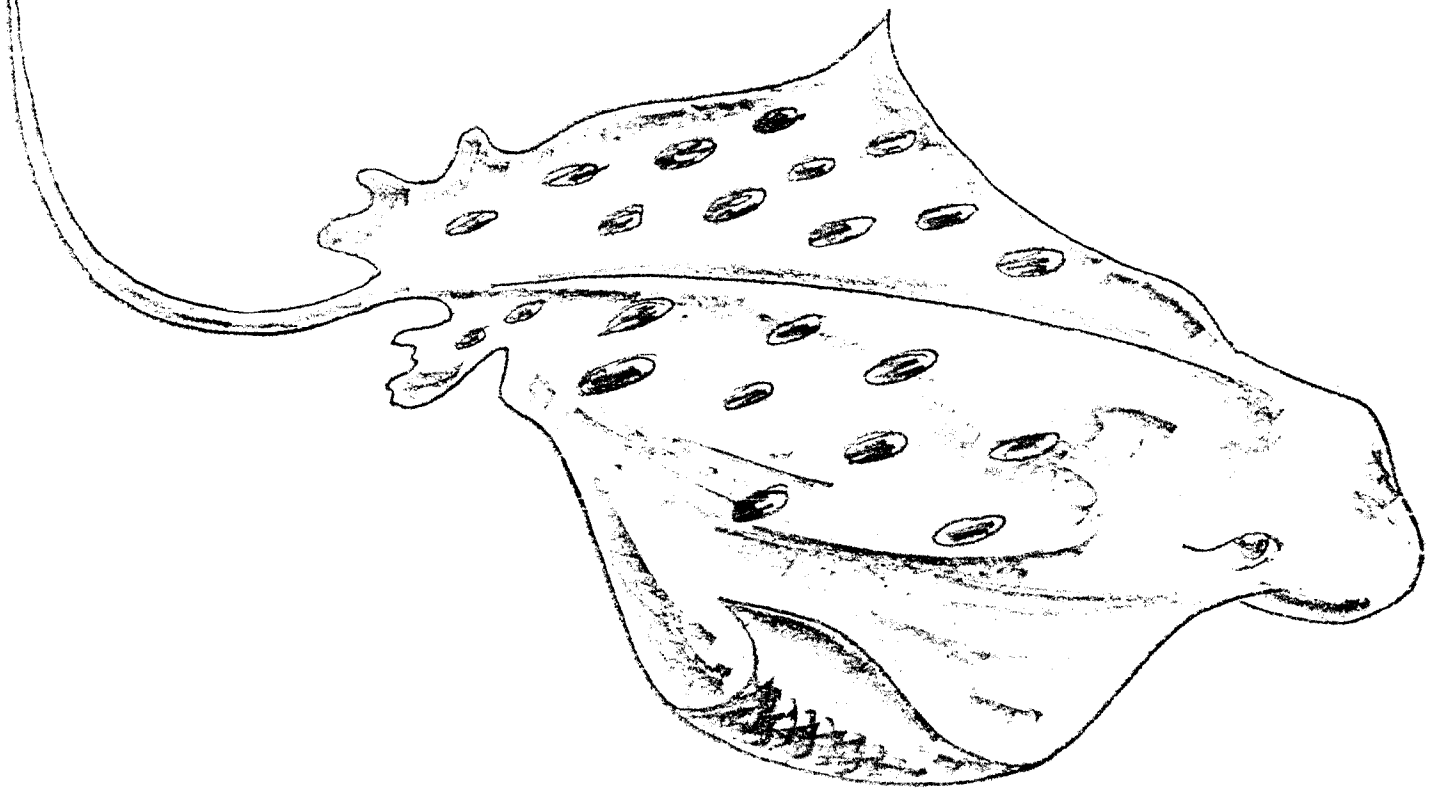
CAT. NO.
12G-5-102

STINGRAY

by STERN



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I. INSTALLATION

Assemble the game as follows:

Bolt legs to cabinet. Using flat washers under bolt heads, bolt back box to cabinet. Feed cable connectors and ground braid through cable port in back box. Screw ground braid to braid in back box. Insert connectors so they are completely seated on printed circuit board assemblies.

On all games there are some items that must be checked after shipment. Making these visual inspections 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 switches should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

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

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

1. Plumb bob tilt on left side of cabinet near front door.
2. 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.
3. Panel tilt on bottom of playfield panel.

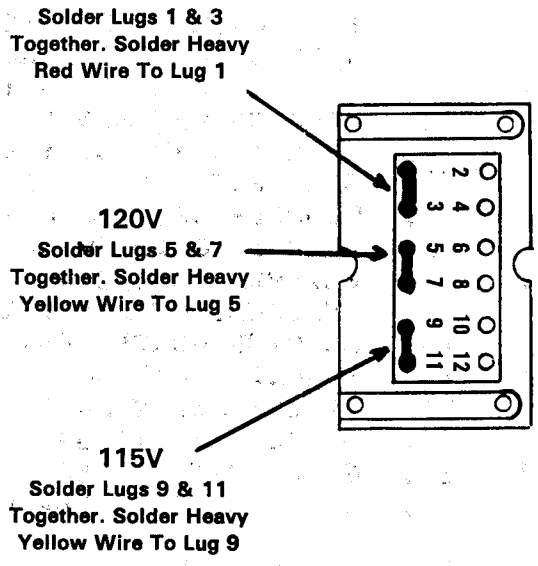
NOTE

TO PROTECT SOLID STATE COMPONENTS BEFORE TOUCHING ANY COMPONENT IN THE BACK BOX, DISCHARGE ANY POSSIBLE STATIC BUILD-UP BY TOUCHING ANY GROUND CIRCUIT, e. g. SIDE ARMOR, GROUND BRAID.

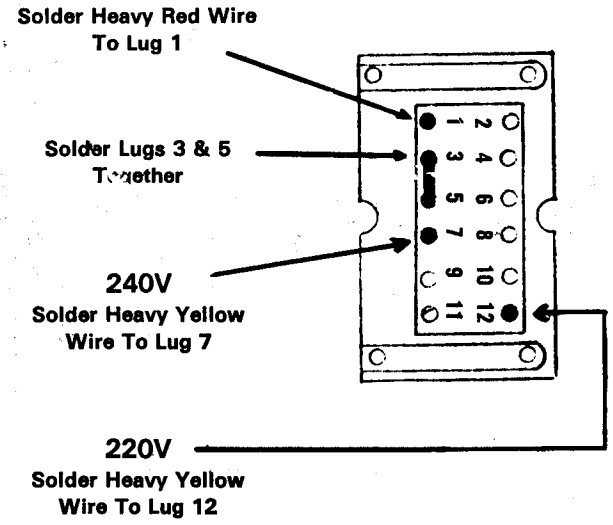
FIGURE 1

STERN 16B-3 TRANSFORMER WIRING CONNECTION INSTRUCTIONS

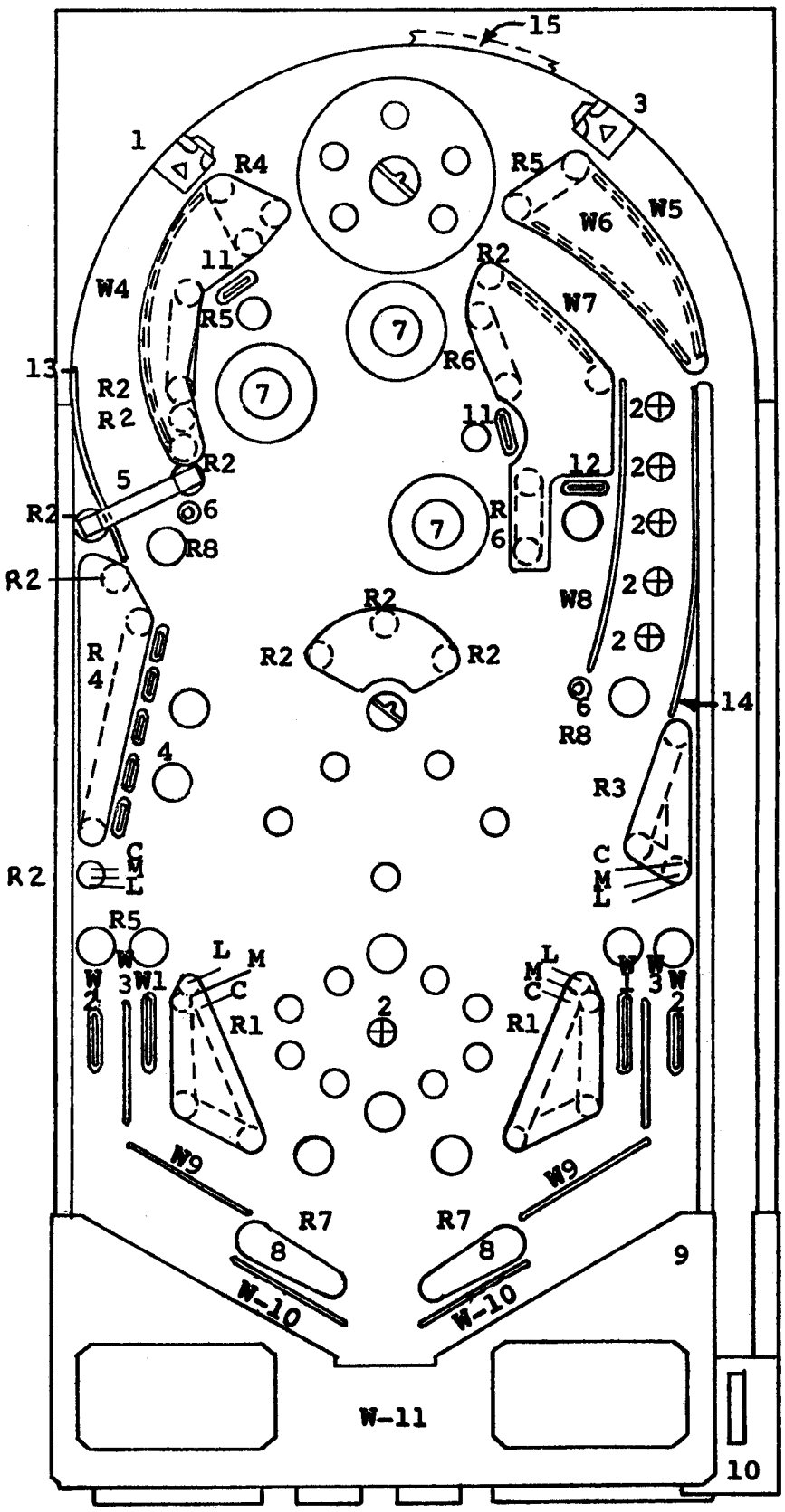
115/120V., 50/60 Cycle Input.
Varistor - Soldered to Line Filter on Left Side of Cabinet
Must Be Stern Part No. 25A-18-1.



220/240V., 50/60 Cycle Input.
Varistor - Soldered to Line Filter on Left Side of Cabinet
Must be Stern Part No. 25A-18-2.



STINGRAY Playfield Chart



RUBBER RINGS

R1	7A-120-250	2-1/2" DIA.
R2	7A-120-031	5/16" DIA.
R3	7A-120-200	2" DIA.
R4	7A-120-350	3-1/2" DIA.
R5	7A-120-125	1-1/4" DIA.
R6	7A-120-150	1-1/2" DIA.
R7	7A-121	FLIPPER
R8	7A-125	

GUIDE WIRE & ROLL OVER WIRE

W1	A-149
W2	A-383
W3	6A-101-C
W4	6A-206
W5	6A-205
W6	6A-204
W7	6A-101-B
W8	6A-210
W9	6A-101-D
W10	6A-139
W11	A-150

PLAYFIELD PLASTIC SHIELDS

TOP ARCH SET 13C-100-1L & M
STINGRAY SET 13C-102-1 TO 7

MISCELLANEOUS PARTS

1. BALL GATE LEFT A-104-L
2. ROLL OVER BUTTON ASS'Y A-1
3. BALL GATE RIGHT A-104-R
4. BANK TARGET ASS'Y D-393-5
5. SPIN TARGET ASS'Y B-102-1
6. BALL GUIDE POST 2A-200
7. THUMPER CAP 13A-6-1
8. FLIPPER & SHAFT A-192
   FLIPPER 4B-122-W
9. INSTRUCTION PLATE 14B-1-2
10. SHOOTER GUAGE 14B-2-1
11. TARGET ASS'Y A-461
12. TARGET ASS'Y A-461-1
13. GUIDE RAIL 1A-591
14. GUIDE RAIL 1A-586
15. TOP ARCH RAIL 1B-107

C- CONSERVATIVE
M- MEDIUM
L- LIBERAL

II. GENERAL GAME OPERATION

PLACE BALL INTO PLAYFIELD BY OUTHOLE.

COIN GAME. Coin should be rejected. Plug in line cord. For proper game operation grounding circuit must be used. Move power ON-OFF Toggle Switch at bottom right front corner of cabinet to "ON" position. The game will play a tune to announce game-readiness. Drop targets are reset, scores are reset to zero, alternating with the "High Game 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 move the ball to the shooter lane. The 1st player-up lite becomes lit. A tune* is played to announce play-readiness. The bonus score is at 10,000 points.

One player is registered each 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. Credit button is in-operative after 4 player's are registered.

Shooting the ball inititates play. Rebound switches score 10 points. Thumper-bumpers, when not lit, score 100 points.

When the ball enters the outhole, the bonus score is added to the players score. The player-up and/or ball in play on the back box is advanced one position. The bonus score starts at 10,000 points. The outhole kicker moves the ball to the shooter lane 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 becomes lit. A random Match* number appears and the "Match" light becomes lit. If the match number is the same as the last two digits in the player's score, a free game is awarded.

Extra ball won during the course of the game is played immediately after the player's regular ball enters the outhole. The player-up and/or ball in play are not advanced for extra ball play. Bonus score is added to the player's score and the bonus is set to 10,000 points before the game moves the extra ball for play.

At the end of the game, a "High Game to Date" is alternately flashed with all player scores. If the "High Score to Date" is beat, this feature* can award 3 free games.

Tilting the game results in loss of the ball in play. 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 outhole kicker moves the ball to the shooter lane.

Slamming the machine results in the loss of the game. All feature lights go out and the game becomes "dead", through a built-in time delay circuit. The purpose of the time delay circuit is to discourage abuse of the machine. After the delay, the "Game Over" light lites and the game readiness tune is played. The time delay occurs anytime one of the slam switches is made to contact. There is a slam switch on the front door. One on the tilt board and one on the playfield. (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 weighed blade should be adjusted to attain the desired sensitivity. Decreasing 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 inserted into each coin chute. Each bookkeeping function is displayed on all player score displays simultaneously. An identification number 05 to 11 appears on the Match/Ball-in-Play window as follows:

DESCRIPTION	
Current Credits	= 05 00000 to 000040
Total Plays (Played & Free Games)	= 06 00000 to 999999
Total Replays (Free Games)	= 07 00000 to 999999
Total Times "High Score to Date" is beat	= 08 00000 to 999999
Coins Dropped Thru Coin Chute #1**	= 09 00000 to 999999
Coins Dropped Thru Coin Chute #2**	= 10 00000 to 999999
Coins Dropped Thru Coin Chute #3**	= 11 00000 to 999999

The game displays the first bookkeeping entry if the Self-Test Button (See Fig. 3) on the inside of the front door is pushed and released nine times at one second intervals. The number 05 now appears in the "Match/Ball-in Play" window. Current credits appear on all 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 the MPU module in the back box. (See Fig. 3). 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 needed.

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 feature can be disabled 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

BONUS SCORE FEATURE:

A bonus of 10,000 to 100,000 may be scored. The game starts with a bonus score of 10,000. The bonus score advances one step at a time, each time the ball goes over one of four "Advance Bonus" roll-over buttons and the button is lit. The two outlanes also advance the bonus score. The bonus is collected when the ball goes into the outhole.

DOUBLE BONUS FEATURE:

The "Double Bonus" is awarded when the right eject hole score lite value (Lites Double Bonus) is lit and ball goes into the right hole. The Double Bonus lite goes out when a ball goes into the outhole and the Bonus Score is collected.

5 DROP TARGET FEATURES:

1st Time Down: Each drop target scores 1000 points, all drop targets down awards 10,000 additional points.

2nd Time Down: Each drop target scores 1000 points, all drop targets down awards 10,000 additional points and is adjustable to:

1) Outlane Special lite on and 1 free game (free game everytime down thereafter).
2) Outlane Special lite on only.

Each drop target down thereafter scores 1000 points, all drop targets down awards 10,000 additional points.

Drop Targets Feature reset for every ball.

SPECIAL LITE OUTLANE FEATURE:

Adjustable for one lite to alternate or both lites to stay on. When lite is lit and ball goes down outlane, 4 adjustable award options are available:

1) 1 extra ball
2) 1 free game
3) 1 extra ball and 1 free game
4) 100,000 points

SPINNER FEATURES:

Unlit spinner scores 100 points, lit spinner scores 1,000 points. The spinner scores "1000 Is Lit" when the ball kickout holes "Scores 5000 points, lites Spinner & Stingray Lane" is lit and the ball goes into either ball kickout hole, the spinner 1000 lite goes out when the ball goes into the outhole.

TARGET FEATURES:

Targets (two in action area) score 100 points, lit targets score 1000 points, the "1000 When Lit" lite is lit when the ball kickout holes "Scores 5000 points, lites Spinner & Stingray Lane" is lit and the ball goes into either ball kickout hole, the target 1000 points when lit lite goes out when the ball goes into the outhole.

V. GAME ADJUSTMENTS

A. Playfield Post Adjustments:

Posts that control left and right outlane openings on playfield can be moved to make access to outlanes conservative or liberal for ball to enter. See Figure 2.

Conservative entry will decrease playing time and scoring.
Liberal entry will increase playing time and scoring.

B. Back Box Game Adjustments:

Each game has thirty-two switches located on the MPU module, located in the back box, that allow play to be customized to the location. See Figure 3. 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 #1 coin chute (next to hinge) is not adjustable and will only give 1 game per coin.

The credits given per coin are selectable by means of switches 1-5 incl. for coin chute #2 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/COIN
#2 (CENTER CHUTE)	5	4	3	2	1	
OR #3	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 dropped.
** One Credit for first coin. Two Credits for second coin provided that no scoring occured between 1st and 2nd coin drops. If scoring occured, second coin gives one credit.

1. **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 are adjustable 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

2. **BALL PER GAME:**

No. of BALLS PER GAME	SWITCH 7
5	ON
3	OFF

3. **CREDIT DISPLAY:**

CREDITS DISPLAY	SWITCH 20
YES	ON
NO	OFF

4. **HIGH SCORE FEATURE:**

The game is designed to award an Extra Ball or Free Game at one, two or three high score levels. See Front Door Game Adjustments.

AWARD	SWITCH 6
EXTRA BALL	OFF
REPLAY	ON

5. **HIGH GAME TO DATE FEATURE:**

The game is designed to award 3 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
FREE GAMES	ON
NOVELTY	OFF
3 Ball 500,000	**5 Ball 840,000**

6. **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 features creates an incentive to play.

MATCH	SWITCH 21
ON	ON
OFF	OFF

7. MELODY OPTION:

The game is designed to play melodies to announce power-up, credit, etc. Some tunes are adjustable by Switch 8.

GAME MELODY	SWITCH 8	MELODY
POWER-UP	ON	Full Melody
"	OFF	Full Melody
COIN	ON	Full Melody
"	OFF	2 Tones Only
CREDIT BUTTON	ON	Full Melody
"	OFF	2 Tones Only
GAME OVER	ON	Full Melody
"	OFF	Full Melody

8. PRO/NOVICE FEATURE:

This feature enables the "Outlane, Thumper Bumpers, and Bonus Rollover Lites" to either all stay on when activated or alternate, thereby changing game scoring.

Pro/Novice	Switch 16
ALTERNATE	ON
ALL LITES ON	OFF

9. OUTLANE SPECIAL AWARD:

Awards received when going through the outlane when the "Special" lite is lit can be adjusted as follows:

AWARD	SWITCHES	POSITION
FREE BALL	31	ON
	32	OFF
FREE GAME	31	OFF
	32	ON
100,000 POINTS	31	OFF
	32	OFF
FREE BALL AND	31	ON
FREE GAME	32	ON

10. DROP TARGET:

Award for hitting all 5 drop target's down the **second time** can be adjusted as follows:

AWARD	SWITCH 24
Special Lite On and 1 Free Game (Free Game awarded everytime 5 targets down thereafter)	ON
Special Lite on only	OFF

VI. FRONT DOOR GAME ADJUSTMENTS:

HIGH SCORE FEATURE ADJUSTMENTS:

The game is designed to award an extra ball or a free game (option) at three score levels. (See High Score Feature Switch 6 Function). The recommended levels are on the score card on the game.

Any level from 10,000 or 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 at one second intervals five times or until number 01 appears on the Match/Ball in Play display.
2. The number on the Player Score Displays is the first 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 High Score 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 high score levels. The number '02' and '03' on the Match/Ball-in-Play display are for the second and third levels, respectively.

NOTE: Only One Extra Ball Can Be Achieved Per Ball In Play.

HIGH GAME TO DATE FEATURE:

The game is designed to award 3 free games (option) when "High Game to Date" is beat. For the recommended, factory preset level, **see page 8.**

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 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 positioning switch 6 to the "OFF" position.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box. See Figure 3.

VII. ROUTINE MAINTENANCE ON LOCATION:

Self tests, which are programmed into the design of the game, are very helpful. As with any solid state piece of equipment the three prong grounding receptacle is a important piece part of the game, that must not be tampered with and must be used properly.

MPU MODULE SELF-TEST:

During power up, the MPU assembly tests itself, which can visibly be seen by the flashing of a LED on the board. When the game is turned on, the LED will flash once, pause, then flash six more times and go out. A tune is then played to announce game readiness. This indicates proper MPU game operating conditions.

GAME SELF-DIAGNOSTIC TESTS:

Pressing the Self-Test button inside the coin door one time activates the game into its self-diagnostic test.

1. Feature lamps: All feature lamps will flash on and off continuously, determining any burnt lamps.
2. Pressing the Self-Test button again causes each digit on all displays 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. Holding both flipper buttons "in" during this test will cause the flipper coils to be energized. 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 a sound shows a fault. If sound is absent, see Solenoid I.D. Page for help in Solenoid identification.
4. Pressing the Self-Test button again causes the MPU to look at each switch assembly for stuck contacts.* If there are any stuck, the number of the first set encountered is flashed on the Player Score displays. The number remains until the fault is corrected. See Switch I.D. page 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'. DO NOT BURNISH OR FILE GOLD PLATED SWITCH CONTACTS.

   *Flipper Button Switches are not included.
5. Pressing the Self-Test button eleven more times causes the MPU to step thru the game levels and bookkeeping functions described previously and finally to repeat the power-up test. To by-pass these functions, turn the game off, then on. The game is now ready to play, after the MPU Self-Test.

Set the game up for play, after successful completion of the Self Diagnostic Test procedure. 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.

VIII CONTACT SWITCH ADJUSTMENTS

All contact switches should be adjusted to have a gap of 1/16" in the open position, and have .010" overtravel closed. All contact switches (except for flipper button & flipper end of stroke) are plated to resist corrosion and, **SHOULD NOT BE FILED OR BURNISHED.** If contacts have dirt or dust on them, a clean piece of paper should be used to clean them, by closing the contacts and wiping gently.

FLIPPER BUTTON & FLIPPER END OF STROKE SWITCHES ONLY. Tarnish or pitted contacts can be corrected with a contact file followed by a burnishing tool. Severely pitted contacts must be replaced as an assembly.

PLAYFIELD

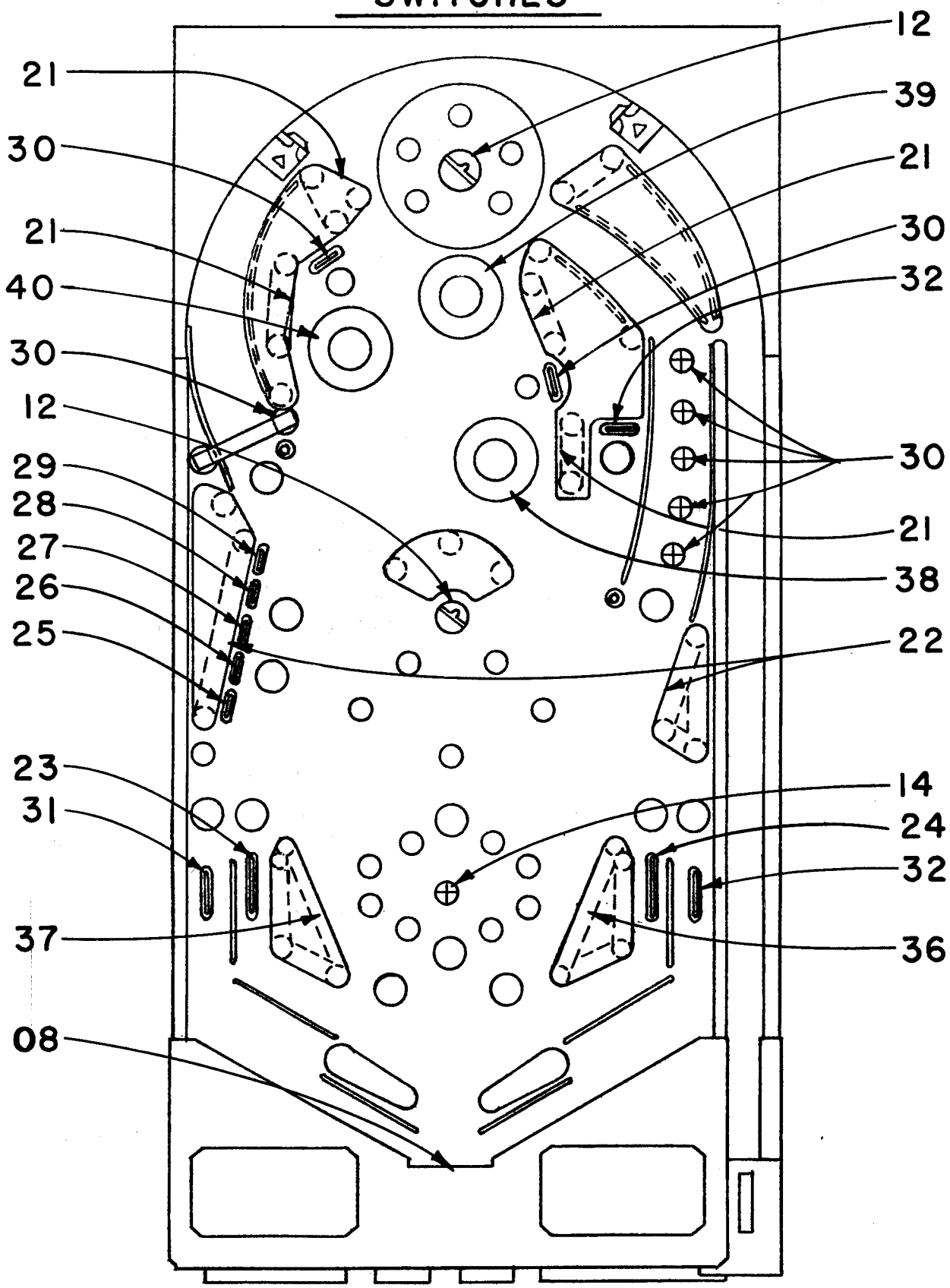
Stern playfields have a durable long life playing finish. Its life expectancy, as well as playing appeal can be greatly extended by periodic cleaning. Inspect and hand polish the ball with a clean cloth. A chipped ball must be replaced, as it will ruin the finish on the playfield. Do not use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield surface.

IX. SWITCH IDENTIFICATION
SELF TEST DISPLAY NUMBERS

Note: Flipper button cabinet switches do not appear on test.

SWITCH NO.	SWITCH LOCATION	SWITCH NO.	SWITCH LOCATION
01		21	(2) 10 POINT SWS
02		22	R & L 50 POINT
03		23	LT INNER OUTLANE
04		24	RT INNER OUTLANE
05		25	DROP TARGET A (BOTTOM)
06	CREDIT BUTTON	26	DROP TARGET B
07	TILT	27	DROP TARGET C
08	OUTHOLE	28	DROP TARGET D
09	COIN #3 (RT)	29	DROP TARGET E (TOP)
10	COIN #2 (CTR)	30	SPINNER, 5 R.O. & 2 TARGETS
11	COIN #1 (LT)	31	LT OUT OUTLANE
12	BALL KICK OUT (2)	32	RT OUT OUTLANE
13		33	
14	(1) ADVANCE BONUS ROLL-OVER	34	
15		35	
16	SLAM (3)	36	RT SLINGSHOT
17		37	LT SLINGSHOT
18		38	RIGHT BUMPER
19		39	TOP BUMPER
20		40	LEFT BUMPER

SWITCHES



SWITCHES NOT ON PLAYFIELD:

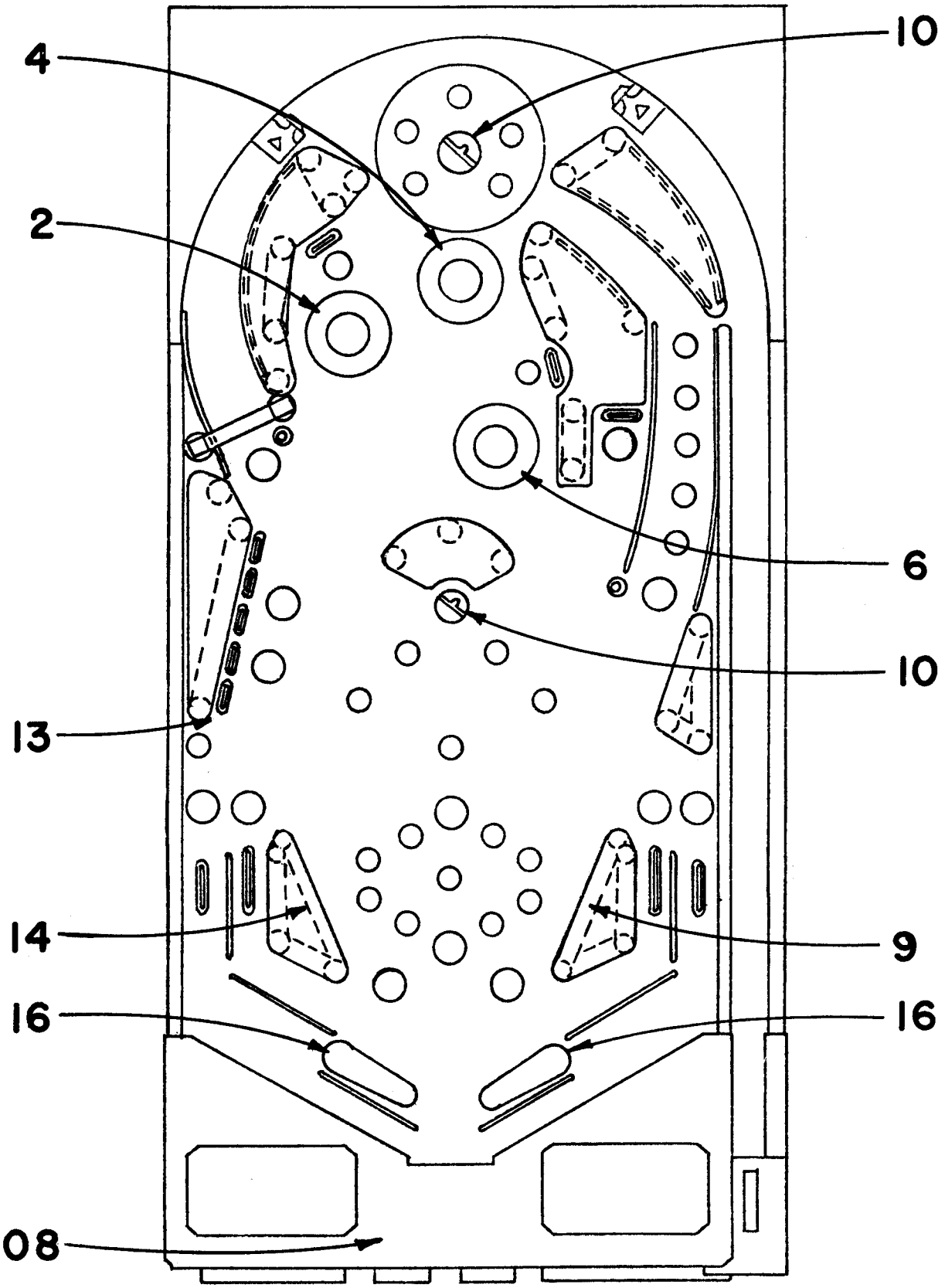
06 CREDIT BUTTON
07 ROLL TILT
07 PENDULUM
09 RIGHT CHUTE
10 CENTER CHUTE
11 LEFT CHUTE
16 DOOR VIB.
16 PLAYBOARD VIB.
16 TILTBOARD VIB.

X. SOLENOID IDENTIFICATION

SELF TEST DISPLAY NUMBERS

SOLENOID NO.	SOLENOID LOCATION
01	CHIME (10) (SMALL)
02	THUMPER - LEFT
03	CHIME (100)
04	THUMPER - TOP
05	CHIME (1,000)
06	THUMPER - RIGHT
07	CHIME (10,000)
08	OUT HOLE
09	RIGHT SLINGSHOT
10	BALL KICK OUT HOLES (2)
11	
12	
13	DROP TARGET RESET
14	LEFT SLINGSHOT
15	KNOCKER
16	(2) FLIPPERS & RELAY ON SOL. DRIVER P.C. BOARD
17	COIN LOCK OUT

SOLENOIDS

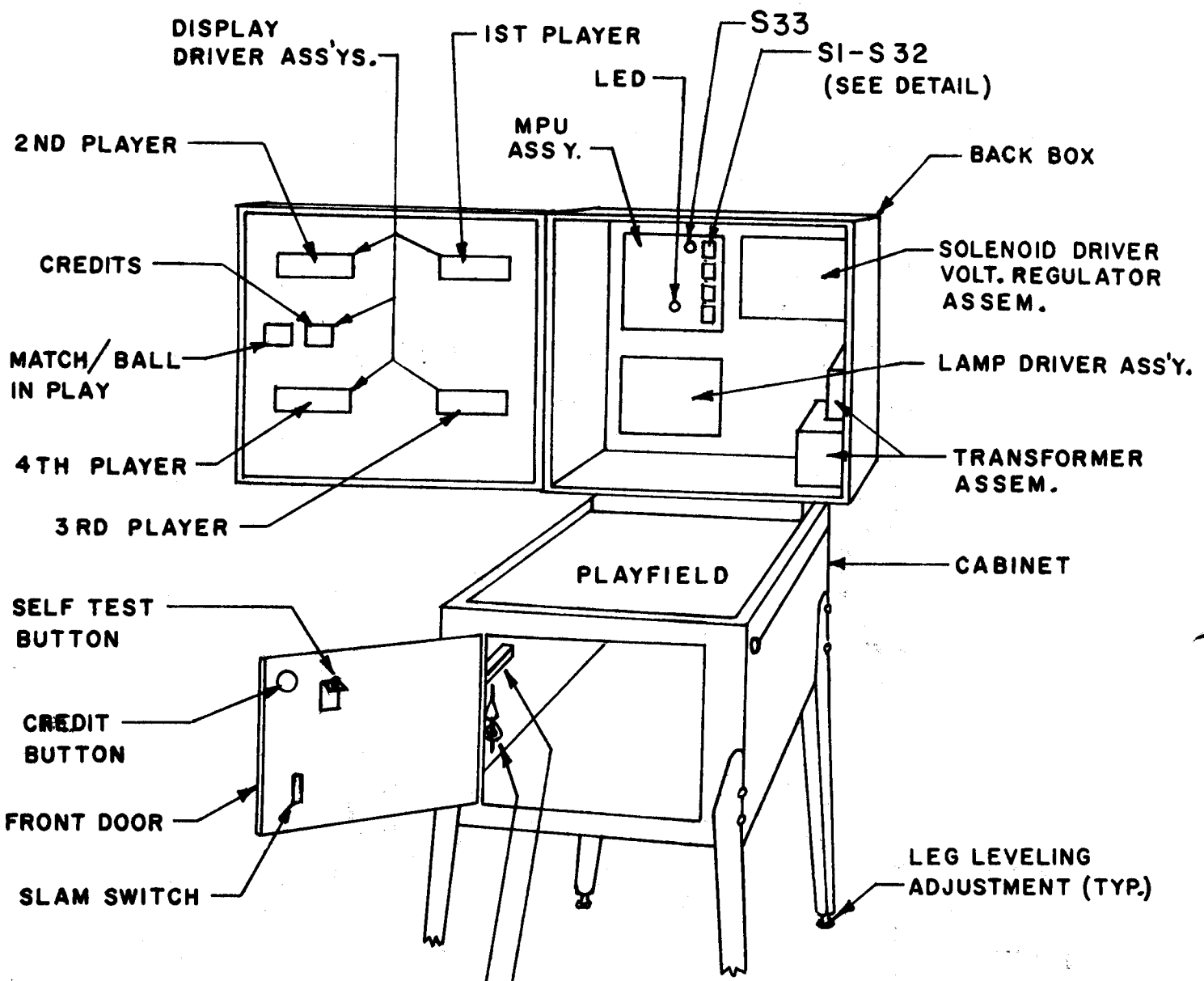


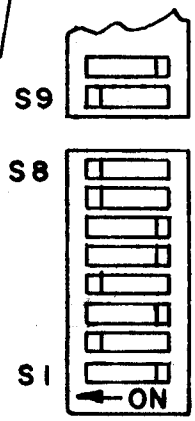
SOLENOIDS NOT ON PLAYFIELD:

01 BELL (SMALL)	07 BELL
03 BELL	15 KNOCKER
05 BELL	17 LOCKOUTS

ELECTRONIC PIN GAME

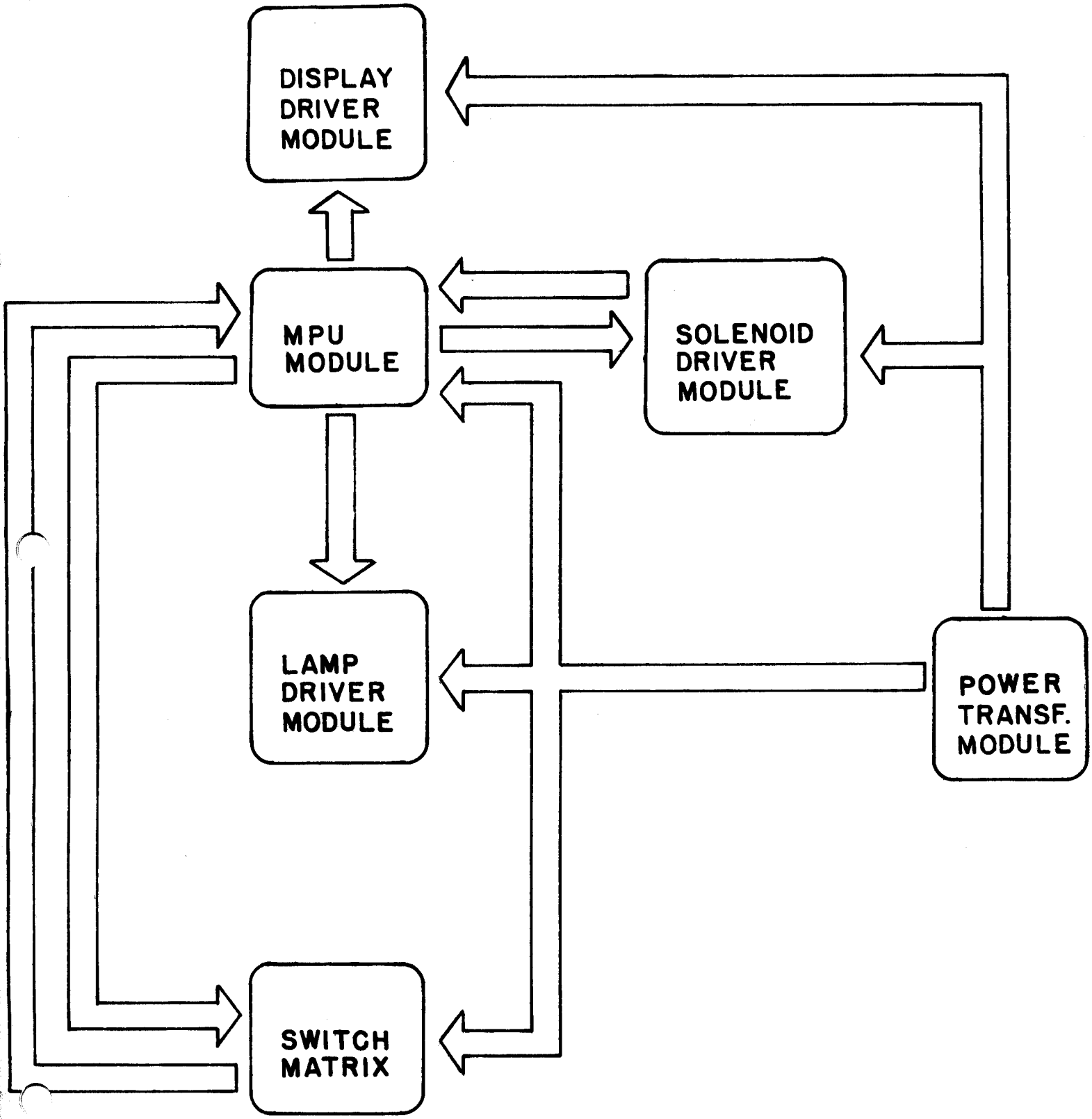
Figure 3





DETAIL S1-S32
MPU ASS'Y.

BLOCK DIAGRAM



XI. PARTS LIST
GAME #102 STINGRAY

MISCELLANEOUS	PART NUMBER
Transformer (Domestic or Export)	16B-3
Transformer & Rectifier Board	C-464
Bulbs, #44	8A-101

ASSEMBLY COILS

Chimes (4)	N-31-2000
Coin Lockout	C-36-5500
Flipper Left & Right (2)	J-25-500/34-5050
Knocker	N-26-1200
Outhole Kicker	J-26-1200
Saucer Eject (2)	J-28-2300
Thumper-Bumper (3)	J-26-1200
Sling-Shot (2)	J-26-1200
Drop Target Reset	B-27-2300

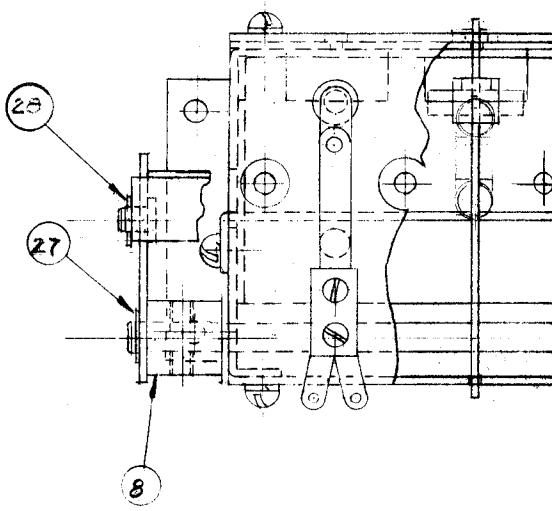
MODULES

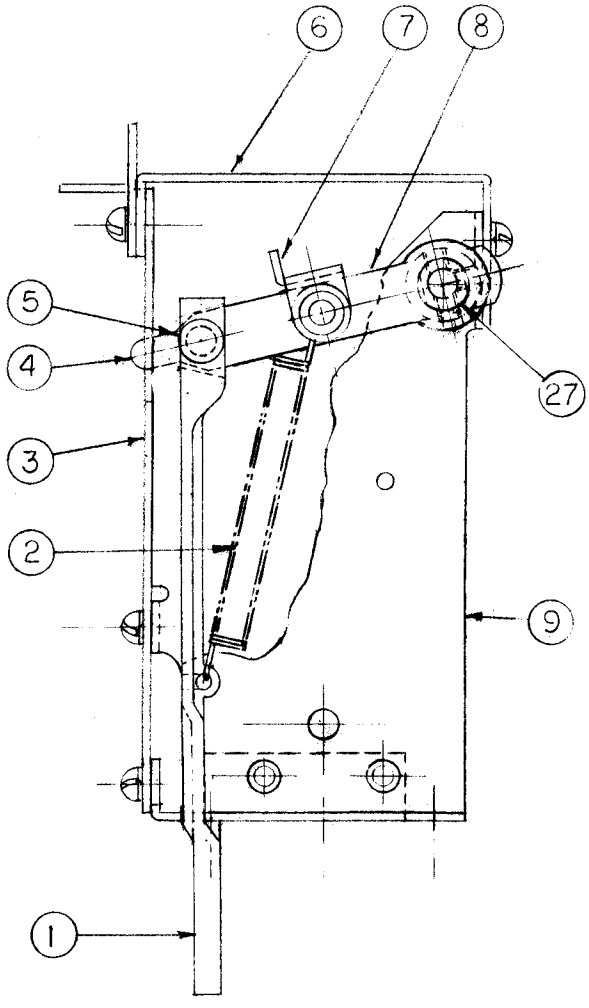
Lamp Driver	B-431
Display Driver (5 Used)	A-434
Solenoid Driver/Voltage Regulator	B-432
MPU	C-433-102
Rectifier Board	A-430

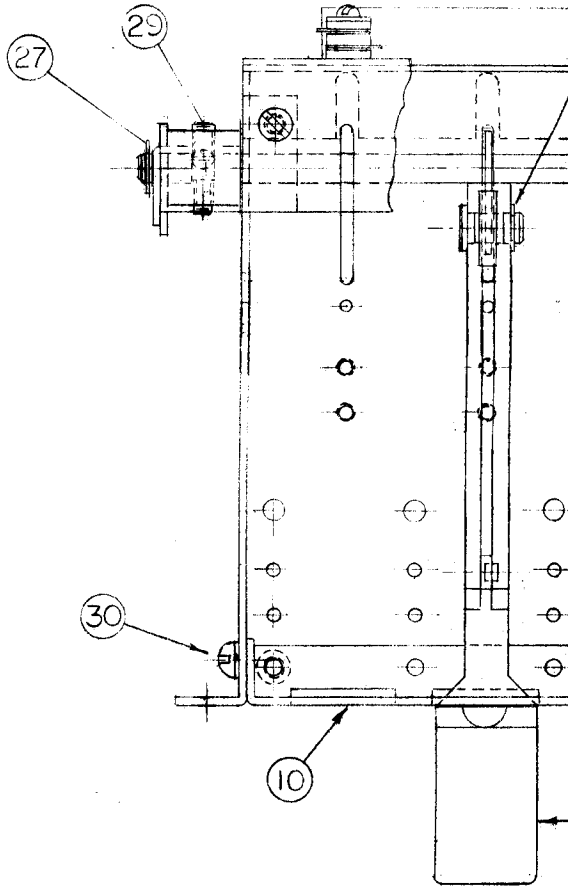
PLAYFIELD PARTS	SEE PLAYFIELD DIAGRAM

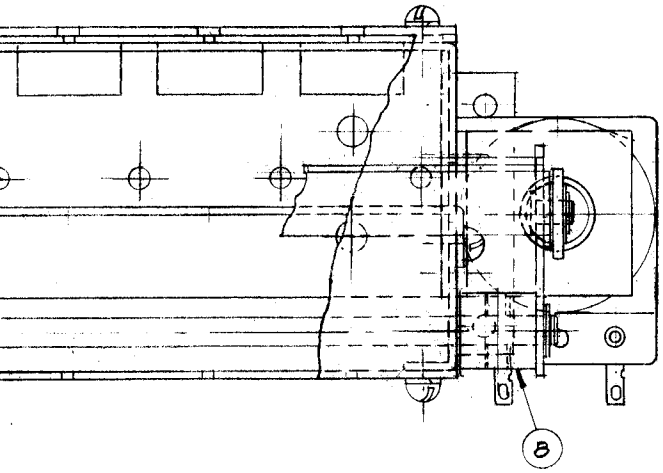
DROP TARGET BANK D-393

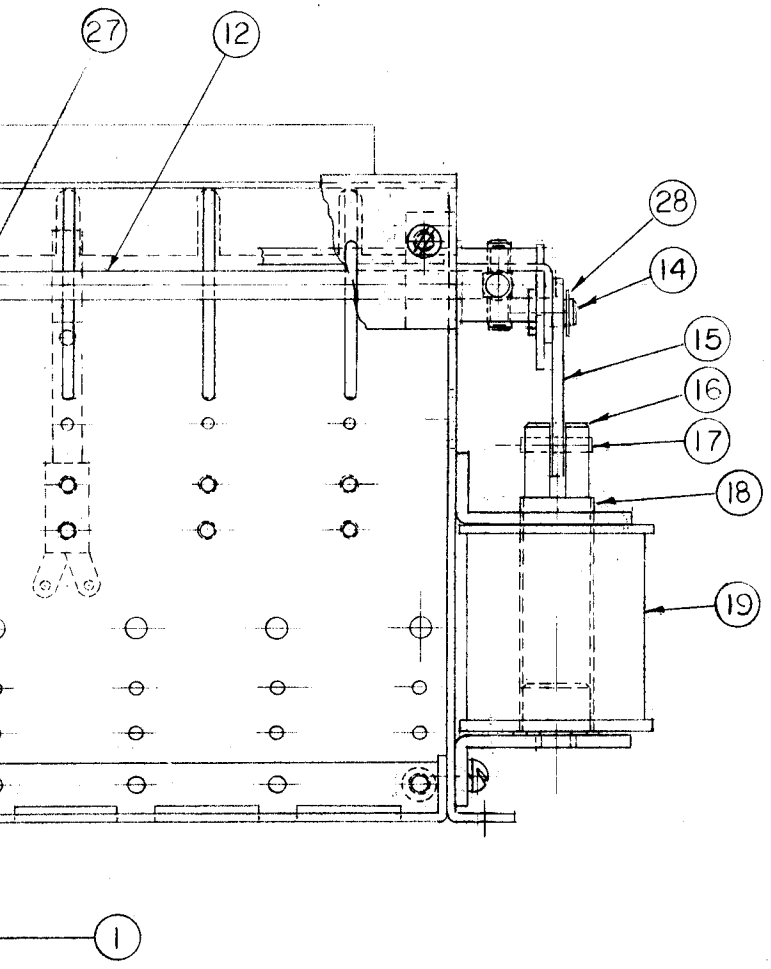
ITEM	PART NO.	DESCRIPTION	NO. REQ'D.
1	13A-9	TARGET	AS REQD
2	5A-169 OR 5A-171	SPRING ELECTRO-MECHANICAL SOLID STATE	1 PER TARGET
3	1B-481-2 TO 12	SCORE SWITCH PLATE	1
4	1A-491	SWITCH ACTUATOR	1 PER TARGET
5	2A-230	TARGET HINGE PIN	2 PLUS 1 PER TARGET
6	1B-480-2 TO 12	RESET SWITCH BRACKET	1
7	1B-484-2 TO 12	RESET BAR	1
8	A-375	TARGET RESET ARM ASSEMBLY	2
9	1B-482-R	END PLATE	1
10	1B-483-2 TO 12	BASE PLATE	1
11			
12	2A-225-2 TO 12	SHAFT	1
13			2
14	2A-231	HINGE PIN - RESET	2
15	1A-489	RESET LINK	1 OR 2
16	2A-226	COIL ARMATURE	1 OR 2
17	17A-101-10	ROLL PIN - 1/8 Φ X 5/8	1 OR 2
18	2A-232	COIL TUBING	1 OR 2
19	27-2300	COIL	1 OR 2
20	A-378	COIL STOP BRACKET ASSEMBLY	1 OR 2
21	1B-482-L	END PLATE	1
22	1A-488	COIL RETAINING BRACKET	1 OR 2
23	1B-485-2 TO 12	SWITCH PROTECTOR	1
24			
25	SW-471	RESET SWITCH	1 PER TARGET
26			
27	17A-104-25	RETAINING RING	2 PLUS 1 PER TARGET
28	17A-104-X21	RETAINING RING - RESET	2
29		#10-32 X 1/4" ALLEN SET SCREW	4
30		8-32 X 3/8 R.H.M.S (SEMS)	14
31		5-40 X 1/2 R.H.M.S.	2 PER TARGET
32			
33			
34			
35			

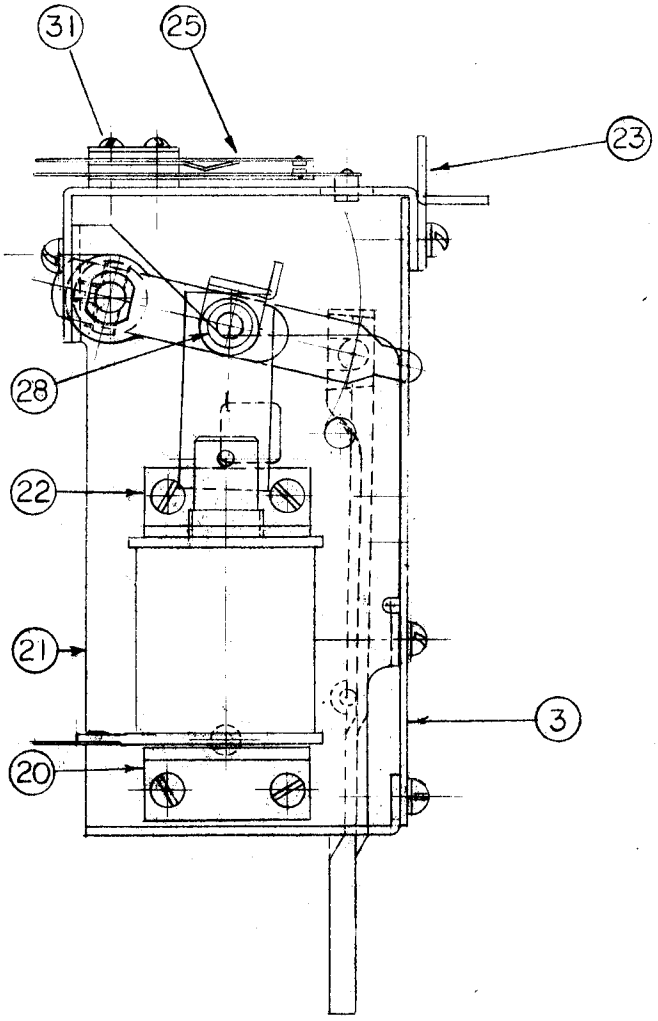

28
27
8


6
7
8
5
4
27
3
2
9
1


29
27
30
10

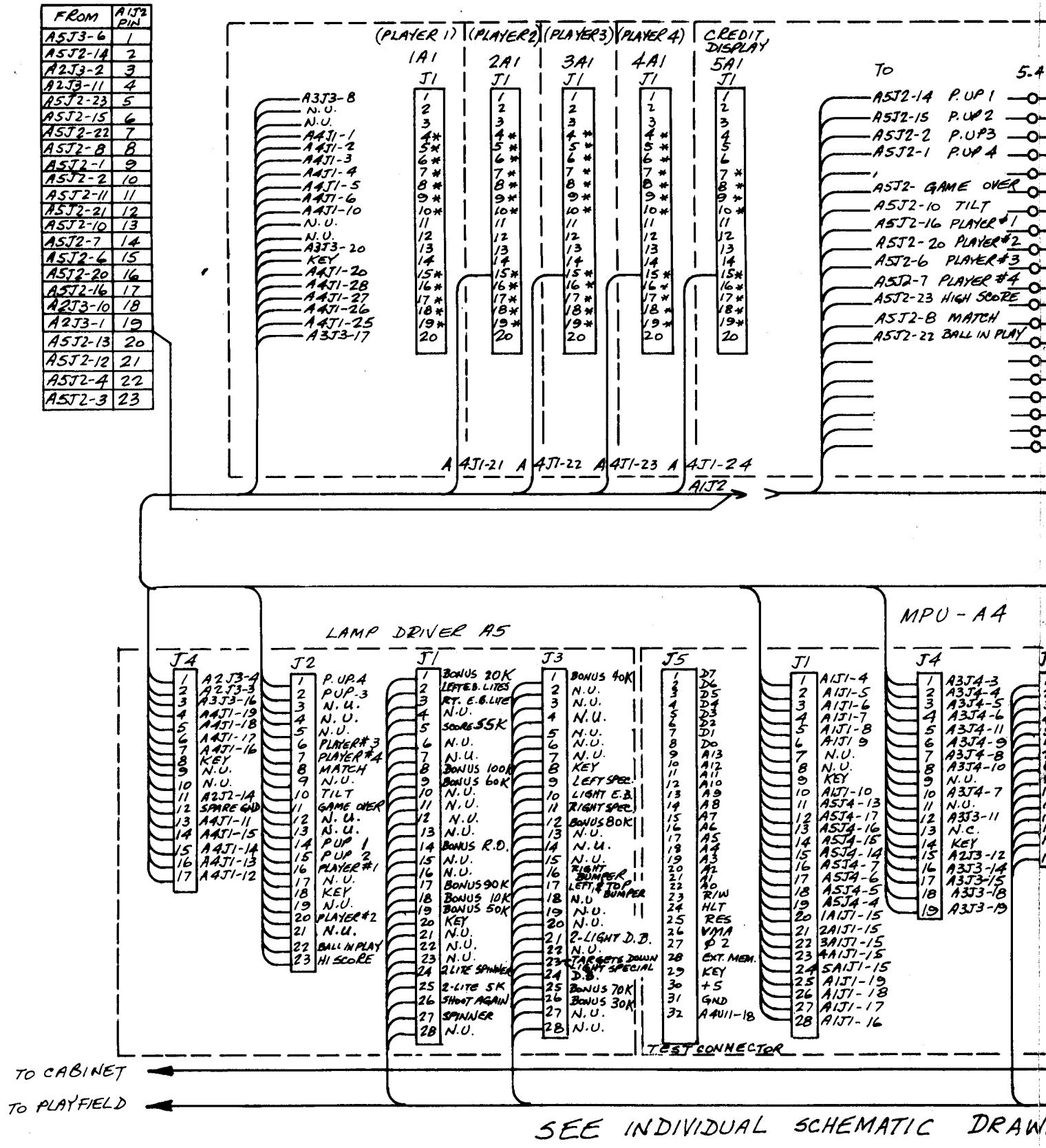

8


27
12
28
14
15
16
17
18
19
1


31
25
23
28
22
21
3
20

A1 INSERT

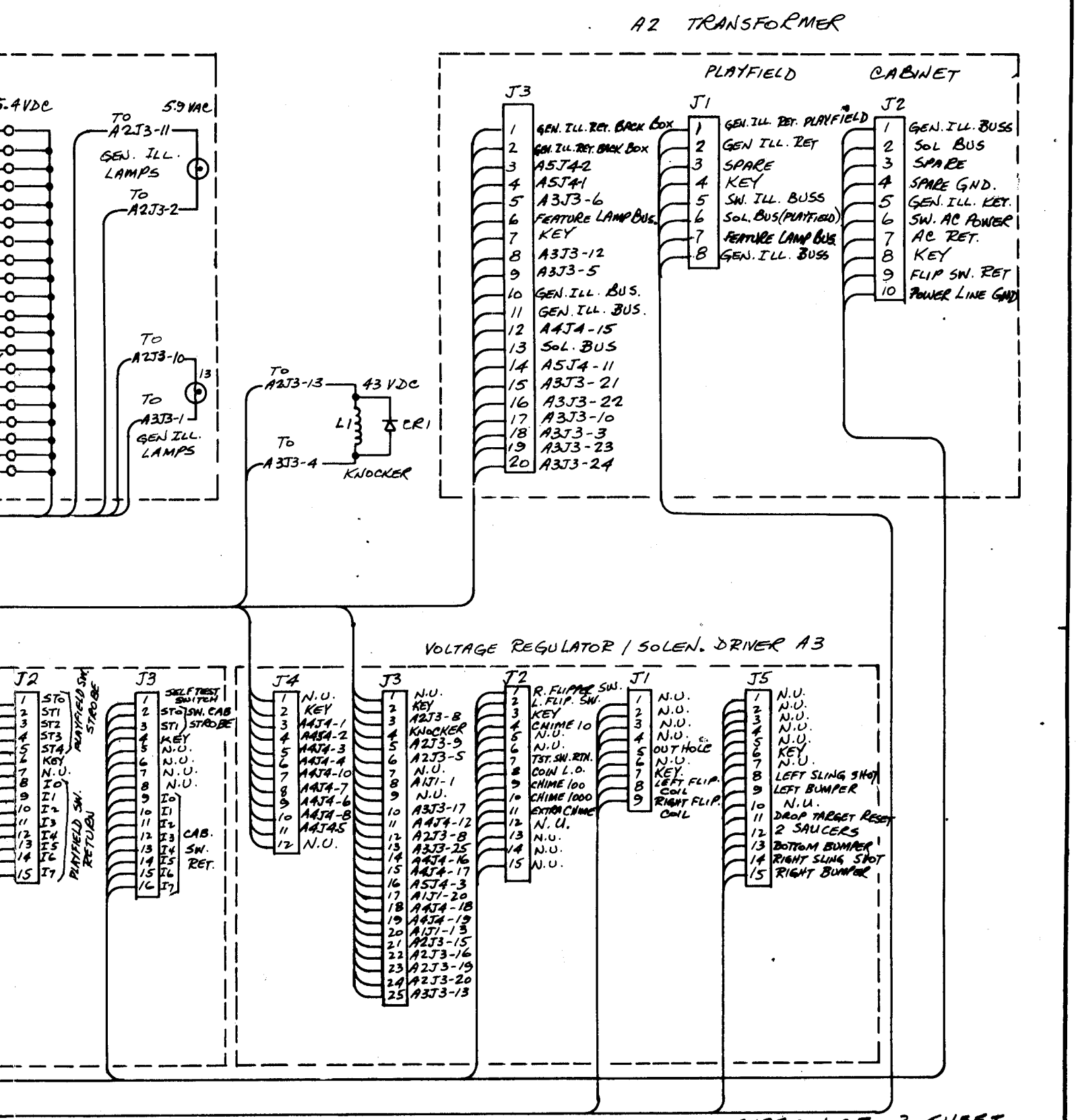
FROM	A1J2 PIN
A5J3-6	1
A5J2-14	2
A2J3-2	3
A2J3-11	4
A5J2-23	5
A5J2-15	6
A5J2-22	7
A5J2-8	8
A5J2-1	9
A5J2-2	10
A5J2-11	11
A5J2-21	12
A5J2-10	13
A5J2-7	14
A5J2-6	15
A5J2-20	16
A5J2-16	17
A2J3-10	18
A2J3-1	19
A5J2-13	20
A5J2-12	21
A5J2-4	22
A5J2-3	23



ISSUE	CHANGE

NO. 12B-173-1

NO. 128-173-1



WINGS FOR WIRE COLORS.

SHEET 1 OF 3 SHEET

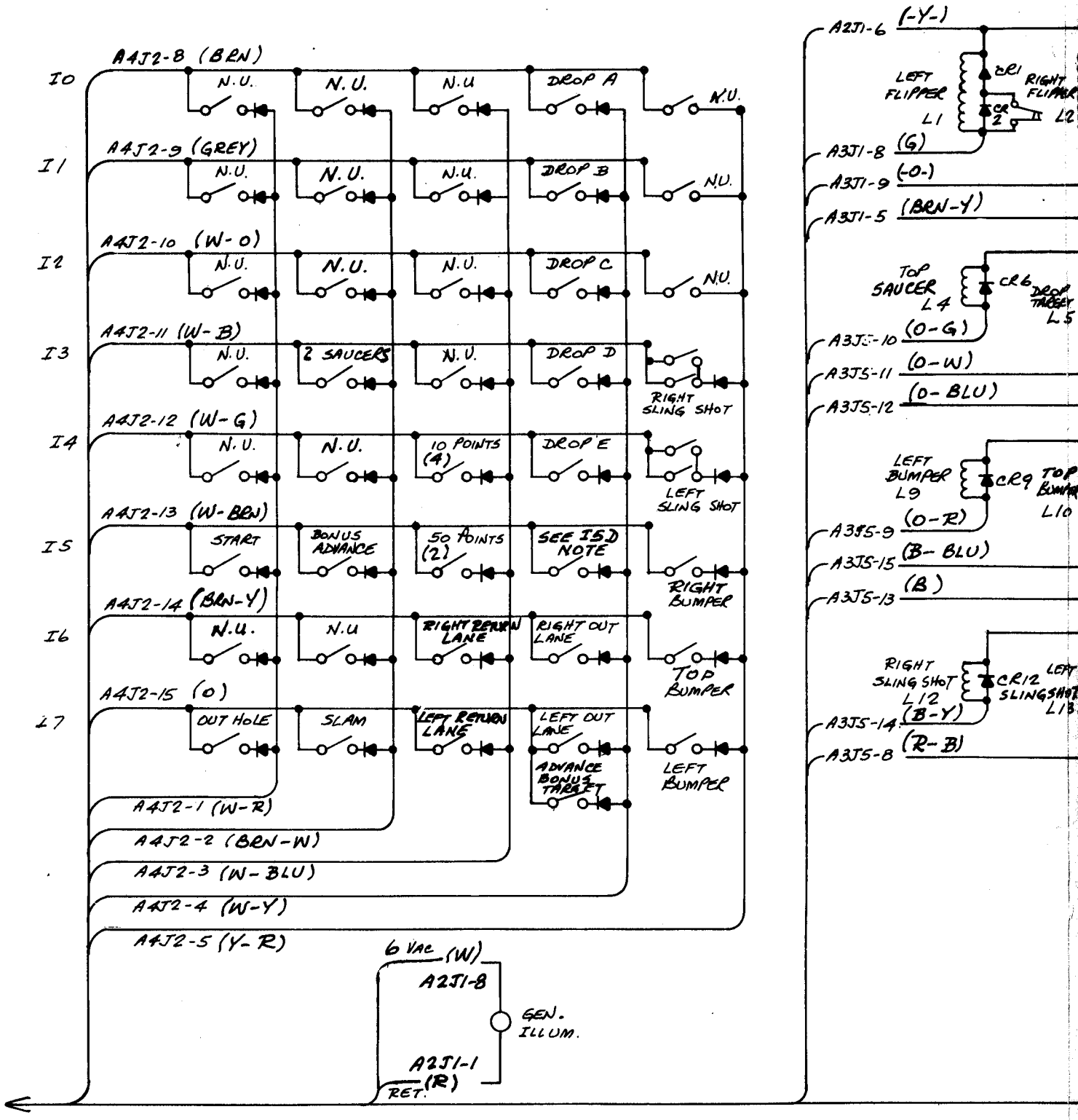
		SCALE: CAD	PART MUST BE FREE OF BURRS
		Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Decimal dimensions on tools plus and minus .001. Angles ±30' unless otherwise specified.	
	DATE		

STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

WIRING DIAGRAM

FOR STINGRAY SOLID STATE

DRN. J. J.	DATE 9-21-77	AM'T CAD
MAT CAD	FIN. CAD	APPR.



PLAYFIELD

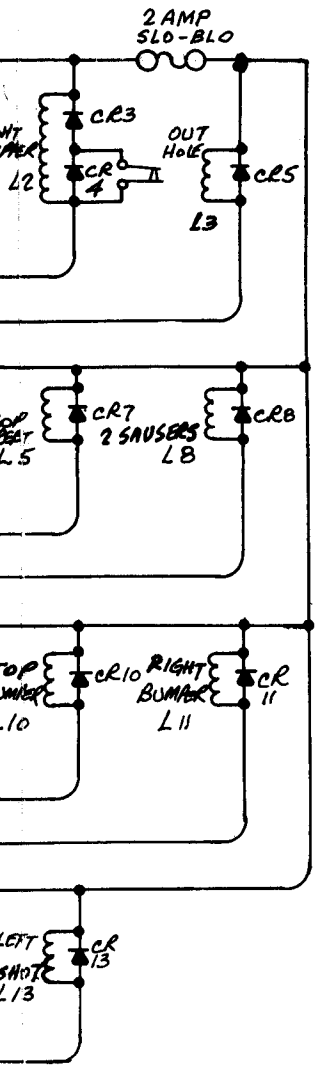
NOTE:

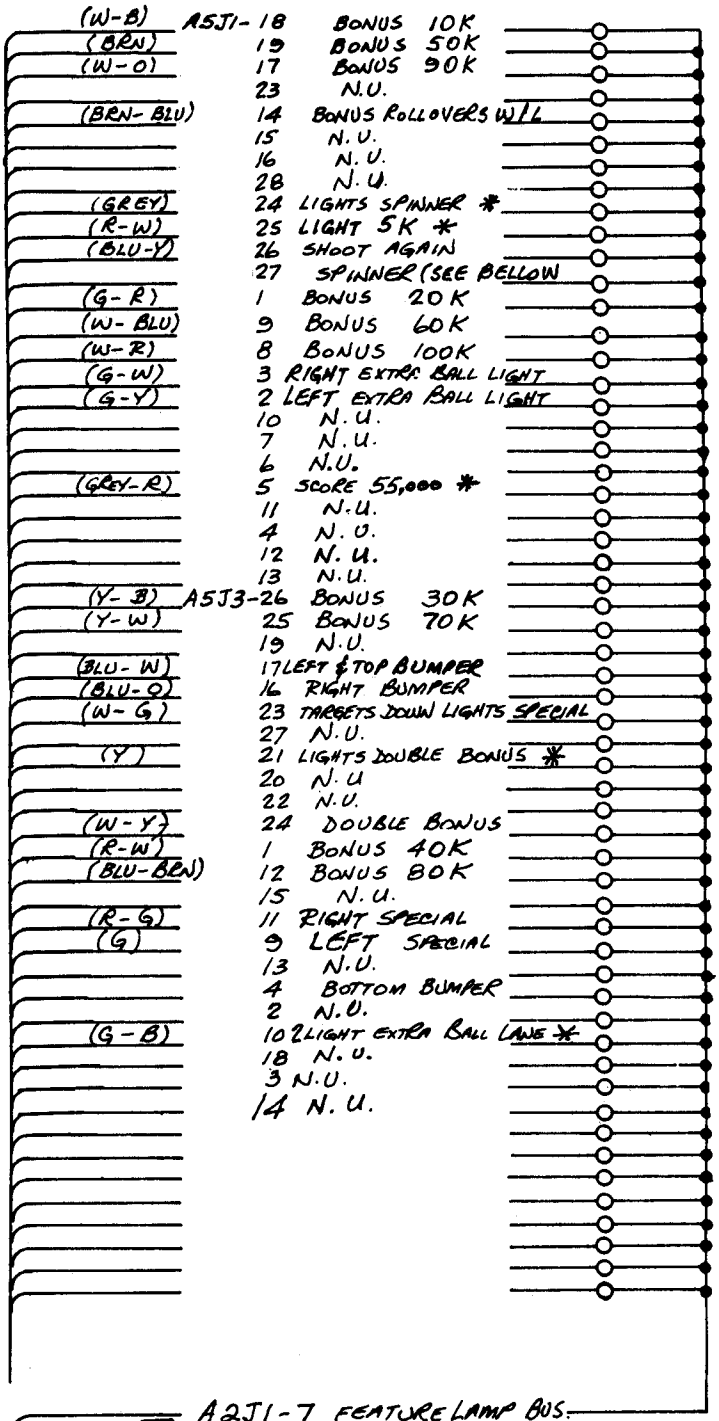
I5D - SPINNER CONTACT
(2) 100/1K TARGETS
(5) 100/1K ROLL OVER BUTTONS

ISSUE	CHANGE

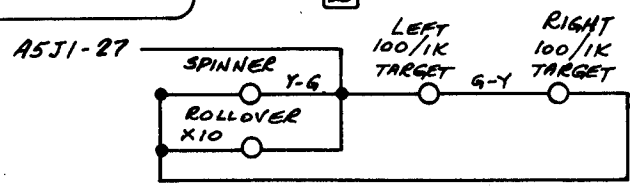
NO. 12B-173-2

NO. 12B-173-2





* HOLE FEATURE LITE



SHEET 2 OF 3 SHEETS

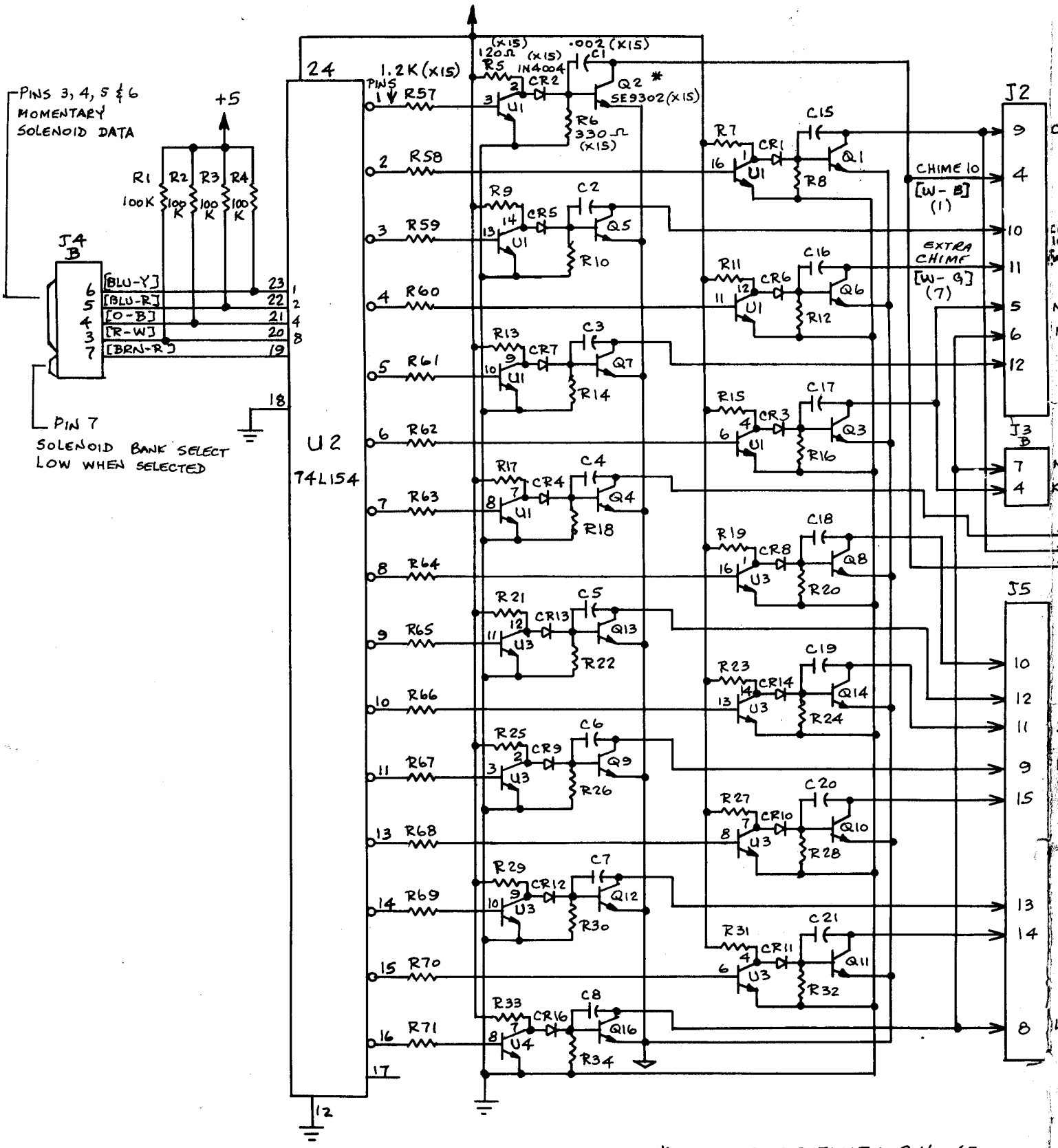
		SCALE: CMT	PART MUST BE FREE OF BURRS
			Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Angles ± 30' unless otherwise specified.
		DATE	

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1725 DIVERSEY BLVD. CHICAGO 60614

WIRING DIAGRAM

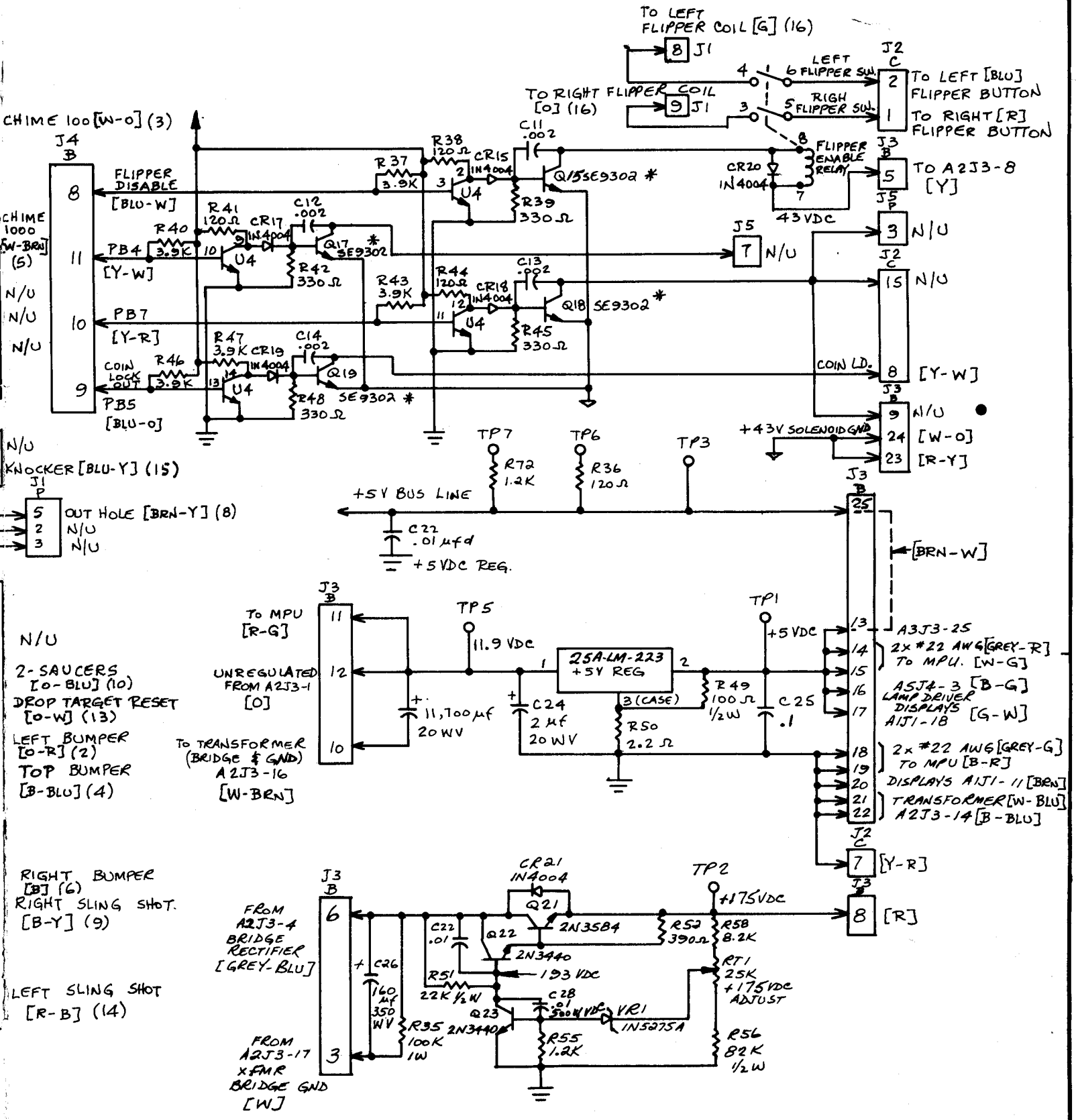
FOR STINGRAY SOLID STATE

DRN. J.T.	DATE 9-20-77	AM'T CMT
MAT CMT	FIN. CMT	APPR.



ISSUE	CHANGE

NO. B-432-5-102



		SCALE:	PART MUST BE FREE OF BURRS
			Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Decimal dimensions on tools plus and minus .001. Angles ±30' unless otherwise specified.
	DATE		

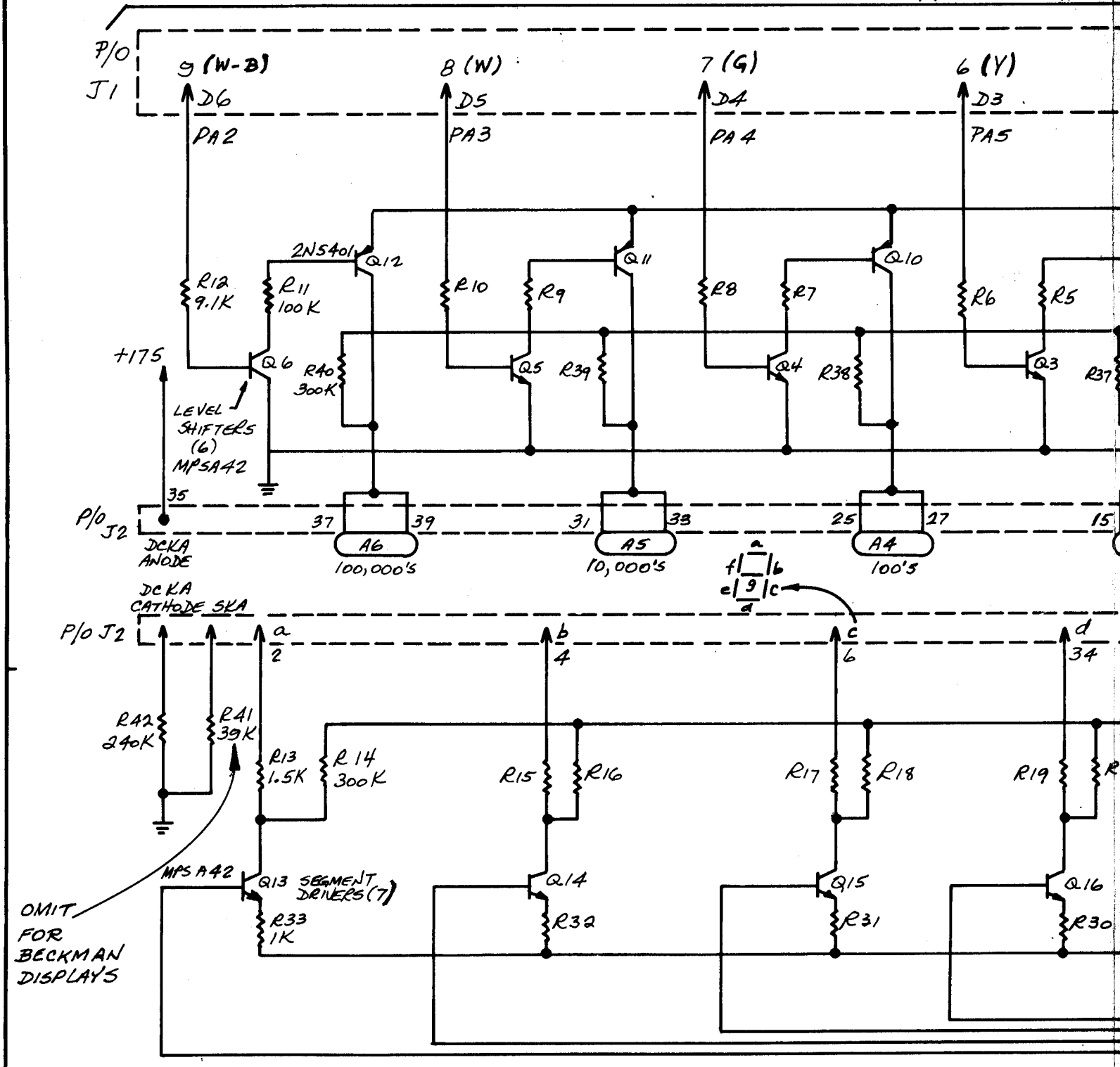
STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

SOLENOID DRIVER VOLTAGE REGULATOR SCHEMATIC

FOR STINGRAY SOLID STATE

DRN.	DATE	AM'T
J.J.	9-20-77	
MAT	FIN.	QP.

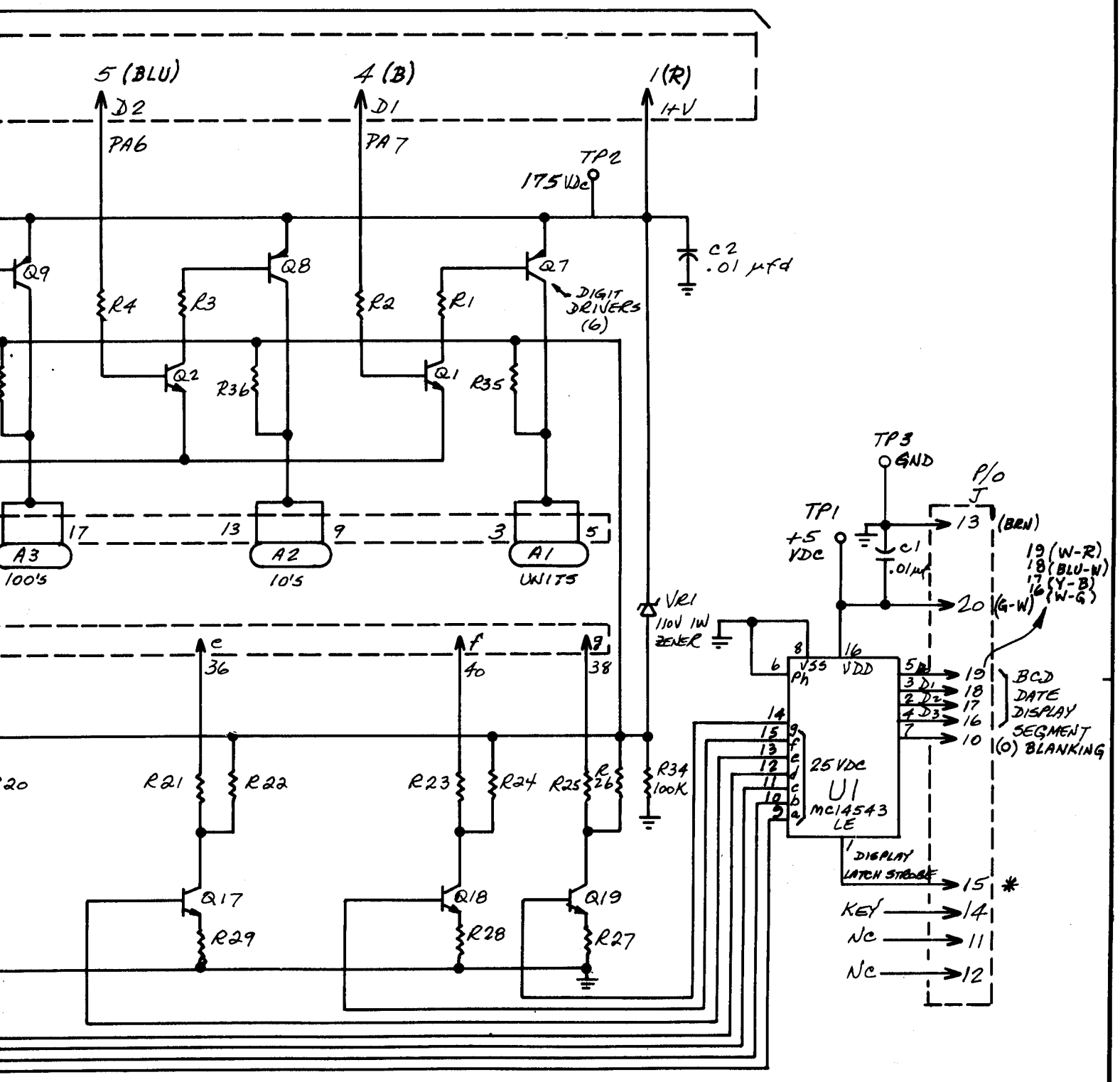
DISPLAY DIGIT ENABLE



ISSUE	CHANGE

NO. B-434-5

NO. B-434-5



*

PIN 15	WIRE COLOR
1ST. PLAYER	B-W
2ND PLAYER	Y-R
3rd. PLAYER	O-BLU
4TH. PLAYER	BRN-O
MATCH/BALL	R-B

	DATE		

SCALE: LAY

PART MUST BE FREE OF BURRS

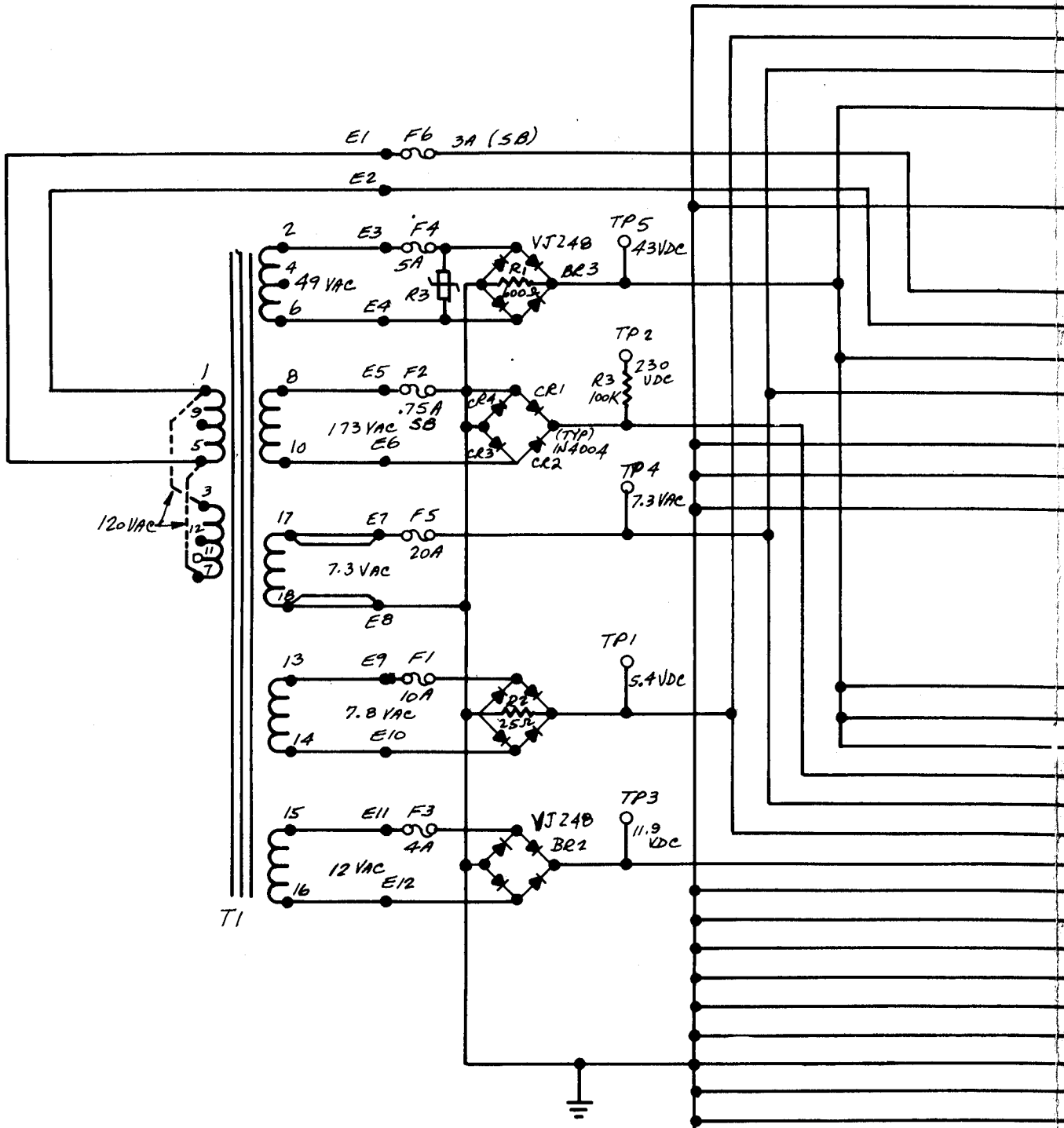
Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Decimal dimensions on tools plus and minus .001. Angles ±30' unless otherwise specified.

STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

DISPLAY BOARD SCHEMATIC

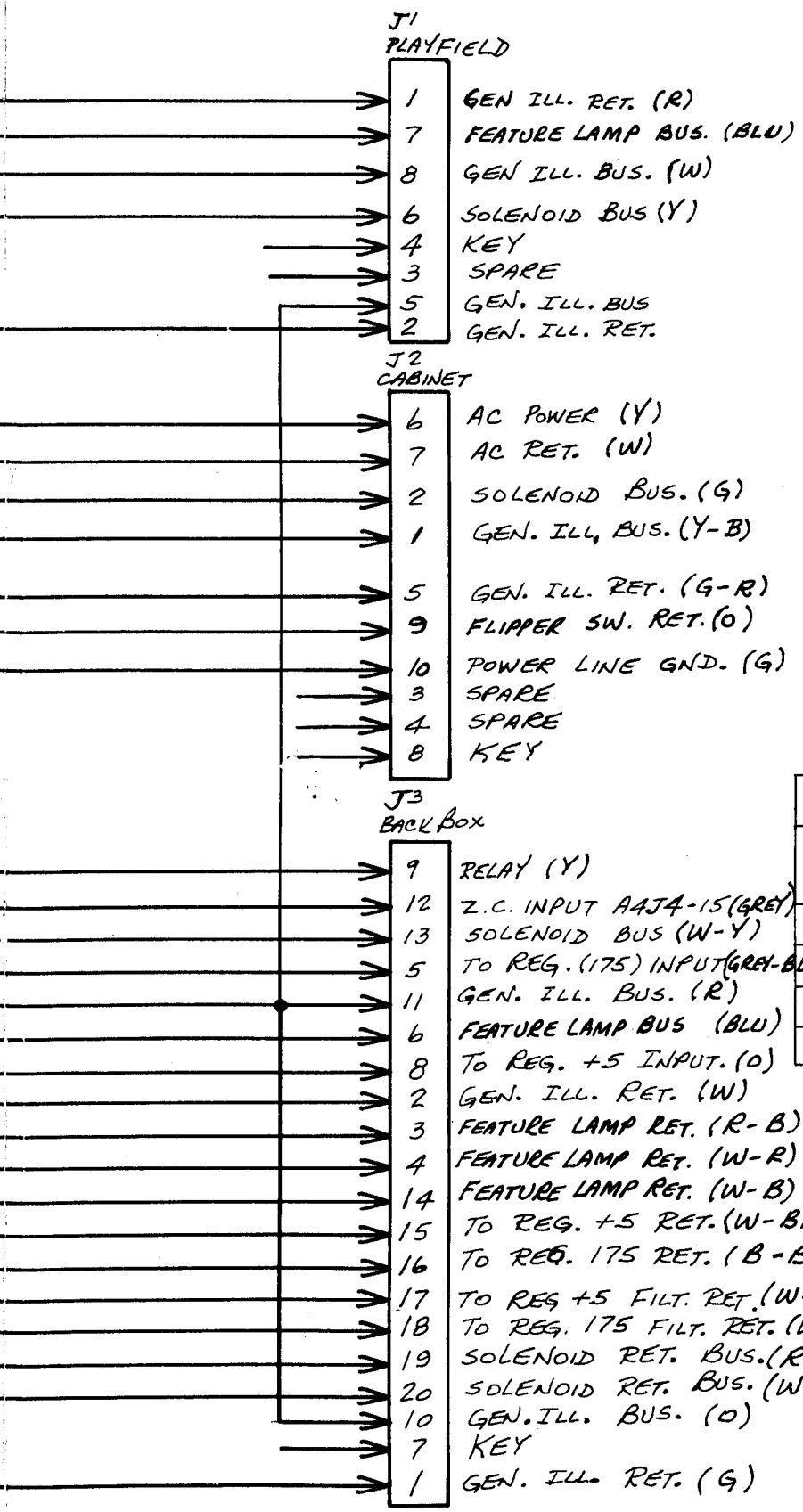
FOR STINGRAY SOLID STATE

DRN. J.J.	DATE 9-20-77	AM'T
MAT	FIN.	APPR.



ISSUE	CHANGE

NO. B-464-5



ABREVIATIONS USED.

GEN ILL.	=	GENERAL ILLUMINATION
RET.	=	RETURN
GND	=	GROUND
REG	=	REGULATED
Z.C.	=	ZERO CROSSING

POWER LINE CONNECTIONS

AC LINE VOLTAGE	STRAP TERMINALS	APPLY POWER TO TERMINALS
115	1 TO 3 AND 9 TO 11	1 AND 9
120	1 TO 3 AND 5 TO 7	1 AND 5
220	3 TO 5	1 AND 12
240	3 TO 5	1 AND 7

SCALE:

PART MUST BE FREE OF BURRS

Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Decimal dimensions on tools plus and minus .001. Angles ±30' unless otherwise specified.

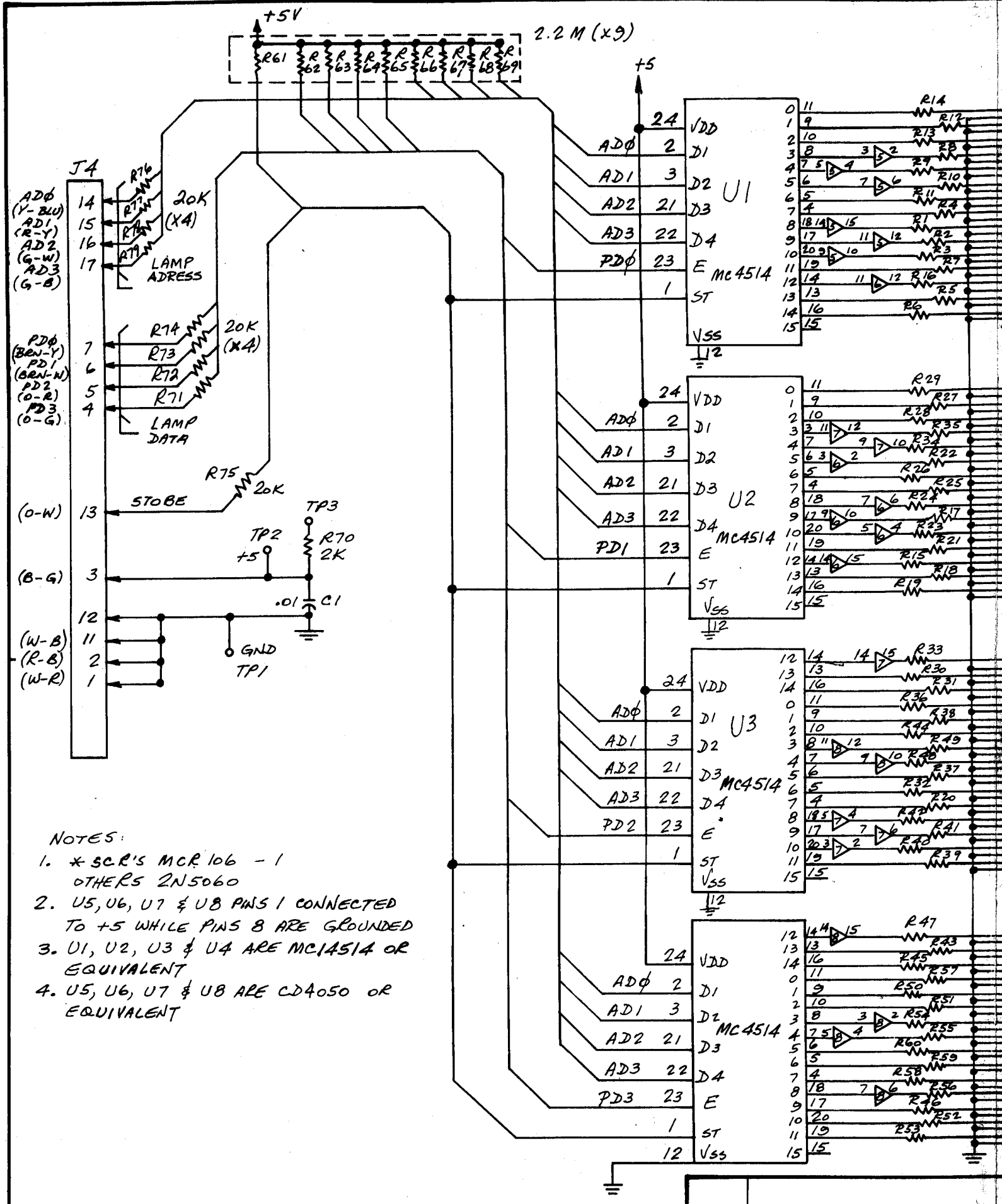
DATE

STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

POWER TRANSFORMER MODULE SCHEMATIC

FOR STINGRAY SOLID STATE

DRN.	DATE	AM'T
J. J.	9-20-77	
MAT	FIN.	APPR.



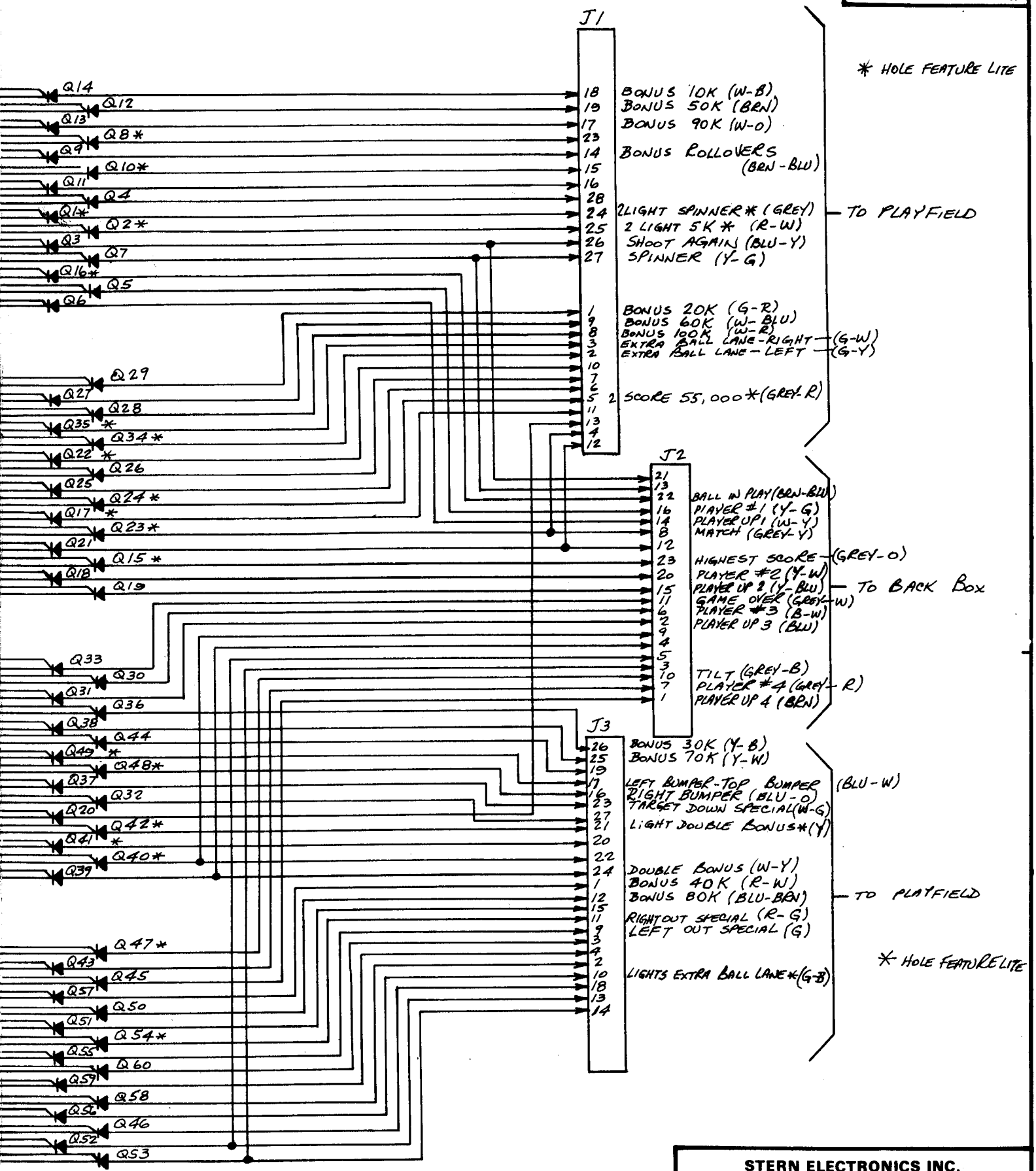
NOTES:

1. * SCR'S MCR 106 - 1 OTHERS 2N5060
2. U5, U6, U7 & U8 PINS 1 CONNECTED TO +5 WHILE PINS 8 ARE GROUNDED
3. U1, U2, U3 & U4 ARE MC14514 OR EQUIVALENT
4. U5, U6, U7 & U8 ARE CD4050 OR EQUIVALENT

ISSUE	CHANGE

NO. B-431-5-102

NO. B-431-5-102



		SCALE:	PART MUST BE FREE OF BURRS
			Unless otherwise specified, all fractional dimensions carry tolerances of plus and minus .010: All decimal dimensions plus and minus .005. Exceptions: Drilled holes plus .003 minus .001. Die casting fractional plus and minus .005: Decimal plus and minus .003. Decimal dimensions on tools plus and minus .001. Angles ±30' unless otherwise specified.
	DATE		

STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

LAMP DRIVER SCHEMATIC

FOR STINGRAY / SOLID STATE

DRN.	DATE	AM'T
C.W.	9-21-77	
MAT	FIN.	APPR.

STINGRAY
By
STERN ELECTRONICS, INC.