DATA EAST

TALES
FROM THE
CRYPT

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DATA EAST PINBALL ®

780-5018-00

CPU JUMPER TABLE

Game	CPU* Version	ROM Location	Jumpers Installed	Removed
ABC M.N. Football	Ver 2	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Robocop	Ver 2	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Phantom of the Opera	Ver 2	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Back to the Future	Ver 3	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
The Simpsons	Ver 3	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Checkpoint	Ver 3	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Teen. Mut. Ninja Turtles	Ver 3	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Batman	Ver 3	5B,5C	J1b,J3,J4,J5b,J6b,J7b,&J8	J1a,J2,J5,J5a,J6a,&J7a
Star Trek	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Hook	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Lethal Weapon 3	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Star Wars	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Rocky & Bullwinkle	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Jurassic Park	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Last Action Hero	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a
Tales From the Crypt	Ver 3	5C	J1b,J3,J5,J5b,J6b,J7b,&J8	J1a,J2,J4,J5a,J6a,&J7a

*Version 2 & 3 have an 8K RAM which is a 28-pin IC at location 5D.

Power-up CPU Self Tests

Upon power-up, the CPU board performs a series of self tests of major components. Turn the game on while observing the LEDS on the CPU board. Tests of the PIAs, RAM, and EPROMs are performed automatically and results of the test are indicated by the PIA LED.

With all tests passed, the LEDs illuminate in the following sequence at power turn-on. The PIA and +5V LEDs illuminate immediately. Approximately 1/2-second later the PIA LED goes out and the Blanking LED illuminates; the +5V and Blanking LEDs remain illuminated until the game is turned off. Test failures are indicated with the PIA LED:

PIA LED	SUSPECT COMPONENT
Stays On	One of the 6821 PIAs
Flashes 1 Time	6264 RAM at location D5.
Flashes 2 Times	EPROM at location C5.

DISPLAY READS "OPEN THE DOOR" -- This indicates a faulty memory condition in RAM. Opening the Coin Door will initiate a Factory Restore, by opening the Memory Protect Switch. Check battery voltage at CMOS RAM with power off.

QUICK REFERENCE FUSE CHART

PPB BOARD
F1 5A Slo-Blo G.I. 6.3VAC
F2 5A Slo-Blo G.I. 6.3VAC
F3 5A Slo-Blo G.I. 6.3VAC
F4 5A Slo-Blo G.I. 6.3VAC
F5 5A Slo-Blo Flipper Power & 50Volt coils
F6 5A Slo-Blo Flash Lamps (34VDC)
F7 3A Slo-Blo Flipper Power & 32Volt coils
F8 4A Slo-Blo 50Volt coils
F9 5A Slo-Blo 50Volt coils

POWER SUPPLY BOARD
F1 7A Slo-Blo +5VDC Regulator Input (9VAC)
F2 7A Slo-Blo +5VDC Regulator Input (9VAC)
F3 Not Used
F4 8A Slo-Blo Switched Illumination Buss (18VDC)
F5 5A Slo-Blo Solenoid (34VDC) Bumpers Slingshots etc.
F6 5A Slo-Blo Solenoid Buss (34VDC)
F7 0.5A Slo-Blo Display Reg. Input (90VAC)

Tales from the Crypt
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GAME & FEATURE SPECIFICATIONS

POWER REQUIREMENTS

This game is provided with a 3-prong plug and **must be connected to a properly grounded outlet to reduce shock hazard** and insure proper game operation. Refer to AC Power Wiring Diagram for transformer connections required for normal, high, and low line conditions.

Normal Line: 109 to 129 Vac (211 to 225 Vac)

High Line: (226 to 235 Vac)-- European, International

Low Line: 95 to 108 Vac (200 to 210 Vac)

MAJOR ASSEMBLY AND FUSE LOCATIONS

Refer to the Game Illustration (page 2) to identify locations of the major assemblies, and fuse values and locations.

PROM SUMMARY

CPU Board: Location C5
Sound Board: Locations U17 (Voice ROM 1), U21 (Voice ROM 2), and U7 (Sound ROM)
Display Controller Board: Location U12, ROM 0

TRANSPORTATION

To reduce the possibility of damage, observe the following precautions whenever transporting the game. Lower the backbox and secure it to the cabinet. Remove the legs and secure the game within the transporting vehicle.

GAME ASSEMBLY PROCEDURES
(Refer to the Game Illustration on page 2)

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton.

2. Remove all packing material. Cabinet legs are located on top of the front moulding above the coin door and the assembly parts package is in the cashbox. There should be four leg levelers, eight leg bolts, six pinballs and a large Allen Wrench, used for securing the backbox, is inserted & taped to the rear of cabinet.

3. Attach leg leveler from the parts package to each leg, make sure that each leveler is threaded through a hex nut before threading it into the leg.

4. Support rear of cabinet and attach rear legs using two leg bolts for each leg.

5. Support front of cabinet and attach front legs using two leg bolts for each leg.

6. While assuring that no cables are being pinched, carefully raise the backbox and secure it in its upright position with the Allen Wrench in the hole in the back of the cabinet and rotating the wrench 270 degrees(3/4 turn).

7. Remove the backbox keys from the playfield glass, unlock and carefully remove the backglass. Set the backglass aside.

8. Check all connectors in the backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. Push on all connectors plugged into the CPU board, Sound Board, Power Supply Boards, and (on insert board) Display board to check that they are properly seated.

9. Check that the fuses on the Power Supply board, PPB board and fuse panel are seated properly.

10. Carefully remove the playfield glass and set it aside.

11. Raise the playfield and support it, by connecting the strap located in the rear of the cabinet, to the eyebolt on the playfield, or the Stay Arm on the Right Side of the Cabinet. (Use the instruction sheet provided in the game to see alternative methods of accessing the playfield bottom.)

12. Check all cabinet cable and playfield lamp board connector terminations.

13. Remove all shipping tie downs.

14. Remove the Plumb Bob tilt from the parts package and install on the pendulem wire on the inside left of the cabinet. (See Cabinet Parts Illustration.)

Backbox Layout

Power Supply Board

PPB Board - Fuses

PPB Board Fuse Description

F1:	G.I. 5AS.B. PLAYFIELD		F5:	50V 5A FLIPPERS/All 50 Volt Coils
F2:	G.I. 5AS.B. BACKBOX DR./Spkr Panel		F6:	32V 5A FLASH LAMPS/Right
F3:	G.I. 5AS.B. PLAYFIELD & COIN DOOR		F7:	32V 3A COILS/Left
F4:	G.I. 5AS.B. BACKBOX DOOR		F8:	50V 4A /50V Coils
			F9:	50V 5A LASER KICK
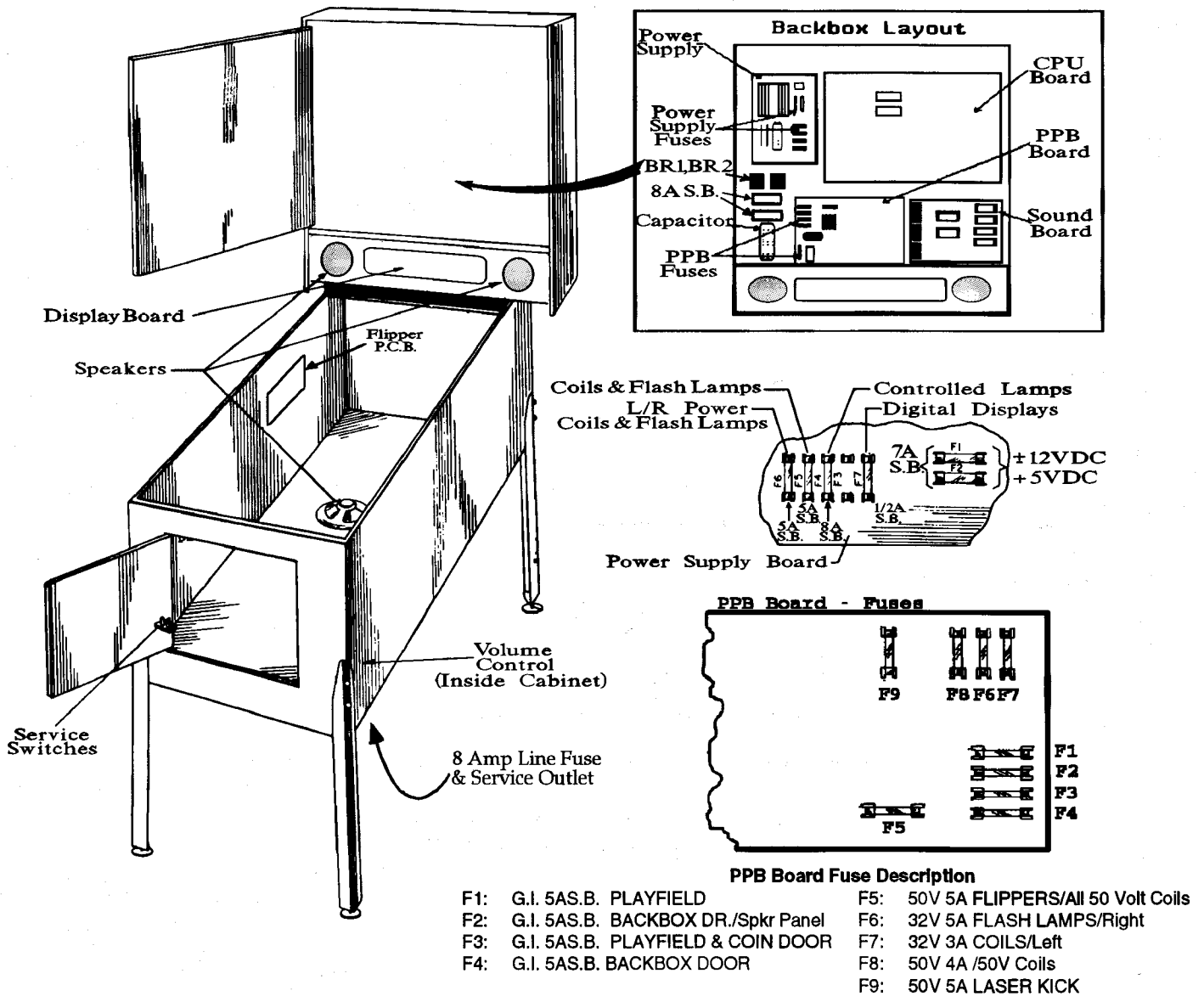
GENERIC LAYOUT ILLUSTRATION

15. Lower the playfield and level the playfield side-to-side by adjusting leg levelers and using the 2 Way Level located beneath the instruction card on the bottom arch.

16. Using the 2 Way Level below the pricing card, adjust the pitch of the playfield to approximately 6.5 degrees.

The playfield incline affects difficulty of play. Use the recommended incline; game difficulty is best varied using game adjustments.

17. Check the plumb tilt and adjust as required.

18. If desired, perform any self tests at this time. With the insert door closed, carefully reinstall and lock the backglass.

19. Place the six pinballs on the playfield near the outhole and carefully reinstall the playfield glass.

20. If desired, make game pricing and Add-A-Ball, Novelty, or 5-Ball Play adjustments at this time.

GAME OPERATION

STANDARD FEATURES

Insert coin(s), the game makes a sound for the first credit and generates sounds for each subsequent coin and the display indicates the number of credit(s) posted. Depress the credit button and a start-up sound is produced, the posted credit(s) are reduced by one, The display now indicated the player or # of players selected from the total depresions of the credit button. The display indicates the ball in play, and a ball is served to the shooter lane. Additional players may be added by depressing the Credit button before the end of ball 1. At game start, an introduction is shown followed by Skill Shot Graphics.

The second closure (adjustable) of the plumb bob tilt switch tilts the ball in play. Closure of the slam tilt switch in the coin door ends the current game(s).

At the end of each ball, earned bonuses are collected. At the end of the last ball for the last player and after bonuses are collected, the system produces a random 2-digit number (a multiple of 10; 00 to 90) for a Match feature (adjustable). Matching the last two digits of a player score with this number awards a credit. Players exceeding high score levels receive free credits (adjustable) and are able to enter their initials with the new High Score achieved. The game then proceeds into the game-over mode and then to the attract mode. A custom message (adjustable) can be displayed during the attract mode.

MANUAL PERCENTAGING

This game is equipped with Manual Percentage Adjustment.:
As previously with our games, you can either set operator adjustments for a replay percent or you can set a fixed replay score.

If you set operator adjustments for a particular replay percent, the game will compute a recommended score to keep the game at that replay percentage.If a change is recommended and the game coin door is opened, the displays will indicate a recommended replay score to beat and make a sound to alert the operator. By pressing the start button, the score to beat will be changed to the recommended level. If you close the coin door or go into audit or adjustment mode, no score change will be made.

You may choose to ignore the recommended change; for example, you may not think last week's players were the usual crowd . Just close the door and the message will disappear without altering the existing level. Or you may choose to make a different score to beat adjustment; this is done by utilizing adjustment 02.

GAMES SPECIFIC FEATURES

"CREATURE FEATURES"

Note: With Creature Feature(s) the visual display and playfield are interactive. Collect Creature Feature by shooting the ball in play into the scoop (see Playfield - Major Assemblies Illustration).

1) SUPER KEEPER TARGETS

Shoot the K E E P E R Eye Ball Targets for 1mil plus 1mil added for additional strikes.

2) THUNDER STORM

Shoot left and right ramps for 1mil, each completion raises the next completion another million.

3) SKULL CRACKING

Shoot the Captive Ball to add additional balls into play.

4) DOOR PRIZE

Select one of three doors shown on the Visual Display, using the flipper buttons to pick the desired door to open. Open the door by using the Crypt Keeper Door Handle located on the front of the cabinet. Search as many doors as you can for point values and special features. If the player opens a door with a ZOMBIE behind it, the round is terminated and the player goes back to regular play.

5) FRIGHTMARE (SuperSpin)

Shoot any or all of the spinners and try to build up your 30 spins for Frightmare value of 25mil.

6) PSYCO POPS

Scoring 20 Pop Bumpers scores 25mil.

7) ROBBING THE CRYPT

Shoot balls into the Crypt for 5mil per shot.

8) LITE "AXE-TRA" BALL

Lites Extra Ball shot on the playfield.

9) SUPER GUILLOTINE

Guillotine Drop Targets all start at 3mil. If a target or targets are knocked down, the targets drop into the display. When the target resets the next value is shown on the display for the next completion.

10) WEREWOLF COUNTDOWN

This round starts a 30mil bonus at the left spinner. The bonus counts down until the player shoots the left spinner. The player will then be awarded remaining points.

11) VIDEO MODE

Player will interface with the Display to help the Crypt Keeper defeat foes.

12) Electric Chair

Player shoots the scoop to collect 1mil times the number of balls remaining in play.
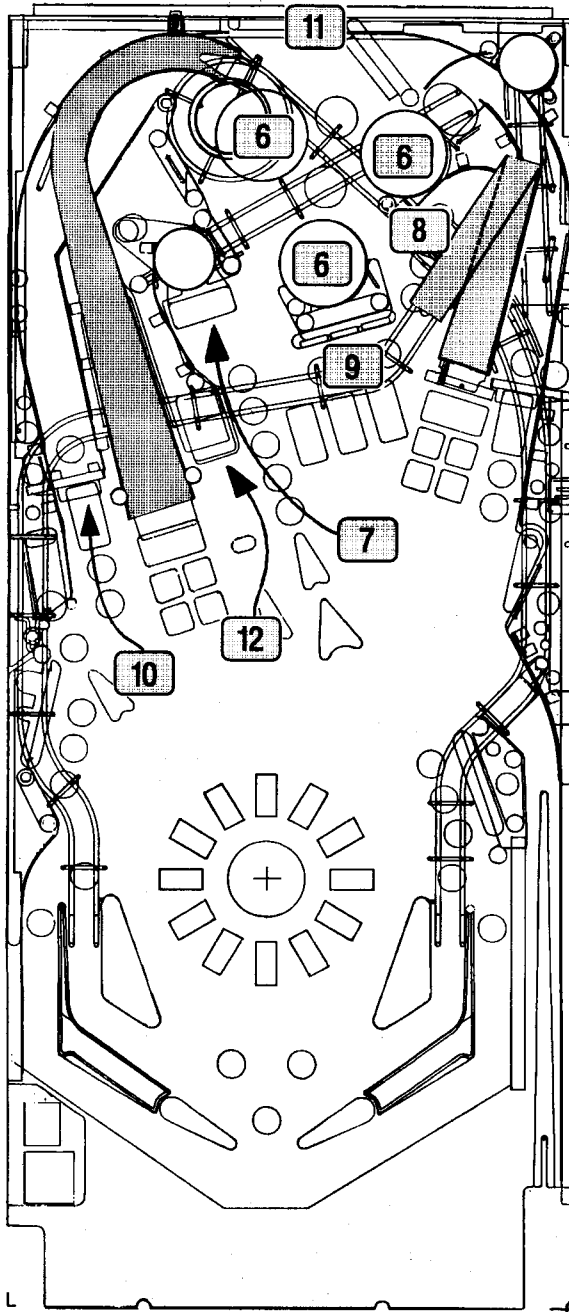
NOTES:

A:

Lit Left (A1) or Right (A3) Spinner will lite the Creature Feature Scoop (A2). Any additional shot or shots will change the value to be collected at the scoop.

B:

When the ball rolls thru the right return lane, the scoop lites on a short timer only to collect the flashing creature feature.

C:

If the player has a creature feature lit and does not want it to change via the spinner, the player may lock the feature with the Door Handle (it can be unlocked again the same way).

D: CRYPT JAM

When all the creature features have been completed, shooting the ball into the scoop starts the Crypt Jam (6-Ball Play, 1mil per switch, during Multiball).

13) LITE MYSTERY DOOR

When the ball rolls thru the left return lane, the 3-Bank Eyeball Targets are lit for Mystery Million Point Values. If the shot into the targets misses, the mystery doors go off.

14) CRYPT KICKER

When lit, and the ball rolls thru the left outlane, the ball will be kicked back into play.
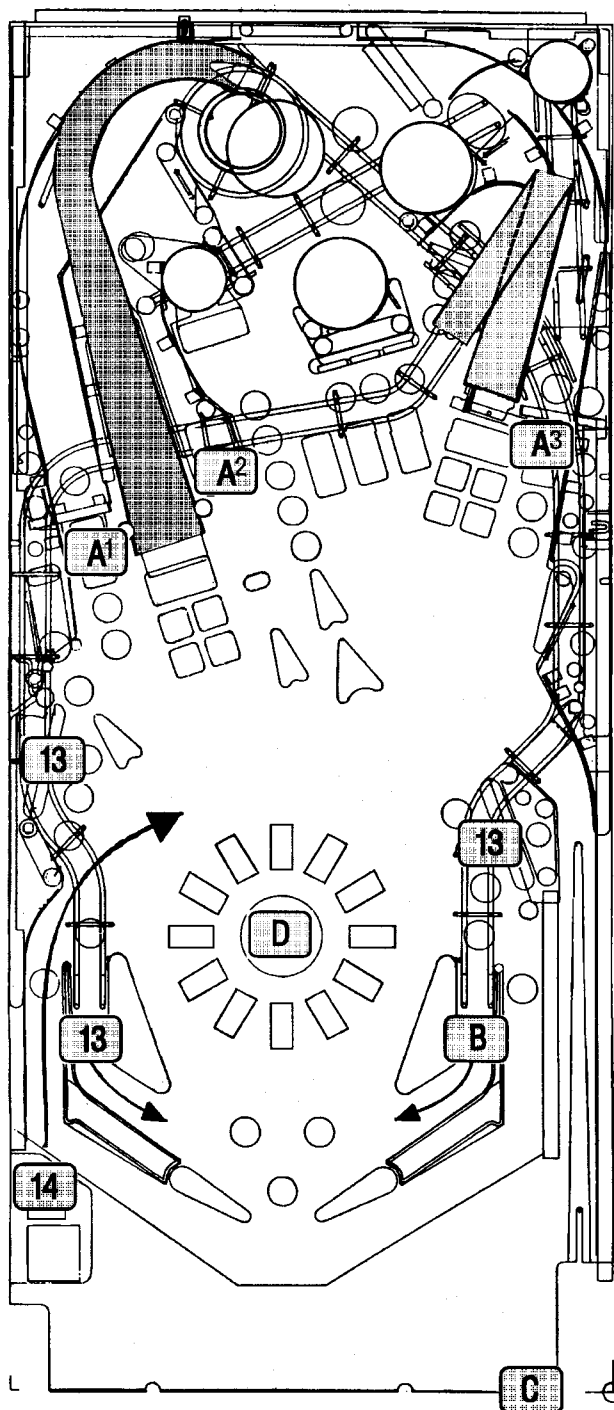
15) LITE CHOP

When the ball rolls thru the right return lane, the Turbo Pop Bumper Pops are lit for 1mil per hit.

16) SCARED TO DEATH

When the ball rolls out the right outlane, the player is awared a point value and loses the ball.

17) PLAY THE ORGAN

When flashing, shoot the right ramp or the completion of BATS, RATS, GHOSTS and GOBBLINS on the left ramp, will start this round. As switches are being completed, musical notes will pass thru the display. Each switch collects a note. Notes are worth 250K. As notes pass thru they may be accompainied by higher displayed point values and/or completion of other playfields rounds and/or special features.

18) LIVING DEAD

When flashing, shoot the right ramp or the completion of BATS, RATS, GHOSTS, and GOBBLINS on the left ramp will start this round. Each switch closure brings a ZOMBIE to life. Zombies are worth 250K, 300K, 350K, et cetera...

19) CHAINSAW MODE

When flashing, shoot the right ramp or the completion of BATS, RATS, GHOSTS, and GOBBLINS on the left ramp will start this round. Switch closures run the Chainsaw. Switches score 250K plus.
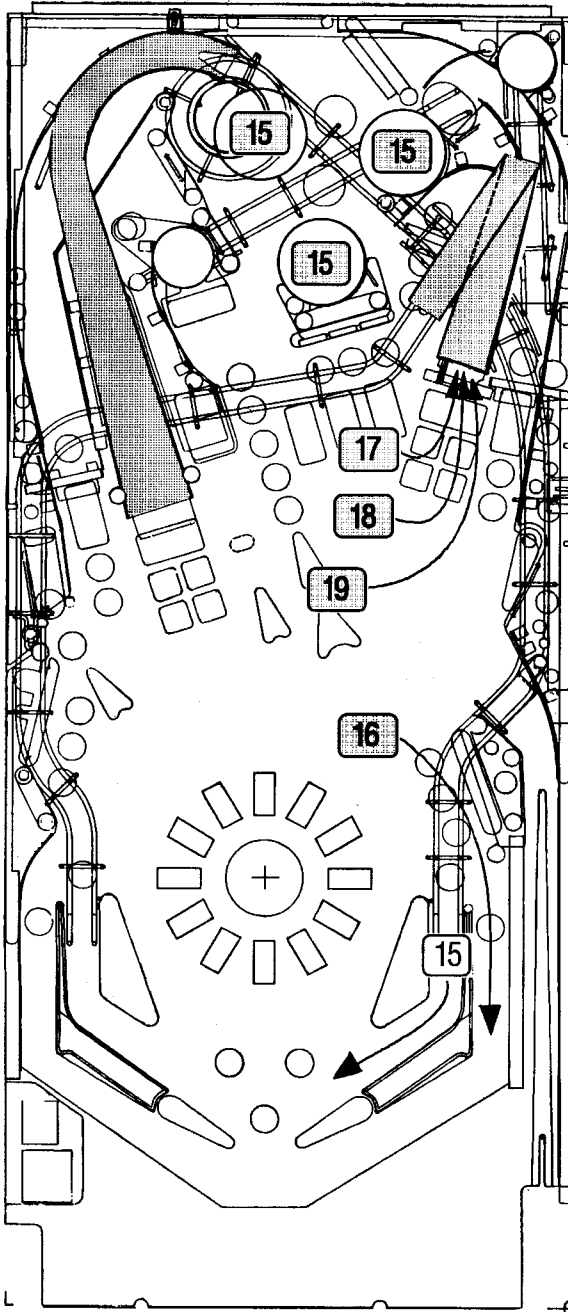
20) GRAVE DIGGER

When flashing, shoot the right ramp or the completion of BATS, RATS, GHOSTS, and GOBBLINS on the left ramp will start this round. Switches help the digger dig down to the coffin. Switches score 250K plus.

21) BATS

1mil for shooting the left ramp once.

22) RATS

2mil for shooting the left ramp once.

23) GHOSTS

3mil for shooting the left ramp once.

24) GOBBLINS

4mil for shooting the left ramp once.
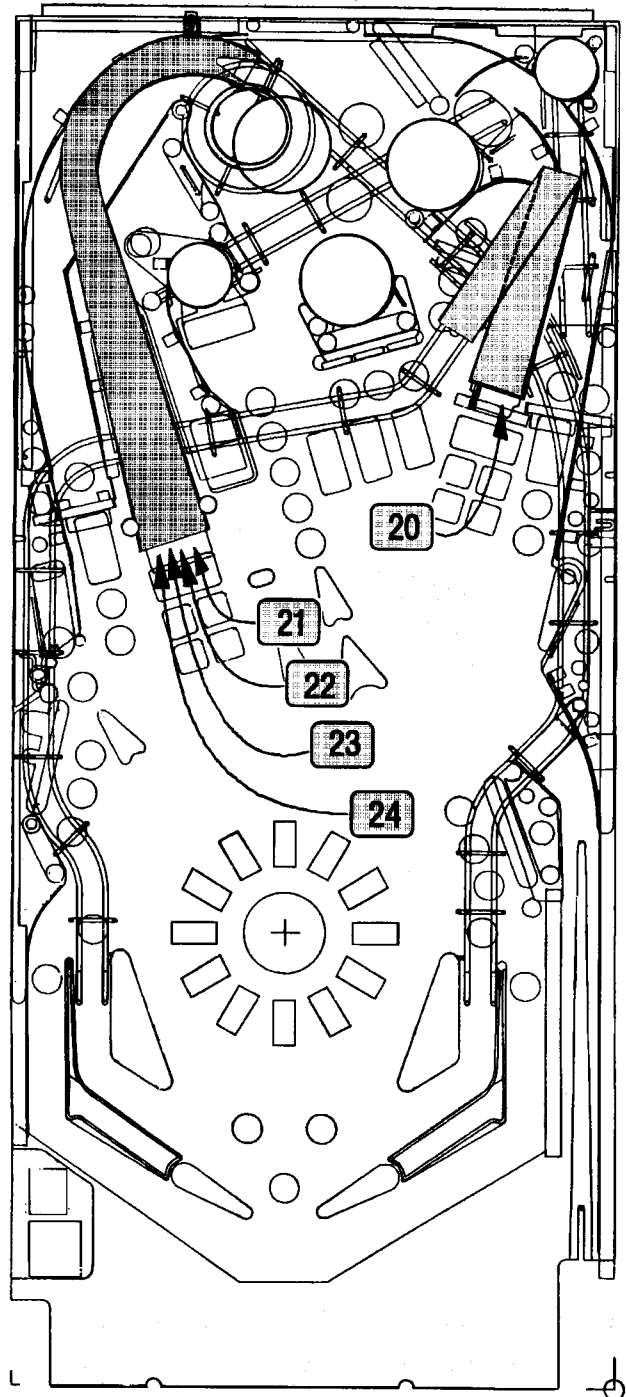
MULTIBALL AND JACKPOTS

D:

Shoot **C R Y P T** to lower the Tombstone for Multi-Ball ready. Shoot the **CRYPT** to start Multi-Ball.

E:

In Multi-Ball, shoot the left ramp to collect the Jackpot (increase the jackpot by shooting the left spinner).

F:

After collecting the Jackpot, the right ramp is worth double the jackpot (The Double Jackpot can also be increased by the right spinner).

G:

When the Double Jackpot is completed, the Tombstone (CRYPT) is ready. Each letter completed adds a ball into play. When the CRYPT is completed, the Tombstone drops for the Monster Jackpot, times the number of balls in play.

H - KILL SHOT:

Shoot the Lit Drop Target Bank with the door handle (located on the front of the cabinet). Awards 2mil times the number of balls in play.

I - CLONE:

Shooting the captive ball target will award the player 5mil and add 1mil for additional shots and award features. Resets each ball to 5mil.
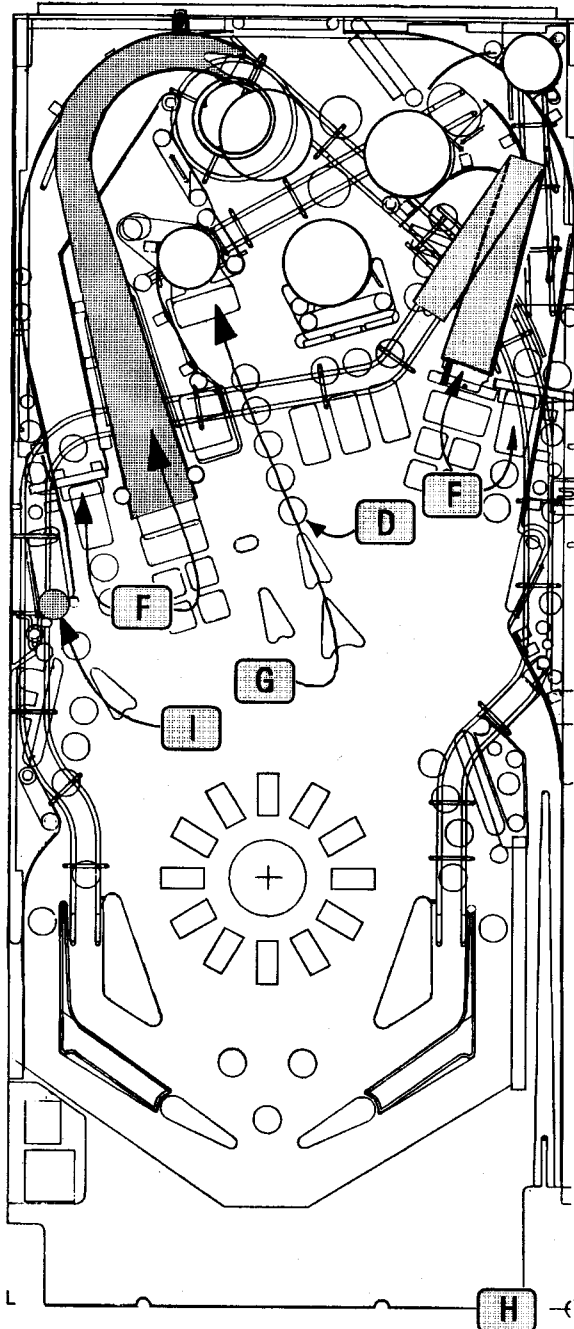
HIGHSCORE

To enter your initials, use the left and right flipper button to choose letter or character as seen on the Visual Display. Hitting the start button locks the letter or character in. Procede with the 2nd and 3rd letter.

NOTES:

AUDIT FUNCTIONS

GENERAL

There are 99 audit functions provided for accounting purposes and for evaluation of game difficulty adjustments. Audit functions are split into two groups. There are 9 most-used audits (1 through 9) in a 'quick look' group and 89 less-used audits (10 through 99), in an 'expanded' group. The various auditing functions are summarized in the **AUDITING FEATURES TABLE** and, when accessed, are shown on the player score displays. The *Audit Number* is shown in the top of the display, the *Description* is shown next and the *Audit Total* in the display. bottom Access and control is provided from switches located on the inside of the coin door.

To access audit functions, open the coin door and make sure that the FORWARD/REVERSE switch is in the FORWARD (up) position. Depress the STEP switch and the display indicates AUDITS & ADJUSTMENTS. This indicates access to audit functions.

With the FORWARD/REVERSE push-button switch still in the FORWARD (up) position, depressing the STEP push-button switch advances through the audit functions one at a time. To review lower-numbered functions, set the forward/reverse push-button switch to the REVERSE (down) position and operate the STEP push-button switch.

To access expanded audits, operate the step push-button until AUDIT 10, EXPAND AUDITS is displayed. Set the choice to YES as indicated in the lower display by depressing the Game Start push-button and then depress the step push-button. The request is installed and Audit 10 is displayed. When you exit audits and adjustments, the Audit 10 setting is returned to off for the next time that a review of audits are required.

Audit totals may be reset to zero using Game Adjustment, **ADJUSTMENT 11**, AUDITS RESET. Game adjustments (1 to 13 and 14 to 61) begin after the last audit function (10 or 99). Once audits functions have been recorded, and if no adjustments are required, you may return the game to the attract mode. If adjustments are required, continue pressing the STEP button until the game adjustments are reached. See Game Adjustments for details.

'QUICK LOOK' FUNCTIONS

Total Paid Credits (AUDIT 1) - the total number of paid credits is displayed.

Free Game Percentage (AUDIT 2) is Total Free Plays (Ex. AUDIT 25) divided by Total Plays (Ex. AUDIT 26).

Average Ball Time (in seconds) (AUDIT 3) is Total Play Time divided by Balls Total (AUDIT 11).

Average Game Time (AUDIT 4) is the Average Game Time expressed in minutes and seconds.

Coins (AUDIT 5, 6, 7 and 8) - These four audit totals are provided to show the amount of coins registered for the left, right, center, and 4th coin chutes, respectively.

Total Coins (AUDIT 9) is the total number of coins dropped through all 4 coin chutes.

Expand Audits (On/Off) (AUDIT 10) permits viewing of expanded audits.

Tales from the Crypt
Game Audit Table

#	Item/Description		#	Item/Description		#	Item/Description	
1	Total Paid Credits		34	Games 1-Player		67	Jackpot Awards	
2	Free Game Percentage		35	Games 2-Player		68	Double Jackpots	
3	Average Ball Time		36	Games 3-Player		69	Monster Jackpots	
4	Average Game Time		37	Games 4-Player		70	Combo Shots	
5	Coins Left		38	Attract Minutes		71	Left Return to Drops	
6	Coins Right		39	Cycles Hi-Score Reset		72	Crypt Jam	
7	Coins Center		40	Coins No Credit		73	Right Return to Pops	
8	Coins 4th Chute		41	Service Credit		74	Psycho Pops	
9	Total Coins		42	Meter Clicks		75	Left Spinner	
10	Expand Audits (On/Off)		43	Proprietary		76	Middle Spinner	
11	Balls Total		44	Proprietary		77	Right Spinner	
12	Extra Balls Total		45	Proprietary		78	Scoop Shot	
13	Extra Balls Percentage		46	Proprietary		79	Left VUK	
14	Replay 1 Awards		47	Total Buy-In Games		80	Right SVUK	
15	Replay 2 Awards		48	Slam Tilts		81	Small Under Trough	
16	Replay 3 Awards		49	Drains Left		82	Large Under Trough	
17	Replay 4 Awards		50	Drains Center		83	"KEEPER" Targets	
18	Total Replays		51	Drains Right		84	Werewolf Countdown	
19	Replay Percentage		52	Laser Kick Used		85	Frightmare	
20	Total Specials		53	Freeze Used		86	Thunder Storm	
21	Special Percentage		54	Death Saves		87	Robbing The Crypt	
22	Total Matches		55	Extra Ball Lit		88	Keeper Targets	
23	Hi-Score Wins		56	Right to Left Orbits		89	Super Guillotine	
24	Hi-Score Percentage		57	Left Ramp		90	Right Ramp Features	
25	Total Free Plays		58	Right Ramp		91	Got Deepest Doors	
26	Total Plays		59	Trick Shot		92	Use Diverter	
27	000.0 - 049.9 Million		60	Multi-Ball Lit		93	Well Lock Used	
28	050.0 - 099.9 Million		61	3-Ball Start		94	Door Prize Select	
29	100.0 - 199.9 Million		62	6-Ball Start		95	Left Turbo Bumper	
30	200.0 - 299.9 Million		63	Multi-Ball Restart		96	Center Turbo Bumper	
31	300.0 - 399.9 Million		64	Captive Ball		97	Right Turbo Bumper	
32	Over 400 Million		65	Skull Cracking		98	Complete Drop Targets	
33	Average Scores		66	Super Laser Kick		99	Grave Stone Hit	

NOTE: THIS PAGE CAN BE PHOTO-COPIED AND USED FOR FIELD AUDIT TRACKING PERFORMANCE.

EXPANDED FUNCTIONS

BALLS TOTAL (Audit 11) is the total of regular and extra balls.

EXTRA BALLS TOTAL (Audit 12) is the total number of extra balls awarded.

EXTRA BALLS PERCENTAGE (Audit 13) is Extra Balls Total (Audit 12) divided by Total Plays (Audit 26).

REPLAY 1-4 AWARDS (Audit 14 - 17) provide the total awards (credit, extra ball, or audit) for replay level 1 or 2 through 4, respectively.

TOTAL REPLAYS (Audit 18) is the total awards (credits, extra balls, or audit only) for exceeding replay score levels.

REPLAY PERCENTAGE (Audit 19) is the Replay Total awards for exceeding replay score levels, Total Replays (Audit 18) divided by Total Plays (Audit 26).

TOTAL SPECIALS (Audit 20) is the total awards (credits, extra balls, or scores) for making specials.

SPECIAL PERCENTAGE (Audit 21) is Total Specials (Audit 20) divided by Total Plays (Audit 26).

TOTAL MATCHES (Audit 22) is the total credits awarded for matching the last two digits of the score with the system-generated Match Number at the end of the game. Percentage of match credits will be adjustable from 0% to 10%, by Adj. 13 if enabled.

HI-SCORE WINS (Audit 23) is the total credits awarded for exceeding the high-score-to-date scores.

HI-SCORE PERCENTAGE (Audit 24) is Hi-Score Wins (Audit 23) divided by Total Plays (Audit 26).

TOTAL FREE PLAYS (Audit 25) is the total free credits for replays, high-score-to-date, specials, and match.

TOTAL PLAYS (Audit 26) is the sum of Total Paid Credits (Audit 1) and Total Free Plays (Audit 25). Note that free credits are not recorded in the Audit until they are actually used.

0.0- 49.9 MILLION (Audit 27) provides the total number of games the Player's final score was between 0 and 49,999,990 points.

50.0 - 99.9 MILLION (Audit 28) provides the total number of games the Player's final score was between 50,000,000 and 99,999,990 points.

100.0 - 199.9 MILLION (Audit 29) provides the total number of games the Player's final score was between 100,000,000 and 199,999,990 points.

200.0 - 299.9 MILLION (Audit 30) provides the total number of games the Player's final score was between 200,000,000 and 299,999,990 points.

300.0 - 399.9 MILLION (Audit 31) provides the total number of games the Player's final score was between 300,000,000 and 399,999,990 points.

OVER 400 MILLION (Audit 32) provides the total number of games the Player's final score was over 400,000,000 points.

AVERAGE SCORES (Audit 33) provides the Average Score by adding the Final Score of each game to a table and dividing this sum by the Total Plays .

1-4 PLAYER GAMES (Audits 34-37) provides the individual totals of 1, 2, 3, or 4 player games, respectively.

ATTRACT MINUTES (Audit 38) provides the number of accumulative minutes the game was is in Attract Mode. Attract Mode is the timer countdown when a game is completed and is awaiting Player to add more credits before the timer runs out.

CYCLES HI-SCORE RESET (Audit 39) provides the number of times that the high score levels have been automatically reset (if enabled).

COINS NO CREDIT (Audit 40) provides the number of times the coin switch was closed without awarding credit(s). This option is used in multiple coin conditions (e.g. 2 quarters - 1 Play).

SERVICE CREDIT (Audit 41) provides the total number of Service credits added to the game. *See Game Diagnostics on page 21 for instructions regarding entry of Service Credits.*

GAME SPECIFIC FUNCTIONS

METER CLICKS (Audit 42) provides the total number of money clicks accumulated, based on the country's lowest coin denomination used for game credit.

PROPRIETARY (Audit 43-46) provides information to the game designer to aid in design development (not for consumer use).

TOTAL BUY-IN GAMES (Audit 47) provides the number of times a player utilized the Buy-In Feature.

SLAM TILTS (Audit 48) provides the number of times the Slam Tilt switch was activated.

DRAINS LEFT (Audit 49) provides the number of times the ball drained out the left drain.

DRAINS CENTER (Audit 50) provides the number of times the ball drained out the center drain.

DRAINS RIGHT (Audit 51) provides the number of times the ball drained out the right drain.

LASER KICK USED (Audit 52) provides the number of times the Laser Kick returned a ball into play.

FREEZE USED (Audit 53) provides the number of times the Freeze feature was enabled. Freeze Feature is when the ball-in-play drains after just a short play, the same ball will be returned back into play.

DEATH SAVES (Audit 54) provides the number of times the ball was returned back into play by the Player physically slamming the front of the cabinet after a ball had drained.

EXTRA BALL LIT (Audit 55) provides the number of times the Extra Ball feature was lit.

RIGHT TO LEFT ORBITS (Audit 56) provides the number of accumulative orbits completed.

RAMPS (LEFT & RIGHT) (Audits 57, 58) provides the number of accumulative ramps completed.

TRICK SHOT (Audit 59) provides the number of times the ball "fell of the right ramp" and Player awarded the right ramp value at time of shot.

MULTI-BALL LIT (Audit 60) provides the number of times Multi-ball was lit.

3-BALL START (Audit 61) provides the total number of times Multi-ball was started with 3 balls.

6-BALL START (Audit 62) provides the total number of times Multi-ball was started with 6 balls.

MULTI-BALL RESTART (Audit 63) provides the total number of times Multi-ball Restart feature was completed.

CAPTIVE BALL (Audit 64) provides the accumulative number of switch closures in the captive ball lane..

SKULL CRACKING (Audit 65) provides the number of times the Skull Crackin' feature was enabled. Skull Crackin' adds an extra ball into play (up to 6) when this feature is enabled.

SUPER LASER KICK (Audit 66) provides the number of times the Laser Kick Feature was lit.

JACKPOT AWARDS (Audit 67) provides the number of times Jackpot feature was awarded.

DOUBLE JACKPOTS (Audit 68) provides the number of times the Double Jackpot feature was awarded.

MONSTER JACKPOTS (Audits 69) provides the number of times the Monster Jackpot feature was awarded.

COMBO SHOT (Audit 70) provides the number of times the Combo Shot (TBD) was enabled.

LEFT RETURN TO DROPS (Audit 71) provides the number of times the Mystery Door feature was completed.

CRYPT JAM (Audit 72) provides the accumulative number of times all the Creature Features were completed.

RIGHT RETURN TO POPS (Audit 73) provides the number of time the ball rolls thru the right return lane and was successfully shot directly up to the Turbo Pop Bumpers.

PSYCHO POPS (Audit 74) provides the number of times the Psycho Pops feature was enabled. This feature is a special round to complete accumulative Pop Bumper switch closures for points.

LEFT SPINNER (Audit 75) provides the number of times the Left Spinner was enabled.

MIDDLE SPINNER (Audit 76) provides the number of times the Middle Spinner was enabled.

RIGHT SPINNER (Audit 77) provides the number of times the Right Spinner was enabled.

SCOOP SHOT (Audit 78) provides the number of times the Scoop was enabled.

LEFT/ RIGHT VUKs (Audits 79, 80) provides the number of times the vertical up kickers were enabled.

SMALL UNDER TROUGH (Audit 81) provides the number of times the small trough was used.

LARGE UNDER TROUGH (Audit 82) provides the number of times the large trough was used.

"KEEPER " COMPLETE (Audit 83) provides the number of times all the letters were completed in KEEPER.

WEREWOLF COUNTDOWN (Audit 84) provides the number of times the Werewolf Countdown feature was enabled. This feature starts at 30mil and starts to subtract points on a timer until the Player successfully enables the left spinner switch. Player is awarded the remaining points.

FRIGHTMARE (Audit 85) provides the number of times the Frightmare feature was enabled. This feature the player has to complete 30 switch closures to collect the Frightmare award.

THUNDER STORM (Audit 86) provides the number of accumulative times this feature (completion of left and right ramps) was completed. Each completion of a ramp in the time frame allowed, increases by 1mil plus.

ROBBING THE CRYPT (Audit 87) provides the number of times the ball was shot into the Gravestone VUK after the Gravestone was lowered (5mil per shot).

KEEPER TARGETS (Audit 88) provides the number of times the Keeper Targets feature was completed. This feature is collected after shooting the scoop, and then all the targets are lit to collect 1mil per switch closure.

SUPER GUILLOTINE (Audit 89) provides the number of times the Super Guillotine feature was completed.

RIGHT RAMP FEATURES (Audit 90) provides the accumulative number of times the Right Ramp features were enabled.

GOT DEEPEST DOORS (Audit 91) provides the accumulative number of times that all the Door Prizes were collected.

USE DIVERTER (Audit 92) provides the number of times the diverter was enabled.

WELL LOCK USED (Audit 93) provides the number of times the Door Handle was used to Lock a Creature Feature.

DOOR PRIZE SELECT (Audit 94) provides the accumulative total of succesive number of Doors selected were a prize was awarded and not receiving a Zombie.

TURBO POP BUMPERS, LEFT, CENTER, & RIGHT (Audits 95-97) provides the acumulative number of times the bumper switches were closed for each one.

COMPLETED DROP TARGETS (Audit 98) provides the number of times the targets were completed.

GRAVE STONE (Audit 99) provides the number of times the gravestone feature was enabled.

GAME ADJUSTMENTS

GENERAL

There are 58 adjustable functions provided to vary difficulty of play and to periodically reset audits and the high score levels. The various game adjustments are summarized in the **Game Adjustments Table** and, when accessed, are shown on the player score displays. The *Adjustment Number* is shown in the top of the display, the *Description* is shown next, and the setting, in the bottom of the display. Access and control is provided from switches located on the inside of the coin door.

Game adjustments are accessed from the audit mode. With the audits displaying AUDIT 1 and the FORWARD/REVERSE switch in the REVERSE (down) position, depress the STEP switch and ADJUSTMENT 58 is shown at the top of the display, FACTORY RESTORE is shown in the middle of the display,and NO is shown in the bottom of the display.With the audits displaying AUDIT 10 or 99)and the FORWARD/REVERSE switch in the FORWARD (up) position, depress the STEP switch and ADJUSTMENT 1 is shown in the top of the display, REPLAY/MANUAL is shown in the middle of the display, and the setting is shown in the bottom of the display.

With the FORWARD/REVERSE switch in the FORWARD (up) position, depressing the STEP switch advances through the game adjustments one at a time. With it in the REVERSE (down) position, the STEP switch selects lower-numbered adjustments. To rapidly scroll through adjustments, hold the STEP switch depressed. Adjustment values are changed by operating the GAME START push-button.The FORWARD/REVERSE switch setting determines whether the values are increased or decreased. (With the FORWARD/REVERSE switch up, the value increases, with it down, the value decreases). When the STEP switch is depressed the display indicates REQUEST INSTALLED.

REPLAY AND GENERIC FEATURES

Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened the player displays indicate the recommended level and a sound is made to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the game start push-button. (If the coin door is closed or you enter audits/adjustments or diagnostics, the replay level is not changed.)

REPLAYS (Adjustment 1 through 6)

Adj. 1 Replay Manual/Fixed

- **Manual:** Adjust for percentage of awards for replay levels (1% through 50%). Proceed to Adj. 2 and 3 for starting replay levels.

- **Fixed:** Lower the automatic value to 0% and the display will indicate Fixed. Proceed to Adj. 2 and 3 for fixed replay levels.

Adj. 2 Start Replay

- **Manual:** Adjust the starting Replay 1 setting to between 50,000,000 and 9,999,000,000.

Adj. 3 Levels Replay/Level 1,2,3 & 4 Replay

- Adjust the number of replay levels to be active (1 to 4). Any additional starting replay levels are automatically set to values higher than Replay 1

- Adjust Replay 1 level to between 50,000,000 and 9,999,000,000. (Same as Start Replay)
  If Adj. 3 is set for 2, adjust Replay 2 level to between 50,000,000 and 9,999,000,000.
  If Adj. 3 is set for 3, adjust Replay 3 level to between 50,000,000 and 9,999,000,000.
  If Adj. 3 is set for 4, adjust Replay 4 level to between 50,000,000 and 9,999,000,000.

Tales from the Crypt
Game Adjustment Table

Adj. No.	Description	Factory Setting	Adj. No.	Description	Factory Setting
1	**Replay/Manual**	10%	32	Free Play	NO
2	Start Replay	300,000,000	33	Custom Message	ON
3	Replay Levels *	01	34	Attract Music	ON
4	Game Awards	CREDIT	35	Flash Lamps	NORMAL
5	Limit Freegame	03	36	Coils Pulse	NORMAL
6	Limit Extra Balls	03	37	Level Adjust By	OPERATOR EXTERNAL
7	Game Rules	MODERATE	38	Extra Adjustment	NO
8	Game Price *	USA7	39	Next Game Promo	ON
9	Game Cleaned	NO	40	Buy-In Type	OFF
10	Coins Reset	NO	41	Restart Game	NO
11	Audits Reset	NO	42	Extra Ball Percentage	25%
12	Restore Hi-Scores	NO	43	Volume Control	100%
13	Expand Adjustments	NO	44	Bill Validator	NO
14	Match Percentage	08	45	Tournament Style	NONE
15	Balls Per Game	03	46	Learn-it Style	50
16	Tilt Warnings	01	47	Trigger Enable	NO
17	Replay Boost	YES	48	Shaker Motor	ON
18	Credits Limit	30	49	Reduced Realism	YES
19	Hi-Scores Allowed	YES	50	Stuck Tilt Option	ON
20	Hi-Score 1 Awards	03	51	Multi-Ball Ready Style	MODERATE
21	Hi-Score 2 Awards	01	52	Rerace Criterion	EASY
22	Hi-Score 3 Awards	00	53	Jackpot Criterion	HARD
23	Hi-Score 4 Awards	00	54	Extra Adjustment	NO
24	Backup Hi-Score 1	500,000,000	55	Extra Adjustment	NO
25	Backup Hi-Score 2	450,000,000	56	Software Meter	00
26	Backup Hi-Score 3	400,000,000	57	Total Earnings	$00.00
27	Backup Hi-Score 4	350,000,000	58	Location ID Number	00
28	Backup Hi-Score 5	300,000,000	59	Game ID Number	00
29	Backup Hi-Score 6	250,000,000	60	Number of Copies Printed	00
30	Reset Hi-Score-To-Date	700	61	Printer Interface	PRESS START TO PRINT
31	Clean Game Every...	1,500	99	**Factory Restore**	NO

* Some settings result in Drop-Down Tables- See Text

Adj. 4 Game Awards Set for replays to award: **CREDIT**, **EXTRA BALL**, **NONE** or **SPECIAL** (when score threshold is achieved a playfield special is lit).

Adj. 5 Limit Freegame - Adjust for the maximum number of free games that may be accumulated per game; 0 to 9 .

Adj. 6 Limit Extra Balls - Adjust for the maximum number of extra balls that may be accumulated per game; 1 to 9 or OFF.

SINGLE-FUNCTION DIFFICULTY ADJUSTMENT (Adj. 7)

Any one of five INSTALL settings for this adjustment may be activated to automatically select settings for multiple adjustments affecting game difficulty. Use the Start button to choose the difficulty level you require and press the step button to activate the setting. After activation, the individual adjustments may be readjusted if desired. Refer to Install Adjustment Table for details.

Adj. 07 Game Rules - Set to **EXTRA EASY, EASY, FACTORY, HARD** or **EXTRA HARD**.
(Note - Additional game features not variable by the Expanded Adjustments may also change using this setting.)

INSTALL ADJUSTMENT	ADJ. 7 Extra Easy	ADJ. 7 Easy	ADJ. 7 Moderate	ADJ. 7 Hard	ADJ. 7 Extra Hard
Multi-Ball Ready Style	04	03	02	01	01
Rerace Criterion	04	04	03	00	00
Jackpot Criterion	YES	YES	YES	YES	NO

NOVELTY / 5-BALL/ADD-A-BALL SETTINGS

The following three combinations are recommended for situations where local laws restrict certain game features regarding the use of replays or the number of balls per game:

Novelty Play Rules - Set to establish recommended settings for no free play or extra balls:

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
1	Manual Replay	Fixed	6	Limit Extra Balls	00
2	Start Replay	00	14	Match Percentage	Off
3	Replay Levels	None	20	Hi-Score 1 Awards	03
4	Game Awards	None	21	Hi-Score 2 Awards	01
5	Limit Freegame	00			

5-Ball Play Rules - Set to establish recommended settings for 5-ball play:

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
1	Manual Replay	07%	15	Balls Per Game	05
2	Start Replay	400,000,000	20	Hi-Score 1 Awards	03
3	Replay Levels	01	21	Hi-Score 2Awards	01
4	Game Awards	Credit			
5	Limit Freegame	03			
6	Limt Extra Balls	03			
14	Match Percentage	04			

Extra Ball Settings-To disable awarding of credits and provide awards with an extra ball:

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
4	Game Awards	Extra Ball	19	Hi-Scores Allowed	No
5	Limit Freegame	00	20-23	Hi-Score 1-4	00
14	Match Percentage	Off			

GAME PRICE (Adj. 8)

There are two methods available for coin switch programming; Standard and Custom. Standard pricing uses a single adjustment (Adj. 8) to select a pricing scheme shown in the **Standard /Custom Pricing Table**. Custom pricing is used to select additional pricing schemes defined by a Drop Down menu .

With Adj. 8 set to **CUSTOM** operating the step button again initiates a drop down menu representing coin switch pulses for the left, right, center and fourth coin slots.The prescribes the number of pulses required for one credit. For example, if *Left Coin Pulses,* was set to 02 and *Coin Switch Pulses Required for 1 Credit*, to 01 a coin in the left slot would produce two credits. Further, if *Left Coin Pulses,* was set to 01 and *Coin Switch Pulses Required for 1 Credit*, to 02, two coins in the left slot would be required for one credit.

Coin Switch Pulses Required for Bonus Credit may be set to post bonus credits when a minimum amount of coins are inserted at one time. For example, if *Left Coin Pulses* was set to 01, *Coin Switch Pulses Required for 1 Credit* to 01 and *Coin Switch Pulses Required for Bonus Credit* to 04, one credit would be posted for each of the first three coins in the left slot and two credits for the fourth coin.

Standard/Custom Pricing - Set for the desired pricing scheme from the Standard Pricing Table as indicated on the dot matrix display. For Custom Pricing, set to **CUSTOM**. When set to CUSTOM, the following adjustments are utilized to tailor each individual coin chute.

Left Coin Switch Pulses - Set the number of pulses registered for closure of the left coin switch; 00 to 99.

Right Coin Switch Pulses - Set the number of pulses registered for closure of the right coin switch; 00 to 99.

Center Coin Switch Pulses - Set the number of pulses registered for closure of the center coin switch; 00 to 99.

4th Coin Switch Pulses - Set the number of pulses registered for closure of the fourth coin switch; 00 to 99.

Coin Switch Pulses Required for 1 Credit - Set the number of coin switch pulses required to post one credit; 00 to 99.

Coin Switch Pulses Required for Bonus Credit- Set the number of coin switch pulses required to award the 1st bonus credit(s); 00 to 99.

Coin Switch Pulses Required for 2nd Bonus Credit- Set the number of coin switch pulses required to award the 2nd bonus credit; 00 to 99.

Credits awarded for 1st Bonus - Set the number of credits awarded for achieving the first Bonus level; 00 to 99.

CUSTOM PRICING TABLE												
Coin Mechs					Adjustments							
Left	Right	Center	4th	Plays/Coins	Left Pulses	Right Pulses	Mid Pulses	4th Pulses	Pulses /Credit	Pulses /Bonus	Pulses /2nd BONUS	Credit /1st BONUS
25¢	25¢	$1.00	N/U	1/25¢ 3/50¢ 1/25¢ 5/$1.00 1/25¢ 6/$1.00	01 01 05	01 01 05	04 04 20	00 00 00	01 01 04	02 04 20	00 00 00	01 01 01
5SCH	10SCH	10SCH	N/U	1/10SCH 1/10SCH 4/30SCH	01 04	02 08	02 08	00 00	02 06	00 00	00 00	00 00
10p	£1	50p	20p	1/30p 2/50p 5/£1 1/50p 3/£1 1/30p 4/£1	01 01 01	15 15 12	06 05 05	02 02 02	03 05 03	00 00 00	00 00 00	00 00 00
20¢	$1.00	N/U	N/U	1/60¢ 2/$1.00	01	05	00	00	03	05	00	01

Adj. 8 Standard Pricing Select	Coin Mechs				Plays Per Coin			
	Left 1st	Center 2nd	Right 3rd	4th	1st	2nd	3rd	4th
USA 1-1 Coin 1 Play	25¢	$1.00	25¢		1PLAY/1COIN	4PLAY/1COIN	1PLAY/1COIN	
USA 2-4 Coin 3 Play	25¢	$1.00	25¢		1PLAY/2COIN	3PLAY/1COIN	1PLAY/2COIN	
					2PLAY/3COIN	6PLAY/2COIN	2PLAY/3COIN	
					3PLAY/4COIN	9PLAY/3COIN	3PLAY/4COIN	
USA 3-2 Coin 1 Play	25¢	$1.00	25¢		1PLAY/2COIN	2PLAY/1COIN	1PLAY/2COIN	
USA 4-2 Coin 1 Play	25¢		25¢		1PLAY/2COIN For the 1st Play			
					1PLAY/1COIN during BUY-IN			
USA 5-$2.00 5 Plays	25¢	$1.00	25¢		1PLAY/2COIN	2PLAY/1COIN	1PLAY/2COIN	
					5PLAY/8COIN	5PLAY/2COIN	5PLAY/8COIN	
USA 6- 50¢ - 3/$1Bill	25¢	$1.00	25¢		1PLAY/2COIN	3PLAY/1COIN	1PLAY/2COIN	
					2PLAY/4COIN	6PLAY/2COIN	2PLAY/4COIN	
USA 7-$2.00 6 Plays	25¢	$1.00	25¢		1PLAY/2COIN	2PLAY/1COIN	1PLAY/2COIN	
					2PLAY/4COIN	6PLAY/2COIN	2PLAY/4COIN	
Austria	5 SCH	10 SCH	10 SCH		1PLAY/2COIN	1PLAY/1COIN	1PLAY/1COIN	
					2PLAY/3COIN	3PLAY/2COIN	3PLAY/2COIN	
					3PLAY/4COIN			
Australia	20¢	$1.00	$2.00		1PLAY/5COIN	1PLAY/1COIN	3PLAY/1COIN	
Belgium	5f	20f	50f		1PLAY/4COIN	1PLAY/1COIN	3PLAY/1COIN	
Canada	25¢	25¢	$1.00		1PLAY/2COIN	1PLAY/2COIN		
					2PLAY/3COIN	2PLAY/3COIN		
					3PLAY/4COIN	3PLAY/4COIN		
Denmark	1Kr	5Kr	10Kr	20Kr	1PLAY/3COIN	2PLAY/1COIN	4PLAY/1COIN	8PLAY/1COIN
French 1	1f	5f	10f	20f	1PLAY/3COIN	2PLAY/1COIN	5PLAY/1COIN	11PLAY/1COIN
					2PLAY/5COIN	5PLAY/2COIN	11PLAY/2COIN	
					5PLAY/10COIN	11PLAY/4COIN		
French 2	1f	5f	10f	20f	1PLAY/5COIN	1PLAY/1COIN	3PLAY/1COIN	7PLAY/1COIN
					3PLAY/10COIN	3PLAY/2COIN	7PLAY/2COIN	
					7PLAY/20COIN	7PLAY/4COIN		
French 3	1f	5f	10f	20f	1PLAY/3COIN	2PLAY/1COIN	4PLAY/1COIN	9PLAY/1COIN
					2PLAY/5COIN	4PLAY/2COIN	9PLAY/2COIN	
					4PLAY/10COIN	9PLAY/4COIN		
German 1	1 DM	2 DM	5 DM		1PLAY/1COIN	2PLAY/1COIN	6PLAY/1COIN	
					2PLAY/2COIN	4PLAY/2COIN		
					3PLAY/3COIN	6PLAY/3COIN		
German 2	1 DM	2 DM	5 DM		1PLAY/1COIN	2PLAY/1COIN	7PLAY/1COIN	
					2PLAY/2COIN	4PLAY/2COIN	21PLAY/3COIN	
					3PLAY/3COIN	6PLAY/3COIN		
German 3	1 DM	2 DM	5 DM		1PLAY/2COIN	1PLAY/1COIN	5PLAY/1COIN	
					2PLAY/3COIN	3PLAY/2COIN	10PLAY/2COIN	
					3PLAY/4COIN	5PLAY/3COIN	15PLAY/3COIN	
Italy 1	500L		500L		1PLAY/1COIN		1PLAY/1COIN	
Italy 2	500L		500L		1PLAY/2COIN		1PLAY/2COIN	
					3PLAY/4COIN		3PLAY/4COIN	
Japan			100¥				1PLAY/1COIN	
							3PLAY/2COIN	
Korea	100 Won		100 Won		1PLAY/1COIN		1PLAY/1COIN	
Netherland 1	1 Guilder	1 Guilder	2.5Guilder		1PLAY/1COIN	1PLAY/1COIN	3PLAY/1COIN	
Netherland 2	1 Guilder	2.5Guilder	5 Guilder		1PLAY/1COIN	3PLAY/1COIN	6PLAY/1COIN	
New Zealand 1	$1.00		$2.00		1PLAY/1COIN		2PLAY/1COIN	
New Zealand 2	$1.00		$2.00		1PLAY/1COIN		3PLAY/1COIN	
Spain	100Pts		500Pts		1PLAY/1COIN		6PLAY/1COIN	
Sweden	1 SEK	5 SEK	10 SEK		1PLAY/10COIN	2PLAY/3COIN	3PLAY/2COIN	
Swiss 1	1 SFR	2 SFR	5 SFR		1PLAY/1COIN	2PLAY/1COIN	6PLAY/1COIN	
Swiss 2	1 SFR	2 SFR	5 SFR		1PLAY/1COIN	3PLAY/1COIN	9PLAY/1COIN	
UK 1	10P	50P	£1	20P	1PLAY/5COIN	1PLAY/1COIN	3PLAY/1COIN	3PLAY/5COIN
					3PLAY/10COIN	3PLAY/2COIN		
UK 2	10P	50P	£1	20P	1PLAY/4COIN	1PLAY/1COIN	3PLAY/1COIN	1PLAY/2COIN
					2PLAY/8COIN	3PLAY/2COIN		2PLAY/4COIN
					3PLAY/10COIN			3PLAY/5COIN
UK 3	10P	50P	£1	20P	1PLAY/5COIN	1PLAY/1COIN	2PLAY/1COIN	2PLAY/5COIN
					2PLAY/10COIN	2PLAY/2COIN		
Yugoslavia	5 Dur		5 Dur		1PLAY/1COIN		1PLAY/1COIN	

ADDITIONAL GENERIC FEATURES

Adj. 9 Game Cleaned - When enabled (set to **YES**) the game cleaning counter will be reset to zero and the Game-Clean-Me message in Tech Alert will go out when **STEP** is depressed. (Also see Adj. 31).

Adj. 10 Coins Reset - When enabled (set to **YES**) all coin/paid credit totals will be reset to zero when **STEP** is depressed.

Adj. 11 Audits Reset - When enabled (set to **YES**) all audit totals except for coins and paid credits will be reset to zero when STEP is depressed.

Adj. 12 Restore Hi-Score - When enabled (set to **YES**) the High Score Levels and associated initials will be restored to backup settings when STEP is depressed .

Adj. 13 Expand Adjustments - When set to **NO**, depressing the STEP push-button advances directly to Adj. 46, FACTORY RESTORE. When set to **YES**, depressing the STEP push-button sequences through the expanded adjustments. When exiting from expanded adjustments, this function is reset to **OFF** for the next time that adjustments are required.

Adj. 14 Match Percentage - Set Match percent from **00%** to **10%** or **OFF**. At 00% the match display occurs at the end of the game but never awards a credit.

Adj. 15 Balls Per Game - Adjust the number of balls per game; **2 to 5.**

Adj. 16 Tilt Warnings - Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; **1 to 3** or **OFF.**

Adj. 17 Replay Boost - Set to **YES** or **NO.** When set to **YES**, exceeding a replay will set a temporary replay level for each time a replay level is surpassed. This new level will equal the previous replay level (when the replay was awarded) plus 50 Million for each following game, until the replays have all been played. At this time the previous level is resumed.

Adj. 18 Credits Limit - Adjust the maximum number of credits that may be posted; 4 to 50.

HIGH SCORE LEVELS (Adj. 19 through 29)

There are four of the six high score levels with associated player initials that are displayed during the attract mode. This provides a high-score-to-date feature. When players exceed these levels, the player initials may be entered to replace the previous ones. These levels may be adjusted to award credits and to be reset to backup values after a selected number of games.

Adj. 19 Hi-Scores Allowed - Set to enable or disable the four high score levels; 00.

Adj. 20 Hi-Score 1 Awards - Adjust the number of credits awarded for exceeding level 1 (the highest of the four levels); 0 to **4.**

Adj. 21 Hi-Score 2 Awards - Adjust the number of credits awarded for exceeding level 1; 0 to 3.

Adj. 22 Hi-Score 3 Awards - Adjust the number of credits awarded for exceeding level 2; 0 to 2.

Adj. 23 Hi-Score 4 Awards - Adjust the number of credits awarded for exceeding level 3; 0 to 1.

Adj. 24 Backup Hi-Score 1 - Adjust the score level to which the world record (the highest of the four levels) may be altered. This adjustment is not affected by Adj.30, Reset HSTD (Factory Reset defaults to 7,500,000).

Adj. 25 Backup Highscore 2 - Adjust the backup score level to which level 1 may be reset.

Adj. 26 Backup Highscore 3 - Adjust the backup score level to which level 2 may be reset.

Adj. 27 Backup Highscore 4 - Adjust the backup score level to which level 3 may be reset.

Adj. 28 Backup Hi-Score 5 - Adjust the backup score level to which level 4 may be reset.

Adj. 29 Backup Hi-Score 6 - Adjust the backup score level to which level 5 may be reset.

Adj. 30 Hi-Score-To-Date - Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; 100 to 900 or OFF (no reset or adjustment).

Adj. 31 Clean Game Every... - Set to 1,500. Adjust the number of games in which the Clean Game Message appears in Tech Alert to indicate the playfield needs cleaning. Adjustable from 100 to 2,000.

Adj. 32 Free Play - When set to **YES**, no coins are required for games.

Adj. 33 Custom Message - When desired, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to **CHANGE** using the Credit button and depress STEP. The letter **A** is indicated in the first position in the display. Vary the letter by operating the left and right flippers. With the desired letter indicated, depress the CREDIT button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. At this time, depress the STEP push-button switch to advance to Adj. 34.

Adj. 34 Attract Music - Set to **ON** (approximately every 3 minutes) or **OFF**.

Adj. 35 Flash Lamps- Set to **NORMAL**, **DIM** or **OFF**. When set to **NORMAL** the Flash Lamps are active, when **DIM** the Flash Lamps impulse power is reduced by 25% and when **OFF** the Flash Lamps do not flash.

Adj. 36 Coils Pulse- Set To **NORMAL, HARD** or **SOFT**. When **HARD** the coil pulse power is increased by 12.5% of the normal pulse rate. When set to **SOFT** the coil pulse power is reduced by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard.

Adj. 37 Level Adjust By - The Manual Percentage Replay Adjustment can only be altered with the front door open (see manual page 3).

Adj. 38 Extra Adj. - Provides information to the game designer to aid in design development (not for consumer use).

Adj. 39 Next Game Promo- Set to **ON** or **OFF**. When set to **ON**, the game, in attract mode will randomly display a short promotion for our next game. When set to **OFF**, the game in attract mode will not generate any sounds or graphics referring to the next game.

Adj. 40 Buy-in Type - Set to 02. When set to 02, the game is set to Extra Ball Buy-in. When set to 01, the game is set to Game Buy-in. Set to OFF to make Buy-in Type inoperative.

Adj. 41 Restart Game -Set to **YES** or **NO**. When set to **YES**, a new game may be started during any ball after the first ball is completed. (Note-Pressing start during the first ball will add additional players.) When set to **NO**, The game disables the start button after the first ball until the final ball is in play.

Adj. 42 Extra Ball Percentage -Set from **0** to **50**. Allows the operator to adjust how frequently the Extra Ball feature is made available to the player.

GAME SPECIFIC FEATURES (Adj. 43 TO Adj. 61)

Adj. 43 Volume Control - Set to 0, 25, 50, 75 or 100 percent. Allows the operator to adjust the background music volume independently from the normal game sounds.

Adj. 44 Bill Validator - Set to YES or NO. When set to **YES** , the display, in game attract mode, will show an "Insert Bill Animation". When set to **NO**, the display, in game attract mode will show "Insert Coin Animation".

Adj. 45 TOURNAMENT STYLE - Set to **NONE, PINBALL EXPO, IFPA-PAPA** or **HOME**. This function determines the default conditions to quickly prepare a game for tournament play. When this setting is changed all audits will be reset and all adjustments will be initiated to the particular style selected. The game will then return

Adj. 45 TOURNAMENT STYLE (cont.) -
to game over attract mode, as if a Factory Restore had been performed.

> **NONE** - Same as a Factory Reset conditions.
> **IFPA** - Straight 50¢ play, no replay, no Extra Ball, no High Scores , **2** Tilt Warnings and No Match.
> **PINBALL EXPO-PAPA-** Same as IFPA settings except Free Play is enabled.
> **HOME**-Sets game for Free Play, extra ball play, no replay, **10%** Match and Extra Ball percentage = **30%**.

Adj. 46 LEARN-IT STYLE - Set from **0** to **9.990** games in increments of **10**. Determines how frequently the Manual Percentage Adjustment evaluates wheter or not to recommend a change to the score. When set to **0,** a change may be recommended at the end of each game.

Adj. 47 TRIGGER ENABLE - Set to **YES** or **NO**. When set to **YES**, the ball launch kicker will fire each time the launch button is pressed. When set to **NO**, the ball launch kicker will not operate.

Adj. 48 SHAKER MOTOR - Set to **ON** or **OFF**. Allows operation of the vibrating Shaker Motor during certain events in game play.

Adj. 49 REDUCED REALISM - Set to **YES** or **NO**. When set to **YES**, the Visual Display will display less "gorey" scenes.

Adj. 50 STUCK TILT OPTION - Set to **ON** or **OFF**. When set to **ON**, if the tilt switch is closed, the game will tilt when the average ball time is reached.

Adj. 51 MULTI-BALL READY STYLE - Determines how Multiball Ready is achieved.

Adj. 52 RERACE CRITERION - Set to **EXEASY, EASY, MODERATE, HARD or EXHARD**. Determines how Multiball can restart.

EXEASY	EASY	MODERATE	HARD	EXHARD
If no Jackpot was completed <u>or</u> TRI-BALL time is low.	If no Jackpot was completed.	If TRI-BALL time is low.	If no Jackpot was completed <u>and</u> TRI-BALL time is low.	Never

Adj. 53 JACKPOT CRITERION - Determines how the Jackpot is lit.

Adj. 54/ 55 PROPRIETARY - Provides information to the game designer to aid in design development (not for consumer use).

Adj. 56 SOFTWARE METER - Provides the operator with the total number of Meter Clicks.

Adj. 57 TOTAL EARNINGS - Provides the operator with the total cash value accumulated since the last Factory Restore occured.

Adj. 58 LOCATION I.D NUMBER - **0** to **9999**. Allows the operator to assign a location identification number to the audit print-out sheet.(Will not be affected by Factory Restore.)

Adj. 59 GAME I.D. NUMBER.- **0** to **9999**. Allows the operator to assign a game identification number to the Audit print-out sheet.(Will not be affected by Factory Restore.)

Adj. 60 NO. OF COPIES PRINTED - Provides the operator with the total number of copies that were printed.

Adj. 61 PRINTER INTERFACE - Allows the operator to print by pressing the Start Button.

Adj. 99 FACTORY RESTORE - Allows the operator to reset all adjustments to the factory settings.

GAME DIAGNOSTICS

The Data East Pinball system provides tests for sounds, digital displays, lamps, switches, and solenoids. Each feature may be tested manually or automatically using the STEP and FORWARD/REVERSE push-button switches inside the coin door and the Game Start push-button switch on the front of the cabinet. The automatic tests may be used for a quick verification of automatic test functions and the manual tests, for troubleshooting.

During game play, activation of switches and operation of coils with associated switches are monitored. If a switch is not made for 50 games it is considered faulty. When operation of a coil should close or open a switch and does not, the coil is considered faulty. In Game Over Attract Mode, faulty switches and coils (if any) are reported (See Tech Alert Description below). Note that reporting of an unused switch does not constitute a problem and that a bad coil could mean that the associated switch requires adjustment.

Wiring to switches, solenoids and controlled lamps uses color-coded wires that basically follows a resistor color-code scheme for the eight rows and eight columns. During the switch tests and during the discrete lamp test, identification of the color of the row and column wires are indicated in the Dot Matrix Display. For example, making the right coin switch during the Switch Test results in the switch functional name (RIGHT COIN) , the row (WHT-YEL) and column (GRN-BRN) wire color codes, and the switch number are shown in the display.

0	BLK	= BLACK	5	GRN	= GREEN
1	BRN	= BROWN	6	BLU	= BLUE
2	RED	= RED	7	VIO	= VIOLET
3	ORN	= ORANGE	8	GRY	= GREY
4	YEL	= YELLOW	9	WHT	= WHITE

Entering Diagnostics

With the game in the game-over mode, open the coin door and make sure that the FORWARD/REVERSE push-button switch is set to REVERSE (down) and depress the STEP push-button switch. The Player displays will show the tollfree Customer Service number 1-800-KICKERS, that is 1-800-542-5377 (U.S. including Illinois) and the toll number (708) 345-7700 (Outside the United States). This indicates entry into game diagnostics.

Service Credits

With the phone number displayed depress the STEP push-button switch. The game now gives the technician the option of adding 1 to 5 service credits. These credits allow the technician to test-play the game without adding any counts to the coin audits (AU 01 & AU 05-AU 08). When the message appears, press and hold the Game Start pushbutton until the desired number of credits are shown on the display. Then press the step button again to add these credits to the game and enter Tech Alert. If no Service Credits are desired, press the step button with the initial message displayed.

Tech Alert

The display will now indicate if there are any faulty switches (i.e., Switches that are normally closed but remain open or open switches that have not been closed (activated) in 50 games. The display will also indicate if the game requires cleaning, based on the number set in Adj. 31.

Easy Trough Clear

Pressing the step button again displays the EASY TROUGH CLEAR message and instructs the player to operate either flipper button to easily remove the balls from the trough. This is provided, to allow the technician a simple method of removing the balls from the trough prior to entering the Active Switch Test , thereby reducing the number of switches closed. Also, test functionality of trough, ensure proper trough operation.

Burn-In Minutes

Pressing the step button while in Tech Alert mode will step game into Burn-in Mode(Factory use). At this stage pressing the game start button will cause the game to exercize all CPU I/O functions. This is provided to constantly exercise sounds, solenoids, etc...

To stop the test press the start button again. Cumulative Burn-In minutes will be displayed. To reset Burn-In minutes to 00, you must perform a Audit Reset, Adj. 11 or a Factory Restore, Adj. 99.

Sound Tests

The Data East Pinball sound system produces true digital stereo sound on left and right speakers and mono on a center speaker. During Sound tests, the bottom display shows the sound board circuit under test and the corresponding sounds are selected by operating the left and right flipper buttons to choose the circuit to be tested. Now press the start button to initiate the sound. Refer to the Sound Test Chart for the sound circuits displayed and the sounds produced.

The sound functions allow verification that all channels are functioning properly and that the speaker connections are correct. Speaker Phase Testing procedures follow for checking speaker connections.

Auto/Manual Tests	Sounds Produced
LEFT SPEAKER	Left Sine
CENTER SPEAKER	Center Sine
RIGHT SPEAKER	Right Sine
VOICE ROM1 (Loc U17)	"Engore!"
VOICE ROM2 (Loc U21)	"Come on into the Crypt!"
MUSIC TEST (Sound ROM, Loc U7)	Level 1-3 Music

SOUND TEST CHART
Speaker Phase Testing

Connections to each of the three speakers are polarized and each must be connected appropriately for the best quality sound. If one speaker has the positive and negative connections reversed with respect to the other two, bass frequencies will not be produced properly and the overall sound quality will be poor.

To test for proper speaker phasing, use the sound test to cycle through the Left, Center, and Right Sine functions. If the Center Sine produces more volume and bass than the Left and Right Sines, the speakers are connected properly. If it produces the same or less, one speaker is connected improperly. To isolate and correct reversed speaker connections, one of two methods may be used.

1. Check each speaker for polarity markings. If the speakers have polarity markings, verify that the single-color wire (BLK, YEL or RED) is connected to the negative (-) terminal.

2. Disconnect the speaker output connector from the Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure that the positive battery terminal is connected to the positive lead (CN1-pin 1, 3, or 6) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

DIGITAL DISPLAY TEST

The Digital display utilizes a Dot Matrix Display Control board mounted in piggyback fashion to the display driver Board. The purpose behind this board is to provide more information (32 X 128 Dots) to the operator as well as displaying graphics to the player.

The board is controlled by a 68B09E microprocessor and it's personality ROMs (Unique to the Game) . It receives Data, Reset & Clock information from the CPU Board via the ribbon cable and sends back multiple Status and Busy signals to the CPU . This is to insure syncronized communication between the CPU and the Display Controller board.

The Drivers for the rows and columns are provided on 4 surface mounted integrated circuits on the Display driver board.

Dot Matrix Display Test

To enter Dot Matrix Display Test, operate the STEP push-button switch from the Sound Manual test. The display will immediately illuminate one vertical column of dots, turning it off and illuminating the next column, until each column has been individually lit, while the other columns are off. It will make one pass. The display will then illuminate the top horizontal row of dots, and test by lighting the row of the display, then turning it off and iluminating the next row, until each row has been has been indivudally lit, while the other rows are off. The test will then illuminate all the dots in the display, except for one column. It will cycle this blank column from left to right for one pass. The display will then again illuminate all the dots except for the top row, and then turning it on and blanking the next row, until each row has been indivudally blanked, while the other rows are on. It will cycle this blank row for one pass. The next test begins with every other dot lit, in both the rows and columns.These dots then go out, and the unlit dots light, resulting in an alternating checkerboard pattern for approximately 4 seconds. The test will repeat these cycles indefinitely until advanced to the next test or until the power is removed. (Please Note- these tests may be interrupted at any time by operating the STEP push-button switch to advance to the next test.)

Laser Kick Test

This test provided to insure proper interaction between certain switches and their associated solenoids without entering game play. For example, by rolling the ball over the left outlane switch the Laser Kick should fire. If it kicks too early or too late, the switch actuator should be adjusted to compensate for this error. If it fails to fire, use the switch test or coil test to help determine the the cause of failure. Note: During this function, similar tests may be performed on Vertical Up Kickers or Saucers in the game.

Gravestone Up & Down Test

This game has a feature which lowers a Target Switch (Gravestone) to allow a shot to the Vertical Up Kicker (VUK) below the playfield. The motor on this mechanism is controlled by a relay driven by Q23 on the CPU and there are 2 Limit Switchs (Gravestone Motor Up & Gravestone Motor Down) used by the CPU to determine the status of the Gravestone Motor.

After entering this test, press and hold the game's Start Button. This will cause the relay to pulse repeatedly as long as the Start Button is depressed. At the same time you will notice that the switch status (ON & OFF) will be indicated in the Dot Matrix Display (Gravestone Up & Down). The appropriate switch should be closed just prior to the limit of the Gravestone Motor Mechanism and both switches should not be closed (ON) at the same time.

This test is located before the Switch Tests so the technician can move the mechanism until both switches read OFF. This will help eliminate erronious readings while trying to trace a problem during the Active Switch Test.

Switches are configured in an 8 x 8 matrix of columns (switch drives) and rows (switch returns) with up to 64 switches possible. The switch tests include three parts; switch test, active switches, and bad switches. Row and column wire colors are indicated in each test using corresponding resistor color code numbers.

Switch Test

From the Laser Kick test, operate STEP push-button switch. The display should indicate SWITCH TEST. Close each switch and observe the displays. The display will indicate the switch name, the display indicates the row and column wire colors, and indicates the switch number. When a switch is released, the name and number disappear until another switch is closed or the test is exited.
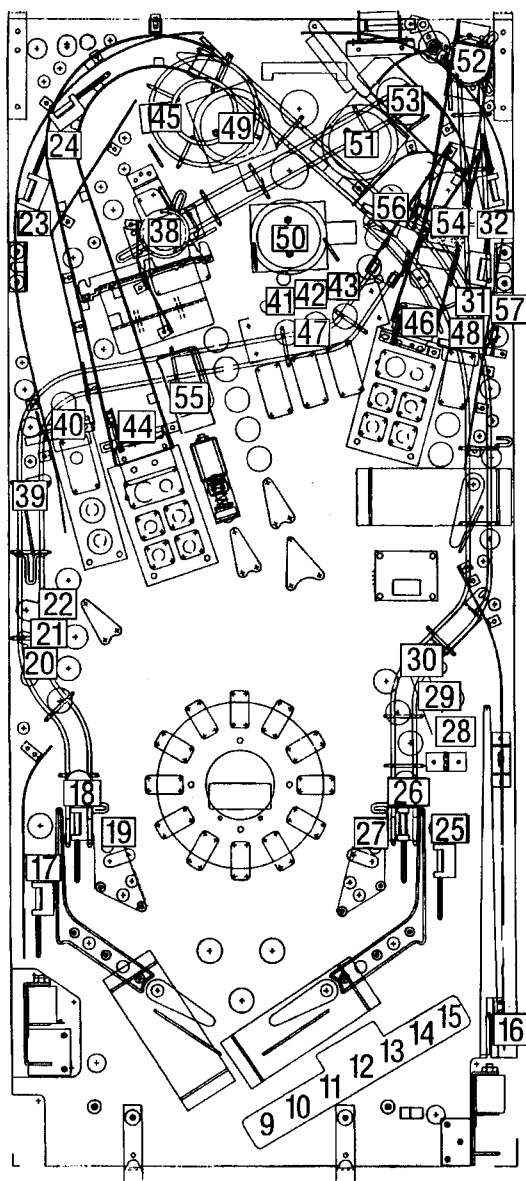
Active Switches

Operate the STEP push-button switch from the Switch Test. The display will indicate ACTIVE SWITCHES. If any switches are stuck closed (or made from the presence of a ball), the display sequences through switch names, and indicates the row and column wire colors, and the switch numbers are indicated in the display. This cycle continues until all switches are cleared or until the STEP push-button switch is depressed.

SWITCH MATRIX CHART

Column / Row	1 Q55 GRN-BRN CN8-1	2 Q54 GRN-RED CN8-2	3 Q53 GRN-ORN CN8-3	4 Q52 GRN-YEL CN8-4	5 Q51 GRN-BLK CN8-5	6 Q50 GRN-BLU CN8-7	7 Q49 GRN-VIO CN8-8	8 Q48 GRN-GRY CN8-9
1 WHT-BRN CN10-9	Plumb Tilt 1	Trough #1 Left 9	Left Outlane 17	Right Outlane 25	Up 33	Left Drop 41	Left Turbo 49	Lamp Ramp Exit 57
2 WHT-RED CN10-8	4th Coin 2	Trough #2 10	Left Return 18	Right Return 26	Not Used 34	Middle Drop 42	Bottom Turbo 50	Not Used 58
3 WHT-ORN CN10-7	Credit Button 3	Trough #3 11	Left Slingshot 19	Right Slingshot 27	Not Used 35	Right Drop 43	Right Turbo 51	Not Used 59
4 WHT-YEL CN10-6	Right Coin 4	Trough #4 12	Left Bottom 3-Bank 20	Right Bottom 3-Bank 28	Down 36	Left Ramp Enter 44	Super VUK Right 52	Not Used 60
5 WHT-GRN CN10-5	Center Coin 5	Trough #5 13	Left Middle 3-Bank 21	Right Middle 3-Bank 29	Grave-Stone 37	Left Ramp Middle 45	Small Trough 53	Not Used 61
6 WHT-BLU CN10-3	Left Coin 6	Trough #6 14	Left Top 3-Bank 22	Right Top 3-Bank 30	VUK Left 38	Right Ramp Enter 46	Large Trough 54	Launch Button 62
7 WHT-VIO CN10-2	Slam Tilt 7	Trough #7 Right 15	Left Bottom Orbit 23	Right Bottom Orbit 31	Captive Ball 39	Right Ramp Exit 47	Power Scoop 55	Left End of Stroke 63
8 WHT-GRY CN10-1	Buy-In Type 8	Shooter Lane 16	Left Top Orbit 24	Right Top Orbit 32	Left Spinner 40	Right Spinner 48	Middle Spinner 56	Right End of Stroke 64

Switch Matrix Locations, Descriptions &
Swtich Part Numbers

Switch Matrix No. & Description		Part No.
01*	Plumb Tilt	See Cabinet
02*	4th Coin	--
03*	Credit Button	500-5097-02
04*	Right Coin	180-5024-00
05*	Center Coin	180-5024-00
06*	Left Coin	180-5024-00
07*	Slam Tilt	180-5022-00
08*	Buy-In Button	180-5073-00
09	Trough #1 Left	180-5119-00
10	Trough #2	180-5119-00
11	Trough #3	180-5119-00

Switch Matrix No. & Description		Part No.
12	Trough #4	180-5119-00
13	Trough #5	180-5119-00
14	Trough #6	180-5119-00
15	Trough #7 Right	180-5118-00
16	Shooter Lane	180-5100-01
17	Left Outlane	500-5706-00
18	Left Return	500-5706-00
19	Left Slingshot	180-5023-00
20	Left Bottom 3 Bank	180-5130-02
21	Left Mid 3 Bank	180-5130-01
22	Left Top 3 Bank	180-5130-00
23	Left Bottom Orbit	500-5706-00
24	Left Top Orbit	500-5707-00
25	Right Outlane	500-5707-00
26	Right Return	500-5707-00
27	Right Slingshot	180-5023-00
28	Right Bottom 3 Bank	180-5130-02
29	Right Mid 3 Bank	180-5130-01
30	Right Top 3 Bank	180-5130-02
31	Right Bottom Orbit	500-5706-00
32	Right Top Orbit	500-5707-00
33*	Up (Tomb)	180-5052-00
34	Not Used	--
35	Not Used	--
36*	Down (Tomb)	180-5052-00
37*	Tombstone Score	180-5083-00
38	VUK Left	180-5064-00
39	Captive Ball Trgt. Switch	180-5114-08
40	Left Spinner	180-5010-04
41	Left Drop Target	180-5092-01
42	Mid Drop Target	180-5092-01
43	Right Drop Target	180-5092-01
44	Left Ramp Enter	180-5090-00
45	Left Ramp Middle	180-5090-00
46	Right Ramp Enter	180-5090-00
47	Right Ramp Exit	180-5093-00
48	Right Spinner	180-5010-04
49	Left Turbo Bumper	180-5015-01
50	Bottom Turbo Bumper	180-5015-01
51	Right Turbo Bumper	180-5015-01
52	Super VUK Right	180-5064-01
53	Small Trough	180-5093-00
54	Large Trough	180-5093-00
55	Power Scoop	500-5057-00
56	Middle Spinner	180-5010-04
57	Left Ramp Exit	180-5090-00
58	Not Used	--
59	Not Used	--
60	Not Used	--
61	Not Used	--
62	Launch Button	180-5073-00
63	Left End of Stroke	180-5124-00
64	Right End of Stroke	180-5124-00

Switch Locations

* = Location is in the cabinet.

LAMP TESTS

Controlled lamps are configured in an 8 x 8 matrix of columns (lamp drives) and rows (lamp returns) with up to 64 lamps possible. The lamp tests include four parts, all lamps, lamp return (row), lamp drive (column), and discrete (individual) lamps. Row and column wire colors are indicated in the discrete lamp test using corresponding resistor color code numbers.

All Lamps

From the Active Switch test, operate the STEP push-button switch. The dot matrix display will indicate ALL LAMPS and all controlled lamps will light.

Lamp Returns

From the ALL LAMPS test, depress the STEP push-button switch. The display indicates LAMP RETURNS, indicates wire color and the LAMP RETURN driver transistor. All controlled lamps in row 1 should be lit. Operating the Game Start push-button switch cycles through each of the rows separately.

Lamp Drives

From the LAMP RETURNS test, depress the STEP push-button switch. The display will indicate LAMP COLUMNS, wire color and the LAMP DRIVES driver transistor. All controlled lamps in column 1 should be lit. Operating the Game Start push-button switch, cycles through each of the columns separately.

SingleLamp

From the LAMP DRIVES test, depress the STEP push-button switch. The display will indicate the lamp name. The display indicates the row and column wire colors and the lamp matrix number. Lamp 01 should light. With the FORWARD/REVERSE push-button switch in the FORWARD (up) position, operating the Game Start push-button switch selects higher-numbered lamps; with it in the REVERSE (down) position, Game Start selects lower-numbered lamps.
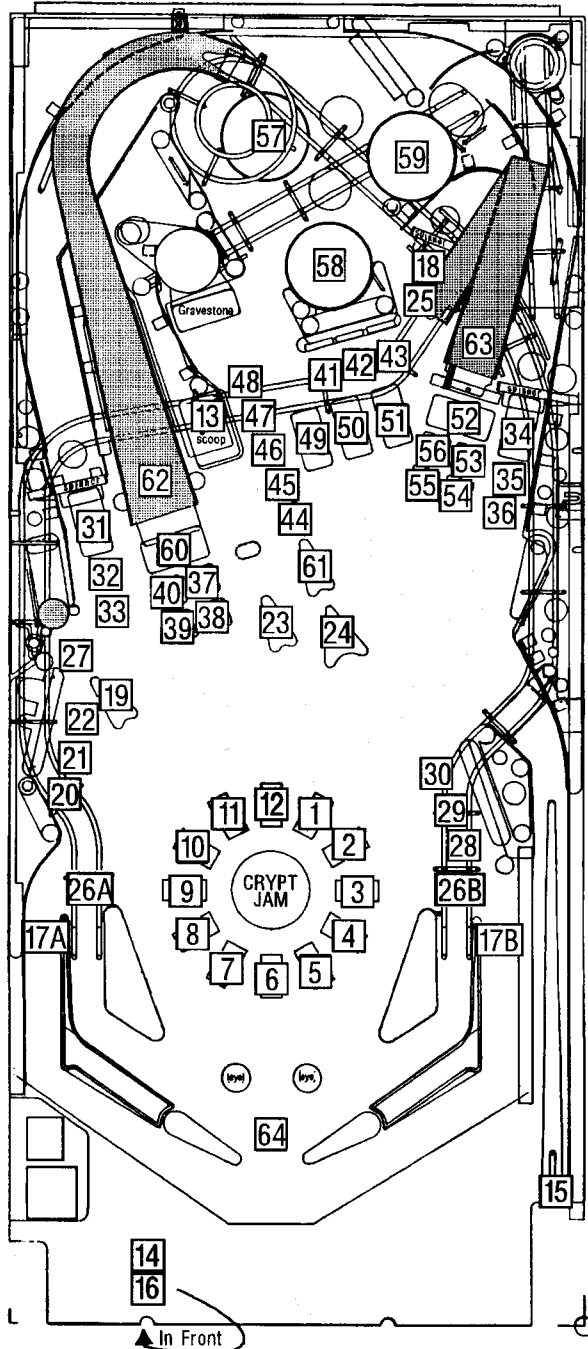
LAMP MATRIX CHART

Column / Row	1 Q71 YEL-BRN CN7-1	2 Q70 YEL-RED CN7-2	3 Q69 YEL-ORN CN7-3	4 Q68 YEL-BLK CN7-4	5 Q67 YEL-GRN CN7-6	6 Q66 YEL-BLU CN7-7	7 Q65 YEL-VIO CN7-8	8 Q64 YEL-GRY CN7-9
1 Q72 RED-BRN CN6-1	Thunder Storm 1	Werewolf Count-down 9	Left/Right Outlane 17	Multiball 25	Lite Creature Feature33	Left Drop Trgt. 41	Mystery Door 1 49	Left Turbo 57
2 Q73 RED-BLK CN6-2	Skull Crackin' 2	Video Mode 10	Extra Ball 18	Right/Left Return 26	Fright-mare 34	Middle Drop Trgt. 42	Mystery Door 2 50	Bottom Turbo 58
3 Q74 RED-ORN CN6-3	Door Prize Select 3	Electric Chair 11	Skull Crush 19	Clone 27	Increase Double Jackpot35	Right Drop Trgt. 43	Mystery Door 3 51	Right Turbo 59
4 Q75 RED-YEL CN6-5	Frightmare 4	Keeper Targets 12	K 20	R 28	Lite Creature Feature36	T 44	Double Jackpot 52	Jackpot 60
5 Q76 RED-GRN CN6-6	Psycho Pops 5	Scoop 13	E 21	E 29	Rats 37	P 45	Living Dead 53	Multiball 61
6 Q77 RED-BLU CN6-7	Robbing the Crypt 6	Buy-In Type 14	E 22	P 30	Goblins 38	Y 46	Grave-digger 54	Left Ramp Enter 62
7 Q78 RED-VIO CN6-8	Extra Ball 7	Launch 15	Collect Creature Feature23	Werewolf Count-down 31	Ghosts 39	R 47	Chainsaw Mode 55	RightRamp Enger 63
8 Q79 RED-GRY CN6-9	Super Guillotine Targets 8	Start Button 16	Monster Jackpot 24	Increase Jackpot 32	Bats 40	C 48	Play the Organ 56	"Axe-tra" Ball 64

Lamp Matrix Location and Descriptions

Lamp Matrix No. & Description		Lamp Matrix No. & Description		Lamp Matrix No. & Description	
01	Thunderstorm	12	Keeper Targets	22	....E
02	Skull Crackin'	13	Over Scoop	23	Collect CreatureFeature
03	Door Prize Select	14	Buy-In Type	24	Monster Jackpot
04	Frightmare	15	Launch	25	Multiball
05	Psycho Pops	16	Start Button	26A	Lite Mystery Door (Lt.Return)
06	Robbing the Crypt	17A	Crypt Kick(Left Outlane)	26B	Chop Pops (Right Return)
07	Lite Extra Ball	17B	Scared to Death(Rt.Outln.)	27	Clone
08	Super GuillotineTargets	18	Extra Ball	28	....R
09	Werewolf Countdown	19	Skull Crush	29	....E
10	Video Mode	20	....K	30	....P
11	Electric Chair	21	....E	31	Werewolf Countdown
				32	Increase Jackpot
				33	Lite CreatureFeature
				34	Frightmare
				35	Increase Double Jackpot
				36	Lite CreatureFeature
				37	Rats
				38	Goblins
				39	Ghosts
				40	Bats
				41	Guillotine DropTarget Left
				42	Guillotine Drop Target Mid
				43	Guillotine Drop Target Right
				44	....T
				45	....P
				46	....Y
				47	....R
				48	C
				49	Mystery Door 1
				50	Mystery Door 2
				51	Mystery Door 3
				52	Double Jackpot
				53	Living Dead
				54	Gravedigger
				55	Chainsaw Mode
				56	Play the Organ
				57	Left Turbo Bumper
				58	Bottom Turbo Bumper
				59	Right Turbo Bumper
				60	Jackpot
				61	Multiball
				62	Left Ramp Enter
				63	Right Ramp Enter
				64	"Axe-tra" Ball

Notes:
General Illumination Lamps Not Shown
For Bulb Type & Part Number, see Page 39

FLASH LAMP / COIL TESTS

Twenty-Two regular (pulsed under microprocessor control) coil drivers are provided to switch ground to coils. The Left/Right relay is used in conjunction with drives 1 through 8 to switch +32 volts between coils or flash lamps; these sets are termed "left" and "right". This relay is located on the PPB board which provides isolation diodes and current limiting resistors. This effectively provides 29 regular coils.

Flash Lamp

From the Single Lamp test, depress the STEP push-button switch. All Flash lamps will fire randomly. This allows the Technician to easily spot any burned out bulbs and replace them without steping through the tests below.

Automatic Test

From the Flash Lamps test, depress the STEP push-button switch. The dot matrix display will indicate ALL COILS. The test pulses each regular solenoid or flash lamp sequentially with the coil/flash lamp names and the wire colors indicated in the display.

Select Coil

From the Coil Test, depress the STEP push-button switch. The display will indicate SELECT COIL and then the name of 1st drive and the wire colors. Operate either Flipper push-button switch to select the coil or flash lamp to be tested. With the desired drive number indicated in the Player 4 display, depress the START push-button switch to cause it to be pulsed repeatedly.

RETURN TO GAME OVER

From the Select Coil test, depress the STEP push-button switch once. The game returns to the game-over mode.
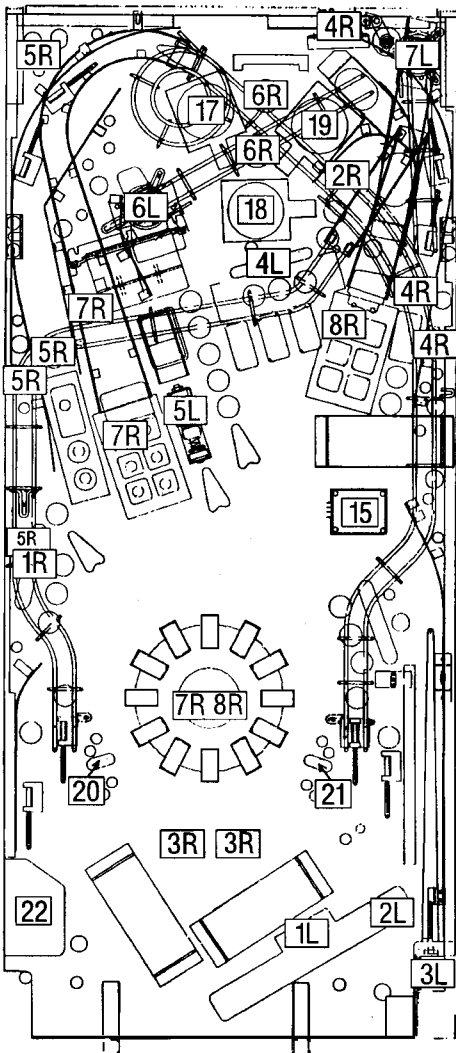
CPU Controlled Auxiliary Solenoids					
Coil Number	Coil Description	Control Line (CPU to Coil)	Power Line (PS to Coil)	Drive Transistor	Coil Type
17	Left Turbo Bumper	BLU-BRN CPU CN19-7	RED PS CN3-6	Q11	23-800
18	Center Turbo Bumper	BLU-RED CPU CN19-4	RED PS CN3-6	Q9	23-800
19	Right Turbo Bumper	BLU-ORN CPU CN19-3	RED PS CN3-6	Q8	23-800
20	Left Slingshot	BLU-YEL CPU CN19-6	RED PS CN3-6	Q10	23-800
21	Right Slingshot	BLU-GRN CPU CN19-8	RED PS CN3-6	Q12	23-800
22	Laser Kickback (See Schematic)	WHT-VIO CPU CN19-9	VIO-YEL PPB J7-3	Q13	23-800

Flipper Solenoids				
Coil Description	Flipper GND CPU to Flip. Sw. to Flip. PCB	Power Line FlipPC to Coil	Coil Type	Power Input To Flip. PCB
Left Flipper 090-5032-00	ORN-GRY CPU CN19-2	BLU-GRY CN1-10	GRY-YEL CN2-1,2	22-1080	BLK-WHT 50VDC
Right Flipper Lwr. 090-5032-00	ORN-VIO CPU CN19-1	BLU-VIO CN1-7	BLU-YEL CN2-4,5	22-1080	GRY/GRY-GRN 8VAC
Right Flipper Upr. 090-5044-00	ORN-VIO CPU CN19-1	GRY-VIO CN1-12	BLK-YEL CN2-1,2	25-1800	- - -

1R   5R 8R
O   O O

2R 4R   3R 3R
O   O   O O

6R
O
Backbox Flash Lamps

NOTES

Game Diagnostics
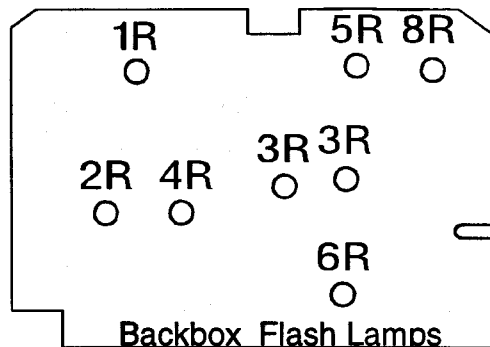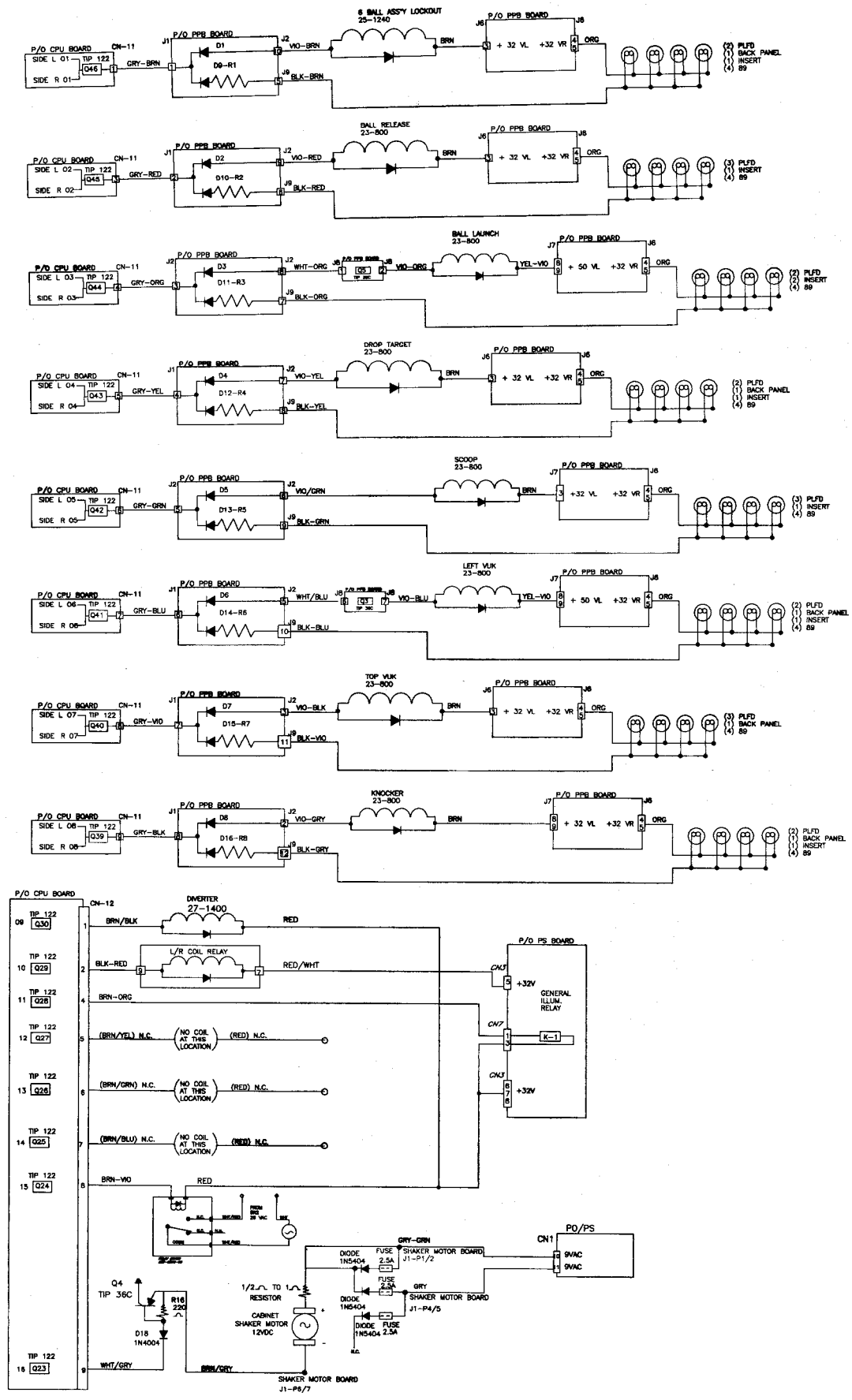
PARTS IDENTIFICATION

Cabinet Parts Illustration

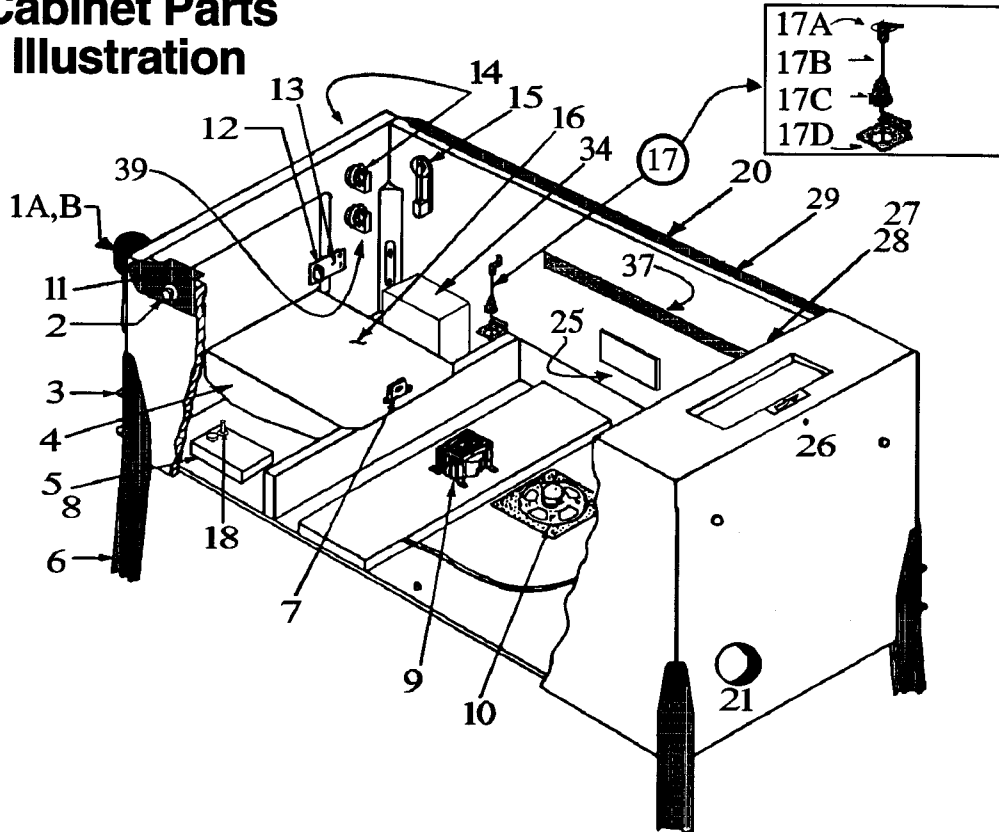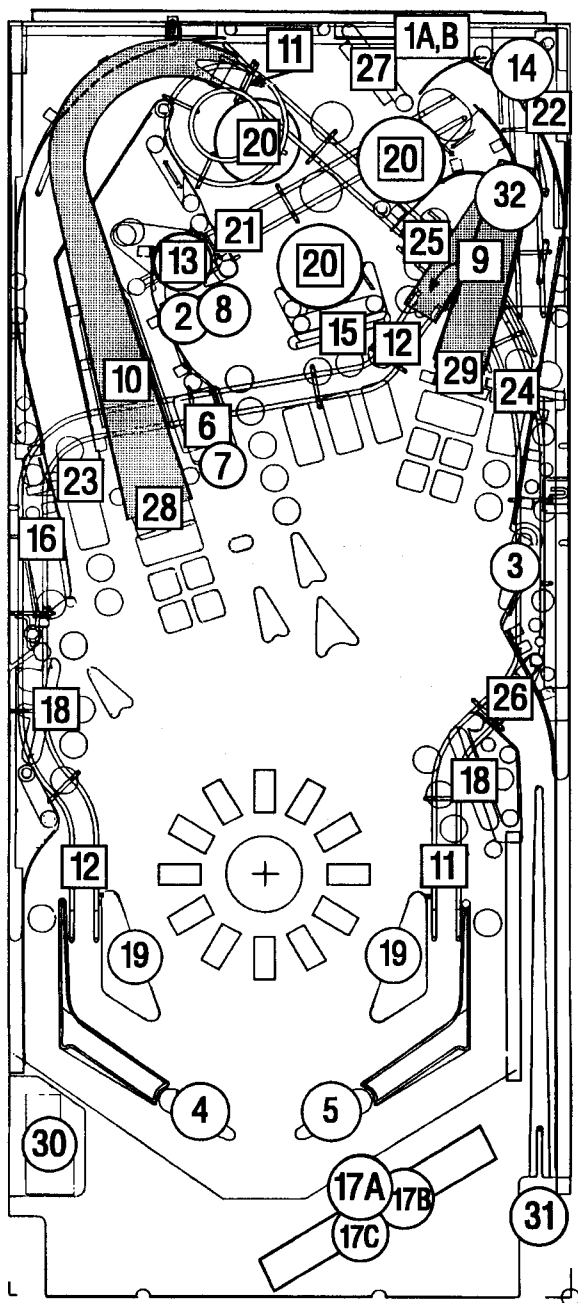| Item	Description	Part No.
1A	Ball Launch Door Handle Ass'y.	515-5937-00
1B	Door Handle Switch Plate Ass'y	515-5936-00
2	Flipper Button	500-5026-32
3	Leg Bolt (Black) 3/8-16 x 2-3/8 Hex Hd.	231-5000-01
4	Cash Box Plastic Bottom	545-5090-00
5	Power Switch DPST Toggle	180-5001-00
6	Leg (Black)	535-5020-30
7	Cash Box Lock Bracket	535-5215-00
8	Power Input Box Ass'y (Crypt)	515-5360-00
9	Transformer	010-5003-00
10	Speaker-Round - 8"	031-5005-00
11	Side Armor - Right	535-5010-35
12	Memory Protect Switch	180-5000-00
13	Memory Protect Switch Bracket	535-6409-00
14	Start Button Switch Ass'y (Red)	500-5728-02
15	Flipper Switch (Left)	180-5048-01
15A	Flipper Switch, Double (Right)	180-5122-00
16	Cash Box Cover (Validator)	535-5013-03
17	Plumb Bob Tilt Assembly	500-5023-00
17A	Hanger Braket (tilt)	535-5221-00
17B	Hanger Wire (tilt) (Attach to "17A")	535-5319-00
17C	Plumb Bob (tilt) (Attach to "17B")	535-5029-00
17D	Contact Bracket (tilt)	535-5319-00

Item	Description	Part No.
18	Volume Control Single 10K Log	123-5000-02
19	Playfield Glass (Tempered) * 21" x 43"	660-5001-00
20	Side Armor - Left	535-5010-36
21	Recessed Cup for Line Cord	545-5122-00
22	Service Switch Set *	180-5012-00
23	Front Molding Lockdown Assy*	500-5020-00
24	Front Molding - Black *	500-5021-10
25	Solid State 3 - Flipper Board	520-5033-03
26	#1 Roto Lock Male	355-5006-01
27	Rear Plastic Ext. P/F Glass	545-5038-00
28	Mounting Fm. Rubber for Ext.	626-5004-00
29	Plastic Channel Left & Right	545-5017-00
30	Backbox Hinge Left *	535-6172-00
31	Backbox Hinge Right *	535-6172-01
32	Leg Leveler * 8-16x3"	500-5017-00
33	Coin Door (w/Validator) USA	500-5018-17
34	Shaker Motor	515-5893-00
35	Shaker Motor P.C. Board	520-5065-00
36	Slide & Pivot Support Brkt. Right*	535-5989-00
37	Slide & Pivot Spt. Brkt. Left	535-5990-00
38	Playfield Support Bar *	535-5019-00
39	Extra Ball Switch	500-5779-07

NOTE 1: An asterisk (*) indicates item is not shown in above illustration.

Item	Description	Part No.
1A	Diverter Assembly	500-5654-00
1B	Diverer Plunger & Crankarm Ass'y	515-5453-00
2.	Motor, Cam & Switch Ass'y	500-5742-01
3.	Flipper Ass'y (Top Right)	500-5756-01
4.	Flipper Ass'y (Lower Right)	500-5755-01
5.	Flipper Ass'y (Lower Left)	500-5755-02
6.	Power Scoop Assembly	500-5741-00
7.	Kick Big Assembly	500-5740-00
8.	Target Back Plate Guide Ass'y	515-5905-00
9.	Steel Ramp Assembly (Right)	500-5650-00
10.	Steel Ramp Assembly (Left)	500-5651-00
11.	Loop Wire Ramp Ass'y (Right)	500-5649-00
12.	Long Wire Ramp Ass'y (Left)	500-5648-00
13.	Vertical Up Kicker (VUK) Ass'y	500-5306-03
14.	Super VUK Assembly	500-5116-06
15.	Drop Target Bank Assembly	500-5621-03
16.	Stand-up Target Assembly	500-5640-18
17A	6-Ball Switch Assembly	500-5683-01
17B	Lock Ball Assembly	500-5684-01
17C	Deflector For 6-Ball Assembly	535-6606-01
18.	3-Bank Stand-Up Target Ass'y	500-5765-00
19.	Slingshot Assemblies	500-5226-00
20.	Turbo Bumper Assemblies	500-5227-00
21.	Wire Ramp Gravestone	535-6741-00
22.	Short Wire Ramp VUK	535-6572-00
23.	Spinner, Left	500-5655-00
24.	Spinner, Right	500-5656-00
25.	Spinner, Middle	500-5656-01
26.	Flap Gate Assembly	500-5494-00
27.	1-Way Gate Assembly	515-5895-00
28.	Lt . Ramp Roll Under Gate Ass'y	500-5657-00
29.	Rt. Ramp Roll Under Gate Ass'y	500-5658-00
30.	Kickback & Knocker Assembly	500-5081-00
31.	Ball Launch Assembly	500-5477-01
32.	Trough Assembly	500-5652-00

NOTES:
1. Items in a ◯ are below the Playfield.

    Items in a ▢ are above the Playfield.

2. Switch part numbers are located on Page 29.
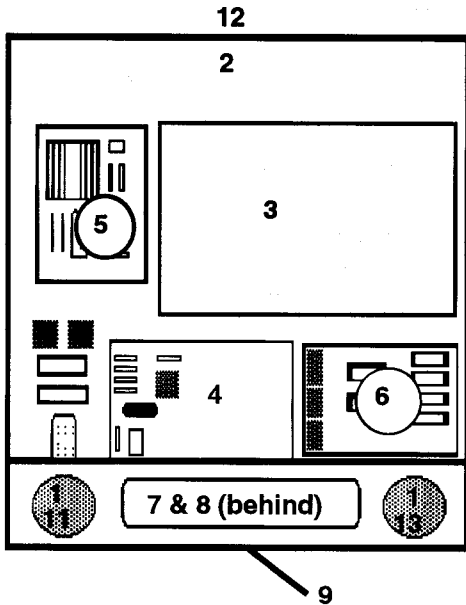
Item	Description	Part No.
1	Speakers	031-5004-00
2	Back Box Lock	355-5008-00
3	CPU †	520-5003-04
4	PPB Board	520-5021-05
5	Power Supply	520-5047-02
6	Sound Board †	520-5050-02
7	Dot Matrix ‡	520-5052-00
8	Display Controller Board †	520-5055-01
9	Speaker Housing	545-5180-02
10	Backglass Artwork *	830-5218-00
11	Speaker Grill Crypt (Left)	830-5616-00
12	Backbox Crypt "Head"	545-5444-00
13	Speaker Grill Crypt (Right)	830-5616-01
14	Static Shield *	535-6437-00
15	Backglass Clear *	660-5008-00
16	26" Plastic Extrusion *	545-5018-04
17	21 $^3/_8$" Plastic Extr. (2) *	545-5018-07
18	Glass Channel 26-1/16" *	545-5021-01

* Not Shown

† When ordering PC Boards with ROMs please specify game name

‡ Indicate Manufacturer

RUBBER PARTS ILLUSTRATION

Item	Description	Part #
A	3/16" I.D. Rubber Ring (8)	545-5348-01
B	Sponge Sleeve (16)	545-5151-00
C	Rubber Sleeve (6)	545-5308-00
D	1-1/2" I.D. Rubber Ring (2)	545-5348-07
E	2" I.D. Rubber Ring (1)	545-5025-08
F	2-3/4" I.D. Rubber Ring (2)	545-5348-20
G	Flipper Rubber Ring (3)	545-5277-00
H	1-1/4" I.D. Rubber Ring (2)	545-5348-06
I	3/8" I.D. Rubber Ring (1)	545-5348-19

Note: Where "A" & "B" are together, B sits under A.
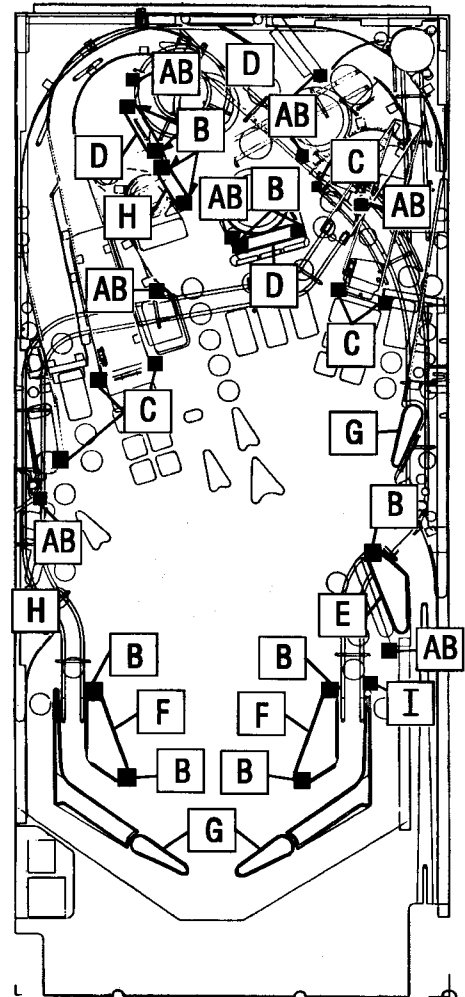
PLAYFIELD TOP PARTS
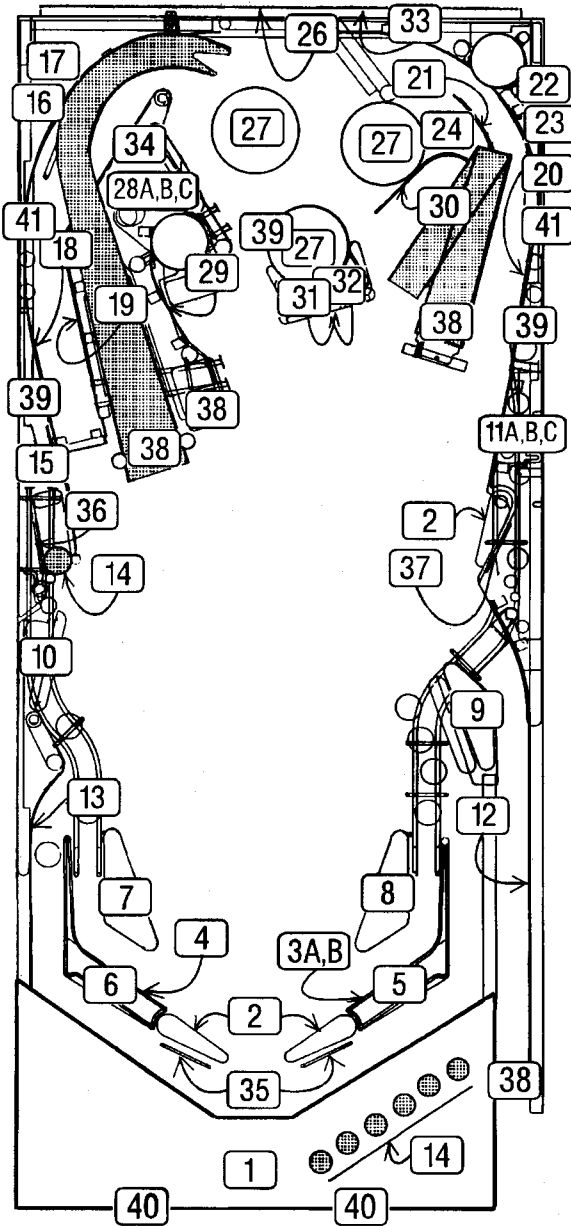
Item	Description	Part Number
1	Bottom Arch Assembly for Crypt	500-5782-00
2	Flippers & Shaft Ass'y (White)	515-5133-01
3A	Return Lane Clear Guide, Long/Right	550-5037-01
3B	Rtrn. Ln. Clr. Gd. Rt. (Piggyback on 3)	550-5046-01
4	Return Lane Clear Guide, Left	550-5042-01
5	Right Return Butyrate	830-5435-02
6	Left Return Butyrate	830-5435-01
7	Slingshot Butyrate Left	830-5435-03
8	Slingshot Butyrate Right	830-5435-04
9	3-Bank Target Butyrate Right	830-5435-15
10	3-Bank Target Butyrate Left	830-5435-05
11A	Top Flipper Lower Butyrate	830-5435-09
11B	Top Flipper Middle Butyrate	830-5435-16
11C	Top Flipper Upper Butyrate	830-5435-27
12	Flat Rail Shooter Lane Right	515-5760-00
13	Flat Rail Outlane Left	515-5761-00
14	Pinballs (7)	260-5000-00
15	Single Stand-up Target Butyrate	830-5435-06
16	Upper Left Lane Butyrate-Upper	830-5435-20
17	Upper Left Lane Butyrate-Lower	830-5435-11
18	Flat Rail Upper Left Lane, Left Side	515-5908-00
19	Flat Rail Upper Left Lane, Right Side	515-5763-00
20	Flat Rail Right Orbit, Right Side	515-5907-00
21	Flat Rail Right Orbit, Left Side	515-5768-00
22	Right Orbit Bi-Level Butyrate, Upper	830-5435-08
23	Right Orbit Bi-Level Butyrate, Lower	830-5435-17
24	Right Orbit Butyrate, Left	830-5435-14
25	Right Orbit Butyrate, Top	830-5435-12
26	Backpanel Butyrate	830-5435-10
27	Turbo Bumper Caps, Red, (3)	550-5057-02
28A	Left Ramp over VUK Butyrate, Upper	830-5435-21
28B	Left Ramp over VUK Butyrate, Lower	830-5435-13
28C	Clear Butyrate Perpendicular to 28A	830-5435-25
29	Flat Rail Left of VUK	515-5909-00
30	Flat Rail Middle Spinner into Trough	515-5911-00
31	Middle Bumper Butyrate Lower	830-5435-07
32	Middle Bumper Butyrate Upper	830-5435-19
33	Mini Mars Clear Backpanel/SVUK	550-5025-01
34	Mini Mars Clear VUK/Gravestone	550-5055-01
35	Snubbers Lower Flippers (2)	535-5373-01
36	Wire Form 2-1/4" S/U Trgt., Left	535-5300-12
37	Wire Form 2" Upper Flipper	535-5300-10
38	Lite Cover Red (3)	545-5014-02
39	Lite Cover Reflector (3)	545-5409-00
40	Playfield Hanger Bracket (2)	535-5216-01
41	Pivot Pin Bracket Assembly (2) with	500-5329-00
	Pivot Bracket Screws (4) and	237-5907-00
	T-Nut (4)	240-5101-00

Posts	Part No.	Qty.
Metel Standoff	530-5035-01	34
Bumper Post-Mach	530-5007-00	7

Decals/Mylar	Part No.
Arch Decals (Left)	820-6103-12
Arch Decals (Right)	820-6103-13
Full Playfield Mylar	820-5831-00
Individual P/F Mylar Pieces	820-5832-XX

NOTE: See page 29 for Switch Part Numbers and Locations.

Parts Identification

LAMP BULBS & SOCKETS
PART NUMBERS, QUANTITIES & LOCATIONS

Item*	Bulb Description/ Part No.	Bulb Qty.	Socket Description	Socket Part No.	Socket Location	Socket Qty.
1	#44 Bulb - 165-5000-44	91	2 Lug Staple Down	077-5000-00	On Playfield	21
			2 Lug Staple Down	077-5000-00	On Backpanel	2
			2 Lug Staple Down	077-5000-00	On Insert	36
			3 Lug Lay-Down	077-5006-00	On Playfield	2
			3 Lug Stand-Up Large	077-5009-00	On Playfield	30
2	#89 Bulb - 165-5000-89	31	Lay-Down Socket	077-5100-00	On Backpanel	4
			2 Lug Stand-Up Small	077-5101-00	On Playfield	7
			2 Lug Stand-Up Small	077-5101-00	On Backbox	8
			2 Lug Stand-Up Large	077-5102-00	On Playfield	11
			Stand-Up Straight Leg	077-5107-00	On Backpanel	1
3	#555 Bulb - 165-5002-00	34	Wedge	077-5007-00	On Playfield	25
			Lay-Down Wedge Black	077-5026-00	On Playfield	9

Note: This diagram represents the physical location of the bulbs (including the General Illumination Bulbs [G.I.] on the Playfield).

NOTES

Parts Identification
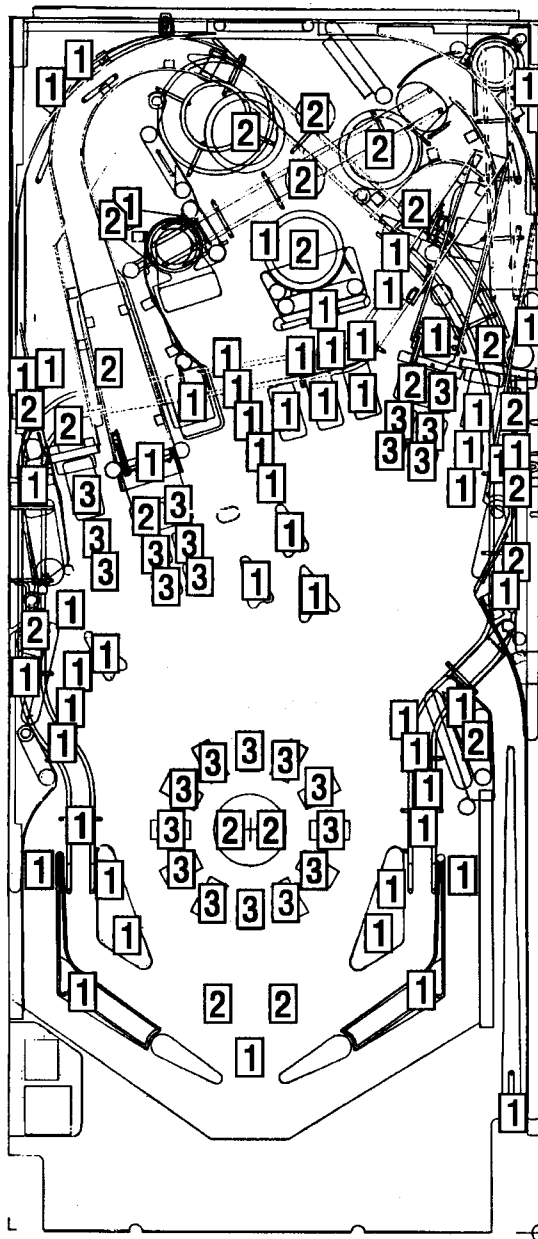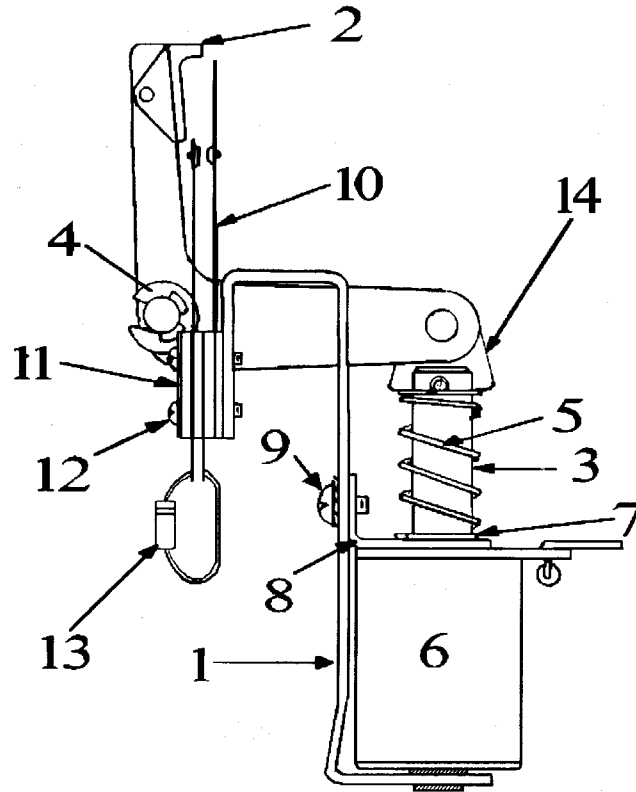
Slingshot Assembly
500-5226-00

Item	Description	Part No.
1	Slingshot Bracket	515-5339-00
2	S. S. Arm & Tip Assembly	515-5340-00
3	Plunger & Link Assembly	515-5338-00
4	1/4 Retaining Ring (2)	270-5002-00
5	Spring	266-5020-00
6	23-800 Coil	090-5001-00
7	Coil Sleeve	260-0004-00
8	Coil Retainer	535-5203-03
9	#8-32 X 1/4" Screw (2)	232-5300-00
10	Slingshot Switch (2)	180-5054-00
11	Tension Plate (2)	535-5846-00
12	#4-40 X 1/2" Screw (4)	237-5837-00
13	Diode 1N4004 (2)	112-5004-00
14	Link	545-5062-00

Flipper Assembly Lower
500-5755-01 (Right), - 02 (Left)

Item	Part No.	Description	Qty.
1	545-5070-00	Flipper Bushing	1
2	234-5000-00	#6-32 x .38 LG. HWH TF	3
3	232-2206-12	#10-32 SOC HD x .75 LG.	1
4	535-6663-02	Spring Bracket (Left)	1
5	265-5029-02	Flipper Return Spring	1
6	535-6664-00	Switch Mounting Bracket	1
7	515-5077-02	Flipper Base (Left)	1
8	515-5077-01	Flipper Base (Right)	1
9	515-5346-00	Coil Stop Bracket	1
10	231-2507-06	1/4-20 SOC HD x .38 LG.	2
11	269-5002-00	Spring Washer	1
12	090-5032-00	Coil 22-1080	1
13	515-5129-00	Front Bracket	1
14	234-5100-00	#8-32 x .38 LG. HWH TF	6
15	515-5822-00	Plunger and Link Assembly	1
16	251-5000-00	Roll Pin	1
17	530-5070-00	Pawl	1
18	231-5019-00	#10-32 x .75 LG. Shoulder Bolt	1
19	535-5279-01	Plunger Stop Bracket	1
20	545-5445-00	Nylon Stop	1
21	535-6663-01	Spring Bracket (Right)	1
22	530-5139-00	Bushing	1
23	238-1306-00	#10-32 Elastic Stop Nut	1
24	260-0003-00	Coil Sleeve	1
25	545-5401-00	Flipper Link	1
26	180-5124-00	End of Stroke Switch	1
27	545-5084-00	Plastic Cap	1
28	237-5506-00	#6-32 x 1" LG. PPH	1
29	237-5899-00	#6-32 x .63 LG PPH	1
30	240-5005-00	#6-32 Elastic Stop Nut	3

Flipper Assembly Upper
500-5756-01 (Right)

Item	Part No.	Description	Qty.
1	545-5070-00	Flipper Bushing	1
2	234-5000-00	#6-32 x .38 LG. HWH TF	3
3	232-2206-12	#10-32 SOC HD x .75 LG.	1
4	535-6663-02	Spring Bracket (Left)	1
5	265-5029-02	Flipper Return Spring	1
6	535-6664-00	Switch Mounting Bracket	1
7	515-5077-02	Flipper Base (Left)	1
8	515-5077-01	Flipper Base (Right)	1
9	515-5346-00	Coil Stop Bracket	1
10	231-2507-06	1/4-20 SOC HD x .38 LG.	2
11	269-5002-00	Spring Washer	1
12	090-5032-00	Coil 22-1080	1
13	515-5129-00	Front Bracket	1
14	234-5100-00	#8-32 x .38 LG. HWH TF	6
15	515-5822-00	Plunger and Link Assembly	1
16	251-5000-00	Roll Pin	1
17	530-5070-00	Pawl	1
18	231-5019-00	#10-32 x .75 LG. Shoulder Bolt	1
19	535-5279-00	Plunger Stop Bracket	1
20	545-5105-00	Rubber Stop	1
21	535-6663-01	Spring Bracket (Right)	1
22	530-5139-00	Bushing	1
23	238-1306-00	#10-32 Elastic Stop Nut	1
24	260-0003-00	Coil Sleeve	1
25	545-5401-00	Flipper Link	1
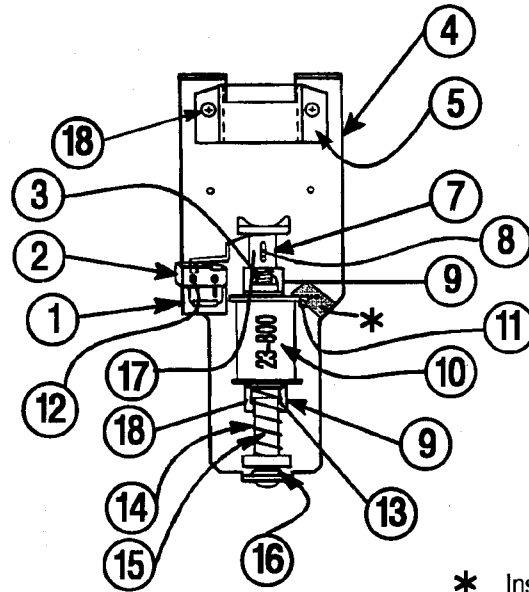
* – Insulator Tape
to prevent short.

Item	Description	Part No.
1	Switch Insulator	535-5051-00
2	Microswitch	180-5064-01
3	Cap Spring	266-5025-00
4	Ball Kickup Mounting Bracket	535-5298-00
5	Ball Guide Bracket	535-6047-00
6	#6-32 x 3/8 SEMS (2)*	232-5201-00
7	Vertical Kicker Cap	545-5227-00
8	Pin 3/32/x 7/16	251-5004-00
9	Rear Coil Retainer Bracket (2)	535-5203-03
10	Coil 23-800	090-5001-01
11	1N4004 Diode	112-5003-00
12	2-56 x 1/2 Screw (2)	237-5806-00
13	#6-32 x 1/4 Phil. M.S.	232-5200-00
14	Spring	266-5009-00
15	Plunger Assembly	515-5352-00
16	Bumper	545-5105-00
17	Compression Ring (3)	270-5010-00
18	#6-32 x 1/4 SEMS (3)	232-5200-00
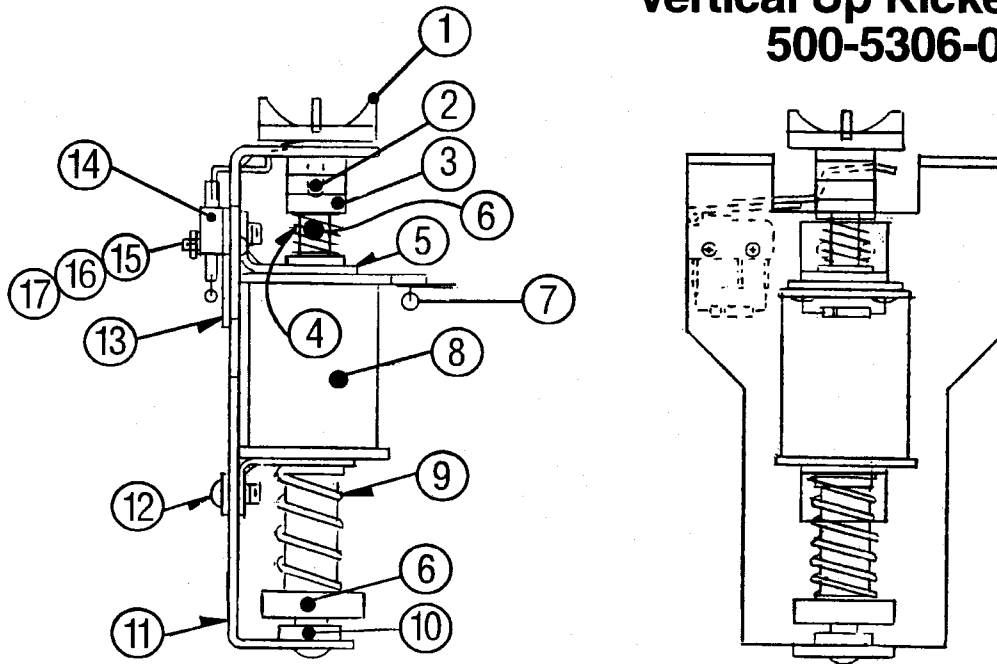
Item	Description	Part No.
1	Vertical Kicker	545-5227-00
2	Pin	535-5111-00
3	Comp. Ring (3)	270-5010-00
4	Spring	266-5025-00
5	Coil Bracket (2)	535-5001-01
6	Plunger Assembly	515-5352-00
7	IN4004 Diode	112-5003-00
8	23-800 Coil	090-5001-01
9	Spring	266-5009-00
10	Bumper	280-5003-00
11	Bracket	535-5271-00
12	8-32 x 1/4 SEMS (4)	232-5300-00
13	Insulator	545-5193-00
14	Micro Switch Assembly	180-5063-00
15	2-56 x 1/2 SCR (2)	237-5806-00
16	Lockwasher (2)	244-5001-00
17	Hex Nut (2)	240-5301-00

Turbo Bumper
500-5227-00

Rod & Ring
Ass'y
515-5085-00

Bumper
Body
545-5197-00

Switch
180-5015-01

Bumper Skirt
545-5098-00

Bumper Housing
545-5100-00

Diode
1N4001
112-5004-00

Fiber Yoke
545-5120-00

Plunger
530-5062-00

Plunger Brkt.
535-5277-00

Metal Yoke
535-5877-00

Spring
266-5009-00

Coil
090-5001-00
(AE-23-800)

Coil Sleeve
260-0004-00

Coil Stop Ass'y
515-5088-00

Shaker Motor
515-5893-00

545-5425-00
Insulator

237-5904-00
10-32 X 1/2 SCHS
Cap Screw
(4 Req'd)

237-5903-00
8-32 X 3/8
HWH Screw
(2 Req'd)

041-5029-00
Shaker Motor

535-6727-00
Weight-Shaker Motor
(2 Required)

535-6711-00
Shaker Motor
Mtg. Brkt.

Kickback & Knocker Asembly
500-5081-00

COIL RETAINER BRACKET
535-5203-03

232-5300-00
SCREW
#8-32X 1/4 (2)

COIL SLEEVE
545-5076-00

COIL
090-5001-01
(AE-23-800)

545-5105-00
GROMMET

266-5020-00
SPRING

SPRING WASHER
269-5002-00

515-5000-02
PLUNGER ASS'Y

KICKBACK/KNOCKER BRKT.
535-5265-00

Ball Launch Ass'y
500-5477-01
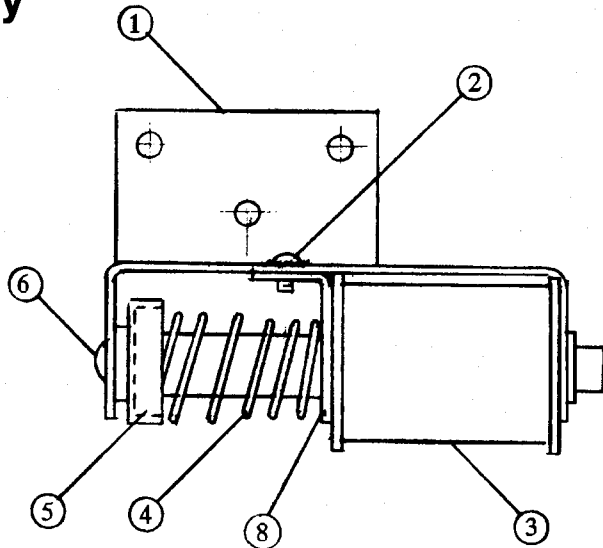
Item	Description	Part No.	Item	Description	Part No.
1	Coil Mounting Bracket	535-6385-00	5	Plunger Assembly	515-5000-02
2	8-32 x 1/4 Sems. (2)	232-5300-00	6	Grommet	545-5105-00
3	Coil 24-940	090-5036-01	7	1N4004 Diode	112-5003-00
4	Spring	266-5020-00	8	Coil Retainer Bracket	535-5203-03

Diverter Plunger &
Crank Arm Ass'y
515-5453-00

232-2204-06
#8-32 Cap Screw

515-5396-00
Crank Arm
Ass'y.

266-5000-00
Spring

090-5015-00
Coil

515-5088-00
Coil Stop

27-1400

535-5203-03
Coil Retain.
Brkt.

232-5200-00
#6-32x1/4"
Screws

515-5338-00
Plunger Ass'y.

535-6026-00
Mtg.Brkt

250-0008-00
Retaining
Ring
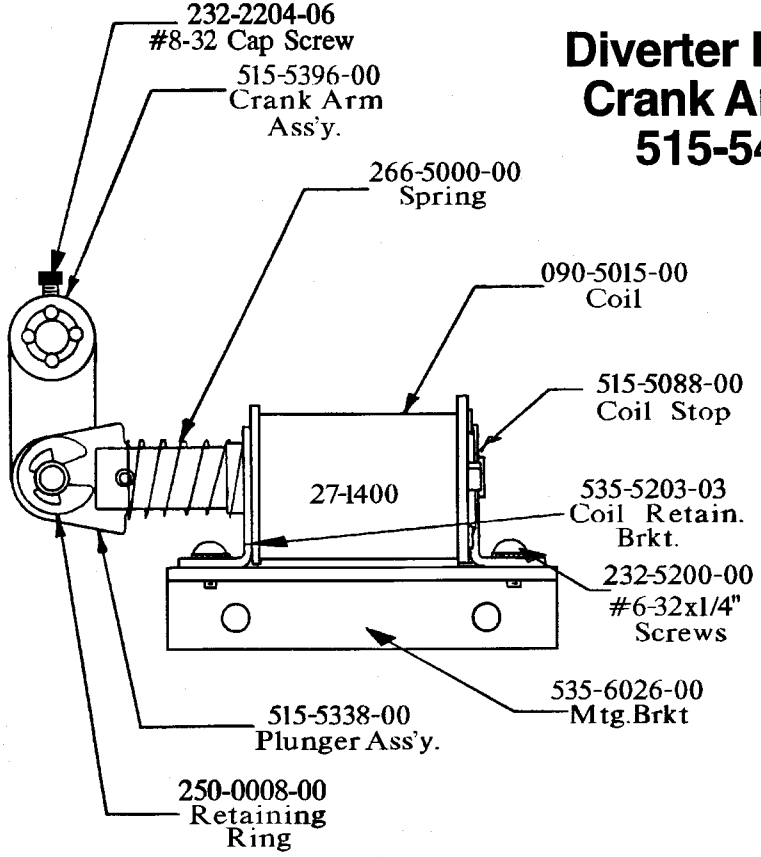
Diverter Ass'y
500-5654-00

250-0008-00
Retaining Ring

530-5235-00
Shaft

237-5501-00 (2)
6-32 X ⅜ FHMS

535-5126-00
Diverter
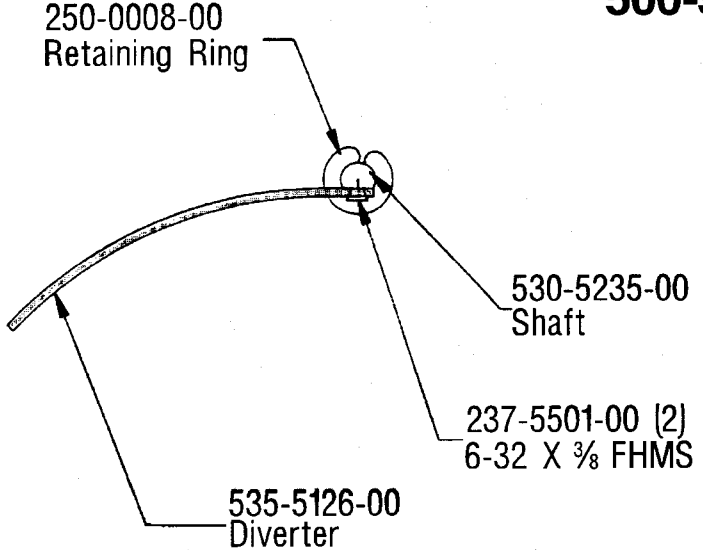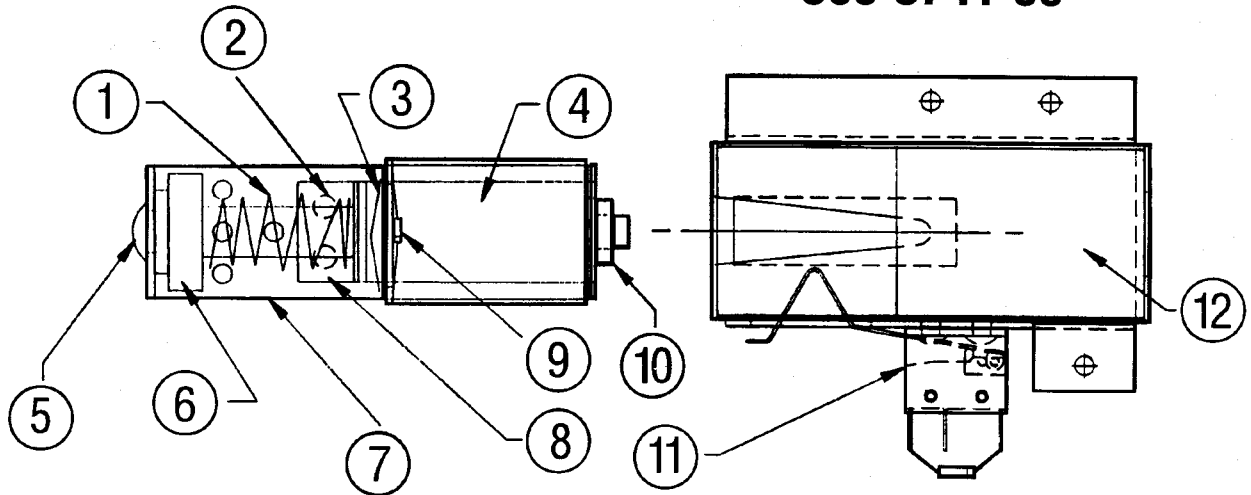
Item	Description	Part No.
1	Spring	266-5020-00
2	8-32 X 1/4 SEMS (TYP 2)	232-5300-04
3	Spring Washer	269-5002-00
4	Coil 23-800	090-5001-00
5	Rubber Grommet	545-5101-00
6	Plunger Assembly	515-5000-02
7	Frame	535-6730-00
8	Bracket	535-5203-01
9	Diode	112-5003-00
10	Coil Sleeve	545-5076-00
11	Micro Switch	180-5057-00
	Diode	112-5003-00
	Switch Protect Plate	535-6539-00
	#2 Lockwasher	244-5001-00 (2)
	2-56 Hex Nut	240-5301-00 (2)
	Micro Bracket	535-6163-00
	2-56 PHMS	237-5806-00 (2)
	6-32 PHMS	232-5200-00 (2)
12	Power Scoop Weld Assembly	515-5899-00

Lock Ball Assembly
500-5684-01
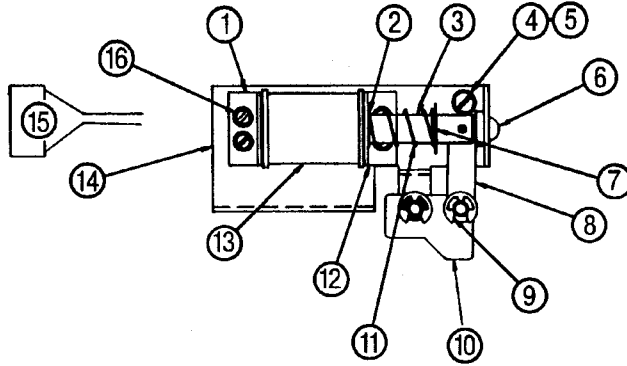
Deflector
535-6606-01
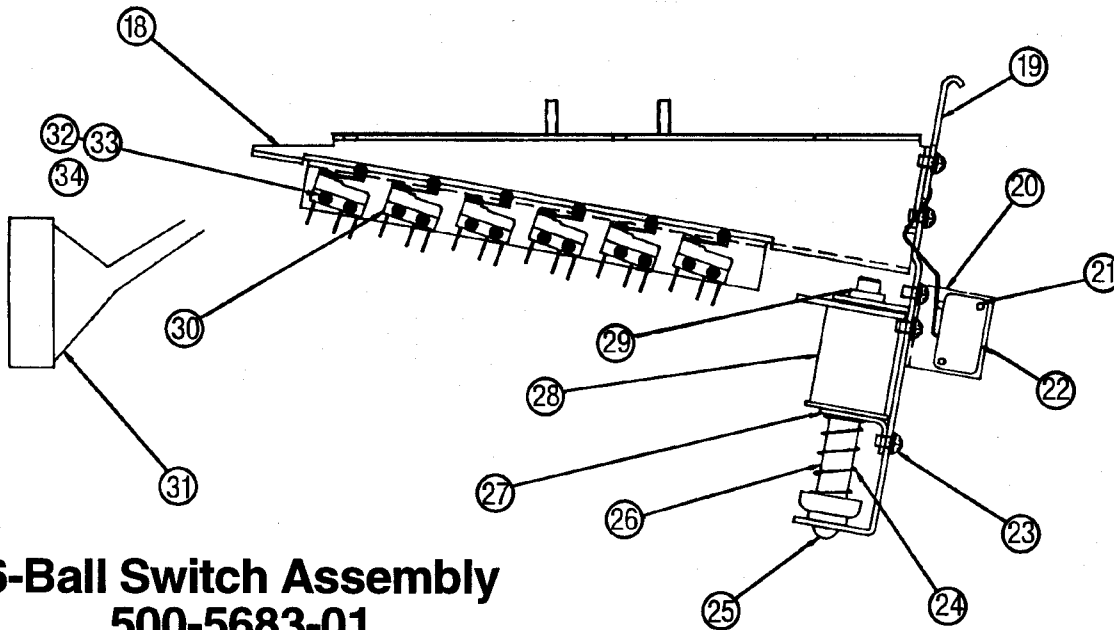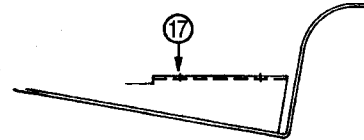
6-Ball Switch Assembly
500-5683-01

Item	Description	Part No.	Item	Description	Part No.
1	Core Stop Assembly	515-5088-00	18	Outhole Mounting Bracket	535-6621-01
2	Coil Sleeve	545-5411-00	19	Coil Mounting Bracket	535-6622-01
3	Plunger *7/16 X 2-1/4 LG	530-5250-01	20	Switch Mounting Bracket	535-6623-00
4	Spacer	545-5400-00	21	#4-40 PPH X .62 LG (2)	237-5806-00
5	#8-32 PPH X 1" LG	232-1104-16	22	Switch, Miniature	180-5119-00
6	Rubber Bumper	545-5105-00	23	#8-32 PPH w/SEM X.25 LG (8)	232-5300-00
7	E-Ring .44 Shaft	270-5005-00	24	Spring	266-5020-00
8	Link, Lock Ball	545-5058-00	25	Rubber Bumper	545-5105-00
9	E-Ring, .25 Shaft (2)	250-0008-00	26	Plunger Assembly	515-5000-02
10	Lock Ball Cam Assembly	515-5815-01	27	Coil Retaining Bracket	535-5203-01
11	Spring	266-5000-00	28	Coil, 23-800	090-5001-00
12	Coil Retaining Bracket	535-6658-00	29	Coil Sleeve	545-5076-00
13	Coil, 25-1240	090-5034-00	30	Switch, Subminiature (6)	180-5119-00
14	Lock Ball Bracket Assembly	515-5817-01	31	Wire Harness	036-5301-00
15	Wire Harness	036-5301-01	32	#2-56 PPH X .5 LG (12)	237-5806-00
16	#6-32 HWH TC X .38 LG (4)	237-5898-00	33	#2 Split LW (12)	244-5001-00
17	Deflector	535-6606-01	34	Switch Protector (6)	535-6539-00

535-5934-18
Target & Switch
Assembly
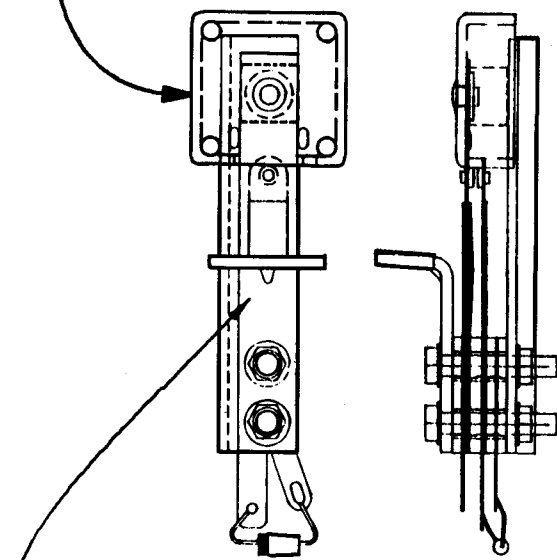
535-5282-00
Mounting Bracket

**1-Bank Stand-Up
Target Assembly
500-5640-18**

515-5935-00
Target & Switch
Assembly
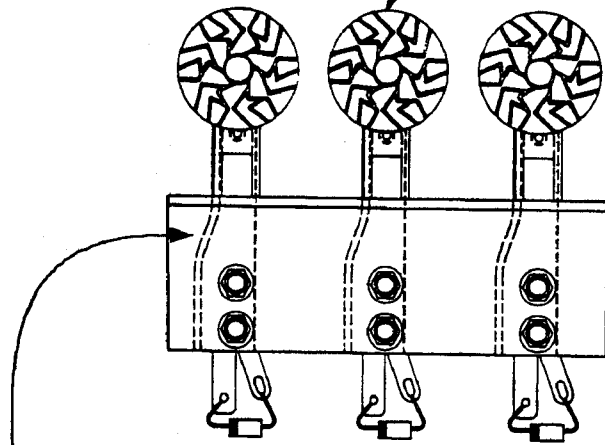
535-5275-00
Mounting Bracket

**3-Bank Stand-Up
Target Assembly
500-5765-00**

Trough Assembly
500-5652-00
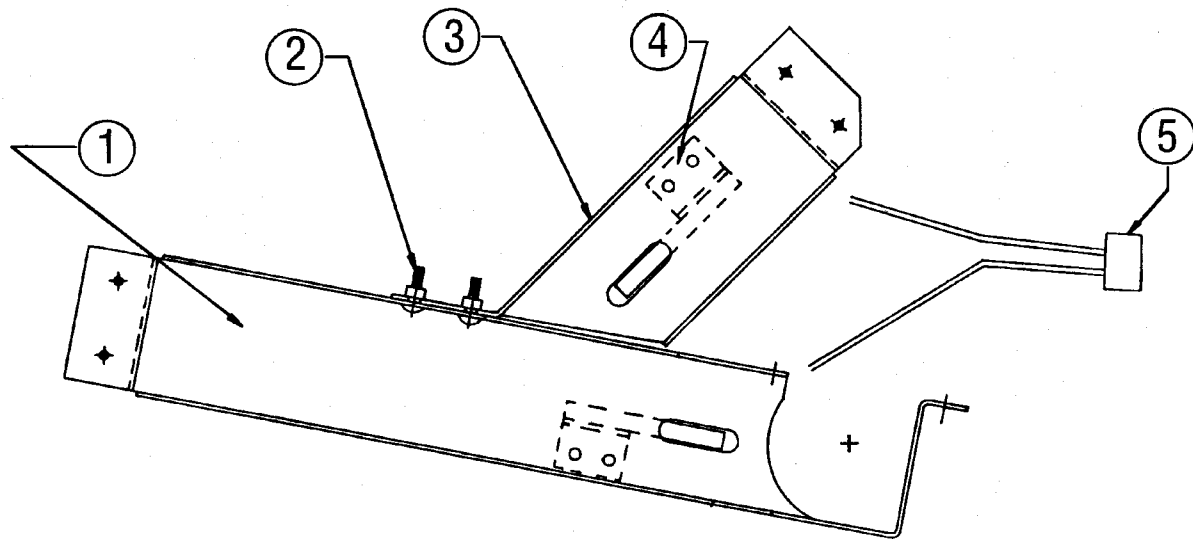
Item	Description	Part No.
1	Trough (Large)	535-6581-00
2	4-440 PHMS 4-40 STOP NUT	237-5882-00 (2) 238-1102-00 (2)
3	Trough (Small)	535-6582-00
4	Micro Switch Diode 2-56-PHMS #2 Split Lock Washer Switch Protect Plate Switch Bracket Rivet	180-5093-00 (2) 112-5001-00 (2) 237-5806-00 (4) 244-5001-00 (4) 535-6539-00 (2) 535-5794-00 (2) 249-5009-00 (4)
5	Cable	

545-5443-00
Head

237-5701-00
10-32 X 3/8
PHMS (4)

242-5010-00 (4)
Washer

535-6782-00
Door Handle
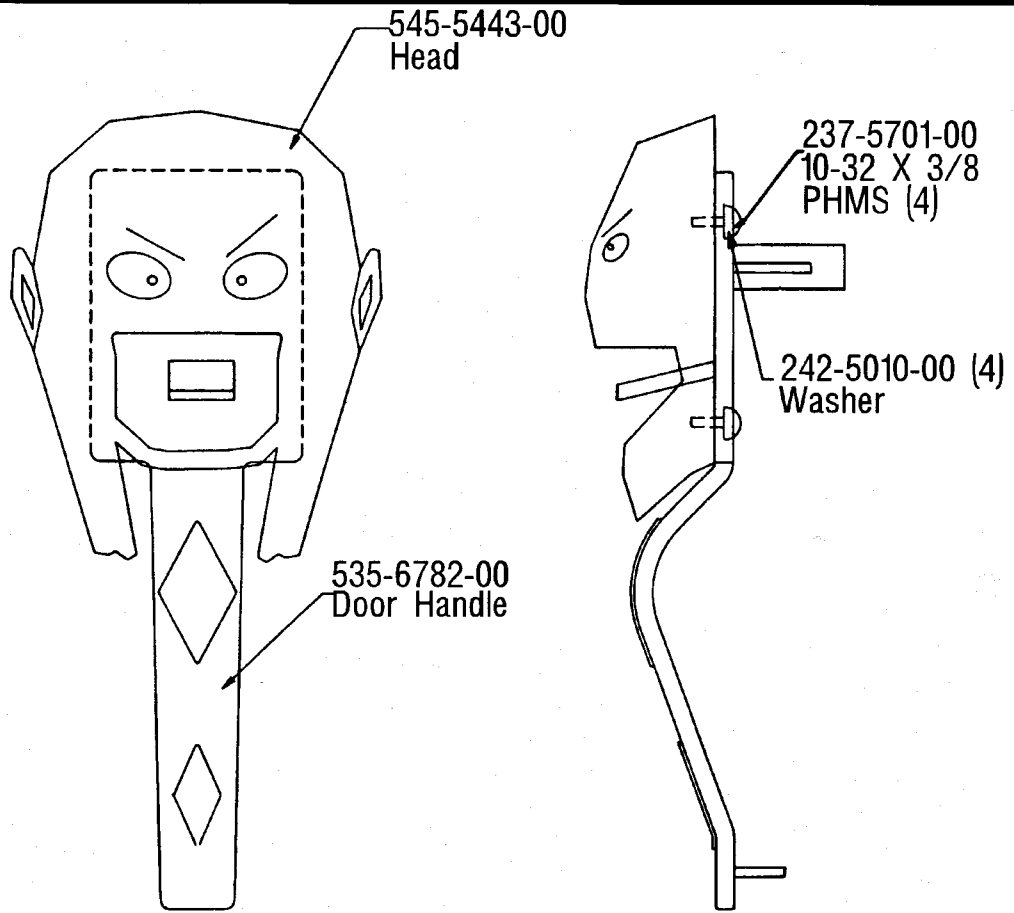
Ball Launch Door Handle Assembly - 515-5937-00 &
Door Handle Switch Plate Assembly - 515-5936-00

535-6793-00
Switch Plate
(Cabinet)

237-5832-00 (2)
4-40 PHMS
SEMS X 5/8 LG.
Note: Loctite

180-5073-00
Switch

112-5001-00
Diode
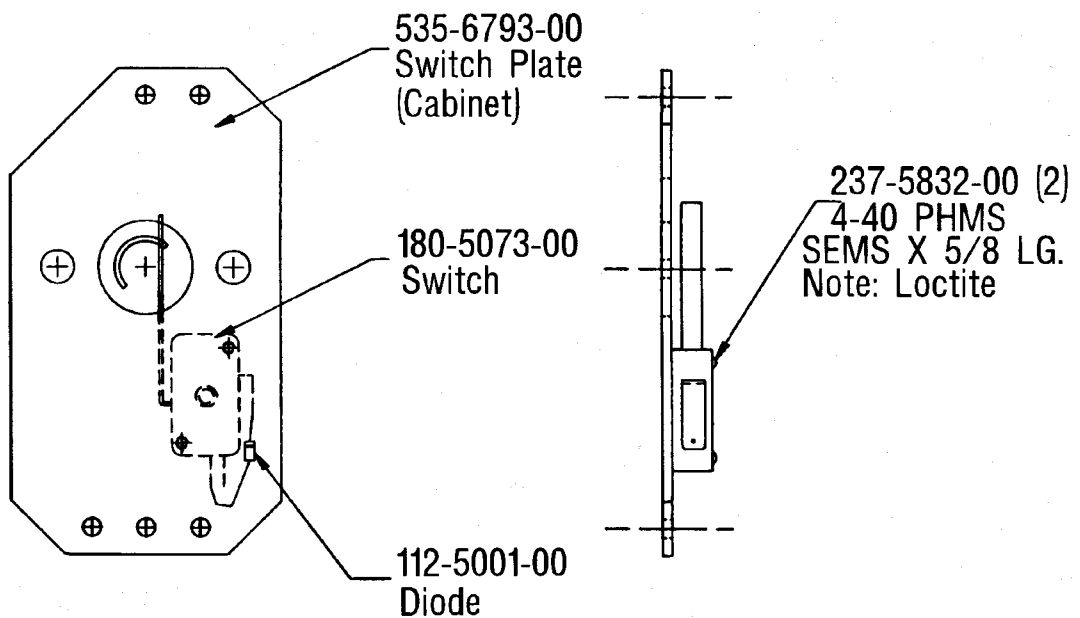
Notes

Drop Target Bank Assembly
500-5621-03

Item	Description	Part No.
1	TARGET END PLATE (2)	535-6162-00
2	TARGET FRAME	535-6159-XX
3	8-32 X 3/8 (6)	237-0011-01
4	SPRING MTG. PLATE	535-6510-03
5	TARGET	545-5048-01
6	TRGT. RETAIN. BRKT.	535-5042-XX
7	8-32 I 3/8 SHWHT TYPE 23 (5)	237-5891-00
8	TRGT. RESET SPRING	265-5003-00
9	COIL SPT. BRKT.	535-6658-00
10		
11	23-800 COIL	090-5001-00
12	COIL SLEEVE	260-0004-00
13	PLUNGER STOP BRKT.	515-5088-00
14	PLUNGER/LINK ASSY	515-5088-00
15	TRGT. LIFT BRKT.	535-6509-XX
16	TRGT. SHAFT	530-5179-XX
17	E-RING (1/4)	250-0008-00
18	PIVOT SHAFT	530-5180-XX
19	E-RING (1/8)	270-5000-00
20	SWITCH ASSY	180-5092-01
21	SWITH PLATE	535-5846-00
22	6-32 X 1/2	232-1103-08
23	IN 4004 DIODE	112-5003-00
24	PLUNGER LINK	545-5062-00
25	ADJ. BRKT.	535-6508-00
26	8-32 X7/6 (1)	237-5890-00
27	8-32 NYLOC	238-1304-00

535-6733-01
MOTOR BRK'T.

237-5832-00(4)
4-40 PHMS SEMS
5/8 LG.
NOTE; LOCTITE

515-5900
MOTOR AS

530-5083-00
NYLON BEARING

515-5942-00
CAM ASS,Y.
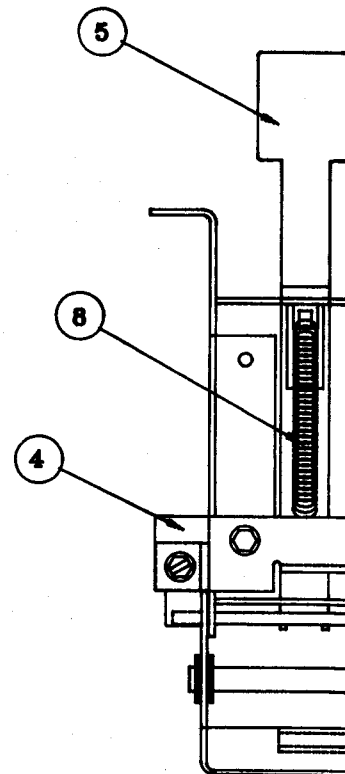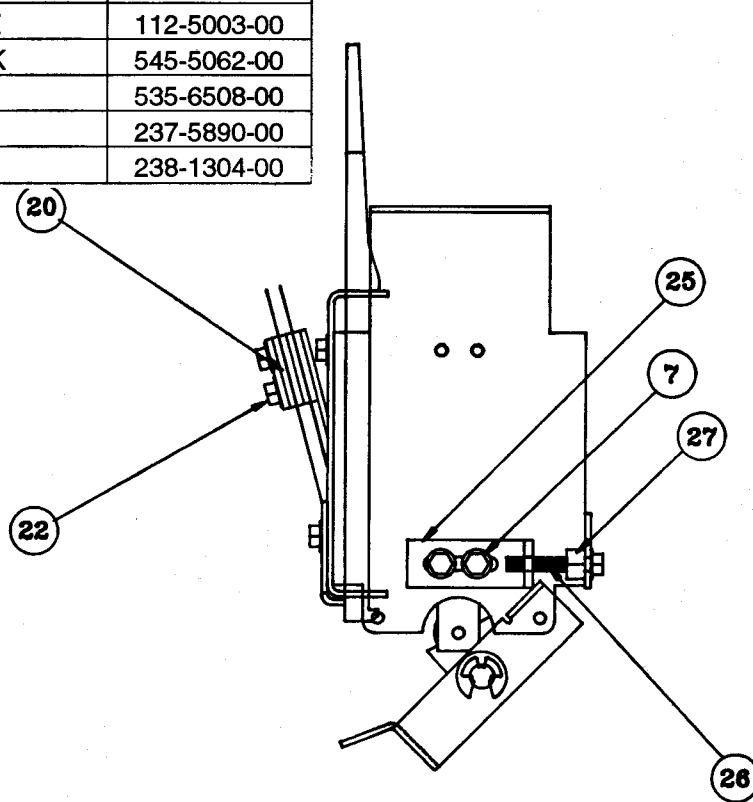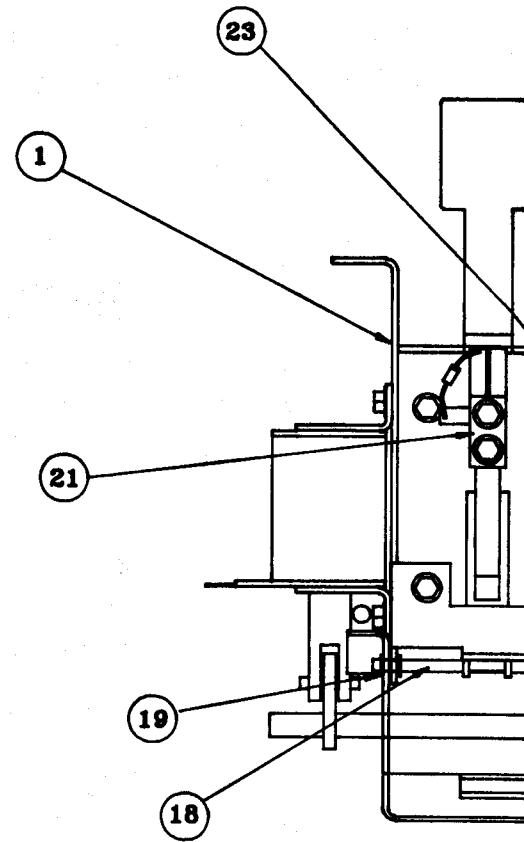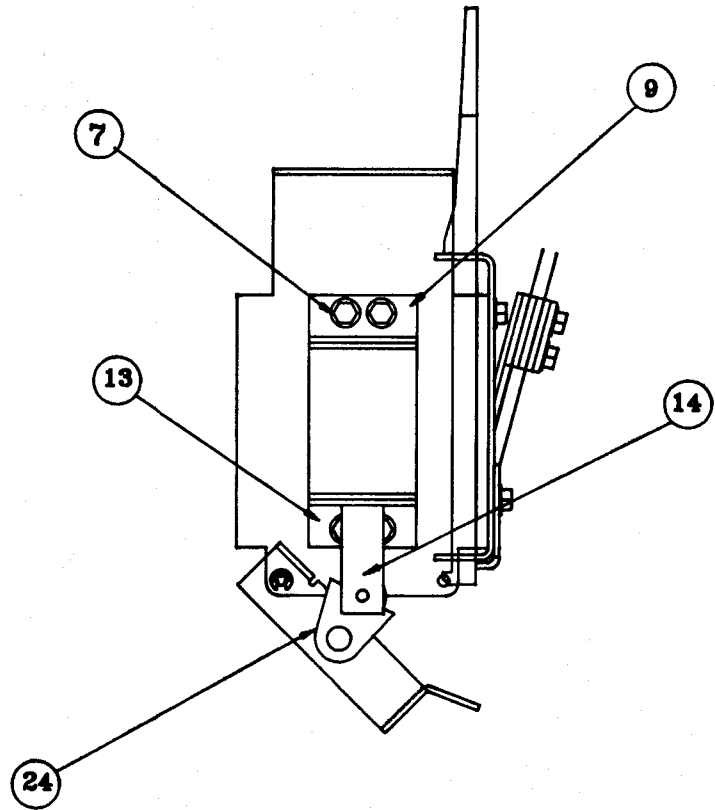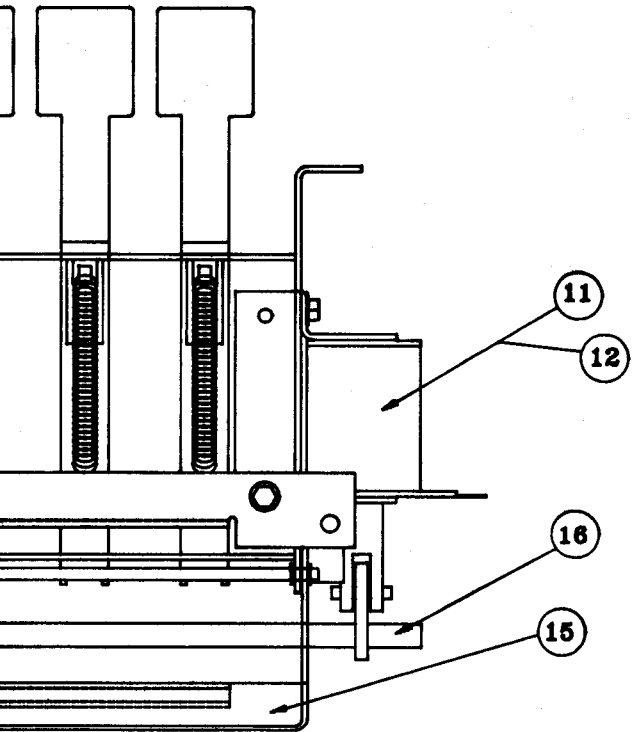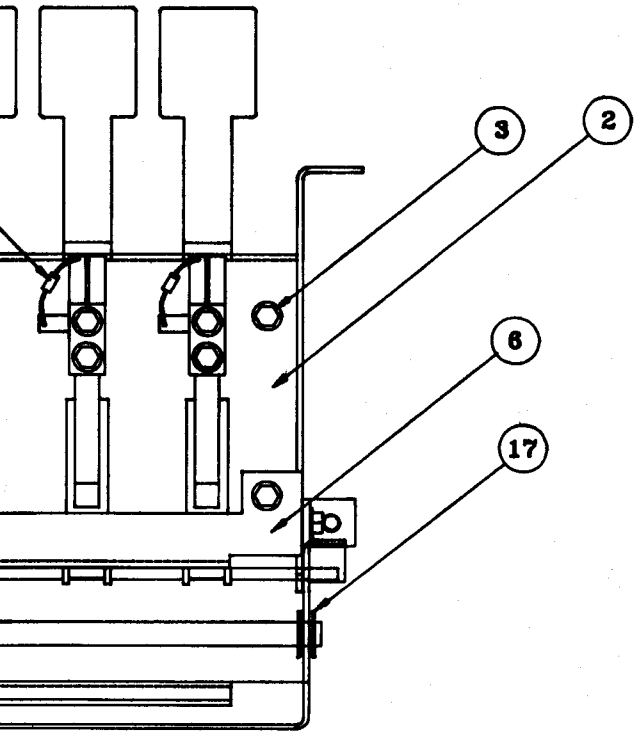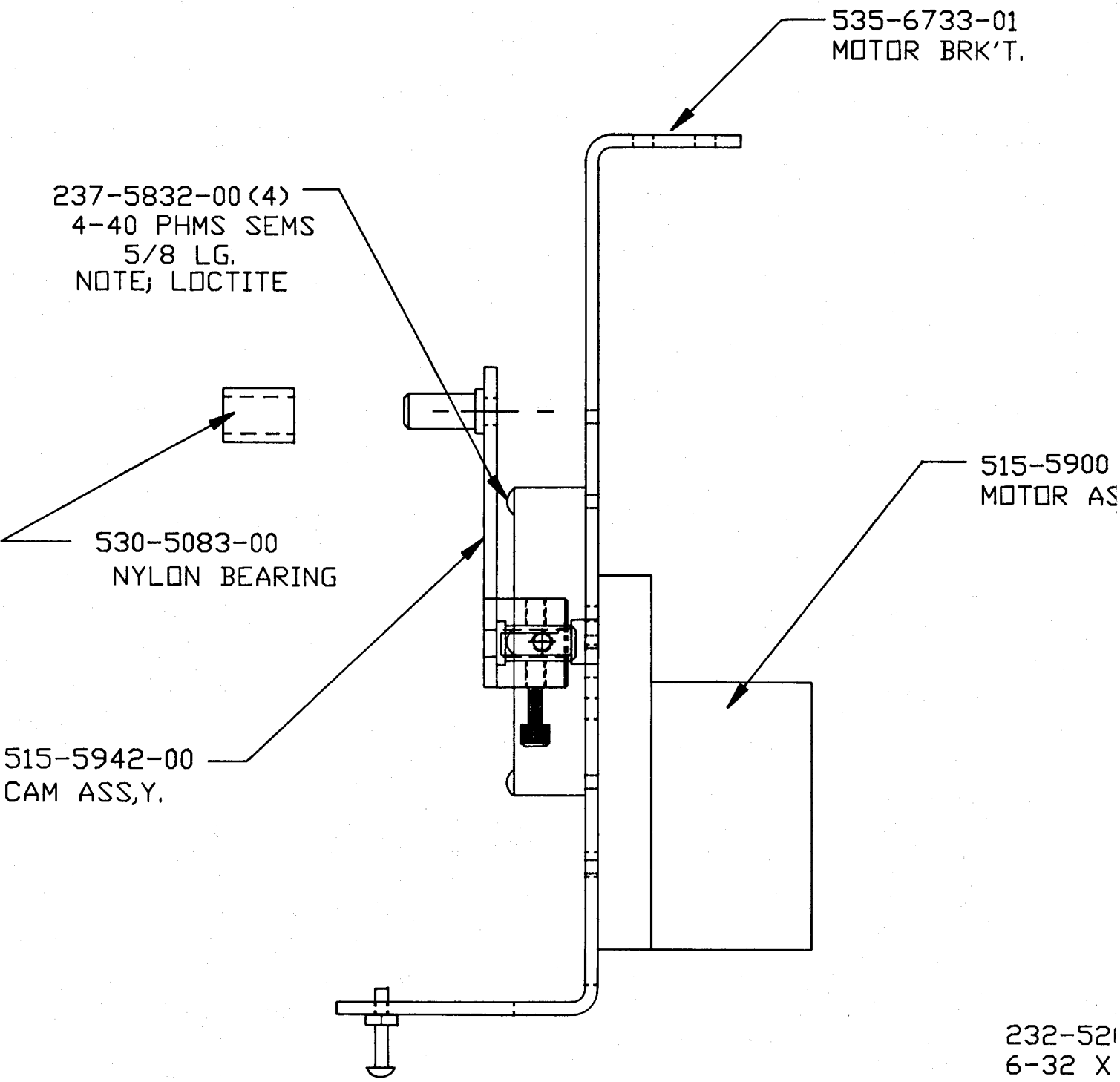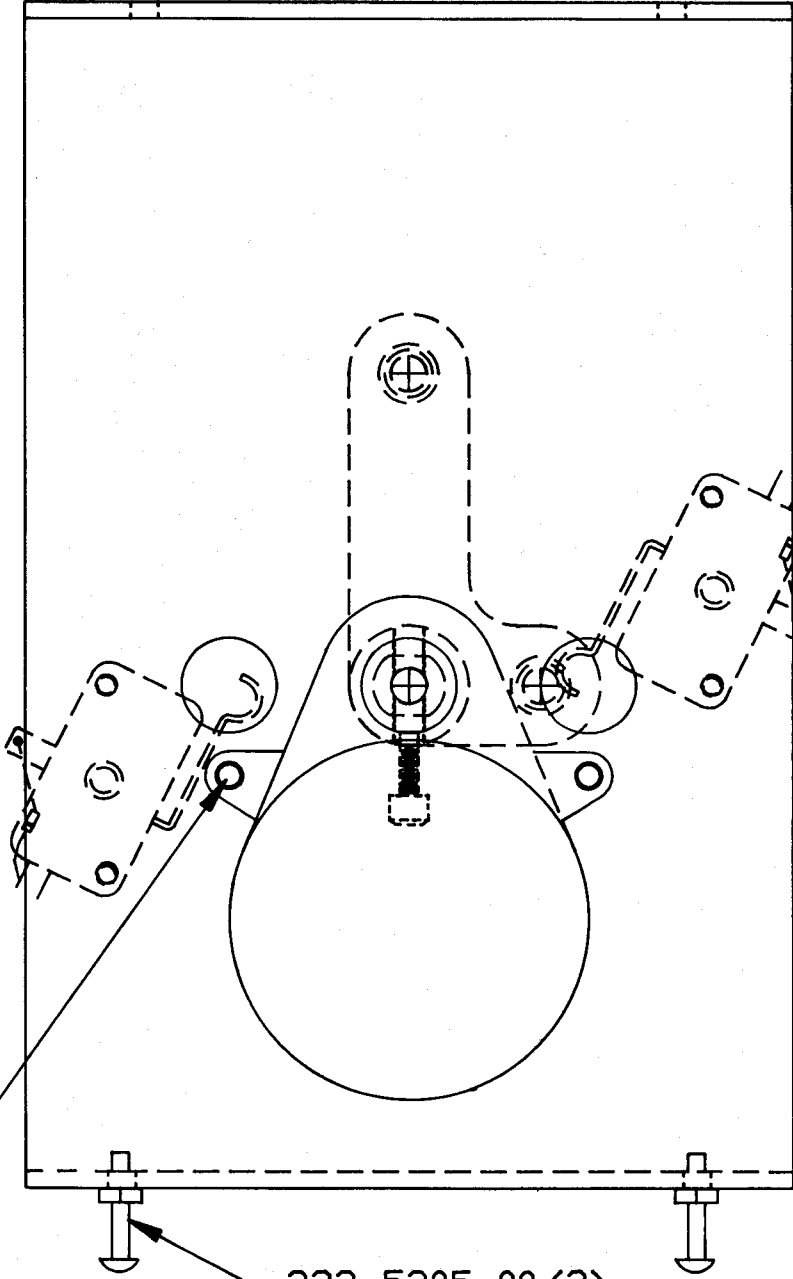
232-52(
6-32 X

180-5052-00 (2)
SWITCH
112-5001-00 (2)
DIODE

-00
:S'Y.

01-00
3/8 PHMS

232-5205-00 (2)
6-32 PHMS
240-5004-00 (2)
HEX NUT 6-32

Target Back Plate Guide Assembly
515-5905-XX

545-5430-00 (2)
FRAME EXTENSION

240-5005-00 (2)
6-32 STOP NUT

545-5728-(
TARGET BA(

535-6815-00
BRK'T

545-5427-00
TARGET BACK
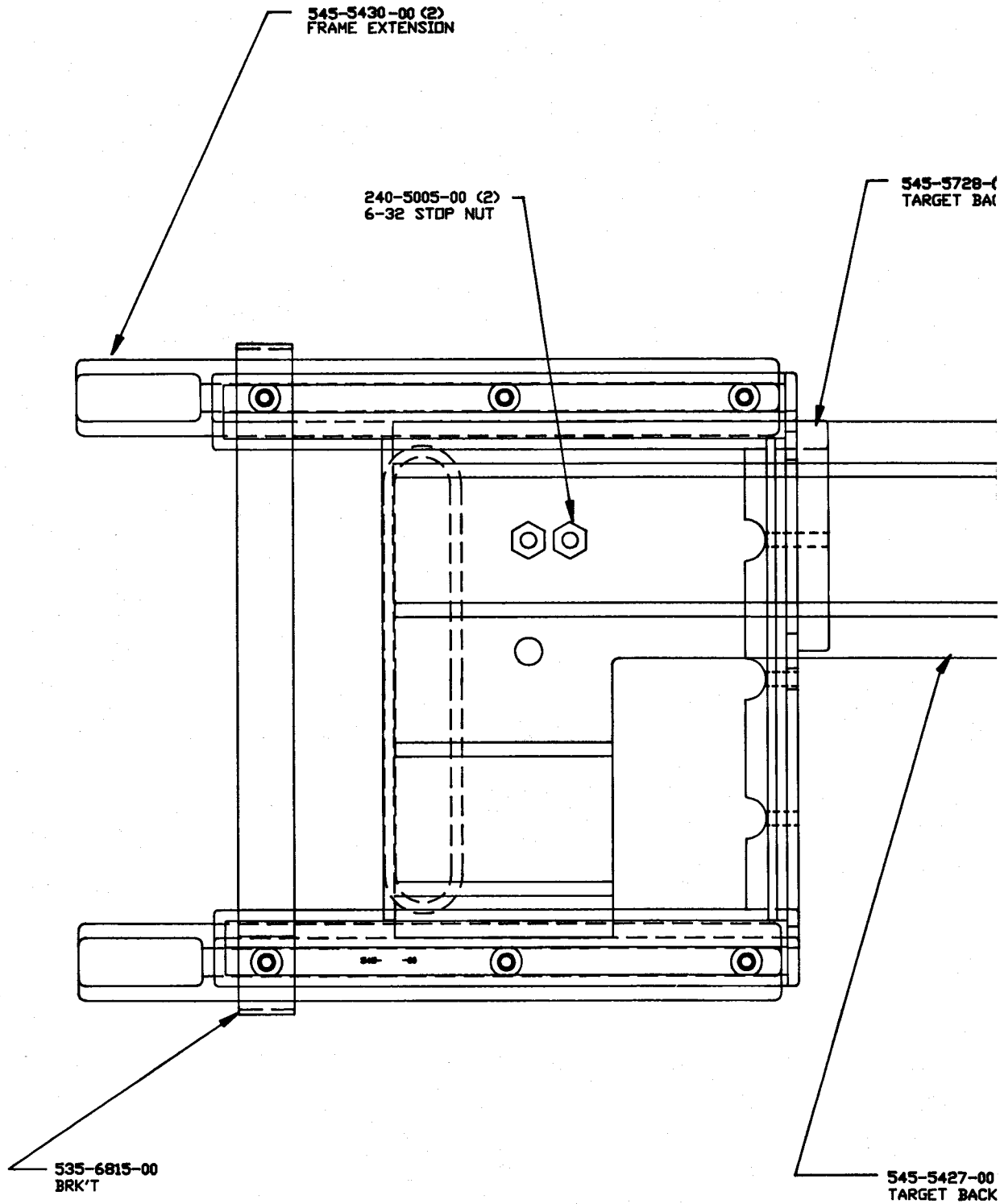
626-5011-00 (2)
FOAM PAD

237-5870-00 (6)
6 X 5/8 HWHSMS

237-5503-00 (2)
6-32 5/8 PHMS

CK PLATE GUIDE
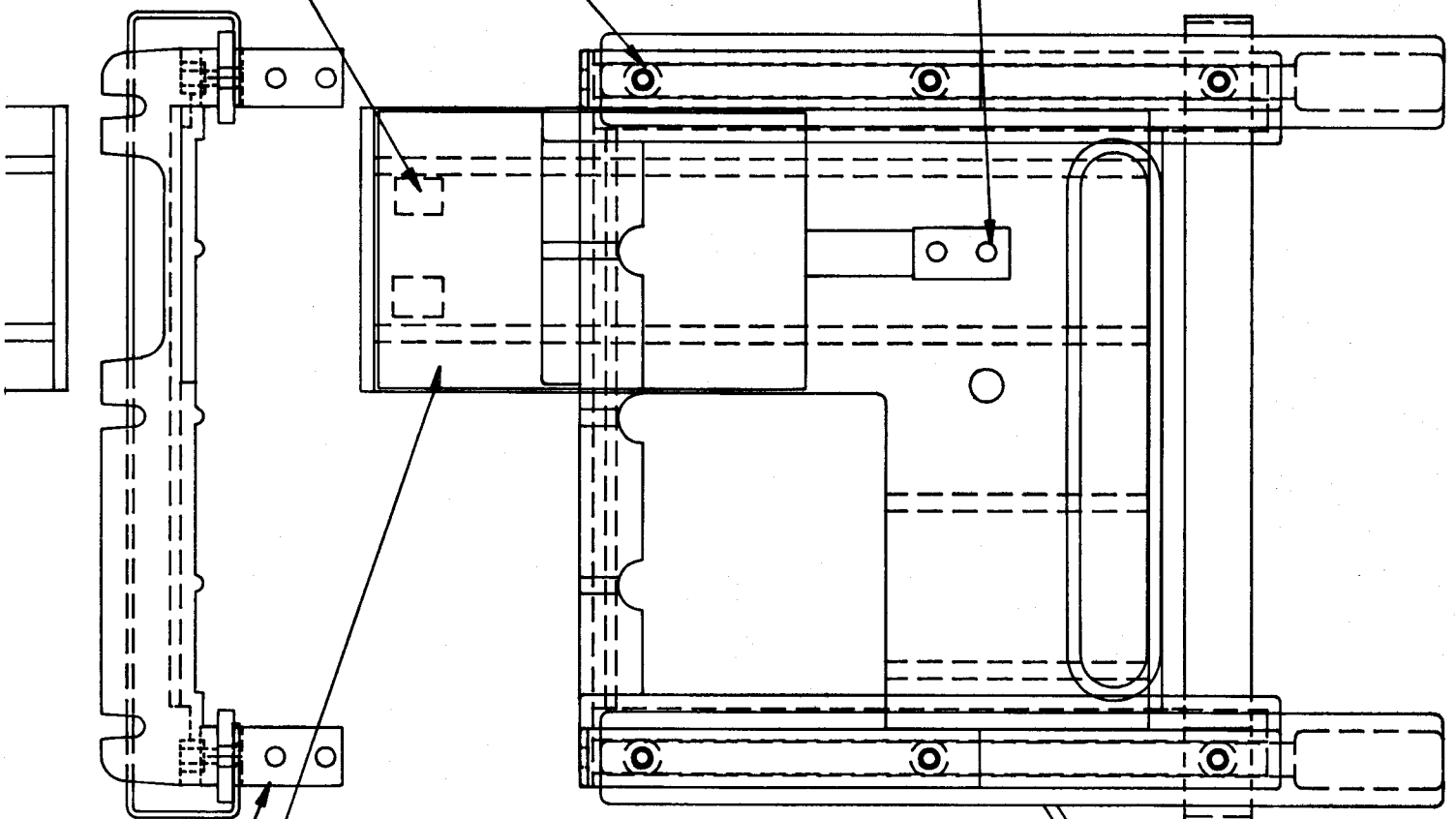
535-6794-00(2)
SUPPORT BRK'T.

PLATE

515-5906-XX
GRAVESTONE TARGET ASS'Y.

PART NO#.	TARGET ASS'Y, NO#,
-00	515-5906-00 CRYPT

535-6573-00
WIRE RAMP

Unique Parts
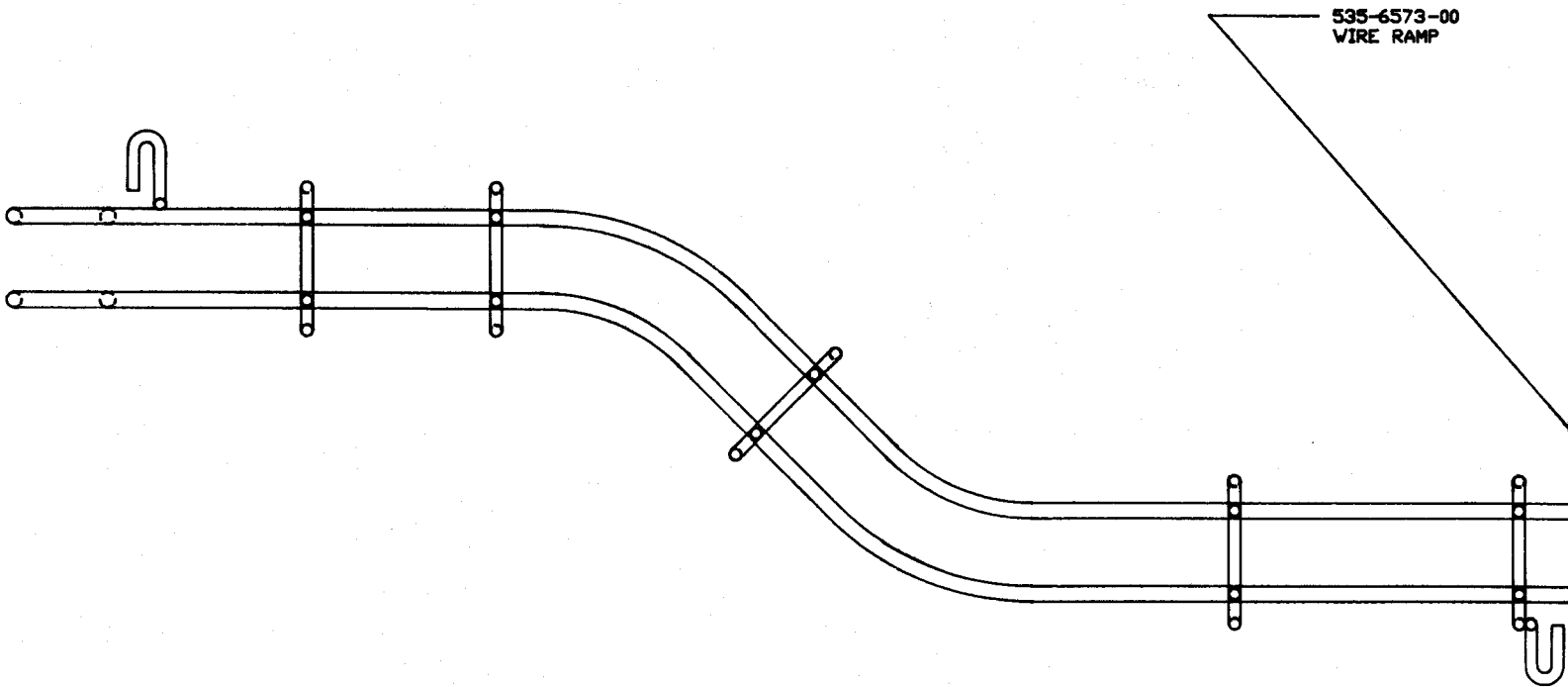
180-5093-00
MICRO SWITCH

237-5806-00 (2)
2-56 X 1/2 PHMS
244-5001-00 (2)
#2 SPLIT LOCK WASHER
240-5301-00 (2)
2-56 HEX NUT
535-6539-00
SWITCH PROTECT PLATE
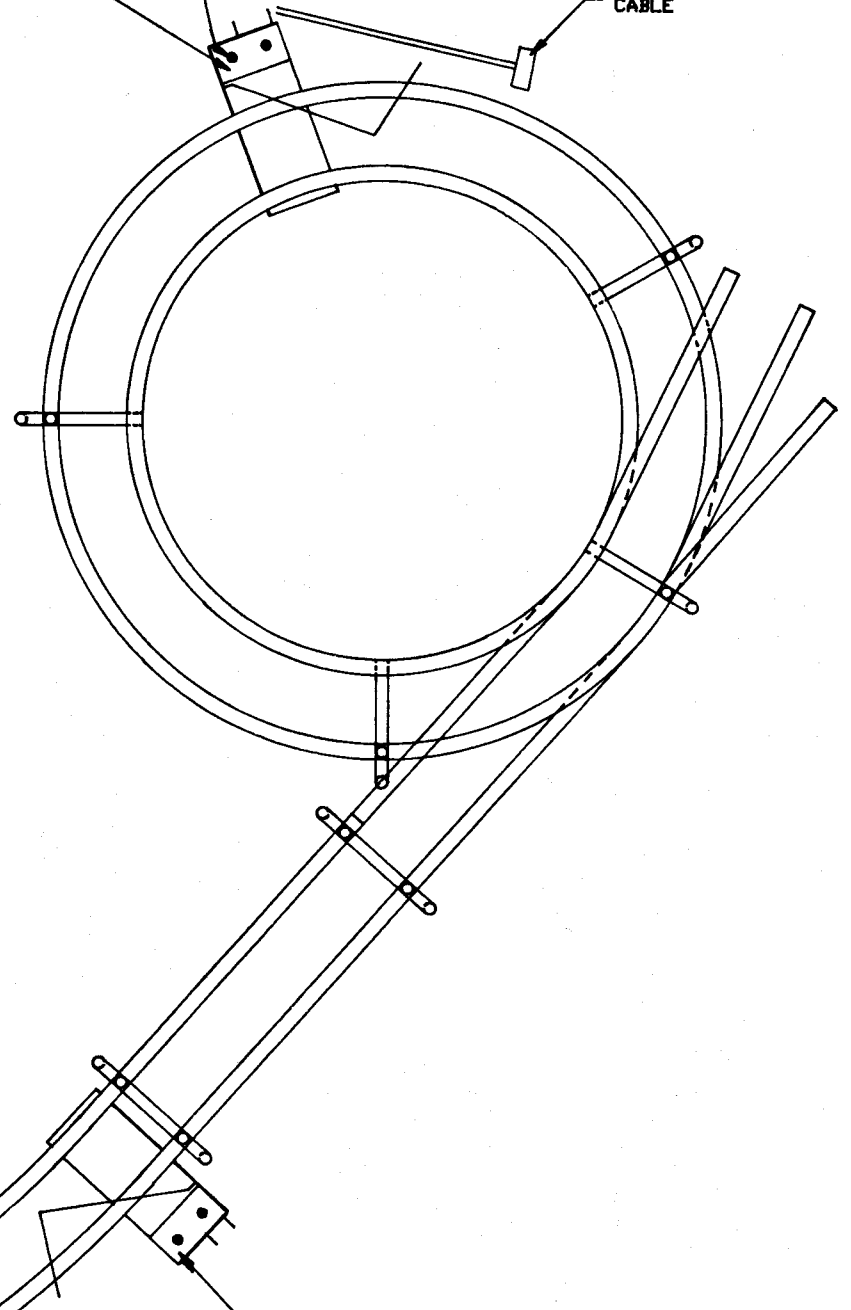
CABLE

237-5806-00 (2)
2-56 X 1/2 PHMS
244-5001-00 (2)
#2 SPLIT LOCK WASHER
240-5301-00 (2)
2-56 HEX NUT
535-6539-00
SWITCH PROTECT PLATE
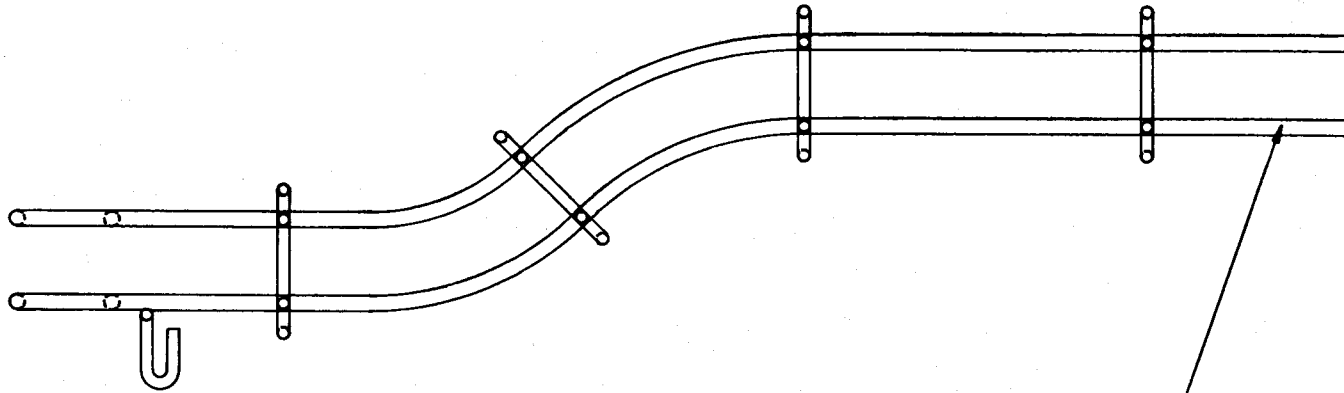
CABLE

535-6574-00
WIRE RAMP
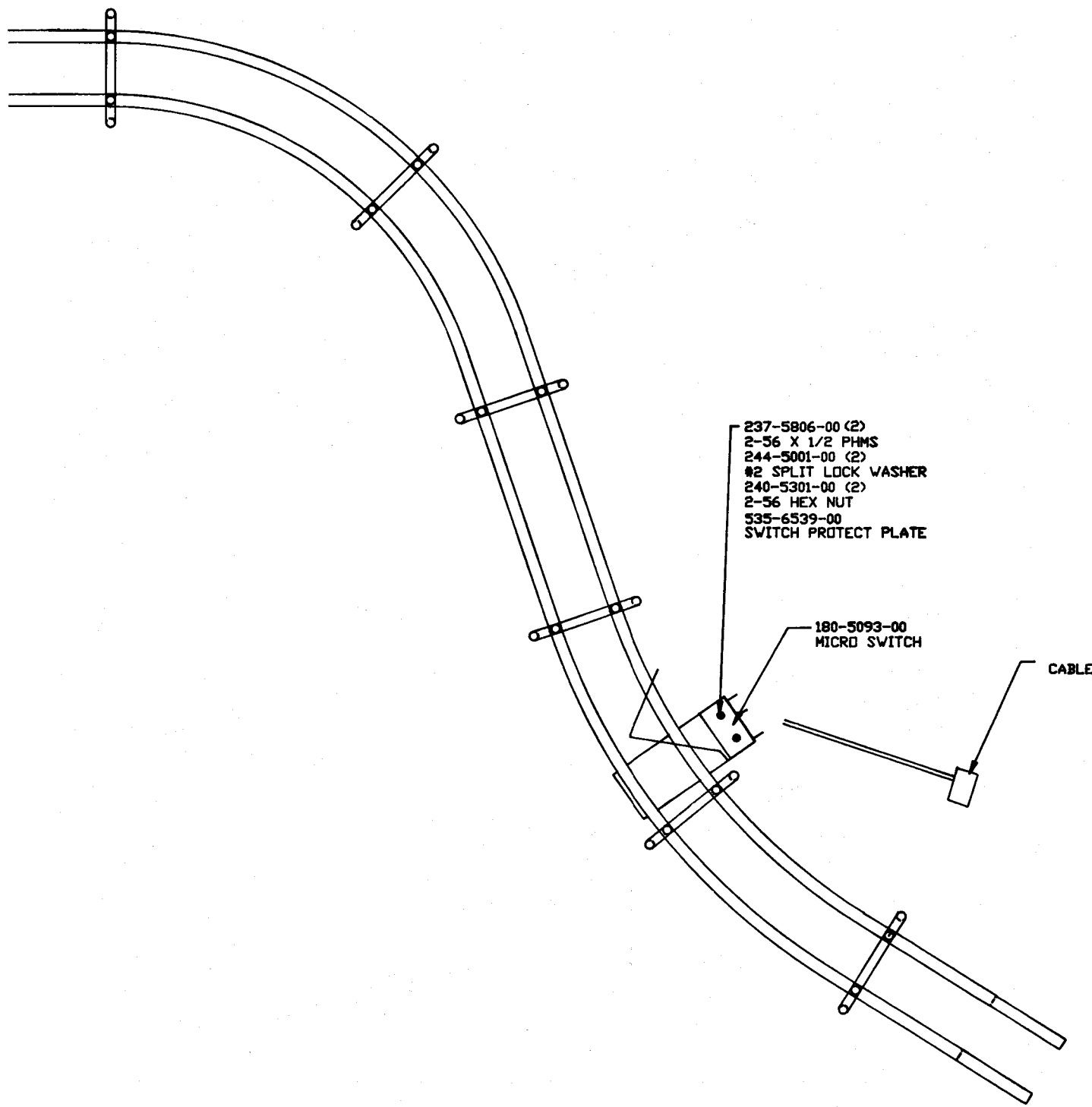
237-5806-00 (2)
2-56 X 1/2 PHMS
244-5001-00 (2)
#2 SPLIT LOCK WASHER
240-5301-00 (2)
2-56 HEX NUT
535-6539-00
SWITCH PROTECT PLATE

180-5093-00
MICRO SWITCH

CABLE
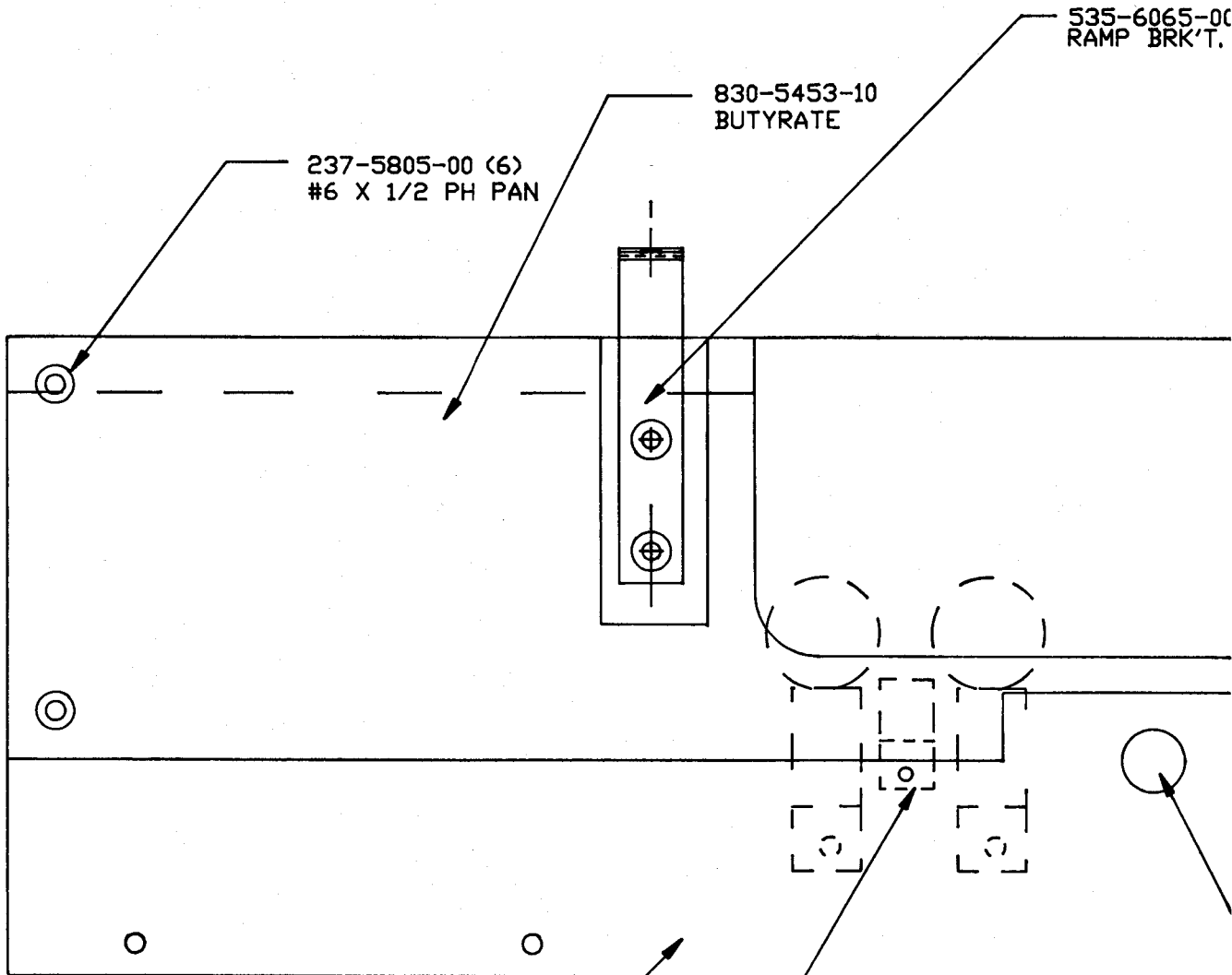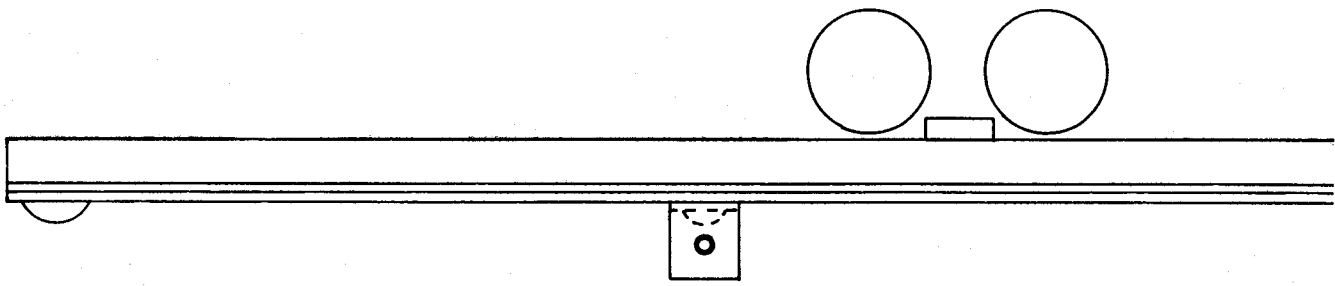
535-6065-00
RAMP BRK'T.

830-5453-10
BUTYRATE

237-5805-00 (6)
#6 X 1/2 PH PAN

040-5000-03 (3)
CABLE CLAMP
234-5000-00 (3)
6 X 3/8 HWHSMS

525-5319-00
BACK PANEL

60
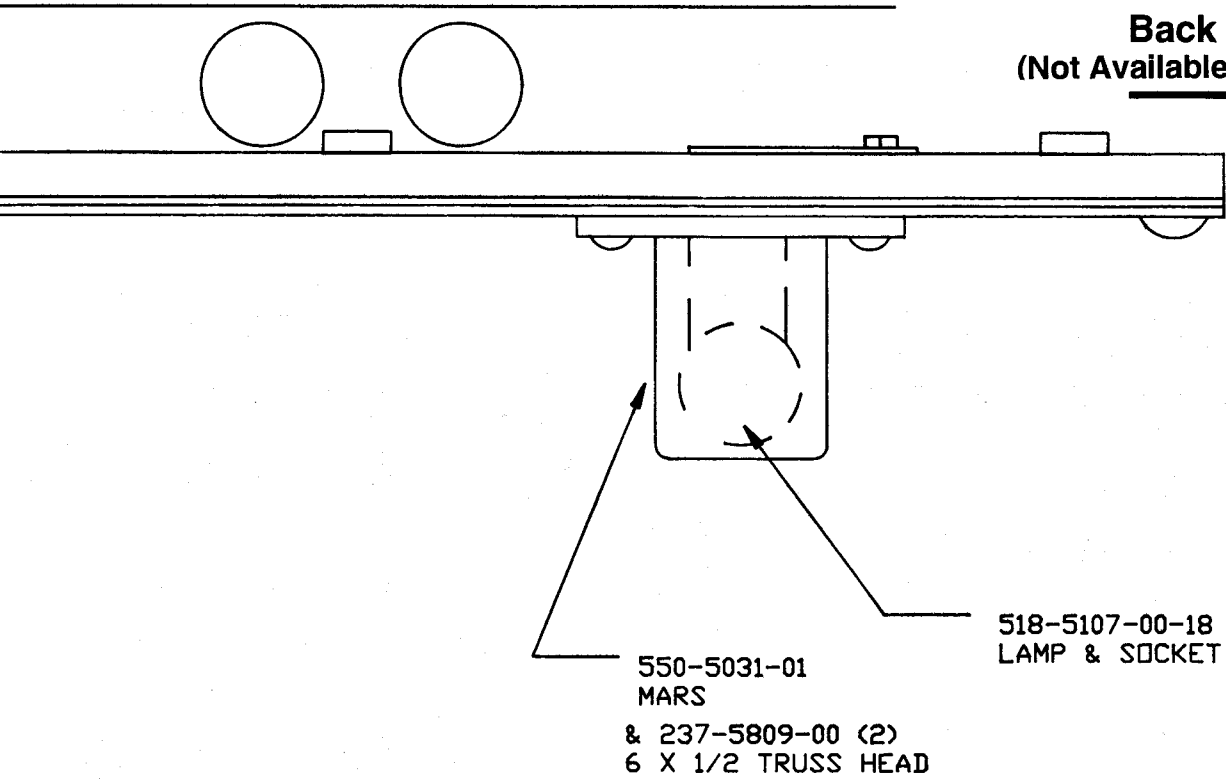
Unique Parts

518-5107-00-18
LAMP & SOCKET

550-5031-01
MARS

& 237-5809-00 (2)
6 X 1/2 TRUSS HEAD
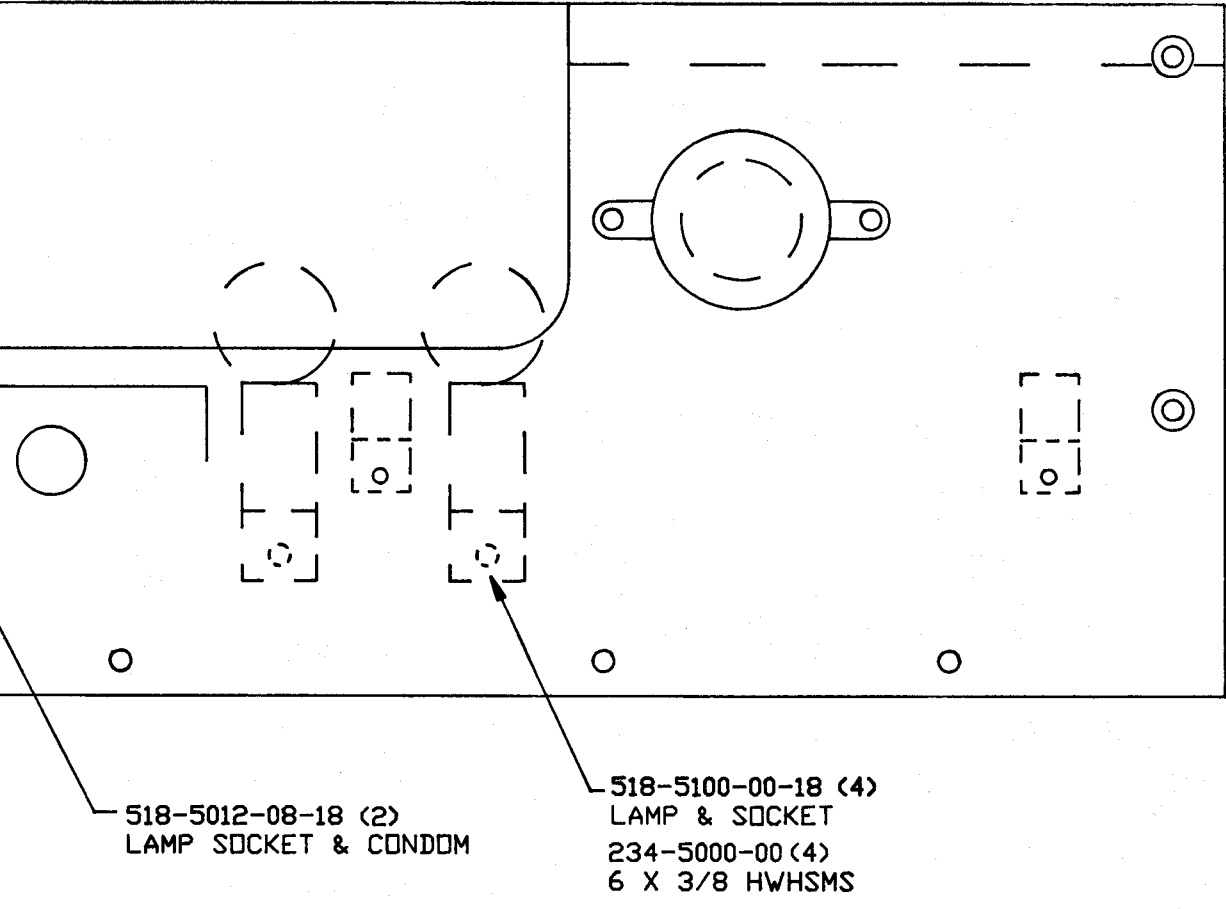
518-5012-08-18 (2)
LAMP SOCKET & CONDOM

518-5100-00-18 (4)
LAMP & SOCKET

234-5000-00 (4)
6 X 3/8 HWHSMS
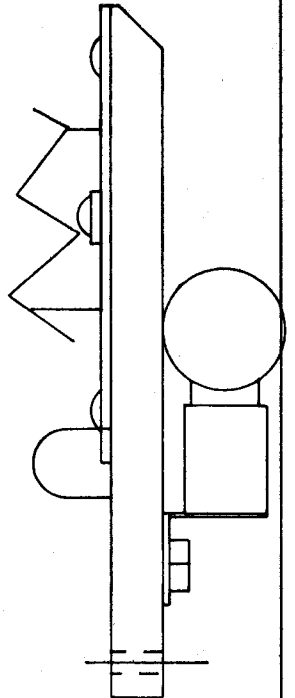
FOR LOWER LINE VOLTAGES
OR 220 VOLT OPERATION
SEE SAMPLES BELOW
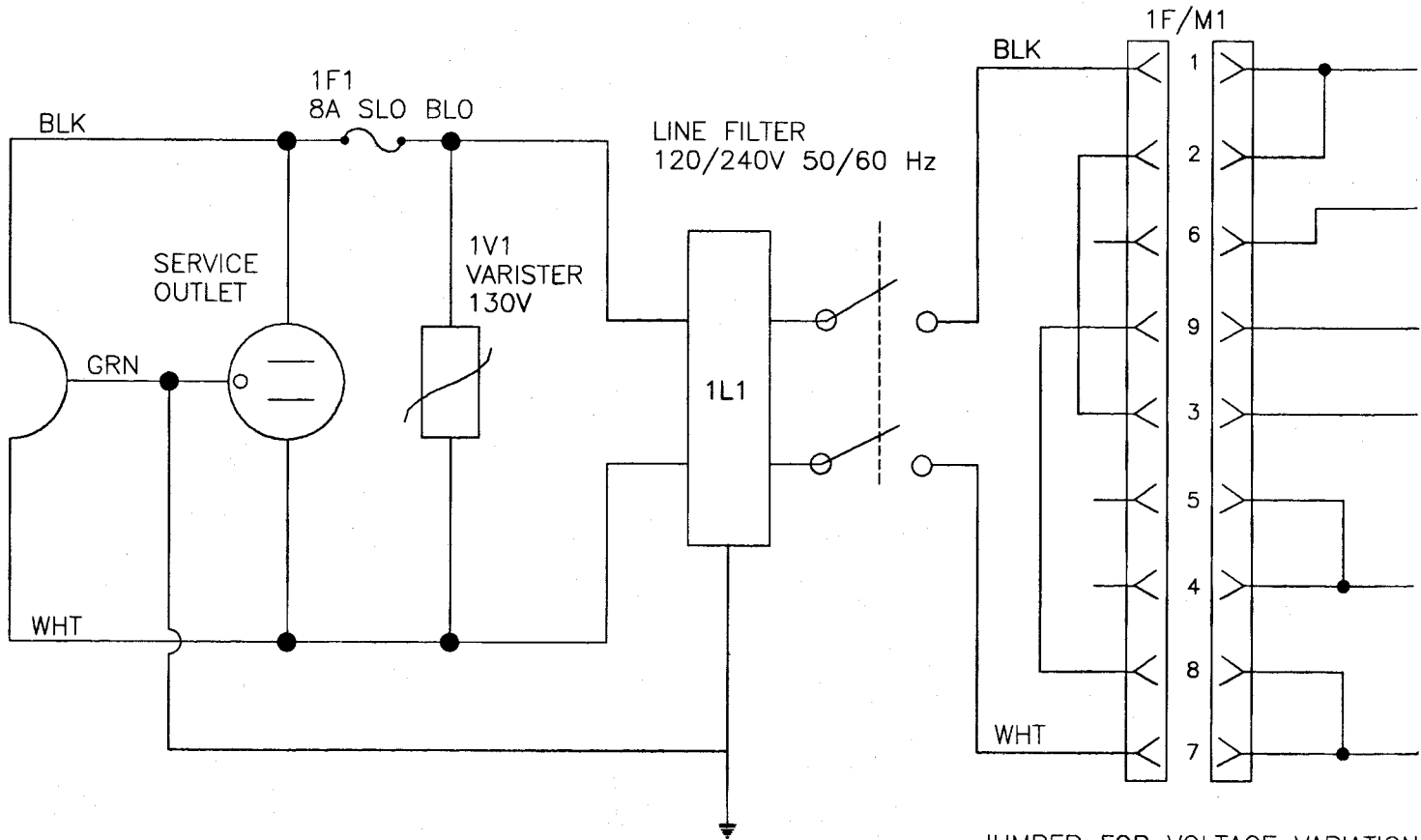
BLK

1F1
8A SLO BLO

LINE FILTER
120/240V 50/60 Hz

1F/M1

BLK

1

2

6

9

3

5

4

8

SERVICE
OUTLET

1V1
VARISTER
130V

GRN

1L1

WHT

7

WHT

JUMPER FOR VOLTAGE VARIATION

230/218/206 VOLTS	100/105 VOL
1F1= 4A SLO BLO	1F1= 8A SLC
1V1=275V VARISTOR	1V1= 130V V

REMOVE
PIN 9

BLK

1

2

206V

6

9

218/230V

3

WHT 206/218V

5

4

8

WHT 230V

7

BLK

WHT

COIN DOOR

1F/M4

1
2
3

PLUMB
TILT   SW1

4TH COIN   SW2   13

RIGHT COIN   SW4   4
CENTER COIN   SW5   5
LEFT COIN   SW6   6
SLAM TILT   SW7   7

MEMORY LOCK
SWITCH

STEP   10
                             11
FOR/REV   12

RIGHT
FLIPPER
SWITCH

                    0.1   0.1   LEFT FLIP
                                 SWITCH
                   mfd mfd
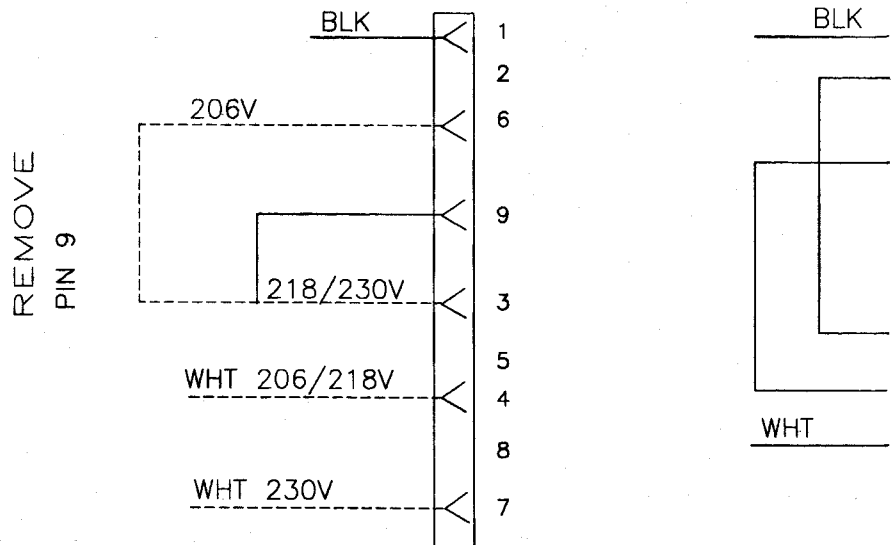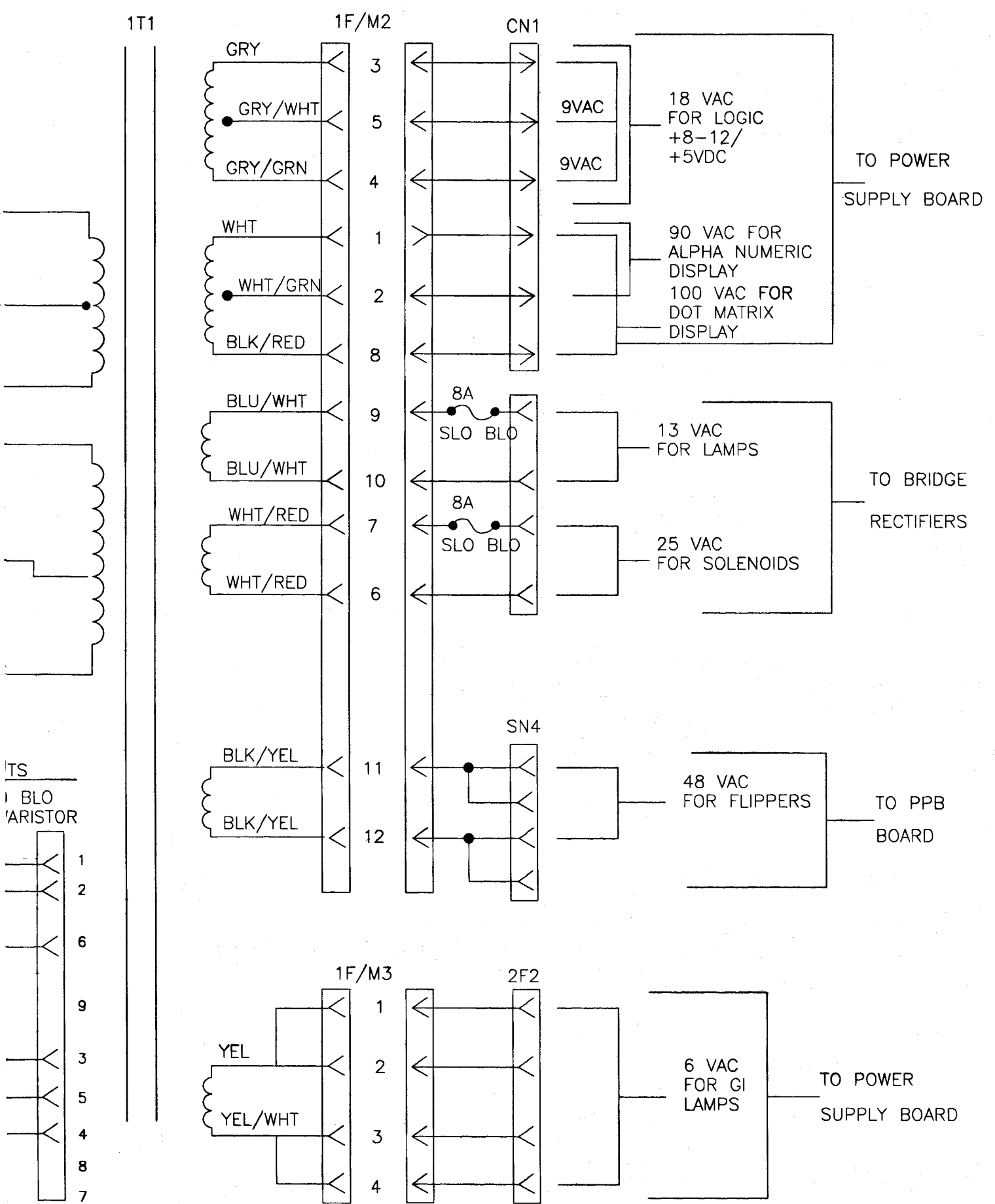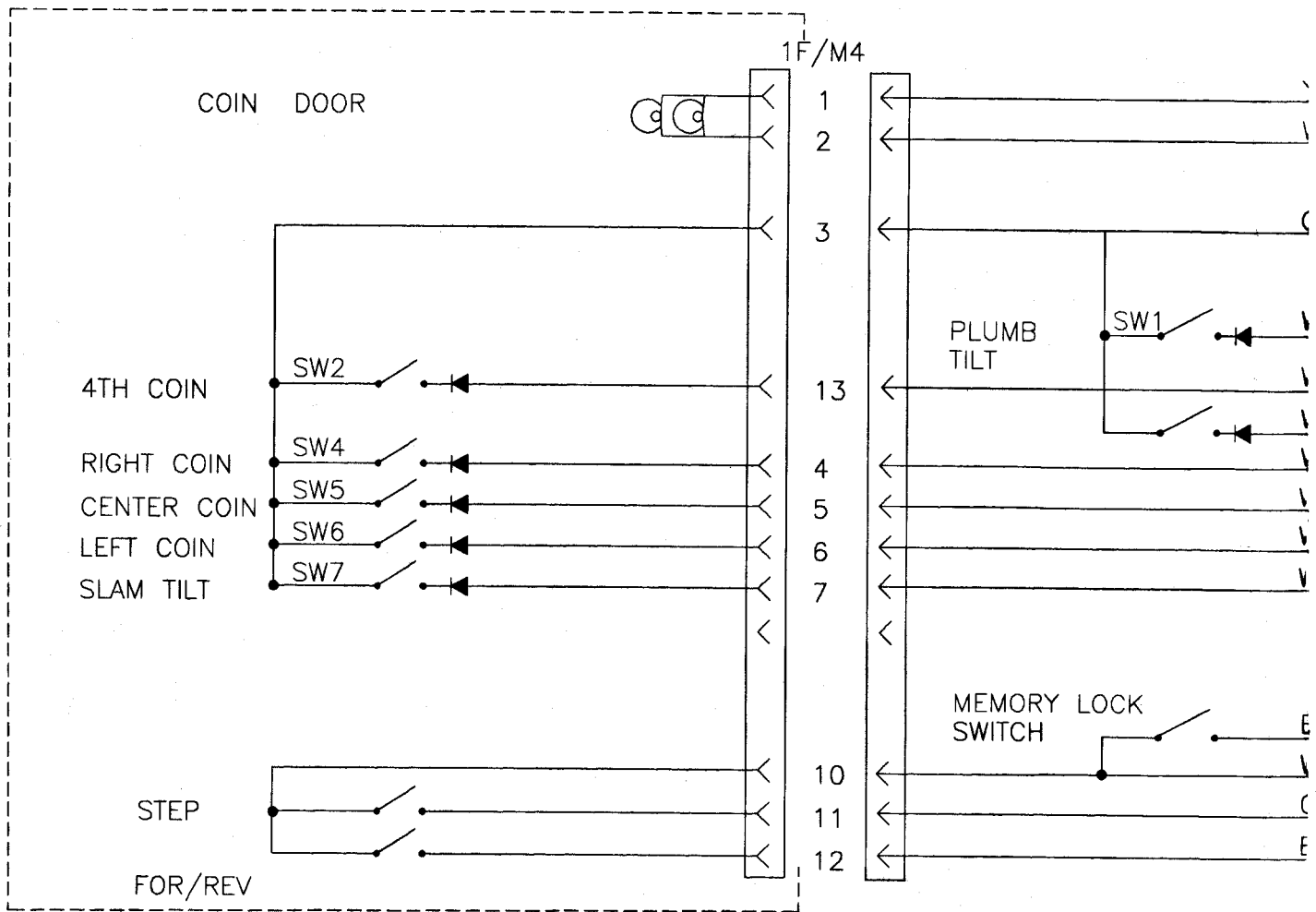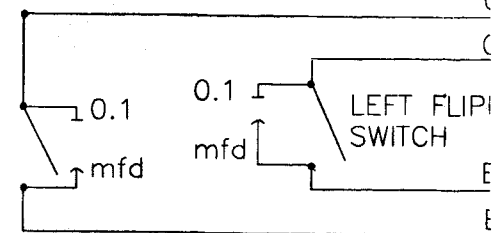
CABINET
SPEAKER
MONO   +
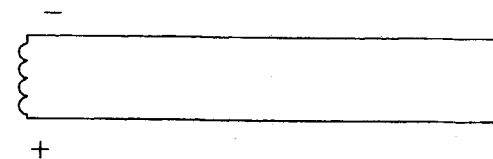
STEREO
VOLUME CONTROL
10K LOGARITHMIC

LEFT
CHANNEL

1M/F

N.C. ——→ 7

YEL ——→ 9

WHT/YEL ——→ 10) ─ 6.3 VAC FROM

N.C. ——→ 8) ── G.I. LAMP FUSES

GRN/BRN ——→ 11)   CN8
                        |< 1   SW DRIVE 1

                        CN10
WHT/BRN ——→ 12) |< 1   SW RETURN 1
WHT/RED ——→) |< 2   SW RETURN 2
WHT/ORG ——→ 13) |< 3   SW RETURN 3
WHT/YEL ——→ 14) |< 4   SW RETURN 4
WHT/GRN ——→ 15) |< 5   SW RETURN 5
WHT/BLU ——→ 16) |< 6   SW RETURN 6
WHT/VIO ——→ 17) |< 7   SW RETURN 7
N.C. ——→ 18) |< 8   SW RETURN 8

                        CN14
BLK/RED ——→ 4) |< 1
WHT ——→ 3) |< 2   DIAGNOSTICS
GRN ——→ 1) |< 3   SWITCHES
BLU ——→ 2) |< 4

                        CN 19
ORG/VIO ——→ 20) |< 1   FLIPPER GROUND
ORG/GRY ——→ 23) |< 2   FROM CPU RELAY
PER

BLU/GRY ——→ 24)   SWITCHED GROUNG
BLU/VIO ——→ 21)   FOR FLIPPERS
N.C. ——→ 19)

                        CN1
YEL/WHT ——→ 5) |< 7   CENTER −

YEL/BLK ——→ 6) |< 6   CENTER +

                        CN3
                BLK |< 1   R OUT
                RED |< 2   R IN
                WHT |< 4   L OUT
                ORG |< 5   L IN
        SHIELD |< 3   SHIELD
                        | 6

RIGHT
CHANNEL

FROM CPU
BOARD

TO PLAYFIELD

FROM
SOUND BOARD

SOUND

CN4

YEL/WHT	7	C-
YEL/BLK	6	C+
N.C.	5	KEY
RED/WHT	4	L-
RED/BLK	3	L+
BLK	2	R-
BLK/YEL	1	R+

CAB.
PANEL

CN3

	6	N.U.
	5	N.U.
	4	N.U
BLK	3	OUT
WHT	2	GND
RED	1	IN

CAB.

CN2

+12V / KEY / N.C. / -12V / GND / +5V
GRY/WHT / N.C. / BLK/WHT / BLK / GRY

C1

E / SPARE R/W / SPARE / SC2 / SS6 / SS4 / SS2 / SS0
N.C. / RESET / SC1 / SS7 / SS5 / SS3 / SS1 / BLNK GND

BR1
C1
30000 MICROFARAD 25V

BR2

8 AMP S.B.
8 AMP S.B.

VIO PS CN
ORG PS CN
ORG PS CN
BLK PS CN
BLK PS CN
WHT/RED
WHT/RED
BLU/WHT
BLU/WHT

CPU

CN17

BLK / BLK / BLK / GRY / GRY / GRY / KEY / N.C.
GND / +5V / KEY / N.C.

CN21
E / SPARE R/W / SPARE / SC2 / SS6 / SS4 / SS2 / SS0
N.C. / RESET / SC1 / SS7 / SS5 / SS3 / SS1 / BLK GND
SOUND CN5

CN22
N.U. / N.U. / CK / D6 / D4 / D2 / D0 / N.U. / GND
N.U. / RST / D7 / D5 / D3 / D1 / N.U. / STV / BUSY
DOT MATRIX DISPLAY J1

CN1
N.C. / N.C. / N.C. / VIO / VIO/WHT / N.C. / KEY / N.C.
PRINTER STROBE / PRINTER CONTROL

CN2
GRY/BLK / N.C. / N.C. / N.C. / KEY / N.C. / N.C.
ENABLE / N.C. / N.C. / N.C. / KEY / N.C. / N.C.

CN3
ORG/GRY / ORG/VIO / ORG/BLU / ORG/GRN / ORG/YEL / KEY / ORG/BLK / ORG/RED / ORG/BRN / GRY/RED / GRY/WHT / N.C.
DATA LINE TO PRINTER / DATA LINE TO PRINTER / DATA LINE TO PRINTER / DATA LINE TO PRINTER / DATA LINE TO PRINTER / DATA LINE TO PRINTER & MAGNET / DATA LINE TO PRINTER & MAGNET / DATA LINE TO PRINTER & MAGNET / CB2 MOTOR STROBE / CA2 PRINTER BUSY / N.C.

KEY
SPEC COIL SW3
SPEC COIL SW2
SPEC COIL SW4
SPEC COIL SW1
GND
N.C.
SPEC COIL SW5
SPEC COIL SW6

RIGHT
LEFT
SPEC COIL DRIVE 3
SPEC COIL DRIVE 2
KEY
SPEC COIL DRIVE 4
SPEC COIL DRIVE 1
SPEC COIL DRIVE 5
SPEC COIL DRIVE 6

FLIPPER GND
LAMP B+ +18V
KEY
LAMP B+ +18V
LAMP GND
KEY
LAMP GND

CN14

BLU	4	FORWARD/REVERSE
GRN	3	STEP
WHT	2	GND
BLK/RED	1	MEM. LOCK

CABINET

CN13

BLK	4	
BLK	3	COIL GND
BLK	2	
BLK	1	

PS CN4

CN12
COIL DRIVES 9–16
16 15 14 13 12 11 10 9
WHT/GRY / BRN/VIO / N.C. / N.C. / N.C. / KEY / BLK/RED / BRN/BLK
PPB A8/PP1 MOTOR RELAY / N.U. / N.U. / N.U. / S.U. RELAY / A/B RELAY / DIVERTER
UP/DOWN

CN11
COIL DRIVES 1–8
8 7 6 5 4 3 2 1
GRY/BRN / GRY/BLU / GRY/GRN / GRY/YEL / GRY/ORG / GRY/RED / N.C. / GRY/BRN
PPB J1

CN10
SWITCH RETURN (ROWS)
1 2 3 4 5 6 7 8
WHT/BRN / WHT/RED / WHT/ORG / WHT/YEL / WHT/GRN / WHT/BLU / WHT/VIO / WHT/GRY
PLAYFIELD CABINET (1M–F5)

CN9
SWITCH DRIVERS (COLUMN)
8 7 6 5 4 3 2 1
GRN/BRN / GRN/RED / GRN/BLK / N.C. / GRN/YEL / GRN/ORG / GRN/RED / GRN/BRN
PLAYFIELD CABINET

CN7
LAMP DRIVERS (COLUMNS)
8 7 6 5 4 3 2 1
YEL/GRY / YEL/VIO / YEL/BLU / YEL/GRN / N.C. / YEL/BLK / YEL/ORG / YEL/BRN
PLAYFIELD CABINET

CN6
LAMP RETURNS (ROWS)
8 7 6 5 4 3 2 1
RED/GRY / RED/VIO / RED/BLU / RED/YEL / N.C. / RED/GRN / RED/ORG / RED/BLK
PLAYFIELD CABINET

64   Playfield Coil/Flashlamp Wiring Diagram

+50VDCL PPB J7-8/9

YEL/VIO

BRN

| TOP VUK 23-800 7L | LEFT VUK 50V 23-800 6L | SCOOP 23-800 5L | DROP TARGET 23-800 4L | BALL LAUNCH 23-800 3L | BALL RELEASE 23-800 2L | 6 BALL LOCKOUT 25-1240 1L |

A/B RELAY
NORMALLY CLOSED SIDE = "N.C." = "L"EFT = "
NORMALLY OPEN SIDE = "N.O." = "R"IGHT = "
N.U. MEANS "NOT USED"

WHT/VIO VIO/BLK VIO/BLU VIO/GRN VIO/YEL VIO/ORG VIO/RED VIO/BRN

WHT/BLU

WHT/ORG

TO CPU CN12-P8 Q23
TO CPU CN19-9 Q13

10 9 D20 1N4004 | 7 6 D19 1N4004 | 4 3 D18 1N4004 | 2 1 D17 1N4004 | 1 2 3 4 5 6 7 8 9 10

N.C. KEY

R-18 220Ω Q2 TIP 36C
R-17 220Ω Q3 TIP 36C
R-16 220Ω Q4 TIP 36C
R-15 220Ω Q5 TIP 36C

1R R-1 D9 D1	1	GRY/BRN	1	SOL. DRIVE 1 Q46
2R R-2 D10 D2	2	GRY/RED	3	SOL. DRIVE 2 Q45
3R R-3 D11 D3	3	GRY/ORG	4	SOL. DRIVE 3 Q44
4R R-4 D12 D4	4	GRY/YEL	5	SOL. DRIVE 4 Q43
5R R-5 D13 D5	5	GRY/GRN	6	SOL. DRIVE 5 Q42
6R R-6 D14 D6	6	GRY/BLU	7	SOL. DRIVE 6 Q41
7R R-7 D15 D7	7	GRY/VIO	8	SOL. DRIVE 7 Q40
8R R-8 D16 D8	8	GRY/BLK	9	SOL. DRIVE 1 Q46
9 R9	9	BRN/BLK	1	SOL. DRIVE 9 Q30
		BLK/RED	2	SOL. DRIVE 10 Q29
12 R10	10	N.U.	4	SOL. DRIVE 11 Q28
13 R11	12	N.U.	5	SOL. DRIVE 12 Q27
14 R12	13	N.U.	6	SOL. DRIVE 13 Q26
15 R13	14	N.U.	7	SOL. DRIVE 14 Q25
16 R14	15	BRN/VIO	8	SOL. DRIVE 15 Q24
		WHT/GRY	9	SOL. DRIVE 16 Q23

K1
D22 SOL
F8

CN12 P.S.CN7

+ 32V BRN/ORG

SOL I

+32V
KEY

RY1 GENERAL ILLUMINATION RELAY

POWER SUPPLY BOARD

C.P.U. BOARD

BLK/BRN
J9

BLK/WHT BLK/WHT VIO/YEL GRY/YEL YEL/VIO YEL/VIO N.U. N.U.
+50VDCR (NORMALLY OPEN)
FLIPPER +500C
+50VDCL (NORMALLY CLOSED)
J7

BRN BRN BRN ORG ORG KEY RED/WHT
J6
+32VL +32VR

+32V FROM P.S. CN3 PIN5

+ 32VDCR PPB J6-4/5 ORG

| (2)PLFD (1) BACK PANEL (1)INSERT 1R | (3) PLFD (1) INSERT 2R | (2) PLFD (2) INSERT 3R | (2)PLFD (1)BACK PANEL (1)INSERT 4R |
| (4) NO.89   BLK/BRN | (4) NO.89 | (4) NO.89 | (4) NO. 89 |

BLK/RED
BLK/ORG
BLK/YEL

+ 32VDCR PPB J6-4/5 ORG

| (3)PLFD (1) INSERT 5R | (2)PLFD (1)BACK PANEL (1)INSERT 6R | (3)PLFD (1)BACK PANEL 7R | (2) PLFD (1)BACK PANEL (1)INSERT 8R |
| (4) NO. 89   BLK/GRN | (4) NO.89 | (4) NO.89 | (4) NO.89 |

BLK/BLU
BLK/VIO
BLK/GRY

+50 VDC PPB J7-3

VIO/YEL

3

LASER
KICK
23-800

SP6

BLLU/BLK

4

Q 4

3

RIGHT
SLINGSHOT
23-800

SP5

LEFT
THUMPER
BUMPER
23-800

SP4

LEF
SLI
23-

SP3

CN 3

RED

6 POWER SUPPLY

CENTER THUMPER BUMPER 23-800

RIGHT THUMPER BUMPER 23-800

T NGSHOT -800

SP2

SP1

CN 19

BLU-ORG   3 SW.SOL DRIVE 1Q8

BLU-RED   4 SW.SO. DRIVE 2Q9

BLU-YEL   6 SW.SOL DRIVE 3Q10

BLU-BRN   7 SW.SOL DRIVE 4Q11

BLU-GRN   8 SW.SOL DRIVE 5Q12

WHT   9 SW.SOL DRIVE 6Q13

Switch Number	Description	Part No.				Switch Number	Descript
01*	Plumb Tilt	See Cabinet	17	Left Outlane	500-5706-00	33*	Up (Toml
02*	4th Coin	-	18	Left Return	500-5706-00	34	Not Usec
03*	Credit Button	500-5097-02	19	Left Slingshot	180-5023-00	35	Not Usec
04*	Right Coin	180-5024-00	20	Left Bottom 3 Bank	180-5130-02	36*	Down (Tc
05*	Center Coin	180-5024-00	21	Left Mid 3 Bank	180-5130-01	37*	Tombstoi
06*	Left Coin	180-5024-00	22	Left Top 3 Bank	180-5130-00	38	VUK Left
07*	Slam Tilt	180-5022-00	23	Left Bottom Orbit	500-5706-00	39	Captive E
08*	Buy-In Button	180-5073-00	24	Left Top Orbit	500-5707-00	40	Left Spin
09	Trough #1 Left	180-5119-00	25	Right Outlane	500-5707-00	41	Left Drop
10	Trough #2	180-5119-00	26	Right Return	500-5707-00	42	Mid Drop
11	Trough #3	180-5119-00	27	Right Slingshot	180-5023-00	43	Right Drc
12	Trough #4	180-5119-00	28	Right Bottom 3 Bank	180-5130-02	44	Left Ram
13	Trough #5	180-5119-00	29	Right Mid 3 Bank	180-5130-01	45	Left Ram
14	Trough #6	180-5119-00	30	Right Top 3 Bank	180-5130-02	46	Right Rai
15	Trough #7 Right	180-5118-00	31	Right Bottom Orbit	500-5706-00	47	Right Rai
16	Shooter Lane	180-5100-01	32	Right Top Orbit	500-5707-00	48	Right Spi

66 Playfield Switch Wiring Diagram
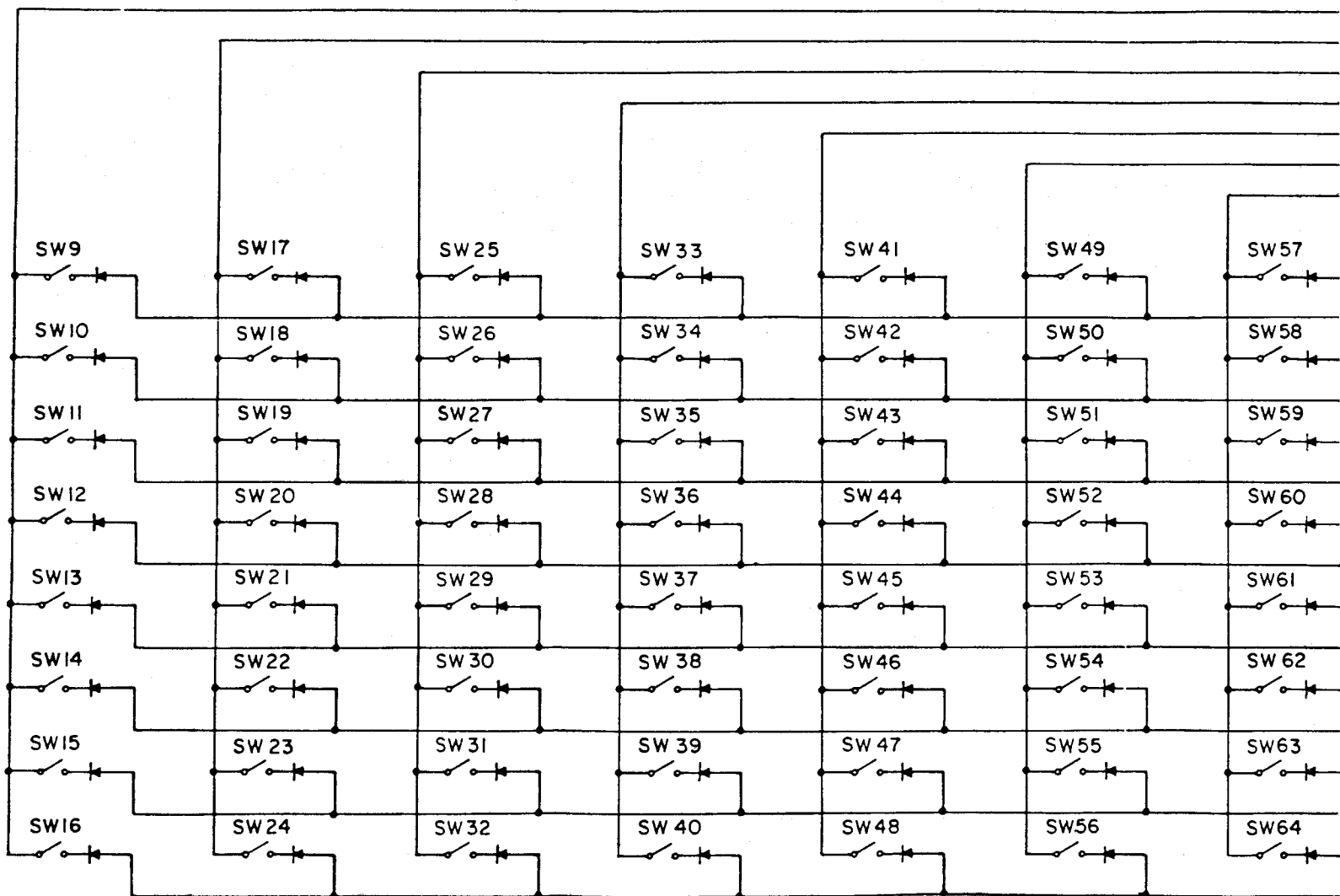
)	180-5052-00	49	Left Turbo Bumper	180-5015-01
	-	50	Bottom Turbo Bumper	180-5015-01
	-	51	Right Turbo Bumper	180-5015-01
mb)	180-5052-00	52	Super VUK Right	180-5064-01
ne Score	180-5083-00	53	Small Trough	180-5093-00
	180-5064-00	54	Large Trough	180-5093-00
Ball Trgt. Switch	180-5114-08	55	Power Scoop	500-5057-00
ner	180-5010-04	56	Middle Spinner	180-5010-04
Target	180-5092-01	57	Left Ramp Exit	180-5090-00
Target	180-5092-01	58	Not Used	-
p Target	180-5092-01	59	Not Used	-
p Enter	180-5090-00	60	Not Used	-
p Middle	180-5090-00	61	Not Used	-
mp Enter	180-5090-00	62*	Launch Button	180-5073-00
mp Exit	180-5093-00	63*	Left End of Stroke	180-5124-00
nner	180-5010-04	64*	Right End of Stroke	180-5124-00

CN8

GRN - RED	2	SWITCH DRIVE 2
GRN - ORG	3	SWITCH DRIVE 3
GRN - YEL	4	SWITCH DRIVE 4
GRN - BLK	5	SWITCH DRIVE 5
GRN - BLU	7	SWITCH DRIVE 6
GRN - VIO	8	SWITCH DRIVE 7
GRN - GRY	9	SWITCH DRIVE 8

CPU BOARD

CN10

WHT - BRN	9	SWITCH RETURN 1
WHT - RED	8	SWITCH RETURN 2
WHT - ORN	7	SWITCH RETURN 3
WHT - YEL	6	SWITCH RETURN 4
WHT - GRN	5	SWITCH RETURN 5
WHT - BLU	3	SWITCH RETURN 6
WHT - VIO	2	SWITCH RETURN 7
WHT - GRY	1	SWITCH RETURN 8

49	Mystery Door 1
50	Mystery Door 2
51	Mystery Door 3
52	Double Jackpot
53	Living Dead
54	Gravedigger
55	Chainsaw Mode
56	Play the Organ
57	Left Turbo Bumper
58	Bottom Turbo Bumper
59	Right Turbo Bumper
60	Jackpot
61	Multiball
62	Left Ramp Enter
63	Right Ramp Enter
64	"Axe-tra" Ball

CN7

Wire	Pin	Signal
YEL - BRN	1	LAMP DRIVE 1
YEL - RED	2	LAMP DRIVE 2
YEL - ORN	3	LAMP DRIVE 3
YEL - BLK	4	LAMP DRIVE 4
YEL - GRN	6	LAMP DRIVE 5
YEL - BLU	7	LAMP DRIVE 6
YEL- VIO	8	LAMP DRIVE 7
YEL - GRY	9	LAMP DRIVE 8

LB 57
LB58
LB59
LB60
LB61
LB62
LB63
LB64

LAMP DRIVE 1	Q71	LAMP RETURN 1	Q72
LAMP DRIVE 2	Q70	LAMP RETURN 2	Q73
LAMP DRIVE 3	Q69	LAMP RETURN 3	Q74
LAMP DRIVE 4	Q68	LAMP RETURN 4	Q75
LAMP DRIVE 5	Q67	LAMP RETURN 5	Q76
LAMP DRIVE 6	Q66	LAMP RETURN 6	Q77
LAMP DRIVE 7	Q65	LAMP RETURN 7	Q78
LAMP DRIVE 8	Q64	LAMP RETURN 8	Q79

CPU BOARD

CN6

Wire	Pin	Signal
RED- BRN	1	LAMP RETURN 1
RED- BLK	2	LAMP RETURN 2
RED- ORN	3	LAMP RETURN 3
RED- YEL	5	LAMP RETURN 4
RED- GRN	6	LAMP RETURN 5
RED- BLU	7	LAMP RETURN 6
RED- VIO	8	LAMP RETURN 7
RED- GRY	9	LAMP RETURN 8

G.I. LAMPS

4M / F6

1	YEL
2	WHT- YEL
3	VIO
4	WHT-VIO

TO G.I. FUSES

ALPHANUMERIC SEGMENT DRIVE

DIGIT STROBE S1-S9

DIGIT STROBE S9-S16

7-SEGMENT DRIVE

CN22

CN1

DISPLAY STROBE OUTPUT

RA1

CN2

RA2

CN3

7-SEGMENT OUTPUT

RA3

CN18

SPEC COIL SWITCH INPUT

ALPHANUMERIC SEGMENT/SOUND CONTROL PIA

6821

DISPLAY STROBE DECODER 74154

SPECIAL COIL SWITCH INPUT

7402

SPEC COIL SWITCH INPUT

DISPLAY STROBE 7-SEGMENT PIA

ADDRESS DECODER

LS138

LS138

LS139

NON REFLEXIVE SOLENOID CONTROL

R11
R12

SPECIAL COIL DRIVE

R13
R14
R15
R16
R17
R18

R19
R20
R21
R22
R23
R24
R25
R26
R27
R28

Q2
Q3
Q9
Q4
Q10
Q5
Q11
Q6
Q12
Q7

1
2
3
4
5
6

CN9

SPEC COIL DRIVES FLIPPER GND

LAMP PIA
6821

DIAG LEDS

FLIPPER GROUND RELAY

CN20

FLIPPER 3, 4 GND

4020

LAMP DRIVE
LS08 LS08

LAMP RETURN
7406 7406

LAMP B+ FILTER

PIA
6821

SWITCH DRIVE (COLUMNS)

LAMP DRIVE (COLUMNS)

8
7
6
5
4
3
2
1

LAMP RETURN (ROWS)

1
2
3
4
5
6
7
8

R55
R56
R57
R58
R59
R60
R61
R62

CN4

LAMP B+ (+18V)

CN5

LAMP GND

(8)(7)(6)(5)(4)(3)(2)(1)

CN8

CN7

CN6

SWITCH DRIVE (COLUMNS)

LAMP DRIVE (COLUMNS)

LAMP RET (ROWS)

CPU BOARD 1 OF 4

70 CPU BOard Logic Diagram (Sheets 1-4)

DIS. BD)

SEG. G
N.C.
N.C.
KEY

2
1
11
10
6

PB6
PB7
CA2
CB2

C48
C47
C156
C155

RA24-3
RA24-2
4.7K

+5

+5

A

20 22 24

BLANKING

3 (8-B)
3 (8-D)
BLANKING
(1-12G)

+5

28 CS2
21 R/W
25 E
34 RESET
26 RS0
35 RS1

PA0 2
PA1 3
PA2 4
PA3 5
PA4 6
PA5 7
PA6 8
PA7 9

9B
6821

RA22
4.7K x 8

SEG. H
SEG. J
SEG. K
SEG. M
SEG. N
SEG. P
SEG. R
DECIMAL

PA0 11
PA1 12
PA2 13
PA3 14
PA4 15
PA5 16
PA6 17
PA7 18

33 D0
32 D1
31 D2
30 D3
29 D4
28 D5
27 D6
26 D7

PB0 10
PB1 11
PB2 12
PB3 13
PB4 14
PB5 15
PB6 16
PB7 17

RA21
4.7K x 8

SEG. A
SEG. B
SEG. C
SEG. D
SEG. E
SEG. F
SEG. G
COMMA

PB0 19
PB1 20
PB2 21
PB3 22
PB4 23
PB5 24
PB6 25
PB7 26
2
1

37 IROB
38 IROA

CA1 40
CB1 18

VSS 1

RA23
4.7K x 0

PA0 3
PA1 4
PA2 5
PA3 6
PA4 7
PA5 8
PA6 9
PA7 10

CN22 ALPHANUMERIC SEGMENT DRIVERS

+5

28 22 24

23 CS2
21 R/W
25 E
34 RESET

PA0 2
PA1 3
PA2 4
PA3 5
PA4 6
PA5 7
PA6 8
PA7 9

7B
6821

36 RS0
15 RS1

RA20
4.7K x 8

PB0 3
PB1 4
PB2 5
PB3 6
PB4 7
PB5 8
PB6 9
PB7 10
2
1

CN21 SOUND DRIVERS

33 D0
32 D1
31 D2
30 D3
29 D4
28 D5
27 D6
26 D7

PB0 10
PB1 11
PB2 12
PB3 13
PB4 14
PB5 15
PB6 16
PB7 17

37 IROB
38 IROA

CA1 40
CB1 18
CA2 39
CB2 19

VSS 1

RA19
4.7K x 8

CA1 20
CB1 15
CA1 11
CB1 16
CA2 12
CB2 18
13
14
19
17

CN8
1　SWITCH DRV. 1
CN8
2　SWITCH DRV. 2
CN8
3　SWITCH DRV. 3
CN8
4　SWITCH DRV. 4
CN8
5　SWITCH DRV. 5
CN8
7　SWITCH DRV. 6
CN8
8　SWITCH DRV. 7
CN8
9　SWITCH DRV. 8

CN8
6

RA6
1K x 8

C81
C80
C79
C78
C77
C76
C75
C74
.01M

+5

RESET
E
R/W

CPU BOARD　SHT 2 OF 4

A

D7 – D22 IN4002

Q   R39   1.2K ½w   2N5060   Q81   D7   Q72 TIP122   CN6 1   **LAMP RET. 1**

RB1 8   7   6.8K   R47 1K   R55 4Ω3W

D8   .1µ   C50

B

R40   1.2K ½w   2N5060   1   Q82   D9   Q73 TIP122   CN6 2   **LAMP RET. 2**

RB1 6   5   6.8K   R48 1K   R56 4Ω3W

D10   .1µ   C51

R41   1.2K ½w   2N5060   2   Q83   D11   Q74 TIP122   CN6 3   **LAMP RET. 3**

RB1 4   3   6.8K   R49 1K   R57 4Ω3W

D12   .1µ   C52

C

RA8-2 2.2K   R38   Q71 TIP42   CN7 1   **LAMP DRV. 1**

Q63   Q   2N6427

R42   1.2K ½w   2N5060   3   Q84   D13   Q75 TIP122   CN6 5   **LAMP RET. 4**

RB1 2   1   6.8K   R50 1K   R58 4Ω3W

D14   .1µ   C53

D

RA8-3 2.2K   R37   Q70 TIP42   CN7 2   **LAMP DRV. 2**

Q62   1   2N6427

RA8-4 2.2K   R36   Q69 TIP42   CN7 3   **LAMP DRV. 3**

Q61   2   2N6427

R43   1.2K ½w   2N5060   4   Q85   D15   Q76 TIP122   CN6 6   **LAMP RET. 5**

RB2 8   7   6.8K   R51 1K   R59 4Ω3W

D16   .1µ   C54

E

RA8-5 2.2K   R35   Q68 TIP42   CN7 4   **LAMP DRV. 4**

Q60   3   2N6427

R44   1.2K ½w   2N5060   5   Q86   D17   Q77 TIP122   CN6 7   **LAMP RET. 6**

RB2 6   5   6.8K   R52 1K   R60 4Ω3W

D18   .1µ   C55

RA8-6 2.2K   R34   Q67 TIP42   CN7 6   **LAMP DRV. 5**

Q59   4   2N6427

RA8-7 2.2K   R33   Q66 TIP42   CN7 7   **LAMP DRV. 6**

Q58   5   2N6427

R45   1.2K ½w   2N5060   6   Q87   D19   Q78 TIP122   CN6 8   **LAMP RET. 7**

RB2 4   3   6.8K   R53 1K   R61 4Ω3W

D20   .1µ   C56

F

RA8-8 2.2K   R32   Q65 TIP42   CN7 8   **LAMP DRV. 7**

Q57   6   2N6427

RA8-9 2.2K   R31   Q64 TIP42   CN7 9   **LAMP DRV. 8**

Q56   7   2N6427

R31 – R38 27Ω3W

R46   1.2K ½w   2N5060   7   Q88   D21   Q79 TIP122   CN6 9   **LAMP RET. 8**

RB2 2   1   6.8K   R54 1K   R62 4Ω3W

D22   .1µ   C57

G

H

CPU BOARD SHT. 4 OF 4

CN2X6

1
2
3
4
5
6

CN3X10
1
2
3
4
5
6
7
8
9
10

LGROUND
SOLENOID
34VDC
KEY

CN4X12
1
2

F6 5A S-B 250V
F4 8A S-B 32V
F5 4A S-B 250V

15G470KM

CN1X12
1
2
3
4
5
6
7
8
9
10
11
12

C9
0.1
200V

C8
150uf
100V

Z1

D5
1N4004

R15
130
5w

C10
150uf
200V

C11
150uf
200V

D7
1N4004

D8
1N5220
3.9V

F7 1/2 S-B 250V

C2
100uf
25V

D3
1N4001

F1 7A S-B 250

DB1
CM3501

D2
1N4001

C3
47uf
63V

11
12
6

R2
2.15K
1%

5

M

CN10X3
1
2
3

F2 7A S-B 250

C1
1000uf
25V

C4
18000uf
25V

D13
1N5401

D14
1N5401

R3
4.99K
1%

CN9X4
1
2
3
4

RY1
24VDC/10A

2   6
4   5
1
3
8   7

CN7X5
1
2
3
4
5

D1
1N4001

NOTES:
-ALL RESISTOR V
 UNLESS OTHERWI
-ALL CAPACITOR V
 UNLESS OTHERWI
-D12 NOT USED.

H   G   F

Connector 1 (left):
4, 5 LAMP, 6 +16VDC, 7, 8 LAMP, 9, 10 GROUND, 11, 12

CN5X — 1 GROUND, 2 -96VDC, 3 -110VDC, 4 +68VDC, 5 +12VDC, 6 +5VDC, 7 KEY, 8 N.C.

7812 VR1

TP1 +5VDC
TP2 LOGIC GROUND
TP3 +12V UNREG.
TP4 -12V UNREG.

C15 22uf 25V
C14 22uf 25V
R16 1.5K
C16 .1 500V

TR3 MJE15030

D6 1N5228 3.9V
R12 1.5K 1/2W
TR1 MPSA92
D9 1N4760B 68V
C13 0.1 500V
R11 330K 1/2W
R14 2K 5W
TR6 MJE15030
R8 47K 1W

D11 1N4764 100V
R9 47K 1W
TR2 MPSA42
D10 1N4743 13V
R13 1.5K 1/2W
C12 0.1 500V
R10 330K 1/2W
TR4 MJE15031
R17 1.5K 1/2W

CN6X15
1 LOGIC GROUND
2 -12VDC UNREG.
3 +12VDC UNREG.
4
5 KEY
6 +12VDC UNREG.
7 +5VDC
8 +5VDC
9 +5VDC
10 +5VDC
11 LOGIC GROUND
12 LOGIC GROUND
13 LOGIC GROUND
14 LOGIC GROUND
15 LOGIC GROUND

TR5 2N6057
R5 270 1%
R6 0.12 5W
IC1 CT723CP
R1 2.74K 1%
D4 1N4001
R7 1.5K 1%
R4 1.5K
C5 470pf
C6 0.1 50V
C7 330uf 25V

CN8X9
1
2
3
4
5 GENERAL ILLUMINATION
6
7
8
9

VALUES ARE IN OHMS, 5%, 1/4W, ...SE SPECIFIED.
...VALUES ARE IN MICROFARADS, ...SE SPECIFIED.

DATA EAST PINBALL
POWER SUPPLY BOARD SCHEMATIC

PREPARED BY: CES INC.
DWG SIZE C
PART NO. 520-5047-02
SHEET 1 OF 1
MODEL
REV A

CN2

+5 GND -12 ▽ +12

1 9

FB1 FB3 FB5 R25
C29 C37 C51
FB2 FB4 FB6
C38 C52 C53 C54

C39 R18 C55
R19
C56
VR1 VR2 C57
C59 C58

C31 C30 U31

C60

C40 C61
C32 C41 C62
C42 C63

U25 R12

74LS74 U28 R20 CN3
LM833 R21
C43 C64
C33 C44 C65
R7 R13 C66 P0T1
R14
U26 R15
TDA1543 C45
C46 U32

C34 U29

C35 C67

R8 SSM2024
R9 C68
R10 C69
R11 C70
C47
R16 R22 CN4
C48 R23
R24 SP1
U27 U30 C71 SP2
74LS74 LM833 C72 ▽ SP3
C73
C49
C50 C74
R17 U33

D E
DATA
EAST

520-5050-00   REV.-C

76 **Display Controller Board**

D

U6 — 74LS157
E · 15 G · SEL
BA2 2 1A
CA5 3 1B
BA3 5 2A
CA6 6 2B
BA0 11 3A
CA3 10 3B
BA1 14 4A
CA4 13 4B
1Y 4 MA2
2Y 7 MA3
3Y 9 MA0
4Y 12 MA1

U3 — 74LS157
E · 15 G · SEL
BA4 2 1A
RA1 3 1B
BA6 5 2A
RA3 6 2B
BA7 11 3A
RA4 10 3B
BA5 14 4A
RA2 13 4B
1Y 4 MA4
2Y 7 MA6
3Y 9 MA7
4Y 12 MA5

U7 — 74LS157
E · 15 G · SEL
BA8 2 1A
CA7 3 1B
BA10 5 2A
CA8 6 2B
BA11 11 3A
CA9 10 3B
BA9 14 4A
RA0 13 4B
1Y 4 MA8
2Y 7 MA10
3Y 9 MA11
4Y 12 MA9

U4 — 74LS157
E · 15 G · SEL
+5V 2 1A
XA7 3 1B
CA12 5 2A
ZA0 6 2B
CA10 11 3A
XA6 10 3B
CA11 14 4A
13 4B
1Y 4 N.C.
2Y 7 MA14
3Y 9 MA12
4Y 12 MA13

DDATA
XA8
XA7

ZA0
CORE
BSE
RAMCS
BWR

DDATA
CA6

U20B — 74LS74A
D 12 · PR 10 · Q 9 N.C.
CP 11 · CLR 13 · Q 8 N.C.
+5V

DOTCLK

U8 — 62256
A0 10 MA0
A1 9 MA1
A2 7 MA2
A3 6 MA3
A4 5 MA4
A5 4 MA5
A6 3 MA6
A7 25 MA7
A8 24 MA8
A9 21 MA9
A10 23 MA10
A11 2 MA11
A12 26 MA12
A13 1 MA13
A14 MA14
I/O0 11
I/O1 12
I/O2 13
I/O3 15
I/O4 16
I/O5 17
I/O6 18
I/O7 19
CS 20
OE 22
WE 27

U9 — 68B45
+5V 20 VCC
CRTCCS 25 CS
BA0 24 RS
E 23 E
RESET 2 RESET
BWR 22 R/W
DOTCLK 21 CLK
HS 39 HS
N.C. 40 VS
DE 18 DE
CURSOR 19 CURSOR
LPSTB
VSS
MA0 4 CA0
MA1 5 CA1
MA2 6 CA2
MA3 7 CA3
MA4 8 CA4
MA5 9 CA5
MA6 10 CA6
MA7 11 CA7
MA8 12 CA8
MA9 13 CA9
MA10 14 CA10
MA11 15 CA11
MA12 16 CA12
MA13 17 CA13
BD0 33 D0
BD1 32 D1
BD2 31 D2
BD3 30 D3
BD4 29 D4
BD5 28 D5
BD6 27 D6
BD7 26 D7
RA0 38 RA0
RA1 37 RA1
RA2 36 RA2
RA3 35 RA3
RA4 34 RA4

CA0
CA13

U2 — PAL16R4
OE 11 · CLK
CURSOR 2
HS 3
DDATA 4
RA0 5
DE 6
CRTCCS 7
CA0 8
CA13 9
I/O 19 FING
I/O 18 DE
Q 17 SDATA
Q 16 RDATA
Q 15
Q 14 N.C.
I/O 13 PCLK
I/O 12 CLATCH

C

RESET
ROMCS

BWR
FING

RESET
ROMCS

RAO

CRTCCS

FING

U11 — 68B09E
D0 31
D1 30
D2 29
D3 28
D4 27
D5 26
D6 25
D7 24
A0 8 BA0
A1 9 BA1
A2 10 BA2
A3 11 BA3
A4 12 BA4
A5 13 BA5
A6 14 BA6
A7 15 BA7
A8 16 BA8
A9 17 BA9
A10 18 BA10
A11 19 BA11
A12 20 BA12
A13 21 BA13
A14 22 BA14
A15 23 BA15
VCC 7
NMI 2
FIRQ 4
IRQ 3
TSC 39
VSS 1
LIC 36 N.C.
AVMA 36 N.C.
R-W 32
BA 6 N.C.
BS 5 N.C.
BUSY 33 N.C.
E 34
Q 35
HALT 40
RESET 37

R12 10K +5V

U1B — 74HCT240
G 19
A1 2 Y1 9
A2 13 Y2 7
A3 15 Y3
A4 17 Y4 3
E
RST

U1A — 74HCT240
G 1
A1 18 Y1
A2 4 Y2
A3 6 Y3
A4 8 Y4
RDATA
PCLK
CLATCH
RA0

CN1-1 DE
CN1-2 GND
CN1-3 ROW DATA
CN1-4 GND
CN1-5 ROW CLK
CN1-6 GND
CN1-7 COL LATCH
CN1-8 GND
CN1-9 PIX CLK
CN1-10 GND
CN1-11 SDATA
CN1-12 GND
CN1-13 N.C.
CN1-14 N.C.

B

C5 C6 C1 C2 C3 C4

C1-C6 = 470pf

U13A — 74LS74A
D 2 · PR 4 · Q 5 E
CP 3 · CLR · Q 6 E
+5V

U16 — PAL16L8
BA15 2
BA14 3
BA13 4
BA12 5
XA0 6
BWR 7
BA1 8
XA5 9
G 11
I/O 19 RAMWR
I/O 18 ROMCS
I/O 17 PORTIN
I/O 16 CRTCCS
I/O 15 CORE
I/O 14 BSE
I/O 13 RAMCS
I/O 12 ZA0

A

DATA EAST

DOT MATRIX CONTROLLER BOARD

BOARD NAME:

PART NO. 520-5055-00
PREPARED BY: C.E.S. INC.
SIZE D
SHEET 1 OF 1
REV D

RST

CN1

C13 C16 C18

C1
C2
C3
C4
C5
C6
C7

C9

U6
74LS157

U9
68B45

U11
68B09

U3
74LS157

C14

U7
74LS157

U1
74HCT240

C10

U4
74LS157

C15

R1
R2
R3
R4
C17

C19
ROM 0
U12

C8

U8
RAM

U10
74LS245

U2
PAL16R4

C11

U5
74LS151

FB2
C53
FB1

CN2
3   1
GND   +5V

C12

DATA
EAST

C20

R5

R6

U13

74LS74

C21

X1   8MHZ

C22

ROM 1

U14

RESET   CN3

R13   C36   C44

C23   C27   C37   C45

R7   C28   C38   C46

C24   C29   C39   C47

R8   C30   C40   C48

R9   C31   C41   C49

R10   C32   C42   C50

R11   C33   C51

R12   C34   R19

                        R20
C25   U17   R21

                        R22
U15   SW1   R23

        74LS245 ON   R24

HCT00   R14   R25

                C43   R26

C26   C35   C52

U16   U18   U19   U20

PAL16L8 74LS374 74LS163 74LS74

R15

R16

R17

R18

REV.-D
520-5055-00

AREA USAGE 1 17 P

PART NO.	INTL CODE
281103-01	S

Vcc R19 20K
C14 10uF
D3 1N914
Vcc

U9 SN74LS74
1 5 2 6 3 4
Vcc
Vcc

10 12 D U9 SN74LS74 Q 9
11 CLK Q 8
13 S
Vcc

U6
3 4
5 6
9 8

P1
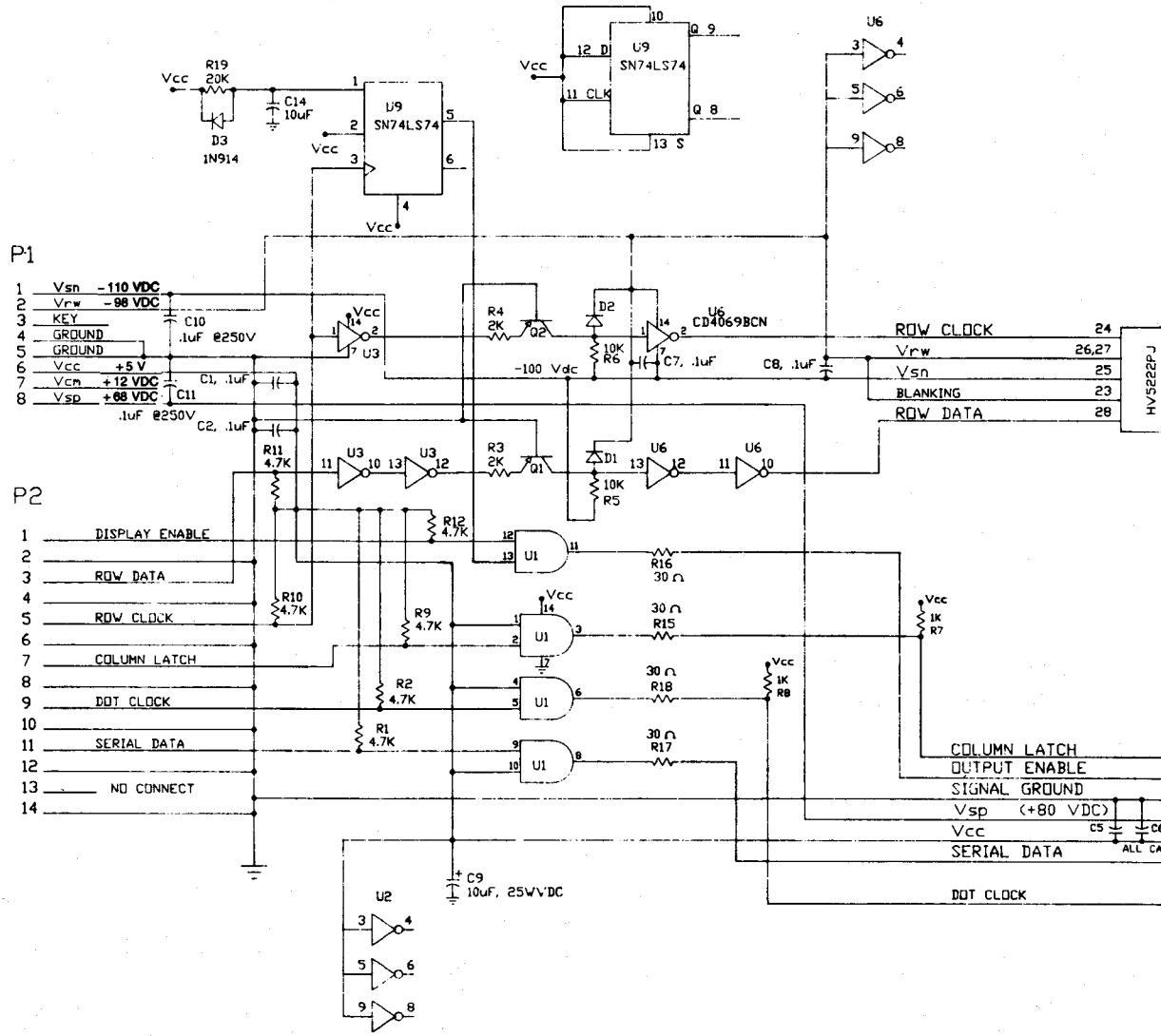
1 Vsn -110 VDC
2 Vrw -98 VDC
3 KEY
4 GROUND
5 GROUND
6 Vcc +5 V
7 Vcm +12 VDC
8 Vsp +68 VDC

C10 .1uF @250V
C1, .1uF
C11 .1uF @250V
C2, .1uF

Vcc
U3 1 2 7 14

R4 2K Q2
D2
R6 10K
-100 Vdc
U6 CD4069BCN
1 14
C7, .1uF
C8, .1uF

ROW CLOCK 24
Vrw 26,27
Vsn 25
BLANKING 23
ROW DATA 28

HV5222PJ

R11 4.7K
U3 11 10 13 U3 12
R3 2K Q1
D1
U6 13 12 U6 11 10
R5 10K

P2

1 DISPLAY ENABLE
2
3 ROW DATA
4
5 ROW CLOCK
6
7 COLUMN LATCH
8
9 DOT CLOCK
10
11 SERIAL DATA
12
13 NO CONNECT
14

R10 4.7K
R12 4.7K
12 13 U1 11
R16 30Ω

R9 4.7K
Vcc 14
1 2 U1 3
R15 30Ω

R2 4.7K
17 4 5 U1 6
R18 30Ω

R1 4.7K
9 10 U1 8
R17 30Ω

Vcc 1K R7
Vcc 1K R8

COLUMN LATCH
OUTPUT ENABLE
SIGNAL GROUND
Vsp (+80 VDC)
Vcc
SERIAL DATA

C5 C6
ALL CA

DOT CLOCK

U2
3 4
5 6
9 8

C9 10uF, 25WVDC

NOTES

78 Display Drivers, Drawing 1

REVISIONS				
ZONE	SYM	DESCRIPTION	DATE	APPROVED

D

C

GND
B 220K
32 OUTPUTS
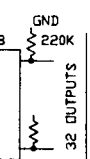
CATHODE CONNECTIONS

DALE PLASMA DISPLAY
PD-128G032

ANODE CONNECTIONS   ANODE CONNECTIONS

32 OUTPUTS   32 OUTPUTS   32 OUTPUTS   32 OUTPUTS

ALL RESISTORS
ARE 27K OHM
X 128 RESISTORS

HV9308PJ   HV9308PJ   HV9308PJ   HV9308PJ

18 22 26 28 23 24 25 27   18 22 26 28 23 24 25 27   18 22 26 28 23 24 25 27   18 22 26 28 23 24 25 27

C4   C3
PACITORS ARE .1uF.

FOLD
B

281103

CLASS 2

UNLESS OTHERWISE SPECIFIED		
DIMENSIONS ARE IN INCHES		METRIC
TOLERANCES ON		
FRACTIONS	DECIMALS	ANGLES	MILLIMETERS
21/64	.XX ±.01		.XX±.25
	.XXX ±.005	0°30'	.XXX±.127
	.XXXX ±.0005		.XXXX±.0127

MATERIAL
_____

FINISH
_____

SIGNATURES	DATE
DR _Jan M. Matejka_	92-02-21
CHKD _Vera Krooman_	92-03-06
DSGN _T. SHANK_	92-02-06
SR PROJ ENGR	
SECT SUPVR	
APPD _KEITH RAYSBY_	92-03-07

DALE ELECTRONICS, INC.
A COMPANY OF VISHAY
COLUMBUS, NEBRASKA

TITLE
ELECTRICAL SCHEMATIC
APD-128G032

SIZE	CODE IDENT NO.	DRAWING NO.
D	91637	281103

SCALE NONE   SHEET 1 OF 1

A

P3

P4

R1 - R32
(32) 22K, 1/4W

R33 - R64
(32) 22K, 1/4W

U1

HV24 HV41
HV23 HV42
HV22 HV43
HV21 HV44
HV20 HV45
HV19 HV46
HV18 HV47
HV17 HV48
HV16 HV49
HV15 HV50
HV14 HV51
HV13 HV52
HV12 HV53
HV11 HV54
HV10 HV55
HV9   HV56
HV8   HV57
HV7   HV58
HV6   HV59
HV5   HV60
HV4   HV61
HV3   HV62
HV2   HV63
HV1   HV64

HV7708

+5V

Vap

C18
.1uf 100V

C1
.1uf 50V

R129 - R160
(32) 100K, 1/4W

P7

32 CONN

Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22

U3
HV5222PJ

DO

ENB
CLK
SUBSTRATE
VCC
STROBE
DI

Vpw

R164
4.7K

R163
4.7K

Q2
MMBT4401

Vsn

Q4
MMBT4401

R166
4.7K

C3
.1uf 50V

Van

C7
.01uf 50V

Van

DISPLAY   GP-C

COL[0:32]

COL[01:32]   COL[33:64]

R1 27K   R2 27K   R33 27K   R34 27K   R64 27K

U1 SN75555FN   U2 SN75555FN

C5
.1 uF

C6
.1 uF
100V

C7
.1 uF
100 V

C8
.1 uF

BYPASS CAPS LOCATED NEAR IC'S

P2
INPUT

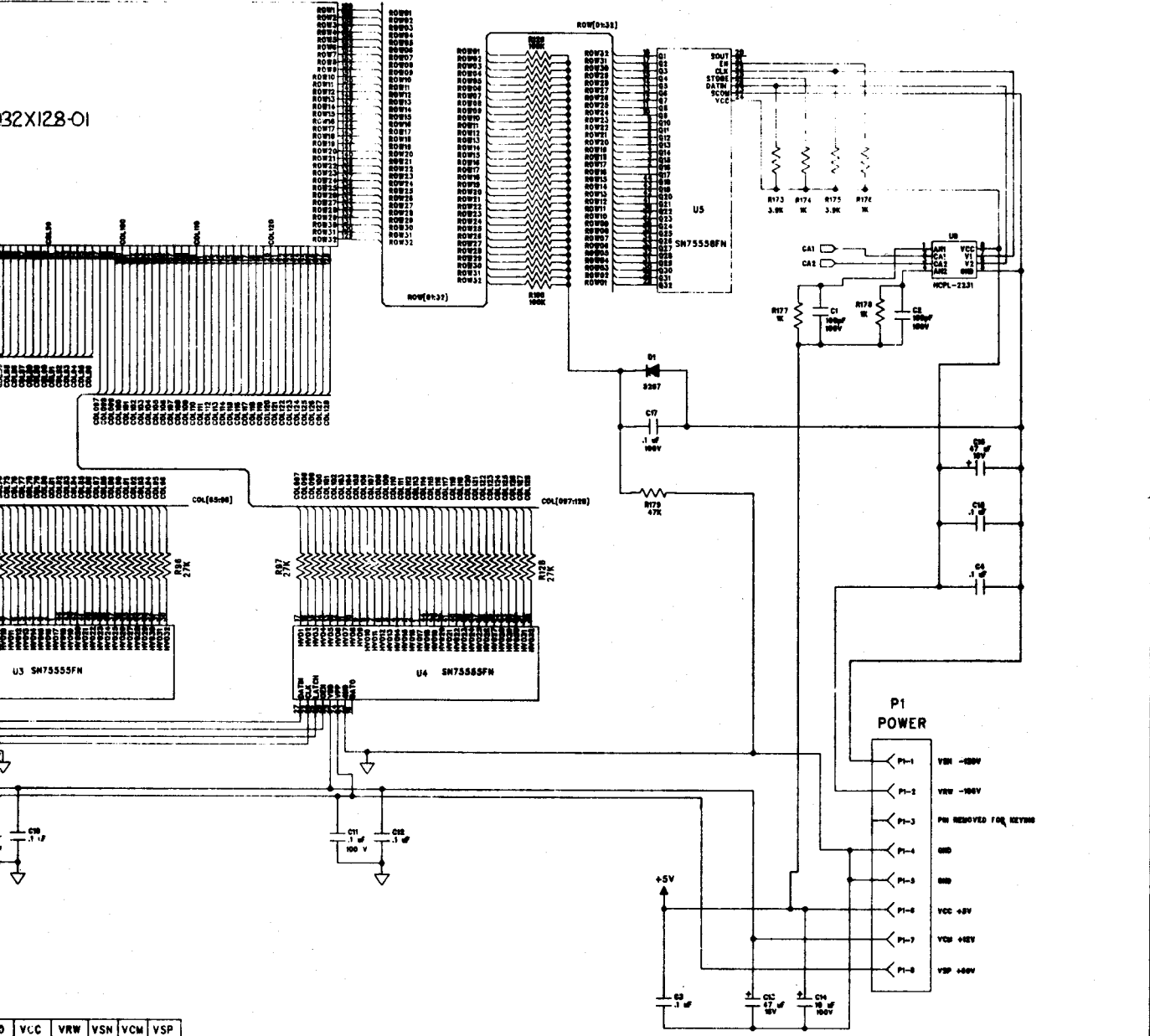|			
DE	P2-1	R101 47K	R167 100	U8F 74HC04	U7B DS88L12
	P2-2				
RDATA	P2-3	R102 47K	R168 100	U8E 74HC04 CA2	U7C DS88L12
	P2-4				
RCLK	P2-5	R103 47K	R169 100	U8D 74HC04 CA1	U7F DS88L12
	P2-6				
COLLAT	P2-7	R104 47K	R170 100	U8C 74HC04	U7D DS88L12
	P2-8				
DOTCLK	P2-9	R105 47K	R171 100	U8B 74HC04	U7E DS88L12
	P2-10				
SDATA	P2-11	R106 47K	R172 100	U8A 74HC04	U7A DS88L12
	P2-12				
	P2-13				
GND	P2-14				

REF DES	QN
U1 - U4	23
U5	
U6	7
U7	7
U8	

2. RESISTOR VALUES ARE IN OHMS, 1/8 WATT, 5%.
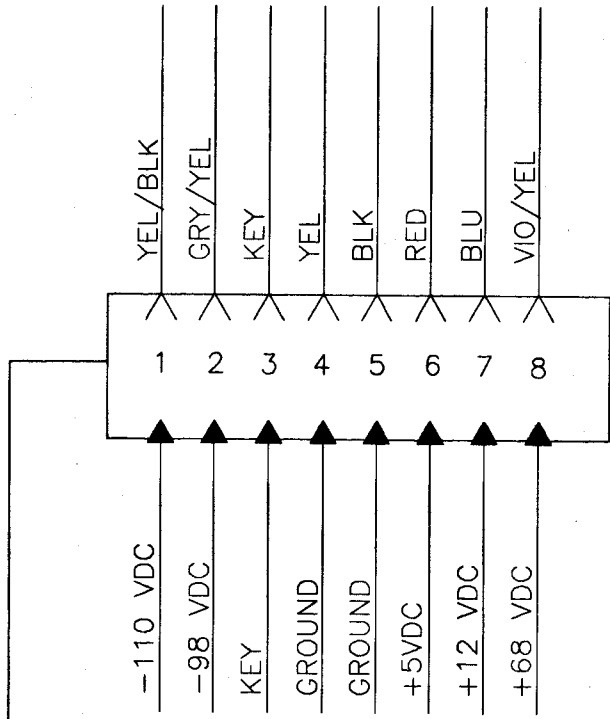1. CAPACITOR VOLTAGES ARE 50V, 20%.
NOTES: UNLESS OTHERWISE SPECIFIED.

132X128-01

U5 SN7555BFN

U3 SN75555FN

U4 SN7555SFN

P1 POWER

	P1-1	VSN -180V
	P1-2	VRW -100V
	P1-3	PIN REMOVED FOR KEYING
	P1-4	GND
	P1-5	GND
	P1-6	VCC +5V
	P1-7	VCM +12V
	P1-8	VSP +90V

+5V

	VCC	VRW	VSN	VCM	VSP
				25	24
		24	23		
	14				
				14	
		8	5		

PI

Connector pins 1-8 (top labels / wire colors):
- 1: YEL/BLK
- 2: GRY/YEL
- 3: KEY
- 4: YEL
- 5: BLK
- 6: RED
- 7: BLU
- 8: VIO/YEL

Connector pins 1-8 (bottom labels):
- 1: −110 VDC
- 2: −98 VDC
- 3: KEY
- 4: GROUND
- 5: GROUND
- 6: +5VDC
- 7: +12 VDC
- 8: +68 VDC

RIBBON CABLE P2

	DISPLAY ENABLE	ROW DATA	ROW CLOCK	COL. LATCH	PIX CLOCK	SER. DATA	NOT USED	
	GROUND	GROUND	GROUND	GROUND	GROUND	GROUND	NOT USED	
2	O	O	O	O	O	O	O	14
1	O	O	O	O	O	O	O	13

RIBBON CABLE
P2

RIBBON CABLE
CNI

	DISPLAY ENABLE	ROW DATA	ROW CLOCK	COL. LATCH
	GROUND	GROUND	GROUND	GROUND
2	O	O	O	O
1	O	O	O	O

DOT MATRIX BOARD
520-5052-00

CABLE

	GROUND	GROUND	NOT USED		
	PIX CLOCK	SER. DATA	NOT USED		
	o	o	o	14	2
	o	o	o	13	1

RIBBON CABLE
CN3

	NOT USED	SWITCH 2	SWITCH 4	SWITCH 6	SWITCH 8	DATA 1	DATA 3	DATA 5	DATA 7	RESET	STAT 0	STAT 2	BUSY	
	NOT USED	SWITCH 1	SWITCH 3	SWITCH 5	SWITCH 7	DATA 0	DATA 2	DATA 4	DATA 6	STROBE	NOT USED	STAT 1	STAT 3	
2	o	o	o	o	o	o	o	o	o	o	o	o	o	26
1	o	o	o	o	o	o	o	o	o	o	o	o	o	25

RED   KEY   BLK

| 1 | 2 | 3 |

CN2

+5 VDC   KEY   GROUND

CONTROLLER BOARD
520-5055-00

4 N.C.

R46 15K
Q17 2N3906
R44 4.7K
+5
R48 2.2M
U3c 4093 10
R50 2.2K
R9 470
L3 LED
Q44 MPSA42
R52 2K/5W
R41 47
R40 82
Q15 TIP32C
Q16 TIP36C
D11 1N4004
R51 100

R26 390K
U2b 4093 5 6 4 N.C.
C6 0.1 MYLAR
U2c 4093 9 8 10
R36 2.2M
SR3 S2800B
D14 1N5402
D15 1N5402
R31 2.2K
R30 470
Q11 2N3906
R25 15K
R24 4.7K
Q8 MPSA42
L2 LED
+5
R53 22K
R18 2K/5W
R20 47
R19 82
Q9 TIP32C
Q10 TIP36C
D6 1N4004
D9 1N5402
D5 1N5402
D10 1N5402
D4 1N5402
R55 22K

F5 3A
CN2-1 COIL "C"
CN2-2 COIL "C"
F3 3A
CN2-3 NOT USED
CN2-4 COIL "B"
CN2-5 COIL "B"
F1 3A
CN2-6 KEY
CN2-7 COIL "A"
CN2-8 COIL "A"
F4 3A
CN2-9 8.0VAC
F2 3A
CN2-10 8.0VAC
CN2-11 +50.0VDC
CN2-12 +50.0VDC

(Fig 1)

Solid State Flipper Switch
Wiring Diagram

(Hold CKT. Enable)

Flipper Switch "A"
(SSFB - CN1 - 7)

Flipper
Cabinet
Switch

(Normally
Open)

← (BLU/VIO)

GND
(SSFB - CN1 - 6)

↑
(BLK)

E.O.S. - Switch
Mounted on
Flipper Ass'y

(Normally
Closed)

(BRN/VIO)
↓

E.O.S. "A"
(SSFB - CN1 - 1)

(One Shot Enable)
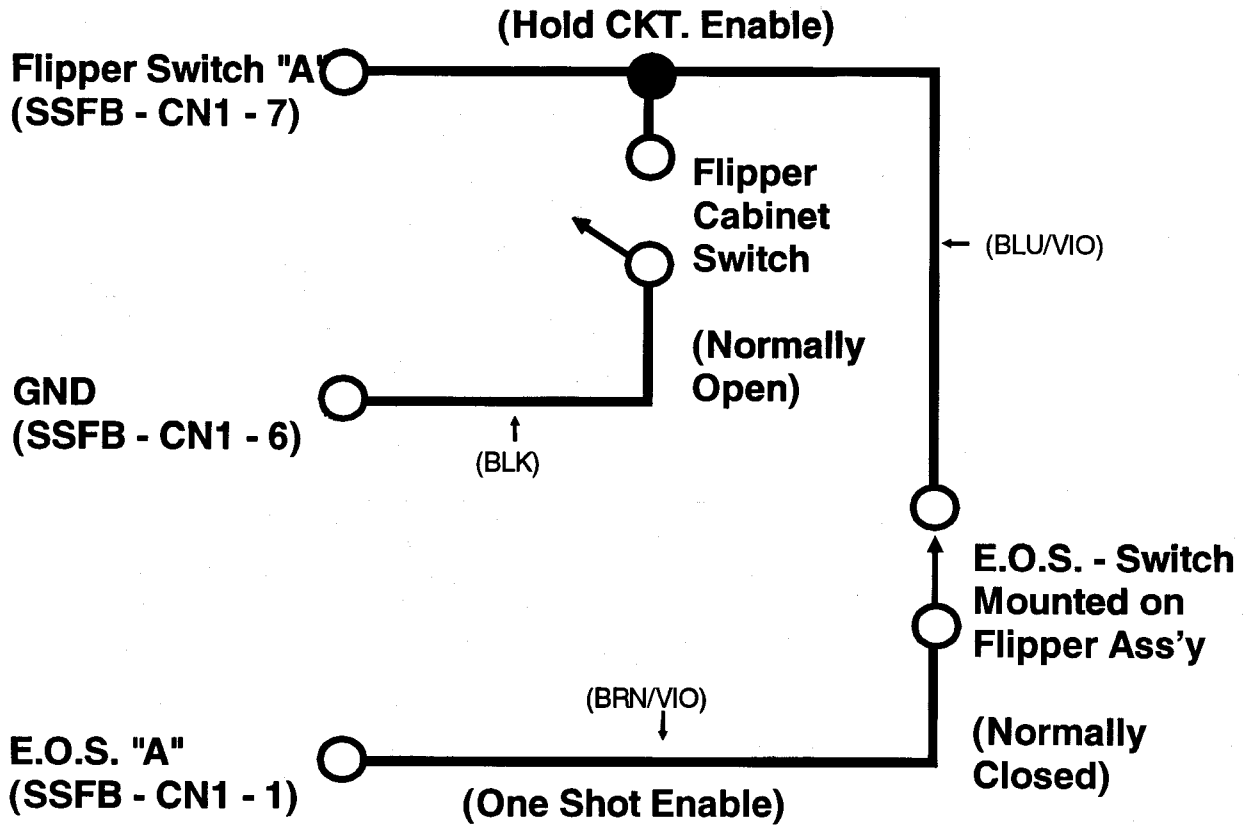
Theory of Operation
for the Solid State Flippers

The Solid State Flipper Board is a Multiple Flipper Solenoid Driver Circuit.
Each solenoid driver circuit contains a One Shot Timer, a 50V Driver, and
an 8V Driver.

Looking at one circuit, Schmidt NAND gates U1A, U1b, and U1D make
up the One Shot Timer. The timer length is controlled by R10, R33 and
C2. The output of the timer is gated at U1C with the buffered switch in-
put from Q6. The output of U1C controls the 50V driver circuit consisting
of Q4, Q1, Q2, Q3, and D1. As long as the flipper button is activated, Q6
will keep the 8V driver circuit, SR1, on.

The 50 volts provides the actuation power to the flipper solenoid while
the 8 volts provides the holding power.

E.O.S. Switch
Theory of Operation

The End of Stroke (E.O.S.) Switch used in our flipper circuit is a Gold Peened Contact, Blade Switch Assembly, mounted on the flipper assembly.

Electrically, it is connected in series with the Cabinet Flipper Switch and the Flipper E.O.S. input on the Solid State Flipper Board (S.S.F.B.) connector CN1 which enables the 50 Volt DC Drive Circuit.

Refering to Fig. 1, one side of the Flipper Cabinet Switch is connected to ground (BLK-Wire), the other side (BLU-VIO Wire) is connected to the flipper switch input on the S.S.F.B. connector CN1 which enables your 9 Volt DC holding voltage and is connected in series to the E.O.S. switch which is a normally closed switch.

The function of the E.O.S. switch is to prevent the flipper bat from being knocked back by a high velocity shot on the playfield. If while holding the flipper in the up position, the bat is moved back 1/16" or more, the E.O.S. switch will close giving the coil another 50 Volt pulse.

E.O.S. Switch Adjustment

The switch contacts should be adjusted so that when the solenoid is energized, the contacts stay closed for almost the full travel of the plunger. The contacts should open 1/16" before the plunger bottoms out or reaches maximum travel.

Troubleshooting Tips

If the switch contacts are not making, then the series circuit to the 50 Volt Drive Circuit Enable will be broken causing the flipper not to work at all. This is also indicated by the L.E.D. on the S.S.F.B. not flashing when the cabinet flipper switch is closed. This can be easily determined by taking a jumper wire and shorting the switch. If proper adjustment of the switch does not resolve the problem, then replacement will be necessary.

Note: You may solder the two wires together going to the switch and bypass it completely, until a replacement is installed.

C UPPER RIGHT FLIPPER COIL 22-1080

SOLID STATE FLIP.PCB CN2-1,2 BLK-YEL

CPU BD. CN19-1 ORN-VIO

B LEFT FLIPPER COIL 22-1080

SOLID STATE FLIP.PCB CN2-4,5 GRY-YEL

CPU BD. CN19-2 ORN-GRY

A RIGHT FLIPPER COIL 22-1080

SOLID STATE FLIP.PCB CN2-7,8 BLU-YEL

CPU BD. CN19-1 ORN-VIO

	CN1		CN2		
UP.FLIP.SW. GRY-VIO	12 UPPER FLIP.ENABLE		1 BLK-YEL	UPPER FLIP.COIL	UPPER FLIP. POWER
LEFT FLIP.SW. BLU-GRY	11 LEFT FLIP.ENABLE		2 BLK-YEL	UPPER FLIP.COIL	
	10 NOT USED		3		
LEFT FLIP.EOS BRN-GRY	9 LEFT FLIP. EOS		4 GRY-YEL	LEFT FLIP.COIL	LEFT FLIP. POWER
PS CN6-10 GRY-WHT	8 + 5VDC		5 GRY-YEL	LEFT FLIP.COIL	
RIGHT FLIP.SW. BLU-VIO	7 RIGHT FLIP.ENABLE		6 KEY		
CPU CN5-7 BLK	6 GND		7 BLU-YEL	RIGHT FLIP.COIL	RIGHT FLIP. POWER
CPU CN10-2 WHT-VIO	5 SW.RETURN 7		8 BLU-YEL	RIGHT FLIP.COIL	
CPU CN8-9 GRN-GRY	4 SW.DRIVE 8		9 GRY	PS CN1-11	8VAC
CPU CN10-1 WHT-GRY	3 SW.RETURN 8		10 GRY-GRN	PS CN1-10	8VAC
	2 KEY		11 BLK-WHT	PPB J7-1	50VDC
RIGHT FLIP.EOS BRN-VIO	RGT.FLIP. EOS		12 BLK-WHT	PPB J7-5	50VDC

SOLID STATE 3 FLIPPER PCB

520-5033-03

Solid State Flippers
PCB Wiring Diagram

Connector CN 1

Pin#	Goes to	Wire Color	It Is
1	Rgt. Flipper EOS	BRN-GRY	Rgt. Flip. End of Stroke
2			Key
3	CPU CN 10-1	WHT-GRY	Sw. Ret. 8
4	CPU CN 8-9	GRN-GRY	Sw. Drive 8
5	CPU CN 10-2	WHT-VIO	Sw. Ret. 7
6	Rgt. Flip. Sw.	BLU-VIO	Rgt. Flip. Enable
7	CPU CN 5-9	BLK	GND
8	PS CN 6-10	GRY-WHT	+5V DC
9	Lft. Flip. EOS	BRN-GRY	Left Flip. End of Stroke
10			
11	Lft. Flip. Sw.	BLU-GRY	Lft. Flip. Enable
12	Upper Rgt. Flip. Sw.	GRY-VIO	Upper Rgt. Flip. Enable

Connector CN 2

Pin #	Goes To	Wire Color	It Is
1	Upper Rgt. Flip. Coil	BLK-YEL	Upper Rgt. Flip. Power
2	Upper Rgt. Flip. Coil	BLK-YEL	Upper Rgt. Flip. Power
3			Not Used
4	Lft. Flip. Coil	GRY-YEL	Lft. Flip. Power
5	Lft. Flip. Coil	GRY-YEL	Lft. Flip. Power
6			Key
7	Rgt. Flip. Coil	BLU-YEL	Rgt. Flip. Power
8	Rgt. Flip. Coil	BLU-YEL	Rgt. Flip. Power
9	PS CN 1-11	GRY	9V AC
10	PS CN 1-10	GRY-GRN	9V AC
11	PPB J7-1	BLK-WHT	50V DC
12	PPB J7-5	BLK-WHT	50V DC

Solid State Flipper Circuit Troubleshooting Flowchart

START

Check End-of-Stroke (EOS) Switch mounted on the flipper ass'y.

(Normally Closed (N.C.) Switch)

Check Flipper Switch mounted on side of cabinet.

(Normally Open (N.O.) Switch)

Check wiring & connections from CN1 to EOS to

Does Flipper energize?

YES → Does Flipper remain energized when button is held?

YES → **OK!**

NO → Check Fuses F2 & F4 on Solid State Flipper Board (SSFB).

NPF → Check connector CN2 on SSFB Pins 9&10 for 8V AC.

YES

Does Flipper energize? NO → Does LED flicker on Solid State Flipper Board?

YES → Check Fuses on Solid State Flipper Board (SSFB) F1, F3 & F5

NO →

Check 2-Pin connector (GRY & GRY/GRN Wire) beneath head in Cabinet for continuity. Check output voltage from transformer.

NO

NPF

Replace Solid State Flipper Board (SSFB).

Check wiring & connections.

NPF

Check connector CN2 on SSFB Pins 11&12 for 50V DC.

NO

Check F5 (5Amp Slo-Blo) on PPB.

NPF

Check connector J7, Pins 1,2,3 for 50V DC on PPB.

YES

NO

YES

cabinet switches.

GND connector CN1 Pins 1 & 12 on SSFB; Does LED flicker?

NO

YES

Replace Solid State Flipper Board (SSFB).

Replace PPB.

Note: NPF = No Problem Found

DATA EAST LIMITED WARRANTY

Data East USA, Inc., ("Seller") warrants only to the initial purchaser of its products that the items listed below are free from defects in material and workmanship under normal use and service for the warranty period specified:

PRINTED CIRCUIT BOARDS (GAME LOGIC) 60 DAYS

No other parts of Seller's product are warranted.

Warranty periods are effective from the initial date of shipment from Seller to its authorized distributors.

Seller's sole liability shall be, at its option, to repair or replace products which are returned to Seller during the warranty periods specified, provided:

1. Seller is notified promptly upon discovery by purchaser that stated products are defective.

2. Such products are properly packaged and then returned freight prepaid, to Seller's plant.

This warranty does not apply to any parts damaged during shipment and/or due to improper handling, or due to improper installation or usage, or alteration. In no event shall the Seller be liable for any anticipated profits, loss of profits, loss of use, accidental or consequential damages or any other losses incurred by the customer in connection with the purchase of a Data East USA., product.
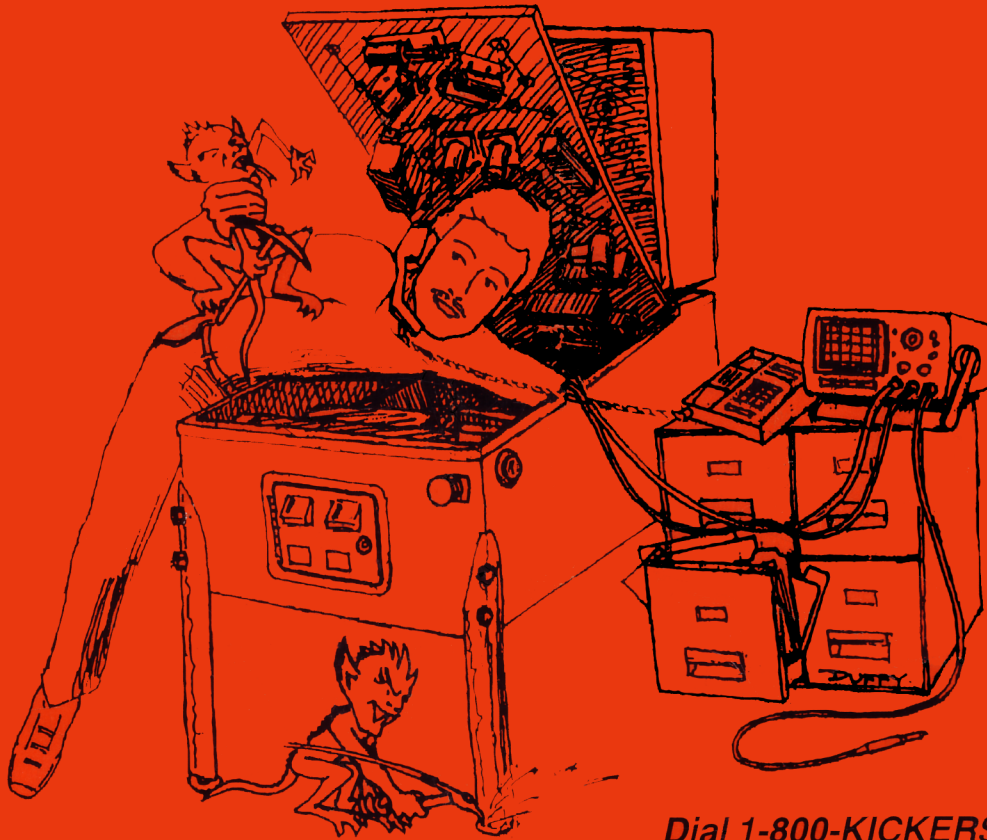
WARRANTY DISCLAIMER

EXCEPT AS SPECIFICALLY PROVIDED IN A WRITTEN CONTRACT BETWEEN SELLER AND PURCHASER, THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

WARNING--This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Data East Pinball, Inc.
Technical Support
1-800-KICKERS

Need Technical Advice?

Dial 1-800-KICKERS