MONTE CARLO

Gottlieb®
PINBALL

INSTRUCTION MANUAL

MONTE CARLO

(GAME #708)

(3 BALL GAME)

INSTRUCTION MANUAL

Applicable for all games.

TABLE OF CONTENTS

	PAGE(S)
I. INSTALLATION.....	1
II. INITIALIZATION.....	2
III. GAME OPERATION.....	2,3
IV. GAME PLAY AND SCORING.....	4-5
V. SOUND.....	6
VI. GAME ADJUSTMENTS.....	6,7
VII. BOOKKEEPING AND SELF TEST.....	8-12
VIII. THEORY OF OPERATION.....	13-16
IX. GENERAL INFORMATION.....	17,18
X. WIRING AND SCHEMATIC DIAGRAMS.....	19-46
XI. PARTS INFORMATION.....	47-54

MONTE CARLO

GAME PROMS:
708/PROM 1
708 PROM 2

SOUND PROMS:
708/DROM 1
708/YROM 1
708/YROM 2

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SUPPLEMENTAL ADDENDUM

ATTACHED TO AND A PART OF ALL SYSTEM 80B ALPHANUMERIC DISPLAY GAME INSTRUCTION MANUALS

DISPLAY BOARD(A4)

1. THE ALPHANUMERIC DISPLAY BOARD(A4) IN THIS GAME MAY BE DIFFERENT THAN THE ONE AS ILLUSTRATED ON PAGE(S) 34 AND 35-36.

2. THE DIFFERENT DISPLAY BOARD (A4), PART NO. MA-644F, CONTAINS DISPLAYS DS1 AND DS2, PART NOS. XO-870.

3. THE DISPLAY BOARDS AS AN ASSEMBLY ARE INTERCHANGEABLE; HOWEVER, THE DISPLAY(S) DS1 AND DS2 ARE NOT INTERCHANGEABLE FROM ONE ASSEMBLY TO ANOTHER.

4. TO QUICKLY DETERMINE WHICH DISPLAY BOARD (A4) IS USED IN THIS GAME, OBSERVE THE LOCATION OF THE VACUUM EXHAUST TIP.

FIGURE 1A. DISPLAY BOARD (A4), (MA-644), DISPLAY(S) XO-840
FIGURE 1B. DISPLAY BOARD (A4), (MA-644F), DISPLAY(S) XO-870

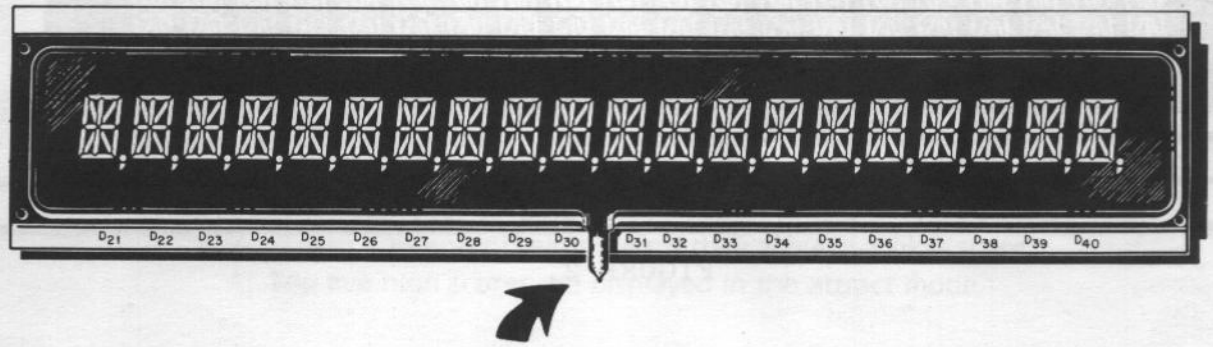


FIGURE 1A.

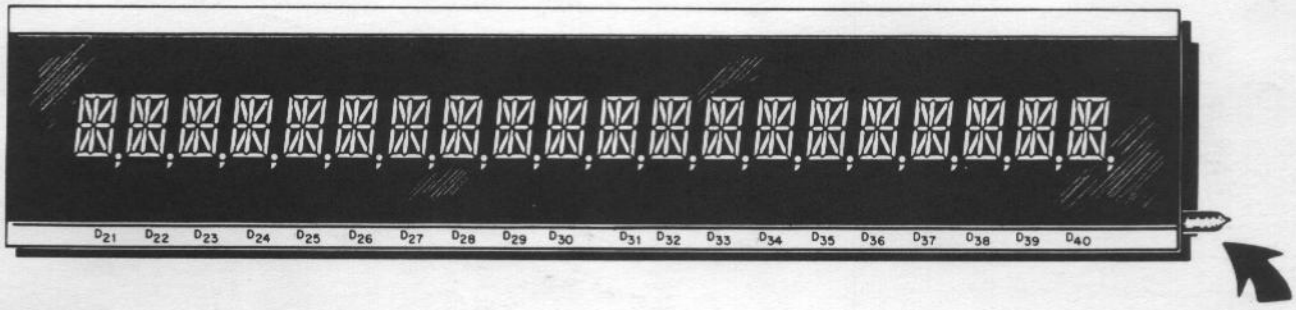


FIGURE 1B.

5. THE DIFFERENT DISPLAYS, XO-840 AND XO-870, ARE ELECTRICALLY EQUIVALENT. HOWEVER, THE PINOUT NUMBERING SEQUENCES ARE DIFFERENT. FIGURE 2 ILLUSTRATES THE SCHEMATIC PORTION OF MA-644F UTILIZING THE XO-870 DISPLAYS.

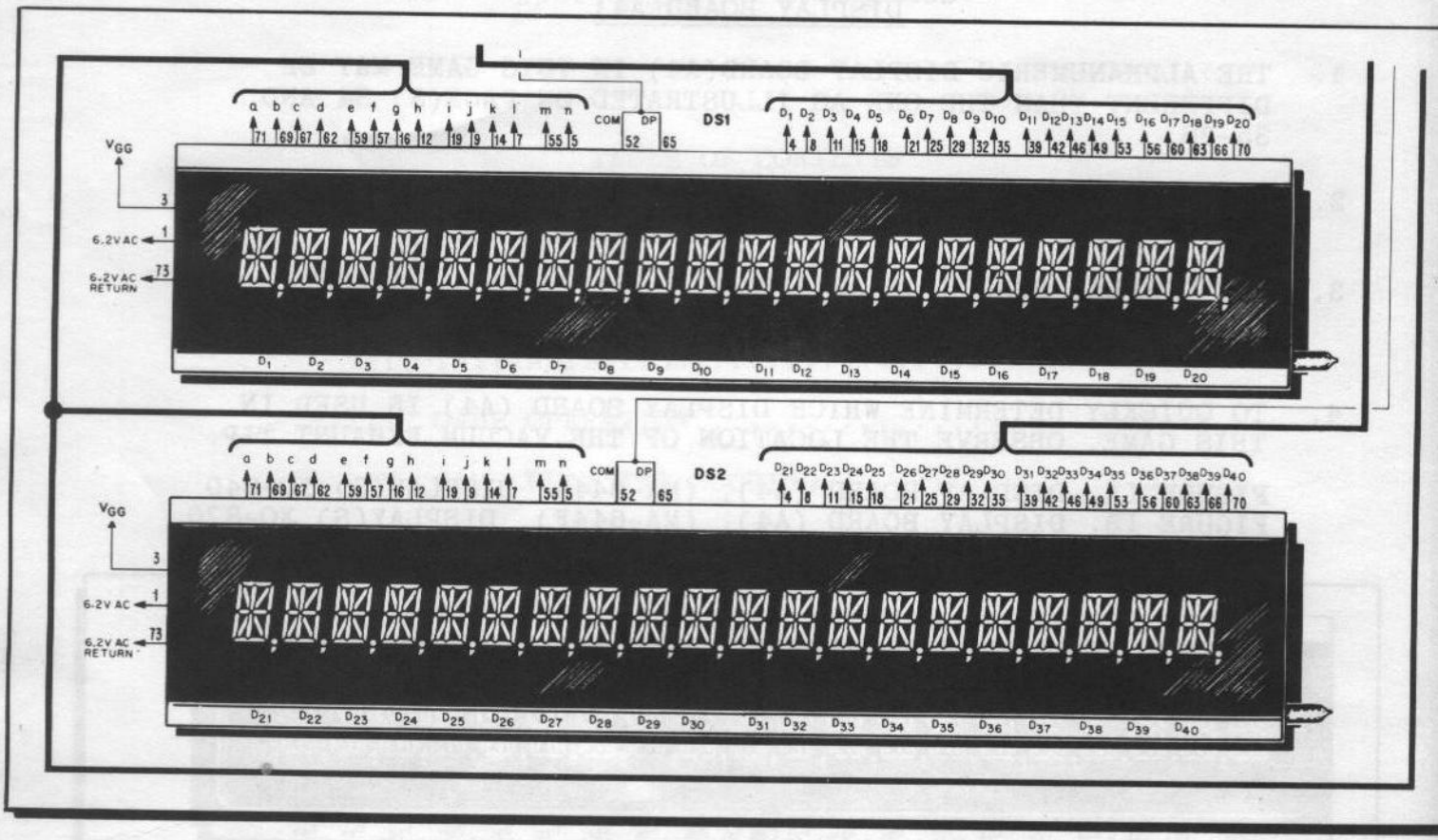


FIGURE 2.

SYSTEM 80B OVERVIEW

System 80B contains three new circuit boards. These are the Alphanumeric Display, the Power Supply, and the Control Board Piggyback which is attached to the Control Board. The Alphanumeric Display takes the place of the Four and Seven Digit Displays used in System 80A games. The new Power Supply takes the place of the System 80A Power Supply. The Control Board Piggyback takes the place of ROMS (U2-U3) used in System 80A games.

Some of the new features of System 80B are:

1) Capability to display messages.
2) Enhanced bookkeeping and self-test.
3) Players can enter their initials if they achieve a high score.
4) Top five high scores are displayed in the attract mode.

"**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."

A-22670

I. INSTALLATION

A. SET-UP

1. Bolt the legs to the cabinet.

2. Lift lightbox into an upright position. Be sure none of the cables are crimped in between the lightbox and cabinet.

3. Engage the snap in the rear of the lightbox to the cabinet.

4. To remove the lightbox backglass and gain servicing access to the electronics panel, fluorescent lamp assembly, speaker and the alphanumeric display board, proceed as follows:

   Unlock the lightbox, grasp the backglass lift trim, lift the backglass up and out carefully and set aside.

   To remove the speaker/alphanumeric display panel, grasp the upper portion of the panel, lift up about 1/2", swivel the top of the panel downwards and bring towards you, set down on the cabinet side mouldings. The acrylic display panel cover will also become detached at this stage.

5. Secure the lightbox to the cabinet with the bolts and washers provided.

6. Open the cabinet door and loosen the front moulding locking arm.

7. Remove the moulding from the playfield.

8. Slide the cabinet glass toward you and remove it.

9. Raise the playboard, slide it forward and rest it on its support.

10. Unravel and straighten out the power line cord located at the rear of the pinball cabinet.

11. Proceed to "B. CHECK-OUT".

B. CHECK-OUT

1. Check that all cables are clear of moving parts.

2. Check for any loose wires.

3. Check switches for loose solder or other foreign matter.

4. Be certain all fuses are firmly seated.

5. Check transformer for any foreign matter across terminals.

6. Be sure that the Transformer Panel power input connector A12J7, corresponds to the supply voltage.

7. Check the setting of the normally open tilt switch on the underside of the playfield. One blade should be free-floating with a weight on the end.

8. Lower the playfield into the cabinet. Using the leg adjusters, level the playfield and set the pitch. Recommended pitch is 5-1/2° - 6°.

9. The plumb-bob tilt can be adjusted by loosening the wing nut and raising the plumb-bob to increase its sensitivity, or lowering it to decrease its sensitivity.

   The ball-roll tilt can be adjusted by loosening the front screw and raising the tilt bracket to increase sensitivity, or lowering it to decrease its sensitivity.

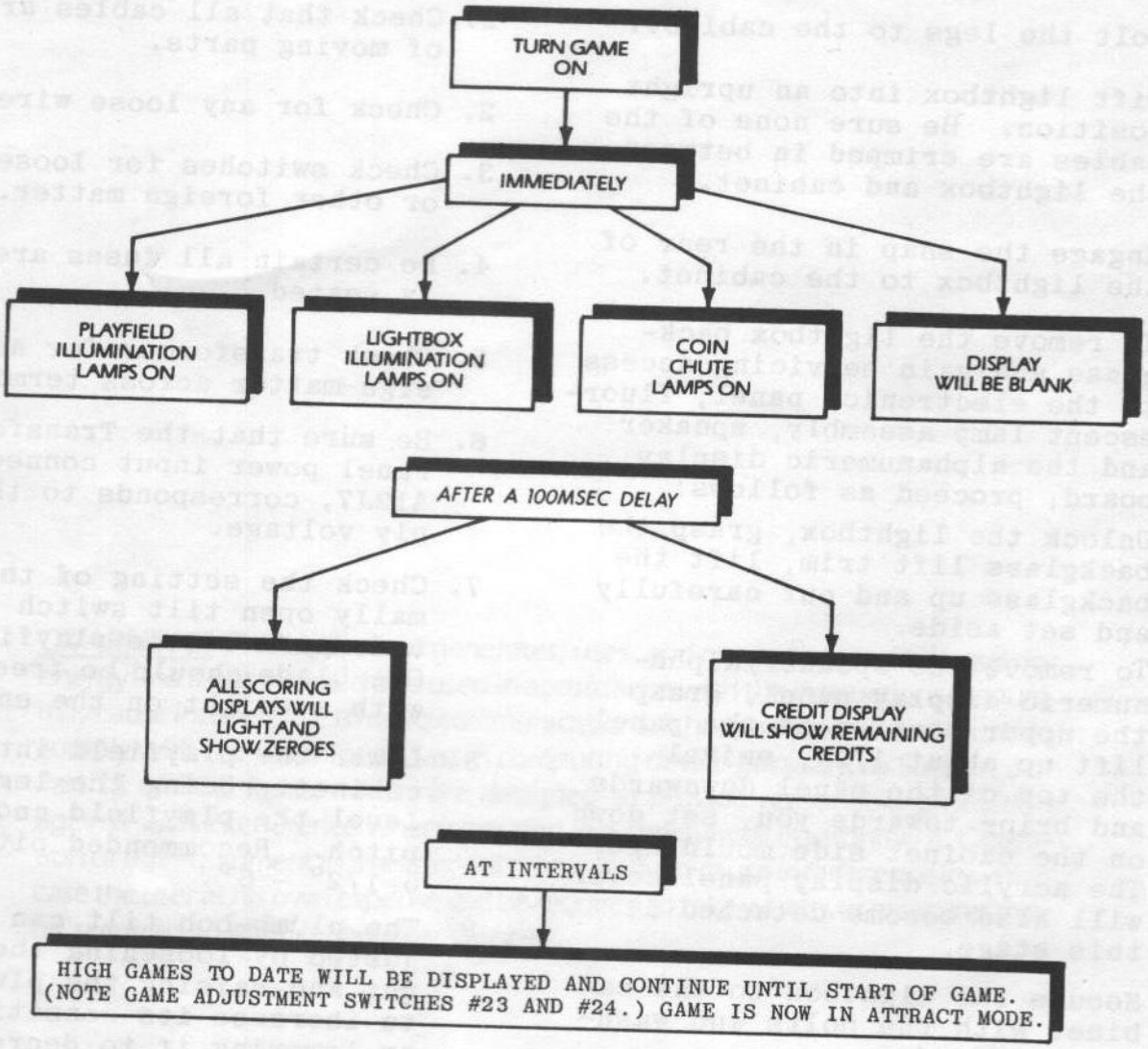
10. Reinstall the cabinet glass, front moulding and the lightbox assembly.

11. Plug the line-cord into a properly grounded 3-wire receptacle ONLY!

12. Refer to Section VI to make all necessary game adjustments.

13. CAUTION If this game has been subjected to extreme cold, allow to warm up to room temperature.

II. INITIALIZATION



III. GAME OPERATION

A. GAME START

Three balls must be in the ball return trough to start a game.

1. Insert coins into coin chute.
   a. Coin chute tune is played.
   b. Total credits are displayed in the center of the lower display.

2. Press Credit Button to start game.
   a. Credit tune is played.
   b. Total credits displayed decrease by one.

3. All playfield features reset.

4. The first player score display flashes two zeros.

B. FIRST PLAYER

1. First player's score display flashes two zeros.

2. The other player's displays are now blank.

3. The ball-in-play is displayed in the center of the upper display.

4. When the ball enters the outhole, any bonus earned is scored.

C. ADDITIONAL PLAYERS

1. Additional players are indicated by two zeros (not flashing) in each corresponding player's display.

2. After the maximum number of players are added, or no more credits remain, the Credit Button has no effect.

3. Additional players can be added anytime during the first ball in play.

D. EXTRA BALLS

1. When the SHOOT AGAIN lamp is lit, neither the player-up nor the ball-in-play changes when the ball enters the outhole.

2. Only one extra ball per ball-in-play is given.

E. TILT MODE

1. Tilting the game results in a loss of ball in play.

2. When the game is tilted, all the playfield lamps go off.

3. All accumulated bonus and bonus multipliers are lost.

F. SLAM MODE

1. If the normally closed slam switch (located inside front door) is opened, the entire game is ended for all players.

2. The entire switch matrix is inactive for three seconds.

3. If the match feature exists (dependent on Switch #26), a replay can be won even if the game is slammed.

4. Game returns to the attract mode.

G. GAME OVER

1. A random match number appears in the ball-in-play display. If this number matches the last two digits in any player's score, a replay (dependent on SWITCH #26) is awarded.

2. The High Games To Date are periodically displayed, dependent on Switches #23 and #24. When the Highest Game To Date is beaten, an award (dependent on Switches #23 and #24) is given.

3. All of the drop targets will reset (when used).

IV. GAME PLAY AND SCORING

MONTE CARLO

HOW TO PLAY

TOP ROLLOVERS

- SCORE 5000 UNLIT.
- SCORE 15,000 AND LIGHT A POP BUMPER WHEN LIT.
- SCORE 50,000 WHEN LIT IF ALL POP BUMPERS ARE LIT.

RIGHT FLIPPER

- FREEZE TOP ROLLOVER LIGHTS WHEN HELD ON.

HOLES

- SCORE 10,000.
- SPIN THE ROULETTE WHEEL AND CAPTURE BALL WHEN FLASHING. AFTER THE ROULETTE WHEEL SPINS:
  1) SCORE 10,000 IF ODD OR EVEN IS LIT AND THE NUMBER ON THE WHEEL (RED OR BLACK) IS ODD OR EVEN RESPECTIVELY.
  2) SCORE 10,000 IF RED OR BLACK IS LIT AND THE NUMBER ON THE WHEEL IS RED OR BLACK RESPECTIVELY.
  3) COLLECT BET BONUS X MULTIPLIER IF THE NUMBER ON THE WHEEL MATCHES A DROP TARGET NUMBER THAT IS LIT.
  4) LIGHT TOP HOLE (SPECIAL) IF THE NUMBER ON THE WHEEL IS "00".
  5) LIGHT LEFT OR RIGHT HOLE (EXTRA BALL) IF THE NUMBER ON THE WHEEL IS "0".
- TOP HOLE AWARDS SPECIAL WHEN LIT (RED).
- LEFT OR RIGHT HOLE AWARDS EXTRA BALL WHEN LIT (PURPLE).

DROP TARGETS

- SCORE 5000 UNLIT.
- SCORE 10,000 WHEN LIT.
- SCORE 15,000 AND TURN LAMP ON SOLID WHEN FLASHING.
- ALL TARGETS DOWN ON ANY ONE OF THE FOUR TARGET BANKS ADVANCES THE BET BONUS AND RESETS THE BANK.
- (5-BALL) SCORE 1000 UNLIT.
- (5-BALL) SCORE 5000 WHEN LIT.

IV. GAME PLAY AND SCORING

LEFT RAMP ROLLUNDER

- COLLECT BET BONUS AND LIFT RAMP.

TOP LEFT ROLLUNDER

- SCORE 5000 AND ADVANCE BET BONUS.

RIGHT RAMP ENTRANCE ROLLUNDER

- NO SCORE.

RIGHT RAMP EXIT ROLLUNDER

- SCORE 30,000 AND ADVANCE BET BONUS.
- SCORE 10,000,000 WHEN 10,000,000 LAMPS FLASHING.

SPOT TARGETS

- SCORE 15,000 ADVANCE BET BONUS, AND OPEN BALL GATE.

LEFT AND RIGHT OUTLANES

- SCORE 50,000 AND CLOSE BALL GATE.

LEFT AND RIGHT RETURN ROLLOVERS

- SCORE 300.

RUBBER SWITCHES

- SCORE 30.
- TOGGLE ODD AND EVEN LAMPS.

POP BUMPERS

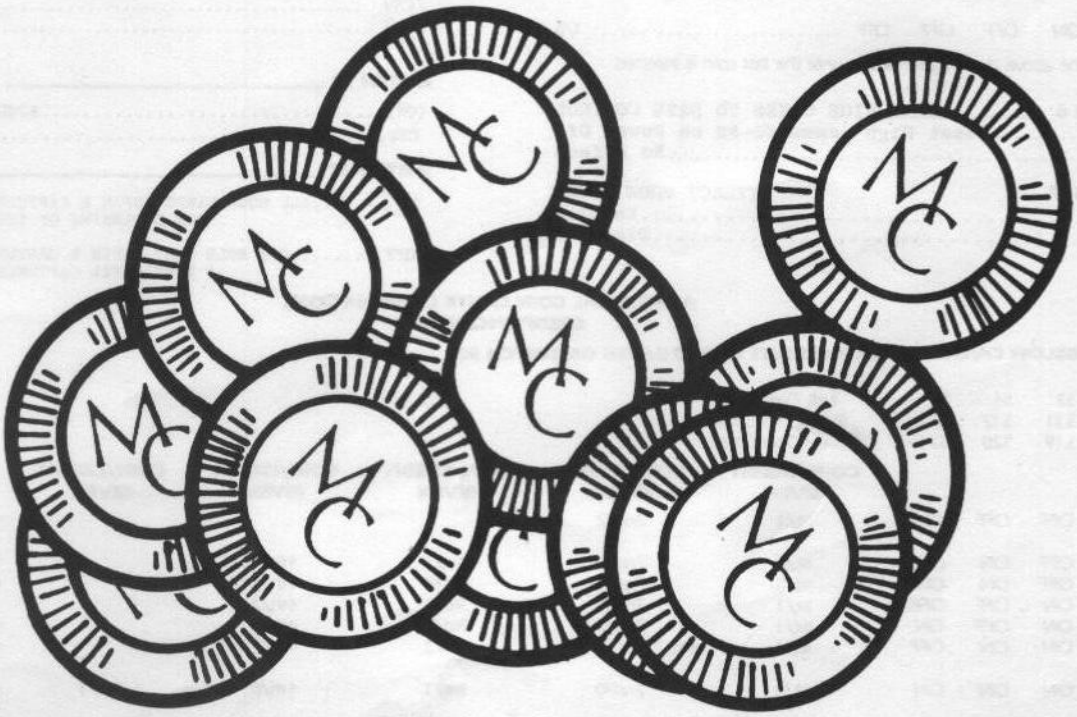
- SCORE 1000 UNLIT.
- TOGGLE RED AND BLACK LAMPS.
- SCORE 10,000 WHEN LIT.
- ROTATE POP BUMPER LAMPS.

OUTHOLE

- COLLECT BET BONUS.

MULTI-BALL

- ALL BALLS ARE RELEASED AFTER ALL CAPTURED.
- PLAYFIELD SWITCHES SCORE 3X WHILE 3 BALLS ARE ON THE FIELD AND 2X WHILE 2 BALLS ARE ON THE FIELD.



V. SOUND, VI. GAME ADJUSTMENTS

V. SOUND

The Sound Board installed in this game has been programmed for sound only.

VI. GAME ADJUSTMENTS

A. CONTROL BOARD SWITCH ADJUSTMENTS

NOTE: The following switch adjustments pertaining to **SYSTEM 80B** only. There are 32 switches on the control board which permit adjustment of the game parameters. These switches are contained in four packages of eight switches each, as shown below.

COIN CHUTE COMBINATIONS
SYSTEM 80B

SWITCHES					COIN CHUTE ADJUSTMENTS	
S1	S2	S3	S4	S5		Left Coin Chute
S9	S10	S11	S12	S13		Right Coin Chute
S17	S18	S19	S20	S21		Center Coin Chute
					CREDITS/COINS	
OFF	OFF	OFF	OFF	OFF		1/1
OFF	OFF	OFF	OFF	ON		2/1
OFF	OFF	OFF	ON	OFF		3/1
OFF	OFF	OFF	ON	ON		4/1
OFF	OFF	ON	OFF	OFF		5/1
OFF	OFF	ON	OFF	ON		6/1
OFF	OFF	ON	ON	OFF		7/1
OFF	OFF	ON	ON	ON		8/1
OFF	ON	OFF	OFF	OFF		9/1
OFF	ON	OFF	OFF	ON		10/1
OFF	ON	OFF	ON	OFF		1/2
OFF	ON	OFF	ON	ON		2/2
OFF	ON	ON	OFF	OFF		3/2
OFF	ON	ON	OFF	ON		4/2
OFF	ON	ON	ON	OFF		5/2
OFF	ON	ON	ON	ON		6/2
ON	OFF	OFF	OFF	OFF		7/2
ON	OFF	OFF	OFF	ON		8/2
ON	OFF	OFF	ON	OFF		9/2
ON	OFF	OFF	ON	ON		10/2
ON	OFF	ON	OFF	OFF		1/3
ON	OFF	ON	OFF	ON		2/3
ON	OFF	ON	ON	OFF		1/4
ON	OFF	ON	ON	ON		3/4
ON	ON	OFF	OFF	OFF		1/5

*All of the above do not give credits until the last coin is inserted.

SWITCH 6 — HIGH GAMES TO DATE CONTROL
- ON ..... Reset High Games #2-#5 on Power Off
- (OFF) ..... No Effect

SWITCH 7 — ATTRACT MODE SOUND
- (ON) ..... Enabled
- OFF ..... Disabled

SWITCH 8 — 10,000,000 SHOT CONTROL
- ON ..... LIT EVERY 40 SWITCH CLOSURES (LIBERAL)
- OFF ..... LIT AT RANDOM (CONSERVATIVE)

SWITCH 14 — COIN CHUTE LEFT AND RIGHT CONTROL
- ON ..... Same
- OFF ..... Separate

SWITCHES 15	16	MAXIMUM CREDITS
OFF	OFF	8
OFF	ON	10
ON	OFF	15
ON	ON	20

SWITCH 22 — PLAYFIELD SPECIAL
- ON ..... Extra Ball
- OFF ..... Special

SWITCHES 23	24	HIGHEST GAME TO DATE AWARDS
OFF	OFF	None (Not Displayed)
OFF	ON	None
ON	OFF	2 Replay
ON	ON	3 Replay

SWITCH 25 — BALLS/GAME
- ON 3
- OFF 5

SWITCH 26 — MATCH
- (ON) ..... On
- OFF ..... Off

SWITCH 27 — REPLAY LIMIT
- ON 1
- (OFF) ..... No Limit

SWITCH 28 — NOVELTY
- ON ..... Score 500,000 in place of extra ball and special.
- (OFF) ..... Normal

SWITCH 29 — GAME MODE
- ON ..... Extra Ball
- (OFF) ..... Replay

SWITCH 30 — 3RD COIN CHUTE CREDIT CONTROL
- ON ..... Add 9
- (OFF) ..... No Effect

SWITCH 31 — MATCH CONTROL
- (ON) ..... ROULETTE WHEEL MATCH
- OFF ..... NORMAL MATCH

SWITCH 32 — GAME CONTROL
- (ON) ..... ALL HOLE LAMPS (SPIN & CAPTURE) ARE ENABLED AT THE BEGINNING OF THE GAME. (LIBERAL)
- OFF ..... ONE HOLE LAMP (SPIN & CAPTURE) IS ENABLED AT A TIME UNTIL CAPTURED. (CONSERVATIVE)

ADDITIONAL COIN CHUTE COMBINATIONS
CREDIT INCENTIVES

ALL OF THE BELOW CANNOT HAVE 9 CREDITS ADDED BASED ON SWITCH 30

SWITCHES												
S1	S2	S3	S4	S5 -	Left Coin Chute							
S9	S10	S11	S12	S13 -	Right Coin Chute							
S17	S18	S19	S20	S21 -	Center Coin Chute							
					COIN/CREDIT GIVEN	COIN/CREDIT GIVEN	COIN/CREDIT GIVEN	COIN/CREDIT GIVEN	COIN/CREDIT GIVEN		TOTAL COIN/ TOTAL CREDIT
ON	ON	OFF	OFF	ON	1st/1	2nd/2				=	2/3
ON	ON	OFF	ON	OFF	1st/0	2nd/1	3rd/1	4th/1		=	4/3
ON	ON	OFF	ON	ON	1st/0	2nd/1	3rd/0	4th/2		=	4/3
ON	ON	ON	OFF	OFF	1st/1	2nd/1	3rd/1	4th/2		=	4/5
ON	ON	ON	OFF	ON	1st/1	2nd/2	3rd/1	4th/3		=	4/7
ON	ON	ON	ON	OFF	1st/1	2nd/2	3rd/2	4th/2		=	4/7
ON	ON	ON	ON	ON	1st/0	2nd/0	3rd/1	4th/0	5th/1	=	5/2

VI. GAME ADJUSTMENTS

B. SOUND ADJUSTMENTS

The speaker(s) output is controlled by the potentiometer mounted on a bracket located inside the cabinet next to the front door hinge.

Turning the potentiometer counter clockwise will decrease the volume. Turning it clockwise will increase the volume.

SWITCH BANK SETTINGS:

DIP SWITCH

Position 1.....Not Used
Position 2.....Not Used
Position 3.....Off
Position 4.....On

C. POST ADJUSTMENTS

The post located just above the right and left outlanes can be positioned for liberal/conservative play. The smaller opening produces a more liberal game.

D. SPIN-A-BALL SWITCH ADJUSTMENT,

(P/O PRINTED CIRCUIT DISC ASSEMBLY)

Observe that the gap between the printed circuit board contact foil and the actuating switch contact should be adjusted for a gap of .016 using a standard automotive type feeler gauge. Bend the switch blade in the proper direction for correct switch operation.

VII. BOOKKEEPING AND SELF TEST

The circuitry in this game helps the Operator perform many Bookkeeping and Self/Test functions. These functions are accessed by the Self/Test Switch inside the front door.

Section VII A., details the Bookkeeping system, while Section VII B., details the Self/Test operation. The Flow Chart in Section VII D., gives the general order and function of both Bookkeeping and Self/Test steps.

A. BOOKKEEPING SYSTEM 80B

- See Flow Chart for Bookkeeping Assignments (1-15).

I. STEPPING THROUGH BOOKKEEPING

1. Press the SELF-TEST button inside the front door.

"TEST MODE" should appear in the upper display.

2. Press the SELF-TEST button again. Step 1 and its information will be displayed.

3. Pressing the SELF-TEST button will increment the bookkeeping step number and appropriate information will be displayed.

Pressing the SELF-TEST button after Step 15 will start the SELF-TEST function (Step 16-21). At this point Bookkeeping cannot be re-entered by pressing the SELF-TEST button. To reenter, turn the game OFF/ON or open the slam switch. The game will return to the attract mode. Then press the SELF-TEST button.

4. To exit from Bookkeeping at any time:

   a. Turn power OFF/ON or
   b. Open slam switch.

II. HOW TO SET BOOKKEEPING INFORMATION TO ZERO

1. For a Particular Bookkeeping Step

   a. Advance Bookkeeping so the step to be zeroed is displayed.

   b. Press the credit button. Notice information replaced by zeros. Note: Step 6 (Replay Percentage) cannot be zeroed using the credit button.

2. Zeroing All Bookkeeping Steps Except #11, 12, 13 and 14.

   (These are the replay level and high game to date scores)

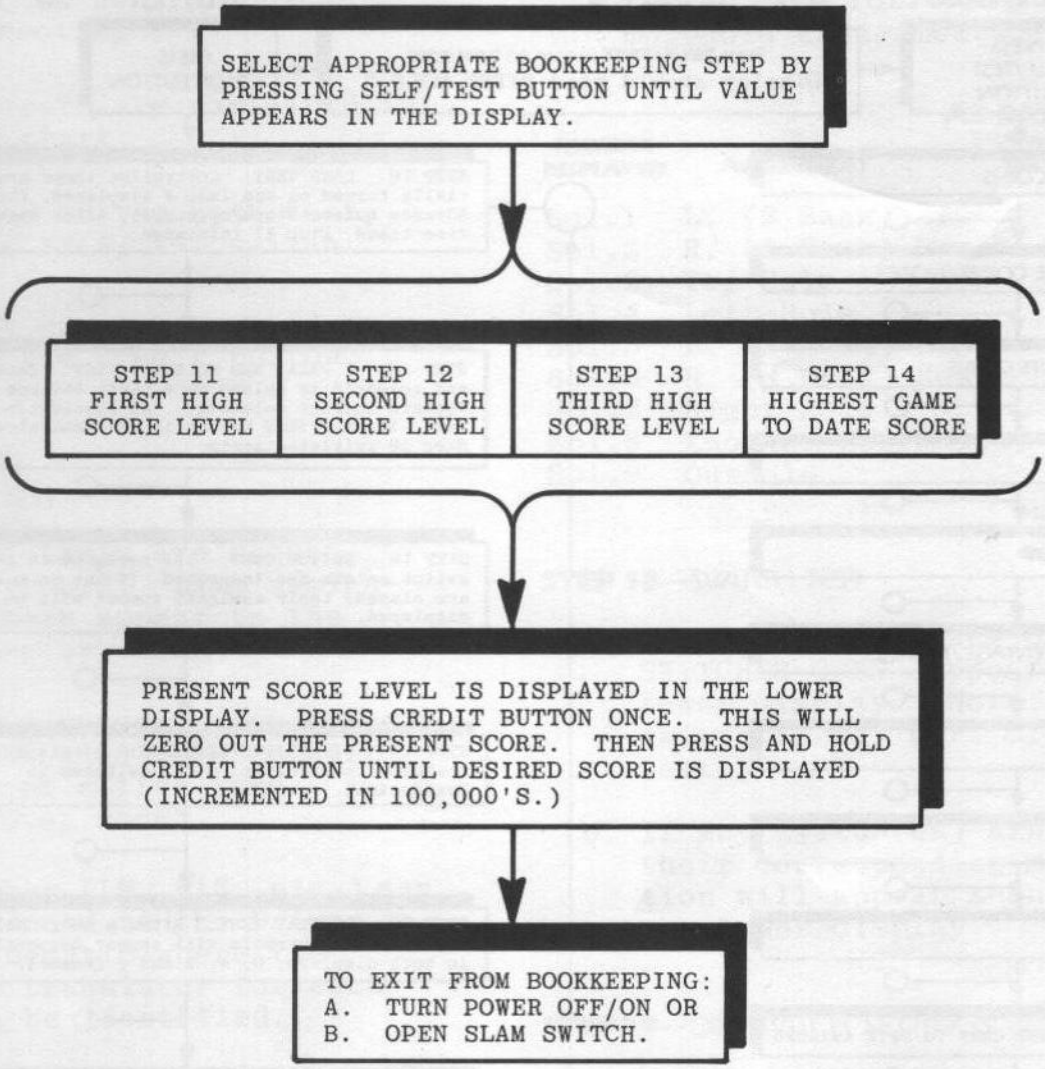
   a. Go to Step #15.

   b. Press the credit button. A message will be displayed.

   c. Zeroing is complete.

VII. BOOKKEEPING AND SELF TEST

III. HOW TO RESET HIGH SCORE LEVELS OR HIGH GAME TO DATE SCORES



NOTES:

1. Step 11 must be a lower score than Step 12. Step 12 must have a lower score than Step 13. Otherwise, the scores will not be recognized.

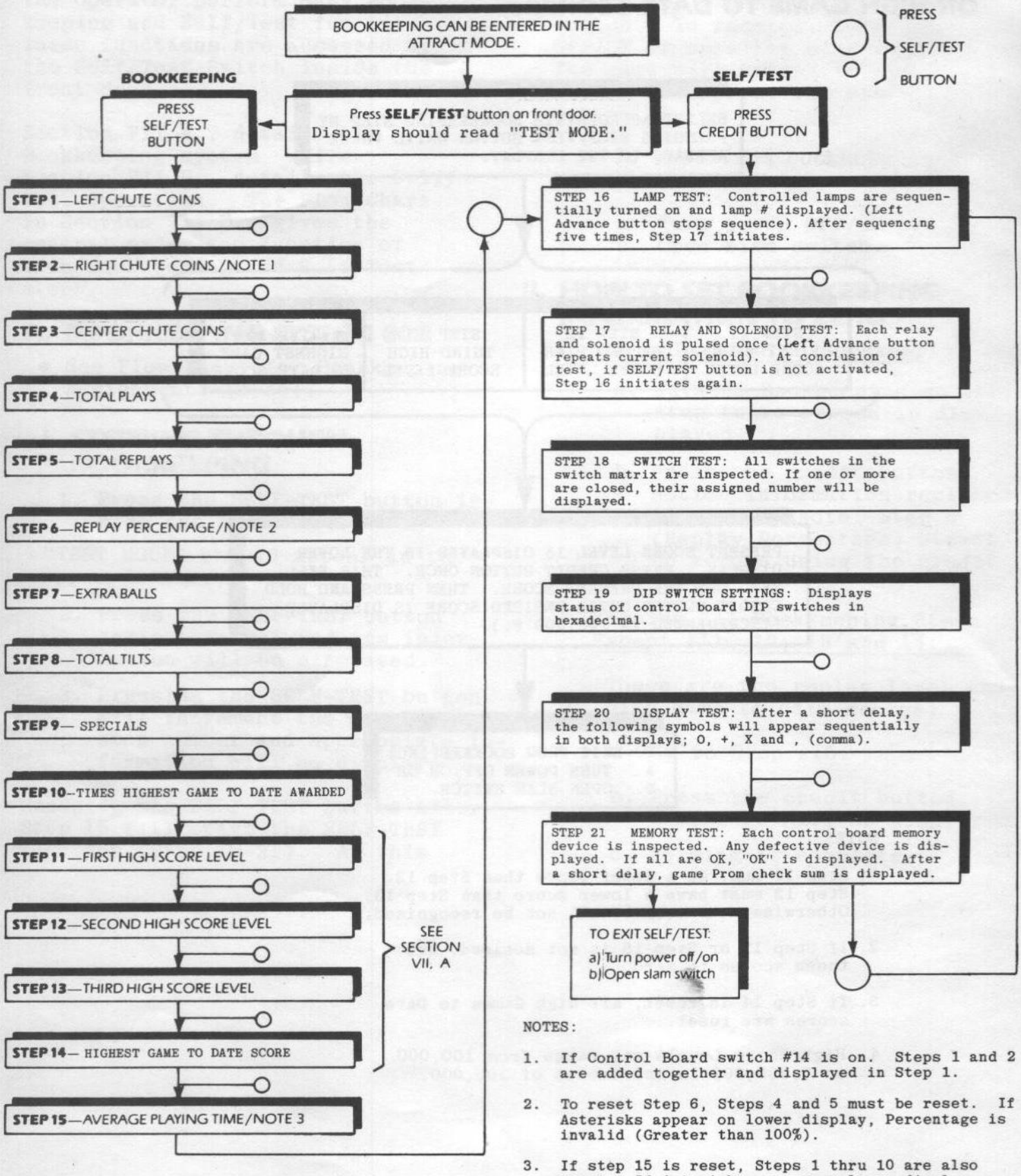
2. If Step 12 or Step 13 is not desired, set those scores to zero.

3. If Step 14 is reset, all High Games to Date scores are reset.

4. High Score Levels may range from 100,000 to 9,900,000 in increments of 100,000.

VII. BOOKKEEPING AND SELF TEST

B. FLOW CHART



NOTES:

1. If Control Board switch #14 is on. Steps 1 and 2 are added together and displayed in Step 1.
2. To reset Step 6, Steps 4 and 5 must be reset. If Asterisks appear on lower display, Percentage is invalid (Greater than 100%).
3. If step 15 is reset, Steps 1 thru 10 are also reset. If Asterisks appear on lower display, Time is invalid (Greater than 16½ minutes per game).

VII. BOOKKEEPING AND SELF TEST

C. SELF/TEST

- Steps 16 through 21 are SELF/TEST or game tests the operator can use for quick troubleshooting.
- All the tests are explained in the flow chart.
- To advance to the next test, press the SELF/TEST switch.
- Each test can be repeated by pressing the credit button.

STEP 16—LAMP TEST

a. Lamp Test-Lamps are sequentially strobed. Lamp assignment numbers appear in the lower display.

The Left Advance button stops lamp sequencing for repeated flashing of active lamp. (Single Step Mode).

Lamp number (L9, L16, etc.) can be referenced to the Driver Board Schematic where the specific transistor for each lamp can be identified.

STEP 17—RELAY AND SOLENOID TEST

a. Relay Test-All relays are pulsed in the following order with their corresponding lamp driver number appearing in the lower display.

The left advance button stops sequencing for repeated activation of relay or solenoid. (Single Step Mode).

A3 Driver Board Transistor Assignment (See Schematic)

Q (Game Over) Relay.....A3J3 PIN-$\bar{A}$(Q1)
T (Tilt) Relay.....A3J3 PIN-$\bar{B}$(Q2)
(Any other relays which may be used).

b. Solenoid Test-Each solenoid on the playfield is sequentially pulsed. The solenoid number displayed identifies which solenoid is being tested. The following chart lists solenoid assignments.

NUMBER DISPLAYED	ASSIGNMENT	A3 DRIVER BOARD TRANSISTOR ASSIGN. SEE SCHEMATIC
Sol.1	L. (2 Bank) Reset	Q60
Sol.2	R. (2 Bank) Reset	Q57/Q58
Sol.3	Top Hole	Q54
Sol.4	Left Hole	Q55
Sol.5	L. (3 Bank) Reset	Q61/Q62
Sol.6	R. (3 Bank) Reset	Q63/Q64
Sol.7	Right Hole	Q56
Sol.8	Knocker Assembly	Q53
Sol.9	Outhole	Q59

STEP 18—SWITCH TEST

a. If all switches are open, "ALL SWITCHES OPEN" appears in the lower display. (Note: Slam switch is not part of this test.)

b. If any switch(es) are closed, their corresponding matrix location will appear sequentially in the lower display.

STEP 19—DIP SWITCH SETTINGS

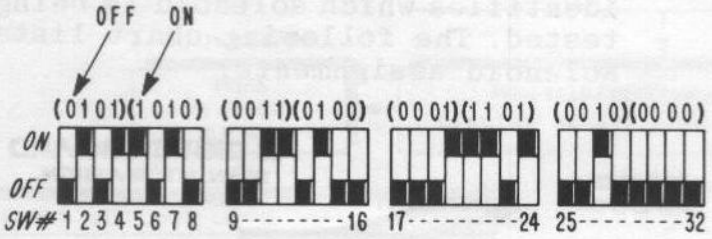
a. The status of the Control Board (A1) switches appears in the lower display.

DISPLAYED HEXADECIMAL	DECIMAL	BINARY
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111

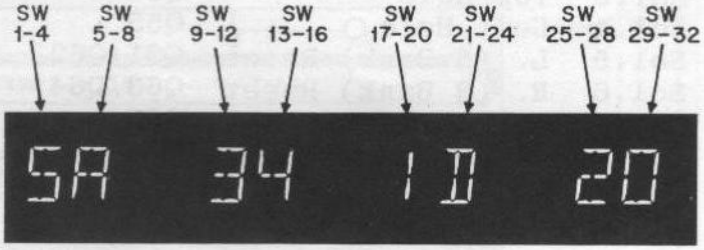
VII. BOOKKEEPING AND SELF TEST

CONTROL BOARD (A1) SWITCHES

EXAMPLE



DISPLAYED



Checking Switches

1) Switch all odd number switches to the ON position, and all even switches to the OFF position. Press credit button. Display should now show:

2) Switch all even numbered switches to the ON position and all odd switches to the OFF position. Press credit button. Display should now show:

STEP 20—DISPLAY TEST

After a short delay, the following characters will appear sequentially in all digit positions; 0, +, X and , (comma).

STEP 21—MEMORY TEST

Each control based memory device is checked. If all are good, an "OK" will be displayed.

If a memory chip located on the A1 Control Board is defective, its number will be displayed. If no devices are found to be defective, "OK" is displayed in the lower display. Then after a short delay the Game Prom check sum will be displayed.

VIII. THEORY OF OPERATION

This section will cover only the differences between System 80A and System 80B. Figure 1 is a block diagram indicating the interconnections between the modules of System 80B.

A. CONTROL BOARD (A1)

The Piggyback Board eliminates the need for the ROMS (U2-U3) and the game prom (PROM 1) used in System 80A. The new game prom for each game is a 2764 EPROM labeled with the game number. This device is plugged into the Piggyback Board which is soldered into the Control Board.

The use of the Alphanumeric Display eliminates the need for Z19, Z21, Z22, Z23, Z24, Z25 (System 80A Display Control), and connector A1J3. The Control Board transmits information to the Display Board via a data bus (DATA 0 - DATA 7) and control lines (LD1, LD2, and RESET) from A1J2 to 1A4J1. The state of the LD1 and LD2 lines determine whether the upper or lower display tube receives the information on the data bus.

B. POWER SUPPLY (A2)

The new Power Supply develops a regulated +5V DC only and supplies it to the Control Board (VCC), Display Board (VSS), and Sound Board (VCC).

C. DISPLAY BOARD (A4)

This board takes the place of the four and seven digit displays used in System 80A games. During game play the upper display contains the scores of players one and two along with the ball in play (center). The lower display contains the scores of players three and four along with the amount of credits remaining (center). During Game Over the display information alternates between the scores from the previous game and the current High Games To Date.

The Display Board incorporates two vacuum fluorescent display tubes and three display controllers (U1-U2-U3). Each tube consists of a filament, grids (digits), and anodes (segments). U1 controls the digits of the upper display tube. U2 controls the digits of the lower display tube. U3 controls the segments of both tubes. When power is supplied to the game, the Control Board sends a negative going reset pulse to the base of Q1. This resets the display system. The digit information is multiplexed using an internal clock in U1 to control the refresh rate. This makes it appear as if all the digits are being enabled at once.

VIII. THEORY OF OPERATION

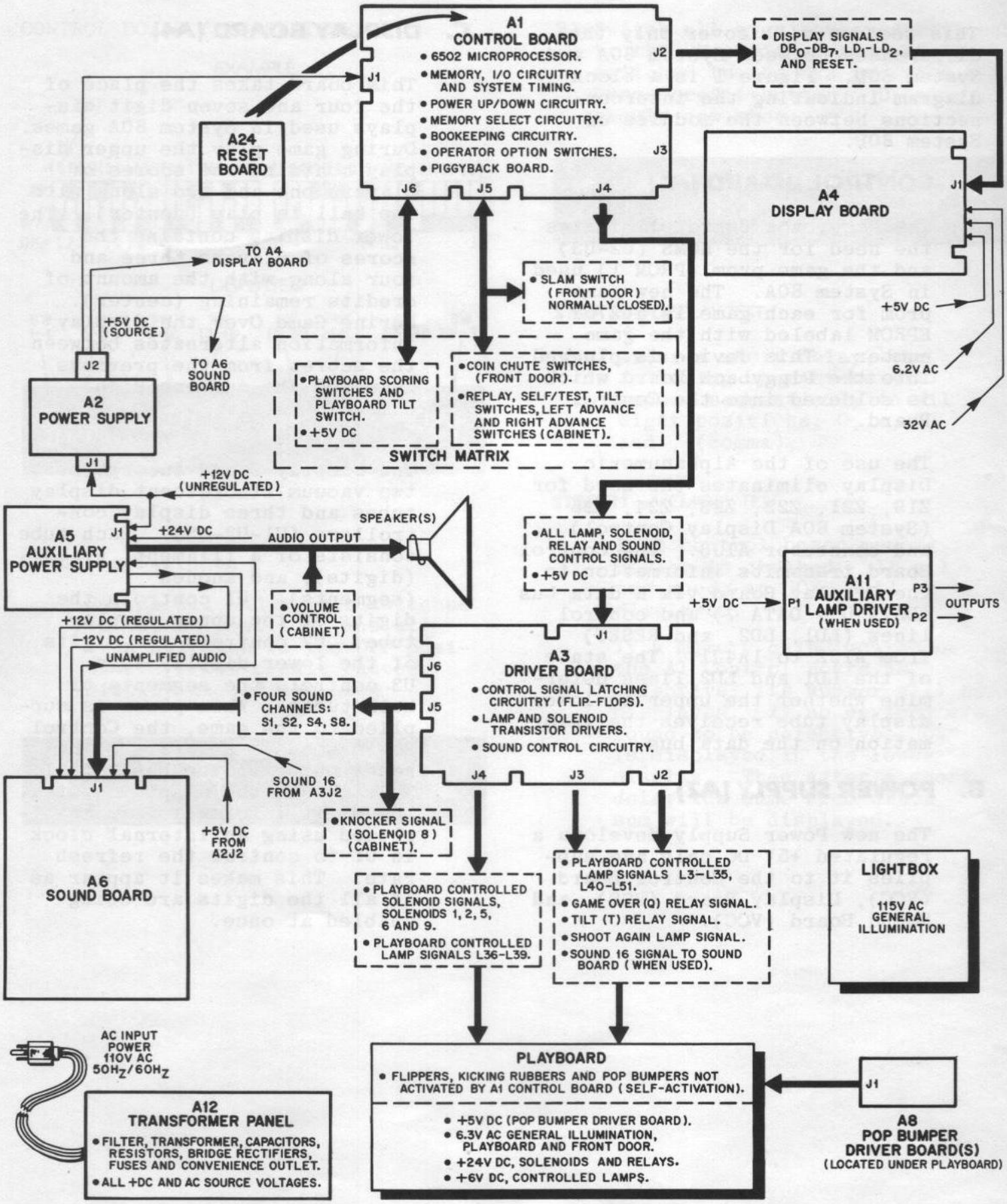


FIGURE I. SYSTEM 80B BLOCK DIAGRAM

VIII. THEORY OF OPERATION

The Display Board is supplied with 32V AC from the transformer panel. Voltages VGG, VDD, and VCO are then developed from this input. The transformer panel also supplies 6.2V AC to the display tube filaments.

The filaments are biased 7.5V DC above VGG (VCO) by the zener diode VR1. Figure 2 shows the basic drive circuitry and waveform for a single digit and segment of the display.

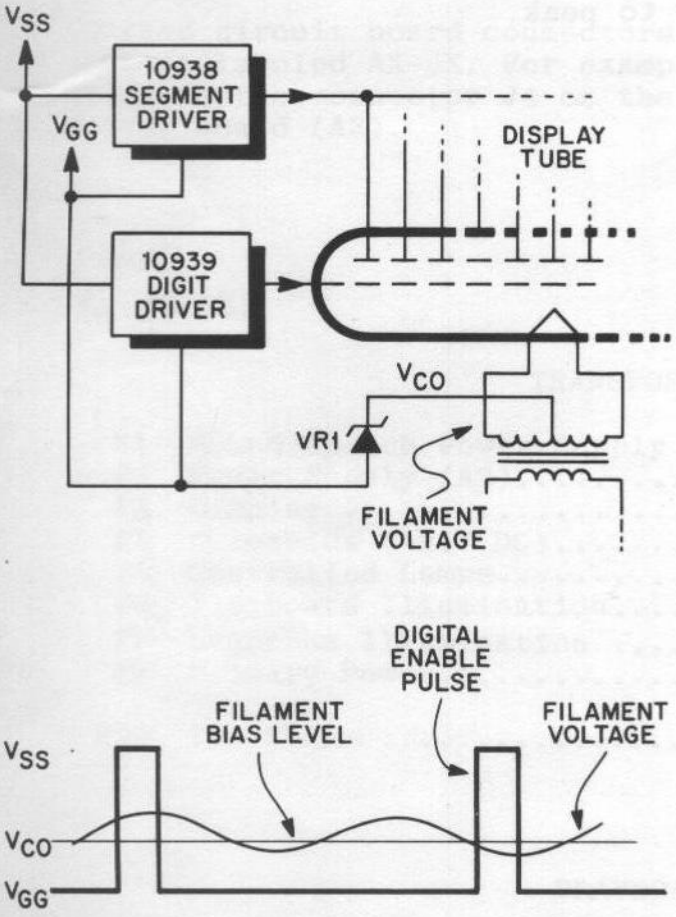


FIGURE 2. BASIC DRIVE CIRCUIT

D. SOUND BOARD (A6)

The MA-766 Sound Board consists of two 6502 microprocessor systems, a dual DAC, an L.P.C. speech generator, two programmable sound generators, input ports to receive commands from the game Control Board, and a low level audio output, which is sent to the MA-767 Auxiliary Power Supply Board for amplification.

The Sound Board requires three supply voltages: +5V DC, +12V DC and -12V DC. In addition a power up reset signal is required from the Control Board.

SYSTEM CLOCK

A 4 MHz oscillator is configured with R11, R12, C14, C15, C21, XTAL-1 and T1. R21 and C22 are optional. This 4 MHz clock is divided by 4 to a 1 MHz clock for both processors' clock input, pin 37 of N1 and T3. A 2 Mhz clock from S1 pin 14 is sent to the two AY-3-8913 Programmable Sound Generator, H4 and K4, pin 20. A 250 KHz signal from S1 pin 11 is the clock for the programmable timer section consisting of N5, H5, T5 and K5, pin 2.

INPUT CODE LATCH SYSTEM

Eight input lines from the Control Board come in on A6P1 and are pulled up by S1P1 and sent to the two input code latches A3 and B2, one for each microprocessor system. A2, pin 8, becomes a logic high when any of it's inputs are low. This output is connected to pin 11 of the input code latches (A3 and B2). A positive edge at pin 11 causes A3 and B2 to latch the data at their inputs. A2 pin 8 is also connected to the clock inputs of two flip flops, A4 pin 3 and A4 pin 11. When A2 pin 8 goes high, both flip flops are clocked, setting both $\bar{Q}$ outputs low. The $\bar{Q}$ outputs, A4 pin 6 and pin 8, are connected to both of the 6502's active low interrupt request lines, T3 and N1, pin 4. The $\bar{Q}$ outputs of A4 will stay low until the associated 6502 reads its input port therefore clearing the interrupt.

NOTE: DIP Switch 3 should remain off and DIP Switch 4 should remain on. This prevents the S4 input from generating an interrupt.

VIII. THEORY OF OPERATION

SYSTEM RAM

The sound board is designed to accomodate different types of RAM. JP1 and JP3 should be connected if HM6116's or 2158A's are used. JP2 and JP4 should be connected if 2158B's are used.

RESET

The Sound Board receives an external reset signal from A1J2 pin 24. This active low reset signal is pulled up by R34 and sent to G5, pin 1 (2-input AND gate). However, if a manual reset is desired, pushing switch SW2 will reset the processor.

INPUT PORT

Input Port B3 reads the test switch SW1 and two option switches, DIP switches 1 and 2. Pressing test switch SW1 will produce a tone.

MAIN SUMMER

The main summer consists of R13 through R17 and B1, pins 12, 13 and 14. B1 pin 14 is the main output from the Sound Board, at A6P1 pin 18, and will swing plus or minus 5V peak to peak.

IX. GENERAL INFORMATION

A. PRINTED CIRCUIT BOARDS ARE DESIGNATED AS FOLLOWS:

A1 - Control Board
A2 - Power Supply
A3 - Driver Board
A4 - Display Board
A5 - Auxiliary Power Supply
A6 - Sound Board
A7 - Diode Board
A8 - Pop Bumper Driver Board
A11- Auxiliary Lamp Driver
A13- Resistor Board
A24- Reset Board

Printed circuit board connectors will be labeled AX-JX. For example, A3-J4 is the connector J4 on the driver board (A3).

B. WIRE COLORS ARE SHOWN AS NUMBERS:

0 Black
1 Brown
2 Red
3 Orange
4 Yellow
5 Green
6 Blue
7 Violet
8 Gray
9 White

For example, 688 is a BLUE-GRAY-GRAY striped wire.

C. FUSES

TRANSFORMER PANEL FUSES

F1	Sound/Speech Power Supply (A6)	12V AC	1/2 Amp
F2	Power Supply (A2)	10V AC	6-1/4 Amp SLO-BLO
F3	Display	32V AC	1/4 Amp SLO-BLO
F4	Solenoids (+24V DC)	28V AC	8 Amp SLO-BLO
F5	Controlled Lamps	8V AC	8 Amp SLO-BLO
F6	Playboard Illumination	6.3V AC	8 Amp SLO-BLO
F7	Lightbox Illumination	115V AC	1/2 Amp SLO-BLO
F8	Primary Power	110V AC	5 Amp SLO-BLO
		220V AC	2-1/2 Amp SLO-BLO
F20	Input Line	110V AC	8 Amp SLO-BLO
		220V AC	4 Amp SLO-BLO

PLAYBOARD FUSES

F10	Target Bank Reset	1 Amp SLO-BLO
F11	Outhole, Hole Kickers	1 Amp SLO-BLO
F12	Ball Release	1 Amp SLO-BLO
F13	Ramp	2-1/2 Amp SLO-BLO
F14	Top Left Pop Bumper	2 Amp SLO-BLO
F15	Top Right Pop Bumper	2 Amp SLO-BLO
F16	Bottom Pop Bumper	2 Amp SLO-BLO

IX. GENERAL INFORMATION

D. COIL CHART

SOLENOID COILS					
PART NUMBER	GENERAL USAGE	RESISTANCE (OHMS)	NUMBER OF TURNS	WIRE GAUGE	WRAPPER COLOR
A-1496	KICKING TARGET KICKING RUBBERS POP BUMPERS	2.95	635	#23	Yellow
A-4893	UP KICKER POP BUMPERS BALL KICKER	2.1	535	#22	Red
A-5194	UP KICKER GONG KICKING TARGETS POP BUMPERS	4.5	780	#24	Blue
A-5195	CONTACT KICKER KNOCKER HOLE KICKER	11.6	1305	#26	White
A-16570	HOLE KICKER, OUTHOLE	15.5	1450	#27	Green
A-17875	FLIPPERS	2.8/40	560/1100	#24/31	Yellow
A-17891	5 BANK RESET	3.35	850	#22	White
A-18102	3 BANK RESET, 7 BANK RESET USES 2	9.0	1430	#24	Red
A-18318	4 BANK RESET	6.7	1130	#24	Orange
A-19300	BALL KICKER	7.8	1075	#25	Orange
A-20095	SUPER FLIPPER	1.55/35.5	450/900	#22/31	Red
A-21741	UP KICKER	2.5	575	#23	Orange
A-24161	INTERMEDIATE FLIPPER	2.2/40	520/1050	#23/31	Blue
RELAY COILS					
A-16890	Q, T, AND COIN LOCKOUT RELAYS	231.0	4000	#35	Orange
A-20558	GATE RELAY	156.0	3400	#34	White
A-18642	MEMORY/ DROP TARGETS	58.0	1590	#33	White
A-19508	MEMORY/ DROP TARGETS	35.0	1250	#32	YELLOW

*Coils may vary from game to game. Check game manual for exact coil usage.

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

TABLE OF CONTENTS

PAGE(S)

POP BUMPER DRIVER BOARD (A8)
- COMPONENT LOCATION AND PARTS LIST..... 20
- SCHEMATIC DIAGRAM..... 20

CONTROL BOARD (A1), PIGGYBACK
- COMPONENT LOCATION AND PARTS LIST..... 21
- SCHEMATIC DIAGRAM..... 21

CONTROL BOARD (A1)
- COMPONENT LOCATION AND PARTS LIST..... 22
- SCHEMATIC DIAGRAM..... 23-25

DRIVER BOARD (A3)
- COMPONENT LOCATION AND PARTS LIST..... 26
- SCHEMATIC DIAGRAM..... 27, 28

RESISTOR BOARD (A13) 25231
- COMPONENT LOCATION AND PARTS LIST..... 29

RESISTOR BOARD (A7) 25230
- COMPONENT LOCATION AND PARTS LIST..... 29

DIODE BOARD (A7) 25229
- COMPONENT LOCATION AND PARTS LIST..... 29

DIODE BOARD (A7) 24030
- COMPONENT LOCATION AND PARTS LIST..... 29

AUXILIARY POWER SUPPLY (A5)
- COMPONENT LOCATION AND PARTS LIST..... 30
- SCHEMATIC DIAGRAM..... 30

SOUND BOARD (A6)
- COMPONENT LOCATION AND PARTS LIST..... 31
- SCHEMATIC DIAGRAM..... 32, 33

LIGHTBOX
- SCHEMATIC/WIRING DIAGRAM..... 34

AUXILIARY LAMP DRIVER (A11) (AUX. LIGHTBOX)
- COMPONENT LOCATION AND PARTS LIST..... 35
- SCHEMATIC DIAGRAM..... 35

DISPLAY BOARD (A4)
- COMPONENT LOCATION AND PARTS LIST..... 36
- SCHEMATIC DIAGRAM..... 37, 38

RESET BOARD (A24)
- COMPONENT LOCATION AND PARTS LIST..... 39
- SCHEMATIC DIAGRAM..... 39

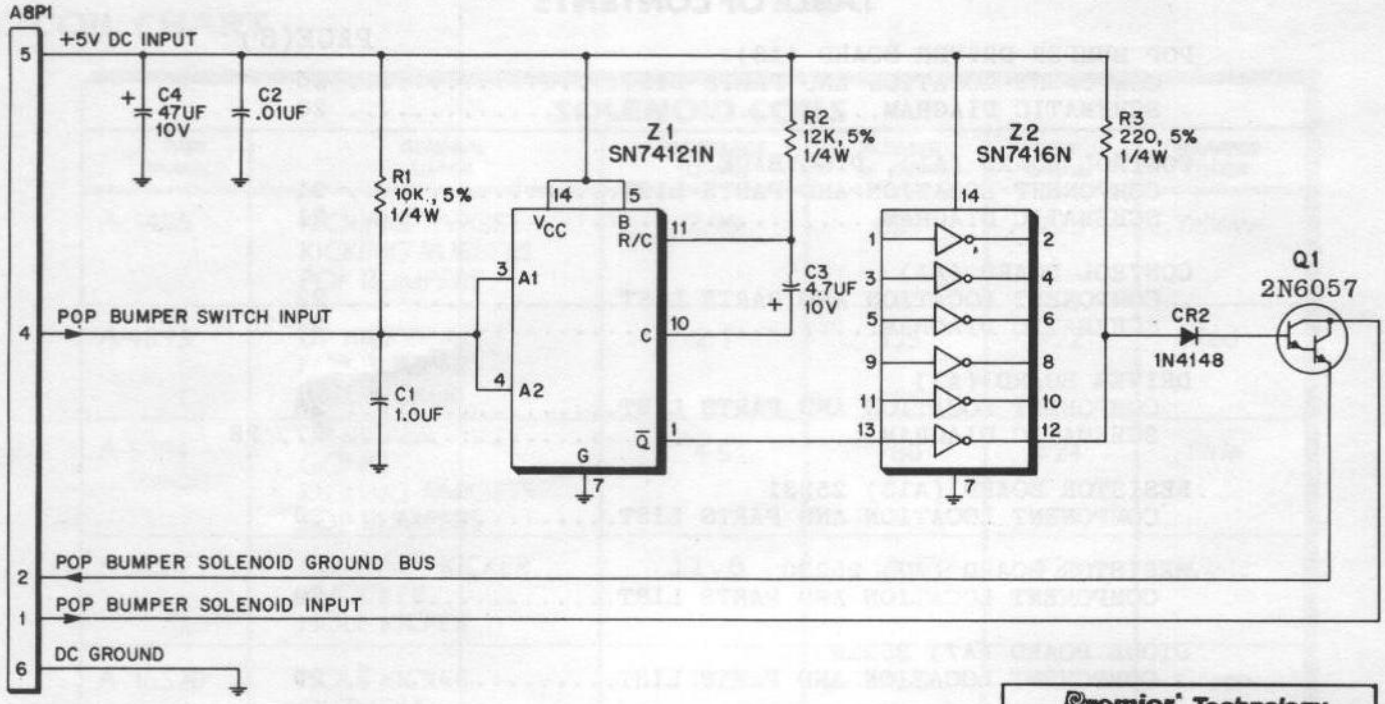
PLAYBOARD
- PLAYBOARD SWITCH MATRIX..... 40
- PLAYBOARD ILLUMINATION AND SOLENOIDS..... 41, 42

AUXILIARY LAMP DRIVER (A11) (PLAYBOARD)
- COMPONENT LOCATION AND PARTS LIST..... 43
- SCHEMATIC DIAGRAM..... 43

POWER SUPPLY (A2)
- COMPONENT LOCATION AND PARTS LIST..... 44
- SCHEMATIC DIAGRAM..... 44

TRANSFORMER PANEL/CABINET
- SCHEMATIC/WIRING DIAGRAM..... 45, 46

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



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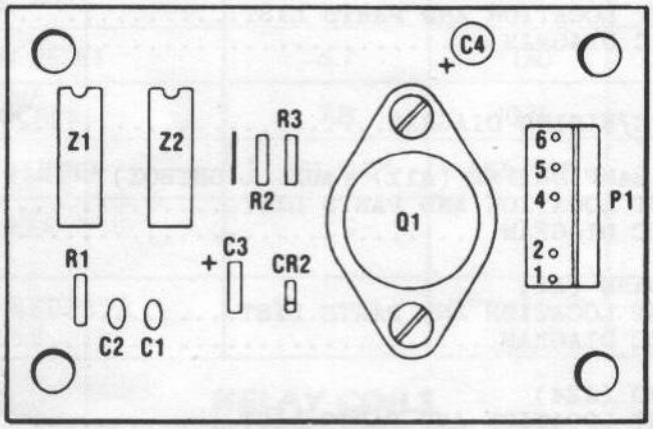
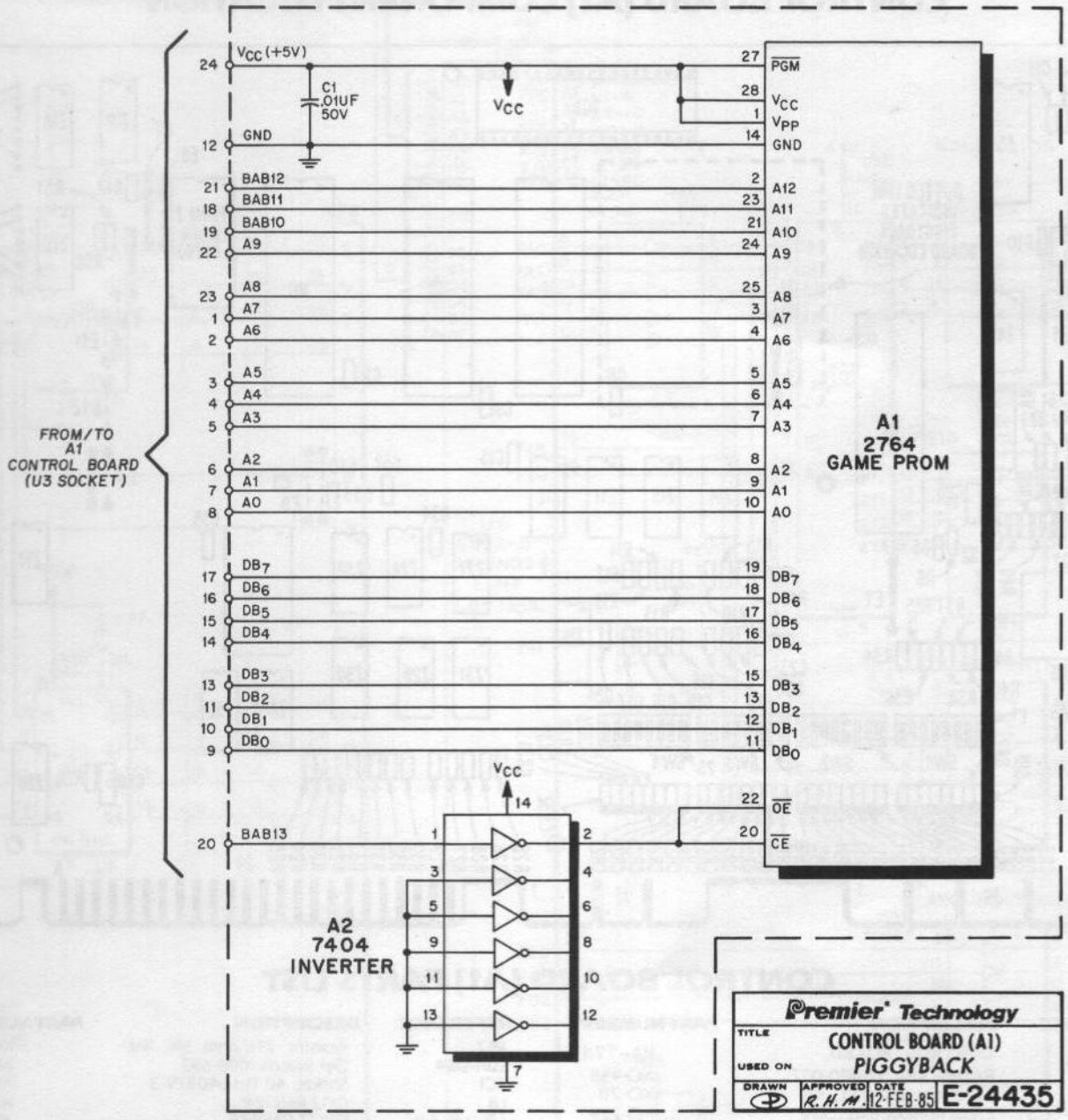
POP BUMPER DRIVER BOARD (A8) COMPONENT LOCATION



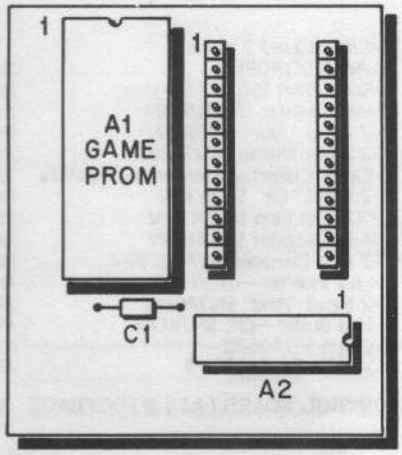
POP BUMPER DRIVER BOARD (A8) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	POP BUMPER DRIVER BOARD	A-19741
C1	Capacitor, 1 UF, 50V, Non-Polarized	XO-294
C2	Capacitor, .01 UF, 100V	XO-202
C3	Capacitor, 4.7 UF, 10%, 10V Tantalum, Axial	XO-226
C4	Capacitor, 47 UF, 10V	XO-227
CR2	Diode 1N4148	XO-261
P1	Connector	XO-868
R1	Resistor, 10K ohm, 1/4W, 5%	XO-18
R2	Resistor, 12K ohm, 1/4W, 5%	XO-9
R3	Resistor, 220 ohm, 1/4W, 5%	XO-21
Q1	Transistor, Darlington 2N6057	XO-311
Z1	IC SN74121N	XO-417
Z2	IC SN7416N	XO-405

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



CONTROL BOARD (A1), PIGGYBACK COMPONENT LOCATION

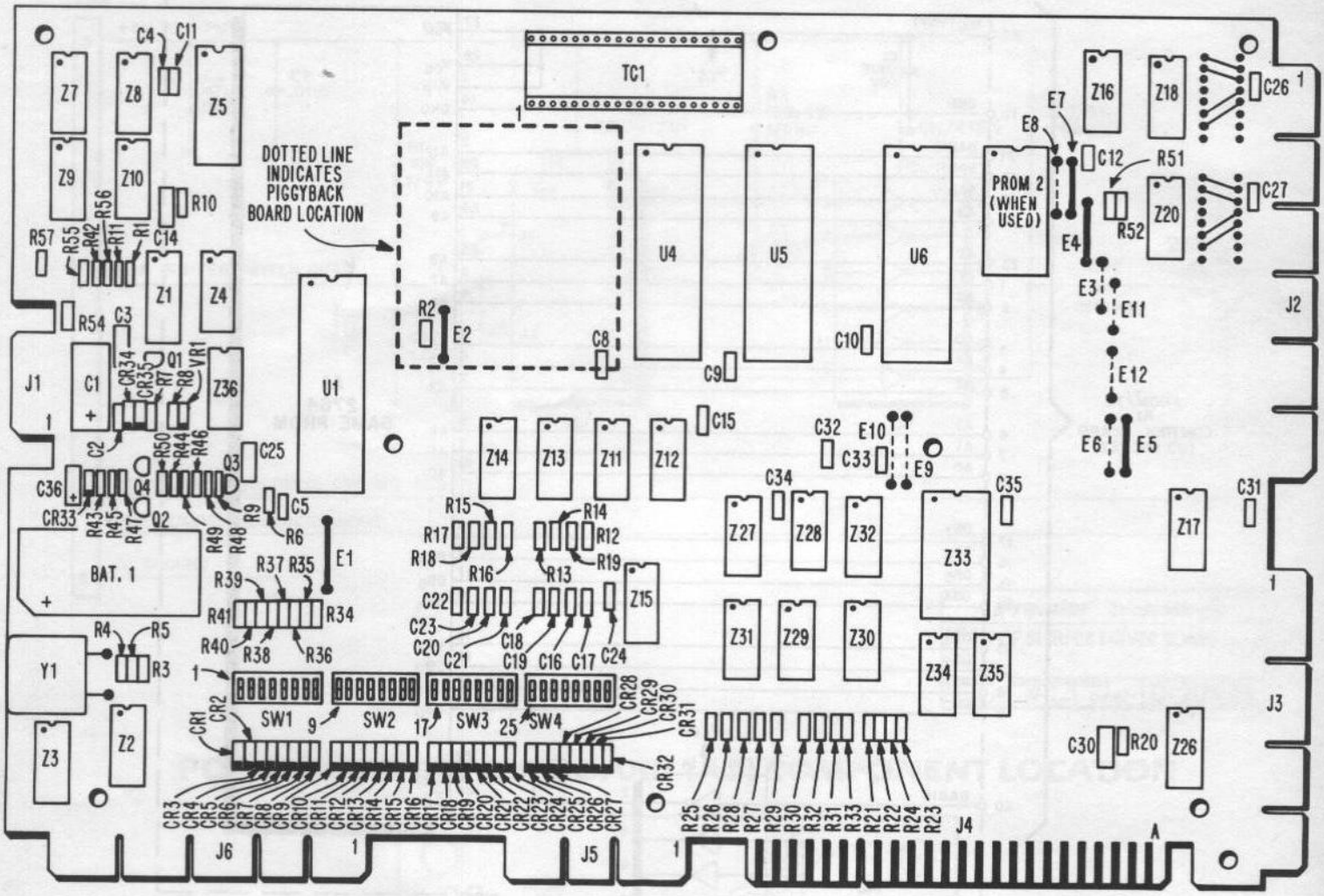


CONTROL BOARD (A1), PIGGYBACK PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Control Board (A1), Piggyback	MA689
A1	Game Prom, 2764	XO-489
A2	IC, 7404 Inverter	XO-402
C1	Capacitor, .01UF, +80% -20%, 50V	XO-229
	Socket, 28 Pin	XO-536

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

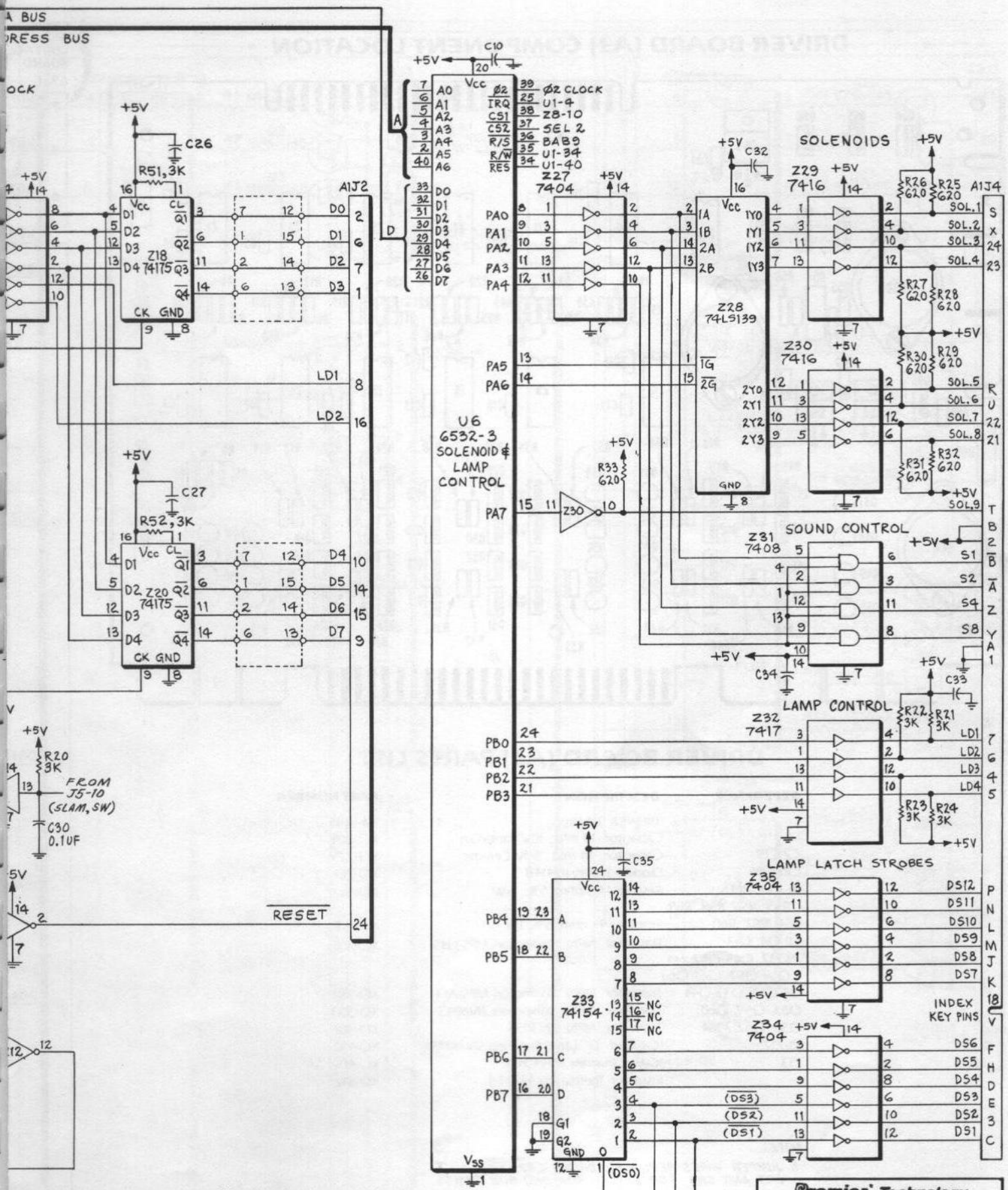
CONTROL BOARD (A1) COMPONENT LOCATION



CONTROL BOARD (A1) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	CONTROL BOARD	MA-774
Bat. 1	Battery-3.6V 326R10-002	XO-458
C1	Capacitor, 100 mfd., 10V	XO-211
C2, C4, C5, C8-C12, C15-C24, C26, C27, C31-C35	Capacitor, .01 mfd., 50V	XO-229
C3, C14, C25, C30	Capacitor, .1 mfd., 50V	XO-230
C36	10 mfd., 10V, TNT-AX CAP	XO-209
CR1-CR35	Diode, GP IN4148	XO-261
Q1, Q4	Transistor-PNP MPS-A70	XO-309
Q2, Q3	Transistor, NPN (Motorola) 2N4400	XO-313
R1, R6 R11-R24 R42, R45, R46, R48, R51, R52, R54-R57	Resistor, 3.0K ohm, 5%, ¼W	XO-23
R2, R34-R41	Resistor, 4.7K ohm, 5%, ¼W	XO-7
R3, R43, R49	Resistor, 5.6K ohm, 5%, ¼W	XO-19
R4, R5, R44	Resistor, 2.0K ohm, 5%, ¼W	XO-14
R7	Resistor, 62 ohm, 5%, ¼W	XO-3
R8, R50	Resistor, 180 ohm, 5%, ¼W	XO-24
R9	Resistor, 1K ohm, 5%, ¼W	XO-5
R10	Resistor, 2.7M ohm, 5%, ¼W	XO-13
R25-R33	Resistor, 620 ohm, 5%, ¼W	XO-4

REFERENCE	DESCRIPTION	PART NUMBER
R47	Resistor, 24K ohm, 5%, ¼W	XO-10
SW1-SW4	Dip Switch 1008-692	XO-505
TC1	Socket, 40 Pin 640379-3	XO-530
U1	CPU R6502P	XO-360
U4, U5, U6	PRIOT R6532P	XO-361
VR1	Diode-3.0V, 5% IN5225B or IN5987B	XO-269
Y1	Crystal, 3.579545 MHZ	XO-456
Z1	IC-Cmos-Dual 1 Shot SCL4528BE	XO-414
Z2	IC-Dual Flip Flop SN7474N	XO-423
Z3, Z11, Z12, Z16, Z17, Z26, Z27, Z34, Z35	IC-Hex Inverter SN7404N	XO-402
Z4	IC-Cmos-Quad 2 Input "And" SCL4081BE	XO-401
Z5	IC-Static Ram S5101-L	XO-356
Z7	IC-Hex Inverter SN74LS04N	XO-418
Z8	IC-2 Input "Nor" SN7402N	XO-421
Z9, Z13, Z14	IC-2 Input "Nand" SN7400N	XO-420
Z10	IC-Open Collector Inverter SN74LS05N	XO-411
Z15	IC-2 Input "Or" SN7432N	XO-407
Z18, Z20	IC-"D" Flip Flop SN74175N	XO-410
Z33	IC-4-16 Decoder SN74154N	XO-409
Z28	IC-2 to 4 Decoder SN74LS139N	XO-419
Z29, Z30	IC-Hex Inverter—OC/HV SN7416N	XO-405
Z31	IC-2 Input "And" SN7408N	XO-404
Z32	IC-Hex Buffer—OC SN7417N	XO-406
Z36	IC-Cmos SCL4069B	XO-424
	Socket 24 Pin 640361-3	XO-529
	CONTROL BOARD (A1), PIGGYBACK	MA689



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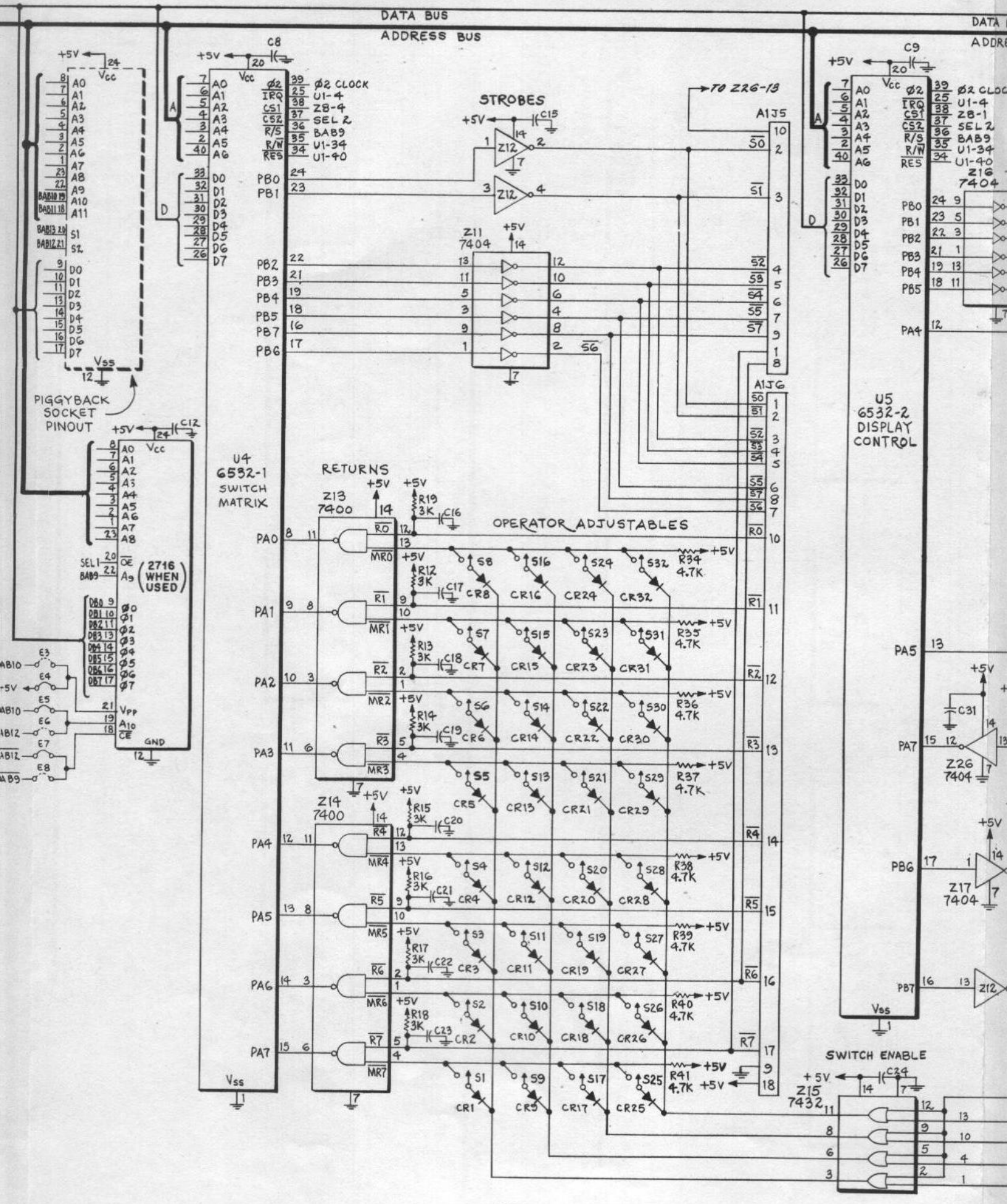
X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



NOTE: UNLESS OTHERWISE INDICATED;
1. RESISTORS ARE ±5%, 1/4W.
2. CAPACITORS ARE .01UF, 50V.
3. DIODES ARE TYPE 1N4148.
4. REF. DESIGNATION Z6 NOT USED.

SPARE GATES

Z3 7404 · Z30 7416
Z12 7404 · Z32 7417
Z27 7404 · Z32 7417
Z29 7416 · Z9 7400
Z29 7416 · Z9 7400
Z36 4069 · Z36 4069
Z36 4069 · Z36 4069

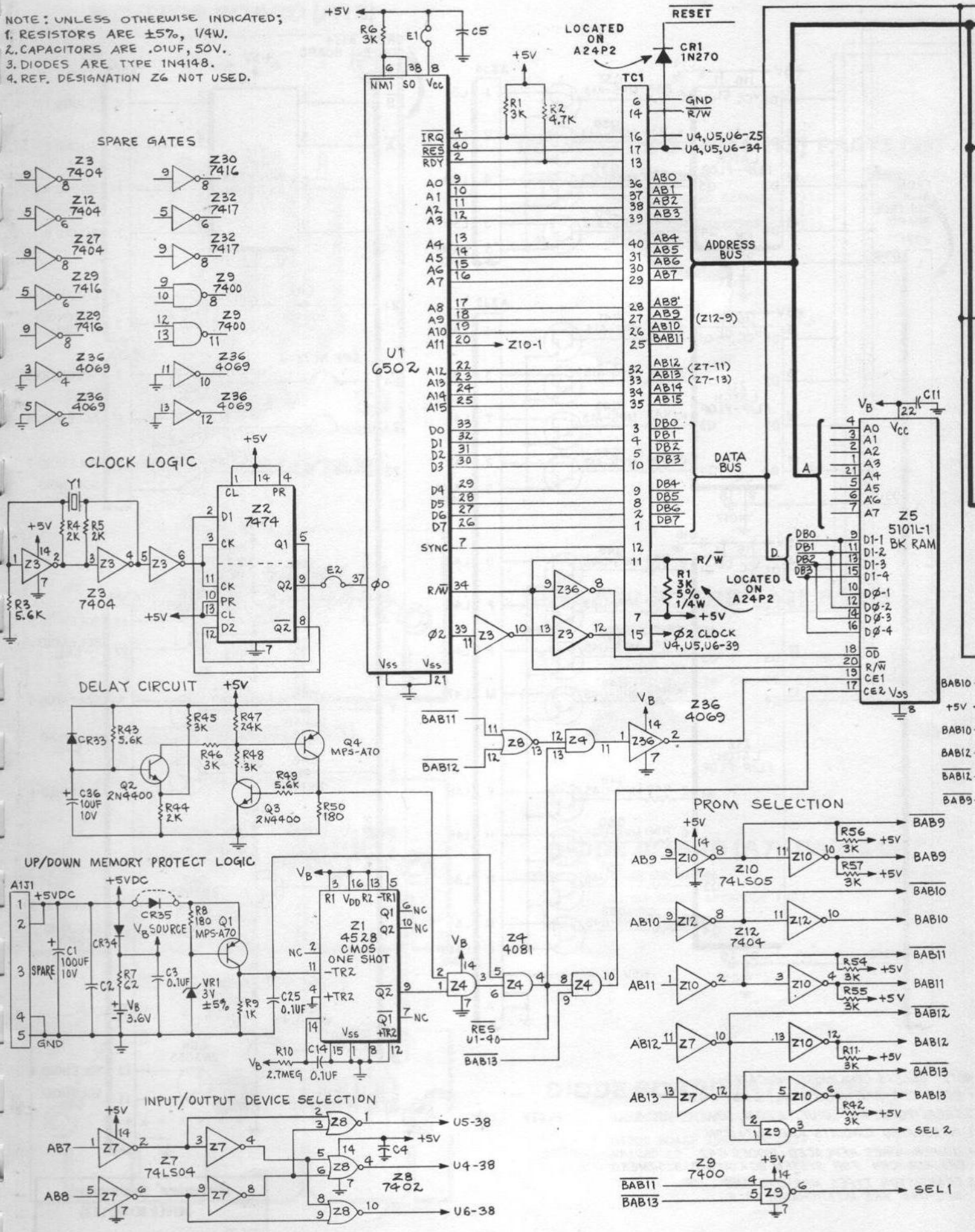
CLOCK LOGIC

DELAY CIRCUIT

UP/DOWN MEMORY PROTECT LOGIC

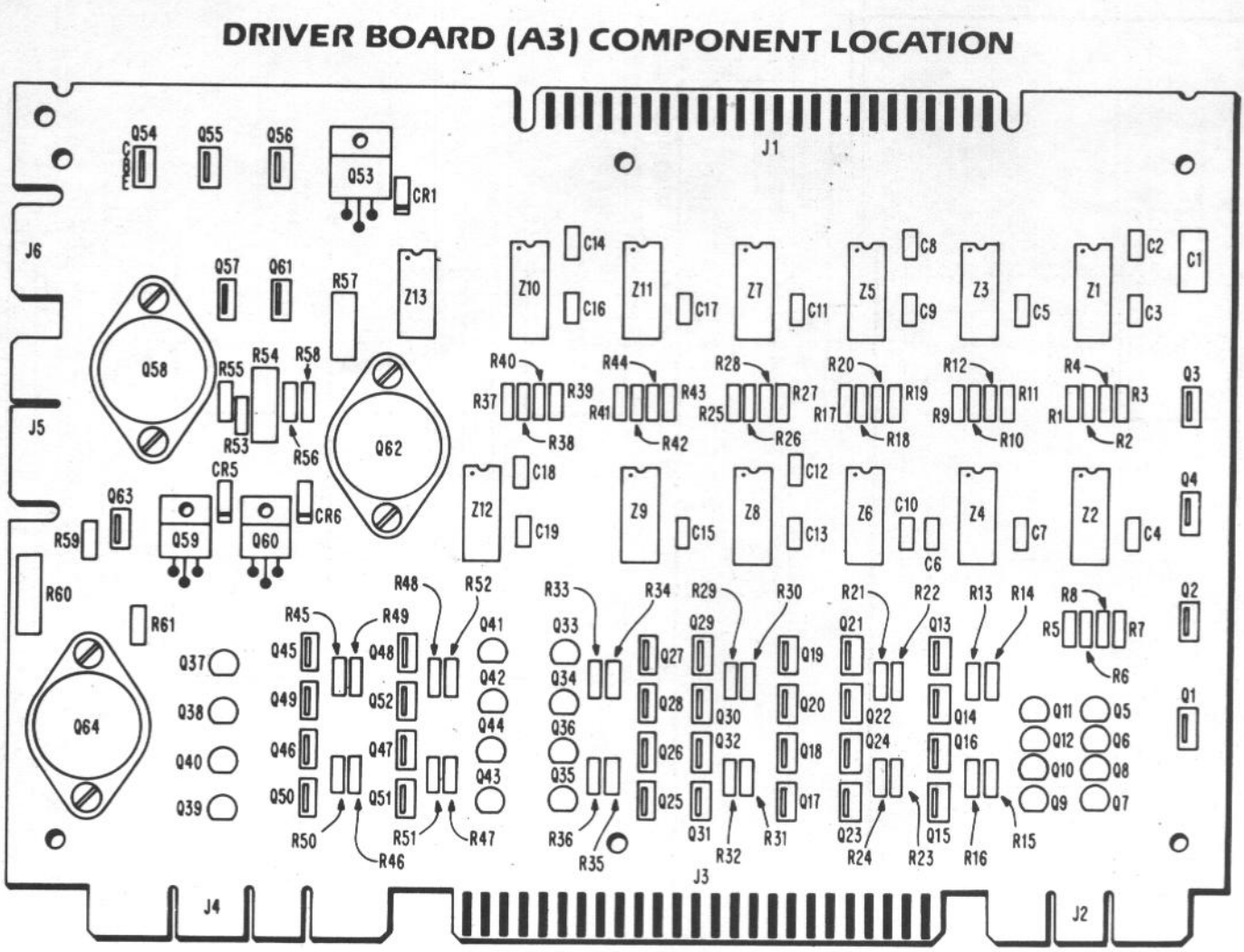
INPUT/OUTPUT DEVICE SELECTION

PROM SELECTION



X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DRIVER BOARD (A3) COMPONENT LOCATION

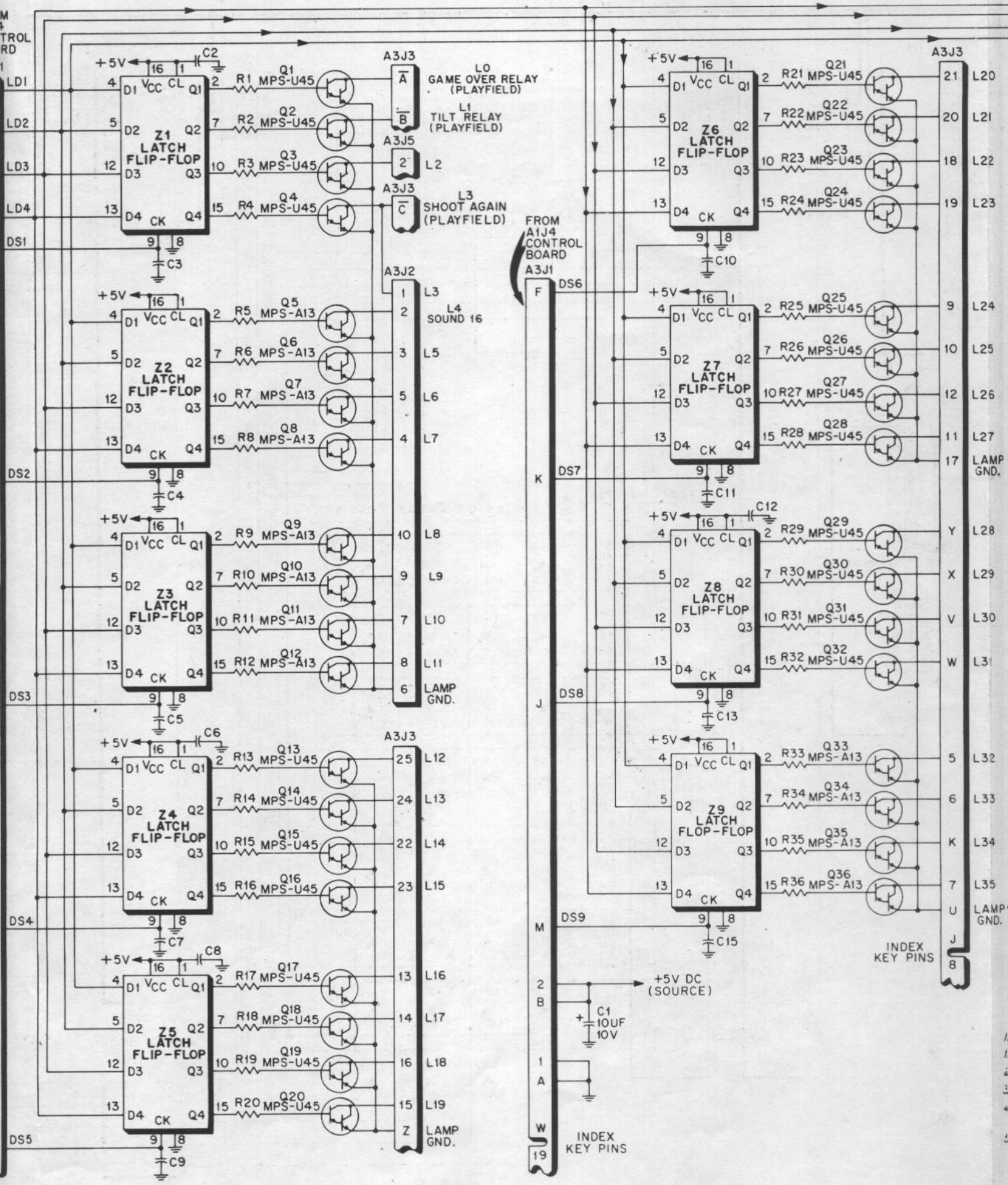


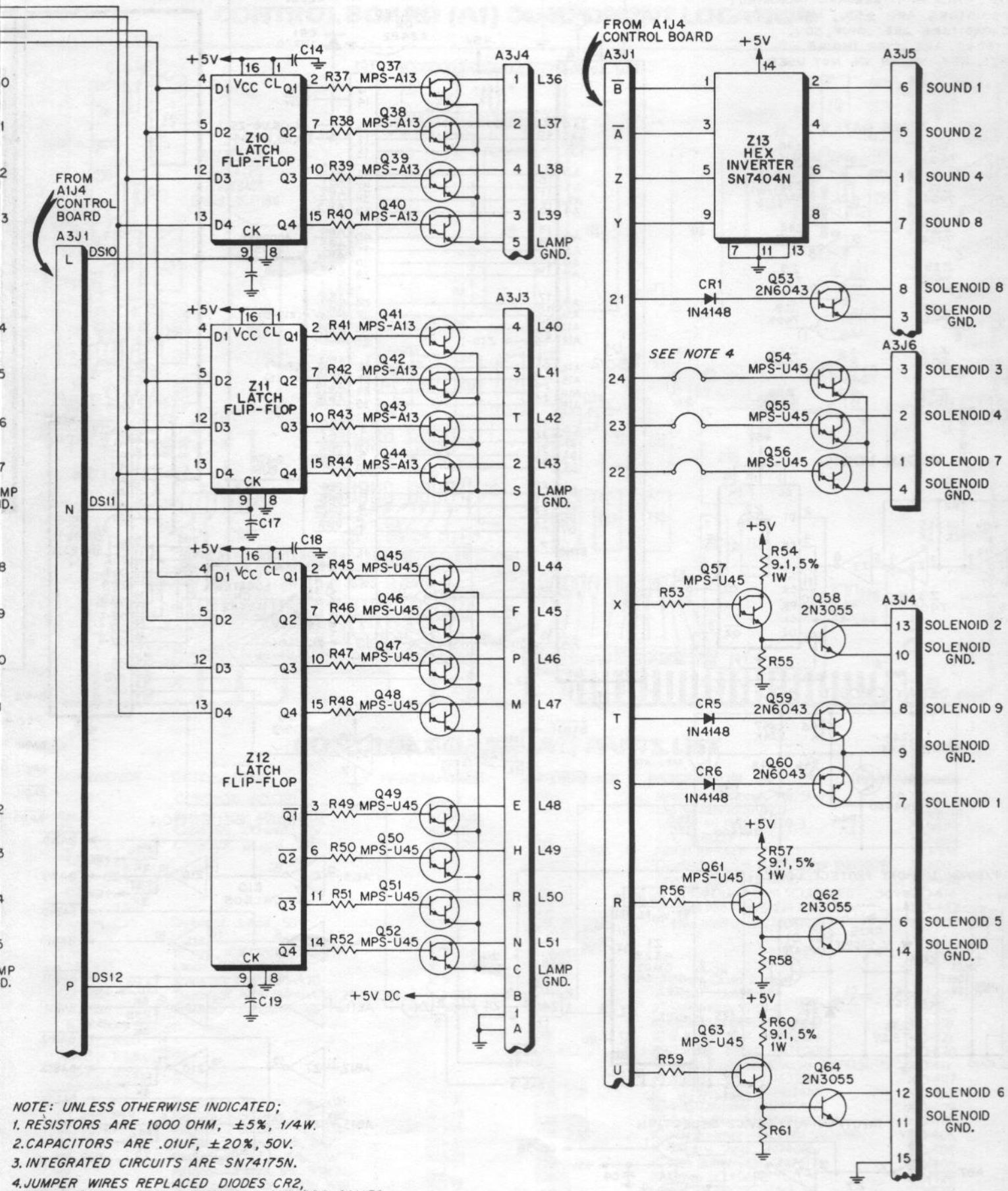
DRIVER BOARD (A3) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	DRIVER BOARD	MA-295
C1	Capacitor, 10 mfd, 10V Tantalum	XO-209
C2-C19	Capacitor, 01 mfd, 50V Ceramic	XO-229
CR1-CR6	Diode—Silicon 1N4148	XO-261
R1-R53, R61, R55, R56, R58, R59	Resistor 1.0K ohm, 5%, ¼W	XO-5
R54, R57, R60	Resistor, 91 ohm, 5%, 1W	XO-158
Q1-Q4, Q13-Q32, Q45-Q52, Q54-Q57, Q61, Q63	Transistor, NPN, Darlington MPS-U45	XO-306
Q5-Q12, Q33-Q44	Transistor, NPN, Darlington MPS-A13	XO-304
Q53, Q59, Q60	Transistor, NPN, Darlington 2N6043	XO-303
Q58, Q62, Q64	Transistor, NPN, 2N3055	XO-301
Z1-Z12	IC-Quad "D" Latch Flip Flop SN74175N	XO-410
Z13	IC-Hex Inverter SN7404N	XO-402
	Insulator-Thermalloy 43-03-4	XO-512

NOTE:

1. *JUMPER WIRES REPLACED DIODES CR2, CR3 AND CR4 FOR SYSTEM 80A AND 80B GAMES.*
2. *TRANSISTOR TYPES MPS-U45 AND NDS-U45 ARE INTERCHANGEABLE.*


TROL
RD
LD1
LD2
LD3
LD4
DS1
DS2
DS3
DS4
DS5
+5V
Z1 LATCH FLIP-FLOP
Z2 LATCH FLIP-FLOP
Z3 LATCH FLIP-FLOP
Z4 LATCH FLIP-FLOP
Z5 LATCH FLIP-FLOP
Z6 LATCH FLIP-FLOP
Z7 LATCH FLIP-FLOP
Z8 LATCH FLIP-FLOP
FLOP-FLOP
Q1 MPS-U45
Q2 MPS-U45
Q3 MPS-U45
Q4 MPS-U45
Q5 MPS-A13
Q6 MPS-A13
Q7 MPS-A13
Q8 MPS-A13
Q9 MPS-A13
Q10 MPS-A13
Q11 MPS-A13
Q12 MPS-A13
Q13 MPS-U45
Q14 MPS-U45
Q15 MPS-U45
Q16 MPS-U45
Q17 MPS-U45
Q18 MPS-U45
Q19 MPS-U45
Q20 MPS-U45
Q21 MPS-U45
Q22 MPS-U45
Q23 MPS-U45
Q24 MPS-U45
Q25 MPS-U45
Q26 MPS-U45
Q27 MPS-U45
Q28 MPS-U45
Q29 MPS-U45
Q30 MPS-U45
Q31 MPS-U45
Q32 MPS-U45
Q33 MPS-A13
Q34 MPS-A13
Q35 MPS-A13
Q36 MPS-A13
A3J3
A3J5
A3J2
A3J1
LO GAME OVER RELAY (PLAYFIELD)
L1 TILT RELAY (PLAYFIELD)
L2
L3 SHOOT AGAIN (PLAYFIELD)
L3
L4 SOUND 16
LAMP GND.
FROM A1J4 CONTROL BOARD
DS6
DS7
DS8
DS9
INDEX KEY PINS
+5V DC (SOURCE)
C1 10UF 10V
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C15



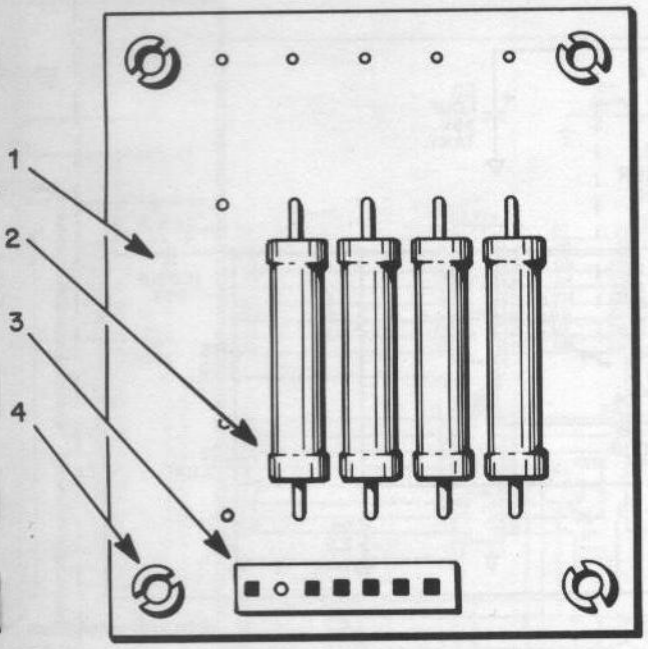
NOTE: UNLESS OTHERWISE INDICATED;

1. RESISTORS ARE 1000 OHM, ±5%, 1/4W.
2. CAPACITORS ARE .01UF, ±20%, 50V.
3. INTEGRATED CIRCUITS ARE SN74175N.
4. JUMPER WIRES REPLACED DIODES CR2, CR3 AND CR4 FOR SYSTEM 80A AND 80B GAMES.
5. TRANSISTOR TYPES MPS-U45 AND NDS-U45 ARE INTERCHANGEABLE.

Premier Technology			
TITLE: DRIVER BOARD (A3)			
USED ON			
DRAWN: CP	APPROVED: BAM	DATE: 12-12-80	E-20915

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

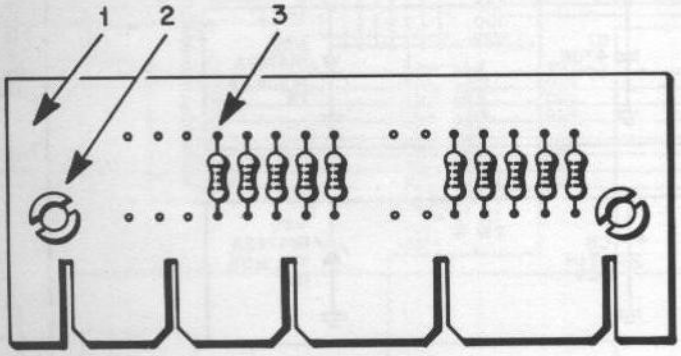
RESISTOR BOARD (A13)



RESISTOR BOARD (A13) PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	RESISTOR BOARD ASSEMBLY (A13)	25231
2	RESISTOR, 4 OHM, 7W, WW, (4)	XO-878
3	7 POSITION CONNECTOR (A13P1)	XO-526
4	SPACER (4)	23984

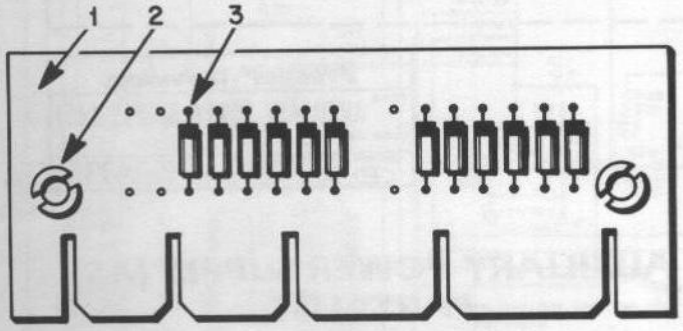
RESISTOR BOARD (A7)



RESISTOR BOARD (A7) PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	RESISTOR ASSEMBLY	25230
2	SPACER (2)	23984
3	RESISTOR, 4.7K OHM, 5%, 1/4W, (10)	XO-7

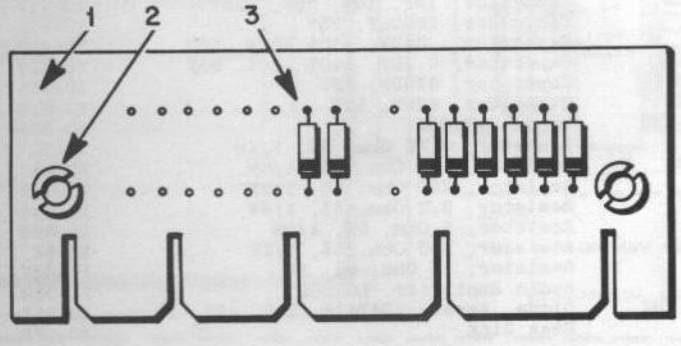
DIODE BOARD (A7)



DIODE BOARD (A7) PARTS LIST

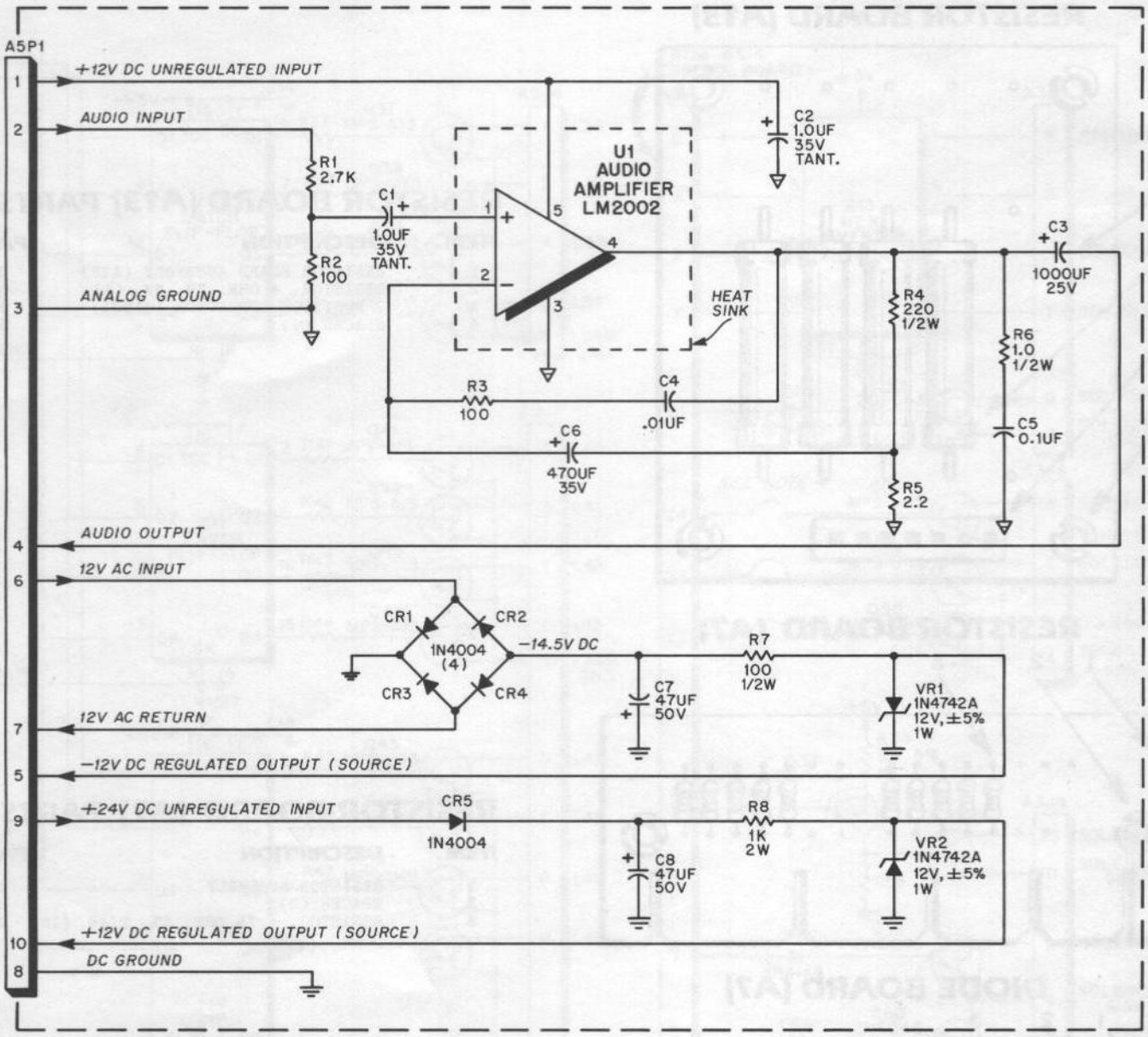
ITEM	DESCRIPTION	PART NO.
1	DIODE BOARD ASSEMBLY (A7)	25229
2	SPACER (2)	23984
3	DIODE, 1N270 (12)	XO-265

DIODE BOARD (A7)

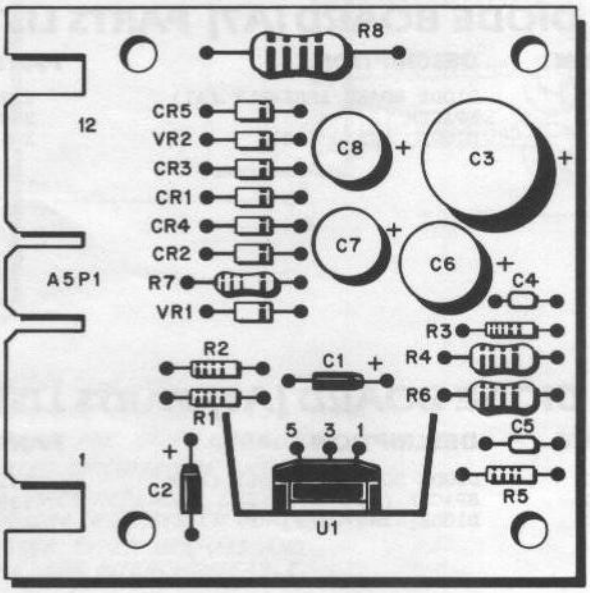


DIODE BOARD (A7) PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	DIODE BOARD ASSEMBLY (A7)	24252
2	SPACER (2)	23984
3	DIODE, 1N270 (8)	XO-265



AUXILIARY POWER SUPPLY (A5) COMPONENT LOCATION



Premier Technology

TITLE AUXILIARY POWER SUPPLY (A5)

USED ON

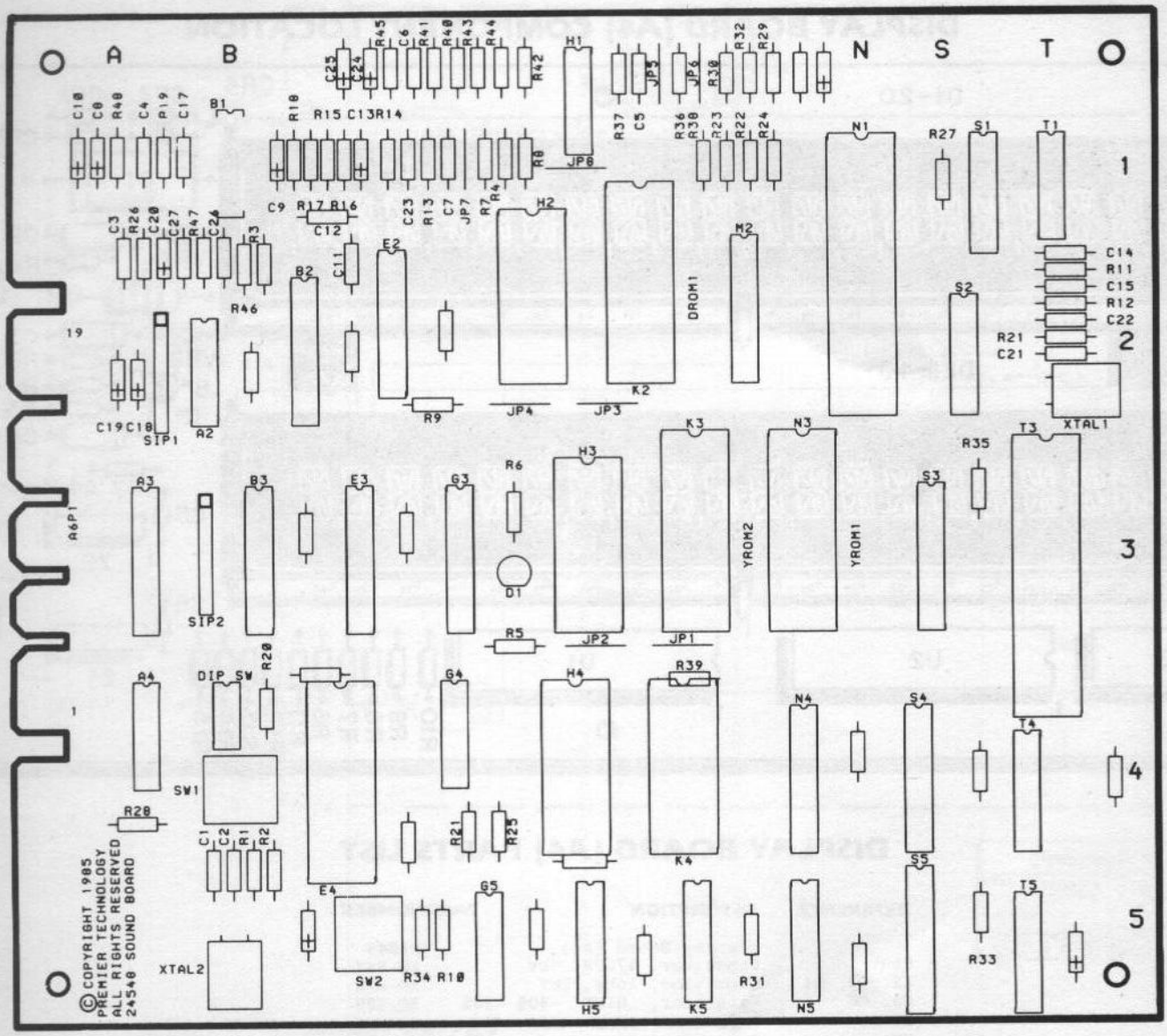
DRAWN	APPROVED	DATE	
CP	R.H.M.	9-OCT-85	E-24715

AUXILIARY POWER SUPPLY (A5) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Auxiliary Power Supply	MA-767
C1,C2	Capacitor, 1UF, 10%, 35V, TANT	XO-715
C3	Capacitor, 1000UF, 25V	XO-874
C4	Capacitor, .01UF, +80% -20%, 50V	XO-229
C5	Capacitor, 0.1UF, +80% -20%, 50V	XO-230
C6	Capacitor, 470UF, 35V	XO-284
C7,C8	Capacitor, 47UF, 50V	XO-210
CR1-CR5	Diode, 1N4004	XO-254
R1	Resistor, 2.7K Ohm, 5%, 1/4W	XO-6
R2,R3	Resistor, 100 Ohm, 5%, 1/4W	XO-28
R4	Resistor, 220 Ohm, 5%, 1/2W	XO-185
R5	Resistor, 2.2 Ohm, 5%, 1/4W	XO-595
R6	Resistor, 1 Ohm, 5%, 1/2W	XO-593
R7	Resistor, 100 Ohm, 5%, 1/2W	XO-52
R8	Resistor, 1K Ohm, 5%, 2W	XO-627
U1	Audio Amplifier, LM2002	XO-550
VR1,VR2	Diode, Zener, 1N4742A, 12V, ±5%, 1W	XO-257
	Heat Sink	XO-472

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

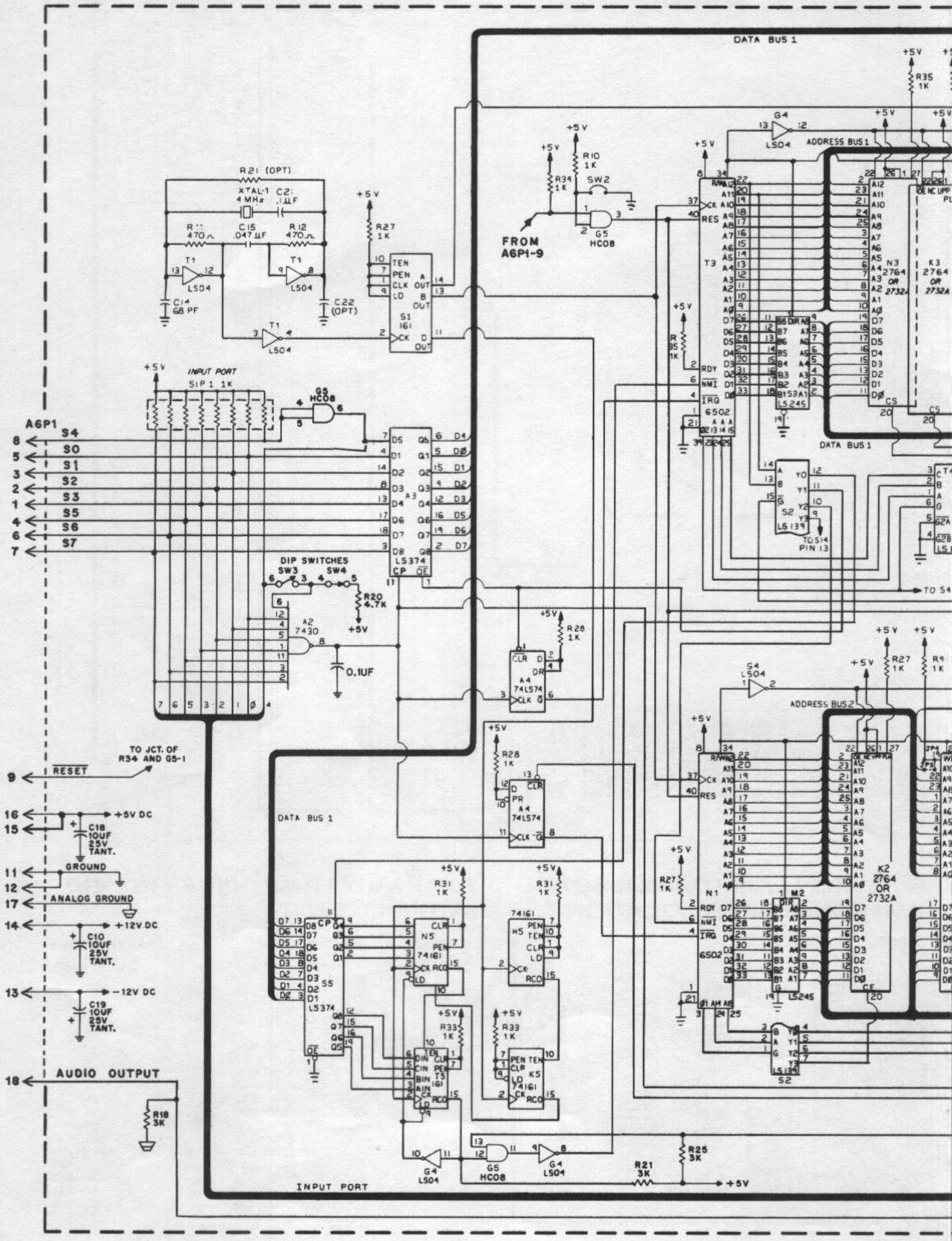
SOUND BOARD (A6) COMPONENT LOCATION

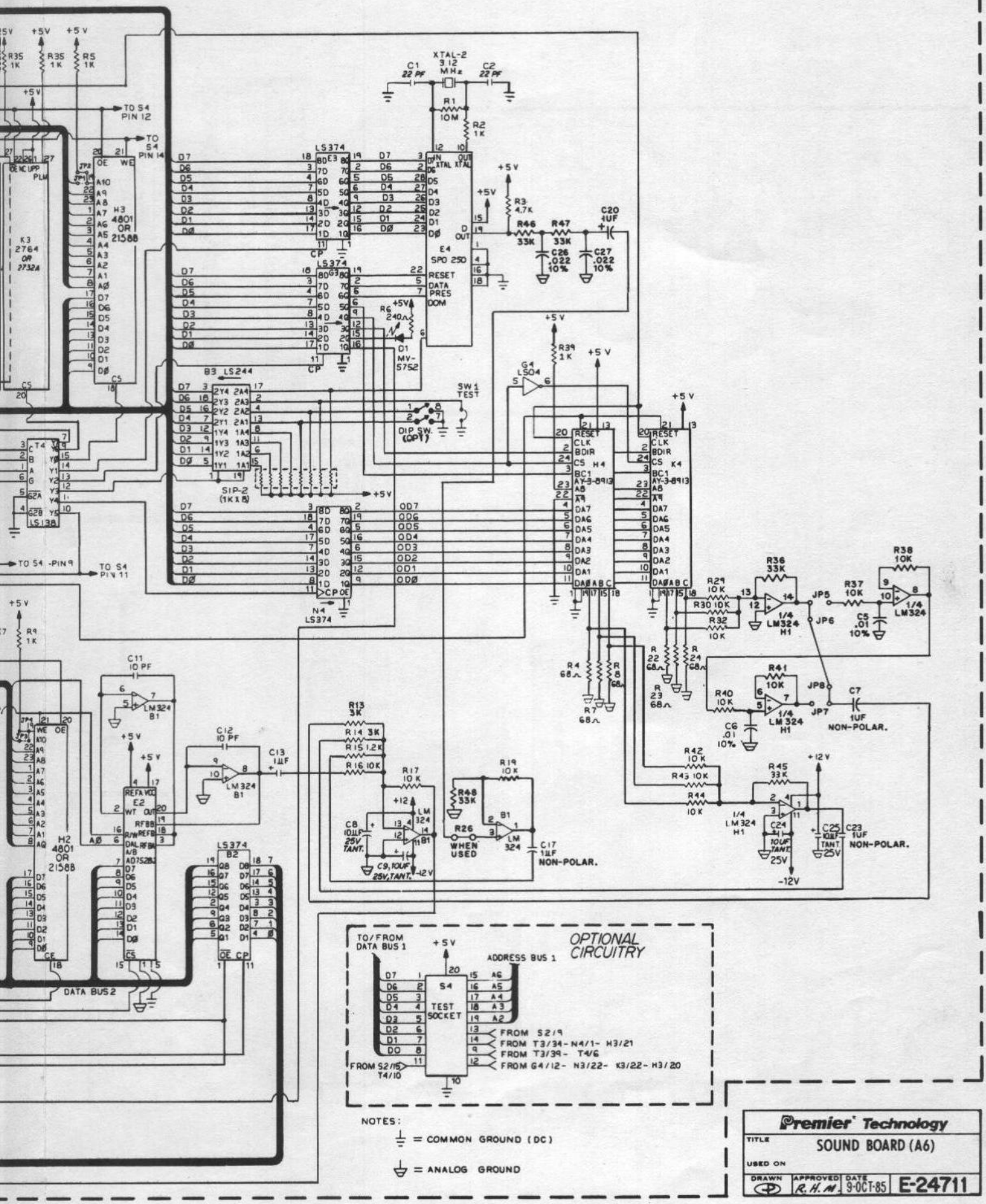


SOUND BOARD (A6) PARTS LIST

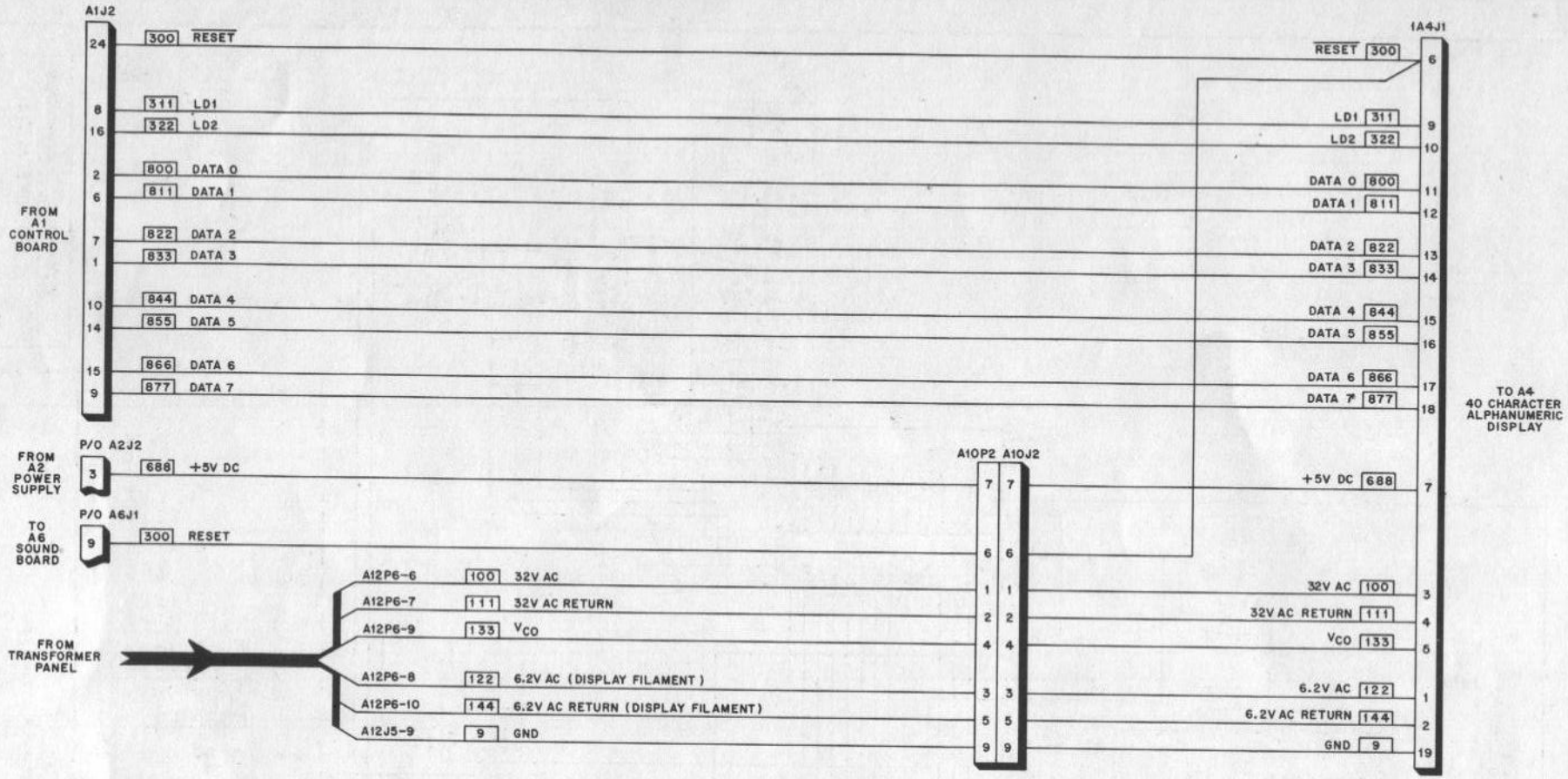
REFERENCE	DESCRIPTION	PART NUMBER
	Sound Board Assembly (A6)	MA766
C1,C2	Capacitor, 22PF, 50V MONO AX-CM, 10%	XO-633
C5,C6	Capacitor, .01UF, 50V AX-CM, 10%	XO-696
C7,C17,C23	Capacitor, 1UF, 50V CM-RD (AX) Non-Polarized	XO-294 (XO-746)
C8,C9,C10, C18,C19,C24, C25,and ALL UNMARKED POLARIZED CAPACITORS	Capacitor, 10UF, 25V TANT-AX, 20%, Polarized	XO-127
C11,C12	Capacitor, 10PF, 50V AX-CM +80%-20%	XO-635
C13,C20	Capacitor, 1UF, 35V TANT-AX, 10%	XO-715
C14	Capacitor, 68PF, 50V MONO AX-CM, 10%	XO-636
C15	Capacitor, .047UF, 50V MONO AX-CM, 20%	XO-638
C21,and ALL UNMARKED CAPACITORS	Capacitor, 0.1UF, 50V AX-CM, +80%-20%	XO-230
C26,C27	Capacitor, .022UF, 50V AX-CM, 10%	XO-873
D1	Diode, MV5752	XO-270
DIP SW	Dip Switch, 4 Position, 8 Pin	XO-640
R1	Resistor, 10M Ohm, 5%, 1/4W	XO-73
R2,R5,R9 R10,R27,R28, R31,R33-R35, R39	Resistor, 1K Ohm, 5%, 1/4W	XO-5
R3,R20	Resistor, 4.7K Ohm, 5%, 1/4W	XO-7
R4,R7,R8 R22-R24	Resistor, 68 Ohm, 5%, 1/4W	XO-748

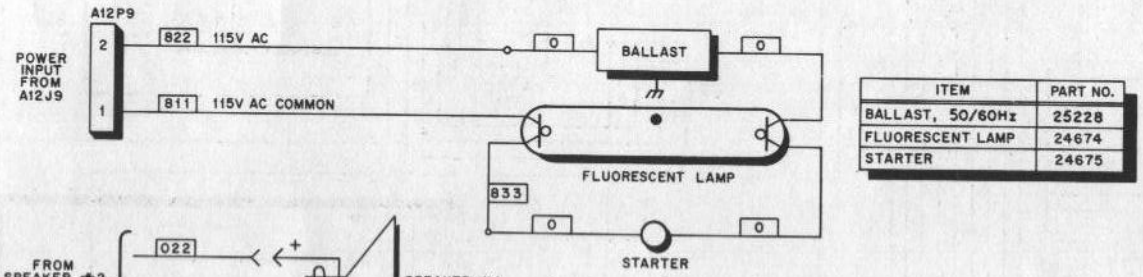
REFERENCE	DESCRIPTION	PART NUMBER
R6	Resistor, 240 Ohm, 5%, 1/4W	XO-173
R11,R12	Resistor, 470 Ohm, 5%, 1/4W	XO-35
R13,R14,R18, R21,R25	Resistor, 3K Ohm, 5%, 1/4W	XO-23
R15	Resistor, 1.2K Ohm, 5%, 1/4W	XO-175
R16,R17,R19	Resistor, 10K Ohm, 5%, 1/4W	XO-18
R29,R30,R32, R37,R38,R40-R44		
R36,R45-R48	Resistor, 33K Ohm, 5%, 1/4W	XO-43
SIP1,SIP2	Resistor Pack, SIP, 1K Ohm, 9 Pin	XO-493
SW1,SW2	Switch, Push Button, N.O.	XO-365
XTAL 1	Crytsal, 4.0 MHZ	XO-366
XTAL 2	Crystal, 3.12 MHZ	XO-639
A2	7430 8-input "NAND" gate	XO-643
A3,B2	74LS374 Octal D-type flip flop	XO-96
A4	74LS74 Dual D-type flip flop	XO-434
B1,H1	LM324 Quad op-amp	XO-644
B3	74LS244 Octal buffer/driver	XO-117
E2	AD7528J DAC	XO-647
E3,G3,N4,S5	74LS374 Octal D-type flip flop	XO-96
E4	SP0250 Speech generator	XO-645
G4,T1	74LS04 Hex Inverter	XO-418
G5	74HC08 Quad 2-input "AND" gate	XO-872
H2,H3	2K x 8 RAM (6116) (200NS)	XO-191
H4,K4	AY-3-8913 Sound generator	XO-646
H5,K5,N5, S1,T5	74161 Synchronous presettable binary counter	XO-192
K2,K3,N3	2764 EProm	XO-489
N1,T3	R6502-13 CPU	XO-360
M2,S3	74LS245 Octal bus transceiver	XO-79
S2	74LS139 Dual 1 of 4 decoder	XO-419
T4	74LS138 1 of 8 decoder/ demultiplexor	XO-437
	28 Pin Dip Socket (4)	XO-536
	Jumper, 22 GA (5)	XO-469


DATA BUS 1
ADDRESS BUS1
ADDRESS BUS2
FROM A6P1-9
A6P1
INPUT PORT
DIP SWITCHES
SW3
SW4
TO JCT. OF R34 AND G5-1
RESET
+5V DC
GROUND
ANALOG GROUND
+12V DC
-12V DC
AUDIO OUTPUT
TO S4
TO S14 PIN 13
INPUT PORT



Premier Technology			
TITLE: SOUND BOARD (A6)			
USED ON			
DRAWN	APPROVED	DATE	E-24711
CP	R.H.M.	9-OCT-85	

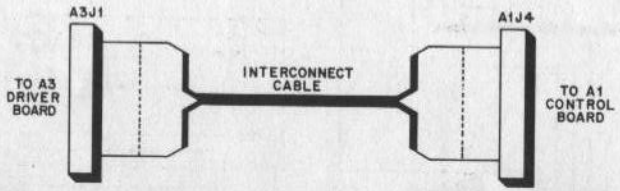




ITEM	PART NO.
BALLAST, 50/60Hz	25228
FLUORESCENT LAMP	24674
STARTER	24675

SEE PLAYBOARD SCHEMATIC FOR AUXILIARY LIGHTBOX LAMP CIRCUITRY

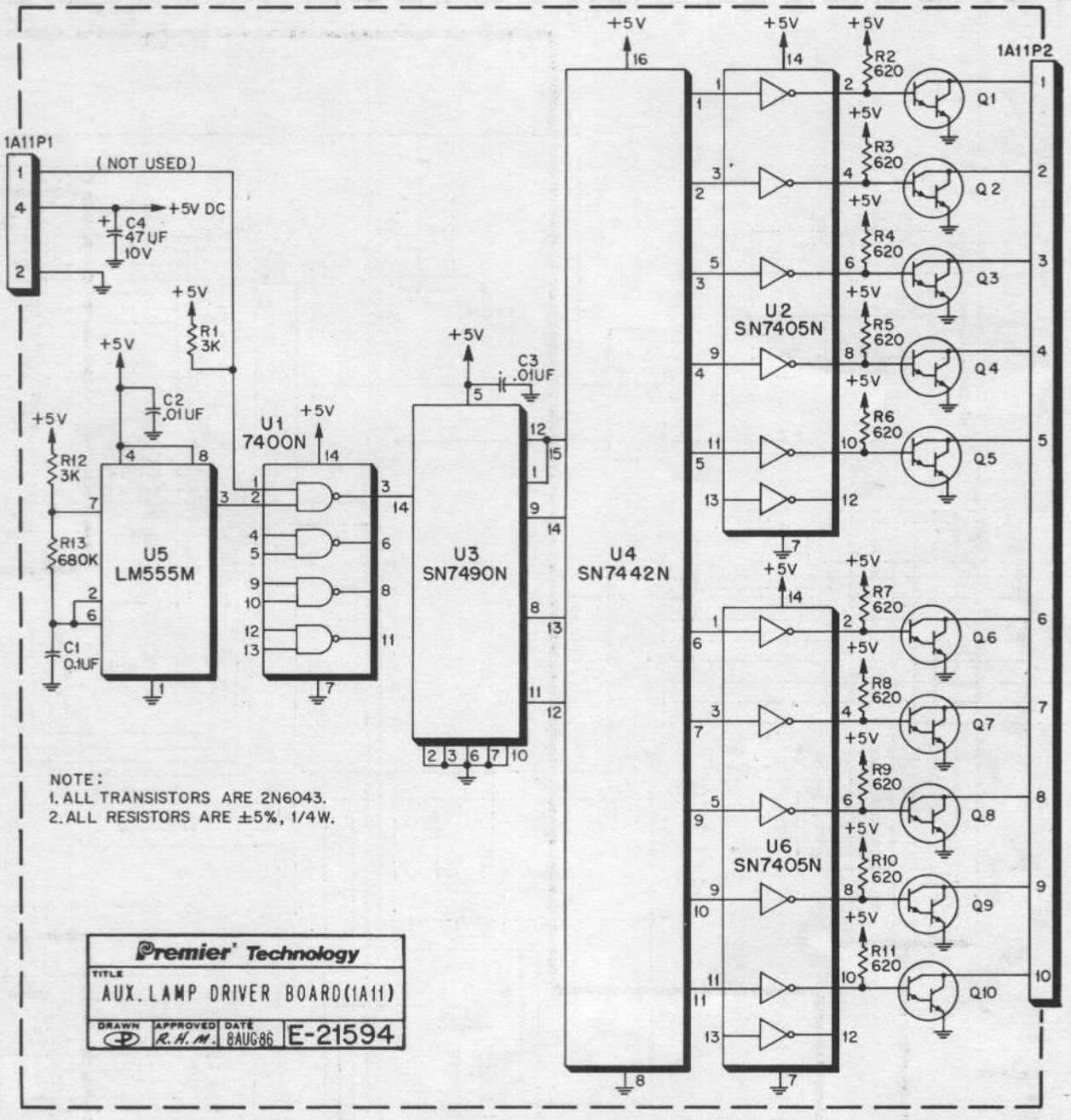
COLOR CODE			
0	BLACK	5	GREEN
1	BROWN	6	BLUE
2	RED	7	PURPLE
3	ORANGE	8	GRAY
4	YELLOW	9	WHITE



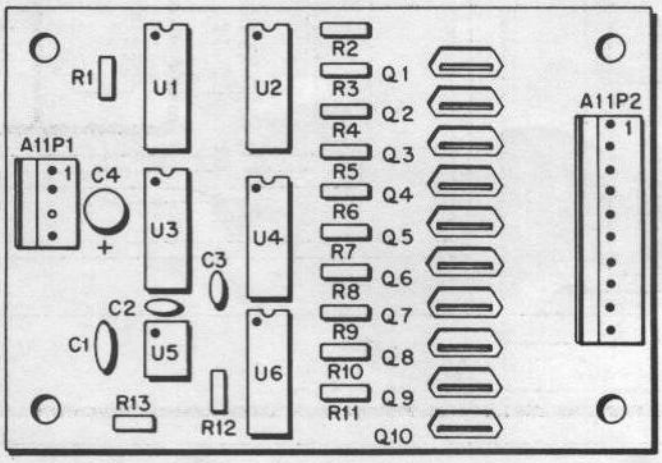
Premier Technology

TITLE: LIGHTBOX. SCHEMATIC/ WIRING DIAGRAM

DRAWN	APPROVED	DATE	E-25052
	R.H.M.	8-AUG-86	



AUXILIARY LAMP DRIVER BOARD (A11) COMPONENT LOCATION

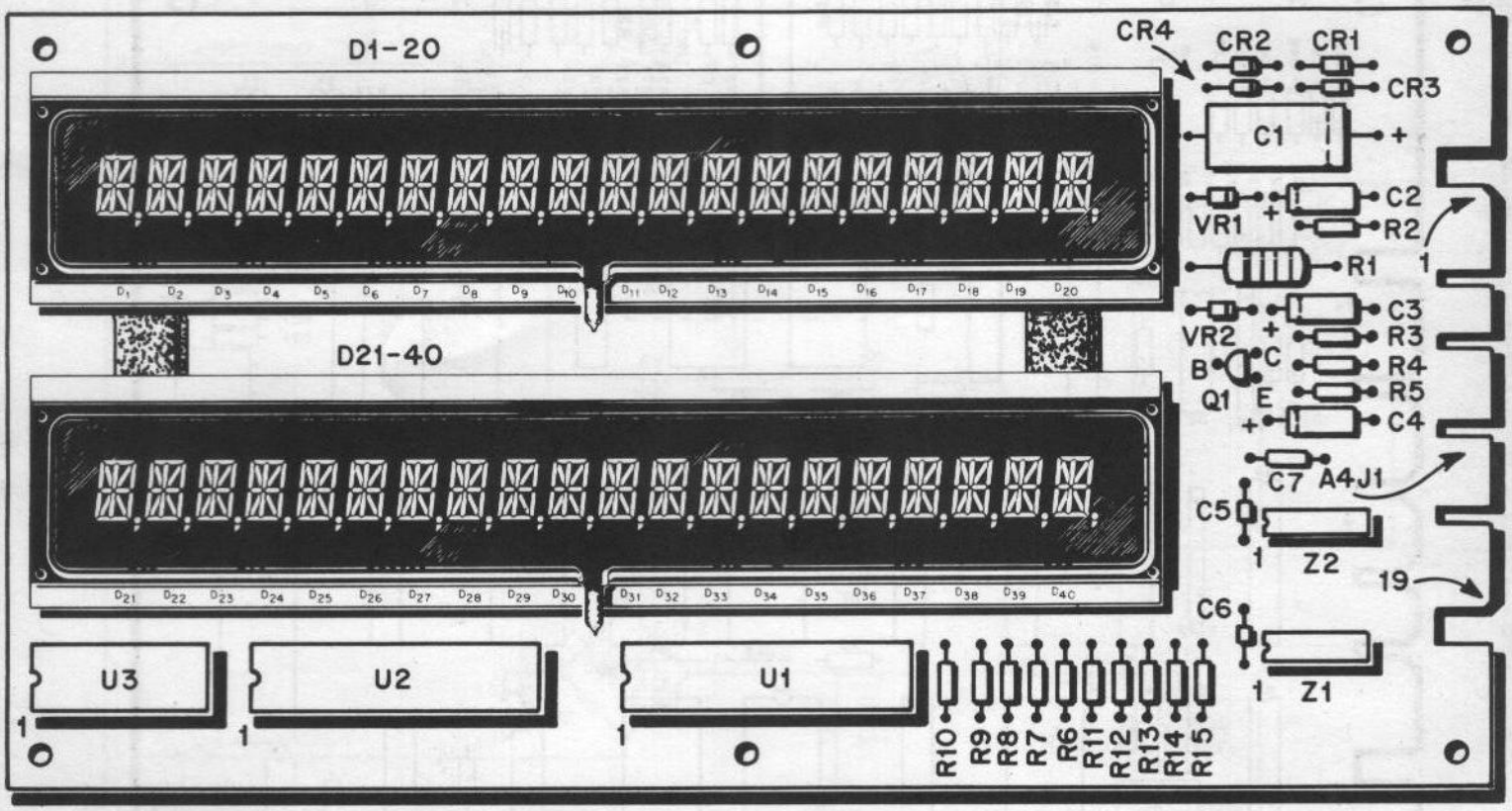


AUXILIARY LAMP DRIVER BOARD (A11) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	AUXILIARY LAMP DRIVER ASSEMBLY	MA-866
C1	CAPACITOR, .1 MFD, 100V CERAMIC RADIAL LEAD	XO-626
C2-C3	CAPACITOR, .01 MFD, 100V RADIAL LEAD	XO-202
C4	CAPACITOR, 47 MFD, 10V ELECTROLYTIC RADIAL LEAD	XO-227
Q1-Q10	TRANSISTOR, 2N6043 NPN DARLINGTON	XO-303
R1,R12	RESISTOR, 3K OHM, 5%, 1/4 W	XO-23
R2-R11	RESISTOR, 620 OHM, 5%, 1/4W	XO-4
R13	RESISTOR, 680K OHM, 5%, 1/4W	XO-669
U1	I.C. 2-INPUT NAND	XO-420
U2,U6	I.C. INVERTER	XO-403
U3	I.C. DECADE COUNTER	XO-425
U4	I.C. DECODER	XO-426
U5	I.C. TIMER	XO-631
P2	10 POS. CONNECTOR	XO-531
P1	4 POS. CONNECTOR	XO-532

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

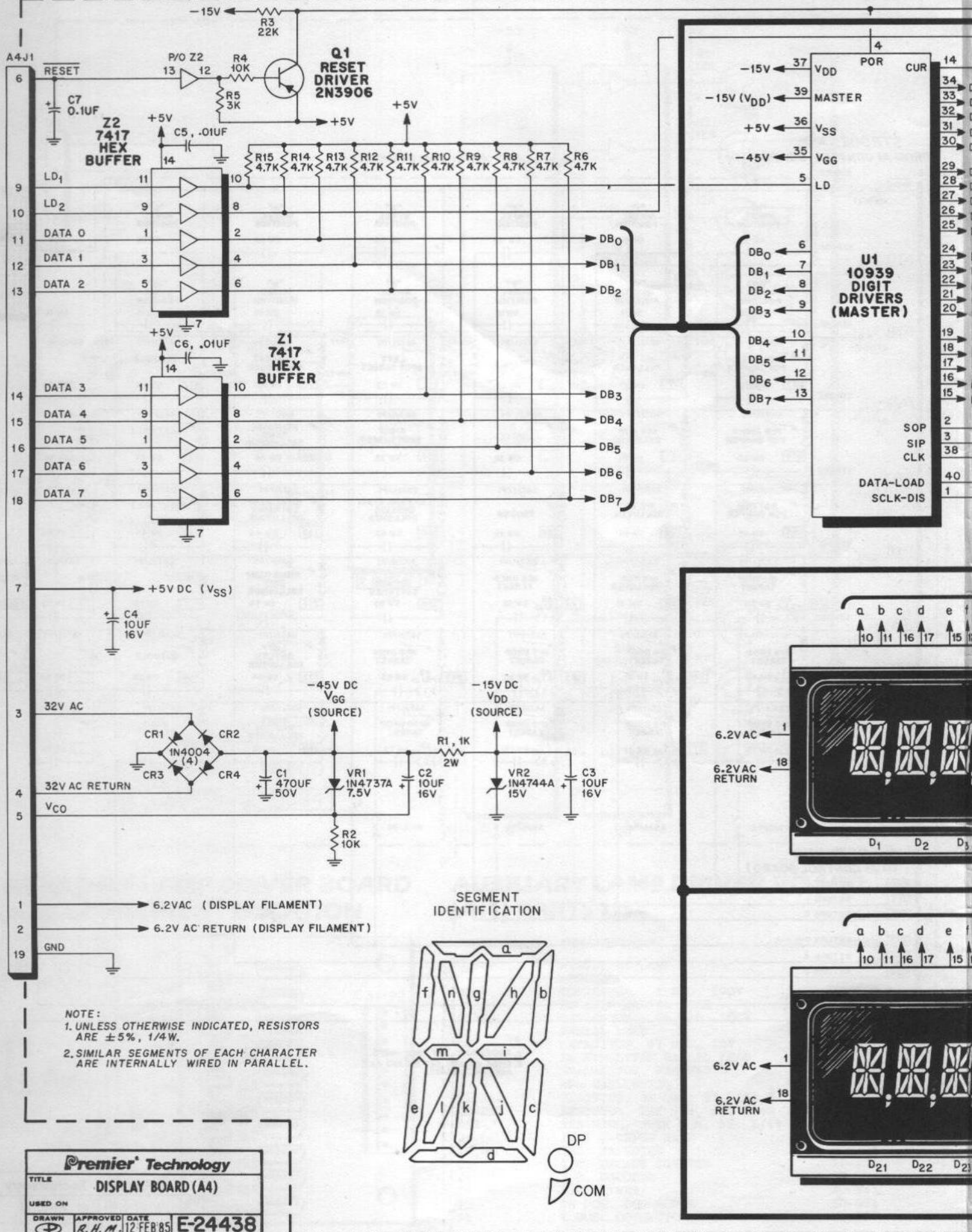
DISPLAY BOARD (A4) COMPONENT LOCATION



DISPLAY BOARD (A4) PARTS LIST

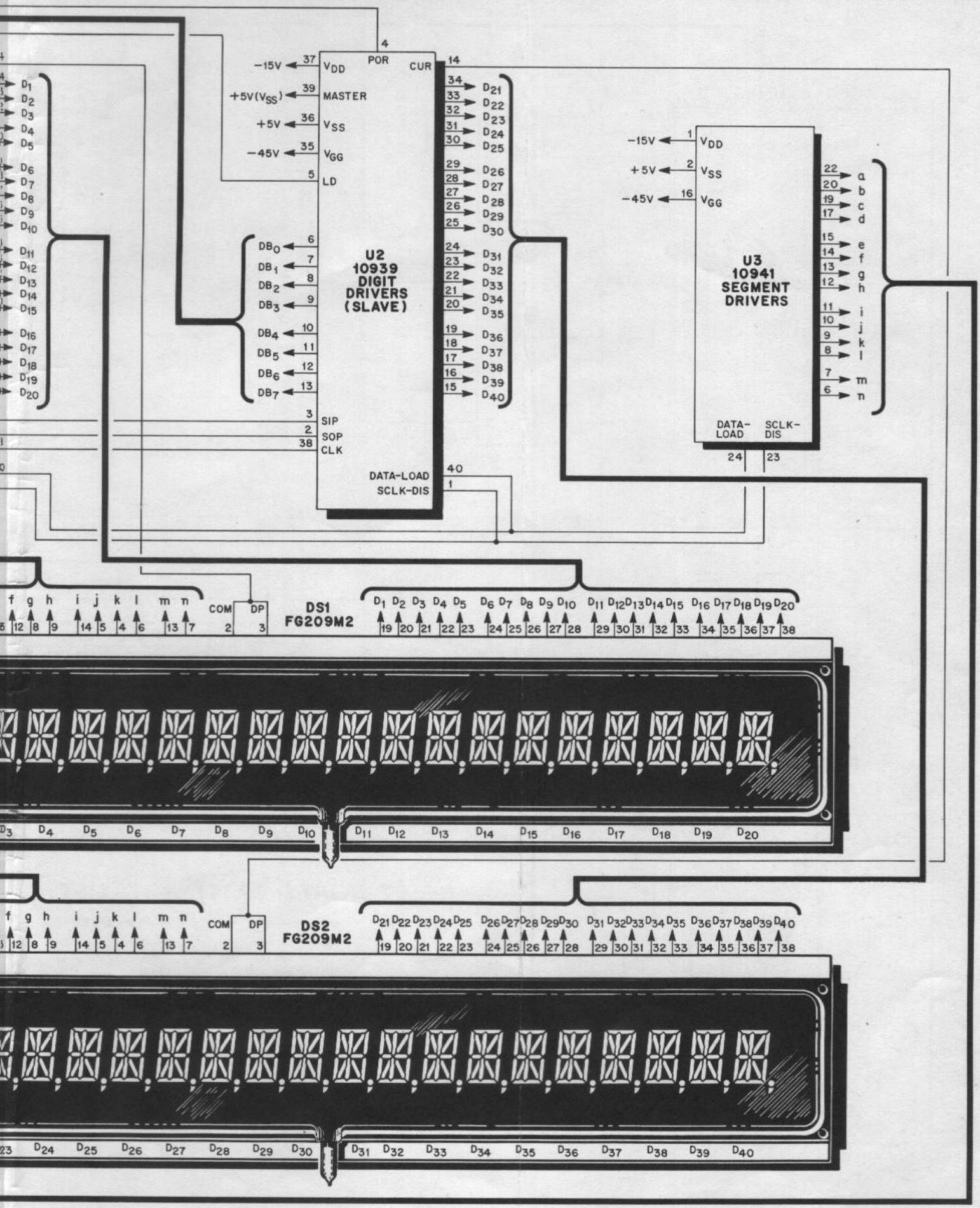
REFERENCE	DESCRIPTION	PART NUMBER
	Display Board (A4)	MA644
C1	Capacitor, 470UF, 50V	XO-847
C2, C3, C4	Capacitor, 10UF, 16V	XO-846
C5, C6	Capacitor, .01UF, +80% -20%	XO-229
*C7	Capacitor, 0.1UF, 50V	XO-230
CR1-CR4	Diode, 1N4004	XO-254
DS1, DS2	Display, Alphanumeric	XO-840
Q1	Transistor, PNP, 2N3906	XO-588
R1	Resistor, 1K, 5%, 2W	XO-627
R2, R4	Resistor, 10K, 5%, 1/4W	XO-18
R3	Resistor, 22K, 5%, 1/4W	XO-42
R5	Resistor, 3K, 5%, 1/4W	XO-23
R6-R15	Resistor, 4.7K, 5%, 1/4W	XO-7
U1, U2	IC, Digit Drivers, 10939	XO-841
U3	IC, Segment Drivers, 10941	XO-842
VR1	Diode, Zener, 1N4737A, 7.5V	XO-844
VR2	Diode, Zener, 1N4744A, 15V	XO-843
Z1, Z2	IC, Hex Buffer, 7417	XO-406
	Tape, Vinyl Foam	24127-1

*C7 IS LOCATED ON THE NON-COMPONENT SIDE OF THE BOARD IN SOME CASES.

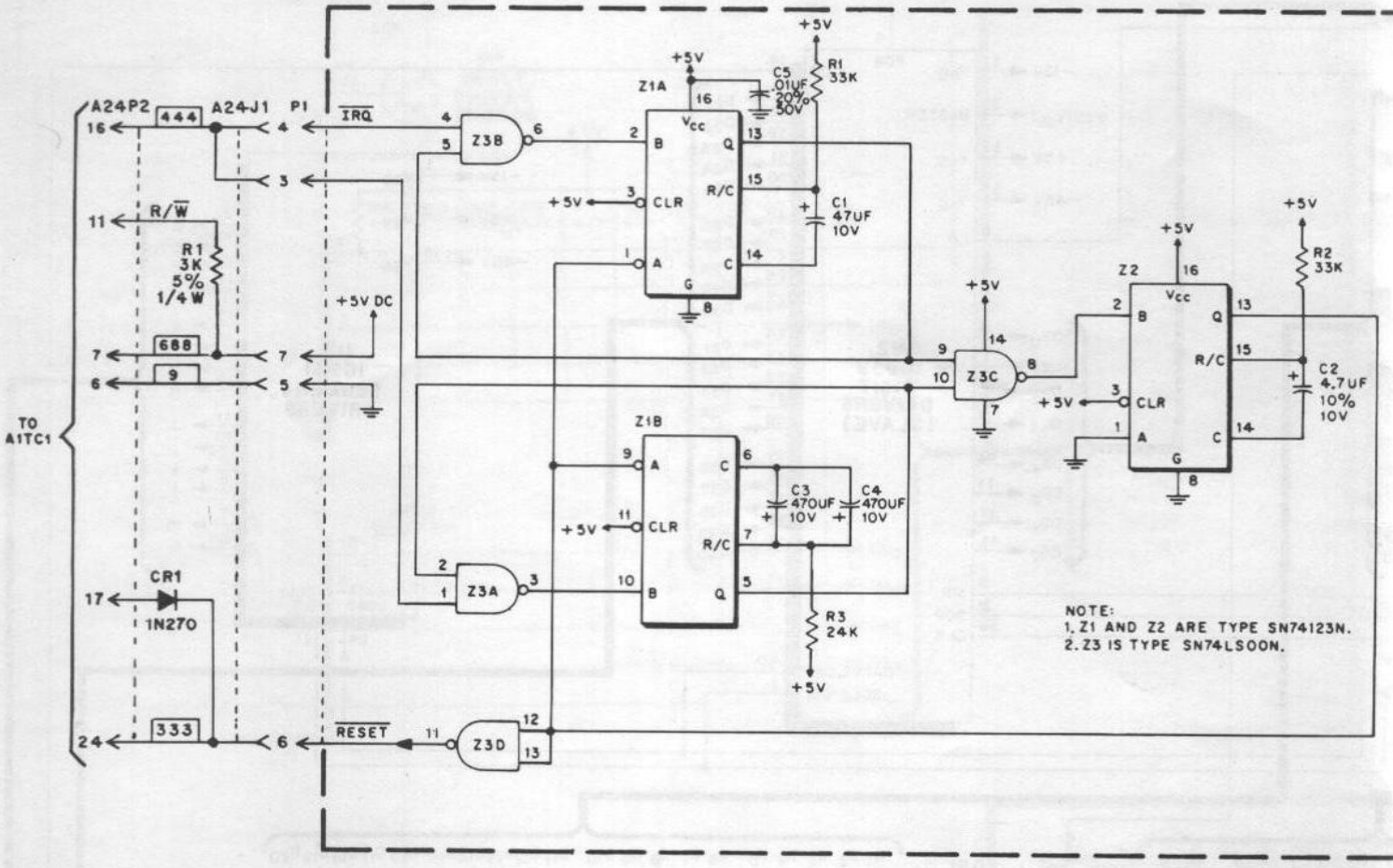


NOTE:
1. UNLESS OTHERWISE INDICATED, RESISTORS ARE ±5%, 1/4W.
2. SIMILAR SEGMENTS OF EACH CHARACTER ARE INTERNALLY WIRED IN PARALLEL.

Premier Technology			
TITLE: DISPLAY BOARD (A4)			
USED ON			
DRAWN	APPROVED R.H.M.	DATE 12 FEB 85	E-24438

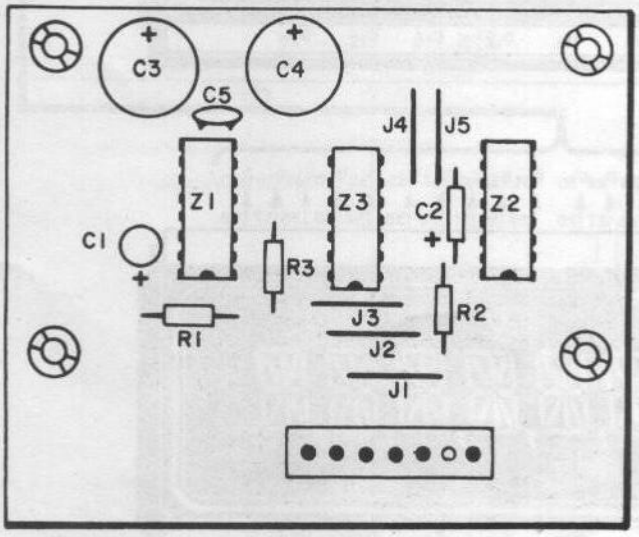

U2
10939
DIGIT
DRIVERS
(SLAVE)
U3
10941
SEGMENT
DRIVERS
DS1
FG209M2
DS2
FG209M2
POR
CUR
LD
SIP
SOP
CLK
DATA-LOAD
SCLK-DIS
MASTER
COM
DP
−15V
+5V(VSS)
+5V
−45V
VDD
VSS
VGG

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



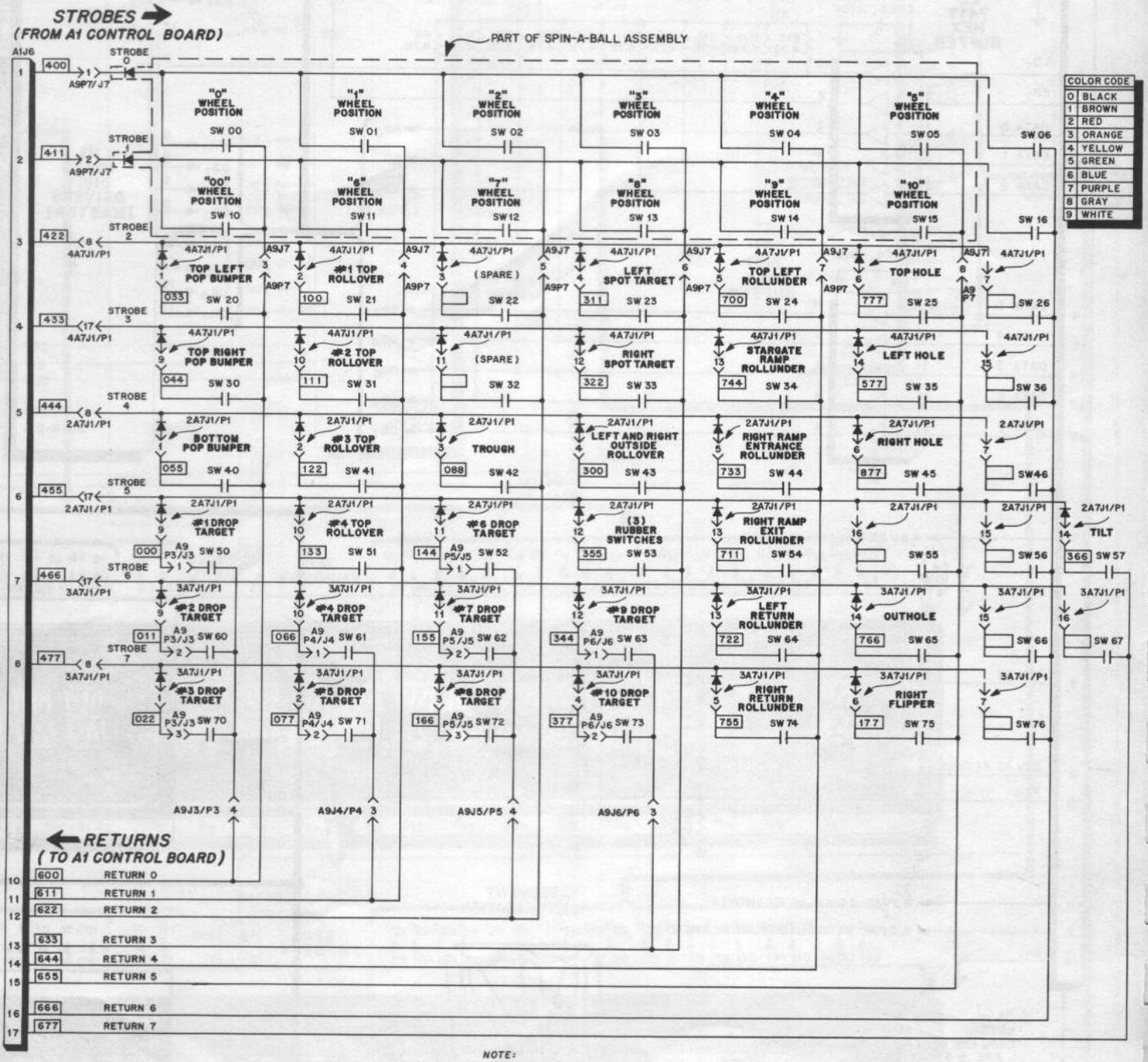
Premier Technology			
TITLE: RESET CIRCUIT BOARD			
USED ON:			
DRAWN	APPROVED: BAM	DATE: 4-2-81	C-21063

RESET BOARD (A24) COMPONENT LOCATION



RESET BOARD (A24) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	RESET BOARD	MA-164
R1, R2	Resistor 33K ohm, 5%, ¼W.	XO-43
R3	Resistor 24K ohm, 5%, ¼W.	XO-10
C1	Capacitor 47 µfd., 10V.	XO-227
C2	Capacitor 4.7 µfd., 10V.	XO-226
C3, C4	Capacitor 470 µfd., 10V.	XO-214
C5	Capacitor .01 µfd.	XO-202
Z1, Z2	IC 74123N	XO-398
Z3	IC 74LS00N	XO-427
	7 Pin Connector	XO-526
A24P2/A24J2	Cable Assembly	MA-796

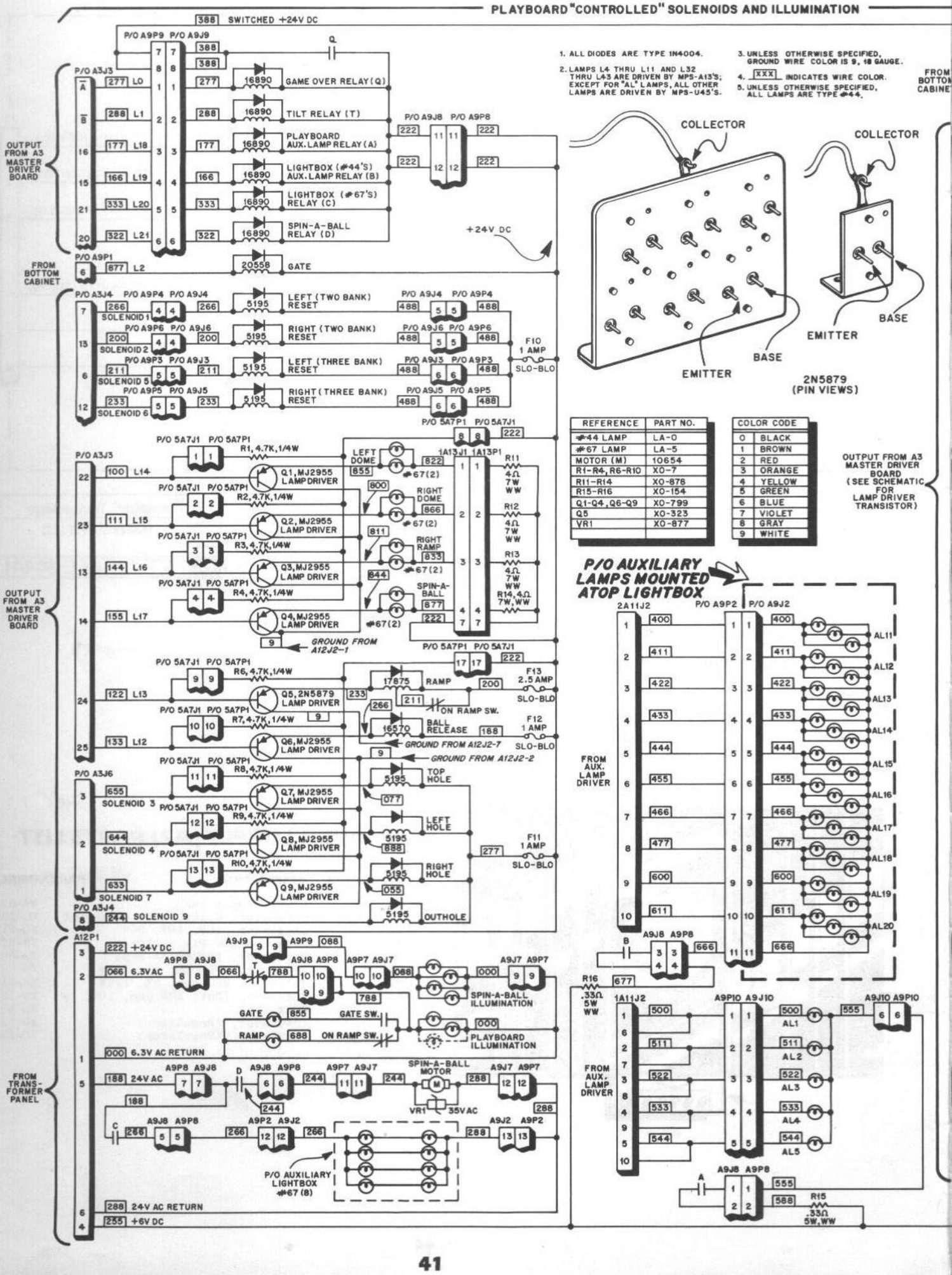


NOTE:

1. DIODES USED ARE TYPE 1N270.
2. DIODE BOARDS 2A7, 3A7 AND 4A7 PART NO.'S 25229.

Premier Technology			
TITLE	SWITCH MATRIX		
USED ON	GAME #708		
DRAWN	APPROVED R.H.M.	DATE 7-DEC-86	E-25236

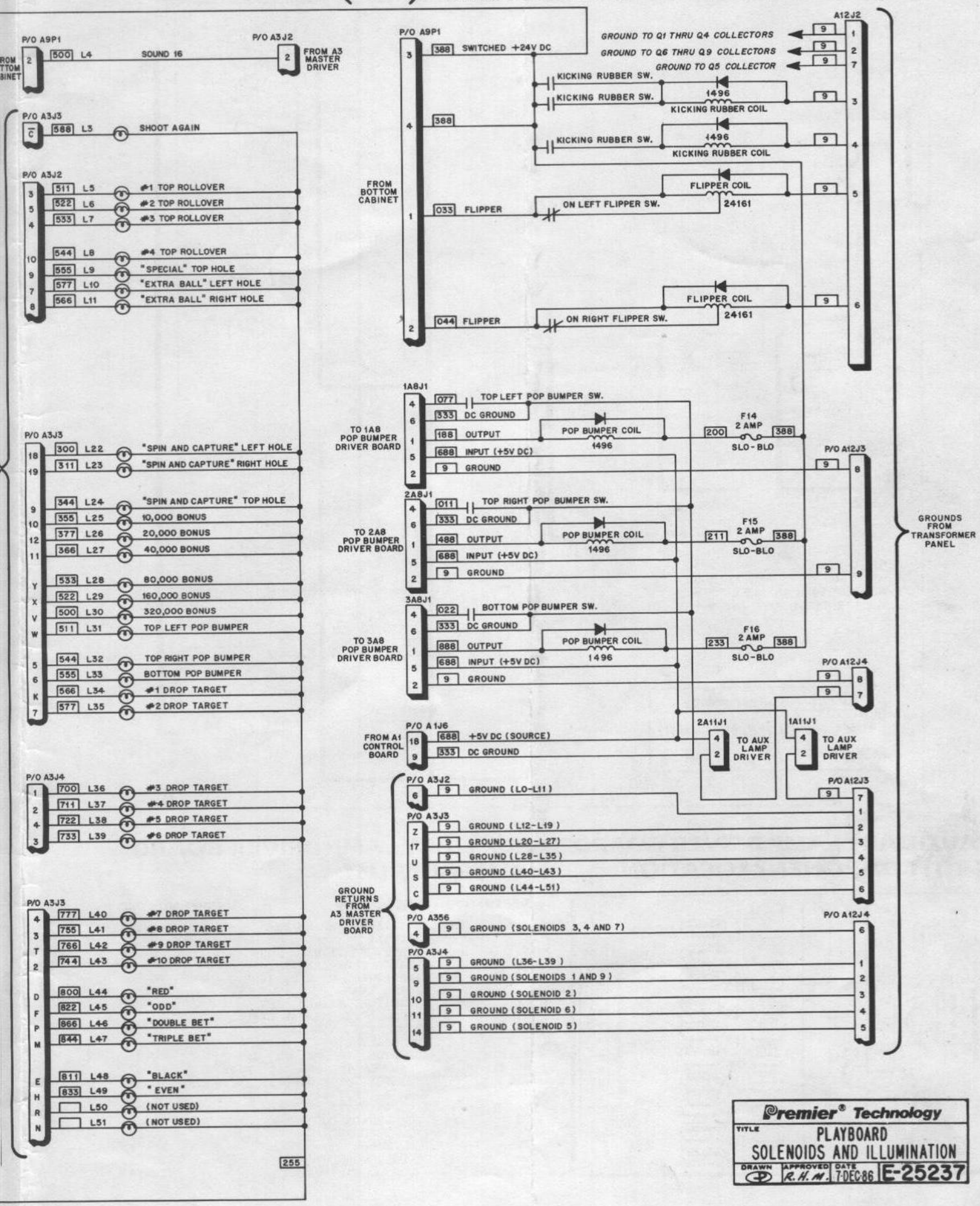
PLAYBOARD "CONTROLLED" SOLENOIDS AND ILLUMINATION



REFERENCE	PART NO.
#44 LAMP	LA-0
#67 LAMP	LA-5
MOTOR (M)	10654
R1-R4, R6-R10	XO-7
R11-R14	XO-876
R15-R16	XO-154
Q1-Q4, Q6-Q9	XO-799
Q5	XO-323
VR1	XO-877

COLOR CODE	
0	BLACK
1	BROWN
2	RED
3	ORANGE
4	YELLOW
5	GREEN
6	BLUE
7	VIOLET
8	GRAY
9	WHITE

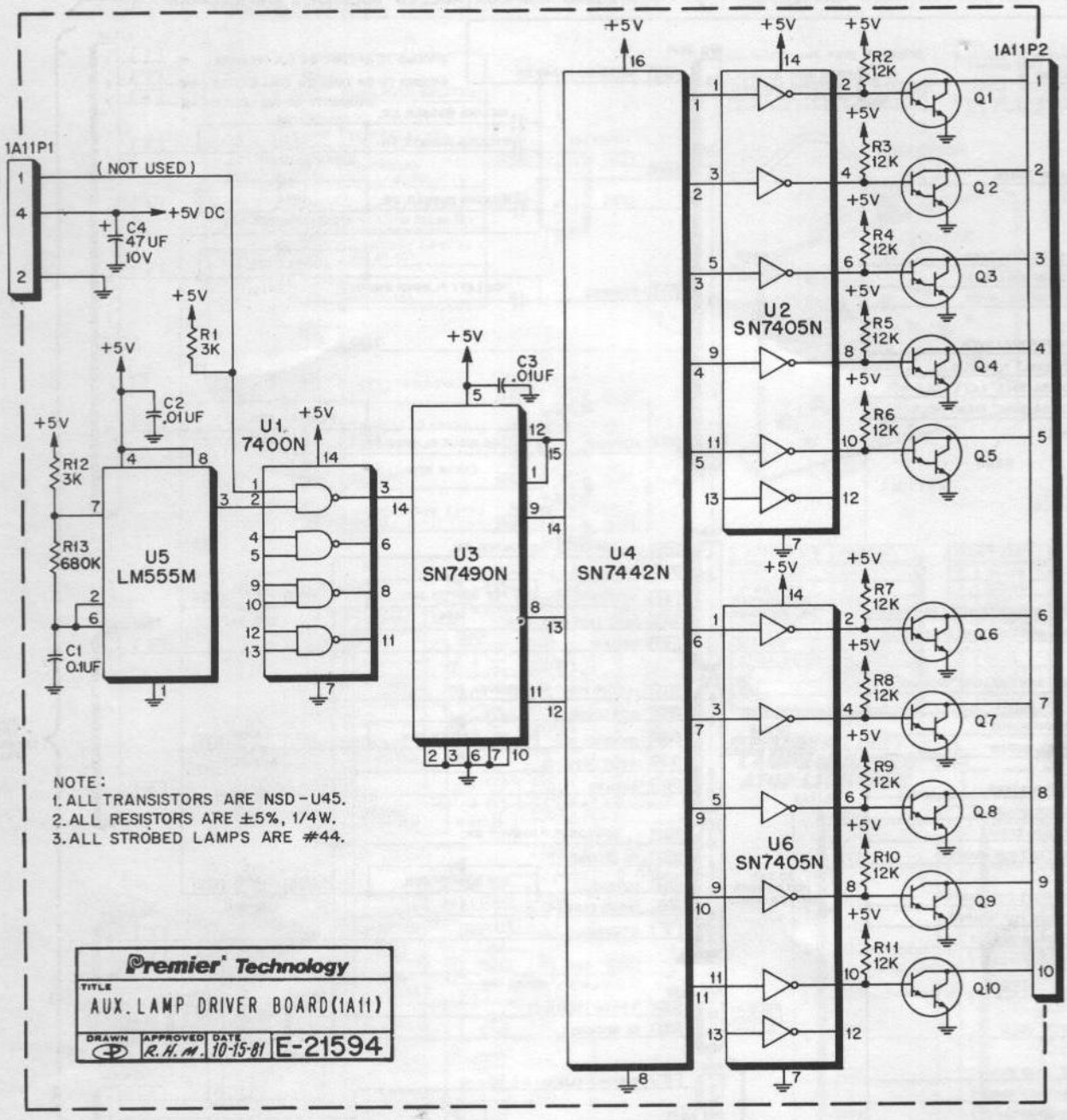
PLAYBOARD "NON-CONTROLLED" SOLENOIDS AND ILLUMINATION



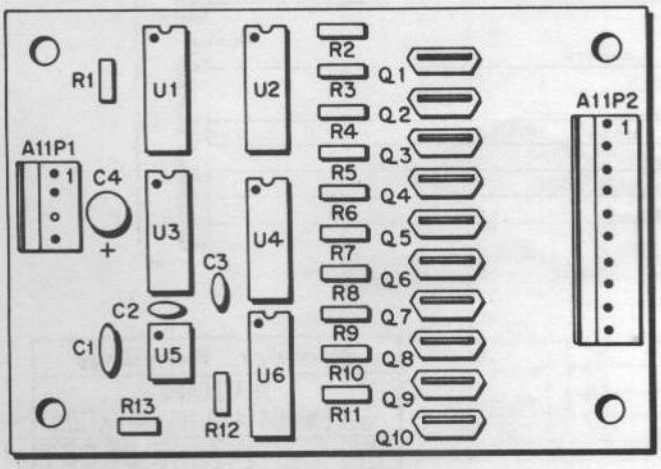
Premier® Technology

TITLE	DRAWN	APPROVED	DATE	
PLAYBOARD SOLENOIDS AND ILLUMINATION	CD	R.H.M.	7-DEC-86	E-25237

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



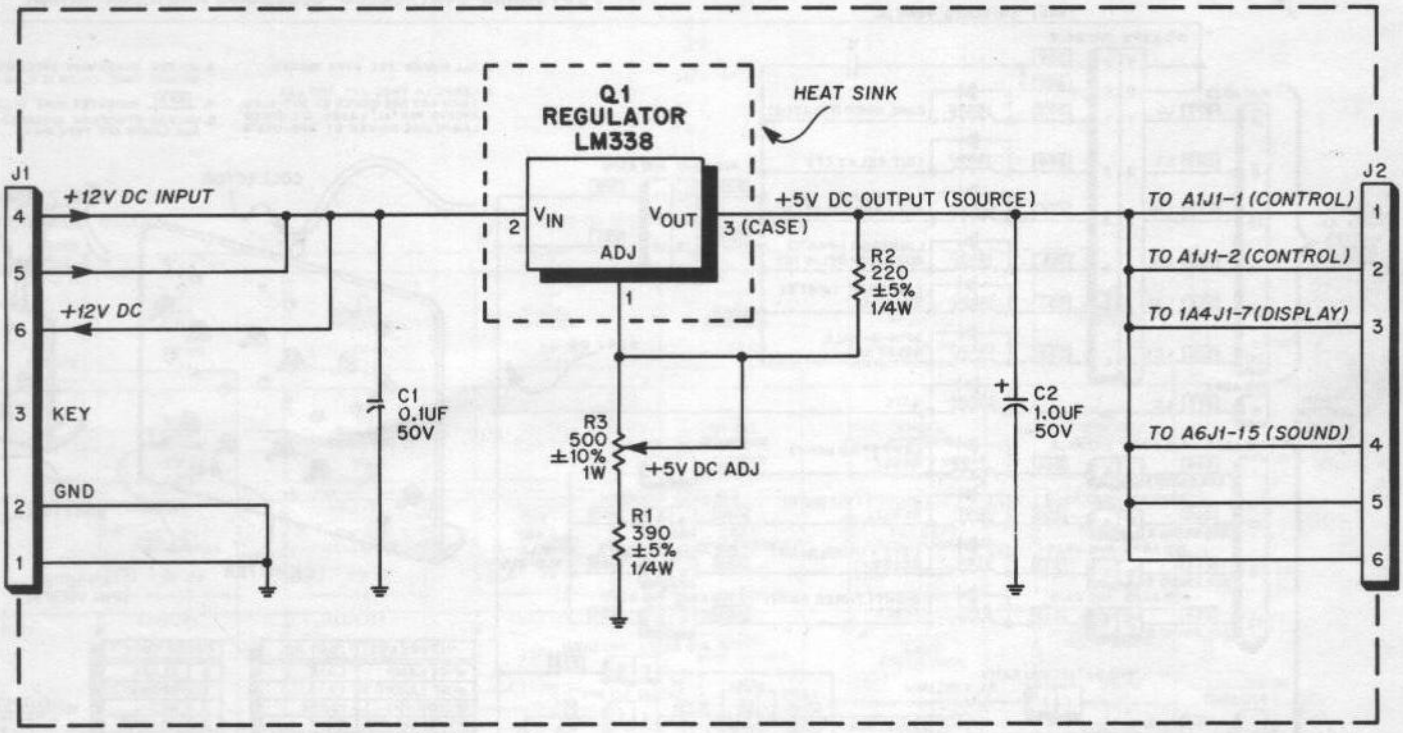
AUXILIARY LAMP DRIVER BOARD (A11) COMPONENT LOCATION



AUXILIARY LAMP DRIVER BOARD (A11) PARTS LIST

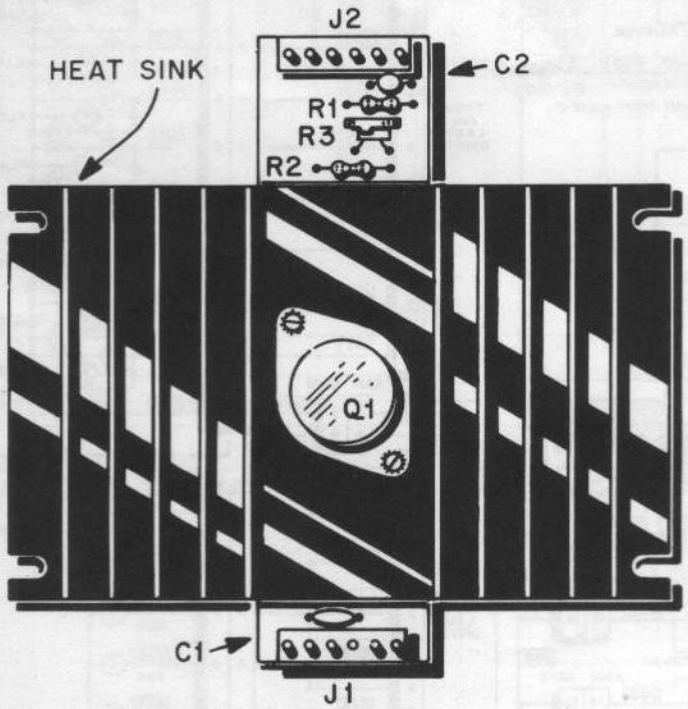
REFERENCE	DESCRIPTION	PART NUMBER
	AUXILIARY LAMP DRIVER ASSEMBLY	MA-789
C1	CAPACITOR, .1 MFD, 100V CERAMIC RADIAL LEAD	XO-626
C2-C3	CAPACITOR, .01 MFD, 100V RADIAL LEAD	XO-202
C4	CAPACITOR, 47 MFD, 10V ELECTROLYTIC RADIAL LEAD	XO-227
Q1-Q10	TRANSISTOR, NSD-U45 NPN DARLINGTON	XO-146
R1,R12	RESISTOR, 3K OHM, 5%, 1/4 W	XO-23
R2-R11	RESISTOR, 12K OHM, 5%, 1/4W	XO-9
R13	RESISTOR, 680K OHM, 5%, 1/4W	XO-669
U1	I.C. 2-INPUT NAND	XO-420
U2,U6	I.C. INVERTER	XO-403
U3	I.C. DECADE COUNTER	XO-425
U4	I.C. DECODER	XO-426
U5	I.C. TIMER	XO-631
P2	10 POS. CONNECTOR	XO-531
P1	4 POS. CONNECTOR	XO-532

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



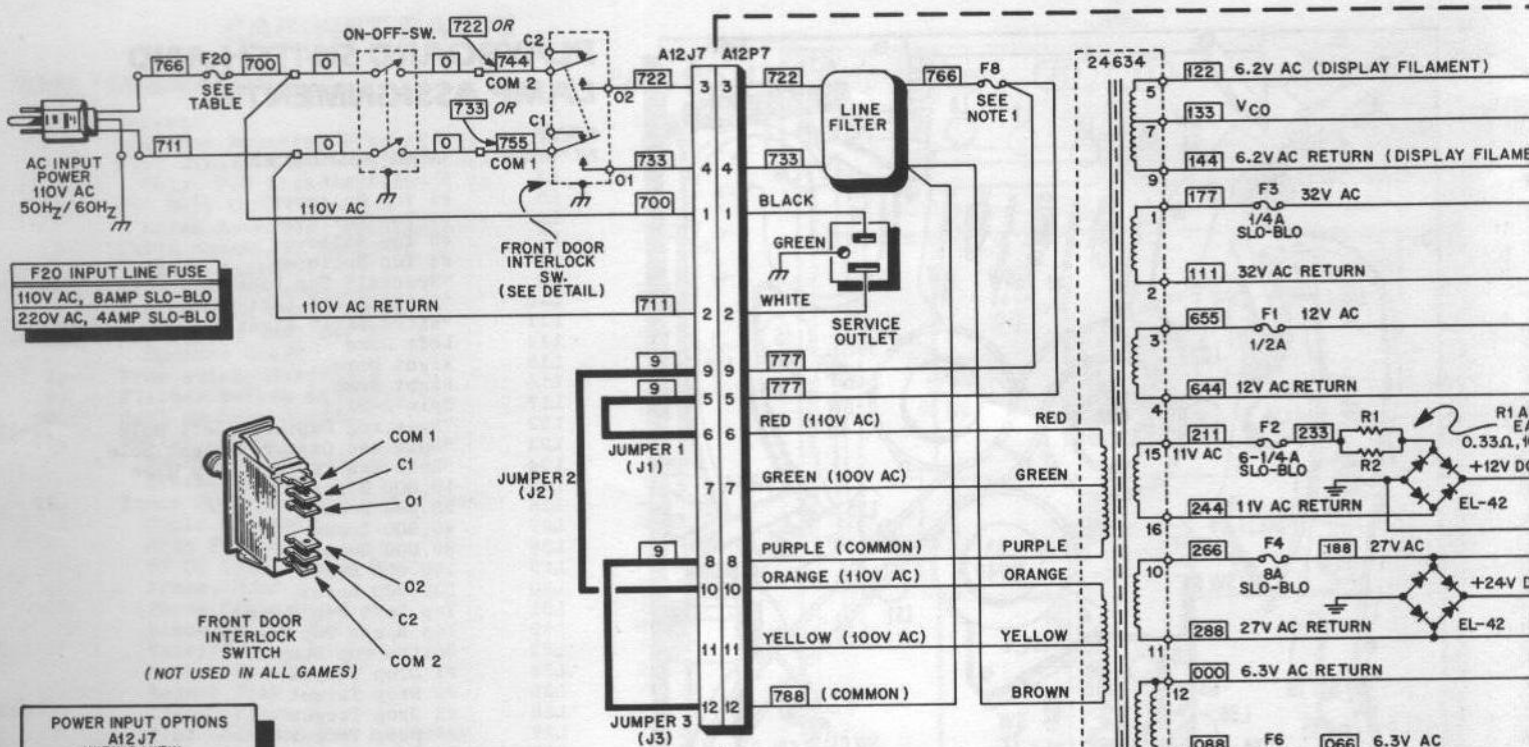
Premier Technology			
TITLE: POWER SUPPLY (A2)			
USED ON			
DRAWN	APPROVED R.H.M.	DATE 12 FEB 85	E-24441

POWER SUPPLY (A2) COMPONENT LOCATION



POWER SUPPLY (A2) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Power Supply (A2)	MA-831
C1	Capacitor, 0.1UF, +80% -20%, 50V	XO-230
C2	Capacitor, 1UF, 10%, 50V	XO-217
J1, J2	Connector, 6 Pin, Molex	XO-373
Q1	Regulator, LM338, (5 Amp)	XO-839
R1	Resistor, 390 ohm, 5%, 1/4W	XO-845
R2	Resistor, 220 ohm, 5%, 1/4W	XO-21
R3	Resistor, (Pot) 500 ohm, 10%, 1W	XO-112
	Heat Sink	XO-534
	Insulator, (Regulator)	XO-522
	Insulator, (Regulator)	XO-523



F20 INPUT LINE FUSE
110V AC, 8AMP SLO-BLO
220V AC, 4AMP SLO-BLO

POWER INPUT OPTIONS
A12 J7 WIRING VIEW PIN NUMBERS

1	2	3	4
5	6	7	8
9	10	11	12

100V AC INPUT JUMPERS

1	2	3	4
J1	6	J1	J3
J2	10	J2	J3

110V AC INPUT JUMPERS

1	2	3	4
J1	J1	7	J3
J2	J2	11	J3

200V AC INPUT JUMPERS

1	2	3	4
J1	6	J1	J2
9	10	J2	12

210V AC INPUT JUMPERS

1	2	3	4
J1	6	J1	J2
9	J2	11	12

220V AC INPUT JUMPERS

1	2	3	4
J1	J1	7	J2
9	J2	11	12

COLOR CODE			
0	BLACK	5	GREEN
1	BROWN	6	BLUE
2	RED	7	VIOLET
3	ORANGE	8	GRAY
4	YELLOW	9	WHITE

NOTES:
1. PRIMARY POWER FUSE VALUES;
   110V AC, 5AMP SLO-BLO
   220V AC, 2.5AMP SLO-BLO
2. XXX INDICATES WIRE COLOR.
3. A12J7 SHOWN IN 110V AC OPERATION.

⏚ CIRCUIT GROUND

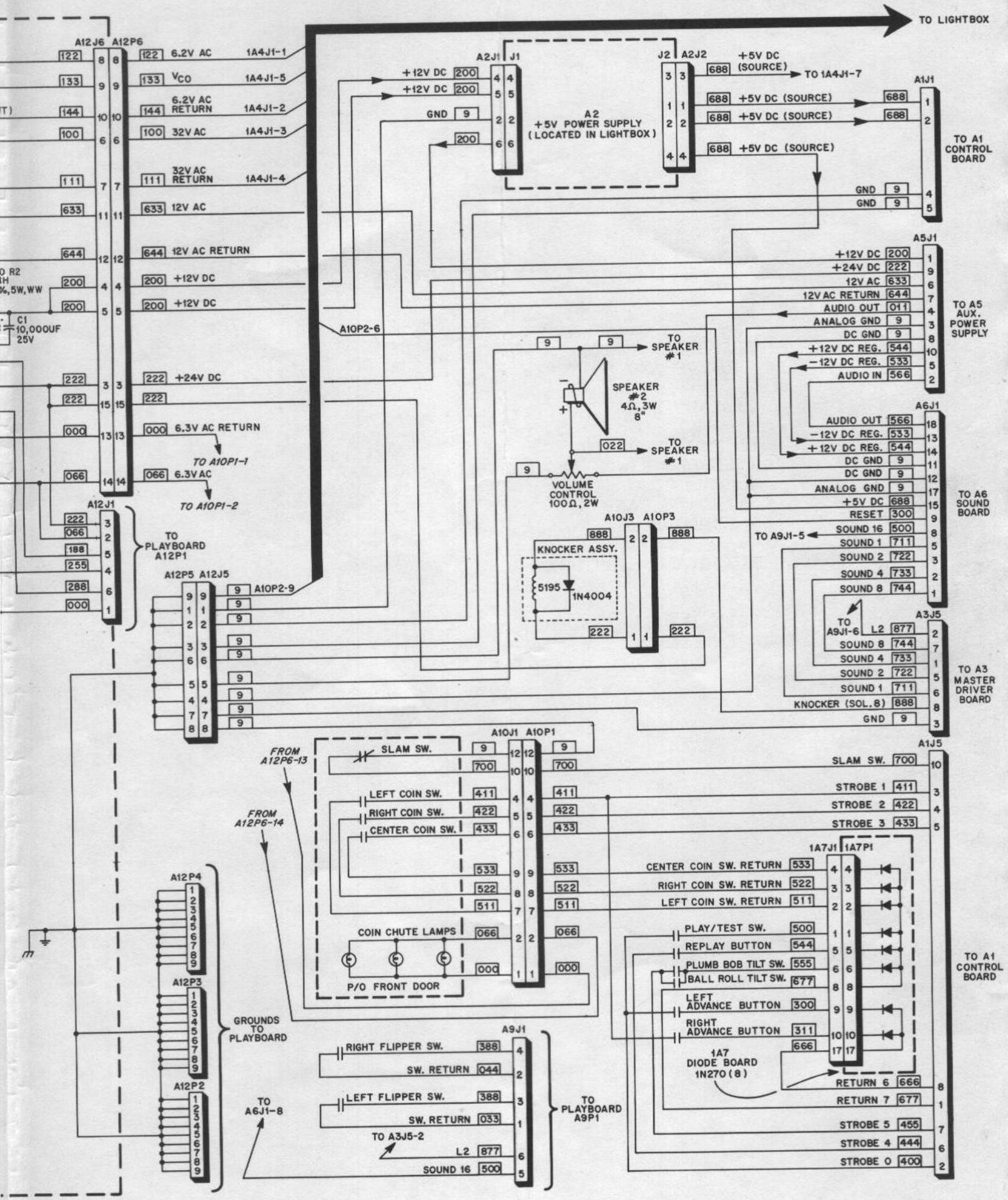
⏚ EARTH GROUND

FUSE DESIGNATIONS	
F1	SOUND POWER SUPPLY(A6)
F2	POWER SUPPLY (A2)
F3	DISPLAYS (32V AC)
F4	SOLENOIDS (+24V DC)
F5	CONTROLLED LAMPS
F6	PLAYFIELD ILLUMINATION
F7	LIGHTBOX ILLUMINATION
F8	PRIMARY POWER
F20	LINE INPUT

A12
TRANSFORMER PANEL
MA-908
USED WITH
SYSTEM 80B

Premier Technology

TITLE			
TRANSFORMER PANEL/CABINET SCHEMATIC/WIRING DIAGRAM			
DRAWN	APPROVED	DATE	E-25238
CP	R.H.M.	7-DEC-86	


TO LIGHTBOX
A12J6 A12P6
122 6.2V AC 1A4J1-1
133 VCO 1A4J1-5
144 6.2V AC RETURN 1A4J1-2
100 32V AC 1A4J1-3
111 32V AC RETURN 1A4J1-4
633 12V AC
644 12V AC RETURN
200 +12V DC
200 +12V DC
222 +24V DC
222
000 6.3V AC RETURN
TO A10P1-1
066 6.3V AC
TO A10P1-2
C1 10,000UF 25V
A12J1
TO PLAYBOARD A12P1
A12P5 A12J5
A10P2-9
A10P2-6
A2J1 J1
+12V DC 200
+12V DC 200
GND 9
200
A2 +5V POWER SUPPLY (LOCATED IN LIGHTBOX)
J2 A2J2
+5V DC (SOURCE)
TO 1A4J1-7
688 +5V DC (SOURCE)
688 +5V DC (SOURCE)
688 +5V DC (SOURCE)
A1J1
TO A1 CONTROL BOARD
GND 9
GND 9
A5J1
+12V DC 200
+24V DC 222
12V AC 633
12V AC RETURN 644
AUDIO OUT 011
ANALOG GND 9
DC GND 9
+12V DC REG. 544
-12V DC REG. 533
AUDIO IN 566
TO A5 AUX. POWER SUPPLY
TO SPEAKER #1
SPEAKER #2 4Ω, 3W 8"
022 TO SPEAKER #1
VOLUME CONTROL 100Ω, 2W
A6J1
AUDIO OUT 566
-12V DC REG. 533
+12V DC REG. 544
DC GND 9
DC GND 9
ANALOG GND 9
+5V DC 688
RESET 300
SOUND 16 500
SOUND 1 711
SOUND 2 722
SOUND 4 733
SOUND 8 744
TO A6 SOUND BOARD
TO A9J1-5
A10J3 A10P3
888
KNOCKER ASSY.
5195 1N4004
222
A3J5
TO A9J1-6 L2 877
SOUND 8 744
SOUND 4 733
SOUND 2 722
SOUND 1 711
KNOCKER (SOL.8) 888
GND 9
TO A3 MASTER DRIVER BOARD
A10J1 A10P1
FROM A12P6-13
FROM A12P6-14
SLAM SW. 700
LEFT COIN SW. 411
RIGHT COIN SW. 422
CENTER COIN SW. 433
533
522
511
COIN CHUTE LAMPS 066
000
P/O FRONT DOOR
A1J5
SLAM SW. 700
STROBE 1 411
STROBE 2 422
STROBE 3 433
1A7J1 1A7P1
CENTER COIN SW. RETURN 533
RIGHT COIN SW. RETURN 522
LEFT COIN SW. RETURN 511
PLAY/TEST SW. 500
REPLAY BUTTON 544
PLUMB BOB TILT SW. 555
BALL ROLL TILT SW. 677
LEFT ADVANCE BUTTON 300
RIGHT ADVANCE BUTTON 311
666
1A7 DIODE BOARD 1N270(8)
RETURN 6 666
RETURN 7 677
STROBE 5 455
STROBE 4 444
STROBE 0 400
TO A1 CONTROL BOARD
A12P4
A12P3
A12P2
GROUNDS TO PLAYBOARD
A9J1
RIGHT FLIPPER SW. 388
SW. RETURN 044
LEFT FLIPPER SW. 388
SW. RETURN 033
TO A3J5-2
L2 877
SOUND 16 500
TO PLAYBOARD A9P1
TO A6J1-8

XI. PARTS INFORMATION

TABLE OF CONTENTS

PAGE

PLAYBOARD PARTS
LAMPS AND SWITCHES..... 48

CABINET PARTS..... 49

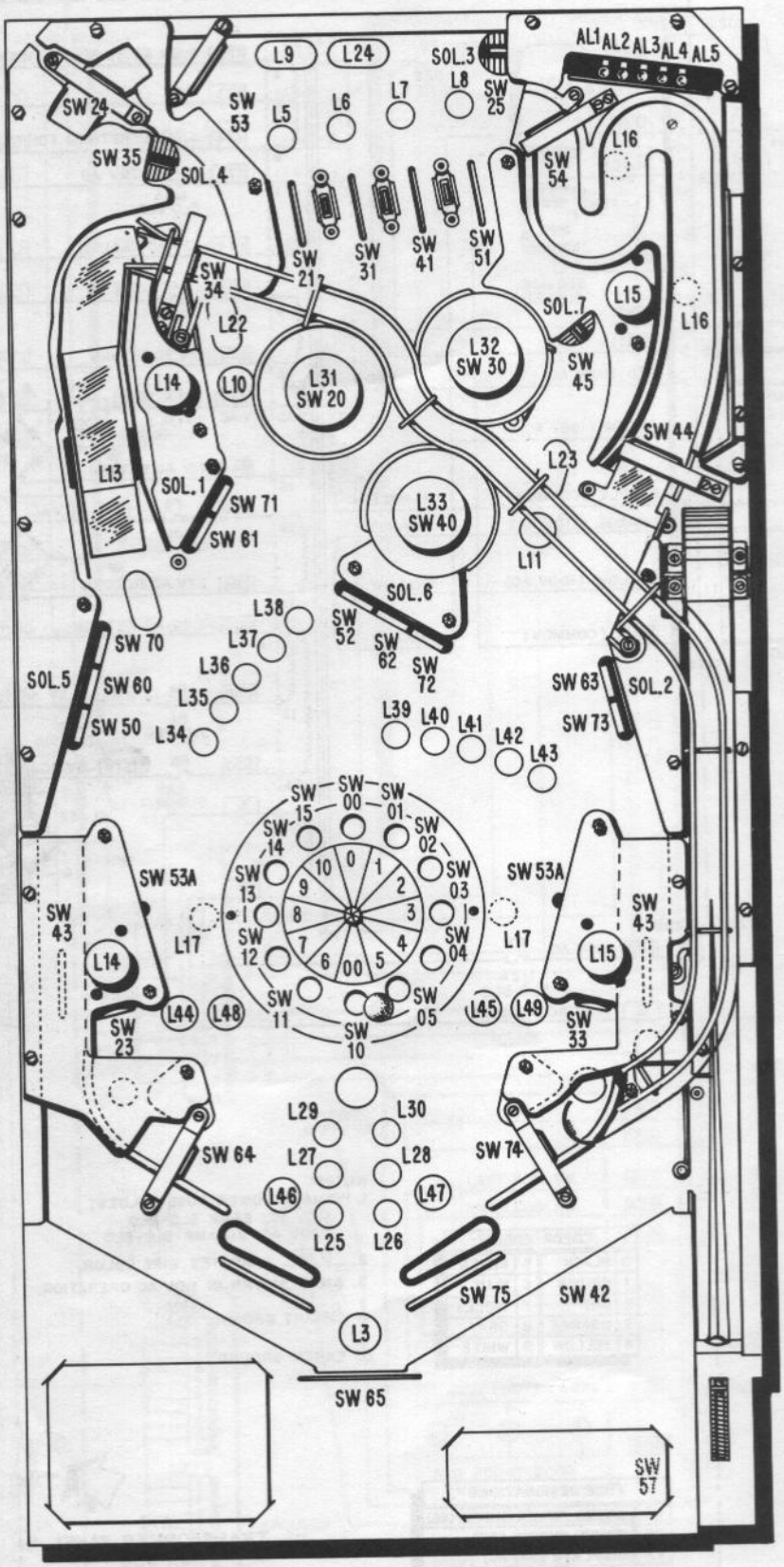
PLAYBOARD PARTS
RUBBER RINGS AND MISCELLANEOUS PARTS..... 50

STARGATE RAMP
EXPLODED VIEW..... 51

AUXILIARY LIGHTBOX
EXPLODED VIEW..... 52

SPIN-A-BALL ASSEMBLY
EXPLODED VIEW..... 53

XI. PARTS INFORMATION



PLAYBOARD SWITCH AND LAMP ASSIGNMENTS

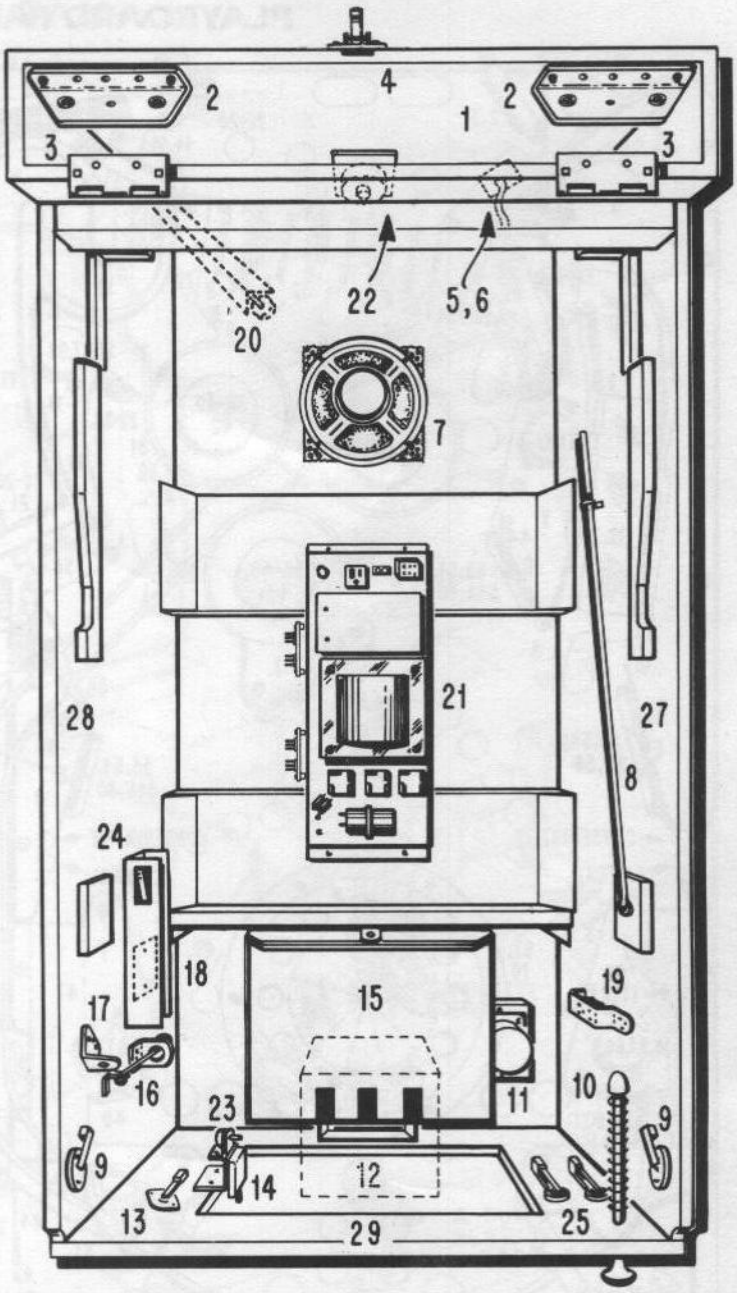
LAMP NUMBER	LAMP ASSIGNMENT
L3	Shoot Again
L5	#1 Top Rollover
L6	#2 Top Rollover
L7	#3 Top Rollover
L8	#4 Top Rollover
L9	"Special" Top Hole
L10	"Extra Ball" Left Hole
L11	"Extra Ball" Right Hole
L14	Left Dome
L15	Right Dome
L16	Right Ramp
L17	Spin-A-Ball
L22	"Spin and Capture" Left Hole
L23	"Spin and Capture" Right Hole
L24	"Spin and Capture" Top Hole
L25	10,000 Bonus
L26	20,000 Bonus
L27	40,000 Bonus
L28	80,000 Bonus
L29	160,000 Bonus
L30	320,000 Bonus
L31	Top Left Pop Bumper
L32	Top Right Pop Bumper
L33	Bottom Pop Bumper
L34	#1 Drop Target
L35	#2 Drop Target
L36	#3 Drop Target
L37	#4 Drop Target
L38	#5 Drop Target
L39	#6 Drop Target
L40	#7 Drop Target
L41	#8 Drop Target
L42	#9 Drop Target
L43	#10 Drop Target
L44	"Red"
L45	"Odd"
L46	"Double Bet"
L47	"Triple Bet"
L48	"Black"
L49	"Even"

SWITCH MATRIX NUMBER	SWITCH ASSIGNMENT	PART NO.
SW 00-	Spin-A-Ball "0", "1"-"5" (6)	P/O 25213
SW 05	(See Exploded View Item 9A)	
SW 10-	Spin-A-Ball "00", "6"-"10" (6)	P/O 25213
SW 15	(See Exploded View Item 9A)	
SW 20	Top Left Pop Bumper (with Bracket)	21356
SW 21	#1 Top Rollover	18892
SW 23	Left Spot Target (with Bracket)	20867
SW 24	Top Left Rollunder	21137
SW 25	Top Hole (Assembly)	18085
SW 30	Top Right Pop Bumper (with Bracket)	21356
SW 31	#2 Top Rollover	18892
SW 33	Right Spot Target (with Bracket)	20867
SW 34	Stargate Ramp Rollunder	21137
SW 35	Left Hole (Assembly)	18085
SW 40	Bottom Pop Bumper (with Bracket)	21353
SW 41	#3 Top Rollover	18892
SW 42	Trough	19754
SW 43	Left and Right Outside Rollover (2)	18892
SW 44	Right Ramp Entrance Rollunder	21137
SW 45	Right Hole (Assembly)	18085
SW 50	#1 Drop Target	18094
SW 51	#4 Top Rollover	18892
SW 52	#6 Drop Target	18094
SW 53	Rubber Switch	18079
SW 53A	Kicking Rubber	18079
	Scoring Switch (2)	18086
	Actuating Switch and Bracket (2)	22224
SW 54	Right Ramp Exit Rollunder	22672
SW 57	Tilt (with Bracket)	9141
SW 60	#2 Drop Target	18095
SW 61	#4 Drop Target	18095
SW 62	#7 Drop Target	18095
SW 63	#9 Drop Target	18095
SW 64	Left Return Rollunder	21137
SW 65	Outhole (Assembly)	18688
SW 70	#3 Drop Target	18093
SW 71	#5 Drop Target	18093
SW 72	#8 Drop Target	18093
SW 73	#10 Drop Target	18093
SW 74	Right Return Rollunder	21137
SW 75	Right Flipper	22398

XI. PARTS INFORMATION

CABINET PARTS

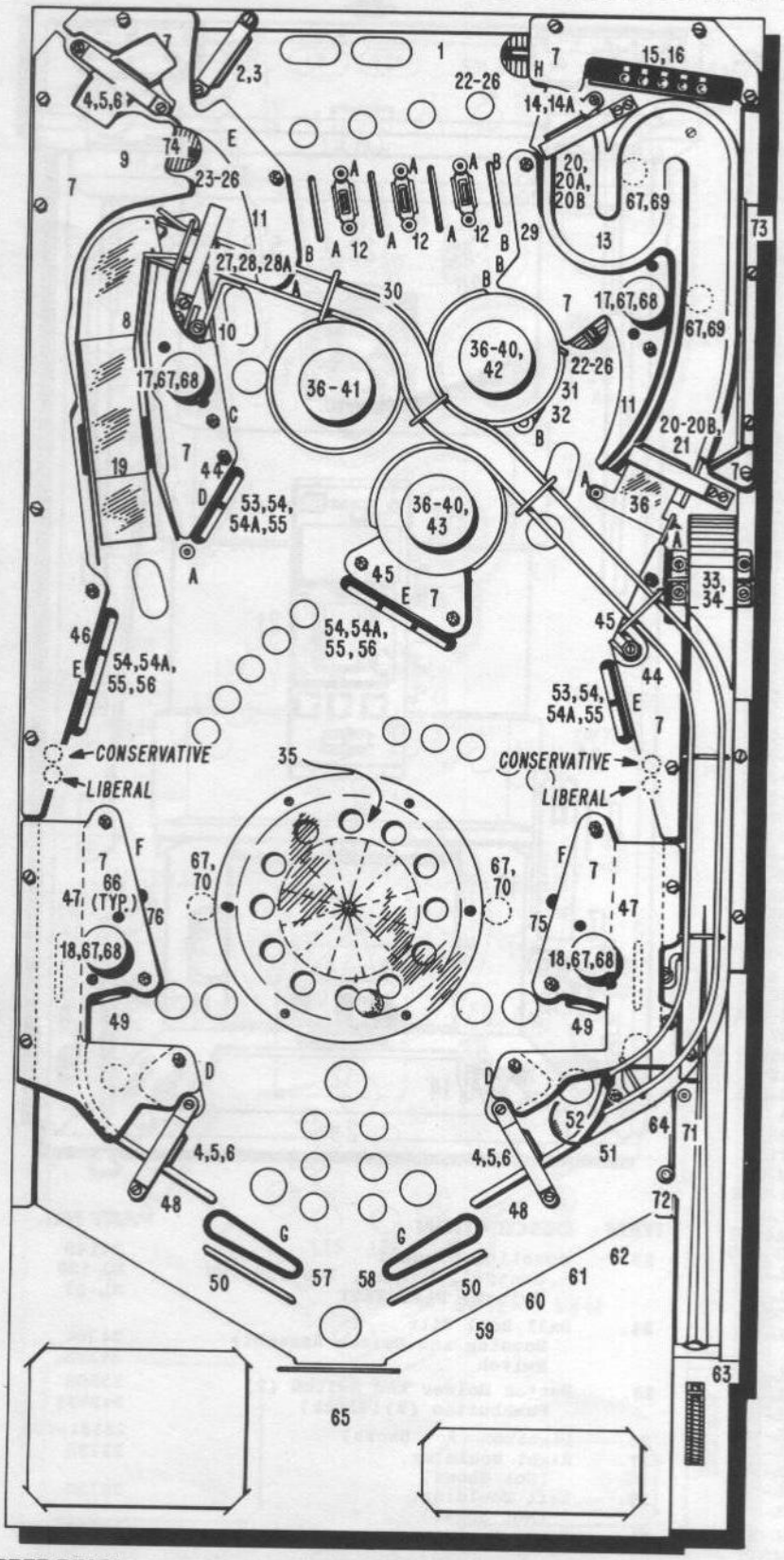
ITEM	DESCRIPTION	PART NO.
1.	Cabinet	25270-708
2.	Lightbox Mounting Bracket (2)	19916
3.	Butt Hinge, (Shown For Reference Only, P/O Lightbox Assy.) (2)	22734
4.	"U" Bolt (P/O Lightbox)	24659
	Latch Assembly (P/O Cabinet)	21969
5.	Cable Assembly, Domestic (High Voltage)	MA-794
6.	Line Cord (Domestic)	23365
	Line Cord Cover Plate	21955
7.	Speaker, 4 Ohm, 3W, 8"	EL-83
	Speaker Guard	20931
8.	Prop Stick, Playfield	23940
9.	Flipper Switch Assembly (2)	17838
10.	Ball Shooter Assembly	8835
11.	Switch, On/Off	23799
	Switch Plate (2)	18769
	Switch Housing	15163
12.	Front Door Assembly (Universal)	MA-688
	Cable Assembly	MA-676
	Slam Switch	24567
	6V DC Lamp, Wedge Base	FD-2
	Frame, Door	FD-13
	Three Chute Door	24160
	Black Button Bezel	FD-14
	Entry/Reject Button	FD-15
	Button Spring	FD-16
	Reject Flap	FD-17
	Clamp, Frame	FD-18
	Flat Lock and Cam Assembly	FD-19
	Base Plate with Pivot and Stud	FD-20
	Microswitch Bracket	FD-21
	Clear Plastic Cover for Microswitch	FD-22
	Coin Microswitch with Wire	FD-23
	Lampholder	FD-24
	Black Reject Bezel	FD-26
13.	Replay Switch Assembly	18092
14.	Interlock Switch Assembly (When Used)	24148
	Switch	EL-66
	Switch Cover	21888
15.	Cashbox	24867
	Cover	24868
	Liner (Small) (3)	24870
	Liner (Large) (2)	24871
16.	Plumb Bob Tilt Switch Assembly	
	Strike Plate	358
	Carbon, Tilt Bob	MH-30
	Rod, Tilt	357
17.	Locator Bracket	18578
18.	Diode Assembly	24252
	Diode, 1N270 (8)	XO-265
19.	Knocker Assembly	MA-12
20.	Cabinet Leg (4)	4337
	Leg Bolt (8)	3775
	3" Leg Adjuster (4)	MH-21
21.	Transformer Panel Assembly	MA-908
	Bridge Rectifier (3)	EL-42
	Cable Assembly (Secondary)	MA-812
	Capacitor, 10,000UF, 25V	XO-830
	Filter, Line	EL-50
	Fuse Block (6 Pos.)	EL-12
	Fuse Cover	23805
	Fuse Holder (F7 and F8) (2)	EL-78
	Fuses	
	F1, 1/2 Amp	EL-28
	F2, 6-1/4 Amp, SLO-BLO	EL-29
	F3, 1/4 Amp, SLO-BLO	EL-5
	F4, 8 Amp, SLO-BLO	EL-26
	F5, 8 Amp, SLO-BLO	EL-26
	F6, 8 Amp, SLO-BLO	EL-26
	F7, 1/2 Amp, SLO-BLO	EL-20
	F8, 5 Amp, SLO-BLO (110V AC)	EL-8
	F8, 2.5 Amp, SLO-BLO (220V AC)	EL-21
	Ground Bus Assembly (2)	24542
	Outlet, Service	18133
	Resistor, 0.33 Ohm, 10% 5W, Wire-Wound (2)	XO-154
	Transformer	24634
22.	Fuse Holder	EL-78
	F20, 8 Amp, SLO-BLO (110V AC)	EL-26
	F20, 4 Amp, SLO-BLO (220V AC)	EL-33



ITEM	DESCRIPTION	PART NO.
23.	Mounting Bracket	24149
	Control, Volume, 100 Ohm, 2W	XO-199
	Switch, PLAY/TEST	EL-57
24.	Ball Roll Tilt	
	Housing and Switch Assembly	24394
	Switch	24393
25.	Button Holder and Switch (2)	23503
	Pushbutton (2)(Black)	24293Y
26.	Lightbox (Not Shown)	25181-708
27.	Right Moulding, (Not Shown)	22735
28.	Left Moulding, (Not Shown)	22736
29.	Front Moulding, (Not Shown)	16951

XI. PARTS INFORMATION

PLAYBOARD PARTS INFORMATION



RUBBER RINGS

ITEM	DESCRIPTION	PART NO.
A	Mini-Post (10)	15705
B	5-16" (8)	10217
C	1-1/2"	10220
D	1" (3)	10219
E	2" (4)	10221
F	2-1/2" (2)	10222
G	Flipper, Red (2)	13151
H	Small Mini-Post	14793

MISCELLANEOUS PARTS

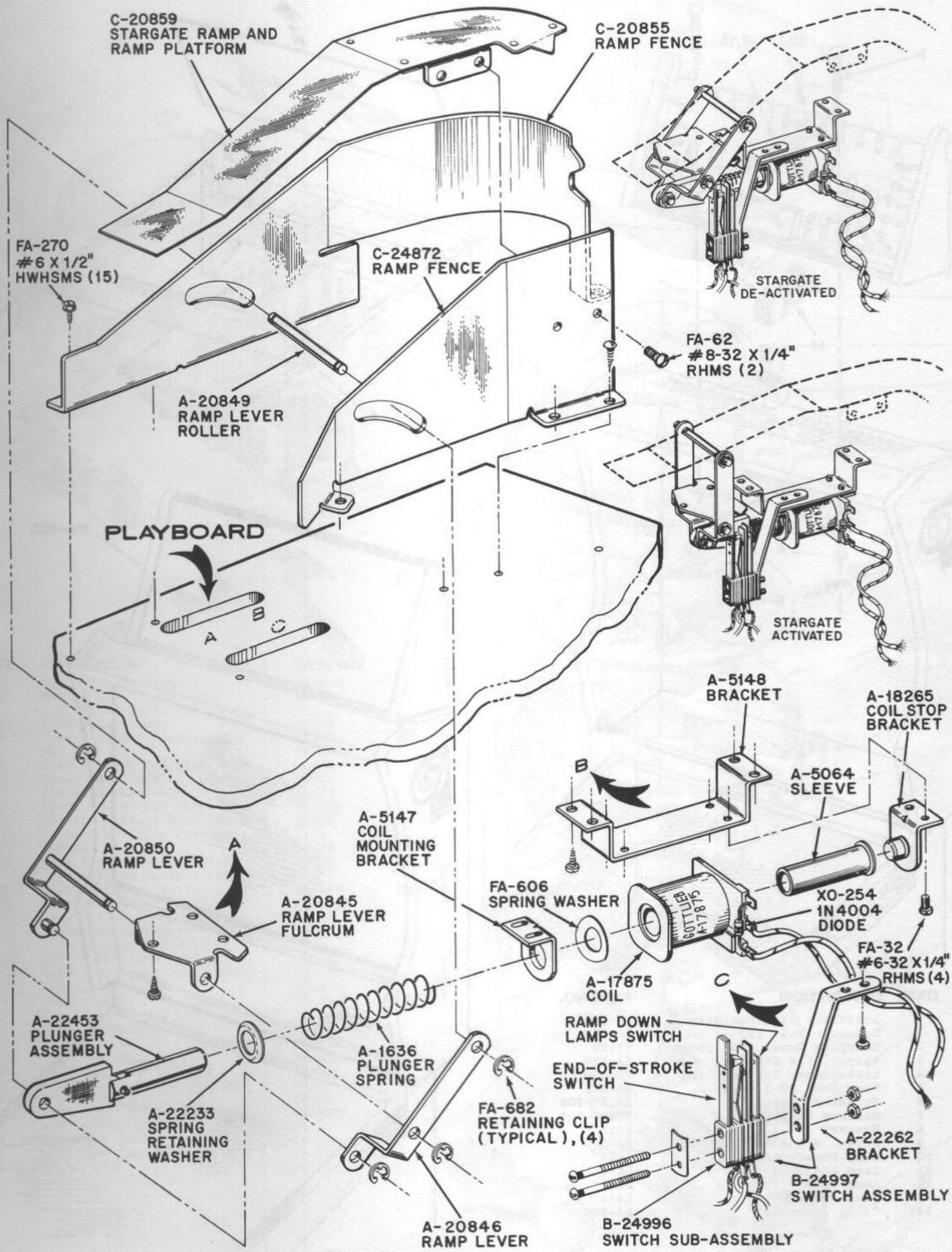
DESCRIPTION	PART NO.
"T" Relay Assembly	MA-25
"Q" Relay Assembly	MA-23
"A" Relay Assembly	MA-833
"B" Relay Assembly	MA-888
"C" Relay Assembly	MA-865
"D" Relay Assembly	MA-882
Glass Stop Decal	25274

PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	Flat Rail	25232
2	Metal Shield	17300
3	Gate Wireform	21696
4	Metal Shield (3)	4705
5	Gate Wireform (3)	22118
6	Rollunder Spring (3)	14236
7	Plastic Shield Set	25249
8	Ball Guide Rail	4832
9	Ball Guide Rail	25235
10	Ball Guide Rail	20100
11	Flat Rail (2)	25234
12	Rollover Guide, White (3)	15646Z
13	Plastic Formed Ramp	25209
14	Ramp Spacer	25260
14A	Screw, #8 x 2" HWHSMS	FA-305
15	Billboard Assembly,(Includes Decal)	MA-907
16	Billboard Decal	25277
17	Plastic Dome Hat, Red, (2)	25147U
18	Plastic Dome Hat,Amber (2)	25147N
19	Stargate Ramp Assembly (See Exploded View Illustration)	
20	Metal Shield (2)	25150
20A	Gate Wireform	25246
20B	Rollunder Spring (2)	25152
21	Gate Wireform	25259
22	Ball Snubber (2)	16038
23	Hole Base Plate, Red, (3)	15707U
24	Hole Liner (3)	11151
25	Hole Kicker Assembly (3)	MA-444
26	Hole Switch Arm, Red, (3)	15708U
27	Metal Shield	25245
28	Gate Wireform	25246
28A	Rollunder Spring	25247
29	Ball Guide Rail	6931
30	Wireform Ramp	25180
31	Ball Guide Rail	18070
32	Ball Guide Rail	6931
33	Ball Scoop	25241
34	Ball Bridge	25242
35	Window and Spin-A-Ball Assembly (See Exploded View Illustration)	
36	Ramp Flap	25056
37	Pop Bumper Cap, White (3)	10434Z
38	Pop Bumper Skirt, White (3)	10433Z
39	Pop Bumper Body and Socket,White(3)	MA-27
40	Bumper Cap Decal (3)	25275
41	Pop Bumper Trim Platter	8246
42	Pop Bumper Trim Platter	25258
43	Pop Bumper Trim Platter	25257
44	Ball Guide Rail (2)	18070
45	Ball Guide Rail (2)	6612
46	Ball Guide Rail	3722
47	Ball Guide Rail (2)	4832
48	Ball Guide Rail (2)	23833
49	Spot Target Assembly, White (2)	20867
50	Ball Snubber Rail (2)	13798
51	Ramp Fence	25244
52	Velcro Strip	MP-18
53	Target Bank Assembly, (With Targets/Decals), (2)	MA-899
54	Plastic Target, Red, (5)	11905U
54A	Plastic Target, Black, (5)	11905Y
55	Target Decal (10)	25276
56	Target Bank Assembly, (With Targets/Decals), (2)	MA-183
57	Left Flipper Assembly	MA-656
58	Right Flipper Assembly	MA-657
59	1-1/16" Steel Ball (3)	21864
60	Ball Return Unit Assembly	21622
61	Ball Return Gate	20607
62	Ball Return Gate Wireform	20601
63	Ball Shooter Gauge	9767-708
64	Ball Gate	14099
65	Cardholder	13657-708
66	Rivet, Plastic, (8)	MP-10
67	#67 Lamp (8)	LA-5
68	#67 Lamp Socket, (4)	25145
69	#67 Lamp Socket, (2)	25053
70	#67 Lamp Socket, (2)	24881
71	Ball Gate Assembly	MA-420
72	Ball Guide Rail	6931
73	Flat Guard Rail	25020
74	Ball Snubber	21532
75	Kicker Assembly	MA-135
76	Kicker Assembly	MA-135A

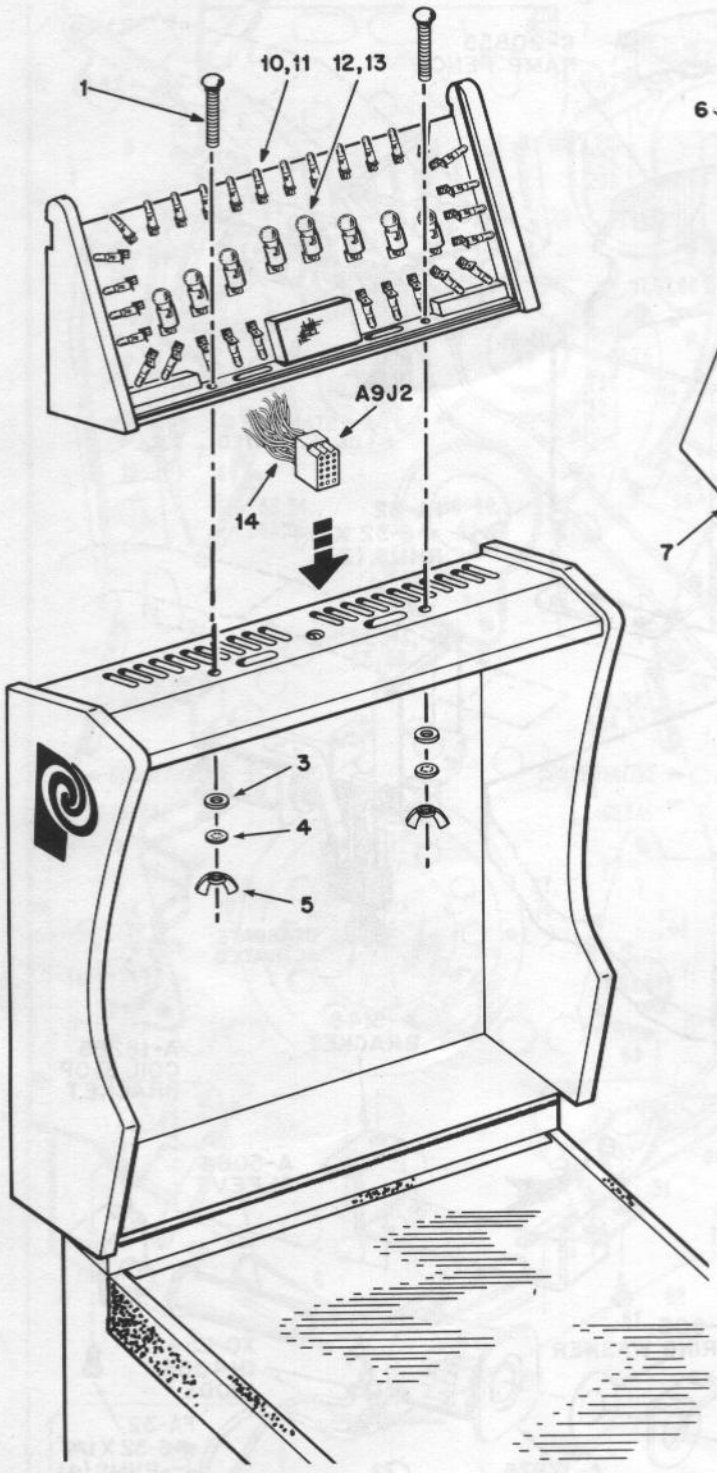
XI. PARTS INFORMATION

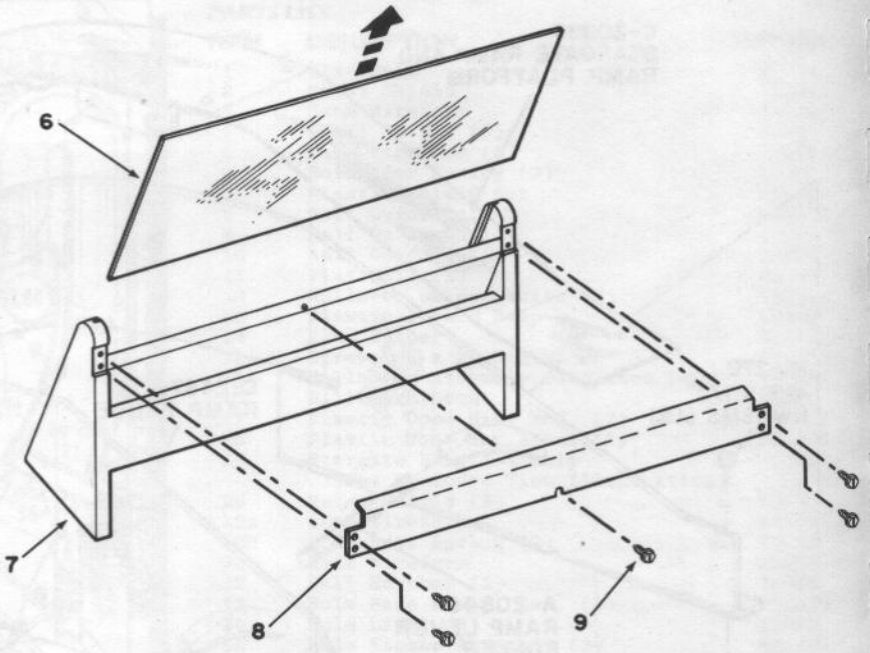
STARGATE RAMP

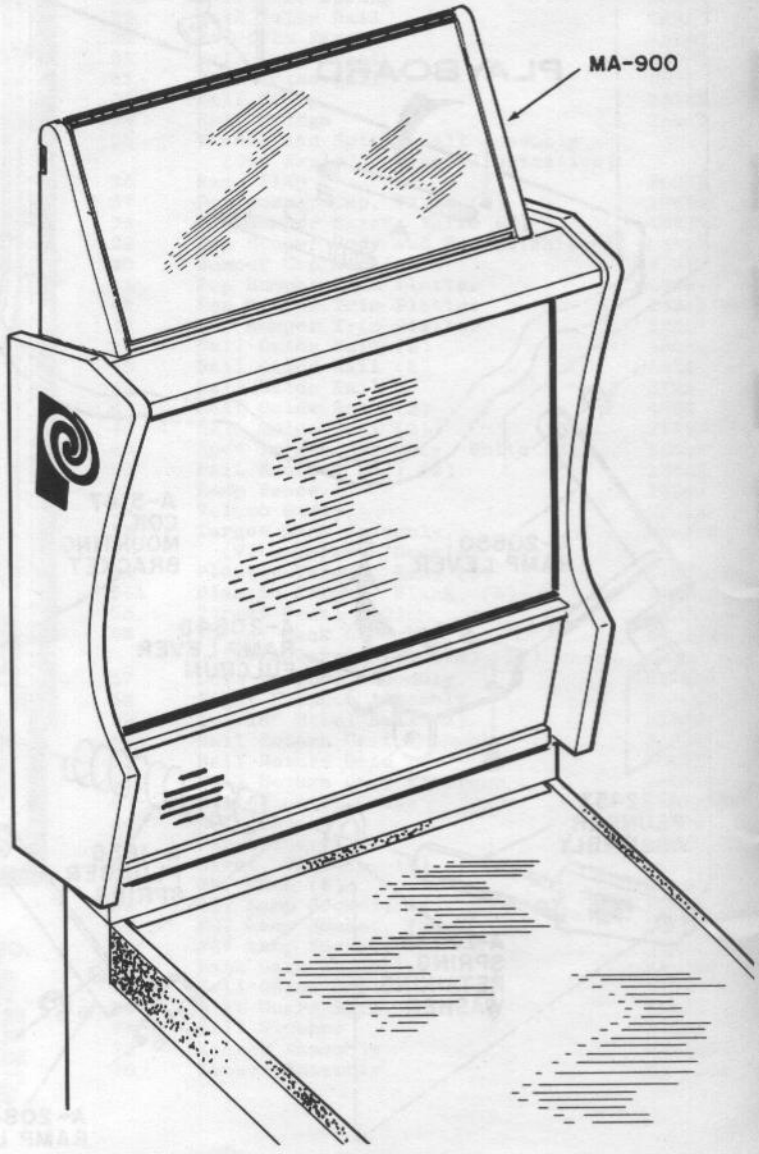


XI. PARTS INFORMATION

AUXILIARY LIGHTBOX



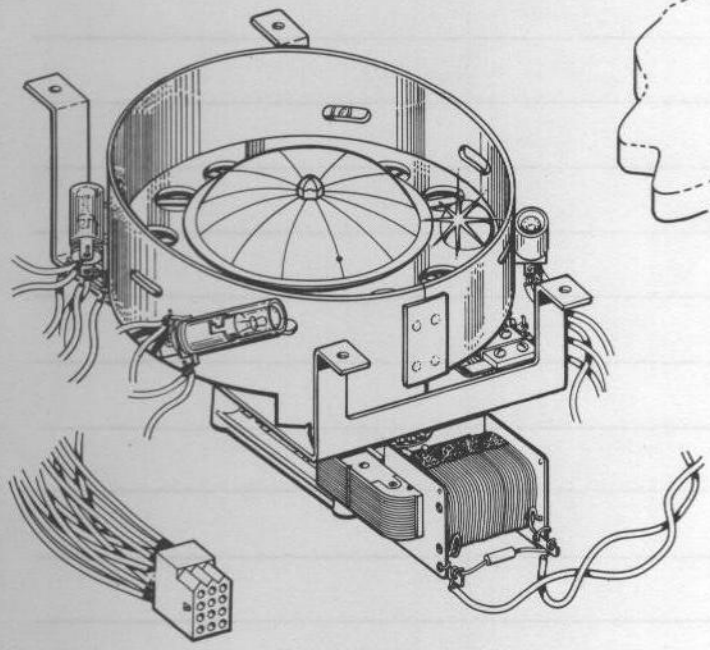


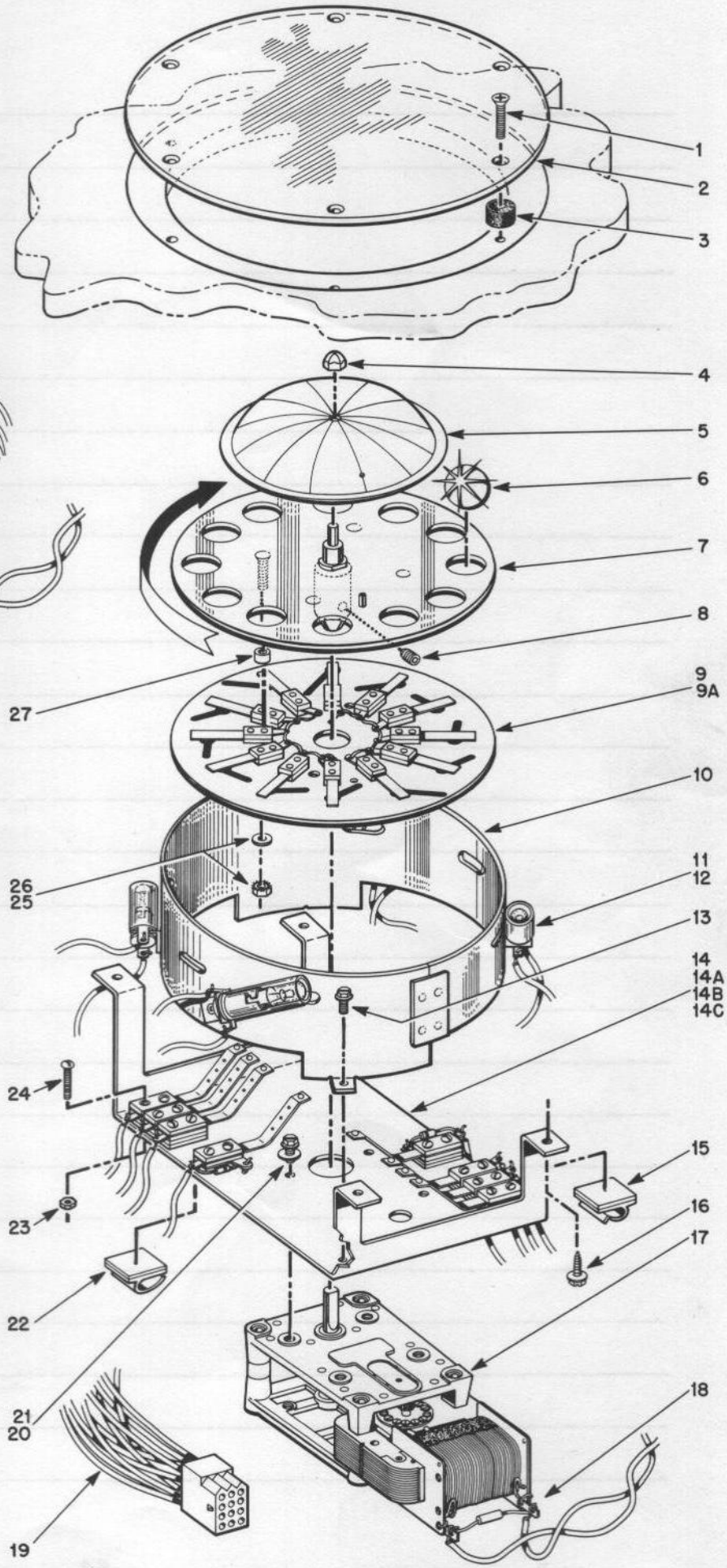


ITEM	DESCRIPTION	PART NO.
	Auxiliary Lightbox Assy.	MA-900
1	Carriage Bolt (2)	FA-114
2	Shipping Cover (Not Shown)	25189
3	Washer, 1/4 Std. (2)	FA-620
4	Lockwasher, 1/4 Int. (2)	FA-639
5	Wing Nut, 20-1/4 (2)	FA-672
6	Screened Display	25187-708
7	Backbox Display	25188-708
8	Bracket	25186
9	Screw, 8 x 1/2 HWHSMS (5)	FA-300
10	Lamp Socket (30)	2913
11	Lamp #44 (30)	LA-0
12	Lamp Socket (8)	25053
13	Lamp #67 (8)	LA-5
14	Cable Assembly	MA-896

XI. PARTS INFORMATION

SPIN-A-BALL ASSEMBLY





ITEM	DESCRIPTION	PART NO.
	Spin-A-Ball Assembly	MA-898
1	6-32 x 3/4" FH Phillips MS Nylon Patch (6)	FA-39
2	Playboard Window	25239
3	Sponge Rubber Washer (6)	21219
4	Pal Nut	FA-666
5	Plastic Dome Indicator	10660-708
6	Steel Ball, 3/4"	25210
7	Plate Sub-Assembly	25112
8	10-32 x 1/4" Set Screw	FA-159
9	Printed Circuit Disc Assembly (with Switches Attached)	25213
9A	Switch (12)	25214
10	Ring Fence Sub-Assembly (with Lamp Sockets Attached)	25220
11	Light Shield, (Yellow), (4)	24410T
12	Lamp, #44 (4)	LA-0
13	6-32 x 1/4" Rolok (2)	FA-44
14	Frame Sub-Assembly (with Switches Attached)	25218
14A	Switch (Returns 0-5) (6)	25215
14B	Switch (Strobes 0-1) (2)	25216
14C	Diode, 1N270 (2)	XO-265
15	Cable Clamp	MP-33
16	8 x 1/2" HWH SMS (4)	FA-300
17	Motor, (200 RPM, CW)	10654
18	Varistor, 35V AC (VR1)	XO-877
19	Cable Assembly (A9J7)	MA-894
20	#8 Washer (3)	FA-617
21	8-32 x 3/8" HWHMS SEMS (3)	FA-69
22	Cable Clamp	MP-34
23	5-40, 1/4" HEX Nut (16)	FA-650
24	5-40 x 1/2" RHMS (16)	FA-1
25	#6 Washer (4)	FA-615
26	6-32 KEPS Nut (4)	FA-647
27	Spacer (4)	25240

SERVICE NOTES

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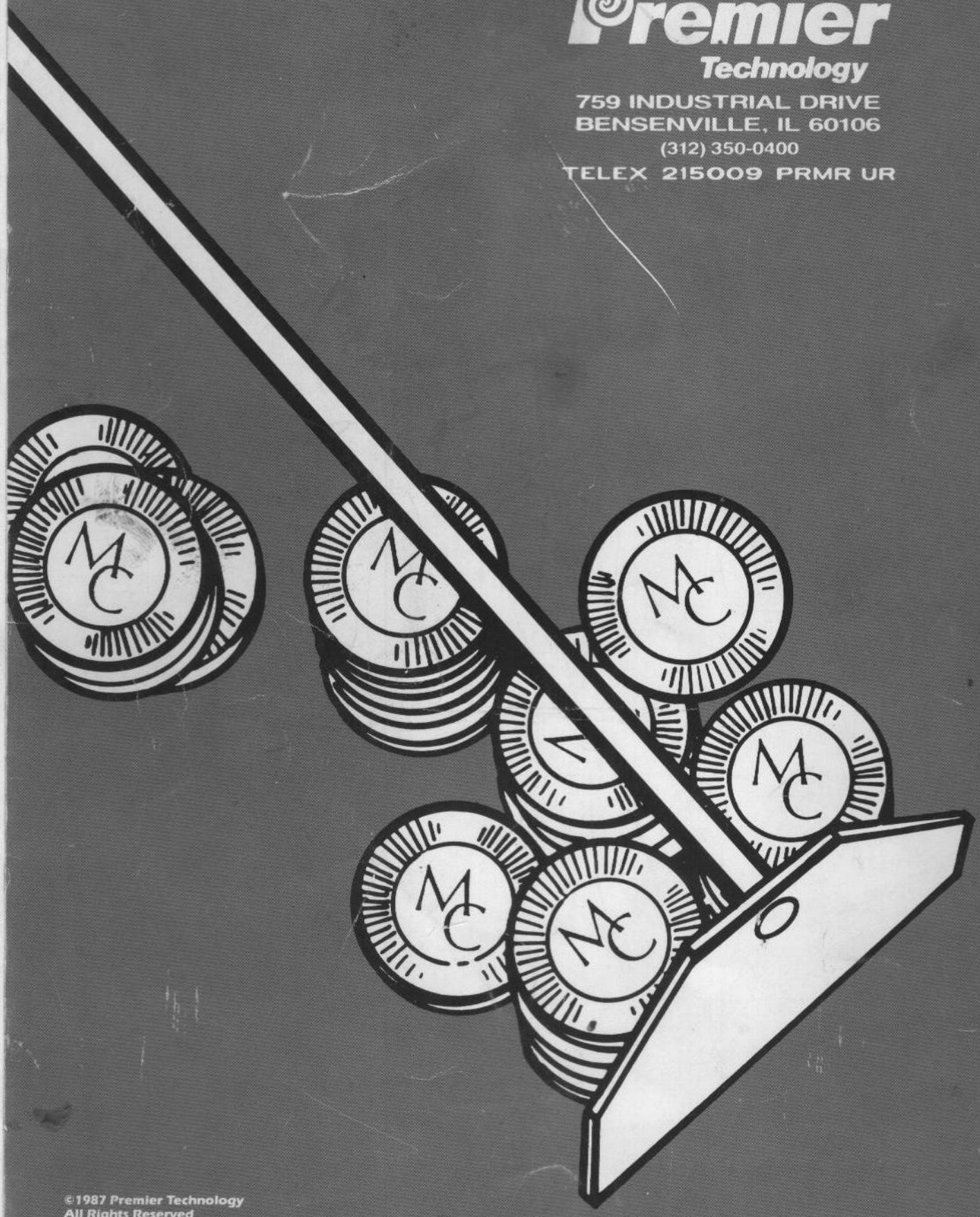

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