

ARENA
(GAME #709)
(3 BALL GAME)

INSTRUCTION MANUAL
Applicable for all games.

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GAME PROMS:
709/PROM 1
709/PROM 2

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

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Technology

759 INDUSTRIAL DRIVE
BENSENVILLE, IL 60106
(312) 350-0400
TELEX 215009 PRMR
FAX: (312) 350-1097

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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.

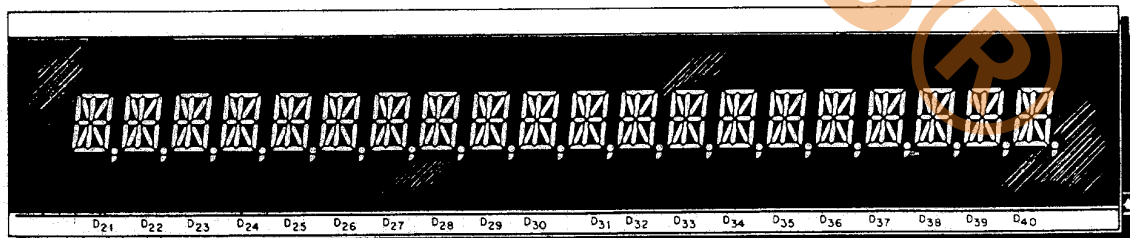


FIGURE 1B.

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.

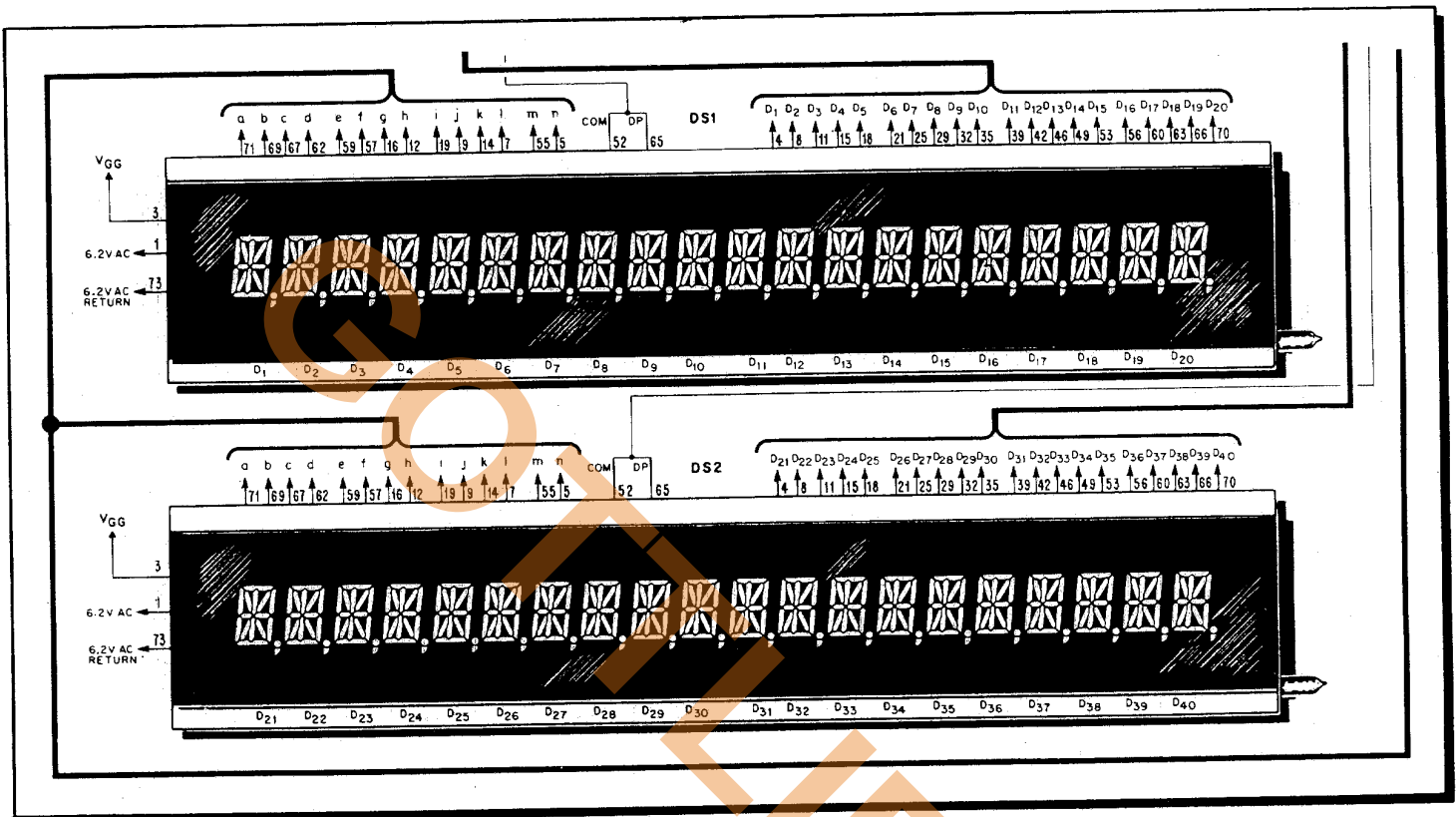


FIGURE 2.

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.
- 5) Automatic Replay percentaging.

“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.”

I. INSTALLATION

A. SET-UP

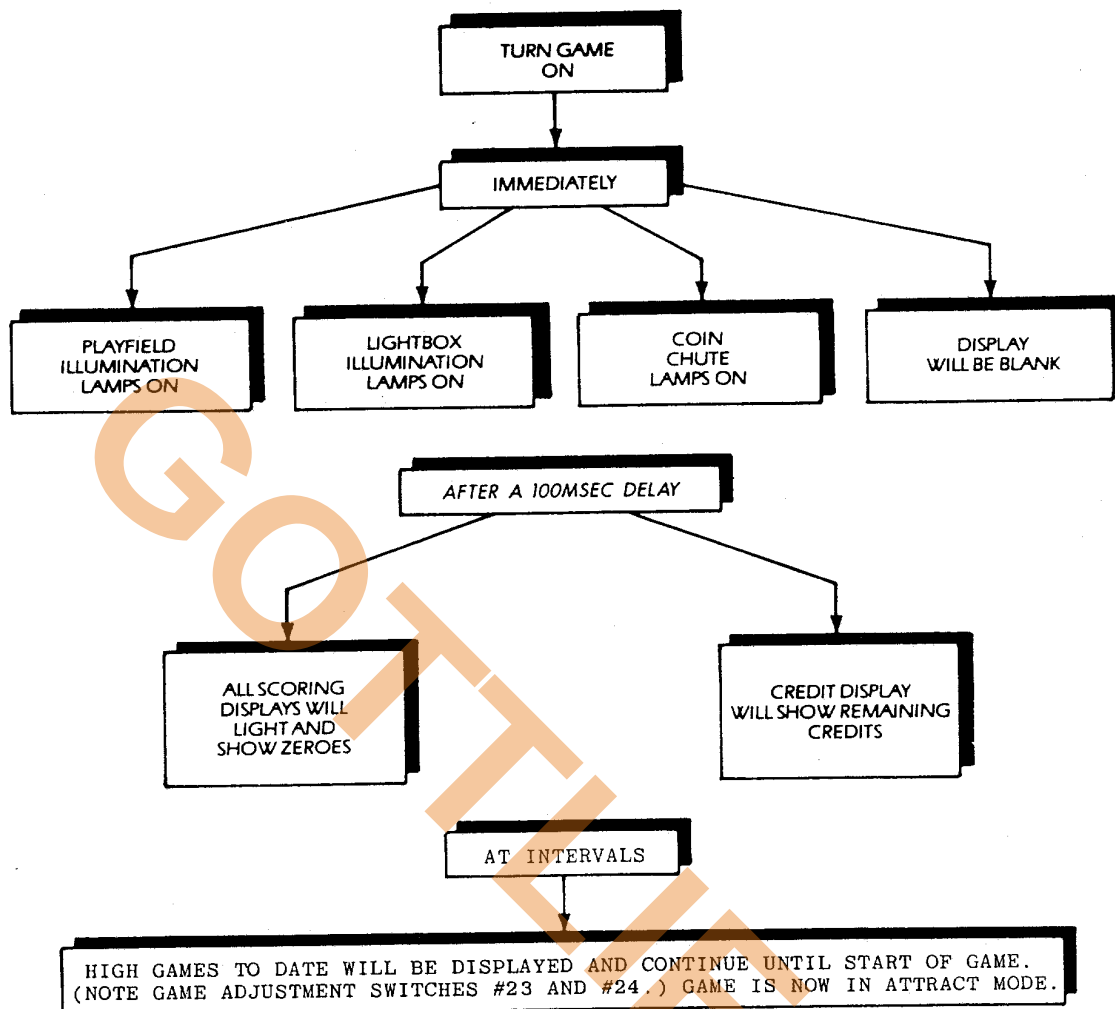
1. Bolt the legs to the cabinet.
2. Lift lightbox into an upright position. Be sure none of the cables are crimped in between the lightbox and cabinet.
3. Engage the snap in the rear of the lightbox to the cabinet.
4. To remove the lightbox backglass and gain servicing access to the electronics panel, 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 $5\frac{1}{2}^{\circ}$ - 6° , SEE ILLUSTRATION AT LEFT.
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

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.

III. GAME OPERATION

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).

HOW TO PLAY

TOP ROLLOVERS

- SCORE 500 UNLIT.
- ADD BONUS.
- SCORE 5000 WHEN LIT.
- COMPLETING THE SEQUENCE CAPTURES A BALL.
- COMPLETING THE SEQUENCE WHEN 2 BALLS ARE CAPTURED LAUNCHES ALL BALLS (MULTI-BALL).

LEFT AND RIGHT SIDE SPOT TARGETS

- SCORE 1000 UNLIT.
- SCORE 5000 AND ADD BONUS WHEN FLASHING.
- COMPLETING THE LEFT OR RIGHT SIDE SPOT TARGETS ADVANCES THE MULTIPLIER, LIGHTS RAMP VALUE (UPPER PLAYFIELD), AND LIGHTS ITS RESPECTIVE COMPLETE LAMP (CYS1 OR CYS2).
- COMPLETING ALL 6 SPOT TARGETS LIGHTS THE SPECIAL (UPPER PLAYFIELD) WHEN LIGHT SPECIAL IS LIT (BASED ON SWITCH #32).
- (5-BALL) SCORE 500 UNLIT.
- (5-BALL) SCORE 1000 WHEN FLASHING.

ROLLOVER DROP TARGETS (W-A-L-L)

- SCORE 5000.
- ADD BONUS.
- COMPLETING THE TARGETS STARTS THE TARGET RESET TIMER.
- COMPLETING THE TARGETS AND THE TOP SPOT TARGETS ("GUARDS") LIGHTS THE EXTRA BALL (UPPER PLAYFIELD).
- (5-BALL) SCORE 1000.

TOP SPOT TARGETS ("GUARDS")

- SCORE 1000 UNLIT.
- ADD BONUS.
- SCORE 5000 WHEN LIT.
- COMPLETING THE TARGETS AND THE ROLLOVER DROP TARGETS (W-A-L-L) LIGHTS THE EXTRA BALL (UPPER PLAYFIELD).
- (5-BALL) SCORE 500 UNLIT.
- (5-BALL) SCORE 1000 WHEN LIT.

LEFT AND RIGHT HOLES

- NO SCORE.

IV. GAME PLAY AND SCORING

CENTER ROLLOVER AND LEFT AND RIGHT SIDE ROLLOVERS (P-I-T)

- SCORE 500 UNLIT.
- SCORE 5000 AND ADD BONUS WHEN LIT.
- COMPLETING THE SEQUENCE P-I-T LIGHTS 1,000,000 (UPPER PLAYFIELD).

SPINNER

- SCORE 500 UNLIT.
- SCORE 5000 WHEN FLASHING.

RAMP ROLLUNDER

- SCORE 5000.
- ADVANCE RAMP VALUE (5000 X MULT) WHEN LIT (WHITE).
- OPEN BOTH GATES WHEN UNLIT (GREEN).
- (5-BALL) SCORE 1000.

RIGHT FLIPPER SWITCH

- ROTATE TOP ROLLOVERS.
- DISPLAY BONUS VALUE, RAMP VALUE, AND REPLAY LEVEL (AUTO-PERCENTAGING ONLY) WHEN HELD CLOSED.

LEFT AND RIGHT RETURN ROLLOVERS

- SCORE 1000.
- ADD BONUS.
- START SPINNER FLASHING WHEN LIT.

LEFT AND RIGHT OUTSIDE ROLLOVERS

- SCORE 5000 UNLIT.
- ADD BONUS.
- SCORE 50,000 WHEN LIT.

RUBBER SWITCHES

- SCORE 30.
- TOGGLE RETURN ROLLOVERS AND OUTSIDE ROLLOVERS.
- (5-BALL) TOGGLE ADVANCE RAMP VALUE (WHITE).

OUTHOLE

- COLLECT BONUS VALUE.

(UPPER PLAYFIELD)

#1 HOLE ROLLOVER

- SCORE 25,000.
- COLLECT RAMP VALUE WHEN LIT.

#2 HOLE ROLLOVER

- SCORE 50,000.
- AWARD EXTRA BALL WHEN LIT.

#3 HOLE ROLLOVER

- SCORE 75,000.
- AWARD SPECIAL WHEN LIT.

#4 HOLE ROLLOVER

- SCORE 100,000.
- SCORE ADDITIONAL 1,000,000 WHEN FLASHING.

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 AND
RANDOM FLASH DURING GAME PLAY**
ON ENABLED
OFF DISABLED

ADDITIONAL COIN CHUTE COMBINATIONS CREDIT INCENTIVES

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

SWITCHES					Left Coin Chute	Right Coin Chute	Center Coin Chute					
S1	S2	S3	S4	S5 -								
S9	S10	S11	S12	S13 -								
S17	S18	S19	S20	S21 -								
					COIN/ CREDIT GIVEN	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	

SWITCH 8 _____ **AUTO-PERCENTAGE CONTROL**
ON ENABLED
OFF DISABLED (NORMAL HIGH SCORE MODE)

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 _____ **EXTRA BALL CONTROL**
ON TOP SPOT TARGETS ("GUARDS") ARE MEMORIZED
BALL TO BALL (LIBERAL).
OFF TOP SPOT TARGETS ("GUARDS") ARE RESET
BALL TO BALL (CONSERVATIVE).

SWITCH 32 _____ **PLAYFIELD SPECIAL CONTROL**
ON COMPLETING ALL 6 SPOT TARGETS (CYS1 & CYS2) ONCE
LIGHTS THE SPECIAL (LIBERAL).
OFF COMPLETING ALL 6 SPOT TARGETS (CYS1 & CYS2) TWICE
LIGHTS THE SPECIAL (CONSERVATIVE).

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.

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.

SWITCH BANK SETTINGS:

DIP SWITCH

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

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

Applicable only to:

- Step 1 - Left chute coins
- Step 2 - Right chute coins
- Step 3 - Center chute coins

- a. Advance Bookkeeping so the step to be zeroed is displayed.
- b. Press the credit button. Notice information replaced by zeros.

2. Zeroing All Bookkeeping Steps

Except Auto-Percentaging setting (Step 6), Replay Levels (Steps 11-13), and Highest Game To Date Score (Step 14).

- a. Go to Step 15 (average playing time).
- b. Press the credit button. The message "Bookkeeping Cleared" will be displayed.
- c. Zeroing is complete.

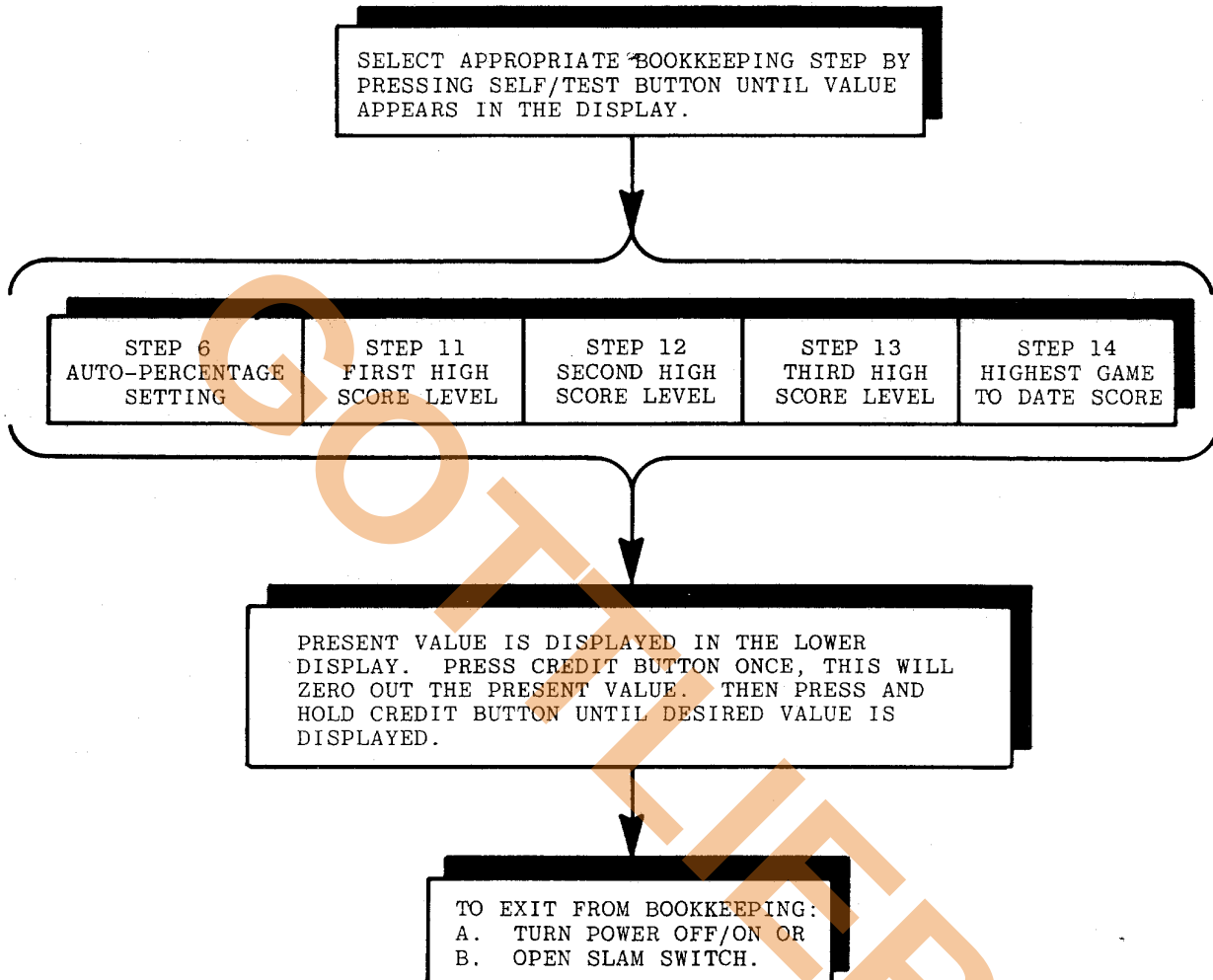
HOW TO USE AUTOMATIC REPLAY PERCENTAGING

Move Control Board switch #8 to the on position to enable Auto-Percentaging. Set the desired percent payout while in Step 6 of bookkeeping (See Page 9). When Auto-Percentaging is enabled, only the first High Score Replay Level is used. The second and third levels are ignored.

Periodically the first Replay Level will be adjusted by 100,000 points at a time. After 10,000 games have been played, the Total Plays (Step 4), Total Replays (Step 5), and Game Time (Step 15) bookkeeping values are reset to 0 (Refer to Page 10).

VII. BOOKKEEPING AND SELF TEST

III. HOW TO SET/RESET AUTO-PERCENTAGE SETTING, HIGH SCORE LEVELS OR HIGH GAME TO DATE SCORES.

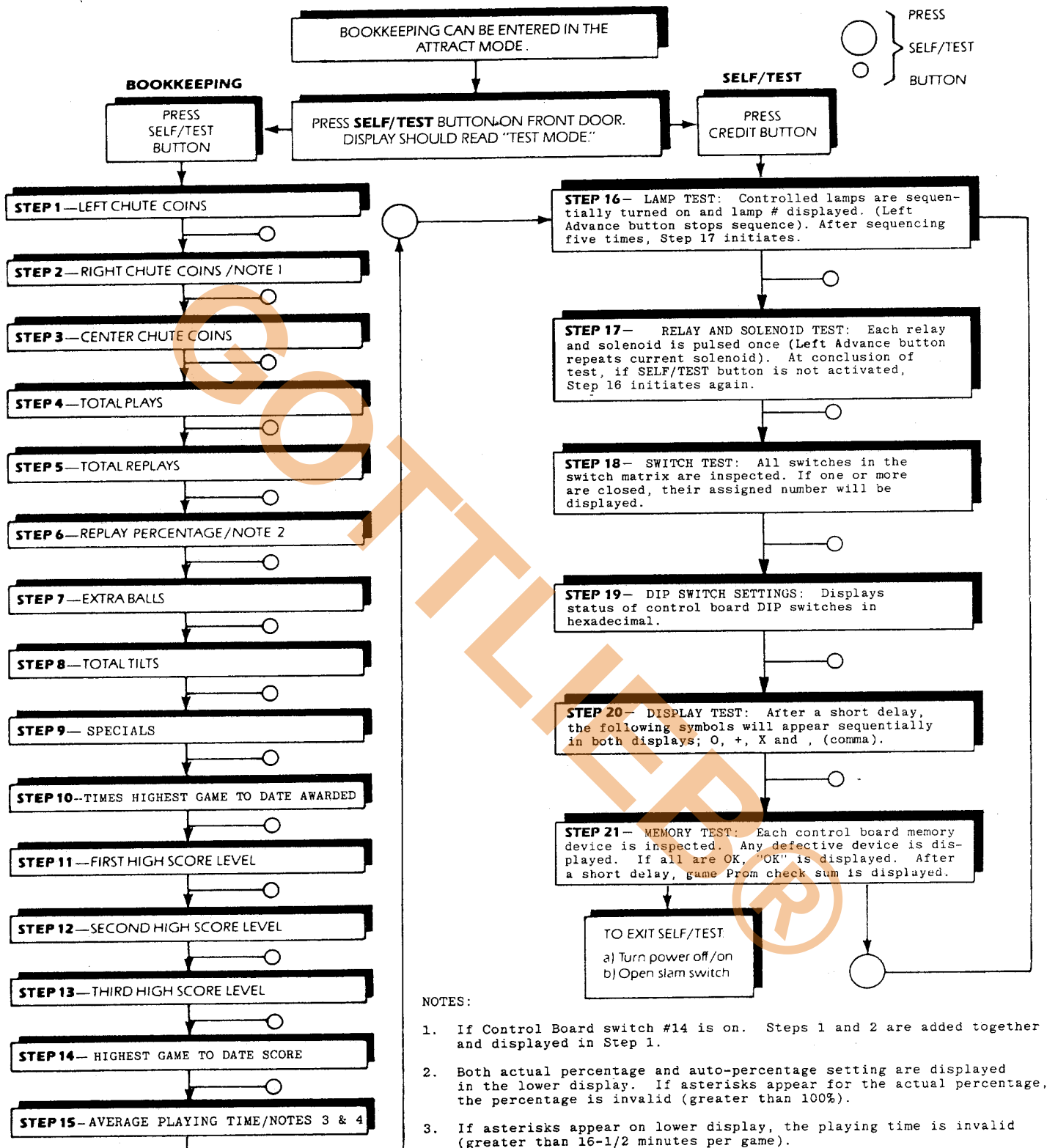


NOTES:

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.
5. Only the first High Score Level is used when auto-percentaging (switch 8) is enabled.

VII. BOOKKEEPING AND SELF TEST

B. FLOW CHART



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-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	Display Light Show	Q60
Sol.2	(4 Bank) Reset	Q57/Q58
Sol.3	Display Light Show	Q54
Sol.4	Playboard Lamp (R)	Q55
Sol.5	Right Hole	Q61/Q62
Sol.6	Left Hole	Q63/Q64
Sol.7	Playboard Lamp (L)	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

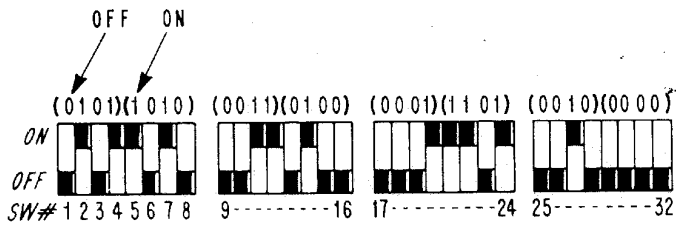
- a. The status of the Control Board (A1) switches appears in the lower display.

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

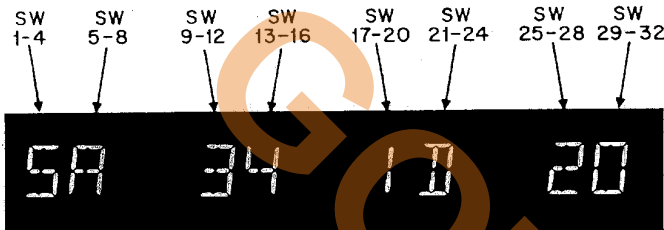
VII. BOOKKEEPING AND SELF TEST

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; O, +, 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

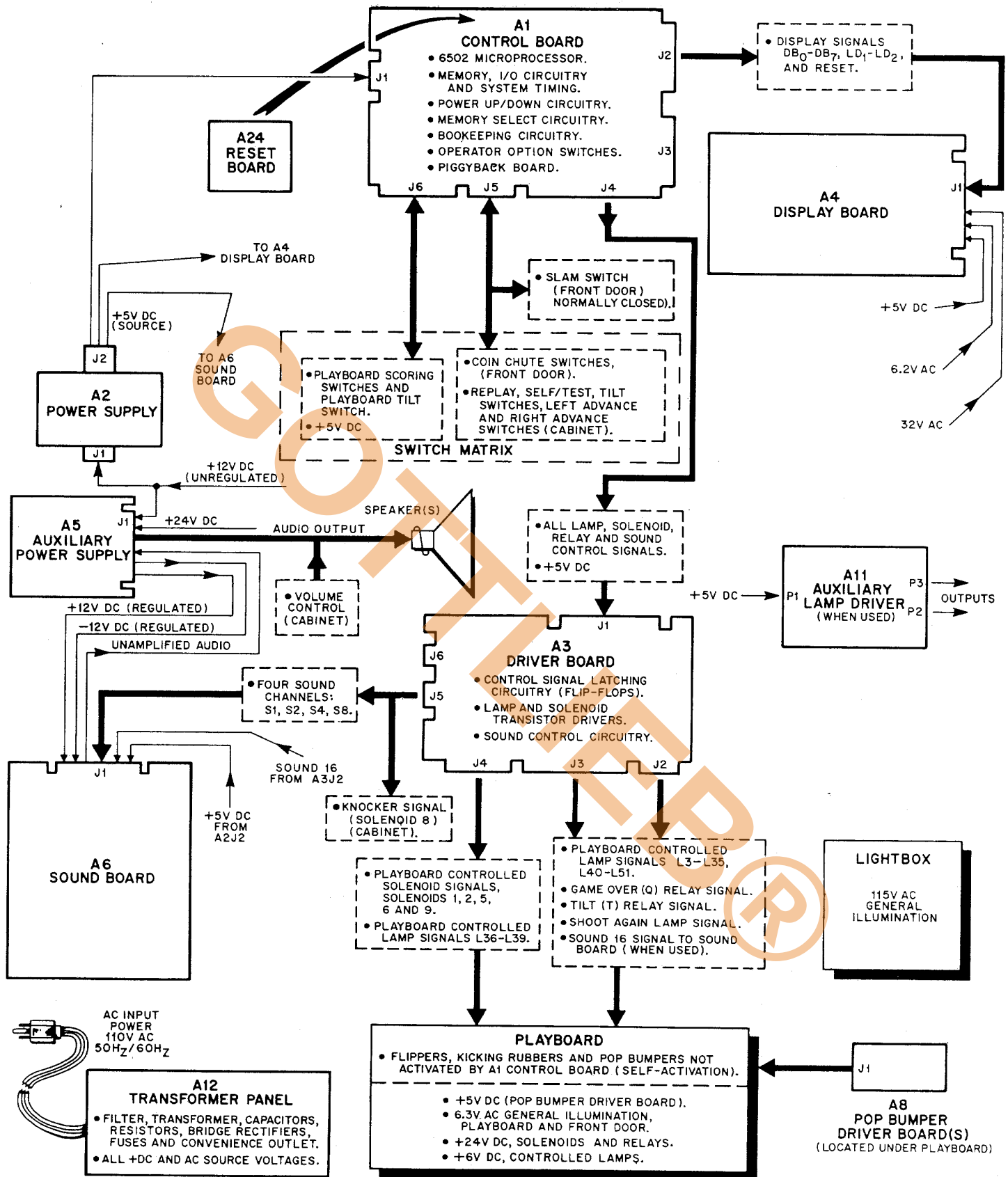


FIGURE 1. SYSTEM 80B BLOCK DIAGRAM

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.

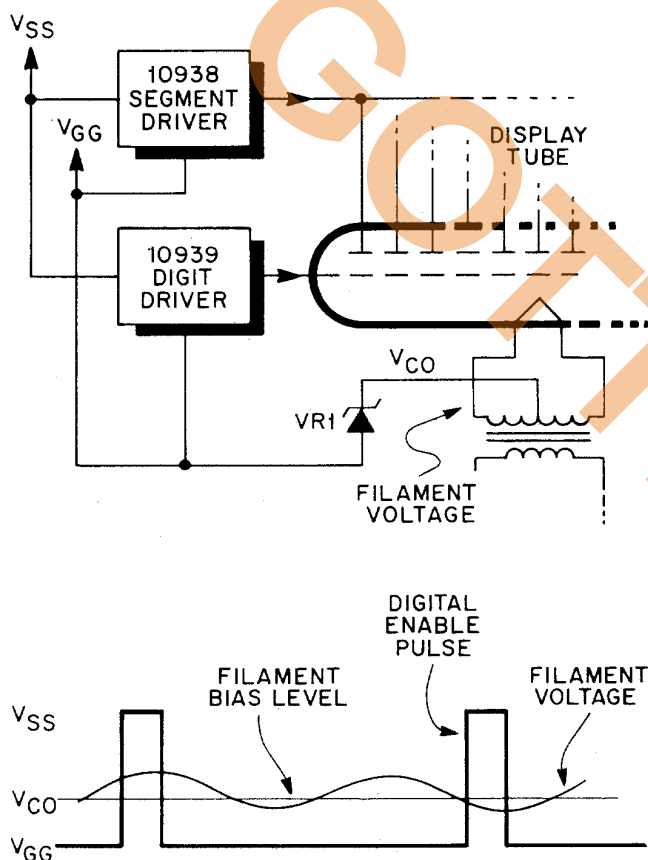


FIGURE 2. BASIC DRIVE CIRCUIT

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
A15- LED Board Assembly
A16- Transistor Driver 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	....	5 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
F9	Display Filament.....	6.2V AC	....	1 Amp
F9A	Display Filament.....	6.2V AC	....	1 Amp
F20	Input Line.....	110V AC	....	8 Amp SLO-BLO
		220V AC	....	4 Amp SLO-BLO

PLAYBOARD FUSES

F10	Ball Release.....	1 Amp SLO-BLO
F11	Left Hole, Right Hole, Outhole.....	1 Amp SLO-BLO
F12	(4-Bank) Drop Target Reset.....	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	O, 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

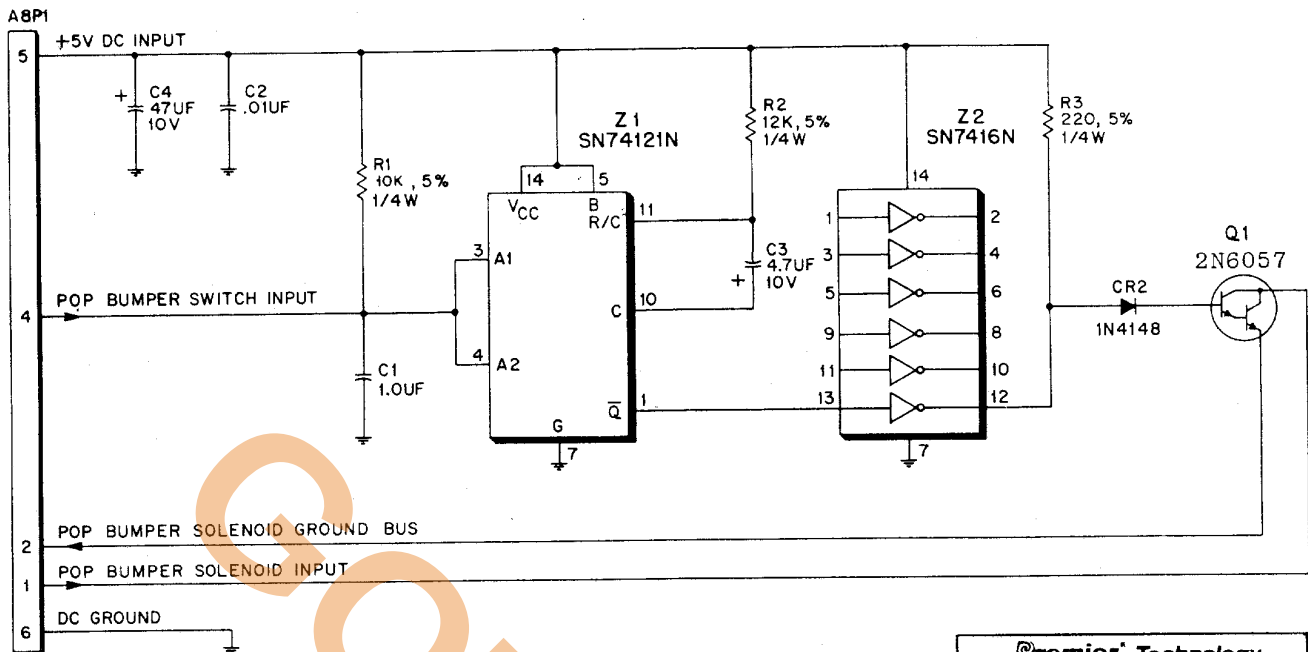
*Coils may vary from game to game. Check game manual for exact coil usage.

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

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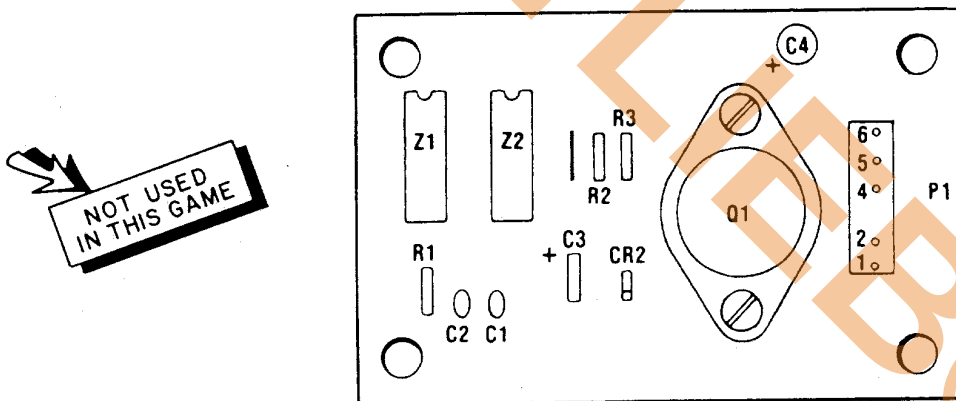
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X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



Premier Technology			
TITLE POP BUMPER DRIVER BOARD (A8)			
USED ON			
DRAWN	APPROVED	DATE	D-20923
P	AC	10-4-82	

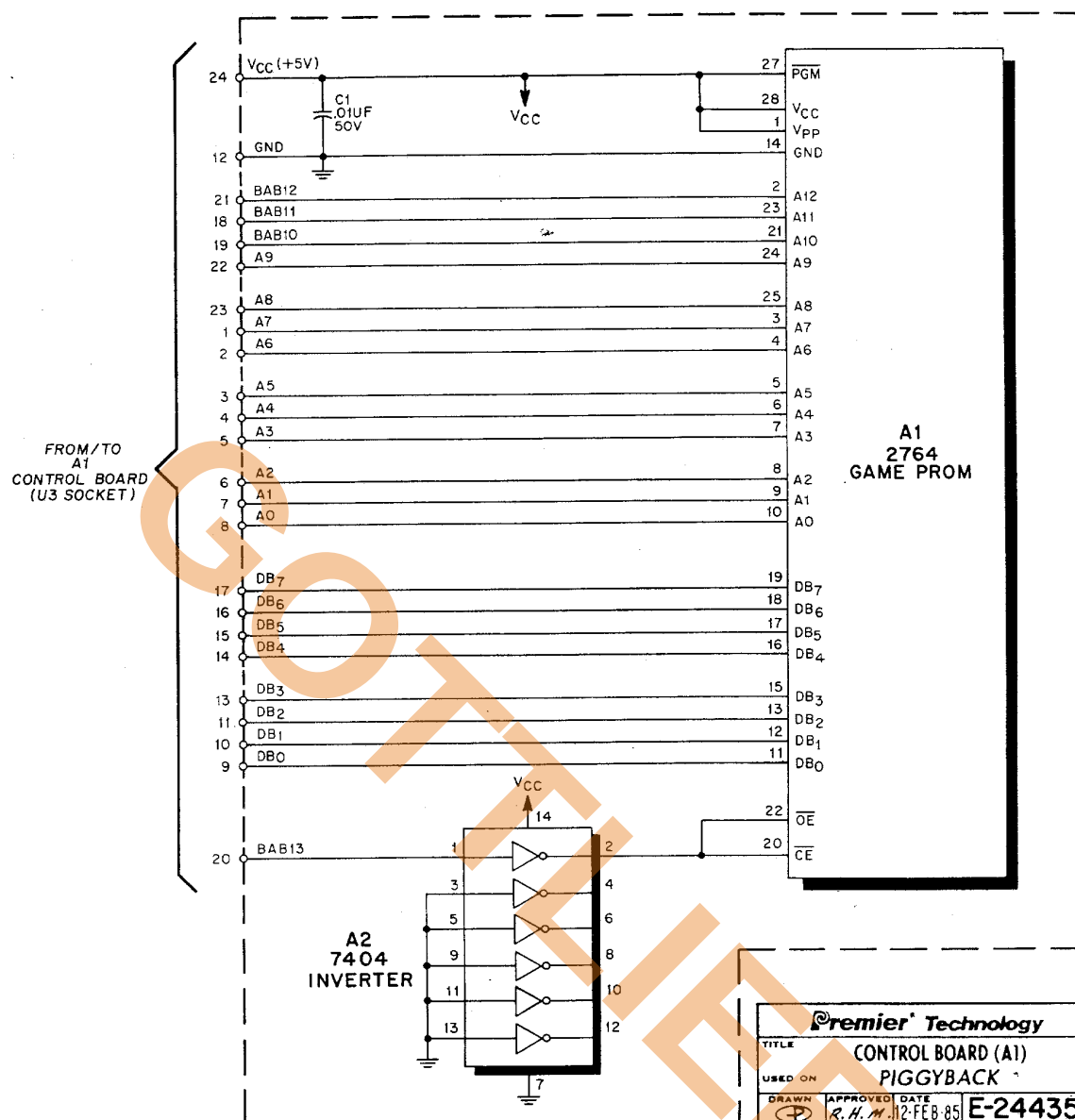
POP BUMPER DRIVER BOARD (A8) COMPONENT LOCATION



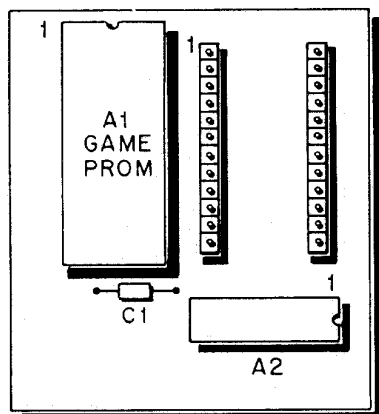
POP BUMPER DRIVER BOARD (A8) PARTS LIST

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-879
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**

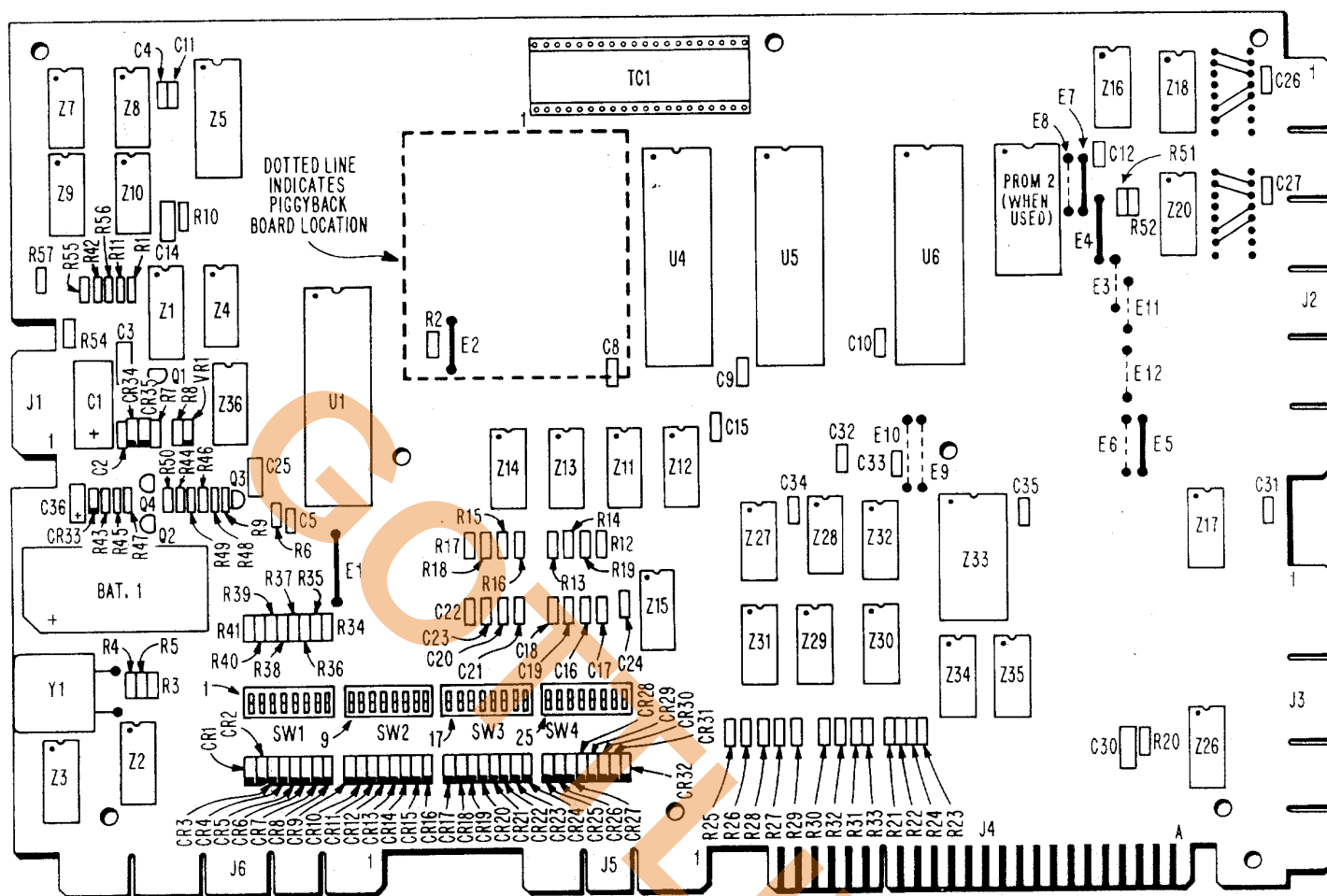


**CONTROL BOARD (A1),
PIGGYBACK
PARTS LIST**

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

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

CONTROL BOARD (A1) COMPONENT LOCATION



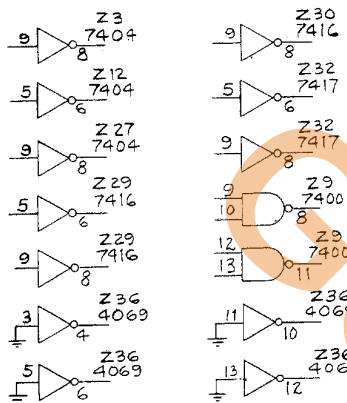
CONTROL BOARD (A1) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER	REFERENCE	DESCRIPTION	PART NUMBER
	CONTROL BOARD	MA-774	R47	Resistor, 24K ohm, 5%, 1/4W	XO-10
Bat 1	Battery-3.6V NI-CAD	XO-458	SW1-SW4	Dip Switch 1008-692	XO-505
C1	Capacitor, 100 mfd, 10V	XO-211	TC1	Socket, 40 Pin 640379-3	XO-530
C2, C4, C5,	Capacitor, .01 mfd, 50V	XO-229	U1	CPU R6502 P	XO-360
C8-C12,			U4, U5, U6	PIROT R6532 P	XO-361
C15-C24,			VR1	Diode-3.0V, 5% IN5225B or IN5987B	XO-269
C26, C27,			Y1	Crystal, 3.579545 MHZ	XO-456
C31-C35			Z1	IC-Cmos-Dual 1 Shot SCL45288E	XO-414
C3, C14, C25,	Capacitor, .1 mfd, 50V	XO-230	Z2	IC-Dual Flip Flop SN7474N	XO-423
C30			Z3, Z11, Z12,	IC-Hex Inverter SN7404N	XO-402
C36	10 mfd, 10V, TNT-AX CAP	XO-209	Z16, Z17,		
CR1-CR35	Diode, GP IN4148	XO-261	Z26, Z27, Z34,		
Q1, Q4	Transistor-PNP MPS-A70	XO-309	Z35		
Q2, Q3	Transistor, NPN (Motorola) 2N4400	XO-313	Z4	IC-Cmos-Quad 2 Input "And" SCL4081BE	XO-401
R1, R6	Resistor, 3.0K ohm, 5%, 1/4W	XO-23	Z5	IC-Static Ram S5101-L	XO-356
R11-R24			Z7	IC-Hex Inverter SN74LS04N	XO-418
R42, R45,			Z8	IC-2 Input "Nor" SN7402N	XO-421
R46, R48,			Z9, Z13, Z14	IC-2 Input "Nand" SN7400N	XO-420
R51, R52,			Z10	IC-Open Collector Inverter SN74LS05N	XO-411
R54-R57			Z15	IC-2 Input "Or" SN7432N	XO-407
R2, R34-R41	Resistor, 4.7K ohm, 5%, 1/4W	XO-7	Z18, Z20	IC-"D" Flip Flop SN74175N	XO-410
R3, R43, R49	Resistor, 5.6K ohm, 5%, 1/4W	XO-19	Z33	IC-4-16 Decoder SN74154N	XO-409
R4, R5, R44	Resistor, 2.0K ohm, 5%, 1/4W	XO-14	Z28	IC-2 to 4 Decoder SN74LS139N	XO-419
R7	Resistor, 62 ohm, 5%, 1/4W	XO-3	Z29, Z30	IC-Hex Inverter-OC/HV SN7416N	XO-405
R8, R50	Resistor, 180 ohm, 5%, 1/4W	XO-24	Z31	IC-2 Input "And" SN7408N	XO-404
R9	Resistor, 1K ohm, 5%, 1/4W	XO-5	Z32	IC-Hex Buffer-OC SN7417N	XO-406
R10	Resistor, 2.7M ohm, 5%, 1/4W	XO-13	Z36	IC-Cmos SCL4069B	XO-424
R25-R33	Resistor, 620 ohm, 5%, 1/4W	XO-4		Socket 24 Pin 640361-3	XO-529

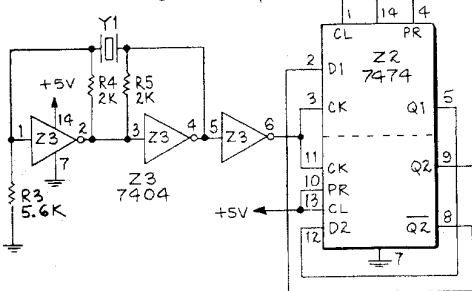
CONTROL BOARD (A1), PIGGYBACK MA689

NOTE: UNLESS OTHERWISE INDICATED;
 1. RESISTORS ARE $\pm 5\%$, 1/4W.
 2. CAPACITORS ARE .01UF, 50V.
 3. DIODES ARE TYPE IN4148.
 4. REF. DESIGNATION Z6 NOT USED.

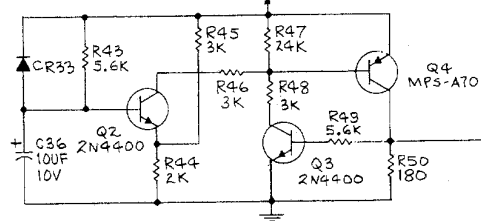
SPARE GATES



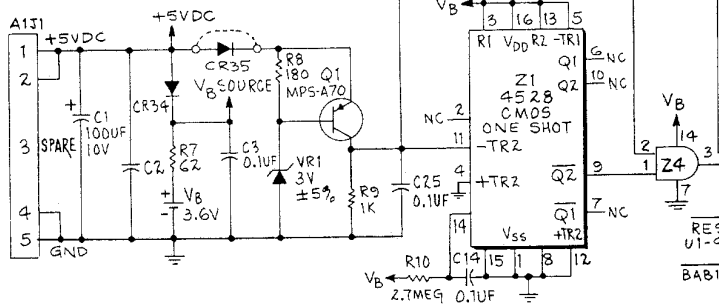
CLOCK LOGIC



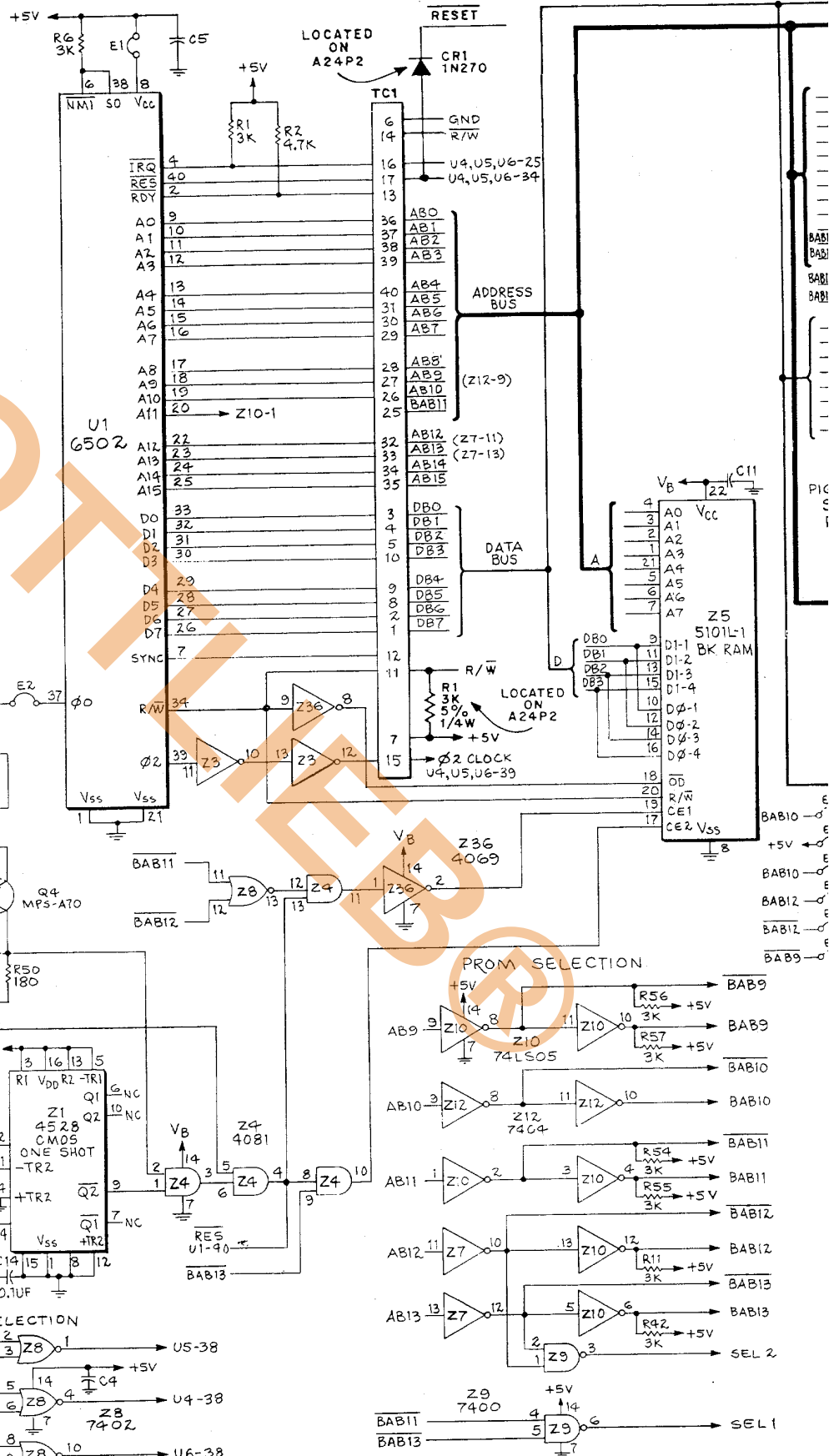
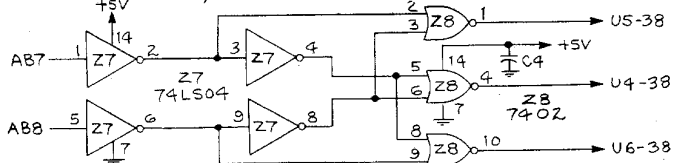
DELAY CIRCUIT



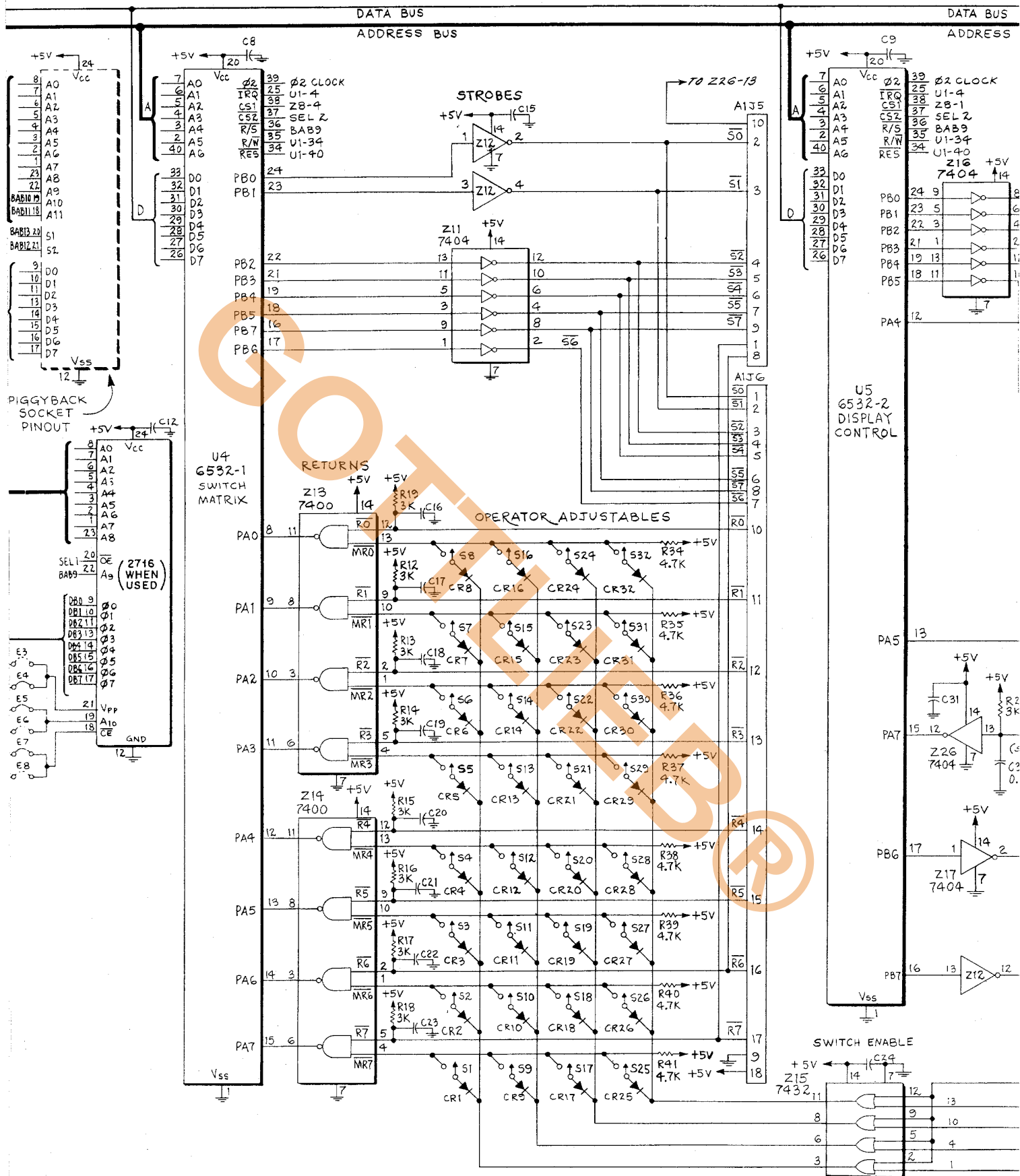
UP/DOWN MEMORY PROTECT LOGIC



INPUT/OUTPUT DEVICE SELECTION

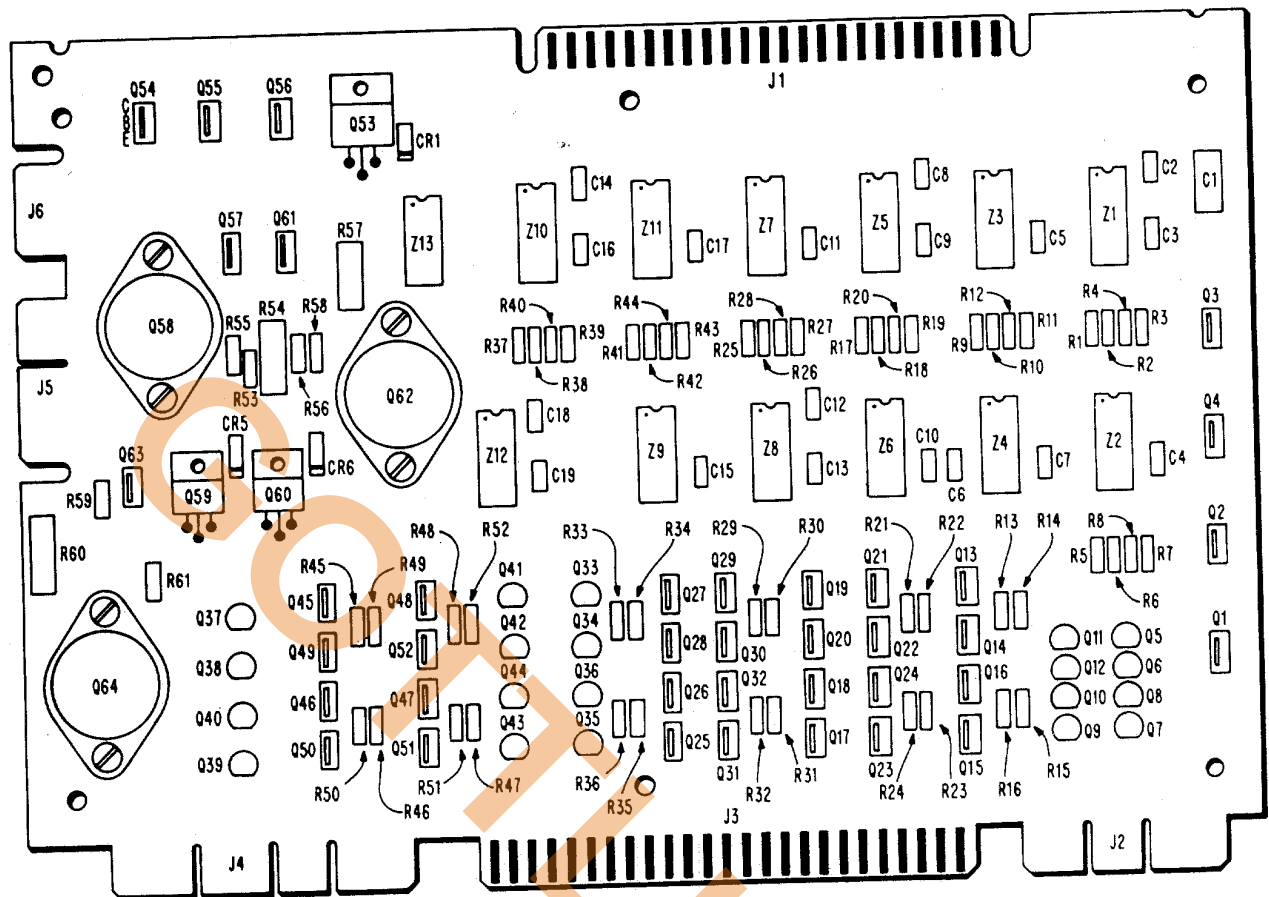


X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DRIVER BOARD (A3) COMPONENT LOCATION



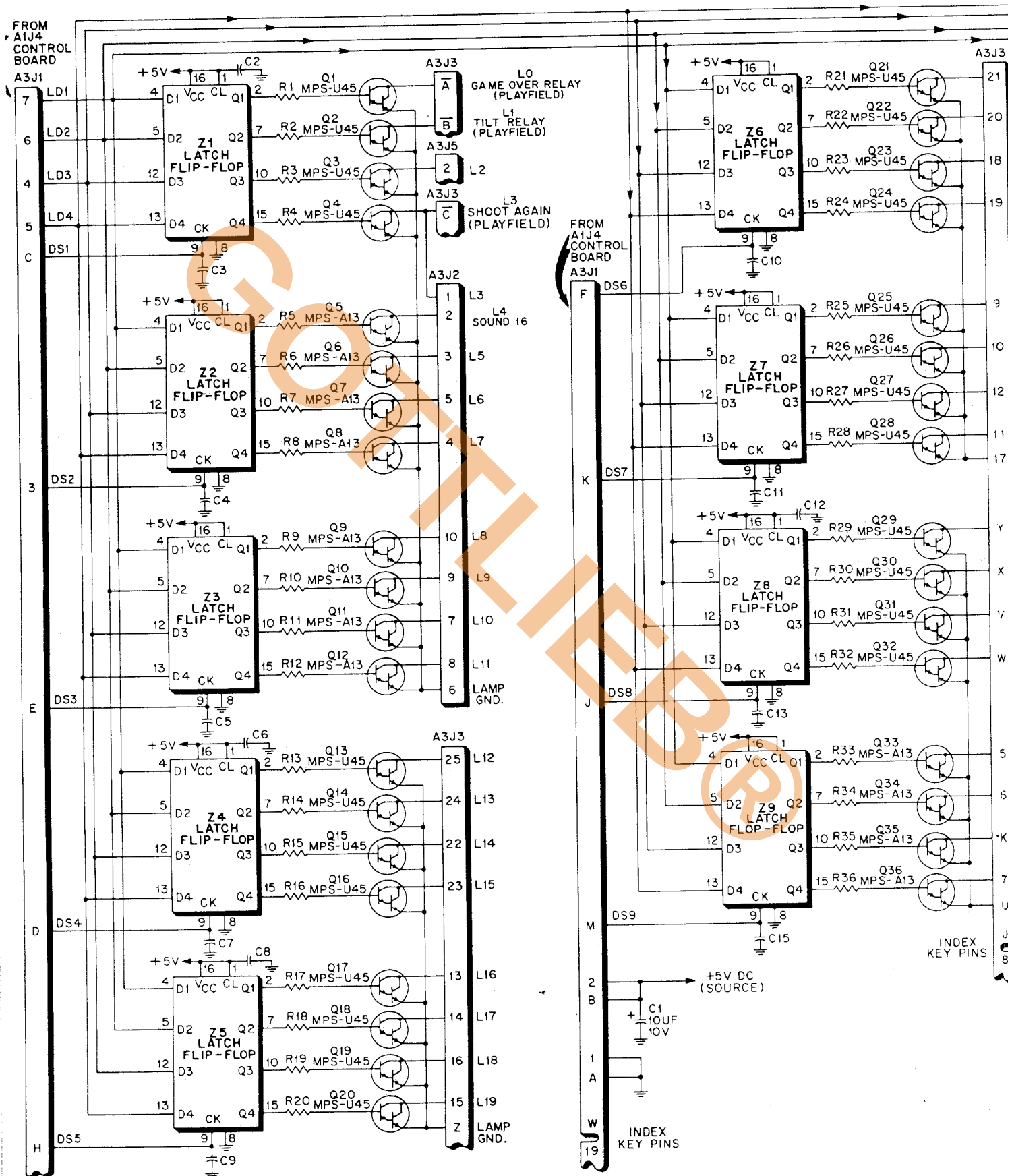
DRIVER BOARD (A3) PARTS LIST

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,	Resistor 10K ohm, 5%, 1/4W	XO-5
R55, R56, R58, R59		
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

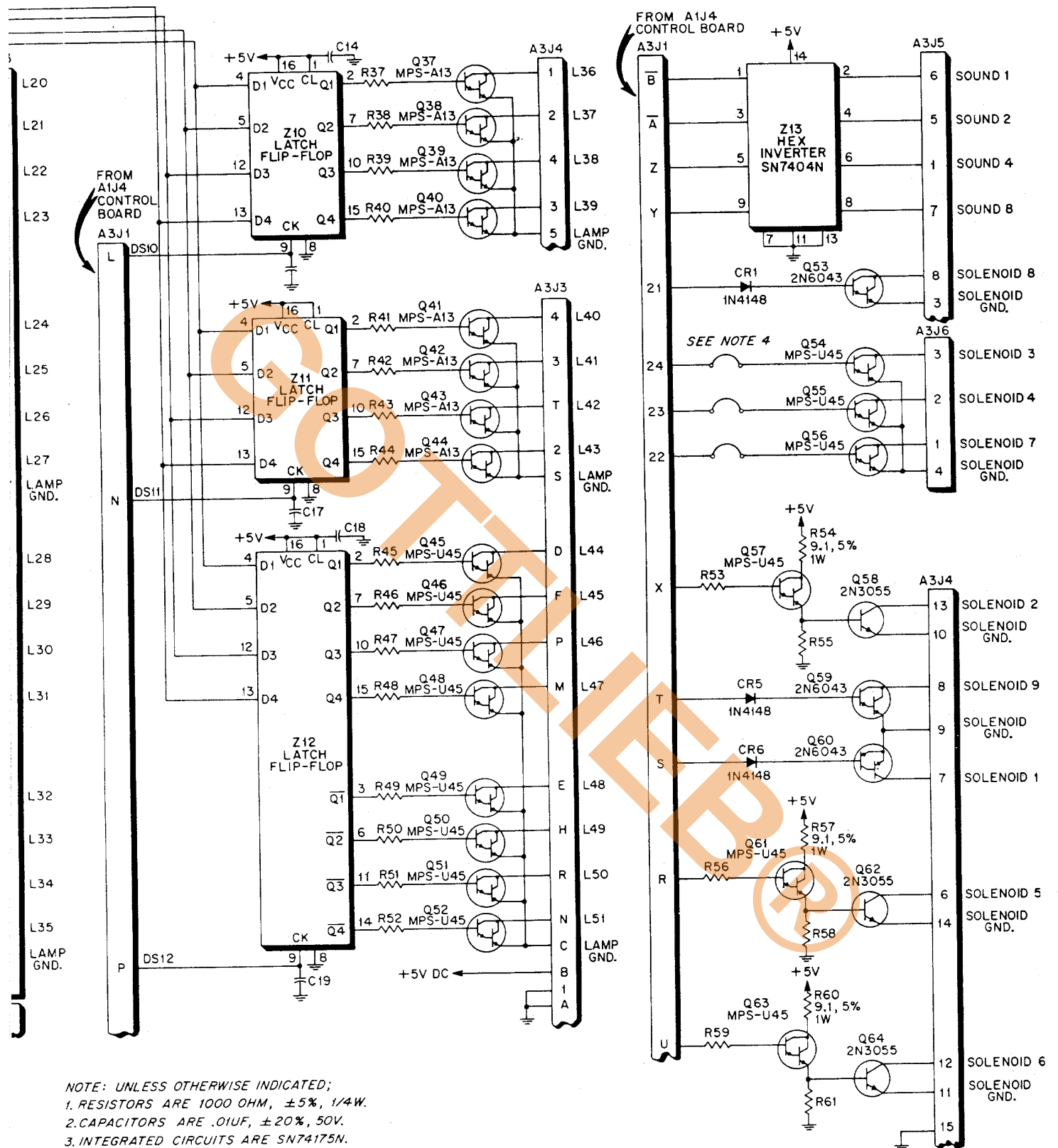
NOTE:

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.

X. WIRING AND SCHEMATA



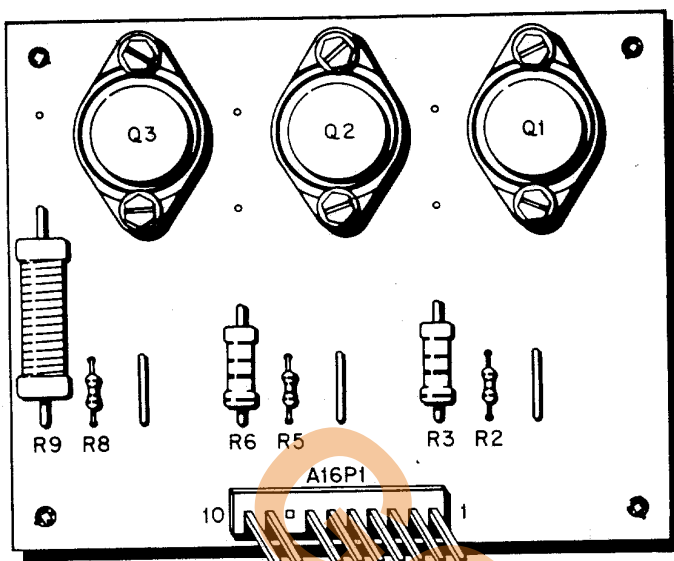
TIC DIAGRAMS, PARTS LISTS



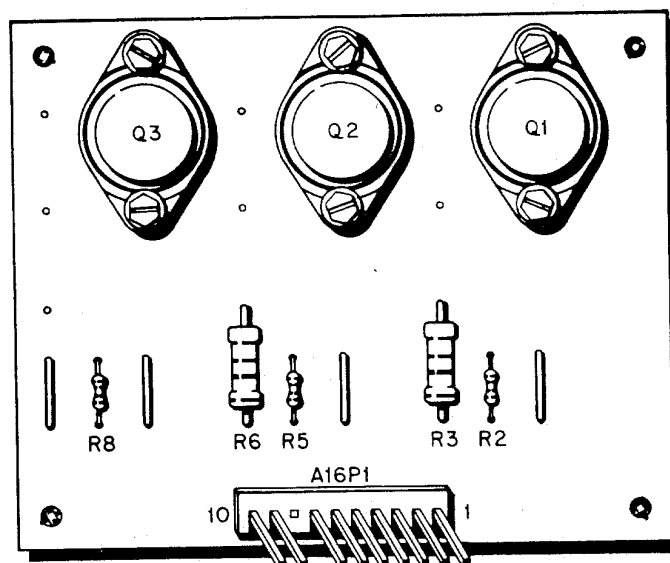
- NOTE: UNLESS OTHERWISE INDICATED;
 1. RESISTORS ARE 1000 OHM, $\pm 5\%$, 1/4W.
 2. CAPACITORS ARE .01UF, $\pm 20\%$, 50V.
 3. INTEGRATED CIRCUITS ARE SN74175N.
 4. JUMPER WIRES REPLACED DIODES CR2, CR3 AND CR4 FOR SYSTEM 80A AND 80B GAMES.
 5. TRANSISTOR TYPES MPS-U45 AND NDS-U45 ARE INTERCHANGEABLE.

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

TRANSISTOR DRIVER BOARD (A16) COMPONENT LOCATION



TRANSISTOR DRIVER BOARD (A16) COMPONENT LOCATION



TRANSISTOR DRIVER BOARD (A16) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Transistor Driver Board Assembly (1A16)	MA-940
Q1-Q3	Transistor, MJ2955	XO-799
R2, R5, R8	Resistor 4.7K Ohm, 5%, 1/4W	XO-7
R3, R6	Resistor 8 Ohm, 5%, 5W	XO-876
R9	Resistor 4 Ohm, 5%, 7W	XO-878
P1	10 Position Connector	XO-879
	Circuit Board Support (4)	MP-40

TRANSISTOR DRIVER BOARD (A16) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Transistor Driver Board Assembly (2A16)	MA-942
Q1-Q3	Transistor, MJ2955	XO-799
R2, R5, R8	Resistor 4.7K Ohm, 5%, 1/4W	XO-7
R3, R6	Resistor 56 Ohm, 5%, 2W	XO-898
P1	10 Position Connector	XO-879
	Circuit Board Support (4)	MP-40

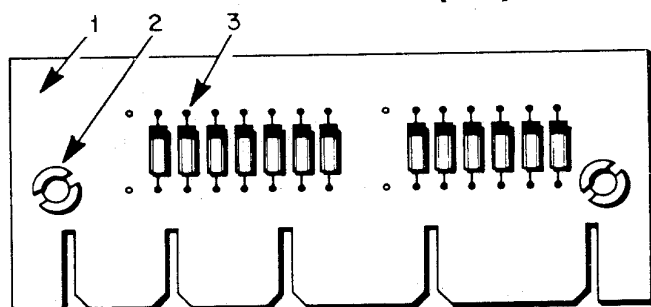
LED BOARD (A15) COMPONENT LOCATION



LED BOARD (A15) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	LED Board Assembly	MA-956
DS1, DS3, DS5	LED, Red	XO-865
DS7, DS9		
DS2, DS4, DS6	LED, Green	XO-866
DS8, DS10		
R1	Resistor, 150 Ohm, 5%, 1/4W	XO-574
P1	12 Position Connector	XO-880

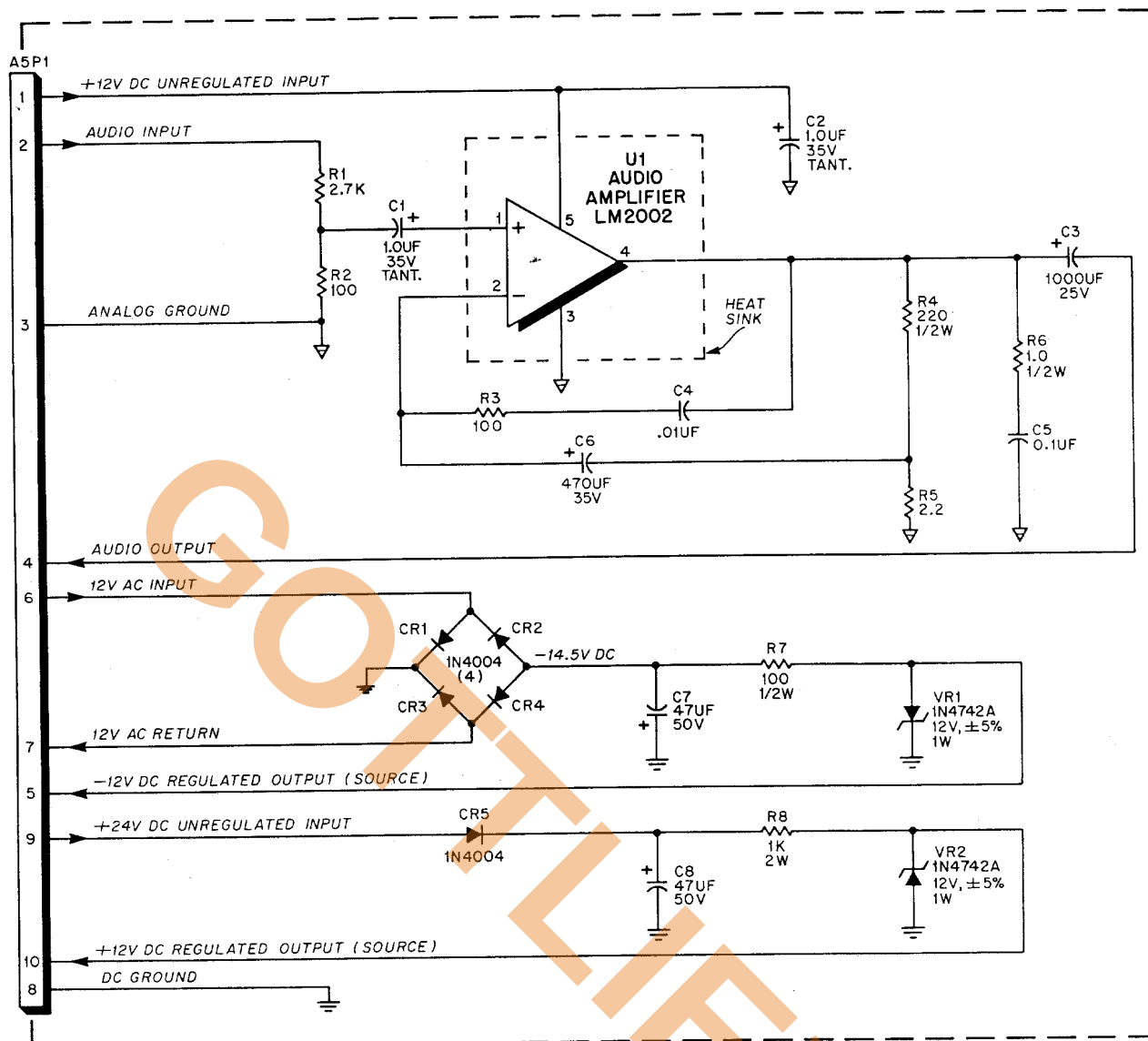
DIODE BOARD (A7)



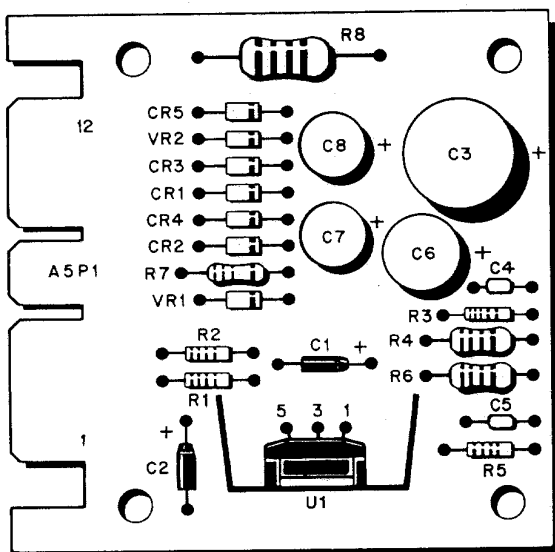
DIODE BOARD (A7) PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	Diode Board Assembly (A7)	23941
2	Spacer (2)	23984
3	Diode, 1N270 (13)	XO-265

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



AUXILIARY POWER SUPPLY (A5) COMPONENT LOCATION



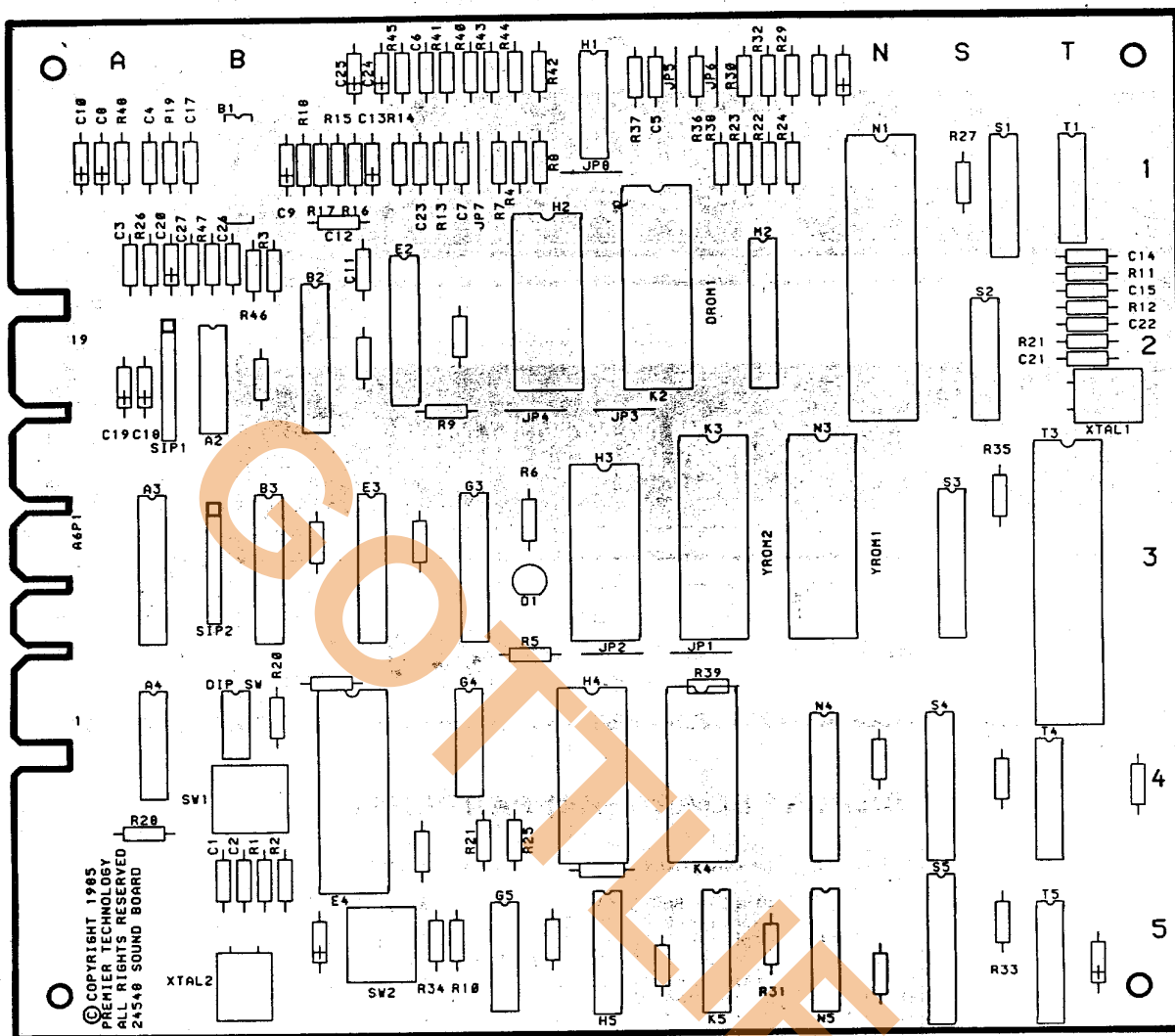
Premier Technology			
AUXILIARY POWER SUPPLY (A5)			
TITLE	USED ON	DRAWN	APPROVED
		R.H.M.	9-OCT-85
			E-24715

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

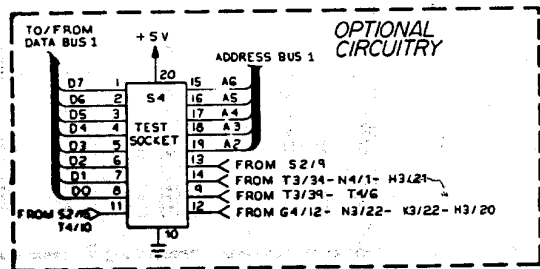
SOUND BOARD (A6) COMPONENT LOCATION



SOUND BOARD (A6) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER	REFERENCE	DESCRIPTION	PART NUMBER
C1,C2	Sound Board Assembly (A6)	MA766	R6	Resistor, 240 Ohm, 5%, 1/4W	XO-173
C5,C6	Capacitor, 22PF, 50V MONO	XO-633	R11,R12	Resistor, 470 Ohm, 5%, 1/4W	XO-35
C7,C17,C23	AX-CM, 10%	XO-696	R13,R14,R18,	Resistor, 3K Ohm, 5%, 1/4W	XO-23
C8,C9,C10,	Capacitor, .01UF, 50V	XO-294	R21,R25	Resistor, 1.2K Ohm, 5%, 1/4W	XO-175
C18,C19,C24,	AX-CM, 10%	(XO-746)	R16,R17,R19	Resistor, 10K Ohm, 5%, 1/4W	XO-18
C25, and ALL	Capacitor, 1UF, 50V CM-RD (AX)	XO-127	R29,R30,R32,		
UNMARKED	Non-Polarized		R37,R38,R40-		
POLARIZED	Capacitor, 10UF, 25V		R44		
CAPACITORS	TANT-AX, 20%, Polarized		R36,R45-R48	Resistor, 33K Ohm, 5%, 1/4W	XO-43
C11,C12	Capacitor, 10PF, 50V AX-CM	XO-635	SIP1,SIP2	Resistor Pack, SIP, 1K Ohm, 9 Pin	XO-493
C13,C20	+80%-20%	XO-715	SW1,SW2	Switch, Push Button, N.O.	XO-365
C14,C22	Capacitor, 1UF, 35V	XO-896	XTAL1	Crysal, 4.0 MHZ	XO-366
C15	Capacitor, 33PF, 100V,	XO-638	XTAL2	Crystal, 3.12 MHZ	XO-639
ALL UNMARKED	AX, 10%	XO-230	A2	7430 8-input "NAND" gate	XO-643
CAPACITORS	Capacitor, .047UF, 50V MONO	XO-873	A3,B2	74LS374 Octal D-type flip flop	XO-96
C26,C27	AX-CM, 20%	XO-270	A4	74LS74 Dual D-type flip flop	XO-434
D1	Capacitor, 0.1UF, 50V	XO-640	B1,H1	LM324 Quad op-amp	XO-644
DIP SW	AX-CM, +80%-20%	XO-73	B3	74LS244 Octal buffer/driver	XO-117
R1	Capacitor, .022UF, 50V	XO-5	E2	AD7528J DAC	XO-647
R2,R5,R9	AX-CM, 10%	XO-7	E3,G3,N4,S5	74LS374 Octal D-type flip flop	XO-96
R10,R27,R28,	Capacitor, 0.1UF, 50V	XO-748	E4	SPO250 Speech generator	XO-645
R31,R33-R35,	AX-CM, +80%-20%		G4,T1	74LS04 Hex Inverter	XO-418
R39	Capacitor, 10M Ohm, 5%, 1/4W		G5	74HC08 Quad 2-input "AND" gate	XO-872
R3,R20	Resistor, 1K Ohm, 5%, 1/4W		H2,H3	2K x 8 RAM (6116) (200NS)	XO-191
R4,R7,R8	Resistor, 4.7K Ohm, 5%, 1/4W		H4,K4	AY-3-8913 Sound generator	XO-646
R22-R24	Resistor, 68 Ohm, 5%, 1/4W		H5,K5,N5,	74161 Synchronous presettable	XO-192
			S1,T5	binary counter	
			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/	XO-437
				demultiplexor	
				28 Pin Dip Socket (4)	XO-536
				Jumper, 22 GA (5)	XO-469

ATIC DIAGRAMS, PARTS LISTS

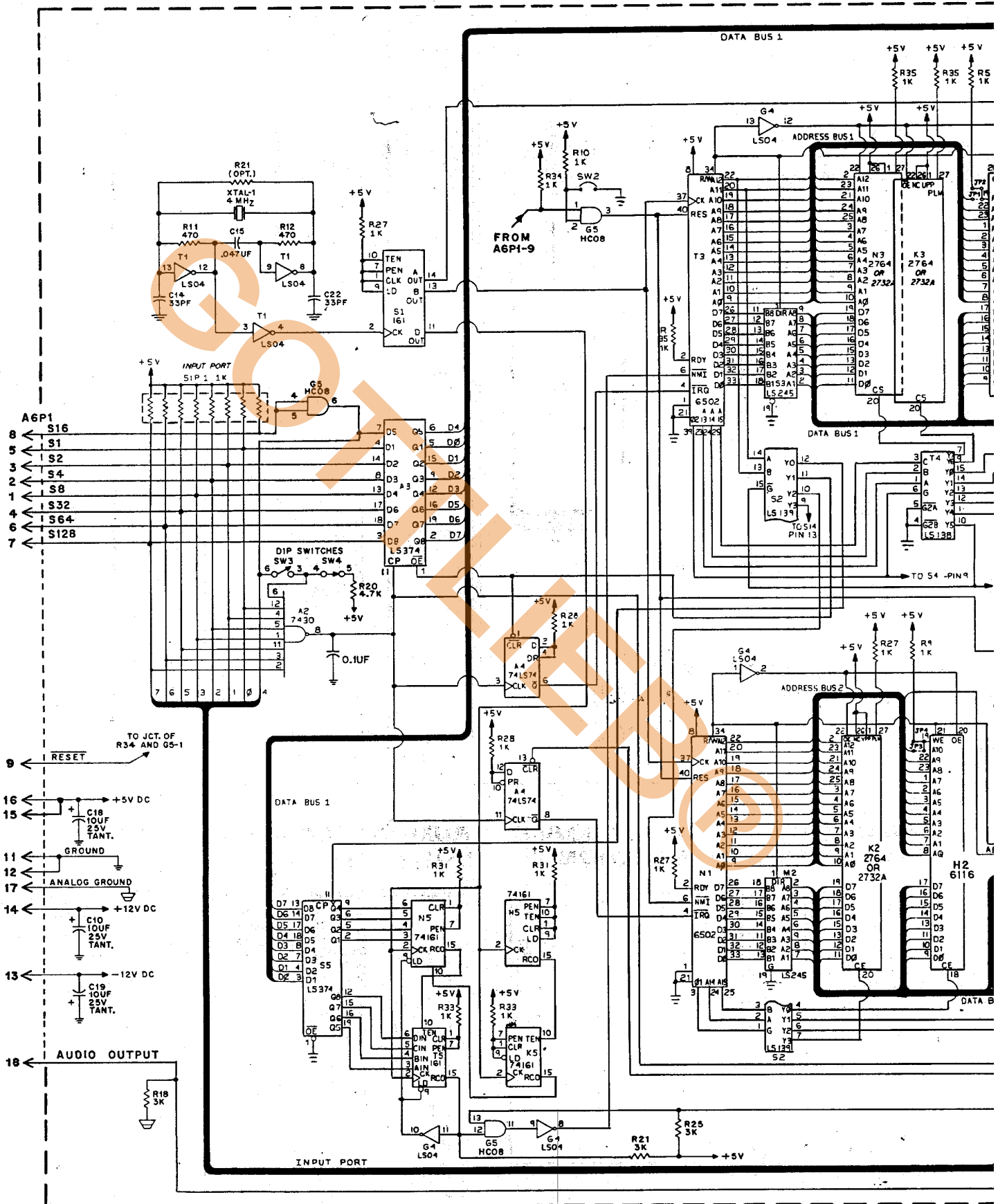


$\perp$ = COMMON GROUND (DC)

 = ANALOG GROUND

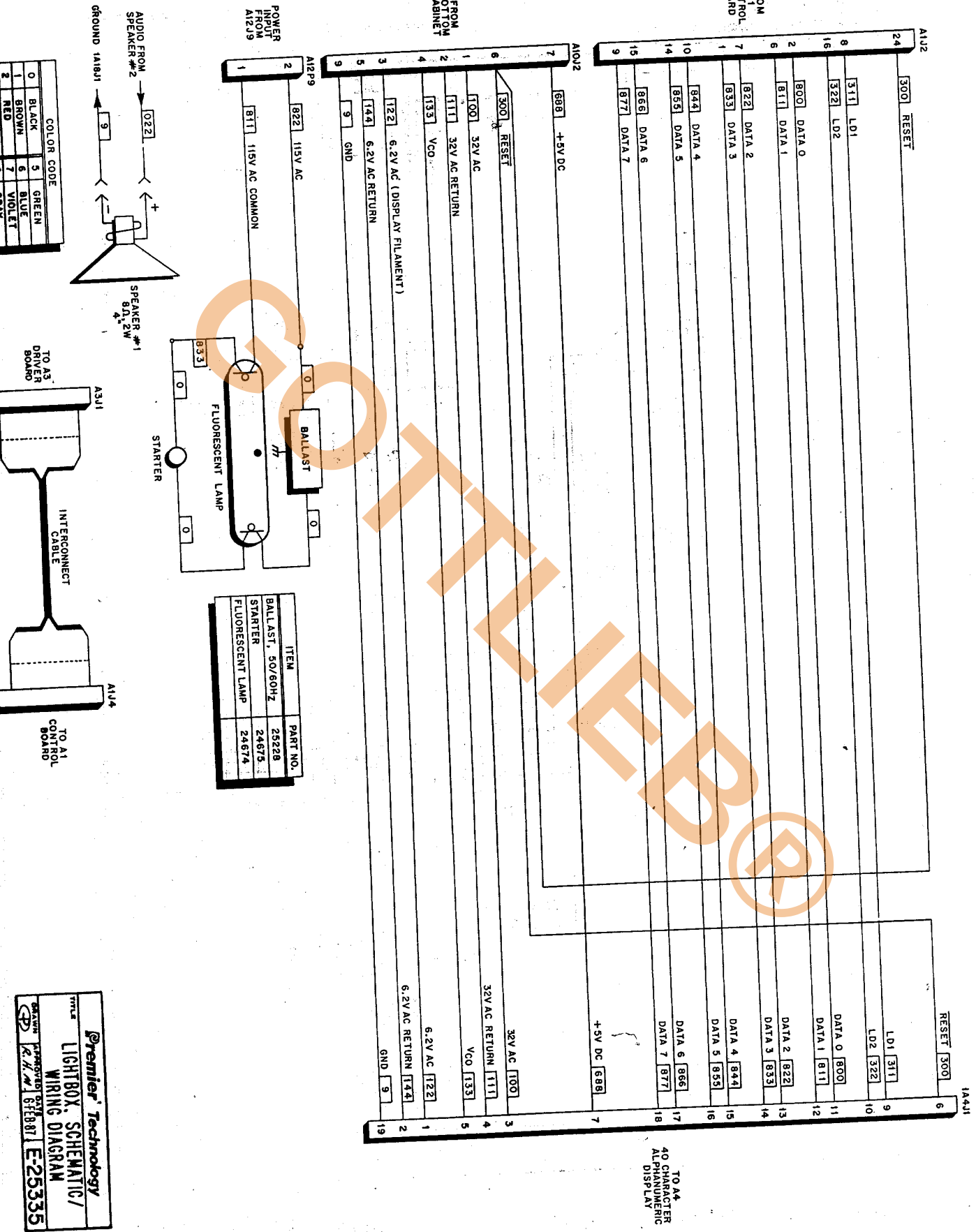
TITLE				SOUND BOARD (A6)	
USED ON					
DRAWN		APPROVED		DATE	
					
				E-24711	

X. WIRING AND SCHEMATIC D



X. WIRING AND SCHEMATIC

Premier Technology
 TITLE LIGHTBOX, SCHEMATIC/
 WIRING DIAGRAM
 DATE 12/19/81 BY E-25335



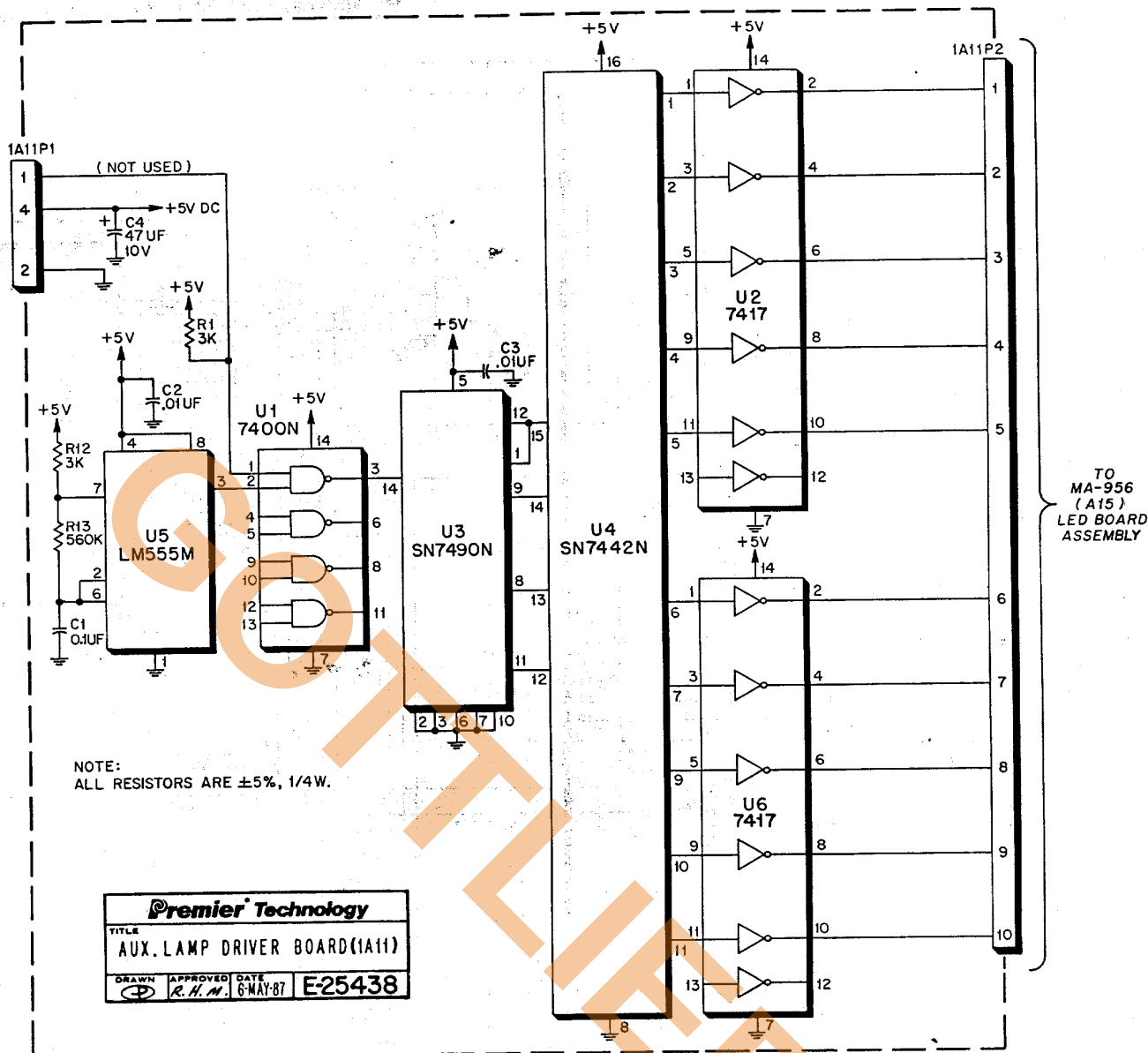
TO A4
40 CHARACTER
ALPHANUMERIC
DISPLAY

34
FROM
BOTTOM
CABINET

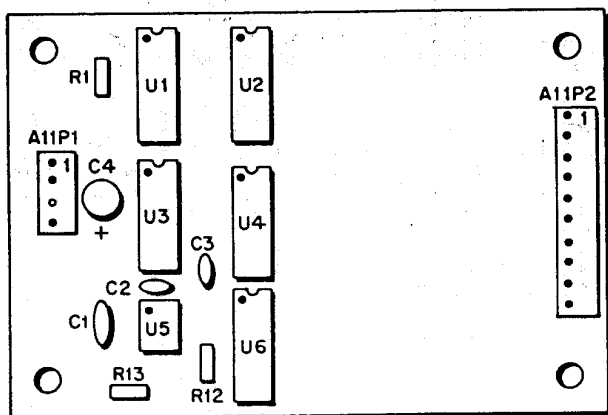
FROM
A1
CONTROL
BOARD

MATIC DIAGRAMS, PARTS LISTS

WIRING DIAGRAM
DRAWN R.H.M. 6 FEB 87
E-25335



**AUXILIARY LAMP DRIVER BOARD
(A11) COMPONENT LOCATION**

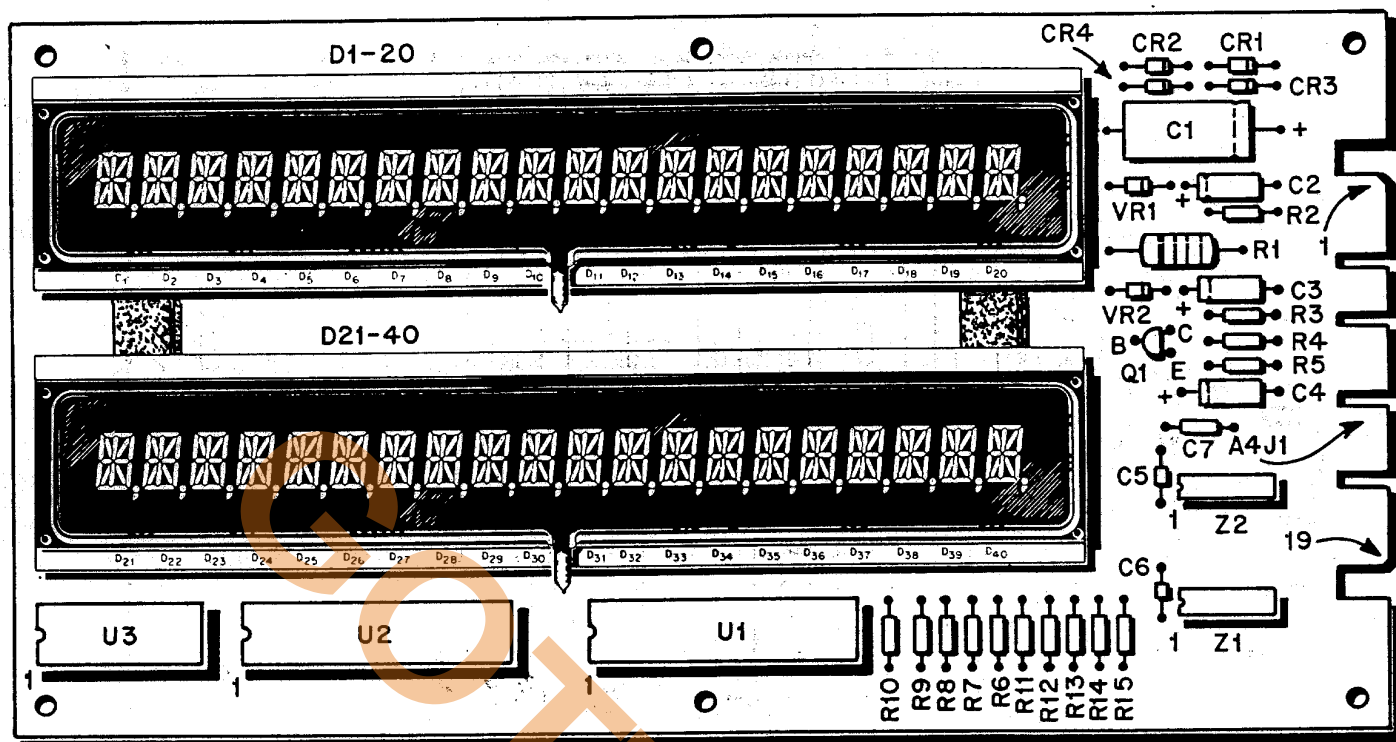


**AUXILIARY LAMP DRIVER BOARD
(A11) PARTS LIST**

REFERENCE	DESCRIPTION	PART NUMBER
	Auxiliary Lamp Driver Assembly	MA-936
C1	Capacitor, .1 MFD, 100V	XO-626
	Ceramic Radial Lead	
C2-C3	Capacitor, .01 MFD, 100V	XO-202
	Radial Lead	
C4	Capacitor, 47 MFD, 10V	XO-227
	Electrolytic Radial Lead	
R1, R12	Resistor, 3K Ohm, 5%, 1/4W	XO-23
R13	Resistor, 560K Ohm, 5%, 1/4W	XO-169
U1	2-Input NAND, 7400	XO-420
U2, U6	Inverter, 7417	XO-406
U3	Decade Counter, 7490	XO-425
U4	Decoder, 7442	XO-426
U5	Timer, NE555	XO-631
P2	10 Position Connector	XO-531
P1	4 Position Connector	XO-879
	Circuit Board Support (4)	23984

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DISPLAY BOARD (A4) COMPONENT LOCATION

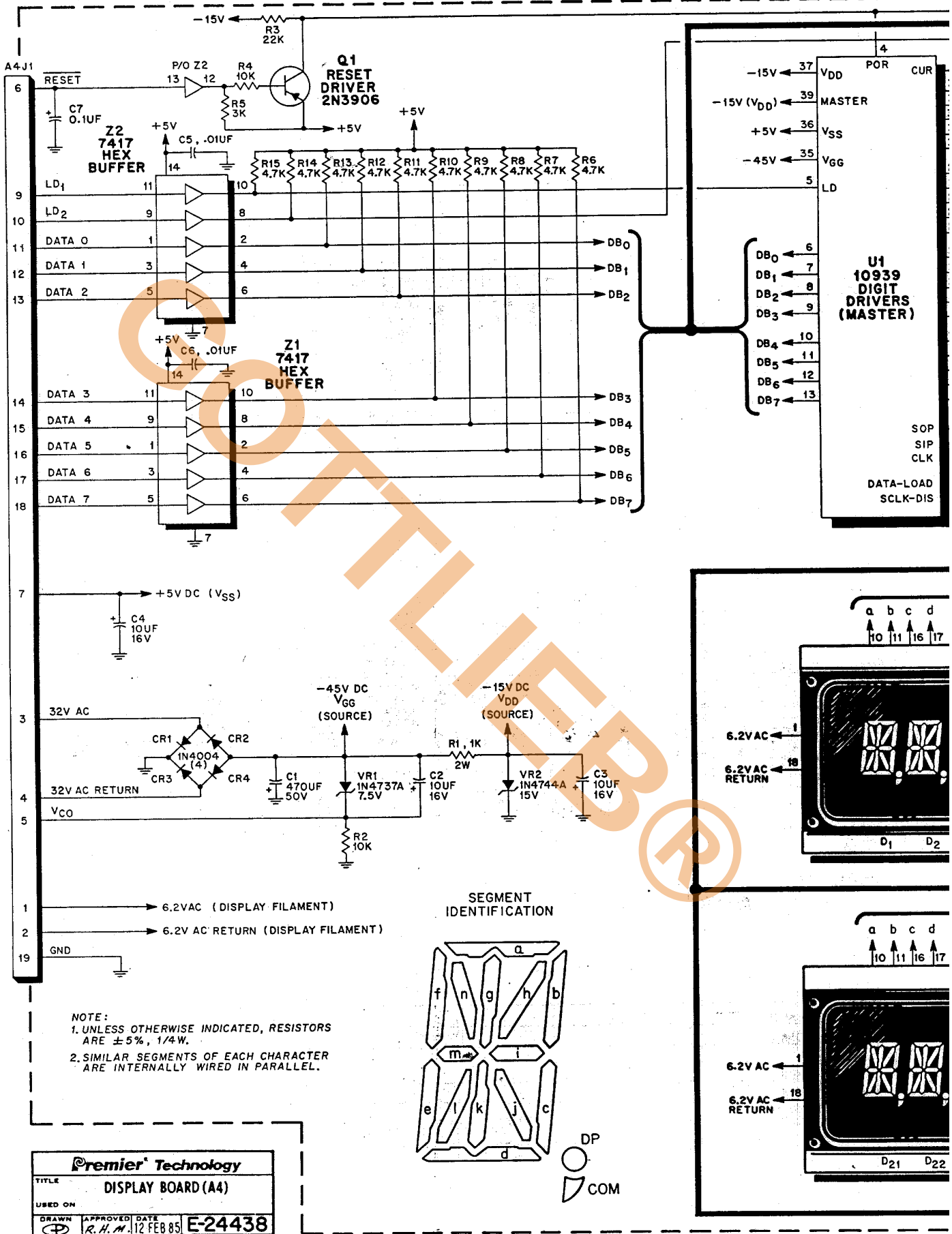


DISPLAY BOARD (A4) PARTS LIST

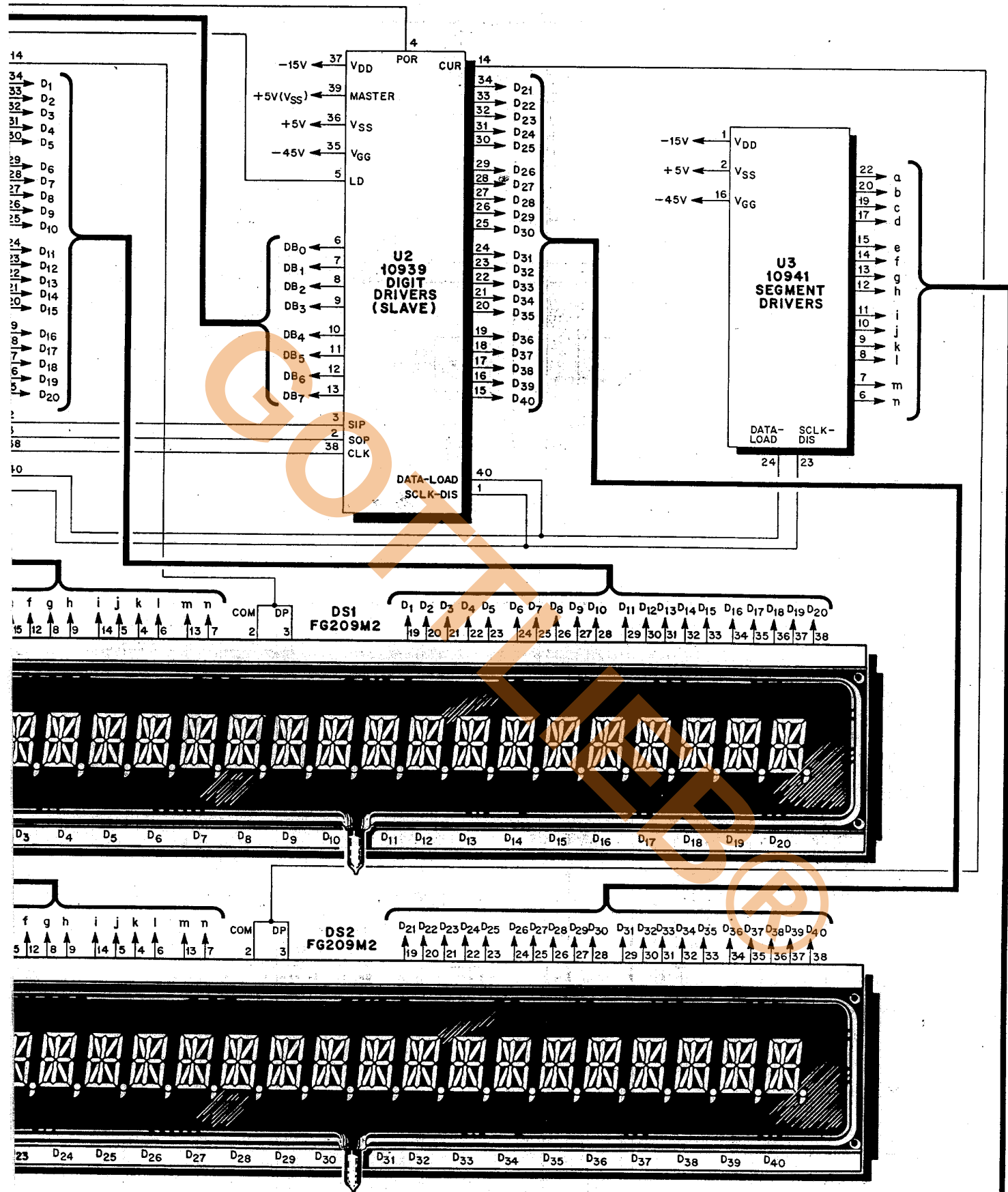
REFERENCE	DESCRIPTION	PART NUMBER
C1	Display Board (A4)	MA644
C2, C3, C4	Capacitor, 470UF, 50V	XO-847
C5, C6	Capacitor, 10UF, 16V	XO-846
*C7	Capacitor, .01UF, +80% -20%	XO-229
CR1-CR4	Capacitor, 0.1UF, 50V	XO-230
DS1, DS2	Diode, 1N4004	XO-254
Q1	Display, Alphanumeric	XO-840
R1	Transistor, PNP, 2N3906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

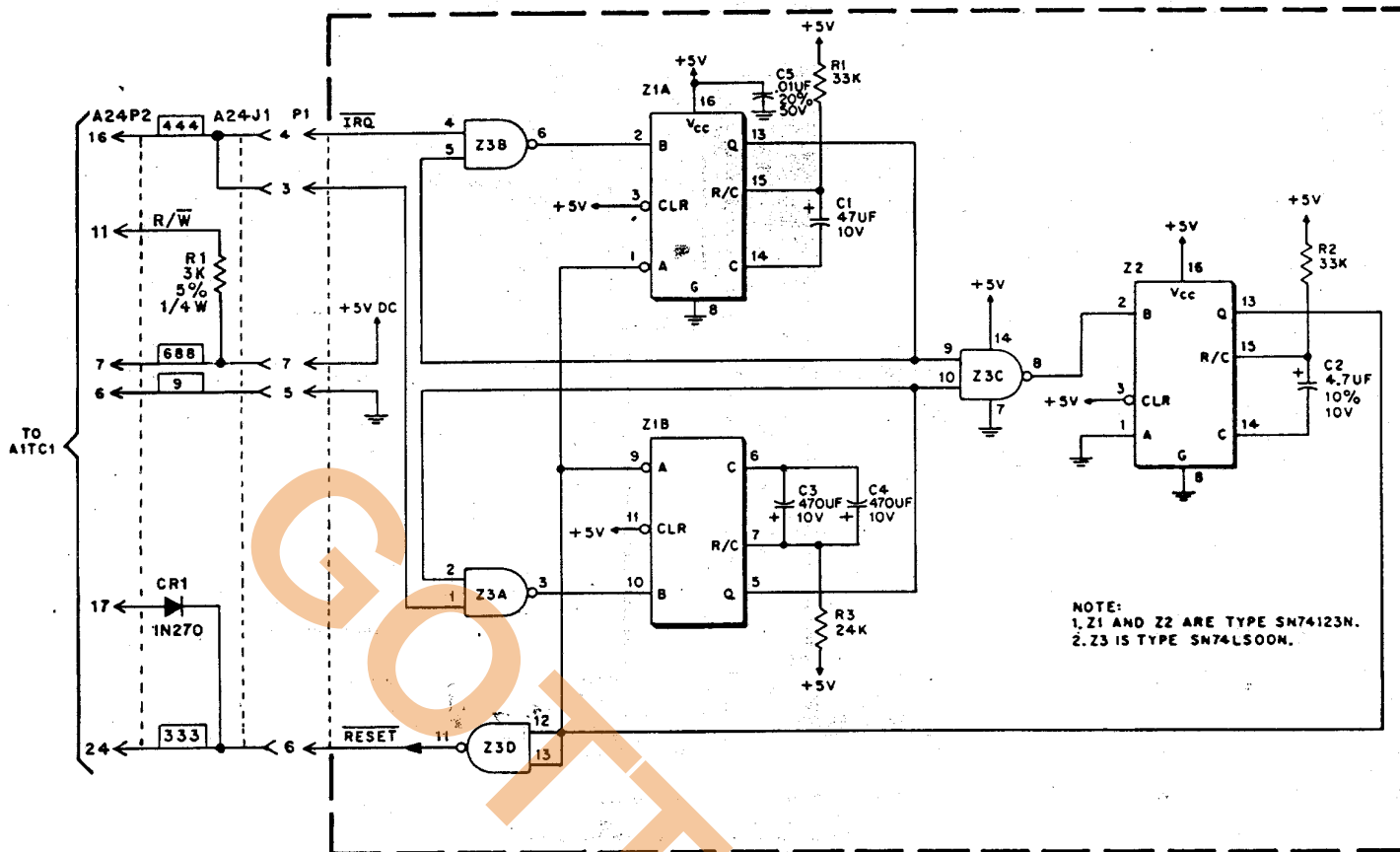
X. WIRING AND SCHEMATIC



TIC DIAGRAMS, PARTS LISTS

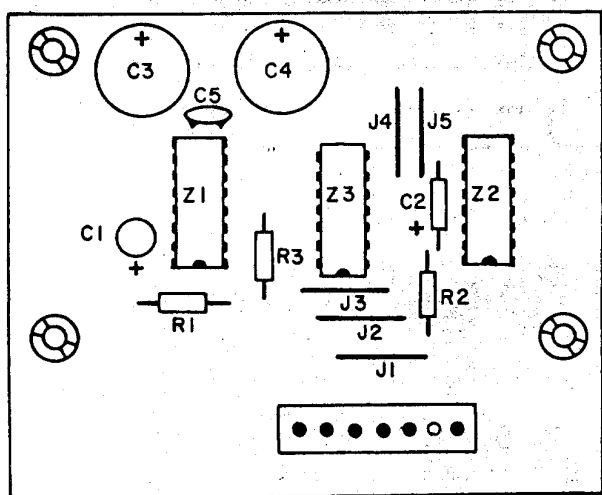


X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



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

**RESET BOARD (A24)
COMPONENT LOCATION**

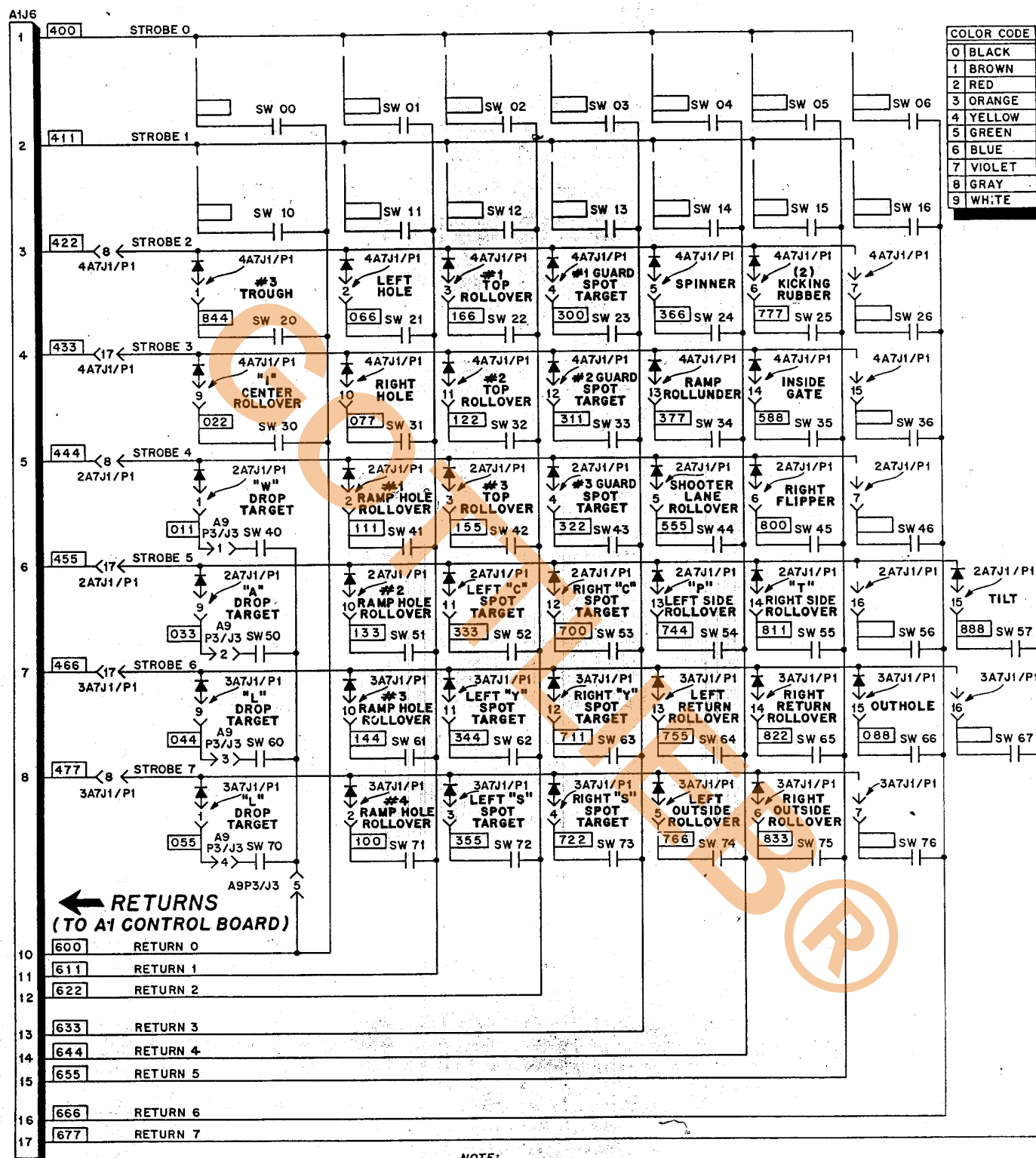


RESET BOARD (A24) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	RESET BOARD	MA-164
R1, R2	Resistor 33K ohm, 5%, 1/4W.	XO-43
R3	Resistor 24K ohm, 5%, 1/4W.	XO-10
C1	Capacitor 47 μ d., 10V.	XO-227
C2	Capacitor 4.7 μ d., 10V.	XO-226
C3, C4	Capacitor 470 μ d., 10V.	XO-214
C5	Capacitor .01 μ d.	XO-202
Z1, Z2	IC 74123N	XO-398
Z3	IC 74LS00N	XO-427
	7 Pin Connector	XO-879
A24P2/A24J2	Cable Assembly	MA-796

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

STROBES →
(FROM A1 CONTROL BOARD)



Premier Technology			
TITLE SWITCH MATRIX			
USED ON GAME #709			
DRAWN R.H.M.	APPROVED DATE 6-MAY-87	E-25439	

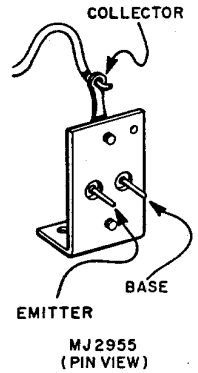
X. WIRING AND SCHEMATA

PLAYBOARD "CONTROLLED" SOLENOIDS AND ILLUMINATION

NOTES

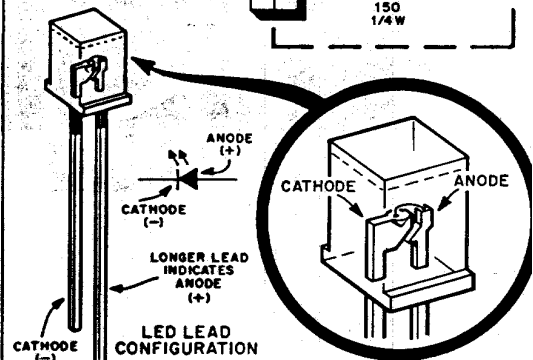
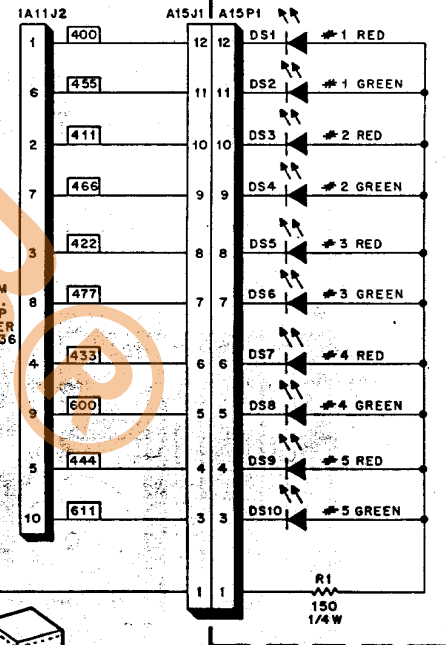
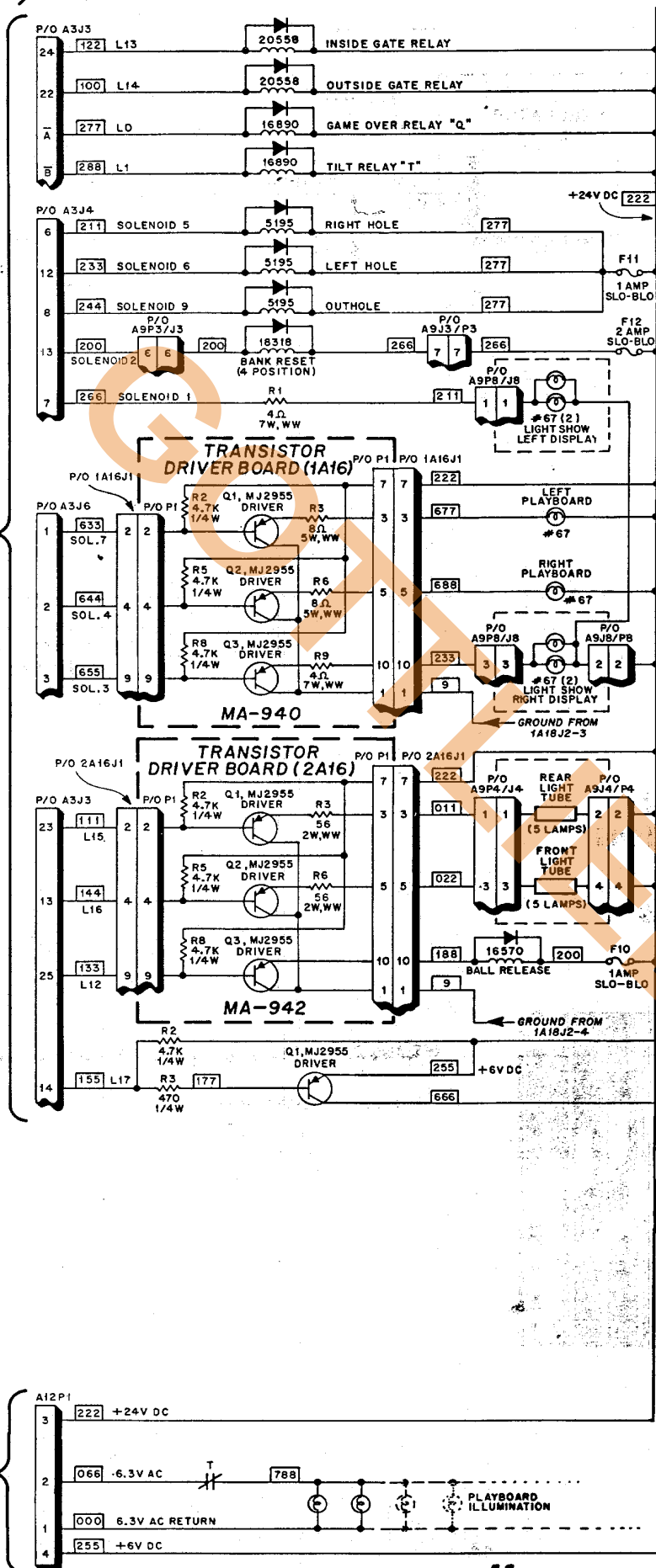
1. ALL DIODES ARE TYPE 1N4004.
2. LAMPS L4 THRU L11 AND L32 THRU L43 ARE DRIVEN BY MPS-A13's; EXCEPT FOR "AL" LAMPS, ALL OTHER LAMPS ARE DRIVEN BY MPS-U45's.
3. UNLESS OTHERWISE SPECIFIED, GROUND WIRE COLOR IS 9, 18 GAUGE.
4. [XXX] INDICATES WIRE COLOR.
5. UNLESS OTHERWISE SPECIFIED, ALL LAMPS ARE TYPE #44.

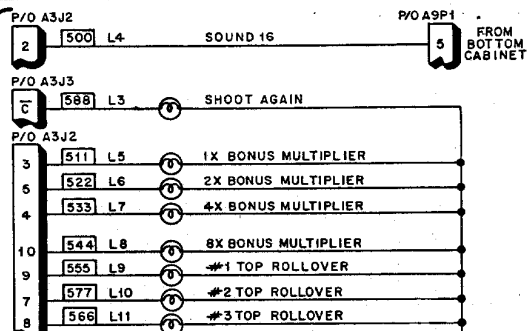
REFERENCE	PART NO.
#44 LAMP	LA-0
#67 LAMP	LA-5
Q1	XO-799
R1	XO-878
R2	XO-7
R3	XO-35



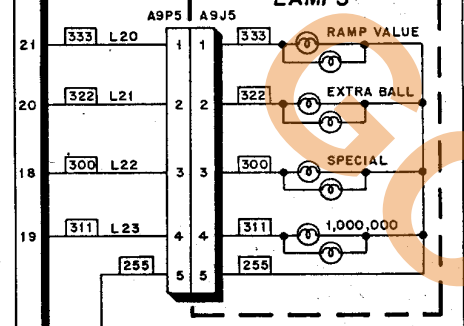
COLOR CODE
0 BLACK
1 BROWN
2 RED
3 ORANGE
4 YELLOW
5 GREEN
6 BLUE
7 VIOLET
8 GRAY
9 WHITE

OUTPUT FROM MASTER DRIVE BOARD (SEE SCHEMAT FOR LAMP DRIVER TRANSISTOR)

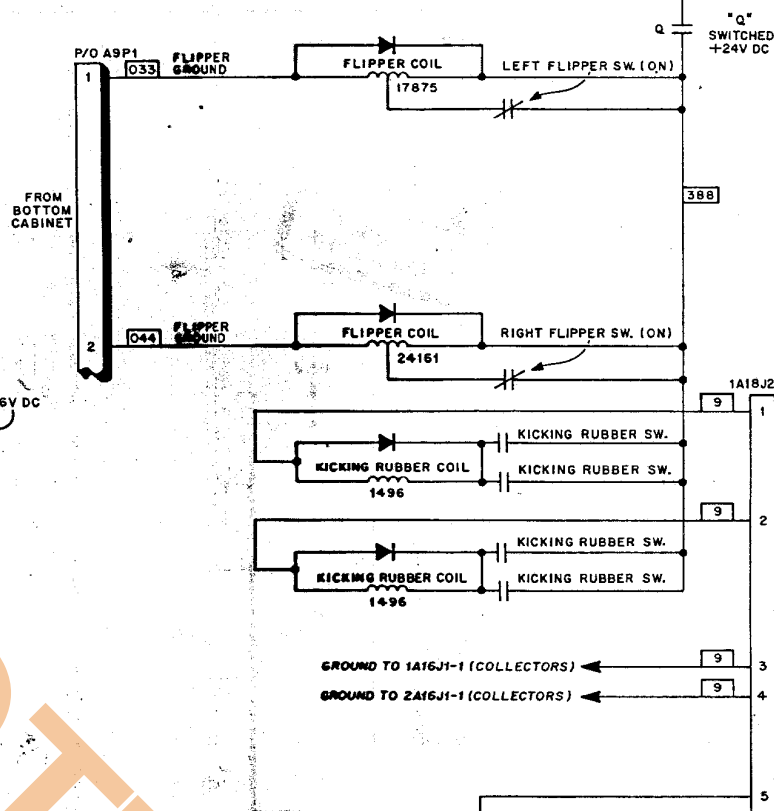
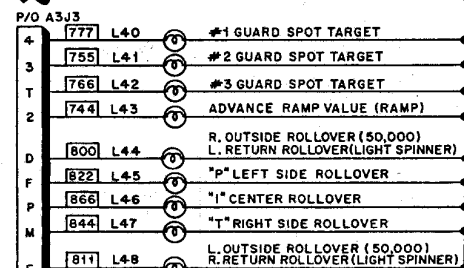
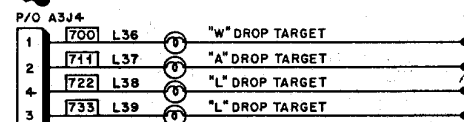
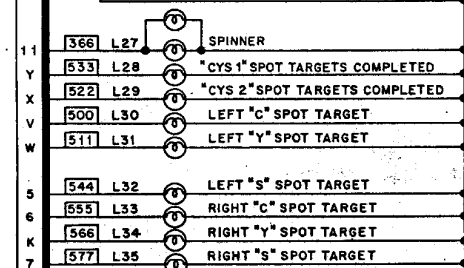
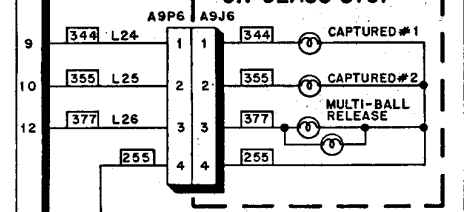




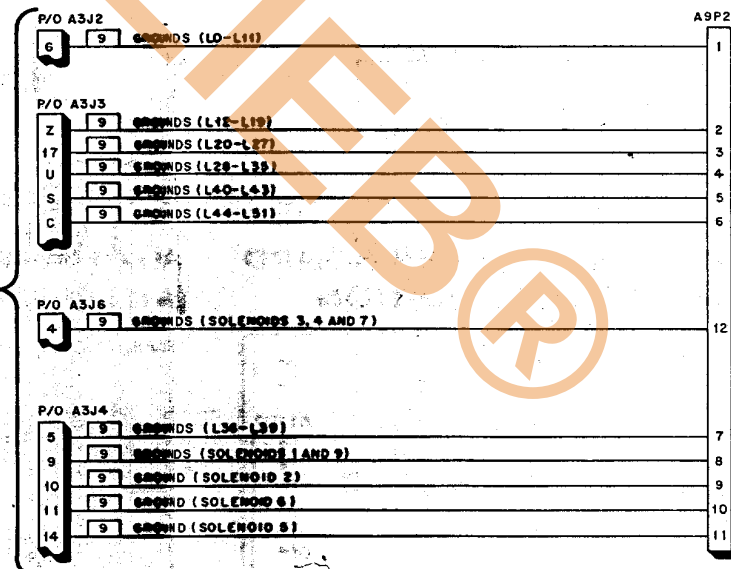
UPPER PLAYBOARD LAMPS



LAMPS MOUNTED ON GLASS STOP



GROUND RETURNS FROM A3 MASTER DRIVER BOARD



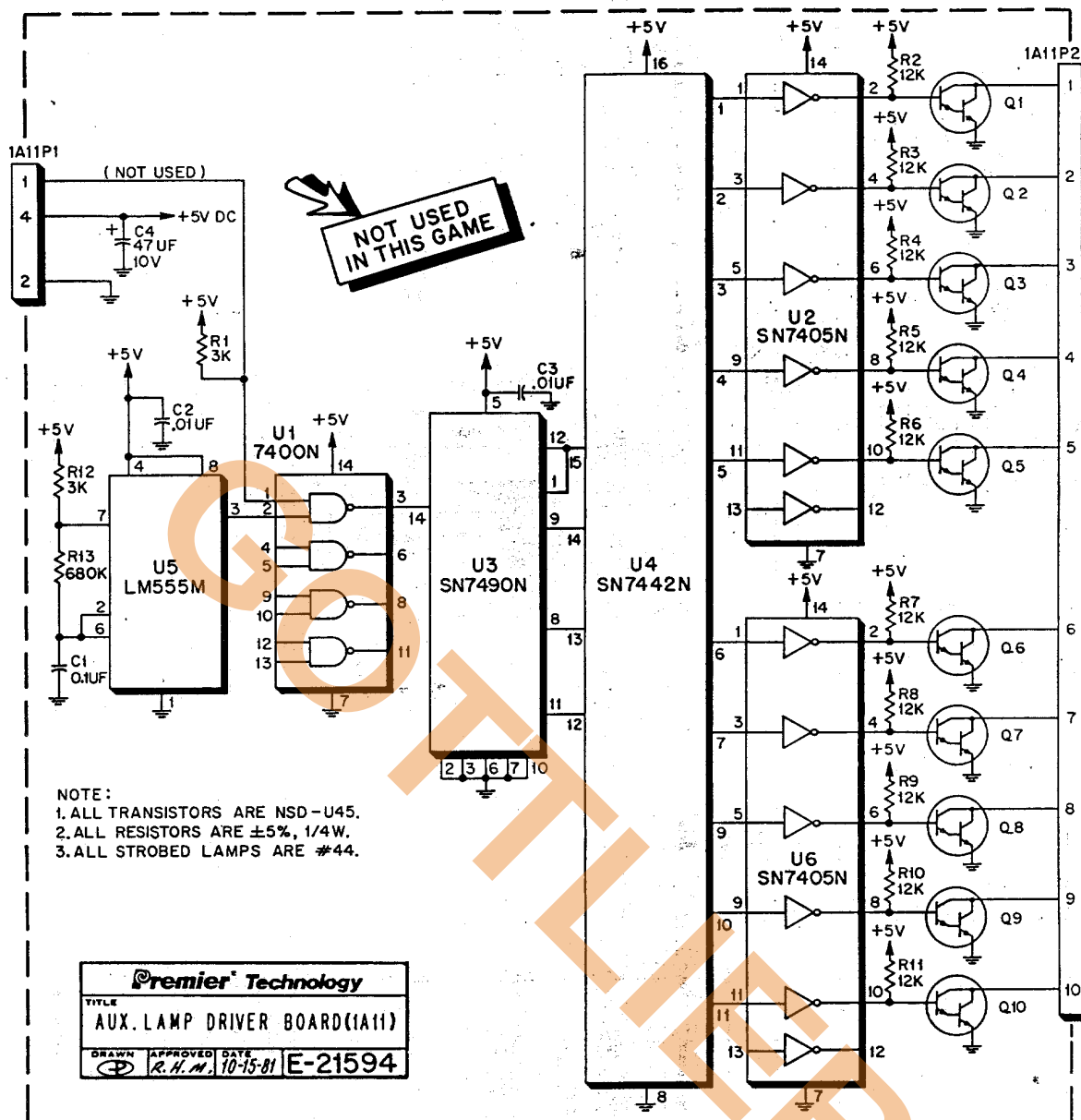
GROUND FROM TRANSFORMER PANEL

Premier Technology

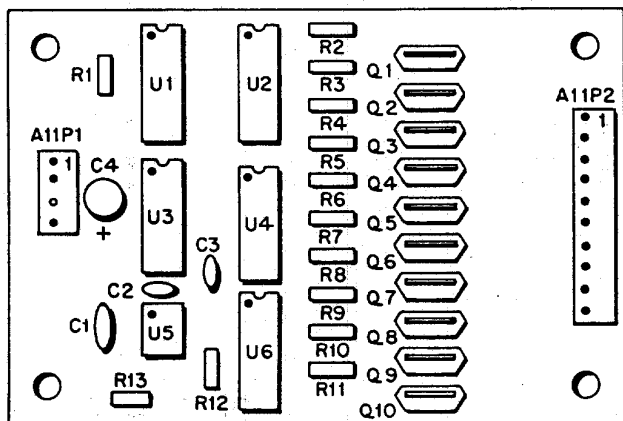
TITLE: **PLAYBOARD SOLENOIDS AND ILLUMINATION**

DRAWN: **R.N.N.** APPROVED DATE: **6 MAY 87** E25440

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



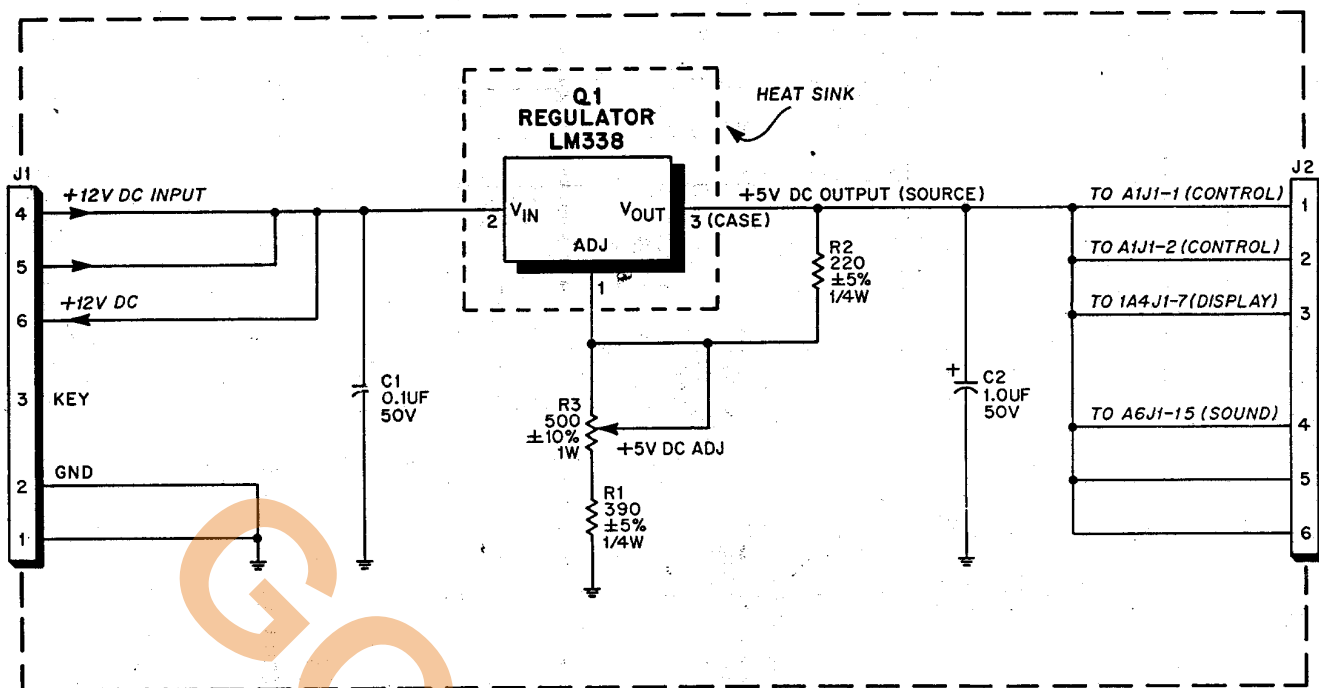
AUXILIARY LAMP DRIVER BOARD (A11) COMPONENT LOCATION



AUXILIARY LAMP DRIVER BOARD (A11) PARTS LIST

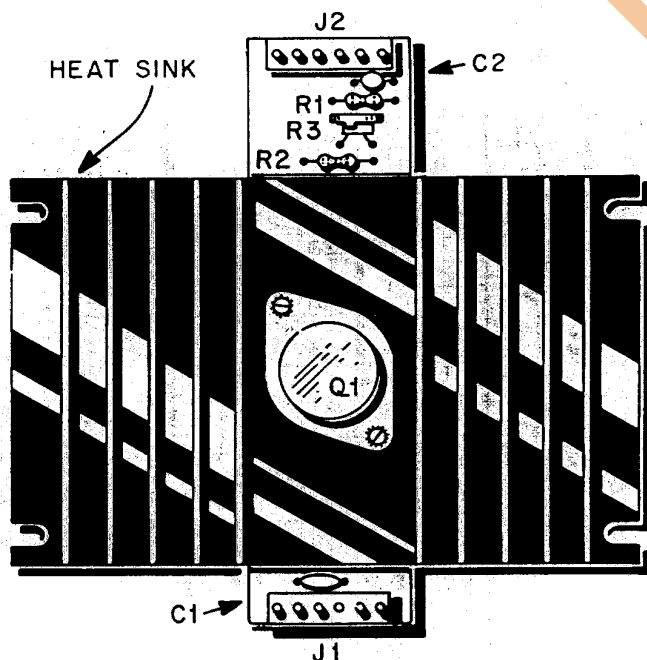
REFERENCE	DESCRIPTION	PART NUMBER
	AUXILIARY LAMP DRIVER ASSEMBLY	MA-789
C1	CAPACITOR, .1 MFD, 100V	XO-626
C2-C3	CERAMIC RADIAL LEAD CAPACITOR, .01 MFD, 100V	XO-202
C4	RADIAL LEAD CAPACITOR, 47 MFD, 10V	XO-227
Q1-Q10	ELECTROLYTIC RADIAL LEAD TRANSISTOR, NSD-U45	XO-146
	NPN DARLINGTON	
R1, R12	RESISTOR, 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, 7400	XO-420
U2, U6	I.C. INVERTER, 7405	XO-403
U3	I.C. DECADE COUNTER, 7490	XO-425
U4	I.C. DECODE, 7442	XO-426
U5	I.C. TIMER, NE555	XO-631
P2	10 POS. CONNECTOR	XO-879
P1	4 POS. CONNECTOR	XO-879

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



Premier Technology			
TITLE			
POWER SUPPLY (A2)			
USED ON			
DRAWN	APPROVED	DATE	E-24441
		12 FEB 85	

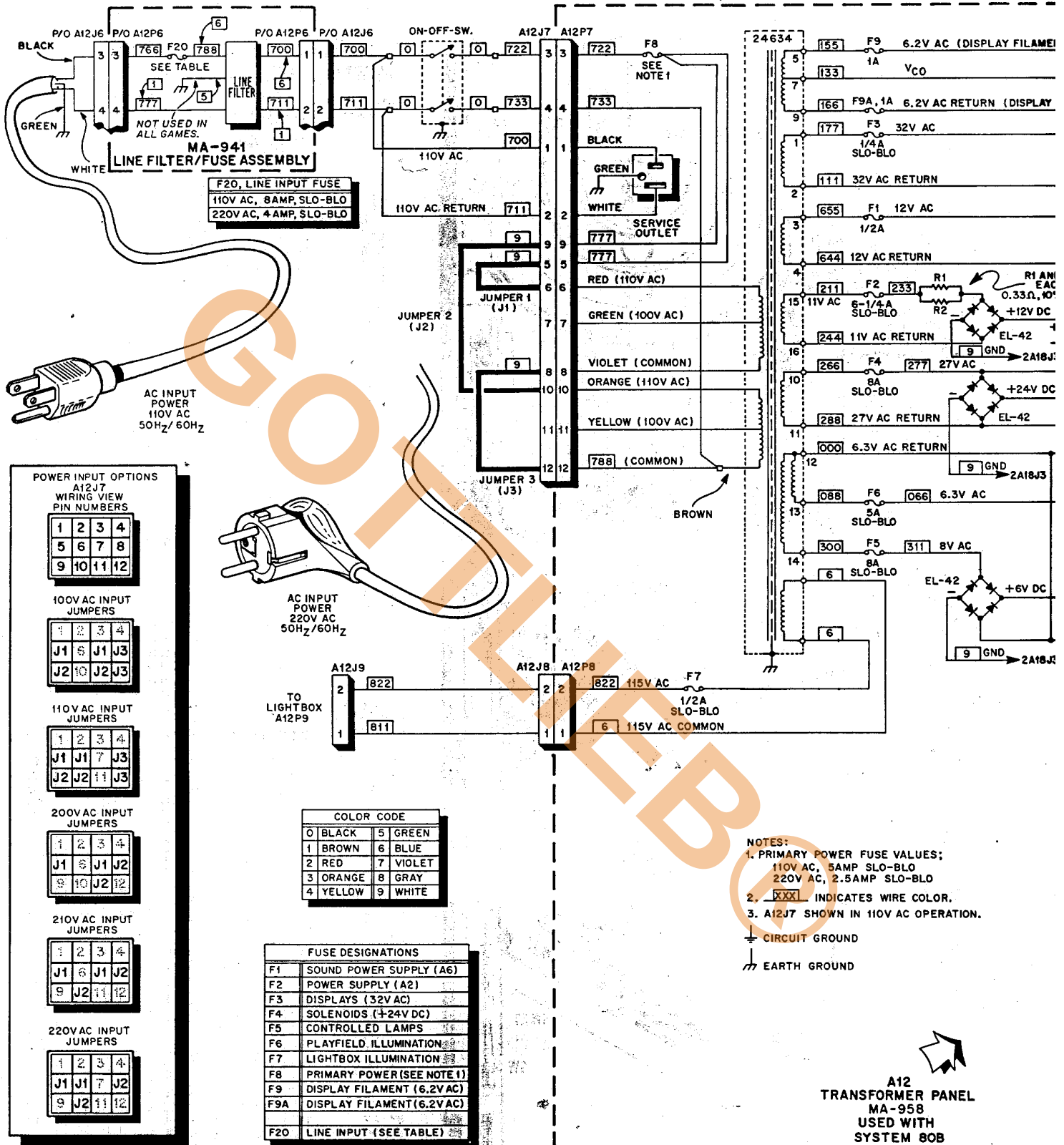
POWER SUPPLY (A2) COMPONENT LOCATION



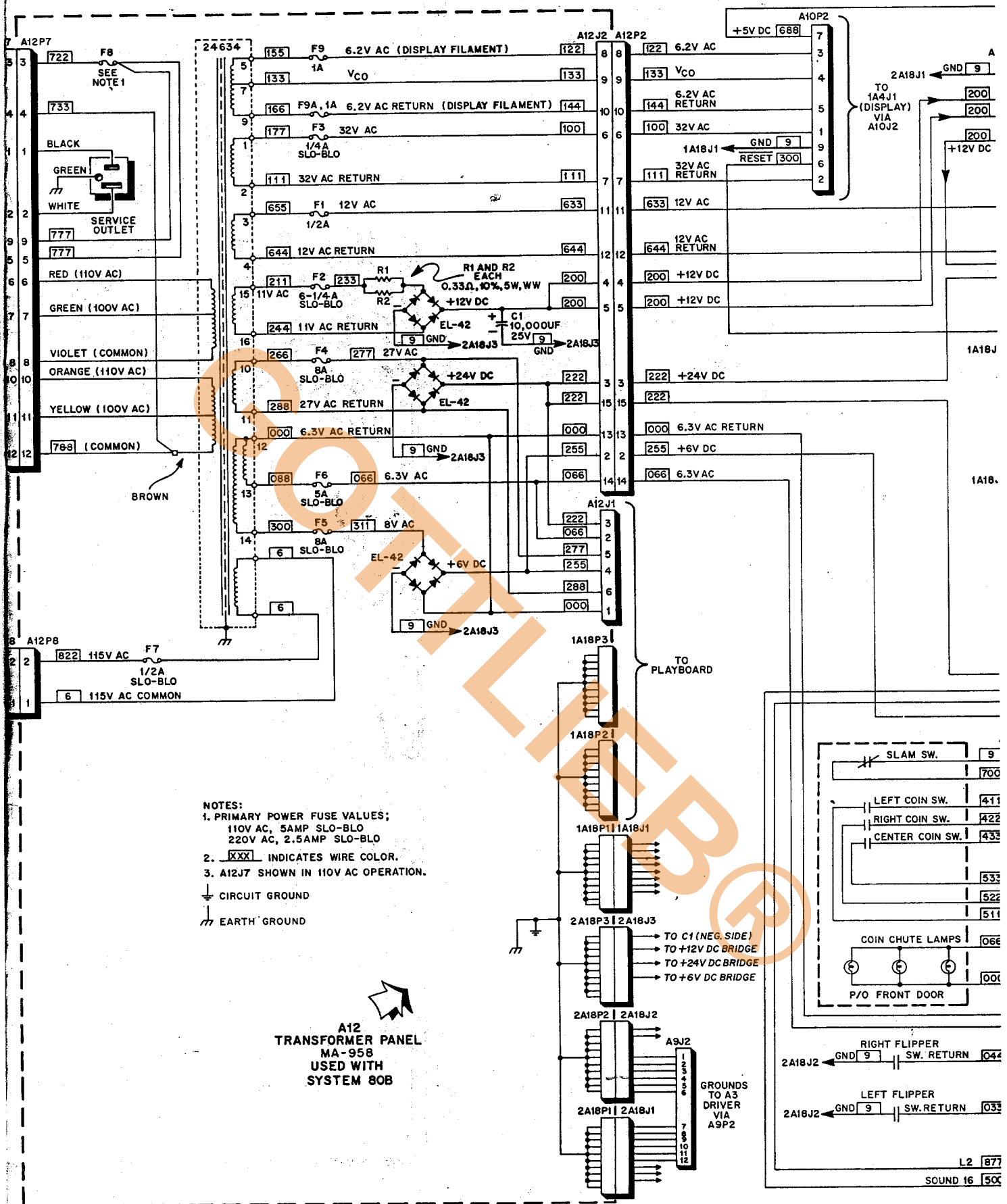
POWER SUPPLY (A2) PARTS LIST

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	XO-879
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

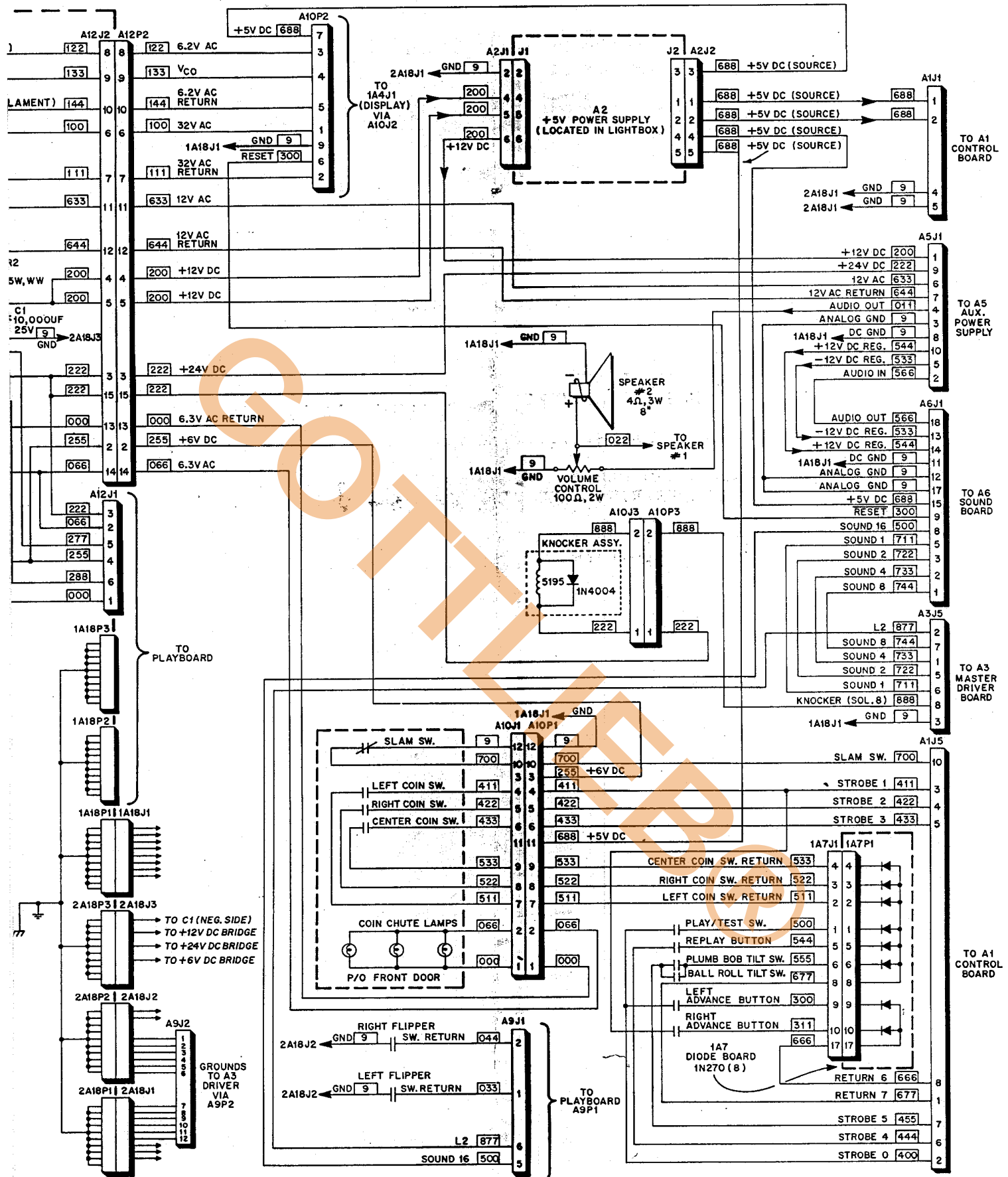
X. WIRING AND SCHEMATIC



X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



DIAGRAMS, PARTS LISTS



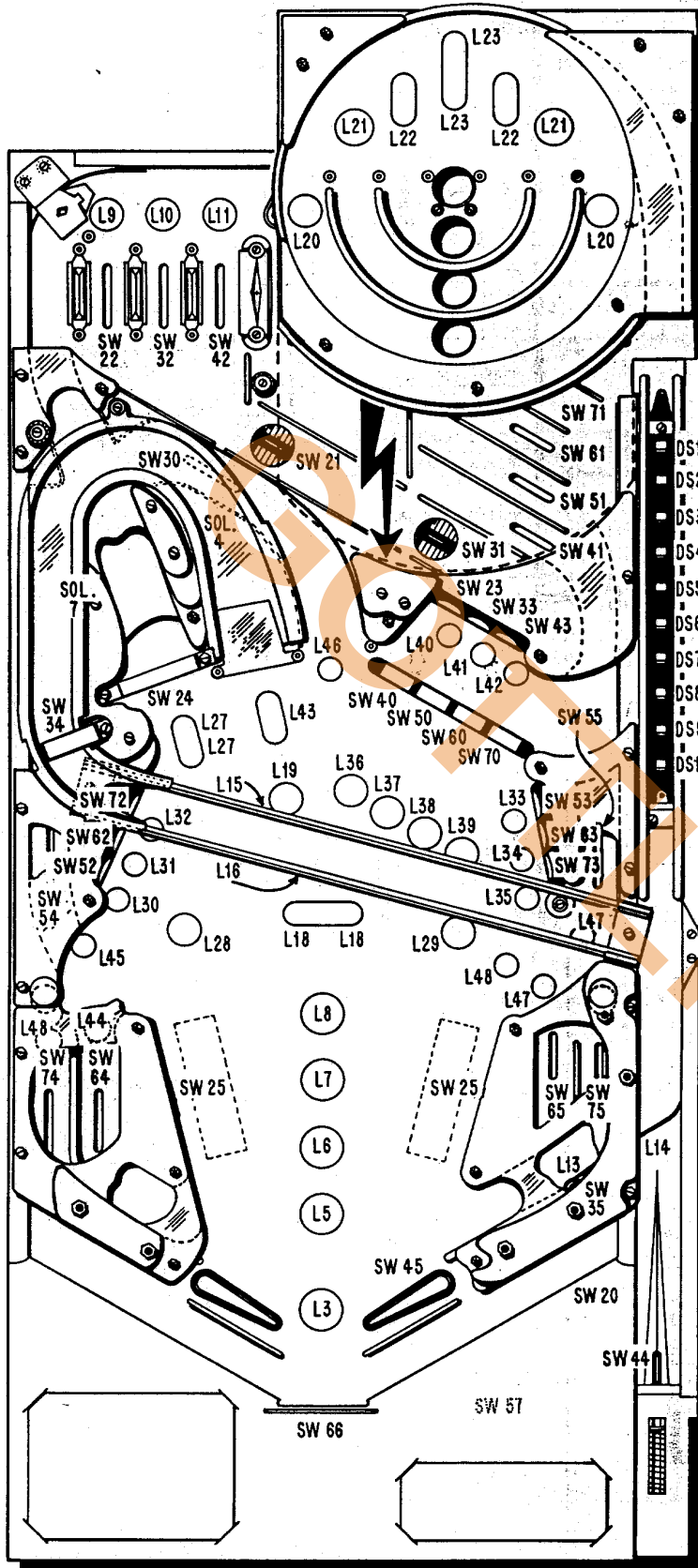
XI. PARTS INFORMATION

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PLAYBOARD PARTS LAMPS AND SWITCHES.....	48
CABINET PARTS.....	49
PLAYBOARD PARTS RUBBER RINGS AND MISCELLANEOUS PARTS.....	50
BALL GATE PARTS EXPLODED VIEW.....	51

XI. PARTS INFORMATION

PLAYBOARD SWITCH AND LAMP ASSIGNMENTS



- NOTE:
1. LED LAMPS DS1-DS10 DRIVEN BY AUXILIARY LAMP DRIVER MA-936.
 2. LAMPS L24-L26 MOUNTED ON GLASS STOP (NOT SHOWN).
 3. SOLENOIDS 4 AND 7 ENABLE INDIVIDUAL #67 LAMPS.
 4. L13 AND L14 ACTUATE INDIVIDUAL BALL GATES.

LAMP NUMBER	LAMP ASSIGNMENT
L3	Shoot Again
L5	1X Bonus Multiplier
L6	2X Bonus Multiplier
L7	4X Bonus Multiplier
L8	8X Bonus Multiplier
L9	#1 Top Rollover
L10	#2 Top Rollover
L11	#3 Top Rollover
L15	Rear Light Tube
L16	Front Light Tube
L18	Light Warrior Pit Special
L19	Warrior Pit (Ramp)
L20	Ramp Value
L21	Extra Ball
L22	Special
L23	1,000,000
L27	Spinner
L28	"CYS 1" Spot Targets Completed
L29	"CYS 2" Spot Targets Completed
L30	Left "C" Spot Target
L31	Left "Y" Spot Target
L32	Left "S" Spot Target
L33	Right "C" Spot Target
L34	Right "Y" Spot Target
L35	Right "S" Spot Target
L36	"W" Drop Target
L37	"A" Drop Target
L38	"L" Drop Target
L39	"L" Drop Target
L40	#1 Guard Spot Target
L41	#2 Guard Spot Target
L42	#3 Guard Spot Target
L43	Advance Ramp Value (Ramp)
L44	Right Outside Rollover (50,000), Left Return Rollover (Light Spinner)
L45	"P" Left Side Rollover
L46	"I" Center Rollover
L47	"T" Right Side Rollover
L48	Left Outside Rollover (50,000), Right Return Rollover (Light Spinner)

SWITCH MATRIX NUMBER	SWITCH ASSIGNMENT	PART NO.
SW 20	#3 Trough	19754
SW 21	Left Hole	18085
SW 22	#1 Top Rollover	18892
SW 23	#1 Guard Spot Target Assembly	25460U
SW 24	Spinner	19353
SW 25	Kicking Rubber (2)	
	Scoring Switch (2)	18808
	Actuating Switch and Bracket(4)	22224
SW 30	"I" Center Rollover	18892
SW 31	Right Hole	18085
SW 32	#2 Top Rollover	18892
SW 33	#2 Guard Spot Target Assembly	25460U
SW 34	Ramp Rollunder	21137
SW 35	Inside Gate	15373
SW 40	"W" Drop Target	18094
SW 41	#1 Ramp Hole Rollover	18892
SW 42	#3 Top Rollover	18892
SW 43	#3 Guard Spot Target Assembly	25460U
SW 44	Shooter Lane Rollover	19754
SW 45	Right Flipper	25435
SW 50	"A" Drop Target	18094
SW 51	#2 Ramp Hole Rollover	18892
SW 52	Left "C" Spot Target Assembly	25460U
SW 53	Right "C" Spot Target Assembly	25460U
SW 54	"P" Left Side Rollover	18892
SW 55	"T" Right Side Rollover	19754
SW 57	Tilt (with Bracket)	9141
SW 60	"L" Drop Target	18095
SW 61	#3 Ramp Hole Rollover	18892
SW 62	Left "Y" Spot Target Assembly	25460U
SW 63	Right "Y" Spot Target Assembly	25460U
SW 64	Left Return Rollover	19754
SW 65	Right Return Rollover	19999
SW 66	Outhole (Assembly)	18688
SW 70	"L" Drop Target	18093
SW 71	#4 Ramp Hole Rollover	18892
SW 72	Left "S" Spot Target Assembly	25460U
SW 73	Right "S" Spot Target Assembly	25460U
SW 74	Left Outside Rollover	18892
SW 75	Right Outside Rollover	19754

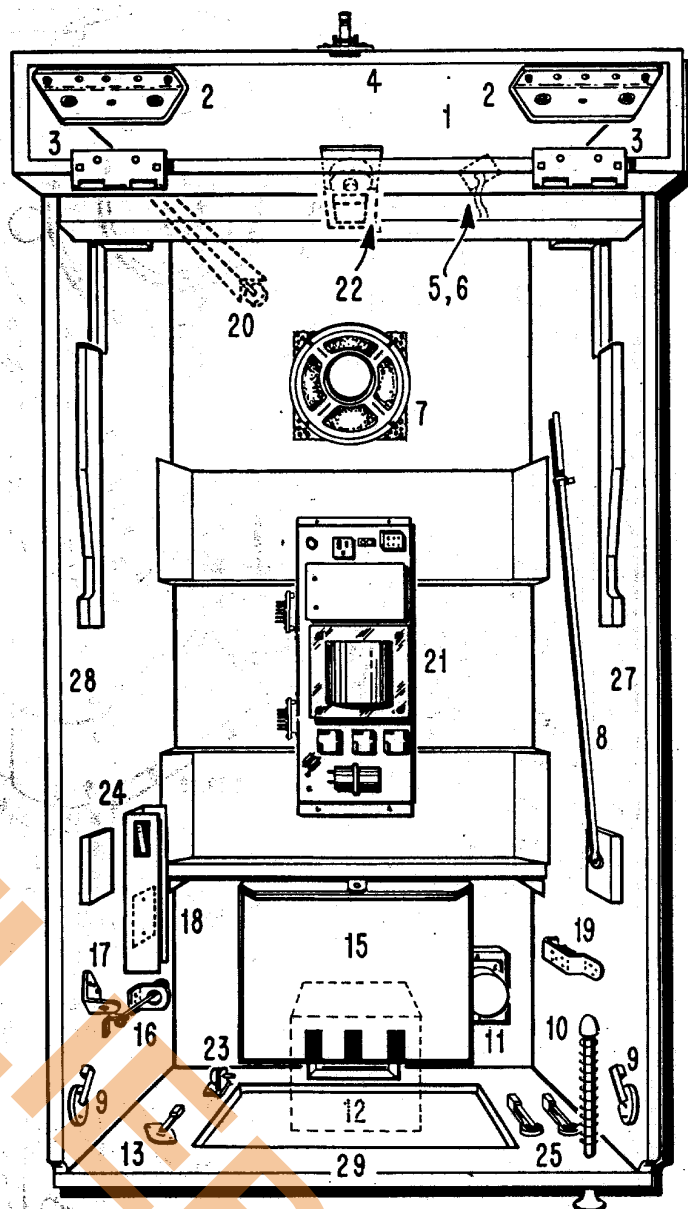
XI. PARTS INFORMATION

CABINET PARTS

ITEM DESCRIPTION

PART NO.

1. Cabinet	25270-709
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)	17838-3
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
15. Cashbox	25309
Cover	25315
Liner (Small) (3)	24870
Liner (Large) (2)	24871
16. Plumb Bob Tilt Switch Assembly	358
Strike Plate	MH-30
Carbon, Tilt Bob	357
Rod, Tilt	22043
Bracket	18578
17. Locator Bracket	24252
18. Diode Assembly	XO-265
Diode, 1N270 (8)	MA-12
19. Knocker Assembly	MA-352
Bell Assembly (Gong) (When Used)	4337
20. Cabinet Leg (4)	4337Y
(Black) (4) (When Used)	4337T
(Gold) (4) (When Used)	3775
Leg Bolt (8)	MH-21
3" Leg Adjuster (4)	25317
1" Sleeve (2)	FA-665
3/8-16, Jam Nut (8)	MA-958
21. Transformer Panel Assembly	EL-42
Bridge Rectifier (3)	MA-948
Cable Assembly (Secondary)	XO-830
Capacitor, 10,000UF, 25V	EL-50
Filter, Line	EL-10
Fuse Block (8 Pos.)	23805
Fuse Cover	EL-78
Fuse Holder (F7 and F8) (2)	EL-28
Fuses	EL-29
F1, 1/2 Amp	EL-5
F2, 6-1/4 Amp, SLO-BLO	EL-26
F3, 1/4 Amp, SLO-BLO	EL-26
F4, 8 Amp, SLO-BLO	EL-8
F5, 8 Amp SLO-BLO	EL-20
F6, 5 Amp SLO-BLO	EL-8
F7, 1/2 Amp SLO-BLO	EL-21
F8, 5 Amp, SLO-BLO (110V AC)	EL-3
F8, 2.5 Amp, SLO-BLO (220V AC)	EL-3
F9, 1 Amp	25374
F9A, 1 Amp	18133
Ground Bus Assembly (2)	XO-154
Outlet, Service	24634
Resistor, 0.33 Ohm, 10%	
5W, Wire-Wound (2)	
Transformer	



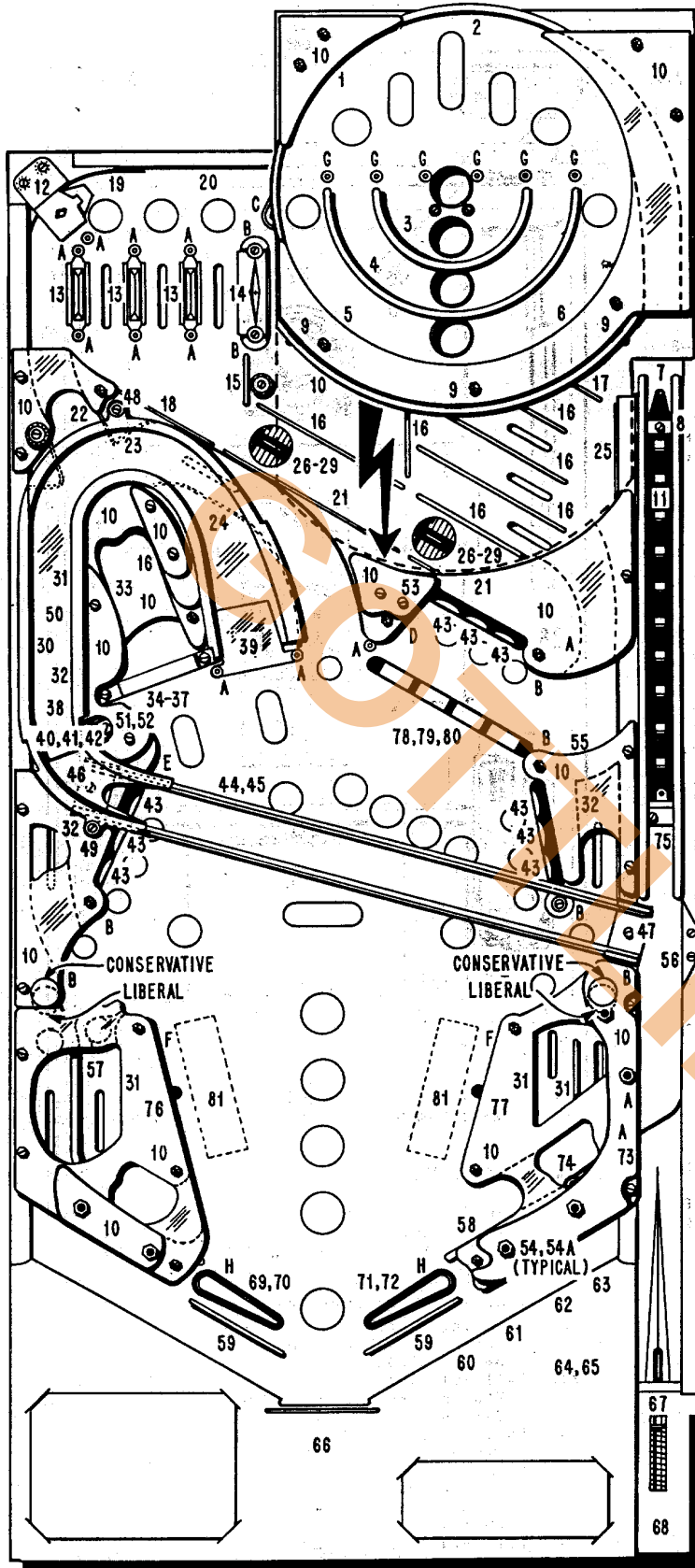
ITEM DESCRIPTION

PART NO.

22. Line Filter Assembly	MA-941
Fuse Holder	EL-78
F20, 8 Amp, SLO-BLO (110V AC)	EL-26
F20, 4 Amp, SLO-BLO (220V AC)	EL-33
Line Filter	EL-50
Line Filter (Germany)	EL-51
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)	25181-709
27. Right Moulding (Not Shown)	22735
(Black) (When Used)	22735Y
(Gold) (When Used)	22735T
28. Left Moulding (Not Shown)	22736
(Black) (When Used)	22736Y
(Gold) (When Used)	22736T
29. Front Moulding (Not Shown)	16951
(Black) (When Used)	16951Y
(Gold) (When Used)	16951T

XI. PARTS INFORMATION

PLAYBOARD PARTS INFORMATION



PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	Ball Guide Rail	25409
2	Ball Guide Rail	25387
3	Ball Guide Rail	25379
4	Ball Guide Rail	25381
5	Ball Guide Rail	25449
6	Ball Guide Rail	25450
7	Ramp Bracket (P/O Upper Playboard)	25343
8	Ramp Wire Assembly	25410
9	Mounting Bracket (3)	25444
10	Plastic Shield Set (Glass Stop, Not Shown)	25447
11	LED Board Assembly	MA-956
12	Arch Gate Assembly	18469
13	Rollover Guide (3)	15648P
14	Ball Guide Rail (2-1/2")	9397P
15	Ball Guide Rail	6931
16	Ball Guide Rail (7)	13833
17	Ball Guide Rail	11703
18	Ball Guide Rail	14568
19	Flat Rail	25372
20	Flat Rail	25369
21	Ball Guide Rail (2)	5977
22	Ball Guide Rail	4831
23	Flat Rail	25382
24	Flat Rail	25371
25	Flat Rail	25345
26	Hole Liner (2) (NOT USED)	
27	Hole Base Plate, Red, (2)	15707U
28	Hole Kicker Assembly (2)	MA-444
29	Hole Switch Arm, Red (2)	15708U
30	Flat Rail	25346
31	Ball Guide Rail (4)	17106
32	Ball Guide Rail (3)	4832
33	Ball Guide Rail	25347
34	Target Shield	14043
35	Swinging Target Assembly	24494
36	Swinging Target Rod	20406
37	Nylon Washer (2)	20407
38	Molded Ramp	25353
39	Ramp Flap	25056
40	Gate Shield	25442
41	Gate Wireform	25443
42	Rollunder Spring	25247
43	Spot Target Assembly (Red) (9)	25460U
44	Light Tube(s) Assembly	MA-952
45	Light Tube (2)	25391
46	Tube Support Bracket	25362
47	Tube Support Bracket	25455
48	Ramp Spacer	25389
49	Ramp Spacer	25395
50	Ramp Decal	25467
51	Post Base (4)	14487Z
52	Split Post Cap (4)	14488Z
53	Plastic Standoff (2)	MP-16
54	Plastic Standoff (6)	25454
54A	8-32, Elastic Stop Nut (6)	FA-660
55	Ball Guide Rail	18070
56	Ball Deflector	21158
57	Ball Guide Rail	23833
58	Ball Guide Rail	25348
59	Ball Snubber Rail (2)	13798
60	1-1/16" Steel Ball (3)	21864
61	Ball Return Unit Assembly	21622
62	Ball Return Gate Assembly	20607
63	Ball Return Gate Wireform	20601
64	Ball Return Fence	23855
65	Ball return Gate Fence	23856
66	Cardholder	13657-709
67	Ball Shooter Gauge	9767-709
68	Ball Shooter Assembly	B-8835
69	Left Flipper Assembly	MA-937
70	Left Flipper Switch	25434
71	Right Flipper Assembly	MA-938E
72	Right Flipper Switch	25435
73	Ball Gate Assembly (No Switch) See Exploded View Illustration	MA-968
74	Ball Gate Assembly (With Switch) See Exploded View Illustration	MA-967
75	LED Board Mounting Bracket (3)	25344
76	Contact Kicker Assembly	MA-135A
77	Contact Kicker Assembly	MA-135
78	Rollover Target Bank Assembly	MA-939
79	Rollover Targets (White) (4)	20892Z
80	Target Decal (4)	25468
81	Mylar Overlay (2)	25080

RUBBER RINGS

ITEM	DESCRIPTION	PART NO.
A	Mini-Post (13)	15705
B	5/16" (8)	10217
C	3/4" (8)	10218
D	1" (8)	10219
E	7/16" (8)	17493
F	2-1/2" (2)	10222
G	Mini-Post (6)	14793
H	Flipper, Red (2)	13151

MISCELLANEOUS PARTS

DESCRIPTION	PART NO.
Support Post(Upper PB.)	25390
Mini-Post Screw	14792
Siamese Post	17492
Plastic 1" Post	11561P
Plastic Support Post	20635P
"T" Relay Assembly	MA-25
"Q" Relay Assembly	MA-23

XI. PARTS INFORMATION

BALL GATE PARTS

PART NO.

DESCRIPTION

ITEM

14376	Switch Collar Sub-Assembly	1
20528 (NOT USED)	Switch Cover	2
465	Switch Collar Sub-Assembly (2)	3
FA-2 (NOT USED)	5-40 x 5/8" RHMS (2)	4
13656 (NOT USED)	8-32 x 3/8" SHCS UNBRAKO (2)	5
FA-71	Diode, 1N4004	6
XO-254	Coll	7
20558	6-32 x 1/4" RHMS SEMS	8
FA-32	5-40, 1/4" HEX	9
FA-650	Switch	10
15373	5-40 x 3/4" RHMS (2)	11
FA-3	Frame/Bushing Sub-Assembly	12
14170	Gate Shaft	13
13654	Gate Wireform	14
14099 (NOT USED)	Gate Wireform	15
21160	Gate Wireform	16
21056	Armature Wireform	17
14375	Armature Wireform	18
13653	6-32 x 1/4" RHMS SEMS	19
FA-32	Washer, #6	20
FA-615	Armature/Rivet Sub-Assembly	21
13660	Spring	22
517		23

