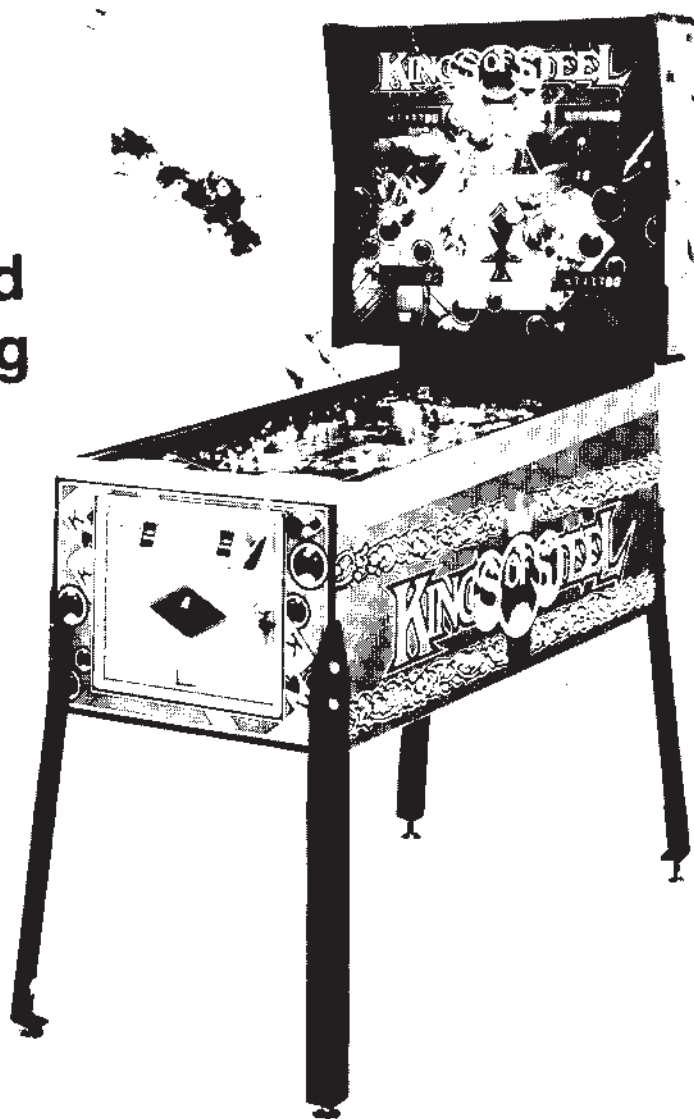


KINGS OF STEEL

Parts and Operating Manual



Bally **MIDWAY** TM MFG. CO

10601 W. Belmont Ave. • Franklin Park, Illinois 60131
Telephone (312) 451-9200



WARNING

**THIS GAME MUST BE GROUNDED. FAILURE TO DO SO MAY
RESULT IN DESTRUCTION TO ELECTRONIC COMPONENTS.**

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not 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.

ELECTRICAL BULLETIN: FOR ALL APPARATUS COVERED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) STANDARD C22.2 NO. 1, WHICH EMPLOYS A SUPPLY CORD TERMINATED WITH A POLARIZED 2-PRONG ATTACHMENT PLUG.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION: POUR PREVENIR CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

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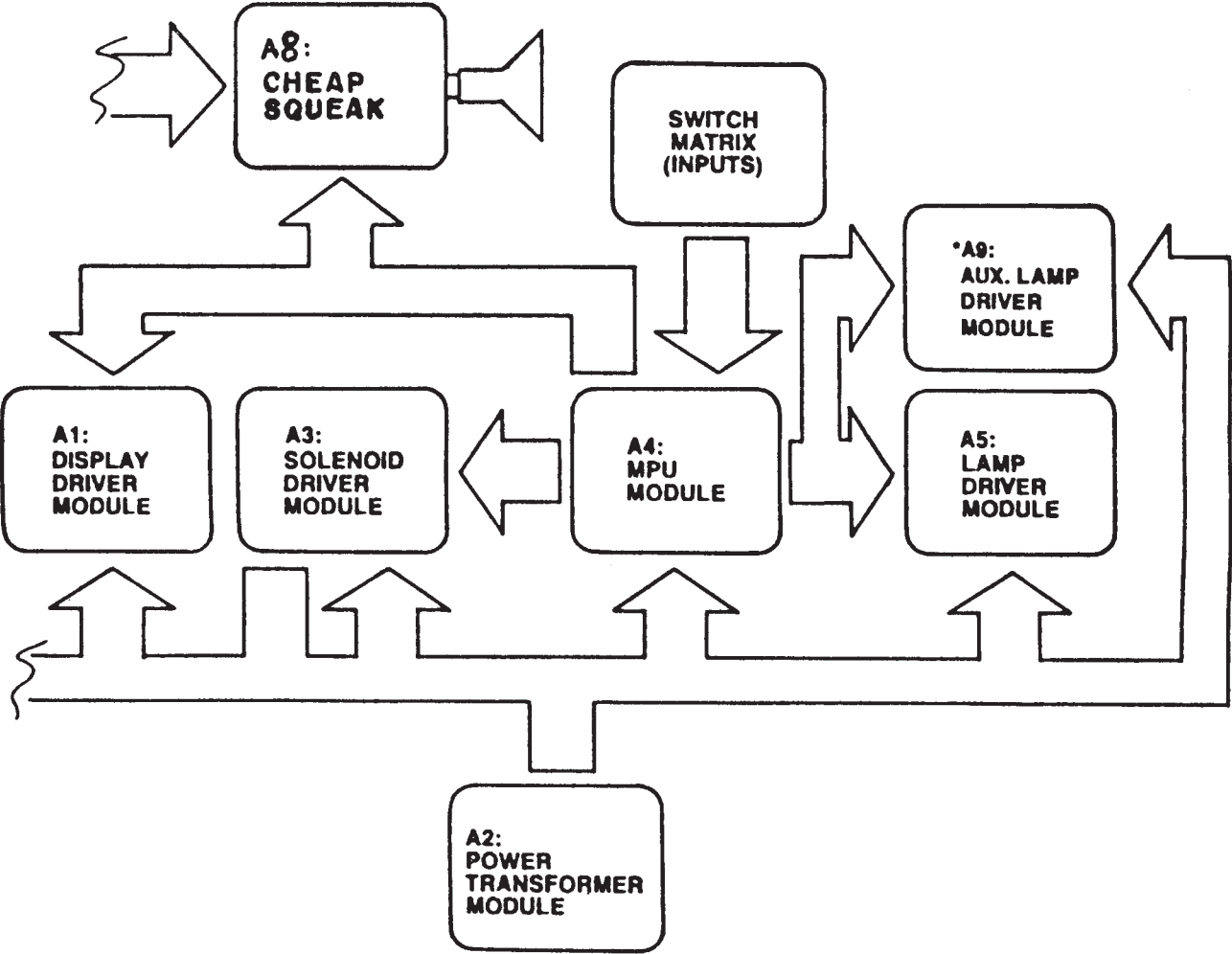
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Installation and General Game Operation Instructions

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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

**REFER TO POWER SUPPLY SCHEMATIC
IN GAME MANUAL FOR TABLE "A"**

115 VAC, 2-8, 3-6, 7-10
120 VAC, 2-8, 4-6, 7-11
220 VAC, 4-8, 7-9
240 VAC, 4-8, 7-11

PART OF POWER—TRANSFORMER MODULE A2, LOCATED IN LOWER CABINET

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.

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.

The game awards all points earned by the player. If spinner is turning and scoring when the ball hits a target, the spinner and the target scores are awarded.

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 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 before the game serves the extra ball for play.

Scoring over 10,000,000 gives "High Score to Date" award.

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 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 are two factory installed slam switches, on the front door, and one on left side of cabinet. (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.

NOTE: Scoring and feature units will differ from game to game.

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 15, appears on the Match/Ball in Play window as follows:

- 05— 00 to— 40 = Current Credits
- *06— 10000 to—99999 = Total Plays (Paid & Free Games)
- *07— 10000 to—99999 = Total Replays (Free Games)
- 08— 00 to—99999 = Game Percentage
- 09— 00 to—99999 = Total times 'High Score to Date' is beat
- *10— 10000 to—99999 = Coins Dropped thru Coin Chute #1
- *11— 10000 to—99999 = Coins Dropped thru Coin Chute #2**
- *12— 10000 to—99999 = Coins Dropped thru Coin Chute #3**
- *13— 00 to—99999 = Number of Specials awarded from Panel Specials Only
- *14— 00 to—99999 = Number of minutes of Game Play
- *15— 00 to—99999 = Number of Service Credits

The game displays the first bookkeeping entry if the Self-Test button (See Fig. III) on the inside of the front door is pressed ten 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), or by pressing the Coin Chute #3 switch. Any or all registers can be cleared by alternating between the Self-Test button and the switch button S33 on the MPU module or Coin Chute #3 switch. 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 5 more times causes the game to play the power-up tune and light the Game Over light.

Service credits are designed to allow the serviceman to test the game under actual play conditions without disturbing the bookkeeping records that reside at identification numbers 06, 07, 10, 11 and 12.

To obtain Service Credits, push and release the Self-Test switch until identification number 05 appears in the 'Match/Ball in Play' window. Hold in the Credit button until the desired number of Service Credits (up to five) appears on the player score displays.

NOTE: If, upon accessing identification number 05, a number of credits greater than five is displayed, pressing the credit button has no effect.

Identification number 15 is reserved as a record of the number of Service Credits used.

*The 10,000 level is pre-set at the factory; can be set to zero, initially, if desired.

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

NOTE: If "Total Play" register is reset to zeroes then "Total Replays" register should also be reset to zeroes to maintain the game percentage value.

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Feature Operation & Scoring

A) Top Roll-Over Buttons Feature (Mini-Straight 4-5-6-7):

A ball rolling over each top roll-over button turns on its corresponding card lite in the Mini-Straight 4-5-6-7 and scores 3000 points—lit or unlit. Making all four top roll-over buttons advances the Saucer Score: 40,000—80,000—SPECIAL. Making all four top roll-over buttons when the Mini-Straight Special Lite is lit, scores 1 SPECIAL: The Mini-Straight Special Lite turns off when any other points except the top roll-over buttons and top rebounds (see FDS #7 & 8 below) are scored. The Mini-Straight Lites 4-5-6-7 reset every ball.

- F.D.S. #8 controls the Mini-Straight Special Lite:
 - ON — Special Lite comes on every ball
 - OFF— Special Lite comes on every other ball
- F.D.S. #7 controls the top right rebound switch:
 - ON — Scores 10 points
 - OFF— Scores 10 points and extinguishes Mini-Straight Special Lite
- F.D.S. #14 controls the amount of Specials collected on the top roll-over buttons:
 - ON — chance for several Specials per game
 - OFF— chance for only one Special per game

B) Top Saucer Feature:

A ball entering the Saucer scores 5000 points, or 10,000 points for each lit card in the Mini-Straight 4-5-6-7 and the lit Saucer Score. The Saucer Score—40,000—80,000—SPECIAL—is advanced by making all four top roll-over buttons. The Saucer Score Lites reset every ball.

- F.D.S. #6 controls the number of Specials in the Saucer per ball:
 - ON — 40,000—80,000—SPECIAL—repeat sequence (chance for several Specials per ball)
 - OFF— 40,000—80,000—SPECIAL—revert back to 40,000 (chance for only one Special per ball)
- F.D.S. #30 controls the Drop Target card feature in the top Saucer:
 - ON — Return lanes always on and top Saucer spots next Drop Target Card
 - OFF— Return lanes alternate on/off and Saucer does not spot card

C) #2 (Deuces) Target Feature:

Each target scores 3000 points. Lighting all of the #2 targets (Deuces) awards the lit value: 2x—3x—4x—5x—50,000. #2 target arrows and values reset every ball. Only one Special per ball can be earned.

- F.D.S.'s #15 & 16 control the Deuces Special Lite:

15	16	
ON	ON	— SPECIAL comes on with 3x
OFF	ON	— SPECIAL comes on with 4x
ON	OFF	— SPECIAL comes on with 5x
OFF	OFF	— SPECIAL comes on after 50,000

D) #3's Target Feature:

The #3's (right) target awards the lit value.

The #3's target also starts the center wheel scores rotating.

The #3's target lites reset every ball.

- F.D.S.'s #23 & 24 control the Extra Ball and Special awarded on this target.

23	24	—	EXTRA BALL	SPECIAL
ON	ON	—	6th Step	9th Step
OFF	ON	—	7th Step	9th Step
ON	OFF	—	8th Step	10th Step
OFF	OFF	—	9th Step	11th Step

Note: only 1 Special per game per player can be earned on this feature.

E) Center Target Feature:

The center target scores 3000 points or the lit score on the score wheel when qualified. Hitting the 3's target will qualify the center target score wheel lites. Hitting the center target when the arrow is flashing

stops the score wheel and awards that value, which stays on to signal what was collected.

The center target arrow must be re-lit by hitting the #3's target.

Values on the center target are clockwise from top:

- 25,000
- 10,000 & Spots next card
- 50,000
- 10,000 & opens gate
- 10,000
- 10,000 & Spots all Deuces

F) Drop Target Card Feature:

Card Bonus drop targets and stand-up targets score 5000 points each. The game starts with the #10 target up. Hitting the lit targets spots the corresponding cards in the Card Bonus Sequence and sets up the next cards to be hit. (Memory coils are used to select the cards.)

Completing the entire Card Bonus Sequence lites a Suit lite:

- 1st Suit = Hearts = 80,000 points
- 2nd Suit = Clubs = 160,000 points
- 3rd Suit = Diamonds = 240,000 points
- 4th Suit = Spades = 320,000 points

Cards score 5000 points each in the outhole (with multipliers when applicable). Card targets and lites are in memory. Hitting four Kings and Ace when lit for Special scores 1 Special.

- F.D.S.'s #21 & #22 controls the Four Kings and Ace Special lite:

- 21 — 22 — Special comes on with:
- ON — ON — 1st Suit
- OFF — ON — 2nd Suit
- ON — OFF — 3rd Suit
- OFF — OFF — 4th Suit

G) Free Ball Gate Feature:

The gate can be opened by the center target when qualified (see E). A ball through the right outlane when the gate is open will be returned to the flipper and the gate will close.

H) Return Lane Feature:

A ball through either return lane scores 1000 and when lit spots the next card in the Card Bonus sequence.

- F.D.S. #30 controls the return lane lites:
 - ON — Always on
 - OFF — Alternates on/off with 10 point score.

I) Miscellaneous Scoring:

Thumper Bumpers score 1000 points
Sling Shot and rebounds score 10 points

J) SPECIAL REPLAY/X-BALL/NOVELTY MODES

Self-test positions 16 and 17 give the operator flexibility to award a replay ball or score (Novelty) when a special is scored. A combination of X-Ball, Novelty can be obtained through the following chart.

Self-test position 16	Set to "03"	Set to "02"	Set to "01"
Playfield X-Balls and Specials	AWARD	AWARD	AWARD
4-7 card special	REPLAY	X-BALL	50,000
2 card target special	REPLAY	X-BALL*	50,000
Saucer special	REPLAY	X-BALL*	50,000
3 card target special	REPLAY	*	50,000
Drop target special	REPLAY	X-BALL*	50,000
3 card target x-ball	X-BALL	X-BALL**	25,000
Self-Test Position 17	Set to "03"	Set to "02"	Set to "01"
	AWARD	AWARD	AWARD
	REPLAY	X-BALL**	25,000

Scoring Thresholds

*50,000 if same player shoot again is lit.

**25,000 if same player shoot again is lit.

V. GAME ADJUSTMENTS

A. Playfield Panel Post Adjustments:

Posts that control left and right outlane opening on panel can be removed 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 S17-S20 for coin chute #2 (Center). The switch settings and resultant credits/coin are as follows:

S20	S19	S18	S17	Credits/Coin	S20	S19	S18	S17	Credits/Coin
OFF	OFF	OFF	OFF	Same as Coin Chute #1 Settings	ON	OFF	OFF	OFF	8/1 Coin
OFF	OFF	OFF	ON	1/1 Coin	ON	OFF	OFF	ON	9/1 Coin
OFF	OFF	ON	OFF	2/1 Coin	ON	OFF	ON	OFF	10/1 Coin
OFF	OFF	ON	ON	3/1 Coin	ON	OFF	ON	ON	11/1 Coin
OFF	ON	OFF	OFF	4/1 Coin	ON	ON	OFF	OFF	12/1 Coin
OFF	ON	OFF	ON	5/1 Coin	ON	ON	OFF	ON	13/1 Coin
OFF	ON	ON	OFF	6/1 Coin	ON	ON	ON	OFF	14/1 Coin
OFF	ON	ON	ON	7/1 Coin	ON	ON	ON	ON	15/1 Coin

The credits given 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 below.

CREDITS/COIN ADJUSTMENTS

COIN CHUTE	SWITCHES					CREDITS	CREDITS	CREDITS	CREDITS	CREDITS	TOTAL CREDITS/CO
#1 (HINGE SIDE)	5	4	3	2	1						
OR #3	13	12	11	10	9						
(RIGHT SIDE)											
OFF	OFF	OFF	OFF	OFF	OFF	1/1 Coin					
OFF	OFF	OFF	OFF	ON	ON	2/1 Coin					
OFF	OFF	OFF	ON	OFF	OFF	3/1 Coin					
OFF	OFF	OFF	ON	ON	ON	4/1 Coin					
OFF	OFF	ON	OFF	OFF	OFF	5/1 Coin					
OFF	OFF	ON	OFF	ON	ON	6/1 Coin					
OFF	OFF	ON	ON	OFF	OFF	7/1 Coin					
OFF	OFF	ON	ON	ON	ON	8/1 Coin					
OFF	ON	OFF	OFF	OFF	OFF	9/1 Coin					
OFF	ON	OFF	OFF	ON	ON	12/1 Coin					
OFF	ON	OFF	ON	OFF	OFF	14/1 Coin					
OFF	ON	OFF	ON	ON	ON	1/2 Coins*					
OFF	ON	ON	OFF	OFF	OFF	2/2 Coins*					
OFF	ON	ON	ON	OFF	ON	3/2 Coins*					
OFF	ON	ON	ON	ON	OFF	4/2 Coins*					
OFF	ON	ON	ON	ON	ON	5/2 Coins*					
ON	OFF	OFF	OFF	OFF	OFF	6/2 Coins*					
ON	OFF	OFF	OFF	ON	ON	7/2 Coins*					
ON	OFF	OFF	ON	OFF	OFF	8/2 Coins*					
ON	OFF	OFF	ON	ON	ON	9/2 Coins*					
ON	OFF	ON	OFF	OFF	OFF	12/2 Coins*					
ON	OFF	ON	OFF	ON	ON	14/2 Coins*					
ON	OFF	ON	ON	OFF	OFF	1/1st Coin	2/2nd Coin				3/2
ON	OFF	ON	ON	ON	ON	0/1st Coin*	1/2nd Coin	1/3rd Coin	1/4th Coin		3/4
ON	ON	OFF	OFF	OFF	OFF	0/1st Coin*	1/2nd Coin	0/3rd Coin**	2/4th Coin		3/4
ON	ON	OFF	OFF	ON	ON	1/1st Coin	1/2nd Coin	1/3rd Coin	2/4th Coin		5/4
ON	ON	OFF	ON	OFF	OFF	1/1st Coin	2/2nd Coin	1/3rd Coin	3/4th Coin		7/4
ON	ON	OFF	ON	ON	ON	1/1st Coin	2/2nd Coin	2/3rd Coin	2/4th Coin		7/4
ON	ON	ON	OFF	OFF	OFF	0/1st Coin***	0/2nd Coin***	1/3rd Coin			1/3
ON	ON	ON	OFF	ON	ON	0/1st Coin**	0/2nd Coin**	0/3rd Coin**	1/4th Coin		1/4
ON	ON	ON	ON	OFF	OFF	0/1st Coin****	0/2nd Coin****	0/3rd Coin****	0/4th Coin****	1/5th Coin	1/5
ON	ON	ON	ON	ON	ON	0/1st Coin***	0/2nd Coin***	1/3rd Coin	0/4th Coin****	1/5th Coin	2/5

*No Credits until 2nd coin is dropped.

**No Credits until 4th coin is dropped.

***No Credits until 3rd coin is dropped.

****No Credits until 5th coin is dropped.

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 25 and 26. Four credit limits are available. Switch settings are listed below.

MAXIMUM CREDITS	SWITCHES	
	26	25
10	OFF	OFF
15	OFF	ON
25	ON	OFF
40	ON	ON

BALLS PER GAME:	# BALLS /GAME	SWITCHES	
		32	31
	5	OFF	ON
	4	ON	OFF
	3	OFF	OFF
	2	ON	ON

MATCH FEATURE:

When the Match Feature is ON, a random number appears on 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 28
	ON	ON
	OFF	OFF
CREDIT DISPLAY:	CREDITS DISPLAYED	SWITCH 27
	YES	ON
	NO	OFF

HIGH SCORE FEATURE:

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

AWARD	SELF TEST POSITION 16	SELF TEST POSITION 17
REPLAY	SET TO "03"	SET TO "03"
EXTRA BALL	SET TO "02"	SET TO "02"
NOVELTY	SET TO "01"	SET TO "01"
NO AWARD	SET TO "00"	SET TO "00"

For combinations of replay/X-ball/Novelty Modes see page 4A "K. Special Replay/X-ball/Novelty Modes"

HIGH SCORE TO DATE OR OVER 10,000,000 SCORE FEATURE:

The game is designed to award free games as an option if high score to date is beat or player exceeds 10,000,000 points. Each time this happens, the winning score becomes the new high 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	SELF TEST POSITION 19
No Award	SET TO "00"
One Credit	SET TO "01"
Two Credits	SET TO "02"
<u>Three Credits</u>	SET TO "03"

State and local laws may regulate the use of the above features, and they have been designed to allow for appropriate adjustment in order to conform to such requirements.

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SOUND OPTION

The game is designed to make several tones and noises to announce power-up, game-up, etc. The tones are intended to attract attention to the game and increase game usage. The tones are controlled by pressing Self-Test button until the #18 shows on the match/ball in display. Now pulse replay button to desired sound setting.

Setting "00"

Most switches associated chimes without feature background.

Setting "01"

Playfield switches associated chimes with background.

Setting "02"

Most scoring will have a noise effect without background.

Setting "03"

Most all scoring will have a noise effect with background.

GAME FEATURE OPTIONS:

Saucer Special Lite Adjustment:

Liberal SW 6 ON

Conservative SW 6 OFF

More than 1 special per ball.

Only 1 special per ball.

Top Right Rebound 4 Thru 7 Card Special Adjustment:

Liberal SW 7 ON

Conservative SW 7 OFF

Hitting rebound does not put special lite out.

Hitting rebound puts special lite out.

4 Thru 7 Special Flashing Per Ball Adjustment:

Liberal SW 8 ON

Conservative SW 8 OFF

Special comes on for every ball.

Special comes on for 1, 3, 5 ball only.

4 Thru 7 Special Collected Per Game Adjustment:

Liberal SW 14 ON

Conservative SW 14 OFF

More than 1 special can be collected.

Only 1 special can be collected.

2 Card Targets Special Lite Adjustment:

Liberal SW 15 ON 16 ON

Medium SW 15 OFF 16 ON

Semi-Medium SW 15 ON 16 OFF

Conservative SW 15 OFF 16 OFF

Making all 3 targets 2 times lites Special.

Making all 3 targets 3 times lites Special.

Making all 3 targets 4 times lites Special.

Making all 3 targets 6 times lites Special.

Drop Targets Special Lite Adjustment:

Liberal SW 21 ON 22 ON

Medium SW 21 OFF 22 ON

Semi-Medium SW 21 ON 22 OFF

Conservative SW 21 OFF 22 OFF

Making all targets 1 time lites special.

Making all targets 2 times lites special.

Making all targets 3 times lites special.

Making all targets 4 times lites special.

3 Card Target Extra Ball And Special Lite Adjustment:

Liberal SW 23 ON 24 ON

Medium SW 23 OFF 24 ON

Semi-Medium SW 23 ON 24 OFF

Conservative SW 23 OFF 24 OFF

Hitting target 6 times lites extra ball, then 3 more times lites special.

Hitting target 7 times lites extra ball, then 2 more times lites special.

Hitting target 8 times lites extra ball, then 2 more times lites special.

Hitting target 9 times lites extra ball, then 2 more times lites special.

Number of Games Replays Per Game Adjustment:

Liberal SW 29 ON

Conservative SW 29 OFF

All replays earned will be collected.

Only 1 replay per player per game.

Left And Right Return Lane Arrow Lite Adjustment:

Liberal SW 30 ON

Conservative SW 30 OFF

Arrow lites are always on and Saucer spots card.

Both lites go on and off when hitting rebound switches.

C. FRONT DOOR GAME ADJUSTMENTS

High Score Feature Adjustments:

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

Any level from 10,000 to 990,000 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 (See Figure III) at one second intervals approximately six times or until identification 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, hold the credit button in and depress and release the Self-Test button. Release the credit button when the desired number appears. Note that the level changes 10,000 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 identification numbers '02' and '03' on the Match/Ball in Play display are for the second and third levels, respectively.

High Score to Date and 10,000,000 Feature:

The game is designed to award free games when 'High Score to Date' is beat, or if the player exceeds 10,000,000 points.

It is recommended that the level, which will build with 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 identification number '04' appears on the 'Match/Ball in Play' display and then do Step 2.

Any level from '00' to 9,990,000 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 self test position 19 as discussed under 'Back Box Game Adjustments.'

SELF TEST SETUP FOR 16-19:

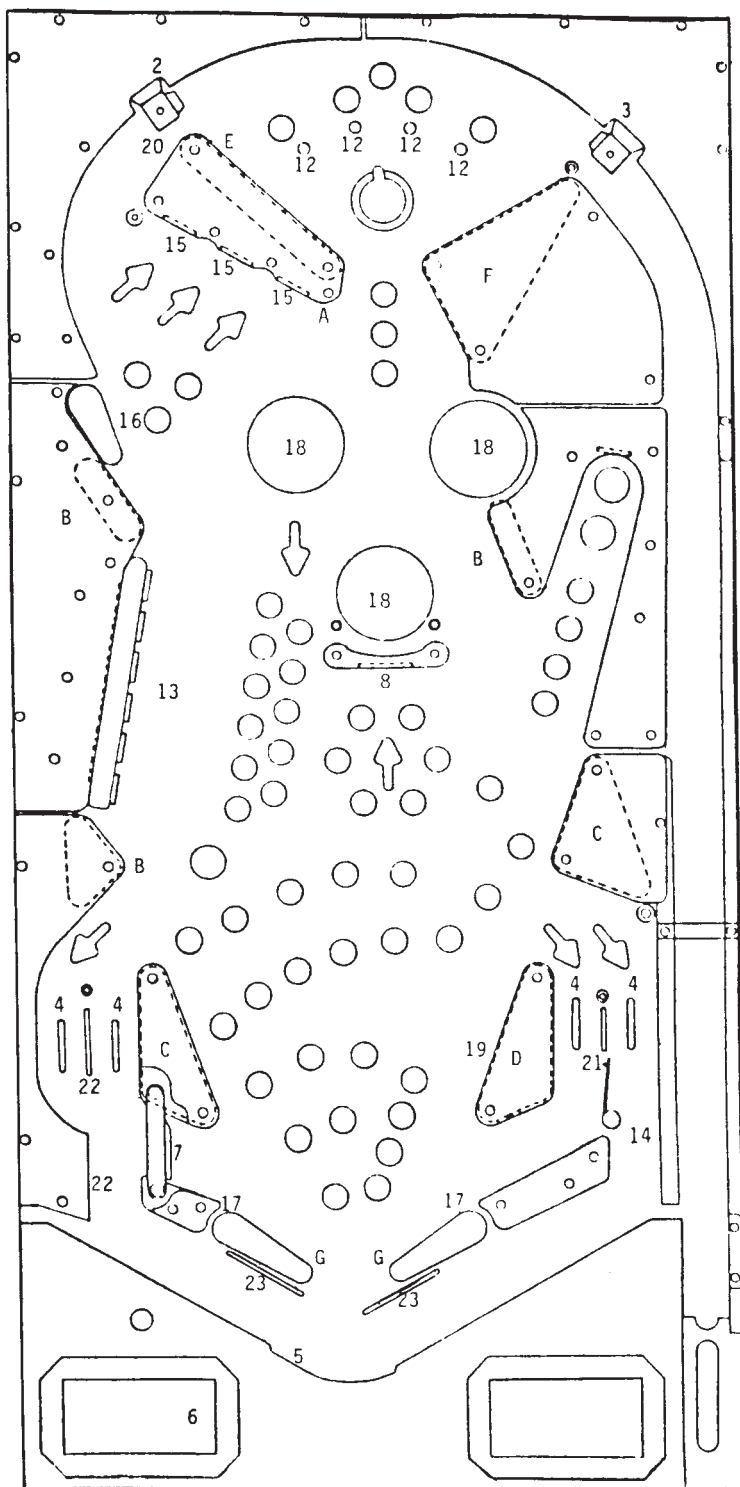
To set up positions 16-19 push and release self test button till 16 shows on match/ball in play. Now pulse replay button for recommended setup from "00" thru "03." Repeat for positions 17, 18 or 19.

SOUND

In addition to game sounds, there is also a Master Volume Control located on the front door. (refer to page 10)

Please note that these module volume controls should be adjusted prior to setting the control on the front door.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box or Coin Chute switch #3. (See Figure III.)



#0390 KINGS OF STEEL RUBBER PARTS

- A. 17-41-641 (4) POST
- B. 17-41-643 (3) 1" DIA.
- C. 17-41-645 (2) 2" DIA.
- D. 17-41-646 (1) 2½" DIA.
- E. 17-41-647 (1) 3" DIA.
- F. 17-41-648 (1) 3½" DIA.
- G. 17-41-682 (2) FLIPPER (Red)

PANEL TOP PARTS

- 1. Eject Hole Assy. A331-00034-0
- 2. Ball Gate Assy. A360-00022-0
(Left)
- 3. Ball Gate Assy. A360-00023-0
(Right)
- 4. Wire Actuator A360-00216-0
Assy. — Right
- 5. Wire Actuator A360-00217-0
Assy.
- 6. Top Mounted Kicker A360-00234-0
- 7. Ball Gate and A371-00040-0
Wire Assy.
- 8. Target Sw, Brkt, A390-00017-0
Diode, & Cap
- 9. Ball Guide Assy. A390-00018-0
- 10. Ball Guide Assy. A390-00019-0
- 11. Ball Guide Assy. A390-00020-0
- 12. Switch & Diode A390-00023-0
Assy.
- 13. Drop Target & A390-00025-0
Memory Coil Assy.
- 14. Free Gate Relay A390-00032-0
Assy.
- 15. Target SW, Brkt, A391-00043-0
Diode & Cap Assy.
- 16. Flipper & Shaft A391-00052-0
Assy. — Lt (Black)
- 17. Mold Flipper Assy. A967-00031-0
Wht — Purch.
- 18. Thumper Bumper A967-00053-0
Assy.
- 19. Slingshot Kicker A967-00059-0
Coil Assy.
- 20. Guide Wire 1¼" 360-175-4600
- 21. Guide Wire 1⅛" 360-175-3200
- 22. Guide Wire 1¾" 360-957-0084
- 23. Guide Wire 627-00172-0

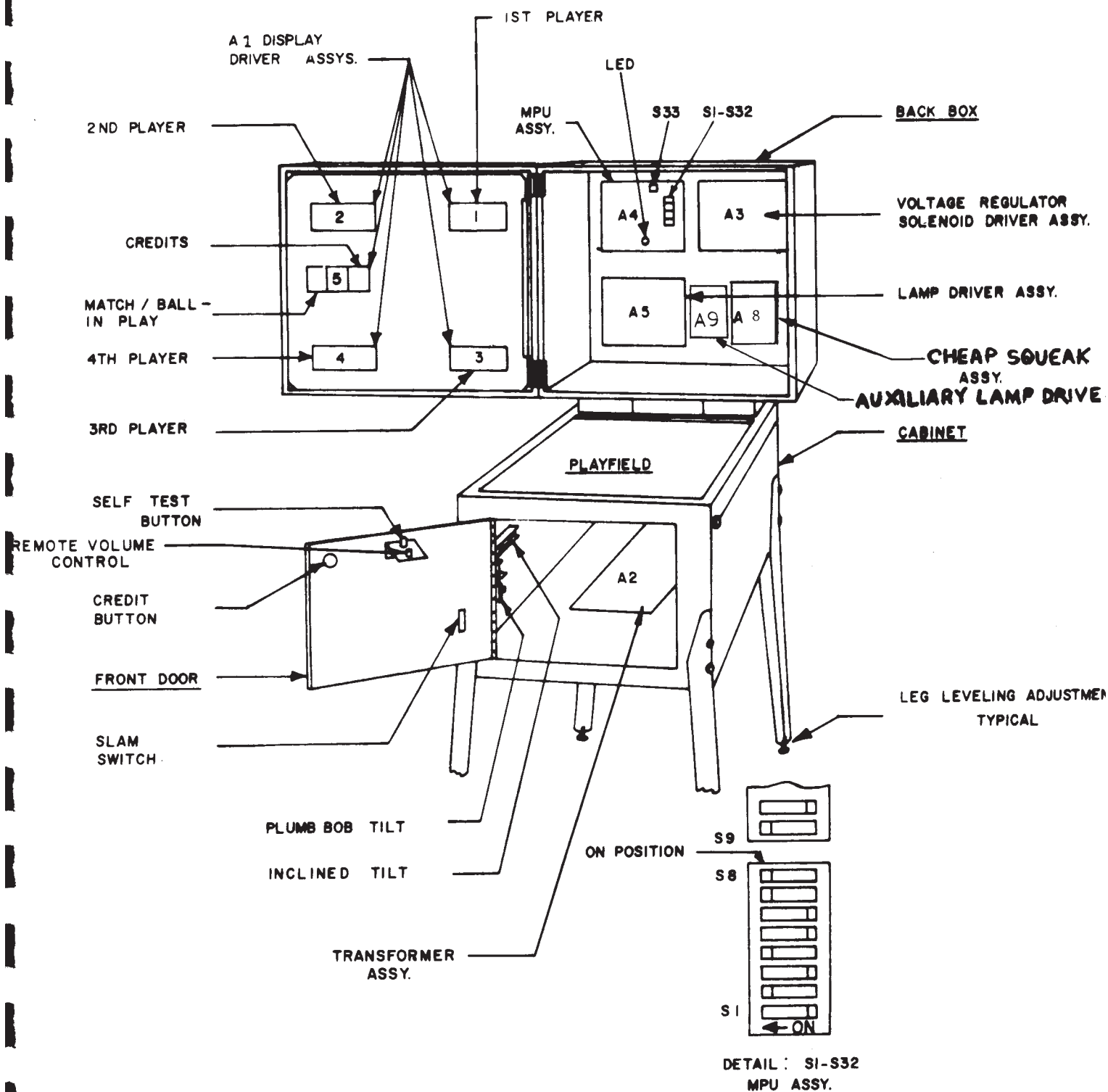


FIGURE III. ELECTRONIC PIN BALL MACHINE

RECOMMENDED

Instructions, Score Cards and High Score Feature Settings
to be used on **Kings of Steel 0390**

3-BALL		5-BALL	
REPLAYS		REPLAYS	
Instruction Card	M-051-00390-A030	Instruction Card	M-051-00390-A031
Score Card	M-051-00390-A038	Score Card	M-051-00390-A039
1 Replay at 1,100,000		1 Replay at 1,600,000	
1 Replay at 2,300,000		1 Replay at 2,700,000	
		EXTRA BALL	
		Instruction Card	M-051-00390-A033
		Score Card	M-051-00390-A039
			W/M-051-00390-A073
		1 Extra Ball at 1,900,000	
		1 Extra Ball at 3,100,000	

ADDITIONAL CARDS					
REPLAYS			EXTRA BALL		
M-051-00390-A040	700,000	1,600,000	M-051-00390-A072	1,700,000	2,900,000
M-051-00390-A041	800,000	1,700,000	M-051-00390-A073	1,900,000	3,100,000
M-051-00390-A042	900,000	1,800,000	M-051-00390-A074	2,100,000	3,300,000
M-051-00390-A043	1,000,000	1,900,000	M-051-00390-A075	2,300,000	3,500,000
M-051-00390-A044	1,000,000	2,000,000			
M-051-00390-A045	1,100,000	2,100,000			
M-051-00390-A046	1,200,000	2,200,200	Instruction Card Novelty		
M-051-00390-A047	1,200,000	2,400,000			
M-051-00390-A048	1,200,000	2,500,000	M-051-00390-A032		
M-051-00390-A049	1,300,000	2,500,000	M-051-00390-A034		
M-051-00390-A050	1,400,000	2,600,000	M-051-00390-A035		
M-051-00390-A051	1,500,000	2,700,000	M-051-00391-A036		
M-051-00390-A052	1,600,000	2,800,000	M-051-00391-A037		
M-051-00390-A053	1,700,000	2,800,000			
M-051-00390-A054	1,800,000	2,900,000	BLANKS (3)		
M-051-00390-A055	1,900,000	2,900,000	High Game to date recommended levels:		
M-051-00390-A056	2,000,000	3,200,000	(reset periodically)		
M-051-00390-A057	2,100,000	3,300,000	3 BALL 2,500,000		
M-051-00390-A064	2,200,000	3,500,000	5 BALL 2,900,000		
M-051-00390-A065	2,300,000	3,600,000			
M-051-00390-A066	2,400,000	3,800,000			
M-051-00390-A067	2,500,000	4,000,000			

Kings of Steel 0390 **RECOMMENDED SETTINGS**

RECOMMENDED REPLAY GAME SETTING FOR:

		3-BALL	5-BALL
SAUCER SPECIAL LITE	SW.6	ON	ON
TOP RIGHT REBOUND 4-7 CARD SPECIAL	SW.7	OFF	OFF
4-7 SPECIAL FLASHING PER BALL	SW.8	ON	ON
4-7 SPECIAL COLLECTED	SW.14	ON	ON
2 CARD TARGETS LITE SPECIAL	SW.15	OFF	ON
	SW.16	ON	OFF
DROP TARGETS SPECIAL LITE	SW.21	OFF	ON
	SW.22	ON	ON
3 CARD TARGET EXTRA BALL/SPECIAL	SW.23	ON	ON
	SW.24	OFF	OFF
NUMBER OF GAMES REPLAYS PER GAME	SW.29	ON	ON
LEFT AND RIGHT RETURN LANE ARROW	SW.30	ON	OFF
BALLS PER GAME	SW.31	OFF	ON
BALLS PER GAME	SW.32	OFF	OFF

REPLAYS

Instruction Card
Score Cards
Major Mode

3-BALL

M-051-00390-A030
M-051-00390-A038
Self-Test Position 16, 17
Set to "03"
SW.28 ON
Self-Test Position 19
Set to "03"

5-BALL

M-051-00390-A031
M-051-00390-A039
Self-Test Position 16, 17
Set to "03"
SW.28 ON
Self-Test Position 19
Set to "03"

X-BALL

Instruction Card
Score Card
Major Mode

Match
High Score to Date

M-051-00390-A033
M-051-00390-A039 W/M-051-00390-A073
Self-Test Position 16, 17
Set to "02"
SW.28 OFF
Self-Test Position 19
Set to "00"

NOVELTY

Instruction Card
Score Card
Major Mode

Match
High Score to Date

M-051-00390-A034
M-051-00390-A036
Self-Test Position 16, 17
Set to "01"
SW.28 OFF
Self-Test Position 19
Set to "00"

M-051-00390-A035
M-051-00390-0037
Self-Test Position 16, 17
Set to "01"
SW. 28 OFF
Self-Test Position 19
Set to "00"

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 Self-Test button again causes the sound module to play same tune repeatedly.
5. 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 'O'.
6. Pressing the Self-Test button 20 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.

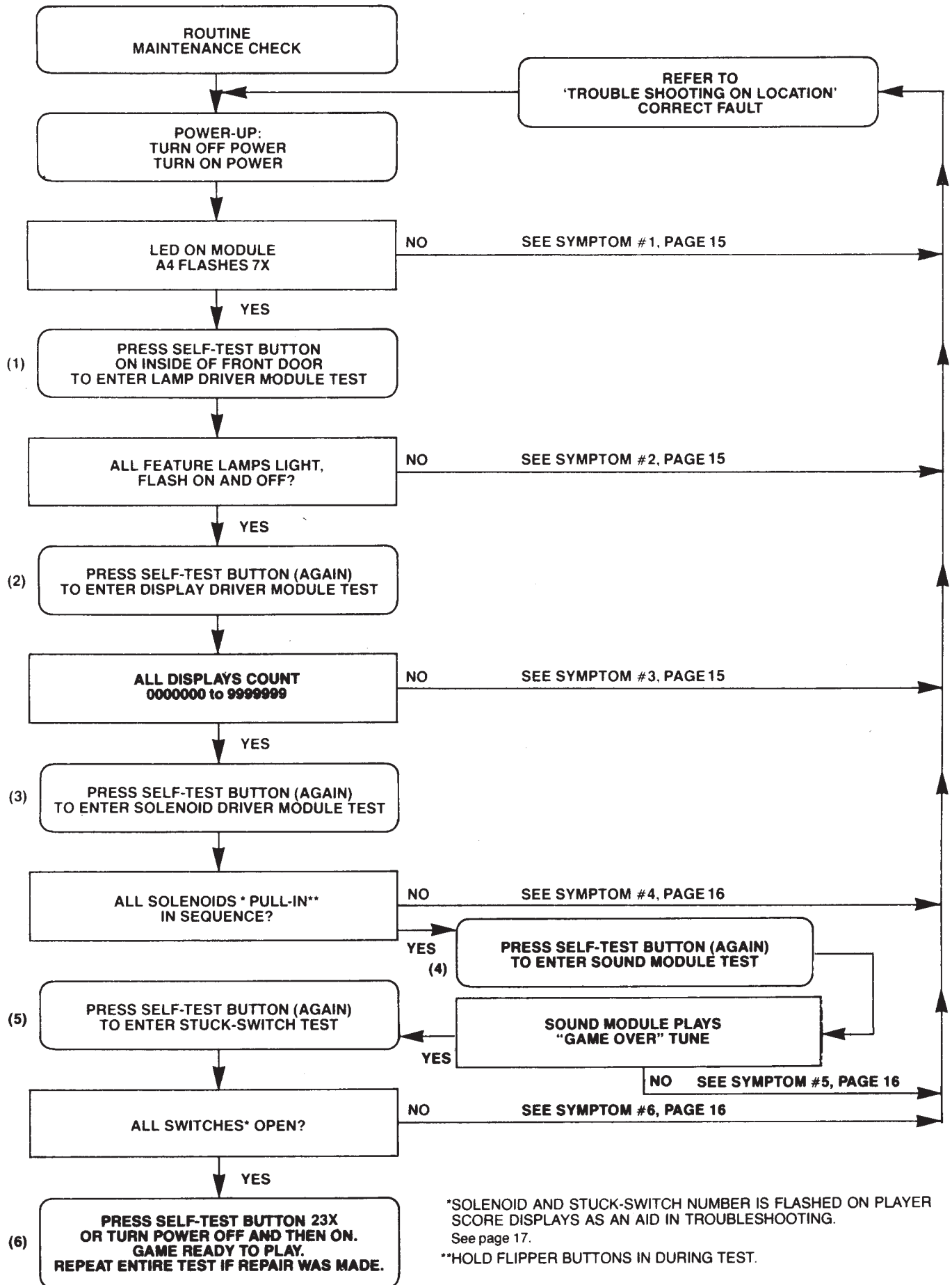
After successful completion of the Self Diagnostic Test procedure, set the game up for play. Exercise each rollover, thumper-bumper, slingshot, etc., by hand until each switch assembly on the playfield has been checked for proper operation. If actuating a switch assembly results in intermittent or no 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 this procedure, more detailed procedures are available from Bally. See the Parts List for ordering information.

FIGURE IV SELF DIAGNOSTIC 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 Sound Module A8.
 H) Repeat AA and AB if game is correct. It is now ready to play. If game is not correct, turn power OFF.
 I) Replace MPU module A4. See CAUTION NOTE, 1C.
 J) 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 (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, AG, AH and if necessary, AI and AJ.
- 5) **SYMPTOM:** No Sound.
ACTION: A) With Power ON, open front door, press Self-Test switch four times.
 B) Turn volume control clockwise to Max.
 C) If correct, sound will be heard. If incorrect, try seating speaker lead connector (J2) and input connector (J1).
 D) If correct, sound will be heard. If incorrect, refer to Module Replacement procedure."
- 6) **SYMPTOM:** Feature (Drop Targets, etc.) does not score.
ACTION: A) With power ON, open front door. Press button (Self-Test switch) five 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).
- 7) **SYMPTOM:** Game blows fuse(s) repeatedly.
ACTION: See Module Replacement Procedure. F.O. 560

*Turn power On-Off switch OFF and then ON.

GAME #0390 KINGS OF STEEL SOLENOID IDENTIFICATION TABLE

Self Test #	SOLENOID IDENTIFICATION	Self Test #	SOLENOID IDENTIFICATION
01	6 DROP TARGET RESET	09	SAUCER
02	"Q" DROP TARGET (BOTTOM)	10	OUTHOLE
03	"J" DROP TARGET (2ND FROM BOTTOM)	11	LEFT THUMPER BUMPER
04	"10" DROP TARGET	12	RIGHT THUMPER BUMPER
05	"Q" DROP TARGET (3RD FROM TOP)	13	BOTTOM THUMPER BUMPER
06	"J" DROP TARGET (2ND FROM TOP)	14	RIGHT SLINGSHOT
07	"Q" DROP TARGET (TOP)	15	GATE
08	KNOCKER	16	COIN LOCKOUT DOOR
		17	K1 RELAY (FLIPPER ENABLE)

SWITCH ASSEMBLY SELF-TEST DISPLAY NUMBERS

Switch Self Test #	DESCRIPTION	Switch Self Test #	DESCRIPTION
01	SAUCER	21	#4 BUTTON
02	RIGHT OUTLANE	22	#5 BUTTON
03	RIGHT RETURN LANE	23	#6 BUTTON
04	LEFT OUTLANE	24	#7 BUTTON
05	LEFT RETURN LANE	25	10 POINT REBOUND (3)
06	CREDIT BUTTON	26	TOP LEFT REBOUNDS (2)
07	RIGHT SLINGSHOT	27	BOTTOM THUMPER BUMPER
08	OUTHOLE	28	"K" TARGET (BOTTOM)
09	COIN III (RIGHT)	29	"K" TARGET (2ND FROM BOTTOM)
10	COIN I (LEFT)	30	"A" TARGET
11	COIN II (MIDDLE)	31	"K" TARGET (2ND FROM TOP)
12	LOWER LEFT REBOUND	32	"K" TARGET (TOP)
13	3'S TARGET	33	RIGHT THUMPER BUMPER
14	TOP RIGHT REBOUNDS (2)	34	LEFT THUMPER BUMPER
15	TILT (3)	35	"Q" DROP TARGET (BOTTOM)
16	SLAM (2)	36	"J" DROP TARGET (2ND BOTTOM)
17	WHEEL TARGET	37	"10" DROP TARGET
18	#2 TARGET (RIGHT)	38	"Q" DROP TARGET (3RD FROM TOP)
19	#2 TARGET (MIDDLE)	39	"J" DROP TARGET (2ND FROM TOP)
20	#2 TARGET (LEFT)	40	"Q" DROP TARGET (TOP)

#0390 Kings of Steel

○ INDICATES SWITCH ASSEMBLY
IDENTIFICATION NUMBERS

NOTE: CABINET: 15, 16

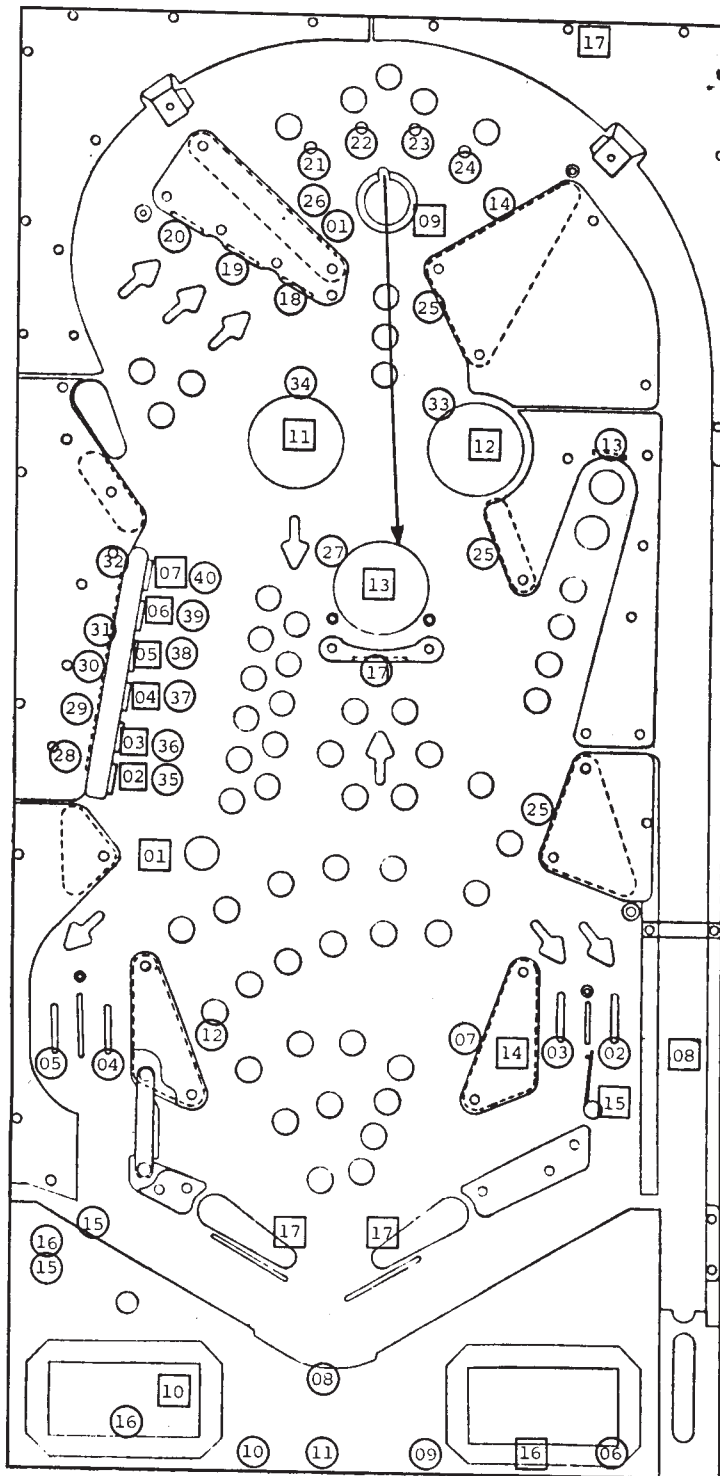
DOOR: 06, 09
10, 11, 16

□ INDICATES SOLENOID
IDENTIFICATION NUMBERS:

NOTE: DOOR: 16

BACKBOX: 17

CABINET: 08



VECTOR SHOWING FOR EJECT SAUCER

BALL SHOULD EXIT TO RIGHT SIDE
OF BOTTOM THUMPER AS
SHOWN

FIGURE V

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" over-travel 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 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 MIDWAY MFG. CO.
10601 WEST BELMONT AVENUE
FRANKLIN PARK, ILLINOIS 60131
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.

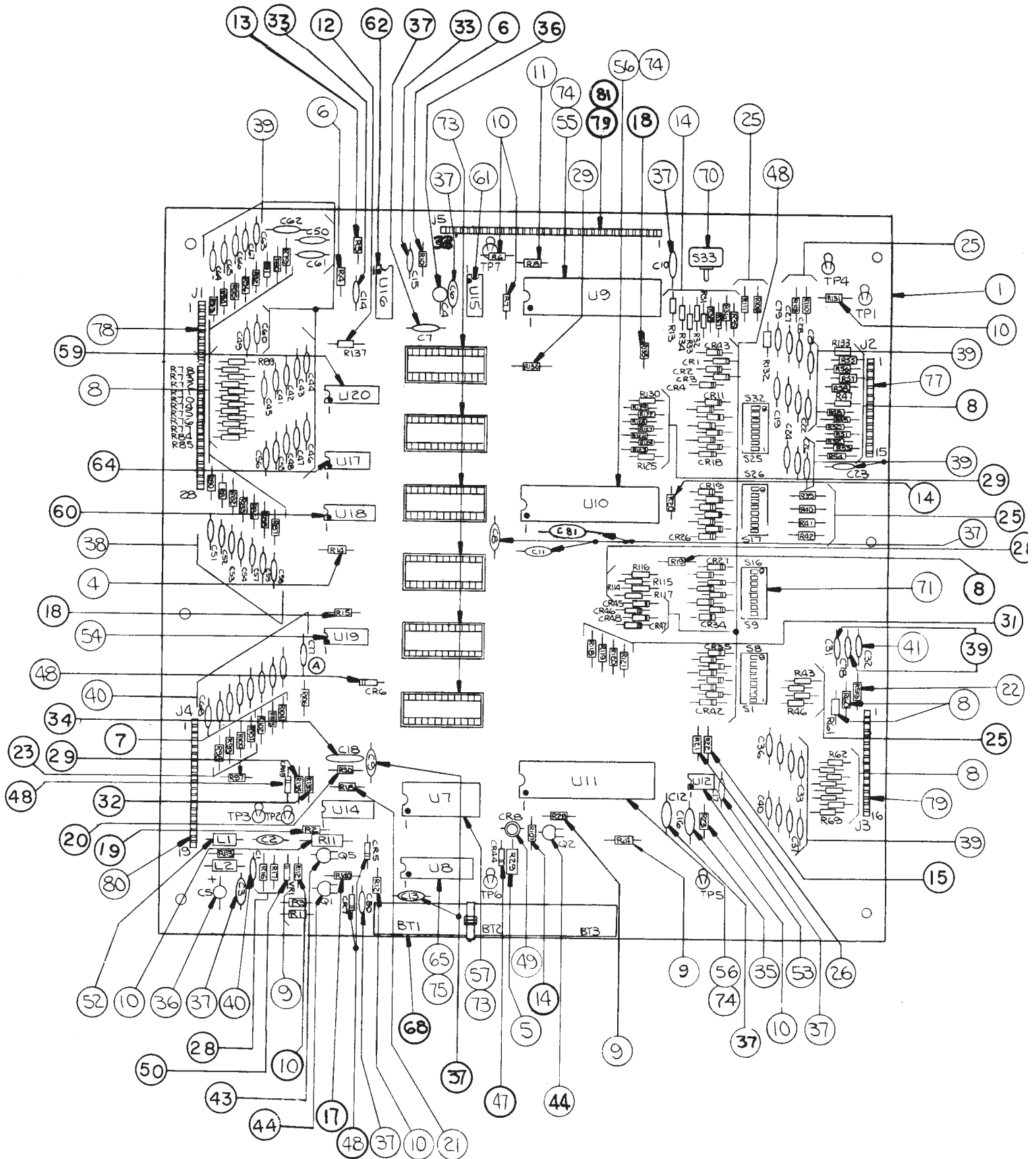
DON'T: Use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield. Do not allow a wax or polish build up. Waxes yellow with age and spoil play appeal.

XI. PARTS LIST

KINGS OF STEEL #0390

MISCELLANEOUS	MIDWAY PART NUMBER	BALLY PART NUMBER
Transformer (Domestic or Export)	MT00-00115-A000	E-122-142
Bulbs, #555	0017-00003-0484	E-125-73
Fuse, 1 Amp. 3 AG Slow Blow (Playfield Solenoid Protection)	0017-00003-0103	E-133-44
ASSEMBLY COILS		
Coin Lockout	A360-00208-0000	FO-36-7000
Flipper (3)	A360-00045-0000	AQ-25-500/ 34-4500
Drop Target Reset (2)	A360-00209-0000	NO-26-1900
Knocker	A360-00046-0000	AR-26-1200
Outhole Kicker	A360-00044-0000	AN-26-1200
Thumper Bumper (3)	A360-00044-0000	AN-26-1200
Saucer	A360-00211-0000	AO-27-1300
Individual Drop Target (6)	A360-00210-0000	CJ-31-2000
Gate	A390-00027-0000	GA-34-4000
Slingshot	A360-00046-0000	AO-26-1200
PLAYFIELD PARTS		See Figure II
MODULES		
Lamp Driver A5	A084-91613-A000	AS-2518-23
Display Driver A1 (4 used)	A084-91617-A000	AS-2518-58
Display Driver A1 (1 Used)	A084-91491-A000	AS-2518-21
MPU A4	A084-91624-A390	
Transformer & Rectifier A2	A370-00064-0000	AS-2877-6
Rectifier Board (Part of A2)	A084-91616-A000	AS-2518-54
Cheap Squeak	A084-91603-B391	
Auxiliary Lamp Driver A9	A084-91614-A000	AS-2518-43
REPAIRS PROCEDURES/AIDS		
Module & Component Replacement		F.O. 560-1
AID (Assistance in Diagnostics) Kit, used with F.O. 560-1		KIT #485-1
MODULE COMPONENTS		
SEE MODULE PARTS LIST		
MODULE COMPONENT STARTER KITS		
(Each kit contains an assortment of the most needed electronic parts for use in Module repair.)		
KIT #558—For Rectifier Board (Part of A2)		
KIT #503—For MPU Board A4 (less Memory U1-U6)		
KIT #492—For Solenoid Drive/Voltage Regulator A3		
KIT #493—For Display Drive A1		
KIT #494—For Lamp Drive A3		

A082-91624-A000 MPU MODULE

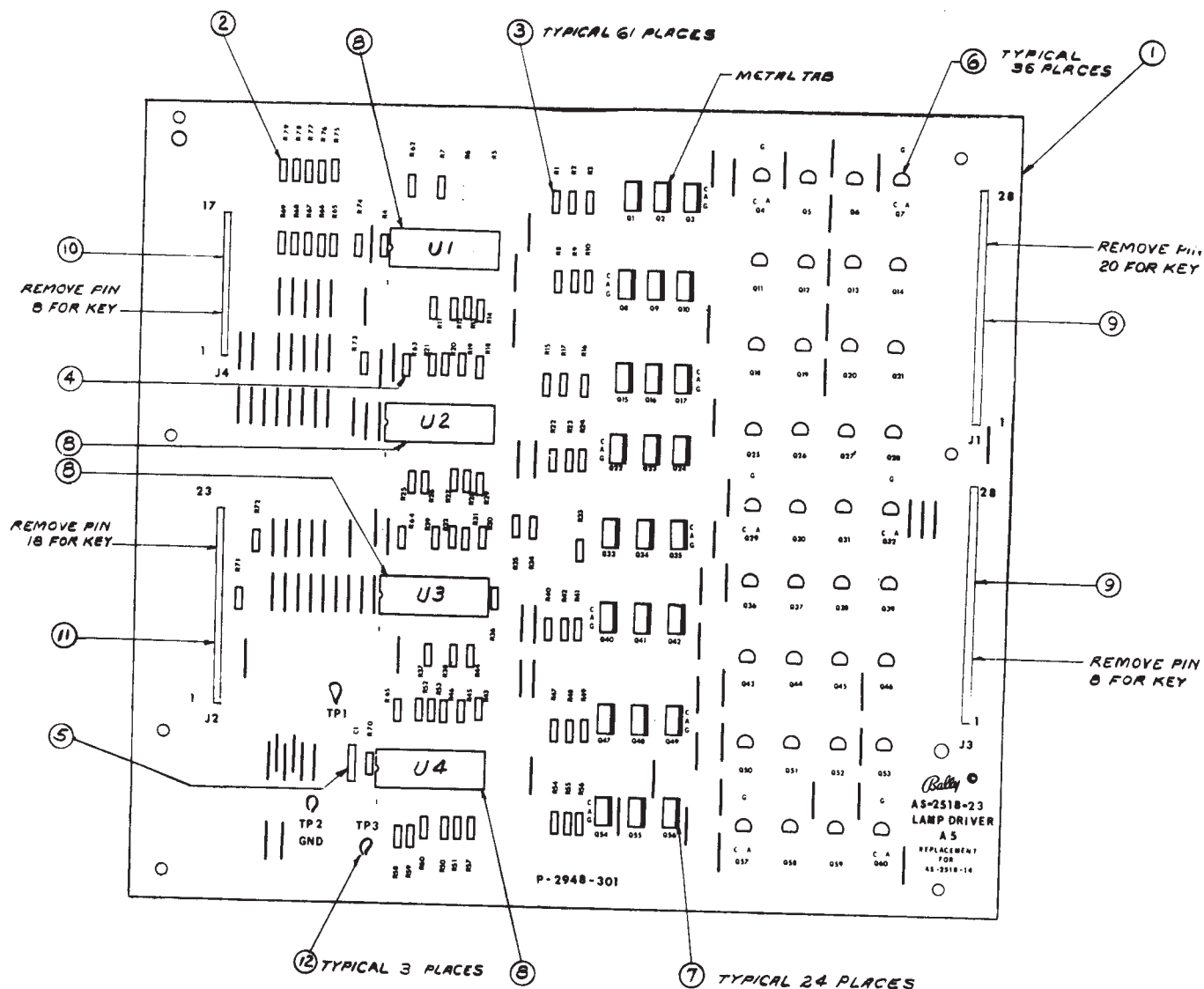


A4: MPU MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A4 (see note 1)	A084-91624-A391	MPU Module Complete.
2	A4 (see note 2)	A082-91624-A000	MPU Module less Program Memory, U1-6 incl.
3-32	See Schematic		Resistors, See schematic for value
33	C14, C15	E-00586-0067	Capacitor, 470 PFD, 1kv
34	C18	E-00586-0088	Capacitor, .05 MFD, 16V
35	C16	E-00586-0081	Capacitor, .1 MFD, 100V
36	C4, C5	E-00586-0073	Capacitor, 4.5 MFD, 25V
37	C3, C6-C13, C17, C81	E-00586-0085	Capacitor, .01 MFD, 25V
38	C79, C41-C67	E-00586-0083	Capacitor, 470 PFD, 50V
39	C19-C31, C78, C33-C40	E-00586-0082	Capacitor, 390 PFD, 50V
40	C1, C2, C68-C77	E-00586-0084	Capacitor, 820 PFD, 50V
41	C32	E-00586-0077	Capacitor, 3000 PF, 1 kv
43	Q5	E-00585-0023	Transistor PNP (MPS-3702)
44	Q1, Q2	E-00585-0031	Transistor (2N3904)
47	CR44	E-00587-0006	Diode (1N4004)
48	CR1-CR7, CR11-CR43, CR45-CR49, CR52	E-00587-0014	Diode (1N4148)
49	CR8	E-00679	LED (Green)
50	VR1	E-00598-0008	Diode Zener (8.2V, 1N9598)
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	HEX Buffer I.C. (14502B)
60	U14, U18	E-00620-0033	HEX Inverter (4049B)
61	U15	E-00620-0034	Quad Memory Drive (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-00628-0003	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	J1	E-00715-0004	28 Pin Wafer Connector
79	J3, J5	E-00715-0017	16 Pin Wafer Connector
80	J4	E-00715-0018	19 Pin Wafer Connector
81	J5	E-00715-0024	17 Pin Wafer Connector

NOTE: Order replacement memory chips U1-U6, specifying game, socket and part number stamped on chip.

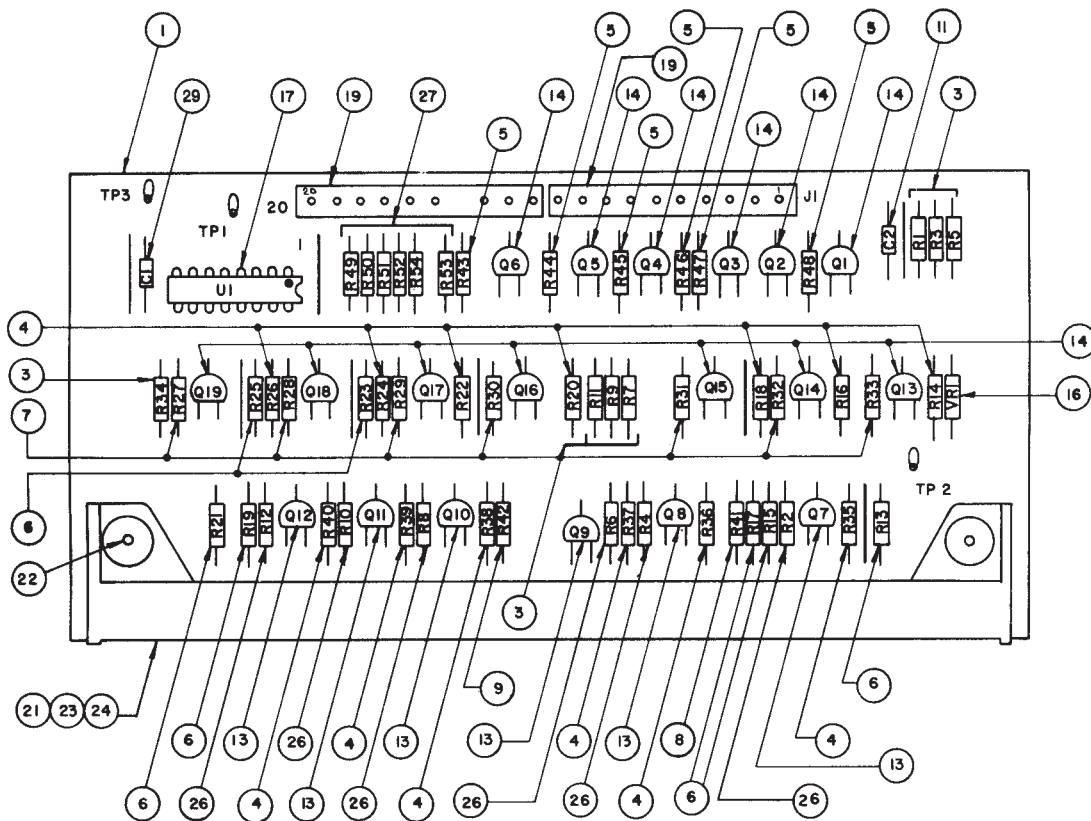
AS-2518-23 LAMP DRIVER MODULE



A5: LAMP DRIVER MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A5	AS-2518-23	Lamp Driver Module, Complete
2	R71-R79	E-00105-242	Resistor, 20k Ω , 5%, 1/4 W
3	R1-R60, R70	E-00105-0237	Resistor, 2k Ω , 5%, 1/4 W
4	R61-R69	E-00105-0256	Resistor, 2.2M Ω , 1/4 W
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-Q60	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
8	U1-U4	E-00620-0037	I.C., Decoder, 14514B
9	J1, J3	E-00715-0004	28 Pin Wafer Connector
10	J4	E-00715-0024	17 Pin Wafer Connector
11	J2	E-00715-0014	23 Pin Wafer Connector
12	TP1, TP2, TP3	P-05399	Test Clip

AS-2518-21 CREDIT DISPLAY DRIVER MODULE

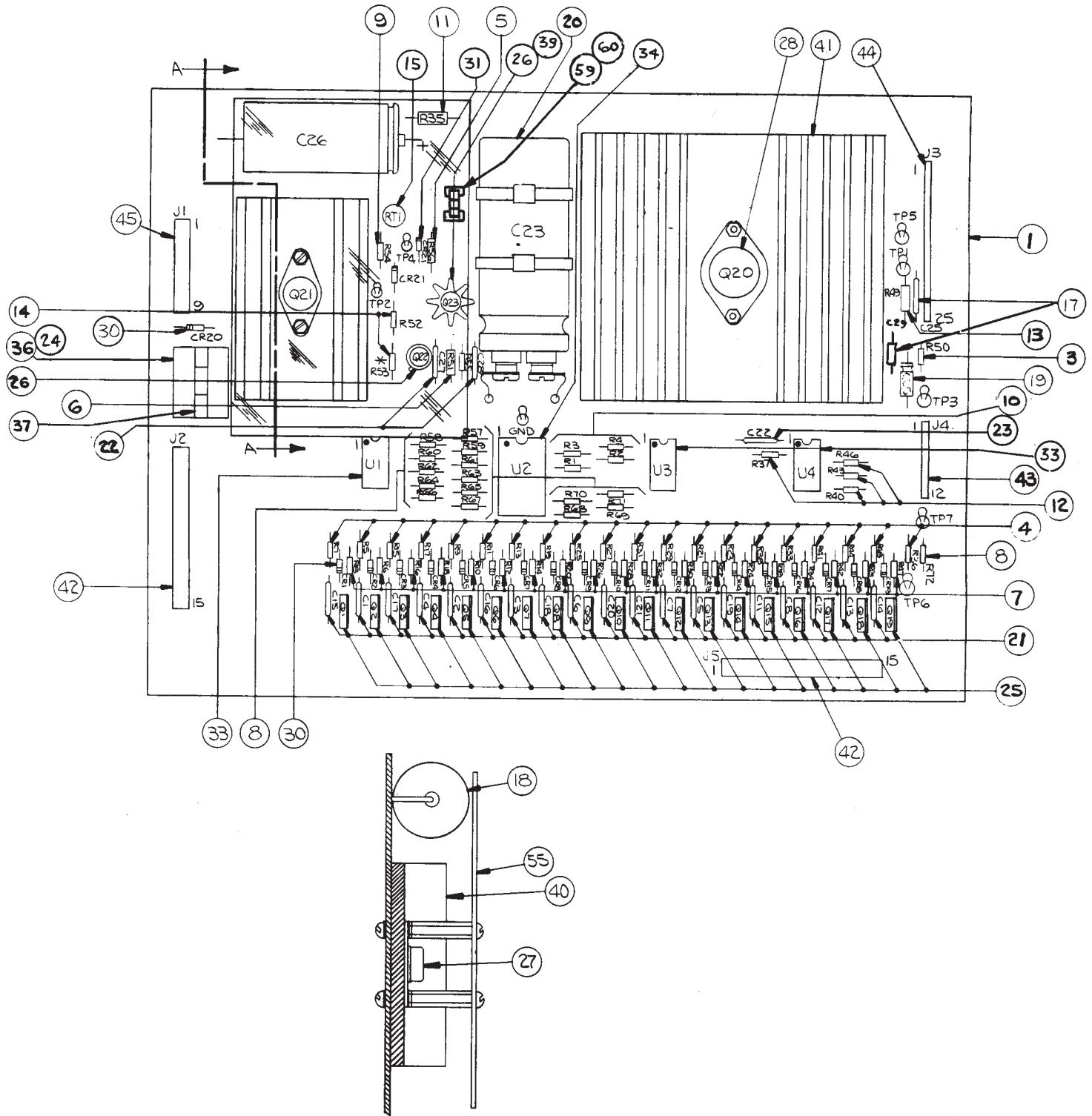


A1: 6 DIGIT DISPLAY DRIVER MODULE COMPONENT PARTS LIST

ITEM	QTY.	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	1	A1	AS-2518-21	6 Digit Display Driver, Complete
3	7	R1, R3, R5, R7, R9, R11, R34	E-105-331	Resistor, 100K Ω
4	13	R14, R16, R18, R20, R22, R24, R26, R35, R36, R37, R38, R39, R40	E-105-227	Resistor, 300K Ω
5	6	R43, R44, R45, R46, R47, R48	E-105-228	Resistor, 9.1K Ω
6	7	R13, R15, R17, R19, R21, R23, R25	E-105-229	Resistor, 1.5K Ω
7	7	R27, R28, R29, R30, R31, R32, R33	E-105-222	Resistor, 1.2K Ω
8	1	R41	E-105-231	Resistor, 39K Ω
9	1	R42	E-105-271	Resistor, 240K Ω
10				
11	1	C2	E-586-65	Capacitor, .01 MFD, 500V
13	6	Q7, Q8, Q9, Q10, Q11, Q12	E-585-32	Transistor (2N5401)
14	13	Q1, Q2, Q3, Q4, Q5, Q6, Q13, Q14, Q15, Q16, Q17, Q18, Q19	E-585-33	Transistor (MPS-A42)
16	1	VR1	E-598-7	Zener Diode, 110V
17	1	U1	E-620-38	I.C. Decoder
18				
19	2	J1	E-715-34	10 Pin Wafer Pin Connector
21	1	DS1	E-680	Digital Display Panel
22	2		M-1836	Hi-Lo Screw, W/H
23	1		P-2399	Display Mounting (Top)
24	1		P-2399-1	Display Mounting (Bottom)
26	6	R2, R4, R6, R8, R10, R12	E-105-287	Resistor, 2.2K Ω
27	6	R49, R50, R51, R52, R53, R54	E-105-242	Resistor, 20K Ω
28	As Req'd			Wire Jumper
29	1	C1	E-586-85	Capacitor, .01 MFD, 25V

NOTE: INTERCHANGEABLE WITH AS-2518-15

AS-2518-22 SOLENOID DRIVER/VOLTAGE REGULATOR MODULE



NOTE: INTERCHANGEABLE WITH AS-2518-16

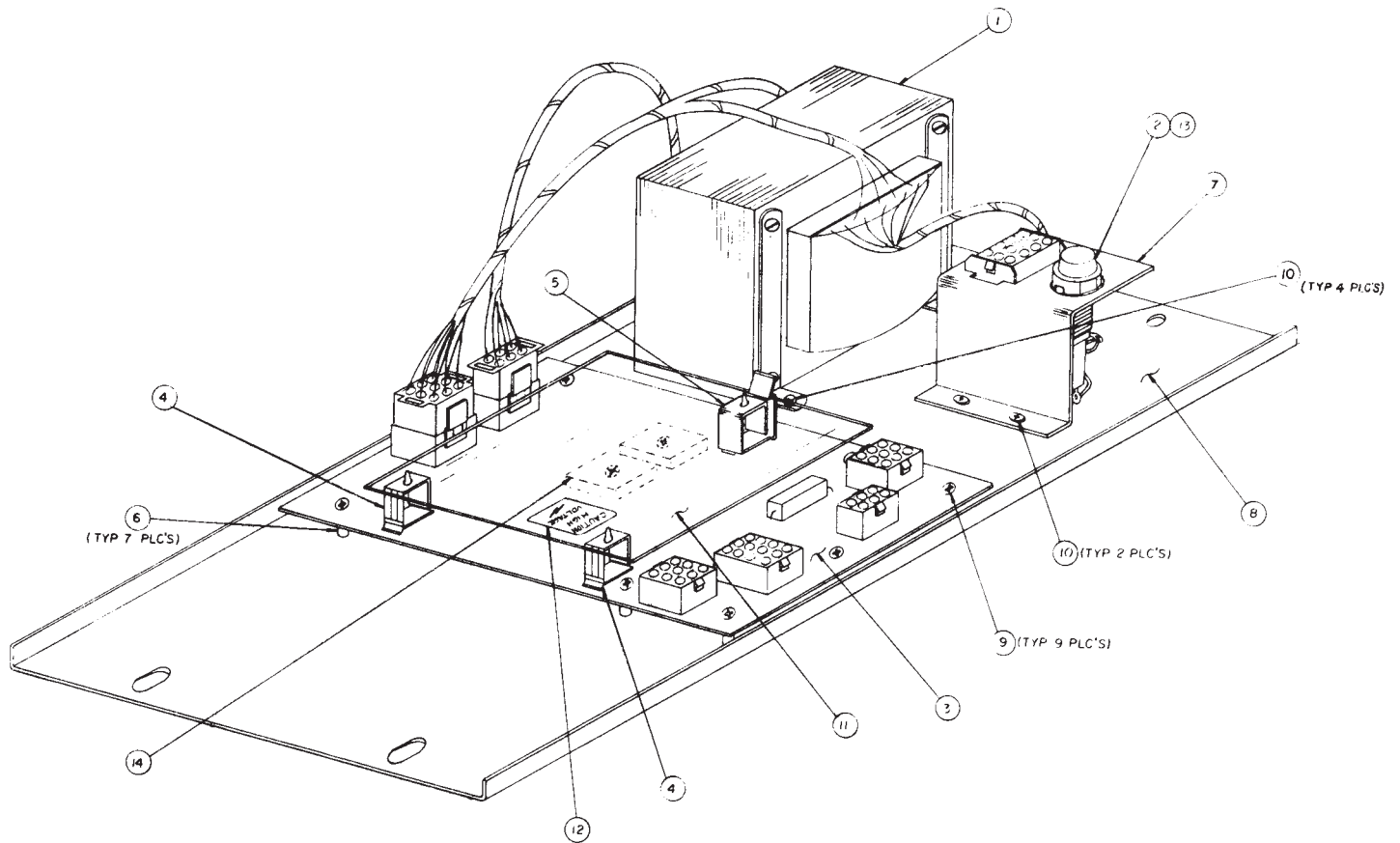
A3: SOLENOID DRIVER/VOLTAGE REGULATOR MODULE

COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A3	AS-2518-22	Solenoid Driver/Voltage Regulator Module, Complete
3-14	Resistors		Resistor, See Schematic for value.
15	RT1	E-00599-0014	Pot. (Linear) 25K
17	C25, 29	E-00586-0014	Capacitor, .1 MFD, 20V
18	C26	E-00586-0059	Capacitor, 160 MFD, 350V
19	C24	E-00586-0063	Capacitor, 2 MFD @ 25V
20	C23	E-00586-0062	Capacitor, 11700 MFD, 20V
21	C1-C8, C11-C21	E-00586-0064	Capacitor, .002 MFD, 1kv
22	C27, C28	E-00586-0065	Capacitor, .01 MFD, 500V
24	K1	E-00146-0795	Relay, Printed Circuit
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-00598-0010	Diode, Zener 140V, IN5275A
33	U1, U3, U4	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, TO5
40		E-00682-0001	Heat Sink, TO66
41		E-00682-0002	Heat Sink, TO3 Case
42		E-00715-0039	15 Pin Wafer Connector
43		E-00715-0016	12 Pin Wafer Connector
44		E-00715-0020	25 Pin Wafer Connector
45		E-00715-0033	9 Pin Wafer Connector
55		M-1838	Shield-Plexiglass
59		E-00148-0021	Fuse Clips
60	F1	E-00133-0029	Fuse 8 AG-3/16 Amp.
23	C22	E-00586-0085	Capacitor, .01 MFD, 25V

*USED WITH ITEM 24, E-00146-0791, PLUG IN RELAY ONLY

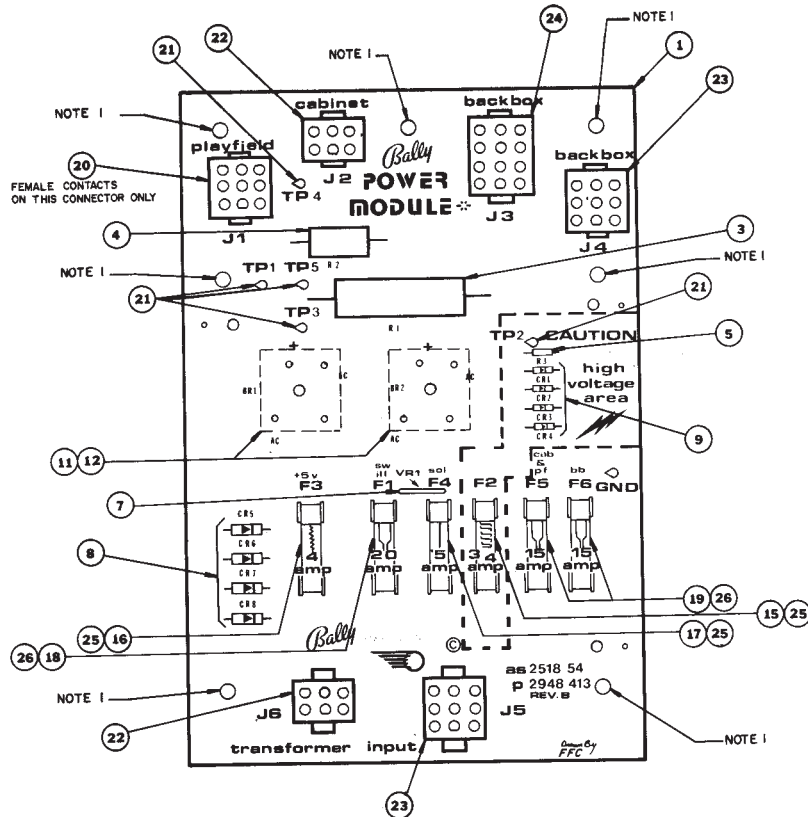
A2: POWER TRANSFORMER MODULE



COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	AS-2877-6	Power Transformer Module, Complete
1		AS-3071-2	Transformer
2		E-148-25	Fuse Holder
3	A2	AS-2518-54	Power Module Assy.
4		M-1829-4	Hinged Support
5		M-1829-3	Edge Holder
6		M-1829-5	Spacer
7		P-6442-244b	Fuse & Connect Brkt.
8		P-6442-246	Chassis
9		RLPP-832-1812	Screw
10		RLPP-1032-1806	Screw
11		P-2692-2	Shield
12		M-469-936a	High Voltage Sticker
13		E-133-24	3A S.B. Fuse
14		M-1834	H. S. Compound

AS-2518-54 RECTIFIER BOARD ASSEMBLY

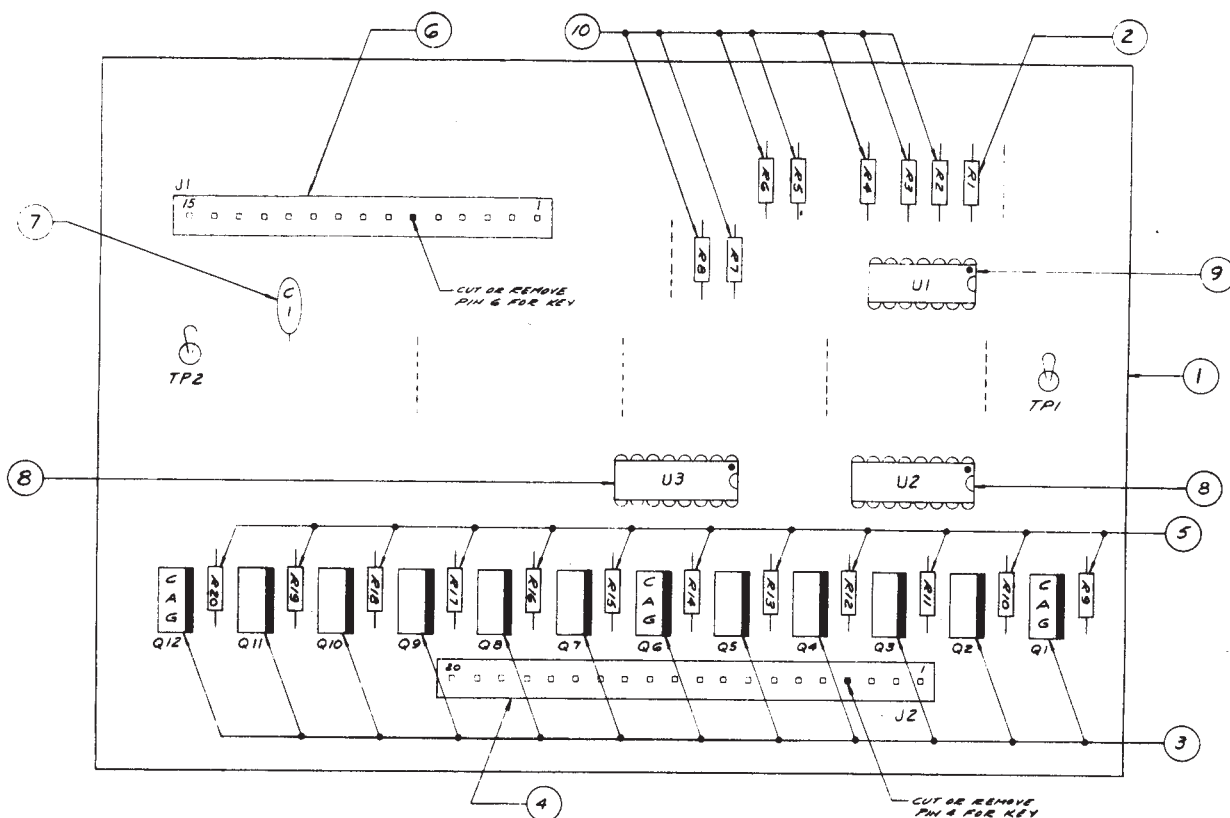


(Part of) A2: POWER TRANSFORMER MODULE COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	AS-2877-6	Power Transformer Module, Complete
1	P/O A2	AS-2518-54	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, ¼W
7	VR1	E-00623	Varistor
8	CR5, CR6, CR7, CR8	E-00587-22 or 24	3A Diode
9	CR1, CR2, CR3, CR4	E-00587-0015	Diode (IN4004)
10			
11	Used with BR1-2	P-1973-480	Spacer
12	BR1, BR2	E-00602-0007	Bridge Rectifier
15	F2	E-00133-0028	Fuse, ¾A, 250V, 3AG
16	F3	E-00133-0004	Fuse, 4A, 32V, 3AG
17	F4 NOTE 1	E-00133-0005	Fuse 5A, 32V, 3AG
18	F1	E-00133-0027	Fuse, 20A, 32V, 3AG
19	F5, F6	E-00133-0015	Fuse, 15A, 32V, 3AG
20	J1	E-806-9	9 CKT Socket Header
21	TP1, 2, 3, 4, 5	P-05399	Test Clip
22	J2, J6	E-805-6	6 CKT Pin Header
23	J4, J5	E-805-9	9 CKT Pin Header
24	J3	E-805-12	12 CKT Pin Header
25	F2, 3, 4	E-00148-0021	Fuse Clips
26	F1, 5, 6	E-00148-0022	Fuse Clips (Low Resistance)

NOTE 1—All games with 4 or more flippers use 7A

AS-2518-43 AUXILIARY LAMP DRIVER



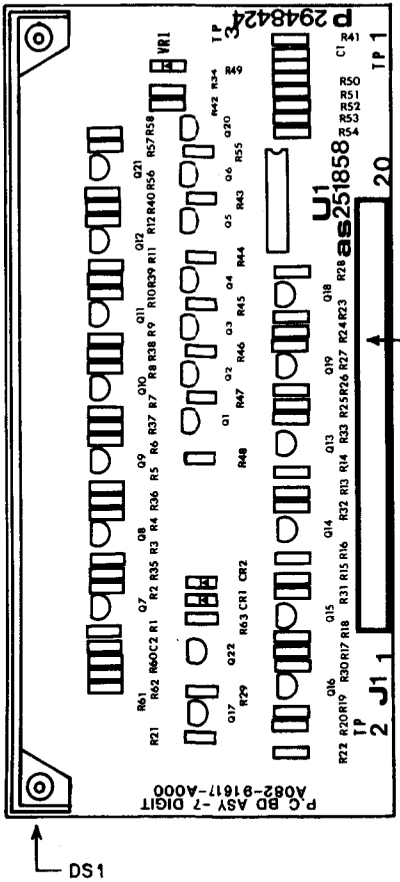
A9: AUXILIARY LAMP DRIVER COMPONENT PARTS LIST

ITEM	QTY.	REFERENCE DESIGNATION	BALLY PART NO.	DESCRIPTION
1	1	A9	AS-2518-43	Auxiliary Lamp Driver, Complete
2	1	R1	E-105-173	Resistor 2.2 Meg. Ω
3	12	Q1 Thru Q12	E-585-29	SCR MCR 106-1
4	2	J2	E-715-34	10 Pin Wafer Pin Connector
5	12	R9 Thru R20	E-105-237	Resistor 2K Ω
6	1	J1	E-715-39	15 Pin Wafer Pin Connector
7	1	C1	E-00586-0065	Capacitor .01 MFD
8	2	U3, U2	E-620-84	MC14555B Binary 1 to 4
9	1	U1	E-620-85	MC14013B Dual D Flip Flop
10	7	R2 Thru R8	E-105-242	Resistor 20K Ω

DESIGNATION LIST

CROSS REFERENCE LIST

DESIGNATION NO.	DESCRIPTION	DESIGNATION NO.	DESCRIPTION
C1	.01 MF 25V	CR1,CR2	1N4148
C2	.01 MF 500V	VR1	1N3045A/110V ZENER
R1	100K OHM 1/4W 5%	Q1-Q6	MPS-A42
R2	2.2K OHM 1/4W 5%	Q7-Q12	2N5401
R3	100K OHM 1/4W 5%	Q13-Q20	MPS-A42
R4	2.2K OHM 1/4W 5%	Q21	2N5401
R5	100K OHM 1/4W 5%	Q22	MPS-A42
R6	2.2K OHM 1/4W 5%	U1	MC14543
R7	100K OHM 1/4W 5%	DS1	DISPLAY ASS'Y
R8	2.2K OHM 1/4W 5%	J1	10 PIN WAFER KK-156 (2)
R9	100K OHM 1/4W 5%	TP1-TP3	TEST LOOPS
R10	2.2K OHM 1/4W 5%		7 DIGIT DISPLAY PCB
R11	100K OHM 1/4W 5%		BUMPER
R12	2.2K OHM 1/4W 5%		
R13	1.5K OHM 1/4W 5%		
R14	300K OHM 1/4W 5%		
R15	1.5K OHM 1/4W 5%		
R16	300K OHM 1/4W 5%		
R17	1.5K OHM 1/4W 5%		
R18	300K OHM 1/4W 5%		
R19	1.5K OHM 1/4W 5%		
R20	300K OHM 1/4W 5%		
R21	1.5K OHM 1/4W 5%		
R22	300K OHM 1/4W 5%		
R23	1.5K OHM 1/4W 5%		
R24	300K OHM 1/4W 5%		
R25	1.5K OHM 1/4W 5%		
R26	300K OHM 1/4W 5%		
R27-R33	1.2K OHM 1/4W 5%		
R34	100K OHM 1/4W 5%		
R35-R40	300K OHM 1/4W 5%		
R41	39K OHM 1/4W 5%		
R42	240K OHM 1/4W 5%		
R43-R48	9.1K OHM 1/4W 5%		
R49-R54	20K OHM 1/4W 5%		
R55	9.1K OHM 1/4W 5%		
R56	100K OHM 1/4W 5%		
R57	2.2K OHM 1/4W 5%		
R58	300K OHM 1/4W 5%		
R59	NOT USED		
R60,R61	1.5K OHM 1/4W 5%		
R62	300K OHM 1/4W 5%		
R63	150K OHM 1/4W 5%		



DESCRIPTION	QTY	DESIGNATION NO.	BALLY'S PART NOS.	MIDWAY'S PART NOS.
.01 MF 25V	1	C1	E-586-85	0360-00800-0005
.01 MF 500V	1	C2	E-586-65	0360-00800-0013
1.2K 1/4W 5%	7	R27-R33	E-105-222	100E-00005-0063
1.5K 1/4W 5%	9	R13,R15,R17,R19 R21,R23,R25,R60 R61	E-105-229	100E-00005-0065
2.2K 1/4W 5%	7	R2,R4,R6,R8,R10 R12,R57	E-105-287	100E-00005-0069
9.1K 1/4W 5%	7	R43-R48,R55	E-105-228	100E-00005-0087
20K 1/4W 5%	6	R49-R54	E-105-242	100E-00005-0095
39K 1/4W 5%	1	R41	E-105-231	100E-00005-0102
100K 1/4W 5%	8	R1,R3,R5,R7,R9, R11,R34,R56	E-105-331	100E-00001-0011
150K 1/4W 5%	1	R63	E-105-248	100E-00001-0120
240K 1/4W 5%	1	R42	E-105-271	100E-00001-0125
300K 1/4W 5%	15	R14,R16,R18,R20, R22,R24,R26,R35- R40,R58,R62	E-105-227	100E-00001-0127
1N3045A/110V ZENER	1	VR1	E-598-7	103E-00001-0028
1N4148	2	CR1,CR2	E-587-14	103E-00002-0005
2N5401	7	Q7-Q12,Q21	E-585-32	0360-00802-0006
MPS-A42	15	Q1-Q6,Q13-Q20,Q22	E-585-33	0360-00802-0007
MC14543	1	U1	E-620-38	0360-00803-0014
7 DIGIT DISPLAY DS1 MTG. HDW TACK-SCREW REPLACEMENT	1 2	DS1	E-680-7	0360-00804-0022 0095-00900-0000
DISPLAY MTG. TOP	1		P-2399	0017-00042-0155
DISPLAY MTG. BOTTOM	1		P-2399-1	0017-00042-0156
PRESSURE SENSITIVE TAPE				0017-00081-0095
BUMPER	1		R-206-9	0017-00041-0598
10 PIN WAFER KK156	2	J1	E-736-10	0151-00031-10XB
TEST LOOPS	3	TP1-TP3	P-5399	0017-00007-0131
7 DIGIT DISPLAY PCB.	1		P-2948-424	A080-91617-A000

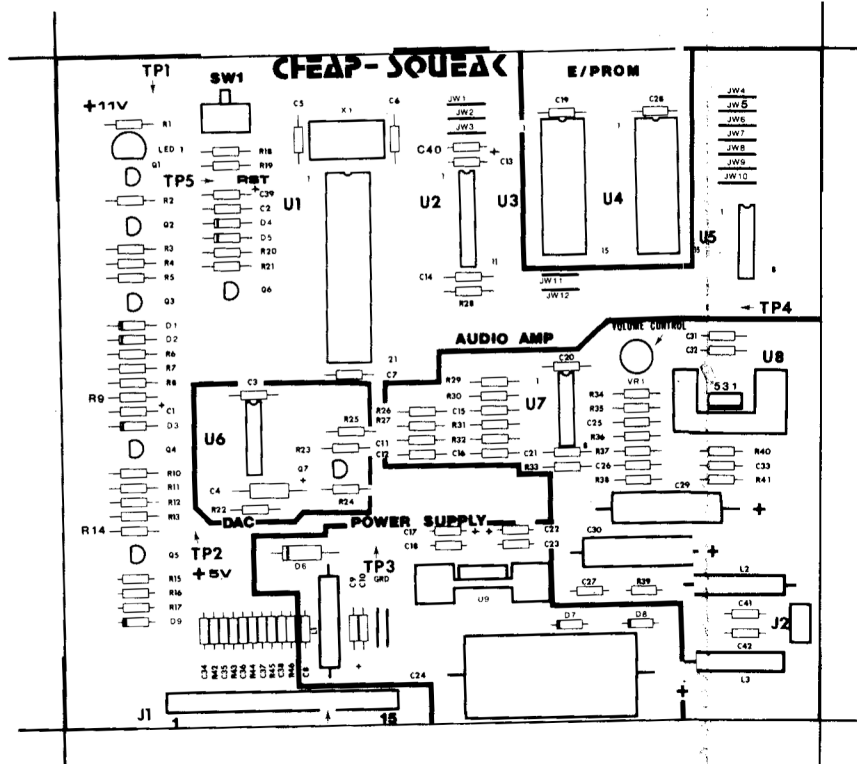
PROJECT ENG: D. MACDONALD		USED ON		REVISIONS	
DO NOT SCALE DWG		HEAT TREAT	SCALE FULL	NO. REQ'D 1 PER	
DIM. TOLERANCES UNLESS SPECIFIED		MAT'L	SEVEN DIGIT DISPLAY ASSY DWG.		PART NO.
CONSTRUCTION TOL. .001		FINISH	A082-91617-A000		M051 - 00114 - A05
FUNCTIONAL TOL. .001					
DECIMAL .001					
HOLE DIA. .001					
DATE 12-09-83					

DESCRIPTION LIST

DESIGNATION NO.	DESCRIPTION	DESIGNATION NO.	DESCRIPTION
C1	6.8 UF @ 25V,	D1-D3	1N4606
C2,C3	TANT	D4,D5	1N4004
C4	.01 UF	D6	VR332,6P30
C5,C6	47 UF @ 16V	D7,D8	1N4004
C7-C9	27 PF,5%	D9	1N9588
C10	.01 UF		
C11	4.7 UF @ 25V,	Q1	2N5305
C12,C13	TANT	Q2	2N4403
C14	3000 PF	Q3	2N3904 NPN
C15	0.1 UF	Q4	2N4403 PNP
C16	47 PF	Q5	2N3904 NPN
C17	150 PF	Q6	2N4403 PNP
C18,C19	220 PF	Q7	2N5305 NPN
C20,C21	4.7 UF @ 25V,		
C22	TANT	U1	MC 6803
C23	.01 UF	U2	LS373
C24	4700 UF @ 25V	U3,U4	EPROM
C25	100 PF	U5	LS10
C26	300 PF	U6	ZN429E-8
C27	0.1 UF	U7	LM 3900
C28	.01 UF	U8	TDA 2002
C29	470 UF @ 6V	U9	MC 7805
C30	1000 UF @ 16V	L1,L2,L3	10 UH CHOKE
C31	.33 UF	XU1	40 PIN SOCKET
C32	0.1 UF	XU3,XU4	28 PIN SOCKET
C33	.05 UF	J1	.045 PIN
C34-C38	820 PF	J2	.045 PIN
C39,C40	4.7 UF @ 25V	TP1-TP5	TEST POINT
C41,C42	TANT	LED 1	MV5254
R1	560 OHM	HEATSINK P/O U8	6030B-TT
R2	47K OHM	HEATSINK P/O U9	6100B
R3	910 OHM	SCREW P/O U8,U9	SCREW 6-32
R4	5.6K OHM	NUT P/O U8,U9	NUT 6-32
R5	62K OHM	P/O U8,U9	INSULATOR
R6	10K OHM	SW1	SWITCH P.C.B.
R7	82K OHM	X1	3.579 MHZ
R8	10K OHM		
R9	47K OHM		
R10	100 OHM		
R11	82 OHM		
R12	9.1K OHM		
R13	7.5K OHM		
R14	39K OHM		
R15,R16	2.7K OHM		
R17	1K OHM		
R18,R19	3.3K OHM		
R20	10K OHM		
R21	16K OHM		
R22	2.7K OHM		
R23	68 OHM		
R24	180 OHM		
R25,R26	100K OHM		
R27	47K OHM		
R28	120 OHM		
R29	120K OHM		
R30	130K OHM		
R31	100K OHM		
R32	200K OHM		
R33	390K OHM		
R34	470K OHM		
R35	24K OHM		
R36	180K OHM		
R37	390K OHM		
R38	2.2 OHM		
R39	1 OHM		
R40	430 OHM		
R41	220 OHM		
R42-R46	470 OHM		

VR 1

PHAN. POT O-1K 1/2W



DESCRIPTION	QTY	DESIGNATION NO.	PART NOS.	DESCRIPTION	QTY	DESIGNATION NO.	PART NOS.
27 PF,5%	2	C5,C6	0360-00800-0052	PHAN. POT O-1K 1/2W	1	VR1	0360-00804-0003
47 PF	1	C14	0360-00800-0027				
100 PF	1	C25	0360-00800-0046				
150 PF	1	C15	0360-00800-0053	1N4606	3	D1-D3	103E-00002-0006
220 PF	1	C16	0360-00800-0054	1N4004	4	D4,D5,D7,D8	03E-00003-0005
300 PF	1	C26	0360-00800-0055	VR332	1	D6	0360-00801-0007
820 PF	5	C34-C38	0360-00800-0004	1N9588 ZENER	1	D9	103E-00001-0002
3000 PF	1	C11	0360-00800-0056				
.01 UF	9	C2,C3,C7-C9,	0360-00800-0005	2N3904 NPN	2	Q3,Q5	104E-00001-0006
		C18,C19,C23,		2N4403 PNP	3	Q2,Q4,Q6	104E-00002-0006
		C28		2N5305 DARL NPN	2	Q1,Q7	104E-00001-0010
.05 UF	1	C33	0360-00800-0006				
0.1 UF	6	C12,C13,C20,	0360-00800-0058	74LS10	1	U5	0360-00803-0046
		C21,C27,C32		74LS373	1	U2	0360-00803-0059
.22 UF	2	C41,C42	0360-00800-0057	MC 6803,MPU	1	U1	0360-00803-0048
.33 UF	1	C31	0360-00800-0059	ZN429E-8,DAC	1	U6	0360-00803-0049
4.7 UF @ 25V,	5	C10,C17,C22,	0360-00800-0008	LM 3900,OP AMP	1	U7	0360-00803-0002
TANT	1	C39,C40		TDA 2002,AUD AMP	1	U8	0360-00803-0009
6.8 UF @ 25V,	1	C1	0360-00800-0048	MC 7805,+5V REG.	1	U9	0360-00803-0050
TANT							
47 UF @ 16V	1	C4	0360-00800-0042	INDUCTOR 10 UH	3	L1,L2,L3	0360-00804-0031
470 UF @ 6V	1	C29	0360-00800-0021				
1000 UF @ 16V	1	C30	0360-00800-0044	28 PIN IC SOCKET	2	XU3,XU4	0360-00804-0028
4700 UF @ 25V	1	C24	0360-00800-0023	40 PIN IC SOCKET	1	XU1	0360-00804-0018
1 OHM	1	R39	100E-00005-0002	.045 SQ. PIN	15	J1	0017-00033-0480
2.2 OHM	1	R38	100E-00005-0003	.045 SQ. PIN	2	J2	0017-00033-0480
68 OHM	1	R23	100E-00005-0029	TEST POINTS	5	TP1-TP5	0017-00007-0131
82 OHM	1	R11	100E-00005-0031	LED MV5254	1	LED 1	0360-00804-0015
100 OHM	1	R10	100E-00005-0033				
120 OHM	1	R28	100E-00005-0035	HEATSINK,6030B-TT	1	P/O U8	0360-00804-0010
180 OHM	1	R24	100E-00005-0039	HEATSINK,6100B	1	P/O U9	0360-00804-0032
220 OHM	1	R41	100E-00005-0041				
430 OHM	1	R40	100E-00005-0050	NUT 6 X 32	2	P/O U8,U9	0017-00103-0005
470 OHM	5	R42-R46	100E-00005-0051	SCREW 6 X 32	2	P/O U8,U9	0017-00101-0339
560 OHM	1	R1	100E-00005-0054				
910 OHM	1	R3	100E-00005-0059	INSULATOR,THERMAL	2	P/O U8,U9	0017-00042-0319
1K OHM	1	R17	100E-00005-0061	SWITCH	1	SW1	0017-00032-0038
2.7K OHM	3	R15,R16,R22	100E-00005-0071	CRYSTAL,3.579 MHZ	1	X1	0360-00804-0019
3.3K OHM	2	R18,R19	100E-00005-0074	P.C.B.	1		A080-91603-B000
5.6K OHM	1	R4	100E-00005-0082				
7.5K OHM	1	R13	100E-00005-0085				
9.1K OHM	1	R12	100E-00005-0087				
10K OHM	3	R6,R8,R20	100E-00005-0088				
16K OHM	1	R21	100E-00005-0165				
24K OHM	1	R35	100E-00005-0097				
39K OHM	1	R14	100E-00005-0102				
47K OHM	3	R2,R9,R27	100E-00005-0104				
62K OHM	1	R5	100E-00005-0107				
82K OHM	1	R7	100E-00005-0112				
100K OHM	3	R25,R26,R31	100E-00005-0115				
120K OHM	1	R29	100E-00005-0118				
130K OHM	1	R30	100E-00005-0119				
180K OHM	1	R36	100E-00005-0122				
200K OHM	1	R32	100E-00005-0123				
390K OHM	2	R33,R37	100E-00005-0130				
470K OHM	1	R34	100E-00005-0132				

PROJECT ENG: D. MACDONALD		USED ON		REVISIONS	
DO NOT SCALE DWG		SCALE FULL		NO. REQ'D 1 PER	
DIM TOLERANCES UNLESS SPECIFIED		DATE 8/31/83		PART NO. M751 - 00114 - B044	
CHEAP SQUEAK PC BD. ASSY.		A080-91603-B000			

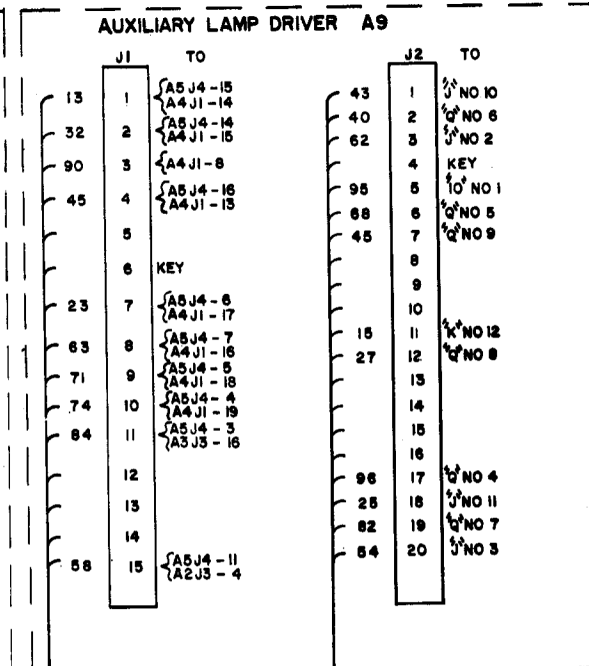
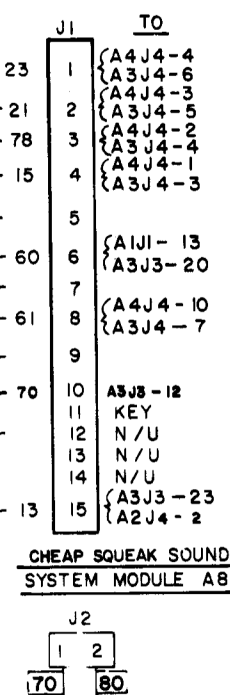
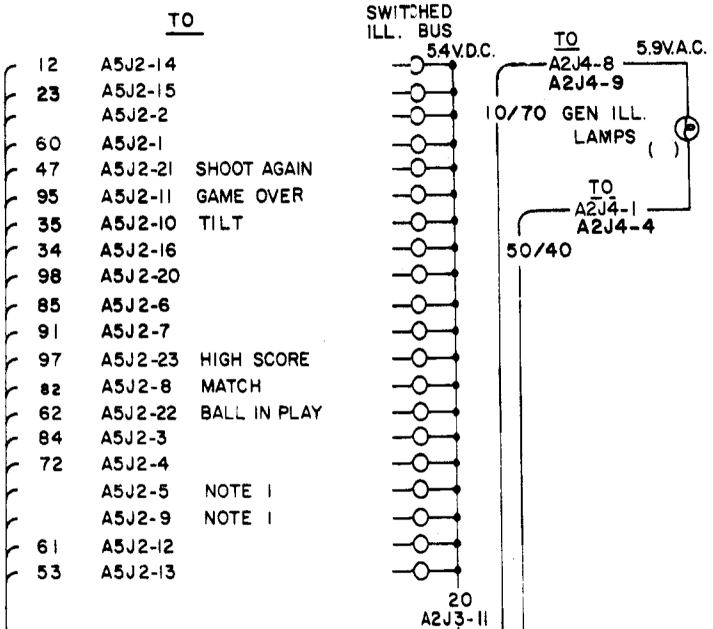
ALL DESIGN OPERATIVE AND PROCESS DATA PERTAINING TO THE ARTICLE SHOWN ON THIS SHEET IS THE PROPERTY OF BALLY MFG. CO. THIS INFORMATION IS DISCLOSED IN CONFIDENCE AND IS NOT TO BE COPIED, REPRODUCED, REVEALED TO OR APPROPRIATED BY OTHER PART OF BALLY MFG. CO. WITHOUT THE EXPRESS CONSENT OF THE OWNERS. THE PRINT IS LOANED AND MUST NOT BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF THE OWNERS AND MUST BE RETURNED ON DEMAND. Bally MANUFACTURING CORP. 2640 BELMONT AVENUE CHICAGO ILLINOIS				REMOVE ALL BURNS			
				OR BY T.M. V.		DATE 12/22/84	
				CK BY		DATE	
				TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS - DECIMALS - EXCEPT HOLE DIA S UNLESS -			
APPROV J.D				DATE 1-13-84			
APPROV G.A				DATE 1-12-84			
FINISH HARDENING				NAME WIRING DIAGRAM - CABINET			
HARDENING				WATER A.			
KINGS OF STEEL				ASSEM NO USED			
MO51-00390-A				MO51-00390-A			

AI INSERT

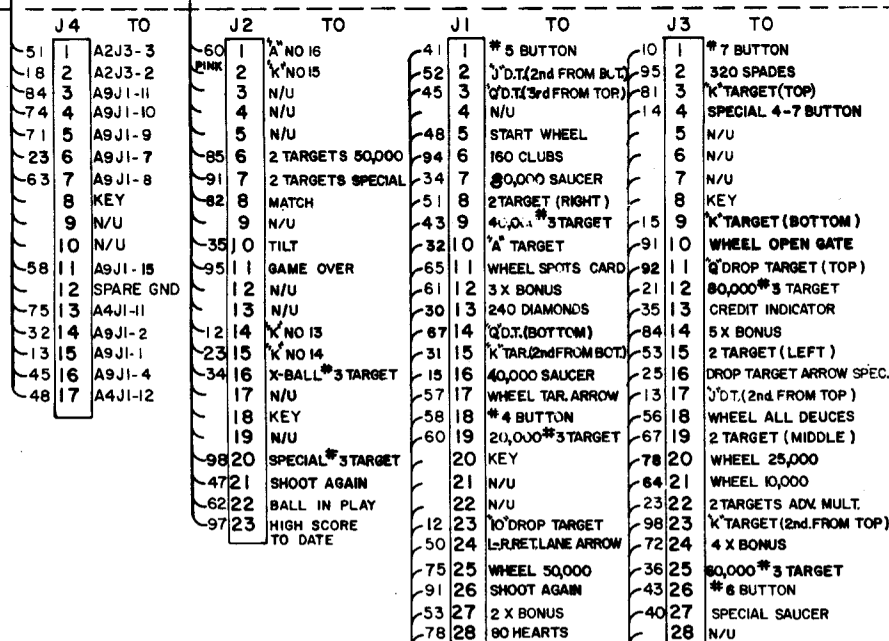
	(PLAYER 1)	(PLAYER 2)	(PLAYER 3)	(PLAYER 4)	CREDIT DISPLAY
	1A1	2A1	3A1	4A1	5A1
TO	J1	J1	J1	J1	J1
10 - A3J3-8	1	1	1	1	1
N/U	2	2	2	2	2
N/U	3	3	3	3	3
80 - A4J1-1	4	4	4	4	4
20 - A4J1-2	5	5	5	5	5
30 - A4J1-3	6	6	6	6	6
40 - A4J1-4	7	7	7	7	7
50 - A4J1-5	8	8	8	8	8
58 - A4J1-6	9	9	9	9	9
70 - A4J1-10	10	10	10	10	10
N/U	11	11	11	11	11
84 A4J1-7	12	12	12	12	12
60 - A3J3-20	13	13	13	13	13
KEY	14	14	14	14	KEY 14
85 - A4J1-20	15	31 15	72 15	67 15	18 15
54 - A4J1-28	16	16	16	16	16
38 - A4J1-27	17	17	17	17	17
25 - A4J1-26	18	18	18	18	18
51 - A4J1-25	19	19	19	19	19
45 - A3J3-17	20	20	20	20	20

A4J1-21 A4J1-22 A4J1-23 A4J1-24

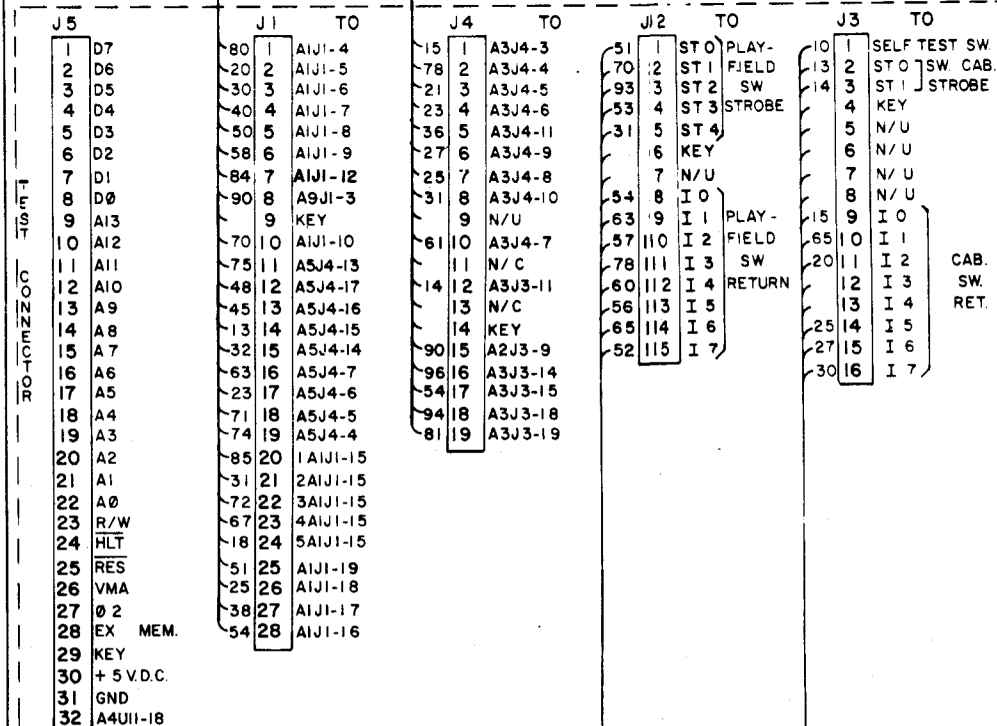
INSERT TO BACK CAB
PLUG



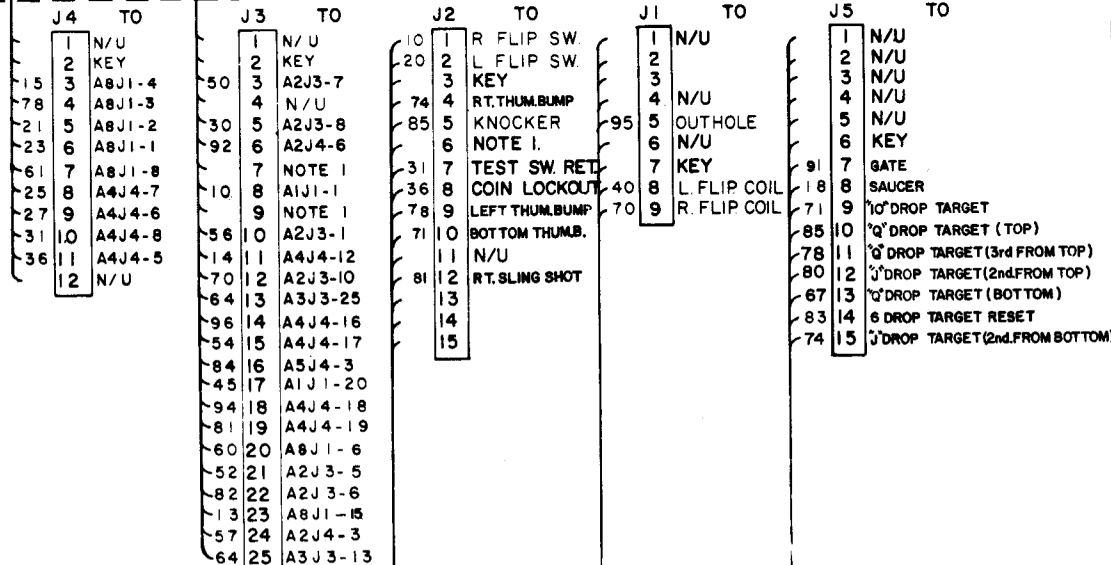
LAMP DRIVER A5



MPU A4



VOLTAGE REGULATOR / SOLENOID DRIVER A3

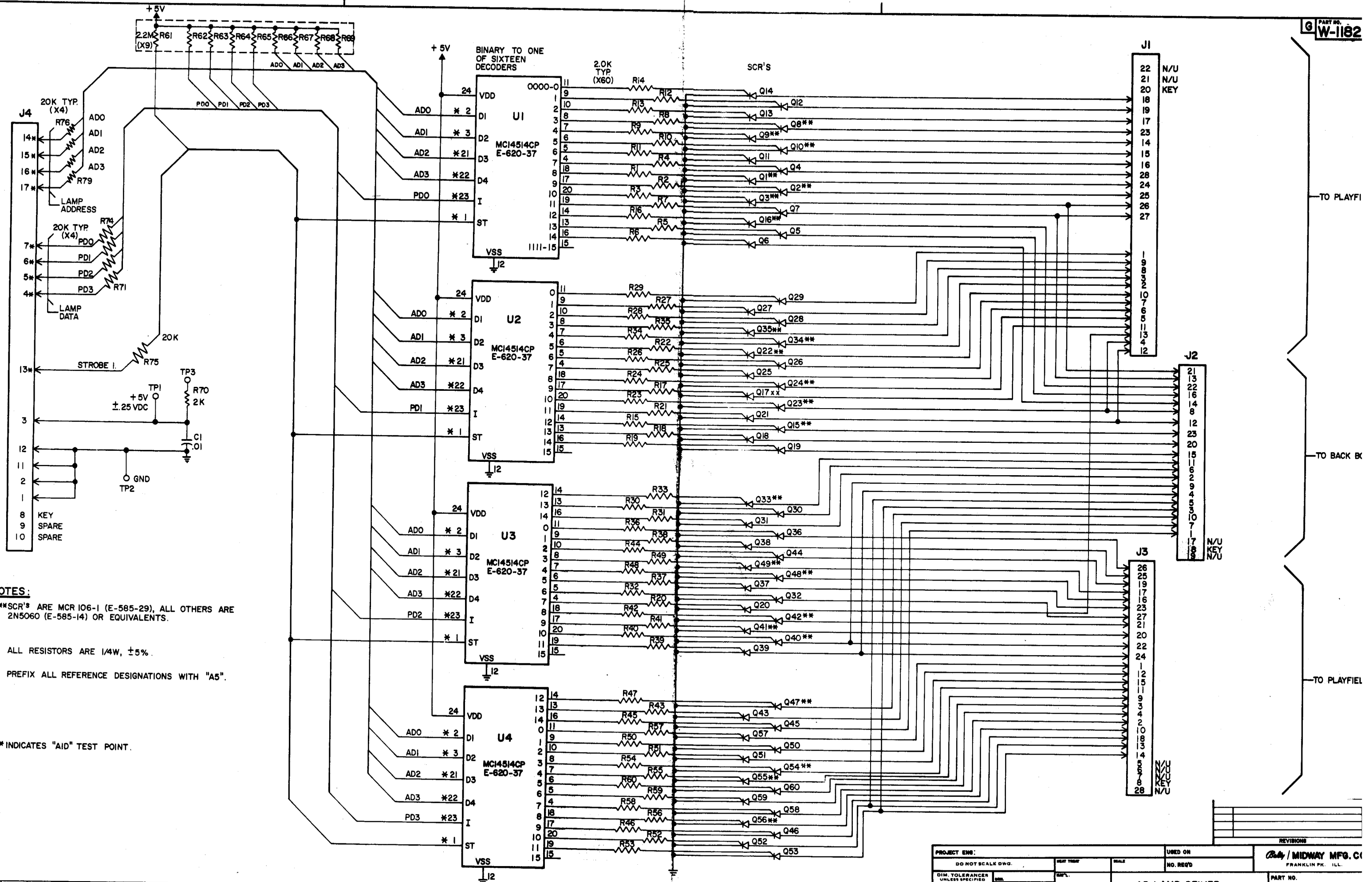


TO LOWER
CABINET
TO PLAYFIELD

1. THESE PINS ARE RESERVED FOR FUTURE USE.
2. WIRE COLOR ARE SHOWN FOR ALL CONNECTOR PINS, SOME WIRE MAY NOT BE USED IN ALL GAMES.
3. * INDICATES AID TEST POINT.

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

ALL DESIGN, PERMIT AND PATENT DATA PERTAINING TO THE ARTICLE SHOWN ON THIS SHEET IS THE PROPERTY OF BALLY MANUFACTURING CORP. ANY REPRODUCTION OF ANY PART OF THIS SHEET WITHOUT WRITTEN PERMISSION OF BALLY MANUFACTURING CORP. IS PROHIBITED. ANY REPRODUCTION OF ANY PART OF THIS SHEET WITHOUT THE EXPRESS CONSENT OF THE OWNERS OF THE PATENT IS PROHIBITED AND MUST NOT BE USED IN ANY MANNER THAT WOULD INFRINGE THE PATENT AND MUST BE RETURNED TO THE MANUFACTURER.				DR BY <u>DATE</u> 12/13/83		Bally MANUFACTURING CORP. 2640 BELMONT AVENUE CHICAGO, ILLINOIS	
				CK BY <u>DATE</u>		PRINTED ON <u>DATE</u> 1-18-84	
REMOVE ALL BURRS				AP'D BY <u>DATE</u> JD 1-18-84		MATERIAL KINGS OF STEEL	
TOLERANCES ON DIMENSIONS UNLESS OTHERWISE SPECIFIED FRACTIONS : 64 DECIMALS .005 ANGLES : 1				AND BY <u>DATE</u> GG 1-18-84		PART NO M051-00390-	
DO NOT SCALE DRAWING				FINISH		LET CHANGE DATE BY CK	



A5 LAMP DRIVER LOCATION

SCR	DESCRIPTION	JACK	PIN NO.	WIRE COLOR
Q22**	"A" TARGET	J1	10	32
Q45	"A" NO 16	J2	1	60
Q16**	BALL IN PLAY	J2	22	62
Q52	CREDIT INDICATOR	J3	13	35
Q48**	DROP TARGET ARROW SPECIAL	J3	16	25
Q33**	GAME OVER	J2	11	95
Q15**	HIGH SCORE TO DATE	J2	23	97
Q34**	"J" DROP TARGET (2ND FROM BOTTOM)	J1	2	52
Q49**	"J" DROP TARGET (2ND FROM TOP)	J3	17	13
Q10**	"K" TARGET (2ND FROM BOTTOM)	J1	15	31
Q37	"K" TARGET (2ND FROM TOP)	J3	23	98
Q55**	"K" TARGET (BOTTOM)	J3	9	15
Q60	"K" TARGET (TOP)	J3	3	81
Q6	"K" NO 13	J2	14	12
Q19	"K" NO 14	J2	15	23
Q31	"K" NO 15	J2	2	PINK
Q1**	L. AND R. RETURN LANE ARROW	J1	24	50
Q23**	MATCH	J2	8	82
Q9**	"Q" DROP TARGET (BOTTOM)	J1	14	67
Q54**	"Q" DROP TARGET (TOP)	J3	11	92
Q35**	"Q" DROP TARGET (3RD FROM TOP)	J1	3	45
Q3**	SHOOT AGAIN (BACKBOX)	J2	21	47
Q3**	SHOOT AGAIN (PLAYFIELD)	J1	26	91
Q32	SPECIAL SAUCER	J3	27	40
Q18	SPECIAL #3 TARGET	J2	20	98
Q59	SPECIAL 4-7 BUTTON	J3	4	14
Q24**	START WHEEL	J1	5	48
Q47**	TILT	J2	10	35
Q46	WHEEL ALL DEUCES	J3	18	56
Q56**	WHEEL OPEN GATE	J3	10	91
Q17**	WHEEL SPOTS CARD	J1	11	65
Q13	WHEEL TARGET ARROW	J1	17	57
Q42**	WHEEL 10,000	J3	21	64
Q41**	WHEEL 25,000	J3	20	78
Q2**	WHEEL 50,000	J1	25	75
Q5	X-BALL #3 TARGET	J2	16	34
Q14	#4 BUTTON	J1	18	58
Q29	#5 BUTTON	J1	1	41
Q36	#6 BUTTON	J3	26	43
Q57	#7 BUTTON	J3	1	10
Q11	40,000 SAUCER	J1	16	15
Q26	80,000 SAUCER	J1	7	34
Q51	2 TARGET (LEFT)	J3	15	53
Q44	2 TARGET (MIDDLE)	J3	19	67
Q28	2 TARGET (RIGHT)	J1	8	51
Q40**	2 TARGETS ADVANCE MULT.	J3	22	23
Q43	2 TARGETS SPECIAL	J2	7	91
Q30	2 TARGETS 50,000	J2	6	85
Q8**	"10" DROP TARGET	J1	23	12
Q12	20,000 #3 TARGET	J1	19	60
Q27	40,000 #3 TARGET	J1	9	43
Q38	60,000 #3 TARGET	J3	25	36
Q50	80,000 #3 TARGET	J3	12	21
Q4	80 HEARTS CARD	J1	28	78
Q25	160 CLUBS CARD	J1	6	94
Q20	240 DIAMONDS CARD	J1	13	30
Q58	320 SPADES CARD	J3	2	95
Q7	2X BONUS	J1	27	53
Q21	3X BONUS	J1	12	61
Q39	4X BONUS	J3	24	72
Q53	5X BONUS	J3	14	84

NOTE: ** INDICATES MCR106-1 ALL OTHERS ARE 2N5060 OR EQUIVALENTS.

A9 AUXILIARY LAMP DRIVER LOCATION

SCR	DESCRIPTION	JACK	PIN NO.	WIRE COLOR
Q1	"J" NO. 10	J2	1	43
Q2	"Q" NO. 6	J2	2	40
Q3	"J" NO. 2	J2	3	62
Q4	"10" NO. 1	J2	5	68
Q5	"Q" NO. 5	J2	6	45
Q6	"Q" NO. 9	J2	7	95
Q7	"K" NO. 12	J2	11	15
Q8	"Q" NO. 8	J2	12	27
Q9	"Q" NO. 4	J2	17	96
Q12	"J" NO. 11	J2	18	25
Q11	"Q" NO. 7	J2	19	82
Q10	"J" NO. 3	J2	20	54

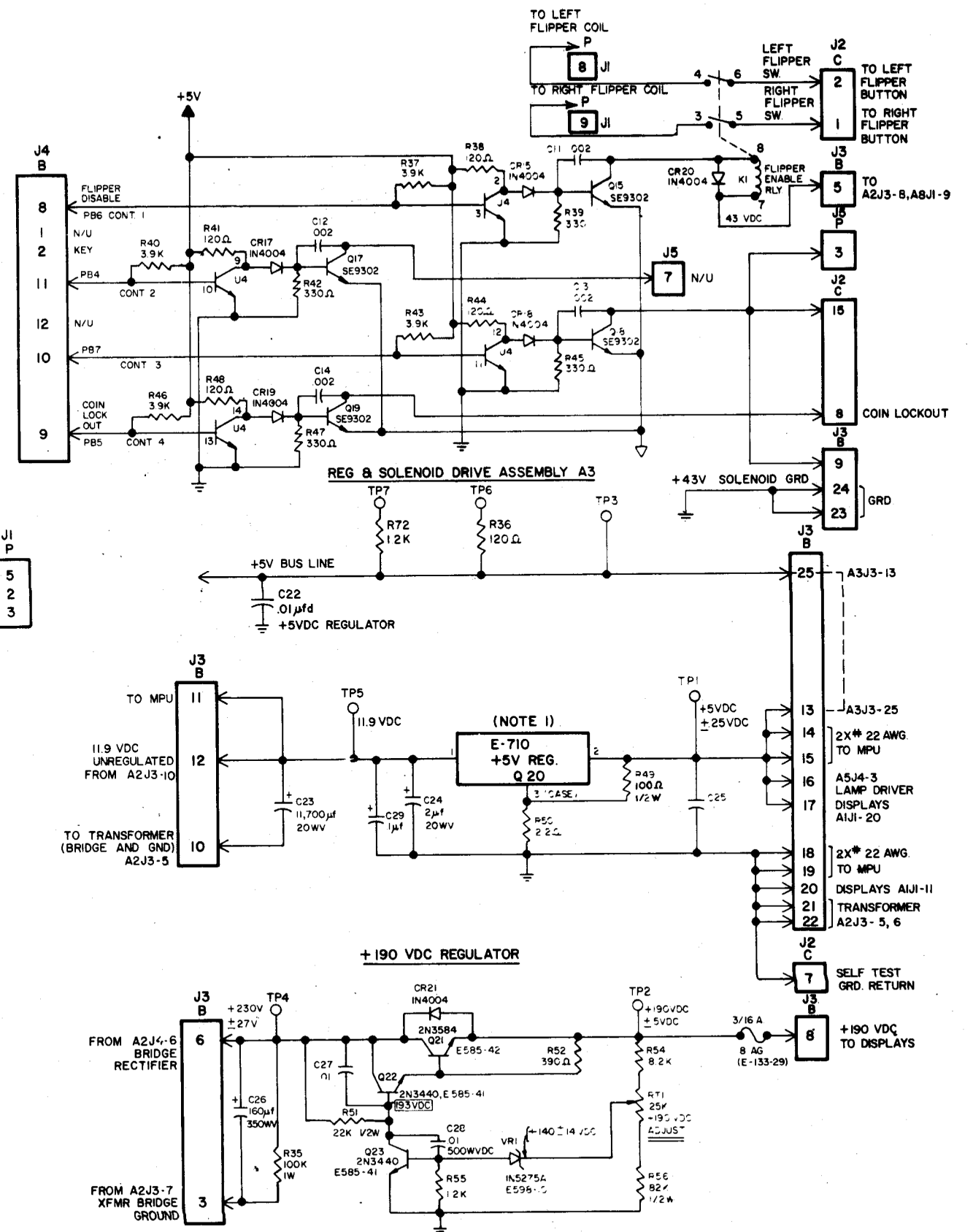
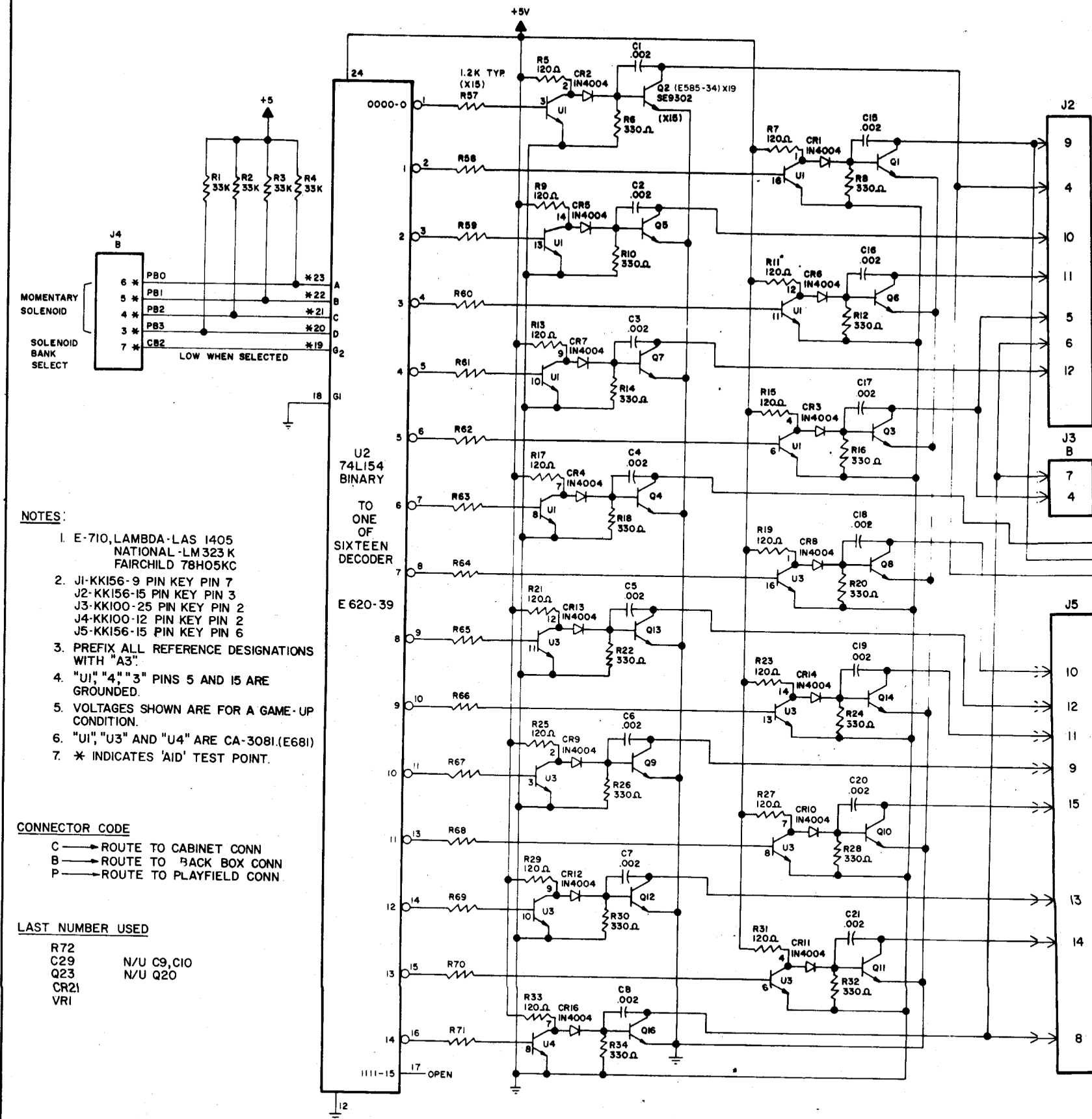
NOTE: SCR'S ARE MCR-106-1,

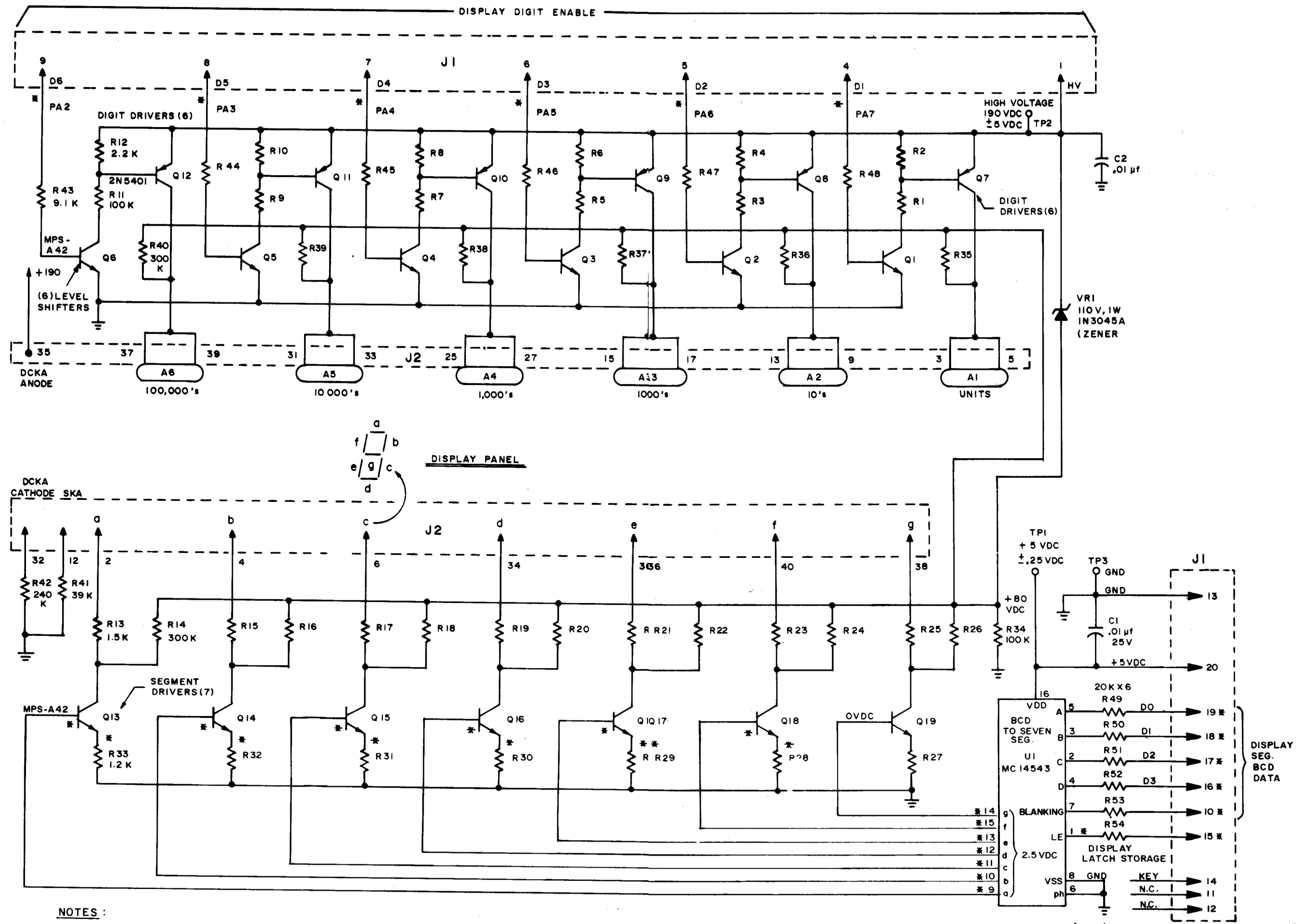
A3 SOLENOID DRIVER LOCATION

TRANSISTORS	DESCRIPTION	JACK	PIN NO.	WIRE COLOR
Q5	BOTTOM THUMPER BUMER	J2	10	71
Q19	COIN LOCKOUT (DOOR	J2	8	36
Q17	GATE	J5	7	91
Q10	"J" DROP TARGET (2ND FROM BOTTOM)	J5	15	74
Q13	"J" DROP TARGET (2ND FROM TOP)	J5	12	80
Q3	KNOCKER	J2	5	85
Q1	LEFT THUMPER BUMPE.	J2	9	78
Q4	OUTHOLE	J1	5	95
Q12	"Q" DROP TARGET (BTOM)	J5	13	67
Q8	"Q" DROP TARGET (TP)	J5	10	85
Q14	"Q" DROP TARGET (3D FROM TOP)	J5	11	78
Q2	RIGHT THUMPER BUMPR	J2	4	74
Q7	RIGHT SLINGSHOT	J2	12	81
Q16	SAUCER	J5	8	18
Q11	6 DROP TARGET RESE	J5	14	83
Q9	"10" DROP TARGET	J5	9	71

NOTE: TRANSISTORS ARE SE930 OR EQUIVALENT

WIRE COLOR CODE	
1-RED -R-	6-BROWN -BR-
2-BLUE -BLU-	7-ORANGE -O-
3-YELLOW -Y-	8-BLACK -B-
4-GREEN -G-	9-GRAY
5-WHITE -W-	0-NO TRACER
J-JUMPER	
1-FIRST NUMBER BODY COLOR	
2-SECOND NUMBER TRACER COLOR	
EXAMPLE: 50 WHITE	
51 WHITE-RED	

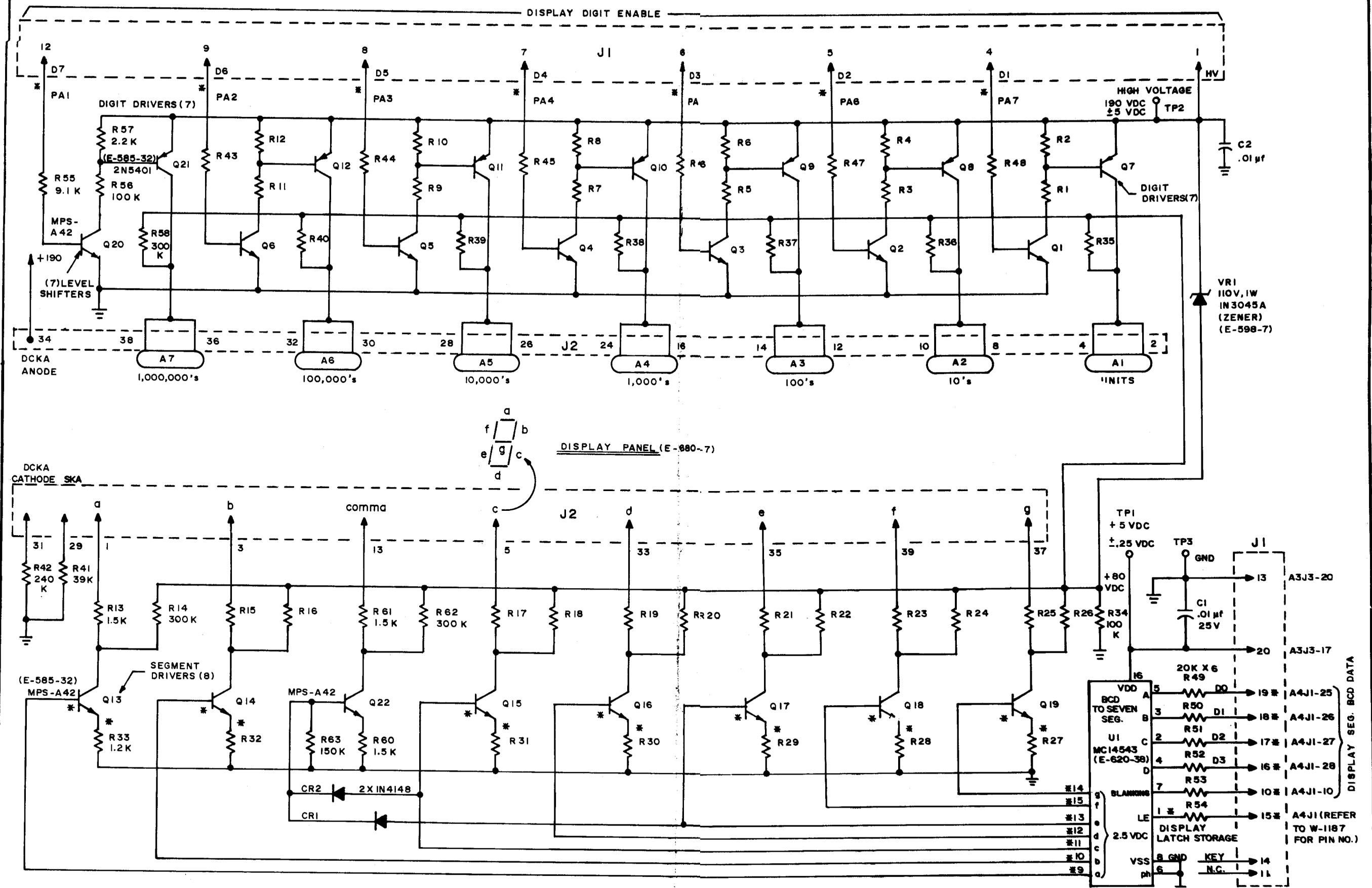




NOTES:

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

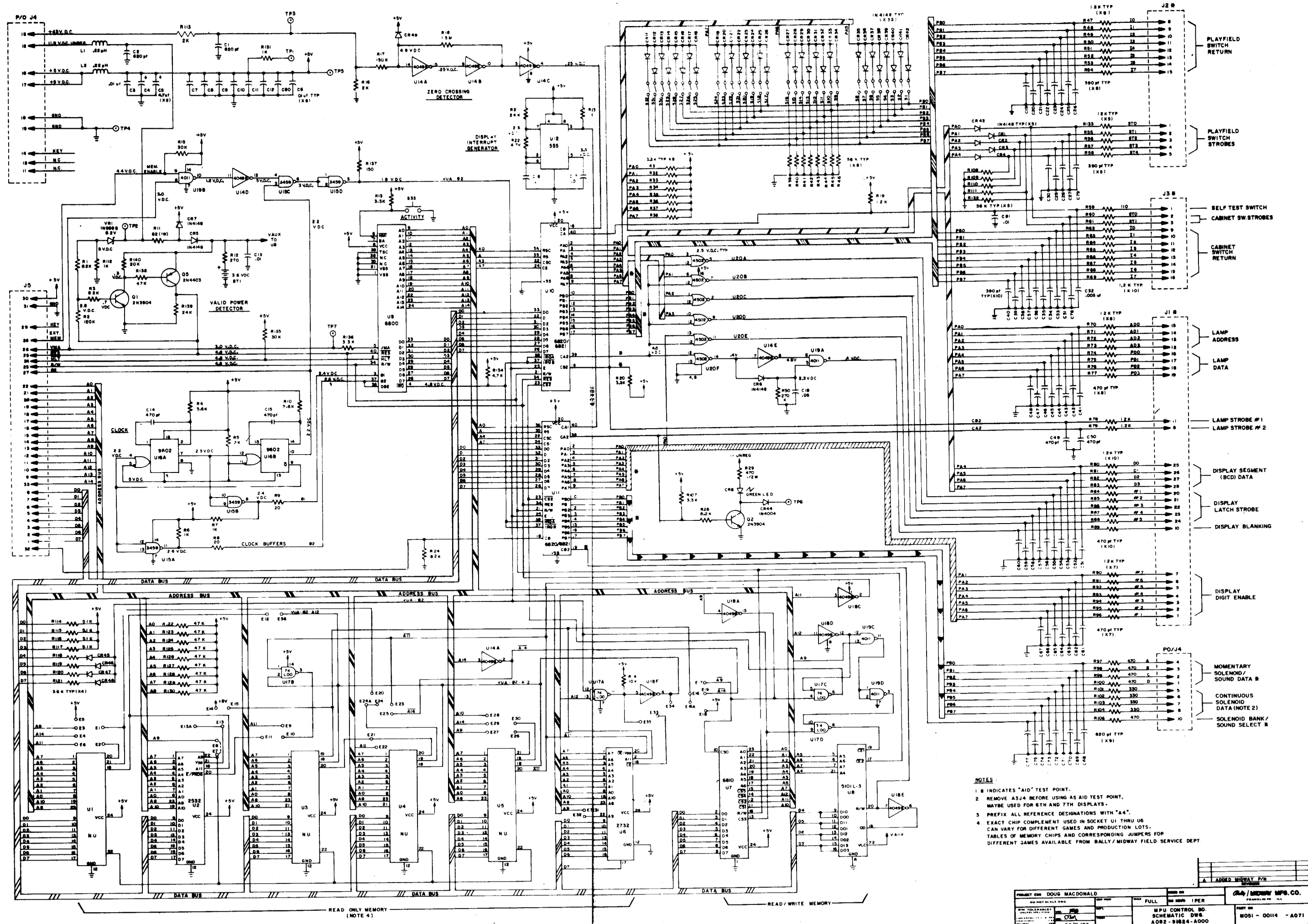
PROJECT ENG: D. MACDONALD		USED ON PINBALL		REVISIONS	
DO NOT SCALE DWG		SCALE FULL		NO. REQ'D 1 PER	
DIM TOLERANCES UNLESS SPECIFIED		HEAT TREAT		PART NO.	
UNLESS OTHERWISE SPECIFIED		FINISH		M051-00114 - A029	
DATE 5/17/83		SIX DIGIT DISPLAY BOARD SCHEMATIC "A1"		A084-91491-A000	
MIDWAY MFG. CO.		FRANKLIN PK ILL		PART NO.	



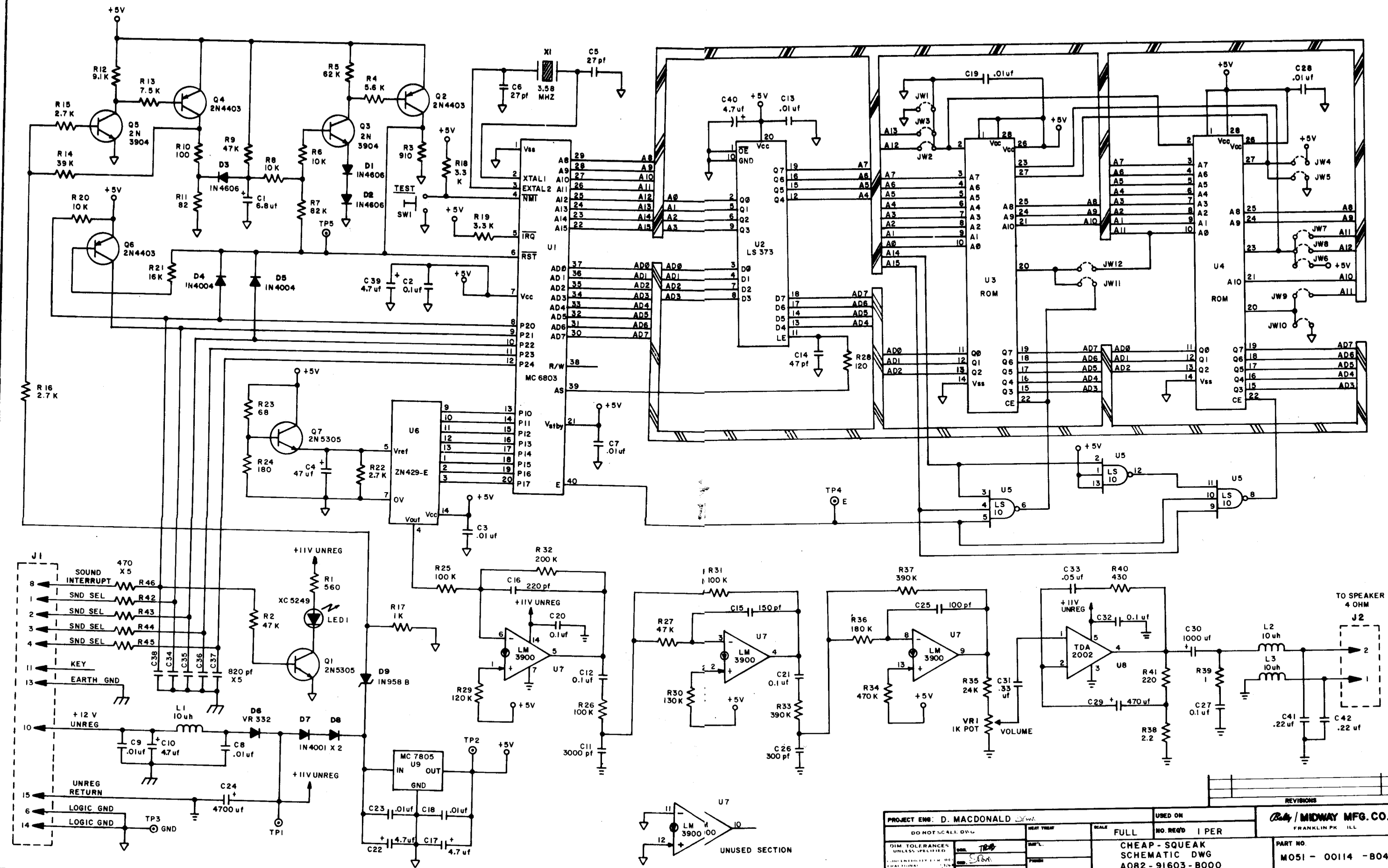
NOTES:

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

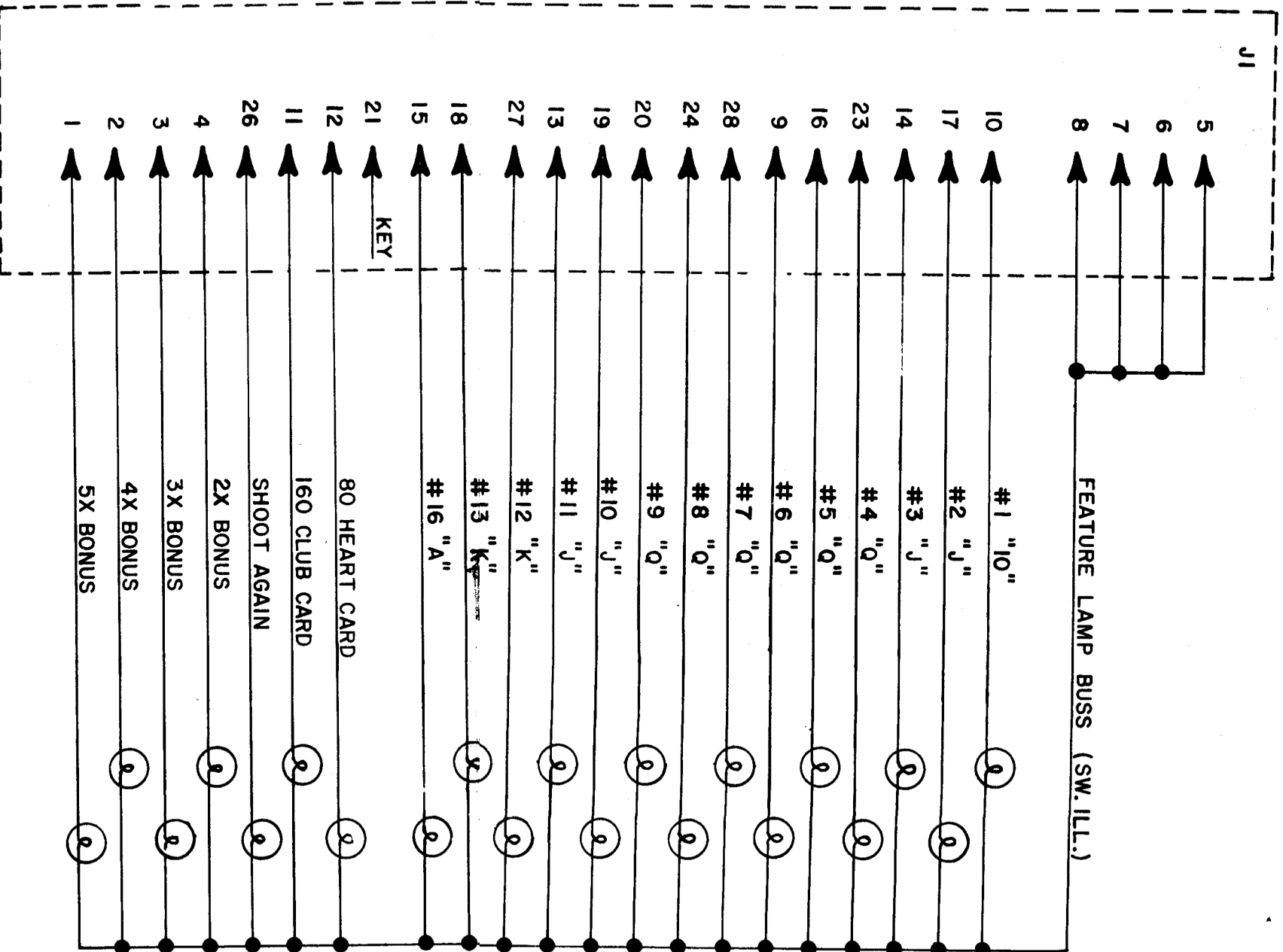
PROJECT ENG: D. MACDONALD		USED ON PINBALL	
DO NOT SCALE DWG.		NO. REQ'D 1 PER	
DIM. TOLERANCES UNLESS SPECIFIED		SCALE FULL	
CONCENTRICITY TYP. 0.03		SEVEN DIGIT DISPLAY BOARD	
FRACTIONAL 1/64		SCHEMATIC "A1"	
DECIMAL 0.005		A084-91617-A000	
HOLE DIA. ± 0.002 -0.003		PART NO.	
DATE 5/13/83		MO51 - 00114 - A057	



NO.	LET.	CHANGE	DATE	BY
-----	------	--------	------	----



PROJECT ENG: D. MACDONALD		USED ON		REVISIONS	
DO NOT SCALE DWG		SCALE		FULL	
DIM TOLERANCES UNLESS SPECIFIED		NO. REQ'D		1 PER	
DATE 8/22/83		CHEAP-SQUEAK SCHEMATIC DWG		PART NO.	
		A082-91603-B000		M051-00114-B045	



REVISIONS	

PROJECT ENG: A. AARSTAD		USED ON KINGS OF STEEL		Bally / MIDWAY MFG. CO. FRANKLIN PK. ILL.	
DO NOT SCALE DWG		SCALE		NO. REQ'D 1 PER	
HEAT TREAT		SCHEMATIC DWG.		PART NO.	
DIM TOLERANCES UNLESS SPECIFIED		KINGS OF STEEL BONUS LITE BOARD		MO 51 - 00390 - B011	
ORIENTATIONS: T.M. 003		A080 - 91703 - A390			
DRAWN: RLV					
CHECKED: 7					
DATE: 12/19/83					
FINISH					

