal through resistor R50 and a negative signal through R49. The summed result is between a full ON condition (white) and a full OFF condition (black) which is a grey level of the TV monitor display.

4.5.5 Car/Playfield Comparator (Top Center of Schematic Sheet 5):

The Car/Playfield Comparator is a network of logic gates that gate together the three video outputs of the Motion Generator and the two video outputs of the Playfield Generator. Table 4-2 provides the seven possible conditions that would cause a high logic level to appear on data lines D6 and D7 of the data bus. The microcomputer MPU recognizes an output from comparator if the MPU initiates an address to the Address Decoder for a $\overline{\text{COLLISION 1}}$ or $\overline{\text{COLLISION 2}}$ "read" signal. This causes tri-state devices E5 and E6 to be enabled and allows the output of the Car/Playfield Comparator to be transferred onto the MPU data bus.

When the MPU receives the data that a skid (high logic level on data line D6) or crash (high logic level on data line D7) condition exists, Program Memory instructs the MPU to cause the appropriate response to be displayed on the TV monitor display, and then to clear the Car/Playfield Comparator. This is done by the MPU outputting an address that is

decoded to cause a low logic level $\overline{\text{COLLISION RESET 1}}$ and/or $\overline{\text{COLLISION RESET 2}}$. The Collision Reset signals reset latch H6 of the Car/Playfield Comparator.

Table 4-2 Conditions of Car/Playfield Data Output

Car/Playfield Comparator Conditions	Data Line Output
Car 1 equals Car 2	D6
Car 1 equals Car 3 or 4	D6
Car 2 equals Car 3 or 4	D6
Car 1 equals Black Playfield (oil)	D6
Car 2 equals Black Playfield (oil)	D6
Car 1 equals White Playfield (track boundary)	D7
Car 2 equals White Playfield (track boundary)	D7

4.5.6 Manual Control Interface (Left Side of Schematic Sheet 5):

The main component of the Manual Control Interface is multiplexer M8. This component acts as a two-pole four-position switch, operated by address lines ADR6 and ADR7 from the microcomputer MPU. Table 4-3 lists the input/output relationship of multiplexer M8 with the given Address inputs. Multiplexer M8 interfaces three different sources of information as follows; 1) coin information; 2) steering information; and 3) switch information. All information is received by the microcomputer MPU when the MPU addresses the Address Decoder for a low logic level $\overline{\text{SWITCH}}$ signal that enables tri-state device K5 for a data output on the D6 and D7 data lines.

Coin information is a matter of storing in the microcomputer RAM the number of times a low logic level pulse appears on the data lines, when the appropriate address input of multiplexer M8 is being addressed. The microcomputer MPU only "looks" for coin pulses during the attract mode.

Steering information is "looked" for by the microcomputer MPU during the play mode. The steering printed circuit assembly consits of two light emitting diodes that are optically aligned with two light sensitive transistors. A toothed cylinder, that is turned by the steering wheel, is inserted between the light emitting diodes and the transistors, and interrupts the light from the diodes. When the steering wheel is turned, two pulses appear at the output of the steering printed circuit assembly that differ in phase. As illustrated in figure 4-6, when the wheel is turned to the right, the A output pulse leads the B output pulse. When the wheel is turned to the left the A output pulse lags the B output pulse. The inverse of the two pulses are applied to the D and clock inputs of two D-type flip-flops (see schematic). The microcomputer MPU recognizes that a steering maneuver has been made when a low logic level appears on data line D7. The MPU then "looks" at data line D6 and determines from the logic level (high or low) if "Steering A" input is leading or lagging "Steering B" input. Once the MPU has processed a steering maneuver, the MPU then outputs an address that is decoded by the Address Decoder and results in a low logic level $\overline{\text{STEERING RESET 1}}$ or $\overline{\text{STEERING RESET 2}}$ signal that resets the D-type flip-flop responsible for the steering signal.

Switch information is received by multiplexer M8 at inputs 1CO and 2CO. The microcomputer MPU addresses Decoders F9, H9, and J9 to determine if a switch is opened or closed. If closed a low

Table 4-3 Operation of Multiplexer M8 With Given Input Address

Address Logic Level		Output	
ADR6	ADR7	1Y (D7)	2Y (D6)
L	L	1C0	2C0
L	H	1C1	2C1
H	L	1C2	2C2
H	H	1C3	2C3

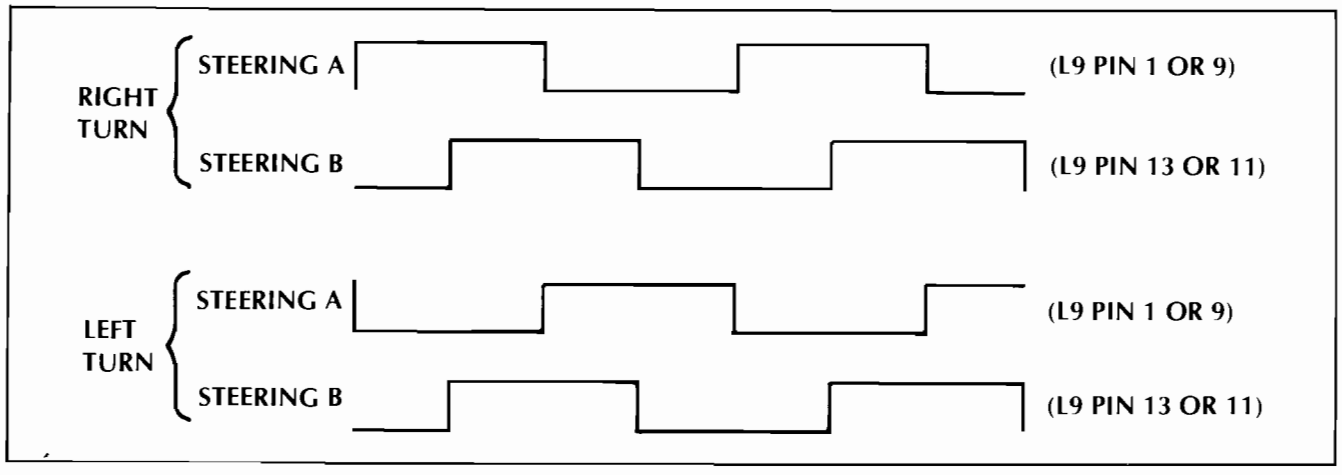


Figure 4-6 Steering Printed Circuit Assembly Output Pulses

Table 4-4 Addresses of Switch Positions for MPU Data Line D6 D7 Input

	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3
ADR0	L	H	L	H	L	H	L	L	H	L	H	L	H	L	L	H	L	H
ADR1	L	L	H	H	L	L	H	L	L	H	H	L	L	H	L	L	H	H
ADR2	L	L	L	L	H	H	H	L	L	L	L	H	H	H	X	X	X	X
ADR3	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L
ADR4	H	H	H	H	H	H	H	L	L	L	L	L	L	L	H	H	H	H
ADR5	L	L	L	L	L	L	L	H	H	H	H	H	H	H	X	X	X	X
multiplexer M8 input 1CO (D7)	1ST1	1ST2	2ND1	2ND2	3RD1	3RD2		GAS1	GAS2	SELF TEST		START 1	START 2	TRACK SEL	OIL SLICK	$ MODE 1	EXT PLAY	TIME 1
multiplexer M8 input 2CO (D6)															TRK CYC	$ MODE 0	SPARE	TIME 0

NOTE: X indicates a condition of either high or low

logic level pulse will result for the given address as listed in table 4-4.

4.5.7 Motor Generator (Top Right of Schematic Sheet 5):

The key to the Motor Generator is the operation of transistor Q1 in conjunction with timer D7,8. Timer D7,8 operates as an oscillator with output frequency dependent upon the resistive charge path of capacitor C22.

Varying the collector to emitter resistive value of transistor Q1, varies the combined resistive charge path of capacitor C22 through transistor Q1 and resistors R21 and R23 in parallel with resistor R22. As the combined resistive value decreases, the output frequency of the timer increases. Variable resistor R23 makes it possible for the technician to adjust the frequency for a desirable motor idle sound.

The conductance of transistor Q1 is varied by grounding any combination of voltage divider resistors R5, R6, R7, and R8. The combinations of these resistors are determined by data, from the microcomputer RAM, applied to the input of Latch D4. Table 4-5 lists the approximate voltages at the base of transistor Q1 (or Q2) for the fifteen different address inputs. These addresses cause a latch condition of Latch D4 only if a low level logic $\overline{\text{MOTOR 1}}$ signal enables Latch D4.

To derive a realistic car motor sound, the output of Timer D7,8 is divided into three separate frequencies by Divider D8, then summed by resistors R42, R43, and R44. A divide by three signal at QB (pin 11) output of D8 is applied to summing resistor R42. Outputs QB and QD (pin 8) are also applied to Exclusive OR Gate C7 to provide a divide by twelve signal at the QA (pin 12) output of D8, which is applied to summing resistor R42.

Table 4-5 Approximate Base Voltage of Transistor Q1 or Q2 for Given Address

Address					Base Voltage of Transistor Q1 or Q2
	DISPLAY 0	DISPLAY 1	DISPLAY 2	DISPLAY 3	
0	L	L	L	L	5.00 VDC
1	H	L	L	L	4.25 VDC
2	L	H	L	L	4.08 VDC
3	H	H	L	L	3.95 VDC
4	L	L	H	L	3.77 VDC
5	H	L	H	L	3.65 VDC
6	L	H	H	L	3.52 VDC
7	H	H	H	L	3.42 VDC
8	L	L	L	H	3.22 VDC
9	H	L	L	H	3.13 VDC
10	L	H	L	H	3.03 VDC
11	H	H	L	H	2.95 VDC
12	L	L	H	H	2.84 VDC
13	H	L	H	H	2.77 VDC
14	L	H	H	H	2.69 VDC
15	H	H	H	H	2.62 VDC

4.5.8 Bang and Screech Generator (Right Bottom of Schematic Sheet 5):

The heart of the Bang and Screech Generator is noise generator B7, D7. Shift Registers B7 and D7 are connected in a manner to produce random noise at the QH (pin 13) output of B7.

Bang is the result of data from the microcomputer RAM, which is used to gate varying amounts of random noise through to the audio amplifier. By starting with a binary data code of 1111 (DISPLAY 3 through DISPLAY 0), then rapidly stepping the data code down to 0000, results in gating noise from noise generator B7, D7 through a resistive value of 550 ohms (R24, R25, R26, and R27 in parallel), to 8.2k ohms, for a data code of 0001, and infinity, for a data code of 0000. The result is an envelope of sound from full ON to full OFF.

Screech sound is produced by processing the output of the random noise generator with a type of hysteresis feedback loop, via schmitt-trigger inverter A5 (7414) and 100 ohm resistors R17 and R18), and then gating this processed noise with SKID 1 or SKID 2.

4.5.9 Audio Output (Bottom Center of Schematic Sheet 5):

The summed signals of the Motor Generators, and Bang and Screech Generator are applied to one leg of a 5k ohm potentiometer. Varying the wiper position of the potentiometer varies the signal input of Audio Amplifier B9 or D9. The output of the Audio Amplifiers are connected to an eight-ohm speaker for each car.

4.6 SELF-TEST FEATURE

A self-test feature is provided in the Sprint 2 game and is activated by merely setting the self-test switch, located just inside and to the left of the coin mechanism access door, to the ON position. This feature provides on-the-spot testing to a level of approximately 70% of the Sprint 2 game. Circuitry that is tested is the microcomputer MPU, RAM, motion circuitry Program Memory, game switches, and pushbutton light emitting diodes (LEDs).

By addressing the RAM, writing the RAM with all possible combinations of data, then reading the RAM, the self-test thoroughly tests the individual random access memory chips and the MPU itself.

By performing a check sum of all the data bits of the Program Memory, the self-test detects any error of the Program Memory.

Operation of all game switches is checked by the self-test operator, by listening for a screech audio output as the operator activates each switch.

Backlighting of each pushbutton is activated for a visual check by the self-test operator.

V. INSTALLATION INSTRUCTIONS

5.1 UNPACKING INSTRUCTIONS

5.1.1 Examination for Shipping Damage:

Before shipment from the factory, components and sub-assemblies of each game are carefully checked for proper operation. However, during shipment some adjustments may have changed or parts may have been damaged. Upon initial removal of the game from the shipping container, first examine the exterior of the cabinet. Then open the rear access panel and also examine the interior. Any shipping damage such as a dented, cracked or broken cabinet, sub-assemblies broken loose, etc., should be reported immediately to the shipper and to Atari, Inc.

5.1.2 Mechanical Inspection:

After determining that the game has been received in good condition, carefully inspect the interior parts and verify the following:

(a) All plug-in connectors are firmly seated.
(b) The fuses are all seated in their holders
(c) No loose foreign objects are present (especially metal objects which could cause electrical short circuits)
(d) No harness wires have become disconnected or pulled loose.

Be sure *all* major assemblies have been checked: game PCB, the transformer and other components on the electronics tray assembly, the two coin mechanisms, the speakers, all player controls and the TV monitor chassis.

Do not go on to the remaining paragraphs in this section until the above mechanical inspection has been thoroughly performed.

5.2 VERIFYING OPERATION OF INTERLOCK SWITCHES

Interlock switches are located inside the rear access door and are there to prevent accidental shock of anyone who has reason to stick a hand inside the cabinet. The function of these switches is to remove all power that goes into the game when the rear access door is open. These switches are mechanically aligned by Kee Games, but it is important that they are checked to insure the proper operation after shipping.

After the completion of subparagraph 5.1.2 plug the AC Power Cord into the appropriate AC Power Source, set the "Power ON/OFF" switch to ON position. Within approximately 30 seconds, there shall be a raster display on the TV monitor. Verify operation of interlock switches as follows:

1. Unlock and completely open rear access door. This will result in the picture of the TV monitor screen to disappear.
2. Press switch plunger for one of the interlock switches and hold for at least ten seconds. If TV monitor picture comes on, replace the other interlock switch.
3. Repeat step 2 with the other interlock switch.
4. Check that both interlock switches are aligned in a manner that when the rear access door is opened the interlock switches will disengage.

Do not go on to the remaining subparagraphs in this section until the operation of the interlock switches has been satisfactorily verified.

5.3 OPERATION OF SELF-TEST FEATURE

5.3.1 Activating the Self-Test Feature:

To activate the self-test feature, unlock and open the coin mechanism door and set the self-test switch, located inside and to the left of the coin mechanism door, to the ON position.

5.3.2 Self-Test Procedure:

The response of activating the self-test feature is as follows:

(a) RAM Test: The TV monitor shall "flash" alpha-numerics on the viewing screen, while an audio "hash" sound comes from the speakers. During the time the TV monitor is flashing pictures of alpha-numerics, a rotating car appears in the lower right-hand corner of the viewing screen, and moves diagonally across the screen toward the upper left-hand corner of the screen. When the car reaches the upper left-hand corner of the screen, the RAM test is completed.

If there is a RAM failure, the TV monitor display will freeze, with the alpha or numeric displayed on the TV monitor that is associated with the particular data code that failed the RAM test.

If the RAM test determines that all RAMs are OK, the self-test feature will automatically begin the ROM test.

(b) ROM Test: The ROM test will have no visual effect on the viewing screen, if all ROMs test results are satisfactory. Therefore, the self-test operator just sees a visual representation of the game structuring in white characters at the top of the TV monitor viewing screen. If a ROM is not operating properly, black numbers will appear in the center of the TV monitor viewing screen. Table 4-1 lists the ROMs of the Sprint 2 PCB for the black numbers on the TV monitor display. If all ROMs are OK, there will not be any black numbers in the center of the TV monitor display.

(c) Switch Test: Perform the following steps. For each step, there will be an audio screech sound from the game cabinet speakers. Absence of the audio screech sound is an indication that the associated switch circuitry is not functioning properly.

1. Set gear shifter on left-hand side of game cabinet in 4th-gear position and set right-side gear shifter in the 1st-gear position.
2. Set right side gear shifter in 2nd-gear position.
3. Set same gear shifter in 3rd-gear position.
4. Set same gear shifter in 4th-gear position (there should be no screech sound), then step on accelerator foot pedal on right-hand side of game cabinet.
5. Set gear shifter on left-hand side of game cabinet in 1st-gear position.
6. Set same gear shifter in 2nd-gear position.
7. Set same gear shifter in 3rd-gear position.
8. Set same gear shifter in 4th-gear position (there should be no screech sound), then step on accelerator foot pedal on left-hand side of game cabinet.
9. Press One Player Start pushbutton.
10. Press Track Select Pushbutton.
11. Press Two Player Start pushbutton.
12. Unlock and open coin mechanism door. (No sound produced)
13. Trip left coin acceptor.
14. Trip right coin acceptor.

(d) Lamp Test: Light emitting diodes for One Player Start, Track Select, and Two Player Start shall be lighted.

5.4 OPTIONAL GAME STRUCTURING

At the end of the RAM test, when the self-test switch is in the ON position, game structuring is displayed in white alpha-numerics at the top of the TV monitor viewing screen. In order to determine the meaning of this display, refer to subparagraph 3.3.6 of Section III of this manual.

VI. MAINTENANCE AND ADJUSTMENTS

6.1 ROUTINE MAINTENANCE

Due to its solid-state electronic circuitry, this Kee game should require very little maintenance and only occasional adjustment.

Game cabinets and glass may be cleaned with any non-abrasive household cleaner. If desired, special coin machine cleaners which leave no residue can be obtained from distributors.

NOTE

The TV monitor is accessible only from inside the game cabinet and these adjustments have to be done while the game is energized. Therefore only persons familiar with safety measures and repair procedures on electrical equipment should perform them.

6.2 ADJUSTMENTS ON TV MONITOR

The TV monitor need be adjusted *only* when the picture is distorted, or if the contrast or brightness seem out of adjustment.

The monitor's adjustments function like those of a conventional commercial television set, except that the volume adjustment has no effect. Instead the game produces its sound in a speaker separate from the TV monitor. Figure 6-1 shows the location

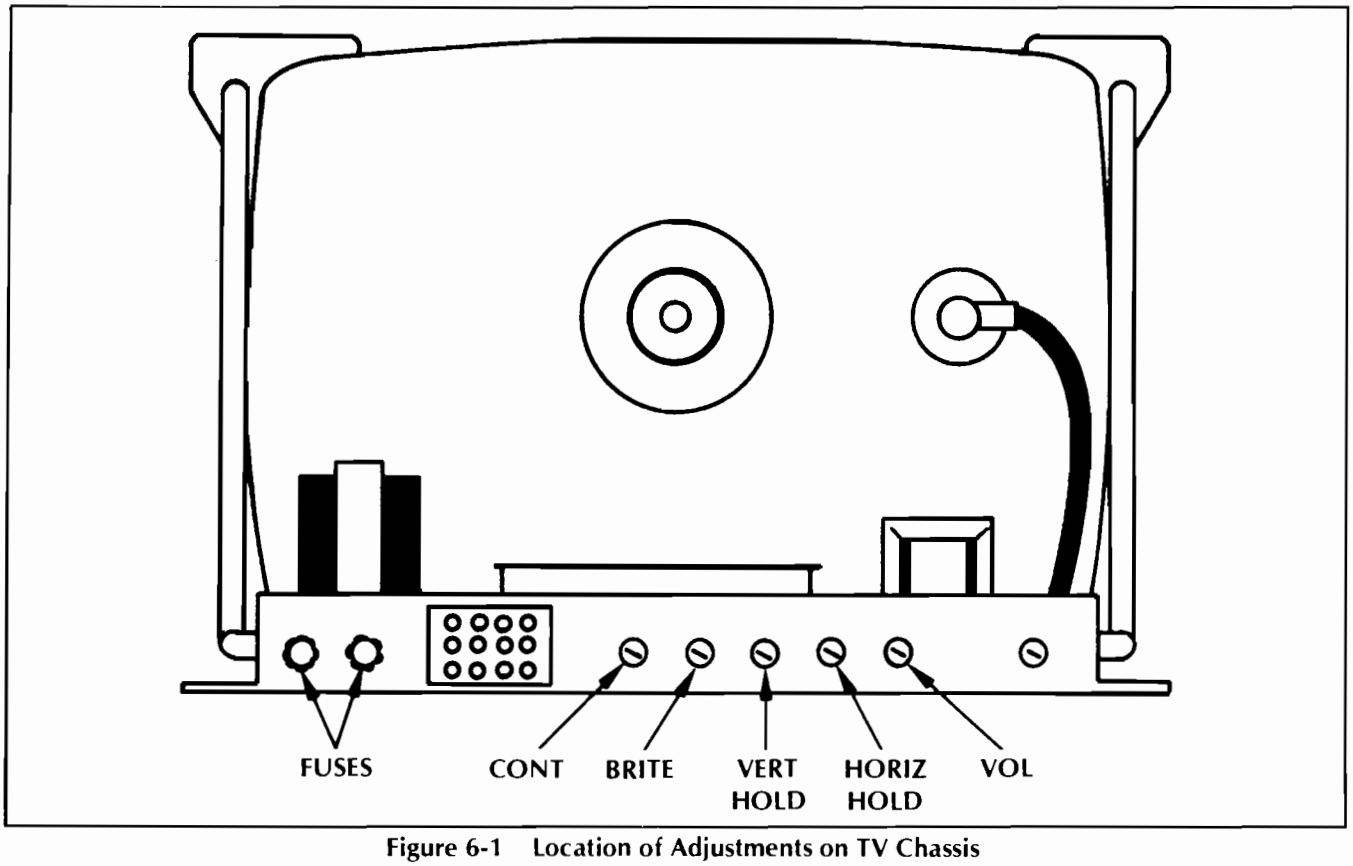


Figure 6-1 Location of Adjustments on TV Chassis

of the adjustments on the rear of the chassis. When making the adjustments follow these general guidelines:

BRITE (Brightness)—Perform this adjustment before the contrast. Adjust so that the white lines covering the screen just barely disappear, when the brightness is turned up.

CONT (Contrast)—Adjust so that the images are as bright as possible against the dark background without being blurred.

HORIZ HOLD (Horizontal Hold)—Adjust if the picture is slightly off-center horizontally, if the images appear warped, or if the picture is broken up into a series of diagonal lines. Adjust for a stable, centered picture.

VERT HOLD (Vertical Hold)—This needs adjustment only if the picture appears to be rolling up or down the screen. Adjust for a stable, centered picture.

VII. DISASSEMBLY AND ASSEMBLY

7.1 GENERAL INFORMATION

The following procedures are supplemented by Exploded Diagram, figure 7-1A and B, and by parts list and drawing A006205-01 located in Section IX of this manual. All capitalized component terms are directly referenced to the parts list.

When working inside the rear access door, always check to make sure that the two interlocking switches are not in the defeat position or stuck in the ON position.

7.2 REMOVING AND INSTALLING THE SPRINT 2 PCB

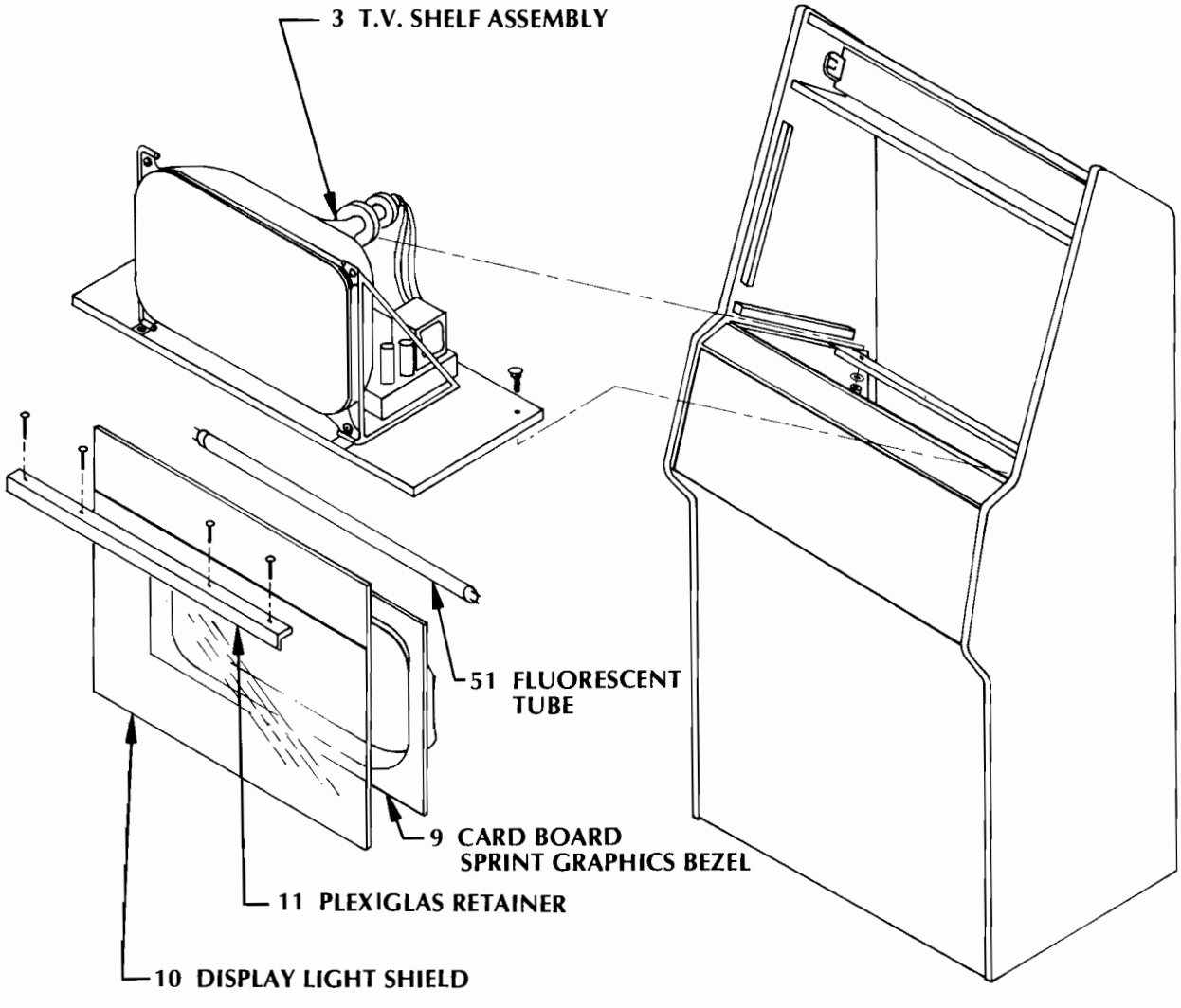
(a) Unlock and open rear access door.
(b) Locate R.F. Shield Box Assembly immediately inside the rear access door. It is an aluminum box with many small holes. On one end of the box is a printed circuit board with an edge connector coming from the edge of the board. This printed circuit board is the R.F. Shield Assembly (PCB).
(c) Remove five pan head phillips screws from each of the long sides (total of ten screws) of the R.F. Shield Assembly (PCB).
(d) Carefully lift the R.F. Shield Assembly (PCB) upward while pulling the Sprint II PC Board Assembly straight out of the R.F. Shield Box Assembly.
(e) To install the Sprint 2 PC Board Assembly, follow preceeding steps (a) through (d) in the reverse order. DO NOT FORCE OR BEND THE PRINTED CIRCUIT BOARDS. BEFORE INSTALLING INTO THE R.F. SHIELD BOX ASSEMBLY, ALWAYS INSPECT THE TWO PRINTED CIRCUIT BOARDS FOR PHYSICAL DAMAGE.

7.3 REMOVING AND INSTALLING THE TV MONITOR

(a) Unlock and open rear access door.
(b) Unplug the 12-pin Molex connector from the chassis of the TV monitor.
(c) With a 3/8-inch wrench, remove two 1/4-20 Machine Hexagonal Nuts, two #10 Split-Lock Washers, and two #10 Flat Washers from underneath the bottom rear sides of the wood T.V. Shelf Assembly.
(d) Remove two #10-24 x 1.25-inch Carriage Bolts from the top rear of the wood TV Shelf Assembly.
(e) With a 1/8-inch hex wrench, remove four 1-inch #10-32 Button Head Socket Cap Screws from the top front edge of the game cabinet.
(f) Remove the black Plexiglas Retainer, then the plexiglas Display Light Shield
(g) Carefully remove the Card Board Sprint Graphics Bezel.
(h) Slowly and carefully, slide the TV Shelf Assembly up and out of the game cabinet.
(i) To install the TV Shelf Assembly into the game cabinet, follow the preceding steps (a) through (h) in the reverse order. Before installing the TV Shelf Assembly, make sure the aluminum foil around the front edge of the wooden base of the TV Shelf Assembly is not damaged. If damaged, replace.

7.4 REPLACING THE STEERING BOARD PCB

(a) Unlock and open rear access door.
(b) Unplug 10-pin Molex connector from the steering board PCB.
(c) With a 7/16-inch wrench, remove self locking hex nut and 1/4-inch internal tooth star-lock washer from the steering wheel axis screw, while a helper holds the steering wheel at the front of the game cabinet.
(d) Remove black plastic edge-toothed wheel.
(e) Remove steering board PCB by removing two 1/2-inch #2-56 pan head Phillips screws.
(f) To install steering board PCB, follow preceding steps (a) through (e) in the reverse order. Before installing the steering board PCB, make sure there is a sufficient amount of silicone lubricant on the inner hole.



Indicates same reference number in parts list A006205-01, Section IX

Figure 7-1A Exploded Diagram, Front View

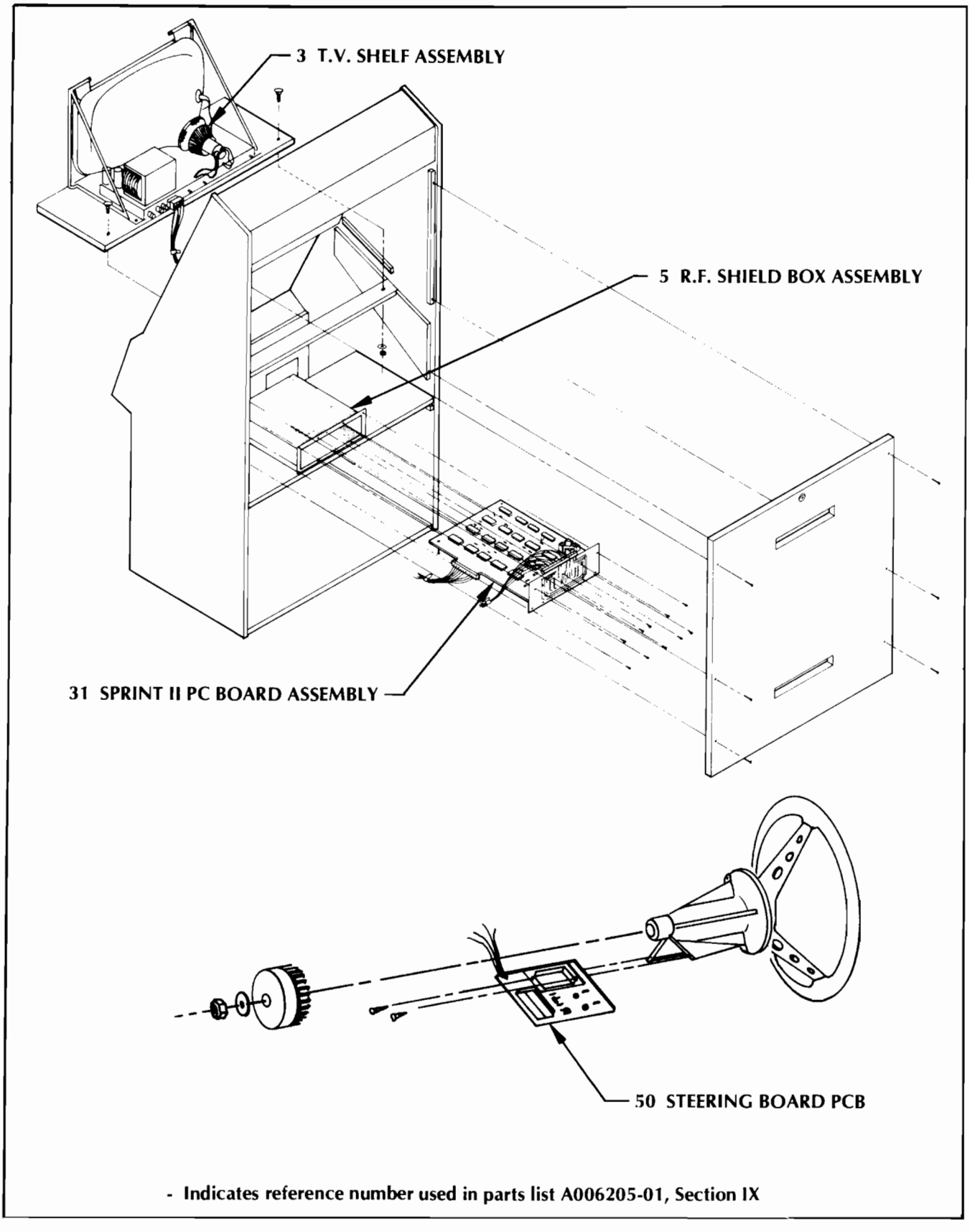


Figure 7-1B Exploded Diagram, Rear View

7.5 REPLACING FLUORESCENT TUBE

(a) With a ⅛-inch hex wrench, remove four 1-inch #10-32 Button Head Socket Cap Screws from the top front edge of the game cabinet.
(b) Remove the black Plexiglas Retainer, then remove the Plexiglas Display Light Shield.
(c) Remove fluorescent tube.
(d) Replace Plexiglas Display Light Shield, making sure Card Board Sprint Graphics Bezel is properly seated.
(e) Attach plexiglas screen with plexiglas retainer and four button head screws.

VIII. TROUBLESHOOTING AND REPAIR

8.1 GENERAL PROCEDURE

NOTE

This section describes troubleshooting procedures in detail sufficient for a person with moderate technical ability to understand. However, for those interested in gaining more information on video game technology, especially the electronics, we recommend reading the **Video Game Operator's Handbook,** *manual no. TM-043. This book is available from Atari, Inc., attn. Customer Service Dept., 2175 Martin Avenue, Santa Clara, CA 95050 for $5.00 each, or from your distributor.*

8.1.1 Identifying the Trouble Area:

The first troubleshooting step should be to note all observable trouble symptoms. Examples of symptoms are: depositing a coin produces no game response, no sound coming out of the speaker at any time, no picture on the TV screen. At the same time also note the game features that still work. A systematic way of checking game operation is to perform the functional check given in Section V of this manual. Carefully train your eye to pick up all clues; by doing this an experienced troubleshooter can often spot the cause of a trouble even before he opens the cabinet.

Keeping these observations in mind, use the understanding of game operation gained from Section III, Description of Operation and Section IX, Schematics. Next narrow down the suspected cause of the trouble to a specific area or areas of the game: coin mechanism, TV monitor, harness or front panel controls (switches, lamps, speakers), electronics tray, printed circuit board or power cord. Be careful not to overlook possible trouble areas that may seem too obvious: a power cord plug that has worked loose from the wall outlet and is no longer fully seated in the receptacle, power ON/OFF set to the OFF position, or a rear panel access door that is not fully closed (thus causing the interrupt switch to block the AC power path to the game).

8.1.2 Locating the Trouble Cause:

Once a problem has been narrowed down to one or more areas, the next step is to perform various tests and measurements to isolate a specific cause of the trouble. Remember that sometimes a very complicated problem, such as erratic game operation, can be traced to a simple cause—the printed circuit board not being properly seated in its edge connector. Start with the most suspect area and trace backwards from the point where the trouble is first observable, using a process of elimination to eventually locate the faulty component, connection, etc. For example, if no sound is audible during game play, first check for a signal at the speaker leads. If no signal is present there, go back to the printed circuit board. If there is still no signal, then systematically check back through the various components of the sound generation circuit.

Substitution of parts is a legitimate and easy way to isolate the cause. For instance, if the PCB is the suspected trouble area, remove it and substitute a know-to-be-good PCB. Then check for correct game operation. Similarly, to check the TV monitor, connect the game to a known-to-be-good monitor. The harness can often be checked by substitution also. Substitute both a known-to-be-good PCB and TV monitor. If the trouble still persists, the harness must be at fault.

The test equipment for use in troubleshooting is discussed in paragraph 8.2.

8.1.3 Correcting the Trouble Cause:

In practice, the steps required to correct troubles can range from simple adjustments (correctly seating the PCB in its edge connector, changing the setting on a potentiometer, adjusting the picture controls on the TV monitor) to repair of loose connections and replacement of defective parts. Extreme care should be exercised when removing integrated circuit devices and discrete components. Use a 40-watt maximum soldering iron with a small tip designed especially for IC work. To remove an IC device, follow this procedure:

Clip all leads and lift the IC package out, leaving two rows of leads. Then remove

leads individually with a soldering iron and needle-nose pliers. Finally, evacuate the holes with a solder sucker. Afterwards clean the area thoroughly, using an approved PCB cleaning solution to remove any traces of flux and dirt. Alcohol will do in a pinch, if necessary.

The microprocessor, read-only memories, and random-access memories are removed by simply pulling them out of their sockets. When placing them into their sockets, make certain they are placed in the correct socket.

Insert the new IC device using an IC insertion tool, making sure that the reference notch is oriented correctly and that the device's leads are not bent during insertion into the board. Afterwards, be sure to solder each lead on *both* sides of the PCB, using as little solder as possible. After soldering, clean the area thoroughly to remove the flux.

Observe the same removal and insertion procedures when replacing discrete components. Trim the leads as close as possible and be sure to orient diodes and capacitors correctly.

8.1.4 Verifying Correct Game Operation:

After locating and correcting the cause of a trouble, re-energize the game and perform a final check by placing the game in the self-test function, then check for correct operation during game play. Doing this will verify that your troubleshooting was correct. If the game operation is still not correct, go back and double-check your work. Make sure that any replaced components were installed correctly. If this was done properly, then start the troubleshooting steps over again. Keep in mind that there may be more than one trouble at a time, and that correcting one trouble can sometimes bring previously undetectable troubles to light.

This verification is especially important when the original trouble had been intermittent, that is, was not happening all the time.

8.2 TEST EQUIPMENT

Electronic troubleshooting of a video game essentially consists of checking for the presence of various signals and of examining their condition. A signal can be thought of as acting like a "messenger" that carries instructions from one unit or circuit to another. Many different types of signals are produced in a video game, and for this reason several unusual and perhaps unfamiliar types of test instruments are used during troubleshooting. Each instrument has its own set of advantages and disadvantages for examining a given type of signal, and both the depth of the intended troubleshooting capability and budget will determine what instruments will be needed. Some instruments are basic and essential, no matter what size of service facility, while other optional instruments are desirable because they make troubleshooting easier and quicker.

8.2.1 Basic Test Equipment:

(a) The Video Probe. This is a simple but invaluable instrument having two leads—a test-clip lead and a test-probe lead. During troubleshooting of video signals the test-clip lead is left connected to the game side of the video coupling capacitor. On the Sprint 2 this point is the junction of summing resistors R48 through R50 on the PCB. When the test-probe lead is then connected to any video developmental signal, that signal will be coupled to the video signal going to the TV monitor and a video probe picture will appear on the TV screen. The shape and other characteristics of this picture will give information about the signal being probed. The video probe is suited for troubleshooting synchronization and image signals, but will not be useful for extremely fast signals (such as the clock) or for very slow analog or digital signals.

A video probe can be constructed in a few minutes from these common electrical components: a length of 20 AWG (American Wire Gauge) rubber-coated wire, a 4.7K-ohm, ¼-watt carbon resistor, and two test leads. For the leads, use a single Mouser test clip (Mouser #131C301 or 302) attached to one end of the wire, and a test prod containing the resistor on the other.

To assemble the video probe, proceed as follows: Remove the cap from the test clip and strip 3/16 inch off each end of the wire. Solder one end to the post in the test clip, thread the other end through the hole in the cap, and snap on the cap. Next unscrew the plastic body of the test prod from the point and trim both leads of the resistor to a 3/16-inch length. Solder one resistor lead to the inside of the point. Thread the other end of the wire through the hole in the body and solder it to the other resistor lead; screw the body back onto the point.

(b) The Logic Probe. This is a test instrument designed for fast verification of digital IC outputs. It is small, convenient to carry, easy to read, and rela-

tively inexpensive. The logic probe derives its power from the system under test; it has two power leads, one for connection to ground and the other to +5 volts DC. When the logic probe's tip is held against a digital signal point, three colored lamps in the tip will indicate the signal's condition or state, as follows:

- The red lamp lit indicates a high or logic level 1 (for TTL components, this is +2.4 to +5 volts)
- The white lamp lit indicates a low or logic level 0 (for TTL components, this is 0 to +0.8 volt)
- The blue lamp lit indicates that the signal is changing states
- No lamps lit indicate the grey region between 0 and 1 (for TTL this is between +0.8 and +2.4 volts)

A circuit shorted to ground will illuminate the white lamp and an open circuit will illuminate the red lamp.

The logic probe is readily available from electronic supply sources; a commercial model found satisfactory is the Kurz-Kasch model LP 520.

(c) The Logic Pulser. This test instrument is similar in size and shape to the logic probe, and it also derives its power from the system under test. When the logic pulser's tip is held against a digital signal point, the source and sink capabilities of the pulser override any IC output and the point is driven to the opposite logic level. If the point that the logic pulser is held against is low, pressing the switch on the side of the pulser will introduce a high pulse. Conversely, pulsing a high line will pull that line low momentarily.

During troubleshooting the logic pulser allows stimulation of in-circuit ICs with a shaped digital pulse. For example, a certain feature of the game may not be working and you suspect that a circuit is not receiving the necessary signal. Use the pulser to imitate that signal: if the circuit begins working, you have proved that the signal was in fact missing and you can begin tracking it down. This technique is very similar to jumping coils in electromechanical games such as pinball machines.

In addition to the regular "pulse" button, there is another switch mounted on the logic pulser. When this switch is set in the "rep" mode, the instrument pulses the digital signal point at a 5-Hz rate or 5 times per second. This extremely low rate is slow enough to allow watching events initiated by the pulser. Counter outputs, for example, are more easily observed when the counter is pulsed or clocked at this rate.

The logic pulser is also readily available from electronic supply sources; a commercial model found satisfactory is the Kurz-Kasch model HL 583.

(d) Oscilloscope. The most versatile test instrument, and also the most expensive, is the oscilloscope. The high-speed TTL integrated circuits used in video games produce fast-rise-time signals. The oscilloscope should have a 50-MHz bandwidth, dual trace and dual time base capability. These latter features allow examination of both input and output signals simultaneously, so that precise timing relationships can be checked. The oscilloscope should also have provision for internal or external sync.

Of the newer, solid-state oscilloscopes, a satisfactory model is the Tektronix 465.

(e) VOM or Volt-Ohmmeter. This common measuring instrument is extremely useful in video game troubleshooting. It can be used to check line voltage, transformer secondary windings, continuity, resistance, power supply voltages, and to some extent used for measurements in the analog circuitry.

One commercial model found satisfactory is the Simpson 260.

8.2.2 Optional Test Equipment:

(a) The Logic Comparator. This test instrument's main benefit is that it can be used to check the functioning of an integrated circuit device while the device is still in place on the printed circuit board. The logic comparator performs the check by comparing the suspect ICs functioning with that of an identical-type reference IC mounted in the instrument itself. Suppose that the functioning of a type-74195 device on the PCB is suspected to be defective. First insert a program card with a known-to-be-good 74195 into the logic comparator, and then clip the comparator test leads onto the leads of the suspect device. If there are any logic state differences between the reference IC and the suspect IC under test, then an LED on the logic comparator will light up to indicate which output is not functioning correctly. Once a defective IC has been located, it should be replaced.

Logic comparators are readily available from electronic supply sources.

(b) Atari Universal Test Fixture. In situations where a large number of video games are being serviced, investment in the Universal Test Fixture will be justified. This item of test equipment forms a test station for troubleshooting printed circuit boards after they have been removed from the game cabinet. The Universal Test Fixture has a full set of controls for operating the game and also has its own TV monitor. The game's PCB is plugged into an edge connector mounted on the side of the Fixture; with this arrangement the PCB is positioned in a convenient way for connecting probes and other test instruments.

A program card inserted into a receptacle in the top of Fixture takes the place of the game's interconnect wires. The program card thus sets up the Fixture for each particular game; the game's name is clearly printed on the program card itself.

With the Universal Test Fixture the method of troubleshooting via substitution of known-to-be-good parts is made fast and convenient. For example, suppose that the TV picture in a game is completely broken up and you want to determine whether the game or monitor is causing the problem. Remove the PCB and plug it into the Fixture's edge connector, and also insert the correct program card for that game. If the picture on the Fixture's monitor is correct, then you know that the problem lies in the game's monitor.

8.3 SPECIFIC TROUBLESHOOTING INFORMATION

The following subparagraphs give additional troubleshooting information about certain areas of the Flyball game.

8.3.1 Coin Mechanism:

If a player inserts a coin and the game does not respond, first check the coin mechanism. If pressing the coin rejector button forces the rejector mechanism to return the coin, then examine the coin to make sure that it is genuine. If it is, then use a set of your own test coins (which should include both very new and very old, worn coins) to determine whether or not the player's coin is undersize or underweight. If your test coins are also returned, this indicates that servicing of the coin acceptor portion of the coin mechanism is called for. Generally the cause of this particular problem is an improperly adjusted magnet gate.

Inside the coin mechanism a magnet is used to test the metallic composition of the coin. Highly magnetic coins, such as those made of steel or iron, will be retained by the magnet and can be returned by actuating the wiper operating lever. Coins having comparatively high magnetic properties will be slowed down by the magnet, and will drop off the end of the rail short of the "accept" entrance and be returned. Coins having little or no magnetic properties, such as brass or zinc coins, will pass through the magnetic field so fast that they will overshoot the "accept" entrance and be returned.

A magnetic gate adjusted with too large a gap may pass both genuine and counterfeit coins. An adjustment with too small a gap can lead to rejection of some or even all coins. Over a period of time, the screw that adjusts the magnet gate has a tendency to work loose, resulting in a gradual narrowing of the gate. At first, only the thickest (i.e., newest) coins are rejected. As time passes, more and more coins are rejected until finally player complaints lead to the calling of the game repairman.

If pressing the coin rejector button does not cause the coin to be returned, and if the game still does not respond, then check the coin mechanism to see if the coin is jammed inside.

If you are certain that the coin is genuine, and that the coin passes through the coin mechanism and into the cash box, then the lack of game response is probably due to some kind of electrical trouble. Check for signals at the electrical contacts of the coin mechanism before moving on to the harness and other parts of the circuitry.

8.3.2 TV Monitor:

The TV monitor is a self-contained unit housed in its own chassis. A trouble's cause may be narrowed down to the monitor—either by the substitution method using a known-to-be-good monitor, or by verifying presence of AC power to the monitor power supply and presence of the *correct* composite video signal. The entire monitor can then be removed from the game cabinet. Doing this facilitates troubleshooting steps, because all monitor components will then be accessible.

A schematic diagram of the monitor circuitry is included in Section IX of this manual. After disconnecting and removing the monitor from the game, standard TV troubleshooting techniques are adequate for locating causes of trouble. Additional servicing information is available from the monitor manufacturer (Motorola).

IX. SCHEMATICS, DRAWINGS, AND PARTS LISTS

NUMBER	TITLE
A006205-01	Parts List and Drawing Final Assembly
A006206-01	Drawing Control Panel Assembly
A005925	Drawing Electronics Tray Assembly
A006285-01	Parts List and Drawing R.F. Shield Assembly (PCB)
A005922-01	Parts List, Drawing, and Schematic Sprint II PC Board Assembly
A000607	Parts List, Drawing, and Schematic Steering Printed Circuit Assembly
A006278-01	Schematic Harness
(none)	Schematic Motorola Model XM 701-10 TV Monitor

SPRINT II

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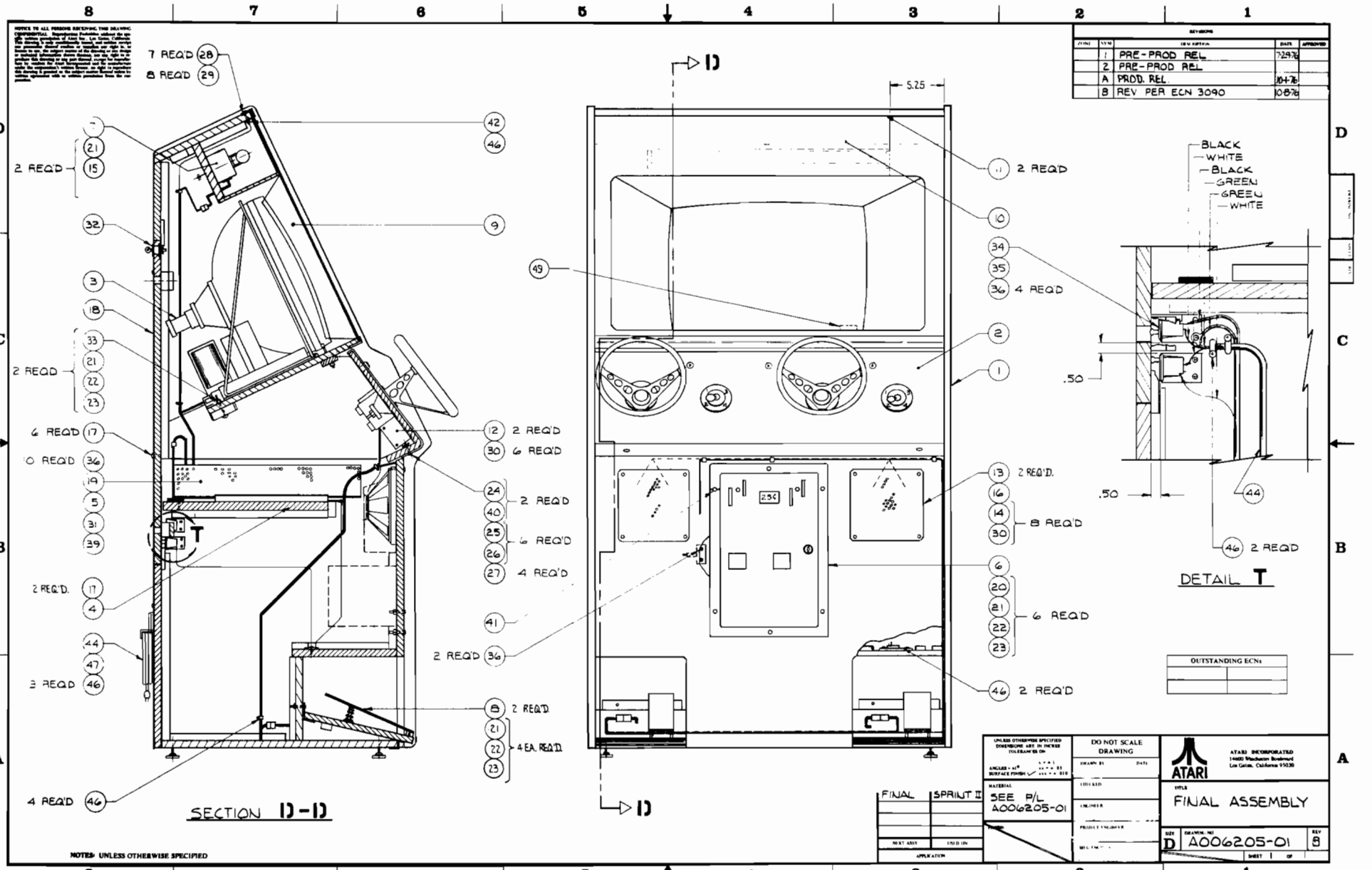
ASSEMBLY TITLE	FINAL ASSEMBLY	P/L A006205-01

PARTS LIST SPECIFICATION — Page 1 of 2

Drawn	FINAL ASSY	REV.
Checked	Mech. Eng.	
Proj. Eng.	Elec. Eng	B

Rev.	Description	Date	Apprv.	Rev.	Description	Date	Apprv.
1	PRE PROD REL	7/29/76					
2	Pre Prod Rel						
A	PROD REL	10/1/76					
B	Rev per ECN 3090	10/8/76					

Item	Part Number	Qty.	DESCRIPTION
1	A006214-02	1	Cabinet Assembly with Graphics
2	A006206-01	1	Control Panel Assembly
3	A005667-01	1	T.V. Shelf Assembly
4	A005925-02	1	Electronics Tray Assembly
5	A005912-01	REF	R.F. Shield Box Assembly
6	A003637-1 1	1	Coin Door Assembly
7	A005495-02	1	24" Fluorescent Fixture Assembly
8	A006284-01	2	Single Foot Pedal Assembly
9	006211-01	1	Bezel, Card Board Sprint Graphics
10	006210-01	1	Shield, Display Light (Silkscreen)
11	005665-01	2	Plex Retainers
12	001638-01	2	Panel MTG. Bracket
13	005419-01	2	Speaker Grill
14	73-77004	8	Rivets, 3/16" O.D. x .68" Lg. .250-.500 Grip
15	72-6612	2	Screws, Sm #6 x 3/4 Lg. Phil Pan Hd.
16	48-001	2	8" Speaker
17	82-1824	8	Wood Screw, #8 x 1.50" Lg, Flat Hd Phil
18	A005410-02	1	Rear Door Assy, with Lock
19	A006285-01	1	R.F. Shield Assy (P.C.B.)
20	75-5124B	6	Bolt, Carriage, 10-24 x 1.50" Lg. Black
21	75-010S	14	#10 Washer, Flat
22	75-040	12	#10 Washer, Split-Lock
23	75-911S	12	#10-24 Nut, Hex
24	75-5520N	2	Bolt, Carriage #¼-20 x 1.25" Lg.
25	75-015S	6	Washer, Flat, ¼"
26	75-045	6	Washer, Split Lock, ¼"
27	75-915S	4	Nut, Machine Hexagon, ¼-20
28	75-99090006	7	Well Nut, Blind Hole Fasterner 10-32
29	82-8016	8	Screw, Button Hd. Socket Cap, 10-32 x 1.00" Lg.
30	72-6812	14	Screw, Self-Tapping #8 x 3/4 Lg., Phil, Pan Hd.
31	A005922-01	1	P.C. Board Assembly, Sprint II (17.50)
32	005233-01	1	Rear Door Seal
33	75-5132N	2	Bolt, Carriage, #10-24 x 2.00 Lg.
34	68-001	2	Interlock Switch, A.C. Power
35	000268-01	2	Interlock Switch Bracket
36	72-6608	16	Screw, SM., Pan Hd., Phil., #6 x ½" Lg.
37	TM-078	1	Techinical Manual
38	A005930-XX	1	Shipping Container
39	72-6808	1	Screw, SM. #8 x ½ Lg Phil Pan Hd.



REVISIONS				
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	1	PRE-PROD REL	7297B	
	2	PRE-PROD REL		
	A	PROD. REL	10-78	
	B	REV PER ECN 3090	10878	

ASSEMBLY TITLE FINAL ASSEMBLY **P/L** A006205 -01

PARTS LIST SPECIFICATION

Item	Part Number	Qty.	DESCRIPTION
40	75-935	2	Wing-Nut, ¼ - 20
41	75-931	1	WingNut, #10-24
42	78-6601216	A/R	Alum Foil (Approx. 6 inches) 1" wide
43			
44	A006222-02	1	Strain Relief Power Cord Assy.
45	A006278-01	1	Harness Schematic
46	72-6610	12	Screw, Sm. #6 x 5/8 Lg. Phl. Pan Hd.
47	78-25001	1	Screw Down Tie-Wrap
48	006305-01	1	Printed Poly Bag
49	006319-01	1	Copyright Decal

REVISIONS				
ZONE	LTR	NEW EDITION	DATE	APPROVED
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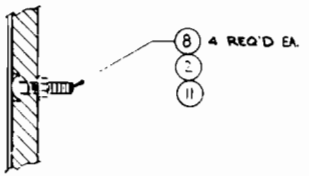
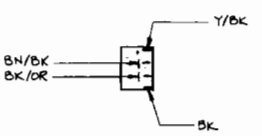
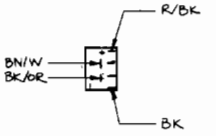
	3	PRE-PROD. REL.		
	A	PRODUCTION REL.		
	B	REV PER ECN 3387		



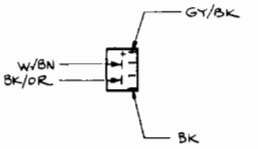
DETAIL J



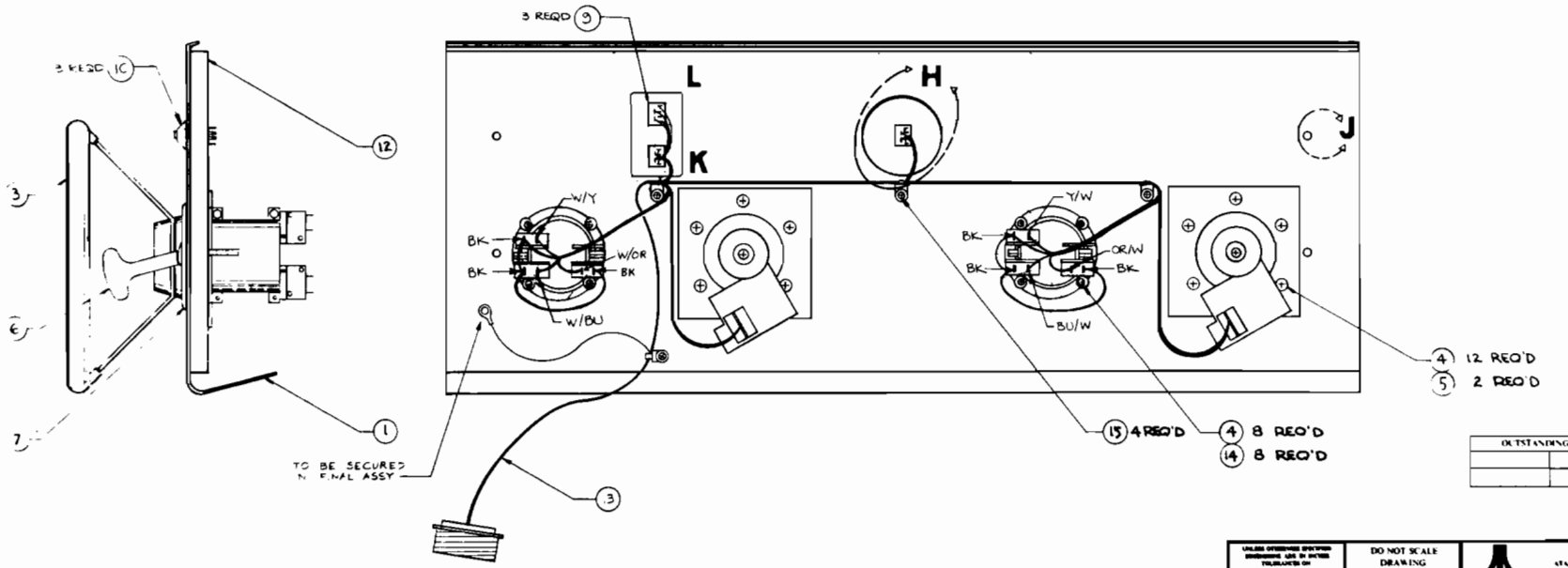
DETAIL L
ONE PLAYER START



DETAIL H
TRACK SELECT



DETAIL K
TWO PLAYER START



OUTSTANDING ECNs	

NOTES: UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

ATARI

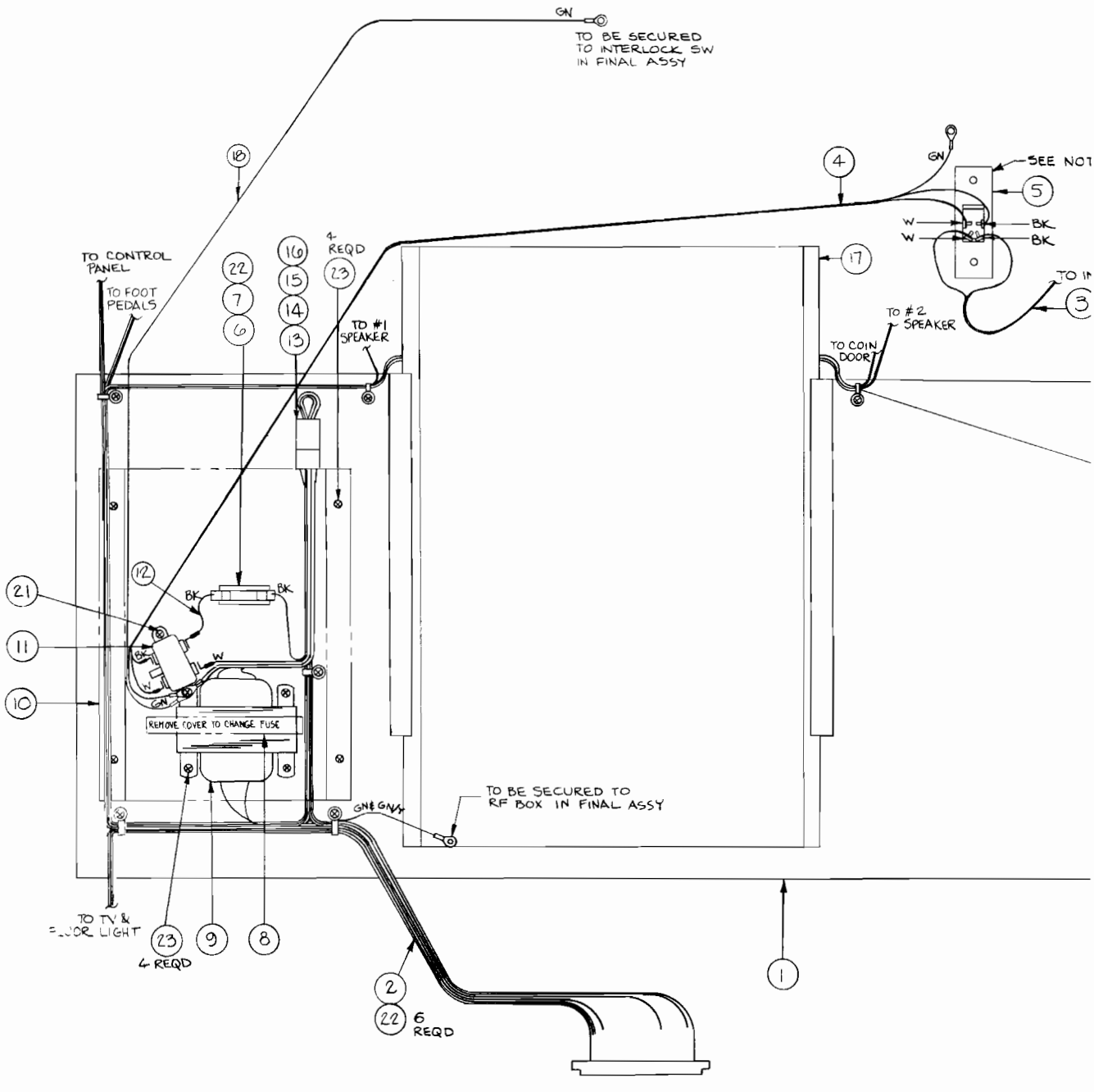
SEE P/L A006206-01

CONTROL PANEL ASS'Y

A006206-01 B

SIZE D

SPRINT 3



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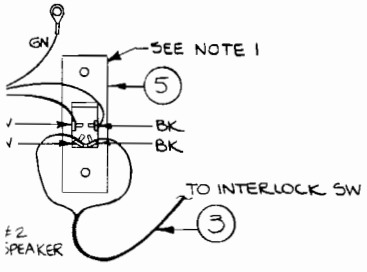
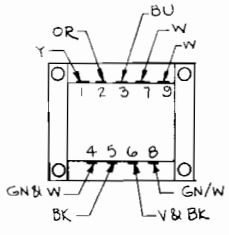
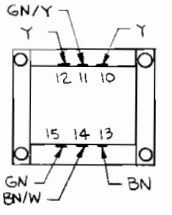


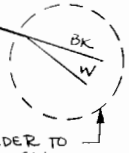


PRIMARY

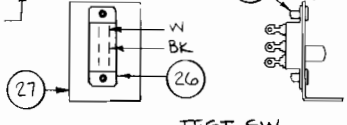


SECONDARY

TRANSFORMER WIRE COLORS



SOLDER TO TEST SW (SEE SK-B)



TEST SW (SEE NOTE 1)

SKETCH B

OUTSTANDING ECNs	

A005664-01	
	A006205-01
A006205-01	SPRINT II
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
ANGLES ± 1°
SURFACE FINISH
x = ±.1
xx = ±.03
xxx = ±.010

MATERIAL: SEE P/L

FINISH:

DO NOT SCALE DRAWING

DRAWN BY DATE

CHECKED

ENGINEER

PROJECT ENGINEER

ATARI

ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030

TITLE: SPRINT II
ELECTRONICS TRAY
ASSEMBLY

SIZE D | DRAWING NO. A005925-XX | REV B

SCALE 1:2 | SHEET 1 OF 1

SPRINT II

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ASSEMBLY TITLE / ASSY, SPRINT II R.F. SHIELD BD. P/L A006285-01

PARTS LIST SPECIFICATION Page 1 of 1

Drawn		
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Proj. Eng.	Elec. Eng	REV. A

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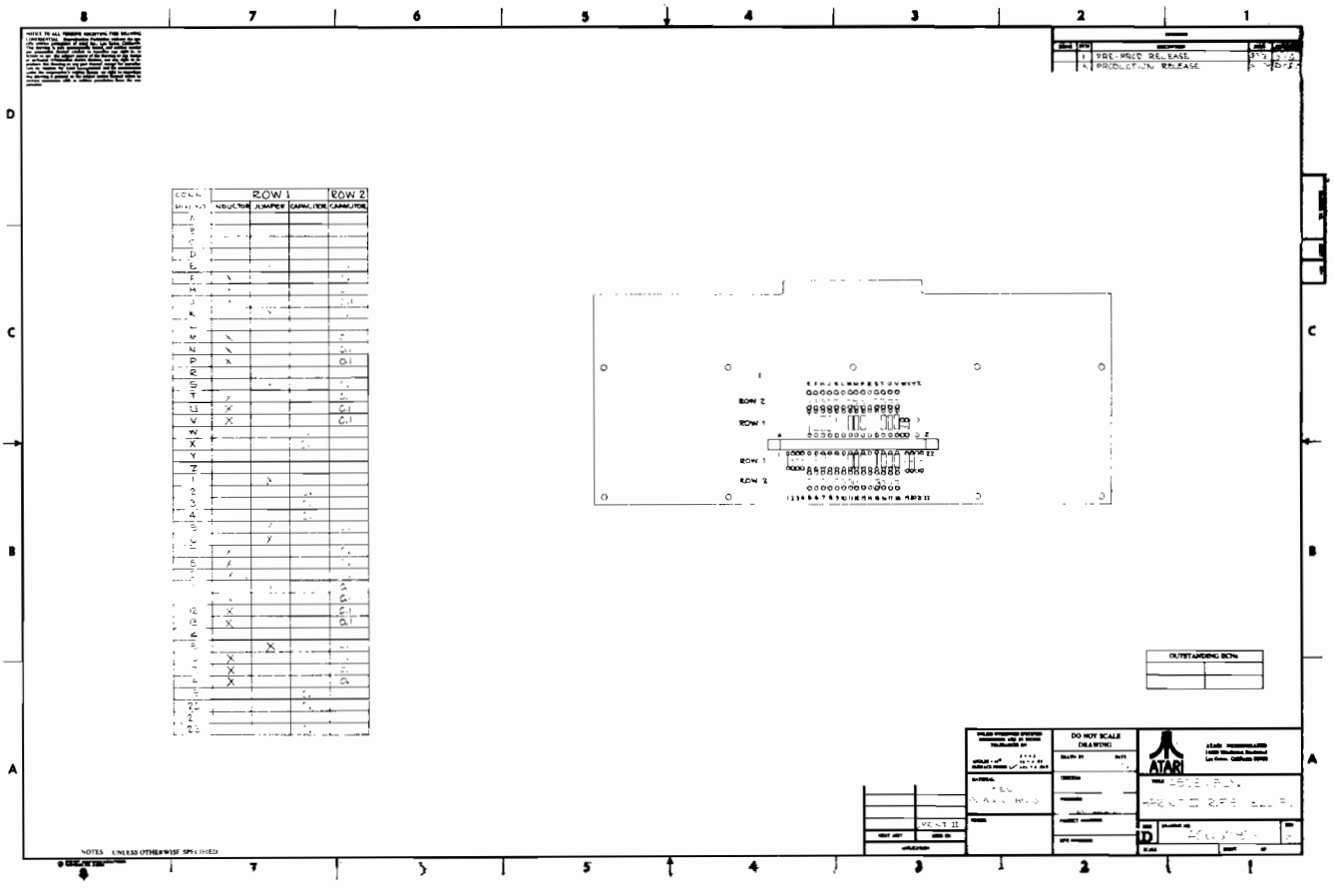
1	PRE-PROD. REL.	8/3/76					
A	PROD. REL.	10/1/76					

Item	Part Number	Qty.	DESCRIPTION
1	005491-01	1	P.C. BOARD
2	79-517222	1	CONNECTOR, 44 PIN P.C. MOUNT
3	41-3003	18	INDUCTOR, 100uh
4	27-250104	32	CAP, CER DISC, 0.1uf 25V
5	52-002	5	Jumper, .4 Center
6	52-003	3	Jumper, .6 Center



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ASSEMBLY TITLE / SPRINT II P.C. ASSY.	P/L A005922-01

PARTS LIST SPECIFICATION — Page 1 of 6

Drawn		
Checked	Mech. Eng.	
Proj. Eng.	Elec. Eng.	Rev. A
	Mfg. Eng.	

Rev.	Description	Date	Apprv.	Rev.	Description	Date	Apprv.
1	PRE PROD.	8/3/76					
A	PRODUCTION REL.	10/1/76					

Item	Part Number	Qty.	Description	
1	005923-01	1	SPRINT P.C. BOARD	
2	10-5101	5	RES., CARBON, 5%, ¼W, 100 OHM	R17,18,35,37,32
3	10-5102	10	" " " " 1K OHM	R1,2,4,19,20,26, 33,38,50,68
4	10-5103	19	" " " " 10K OHM	R3,21,28, ,39-44, 54-61,63,64
5	10-5105	2	" " " " 1M OHM	R6,11
6	10-5182	2	" " " " 1.8K OHM	R48,49
7	10-5222	3	" " " " 2.2K OHM	R15,16,25
8	10-5224	2	" " " " 220K OHM	R8,13
9	10-5225	2	" " " " 2.2M OHM	R5,10
10	10-5331	21	" " " " 330 OHM	R 45,46,51-53, 69-83,86
11	10-5333	2	" " " " 33K OHM	R62,65
12	10-5335	2	" " " " 3.3M OHM	R22,29
13	10-5392	1	" " " " 3.9K OHM	R24
14				
15	10-5474	2	" " " " 470K OHM	R7,12
16	10-5683	2	" " " " 68K OHM	R9,14
17	10-5822	1	" " " " 8.2K OHM	R27
18	19-8D9W2P0	1	RES., WIREWOUND, 20W, 2 OHM	R47
19	19-315502	2	TRIMPOT, 5K OHM	R66,67
20	19-315254	2	TRIMPOT, 250K OHM	R23,R30
21	10-5221	1	RES., CARBON, 5%, ¼W, 220 OHM	R84
22	10-5270	1	" " " " 27 OHM	R85
23				
24				

Item	Part Number	Qty.	Description	
25	21-101103	2	CAP., MYLAR, .01uf 100V	C22,23
26				
27				
28	24-160808	2	CAP., ELECTROLYTIC, 8000uf, 16V	C65,66
29	24-25016	4	" " 10uf, 25V	C17,18,24,25
30	24-250108	2	" " 1000uf, 25V	C49,50
31	24-250227	1	" " 220uf, 25V	C12
32	24-250478	1	" " 4700uf, 25V	C67
33				
34				
35	27-250102	2	CAP., CERAMIC DISC, .001uf, 25V	C55,62
36	27-250103	8	" " " .01uf, 25V	C28,30,57,64, 44-47
37	27-250104	42	" " " .1uf, 25V	C1-4,13-16,19-21, 26,27,29,31-36, 41-43,48,51,52, 54,56,58,59,61, 63,68,69,6-11, 39,70
38				
39				
40	28-101101	2	CAP., DIPPED MICA, 100pf, 100V	C37,38
41	28-101221	2	" " " 220pf, 100V	C53,60
42				
43				
44				
45				
46	31-A14F	2	DIODE, A14,F	CR6,7
47	31-MR501	2	" MR501	CR4,5
48	31-IN914	3	" IN914	CR1,2,3
49				
50				
51	33-2N3644	2	TRANSISTOR, 2N3644	Q1,Q2
52				
53				
54				
55				
56				
57	37-7400	2	INTEGRATED CIRCUIT, 7400	F8,D0

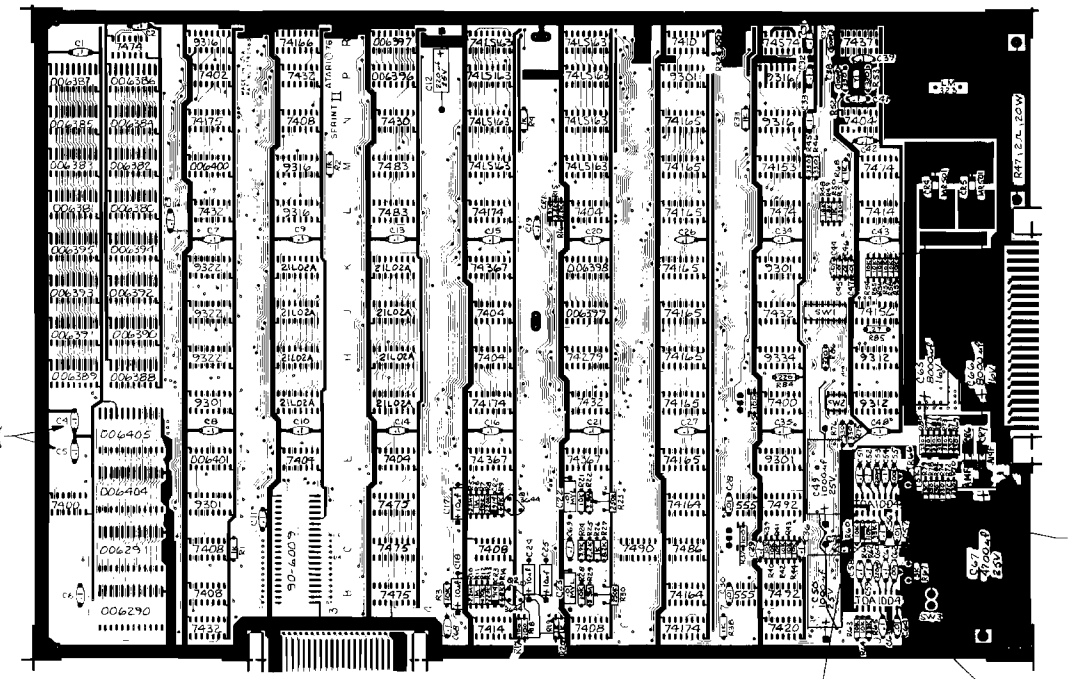
Item	Part Number	Qty.	Description			
58	37-7402	1	INTEGRATED CIRCUIT,		7402	P2
59	37-7404	6	"	"	7404	E3,E4,H5,J5,L6,N9
60	37-7408	5	"	"	7408	B2,C2,N3,C5,A6
61	37-7410	1	"	"	7410	R7
62	37-7414	2	"	"	7414	A5,L9
63	37-7420	1	"	"	7420	A8
64	37-7430	1	"	"	7430	N4
65	37-7432	5	"	"	7432	A2,L2,P3,F6,J8
66	37-7437	1	"	"	7437	R9
67	37-7474	3	"	"	7474	R1,L8,M9
68	37-74S74	1	"	"	74S74	R8
69	37-7475	3	"	"	7475	B4,C4,D4
70	37-7483	2	"	"	7483	L4,M4
71	37-7486	1	"	"	7486	C7
72	37-7490	1	"	"	7490	C6/7
73	37-7492	2	"	"	7492	B8,D8
74	37-9312	2	"	"	9312	F9,H9
75	37-74153	1	"	"	74153	M8
76	37-74156	1	"	"	74156	J9
77	37-74LS163	8	"	"	74LS163	M5,N5,P5,R5, M6,N6,P6,R6
78	37-74164	2	"	"	74164	B7,D7
79	37-74165	8	"	"	74165	E7,F7,H7,J7, K7,L7,M7,N7
80	37-74166	1	"	"	74166	R3
81	37-74174	3	"	"	74174	F5,L5,A7
82	37-74175	1	"	"	74175	N2
83	37-74279	1	"	"	74279	H6
84	37-9301	5	"	"	9301	D2,F2,P7,E8,K8
85	37-9316	5	"	"	9316	R2,L3,M3,N8,P8
86	37-9322	3	"	"	9322	H2,J2,K2
87	37-9334	1	"	"	9334	H8
88	37-555	2	"	"	555	B7/8,D7/8
89	37-74367	3	"	"	74367	E5,K5,E6
90	37-21L02A	8	"	"	21L02A	F3,H3,J3,K3, F4,H4,J4,K4
91	37-LM323	1	REGULATOR		LM323	
92	37-TDA1004	2	OP-AMP		TDA1004	B9,D9

Item	Part Number	Qty.	Description	
93				
94				
95				
96				
97	62-001	1	SWITCH, SPST, MOMENTARY	SW3
98	66-114P1T	1	SWITCH, SPST, x4, DIP	SW2
99	66-118P1T	1	SWITCH, SPST, x8, D1P	SW1
100				
101				
102				
103	72-1608C	2	SCREWS, PAN HD., PHIL., 6-32 x ½ LG, CRES	
104	75-016	2	WASHER, FLAT #6	
105	75-056	2	WASHER, LOCK, INT STAR, #6	
106	75-916C	2	NUT, HEX, #6-32 CRES	
107				
108				
109	78-06001	1	HEATSINK, (LM323)	
110	78-06009	2	HEATSINK, (TDA1004)	
111	78-13016	A/R	CEMENT, (TDA1004 HEATSINK)	
112	78-16005	1	SILPAD (LM323)	
113				
114				
115				
116				
117A	79-42518	16	SOCKET 18 PIN, LOW INSERTION (USED ON -01 BOARDS ONLY)	FO,HQ,JO,KO,LO,MO, NO,PO,F1,H1,J1,K1, L1,M1,N1,P1
117B	79-42518	8	SOCKET 18 PIN, LOW INSERTION (USED ON -02 BOARDS ONLY)	LO,L1,MO,M1,NO,N1, PO,P1
117C			NOT USED ON -03 BOARDS	
118A			NOT USED ON -01 BOARDS	
118B	79-42524	2	SOCKET, 24 PIN, LOW INSERTION (USED ON -02 BOARDS ONLY)	AO,CO
118C	79-42524	4	SOCKET, 24 PIN, LOW INSERTION (USED ON -03 BOARDS ONLY)	AO,DO,EO

Item	Part Number	Qty.	Description		
119	79-42540	1	SOCKET, 40 PIN, LOW INSERTION	C3	
120					
121					
122					
123	90-102	1	CRYSTAL, 12.096MHZ	Y1	
124					
125					
126					
127	006380-01	1	SPRINT II PROGRAM PROM 1	L1	
			(NOT USED ON -03 BOARDS)		
128	006381-01	1	SPRINT II PROGRAM PROM 2	L0	NOT USED ON -03 BOARDS
129	006382-01	1	" " " " 3	M1	
130	006383-01	1	" " " " 4	M0	
131	006384-01	1	" " " " 5	N1	
132	006385-01	1	" " " " 6	N0	
133	006386-01	1	" " " " 7	P1	
134	006387-01	1	" " " " 8	P0	
135					
136					
137	006388-01	1	SPRINT II RACE TRACK PROM 1	F1	USED ON -01 BOARDS ONLY
138	006389-01	1	" " " " " 2	F0	
139	006390-01	1	" " " " " 3	H1	
140	006391-01	1	" " " " " 4	H0	
141	006392-01	1	" " " " " 5	J1	
142	006393-01	1	" " " " " 6	J0	
143	006394-01	1	" " " " " 7	K1	
144	006395-01	1	" " " " " 8	K0	
145					
146					
147	006396-01	1	SPRINT II CHARACTER PROM LSB	P4	
148	006397-01	1	" " " " MSB	R4	
149					
150					
151	006398-01	1	SPRINT II RACE CAR PROM LSB	K6	
152	006399-01	1	" " " " " MSB	J6	
153					
154					

Item	Part Number	Qty.	Description
155	006400-01	1	SPRINT II SYNC PROM M2
156			
157			
158	006401-01	1	SPRINT II ADDRESS DECODE PROM
159			
160			
161			
162			
163	006404-01	1	SPRINT II PROGRAM ROM 1 D1 (USED ON -03 BOARDS ONLY)
164	006405-01	1	SPRINT II PROGRAM ROM 2 E1 (USED ON -03 BOARDS ONLY)
165			
166			
167	006290-01	1	SPRINT II RACE TRACK ROM 1 A1 (USED ON -02 AND -03 BOARDS ONLY)
168	006291-01	1	SPRINT II RACE TRACK ROM 2 C1 (USED ON -02 AND -03 BOARDS ONLY)
169	90-6009	1	INTEGRATED CIRCUIT C3

REVISIONS				
ZONE	SYM	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE		



NOTES:
1. THIS ASSEMBLY TO BE USED 005923 REV 'B' BOARDS
2. ITEMS 110 (HEATSINK) TO BE CEMENTED TO ITEM 92 (TDA1604) WITH HEATSINK CEMENT ITEM 111

MODIFICATIONS:
1 ADD A .1µF CAP(C70) BETWEEN +20V PLANE AND GROUND AS SHOWN.

UNO / NO	006380	006381	006382	006383	006384	006385	006386	006387	006388	006389	006390	006391	006392	006393	006394	006395	006404	006405	006290	006291
VERSION																				
-01	L1	L0	M1	M0	N1	N0	P1	P0	F1	F0	H1	H0	J1	J0	K1	K0				
-02	L1	L0	M1	M0	N1	N0	P1	P0										B1	C1	
-03																	D1	E1	B1	C1

OUTSTANDING ECNs	

NOTES : UNLESS OTHERWISE SPECIFIED

A 006205-01	SPRINT II
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON
ANGLES ± 45° SURFACE FINISH

DO NOT SCALE DRAWING

MATERIAL: SEE PLA005922 -01, -02, -03

FINISH

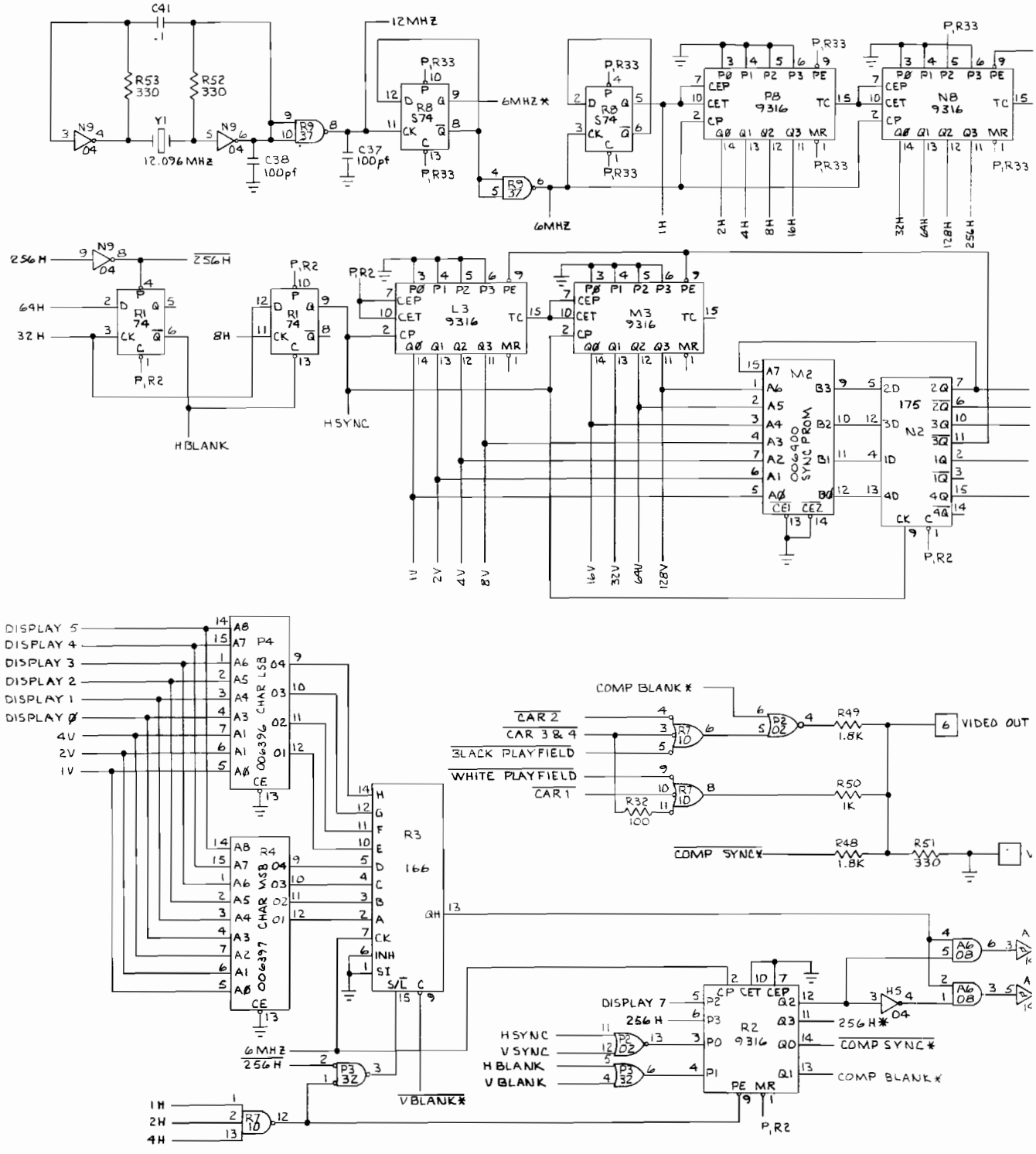
DRAWN BY | DATE
CHECKED
ENGINEER
PROJECT ENGINEER
PRG ENGINEER

ATARI INCORPORATED
1400 Winchester Boulevard
Los Gatos, California 95030

TITLE: ASSEMBLY, SPRINT II P.C. BD

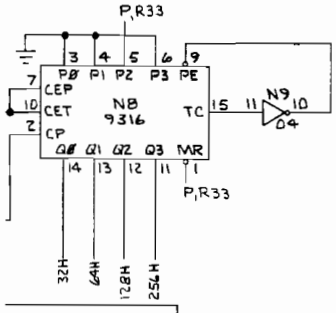
SIZE D | DRAWING NO A005922-XX | REV A

SCALE 1/1 | SHEET 1 OF 1


C41
.1
R53
330
R52
330
Y1
12.096 MHz
C38
100pf
C37
100pf
12MHZ
6MHZ*
6MHZ
1H
2H
4H
8H
16H
32H
64H
128H
256H
256 H
64H
32 H
8H
HBLANK
HSYNC
1V
2V
4V
8V
16V
32V
64V
128V
DISPLAY 5
DISPLAY 4
DISPLAY 3
DISPLAY 2
DISPLAY 1
DISPLAY Ø
4V
2V
1V
006396 CHAR LSB
006397 CHAR MSB
006400 SYNC PROM
COMP BLANK*
CAR 2
CAR 3 & 4
BLACK PLAYFIELD
WHITE PLAYFIELD
CAR 1
R49
1.8K
R50
1K
R48
1.8K
R51
330
R32
100
VIDEO OUT
COMP SYNC*
VBLANK*
DISPLAY 7
256 H
HSYNC
VSYNC
H BLANK
V BLANK
256H*
COMP BLANK*
P,R33
P,R2

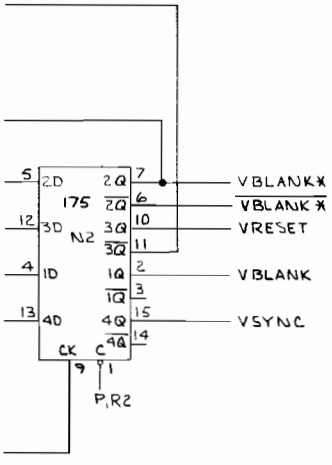
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE VALUES ARE IN OHMS.
2. CAPACITANCE VALUES ARE IN MICROFARADS.

REVISIONS				
SYM	DESCRIPTION	INITIALS and DATE		
		DRFTG	CHECK	ENGRG
1	PRE-PROD. RELEASE			
A	PRODUCTION RELEASE			



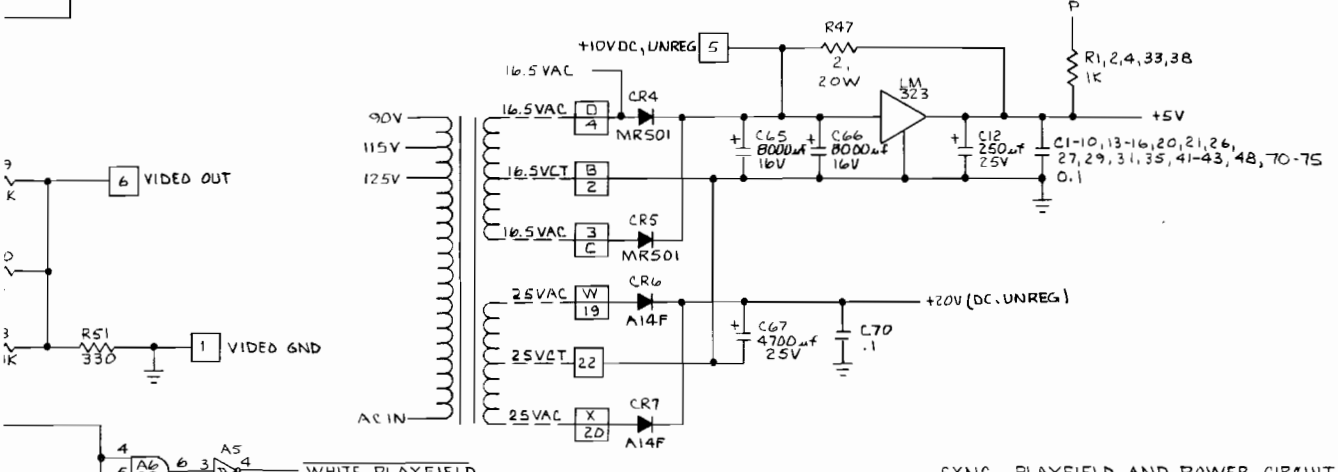
UNUSED GATES	
LOC	TYPE
P2	02
A2, P3, L2	32
N3	08
J4, E3,	04
C7	86

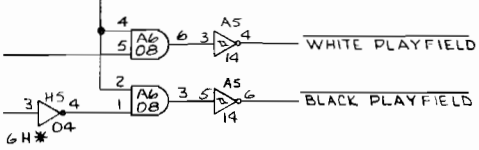
REF DESIGNATION	
HIGHEST	NOT USED
R85	R34, 36, 31
C69	C40
CR7	
Q2	
SW3	
Y1	



REFERENCE ONLY

DWG NO	006380	006381	006382	006383	006384	006385	006386	006387	006388	006389	006390	006391	006392	006393	006394	006395			006404	006405	006290	006291
VERSION																						
-01	L1	L0	M1	M0	N1	N0	P1	P0	F1	F0	H1	H0	J1	J0	K1	K0						
-02	L1	L0	M1	M0	N1	N0	P1	P0													B1	C1
-03																			D1	E1	B1	C1





SYNC, PLAYFIELD AND POWER CIRCUIT

A005922	SPRINT 2
NEXT ASSY	USED ON
APPLICATION	

INTERPRET THIS DRAWING PER USASI Y14.5

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/16 .x ± .1
ANGLES ± 1°
SURFACE FINISH .xx ± .03 .xxx ± .010

MATERIAL:

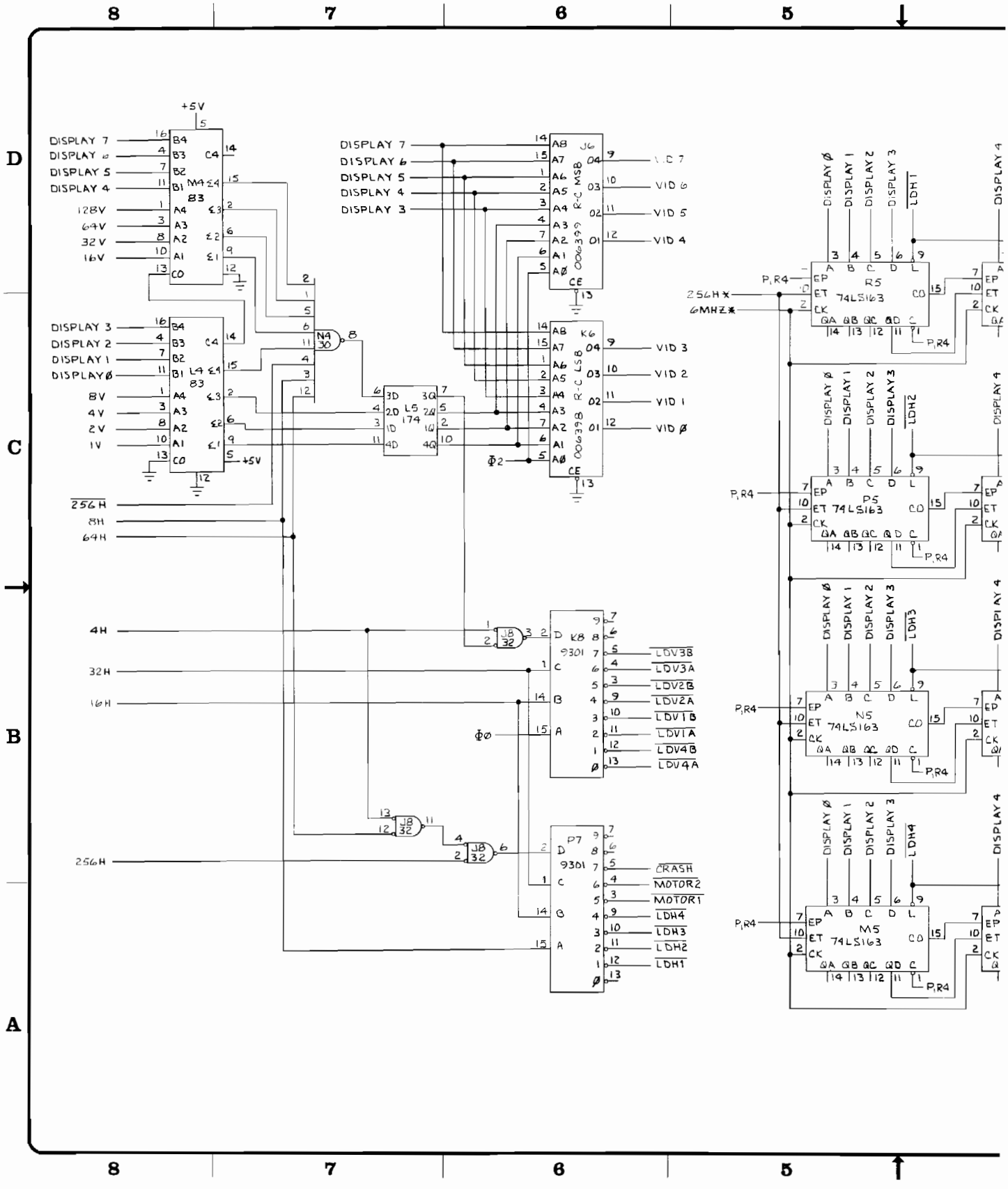
DRAWN BY DATE
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER
DOCUMENT CONTROL
APPROVED

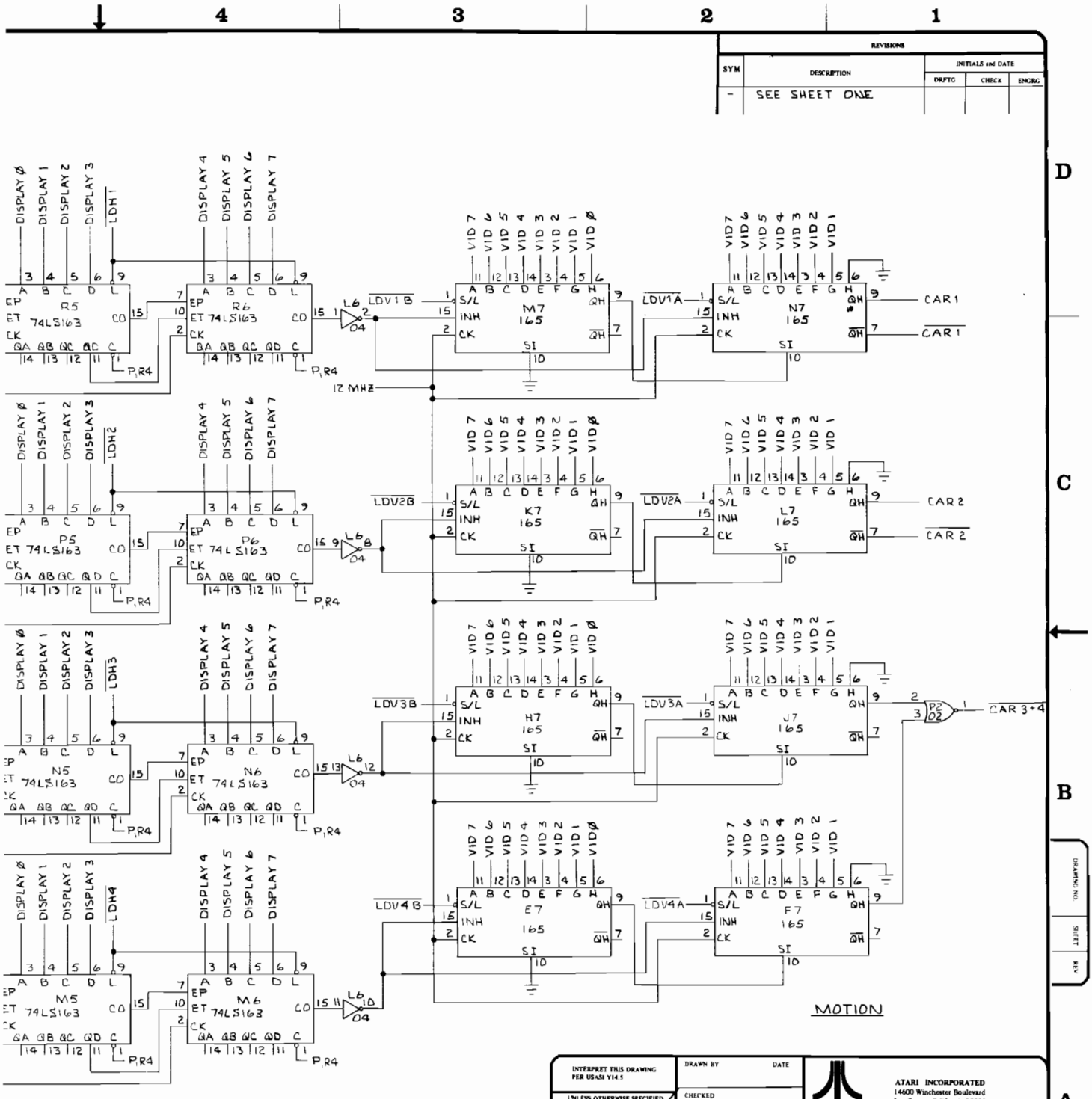
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030

TITLE: SCHEMATIC, SPRINT 2

SIZE	DRAWING NO	REV
D	005922-XX	A
SCALE —		SHEET 1 OF 5

DRAWING NO.
SHEET
REV


8
7
6
5
D
C
B
A
+5V
DISPLAY 7
DISPLAY 6
DISPLAY 5
DISPLAY 4
128V
64V
32V
16V
M4 83
L4 83
DISPLAY 3
DISPLAY 2
DISPLAY 1
DISPLAYØ
8V
4V
2V
1V
+5V
256H
8H
64H
N4 30
L5 174
ΦØ
Φ2
J6 006399 R-C MSB
K6 006398 R-C LSB
VID 7
VID 6
VID 5
VID 4
VID 3
VID 2
VID 1
VID Ø
4H
32H
16H
J8 32
K8 9301
P7 9301
LDV3B
LDV3A
LDV2B
LDV2A
LDV1B
LDV1A
LDV4B
LDV4A
CRASH
MOTOR2
MOTOR1
LDH4
LDH3
LDH2
LDH1
256HX
6MHZ*
P,R4
R5
P5
N5
M5
74LS163
DISPLAY 4



REVISIONS				
SYM	DESCRIPTION	INITIALS and DATE		
		DRFTG	CHECK	ENGRG
-	SEE SHEET ONE			

A005922	SPRINT 2
NEXT ASSY	USED ON
APPLICATION	

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FRACTIONS ± 1/16 .x ± .1
ANGLES ± 1° .xx ± .03
SURFACE FINISH √ .xxx ± .010

MATERIAL

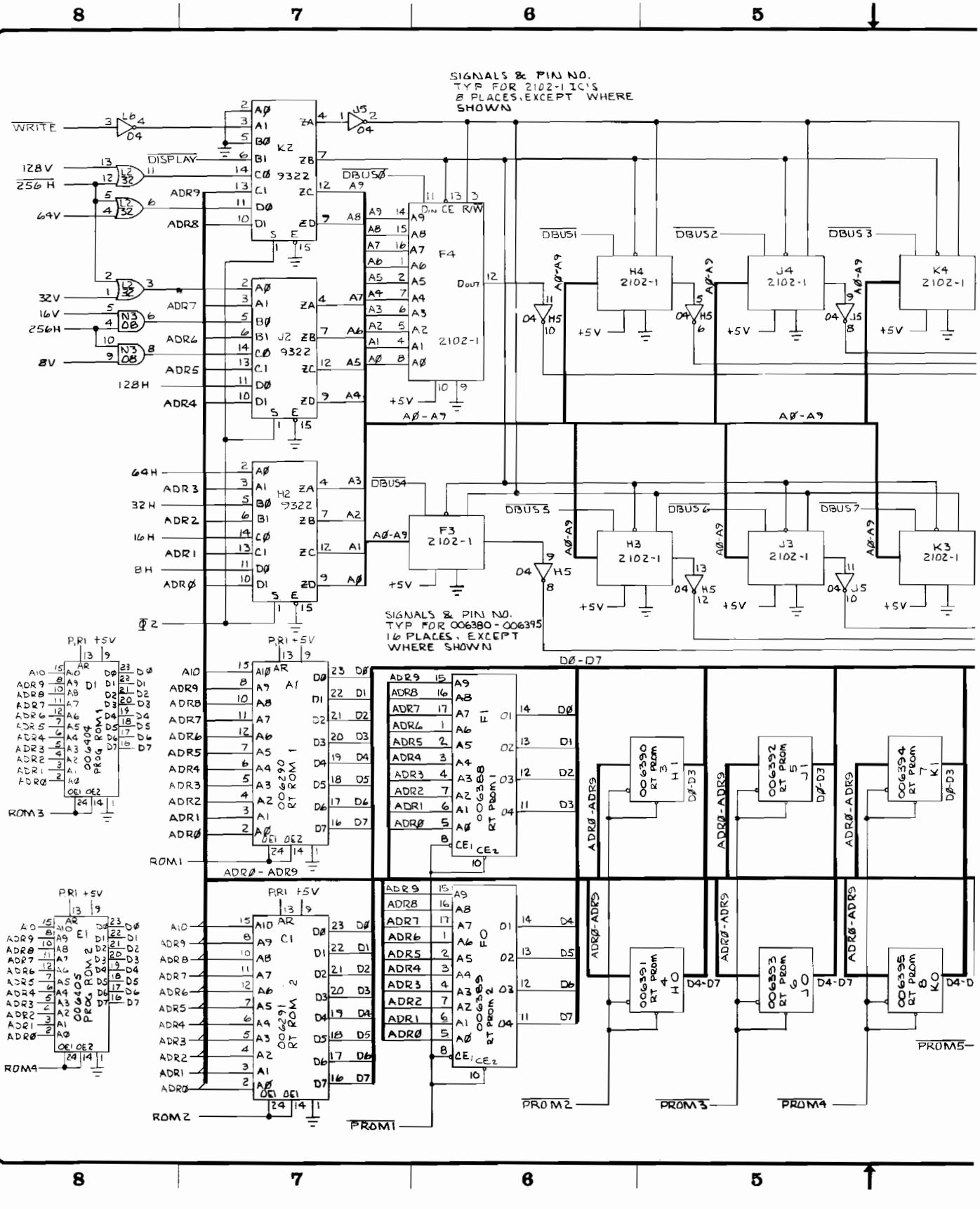
DRAWN BY	DATE
CHECKED	
DESIGN ENGINEER	
PROJECT ENGINEER	
DOCUMENT CONTROL	
APPROVED	

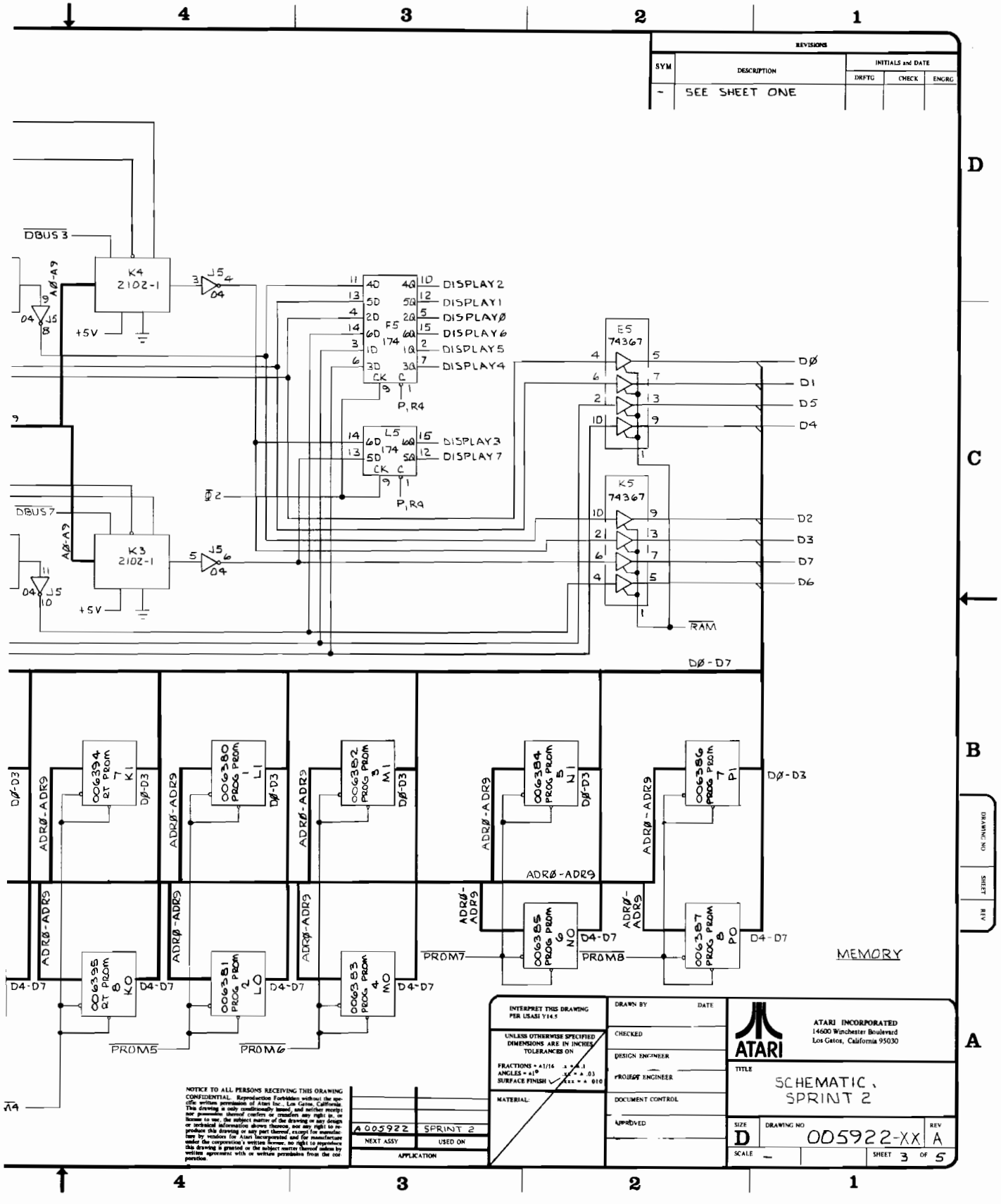
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030

TITLE: SCHEMATIC, SPRINT 2

SIZE	DRAWING NO	REV
D	005922-XX	A
SCALE -	SHEET 2 OF 5	

DRAWING NO.
SHEET
REV.


SIGNALS & PIN NO.
TYP FOR 2102-1 IC'S
8 PLACES, EXCEPT WHERE
SHOWN
WRITE
DISPLAY
128V
256H
64V
32V
16V
8V
128H
64H
32H
16H
8H
ADR9
ADR8
ADR7
ADR6
ADR5
ADR4
ADR3
ADR2
ADR1
ADRØ
DBUSØ
DBUS1
DBUS2
DBUS3
DBUS4
DBUS5
DBUS6
DBUS7
AØ-A9
AØ-A7
+5V
H4 2102-1
J4 2102-1
K4 2102-1
H3 2102-1
J3 2102-1
K3 2102-1
F4 2102-1
F3 2102-1
H2 9322
J2 9322
K2 9322
SIGNALS & PIN NO.
TYP FOR 006380-006395
16 PLACES, EXCEPT
WHERE SHOWN
DØ-D7
ADRØ-ADR9
D4-D7
D4-D3
ROM1
ROM2
ROM3
ROM4
PROM1
PROM2
PROM3
PROM4
PROM5
006390 RT PROM 3 H1
006392 RT PROM 5 J1
006394 RT PROM 7 K1
006391 RT PROM 4 H0
006393 RT PROM 6 J0
006395 RT PROM 8 K0
006380 RT PROM 1
006381 RT PROM 2
006404 PROG ROM 1
006405 PROG ROM 2


REVISIONS
SYM
DESCRIPTION
INITIALS and DATE
DRFTG
CHECK
ENGRG
- SEE SHEET ONE
DBUS3
K4
2102-1
A0-A9
+5V
DISPLAY2
DISPLAY1
DISPLAY0
DISPLAY6
DISPLAY5
DISPLAY4
DISPLAY3
DISPLAY7
P1R4
P1R9
E5
74367
K5
74367
D0
D1
D5
D4
D2
D3
D7
D6
RAM
DBUS7
K3
2102-1
D0-D7
006394
006380
006382
006384
006386
006385
006387
006383
006381
006395
PROM5
PROM6
PROM7
PROM8
ADR0-ADR9
D4-D7
D0-D3
MEMORY
INTERPRET THIS DRAWING PER USASI Y14.5
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/16
ANGLES ± 1°
SURFACE FINISH
MATERIAL
DRAWN BY
DATE
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER
DOCUMENT CONTROL
APPROVED
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030
TITLE
SCHEMATIC, SPRINT 2
SIZE D
DRAWING NO 005922-XX
REV A
SCALE -
SHEET 3 OF 5
A005922
SPRINT 2
NEXT ASSY
USED ON
APPLICATION
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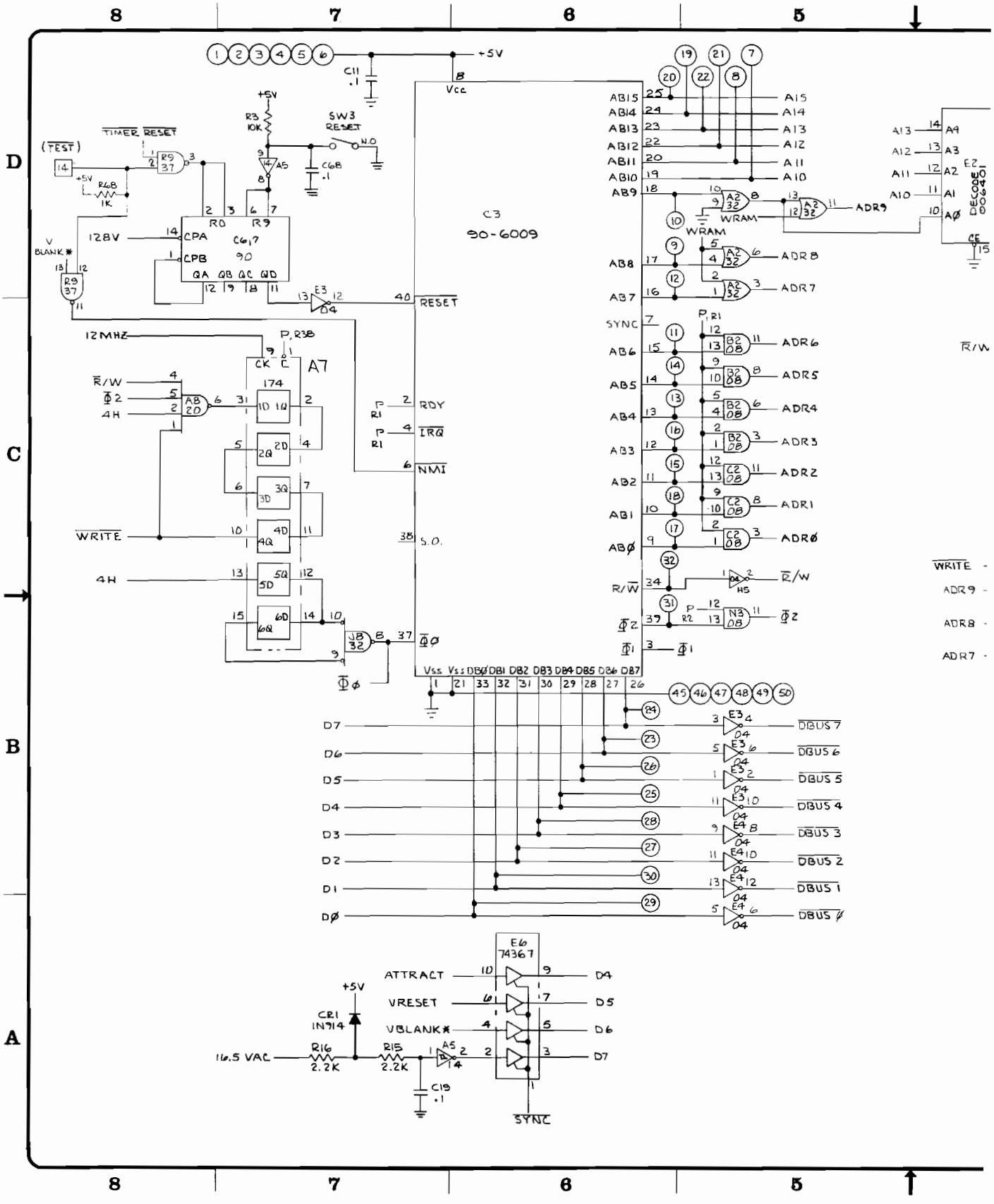
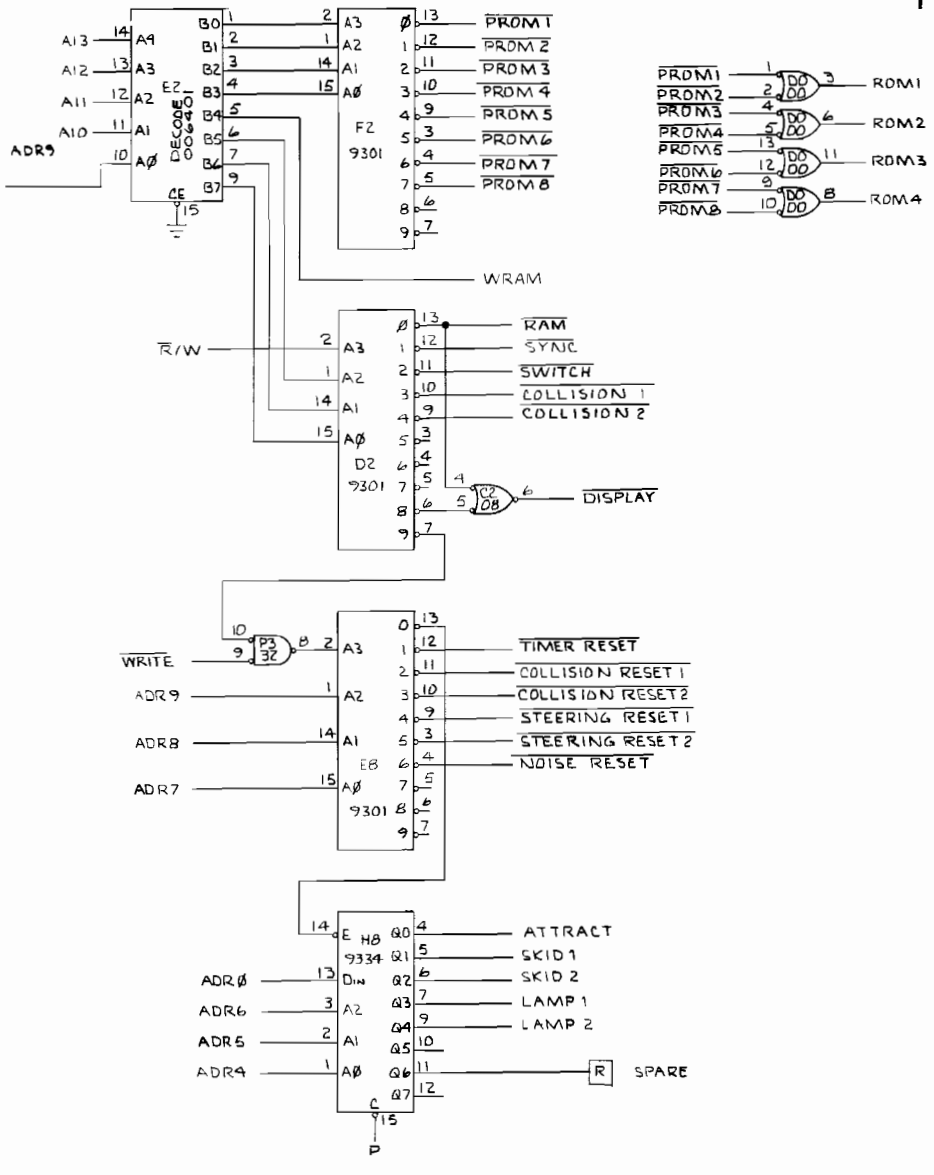

8
7
6
5
D
C
B
A
+5V
C11 .1
Vcc
C3
30-6009
TIMER RESET
(TEST)
R3 10K
SW3 RESET
N.O
C68 .1
R68 1K
128V
V BLANK*
C6,7 90
CPA
CPB
QA QB QC QD
R0
R9
RESET
12MHZ
P,R38
A7
R/W
Φ2
4H
WRITE
RDY
IRQ
NMI
S.O.
ΦØ
Φφ
AB15
AB14
AB13
AB12
AB11
AB10
AB9
AB8
AB7
SYNC
AB6
AB5
AB4
AB3
AB2
AB1
ABØ
R/W
ΦZ
Φ1
WRAM
ADR9
ADR8
ADR7
ADR6
ADR5
ADR4
ADR3
ADR2
ADR1
ADRØ
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
AØ
DECODE 006401
E2
CE
Vss Vss DBØ DB1 DB2 DB3 DB4 DB5 DB6 DB7
D7
D6
D5
D4
D3
D2
D1
DØ
DBUS 7
DBUS 6
DBUS 5
DBUS 4
DBUS 3
DBUS 2
DBUS 1
DBUS Ø
E6 74367
ATTRACT
VRESET
VBLANK*
16.5 VAC
CR1 IN914
R16 2.2K
R15 2.2K
C19 .1
D4
D5
D6
D7
SYNC
WRITE -
ADR9 -
ADR8 -
ADR7 -



MICROPROCESSOR

REVISIONS				
SYM	DESCRIPTION	INITIALS and DATE		
		DRFTG	CHECK	ENGRG
-	SEE SHEET ONE			

A005922	SPRINT 2
NEXT ASSY	USED ON
APPLICATION	

INTERPRET THIS DRAWING PER USASI Y14.5

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/16 .x ± .1
ANGLES ± 1° .xx ± .03
SURFACE FINISH .xxx ± .010

MATERIAL

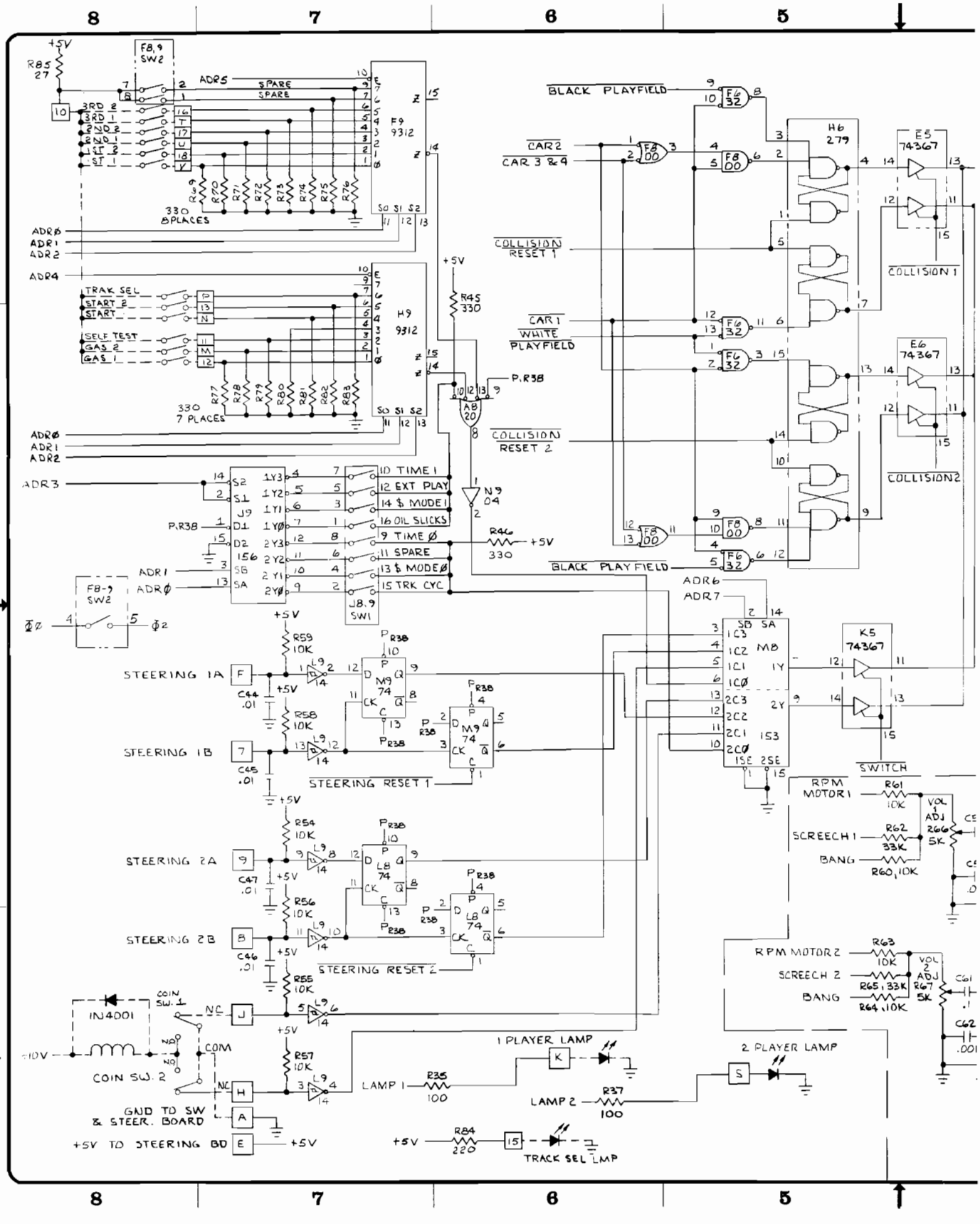
DRAWN BY DATE
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER
DOCUMENT CONTROL
APPROVED

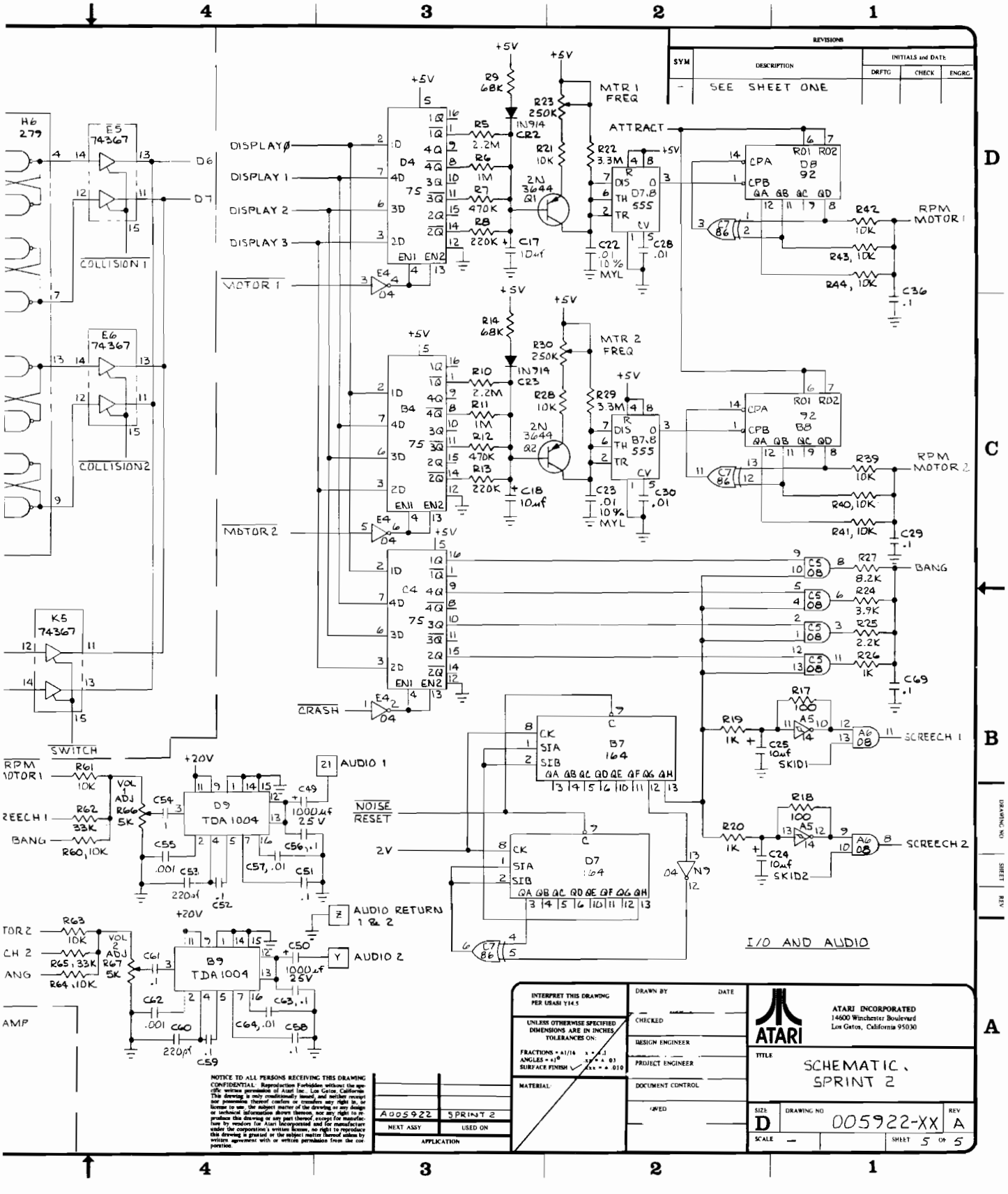
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030

TITLE
SCHEMATIC, SPRINT 2

SIZE	DRAWING NO	REV
D	005922-XX	A
SCALE -		SHEET 4 OF 5

DRAWING NO
SHEET
REV


8
7
6
5
D
C
B
A
+5V
R85 27
F8,9 SW2
ADR5
SPARE
SPARE
3RD 2
3RD 1
2ND 2
2ND 1
ST 2
ST 1
F9 9312
330 8 PLACES
R70 R71 R72 R73 R74 R75 R76
ADR0
ADR1
ADR2
ADR4
TRAK SEL
START 2
START
SELF TEST
GAS 2
GAS 1
H9 9312
330 7 PLACES
R77 R78 R79 R80 R81 R82 R83
R45 330
P.R38
AB 20
ADR3
J9
1Y3 1Y2 1Y1 1Y0 2Y3 2Y2 2Y1 2Y0
1S6
1G 2G
1A 2A
J8,9 SW1
10 TIME 1
12 EXT PLAY
14 $ MODE 1
16 OIL SLICKS
9 TIME 0
11 SPARE
13 $ MODE 0
15 TRK CYC
N9 04
R46 330
+5V
ADR1
ADR0
F8-9 SW2
Φ2
Φ2
R59 10K
R58 10K
R54 10K
R56 10K
R55 10K
R57 10K
STEERING 1A
STEERING 1B
STEERING 2A
STEERING 2B
C44 .01
C45 .01
C47 .01
C46 .01
M9 74
L8 74
STEERING RESET 1
STEERING RESET 2
IN4001
COIN SW. 1
COIN SW. 2
NO
NC
COM
GND TO SW & STEER. BOARD
+5V TO STEERING BD
+10V
BLACK PLAYFIELD
CAR 2
CAR 3 &4
COLLISION RESET 1
CAR 1
WHITE PLAYFIELD
COLLISION RESET 2
F6 32
F8 00
H6 279
E5 74367
E6 74367
COLLISION 1
COLLISION 2
ADR6
ADR7
K5 74367
SWITCH
RPM MOTOR 1
SCREECH 1
BANG
R61 10K
R62 33K
R60, 10K
VOL 1 ADJ 2K 5K
RPM MOTOR 2
SCREECH 2
BANG
R63 10K
R65, 33K
R64, 10K
VOL 2 ADJ R67 5K
C61 .1
C62 .001
1 PLAYER LAMP
2 PLAYER LAMP
LAMP 1
LAMP 2
R35 100
R37 100
R84 220
TRACK SEL LMP


REVISIONS
SYM
DESCRIPTION
INITIALS and DATE
DRFTG
CHECK
ENGRG
- SEE SHEET ONE
DISPLAYØ
DISPLAY 1
DISPLAY 2
DISPLAY 3
MOTOR 1
MOTOR 2
CRASH
ATTRACT
MTR 1 FREQ
MTR 2 FREQ
RPM MOTOR 1
RPM MOTOR 2
BANG
SCREECH 1
SCREECH 2
SKID1
SKID2
COLLISION 1
COLLISION 2
SWITCH
AUDIO 1
AUDIO 2
AUDIO RETURN 1 & 2
NOISE RESET
I/O AND AUDIO
AMP
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030
TITLE
SCHEMATIC, SPRINT 2
SIZE D
DRAWING NO 005922-XX
REV A
SCALE -
SHEET 5 OF 5
A005922
SPRINT 2
NEXT ASSY
USED ON
APPLICATION
DRAWN BY
DATE
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER
DOCUMENT CONTROL
APVED
MATERIAL
INTERPRET THIS DRAWING PER USASI Y14.5
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS = ±1/16 x.xx = ±.01
ANGLES = ±1° x.xxx = ±.005
SURFACE FINISH = 63
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ATARI

Job Title	Dwg.
RACETRAK STEERING PCB ASSY	P/L 000607

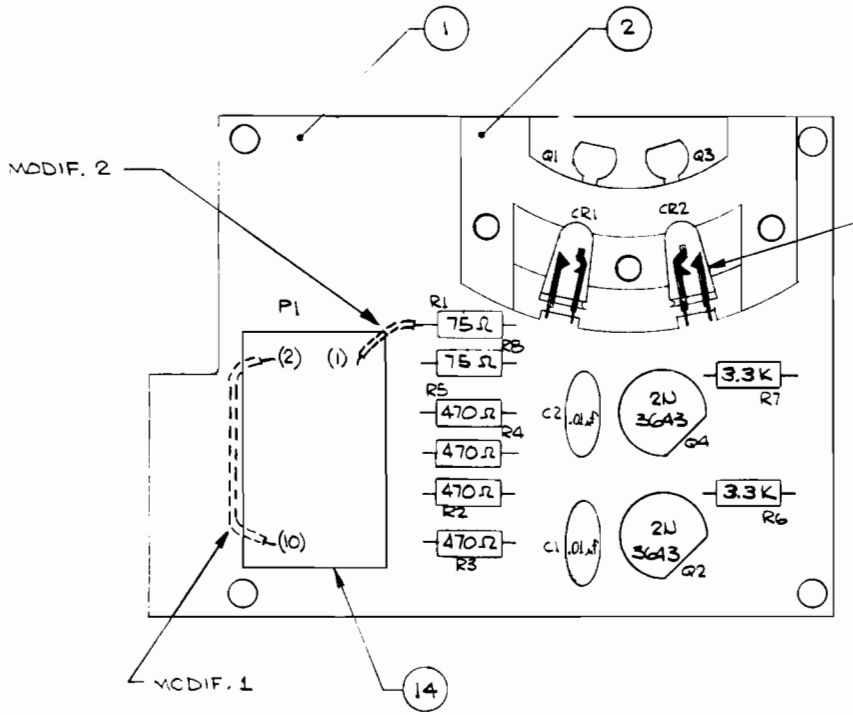
Parts List Specification

sheet 1 of 1

Drawn		
Checked	Mech. Eng.	Rev.
Proj. Eng. MF	Elec. Eng.	M

Rev.	Description	Apprv.	Rev.	Description	Apprv.
H	Redesigned				
J	Rev per ECN 397				
K	Rev per ECN 457				
L	Rev per ECN 601				
M	Rev per ECN 1531				

Item	Part. No.	Qty.	Description
1	000614	1	Printed Circuit Board (E)
2	001092	1	Light Mount
3	001151	Ref	Schematic Diagram
4	11750/10-5750	2	Resistor, Comp., 75 ohm, ¼ watt, 5%
5	11471/10-5471	4	Resistor, Comp, 470 ohm, ¼ watt, 5%
6	11332/10-5332	2	Resistor, Comp, 3.3Kohm, ¼ watt, 5%
7	34104 /27-101103	2	Capacitor, Ceramic, .01uf
8	70006/38-2N5777	2	Transistor, 2N 5777 (Photo Darlington)
9	70000/34-2N3643	2	Transistor, 2N 3643
10	71008/38-ME7124	2	Light Emitting Diode, I.R. ME 7124
11			
12			
13			
14	80089 /79-58005	1	Connector, 10 pin, PC Mount, Amp #1-380991
15	72-1212S	1	Screw, Machine, Pan Head Phil, #2-56 x 3/4 Lg.
16	75-042	1	Washer, Split Lock #2
17	75-912S	1	Nut, Hex, #2-56
18	003749	1	Retainer, Led Light Mount



REFER TO SCHEMATIC 001151

MODIFICATIONS: FOR 000614 REV J P.C. BOARDS

1. JUMPER FROM PIN 2 TO PIN 10 OF THE 10 PIN CONNECTOR, ON CIRCUIT SIDE OF BOARD.
2. JUMPER FROM PIN 1 OF THE 10 PIN CONNECTOR TO THE PAD MARKED +5V (END OF R1) ON CIRCUIT SIDE OF BOARD.

MODIFICATIONS: FOR 000614 REV K P.C. BOARDS.

1. JUMPER FROM PIN 2 TO PIN 10 OF THE 10 PIN CONNECTOR, ON CIRCUIT SIDE OF BOARD.

REVISIONS

SYM	DESCRIPTION	INITIALS and DATE DRFTG
H	REDESIGNED	5-3-74
J	REV. PER ECN 397	5-28-74
K	REV. PER ECN 457	7-3-74
L	REV PER ECN 601	7-16-74
M	REV PER ECN 1531	7/8/75

NEXT ASSY	USED ON
A000598	A000519

APPLICATION

INTERPRET THIS DRAWING PER USASI Y14.5

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON

FRACTIONS ± 1/16 .x ± .1
ANGLES ± 1° .xx ± .03
SURFACE FINISH ✓ .xxx ± .010

MATERIAL SEE PL 000607

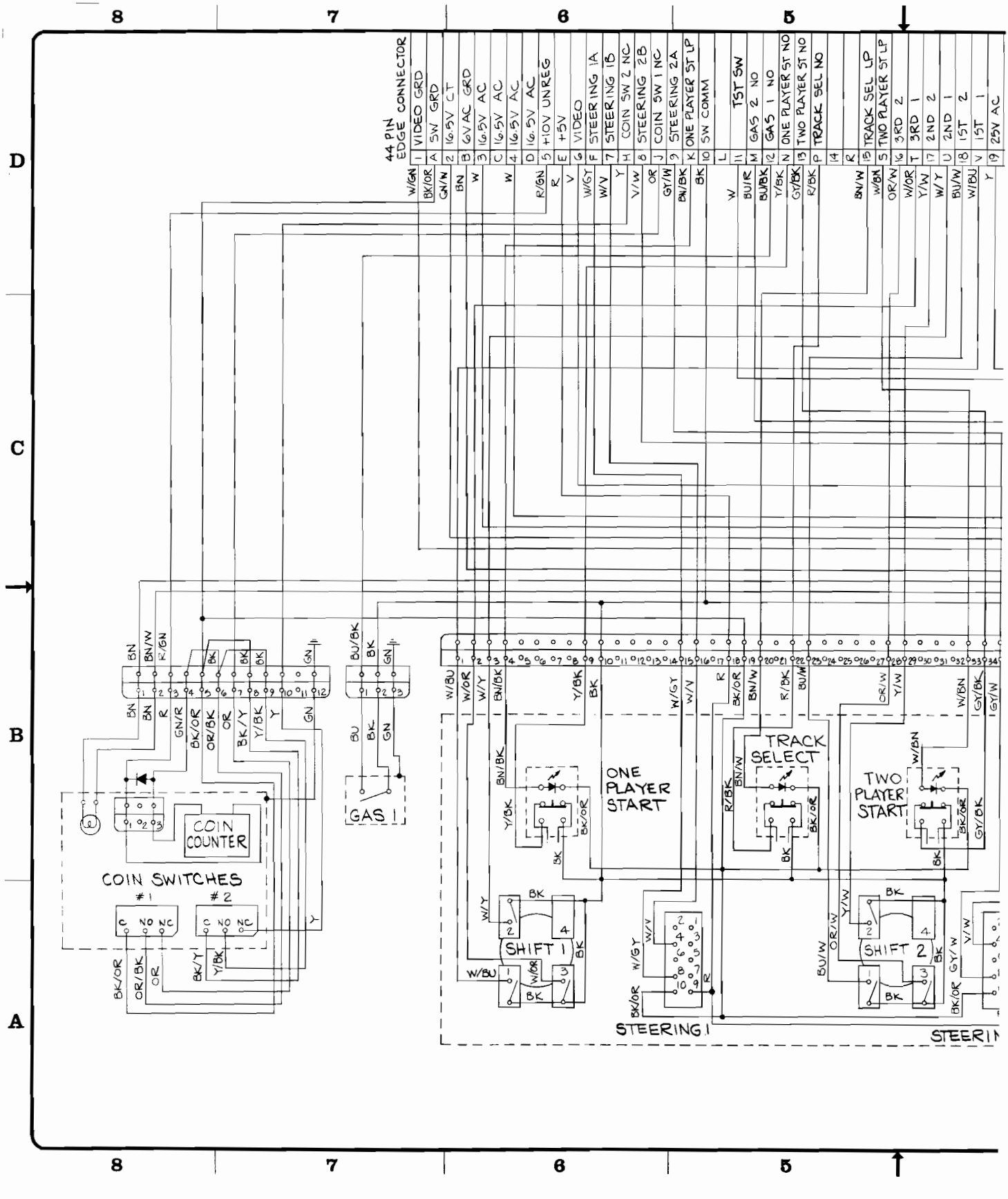
	DATE
DRAWN BY	5-6-74
CHECKED	
DESIGN ENGINEER	
PROJECT ENGINEER	
DOCUMENT CONTROL	

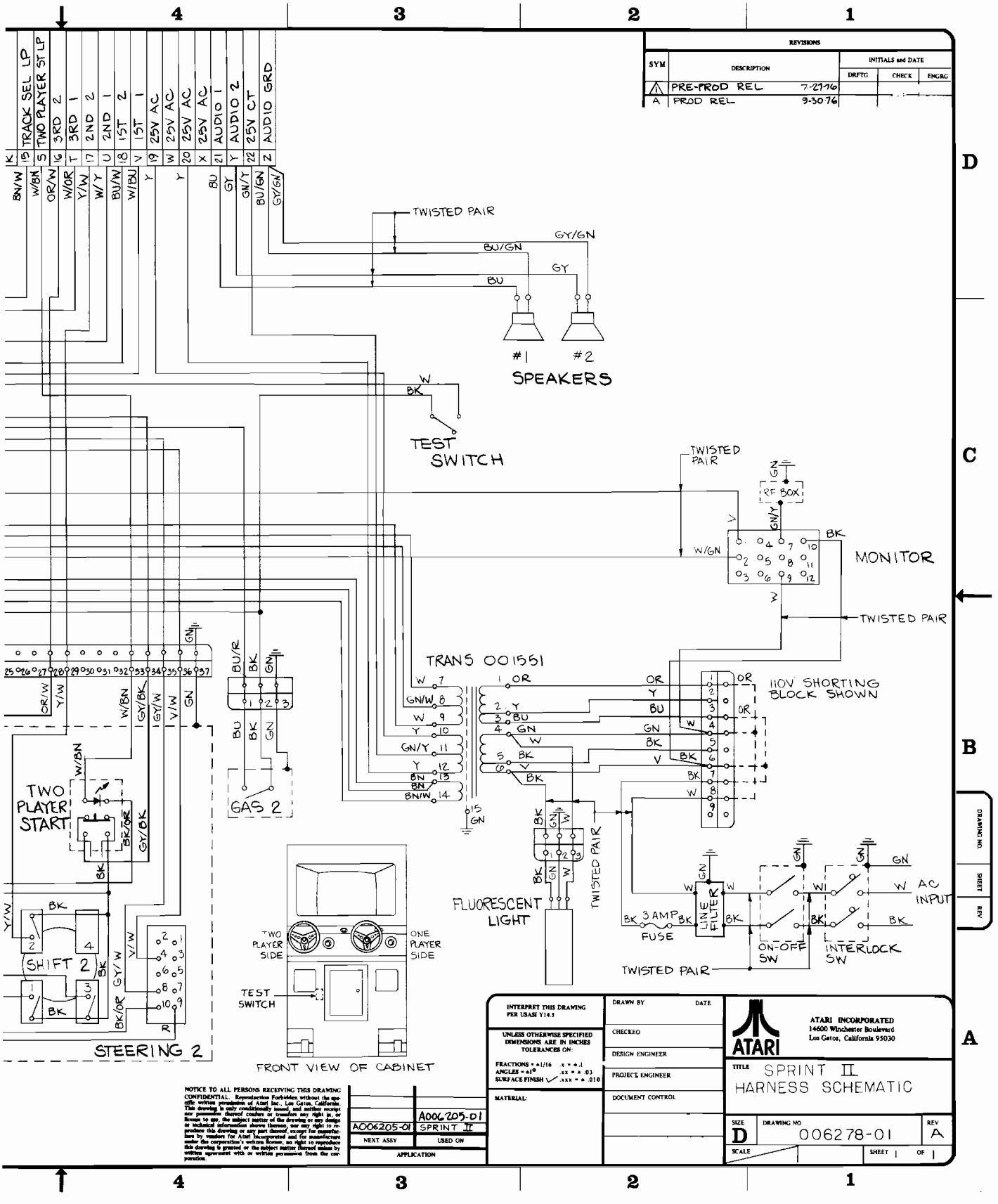
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030

TITLE ASSEMBLY STEERING BOARD

SIZE B | DRAWING NO A000607 | REV M

SCALE 2:1 | SHEET 1 OF 1


8
7
6
5
D
C
B
A
44 PIN EDGE CONNECTOR
1 W/GN VIDEO GRD
A BK/OR SW GRD
2 GN/W 16.5V CT
B BN 6V AC GRD
3 W 16.5V AC
C 16.5V AC
4 W 16.5V AC
D 16.5V AC
5 R/GN +10V UNREG
E R +5V
6 V VIDEO
F W/GY STEERING 1A
7 W/V STEERING 1B
H Y COIN SW 2 NC
8 V/W STEERING 2B
J OR COIN SW 1 NC
9 GY/W STEERING 2A
K BN/BK ONE PLAYER ST LP
10 BK SW COMM
L W
11 BU/R TST SW
M BU/BK GAS 2 NO
12 Y/BK GAS 1 NO
N GY/BK ONE PLAYER ST NO
13 R/BK TWO PLAYER ST NO
P TRACK SEL NO
14
R BN/W
15 W/BN TRACK SEL LP
S OR/W TWO PLAYER ST LP
16 W/OR 3RD 2
T Y/W 3RD 1
17 W/Y 2ND 2
U BU/W 2ND 1
18 W/BU 1ST 2
V Y 1ST 1
19 25V AC
COIN COUNTER
COIN SWITCHES
#1
#2
GAS 1
ONE PLAYER START
TRACK SELECT
TWO PLAYER START
SHIFT 1
SHIFT 2
STEERING 1
STEERING 2


REVISIONS
SYM | DESCRIPTION | INITIALS and DATE: DRFTG | CHECK | ENGRG
A | PRE-PROD REL 7-27-76
A | PROD REL 9-30-76
TRACK SEL LP
TWO PLAYER ST LP
3RD 2
3RD 1
2ND 2
2ND 1
1ST 2
1ST 1
25V AC
25V AC
25V AC
AUDIO 1
AUDIO 2
25V CT
AUDIO GRD
TWISTED PAIR
GY/GN
BU/GN
GY
BU
#1
#2
SPEAKERS
TEST SWITCH
RF BOX
MONITOR
TRANS 001551
110V SHORTING BLOCK SHOWN
TWO PLAYER START
GAS 2
SHIFT 2
STEERING 2
FLUORESCENT LIGHT
FUSE
3 AMP
LINE FILTER
ON-OFF SW
INTERLOCK SW
AC INPUT
TWO PLAYER SIDE
ONE PLAYER SIDE
TEST SWITCH
FRONT VIEW OF CABINET
INTERPRET THIS DRAWING PER USASI Y14.5
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ±1/16 .x ±.1
ANGLES ±1° .xx ±.03
SURFACE FINISH .xxx ±.010
MATERIAL:
DRAWN BY DATE
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER
DOCUMENT CONTROL
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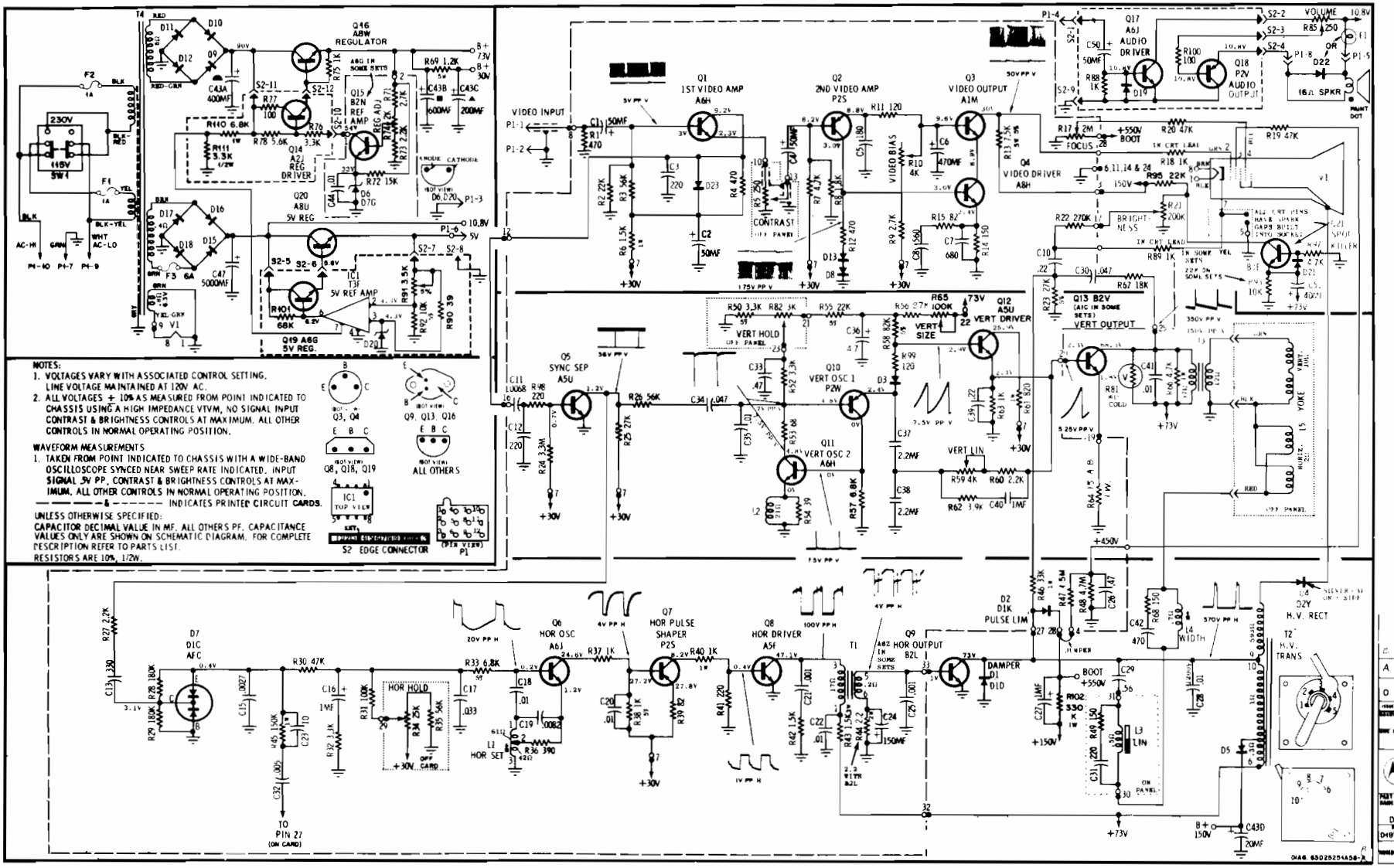
A006205-01
A006205-01 SPRINT II
NEXT ASSY
USED ON
APPLICATION
ATARI
ATARI INCORPORATED
14600 Winchester Boulevard
Los Gatos, California 95030
TITLE SPRINT II
HARNESS SCHEMATIC
SIZE D
DRAWING NO 006278-01
REV A
SCALE
SHEET 1 OF 1
DRAWING NO.
SHEET
REV.



MOTOROLA
DATA PRODUCTS
CAROL STREAM, ILL.

XM501-10B
XM701-10B
DIAGRAM SCHEMATIC

D19VP111, E23VP111

63D25251A58

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