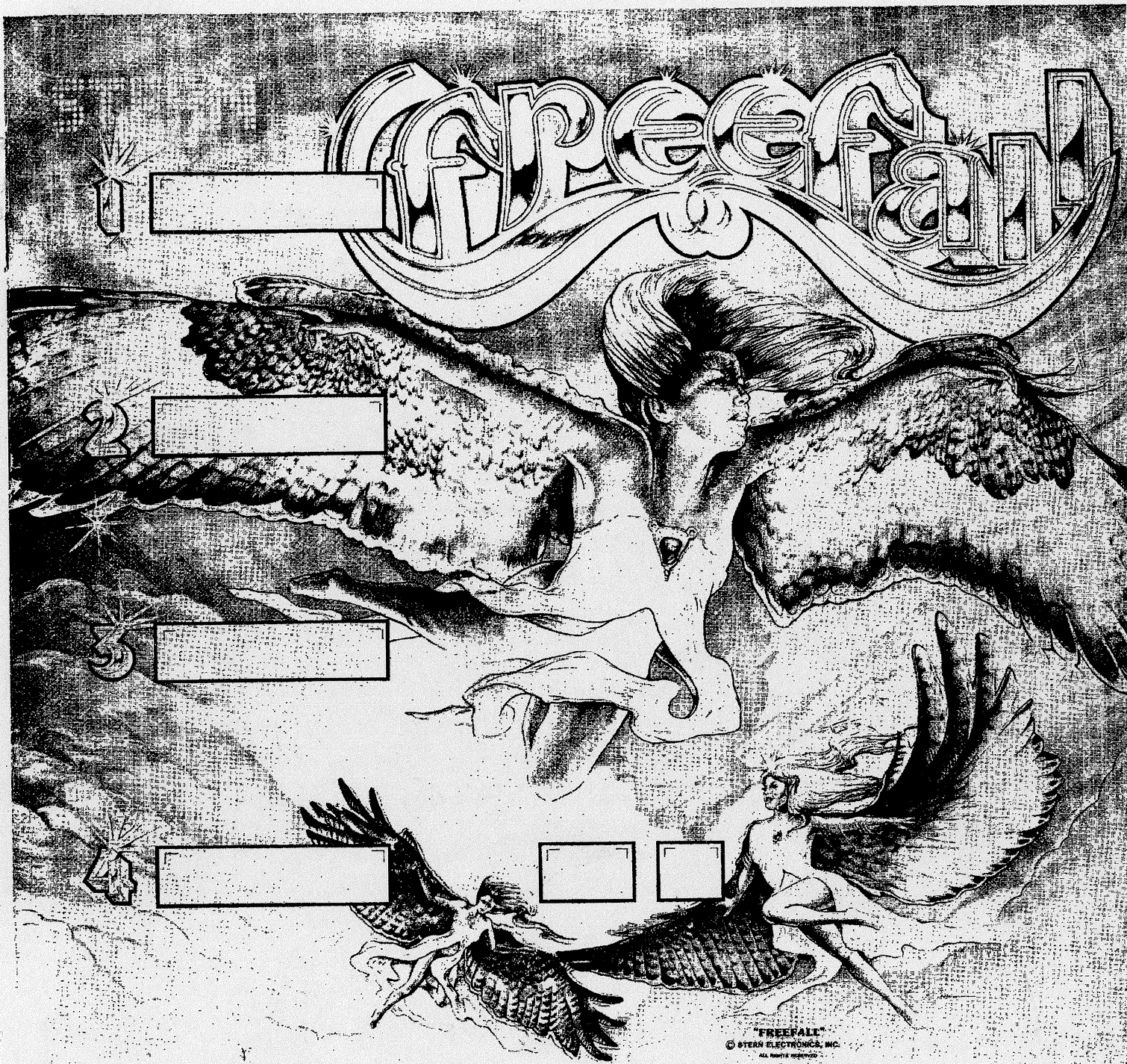




15A-1-124



ELECTRONICS, INC.

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WARNING: THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. AS TEMPORARILY PERMITTED BY REGULATION IT HAS NOT BEEN TESTED FOR COMPLIANCE WITH THE LIMITS FOR CLASS A COMPUTING DEVICES PURSUANT TO SUBPART J OF PART 15 OF FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.

I. INSTALLATION

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.
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 adjustment of the two (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 (gold 15/16" dia.) into ball tilt assembly, and adjust the bracket so the ball will roll free to contact the switch blade, if front of cabinet is raised.

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.

II. 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 an 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, have a pause, flash again, a longer pause, then flash five more times and then will be dimly lit. Accompanying each flash is one note (total of seven), this indicates proper MPU game operation conditions.

GAME SELF-DIAGNOSTIC TESTS:

Pressing the Self-Test button inside the coin door activates the game into its "Self-Diagnostic Test."

1. BURN IN TEST - All outputs tested.
2. FEATURE LAMPS - All feature lamps will flash on and off continuously, determining any burnt lamps.
3. DISPLAYS - Each digit on all displays will cycle from 0 thru 9, then a number 8 will shift left to right. This test will recycle continuously.
4. SOLENOIDS - Each solenoid will 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" display is the same as the number assigned to the solenoid and also the same transistor number on the SDU board. The sound of a solenoid pulling-in as a number appears indicates proper operation (providing transistor is being used), the absence of a solenoid sound shows a fault. If sound is absent, see Solenoid I.D. page in book for help in Solenoid Identification. (After the solenoids are tested, the game sounds are tested.)
5. SWITCHES - The MPU will look at each switch assembly for stuck contacts. *(Flipper Button and flipper End of Stroke switches are not included). If there are any stuck, the lowest number encountered is flashed on the Player Score displays. The number remains until the fault is corrected. See Switch I.D. page in book for help in 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.
6. GAME LEVELS AND BOOKKEEPING FUNCTIONS: - Pressing the Self-Test button eighteen more times causes the MPU to step thru the game levels and bookkeeping functions and finally to repeat the power-up test. To bypass these functions, turn the game off, then on. The game is now ready to play, after the MPU Self-Test.

CONTACT SWITCH ADJUSTMENTS

All contact switches should be adjusted to have a gap 1/16" in the open position, and have .010" overtravel closed. All contact switches (except for flipper buttons & flipper end of stroke switches) are gold 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 SWITCHES ONLY. Tarnish or pitted contacts can be corrected with a contact file followed by a burnishing tool. Severely pitted contact 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.

ELECTRONIC PIN BALL GAME

DISPLAY DRIVER ASSEM'S:-

1ST, 2ND, 3RD & 4TH PLAYERS, CREDITS
AND MATCH/BALL IN PLAY.

(SEE BACK-RACK GLASS FOR LOCATIONS)

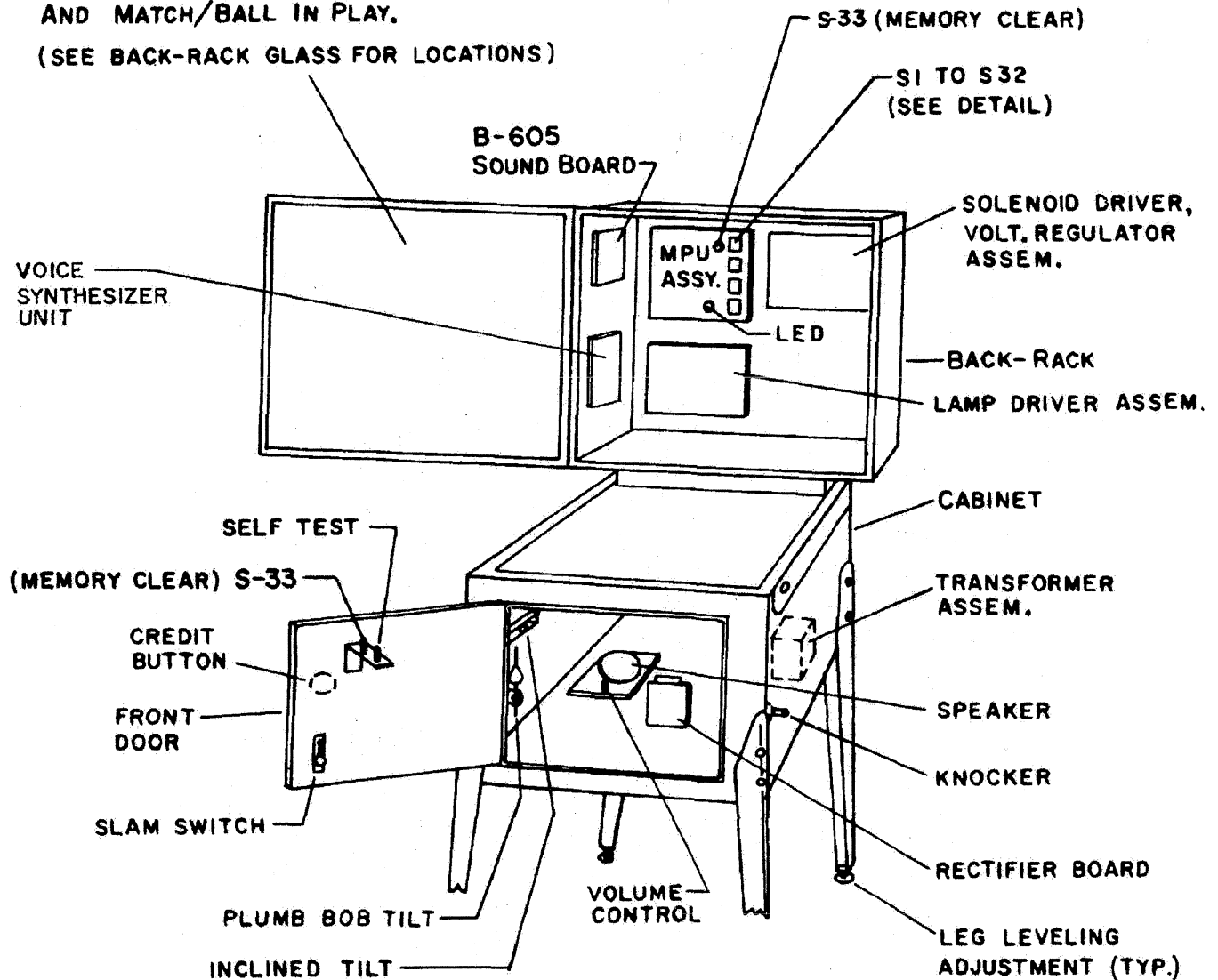
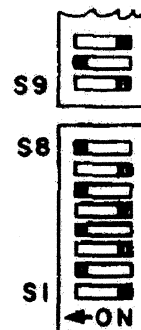


FIGURE 1



DETAIL S1-S32
MPU ASS'Y.

III. GENERAL GAME OPERATION

PLACE BALL INTO PLAYFIELD BY OUTHOLE:

COIN GAME. 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. Seven singular tones will be heard to indicate game-readiness.¹ Feature lites will flash in a programmed attract mode, "HIGH SCORE" lite is lit, player displays flash high score to date, "HIGH SCORE" lite goes off, previous played scores are flashed, and game is ready for play. Coin Game. The game should accept the coin and post credits for coins accepted (*). Pressing the credit button on the door will reset drop targets and cause the outhole kicker to move the ball to the shooter lane. The first player display will flash 00.

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 players are registered). Shooting the ball initiates play.

When the ball enters the outhole, the bonus score is added to the player's score. The player-up and/or ball in play on the back box is advanced one position. The bonus score starts at ** 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 (3 or 5). 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 can be 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 is not advanced for extra ball play. Bonus score is added to the player's score, the bonus is reset to ** and the bonus multiplier earned is restored (memory) or reset (*) before the game moves the extra ball for play.

At the end of the game, a "High Game" is flashed on all players scores. If the "High Game" is beat, this feature(*) can award up to 3 free games.

Tilting while playing the game results in loss of the ball in play. The flippers, thumper-bumper, etc., go "dead". Bonus score is not added. 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 "Shoot Again" lite flashes and the game is ready for play. 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. (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 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.

**Bonus starts at 0.

See back box adjustments.

¹Ball walker and lane kicker cycles.

IV. SELF TEST AND BOOKKEEPING FUNCTIONS

The game is designed to help the operator perform certain diagnostic tests as well as accounting functions as follows:

IV. A. SELF TEST

TEST SWITCH PUSH NUMBER	BALL/MATCH DISPLAY	DESCRIPTION
1st		Burn in test - all outputs tested
2nd		Lamp test - all feature lamps on and off
3rd		Display test - all digits display 000000 thru 999999 then an 8 shifts from left to right
4th		Solenoid test - continuous sequence of solenoids pulsed with solenoid driver transistor, "Q" number displayed
5th	Flashing O if all switches open	Switch test - switch I.D. No. displays if closed

IV. B. BOOKKEEPING FUNCTIONS

TEST SWITCH PUSH NUMBER	BALL/MATCH DISPLAY	DESCRIPTION	DISPLAYS
6th	01	1st Threshold (High Score)	
7th	02	2nd Threshold (High Score)	
8th	03	3rd Threshold (High Score)	
9th	04	Current High Game Threshold	
10th	05	Current Credits	00 to 40
11th	06	Total Plays	00 to 999999
12th	07	Total Replays	00 to 999999
13th	08	Total times high score is passed	00 to 999999
14th	09	Number of coins thru Chute No. 2	00 to 999999
15th	10	Number of coins thru Chute No. 1	00 to 999999
16th	11	Number of coins thru Chute No. 3	00 to 999999
17th	12	Total balls played	00 to 999999
18th	13	Total Extra Balls Awarded	00 to 999999
19th	14	Total Playfield Special Awards	00 to 999999
20th	15	N/U	00
21st	16	Total level 1 passed	00 to 999999
22nd	17	Total level 2 passed	00 to 999999
23rd	18	Total level 3 passed	00 to 999999

V. FRONT DOOR GAME ADJUSTMENTS:

HIGH SCORE FEATURE ADJUSTMENTS:

The game is designed to award a "Extra Ball" or "Free Game" (option) at three score levels. (See High Score Feature). The recommended levels are listed below.

Any level from 10,000 or 9,990,000 can be set, as desired. It is 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 six 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.

HIGH GAME TO DATE FEATURE:

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

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 Adjustments, 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 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 can be turned off by positioning the correct MPU switches.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box or front door.

RECOMMENDED SETTING

	3 BALL	5 BALL
1st Level	500,000	980,000
2nd Level	940,000	2,200,000
3rd Level	_____	_____
High Score To Date	1,300,000	3,000,000

VI. FEATURE OPERATION AND SCORING

To help explanation, playfield switches involved will be called out. See "Switch Identification" (Pg. 18) for location of playfield switches.

BONUS SCORE FEATURE:

2000 score for each lit lite. One and only one completed card goes into reserve bonus.

BONUS ADVANCEMENT:

Pl. Sw. No.	Location	Advance Bonus
22, 23, 24	Center 3 Bank Targets	Lit Number Score 2000 times Multiplier

BONUS MULTIPLIER:

Pl. Sw. No.	Location	Advance Multiplier
17, 18, 19, 20, 21	Left 5 Bank Targets	Increases Multiplier by 1x when all five targets hit (14x Max)
22, 23, 24	Center 3 Bank Targets	Increases Multiplier by 1x when all three targets hit (14x Max)
37 (2)	Outlanes	Increases Multiplier by 1x (14x Max)

Bonus Multiplier can be adjusted to reset after each ball. (See MPU SW #29)

THREE BALL FEATURE:

When "Sky Divers" lites are lit in the ball kicker lane, SKY DIVER #1 and #2 lites are lit and the third ball goes into the ball walker—The three ball feature is *alive*.

SPECIAL:

Special can be awarded by means of three switches; two outlane switches (Pl. Sw. No. 37) and side special switch (Pl. Sw. No. 25)

OUTLANE SPECIAL:

Lites when card is completed once or twice (See MPU Sw. #5) or when 3 ball feature is awarded first or second time (See MPU Sw. #23)

ALTITUDE LANE SPECIAL:

Lites when left 5 bank targets are hit down in sequence.

SPECIAL ADJUSTMENT:

"Special" can be adjusted so there is only one Special per game or one Special per ball. (See MPU Sw. No. 30)

SPECIAL AWARD:

	MPU SW. NO.	
	31	32
NO AWARD	OFF	OFF
SHOOT AGAIN	OFF	ON
100,000	ON	OFF
REPLAY	ON	ON

SHOOT AGAIN COLLECTED:

"Shoot Again" can be awarded by means of the "SPECIAL" feature on game (See MPU Sw. No. 31 & 31).

RIGHT SKY DIVERS LANE (Pl. Sw. No. 4)

Scores 45,000 and signals coil to kick ball out.

SKY DIVER KICKER (Pl. Sw. No. 5)

Scores 15,000 and signals coil to kick ball out.

OUTHOLE REFLEX (Pl. Sw. No. 8)

When closed will advance the ball to the outhole runway switches.

OUTER RETURN LANES (Pl. Sw. No. 9)

Scores 3,000 and spots second "5"—either side.

LOWER RIGHT REBOUND SWS. (Pl. Sw. No. 11)

Scores 10 points, changes line selector and turns outlane special lite on and off when special has been awarded, by completing card or 3 ball feature (if *both* completed card and 3 ball feature is achieved—lite will not turn on and off—will stay on until awarded or game ends).

RIGHT SLINGSHOT (Pl. Sw. No. 12)**LEFT SLINGSHOT (Pl. Sw. No. 13)**

Same as above lower right rebound sws.

LEFT & RIGHT POP BUMPERS (Pl. Sw. No. 14 [rt] & No. 15 [lt])

Scores 1000, changes line selector, turns spinner and top right stand-up target lite on and off.

TOP POP BUMPER (Pl. Sw. No. 16)

Scores 1000 and changes line selector.

5 BANK DROP TARGETS (Pl. Sw. No. 17, 18, 19, 20, 21)

Each target scores 500. Targets hit down in sequence 1-2-3-4-5 scores extra 50,000 points, lites side lane special and increases bonus multiplier by one. Targets hit down out of sequence scores extra 10,000 points and increases bonus multiplier by one. If targets 1-2-4-5 are hit down leaving target #3 standing, the extra ball lites for that ball in play and if hit down would award extra ball plus out of sequence scoring.

3 BANK DROP TARGETS (Pl. Sw. No. 22, 23, 24)

Each target scores 1000 and lites number in lit selector line (See MPU Sw. 22). Liting all numbers with one ball stores "Completed Card" in "Reserve Bonus", plus can lite up outlane special (See MPU Sw. 5). Completed lit lines score 5,000, are put in "Reserve Score" and are carried over from ball to ball.

LEFT LANE STAND-UP TARGET (Pl. Sw. No. 25)

Scores 10,000, lit value and special when lit.

TOP RIGHT ROLL-OVER AND TOP RIGHT STAND-UP (Pl. Sw. No. 26)

Scores 3,000 and lites letter "E" in "SKY DIVERS" lane.

INNER TOP RIGHT ROLL-OVER (Pl. Sw. No. 27)

Scores 5,000 and lites letter "V" in "SKY DIVERS" lane.

INNER TOP LEFT ROLL-OVER (Pl. Sw. No. 28)

Scores 5,000 and lites letter "I" in "SKY DIVERS" lane.

TOP LEFT ROLL-OVER AND TOP LEFT STAND-UP TARGET (Pl. Sw. No. 29)

Scores 3,000 and lites letter "D" in "SKY DIVERS" lane.

MIDDLE RIGHT BOTTOM STAND-UP TARGET (Pl. Sw. No. 30)

Scores 3,000 and lites letter "Y" in "SKY DIVERS" lane.

MIDDLE RIGHT CENTER AND TOP CENTER STAND-UP TARGET (Pl. Sw. No. 31)

Scores 5,000 and lites letter "K" in "SKY DIVERS" lane.

MIDDLE RIGHT TOP STAND-UP TARGET (Pl. Sw. No. 32)

Scores 3,000 and lites letter "S" in "SKY DIVERS" lane.

OUTHOLE LANE SWITCHES (Pl. Sw. No. Lt. 35, Ctr. 34, Rt. 33)

Ball count switches.

Spinner and top right stand-up target (Pl. Sw. No. 36)

Scores 500 or 5,000 when lit.

OUTLANE SWITCHES (Pl. Sw. No. 37)

Scores 15,000 and increases bonus multiplier by one and also awards special when lit.

SHOOTER LANE (Pl. Sw. No. 38)

Allows game to start if 2 balls are in outhole and one in lane.

BALL WALKER LANE (Pl. Sw. No. 39)

Scores 20,000 and advances ball in walker.

INNER RETURN LANES (Pl. Sw. No. 40)

Scores 5,000 and lites letter "R" in "SKY DIVERS" lane.

VII. CREDIT/COIN AND 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 Fig. 3).

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 allows play to be customized to the location. (See Fig. 1). Credits per coin, maximum credits, credit display, balls (3 or 5) per game, match feature, high game feature, special award, maximum extra balls and background sound are selectable by means of 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" position is marked on the assembly. TURN OFF POWER BEFORE MAKING ADJUSTMENTS. MAKE ADJUSTMENTS BEFORE TURNING POWER BACK ON.

FREEFALL SWITCH ASSIGNMENTS

		NONE	X BALL	100K	REPLAY		ON	OFF
32	Special...	OFF	ON	OFF	ON	32	←	←
31	Award...	OFF	OFF	ON	ON	31	←	←
30	Special Feature					30	1/GAME	1/BALL
29	Bonus Multiplier Carry-Order					29	ON	OFF
28	Coin Chute #3					28	See Catalog Or Label On Side Of Cabinet	
27						27		
26						26		
25						25		
24	Add-A-Ball Feature (See 13)					24	ON	OFF
23	3-Ball Feature Outlane Special (See 5)					23	1 Time	2 Time
22	Arrow-Card Selector					22	2 (*)	1
21	Match Features					21	ON	OFF
20	Display Credits					20	ON	OFF
19	Maximum Credit	10	15	25	40	19	←	←
18		OFF	OFF	ON	ON	18	←	←
17	Talking Sound					17	ON	OFF
16	High Score	0	1	2	3	16	←	←
15		OFF	OFF	ON	ON	15	←	←
14	Balls in Walker					14	Carry Over	Reset
13	Maximum Add-A-Balls (See 24)					13	5	3
12	Coin Chute #2					12	See Catalog Or Label On Side Of Cabinet	
11						11		
10						10		
9						9		
8	Background Sound					8	ON	OFF
7	Ball Per Game					7	5	3
6	High Score Feature					6	Replay	X-Ball
5	Completed Card Outlane Special (See 23)					5	1 Card	2 Cards
4	Coin Chute #1					4	See Catalog Or Label On Side Of Cabinet	
3						3		
2						2		
1						1		

*2 on 25% of the Time

CREDITS/COIN ADJUSTMENTS:

The credits given are selectable by means of MPU switches. Sixteen credit ratios are available. The MPU switch settings and resultant credits/coin are as follows:

CREDITS/COIN ADJUSTMENTS SWITCHES

SWITCH No. 1 (BLU)	4	3	2	1		
SWITCH No. 2 (BRN-WHITE)	12	11	10	9		
SWITCH No. 3 (RED-WHITE)	28	27	26	25	CREDITS	COIN
OFF	OFF	OFF	OFF	OFF	1	1
OFF	OFF	OFF	ON	ON	2	
OFF	OFF	ON	OFF	OFF	3	
OFF	OFF	ON	ON	ON	4	
OFF	ON	OFF	OFF	OFF	5	
OFF	ON	OFF	ON	ON	6	
OFF	ON	ON	OFF	OFF	7	
OFF	ON	ON	ON	ON	10	
ON	OFF	OFF	OFF	OFF	14	

				CREDITS	COINS	SEQUENCE OF CREDITS PER COIN			
						1	2	3	4
ON	OFF	OFF	ON	1	2	0	1		
ON	OFF	ON	OFF	3	2	1	2		
ON	OFF	ON	ON	5	2	0	5		
ON	ON	OFF	OFF	7	2	0	7		
ON	ON	OFF	ON	3	4	0	1	0	2
ON	ON	ON	OFF	5	4	1	1	1	2
ON	ON	ON	ON	7	4	1	2	1	3

If two or three coin chutes are adjusted the same for multiple coins, credits will increase as if dropped in same chute.

Credit sequence will reset when:

- 1) credit button is pressed
- 2) any points are scored

BALLS PER GAME:**NO. OF BALLS PER GAME**

3

5

MPU SWITCH 7

OFF

ON

ADD-A-BALL (MEMORY):

This adjustment can store in memory 3 or 5 "Add-A-Balls."

ADD-A-BALL (MEMORY)

1 Only

3

5

MPU SWITCHES**24****13**

OFF

OFF

ON

OFF

ON

ON

CREDIT DISPLAY:**CREDIT DISPLAY**

YES

NO

MPU SWITCH 20

ON

OFF

AWARDED MAXIMUM CREDITS:

In answer to public demand, we at "STERN" are trying to give the players what they want — *MORE* playfield excitement. In order to do this, additional features are *NEEDED*.

In an effort to do so, we have added a coil on the playfield, and eliminated the "Coin Lock-Out Coil" (often called a nuisance by operators).

This Stern game has a new feature not used in any previous Stern pinball:

Coins will be accepted and credit given for the amount of coins inserted.

There are no MPU switches to limit the amount of credits given as in older Stern pinballs (it is even possible to attain 99 credits). There are, however, two (2) MPU switches that will limit the amount of replays awarded. These two switches can be set for a limit of 10, 15, 25, and 40 replays. If the amount of credits shown in the credit/match window is greater than the MPU switches are set for, no replay credit will be awarded.

AWARDED MAXIMUM CREDITS

10

15.....

25

40.....

MPU SWITCHES**18****19**

OFF

OFF

ON

OFF

OFF

ON

ON

ON

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" for setting levels.)

AWARD

Extra Ball

Replay

MPU SWITCH 6

OFF

ON

HIGH GAME TO DATE FEATURE:

The game is designed to award up to 3 free games when "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.

AWARD	MPU SWITCHES	
	15	16
Novelty	OFF	OFF
1 Free Game	ON	OFF
2 Free Games	OFF	ON
3 Free Games	ON	ON

BACKGROUND SOUND:

The "Background Sound" during game play can be controlled as follows:

SOUND	MPU SWITCH 8
OFF	OFF
ON	ON

TALKING FEATURE:

The "Talking Feature" during game play can be controlled as follows:

TALKING FEATURE	MPU SWITCH 17
NO	OFF
YES	ON

MATCH FEATURE:

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

MATCH	MPU SWITCH 21
ON	ON
OFF	OFF

BONUS MULTIPLIER CARRY-OVER:

The "Bonus Multiplier" awarded during the course of the game can be retained from ball to ball or can be adjusted to start at x1 for each ball.

BONUS MULTIPLIER	MPU SWITCH 29
RESET	OFF
RETAIN	ON

NO. OF SPECIALS:

The number of "Specials" awarded can be limited as follows:

SPECIALS	MPU SWITCH 30
1 PER BALL	OFF
1 PER GAME	ON

SPECIAL AWARD:

SPECIAL AWARD	MPU SWITCHES	
	31	32
NO AWARD.....	OFF	OFF
EXTRA BALL.....	OFF	ON
100,000 POINTS.....	ON	OFF
REPLAY.....	ON	ON

OUTLANE SPECIAL LITES WHEN

	MPU SWITCHES	
	5	23
1) COMPLETED CARD		
1 LIT ONE TIME	ON	
2 LIT TWO TIMES	OFF	
2) 3 BALL FEATURE HAS BEEN COMPLETED		
1st TIME		ON
2nd TIME		OFF

BALLS IN WALKER

Anytime the game is TURNED ON, balls in the walker will return to the outhole. The balls left in the walker will remain there for the next game or player. MPU sw. 14 will determine if "SKY DIVER" lite 1 and/or 2 will be on and carried over or balls are left in the walker, lites off and have to be re-lit.

SKY DIVER LITES	MPU SWITCH 14
CARRY OVER	ON
RESET	OFF

ARROW-CARD SELECTOR

Number of arrows by card can be adjusted to have only one on or any two on 25% of the time.

ARROWS ON	MPU SWITCH 22
1 ARROW	OFF
2 ARROWS	ON

PARTS LIST FREEFALL

MISCELLANEOUS

	PART NUMBER
Transformer (Domestic or Export)	16B-6
Transformer & Rectifier Board	B438-4
Bulbs, #44	8A-101
U1	E134-U1B23
U2	E134-U2B23
U5	E134-U5B23
U6	E134-U6B23
U9 Voice E-Prom	E134-U9V0
U10 Voice E-Prom	E134-U10V0

ASSEMBLY COILS

5 Drop Target Bank	B-24-1600
3 Drop Target Bank	B-27-2300
Flippers	J-25-475/34-4500
Thumper (3)	J-26-1200
Side Ball Kicker	J-26-1200
Top Ball Kicker	J-27-1700
Ball Ejector	J-28-2300
Ball Ejector Release	J-28-2300
Ball Walker	J-28-2300
Knocker	N-26-1200
Return Gate	C-31-1800

MODULES

Lamp Driver	B-431
Display Driver	A-645
Match/Ball in Play Display	A-434
Solenoid Driver/Voltage Regulator	B-432
MPU (FOR E PROM SEE MISCELLANEOUS ABOVE)	C-602
Rectifier Board	A-430
Sound Module	C-605
Voice Synthesizer Unit (E PROM SEE MISCELLANEOUS ABOVE)	A-720

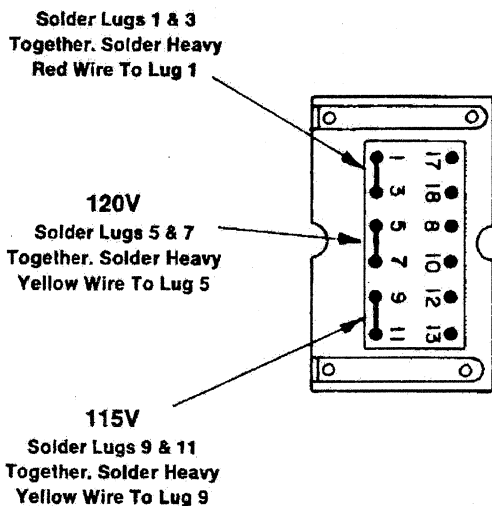
PLAYFIELD PARTS

SEE PLAYFIELD DIAGRAM

STERN 16B-6 TRANSFORMER WIRING CONNECTION INSTRUCTIONS

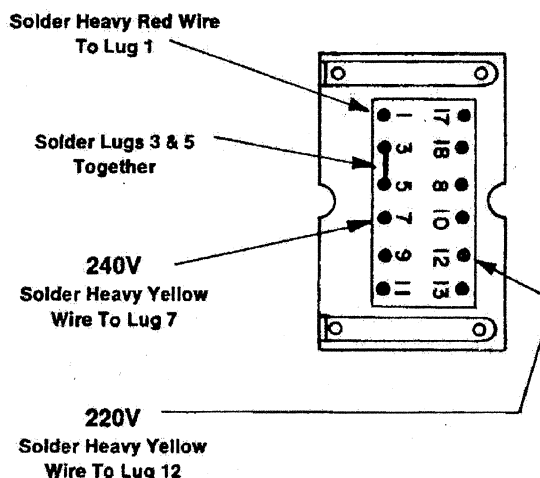
115/120V., 50/60 Cycle Input.

Varistor - Soldered to Line Filter on Left Side of Cabinet
Must Be Stern Part No. 25A-18-1.

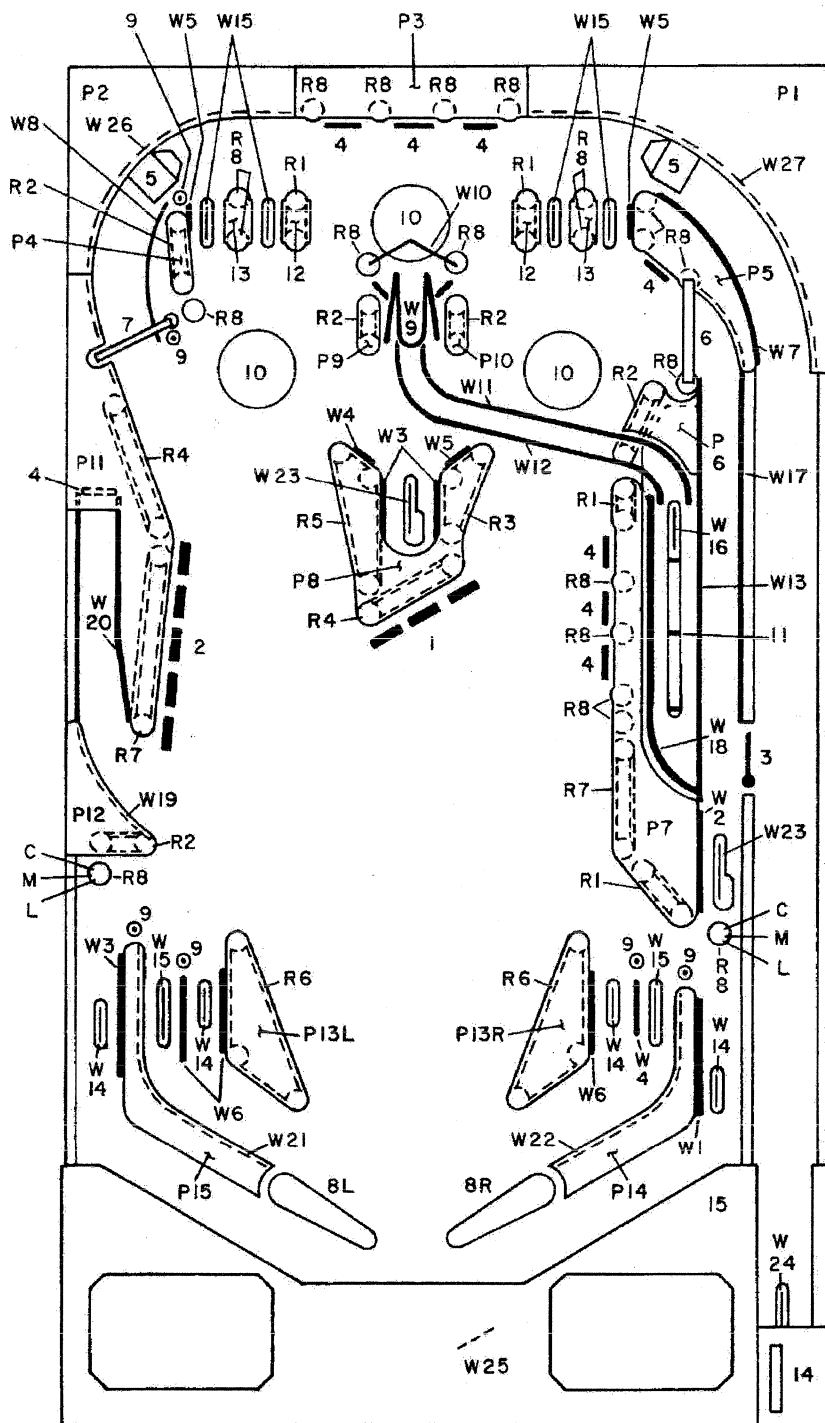


220/240V., 50/60 Cycle Input.

Varistor - Soldered to Line Filter on Left Side of Cabinet
Must be Stern Part No. 25A-18-2.



FREEFALL PLAYFIELD PARTS



GAME ADJUSTMENT

C-CONSERVATIVE
M-MEDIUM
L-LIBERAL

RUBBER RINGS

R1-7A-120-100	R5-7A-120-225
R2-7A-120-125	R6-7A-120-250
R3-7A-120-150	R7-7A-120-275
R4-7A-120-200	R8-7A-135

BALL GUIDES & ROLL-OVERS

W1-6A-101	W15-A-149
W2-6A-101-B	W16-A-643
W3-6A-101-E	W17-A-777
W4-6A-101-G	W18-A-778
W5-6A-101-N	W19-A-779
W6-6A-101-O	W20-A-780
W7-6A-129	W21-A-828
W8-6A-294	W22-A-829
W9-6A-276	W23-A-858
W10-6A-296	W24-A-859
W11-6B-274	W25-A-860
W12-6B-275	W26-C-775
W13-1B-897	W27-C-776
W14-A-383	

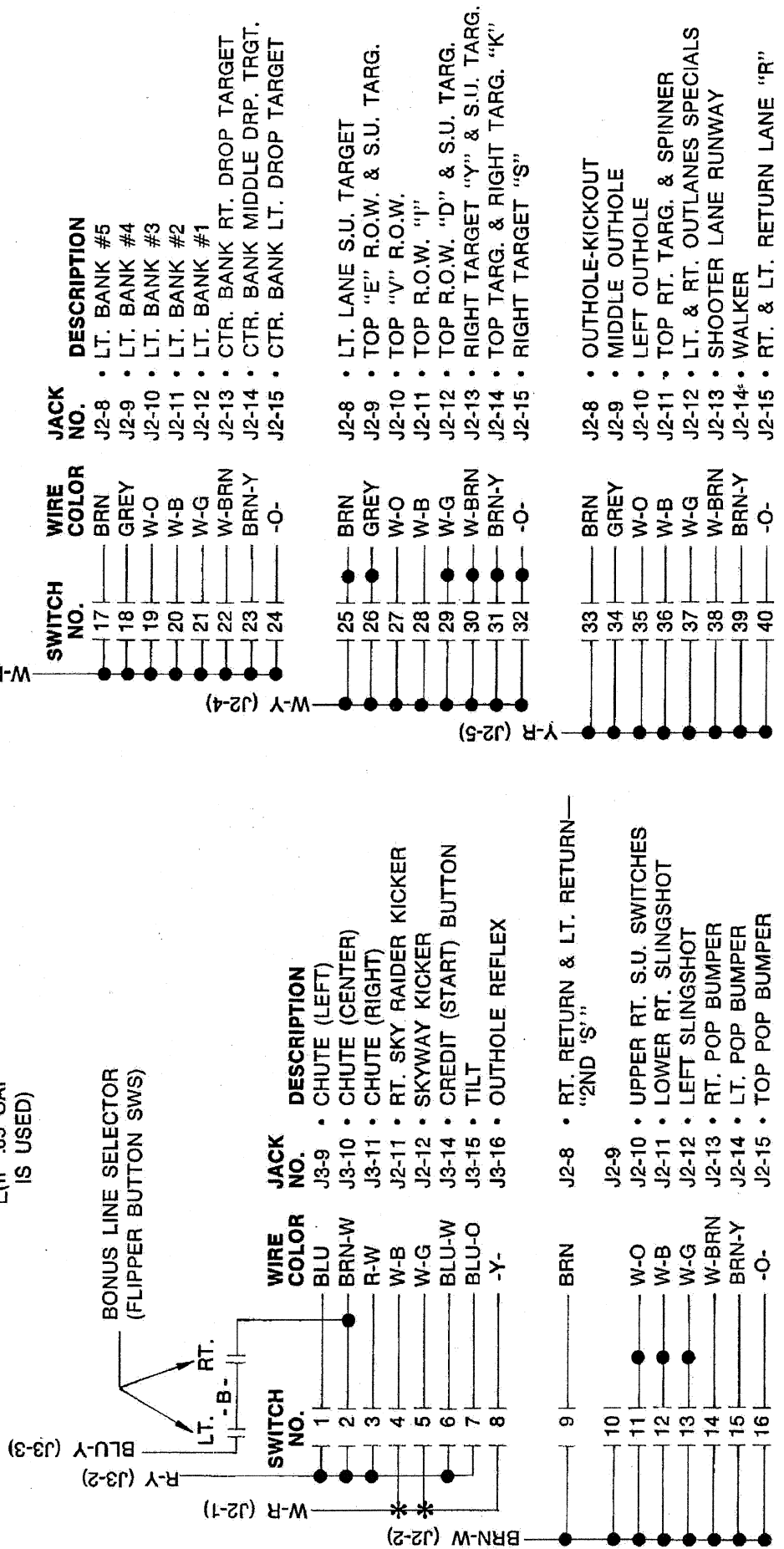
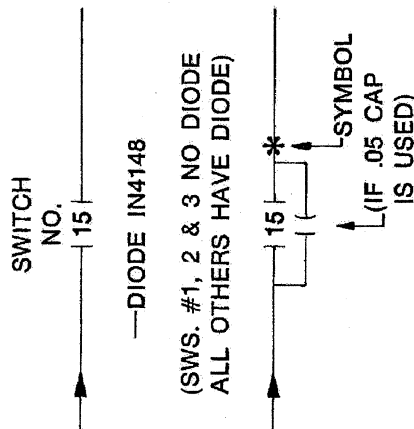
PLASTIC SHIELDS

13C-134-1 to -15
(P1 to P15)

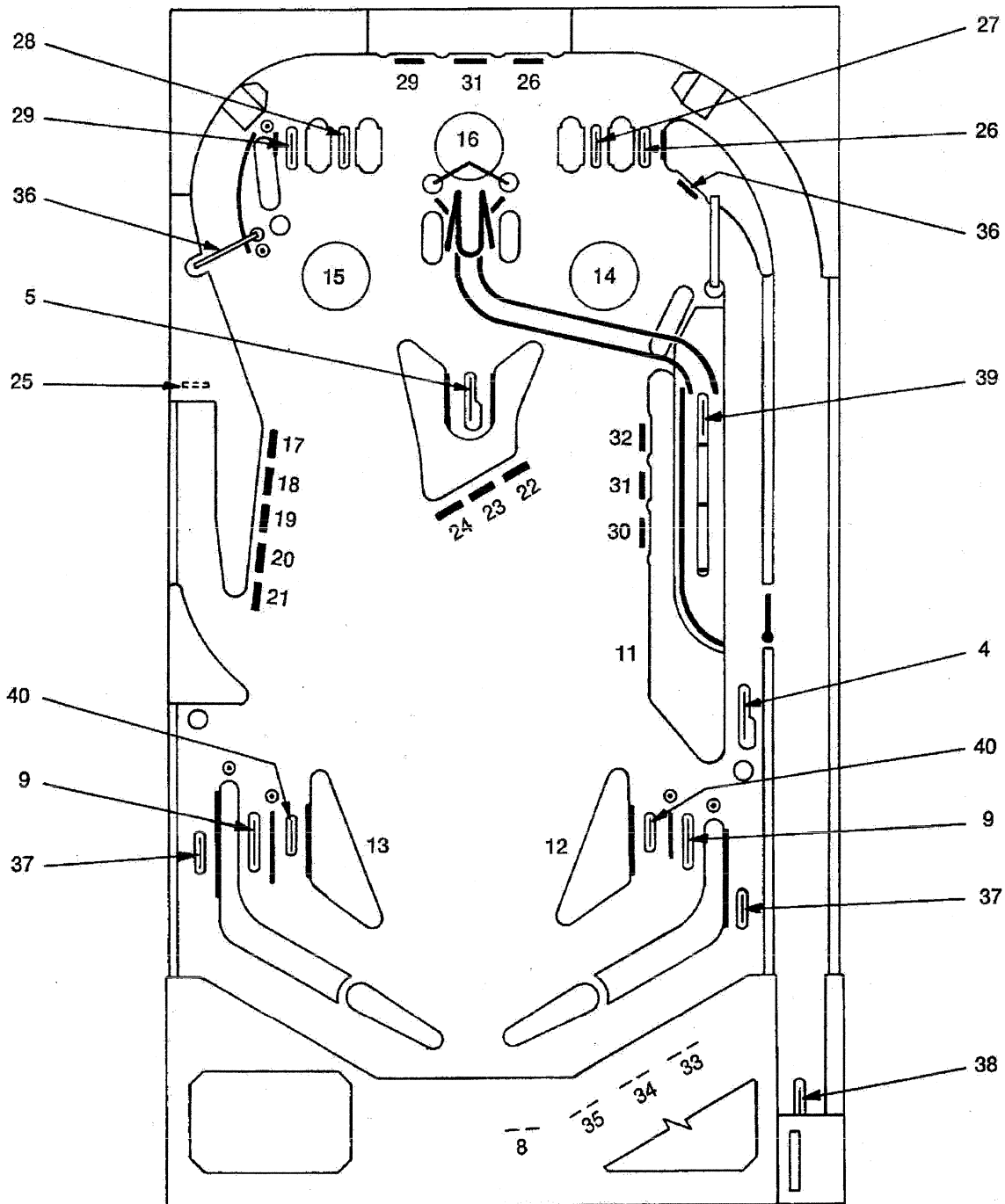
MISC. PARTS & ASSEMBLIES

- 3-Bank Drop Targ. D-823-3B
(Targets alone 13A-45-B)
- 5-Bank Drop Targ. D-823-5A
(Targets alone 13A-35-1 to -5)
- Extra Ball Gate Assembly B-675
(A-722-L-2)
- (8) Stand-Up Targets
(A-722-L-2)
- Ball Gate Assembly
A-611-L & A-611-R (Rt. & Lt.)
- One Way Gate Assembly A-471
- Spin Target Assembly A-563-4
- Flipper Assembly B-634-1-LY
and B-634-1-RY (Rt. & Lt.)
- Ball Guide Post 2A-200
(Rubber Ring 7A-125)
- Thumper Cap 4A-317-Y
- Ball Walker Assembly B-844
- Ball Guide Rail 4A-110-RT
- Ball Guide Rail 4A-121-RT
- Shooter Gauge 14A-2-11
- Instruction Plate 14B-18-1

FREEFALL **SWITCH IDENTIFICATION**



FREEFALL SWITCHES



SWITCHES NOT ON PLAYFIELD

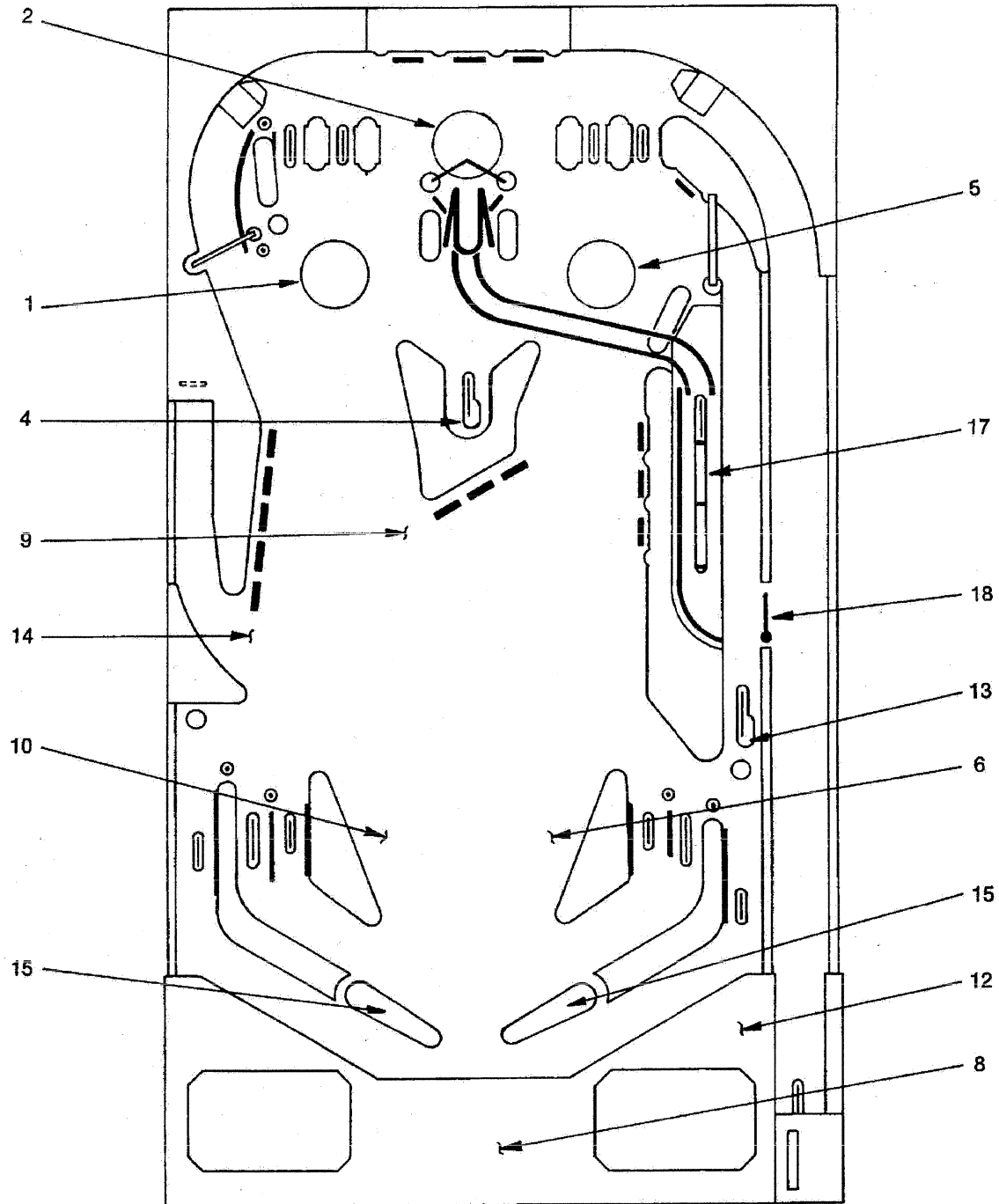
- | | |
|------------------|------------------|
| 1. *LEFT CHUTE | 6. CREDIT BUTTON |
| 2. *CENTER CHUTE | 7. TILT |
| 3. *RIGHT CHUTE | |

* SEE DRAWG. ON SWITCH IDENTIFICATION PAGE

FREEFALL SOLENOID

I.D. NUMBER	TRANS. NUMBER	JACK	WIRE COLOR	DESCRIPTION
1	Q1	J2-9	G-O	LEFT POP BUMPER
2	Q2	J2-4	G-BLU	TOP POP BUMPER
3	Q3	J2-5	G-B	KNOCKER
4	Q4	J1-5	B-BLU	SKYWAY KICKER
5	Q5	J2-10	G-Y	RIGHT POP BUMPER
6	Q6	J2-11	G-R	LOWER RIGHT SLINGSHOT
7	N/U	N/U	N/U	N/U
8	Q8	J5-10	B-O	OUTHOLE (KICKER)
9	Q9	J5-9	R-BLU	CENTER 3 BANK RESET
10	Q10	J5-15	O-W	LEFT SLINGSHOT
11	N/U	N/U	N/U	N/U
12	Q12	J5-13	O-G	OUTHOLE REFLEX
13	Q13	J5-12	B-Y	SKY RAIDER LANE KICKER
14	Q14	J5-11	B-G	LEFT 5 BANK RESET
15				FLIPPER ENABLE RELAY
16	N/U	N/U	N/U	N/U
17	Q17	J5-7	O-R	WALKER
18	Q18	J2-15	R-W	LANE GATE

FREEFALL **SOLENOIDS**



SOLENOID NOT ON PLAYFIELD
3. KNOCKER

MPU-200 JUMPER COMBINATIONS

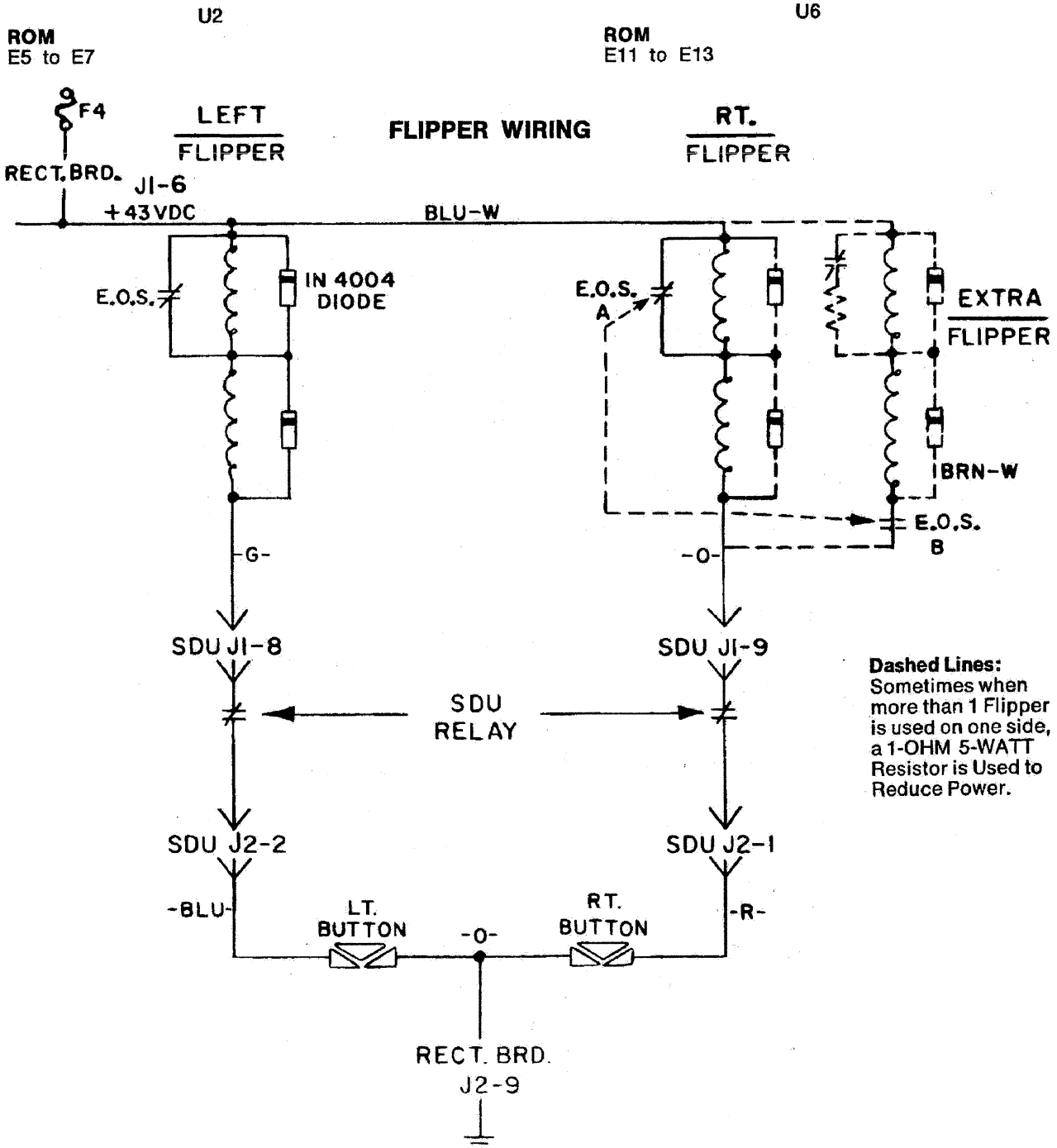
The MPU-200 can be converted to use 25A Roms or E-Proms or any combination of Roms or E-Proms. Below are listed the jumpers needed for each memory chip.

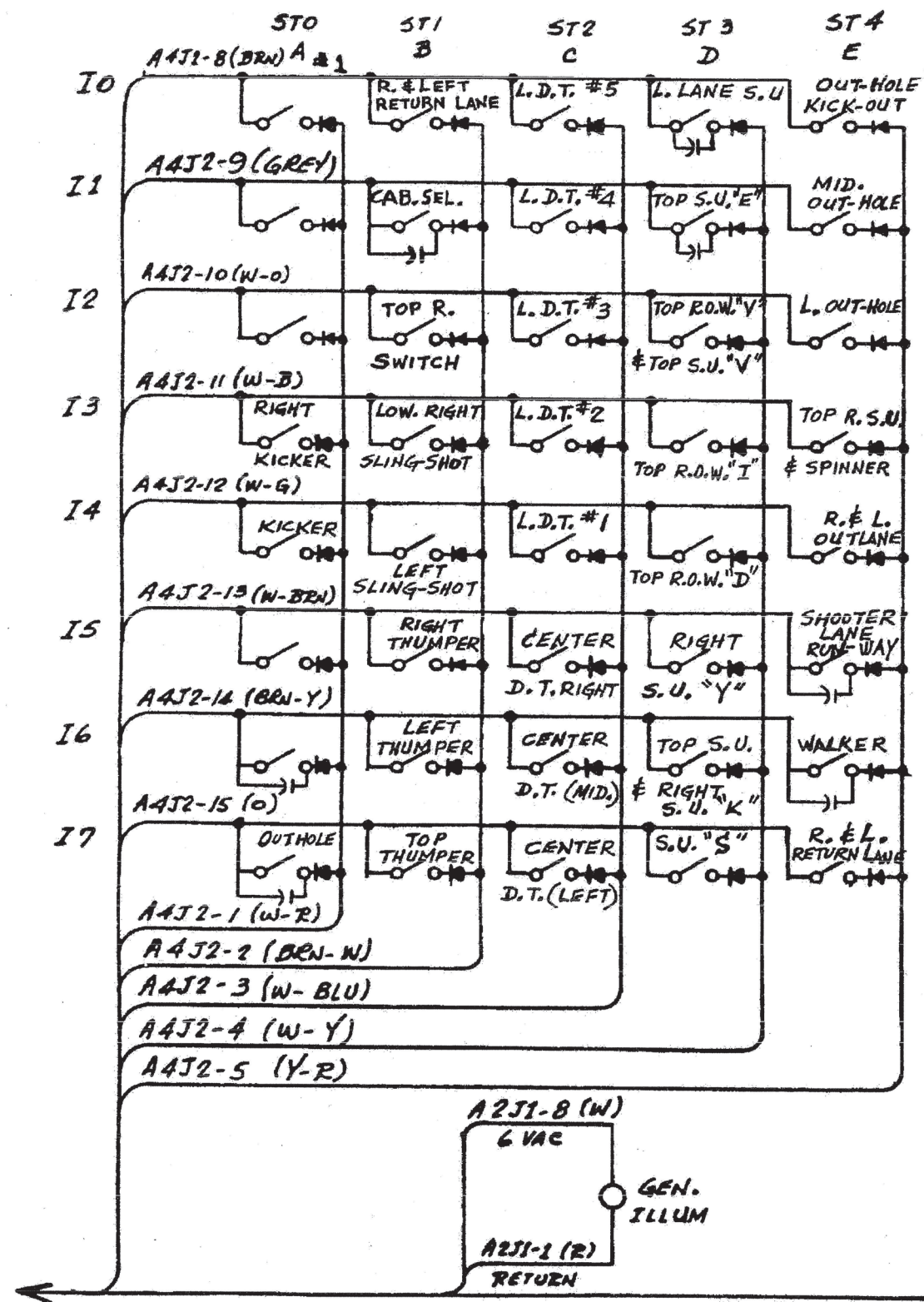
U1	
ROM Stern #25A-	E-PROMS (paper on top)
E9 to E8	E9 to E10
E28 to E26	E28 to E27
U2	
ROM	E-PROM
E5 to E1	E5 to E7
E2 to E6	E2 to E3

U5	
ROM	E-PROM
E19 to E20	E19 to E21
E29 to E31	E29 to E30
U6	
ROM	E-PROM
E13 to E12	E13 to E14
E25 to E22	E25 to E23

The MPU-200 can be down graded to act as a MPU-100 (Rom's Only) following are jumper modifications:

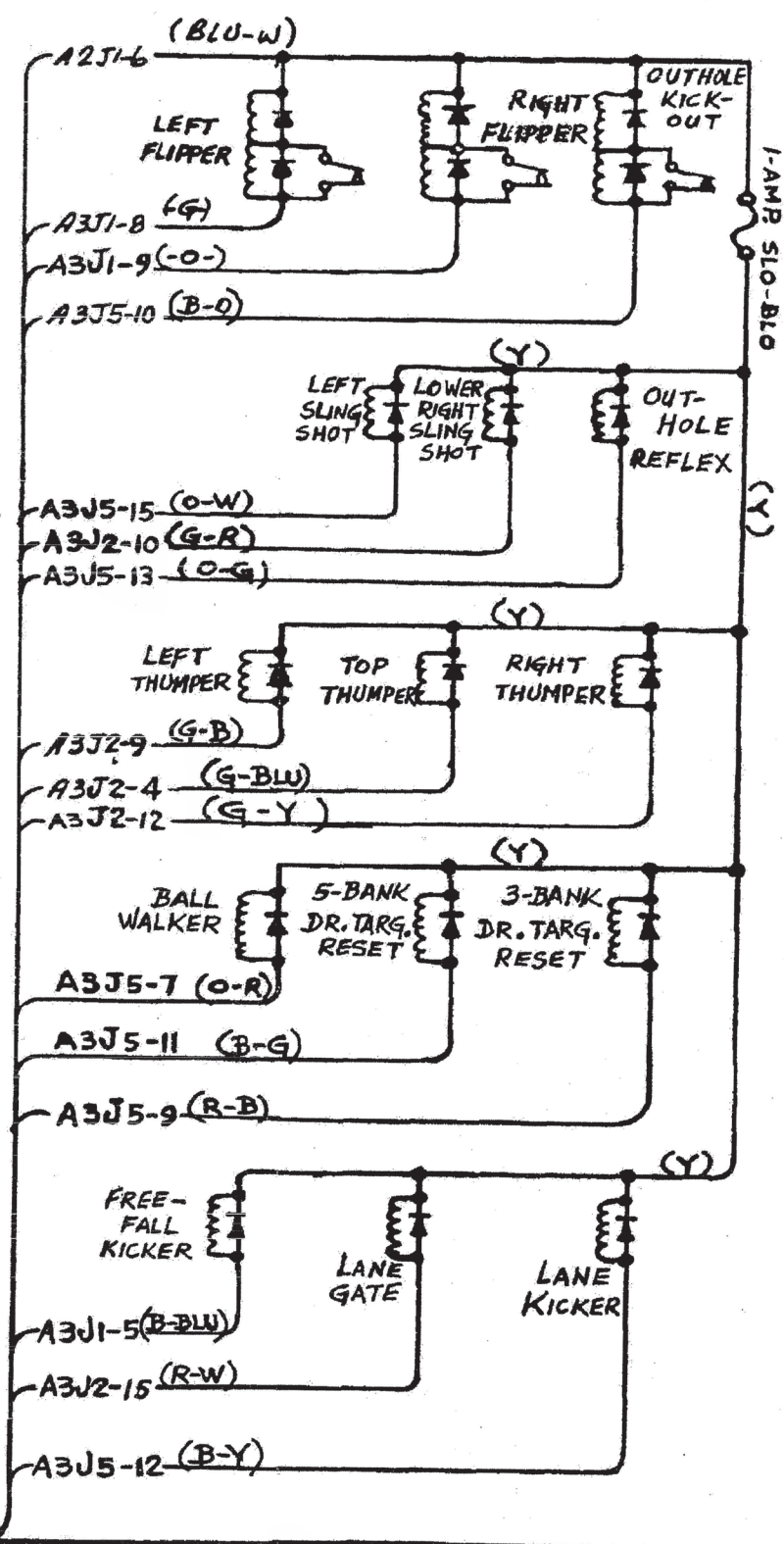
- Remove - E32 - E33
- Remove - E34 - E35





R.O.W. = ROLL OVER WIRE
 S.U. = STAND-UP TARGET
 D.T. = DROP TARGET

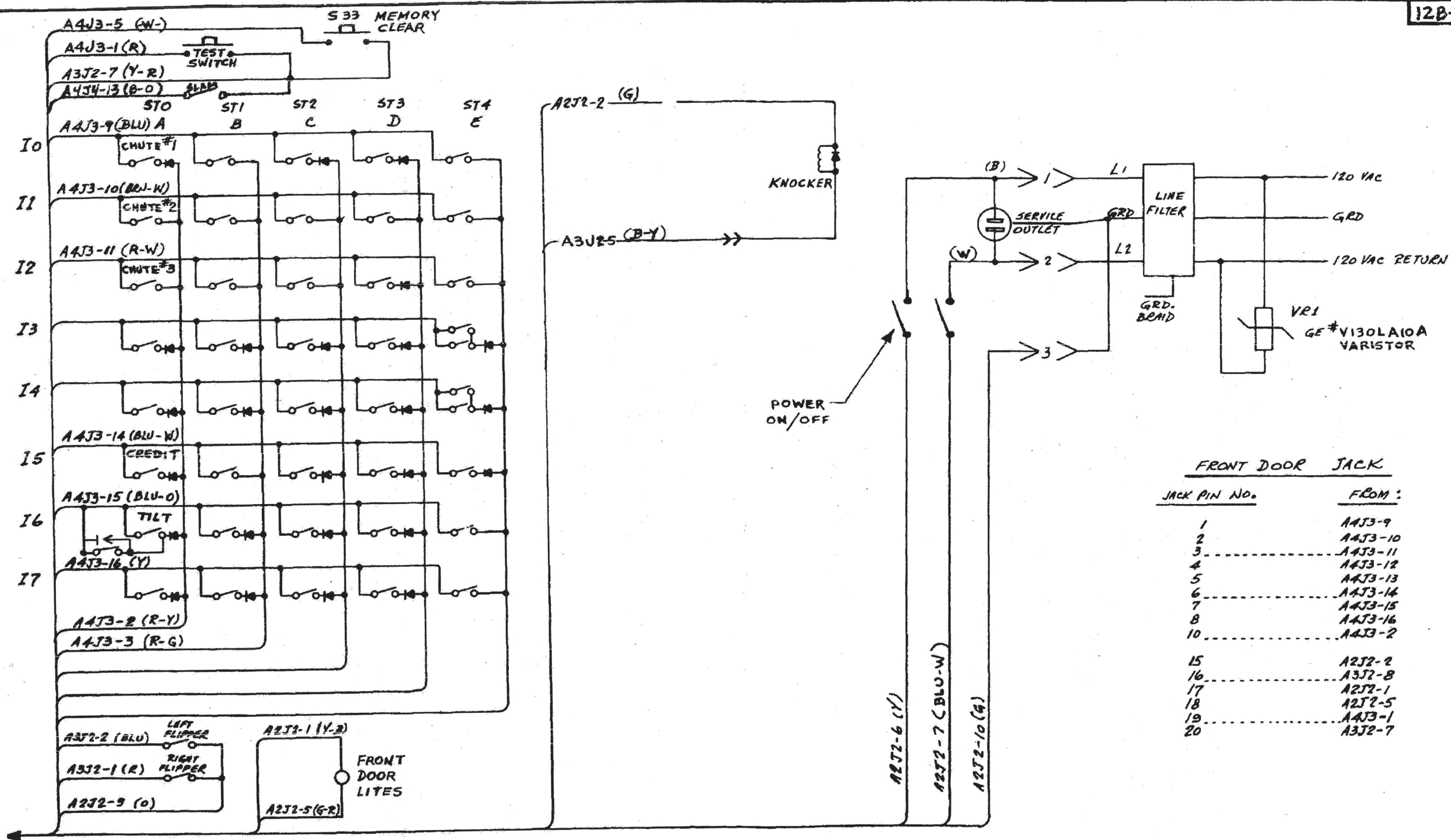
PLAYFIELD
 FREE-FALL -134-



FREEFALL
 LDA LIGHT LOCATION

DESCRIPTION	WIRE COLOR	JACK LDA	PIN NO.	TRANSISTOR
BONUS CARD #11 ROW SELECTOR A	GRN-R	J3	12	50
BONUS CARD #12 ROW SELECTOR A	R-Y	J3	25	38
BONUS CARD #13 ROW SELECTOR A	GREY	J1	9	27
BONUS CARD #24 ROW SELECTOR B	GREY-G	J1	19	12
BONUS CARD #25 ROW SELECTOR B	PUR	J1	17	13
BONUS CARD #26 ROW SELECTOR B	W-BLU	J3	1	57
BONUS CARD #37 ROW SELECTOR C	BLACK	J3	26	14
BONUS CARD #38 ROW SELECTOR C	BLU-R	J1	1	29
BONUS CARD #39 ROW SELECTOR C	BRN-BL	J1	18	14
DROP TARGET #3 EXTRA BALL	W-R	J2	12	21
LEFT BANK IN SEQUENCE	W-B	J2	3	53
LEFT BANK OUT OF SEQUENCE	P-W	J2	4	39
LEFT LANE SPECIAL	R-BLU	J3	18	46
LEFT OUT-LANE RIGHT OUT-LANE	O-BLU	J2	23	15
LINE 1 LEFT LANE 5K	PUR-B	J1	24	1
LINE 2 LEFT LANE 10K	BLU-O	J1	5	24
LINE 3 LEFT LANE 15K	W-R	J3	21	42
LINE 4 LEFT LANE 20K	GREY-B	J3	10	56
LINE 5 LEFT LANE 25K	O-BLU	J1	25	2
LINE 6 LEFT LANE 30K	GREY-R	J1	11	17
LINE 7 LEFT LANE 35K	BLU-R	J3	20	41
LINE 8 LEFT LANE 40K	W	J3	11	54
LINE 9 LEFT LANE 45K	Y-BLU	J3	17	49
LINE 10 LEFT LANE 50K	GRN-O	J1	3	35
LINE 20 LEFT LANE 100K	BLU-W	J1	23	8
MULTIPLIER 2X	RED	J2	7	43
MULTIPLIER 3X	Y	J2	6	30
MULTIPLIER 4X	W-O	J2	20	18
MULTIPLIER 5X	G-W	J2	16	5
RESERVE BONUS	B-W	J3	3	60
RIGHT LANE "D"	Y-B	J3	2	58
RIGHT LANE "E"	B-W	J1	28	4
RIGHT LANE "I"	W-BLU	J1	13	20
RIGHT LANE "K"	B-R	J3	19	44
RIGHT LANE "R"	R-W	J3	4	59
RIGHT LANE "S"	W-B	J3	15	51
RIGHT LANE "2nd S"	GREY-Y	J3	27	32
RIGHT LANE "V"	BRN-R	J1	6	25
RIGHT LANE "Y"	W-O	J1	8	28
RIGHT RETURN-LEFT RETURN LANE "R"	O	J1	14	9
RIGHT RETURN-LEFT RETURN LANE "S"	R-B	J3	16	48
RIGHT TARGET "S"	GRY-BL	J1	10	22
RIGHT TARGET "Y"	B-O	J3	9	55
ROLL OVER WIRE SELECTOR A	PUR-B	J2	2	31
ROLL OVER WIRE SELECTOR B	GRN	J2	15	19
ROLL OVER WIRE SELECTOR C	GRN-B	J2	14	6
SHOOT AGAIN	GRN-B	J1	26	3
SKY RAIDER 1	Y-GRN	J1	7	26
SKY RAIDER 2	BLK	J1	16	11
SPINNER TOP RIGHT 5000	PUR-W	J1	2	34
TOP ROLL OVER WIRE "D" & S.U.	GRY-G	J2	13	7
TOP ROLL OVER WIRE "E" & S.U.	B-W	J2	8	23
TOP ROLL OVER WIRE "I"	B-Y	J2	5	52
TOP ROLL OVER WIRE "V"	W-BLU	J2	9	40
TOP TARGET "K" RIGHT TARGET "K"	GREY-Y	J1	15	10

A2J5-7 (BLU) FEATURE LAMP BUS
 A2J5-3 (BLU)

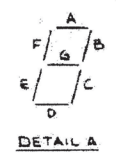
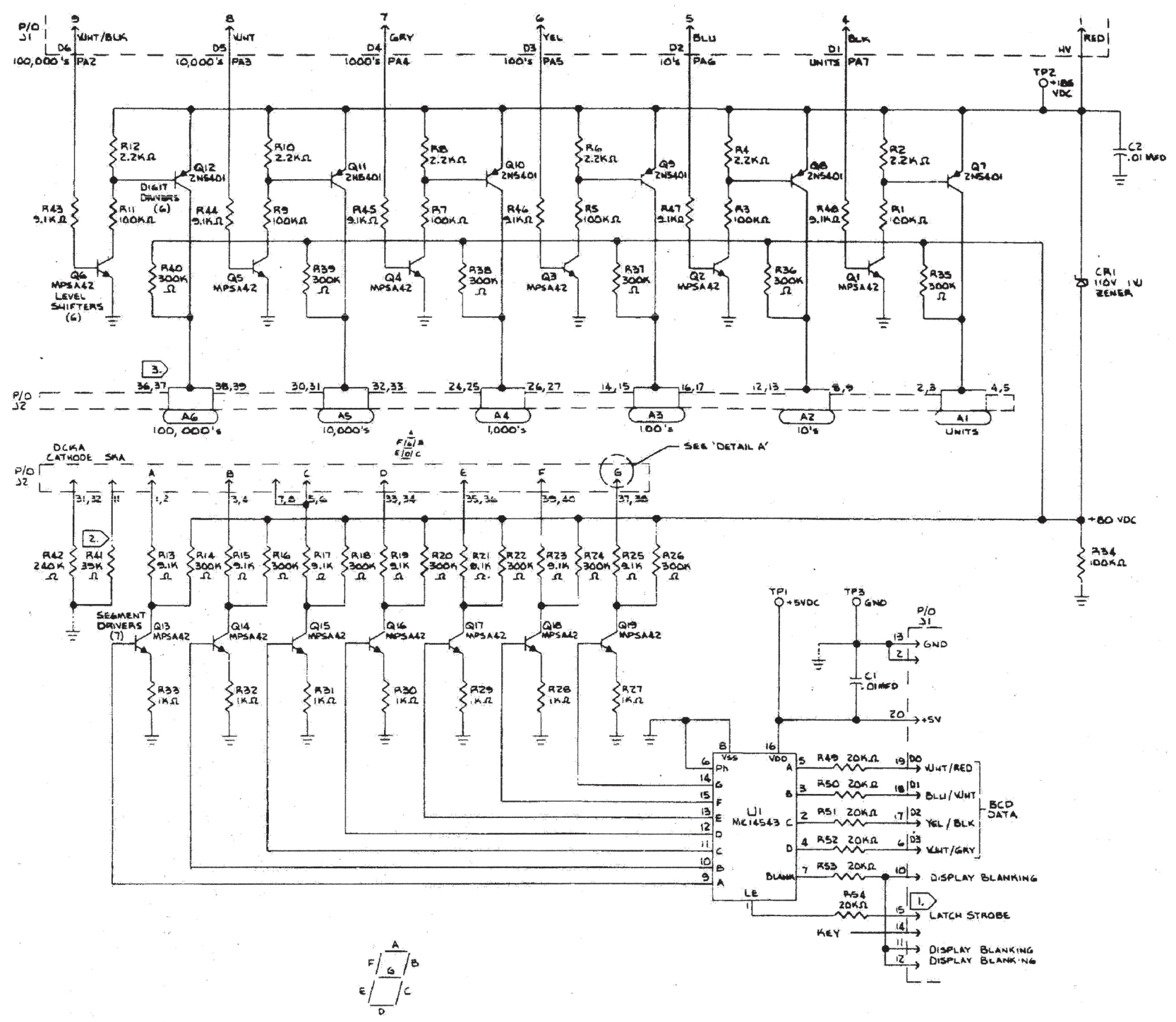


N/U = NOT USED
ALL DIODES ARE IN-4004

ISSUE	CHANGE	DATE

STERN ELECTRONICS INC.		
1725 DIVERSEY BLVD. CHICAGO 90614		
CABINET AND FRONT DOOR WIRING		
FOR STANDARD		
DRM. C.W.	DATE 10-16-79	AMT. 49
MAT. 49	PIN. 49	APPR.

- NOTES:
- 1. PIN IS WIRE COLOR
 - 2. OMIT FOR BECKMAN DISPLAYS
 - 3. 36, 37 DENOTES
- | PLAYER # | WIRE COLOR |
|------------|------------|
| PLAYER #1 | BLK/WHT |
| PLAYER #2 | YEL/RED |
| PLAYER #3 | GRN/BLU |
| PLAYER #4 | BRN/GRY |
| MATCH/BALL | RED/BLK |
- BECKMAN DISPLAY TERMINAL, PANTER DISPLAY TERMINAL

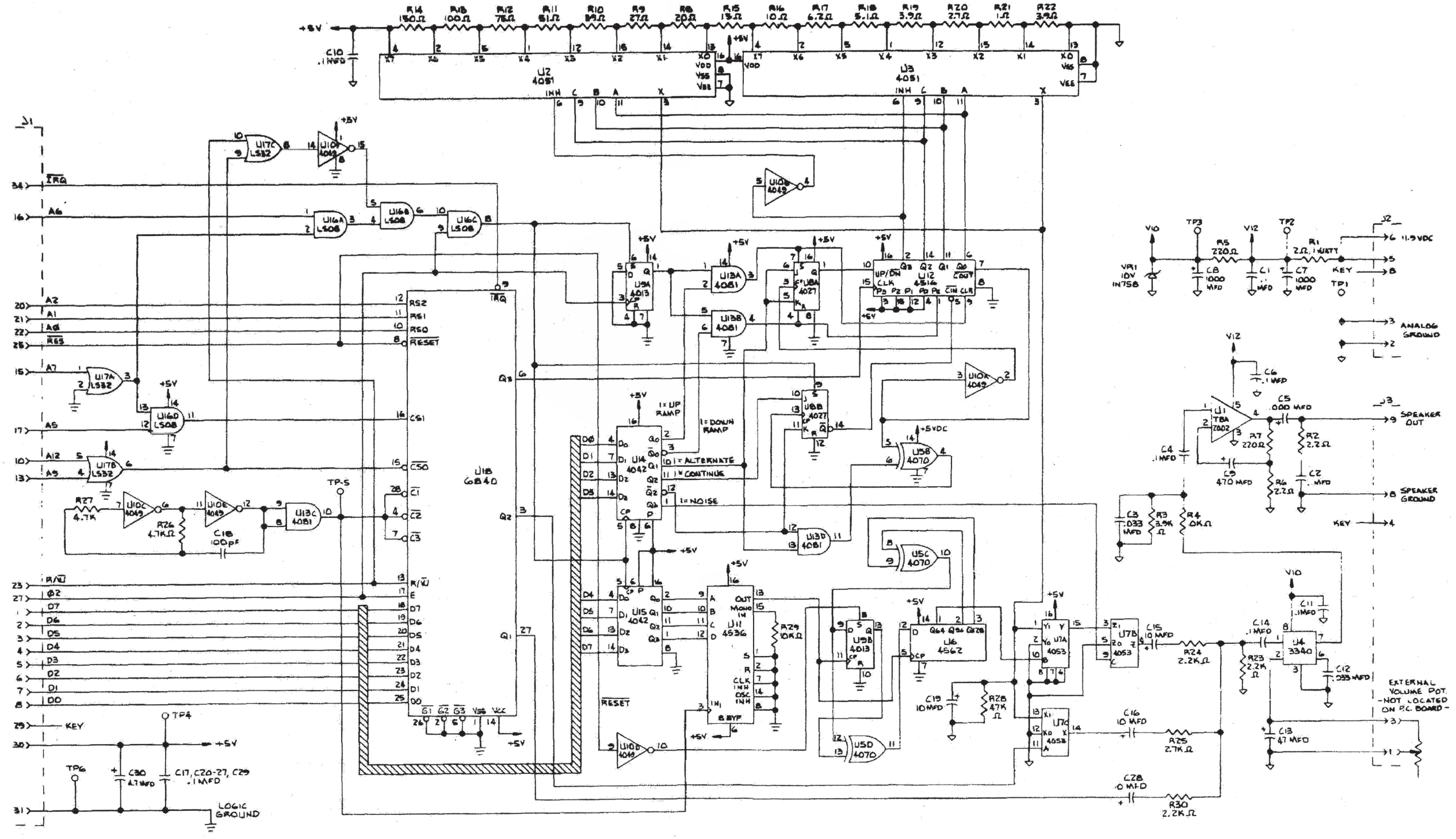


ISSUE	CHANGE	DATE

SCALE: $\frac{1}{4}$ 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 $\pm 30^\circ$ unless otherwise specified.

STERN ELECTRONICS INC.		
1725 DIVERSEY BLVD. CHICAGO 60614		
SCHEMATIC, DISPLAY-P.C. BOARD		
FOR GEN. USE		
DRN. 20.	DATE 5-25-79	AMT. H--
MAT. H--	FIN. H--	APPR.



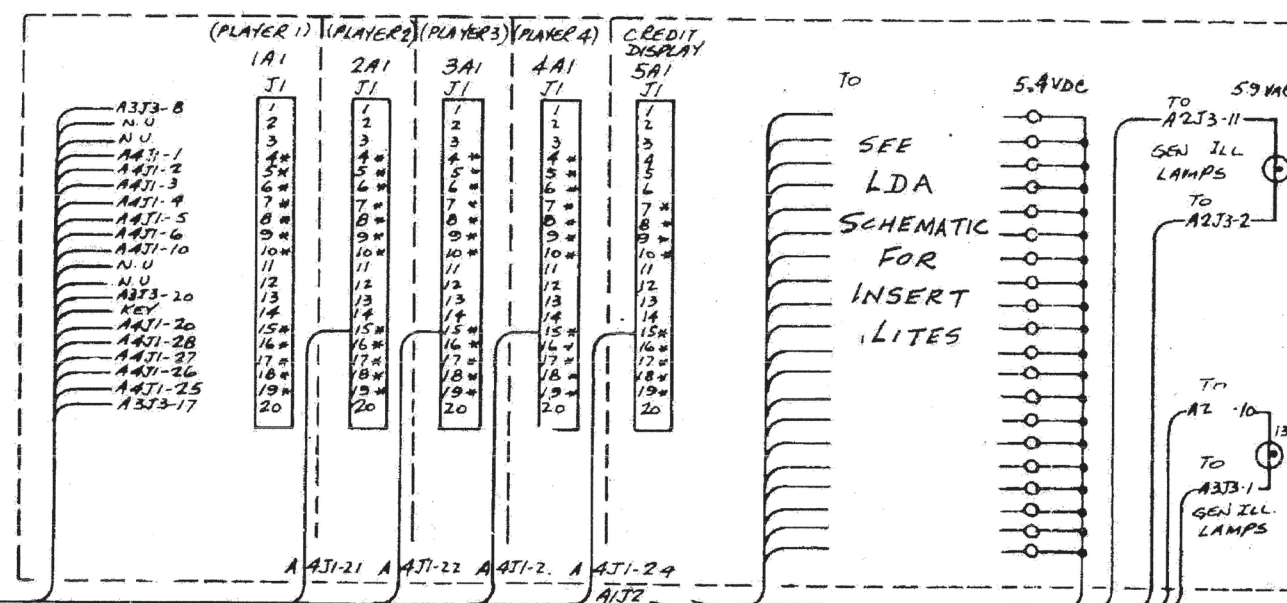
ISSUE	CHANGE	DATE

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 $\pm 30^\circ$ unless otherwise specified.	

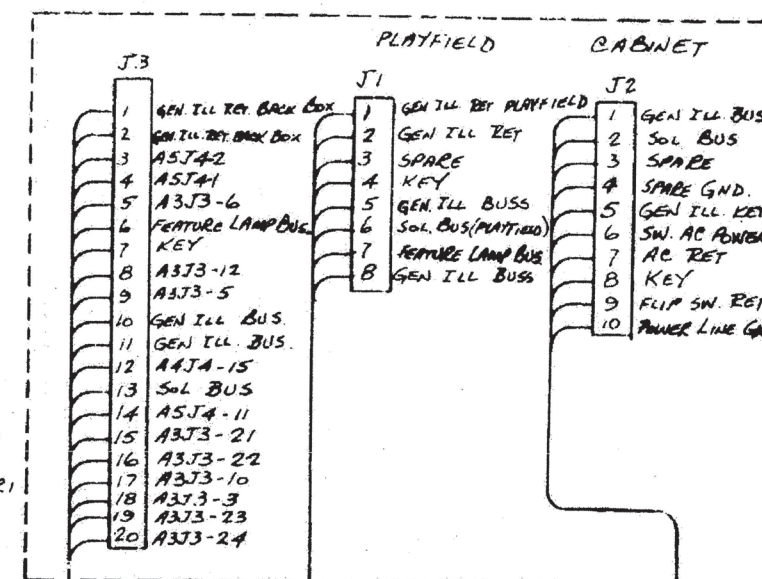
STERN ELECTRONICS INC. 1725 DIVERSEY BLVD. CHICAGO 60614		
SCHEMATIC, ELECTRONIC SOUNDS		
FOR SOLID STATE		
DRN. 2-20	DATE 8-21-79	AM'T
MAT	FIN.	APPR.

A1 INSERT

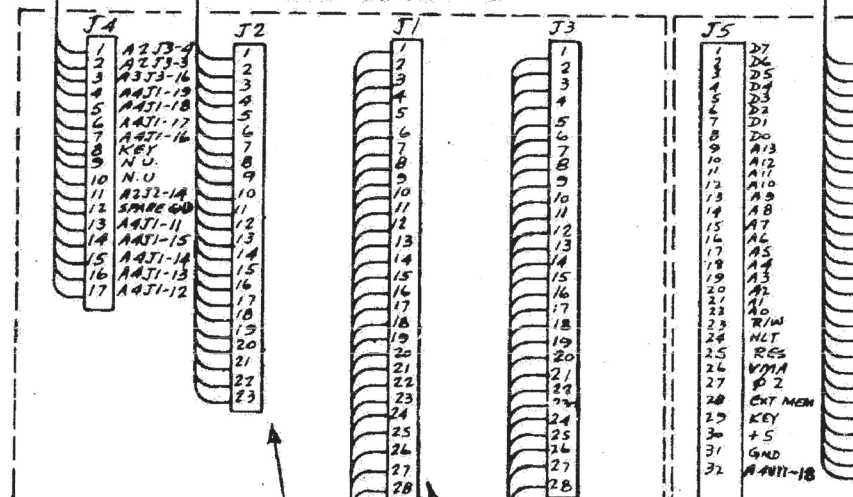
FROM	TO
A2J3-6	1
A2J3-14	2
A2J3-2	3
A2J3-11	4
A2J3-23	5
A2J3-15	6
A2J3-27	7
A2J3-8	8
A2J3-1	9
A2J3-2	10
A2J3-11	11
	12
A2J3-10	13
A2J3-7	14
A2J3-15	15
A2J3-16	16
A2J3-10	17
A2J3-1	18
	19
	20
	21
	22
	23



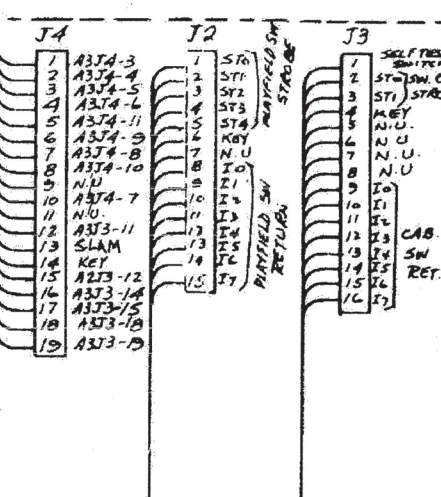
A2 TRANSFORMER



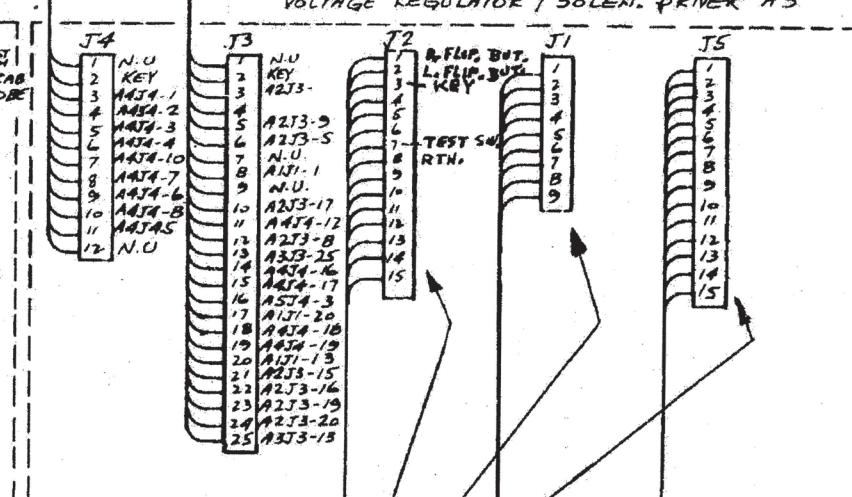
LAMP DRIVER A5



MPU-A4



VOLTAGE REGULATOR / SOLENOID DRIVER A3

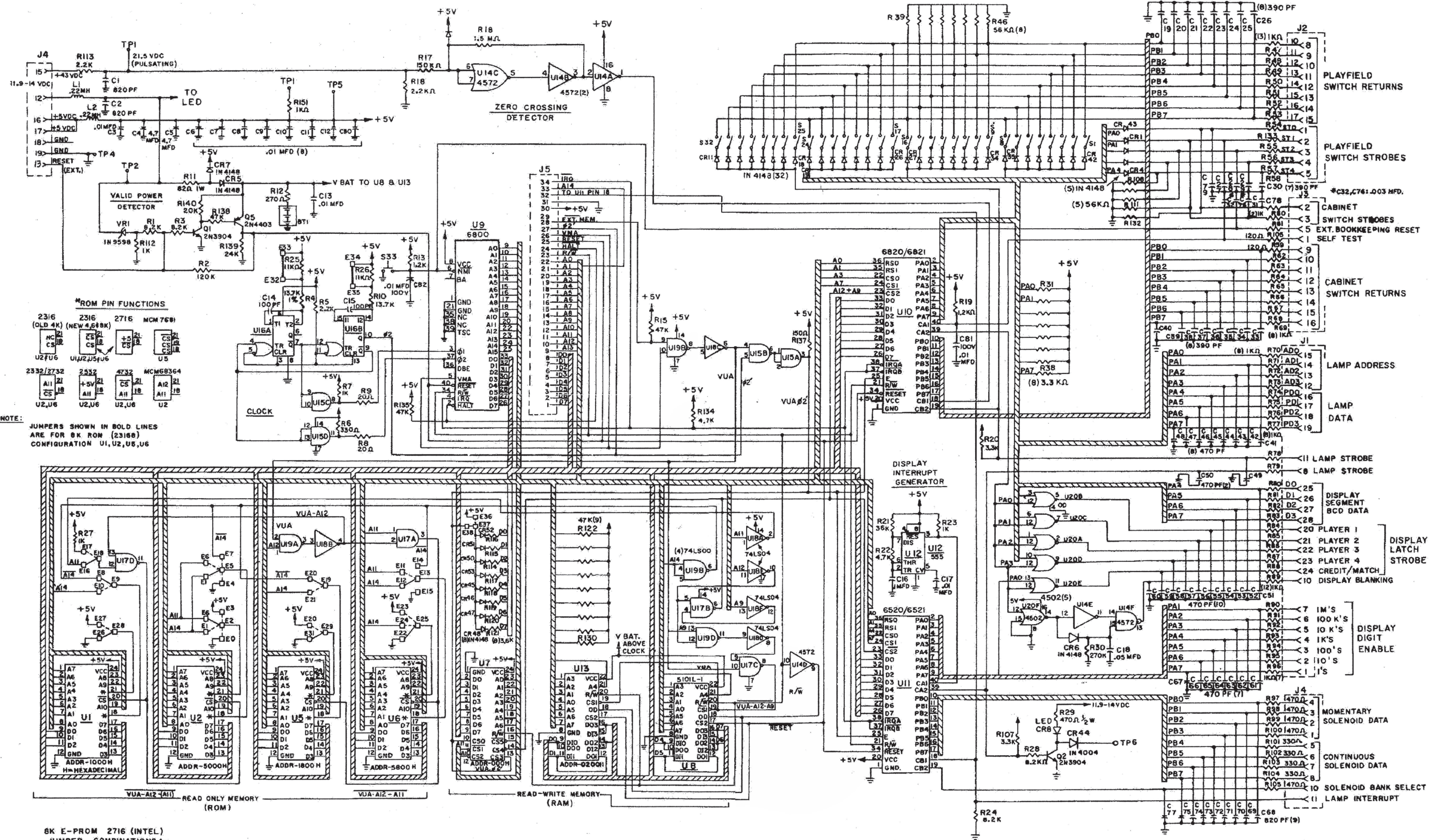


TO CABINET
TO PLAYFIELD

SEE INDIVIDUAL SCHEMATIC DRAWINGS FOR WIRE COLORS.

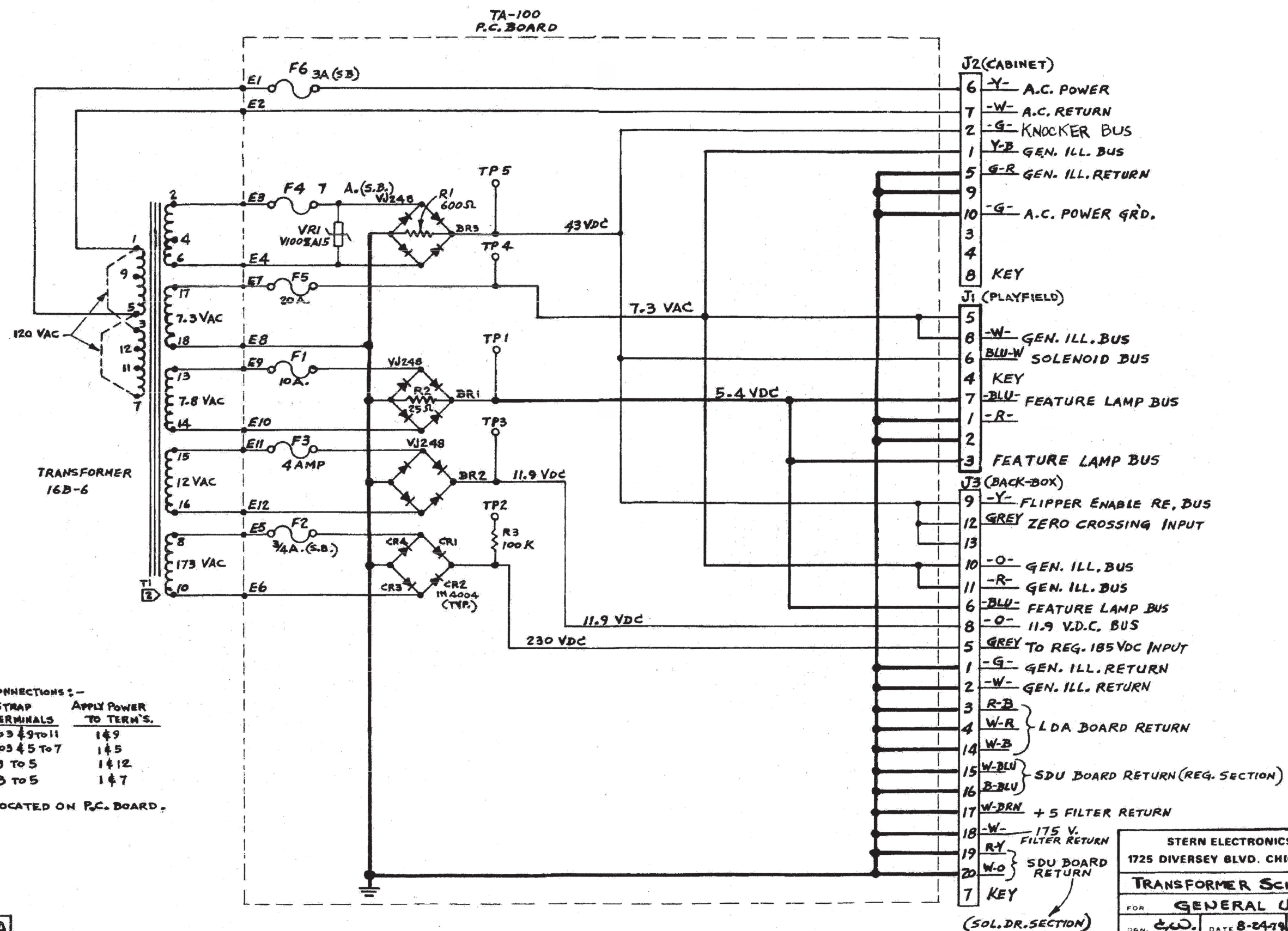
SEE LDA SCHEMATIC FOR
FEATURE LAMP PIN OUTSSEE SDU SCHEMATIC
FOR SOLENOID PIN OUTS.

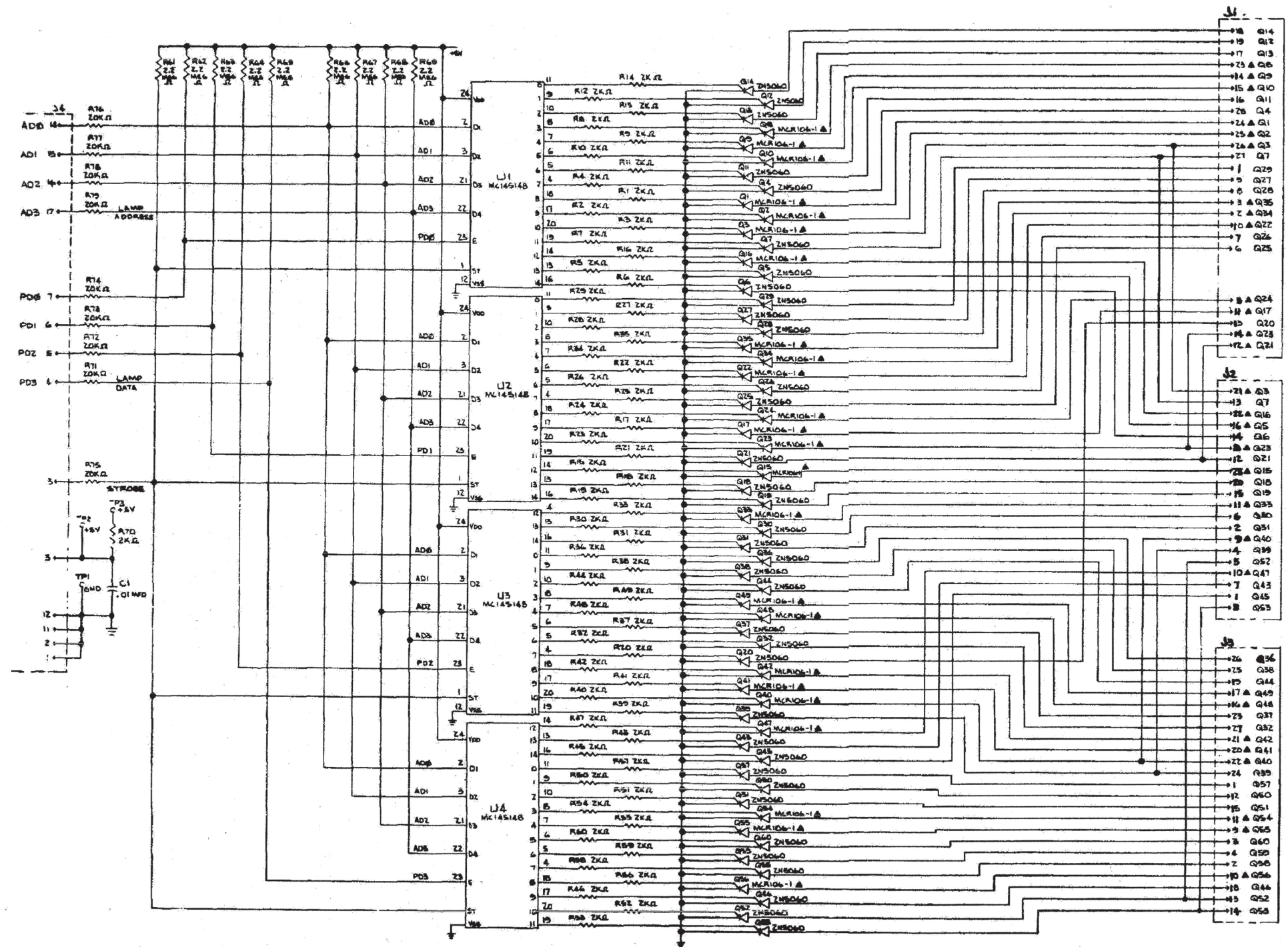
STERN ELECTRONICS INC.		
1725 DIVERSEY BLVD. CHICAGO 60614		
WIRING DIAGRAM		
FOR SOLID STATE		
DRAWN: CW	DATE	AMT
MAT	FIN.	APPR.



8K E-PROM 2716 (INTEL)
JUMPER COMBINATIONS:-

E2-E3	E23-E25
E5-E7	E27-E28
E9-E10	E29-E30
E13-E14	E32-E33
E16-E18	E34-E35
E19-E21	





NOTES:

1. A INDICATES MCR106-1 TRANSISTOR.
2. THIS DOCUMENT FOR LDA-100 REV. A AND LDA-REV. B SINGLE Sided P.C. BOARDS.

FREEFALL
LDA LIGHT LOCATION

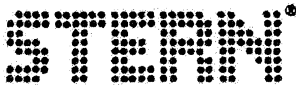
DESCRIPTION	WIRE COLOR	JACK LDA	PIN NO.	TRANSISTOR
BONUS CARD #11 ROW SELECTOR A	GRN-R	J3	12	50
BONUS CARD #12 ROW SELECTOR A	R-Y	J3	25	38
BONUS CARD #13 ROW SELECTOR A	GREY	J1	9	27
BONUS CARD #24 ROW SELECTOR B	GREY-G	J1	19	12
BONUS CARD #25 ROW SELECTOR B	PUR	J1	17	13
BONUS CARD #26 ROW SELECTOR B	W-BLU	J3	1	57
BONUS CARD #37 ROW SELECTOR C	BLACK	J3	26	14
BONUS CARD #38 ROW SELECTOR C	BLU-R	J1	1	29
BONUS CARD #39 ROW SELECTOR C	BRN-BL	J1	18	14
DROP TARGET #3 EXTRA BALL	W-R	J2	12	21
GAME OVER	GREY-W	J2	11	33
HIGH GAME TO DATE	GREY-O	J2	22	16
LEFT BANK IN SEQUENCE	W-B	J2	3	53
LEFT BANK OUT OF SEQUENCE	P-W	J2	4	39
LEFT LANE SPECIAL	R-BLU	J3	18	46
LEFT OUT-LANE RIGHT OUT-LANE	O-BLU	J2	23	15
LINE 1 LEFT LANE 5K	PUR-B	J1	24	1
LINE 2 LEFT LANE 10K	BLU-O	J1	5	24
LINE 3 LEFT LANE 15K	W-R	J3	21	42
LINE 4 LEFT LANE 20K	GREY-B	J3	10	56
LINE 5 LEFT LANE 25K	O-BLU	J1	25	2
LINE 6 LEFT LANE 30K	GREY-R	J1	11	17
LINE 7 LEFT LANE 35K	BLU-R	J3	20	41
LINE 8 LEFT LANE 40K	W	J3	11	54
LINE 9 LEFT LANE 45K	Y-BLU	J3	17	49
LINE 10 LEFT LANE 50K	GRN-O	J1	3	35
LINE 20 LEFT LANE 100K	BLU-W	J1	23	8
MATCH	GREY-Y	J2	1	45
MULTIPLIER 2X	RED	J2	7	43
MULTIPLIER 3X	Y	J2	6	30
MULTIPLIER 4X	W-O	J2	20	18
MULTIPLIER 5X	G-W	J2	16	5
RESERVE BONUS	B-W	J3	3	60
RIGHT LANE "D"	Y-B	J3	2	58
RIGHT LANE "E"	B-W	J1	28	4
RIGHT LANE "I"	W-BLU	J1	13	20
RIGHT LANE "K"	B-R	J3	19	44
RIGHT LANE "R"	R-W	J3	4	59
RIGHT LANE "S"	W-B	J3	15	51
RIGHT LANE "2nd S"	GREY-Y	J3	27	32
RIGHT LANE "V"	BRN-R	J1	6	25
RIGHT LANE "Y"	W-O	J1	8	28
RIGHT RETURN-LEFT RETURN LANE "R"	O	J1	14	9
RIGHT RETURN-LEFT RETURN LANE "S"	R-B	J3	16	48
RIGHT TARGET "S"	GRY-BL	J1	10	22
RIGHT TARGET "Y"	B-O	J3	9	55
ROLL OVER WIRE SELECTOR A	PUR-B	J2	2	31
ROLL OVER WIRE SELECTOR B	GRN	J2	15	19
ROLL OVER WIRE SELECTOR C	GRN-B	J2	14	6
SHOOT AGAIN	GRN-B	J1	26	3
SHOOT AGAIN	GRY-R	J2	21	3
SKY RAIDER 1	Y-GRN	J1	7	26
SKY RAIDER 2	BLK	J1	16	11
SPINNER TOP RIGHT 5000	PUR-W	J1	2	34
TILT	GREY-B	J2	10	47
TOP ROLL OVER WIRE "D" & S.U.	GRY-G	J2	13	7
TOP ROLL OVER WIRE "E" & S.U.	B-W	J2	8	23
TOP ROLL OVER WIRE "I"	B-Y	J2	5	52
TOP ROLL OVER WIRE "V"	W-BLU	J2	9	40
TOP TARGET "K" RIGHT TARGET "K"	GREY-Y	J1	15	10

STERN ELECTRONICS INC.
1725 DIVERSEY BLVD. CHICAGO 60614

LAMP DRIVER SCHEMATIC

FOR FREE FALL

DRN. C.W.	DATE	AM'T
MAT	FIN.	APPR.



ELECTRONICS, INC.

1725 Diversey Parkway, Chicago, Illinois 60614
(312) 935-4600, Telex 25-4657
Toll Free Service Assistance (800) 621-6424