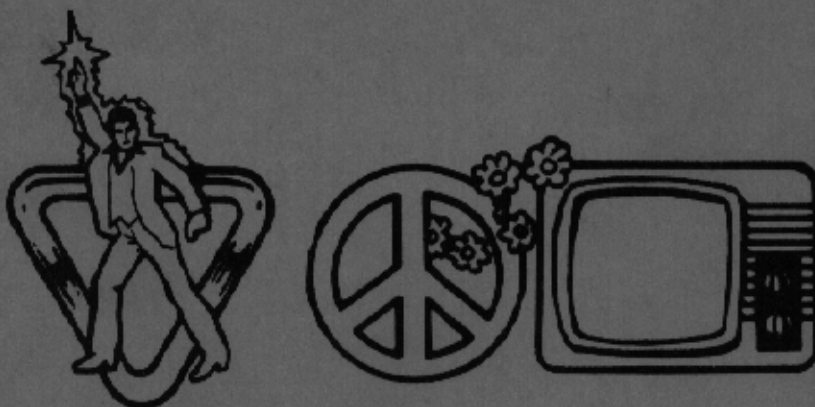


DE DATA EAST

TIME

MARCH 1971



DATA EAST PINBALL ®

1990 Janice Avenue
Melrose Park, Illinois 60160
312-345-7700
FAX 312-345-7718
1-800-KICKERS

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,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

PPB BOARD

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

POWER SUPPLY BOARD

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

TIME MACHINE TABLE OF CONTENTS

GAME SPECIFICATIONS	1
Power Requirements	1
Major Assembly and Fuse Locations.....	1
Circuit Board PROM Locations.....	1
Transportation	1
ASSEMBLY PROCEDURES	1
GAME OPERATION	3
Standard Features.....	3
Automatic Ball Time Averaging	3
Manual Percentaging	4
Game Specific Features	4
AUDIT FUNCTIONS	5
General	5
'Quick Look' Functions	5
Expanded Functions	7
Game Specific Functions	7
GAME ADJUSTMENTS	9
General	9
Replay and Generic Features.....	9
Single-Function Difficulty Adjustments	11
Novelty/5-Ball/Add-A-Ball Rules	11
Game Pricing	12
Additional Generic Features.....	14
Game Specific Features	16
DIAGNOSTIC PROCEDURES	19
Entering Diagnostics	19
Sound Tests.....	19
Digital Display Tests	21
Switch Tests.....	22
Lamp Tests	24
Coil/Flash Lamp Tests.....	26
Return to Game Over	26
SERVICING DIAGRAMS	28
Power Wiring Diagram	28
Cabinet Wiring Diagram	29
Combined Display Connections	30
Backbox Wiring Diagram	31
Playfield Coil/Flash Lamp Wiring Diagram	32
Playfield Special Coil and Flipper Wiring Diagram	33
Playfield Switch Wiring Diagram	34
Playfield Lamp Wiring Diagram	35
CPU Board	36
Power Supply Board	41
Digital Stereo Sound Board	42
Display Board	44
PPB Board	46
PARTS IDENTIFICATION	47
Playfield Parts	47
Playfield Rubbers	48
Backbox Parts	48
Cabinet Parts	49
UNIQUE PARTS	50

DATA EAST LIMITED WARRANTY

Data East USA, Inc., ("Seller") warrants only to the initial purchaser of its products that the items listed below are free from defects in material and workmanship under normal use and service for the warranty period specified:

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.

WARRANTY DISCLAIMER

EXCEPT AS SPECIFICALLY PROVIDED IN A WRITTEN CONTRACT BETWEEN SELLER AND PURCHASER, THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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 (page 2) 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

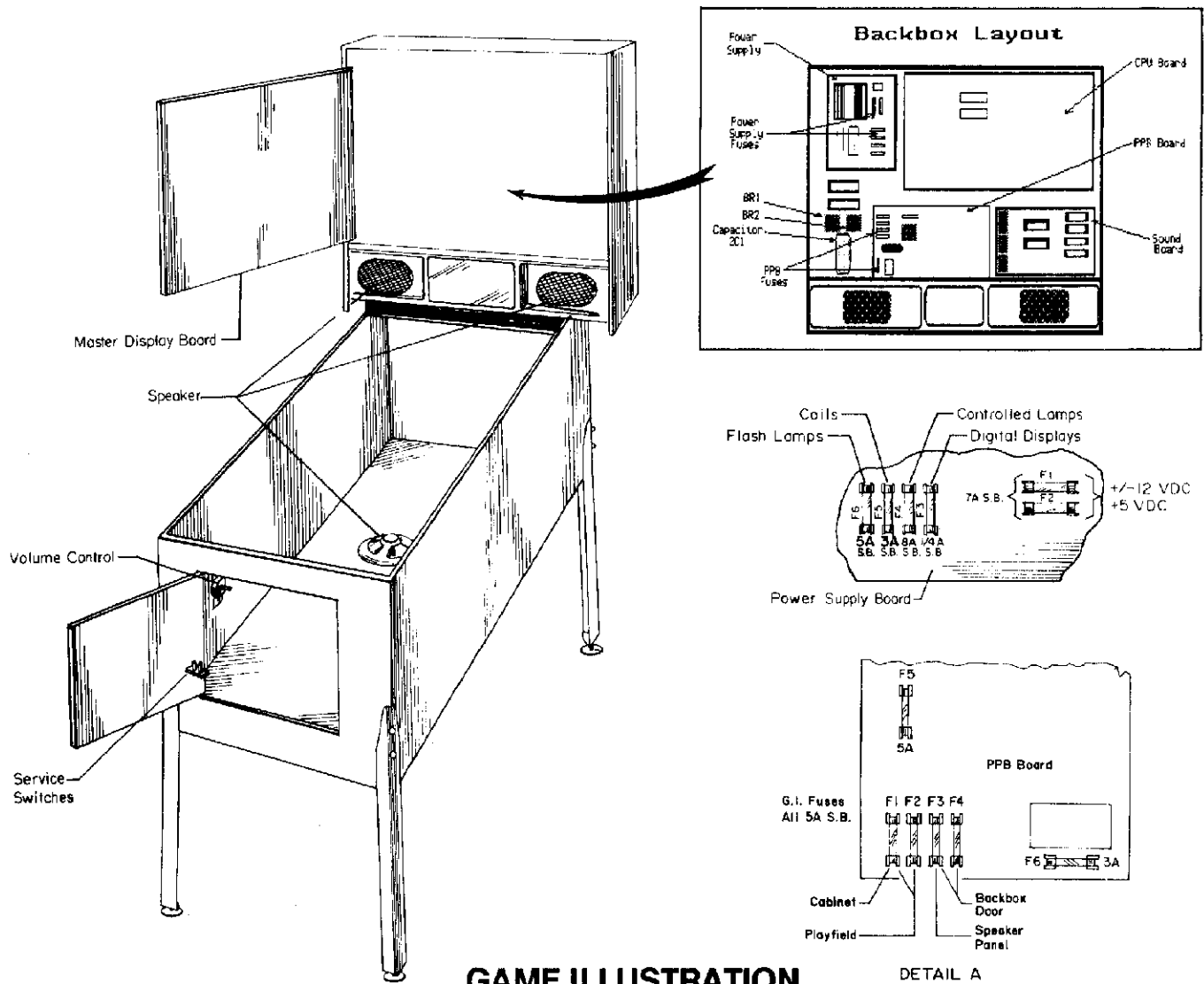
To reduce the possibility of damage, observe the following precautions whenever transporting the game. Lower the backbox and secure it to the cabinet. Remove the legs and secure the game within the transporting vehicle.

GAME ASSEMBLY PROCEDURES (Refer to the Game Illustration on page 2)

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. While assuring that no cables are being pinched, carefully raise the backbox and temporarily secure it in its upright position with the clamps 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 position resulting in possible **injury to personnel and equipment damage**.



GAME ILLUSTRATION

DETAIL A

7. Remove the backbox keys from the clip on the inside of the coin door and unlock and carefully remove the backglass. Set the backglass aside.
8. Carefully remove the playfield glass and set it aside.
9. 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.
10. Check all connectors in the backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal.
11. 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.
12. Check that the fuses on the Power Supply board, PPB board and fuse panel are seated properly.
13. 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.
14. Check all cabinet cable connector terminations.

15. 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.

16. Lower the playfield and level the playfield side-to-side by adjusting leg levelers.

17. 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.

18. Check the plumb tilt and adjust as required.

19. If desired, perform any self tests at this time. With the insert door closed, carefully reinstall and lock the back-glass.

20. 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 PRESS START for the first credit and says STEREO 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 E Ad 36) so make sure that E Ad 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 to keep the game at that replay percentage. If a change is recommended and the game coin door is opened, the displays will indicate a recommended replay score to beat and knock the Klacker to alert the operator. 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

Top Lanes - Score back panel value, spot Starwarp Lamps, Spot corresponding decade target (1970's, 1960's, & 1950's) completing the lanes 6 times lights outlane extraball. (Alternates left to right with the right flipper.)

Starwarp - The top lanes and each ramp spot a letter in **S-T-A-R-W-A-R-P**. Spelling STARWARP activates the timer on the 1 Million Point center ramp shot.

Time Travel - Complete the Triangles for the 1970's, the Circles for the 1960's, the Squares for the for the 1950's and shoot the left or right ramp to go back in time.

Multi-Ball - Go back in time to the 1950's and 3 ball Multi-ball is enabled. Play Multi-ball twice in one game to lite extraball in the right and left outlanes.

Mini-Jackpot - Shoot the center ramp 3 times in succession to complete Mini-Jackpot.

Jackpot - During Multi-ball complete the Center Ramp and score 100,000 to 1,000,000 points. (100,000 points for ramp shot and 100,000 points for each lit 1970's, 1960's, and 1950's target.)

Einstein Shot - Thumper Bumpers increase energy value. Collect the energy value by rolling over a flipper return lane and making an opposite ramp. (example- Left Return lane to Right Ramp)

Laser Kick - Completing flashing left or right ramps re-lights the Laser kick Feature.

Refer to the Game Specific Adjustments on page 16 for additional information.

AUDIT FUNCTIONS

GENERAL

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.

'QUICK LOOK' FUNCTIONS

Total Paid Credits (AU01) - the total number of paid credits is displayed.

Free Percent (AU02) is Free Total (E AU14) divided by Plays Total (E AU13).

Ball Time Average (in seconds) (AU03) is Total Play Time (in minutes) (E AU20) divided by Total Balls Played (E AU21) with the result multiplied by 60.

Coins (AU04, 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 (AU07) is the Replay Total awards for exceeding replay score levels (E AU15) divided by Plays Total (E AU13).

High Score Percentage (AU08) is High Score Total (E AU19) divided by Plays Total (E AU13).

Extra Ball Total (AU09) is the total number of extra balls awarded.

Extra Ball Percentage (AU10) is AU09 divided by Balls Total (E AU21).

Cycles Burn In (AU11) provides the number of diagnostic burn-in cycles (factory use).

Expand Audits (AU12) permits viewing of expanded audits.

EXPANDED FUNCTIONS

Plays Total (E AU13) is the sum of Total Paid Credits (AU01) and Free Total (E AU14). Note that free credits are not recorded in the audits until they are actually used.

Free Total (E AU14) is the total free credits for replays, high-score-to-date, specials, and match.

Replay Total (E AU15) is the total awards (credits, extra balls, or audit only) for exceeding replay score levels.

Special Total (E AU16) is the total awards (credits, extra balls, or scores) for making specials.

Special Percentage (E AU17) is Special Total (E AU16) divided by Plays total (E AU13).

Match Total (E AU18) 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 8%, if enabled.

High Score Wins (E AU19) is the total credits awarded for exceeding the high-score-to-date scores.

Play Time (E AU20) is the cumulative time of balls in play (in minutes).

Balls Total (E AU21) is the total of regular and extra balls.

Replay Awards (E AU22 through 25) provide the total awards (credit, extra ball, or audit) for replay levels 1 through 4, respectively.

Games - Player (E AU24 through 29) provide individual totals of 1- player, 2-player, 3-player, and 4-player games, respectively.

Cycles Attract Mode (E AU30) provides the number of cycles through the attract mode (factory use).

Reset High Score (E AU31) provides the number of times that the high score levels have been automatically reset (if enabled).

GAME SPECIFIC FUNCTIONS

Enter 3 Ball (E AU32) provides the number of times that three ball multi-ball was accomplished.

Percent 3 Ball (E AU33) provides the percentage of games that three multi-ball was accomplished.

Total Lock Ball (E AU34) provides the total number of balls locked.

1970 Lit (E AU35) provides the number of times the 1970's ramp shot was lit.

Return 1970 (E AU36) provides the number of times the game went back to 1970.

1960 Lit (E AU37) provides the number of times the 1960's ramp shot was lit.

Return 1960 (E AU38) provides the number of times the game went back to 1960.

1950 LIT (E AU39) provides the number of times the 1950's ramp shot was lit.

Return 1950 (E AU40) provides the number of times the game went back to 1950.

Laser Kick Scored (E AU41) provides the number of times the Laser Kick was used.

Laser Kick Relit (E AU42) provides the number of times the Laser Kick was re-qualified.

Left Ramp (E AU43) provides the number of times the left ramp was made.

Center Ramp (E AU44) provides the number of times the center ramp was made.

Right Ramp (E AU45) provides the number of times the right ramp was made.

Mini Jackpot Scored (E AU46) provides the number of times the mini jackpot was scored.

Left E = MC² (E AU47) provides the number of times the left ramp was made after the right flipper feed lane was made.

Right E = MC² (E AU48) provides the number of times the right ramp was made after the left flipper feed lane was made.

Special Lit (E AU49) provides the number of times the special was lit.

Special Scored (E AU50) provides the number of times the special was scored.

Jackpot Scored (E AU51) provides the number of times the jackpot was scored.

25K Lanes (E AU52) provides the number of times the 25K bonus was made off the top lanes.

50K Lanes (E AU53) provides the number of times the 50K bonus was made off the top lanes.

100K Lanes (E AU54) provides the number of times the 100K bonus was made off the top lanes.

Bonus Hold (E AU55) provides the number of times the bonus hold was made off the top lanes.

Top Extra Ball (E AU56) provides the number of times the extra ball was made off the top lanes.

2X Ball (E AU57) provides the number of times the 2X all scores was made off the top lanes.

Star Warp Lit (E AU58) provides the number of times the star warp was lit.

Star Warp Scored (E AU59) provides the number of times the star warp was scored.

Drain Left (E AU60) provides the number of times the ball drained out the left drain.

Drain Center (E AU61) provides the number of times the ball drained out the center drain.

Drain Right (E AU62) provides the number of times the ball drained out the right drain.

2X Bonus (E AU63) provides the number of times 2X bonus was made.

3X Bonus (E AU64) provides the number of times 3X bonus was made.

4X Bonus (E AU65) provides the number of times 4X bonus was made.

5X Bonus (E AU66) provides the number of times 5X bonus was made.

Lane Extra Ball (E AU67) provides the number of times an extra ball was made by the out lanes.

1950 Extra Ball (E AU68) provides the number of times an extra ball was made by the out lanes after going back to 1950 twice during the same game.

Buy In Games (E AU69) provides the number of times the buy in feature was used.

Average Game Time (E AU70) provides the average length of a game in seconds.

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 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 AU70) 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.

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 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 the player displays indicate the recommended level and the Klacker knocks to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the game start button. (If the coin door is closed or you enter audits/adjustments or diagnostics, the replay level is not changed.)

REPLAYS (Ad 01 through 06)

Ad 01 Replay Manual/Fixed

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 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)	FactorySetting (Player 4)
AD 01	REPLAY/MANUAL	10%
AD 02	START REPLAY/LEVEL 1 REPLAY	1,900,000
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	EXHARD RULES	OFF
AD 11	NOVELTY RULES	OFF
AD 12	5 BALL RULES	OFF
AD 13	ADDABALL RULES	OFF
AD 14	STANDARD/CUSTOM PRICING	USA 1
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	CREDITS
E Ad 21	AWARDS SPECIAL	CREDITS
E Ad 22	MATCH FEATURE	ON
E Ad 23	BALLS/GAME	03
E Ad 24	WARNING TILT	01
E Ad 25	MAXIMUM EXTRA BALL	03
E Ad 26	CREDITS MAXIMUM	30
E Ad 27	SCORES HIGHEST	ON
E Ad 28	CREDITS HSCR 1	03
E Ad 29	CREDITS HSCR 2	00
E Ad 30	CREDITS HSCR 3	00
E Ad 31	CREDITS HSCR 4	00
E Ad 32	BACKUP HSCR 1	5,000,000
E Ad 33	BACKUP HSCR 2	4,000,000
E Ad 34	BACKUP HSCR 3	3,000,000
E Ad 35	BACKUP HSCR 4	2,500,000
E Ad 36	HSRESET EVERY	700
E Ad 37	FREE PLAY	OFF
E Ad 38	LEFT COIN PULSES	--
E Ad 39	RIGHT COIN PULSES	--
E Ad 40	CENTER COIN PULSES	--
E Ad 41	PULSES FOR CREDIT	--
E Ad 42	PULSES FOR BONUS CREDIT	--
E Ad 43	MESSAGE CUSTOM	ON
E Ad 44	TEXT	ENGLISH
E Ad 45	ATTMODE MUSIC	ON
E Ad 46	FEATURE	ALL
E Ad 47	CHIMES	SUPER
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	1,000,000
E Ad 54	STARWARP MEMORY	ON
E Ad 55	EXTRA BALL 1950	ON
E Ad 56	EXTRA BALL 5X	ON
E Ad 57	LANE PERCENT	FACTORY
E Ad 58	LASER KICK	FACTORY
E Ad 59	KLACKER WARNING	ON
E Ad 60	FACTORY RESET	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
E Ad 23 Balls per Game = 5
E Ad 49 General Scores = Factory
E Ad 50 General Timer = Factory
E Ad 51 General Spotting = Hard
E Ad 52 General Memory = Factory

E Ad 54 Starwarp Memory = 1 Player
E Ad 55 Extra Ball 1950 = On
E Ad 56 Extra Ball 6x = On
E Ad 57 Lane Percent = Factory
E Ad 58 Laser Kick = Factory

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 5 Ball settings.

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 Manual Replay = Fixed
Ad 02 to Ad 05 Replays 1 to 4 = Off
E Ad 20 Awards Replay = Audit
E Ad 21 Awards Special = Score
E Ad 22 Match Feature = Off

E Ad 25 Maximum Extra Balls = 00
E Ad 27 Scores Highest = Off
E Ad 28 to 31 Credits High Score = 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 Manual Replay = 07%
Ad 02 Replay Start = 3,000,000
Ad 03 Replay Levels = 01
E Ad 23 Balls Per Game = 05
E Ad 49 General Scores = Factory
E Ad 50 General Timer = Factory
E Ad 51 General Spotting = Hard

E Ad 52 General Memory = Factory
E Ad 54 Starwarp Memory = 1 Player Reset
E Ad 55 Extra Ball 1950 = On
E Ad 56 Extra Ball 6x = On
E Ad 57 Lane Percent = Factory
E Ad 58 Laser Kick = Factory

INSTALL ADJUSTMENT TABLE

Install Adjustment	Ad 06 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 54 Starwarp Memory	HOLD	HOLD	HOLD	1 PLAYER	RESET
E Ad 55 Extra Ball 1950	ON	ON	ON	OFF	OFF
E Ad 56 Extra Ball 6x	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

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:

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

GAME PRICING (Ad 14 and E Ad 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 E Ad 38 to 42. In order to program E Ad 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, E Ad 38, 39, and 40 represent coin switch pulses for the left, right, and center coin slots. E Ad 41 prescribes the number of pulses required for one credit. For example, if E Ad 38 was set to 02 and E Ad 41 to 01 a coin in the left slot would produce two credits. Further, if E Ad 38 was set to 01 and E Ad 41 to 02, two coins in the left slot would be required for one credit.

E Ad 43 may be set to post bonus credits when a minimum amount of coins are inserted at one time. For example, if E Ad 38 was set to 01, E Ad 41 to 01 and E Ad 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 E Ad 38 to 42 are utilized to tailor each individual coin chute.

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

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

E Ad 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	Left	Center	Right
USA1 1 COIN 1 PLAY	25¢	\$1.00	25¢	1 PLAY/1 COIN	4 PLAY/1 COIN	1 PLAY/1 COIN			
USA2 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			
USA3 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			
GERMAN1 5DM 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			
GERMAN2 5DM 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 HFI	5HFI	1 PLAY/1 COIN 7 PLAY/5 COIN	2 PLAY/1 COIN 8 PLAY/3 COIN	7 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¢	\$1.00	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	1/10 SCH 1/10 SCH 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

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

E Ad 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 Average Ball Time - Maintains average ball time close to 65 seconds. Every 700 (vary with **E Ad 36**) games, average ball time is checked. If greater than 65 seconds, **E Ad 58** is set to **HARD**. If less than 65 seconds, **E Ad 58** is set to **EASY**.

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** push-button advances directly to **E Ad 60**, **FACTORY RESET**. When set to **ON**, depressing the **STEP** push-button sequences through the expanded adjustments. When exiting from expanded adjustments, this function is reset to **OFF** for the next time that adjustments are required.

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

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

E Ad 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**.

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

E Ad 26 Credits Maximum - Adjust the maximum number of credits that may be posted; 5 to 99.

HIGH SCORE LEVELS (E Ad 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 exceed 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.

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

E Ad 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.

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

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

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

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

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

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

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

E Ad 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; 100 to 900 or OFF (no reset or adjustment).

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

E Ad 38 to 42 - Described previously in Game Pricing.

E Ad 43 Message Custom - When desired, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to **CHANGE** 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 push-button switch to advance to E Ad 44.

NOTE

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

E Ad 44 English/French/German Test - Select English, French, or German for display during Audits, Adjustments, and Game Diagnostics.

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

E Ad 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.

E Ad 59 Klacker 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 Klacker is pulsed to alert the location attendant if there are any suspect switches or coils. With this feature disabled (set to OFF), the Klacker is not pulsed during indications of suspect switches or coils.

GAME SPECIFIC FEATURES (E Ad 47 TO 59)

E Ad47 Chimes- Set to OFF, STREET or SUPER. When OFF, the chime sounds are produced through the speakers. When set to STREET, the chimes are energized softly. When set to SUPER, the chimes are energized with more intensity.

E Ad48 Flash Lamps- Set to ON or OFF. When set to ON the Flash Lamps are active, when OFF the Flash Lamps do not flash.

E Ad49- General Scores-Set to EASY, FACTORY or HARD.

Feature Affected	EASY	FACTORY	HARD
Pop Bumpers Level 0 (No decades qualified)	1000	500	200
Pop Bumpers Level 1 (70's qualified)	1500	1000	500
Pop Bumpers Level 2 (60's qualified)	2000	1500	1000
Pop Bumpers Level 3 (50's qualified)	3000	2000	1500
Pop Bumpers Emc ² *	3000	2000	1500
Hitting a stand up target when lit	10,000	6000	4000
Hitting a stand up target when unlit	5000	3000	2000
Top Lane when lit	3000	2000	1500

*Each Pop Bumper switch closure will increase the Einstein ramp shot by the value indicated.

E Ad50 General Timer- Set to EASY, FACTORY, or HARD.

Feature Affected	EASY	FACTORY	HARD
Starwarp	22	20	18
Mini Jackpot	18	15	12
Einstein	15	12	10
Double All Scores	22	20	18

The number expressed in the difficulty settings indicates the time duration of the feature in seconds

E Ad51 General Spotting- Set to EASY, FACTORY, or HARD.

Feature Affected	EASY	FACTORY	HARD
Top Lanes spot letter in Starwarp	ON	ON	OFF
Top Lanes spot stand-up targets	ON	ON	OFF
Ramp Shots spot stand-up targets	ON	ON	OFF

E Ad52 General Memory- Set to EASY, FACTORY, or HARD.

Retained from ball to ball	EASY	FACTORY	HARD
Qualified, but not completed Specials	ON	OFF	OFF
All lit Top Lanes	ON	ON	OFF
All lit Decades and stand-up targets	ON	ON	OFF
All Einstein Bonus	ON	ON	OFF

E Ad53 Starwarp Value- Adjusts the Starwarp shot value from 500,000 to 1,500,000 points.(Each number displayed in the register is multiplied by 100,000.)

E Ad54 Starwarp Memory- Set to **HOLD**, **1PLAYER** or **RESET**.When Set to **HOLD**,all lit Starwarp Lights are retained ball to ball,player to player.When set to **1 PLAYER**,all lit Starwarp lamps are retained ball to ball for the individual player(s)only.When set to **RESET**, for each ball the Starwarp lamps start out unlit.

E Ad55 Extra Ball 1950- Set to **ON** or **OFF**.When set to **ON**,going back to the 1950's twice on the same ball will light one of the outlanes that award an Extra Ball.(Operating the right flipper button causes the lit lane to alternate from left to right.)

E Ad56 Extra Ball 6x- Set to **ON** or **OFF**.When set to **ON**,completing the top Lanes 6 times lights one of the outlanes that award an Extra Ball.(Operating the right flipper button causes the lit lane to alternate from left to right.)

E Ad57 Lane Percent- Set to **EASY**,**FACTORY** or **HARD**.

Completing Top Lanes Awards	EASY	FACTORY	HARD
25K	5%	5%	15%
50K	5%	15%	25%
100K	15%	20%	25%
Bonus Hold	25%	20%	10%
Extra Ball	30%	20%	15%
Double Scores	20%	20%	10%

E Ad58 Laser Kick- Set to **EASY**,**FACTORY** or **HARD**.

EASY-Starts lit on each ball and all Ramp shots Re-light the feature.

FACTORY-Starts lit on each ball and the Outside two ramps Re-light the feature when either are completed.

HARD-Starts lit on the first ball exclusively and only one outside "lit" ramp (alternates with 10 point switch closures) will Re-light the feature.

E Ad59-Klacker Warning- Previously described at the end of Generic Game Features.

E Ad60 Factory Reset-Depressing STEP without changing the value shown in the Player 4 Display locks in any custom message set with E Ad43 and returns the game to Game Over.Set the value to **ON** and depress STEP switch to revert all game adjustments to factory settings and return to Game Over.

NOTES

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.

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 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	5 = Green
1 = Brown	6 = Blue
2 = Red	7 = Violet
3 = Orange	8 = Grey
4 = Yellow	9 = White

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 RIGHT 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) 60 CYCLE TONE (Right Speakers Only) 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.

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 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 portion 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.

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

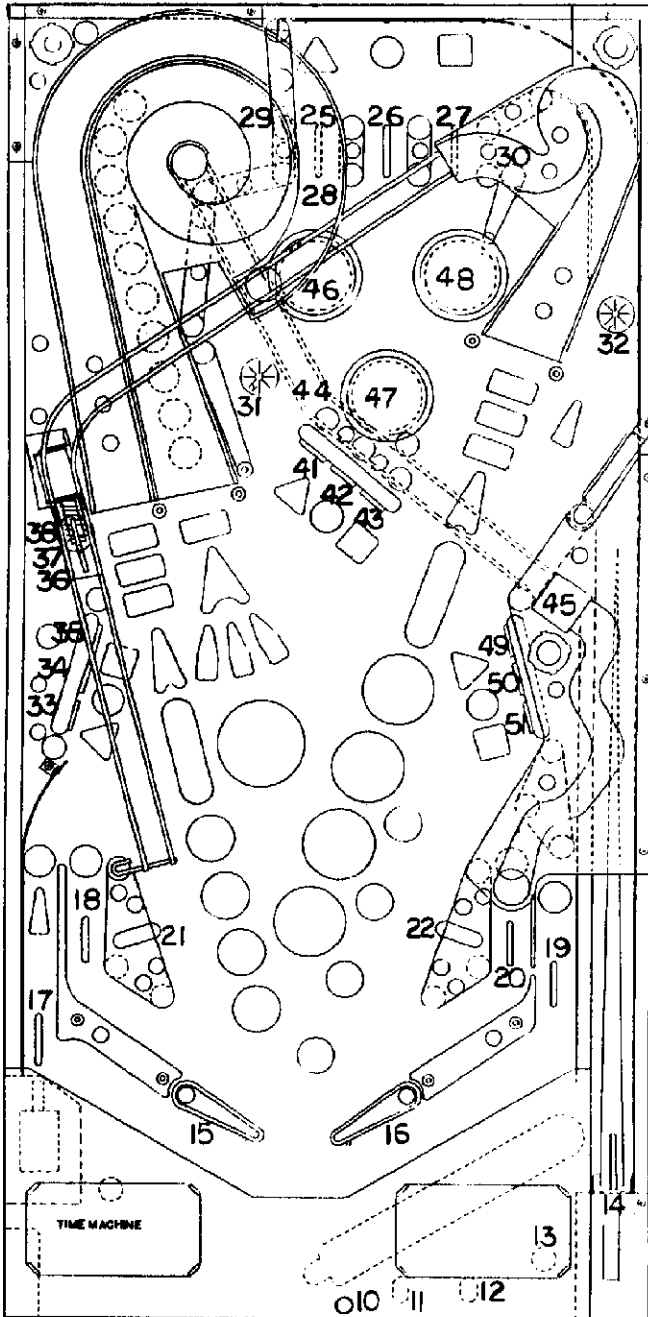
Operate the STEP push-button switch from the Switch Test. Player 1 and 2 Displays indicate BAD SWITCHES. During game play, the system keeps track of the last game in which each switch was made. Should a switch not be made for 100 games, it is considered to be bad. If there are any, the Player 1 and 2 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.

SWITCH MATRIX CHART

ROW (*)	COLUMN (*)	1 GRN-BRN (51) Q55	2 GRN-RED (52) Q54	3 GRN-ORN (53) Q53	4 GRN-YEL (54) Q52	5 GRN-BLK (50) Q51	6 GRN-BLU (56) Q50	7 GRN-VIO (57) Q49	8 GRN-GRY (58) Q48
1	WHT-BRN (91)	Plumb Tilt 1	Not Used 9	Left Outlane 17	1 Lane 25	Left Bank 1 33	Center Bank 1 41	Right Bank 1 49	Not Used 57
2	WHT-RED (92)	Not Used 2	Outhole 10	Left Return 18	2 Lane 26	Left Bank 2 34	Center Bank 2 42	Right Bank 2 50	Not Used 58
3	WHT-ORN (93)	Credit Button 3	Trough #1 11	Right Outlane 19	3 Lane 27	Left Bank 3 35	Center Bank 3 43	Right Bank 3 51	Not Used 59
4	WHT-YEL (94)	Right Coin 4	Trough #2 12	Right Return 20	Left Ramp 28	Wireform 1 36	Wireform 4 44	Not Used 52	Not Used 60
5	WHT-GRN (95)	Center Coin 5	Trough #3 13	Left Slingshot 21	Center Ramp 29	Wireform 2 37	Super VUK 45	Not Used 53	Not Used 61
6	WHT-BLU (96)	Left Coin 6	Shooter Lane 14	Right Slingshot 22	Right Ramp 30	Wireform 3 38	Left Pop Bumper 46	Not Used 54	Not Used 62
7	WHT-VIO (97)	Slam Tilt 7	Left EOS 15	Not Used 23	Left Rollover 31	Not Used 39	Center Pop Bumper 47	Not Used 55	Not Used 63
8	WHT-GRY (98)	Not Used 8	Right EOS 16	Not Used 24	Right Rollover 32	Not Used 40	Right Pop Bumper 48	Not Used 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	Out Hole	180-5011-00
11	Trough #1	180-5009-00
12	Trough #2	180-5009-00
13	Trough #3	180-5010-00
14	Shooter Lane	500-5143-00
15	Left Flip. Instant Info.	180-5026-00
	Left EOS	180-5018-00
16	Right Flip. Instant Info.	180-5026-00
	Right EOS	180-5018-00
17	Left Outlane	500-5144-00
18	Left Return Lane	180-5003-00
19	Right Outlane	500-5142-00
20	Right Return Lane	180-5003-00
21	Left Slingshot Trigger Sw.	180-5023-00
	Left Slingshot Point Sw.	180-5035-00
22	Right Slingshot Trigger Sw.	180-5023-00
	Right Slingshot Point Sw.	180-5035-00
23	Not Used	--
24	Not Used	--
25	Left Top Lane	500-5142-00
26	Center Top Lane	500-5142-00
27	Right Top Lane	500-5142-00
28	Left Ramp	180-5002-00
29	Center Ramp	180-5002-00
30	Right Ramp	180-5002-00
31	Left Star Rollover	180-5003-00
32	Right Star Rollover	180-5003-00
33	Left 3 Bank Bottom	515-5161-02
34	Left 3 Bank Center	515-5124-06
35	Left 3 Bank Top	515-5162-05
36	Lock Ball #1	180-5028-00
37	Lock Ball #2	180-5028-00
38	Lock Ball #3	180-5028-00
39	Not Used	--
40	Not Used	--
41	Center 3 Bank Left	515-5161-02
42	Center 3 Bank Middle	515-5124-06
43	Center 3 Bank Right	515-5162-05
44	Ramp Sw. Under Plyfid	180-5030-00
45	Right Super VUK	180-5041-00
46	Left Pop Bumper	180-5036-00
47	Center Pop Bumper	180-5036-00
48	Right Pop Bumper	180-5036-00
49	Right 3 Bank Top	515-5161-02
50	Right 3 Bank Center	515-5124-06
51	Right 3 Bank Bottom	515-5162-05
52	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 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 it in the REVERSE (down) position, Game Start selects lower-numbered lamps.

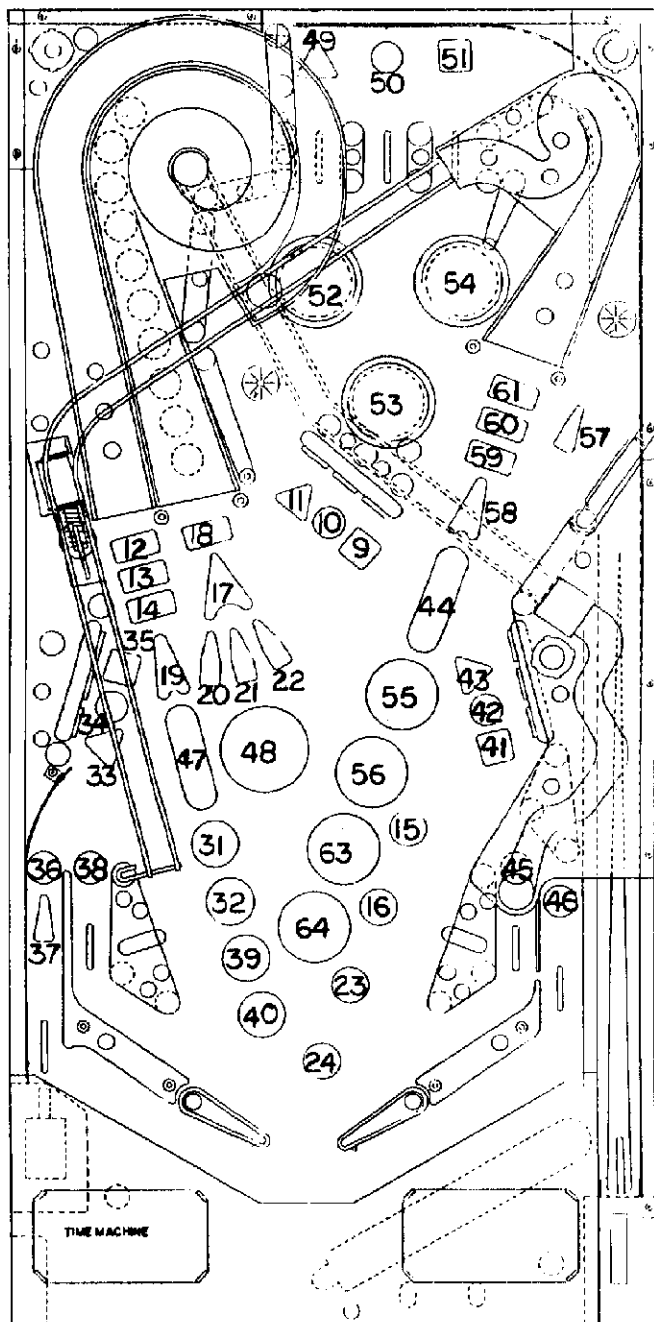
LAMP MATRIX CHART

ROW (*)	1 YEL-BRN (41) Q71	2 YEL-RED (42) Q70	3 YEL-ORN (43) Q69	4 YEL-BLK (40) Q68	5 YEL-GRN (45) Q67	6 YEL-BLU (46) Q66	7 YEL-VID (47) Q65	8 YEL-GRY (48) Q64
1 RED-BRN (21) Q72	Starwarp #1 1	Center Square 9	Special 17	2x Scores 25	Left Triangle 33	Right Square 41	Lane 1 49	Top Right Arrow 57
2 RED-BLK (20) Q73	Starwarp #2 2	Center Circle 10	3 Ball Jackpot 18	Extra Ball 26	Left Circle 34	Right Circle 42	Lane 2 50	Right EMCSQR 58
3 RED-ORN (23) Q74	Starwarp #3 3	Center Triangle 11	Left EMCSQR 19	Bonus Hold 27	Left Square 35	Right Triangle 43	Lane 3 51	Right 1950 59
4 RED-YEL (24) Q75	Starwarp #4 4	Left 1970 12	Left Mini Jackpot 20	100K 28	Left Extra Ball 36	Right Hotdog 44	Pop Left 52	Right 1960 60
5 RED-GRN (25) Q76	Starwarp #5 5	Left 1960 13	Center Mini Jackpot 21	50K 29	Laser Kick 37	Right Return 45	Pop Center 53	Right 1970 61
6 RED-BLU (26) Q77	Starwarp #6 6	Left 1950 14	Right Mini Jackpot 22	25K 30	Left Return 38	Right Extra Ball 46	Pop Right 54	Insert 62
7 RED-VID (27) Q78	Starwarp #7 7	5x 15	3x 23	Targets Lite Special 31	Extra Ball 39	Left Hotdog 47	1980 55	1960 63
8 RED-GRY (28) Q79	Starwarp #8 8	4x 16	2x 24	All Scores 2x 32	Bonus Hold Over 40	Starwarp 48	1970 56	1950 64

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

Lamp Number	Description
01*	"S"tarwarp
02*	s"T'arwarp
03*	st"A'rwarp
04*	sta"R'warp
05*	star"W'arp
06*	starw"A'rp
07*	starwa"R'p
08*	starwar"P'
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 Cntr Plyfid
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 Plyfid
41	Right Square
42	Right Circle
43	Right Triangle
44	Right Hotdog
45	Right Return
46	Right Extra Ball
47	Left Hotdog
48	Starwarp Center Playfield
49	Lane 1
50	Lane 2
51	Lane 3
52	Left Pop Bumper
53	Center Pop Bumper
54	Right Pop Bumper
55	1980
56	1970
57	Top Right Arrow
58	Right Ramp E = MC ²
59	Right Ramp 1950
60	Right Ramp 1960
61	Right Ramp 1970
62*	Engine
63	1960
64	1950



*Indicates Insert Lamp

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 resistors. This effectively provides 23 regular coils.

Automatic Test

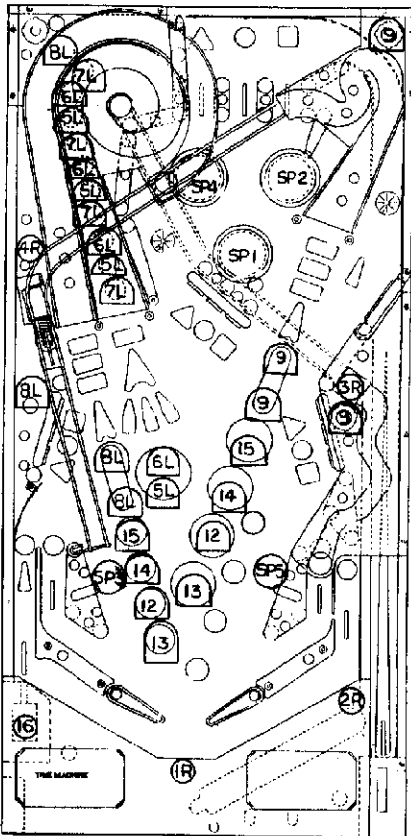
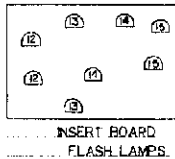
From the Discrete Lamps test, depress the STEP push-button switch. Player 1 and 2 displays indicate COIL TEST. The test pulses each regular solenoid or flash lamp sequentially with the coil/flash lamp name indicated in the Player 1 and 2 displays and the drive number in the Player 4 display.

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 Sw To CPU)	Drive Transistor (TIP 122)	Coil Type
SP1	Right Pop Bumper	BLU-ORN CPU CN19-3	RED PS CN3-6	ORN-BLK CPU CN 18-2	Q8	23-800
SP2	Center Pop Bumper	BLU-RED CPU CN19-4	RED PS CN3-6	ORN-RED CPU CN 18-3	Q9	23-800
SP3	Left Slingshot	BLU-YEL CPU CN19-6	RED PS CN3-6	ORN-YEL CPU CN 18-4	Q10	23-800
SP4	Left Pop Bumper	BLU-BRN CPU CN19-7	RED PS CN3-6	ORN-BRN CPU CN 18-5	Q11	23-800
SP5	Right Slingshot	BLU-GRN CPU CN19-8	RED PS CN3-6	ORN-GRN CPU CN 18-8	Q12	23-800
SP6	NOT USED	-- CPU CN19-9	-- PS CN3-6	-- CPU CN 18-9	Q13	--

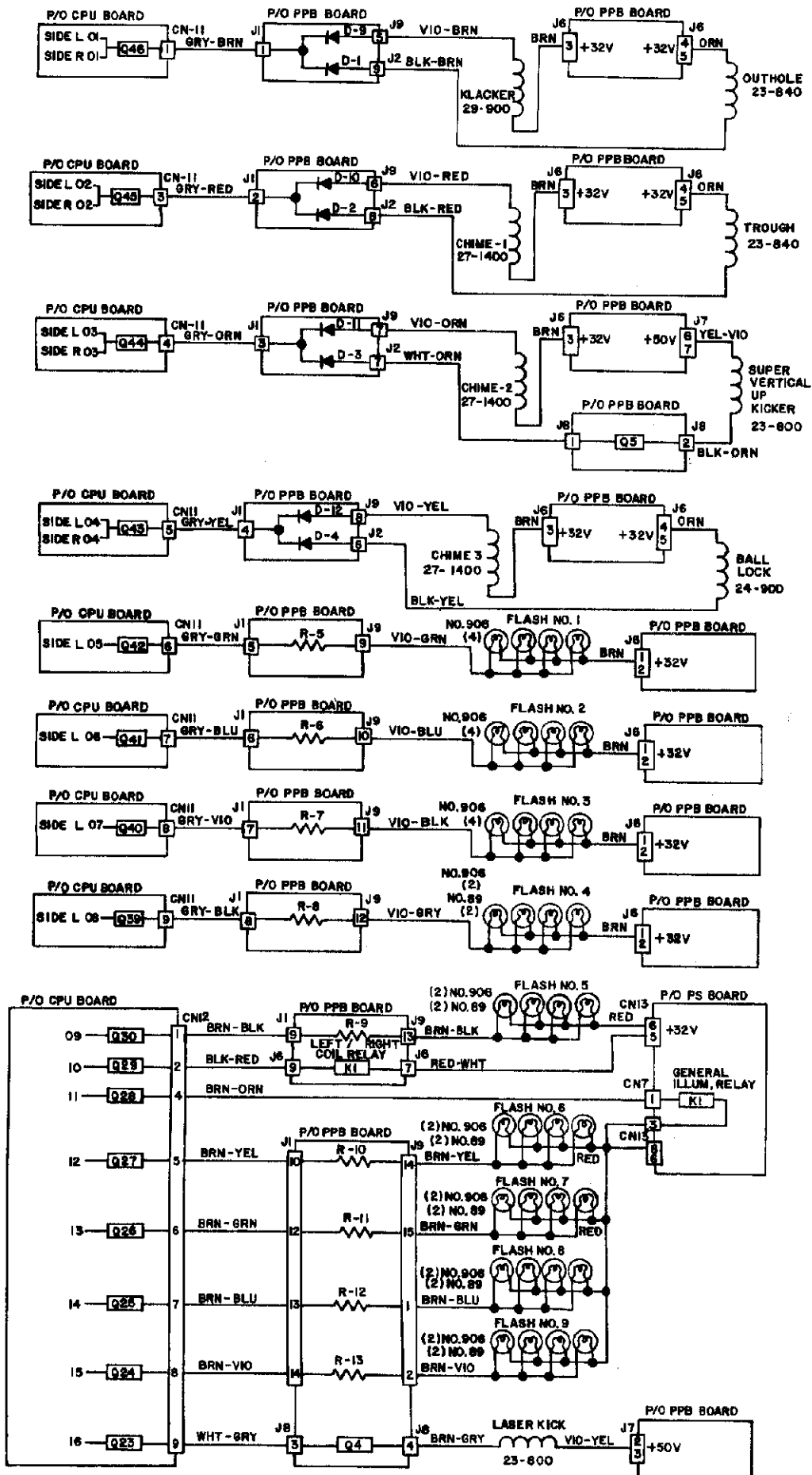
FLIPPER SOLENOIDS

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	22-750/30-2600
Right Flipper	ORN-RED CPU CN19-1	BLU-VIO 1M/F-21	BLK-WHT PPB J7-1,2	22-750/30-2600

TIME MACHINE COIL PART NUMBER CHART

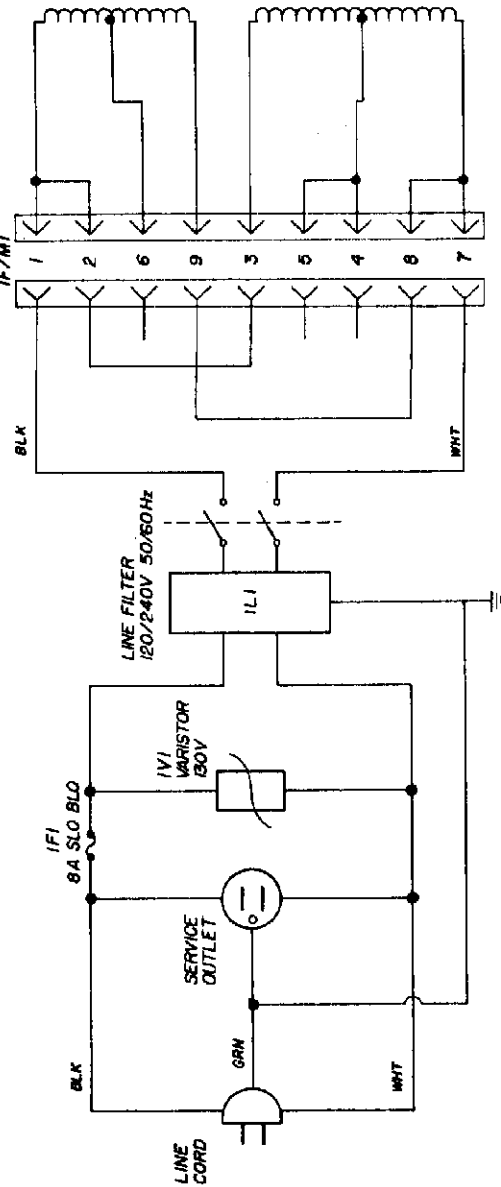
QUANTITY USED	COIL TYPE	DATA EAST PINBALL PART NUMBER
7	23-800	090-5001-00
1	24-900	090-5002-00
2	23-840	090-5005-00
2	22-750/30-2600	090-5011-00
3	27-1400	090-5015-00

TOP



THIS CONFIGURATION FOR 115V

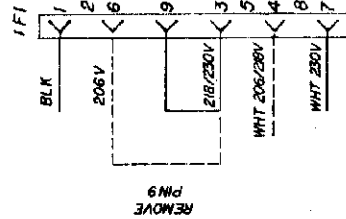
FOR LOWER LINE VOLTAGES
OR 230 VOLT OPERATION
SEE SAMPLES BELOW



JUMPERS FOR VOLTAGE VARIATION

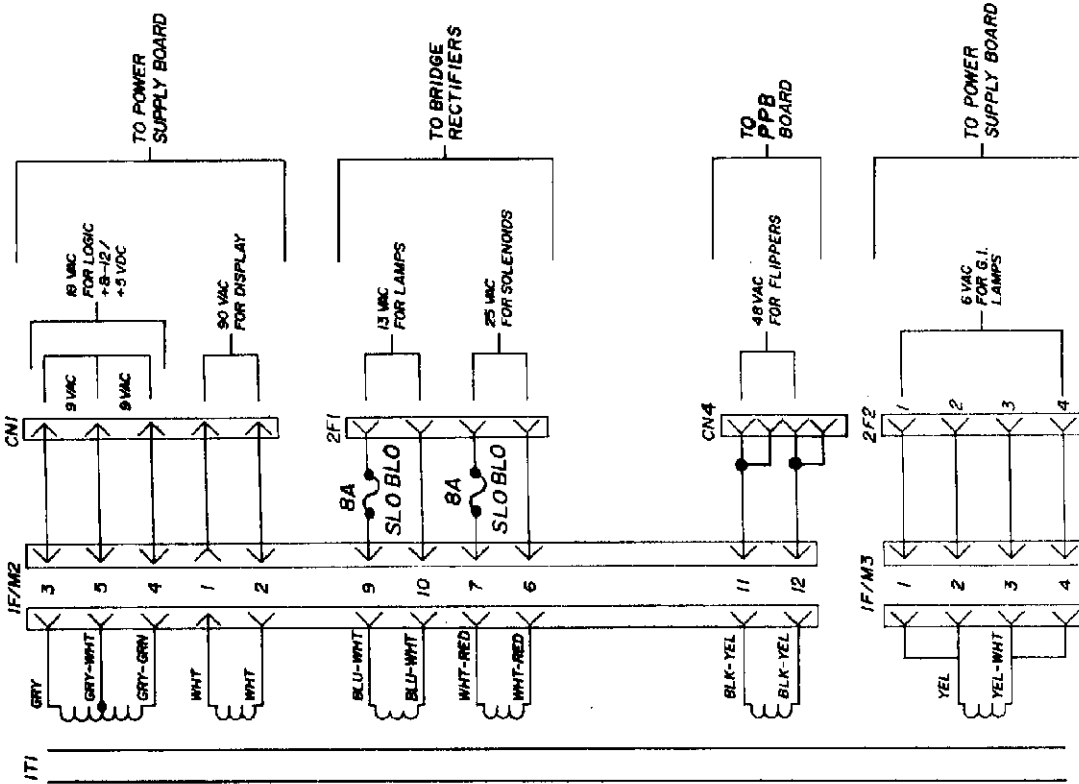
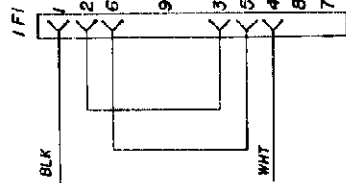
230/218/206 VOLTS

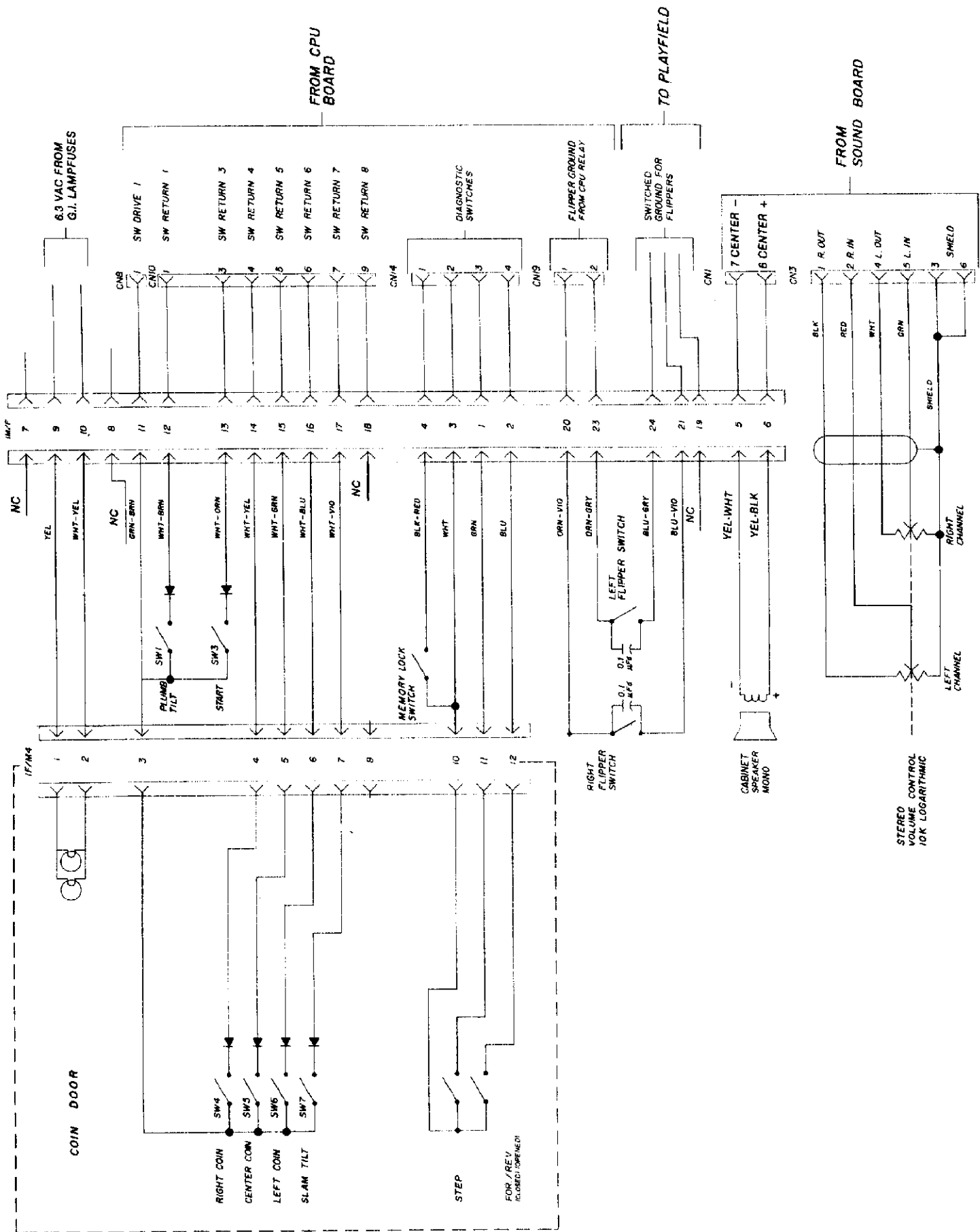
IF1 = 4A SLO BLD
IV1 = 275V VARIATOR



100/105 VOLTS

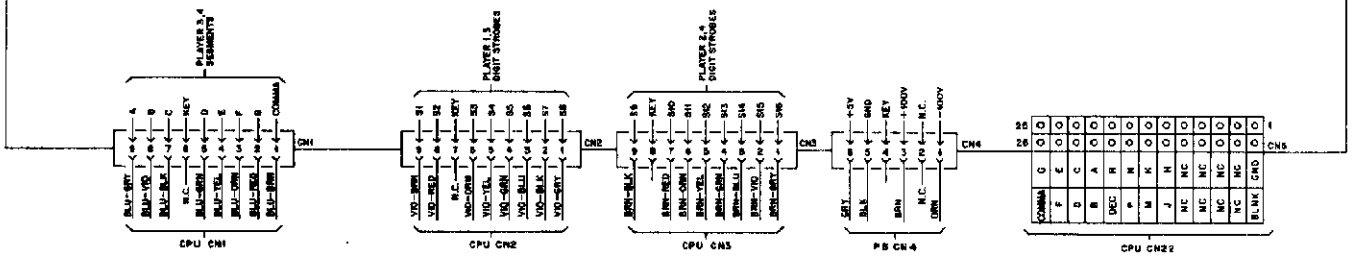
IF1 = 8A SLO BLD
IV1 = 130V VARIATOR

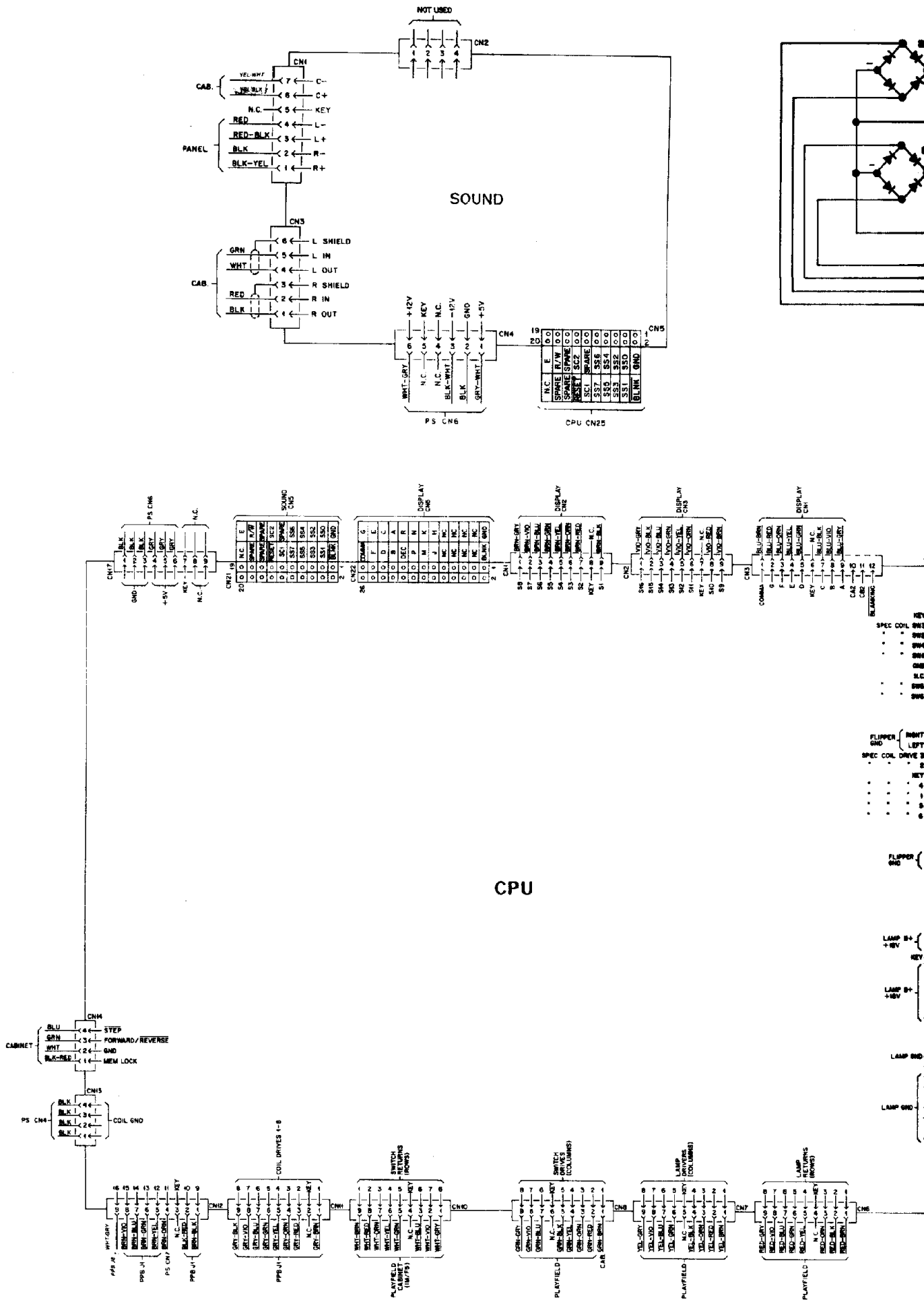


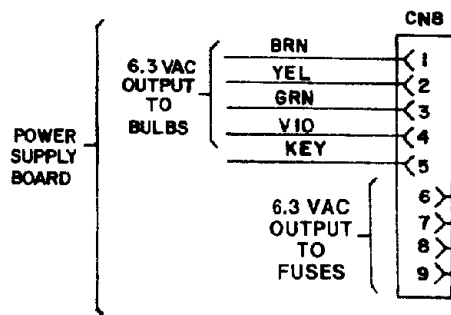
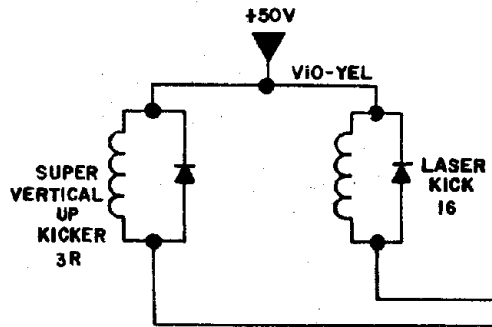


Cabinet Wiring Diagram

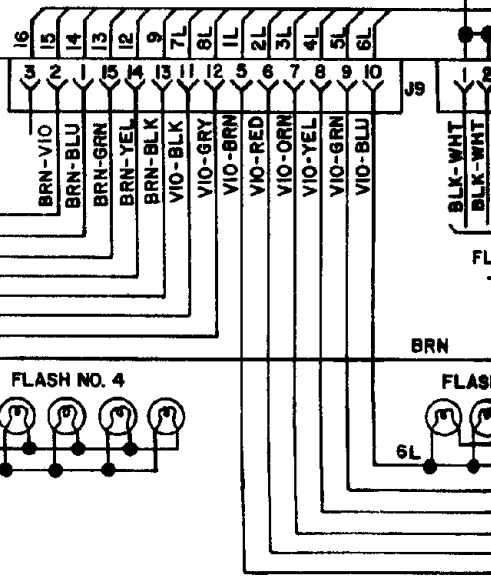
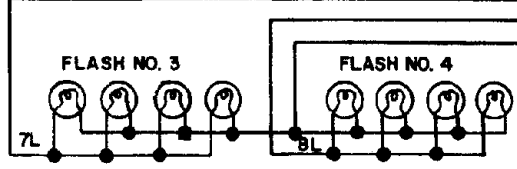
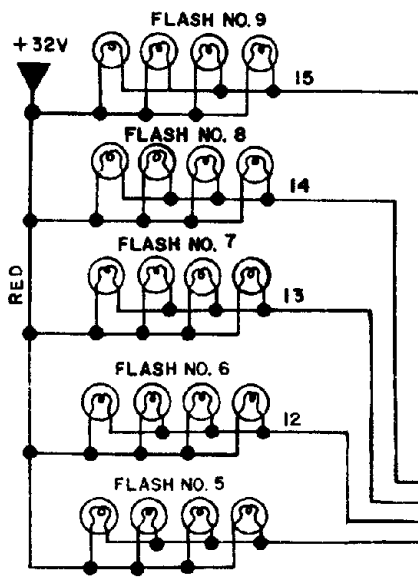
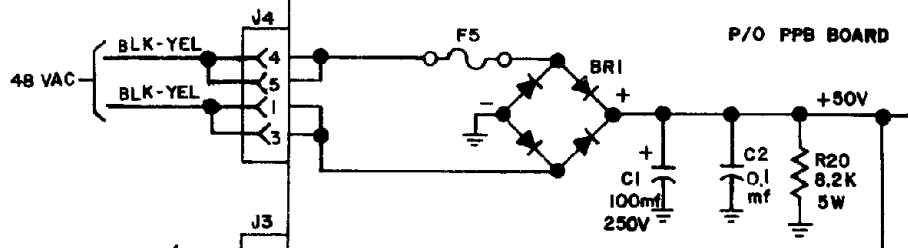
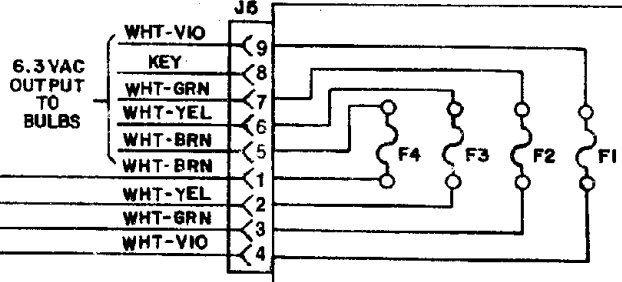
DISPLAY

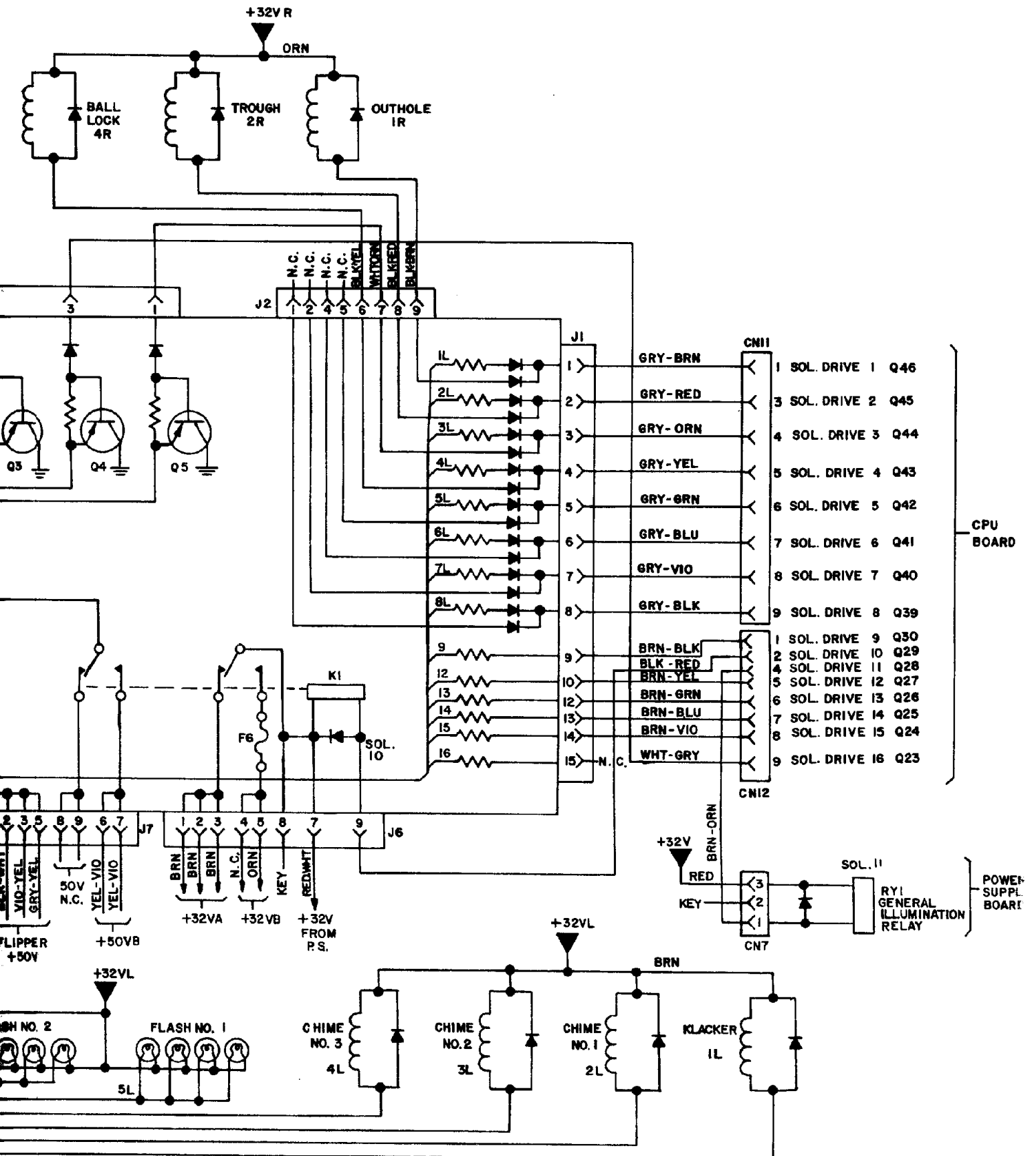


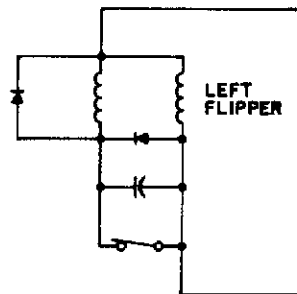
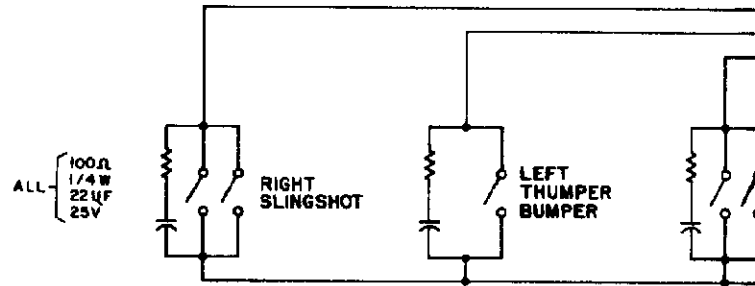
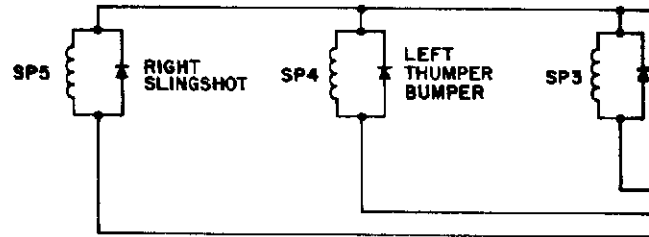


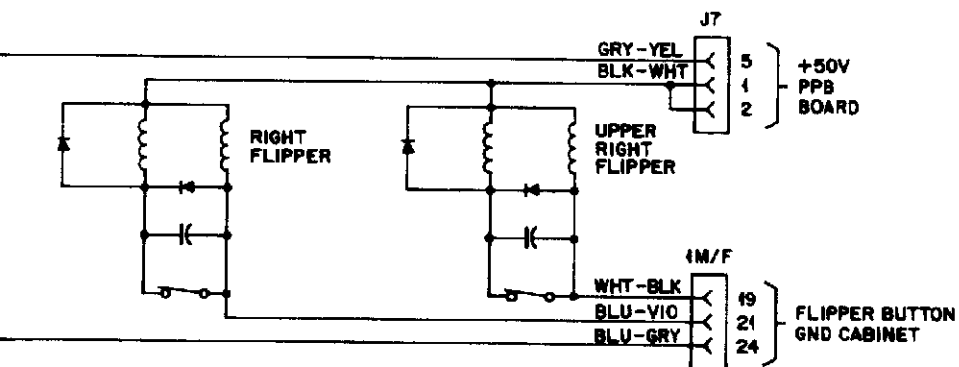
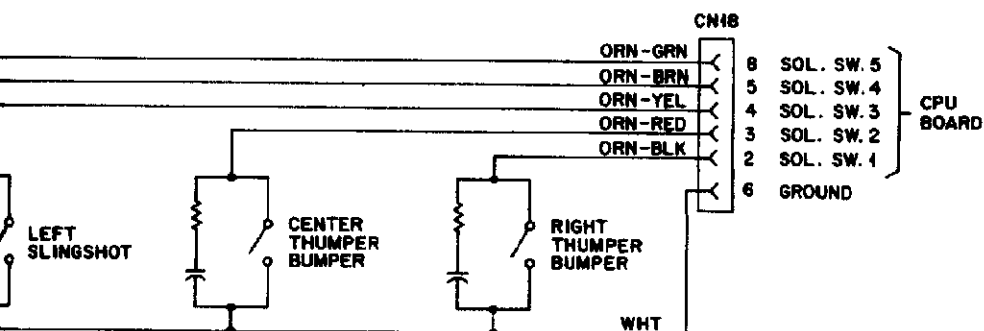
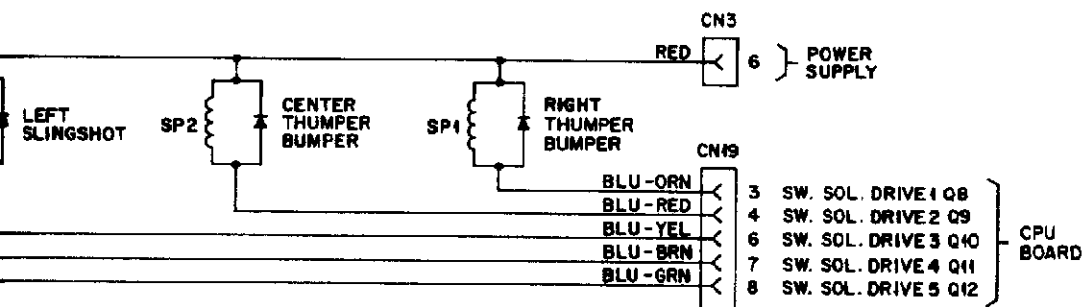


GENERAL ILLUMINATION FUSED LINES



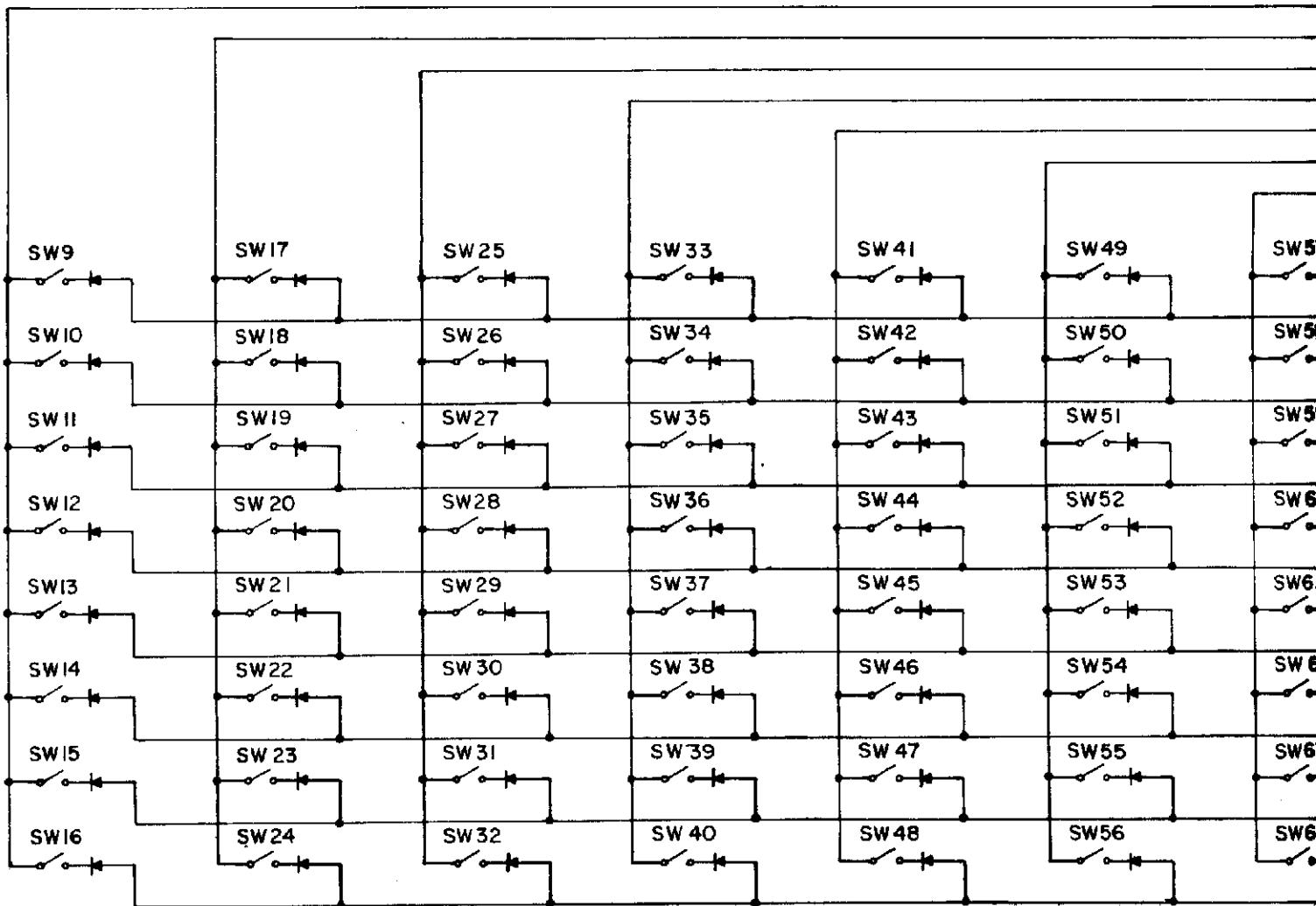






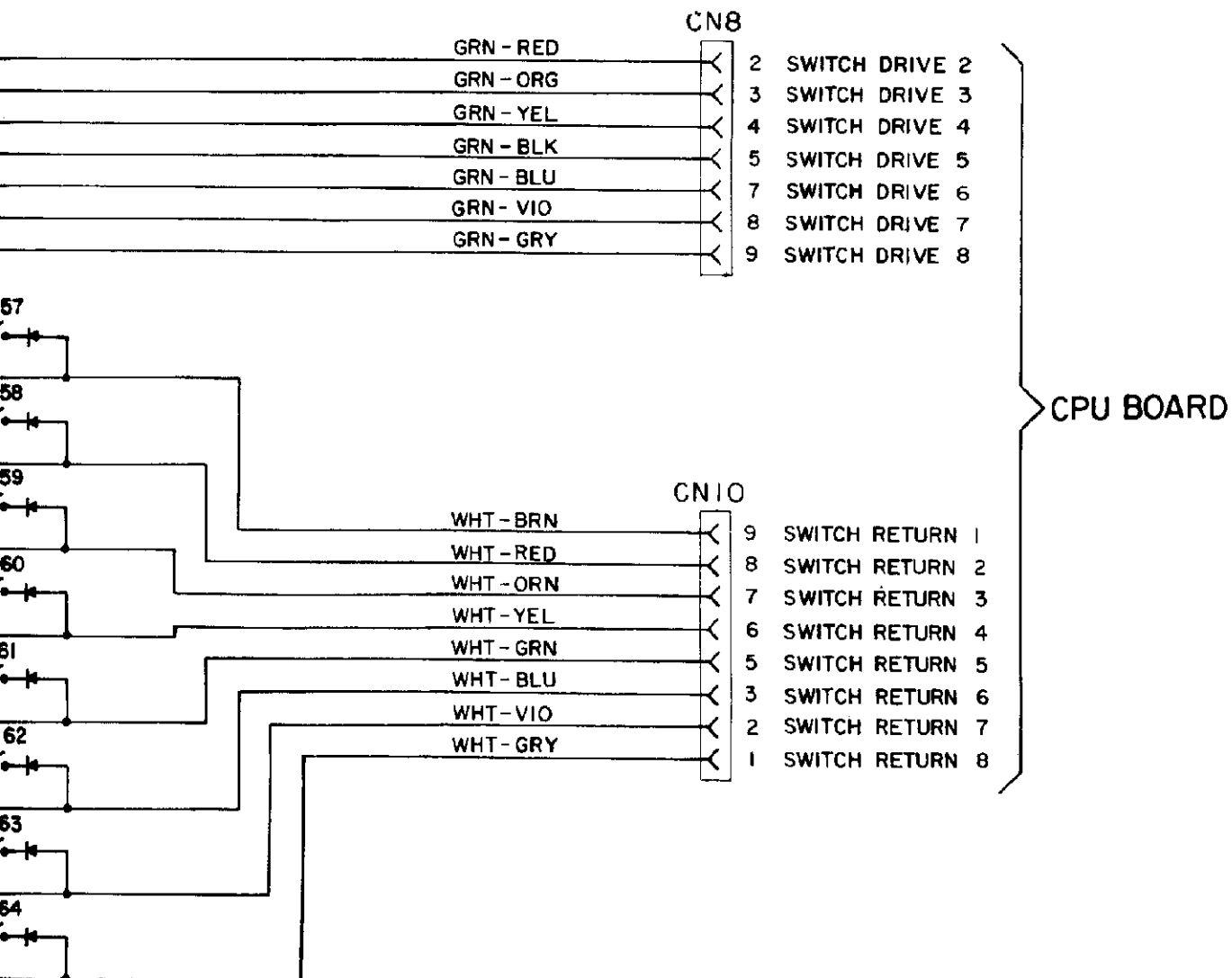
**Switch
Number Description**

01*	Plumb Tilt	16	Right Flip. Instant Info.	31	
02	Not Used		Right EOS	32	
03	Credit Button	17	Left Outlane	33	
04*	Right Coin	18	Left Return Lane	34	
05*	Center Coin	19	Right Outlane	35	
06*	Left Coin	20	Right Return Lane	36	
07*	Slam Tilt	21	Left Slingshot Trigger Sw.	37	
08	Not Used		Left Slingshot Point Sw.	38	
09	Not Used	22	Right Slingshot Trigger Sw.	39	
10	Out Hole		Right Slingshot Point Sw:	40	
11	Trough #1	23	Not Used	41	
12	Trough #2	24	Not Used	42	
13	Trough #3	25	Left Top Lane	43	
14	Shooter Lane	26	Center Top Lane	44	
15	Left Flip. Instant Info. Left EOS	27	Right Top Lane	45	
		28	Left Ramp		
		29	Center Ramp		
		30	Right Ramp		



Left Star Rollover	46	Left Pop Bumper	SWITCH DRIVE 1	Q55
Right Star Rollover	47	Center Pop Bumper	SWITCH DRIVE 2	Q54
Left 3 Bank Bottom	48	Right Pop Bumper	SWITCH DRIVE 3	Q53
Left 3 Bank Center	49	Right 3 Bank Top	SWITCH DRIVE 4	Q52
Left 3 Bank Top	50	Right 3 Bank Center	SWITCH DRIVE 5	Q51
Lock Ball #1	51	Right 3 Bank Bottom	SWITCH DRIVE 6	Q50
Lock Ball #2	52	Not Used Thru 64	SWITCH DRIVE 7	Q49
Lock Ball #3			SWITCH DRIVE 8	Q48
Not Used				
Not Used				
Center 3 Bank Left				
Center 3 Bank Middle				
Center 3 Bank Right				
Ramp Sw. Under Plyfld				
Right Super VUK				

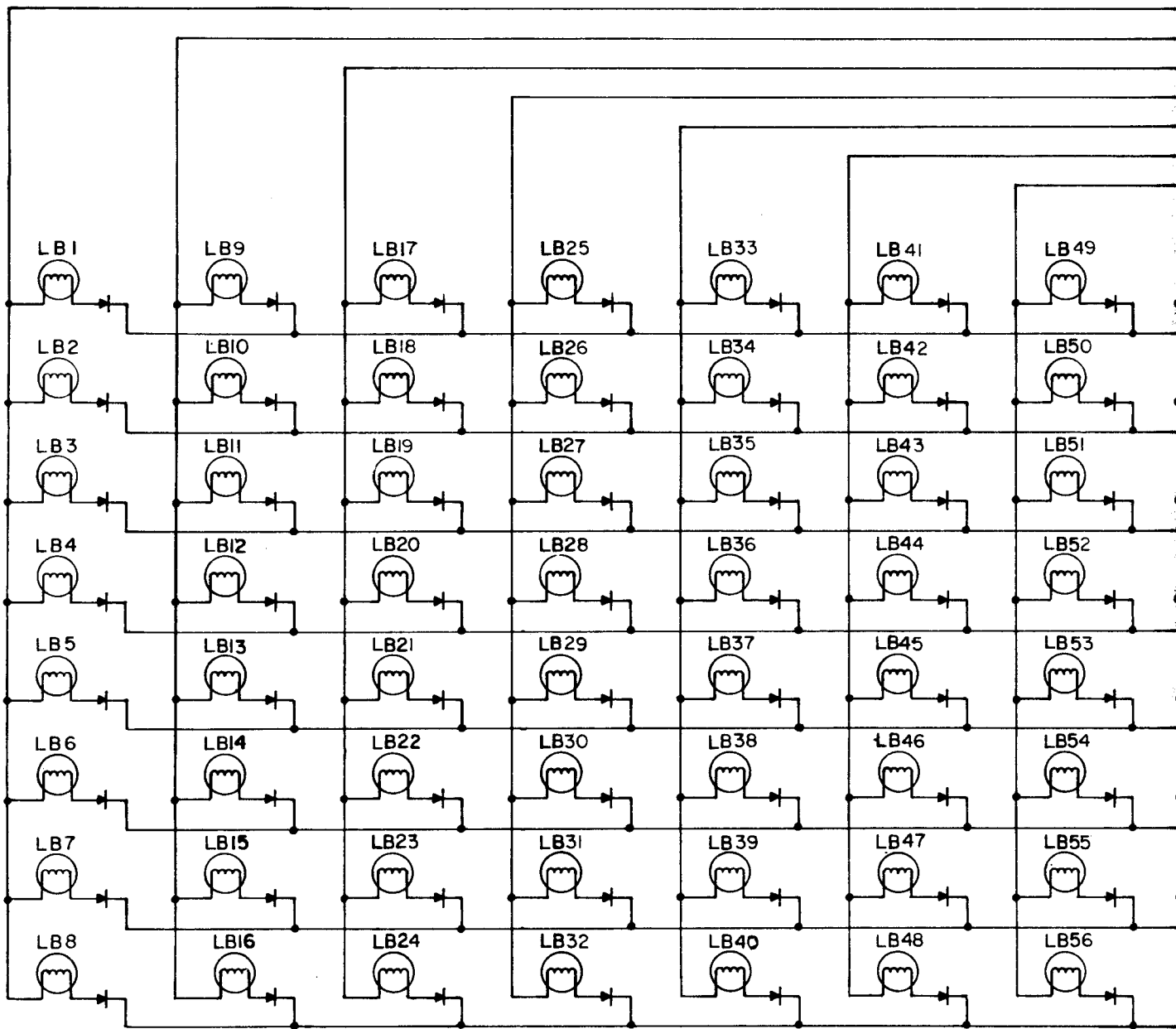
* Indicates cabinet switches.



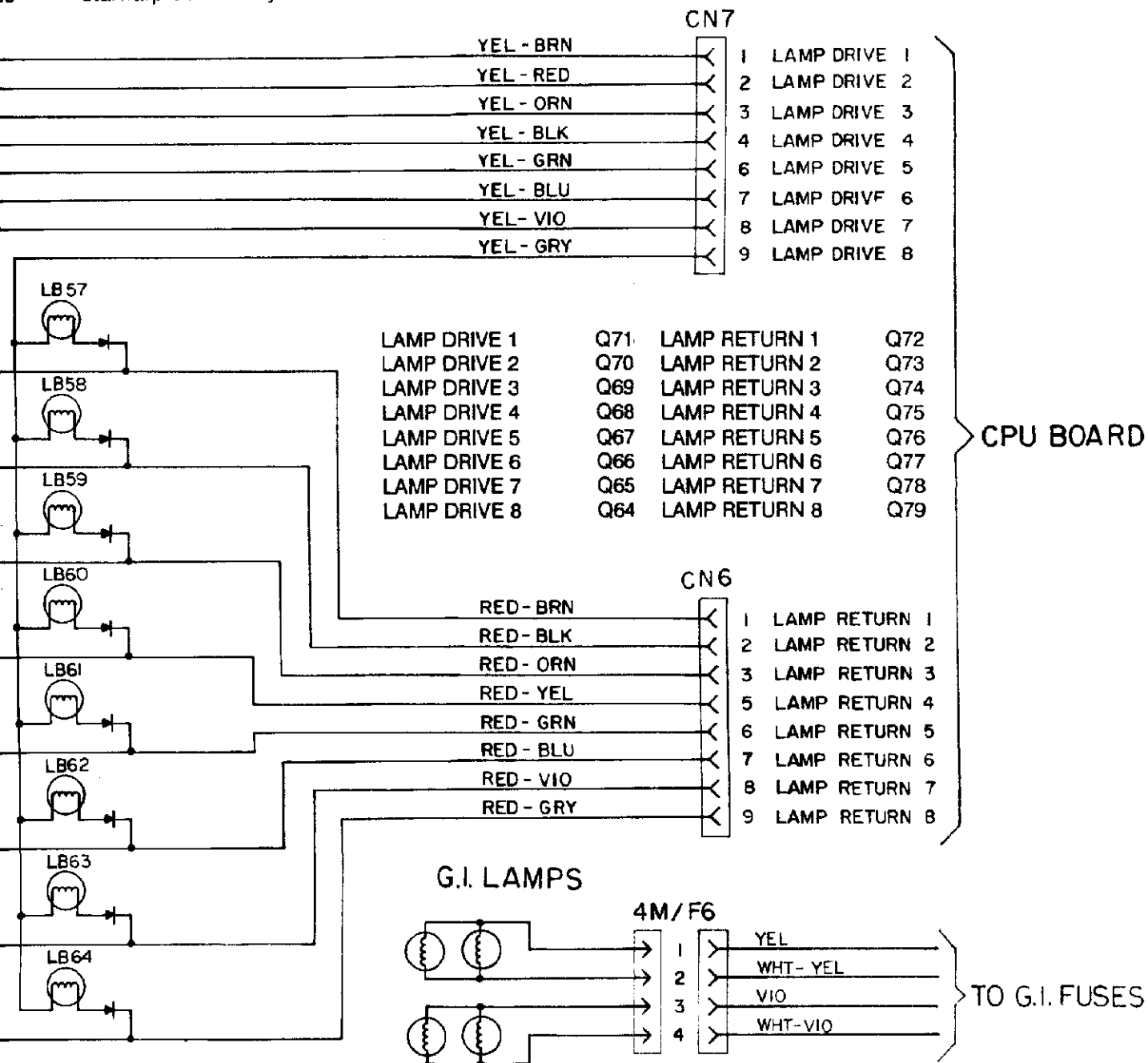
**Lamp
Number Description**

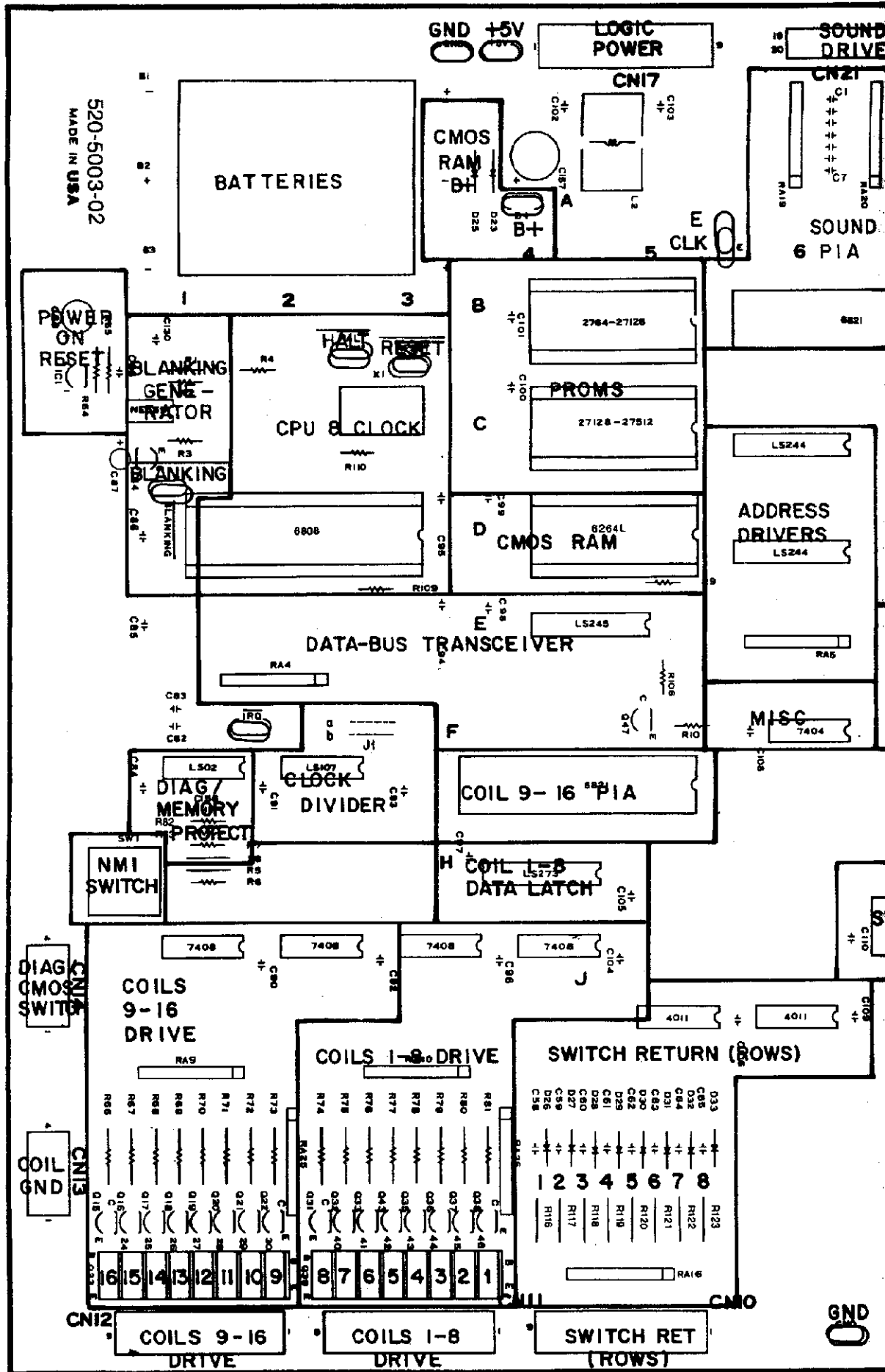
* Indicates insert board lamps.

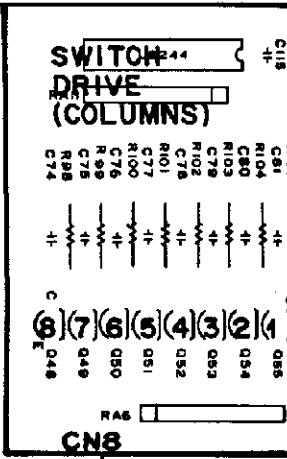
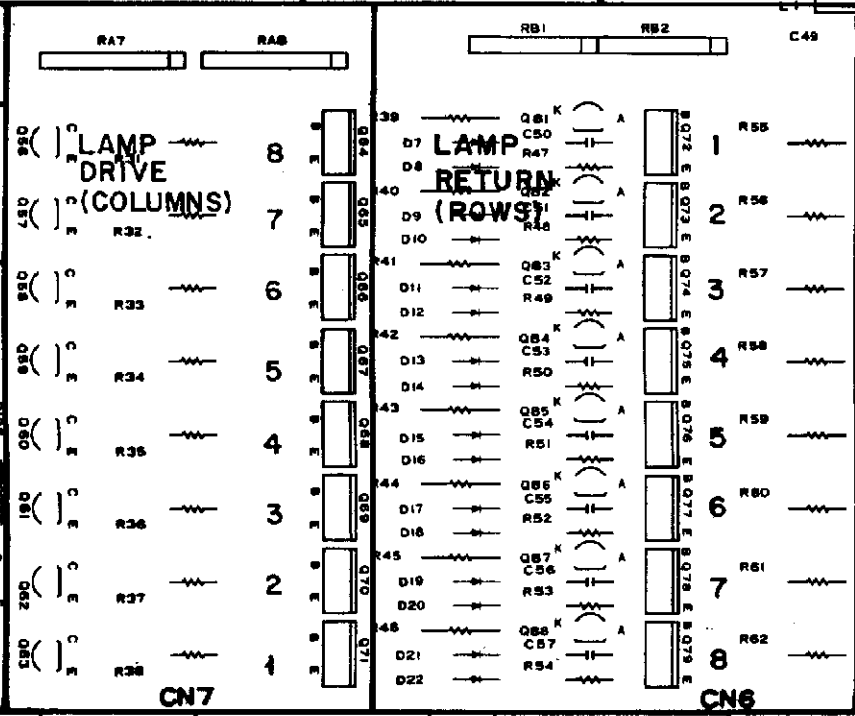
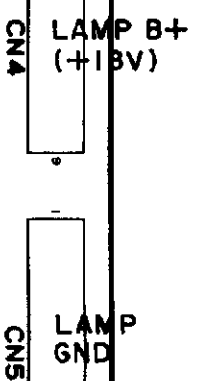
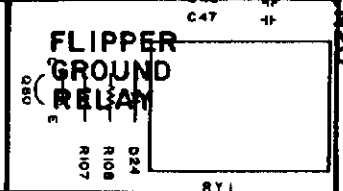
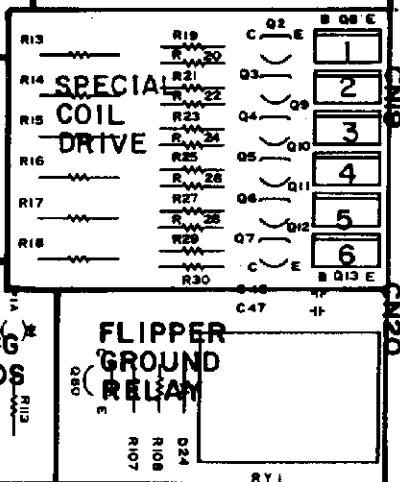
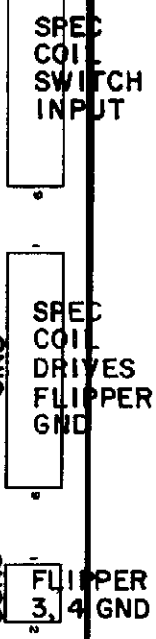
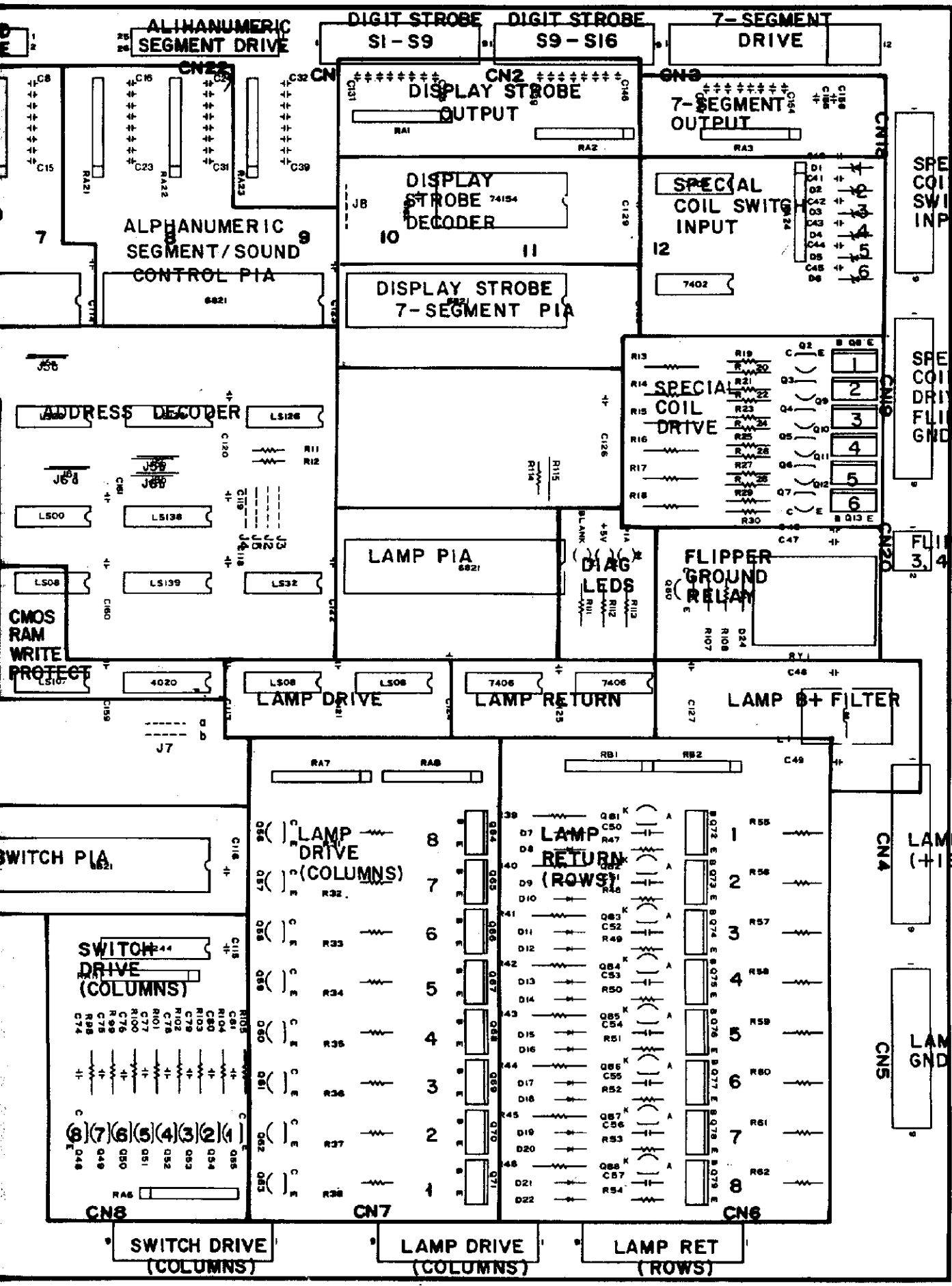
01*	"S"tarwarp	17	Special	33
02*	s"T"arwarp	18	3 Ball Jackpot	34
03*	st"A"rwarp	19	Left Ramp E = MC ²	35
04*	sta"R"warp	20	Left Mini Jackpot	36
05*	star"W"arp	21	Center Mini Jackpot	37
06*	starw"A"rp	22	Right Mini Jackpot	38
07*	starwa"R"p	23	3X	39
08*	starwar"P"	24	2X	40
09	Center Square	25	2X All Scores Cntr Plyfld	41
10	Center Circle	26	Extra Ball Back Panel	42
11	Center Triangle	27	Bonus Hold Back Panel	43
12	Left Ramp 1970	28	100K Back Panel	44
13	Left Ramp 1960	29	50K Back Panel	45
14	Left Ramp 1950	30	25K Back Panel	46
15	5X	31	Targets Light Special	47
16	4X	32	2X All Scores	48

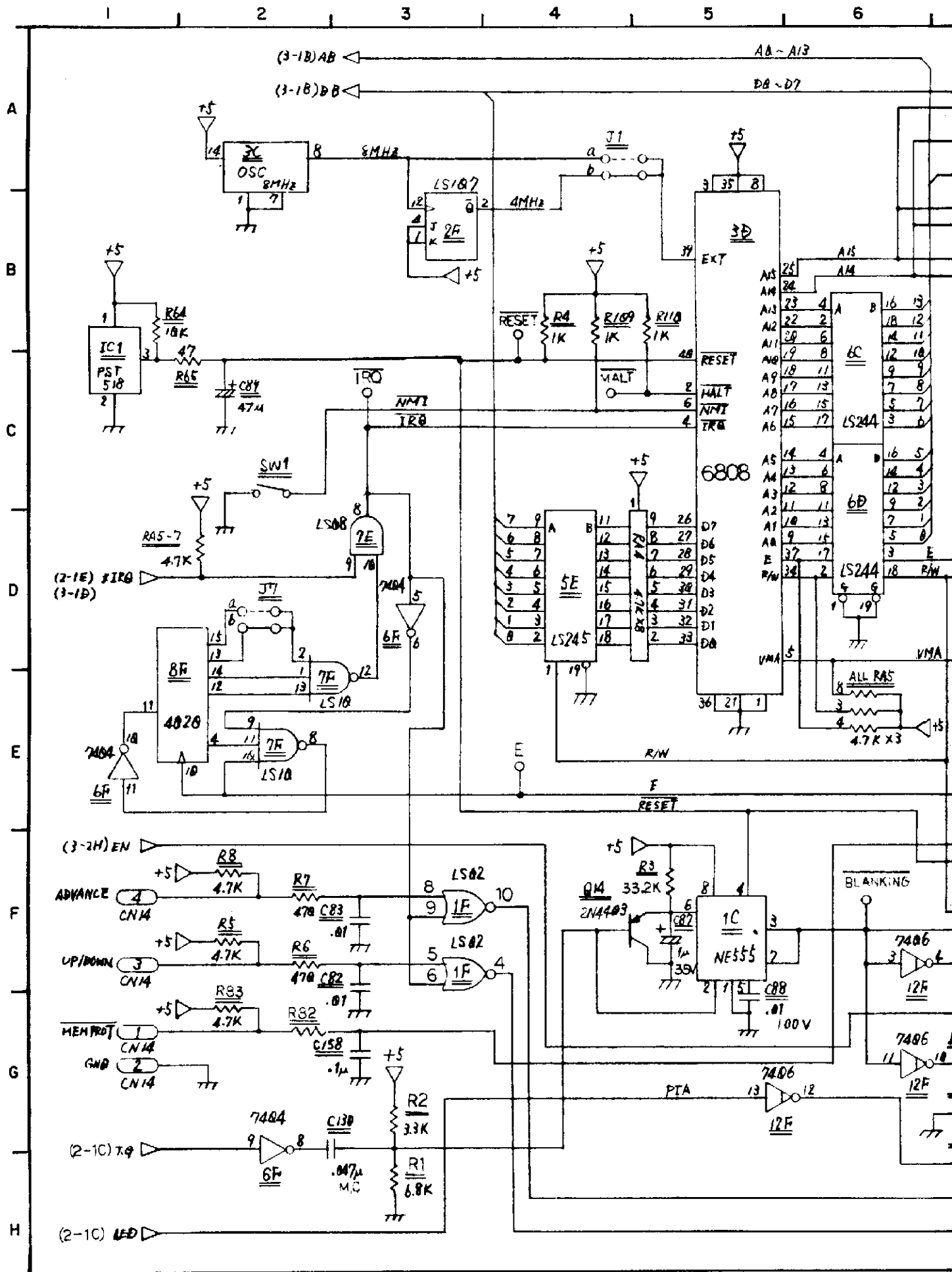


3	Left Triangle	49	Lane 1
4	Left Circle	50	Lane 2
5	Left Square	51	Lane 3
6	Left Extra Ball	52	Left Pop Bumper
7	Laser Kick	53	Center Pop Bumper
8	Left Return	54	Right Pop Bumper
9	Extra Ball Center Playfield	55	1980
10	Bonus Hold Center Plyfid	56	1970
11	Right Square	57	Top Right Arrow
12	Right Circle	58	Right Ramp E = MC ²
13	Right Triangle	59	Right Ramp 1950
14	Right Hotdog	60	Right Ramp 1960
15	Right Return	61	Right Ramp 1970
16	Right Extra Ball	62*	Engine
17	Left Hotdog	63	1960
18	Starwarp Center Playfield	64	1950

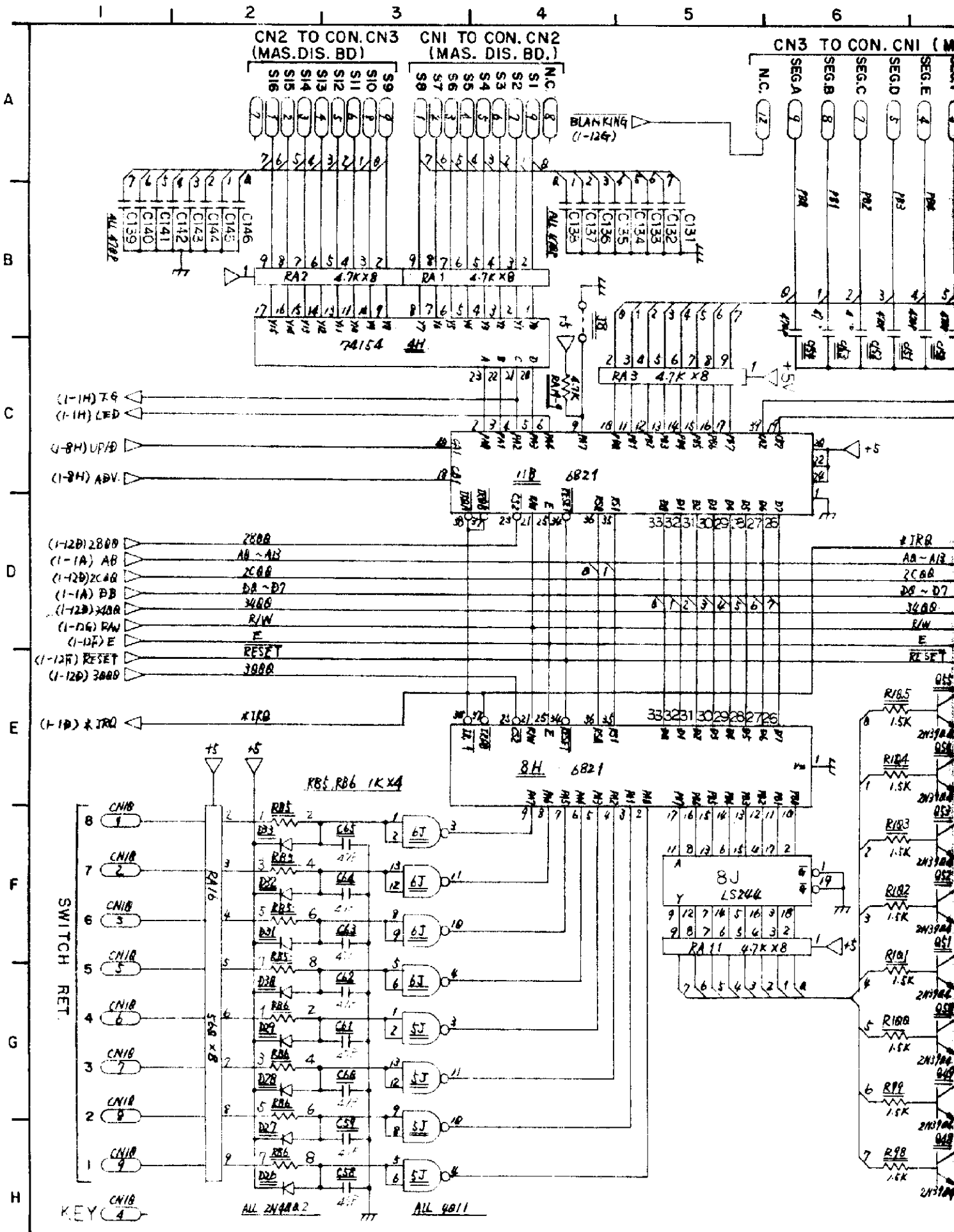


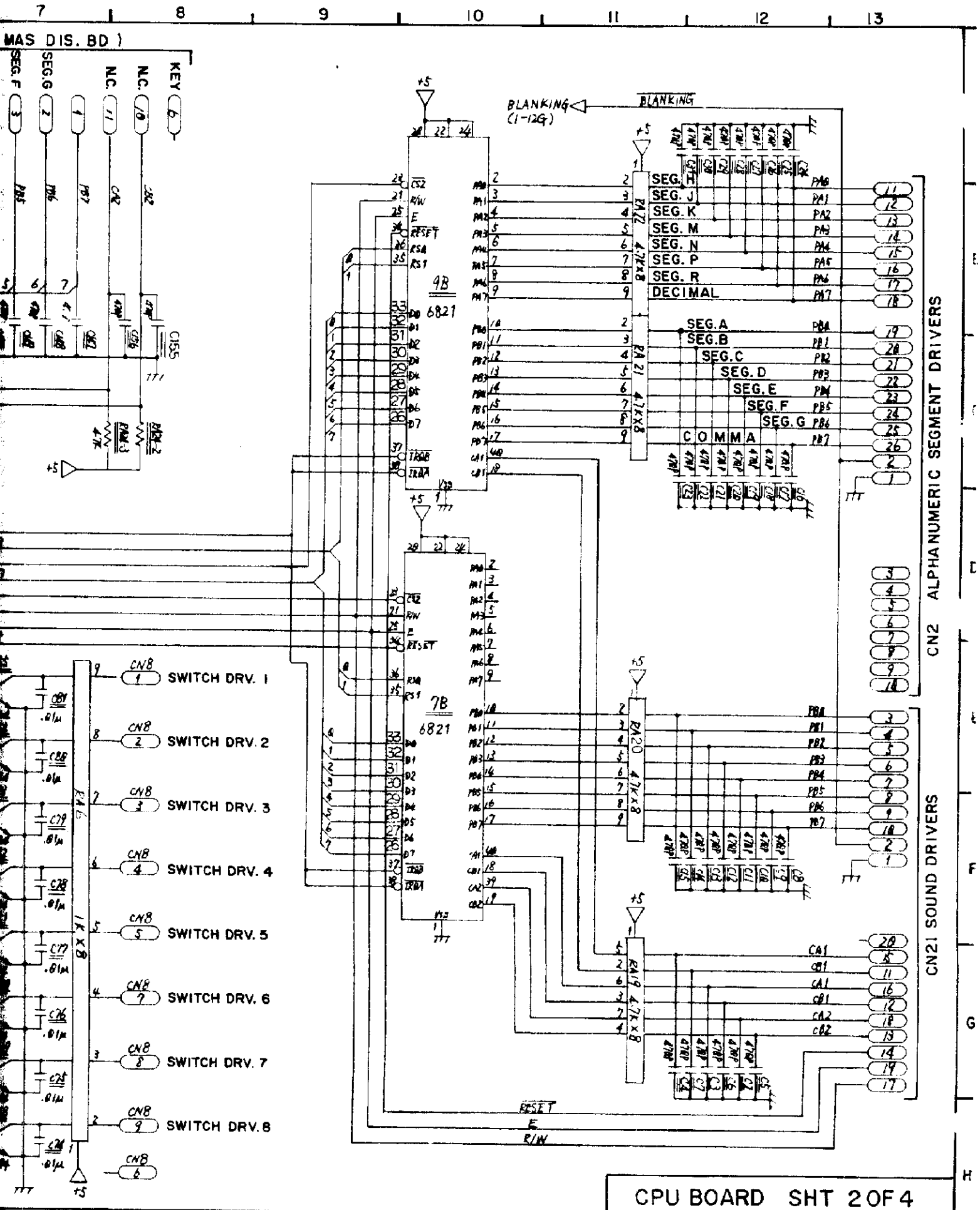




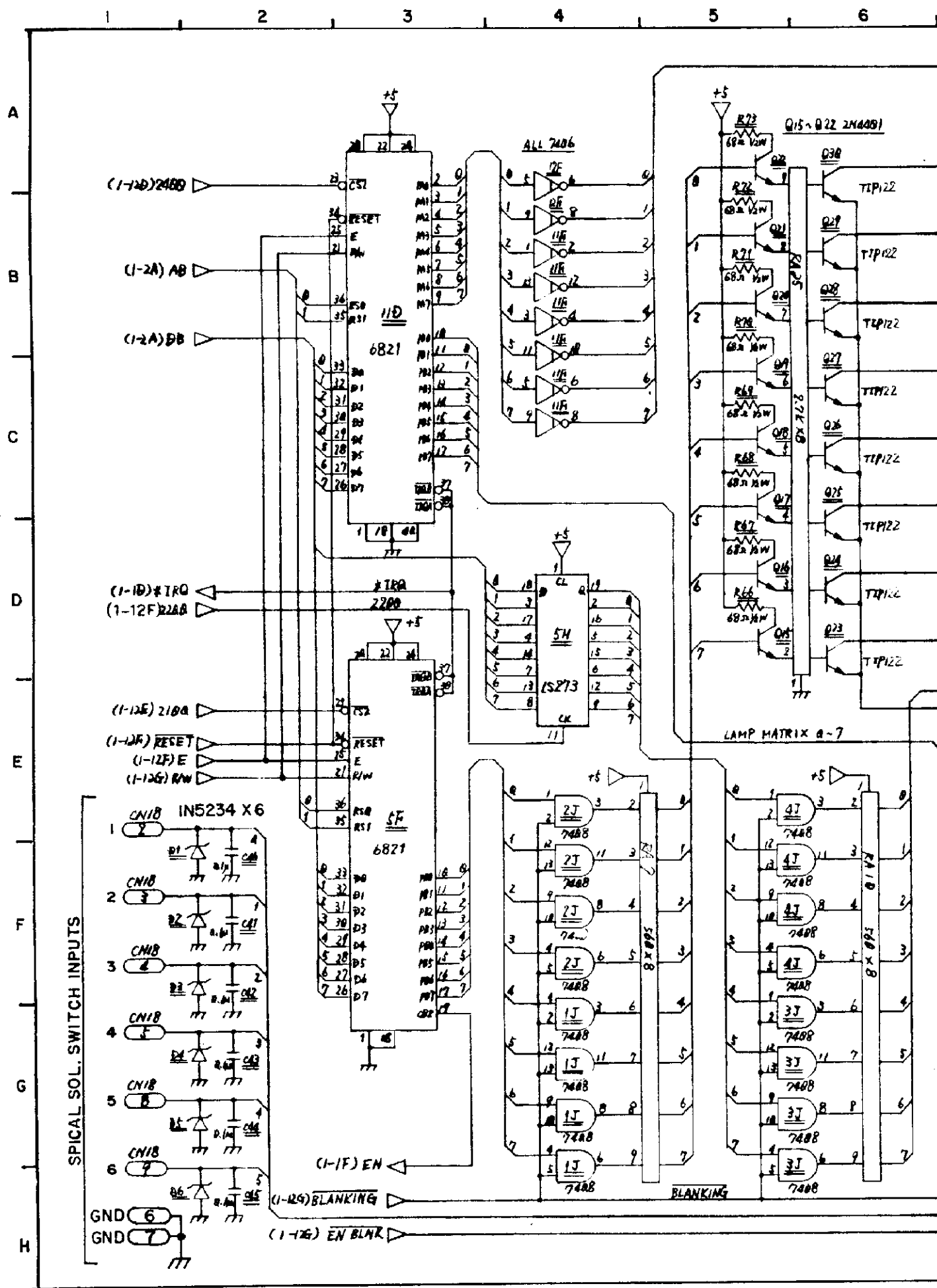


A15		A14		A13		A12		A11		A10		A9		A8		A7		A6		A5		A4		A3		A2		A1		A0	
25	4	23	4	22	2	20	6	19	8	18	11	17	13	16	15	15	17	14	4	13	6	12	8	11	11	10	13	9	15	8	17
16	13	18	12	14	11	9	9	7	8	5	7	3	6	16	5	14	4	12	3	9	2	7	1	5	8	3	5	18	18	3	6





CPU BOARD SHT 20F4



SPICAL SOL. SWITCH INPUTS

LAMP MATRIX A-7

BLANKING

A
B
C
D
E
F
G
H

(1-2D) 2400

(1-2A) AB

(1-2A) DB

(1-1D) *TRQ

(1-12F) 22AB

(1-12E) 2100

(1-12F) RESET

(1-12F) E

(1-12G) RW

CN1B IN5234 X 6

CN1B

CN1B

CN1B

CN1B

CN1B

CN1B

GND

GND

(1-1F) EN

(1-12G) BLANKING

(1-12G) EN BLNK

ALL 7406

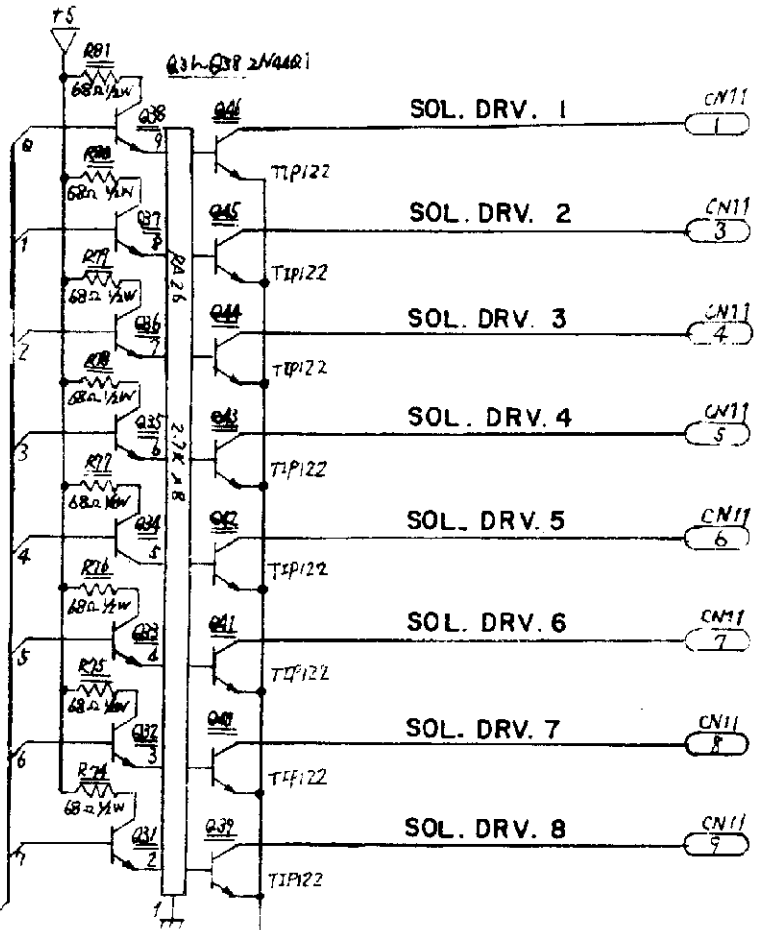
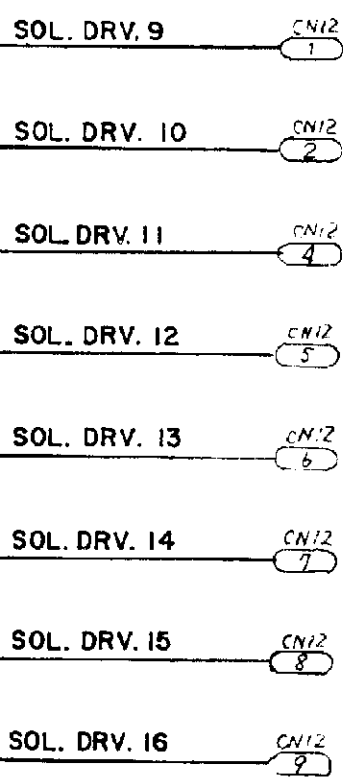
Q15-Q22 2N4001

LAMP MATRIX A-7

BLANKING

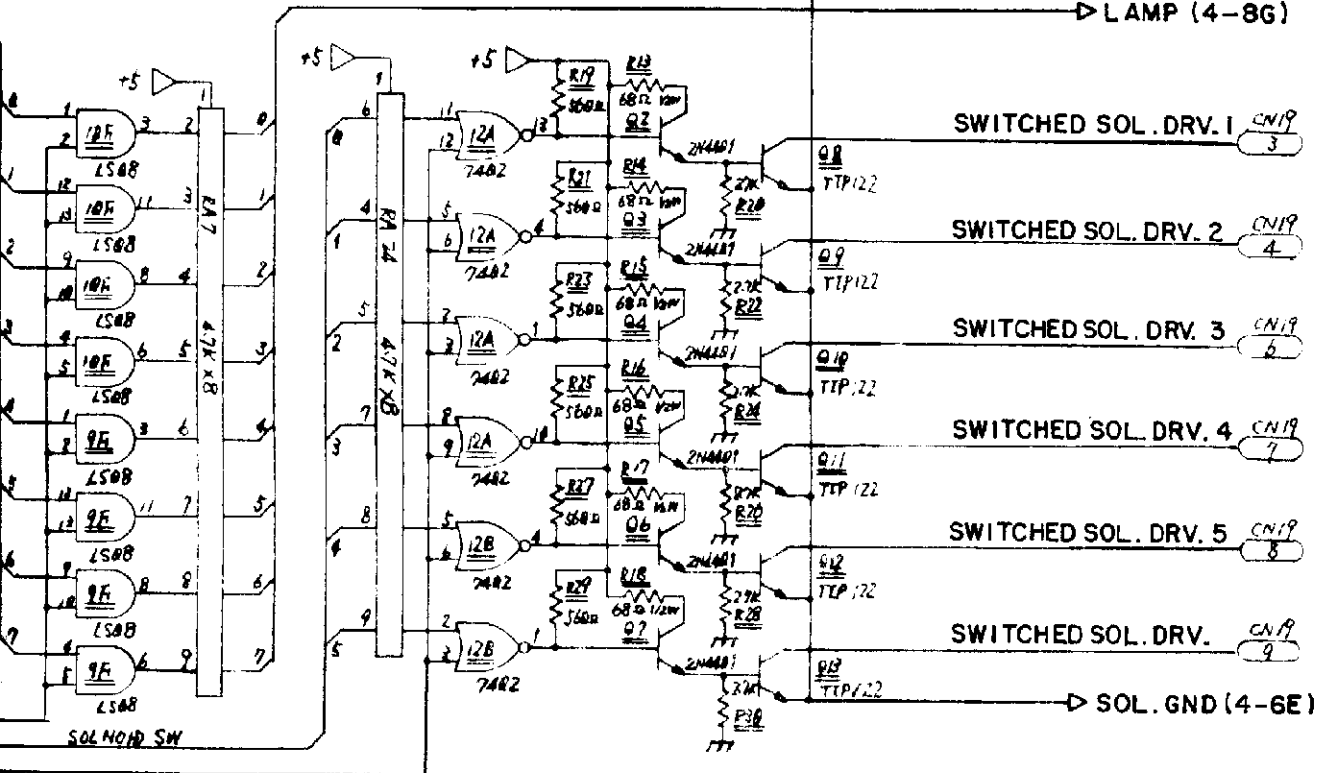
LAMP MATRIX CONT. 8-7

LAMP CNT (4-8A)



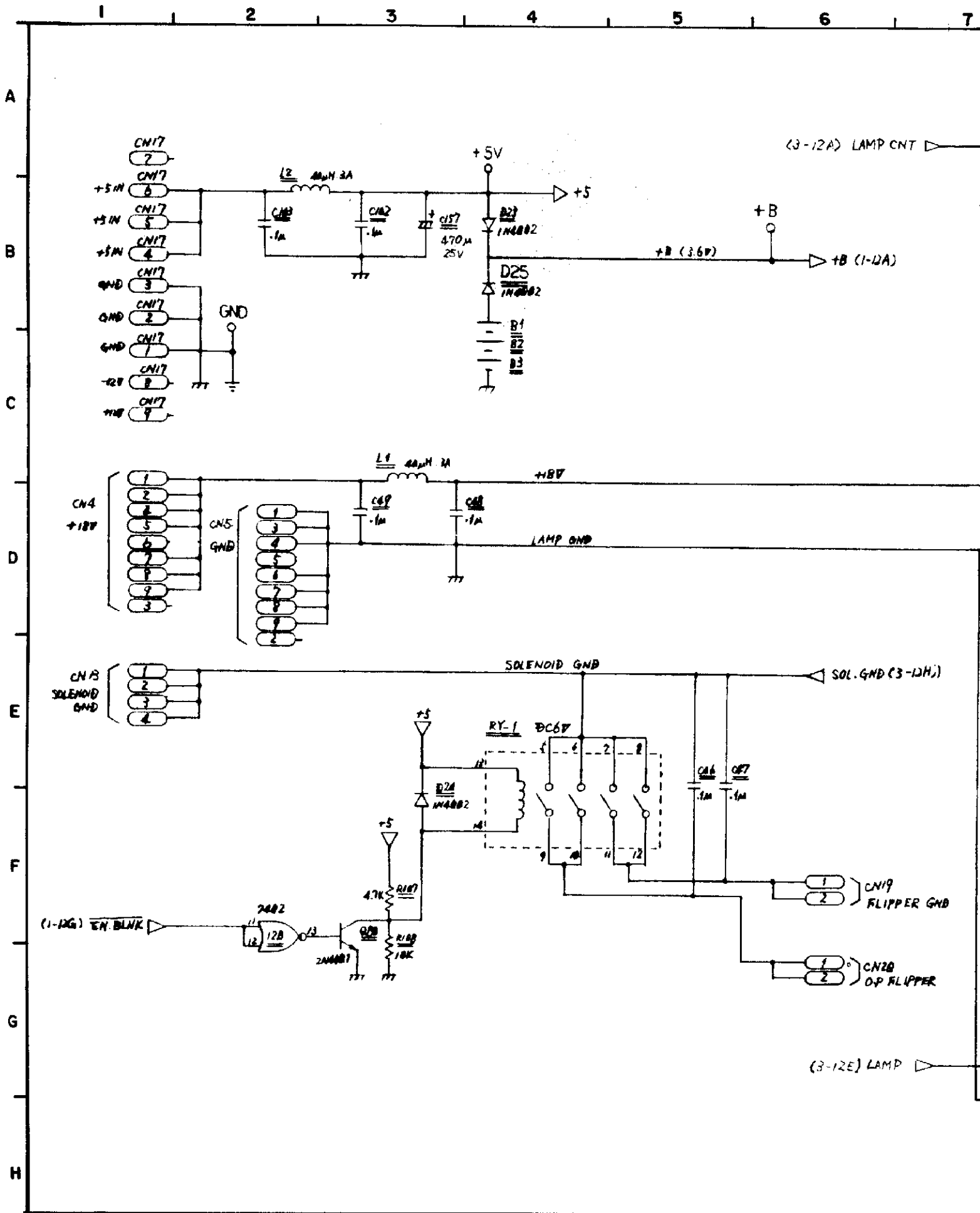
SOLNOID GND

LAMP (4-8G)



SOLNOID SW

CPU BOARD 3 OF 4



8

9

10

11

12

13

A

B

C

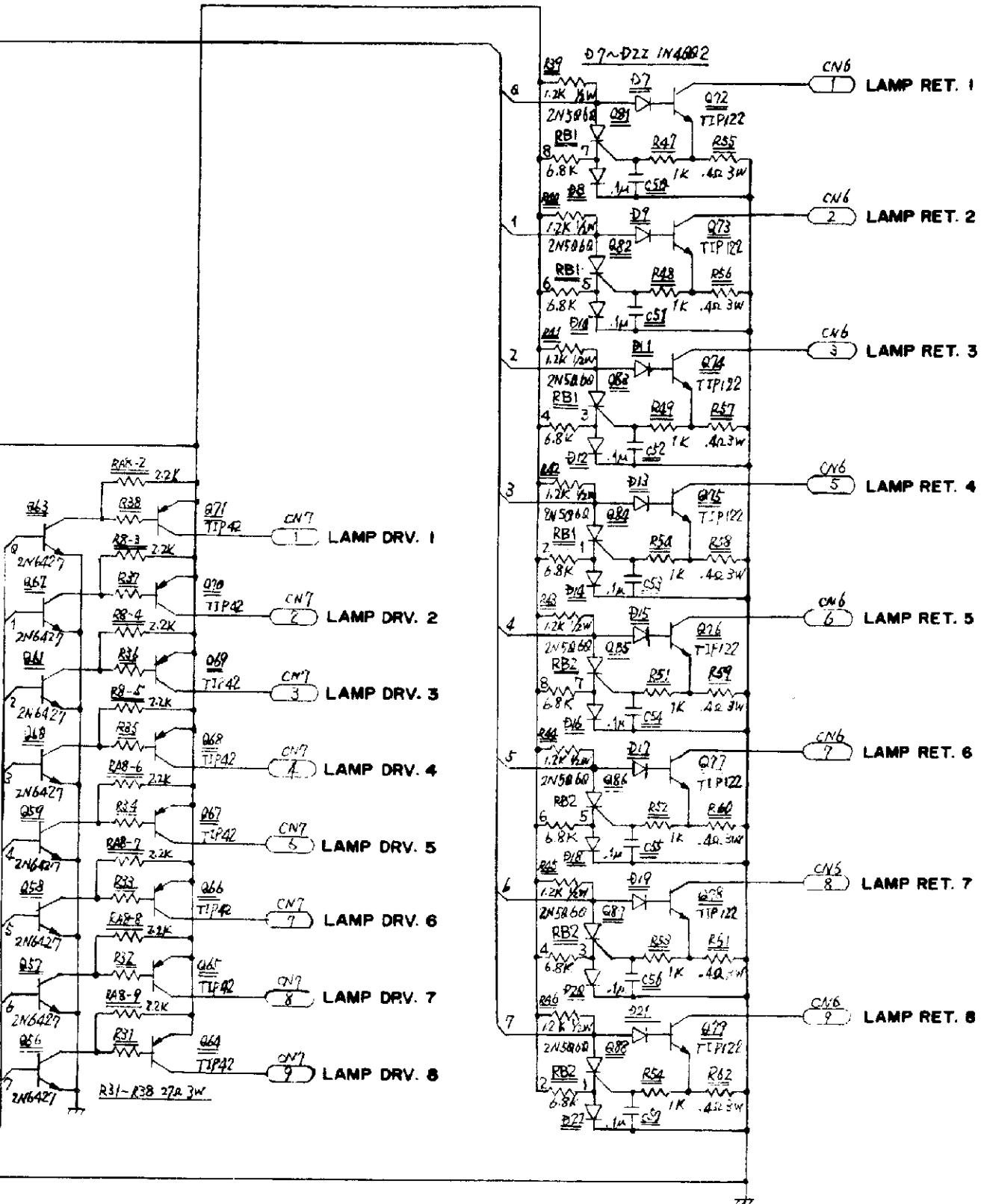
D

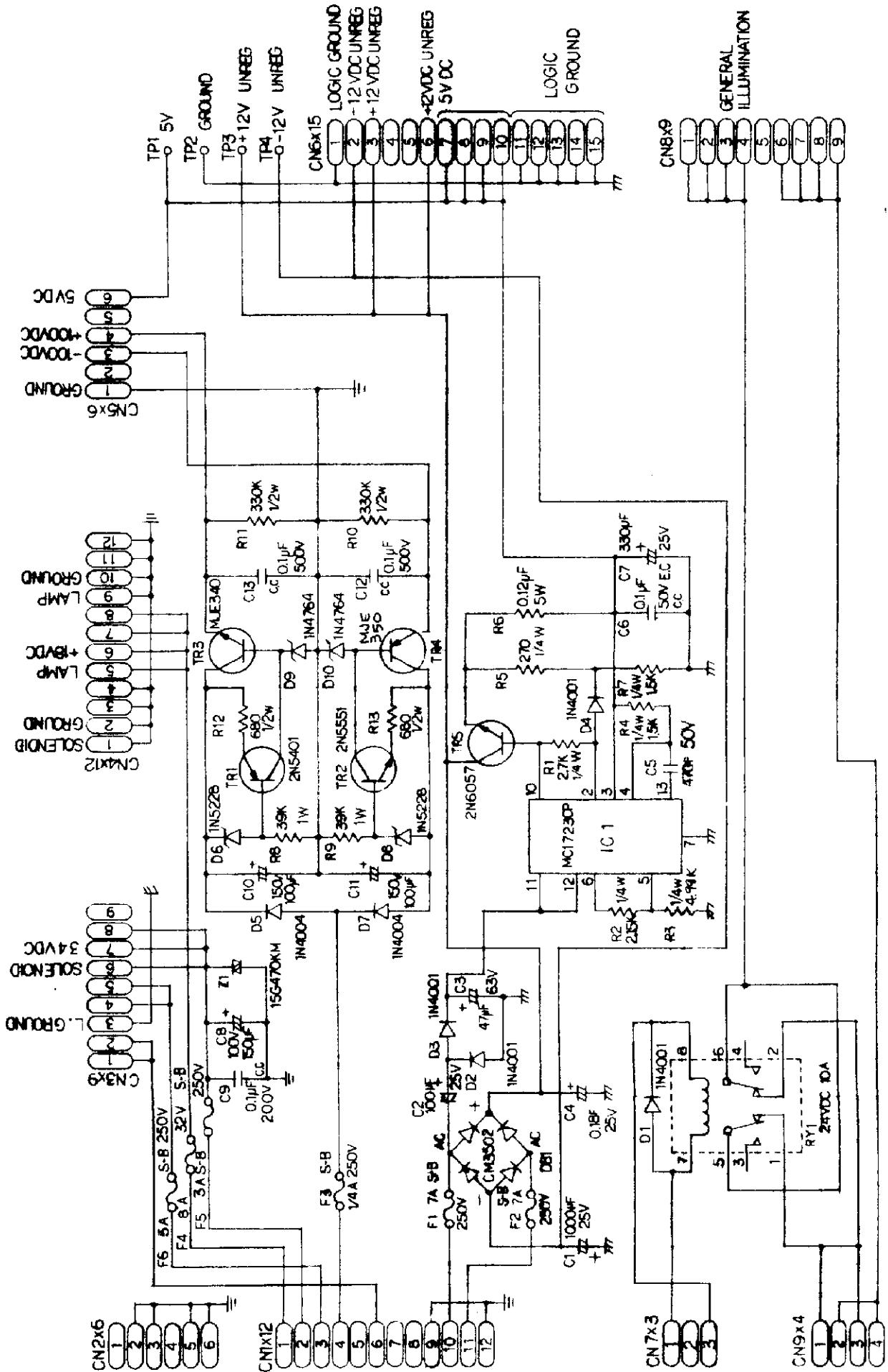
E

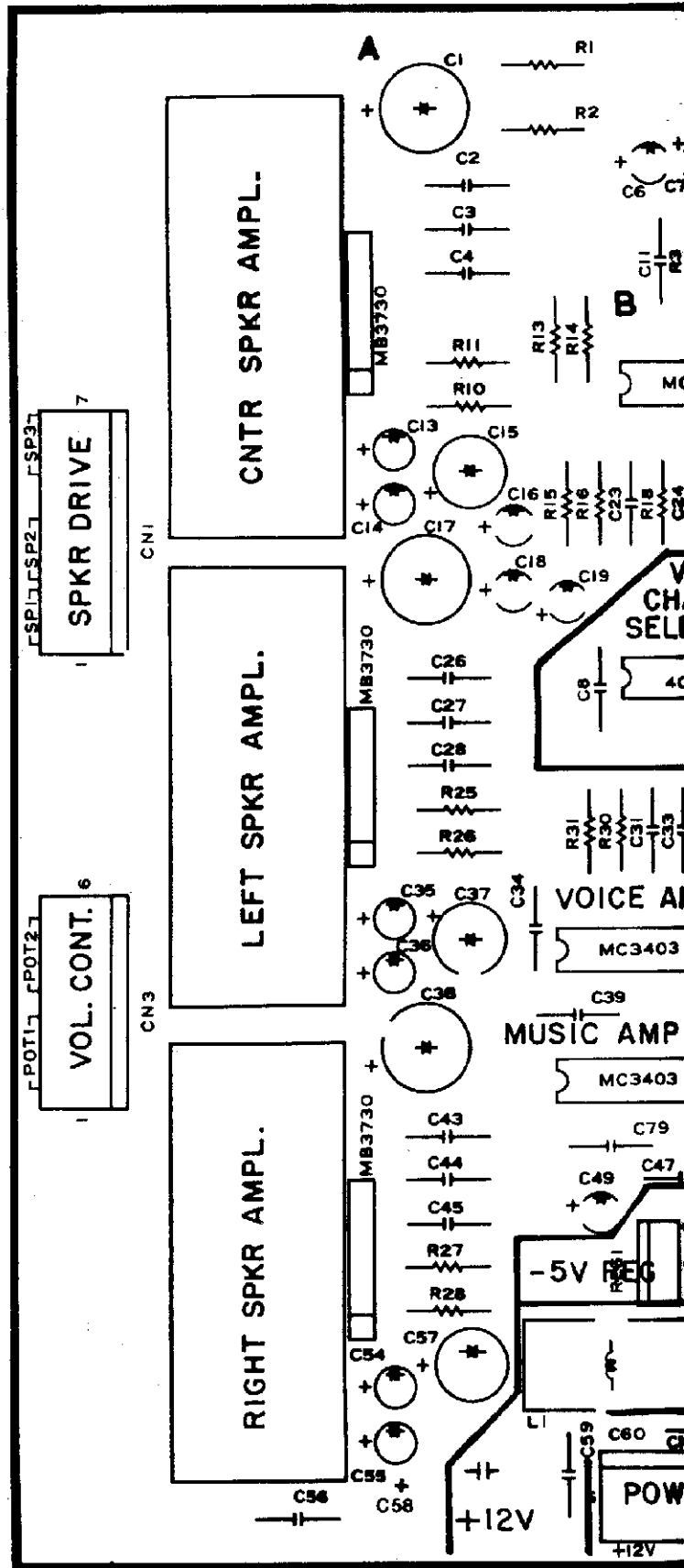
F

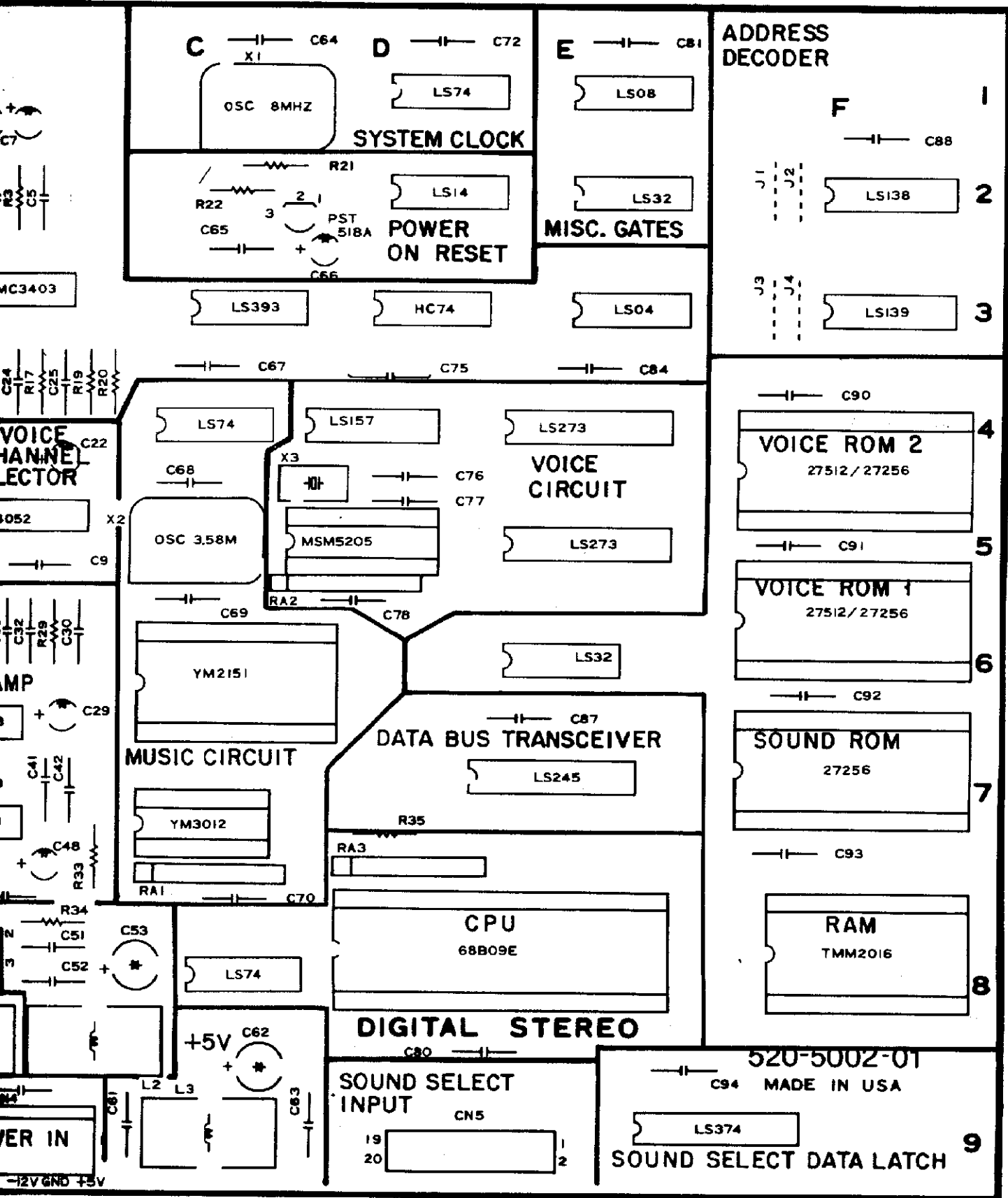
G

H









C — C64 — X1 — OSC 8MHZ

D — C72 — LS74

SYSTEM CLOCK

R21 — R22 — C65 — C66 — PST 518A

LS14

POWER ON RESET

E — C81 — LS08

LS32

MISC. GATES

LS393 — HC74 — LS04

ADDRESS DECODER

F — C88 — LS138

LS139

VOICE CHANNEL SELECTOR

LS74

LS74 — LS157 — LS273

OSC 3.58M — X3 — MSM5205

VOICE CIRCUIT

LS273

C90 — VOICE ROM 2 — 27512 / 27256

C91 — VOICE ROM 1 — 27512 / 27256

MUSIC CIRCUIT

YM2151 — YM3012

LS32

DATA BUS TRANSCEIVER

LS245

C92 — SOUND ROM — 27256

RA1 — CPU 68B09E

DIGITAL STEREO

C93 — RAM — TMM2016

POWER IN — -12V GND +5V

LS74

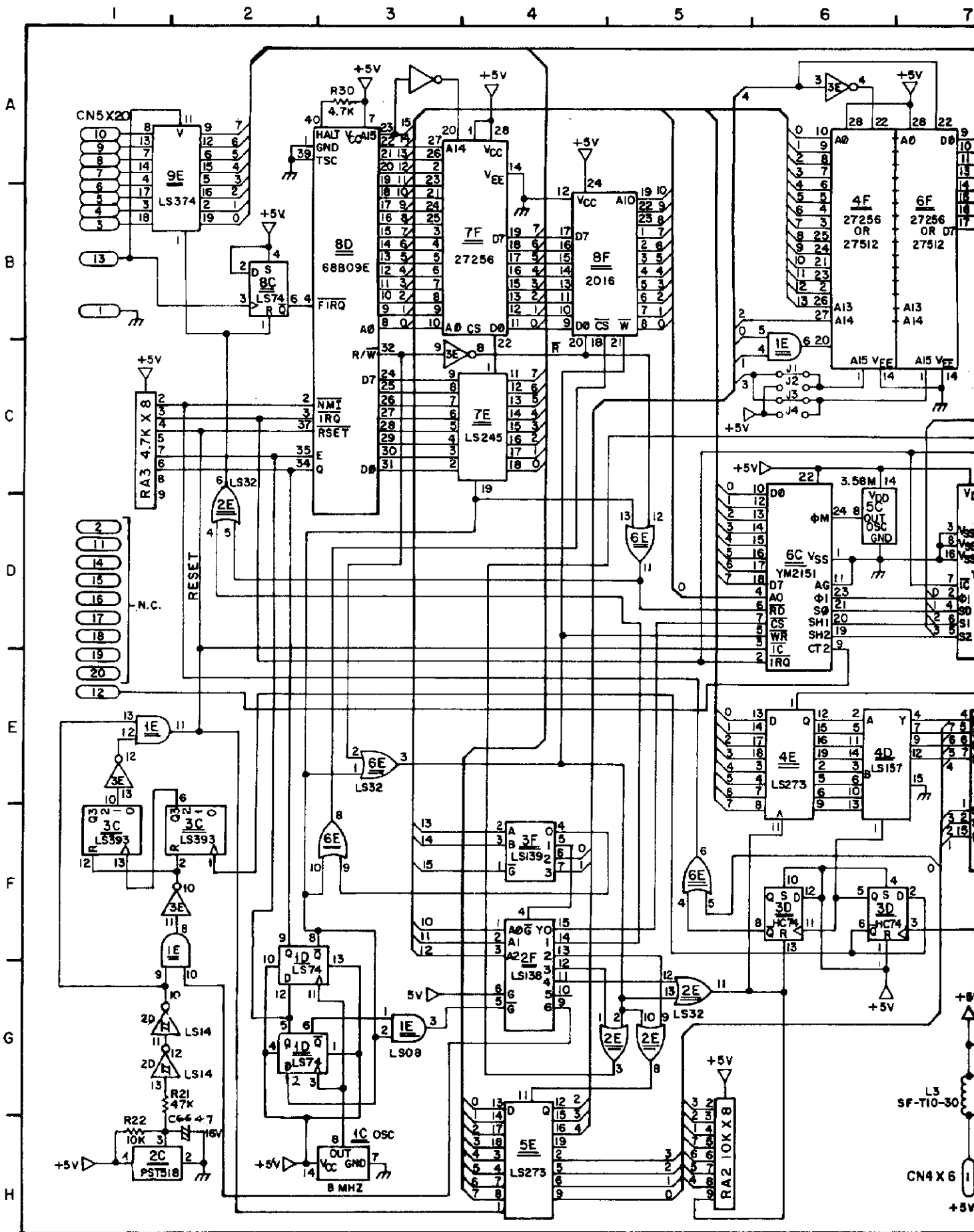
+5V — C62

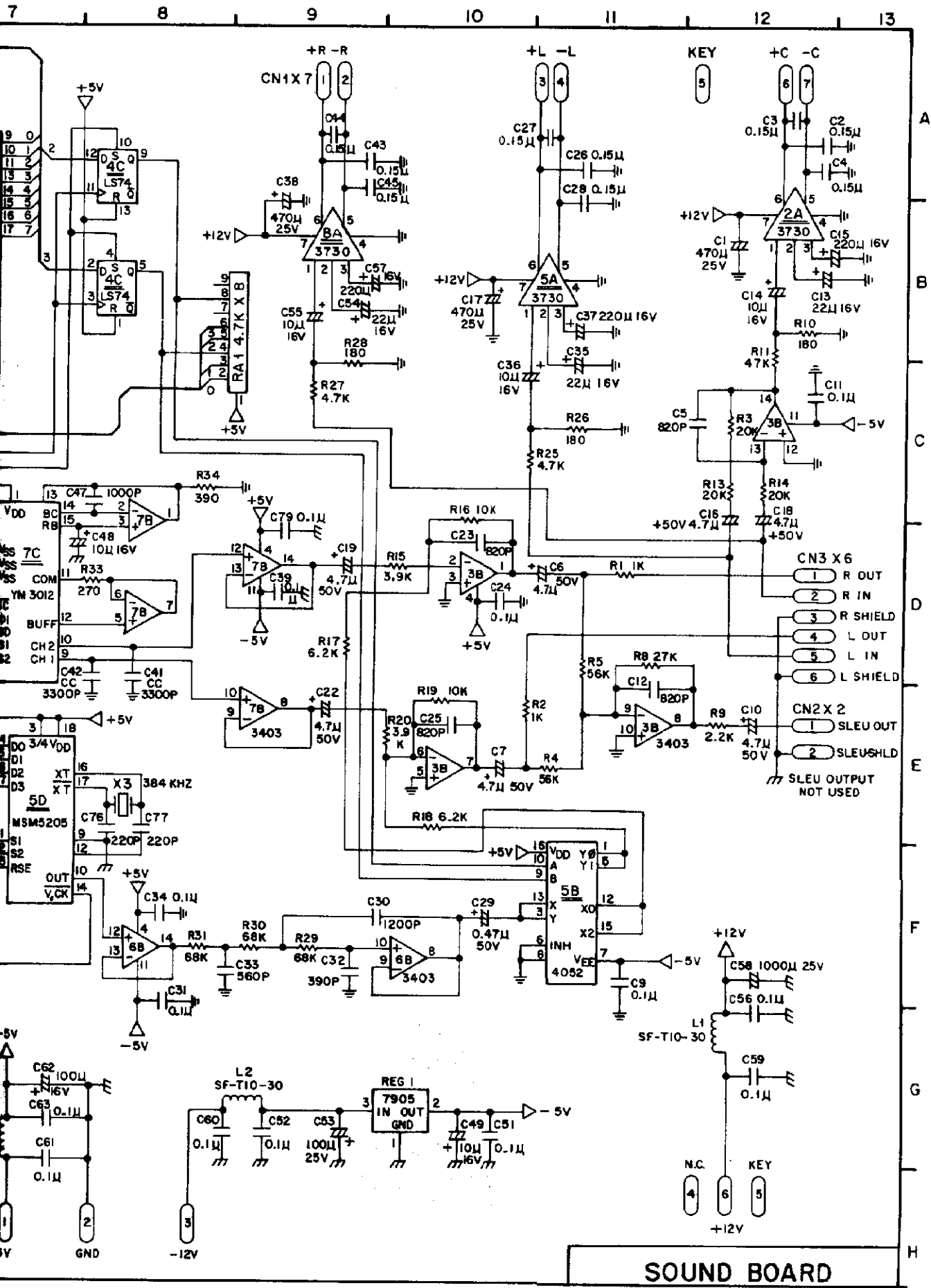
SOUND SELECT INPUT — CN5

520-5002-01 — C94 — MADE IN USA

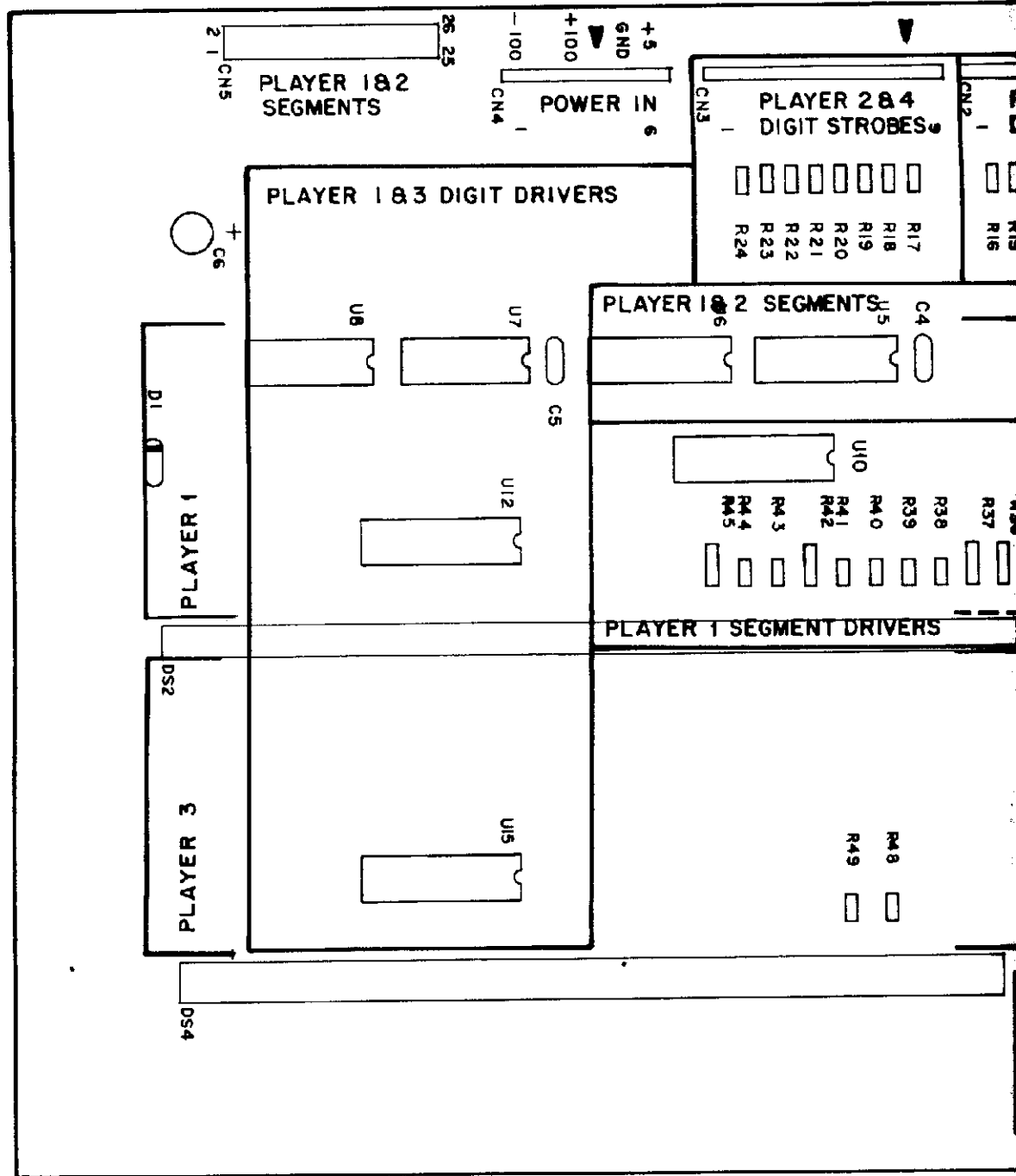
LS374

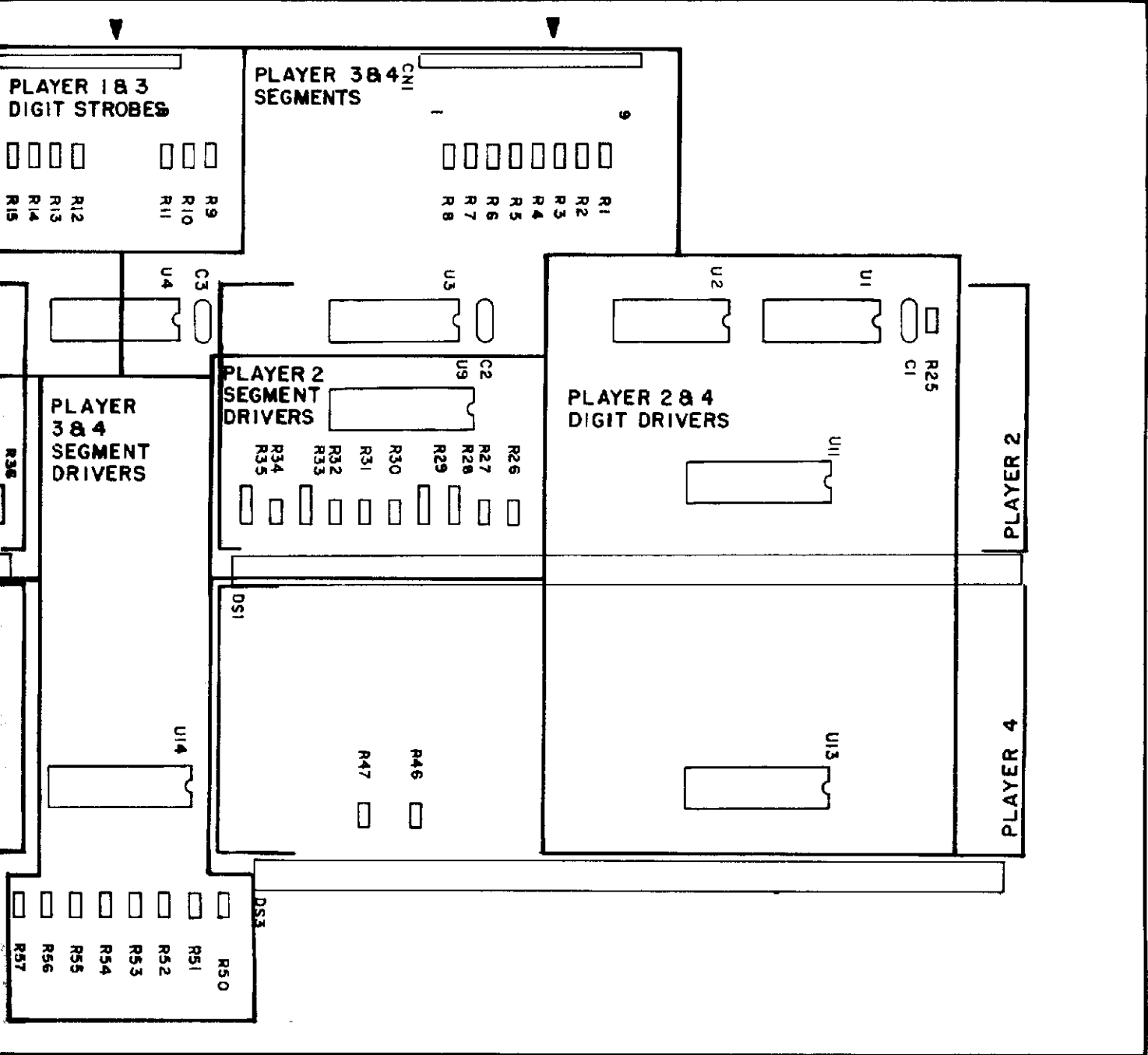
SOUND SELECT DATA LATCH

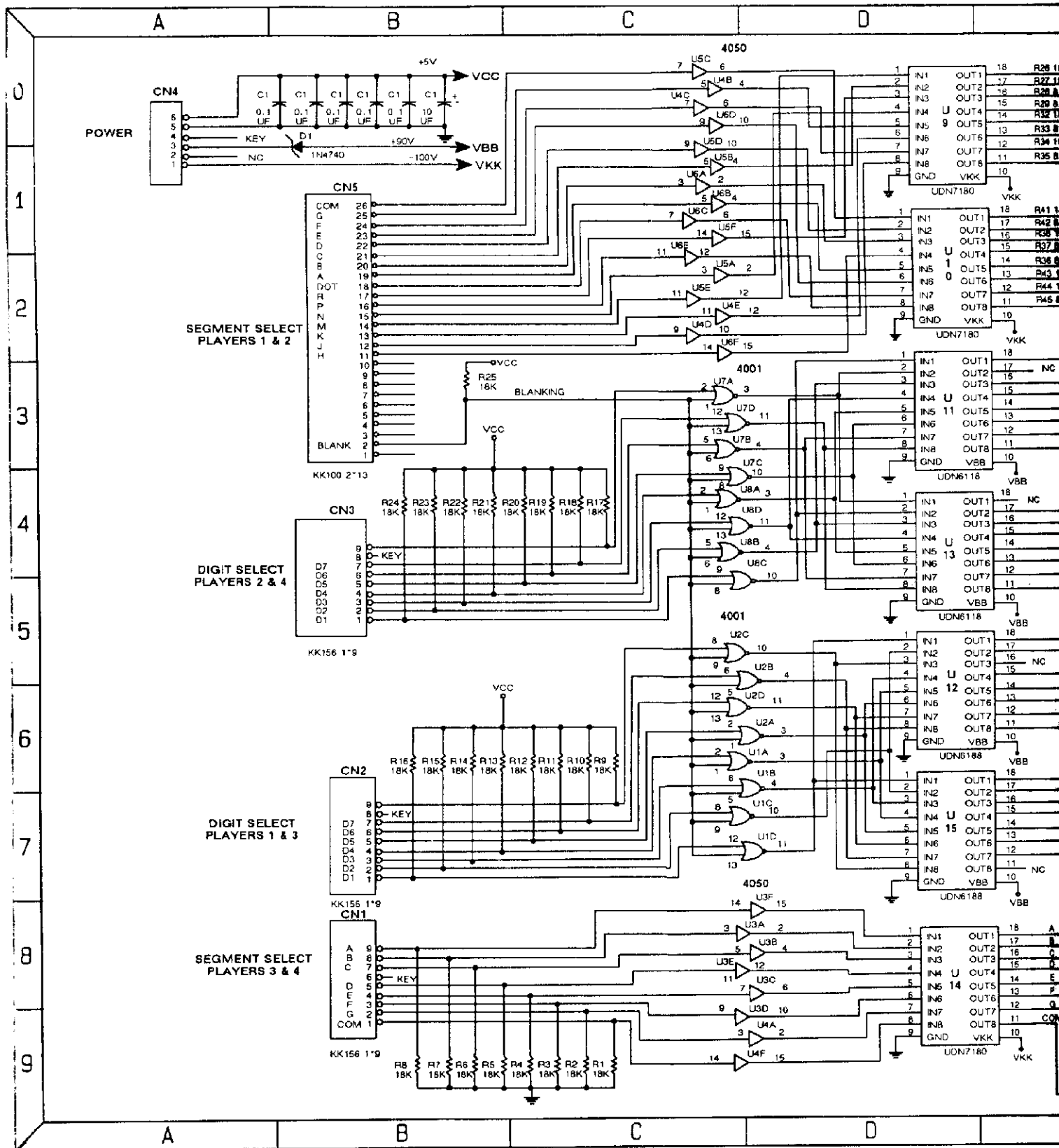


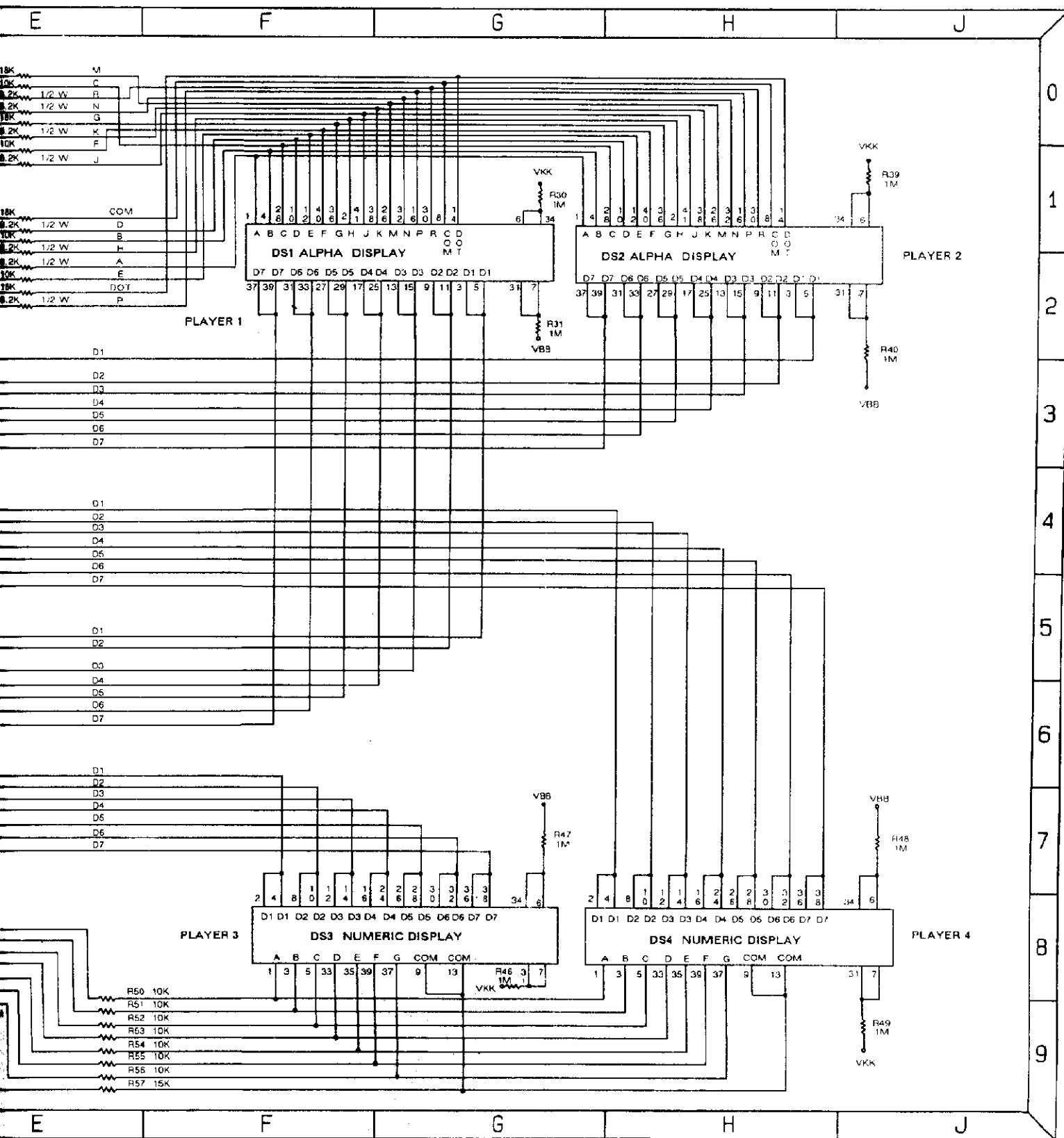


Sound Board Logic Diagram

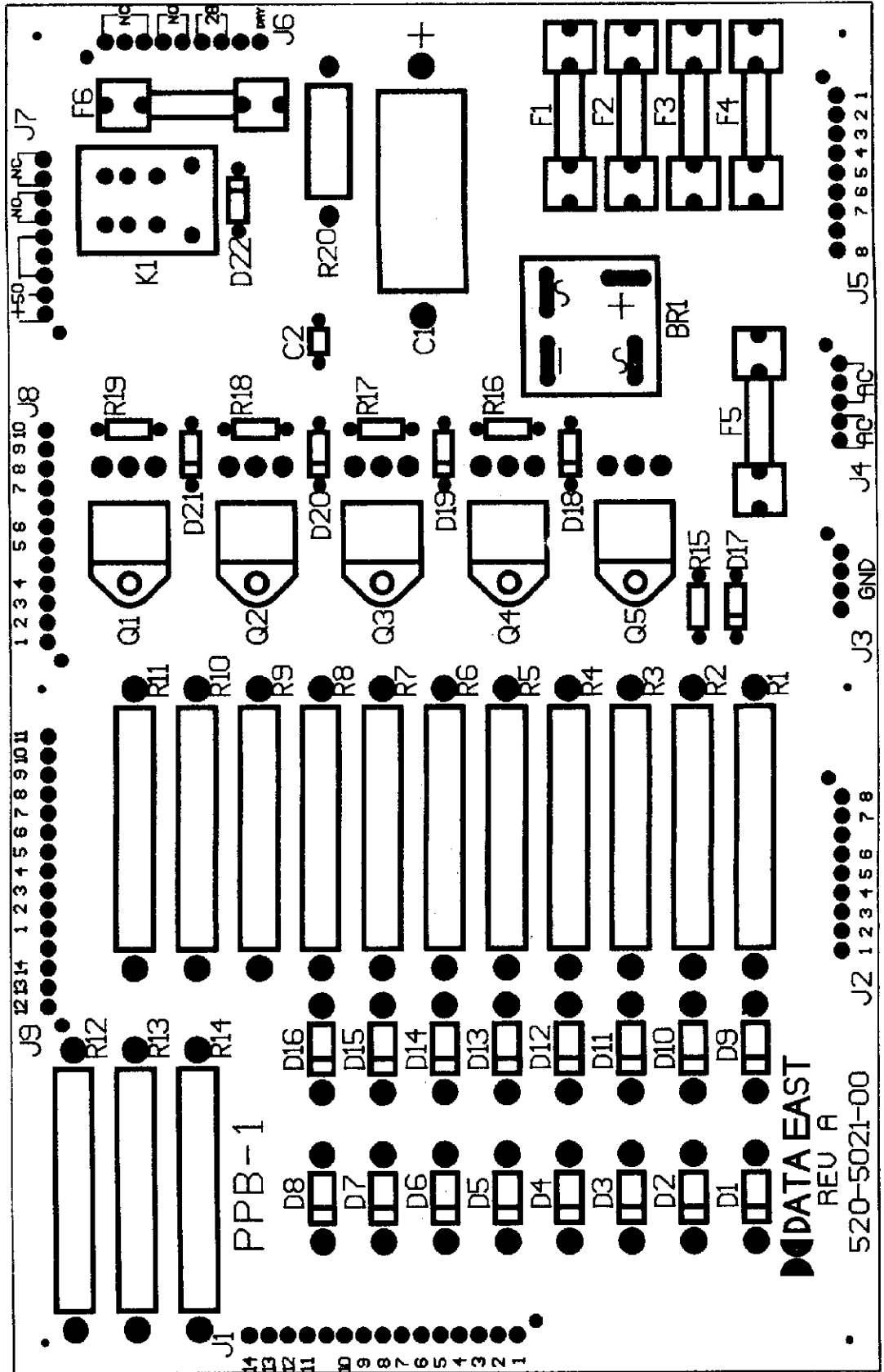


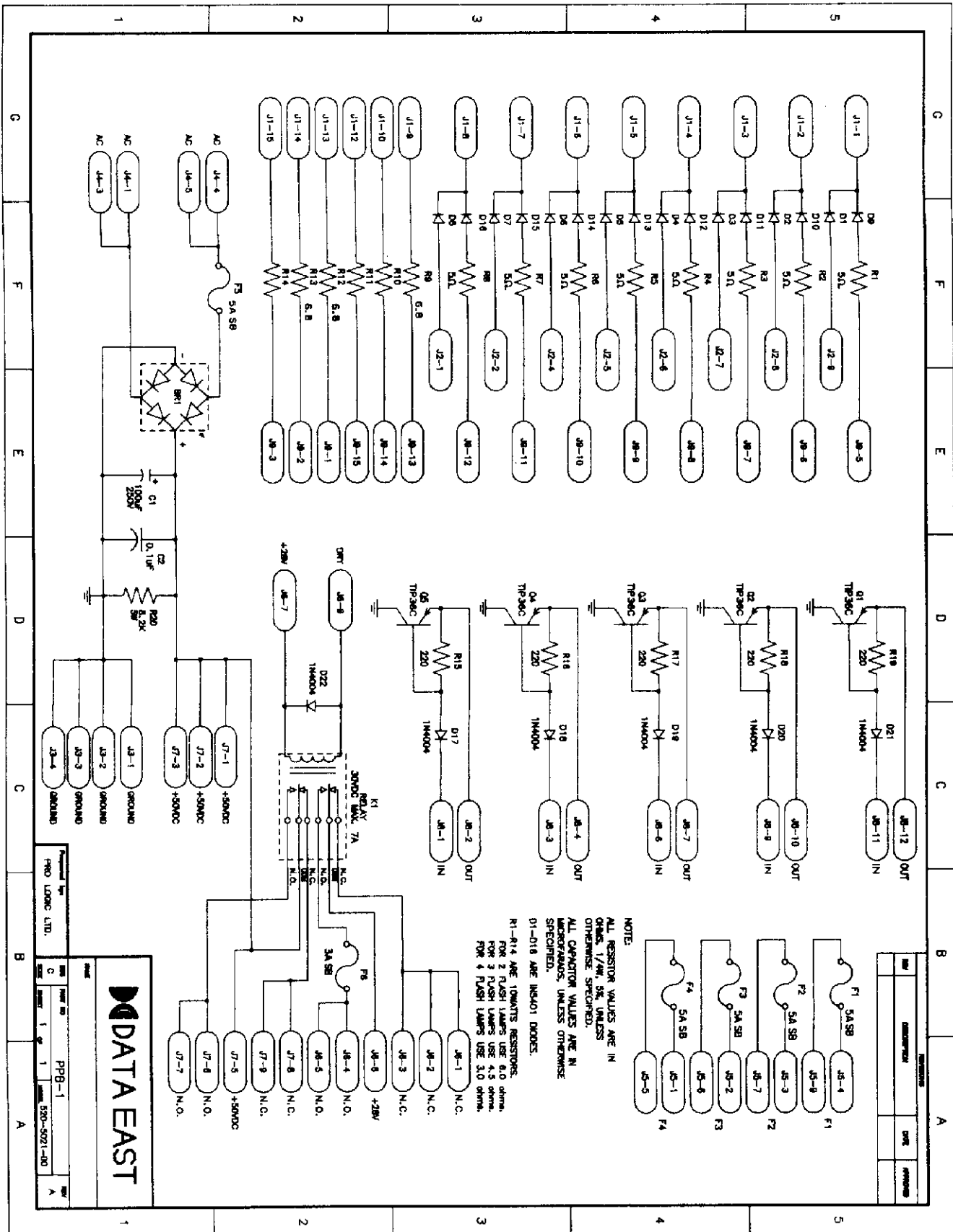




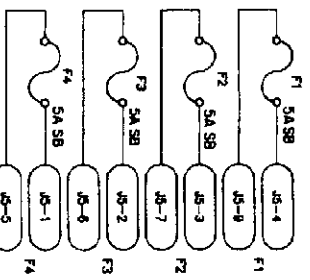


Combined Display Logic Diagram





REV	DESCRIPTION	DATE	APPROVED



NOTE:
 ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 01-018 ARE IN4001 DIODES.
 R1-R14 ARE 10WATTS RESISTORS.
 FOR 2 FLASH LAMPS USE 6.0 ohms.
 FOR 3 FLASH LAMPS USE 4.5 ohms.
 FOR 4 FLASH LAMPS USE 3.0 ohms.

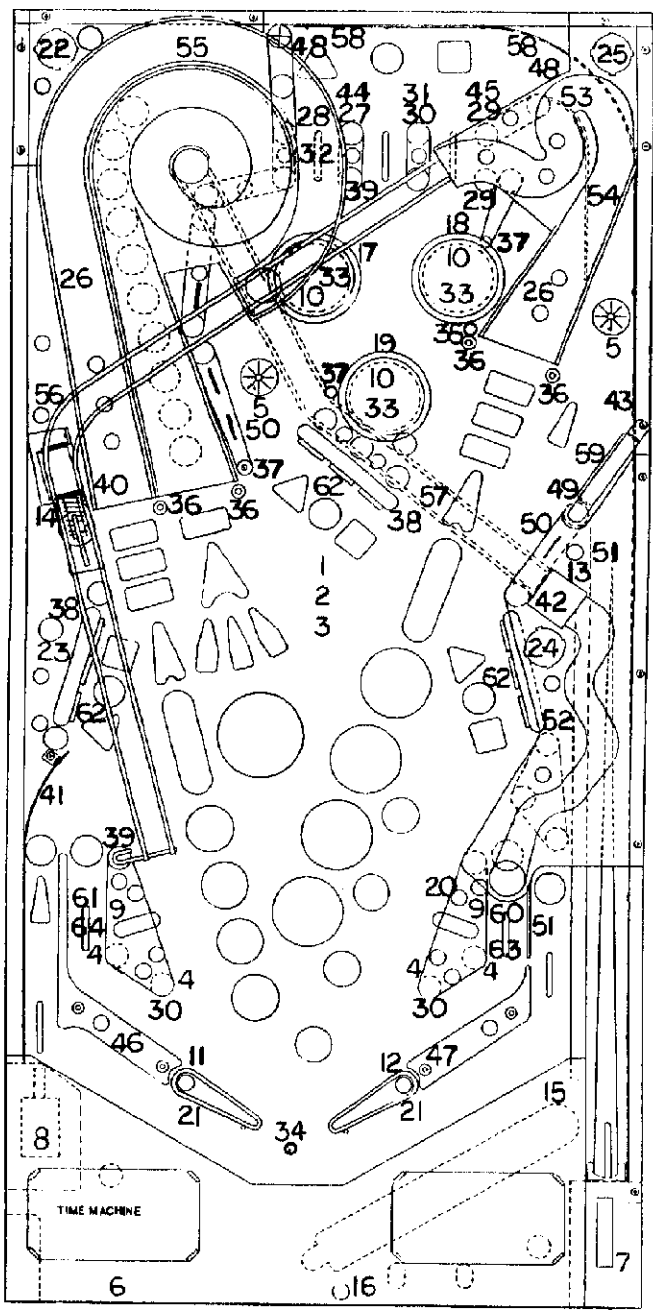
DATA EAST

Part No. **PP8-1**
 Rev. **C**
 Date **1 1 55**
 P.O. Box **550-591-480**

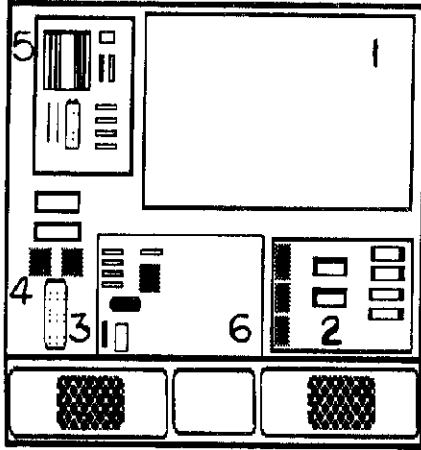
PHO. LOGIC LTD.

Item	Description	Part Number
1.	Completely Assmbl'd Plyfld.	500-5127-00
2.	Screened Playfield	830-5104-00
3.	Playfid Glass (Tempered)	660-5001-00
4.	Acorn Nuts (16)	240-5000-00
5.	Star Rollover (2)	545-5015-00
6.	Bottom Arch	515-5150-00
7.	Shooter Guage	830-5504-02
8.	Laser Kick Assembly	500-5080-00
9.	Slingshot Assembly (2)	500-5029-01

10.	Pop Bumper Assembly (3)	500-5034-07
11.	Left Flipper	500-5031-12
12.	Right Flipper	500-5031-11
13.	Super Vertical Up Kicker	500-5116-00
14.	Ball Lock Assembly	500-5104-00
15.	Ball Trough Eject Assembly	500-5012-00
16.	Outhole Assembly	500-5082-00
17.	Pop Bumper Cap (Red)	545-5035-22
18.	Pop Bumper Cap (Blue)	545-5035-25
19.	Pop Bumper Cap (Yellow)	545-5035-26
20.	Screened Plastic Set	830-5404-26
21.	Flipper Bat and Shaft Assy	515-5133-01
22.	Mini Mars (Red)	545-5059-02
23.	Mini Mars (Green)	545-5059-04
24.	Mini Mars (Blue)	545-5059-05
25.	Mini Mars (Yellow)	545-5059-06
26.	Decal Sheet	820-5017-xx
27.	Jewel Post 1 1/32" (Red) (2)	545-5013-02
28.	Jewel Post 1 1/32" (Grn) (2)	545-5013-04
29.	Jewel Post 1 1/32" (Blu) (2)	545-5013-05
30.	Jewel Post 1 1/32" (Yel) (2)	545-5013-26
31.	Light Hood (Yellow)	545-5011-06
32.	Light Hood (Green)	545-5012-04
33.	Pop Bumper Decal (3)	820-5304-00
34.	Machine Mini Post	530-5071-00
35.	Mini Post	530-5004-00
36.	Bumper Post (4)	530-5057-00
37.	Metal Stand-off (3)	530-5035-01
38.	Machine Bumper Post (2)	530-5007-00
39.	Machine Post (2)	530-5008-00
40.	Left Ramp Ball Guide	500-5107-00
41.	Laser Kick Ball Guide	500-5111-00
42.	Super VUK Ball Deflector	500-5106-00
43.	Shooter Lane Ball Guide	500-5112-00
44.	Light Hood (Red)	545-5011-02
45.	Light Hood (Blue)	545-5012-05
46.	Ball Guide	515-5074-01
47.	Ball Guide	515-5075-01
48.	Wire Gate (2)	535-5307-01
49.	Shooter Ln Gate Mtng Brkt	535-5369-01
50.	Wire Ball Guide 1" (4)	535-5300-05
51.	Wire Ball Guide 2 1/2" (2)	535-5300-01
52.	Right Ball Run	545-5107-00
53.	Wire Ball Guide	535-5346-00
54.	Right Ramp	515-5142-00
55.	Left Ramp	515-5143-00
56.	Top Playfield Wire Ramp	535-5336-00
57.	Under Playfield Wire Ramp	515-5137-00
58.	Wire Gate Mtng Brkt. (2)	535-5269-04
59.	Wire Gate Mounting Brkt.	535-5307-04
60.	Rollover Mounting (Right)	535-5238-01
61.	Rollover Mounting (Left)	535-5238-02
62.	Stand Up Target Assy (3)	515-5144-00
63.	Rollover Wireform (Right)	535-5315-01
64.	Rollover Wireform (Left)	535-5315-02



BACKBOX PARTS ILLUSTRATION

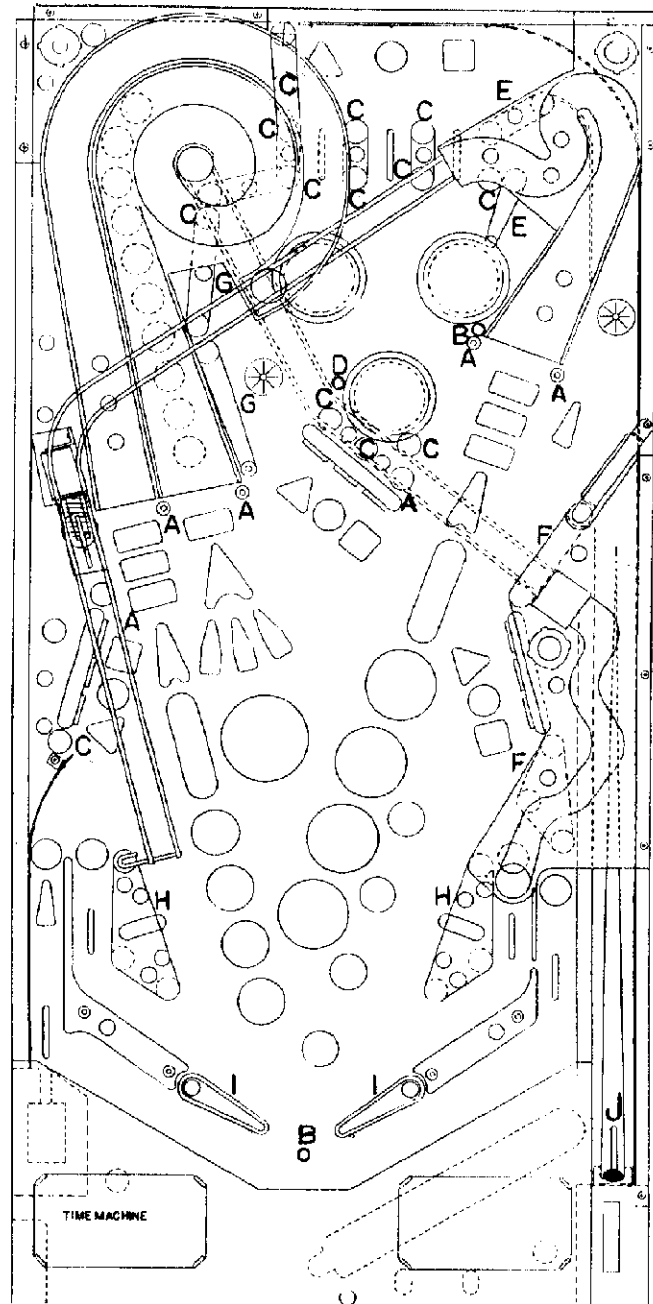


Item	Description	Part No.
1	CPU Board Assy.	520-5003-02
2	Sound Board Assy	520-5002-01
3	Capacitor 2C1	125-5000-00
4	Bridge Rectifiers	112-5000-00
5	Power Supply Bd. Assy	520-5000-00
6	PPB Board	520-5021-02
7	Combined Display Bd Assy*	520-5014-00
8	Complete Backglass*	830-5204-00

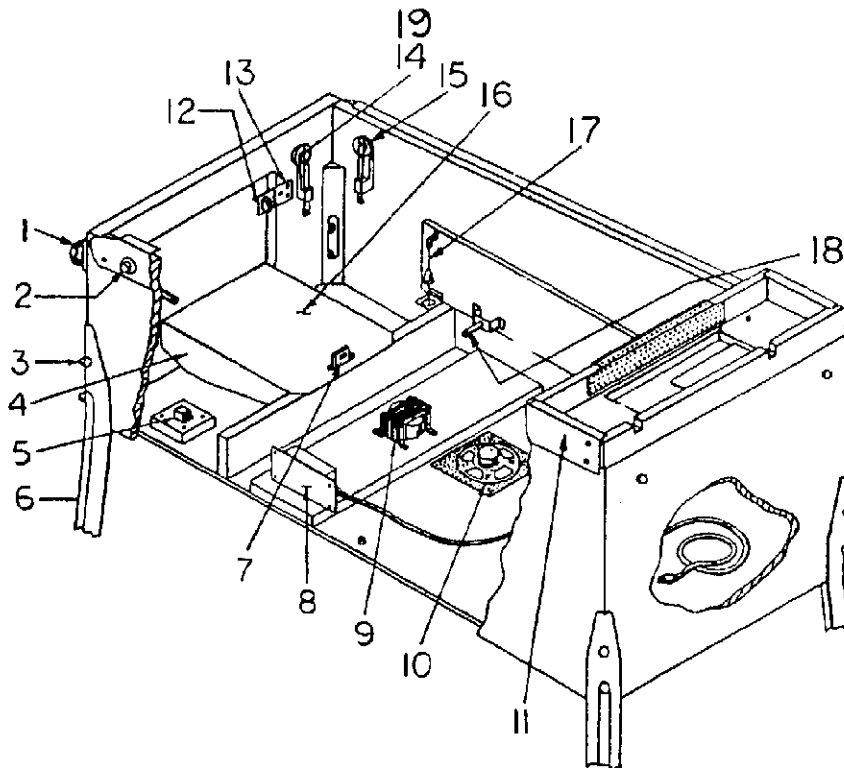
* Not Shown

RUBBER PARTS ILLUSTRATION

Item	Description	Part #
A.	Rubber Post (6)	545-5009-00
B.	3/16" (2)	545-5025-01
C.	5/16" (13)	545-5025-02
D.	7/16"	545-5025-17
E.	1 1/2" (2)	545-5025-07
F.	2" (2)	545-5025-08
G.	2 1/2" (2)	545-5025-09
H.	2 3/4" (2)	545-5034-00
I.	Flipper (2)	545-5024-02
J.	Plunger Tip	545-5027-00



CABINET PARTS ILLUSTRATION



Item	Description	Part No.
1	Ball-shooter Assy	500-5019-03
2	Flipper Button	500-5026-12
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	180-5048-00
16	Cash Box Top	535-5013-00
17	Plumb Bob Tilt Mech. Assy	500-5023-00
18	Volume Control	123-5000-00
19	Start Button	500-5097-00
20	Side Armor -Left	535-5010-02

A VIEW REVERSED 11/18/88

DATA EAST PINBALL, INC.

SCALE FULL DATE: 8-19-88 APPROVED BY: B BALASKO DRAWN BY: B BALASKO

Item	Part No.	Description	Qty
1	180-5032-00	MICRO SWITCH-ROLLOVER	1
2	545-5121-00	RETAINING SPRING WASHER	2
3	545-5121-00	MICRO SWITCH BRACKET	1

Scrapped on Time Machine

MICRO SW. ASSY. - ROLLOVER LEFT DRAWING NUMBER: 500-5142

DATE: 8-19-88

DATA EAST PINBALL, INC.

SCALE FULL DATE: 8-19-88 APPROVED BY: B BALASKO DRAWN BY: B BALASKO

Item	Part No.	Description	Qty
1	180-5033-00	MICRO SWITCH-BALL SHOOTER	1
2	545-5121-00	RETAINING SPRING WASHER	2
3	545-5121-00	MICRO SWITCH BRACKET	1

Time Machine + Inside Alley

MICRO SW. ASSY. - BALL SHOOTER LEFT DRAWING NUMBER: 500-5143

DATE: 8-19-88

DATA EAST PINBALL, INC.

SCALE FULL DATE: 11-17-88 APPROVED BY: [Signature] DRAWN BY: Nick Wade

Item	Part No.	Description	Qty
1	180-5047-00	MICRO SWITCH-ROLLOVER	1
2	545-5121-00	RETAINING SPRING WASHER	2
3	545-5121-00	MICRO SWITCH BRACKET	1

Time Machine

MICRO SW. ASSY. - LASER KICK LEFT DRAWING NUMBER: 500-5144-00

DATE: 11-17-88

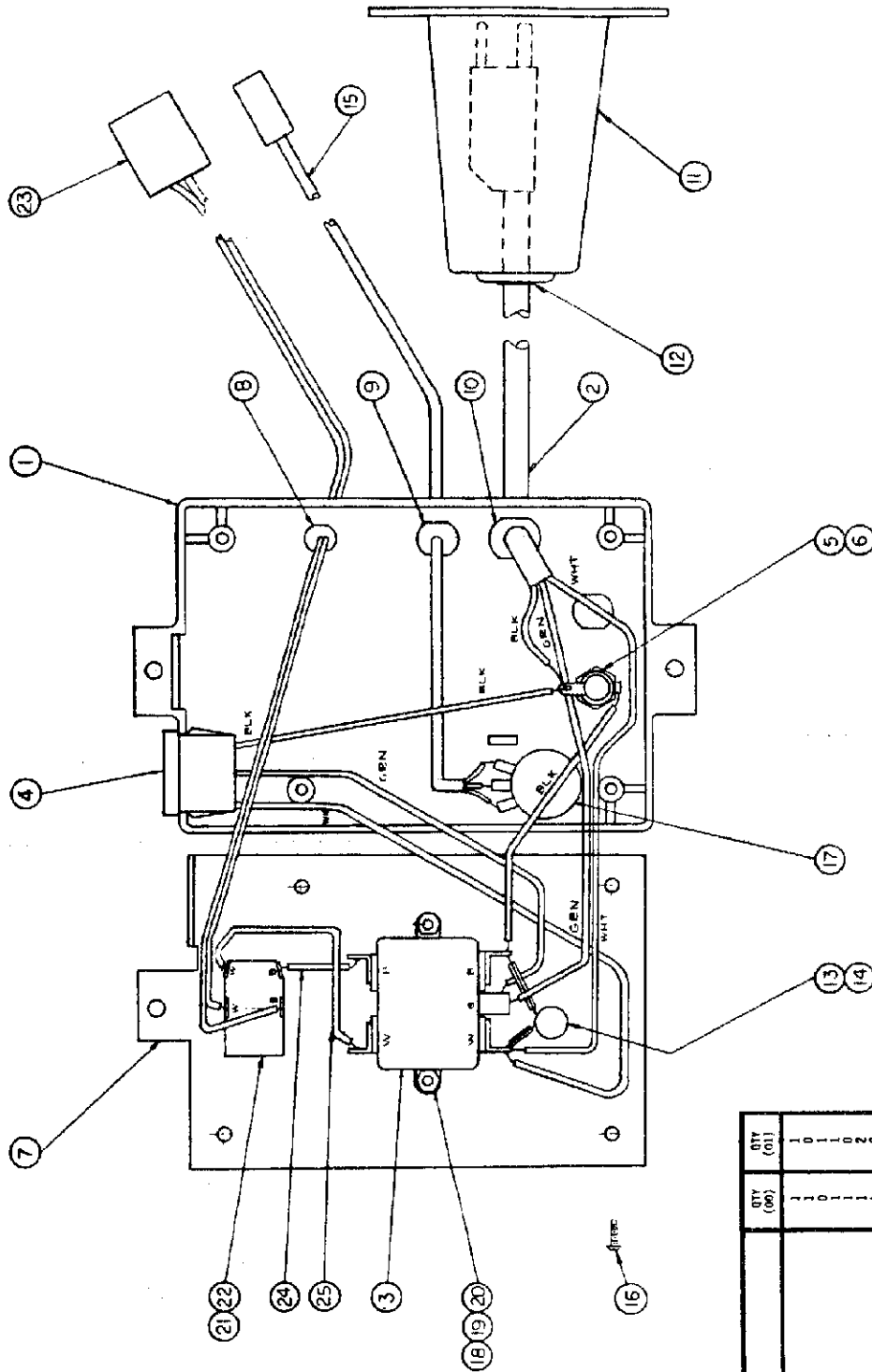
DATA EAST PINBALL, INC.

SCALE FULL DATE: [Blank] APPROVED BY: [Blank] DRAWN BY: [Blank]

Item	Part No.	Description	Qty
1	180-5002-00	MICRO SWITCH 2 LUG-RAMP	1
2	180-5002-01	MICRO SWITCH 3 LUG-RAMP	1

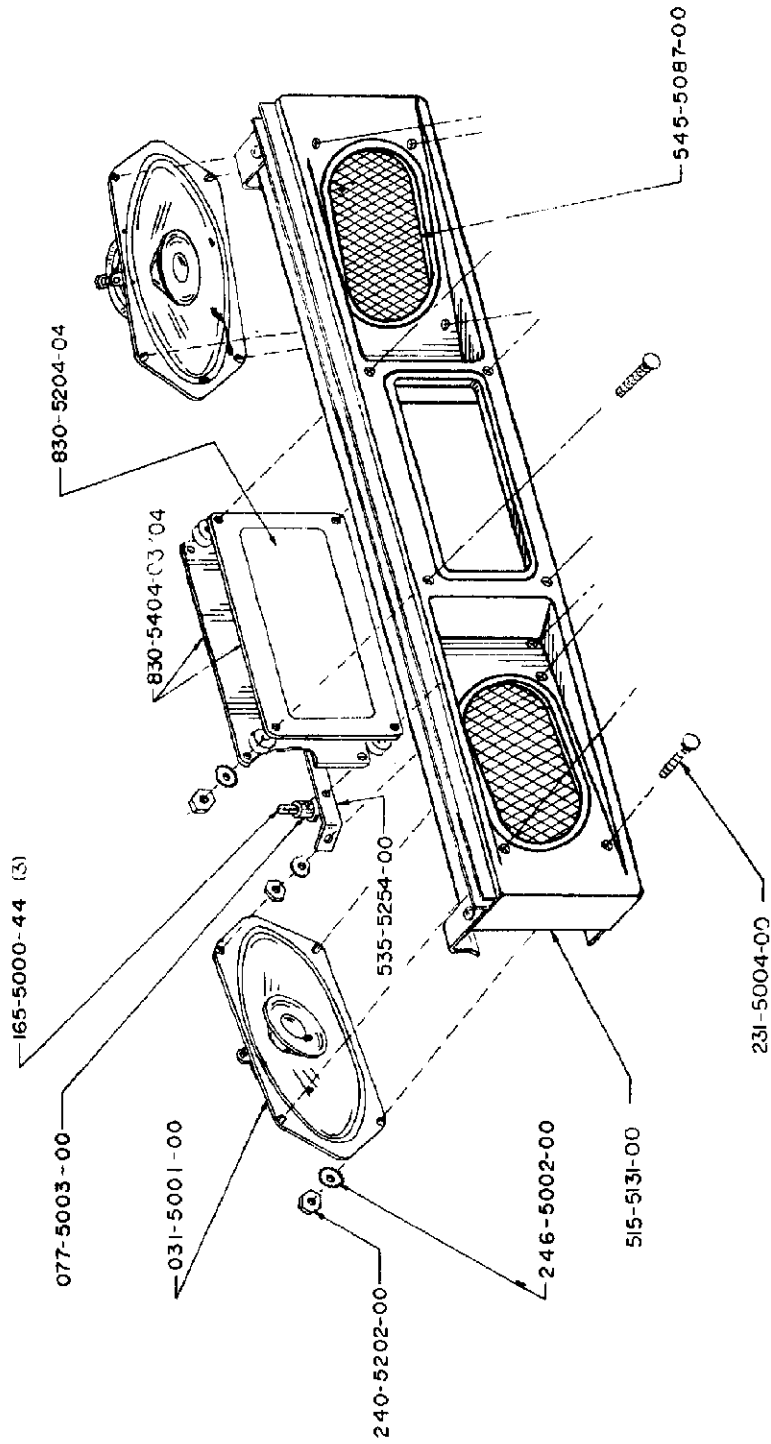
MICRO SW. ASSY. - LASER KICK LEFT DRAWING NUMBER: 500-5144-00

DATE: [Blank]



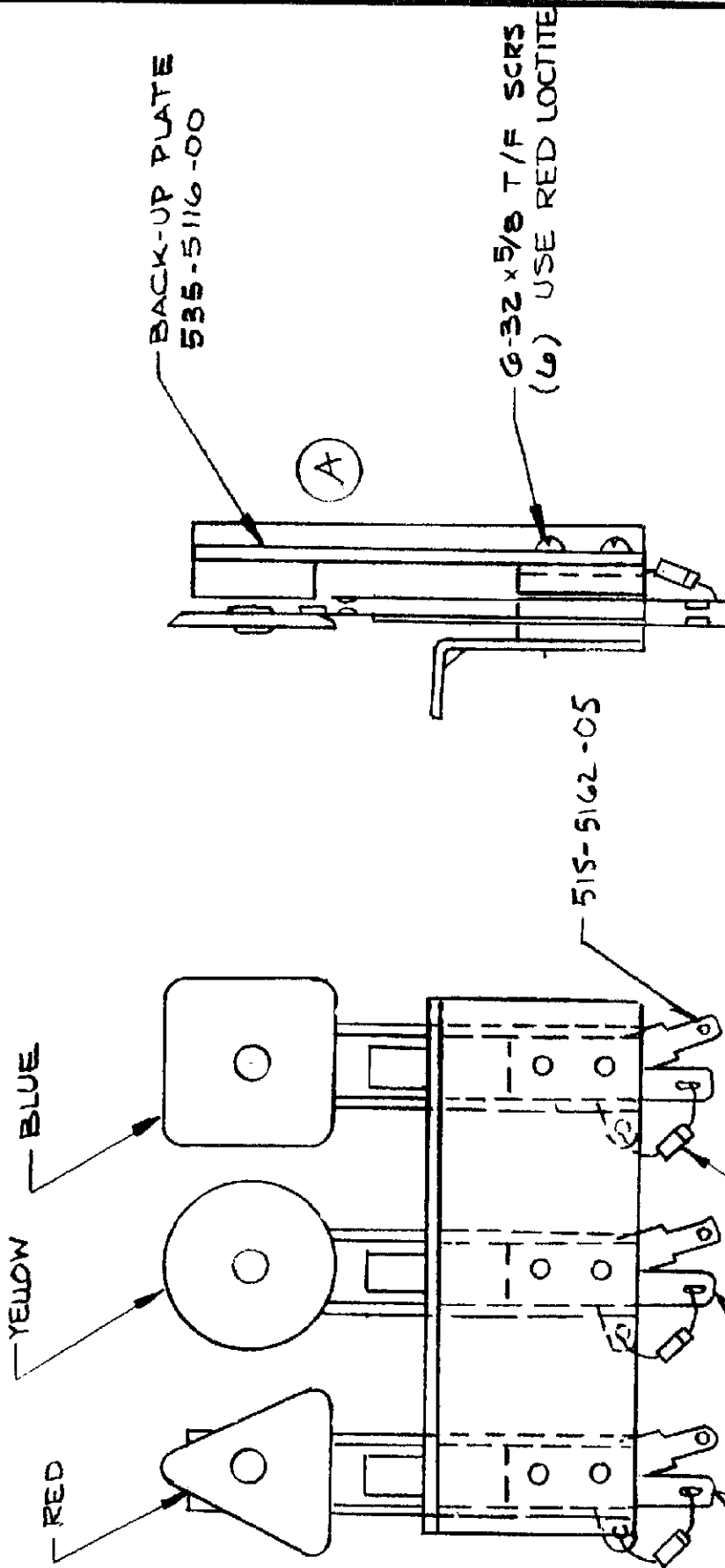
DATA EAST PINEBALL, INC.
 SCALE: NONE
 DATE: 9-6-68
 DRAWN BY: B.F. ALLEN
 PART NO.: 15-5153-XX

ITEM	PART NO.	DESCRIPTION	QTY (00)	QTY (01)
1	545-5125-00	POWER BOX	1	1
2	034-5000-10	POWER CORD 10 FT.	1	1
3	034-5000-12	POWER CORD 12 FT.	1	1
4	156-5000-00	LINE FILTER	1	1
5	106-5008-01	PLATE MOUNT	1	1
6	200-5004-06	2 AMP FUSE	2	2
7	535-5704-00	COVER PLATE	1	1
8	280-5005-01	STRAIN RELIEF BUSHING	1	1
9	280-5005-02	STRAIN RELIEF BUSHING	1	1
10	280-5005-03	STRAIN RELIEF BUSHING	1	1
11	545-5122-00	WIRE BUSHING (LINE CORD)	1	1
12	156-5004-06	2 AMP FUSE	1	1
13	156-5004-06	2 AMP FUSE	1	1
14	604-9001-00	INSULATING TAPPING NYC 18 GAUGE	1	1
15	014-5015-00	VOLUME CONTROL CABLE	1	1
16	237-5000-00	1/8" X 3/8" LG. SELF TAPPING AS SCREW	1	1
17	123-5000-00	VOLUME CONTROL	1	1
18	237-5301-00	1/8" X 3/8" LG. PH. PAN HD. N.S.	1	1
19	246-5000-00	1/8" NUT WASHER	1	1
20	246-5000-00	1/8" NUT WASHER	1	1
21	246-5000-00	1/8" NUT WASHER	1	1
22	246-5000-00	1/8" NUT WASHER	1	1
23	018-5034-00	EXTERNAL TOOTH LOCK WASHER	1	1
24	801-5000-00	ON - OFF CABLE	1	1
25	801-5000-00	14 AWG - WHITE	1	1



500-5124-00 SPEAKER HOUSING ASSEMBLY

SCALE	APPROVED BY	DATE	FIGURE NUMBER
			7



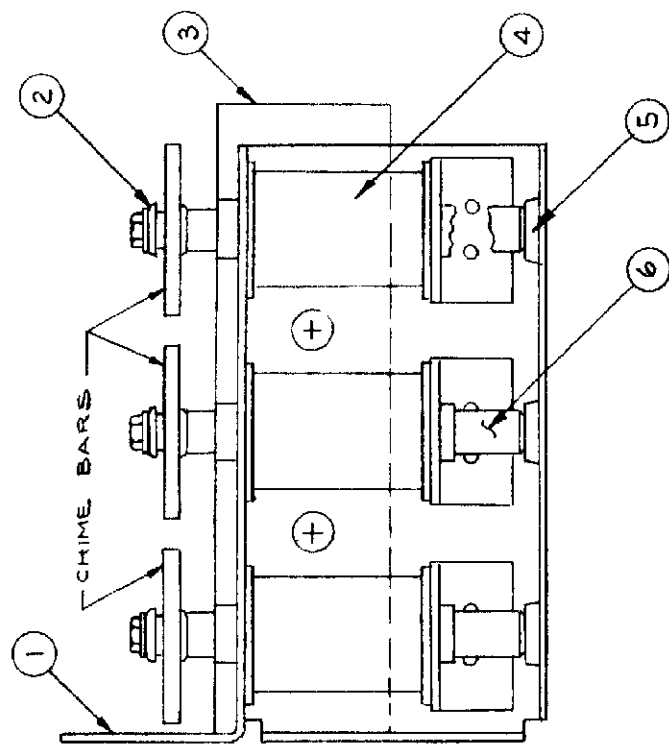
DATA EAST PINBALL INC.

SCALE: 1:1 APPROVED BY: _____ DRAWN BY: ILL
 DATE: 8-4-88

REV	DESCRIPTION
4	DELETED GUSSET FROM BACK PLATE, ADD 9/16

3 BNK STANDUP, TGT-T/M DRAWING NUMBER 515-5144-00

REV	DESCRIPTION	BY	DATE	APP
-----	-------------	----	------	-----

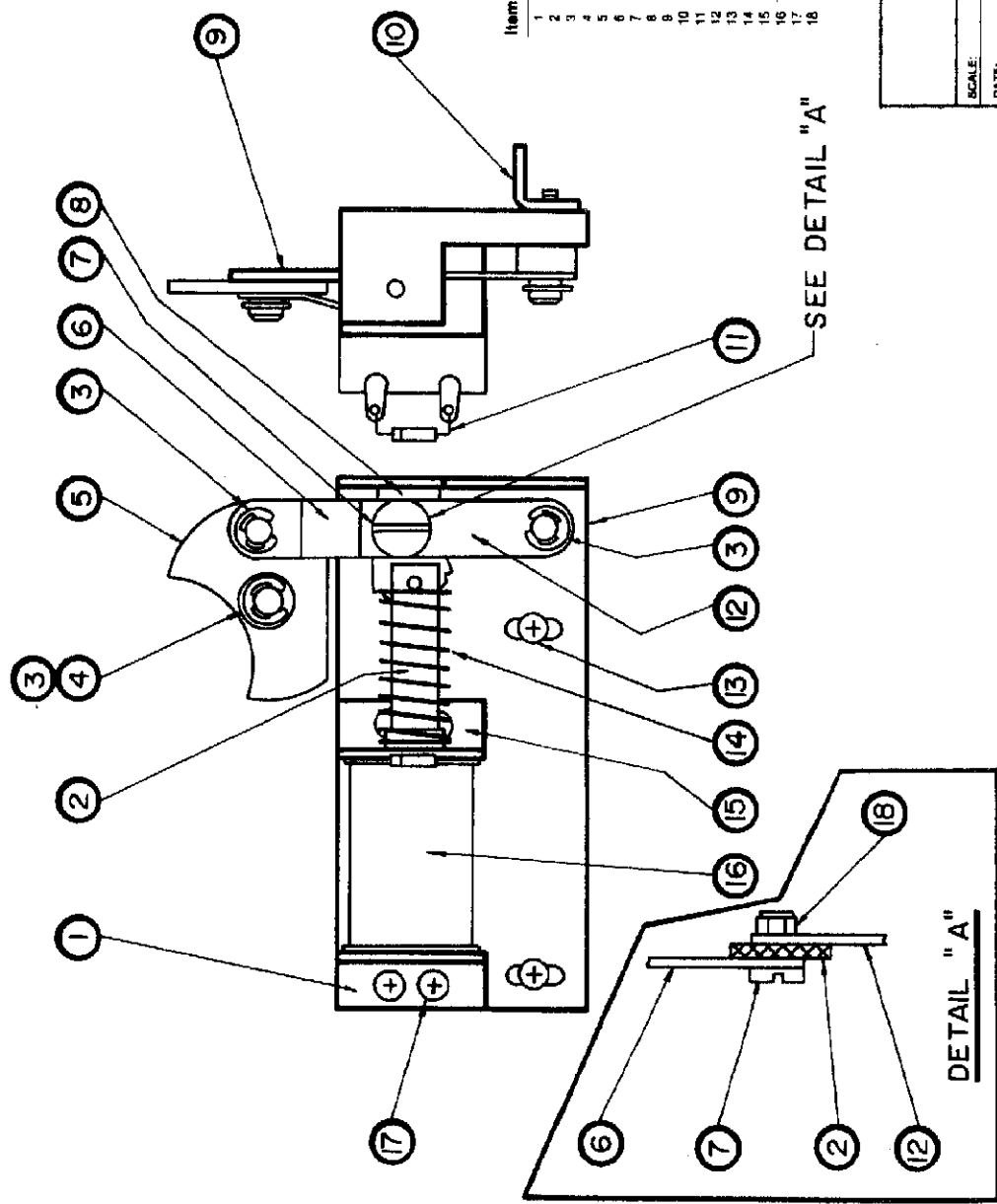


6	515-5188-00	PLGR TIP ASSY	3
5	250-5004-00	BUMPER	3
4	090-5015-00	SOLENOID 29-2000	3
3	515-5189-00	C. BOX & COVER	1
2	280-5006-00	GROMMET	3
1	535-5710-00	COIL BRKT	1
	ITEM	PART No	DESCRIPTION QTY

TOLERANCE UNLESS OTHERWISE SPECIFIED
 DIM. X.X ± .05 X.XXX ± .005
 X.XX ± .015 X.XXXX ±
 ANGULAR FRACTIONAL ± .04
 XX ± .5°
 ALL ± .1°

REG. 1	PREV ASSEM.	DWN. JLL	DATE 10.10.83	TITLE CHIME ASSEMBLY
MAT.		CRFD.	SCALE	
M.T.				
FIN.				

DATA EAST PINBALL, INC. PART NO. 500-5123-00
 1980 JANICE AVE., MELROSE PARK, IL 60160



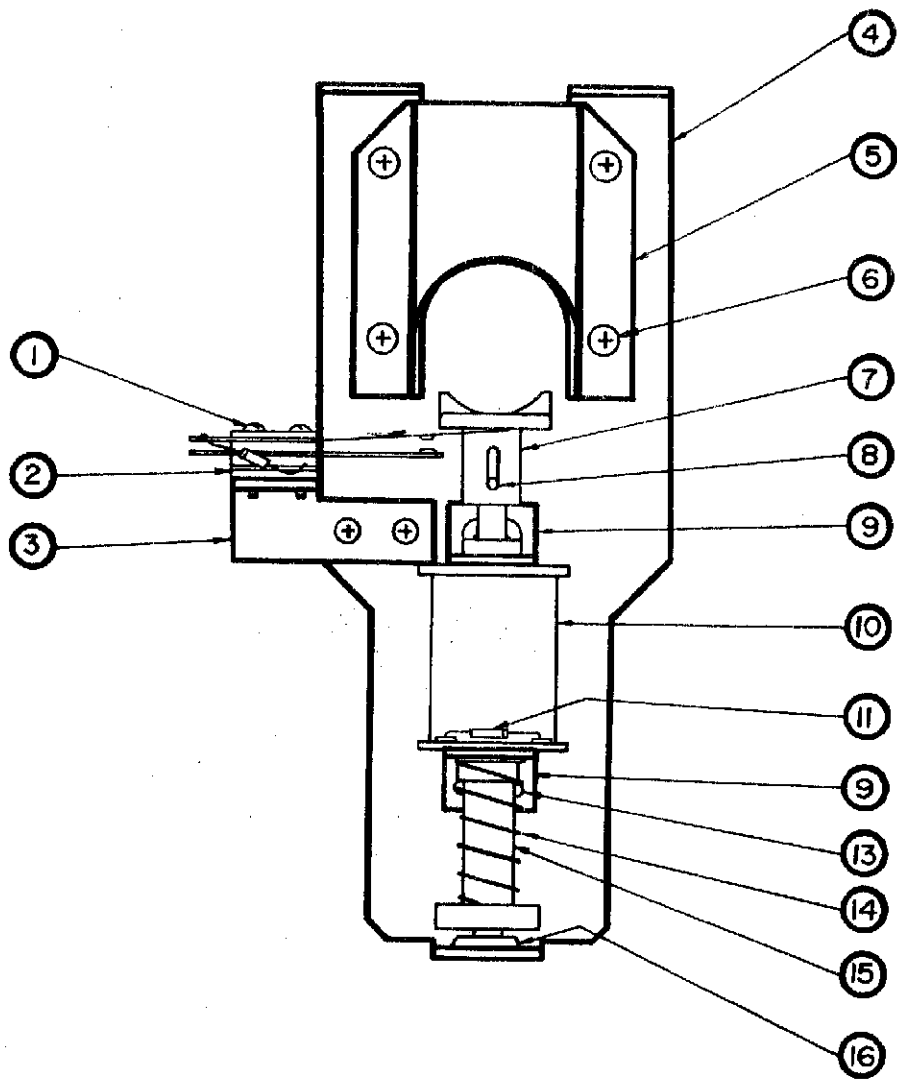
Item	Part No.	Description	Qty.
1	515-5068-00	COIL STOP & BRACKET ASSEMBLY	1
2	515-5006-00	PLUNGER ASSEMBLY	1
3		"E" RING TRUARC (513325)	3
4	242-5012-00	FLAT WASHER (1/4 I.D. x 7/16 O.D. x .132 THK.)	1
5	515-5170-00	LOCK BALL CAM ASSEMBLY	1
6	535-5085-00	OFFSET LINK	1
7	530-5084-00	SHOLDER SCREW	1
8	280-5004-00	RUBBER BUMPER	1
9	515-5192-00	LOCK BALL BRACKET SUB ASSEMBLY	1
10	535-5292-00	MOUNTING BRACKET	1
11	112-5003-00	IN4004 DIODE	1
12	535-5085-00	LINK	1
13	237-5800-00	# 832 x 1/4 LG PH. PAN M.S.	2
14	288-5011-00	PLUNGER SPRING	1
15	535-5203-02	COIL RETAINER BRACKET	1
16	090-5002-02	COIL 24-900	1
17		# 6-32 x 1/4 LG PHIL. PAN. HD. SEMS	4
18	240-5102-00	# 6-32 ELASTIC STOP NUT	1

DETAIL "A"

SEE DETAIL "A"

500-5104-00 LOCK BALL BRACKET ASSEMBLY

SCALE: _____
 DATE: _____
 APPROVED BY: _____
 DRAWN BY: _____
 DRAWING NUMBER: _____



500-5116-00 SUPER VERTICAL UP KICKER

Item	Part No.	Description	Qty.
1		# 4-40 x 9/16 LG MACH. SCREW	2
2	180-5041-00	SWITCH ASSEMBLY	1
3	535-5290-00	BALL KICKUP SWITCH BRACKET	1
4	535-5298-00	BALL KICKUP MOUNTING BRACKET	1
5	535-5427-00	BALL GUIDE	1
6		# 8-32 x 1/4 LG MACH. SCREW	4
7	545-5073-00	VERTICAL KICKER	1
8		3/32 DIA. x 1/2 LG ROLL PIN	1
9	535-5203-01	COIL RETAINER BRACKET	2
10	090-5001-01	COIL: 23-800	1
11	112-5003-00	IN4004 DIODE	1
12			
13	232-5200-00	# 6-32 x 1/4 LG PH. PAN S.M.S. W/EXT. LW	6
14	268-5009-00	SPRING	1
15	515-5096-00	PLUNGER ASSY.—VERTICAL KICKER	1
16	286-5004-00	BUMPER—AHES. BACK	1

IND. IDENTIFY

