

TORPEDO



INSTRUCTION MANUAL

DATA EAST PINBALL

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CPU Jumper Table

Game	* CPU Version	ROM Location	Jumpers	
			Installed	Removed
Laser Wars	Ver 1	5C	J1b, J3, J4, J6a, J7a, & J8	J1a, J2, J5, J6b, & 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

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

* Version 2 has an 8K RAM and 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

PPB BOARD

F1 5A Slo-Blo
F2 5A Slo-Blo
F3 5A Slo-Blo
F4 5A Slo-Blo
F5 5A Slo-Blo
F6 3A Slo-Blo

POWER SUPPLY BOARD

F1 7A Slo-Blo
F2 7A Slo-Blo
F3 0.25A Slo-Blo
F4 8A Slo-Blo
F5 3A Slo-Blo
F6 5A Slo-Blo

TORPEDO ALLEY

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DATA EAST LIMITED WARRANTY

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PRINTED CIRCUIT BOARDS (GAME LOGIC) 60 DAYS

No other parts of Seller's product are warranted.

Warranty periods are effective from the initial date of shipment from Seller to its authorized distributors.

Seller's sole liability shall be, at its option, to repair or replace products which are returned to Seller during the warranty periods specified, provided:

1. Seller is notified promptly upon discovery by purchaser that stated products are defective.
2. Such products are properly packaged and then returned freight prepaid, to Seller's plant.

This warranty does not apply to any parts damaged during shipment and/or due to improper handling, or due to improper installation or usage, or alteration. In no event shall the Seller be liable for any anticipated profits, loss of profits, loss of use, accidental or consequential damages or any other losses incurred by the customer in connection with the purchase of a Data East USA, product.

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Warning — This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

GAME SPECIFICATIONS

POWER REQUIREMENTS

This game is provided with a 3-prong plug and **must be connected to a properly grounded outlet to reduce shock hazard** and insure proper game operation. Refer to AC Power Wiring Diagram for transformer connections required for normal, high, and low line conditions.

Normal Line: 109 to 129 Vac (211 to 225 Vac)

High Line: (226 to 235 Vac)

Low Line: 95 to 108 Vac (200 to 210 Vac)

MAJOR ASSEMBLY AND FUSE LOCATIONS

Refer to the Game Illustration to identify locations of the major assemblies, and fuse values and locations.

PROM SUMMARY

CPU Board: Location 5B, 5C

Sound Board: Locations 6F (Voice ROM 1), 4F (Voice ROM 2), and 7F (Sound ROM)

TRANSPORTATION

To reduce the possibility of damage, observe the following precautions whenever transporting the game. Lower the backbox and secure it to the cabinet. Remove the legs and secure the game within the transporting vehicle.

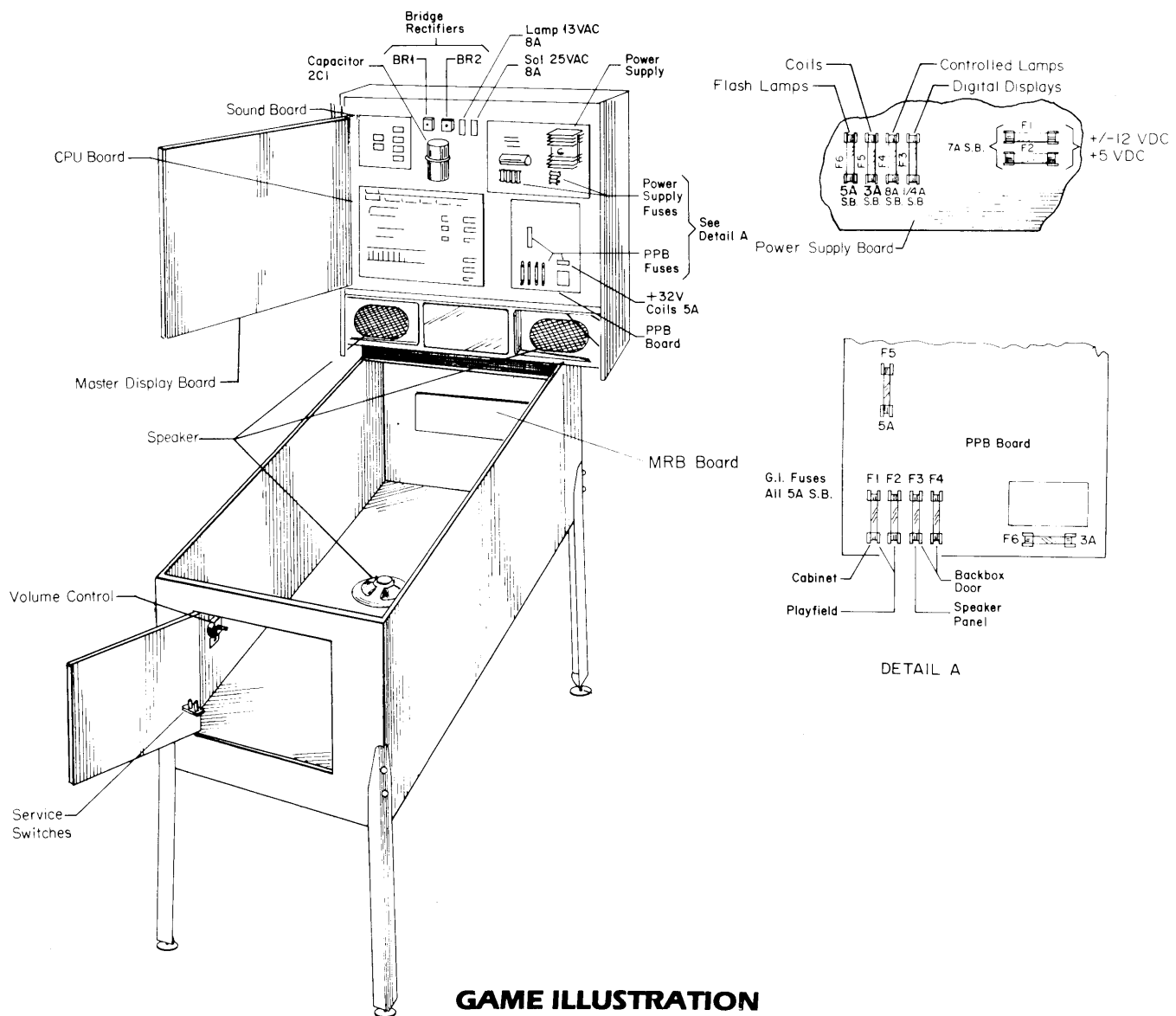
GAME ASSEMBLY PROCEDURES

(Refer to the Game Illustration)

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton.
2. Remove all packing material. Locate cabinet legs in corner packing inserts and assembly parts package in the cashbox. There should be four leg levelers, eight leg bolts, two head bolts with washers, and three pinballs.
3. Attach leg leveler from the parts package to each leg, make sure that each leveler is threaded through a hex nut before threading it into the leg.
4. Support rear of cabinet and attach rear legs using two leg bolts for each leg.
5. Support front of cabinet and attach front legs using two leg bolts for each leg.
6. Reach into the pedestal opening at the rear of the cabinet and free the power cord. Pull the cord from the cabinet and seat it in the slot provided in the pedestal.
7. While assuring that no cables are being pinched, carefully raise the backbox and temporarily secure it in its upright position with the clamp provided on the rear of the cabinet.

WARNING

Do not attempt to move the game with the backbox secured in this temporary manner. If moved, the backbox could come unclamped and suddenly fall to the lowered positions resulting in possible **injury to personnel and equipment damage**.



8. Remove backbox keys from the clip on the inside of the coin door and unlock and carefully remove the backglass. Set the backglass aside.
9. Carefully remove the playfield glass and set it aside.
10. Obtain the two bolts and washers from the parts package and open the backbox insert board. Secure the backbox to the cabinet pedestal with the two bolts and washers.
11. Check all connectors in the backbox for loose wire terminations. Reseat any loose wires by pushing in on the terminal.
12. Push on all connectors plugged into the CPU board, Sound Board, Power Supply Boards, and (on insert board) Display board to check that they are properly seated.
13. Check that the fuses on the Power Supply board and fuse panel are seated properly.
14. Raise the playfield and the support bar on the right side of the cabinet; support the playfield by inserting the support bar into the countersunk notch on the bottom side.
15. Check all cabinet cable connector terminations.

16. Remove the Plumb tilt from the parts package and install on the panel on the inside left of the cabinet. Note that this game is not equipped with a ball roll tilt.
17. Lower the playfield and level the playfield side-to-side by adjusting leg levelers.
18. The playfield front-to-back incline is factory set at approximately 6 degrees. If a pitch indicating meter is not available, adjust the front and rear levelers to the lowest position for the proper pitch. Readjust side-to-side level as required.

NOTE

The playfield incline affects difficulty of play. Use the recommended incline; game difficulty is best varied using game adjustments.

19. Check the plumb tilt and adjust as required.
20. If desired, perform any self tests at this time. With the insert door closed, carefully re-install and lock the backglass.
21. Place the three pinballs on the playfield near the outhole and carefully reinstall the playfield glass.
21. If desired, make game pricing and Add-A-Ball, Novelty, or 5-Ball Play adjustments at this time.

GAME OPERATION

STANDARD FEATURES

Insert coin(s), the game says REQUEST PERMISSION TO COME ABOARD for the first credit and produces sounds for each subsequent coin and the Player 4 display indicates the number of credits posted. Depress the credit button and a start-up sound is produced, the posted credits are reduced by one, Player 1 display flashes, Player 4 display indicates BALL 1, and a ball is served to the plunger trough. Additional players may be added by depressing the Credit button before the end of ball 1.

The second closure (adjustable) of the plumb bob tilt switch tilts the ball in play. Closure of the slam tilt switch in the coin door ends the current game(s).

At the end of each ball, earned bonuses are collected. At the end of the last ball for the last player and after bonuses are collected, the system produces a random 2-digit number (a multiple of 10; 00 to 90) for a Match feature (adjustable). Matching the last two digits of a player score with this number awards a credit. Players exceeding high score levels receive free credits (adjustable) and are able to enter their initials with the new High Score achieved. The game then proceeds into the game-over mode and then to the attract mode. A custom message (adjustable) can be displayed during the attract mode.

AUTOMATIC BALL TIME AVERAGING

A ball time averager feature is provided which can make automatic adjustments affecting player appeal. This feature is provided by 'quick look' adjustment Ad 15 and is enabled as the factory setting. Periodically a check is made of the average ball time and adjustments are made to maintain approximately 65-second ball time. This check is made at the same time that highest scores are reset (expanded ADJUSTMENT Ed 36) so make sure that Ed 36 is not set to OFF. (Note that the other highest score adjustments may be disabled if desired.) Refer to Game Adjustments for additional details.

MANUAL PERCENTAGING

This game is equipped with Manual Percentage Adjustment.

As previously with our games, you can either set operator adjustments for a replay percent or you can set a fixed replay score.

If you set operator adjustments for a particular replay percent, the game will compute a recommended score. When the game coin door is opened, the displays will indicate a recommended replay score to beat, if a change is recommended. By pressing the start button, the score to beat will be changed to the recommended level. If you close the coin door or go into audit or adjustment mode, no score change will be made.

You may choose to ignore the recommended change; for example, you may not think last week's players were the usual crowd. Or you may choose to make a different score to beat adjustment; this is done by utilizing adjustment AD02.

GAME SPECIFIC FEATURES

S-U-B Lanes — The S-U-B lanes perform three functions:

- 1) They advance the bonus multipliers.
- 2) They light the 5K spinner lamp.
- 3) They spot their corresponding ship targets. (S spots a green 'destroyer' target, U spots a blue 'cruiser' target, and B spots a yellow 'aircraft carrier' target.)

Sinking Ships — Once a ship is ready to sink (all three of its targets are lit) a player must hit one of the ships three targets with the pinball to sink the ship. Every time a ship is sunk, two things take place:

- 1) A bonus torpedo is lit in the center of the playfield.
- 2) A missile leading up to the top left roll-under wireform is lit.

Destroying the Fleet — Sinking one of each ship lights the destroy the fleet feature for approximately ten seconds. If the top left roll-under wire is made within the ten seconds, three things are awarded:

- 1) 100K for making the feature.
- 2) 150K for sinking the three ships.
- 3) One of each of the bonus torpedoes are lit.

If the destroy fleet roll-under switch is not made within ten seconds, it can be re-qualified by sinking any one of the ships one time. If the roll-under wire is made within ten seconds, one of each of the three ships must be sunk to re-qualify the Destroy Fleet feature.

Jackpot — Sinking a ship three times (adjustable) qualifies the Jackpot feature. The Jackpot is awarded by making the right ramp and awards 100K for each lit torpedo bonus lamp. A maximum of 1,200,000 can be awarded from the jackpot.

2X Scoring Time Shot — Both Lites Time Shot flipper return lanes are flashing at the beginning of the game. Making either lane flashes the opposite top Playfield 2X lamp (top left scoring gate or top right spinner) for 10 seconds. Making the Time Shot while the lamp is still flashing awards 15 seconds of 2X playfield scoring.

Drop Target 3-Bank — Making a drop target starts a 40-second timer which, when elapsed, resets the drop targets. Completing the 5-bank advances lighting and awarding of 25K, 50K, 100K, and Extra Ball; after winning Extra Ball, the value remains at 25K.

Instant 2-Ball Play — Making the left kicker twice or making the center kicker (from the ramp shot) and then making the left kicker initiates 2-ball, multi-ball play.

Instant 3-Ball Play — Making the left kicker and then making the center kicker locks balls for 3-ball, multi-ball play. Subsequently making either the left or center kicker releases the three balls for multi-ball play.

Ramp — The ramp value is lit at the beginning of the game to score 20K. Making the spinner shot cycles the lit value through 20K-30K-40K- Hold Bonus-Extra Ball-Special. The flashing value is awarded when the ramp shot is made and the lit value returns to 20K.

AUDIT FUNCTIONS

GENERAL

There are 58 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 (AU 01 through AU 11) in a 'quick look' group and 48 less-used audits EU 13 through EU 59) 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 the game must be in the game-over mode. 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 pushbutton switch still in the FORWARD (up) position, depressing the STEP pushbutton switch advances through the audit functions one at a time. To review lower-numbered functions, set the FORWARD/REVERSE pushbutton switch to the REVERSE (down) position and operate the STEP pushbutton switch.

To access expanded audits, operate the step pushbutton until AU 12, EXPAND AUDITS is displayed. Set the choice to ON as indicated in the Player 4 display by depressing the Credit pushbutton and then depress the step pushbutton. The request is installed and EU 13 is displayed. When you exit audits and adjustments, the AU 12 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 Ad 17, Audits Reset. Game adjustments (Ad 01 to Ad 19 and Ed 20 to Ed 60) begin after the last audit function (AU 12 or EU 58). 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 required, continue pressing the STEP button until the game adjustments are reached. See Game Adjustments for details

'QUICK LOOK' FUNCTIONS

Total Paid Credits (AU 01) - the total number of paid credits is displayed.

Free Percent (AU 02) is Free Total (EU 14) divided by Plays Total (EU 13).

Ball Time Average (in seconds) (AU 02) is Total Play Time (in minutes) (EU 20) divided by Total Balls Played (EU 21) with the result multiplied by 60.

Coins (AU 04, 05, and 06) - These three audit totals are provided to show the amount of coins registered for the left, right, and center coin chutes, respectively.

Replay Percentage (AU 07) is the Replay Total awards for exceeding replay score levels (EU 15) divided by Plays Total (EU 13).

High Score Percentage (AU 08) is High Score Total (EU 19) divided by Plays Total (EU 13).

Extra Ball Total (AU 09) is the total number of extra balls awarded.

Extra Ball Percentage (AU 10) is AU 09 divided by Balls Total (EU 21).

Cycles Burn In (AU 11) provides the number of diagnostic burn-in cycles (factory use).

Expand Audits (AU 12) permits viewing of expanded audits.

GAME AUDITS

Audit Number (Player 3 Display)	Audit Description (Players 1 & 2 Displays; totals in Player 4 Display)
--	Torpedo Alley PROM ID
AU 01	Total Paid Credits
AU 02	Free Percent
AU 03	Ball Time Average
AU 04	Coins Left
AU 05	Coins Right
AU 06	Coins Center
AU 07	Replay Percent
AU 08	High Score Percent
AU 09	Extra Ball Total
AU 10	Extra Ball Percent
AU 11	Cycles Burn In
AU 12	Expand Audits (ON/OFF)
EU 13	Plays Total
EU 14	Free Total
EU 15	Replay Total
EU 16	Special Total
EU 17	Special Percent
EU 18	Match Total
EU 19	High Score Wins
EU 20	Play Time (Minutes)
EU 21	Balls Total
EU 22	1 Replay Awards
EU 23	2 Replay Awards
EU 24	3 Replay Awards
EU 25	4 Replay Awards
EU 26	Games 1 Player
EU 27	Games 2 Player
EU 28	Games 3 Player
EU 29	Games 4 Player
EU 30	Cycles Attract Mode
EU 31	Reset High Score
EU 32	Ramp Shots
EU 33	Extra Ball Drop
EU 34	100K Drop
EU 35	Bonus Hold
EU 36	Extra Ball Ramp
EU 37	Left Kicker Hold
EU 38	Center Kicker Hold
EU 39	Torpedo Kicker
EU 40	Destroyer Sinking
EU 41	Cruiser Sinking
EU 42	Aircraft Sinking
EU 43	Special Lit
EU 44	Jackpot Lit
EU 45	Destroy Fleet Lit
EU 46	Destroy Fleet Won
EU 47	Laser Kick Scored
EU 48	Laser Kick Relit
EU 49	Drain Left
EU 50	Drain Center
EU 51	Drain Right
EU 52	Jackpot Shots
EU 53	Right 2X Lit
EU 54	Right 2X Shot
EU 55	Left 2X Lit
EU 56	Left 2X Shot
EU 57	Right Return
EU 58	Left Return
EU 59	Buy In

EXPANDED FUNCTIONS

Plays Total (EU 13) is the sum of Total Paid Credits (AU 01) and Free Total (EU 14). Note that free credits are not recorded in the audits until they are actually used.

Free Total (EU 14) is the total free credits for replays, high-score-to-date, specials, and match.

Replay Total (EU 15) is the total awards (credits, extra balls, or audit only) for exceeding replay score levels.

Special Total (EU 16) is the total awards (credits, extra balls, or scores) for making specials.

Special Percentage (EU 17) is Special Total (EU 16) divided by Plays Total (EU 13).

Match Total (EU 18) is the total credits awarded for matching the last two digits of the score with the system-generated Match Number at the end of the game. Percentage of match credits will be approximately 10%, if enabled.

High Score Wins (EU 19) is the total credits awarded for exceeding the high-score-to-date scores.

Play Time (EU 20) is the cumulative time of balls in play (in minutes).

Balls Total (EU 21) is the total of regular and extra balls.

Replay Awards (EU 22 through 25) provide the total awards (credit, extra ball, or audit) for replay levels 1 through 4, respectively.

Games – Player (EU 24 through 29) provide individual totals of 1- player, 2-player, 3-player, and 4-player games, respectively.

Cycles Attract Mode (EU 30) provides the number of cycles through the attract mode (factory use).

Reset High Score (EU 31) provides the number of times that the high score levels have been automatically reset (if enabled).

GAME SPECIFIC FUNCTIONS

Ramp Shots (EU 32) provides the number of times that ramp shots have been made.

Extra Ball Drop (EU 33) provides the number of extra balls awarded from the drop targets.

100K Drop (EU 34) provides the number times that 100K was awarded from from the drop targets.

Bonus Hold (EU 35) provides the number times that bonus was held over.

Extra Ball Ramp (EU 36) provides the number of extra balls awarded from the ramp shot.

Left Kicker Hold (EU 37) provides the number of times that a ball was locked in the left kicker.

Center Kicker Hold (EU 38) provides the number of times that a ball was locked in the center kicker.

Torpedo Kicker (EU 39) provides the number of times that a ball was shot into the torpedo kicker.

Destroyer Sinking (EU 40) provides the number of times a Destroyer was sunk.

Cruiser Sinking (EU 41) provides the number of times a Cruiser was sunk.

Aircraft Sinking (EU 42) provides the number of times an Aircraft Carrier was sunk.

Special Lit (EU 43) provides the number of times the Special was lit.

Jackpot Lit (EU 44) provides the number of times the Jackpot was lit.

Destroy Fleet Lit (EU 45) provides the number of times that Destroy Fleet was lit.

Destroy Fleet Won (EU 46) provides the number of times that Destroy Fleet was won.

Laser Kick Scored (EU 47) provides the number of times that the Laser Kick has kicked the ball.

Laser Kick Relit (EU 48) provides the number of times that the Laser Kick was relit.

Drain Left (EU 49) provides the number of balls lost through the left drain.

Drain center (EU 50) provides the number of balls lost through the center drain.

Drain Right (EU 51) provides the number of balls lost through the right drain.

Jackpot Shots (EU 52) provides the number of times the Jackpot was lit.

Right 2X Lit (EU 53) provides the number of times that the upper right Playfield 2X Scoring lamp was lit.

Right 2X Shot (EU 54) provides the number of times that the upper right Playfield 2X was scored.

Left 2X Lit (EU 55) provides the number of times that the upper left Playfield 2X Scoring lamp was lit.

Left 2X Shot (EU 56) provides the number of times that the upper left Playfield 2X was scored.

Right Return (EU 57) provides the number of times the right return switch was made.

Left Return (EU 58) provides the number of times the left return switch was made.

Buy In (EU 59) provides the number of times player inserted coin(s) to retain playfield achievements for the next game.

GAME ADJUSTMENTS

GENERAL

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 ED 60 (Expanded Adjustment 60) is shown in the the Player 3 display, INSTALL FACTORY is shown in the Player 1 and 2 displays, and OFF is shown in the Player 4 display. With the audits displaying AU 12 (or expanded EU 58) and the FORWARD/REVERSE switch in the FORWARD (up) position, depress the STEP switch and Ad 01 is shown in the the Player 3 display, AUTO/FIXED REPLAY is shown in the Player 1 and 2 displays, and the setting is shown in the Player 4 display.

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

REPLAY AND GENERIC FEATURES

Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened (during the attract mode) the player displays indicate the recommended level (if appropriate). This new level is entered into adjustments simply by pressing the game start button. (If the coin is closed or you enter audits/adjustments or diagnostics, the replay level is not changed.)

REPLAYS (Ad 01 through 06)

Ad 01 Manual/Fixed Replay

Manual: Adjust for percentage of awards for replay levels (1% through 50%). Proceed to Ad 02 and 03 for starting replay levels.

Fixed: Lower the automatic value below 1% and Player 1 display indicates FIXED. Proceed to Ad 02 through 05 for fixed replay levels.

Ad 02 Start Replay/Level 1 Replay

Manual: With Ad 01 set for manual, adjust the starting Replay 1 setting to between 800,000 and 9,900,000.

Fixed: With Ad 01 set for fixed, adjust Replay 1 level to between 100,000 and 9,900,000. To disable Replay 1, lower the setting to 00.

Ad 03 Levels Replay/Level 2 Replay

Manual: With Ad 01 set for manual, adjust the number of replay levels to be active (1 to 4). Any additional starting replay levels are automatically set to values higher than Replay 1. Proceed to Ad 06.

Fixed: With Ad 01 set for fixed, adjust Replay 2 level to between 100,000 and 9,900,000. To disable Replay 2, lower the setting to 00.

GAME ADJUSTMENT TABLE

Adjustment Number (Player 3)	Description (Players 1 & 2)	Factory Setting (Player 4)
AD 01	REPLAY/MANUAL	15%
AD 02	START REPLAY/LEVEL 1 REPLAY	2,500,000
AD 03	LEVELS REPLAY/LEVEL 2 REPLAY	01
AD 04	LEVEL 3 REPLAY	--
AD 05	LEVEL 4 REPLAY	--
AD 06	EXEASY RULES	OFF
AD 07	EASY RULES	OFF
AD 08	FACTORY RULES	ON
AD 09	HARD RULES	OFF
AD 10	EX HARD RULES	OFF
AD 11	NOVELTY RULES	OFF
AD 12	5 BALL RULES	OFF
AD 13	ADDABAL RULES	OFF
AD 14	STANDARD/CUSTOM PRICING	USA 1
AD 15	TIME SETTING	ON
AD 16	COIN RESET	OFF
AD 17	AUDITS RESET	OFF
AD 18	RESTORE HISCR	OFF
AD 19	EXPAND ADJUSTMENTS	OFF
ED 20	AWARDS REPLAY	CREDITS
ED 21	AWARDS SPECIAL	CREDITS
ED 22	MATCH	ON
ED 23	BALLS/GAME	03
ED 24	WARNING TILT	01
ED 25	LIMIT EX BALL	03
ED 26	CREDITS LIMIT	30
ED 27	SCORES HIGHEST	ON
ED 28	CREDITS HSCR 1	03
ED 29	CREDITS HSCR 2	00
ED 30	CREDITS HSCR 3	00
ED 31	CREDITS HSCR 4	00
ED 32	HSCR 1 BACKUP	5,000,000
ED 33	HSCR 2 BACKUP	4,000,000
ED 34	HSCR 3 BACKUP	3,000,000
ED 35	HSCR 4 BACKUP	2,500,000
ED 36	HSRESET EVERY	300
ED 37	FREE PLAY	OFF
ED 38	LEFT COIN PULSES	-
ED 39	RIGHT COIN PULSES	-
ED 40	CENTER COIN PULSES	-
ED 41	PULSES FOR CREDIT	-
ED 42	PULSES FOR BONUS CREDIT	-
ED 43	MESSAGE CUSTOM	ON
ED 44	TEXT	ENGLISH
ED 45	ATTMODE MUSIC	ON
ED 46	BUYIN FEATURE	ALL
ED 47	RAMP SPOTS SUBLANE	OFF
ED 48	RAMP SPOTS TARGETS	ON
ED 49	RAMP SPOTS LASER KICK	OFF
ED 50	SUBLANE MEMORY	ON
ED 51	SPECIAL MEMORY	OFF
ED 52	TARGET MEMORY	ON
ED 53	ARROW MEMORY	ON
ED 54	LANE SPOTS	ON
ED 55	LASER KICK START	ON
ED 56	3-BANK TIME	FACTORY
ED 57	JACKPOT LAMPS	04
ED 58	KNOCKER ALARM	ON
ED 59	RETURN 2X LIT	ON
ED 60	FACTORY RESTORE	OFF

Ad 04 Level 3 Replay (Fixed Only) - With Ad 01 set for fixed, adjust Replay 3 level to between 100,000 and 9,900,000. To disable Replay 3, lower the setting to 00.

Ad 05 Level 4 Replay (Fixed Only) - With Ad 01 set for fixed, adjust Replay 4 level to between 100,000 and 9,900,000. To disable Replay 4, lower the setting to 00.

SINGLE-FUNCTION DIFFICULTY ADJUSTMENTS (Ad 06 to 10)

Any one of these five INSTALL adjustments may be activated to automatically select settings for multiple adjustments affecting game difficulty. After activation, the individual adjustments may be readjusted if desired. Refer to **Install Adjustment Table** for details.

Ad 06 Extra Easy Rules - Set to ON or OFF.

Ad 07 Easy Rules - Set to ON or OFF.

Ad 08 Factory Rules - Set to ON or OFF.

Ad 09 Hard Rules - Set to ON or OFF.

Ad 10 Extra Hard Rules - Set to ON or OFF.

NOVELTY/5-BALL/ADD-A-BALL RULES (Ad 11, 12, 13)

One of these three INSTALL adjustments may be activated to automatically select settings for multiple adjustments. After activation, the individual adjustments may be readjusted if desired.

NOTE: When more than one of these features is required (for example, Add-A-Ball rules with 5-Ball Play) set only one of these rule features and then change additional adjustments. For the Add-A-Ball and 5-Ball Play example:

Ad 13 Add-a-ball Rules = ON	Ed 51 Special Memory = OFF
Ed 23 Balls/Game = 05	Ed 52 Target Memory = ON
Ed 47 Ramp Spots S-U-B Lanes = OFF	Ed 53 Arrow Memory = ON
Ed 48 Ramp Spots Targets = OFF	Ed 55 Laser Kick Start = ON
Ed 49 Ramp Spots Laser Kick = OFF	Ed 56 3-Bank Time = Factory
Ed 50 S-U-B Lane Memory = ON	

By setting the game up in this fashion, all specials and replay levels will award an extra ball. However, because the operator desires 5-ball play, all game play features are set to conservative.

Ad 11 Novelty Play Rules - Set to establish settings for no free play or extra balls; ON or OFF. If on the following settings are established:

Ad 01 Fixed Replay = Fixed
Ad 02 to 05 Replays 1 to 4 = OFF
Ed 20 Replay Award = Audit
Ed 21 Special Award = Score
Ed 22 Match Feature = OFF
Ed 25 Limit Extra Balls = 0
Ed 27 Highest Scores = OFF
Ed 28 to Ed 31 High Score Credits = 00

Ad 12 5-Ball Play Rules - Set to establish recommended settings for 5- ball play; ON or OFF. If ON the following settings are established:

Ad 01 Replay Manual = 7%	Ed 50 S-U-B Lane Memory = ON
Ad 02 Replay Start = 3,000,000	Ed 51 Special Memory = OFF
Ad 03 Replay Levels = 01	Ed 52 Target Memory = ON
Ed 23 Balls/Game = 05	Ed 53 Arrow Memory = ON
Ed 47 Ramp Spots S-U-B Lanes = OFF	Ed 55 Laser Kick Start = ON
Ed 48 Ramp Spots Targets = OFF	Ed 56 3-Bank Time = Factory
Ed 49 Ramp Spots Laser Kick = OFF	

INSTALL ADJUSTMENT TABLE

Install Adjustment	Ad 06 Extra Easy	Ad 07 Easy	Ad 08 Medium	Ad 09 Hard	Ad 10 Extra Hard
Ed 47 Ramp Spots S-U-B Lane	ON	ON	OFF	OFF	OFF
Ed 48 Ramp Spots Targets	ON	ON	ON	OFF	OFF
Ed 49 Ramp Spots Laser Kick	ON	OFF	OFF	OFF	OFF
Ed 50 S-U-B Lane Memory	ON	ON	ON	ON	ON
Ed 51 Special Memory	ON	OFF	OFF	OFF	OFF
Ed 52 Target Memory	ON	ON	ON	ON	ON
Ed 53 Arrow Memory	ON	ON	ON	ON	ON
Ed 54 Lane Spots	OFF	OFF	OFF	ON	ON
Ed 55 Laser Kick Start	ON	ON	ON	ON	OFF
Ed 56 3-Bank Time	EASY	EASY	FACTORY	HARD	HARD

Ad 13 Add-A-Ball Rules - Set to disable awarding of credits, replacing replay and Special awards with an extra ball; ON or OFF. If ON the following settings are established:

Ed 20 Awards Replay = Extra Ball
 Ed 21 Awards Special = Extra Ball
 Ed 22 Match Feature = Off
 Ed 27 Scores Highest = OFF
 Ed 28 to 31 High Score Credits = 00

GAME PRICING (Ad 14 and Ed 38 to 42)

There are two methods available for coin switch programming; Standard and Custom. Standard pricing uses a single adjustment (Ad 14) to select a pricing scheme shown in the **Standard Pricing Table**. Custom pricing is used to select additional pricing schemes defined by expanded adjustments Ed 38 to 42. In order to program Ed 38 to 42, Ad 14 must be set to CUSTOM and Ad 19 must be set to ON for expanded adjustments.

With Ad 14 set to CUSTOM and expanded adjustments selected, Ed 38, 39, and 40 represent coin switch units for the left, right, and center coin slots. Ed 41 prescribes the number of units required for one credit. For example, if Ed 38 was set to 02 and Ed 41 to 01, a coin in the left slot would produce two credits. Further, if Ed 38 was set to 01 and Ed 41 to 02, two coins in the left slot would be required for one credit.

Ed 43 may be set to post bonus credits when a minimum amount of coins are inserted at one time. For example, if Ed 38 was set to 01, Ed 41 to 01, and Ed 42 to 04, one credit would be posted for each of the first three coins in the left slot and two credits for the fourth coin.

Ad 14 Standard/Custom Pricing - Set for the desired pricing scheme from the **Standard Pricing Table** as indicated in the Player 1 and 2 Displays. For Custom Pricing, set to CUSTOM. When set to CUSTOM, Expanded adjustments Ed 38 to 42 must be set to ON.

Ed 38 Left Coin Switch Pulses - Set the number of pulses registered for closure of the left coin switch; 00 to 99.

Ed 39 Right Coin Switch Pulses - Set the number of pulses registered for closure of the right coin switch; 00 to 99.

Ed 40 Center Coin Switch Pulses - Set the number of pulses registered for closure of the center coin switch; 00 to 99.

STANDARD PRICING TABLE

Ad 24 Standard Pricing Select (Player)	Coin Mechs			Plays/Coins		
	1	2	4	Left	Center	Right
USA 1 1 COIN 1 PLAY	25¢	\$1.00	25¢	1 PLAY/1 COIN	4 PLAY/1 COIN	1 PLAY/1 COIN
USA 2 4 COINS 3 PLAYS	25¢	\$1.00	25¢	1 PLAY/2 COIN 2 PLAY/3 COIN 3 PLAY/4 COIN	3 PLAY/1 COIN	1 PLAY/2 COIN 2 PLAY/3 COIN 3 PLAY/4 COIN
USA 3 2 COINS 1 PLAY	25¢	\$1.00	25¢	1 PLAY/2 COIN	2 PLAY/1 COIN	1 PLAY/2 COIN
AUSTRIA COINAGE	5SCH	10SCH	10SCH	1 PLAY/2 COIN 2 PLAY/3 COIN 3 PLAY/4 COIN	2 PLAY/1 COIN 3 PLAY/2 COIN	2 PLAY/1 COIN 3 PLAY/2 COIN
AUSTRAL COINAGE	20¢		\$1.00	1 PLAY/2 COIN		3 PLAY/1 COIN
UK COINAGE	10P	50P	10P	1 PLAY/1 COIN	5 PLAY/1 COIN	1 PLAY/1 COIN
SWISS COINAGE	1 SFR		2 SFR	1 PLAY/1 COIN 3 PLAY/2 COIN		3 PLAY/1 COIN
BELGIUM COINAGE	5F	5F	20F	1 PLAY/2 COIN 2 PLAY/3 COIN 3 PLAY/4 COIN	1 PLAY/2 COIN 2 PLAY/3 COIN 3 PLAY/4 COIN	3 PLAY/1 COIN
GERMAN 1 5 DM 7 PLAYS	1DM	2DM	5DM	1 PLAY/1 COIN 7 PLAY/5 COIN	2 PLAY/1 COIN 8 PLAY/3 COIN	7 PLAY/1 COIN
GERMAN 2 5 DM 9 PLAYS	1DM	2DM	5DM	1 PLAY/1 COIN 3 PLAY/2 COIN 5 PLAY/3 COIN 7 PLAY/4 COIN 9 PLAY/5 COIN	3 PLAY/1 COIN 7 PLAY/2 COIN 10 PLAY/3 COIN 14 PLAY/4 COIN	9 PLAY/1 COIN
NETHLND COINAGE	1HFI	2-5HFI	2-5HFI	1 PLAY/1 COIN 6 PLAY/5 COIN	3 PLAY/1 COIN	3 PLAY/1 COIN
SWEDEN COINAGE	1KR	5KR	2KR	1 PLAY/3 COIN 2 PLAY/5 COIN	2 PLAY/1 COIN	2 PLAY/1 COIN
FRANCE COINAGE	1F	5F	10F	1 PLAY/3 COIN 2 PLAY/5 COIN	2 PLAY/1 COIN	4 PLAY/1 COIN
ITALY COINAGE	500L		500L	1 PLAY/1 COIN		1 PLAY/1 COIN
SPAIN COINAGE	25P		100P	1 PLAY/1 COIN		5 PLAY/1 COIN
JAPAN COINAGE		100¥			1 PLAY/1 COIN	

CUSTOM PRICING TABLE

Coin Mechs			Plays/Coins	Adjustment Numbers						
Left	Right	Center		14	19	38	39	40	41	42
25¢	25¢	\$1	1/25¢ 3/50¢ 1/25¢ 5/\$1.00 1/25¢ 6/\$1.00	custom custom custom	ON ON ON	01 01 05	01 01 05	04 04 20	01 01 04	02 04 20
5SCH	10SCH	10SCH	1/10SCH 1/10SCH 4/30SCH	custom custom	ON ON	01 04	02 08	02 08	02 06	00 00
20¢	\$1.00	--	1/20¢ 1/60¢ 2/\$1.00	custom custom	ON ON	01 01	05 05	00 00	01 03	00 05
10P	10P	50P	1/10P 6/50P 1/20P 3/50P	custom custom	ON ON	01 01	01 01	05 05	01 02	05 05

Ed 41 Coin Switch Pulses Required for 1 Credit - Set the number of coin switch pulses required to post one credit; 00 to 99.

Ed 42 Coin Switch Pulses Required for Bonus Credit - Set the number of coin switch pulses required to award a bonus credit; 00 to 99.

ADDITIONAL GENERIC FEATURES

Ad 15 Time Setting - Maintains average ball time close to 65 seconds. Every 300 (vary with Ed 36) games, average is checked. If greater than 65 seconds, Ed 55 is set to OFF. If less than 65 seconds, Ed 55 is set to ON. Set this function to ON or OFF.

Ad 16 Coin Reset - When enabled (set to ON) all coin and paid credit totals will be reset to zero when STEP is depressed.

Ad 17 Audits Reset - When enabled (set to ON) all audit totals except for coins and paid credits will be reset to zero when STEP is depressed with FORWARD/REVERSE button in the FORWARD position.

Ad 18 Restore High Score - When enabled (set to ON) the High Score Levels and associated initials will be restored to backup settings when STEP is depressed with FORWARD/REVERSE button in the FORWARD position.

Ad 19 Expand Adjustments - When set to OFF, depressing the STEP pushbutton advances directly to Ed 60, RESTORE FACTORY. When set to ON, depressing the STEP pushbutton sequences through the expanded adjustments. When exiting from expanded adjustments, this function is reset to OFF for the next time that adjustments are required.

Ed 20 Awards Replay - Set for replays to award: CREDIT, EXTRA BALL, or AUDIT (no award but recorded in the audit totals).

Ed 21 Awards Special - Set for Special to award: CREDIT, EXTRA BALL, or SCORE LEVEL.

Ed 22 Match - Set Match ON or OFF.

Ed 23 Balls Per Game - Adjust the number of balls per game; 2 to 9.

Ed 24 Warning Tilt - Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; 1 to 3 or OFF.

Ed 25 Limit Extra Balls - Adjust for the maximum number of extra balls that may be accumulated per ball; 1 to 9 or OFF.

Ed 26 Credits Limit - Adjust the maximum number of credits that may be posted; 5 to 99.

HIGH SCORE LEVELS (Ed 27 through 36)

There are four high score levels with associated player initials that are displayed during the attract mode. This provides a high-score-to-date feature. When players exceeds these levels, the player initials may be entered to replace the previous ones. These levels may be adjusted to award credits and to be reset to backup values after a selected number of games

Ed 27 Scores Highest - Set to enable or disable the four high score levels; ON or OFF.

Ed 28 Credits High Score Level 1 - Adjust the number of credits awarded for exceeding level 1 (the highest of the four levels); 0 to 9.

Ed 29 Credits High Score Level 2 - Adjust the number of credits awarded for exceeding level 2; 0 to 9.

Ed 30 Credits High Score Level 3 - Adjust the number of credits awarded for exceeding level 3; 0 to 9.

Ed 31 Credits High Score Level 4 - Adjust the number of credits awarded for exceeding level 4; 0 to 9.

Ed 32 High Score 1 Backup - Adjust the backup score level to which level 1 (the highest of the four levels) may be reset.

Ed 33 High Score 2 Backup - Adjust the backup score level to which level 2 may be reset.

Ed 34 High Score 3 Backup - Adjust the backup score level to which level 3 may be reset.

Ed 35 High Score 4 Backup - Adjust the backup score level to which level 4 may be reset.

Ed 36 High Score Reset Every - Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; 300 to 99,000 or OFF (no reset or adjustment).

Ed 37 Free Play - When set to ON, no coins are required for games.

Ed 38 to Ed 42 - Described previously in Game Pricing.

Ed 43 Message Custom - When desired, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature ON using the Credit button and depress STEP. The letter A is indicated in the first position of the Player 1 display. Vary the letter by operating the left and right flippers. With the desired letter indicated, depress the CREDIT button to lock in the letter and advance to the next display character. Repeat this procedure until the desired message is indicated in the Player 1 and 2 displays. At this time, depress the STEP pushbutton switch to advance to Ed 44.

NOTE

To lock in the custom message, the game must be returned to Game Over by depressing STEP with Ed 60 displayed.

Ed 44 English/French/German Text - Select English, French, or German for display during Audits, Adjustments, and Game Diagnostics.

Ed 45 Attract Mode Music - Set to ON (once every seven attract mode cycles), OFTEN (every attract mode cycle), or OFF.

Ed 46 Buy-In Feature - Permits player to choose to retain certain playfield achievements for the next game. Set to ALL to retain playfield lamps and locked balls, set to BALLS ONLY to retain locked balls, or set to OFF to disable the feature.

Ed 58 Klocker Warning - When the game is first powered up, any suspect switches or coils are displayed in the Player Displays. With this feature enabled (set to ON), the credit knocker is pulsed to alert the location attendant if there are any suspect switches or coils. With this feature disabled (set to OFF), the credit knocker is not pulsed during indications of suspect switches or coils.

GAME SPECIFIC FEATUES (Ed 47 to 59)

Ed 47 Ramp Spots S-U-B Lane - Set to ON or OFF. When **ON**, each time the ramp shot is completed, one of the unlit S-U-B lane letters is lit.

Ed 48 Ramp Spots Targets - Set to ON or OFF. When **ON**, each time the ramp shot is completed, one unlit target of each color (Red, Green, and Blue) is lit on the playfield.

Ed 49 Ramp Spots Laser Kick - Set to ON or OFF. When **ON**, completing the ramp shot turns on the Laser Kick When Lit target.

Ed 50 S-U-B Lane Memory - Set to ON or OFF. When **ON**, any S-U-B letters lit at the end of a ball are relit for the next ball.

Ed 51 Special Memory - Set to ON or OFF. When **ON**, any Specials lit on the playfield at the end of a ball are relit for the next ball.

Ed 52 Target Memory - Set to ON or OFF. When **ON**, all targets lit at the end of a ball are relit for the next ball.

Ed 53 Arrow Memory - Set to ON or OFF. When **ON**, the 25K arrows lit in the left lane at the end of a ball are relit for the next ball.

Ed 54 Lane Spots - Set to ON or OFF. When **ON**, the S-U-B Lanes spot the corresponding color target each time, up to a **maximum of three times**. When **OFF**, targets are spotted an unlimited number of times.

Ed 55 Laser Kick Start - Set to ON or OFF. When **ON**, the Laser Kick feature is turned on at the start of each ball. When **OFF**, the feature is enabled for the second and subsequent balls only by making the Laser Kick When Lit target.

Ed 56 3-Bank Time - Set to EASY, FACTORY, or HARD. This adjustment increases or decreases the time on the drop target countdown timer which starts when the first target is made. The targets are reset when completed or when the timer elapses.

Ed 57 Jackpot Lamps - Set to 03 or 04. This adjustment determines how many ships of the same color (bonus lamps) must be lit to turn on the Jackpot feature.

Ed 58 Klocker Alarm - Previously described at the end of Generic Game Features.

Ed 59 Return 2X Lit - Set to ON or OFF. When **ON**, the return lanes enable the 2X spinner timer each time they are made. When **OFF**, the return lanes enable the respective spinner when made while lit. Note that in this mode, making the return lane once lites the lamp. The lit lamp alternates with slingshot switch closures.

Ed 60 Factory Restore - Depressing STEP without changing the value shown in the Player 4 display from OFF locks in any custom message set with Ed 49 and returns the game to Game Over. Set the value to ON and depress STEP to revert all game adjustments to factory settings; depress STEP a second time to return to Game Over.

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 pushbutton switches inside the coin door and the Game Start pushbutton 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.

During game play, activation of switches and operation of coils with associated switches are monitored. If a switch is not made for 100 games it is considered bad. When operation of a coil should close or open a switch and does not, the coil is considered bad. Each time the game is powered up, bad switches and coils (if any) are reported; to alert the location attendant, the credit knocker is pulsed. Note that reporting of an unused switch does not constitute a problem and that a bad coil could mean that the associated switch requires adjustment.

Wiring to switches and controlled lamps uses color-coded wires that basically follows a resistor color-code scheme for the eight rows and eight columns. During the the switch tests and during the discrete lamp test, identification of the color of the row and column wires are indicated in the Player 3 Display. For example, making the right coin switch during the Switch Test results in the switch functional name (RIGHT COIN) shown in the Player 1 and 2 Displays, the row (94) and column (51) wire color codes shown in the Player 3 display, and the switch number shown in the Player 4 display. The 94 code (refer to the chart below) indicates a White wire with Yellow stripe for the row wire and the 51 code indicates a Green wire with Brown stripe.

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

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

ENTERING DIAGNOSTICS

With the game in the game-over mode, open the coin door and make sure that the FORWARD/-REVERSE pushbutton switch is set to REVERSE (down) and depress the STEP pushbutton switch. The Player displays will show the toll-free 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 RIGHT SINE VOICE ROM 1 (Loc F6) VOICE ROM 2 (Loc F4) MUSIC TEST (Sound ROM Loc F7)	60 CYCLE TONE (Left Speaker Only) 60 CYCLE TONE (All Speakers) 60 CYCLE TONE (Right Speaker Only) foghorn, aaooga, STAND BY TO TAKE HER DOWN FAST, AYE AYE DIVE DIVE, PERISCOPE UP, PRESS START TO CONTINUE MISSION, WELL DONE COMMANDER MUSIC

Automatic Test

With Customer Service telephone numbers displayed, depress the STEP pushbutton 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 pushbutton switch during the Automatic tests until SOUNDS MANUAL is indicated in the Player 1 and 2 displays. Depressing the Game Start pushbutton switch allows you to advance through each sound function.

Speaker Phase Testing

Connections to each of the three speakers are polarized and each must be connected appropriately for the best quality sound. If one speaker has the positive and negative connections reversed with respect to the other two, bass frequencies will not be produced properly and the overall sound quality will be poor.

To test for proper speaker phasing, use the manual sound test to cycle through the Left, Center, and Right Sine functions. If the Center Sine produces more volume and bass than the Left and Right Sines, the speakers are connected properly. If it produces the same or less, one speaker is connected improperly. To isolate and correct reversed speaker connections, one of two methods may be used.

1. Check each speaker for polarity markings. If the speakers have polarity markings, verify that the single-color wire (BLK, YEL, or RED) is connected to the negative (-) terminal.
2. Disconnect the speaker output connector from the Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure that the positive battery terminal is connected to the positive lead (CN1-pin 1, 3, or 6) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

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 pushbutton 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 pushbutton switch from the automatic test; Player 1 and 2 displays indicate DISPLAY MANUAL and then display ZEROS in all positions. Operate the Game Start pushbutton switch to cycle through each portion of the test.

Switch Test

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.

Switch Test

From the Display Manual test, operate the STEP pushbutton 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 disappears but the switch number remains until another switch is closed or the test is exited.

Active Switches

Operate the STEP pushbutton 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 pushbutton switch is depressed.

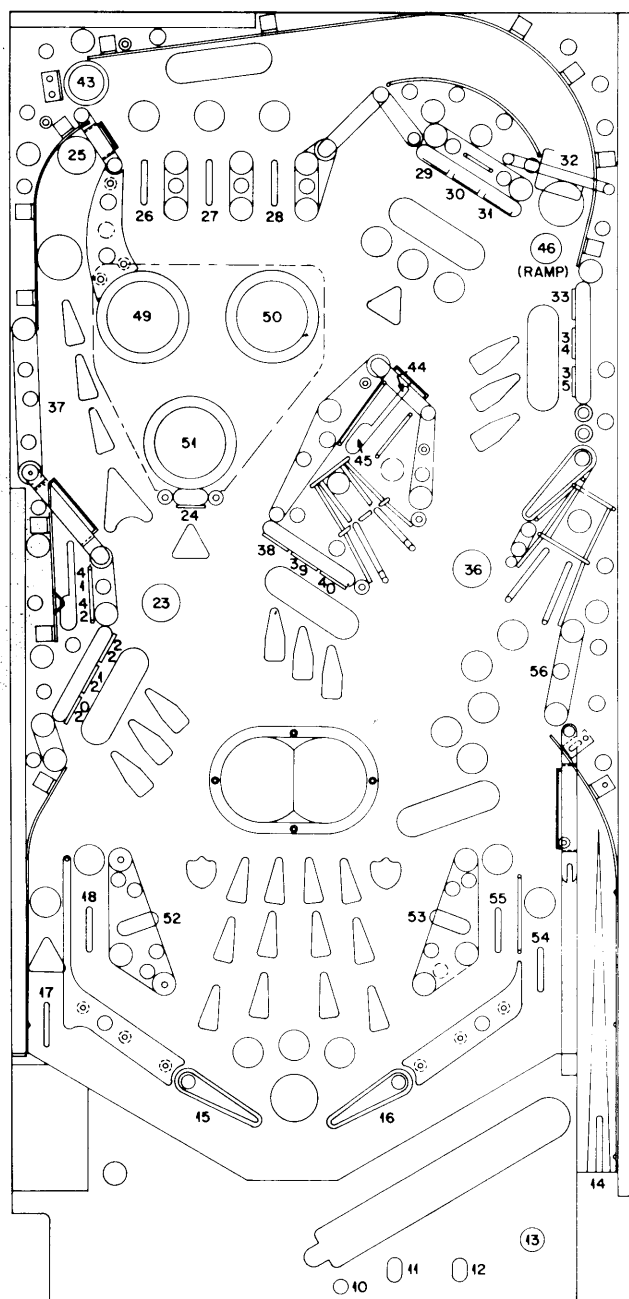
Bad Switches

Operate the STEP pushbutton 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 pushbutton switch is depressed.

SWITCH MATRIX CHART

COLUMN ROW (*)	1 GRN-BRN (51)	2 GRN-RED (52)	3 GRN-ORN (53)	4 GRN-YEL (54)	5 GRN-BLK (50)	6 GRN-BLU (56)	7 GRN-VIO (57)	8 GRN-GRY (58)
1 WHT-BRN (91)	Plumb Tilt 1	Not Used 9	Laser Kick 17	Top Left Spinner 25	Left Yellow Target 33	Left Kicker #1 41	Left Pop Bumper 49	Not Used 57
2 WHT-RED (92)	Not Used 2	Outhole 10	Left Return 18	"S" Lane 26	Center Yellow Target 34	Left Kicker #2 42	Right Pop Bumper 50	Not Used 58
3 WHT-ORN (93)	Credit Button 3	Trough #1 11	Not Used 19	"U" Lane 27	Right Yellow Target 35	Vertical Up Kicker 43	Center Pop Bumper 51	Not Used 59
4 WHT-YEL (94)	Right Coin 4	Trough #2 12	Left Green Target 20	"B" Lane 28	Right Star RO 36	Center Kicker #1 44	Left Slingshot 52	Not Used 60
5 WHT-GRN (95)	Center Coin 5	Trough #3 13	Center Green Target 21	Left Drop Target 29	Left 50 Point Switch 37	Center Kicker #2 45	Right Slingshot 53	Not Used 61
6 WHT-BLU (96)	Left Coin 6	Shooter Lane 14	Right Green Target 22	Center Drop Target 30	Left Blue Target 38	Ramp 46	Right Outlane 54	Not Used 62
7 WHT-VIO (97)	Slam Tilt 7	Left EOS 15	Bottom Left Star RO 23	Right Drop Target 31	Center Blue Target 39	Not Used 47	Right Return Switch 55	Not Used 63
8 WHT-GRY (98)	Not Used 8	Right EOS 16	Spots Laser Kick 24	Right Spinner 32	Right Blue Target 40	Not Used 48	Right 50 Point 56	Not Used 64

(*) 2-DIGIT NUMBER IN PARENTHESES INDICATES RESISTOR COLOR CODE NUMBER DISPLAYED DURING DIAGNOSTICS.



Number	Description	Part No.
*01	Plumb Tilt	500-5023-00
02	Not Used	--
*03	Credit Button	500-5097-00
*04	Right Coin	180-5024-00
*05	Center Coin	180-5024-00
*06	Left Coin	180-5024-00
*07	Slam Tilt	180-5022-00
08	Not Used	--
09	Not Used	--
10	Outhole	180-5011-00
11	Trough :1	180-5009-00
12	Trough :2	180-5009-00
13	Trough :3	180-5010-00
14	Shooter Lane	180-5033-00
15	Left EOS	180-5026-00
16	Right EOS	180-5026-00
17	Laser Kick	180-5047-00
18	Left Return	180-5032-00
19	Not Used	--
20	Left Green Target	180-5049-04
21	Center Green Target	180-5049-04
22	Right Green Target	180-5049-04
23	Bottom Left Star Rollover	180-5003-00
24	Spots Laser Kick Target	180-5049-09
25	Top Left Spinner	180-5004-00
26	"S" Lane	180-5032-00
27	"U" Lane	180-5032-00
28	"B" Lane	180-5032-00
29	Left Drop Target	180-5042-00
30	Center Drop Target	180-5042-00
31	Right Drop Target	180-5042-00
32	Right Spinner	180-5004-00
33	Left Yellow Target	180-5049-06
34	Center Yellow Target	180-5049-06
35	Right Yellow Target	180-5049-06
36	Right Star Rollover	180-5003-00
37	Left 50 Point Switch	180-5017-00
38	Left Blue Target	180-5049-05
39	Center Blue Target	180-5049-05
40	Right Blue Target	180-5049-05
41	Left Kicker :1	180-5031-00
42	Left Kicker :2	180-5040-00
43	Vertical Up Kicker	180-5041-00
44	Center Kicker :1	180-5031-00
45	Center kicker :2	180-5040-00
46	Ramp	180-5045-00
47	Not Used	--
48	Not Used	--
49	Left Thumper Bumper	180-5035-00
50	Right Thumper Bumper	180-5035-00
51	Center Thumper Bumper	180-5035-00
52	Left Slingshot	180-5023-00
53	Right Slingshot	180-5023-00
54	Right Outlane	180-5032-00
55	Right Return	180-5032-00
56	Right 50 Point Switch	180-5017-00
57	Not Used Thru 64	

* Indicates cabinet switches.

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 parts, 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 Bad Switch test, operate the STEP pushbutton 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 pushbutton 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 pushbutton switch cycles through each of the rows separately.

Lamp Drives

From the LAMP ROWS test, depress the STEP pushbutton 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 pushbutton switch cycles through each of the columns separately.

Discrete Lamp

From the LAMP COLUMNS test, depress the STEP pushbutton 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 pushbutton switch in the FORWARD (up) position, operating the Game Start pushbutton switch selects higher-numbered lamps; with it in the REVERSE (down) position, Game Start selects lower-numbered lamps.

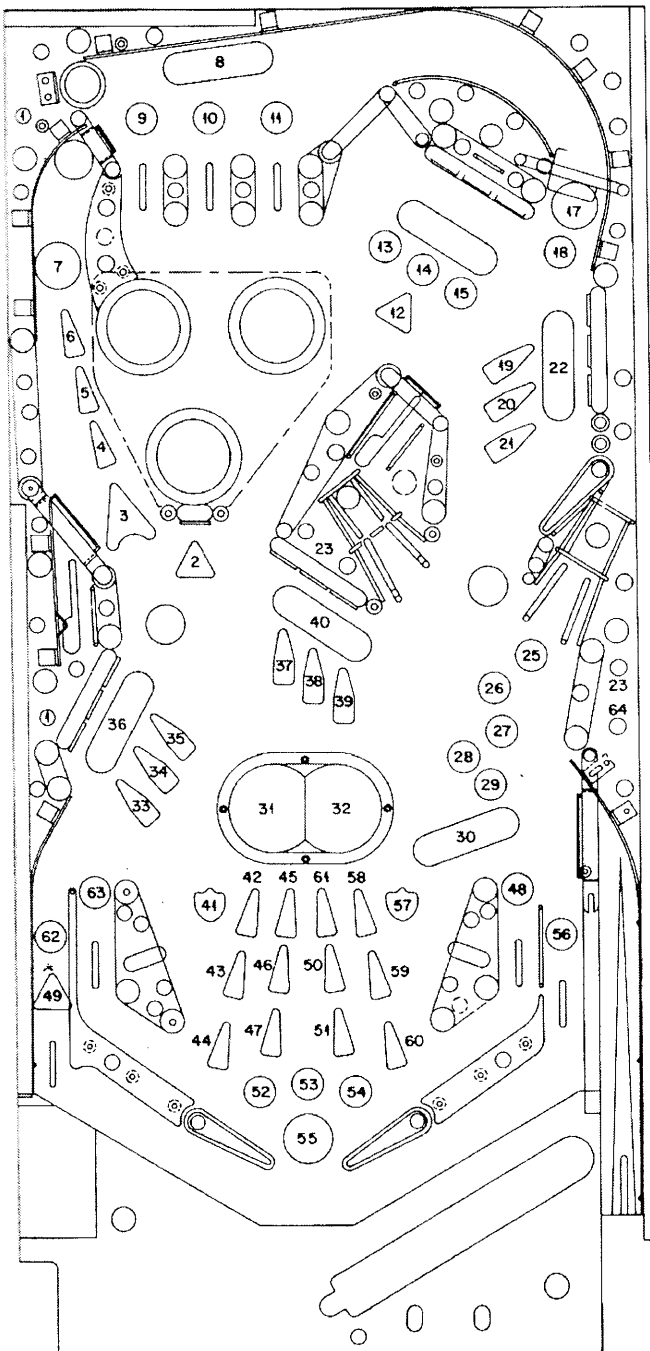
LAMP MATRIX CHART

COLUMN ROW (*)	1 YEL-BRN (41)	2 YEL-RED (42)	3 YEL-ORN (43)	4 YEL-BLK (40)	5 YEL-GRN (45)	6 YEL-BLU (46)	7 YEL-VIO (47)	8 YEL-GRY (48)
1 RED-BRN (21)	Lockball #2 (2) 1	"S" Lane 9	Top Right Playfield 2X 17	Ramp 20K Clear 25	Green Arrow #1 33	Shield Playfield 2X 41	Laser Kick 49	Jackpot 100K Shield 57
2 RED-BLK (20)	Spot Laser Kick 2	"U" Lane 10	5K When Lit 18	Ramp 30K Yellow 26	Green Arrow #2 34	Blue 10K 42	Green 30K 50	Blue 40K 58
3 RED-ORG (23)	Destroy Fleet 100K 3	"B" Lane 11	Yellow Arrow #1 19	Ramp 40K Green 27	Green Arrow #3 35	Green 10K 43	Yellow 30K 51	Green 40K 59
4 RED-YEL (24)	Destroy Fleet 25K Green 4	Extra Ball Triangle 12	Yellow Arrow #2 20	Ramp Bonus Hold Orange 28	Destroyer Hotdog 36	Yellow 10K 44	2X 52	Yellow 40K 60
5 RED-GRN (25)	Destroy Fleet 25K Blue 5	Flagship 25K Clear 13	Yellow Arrow #3 21	Ramp Extra Ball Amber 29	Blue Arrow #1 37	Blue 20K 45	3X 53	Blue 30K 61
6 RED-BLU (26)	Destroy Fleet 25K Yellow 6	Flagship 50K Yellow 14	Aircraft Carrier Hotdog 22	Ramp Hotdog Special 30	Blue Arrow #2 38	Green 20K 46	5X 54	Left Special 62
7 RED-VIO (27)	Top Left Playfield 2X 7	Flagship 100K Orange 15	Lockball #1 (2) 23	Periscope Left (2) 31	Blue Arrow #3 39	Yellow 20K 47	Fire Again 55	Left Return 63
8 RED-GRY (28)	Release Torpedoes Hotdog (2) 8	Insert 2 Torpedo (2) 16	Insert 1 Torpedo (2) 24	Periscope Right (2) 32	Cruiser Hotdog 4	Right Return 48	Right Outlane 56	Release Balls 64

(*) 2-DIGIT NUMBER IN PARENTHESES INDICATES RESISTOR COLOR CODE NUMBER DISPLAYED DURING DIAGNOSTICS.

Lamp Number	Description
-------------	-------------

- | | |
|----|------------------------------|
| 01 | Lockball :2 (2) |
| 02 | Spot Laser Kick |
| 03 | Destroy Fleet 100K |
| 04 | Destroy Fleet 25K Green |
| 05 | Destroy Fleet 25K Blue |
| 06 | Destroy Fleet 25K Yellow |
| 07 | Top Left Playfield 2X |
| 08 | Release Torpedoes Hotdog (2) |
| 09 | "S" Lane |
| 10 | "U" Lane |



Lamp Number	Description
-------------	-------------

- | | |
|-----|-------------------------|
| 11 | "B" Lane |
| 12 | Extra Ball Triangle |
| 13 | Flagship 25K Clear |
| 14 | Flagship 50K Yellow |
| 15 | Flagship 100K Orange |
| *16 | Insert 2 Torpedo |
| 17 | Top Right Playfield 2x |
| 18 | 5K When Lit |
| 19 | Yellow Arrow :1 |
| 20 | Yellow Arrow :2 |
| 21 | Yellow Arrow :3 |
| 22 | Aircraft Carrier Hotdog |
| 23 | Lockball :1 (2) |
| *24 | Insert 1 Torpedo (2) |
| 25 | Ramp 20K Clear |
| 26 | Ramp 30K Yellow |
| 27 | Ramp 40K Green |
| 28 | Ramp Hold Bonus Orange |
| 29 | Ramp Extra Ball Amber |
| 30 | Ramp Hotdog Special |
| 31 | Periscope Left (2) |
| 32 | Periscope Right (2) |
| 33 | Green Arrow :1 |
| 34 | Green Arrow :2 |
| 35 | Green Arrow :3 |
| 36 | Destroyer Hotdog |
| 37 | Blue Arrow :1 |
| 38 | Blue Arrow :2 |
| 39 | Blue Arrow :3 |
| 40 | Cruiser Hotdog |
| 41 | Shield Playfield 2X |
| 42 | Blue 10K |
| 43 | Green 10K |
| 44 | Yellow 10K |
| 45 | Blue 20K |
| 46 | Green 20K |
| 47 | Yellow 20K |
| 48 | Right Return |
| 49 | Laser Kick |
| 50 | Green 30K |
| 51 | Yellow 30K |
| 52 | 2X |
| 53 | 3X |
| 54 | 5X |
| 55 | Fire Again |
| 56 | Right Outlane |
| 57 | Jackpot 100K Shield |
| 58 | Blue 40K |
| 59 | Green 40K |
| 60 | Yellow 40K |
| 61 | Blue 30K |
| 62 | Left Special |
| 63 | Left Return |
| 64 | Release Balls |

* Indicates insert board lamps.

COIL TEST

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 MRB board which provides isolation diodes and current limiting and heater resistors. This effectively provides 23 regular coils.

There are two coil tests for testing the regular coils; COIL TEST and SELECT COIL. The first test sequentially pulses each coil and the second pulses a selected coil repeatedly. Pop bumper and slingshot coils are switch-triggered and may be tested by closing the associated switch triggers.

Automatic Test

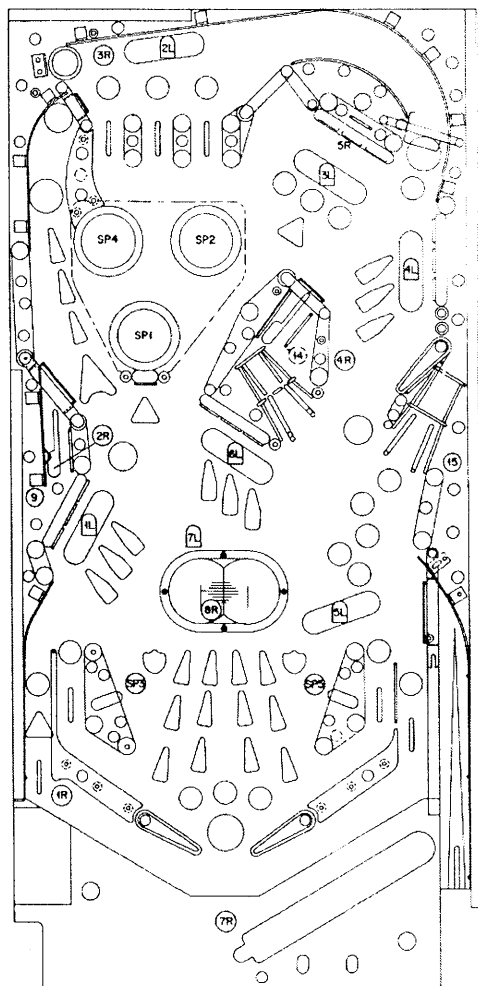
From the Discrete Lamps test, depress the STEP pushbutton switch. Player 1 and 2 displays indicate COIL TEST. The test pulses each regular solenoid or flash lamp sequentially with the coil/flash lamp name indicated in the Player 1 and 2 displays and the drive number in the Player 4 display.

Select Coil

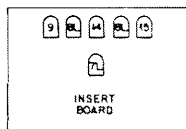
From the Coil Test, depress the STEP pushbutton switch. Player 1 and 2 displays indicate SELECT COIL and then the name of drive 1L, the drive number is indicated in the Player 4 display. Operate the Game Start pushbutton switch to select the coil or flash lamp to be tested. With the desired drive number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

RETURN TO GAME OVER

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



LEGEND
 (●) - COIL
 (⊗) - FLASH LAMP



SWITCH TRIGGERED SOLENOIDS

Coil Number	Coil Description	Control Line (CPU to Coil)	Power Line (PS to Coil)	Trigger Line (Coil Sw to CPU)	Drive Transistor (TIP122)	Coil Type
SP1	Center Thumper Bumper	BLU-ORN CPU CN19-3	RED PSCN3-6	ORN-BRN CPU CN18-2	Q8	23-800
SP2	Right Thumper Bumper	BLU-RED CPU CN19-4	RED PSCN3-6	ORN-RED CPN CN18-3	Q9	23-800
SP3	Left Slingsho	BLU-YEL CPU CN19-6	RED PSCN3-6	ORN-YEL CPU CN18-4	Q10	23-800
SP4	Left Thumper Bumper	BLU-BRN CPU CN19-7	RED PSCN3-6	ORN-BRN CPU CN18-5	Q11	23-800
SP5	Right Slingshot	BLU-GRN CPU CN19-8	RED PSCN3-6	ORN-GRN CPU CN18-8	Q12	23-800
SP6	NOT USED	-- CPU CN19-9	-- PSCN3-6	-- CPU CN18-9	Q13	--

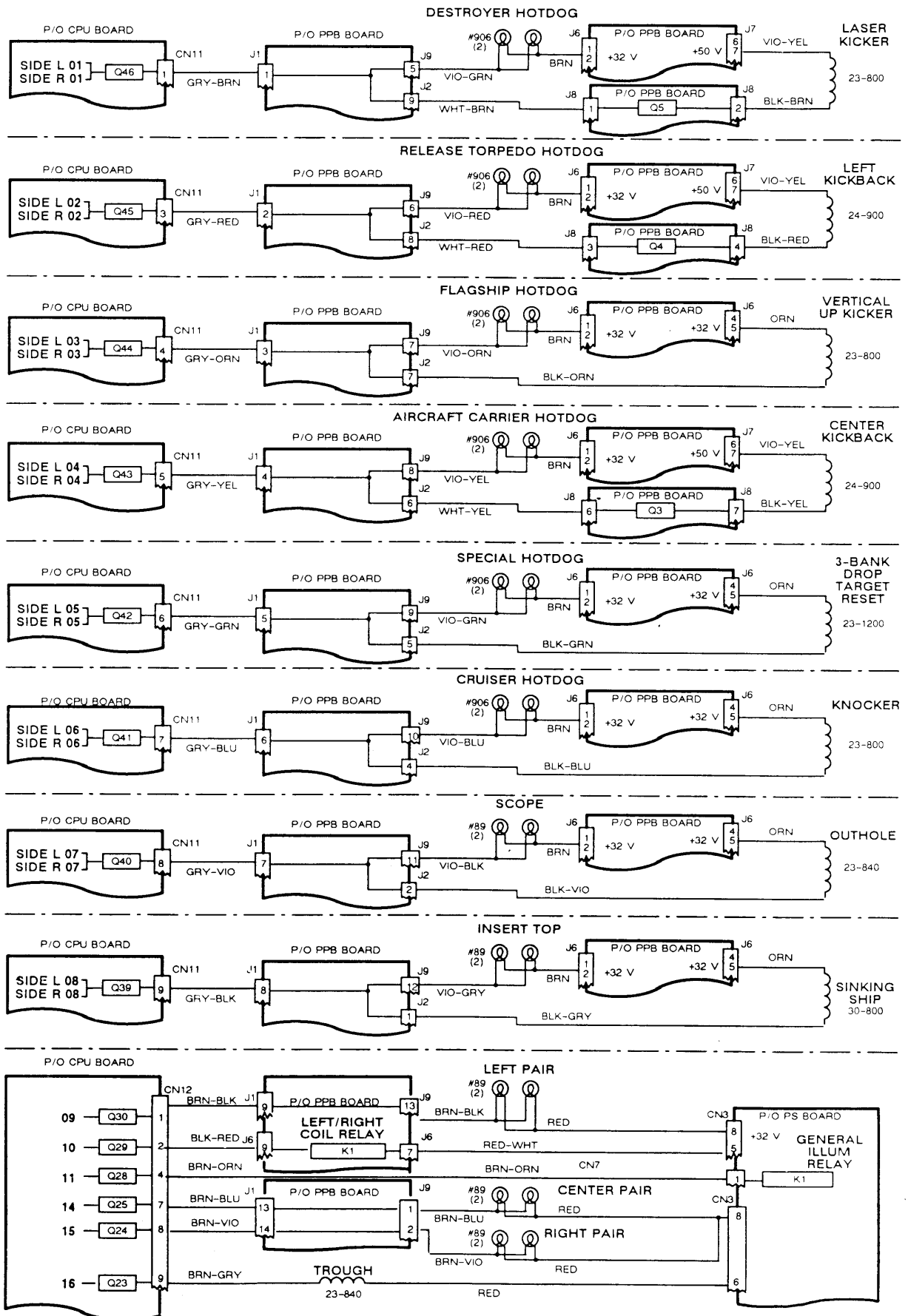
FLIPPER SOLENOIDS

Coil Description	Flipper GND (CPU to Cab)	Flipper GND (Cab to Coil)	Power Line (PPB to Coil)	Coil Type
Left Flipper	ORN-BLU CPU CN19-2	BLU-GRY 1M/F-24	GRY-YEL PPB J7-5	23-700/30-2600
Right Flipper	ORN-RED CPU CN19-1	BLU-VIO 1M/F-21	BLK-WHT PPB J7-1,2	23-700/30-2600
Upper Right Flipper	ORN-RED CPU CN19-1	WHT-BLK 1M/F-19	BLK-WHT PPB J7-1,2	23-700/30-2600

TORPEDO ALLEY COIL PART NUMBER CHART

QTY USED	COIL TYPE	DATA EAST PINBALL PART NUMBER
8	23-800	090-5001-00
2	24-900	090-5002-00
2	23-840	090-5005-00
1	23-1200	090-5008-00
1	30-800	090-5010-00
3	23-700/30-2600	090-5013-00

CPU CONTROLLED COIL AND FLASH LAMP CONNECTIONS



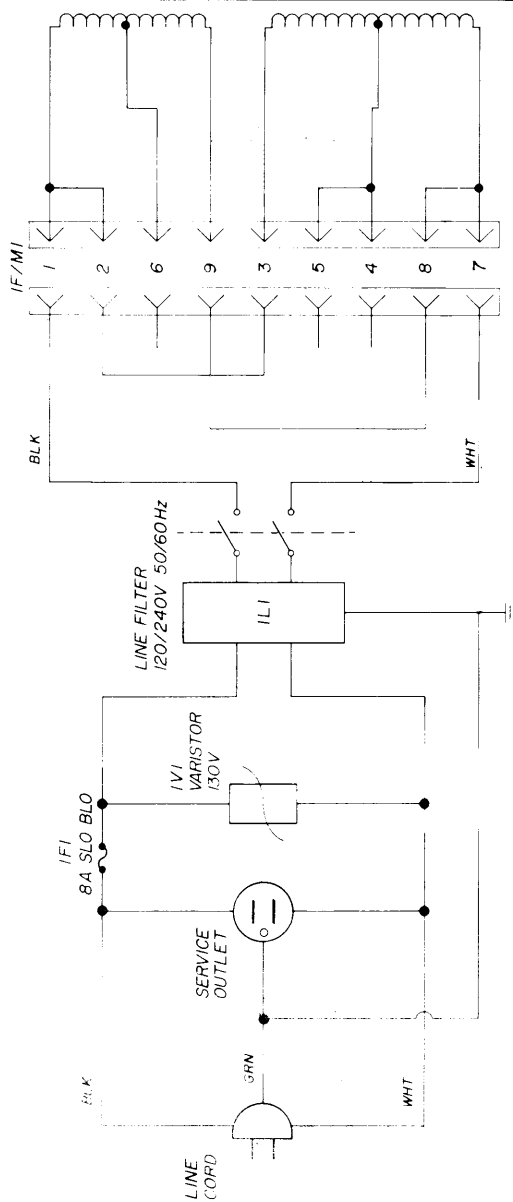
IDENTIFICATION OF COIL/FLASH LAMP NUMBERS (SHOWN BOLD IN CPU BLOCKS) PROVIDED IN PLAYER 1 AND 2 DISPLAYS.

COIL/FLASH LAMP DESCRIPTIONS (SHOWN IN BOLD) PROVIDED IN PLAYER 3 AND 4 DISPLAYS.

171

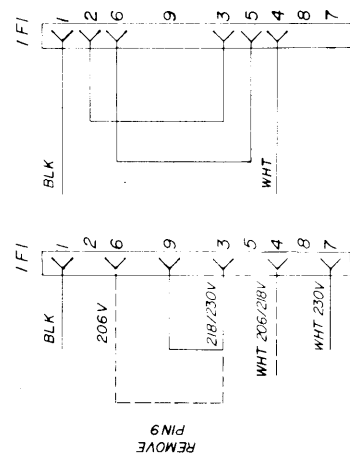
THIS CONFIGURATION FOR 115 V

FOR LOWER LINE VOLTAGES
OR 230 VOLT OPERATION
SEE SAMPLES BELOW

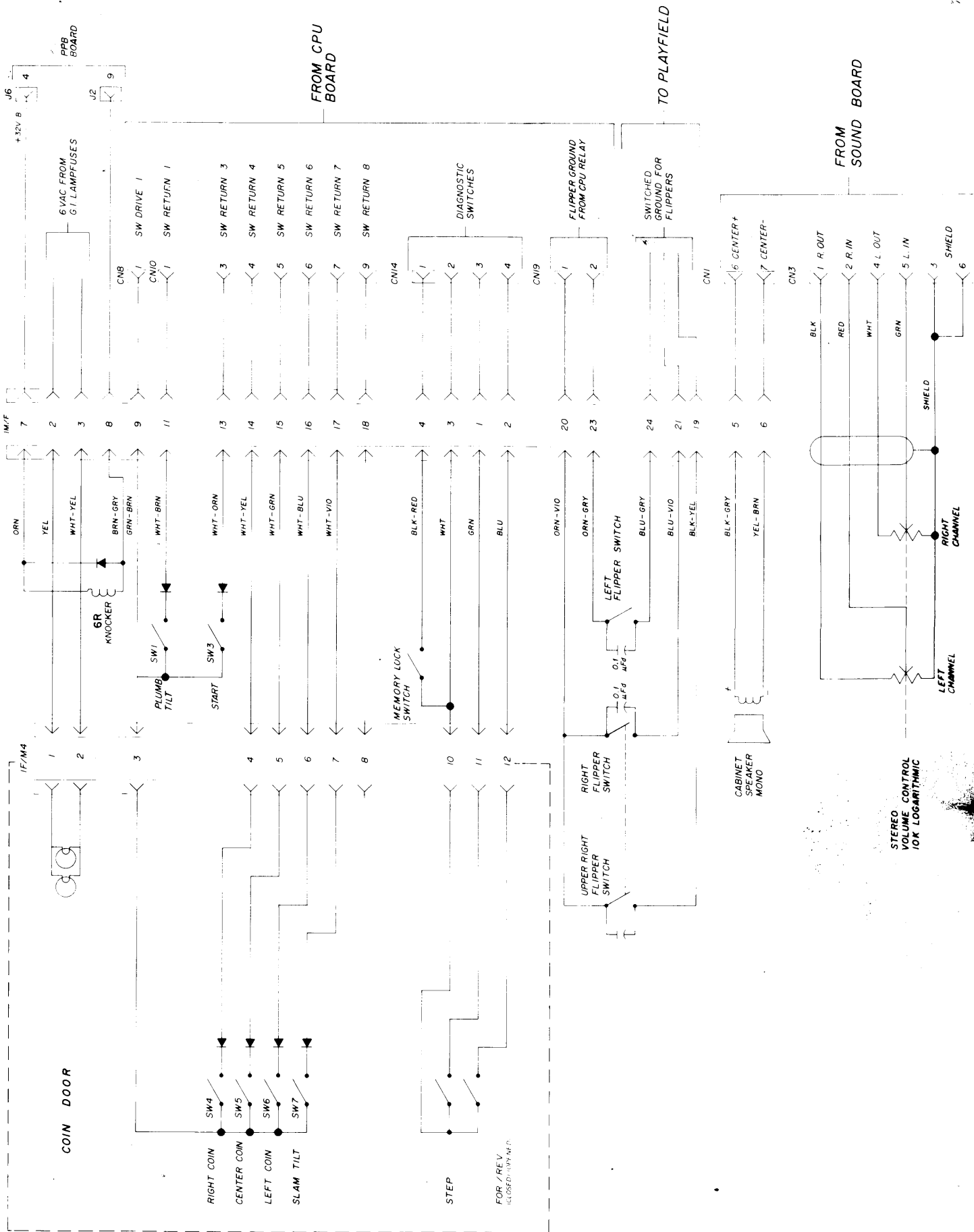


JUMPERS FOR VOLTAGE VARIATION

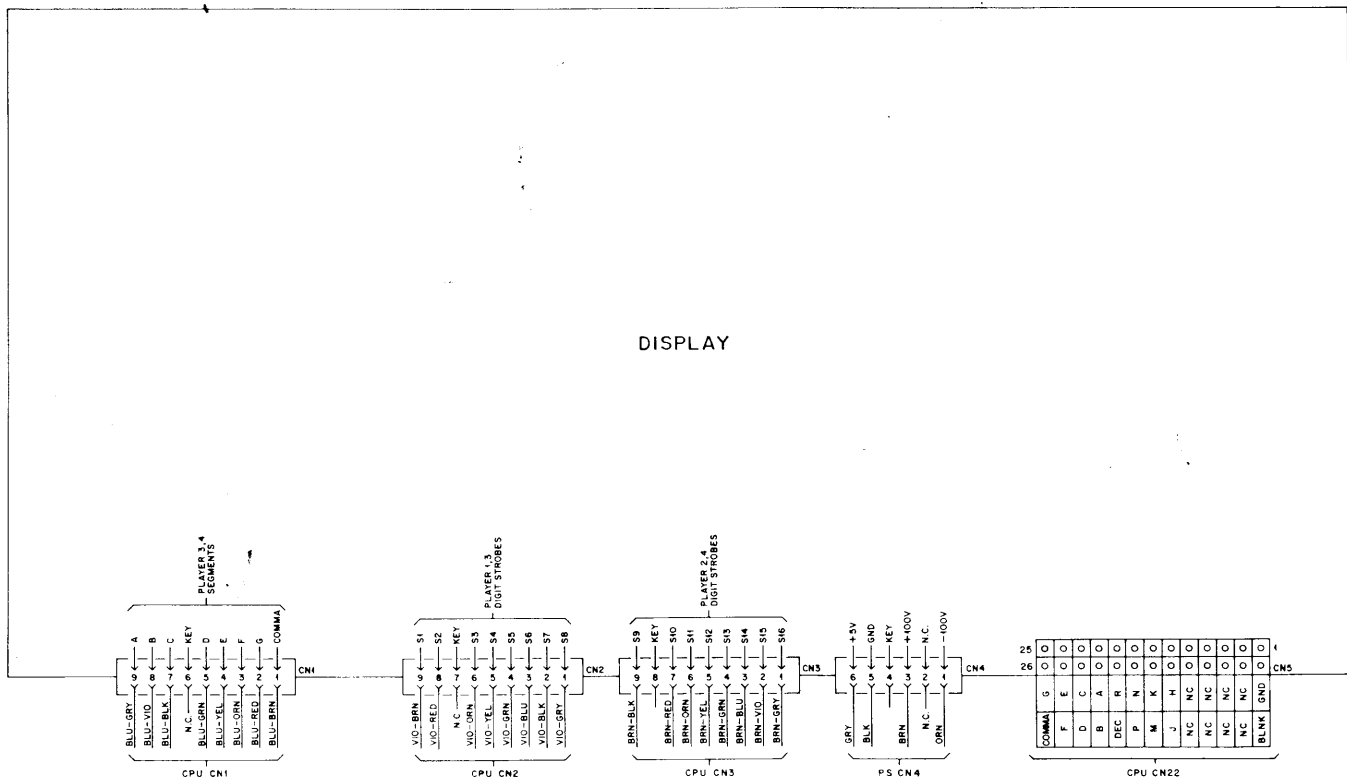
230/218/206VOLTS
IFI = 4A SLO BLO
IVI = 275V VARISTOR

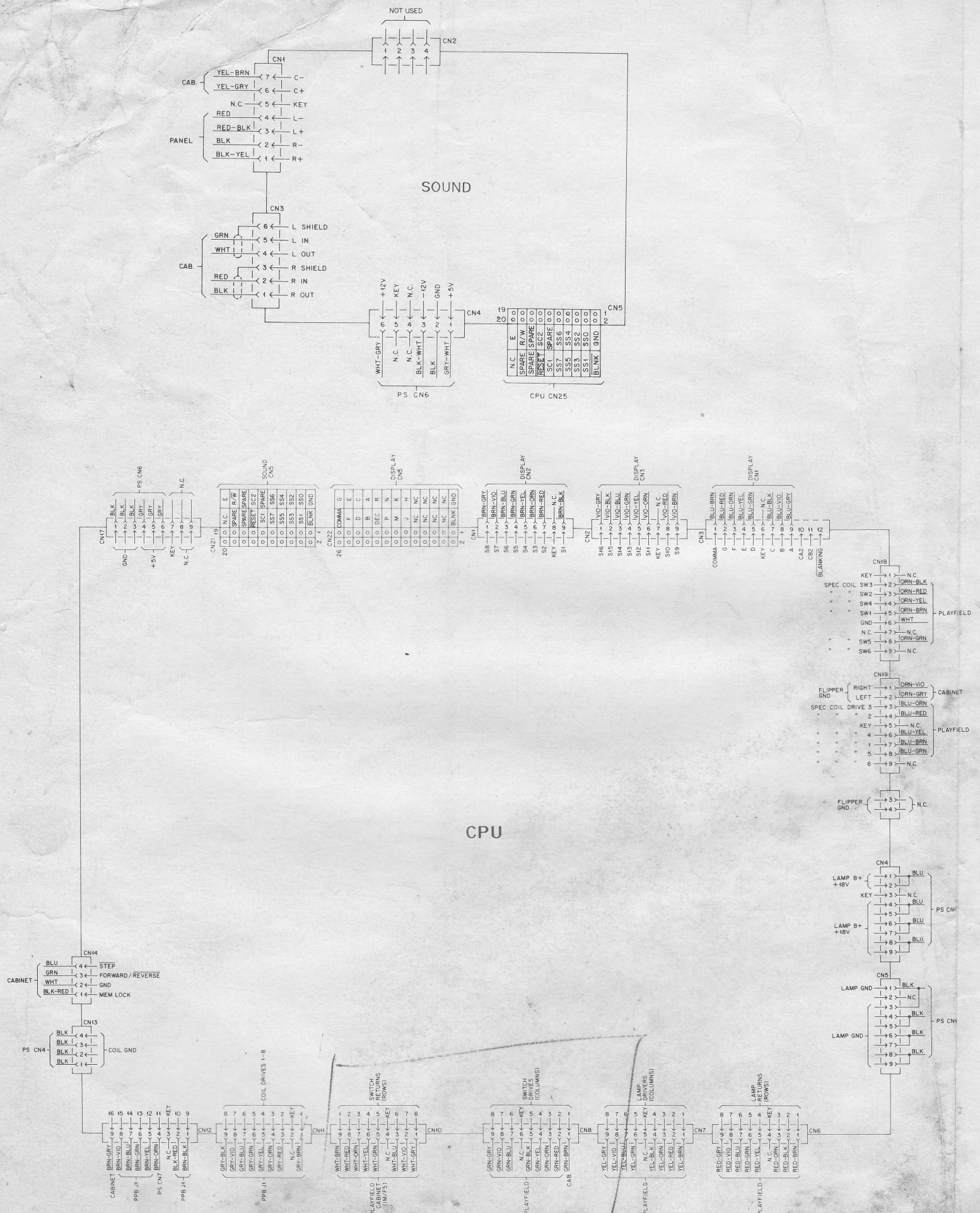


Power Wiring Diagram

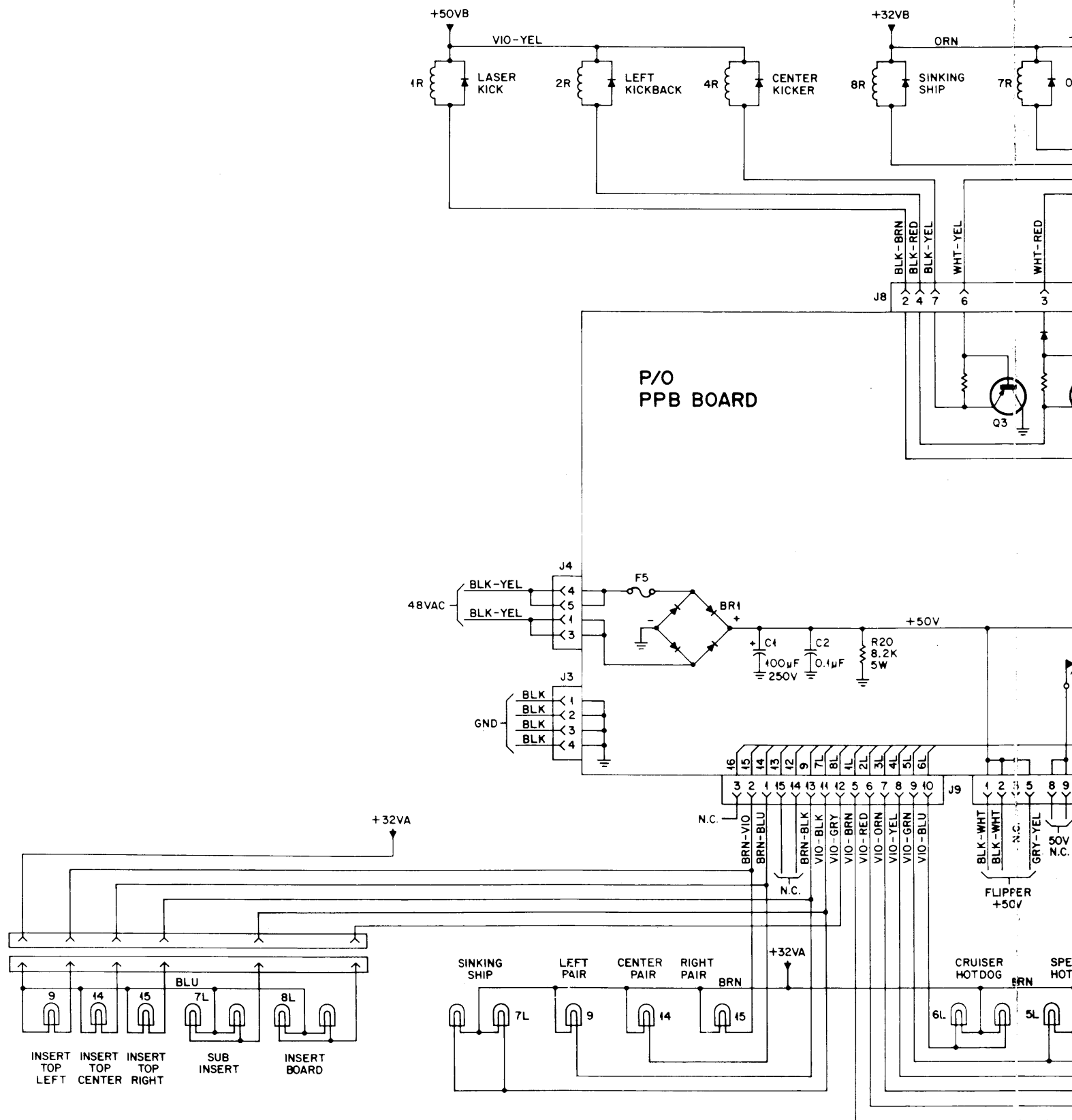


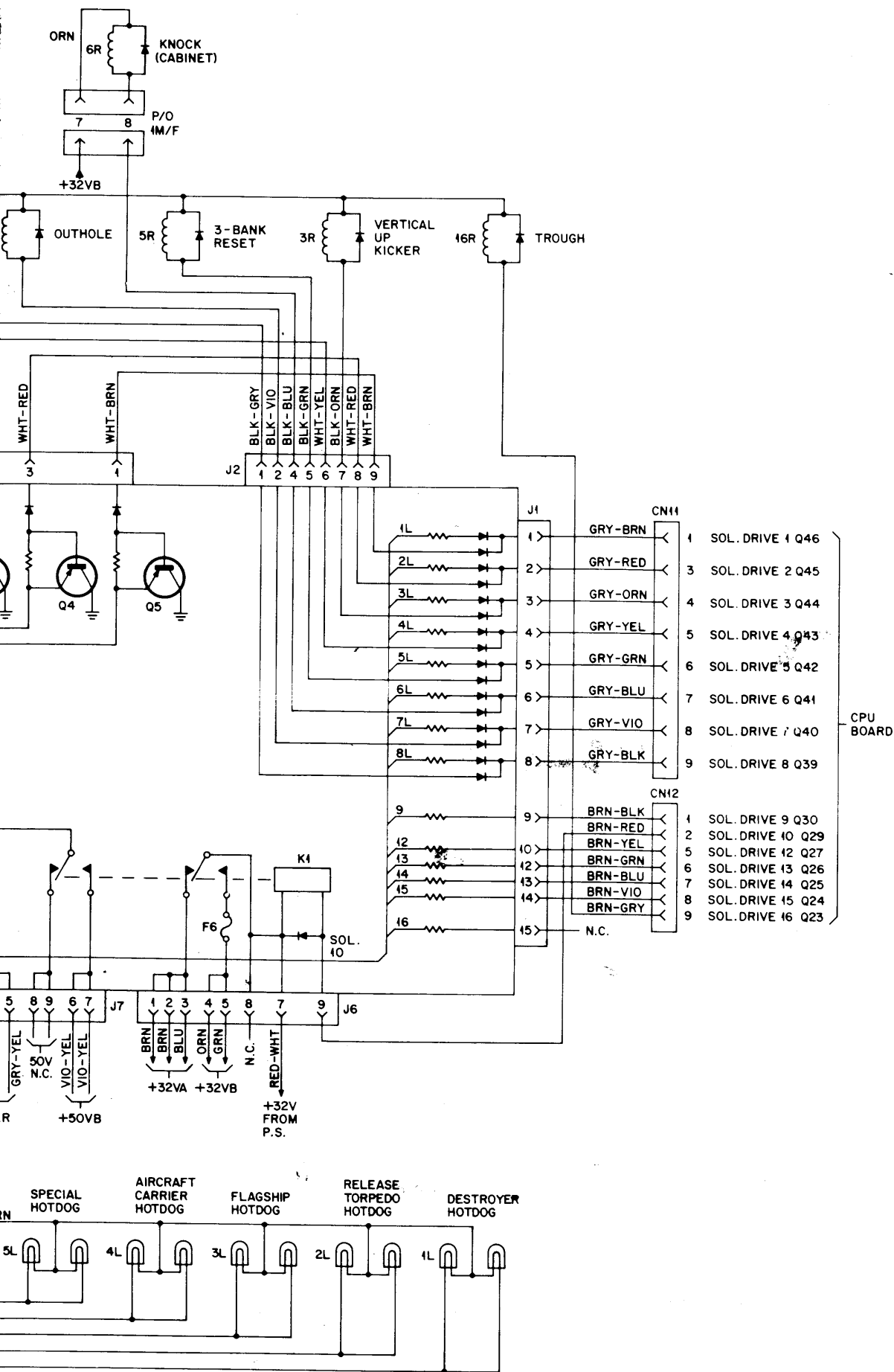
Cabinet Wiring Diagram



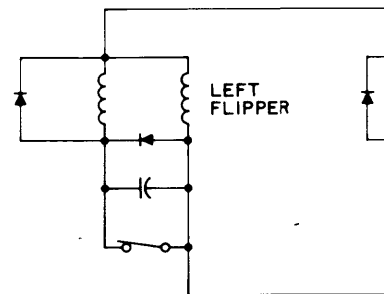
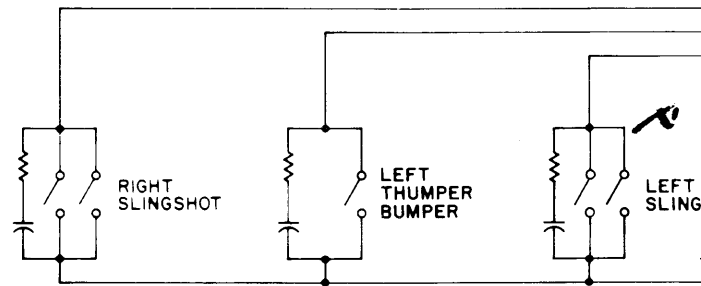
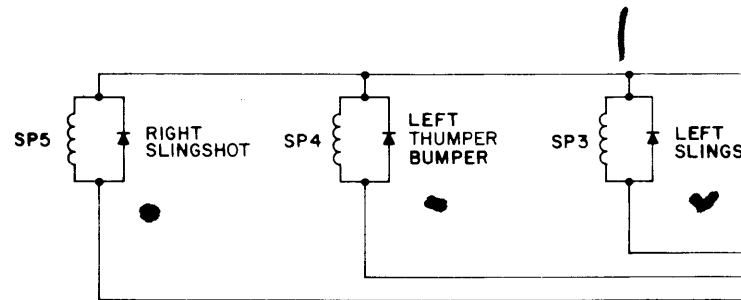








Q



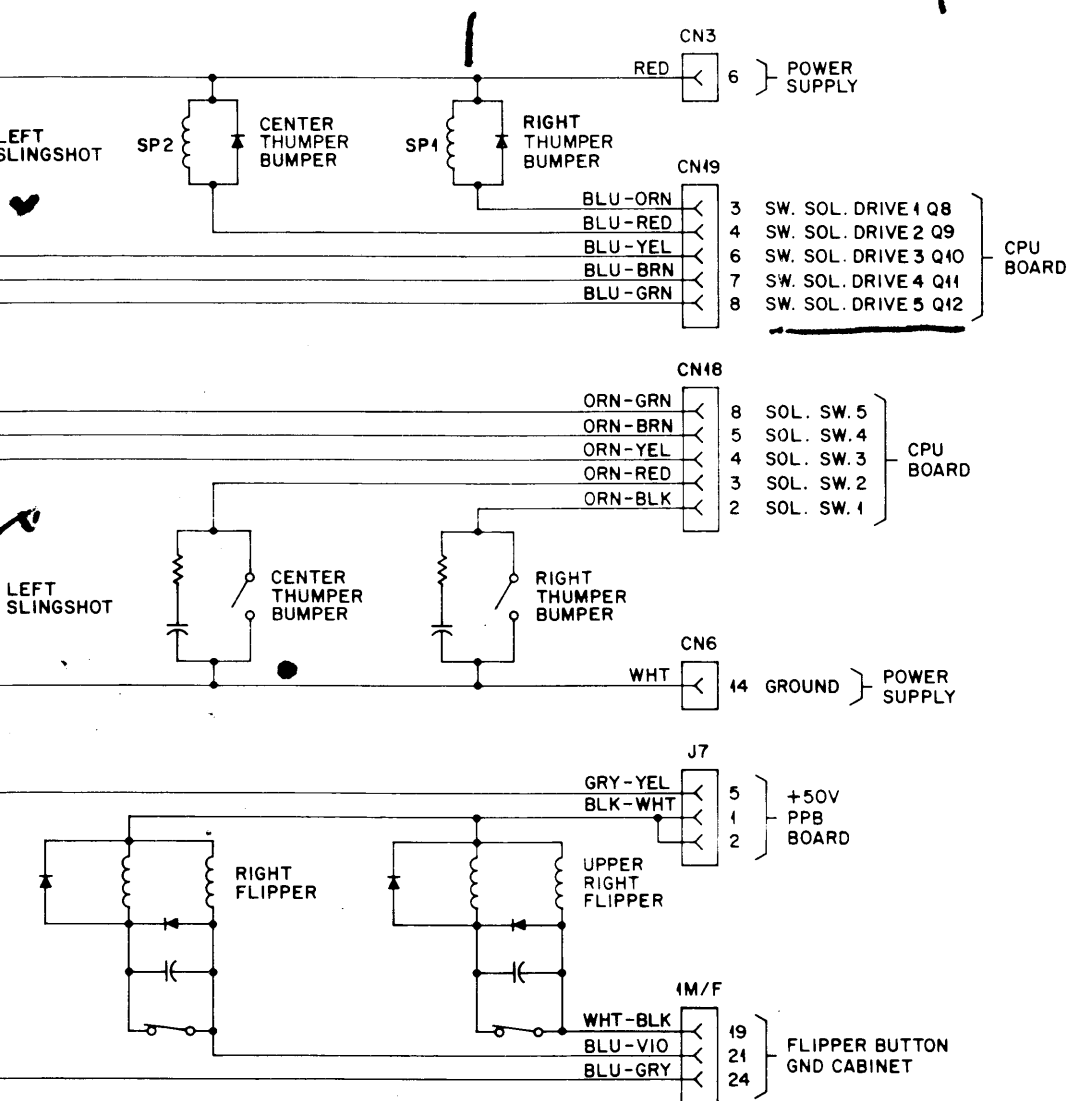
Q10

Q8

S0

S2

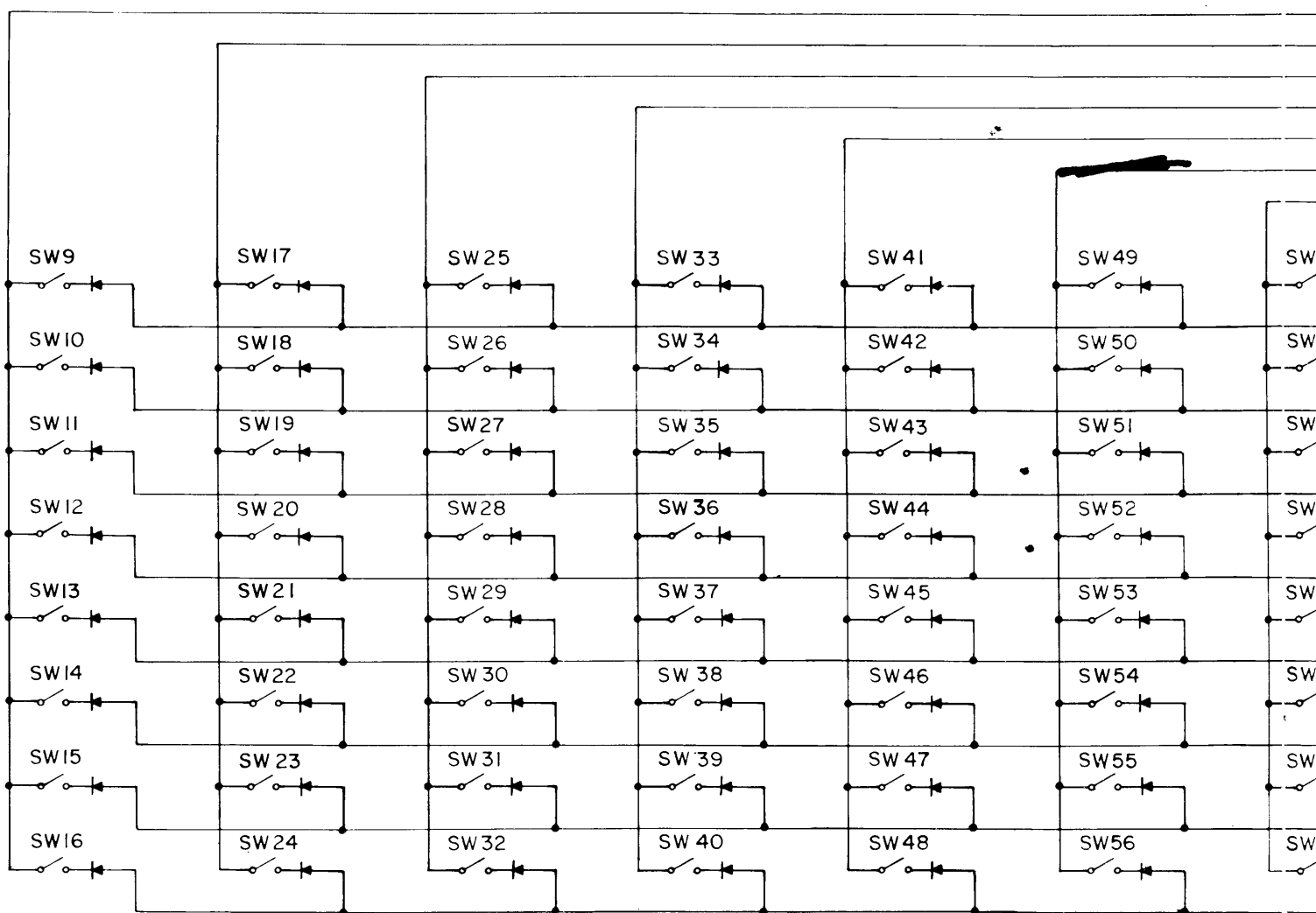
Q8
Q10



52

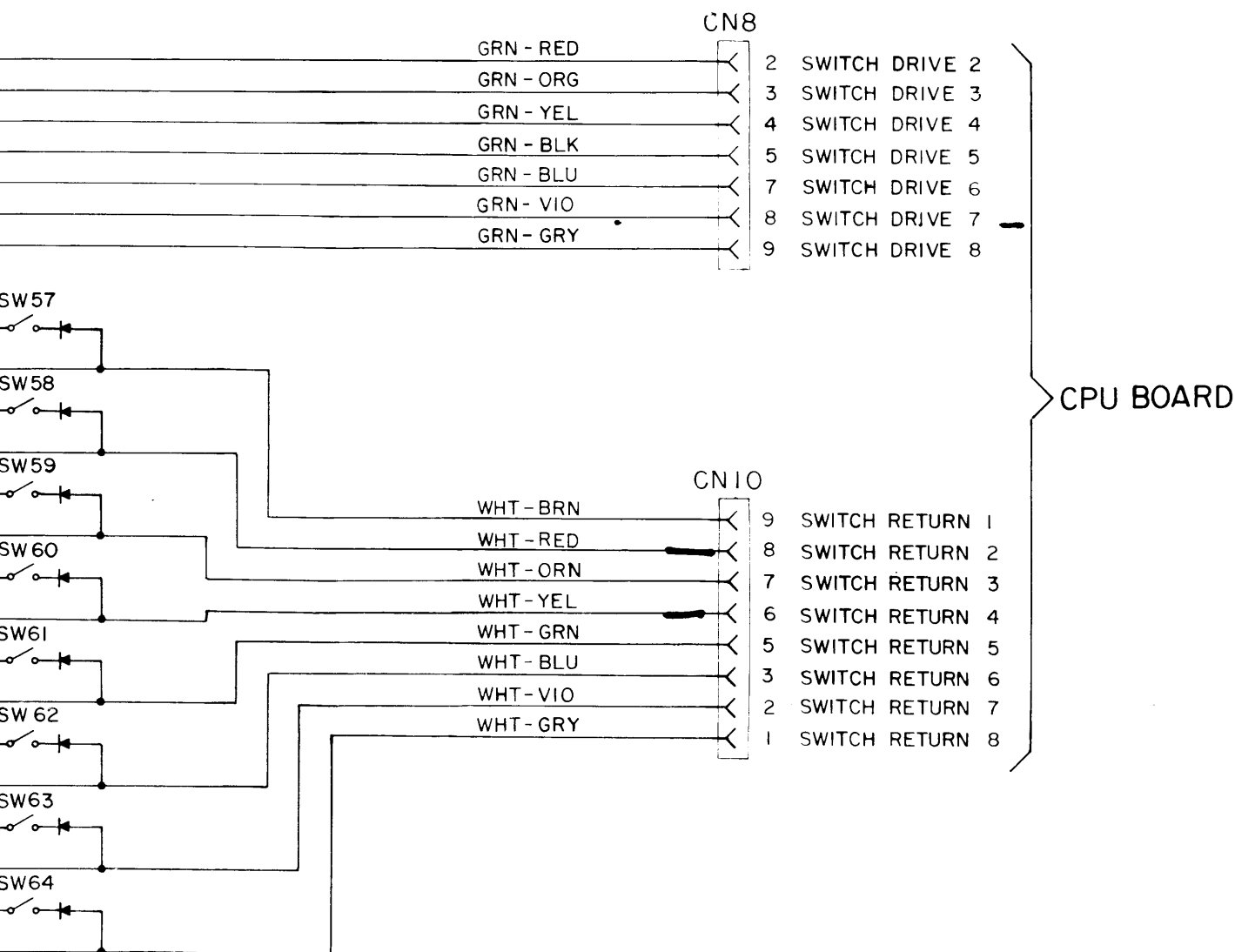
**Switch
Number Description**

*01	Plumb Tilt	16	Right EOS	31
02	Not Used	17	Laser Kick	32
*03	Credit Button	18	Left Return	33
*04	Right Coin	19	Not Used	34
*05	Center Coin	20	Left Green Target	35
*06	Left Coin	21	Center Green Target	36
*07	Slam Tilt	22	Right Green Target	37
08	Not Used	23	Bottom Left Star Rollover	38
09	Not Used	24	Spots Laser Kick Target	39
10	Outhole	25	Top Left Spinner	40
11	Trough :1	26	"S" Lane	41
12	Trough :2	27	"U" Lane	42
13	Trough :3	28	"B" Lane	43
14	Shooter Lane	29	Left Drop Target	44
15	Left EOS	30	Center Drop Target	45



Right Drop Target	46	Ramp
Right Spinner	47	Not Used
Left Yellow Target	48	Not used
Center Yellow Target	49	Left Thumper Bumper
Right Yellow Target	50	Right Thumper Bumper
Right Star Rollover	51	Center Thumper Bumper
Left 50 Point Switch	52	Left Slingshot
Left Blue Target	53	Right Slingshot
Center Blue Target	54	Right Outlane
Right Blue Target	55	Right Return
Left Kicker :1	56	Right 50 Point Switch
Left Kicker :2	57	Not Used
Vertical Up Kicker	Thru 64	
Center Kicker :1		
Center Kicker :2		

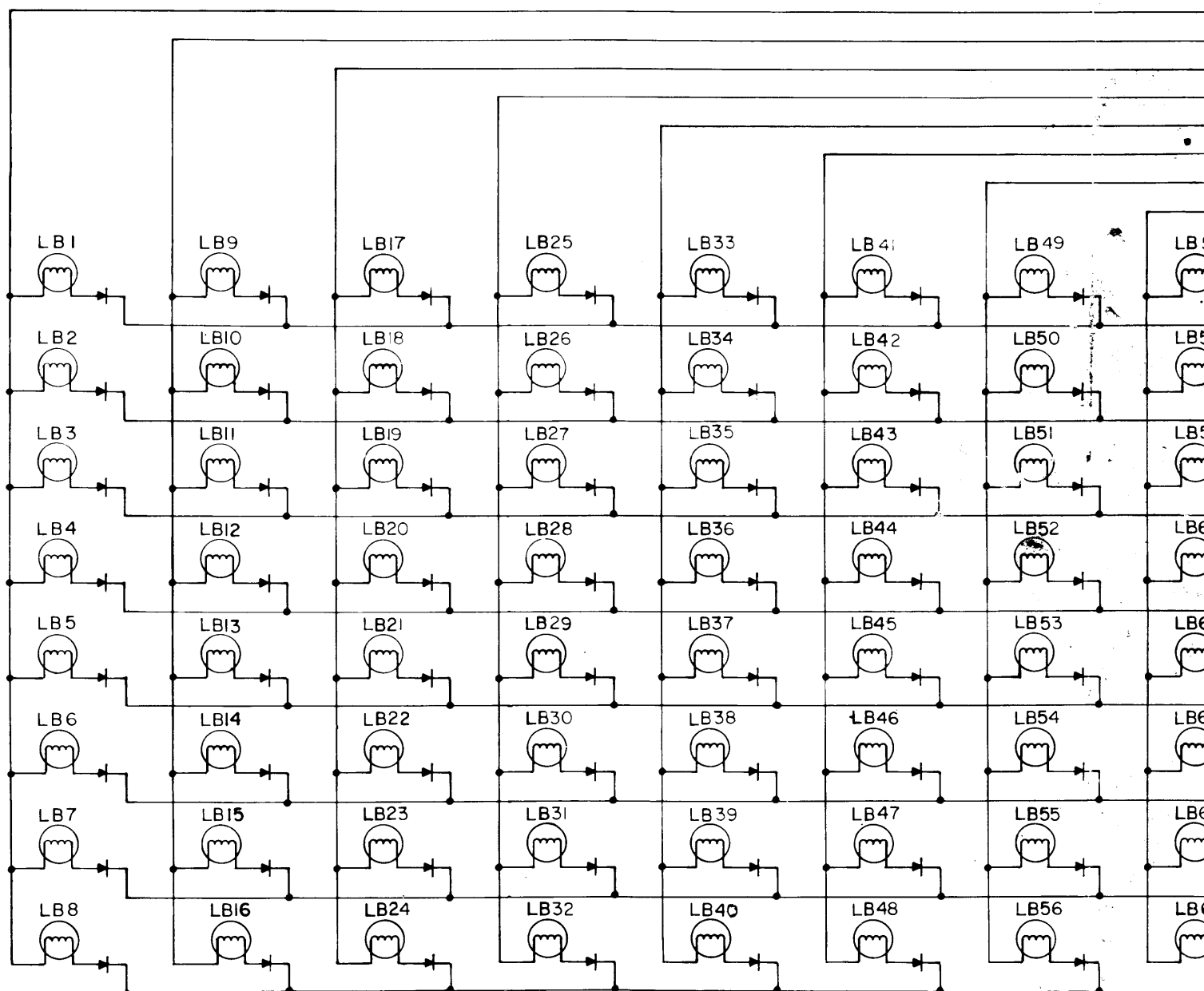
* Indicates cabinet switches.



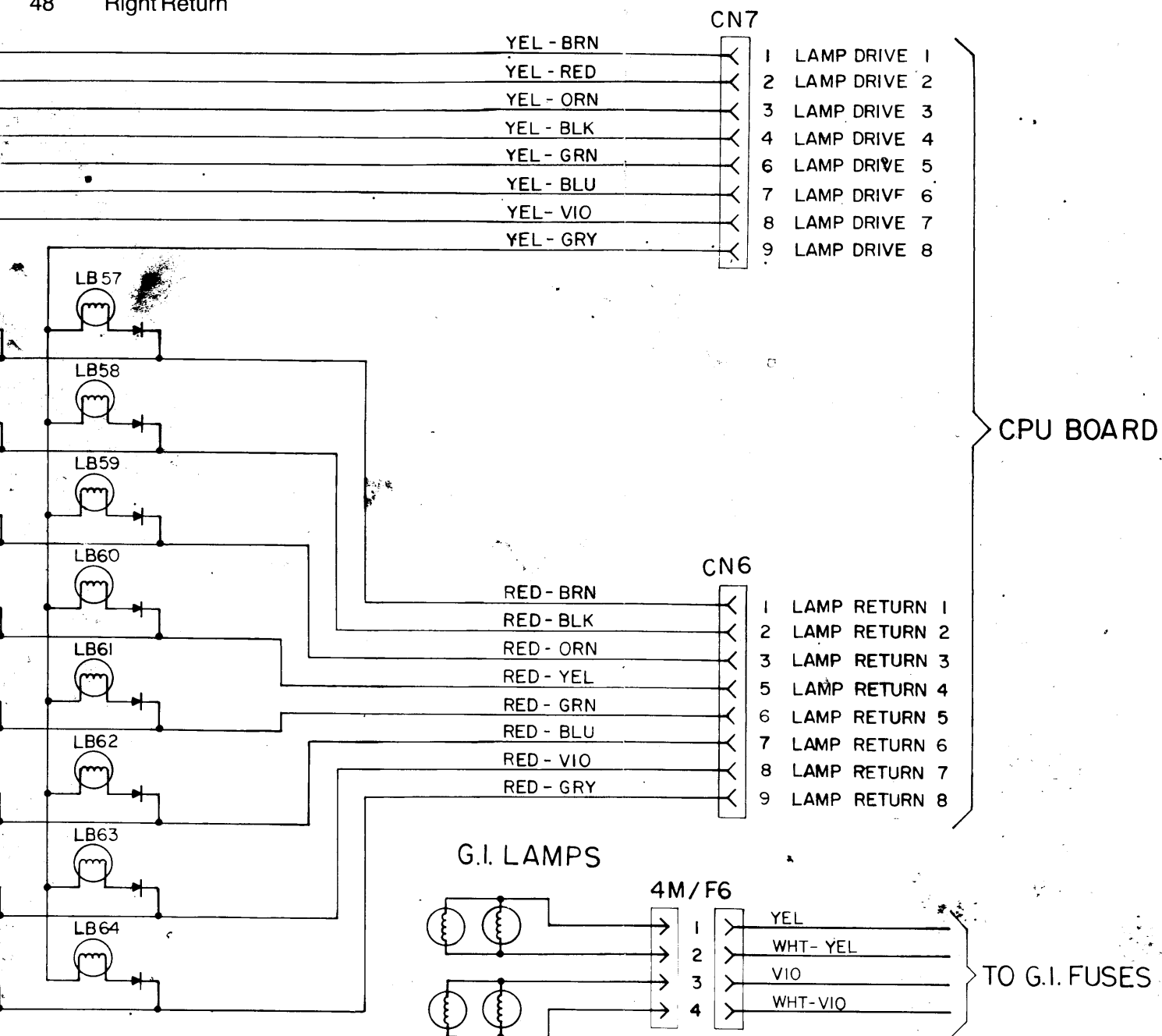
**Lamp
Number Description**

* Indicates insert board lamps.

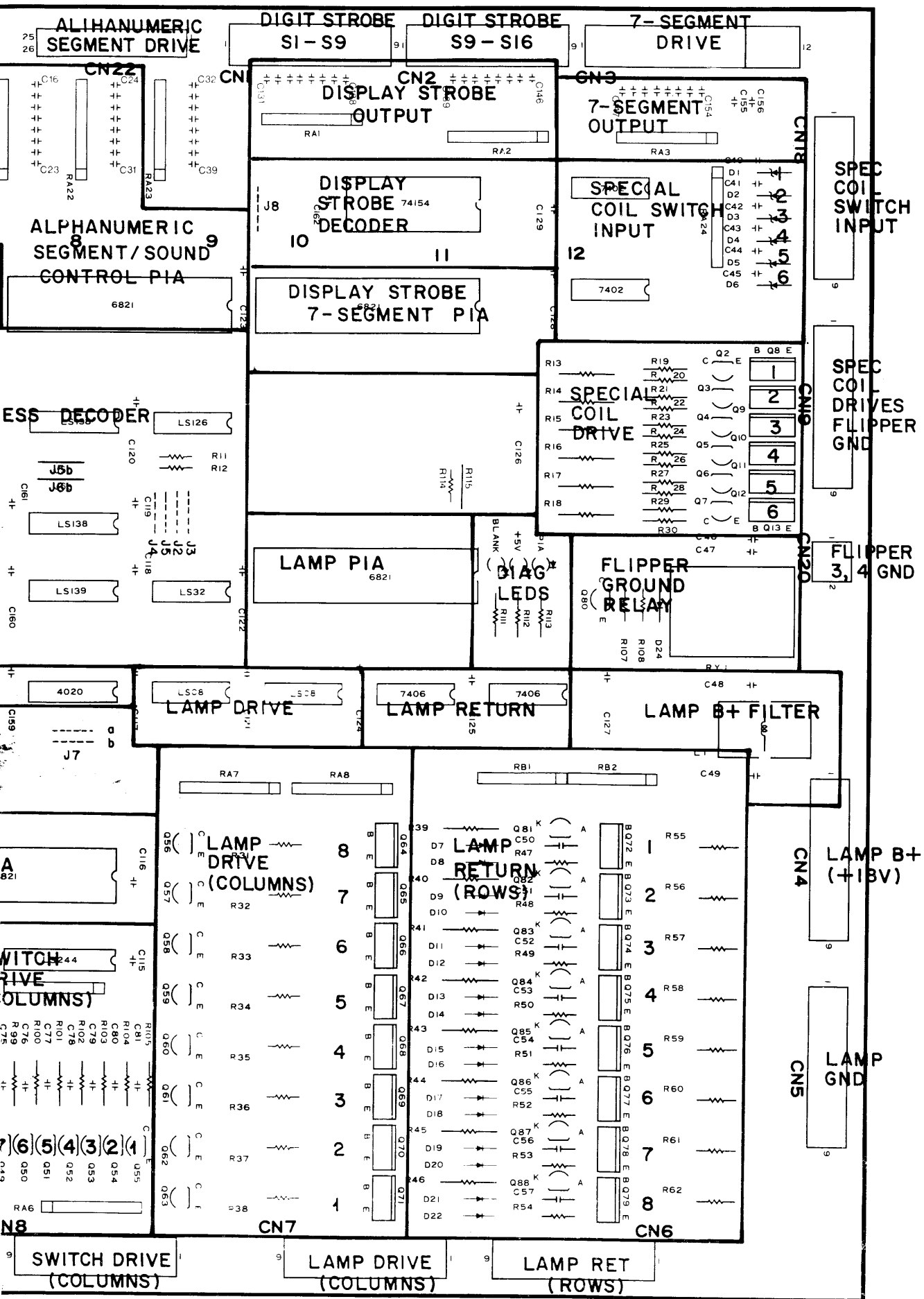
01	Lockball :2 (2)	17	Top Right Playfield 2x	33	
02	Spot Laser Kick	18	5K When Lit	34	
03	Destroy Fleet 100K	19	Yellow Arrow :1	35	
04	Destroy Fleet 25K Green	20	Yellow Arrow :2	36	
05	Destroy Fleet 25K Blue	21	Yellow Arrow :3	37	
06	Destroy Fleet 25K Yellow	22	Aircraft Carrier Hotdog	38	
07	Top Left Playfield 2X	23	Lockball :1 (2)	39	
08	Release Torpedoes Hotdog (2)	*24	Insert 1 Torpedo (2)	40	
09	"S" Lane	25	Ramp 20K Clear	41	
10	"U" Lane	26	Ramp 30K Yellow	42	
11	"B" Lane	27	Ramp 40K Green	43	
12	Extra Ball Triangle	28	Ramp Hold Bonus Orange	44	
13	Flagship 25K Clear	29	Ramp Extra Ball Amber	45	
14	Flagship 50K Yellow	30	Ramp Hotdog Special	46	
15	Flagship 100K Orange	31	Periscope Left (2)	47	
*16	Insert 2 Torpedo	32	Periscope Right (2)	48	



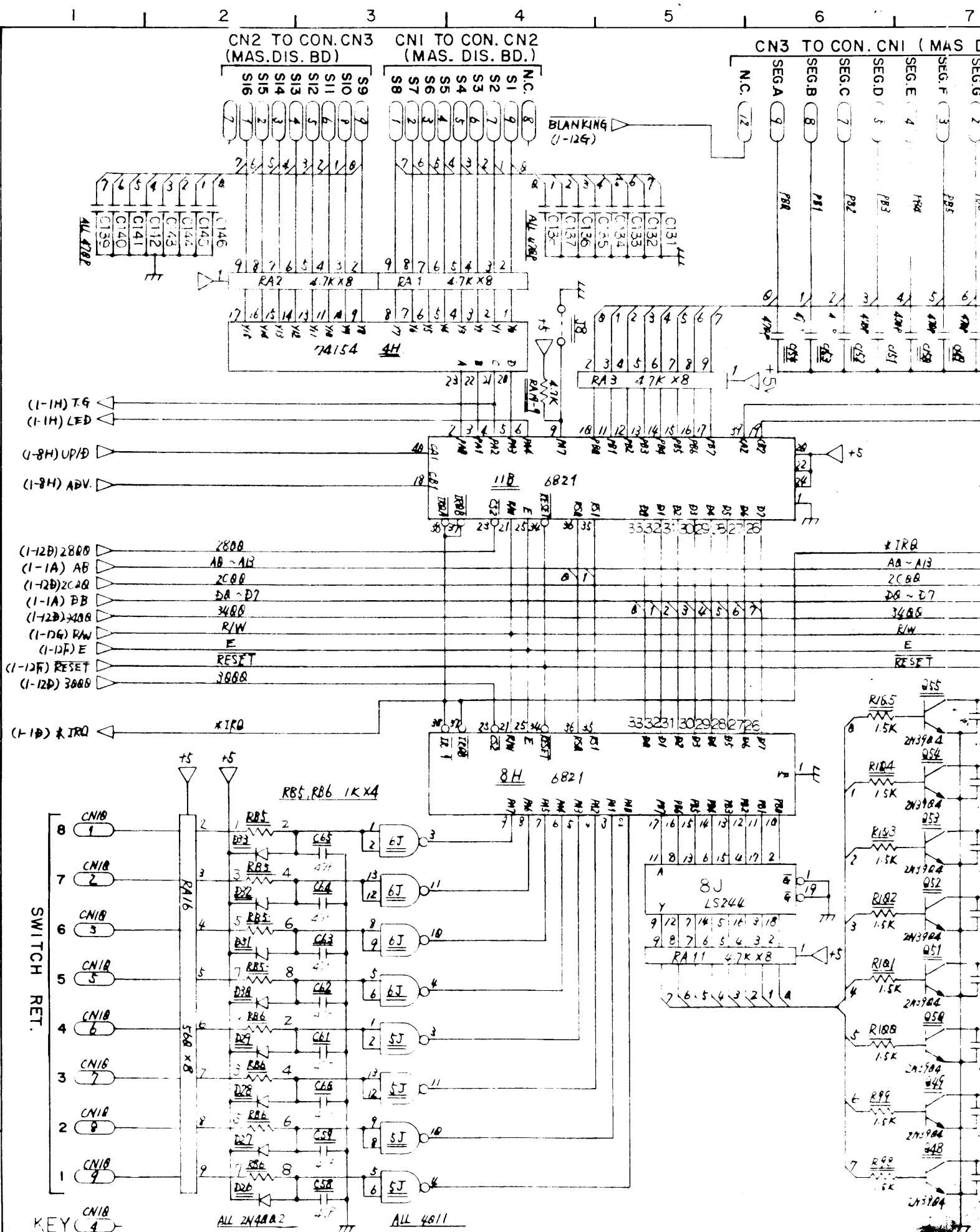
33	Green Arrow :1	49	Laser Kick
34	Green Arrow :2	50	Green 30K
35	Green Arrow :3	51	Yellow 30K
36	Destroyer Hotdog	52	2X
37	Blue Arrow :1	53	3X
38	Blue Arrow :2	54	5X
39	Blue Arrow :3	55	Fire Again
40	Cruiser Hotdog	56	Right Outlane
41	Shield Playfield 2X	57	Jackpot 100K Shield
42	Blue 10K	58	Blue 40K
43	Green 10K	59	Green 40K
44	Yellow 10K	60	Yellow 40K
45	Blue 20K	61	Blue 30K
46	Green 20K	62	Left Special
47	Yellow 20K	63	Left Return
48	Right Return	64	Release Balls

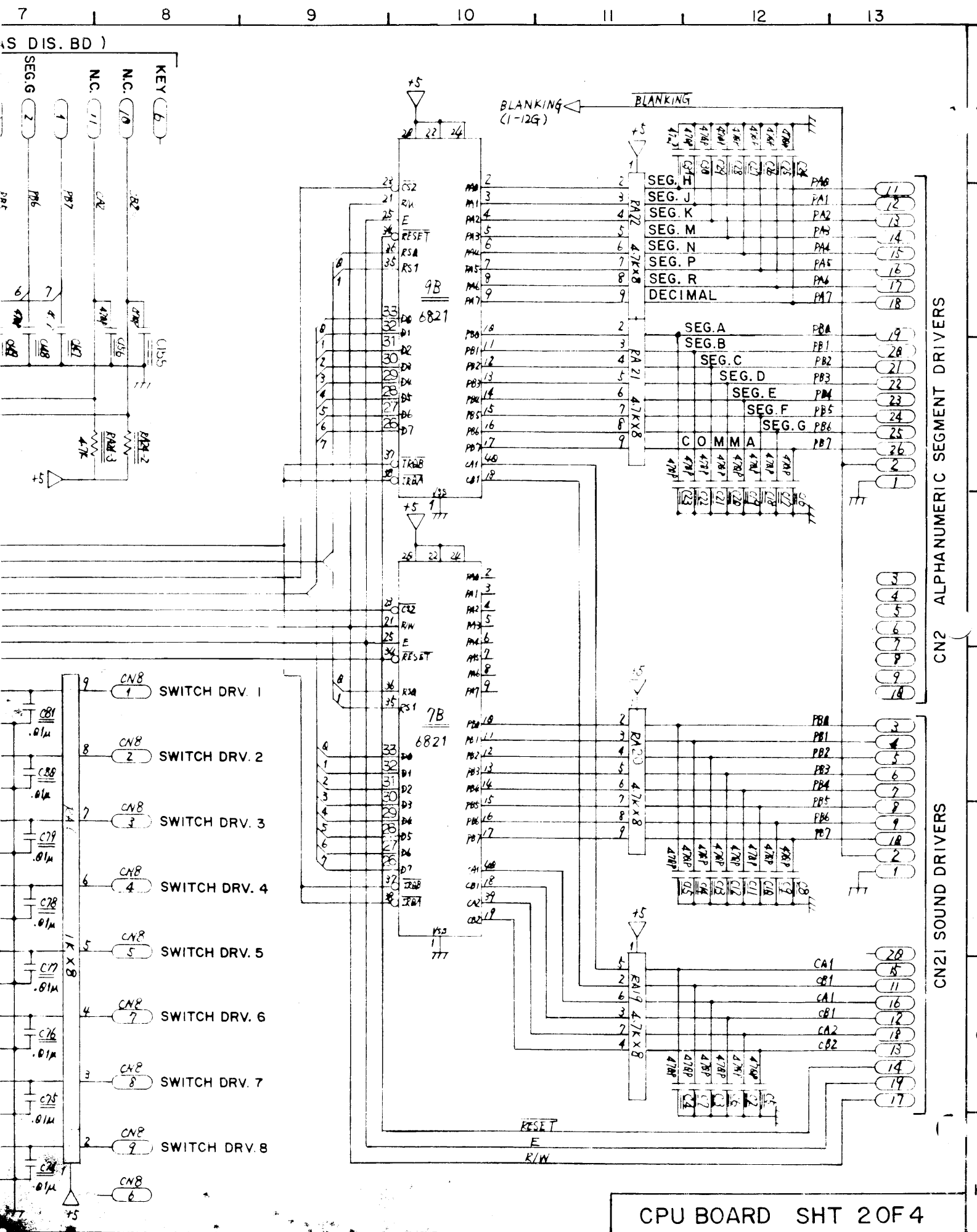


Playfield Lamp Wiring Diagram



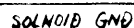






CPU BOARD SHT 2 OF 4

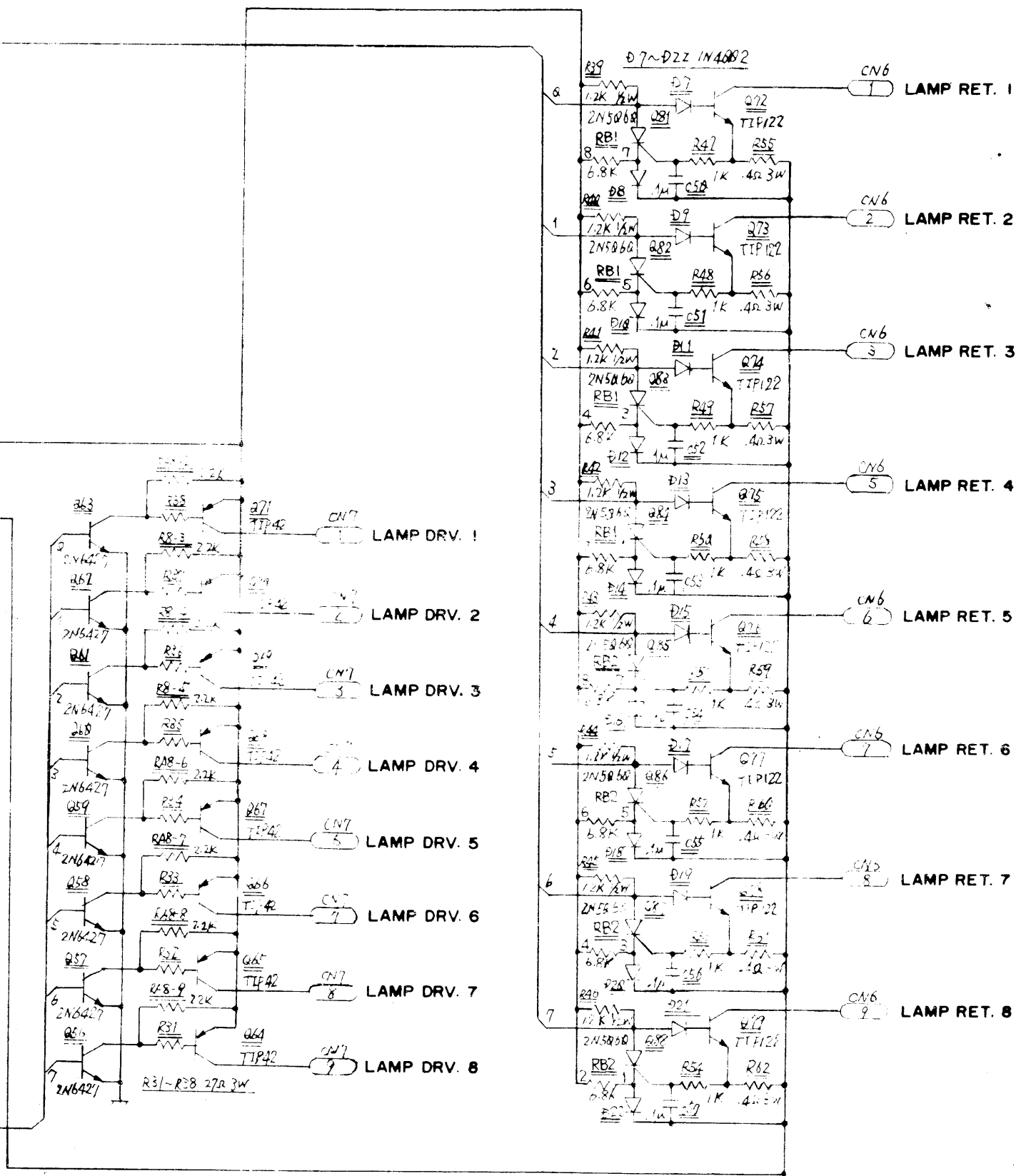
→ LAMP CNT (4-8A)



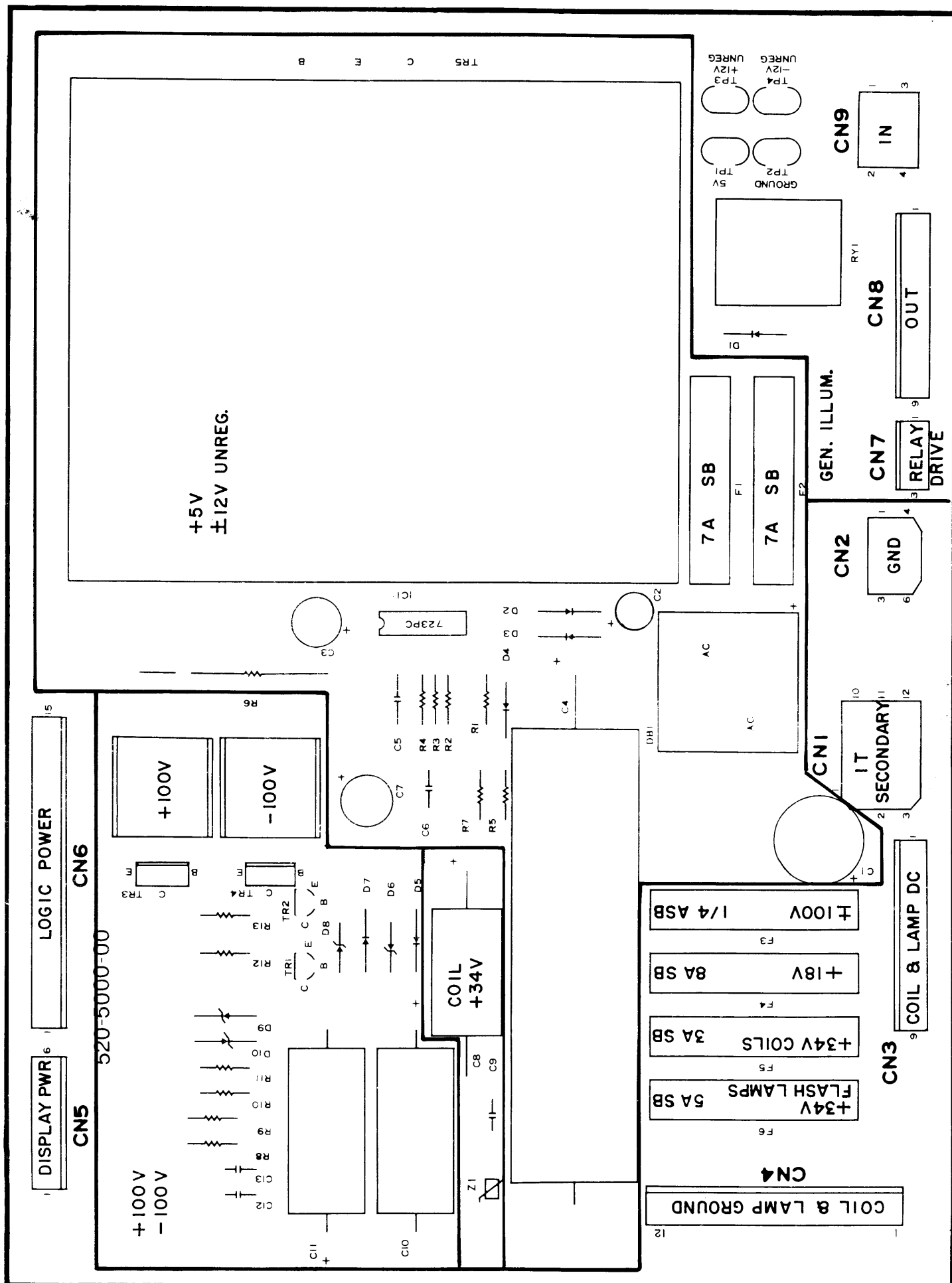
→ LAMP (4-8G)

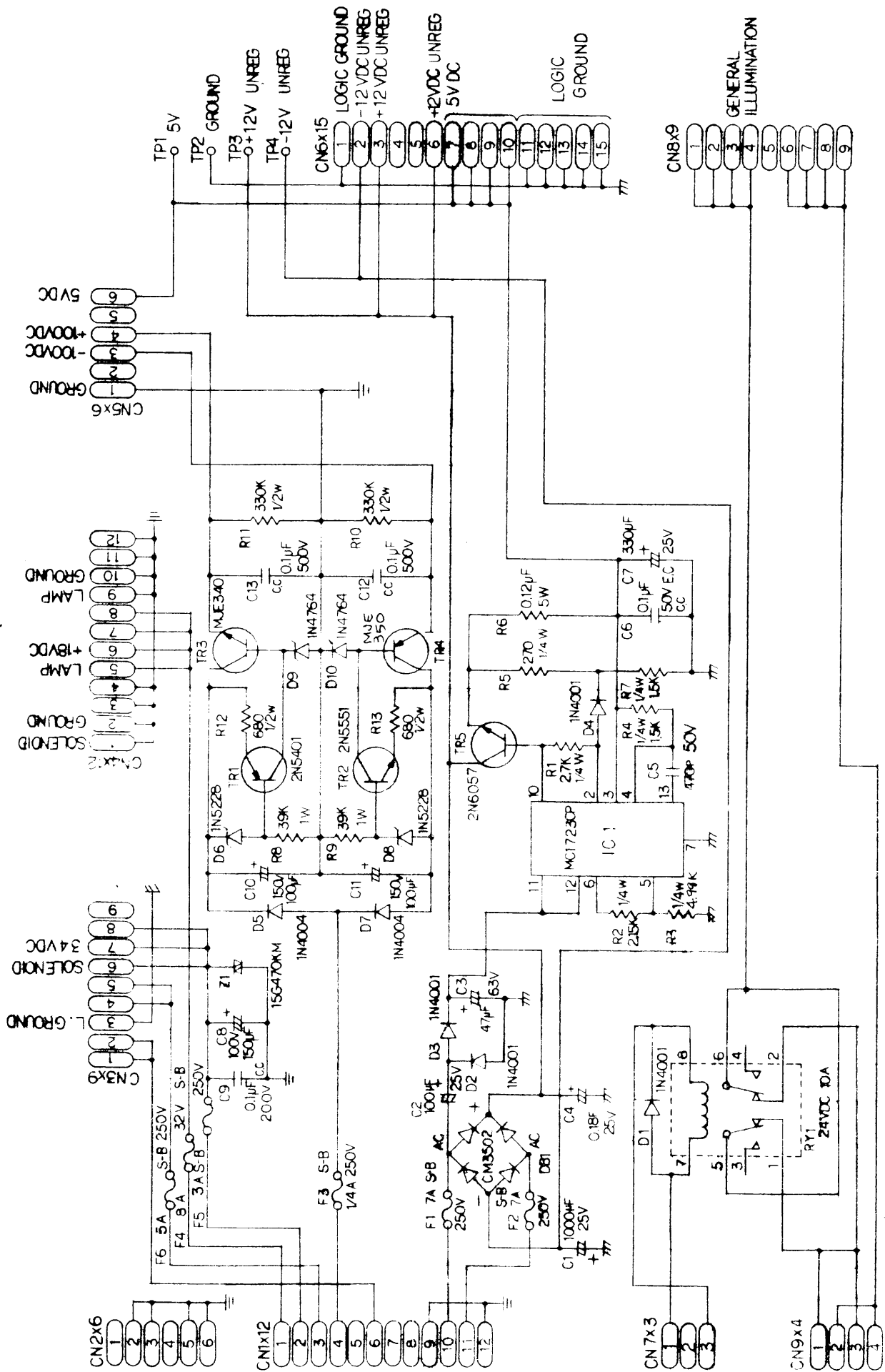


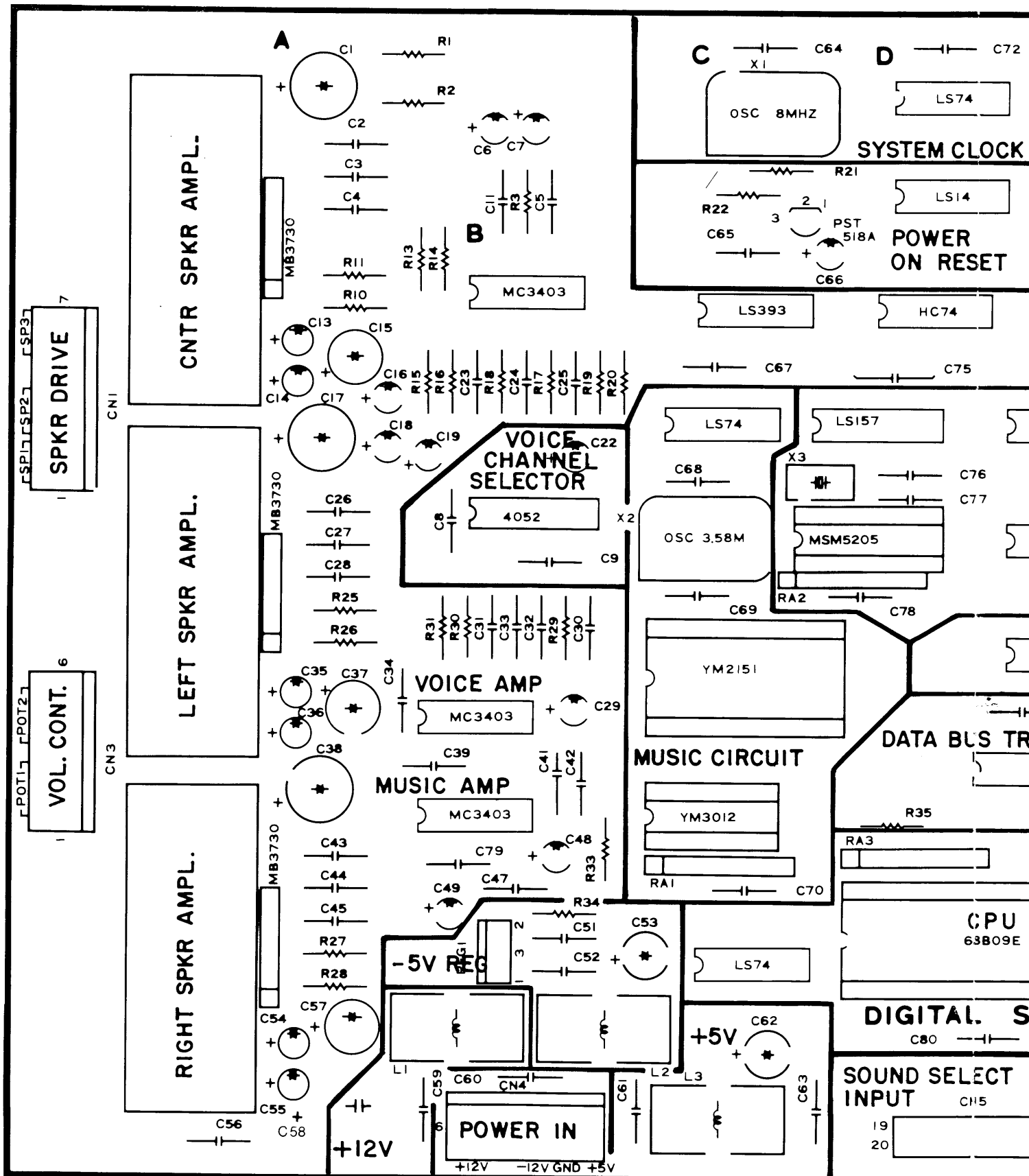
CPU BOARD 3 OF 4



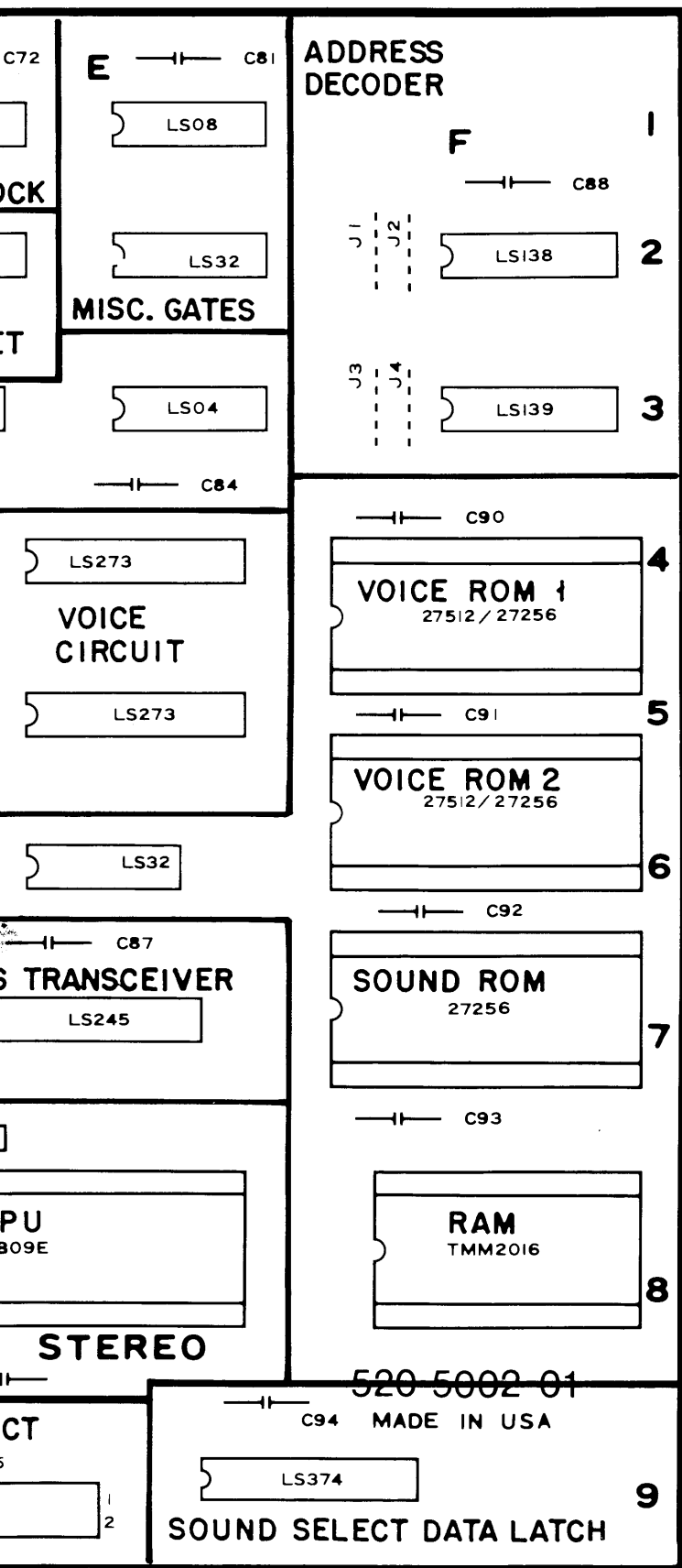
CPU BOARD SHT 4 OF 4

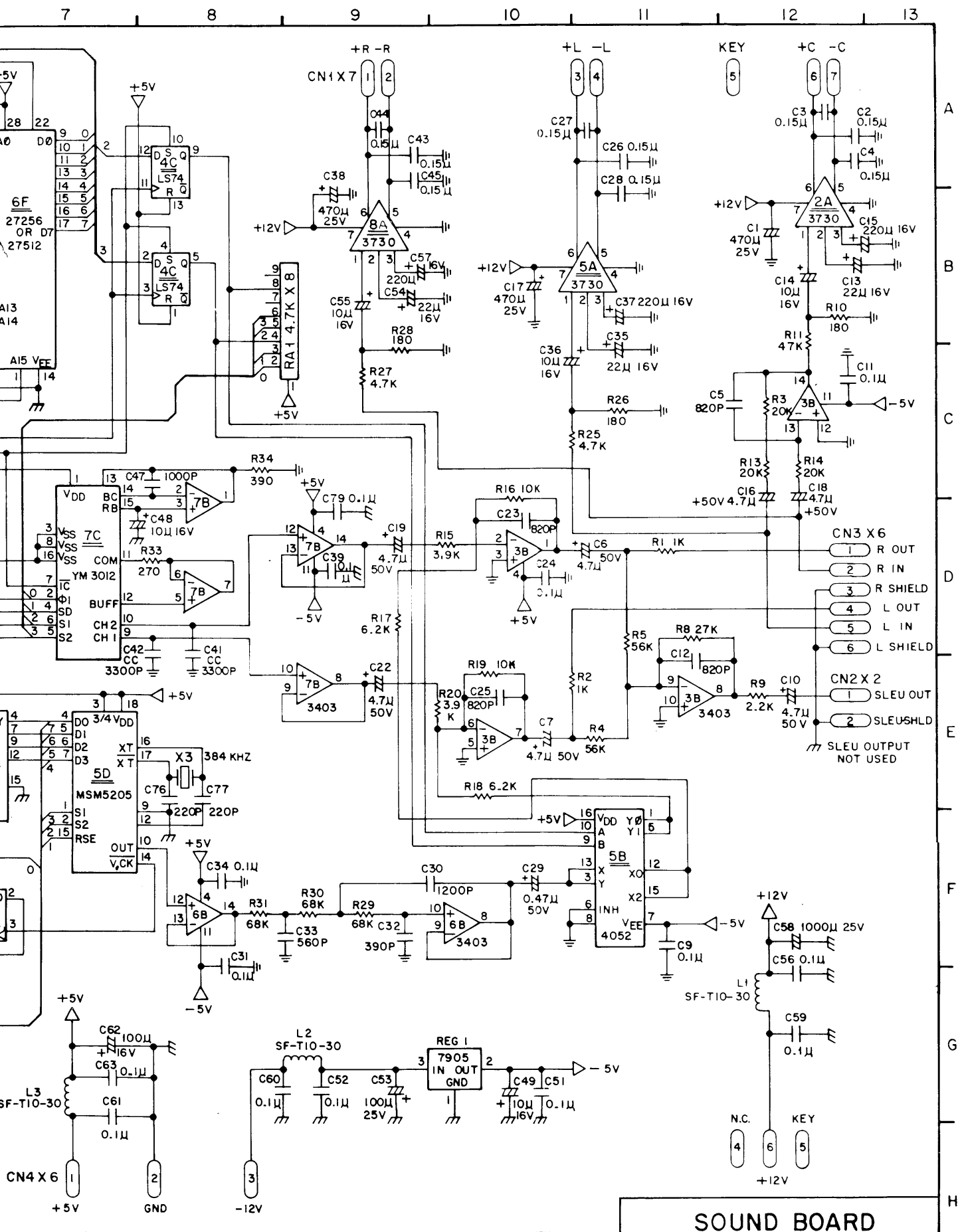




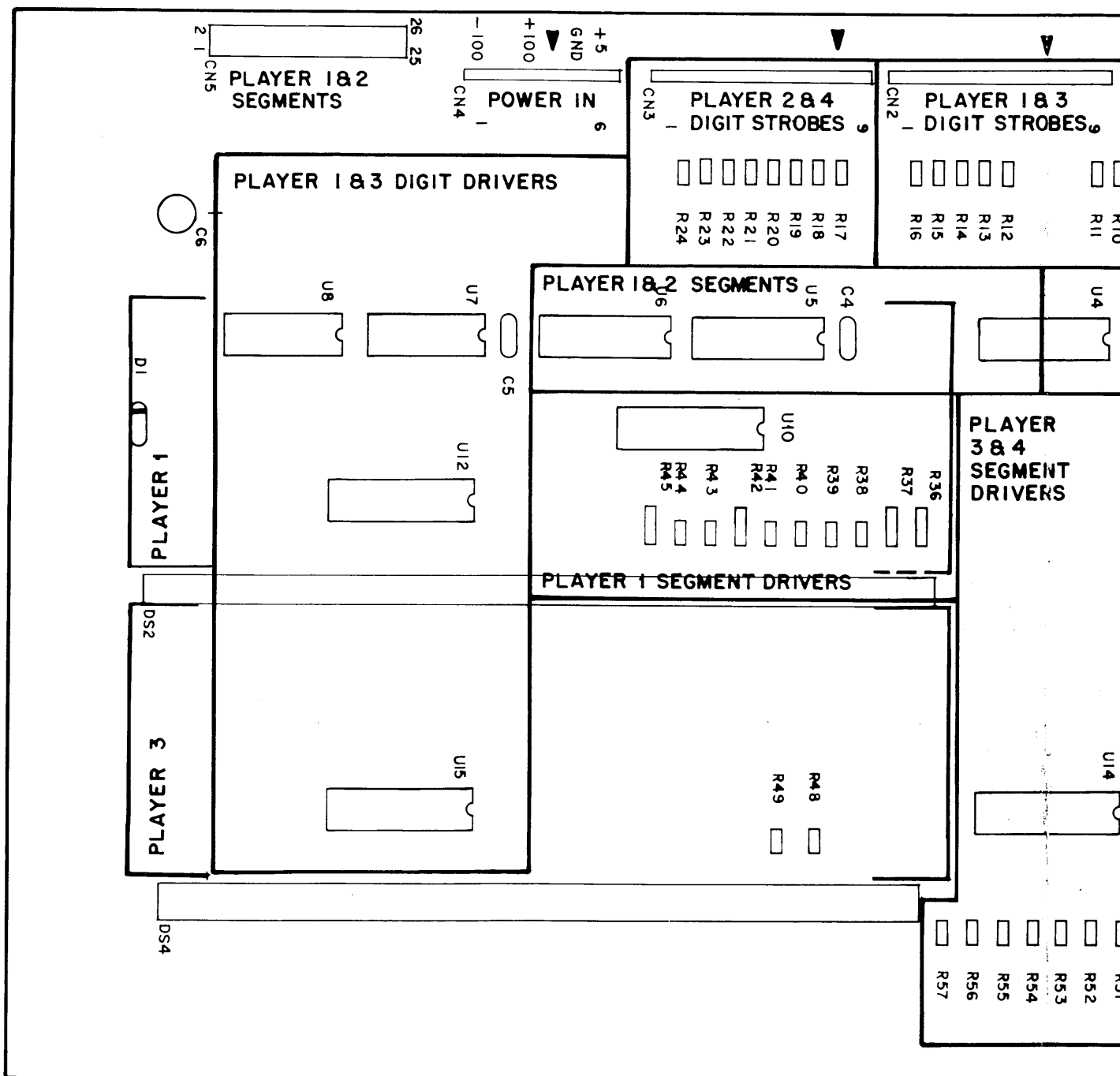


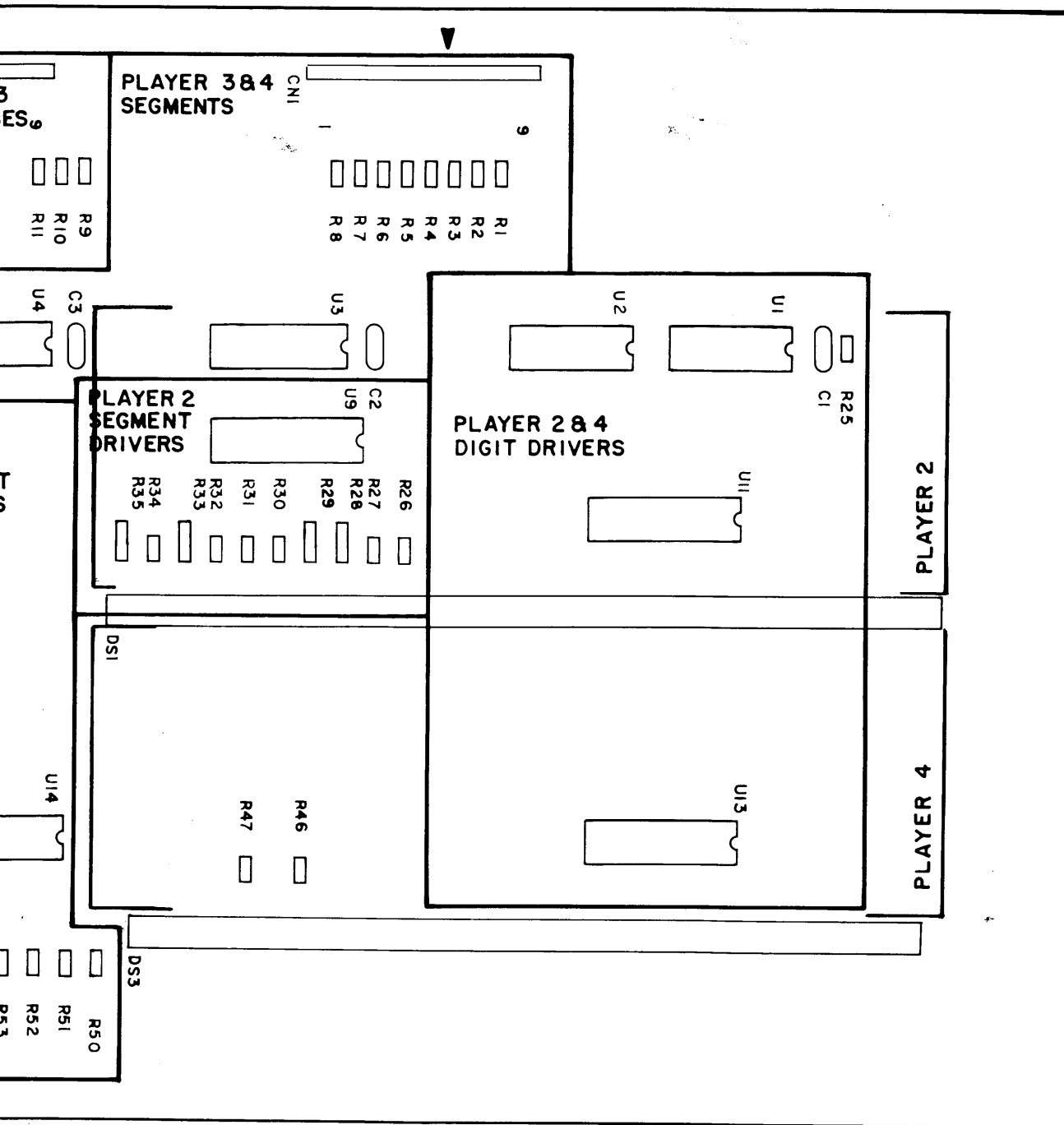
Sound Board Assembly Drawing



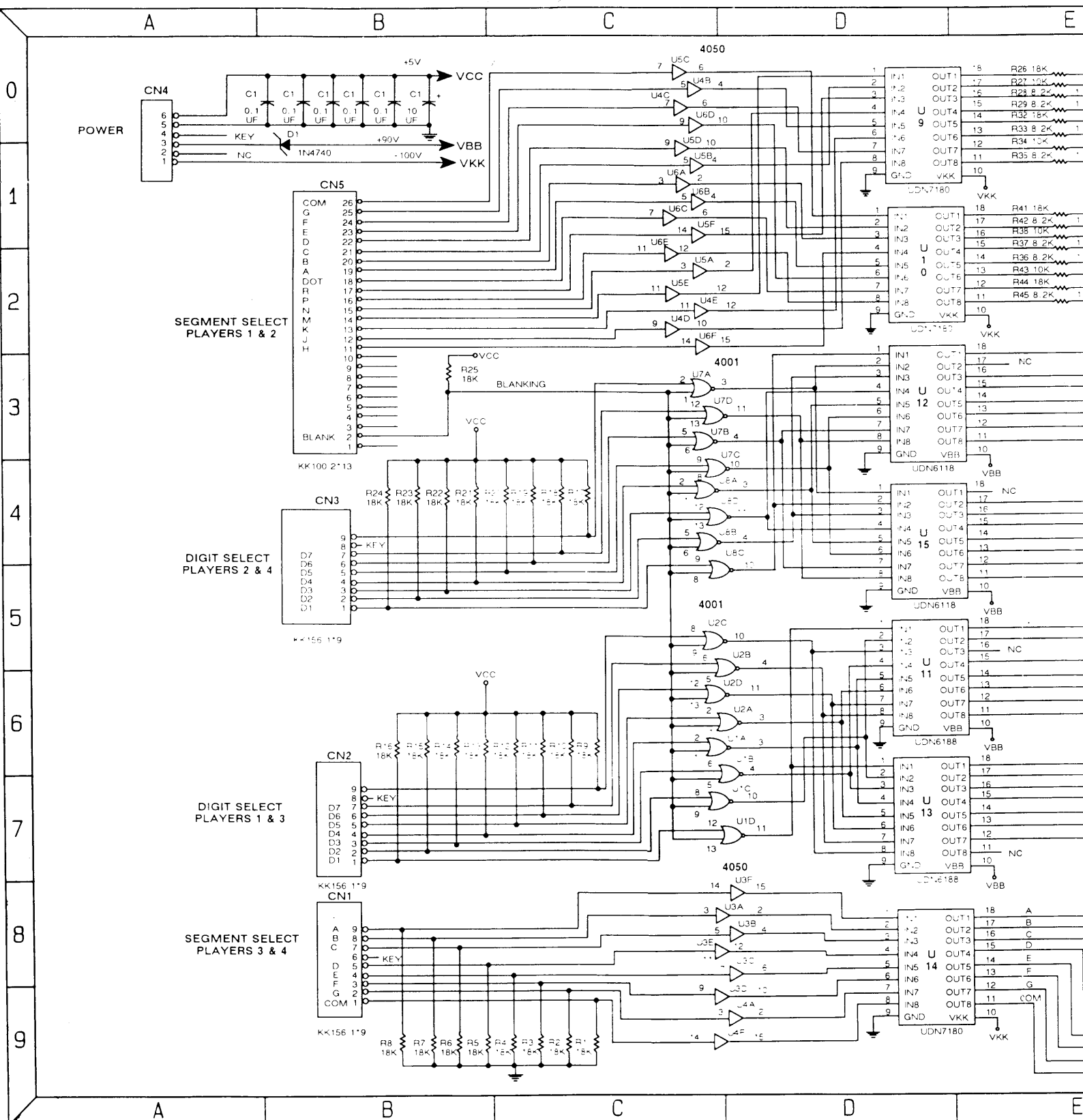


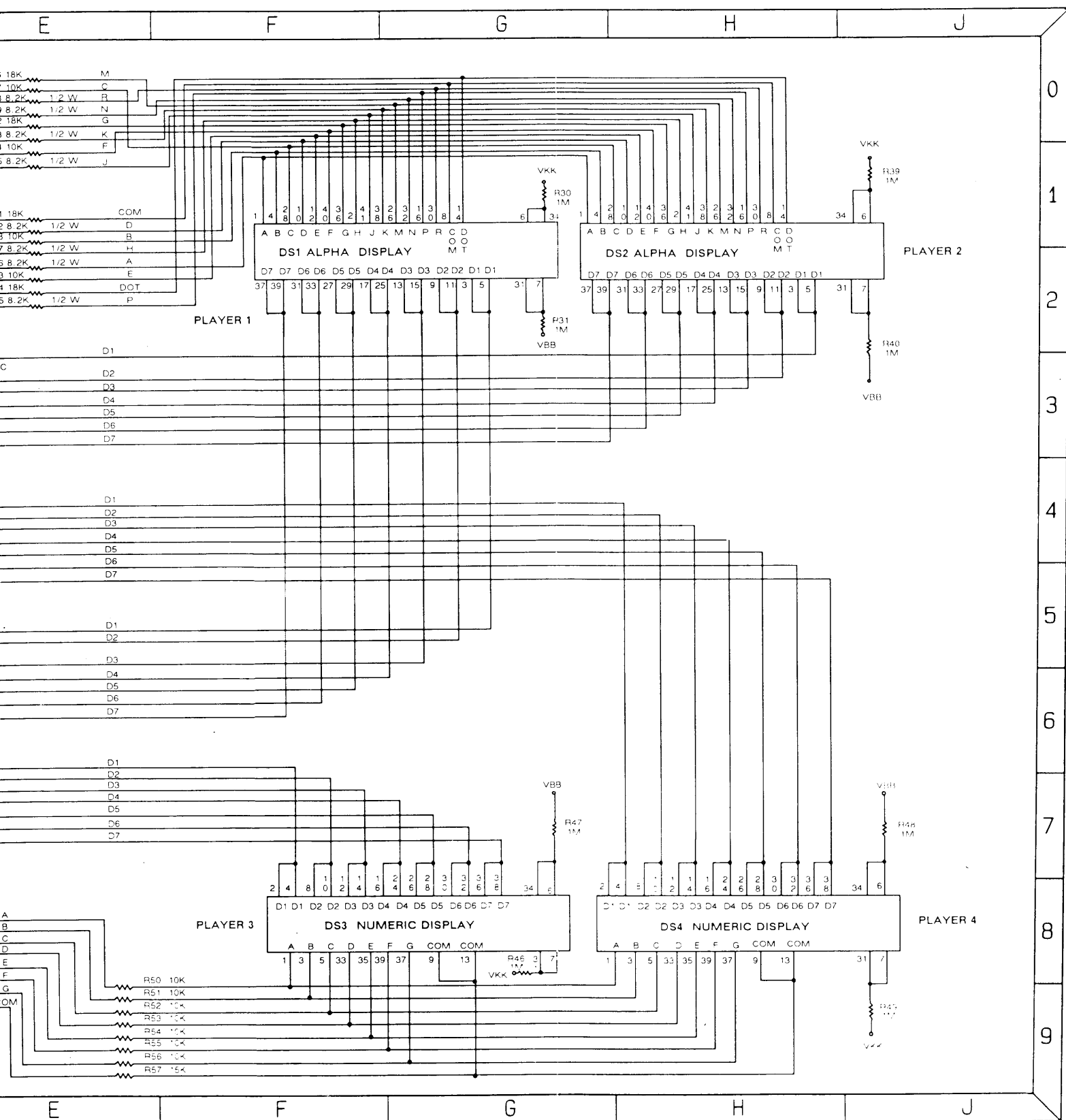
Sound Board Logic Diagram



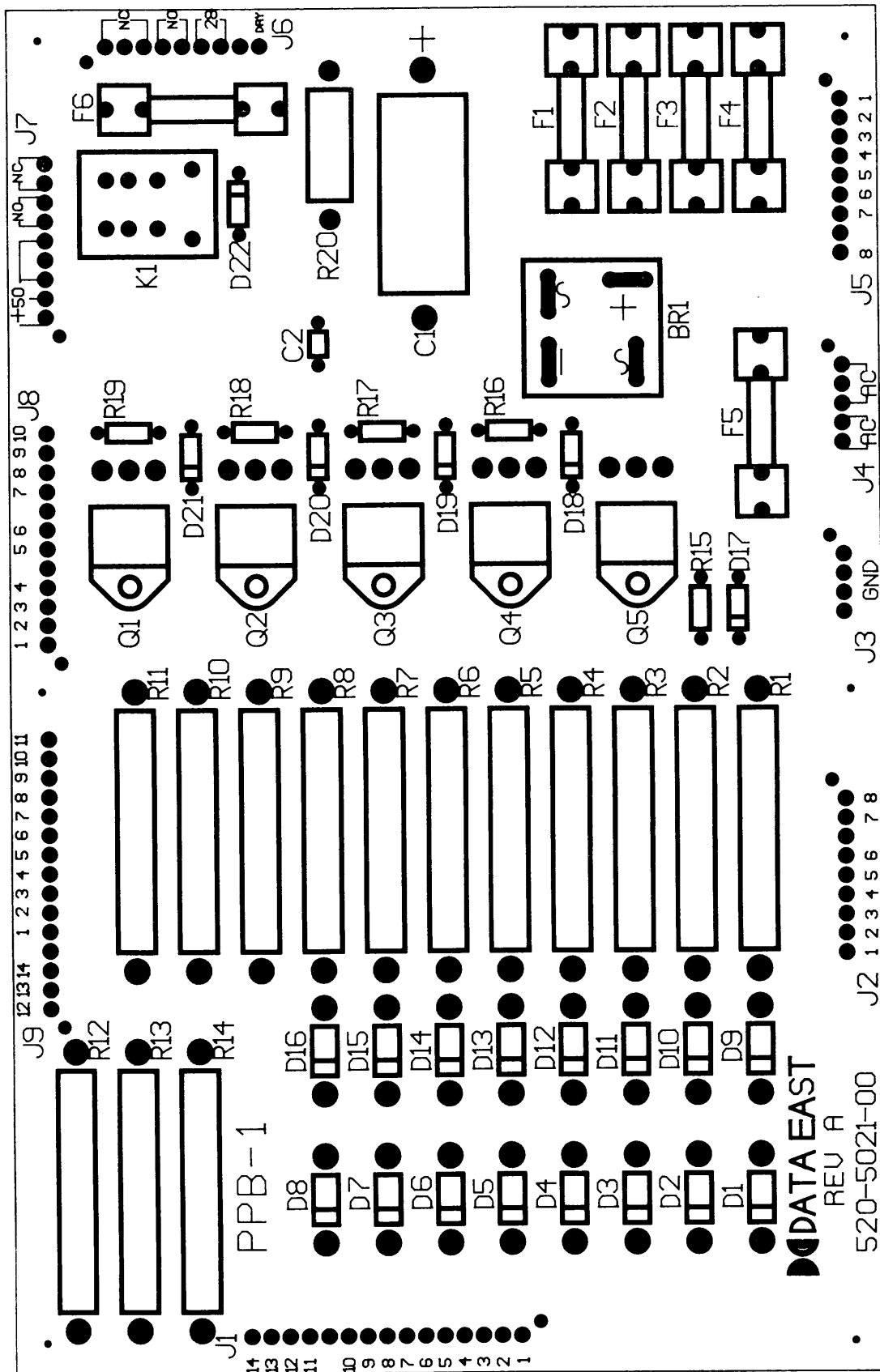


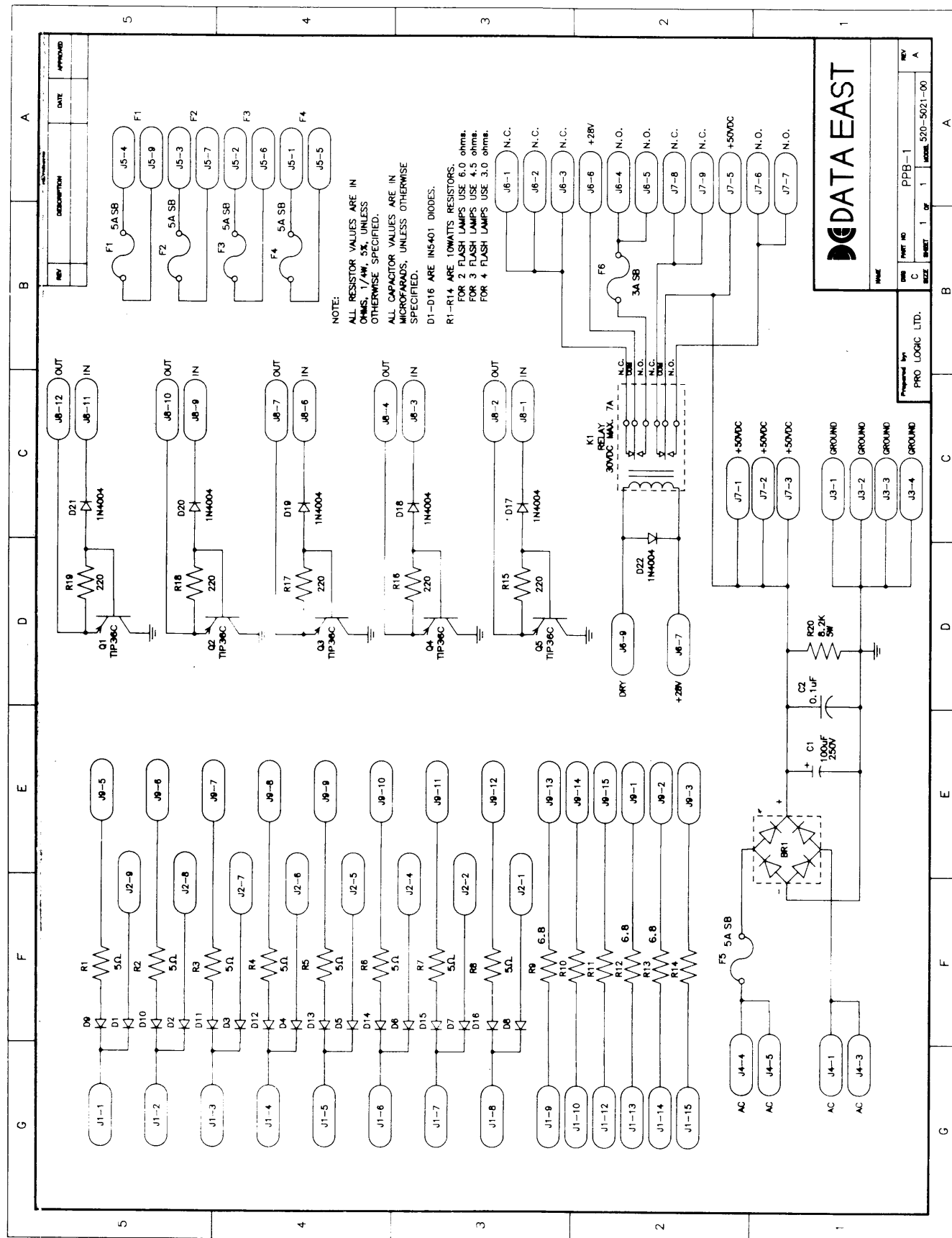
Tolerances: (except as noted)		PART NO. 520-5014-00			
Angular:	±	DESCRIPTION: COMPONENT LEGEND			
Decimal:	±				
Fractional:	±	DRAWING NO.			
Drawn:	Date:				
Checked:	By:	ELECTRONIC DESIGN & MANUFACTURING, INC.			
Approved:	By:				
		Size:	Scale: 2:1	Sheet:	of



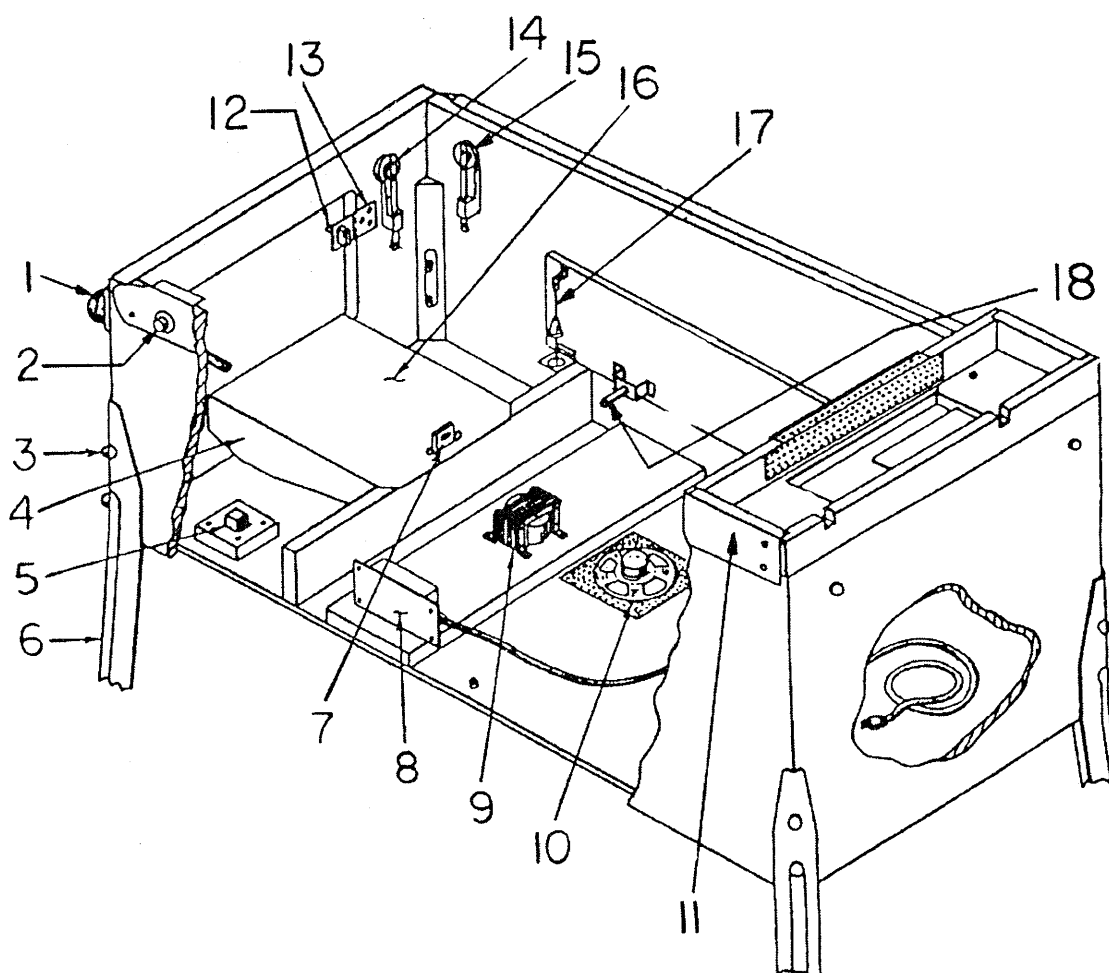


Combined Display Logic Diagram

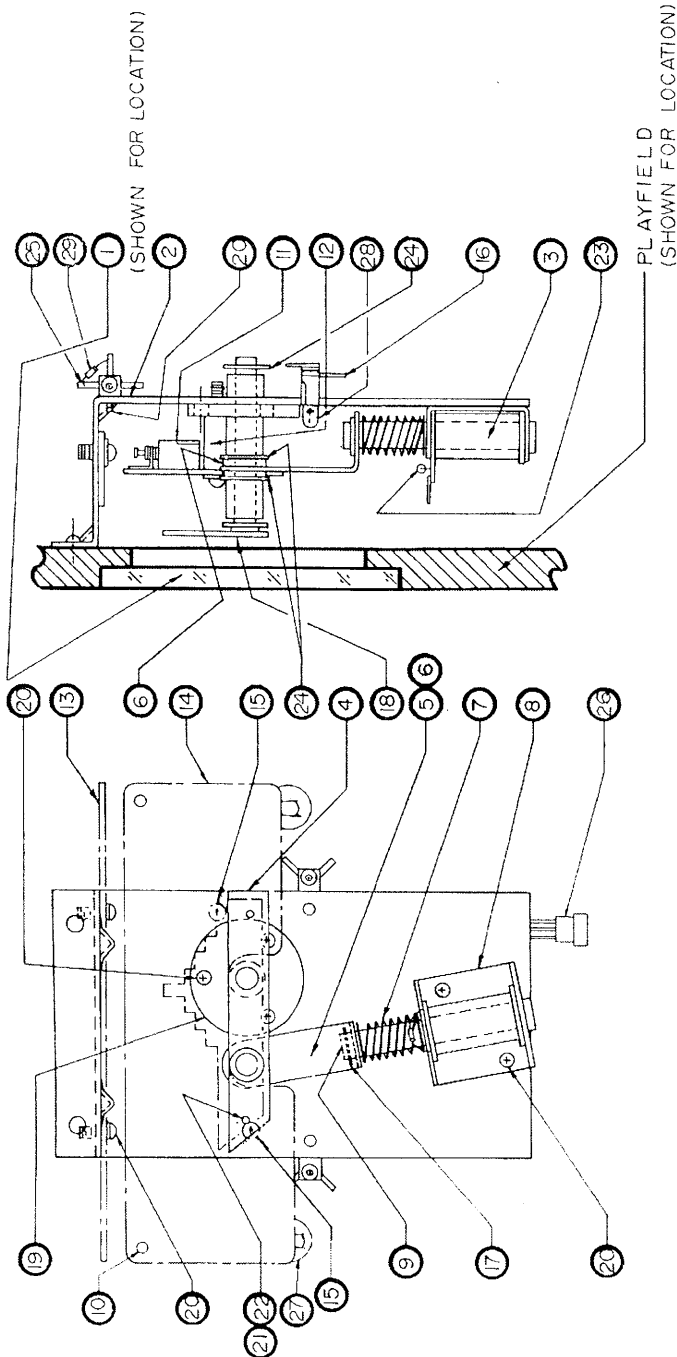




CABINET PARTS ILLUSTRATION

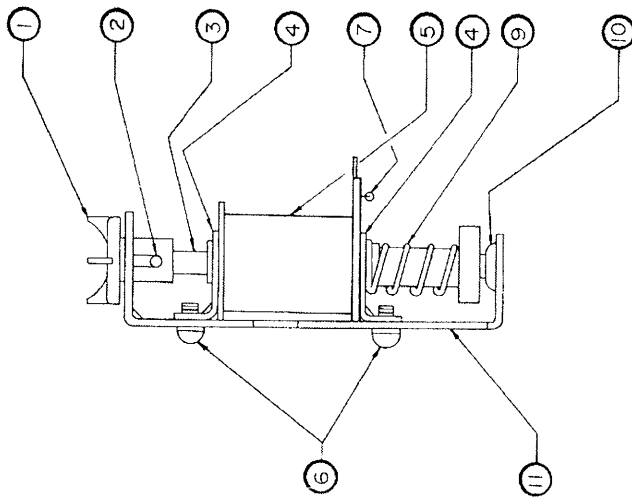


Item	Description	Part No.
1	Ball-shooter Assy	500-5019-02
2	Flipper Button	500-5026-02
3	Leg Bolt (Chrome)	231-5000-00
4	Cash Box Bottom	535-5014-00
5	On/Off Switch DP/ST	180-5001-00
6	Leg (Chrome)	535-5020-10
7	Lock Bracket - Cash Box	535-5215-00
8	Power Input Box Assy	515-5018-10
9	Transformer	010-5002-00
10	Speaker-Round (6")	031-5000-00
11	Side Armor-Right	535-5010-01
12	Memory Protect Switch	180-5000-00
13	Memory Protect Switch Bracket	535-5225-00
14	Start Switch	180-5016-00
15	Tungston Switch-Flipper	180-5013-00
16	Cash Box Top	535-5013-00
17	Plumb Bob Tilt Mech. Assy	500-5023-00
18	Volume Control	123-5000-00



500-5084-00 Ship. Tilt Assembly

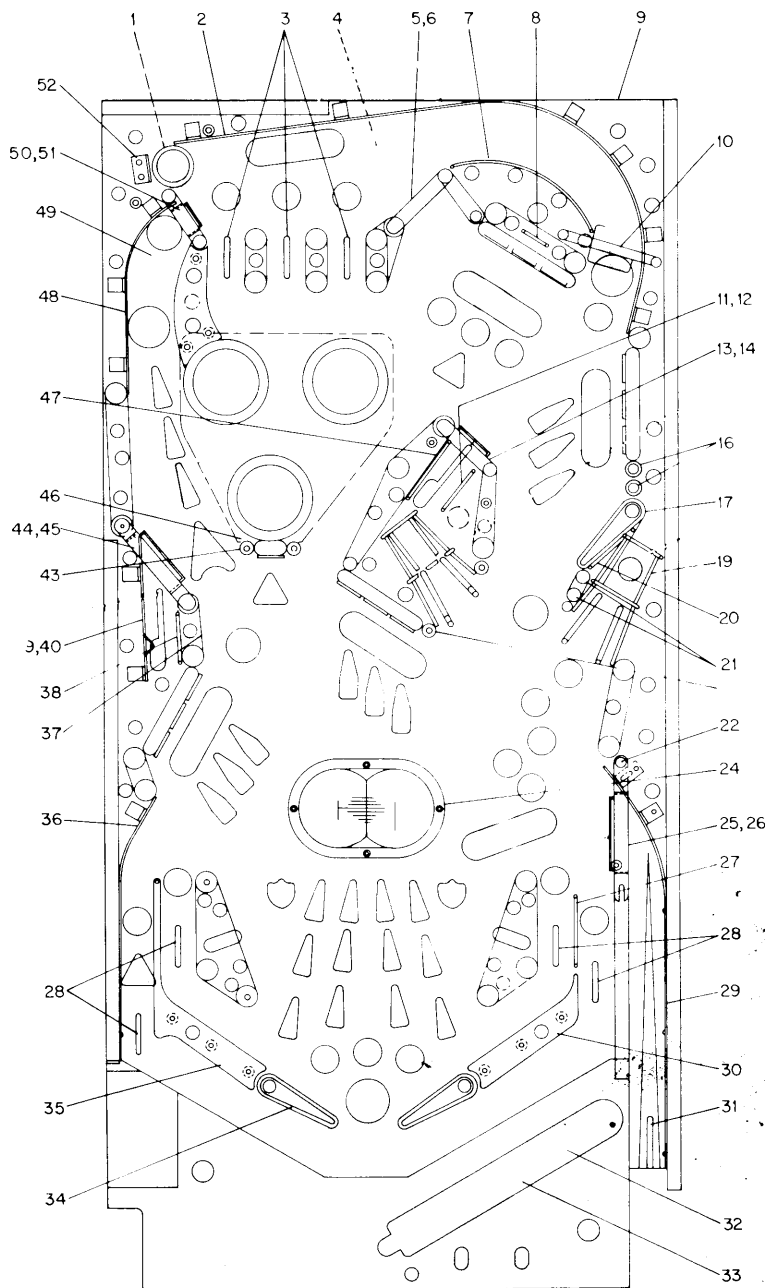
Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
1	545-5067-00	Lens-Periscope	1	16	077-5002-00	Lamp Socket	2
2	535-5266-00	Mounting Bracket	1	17	—	5/16" Retaining Ring	1
3	090-5010-00	Coil (30-800)	1	18	830-5403-03	Ship Plastic	1
4	515-5090-00	Ship Mounting Plate Assy	1	19	545-5068-00	Flipper Bushing	1
5	535-5061-00	Plunger Link	1	20	#6-32 x 1/4" L.G. P.H. Pan Sem W/Ext. Th. Lckwshr	11	
6	—	Nyliner (Thompson #4 L1-FF	1	21	1/32" Thick	Flat Washer	2
7	266-5014-00	Spring	1	22	3/32" Dia.	Rivet	2
8	535-5267-00	Coil Bracket	1	23	112-5003-00	IN4004 Diode	1
9	515-5089-00	Plunger Assy	1	24	—	1/4" Retaining Ring	3
10	1/8" Dia.	Rivet	2	25	077-5006-00	Lamp Socket	2
11	077-5100-00	Lamp Socket	2	26	036-5043-00	Sinking Ship Assembly Cable	1
12	254-5000-07	3/4" Plastic Spacer	2	27	165-5000-89	#89 Bulb	2
13	830-5403-01	Small Sky Plastic	1	28	165-5000-44	#44 Bulb	4
14	830-5403-02	Large Sky Plastic	1	29	112-5001-00	IN4001 Diode	2
15	#6-32 x 1" Lg.	Slotted Round Hd. M.S	2				



500-5067-00 Vertical Up Kicker

Item	Part No.	Description	Qty
1	545-5073-00	Ball Poppers	1
2	.094 x .500 Pin		1
3	515-5096-00	Plunger Assy - Ball Popper	1
4	535-5203-01	Coil Retainer Brkt.	2
5	090-5001-01	Coil: 23-800	1
6	#8-32 x 1/4" Lg. Ph. Pan Sems w/Ext. Th. Lckwshr		4
7	112-5003-00	IN4004 Diode	1
8	—		
9	266-5009-00	Spring-Ball Popper	1
10	—	Gromet	1
11	535-5271-00	Ball Poppers Brkt.	1

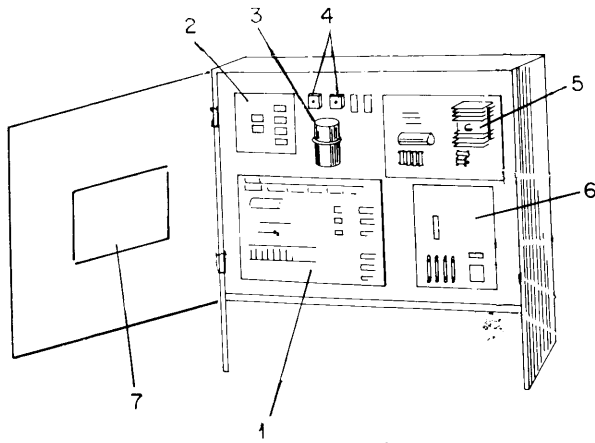
PLAYFIELD PARTS ILLUSTRATION



Item	Description	Part No.
*1	Wire Ramp-Left	535-5335-00
2	Ball Guide Assy - Top	500-5087-00
3	Micro Switch Rollover & Brkt Assy	500-5109-00
*4	Wire Ramp - Center	535-5334-00
5	Mounting Brkt	535-5269-02
6	Wire Gate	535-5302-02
7	Wire Form - Curved	535-5338-00
8	Wire Form Staight - 1"	535-5300-05
9	P/F Back Panel Assy	515-5106-00
10	Spinning Target & Brkt Assy	500-5060-01
11	Switch Ball Guide Assy	500-5093-00
12	Micro Switch Ball Guide	180-5031-00
13	Mounting Brkt	535-5210-00
14	Wire Gate, Short	535-5314-01
15	---	---
16	Metal Standoff W/Groove	530-5035-01
17	Flipper & Shaft Assy. Yellow	515-5133-02
18	---	---
*19	Wire Ramp Right	515-5108-00
20	Wire Form Straight - 2"	535-5300-10
21	Mounting Standoff W/Groove	530-5035-01
22	Bumper Post - Mach	530-5001-00
23	Mounting Standoff W/Groove	530-5035-01
24	Lens - Periscope	545-5067-00
25	Mounting Gate Brkt	535-5250-00
26	Wire Gate	535-5323-01
27	Wire Form Straight - 3"	535-5300-02
28	Micro Switch Rollover & Brkt Assy	500-5109-00
29	Ball Guide Assy - Lower Right	500-5086-00
30	Return Ball Guide - Right	535-5407-00
31	Micro Switch Rollover & Brkt Assy	500-5110-00
32	Wire Form & Brkt Assy	500-5042-00
33	Switch Plate Assy	500-5041-00
34	Flipper & Shaft Assy. White	515-5133-01
35	Return Ball Guide - Left	535-5406-00
36	Ball Guide Assy - Lower Left	500-5090-00
37	Wire Form Straight - 1"	535-5300-05
38	Wire Form Straight - 1 3/4"	535-5300-09
39	Micro Switch - Ball guide	180-5031-00
40	Ball Guide Assy - Micro Switch	500-5089-00
41, 42	---	---
43	Bumper Post Mach	530-5007-00
44	Wire Gate	535-5307-01
45	Mounting Brkt	535-5269-01
46	Mini-Post Wood Thd.	530-5004-00
47	Wire Form Straight - 2 1/2"	535-5300-01
48	Ball Guide Assy - Top Left	500-5088-00
49	Wire Form Brkt Assy	500-5068-00
50	Wire Gate	535-5307-03
51	Mounting Brkt	535-5269-03
52	Ball Stop	535-5273-00

* Not Shown

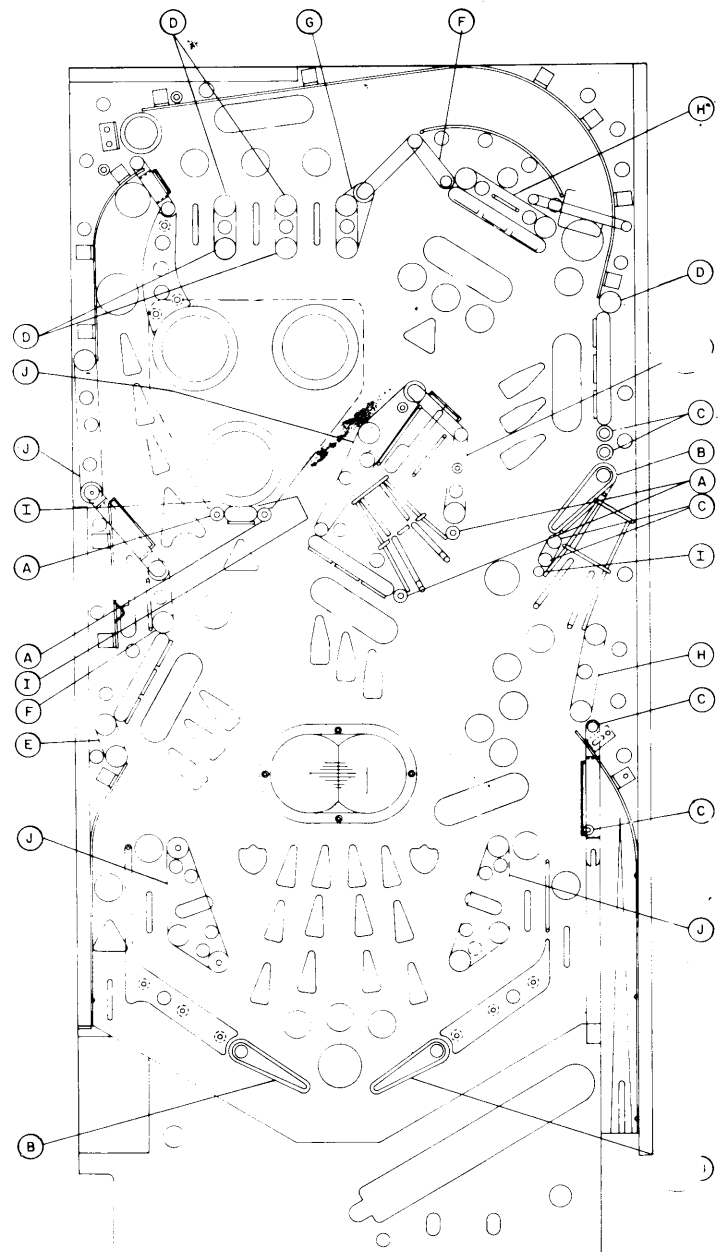
BACKBOX PARTS ILLUSTRATION



Item	Description	Part No.
1	CPU Board Assy	520-5003-02
2	Sound Board Assy	520-5002-01
3	Capacitor 2C1	125-5000-00
4	Bridge Rectifiers	112-5000-00
5	Power Supply Bd Assy	520-5000-00
6	PPB Board	520-5021-00
7	Combined Display Bd Assy	520-5014-00

RUBBER PARTS ILLUSTRATION

Item	Description	Part No.
A	Bumper Post	545-5009-01
B	Flipper Rubber (Red)	545-5024-02
C	3/16" I.D. Ring	545-5025-01
D	5/16" I.D. Ring	545-5025-02
E	3/4" I.D. Ring	545-5025-04
F	1" I.D. Ring	545-5025-05
G	1-1/4" I.D. Ring	545-5025-06
H	1-1/2" I.D. Ring	545-5025-07
I	7/16" O.D. Ring	545-5025-17
J	2 3/4" I.D. Ring	545-5034-00



S.P