

16-542-101

July 8, 1986



INSTRUCTION MANUAL

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Road Kings (System-11) ROM Summary

IC	DESCRIPTION	TYPE	IDENTIFIER	BOARD	PART NUMBER
Game ROM 1	32K x 8 ROM	27256	U27	CPU	A-5343-542-2
Game ROM 2	8K x 8 ROM	2764	U26	CPU	A-5343-542-1
Sound ROM 1	32K x 8 ROM	27256	U21	CPU	A-5343-542-4
Sound ROM 2	32K x 8 ROM	27256	U22	CPU	A-5343-542-3

Background (B/G)

Music ROM	32K x 8 ROM	27256	U4	B/G Music	A-5343-542-5
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Game	System 11 CPU Rev.	P/N - U15	P/N - U27	P/N - U26	P/N - U21	P/N - U22	P/N - U24	Jumpers
High Speed	A	5400-09250-00	A-5343-541-1	A-5343-541-5	A-5343-541-3	A-5343-541-2	5400-09250-00	W1, 2, 4, 5, and 7
↓	B, C, D		↓	↓	↓	↓		W1, 2, 4, 5, 7, 8, 11, 12, 13, 14, 16, 17, and 18
Alley Cats	A		A-5343-1918-2	A-5343-1918-1	A-5343-1918-4	A-5343-1918-3		W1, 3, 5, and 7
↓	B, C, D		↓	↓	↓	↓		W1, 3, 5, 7, 9, 11, 12, 13, 14, 16, 17, and 18
Grand Lizard	B, C, D		A-5343-523-1	A-5343-523-5	A-5343-523-2	A-5343-523-3		W1, 2, 4, 5, 7, 8, 11, 12, 13, 14, 16, 17, and 18
Road Kings	D-G	↓	A-5343-542-2	A-5343-542-1	A-5343-542-4	A-5343-542-3	↓	W1, 2, 4, 5, 7, 8, 11, 12, 13, 14, 16, 17, and 18

Sol. No.	Function	Solenoid Type	Wire Color	Connections		Driver Trans.	Solenoid Part No.
				CPU Bd.	Playfield/Cabinet		
01	Outhole	Controlled	Gry-Brn	1P11-1	8P3-1	Q33	AE-23-800-01
02	Ball Trough Feeder	Controlled	Gry-Red	1P11-3	8P3-2	Q25	AE-23-800-03
03	Left Eject Hole	Controlled	Gry-Orn	1P11-4	8P3-3	Q32	AE-23-800-03
04	Center Eject Hole	Controlled	Gry-Yel	1P11-5	8P3-4	Q24	AE-23-800-03
05A ³	Rear Playfield Flashers	Switched	{Vio-Grn}	1P11-6	8P3-5 (to B4 on Diode Sw. Bd.)	Q31	#63 flashlamps
05C ³	Upper Left Kicker	Switched	{Blk-Grn}	(Brn-Grn)		Q31	AE-23-800-11 & Relay/Snb
06	Power Kicker (Left Outlane)	Controlled	Gry-Blu	1P11-7	8P3-6	Q23	AE-24-900-01 & Relay/Snb
07	Left Lightning Bolt	Controlled	Gry-Vio	1P11-8	8P3-7	Q30	#63 flashlamps
08	Right Lightning Bolt	Controlled	Gry-Blk	1P11-9	8P3-8	Q22	#63 flashlamps
09	Left Gate	Controlled	Brn-Blk	1P12-1	8P3-9	Q17	SM1-35-4000-DC
10	Right Gate	Controlled	Brn-Red	1P12-2	8P3-10	Q9	SM1-35-4000-DC
11	General Illumination Relay	Controlled	Brn-Orn	1P12-4	3P7-1	Q16	5580-09555-00
12	Solenoid Select Relay	Controlled	Brn-Yel	1P12-5	8P3-12	Q8	5580-09555-00
13A ³	Knocker	Switched	{Vio-Wht}	1P12-6	8P3-13 (to B3 on Diode Sw. Bd.)	Q15	AE-23-800-02
13C ³	Ramp Up	Switched	{Blk-Wht}	(Brn-Grn)		Q15	AE-24-900-02
14A ³	Mid-Insert Board Flashers	Switched	{Vio-Blu}	1P12-7	8P3-14 (to B2 on Diode Sw. Bd.)	Q7	#63 flashlamps
14C ³	Ramp Down	Switched	{Blk-Blu}	(Brn-Blu)		Q7	SM-26-600-DC
15A ³	Bikes Flasher (Backbox)	Switched	{Vio-Blk}	1P12-8	8P3-15 (to B1 on Diode Sw. Bd.)	Q14	#63 flashlamps
15C ³	Drop Target	Switched	{Blk-Vio}	(Brn-Vio)		Q14	SA-5-24-750-DC
16	Coin-Lockout Relay	Controlled	Brn-Gry	1P12-9	7P1-7,7P2-4	Q6	404603-2 (Coinco p/n)
17	Left Kicker	Special #1	Blu-Brn	1P19-7	8P3-17	Q75	AE-23-800-03
18	Right Kicker	Special #2	Blu-Red	1P19-4	8P3-18	Q71	AE-23-800-03
19	Upper Jet Bumper	Special #3	Blu-Orn	1P19-3	8P3-19	Q73	AE-23-800-03
20	Left Jet Bumper	Special #4	Blu-Yel	1P19-6	8P3-20	Q69	AE-23-800-03
21	Right Jet Bumper	Special #5	Blu-Grn	1P19-8	8P3-21	Q77	AE-23-800-03
22	Lower Jet Bumper	Special #6	Blu-Blk	1P19-9	8P3-22	Q79	AE-23-800-03
-	Right Flipper	-	Orn-Vio [Blu-Vio]	1P19-1	7P1-20 [7J1-21,8P3-34] ²	-	FL23/600-30/2600-50VDC
-	Left Flipper	-	Orn-Gry [Blu-Gry]	1P19-2	7P1-23 [7J1-24,8P3-32] ²	-	FL23/600-30/2600-50VDC

Notes: 1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" coils are pulsed, when Sol. 12 is de-energized; "C" coils are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the B terminal connection listed for the Diode Switching Board, which controls the device pulsing by Sol. 12.

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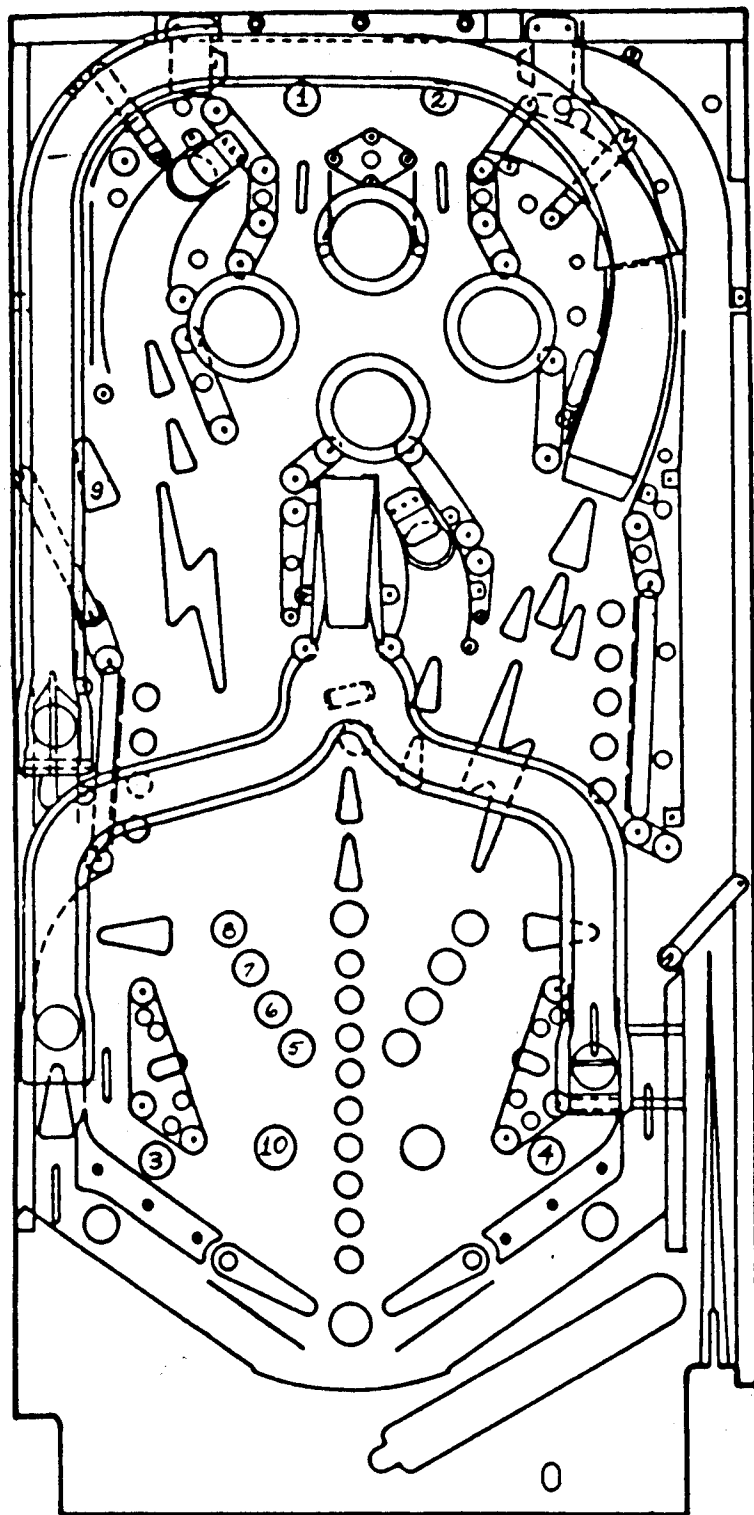
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ROAD KINGS



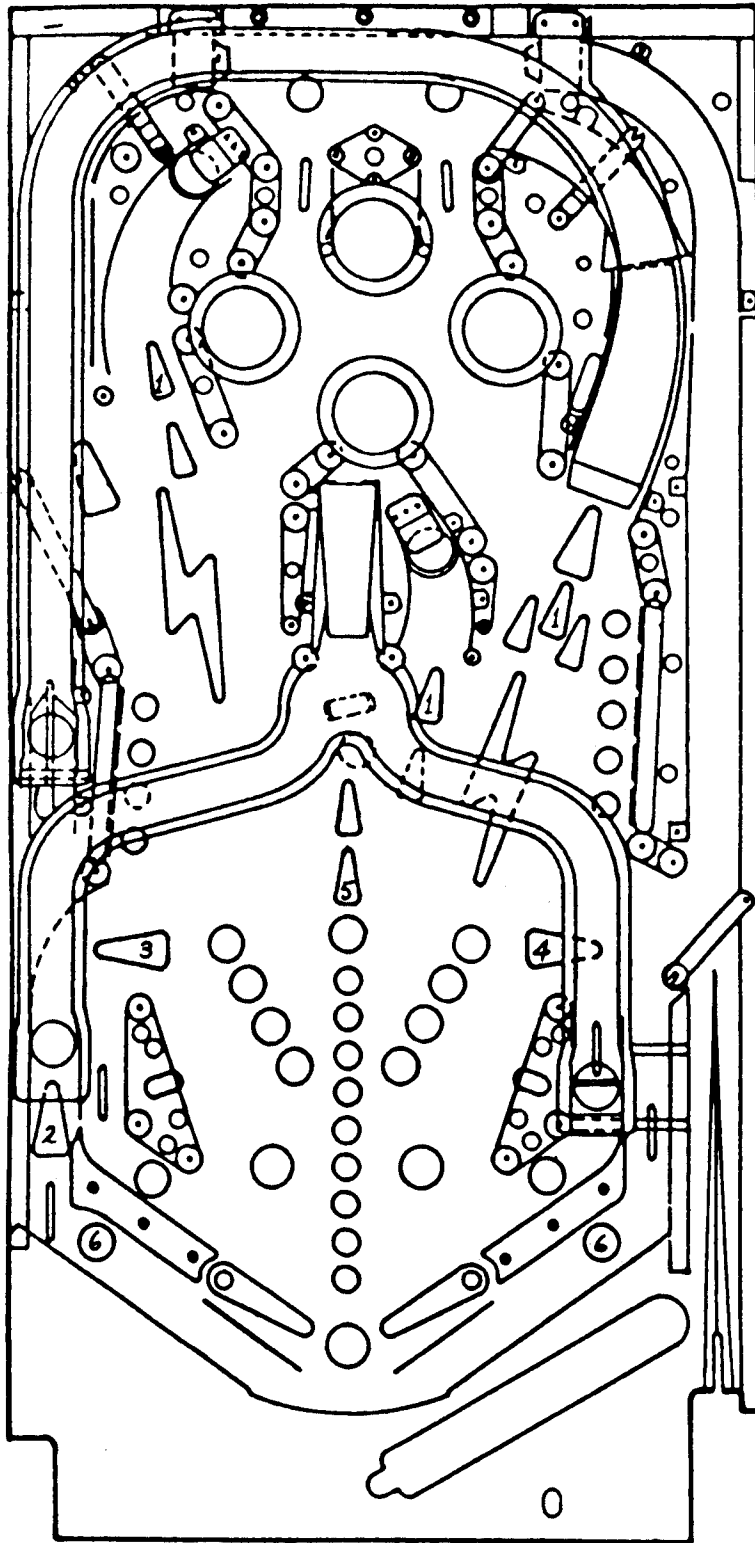
LANES 1, 2, 3, & 4

Making Lanes 1, 2, 3, and 4 (1 - 4) advances Bonus Multiplier string 2X, 3X, 4X, 5X (5 - 8).

Making lanes 1 through 4 also lights timed* BONUS HOLDOVER lamp (9) at upper left corner of playfield (large amber arrow). Making Bonus Holdover shot lights HOLD BONUS lamp (10). This carries any accumulated bonus to player's next ball.

* Time is operator adjustable.

ROAD KINGS



Making

R - O - A - D TARGETS:

- A. Light first LOCK lamp (at random) (1).
- B. Light POWER KICK™ (2).
- C. Light left COLLECT DETOUR VALUE (3).

Making

K - I - N - G - S TARGETS:

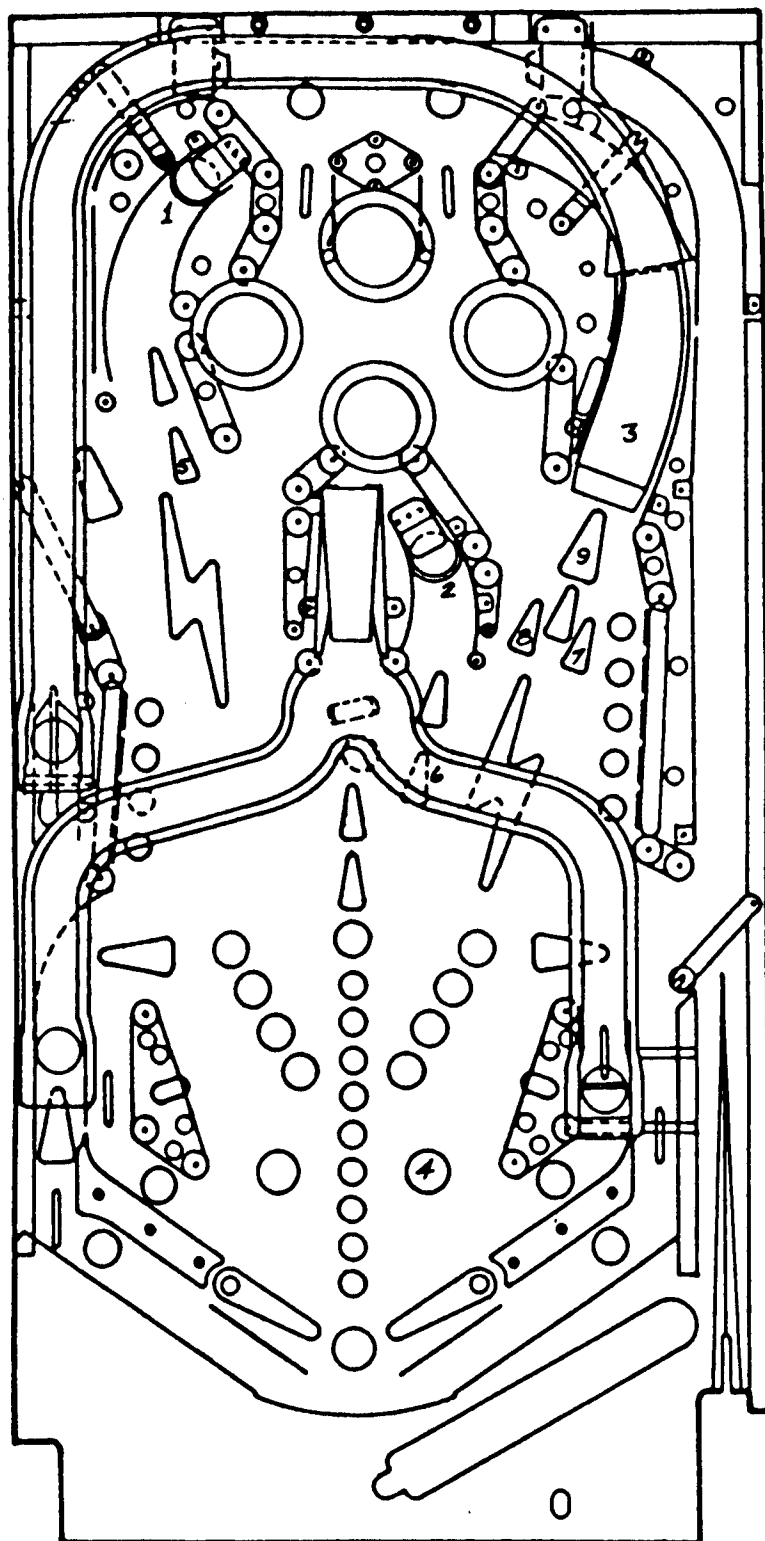
- A. Light second LOCK lamp (at random) (1).
- B. Light POWER KICK™ arrow (2).
- C. Light right COLLECT DETOUR VALUE lamp (4).

Making

R-O-A-D-K-I-N-G-S TARGETS (Together):

- A. Awards 25,000 points.
- B. Light Center Drop Target EXTRA BALL lamp (5).
- C. Light an outlane SPECIAL lamp (6).

ROAD KINGS



MULTI-BALL™ PLAY:

Locking two balls in any two of the three possible shots: (1) Left Eject, (2) Center Eject, or (3) the upper right Ramp starts Multi-Ball play; lights ALL SCORES DOUBLE lamp (4); and builds Time Lock value†.

TIME LOCK™:

Once Multi-Ball play is achieved, the three red TIME LOCK arrows (5, 6, 7) blink. The object is to again lock the two balls in play into any two of the three lit shots (Left Eject, Center Eject, or the upper right ramp). Locking one ball starts the timer for the second ball to be locked.

If the player does not lock the second ball before the time runs out, the locked ball is ejected, and the player resumes Multi-Ball play.

Locking both balls completes the Time Lock sequence, and the player collects the Time Lock value (built during Multi-Ball play), raises the right ramp, and lights timed* right ramp EXTRA BALL (8). If the time expires or Extra Ball is collected, MEGA SCORE (9) then lights for a possible 300,000 points.

† - Time Lock value increases only during Multi-Ball play.

* - Time is operator adjustable.

Section 1

Game Operation & Test Information

- ***Road Kings (System-11) ROM Summary***
- ***Pinball Game Assembly Instructions***
- ***Game Play***
- ***Game Status Displays***
- ***Game Adjustment Procedure***
- ***Game Pricing***
- ***Test/Diagnostic Procedures***

Road Kings (System-11) ROM Summary

IC	DESCRIPTION	TYPE	IDENTIFIER	BOARD	PART NUMBER
Game ROM 1	32K x 8 ROM	27256	U27	CPU	A-5343-542-2
Game ROM 2	8K x 8 ROM	2764	U26	CPU	A-5343-542-1
Sound ROM 1	32K x 8 ROM	27256	U21	CPU	A-5343-542-4
Sound ROM 2	32K x 8 ROM	27256	U22	CPU	A-5343-542-3
Background (B/G)					
Music ROM	32K x 8 ROM	27256	U4	B/G Music	A-5343-542-5

NOTICE

To order a replacement ROM from your authorized WILLIAMS ELECTRONICS GAMES distributor, specify: (1) part number (if available); (2) ROM label color; (3) ROM level (number) on the label; (4) which game the ROM is used in.

CONNECTOR IDENTIFICATION

WILLIAMS ELECTRONICS GAMES uses a special technique to identify connectors. Each plug or jack receives a prefix number (which identifies the circuit board), a letter, and a number. J-designations refer to the male part of a connector. P-designations refer to the female part of a connector. For example, 1J1 designates jack 1 of board 1 (a CPU Board jack); 3P6 designates plug 6 of board 3 (a Power Supply Board plug).

Identifying the specific pin number of a connector involves a hyphen, which separates the pin number from the plug or jack designation. For example, 1J1-3 refers to pin 3 of jack 1 on board 1.

Road Kings CIRCUIT BOARDS

All major *Road Kings* Circuit Boards are in the backbox. They are accessible by removing the backbox glass, unlatching the insert board, and swinging it open.

CPU BOARD. The System-11 CPU Board (p/n D-10881) must be equipped with the ROMs specified in the *Road Kings* (System-11) ROM Summary. For this ROM complement, on *Revision B (or later)* CPU boards (having jumpers W1 through W18): jumpers W1, W2, W4, W5, W7, W8, W11, W12, W13, W14, W16, W17, and W18 must be connected. Jumper W7 is cut/removed for West German games.

BACKGROUND MUSIC BOARD. The Background Music Board is p/n D-11197, as supplied with ROM and microprocessor.

DISPLAY BOARDS. The Alphanumeric Display Board is p/n D-10877. Two of the 7-digit Player Score Displays (player 1 and 2) are p/n C-10866. The player 3 and 4 Displays are p/n C-8364-1. The 2-digit Credit (also BALL IN PLAY), 2-digit MATCH Display is p/n C-8365-1.

POWER SUPPLY BOARD. The Power Supply Board is p/n D-8345-541.

Prefix numbers for *Road Kings* System-11 circuit boards and major assemblies are listed below. A prefix number may precede a component designator to identify the unit (e.g., connector 1J1).

1 - CPU	6 - Backbox	11 - B/G Music
2 - (not assigned)	7 - Cabinet	12 - (not assigned)
3 - Backbox Power Supply	8 - Playfield	13 - (not assigned)
4 - Alphanumeric Display	9 - Insert Board	14 - (not assigned)
5 - Player Score Displays	10 - (not assigned)	15 - Flipper Power Supply

Road Kings GAME CONTROL LOCATIONS

The On-Off switch is on the bottom of the cabinet near the right front leg.

The Volume Control is on the left inner wall of the cabinet on the tilt mechanisms board. It is accessible by opening the coin box door.

The Credit switch is a pushbutton to the left of the coin door on the cabinet exterior.

GAME ADJUSTMENT/DIAGNOSTIC SWITCHES. *Road Kings* allows the operator to program virtually all game adjustments, obtain bookkeeping information, and diagnose problems, using only three switches mounted on the inside of the coin door and the Credit button beside the coin door.

ADVANCE, AUTO-UP/MANUAL-DOWN, and HIGH-SCORE RESET are the switches located on the inside of the coin door. Refer to the Game Status Displays text and the Text/Diagnostic Procedures for details concerning their operation.

The Memory Protect switch is on the inside frame of the coin door. This interlock switch must be open to clear bookkeeping totals and to make game adjustments. It automatically opens, when the coin door opens.

The CPU Diagnostic switch (SW 2) is the lower switch (of the two switches mounted on the left edge of the CPU Board) near a large, socketed microprocessor chip. This switch initiates the Memory Chip Test explained in the Diagnostic Procedures.

The Sound Diagnostic switch (SW 1) is the upper switch of the two mounted on the left edge of the CPU Board. This switch initiates the Sound Section Test. Refer to the Diagnostic Procedures.

PINBALL GAME ASSEMBLY INSTRUCTIONS

1. Open the shipping container; remove all cartons, parts, and other items, and set them aside.
2. Place cabinet on a support and attach rear legs, using leg bolts (provided in the cash box).
3. Attach the front legs, using leg bolts.
4. Reach into the cabinet and backbox and check the mating of the interconnecting cables, matching several wire colors at each connector.

CAUTION

Ensure that the interconnecting cables are free to move (not kinked or pinched). Be careful not to damage wires at any stage of the assembly process.

5. Raise the hinged backbox into position. Remove backglass, unlatch and open the Insert Board, and secure the backbox with mounting bolts through the bottom holes into the threaded fasteners in the cabinet.
6. Extend the rear leg levelers to approximately 2/3 length. Remove the cabinet from its support and place it on the floor.
7. Remove the playfield cover glass to permit accurate measurement of the playfield level and pitch. Level (side-to-side) the playfield (preferably measured ON the playfield surface), and firmly tighten the nut on each leg leveler shaft to maintain this level setting, as shown in Figure 1.
8. Adjust the front leg levelers for proper playfield level (side-to-side) and playfield pitch angle (incline) of approximately 6 degrees. (Again, it is recommended that these measurements be made ON the playfield, not the cabinet nor the playfield cover glass.) Tighten the nut on each leg leveler shaft to maintain this setting.

CAUTION

Playfield pitch angle adjustments can affect the operation of the ball-roll tilt and the plumb bob tilt, inside the cabinet. The operator should adjust these tilt mechanisms for proper operation, after completion of the desired playfield pitch angle setting.

9. Move the game into the desired location; recheck the level and pitch angle of the playfield.
10. Verify that two balls are installed in the game.
11. Clean and re-install the playfield cover glass. Prepare the game for player operation.

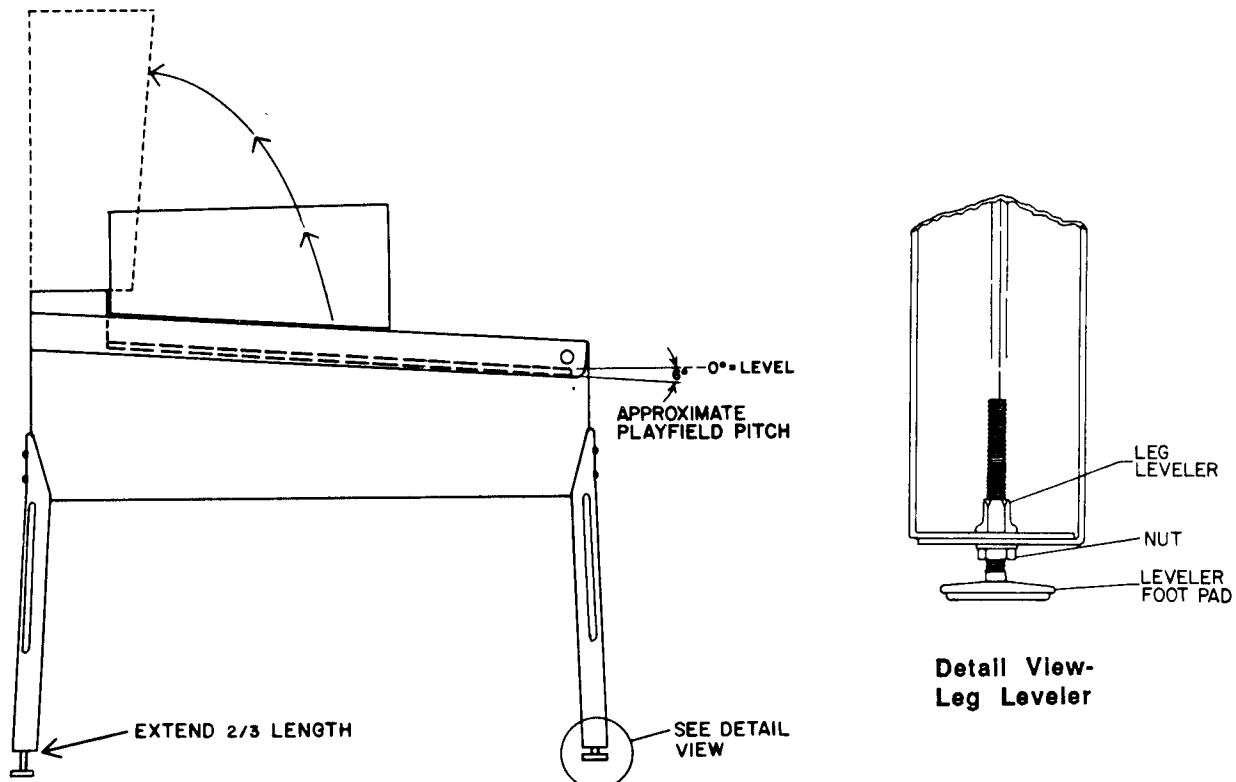


Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details.

GAME OPERATION

WARNING

After assembly and installation at its site location, this game must be plugged into a properly grounded outlet to prevent shock hazard, and to assure proper game operation. DO NOT use a 'cheater' plug to defeat the ground pin on the line cord. DO NOT cut off the ground pin.

POWERING UP. With the coin door closed, plug the game in, and switch it ON, using the On-Off switch. In normal operation, the player 1 score display and the lower two 2-digit displays (Credits and BALL IN PLAY/MATCH) initially all show 00. The GAME OVER indicator blinks. Then, the game goes into the Attract Mode (Playfield and backbox lamps flashing, sounds being heard, etc.).

CAUTION

Road King's System 11 game program has a new capability to aid the operator and service personnel: At game Turn-On (and also when the operator is beginning the Test/Diagnostic Procedures), a display now signals when a switch has NOT been actuated during ball play for 60 balls (20 games). Up to three switches can be displayed during this Switch Problem reporting activity. Moreover, *Road Kings* compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep *Road Kings* earning good profits! More information is available in the Diagnostic Procedures text describing the Switch Testing.

ATTRACT MODE*. Playfield and backbox lamps blink. All player score displays exhibit a series of messages informing the player concerning:

- A. Recent highest scores*;
- B. A "custom message": **FIGHT THE - ... "ROAD KINGS";**
- C. The score to achieve to obtain a Replay award*.
- D. Brief game feature instructions.

These displays (or variations of them) reappear occasionally, accompanied by sounds and music, until a player initiates game play by inserting a coin or, when credits are available, pressing the Credit button.

CREDIT POSTING. Insert coin(s). A sound is heard for each coin, and the Credits display shows the number of credits purchased. Even if the number of maximum allowable credits* is exceeded by coin purchase or high score, credits are posted correctly. However, the coin-lockout coil then de-energizes, until the number of remaining credits is less than the maximum. No more credits may be purchased (and coins are rejected), while the coin-lockout coil is de-energized.

STARTING A GAME. Press the Credit button once. A startup sound plays, and the amount shown in the Credit display decreases by one. Player display 1 flashes (until the first playfield switch is actuated), and the BALL IN PLAY display shows 1. Additional players may enter the game by pressing the Credit button once for each player, before the end of play on the first ball.

TILT. Actuating the Slam Tilt switch on the coin door inside the cabinet ends the current game; *Road Kings* then proceeds to the Game Over Mode. With the actuation of the ball-roll or playfield tilt switches, or the third closure* of the plumb bob tilt switch, the player loses the remaining play of that ball, but can complete the game.

END OF GAME. All earned scores and bonuses are awarded. If a player's final score exceeds the specified value, the player receives a designated award for achieving the current highest score. A random digit set* appears in the MATCH display. Credit* may be awarded, when the last two digits of any player's score display (1 through 4) match the random digits of the MATCH display. Match, high score, and game over sounds are made, as appropriate.

GAME OVER MODE. The GAME OVER indicator lights. The player 1 and 2 score displays show **GAME OVER**. Then, the high scores flash on the appropriate player score displays. The game proceeds to the Attract Mode.

* - operator-adjustable feature

Road Kings GAME PLAY

- **R-O-A-D-K-I-N-G-S**

Four ways are available to "spot" a letter: (1) Hit letter directly; (2) Hit the Detour drop target, when the Spots Letter lamp is lit; (3) Make the right ramp (inverted J) ramp shot; (4) Make the Detour (inverted Y) ramp shot, when the Spots Letter lamp is lit. Completing the standup targets for either R-O-A-D or K-I-N-G-S lights: (1) one Lock lamp (green arrow); (2) the Power Kick lamp (yellow arrow); and (3) one associated Collect Detour lamp (gold arrow). Completing both R-O-A-D and K-I-N-G-S lights the center Extra Ball lamp, then the Special lamp.

- **Center Detour Ramp**

When a Collect Detour Value lamp is NOT lit, a Detour shot increases the value of the Detour shot and, if the Spots Letter W/L is lit, spots a letter in ROAD KINGS. When a Collect Detour lamp is lit, a Detour shot awards the Detour value, and, if lit, the Extra Ball award. Note flashing arrows are for ramp shot.

- **Drop Target**

When the Spots Letter W/L lamp is lit, making the Detour drop target shot spots a letter in ROAD KINGS. The Spots Letter lamp lights at beginning of play, and by passing through Lane 1 or Lane 2, when lit. Steadily lit (not flashing) arrows apply to the drop target.

- **1-2-3-4 Lanes**

Completing all four lanes advances the bonus multiplier (2X, 3X, 4X, 5X) and lights the Bonus Holdover W/L lamp (timed adjustment).

Bonus Holdover

Make the Bonus Holdover W/L shot (upper left playfield) to start bonus on next ball at level achieved.

Eject Hole Bonus

Shooting ball in unlit eject hole builds eject hole bonus value and kicks out ball.

MULTI-BALL™ PLAY

Shoot ball into upper left eject hole, center eject hole, or up rear (J) ramp, when the associated Lock lamp (green arrow) is flashing. After both balls are "locked", eject hole bonus is awarded, and Multi-Ball™ play begins, when the balls are ejected onto the playfield. Scoring doubles during this Multi-Ball™ play.

Time Lock

During Multi-Ball™ play, the Time Lock lamps (red arrows) flash. Scoring causes the value of *Time Lock Jackpot* to increase. Locking one ball stops the flashing of the lamp associated with that lock. Locking the second ball begins *Time Lock* and awards *Time Lock Jackpot*. During *Time Lock*, the rear ramp entrance raises to enable Extra Ball and **Mega Score** play.

Mega Score

While the **Mega Score** lamp is lit, shooting the ball under the rear (J) ramp and around the top of the playfield awards **Mega Score**. Note that the right rollunder switch (#35) and then the left rollunder switch (#36) must be made in that order to collect **Mega Score**.

CONSOLATION EXTRA BALL

This feature is available only on the last ball, whenever the average ball time for the first two balls is less than 33 seconds. To collect the Extra Ball, a player must make the Detour drop target shot within the first 30 seconds of the last ball play.

Road Kings GAME STATUS DISPLAYS

Road Kings utilizes a new format for the display of information concerning the game's bookkeeping and game play feature adjustment. Basically, three classes of information now become available to the game owner/operator: Id (Identification); Au (Audit); Ad (Adjustment). Each of the underscored two-letter abbreviations for these classes appears in the Credits display, while the system microprocessor for the *Road Kings* game is displaying the items within each class in the status display mode.

Identification Information--Id

With the game turned on, the coin door open, and the AUTO-UP switch in the Up position, the operator can press the ADVANCE switch once, briefly. *Road King's* displays immediately change from the Attract Mode to the Game Status Display Mode. This is evident by the following display, shown in columnar form. The column headings refer to the various backbox displays. (Player display 3 does not appear in the listing because it remains blank):

Player 1	Player 2	Player 4	Credits	BALL IN PLAY/ MATCH
-------------	-------------	-------------	---------	------------------------

ROAD	KINGS	542 L*	Id	00
------	-------	--------	----	----

* - 1 indicates initial ROM revision level; 2, 3, etc. for later revisions.

The game is named in the player score 1 and 2 displays. The game's identification number and the ROM revision level appears in the player 4 display. The Credits display shows the status display mode in abbreviated form, *Id*. The BALL IN PLAY/MATCH display shows the status display mode item for this particular display.

Audit Information--Au

While the AUTO-UP switch remains in the Up position, the operator can press the ADVANCE switch once, briefly, to begin the backbox displays of Audit (sometimes called "bookkeeping") Information. Forty-four audit entries are now available. Calculation of the various factors is no longer necessary because the *Road Kings* System 11's game program now performs all the mathematical factor computations. This information is intended to aid the owner/operator in evaluating how the game is performing in each location, by providing knowledge about which game features are receiving the most play. With this information, the owner/operator can determine whether adjusting the game features to other settings will contribute to increased game earnings.

The operator can press the ADVANCE button once to view each Audit Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

The ***Road Kings* Audit Table** lists the 44 items of the Audit Information portion of the *Road Kings* Game Status Displays. Presentation of the displays is similar to that for the Identification Information; however, the player 1 and 2 displays are combined as a descriptive phrase. In light type below the column headings appear the respective backbox displays where the information appears. Because the player 4 display contains information which depends on game play, only a few example entries are shown in the table. The Credits display shows *Au* for all 44 audit items, so its entry is omitted from the tabular listing. Detection of erroneous data affecting any of the counters used in these audit items causes the message, ERROR, to be displayed in the player 3 display, during display of any audit item associated with that particular counter. (The program does not analyze the cause of the error; it merely alerts the operator of the error's existence by the message.)

Road Kings GAME STATUS DISPLAYS (Continued)

Road Kings Audit Table

Audit Item	Descriptive Phrases	Audit Factor Value ¹
(MATCH)	(Player 1 and 2 Displays)	(Player 4)
01	Left Coins (chute next to coin door hinge)	432
02	Center Coins	0
03	Right Coins	398
04	Paid Credits	830
05	Total Plays	
06	Total Free (Total Free Plays)	
07	Percent Free (% Free Plays)	
08	Replay Awards	
09	Percent Replay (% Replay Awards)	
10	Special Awards	
11	Percent Special (% Special Awards)	
12	Match Awards	
13	HSTD (High Score to Date) Credits	
14	Percent HSTD (% HSTD Credits)	
15	Extra Balls	
16	Percent Ex. Ball (% Extra Balls)	
17	Av. Ball Time (Average Time in Seconds)	
18	Min. of Play (Minutes of Play)	
19	Balls Played	
20	Replay 1 Awards	
21	Replay 2 Awards	
22	Replay 3 Awards	
23	Replay 4 Awards	
24	1 Playr Games	
25	2 Playr Games	
26	3 Playr Games	
27	4 Playr Games	
28	Burn in Cycles	
29	Multi Balls [# of Multi-Ball games]	
30	Time Locks [# of Time-Locks]	
31	Mega Scores [# of times for Mega-Score]	
32	Detour Ex. Balls [# of Detour Extra Balls]	
33	R. Ramp Ex. Balls [# Rt. Ramp Extra Balls]	
34	Bonus Holds [# of Bonus Holds]	
35	Consol. Active [# of times Consolation Extra Ball lighted]	
36	Det. Ex. B. Lit [# of times Detour Extra Ball lighted]	
37	Special Lit [# of times Special lighted]	
38	Att. Mode Cycles [# of times Attract Mode]	
39	H. S. Reset Counter	6,000
40	Aut. Pct. Data 1	
41	Aut. Pct. Data 2	
42	Aut. Pct. Data 3	
43	Aut. Pct. Data 4	
44	Aut. Pct. Data 5	

NOTE:

1. The numbers shown in this column for Items 1 through 4 are examples. Entries for all items depend on the amount of play; thus, they will vary from location to location.

Adjustment Information--Ad

At end of the Audit Information presentation, with the AUTO-UP switch in the Up position, the operator can press the ADVANCE button to proceed to the Adjustment Information portion of the *Road Kings* Game Status Displays.

The operator can press the ADVANCE button once to view each Adjustment Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

Road Kings GAME STATUS DISPLAYS (Continued)

The **Road Kings Game Adjustment Table** lists the 70 items of the Adjustment Information portion of the *Road Kings* Game Status Displays. Presentation of the displays is similar to that for the Audit Information (that is, the player 1 and 2 displays combine as a descriptive phrase; the light type below the column headings names the respective backbox displays where the information appears, etc.). The Credits display shows *Ad* for all 70 adjustment items, so its entry is omitted from the tabular listing.

Road Kings Game Adjustment Table

Adjustment Item (MATCH)	Descriptive Phrases		Factory Setting (Player 4)
	(Player 1 and 2 Displays)	(Player 3)	
01	AUTO REPLAY ¹ FIXED REPLAY ¹	PERCENT	LEARN10 SCORES ¹
02	REPLAY START (or REPLAY LEVEL 1) ¹		1,500,000
03	REPLAY LEVELS (or REPLAY LEVEL 2) ¹		01 (or OFF)
04	(REPLAY LEVEL 3) ¹		(see text)
05	(REPLAY LEVEL 4) ¹		(see text)
06	REPLAY AWARD		Credit
07	SPECIAL AWARD		Credit
08	MATCH FEATURE		On
09	BALLS / GAME		03
10	TILT WARNING		03
11	MAXIMUM EX. BALL		04
12	MAXIMUM CREDITS		10
13	HIGHEST SCORES		On
14	BACKUP HI. SCR.1		4,000,000
15	BACKUP HI. SCR. 2		3,500,000
16	BACKUP HI. SCR. 3		3,000,000
17	BACKUP HI. SCR. 4		2,500,000
18	HI. SCR.1 CREDITS		04
19	HI. SCR.2 CREDITS		03
20	HI. SCR.3 CREDITS		02
21	HI. SCR.4 CREDITS		01
22	H. S. RESET EVERY (3,000 PLAYS) ²		
23	FREE PLAY		NO
24	U.S.A. 1 COINAGE (1 COIN 1 PLAY) ^{2,3}		
25	LEFT UNITS		01
26	CENTER UNITS		04
27	RIGHT UNITS		01
28	UNITS/ CREDIT		01
29	UNITS/ BONUS		00
30	MINIMUM UNITS		00
31	LOCK MEMORY [no = not retained in memory; yes = retained]		YES
32	TIME LOCK [easy - regular - hard]		regular
33	BON. HOLD TIMING [7 - 15 sec.]		10 sec
34	DET. EXIT MEMORY [no = not retained; yes = retained]		YES
35	DETOUR ADVANCE. [10,000 - 90,000]		50,000
36	TARGET MEMORY [no = not retained in memory; yes = retained]		YES
37	LIGHT EX. BALL [2nd; 3rd; 4th]		3rd
38	TIM. LOCK EX. BALL [15 - 25 sec.]		17 sec
39	PWR. KICK SAFETY [On = Pwr Kick lamp flashes 5 sec. after kick for next kick; Off = no flashing lamp]		On
40	PWR. KICK MEMORY [no = not retained in memory; yes = retained]		YES
41	CONSOL. EX. BALL [no; yes = avg. ball time (3rd ball) >32 sec., center ramp lit for 30 sec.]		YES

Road Kings GAME STATUS DISPLAYS (Continued)

Road Kings Game Adjustment Table (Continued)

Adjustment Item (MATCH)	Descriptive Phrases (Player 1 and 2 Displays)	Factory Setting (Player 4)
42	EX. BALL MEMORY [no = not retained in memory; yes = retained]	YES
43	SPECIAL MEMORY [no = not retained in memory; yes = retained]	YES
44	ATT.MODE SPEECH [On; Off]	On
45	ATT.MODE MUSIC [On; Off]	On
46	PWR.KICK INITIAL [yes; no]	YES
47	M.SCORE VALUE [50,000 - 250,000]	150,000
48	M.SCORE SHOTS [1 - 99]	50
49	CUSTOM MESSAGE ⁴	ON
50	SW. ALARM KNOCKER	YES
51	ENGLISH TEXT	
52	UNUSED ADJUST	
53 ⁵	INSTALL GERMAN 1 ⁶	
54 ⁵	INSTALL GERMAN 2 ⁶	
55 ⁵	INSTALL GERMAN 3 ⁶	
56 ⁵	INSTALL GERMAN 4 ⁶	
57 ⁵	INSTALL GERMAN 5 ⁶	
58 ⁵	INSTALL GERMAN 6 ⁶	
59 ⁵	INSTALL ADDABALL	NO
60 ⁵	INSTALL 5-BALL	NO
61 ⁵	INSTALL NOVELTY	NO
62 ⁵	INSTALL EX. EASY	NO
63 ⁵	INSTALL EASY	NO
64 ⁵	INSTALL MEDIUM	NO
65 ⁵	INSTALL HARD	NO
66 ⁵	INSTALL EX. HARD	NO
67	AUTO BURN-IN	NO
68	CLEAR COINS	NO
69	CLEAR AUDITS	NO
70	INSTALL FACTORY	NO

NOTES:

- Automatic Replay percentage value range is adjustable from 5 to 50%, via the Credit button. Item 02 permits changing the factory setting value for Replay Start Level (valid for next 500 games played). Item 03 permits setting up to four replay levels, with values as detailed in text describing item 03.
For Fixed Replay Scores, set Auto Replay value to 1 less than 5(%) via the Credit button. Go to items 02, 03, 04, and 05 to install their replay level scores. Turn off any replay score level by setting 00 as its value.
- Phrase in parentheses is Factory Setting. Phrase appears in (player) 3 and 4 displays. Press Credit button to change setting of item 22, or the game pricing of item 24.
- To change country OR coinage setting, press Credit button to obtain 16 Standard settings, followed by a Custom Setting. The Custom Setting activates items 25 through 30. When a Standard Setting is used, items 25 through 30 are set automatically, and cannot be changed.
- To install Custom Message, press flipper button for alphabet and special characters. Press Credit button for next message letter or character.
- Special Preset Adjustment, whose effects are noted in the Game Adjustment text.
- Refer to **Pricing Table** and text describing these items.

GAME ADJUSTMENT PROCEDURE

Adjustment Items 01 through 70

The coin door must be open to access the Game Adjustment/Diagnostic switches. All readings and adjustments require operation of these coin door switches. Some adjustments utilize the Credit button; some also use the flipper button(s). Additional text describing the game adjustment items follows this procedure.

1. Use AUTO-UP and press ADVANCE. The BALL IN PLAY/MATCH display initially indicates **Ad 01**. The player 1 and 2 score displays indicate AUTO REPLAY. The player 3 display shows PERCENT. If the factory setting has not been changed, the player 4 display shows 10, indicating the setting of a 10% replay percentage.

GAME ADJUSTMENT PROCEDURE (Continued)

2. To reach a higher item number (in the BALL IN PLAY/MATCH display), use AUTO-UP and press ADVANCE. To return to a previous item number, use MANUAL-DOWN and press ADVANCE.
3. With the desired item number (refer to the **Road Kings Game Adjustment Table**) showing in the BALL IN PLAY/MATCH display, increase the value shown in the player 4 display by using AUTO-UP and pressing the Credit button. Repeat this step for each item, until all adjustments have been made.

For example, the operator may desire to zero the values associated with certain items listed in the **Road Kings Audit Table**. To zero the first four items (concerning the coin chutes and the total coins), the operator can proceed to item 68, Clear Coins, and press the Credit button to obtain the YES option. The operator then presses the ADVANCE button and notes the "COINS CLEARED" display, which verifies that the entry values for items 01 through 04 of the Audit Items are now reset to zero.

4. To proceed through the entire adjustments series, press *and hold* ADVANCE, until **Ad 70** shows in the BALL IN PLAY/MATCH display. From item 70, you can: (A) return to the Game-Over Mode; (B) restore factory settings and zero audit (bookkeeping) totals. Perform either of the following, as desired:
 - A. To reach Game-Over Mode, use AUTO-UP and press ADVANCE once. *Road Kings* now goes to the Game-Over Mode.
 - B. To restore factory settings, zero all audit (bookkeeping) totals, *and* return to Game-Over Mode, use AUTO-UP or MANUAL-DOWN to display item 70 in the BALL IN PLAY/MATCH display. Press the Credit button to display the YES option in the player 4 display. Using AUTO-UP, press ADVANCE once. *Road Kings* now zeroes ALL audit totals and changes ALL game adjustments back to those originally selected as Factory Settings. It then shows the operator a message ("FACTORY SETTING") that this has occurred. (A problem in the Memory Protection circuit or closing the coin door will cause the message "ADJUST FAILURE" to appear.) Press ADVANCE once more to return to the Game-Over Mode.

Details of Adjustment Items 01 through 70

01 Auto Replay (or Fixed Replay)

Of the two options, AUTO REPLAY is the Factory Setting. The percentage of replays automatically awarded has a Factory Setting of *LEARN 10 %* (German games have a Factory Setting of 15%). The LEARN mode aids a game's initial installation by causing the game program to compare the value of the Replay Level to the player's score 16 times during the first 800 games. At each comparison, the program increases (or decreases) the Replay Level value by 100,000 to achieve the replay percentage specified either via the factory setting or later operator adjustment. (After the first 800 games, the comparison occurs after every 500 games.) Use the Credit button to change the percentage within the range of *LEARN 5* to *LEARN 50*, followed by *5* to *50 (%)*, with the value increasing using AUTO-UP (or decreasing using MANUAL-DOWN). The next Credit button change beyond 50%, or below *LEARN 05%*, selects the FIXED REPLAY option.

For AUTO REPLAY, Ad 02 provides the Starting Replay Level (player 1 and 2 displays show REPLAY START). Ad 03 provides the number of replay levels (01, 02, 03, or 04). *Road Kings* then proceeds to Ad 06 automatically.

For FIXED REPLAY, Ad 02 is the first replay level (REPLAY LEVEL 1). Ad 03, 04, and 05 are the other replay levels.

02 Starting Replay Level (or Replay Level 1)

For AUTO REPLAY (refer to Ad 01), the Factory Setting is 1,500,000 (German games have a Factory Setting of 1,000,000). The range of settings is *800,000* through *2,000,000* (by increments of 100,000 with AUTO-UP or decrements of 100,000 with MANUAL-DOWN).

For FIXED REPLAY, the operator can enter the value to be used for the first fixed replay score level via the Credit button. The range of settings is: *OFF*; *100,000* through *9,900,000* (by increments of 100,000 with AUTO-UP, or decrements of 100,000 with MANUAL-DOWN).

GAME ADJUSTMENT PROCEDURE (Continued)

03 Replay Levels (or Replay Level 2)

For AUTO REPLAY (refer to Ad 01), the Factory Setting is 01 (one replay level). The option range is *one, two, three, or four* replay level(s). When the operator chooses two replay levels, *Road Kings* automatically adjusts the second replay level to be twice the value selected for Ad 02, the starting replay level. Choosing three or four replay levels automatically adjusts their replay levels to three times or four times the Ad 02 value.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

04 (Replay Level 3)

For AUTO REPLAY, this Adjustment Item is not applicable. *Road Kings* automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

05 (Replay Level 4)

For AUTO REPLAY, this Adjustment Item is not applicable. *Road Kings* automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

06 Replay Award

For either AUTO REPLAY or FIXED REPLAY (Ad 01), the operator can select the form of the award automatically provided when the player exceeds any Replay Level (Automatic or Fixed). The choices are:

- Credit* - Reaching each replay level obtains a credit (free game). This is the Factory Setting.
- Ball* - Reaching each replay level obtains an extra ball.
- Audit* - Reaching each replay level obtains nothing to the player; it does increase the entry value of the Audit Item(s) maintaining a tally of these awards (Au 08, and Au 20 through 23, as applicable).
- Coil* - Reaching each replay level causes the Kicker coil to activate once per free play won (instead of awarding a credit for each level exceeded).

NOTE

A ticket dispenser or token dispenser can be activated by the Kicker coil driver to provide an alternative award for each free play achieved by the player.

07 Special Award

The operator can select the form of the award automatically provided when the player scores a Special. The choices are:

- Credit* - Scoring each Special, when lit, obtains a credit (free game). This is the Factory Setting. A variation to this award occurs, when the setting of Ad 06 is Coil. (This permits a ticket or token dispenser to provide the award, when applicable.)
- Ball* - Scoring each Special, when lit, obtains an extra ball.
- Score* - Scoring each Special, when lit, obtains a score advance of 100,000 points to the player.

08 Match Award

The operator can select whether the Match action occurs at completion of each game. The choices are:

- On* - This is the Factory Setting. The game selects a random two-digit number at end of game and compares each player's score for an identical two digits in the rightmost two positions. A matching of the two digits results in the award of a credit (or a ticket/token, if a dispenser is attached, and the setting of Ad 06 is Coil).
- Off* - The MATCH display does not operate at completion of the game; no award is given.

09 Balls / Game

The operator can define a "game" by specifying the number of balls to be played. The Factory Setting is 3. The range of settings is 1 through 9.

GAME ADJUSTMENT PROCEDURE (Continued)

10 Tilt Warning

The operator can specify the allowable number of total actuations of the plumb bob and playfield tilt mechanisms that can occur before the game is "tilted". The range of this setting is 1 through 5. The Factory Setting is 3.

11 Maximum Extra Ball

The operator can specify the maximum number of Extra Balls to be accumulated at any time. The range of this setting is 00 (which allows NO extra ball play, and displays a message, NO EX. BALL) and 1 through 9. The Factory Setting is 4.

12 Maximum Credits

The operator can specify the maximum number of credits the game can accumulate, either through game play awards or coin purchases. The range of settings is 5 through 99. The Factory Setting is 10 (Factory Setting for German games is 30). Reaching the specified setting actuates the coin-lockout relay, preventing the purchase of additional credits by causing the coins to be rejected.

NOTE

Whenever the number of credits is less than the specified maximum credits, any credits obtained by coin purchase or game awards (High Score, Match, Replay Levels, etc.) will be accumulated even though they exceed the maximum value. Thereafter, no additional credits can be accumulated, until the credit total is reduced below the specified maximum setting.

13 Highest Scores

The operator can allow the game to maintain a record of the four highest scores achieved to date. The Factory Setting is On. The optional alternative is Off, which deactivates this adjustment item.

14 Backup High Score 1

The operator can set the Backup High Score value in the player 1 score display, using the Credit button. The Factory Setting is 3,000,000. The game automatically restores the value set, when the operator presses, and holds, the HIGH SCORE RESET switch, or when an automatic High Score Reset event (Ad 22) occurs.

15 Backup High Score 2

This adjustment is similar to Ad 14, except that this applies to the player 2 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 2,800,000. It is also restored as described for Ad 14.

16 Backup High Score 3

This adjustment is similar to Ad 14, except that this applies to the player 3 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 2,600,000. It is also restored as described for Ad 14.

17 Backup High Score 4

This adjustment is similar to Ad 14, except that this applies to the player 4 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 2,400,000. It is also restored as described for Ad 14.

18 Credits for Highest Score 1

The operator can select the number of credits to be awarded, by using the Credit button, whenever a player exceeds the previous Highest Score. The range of this setting is 00 through 10. The Factory Setting is 03. A variation to this award occurs, when the setting of Ad 06 is Coil. (This permits a ticket or token dispenser to provide the award, when applicable.)

19 Credits for Highest Score 2

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the second highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

GAME ADJUSTMENT PROCEDURE (Continued)

20 Credits for Highest Score 3

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the third highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

21 Credits for Highest Score 4

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the fourth highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

22 Automatic High Score Reset

The operator can specify (via Credit button) that the game will provide an automatic reset of the displayed "Highest Scores", and the number of games to be played before the reset occurs. The values provided upon reset are those selected by the operator in Ad 14 through 17, the Backup High Scores. The range of this setting is *Off* (to disable this adjustment), and 1,000 to 99,000 games (in increments of 1,000). The Factory Setting is 6,000. (Audit item 39 displays the number of games remaining before the reset.)

23 Free Play

The operator can select (via the Credit button) whether a player can operate the game without a coin (free play) or with a coin. The optional alternatives are *No* (a coin is necessary) or *Yes* (game play is free; no coin is required). The Factory Setting is *No*.

24 Coinage Selections

The operator can specify (via the Credit button) any of the 16 Standard Settings for game pricing, each of which exhibits a message identifying the country and the number of coins required and the number of games that the coin requirement purchases. Choosing a Standard Setting permits the game to omit items Ad 25 through 30, which are adjustments allowing for a special custom coinage setting. The Factory Setting is U.S.A. 1 : 1 COIN 1 PLAY, as shown by the backbox display.

Following the last Standard Setting is a Custom Coinage Setting, which allows the operator to utilize Ad 25 through 30 in establishing a special coinage setting. A message, CUSTOM COINAGE, indicates that the operator can enter the appropriate values into the Ad 25 through 30 adjustment items.

The values for Ad 25 through 30 of each Standard Setting, as well as other possible values for the Custom Coinage Setting are shown in the **Pricing Table**.

25 Left Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the left coin chute.

26 Center Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the center coin chute.

27 Right Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the right coin chute.

28 Units Required for Credit

The operator can define (via the Credit button) the number of coin units required to obtain 1 Credit. A coin unit counter in the game program totals the number of coin units purchased through all coin chutes prior to each game. If the total number of coin units purchased exceeds the 1 Credit factor by a multiple (or more, coin units) of the specified Units per Credit value, the Credits display shows the proper number of Credits. The coin unit counter retains any remaining coin units, until the start of a game; then, the coin unit counter is cleared (its contents are zeroed). The Factory Setting is 01.

29 Units Required for Bonus

The operator can specify (via the Credit button) that 1 additional Credit is to be indicated in the Credits display, when a particular number of coin units are accumulated. The Factory Setting is 00.

GAME ADJUSTMENT PROCEDURE (Continued)

30 Minimum Units Required for any Credits Posted

The operator can specify that NO Credits are to be posted (indicated in the Credits display), until the credit units counter reaches a particular value. The Factory Setting is 00.

31 Lighted Lock Lamps In Memory

The operator can choose (via the Credit button) whether transfer of a player's lighted Lock lamps can occur from one ball to the next ('next ball' play) by being stored in, and recalled from, memory. The choices are *No* (lighted Lock lamp(s) data are not stored) or *Yes* (lighted Lock lamp(s) data are stored and recalled for the player's next ball). The Factory Setting is *Yes*.

32 Time Lock Timing

The operator can choose (via the Credit button) the degree of difficulty for achieving the Time Lock feature, by selecting one of the three timing rates. The range of this setting is *Easy* (slow timing rate), *Regular*, and *Hard* (fast timing rate). The Factory Setting is *Regular*.

33 Lighted Bonus Holdover Timing

The operator can choose (via the Credit button) how long the Bonus Holdover W/L (When Lit) shot is available. The range of this setting is from 7 through 15 seconds. The Factory Setting is 10 seconds.

34 Lighted Detour Exit Lamps In Memory

The operator can choose (via the Credit button) whether the lighted Collect Detour Value W/L lamps are stored in memory for 'next ball' play. The choices are *No* (lighted lamp(s) data are not stored) or *Yes* (lighted lamp(s) data are stored and recalled for the player's next ball). The Factory Setting is *Yes*.

35 Detour Value Score Increases

The operator can choose (via the Credit button) the amount by which the Detour Value score increases, when achieved. The range of this setting is 10,000 through 90,000. The Factory Setting is 50,000.

36 Lighted R-O-A-D-K-I-N-G-S Targets In Memory

The operator can choose (via the Credit button) whether the lighted targets are retained in memory for 'next ball' play. The choices are *No* (lighted targets data are not stored) or *Yes* (lighted targets data are stored and recalled for the player's next ball). The Factory Setting is *Yes*.

37 Bonus Multiplier Memory

The operator can choose (via the Credit button) which (2nd, 3rd, or 4th) completion of the R-O-A-D-K-I-N-G-S targets lights the Extra Ball lamp. The range of this setting is 2nd through 4th. The Factory Setting is 3rd.

38 Right Ramp Extra Ball Timing

The operator can choose (via the Credit button) the duration of the Right Ramp Extra Ball shot. The range of this setting is 15 through 25 seconds, or until the player makes the shot. The Factory Setting is 17 seconds.

39 Power Kick (Outlane Kicker) Safety

The operator can choose (via the Credit button) whether the Power Kick lamp (left outlane) flashes for five seconds after the ball is kicked. If the ball enters the left outlane during this flashing period, the ball will be kicked again. The choices are *On* (the Power Kick lamp is flashing and the ball will be kicked) or *Off* (the Power Kick lamp does *not* flash). The Factory Setting is *On*.

40 Power Kick Memory

The operator can choose (via the Credit button) whether the lighted Power Kick lamp remains in memory from ball to ball. Two choices are available:

- YES - The lighted Power Kick lamp DOES remain in memory from ball to ball. This is the Factory Setting, and is shown in the player 4 display.
- NO - The lighted Power Kick lamp does NOT remain in memory from ball to ball. (Player 4 shows NO.)

GAME ADJUSTMENT PROCEDURE (Continued)

41 Consolation Extra Ball

The operator can choose (via the Credit button) whether the player, who has an average ball time of 32 seconds on the last ball, receives a 30-second period in which to make the center Extra Ball shot. The choices are *Yes* (the player receives the 30-second period for the Consolation Extra Ball) and *No* (no Consolation Extra Ball period is given). The Factory Setting is YES.

42 Flashing Center Extra Ball Lamp Memory

The operator can choose (via the Credit button) whether the flashing Extra Ball lamp is stored in memory for 'next ball' play. The choices are *No* (flashing lamp data are not stored) or *Yes* (flashing lamp data are stored and recalled for the player's next ball). The Factory Setting is NO.

43 Outlane Special in Memory

The operator can choose (via the Credit button) whether the outlane Special is stored in memory for 'next ball' play. The choices are *No* ('Special' data are not stored) or *Yes* ('Special' data are stored and recalled for the player's next ball). The Factory Setting is YES.

44 Attract Mode - Speech

The operator can choose (via the Credit button) whether the speech can be heard approximately every 3-1/2 minutes during the Attract Mode. Two choices are available:

- On* - The Attract Mode speech can be heard. This is the Factory Setting, and is shown in the player 4 display.
- Off* - NO Attract Mode speech can be heard. (Player 4 shows *Off*.)

45 Attract Mode - Music

The operator can choose (via the Credit button) whether the music can be heard approximately every 3-1/2 minutes during the Attract Mode. Two choices are available:

- On* - The Attract Mode music can be heard. This is the Factory Setting, and is shown in the player 4 display.
- Off* - NO Attract Mode speech can be heard. (Player 4 shows *Off*.)

46 Left Outlane Lit Initially

The operator can choose (via the Credit button) whether the Power Kick lamp is lighted at the start of each player's game. The choices are *No* (Power Kick lamp is not lighted) or *Yes* (Power Kick lamp is lighted). The Factory Setting is YES.

47 Mega-Score Value

The operator can select (via the Credit button) the amount of the point value of the Mega-Score shot within the range from 50,000 through 250,000, in increments of 50,000. The point value selected is ONE- HALF the double score point value. The Factory Setting is 150,000.

48 Number of Mega-Score Shots Allowed During Multi-Ball™

The operator can select (via the Credit button) the maximum number of Mega-Score shots allowed during Multi-Ball™. The range is from 1 through 99. The Factory Setting is 50.

49 Custom Message

The operator can choose (via the Credit button) whether to display a message during the Attract Mode. (When display of a message is selected, the operator can either utilize the message provided or change the message.) Three choices are available:

- 1 - Display a message during the Attract Mode. The player 4 display shows this choice as ON. This is the Factory Setting. The 2-line message provided is:
FIGHT THE-- "ROAD KINGS"
- 2 - Do NOT display a message during the Attract Mode. (Player 4 shows OFF.)
- 3 - The player 4 display shows this choice as CHANGE. The operator can enter a special ("custom") message, as follows:
A. Press ADVANCE once. The operator can now enter as many as three 14-character lines for display during the Attract Mode.

GAME ADJUSTMENT PROCEDURE (Continued)

49 Custom Message (Continued)

- 3 - B. Use the flipper button(s) to select each message character (alphabet, numbers, and special symbols are available). In case of error, enter a "back arrow" (just before "space") to correct, followed by correct character. For a period after any letter, use letters with periods (following the special symbols). The entire character set is the following:

ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789<>?-/''

A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z. _

- C. Move to the next character via the Credit button. No entirely blank lines will be displayed.

50 SW. ALARM KNOCKER

The operator can choose (via the Credit button) whether the knocker operates, sounding an alarm to signal a switch problem, at the time of game Turn-On and at the beginning of the Test/Diagnostic Procedures. Two choices are available:

- YES - The knocker sounds, signalling a switch problem, at game Turn-On and at the beginning of the Test/Diagnostic Procedures. This is the Factory Setting, and is shown in the player 4 display.
- NO - The knocker does NOT sound. (Player 4 shows NO.)

51 ENGLISH TEXT

The operator can choose to display the message, audit, adjustment, and Test /Diagnostic information in English or German (Deutsch) via the Credit button.

52 UNUSED ADJUST

This adjustment is not used for *Road Kings*.

SPECIAL PRESET ADJUSTMENTS CAUTION

Adjustments 53 through 66 are Special Preset Adjustments to enable the operator to perform the setting of multiple adjustments at once. They permit the operator to: (1) modify a game for a specific area (special German coinage settings, for example, Ad 53 through 58); (2) change a group of adjustments to conform with laws of certain localities (Ad 59 through 61); and (3) to change the degree of difficulty of game play (Ad 62 through 66). A list of the preceding individual Adjustments affected accompanies each of these Special Preset Adjustments. Whenever the operator chooses to use any Special Preset Adjustment, the operator can later access any or all of the individual Adjustments affected by that Special Adjustment for subsequent changes.

A similar technique is recommended in the event of error or uncertainty concerning any Special Preset Adjustment, after the operator selects it: The operator can restore the factory setting of each individual Adjustment, then select the desired Special Preset Adjustment, and then return to any of the preceding individual adjustments to determine whether use of the Special Adjustment has had the desired effect.

The Backbox displays for each Special Preset Adjustment indicate whether the operator has selected it, by identifying the Adjustment in the player 1 and 2 displays by name and the selection choice of NO, meaning Not Selected (this is the Factory Setting), or YES, meaning Selected, in the player 4 display. Selection occurs by using the Credit button to choose YES and then pressing ADVANCE.

53 Install German 1

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Credit Award play with 10 games for 5 DM. Individual Adjustments are affected, as follows:

Ad	Name	New Setting	Ad	Name	New Setting
01	Auto Replay	15	15	Backup Hi Scr 2	3,500,000
02	Replay Start	1,000,000	16	Backup Hi Scr 3	3,000,000
03	Replay Levels	1	17	Backup Hi Scr 4	2,500,000
06	Replay Award	Credit	18	Hi Scr 1 Credits	03
07	Special Award	Credit	19	Hi Scr 2 Credits	00
08	Match Feature	On	20	Hi Scr 3 Credits	00
12	Maximum Credits	30	21	Hi Scr 4 Credits	00
14	Backup Hi Scr 1	4,000,000	24	German 1 Coinage	10 Plays/5DM

GAME ADJUSTMENT PROCEDURE (Continued)

53 Install German 1 (Continued)

Note: This Special Preset Adjustment is automatically installed, when the CPU Board jumper W7 is cut (or removed), AND the Factory Setting is requested.

54 Install German 2

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Ticket/Token operation with 10 games for 5 DM. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Coil	17	Backup Hi Scr 4	2,500,000
07	Special Award	Ball	18	Hi Scr 1 Credits	03
08	Match Feature	On	19	Hi Scr 2 Credits	00
14	Backup Hi Scr 1	4,000,000	20	Hi Scr 3 Credits	00
15	Backup Hi Scr 2	3,500,000	21	Hi Scr 4 Credits	00
16	Backup Hi Scr 3	3,000,000	24	German 1 Coinage	10 Plays/5DM

55 Install German 3

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Keyset Mode operation with 10 games for 5 DM. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Audit	17	Backup Hi Scr 4	00
07	Special Award	Score	18	Hi Scr 1 Credits	00
08	Match Feature	Off	19	Hi Scr 2 Credits	00
14	Backup Hi Scr 1	00	20	Hi Scr 3 Credits	00
15	Backup Hi Scr 2	00	21	Hi Scr 4 Credits	00
16	Backup Hi Scr 3	00	24	German 1 Coinage	10 Plays/5DM

56 Install German 4

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Credit Award play with 6 games for 5 DM. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Credit	17	Backup Hi Scr 4	2,500,000
07	Special Award	Credit	18	Hi Scr 1 Credits	03
08	Match Feature	On	19	Hi Scr 2 Credits	00
14	Backup Hi Scr 1	4,000,000	20	Hi Scr 3 Credits	00
15	Backup Hi Scr 2	3,500,000	21	Hi Scr 4 Credits	00
16	Backup Hi Scr 3	3,000,000	24	German 1 Coinage	6 Plays/5DM

57 Install German 5

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Ticket/Token operation with 6 games for 5 DM. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Coil	17	Backup Hi Scr 4	2,500,000
07	Special Award	Ball	18	Hi Scr 1 Credits	03
08	Match Feature	On	19	Hi Scr 2 Credits	00
14	Backup Hi Scr 1	4,000,000	20	Hi Scr 3 Credits	00
15	Backup Hi Scr 2	3,500,000	21	Hi Scr 4 Credits	00
16	Backup Hi Scr 3	3,000,000	24	German 1 Coinage	6 Plays/5DM

GAME ADJUSTMENT PROCEDURE (Continued)

58 Install German 6

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Keyset Mode operation with 6 games for 5 DM. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Audit	17	Backup Hi Scr 4	00
07	Special Award	Score	18	Hi Scr 1 Credits	00
08	Match Feature	Off	19	Hi Scr 2 Credits	00
14	Backup Hi Scr 1	00	20	Hi Scr 3 Credits	00
15	Backup Hi Scr 2	00	21	Hi Scr 4 Credits	00
16	Backup Hi Scr 3	00	24	German 1 Coinage	6 Plays/5DM

59 Install Add A Ball

The operator can utilize this option to delete all Free Play awards and replace them with Extra Ball awards. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
06	Replay Award	Ball	19	Hi Scr 2 Credits	00
07	Special Award	Ball	20	Hi Scr 3 Credits	00
08	Match Feature	Off	21	Hi Scr 4 Credits	00
18	Hi Scr 1 Credits	00			

60 Install 5 Ball

The operator can change the game to 5-Ball play, including the changing of certain features to the recommended 5-Ball play difficulty level. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
02	Replay Start	3,500,000	33	Bonus Holdover Time	8 sec
09	Balls / Game	05	34	Detour Exit Memory	No
31	Lock Memory	Yes	35	Detour Advance	30,000
32	Timelock	Hard	41	Consol. Extra Ball	No

61 Install Novelty

The operator can remove all Free Play and Extra Ball awards. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
01	Fixed Replay		08	Match Feature	Off
02	Replay Level 1	Off	11	No Extra Ball	No
03	Replay Level 2	Off	18	Hi Scr 1 Credits	00
04	Replay Level 3	Off	19	Hi Scr 2 Credits	00
05	Replay Level 4	Off	20	Hi Scr 3 Credits	00
06	Replay Award	Audit	21	Hi Scr 4 Credits	00
07	Special Award	Score			

62 Install Extra Easy

The operator can change the game play difficulty adjustments to a combination that is extremely easy (sometimes called "liberal"). Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
31	Lock Memory	Yes	39	Power Kick Safety	On
32	Time Lock	Easy	40	Power Kick Memory	No
33	Bonus Holdover Time	12 sec	41	Consol. Extra Ball	No
34	Detour Exit Memory	Yes	42	Extra Ball Memory	Yes
35	Detour Advance	70,000	43	Special Memory	Yes
36	Target Memory	Yes	46	Power Kick Initial	Yes
37	Light Extra Ball	2nd	47	Mega-Score Value	200,000
38	Timelock Extra Ball	17 sec	48	Mega-Score Shots	50

GAME ADJUSTMENT PROCEDURE (Continued)

63 Install Easy

The operator can change the game play difficulty adjustments to a combination that is slightly easier than the Factory Settings. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
31	Lock Memory	Yes	39	Power Kick Safety	On
32	Time Lock	Easy	40	Power Kick Memory	Yes
33	Bonus Holdover Time	11 sec	41	Consol. Extra Ball	Yes
34	Detour Exit Memory	Yes	42	Extra Ball Memory	Yes
35	Detour Advance	50,000	43	Special Memory	Yes
36	Target Memory	Yes	46	Power Kick Initial	Yes
37	Light Extra Ball	3rd	47	Mega-Score Value	200,000
38	Timelock Extra Ball	20 sec	48	Mega-Score Shots	50

64 Install Medium

The operator can change the game play difficulty adjustments to a combination that matches the Factory Settings. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
31	Lock Memory	Yes	39	Power Kick Safety	On
32	Time Lock	Regular	40	Power Kick Memory	Yes
33	Bonus Holdover Time	10 sec	41	Consol. Extra Ball	Yes
34	Detour Exit Memory	Yes	42	Extra Ball Memory	No
35	Detour Advance	50,000	43	Special Memory	No
36	Target Memory	Yes	46	Power Kick Initial	Yes
37	Light Extra Ball	3rd	47	Mega-Score Value	150,000
38	Timelock Extra Ball	17 sec	48	Mega-Score Shots	50

65 Install Hard

The operator can change the game play difficulty adjustments to a combination that is more difficult than the Factory Settings. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
31	Lock Memory	Yes	39	Power Kick Safety	On
32	Time Lock	Hard	40	Power Kick Memory	No
33	Bonus Holdover Time	8 sec	41	Consol. Extra Ball	No
34	Detour Exit Memory	No	42	Extra Ball Memory	Yes
35	Detour Advance	30,000	43	Special Memory	Yes
36	Target Memory	Yes	46	Power Kick Initial	No
37	Light Extra Ball	3rd	47	Mega-Score Value	100,000
38	Timelock Extra Ball	17 sec	48	Mega-Score Shots	20

66 Install Extra Hard

The operator can change the game play difficulty adjustments to a combination that is much more difficult than the Factory Settings. Individual Adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>	<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
31	Lock Memory	No	39	Power Kick Safety	Off
32	Time Lock	Hard	40	Power Kick Memory	No
33	Bonus Holdover Time	7 sec	41	Consol. Extra Ball	No
34	Detour Exit Memory	No	42	Extra Ball Memory	No
35	Detour Advance	20,000	43	Special Memory	No
36	Target Memory	No	46	Power Kick Initial	No
37	Light Extra Ball	4th	47	Mega-Score Value	50,000
38	Timelock Extra Ball	15 sec	48	Mega-Score Shots	10

67 Auto Burn-In

The operator can choose the YES option for this Special Preset Adjustment to perform certain automatic testing of the game, as used in the factory. It does not affect the game operation, but merely provides for a cyclic testing of most of the game's mechanisms.

GAME ADJUSTMENT PROCEDURE (Continued)

68 Clear Coins

The operator can request the clearing of the coinage audits (Au 01 through 04) by selecting (via the Credit button) the YES option, as shown in the player 4 display. This adjustment zeroes the counters tallying the number of coins through each slot, the Paid Credits counter, and the Credits display.

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays COINS CLEARED.

69 Clear Audits

The operator can request the clearing of the non-coinage audits (Au 05 through 38) by selecting (via the Credit button) the YES option, as shown in the player 4 display. This Adjustment zeroes the counters tallying the remaining Audit factors. Please note that this does NOT affect the Automatic Replay Percentaging data nor the automatic High Score Reset counter.

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays AUDITS CLEARED.

70 Install Factory

The operator can request the game to provide the normal Factory Settings to restore the game to its 'factory condition'. This Adjustment clears all Audits, resets all Game Adjustments to the respective Factory Settings, and provides a restart of the Auto Replay (Ad 01).

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays FACTORY SETTING.

Closing of the coin door before appearance of the FACTORY SETTING message or a problem in the Memory Protect circuit will cause the game to display ADJUST FAILURE.

A loss of battery power or improper treatment of the Game Adjustments will cause the game to attempt to restore Factory Settings. The game announces the results of this reset process with the appropriate message, FACTORY SETTING or ADJUST FAILURE.

RESETTING THE HIGH SCORES

The challenge of exceeding the High Score (either the factory setting or a higher score by another player) is the goal of many pinball game players. To keep a pinball game challenging requires a method of resetting the High Score value for those occasions when a skilled player registers a truly excellent score. Other players note this score and may decide not to play simply because their skill is not adequate to exceed an extremely high score.

For *Road Kings*, in fact, three methods of resetting the High Score values are available. The simplest method involves allowing Game Adjustment Item Ad 22 to reset the High Score values automatically after the specified number of plays designated by the operator. The second method requires pressing the High Score Reset switch on the inside of the coin door in the Attract Mode. This action simply erases the previous high score values and replaces them with the Backup High Score values. The third method establishes new values replacing the factory setting values or previous operator setting values; it requires performing the following steps:

1. Using AUTO-UP or MANUAL-DOWN, reach item Ad 14 (and items Ad 15, 16, and 17, if desired). The High Score value of the factory setting (or previous operator-adjusted setting) appears in the player 1 display. If this value is satisfactory, go to step 4 below.
2. If you wish to increase the High Score value from that displayed in the player 1 display, use AUTO-UP, and press the Credit button, until the desired value shows in the player 1 display.
3. If you wish to decrease the High Score value, use MANUAL-DOWN, and press the Credit button, until the desired value shows in the player 1 display.
4. Using AUTO-UP, press and hold down ADVANCE, until the Credits display shows Ad and the BALL IN PLAY/MATCH display shows item 70. Press ADVANCE once, to return to Game-Over Mode.
5. Press the High Score Reset switch (on coin door), and listen for the sound signifying that the score reset action is complete. Observe player score displays (player 1, player 2, etc.) to verify that the new High Score values are displayed.

GAME PRICING

PRICING MADE EASY. Game Adjustment Item Ad 24 allows the operator an easy method of setting the pricing functions. If the operator enters a "Standard Setting" number (from 01 to 16) into Adjustment Item 24, each of the other pricing items (25 through 30) changes to the value shown in the **Pricing Table** for that selected "Standard Setting".

CUSTOM PRICING. Adjustment Item 24 must be set to the Custom Coinage Setting (player 1 and 2 displaying CUSTOM COINAGE) to enable the operator to enter desired custom pricing selections for Items 25 through 30, based on the **Pricing Table**. Item 25 is the left coin chute multiplier. Item 26 is the center coin chute multiplier. Item 27 is the right coin chute multiplier. Item 28 is the number of coin units equal to one Credit. (A Credit is usually equal to one game.)

The calculation of the ratio of Games : Price uses the ratio equation of $X : VC$, where:

X = Coin Chute Multiplier (Item 25, 26, or 27 in **Pricing Table**);

V = Value of coin;

C = Coin units equivalent to one Credit (Item 28).

For example, for 25¢ chutes at the factory setting, substituting values in the Games : Price ratio calculation gives $1 : 25 \times 1$, or one game for 25¢.

UNITS REQUIRED FOR BONUS CREDIT. Item 29 is the number of coin units that must pass through the coin chute(s) before an additional Credit (game) is posted (displayed). At the factory setting, the number in this item is 00. (This 00 means that NO bonus credit (free game) is awarded, although purchase of more than one game at a time occurs.)

MINIMUM COIN UNITS. Item 30 determines the number of coin units that must pass through the coin chute(s) before play may begin. The factory setting for this item is 00. (This 00 means that the Minimum Coin Units feature (Item 30) is disabled, by the factory setting.)

GAME PRICING (Continued)

Road Kings Pricing Table

Country	Coin Chute			Games/Coin	Pricing Functions							
	Left	Center	Right		24	25	26	27	28	29	30	
USA and Canada	25¢		25¢	1/25¢, 4/\$1 ^{1,2} 1/50¢, 2/\$1 ² 2/25¢, 8/\$1 1/25¢, 3/50¢, 6/\$1 ² 1/25¢, 5/\$1 1/50¢, 3/\$1 ²	01	01	04	01	01	00	00	
					03	01	04	01	02	00	00	
					00	02	00	02	01	00	00	
					04	01	04	01	01	02	00	
					00	01	00	01	01	04	00	
					02	01	04	01	02	04	00	
West Germany	1 DM	2 DM	5 DM	1/1 DM, 3/2 DM, 10/5 DM ^{2,3} 1/1 DM, 2/2 DM, 6/5 DMark ² 1/1 DM, 3/2 DM, 9/5 DM 1/2x1 DM, 1/2 DM, 3/5 DM ² 2/1 DM, 5/2 DM, 14/5 DM ² Ticket/Token Mode ⁴ Keyset Mode ⁴	09	09	18	45	05	45	00	
					10	06	12	30	05	00	00	
					00	09	18	45	05	00	00	
					11	03	06	15	05	00	00	
					12	13	26	65	05	65	00	
France	1 F	5 F	10 F	1/3x1 F, 2/5 F, 5/10 Franc ²	13	02	10	20	05	20	00	
Antilles (Netherlands)	25¢	-	1 G	1/25¢, 4/1 Guilder	00	01	01	04	01	00	00	
Netherlands	25¢	-	1 G	1/25¢, 5/1 Guilder	00	01	00	05	01	00	00	
Belgium	5 F	-	20 F	1/2x5 F, 2/20 Franc ²	08	01	01	04	02	00	00	
	5 F	5 F	20 F	1/2X5 F, 1/2X5 F, 2/20 F ²	08	01	01	04	02	00	00	
	5 F	20 F	20 F	1/2x5 F, 2/20 F, 2/20 F ²	00	01	04	04	02	00	00	
Spain	25 P	-	100P	1/25 P, 5/100 Peseta ²	15	01	00	05	01	00	00	
Switzerland	1 F	2 F	5 F	1/1 F, 3/2 F, 7/5 Franc	00	02	06	14	02	00	00	
	1 F	-	2 F	1/1 F, 3/2 F ²	07	03	00	06	02	00	00	
Japan	100 ¥	-	100 ¥	2/100 Yen	00	04	00	04	02	00	00	
	-	100 ¥	-	2/100 ¥ ²	16	01	04	01	02	00	00	
Italy	100 L	-	100 L	1/200 Lire ²	14	01	04	01	02	00	00	
Australia	20¢	-	\$1	1/2x20 ¢, 3/\$1 ²	05	01	00	06	02	00	00	
United Kingdom	10 P	50 P	20 P	1/10 P, 5/50 P, 2/20 Pence	00	01	05	02	01	00	00	
	10 P	50 P	10 P	1/10 P, 5/50 P ²	06	01	05	01	01	00	00	
Argentina	10¢	10¢	10¢	1/1 Token	00	01	01	01	01	00	00	
Austria	5 Sch	-	10 Sch	2/5 Sch, 5/10 Schilling	00	02	00	05	01	00	00	
	1 Sch	5 Sch	10 Sch	2/5x1 Sch, 2/5 Sch, 5/10 Sch	00	02	10	25	05	00	00	
Chile	Token	-	Token	1/1 Token ^{1,2}	01	01	04	01	01	00	00	
Denmark	1 Kr	5 Kr	10 Kr	1/2x1 Kr, 3/5 Kr, 7/10 Krone	00	01	06	14	02	00	00	
Finland	1 Mka	-	1 Mka	1/1 Markka ^{1,2}	01	01	04	01	01	00	00	
New Zealand	20¢	-	20¢	1/2x20¢ ²	03	01	04	01	02	00	00	
Norway	1 Kr	-	1 Kr	1/2x1 Kr, 3/5x1 Krone	00	01	00	01	02	05	00	
Sweden	1 Kr	-	1 Kr	1/2x1 Krona ²	03	01	04	01	02	00	00	
Notes: 1. Factory Default. 2. Standard Setting - Adjust setting of Item 24 ONLY. 3. Default with jumper W7 cut/removed. 4. Other functions are also affected; see the explanations for Adjustment items 53 through 58.												

TEST/DIAGNOSTIC PROCEDURES

WILLIAMS ELECTRONICS GAMES provides a series of diagnostic tests to aid the operator in determining game condition (that is, whether the game's features and highlights are operating satisfactorily). These tests activate virtually all the electronic and electromechanical devices comprising the game, so that the operator can readily locate a malfunctioning device or simply verify that all devices are working properly. In order, these tests deal with the music, the displays, the game sounds, the lamps, the solenoids, and the switches.

In addition to the diagnostic testing, a feature called the Auto Burn-in Mode is available. Activating this mode enables the operator to observe the game while all of the diagnostic tests, *except the switch test*, occur. This can be very helpful in locating intermittent problems.

TEST/DIAGNOSTIC PROCEDURES (Continued)

Activating either the entire test series or one of the individual tests requires use of the Game Adjustment/Diagnostic switches. Open the coin door for access to these switches. To proceed to the Diagnostic Tests, the operator must simply switch the game On, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN, and press the ADVANCE button.

CAUTION

*Road King's game program has a special feature to aid the operator and service personnel: When the operator is beginning the Test/Diagnostic Procedures (and also at game Turn-On), a display now signals when a switch has NOT been actuated during ball play for a lengthy period of time (60 balls, or 20 games). However, for the Switch Problem Reporting activity at the beginning of the Test/Diagnostic Procedures, the display of problem switches is *not* limited to just three switches; it now includes *ALL* switches exhibiting problems. Refer to the text on Switch Tests for more information.*

MUSIC TEST.

1. In the Music Test, observe that the player 1 and 2 displays show the message, MUSIC TEST. Switching to AUTO-UP, observe that the message now reads MUSIC OFF, and that the BALL IN PLAY/MATCH display shows 00. Press the Credit button to select the desired music selection: 01 - 'Start Drums' through 08 - 'HiScore Theme' (the selections repeat). Adjust the volume control for proper sound level for the game location.
2. Use the AUTO-UP position.

DISPLAY TEST.

1. To initiate the Display Test, press ADVANCE. Observe that player 1 and 2 displays briefly show the message, DISPLAY TEST, and that the Credits display shows 00 (the Display Test identifier).
2. Use AUTO-UP. Observe that all displays begin a display cycle of all 0s through all 9s, one digit at a time. Verify that the proper comma segments light during display of the odd-numbered digits. Next, a special "all segments" character 'walks' from left to right across each display (player 1, 2, 3, 4, BALL IN PLAY/MATCH, Credits).
3. To halt the display cycle, use MANUAL-DOWN. Then, press ADVANCE to step through the sequential digit display, digit by digit, and the subsequent "all segments" characters display test. Use AUTO-UP to resume cycling, and to proceed to the next test.

SOUND TEST.

1. (From Display Test) To initiate the Sound Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, SOUND TEST, and that the Credit display shows 01 (the Sound Test identifier). The BALL IN PLAY/MATCH display shows a series of test steps from 00 through 07. Verify that a different sound is heard each time the number in the BALL IN PLAY/MATCH display changes.
2. To repeatedly pulse a single sound, use MANUAL-DOWN. Verify that one particular sound repeats. Press ADVANCE to step to the next sound, which repeats until ADVANCE is pressed again. Use AUTO-UP to resume cycling the sounds, and to proceed to the next test.

LAMP TESTS.

1. **All Lamps.**
(From Sound Test) To initiate the first Lamps Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, ALL LAMPS, and that the Credit display shows 02 (All Lamps Test identifier) and that all feature lamps (playfield and backbox) blink on and off. (Note, however, that the General Illumination lamps remain lighted steadily.) To locate the wiring associated with a particular lamp, refer to the **Lamp-Matrix Table**. CPU Board connections at jacks 1J6 (columns) and 1J7 (rows) are also listed in the table.

TEST/DIAGNOSTIC PROCEDURES (Continued)

Road Kings Lamp-Matrix Table

COLUMN ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 RED-BRN 1J6-1	Game Over 1	R Target 9	S Target 17	Right - Collect Detour Value 25	Right Extra Ball 33	Bonus 40,000 41	Bonus 5000 49	Not Used 57
Q81 RED-BLK 1J6-2	Match 2	O Target 10	Lane 1 18	Left Timelock 26	Mega-Score 34	Bonus 60,000 42	Bonus 6000 50	Not Used 58
Q82 RED-ORN 1J6-3	Shoot Again (Backbox) 3	A Target 11	Lane 2 19	Center Timelock 27	2X 35	Bonus 80,000 43	Bonus 7000 51	Not Used 59
Q83 RED-YEL 1J6-5	Ball In Play 4	D Target 12	Lane 4 20	Power Kick 28	3X 36	Cruise Again 44	Bonus 8000 52	Not Used 60
Q84 RED-GRN 1J6-6	Hold Bonus 5	K Target 13	Lane 3 21	Right Special 29	4X 37	Bonus 1000 45	Bonus 9000 53	Not Used 61
Q85 RED-BLU 1J6-7	Spots Letter 6	I Target 14	Bonus Hold When Lit 22	Left Special 30	5X 38	Bonus 2000 46	Center Extra Ball 54	Not Used 62
Q86 RED-VIO 1J6-8	Left Lock 7	N Target 15	All Scores Double 23	Right Timelock 31	Bonus 10,000 39	Bonus 3000 47	Detour When Lit 55	Not Used 63
Q87 RED-GRY 1J6-9	Center Lock 8	G Target 16	Left - Collect Detour Value 24	Right Lock 32	Bonus 20,000 40	Bonus 4000 48	Not Used 56	Not Used 64

2. Single Lamps.

From the All Lamps test, using AUTO-UP, press ADVANCE to enable *Road Kings* to initiate the Single Lamps Test. The player 1 and 2 displays initially show the message, SINGLE LAMPS, and the Credit display shows 03. Then, the BALL IN PLAY/ MATCH display shows 01 and the player 1 and 2 displays show GAME OVER, the name of the lamp currently blinking. Press the Credit button to proceed through an ascending series of designator numbers (01 through 64), with the player 1 and 2 displays showing the individual lamp's name. Press and hold the Credit button to proceed rapidly to the desired lamp.

SOLENOID TEST.

1. (From Lamp Test) Using AUTO-UP, press ADVANCE. Observe that the player 1 and 2 displays show the message, COIL TEST, the Credit display shows 04 (Solenoid Test identifier). Next, the BALL IN PLAY/ MATCH display shows a series of test steps from 01 through 22, while the player 1 and 2 displays show the name of the solenoid. During each of these steps, pulsing of the respective solenoid occurs. The test cycles repeatedly, unless halted via the MANUAL-DOWN switch. Refer to the **Solenoid Table** for solenoid numbers and wiring information. CPU Board connections at 1P11, 1P12, and 1P19 are also listed in the table.

NOTE

As directed by the game program, the Solenoid Select Relay (solenoid 12) switches the solenoid B+ power between two power busses to permit actuating two groups of solenoids at the proper times. In its de-energized state, the Relay connects the 'circuit A power' to 16 "controlled" solenoids (identified in the table with no suffix letter or the letter A, after the solenoid number). Individual solenoid operation then depends on the game program enabling the ground path for solenoid actuation via the driver transistor associated with each solenoid circuit. For example, the game program can actuate the Rear Field Flashers (sol. 05A), via the driver transistor Q31.

When the game program determines that the Relay (sol. 12) must be energized, the relay then connects 'circuit C power' to four group C solenoids (05C, 13C, 14C, and 15C). Now, driver transistor Q31 can actuate the Upper Left Kicker (sol. 05C). Using this "multiplexing" technique, the same driver transistor can control actuation of two separate solenoids.

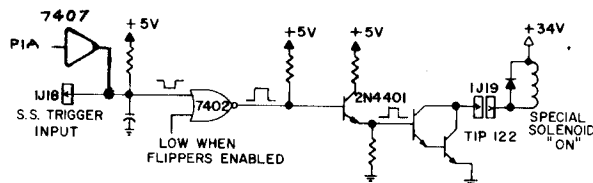
TEST/DIAGNOSTIC PROCEDURES (Continued)

Road Kings Solenoid Table

Sol. No.	Function	Solenoid Type	Wire Color	Connections		Driver Trans.	Solenoid Part No.
				CPU Bd.	Playfield/Cabinet		
01	Outhole	Controlled	Gry-Brn	1P11-1	8P3-1	Q33	AE-23-800-01
02	Ball Trough Feeder	Controlled	Gry-Red	1P11-3	8P3-2	Q25	AE-23-800-03
03	Left Eject Hole	Controlled	Gry-Orn	1P11-4	8P3-3	Q32	AE-23-800-03
04	Center Eject Hole	Controlled	Gry-Yel	1P11-5	8P3-4	Q24	AE-23-800-03
05A ³	Rear Playfield Flashers	Switched	{ Vio-Grn }	1P11-6	8P3-5 (to B4 on	Q31	#63 flashlamps
05C ³	Upper Left Kicker	Switched	{ Blk-Grn }	(Brn-Grn)	Diode Sw. Bd.)	Q31	AE-23-800-11 & Relay/Snb
06	Power Kicker (Left Outlane)	Controlled	Gry-Blu	1P11-7	8P3-6	Q23	AE-24-900-01 & Relay/Snb
07	Left Lightning Bolt	Controlled	Gry-Vio	1P11-8	8P3-7	Q30	#63 flashlamps
08	Right Lightning Bolt	Controlled	Gry-Blk	1P11-9	8P3-8	Q22	#63 flashlamps
09	Left Gate	Controlled	Brn-Blk	1P12-1	8P3-9	Q17	SM1-35-4000-DC
10	Right Gate	Controlled	Brn-Red	1P12-2	8P3-10	Q9	SM1-35-4000-DC
11	General Illumination Relay	Controlled	Brn-Orn	1P12-4	3P7-1	Q16	5580-09555-00
12	Solenoid Select Relay	Controlled	Brn-Yel	1P12-5	8P3-12	Q8	5580-09555-00
13A ³	Knocker	Switched	{ Vio-Wht }	1P12-6	8P3-13 (to B3 on	Q15	AE-23-800-02
13C ³	Ramp Up	Switched	{ Blk-Wht }	(Brn-Grn)	Diode Sw. Bd.)	Q15	AE-24-900-02
14A ³	Mid-Insert Board Flashers	Switched	{ Vio-Blu }	1P12-7	8P3-14 (to B2 on	Q7	#63 flashlamps
14C ³	Ramp Down	Switched	{ Blk-Blu }	(Brn-Blu)	Diode Sw. Bd.)	Q7	SM-26-600-DC
15A ³	Bikes Flasher (Backbox)	Switched	{ Vio-Blk }	1P12-8	8P3-15 (to B1 on	Q14	#63 flashlamps
15C ³	Drop Target	Switched	{ Blk-Vio }	(Brn-Vio)	Diode Sw. Bd.)	Q14	SA-5-24-750-DC
16	Coin-Lockout Relay	Controlled	Brn-Gry	1P12-9	7P1-7,7P2-4	Q6	404603-2 (Coinco p/n)
17	Left Kicker	Special #1	Blu-Brn	1P19-7	8P3-17	Q75	AE-23-800-03
18	Right Kicker	Special #2	Blu-Red	1P19-4	8P3-18	Q71	AE-23-800-03
19	Upper Jet Bumper	Special #3	Blu-Orn	1P19-3	8P3-19	Q73	AE-23-800-03
20	Left Jet Bumper	Special #4	Blu-Yel	1P19-6	8P3-20	Q69	AE-23-800-03
21	Right Jet Bumper	Special #5	Blu-Grn	1P19-8	8P3-21	Q77	AE-23-800-03
22	Lower Jet Bumper	Special #6	Blu-Blk	1P19-9	8P3-22	Q79	AE-23-800-03
-	Right Flipper	-	Orn-Vio [Blu-Vio]	1P19-1	7P1-20 [7J1-21,8P3-34] ²	-	FL23/600-30/2600-50VDC
-	Left Flipper	-	Orn-Gry [Blu-Gry]	1P19-2	7P1-23 [7J1-24,8P3-32] ²	-	FL23/600-30/2600-50VDC

Notes: 1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" coils are pulsed, when Sol. 12 is de-energized; "C" coils are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the B terminal connection listed for the Diode Switching Board, which controls the device pulsing by Sol. 12.

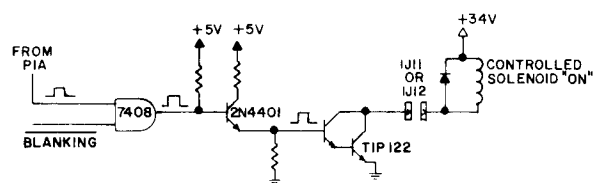
"On" State Logic - Special Solenoid



"Off" State - Special Solenoid:

The Special Switch Trigger Input goes low. Meanwhile, the PIA line remains high. The remaining signals reverse their states.

"On" State Logic - Controlled Solenoid



"Off" State - Controlled Solenoid:

The Enable Input (from the PIA) goes low. Meanwhile, the BLANKING signal remains high. The rest of the signals reverse their states.

To continuously pulse a single solenoid, use MANUAL-DOWN. Press ADVANCE to sequence through the controlled and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

TEST/DIAGNOSTIC PROCEDURES (Continued)

SWITCH TESTS.

1. Switch Levels.

(From Solenoid Test) To initiate the Switch Levels Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, SWITCH LEVELS, the Credit display shows 05 (Switch Levels Test identifier), and the BALL IN PLAY/MATCH display is blank, indicating that no switch is actuated.

If, however, a switch *is* actuated (possibly stuck closed), the BALL IN PLAY/MATCH display shows that switch's number, while the player 1 and 2 displays indicate the switch's name. A sound also accompanies the displays. (This is another facet of the new *Road Kings System-11* switch testing capability.) If more than one switch is closed, each switch's name and number becomes a member of a series of displays, each showing the switches' names and numbers. (In addition, either of these problems could result in the reporting of a switch problem (or problems) at game Turn-On or at the beginning of Diagnostic Tests.)

As soon as the operator opens a closed switch, its name and number are eliminated from the Switch Levels display series. For *Road Kings*, switch numbers can range from 01 through 48. Refer to the **Switch-Matrix Table** for switch numbers and wiring information. CPU Board connections at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

Row Problems. If a display of two (or more) switch numbers of a row occurs, although only one switch is closed, check for a short circuit between the column wires.

Multiple Switch Number Indications. Check the associated column wire for a short circuit to ground.

Column Problems. If display of two (or more) switch numbers in a column occurs (while only one switch is actuated), check for a short circuit between the row wires.

Use AUTO-UP to proceed to the next test.

Road Kings Switch-Matrix Table

COLUMN \ ROW	1 Q45 GRN-BRN 1J8-1	2 Q49 GRN-RED 1J8-2	3 Q44 GRN-ORN 1J8-3	4 Q48 GRN-YEL 1J8-4	5 Q43 GRN-BLK 1J8-5	6 Q47 GRN-BLU 1J8-7	7 Q42 GRN-VIO 1J8-8	8 Q46 GRN-GRY 1J8-9
1 WHT-BRN 1J10-9	Plumb Bob Tilt 1	R Target 9	S Target 17	Left Jet Bumper 25	Right Ten Point 33	Right Trough 41	Not Used 49	Not Used 57
2 WHT-RED 1J10-8	Ball Roll Tilt 2	O Target 10	Lane 1 18	Right Jet Bumper 26	Upper Left Kicker 34	Left Trough 42	Not Used 50	Not Used 58
3 WHT-ORN 1J10-7	Credit Button 3	A Target 11	Lane 2 19	Bottom Jet Bumper 27	Right Rollunder 35	Left Kicker 43	Not Used 51	Not Used 59
4 WHT-YEL 1J10-6	Right Coin Chute 4	D Target 12	Lane 4 20	Left Outlane 28	Left Rollunder 36	Right Kicker 44	Not Used 52	Not Used 60
5 WHT-GRN 1J10-5	Center Coin Chute 5	K Target 13	Lane 3 21	Right Outlane 29	Left Eject 37	Left Ten Point 45	Not Used 53	Not Used 61
6 WHT-BLU 1J10-3	Left Coin Chute 6	I Target 14	Right Ramp - Enter 22	Drop Target 30	Center Eject 38	Playfield Tilt 46	Not Used 54	Not Used 62
7 WHT-VIO 1J10-2	Slam Tilt 7	N Target 15	Ramp Raise (E O S) 23	Center Ramp - Enter 31	Ball Shooter 39	Left Flipper (E O S) 47	Not Used 55	Not Used 63
8 WHT-GRY 1J10-1	High-Score Reset 8	G Target 16	Top Jet Bumper 24	Center Ramp - Right Exit 32	Outhole 40	Right Flipper (E O S) 48	Not Used 56	Not Used 64

TEST/DIAGNOSTIC PROCEDURES (Continued)

SWITCH TESTS (Continued)

2. Switch Edges.

From the Switch Levels Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, SWITCH EDGES, the Credit display shows 06 (Switch Edges Test identifier), and the BALL IN PLAY/MATCH display is blank, indicating that no switch is actuated.

This test permits the operator to test whether actuating a switch provides the proper signal to the System-11 switch testing program. When actuating a switch, the operator should see the switch's name and number (in the player 1 and 2, and the BALL IN PLAY/MATCH displays, respectively). If no indication appears at the time the switch is actuated, the operator then knows that there is a malfunction associated with that switch.

Using this technique, the operator can test each switch appearing in the *Road Kings* switch problem reporting displays (either at game Turn-On or at the beginning of the Diagnostic Tests) to determine whether the switch can be actuated. If the switch's name and number are displayed while the operator checks its operation, the operator then knows that the reported problem with that switch is NOT currently caused by a switch malfunction. The operator can then seek other causes for the reported problem, being almost certain now that the switch did not fail. *This test is also useful when the operator is adjusting the sensitivity of a particular switch's actuation mechanism.*

Among the possibilities is the fact that the players have not hit that switch because of some other problem; the operator should try to analyze what could cause the switch to be missed, and remedy that problem cause. With these new tests, switch problems are, therefore, more easily isolated.

Coin Chute Switches. During the Switch Edges test, the System-11 switch testing program energizes the coin lockout relays, to prevent testing actuations of the coin chute switches from affecting the data contained in the audit counters, thereby maintaining accurate records of the game's earnings.

3. **Playfield or CPU Board?** To determine whether a switch problem is in the playfield or the CPU Board, remove connectors 1P8 and 1P10 from the CPU Board. Begin the Switch Test. Use a jumper wire to simulate switch actuation. For example, placing a jumper between 1J10-9 and 1J8-2 should (based on the **Switch-Matrix Table**) should produce an indication of switch 09 being actuated.

ENDING THE DIAGNOSTIC TESTS.

To end the Diagnostic Tests, reach the Switch Edges Test (06 in the Credits display), use AUTO-UP and press ADVANCE. The backbox displays should show the *Road Kings* game's Identification Information. Use MANUAL-DOWN, and press ADVANCE to reach Adjustment Item 70 (INSTALL FACTORY). Use AUTO-UP and press ADVANCE to obtain the Attract Mode.

AUTO BURN-IN MODE.

The Auto Burn-in Mode permits the operator to check intermittent (or nonrecurring) problems associated with most portions of the game's circuitry. Repeatedly cycling through a group of tests can sometimes bring a problem, which occurs only randomly or occasionally, to exhibit itself more frequently, thereby aiding in the isolation of the problem. To activate the Auto Burn-in Mode:

1. While in the Game Adjustments, reach Ad 67 and change the Factory Setting of NO to YES, via the Credit button. Set the AUTO-UP/MANUAL-DOWN switch to AUTO-UP.
2. Press ADVANCE to start the Auto Burn-in Mode. This mode repeatedly sequences through the Music Test, the Display Test, the Sound Test, the All Lamps portion of the Lamp Test, and the Solenoid Test.
3. To halt the Auto Burn-in Mode, switch the game Off and then On. *Road Kings* now starts in the Attract Mode. (If a switch problem is now reported by the displays, perform the Switch Tests again to determine the nature of the problem; then, perform necessary repairs.)

TEST/DIAGNOSTIC PROCEDURES (Continued)

SYSTEM-11 MEMORY CHIP TEST.

A new feature is now included in the Memory Chip Test for System 11. A diagnosis of the condition of the "blanking circuit" now occurs during this testing. (The "blanking circuit" protects the displays, lamps, and solenoids against a hardware malfunction.) The test requires approximately 1.5 seconds. Display of an 8 on the CPU Board LED during the test indicates that the "blanking circuit" operation is normal; display of a 0 during the test indicates that the "blanking circuit" is NOT functioning. Following the complete Memory Chip Test, one of indications listed in the **CPU LED Indicator Codes Table** should appear. To perform the test, press the CPU Diagnostic Switch (SW 2) on the edge of the CPU Board.

CPU LED Indicator Codes Table

Code	Code Meaning
0 ¹	Test Passed (game goes to <u>Game-Over Mode</u>).
1	CPU Board lockup; also, check Memory Protect circuit and U25 CMOS RAM for 'stuck' bits.
2	U27 Game ROM 1 faulty. (lower ROM, CPU Bd.)
3	U26 Game ROM 2 faulty. (upper ROM, CPU Bd.)
4	Unused (see "Other or No Indications")
5	Blanking signal 'stuck'; coin door closed; Memory Protect circuit faulty; or U25 CMOS RAM faulty.
Other or 2 No Indications	System Failure: Check 5 VDC Power Supply; U26 Game ROM 2 faulty.
Notes: 1. Zero (0) displayed during Memory Chip Test (using CPU Board switch SW2) indicates that Blanking Circuit is NOT functioning. 2. Eight (8) displayed during Memory Chip Test indicates that Blanking Circuit is functioning properly.	

SYSTEM-11 SOUND SECTION TEST.

Press the Sound Diagnostic Switch (SW 1) on the CPU Board. Listen for the sound. The sound repeats, until the operator switches the *Road Kings* game Off and On.

NO SOUND DURING THIS TEST (but sound can be heard during the Diagnostic Tests).

Check the sound-select inputs (pins 2 through 9 of U9) to see if they pulse during Sound Test 01. Also, check the -12 V supply voltage on the CPU Board. If this voltage is low (or AC ripple seems too high), perform the following checks:

1. The gray and gray-green transformer secondary wires for 19.4 VAC.
2. The CPU Board filter capacitor C26 for -12 VDC.
3. The filter capacitor C26 for excessive AC ripple (over 0.75VAC).

If the previous checks did not isolate the problem, turn the Volume Control for maximum output. Momentarily touch a powered-up AC soldering pencil on the center tap of the Volume Control.

CAUTION

DO NOT use a soldering iron over 40 watts. Note also that cordless soldering irons will NOT work for this test.

Hearing a low hum indicates that the power amplifier (U1, TDA2002), the Volume Control, and the speaker are operating satisfactorily. Not hearing a hum requires repeating the test with the Volume Control turned part way down, to determine whether the Volume Control is faulty.

GAME MAINTENANCE

MAINTENANCE INFORMATION. Figure 2 shows the two main lubrication points of the Ball Trough Feeder (also the Multi-Ball Ejector, which utilizes the same mechanism). The shaded arrows show the directions in which the Ball Trough Feeder and other parts of its related assemblies can be adjusted for proper operation.

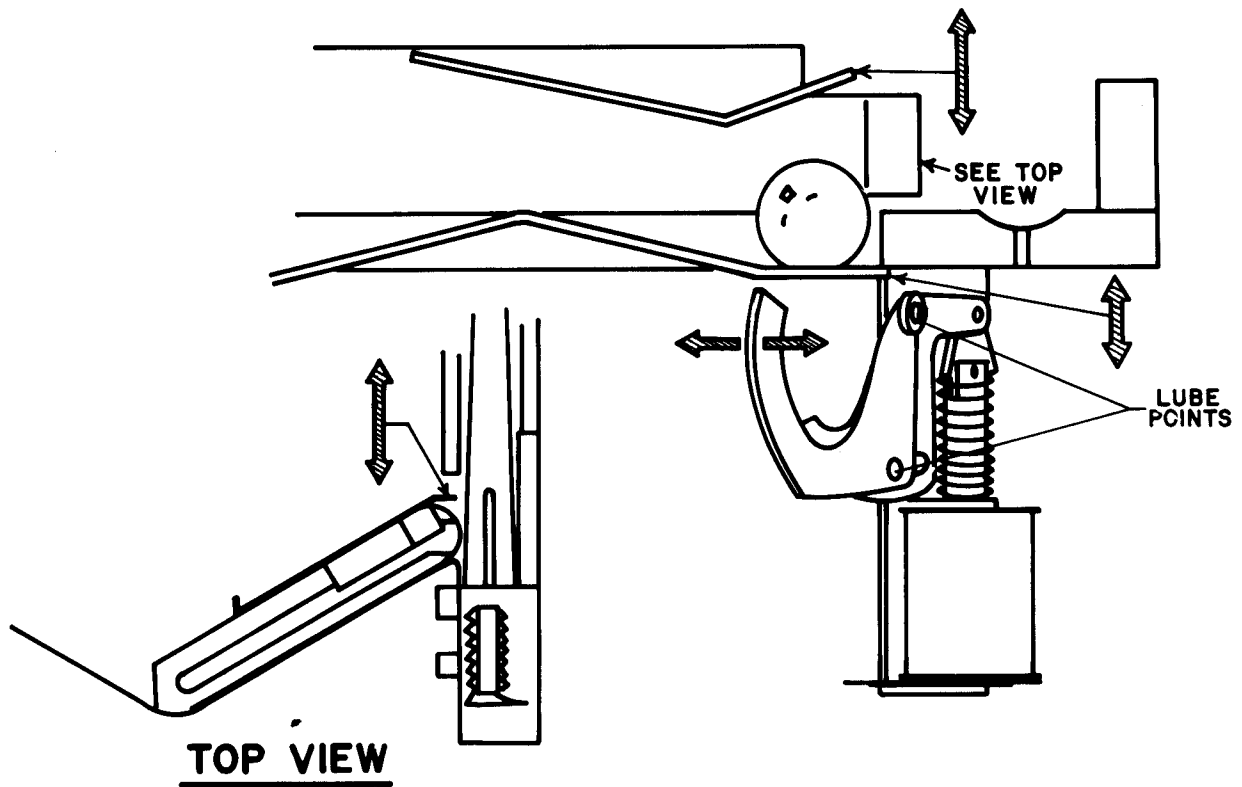


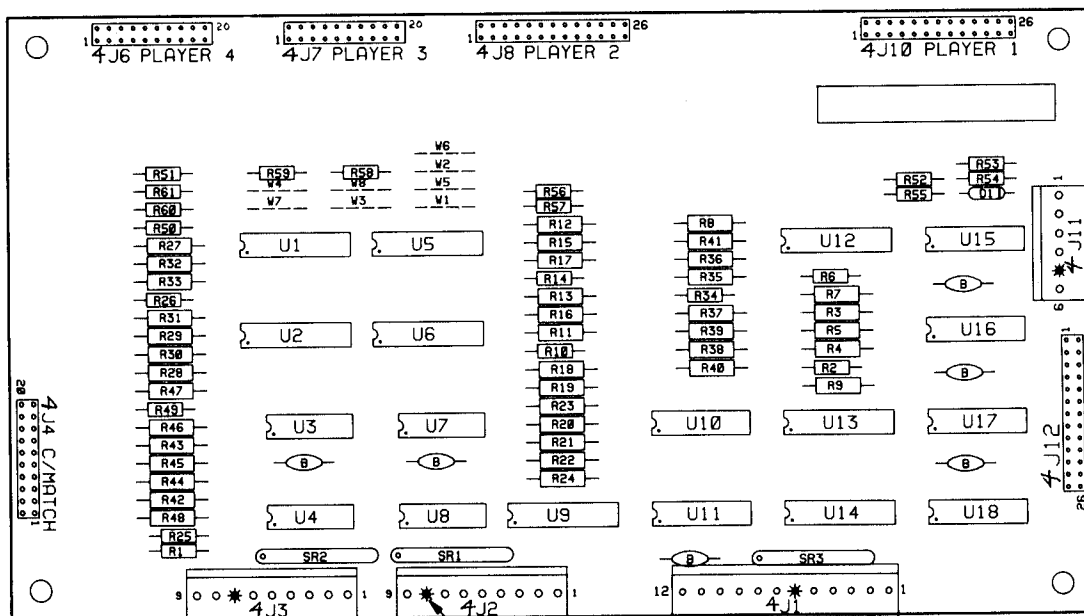
Figure 2. Adjustments and Lubrication Points, Ball Trough Feeder.

Section 2

Game Parts Information

- **Parts Lists and Diagrams:**

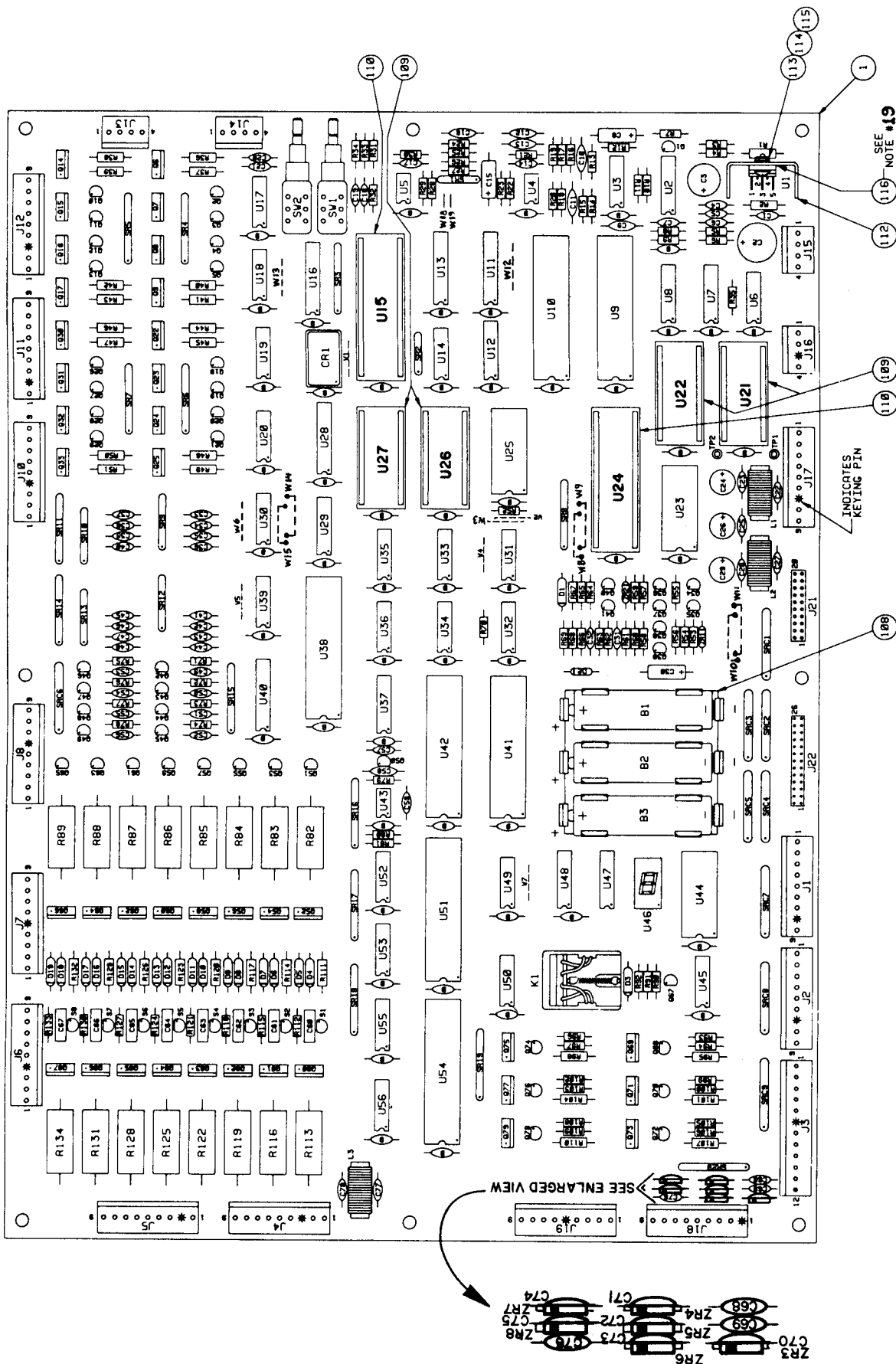
**A/N Master Display Board (D-10877)
CPU Board (D-10881-542)
Background Music Board (D-11197)
Power Supply Board (D-8345-541)
Backbox
Playfield Parts
Switches
Lamps
Solenoids & Rubber Parts
Flipper Assemblies
Ball Trough Feeder
Playfield Pivot Parts
Miscellaneous Game Parts
Loop Shot Assembly
Outlane Kickback Assembly
Jet Bumper Assembly
Jet Bumper Coil Assembly
Drop Target Assembly**



Alphanumeric Master Display Board

p/n D-10877

Item	Part No.	Ckt Designation	Description
1	5760-10875-00		Bare P. C. Board
2	5791-10850-00	J8, J10, J12	Connector, 26 pin (Hdr)
3	5791-09437-00	J4, J6, J7	Connector, 20 pin (Hdr)
4	5791-10862-12	J1	Connector, 12 pin (Hdr)
5	5791-10862-09	J2, J3	Connector, 9 pin (Hdr)
6	5791-10862-06	J11	Connector, 6 pin (Hdr)
7	5010-10258-00	R25, R26, R50 - R61	Resistor, 1 M, 1/4 w, 5%
8	5010-09774-00	R1, R2, R6, R10, R14, R34, R35	Resistor, 22 K, 1/4 w, 5%
9	5010-08772-00	R49	Resistor, 15 K, 1/4 w, 5%
10	5010-09269-00	R36, R37, R39, R40	Resistor, 12 K, 1/4 w, 5%
11	5010-08981-00	R11 - R13, R15 - R17 R18 - R24, R27 - R33 R42 - R48	Resistor, 10 K, 1/4 w, 5%
12	5010-09534-00	W1 - W8	Resistor, 0 Ω
13	5019-10387-00	SR1 - SR3	SIP, 18 K, 9R, 10P, 5%
14	5043-08980-00	B	Capacitor, 0.01 mfd, 50V
15	5075-09135-00	D1	Zener, 1N4740A, 10V, 1 w
16	5310-09153-00	U10, U11, U15 - U18	IC, Hex Buffer, 4050
17	5310-09882-00	U3, U4, U7, U8	IC, Quad NOR, 4001B
18	5680-08969-00	U9, U12 - U14	IC, Cathode Seg. Driver, UDN7180A
19	5680-08968-00	U1, U2, U5, U6	IC, Anode/Digit Driver, UDN6118A or 6184
20	16-8850-139		Label, P. C. Board Ident.
21	5010-10927-00	R3 - R5, R7 - R9, R38	Resistor, 8.2 K, 1/2 w, 5%

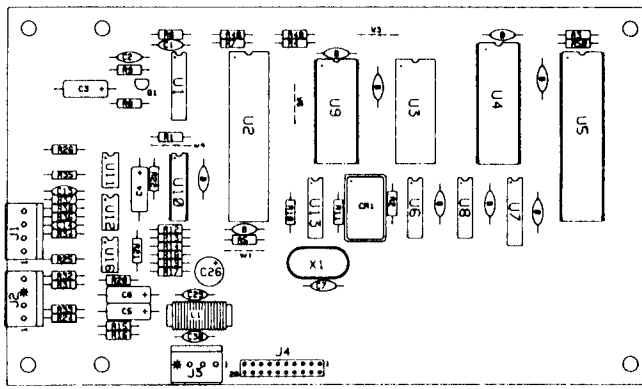


System 11 CPU Board (D-10881) Parts Information

Road Kings 33

B I L L O F

ITEM	PART NO.	DESCRIPTION	QTY.
1.	5791-00	20-PIN RIBBON HEADER	1
2.	5837-00	26-PIN RIBBON HEADER	1
3.	5838-00	26-PIN RIBBON HEADER	1
4.	5839-00	26-PIN RIBBON HEADER	1
5.	5840-00	26-PIN RIBBON HEADER	1
6.	5841-00	26-PIN RIBBON HEADER	1
7.	5842-00	26-PIN RIBBON HEADER	1
8.	5843-00	26-PIN RIBBON HEADER	1
9.	5844-00	26-PIN RIBBON HEADER	1
10.	5845-00	26-PIN RIBBON HEADER	1
11.	5846-00	26-PIN RIBBON HEADER	1
12.	5847-00	26-PIN RIBBON HEADER	1
13.	5848-00	26-PIN RIBBON HEADER	1
14.	5849-00	26-PIN RIBBON HEADER	1
15.	5850-00	26-PIN RIBBON HEADER	1
16.	5851-00	26-PIN RIBBON HEADER	1
17.	5852-00	26-PIN RIBBON HEADER	1
18.	5853-00	26-PIN RIBBON HEADER	1
19.	5854-00	26-PIN RIBBON HEADER	1
20.	5855-00	26-PIN RIBBON HEADER	1
21.	5856-00	26-PIN RIBBON HEADER	1
22.	5857-00	26-PIN RIBBON HEADER	1
23.	5858-00	26-PIN RIBBON HEADER	1
24.	5859-00	26-PIN RIBBON HEADER	1
25.	5860-00	26-PIN RIBBON HEADER	1
26.	5861-00	26-PIN RIBBON HEADER	1
27.	5862-00	26-PIN RIBBON HEADER	1
28.	5863-00	26-PIN RIBBON HEADER	1
29.	5864-00	26-PIN RIBBON HEADER	1
30.	5865-00	26-PIN RIBBON HEADER	1
31.	5866-00	26-PIN RIBBON HEADER	1
32.	5867-00	26-PIN RIBBON HEADER	1
33.	5868-00	26-PIN RIBBON HEADER	1
34.	5869-00	26-PIN RIBBON HEADER	1
35.	5870-00	26-PIN RIBBON HEADER	1
36.	5871-00	26-PIN RIBBON HEADER	1
37.	5872-00	26-PIN RIBBON HEADER	1
38.	5873-00	26-PIN RIBBON HEADER	1
39.	5874-00	26-PIN RIBBON HEADER	1
40.	5875-00	26-PIN RIBBON HEADER	1
41.	5876-00	26-PIN RIBBON HEADER	1
42.	5877-00	26-PIN RIBBON HEADER	1
43.	5878-00	26-PIN RIBBON HEADER	1
44.	5879-00	26-PIN RIBBON HEADER	1
45.	5880-00	26-PIN RIBBON HEADER	1
46.	5881-00	26-PIN RIBBON HEADER	1
47.	5882-00	26-PIN RIBBON HEADER	1
48.	5883-00	26-PIN RIBBON HEADER	1
49.	5884-00	26-PIN RIBBON HEADER	1
50.	5885-00	26-PIN RIBBON HEADER	1
51.	5886-00	26-PIN RIBBON HEADER	1
52.	5887-00	26-PIN RIBBON HEADER	1
53.	5888-00	26-PIN RIBBON HEADER	1
54.	5889-00	26-PIN RIBBON HEADER	1
55.	5890-00	26-PIN RIBBON HEADER	1
56.	5891-00	26-PIN RIBBON HEADER	1
57.	5892-00	26-PIN RIBBON HEADER	1
58.	5893-00	26-PIN RIBBON HEADER	1
59.	5894-00	26-PIN RIBBON HEADER	1
60.	5895-00	26-PIN RIBBON HEADER	1
61.	5896-00	26-PIN RIBBON HEADER	1
62.	5897-00	26-PIN RIBBON HEADER	1
63.	5898-00	26-PIN RIBBON HEADER	1
64.	5899-00	26-PIN RIBBON HEADER	1
65.	5900-00	26-PIN RIBBON HEADER	1
66.	5901-00	26-PIN RIBBON HEADER	1
67.	5902-00	26-PIN RIBBON HEADER	1
68.	5903-00	26-PIN RIBBON HEADER	1
69.	5904-00	26-PIN RIBBON HEADER	1
70.	5905-00	26-PIN RIBBON HEADER	1
71.	5906-00	26-PIN RIBBON HEADER	1
72.	5907-00	26-PIN RIBBON HEADER	1
73.	5908-00	26-PIN RIBBON HEADER	1
74.	5909-00	26-PIN RIBBON HEADER	1
75.	5910-00	26-PIN RIBBON HEADER	1
76.	5911-00	26-PIN RIBBON HEADER	1
77.	5912-00	26-PIN RIBBON HEADER	1
78.	5913-00	26-PIN RIBBON HEADER	1
79.	5914-00	26-PIN RIBBON HEADER	1
80.	5915-00	26-PIN RIBBON HEADER	1
81.	5916-00	26-PIN RIBBON HEADER	1
82.	5917-00	26-PIN RIBBON HEADER	1
83.	5918-00	26-PIN RIBBON HEADER	1
84.	5919-00	26-PIN RIBBON HEADER	1
85.	5920-00	26-PIN RIBBON HEADER	1
86.	5921-00	26-PIN RIBBON HEADER	1
87.	5922-00	26-PIN RIBBON HEADER	1
88.	5923-00	26-PIN RIBBON HEADER	1
89.	5924-00	26-PIN RIBBON HEADER	1
90.	5925-00	26-PIN RIBBON HEADER	

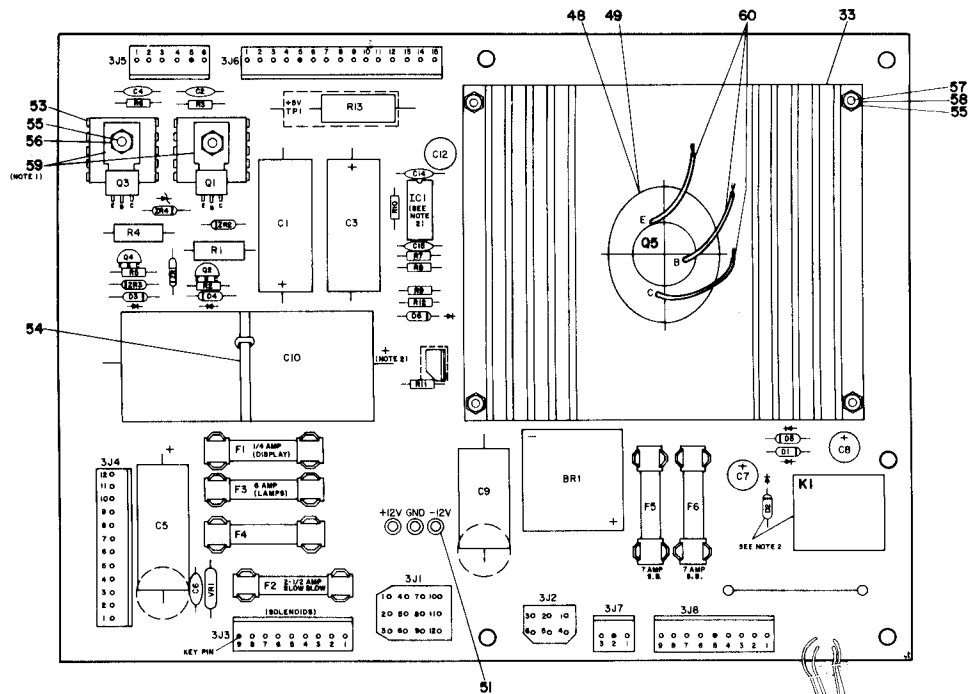


Background Music Board

p/n D-11197-542

Item	Part No.	Ckt Designation	Description
1	5766-11088-00		Bare P. C. Board
2	5371-09152-00	U1	IC, D/A Convtr, MC1408
3	5430-10322-00	U2	IC, PIA, MC68B21
4	5340-09878-00	U3	IC, RAM, 2016
5	5281-09487-00	U6	IC, Dual Flipflop, 74LS74
6	5281-09745-00	U7	IC, Dual Mux, 74LS138
7	5281-09235-00	U8	IC, Triple Nand, 74LS10
8	5370-09321-00	U11, U12, U16	IC, Op Amp, MC1458
9	5281-09215-00	U13	IC, Hex Inv, 74LS04
10	5160-10269-00	Q1	Transistor, 2N3904, NPN
11	5010-08983-00	R6 - R8	Resistor, 3.3K, 5%, 1/4w, C. Film
12	5010-08991-00	R1 - R5, R48 - R50	Resistor, 4.7K, 5%, 1/4w, C. Film
13	5010-08997-00	R24 - R26, R31	Resistor, 2.7K, 5%, 1/4w, C. Film
14	5010-09179-00	R9	Resistor, 3.3M, 5%, 1/4w, C. Film
15	5010-09034-00	R12 - R14, R17, R19, R32 - R35	Resistor, 10K, 5%, 1/4w, C. Film
16	5010-09363-00	R37	Resistor, 5.6K, 5%, 1/4w, C. Film
17	5010-09324-00	R15, R16, R20 - R22, R36, R38	Resistor, 27K, 5%, 1/4w, C. Film
18	5010- 8998-00	R10, R11	Resistor, 2.2K, 5%, 1/4w, C. Film
19	5010-10987-00	R13, R18	Resistor, 56K, 5%, 1/4w, C. Film
20	5010-09534-00	W1, W3, W4, W6	Resistor, 0Ω
21	5043-09844-00	C1	Capacitor, 47 pfd, ceramic, 50V, axial
22*	5043-08980-00	C2, C13, C14	Capacitor, .01 mfd, ceramic, 50V, axial
23	5040-09343-00	C3 - C6	Capacitor, 10 mfd, electr., 20V, axial
24	5043-09492-00	C7	Capacitor, 100 pfd, ceramic, 50V, axial
25	5043-09845-00	C29, C30	Capacitor, .001 mfd, ceramic, 50V, axial
26	5040-10974-00	C26	Capacitor, 100mfd, electr., 35V, axial
27	5551-09822-00	L1	Inductor, 4.7 μH, 3A
28	5791-10862-04	J1, J2, J3	Connector, 4 pin (Hdr)
29	5791-09437-00	J4	Connector, 20 pin, (Hdr) Ribbon Cable
30	5700-10176-00		IC Socket, 28 pin
a)	A-5343-542-5	U4	IC, B/G Music ROM
31	5700-08985-00		IC Socket, 40 pin
a)	5400-10320-00	U5	IC, μProcessor, MC68B09E
32	5700-09004-00		IC Socket, 24 pin
a)	5370-11086-00	U9	IC, Sound Processor, YM2151
33	5700-09006-00		IC Socket, 16 pin
a)	5371-11087-00	U10	IC, D/A Conv, YM3012
34	5521-10931-00	CR1	Oscillator, 8 MHz
35	5520-09020-00	X1	Crystal, 3.58 MHz

Note: Nine capacitors provide +5VDC filtering for ICs; they are shown on diagram with "B" symbol.



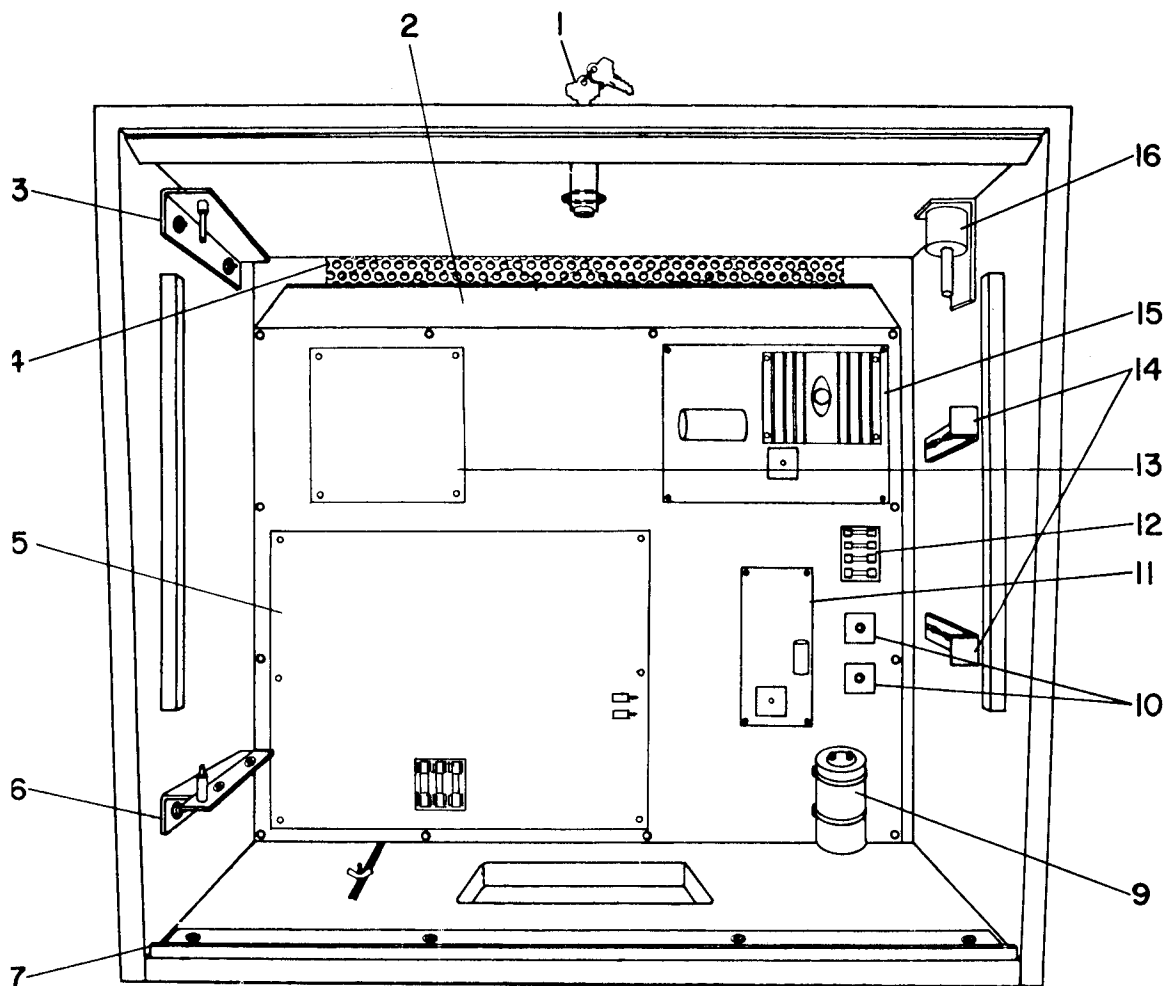
NOTES:

1. Heat sink compound must be applied between transistor and heat sink.
2. Observe index mark on integrated circuit, polarity of capacitors and diodes, and position of transistors.
3. The view of Q5 and its related heat sink and hardware is from the bottom of the heat sink, to clarify installation.

Power Supply

p/n D-8345-541

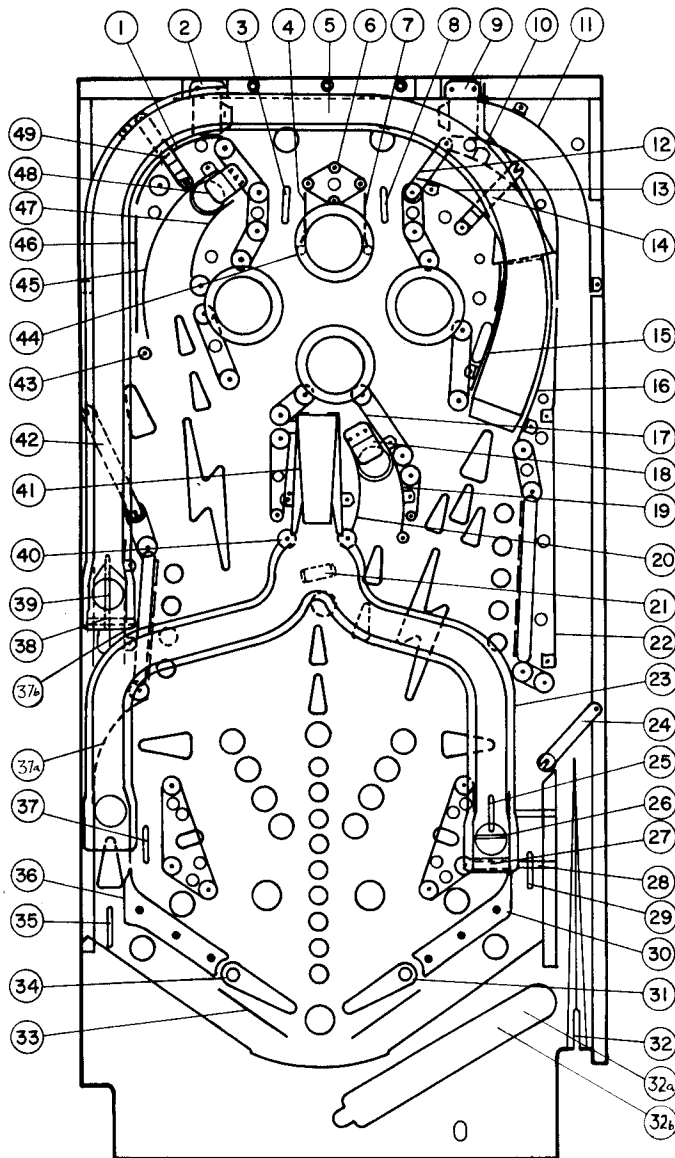
Item	Part No.	Ckt Designation	Description	Item	Part No.	Ckt Designation	Description
1	5765-09466-01		Bare P. C. Board	28	5164-09057-00	Q1	Transistor, SDS201, NPN
2	5013-09426-00	R7	Resistor, 2.15K, 1%, 1/4w, Metal Film	29	5164-09056-00	Q4	Transistor, MPSD02, NPN
3	5013-09427-00	R8	Resistor, 4.99K, 1%, 1/4w, Metal Film	30	5194-09058-00	Q3	Transistor, SDS202, PNP
4	5010-09428-00	R11	Resistor, 1.5K, 2%, 1/4w, Carbon Film	31	5194-09055-00	Q2	Transistor, MPSD52, PNP
5	5010-09085-00	R10	Resistor, 1.5K, 5%, 1/4w	32	5162-09425-00	Q5	Transistor, 2N6057, NPN
6	5010-09541-00	R9	Resistor, 2.7K, 2%, 1/4w	33	5705-09431-00		Heat Sink
7	5010-09508-00	R12	Resistor, 270Ω, 2%, 1/4w, Carbon Film	34	5791-09074-00	3J6	Connector, 15 pin (Hdr)
8	5012-09429-00	R13	Resistor, 0.12Ω, 5%, 5w	35	5791-09027-00	3J3, 3J8	Connector, 9 pin (Hdr)
9	5010-09536-00	R1, R4	Resistor, 39K, 5%, 1w	36	5791-09038-00	3J2	Connector, 6 pin (Hdr)
10	5010-09061-00	R2, R5	Resistor, 680Ω, 2w	37	5791-09067-00	3J5	Connector, 6 pin (Hdr)
11	5010-09069-00	R3, R6	Resistor, 330K, 5%, 1/2w	38	5791-09434-00	3J4	Connector, 12 pin (Hdr)
12	5040-09419-00	C10	Capacitor, 18,000 mfd, electr., 20V, axial	39	5791-09435-00	3J7	Connector, 3 pin (Hdr)
13	5040-09420-00	C9	Capacitor, 1000 mfd, electr., 25V, axial or radial	40	H-11065	3J9	Cable/Connector Assembly
14	5040-09423-00	C12	Capacitor, 330 mfd, electr., 10V, radial	a)	5791-09400-00		Connector shell
15	5043-9065-00	C15	Capacitor, 470 pfd	b)	5820-09080-00		Connector pin
16	5040-9053-00	C1, C3	Capacitor, 100 mfd, electr., 150V	41	5791-09068-00	3J1	Connector, 12 pin (Hdr)
17	5040-09070-00	C5	Capacitor, 100 mfd, electr., 100V, axial or radial	42	5321-09178-00		Fuseholder
18	5043-09072-00	C2, C4	Capacitor, 0.1 mfd, 500V, disc	43	5731-09128-00	F2	Fuse, 2.5A, 250v, S-B
19	5043-09446-00	C14	Capacitor, 0.1 mfd, 50V, disc	44	5731-09071-00	F3	Fuse, 8A, 32v
20	5070-06258-00	D1, D2, D5, D6	Diode, 1N4001	45	5731-09128-00	F4	Fuse, 2.5A, 250v, S-B
21	5070-09054-00	D3, D4	Diode, 1N4004	46	5731-08761-00	F1	Fuse, 1/4A, 250v, S-B
22	5075-09059-00	ZR1, ZR3	Zener, 1N5990, 3.9v, 5%	47	5017-09064-00	VR1	Varistor
23	5075-09060-00	ZR2, ZR4	Zener, 1N4764, 100v, 5%	48	5700-09445-00		Socket
24	5460-09424-00	IC1	IC, Volt. Reg., MC1723C	49	5701-09652-00		Mica Insulator
25	5043-09443-00	C6	Capacitor, 0.1 mfd, 200v, disc	50	5580-09555-00	K1	Relay, 24VDC, 10A, DPDT
26	5040-09421-00	C7	Capacitor, 100 mfd, 25v, radial	51	5824-09428-00	TP1 - TP4	Terminal, #1502-1 (Test Post)
27	5040-09422-00	C8	Capacitor, 47 mfd, 50v, radial	52	5100-09418-00	BR1	Bridge Rectifier, 35A, 100V
				53	5705-09042-00		Heat Sink
				54	03-7947		Tie Wrap
				55	4005-01016-00		Mach. Screw, 5-40 x 7/16, RH
				56	4700-00004-00		Flatwasher, 0.146 x 3/8, 21 Ga.
				57	4701-00023-00		Lockwasher, #5, split
				58	4405-01117-00		Hex Nut, 5-40
				59	20-9229		Heat sink Thermal Compound
				60	HW-30118-4		Lead wire, 18 AWG, 3"
				61	5731-01003-00	F6, F5	Fuse, 7A, 250V, S-B



Backbox Parts Listing

Item	Part No.	Description
1	20-6542-TB	Cam Lock
2	D-11032	PCB Plate Assembly
3	A-7984	Upper Insert Board Hinge Assembly
4	01-6645	Venting Screen
5	D-10881-542	System 11 CPU, Road Kings
6	A-7985	Lower Insert Board Hinge Assembly
7	01-8400	Backglass Mounting Bracket
8	Not Used	
9	5040-09051-00	Capacitor, 30,000 μ Fd., 25V
10	5100-09418-00	Bridge Rectifier, 100v, 35A.
11	C-9939	Flipper Power Supply
12	5733-10702-04	Fuse Holder
13	D11197-542	Background Music Board, Road Kings
14	01-8084	Insert Stop Bracket
15	D-8345-541	Power Supply Assembly
16	B-10686	Knocker Assembly

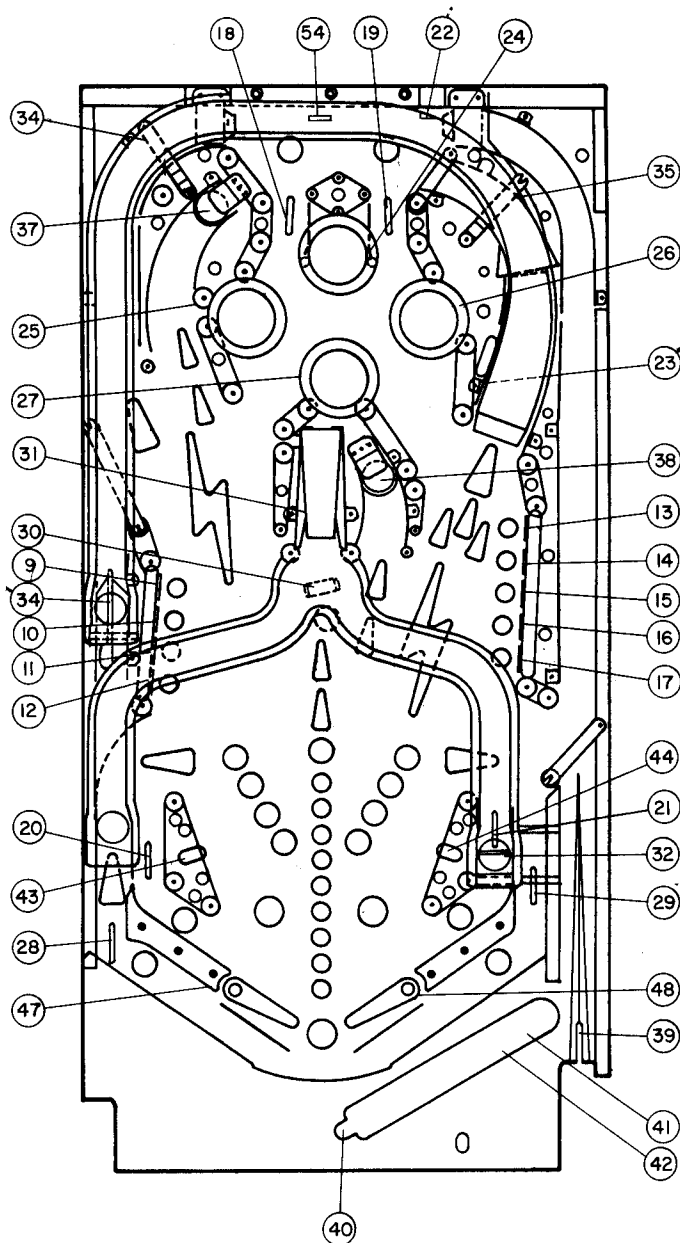
Playfield Parts



Item	Part No.	Description
1	12-6696	Kicker Wireform Upper
2	B-10732-L	Ballgate Assembly, Left
3	A-5844-35	Rollover Wire & Bracket
4	12-6698	Jet Bumper Wireform, Left
5	C-11144	Right (J) Ramp Assembly
6	02-3408	Playfield Post
7	12-6697	Jet Bumper Wireform, Right
8	A-5844-35	Rollover Wire & Bracket
9	B-10732-R	Ballgate Assembly, Right
10	12-6700	Upper Ball Shooter Wireform
11	R-11145	Ballguide
12	A-10827	Ballgate Assembly
13	C-11134	Lift Ramp Assembly, Left
14	A-10751	Ballgate Assembly
15	See Item # 13	
16	C-11133	Lift Ramp Assembly, Right
17	Not Applicable	
18	01-6933	Eject Shield
19	A-11129	Eject Ballguide Assembly
20	12-6695	Lockout Wireform, Left
21	D-9612	Drop Target Assembly
22	01-5224	Ballguide
23	C-11135	Y Ramp Assembly
24	A-11126	Ballshooter Gate Assembly
25	A-5844-35	Rollover Wireform & Bracket
26	A-11124	Y Ramp Switch Assembly
27	01-8331	Ball Deflector
28	01-8370	Y Ramp Holding Bracket
29	A-5844-35	Rollover Wireform & Bracket
30	A-8108-R	Flipper Return Frame
31	C-9952-R	Flipper Assembly
32	A-5844-46	Rollover Wireform & Bracket
32a	A-8645	Wireform & Bracket Assembly
32b	A-5844-44	Rollover Wireform & Bracket
33	12-6468	Anti-rebound Wire
34	C-9952-L	Flipper Assembly
35	A-5844-35	Rollover Wire & Bracket
36	A-11125	Flipper Ballguide Assembly, L
37	A-5844-35	Rollover Wire & Bracket
37a	B-11162	Ballguide
37b	A-11128	Ballguide
38	01-8331	Ball Deflector
39	A-11195	Wireform & Bracket
40	02-4270	Y Ramp Mounting Post
a)	03-8041	Spacer .250 Large
41	B-11130	Loop Shot Assembly
42	A-11127	Ball Kicker Gate Assembly
43	02-4056	Playfield Post
44	02-4003	Playfield Post
45	A-11252	Eject Ballguide Assembly
46	12-6466-18	Ballguide Wire 4 1/2"
47	12-6699	Wireform
48	01-6933	Eject Shield
49	A-10751	Ball Gate Assembly

Switches

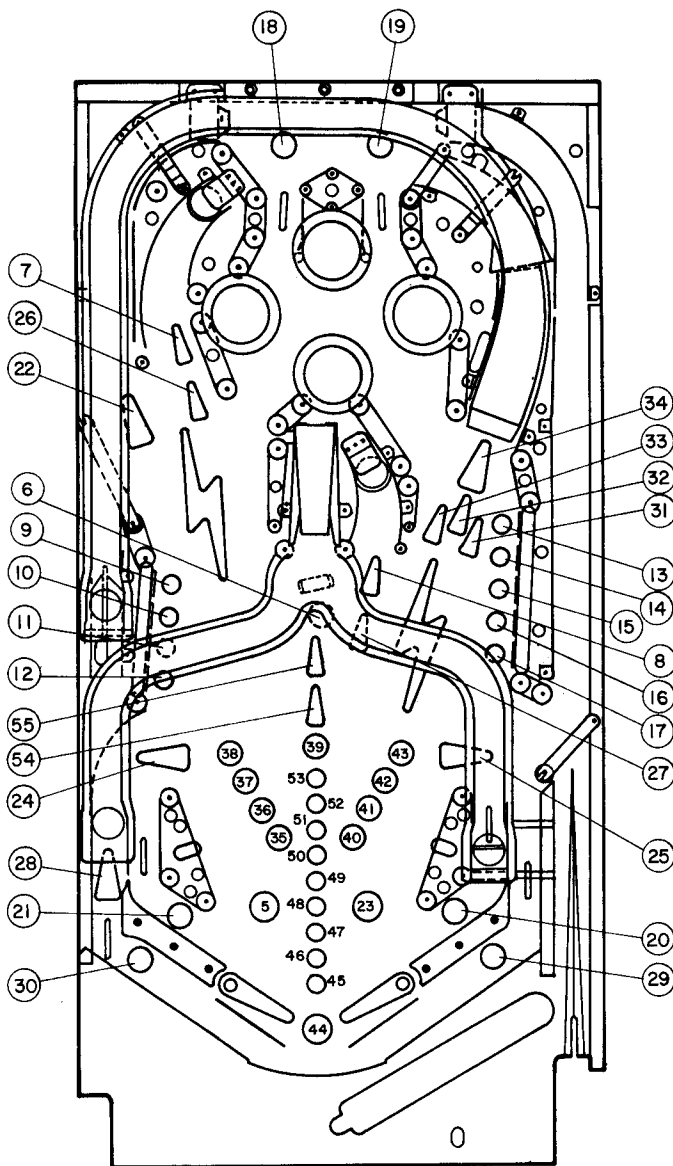
Item	Part No.	Description
1	A-8476	Plumb Bob Tilt
2	B-6572	Ball Roll Tilt
3	SW-1A-126	Credit Button
4	904845*	Right Coin Chute (* - Coinco p/n)
5	904845*	Center Coin Chute
6	904845*	Left Coin Chute
7	904704*	Slam Tilt
8	5641-09369-00	High Score Reset
9	A-11022	R Stationary Target
10	A-11022	O Stationary Target
11	A-11022	A Stationary Target
12	A-11022	D Stationary Target
13	A-11022	K Stationary Target
14	A-11022	I Stationary Target
15	A-11022	N Stationary Target
16	A-11022	G Stationary Target
17	A-11022	S Stationary Target
18	SW-1A-124	Lane 1
19	SW-1A-124	Lane 2
20	SW-1A-124	Lane 3
21	SW-1A-124	Lane 4
22	5647-11074-00	Right Ramp 1 Enter (Right)
23	5647-12001-00	Ramp Raise "EOS"
24	A-7459-7	Top Jet Bumper
25	A-7459-7	Left Jet Bumper
26	A-7459-7	Right Jet Bumper
27	A-7459-7	Bottom Jet Bumper
28	SW-1A-124	Left Outlane
29	SW-1A-124	Right Outlane
30	17-1042	Drop Target
31	5647-12000-00	Center Ramp - Enter
32	SW-1A-118	Center Ramp - Right Exit
33	A-4834-H	Right Ten Point
34	5647-09633-00	Upper Left Kicker
35	SW-1A-118	Right Rollunder
36	SW-1A-118	Left Rollunder
37	17-1012	Left Eject
38	17-1012	Center Eject
39	SW-1A-138	Ball Shooter Lane
40	17-1067	Outhole
41	5647-09633-00	Right Trough
42	5647-09957-00	Left Trough
43	SW-1A-122	Left Kicker (scoring)**
44	SW-1A-122	Right Kicker (scoring)**
45	A-4834-H	Left Ten Point
46	SW-1A-117	Playfield Tilt
47	SW-1A-150-1	Left Flipper EOS
48	SW-1A-150	Right Flipper EOS
49-53	Not Used	Not Used
54	5647-11099-00	Right Ramp 2 Exit (Left)
55-64	Not Used	Not Used
-	SW-10A-48	Flipper Button



** [Kicker Actuating Sw: SW-1A-114; B-8734 w/RC]

Lamps

Lamp Location/Description



- 1 Game Over (Backglass)
- 2 Match (Backglass)
- 3 Shoot Again (Backglass)
- 4 Ball In Play (Backglass)
- 5 Hold Bonus
- 6 Spots Letter
- 7 Left Lock
- 8 Center Lock
- 9 Target R
- 10 Target O
- 11 Target A
- 12 Target D
- 13 Target K
- 14 Target I
- 15 Target N
- 16 Target G
- 17 Target S
- 18 Lane "1"
- 19 Lane "2"
- 20 Lane "3"
- 21 Lane "4"
- 22 Bonus Holdover W/L
- 23 All Scores Double
- 24 Left - Collect Detour Value W/L
- 25 Right - Collect Detour Value W/L
- 26 Left Timelock
- 27 Center Timelock
- 28 Power Kick
- 29 RightSpecial
- 30 Left Special
- 31 Right Timelock
- 32 Right Lock
- 33 Right Extra Ball
- 34 Mega-Score
- 35 2X
- 36 3X
- 37 4X
- 38 5X
- 39 Bonus 10,000
- 40 Bonus 20,000
- 41 Bonus 40,000
- 42 Bonus 60,000
- 43 Bonus 80,000
- 44 Cruise Again
- 45 Bonus 1,000
- 46 Bonus 2,000
- 47 Bonus 3,000
- 48 Bonus 4,000
- 49 Bonus 5,000
- 50 Bonus 6,000
- 51 Bonus 7,000
- 52 Bonus 8,000
- 53 Bonus 9,000
- 54 Center Extra Ball
- 55 Detour When Lit

Solenoids/ Flashers

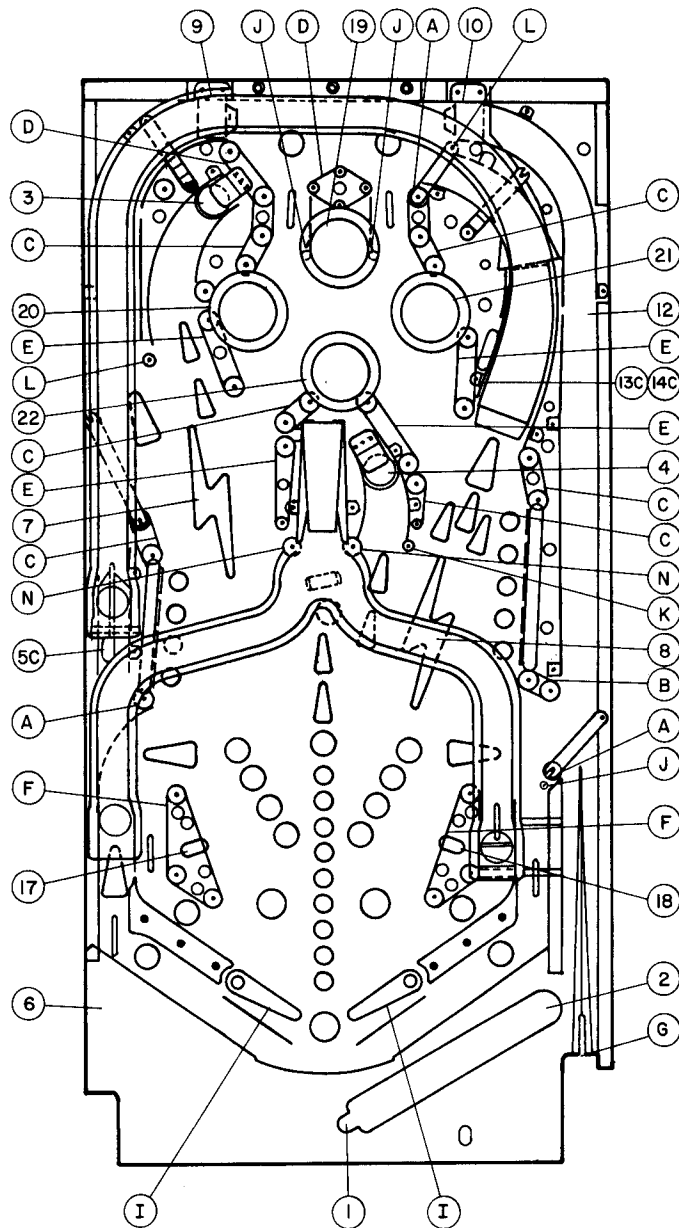
Item	Part No.	Description
1	AE-23-800-01	Trough Kicker (Outhole)
2	AE-23-800-03	Ball Shooter Lane Feeder
3	AE-23-800-03	Left Eject Hole
4	AE-23-800-03	Center Eject Hole
5A	#63 Flashlamps	Rear Playfield Flashers
5C	AE-23-800-11*	Upper Left Kicker
6	AE-24-900-01*	Power Kicker (L. Outlane)
7	#63 Flashlamps	Left Lightning Bolt
8	#63 Flashlamps	Right Lightning Bolt
9	SM1-35-4000-DC	Left Gate
10	SM1-35-4000-DC	Right Gate
11	5580-09555-00	General Illumination Relay
12	5580-09555-00	Solenoid Select Relay
13A	AE-23-800-02	Credit Knocker
13C	AE-24-900-02	Ramp Up
14	#63 Flashlamps	Mid-Insert Board Flashers
14C	SM-26-600-DC	Ramp Down
15	#63 Flashlamps	Bikes Flashers (Backbox)
16	404603-2**	Coin-Lockout Relay
17	AE-23-800-03	Left Kicker
18	AE-23-800-03	Right Kicker
19	AE-23-800-03	Top Jet Bumper
20	AE-23-800-03	Left Jet Bumper
21	AE-23-800-03	Right Jet Bumper
22	AE-23-800-03	Bottom Jet Bumper
-	FL 23/600-30/2600-50VDC	Right Flipper
-	FL 23/600-30/2600-50VDC	Left Flipper

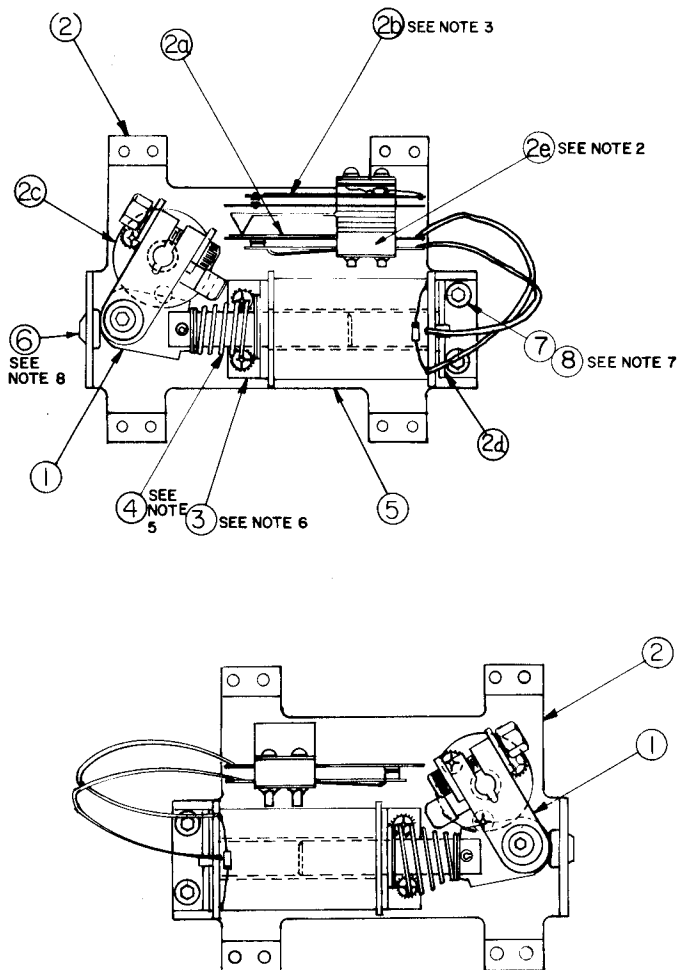
* - with Relay Snubber

** - Coinco p/n

Rubber Parts

Item	Part No.	Description
A	23-6300	5/16" Ring
B	23-6301	3/4" Ring
C	23-6302	1" Ring
D	23-6303	1-1/4" Ring
E	23-6304	1-1/2" Ring
F	23-6306	2-1/2" Ring
G	23-6327	Ball Shooter Tip
H	23-6420	Grommet
I	23-6519-4	Red Ring
J	23-6535	Bumper
K	23-6552	Sleeving
L	23-6556	Sleeving
M	23-6577	5/8" dia. Bumper
N	23-6579	3/4" Tapered Bumper





Flipper Assembly p/n C-9952-R

Item	Part No.	Description
1	B-10655-R	Crank Link Assembly
a)	02-4179	Link Spacer Bushing
b)	4010-01086-14	Cap Screw, 10-32 x 7/8, SH
c)	4700-00023-00	Washer, 5/8 o.d. x 13/64 i. d. x 16 ga.
d)	4701-00004-00	Lockwasher, #10 split
e)	4410-01132-00	Nut, 10-32 ESNA
f)	A-10656	Flipper Link Assembly
1.)	02-4219	Coil Plunger
2.)	20-9370-1	Spring Pin, 5/32 dia. x 7/16
3.)	01-7698	Flipper Link
g)	B-10657-R	Flipper Crank Assembly, Right
1.)	01-8073-R	Flipper Crank, Right
2.)	17-1037	Crank Washer
3.)	4010-01066-18	Cap Screw, 10-32 x 1-1/8, HCS
4.)	4410-01127-00	Nut, 10-32 Hex H. D.
5.)	4700-00107-00	Washer, 5/8 o.d. x 13/64 i. d. x 12 ga.
6.)	4701-00004-00	Lockwasher, #10 split
7.)	RM-23-06	Tubing, H. S. 1/4 DWP
2	C-9954-R	Flipper Base/Lane Change Assembly, R.
a)	06-14G	Insulating Blade
b)	SW-1A-150	Lane Change Switch
c)	03-7568	Flipper Bushing
d)	A-10821	Flipper Stop Assembly
e)	03-7811	End of Stroke (EOS) Switch
3	01-7695	Solenoid Bracket
4	10-376	Coil Plunger Spring
5	FL-23/600-30/2600	Flipper Coil
6	23-6577	Bumper Plug
7	4010-01066-06	Cap Screw, 10-32 x 3/8, AH
8	4710-00004-00	Lockwasher, #10 split

NOTES:

- Each Flipper Assembly is mounted below the playfield, in conjunction with the plastic flipper and shaft (20-9250) and flipper rubber (23-6519) (on the upper side of the playfield)
- The tip of the EOS Switch must travel .015 (± .010, .000 inch), before the contacts fully open with the flipper in the actuated position. The EOS Switch contacts must have a gap of .062 (± .015) inch. Any adjustment of the EOS Switch must be made at a minimum distance of .25 inch from the switch body
- The Lane Change Switch must have a gap of .046 (± .015) inch, when fully open
- All moving elements of the assembly must operate freely without any evidence of binding
- Coil plunger spring must fit within the four lugs of the solenoid bracket
- For coil replacement, remove solenoid bracket, (item 3) to prevent screw damage
- Use Loctite when reassembling flipper stop bracket screws.
- When using bumper plug on older flipper assemblies, readjust flipper position.
- Solid color grey (or blue) wire connects to the banded end of the diode, mounted on the connector end of flipper coil (item 5). Wire with trace color connects to the unbanded end of the diode.

Flipper Assembly p/n C-9952-L (Parts listed replace same Items of C-9952-R)

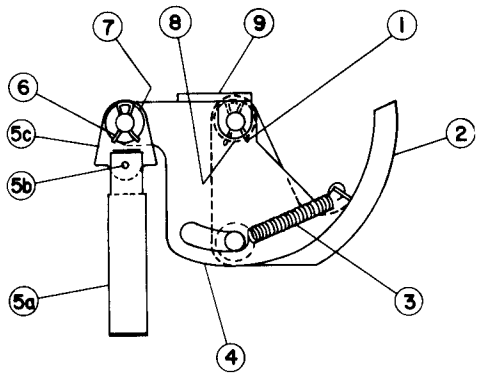
Item	Part No.	Description
1	B-10655-L	Crank Link Assembly
g)	B-10657-L	Flipper Crank Assembly, Left
1.)	01-8073-L	Flipper Crank, Left
2	C-9954-L	Flipper Base/Lane Change Assy, L.

Road Kings Y-Ramp p/n C-11135

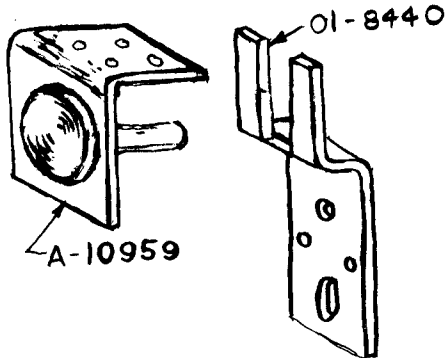
Item	Part No.	Description
1	03-8021	Y-Ramp, Plastic
2	01-8388	Ramp Lane Selector
3	02-4266	Lane Selector Mounting Post
4	10-391	Selector Spring
5	4006-01003-06	Mach. Screw 6-32 x 3/16, P-PH-S
6	4700-00009-00	Flat Washer, #6
7	03-8042	Nylon Washer

Ball Trough Feeder

p/n C-9638



Item	Part No.	Description
1	12-6227	Clip, Hair Pin
2	A-8247	Ball Eject Cam Assembly
3	10-320	Spring
4	A-6949-L	Spring Plate Assembly
5	A-8050-1	Plunger Assembly
a)	02-3407-2	Coil Plunger
b)	20-8716-5	Roll Pin
c)	01-1789	Armature Link
6	12-6227	Clip, Hair Pin
7	4700-00030-00	Washer, 1/2 o.d. x 17/64 i.d. x 15 ga.
8	4700-00103-00	Washer, 1/2 o.d. x .265 i.d. x .015 thk.
9	A-8268	Mounting Bracket Assembly



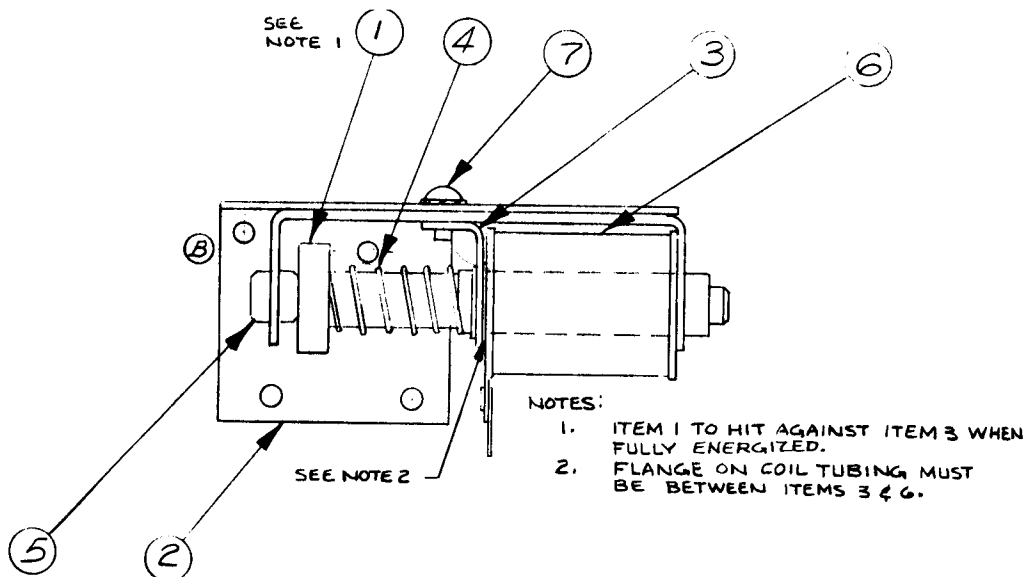
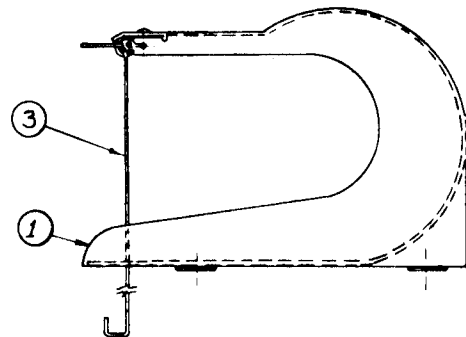
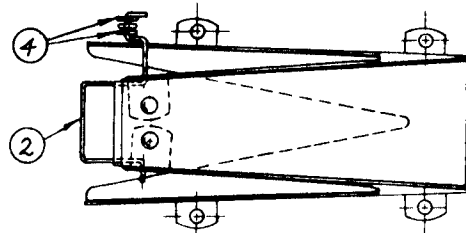
Playfield Pivot & Hinge Bracket

Miscellaneous Road Kings Parts

Part No.	Description
31-1002-542	R. K. Screened Playfield
31-1357-542	R. K. Backglass
31-1388	Drop Target Decal
31-1389	Stationary Target Decal
31-1006-542	R. K. Plastics Set
31-1390-L	Y-ramp Decal, Left
31-1390-R	Y-ramp Decal, Right
5555-09382-01	Speaker, 4Ω, 3w, 6"
5555-10779-00	Speaker, 8Ω, 30w, 4 x 10
20-9269	Standoff, 1/2", P-nut (on PCB)
01-6571	Mounting Bracket, Hinge, Insert Bd.
01-6652	Stop Bracket
01-6655	Latch - Insert Board
11-542-IN	Road Kings Wood Insert
5795-09453-00	Ribbon Cable, 20-conductor
5795-10868-14	Ribbon Cable, 26-conductor, 14"
5795-10937-06	Ribbon Cable, 20-conductor, 6"
5795-10938-22	Ribbon Cable, 26-conductor, 22"
5795-09941-00	Ribbon Cable, 20-conductor, 18"

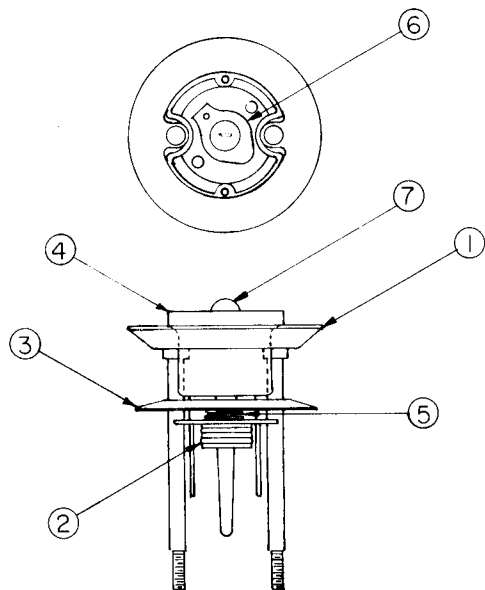
p/n B-11130

Item	Part No.	Description
1	B-11131	Loop Shot Shell Assy
2	12-6693	Loop Shot Actuating Wireform
3	12-6704	Switch Actuator
4	03-7796-1	Washer, Nylon



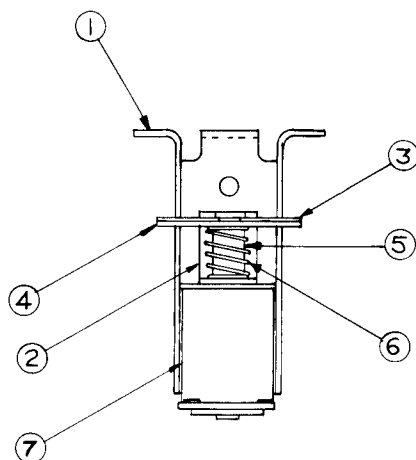
p/n A-11041

Item	Part No.	Description
1	A-6306-2	Bell Armature Assembly
2	B-7409-2	Mounting Bracket Assembly
3	01-8-508-T	Solenoid Bracket
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	AE-24-900-01	Coil Assembly, Complete
7	4008-01017-05	Mach. Screw (8-32 x 5/16, P-RH-S)



B-9414 JET BUMPER ASSEMBLY

ITEM	PART NO.	DESCRIPTION
1	A-4754	Bumper Ring Assembly
2	03-6009-A5	Bumper Base
3	03-6035-5	Bumper Water
4	03-7443-5	Bumper Body
5	10-7	Bumper Spring
6	24-6416	Bumper Socket
7	24-6549	#44 Bulb



B-9415 JET BUMPER COIL ASSEMBLY

ITEM	PART NO.	DESCRIPTION
1	B-7417	Bracket and Stop Assembly
2	01-1747	Coil Retaining Bracket
3	01-5492	Armature Link Steel
4	01-5493	Armature Link Bakelite
5	02-3406-1	Coil Plunger
6	10-326	Armature Spring
7	SG1-23-850-DC	Solenoid Coil

Drop Target Assembly

p/n D-9612

Item	Part No.	Description	Item	Part No.	Description
1	01-7575-2	Drop Target Frame	12	B-9744	Reset Finger Assembly
2	03-7479	Drop Target Guide	a)	02-3972	Drop Target Plunger
3	01-7572	Target Retaining Bar	b)	01-7570	Reset Finger
4	B-9534	Drop Target Assembly	c)	01-7571	Spring Holder
a)	4104-01001-04	Sh. Metal Screw, #4 x 1/4, P-PH-A	d)	4410-01132-00	Nut, 10-32 ESN
b)	01-7037	Target Backup Blade	13	4701--00002-00	Lockwasher, #6 split
c)	03-7773-4	Drop Target	14	A-9613	Microswitch & Bracket
d)	10-364	Target Retractor Spring	a)	01-7618	Switch Bracket
5	01-7689	Coil Support Bracket	b)	17-1042	Switch, Drop Target
6	01-7688	Reset Adj. Bracket	c)	4004-01003-10	Mach. Screw, 4-40 x 5/8, P-PH-S
7	4106-01001-07	Sh. Metal Screw, #6 x 7/16, P-PH-A	d)	5070-06258-00	Diode, 1N4001
8	4006-01003-14	Mach. Screw, 6-32 x 7/8, P-PH-S	15	4006-01003-04	Mach. Screw, 6-32 x 1/4, P-PH-S
9	4006-01005-06	Mach. Screw, 6-32 x 3/8, P-PH	16	A-9548	Coil Stop Assembly
10	SA5-24-750-DC	Coil Assembly	a)	01-7590	Solenoid Stop Bracket
a)	03-7066-4	Coil Sleeve	b)	02-3986	Armature Stop
11	10-128	Kicker Spring	c)	02-3058-2	Collar
			17	4700-00076-00	Washer, .312 o.d. x .156 i.d .0418 thk.

Section 3

Reference Diagrams & Schematics

- **Diagrams and Schematics:**

**Power Wiring
Cabinet Wiring
Background Music Board
A/N Master Display Board
CPU Board
Interboards Signals
Power Supply Board
Displays**

TWO SPEAKER SYSTEM

The diagram illustrates the wiring for a two-speaker system. It shows the following components and connections:

- Audio Input:** Labeled "AUDIO" with a line connecting to terminal 1J15.
- Ground:** Labeled "GND" with a line connecting to terminal 3 of the 1J15 block.
- Front Speaker Assembly:** A speaker symbol labeled "FRONT SPEAKER ASSEMBLY" with a "+" sign. It is connected to the BLK-YEL wire from terminal 1 of the 1P15 block and the BLK wire from terminal 2 of the 1P15 block.
- Speaker Connections:**
 - Terminal 1 of the 1P15 block connects to the BLK-YEL wire, which goes to the "+" terminal of the FRONT SPEAKER ASSEMBLY.
 - Terminal 2 of the 1P15 block connects to the BLK wire, which goes to the "-" terminal of the FRONT SPEAKER ASSEMBLY.
- Bottom of Cabinet:** A speaker symbol labeled "BOTTOM OF CABINET" with a "+" sign. It is connected to the BLK-YEL wire from terminal 2 of the 8P9 block and the BLK wire from terminal 1 of the 8J9 block.
- Terminal Blocks:**
 - 1J15:** A 4-terminal block with terminals 1, 2, 3, and 4. Terminal 1 is connected to AUDIO, and terminal 3 is connected to GND.
 - 1P15:** A 2-terminal block with terminals 1 and 2. Terminal 1 is connected to the BLK-YEL wire, and terminal 2 is connected to the BLK wire.
 - 8P9:** A 2-terminal block with terminals 1 and 2. Terminal 2 is connected to the BLK-YEL wire, and terminal 1 is connected to the BLK wire.
 - 8J9:** A 2-terminal block with terminals 1 and 2. Terminal 1 is connected to the BLK wire, and terminal 2 is connected to the BLK-YEL wire.

Preliminary Cabinet Wiring Diagram

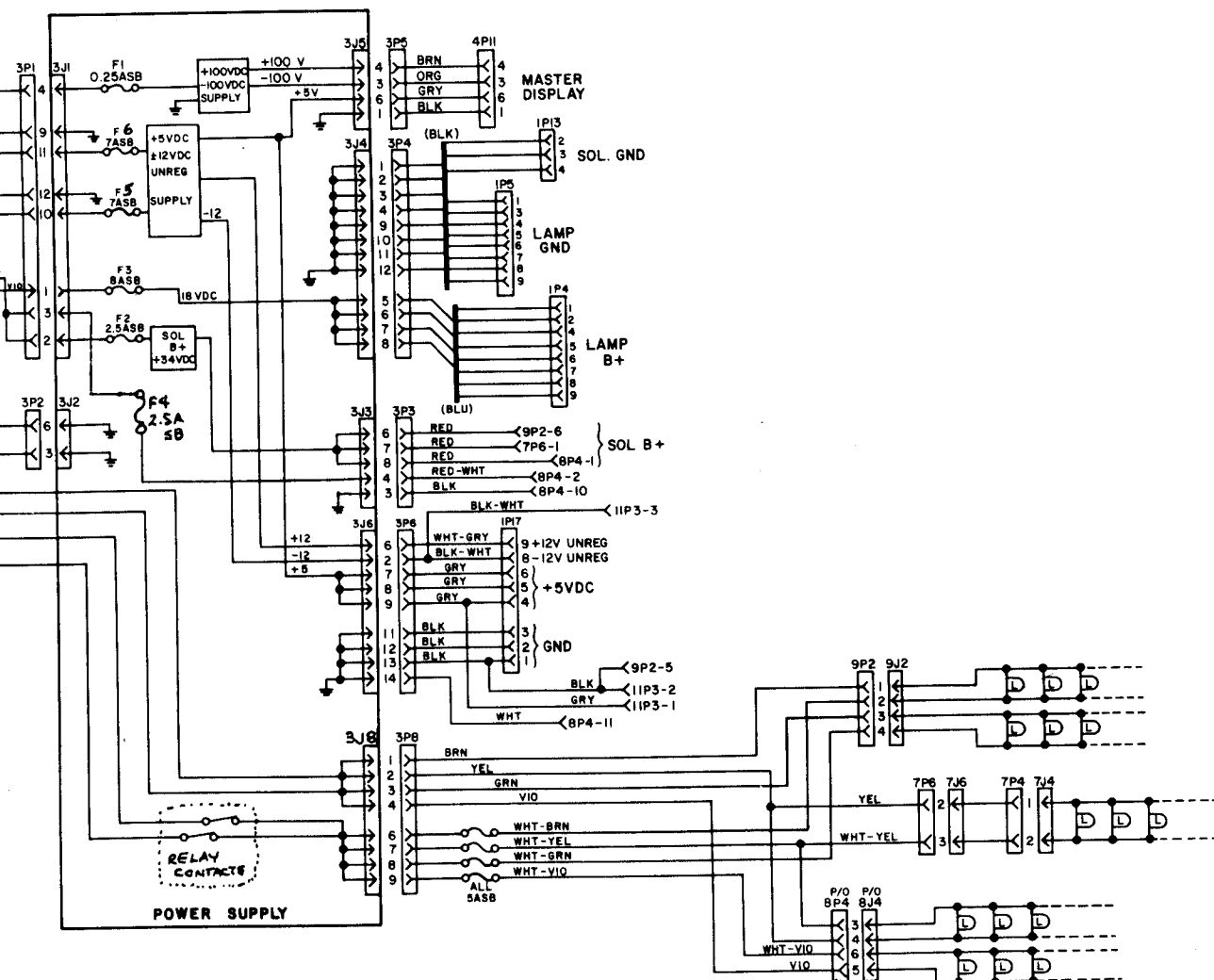
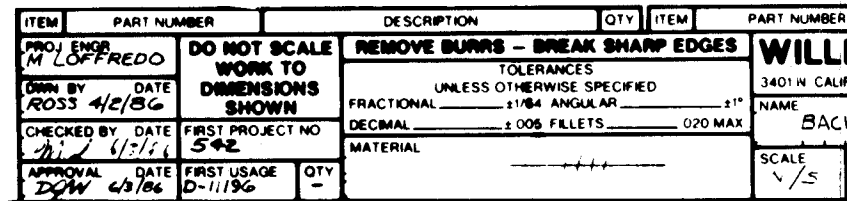


CHART (Transformer)	
230 VAC	103.5 VAC
7P5 1 2 3 4 5 6 7 BLK WHT	7P5 1 2 3 4 5 6 7 BLK WHT
4 ASB	8 ASB
275 V	130 V

VARISTOR: 5017-09063-00
 VARISTOR: 5017-09044-00
 4 ASB: 5731-06314-00
 8 ASB: 5730-09252-00

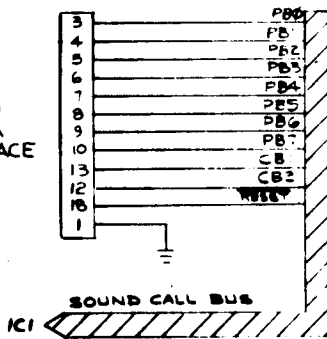
This is a representative diagram, typical of the usual pinball power wiring.
 The correct diagram will be included in Amendment 1 for Road Kings.

Preliminary Power Wiring Diagram



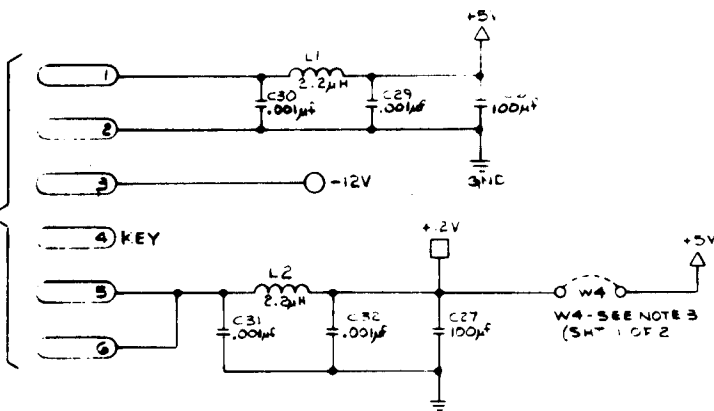
REV	DESCRIPTION OF CHANGE	ECN NO	DATE
	N. P. R.	15455	2-2-86
	SEE COVER SHEET	15455	2-10-86

J4
CPU
DATA
INTERFACE



IB1 FMI
IA1 FMB
ID1 BG SOUND

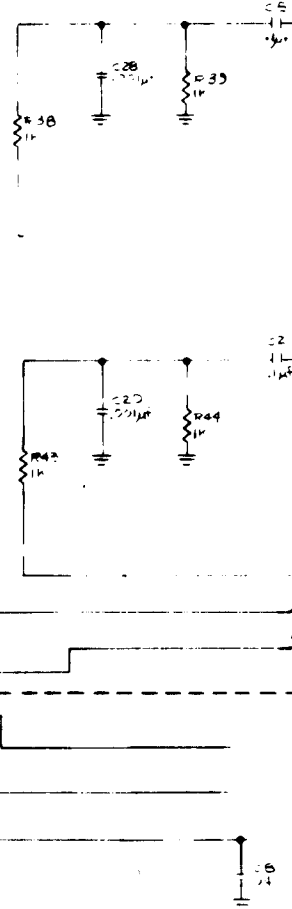
J3
POWER



MIXING RESISTOR CHART

GAME	RES.	R27	R28	R29	R30
ROAD KINGS		+	+	+	+

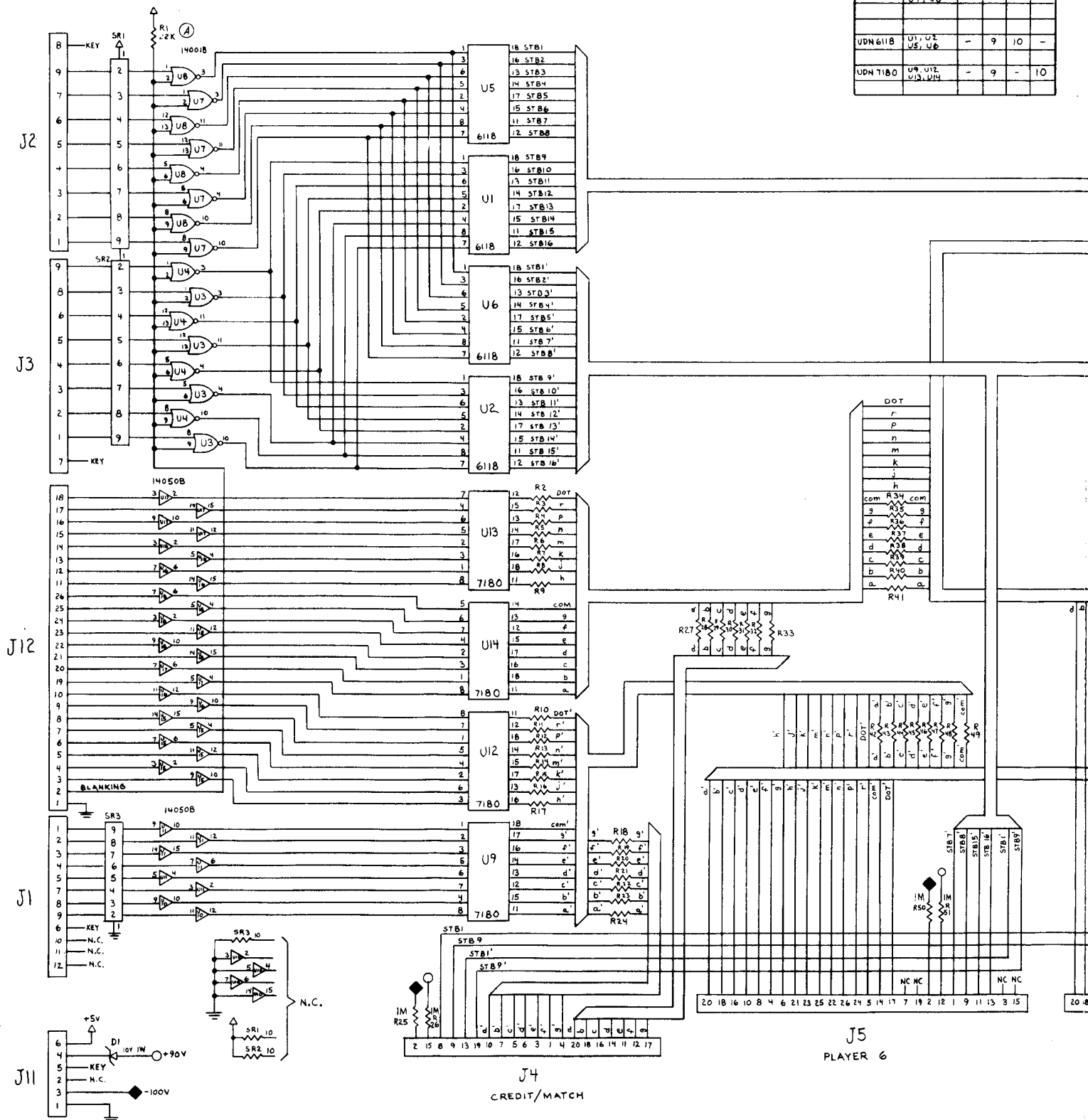
+ DENOTES NOT USED



1

1

POWER TABLE					
TYPE	REF. DESIG.	+5V	GND	+90	-100
14050	U10, U11 U12 - U18	1	8	-	-
14001	U3, U4 U7, U8	14	7	-	-
UDN611B	U1, U2 U5, U6	-	9	10	-
UDN7180	U9, U12 U13, U14	-	9	-	10



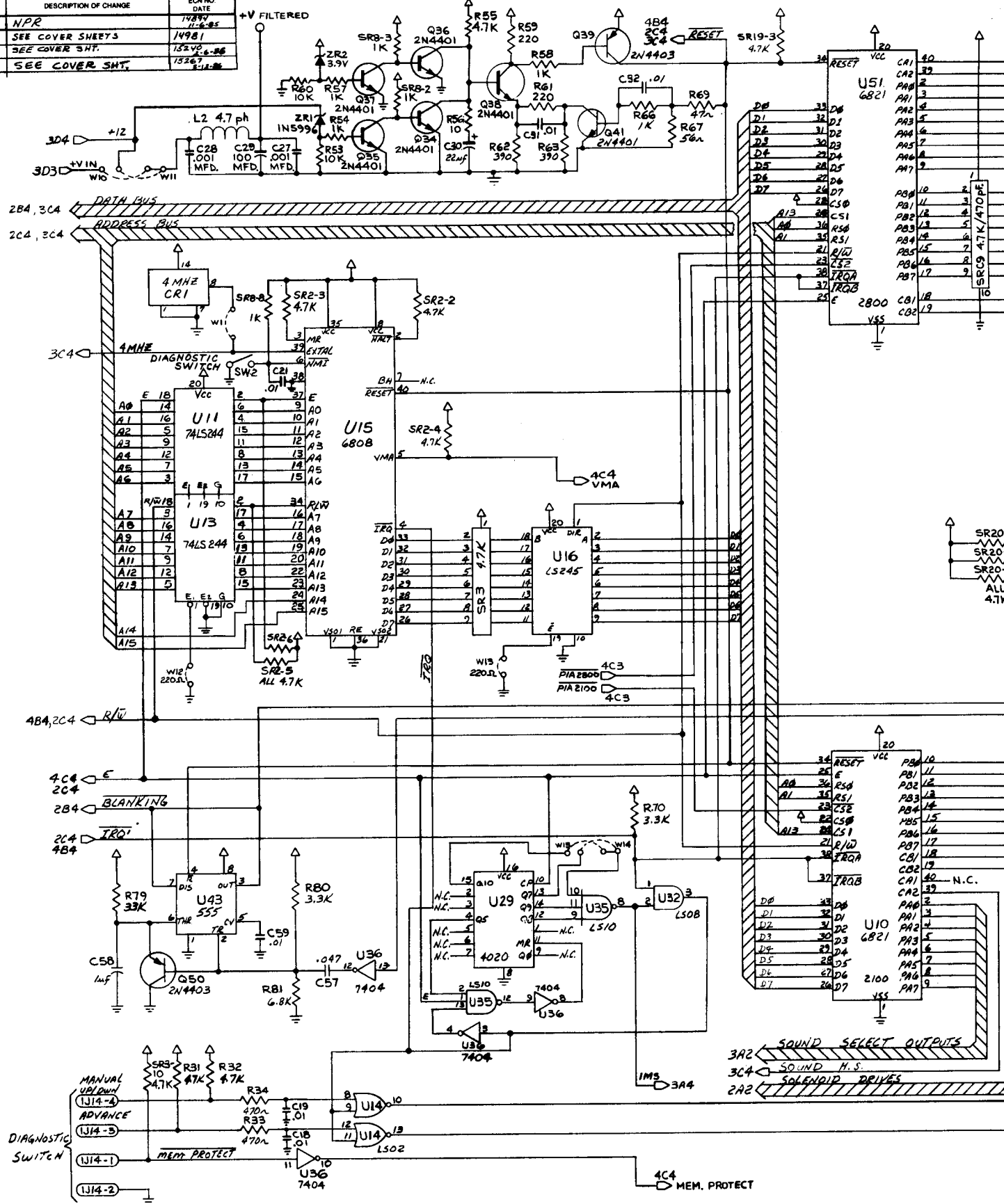
REV	DESCRIPTION OF CHANGE	ECN NO
		DATE
	NPR	14899
		12-6-85
A	SEE COVER SHEETS	14981
B	SEE COVER SMT.	15267
C	SEE COVER SMT.	15267

D

C

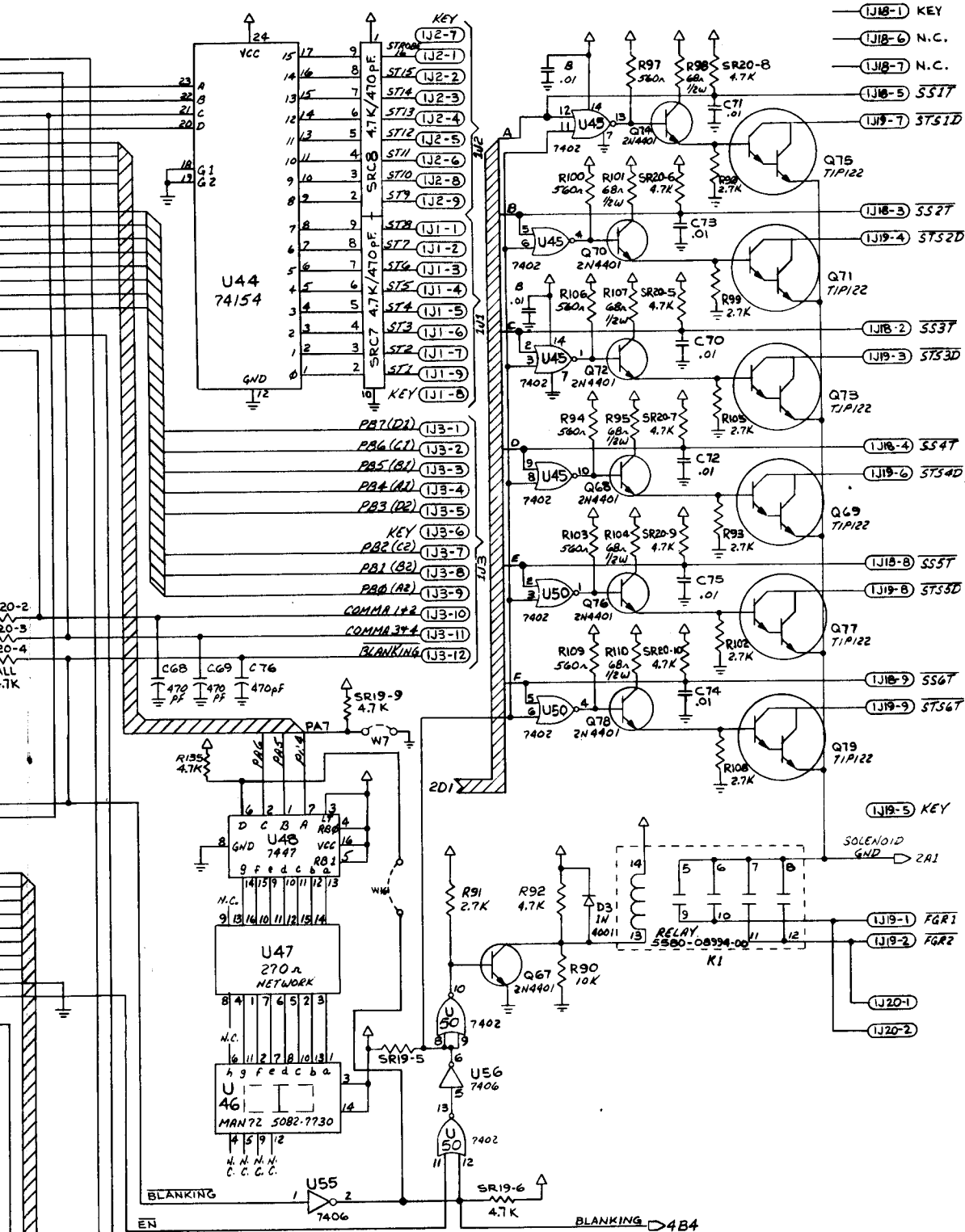
B

A



4

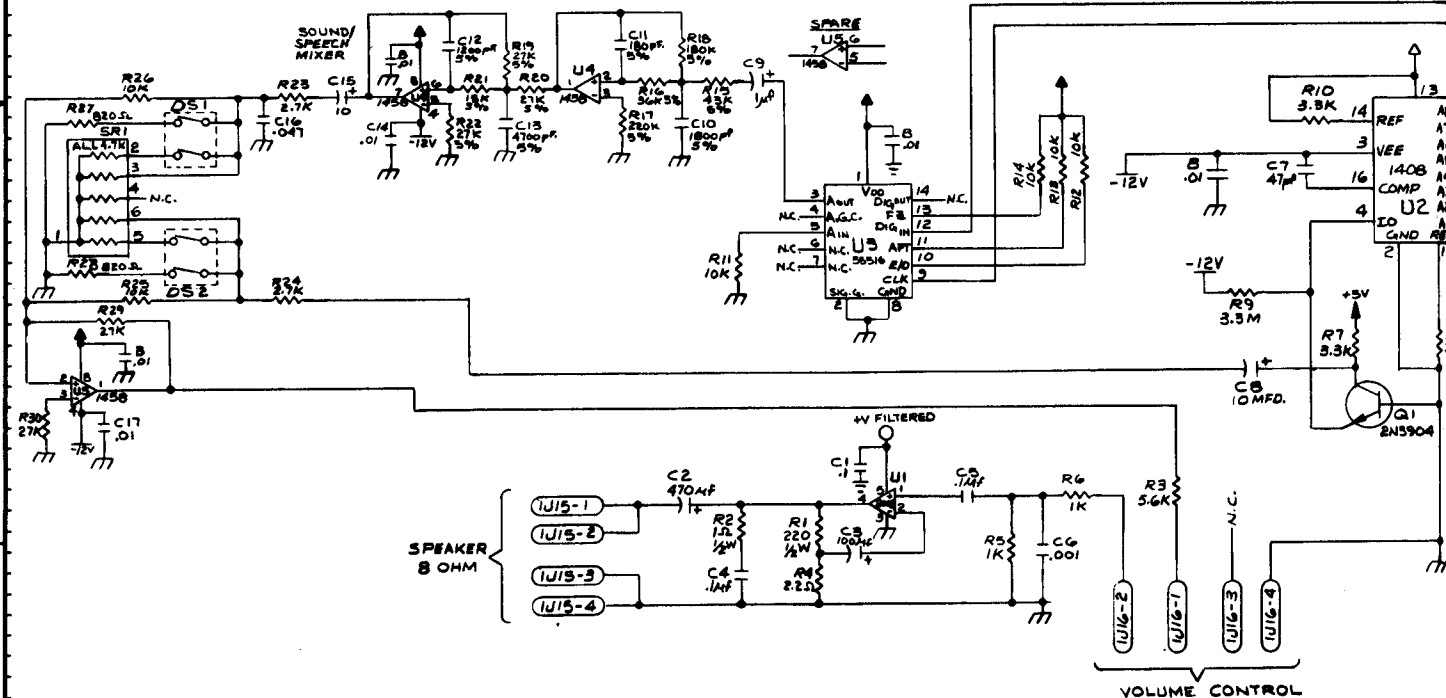
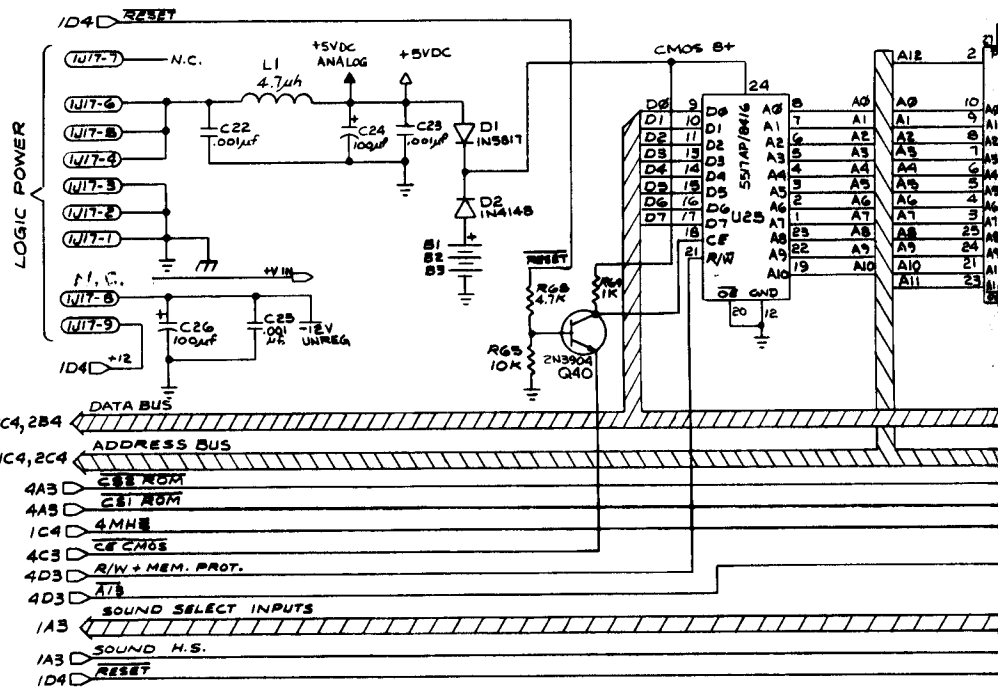
3



ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY
PROJ. ENGR M. LOFFREDO	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS - BREAK SHARP EDGES		WILLIAMS ELECTRONICS, INC.			
OWN BY ROSS 9-11-85	DATE	TOLERANCES UNLESS OTHERWISE SPECIFIED		3401 N. CALIFORNIA AVE	CHICAGO IL	60618	
CHECKED BY DATE	FIRST PROJECT NO. 541	FRACTIONAL ±1/64 ANGULAR ±1°		NAME SCHEMATIC, CPU SYS 11			
APPROVAL DATE	FIRST USAGE D-10880	DECIMAL ±.005 FILLETS ±.020 MAX		SCALE X	SHT 1 OF 4	PART NO 16-8947	REV C

Schematic, System 11 CPU (16-8947, Sheet 1 of 4)

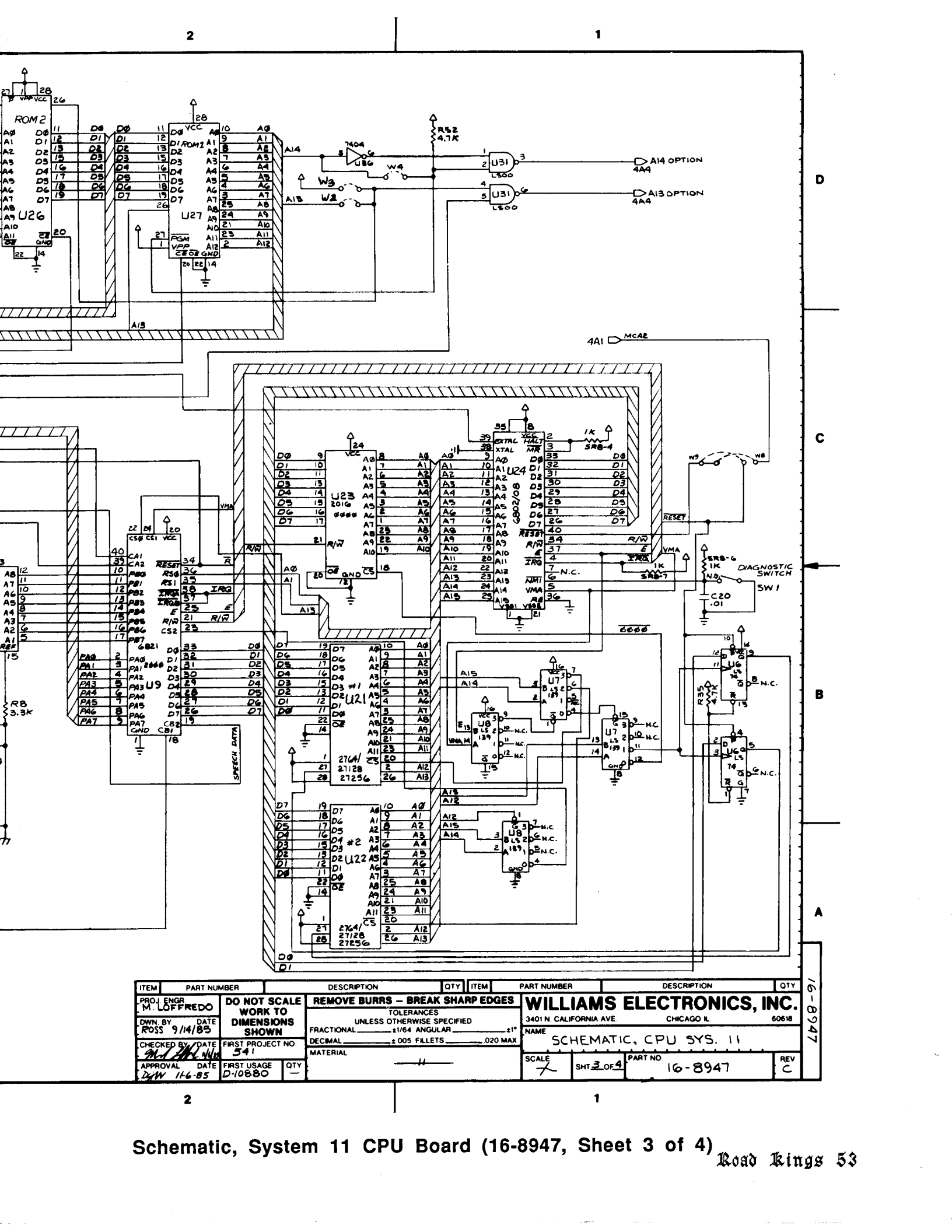
REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N.P.R.	1498-85
A	SEE COVER SHEETS	1498-85
B	SEE COVER SMT	15240 2-6-86
C	SEE COVER SMT	15267 2-12-86



SPEAKER
8 OHM

VOLUME CONTROL

1A3 DMS



ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY
PROJ ENGR M. LOFFREDO	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS - BREAK SHARP EDGES		WILLIAMS ELECTRONICS, INC.			
DWN BY ROSS 9/14/85	DATE 9/14/85	FRACTIONAL UNLESS OTHERWISE SPECIFIED	±1/64 ANGULAR ±.020 MAX	3401 N. CALIFORNIA AVE CHICAGO IL 60618			
CHECKED BY DATE	FIRST PROJECT NO 541	DECIMAL ±.005 FILETS		NAME SCHEMATIC, CPU SYS. 11			
APPROVAL DATE	FIRST USAGE D-10880	MATERIAL		SCALE X	SHT 3 OF 4	PART NO 16-8947	REV C

REV	DESCRIPTION OF CHANGE	EON NO DATE
	N. P. R.	14894 10-8-85
A	SEE COVER SHEETS	14981 11-19-85
B	SEE COVER SHT.	15240 2-5-86
C	SEE COVER SHT.	15267 5-13-86

1A3 MEM. PROTECT

2C4 1B4 E

1C3 VMA

2C4 1B4 R/W

3C4 2C4 1D4 RESET

2C4 1A4 IRQ'

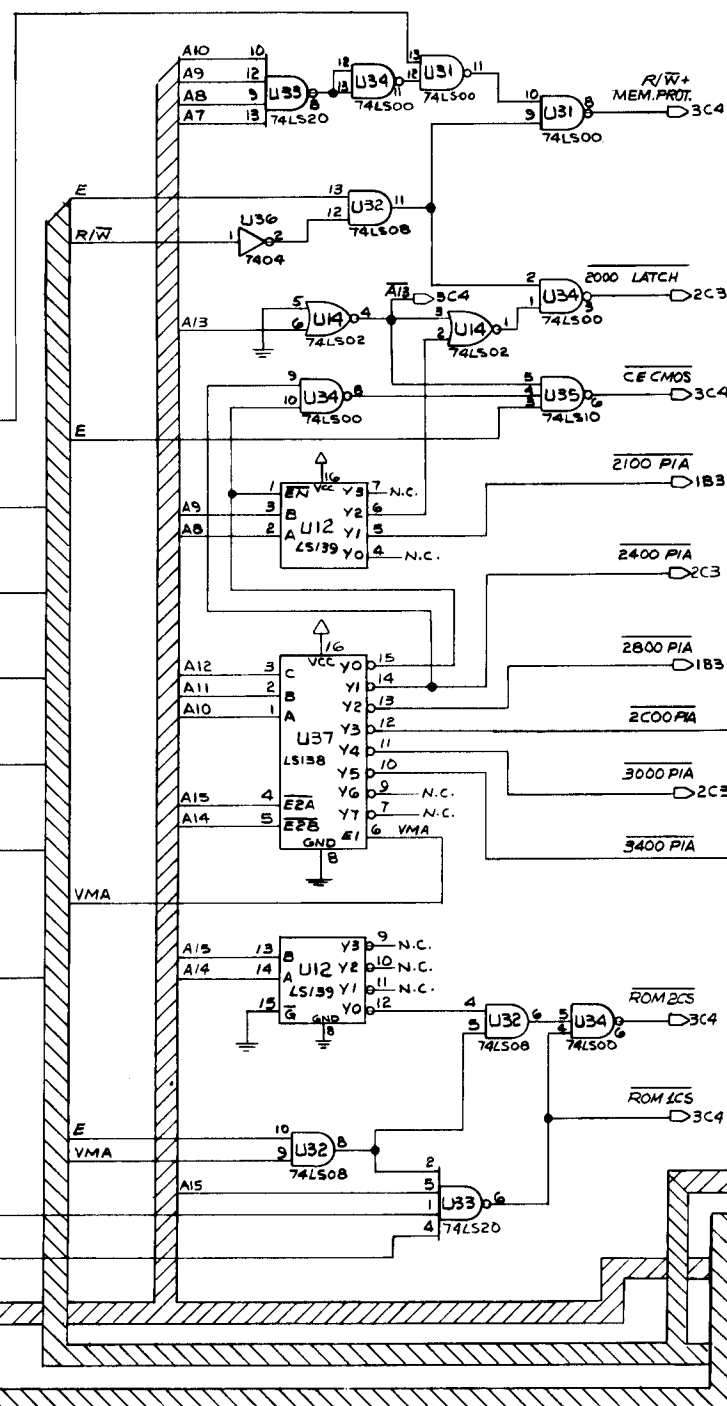
1A1 BLANKING

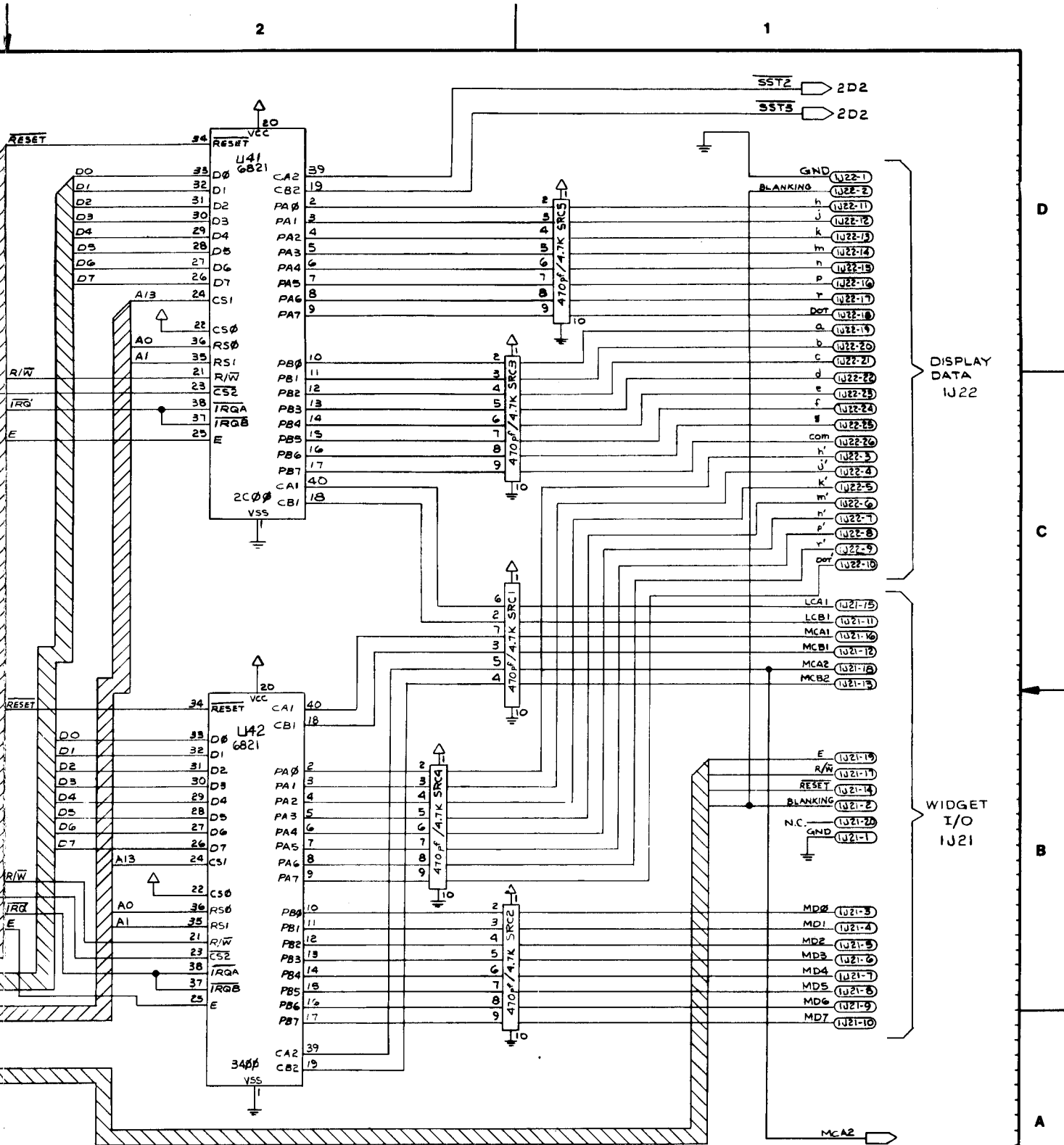
3D1 A14 OPTION

3D1 A13 OPTION

ADDRESS
BUS

DATA
BUS





ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY
PROJ ENGR M. LOFFREDO	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS - BREAK SHARP EDGES		WILLIAMS ELECTRONICS, INC.			
OWN BY ROSS	DATE 8/1/85	TOLERANCES UNLESS OTHERWISE SPECIFIED		3401 N. CALIFORNIA AVE.	CHICAGO IL	60618	
CHECKED BY DATE	FIRST PROJECT NO. 541	FRACTIONAL 1/64 ANGULAR	±"	NAME SCHEMATIC, CPU SYS 11			
APPROVAL DATE	FIRST USAGE D-10880	DECIMAL ±.005 FILLETS	±.020 MAX	SCALE N/S	SHT 4 OF 4	PART NO 16-8947	RFV C

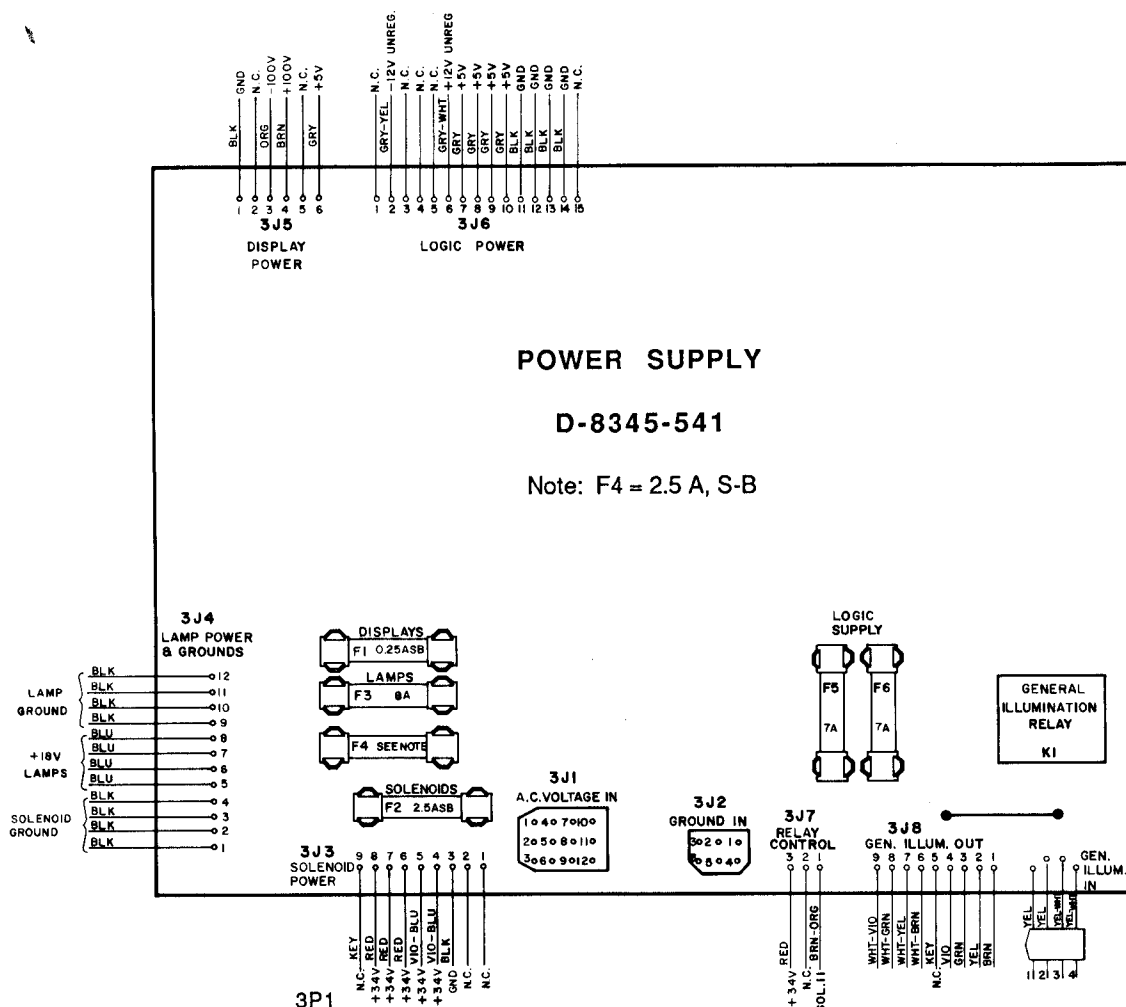
Schematic, System 11 CPU Board (16-8947, Sheet 4 of 4)

KEY
 SP SOL-3SW
 SP SOL-2SW
 SP SOL-4SW
 SP SOL-1SW
 N.C.
 N.C.
 SP SOL-5SW
 SP SOL-6SW

KEY
 SP SOL-3
 SP SOL-2
 SP SOL-4
 SP SOL-1
 SP SOL-5
 SP SOL-6

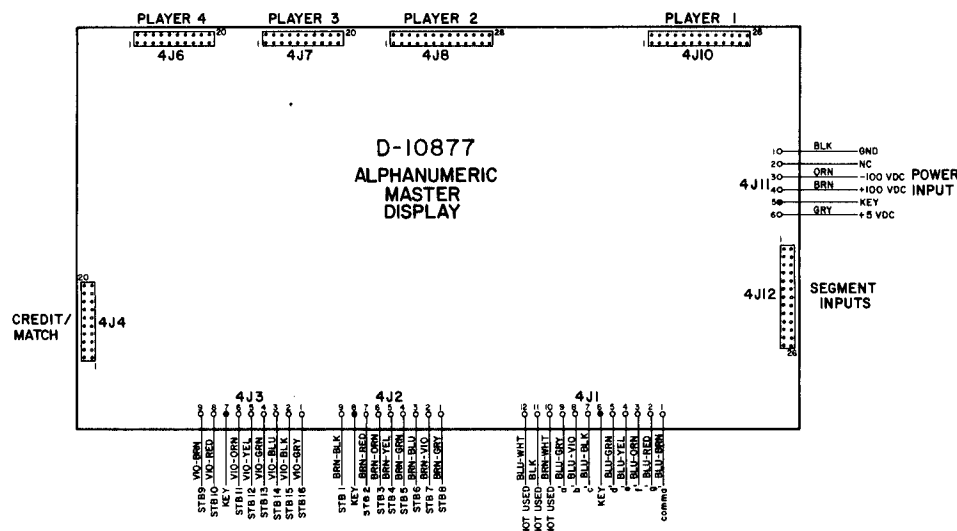
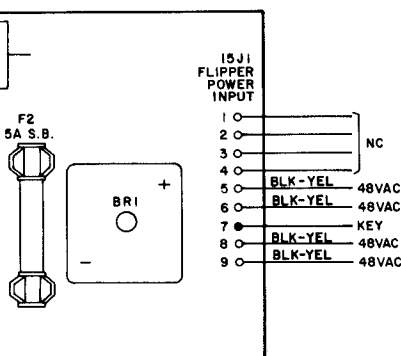
KEY

KEY

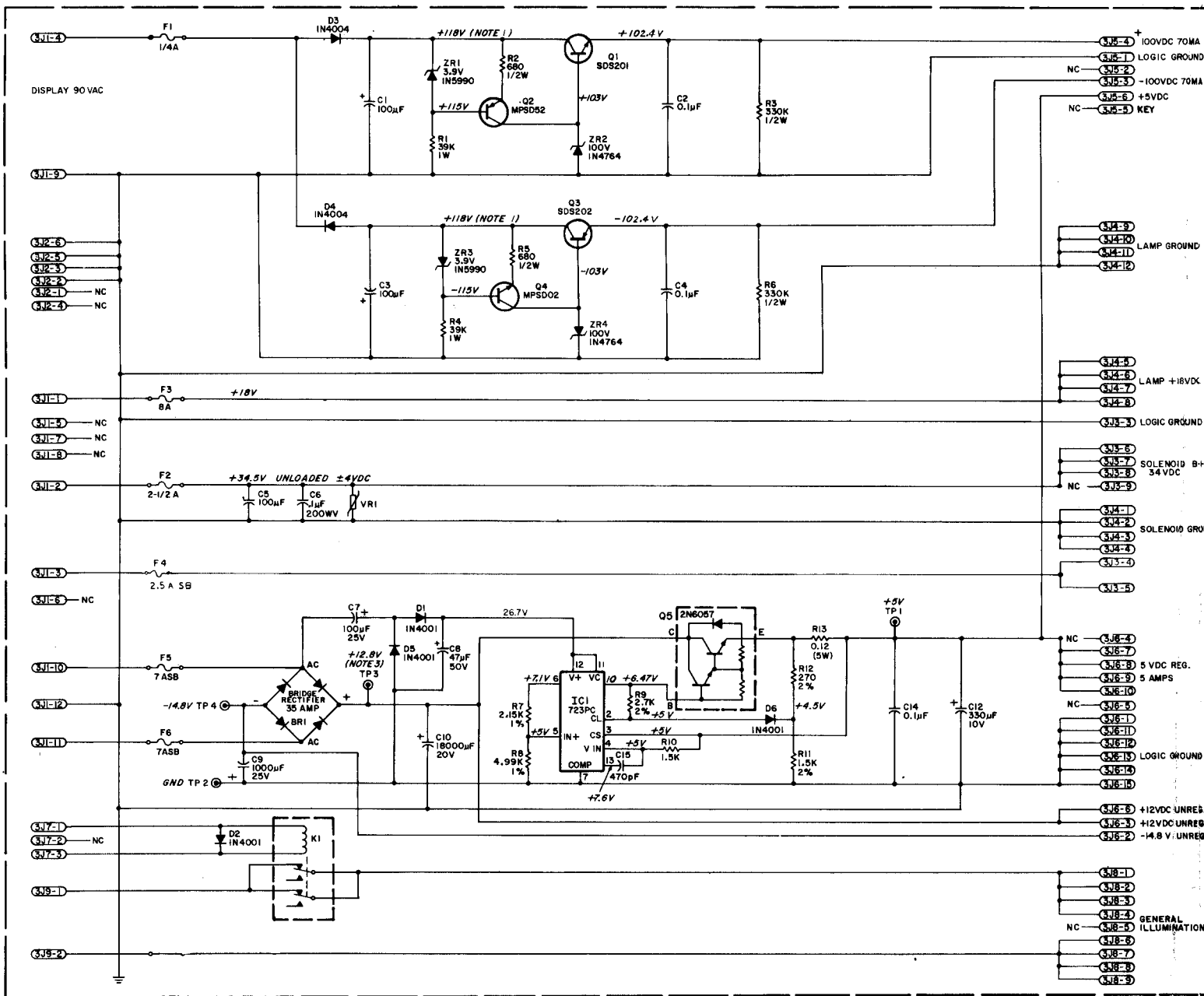


Pin	Wire Color	Connection
1	VIO	Lamp Rectifier, + 18V DC
2	ORN	Solenoid Rectifier, +34V DC
3	ORN	Solenoid Rectifier, +34V DC
4	WHT	Transformer, 88.5V AC
5	---	---
6	---	---
7	---	---
8	---	---
9	WHT	Transformer, 88.5V AC
10	GRY-GRN	Transformer, 19-4V AC, 1Ø, C.T.
11	GRY	Transformer, 19-4V AC, 1Ø, C.T.
12	GRY-WHT	Transformer, 19-4V AC, C.T. Com.

Pin	Wire Color	Connection
1	---	---
2	---	---
3	BLK	Lamp Rectifier (Gnd)
4	---	---
5	---	---
6	BLK	Lamp Rectifier (Gnd)



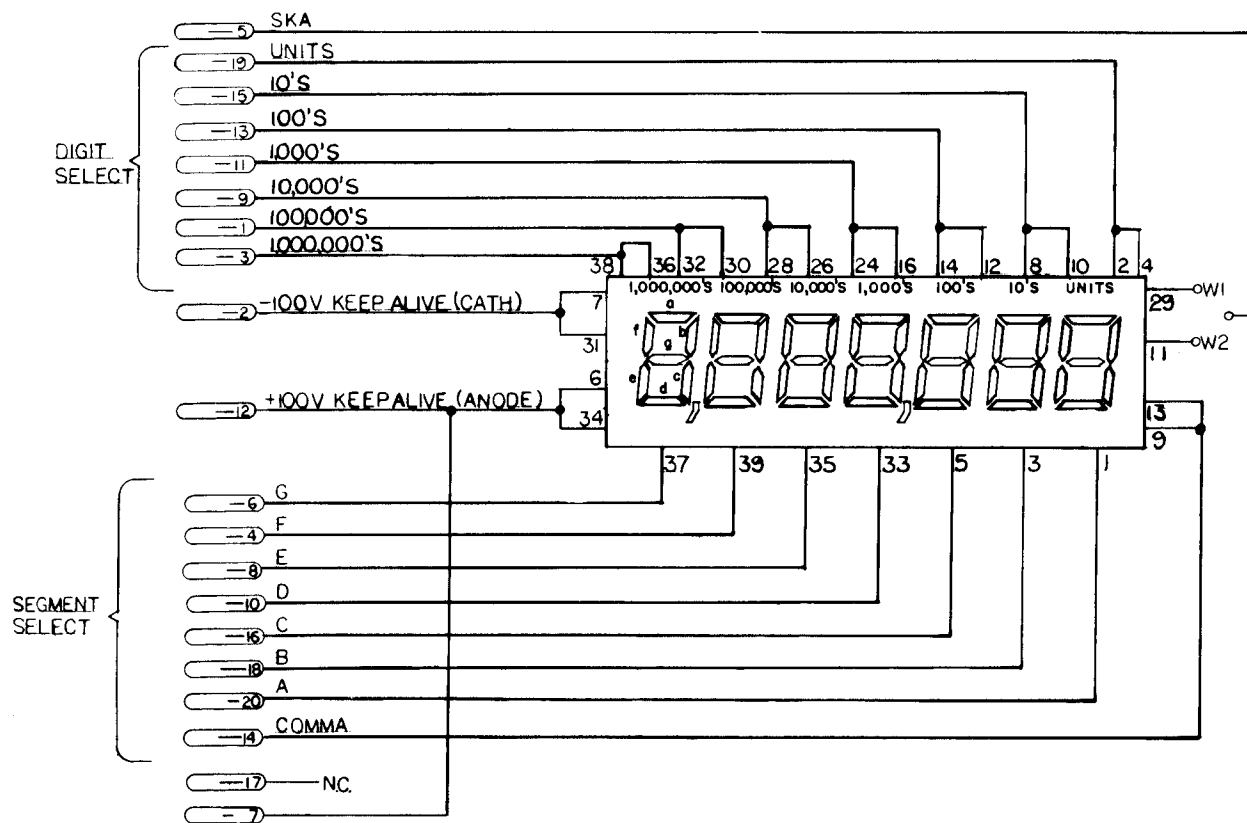
Interboards Signals Diagrams



NOTES:

1. Display voltage measured with digits display test ON, and displays at all zeroes.
2. Unless otherwise indicated, all resistors are in ohms (Ω), 1/4 watt.
3. TP3 (unregulated +12 VDC) readout should not go lower than +10.5 V, or intermittent reset will occur.

D-8345 Power Supply Schematic



C-8364 Player Score Display Schematic

ROAD KINGS Switch-Matrix Table

COLUMN ROW	1 Q45 GRN-BRN 1J8-1	2 Q49 GRN-RED 1J8-2	3 Q44 GRN-ORN 1J8-3	4 Q48 GRN-YEL 1J8-4	5 Q43 GRN-BLK 1J8-5	6 Q47 GRN-BLU 1J8-7	7 Q42 GRN-VIO 1J8-8	8 Q46 GRN-GRY 1J8-9
1 WHT-BRN 1J10-9	Plumb Bob Tilt 1	R Target 9	S Target 17	Left Jet Bumper 25	Right Ten Point 33	Right Trough 41	Not Used 49	Not Used 57
2 WHT-RED 1J10-8	Ball Roll Tilt 2	O Target 10	Lane 1 18	Right Jet Bumper 26	Upper Left Kicker 34	Left Trough 42	Not Used 50	Not Used 58
3 WHT-ORN 1J10-7	Credit Button 3	A Target 11	Lane 2 19	Bottom Jet Bumper 27	Right Rollunder 35	Left Kicker 43	Not Used 51	Not Used 59
4 WHT-YEL 1J10-6	Right Coin Chute 4	D Target 12	Lane 3 20	Left Outlane 28	Left Rollunder 36	Right Kicker 44	Not Used 52	Not Used 60
5 WHT-GRN 1J10-5	Center Coin Chute 5	K Target 13	Lane 4 21	Right Outlane 29	Left Eject 37	Left Ten Point 45	Not Used 53	Not Used 61
6 WHT-BLU 1J10-3	Left Coin Chute 6	I Target 14	Right Ramp 1 Enter (Right) 22	Drop Target 30	Center Eject 38	Playfield Tilt 46	Right Ramp 2 Exit (Left) 54	Not Used 62
7 WHT-VIO 1J10-2	Slam Tilt 7	N Target 15	Ramp Raise (E O S) 23	Center Ramp - Enter 31	Ball Shooter 39	Left Flipper (E O S) 47	Not Used 55	Not Used 63
8 WHT-GRY 1J10-1	High-Score Reset 8	G Target 16	Top Jet Bumper 24	Center Ramp - Right Exit 32	Outhole 40	Right Flipper (E O S) 48	Not Used 56	Not Used 64

ROAD KINGS Lamp-Matrix Table

COLUMN ROW	1 Q65 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 RED-BRN 1J6-1	Game Over 1	Target "R" 9	Target "S" 17	Right - Collect Detour Value W/L 25	Right Extra Ball 33	Bonus 40,000 41	Bonus 5000 49	Not Used 57
Q81 RED-BLK 1J6-2	Match 2	Target "O" 10	Lane "1" 18	Left Timelock 26	Mega-Score 34	Bonus 60,000 42	Bonus 6000 50	Not Used 58
Q82 RED-ORN 1J6-3	Shoot Again (Backbox) 3	Target "A" 11	Lane "2" 19	Center Timelock 27	2X 35	Bonus 80,000 43	Bonus 7000 51	Not Used 59
Q83 RED-YEL 1J6-5	Ball In Play 4	Target "D" 12	Lane "3" 20	Power Kick 28	3X 36	Cruise Again 44	Bonus 8000 52	Not Used 60
Q84 RED-GRN 1J6-6	Hold Bonus 5	Target "K" 13	Lane "4" 21	Right Special 29	4X 37	Bonus 1000 45	Bonus 9000 53	Not Used 61
Q85 RED-BLU 1J6-7	Spots Letter 6	Target "I" 14	Bonus Hold- over W/L 22	Left Special 30	5X 38	Bonus 2000 46	Center Extra Ball 54	Not Used 62
Q86 RED-VIO 1J6-8	Left Lock 7	Target "N" 15	All Scores Double 23	Right Timelock 31	Bonus 10,000 39	Bonus 3000 47	Detour When Lit 55	Not Used 63
Q87 RED-GRY 1J6-9	Center Lock 8	Target "G" 16	Left - Collect Detour Value W/L 24	Right Lock 32	Bonus 20,000 40	Bonus 4000 48	Not Used 56	Not Used 64

WARNINGS & NOTICES

WARNING

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All games that leave *WILLIAMS'* plants have been tested and found to comply with FCC Rules. Because the sticker is proof of this fact, legal repercussions to the owner and distributor of the game may result, if the sticker is missing. If you receive any *WILLIAMS'* game, manufactured after December 1982, that has no FCC sticker, call *WILLIAMS'* for advice or write us a note on your Game Registration Card. Be sure that the card bears your game's serial number.

RF Interference Notice

CABLE HARNESS PLACEMENTS and ground strap routing on this game have been designed to keep RF radiation and conduction within levels accepted by the FCC Rules.

TO MAINTAIN THESE LEVELS, reposition harnesses and reconnect ground straps to their original placements, if they become disconnected during maintenance.

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ELECTRONICS GAMES, INC.

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