



Bally

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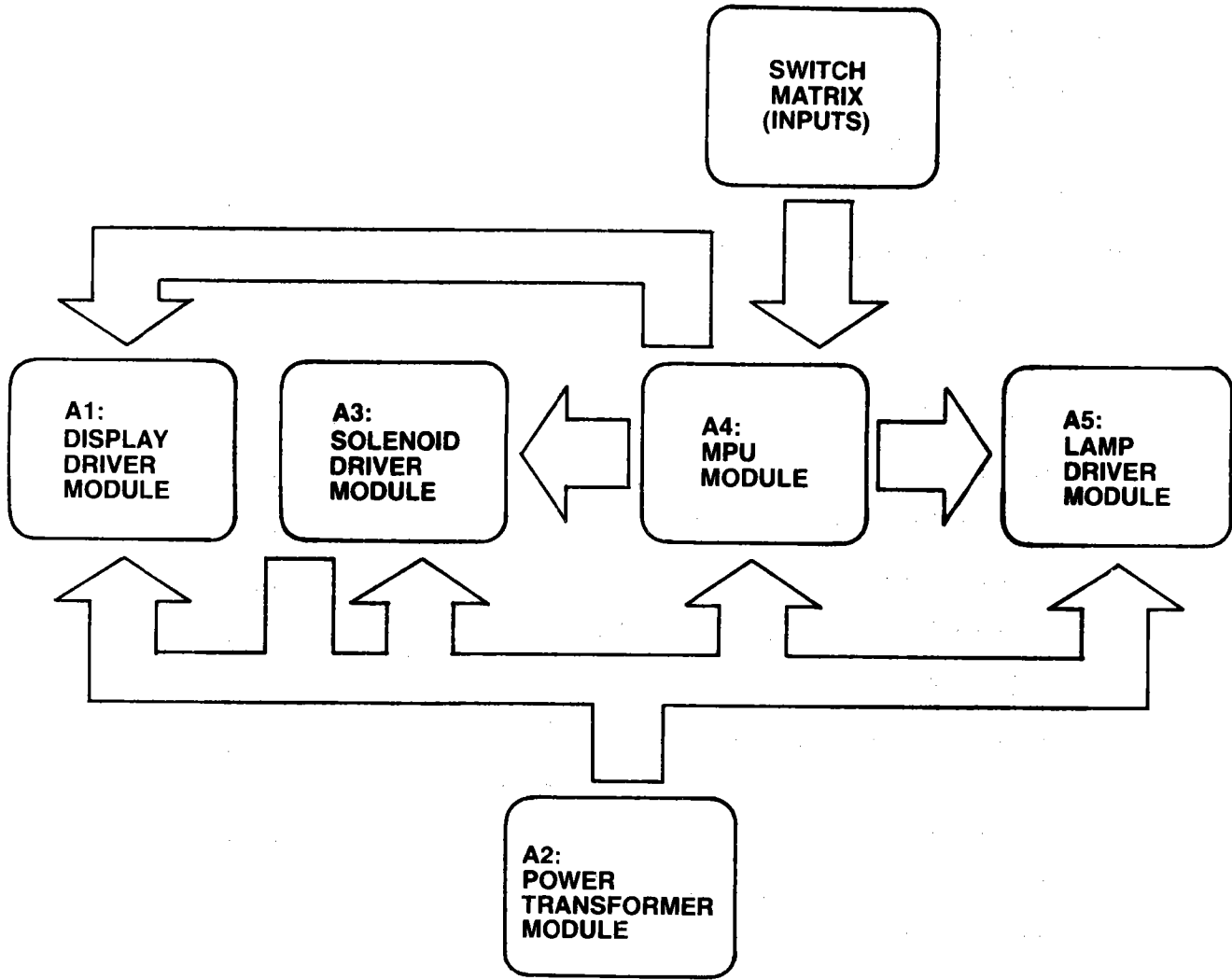
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Installation and General Game Operation Instructions

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BLOCK DIAGRAM—ELECTRONIC PINBALL GAME



I. INSTALLATION

Assemble the game as follows:

Bolt legs to cabinet. Bolt back box to cabinet. Use flat washers under bolt heads. Gently feed cable connectors and ground braid through cable port in back box. Screw ground braid to braid in back box. Carefully and fully insert connectors on printed circuit assemblies.

On all games there are certain items that should be checked after shipment. These are visual inspections which may avoid time consuming service work later. Minor troubles caused by abusive handling in shipment are unavoidable. Cable connectors may be loosened, switches (especially tilt switches) may go out of adjustment. Plumb bob tilt switch should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

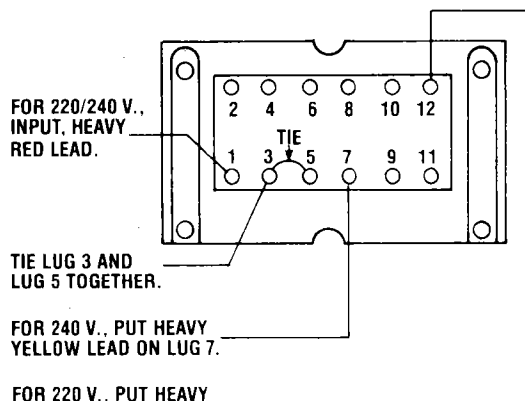
1. Check that all cable connectors are completely seated on printed circuit assemblies.
2. Check that cables are clear of all moving parts.
3. Check for any wires that may have become disconnected.
4. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
5. Check wires on coils for proper soldering. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
6. Check that fuses are firmly seated and making good contact.
7. Check the transformer for any foreign material shorting across wiring lugs.
8. Check wiring of transformer to correspond to location voltage. See figure 1.

Check adjustment of the three (normally open) tilt switches:

1. Panel tilt on bottom of playfield panel.
2. Plumb bob tilt on left side of cabinet near front door.
3. Ball tilt above plumb bob tilt. Insert the smaller ball (15/16" dia.) into the ball tilt assembly, and adjust the bracket so the ball will roll free to contact the switch blade, if front of cabinet is raised.

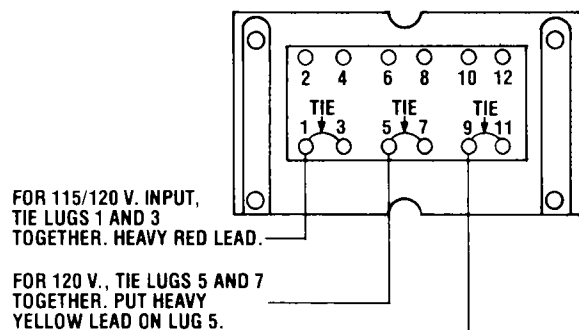
TRANSFORMER CONNECTION INSTRUCTIONS

E-122-125 TRANSFORMER WIRING FOR 220/240 V.,
50/60 CYCLE INPUT.



VARIATOR, BALLY PART NO. E-713-1,
LOCATED IN CABINET, MUST BE USED
FOR OPERATION AT 220 V. OR 240 V.A.C.

E-122-125 TRANSFORMER WIRING FOR 115/120 V.,
50/60 CYCLE INPUT.



VARIATOR, BALLY PART NO. E-713,
LOCATED IN CABINET, MUST BE USED
FOR OPERATION AT 115 OR 120 V.A.C.

FIGURE I. TRANSFORMER
(PART OF POWER—TRANSFORMER MODULE A2, LOCATED IN BACK BOX).

II. GENERAL GAME OPERATION

Place ball into playfield by outhole.

Coin game. Coin should be rejected. Plug in line cord. Move power ON-OFF master switch at bottom right front corner of cabinet to 'ON' position. The game will play a power-up tune to announce game-readiness. Drop targets are reset, scores are set to zero, alternating with the 'High Score to Date,' and the game is ready for play. Coin game. The game should accept the coin and post credits* for coins accepted (adjustable). Pressing the credit button on the door will cause the outhole kicker to serve the ball to the shooter alley. The 1st player-up lite is lit. A game-up tune* is played to announce play-readiness. The bonus score is advanced to 1000 points.

One player is posted each additional time the credit button is pressed (one to four can play). The credits are reduced by one each time the credit button is pressed until the credits are reduced to zero.

Shooting the ball initiates play. Rebound switches score 10 points. Thumper-bumpers, when not lit, score 10 points.

When the ball enters the outhole, the bonus score is added to the total score. The player-up and/or ball in play on the back box is advanced one position. The bonus score is advanced to 1000 points. The outhole kicker serves the ball to the shooter alley and play is resumed. This continues until each player has played the allowable number of balls per game (adjustable). At this time the 'Game Over' light is lit. A random Match* number appears and the 'Match' light is lit. If the number is the same as the last two digits in a player's score, a free game is awarded.

Extra balls won during the course of the game are played immediately after the player's regular ball enters the outhole. The player-up and/or ball in play on the back box are not advanced for extra ball play. Bonus score is added to the player's score and the bonus is set to 1000 points before the game serves the extra ball for play.

At the end of the game, a 'High Score to Date' is alternately flashed with all 4 player scores. If the 'High Score to Date' is beat, this feature* awards 3 free games.

Tilting the game results in loss of a ball. The flippers, thumper-bumpers, etc., go 'dead.' Bonus points are not scored. The purpose of the tilt penalty is to discourage the player from jostling the machine in an attempt to prolong play. Game action becomes normal after the ball kicker assembly serves the ball to the shooter alley.

Slamming the machine results in loss of the game. All feature lights go out, the game goes 'dead,' and a time delay occurs. The purpose of the time delay is to discourage unnecessary abuse of the machine. After the delay, the 'Game Over' light lites and the power-up tune is played. The time delay occurs anytime one of the slam switches is made to contact. There is one factory installed slam switch on the front door. (Any number of slam switches could be installed by the operator, to meet his individual requirement.) The switch should be adjusted to have approximately 1/16" gap between the contacts. The weighted blade should be adjusted to attain the desired sensitivity. Decreasing the gap between contacts will make the switch more sensitive. Opening the gap will reduce sensitivity.

*Some tunes and features can be disabled by operator if so desired. See Back Box Adjustments.

III. BOOKKEEPING FUNCTIONS

The game is designed to help the operator perform certain accounting functions. The game can display the number of total plays and replays (free games). It can display the number of coins dropped down each coin chute. The bookkeeping functions are displayed on all player score displays simultaneously. An identification number, 05 to 11 appears on the Match/Ball in Play window as follows:

- 05— 00 to— 40 = Current Credits
- 06—10000 to—999999 = Total Plays (Payed & Free Games)
- 07—10000 to—999999 = Total Replays (Free Games)
- 08— 00 to—999999 = Total times 'High Score to Date' is beat
- 09—10000 to—999999 = Coins Dropped thru Coin Chute #1
- 10—10000 to—999999 = Coins Dropped thru Coin Chute #2**
- 11—10000 to—999999 = Coins Dropped thru Coin Chute #3**

The game displays the first bookkeeping entry if the Self-Test switch (See Fig. III) on the inside of the front door is pressed nine times. Alternately push and release the Self-Test button at one second intervals. The number 05 appears in the 'Match/Ball in Play' window. Current credits appear on the player score displays. Each additional press of the button causes the next entry to be displayed.

After the data in each bookkeeping register is recorded, it can be set to zero simply by pressing switch button S33, located on A4, the MPU module in the back box. (See Fig. III). Any or all registers can be cleared by alternating between the Self-Test button and the switch button on the MPU module. The operator is given this option as a possible convenience and can elect to use or not use it as his needs direct.

Pressing the button once more with the eleventh entry displayed causes the game to play the power-up tune and light the Game-Over light.

*Some tunes and features can be displayed by operator if so desired. See Back Box Adjustments.

**If Coin Chute is not used in game, number displayed (if other than 00) on Player Score displays has no significance.

IV. FEATURE OPERATION AND SCORING

A. Bonus Score Features:

A Bonus Score of 1,000 to 15,000 may be scored. The game starts with a Bonus Score of 1,000. The Bonus Score advances one step at a time each time the ball goes thru the flipper return lanes, the 'C' & 'Y' lanes, hits a 'C,' 'L,' or 'E' target on the right, or hits a drop target on the left. 500 points is scored as these features are made.

When the ball goes into the outhole, the lit bonus score is added to the player's total score; If the double bonus lite is lit, twice the lit bonus score is added to the player's score. A tilt nullifies the bonus score.

B. Double Bonus Feature:

The Double Bonus is awarded when all (5) drop targets are knocked down the first time.

The Double Bonus lite goes out when a ball goes into the outhole and the Bonus Score is collected.

C. Drop Target Feature:

The recommended, 3-Ball game adjustments result in the following awards: (See Section V for Adjustments)

Each Drop Target scores 500 points and the bonus advances one step.

1ST time all (5) targets are knocked down, 5,000 points are scored, double bonus lite lites. Targets then reset.

2ND time all (5) targets are knocked down scores extra ball.

3RD time all (5) targets are knocked down and each additional time scores a special.

Only one extra ball is awarded at any one time. The extra ball earned must be played off before another extra ball can be scored. The game is adjustable to award an extra ball when a pre-adjusted Hi-Score is registered or through the special feature. The 'Special' award is adjustable to score a credit or an extra ball.

D. SPINNER FEATURE:

3 Ball Feature; Lit spinner scores 1,000 points, unlit spinner scores 10 points. Lit spinner alternates from side to side with multiple (500, 5,000) point scoring.

5 Ball Feature; Spinners score 10 points. When all drop targets are knocked down, lit spinner scores 1,000 points. Lit spinner alternates from side to side with multiple scoring.

E. S-U-P-E-R FEATURE:

A ball in the top hole or a ball hitting center target scores 3,000 points and lites letter that corresponds to lit arrow. The arrow is then advanced to the next position. Each 10 points scored also moves arrows one position.

The recommended, 3 ball game adjustments result in the following award:

When 'S-U-P-E-R' series is completed, one credit (Free Game) is awarded.

After 'S-U-P-E-R' series is completed, it resets and above sequence is repeated.

F. C-Y-C-L-E FEATURE:

Completing the 'C-L-E' portion, lites center thumper-bumper (1,000 points/hit when lit). Also lites outlane special.

The recommended, 3 ball game adjustments result in the following award:

Completing 'C-Y-C-L-E' lites both outlanes to score special constantly.

G. OUTLANE SPECIAL FEATURE:

Recommended for 3 ball-play: When ball goes down lit outlane, 1 credit (adjustable) is awarded. (See Section V)

V. GAME ADJUSTMENTS

A. Playfield Panel Post Adjustments:

Posts that control left and right outlane opening on panel can be moved to make access to outlanes easier or harder for ball to enter. See Figure II.

Easier entry will decrease playing time and scoring (conservative).

Harder entry will increase playing time and scoring (liberal).

B. Back Box Game Adjustments:

Each game has thirty-two switches located on A4, the MPU module, located in the back box, that allow play to be customized to the location. See Figure III. Credits per coin, maximum credits, credit display, balls per game, match feature, high game feature, special award and melody are selectable by means of the switches. The switches are contained in four-sixteen lead packages numbered S1-8, S9-16, S17-24 and S25-32 for easy identification. The "ON" toggle position is marked on the assembly. **Turn off power before making adjustments.**

Credits/Coin Adjustments:

The credits per coin are selectable by means of S22 and S23 for coin chute #2. The switch settings and resultant credits/coin are as follows:

SWITCHES		CREDITS / COIN
S23	S22	
OFF	OFF	1/COIN
OFF	ON	6/COIN
ON	OFF	SAME AS COIN CHUTE #1
ON	ON	12/COIN

The credits given per coin are selectable by means of switches 1-5 incl., for coin chute #1 and switches 9-13 incl., for coin chute #3. Thirty-one different credit ratios are available for each coin chute. The switch settings and resultant credits/coin are listed on page 11.

CREDITS/COIN ADJUSTMENTS

COIN CHUTE #1 (HINGE SIDE) OR #3	SWITCHES					CREDITS/COIN
	5	4	3	2	1	
	13	12	11	10	9	
	OFF	OFF	OFF	OFF	OFF	3/2 COINS**
	OFF	OFF	OFF	OFF	ON	3/2 COINS**
	OFF	OFF	OFF	ON	OFF	1/COIN
	OFF	OFF	OFF	ON	ON	1/2 COINS*
	OFF	OFF	ON	OFF	OFF	2/COIN
	OFF	OFF	ON	OFF	ON	2/2 COINS*
	OFF	OFF	ON	ON	OFF	3/COIN
	OFF	OFF	ON	ON	ON	3/2 COINS*
	OFF	ON	OFF	OFF	OFF	4/COIN
	OFF	ON	OFF	OFF	ON	4/2 COINS*
	OFF	ON	OFF	ON	OFF	5/COIN
	OFF	ON	OFF	ON	ON	5/2 COINS*
	OFF	ON	ON	OFF	OFF	6/COIN
	OFF	ON	ON	OFF	ON	6/2 COINS*
	OFF	ON	ON	ON	OFF	7/COIN
	OFF	ON	ON	ON	ON	7/2 COINS*
	ON	OFF	OFF	OFF	OFF	8/COIN
	ON	OFF	OFF	OFF	ON	8/2 COINS*
	ON	OFF	OFF	ON	OFF	9/COIN
	ON	OFF	OFF	ON	ON	9/2 COINS*
	ON	OFF	ON	OFF	OFF	10/COIN
	ON	OFF	ON	OFF	ON	10/2 COINS*
	ON	OFF	ON	ON	OFF	11/COIN
	ON	OFF	ON	ON	ON	11/2 COINS*
	ON	ON	OFF	OFF	OFF	12/COIN
	ON	ON	OFF	OFF	ON	12/2 COINS*
	ON	ON	OFF	ON	OFF	13/COIN
	ON	ON	OFF	ON	ON	13/2 COINS*
	ON	ON	ON	OFF	OFF	14/COIN
	ON	ON	ON	OFF	ON	14/2 COINS*
	ON	ON	ON	ON	OFF	15/ COIN
	ON	ON	ON	ON	ON	15/2 COINS*

*No Credits until second coin is dropped.

**One Credit for first coin. Two Credits for second coin provided that no scoring occurred between 1st and 2nd coin drops. If scoring occurred, second coin gives one credit.

MAXIMUM CREDITS:

The maximum credits accepted by the machine limits the number of games that can be accumulated by coining, by winning replays or both. The maximum number of credits is selectable by means of switches 17, 18 and 19. Eight credits limits are available. Switch settings are listed below.

MAXIMUM CREDITS	SWITCHES		
	19	18	17
5	OFF	OFF	OFF
10	OFF	OFF	ON
15	OFF	ON	OFF
20	OFF	ON	ON
25	ON	OFF	OFF
30	ON	OFF	ON
35	ON	ON	OFF
40	ON	ON	ON

BALLS PER GAME:

# BALLS/GAME	SWITCH 16
5	ON
3	OFF

MATCH FEATURE:

When the Match Feature is ON, a random number appears in the 'Match/Ball in Play' window and the word MATCH is illuminated. If the number matches the tens digit in a player's score, a free game is awarded. The Match feature creates an incentive to play.

MATCH	SWITCH 21
ON	ON
OFF	OFF

CREDIT DISPLAY:

CREDITS DISPLAYED	SWITCH 20
YES	ON
NO	OFF

HIGH SCORE FEATURE:

The game is designed to award an Extra Ball or Free Game at each of the three score levels. See Front Door Game Adjustments.

AWARD	SWITCH 6
EXTRA BALL	OFF
REPLAY	ON

MELODY OPTION:

The game is designed to play several melodies to announce power-up, game-up, etc. The tunes are intended to attract attention to the game and increase game usage. The tunes are controlled by switch 8.

TUNES	SWITCH 8
ON	ON
OFF	OFF

HIGH SCORE TO DATE FEATURE:

The game is designed to award free games as an option if high score to date is beat. Each time this happens, the winning score becomes the new high game score to beat. This score is displayed on all 4 player score displays at the end of each game as an incentive to play. Recommended setting is underlined.

HIGH SCORE TO DATE FEATURE	SWITCH 15	SWITCH 14
No Award (Novelty)	OFF	OFF
One Credit	OFF	ON
Two Credits	ON	OFF
<u>Three Credits</u>	<u>ON</u>	<u>ON</u>

DROP TARGET FEATURE AWARD:

The scoring options for the 'Drop Target Feature' are detailed in Section IV.

The Drop Target options and switch settings are shown below. Recommended 3-Ball and 5-Ball play switch settings are underlined.

3RD TIME DOWN			2ND TIME DOWN		
S30	S29		S28	S27	
OFF	OFF	NO AWARD	OFF	OFF	NO AWARD
OFF	ON	5000 POINTS (NOVELTY)	OFF	ON	5000 POINTS (NOVELTY)
ON	OFF	EXTRA BALL	ON	OFF	5000, EXTRA BALL
<u>ON</u>	<u>ON</u>	<u>ONE CREDIT</u>	<u>ON</u>	<u>ON</u>	<u>EXTRA BALL</u>

C-Y-C-L-E FEATURE: SEE SECTION IV.

Recommended 3-Ball-play switch settings are underlined.

Completing 'C-Y-C-L-E' awards:

S24	
<u>ON</u>	<u>BOTH OUTLANES LIT (LIBERAL)</u>
OFF*	<u>ONE OUTLANE LIT. LANE LIGHT ALTERNATIVES EVERY 10 POINTS SCORED. (CONSERVATIVE)</u>

OUTLANE SPECIAL AWARD: SEE SECTION IV.

Recommended 3 and 5 Ball play switch settings are underlined.

BALL DOWN LIT OUTLANE AWARDS

S32	S31	
OFF	OFF	NO AWARD (NOVELTY)
OFF	ON	EXTRA BALL
<u>ON</u>	<u>OFF</u>	<u>1 CREDIT</u>
ON	ON	1 CREDIT AND EXTRA BALL

S-U-P-E-R FEATURE: SEE SECTION IV.

Recommended 3 Ball play switch settings are underlined.

COMPLETING S-U-P-E-R AWARDS

S26	S25	
OFF	OFF	NO AWARD
OFF	ON	EXTRA BALL
ON*	OFF*	ONE CREDIT
<u>ON</u>	<u>ON</u>	<u>TWO CREDITS</u>

*5 Ball-Play setting.

C. Front Door Game Adjustments:

High Score Feature Adjustments:

The game is designed to award an extra ball (option) or a free game at each of three score levels. The recommended levels are on the score card in the game.

Any level from 2,000 to 998,000 can be set, as desired. It is also possible to reset or turn off (00) any or all of the levels, if desired.

1. Push and release Self-Test button at one second intervals approximately five times or until number 01 appears on the Match/Ball in Play display.
2. The number on the Player Score Displays is the score level*. It can be increased, if desired, by holding the credit button in. To decrease the score level, reset to '00' and then hold the credit button in. Release the credit button when the desired number appears. Note that the level changes 2,000 points at a time. If the number '00' is left on the displays, the high score feature is eliminated for that level.
3. Repeat steps 1 and 2 for the second and third score levels. The number '02' and '03' on the Match/Ball in Play display are for the second and third levels, respectively.

High Score to Date Feature:

The game is designed to award free games when 'High Score to Date' is beat. For the recommended, factory preset level, see page 11.

It is recommended that the level, which will build with game play, be periodically reset to the factory recommended level to encourage game play. The adjustment procedure is the same as for the High Score Feature Adjustment, Steps 1 and 2. Continue pushing the Self-Test button until the number '04' appears on the Match/Ball in Play display and then do Step 2.

Any level from '00' to 998,000 can be set as described. It is to be noted that '00' does **not** turn off the feature, as it does on High Score feature. The feature is turned off by positioning switch 15 to the 'OFF' position, and 'ON' by positioning switch 15 to the 'ON' position, as discussed under "Back Box Game Adjustments."

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box. See Figure III.

#1094-E EVEL KNEIVEL

RUBBER PARTS

A.	R-521	3/4" DIA.	(2)
B.	R-521-1	1" DIA.	(4)
C.	R-521-2	1 1/2" DIA.	(2)
D.	R-521-3	2" DIA.	(1)
E.	R-521-5	3" DIA.	(4)
F.	R-406-3	FLIPPER	(2)
G.	R-243	5/16" DIA.	(17)

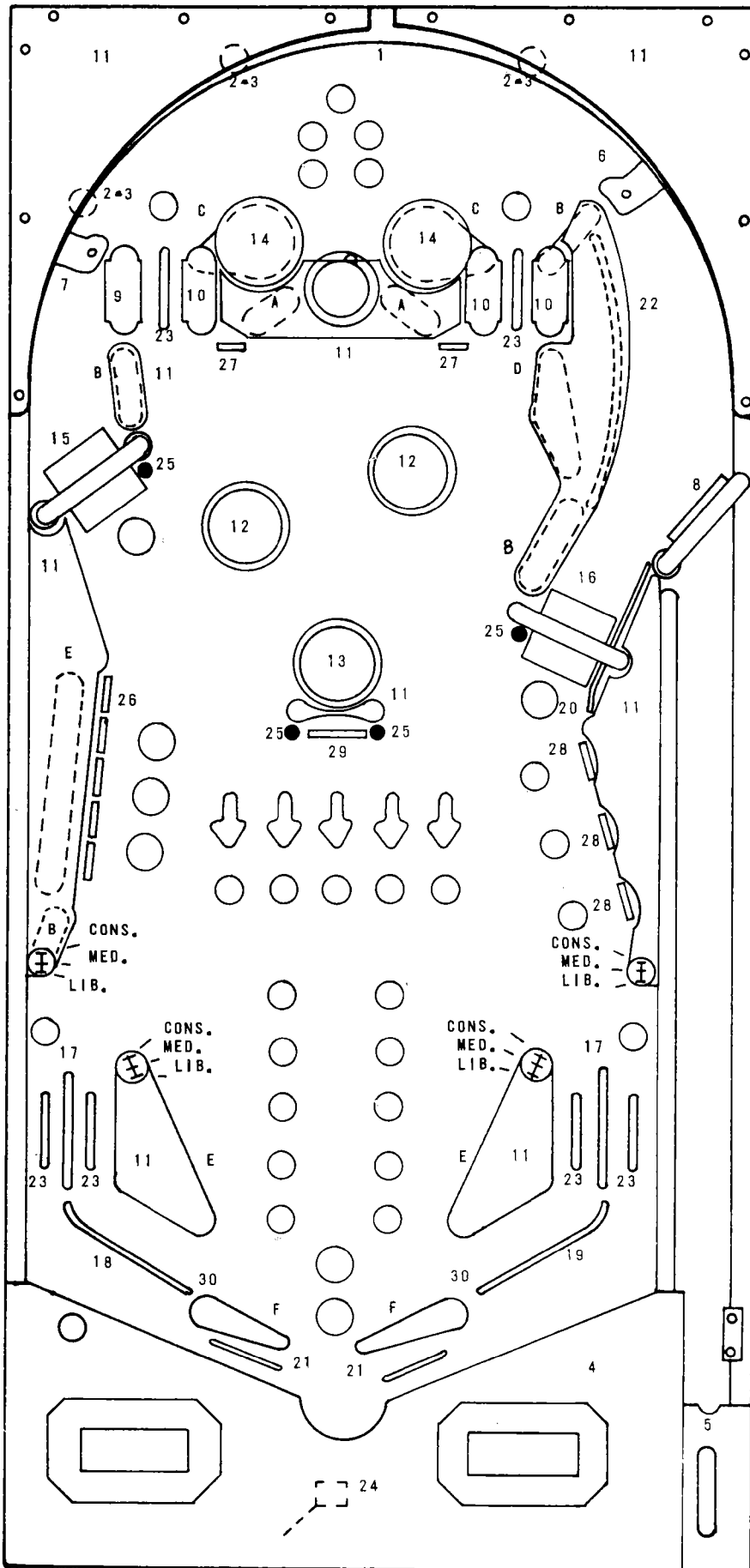
PANEL TOP PARTS

1.	ARCH RAIL	M-1774	
2.	RAIL POST	C-907	(3)
3.	RAIL POST CAP	C-908	(3)
4.	BOTTOM ARCH	P-5871-56	
5.	SHOOTER GAUGE	P-6359-22	
6.	BALL GATE	A-1475-9	(R)
7.	BALL GATE	A-1475-10	(L)
8.	BALL GATE	AS-2250-24	
9.	PLASTIC GUIDE	C-935-1	
10.	PLASTIC GUIDE	C-936-1	(3)
11.	SCREENED PLASTICS (SET)	A-2890-124	
12.	THUMPER CAP	A-3713-11	(2)
13.	THUMPER CAP	A-3713-29	
14.	THUMPER CAP	A-3852	(2)
15.	SPINNER GATE	AS-2250-44	(L)
16.	SPINNER GATE	AS-2250-45	(R)
17.	GUIDE WIRE	M-121-18	(2)
18.	GUIDE WIRE	M-121-43	
19.	GUIDE WIRE	M-121-44	
20.	GUIDE WIRE	M-121-48	
21.	GUIDE WIRE	M-121-53	(2)
22.	GUIDE WIRE	M-121-63	
23.	ROLLOVER WIRE ASS'Y	AS-2806-1	(6)
24.	ROLLOVER WIRE ASS'Y	AS-2806-21	
25.	MINI POST ASS'Y	AS-2836	(4)
26.	DROP TARGET ASS'Y	AS-2795-54	
27.	TARGET ASS'Y	AS-2911-3	(2)
28.	TARGET ASS'Y	AS-2911-20	(3)
29.	TARGET ASS'Y	AS-2911-19	
30.	FLIPPER & SHAFT ASS'Y	AS-2214-24	(2)

CONS.—CONSERVATIVE
 MED.—MEDIUM
 LIB.—LIBERAL

INDICATES MOVABLE POSTS FOR SCORING
 ADJUSTMENTS

FIGURE II—PLAYFIELD PARTS



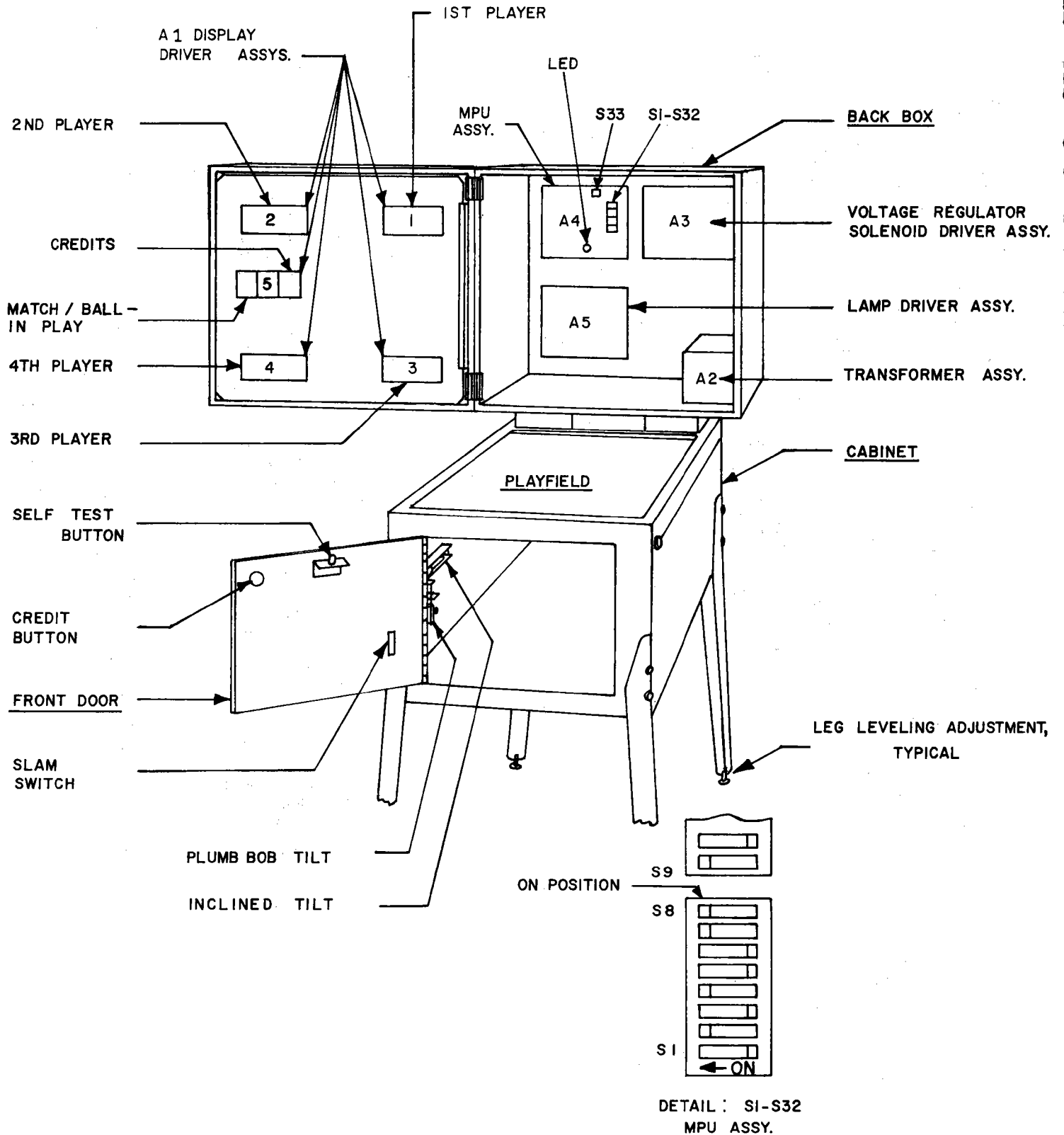


FIGURE III. ELECTRONIC PIN BALL MACHINE

INSTRUCTION CARD OPTIONS FOR EVEL KNEVEL GAME #1094-E

5-BALL	NON NOVELTY							
OPTION DESCRIPTION	Instruction Card Letter and Award Designation							
	A	B	C	D	E	F	G	H
OUTLANE SPECIAL (CONS.)	1 CR	1 CR	EB	1CR 1EB	1CR 1EB	1 CR	EB	1CR 1EB
S-U-P-E-R	1 CR	2 CR	EB	1 CR	2 CR	1 CR	EB	1 CR
DROP TARGET SPECIAL	1 CR		5K	1 CR		5K EB	5K EB	5K EB

3-BALL	NON NOVELTY							
OPTION DESCRIPTION	Instruction Card Letter and Award Designation							
	A	I	C	D	J	F	G	H
OUTLANE SPECIAL (LIB.)	1 CR	1 CR	EB	1CR 1EB	1CR 1EB	1 CR	EB	1CR 1EB
S-U-P-E-R	1 CR	2 CR	EB	1 CR	2 CR	1 CR	EB	1 CR
DROP TARGET SPECIAL	1 CR	1 CR	5K	1 CR	1 CR	5K EB	5K EB	5K EB

3 & 5 BALL	NOVELTY*		
OPTION DESCRIPTION	Instruction Card Letter and Award Description		
	K		
DROP TARGET SPECIAL	5K		

NOTES:

(CR) Credit-replay
(EB) Extra Ball
(5K) 5,000 Points

(Cons.) Conservative
(Lib.) Liberal
 * No Credit or Extra Ball

(USE APPROPRIATE RED MATCH AND HIGH SCORE TO DATE CARD)

VIII. ROUTINE MAINTENANCE ON LOCATION:

Self-Test routines are written into the game design. They are particularly useful for routine maintenance. The tests are described below. The first test is automatic and occurs on power-up. This test causes the MPU module A4 to examine itself for failures. Seven flashes of an LED indicates proper operation. The second series of self-diagnostic tests causes the MPU to 'exercise' each of the other modules in such a way as to make their faults, if any, obvious. See Figure III and Page ii.

It is recommended that these tests be used several times a week to check out the games before play. If faults are discovered, they may be corrected on location if the operator has a stock of replacement modules. See "Trouble Shooting on Location."

MPU Module Self-Test:

At power on, the LED on the MPU module flashes once. (Flicker-Flash). After a pause, it flashes six more times and goes out. A power-up tune is played to announce game readiness. This indicates proper MPU operating condition and successful completion of the power-up test.

Game Self-Diagnostic Tests:

1. Pressing the Self-Test button inside the door initiates the Self-Test routine. See Figures III and IV. All switched lamps flash off and on continuously.
2. Pressing the Self-Test button again causes each digit on each display to cycle from 0 thru 9, and repeat continuously.
3. Pressing the Self-Test button again causes each solenoid to be energized, one at a time, in a continuous sequence. Hold both flipper buttons 'in' during this test. The number appearing on the Player Score displays is the same as the number assigned to the solenoid. The sound of a solenoid pulling-in as a number appears indicates proper operation. The absence of sound is improper. If sound is absent, see Page 17 for help in Solenoid identification.
4. Pressing the Self-Test button again causes the MPU to search each switch assembly for stuck contacts. If any are found, the number of the first set encountered is flashed on the Player Score displays. The number remains until the fault is cleared. See Page 17 for help in Stuck Switch identification. Other numbers may follow if more stuck contacts are present. If there are no stuck switches, the Match/Ball in Play display flashes '0.'
5. Pressing the Self-Test button eleven more times causes the MPU to step thru the threshold and bookkeeping functions described previously and finally to repeat the power-up test. For more rapid exit to power-up, turn the game off, then on. The game is now ready to play.

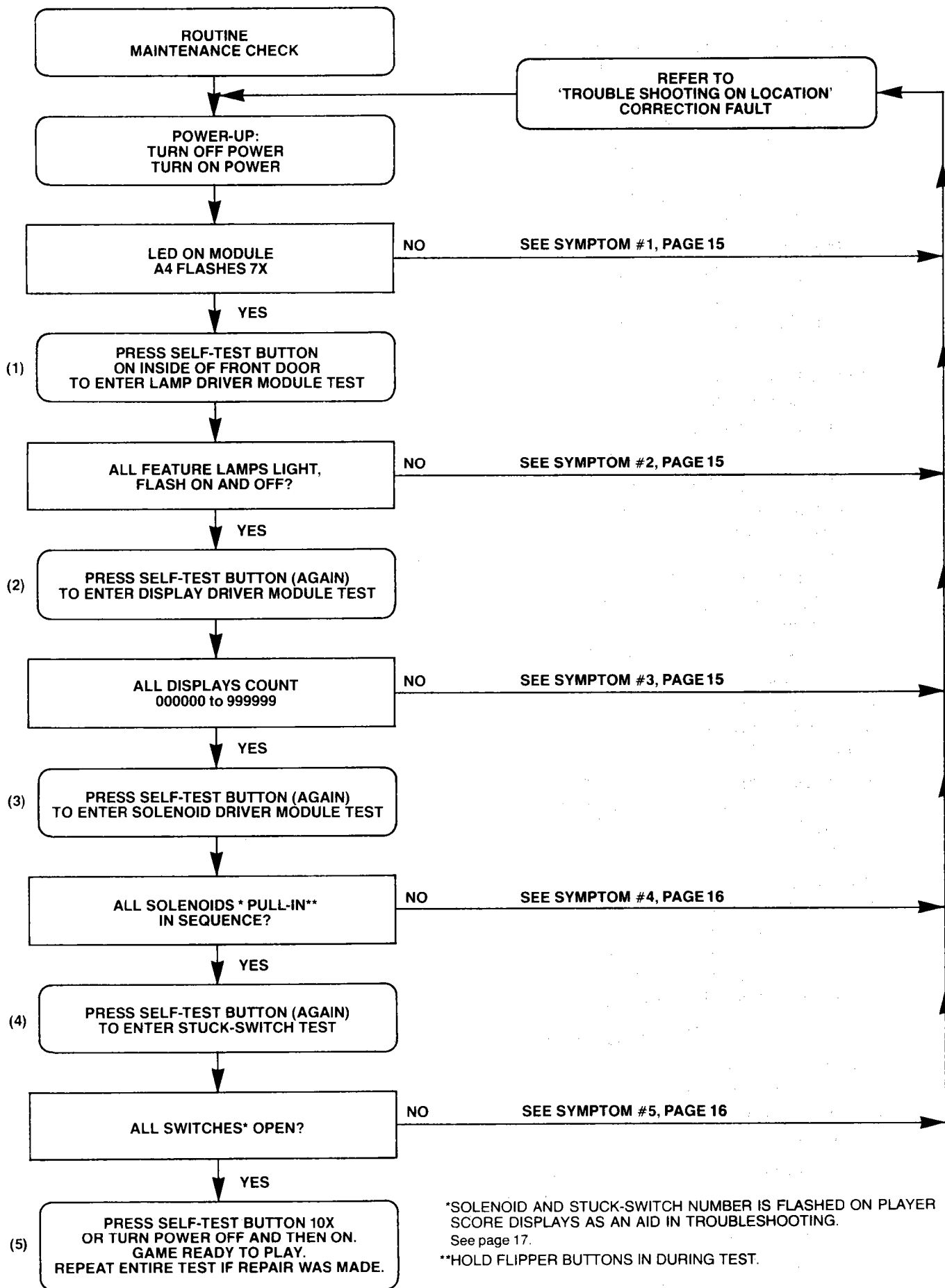
After successful completion of the Self Diagnostic Test procedure, set the game up for play. Exercise each rollover, thumper-bumper, slingshot, etc., by hand until each switch assembly on the playfield has been checked for proper operation. If actuating a switch assembly results in intermittent or no response, clean contacts by gently closing them on a clean business card or piece of paper and wiping until they wipe clean. Regap, if necessary, to 1/16". **Do not burnish or file Gold Plated Switch Contacts.**

IX. TROUBLESHOOTING ON LOCATION

The game is designed to make troubleshooting easy. Several simple procedures are given herein that cover the greatest percentage of game failures. They are written for an operator on location and require module replacement. (See Figure III) Symptoms and the action to be taken are given for each type of problem.

If the problem is more complicated and is not solved by following the simple procedure, two other more detailed procedures are available. One is for the **Serviceman** (or Operator) **on location** and consists of Module Replacement and intermodule continuity procedures. The second is for the **Serviceman** in a **Service Center** with a known-good game. The procedure is written for fault localization, and repair or replacement of defective components on malfunctioning modules. Both procedures are available from Bally. See the Parts List for ordering information.

FIGURE IV SELF DIAGNOSTIC TEST



*SOLENOID AND STUCK-SWITCH NUMBER IS FLASHED ON PLAYER SCORE DISPLAYS AS AN AID IN TROUBLESHOOTING.

See page 17.

**HOLD FLIPPER BUTTONS IN DURING TEST.

- 1A) **SYMPTOM:** Game does not play power-up tune when power is turned on. General illumination is present.
- ACTION:** **A)** Turn power OFF. Open back box. Locate light emitting diode (LED) on MPU module A4.
- B)** Turn Power ON. LED must flash 7X to indicate that module A4 is good. Correct flash sequence is flicker/flash-pause-and then six more flashes and LED goes out.
- C)** If LED does not come on, or does not flash, or flashes, but less than 7X, turn off power. Replace MPU module A4.
- CAUTION:** **Replacement MPU Module must have same Part Number or incorrect operation will result! See Parts List for MPU Module Part Number.**
- Turn power ON.
- D)** If game is correct, it is now ready for play. If game is not correct, refer to Module Replacement procedure. (See Parts List.)
- 2A) **SYMPTOM:** Not all feature lamps light during game play.
- ACTION:** **A)** With power ON, open front door. Press button (Self-Test switch) once. If the game is correct, **all** feature lamps flash ON and OFF.
- B)** Carefully raise playfield or open back box to gain access to lamps.
- C)** Replace bulbs that do not flash.
- D)** If game is correct, it is now ready for play.
- E)** If game is not correct, turn power OFF. Replace Lamp Driver Module A5. Turn power ON and repeat A.
- F)** If game is correct, it is now ready for play.*
- G)** If game is not correct, turn power OFF. Replace MPU module A4. See CAUTION, 1C. Turn power ON and repeat A.
- H)** If game is correct, it is now ready for play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)
- 2B) **SYMPTOM:** One or some switched lamps always ON.
- ACTION:** Repeat 2AA, AB, AE, and AF and, if necessary AG & AH.
- 3A) **SYMPTOM:** Display digits improper on **one** or **several**, but less than all Display Driver module(s), A1. Improper: One or several segments always OFF, digits mottled or several segments or digit(s) always ON.
- ACTION:** **A)** With power ON, open front door. Press button (Self-Test switch) twice. If the game is correct, each digit on each Display Driver Module A1 (5 used/game) displays the count 1-9 and 0 continuously in all 6 digit positions. Note defective Display Driver modules.
- B)** Turn power OFF.
- CAUTION: High Voltage is supplied to the Display Driver Modules, A1, from the Solenoid Driver/Voltage Regulator Module A3. Wait 30 seconds for High Voltage to Bleed Off.**
- C)** Replace Display Driver module(s) A1. Turn power ON. Repeat A.
- D)** If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)
- 3B) **SYMPTOM:** **All** displays improper (all five display Driver modules). Improper: Digit(s) always on or off/segment(s) always on or off, all displays.
- ACTION:** **A)** Repeat 3AA, and AB.
- B)** Replace MPU module A4. See CAUTION NOTE, 1C. Turn power ON. Repeat A.

- C)** If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)
- 3C) SYMPTOM:** One or several displays always off.
- ACTION:**
- A)** Do 3AA, AB, AC, and AD.
 - B)** Repeat 3BB and BC, if necessary.
- 4A) SYMPTOM:** Solenoid(s) do(es) not pull-in during course of game.
- ACTION:**
- A)** With power ON, open front door. Press button (Self-Test switch) three times.
 - B)** If game was correct, each solenoid would be energized. A number is flashed on the Player Score displays as each solenoid is pulsed. Note any numbers that do not have the sound of a solenoid associated. See Solenoid Identification Table, Page 17 and Figure V.
 - C)** Carefully lift the playfield (or open the back box) to gain access to the solenoid. Turn power OFF. Inspect the solenoid.
 - D)** If a lead is broken off, repair. Repeat A & B. If game is correct, it is now ready for play.* If solenoid wiring was correct, turn power OFF.
 - E)** Replace Solenoid Driver/Voltage Regulator module A3. See CAUTION NOTE 3AB.
 - F)** Repeat AA & AB. If game is correct, it is now ready to play.* If game is not correct, turn power OFF.
 - G)** Replace MPU module A4. See CAUTION NOTE, 1C.
 - H)** Repeat A & B. If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement Procedure. (See Parts List.)
- 4B) SYMPTOM:** Solenoid(s) always energized—Note: If impulse solenoids (chimes, ball ejects, slingshots, thumper-bumpers, etc.) are energized continuously, they are subject to damage. Limit troubleshooting to one minute with power ON, followed by **five minutes with power OFF**. Repeat as necessary. Replace damaged solenoids.
- ACTION:** Do 4AA, AB, AE, AF and if necessary, AG and AH.
- 5) SYMPTOM:** Feature (Drop Targets, etc.) does not score.
- ACTION:**
- A)** With power ON, open front door. Press button (Self-Test switch) four times.
 - B)** If the game is correct, Match/Ball in Play display would flash '0.' If a number appears on the Player Score displays, see Switch Assembly Identification Table, Page 17 and Figure V.
 - C)** Carefully lift the playfield. Locate the switch assembly identified from the number. Visually inspect the switch assembly. If the contacts are 'stuck', regap them to 1/16". See section under ADJUSTMENTS. Repeat A & B. If the game is correct, it is now ready to play.* If game is not correct, turn the power OFF.
 - D)** Replace MPU module A4. See CAUTION NOTE 1, C.
 - E)** Repeat A & B. If the game is correct, it is now ready to play.* If the game is not correct, refer to Module Replacement Procedure. (See Parts List.)
- 6) SYMPTOM:** Game blows fuse(s) repeatedly.
- ACTION:** See Module Replacement Procedure. F.O. 512
- *Turn power On-Off switch OFF and then ON.

GAME #1094-E EVEL KNEIVEL

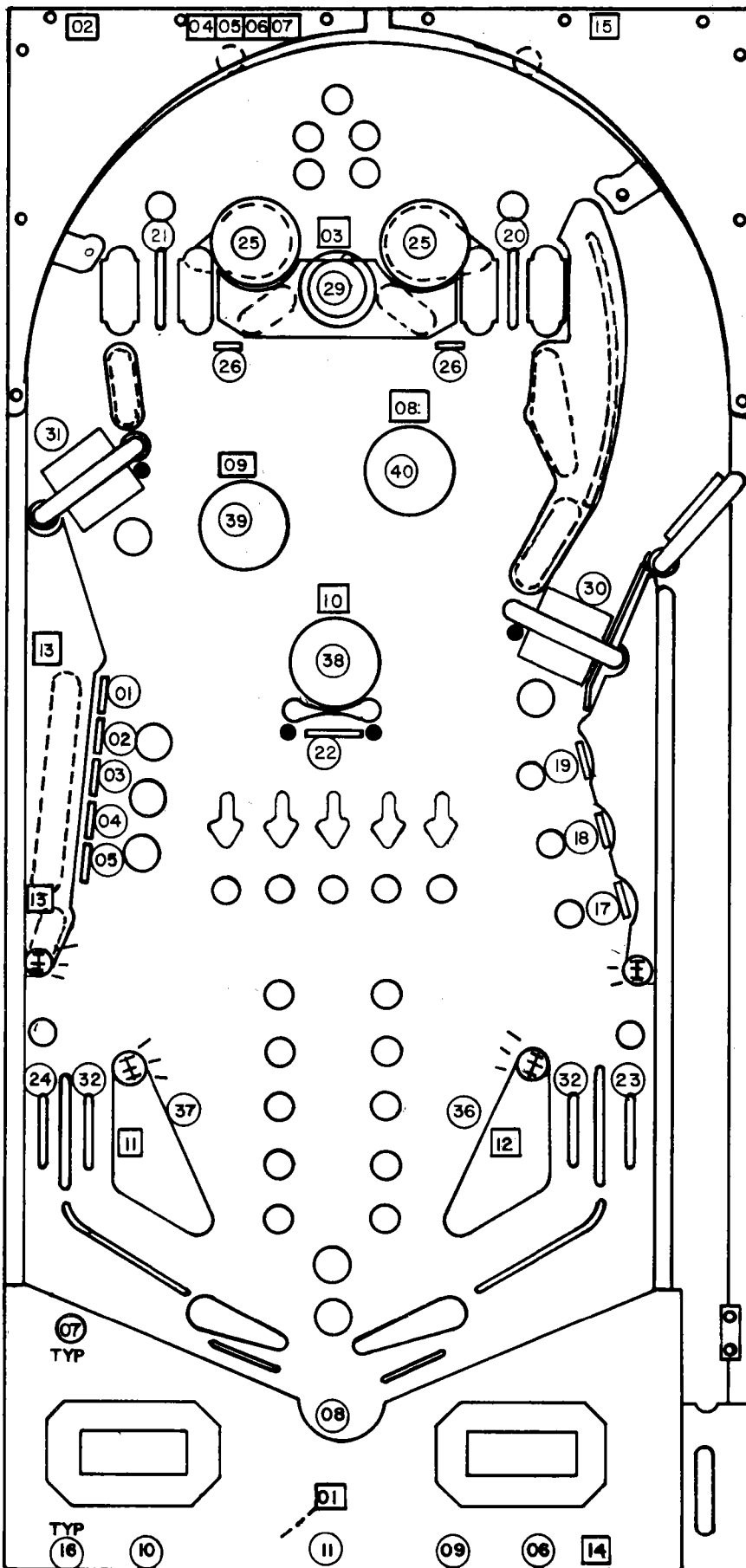
SOLENOID IDENTIFICATION TABLE

SELF-TEST NO.	SOLENOID IDENTIFICATION	SELF-TEST NO.	SOLENOID IDENTIFICATION
01	OUTHOLE	09	MIDDLE THUMPER-BUMPER
02	KNOCKER	10	BOTTOM THUMPER-BUMPER
03	SAUCER	11	LEFT SLING SHOT
04	CHIME 10	12	RIGHT SLING SHOT
05	CHIME 100	13	DROP TARGET RESET
06	CHIME 1000	14	COIN LOCK-OUT
07	EXTRA CHIME	15	K1 RELAY (FLIPPER ENABLE)
08	TOP THUMPER-BUMPER		

SWITCH ASSEMBLY SELF-TEST DISPLAY NUMBERS

SWITCH SELF-TEST	SWITCH DESCRIPTION	SWITCH SELF-TEST	SWITCH DESCRIPTION
01	DROP TARGET A	21	'C' LANE (TOP)
02	DROP TARGET B	22	CENTER TARGET
03	DROP TARGET C	23	RIGHT OUT LANE
04	DROP TARGET D	24	LEFT OUT LANE
05	DROP TARGET E	25	L & R 'E.K.'
06	CREDIT BUTTON	26	SCORING BUMPER TOP RED TARGETS & GP* 100
07	TILT	27	
08	OUTHOLE	28	
09	COIN III (RIGHT)	29	TOP HOLE SAUCER
10	COIN I (LEFT)	30	RIGHT SPINNER
11	COIN II (IF USED)	31	LEFT SPINNER
12		32	L & R FLIPPER FEEDER LANES
13		33	
14		34	
15		35	
16	SLAM	36	RIGHT SLINGSHOT
17	'E' TARGET	37	LEFT SLINGSHOT
18	'L' TARGET	38	BOTTOM BUMPER
19	'C' TARGET	39	MIDDLE BUMPER
20	'Y' LANE (TOP)	40	TOP BUMPER

*GENERAL PURPOSE OR MULTIPLE



○ INDICATES SWITCH ASSEMBLY IDENTIFICATION NUMBERS. NOTE THAT 07 IS IN THE CABINET; 06, 09, 10, 11 & 16 ARE ON THE DOOR.

□ INDICATES SOLENOID IDENTIFICATION NUMBERS. NOTE THAT 04, 05, 06, 07 ARE IN THE CABINET; 14 IS ON THE DOOR.

FIGURE V EVEL KNEVEL SELF-DIAGNOSTIC TEST READ-OUTS

ASSEMBLY ADJUSTMENTS:

GENERAL:

All switch assemblies consist of leaf springs, contacts, separators, plastic tubing and screws to hold them to the mounting surface. Before attempting to adjust a switch assembly, make sure that these screws are tight. If not, tighten screw closest to the contact end of the leaf spring first. This will prevent the assembly from being secured in such a manner that the leaf springs tend to fan out. In general, all leaf springs are adjusted for a 1/16" gap in the open position and .010" overtravel or wipe in the closed position. All contacts should be in good condition. Unless otherwise instructed, they should be dry or non-lubricated. All contacts should be free of dust and dirt. Contacts, with the exception of the flipper button switch assemblies, are plated to resist corrosion. Filing or burnishing breaks the finish and encourages corrosion. Clean by closing the contacts over a clean piece of paper (e.g. a business card) and wiping gently until the contacts are clean. For the flipper button switch assemblies **ONLY:** Tarnish can be removed with a contact file followed by a burnishing tool. Severely pitted contacts must be replaced as an assembly. In general, contacts need be cleaned or replaced and adjusted only when they are found to be a source of game malfunction.

X. SERVICE PARTS:

A parts catalogue is available upon request. The catalogue is illustrated and lists all replacement parts for each game manufactured by Bally. Requests should be addressed to:

BALLY MANUFACTURING CORPORATION
2640 WEST BELMONT AVENUE
CHICAGO, ILLINOIS 60618
ATTN: PARTS DEPARTMENT

SERVICE HINTS:

The Bally playfield has an improved tuff-coat finish with excellent wearing properties. Its life expectancy, as well as play appeal, can be extended by periodic cleaning of the playfield.

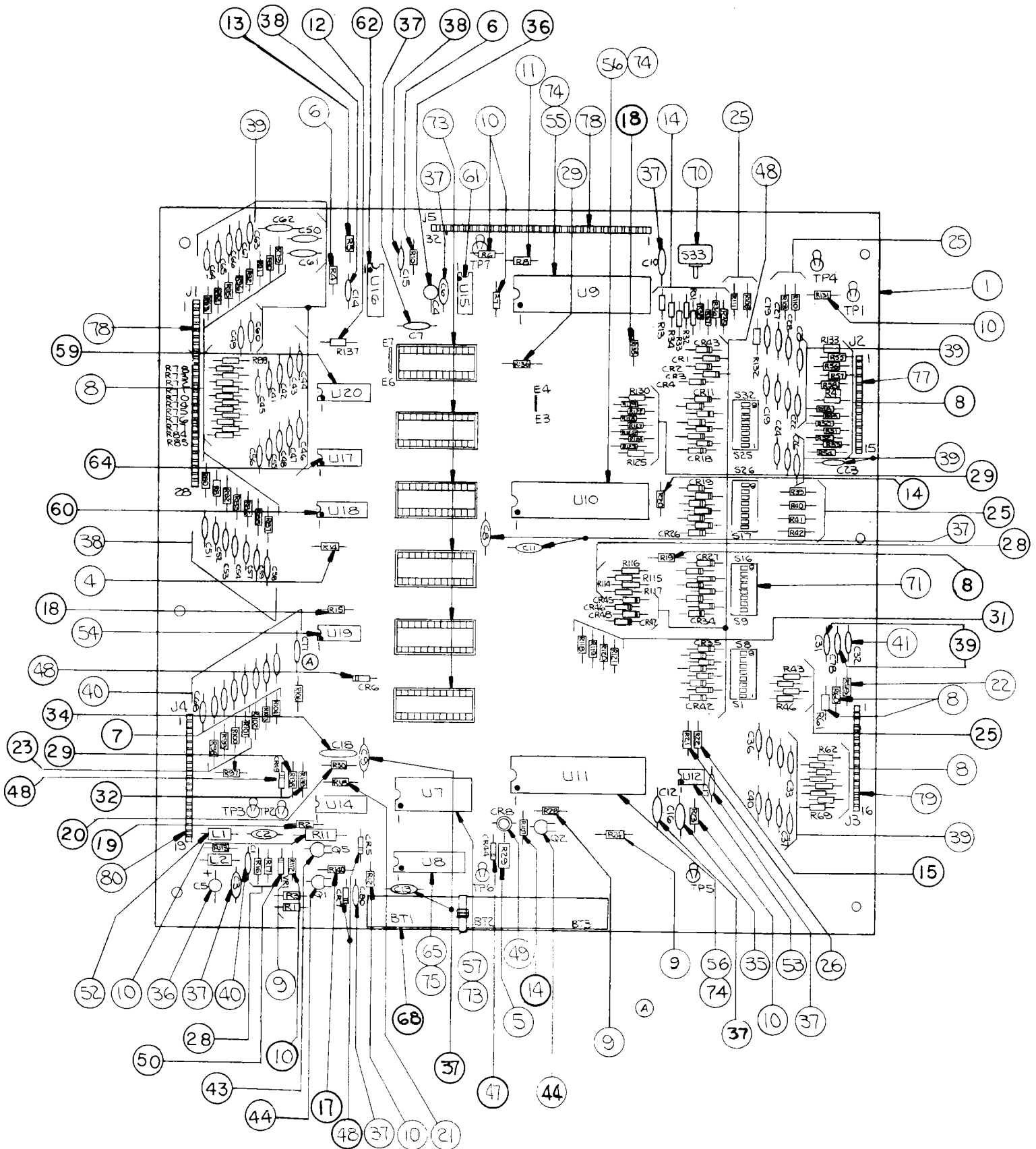
DO: Bally recommends you clean your playfield with Wildcat #125 (Wildcat Chemical Co., 1333 W. Seminary Drive, Ft. Worth, Texas 76115). Wildcat #125 is a combination cleaner and polish. Bally has tried and tested this product and found it to be very effective. If Wildcat #125 is not available, Bally suggests you ask your Distributor to order it. Inspect and hand polish the ball in a clean cloth. A chipped ball must be replaced. It can ruin the finish on the playfield in a short period of time.

DON'T: Use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield. Do not allow a wax or polish build up. Waxes yellow with age and spoil play appeal.

XI. PARTS LIST
GAME #1094-E EVEL KNIEVEL

MISCELLANEOUS	PART NUMBER
Transformer (Domestic or Export)	E-122-125
Bulbs, #44	E-125-22
 ASSEMBLY COILS	
Chimes (4)	CN-31-2000
Coin Lockout	FO-36-7000
Flipper Left & Right (2)	AQ-25-500/ 34-5050
Knocker	AR-26-1200
Outhole Kicker	AN-26-1200
Saucer Eject	AO-26-1200
Thumper-Bumper (3)	AN-26-1200
Sling-Shot (2)	AN-26-1200
 PLAYFIELD PARTS	 See Figure II
 UNIT COILS	
Drop Target (Reset) (2)	NO-27-2300
 MODULES	
Lamp Driver A5	AS-2518-14
Display Driver A1 (5 Used)	AS-2518-15
Solenoid Driver/ Voltage Regulator A3	AS-2518-16
MPU A4	AS-2887-3
Transformer & Rectifier A2	AS-2877
Rectifier Board (Part A2)	AS-2518-18
 MODULE COMPONENTS	
SEE MODULE PARTS LIST.	
 REPAIR PROCEDURES/AIDS	
Module Replacement Level	F.O. 512
Component Replacement Level	F.O. 513
AID (Assistance in Diagnostics)	
Kit, used with F.O. 512, F.O. 513	KIT #485

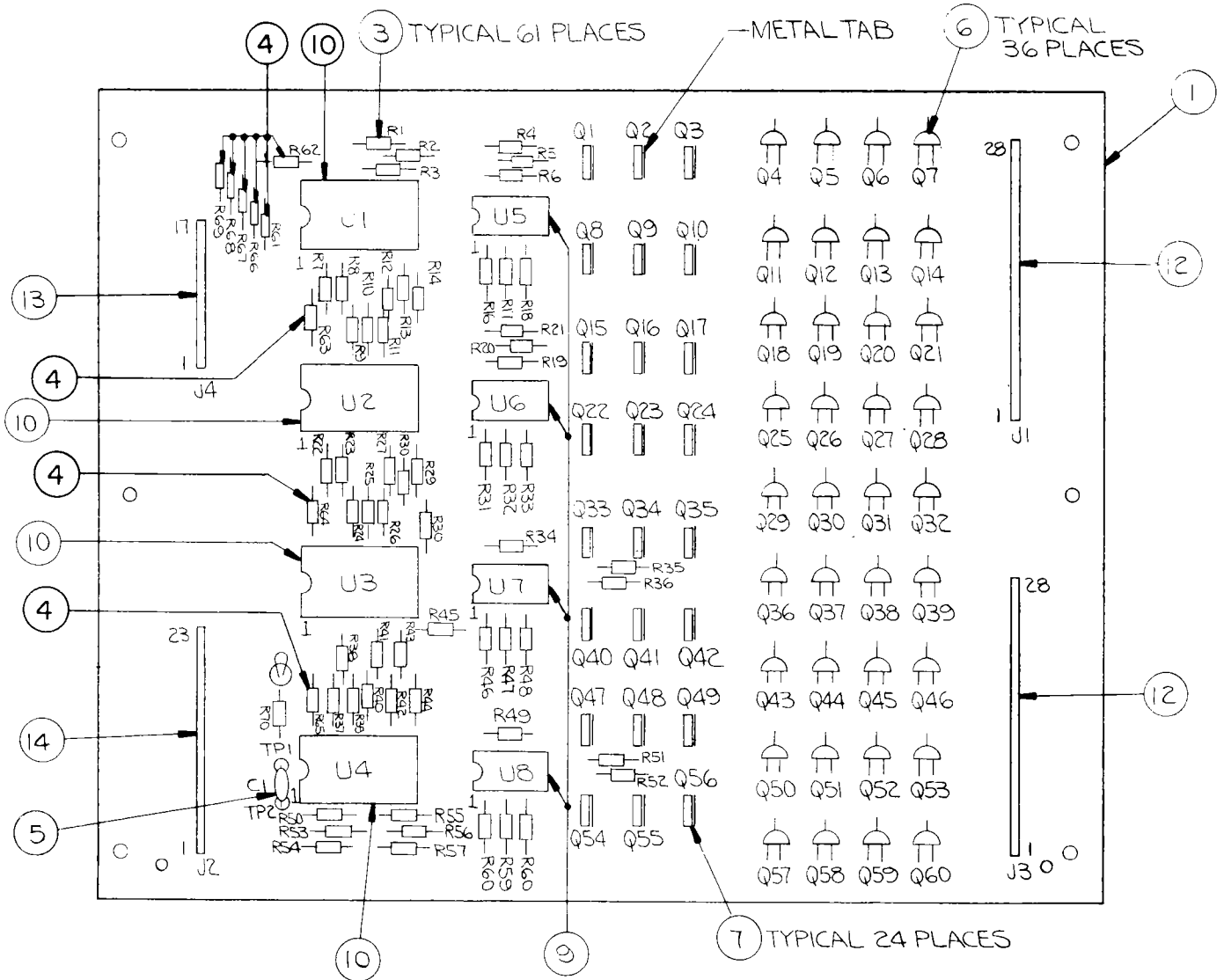
AS-2518-17 MPU MODULE



A4: MPU MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A4	AS-2887-3	MPU Module, Complete, Evel Knievel
2	A4	AS-2518-17	MPU Module less Program Memory, U1-6 incl.
3-32	See Schematic		Resistors, See schematic for value.
34	C18	E-00586-0019	Capacitor, .05 MFD, 100V
35	C16	E-00586-0023	Capacitor, 1 MFD, 100V
36	C4, C5	E-00586-0073	Capacitor, 4.5 MFD, 25V
37	C3, C6-C13, C17	E-00586-0065	Capacitor, .01 MFD, 500V
38	C14, C15, C79, C41-C67	E-00586-0067	Capacitor, 470 PFD, 1kv
39	C19-C31, C78, C33-C40	E-00586-0069	Capacitor, 390 PFD, 1kv
40	C1, C2, C68-C77	E-00586-0075	Capacitor, 820 PFD, 1kv
41	C32	E-00586-0077	Capacitor, 3000 PF, 1kv
43	Q5	E-00585-0023	Transistor PNP (MPS-3702)
44	Q1, Q2	E-00585-0031	Transistor (2N3904)
47	CR44	E-00587-0006	Diode (IN4004)
48	CR1-CR7, CR11-CR43, CR45-CR48	E-00587-0014	Diode (IN4148)
49	CR8	E-00679	LED (Green)
50	VR1	E-00598-0008	Diode Zener (8.2V, IN9598)
52	L1, L2	E-00604-0003	Inductor, 22 Micro Hy.
53	U12	E-00620-0004	Timer (555)
54	U19	E-00620-0005	Quad 2 Input (4011)
55	U9	E-00620-0028	MPU I.C. (6800)
56	U10, U11	E-00620-0029	PIA I.C. (6820)
57	U7	E-00620-0030	RAM I.C. (6810)
59	U20	E-00620-0032	HES Buffer I.C. (14502B)
60	U14, U18	E-00620-0033	HEX Inverter (14049B)
61	U15	E-00620-0034	Quad Memory Driver (MC3459L)
62	U16	E-00620-0035	Dual Monostable (9602)
64	U17	E-00620-0041	Quad 2 Inputs (74L00N)
65	U8	E-00620-0042	RAM (C MOS, P5101L-3)
68	BT1, BT2, BT3	E-00628-0002	Battery
70	S33	E-00658-0001	Push Button Switch
71	S1-S8, S9-S16, S17-S24, S25-S32	E-00677	DIP Switch
73		E-00712	24 Pin Socket
74		E-00712-0001	40 Pin Socket
75		E-00712-0003	22 Pin Socket
77	J2	E-00715	15 Pin Wafer Connector
78	J4, J5	E-00715-0004	28 Pin Wafer Connector
79	J3	E-00715-0017	16 Pin Wafer Connector
80	J1	E-00715-0018	19 Pin Wafer Connector
81	J5	E-00715-0023	4 Pin Wafer Connector

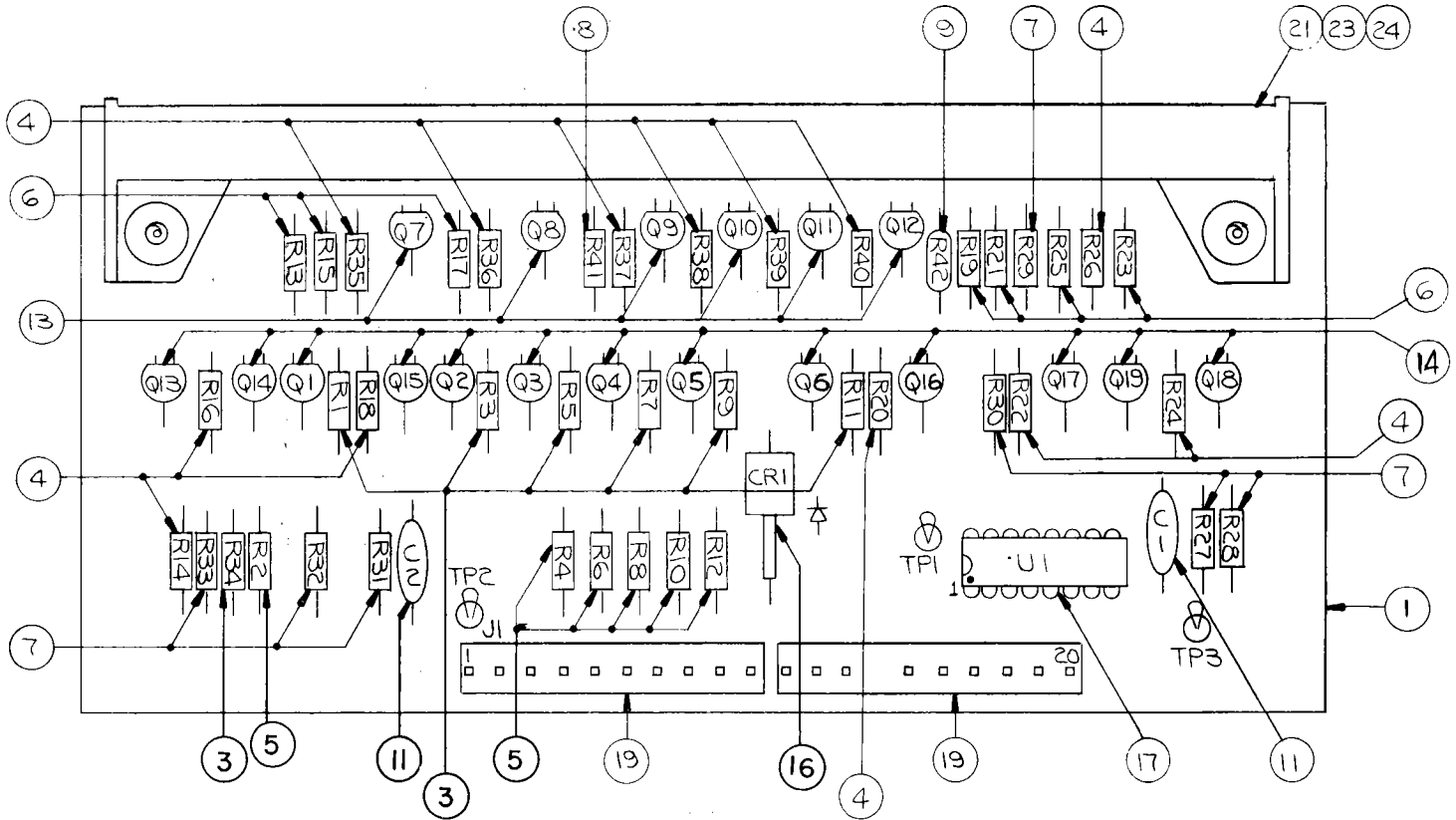
AS-2518-14 LAMP DRIVER MODULE



A5: LAMP DRIVER MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A5	AS-2518-14	Lamp Driver Module, Complete
3	R1-R60, R70	E-00105-0237	Resistor, 2k Ω , 5%, 1/4W
4	R61-R69	E-00105-0256	Resistor, 2.2M Ω , 1/4W
5	C1	E-00586-0065	Capacitor, .01 MFD, 500V
6	Q4-Q7, Q11-Q14, Q18-Q21, Q25-Q32, Q36-Q39, Q43-Q46, Q50-Q53, Q57, Q58	E-00585-0014	SCR, 2N5060
7	Q1-Q3, Q8-Q10, Q15-Q17, Q22-Q24, Q33-Q35, Q40-Q42, Q47-Q49, Q54-Q56	E-00585-0029	SCR, MCR106-1
9	U5-U8	E-00620-0007	I.C., Buffer, CD4050AE
10	U1-U4	E-00620-0037	I.C., Decoder, 14514B
12	J1, J3	E-00715-0004	28 Pin Wafer Connector
13	J1	E-00715-0013	17 Pin Wafer Connector
14	J4	E-00715-0014	23 Pin Wafer Connector

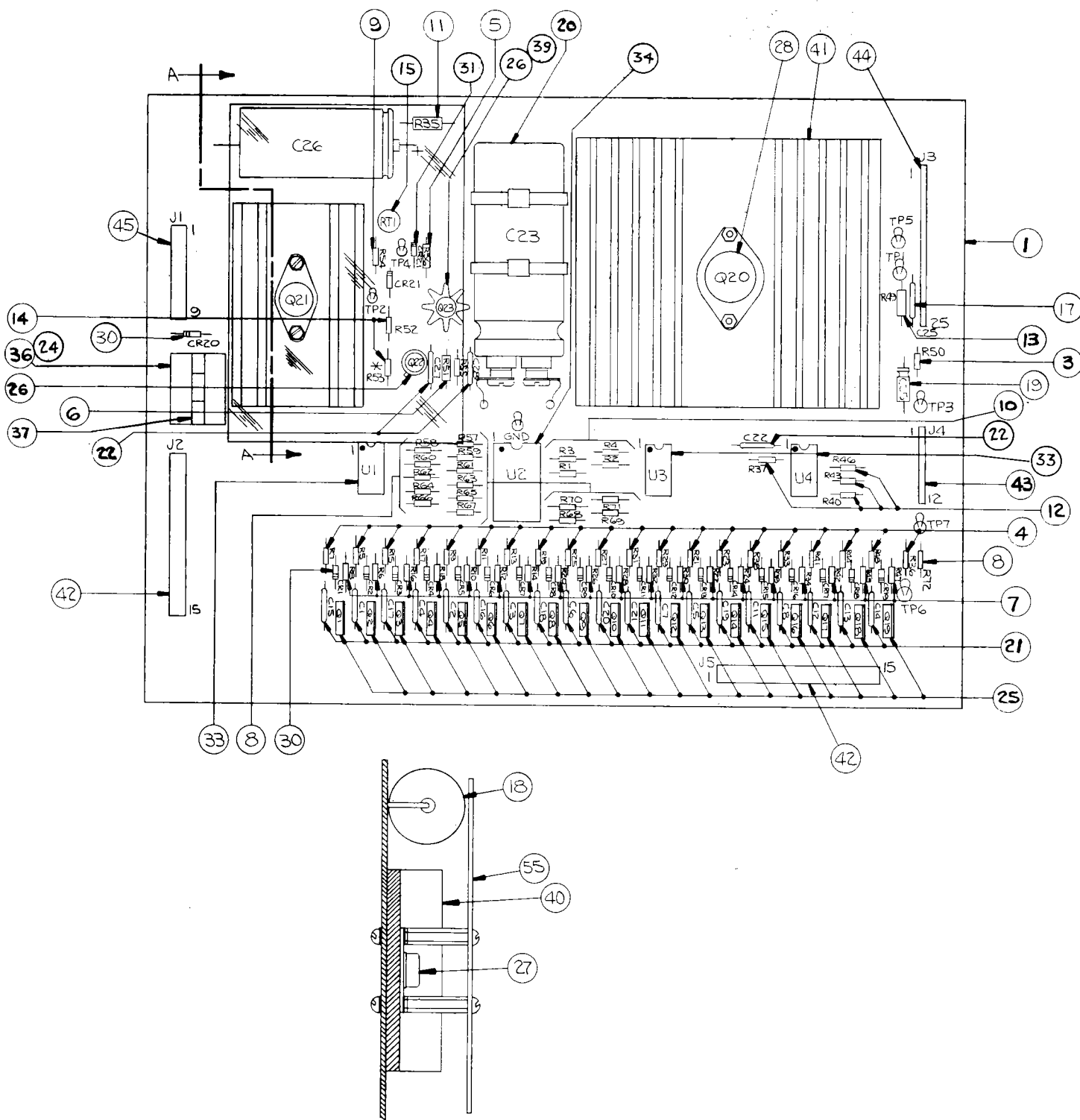
AS-2518-15 DISPLAY DRIVER MODULE



A1: DISPLAY DRIVER MODULE COMPONENT PARTS LIST

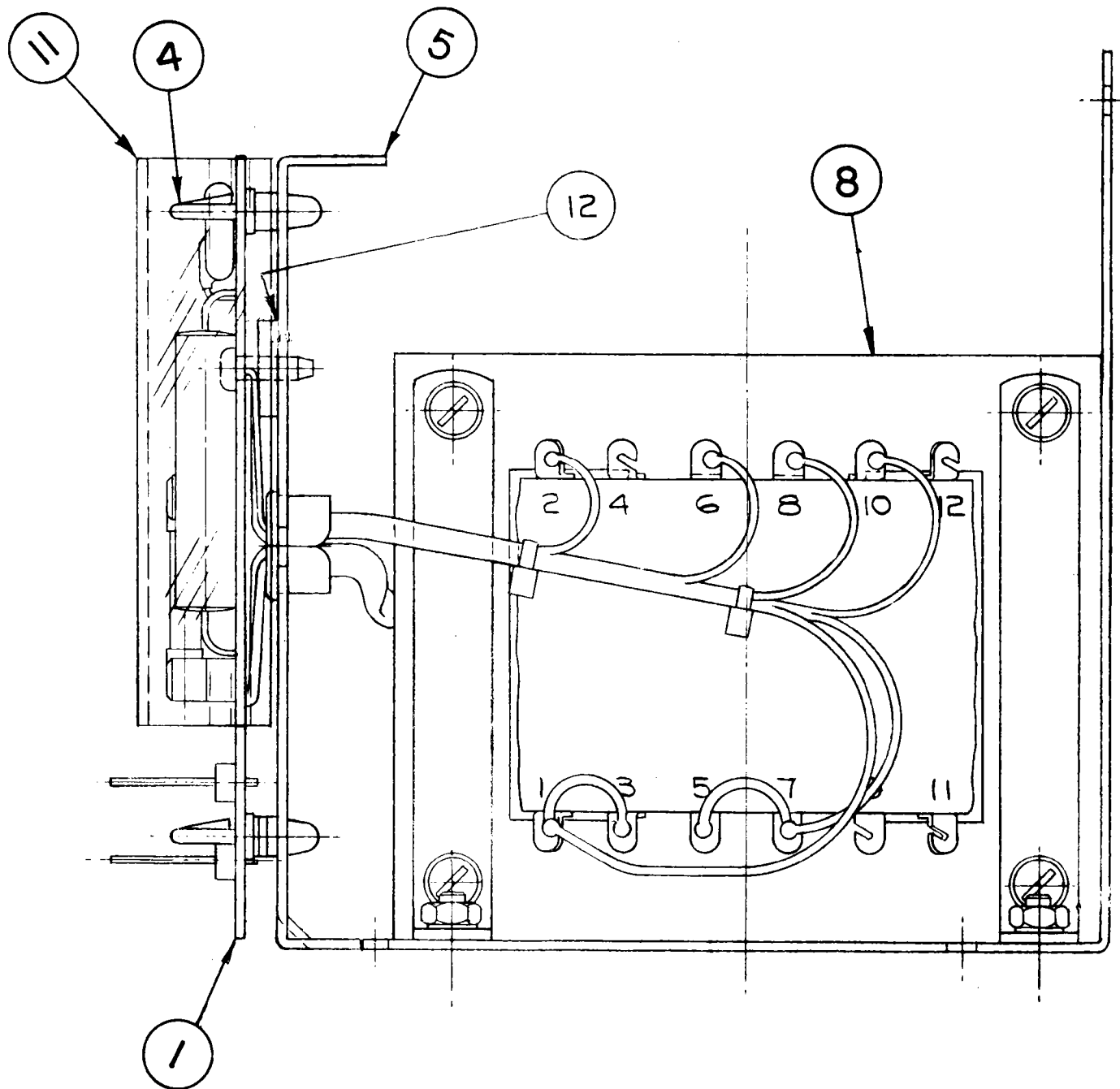
ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A1	AS-2518-15	Display Driver Module, Complete
3	R1, R3, R5, R7, R9, R11, R34	E-00105-0226	Resistor, 100K
4	R14, R16, R18, R20, R22, R24, R26, R35-R40	E-00105-0227	Resistor, 300K
5	R2, R4, R6, R8, R10, R12	E-00105-0228	Resistor, 9.1K
6	R13, R15, R17, R19, R21, R23, R25	E-00105-0229	Resistor, 1.5K
7	R27-R33	E-00105-0230	Resistor, 1K
8	R41	E-00105-0231	Resistor, 39K
9	R42	E-00105-0271	Resistor, 240K
11	C1, C2	E-00586-0065	Capacitor, .01 MFD, 500V
13	Q7-Q12	E-00585-0032	Transistor, 2N5401
14	Q1-Q6, Q13-Q19	E-00585-0033	Transistor, MPS-A42
16	CR1	E-00598-0009	Zener Diode, 110V, 1W, IN3045A
17	U1	E-00620-0038	I.C. Decoder, 14543B
19	J1, J2	E-00715-0011	10 Pin Wafer Connector
21	DS1	E-00680	Digital Display Panel
23		P-02399	Display Mounting (Top)
24		P-02399-0001	Display Mounting (Bottom)

AS-2518-16 SOLENOID DRIVER/VOLTAGE REGULATOR MODULE



A3: SOLENOID DRIVER/VOLTAGE REGULATOR MODULE COMPONENT PARTS LIST

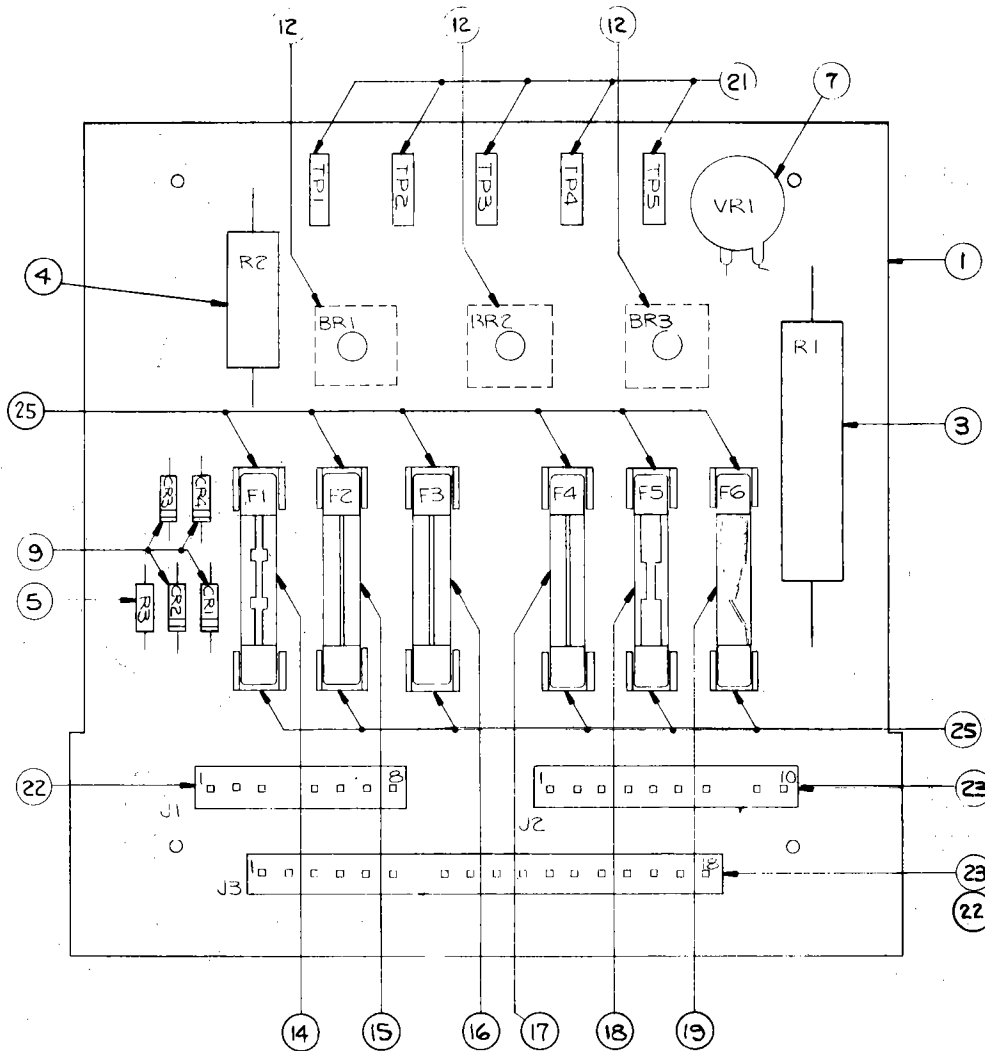
ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A3	AS-2518-16	Solenoid Driver/ Voltage Regulator Module, Complete
3-14	Resistors		Resistor, See Schematic for value.
15	RT1	E-00105-0014	Pot. (Linear) 25K
17	C25	E-00586-0014	Capacitor, 1 MFD, 20V
18	C26	E-00586-0059	Capacitor, 160 MFD, 350V
19	C24	E-00586-0062	Capacitor, 2 MFD @ 50V
20	C23	E-00586-0063	Capacitor, 11700 MFD, 20V
21	C1-C8, C11-C21	E-00586-0064	Capacitor, .002 MFD, 1kv
22	C22, C27, C28	E-00586-0065	Capacitor, .01 MFD, 500V
24	K1	E-00146-0791	Relay
25	Q1-Q19	E-00585-0034	Transistor, SE9302
26	Q22, Q23	E-00585-0041	Transistor, 2N3440
27	Q21	E-00585-0042	Transistor, 2N3584
28	Q20	E-00710	+5V Regulator, LAS1405 or 78H05KC or LM323K
30	CR1-CR21	E-00587-0015	Diode (IN4004)
31	VR1	E-00598- 0000 -10	Diode, Zener 110V, IN5275A
33	U1, U2, U3	E-00681	I.C. Transistor Array, CA3081
34	U2	E-00620-0039	I.C. Binary to 1/16 Decoder, 74L154
36		E-00592-0002	Relay Socket
37		M-1839	Relay Holder
39		E-00682	Heat Sink, TO18
40		E-00682-0001	Heat Sink, TO66
41		E-00682-0002	Heat Sink, TO3 Case
42		E-00715-0013	15 Pin Wafer Connector
43		E-00715-0016	12 Pin Wafer Connector
44		E-00715-0020	25 Pin Wafer Connector
45		E-00715-0021	9 Pin Wafer Connector
55		M-1837	Shield-Plexiglass



**A2: POWER TRANSFORMER MODULE
COMPONENT PARTS LIST**

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	AS-2877	Power Transformer Module, Complete
1		AS-2518-18	Rectifier Board Assembly
4		M-1829a	Circuit Board Support
5		A-3840b	Mounting Plate & Stud Assembly
8		E-00122-0125c	Transformer 120/240V, 50/60 Hz
11		P-2692b	P.C.B Cover
12		M-1834	Heat Sink Compound

AS-2518-18 RECTIFIER BOARD ASSEMBLY



RECTIFIER BOARD ASSEMBLY (Part of) A2: POWER TRANSFORMER MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	P/O A2	AS-2518-18	Rectifier Board Assembly, Complete
3	R1	E-00104-0092	Resistor, 10%, 600 Ohm, 10W
4	R2	E-00104-0091	Resistor, 25 Ohm, 5W
5	R3	E-00105-0226	Resistor, 5%, 100K Ohm, 1/4W
7	VR1	E-00623	Varistor
9	CR1, CR2, CR3, CR4	E-00587-0006	Diode (IN4004)
12	BR1, BR2, BR3	E-00602-0003	Bridge Rectifier (VJ248 VARO)
14	F1	E-00133-0010	Fuse, 10A, 32V, 1AG
15	F2	E-00133-0028	Fuse, 3/4A, 250V, 3AG, S.B.
16	F3	E-00133-0004	Fuse, 4A, 32V, 3AG
17	F4	E-00133-0005	Fuse, 5A, 32V, 3AG
18	F5	E-00133-0027	Fuse, 20A, 32V, 3AG
19	F6	E-00133-0024	Fuse, 3A, 3AG, S.B.
21		E-00684	Test Point
22	J1, J3	E-00715-0010	8 Pin Wafer Connector
23	J2, J3	E-00715-0011	10 Pin Wafer Connector
25		E-00148-0021	Fuse Clips

1094-E Evel Knievel Instruction Manual (FO-541) Changes:

PAGE 5:

Credits/Coin Adjustments: Last sentence. Delete Reference to Page 11 as follows:

PAGE 11:

Replay Score Cards AL, AM & AN have been added as follows:

M-1508-66-AL	140,000	174,000
M-1508-66-AM	146,000	180,000
M-1508-66-AN	154,000	188,000

Change Instruction Cards I & J to AP & AS respectively.

Change 3 Ball Instruction Card C to AQ.

ADD "AO, AP, AQ, AR, AS, AT, AU, AV & AW" to "INSTRUCTION".

PAGE 12:

3 Ball Non-Novelty Chart
Instruction Card Letter Designations:

A replaced by AO
I replaced by AP
C replaced by AQ
D replaced by AR
J replaced by AS
F replaced by AT
G replaced by AU
H replaced by AV

Novelty Chart:

3 Ball Play use new AW
5 Ball Play continue to use K

PAGE 22:

Item 59, Change "HES" to "HEX"

PAGE 24:

Item 16, Change "E-00598-0009" to "E-00598-0007"

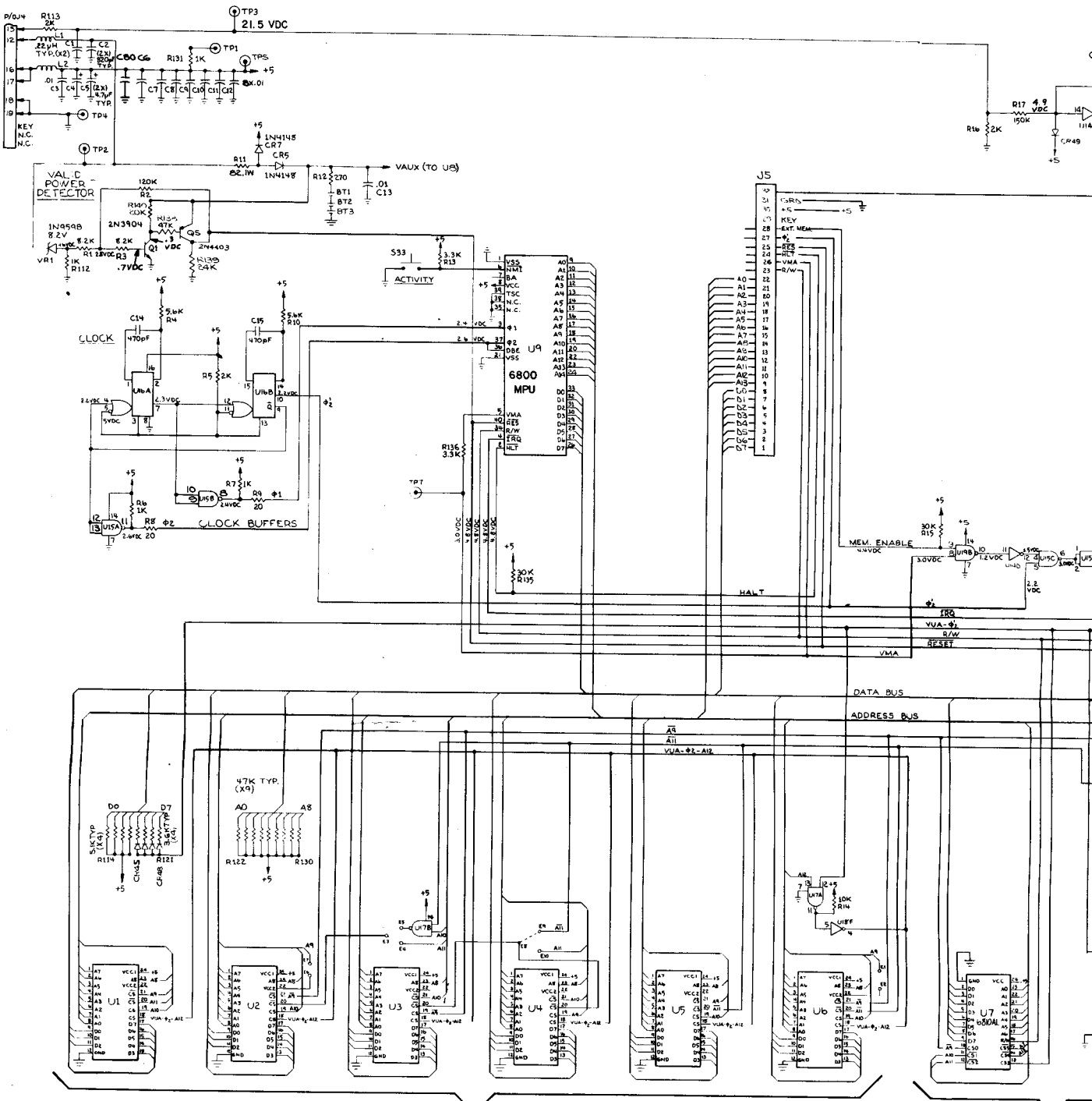
PAGE 26:

Item 19, Change "E-00586-0062" to "E-00586-0063"
Change Description from 50V to 25V

Item 20, Change "E-00586-0063" to "E-00586-0062"

Item 31, Change "E-00598-0009" to "E-00598-0010"
Change Description from 110V to 140V

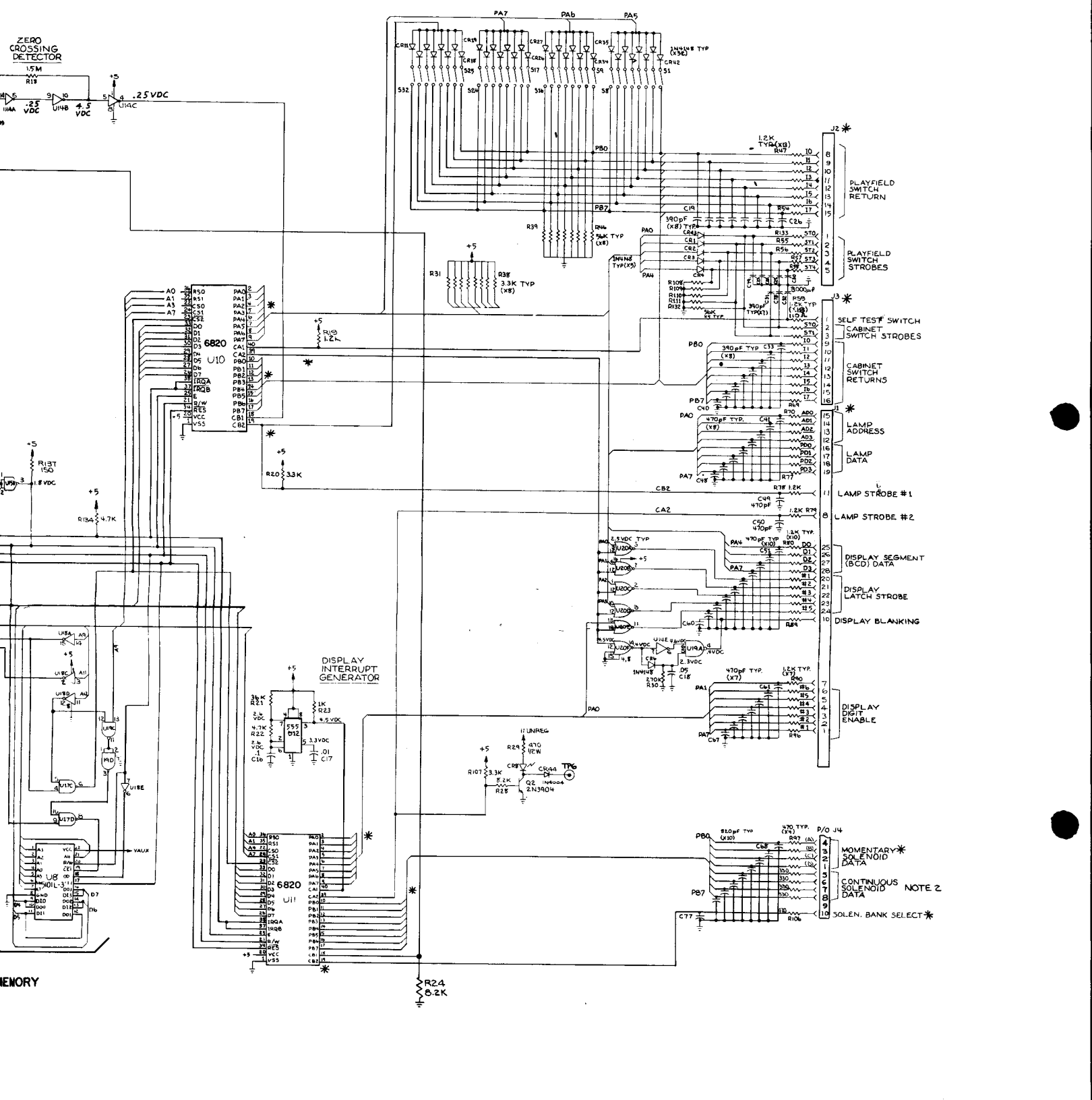
+3 V.D.C.
11.5 V.D.C. UNRES.
+5 VDC
+5VDC
GRD.
GRD.
KEY
N.C.
N.C.



- NOTES:
 1. * INDICATES "AID" TESTPOINT.
 2. REMOVE A3J4 BEFORE USING AS AID TEST POINT
 3. PREFIX ALL REFERENCE DESIGNATIONS WITH "A4".

READ ONLY MEMORY

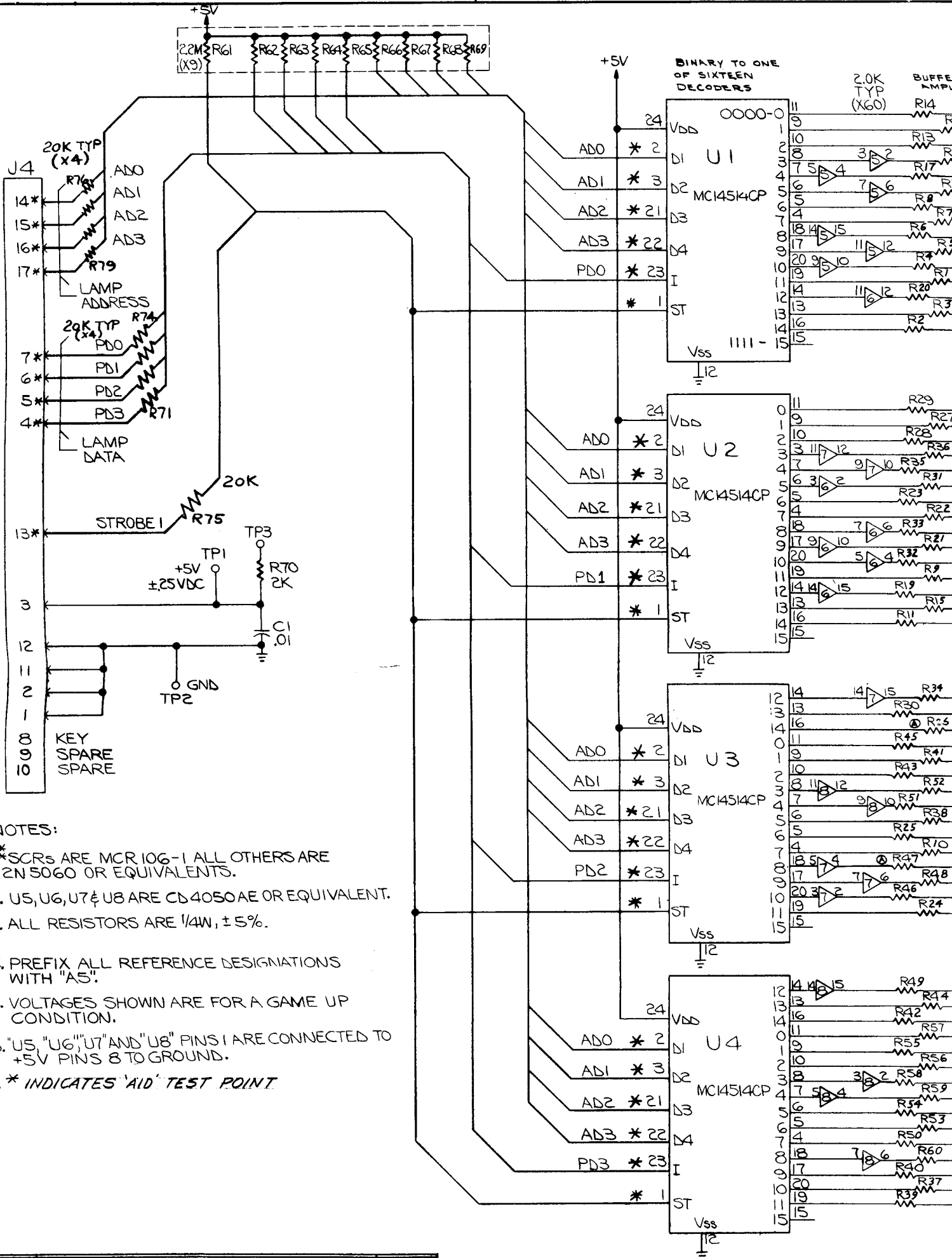
READ / WRITE MEM



MEMORY

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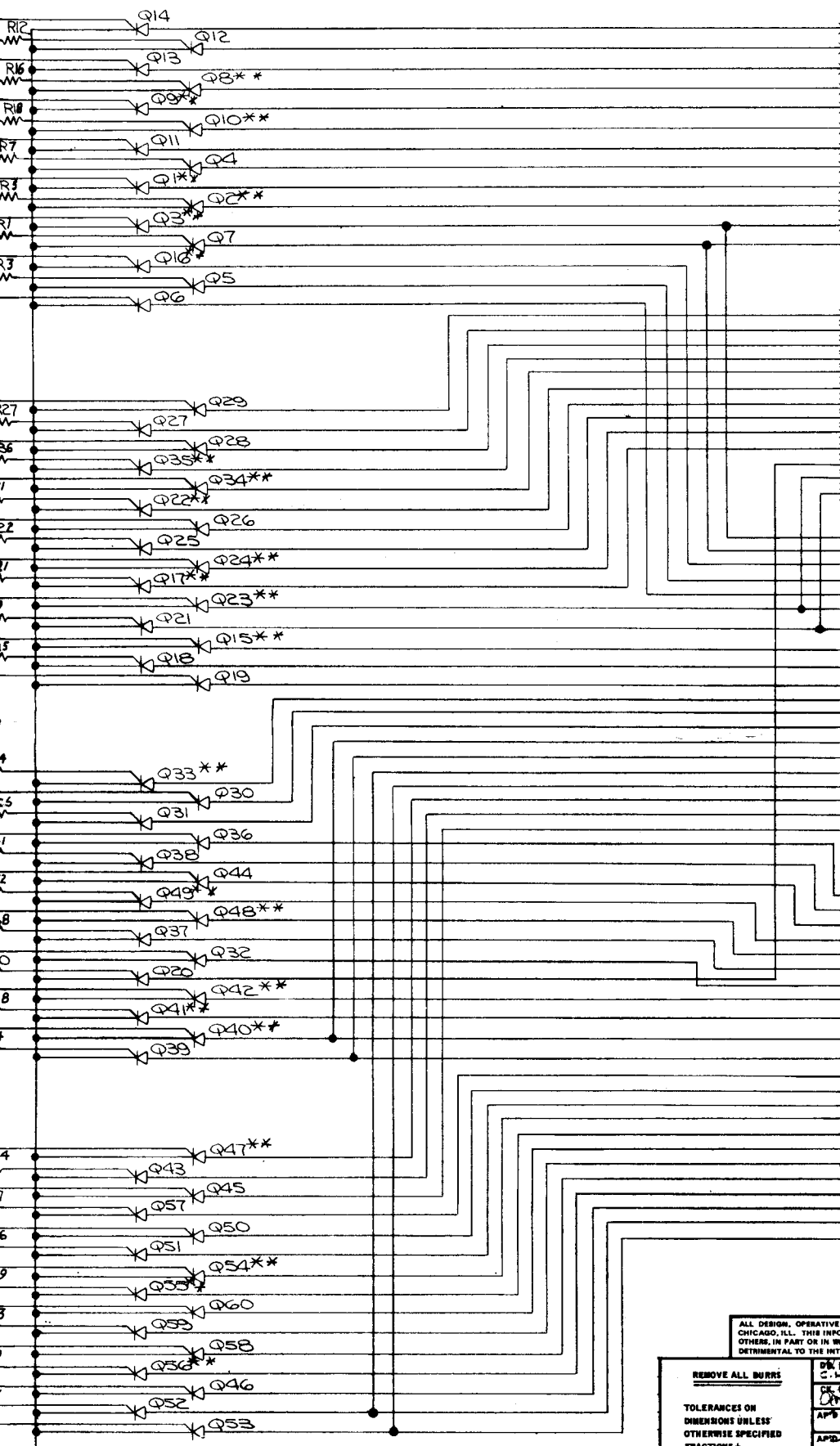
REMOVE ALL BURRS		DR. BY DATE DAN 2-77		Bally MANUFACTURING CORP. 1094-E	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS: 1/64 DECIMALS: ± .005 ANGLES: 1°		CR. BY DATE SJS 7-77		2640 BELMONT AVENUE CHICAGO, ILLINOIS	
DO NOT SCALE DRAWING		AP'D BY DATE WJ 2/77		FEB 21 1977	
		PRINT CONTROL		ASSEM. NO. USED ON/W	
		MATERIAL		PART NO. W-1181-2c	
		NAME (A4)		MPU CONTROL BOARD SCHEMATIC	
		FINISH			
		HARDENING			
NO.	LET.	CHANGE	DATE	BY	CK.



NOTES:

1. *SCRs ARE MCR 106-1 ALL OTHERS ARE 2N5060 OR EQUIVALENTS.
2. U5, U6, U7 & U8 ARE CD4050AE OR EQUIVALENT.
3. ALL RESISTORS ARE 1/4W, ±5%.
4. PREFIX ALL REFERENCE DESIGNATIONS WITH "A5".
5. VOLTAGES SHOWN ARE FOR A GAME UP CONDITION.
6. "U5," "U6," "U7" AND "U8" PINS 1 ARE CONNECTED TO +5V PINS 8 TO GROUND.
7. * INDICATES 'AID' TEST POINT

SCR'S



J1

22 N/U
 21 N/U
 20 KEY
 18 BONUS 1K
 19 BONUS 5K
 17 BONUS 5K
 23 "S" TOP
 14 "R" TOP
 15 NOTE 1
 16 "S" TOP
 28 NOTE 1
 24 "C" TOP
 25 "C" TOP
 26 NOTE 1
 27 NOTE 1

J2

21 SHOOT AGAIN
 18 JUMP 1
 22 BALL IN PLAY
 16 N PLAY 1
 14 PUP 1
 8 MATCH
 12 JUMP 2
 23 HI SCORE
 20 N PLAY 2
 15 PUP 2
 11 GAME OVER
 2 N PLAY 3
 9 PUP 3
 4 JUMP 3
 3 NOTE 1
 5 JUMP 4
 10 TILT
 7 PLAY 4
 17 UP 4
 18 N/U
 19 KEY
 10 N/U

J3

26 BONUS 3K
 25 BONUS 7K
 10 NOTE 1
 17 "P" TOP
 23 BOTTOM BUMPER
 16 EX. BALL TARGET
 27 "P" TOP
 21 RT OUTLANE
 20 "E" TOP
 22 SPBA
 24 NOTE 1
 12 BONUS 4K
 10 BONUS 5K
 10 D.B.
 10 "E" TOP
 10 TOP & MIDDLE BUMPER
 10 D.B. TARGET
 10 "E" TOP
 22 LF SPINNER
 22 LF OUTLANE SP
 22 NOTE 1
 22 CREDIT
 22 NOTE 1
 22 N/U
 22 N/U
 22 N/U
 22 KEY
 22 N/U

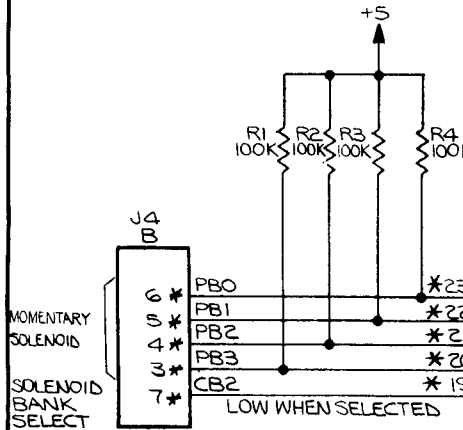
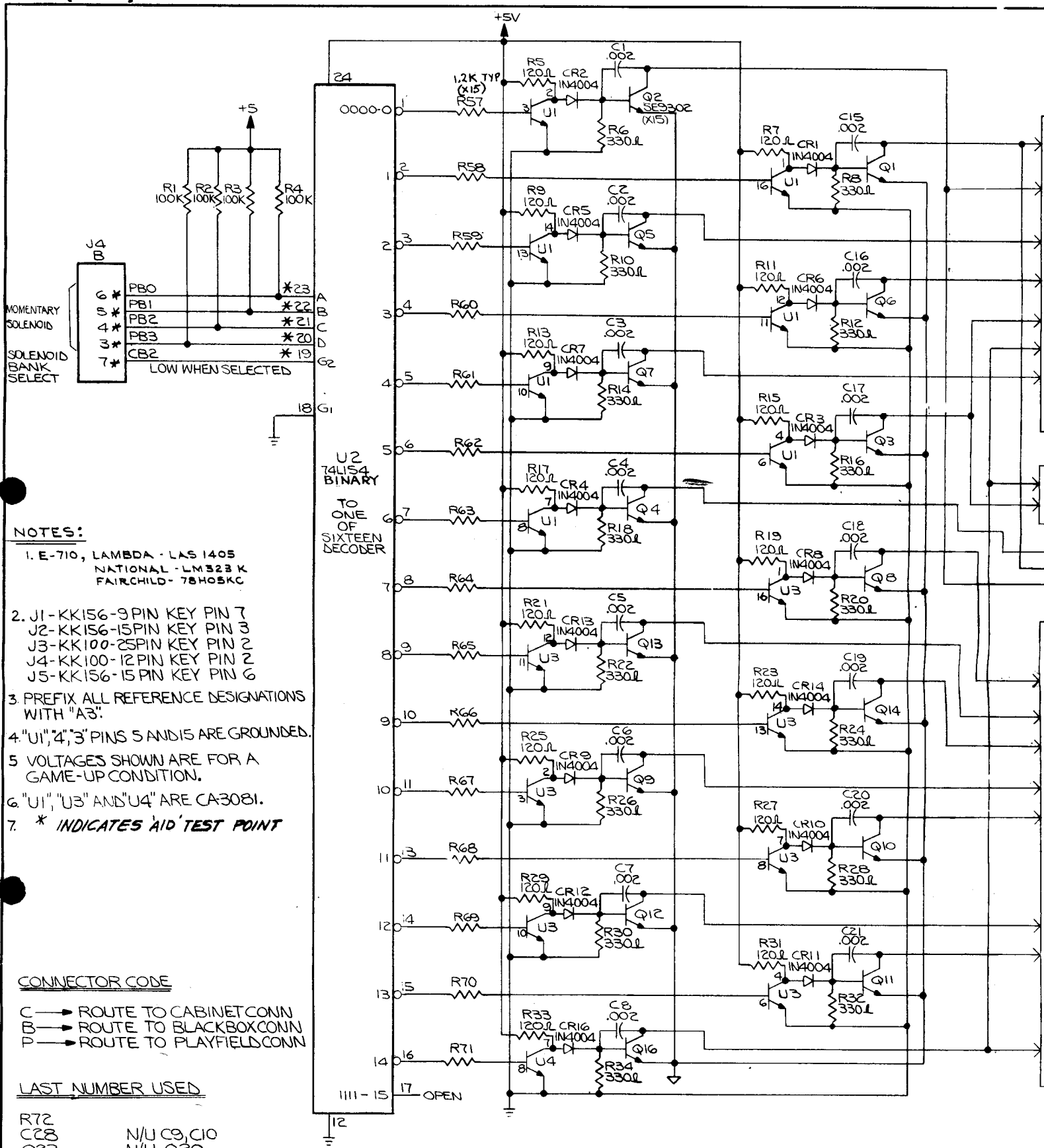
TO PLAYFIELD

TO BACK BOX

TO PLAYFIELD

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<p>REMOVE ALL BURRS</p> <p>TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED</p> <p>FRACTIONS ±</p> <p>DECIMALS ±</p> <p>ANGLES ±</p>			<p>DATE 3-18-77</p> <p>DATE 3-18-77</p> <p>DATE 3-18-77</p> <p>DATE 3-18-77</p> <p>DATE 3-18-77</p> <p>DATE 3-18-77</p>		<p>Bally MANUFACTURING CORP. E.K.</p> <p>2640 BELMONT AVENUE CHICAGO, ILLINOIS # 1094-E</p> <p>APR 18 1977</p>				
<p>NO. LET. CHANGE</p>		<p>DATE BY CK.</p>		<p>PRINT CONTROL</p>		<p>NAME AS</p>		<p>TOTAL SCALE</p>	
<p>DO NOT SCALE DRAWING</p>				<p>HARDENING</p>		<p>LAMP DRIVER SCHEMATIC</p>			
<p>1 A R26 WAS R36, R47 WAS R42</p>				<p>5-2-77</p>		<p>ASSEMB. NO. USED ON/T</p>			



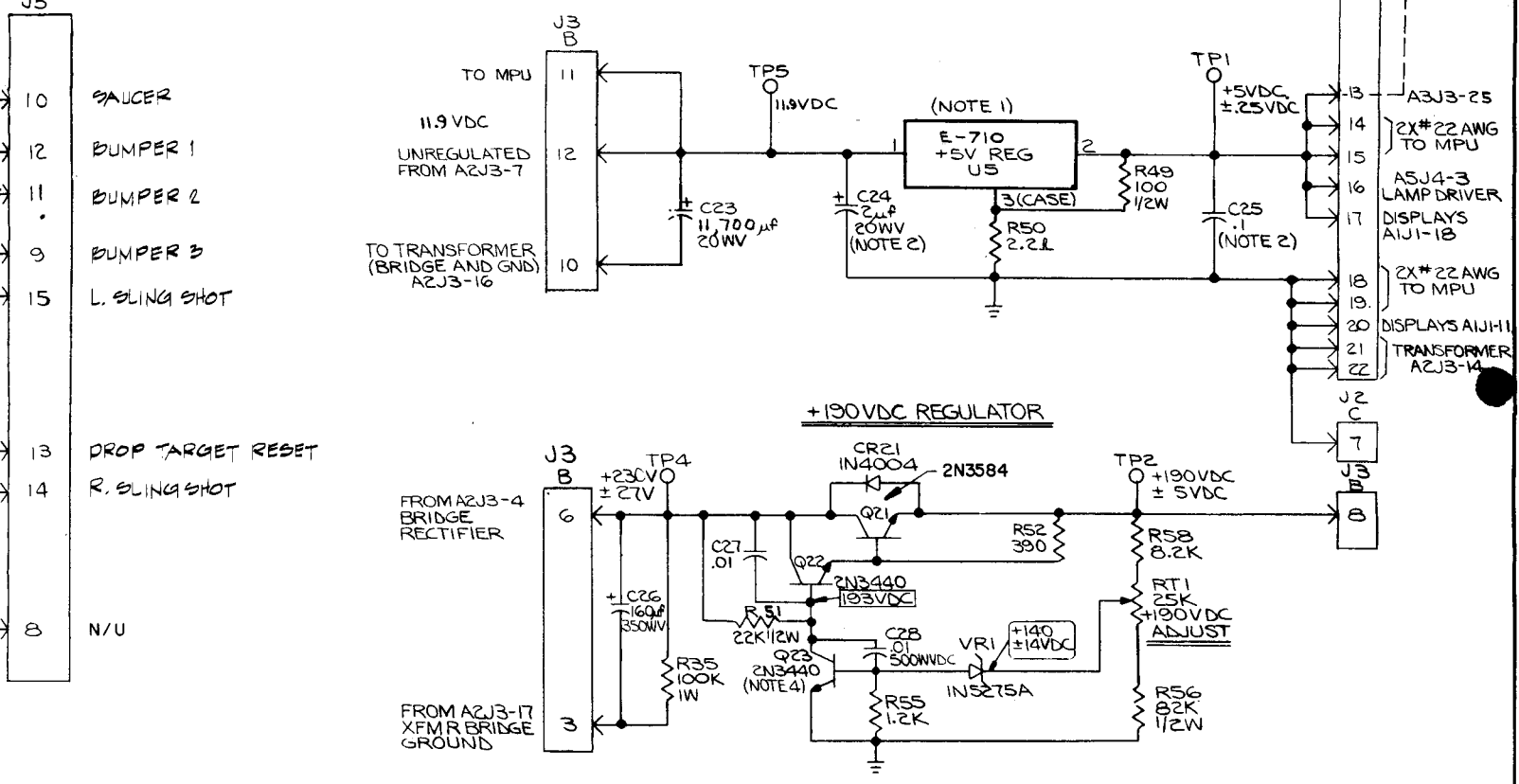
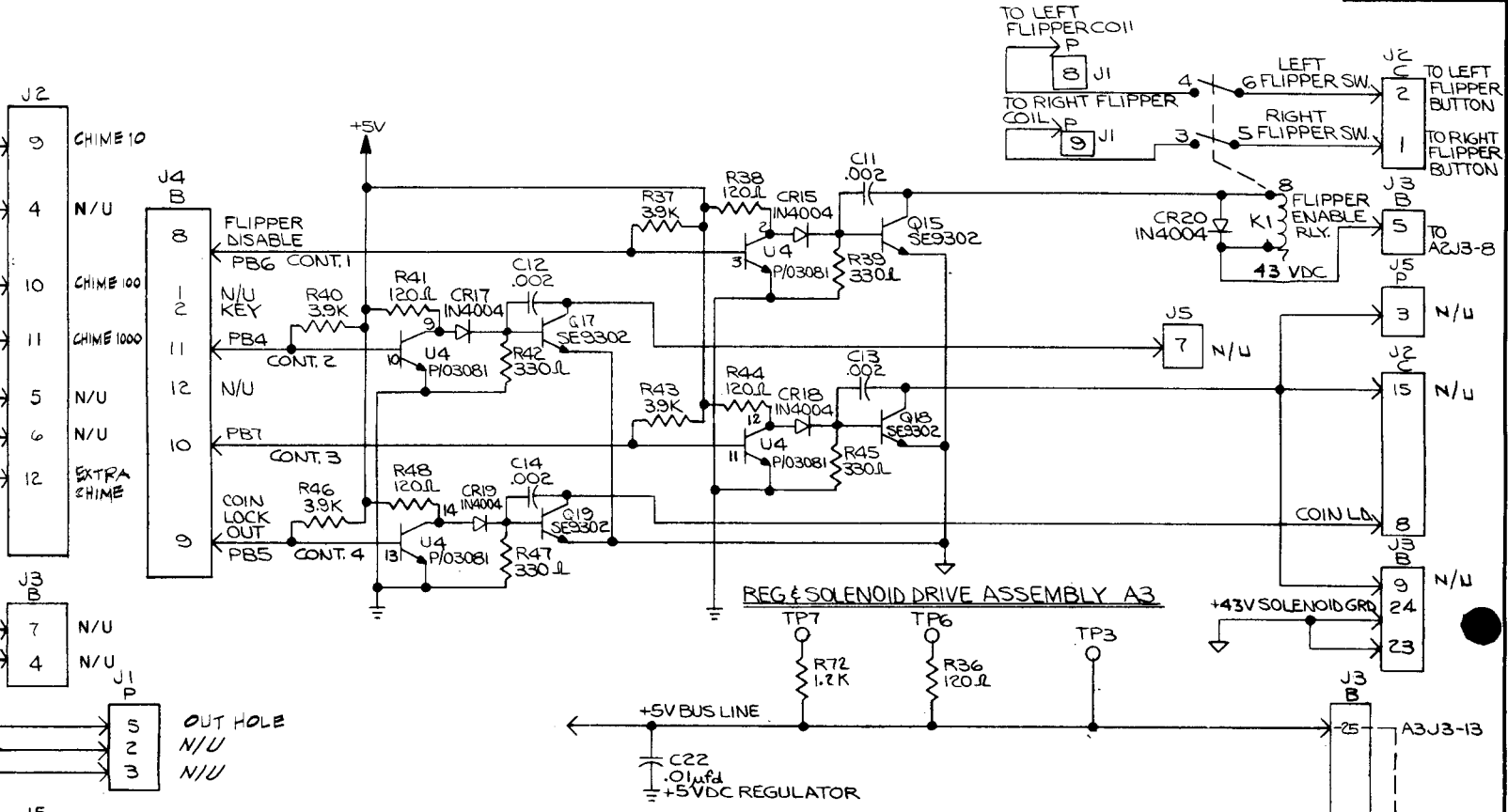
- NOTES:**
1. E-710, LAMBDA - LAS 1405
 NATIONAL - LM323 K
 FAIRCHILD - 78H05KC
 2. J1-KK156-9 PIN KEY PIN 7
 J2-KK156-15 PIN KEY PIN 3
 J3-KK100-25 PIN KEY PIN 2
 J4-KK100-12 PIN KEY PIN 2
 J5-KK156-15 PIN KEY PIN 6
 3. PREFIX ALL REFERENCE DESIGNATIONS WITH "A3".
 4. "U1", "4", "3" PINS 5 AND 15 ARE GROUNDED.
 5. VOLTAGES SHOWN ARE FOR A GAME-UP CONDITION.
 6. "U1", "U3" AND "U4" ARE CA3081.
 7. * INDICATES AID TEST POINT

CONNECTOR CODE

C → ROUTE TO CABINETCONN
 B → ROUTE TO BLACKBOXCONN
 P → ROUTE TO PLAYFIELDCONN

LAST NUMBER USED

R72
 C28 N/U C9, C10
 Q23 N/U Q20
 CR21
 VR1

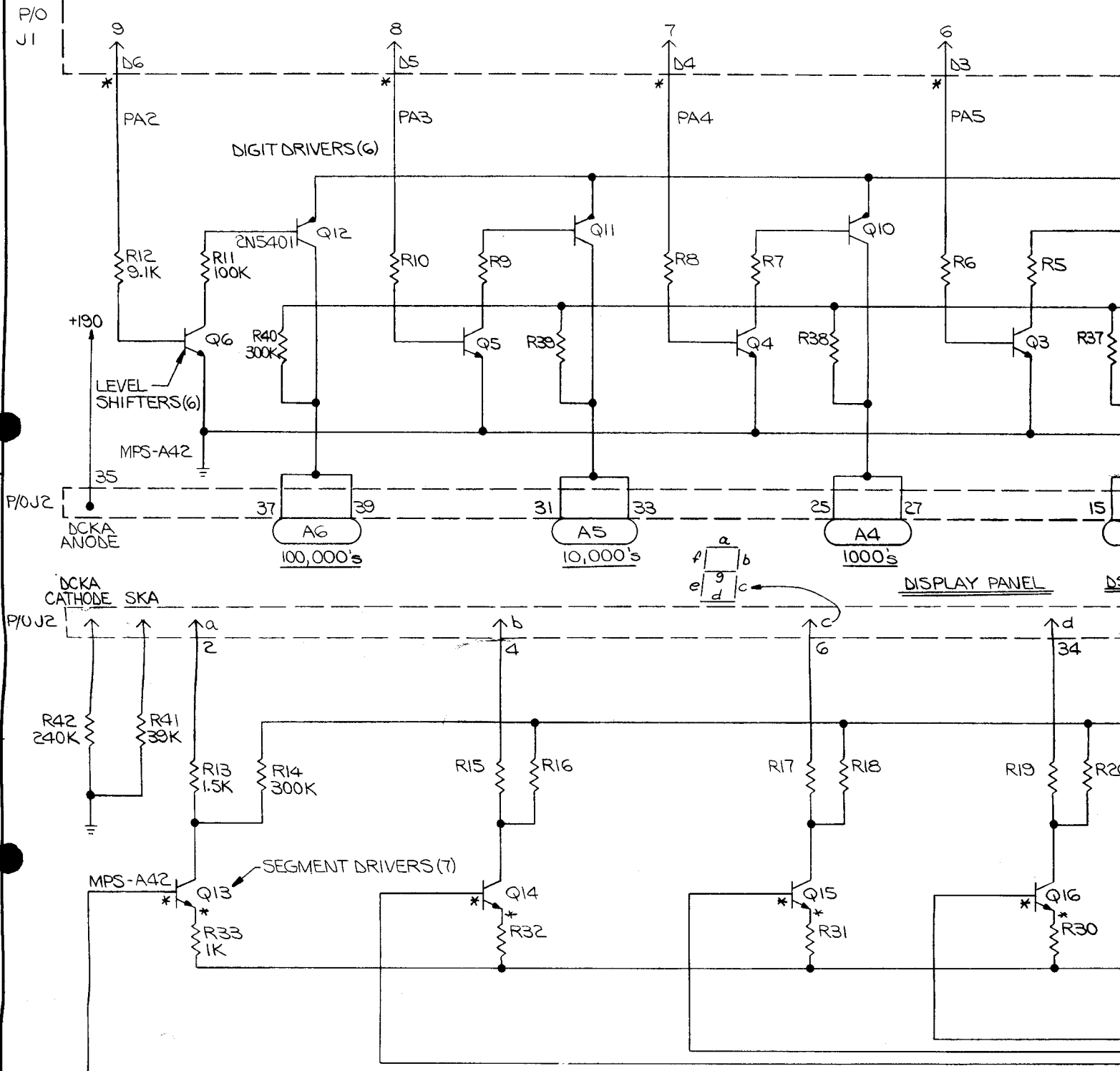


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REMOVE ALL BURRS		DR. BY	DATE	Bally MANUFACTURING CORP. E.K.		2640 BELMONT AVENUE CHICAGO, ILLINOIS		1094-E	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS ± DECIMALS ± ANGLES ±		CR. BY	DATE	APR 18 1977					
DO NOT SCALE DRAWING		APP'D BY	DATE	NAME		MATERIAL		ASSEM. NO. USED ON/OF	
		CHK'D BY	DATE	SOLENOID DRIVER VOLTAGE REGULATOR SCHEMATIC				PART NO. W-1183-2c	
		FORN:							
		HARDENING:							

NO.	LET.	CHANGE	DATE	BY	CHK.

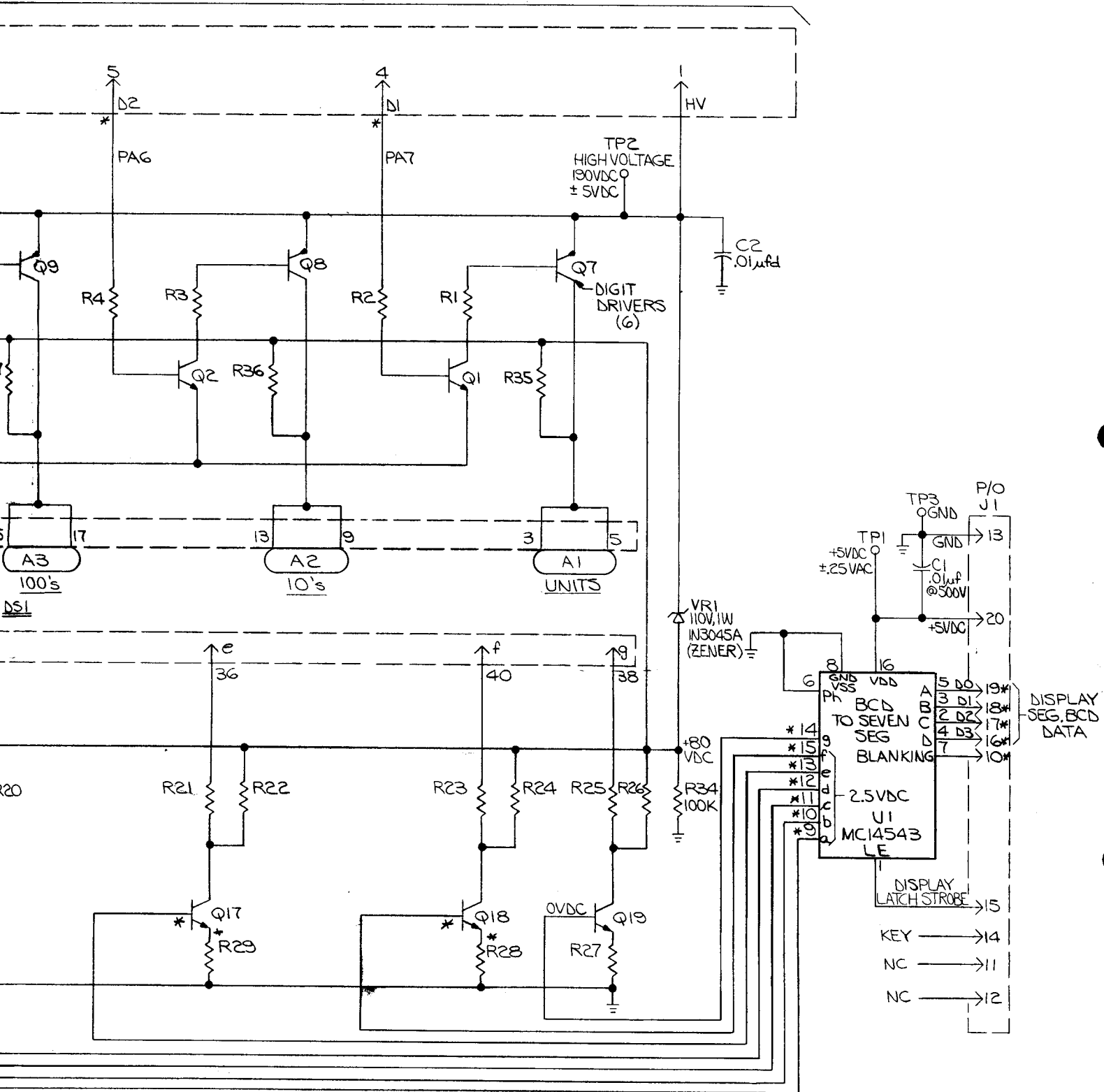
DISPLAY DIGIT ENABLE



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE $\pm 5\%$, 1/4W.
2. PREFIX ALL REFERENCE DESIG. WITH ASSEMBLY REFERENCE DESIG. "A1"
3. * INDICATES 'AID' TEST POINT.

OPER.	DEPT.	DESCRIPTION	TOOL No.
-------	-------	-------------	----------



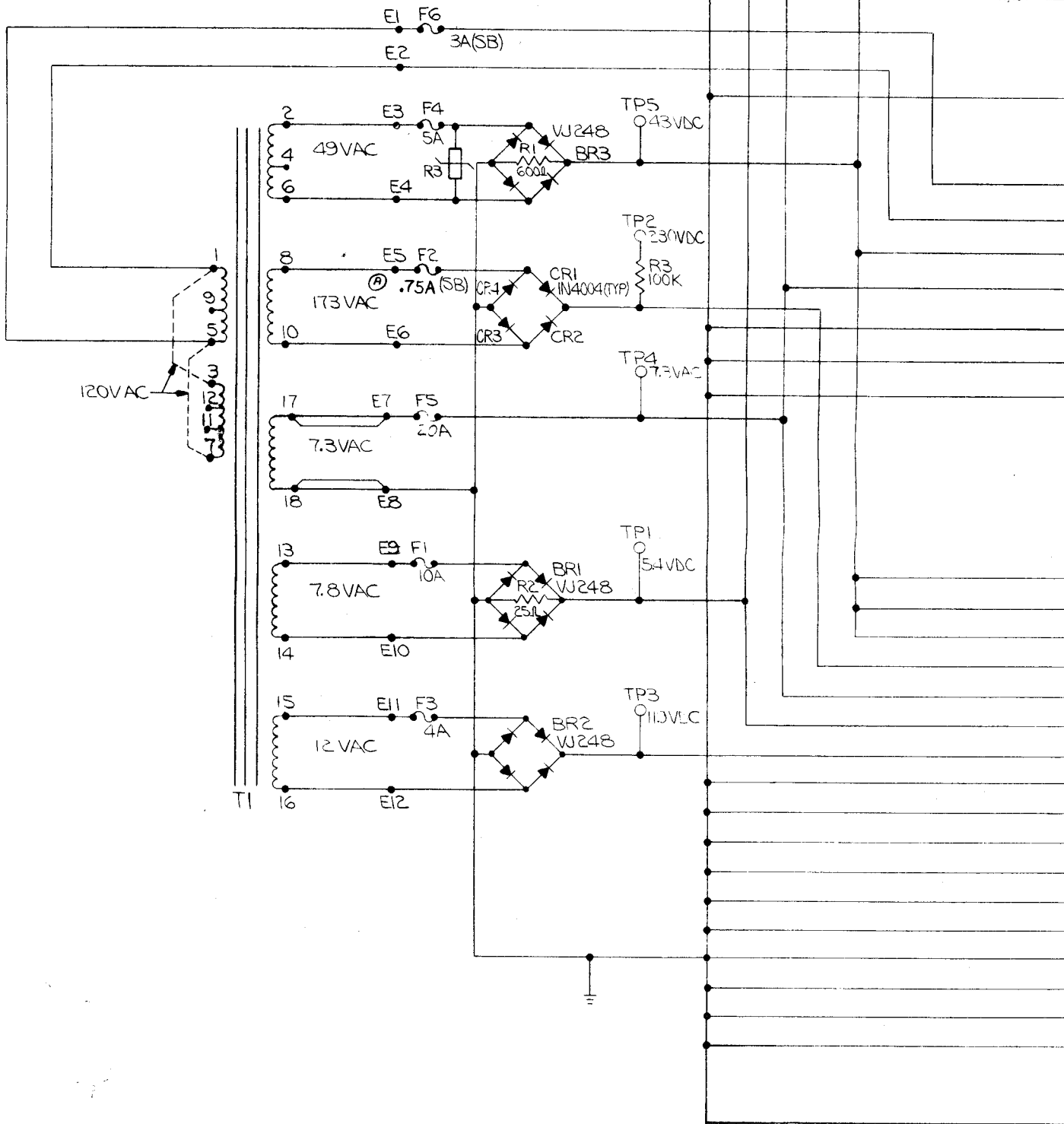
DIE SIZE — C.C. — FT. PER M — LBS. PER M —

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REMOVE ALL BURRS		DESIGNED BY: <i>WMS</i>	DATE: <i>9-76</i>	Bally MANUFACTURING CORP #1094-E 2640 BELMONT AVENUE CHICAGO, ILLINOIS #1074-E #1066-E	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED		CHK BY:	DATE:		
FRACTIONS ±		APP'D BY: <i>WMS</i>	DATE: <i>9-76</i>	PRINT CONTROL:	TOTAL: <i>74</i>
DECIMALS ±		APP'D BY: <i>WMS</i>	DATE: <i>9-76</i>	NAME: DISPLAY BOARD SCHEMATIC "A1"	SCALE: <i>1</i>
ANGLES ±		FINISH: <i>W</i>		MATERIAL:	ASSEM. NO. USED ON/W
DO NOT SCALE DRAWING		HARDENING: <i>W</i>			PART NO. W-1184c

NO.	LET.	CHANGE	DATE	BY	CK.
1		ADDED NOTE 3 #ASTRISKS	11-2-76	S.T.W.	

TRANSFORMER ASSEMBLY A2



J1
PLAYFIELD

- 1 GEN. ILL. RET.
- 7 SW. ILL. BUS.
- 8 GEN. ILL. BUS.
- 6 SOLENOID BUS.
- 4 KEY
- 3 SPARE
- 5 GENERAL ILL. BUS (B)
- 2 GEN. ILL. RET. (D)

J2
CABINET

- 6 A.C. POWER
- 7 A.C. RET
- 2 SOLENOID BUS
- 1 GEN. ILL. BUS.
- 5 GEN. ILL. RET.
- 9 FLIP SW. RET.
- 10 POWER LINE GRD
- 3 SPARE
- 4 SPARE
- 8 KEY

J3
BACKBOX

- 9 RELAY
- 12 Z. C. INPUT, A4J4-15 (C)
- 13 SOLENOID BUS.
- 5 TO REG (190) INPUT
- 11 GEN. ILL BUS
- 6 SW. ILL BUS
- 8 TO REG (+5) INPUT
- 2 GEN. ILL. RET.
- 3 SW. LAMP RET.
- 4 SW. LAMP RET
- 14 SW. LAMP RET.
- 15 TO REG (+5) RET.
- 16 TO REG 190 RET.
- 17 TO REG +5 FILT RET.
- 18 TO REG (190) FILT RET.
- 19 SOLENOID RET. BUS.
- 20 SOLENOID RET. BUS.
- 10 GEN. ILL. BUS.
- 7 KEY
- 1 GEN. ILL. RET.

NOTES:

1. WIRE A.C. POWER AND TERMINALS PER TABLE 1.
2. VOLTAGES SHOWN ARE FOR GAME IN POWER-UP CONDITION.
3. PREFIX ALL REFERENCE DESIGNATIONS WITH A2.

TABLE 1
POWER LINE CONNECTIONS

LINE VOLTAGE VRMS A.C.	STRAP TERMINALS	APPLY POWER TO TERMINALS
115	1T03 AND 9T011	1 AND 9
120	1T03 AND 5T07	1 AND 5
220	3T05	1 AND 12
240	3T05	1 AND 7

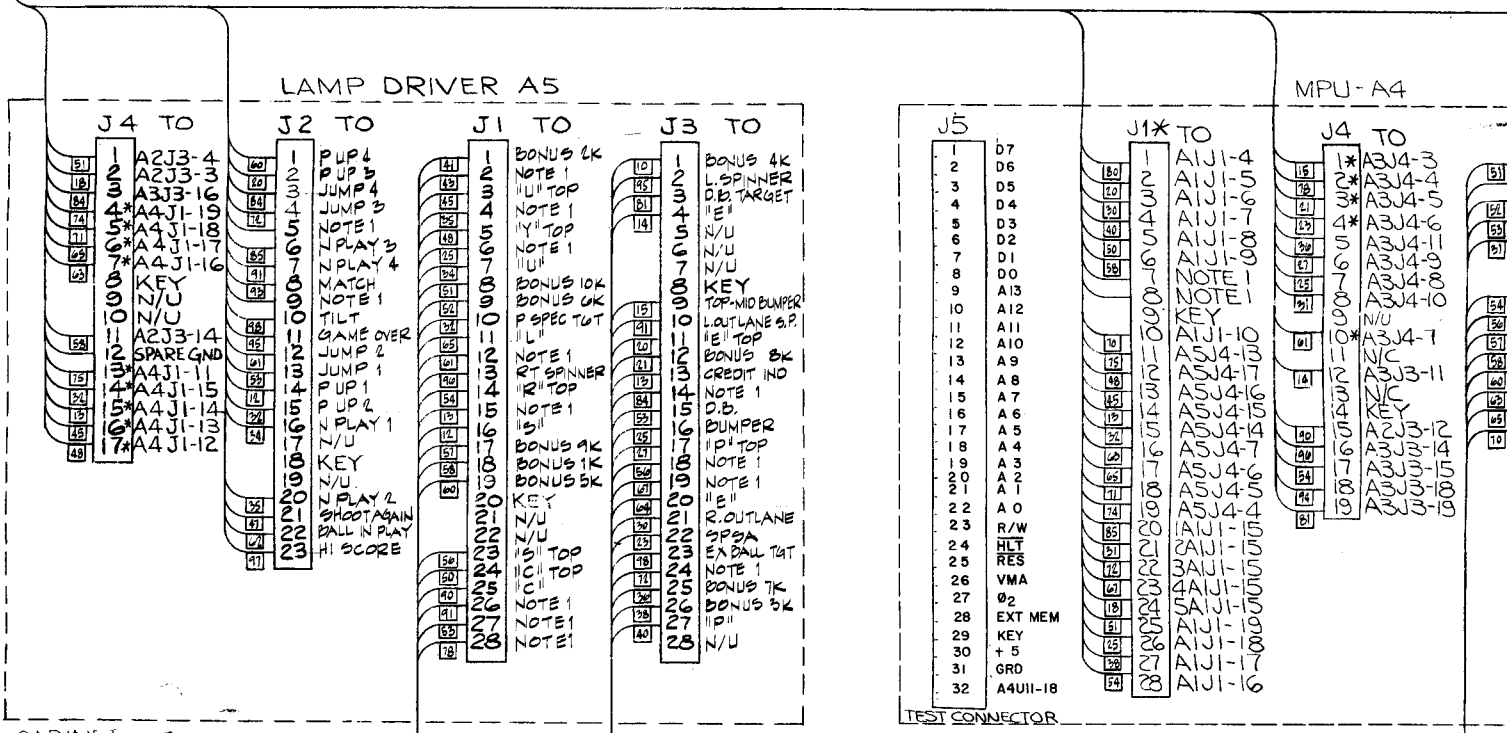
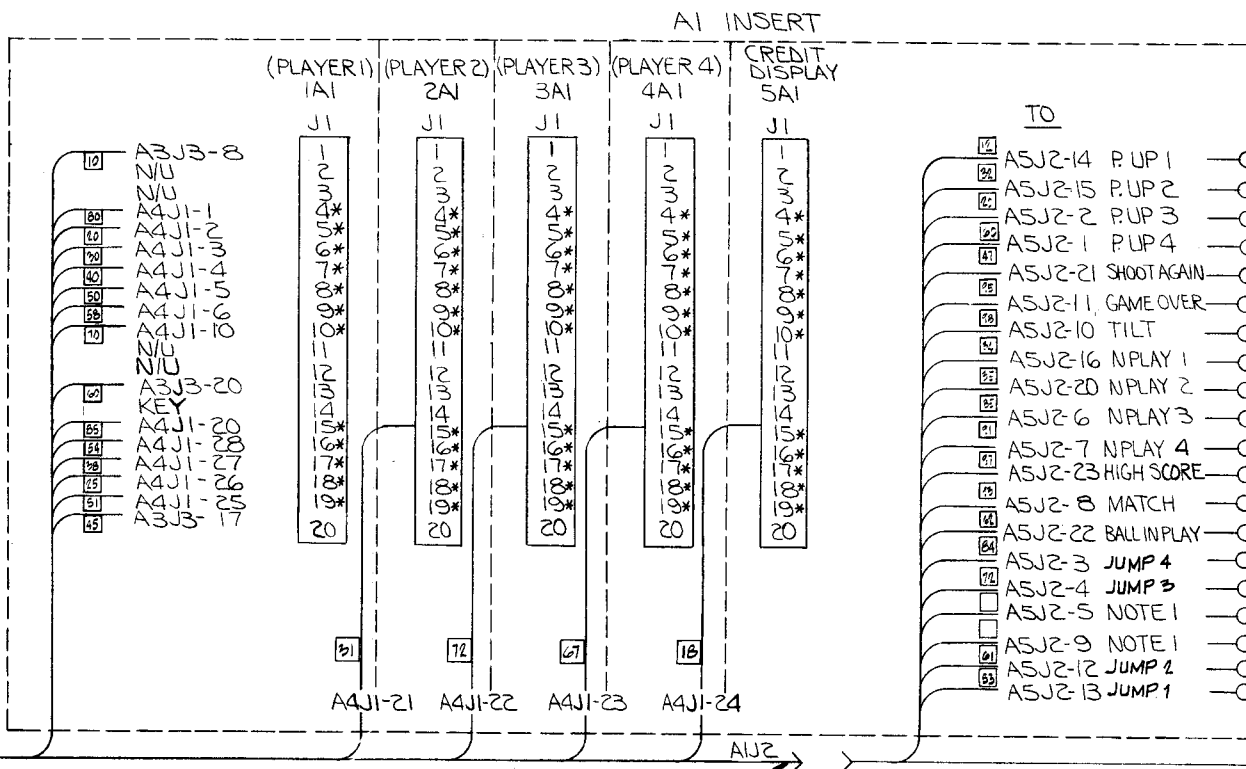
DIE SIZE — C.C. — FT. PER M — LBS. PER M —

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NO.	LET.	CHANGE	DATE	BY	CK.
2	D	J1-2 READ "GND"	5-20-77	MS	CK
2	C	J3-12 READ "Z.C. INPUT"	5-20-77	MS	CK
1	B	ADDED JUMPER J1 5 TO J3-11	5-2-77	JCG	MS
1	A	F2 WAS 5.0A	5-2-77	JCG	MS

REMOVE ALL BURRS		D BY DATE C 20 2-11-77		DATE 2-11-77		Bally MANUFACTURING CORP. #1094-E		2640 BELMONT AVENUE CHICAGO, ILLINOIS		* 1074-E	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED		AP'D BY DATE		FEB 21 1977		NAME		POWER TRANSFORMER MODULE SCHEMATIC		ASSEN. NO. USED ON/W	
FRACTIONS ±		MATERIAL		FINISH		HARDENING		PART NO.		W-1185-1c	
DECIMALS ±		DO NOT SCALE DRAWING									
ANGLES ±											

FROM	AJ2 PIN	
A5J3-6	1	20
A5J2-14	2	12
A2J3-2	3	50
A2J3-11	4	10
A5J2-23	5	97
A5J2-15	6	32
A5J2-22	7	62
A5J2-8	8	93
A5J2-1	9	60
A5J2-2	10	20
A5J2-11	11	95
A5J2-21	12	47
A5J2-10	13	98
A5J2-7	14	91
A5J2-6	15	85
A5J2-20	16	35
A5J2-16	17	34
A2J3-10	18	40
A2J3-1	19	70
A5J2-13	20	53
A5J2-12	21	61
A5J2-4	22	72
A5J2-3	23	84



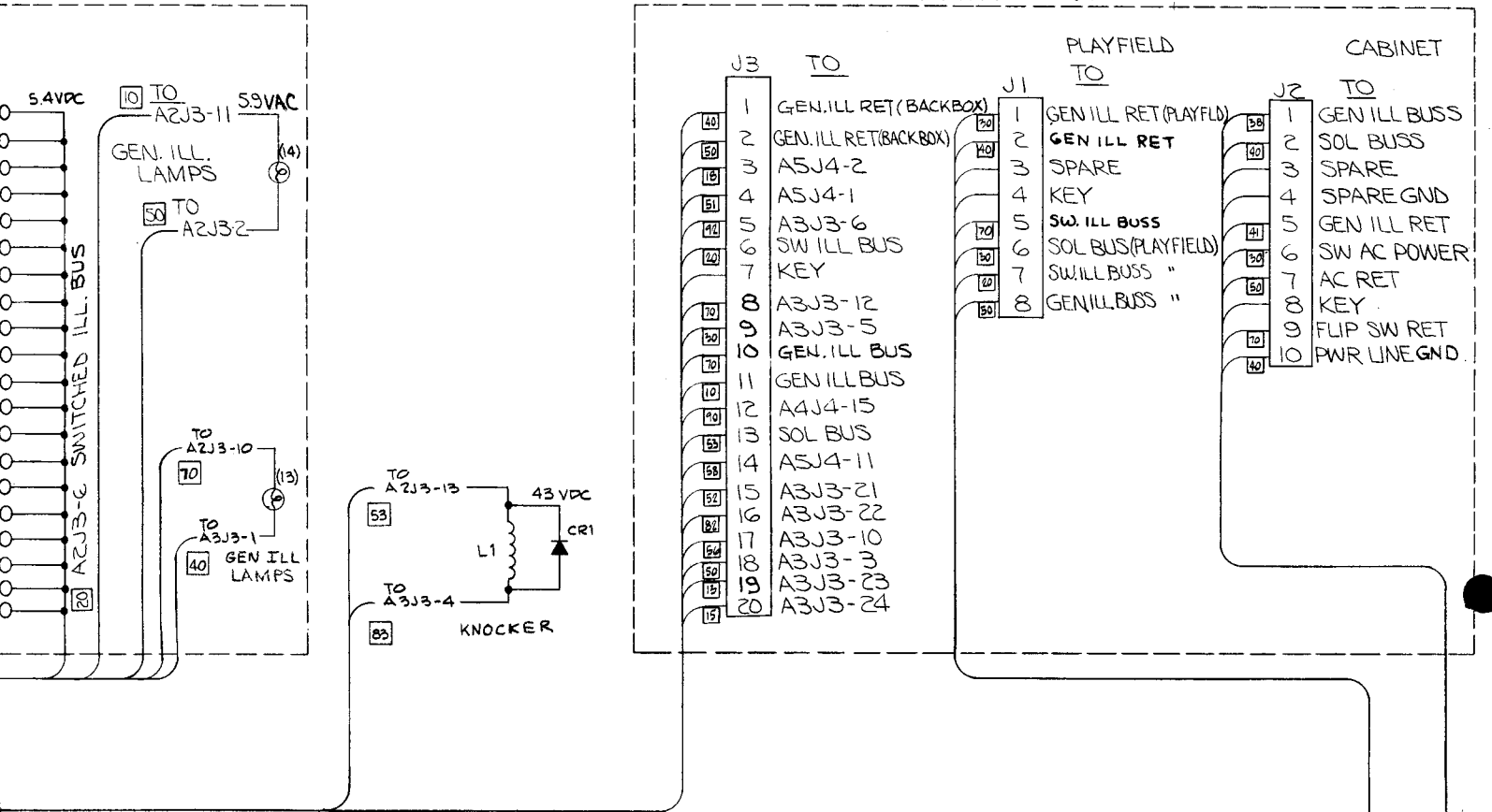
TO CABINET
TO PLAYFIELD

- NOTES:
1. THESE PINS ARE RESERVED FOR FUTURE USE.
 2. WIRE COLORS ARE SHOWN FOR ALL CONNECTOR PINS. SOME WIRES MAY NOT BE USED IN ALL GAMES.
 3. * INDICATES AID TEST POINT

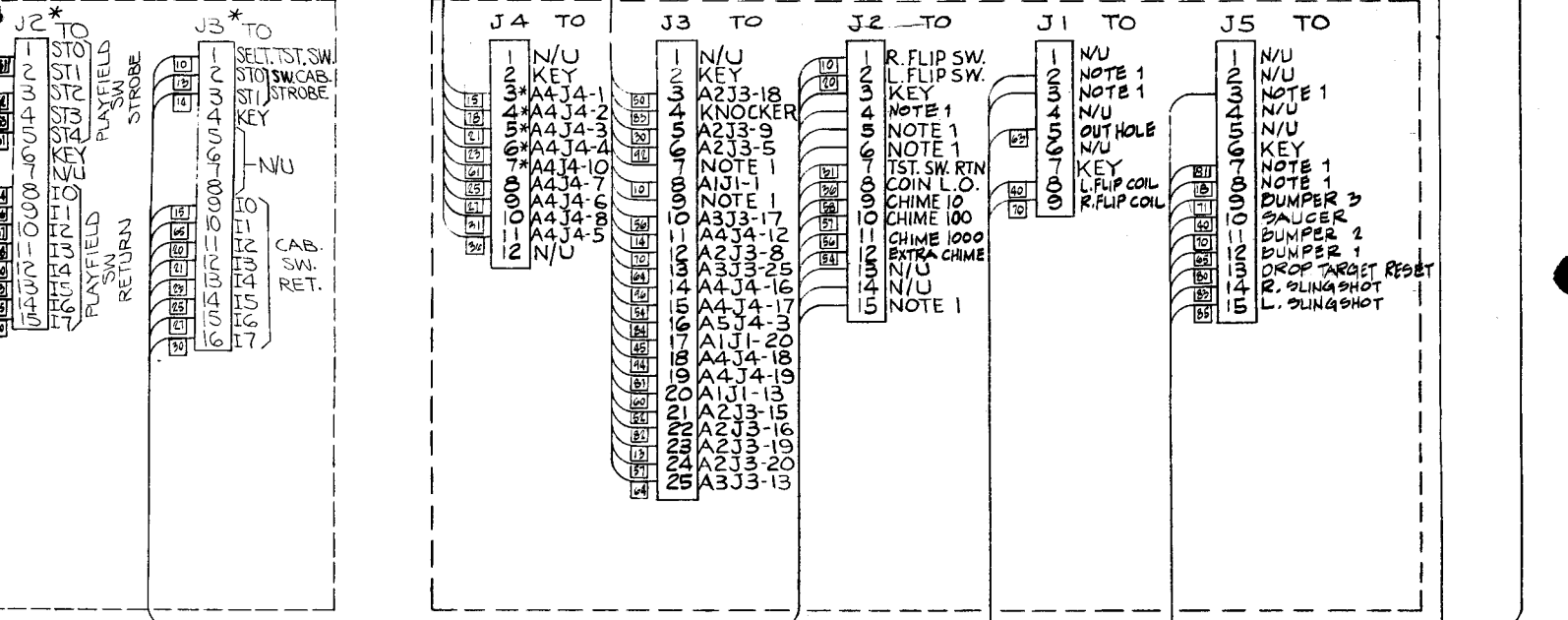
BACKBOX WIRING

OPER.	DEPT.	DESCRIPTION	TOOL No.
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A2 TRANSFORMER



VOLTAGE REGULATOR/SOLEN DRIVER A3



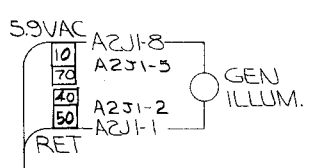
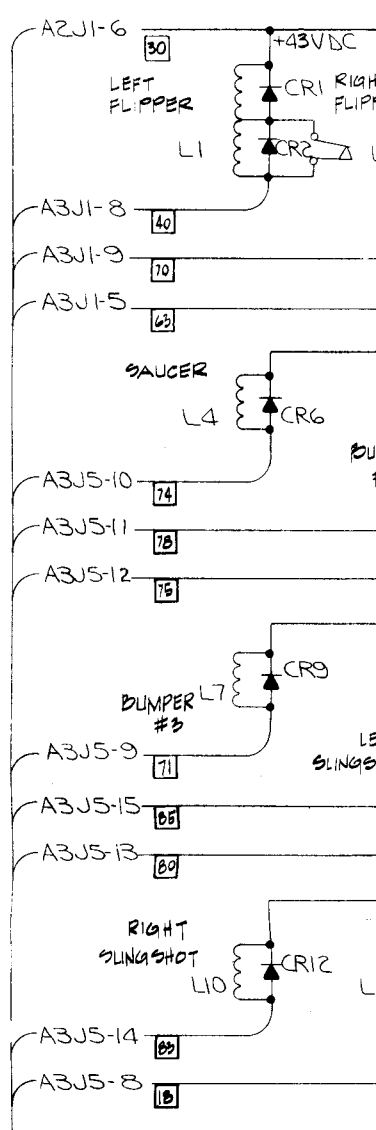
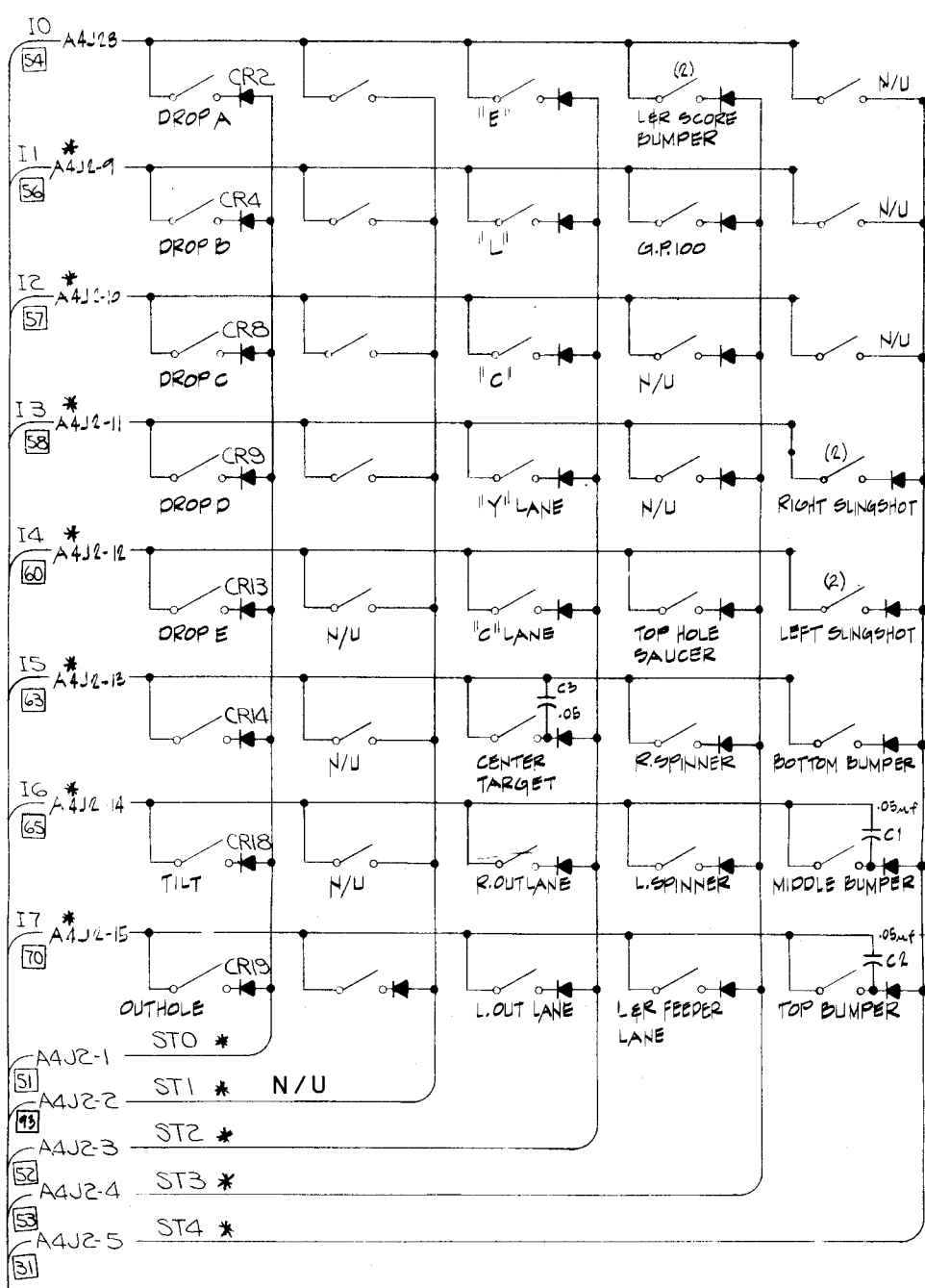
SHEET 1 OF 3 SHEETS

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WIRE COLOR CODE

1 - RED	6 - BROWN
2 - BLUE	7 - ORANGE
3 - YELLOW	8 - BLACK
4 - GREEN	9 - GRAY
5 - WHITE	0 - NO TRACE

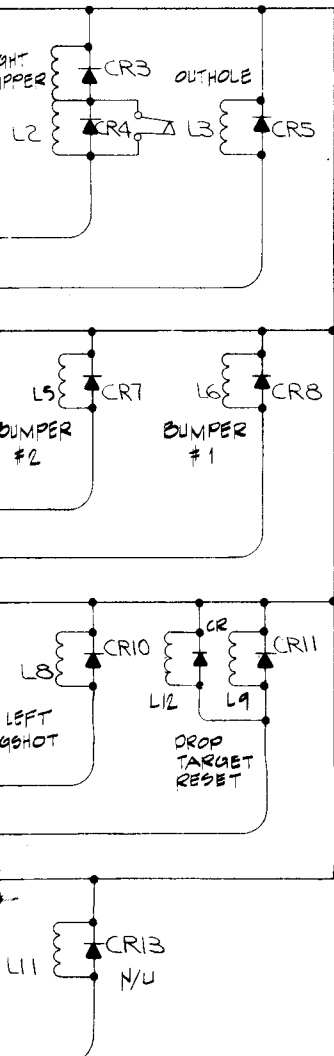
REMOVE ALL BURRS		DATE 3-18-77		Bally MANUFACTURING CORP. E.K.	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED		DATE 3-16-77		2640 BELMONT AVENUE CHICAGO, ILLINOIS 1094-E	
FRACTIONS ±		APP'D BY	DATE	PRINT CONTROL	PROG.
DECIMALS ±		FINISH	NAME	WIRING DIAGRAM ELECTRONIC	TOTAL 3
ANGLES ±		HARDENING	MATERIAL	ASSEM. NO. USED ON/W	SCALE
DO NOT SCALE DRAWING		PART NO. W-1186-2C		3	



PLAYFIELD
AG

- NOTES:
- NOTE 1 INDICATES NOT USED.
 - N/U NOT USED ON PLAY FIELD
 - ** INDICATES AID TEST POINT

OPER.	DEPT.	DESCRIPTION	TOOL No.

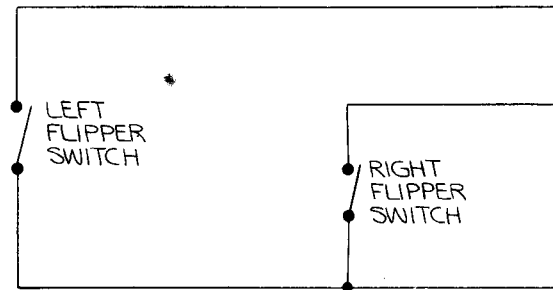
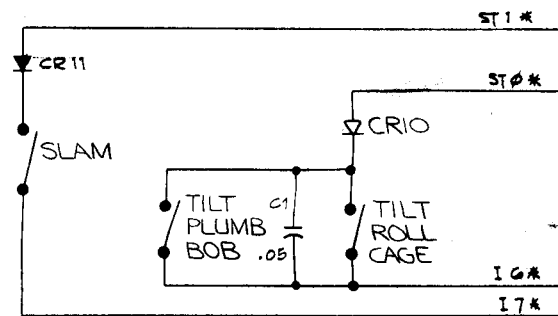
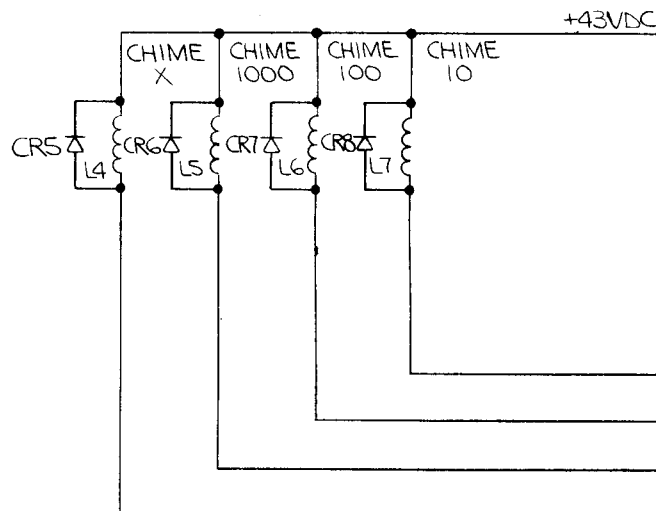
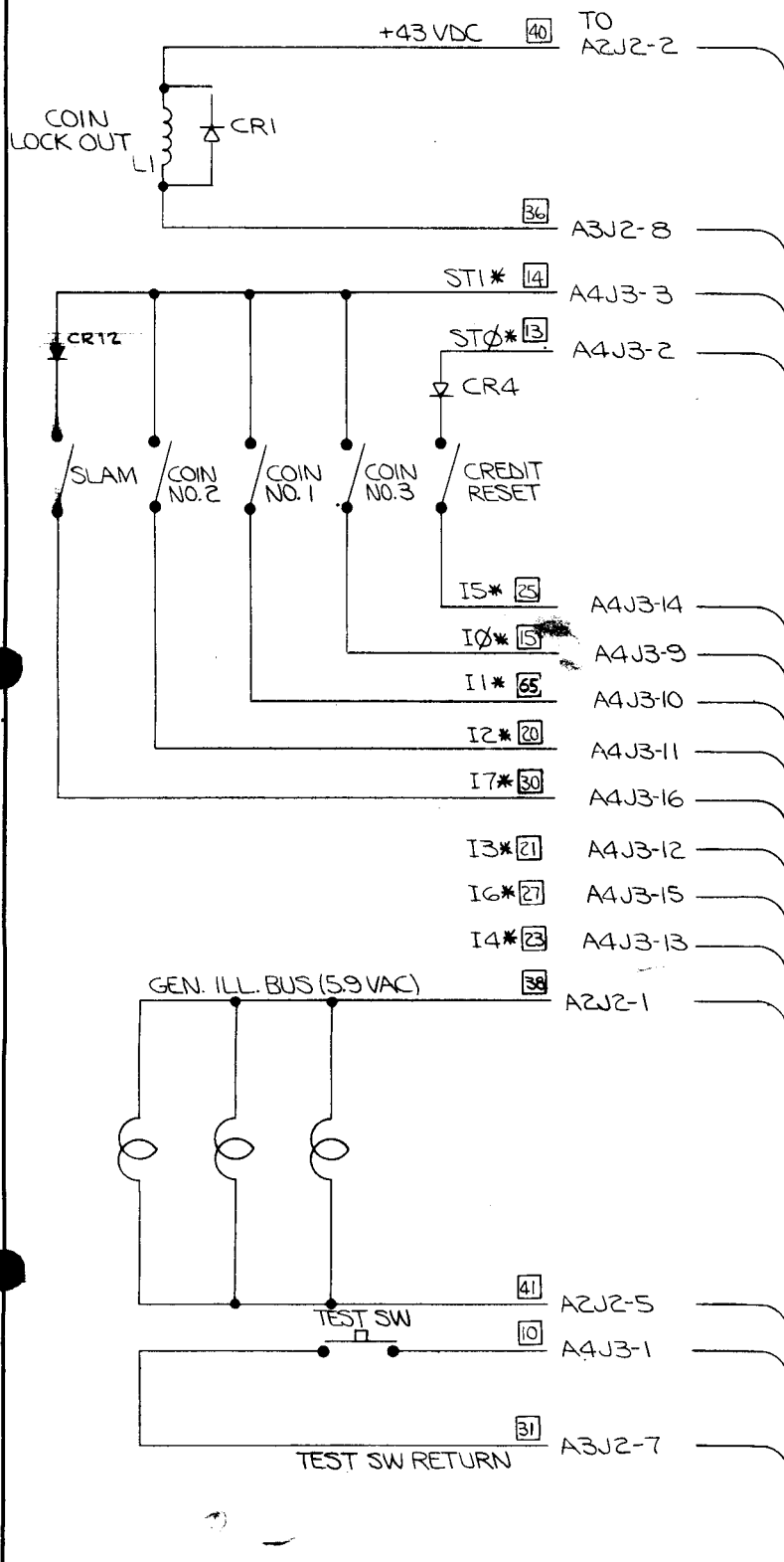


TO	Component	Description	5.4VDC
58	ASJ1-18	BONUS 1K	
60	ASJ1-19	BONUS 5K	
57	ASJ1-17	BONUS 9K	
56	ASJ1-23	"S" TOP	
54	ASJ1-14	"R" TOP	
13	ASJ1-15	NOTE 1	
12	ASJ1-16	"S"	
18	ASJ1-28	"R"	
50	ASJ1-24	"C" TOP	
40	ASJ1-25	"C"	
41	ASJ1-26	NOTE 1	
32	ASJ1-27	NOTE 1	
41	ASJ1-1	BONUS 2K	
52	ASJ1-9	BONUS 6K	
51	ASJ1-8	BONUS 10K	
48	ASJ1-3	"U" TOP	
43	ASJ1-2	NOTE 1	
32	ASJ1-10	SPECIAL TGT	
24	ASJ1-7	"U"	
25	ASJ1-6	NOTE 1	
48	ASJ1-5	"Y" TOP	
46	ASJ1-11	"L"	
35	ASJ1-4	NOTE 1	
21	ASJ1-12	NOTE 1	
20	ASJ1-13	R.SPINNER	
38	ASJ3-26	BONUS 3K	
36	ASJ3-25	BONUS 7K	
47	ASJ3-19	NOTE 1	
47	ASJ3-17	"P" TOP	
45	ASJ3-16	BUMPER	
48	ASJ3-23	EX BALL TGT	
40	ASJ3-27	"P"	
30	ASJ3-21	R.OUTLANE SP	
44	ASJ3-20	"E"	
23	ASJ3-22	S.P.S.A.	
12	ASJ3-24	NOTE 1	
10	ASJ3-1	BONUS 4K	
21	ASJ3-12	BONUS 8K	
33	ASJ3-15	DOUBLE BONUS	
20	ASJ3-11	"E" TOP	
18	ASJ3-9	TOP & MID BUMPER	
13	ASJ3-13	CREDIT IND	
14	ASJ3-4	"E"	
15	ASJ3-2	L.SPINNER	
11	ASJ3-10	L.OUTLANE S.P.	
20	ASJ3-18	NOTE 1	
21	ASJ3-3	D.B. TARGET	
24	ASJ3-14	NOTE 1	
20	A2J1-7	FEATURE LAMP BUS	

SHEET 2 OF 3 SHEETS

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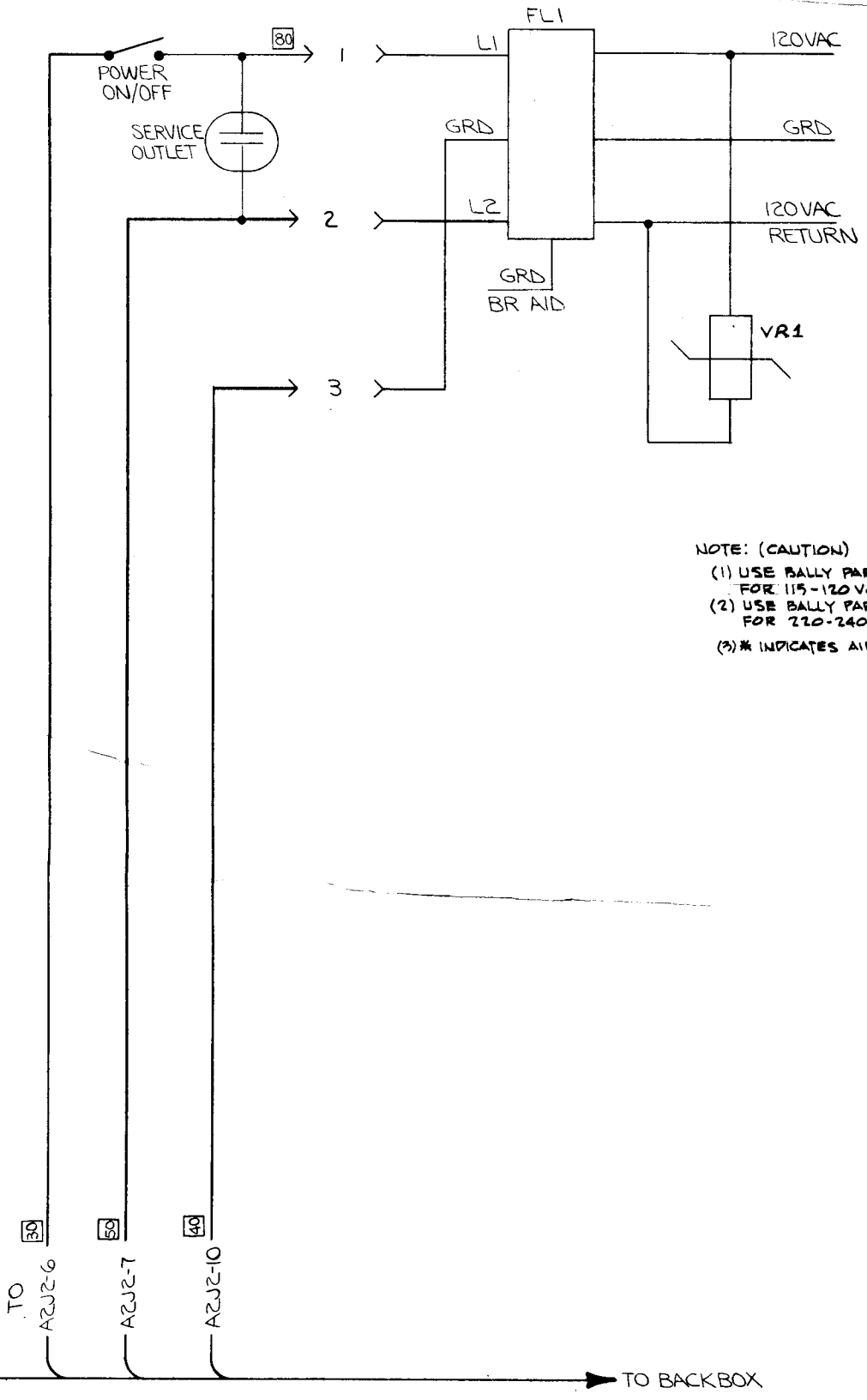
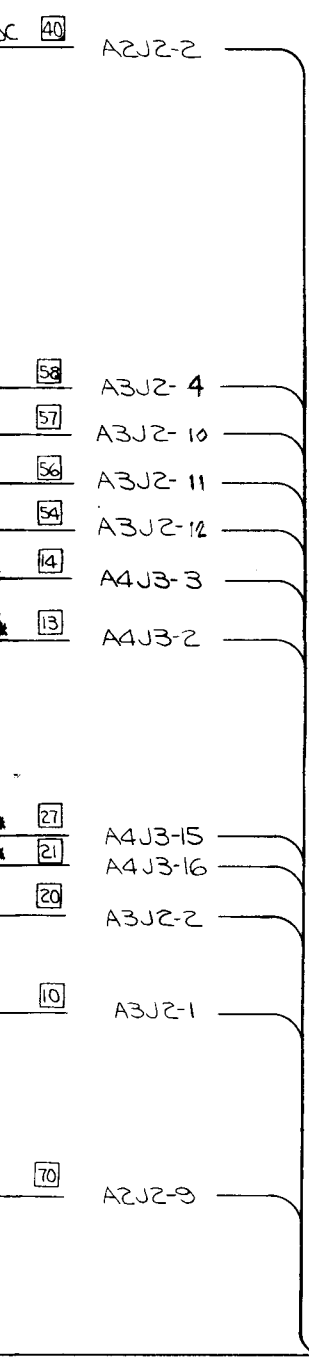
REMOVE ALL BURRS TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS ± DECIMALS ± ANGLES ± DO NOT SCALE DRAWING	DR BY: <i>SH</i> DATE: <i>2-2-77</i> CR BY: <i>Dev</i> DATE: <i>3-18-77</i>	Bally MANUFACTURING CORP. E.K. 2640 BELMONT AVENUE CHICAGO, ILLINOIS 60648 APR 18 1977		TOTAL: 3 SCALE: <i>N</i>
	AP'D BY: _____ DATE: _____ FINISH: <i>N</i>	NAME: _____ E.K.	ASSEN. NO. USED ON/W: _____	
	HARDENING: <i>N</i>	MATERIAL: _____ WIRING DIAGRAM		PART NO.: W-1186-2c
	NO. LET. CHANGE DATE BY CK.	ASSEMBLY CONTROL: _____ CHECKED: _____ FILED: _____ APPROVED: _____ DESIGNED: _____ DRAWN: _____ INSP: _____ TOOK: _____ MARK: _____		



J1

TO	J1 PIN	TO	J1 PIN
A4J3-9	1	A4J3-3	11
A4J3-10	2	A2J2-2	15
A4J3-11	3	A3J2-8	16
A4J3-12	4	A2J2-1	17
A4J3-13	5	A2J2-5	18
A4J3-14	6	A4J3-1	19
A4J3-15	7	A3J2-7	20
A4J3-16	8		
A4J3-2	10		

A7 CABL



NOTE: (CAUTION)
 (1) USE BALLY PART NO E-713 FOR 115-120 VAC.
 (2) USE BALLY PART NO E-715-1 FOR 220-240 VAC.
 (3) * INDICATES AID TEST POINT



CABINET ASSY. WIRING

SHEET 3 OF 3 SHEETS

DIE SIZE — C.C. — FT. PER M — LBS. PER M —

ALL DESIGN, OPERATIVE AND PROCESS DATA PERTAINING TO THE ARTICLE SHOWN ON THIS SHEET IS THE PROPERTY OF BALLY MFG. CORP., CHICAGO, ILL. THIS INFORMATION IS DISCLOSED IN CONFIDENCE AND IS NOT TO BE COPIED, REPRODUCED, REVEALED TO OR APPROPRIATED BY OTHERS, IN PART OR IN WHOLE, WITHOUT THE EXPRESS CONSENT OF THE OWNERS. THE PRINT IS LOANED AND MUST NOT BE USED IN ANY MANNER DETRIMENTAL TO THE INTEREST OF THE OWNERS, AND MUST BE RETURNED ON DEMAND.

REMOVE ALL BURRS TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS ± DECIMALS ± ANGLES ± DO NOT SCALE DRAWING	DR. BY: [] DATE: []	Bally MANUFACTURING CORP. E.K. 2640 BELMONT AVENUE CHICAGO, ILLINOIS								TOTAL: 3	SCALE: []
	CHK. BY: [] DATE: []	PRINT CONTROL: []	CORR: []	SUP: []	FTR: []	ISS: []	SEP: []	DEC: []	FEB: []	MAR: []	ASSEM. NO. USED ON/V: []
	APD BY: [] DATE: []	NAME: WIRING DIAGRAM ELECTRONIC									
	MDR BY: [] DATE: []	MATERIAL: []									
NO. LET. CHANGE DATE BY CK.	PART NO. W-1186-2c										