

CPU JUMPER TABLE

Game	CPU* Version	ROM		Jumpers	Removed
		Location	Location		
Laser Wars	Ver 1	5C		J1b,J3,J4,J6a,J7a,&J8	J1a,J2,J5,J6,&J7b
	Ver 2	5C		J1b,J3,J4,J5a,J6a,J7b,&J8	J1a,J2,J5,J5b,J6b,&J7a
Secret Service	Ver 2	5B,5C		J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Torpedo Alley	Ver 2	5B,5C		J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Time Machine	Ver 2	5B,5C		J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a

*Version 1 has a 2K RAM which is a 24-pin IC at location 5D.

*Version 2 has an 8K RAM which is a 28-pin IC at location 5D.

Power-up CPU Self Tests

Upon power-up, the CPU board performs a series of self tests of major components. Turn the game on while observing the LEDs on the CPU board. Tests of the PIAs, RAM, and EPROMs are performed automatically and results of the test are indicated by the PIA LED.

With all tests passed, the LEDs illuminate in the following sequence at power turn-on. The PIA and +5V LEDs illuminate immediately. Approximately 1/2-second later the PIA LED goes out and the Blanking LED illuminates; the +5V and Blanking LEDs remain illuminated until the game is turned off. Test failures are indicated with the PIA LED:

PIA LED

- Stays On
- Flashes 1 Time
- Flashes 2 Times
- Flashes 3 Times

SUSPECT COMPONENT

- One of the 6821 PIAs
- 6064 RAM at location D5.
- EPROM at location B5.
- EPROM at location C5.

QUICK REFERENCE FUSE CHART

FPB BOARD

- F1 5A Sio-Bio G.I. 6.3VAC
- F2 5A Sio-Bio G.I. 6.3VAC
- F3 5A Sio-Bio G.I. 6.3VAC
- F4 5A Sio-Bio G.I. 6.3VAC
- F5 5A Sio-Bio Flipper Power 48VAC
- F6 3A Sio-Bio PPB Solenoids/Flash Lamps (34VDC)

POWER SUPPLY BOARD

- F1 7A Sio-Bio + 5VDC Regulator Input (9VAC)
- F2 7A Sio-Bio + 5VDC Regulator Input (9VAC)
- F3 0.25A Sio-Bio Display Reg. Input (90VAC)
- F4 8A Sio-Bio Switched Illumination Buss (18VDC)
- F5 3A Sio-Bio Solenoid Buss (34VDC)
- F6 5A Sio-Bio Solenoid Buss (34VDC)

AUDIT FUNCTIONS

There are 70 audit functions provided for accounting purposes and for evaluation of game difficulty adjustments. Audit functions are split into two groups. There are eleven most-used audits (AU01 through AU11) in a 'quick look' group and 58 less-used audits (E AU13 through E AU70), in an 'expanded' group. The various auditing functions are summarized in the **AUDITING FEATURES TABLE** and, when accessed, are shown on the player score displays. The **Audit Number** is shown in the Player 3 Display, the **Description** in the Player 1 and 2 Displays, and the **Audit Total** in the Player 4 Display. Access and control is provided from switches located on the inside of the coin door.

To access audit functions, open the coin door and make sure that the FORWARD/REVERSE switch is in the FORWARD (up) position. Depress the STEP switch and the game name is shown in the Player 1 and 2 displays, the Player 3 display is blank, and the PROM revision level is shown in the Player 4 display. This indicates access to audit functions.

With the FORWARD/REVERSE push-button switch still in the FORWARD (up) position, depressing the STEP push-button switch advances through the audit functions one at a time. To review lower-numbered functions, set the forward/reverse push-button switch to the REVERSE (down) position and operate the STEP push-button switch.

To access expanded audits, operate the step push-button until AU12, EXPAND AUDITS is displayed. Set the choice to ON as indicated in the Player 4 display by depressing the Credit push-button and then depress the step push-button. The request is installed and E AU13 is displayed. When you exit audits and adjustments, the AU12 setting is returned to off for the next time that a review of audits are required.

Audit totals may be reset to zero using Game Adjustment Ad17, Audits Reset. Game adjustments (Ad01 to Ad19 and E Ad20 to E Ad60) begin after the last audit function (AU12 or E AU70). Once audits functions have been recorded, and if no adjustments are required, you may return the game to the attract mode. If adjustments are required, continue pressing the STEP button until the game adjustments are reached. See Game Adjustments for details.

Audit Number (Player 3 Display)	Audit Description (Players 1 & 2 Displays: Audits in Player 4 Display)	Audit Number (Player 3 Display)	Audit Description (Players 1 & 2 Displays: Audits in Player 4 Display)
AU 01	Total Paid Credits	E AU 36	Return 1970
AU 02	Percent Free	E AU 37	1980 LI
AU 03	Average Ball Time	E AU 38	Return 1980
AU 04	Coins Left	E AU 39	1990 LI
AU 05	Coins Right	E AU 40	Return 1990
AU 06	Coins Center	E AU 41	Laser Kick Scored
AU 07	Replay Percent	E AU 42	Laser Kick Hit
AU 08	High Score Percent	E AU 43	Left Ramp
AU 09	Extra Ball Total	E AU 44	Center Ramp
AU 10	Extra Ball Percent	E AU 45	Right Ramp
AU 11	Cycles Burn In	E AU 46	Mini Jackpot Scored
AU 12	Expand Audits (ON/OFF)	E AU 47	Left E = MC ²
E AU 13	Plays Total	E AU 48	Right E = MC ²
E AU 14	Free Total	E AU 49	Special LI
E AU 15	Replay Total	E AU 50	Special Scored
E AU 16	Special Total	E AU 51	Jackpot Scored
E AU 17	Special Percent	E AU 52	25K Lanes
E AU 18	Match Total	E AU 53	50K Lanes
E AU 19	High Score Awards	E AU 54	100K Lanes
E AU 20	Play Time (Minutes)	E AU 55	Bonus Hold
E AU 21	Balls Total	E AU 56	Top Extra Ball
E AU 22	Replay 1 Awards	E AU 57	2x Scores
E AU 23	Replay 2 Awards	E AU 58	Star Warp LI
E AU 24	Replay 3 Awards	E AU 59	Star Warp Scored
E AU 25	Replay 4 Awards	E AU 60	Drain Left
E AU 26	Games 1 Player	E AU 61	Drain Right
E AU 27	Games 2 Player	E AU 62	2x Bonus
E AU 28	Games 3 Player	E AU 63	3x Bonus
E AU 29	Games 4 Player	E AU 64	4x Bonus
E AU 30	Cycles Attract Mode	E AU 65	5x Bonus
E AU 31	Cycles High Score Reset	E AU 66	Lane Extra Ball
E AU 32	Enter 3 Ball	E AU 67	1990 Extra Ball
E AU 33	Percent 3 Ball	E AU 68	Buy In Games
E AU 34	Percent Lock Ball	E AU 69	Average Game Time
E AU 35	1970 LI	E AU 70	

GAME ADJUSTMENTS

There are 60 adjustable functions provided to vary difficulty of play and to periodically reset audits and the high score levels. The various game adjustments are summarized in the **Game Adjustments Table** and, when accessed, are shown on the player score displays. The **Adjustment Number** is shown in the Player 3 Display, the **Description** in the Player 1 and 2 Displays, and the **Setting** in the Player 4 Display. Access and control is provided from switches located on the inside of the coin door.

Game adjustments are accessed from the audit mode. With the audits displaying game identification and the FORWARD/REVERSE switch in the REVERSE (down) position, depress the STEP switch and E Ad60 (Expanded Adjustment 60) is shown in the Player 3 display. FACTORY RESET is shown in the Player 1 & 2 displays, and OFF is shown in the Player 4 display. With the audits displaying AU12 (or expanded E Ad70) and the FORWARD/REVERSE switch in the FORWARD (up) position, depress the STEP switch and Ad01 is shown in the Player 3 display, REPLAY MANUAL/FIXED is shown in the Player 1 and 2 displays, and the setting is shown in the Player 4 display.

With the FORWARD/REVERSE switch in the FORWARD (up) position, depressing the STEP switch advances through the game adjustments one at a time. With it in the REVERSE (down) position, the STEP switch selects lower-numbered adjustments. To rapidly scroll through adjustments, hold the STEP switch depressed. Adjustment values are changed by operating the GAME START switch. The FORWARD/REVERSE switch setting determines whether the values are increased or decreased. (With the FORWARD/REVERSE switch up, the value increases, with it down, the value decreases). When the STEP switch is depressed the Player 1 and 2 displays indicate REQUEST INSTALLED.

CUSTOM PRICING TABLE

Coin Mechs	Center	Plays/Coins	Adjustment Numbers							
			14	19	38	39	40	41	42	
25c	\$1.00	1/25c 3/50c 1/25c 5/\$1.00 1/25c 6/\$1.00	Custom	ON	01	01	04	01	04	02
5SCH	10SCH	1/10 SCH 1/10 SCH 4/30SCH	Custom	ON	01	02	02	02	06	00
20c	\$1.00	1/20c 1/60c 2/\$1.00	Custom	ON	01	05	00	01	03	05
10P	50P	1/10P 6/50P 1/20P 3/50P	Custom	ON	01	01	05	01	05	05

INSTALL ADJUSTMENT TABLE

Install Adjustment	Ad 05 Extra easy	Ad 07 Easy	Ad 08 Factory	Ad 09 Hard	Ad 10 Extra Hard
E Ad 49 General Scores	EASY	FACTORY	FACTORY	FACTORY	HARD
E Ad 50 General Timer	EASY	EASY	FACTORY	FACTORY	HARD
E Ad 51 General Spotting	EASY	EASY	FACTORY	HARD	HARD
E Ad 52 General Memory	EASY	FACTORY	FACTORY	HARD	HARD
E Ad 53 Starwarp Memory	HOLD	HOLD	HOLD	1 PLAYER	RESET
E Ad 55 Extra Ball 1950	ON	ON	ON	OFF	OFF
E Ad 56 Extra Ball 8x	ON	ON	ON	ON	HARD
E Ad 57 Lane Percent	EASY	FACTORY	FACTORY	HARD	HARD
E Ad 58 Laser Kick	EASY	EASY	FACTORY	HARD	HARD

GAME ADJUSTMENT TABLE

Adjustment Number (Player 3)	Description (Players 1 & 2)	Factory Setting (Player 4)
Ad 01	REPLAY/MANUAL	1000
Ad 02	START REPLAY/LEVEL 1 REPLAY	1,000,000
Ad 03	LEVEL 3 REPLAY	01
Ad 04	LEVEL 4 REPLAY	01
Ad 05	EASY RULES	OFF
Ad 06	EASY RULES	OFF
Ad 07	EASY RULES	ON
Ad 08	HARD RULES	OFF
Ad 09	HARD RULES	OFF
Ad 10	NOVELTY RULES	OFF
Ad 11	NOVELTY RULES	OFF
Ad 12	5 BALL RULES	OFF
Ad 13	ADDBALL RULES	OFF
Ad 14	STANDARD/CUSTOM PRICING	LIGHT CUSTOM
Ad 15	AVERAGE BALL TIMER	ON
Ad 16	COIN RESET	OFF
Ad 17	AUDITS RESET	OFF
Ad 18	HIGH SCORE RESET	OFF
Ad 19	EXPAND ADJUSTMENTS	OFF
E Ad 20	AWARDS REPLAY	OFF
E Ad 21	AWARDS SPECIAL	CREDITS
E Ad 22	MATCH FEATURE	CREDITS
E Ad 23	BALLS/GAME	03
E Ad 24	WARNING TILT	01
E Ad 25	MAXIMUM EXTRA BALL	OFF 1
E Ad 26	CREDITS MAXIMUM	30
E Ad 27	SCORES HIGHEST	ON
E Ad 28	CREDITS HSCHR 1	03
E Ad 29	CREDITS HSCHR 2	00
E Ad 30	CREDITS HSCHR 3	00
E Ad 31	CREDITS HSCHR 4	00
E Ad 32	BACKUP HSCHR 1	5,000,000
E Ad 33	BACKUP HSCHR 2	4,000,000
E Ad 34	BACKUP HSCHR 3	3,000,000
E Ad 35	BACKUP HSCHR 4	2,500,000
E Ad 36	HSRESET EVERY	700
E Ad 37	FREE PLAY	OFF
E Ad 38	LEFT COIN PULSES	1
E Ad 39	RIGHT COIN PULSES	30
E Ad 40	CENTER COIN PULSES	1
E Ad 41	PULSES FOR CREDIT	1
E Ad 42	PULSES FOR BONUS CREDIT	1
E Ad 43	MESSAGE CUSTOM	ON
E Ad 44	TEXT	ON
E Ad 45	ATTITUDE MUSIC	ENGLISH
E Ad 46	FEATURE	ALL
E Ad 47	CHIMES	ON
E Ad 48	FLASH LAMPS	ON
E Ad 49	GENERAL SCORES	FACTORY
E Ad 50	GENERAL TIMER	FACTORY
E Ad 51	GENERAL SPOTS	FACTORY
E Ad 52	GENERAL MEMORY	FACTORY
E Ad 53	STARWARP SCORES	FACTORY
E Ad 54	STARWARP MEMORY	1,000,000
E Ad 55	EXTRA BALL 1950	ON
E Ad 56	EXTRA BALL 8x	ON
E Ad 57	LANE PERCENT	ON
E Ad 58	LASER KICK	FACTORY
E Ad 59	KLACKER WARNING	ON
E Ad 60	FACTORY RESET	OFF

GAME DIAGNOSTICS

The Data East Pinball system provides tests for sounds, digital displays, lamps, switches, and solenoids. Each feature may be tested manually or automatically using the STEP and FORWARD/REVERSE push-button switches inside the coin door and the Game Start push-button switch on the front of the cabinet. The automatic tests may be used for a quick verification of automatic test functions and the manual tests, for troubleshooting.

ENTERING DIAGNOSTICS

With the game in the game-over mode, open the coin door and make sure that the FORWARD/REVERSE push-button switch is set to REVERSE (down) and depress the STEP push-button switch. The Player displays will show the tollfree Customer Service number 1-800-KICKERS; that is 1-800-542-5377 (outside Illinois) and the toll number (312) 345-7700 (inside Illinois). This indicates entry into game diagnostics.

SOUND TESTS

The Data East Pinball sound system produces true digital stereo sound on left and right speakers and mono on a center speaker. During Sound Tests, the Player 1 and 2 displays show the sound board circuit under test and the corresponding sounds are produced. Refer to the Sound Test Chart for the sound circuits displayed and the sounds produced.

The sine wave functions allow verification that all channels are functioning properly and that the speaker connections are correct. Speaker Phase Testing procedures follow for checking speaker connections.

SOUND TEST CHART

Auto/Manual Tests (Player 1 & 2)	Sounds Produced
LEFT SINE CENTER SINE VOICE ROM1 (Loc F6) VOICE ROM2 (Loc F4) MUSIC TEST (Sound ROM Loc F7)	60 CYCLE TONE (Left Speakers Only) 60 CYCLE TONE (All speakers) PRESS. FIELD; NEAT-O-SEE YA LATER ALLIGATOR PSYCHEDELIC MAN...70'S, GAG ME WITH A, FAR OUT! MUSIC

Automatic Test

With Customer Service telephone numbers displayed, depress the STEP push-button switch. Player 1 and 2 displays indicate SOUNDS AUTO and the system sequences through the test producing the sounds indicated in the Sound Test Chart.

Manual Test

Operate the STEP push-button switch during the Automatic tests until SOUNDS MANUAL is indicated in the Player 1 and 2 displays. Depressing the Game Start push-button switch allows you to advance through each sound function.

DIGITAL DISPLAY TEST

Digital displays are driven by digit and segment driver circuits. Digit drivers sequentially select individual character positions (Player 1 and 2 displays) and digit positions (Player 3 and 4 displays). Segment drivers (16 for Player 1 and 2 characters; 7 for Player 3 and 4 digits) select the individual segments of each position.

Automatic Test

To enter Display tests, operate the STEP push-button switch from the Sound Manual test. Player 1 and 2 displays indicate DISPLAY AUTO. The displays will sequence from all ZEROS to all nines in the four displays. Next all segments are lit for each digit position in sequence.

Manual Test

Operate the TEST push-button switch from the automatic test. Player 1 and 2 displays indicate DISPLAY MANUAL and then display ZEROS in all positions. Operate the Game Start push-button switch to cycle through each position of the test.

Switches

Switches are configured on an 8 x 8 matrix of columns (switch drives) and rows (switch returns) with up to 64 switches possible. The switch tests include three parts: switch test, active switches, and bad switches. Row and column wire colors are indicated in each test using corresponding resistor color code numbers.

0 = Black
1 = Brown
2 = Red
3 = Orange
4 = Yellow

5 = Green
6 = Blue
7 = Violet
8 = Grey
9 = White

Switch Test

From the Display Manual test, operate STEP push button switch. Player 1 and 2 displays indicate SWITCH TEST. Close each switch and observe the displays. The Player 1 and 2 displays will indicate the switch name, the Player 3 display indicates the row and column wire colors, and the Player 4 display indicates the switch number. When a switch is released, the name and number disappear until another switch is closed or the test is exited.

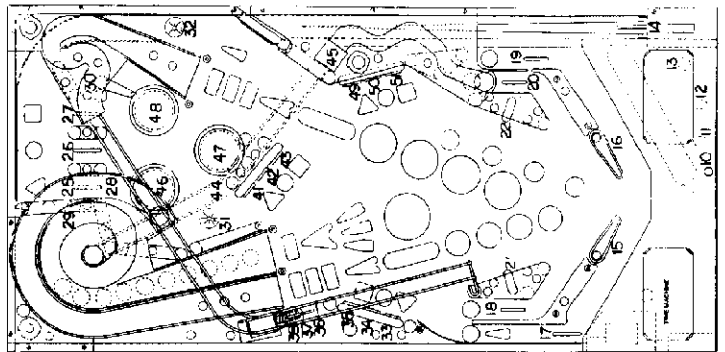
Active Switches

Operate the STEP push-button switch from the Switch Test. Player 1 and 2 Displays indicate ACTIVE SWITCHES. If any switches are stuck closed (or made from the presence of a ball), the Player 1 and 2 displays sequence through switch names, the Player 3 display indicates the row and column wire colors, and the switch numbers are indicated in the Player 4 display. This cycle continues until all switches are cleared or until the STEP push-button switch is depressed.

Bad Switches

Operate the STEP push-button switch from the Switch Test. Player 1 and 2 Displays indicate BAD SWITCHES. During game play, the system keeps track of the last game in which each switch was made. Should a switch not be made for 100 games, it is considered to be bad. If there are any, the Player 1 and 2 displays sequence through switch names, the Player 3 display indicates the row and column wire colors, and the switch numbers are indicated in the Player 4 display. This cycle continues until the STEP push-button switch is depressed.

Number	Description	Part No.	10
01*	Plumb Tilt	500-5023-00	180-5011-00
02	Not Used		180-5009-00
03	Credit Button	500-5097-00	180-5009-00
04*	Right Coin	180-5024-00	180-5010-00
05*	Center Coin	180-5024-00	500-5143-00
06*	Left Coin	180-5024-00	180-5026-00
07*	Slam Tilt	180-5022-00	180-5018-00
08	Not Used		180-5026-00
09	Not Used		180-5018-00



SWITCH MATRIX CHART

ROW (*)	COLUMN	1	2	3	4	5	6	7	8
GRN-BRN (51)	GRN-BRN (51)	Plumb	Not Used	Left	Right	Center	Trough	Left	Right
GRN-RED (52)	GRN-RED (52)	Not Used	Outlane	Left	Right	Center	Trough	Left	Right
GRN-ORN (53)	GRN-ORN (53)	Not Used	Outlane	Left	Right	Center	Trough	Left	Right
GRN-VEL (54)	GRN-VEL (54)	Left	Lane	Left	Right	Center	Trough	Left	Right
GRN-BLK (55)	GRN-BLK (55)	Left	Lane	Left	Right	Center	Trough	Left	Right
GRN-VIO (56)	GRN-VIO (56)	Center	Bank 1	Left	Right	Center	Trough	Left	Right
GRN-GRV (57)	GRN-GRV (57)	Right	Bank 1	Left	Right	Center	Trough	Left	Right
GRN-GRV (58)	GRN-GRV (58)	Right	Bank 1	Left	Right	Center	Trough	Left	Right
GRN-VIO (59)	GRN-VIO (59)	Right	Bank 2	Left	Right	Center	Trough	Left	Right
GRN-RED (60)	GRN-RED (60)	Right	Bank 2	Left	Right	Center	Trough	Left	Right
GRN-ORN (61)	GRN-ORN (61)	Right	Bank 2	Left	Right	Center	Trough	Left	Right
GRN-VEL (62)	GRN-VEL (62)	Right	Bank 2	Left	Right	Center	Trough	Left	Right
GRN-BRN (63)	GRN-BRN (63)	Right	Bank 3	Left	Right	Center	Trough	Left	Right
GRN-GRV (64)	GRN-GRV (64)	Right	Bank 3	Left	Right	Center	Trough	Left	Right

LAMP TESTS

Controlled lamps are configured on an 8 x 8 matrix of columns (lamp drives) and rows (lamp returns) with up to 64 lamps possible. The lamp tests include four cards: all lamps; lamp return (row); lamp drive (column); and discrete lamps. Row and column wire colors are indicated in the discrete lamp test using corresponding resistor color code numbers.

All Lamps

From the Bus Switch test, operate the STEP push-button switch. Player 1 and 2 displays indicate ALL LAMPS and all controlled lamps will light.

Lamp Returns

From the ALL LAMPS test, depress the STEP push-button switch. Player 1 and 2 displays indicate LAMP ROWS and the Player 4 display indicates 01 for row 1. All controlled lamps in row 1 should be lit. Operating the Game Start push-button switch cycles through each of the rows separately.

Lamp Drives

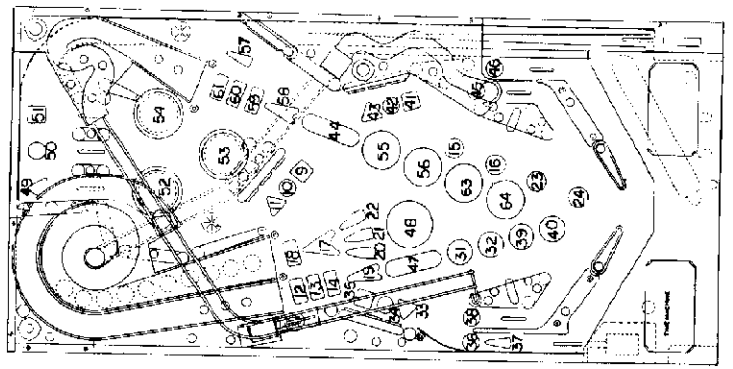
From the LAMP ROWS test, depress the STEP push-button switch. Player 1 and 2 displays indicate LAMP COLUMNS and the Player 4 display indicates 01 for column 1. All controlled lamps in column 1 should be lit. Operating the Game Start push button switch cycles through each of the columns separately.

Discrete Lamp

From the LAMP COLUMNS test, depress the STEP push-button switch. Player 1 and 2 displays indicate LAMP TEST and then the name assigned to lamp 01; the Player 1 and 2 displays indicate the lamp name, the Player 3 display indicates the row and column wire colors, and the Player 4 display indicates 01. Lamp 01 should light. With the FORWARD/REVERSE push button switch in the FORWARD (up) position, operating the Game Start push-button switch selects higher-numbered lamps; with in the REVERSE (down) position, Game Start selects lower numbered lamps.

Lamp Number	Description
01*	Starwarp
02*	sTstarwarp
03*	Starwarp
04*	Starwarp
05*	Starwarp
06*	Starwarp
07*	Starwarp
08*	Starwarp
09	Center Square
10	Center Circle

11	Center Triangle
12	Left Ramp 1970
13	Left Ramp 1960
14	Left Ramp 1950
15	5X
16	4X
17	Special
18	3 Ball Jackpot
19	Left Ramp E - MC ²
20	Left Mini Jackpot
21	Center Mini Jackpot
22	Right Mini Jackpot
23	3X
24	2X
25	2X All Scores Cnt Playfield
26	Extra Ball Back Panel
27	Bonus Hold Back Panel
28	100K Back Panel
29	50K Back Panel
30	25K Back Panel
31	Targets Light Special
32	2X All Scores
33	Left Triangle
34	Left Circle
35	Left Square
36	Left Extra Ball
37	Laser Kick
38	Left Return
39	Extra Ball Center Playfield
40	Bonus Hold Center Playfield
41	Right Square
42	Right Circle
43	Right Triangle
44	Right Holog
45	Right Return
46	Right Extra Ball
47	Left Holog
48	Starwarp Center Playfield
49	Lane 1
50	Lane 2
51	Lane 3
52	Center Pop Bumper
53	Left Pop Bumper
54	Right Pop Bumper
55	1980
56	1970
57	Top Right Arrow
58	Right Ramp E - MC ²
59	Right Ramp 1960
60	Right Ramp 1950
61	Right Ramp 1970
62*	Engine
63	1960
64	1950



*Indicates Insert Lamp

LAMP MATRIX CHART

ROW COLUMN (*)	1	2	3	4	5	6	7	8
1 RED-BRN	Starwarp #1	Center Square 9	Special 17	2X	Left Triangle 33	Right Square 41	Lane 1 49	Top Right Arrow 57
2 RED-BLK	Starwarp #2	Center Circle 10	3 Ball Jackpot 18	Extra Ball 26	Left Circle 34	Right Circle 42	Lane 2 50	Right EMC50R 58
3 RED-BRN	Starwarp #3	Center Triangle 11	Left EMC50R 19	Bonus Hold 27	Left Square 35	Right Triangle 43	Lane 3 51	Right 1950 59
4 RED-VEL	Starwarp #4	Left Mini Jackpot 12	100K 20	Extra Ball 28	Left Extra Ball 36	Right Holog 44	Pop Left 52	Right 1960 60
5 RED-BRN	Starwarp #5	Left Center Mini Jackpot 13	Center Mini Jackpot 21	50K 29	Laser Kick 37	Right Return 45	Pop Center 53	Right 1970 61
6 RED-BLU	Starwarp #6	Left Starwarp 14	Right Mini Jackpot 22	25K 30	Left Return 38	Right Extra Ball 46	Pop Right 54	Insert 62
7 RED-VIO	Starwarp #7	Starwarp 15	Extra Ball 23	Targets Light Special 31	Extra Ball 39	Left Holog 47	1980 63	1960 63
8 RED-GRY	Starwarp #8	4X 16	2X 24	All Scores 32	Bonus Hold 40	Starwarp 48	1970 64	1950 64

COIL TESTS

Sixteen regular (pulsed under microprocessor control) and six switch-triggered coil drivers are provided to switch ground to coils. Coil number 10 is used in conjunction with drives 1 through 8 to switch +34 volts between coils or flash lamps; these sets are termed "left" and "right". Coil number 10 is located on the PPB board which provides isolation diodes and current limiting and heater resistors. This effectively provides 23 regular coils.

Automatic Test

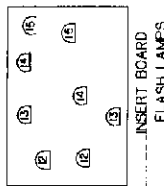
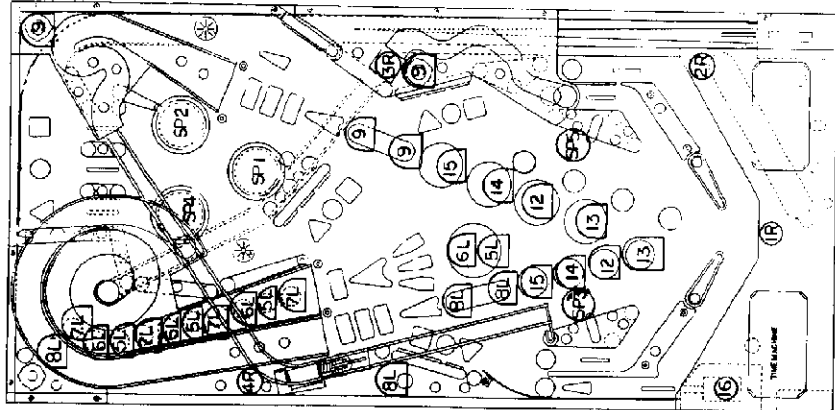
From the Discrete Lamps test, depress the STEP push-button switch. Player 1 and 2 displays indicate COIL TEST. The test pulses each regular solenoid or flash lamp sequentially with the coil/flash lamp name indicated in the Player 1 and 2 displays and the drive number in the Player 4 display.

Select Coil

From the Coil Test, depress the STEP push-button switch. Player 1 and 2 displays indicate SELECT COIL and then the name of drive 1L, the drive number is indicated in the Player 4 display. Operate the Game Start push-button switch to select the coil or flash lamp to be tested. With the desired drive number indicated in the Player 4 display, depress the STEP push-button switch to cause it to be pulsed repeatedly.

RETURN TO GAME OVER

From the Select Coil test, depress the STEP push-button switch one time if a selected coil is pulsing or two times none is pulsing. The game returns to the game-over mode.



SWITCH TRIGGERED SOLENOIDS

Coil Number	Coil Description	Control Line (CPU to Coil)	Power Line (PS to Coil)	Trigger Line (Coil to CPU)	Drive Transistor (QIP, 12Z)	Coil Type
SP1	Center Pop Bumper	BLU-ORN 3	PS CNG 6	ORN-BLK CPU CH 18.2	Q8	23 800
SP2	Right Pop Bumper	BLU-RED 4	PS CNG 6	ORN-BLK CPU CH 18.2	Q9	23 800
SP3	Left Singe Shot	BLU-YEL 4	PS CNG 6	ORN-YEL CPU CH 18.3	Q10	23 800
SP4	Left Pop Bumper	BLU-GRN 5	PS CNG 6	CPU CH 18.4	Q11	23 800
SP5	Right Singe Shot	BLU-GRN 5	PS CNG 6	CPU CH 18.5	Q12	23 800
SP6	NOT USED	CPU CH 18.6	PS CNG 6	CPU CH 18.6	Q13	23 800

FLIPPER SOLENOIDS

Coil Description	Flipper GND (CPU to Coil)	Power Line (CPU to Coil)	Coil Type
Left Flipper	ORN-BLU CPU CH 18.2	BLU-GRN 5	23 750/20-2630
Right Flipper	ORN-RED CPU CH 18.1	BLU-YEL 4	23 750/20-2630

TIME MACHINE COIL PART NUMBER CHART

QUANTITY USED	COIL TYPE	DATA EAST PART NUMBER	COIL PART NUMBER
1	23-800	090 5011 00	090 5011 00
2	23-840	090 5002 00	090 5002 00
2	23-840	090 5005 00	090 5005 00
3	23-800	090 5011 00	090 5011 00
	27-1400	090 5015 00	090 5015 00

TOP

