featuring our unique

Find-It-In-Front: Dr. Pinball Section

DR. DR. DR. DR.

SEGA™ PINBALL, INC. 10th ANNIVERSARY

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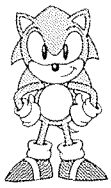
Please call us at 1-800-542-5377 or 1-708-345-7700 for Technical Support.

 SPI Part N°: **780-5056-00**

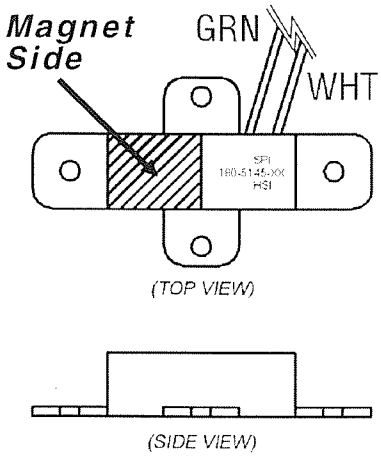
WOW! Look what's new at Sega Pinball!



We continually strive to decrease the amount of maintenance required on the playfield like improving the reliability of playfield switches and the accuracy of switch closures during game play. This of course, satisfies both the needs of the operator and the player!

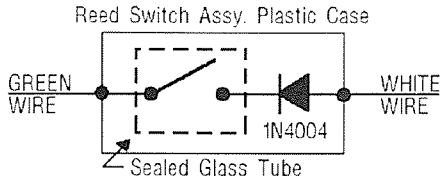
How do we do this?! Simplify, simplify, simplify... — how many times have we said this and found that it really works! In **Apollo 13**, we introduced the first Switch Membrane Switch Assembly used in the 8-Ball Trough Assembly and since then, have had almost no failures. In **Golden Eye** we had introduced the Happ Controls Modular Stand-Up Target; In **Space Jam** we had introduced the New Reed Switch Ball Sensor. Both are being used with great success!

The Reed Switch Ball Sensor



Shown below is the *Theory of Operation* for this *new sensor* which can be used in any Roll-Over or Roll-Under Switch application. In this game we are utilizing them on the Super VUK, X-Wing, Plastic Ramp (Big) and Trough Assemblies.

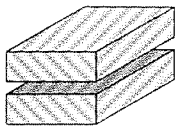
The advantage is that this sensor has much greater accuracy than *standard switches*, has a built-in Diode (1N4004) and requires no adjustments or maintenance at all. The only special requirement is the *use* of ***non-magnetic fasteners***. We are currently using ***non-magnetic stainless steel screws*** but brass and aluminum will also work. The reason for this is, a fastener that is **not** made of *non-magnetic material* can become magnetized and affect the balanced magnetic field within the sensor of the Reed Switch Assembly. This can affect the accuracy with which it senses the ball.



Overview of this switch: Consists of a Diode (1N4004) and a HSR-042 Reed Switch. The Cable Wiring Harness has the Green Wire going to the switch and the White Wire going to the Anode side of the Diode. The Contact Rating is 100 Volts AC/DC, 0.2 Amps AC/DC, 4 Watts (Resistance Load) & 2 Watts (Inductive Load). The Temperature Operation Range: 0-150° F.

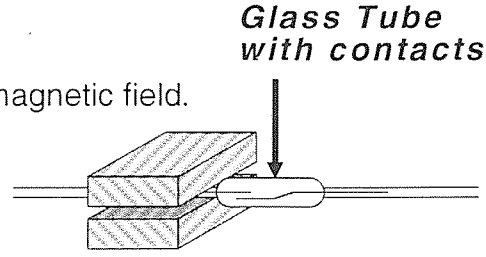
Theory of Operation

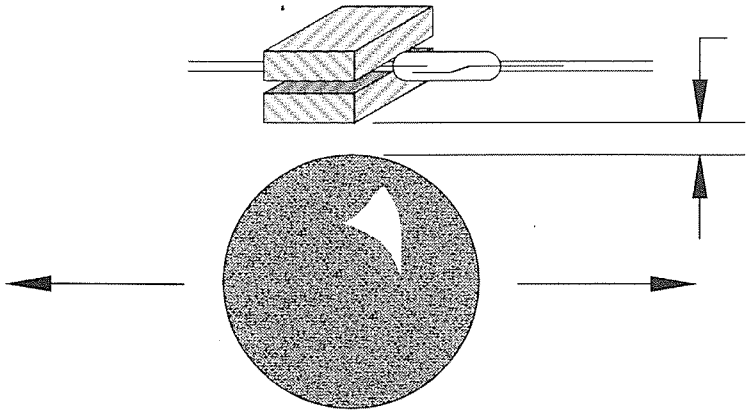
Here's how it works:



Two magnets of equal strength creating a balanced magnetic field.

The Reed Switch is positioned in the balanced field.

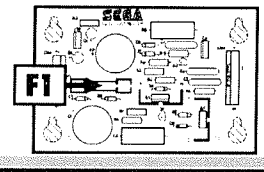




As a pinball passes in close proximity to the bottom magnet, it disturbs the balanced field. The lower magnet is strengthened by the presence of the pinball, thus operating the Reed Switch contacts.

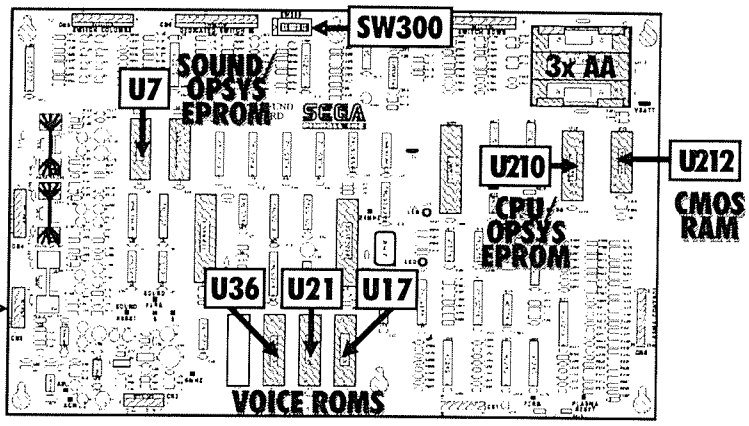
The Reed Switch contacts are hermetically sealed in a glass tube, filled with inert gas to provide long life with stable electrical and operating characteristics. The magnets, the glass tube (with contacts), the Green & White Wires & Diode are sealed in the Plastic Reed Switch Housing in soft epoxy.

BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs



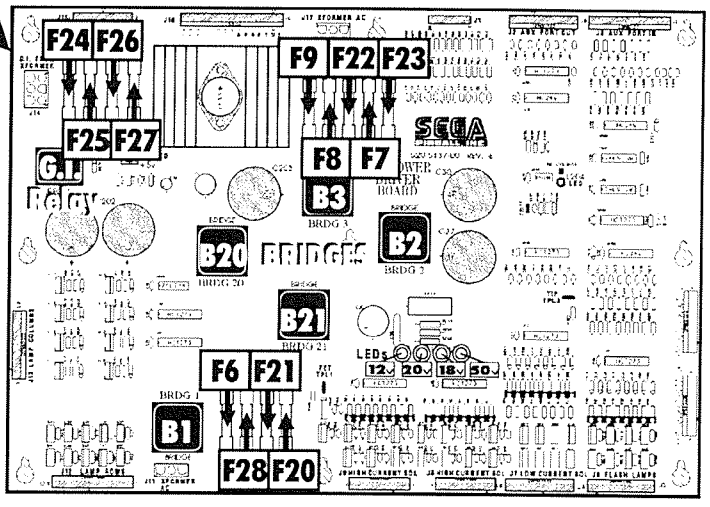
Display Power Supply Bd.

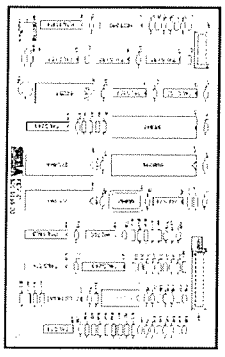
CPU / Sound Board *No Fuses*



I / O Power Driver Board

Display Controller Board *No Fuses*





QUICK REFERENCE FUSE CHART			
Backbox Fuses **DISPLAY POWER SUPPLY BOARD**			
F1	¾A 250v S.B.	90v DC	High Voltage Display
I / O POWER DRIVER BOARD			
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Magnet
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamp (Upper Left Playfield)
F25	5A 250v S.B.	6.3v AC	G.I. Lamp (Lower Left Playfield)
F26	5A 250v S.B.	6.3v AC	G.I. Lamp (Lwr. Rt. P/F & Coin Door)
F27	5A 250v S.B.	6.3v AC	G.I. Lamp (Upper Right Playfield)
F28	3A 250v S.B.	24v AC	**Not Used / Spare**
Cabinet Fuses **SERVICE (AC) OUTLET BOX (CABINET BOTTOM)**			
Main Fuse Line: 1X 8A 250v S.B. (Int'l) 2X 5A 250v S.B.			
Under Playfield Fuses **FOR FLIPPERS & MAGNET**			
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Magna-Diverter (BRN/VIO↔VIO/YEL)

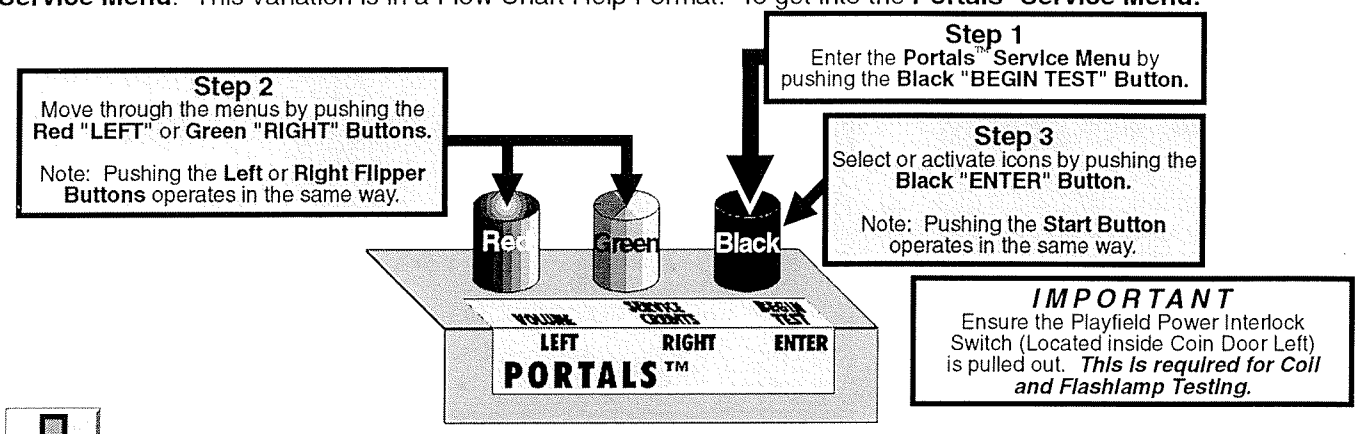
*** All BRIDGES rated 35A @ 100v ***	
B1	+50v DC High Current Coils
B2	+20v DC Low Current Coils
B3	+/-12v DC Sound/Display/Logic
B20	+18v DC Illumination
B21	+5v DC Logic Voltage

See Section 4, Chapter 1, for Backbox and Cabinet General Parts.

DR. Find-It-In-Front: Dr. Pinball

✻ FIND-IT-IN-FRONT: DR. PINBALL SECTION EXPLAINED ✻

The key technical data from various parts of the manual were extracted and combined into the "Find-It-In-Front: Dr. Pinball Section." This section (pages DR. ❶ - ⑩) will assist the technician in locating important technical information needed to troubleshoot the Pinball Machine. Dr. Pinball is also available on the game in the **Portals™ Service Menu**. This variation is in a Flow Chart Help Format. To get into the **Portals™ Service Menu:**



In our **Portals™ Service Menu**, selecting the "DR" *Icon* will bring the operator/technician into Dr. Pinball (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine in a Flow Chart format (Just follow along & answer the questions.).

☆ ☆ ☆ ☆ HOW IT WORKS ☆ ☆ ☆ ☆

First, the operator/technician must enter the Service Mode (for a complete description of the **Portals™ Service Menu** and **ICONS** see Section 3, Chapter 1). To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the Portals™ Service Switch Set (**Red**, **Green** & **Black Buttons**). Push down the **Black "BEGIN TEST" Button**. Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "Portals™ © 1997 SEGA PINBALL, INC.," followed by the **MAIN MENU**.

While in the **MAIN MENU**, select the "DIAG" *Icon*, then select the Cross "DR." *Icon*. This will bring you (the operator / technician) into **DR. PINBALL** (Flow Chart Menus) which offers you a choice of three (3) Sub-Menus: Coil "DR.," Switch "DR." and Lamp "DR." *Icons*. Selecting a particular sub-menu will give you a choice of which specific Flipper, Coil, Switch or Lamp circuit needs to be diagnosed. The display will now ask a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When Dr. Pinball asks a question or request a procedure the Dr. will expect a response such as "no" or "yes" (see below examples of the *Mini-Icons* which will prompt the operator). You the operator/technician must respond by using your **Flipper Buttons** to "SELECT" a *Mini-Icon* and the **Start Button** to "ENTER" your selection.

Note: The "Portals" service switches located on the coin door can also be used to select and enter Mini-Icons. In switch test this is required since flipper and start switches are part of the test.

From the Main Menu In Portals™ GO TO DIAGNOSTICS MENU →

From the Diagnostics Menu GO TO DR. PINBALL →

From the Dr. Pinball Menu GO TO FLIPPER, COIL, SWITCH OR LAMP FLOW CHARTS

The following are the *Mini-Icons* with explanations for the Dr. Pinball Sub-Menus:

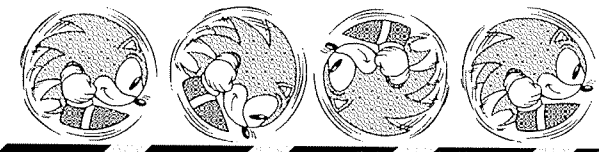
Select a Coil, Lamp, Switch or Flipper to diagnose with "-" or "+" Icon; Then select the "RUN" Icon to activate the choice.
"PREV" goes back to previous question.
"QUIT" exits Portals completely.

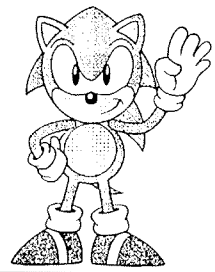
Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given.
"END" lets you select a new item to test.

Seen when diagnosis is given.
Select any Icon for your next step.
"?" gives Help.

In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected.

INSTALL 4 BALLS!





SPECIAL THE STAR WARS TRILOGY EDITION

is a 4-Ball Game!

✻ DIAGNOSTIC AIDS ✻

The *display reads* "OPERATOR ALERT..." — A message displayed during Game Mode or Power-Up to alert the operator of a problem.

OPERATOR ALERT works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled (e.g. in the Auto Launch, Scoop, Eject, etc.). If this assembly has a closed switch indicating a ball is stuck or the switch is *stuck closed*, the **CPU Board** will activate the coil ten times. If the switch remains closed, the game will display a message indicating there is a problem (e.g. "**OPERATOR ALERT AUTOLAUNCH NOT WORKING**"). This not only warns the operator of a problem immediately, but indicates exactly where the operator should look to resolve it.

The *display flashes* "OPEN THE COIN DOOR" — This indicates that CMOS RAM memory (CPU Loc. U212) has been corrupted.

This is caused by either failure in memory (e.g. batteries are dead or faulty **RAM**) or upon installation of updated version of code. Opening the Coin Door will initiate a Factory Restore, by opening the Memory Protect Switch. Check battery voltage at **CMOS RAM** with power off.

CPU DIP SWITCH SETTINGS, LOC. SW300 CPU/SOUND BOARD

CUSTOM FACTORY ADJUSTMENTS BY COUNTRY*

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
USA *	ON								
	OFF	●	●	●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
AUSTRIA	ON	●							
	OFF		●	●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BELGIUM	ON		●						
	OFF	●		●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BRAZIL	ON	●		●	●				
	OFF		●			●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
CANADA	ON	●	●						
	OFF			●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
FRANCE	ON		●	●					
	OFF	●			●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
GERMANY	ON	●	●	●					
	OFF				●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
ITALY	ON				●				
	OFF	●	●	●		●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
JAPAN	ON	●			●				
	OFF		●	●		●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NETHERLANDS (Holland / Dutch)	ON			●					
	OFF	●	●		●	●	●	●	●

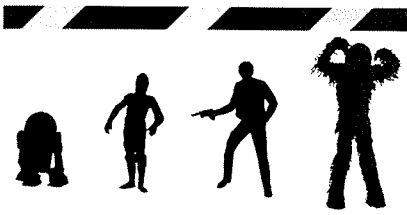
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NORWAY	ON		●		●				
	OFF	●		●		●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWEDEN	ON	●	●		●				
	OFF			●		●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWITZERLAND	ON			●	●				
	OFF	●	●			●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK	ON	●		●					
	OFF		●		●	●	●	●	●

*All countries not noted use the "USA Setting"

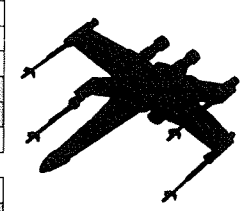


THE STAR WARS TRILOGY SPECIAL EDITION

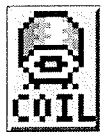
ROM SUMMARY TABLE

I.C. NAME	TYPE	BOARD NAME	LOC.	PART Nº
Game ROM	1MB	CPU / Sound Board	U210	965-0235-56
Voice ROM 1	4MB	CPU / Sound Board	U17	965-0236-56
Voice ROM 2	4MB	CPU / Sound Board	U21	965-0237-56
Voice ROM 3	Not Used	CPU / Sound Board	U36	Not Used
Voice ROM 4	Not Used	CPU / Sound Board	U37	Not Used
Sound EPROM	512K	CPU / Sound Board	U7	965-0238-56

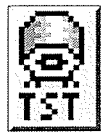
Display EPROM	4MB	Display Controller Bd.	ROM Ø	965-0239-56
Display EPROM	Not Used	Display Controller Bd.	ROM 3	Not Used



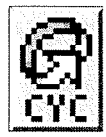
From the Main Menu in Portals™ GO TO DIAGNOSTICS MENU →



From the Diagnostics Menu GO TO COIL MENU →



From the Coil Menu GO TO COIL TEST →



From the Coil Menu GO TO CYCLING COILS

COILS DETAILED CHART TABLE

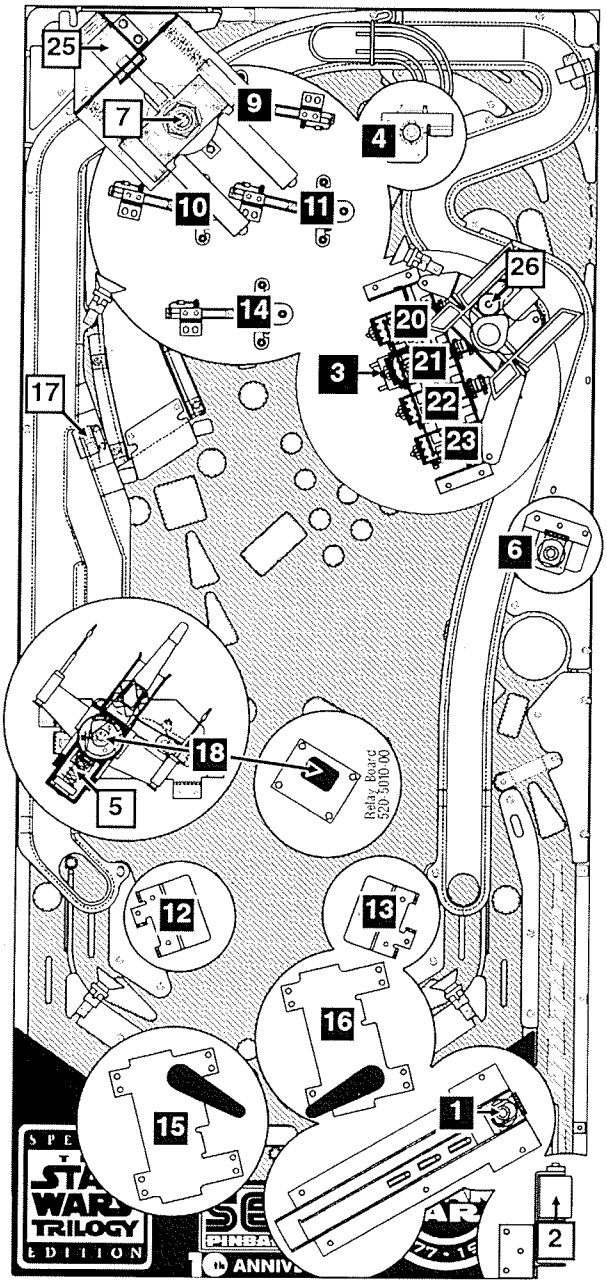
	High Current Coils Group 1	Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v	23-700 090-5022-00T
#3	4-BANK DROP TARGET RESET	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#4	TOP VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#5	X-WING CANNON	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-P4/5	50v	23-800 090-5053-00
#6	BOTTOM VUK	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#7	RAMP MAGNET	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	J10-P4/5	50v	22-650 090-5042-01
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v	N/A

	High Current Coils Group 2	Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#10	LEFT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#14	BOTTOM TURBO BUMPER	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v	22-1080 090-5032-00T

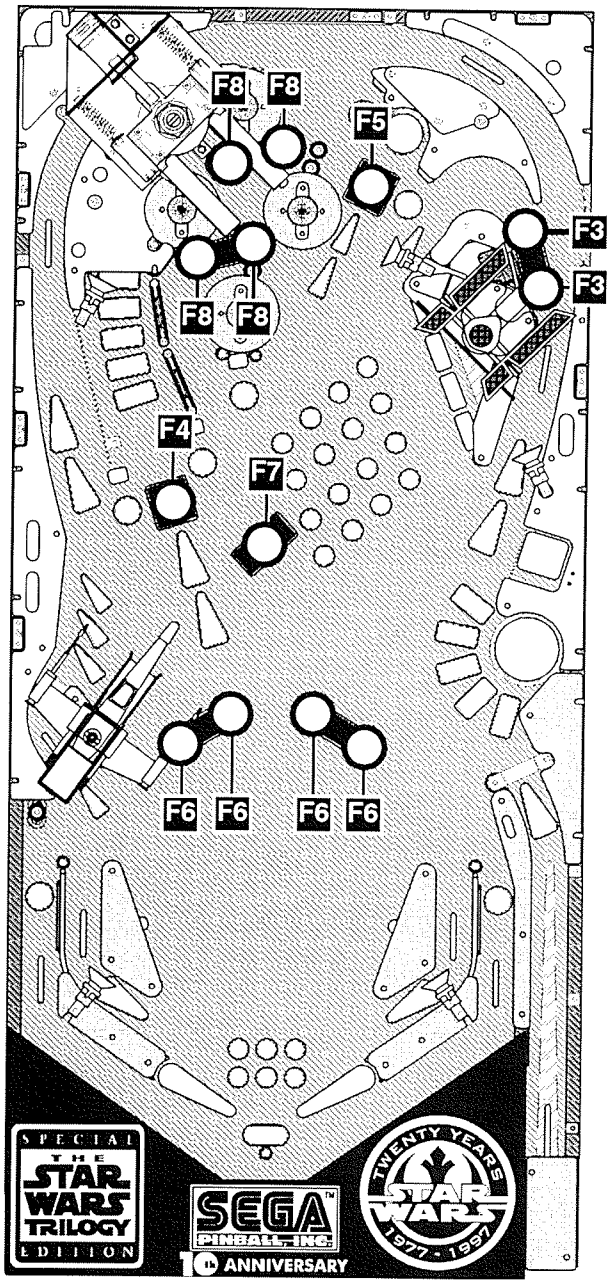
	Low Current Coils Group 1	Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#17	X-WING DIVERTER	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v	31-1500 090-5054-00
#18	X-WING MOTOR RELAY	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v	24v DC 10A DPDT 520-5010-00
#19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	N/C	N/C	N/C
#20	4-BANK #1 (TOP) DOWN	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v	32-1800 090-5031-00
#21	4-BANK #2 DOWN	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v	32-1800 090-5031-00
#22	4-BANK #3 DOWN	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v	32-1800 090-5031-00
#23	4-BANK #4 (BOT) DOWN	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v	32-1800 090-5031-00
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v	5v Meter (If Required)

	Flash Lamps (FLASH)	Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Bulb Type
#25	COIL MAGNET SLIDE	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	BRN	J7-P1	20v	23-800 090-5001-00B
#26	COIL TIE FTR. SHAKE	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	BRN	J7-P1	20v	31-1500 090-5054-00
#F3	FLASH TIE FTR.*2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F4	FLASH RT RAMP*1	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F5	FLASH TOP VUK*1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F6	FLASH DARTH*4	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F7	FLASH SUPER JP*1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F8	FLASH POPS*4	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	#89 Bulb 165-5000-89

COIL LOCATIONS

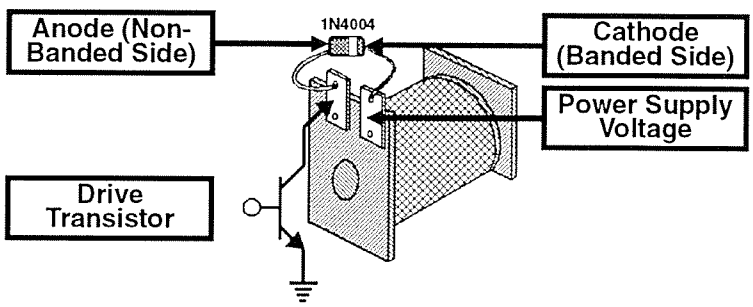


FLASH LAMP LOCATIONS

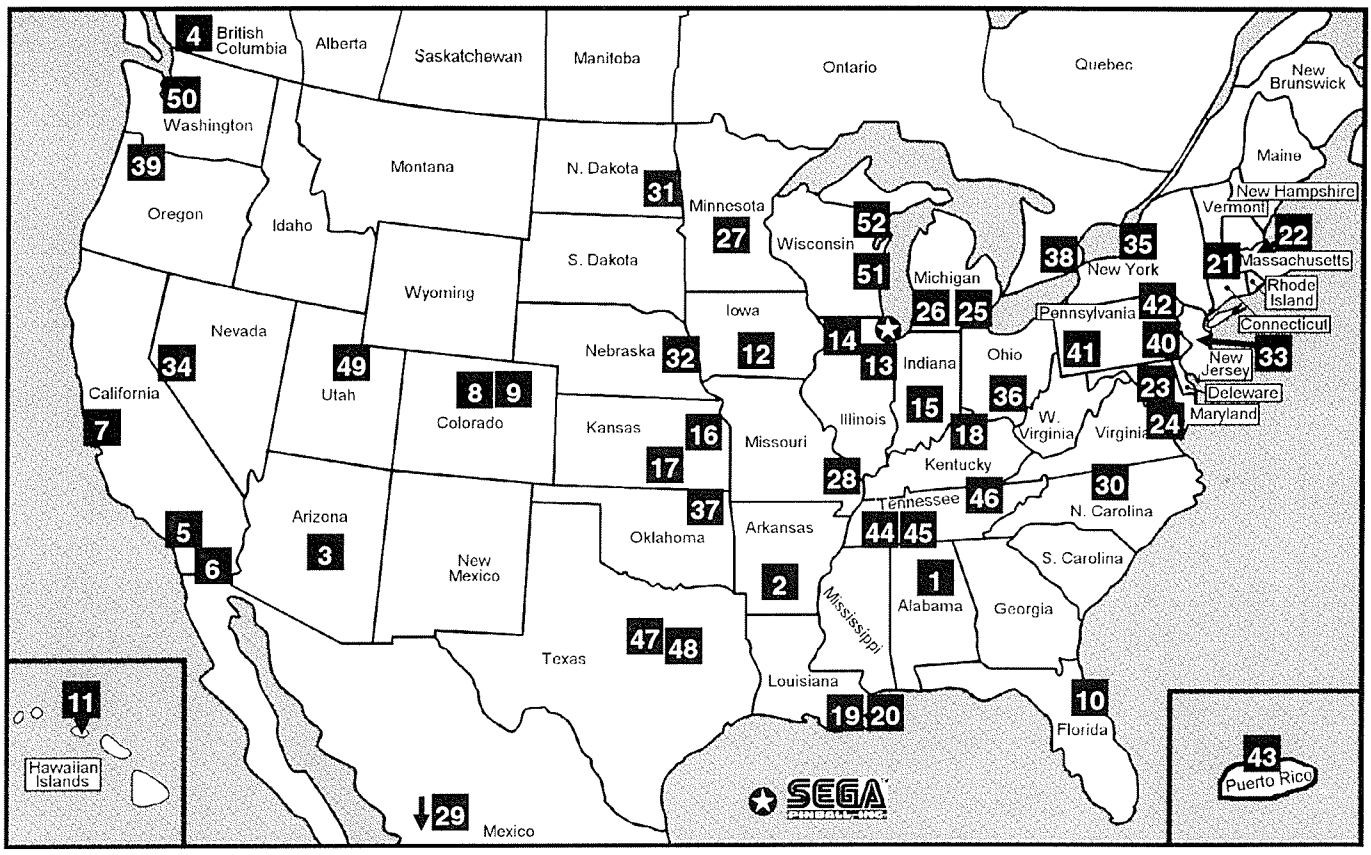


Legend Note: = Coil/Flash Lamp mounted above playfield. = Coil/Flash Lamp mounted below the playfield.
= Bulb goes through hole in the playfield. = Bulb is under playfield insert. = Bulb under Mini-Mar (Light Cover).

TYPICAL COIL WIRING



DOMESTIC DISTRIBUTORS



#	STATE/PROVINCE AND CITY		NAME	PHONE
1	AL	Birmingham	Birmingham Vending	205-324-7526
2	AR	N. Little Rock	Godwin Distributing	501-753-1138
3	AZ	Phoezix	Betson Pacific	602-233-0190
4	BC	Burnaby (Can.)	Can. Coin Machine	604-420-4008
5	CA	Buena Park	Betson Pacific	714-228-7500
6		San Diego	Betson Pacific	619-459-0871
7		S. San Francisco	Betson Pacific	415-952-4220
8	CO	Denver	Col. Game Exchange	303-893-4300
9			Mountain Coin	303-427-2133
10	FL	Orlando	Birmingham Vending	407-425-1505
11	HI	Ewa Beach	50th State Coin Op.	808-682-4561
12	IA	Des Moines	Greater American Dist.	515-244-2828
13	IL	Chicago	Atlas Distributing	312-276-5005
14		Inverness	James Industries	708-358-8000
15	IN	Indianapolis	J. & J. Distributing	317-899-2530
16	KS	Lenexa	Bird Distributing	913-888-8877
17		Wichita	United Distributing	316-263-6181
18	KY	Louisville	Kentucky Coin Machine	502-966-5266
19	LA	Metairie	AMA Distributors, Inc.	504-835-3232
20			New Orleans Novelty	504-888-3500
21	MA	E. Long Meadow	Gekay Sales	413-525-2700
22		Norwood	Mondial Int'l. Dist.	617-769-9966
23	MD	Baltimore	Automated Services	410-646-4100
24			Weiner Distributing	410-525-2600
25	MI	Farmington Hills	Atlas Distributing	810-615-1703
26		Wyoming	Atlas Distributing	616-241-1472

#	STATE/PROVINCE AND CITY		NAME	PHONE
27	MN	Bloomington	Hanson Distributing	612-884-6604
28	MO	St. Louis	J. & J. Distributing	314-645-3393
29	MX	Col. Napoles	James Industries	011-525-543-1174
30	NC	Archdal	Operators Distributing	910-884-5714
31	ND	Fargo	M.H. Associates, Inc.	701-282-7877
32	NE	Omaha	Greater American Dist.	402-553-2812
33	NJ	Springfield	Mondial Int'l. Dist.	201-467-9700
34	NV	Reno	Reno Game Sales	702-829-2080
35	NY	Rochester	Mondial Dist.	716-586-1100
36	OH	Cincinnati	Atlas Distributing	513-771-1909
37	OK	Tulsa	Galaxy Distributing, Co.	918-835-1166
38	ON	Rexdale (Can.)	New Way Sales	.416-674-8000
39	OR	Portland	American Coin	503-233-7000
40	PA	Bensalem	Mondial Int'l. Dist.	215-638-1122
41		Pittsburgh	Mondial Int'l. Dist.	412-881-8804
42		Wilkes-Barre	Roth Novelty	717-824-9994
43	PR	Carolina	James Industries	809-253-7149
44	TN	Memphis	Games Sales Co., Inc.	901-525-8351
45			Green G.A.M.E.S.	901-353-1000
46		Nashville	Sammons-Pennington	615-244-3020
47	TX	Corsicana	Master Sales	903-874-4740
48		Dallas	Commercial Music	214-741-6381
49	UT	Salt Lake City	Struve Distributing	801-328-1636
50	WA	Seattle	American Coin	206-764-9020
51	WI	Green Bay	Pioneer Sales & Svc.	414-468-5200
52		Menomonee Falls	Pioneer Sales & Svc.	414-781-1420

TECHNICAL SUPPORT
SEGA PINBALL, INC.

For Parts and Service, call your local distributor. The numbered locations are general areas. View table and map for corresponding numbered distributor. If your state/province does not have a distributor, call the nearest state/province. Distributors and phone numbers are subject to change. Call Sega Pinball, Inc. Technical Support with any questions or if your distributor cannot help you, at **1-800-542-5377** (USA or Canada or elsewhere at 1-708-345-7700).

Game Set-Up

Game Assembly Procedures

(Reference Find-It-In-Front: Dr. Pinball, taking note of pages ii, iii & 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. ***CAUTION:*** *At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling.* **Pinball game is 300 lbs.+.**

2. Remove all packing material. The four (4) Cabinet Leg Assemblies (Leg Levelers are attached) are in the corner packing material of the crate. A large Allen Wrench (use for securing the backbox) is inserted and taped to the rear of the cabinet. Leg Bolts, Steel Balls and any miscellaneous parts are in the cash box.

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

4. 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° (¾ turn).

5. Remove the Coin Door Keys from the playfield glass, and open the Coin Door. Remove the Backbox Keys hanging inside the Coin Door, unlock the Backbox and open.

6. 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/Sound Board, I/O Power Driver Board, and the Display Power to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly. Close and lock the Backbox and secure the keys back inside the Coin Door.

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

8. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any) inside the cabinet. ***READ ALL PRINTED INFORMATION!*** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game.

9. Raise the playfield and support it, by lifting the Prop Rod on the Left Side of the Cabinet and placing the notched end into the hole on the under playfield. See the illustration "Easy Access Service System" opposite this page.

10. Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.

11. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. Check the plumb tilt and adjust as required. See Section 4, Chapter 1, Parts Identification & Location.

12. Lower the playfield and ensure game is level side-to-side by adjusting Leg Levelers, if required. See the illustration "Leg Leveler Adjustment" opposite this page.

13. With the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), the game pitch is 6.5°; depending on the condition of the floor, adjust the Leg Levelers as required.

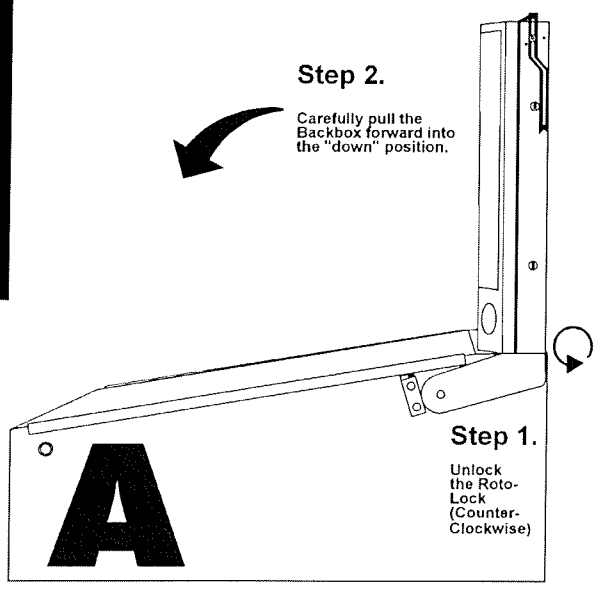
The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

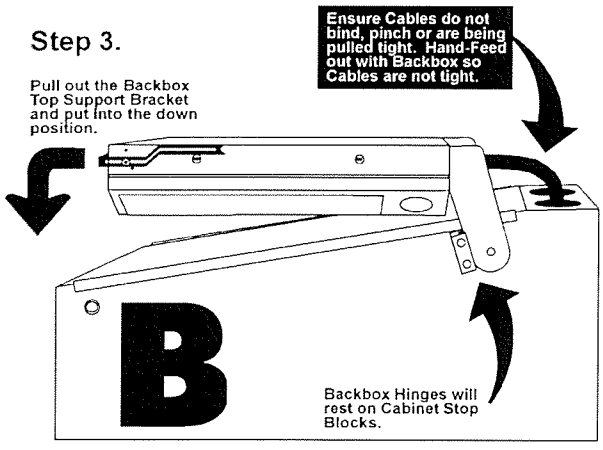
14. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Go To Diagnostics Menu, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.

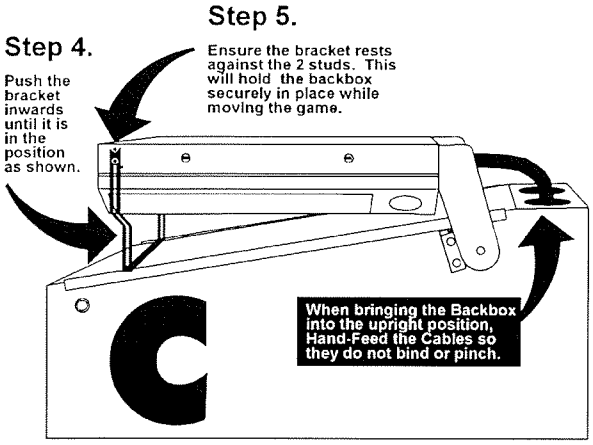
15. **INSTALL 4 BALLS** on the playfield near the outhole and carefully reinstall the playfield glass. (Amount of balls are always specified on decal attached to the lock down assembly.)

16. If desired, make Game Pricing (Standard and/or Custom) and Add-A-Ball, Novelty, or X-Ball Play adjustments at this time. See Section 3, Chapter 4, Go To Adjustments Menu, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing changes.

How to Secure the Backbox for Transporting







See Section 4, Chapter 1, Backbox - General Parts, for part numbers.

Leg Leveler Adjustment

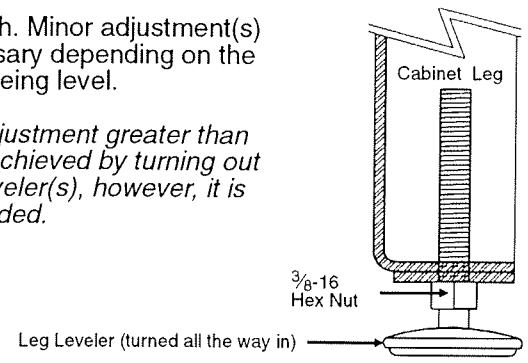
This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

Attach the four (4) Leg Assemblies to cabinet corners with the eight (8) leg bolts provided. See Section 4, Chapter 1, Cabinet - General Parts, for part numbers.

YOUR PLAYFIELD PITCH IS NOW AT 6.5° AS REQUIRED FOR PROPER GAME PLAY!

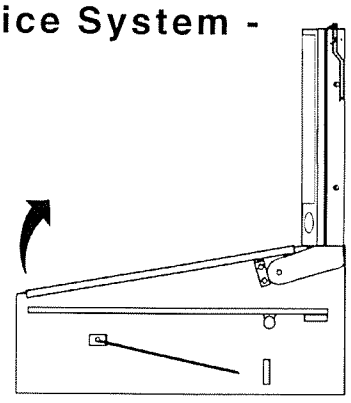
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

For custom adjustment greater than >6.5° can be achieved by turning out the rear leg leveler(s), however, it is not recommended.



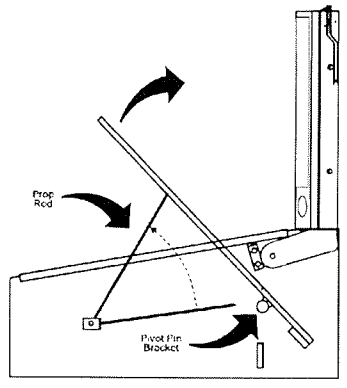
Easy Access Service System - 2 Positions

Carefully lift the playfield ***using the left and right ball guides*** upward.



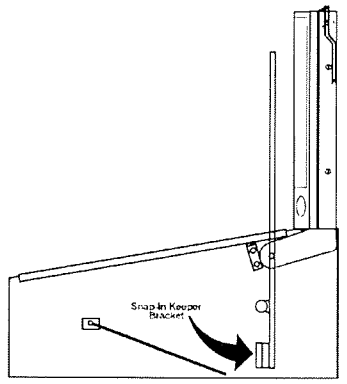
Position 1

When lifted high enough, support the bottom of the playfield with your hand and pull up the Prop Rod (located on the left or right side inside the cabinet) and position end of the Prop Rod into the receiving hole in the playfield. *Or....*



Position 2

Continue pushing upwards until the playfield's Snap-In Keeper Brackets "lock" into position with the Snap-In Keeper Bracket in the cabinet. *(Note: Push the release button on the Cabinet Snap-In Keeper Bracket to bring playfield down.)*



Game Operation & Features

Start of Game Features

Starting a Normal Game

Insert coin(s). The game generates a sound for the first coin & for each subsequent coin with the display indicating the number of credits posted. Press the **START BUTTON** and a start-up sound is produced, and the posted credits are reduced by one. If the last Game Specific Adjustment, Novice Mode Enabled, is changed to **YES** (Default = **NO**), the display awaits choice from player 1 to select **REGULAR GAME** rules or **NOVICE GAME** rules with the *flipper buttons*. If the player *does not select rules*, the game will default to ***Regular Rules***. After selection (or time-out default to Regular Game) subsequent players can be added (**up to 6 can play!**) by pressing the **START BUTTON** before the end of ball 1. **Note 1:** The subsequent players will play the same game (Novice or Regular) determined by Player's 1 choice.

The display now indicates the player or # of players selected from the total depressions of the **START BUTTON**. The display indicates the ball in play, and a ball is served to the *Shooter Lane*. An introduction is shown followed by Skill Shot Graphics. Pressing the **START BUTTON** after ball 1 of any player will start a new game (if credits are available), ***but only*** if the **START BUTTON** is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any ½ credit remaining during game play after the end of ball 1, or power down, will be eliminated.)

Starting Team Play (Doubles!)

Team Play is a four player game. The totals for players 1 & 3 (Team 1) and players 2 & 4 (Team 2) are displayed individually as well as the combined score for both teams. Team Play only works in a 4-Player game. In all other cases, the individual scores are shown.

Starting League/Tournament Play

After credit is posted, while holding in the **LEFT FLIPPER BUTTON**, press the **START BUTTON**. League Play has now begun. The differences between Normal Game Play and League/Tournament Play are: There is no "auto-percentaging" (awarding extra balls, specials, etc. to players with very low scores on the second or third ball). Mystery Features are awarded in a set order rather than random in Normal Game Play. Percentage Game Features are not automatically advanced as they are for the Regular Play Features.

Starting Pinball Wizard Play

After credit is posted, while holding in the **RIGHT FLIPPER BUTTON**, press the **START BUTTON**. Pinball Wizard Play has now begun. The same as League/Tournament Play, but oooooooh! so much gosh darn harder!

During Game Features

Feature Mode & Combination Shots

Features are lit on the playfield and started by completing certain play shots (e.g. completion of target banks, orbit(s), ramp(s) and/or any combination of the shots). Combination shots (combos) are a series of shots completed in many different variations. For example, a shot to the Ramp with the ball being returned to the Left Inlane then immediately shot to the Orbit of the playfield returning to a Flipper and then shot to another Ramp would be a hard combo shot worthy of many points. These combinations vary per game. For feature modes & combos certain points or awards are given after completion.

Multiball

Multiball is started after completion of certain Feature Modes or may be a mode itself depending on game rules/play. Multiball may vary with the amount of balls used in Multiball depending on game style. Typically, if Multiball play was short, a "restart" option is given. Watch the Display for instructions on the restart.

Replay Feature

Replay awards are given as the player exceeds a High Score Level during game play. This can be adjusted with Adjustment 3, Replay Awards (Default=**CREDIT**, adjustable). Players exceeding the High Score Levels can receive: **CREDIT**, **EXTRA BALL**, or **SPECIAL**. Adjust to **NONE** if a replay award is not desired.

Video Mode

The video modes require the player to play on-screen. The interactive video play requires the player to use the flipper buttons to play the mode.

End of Game Features

Game Endings

When all player(s) have played all balls (including any Extra Balls), the game ends. If power is interrupted during the course of a game, it will end that game (***see Starting a Normal Game***). Closure of the Plumb Bob Tilt Switch according to the number of tilts set (Default = 2, adjustable) or its prolonged closure will end the current Ball-In-Play. Closure of the Slam Tilt Switch on the coin door ends the current game(s).

Match Feature

At the end of each ball, earned bonuses are collected. At the end of the last ball of a game (including any extra balls, if applicable), earned bonuses are collected, then the system produces a random 2-digit number (a multiple of 10; 00 to 90). Matching the last 2 digits of the player's score with this number awards a credit. In Adj. 11, Match Percentage (Default=**7%**, adjustable) can be changed from 0-10%. Changing the percentage to **0%** displays the "Match Animation" at the end of the game, however, will never match (to award a credit). Changing this adjustment to **OFF** will not display the "Match Animation" nor award a credit.

Continued Next Page.

SINGLE BALL PLAY

GAME START

Before you launch yourself into space, watch the *Display! Hint: Choices can be made by pressing the Flipper Buttons.* Press **Launch Button** to fire the ball into play and begin your adventure!

FORCE TARGETS

Complete **F-O-R-C-E Targets** to lite one of the five (5) features at the ***Big Hole***. Successfully finish any one of the ***Big Hole Features*** to lite the ***Hurry-Up Lamp*** on *Darth Vader's Respiratory Sensor Matrix.*

LAND SPEEDER ORBITS

Roll through either **Return Lane** and shoot the opposite lit ***Orbit*** to advance toward the next Landspeeder threshhold. Crossing a Landspeeder threshhold earns a ***Bonus Award*** such as *Points, Super Pops, Extra Ball,* etc. and lites the corresponding lamp on *Darth Vader's Respiratory Sensor Matrix.*

THAW HAN SOLO

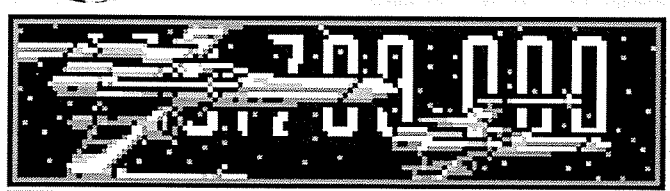
Shoot the ***Big Hole*** to advance toward releasing Han Solo from his encasement in carbonite. Crossing the threshhold thaws Han, lites the **Thaw Han Solo Lamp** on *Darth Vader's Respiratory Sensor Matrix,* and offers a chance to answer a ***STAR WARS TRIVIA QUESTION*** for big points. Use the **Flipper Buttons** to choose your answer to the question as it appears in the *Dot Matrix Display.*

POP BUMPERS

Pop Bumpers score *1,000 Points per Pop.* At each *Pop Threshhold, Pop Awards* are increased by *1,000 Points* to a maximum of *10,000 Points per Pop.* As *Pop Threshholds* are achieved, the player also receives *100K, 200K, etc.* to a maximum of *900K points.* The next *Pop Threshhold* appears in the *Display as Pop Bumper Hits* are scored.

SUPER POPS

When **Super Pops** are active, the player receives *20,000 Points per Pop.* All *Pop Scoring Threshholds, Awards,* and *Bonus Features* remain the same.



BIG HOLE FEATURES

CANTINA HURRY-UP

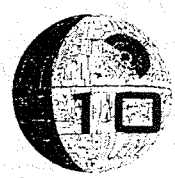
Shoot the **Big Ramp** to collect the value that is rapidly counting down on the *Display.* Then ***Pump the Big Ramp*** repeatedly to earn this score over and over again! Feature ends when count- down reaches its minimum value or when the player misses a repetition of the ***Big Ramp Shot.***

EXTRA BALL HURRY-UP

Shoot into the **Heroic VUK** to collect an **EXTRA BALL** before the 15 second timer expires.

SPECIAL HURRY-UP

Shoot under the **X-Wing Fighter** to collect a ***Special*** before the 15 second timer expires.

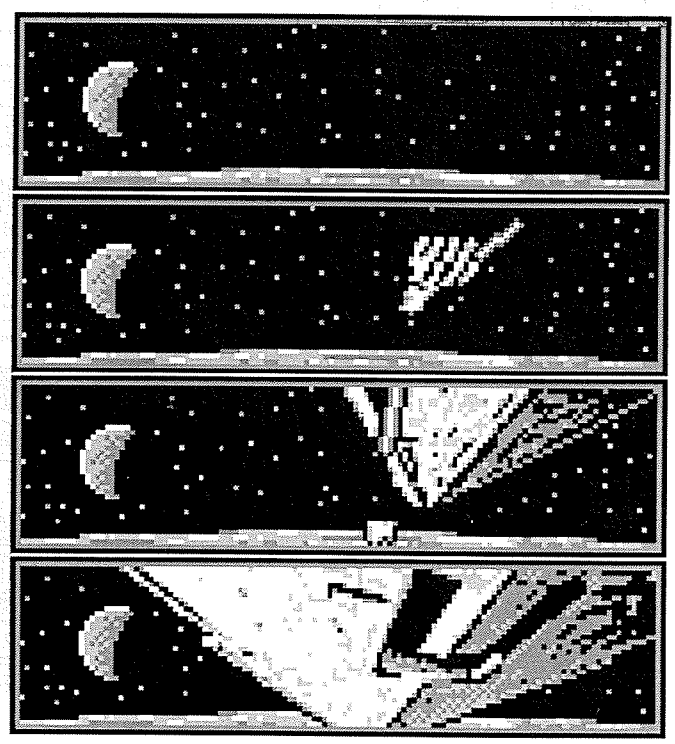


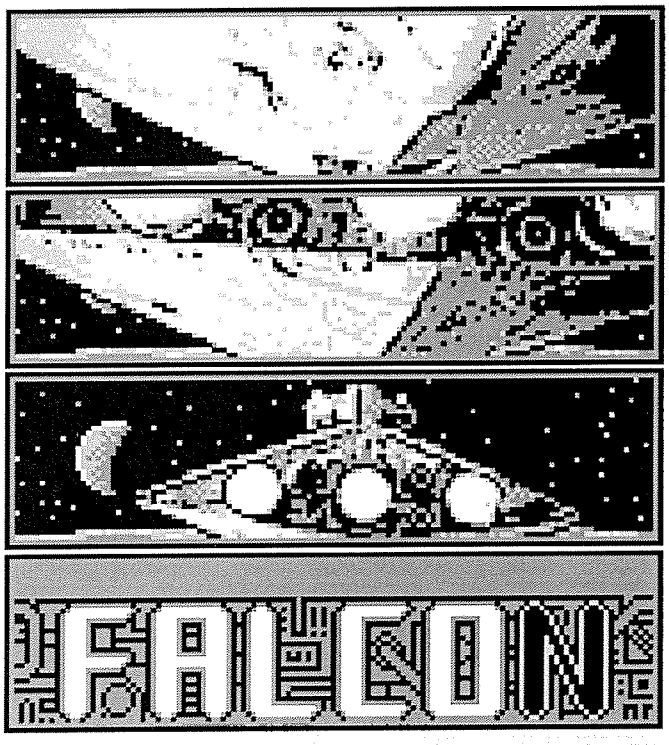
BOUNTY HUNTER

Maneuver your *Speeder Bike* through the *Forests of Endor* on the *Video Display.* Use the **Flipper Buttons** to move your *Speeder Bike* to avoid trees and other obstacles while flying across *Bonus Objects* for even bigger scores! Feature ends when the player crashes or successfully exits the forest.

PROBE DROIDS

Once this ***2-Ball Multiball*** begins, hit the currently raised **Drop Target** to collect ***Probe Droid Jackpots.*** Feature continues as long as the player remains in ***2-Ball Multiball.***





FALCON MULTIBALL

Lite **F-A-L-C-O-N Lamps** by shooting the **Big Ramp**. Spell **FALCON** to start ***Falcon Multiball***. During ***Falcon Multiball***, each switch closure scores *2,000 Points* and adds *2,000 Points* to the ***Falcon Jackpot***. Complete the number of switch closures indicated in the *Display* to lite the ***Falcon Jackpot*** at the **Big Ramp**. Shoot the **Big Ramp** to collect the ***Falcon Jackpot*** and add another ball! Scoring a ***Falcon Jackpot*** also lites the corresponding lamp on *Darth Vader's Respiratory Sensor Matrix*. Play continues until only a single ball remains.

MULTIBALL & JACKPOTS

STAR WARS MULTIBALL

Destroy the attacking fleet of **Tie Fighters** by hitting the **Drop Targets** to advance toward *Multiball Ready.* Shoot the *Strobing Drop Target* shot ***BEFORE*** hitting any other *Drop Target* and **INSTANTLY** advance to *Multiball Ready*. Once *Multiball* is *Ready*, load the **Cannon** via the lit **Big Ramp** or the **Heroic VUK** (top) and then shoot through the opening in the **Drop Targets** to start ***Star Wars Multiball***. Once in ***Multiball***, all **Drop Targets** add *2,000 Points* to the ***Jackpot Values.*** Shoot the **Big Ramp** to collect a minimum 500K ***Jackpot*** and add 500K to the ***Super Jackpot.*** Complete the **F-O-R-C-E Targets** to lite the ***Super Jackpot*** and add 500K per **Letter** to the ***Super Jackpot Value***. While **STAYING IN MULTIBALL PLAY**, load the **Cannon** again via the **Big Ramp** or the **Heroic VUK** and shoot through the opening in the **Drop Targets** to collect the ***Super Jackpot***. Collecting a ***Super Jackpot*** during ***Star Wars Multiball*** lites the corresponding lamp on *Darth Vader's Respiratory Sensor Matrix*, and starts a new *Jackpot Sequence* with a 500K minimum ***Jackpot*** available at the **Big Ramp**.

MULTIBALL RESTART

Jedi Knights in training may be offered a chance to ***Restart Star Wars Multiball*** if they failed to use the Force to Master Yoda's satisfaction. Shoot the **Heroic VUK** before the timer expires for a second chance to play ***Star Wars Multiball.***

RETURN OF THE JEDI

The game has six (6) indicator lamps located on *Darth Vader's Respiratory Sensor Matrix*. The indicators denote *various game features as seen below:*

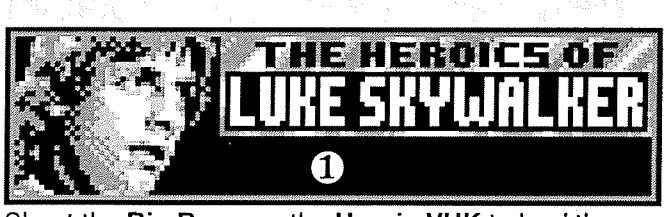
1. **SUPER JACKPOT** - Lit by scoring a ***Super Jackpot*** during ***Star Wars Multiball***.
2. **HURRY-UP** - Start and complete any **Big Hole Feature**.
3. **FALCON JACKPOT** - Collect a ***Jackpot*** during ***Millenium Falcon Multiball.***
4. **COMPLETE HEROIC** - Start and complete any ***Heroic Feature*** (see the next page for the **Heroic Features**).
5. **THAW HAN SOLO** - Complete all *Han Solo Lights*.
6. **LANDSPEEDER** - Collect any award from the ***Landspeeder Orbits***.

When the player has lit all 6 indicators, **RETURN OF THE JEDI** will lite at the **Heroic VUK** with a blinking yellow lamp. Shoot the **Heroic VUK** to start **RETURN OF THE JEDI**. In **RETURN OF THE JEDI**, the player gets sixty (60) seconds of continuous ***4-Ball Multiball*** play. Shoot the **Big Ramp** to load the **X-Wing Cannon**. Make the **X-Wing** shot to collect a ***Jedi Jackpot***. After sixty (60) seconds, the flippers are turned off, the balls drain, and 1 ball is placed back into play and the game continues.

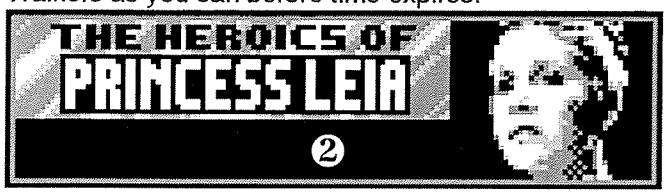
HEROIC FEATURES

SIX HEROIC FEATURES

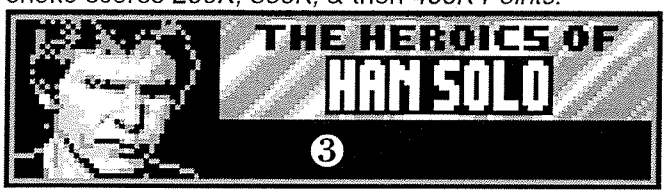
Enter the **Heroic VUK** when lit to start one of the six (6) ***Heroic Features***. Complete any ***Heroic Feature*** to lite the **Complete Heroic Lamp** on *Darth Vader's Respiratory Sensor Matrix.*



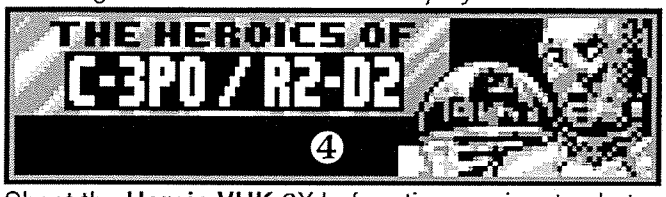
Shoot the **Big Ramp** or the **Heroic VUK** to load the **X-Wing Cannon**. Shoot the flashing ***Mini-Orbit*** to collect ***Jackpots*** and knock out as many *Imperial Walkers* as you can before time expires.



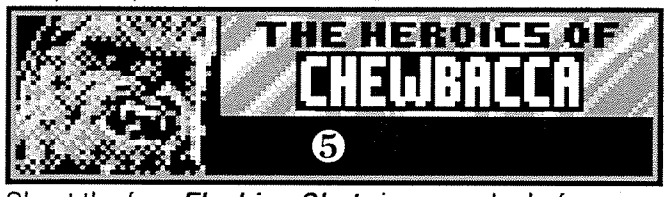
Shoot the **Big Ramp** 3X before time runs out to help Princess Leia choke Jabba the Hutt. Each successive choke scores *200K, 300K,* & then *400K Points.*



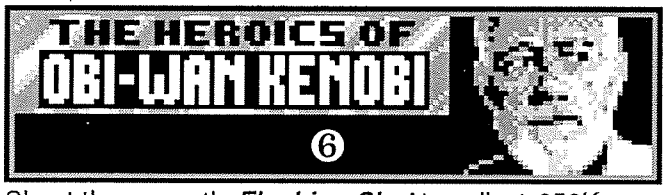
Shoot into the **Big Hole** to collect the value which is counting down in the *Dot Matrix Display.*



Shoot the **Heroic VUK** 3X before time expires to shut down the *Garbage Masher.* Successive shots score *50K, 150K,* and then *200K Points.*

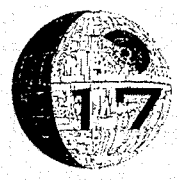


Shoot the four ***Flashing Shots*** in any order before time runs out. Successive shots score *100K, 200K, 300K,* and then *400K Points.*



Shoot the currently ***Flashing Shot*** to collect *250K, 300K,* and then *350K Points.*

OTHER FEATURES

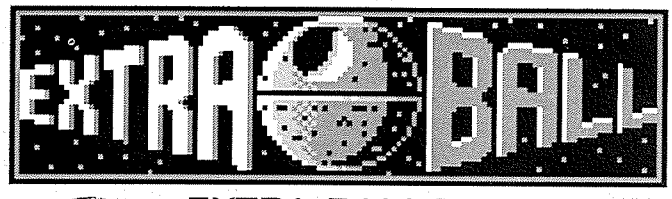


BONUS MULTIPLIER

Shoot under the **X-Wing Fighter** (Special Lamp) to advance the *Bonus Multiplier* 1X to a maximum of 6X and a chance at an **Extra Ball.**

LIGHTSABER SAVER

Hit the **3-bank Light-Saber-Saver Targets** to lite the ***Lightsaber Saver*** at the **Outlanes**. Draining through an **Outlane** with the ***Lightsaber Saver*** lit will automatically save your ball by launching another one into play. But be careful... hitting the **Slingshots** causes the lit ***Lightsaber Saver*** to roam between the two **Outlanes!**



EXTRA BALLS

Extra Balls can be lit or earned by crossing a ***Landspeeder Scoring Threshhold*** from the **Big Hole** or by maxing out the *Bonus Multiplier* under the **X-Wing.**

SPECIALS

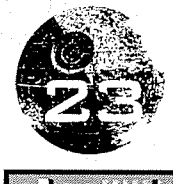
Specials can be lit or earned by crossing a ***Pop Bumper*** or ***Land-speeder Scoring Threshhold*** or from the **Big Hole.**

COMBINATION SHOTS

Star Wars features several *Multi-Way Combos.* These *Combo Shots* involve natural sequences of key shots in the game. Several undocumented difficult combos may also be present.

END-OF-BALL-BONUS

At the end of each ball, players will receive 10K for each *Landspeeder Orbit Shot,* 10K for each *Big Ramp Shot,* and 30K for each *Heroic Mode Started* on that ball. Players will also receive 30K for *Each Lamp Lit* on *Darth Vader's Respiratory Sensor Matrix.*



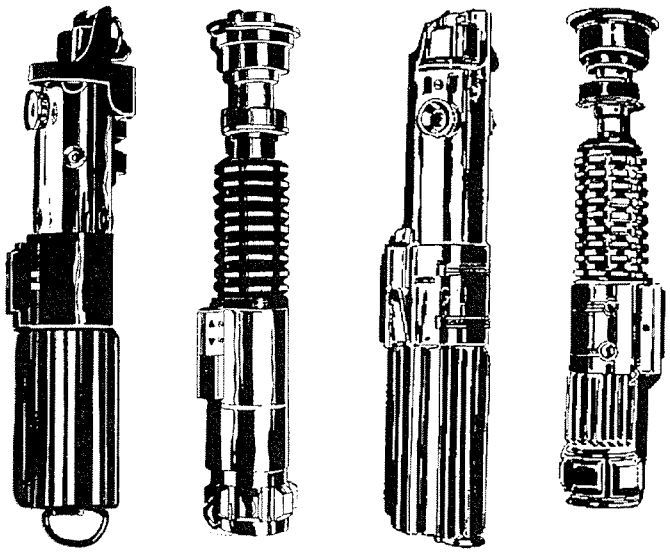
SHADOWS OF THE EMPIRE

Although the ***Empire*** has once again been defeated, the ***Rebellion*** is far from over. *Rules and Point Values are subject to change without notice!*

GAME MANUAL TRIVIA

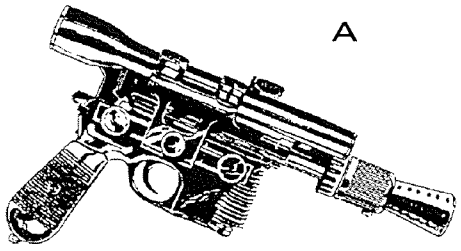
1. WHICH SABER DOES LUKE SKYWALKER USE?
   (A) (B) (C) (D)
2. WHICH SABER DOES DARTH VADER USE?
   (A) (B) (C) (D)
3. WHICH SABER DOES OBI-WAN KENOBI USE?
   (A) (B) (C) (D)

A B C D

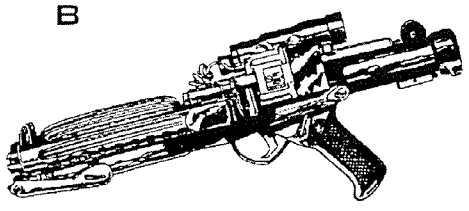


4. WHICH BLASTER DOES HAN SOLO USE? (THE TROOPERS USE THE OTHER ONE)

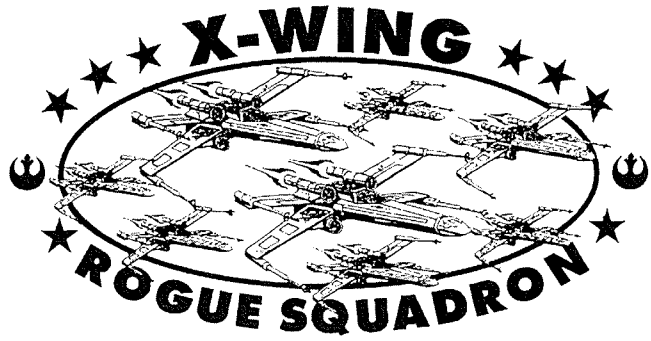
A

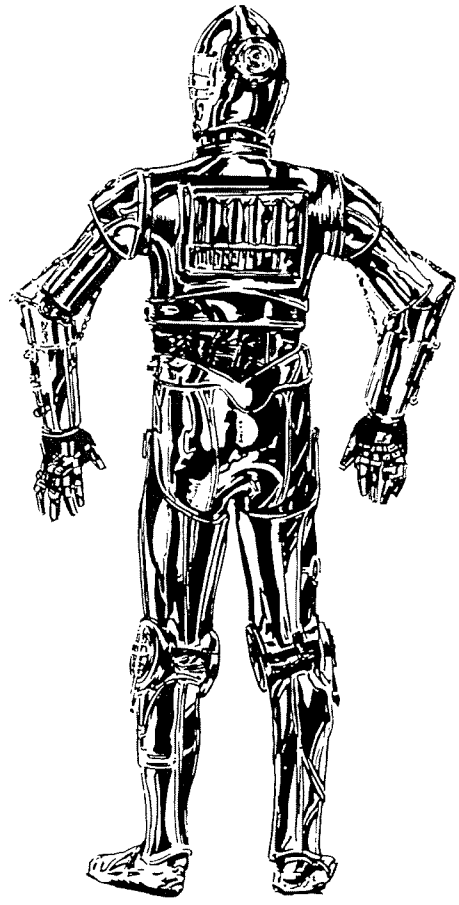


B



PATCHES





ANSWERS:

Portals™ Service Menu Introduction

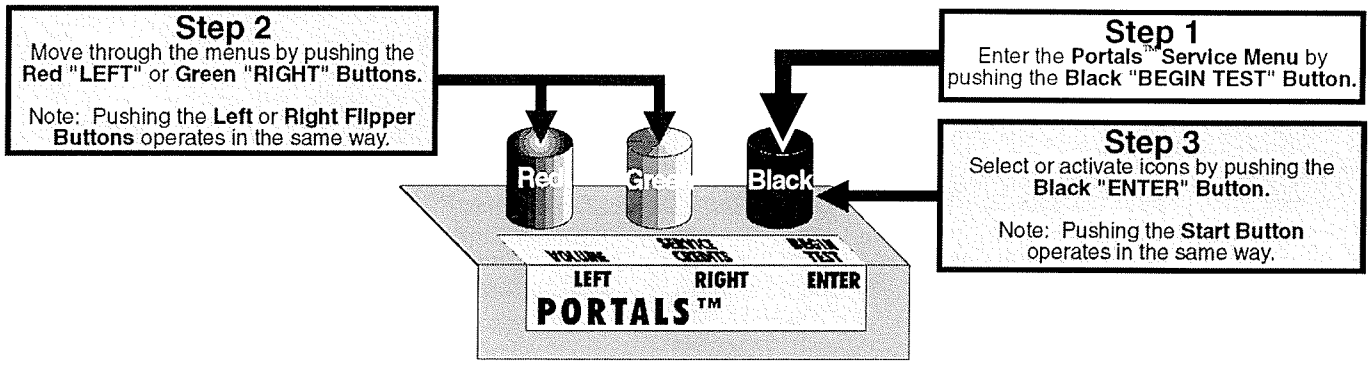
Section 3
Table of Contents

Bullet Legend:
• From Main Menu, Level 1.
: From Sub-Menu, Level 2.
:: From Sub-Menu, Level 3.
¤ Added Information / Instruction.

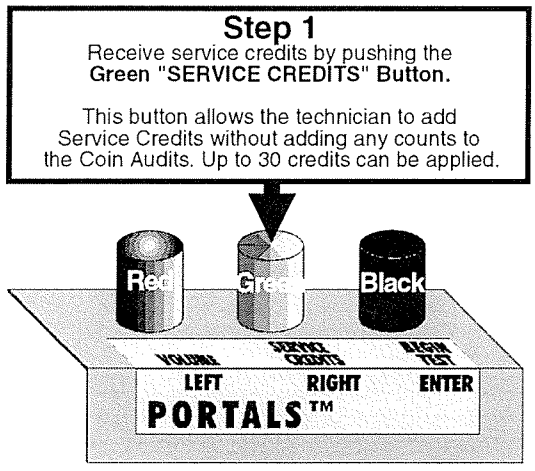
Service Switch Set (Red, Green & Black Buttons) Access & Use

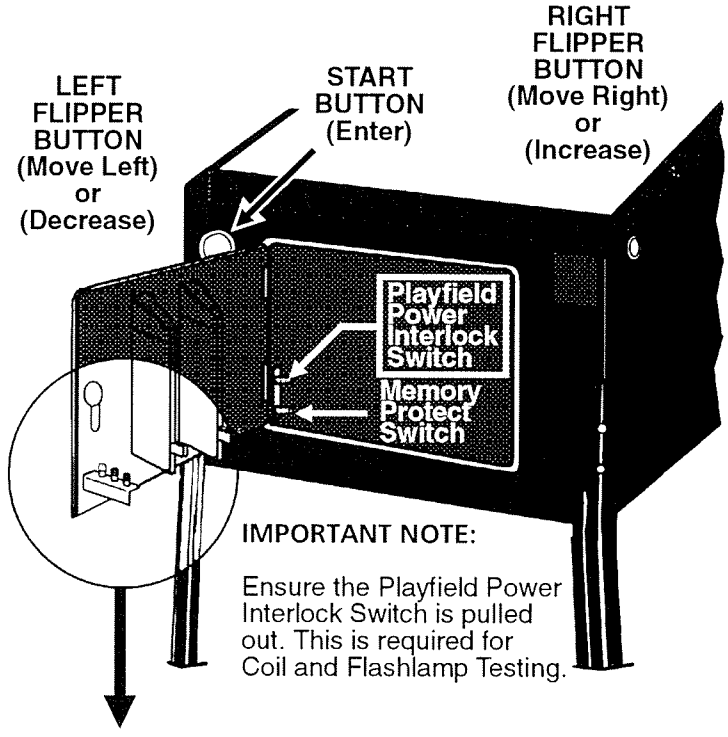
Open Coin Door and view Service Switch Set (see figures below). The Memory Protect Switch is now disabled; when changing adjustments, leave the coin door open, so changes can be made. **Please ensure the Playfield Power Interlock Switch is pulled out for Coil and Flashlamp testing (this is required).**

❶ *Entering* Portals™ Service Menu *(will not operate in Volume Mode):*

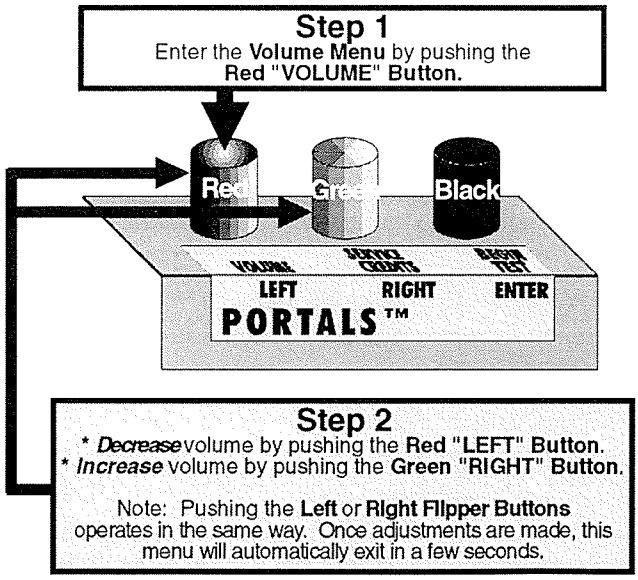


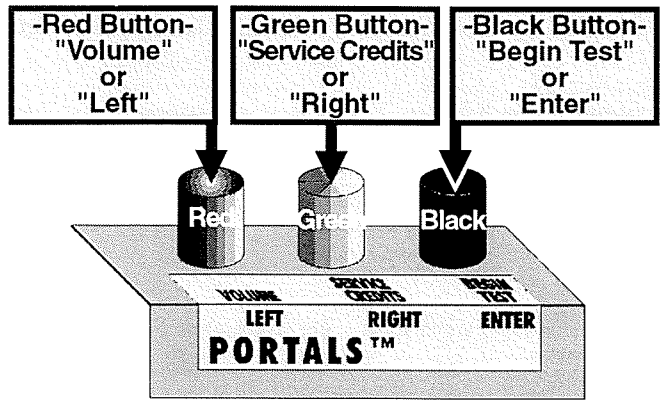
❷ *Adding* Service Credits *(will not operate in Service or Volume Modes):*





❸ *Entering the* Volume Menu *(will not operate in Service Mode):*



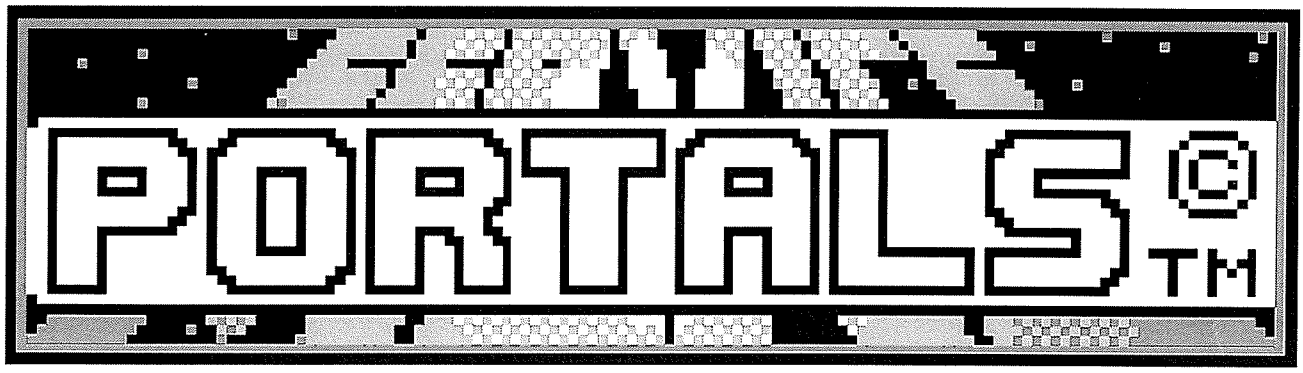


How to Use This Section

This section will cover all functions available in the **Portals™ Service Menu** in a *Step-By-Step* process. This section is divided into chapters which coincide with the **MAIN MENU**. The following pages in this chapter will instruct the operator on how to move through the menus. It's simple, easy and fun to use!

To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the Service Switch Set (**Red**, **Green** & **Black Buttons**). Push down the **Black "BEGIN TEST" Button**.

Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "Portals™ © 1996 SEGA PINBALL, INC.," followed by the **MAIN MENU**:

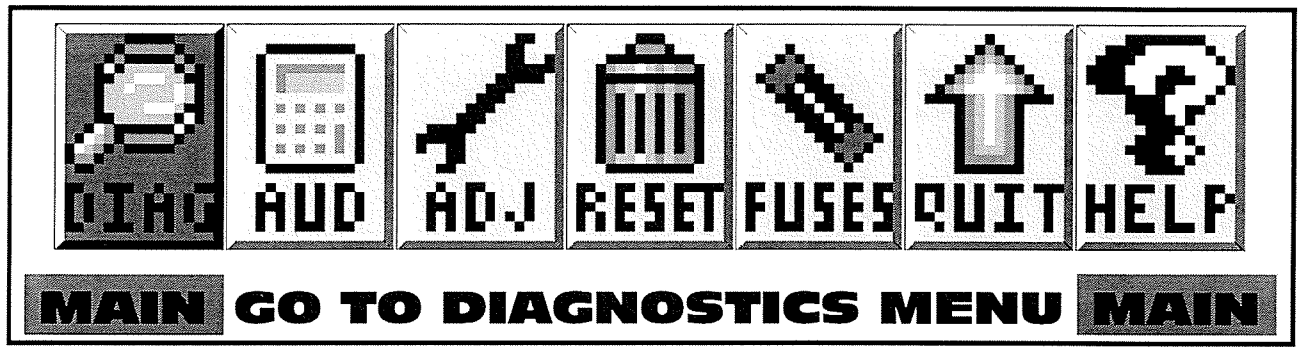


The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's ***MEMORY PROTECT*** is enabled; ***meaning any changes that are made will be not be written to memory***. If changing adjustments is required, ensure the Coin Door is open.

Use the **Red "LEFT" & Green "RIGHT" Buttons** (or **Left** & **Right Flipper Buttons**) to move the selected **ICON** left or right, and the **Black "ENTER" Button** (or **Start Button**) to activate the selected **ICON**. The use of the Service Switch Set (**Red**, **Green**, & **Black Buttons**) *is required* in Switch Test or Active Switch Test, as the **Start & Flipper Buttons** are a part of this test.

For diagnostic purposes, be sure the ***Playfield Power Interlock Switch*** is pulled out so ***Playfield Power*** is not disabled.

The **MAIN MENU** now appears with the "DIAG" *Icon* (**DIAGNOSTICS MENU**) flashing:

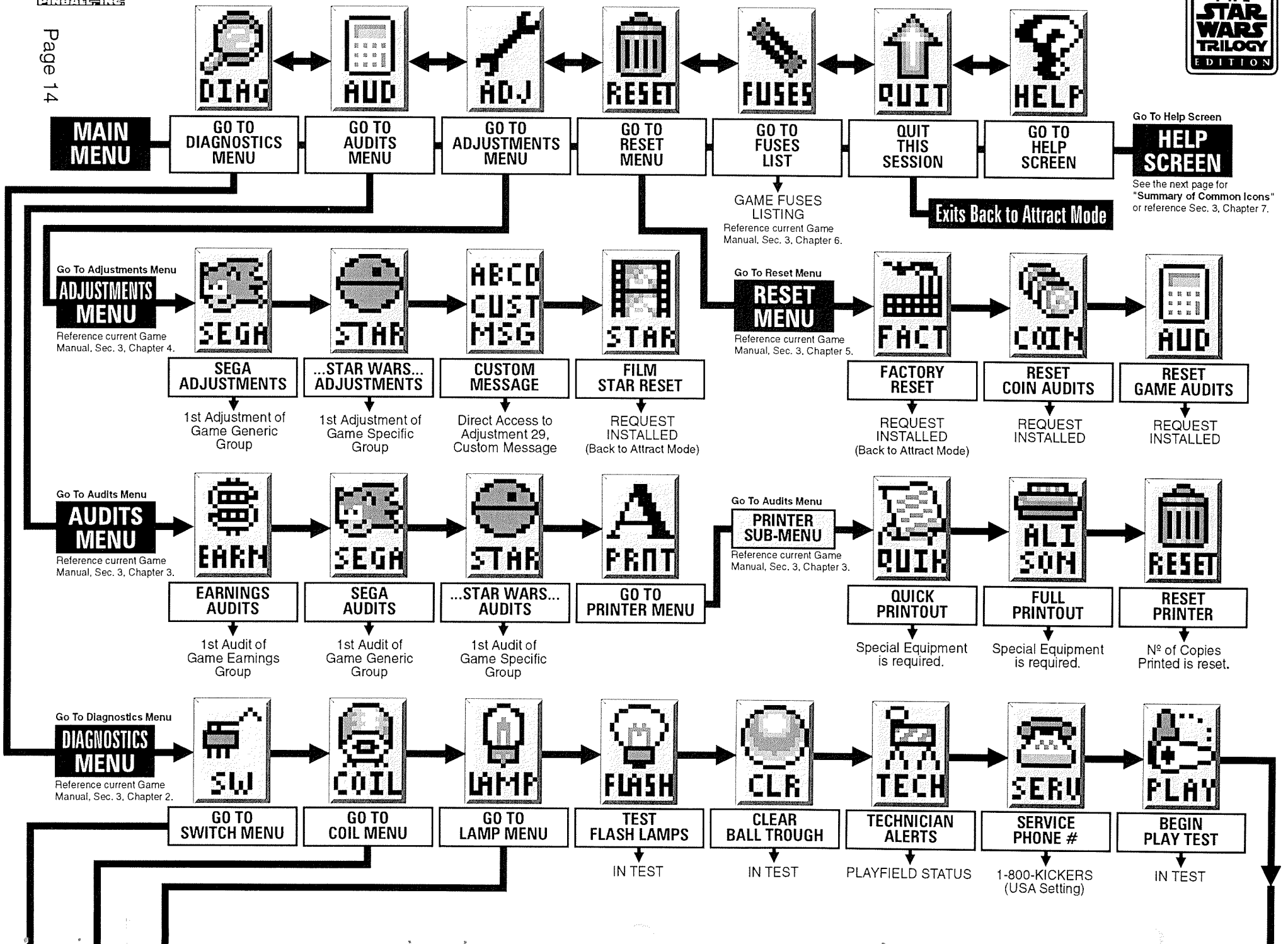


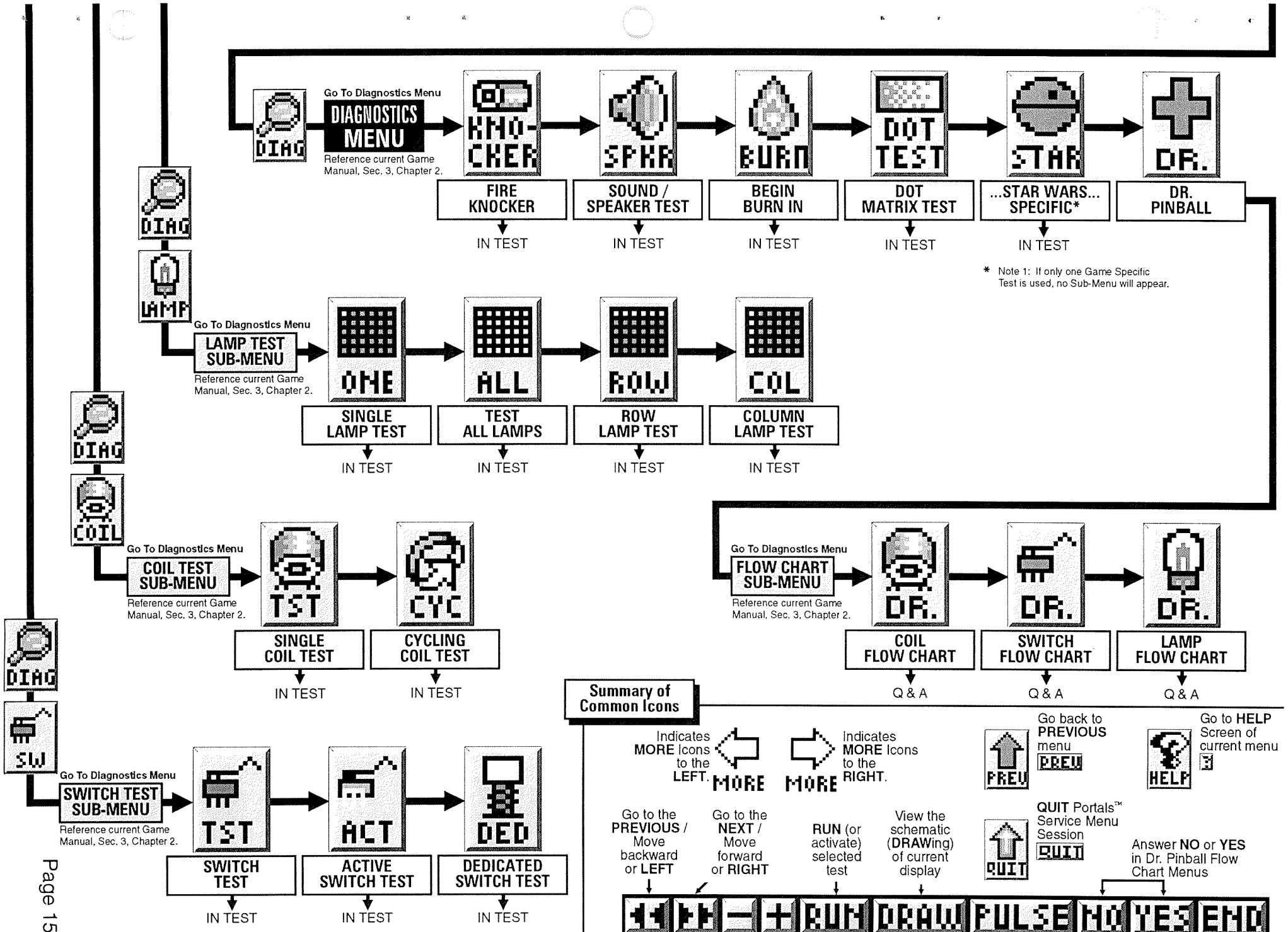
As the operator views the Menu Screen(s), the ⇦ MORE ⇨ MORE symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the **Black "ENTER" Button** (or **Start Button**) will select the *Icon* and the Menu Screen will change to the menu selected. Select the **"PREV"** *Icons* to move backwards through the menu levels. Select the **"QUIT"** *Icon* to completely exit the Service Mode.

View the **Portals™ Service Menu Icon Tree** on the next pages for a complete overview of all menus used in this system. View the last chapter (HELP) if more information is required. Selecting the "QUIT" *Icon* with the **Red "LEFT"** or **Green "RIGHT" Buttons** (or either **Flipper Button**), then pressing the **Black "ENTER" Button** (or **Start Button**) will exit the Service Mode. This applies to the large and small "QUIT" *Icons*.

The **chapters** in this **section**, which coincide with the **MAIN MENU**, will also provide more detailed information which could not fit in the display. Use both the manual and the display to help customize, troubleshoot and/or diagnose faults, if any.

Portals™ Service Menu Icon Tree for *The Star Wars Trilogy - Special Edition*




DIAG
Go To Diagnostics Menu
DIAGNOSTICS MENU
Reference current Game Manual, Sec. 3, Chapter 2.
KNO-CKER
SPKR
BURN
DOT TEST
STAR
DR.
FIRE KNOCKER
SOUND / SPEAKER TEST
BEGIN BURN IN
DOT MATRIX TEST
...STAR WARS... SPECIFIC*
DR. PINBALL
IN TEST
* Note 1: If only one Game Specific Test is used, no Sub-Menu will appear.
LAMP
Go To Diagnostics Menu
LAMP TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
ONE
ALL
ROW
COL
SINGLE LAMP TEST
TEST ALL LAMPS
ROW LAMP TEST
COLUMN LAMP TEST
COIL
Go To Diagnostics Menu
COIL TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
TST
CYC
SINGLE COIL TEST
CYCLING COIL TEST
Go To Diagnostics Menu
FLOW CHART SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
COIL FLOW CHART
SWITCH FLOW CHART
LAMP FLOW CHART
Q & A
SW
Go To Diagnostics Menu
SWITCH TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
TST
ACT
DED
SWITCH TEST
ACTIVE SWITCH TEST
DEDICATED SWITCH TEST
Summary of Common Icons
Indicates MORE Icons to the LEFT.
MORE
MORE
Indicates MORE Icons to the RIGHT.
PREV
Go back to PREVIOUS menu
HELP
Go to HELP Screen of current menu
Go to the PREVIOUS / Move backward or LEFT
Go to the NEXT / Move forward or RIGHT
RUN (or activate) selected test
View the schematic (DRAWing) of current display
QUIT
QUIT Portals™ Service Menu Session
Answer NO or YES in Dr. Pinball Flow Chart Menus
RUN
DRAW
PULSE
NO
YES
END
DECREMENT (-) displayed value or
INCREMENT (+) displayed value or
PULSE Coil
END Coil selection to select new Coil in

Portals™ Service Menu Example

This example will demonstrate activation of *Icons* in the **DIAGNOSTICS MENU**. The example will show activation of the "SW" *Icon* (**GO TO SWITCH MENU**). In this menu, the switches can be tested individually and also all active switches can be tested. Use the same technique to access all the *Icons* in the **Portals™ Service Menu**. Follow **Portals™ Service Menu Icon Tree** on the previous pages as a guide to help navigate through the entire system (Also, go to the chapter in this manual explaining the icon(s) selected.).

If the display is in any other menu other than the **MAIN MENU**, use the **Red "LEFT"** & **Green "RIGHT" Buttons** to select the "PREV" *Icon* and press the **Black "ENTER" Button** to activate the **ICON** thus moving back to the previous menu. Do so until **MAIN MENU** appears.

Chapters 2 through 7 will cover all menu items within the **Portals™ Service Menu**. The *Icon* is shown preceding the text. Find the *Icon* in the **Portals™ Service Menu** by navigating with the **Red** or **Green Buttons**. Each chapter started is from the **MAIN MENU**. Within the chapter, the sub-menu's will be covered sequentially with their explanation & function. If the operator *"gets lost"*, select and activate the "PREV" *Icon* until the display indicates **MAIN MENU**. For more help, see Chapter 7.

The "MORE" *symbols* are indicating that *"more icons"* are available which don't appear in the display and which way to move the selection to view the *Icons*.

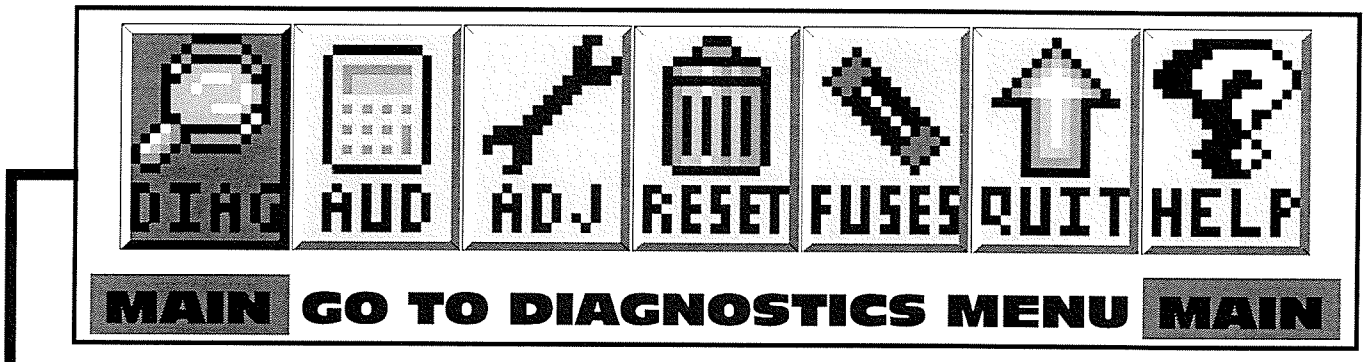
Important Note:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. ***If no Icons appear in the display because of a testing function or special display (e.g. Help, Schematic Display, etc.), press any service button to exit to the previous menu or sub-menu.***

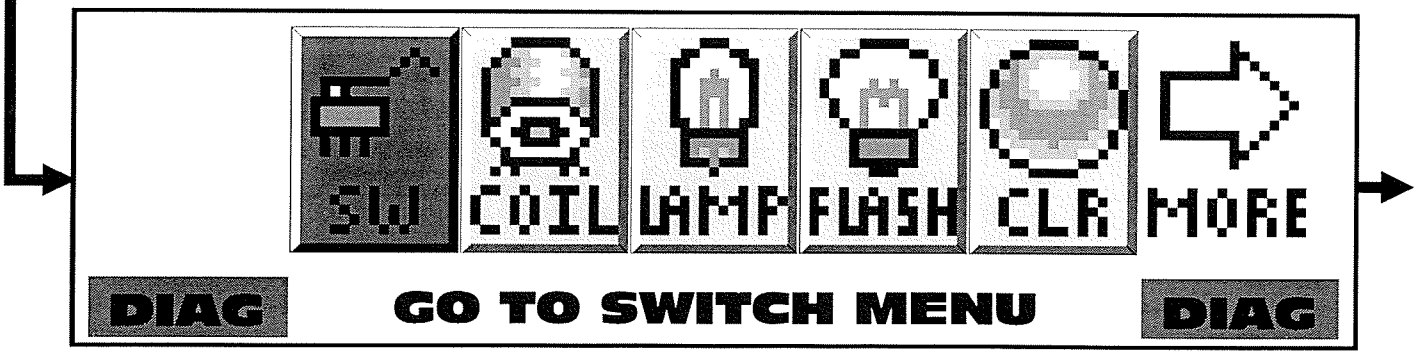
Selecting & activating the "QUIT" *Icon* from any display will exit the *Service Session*.

Selecting & activating the "HELP" *Icon* will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

Example: From the **MAIN MENU**, use the **Red "LEFT"** or **Green "RIGHT" Buttons** to select the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**).

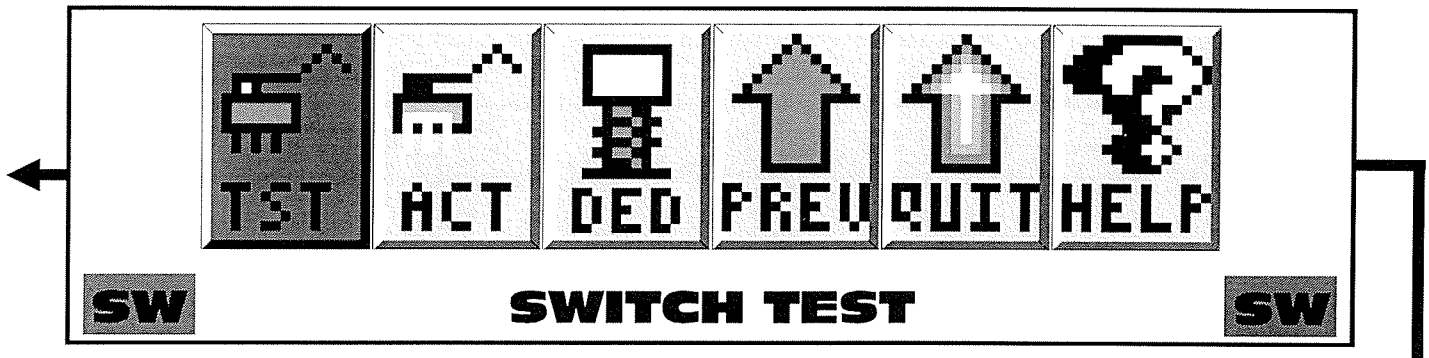


Press the **Black "ENTER" Button** to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

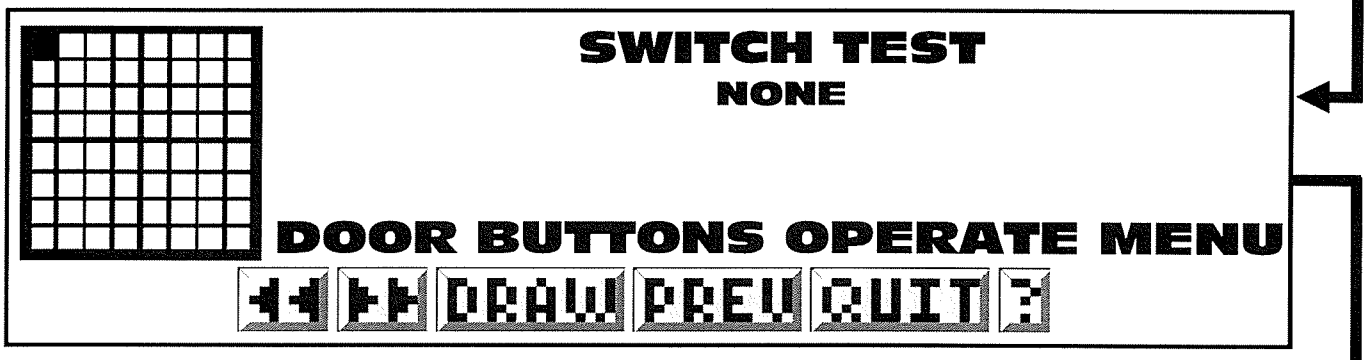


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing. Press the **Black Button** to *activate* this icon. This will bring up the **SWITCH TEST MENU**.

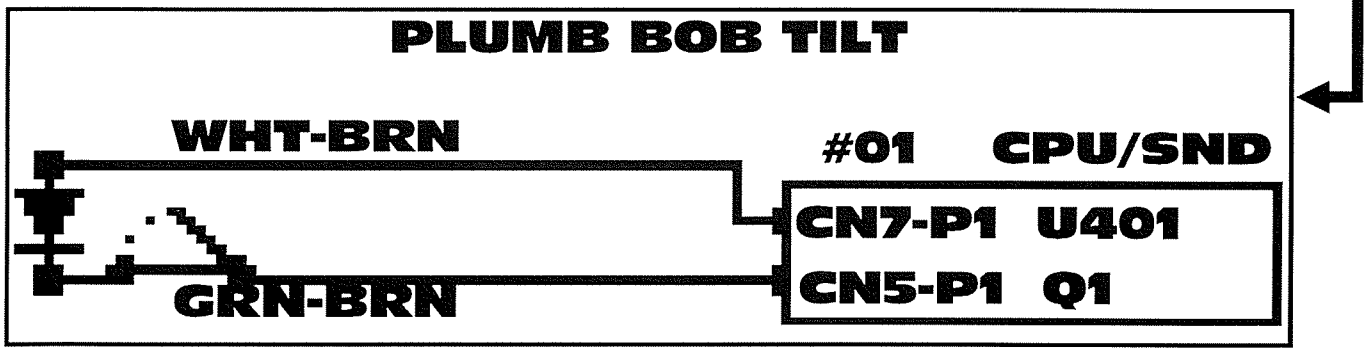
The **SWITCH TEST MENU** now appears with the "TST" *Icon* (**SWITCH TEST**) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the **Switch Test Display**.



The **Switch Test Display** now appears.



All switches can be tested one at a time (When possible, use a pinball to close any playfield switches; rolling the ball at Stand-Up Targets or over/under switches is suggested. Use finger for all non-playfield switches.) As each switch is closed, the respective Switch Matrix Grid Position (1-64) will be lit. To view the schematic for the switch selected, press the **Red** or **Green Buttons** to select the "DRAW" *Icon*. Press the **Black Button** to *activate* this icon. This will bring up the **Switch Schematic Display** for the switch being closed.



An example is shown with Switch #01, Plumb Bob Tilt, selected. The display describes the switch in the Switch Matrix which includes the name of the switch, the Return (Row) Wire and the Drive (Column) Wire, drive transistor, the part number (not shown in the above example) and the "Pin-Outs" from the CPU/Sound Board.

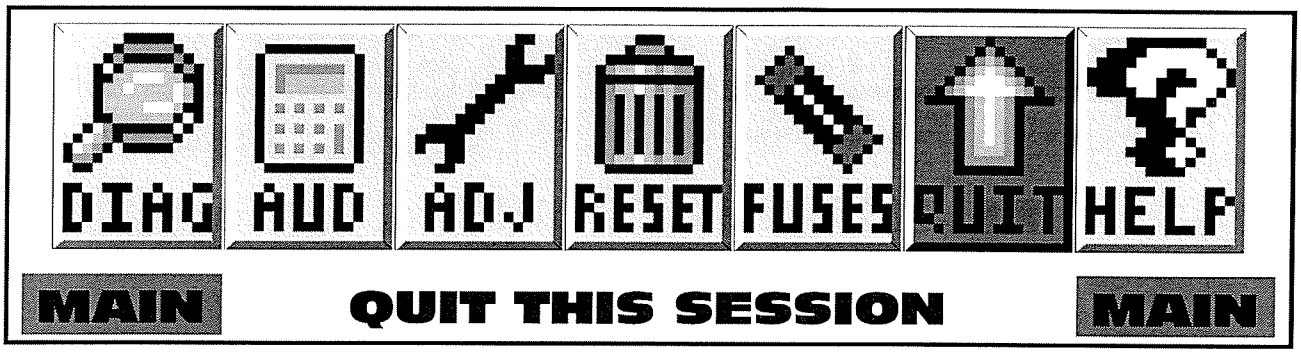
While in Switch or Active Switch Tests, the **Flipper & Start Buttons** are deactivated. Use the **Red "LEFT," Green "RIGHT"** and/or **Black "ENTER" Buttons** to select and activate the "**MINI-ICONS**" at the bottom of the display. In Switch Test, if the "Left Arrow" or "Right Arrow" *Icon* is activated, the display will go to the previous tests (Active and Dedicated Switch Tests). Use the **Red** or **Green Buttons** to change the selected **ICON** to "PREV"*Icon.* Press the **Black "ENTER" Button** to go to the previous menu.

Note:
In **Dedicated Switch Test**, the **Flipper & Start Buttons** are to be used instead of the **Red**, **Green** & **Black Service Buttons**, as these buttons are deactivated for this test.

Exit out of the sub-menu by activating the big "PREV" *Icon* in the menu. This will bring up the **DIAGNOSTICS MENU**. The Switch Test Session is now complete. See the next page about exiting the **Portals™ Service Menu**.

Exiting the Portals™ Service Menu

All *Icons* will be covered in the chapters of this section with the exception of the "QUIT" *Icon*, in the **MAIN MENU**. Both the large and small *Icons* if selected and activated, will exit the user from the **Portals™ Service Menu**. The display will return back to the **ATTRACT MODE**! To re-enter the **Portals™ Service Menu** follow the instructions at the beginning of this chapter.



If more help is required, see Chapter 7 of this section, and view the various help displays in the game.

Your Notes

Go To Diagnostics Menu

Special Note: If the ***display flashes*** **"OPEN THE COIN DOOR"** the game is indicating that memory has been corrupted. This is caused be either failure in memory (e.g. batteries are dead and/or faulty **RAM**) or upon installation of updated version of game code. Opening the Coin Door will initiate a *Factory Restore*, by opening the ***Memory Protect Switch***. Check battery voltage at **CMOS RAM** with the power off.

Overview

The **Portals™ Service Menu System** provides tests for sounds, display, lamps, switches and coils. Each feature may be tested manually or automatically after entering the **Portals™ Service Menu** (see Chapter 1 of this section). Select the "DIAG" *Icon* from the **MAIN MENU** to go to the **DIAGNOSTICS MENU**. The automatic tests (e.g. Cycling Coils, Flash Lamps, etc.) may be used for a quick verification of automatic test functions and the manual tests (Begin Play Test, Single Lamp/All/Row/Column Tests, etc.) may be used for troubleshooting.

During game play, activation of switches and operation of coils with associated switches are monitored. If the CPU Board does not detect a switch transition ("Stuck Open" / "Stuck Closed") 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 the Attract Mode, faulty switches and coils (if any) are reported (Select the "TECH" *Icon*, Technician Alerts, from the **DIAGNOSTICS MENU**). 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.

GO TO DIAGNOSTICS MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "DIAG" *Icon* in the **MAIN MENU** with either **Flipper** or **Red "LEFT"** & **Green "Right" Buttons** (upon entry of the **Portals™ Service Menu**, the system defaults with the selection of the "DIAG" *Icon* flashing) and press the **Start** or **Black "ENTER" Buttons**. The **DIAGNOSTICS MENU** appears.

The "MORE" *symbols* are indicating that *"more icons"* are available which don't appear in the display and which way to move the selection to view the *Icons*.

Important Notes:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.

Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

In Diagnostics, selecting & activating the "-" or "+" *Icons* moves test forwards/backwards.

Selecting & activating the "RUN" *Icon* repeats the test on the coil or flash lamp left off at.

Selecting & activating the "ARROW" *Icons* moves between tests in the sub-menu.

Selecting & activating the "DRAW" *Icon* will show the schematic for that switch or coil.

Some tests require navigation through the menu(s) and selection of the *Icons* with the **Red "LEFT," Green "RIGHT"** and **Black "ENTER" Buttons**. This is required is Switch & Active Switch Tests, as the **Flipper** & **Start Buttons** are a part of the test.

In Coil Test, ensure the **Power Interlock Switch** is pulled out. (See ***Access & Use*** of Chapter 1 of this section for the location.) If the switch is not pulled out, the Coils & Flash Lamps cannot be tested (32v DC / 50v DC are disabled). Closing the Coin Door will automatically reset this switch. Coils & Flash Lamps are checked manually in Coil Test. To automatically check coils, go to Cycling Coils from the **COIL TEST MENU**. To automatically check flash lamps, go to Flash Lamp Test, from the **DIAGNOSTICS MENU**.

Go To Switch Menu

From the **DIAGNOSTICS MENU**, select the "SW" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. 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 Test Menu consists of three parts: Switch Test, Active Switches, and Dedicated Switch Test.

Note: The Flipper & Start Buttons are deactivated during Switch Tests.

Switch Test

To initiate, from the **SWITCH MENU**, select the "TST" *Icon* with the **Red** or **Green Button** & press the **Black Button**. In Switch Test, close each switch and observe the display. The display will describe the switch in the Switch Matrix, which includes the switch name, Return (Row) Wire, Drive (Column) Wire, Part Nº, and the "Pin-Outs" from the CPU/SOUND Board. When the switch is released, the information of the last switch closed will remain in the display until another switch is closed or the test is exited. To view the switch schematic, select the mini "DRAW" *Icon* with the **Red** or **Green Button** & press the **Black Button**.

Active Switch Test

To initiate, from the **SWITCH MENU**, select the "ACT" *Icon* with either **Red** or **Green Button** & press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Switch Menu or selecting either of the "ARROW" *Icons* will move through the tests. If any switches are stuck closed (or made from the presence of a pinball), the display sequences through the Switch Names, Return (Row) Wire, Drive (Column) Wire, Drive Transistor, Part Nº, and the "Pin-Outs" from the CPU/SOUND Board. This cycle continues until all switches are cleared or until the test is exited.

Dedicated Switch Test

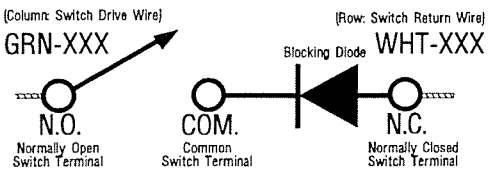
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** (The service switches are deactivated during this test.). The display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part Nº, and the "Pin-Outs" from the CPU/SOUND Board.

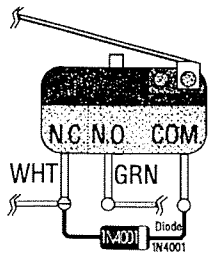
SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive) / Row (Return)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 GRN-BLK CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
1 U400 WHT-BRN CN7-P9	NOT USED 1	NOT USED 9	4-BANK DROP #1 (TOP) 17	NOT USED 25	NOT USED 33	NOT USED 41	TOP TURBO BUMPER 49	LEFT OUTLANE 57
2 U400 WHT-RED CN7-P8	4TH COIN SLOT 2	NOT USED 10	4-BANK DROP #2 18	NOT USED 26	SPECIAL 34	NOT USED 42	LEFT TURBO BUMPER 50	LEFT RETURN LANE 58
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT 3	NOT USED 11	4-BANK DROP #3 19	NOT USED 27	X-WING HOME 35	RIGHT ORBIT TOP 43	RIGHT TURBO BUMPER 51	LEFT SLINGSHOT 59
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT 4	4-BALL TROUGH #1 (LEFT) 12	4-BANK DROP #4 (BOT-TOM) 20	(**F**) ORCE S-U 28	X-WING ENABLE 36	RIGHT ORBIT BOTTOM 44	BOTTOM TURBO BUMPER 52	RIGHT OUTLANE 60
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA 5	4-BALL TROUGH #2 13	DROP TARGET HOLE 21	F (**O**) RCE S-U 29	X-WING LOADED 37	TOP VUK 45	LAUNCH BUTTON 53	RIGHT RETURN LANE 61
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT 6	4-BALL TROUGH #3 14	BIG RAMP ENTER (LEFT) 22	FO (**R**) CE S-U 30	3-BANK (BOTTOM) 38	BOTTOM VUK 46	START BUTTON 54	RIGHT SLINGSHOT 62
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT 7	4-BALL TROUGH VUK OPTO 15	BIG RAMP EXIT 23	FOR (**C**) E S-U 31	3-BANK (MID) 39	LEFT ORBIT BOTTOM 47	SLAM TILT 55	NOT USED 63
8 U401 WHT-GRY CN7-P1	NOT USED 8	SHOOTER LANE 16	BIG RAMP ENTER (RIGHT) 24	FORC (**E**) S-U 32	3-BANK (TOP) 40	NOT USED 48	PLUMB BOB TILT 56	NOT USED 64

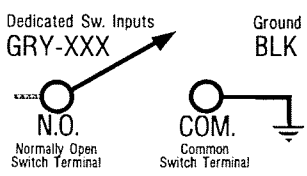
GND / IC U206 INPUTS	Ground BLK CN6-P1, -P11
1 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON DS-1
2 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke) DS-2
3 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON DS-3
4 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke) DS-4
5 (Not Used) GRY-GRN CN6-P7	NOT USED DS-5
6 GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (Normal) (In Test: LEFT) DS-6
7 GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (Normal) (In Test: RIGHT) DS-7
8 GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (Normal) (In Test: ENTER) DS-8

Typical Switch Schematic & Side View



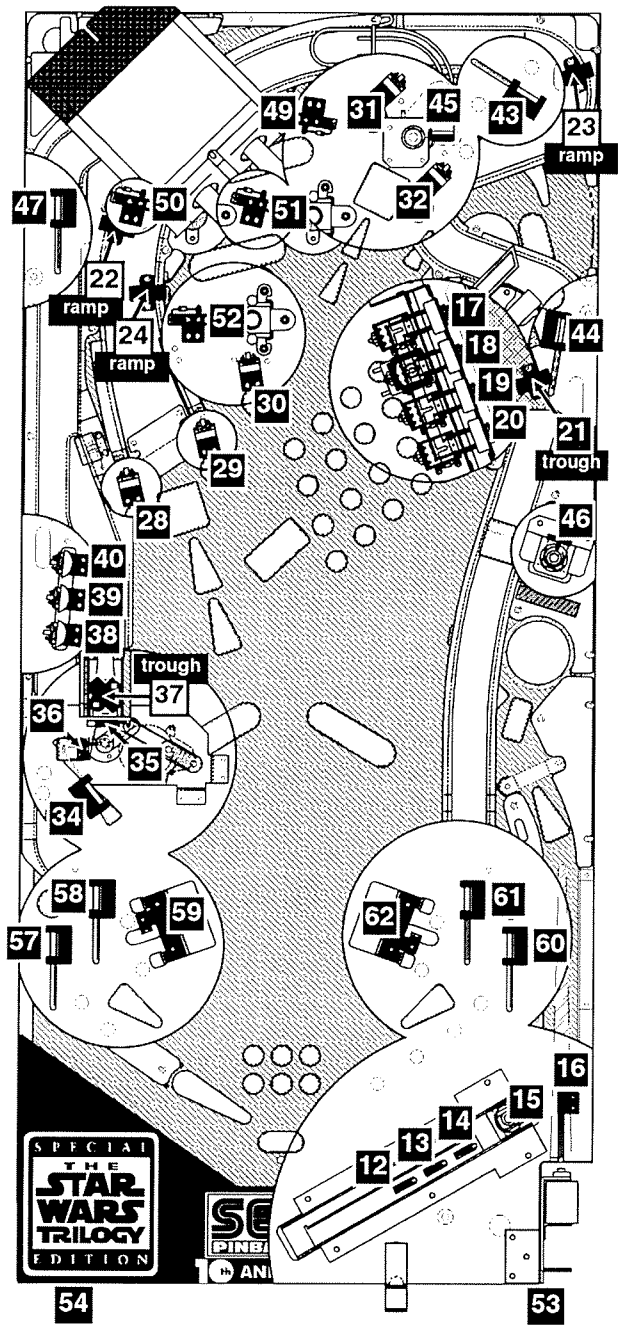


Dedicated Switch Schematic



Switch Matrix Grid Descriptions with Part Numbers and Locations †

The switch locations correspond with the Switch N° in the table below and the Switch Matrix Grid.



Legend Note:

☐ = Switches mounted above playfield.

■ = Switches mounted below playfield.

* The following switches are located in the cabinet and are not noted in the diagram above:

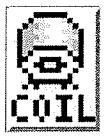
2 4 5 6 55 56

The following switches are not used:

1 8 9 10 11 25 26 27 33 41 42 48 63 64

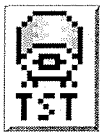
Note: The ¥ Coin Switch (for Japan) is 180-5091-00

Sw. N°	Col. N°	Row N°	Switch Matrix Description	Part N°
1	1	1	NOT USED	— - — - —
2*	1	2	4TH COIN SLOT	(Export Use)
3*	1	3	*6TH COIN SLOT*	(Future Use)
4*	1	4	RIGHT COIN SLOT	180-5024-00
5*	1	5	CENTER COIN SLOT / DBA	Bill Acceptor
6*	1	6	LEFT COIN SLOT	180-5024-00
7*	1	7	*5TH COIN SLOT*	(Future Use)
8	1	8	NOT USED	— - — - —
9	2	1		
10	2	2		
11	2	3		
12	2	4	4-BALL TROUGH #1 (LEFT)	180-5119-00
13	2	5	4-BALL TROUGH #2	
14	2	6	4-BALL TROUGH #3	
15	2	7	4-BALL TROUGH VUK OPTO TRANS	520-5124-00
			OPTO REC	520-5125-00
16	2	8	SHOOTER LANE	180-5100-01
17	3	1	4-BANK DROP #1 (TOP)	180-5158-00
18	3	2	4-BANK DROP #2	
19	3	3	4-BANK DROP #3	
20	3	4	4-BANK DROP #4 (BOTTOM)	
21	3	5	DROP TARGET HOLE	180-5145-02
22	3	6	BIG RAMP ENTER (LEFT)	180-5145-00
23	3	7	BIG RAMP EXIT	
24	3	8	BIG RAMP ENTER (RIGHT)	
25	4	1	NOT USED	— - — - —
26	4	2		
27	4	3		
28	4	4	(**F**) ORCE S-U	500-6138-01
29	4	5	F (**O**) RCE S-U	
30	4	6	FO (**R**) CE S-U	
31	4	7	FOR (**C**) E S-U	
32	4	8	FORC (**E**) S-U	
33	5	1	NOT USED	— - — - —
34	5	2	SPECIAL	500-5707-00
35	5	3	X-WING HOME	180-5119-00
36	5	4	X-WING ENABLE	
37	5	5	X-WING LOADED	180-5145-02
38	5	6	3-BANK (BOTTOM)	500-6189-03
39	5	7	3-BANK (MID)	
40	5	8	3-BANK (TOP)	
41	6	1	NOT USED	— - — - —
42	6	2		
43	6	3	RIGHT ORBIT TOP	500-5707-00
44	6	4	RIGHT ORBIT BOTTOM	500-5706-00
45	6	5	TOP VUK	180-5116-00
46	6	6	BOTTOM VUK	180-5145-02
47	6	7	LEFT ORBIT BOTTOM	500-5707-00
48	6	8	NOT USED	— - — - —
49	7	4	TOP TURBO BUMPER	180-5015-03
50	7	2	LEFT TURBO BUMPER	
51	7	3	RIGHT TURBO BUMPER	
52	7	4	BOTTOM TURBO BUMPER	
53	7	5	LAUNCH BUTTON	500-6121-06
54	7	6	START BUTTON	500-6090-06
55*	7	7	SLAM TILT (On Coin Door)	180-5022-00
56*	7	8	PLUMB BOB TILT HANGER	535-5319-00
			CONTACT	535-7563-01
57	8	1	LEFT OUTLANE	500-5707-00
58	8	2	LEFT RETURN LANE	
59	8	3	LEFT SLINGSHOT	180-5054-00
60	8	4	RIGHT OUTLANE	500-5707-00
61	8	5	RIGHT RETURN LANE	
62	8	6	RIGHT SLINGSHOT	180-5054-00
63	8	7	NOT USED	— - — - —
64	8	8		



Go To Coil Menu

From the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The coils are listed in groups. The first 2 groups are the High Current Coils. The next group is the Low Current Coils. The next group is the Flash Lamps. The remaining coils are special coils. These coils are listed in a Coils Detailed Chart Table following the Playfield Coil & Flash Lamp Locations.



Single Coil Test

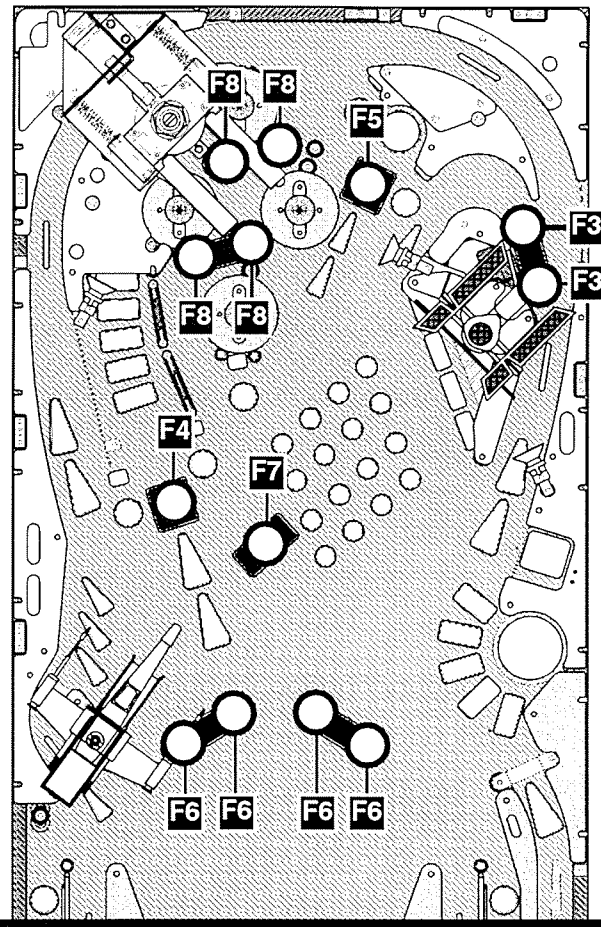
To initiate, from the **COIL MENU**, select the "TST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-24 and Flash Lamps F1-F8; In this game, Coils 25 & 26 are in the F1 & F2 Flash Lamp positions.). Press the **Black Button** on the "+" *Icon*, as each coil is selected, the display will describe the coil or flash lamp name with the corresponding number, the wire with colors, the "Pin-Outs" from the I/O Power Driver Board, the coil voltage & gauge-turns (e.g. 23-800). Press the **Black Button** again to move forward in the test. To test and view a particular coil or flash lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the coil or flash lamp will fire on the playfield and/or backbox, with the display indicating the coil or flash lamp information. Continue with the same procedure to run through the entire test.

Cycling Coil Test

To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either **Red** or **Green Button** and press the **Black Button**.. If still in a previous test, select the "PREV" *Icon* to return to Coil Menu or selecting either of the "ARROW" *Icons* will move to Cycling Coil Test (selecting again will return to Coil Test). The test pulses each regular coil or flash lamp sequentially (cycling) on the playfield and backbox. The display indicates "CYCLING COILS."

Playfield Flash Lamp Locations

Type	Description
#F3 FLASH	TIE FTR.:*2 (#89 Bulb)
#F4 FLASH	RT RAMP:*1 (#89 Bulb)
#F5 FLASH	TOP VUK:*1 (#89 Bulb)
#F6 FLASH	DARTH:*4 (#89 Bulb)
#F7 FLASH	SUPER JP:*1 (#89 Bulb)
#F8 FLASH	POPS:*4 (#89 Bulb)



Legend Note:

☐ = Flash Lamps mounted above playfield.

■ = Flash Lamps mounted below playfield.

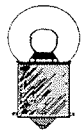
Spots Actual Location:

◯ = Bulb goes through hole in the playfield.

◯ = Bulb is under playfield insert.

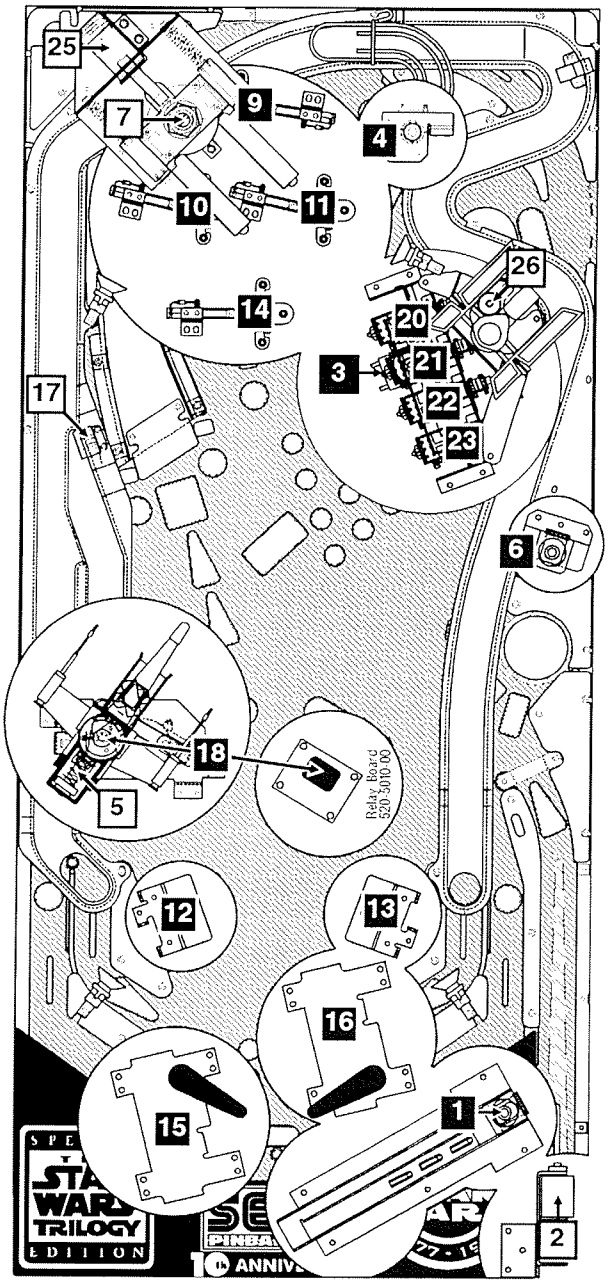
◉ = Bulb under Mini-Mar (Light Cover).

The following bulb is used for Flash Lamps (see table above for bulb usage).



#89 Bulb
(Bayonet)
165-5000-89

Playfield Coil Locations



Type	Coil Description
COIL 1	TROUGH UP-KICKER (VUK) (24-940)
COIL 2	AUTO LAUNCH (23-700)
COIL 3	4-BANK DROP TARGET RESET (24-940)
COIL 4	TOP VUK (24-940)
COIL 5	X-WING CANNON (23-800)
COIL 6	BOTTOM VUK (23-800)
COIL 7	RAMP MAGNET (22-650)
COIL 8	(EUROPEAN TOKEN DISPENSER)
COIL 9	TOP TURBO BUMPER (26-1200)
COIL 10	LEFT TURBO BUMPER (26-1200)
COIL 11	RIGHT TURBO BUMPER (26-1200)
COIL 12	LEFT SLINGSHOT (26-1200)
COIL 13	RIGHT SLINGSHOT (26-1200)
COIL 14	BOTTOM TURBO BUMPER (26-1200)
COIL 15	LEFT FLIPPER [50v RED/YEL] (22-1080)
COIL 16	RIGHT FLIPPER [50v RED/YEL] (22-1080)
COIL 17	X-WING DIVERTER (31-1500)
COIL 18	X-WING MOTOR RELAY (24V DC 10A DPDT)
COIL 19	NOT USED
COIL 20	4-BANK #1 (TOP) DOWN (32-1800)
COIL 21	4-BANK #2 DOWN (32-1800)
COIL 22	4-BANK #3 DOWN (32-1800)
COIL 23	4-BANK #1 (BOT) DOWN (32-1800)
COIL 24	(OPTIONAL COIN METER)
COIL 25	COIL MAGNET SLIDE (23-800)
COIL 26	COIL TIE FTR. SHAKE (31-1500)

Legend Note:

□ = Coils mounted above playfield.

■ = Coils mounted below playfield.

The following coil is not used:

19

The following coils are optional:

8 24

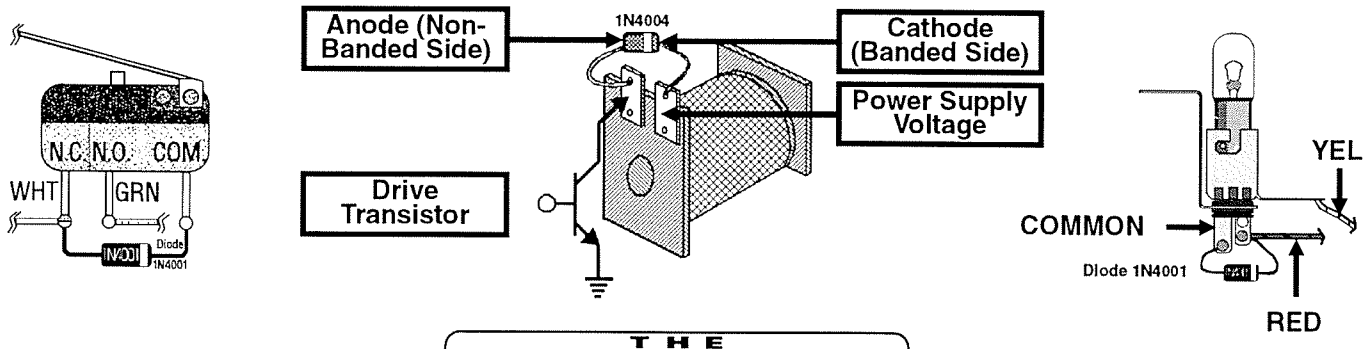
COILS DETAILED CHART TABLE

	High Current Coils Group 1.	Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v	23-700 090-5022-00T
#3	4-BANK DROP TARGET RESET	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#4	TOP VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#5	X-WING CANNON	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-P4/5	50v	23-800 090-5053-00
#6	BOTTOM VUK	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#7	RAMP MAGNET	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	J10-P4/5	50v	22-650 090-5042-01
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v	N/A
	High Current Coils Group 2	**Drive Transistor (D.T.)**	**Driver Ouput Board**	**D.T. Control Line Color**	**D.T. Control Line Connect**	**Power Line Color**	**Power Line Connnection**	**Power Voltage**	**Coil GA/Turn or Bulb Type**
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#10	LEFT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#14	BOTTOM TURBO BUMPER	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v	22-1080 090-5032-00T
	Low Current Coils Group 1	**Drive Transistor (D.T.)**	**Driver Ouput Board**	**D.T. Control Line Color**	**D.T. Control Line Connect**	**Power Line Color**	**Power Line Connnection**	**Power Voltage**	**Coil GA/Turn or Bulb Type**
#17	X-WING DIVERTER	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v	31-1500 090-5054-00
#18	X-WING MOTOR RELAY	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v	24v DC 10A DPDT 520-5010-00
#19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	N/C	N/C	N/C
#20	4-BANK #1 (TOP) DOWN	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v	32-1800 090-5031-00
#21	4-BANK #2 DOWN	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v	32-1800 090-5031-00
#22	4-BANK #3 DOWN	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v	32-1800 090-5031-00
#23	4-BANK #4 (BOT) DOWN	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v	32-1800 090-5031-00
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v	5v Meter (If Required)

Coils Detailed Chart Table Continued

Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Bulb Type
#25	COIL MAGNET SLIDE	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	BRN	J7-P1	20v	23-800 090-5001-00B
#26	COIL TIE FTR. SHAKE	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	BRN	J7-P1	20v	31-1500 090-5054-00
#F3	FLASH TIE FTR.*2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F4	FLASH RT RAMP*1	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F5	FLASH TOP VUK*1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F6	FLASH DARTH*4	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F7	FLASH SUPER JP*1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v	#89 Bulb 165-5000-89
#F8	FLASH POPS*4	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	#89 Bulb 165-5000-89

TYPICAL SWITCH, COIL & LAMP WIRING



Go To Lamp Menu

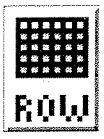
From the **DIAGNOSTICS MENU**, select the "LAMP" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Controlled lamps are configured in and 8 x 10 Matrix of Columns (Lamp Drives) and Rows (Lamp Returns) with up to 80 lamps possible. The Lamp Test Menu consists of four parts: Single Lamp Test, Test All Lamps, Row Lamp Test and Column Lamp Test.

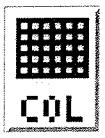
Single Lamp Test

To initiate, from the **LAMP MENU**, select the "ONE" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Lamp Test from Column 1, Row 1, Switch 1. Press the **Black Button** on the "+" *Icon*, as each lamp is selected, the lamp will light at it's location on the playfield as well as the display, indicating the Lamp Matrix Grid Position, lamp name with the corresponding number, Return (Row) Wire & Color, Drive (Column) Wire & Color, and associated drive transistors. Press the **Black Button** again to move forward in the test. To test and view a particular lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the lamp will light-up on the playfield, with the display indicating the lamp information. Continue with the same procedure to run through the entire test.

Test All Lamps

To initiate, from the **LAMP MENU**, select the "ALL" *Icon* with either **Red** or **Green Button** and press the **Black Button**. If still in Single Lamp Test (or any 1 of the 4 tests), select the "PREV" *Icon* to return to Lamp Menu or selecting either of the "ARROW" *Icons* will move through the tests, keep activating until Test All Lamps is displayed. The display will indicate "ALL LAMPS ON" and the lamps on the playfield will be lit, alternating between the rows in the Lamp Matrix Grid.





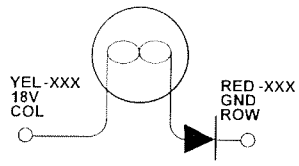
Row & Column Lamp Tests

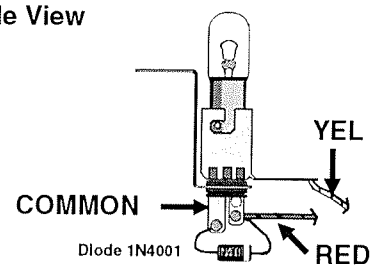
To initiate, from the **LAMP MENU**, select the "ROW" or "COL" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Lamp Menu or selecting either of the "ARROW" *Icons* will move through the tests, keep activating until Row or Column Lamp Test (whichever desired) is displayed. In this test, each set of lamps in each Row or Column of the Lamp Matrix Grid (respective to each test) will light-up on the playfield and is indicated in the display.

LAMP MATRIX GRID

Column (18V) / Row (GND)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	NOT USED 1	NOT USED 2	GRID: SUPER JACKPOT #555 Bulb 3	GRID: HURRY-UP #555 Bulb 4	GRID: FALCON JACKPOT #44 Bulb 5	GRID: COMPLETE HEROIC #555 Bulb 6	GRID: THAW HAN SOLO #555 Bulb 7	GRID: LAND SPEEDER #555 Bulb 8
2: Q34 RED-BLK J12-P2	SHOOT AGAIN #555 Bulb 9	LAUNCH BUTTON #555 Bulb 10	LEFT ORBIT ARROW #555 Bulb 11	RIGHT ORBIT ARROW #555 Bulb 12	TOP VUK ARROW #555 Bulb 13	NOT USED 14	NOT USED 15	NOT USED 16
3: Q35 RED-ORG J12-P3	DROP #1 TIE #4 (LEFT) #555 Bulb 17	DROP #1 TIE #3 #555 Bulb 18	DROP #1 TIE #2 #555 Bulb 19	DROP #1 TIE #1 (RIGHT) #44 Bulb 20	DROP #2 TIE #4 (LEFT) #555 Bulb 21	DROP #2 TIE #3 #555 Bulb 22	DROP #2 TIE #2 #555 Bulb 23	DROP #2 TIE #1 (RIGHT) #44 Bulb 24
4: Q36 RED-YEL J12-P4	CANTINA HURRY-UP #555 Bulb 25	EXTRA BALL HURRY-UP #555 Bulb 26	SPECIAL HURRY-UP #555 Bulb 27	BOUNTY HUNTER #555 Bulb 28	PROBE DROIDS #555 Bulb 29	3-BANK (BOTTOM) #555 Bulb 30	3-BANK (MID) #555 Bulb 31	3-BANK (TOP) #555 Bulb 32
5: Q37 RED-GRN J12-P5	(F) ORCE #555 Bulb 33	F (O) RCE #555 Bulb 34	FO (R) CE #555 Bulb 35	FOR (C) E #555 Bulb 36	FORC (E) #555 Bulb 37	SPECIAL #44 Bulb 38	EXTRA BALL #555 Bulb 39	JACKPOT (MINI-LOOP) #555 Bulb 40
6: Q38 RED-BLU J12-P6	DROP #3 TIE #4 (LEFT) #555 Bulb 41	DROP #3 TIE #3 #555 Bulb 42	DROP #3 TIE #2 #555 Bulb 43	DROP #3 TIE #1 (RIGHT) #44 Bulb 44	DROP #4 TIE #4 (LEFT) #555 Bulb 45	DROP #4 TIE #3 #555 Bulb 46	DROP #4 TIE #2 #555 Bulb 47	DROP #4 TIE #1 (RIGHT) #44 Bulb 48
7: Q39 RED-VIO J12-P8	HAN SOLO LEFT #1 (TOP) RED LED 49	HAN SOLO LEFT #2 RED LED 50	HAN SOLO LEFT #3 RED LED 51	HAN SOLO LEFT #4 (BOT) RED LED 52	HAN SOLO RT. #1 (TOP) RED LED 53	HAN SOLO RIGHT #2 RED LED 54	HAN SOLO RIGHT #3 RED LED 55	HAN SOLO RT. #4 (BOT) RED LED 56
8: Q40 RED-GRY J12-P9	TOP TURBO BUMPER #555 Bulb 57	LEFT TURBO BUMPER #555 Bulb 58	RIGHT TURBO BUMPER #555 Bulb 59	BOTTOM TURBO BUMPER #555 Bulb 60	RETURN OF THE JEDI #555 Bulb 61	SUPER JACKPOT #555 Bulb 62	RAMP DIVERTER LEFT GRN LED 63	RAMP DIVERTER RIGHT GRN LED 64
9: Q41 RED-WHT J12-P10	FALCO (N) #555 Bulb 65	FALC (O) N #555 Bulb 66	FAL (C) ON #555 Bulb 67	FA (L) CON #555 Bulb 68	F (A) LCON #555 Bulb 69	(F) ALCON #555 Bulb 70	LOAD X-WING (RAMP) #44 Bulb 71	LOAD X-WING (VUK) #44 Bulb 72
10: Q42 RED J12-P11	LEFT OUTLANE #555 Bulb 73	LEFT RETURN LANE #555 Bulb 74	RIGHT RETURN LANE #555 Bulb 75	RIGHT OUTLANE #555 Bulb 76	LEFT ORBIT ARROW #555 Bulb 77	RIGHT ORBIT ARROW #555 Bulb 78	JACKPOT (RAMP) #555 Bulb 79	RAMP ARROW #555 Bulb 80

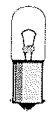
Typical Switch Schematic & Side View





The following Bulbs are used in the Lamp Matrix Grid (See Table Grid for details):
{This game only Lamps #49-#56 are Small RED LEDs, SPI Part №: 165-5102-00 and Lamps #63-#64 are Large GREEN LEDs, SPI Part № 165-5101-00.}

#555 Bulb (Wedge)
165-5002-00



#44 Bulb (Bayonet)
165-5000-44

Lamp Matrix Grid Locations

The lamp locations correspond with the Lamp Number in the Lamp Matrix Grid on the previous page.

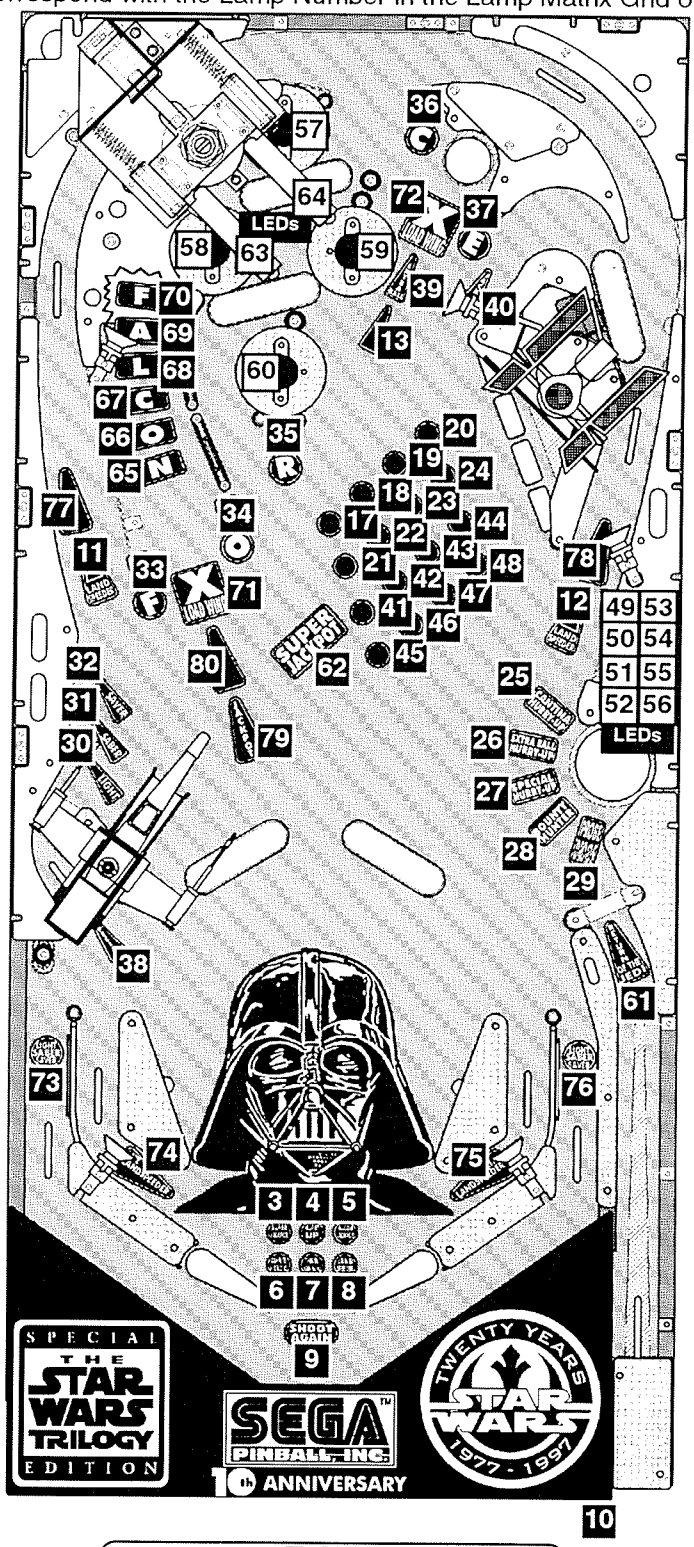
Legend Note:

☐ = Lamps mounted above playfield.

■ = Lamps mounted below playfield.

The following Lamps are not used:

1 **2** **14** **15** **16**



Test Flash Lamps

From the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicated "CYCLING FLASHERS" and all the flash lamps will cycle continuously until the test is exited. This test is allows the technician to easily spot any burned-out bulbs and replace them.

Clear Ball Trough

From the **DIAGNOSTICS MENU**, select the "CLR" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This is provided to allow the technician a simple method of removing the balls from the trough and also, to test functionality of the trough, ensuring proper trough operation. After selecting this *Icon* the display will show a graphic of the ball trough with balls in the trough with it's corresponding switch number. Select the "RUN" *Icon* to eject the ball in the first position. Simultaneously, the display and the playfield will eject the ball to the Trough Up-Kicker, eject from the Trough Up-Kicker into the Shooter Lane and will be ejected onto the playfield where the technician can easily retrieve the pinball or allow the ball(s) to re-enter the trough to continue Clear Ball Trough Test.

⚠ **Caution:** *Continuous use of above test may overheat the Trough Up-Kicker Coil.* ⚠

Technician Alert

From the **DIAGNOSTICS MENU**, select the "TECH" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will 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.)

Service Phone

From the **DIAGNOSTICS MENU**, select the "SERV" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate a phone number to call if technical assistance is required (the phone number is different for each *Country Dip Switch Setting*).

Begin Play Test

From the **DIAGNOSTICS MENU**, select the "PLAY" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** Button and press the **Black "ENTER" Button**. After selecting this *Icon* the technician can test certain play functions to insure all switch activated coils function without entering game play. For example, by rolling the ball over the left outlane switch, the Laser Kick should fire. If it kicks to 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 cause of the failure. During this function, similar tests may be performed on the "Ejects", Slingshots, Vertical Up-Kickers, Pop Bumpers, etc. in the game. For unique Play Test functions, select the "GAME SPECIFIC" *Icon* in the **DIAGNOSTICS MENU**.

Fire Knocker

From the **DIAGNOSTICS MENU**, select the "KNOCKER" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The digitally mastered "Knocker" is sounded.

Sound / Speaker Test

From the **DIAGNOSTICS MENU**, select the "SPKR" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The BSMT 2000 Sound System produces true digital stereo sound from Backbox & Cabinet Speakers or *"Mono"* on the Cabinet Speaker (when used by itself). After selecting this *Icon*, select the "-" or "+" *Icons* and press the **Black "ENTER" Button** to activate the first test. Repeat to visually see & hear all tests. Select the "RUN" *Icon* to activate the test chosen without moving to the next test.

During Sound Tests, the display shows the speaker identification and the corresponding sound(s). The sound functions allow verification that both channels are functioning properly & that the speaker connections are correct.

Speaker Phase Testing

Continued

Connections to each of 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 one, 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 Backbox & Cabinet, and Backbox Sine (repeated) functions. If the Cabinet Sine produces more volume and bass than the Left Sine, 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 Backbox Speaker RED/WHT Wire and the Cabinet Speaker YEL/WHT Wire is connected to the negative (-) terminal.

2. Disconnect the speaker output connector from the CPU / Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure the positive battery terminal is connected to the positive lead (CN4, Pin-3 (RED/BLK) or Pin-6 (YEL/BLK)) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

Auto / Manual Tests	Sounds Produced
Speaker Test	Tone
Sound/OPSYS EPROM (Loc. U7)	Level 1-3 (Music Test)
Voice ROM 1 (Loc. U17)	Speech Pattern 1

Auto / Manual Tests	Sounds Produced
Voice ROM 2 (Loc. U21)	Speech Pattern 2
Voice ROM 3 (Loc. U36)	Speech Pattern 3
Voice ROM 4 (Loc. U37)	Not Used

Begin Burn In

From the **DIAGNOSTICS MENU**, select the "BURN" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the Begin Burn-In Test will start. At this stage the game will exercise all CPU I/O Functions (Dot Matrix Display Test, Coil Testing, Lamp Testing, Sound, etc.). This is provided to constantly exercise sounds, coils, etc... Cumulative Burn-In minutes will be displayed. To reset Burn-In minutes to 00, select the "RESET" *Icon* in the **MAIN MENU** and select the "FACT" *Icon* (Factory Reset). See Chapter 5, Go To Reset Menu, of this section.

Dot Matrix Test

From the **DIAGNOSTICS MENU**, select the "DOT TEST" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the Dot Matrix Test immediately begins. The display will immediately illuminate & cycle for 1 pass of each test continuously for each of the following tests:

1. Illuminates 1 vertical column of dots, turning it off & illuminating the next column, until each column has been individually lit, while the other columns are off.
2. Illuminates 1 horizontal row of dots, turning it off & illuminating the next row, until each row has been individually lit, while the other rows are off.
3. Illuminates all the dots, except for one column from left to right.
4. Illuminates all the dots, except for one row from top to bottom.
5. Illuminates every other dot lit, in both the rows and columns.
6. Illuminates all dots at 30%, 70% & 100% brightness.

Note: Pressing any button will exit the test & return to **DIAGNOSTICS MENU**.

Dot Matrix Display Explained

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

The board is controlled by a 6809E Microprocessor and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the CPU/Sound Board via the ribbon cable and sends back multiple Status and Busy Signals to the CPU. This is to insure synchronized communication between the CPU and the Display Controller Board. The Drivers for the rows and columns are provided on 5 surface mounted integrated circuits on the Dot Matrix Display Driver Board.

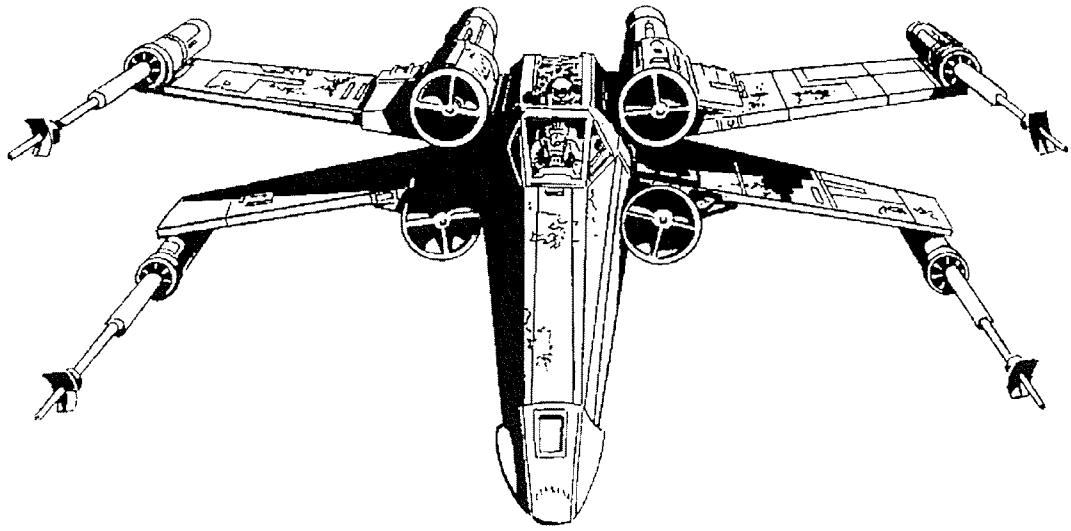
The Star Wars Trilogy - Special Edition Specific

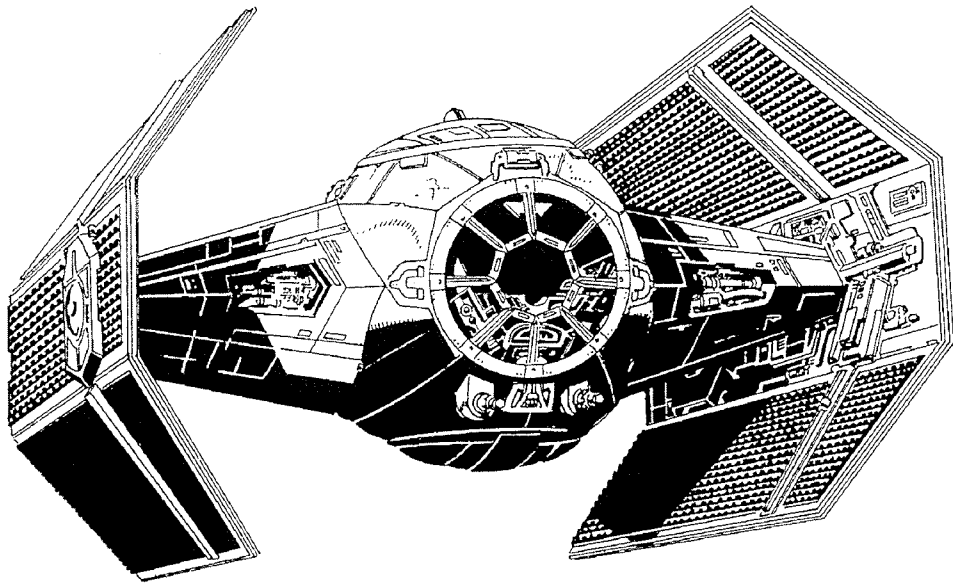
From the **DIAGNOSTICS MENU**, select the "STAR" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the technician can test and adjust any game specific function(s) from the sub-menu. Similar to "BEGIN PLAY TEST," this menu is used to test the game specific features. The feature(s) is the X-Wing Assembly (hereon noted as Cannon).

In this test, the ball should be placed directly into the Cannon; the Display will indicate the switch status of the Cannon: "**HOME**", "**LOADED**" & "**ENABLE**". The ❒ "**HOME**" (Switch 35) indicator will be active when the Cannon is in the far left position allowing it to be loaded. This is the position it should be in when it is at rest during normal operation. The ❒ "**ENABLE**" (Switch 36) indicator will be activated when the Cannon is at rest indicating it is in the safety position. When this switch is closed the Cannon will not be allowed to fire the ball. This switch will open as soon as the Cannon moves out of the safety position. This ensures the ball will not be fired back up the ramp or at something it was not intended to shoot at. The ❒ "**LOADED**" (Switch 37) indicator will be active anytime a ball is loaded into the Cannon.

When the ball is loaded into the Cannon, select the "RUN" *Mini-Icon* and press the **Start Button**. This will move the Cannon; then, when the ball can be fired out, press the **Launch Button**. *Cautionary Note:* The **Start Button** runs the motor at all times in this test & the **Launch Button** fires the coil (Cannon) at all times in this test. *Operational Note: In normal game play, the X-Wing will automatically rotate as soon as it receives a ball; the player must then hit the Launch Button to fire the ball into the 4-Bank Drop Target Opening (at the Tie Fighter).*

NOTE: If your Cannon is malfunctioning and cannot immediately be fixed, go to the **MAIN MENU** in the **Portals® Service Menu** and select the "ADJ" *Icon* (Go To Adjustments Menu), then select the "STAR" *Icon* to view the Game Specific Adjustments to change Adjustment 49 from "**ON**" to "**OFF**." This will disable the Cannon and the Mini-Magnet Diverter, so in normal game play the ball will not be loaded into the Cannon (See Sec. 3, Chp. 4 for more details on adjustments). *After the problem is rectified don't forget to change the adjustment back to the default of "**ON**."*





Dr. Pinball (Flow Chart Menus)

To initiate, from the **DIAGNOSTICS MENU**, select the Cross "DR." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This will bring you (the operator / technician) into **DR. PINBALL** (Flow Chart Menus) which offers you a choice of three sub-menus: Coil "DR.," Switch "DR." and Lamp "DR." *Icons*. Selecting a particular sub-menu will give you a choice of which specific Coil (any and all coil assemblies such as flippers, VUKs, magnets, etc.), Switch or Lamp circuit needs to be diagnosed. The display will now ask a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When Dr. Pinball asks a question or request a procedure the Dr. will expect a response such as "no" or "yes" (see below examples of the *Mini-Icons* which will prompt the operator). You the operator/technician must respond by using your **Flipper Buttons** to "SELECT" a mini-icon and the **Start Button** to "ENTER" your selection.

The following are the *Mini-Icons* with explanations for the Dr. Pinball Sub-Menus to follow:

→ Select a Coil, Lamp, Switch or Flipper to diagnose with "-" or "+" *Icon*; Then select the "RUN" *Icon* to activate the choice.
"PREV" goes back to previous question.
"QUIT" exits Portals completely.
Help "?" gives direction on button usage.

→ Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given.
"END" lets you select a new item to test.
"PREV", "QUIT" and "?" (see first example above).

→ Seen when diagnosis is given. Select any *Icon* for your next step.
"END" lets you select a new item to test.
"PREV", "QUIT" and "?" (see first example above).

→ In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected.
"END" lets you select a new item to test.
"PREV", "QUIT" and "?" (see first example above).

Coil Flow Chart

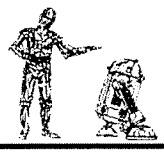
To initiate, from the **DR. PINBALL MENU**, select the Coil "DR." *Icon* with either the **Red** or **Green Button** and press the **Black Button**. This is the Coil Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.

Switch Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Switch "DR." *Icon* with either the **Red** or **Green Button** and press the **Black Button**. This is the Switch Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.

Lamp Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Lamp "DR." *Icon* with either the **Red** or **Green Button** and press the **Black Button**. This is the Lamp Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.



THE STAR WARS TRILOGY
SPECIAL EDITION

GAME AUDIT TABLE

Copy for Field Audit Tracking Performance (Use blank columns to fill-in Audit Info.).

SEGA™ PINBALL, INC.

Earnings Audits 1-12

	Audit Name	Fill-In		Audit Name	Fill-In		Audit Name	Fill-In
1	TOTAL PAID CREDITS		5	COINS THRU LEFT SLOT		9	TOTAL COINS	
2	FREE GAME PERCENTAGE		6	COINS THRU RIGHT SLOT		10	TOTAL EARNINGS	
3	AVERAGE BALL TIME		7	COINS THRU CENTER SLOT		11	METER CLICKS	
4	AVERAGE GAME TIME		8	COINS THRU 4TH SLOT		12	SOFTWARE METER	

Sega Audits 13-55

	Audit Name	Fill-In		Audit Name	Fill-In		Audit Name	Fill-In
13	TOTAL BALLS PLAYED		28	1M—1.99M SCORES		43	TOTAL REGULAR PLAYS	
14	TOTAL EXTRA BALLS		29	2M—3.99M SCORES		44	AVG. REGULAR GAME TIME	
15	EXTRA BALL PERCENT		30	4M—7.99M SCORES		45	REGULAR GAME MBALLS	
16	REPLAY 1 AWARDS		31	8M—11.99M SCORES		46	REGULAR GAME REPLAYS	
17	REPLAY 2+ AWARDS		32	12M+ SCORES		47	TOTAL NOVICE PLAYS	
18	TOTAL REPLAYS		33	AVERAGE SCORES		48	AVG. NOVICE GAME TIME	
19	REPLAY PERCENT		34	SERVICE CREDITS		49	NOVICE GAME MBALLS	
20	TOTAL SPECIALS		35	BALL SEARCH STARTED		50	NOVICE GAME REPLAYS	
21	SPECIAL PERCENT		36	LOST BALL FEEDS		51	AVG. NOVICE BALL SAVES	
22	TOTAL MATCHES		37	LOST BALL GAME STARTS		52	LEFT FLIPPER USED	
23	HIGH SCORE AWARDS		38	LEFT DRAINS		53	RIGHT FLIPPER USED	
24	HIGH SCORE PERCENT		39	CENTER DRAINS		54		
25	TOTAL FREE PLAYS		40	RIGHT DRAINS		55		
26	TOTAL PLAYS		41	SLAM TILTS				
27	0—999K SCORES		42	TOTAL BALLS SAVED				

The Star Wars Trilogy - Special Edition Audits 56-99

	Audit Name	Fill-In		Audit Name	Fill-In		Audit Name	Fill-In
56	LEFT ORBITS		72	MULTIBALL RESTART LIT		88	FALCON MBALL	
57	RIGHT ORBITS		73	MBALL RESTARTED		89	FALCON JACKPOTS	
58	BIG RAMP		74	MBALL RAMP JACKPOTS		90	LANDSPEEDER AWARDS	
59	TOP VUK		75	MBALL FORCE JACKPOTS		91	HAN SOLO THAWED	
60	HAN SOLO HOLE		76	SUPER JACKPOTS		92	RETURN OF THE JEDI	
61	4-BANK HOLE		77	HEROICS OF LUKE		93	VIDEO MODE	
62	CANNON LOADED		78	HEROICS OF LEIA		94	TRIVIA GAME	
63	UNDER X-WING		79	HEROICS OF HAN SOLO		95	FORCE TARGETS COMP.	
64	SKILL AWARD #1		80	HEROICS OF C-3PO/R2-D2		96	RIGHT HOLE FEATURES	
65	SKILL AWARD #2		81	HEROICS OF CHEWBACCA		97	HEROIC LIT	
66	SKILL AWARD #3		82	HEROICS OF OBI-WAN		98	LIGHTSABER LIT	
67	SKILL AWARD #4		83	CANTINA HURRY-UP		99	LIGHTSABER USED	
68	TIE FIGHTERS KILLED		84	EXTRA BALL HURRY-UP			***CPU Version:***	
69	MBALL READY		85	SPECIAL HURRY-UP			***Display Version:***	
70	MULTIBALL START		86	BOUNTY HUNTER			***Date Audited:***	
71	2+ MBALL START		87	PROBE DROIDS			***Audited By:***	

Location:

Go To Audits Menu

Overview

The **Portals™ Service Menu System** provides 99 Audit Functions for accounting purposes and for evaluation of *Game Difficulty Adjustments*. The Audit Functions are divided into 3 groups: 1st— **Earnings (Coin) Audits**, are the first 12 most-used Audits; 2nd— **Sega Audits**, are the Game Play Generic Audits 13-55; 3rd— **The Star Wars Trilogy - Special Edition Audits**, are the Game Play Specific Audits 56-99; Audits left open (blank space in gray, e.g. Audits 54 & 55) are currently ***Not Used,*** allowing for ***Future Expansion,*** if any, or are ***Proprietary***. If the code version is upgraded, view Audits in the display & write the audit(s) in the blank(s) if any audit(s) were added. Each group may be viewed in the **Portals™ Service Menu** (see Chapter 1, Portals Service Menu Introduction, of this Section). View all audits with the **Game Audit Table** provided on the previous page. Copy page to fill-in important audit information as required.

GO TO AUDITS MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "AUD" *Icon* in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **AUDITS MENU** appears.

Important Notes:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.

Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

Selecting & activating the "ARROW" *Icons* selects the next or previous audit in the group.

Earnings Audits (1-12)

From the **AUDITS MENU**, select the "EARN" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st audit in this group. Continue to select either of the "ARROW" *Icons* to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. Nº	Audit Name	Audit Definition
Au. 1	Total Paid Credits	Provides the total number of paid credits.
Au. 2	Free Game Percentage	This percentage is derived from dividing Audit 25, Total Free Plays, by Audit 26, Total Plays.
Au. 3	Average Ball Time	In seconds, the average ball time is derived from the total play time divided by Audit 13, Total Balls Played.
Au. 4	Average Game Time	The average game time is expressed in minutes and seconds.
Au. 5	Coins Thru Left Slot	Provides the total number of times Coin Switch (Sw. 6) was closed.
Au. 6	Coins Thru Right Slot	Provides the total number of times Coin Switch (Sw. 4) was closed.
Au. 7	Coins Thru Center Slot	Provides the total number of times Coin Switch (Sw. 5) was closed.
Au. 8	Coins Thru 4th Slot	Provides the total number of times Coin Switch (Sw. 2) was closed.
Au. 9	Total Coins	Provides the total amount of coins registered through all the slots.
Au. 10	Total Earnings	The total cash value accumulated since the last *Factory Restore* occurred (see Chapter 5, Go to Reset Menu, of this section).
Au. 11	Meter Clicks	Provides the total number of money clicks accumulated. (Based on the country's lowest coin denomination used for the game credit.)
Au. 12	Software Meter	Provides the continuing total of Meter Clicks. This audit cannot be reset; the display shows the constant addition of Meter Clicks.

Sega Audits (13-55)

From the **AUDITS MENU**, select the "SEGA" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st audit in this group. Continue to select either of the "ARROW" *Icons* to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. Nº	Audit Name	Audit Definition
Au. 13	Total Balls Played	Provides the total number of regular and extra balls.
Au. 14	Total Extra Balls	Provides the total number of extra balls awarded.
Au. 15	Extra Balls Percent	Provides the percentage total from dividing Audit 14, Total Extra Balls, by Audit 26, Total Plays.
Au. 16	Replay 1 Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level 1.
Au. 17	Replay 2+ Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level(s) 2 or higher.
Au. 18	Total Replays	Provides the total awards (Credits, Extra Balls, Or Audit Only) for exceeding replay score levels.
Au. 19	Replay Percent	Provides the percentage total from dividing Audit 18, Total Replays, by Audit 26, Total Plays. The percentage reflects replay total awards for exceeding replay score levels.
Au. 20	Total Specials	Provides the total awards (Credits, Extra Balls, Or Scores) for making specials.
Au. 21	Special Percent	This percentage is derived from dividing Audit 20, Total Specials, by Audit 26, Total Plays.
Au. 22	Total Matches	Provides 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 is adjustable from 0% to 10% by Adjustment 11, Match Percentage, if enabled. (See Chapter 4, Go to Adjustments Menu, of this section.)
Au. 23	High Score Awards	Provides the total credits awarded for exceeding the High-Score-To-Date scores.
Au. 24	High Score Percent	This percentage is derived from dividing Audit 23, High Score Awards, by Audit 26, Total Plays.
Au. 25	Total Free Plays	Provides the total free credits for replays, High-Score-To-Date, Specials, and Match.
Au. 26	Total Plays	This total is derived by adding the sum of Audit 1, Total Paid Credits, and Audit 25, Total Free Plays. Note that free credits are not recorded in the Audit until they are actually used.
Au. 27	0—999K Scores	Provides the total number of games the Player's final score was between 0 and 999,990 points.
Au. 28	1M—1.99M Scores	Provides the total number of games the Player's final score was between 1,000,000 and 1,999,990 points.
Au. 29	2M—3.99M Scores	Provides the total number of games the Player's final score was between 2,000,000 and 3,999,990 points.
Au. 30	4M—7.99M Scores	Provides the total number of games the Player's final score was between 4,000,000 and 7,999,990 points.
Au. 31	8M—11.99M Scores	Provides the total number of games the Player's final score was between 8,000,000 and 11,999,990 points.
Au. 32	12M+ Scores	Provides the total number of games the Player's final score was over 12,000,000 points.
Au. 33	Average Scores	This total is derived from adding the Final Score of each game to a table and dividing this sum by Audit 26, Total Plays.
Au. 34	Service Credits	Provides the total number of times Dedicated Switch (DS-7) was closed, not in the Portals™ Service Menu. (See Chapter 1, Introduction [*Access & Use*] for instructions on how to receive Service Credits.)
Au. 35	Ball Search Started	Provides the total number of times the game performed a ball search.
Au. 36	Lost Ball Feeds	Provides the total number of times the game added a ball to play when it could not find a ball after ball search.

Sega Audits Continued.

Audit Name		Audit Definition
Au. 37	Lost Ball Game Starts	Provides the total number of times the game started with a ball missing from the ball trough at the start of a game.
Au. 38	Left Drains	Provides the total number of times Rollover Switch 57 was closed.
Au. 39	Center Drains	Provides the total number of times the game ball had drained with the last switch closed was not Sw. 57 or Sw. 60.
Au. 40	Right Drains	Provides the total number of times Rollover Switch 60 was closed.
Au. 41	Slam Tilts	Provides the total number of times Contact Switch 55 was closed.
Au. 42	Total Balls Saved	Provides the total number of times this feature was used. This feature is enabled at the start of each ball and is disabled as soon as the ball makes contact with 5 game switches or allocated time expired.
Au. 43	Total Regular Plays	Provides the total number of times Regular Games were played.
Au. 44	Avg. Regular Game Time	Provides the average game time of Regular played games.
Au. 45	Regular Game MBalls	Provides the number of times this feature was played in a Regular Game.
Au. 46	Regular Game Replays	Provides the total number of times this feature was awarded in a Regular Game.
Au. 47	Total Novice Plays	Provides the total number of times Novice Games were played.
Au. 48	Avg. Novice Game Time	Provides the average game time of Novice played games.
Au. 49	Novice Game MBalls	Provides the total number of times this feature was played in a Novice Game.
Au. 50	Novice Game Replays	Provides the total number of times this feature was awarded in a Novice Game.
Au. 51	Avg. Novice Ball Saves	Provides the average number of times this feature was used to maintain the ball time criteria for a Novice Game.
Au. 52	Left Flipper Used	Provides the total number of times Dedicated Switch (DS-1) was closed.
Au. 53	Right Flipper Used	Provides the total number of times Dedicated Switch (DS-3) was closed.
Au. 54-Au. 55		These audits are ***Not Used***, allowing for ***Future Expansion***, if any, and/or ***Proprietary*** (used for programming).

The Star Wars Trilogy - Special Edition Audits (56-99)

From the **AUDITS MENU**, select the "STAR" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st audit in this group. Continue to select either of the "ARROW" *Icons* to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. Nº	Audit Name	Audit Definition
Au. 56	Left Orbits	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 57	Right Orbits	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 58	Big Ramp	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 59	Top VUK	Provides the total number of times Switch 45 was closed.
Au. 60	Han Solo Hole	Provides the total number of times the ball entered the round hole (in front of Han Solo) with no features lit.
Au. 61	4-Bank Hole	Provides the total number of times the ball entered the big hole (behind the 4-Bank Drop Target) and Switch 21 was closed.
Au. 62	Cannon Loaded	Provides the total number of times Switch 37 was closed.
Au. 63	Under X-Wing	Provides the total number of times Switch 34 was closed.
Au. 64	Skill Award #1	Provides the total number of times this feature was awarded.
Au. 65	Skill Award #2	Provides the total number of times this feature was awarded.

	Audit Name	Audit Definition
Au. 66	Skill Award #3	Provides the total number of times this feature was awarded.
Au. 67	Skill Award #4	Provides the total number of times this feature was awarded.
Au. 68	Tie Fighters Killed	Provides the total number of times a Tie Fighter was killed when lit. To kill a Tie Fighter, the corresponding Switches (Sw. 17-20) of the 4-Bank Drop Target must be closed.
Au. 69	MBall Ready	Provides the total number of times feature was ready (determined by all Tie Fighters Killed, see previous audit) awaiting Multiball.
Au. 70	Multiball Start	Provides the total number of times Multiball was played.
Au. 71	2+ MBall Start	Provides the total number of times Multiball was played more than once by a single player in one game.
Au. 72	Multiball Restart Lit	Provides the total number of times Multiball was played and no Jackpots were collected.
Au. 73	Multiball Restarted	Provides the total number of times Multiball was restarted after Multiball Restart was lit.
Au. 74	MBall Ramp Jackpots	Provides the total number of times this feature was awarded by shooting the lit Ramp.
Au. 75	MBall FORCE Jackpots	Provides the total number of times this feature was awarded after completing the lit F-O-R-C-E Stand-Up Targets (Sw. 28-32).
Au. 76	Super Jackpots	Provides the total number of times this feature was awarded by shooting the pinball from the Cannon into the 4-Bank Drop Target Hole.
Au. 77	Heroics of Luke	Provides the total number of times this feature was played.
Au. 78	Heroics of Leia	Provides the total number of times this feature was played.
Au. 79	Heroics of Han Solo	Provides the total number of times this feature was played.
Au. 80	Heroics of C-3PO/R2-D2	Provides the total number of times this feature was played.
Au. 81	Heroics of Chewbacca	Provides the total number of times this feature was played.
Au. 82	Heroics of Obi-Wan	Provides the total number of times this feature was played.
Au. 83	Cantina Hurry-Up	Provides the total number of times this feature was played.
Au. 84	Extra Ball Hurry-Up	Provides the total number of times this feature was played.
Au. 85	Special Hurry-Up	Provides the total number of times this feature was played.
Au. 86	Bounty Hunter	Provides the total number of times this feature was played.
Au. 87	Probe Droids	Provides the total number of times this feature was played.
Au. 88	Falcon MBall	Provides the total number of times this feature was played.
Au. 89	Falcon Jackpots	Provides the total number of times this feature was collected after completing the F-A-L-C-O-N Lamps (65-70) under the Big Ramp.
Au. 90	Landspeeder Awards	Provides the total number of times this feature was awarded.
Au. 91	Han Solo Thawed	Provides the total number of times this feature was completed.
Au. 92	Return of the Jedi	Provides the total number of times this feature was played. (Multiple variations of switch closures are used to determine this.)
Au. 93	Video Mode	Provides the total number of times this feature was played.
Au. 94	Trivia Game	Provides the total number of times this feature was played.
Au. 95	Force Targets Completed	Provides the total number of times these feature switches were completed after completing the F-O-R-C-E Stand-Up Targets (Sw. 28-32).
Au. 96	Right Hole Features	Provides the total number of times these features Lamps (25-29) were played.
Au. 97	Heroic Lit	Provides the total number of times the Top VUK Hole was lit.
Au. 98	Lightsaber Lit	Provides the total number of times the Outlane Ballsaver Lamps (73 & 76) were lit.
Au. 99	Lightsaber Used	Provides the total number of times the Outlane Ballsaver Switches (57 & 60) were closed (used).

Go To Printer Menu

From the **AUDITS MENU**, select the "PRNT" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **PRINTER MENU** appears.

☞ Special equipment is required for this Sub-Menu

The **Portals™ Service Menu System** provides 3 Audit Printing Adjustment Functions to print information on a "Hand-Held" printer, download game information to a Laptop PC or clear the printout count. A printer interface board, hand-held printer and/or a special software program is required to run this menu. Entering this menu and selection/activation of the *Icons* without this equipment/software will not affect the game.

Adjustment 51, Printer Interface (Quick Printout)

From the **PRINTER MENU**, select the "QUIK" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the printout. Only the Earnings Audits can be printed out to a "Hand-Held" Printer.

Adjustment 52, Alison Interface (Full Printout)

From the **PRINTER MENU**, select the "ALISON" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the download. A special software program and a Lap Top PC is required. All game audits (Earnings, Sega & Game Specific) can be retrieved.

Adjustment 53, Nº of Copies Printed (Reset Printer)

From the **PRINTER MENU**, select the "RESET" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the clear the "Nº of copies printed" count total.

RESETTING AUDIT NOTES:

Audit Note: 1st Way to Reset Audits

To reset audits, from the **MAIN MENU**, select the "ADJ" *Icon*. See Chapter 4, Go to Adjustments Menu, of this section.

Select the "SEGA" *Icon*, from the **ADJUSTMENT MENU**, and advance to Adj. 8, Reset Coin Audits, with the "RIGHT ARROW" *Icon*. Select the "+" *Icon* to change setting to **YES**. When enabled, the *Coin Audits* (5-11) will be reset to zero.

Advance to Adj. 9, Reset Game Audits, with the "RIGHT ARROW" *Icon*. Select the "+" *Icon* to change setting to **YES**. When enabled, *all the audits* will be reset to zero, **except** for the *Coin Audits* (5-11) ***and*** Audit 12, Software Meter (the only audit which cannot be reset to zero).

Audit Note: 2nd Way to Reset Audits

To reset audits, from the **MAIN MENU**, select the "RESET" *Icon*. See Chapter 5, Go to Reset Menu, of this section.

Selection of the "COIN" *Icon*, from the **RESET MENU**, will reset the *Coin Audits* (5-11) to zero.

Selection of the "AUD" *Icon*, from the **RESET MENU**, will reset all audits to zero, **except** for the *Coin Audits* (5-11) ***and*** Audit 12, Software Meter (the only audit which cannot be reset to zero).

Sega Adjustments Continued.

Adjustment Name		Adjustment Definition
Adj. 4	**Free Game Limit**	Adjust the max. # of *Free Games* that may be accumulated per game; **0 - 9**.
Adj. 5	**Extra Ball Limit**	Adjust the max. # of *Extra Balls* that may be accumulated per game; **1 - 9** or **OFF**.
Adj. 6	**Game Difficulty**	Set to **EXTRA EASY**, **EASY**, **MODERATE, HARD** or **EXTRA HARD.** *(Note: Additional game features which are not adjusted may also change when adjusting this adjustment; see below table.)* Default is **MODERATE**. Any one of the ***INSTALL*** settings (in a "Drop-Down" Table) for this adjustment may be activated to automatically select settings for multiple adjustments affecting game difficulty. Select and activate the "-" or "+" *Icons* to choose the difficulty level required. After activation, the individual adjustments may be readjusted, if desired. Refer to the **Install Adjustment Table** below for details.

Adjustments which change when set to:	Extra Easy	Easy	Moderate	Hard	Extra Hard
(44) MBall Restart	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(45) Extra Ball Memory	ON	ON	ON	ON	OFF
(46) Multiball Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(47) Landspeeder Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(48) Falcon Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(50) Lightsaber Criterion	EASY	EASY	MODERATE	HARD	HARD

Play Rules: Novelty & 4-Ball, plus 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.	*Adjustment Name*	*Setting*	*Adj.*	*Adjustment Name*	*Setting*
1	Replays: Fixed/Manual	Fixed	5	Extra Ball Limit	00
2	Replay Levels	None	11	Match Percentage	Off
3	Replay Award	None	17	High Score #1 Awards	1
4	Free Game Limit	0	18	High Score #2 Awards	0

4-Ball Play Rules - Set to establish recommended settings for 4-Ball Play:

Adj.	Adjustment Name	*Setting*	*Adj.*	Adjustment Name	*Setting*
1	Replays: Fixed/Manual	07%	5	Extra Ball Limit	3
2	Replay Levels	1	11	Match Percentage	4
3	Replay Award	Credit	12	Balls Per Game	5
4	Free Game Limit	5	17	High Score #1 Awards	1
			18	High Score #2 Awards	0

Add-A-Ball Settings -To disable awarding of credits and provide awards with an Extra Ball:

Adj.	*Adjustment Name*	*Setting*	*Adj.*	*Adjustment Name*	*Setting*
3	Replay Award	Extra Ball	16	Allow High Scores	No
4	Free Game Limit	00	17-20	High Score #1 - #4 Awards	0
11	Match Percentage	Off			

Adj. 7	**Game Pricing**	There are two methods available for coin switch programming: Standard & Custom. Standard pricing uses a single adjustment as seen in the first display. See the Standard Pricing Table. If "Custom" is selected, a "Drop-Down" Table appears. Select a pricing scheme shown in the **Custom Pricing Table** as seen below.

With Adjustment 7 set to **CUSTOM** operating the **Black "Enter" Button** again initiates a drop down menu representing coin switch pulses for the LEFT, CENTER, RIGHT and 4TH Coin Slots. The prescribed the number of pulses are required for 1 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 2 Credits. Further, if *Left Coin Pulses,* was set to 01 and *Coin Switch Pulses Required for 1 Credit*, to 02, 2 Coins in the Left Slot would be required for 1 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, 1 Credit would be posted for each of the first 3 Coins in the Left Slot and 2 Credits for the 4th Coin.

Sega Adjustment 7 Continued.

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 pulses required to post one credit; **00** to **99**.
Coin Switch Pulses Required for Bonus Credit	Set the number of pulses required to award the 1st Bonus credit(s); **00** to **99**.
Coin Switch Pulses Required for 2nd Bonus Credit	Set the number of 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

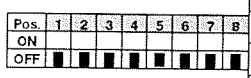
Coin Mechanisms					<<< Adjustments >>>							
LEFT	CENTER	RIGHT	4TH	*Plays/Coins*	LEFT Pulses	CENTER Pulses	RIGHT Pulses	4TH Pulses	Pulses /Credit	Pulses /Bonus	Pulses /2nd Bonus	Credit /1st Bonus
25¢	$1.00	25¢	N/U	1/25¢ 3/50¢ 1/25¢ 5/$1.00 1/25¢ 6/$1.00	01 01 05	04 04 20	01 01 05	00 00 00	01 01 04	02 04 20	00 00 00	01 01 01
5*SCH*	10*SCH*	10*SCH*	N/U	1/10 S 1/10 S 4/30 S	01 04	02 08	02 08	00 00	02 06	00 00	00 00	00 00
10*p*	50*p*	£1	20*p*	1/30*p* 2/50*p* 5/£1 1/50*p* 3/£1 1/30*p* 4/£1	01 01 01	06 05 05	15 15 12	02 02 02	03 05 03	00 00 00	00 00 00	00 00 00
20¢	N/U	$1.00	N/U	1/60¢ 2/$1.00	01	00	05	00	03	05	00	01

Below and the following page is the **Standard Pricing Select Table** for the individual countries listed. The *Pricing Scheme* is determined in two ways - **1:** The CPU/Sound Board Dip Switch (Sw. 300) Setting; and, **2:** The Country Setting Option. For each country listed, the Dip Switch Setting is shown (Column 1). At this time, not all countries have a *unique* Dip Switch Setting. For the countries without a unique setting, the USA Setting (or all positions in the "OFF" position) is used. In lieu of determining the best *Pricing Scheme* for your location, "pre-sets" were made available which would best suit any given situation. If the Factory Default setting is not the selection you feel is best for your location, choose any of the other pre-set settings. If any of these settings do not suit your needs, then **CUSTOM PRICING** will need to be accomplished (however, any "custom" changes made here will be lost after a **FACTORY RESET** so it is suggested to write down your unique set-up).

The Standard Pricing Select Table Explained:

Column 1: CPU/Sound Board Dip Switch 300 Settings: (self-explanatory). **Column 2:** Country Setting Option: The different available pre-sets are listed. **Columns 3-6:** Coin Mechanisms - These show the coinage through the available slots on the Coin Doors. Different countries use different Coin Doors. For example, USA style Coin Doors, which have only 2 coin acceptors (left & right) may utilize the "Center" slot cable for an optional Bill Validator. Different Coin Doors may have up to 4 coin acceptors. **Columns 7-10:** Pricing Scheme Explained - Shows the number of plays received for the monies required determined by the setting selected.

Standard Pricing Select Table

CPU/SOUND BOARD DIP SWITCH 300 SETTINGS	COUNTRY SETTING OPTION † ‡	Coin Mechanisms: COINS THRU ... SLOT: LEFT	CENTER	RIGHT	4TH	Pricing Scheme Explained: *Number of "Plays" for Price Amount Shown*			
	USA1	25¢	$1.00	25¢		1 /25¢			
	USA2	25¢	$1.00	25¢		1 /50¢	2 /75¢	3 /$1.00	
	USA3	25¢	$1.00	25¢		1 /50¢			
	USA4	25¢		25¢		1 /50¢			
	USA5	25¢	$1.00	25¢		1 /50¢	5 /$2.00		
	USA6	25¢	$1.00	25¢		1 /50¢	2 /'4 X 25¢'	3 /$1.00 Bill ← Used to promote the Bill Validator	
	USA7	25¢	$1.00	25¢		1 /50¢	4 /$1.50	6 /$2.00	
	USA8 †	25¢	$1.00	25¢		1 /50¢	3 /$1.00		

Standard Pricing Select Table - *(Continued)*

CPU/SOUND BOARD DIP SWITCH 300 SETTINGS	COUNTRY SETTING OPTION † ‡	Coin Mechanisms — COINS THRU ... SLOT: LEFT	CENTER	RIGHT	4TH	Pricing Scheme Explained — *Number of "Plays" for Price Amount Shown*			
		For all of USA Settings, see previous page (the USA Default Setting is repeated below):							
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	USA8 †	25¢	$1.00	25¢		1 /50¢	3 /$1.00		
Pos. 1 2 3 4 5 6 7 8 ON ■ OFF ■ ■ ■ ■ ■ ■ ■	Austria †	5S	10S	10S		1 /10S	2 /15S	3 /20S	
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Australia 1 ‡	20¢	$A 1	$A 2		1 /$A 1	2 /$A 2		
	Australia 2 ‡	20¢	$A 1	$A 2		1 /$A 1	2 /$A 2		
Pos. 1 2 3 4 5 6 7 8 ON ■ OFF ■ ■ ■ ■ ■ ■ ■	Belgium †	5 BF	20 BF	50 BF		1 /20 BF	3 /50 BF		
		This country uses unique Tokens and/or Debit Cards *only* (pricing varies).							
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■ ■	Brazil †	1 'coin'	4 'coins'	1 'coin'		1 /'2 coins'			
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■ ■	Canada †	25¢	25¢	Can$ 1		1 /50¢	2 /75¢	3/ Can$ 1	
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Denmark 1 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1 /3 DKr	2 /5 DKr		
	Denmark 2 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1 /2 DKr	3 /5 DKr	7 /10DKr	
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Finland ‡	1 Fmk	5 Fmk			1 /5 Fmk	4 /10 Fmk		
	France 1 ‡	1 Fr	5Fr	10 Fr	20 Fr	1 /3 Fr	2 /5 Fr	5 /10 Fr	11 /20 Fr
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■	France 2	1 Fr	5 Fr	10 Fr	20 Fr	1 /5 Fr	3 /10 Fr	7 /20 Fr	
	France 3	1 Fr	5 Fr	10 Fr	20 Fr	1 /3 Fr	2 /5 Fr	4 /10 Fr	9 /20 Fr
	Germany 1	1 DM	2 DM	5 DM		1 /1 DM	6/'1 X 5 DM'		
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ ■ OFF ■ ■ ■ ■ ■	Germany 2	1 DM	2 DM	5 DM		1 /2 DM	2 /3 DM	3 /4 DM	4 /5 DM
	Germany 3 †	1 DM	2 DM	5 DM		1 /2 DM	2 /3 DM	3 /4 DM	5 /5 DM
	Germany 4	1 DM	2 DM	5 DM		1 /1 DM	6 /5 DM		
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Greece ‡	50 Dr		100 Dr		1 /50 Dr	3 /100 Dr		
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Hong Kong ‡	1 HK$	2 HK$	5 HK$		1 /5 HK$			
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Hungary ‡	10 Ft	10 Ft	20 Ft		1 /20 Ft	3 /40 Ft		
Pos. 1 2 3 4 5 6 7 8 ON ■ OFF ■ ■ ■ ■ ■ ■ ■	Italy 1 †	500 Lit		500 Lit		1 /500 Lit			
	Italy 2	500 Lit		500 Lit		1 /1000 Lit	3 /2000 Lit		
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■ ■	Japan 1 †			100¥		1 /100¥			
	Japan 2			100¥		1 /100¥	3 /200¥		
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Korea ‡	100 Won		100 Won		1 /100 Won			
Pos. 1 2 3 4 5 6 7 8 ON ■ OFF ■ ■ ■ ■ ■ ■	Netherlands 1	1 Fls.	1 Fls.	2.5 Fls.		1 /1 Fls.	3 /2.5 Fls.		
	Netherlands 2 †	1 Fls.	2.5 Fls.	5 Fls.		1 /1 Fls.	3 /2.5 Fls.	6 /5 Fls.	
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	New Zealand 1 ‡	$NZ 1		$NZ 2		1 /$NZ 1	2 /$NZ 2		
	New Zealand 2 ‡	$NZ 1		$NZ 2		1 /$NZ 1	3 /$NZ 2		
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■	Norway 1 †	10 NKr	5 NKr	20 NKr		2 /10 NKr	1 /5 NKr	4 /20 NKr	
	Norway 2	10 NKr	5 NKr	20 NKr		1 /10 NKr	3 /20 NKr		
Pos. 1 2 3 4 5 6 7 8 ON OFF ■ ■ ■ ■ ■ ■ ■ ■	Spain ‡	100 Pts		500 Pts		1 /100 Pts	6 /500 Pts		
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■	Sweden 1 †	1 SKr	5 SKr	10 SKr		1 /10 SKr	2 /15 SKr	3 /20 SKr	
	Sweden 2	1 SKr	5 SKr	10 SKr		1 /5 SKr			
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■	Switzerland 1 †	1 SwF	2 SwF	5 SwF		1 /1 SwF	6 /5 SwF		
	Switzerland 2	1 SwF	2 SwF	5 SwF		1 /1 SwF	3 /2 SwF	9 /5 SwF	
Pos. 1 2 3 4 5 6 7 8 ON ■ ■ OFF ■ ■ ■ ■ ■ ■	UK 1	10p	50p	1£	20p	1 /50p	3 /1£		
	UK 2	10p	50p	1£	20p	1 /40p	3 /1£		
	UK 3 †	10p	50p	1£	20p	1 /50p			

Notes: † indicates Factory Default for that setting. ‡ indicates a USA Dip Switch Setting (all positions in the "OFF" position).

Sega Adjustments Continued.

Adjustment Name		Adjustment Definition
Adj. 8	**Reset Coin Audits**	Default is **NO**. Select the "+" *Icon* to change to **YES**. ⚠ When enabled, all *Coin Audits* (Audits 5-11), will be reset to zero.
Adj. 9	**Reset Game Audits**	Default is **NO**. Select the "+" *Icon* to change to **YES**. ⚠ When enabled, all audits will be reset to zero, except for the *Coin Audits* (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).
Adj. 10	**Reset High Scores**	When enabled (set to **YES**) the High Score Levels and associated initials will be restored to the backup settings when the "+" *Icon* is selected and activated.
Adj. 11	**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. 12	**Balls Per Game**	Adjust the number of balls per game; **2** to **5**. Default is **3**.
Adj. 13	**Tilt Warnings**	Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; **1**, **2**, **3** or **OFF.**
Adj. 14	**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. 15	**Credit Limit**	Adjust the maximum number of credits that may be posted; **4** to **50**. Default is **30**.

Note: There are 4 of the 6 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. 16	**Allow High Scores**	Set to enable (set to **YES**) or disable the four high score levels by setting to zero.
Adj. 17	**High Score #1 Awards**	Adjust the number of awards (**0** to **4**) awarded for exceeding level 1 (the highest of the four levels).
Adj. 18	**High Score #2 Awards**	Adjust the number of awards (**0** to **3**) awarded for exceeding level 2.
Adj. 19	**High Score #3 Awards**	Adjust the number of awards (**0** to **2**) awarded for exceeding level 3.
Adj. 20	**High Score #4 Awards**	Adjust the number of awards (**0** to **1**) awarded for exceeding level 4.
Adj. 21-26	**Default High Score #1 - #6**	Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 27, HSTD Reset Count. Adjust the backup score to which levels **2 - 6** may be reset, respectively.
Adj. 27	**HSTD Reset Count**	**HSTD** (**H**igh **S**core **T**o **D**ate). Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; **100** to **9,900** or **OFF** (no reset or adjustment). Default is **2,000**.
Adj. 28	**Free Play**	When set to **YES**, no coins are required for games.
Adj. 29	**Custom Message**	Set to **ON** or **OFF**. When set to **ON**, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"RED"** and/or **"GREEN" Buttons**, select either of the **"ARROW"** *Icons*. Press the **"BLACK" Button** (*Request Installed* blinks at the top of the display and the letter **A** is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or **"RED"** or **"GREEN" Buttons**). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the **"BLACK" Button**.
Adj. 30	**Attract Mode Sounds**	Set to **ON** or **OFF**. When set to **ON**, attraction sounds are played between games.

	Adjustment Name	Adjustment Definition
Adj. 31	Flash Lamp Power	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 will not flash.
Adj. 32	Coil Pulse Power	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 ***decreased*** 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. Adjust as required.
Adj. 33	Knocker Volume	Set to **NORMAL, LOW** or **OFF**. Default is **NORMAL**. When set to **LOW**, the volume is decreased 50%. When set to **OFF**, no sound is heard when the "knocker" is sounded.
Adj. 34	Minimum Game Time	Set between **0:01 - 8:59** for minimum game time. Default is **OFF**. If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied.
Adj. 35	Novice Mode Enabled	Set to **YES** or **NO**. Default is **YES**. When set to **YES**, before game play, the player can choose Novice Play (a 1-Ball Game with a guaranteed play time). **NOVICE GAME** rules give the player a guaranteed minimum game time - ***if the ball drains before the time is up, it will be returned to the player***. When the ball drains after the time is up, the game ends). When set to **NO**, this feature is turned off, and defaults to Regular Game Play.
Adj. 36	Game Restart	Set to **YES** or **NO**. When set to **YES**, a new game may be started during any ball after the first ball is completed (if credits are available). (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. Review Section 2, Chapter 1, Game Operations & Features for details.
Adj. 37	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.
Adj. 38	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. 39	Tournament Mode	Set to **NONE, PINBALL EXPO, IFPA-PAPA** or **HOME**. Tournament Mode 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 to *Game Over Attract Mode*, as if a *Factory Reset* 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 & **30%** Extra Ball.
Adj. 40	Euro. Token Disp.	Set to **ON** or **OFF**. When set to **ON**, the operator can enable the "knocker" cable in the cabinet to drive an external device (e.g. European Token Dispenser) without the game giving a replay.
Adj. 41	Special Memory	Set to **YES** or **NO**. When set to **YES**, the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to **NO**, the lit 'Special' light will go out at the end of each ball.
Adj. 42	Location ID	**00** to **9999**. Allows the operator to assign a location identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of Chp. 3, Go To Audits Menu & Chp. 5, Go to Reset Menu (this section) for more details on Factory Reset & Printing.
Adj. 43	Game ID	**00** to **9999**. Allows the operator to assign a game identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of Chp. 3, Go To Audits Menu & Chp. 5, Go to Reset Menu (this section) for more details on Factory Reset & Printing.

The Star Wars Trilogy - Special Edition Adjustments (44-50)

From the **ADJUSTMENTS MENU**, select the "STAR" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st adjustment in this group. Continue to select either of the "ARROW" *Icons* to view each adjustment one at a time. Select either the "-" or "+" *Icons* to change the value, if desired. The display will describe the adjustment number, the adjustment name, and the adjustment total or value. The current adjustment will remain in the display until the next adjustment is chosen or when the sub-menu is exited.

Adj. Nº	Adjustment Name	Adjustment Definition
Adj. 44	**MBall Restart**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how Multiball can restart.
Adj. 45	**Extra Ball Memory**	Set to **ON** or **OFF**. Default is **ON**. When set to **ON**, the lit 'Extra Ball' light will be retained in memory from ball-to-ball for the same player. When set to **OFF**, the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 46	**Multiball Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how the Multiball Feature is started and played.
Adj. 47	**Landspeeder Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how the Orbit Feature is played; **EASY** leaves the Orbits lit; **EXHARD** blinks them and goes off.
Adj. 48	**Falcon Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how fast the letters will go away while the player is trying to complete the Big Ramp Feature; As the letters in F-A-L-C-O-N are completed, if there is a delay in achieving all the letters, the letters will turn off in reverse order (i.e. After F-A-L-C is completed, and the player doesn't achieve the "O" the letter "C" will turn off; then the letter "L", etc., until the next letter is achieved.).
Adj. 49	**X-Wing Cannon Enabled**	Set to **ON** or **OFF**. Default is **ON**. When set to **ON**, the X-Wing Cannon is operational. When set to **OFF**, the X-Wing Cannon & Mini-Magnet on the Left Ramp are disabled. Use the **OFF** setting, if the X-Wing Cannon is malfunctioning awaiting service and/or repair.
Adj. 50	**Lightsaber Criterion**	Set to **EASY, MODERATE,** or **HARD**. Default is **MODERATE**. Determines how the Virtual Laser Kick is lit. After completing the *3-Bank LIGHT SABER SAVER,* the outlanes are lit for Ball Save (...if lit when the ball drains, the ball will be automatically returned to play via the Shooter Lane.). **EASY** leaves the lanes lit between balls; **MODERATE** leaves in the state previous ball loss; **HARD** turns off between balls.

Custom Message

To go directly to Adjustment 29, Custom Message, from the **ADJUSTMENT MENU**, select the "CUST MESS" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"RED"** and/or **"GREEN" Buttons**, select either of the **"ARROW"** *Icons*. Press the **"BLACK" Button** (*Request Installed* blinks at the top of the display and the letter **A** is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or **"RED"** or **"GREEN" Buttons**). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the **"BLACK" Button**.

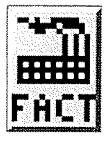
Film Star Reset

To reset the game with special settings (not the normal Factory Setting), from the **ADJUSTMENT MENU**, select the "STAR" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This setting is determined to be ideal for the home environment. See Chapter 5, Go to Reset Menu, of this section, to change to factory defaults if changes made are not desired.

RESETTING & PRINTING ADJUSTMENTS NOTES:

Adjustment Note: Resetting Adjustments

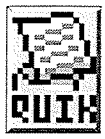
To reset adjustments, from the **MAIN MENU** select the "RESET" *Icon*. See Chapter 5, Go to Reset Menu, of this section.



Selection of the "FACT" *Icon*, from the **RESET MENU**, will reset all adjustments to the *Factory Settings* (except for Proprietary Adjustments). The display will return to the **Attract Mode**. To perform any other functions, the system must be entered again by pressing the **Black "BEGIN TEST" Button** on the coin door (see Chapter 1, Introduction, of this section).

Adjustment Note: Printing Audit Information

To print audits, from the **AUDITS MENU** select the "PRNT" *Icon*. See Chapter 3, Go to Audits Menu, at the end of that section (*special equipment is required*).



Selection of the "QUIK" *Icon*, from the **PRINTER MENU**, will start a quick print.

Selection of the "ALISON" *Icon*, from the **PRINTER MENU**, will start a Full Printout (Downloads to a PC).

Selection of the "RESET" *Icon*, from the **PRINTER MENU**, will reset the total Nº of copies value to zero.

Go To Reset Menu

Overview

The **Portals™ Service Menu System** provides three (3) functions to reset adjustments and/or audits back to the *Factory Setting*. See Chapter 3, Go to Audits Menu, and Chapter 4, Go to Adjustments Menu, for the Game Audits & Adjustments Information. If a Factory Reset is performed, the Service Session is exited and returns to the Attract Mode. If reset of Coin or Game Audits is performed, the display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Please note that once reset, all customized settings are lost! Certain audits and adjustments however cannot be reset (refer to the details below).

GO TO RESET MENU

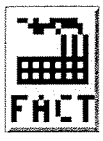
With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "RESET" *Icon* in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **RESET MENU** appears.

Important Notes:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icon*.

Selecting & activating the "QUIT" *Icon* from the display will exit the Service Session.

Selecting & activating the "HELP" *Icon* from the display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



Factory Reset

From the **RESET MENU**, select the "FACT" *Icon* with either **Red** or **Green Button** and press the **Black Button**. ⚠ All adjustments will be reset to *Factory Settings* (except for Proprietary Adjustments). The display will indicate **REQUEST INSTALLED** and exit the Service Session. See Chapter 4, Go to Adjustments Menu, of this section, for the *Factory Settings* in the **Game Adjustment Table**.

Reset Coin Audits

From the **RESET MENU**, select the "COIN" *Icon* with either **Red** or **Green Button** and press the **Black Button**. ⚠ All Coin Audits (See **Fig. 1**) will be reset to Factory Settings. The display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Coin Audits can also be reset from the **ADJUSTMENTS MENU, SEGA ADJUSTMENT 8**. See Chapter 4, Go to Adjustments Menu, of this section. After selecting this *Icon*, all of the ***Coin Audits (5-11)*** are reset to zero.

Reset Game Audits

From the **RESET MENU**, select the "AUD" *Icon* with either **Red** or **Green Button** and press the **Black Button**. ⚠ All Game Audits (See **Fig. 2**) will be reset to Factory Settings. The display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Game Audits can also be reset from the **ADJUSTMENTS MENU, SEGA ADJUSTMENT 9**. See Chapter 4, Go to Adjustments Menu, of this section. After selecting this *Icon*, all of the ***Audits*** are reset to zero, except for the Coin Audits (Audits 5-11) and Audit 12, Software Meter. Audit 12 is the only audit which cannot be reset.

Fig. 1

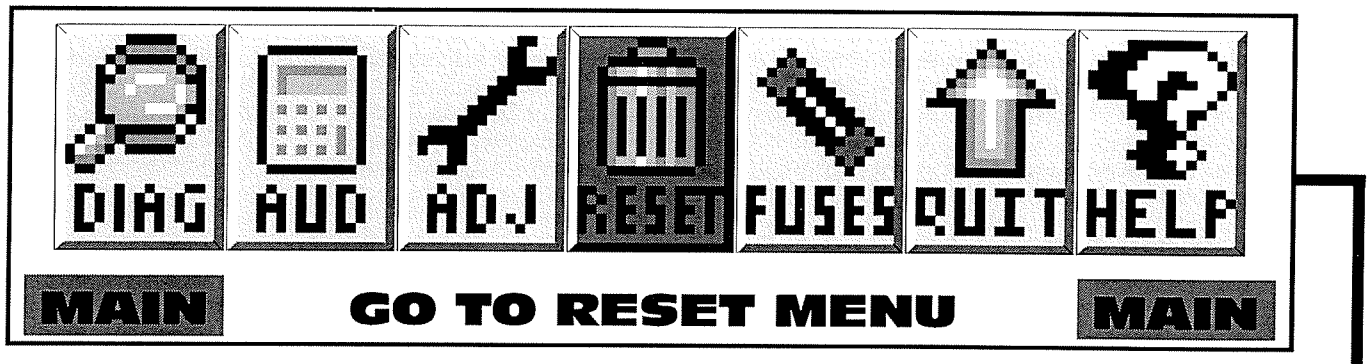
• Reset Coin Audits	
Earnings Audits (Coin Audits Only 5-11)	
Au. №	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Fig. 2

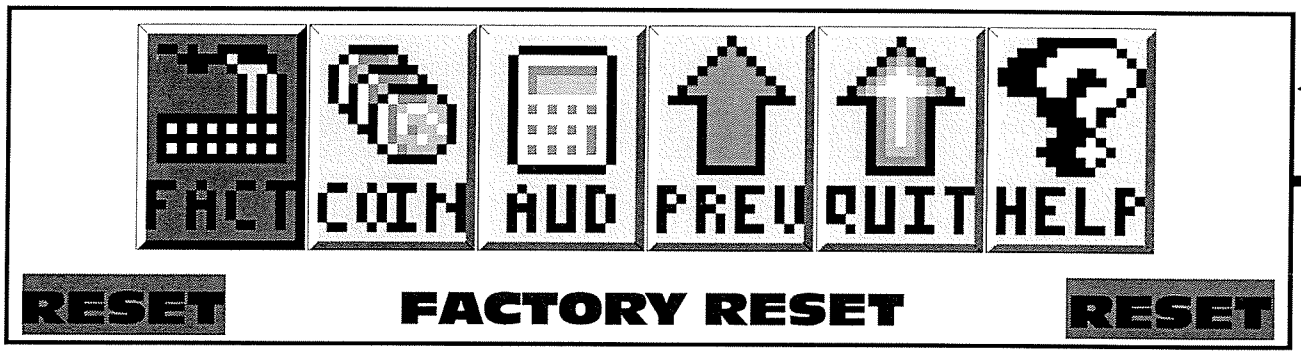
• Reset Game Audits	
Earnings (1-4), Generic/Specific Audits (13+)	
Au. №	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Example:

From the **MAIN MENU**, use the **Red** or **Green Buttons** to select the "RESET" *Icon* (**GO TO RESET MENU**).



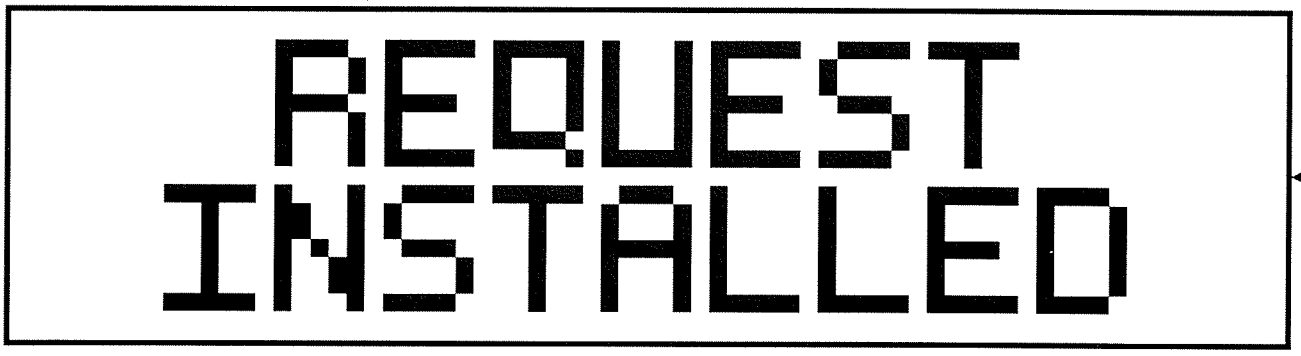
Press the **Black Button** to activate this **ICON**. This will bring up the **RESET MENU**.



The **RESET MENU** now appears with the "FACT" *Icon* (**FACTORY RESET**) flashing:

CAUTION: IF CUSTOMIZED SETTINGS ARE MADE TO THE GAME, DO NOT PRESS THE START BUTTON OR THESE SETTINGS WILL BE LOST!

Press the **Black Button** to activate this **ICON**. This will reset all adjustments back to *Factory Settings*.



The **REQUEST INSTALLED** now appears momentarily and the *Service Session* is automatically exited with the display returning to the **ATTRACT MODE**.

If the "COIN" or "AUD" *Icons* are chosen and activated, the affected audits (see previous page) will be reset, the display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**.

Go To Fuses List

Overview

The **Portals™ Service Menu System** provides a current Fuse List for this game. The fuses are located in the Backbox (on the Display Power Supply Board and the I/O Power Driver Board), and also in the Cabinet (under the playfield by the Flippers and/or by any unique assembly, such as magnets). See the front of this manual (pg. i) for the complete Fuse List in the *Quick Reference Fuse Chart* and note the drawings.

GO TO FUSES LIST

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "FUSES" *Icon* in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st fuse in this group. Continue to select either of the "ARROW" *Icons* to view each fuse one at a time. The display will describe the fuse identification number (e.g. F1, F6, F7, etc.), location of fuse (i.e. Backbox: Board name located on; or Cabinet: Under the playfield or in Service Outlet), rating of fuse (e.g. 5A 250v S.B. - i.e. 5 Amp, 250 volt, Slo-Blo), and 'use of fuse' (e.g. 90v DC High Voltage Power, etc.). The current fuse listed will remain in the display until the next fuse is chosen or when the sub-menu is exited.

Important Notes:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.

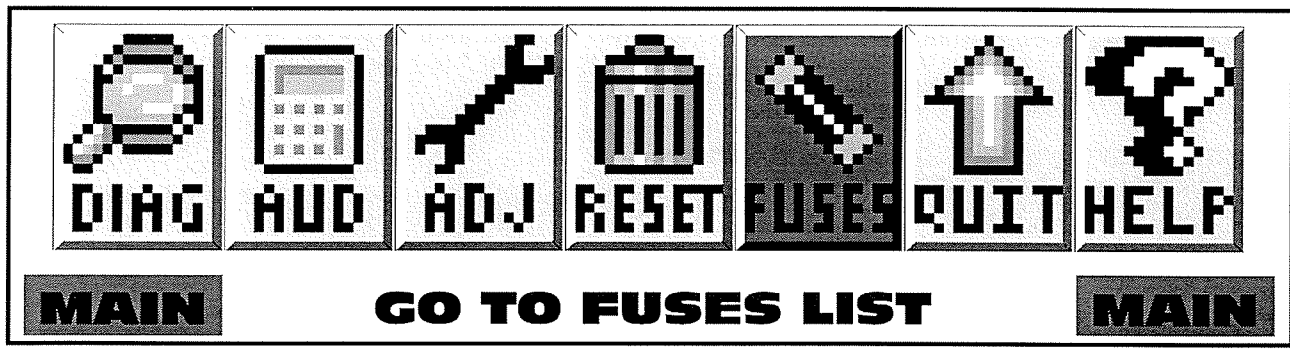
Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

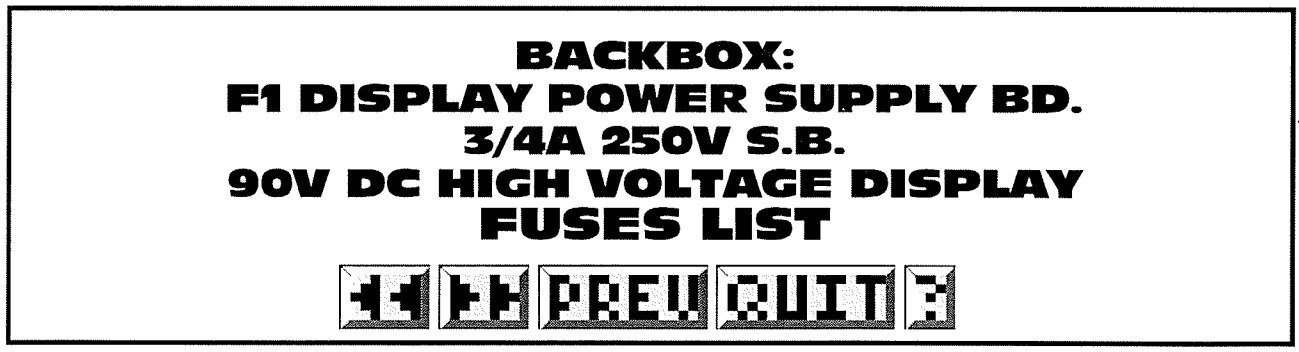
Selecting & activating the "ARROW" *Icons* selects the next or previous fuse in this group.

Example:

From the **MAIN MENU**, use the **Red** or **Green Buttons** to select the "FUSES" *Icon* (GO TO FUSES LIST).



Press the **Black Button** to activate this **ICON**. This will bring up the **FUSES LIST**.



PORTALS™ SERVICE MENU

PROBLEM/SOLUTION TABLE

Use this table for a quick simple solution(s) guide. For more technical assistance view Section 5.

PROBLEM	SOLUTION
Will not enter the Service Mode after depressing the **Black "BEGIN TEST" Button**.	• Check the Service Switch(es) (**Red, Green & Black Buttons**) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU Board Connector CN14. • Check CPU Board, possibly failed.
Service Buttons (**Red, Green** and **Black**) are nonfunctional.	• Check the Service Switches for poor connections or broken wires.
The display blanks out.	• Check the Dot Matrix Display for loose wiring harness connections. • Check Bridge Rectifier 3 & 8 Amp Slo Blo Fuse. Refer to Section 5, Chapter 4, Schematics & Troubleshooting.
Icons "*scroll*" along continuously in the **MAIN MENU**.	• If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the **Green Button** is removed. If the Green Button "clicks" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Service Bulletin #74.)
The **Start** and **Flipper Buttons** do not select or activate *Icons* in the **SWITCH TEST MENU**.	• This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the **Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons** in this Sub-Menu (See Chapter 1).
Can't move selection of *Icon* with the **Left** and/or **Right Flipper Buttons**.	• Check the **Flipper Buttons** for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart. • This is normal ***only*** in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some *Icons* appear non-functional in the **PRINTER MENU(S)**.	• If no printing equipment is connected, the "-" *Icon*, "+" *Icon* and "RUN" *Icon* will appear not to function (See Chapter 5).
Some *Icons* appear non-functional in the **GAME SPECIFIC MENU** under the **DIAGNOSTICS MENU**.	• If there is no other test under this Menu, the "Left Arrow" & "Right Arrow" *Icons* will appear not to function. The remaining *Icons* should function as normal. Note: If there is no Game Specific Special Test, the "**GAME SPECIFIC**" *Icon* will not invoke another display.
The display returns to the **ATTRACT MODE** exiting the Service Session from the **FACTORY RESET MENU**.	• This is normal. After a **FACTORY RESET**, the Service Session is automatically exited (See Chapter 4).
In **COIL TEST MENU**, the coils and flashlamps ***do not*** fire after activating the "RUN" *Icon*.	• Ensure the **POWER INTERLOCK SWITCH** (See figure on front inside cover) ***is pulled out***.
In **Portals™ Service Menu**, the volume cannot be adjusted with the **Red** or **Green Buttons**.	• The Volume adjustment can only be made when the Service Menu is exited. The **Volume Mode** is entered by pressing the **Red "VOLUME" Button**. Then use the **Red** or **Green Button** to increase/decrease volume. (Red "LEFT" decrements; Green "RIGHT" increments.)
In **Portals™ Service Menu**, the display seems to lock up, or the Help Display appears to be non-functional.	• If you cannot clear the situation by exiting back one Menu, exit completely out of the **Portals™ Service Menu**, and re-enter. If the problem persists, call Tech. Support for additional help.

Go To Help Screen

Overview

The **Portals™ Service Menu System** provides help screens in each display (except if the display is in a testing mode). Each screen is basic and some terms may vary. At the beginning of each chapter in this section, *Icons* are shown and described to give detail of the particular function of the individual *Icons*. The table on the previous page was designed to help answer some questions of situations which may arise.

GO TO HELP SCREEN

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "HELP" *Icon* in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **HELP SCREEN** appears cycling through the different icon usages pertinent to that menu level.

MENU HELP SCREEN
USE THE RED OR GREEN BUTTONS TO CHANGE THE SELECTED ICON. PRESS THE BLACK BUTTON TO ACTIVATE THE SELECTED ICON. THE FLIPPER & START BUTTONS FUNCTION IN THE SAME WAY.

Important Notes:

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.

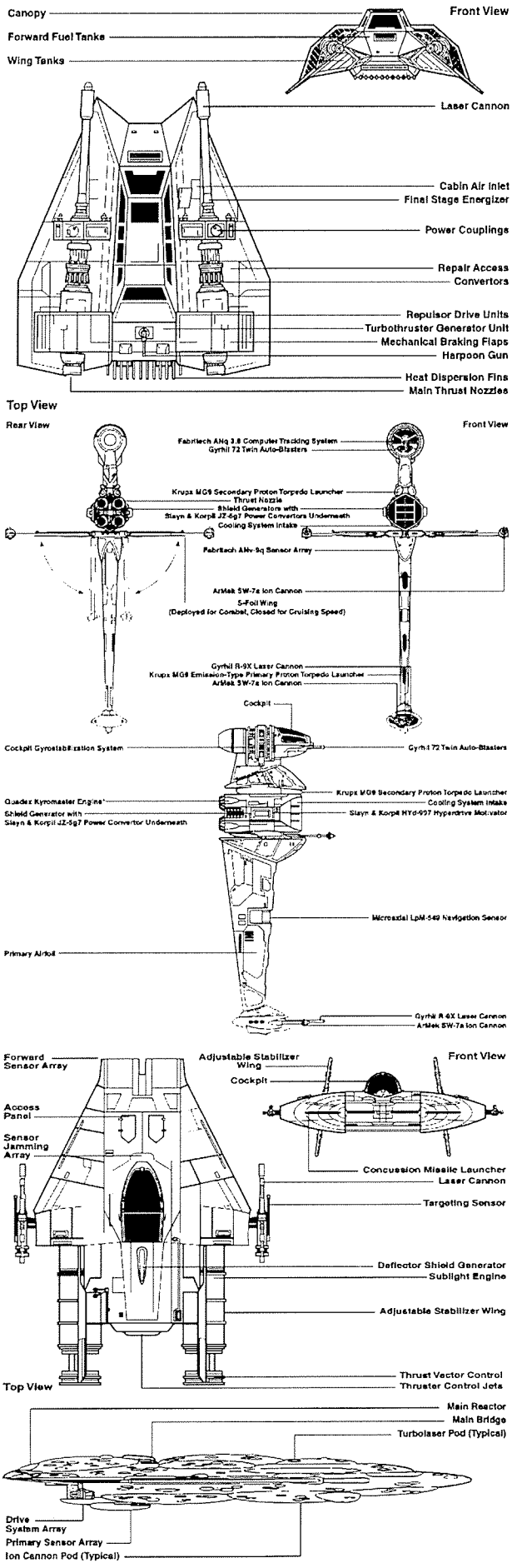
Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

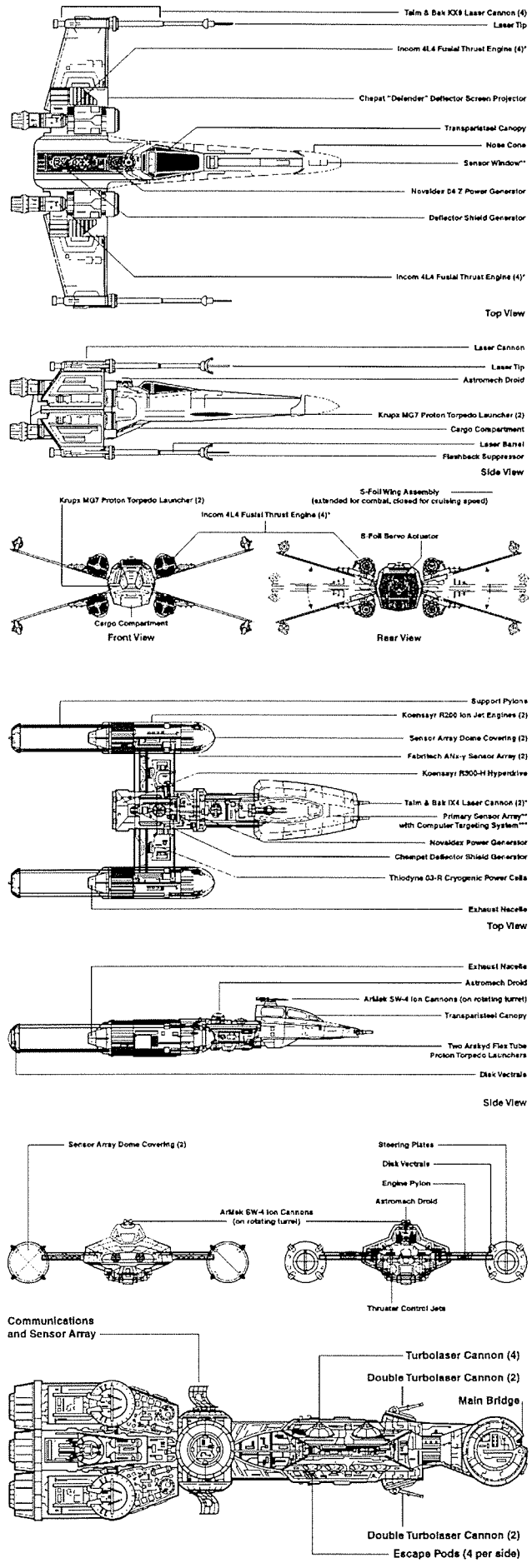
Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

These "Mini-Icons" vary in functionality depending in what sub-menu they are used. Refer to the beginning of each chapter in this section for the function they serve in that menu or select the "HELP" *Icons* in the display where the *Icon* in question is being used.

Review Chapter 1, Introduction:	How to enter the **Portals™ Service Menu**. The chapter outlines the entire **Portals™ Service Menu**. View the **Icon Tree** in this manual which describes the names and menu descriptions of each *Icon*. View the display, after selecting and activating either of the "HELP" or "?" *Icons*.
Review Chapter 2, Go to Diagnostics Menu:	Find all the tests needed to troubleshooting the game.
Review Chapter 3, Go to Audits Menu:	Gather play information and printing functions (downloading).
Review Chapter 4, Go to Adjustments Menu:	Customize the game to vary difficulty of play or to change functions of the game.
Review Chapter 5, Go to Reset Menu:	Reset audits and adjustments to Factory Settings.
Review Chapter 6, Go to Fuses Menu:	View the location & descriptions of the game fuses (the same information is referenced in the Fuse Chart Table on pg. i).

This concludes the **Portals™ Service Menu**. Review the Table of Contents at the beginning of this manual, and the detailed Table of Contents for Section 3 to quickly find the information required. The remainder of the sections in this manual will cover all the parts in this game and provide helpful information to aide in troubleshooting. If questions still arise after reading this section completely, call our Technical Support Department.

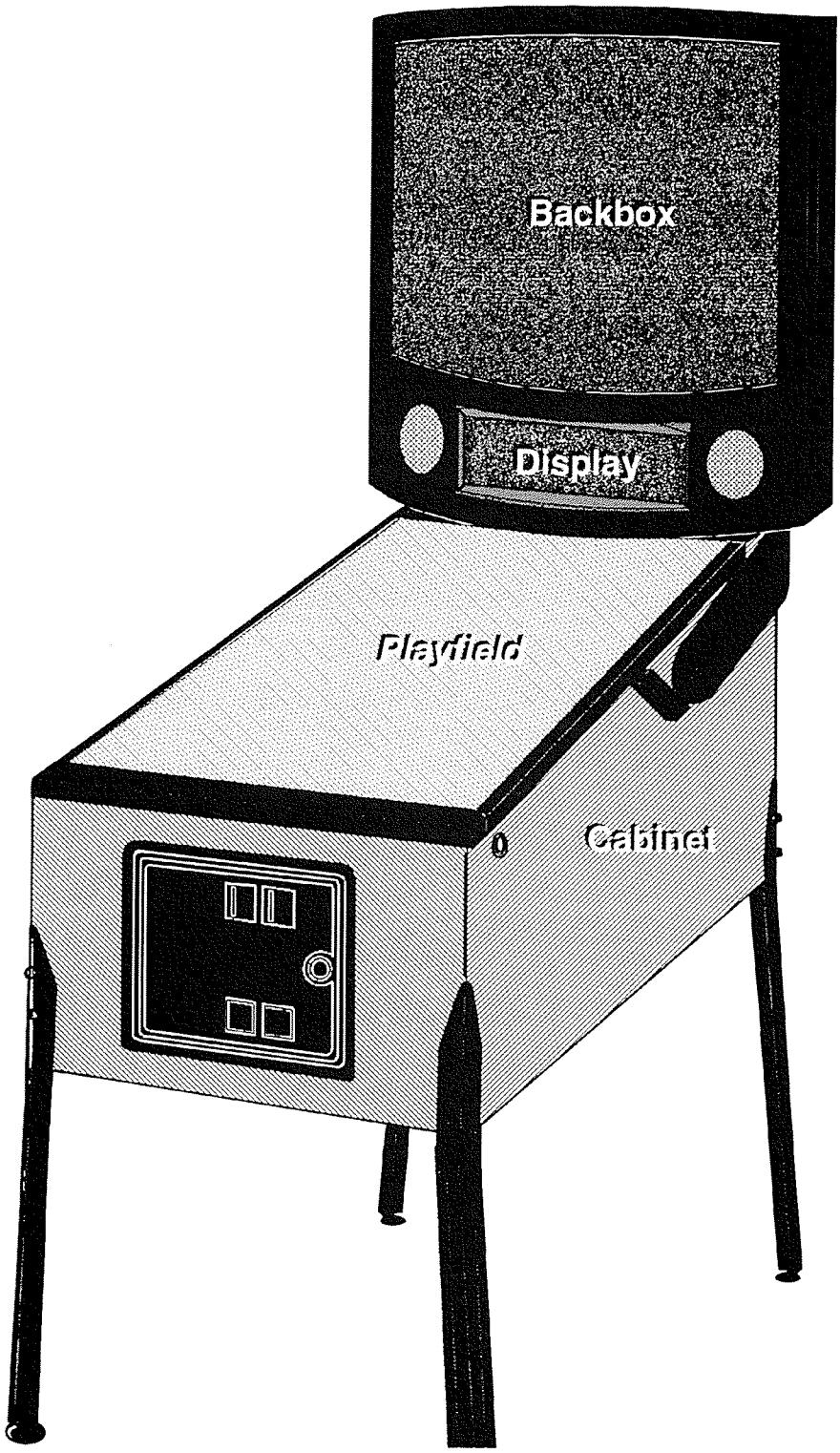

Canopy
Forward Fuel Tanks
Wing Tanks
Front View
Laser Cannon
Cabin Air Inlet
Final Stage Energizer
Power Couplings
Repair Access
Convertors
Repulsor Drive Units
Turbothruster Generator Unit
Mechanical Braking Flaps
Harpoon Gun
Heat Dispersion Fins
Main Thrust Nozzles
Top View
Rear View
Front View
Fabritech ANq 3.8 Computer Tracking System
Gyrhil 72 Twin Auto-Blasters
Krupx MG9 Secondary Proton Torpedo Launcher
Thrust Nozzle
Shield Generators with
Slayn & Korpil JZ-6g7 Power Convertors Underneath
Cooling System Intake
Fabritech ANv-9q Sensor Array
ArMek SW-7a Ion Cannon
S-Foil Wing
(Deployed for Combat, Closed for Cruising Speed)
Gyrhil R-9X Laser Cannon
Krupx MG8 Emission-Type Primary Proton Torpedo Launcher
ArMek SW-7a Ion Cannon
Cockpit
Cockpit Gyrostabilization System
Gyrhil 72 Twin Auto-Blasters
Quadex Kyromaster Engine*
Shield Generator with
Slayn & Korpil JZ-5g7 Power Convertor Underneath
Krupx MG9 Secondary Proton Torpedo Launcher
Cooling System Intake
Slayn & Korpil HYd-997 Hyperdrive Motivator
Microadal LpM-549 Navigation Sensor
Primary Airfoil
Gyrhil R-9X Laser Cannon
ArMek SW-7a Ion Cannon
Forward Sensor Array
Access Panel
Sensor Jamming Array
Adjustable Stabilizer Wing
Cockpit
Front View
Concussion Missile Launcher
Laser Cannon
Targeting Sensor
Deflector Shield Generator
Sublight Engine
Adjustable Stabilizer Wing
Thrust Vector Control
Thruster Control Jets
Top View
Main Reactor
Main Bridge
Turbolaser Pod (Typical)
Drive System Array
Primary Sensor Array
Ion Cannon Pod (Typical)


Taim & Bak KX9 Laser Cannon (4)
Laser Tip
Incom 4L4 Fusial Thrust Engine (4)*
Chepat "Defender" Deflector Screen Projector
Transparisteel Canopy
Nose Cone
Sensor Window**
Novaldex 04 Z Power Generator
Deflector Shield Generator
Incom 4L4 Fusial Thrust Engine (4)*
Top View
Laser Cannon
Laser Tip
Astromech Droid
Krupx MG7 Proton Torpedo Launcher (2)
Cargo Compartment
Laser Barrel
Flashback Suppressor
Side View
Krupx MG7 Proton Torpedo Launcher (2)
Incom 4L4 Fusial Thrust Engine (4)*
S-Foil Wing Assembly
(extended for combat, closed for cruising speed)
S-Foil Servo Actuator
Cargo Compartment
Front View
Rear View
Support Pylons
Koensayr R200 Ion Jet Engines (2)
Sensor Array Dome Covering (2)
Fabritech ANs-y Sensor Array (2)
Koensayr R300-H Hyperdrive
Taim & Bak IX4 Laser Cannon (2)*
Primary Sensor Array**
with Computer Targeting System***
Novaldex Power Generator
Cheapet Deflector Shield Generator
Thiodyne 03-R Cryogenic Power Cells
Exhaust Nacelle
Top View
Exhaust Nacelle
Astromech Droid
ArMek SW-4 Ion Cannons (on rotating turret)
Transparisteel Canopy
Two Arakyd Flex Tube
Proton Torpedo Launchers
Disk Vectrals
Side View
Sensor Array Dome Covering (2)
Steering Plates
Disk Vectrals
Engine Pylon
Astromech Droid
ArMek SW-4 Ion Cannons
(on rotating turret)
Thruster Control Jets
Communications and Sensor Array
Turbolaser Cannon (4)
Double Turbolaser Cannon (2)
Main Bridge
Double Turbolaser Cannon (2)
Escape Pods (4 per side)

Parts Identification & Location (The Pink Pages)

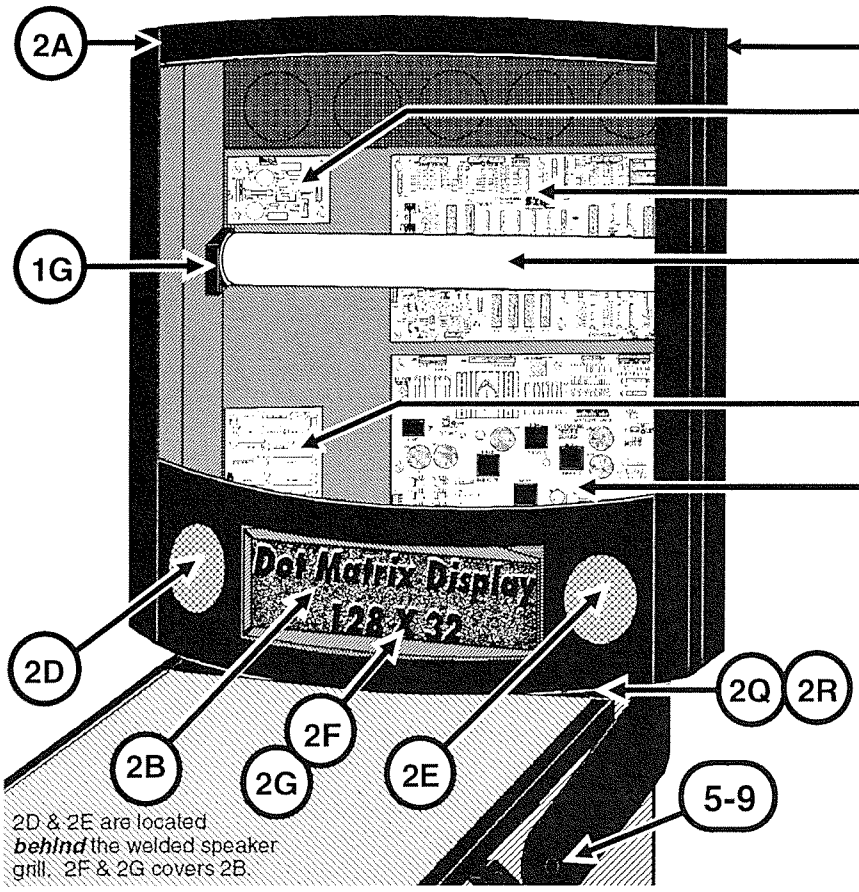
Overview

This section provides the part numbers and locations of all the components in the pinball machine. The parts are arranged in basically 3 groups: Backbox, Cabinet, and Playfield. Generic parts which may change as production continues (quantity and/or size) are listed together. Quantities greater than 0 indicates that the part is used in this game. Since quantity changes *may occur*, an item indicating "0" may be used. Compare the item which needs to be replaced with the drawings provided (the posts, sockets, bulbs and rubber rings are drawn actual size). Major Assemblies & Ramps are detailed in the Blue Pages, Chapter 2, Drawings for Major Assemblies & Ramps.



Section 4 Table of Contents

Backbox - General Parts



Take Note:

☞ If both the Back & Front Sides of the Backbox are required, order **without** the "A" (Back) and "B" (Front) at the end of Item 1 & 2 Part #.

† When ordering Item 1C, please specify the Game Name to receive with correct ROMs.

* An asterisk (*) indicates items are not noted in the pictorial.

Nº	Backbox Part Name	QTY.	SPI Part Nº
1	Back Side Metal Backbox Assembly		505-6002-56-56A
ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:			
1A	Welded Metal B-box (Back Side) Plain	1	**515-6623-00**
1B	**Display Power Supply Board**	1	**520-5138-00**
1C	**†CPU/Sound Board (Mono)**	1	**520-5136-10**
1D	**Display Controller Board**	1	**520-5055-01**
1E	**I/O Power Driver Board**	1	**520-5137-01**
1F*	#8-32 X 3/8" HWH (for Items 1B-1E, & 1DD)	26	237-5903-00
1G	Lamp Holder (Self-Locking)	2	077-5214-00
1H*	#6-32 X 3/4" HWH Swage	2	237-5976-05
1I*	Starter Base (with Leads)	1	077-5213-00
1J*	#4 X 3/4" PRH T-25 Screw	2	237-5873-00
1K*	Starter - Fluorescent FS2 Light	1	165-5011-01
1L	**Fluorescent Tube - F20T12CW**	1	**165-5031-02**
1M*	**Ballast Sub-Assembly**	1	**500-6143-00-56**
	Ordering Item 1M Sub-Assy. includes:		
	Ballast - SP2 120v 60Hz 13W (UL)	*1*	*010-5007-00*
	Fluor. Lamp Cable Wiring Harness	*1*	*036-5402-15-56*
1N*	**Backbox Lock & Key**	2	**355-5018-00**
1O*	**Lock Cam for above Lock**	1	**355-7933-00**
1P*	**#1 Roto Lock Female**	1	**355-5006-02**
	Note: #1 Roto Lock Male (on Cabinet)	*1*	*355-5006-01*
1Q*	#10-32 Stop Nut (for Item 1P)	2	240-5203-00
1R*	#10 Washer (for Item 1P/1Q)	2	242-5003-00
1S*	**Ribbon Cable, 14-Pin** (Display Controller Bd. to Dot Matrix Disp. Bd.)	1	**036-5260-03**
1T*	**Ribbon Cable, 20-Pin** (CPU/Sound Board to I/O Power Driver Board)	1	**036-5000-04**
1U*	**Ribbon Cable, 26-Pin** (CPU/Sound Bd. to Display Controller Board)	1	**036-5001-48**
1V*	Power to Fluor. Cable Wiring Harness	1	036-5414-10-56
1W*	Display Cable Wiring Harness	1	036-5409-00-56
1X*	Speaker Cable Wiring Harness	1	036-5388-01-56
1Y*	3/4" Cable Clamp	2	040-5000-08
1Z*	1" Cable Clamp	9	040-5000-09
1AA*	1/4" Cable Clamp	2	040-5000-03
1BB*	1/2" Cable Clamp	1	040-5000-06
1CC*	#6-32 Stop Nut (for Items 1M, 1Y-1BB)	16	240-5005-00
1DD*	Top Backbox Shipping Support Brckt.	1	515-6623-07
1EE*	Deflector Pad (Bumper)	2	545-5428-00
1FF*	Washer 1/4" I.D. X 1" O.D.	4	242-5009-00
1GG*	#8 Washer (Items 1EE-1GG for 1DD)	2	242-5005-00

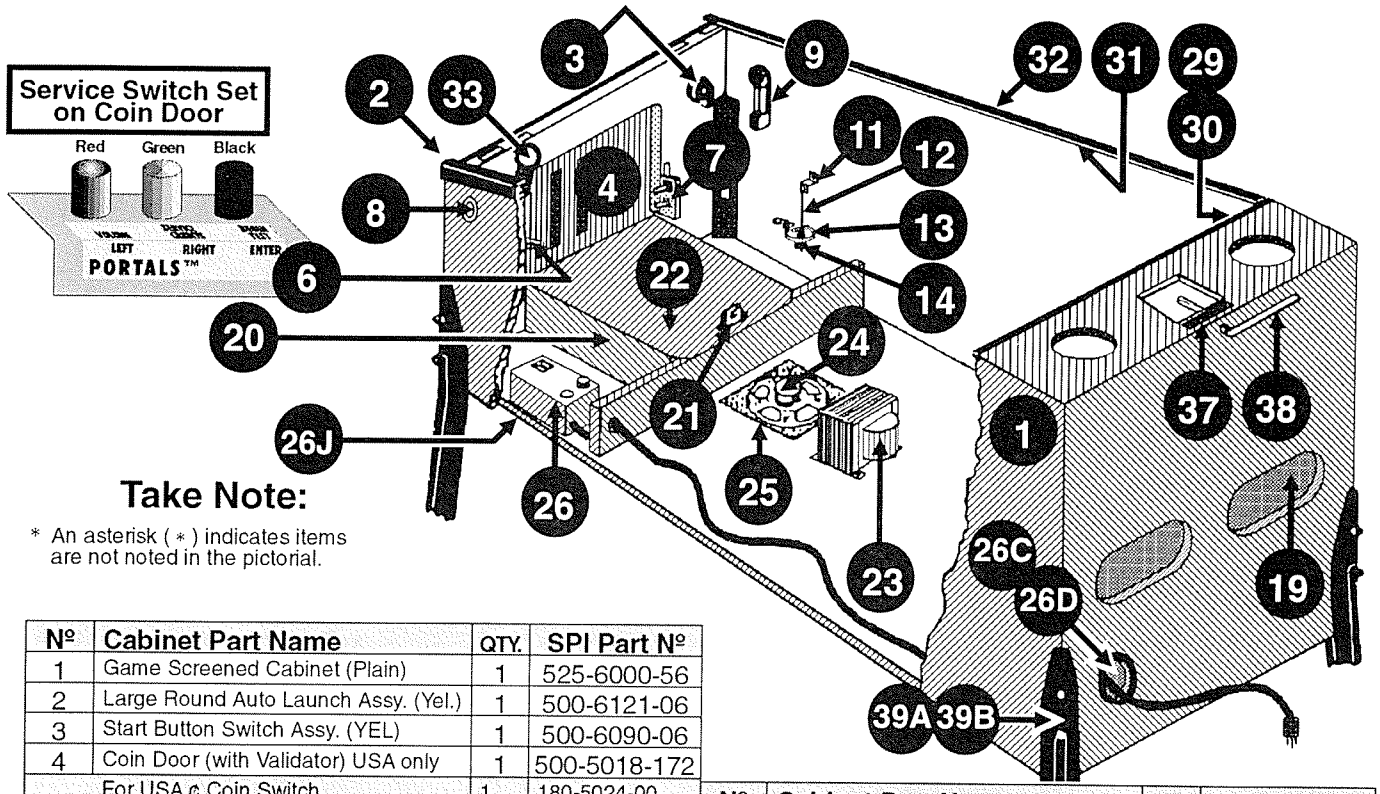
Nº	Backbox Part Name	QTY.	SPI Part Nº
2	Front Side Metal Backbox Assembly		505-6002-56-56B
ORDERING ABOVE (ITEM 2) ASSEMBLY PART Nº WILL INCLUDE:			
2A	Welded Metal B-box (Frnt. Side) Plain	1	**515-6623-01**
2B	**Dot Matrix Display Board 128 X 32**	1	**520-5052-00**
2C*	#6-32 X 1/2" PPH Screw	4	232-5202-00
2D	Speaker 4" X 4" Quam (Left Side)	1	031-5004-00
2E	Speaker Backplate (Right Side Cover)	1	820-6157-00
2F	Dot Matrix Display Butyrate Cover	1	545-5751-00
2G	Dot Matrix Display Bezel	1	545-5752-00
2H*	Washer - 9/64" X 5/16" X 1/32	2	242-5017-00
2I*	#6-32 Stop Nut (for Items 2C, 2D, 2G & 2L)	28	240-5005-00
2J*	#10-32 Stop Nut (for Items 2K)	2	240-5203-00
2K*	Sega Logo Stick-On Plate	1	535-7877-00
2L*	Bracket (Holds Dot Matrix Display)	2	515-6623-02
	...Star Wars... Backglass Sub-Assy.	1	**515-5450-00-43**
	Ordering Item 2L Sub-Assy. includes:		
	2-Sided Tape (6")	*1*	*626-5005-00*
	Backglass - Lexan	*1*	*545-5743-00*
	Backglass - Star Wars Art Work	*1*	*830-5256-01*
2M*	*Backglass - Butyrate Back Cover*	*1*	*545-5753-00*
2N*	#6 Washer (fastens w/Item 2I for Items 2K/2L)	20	242-5001-00
2O*	Bracket Top/Bot. (Holds Backglass)	2	515-6623-03
2P*	Bracket Side (Holds Backglass Assy.)	2	515-6623-04
2Q	Pedistal Plate	1	515-6623-05
2R	#6 X 1/2" PTH	4	237-5809-00
2S*	Door Stiffner Bracket	1	515-6623-06
2T*	3/8" X 1/4" Poly. Foam 4.75" (for side gaps)	1	626-5038-00
3 *	Fuse Description Label (Space Jam)	1	820-6152-43
4 *	#8-32 Keps Nut (Secures Item 1 to 2)	4	240-5104-00

The following items secure the Backbox to the Cabinet:

5	Sq. Neck 1/4"-20 X 7/8" Car. Bolt	2	231-5014-00
6	Hinge Spacer	2	530-5099-00
7	Washer 1/4" I.D. X 7/8" O.D.	2	242-5016-00
8	Washer 1/4" I.D. X 1" O.D.	2	242-5009-00
9	1/4"-20 Flange Nut	2	240-5300-00

For Fuses, Bridges, Relays & ROMs locations, see Dr. Pinball: Find-It-In-Front page DR. ❶.

Cabinet - General Parts



Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

№	Cabinet Part Name	QTY.	SPI Part №
1	Game Screened Cabinet (Plain)	1	525-6000-56
2	Large Round Auto Launch Assy. (Yel.)	1	500-6121-06
3	Start Button Switch Assy. (YEL)	1	500-6090-06
4	Coin Door (with Validator) USA only	1	500-5018-172
	For USA ¢ Coin Switch	1	180-5024-00
	For JAPAN ¥ Coin Switch	1	180-5091-00
	Item 4 secured by: **4A:** 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5003-00), **4B:** 1/4"-20 Flange Nut (Qty. 4) (240-5300-00),		
5 *	Slam Tilt Switch (on Coin Door)	1	180-5022-00
6	Service Switch Set (on Coin Door)	1	180-5012-03
7	Dual Switch Assembly	1	500-5808-00
	ORDERING ABOVE (ITEM 7) ASSEMBLY PART № WILL INCLUDE:		
7A*	Mounting Bracket	1	535-6958-00
7B*	Playfield Power Interlock Switch (Top)	1	180-5136-00
7C*	Memory Protect Switch (Bottom)	1	180-5000-00
8	Flipper Button Assembly Red	2	500-5026-32
9	Flipper Cabinet Sw. - Self-Cleaning	2	180-5160-00
10 *	Pal Nut for Flipper Button	2	240-5003-00
11	Tilt Hanger Bracket	1	535-5221-00
12	Tilt Hanger Wire (Attached to "11")	1	535-5319-00
13	Tilt Contact Wire	1	535-7563-01
14	Tilt Plumb Bob (Attached to "12")	1	535-5029-00
15	Pivot Pin Keeper Brkt. (Female)	1	535-7685-00
	Note: Pivot Pin Brkt. (Male) (On Playfield): 500-6088-00		
	Item 15 secured by: **15A:** 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5003-00), **15B:** 1/4"-20 Flange Nut (2/per) (240-5300-00)		
16 *	Prop Rod	1	535-7553-00
	Item 16 secured by: **16A:** #10-24 X 1-3/4" Carriage Bolt Sq. Neck (231-5022-00), **16B:** #10-24 Nylon Stop Nut (240-5206-00)		
17 *	Mylar Carriage Bolt Cover Disc	6	820-5041-00
18 *	Cabinet Stop Bracket (Nylon)	2	545-5763-00
	ABOVE (ITEM 18) USES THE FOLLOWING WHEN SECURED:		
	Hinge Spacer	2	530-5099-00
	Washer 1/4" I.D. X 1" O.D.	2	242-5009-00
	Item 18 secured by: **18A:** 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5003-00), **18B:** 1/4"-20 Flange Nut (2/per) (240-5300-00),		
19	Grills 2-1/2" X 18" (Back/Bot.) (Qty. 2)	2	545-5072-02
20	Cash Box Plastic Bottom	1	545-5090-00
21	Cash Box Lock Bracket (wire)	1	535-7562-00
22	Cash Box Cover (Validator)	1	535-5013-03
23	Transformer with Ballast Winding	1	010-5012-00
24	Speaker - Round - 8" ø Quam 4Ω	1	031-5005-00
25	Speaker Grill 7" x 7"	1	545-5072-03

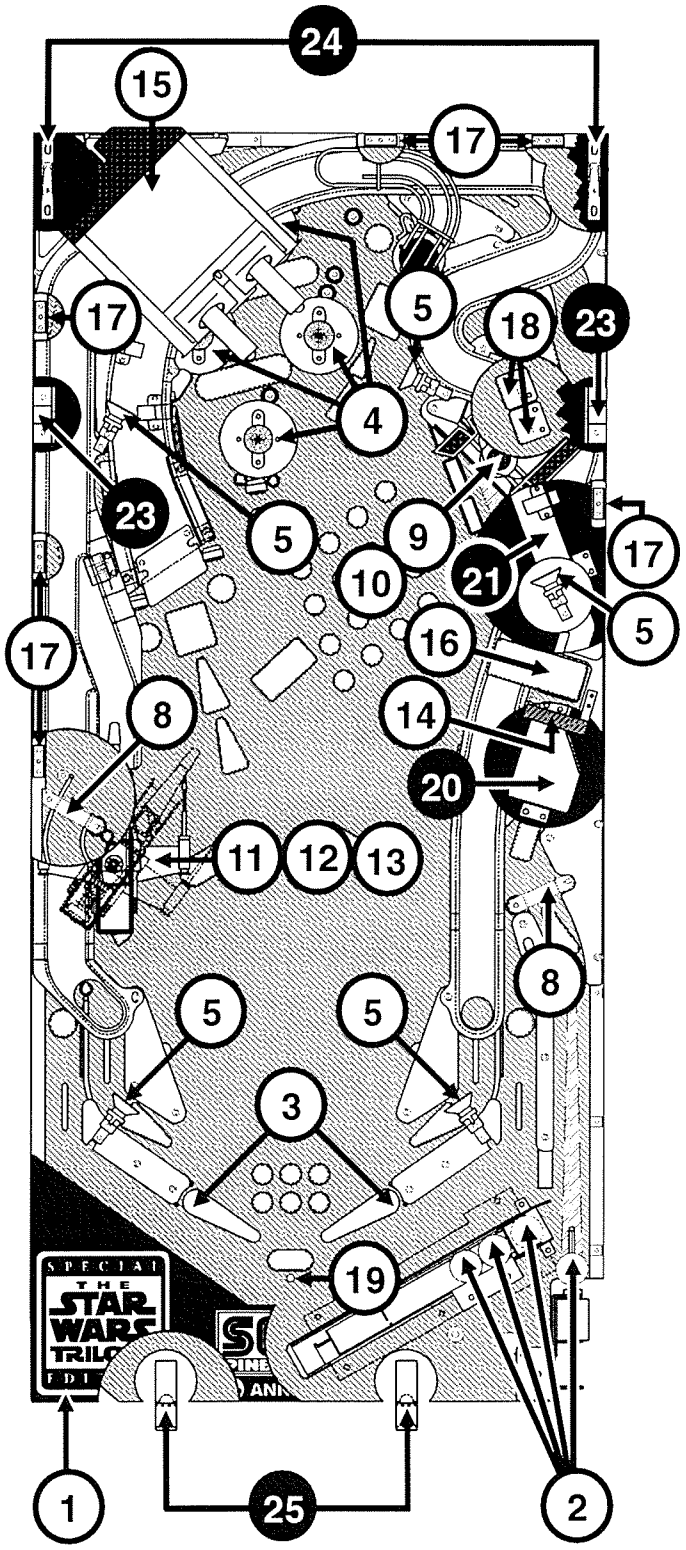
№	Cabinet Part Name	QTY.	SPI Part №
26	Power Input Box Sub-Assy. (no Vol. pot)	1	515-5360-01
	ORDERING ABOVE (ITEM 26) SUB-ASSY. PART № WILL INCLUDE:		
26A*	Power Box (Plain)	1	535-5932-00
26B*	Service Outlet (for USA)	1	180-5008-01
26C	Line Cord 10' ROJ 3" Max.	1	034-5000-10
26D	Recessed Cup for Line Cord	1	545-5122-00
26E*	Line Filter	1	150-5000-00
26F*	Varistor TNR159211KM	1	150-5001-00
26G*	Fuse 8 Amp (Domestic)	1	200-5000-05
26H*	Fuse Holder	1	205-5001-00
26I*	On/Off Switch Plate	1	535-5224-01
26J	On/Off Switch Toggle (Under Cabinet)	1	180-5001-00
26K*	Power Box Decal	1	820-6123-01
27 *	Snap-In Keeper Female	2	355-5016-02
	Note: Snap-In Keeper Male (On Playfield)	1	*355-5016-01*
28 *	Catch Bracket (for Item 27)	2	535-7700-00
	Item 28 secured by: **28A:** #10-24 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5012-00), **28B:** #10-24 Keps Nut (2/per) (240-5207-00)		
29	Rear Plastic Ext. Playfield Glass 20 3/8"	1	545-5038-00
30	Mounting Foam Rubber for Ext.	1	626-5004-00
31	Plastic Channel Left & Right	1	545-5017-00
32	Side Armor (Left & Right Same)	2	535-7297-02
	Item 32 secured by: **32A:** #10-24 X 1" Carriage Bolt Sq. Neck (2/per) (231-5021-00), **32B:** #10-24 Hex Nut (2/per) (240-5202-00), **33B:** #8 X 5/8" Tamper Proof (237-5947-00)		
33	Front Molding Lockdown Assembly	1	500-5020-01
	Item 33 secured by: **33A:** #10-24 X 1-1/4" Carriage Bolt (Qty. 2) (231-5012-00), **33B:** #10-24 Keps Nut (Qty. 2) (240-5207-00)		
34 *	Front Molding Lockdown Spring	1	265-5008-00
35 *	Front Molding - Black	1	500-5757-01-00
36 *	Playfield Glass (T.P.) 21" x 43"	1	660-5001-00
37	#1 Roto Lock Male	1	355-5006-01
	Note: #1 Roto Lock Female (on Backbox)	1	*355-5006-02*
	Item 37 secured by: **37A:** #10-24 X 1-3/4" Carriage Bolt Sq. Neck (Qty. 2) (231-5022-00), **37B:** #10-24 Nylon Stop Nut (Qty. 2) (240-5206-00)		
38	Hex Key Allen Wrench 5/16"	1	777-0001-00
39	Leg Assembly	4	500-5921-50
	ORDERING ABOVE (ITEM 39) ASSEMBLY PART № WILL INCLUDE:		
39A	Leg (Black)	4	535-5020-50
39B	Leg Leveler 3/8" - 16 X 3"	4	500-5017-00
	Item 39 secured by: Leg Bolt Back Plate (535-5703-00), and Leg Bolt 3/8" X 16 X 2-1/2" Hex 5/8" Hd. (2/per) (231-5001-01)		

Playfield - General Parts

Nº	Above Playfield Name	QTY.	SPI Part Nº
1	Bottom Arch Assembly (Plastic)		500-6005-00-56
ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:			
1A*	Bottom Arch without "Fork" (Plain)	1	545-5302-07
1B*	#6-32 X 1-1/4" PPH MS	2	237-5508-00
1C*	Spacer 3/4" Plastic 3/8" (Gray)	2	254-5000-07
1D*	#6-32 Nylon Stop Nut	2	240-5005-00
1E*	Bottom Arch Shooter Lane Buty. -12	1	830-5906-20
1F*	Nelson Protect Strip 8-9/16"	2	545-5212-02
1G	Bottom Arch Fence	1	535-7901-00
The following decals are not included with this assembly:			
*	Arch Left; Arch Right; and Arch Center	1 ea.	820-6184-06; -07; and -10
2	1-1/16" Steel Balls	4	260-5000-00
3	Flipper & Shaft Assy. White with Sega Saturn™ Logo ©97	2	515-5133-08-05
4	Pop Butyrate & Red Hat Assembly	4	515-6674-01
ORDERING ABOVE (Item 4) SUB-ASSY. PART Nº WILL INCLUDE:			
4A	Pop Bumper Butyrate Cap	1	830-5919-00
4B	Mini-Mars Hat Light Cover Red	1	550-5032-02
4C	Rivet - 1/8"ø X 3/16" Lg.	2	249-5001-00
5	Light Reflector	5	545-5409-01
6 *	Playfield Back Panel Game Specific	1	525-5455-00
7 *	Cabinet Back Panel Game Specific	1	525-5456-00
8	1-Way Gate Mounting Bracket	2	535-5269-03
	Wire Gate (for above)		535-5307-03
9	Tie Fighter	1	545-5772-00
10	Darth Vader	1	545-5786-00
Note:	The above Items 9 & 10 are attached to the Tie Fighter Assy., 515-6182-00-56, a Major Assy. (See Section 4, Chapter 2).		
11	X-Wing Fighter	1	545-5784-00
12	Luke Skywalker	1	545-5787-00
13	R2D2	1	545-5788-00
Note:	The above Items 11-13 are attached to the X-Wing Assembly, 515-6651-00-56, a Major Assy. (See Section 4, Chapter 2).		
14	Han Solo (in Carbonite)	1	545-5790-00
Note:	The above Item 14 is attached to the Han Solo Assembly, 500-6191-00-56, a Major Assy. (See Section 4, Chapter 2).		
15	Cannon Cover	1	545-5791-00
Note:	The above Item 15 is attached to the Magna-Diverter Assy., 500-6176-00-56, a Major Assy. (See Section 4, Chapter 2).		
16	Scoop Weldment Assy.	1	515-6664-00
Note:	The above Item 16 is the Exit Hole from the Super VUK.		
17	Ramp Mounting Bracket	6	535-6508-00
18	Ball Snubber (Stop) Bracket	2	535-7280-01
19	Plastic Hole Plug (White)	1	545-5232-01

Nº	Below Playfield Name	QTY.	SPI Part Nº
20	Trough Weldment (Small)	1	515-6673-00
Note:	The above Item 20 is the front Entrance to the Super VUK.		
21	Trough Weldment (Large)	1	515-6660-00
Note:	The above Item 21 is the back Entrance to the Super VUK and is attached to the Under-Trough Assy., 500-6180-00-56, a Major Assy. (See Section 4, Chapter 2).		
22 *	VUK Angle Support Bracket		535-7911-00
Note:	The above Item 22 is attached to the VUK to ensure the correct angle of the VUK which shoots the ball up.		
23	Pivot Pin Bracket (Male)	2	500-6088-00
Note:	*Pivot Pin Brkt. (Female) (In Cabinet)*	2	*535-7685-010*
24	Snap-In Keeper Male	2	355-5016-01
Note:	*Snap-In Keeper Female (In Cabinet)*	2	*355-5016-010*
25	Playfield Hanging Bracket	2	535-5216-03
26 *	3½" Plastic Post (holds cables)	9	545-5253-01
27 *	5½" Cable Tie (ties cable to post)	9	040-5001-02

P1 *	Playfield Screened (No Parts)	1	830-5156-00
P2 *	Playfield Complete with all Parts	1	505-6004-56-56

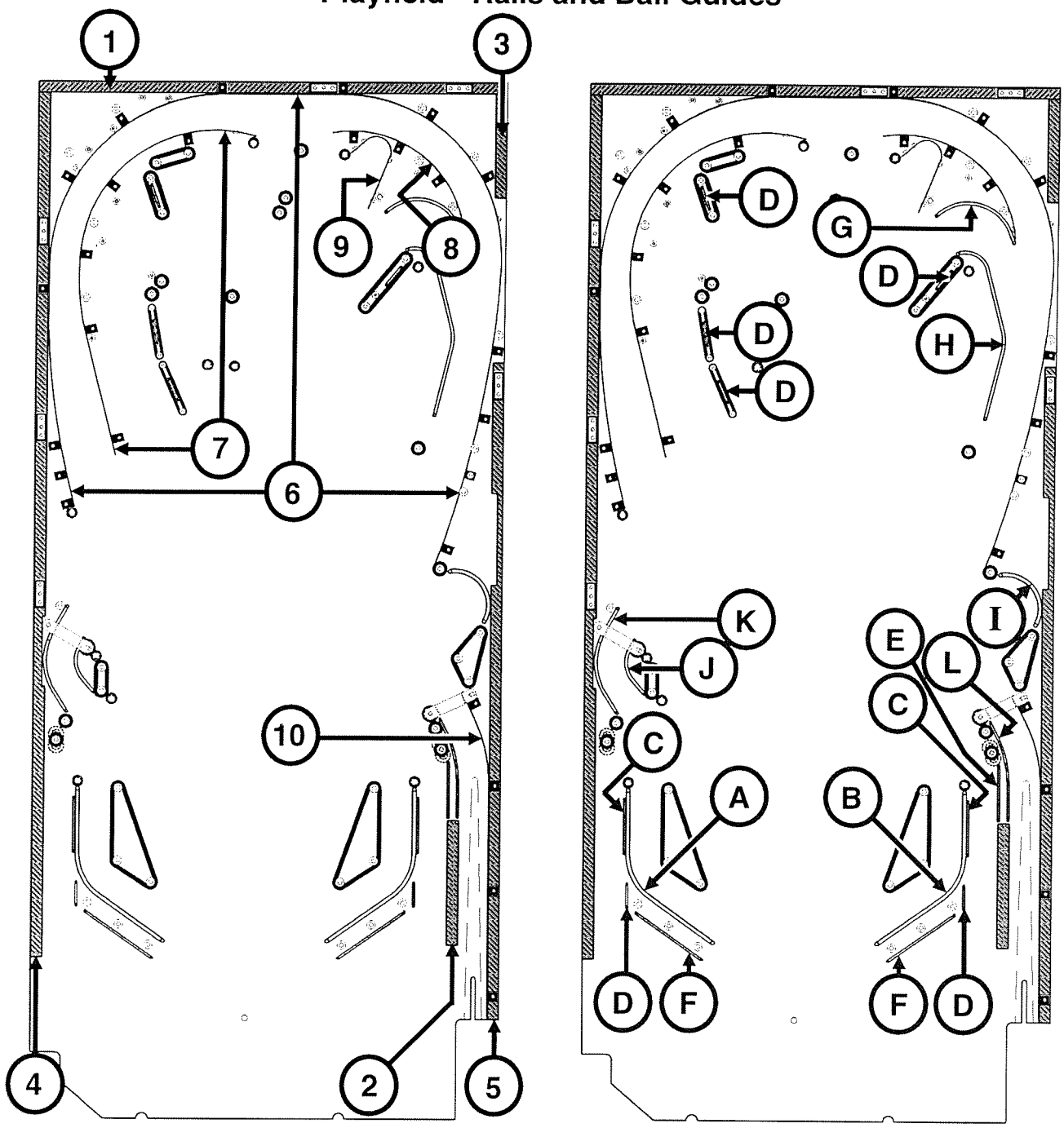


Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

1. For rails & ball guides, butyrate, mylar, decals, rubber parts, switches & targets, metal & plastic posts, sockets & bulbs, see the following pages in this chapter.
2. See Section 4, Chapter 2, for balance of items which are part of or attached to a Major Assembly.
3. **Legend Note:** Items noted with a white circle (①) are mounted above the playfield; items noted with a black circle (❶) are mounted below the playfield.

Playfield - Rails and Ball Guides



Nº	Rail Name	QTY.	SPI Part Nº
1	Wood Rail 20¼" Top	1	525-5007-05
2	Wood Rail 5.41" Shooter Lane	1	525-5007-45
3	Wood Rail 4½" Top Right	1	525-5007-46
4	Wood Rail Left	1	525-5451-00
5	Wood Rail Right	1	525-5452-00
6	Flat Metal Rail #1 Large Orbit	1	535-7953-00
7	Flat Metal Rail #2 Orbit Left	1	535-7954-00
8	Flat Metal Rail #3 Orbit Right	1	535-7955-00
9	Flat Metal Rail #4 Top VUK	1	535-7956-00
10	Flat Metal Rail #5 Shooter Lane	1	535-7957-00

Nº	Ball Guide Name	QTY.	SPI Part Nº
A	Return Guide Left	1	535-7560-00
B	Return Guide Right	1	535-7560-01
C	Ball Guide Rail (Outlane Fence)	2	535-7595-00
D	Ball Guide Wire Form 1"	6	535-5300-05
E	Ball Guide Wire Form 2¼"	1	535-5300-01
F	Ball Guide Wire Form 3½"	2	535-5300-03
G	Ball Guide Rail #1 (By Top VUK)	1	535-7958-00
H	Ball Guide Rail #2 (Orbit Right)	1	535-7959-00
I	Ball Guide Rail #3 (By Bot VUK)	1	535-7960-00
J	Ball Guide Rail #4 (X-Wing Rt.)	1	535-7961-00
K	Ball Guide Rail #5 (X-Wing Lt.)	1	535-7973-00
L	Ball Guide Rail #6 (Shooter Lane)	1	535-7974-00

Playfield - Butyrate, Decals and Mylar

= Butyrate Screened & Mylar

= Butyrate Clear Lower

= Butyrate Clear Upper

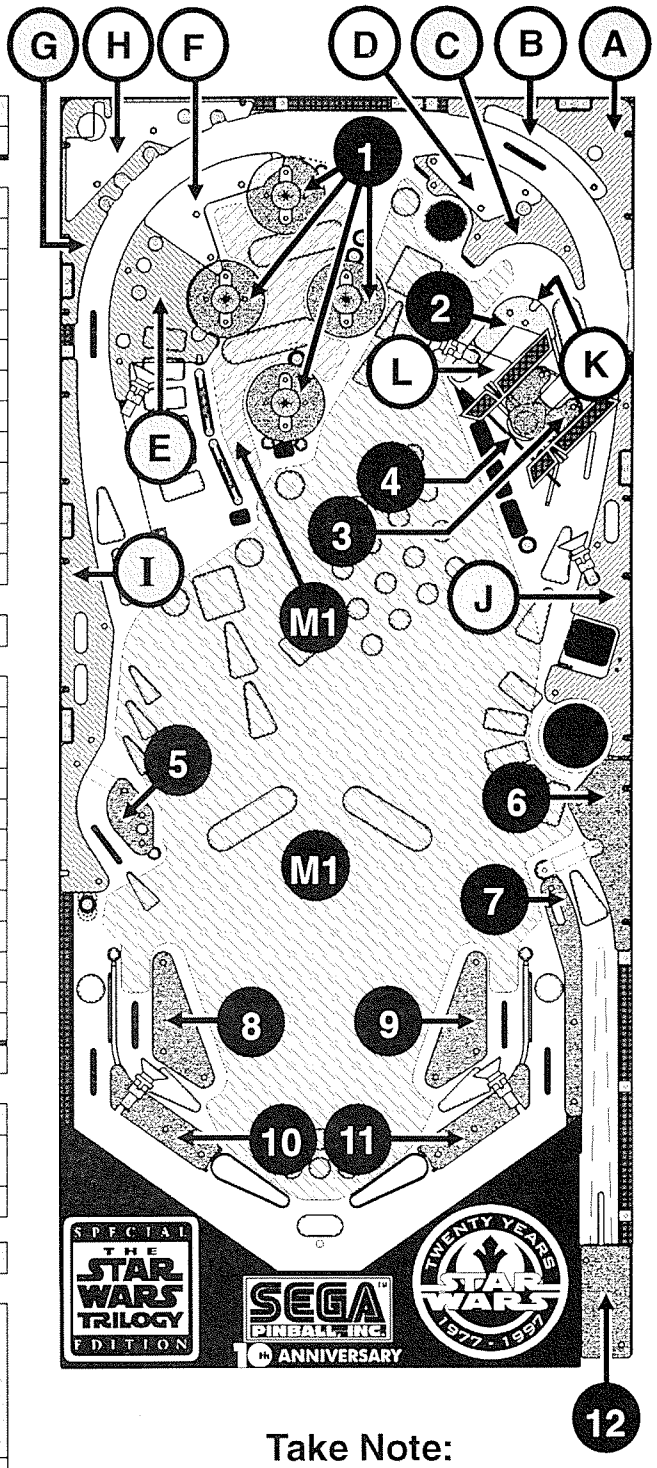
Nº	Screened ButYrate Name	QTY.	SPI Part Nº
1	Butyrate Pop Bumper Cap	4	830-5919-00
	Buty. Sheet Screened (2-14) (Complete)		830-5914-XX
2	Butyrate 2 - Drop Target	1	830-5914-02
3	Butyrate 3 - Tie Fighter Top	1	830-5914-03
4	Butyrate 4 - Tie Fighter Front	1	830-5914-04
5	Butyrate 5 - X-Wing	1	830-5914-05
6	Butyrate 6 - Right Side Bottom	1	830-5914-06
7	Butyrate 7 - Shooter Lane	1	830-5914-07
8	Butyrate 8 - Left Slingshot	1	830-5914-08
9	Butyrate 9 - Right Slingshot	1	830-5914-09
10	Butyrate 10 - Left Return	1	830-5914-10
11	Butyrate 11 - Right Return	1	830-5914-11
12	Butyrate 12 - Bottom Arch	1	830-5914-12
13 *	Butyrate 13 - Keychain	1	830-5914-13
14 *	Butyrate 14 - Keychain	1	830-5914-14

Nº	Clear ButYrate Name	QTY.	SPI Part Nº
	Buty. Sheet Clear (A-L) (Complete)		830-5916-XX
A	Buty. 01 - Top Right Corner	1	830-5916-01
B	Buty. 02 - Top Rt. Corner Top (Upper)	1	830-5916-02
C	Buty. 03 - Top Right Center	1	830-5916-03
D	Buty. 04 - Top Rt. Center Top (Upper)	1	830-5916-04
E	Buty. 05 - Top Left Center	1	830-5916-05
F	Buty. 06 - Top Left Center Top (Upper)	1	830-5916-06
G	Buty. 07 - Top Left Corner	1	830-5916-07
H	Buty. 08 - Top Left Corner Top (Upper)	1	830-5916-08
I	Buty. 09 - Left Side	1	830-5916-09
J	Buty. 10 - Right Side	1	830-5916-10
K	Buty. 11 - Drop Target (Upper)	1	830-5916-11
L	Buty. 12 - Drop Target (Upper)	1	830-5916-12
M *	Butyrate Big Ramp Entrance Cover	1	830-5920-00

Nº	Mylar Name	QTY.	SPI Part Nº
M1	Mylar Turbo Bumper Area Mylar Full Playfield Area	1	820-5867-00
n/a	Mylar Cover Discs (Cabinet)	6	820-5041-00

Nº	...Star Wars... Decal Name	QTY.	SPI Part Nº
	...Star Wars... Decal Sheet (Complete)		820-6184-XX
	Coin Door: -02 (Portals Service Switch), **Bottom Arch:** -10 (Center), -06 (Left), -07 (Right),-03 (Install 4 Balls) **Backbox:** -08 (Warning Don't Lean on Door...) **4-Bank D/T: Top:** -19, -21, -23 & -25; **Front:** -18, -20, -22, & -24 **Misc:** -01 (Backpanel); -04 (Flip. Rt.), -05 (Flip. Lt.); -11 & -12 (Gun Barrel); -13 & -14 (Scoop Top & Side); -15, -16, & -17 (X-Wing Side, Side Front & Top);		
n/a	Game Specific Backbox Fuse Loc.	1	820-6152-56

Nº	Generic Decal Name	QTY.	SPI Part Nº
n/a	"Suitable for Indoor Use Only (UL)"	1	820-6001-01
n/a	"High Voltage Label (UL)"	2	820-6082-01
n/a	"Power Box Decal - USA"	1	820-6123-01
n/a	"Danger Coin Door Label (UL)"	1	820-6140-00
n/a	"UL Listing Label"	1	820-6141-00
n/a	"Fuse Lable (UL)"	1	820-6143-00
n/a	"Start" (Word & Arrow) Decal	1	820-6177-00

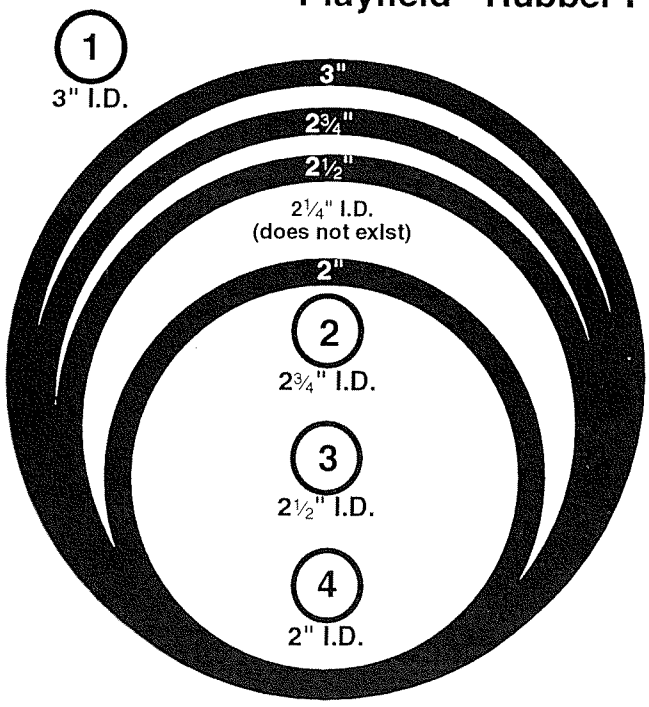


Take Note:

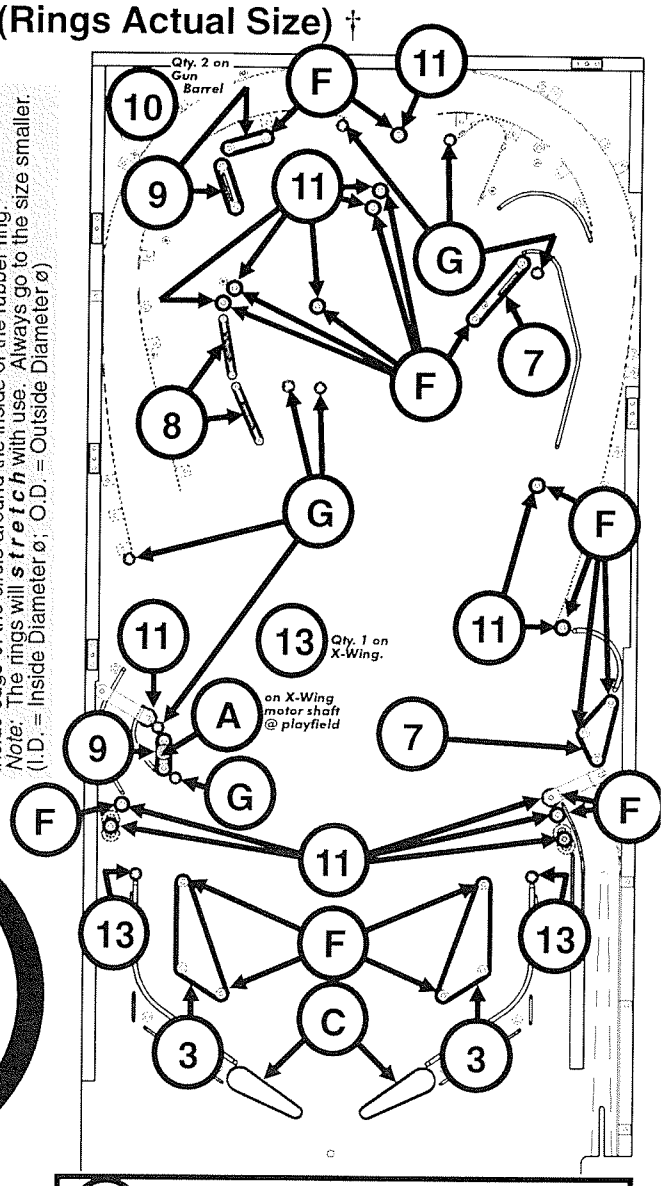
* An asterisk (*) or "n/a" indicates items are not noted in the pictorial.

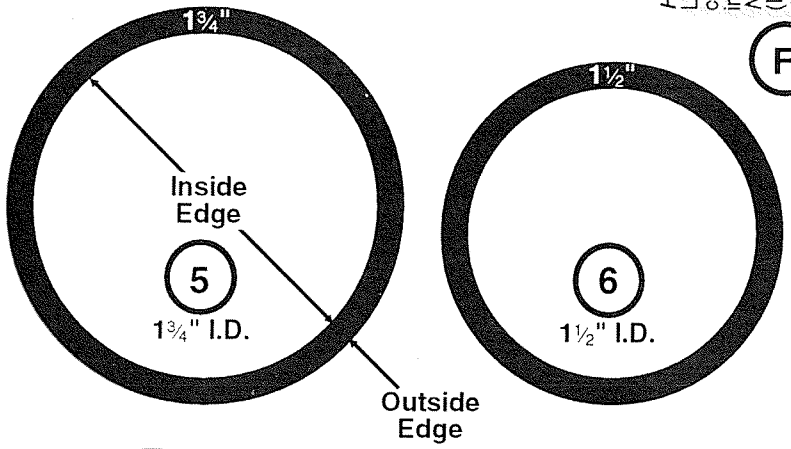
1. To order the entire decal, screened butyrate or clear butyrate sheets, use the Part Nº with the "-XX" ending. For individual pieces replace the "-XX" with appropriate last 2-digit number. *Attention: Individual pieces may not be available.*
2. Butyrate 1 - Pop Bumper Cap (Qty. 4) have riveted Light Hats in this game. See Playfield - General Parts or Major Assy. & Ramps (Section 4, Chapter 2) for the sub-assembly Part Nº.
3. **Legend Note:** Items noted with a black circle (❶) are screened butyrate or mylar. Items noted with a white circle (①) are upper layer "clear" butyrate; items noted with a gray circle (◍) are lower layer "clear" butyrate.

Playfield - Rubber Parts (Rings Actual Size) †

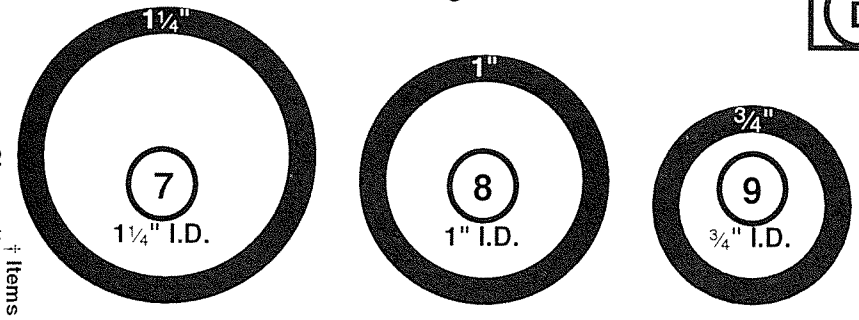


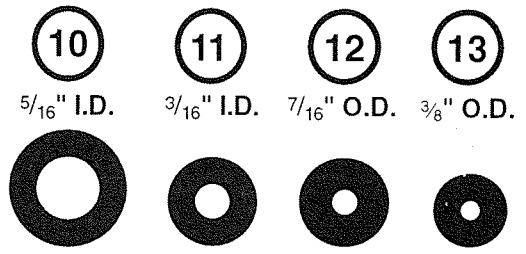
How to measure: Lay ring over circle of closest size. If you see the outside edge of the circle, move to one ring smaller. With the correct size you will see the inside edge of the circle around the inside of the rubber ring. *Note:* The rings will ***stretch*** with use. Always go to the size smaller. (I.D. = Inside Diameter ø; O.D. = Outside Diameter ø)





D Rubber Bumpers (Qty. 5) are all located on:
• TRUK • Ball Launch• VUKs (X2) • X-Wing





† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

№	Rubber Part Name	QTY.	Part №	№	Rubber Part Name	QTY.	Part №
A	Rubber Bushing (Small)	1	545-5192-00	4	2" I.D. Black Rubber Ring	0	545-5348-08
B	Small Flipper Rubber Ring	0	545-5207-00	5	1¾" I.D. Black Rubber Ring	0	545-5348-21
C	Large Flipper Rubber Ring	2	545-5277-00	6	1½" I.D. Black Rubber Ring	0	545-5348-07
D	Rubber Bumper (Grommet)	5	545-5105-00	7	1¼" I.D. Black Rubber Ring	2	545-5348-06
E	Bumper Post Rubber	0	545-5009-00	8	1" I.D. Black Rubber Ring	2	545-5348-05
F	Post Rubber (Sleeve Short)	19	545-5151-00	9	¾" I.D. Black Rubber Ring	3	545-5348-04
G	Post Rubber (Sleeve Tall)	8	545-5308-00	10	5/16" I.D. Black Rubber Ring	2	545-5348-02
1	3" I.D. BLK Rubber Ring	0	545-5348-10	11	3/16" I.D. Black Rubber Ring	14	545-5348-01
2	2¾" I.D. Black Rubber Ring	0	545-5348-20	12	7/16" O.D. Black Rubber Ring	0	545-5348-17
3	2½" I.D. Black Rubber Ring	2	545-5348-09	13	⅜" O.D. Black Rubber Ring	3	545-5348-19

Playfield & Cabinet - General Switches †

Nº	Playfield Switch Name	QTY.	Part Nº
1	OPTO Transmitter Switch	1	520-5124-00
	OPTO Receiver Switch	1	520-5125-00
2	Micro Rollover Switch (3 in trough)	5	180-5119-00
3	Shooter Lane Switch Assembly	1	500-5498-01
ORDERING ABOVE (ITEM 3) ASSEMBLY PART Nº WILL INCLUDE:			
3A	Micro Switch	1	180-5100-01
3B	Bracket	1	535-6173-00
3C	#2-56 X 3/8" HWH Screw	2	237-5938-00
4	Drop Target Switch	4	180-5158-00
5	Magnet Reed Switch Type 1 (Ramp)	3	180-5145-00
6	Magnet Reed Switch Type 2	3	180-5145-02
7	Micro Sw. Rollover Assy. (Rt. Brkt.)	7	500-5707-00
8	Micro Sw. Rollover Assy. (Lt. Brkt.)	1	500-5706-00
9	Turbo Bumper Switch	4	180-5015-03
10	Slingshot Micro Switch	4	180-5054-00
11	Loop Switch (used on VUKs)	1	180-5116-00

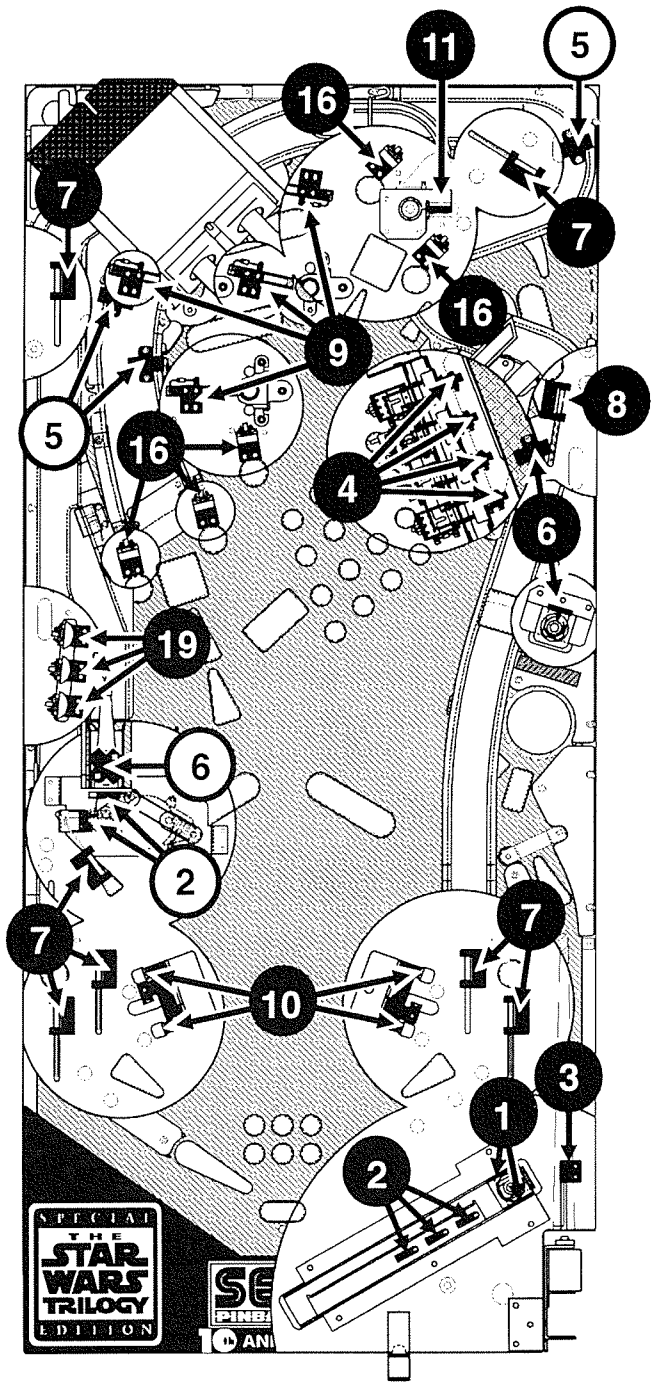
These Stand-Up Targets (Items 12-19) are detailed on the next page:

12	Stand-Up Target Round 1"	0	500-5835-XX
13	Stand-Up Target Rect. 1" X 1-1/2"	0	500-5321-XX
14	Stand-Up Target Square 1"	0	500-5232-XX
15	Stand-Up Target Narrow Rect.	0	500-5857-XX
16	Modular S-U Target Narrow (Clear)	5	500-6138-01
17	Modular Stand-Up Target Round	0	500-6075-XX
18	Modular Stand-Up Target Square	0	500-6139-XX
19	Modular S-U Trgt. 1" Spherical (Amb.)	3	500-6189-03

Nº	Cabinet Switch Name	QTY.	Part Nº
A *	Start Button Sw. Assy. (Yellow Flip. Style)	1	500-6090-06
B *	Coin Door Switch (USA)	4	180-5024-00
	Coin Door Switch (¥ Japan)	n/a	180-5091-00
C *	Slam Tilt Switch	1	180-5022-00
D *	Flipper Stack Power Switch	2	180-5160-00
E *	Service Switch Set (3-Button)	1	180-5012-03
F *	Dual Switch Assembly	1	500-5808-00
ORDERING ABOVE (ITEM F) ASSEMBLY PART Nº WILL INCLUDE:			
F1 *	Memory Protect Switch	1	180-5000-00
F2 *	Interlock Switch	1	180-5136-00
F3 *	Bracket	1	535-6958-00
G *	Service Outlet	1	180-5008-01
H *	On/Off Switch	1	180-5001-00

Plastic Part Color Chart			
Nº	Color Name	Nº	Color Name
-01	Clear	-09	Purple
-02	Red	-10	Fluorescent Orange
-03	Amber	-11	Fluorescent Green
-04	Green	-12	Fluorescent Blue
-05	Blue	-13	Teal Green
-06	Yellow	-14	Gray
-07	Orange	-15	Luminescent
-08	White	-16	Gold

Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit Nº which correspond to the color of that part. The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº. corresponding to the color desired. Not all colors may be available.



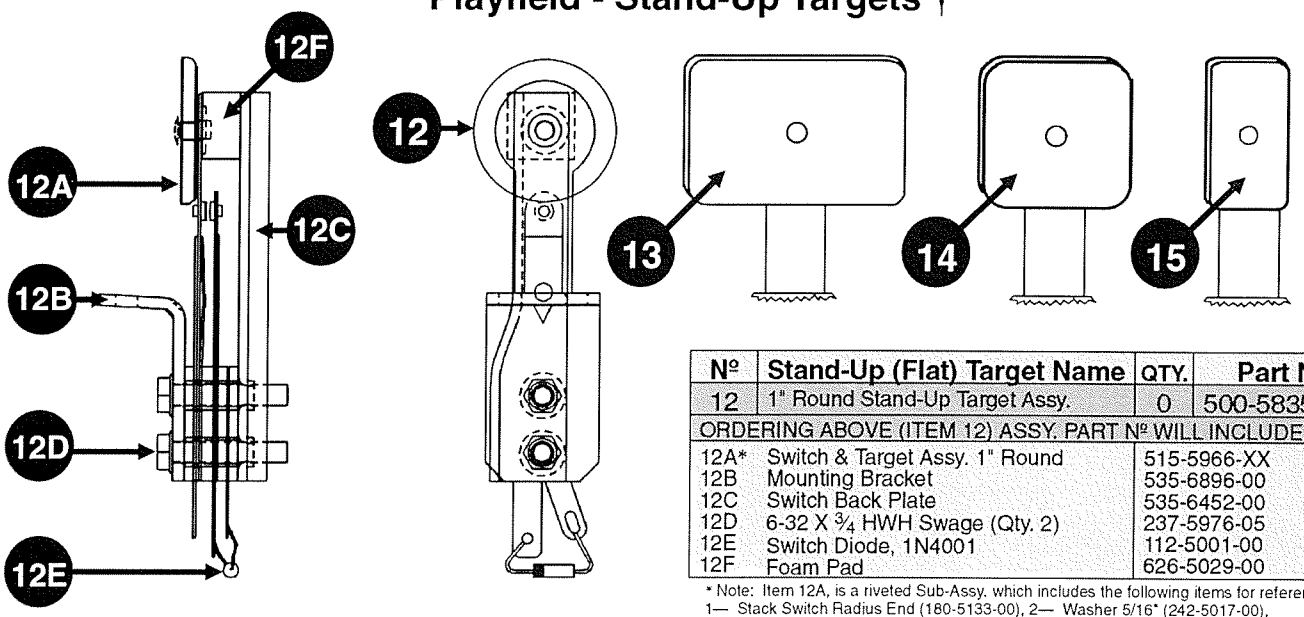
Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

1. For switches used corresponding to the Switch Matrix Grid of this game, see Section 3, Chapter 2, ...Diagnostics.
2. For location of the Cabinet Switches, see the beginning of this chapter.
3. **Legend Note:** Items noted with a white circle (①) are mounted above the playfield; items noted with a black circle (❶) are mounted below the playfield.

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Stand-Up Targets †



№	Stand-Up (Flat) Target Name	QTY.	Part №
12	1" Round Stand-Up Target Assy.	0	500-5835-XX
ORDERING ABOVE (ITEM 12) ASSY. PART № WILL INCLUDE:			
12A*	Switch & Target Assy. 1" Round		515-5966-XX
12B	Mounting Bracket		535-6896-00
12C	Switch Back Plate		535-6452-00
12D	6-32 X ¾ HWH Swage (Qty. 2)		237-5976-05
12E	Switch Diode, 1N4001		112-5001-00
12F	Foam Pad		626-5029-00

* Note: Item 12A, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— 1" Round Target (545-5456-XX).

13	1" X 1½" Stand-Up Rect. Target Assy.	0	500-5321-XX
ORDERING ABOVE (ITEM 13) ASSY. PART № WILL INCLUDE:			
13A	Sw. & Target Assy. 1" X 1½" Rect. Items 13B-F are identical to 12B-F		515-6027-XX Identical to 12B-F

* Note: Item 13A, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— Rectangular Target (545-5145-XX).

14	1" Sq. Stand-Up Target Assy.	0	500-5232-XX
ORDERING ABOVE (ITEM 14) ASSY. PART № WILL INCLUDE:			
14A	Sw. & Target Assy. 1" Square Items 14B-F are identical to 12B-F		515-5162-XX Identical to 12B-F

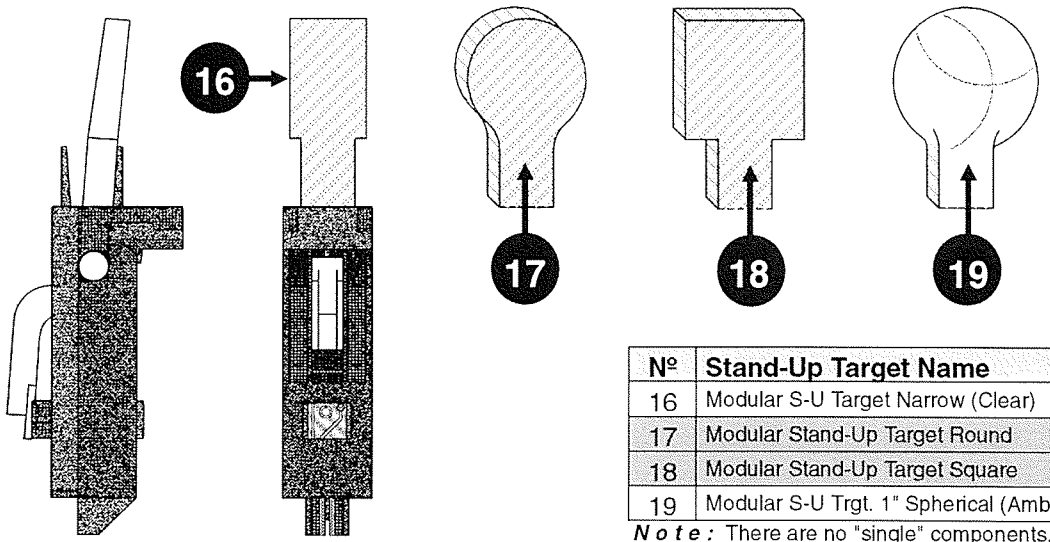
* Note: Item 14A, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— 1" Square Target (545-5470-XX).

15	Narrow Stand-Up Target Assy.	0	500-5835-XX
ORDERING ABOVE (ITEM 15) ASSY. PART № WILL INCLUDE:			
15A	Sw. & Target Assy. Narrow Items 15B-F are identical to 12B-F		515-5967-XX Identical to 12B-F

* Note: Item 15A, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Square End (180-5132-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— Narrow Target (545-5210-XX).

Take Note:

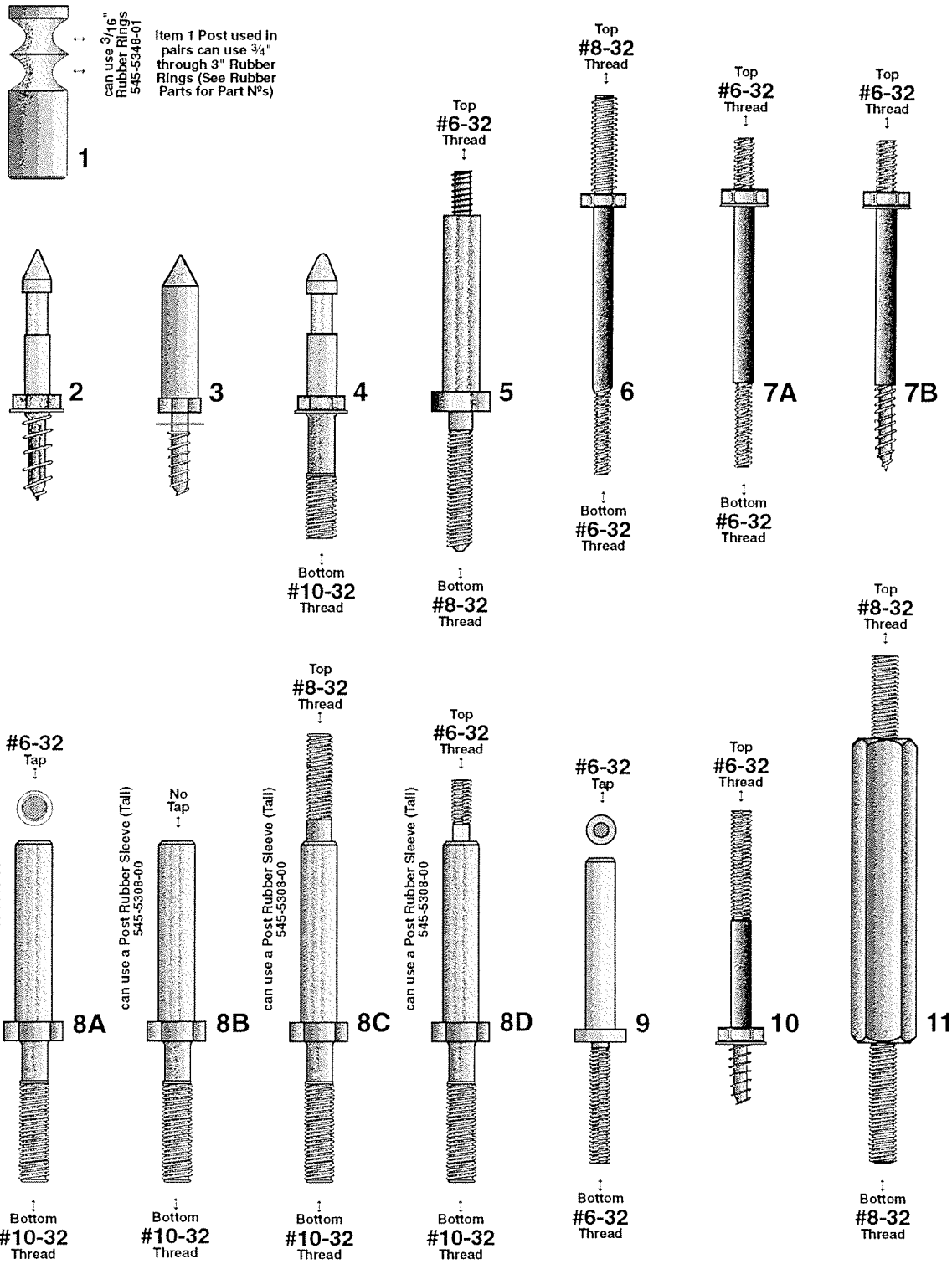
1. For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.
2. The "-XX" in Part №s which may come in various colors should be replaced with the desired 2-Digit № for the color desired. *Not all colors may be available.*
3. See the Plastic Part Color Chart on the previous page for color description with corresponding last 2-Digit №.



№	Stand-Up Target Name	QTY.	Part №
16	Modular S-U Target Narrow (Clear)	5	500-6138-01
17	Modular Stand-Up Target Round	0	500-6075-XX
18	Modular Stand-Up Target Square	0	500-6139-XX
19	Modular S-U Trgt. 1" Spherical (Amb.)	3	500-6189-03

Note: There are no "single" components. The entire target must be ordered if replacement is necessary.

Playfield - Metal Posts and Nuts (Actual Size) †



Shown Below:
- #6-32 Nylon Stop Nut: 240-5005-00

Top & Side Views

Not Shown:
- #6-32 Nylon Stop Nut with 1/4" Hex Body: 240-5010-00
- #8-32 Nylon Stop Nut: 240-5102-00
- #10-32 Nylon Stop Nut: 240-5203-00

Shown Below:
- #6-32 KEPS Nut (with Star Washer): 240-5008-00

Bottom & Side Views

Not Shown:
- #6-32 KEPS Nut with 1/4" Hex Body: 240-5011-00
- #8-32 KEPS Nut: 240-5104-00
- #10-32 KEPS Nut: 240-5208-00

Shown Below:
- #6-32 T-Nut: 240-5002-00

Bottom & Side Views

Not Shown:
- #6-32 T-Nut with Side Cut Off: 240-5002-01
- #8-32 T-Nut: 240-5101-00
- #10-32 T-Nut: 240-5007-00
- #10-32 T-Nut with Side Cut Off: 240-5205-00

Shown Below:
- #6-32 Hex Nut (No Star Washer): 240-5004-00

Top View

Not Shown:
- *#8-32 Hex Nut: 240-5003-00*
- *#10-32 Hex Nut: 240-5201-00*

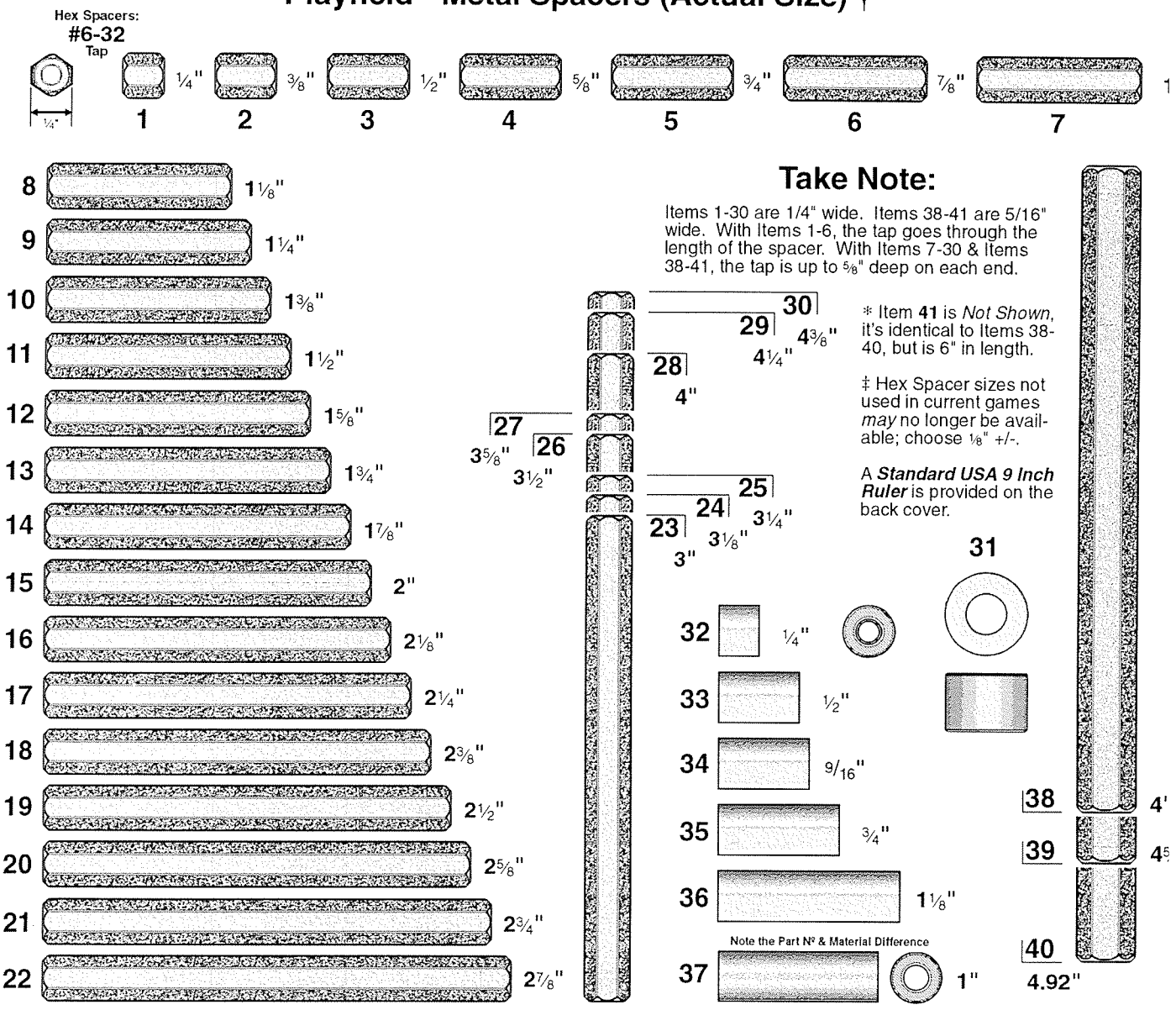
Nº	Metal Post Name	QTY.	SPI Part Nº
1	Stand-Off Double Groove Post 1 1/16"	0	530-5102-00
2	Mini-Post Wood Screw	0	530-5004-00
3	Mini-Post Wood Screw (no cut-away)	0	530-5004-01
4	Mini-Post #10-32 Bottom	6	530-5005-00
5	Post #6-32 Top / #8-32 Bottom	0	530-5007-00
6	Post #8-32 Top / #6-32 Bottom	0	530-5008-00
7A	Post #6-32 Top / #6-32 Bottom	24	530-5012-02
7B	Post #6-32 Top / Wood Screw Bottom	16	530-5010-02
8A	Post Hex Base #6-32 Tap/#10-32 Bot.	4	530-5332-01
8B	Post Hex Base (No Tap)/#10-32 Bot.	7	530-5332-00
8C	Post Hex Base #8-32 Top/#10-32 Bot.	0	530-5332-02
8D	Post Hex Base #6-32 Top/#10-32 Bot.	0	530-5332-03
9	Post #6-32 Tap / #6-32 Bottom	0	530-5127-00
10	Post #6-32 Top / Wood Screw Bottom	0	530-5263-01
11	Playfield Support #8-32 Top/Bottom	0	530-5285-00

Some other nuts (Not Shown / Not Used with above posts):

- #10-24 T-Nut, 240-5200-00 • #10-24 Hex, 240-5202-00 • #10-24 Nylon Stop, 240-5206-00 • #10-24 KEPS, 240-5207-00
- #6-32 Acorn Cap (WHT), 240-5000-00 • #6-32 Acorn Cap (BLK), 240-5006-00 • #6-32 Wing, 240-5001-00 • #8-32 Wing, 240-5100-00

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Metal Spacers (Actual Size) †



Take Note:

Items 1-30 are 1/4" wide. Items 38-41 are 5/16" wide. With Items 1-6, the tap goes through the length of the spacer. With Items 7-30 & Items 38-41, the tap is up to 5/8" deep on each end.

* Item **41** is *Not Shown*, it's identical to Items 38-40, but is 6" in length.

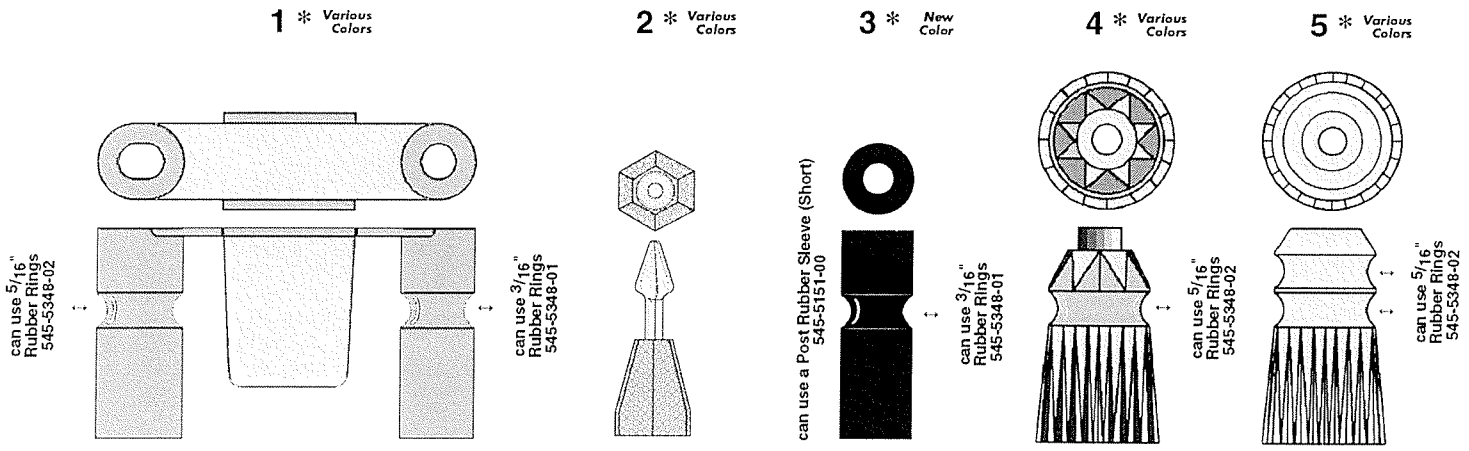
‡ Hex Spacer sizes not used in current games *may* no longer be available; choose 1/8" +/-.

A ***Standard USA 9 Inch Ruler*** is provided on the back cover.

Nº	Metal Spacer Name	QTY.	SPI Part Nº	Nº	Metal Spacer Name	QTY.	SPI Part Nº
1	1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-00	22	2 7/8" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-31
2	3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-12	23	3" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-14
3	1/2" X 1/4" Hex Spacer #6-32 Tap	11	254-5008-03	24	3 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-19
4	5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-02	25	3 1/4" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-26
5	3/4" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-04	26	3 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-27
6	7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-05	27	3 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-25
7	1" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-06	28	4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-21
8	1 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-17	29	4 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-30
9	1 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-11	30	4 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-29
10 ‡	1 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-33	31	3/8" X 1/2" Spacer (Used with Backbox)	6	530-5099-00
11	1 1/2" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-09	32	1/4" X 5/16" X .144" I.D. Spacer Tap.	5	254-5014-03
12 ‡	1 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-13	33	1/2" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-00
13	1 3/4" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-10	34	9/16" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-04
14 ‡	1 7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-20	35	3/4" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-01
15	2" X 1/4" Hex Spacer #6-32 Tap	4	254-5008-07	36	1 1/8" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-02
16	2 1/8" X 1/4" Hex Spacer #6-32 Tap	5	254-5008-32	37	1" X 5/16" X .144" I.D. Spacer Tap.	0	254-5001-00
17	2 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-18	38	4" X 5/16" Hex Spacer #6-32 Tap	2	254-5018-03
18	2 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-28	39	4 5/16" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-00
19	2 1/2" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-16	40	4.92" X 5/16" Hex Spacer #6-32 Tap	2	254-5018-04
20 ‡	2 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-08	41 *	6" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-02
21	2 3/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-15				

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Plastic Posts and Spacers (Actual Size) †



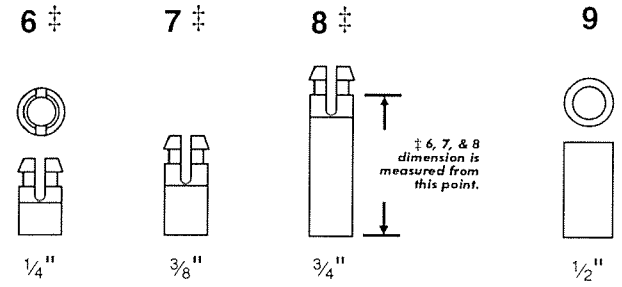
Items 3-5 Posts used in pairs can use ¾" through 3" Rubber Rings
(See Rubber Parts for Part Nºs)

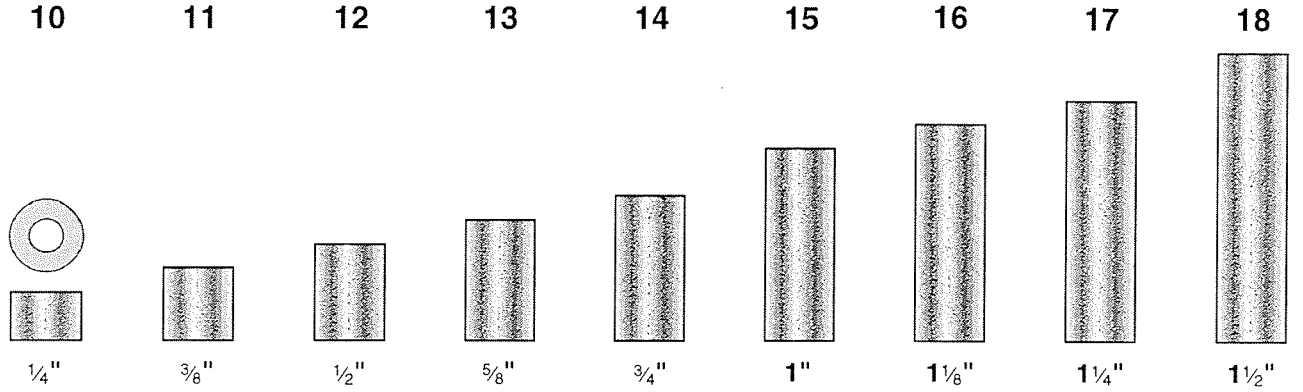
Take Note:

* Items 1-2 and 4-5 come in various colors, see the Plastic Part Color Chart at the end of Section 4, Chapter 2. Replace the last 2-digits (or -XX) with desired color replacement (These posts may not be available in every color.). *Item 3 is currently available in Gold for this game only; normally it is Black.*

‡ Items 6, 7 & 8 (Light Board Spacers) dimensions are measured from bottom to just under cut-away (see pictorial to the right).

—Items 10-18 Spacers are used in conjuntion with Metal Posts (see Items 6, 7A & 7B on that page) and/or a #6-32 1¾" PPH Screw (237-5511-00) with a #6-32 Nylon Stop Nut (240-5005-00). These items are only available in the sizes specified / shown.



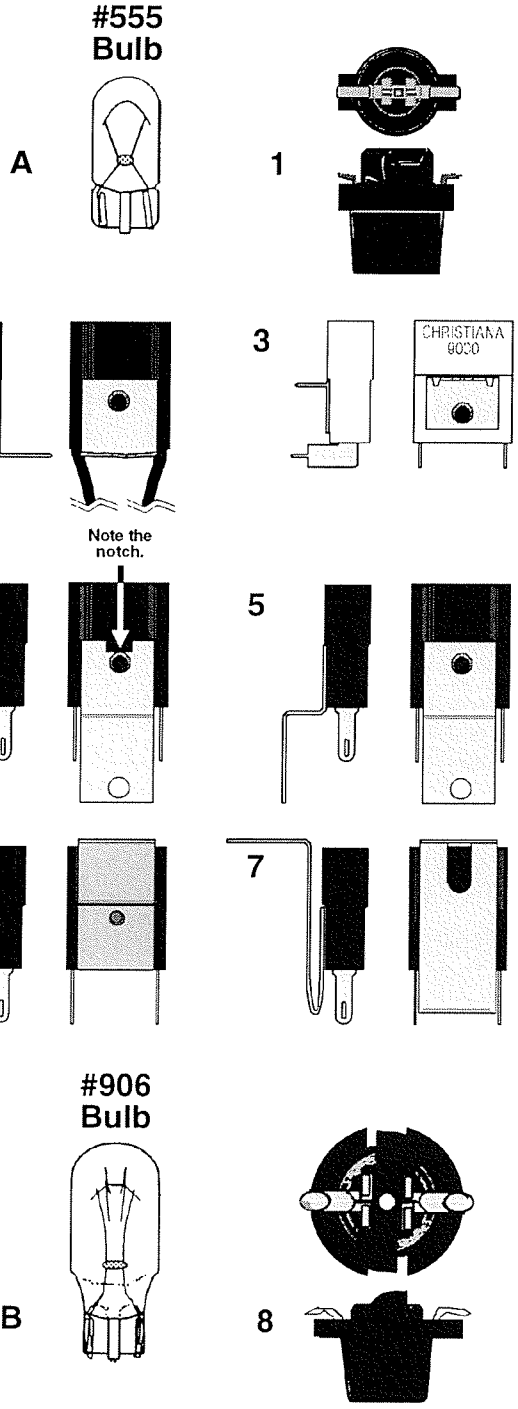


Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº	Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº
1 *	Top Lane Mini-Light Hood	0	550-5061-XX	10	¼" X ⅜" Spacer Gray	0	254-5000-02
2 *	Mini-Jewel Post	0	550-5052-XX	11	⅜" X ⅜" Spacer Gray	1	254-5000-12
3 *	1 1/16" *Single* Groove Post (Gold)	51	550-5059-16	12	½" X ⅜" Spacer Gray	0	254-5000-01
4 *	*Single* Groove Jewel Post	0	550-5034-XX	13	⅝" X ⅜" Spacer Gray	0	254-5000-14
5 *	*Double* Groove Jewel Post	0	545-5209-XX	14	¾" X ⅜" Spacer Gray	2	254-5000-07
6 ‡	¼" Slf. Rtn. Spacer White	0	254-5007-02	15	1" X ⅜" Spacer Gray	0	254-5000-04
7 ‡	⅜" Slf. Rtn. Spacer White	19	254-5007-01	16	1⅛" X ⅜" Spacer Gray	0	254-5000-06
8 ‡	¾" Slf. Rtn. Spacer White	0	254-5007-03	17	1¼" X ⅜" Spacer Gray	0	254-5000-05
9	½" X ¼" Spacer White (Narrow)	0	254-5000-03	18	1½" X ⅜" Spacer Gray	0	254-5000-08

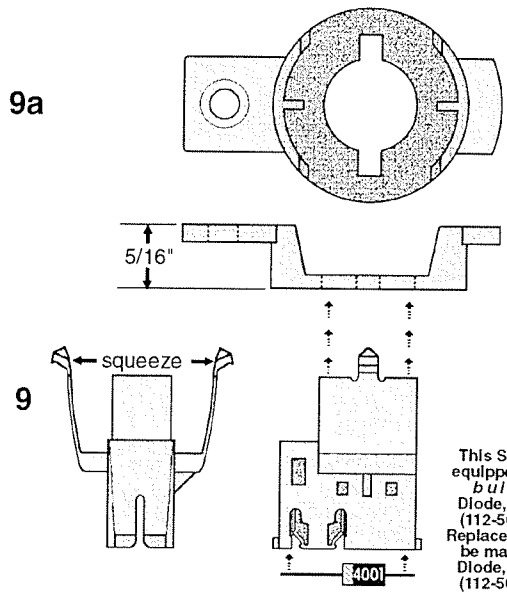
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Wedge Base Bulbs and Sockets (Actual Size) †

#555 Bulb



The below Snap-On Socket Bracket currently is available in two height sizes (Item 9a is 5/16" High and Item 9b is 19/32" High.)



This Socket is equipped with a *built-in* Diode, 1N4003 (112-5013-00). Replacement can be made with Diode, 1N4001 (112-5003-00).

Take Special Note:

Item 9 Socket is the new Insulation Displacement Connection (IDC) Style. This new design is used in the same application as PC Light Boards, allowing for easier bulb replacement. This style is solderless, and has a built-in diode. This socket is secured to the playfield or component by Items 9a & 9b Snap-On Socket Brackets, or may also be snapped into Item 9c Socket Mounting Boards (specially designed plastic sheets) where sockets are positioned too close together. Just squeeze the "side arms" of the socket together and pull away from the bracket or mounting board for easy #555 Bulb replacement.

№	#555 Bulb & Socket Name	QTY.	Part №
A	#555 Wedge Base Bulb	64	165-5002-00
1	#555 Wedge Base (WB) Socket	0	077-5007-00
2	Turbo Pop Bumper Socket	4	077-5206-00
3	PC Light Board Laydown WB Socket	0	077-5207-00
4	Laydown WB Socket (with notch)	9	077-5026-01
5	Laydown WB Socket (without notch)	0	077-5026-00
6	WB Offset Socket (Step-Bracket)	0	077-5029-00
7	WB Offset Socket (use Item 6)	0	077-5029-01

№	#906 Bulb & Socket Name	QTY.	Part №
B	#906 Wedge Base Bulb	0	165-5004-00
8	#906 Wedge Base Socket	0	077-5016-00

№	#555 IDC Socket Name	QTY.	Part №
9	#555 *New* IDC Snap-On Socket	51	077-5216-00
9a	5/16" Ht. Snap-On Socket Bracket	22	545-5760-18
9b *	19/32" Ht. Snap-On Socket Bracket	0	545-5760-19
9c *	#555 IDC Socket Mounting Boards (4 Boards: 00, 01, 02, 03)	1	830-5703-00, -01, -02 & -03

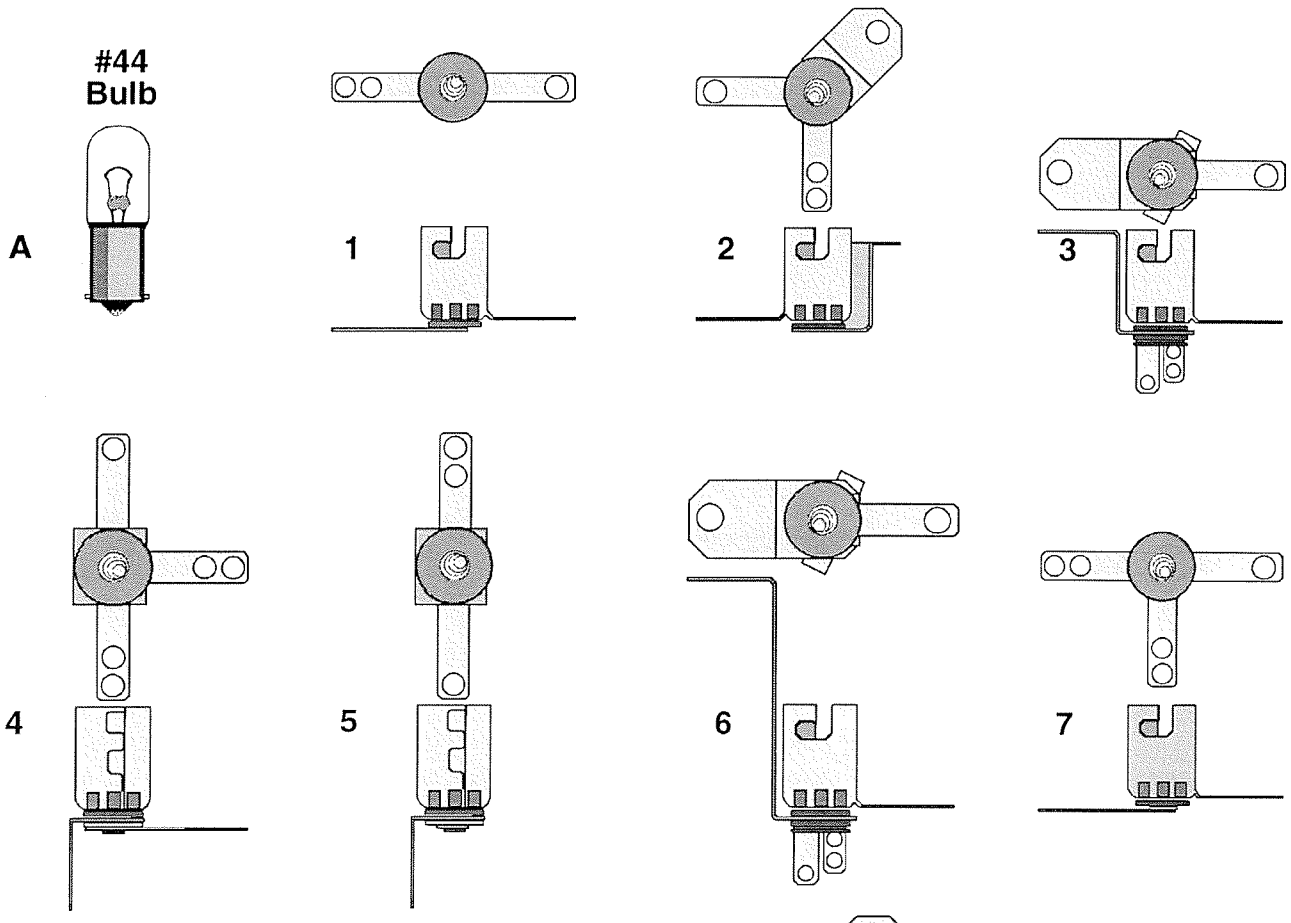
Take Note:

* An asterisk (*) indicates items are not shown on this page.

1. Item 1 Socket was used on PC Light Boards to position bulbs vertically.
2. Item 2 Socket has 2 Wires attached are approximately 12" ea.
3. Item 3 Socket was used on PC Light Boards to position bulbs horizontally.
4. Item 4 Socket is normally used with Reflectors.
5. If Item 7 Socket is desired, order Item 6 for replacement. >>>Item 7 Socket is no longer available.<<<
6. Item B Bulb (#906) is normally used in conjunction with Item 8 Socket, but ***can*** be used with Items 1-7 Sockets on this page.
   Note: Always replace with same type bulb in original application.
7. Item 8 Socket is sometimes used in conjunction with Mini-Mars or special Butyrate assemblies.
8. See the start of this chapter for Fluor. Bulb & associated parts. See the end of this chapter for misc. bulbs & parts.

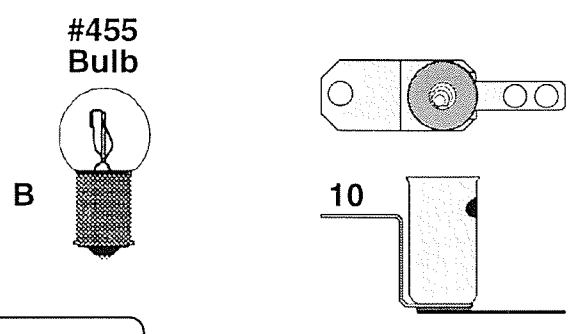
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Small Bayonet Type Bulbs and Sockets (Actual Size) †



№	#44 Bulb & Socket Name	QTY.	SPI Part №
A	#44 Bulb	36	165-5000-44
1	2-Lug Staple Down Socket	29	077-5000-00
2	2-Lug Stand-Up Short Socket	2	077-5002-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00
4	3-Lug Laydown Socket	3	077-5006-00
5	2-Lug Laydown Socket	0	077-5003-00
6	3-Lug Stand-Up Long Socket	2	077-5009-00
7	3-Lug Staple Down Socket	0	077-5001-00
8	2-Lug Stand-Up Long Socket	0	077-5005-00
9	3-Lug Stand-Up Long Shell Socket	0	077-5013-00

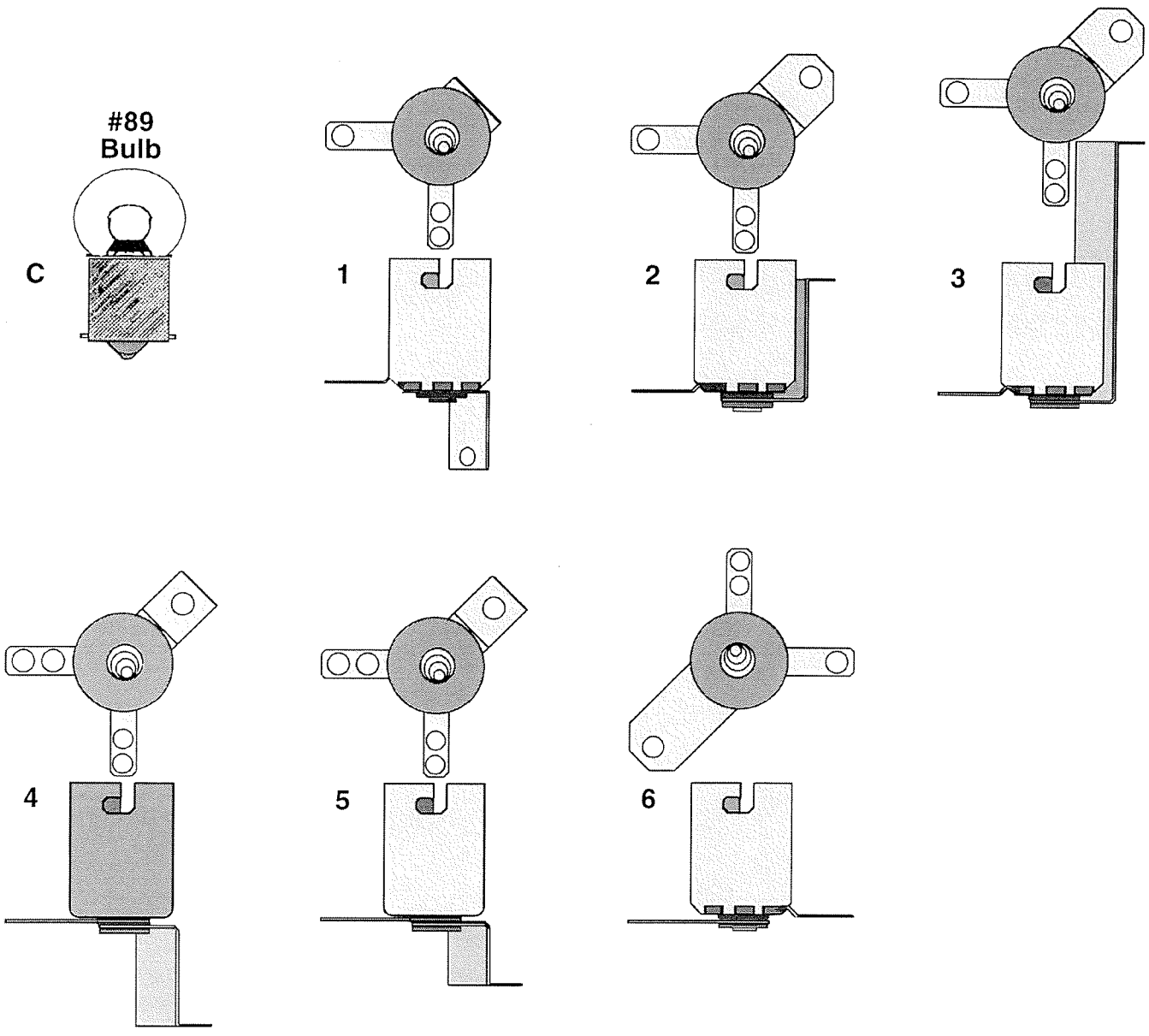
№	#455 Bulb & Socket Name	QTY.	SPI Part №
B	#455 Twinkle Bulb	0	165-5003-00
10	1-Lug Stand-Up Long Shell Socket	0	077-5012-00



Take Note:

Item B Bulb (#455) is normally used in conjunction with Item 10 Socket, but ***can*** be used with Items 1-9 Sockets on this page.
Note: Always replace with same type bulb in original application.

Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) †



† Items with Ø Qty. are not used in this game.
Size and/or quantities may change during production.

Nº	#89 Bulb & Socket Name	QTY.	SPI Part Nº
C	#89 Bulb	13	165-5000-89
1	Laydown Standard Socket	1	077-5100-00
2	2-Lug Stand-Up Short Socket	0	077-5101-00
3	2-Lug Stand-Up Long Socket	12	077-5102-00
4	Stand-Up Socket Rev. Short	0	077-5103-00
5	2-Lug Stand-Up Small Socket	0	077-5106-00
6	Straight Leg Socket	0	077-5107-00

Playfield - Miscellaneous Bulbs (Actual Size) †

Nº	Miscellaneous Bulb Name	QTY.	SPI Part Nº
1	Neon NE-2 Bulb (used with Motors)	1	165-5021-00
Note:	The above Item 1 is used on the X-Wing Drive Assembly, 500-6175-00-56.		
2	LED (MT5000UR) Ultra Bright OPTO	2	165-5100-00
Note:	The above Item 2 is used on the below Item E (1 per).		
3 *	LED (SSB-LX02SRC) (Sm. Rect. RED)	8	165-5102-00
Note:	The above Item 3 is used on the below Item G (4 per).		
4 *	LED (SSL-LX100133GD) (Lg. Round GRN)	2	165-5101-00
Note:	The above Item 4 is used on the below Item H (1 per).		

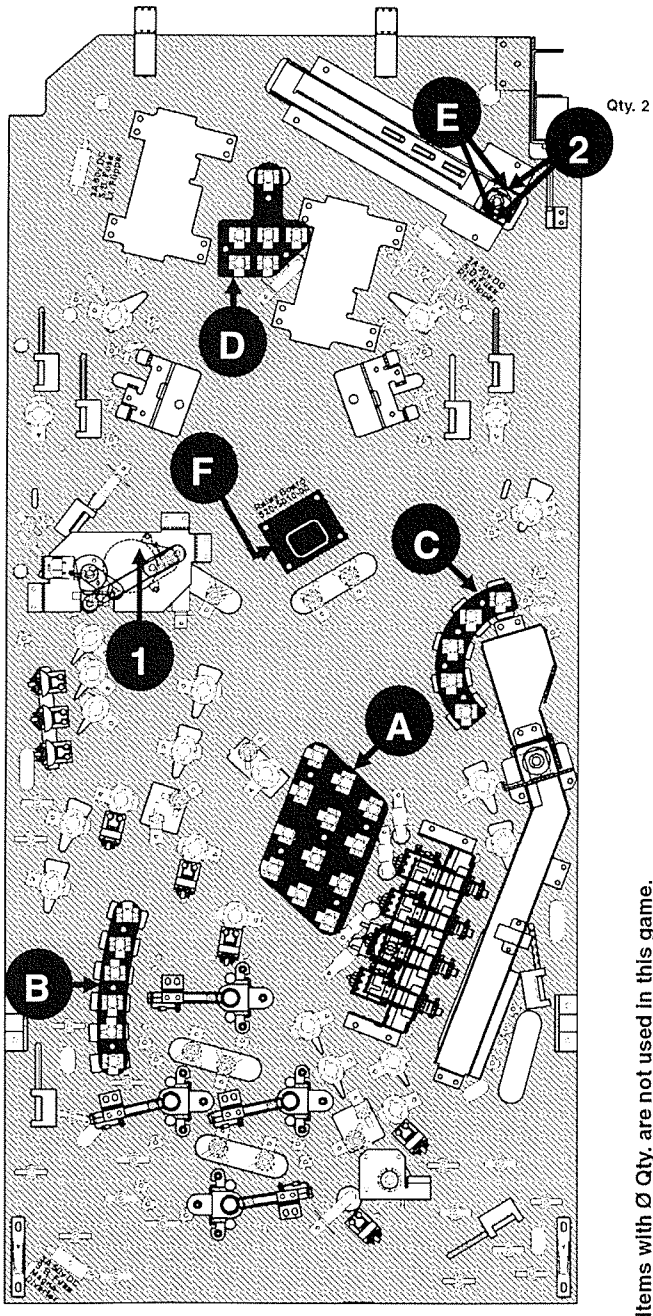
1 NEON BULB

This Neon Bulb is used with Motors for voltage spike suppression.

2 OPTO LED

This OPTO LED (Ultra Bright Red) is normally used on OPTO Boards.

Nº	Miscellaneous Board Name	QTY.	SPI Part Nº
A	...Star Wars... Light Board Assembly #0		515-6671-00-56
ORDERING ABOVE (ITEM M1) SUB-ASSY PART Nº WILL INCLUDE:			
—	**Socket Mounting Board #0**	1	**830-5703-00**
*—	*New* #555 IDC Snap-On Socket	12	077-5216-00
*—	#555 Wedge Base Bulb	12	165-5002-00
*—	Spacer 3/8" Plastic Slf. Rtn.	5	254-5007-01
B	...Star Wars... Light Board Assembly #1		515-6671-01-56
ORDERING ABOVE (ITEM M2) SUB-ASSY PART Nº WILL INCLUDE:			
—	**Socket Mounting Board #1**	1	**830-5703-01**
*—	*New* #555 IDC Snap-On Socket	6	077-5216-00
*—	#555 Wedge Base Bulb	6	165-5002-00
*—	Spacer 3/8" Plastic Slf. Rtn.	3	254-5007-01
C	...Star Wars... Light Board Assembly #2		515-6671-02-56
ORDERING ABOVE (ITEM M3) SUB-ASSY PART Nº WILL INCLUDE:			
—	**Socket Mounting Board #2**	1	**830-5703-02**
*—	*New* #555 IDC Snap-On Socket	5	077-5216-00
*—	#555 Wedge Base Bulb	5	165-5002-00
*—	Spacer 3/8" Plastic Slf. Rtn.	4	254-5007-01
D	...Star Wars... Light Board Assembly #3		515-6671-03-56
ORDERING ABOVE (ITEM M4) SUB-ASSY PART Nº WILL INCLUDE:			
—	**Socket Mounting Board #3**	1	**830-5703-03**
*—	*New* #555 IDC Snap-On Socket	6	077-5216-00
*—	#555 Wedge Base Bulb	6	165-5002-00
*—	Spacer 3/8" Plastic Slf. Rtn.	3	254-5007-01
n/a *	#6 X 7/8" HWH AB Zinc	15	234-5003-01
Note:	*Above item secures the Light Bd. Assemblies to the playfield.*		
E	OPTO Transmitter (TRANS) Board	1	520-5124-00
	OPTO Receiver (REC) Board	1	520-5125-00
Note:	The above Item E is found on the 4-Ball Trough Assembly, 500-6119-14.		
F	Relay Board Assy.	1	520-5010-00
Note:	The above Item H is used for operation of the X-Wing Drive Assembly, 500-6175-00-56.		
G *	Han Solo PCB (4 Flat LEDs)	2	520-5157-00
Note:	The above Item F is found on the Han Solo Assembly, 500-6191-00-56.		
H *	Cannon PCB (1 Round LED)	2	520-5158-00
Note:	The above Item G is found on the Gun Barrel Sub-Assy., 515-6683-00-56 of the Magna Diverter Assy., 500-6176-00-56.		



Take Note:

* An asterisk (*) indicates items are not shown on this page.

1. See start of this chapter, Backbox - General Parts for Fluorescent Tube associated parts (e.g. starter, ballast & cable).
2. Individual parts included on above Light Board Assemblies may be ordered separately. To order the complete #555 IDC Socket Mounting Board Sheet (with no parts attached) use the Part Nº: 830-5703-XX.
3. See Section 4, Chapter 2, Drawings for Major Assemblies & & Ramps, for assemblies referenced on this page.

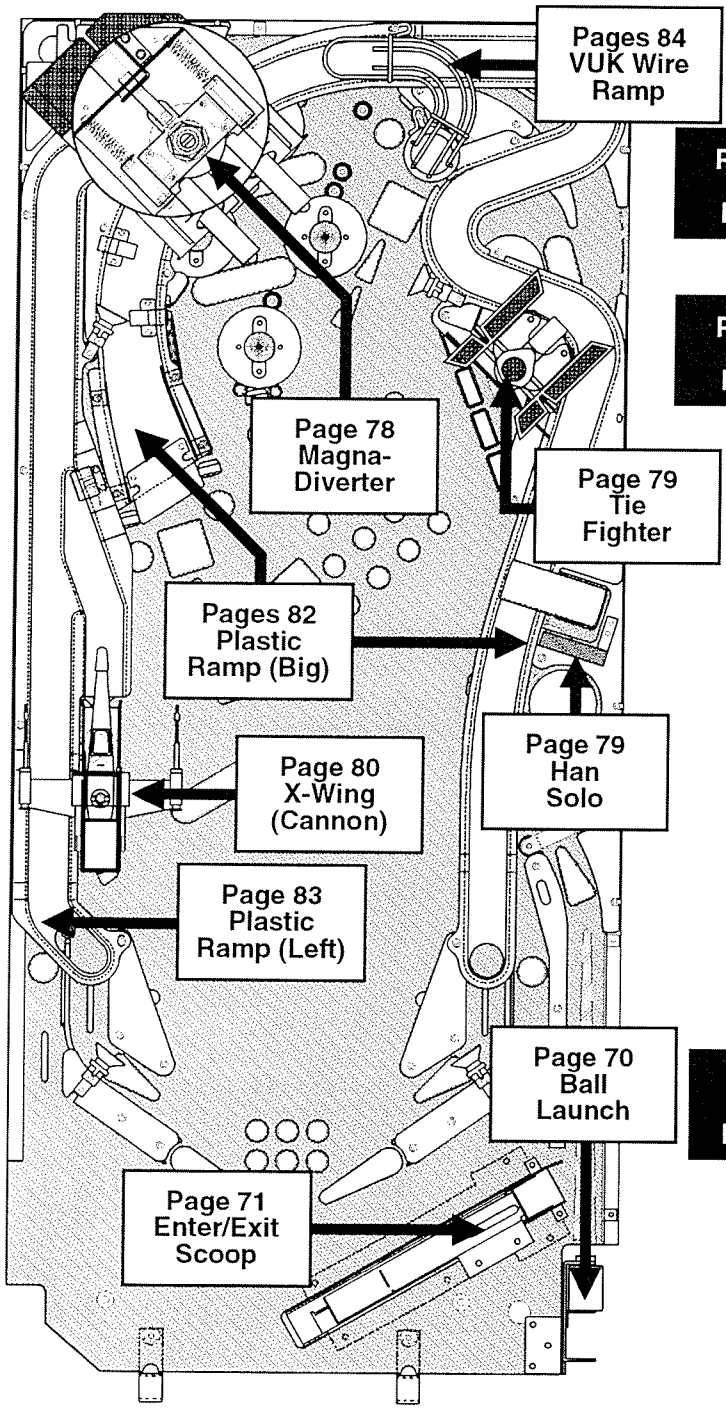
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Drawings for Major Assemblies & Ramps (The Blue Pages)

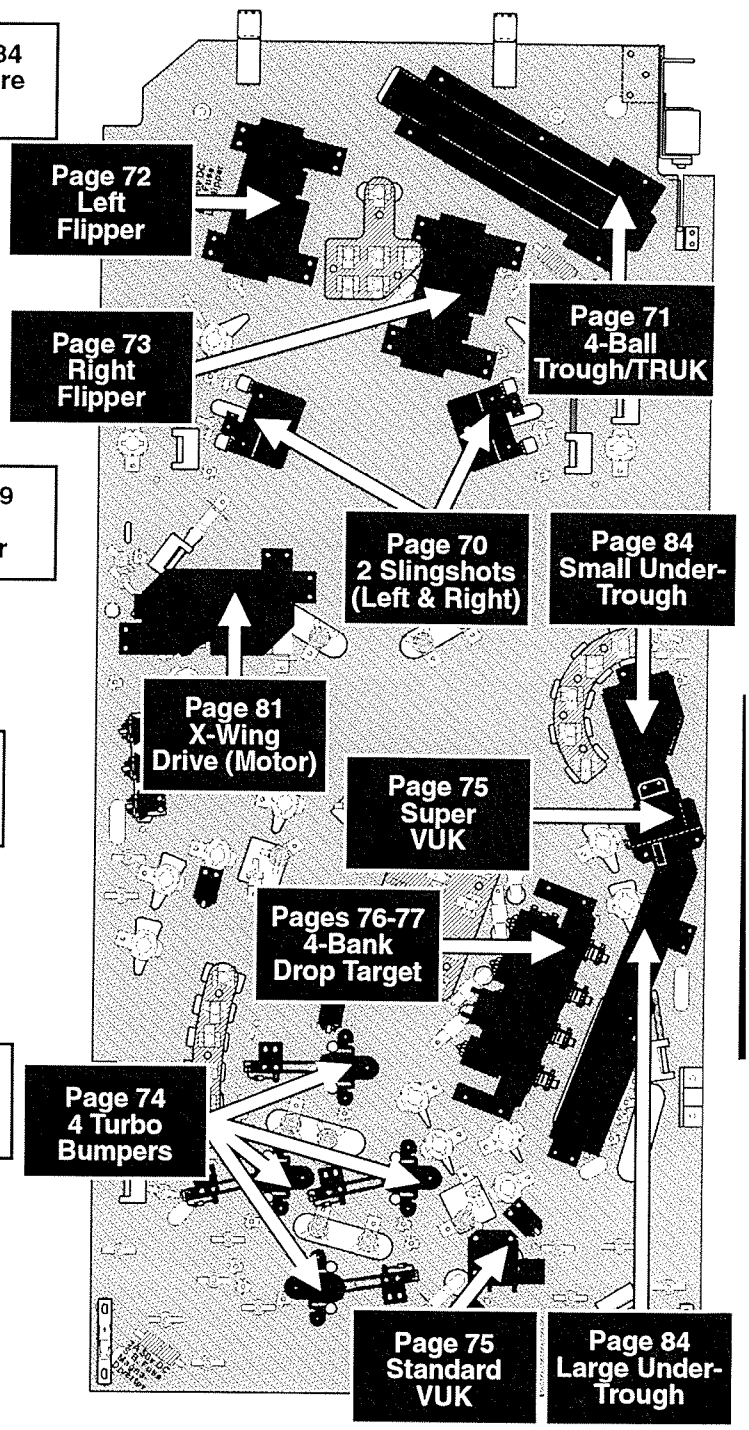
Overview

Drawings are provided for the Major Assemblies in this game with individual parts of each assembly numbered (items noted with a white circle (①) are mounted above the playfield; items noted with a black circle (❶) are mounted below.) All numbered parts describe the name, quantity and Part Nº. Where multiple parts are riveted &/or assembled as sub-assemblies, the sub-assembly needs to be ordered. Minor changes may be made during production. Always verify the part to be replaced with the Part Nº and/or description as noted. Replacement parts may be substituted with revised parts which may have a different Part Nº. View any special notes on each page of this chapter. For General Part Nºs or items not described in this chapter, see the Pink Pages: Chapter 1, of this section. Call our Technical Support Office at 800-542-5377 in USA/Canada or at 708-345-7700 with any questions.

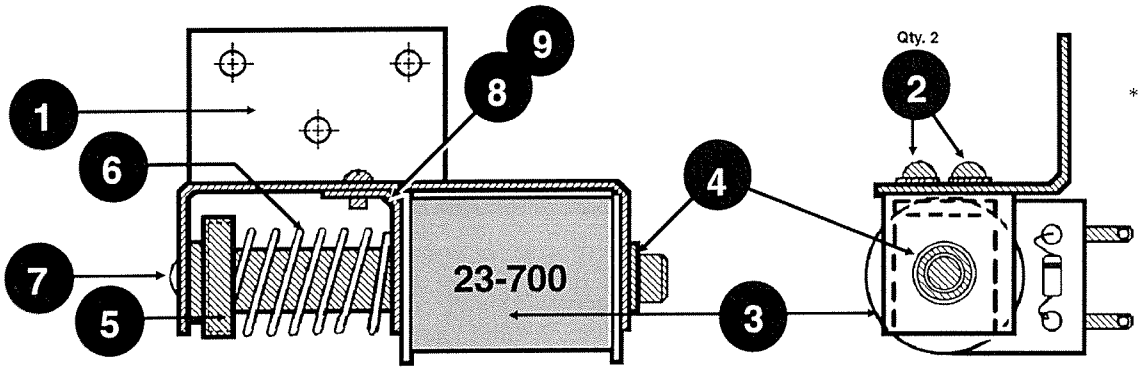
Assemblies Mounted Above



Assemblies Mounted Below



Ball Launch Assembly, 500-5477-05 (Items 1-10)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

№	Individual Part Name	QTY.	SPI Part №
1	Coil Mounting Bracket	1	535-6385-00
2	#8-32 X 1/4" PPH MS (SEMS)	2	232-5300-00
3	Coil, 23-700	1	090-5022-00T
ORDERING ABOVE (ITEM 3) COIL PART № WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5076-00
5	Plunger Assembly	1	515-5000-02
6	Compression (Relay) Spring	1	266-5020-00
7	Rubber Bumper (Grommet)	1	545-5015-00
8	Coil Retaining Bracket	1	535-5203-03
9	Spring Washer	1	266-5002-00
10 *	Cable Wiring Harness	1	036-5390-16-56

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

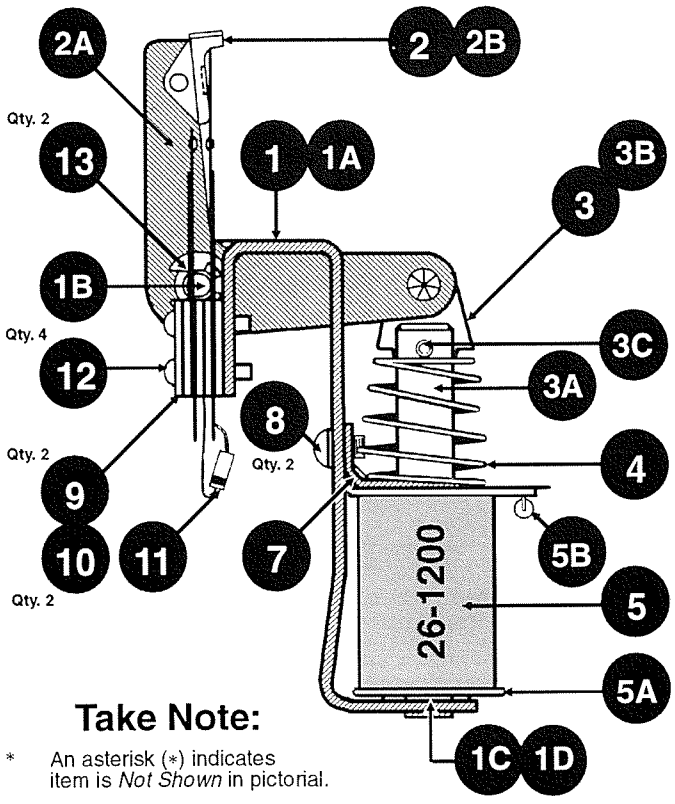
№	Associated Part Name	QTY.	SPI Part №
n/a *	#8 X 5/8" HWH SWAGE (Serr) Zinc	3	237-5975-03
Note:	*Above item secures this Ball Launch to the playfield.*		
n/a *	Shooter Lane Micro-Switch Assembly	1	500-5498-01

Slingshot Assembly, 500-5849-01 (Qty. 2) (Items 1-13)

№	Individual Part Name	QTY.	SPI Part №
1	Slingshot Bracket Assembly	1	515-5339-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART № WILL INCLUDE:			
1A	Slingshot Bracket	1	535-5919-01
1B	Hinge Stud	1	530-5034-01
1C	Armature Stop	1	530-5017-01
1D	Shading Ring	1	530-5307-00
2	Arm & Tip Assembly	1	515-5340-01
ORDERING ABOVE (ITEM 2) SUB-ASSY. PART № WILL INCLUDE:			
2A	Arm	1	515-5341-01
2B	Kicker Tip	1	545-5216-01
2C	Rivet 1/8" ø x 1/4" Lg.	1	249-5003-00
3	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 3) SUB-ASSY. PART № WILL INCLUDE:			
3A	Plunger 2" Lg.	1	530-5025-01
3B	Plunger Link	1	545-5293-00
3C	Roll Pin 1/8" ø x 5/8" Lg.	1	251-5008-00
4	Compression Spring	1	266-5020-00
5	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 5) COIL PART № WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
6	Coil Sleeve	1	545-5031-00
7	Coil Retaining Bracket	1	535-5203-03
8	#8-32 X 1/4" PPH MS (SEMS)	2	232-5300-00
9	Slingshot Switch	2	180-5054-00
10	Switch Plate	2	535-5045-00
11	Switch Diode, 1N4001	2	112-5001-00
12	#6-32 X 5/8" HWH SWAGE	4	237-5976-04
13	Retaining Ring 1/4" ø	2	270-5002-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

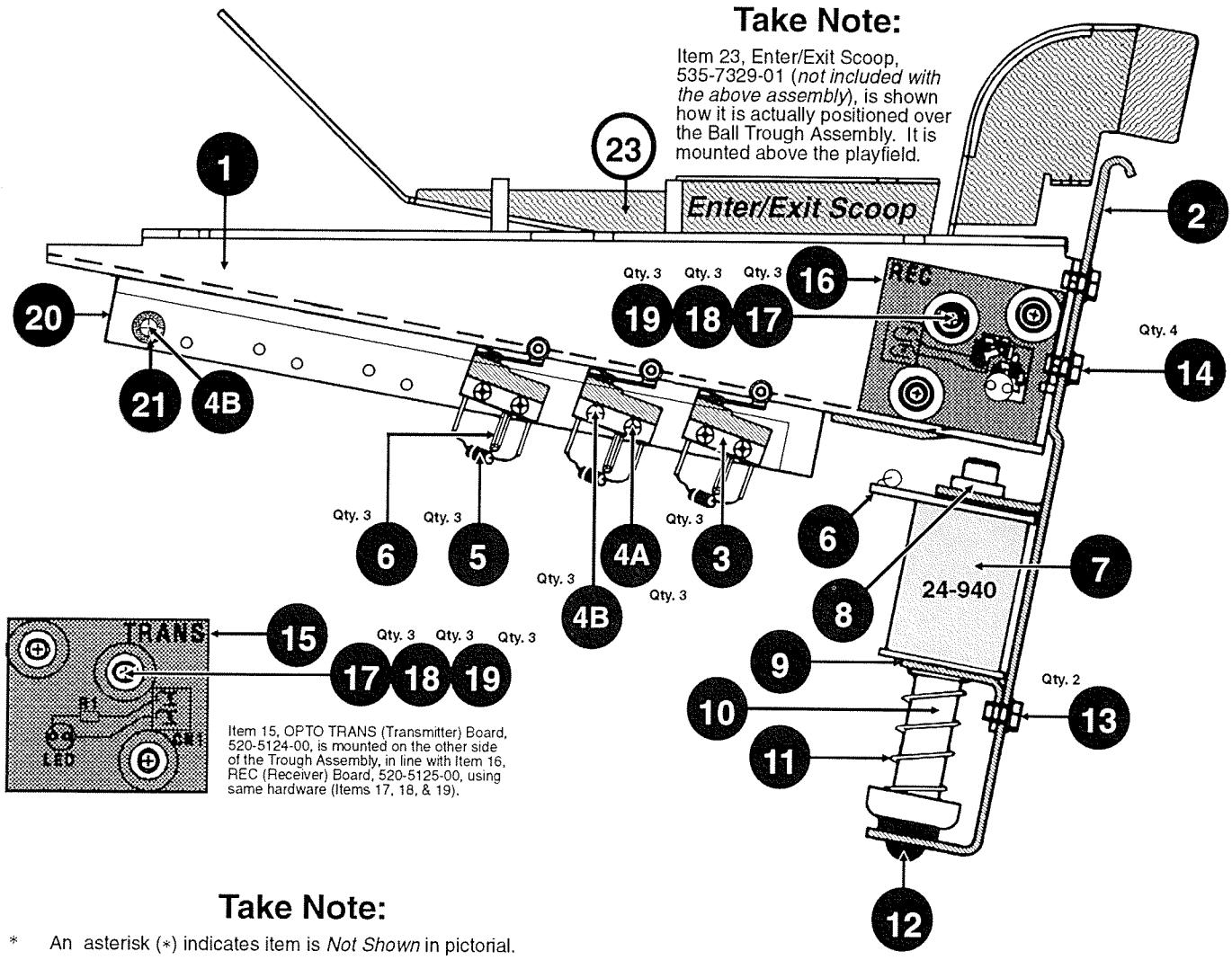
№	Associated Part Name	QTY.	SPI Part №
n/a *	2-1/2" I.D. Black Rubber Ring (1 per)	2	545-5348-09
n/a *	#8 X 1/2" HWH AB (Blue) (3 per)	6	234-5101-05
Note:	*Above item secures both Slingshots to the playfield.*		



Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

4-Ball Trough (OPTO) Assembly, 500-6119-14 (Items 1-22) and Ball Trough Enter/Exit Scoop, 535-7329-01 (Item 23)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

1. *The Lock Ball Assembly is no longer required.* Ball Position (1) is determined by the OPTO Switch; therefore, a 4-Ball Trough, requires only 3 Submini-Switch Roller Actuators.

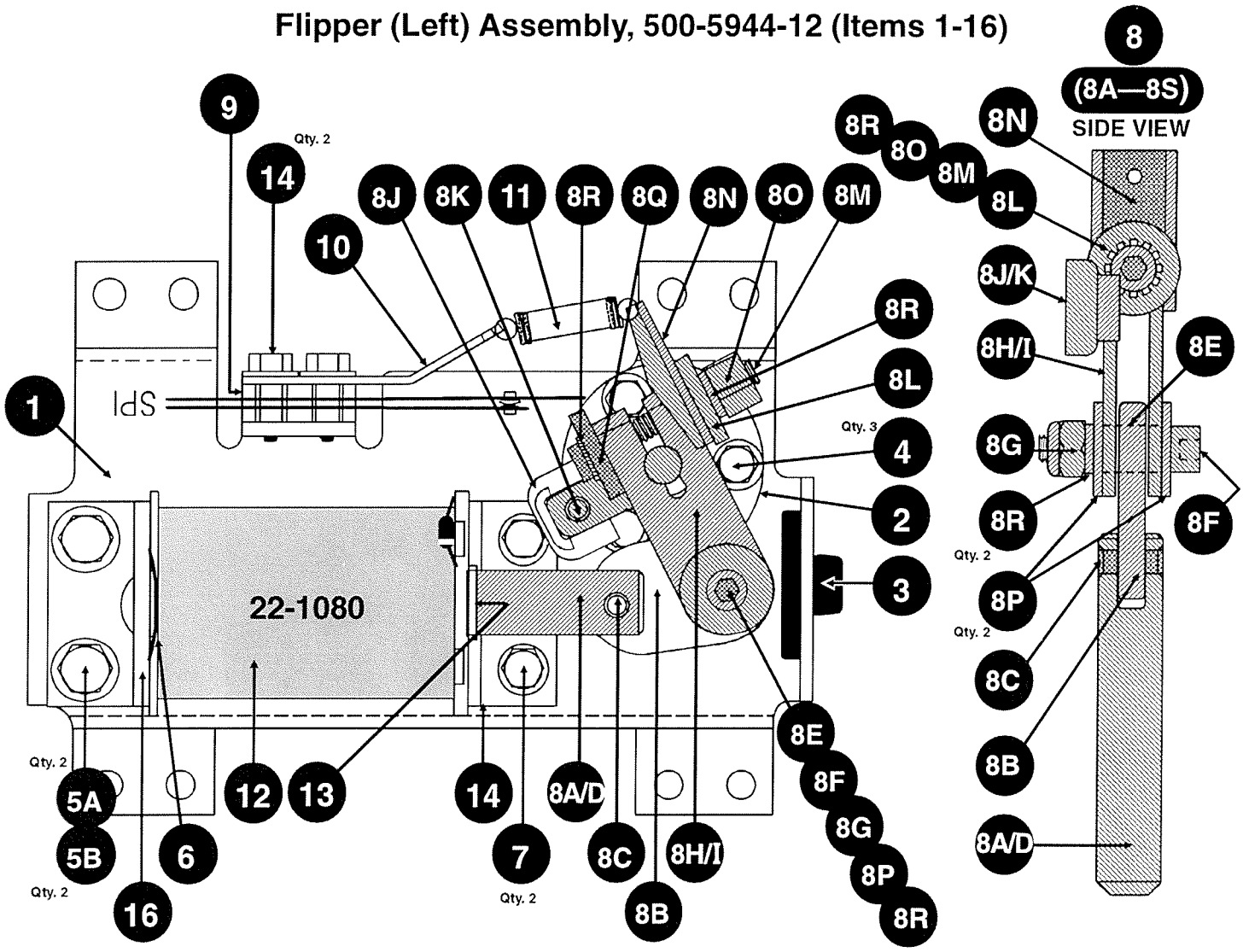
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Ball Trough Outhole Mounting Bracket	1	515-6580-00
2	Coil Mounting Bracket	1	535-7330-01
3	Submini-Switch Roller Actuator	3	180-5119-00
4A	#2-56 X 3/8" HWH SER TF	3	237-5938-00
4B	#2-56 X 1/2" HWH SER TF	4	237-5937-00
5	Switch Diode, IN4001	3	112-5001-00
6	Insulation Tubing 3/4" length	4	605-5006-00
7	Coil, 24-940	1	090-5036-00B
ORDERING ABOVE (ITEM 7) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
8	Coil Sleeve	1	545-5076-00
9	Coil Retaining Bracket	1	535-5203-03
10	Plunger Assembly	1	515-5941-01
11	Compression Spring	1	266-5020-00
12	Rubber Bumper (Grommet)	1	545-5105-00
13	#8-32 X 1/4" HWH SER TF	2	237-5964-00

Nº	Individual Part Name	QTY.	SPI Part Nº
14	#8-32 X 3/8" HWH SWAGE	4	237-5975-00
15	OPTO Transmitter (TRANS) Board	1	520-5124-00
16	OPTO Receiver (REC) Board	1	520-5125-00
17	OPTO PCB Tube Spacer	6	530-5308-02
18	OPTO PCB Rubber Grommet	6	545-5518-00
19	#6-32 X 5/8" HWH SWAGE	6	237-5976-04
20	Trough Ball Guide Plate	1	535-7801-00
21	1/4" X 5/16" X .144" I.D. Spacer Tap.	1	254-5014-03
22 *	Cable Wiring Harness	1	036-5399-04

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
23	Ball Trough Enter / Exit Scoop	1	535-7329-01
n/a *	#8 X 1/2" HWH AB (Blue)	9	234-5101-05
Note:	*Above item secures this 4-Ball Trough & Scoop to the playfield.*		
n/a *	1-1/16" Steel Balls	4	260-5000-00

Flipper (Left) Assembly, 500-5944-12 (Items 1-16)



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Flipper Base Plate Kit (Left)	1	515-6617-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:			
—	Flipper Base Plate (Left) already threaded with all necessary Thread Forming Screws (Items 4, 5A, 7 & 15)		
2	Flipper Bushing	1	545-5594-00
3	Deflector Pad (Bumper)	1	545-5428-00
4	#6-32 X .38" HWH TF SWAGE	3	237-5976-02
5A	#10-32 X .38" HWH SWAGE	2	237-5985-00
5B	#10 Lock Washer	2	246-5002-00
6	Spring Washer	1	269-5002-00
7	#8-32 X .38 HWH TF SWAGE	2	237-5975-00
8	Plunger, Link & Pawl (Left) Sub-Assy.	1	515-6518-01
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	1	515-6304-01
8B	*Flipper Link*	*1*	*545-5611-00*
8C	*Spirol Pin ø 5/32" X 7/16" Lg.*	*1*	*251-5015-01*
8D	*Flipper Plunger with Flat*	*1*	*530-5349-01*
8E	Extended Flipper Bushing	1	530-5139-01
8F	#10-32 X 7/8" Lg. SOC HD	1	237-5966-00
8G	#10-32 Nylon Stop Nut	1	240-5203-00
8H	Pawl (Mounting Link) (Left) Sub-Assy.	1	515-6305-01
8I	Pawl (Mounting Link) (Left) *Plain*	1	535-7271-01
8J	Switch Actuator	1	545-5612-00
8K	Rivet 1/8" ø X 1/4" Lg.	1	249-5003-00
8L	Washer .105" THK .203" ID X .63" OD	1	242-5039-00
8M	#10-32 SOC HD X 1.25" Lg.	1	237-5950-01
8N	Return Bracket	1	535-7353-00
8O	#10-32 X 9/32" Long 3/8" Hex Nut	1	240-5209-00
8P	Wshr. .06" THK (same ID/OD)	2	242-5038-00
8Q	Washer .105" THK .203" ID X .63" OD	1	242-5039-01
8R	#10 Star Washer	3	246-5002-00

Nº	Individual Part Name	QTY.	SPI Part Nº
9	Power (End of Stroke) Switch	1	180-5149-00
10	Switch Plate/Spring Return Lt. Brkt.	1	535-7354-01
11	Flipper Return Spring	1	265-5035-00
12	Coil, 22-1080 (YEL-GRN)	1	090-5032-00T
ORDERING ABOVE (ITEM 12) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
13	Coil Sleeve	1	545-5388-00
14	Coil Support Bracket	1	535-7356-00
15	#6-32 X 5/8" HWH TF SWAGE	2	237-5976-04
16	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:			
16A	Coil Stop with with .093" ø Hole	1	530-5350-01
16B	Shading Ring	1	530-5123-00
16C	Coil Stop Bracket	1	535-7355-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

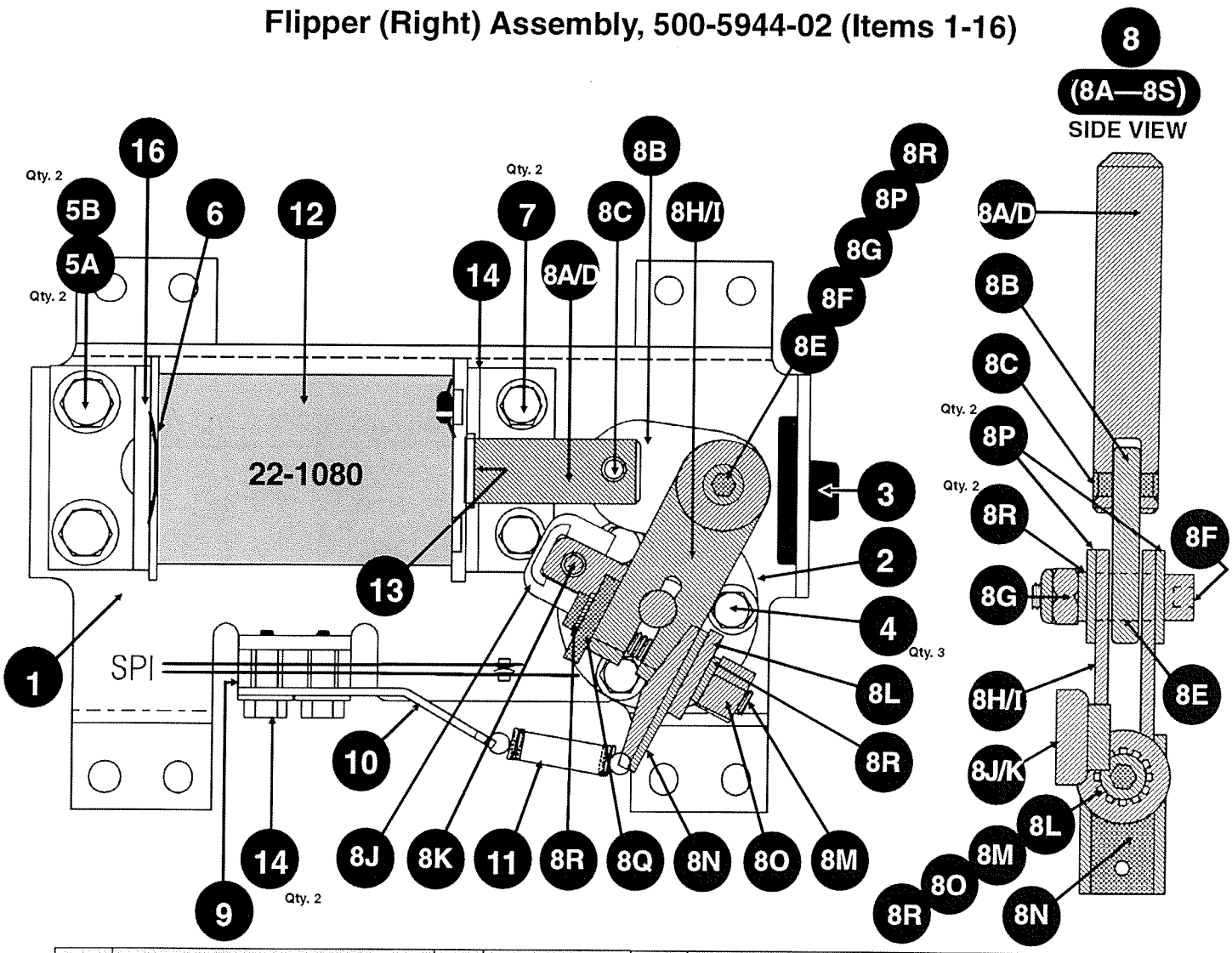
Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	Flipper & Shaft Assy. White with Sega Saturn™ Logo ©1997	1	515-5133-08-05
n/a *	Large Flipper Rubber Ring	1	545-5277-00
n/a *	Left Flipper Decal	1	820-6184-05
n/a *	#10 X 1/2" HWH MS (Serr) Zinc ST	8	237-5949-00
Note: Above item secures this Flipper to the playfield.			

Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

1. ***IMPORTANT:*** When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assy. due to overall wear & tear.
2. ‡‡‡ Check all other components and replace as required. ‡‡‡

Flipper (Right) Assembly, 500-5944-02 (Items 1-16)



№	Individual Part Name	QTY.	SPI Part №
1	Flipper Base Plate Kit (Right)	1	515-6617-00
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART № WILL INCLUDE:			
—	Flipper Base Plate (Right) already threaded with all necessary Thread Forming Screws (Items 4, 5A, 7 & 15)		
2	Flipper Bushing	1	545-5594-00
3	Deflector Pad (Bumper)	1	545-5428-00
4	#6-32 X .38" HWH TF SWAGE	3	237-5976-02
5A	#10-32 X .38" HWH TF SWAGE	2	237-5985-00
5B	#10 Lock Washer	2	246-5002-00
6	Spring Washer	1	269-5002-00
7	#8-32 X .38 HWH TF SWAGE	2	237-5975-00
8	Plunger, Link & Pawl (Rt.) Sub-Assy.	1	515-6518-00
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART № WILL INCLUDE:			
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	1	515-6304-01
8B	*Flipper Link*	*1*	*545-5611-00*
8C	*Spirol Pin ø 5/32" X 7/16" Lg.*	*1*	*251-5015-01*
8D	*Flipper Plunger with Flat*	*1*	*530-5349-01*
8E	Extended Flipper Bushing	1	530-5139-01
8F	#10-32 X 7/8" Lg. SOC HD	1	237-5966-00
8G	#10-32 Nylon Stop Nut	1	240-5203-00
8H	Pawl (Mounting Link) (Rt.) Sub-Assy.	1	515-6305-00
8I	Pawl (Mounting Link) (Right) *Plain*	1	535-7271-00
8J	Switch Actuator	1	545-5612-00
8K	Rivet 1/8" ø X 1/4" Lg.	1	249-5003-00
8L	Washer .105" THK .203" ID X .63" OD	1	242-5039-00
8M	#10-32 SOC HD X 1.25" Lg.	1	237-5950-01
8N	Return Bracket	1	535-7353-00
8O	#10-32 X 9/32" Long 3/8" Hex Nut	1	240-5209-00
8P	Wshr. .06" THK (same ID/OD)	2	242-5038-00
8Q	Washer .105" THK .203" ID X .63" OD	1	242-5039-01
8R	#10 Star Washer	3	246-5002-00

№	Individual Part Name	QTY.	SPI Part №
9	Power (End of Stroke) Switch	1	180-5149-00
10	Switch Plate/Spring Return Rt. Brkt.	1	535-7354-00
11	Flipper Return Spring	1	265-5035-00
12	Coil, 22-1080 (YEL-GRN)	1	090-5032-00T
ORDERING ABOVE (ITEM 12) COIL PART № WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
13	Coil Sleeve	1	545-5388-00
14	Coil Support Bracket	1	535-7356-00
15	#6-32 X 5/8" HWH TF SWAGE	2	237-5976-04
16	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 16) SUB-ASSY. PART № WILL INCLUDE:			
—	Coil Stop with with .093" ø Hole	1	530-5350-01
—	Shading Ring	1	530-5123-00
—	Coil Stop Bracket	1	535-7355-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

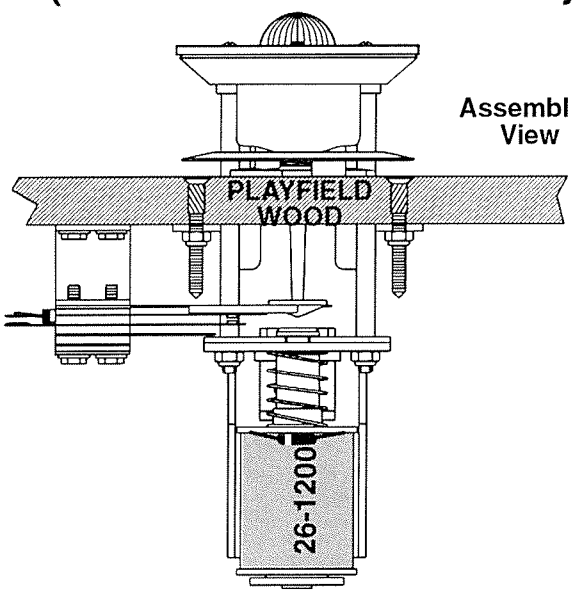
№	Associated Part Name	QTY.	SPI Part №
n/a *	Flipper & Shaft Assy. White with Sega Satum™ Logo ©1997	1	515-5133-08-05
n/a *	Large Flipper Rubber Ring	1	545-5277-00
n/a *	Right Flipper Decal	1	820-6184-04
n/a *	#10 X 1/2" HWH MS (Serr) Zinc ST	8	237-5949-00
Note: Above item secures this Flipper to the playfield.			

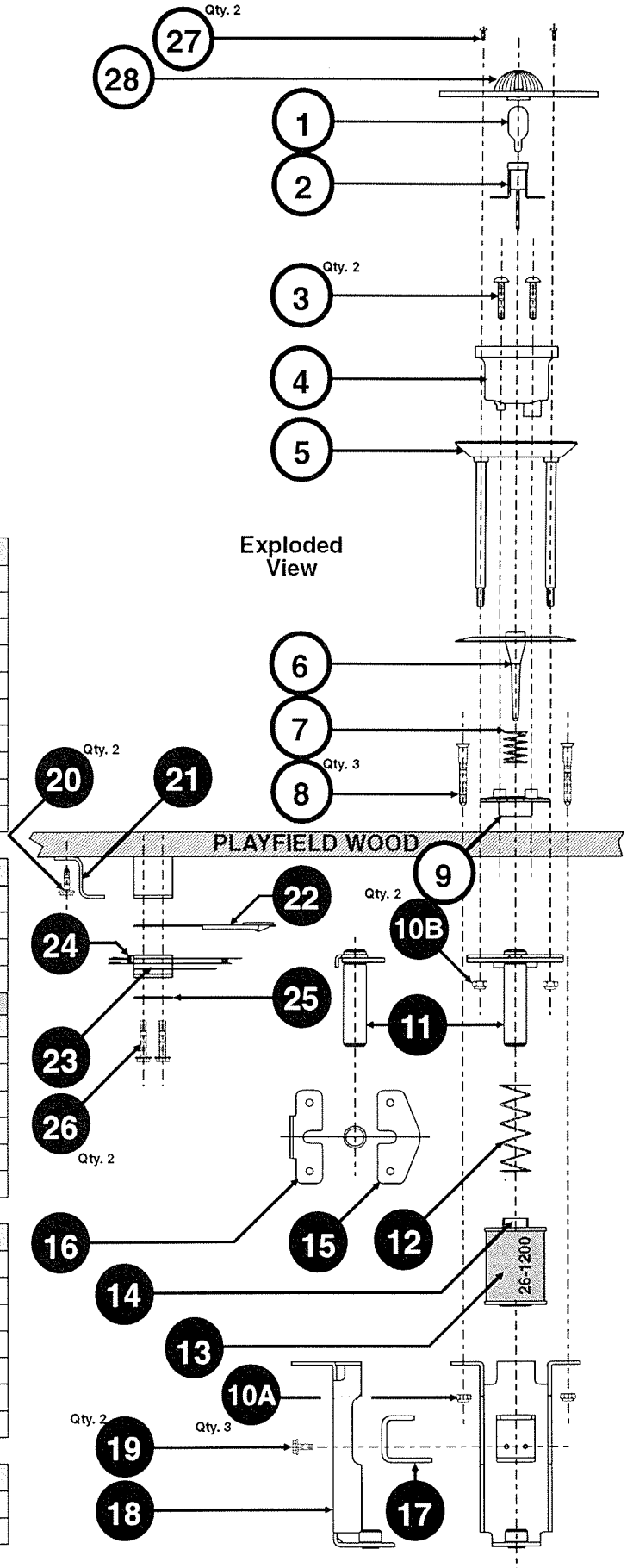
Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

1. ***IMPORTANT:*** When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assembly due to overall wear & tear.
2. ‡‡‡ Check all other components and replace as required. ‡‡‡

Turbo Bumper Individual Parts (Qty. 4) (Items 1-28)
(Not available as an assembly. Parts are grouped for easy reference.)





TOP GROUP

Nº	Individual Part Name	QTY.	SPI Part Nº
1	#555 Wedge Base Bulb	1	165-5002-00
2	#555 Wedge Base Socket	1	077-5206-00
3	#5 X 7/8" PH RH (AB)	2	237-5826-00
4	Bumper Body	1	545-5197-00
5	Ring Assembly	1	515-5085-00
6	Bumper Skirt	1	545-5607-00
7	Bumper Skirt Spring	1	266-5048-00
8	#6-32 X 1-3/16" Spiral Shank	3	237-5957-00
9	Bumper Base	1	545-5195-00
10A	#6-32 Nylon Stop Nut	3	240-5005-00

BOTTOM GROUP

Nº	Individual Part Name	QTY.	SPI Part Nº
10B	#6-32 Nylon Stop Nut	2	240-5005-00
11	Plunger	1	530-5348-00
12	Coil Spring	1	266-5047-00
13	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 13) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
14	Coil Sleeve	1	545-5031-00
15	Fiber Yoke	1	545-5609-00
16	Metal Yoke	1	535-7346-00
17	Metal Yoke Stop	1	535-7347-00
18	Coil Bracket Welded Assembly	1	515-5939-00
19	#6-32 X 1/4" HWHTF SWAGE	2	237-5976-01

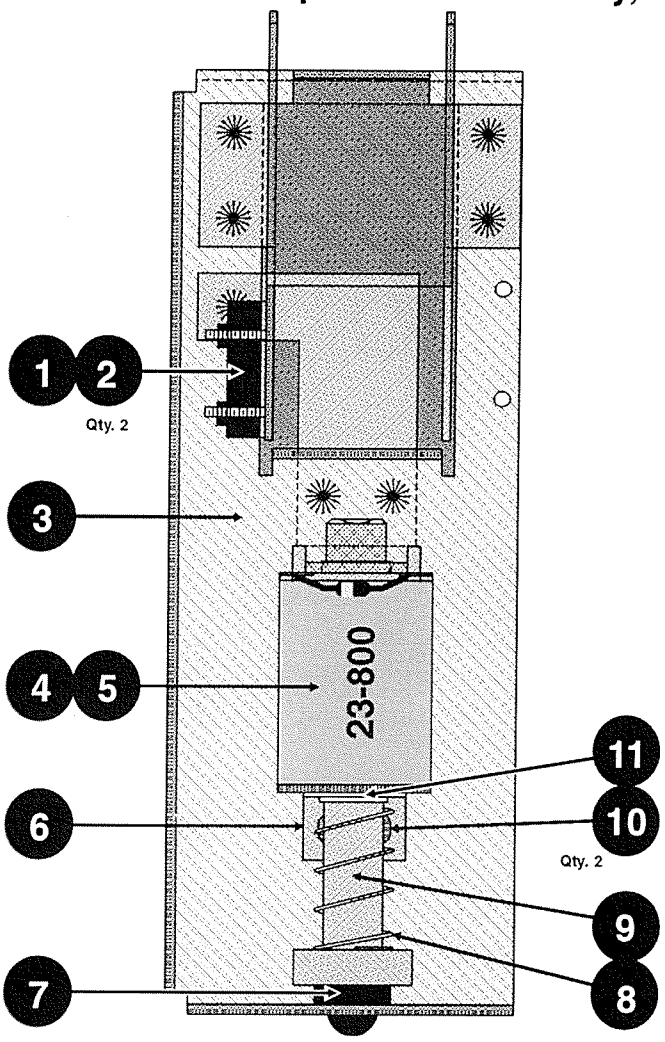
SWITCH GROUP

Nº	Individual Part Name	QTY.	SPI Part Nº
20	#6 X 1/2" HWH (AB)	2	234-5001-02
21	Switch Bracket	1	535-7342-00
22	Spoon Switch Actuator	1	545-5610-01
23	Stack Switch	1	180-5015-03
24	Switch Diode, 1N4001	1	112-5001-00
25	Switch Plate	1	535-7344-00
26	#6-32 X 3/4" HWHMS SWAGE	2	237-5976-05

ASSOCIATED GROUP

Nº	Associated Part Name	QTY.	SPI Part Nº
27	#6 X 3/8" PH RH (PER POP)	2	237-5000-00
28	Pop Buty. & Red Hat Assy. (PER POP)	1	515-6674-01

Super VUK Assembly, 500-6179-00-56 (Items 1-12)



Take Note:

* An (*) asterisk indicates item is *Not Shown* in pictorial.

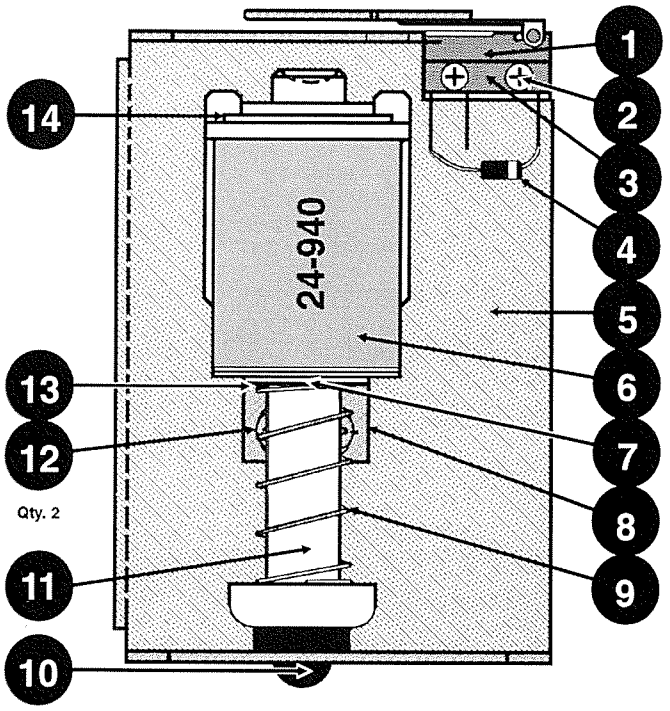
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Reed Switch	1	180-5145-02
2	#4-40 Hex Nut Keps Stainless	2	240-5303-01
3	VUK Mounting Bracket Weldment	1	515-6659-00
4	Coil, 23-800	1	090-5001-00T
ORDERING ABOVE (ITEM 4) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
5	Coil Sleeve	1	545-5076-00
6	Coil Mounting Bracket	1	535-5203-03
7	Rubber Bumper (Grommet)	1	545-5105-00
8	Compression Spring	1	266-5020-00
9	Plunger Assembly	1	515-5941-01
10	#8-32 X 1/4" PPH (Lock-Tite)	2	232-5300-00
11	Crescent Spring Washer	1	269-5002-00
12 *	Cable Wiring Harness	1	036-5421-01

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Zinc)	5	234-5101-00
Note: Above item secures this Super VUK to the bottom of playfield.			
n/a *	Scoop Weldment Assembly †	1	515-6664-00
n/a *	Scoop Decal Top	1	820-6184-13
n/a *	Scoop Decal Side	1	820-6184-14
n/a *	#8 X 1/2" HWH AB (Blue)	4	234-5101-05
Note: Above item secures this Scoop to the top of playfield.			

† The Scoop is located above the playfield. The ball is shot from the Super VUK and brought into the Big Plastic Ramp.

Standard VUK Assembly, 500-5839-01 (Items 1-14)

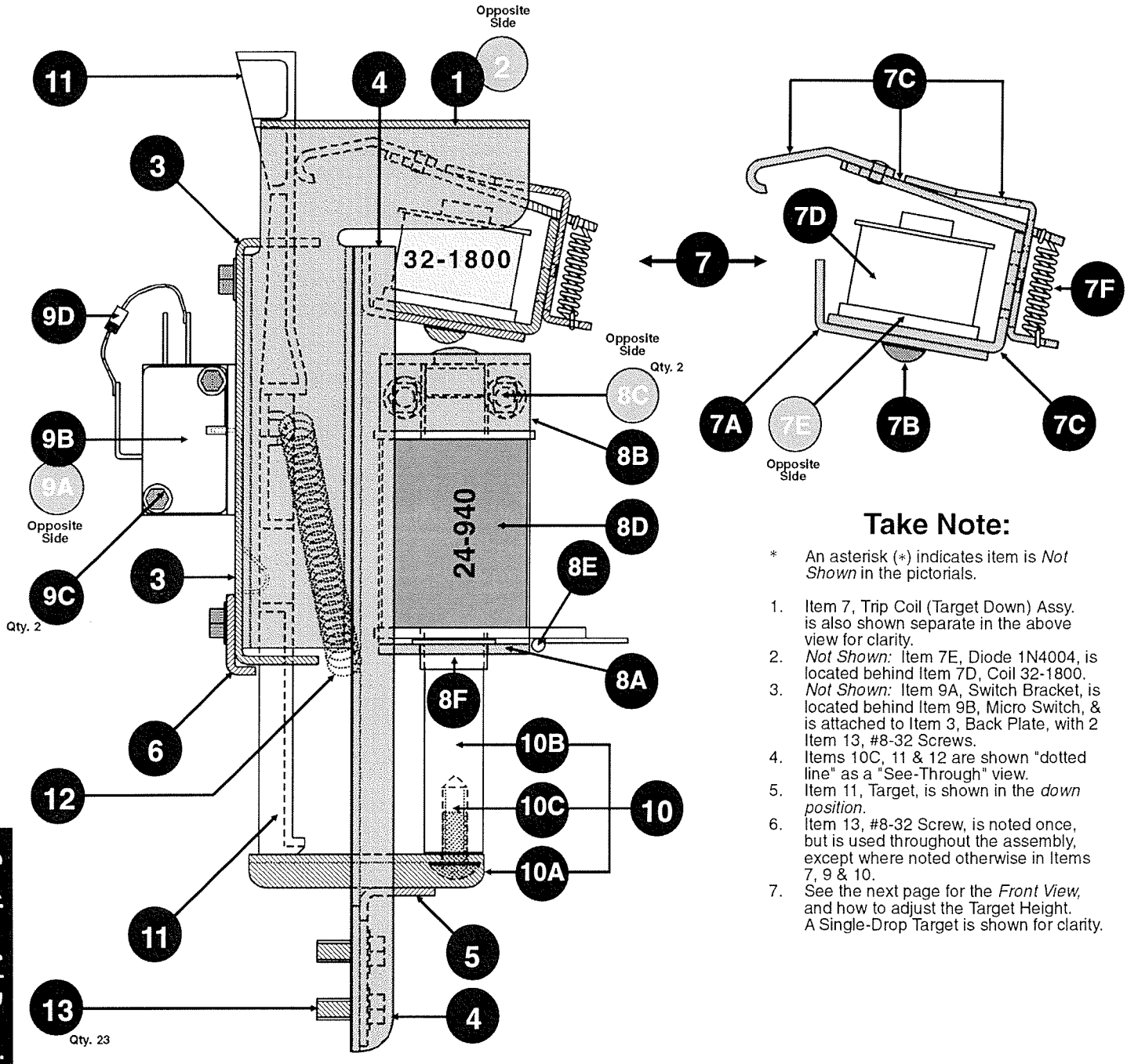


Nº	Individual Part Name	QTY.	SPI Part Nº
1	Micro Switch (Loop Type)	1	180-5116-00
2	#2-56 X 1/2" HWH	2	237-5937-00
3	Switch Body Protect Plate	1	535-6539-00
4	Switch Diode, 1N4001	1	112-5001-00
5	VUK Bracket	1	535-6607-00
6	Coil, 24-940	1	090-5036-00B
ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:			
—*	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
7	Coil Sleeve	1	545-5076-00
8	Coil Mounting Bracket	1	535-5203-03
9	Compression Spring	1	266-5020-00
10	Rubber Bumper (Grommet)	1	545-5105-00
11	Plunger Assembly	1	515-5941-01
12	#8-32 X 1/4" PPH (Lock-Tite)	2	232-5300-00
13	Crescent Spring Washer	1	269-5002-00
14	Coil Insulator	1	545-5431-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	VUK Angle Support Bracket	1	535-7911-00
n/a *	#8 X 1/2" HWH AB (Blue)	5	234-5101-05
Note: Above item secures this VUK & Angle Brkt. to the playfield.			

4-Bank Drop Target Assembly (with Trip Coil), 500-6097-04-56 (Items 1-14) (Side View)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

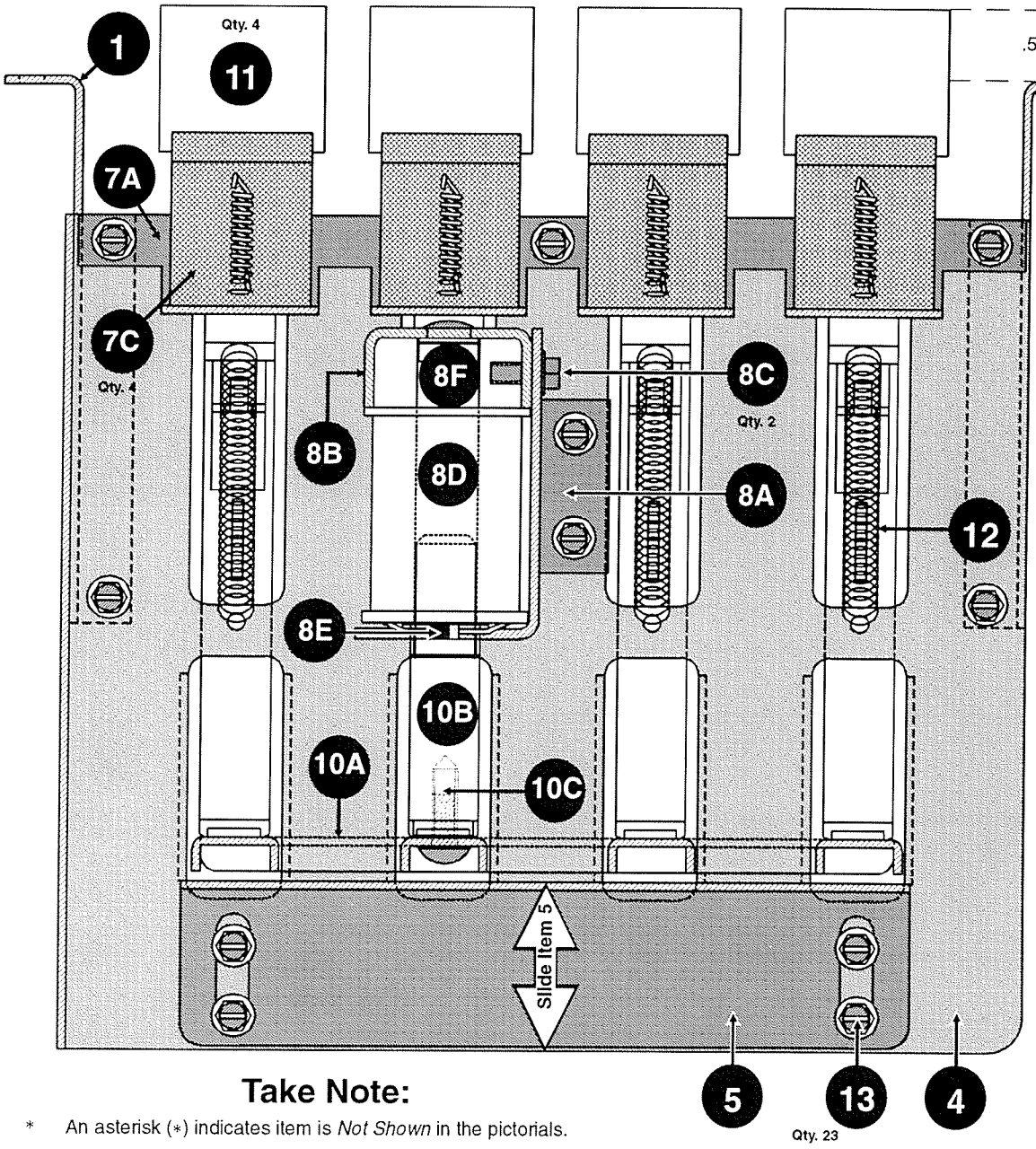
1. Item 7, Trip Coil (Target Down) Assy. is also shown separate in the above view for clarity.
2. *Not Shown:* Item 7E, Diode 1N4004, is located behind Item 7D, Coil 32-1800.
3. *Not Shown:* Item 9A, Switch Bracket, is located behind Item 9B, Micro Switch, & is attached to Item 3, Back Plate, with 2 Item 13, #8-32 Screws.
4. Items 10C, 11 & 12 are shown "dotted line" as a "See-Through" view.
5. Item 11, Target, is shown in the *down position*.
6. Item 13, #8-32 Screw, is noted once, but is used throughout the assembly, except where noted otherwise in Items 7, 9 & 10.
7. See the next page for the *Front View*, and how to adjust the Target Height. A Single-Drop Target is shown for clarity.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Drop Target Left Side Bracket	1	535-7714-00
2	Drop Target Right Side Bracket	1	535-7714-01
3	4-Bank Drop Target Back Plate	1	535-7713-04
4	4-Bank Drop Target Support Bracket	1	535-7712-04
5	4-Bank Height Adjustment Bracket	1	535-7709-04
6	4-Bank Target Retainer Bracket	1	535-7728-04
7	"Target Down" (Trip Coil) Brkt. Assy.	1	515-6538-04
ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:			
7A	4-Bank Trip Coil Mounting Bracket	1	535-7711-04
7B	#8-32 X 3/8" PPH (Sems)	4	232-5301-00
7C	Trip Coil Welded Assembly	4	515-6534-00
Note:	*Ordering above Item 7C will include:*		
7D	*Coil, 32-1800*	*1*	*090-5031-00*
7E	*Diode, 1N4004*	*1*	*112-5003-00*
7F	*Small Spring*	*1*	*265-5024-00*

Nº	Individual Part Name	QTY.	SPI Part Nº
8	Target Reset Coil Housing Assembly	1	515-6535-01
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			
8A	Coil Housing Bracket	1	535-7707-00
8B	Coil Housing Welded Cap Assy.	1	515-6533-00
8C	#8-32 X 3/8" HWH SWAGE	2	237-5975-00
8D	Coil, 24-940		090-5036-00B
Note:	*Ordering above Item 8D will include:*		
8E	*Diode, 1N4004 (positioned at bottom)*	*1*	*112-5003-00*
8F	Coil Sleeve	1	545-5709-00
9	Drop Target Switch Assembly	4	515-6536-00
ORDERING ABOVE (ITEM 9) SUB-ASSY. PART Nº WILL INCLUDE:			
9A*	Drop Target Switch Bracket Assy.	1	535-7710-00
9B	Drop Target Micro Switch	1	180-5158-00
9C	#4-40 5/8" HWH TF	2	237-5945-00
9D	Diode, 1N4001	1	112-5001-00
9E*	#18 Insulating Tube	.1 ft.	605-5003-00

Items 10-14 and Associated Parts are continued on the next page.

4-Bank Drop Target Assy., 500-6097-04-56 (Items 1-14) *Continued*
(Front View)



Target Height Adjustment Procedure:

i. Adjust the height of the top of Item 11, Target, at .52" (+/- .01"), [just over ½ inch] relative to Items 1 & 2, Left & Right Side Brackets, as shown left. (Item 11, Target, should be in the *down position.*)

*Note: This adjustment procedure should have the top side of Item 11, Target, "flush to approx. 1/16 inch" **above** the playfield surface after reinstalling to the underside of the playfield.*

Keeping the top side of the target (in the down position) from '*flush to approximately 1/16*"' ***above*** the playfield will **prevent a ball trap from occurring**.

ii. Loosen Item 13, #8-32 Screws, holding Item 5, Height Adjustment Plate, attached to Item 4, Support Bracket. *(Hint: Loosen the screws just enough so that the adjustment plate will move only when touched.)*

iii. Slide Item 5, Height Adjustment Plate, either up or down, causing Item 10A, Lift Bracket, to raise or lower the target to desired height.

iv. Tighten Item 13, #8-32 Screws, when proper adjustment is made.

Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

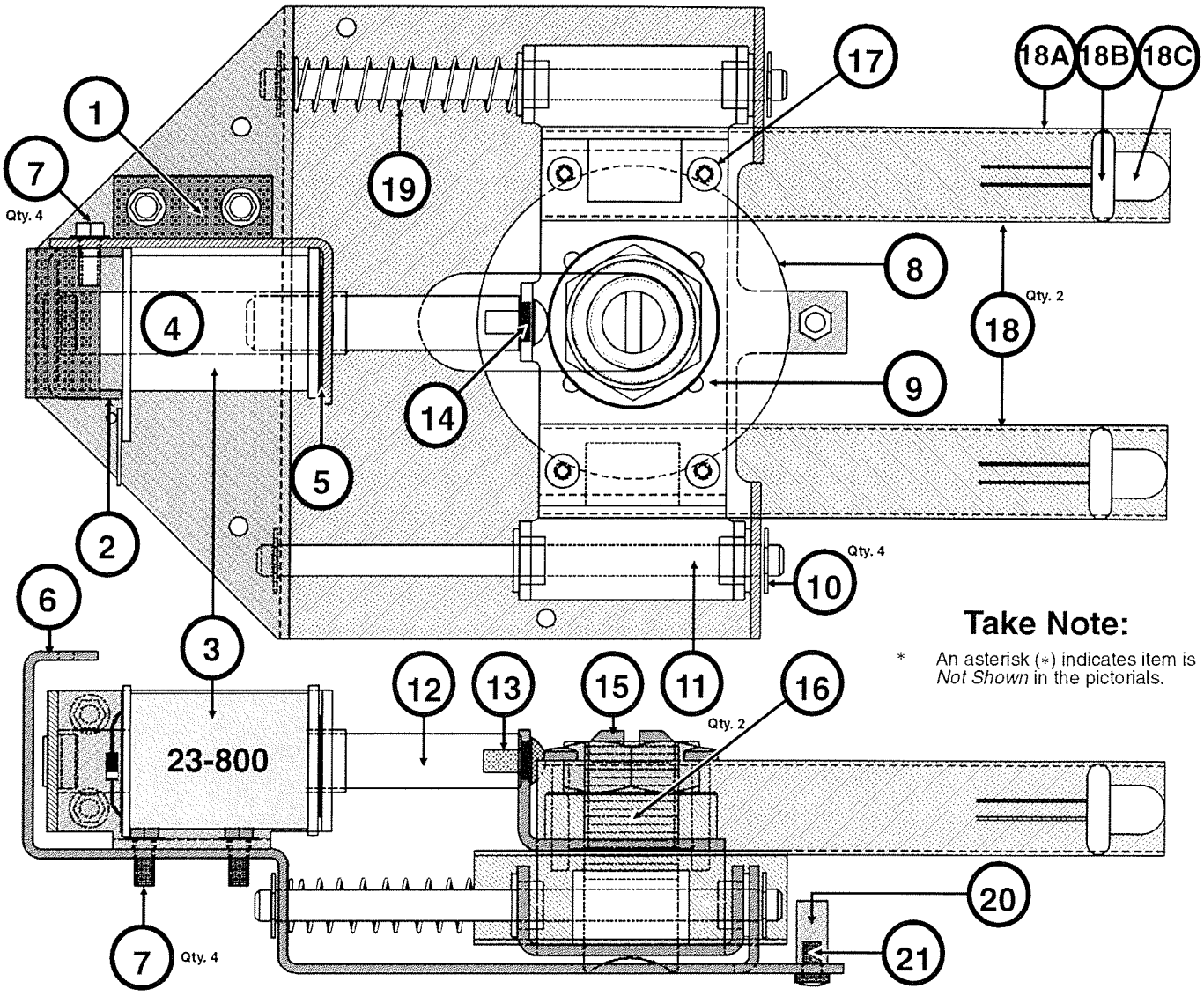
1. *Not Shown:* Item 9, Switch Assy., is located on the back of Item 3, Back Plate.
2. Item 8E, Coil Sleeve, and Item 10B, Plunger, are shown "dotted line" as a "See-Through" view.
3. Item 13, #8-32 Screw, is noted once, but is used throughout the assembly, except where noted otherwise in Items 7, 9 & 10.
4. Item 11, Target, is shown in the *down position.*
5. See the previous page for the *Side View*, for parts not noted on this view.

Nº	Individual Part Name	QTY.	SPI Part Nº
10	4-Bank Plunger & Lift Bracket Assy.	1	515-6537-04
ORDERING ABOVE (ITEM 10) SUB-ASSY. PART Nº WILL INCLUDE:			
10A	4-Bank Drop Target Lift Bracket	1	535-7706-04
10B	Drop Target Plunger	1	530-5410-00
10C	#10-32 X 3/8" PPH (Sems)	1	232-5401-00
11	Drop Target (Roll Over) White	4	545-5533-01
12	Target Reset Spring	4	265-5003-00
13	#8-32 X 3/8" HWH Mach. Scr. Type C	23	237-5903-00
14 *	Compression Spring	1	266-5020-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	4	234-5101-05
Note: Above item secures this 4-Bank Drop Target to the playfield.			
n/a *	Target Decal 1 Front (the four decal Part Nºs listed are all identical)	1 ea.	820-6184-18; -20; -22; -24
n/a *	Target Decal 2 Top (the four decal Part Nºs listed are all identical)	1 ea.	820-6184-19; -21; -23; 0-25
n/a *	Cable Wiring Harness	1	036-5423-04-56

Magna-Diverter Assembly, 500-6176-00-56 (Items 1-23)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

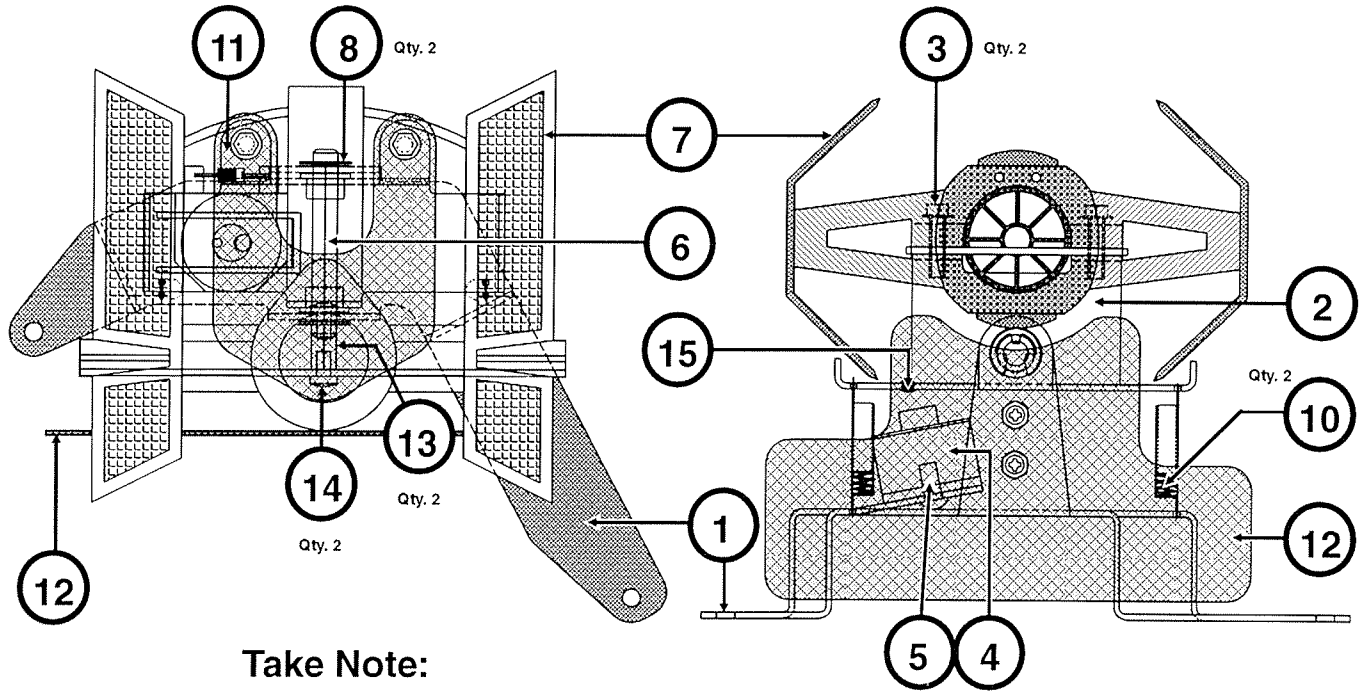
№	Individual Part Name	QTY.	SPI Part №
1	Coil Housing Bracket	1	535-7707-00
2	Coil Housing Cap Assembly	1	515-6533-01
3	Coil, 23-800	1	090-5001-00B
ORDERING ABOVE (ITEM 3) COIL PART № WILL INCLUDE:			
—	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
4	Coil Sleeve	1	545-5709-00
5	Spring Washer	1	269-5002-00
6	Magna-Diverter Base	1	535-7943-00
7	#8-32 X 3/8" HWH SWAGE	4	237-5975-00
8	Magnet Coil, 22-650	1	090-5042-01
ORDERING ABOVE (ITEM 8) COIL PART № *WILL NOT* INCLUDE:			
—	Male Lug, 14 Awg .093 02-09-2101	2	055-5023-09
—	1 x 2, .093 Conn. Male 03-09-2022	1	045-5004-02
9	Carriage Assembly	1	515-6647-01
10	Retaining Ring 1/4"ø E-Ring	4	270-5002-00
11	Support Pin	2	530-5449-00
12	Plunger	1	530-5410-00
13	#10-32 X 3/8" PH TRUS (St. Steel)	1	237-5988-00
14	Spacer .1" Ht. X .19" ID X .25" OD	1	254-5021-00
15	3/4"-16 Hex Nut	1	240-5315-00
16	Threaded Core with Large Chamfer	1	530-5320-01A
17	#6-32 X 7/8" PPH	4	237-5505-00

№	Individual Part Name	QTY.	SPI Part №
18	Gun Barrel Sub-Assembly	2	515-6683-00-56
ORDERING ABOVE (ITEM 18) COIL PART № WILL INCLUDE:			
18A	Gun Barrel	1	530-5463-00
18B	Rubber Ring - 5/16" I.D.	1	545-5348-02
18C	Cannon PCB (1 Round LED)	1	520-5158-00
19	Compression Spring	1	266-5034-00
20	1/2" X 1/4" Hex Spacer - #6-32 Tap	1	254-5008-03
21	#6-32 X 1/4" PPH MS (Sems) Zinc	1	232-5200-00
22 *	Magnet Slide Cable Wiring Harness	1	036-5423-10-56
23 *	Cannon LED Cable Wiring Harness	1	036-5423-15-56

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

№	Associated Part Name	QTY.	SPI Part №
n/a *	#6-32 X 3/4 Fin Shank Screw	4	237-5921-02
n/a *	#8 Washer .17 ID X 1/2" OD	4	242-5015-00
n/a *	#6-32 X 3/8 PPH MS (Sems) Zinc	4	232-5201-00
Note: Above items secures this Magna-Diverter to the P/F in combination w/Hex Spacers (see Sec. 4, Chp. 1, Pg. 63 to locate size).			
n/a *	Gun Barrel Decals (Left & Right)	1 ea.	820-6184-11, -12
n/a *	Cannon Cover	1	545-5791-00
n/a *	Snap Rivet (Plastic) - 1/8" ø	1	249-5019-00
n/a *	#8 Washer (with above Snap Rivet)	1	242-5015-00
n/a *	#6-32 X 1/4 PPH MS (Sems) Zinc	1	232-5200-00
n/a *	#6 Washer (with above #6-32)	1	242-5001-00
Note: Above items secures this Cover to the Magna-Diverter.			

Tie Fighter Complete Assembly, 500-6182-00-56 (Items 1-15)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

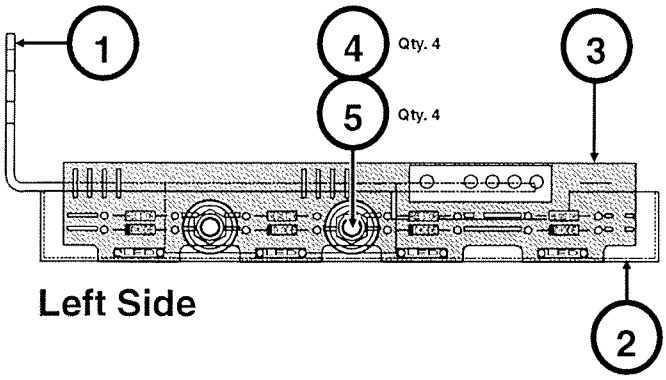
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Tie Fighter Base	1	535-7981-00
2	Tie Fighter Carriage	1	515-6665-00
3	#8-32 X 5/8" HWH SWAGE	2	237-5975-03
4	Coil, 31-1500 with Core	1	090-5054-00
5	#8-32 X 3/8" PPH (Sems)	1	232-5301-00
6	Support Pin	1	530-5449-01
7	Tie Fighter	1	545-5772-00
8	Retaining Ring 1/4"ø	2	270-5002-00
9 *	Darth Vader	1	545-5786-00
10	Return Spring	2	265-5048-00

Nº	Individual Part Name	QTY.	SPI Part Nº
11	Butyrate 3 - Tie Fighter Top	1	830-5914-03
12	Butyrate 4 - Tie Fighter Front	1	830-5914-04
13	1/2" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-03
14	#6-32 X 1/4" PPH MS (Sems) Zinc	2	232-5200-00
15	Rivet (Brass) - 1/8"ø x 5/32" Lg.	1	249-5009-02
16 *	Cable Wiring Harness	1	036-5423-11-56

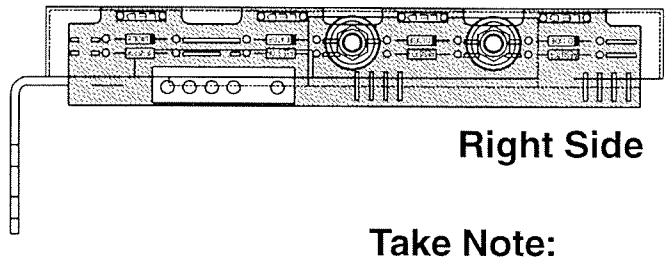
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	4	234-5101-05
Note:	*Above item secures this Tie Fighter to the playfield.*		

Han Solo Assembly, 500-6191-00-56 (Items 1-6)



Left Side



Right Side

Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Han Solo Mounting Bracket	1	535-7997-00
2	Han Solo In Carbonite (Plastic Front)	1	545-5790-00
3	Han Solo PCB (4 Flat LEDs per bd.)	2	520-5157-00
4	1/4" X 5/16" X .144" I.D. Spacer Tap.	4	254-5014-03
5	#6-32 X 1/2" HWH SWAGE	4	237-5976-03

Nº	Individual Part Name	QTY.	SPI Part Nº
6 *	LED Cable Wiring Harness	1	036-5423-05-56

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

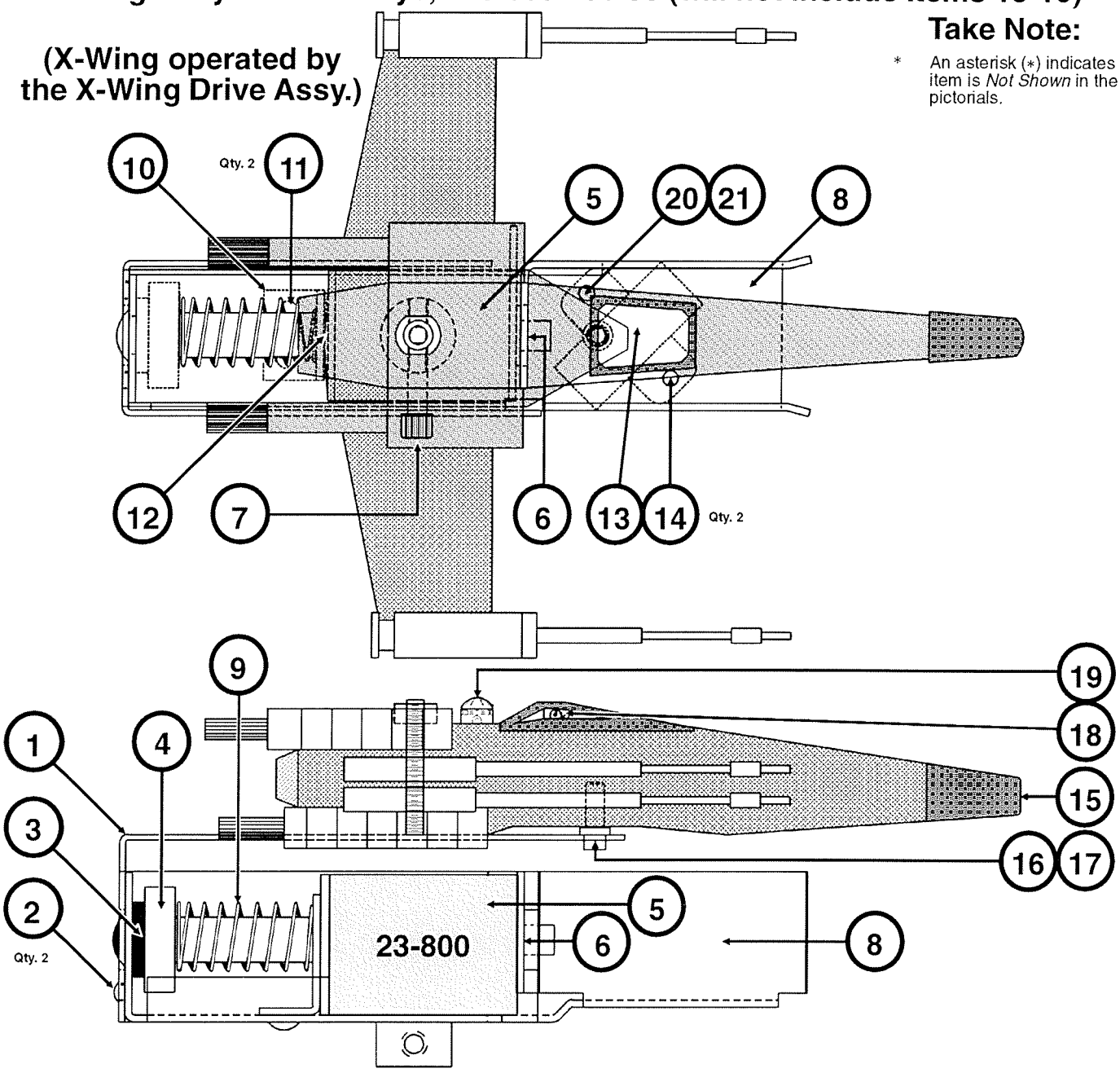
Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#6 X 1/2" HWH AB (Zinc) Red	2	234-5001-02
Note:	*Above item secures this Han Solo Assembly to the playfield.*		

Complete X-Wing Assy., 515-6651-00-56 (Items 1-23)
X-Wing Assy. without Toys, 515-6651-01-56 (will not include Items 15-19)

(X-Wing operated by the X-Wing Drive Assy.)

Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.



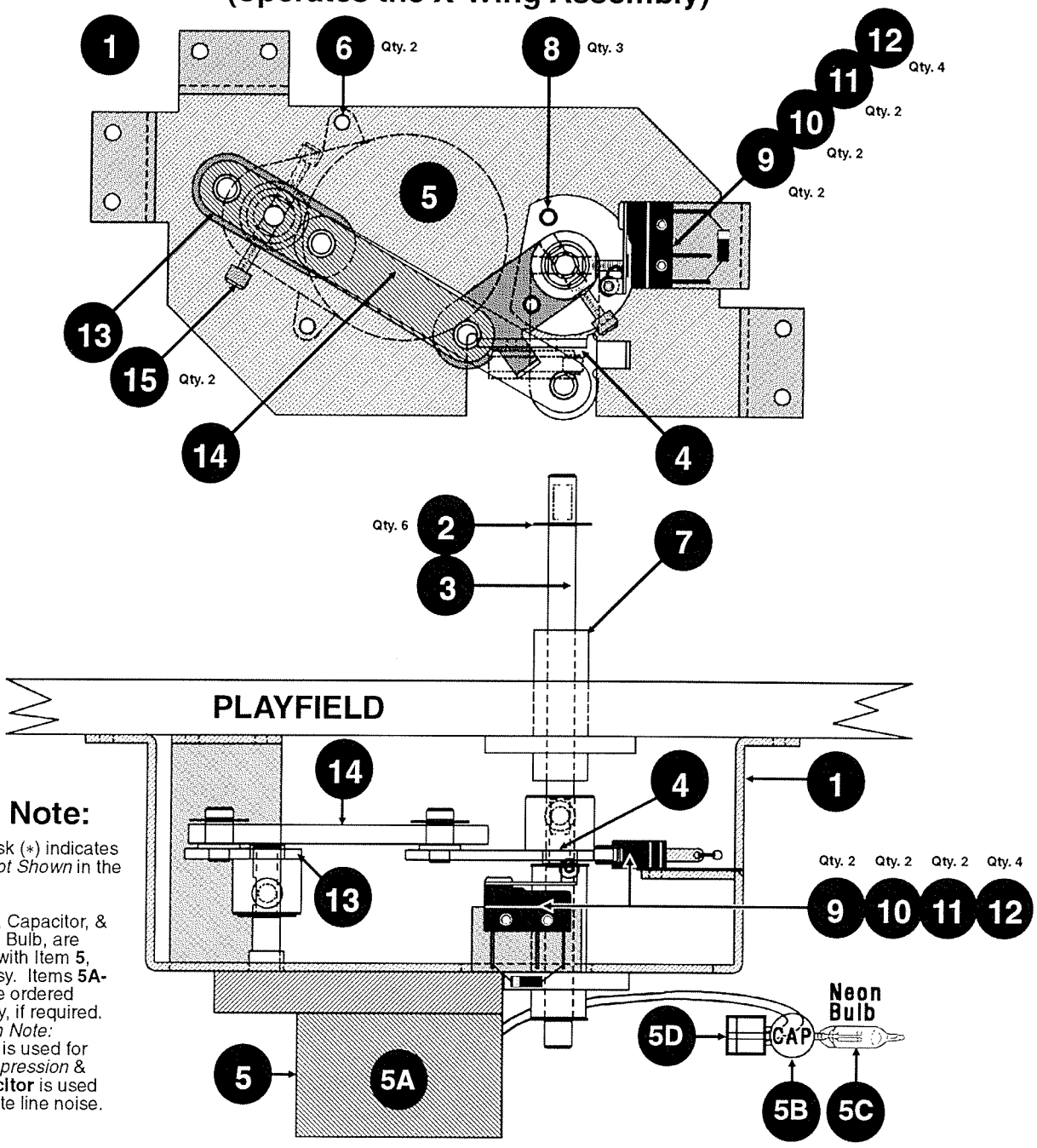
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Frame Cover Bracket Welded Assy.	1	515-6654-00
2	#6-32 X 1/4" PHMS Sems	2	232-5200-00
3	Rubber Bumper (Grommet)	1	545-5105-00
4	Plunger Assembly	1	515-5941-00
5	Coil, 23-800 (Lugless)	1	090-5053-00
ORDERING ABOVE (ITEM 5) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
6	Coil Sleeve	1	545-5076-00
7	#8-32 X 3/8" S.H.C.S.	1	237-5897-00
8	X-Wing Cannon Frame Welded Assy.	1	515-6650-00
9	Compression Spring	1	266-5020-00
10	Coil Retainer Bracket	1	535-5203-03
11	#8-32 X 1/4 PHMS Sems	2	232-5300-00
12	Spring Washer	1	269-5002-00
13	Reed Switch	1	180-5145-02

Nº	Individual Part Name	QTY.	SPI Part Nº
14	Rivet (Brass) - 1/8"ø x 1/4" Lg.	2	249-5005-00
ORDERING X-WING ASSY. 515-6651-**01**-56 WILL NOT INCLUDE:			
15	X-Wing Fighter	1	545-5784-00
16	#6-32 Nylon Stop Nut	1	240-5005-00
17	Rubber Ring - 3/8" O.D.	1	545-5348-19
18	Luke Skywalker	1	545-5787-00
19	R2D2	1	545-5788-00
20	Washer 3/64" X 3/8" X 3/64" (Nylon)	1	242-5019-00
21	1/8" Cable Clamp	1	040-5000-01
22 *	X-Wing Coil Cable Wiring Harness	1	036-5423-16-56
23 *	Reed Switch Cable Wiring Harness	1	036-5421-01

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	X-Wing Decal Side;Side Front; & Top	1 ea.	820-6184-15; -16; 17
n/a *	X-Wing (Motor) Assembly	1	500-6175-00-56

X-Wing Drive (Motor) Assembly, 500-6175-00-56 (Items 1-17)
(operates the X-Wing Assembly)



Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

1. Items **5B**, Capacitor, & **5C**, Neon Bulb, are included with Item **5**, Motor Assy. Items **5A-5E** can be ordered separately, if required.
2. *Operation Note:* The **bulb** is used for *spike suppression* & the **capacitor** is used to eliminate line noise.

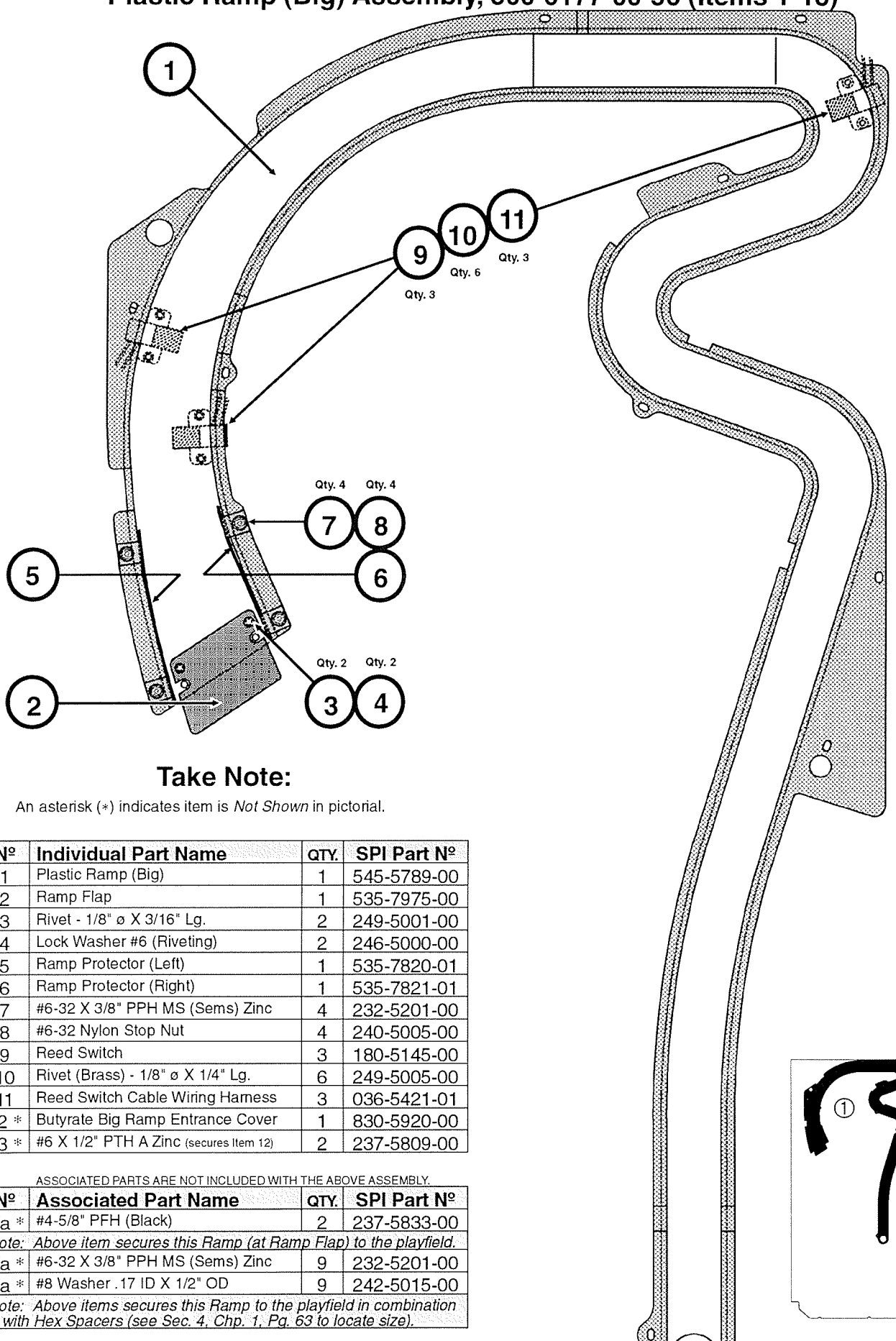
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Mounting Bracket (X-Wing Motor)	1	535-7942-00
2	Retaining Ring 1/4"ø	6	270-5002-00
3	Shaft	1	530-5448-00
4	Cam Link Assembly (Large)	1	515-6646-00
5	Motor Assembly	1	515-6383-00
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	Motor 24v AC 60Hz 3W 6 RPM CCW	1	041-5058-00
5B	Capacitor TE .1 Mfd 500v Disc	1	130-5000-00
5C	Neon Bulb NE-2	1	165-5021-00
5D	1 X 2, .093 Conn. Male 03-09-2022	1	045-5004-02
5E *	Male Lugs, 14 Awg .093 02-09-2101	2	055-5023-09
6	#6-32 X 3/8" PHMS (Sems)	2	232-5201-00
7	Bushing	1	545-5783-00
8	#6-32 X 1/2" HWH TF	3	237-5924-00
9	Micro Switch (Roller Actuator)	2	180-5119-00

Nº	Individual Part Name	QTY.	SPI Part Nº
10	Diode, 1N4001	2	112-5001-00
11	Sw. Protect (Fiche Paper)	2	545-5633-00
12	#2-56 X 1/2" HWH TF	4	237-5937-00
13	Cam Link Assembly (Small)	1	515-6649-00
14	Link	1	535-8042-00
15	#8-32 X 3/8" Soc. Hd. Cap Screw	2	237-5897-00
16 *	X-Wing Load Cable Wiring Harness	1	036-5423-13-56
17 *	X-Wing Home/Away Cbl. Wrg. Hrns.	1	036-5423-14-56

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#6 X 1/2" HWH AB (Zinc) Red	3	234-5001-02
Note: Above item secures this Motor Bracket to the playfield.			
n/a *	Relay Board	1	520-5010-00

Plastic Ramp (Big) Assembly, 500-6177-00-56 (Items 1-13)



Take Note:

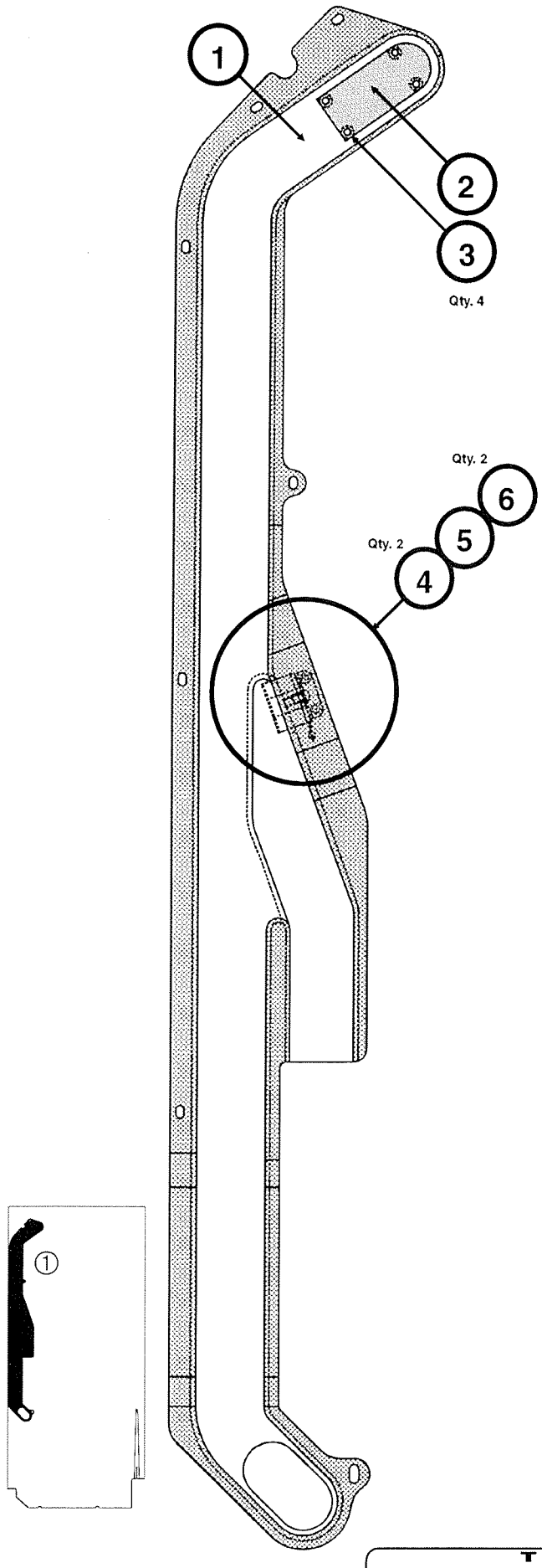
* An asterisk (*) indicates item is *Not Shown* in pictorial.

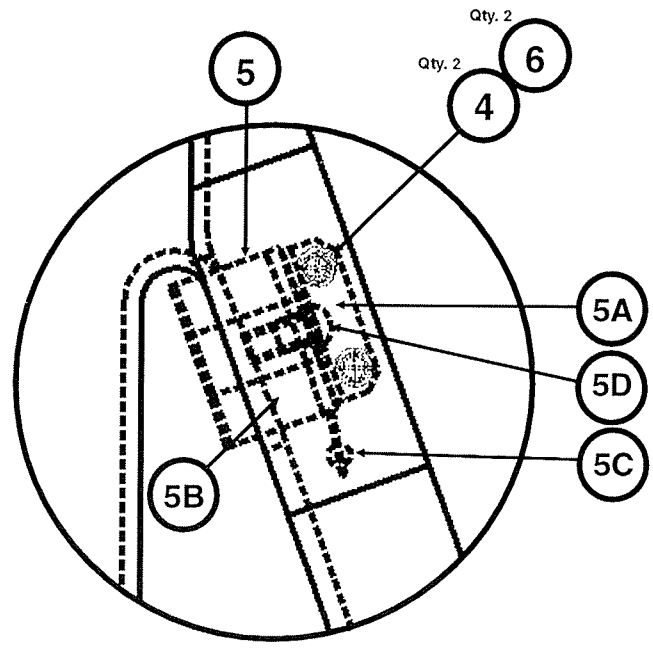
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Plastic Ramp (Big)	1	545-5789-00
2	Ramp Flap	1	535-7975-00
3	Rivet - 1/8" ø X 3/16" Lg.	2	249-5001-00
4	Lock Washer #6 (Riveting)	2	246-5000-00
5	Ramp Protector (Left)	1	535-7820-01
6	Ramp Protector (Right)	1	535-7821-01
7	#6-32 X 3/8" PPH MS (Sems) Zinc	4	232-5201-00
8	#6-32 Nylon Stop Nut	4	240-5005-00
9	Reed Switch	3	180-5145-00
10	Rivet (Brass) - 1/8" ø X 1/4" Lg.	6	249-5005-00
11	Reed Switch Cable Wiring Harness	3	036-5421-01
12 *	Butyrate Big Ramp Entrance Cover	1	830-5920-00
13 *	#6 X 1/2" PTH A Zinc (secures Item 12)	2	237-5809-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#4-5/8" PFH (Black)	2	237-5833-00
Note: Above item secures this Ramp (at Ramp Flap) to the playfield.			
n/a *	#6-32 X 3/8" PPH MS (Sems) Zinc	9	232-5201-00
n/a *	#8 Washer .17 ID X 1/2" OD	9	242-5015-00
Note: Above items secures this Ramp to the playfield in combination with Hex Spacers (see Sec. 4, Chp. 1, Pg. 63 to locate size).			

Plastic Ramp (Left) Assembly, 500-6178-00-56 (Items 1-5)





Take Note:

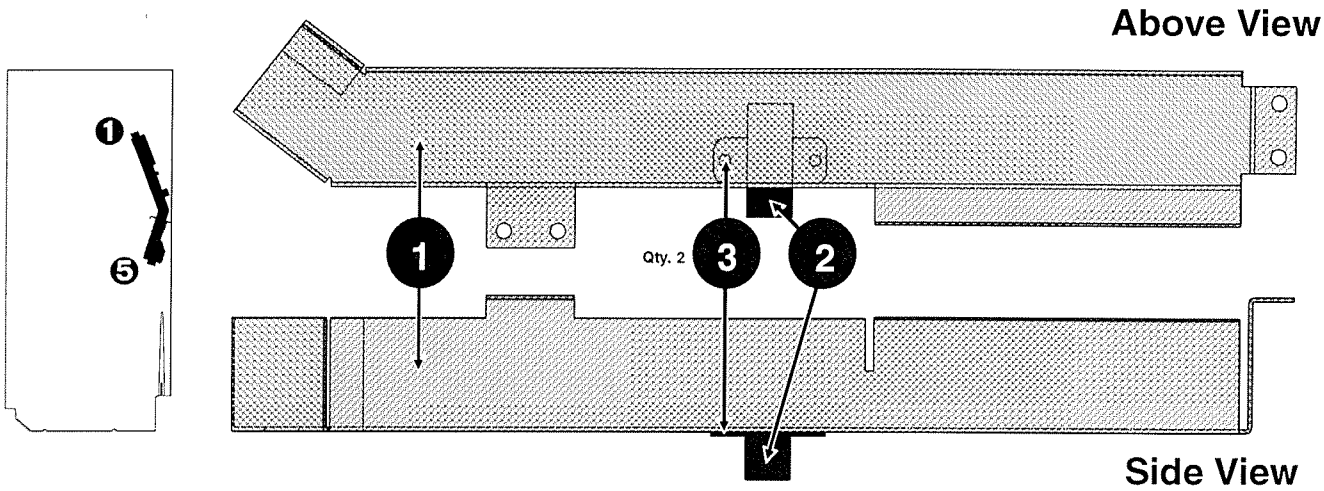
* An asterisk (*) indicates item is *Not Shown* in pictorial.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Plastic Ramp (Left)	1	545-5792-02
2	Ramp Protector (Top)	1	535-7976-00
3	Rivet - 1/8"ø X 1/4" Lg.	4	249-5003-00
4	#6-32 X 3/8" HWH SWAGE	2	237-5976-02
5	Magnet Assembly	1	500-6190-00-56
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	Magnet Bracket	1	535-7994-00
5B	Coil, 31-1500 with Core	1	090-5054-00
	Note: Ordering above Item 5B will include:	1	
5C	*Diode, 1N4004*	*1*	*112-5003-00*
5D	#8-32 X 3/8" PPH	1	232-5301-00
5E *	Diverter Cable Wiring Harness		036-5423-12-56
6	#6 Washer	2	242-5001-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#6-32 X 3/8" PPH MS (Sems) Zinc	7	232-5201-00
n/a *	#8 Washer .17 ID X 1/2" OD	7	242-5015-00
Note: Above items secures this Ramp to the playfield in combination with Hex Spacers (see Sec. 4, Chp. 1, Pg. 63 to locate size).			

Under-Trough (Large) Assembly, 500-6180-00-56 (Items 1-4) † and Under-Trough (Small) Sub-Assy., 515-6673-00 (Item 5) ‡



Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Trough Weldment (Large) †	1	515-6660-00
2	Reed Switch	1	180-5145-02
3	Rivet (Brass) - 1/8"ø X 5/32" Lg.	2	249-5009-02
4 *	Reed Switch Cable Wiring Harness	1	036-5421-01

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	4	234-5101-05

Note: Above items secures this Large Trough to the playfield.

† This trough is located under the playfield behind the 4-Bank Drop Target and brings the Ball to the Super VUK. The Ball is then shot out from the Super VUK into the Big Ramp.

Nº	Individual Part Name	QTY.	SPI Part Nº
5	Trough Weldment (Small) ‡	1	515-6673-00

Item 5 shown only in the Playfield Reference Pictorial.

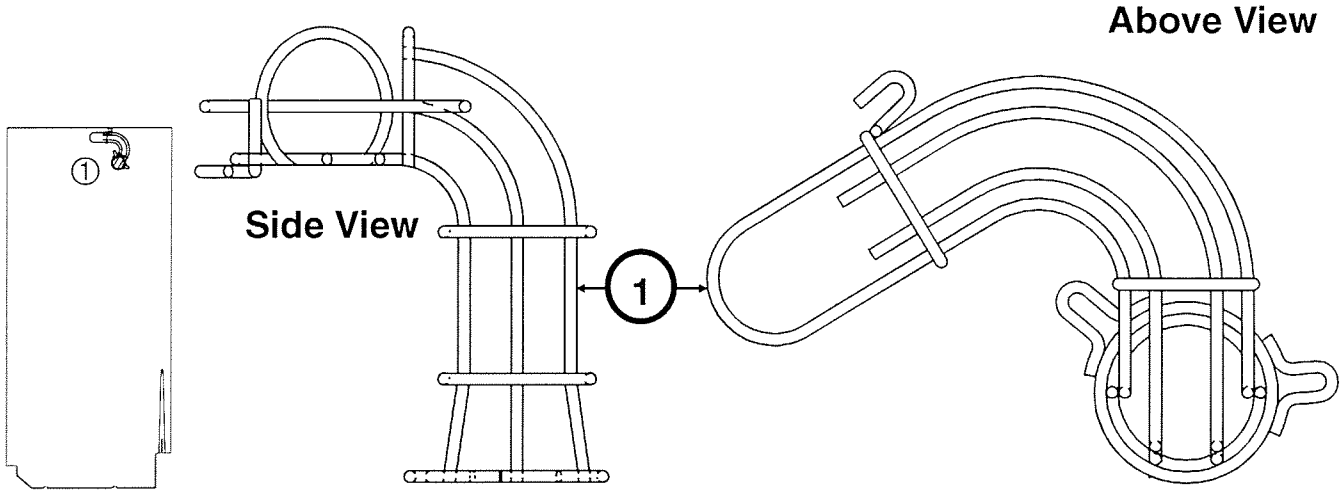
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#4-40 Keps Nut	2	240-5318-00
n/a *	#8 X 1/2" HWH AB (Blue)	2	234-5101-05

Note: Above items secures this Small Trough to the playfield.

‡ This small trough is located under the playfield in front of the Super VUK (the Entrance hole is in front of the Han Solo Assy.) and brings the ball to the Super VUK. The Ball is then shot out from the Super VUK into the Big Ramp.

VUK Wire Ramp, 515-6665-03 (Item 1)



Nº	Ramp Name	QTY.	SPI Part Nº
1	VUK Wire Ramp	1	515-6656-03

Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorials.

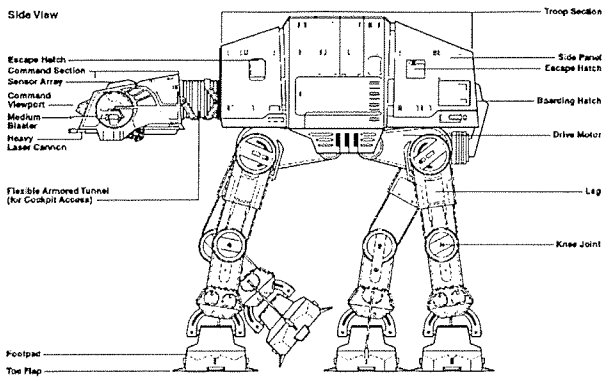
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

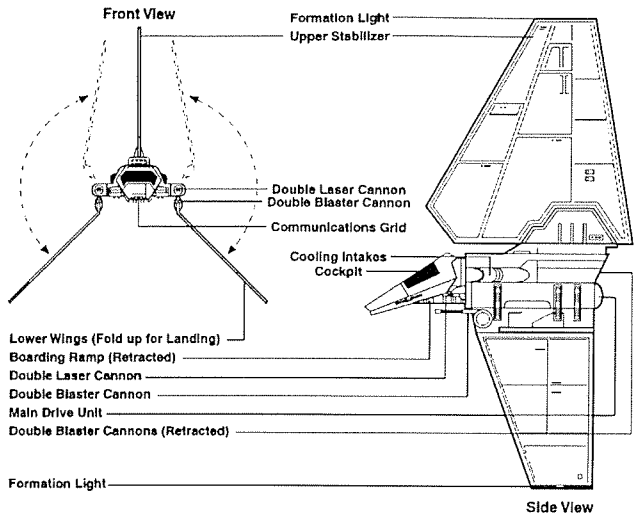
Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#6-32 X 5/8" PPH Mach. Scr.	3	232-5203-00
n/a *	Post Hex Base #6-32 Tap/#10-32 Bot.	2	530-5332-01
n/a *	#8 Washer .17" ID X .5" OD X .03	1	242-5015-00

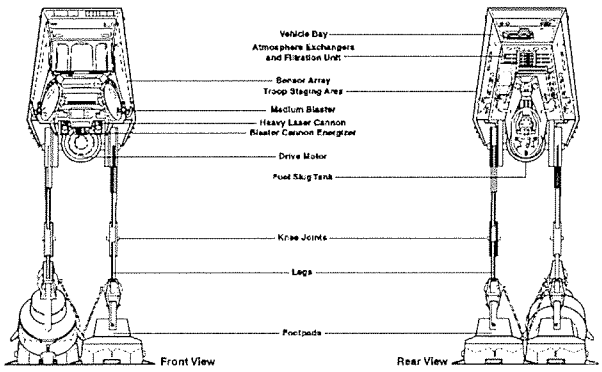
Note: Above items secures the Wire Ramp to the playfield.

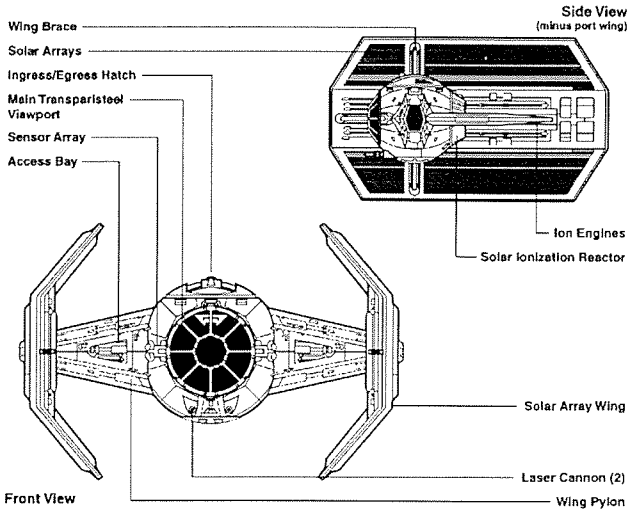
Section 5
Schematics & Troubleshooting

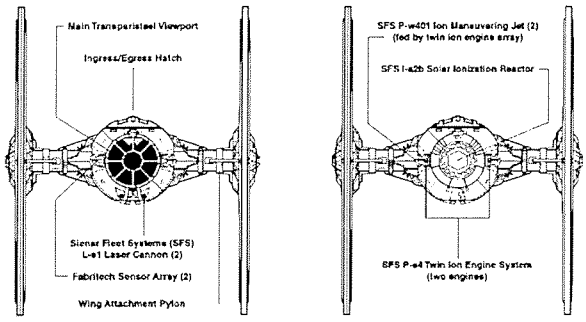
Table of Contents

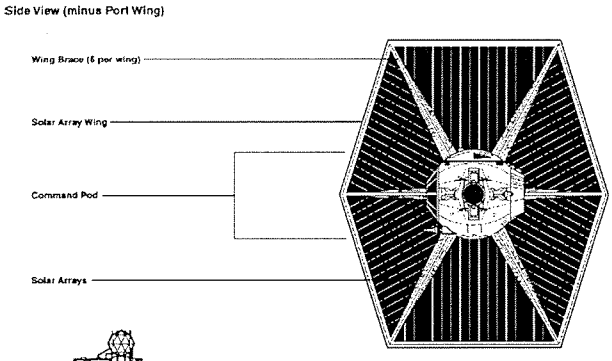

Side View
Troop Section
Escape Hatch
Command Section
Sensor Array
Command Viewport
Medium Blaster
Heavy Laser Cannon
Side Panel
Escape Hatch
Boarding Hatch
Drive Motor
Flexible Armored Tunnel (for Cockpit Access)
Leg
Knee Joint
Footpad
Toe Flap

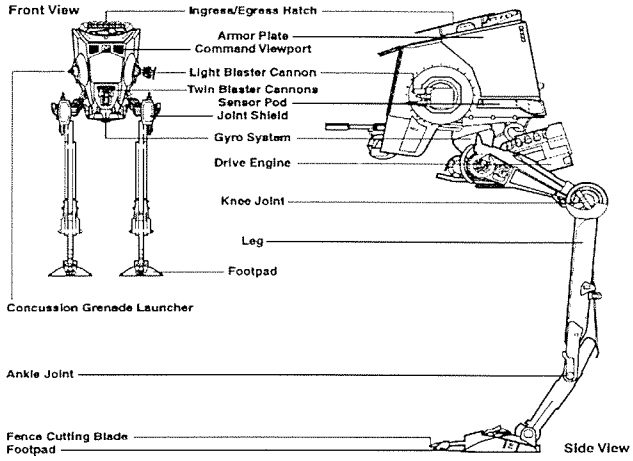

Front View
Formation Light
Upper Stabilizer
Double Laser Cannon
Double Blaster Cannon
Communications Grid
Cooling Intakes
Cockpit
Lower Wings (Fold up for Landing)
Boarding Ramp (Retracted)
Double Laser Cannon
Double Blaster Cannon
Main Drive Unit
Double Blaster Cannons (Retracted)
Formation Light
Side View

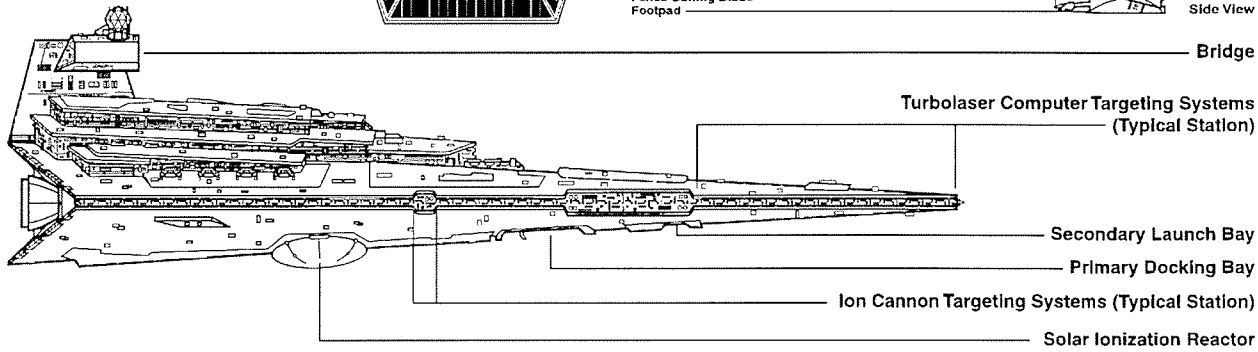

Vehicle Bay
Atmosphere Exchangers and Filtration Unit
Sensor Array
Troop Staging Area
Medium Blaster
Heavy Laser Cannon
Blaster Cannon Energizer
Drive Motor
Fuel Slug Tank
Knee Joints
Legs
Footpads
Front View
Rear View


Side View
(minus port wing)
Wing Brace
Solar Arrays
Ingress/Egress Hatch
Main Transparisteel Viewport
Sensor Array
Access Bay
Ion Engines
Solar Ionization Reactor
Solar Array Wing
Laser Cannon (2)
Wing Pylon
Front View


Main Transparisteel Viewport
Ingress/Egress Hatch
Sienar Fleet Systems (SFS) L-s1 Laser Cannon (2)
Fabritech Sensor Array (2)
Wing Attachment Pylon
SFS P-w401 Ion Maneuvering Jet (2) (fed by twin ion engine array)
SFS I-a2b Solar Ionization Reactor
SFS P-s4 Twin Ion Engine System (two engines)


Side View (minus Port Wing)
Wing Brace (6 per wing)
Solar Array Wing
Command Pod
Solar Arrays

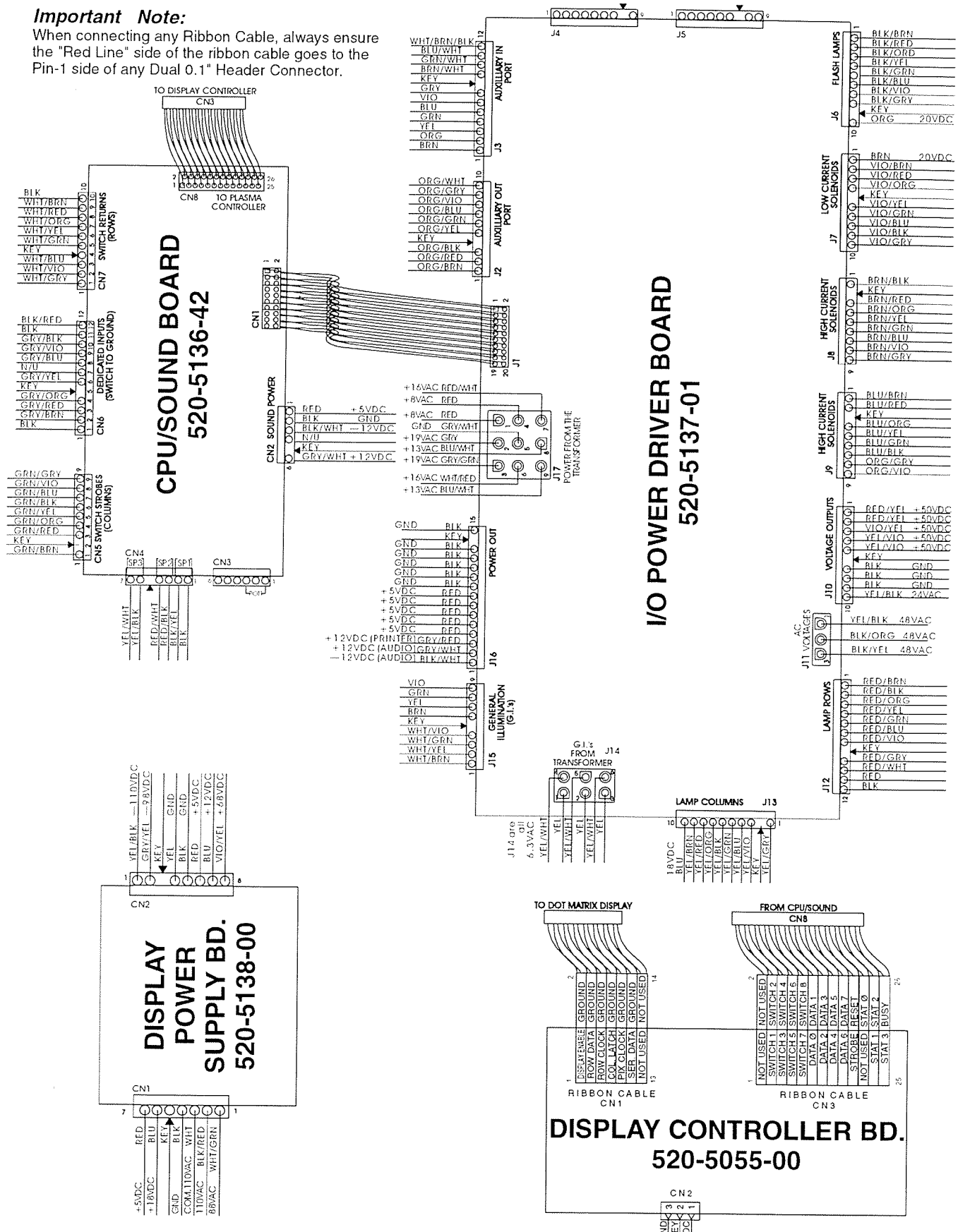

Front View
Ingress/Egress Hatch
Armor Plate
Command Viewport
Light Blaster Cannon
Twin Blaster Cannons
Sensor Pod
Joint Shield
Gyro System
Drive Engine
Knee Joint
Leg
Footpad
Concussion Grenade Launcher
Ankle Joint
Fence Cutting Blade
Footpad
Side View


Bridge
Turbolaser Computer Targeting Systems (Typical Station)
Secondary Launch Bay
Primary Docking Bay
Ion Cannon Targeting Systems (Typical Station)
Solar Ionization Reactor

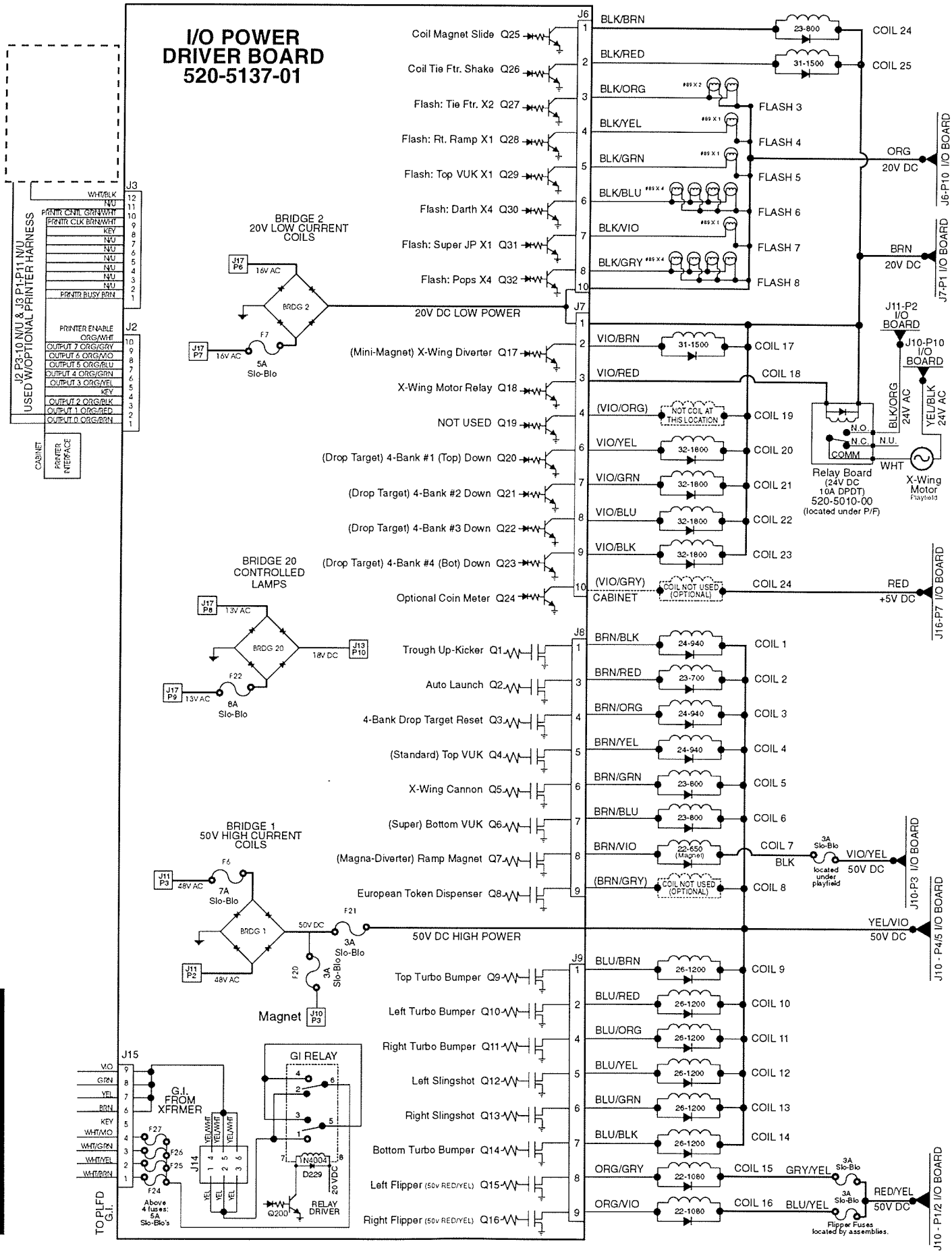
Backbox Wiring

Backbox Board Layout Wiring Diagram

Important Note:
When connecting any Ribbon Cable, always ensure the "Red Line" side of the ribbon cable goes to the Pin-1 side of any Dual 0.1" Header Connector.



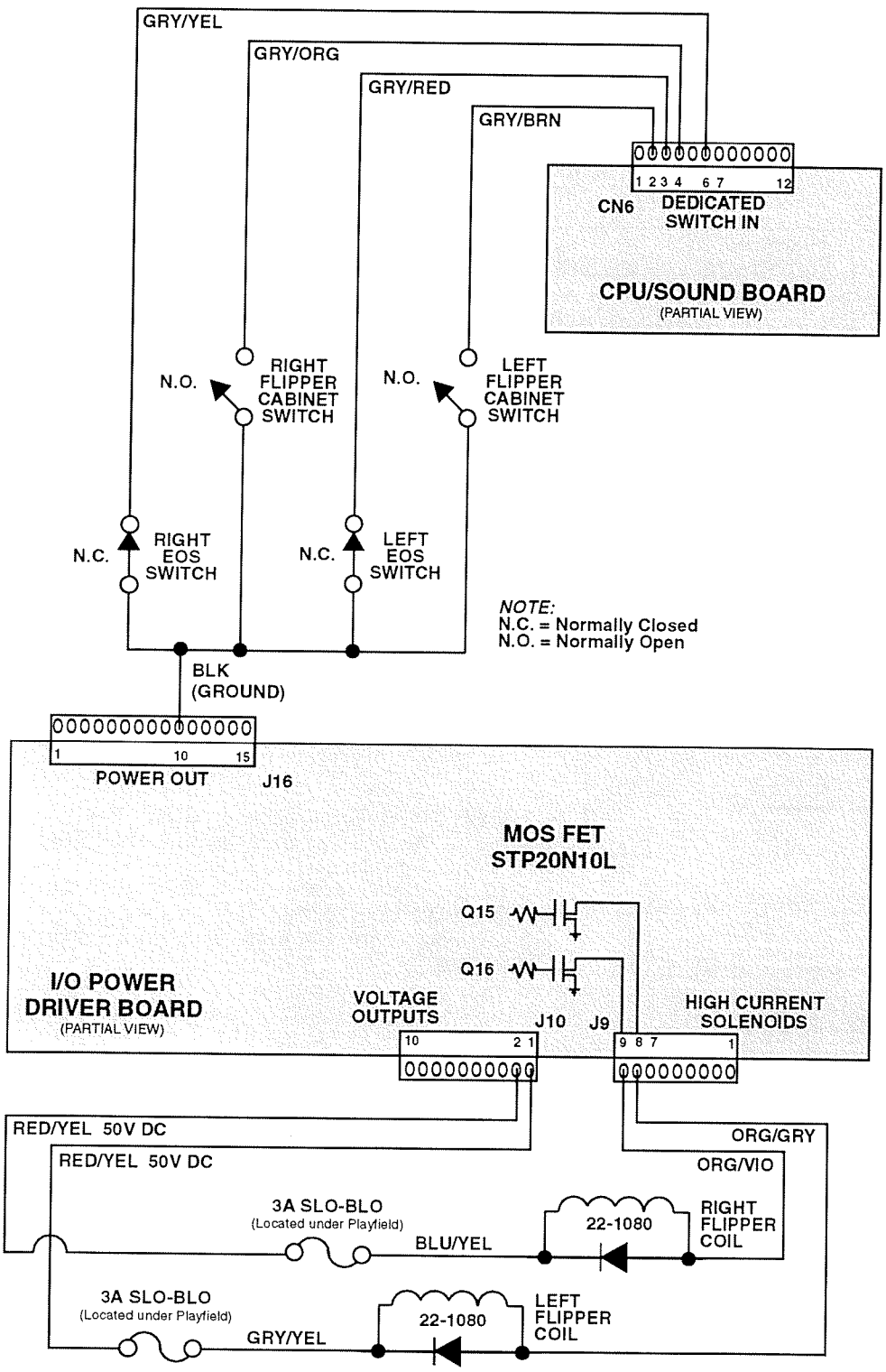
Backbox I/O Power Driver Board Detailed Wiring Diagram



Playfield Wiring

2-Flipper Circuit Wiring Diagram

The **White Star Board System**™ has allowed us to *simplify* the flipper circuit to the point where we have *eliminated the flipper board* all together. The flipper circuit is now configured the same as any other solenoid drive circuit.



Technical Overview

Our ***New Flipper System*** uses one supply voltage (50v DC) for both kick and hold. Once the **Game CPU** detects a flipper cabinet switch closure (during game play) it applies a 40 msec pulse to the gate of the flipper drive transistor (STP20N10L). If it continues to detect a flipper cabinet switch closure (the player holding the button in) it will continue to pulse the flipper drive transistor 1 msec every 12 msecs for the duration of the hold cycle.

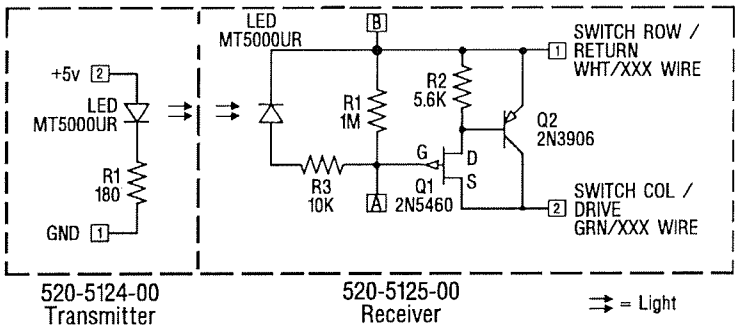
The **E.O.S.** (End-Of-Stroke) **Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect a switch closure if the flipper bat is forced back by a high velocity shot or rebound on the playfield and will apply another 40 msec pulse of 50v DC to the coil.

Trough Up-Kicker OPTO
Theory of Operation & Schematic

Theory of Operation

As light from the Transmitter falls on the **Receiver LED**, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the gate of **Q1**, turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s Base, the transistor is off acting as an *OPEN SWITCH*. When the light is interrupted (*BLOCKED*) **R1** bleeds the gate voltage off of **Q1** allowing it to conduct, switching **Q2** on, which acts as a *CLOSED SWITCH*.

Fig. 1



TAKE NOTE:
LED MT5000UR
(Ultra Bright Red)
Sega Pinball Part Nº
165-5100-00

Troubleshooting

1. Volt Meter Test (indicates normal operating condition):

A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.8 - 1.2v DC.

B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.0 - 0.1v DC.

2. Oscilloscope Test (indicates normal operating condition):

Fig. 2A

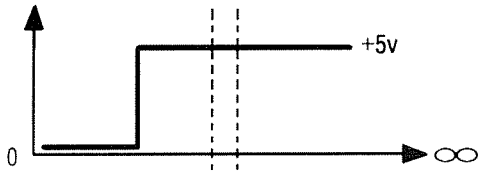
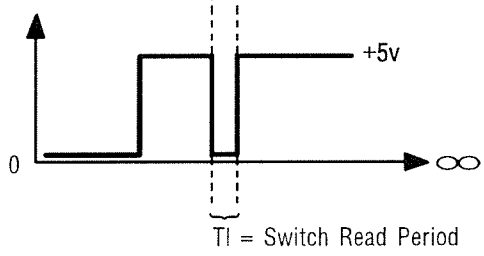


Fig. 2B



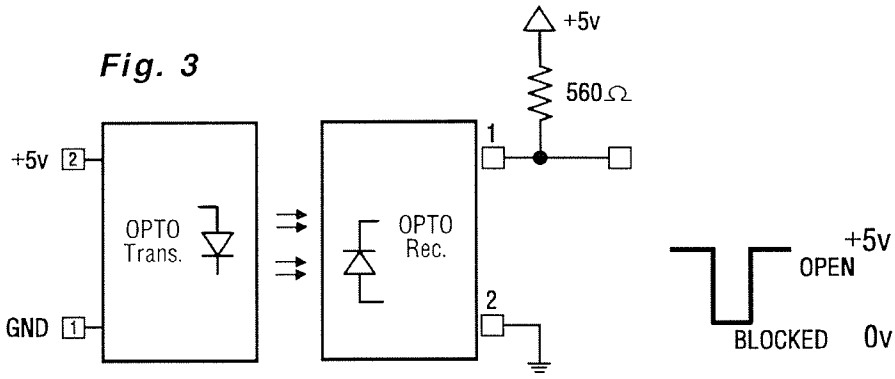
A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (See Fig. 1). The Scope should display a **STEADY +5v** as shown in Fig. 2A, Wave Form Diagram.

B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (See Fig. 1). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in Fig. 2B, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. 3 Below):

Disconnect the OPTO Transmitter / Receiver Board from the circuit. Connect one side of a 560Ω Pull-up Resistor to **Pin-1** of the OPTO Receiver Bd. and the other side of the resistor to a 5v DC source. Connect **Pin-2** to GND. Connect a +5v DC source to **Pin-1** of the Transmitter & GND to **Pin-2**. Align with the Receiver OPTO approx. 3" distance. Using your Volt-Meter or an Oscilloscope, monitor **Pin-1** while *BLOCKING* and *UNBLOCKING* the ***BEAM*** from the Trans. The output will be approx. +5v DC when the ***BEAM IS NOT BLOCKED*** and approx. Øv when the ***BEAM IS BLOCKED.***

Fig. 3

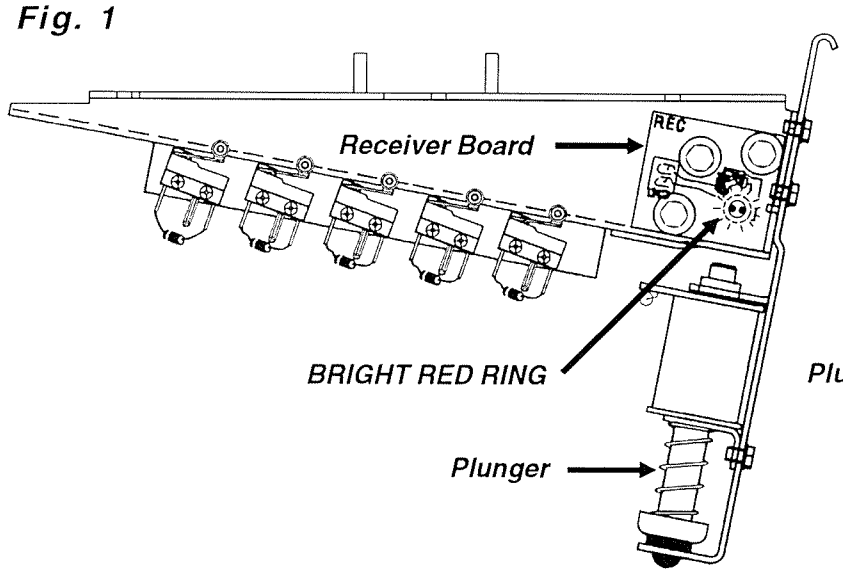


Single Trough OPTO Alignment / Test

When a working **OPTO** is installed and connected in a game, the transmitter should light when the power is switched on. With the playfield in Service Position #1 (playfield lifted up in the half-way position resting on the Prop Rod) and the game on, the light should show up as a **BRIGHT RED RING** through the back of the Receiver Board around the **Receiver LED** (See Fig. 1). With the game in ***Switch Test Mode***, lifting the Trough Plunger with a fingertip should block the **BEAM** and cause the Switch Position to trigger (See Fig. 2). View Fig. 3a & 3b for a sectional view of the Light Path (note alignment) and what happens as a ball breaks the light beam.

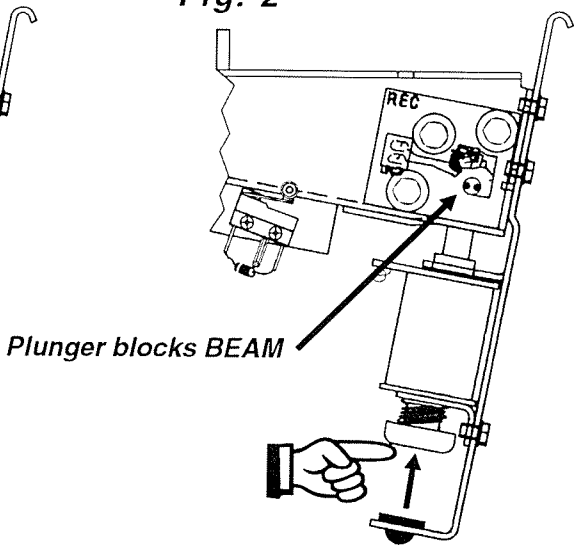
View facing trough (with playfield in Service Position #1)

Fig. 1



Lift plunger to check switch as shown.

Fig. 2



Sectional view from right

Fig. 3a

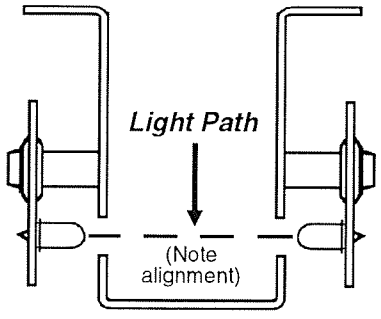
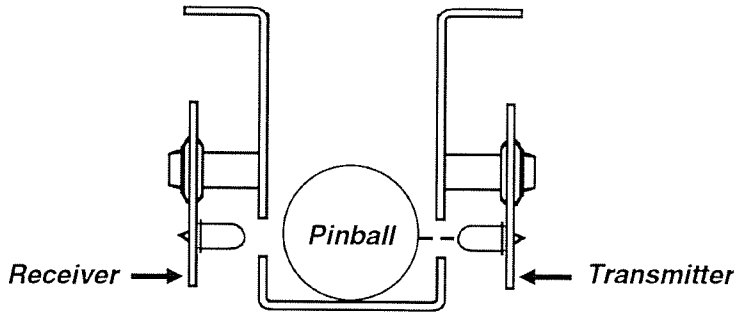


Fig. 3b



I M P O R T A N T
*If replacement of **LED** is required, insure that is **mounted correctly** before and after soldering (See Fig. 4a / 4b).*

Fig. 4a
Correct Position

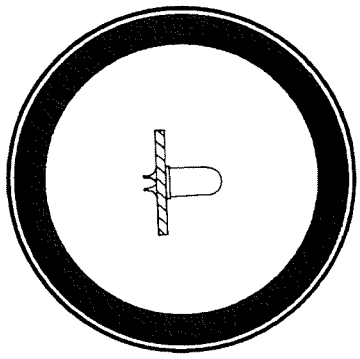
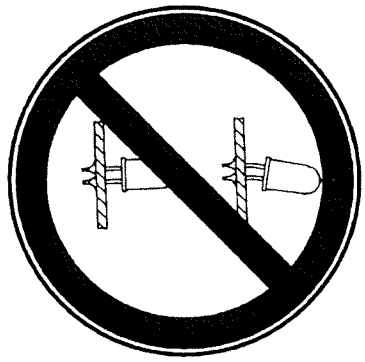
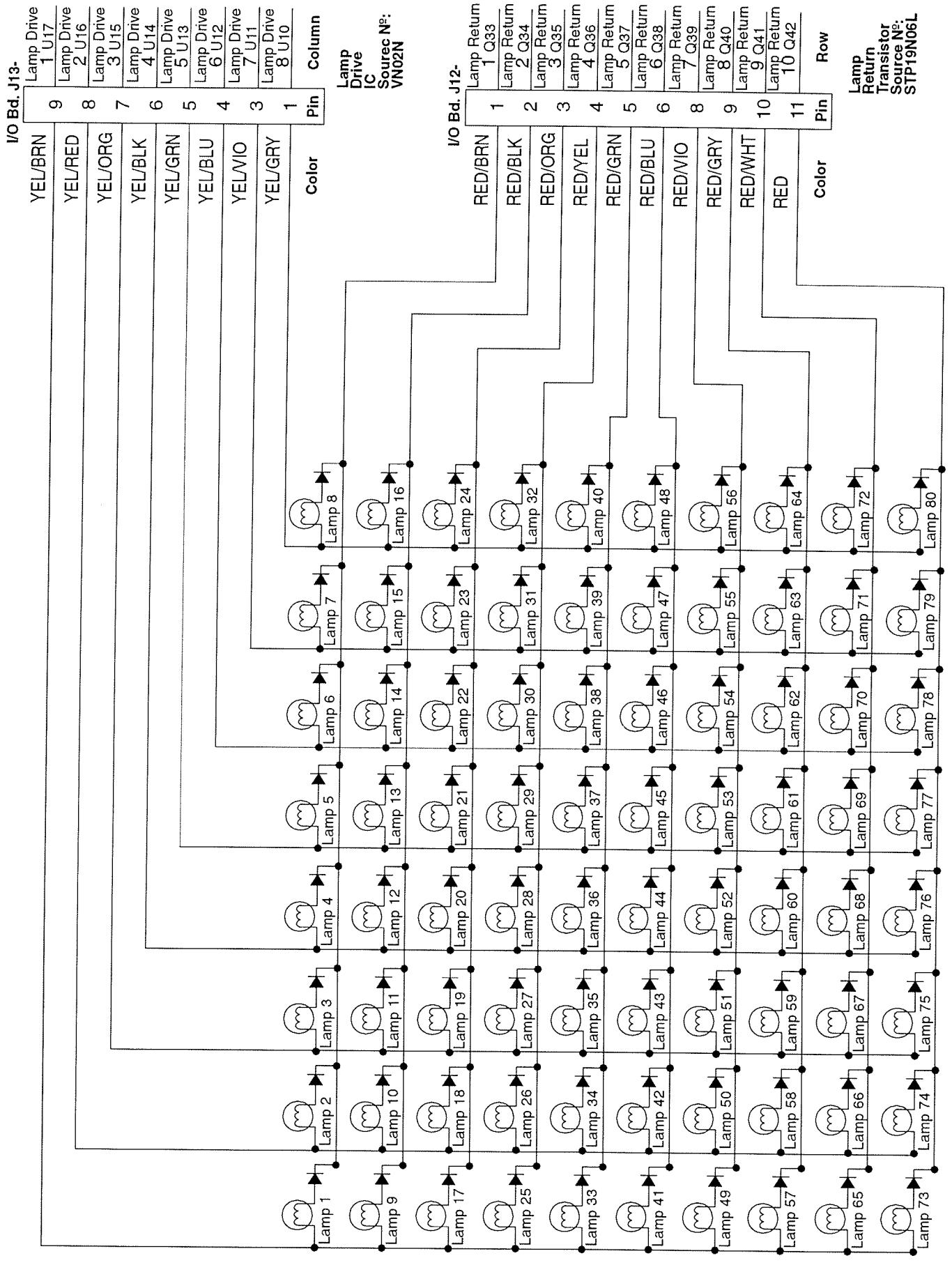


Fig. 4b
Incorrect Position



Playfield Switch Wiring Diagram

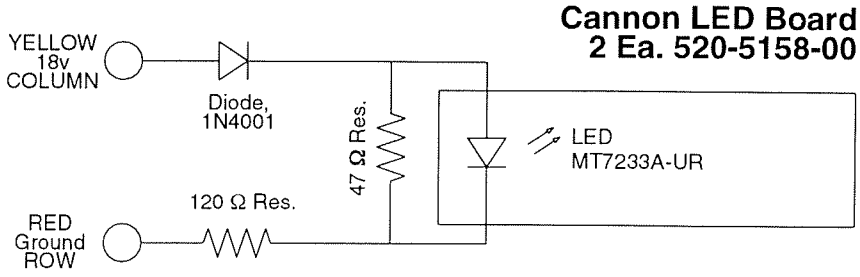
Playfield Lamp Wiring Diagram



Cannon LED Schematic & Parts

Reference:	
LT. BD.:	LAMP COL. 7 #63 YEL/VIO LAMP ROW 8 RED/GRY
RT. BD.:	LAMP COL. 8 #64 YEL/GRY LAMP ROW 8 RED/GRY

Cannon LED Board
2 Ea. 520-5158-00



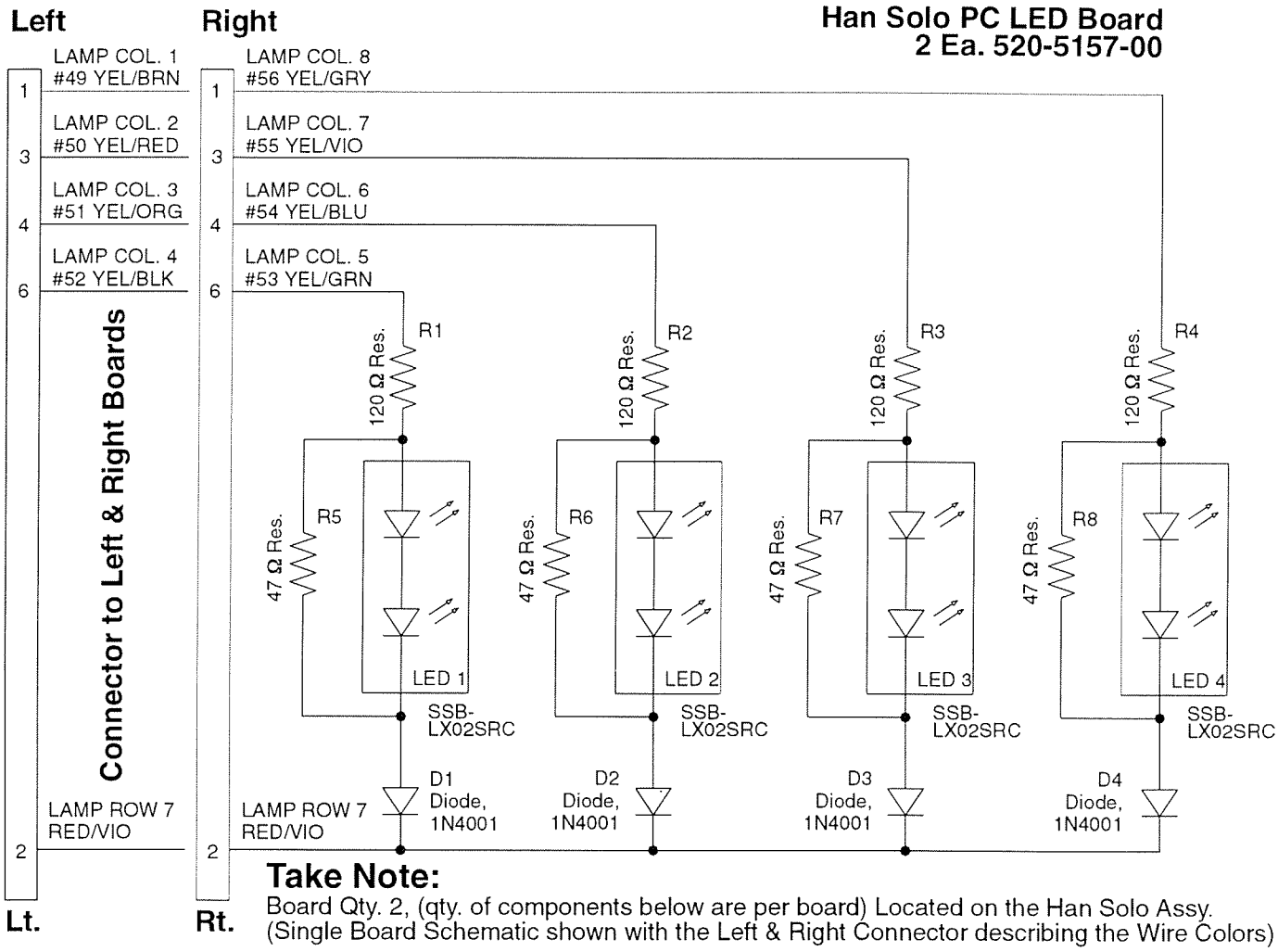
Take Note:

Board Qty. 2, (qty. of components below are per board) Located on the Magna-Diverter Assy., 500-6176-05-56, part of the Gun-Barrel Sub-Assy., 515-6683-00-56.

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	112-5001-00	n/a	Diode, 1N4001
2	1	121-5003-00	n/a	120 Ω, 1/4 W Resistor
3	1	121-5016-00	n/a	47 Ω, 1/4 W Resistor
4	1	165-5101-00	n/a	Lg. Round Green LED, (SSL-LX100133GD)

Han Solo PCB LED Schematic & Parts

Han Solo PC LED Board
2 Ea. 520-5157-00



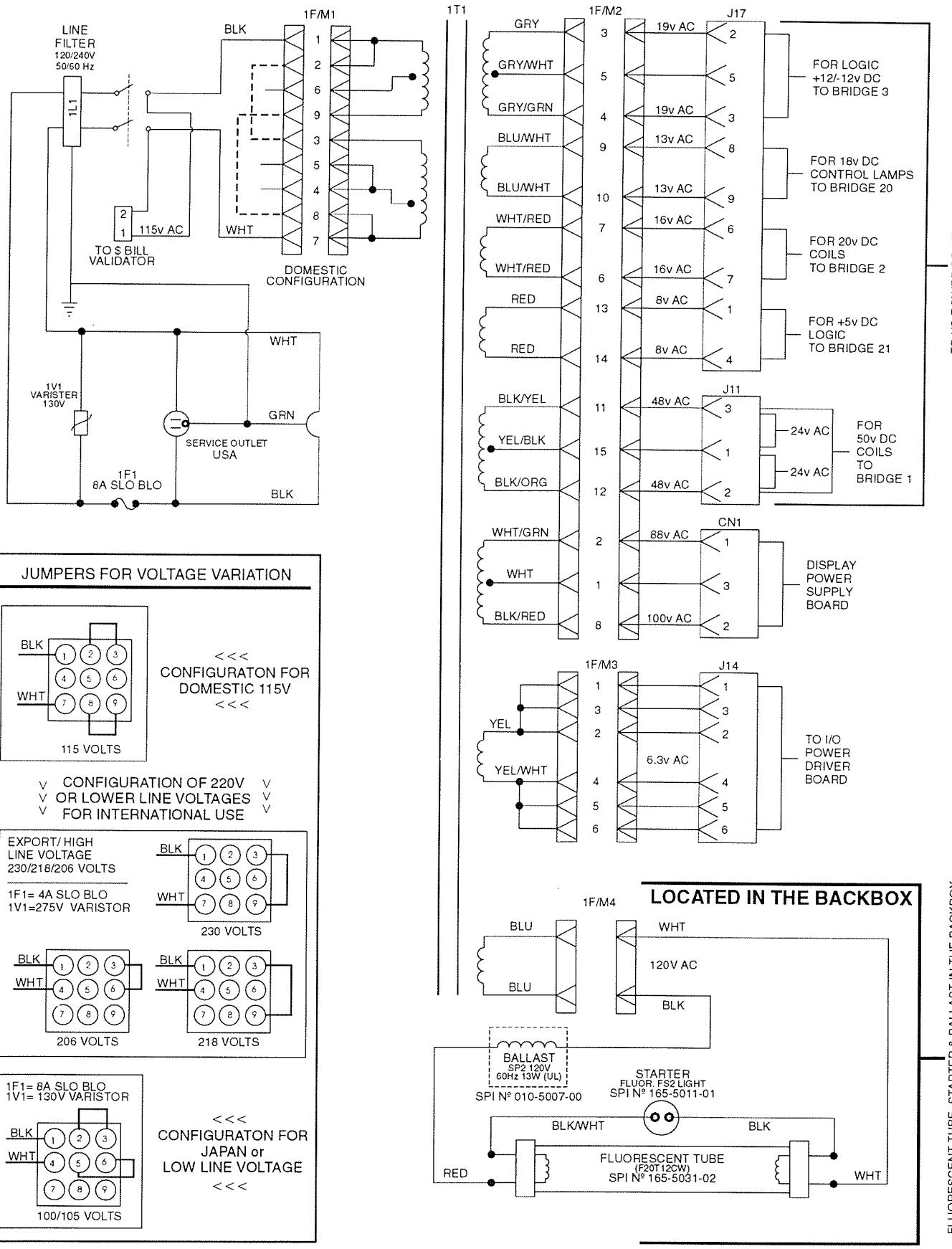
Take Note:

Board Qty. 2, (qty. of components below are per board) Located on the Han Solo Assy. (Single Board Schematic shown with the Left & Right Connector describing the Wire Colors)

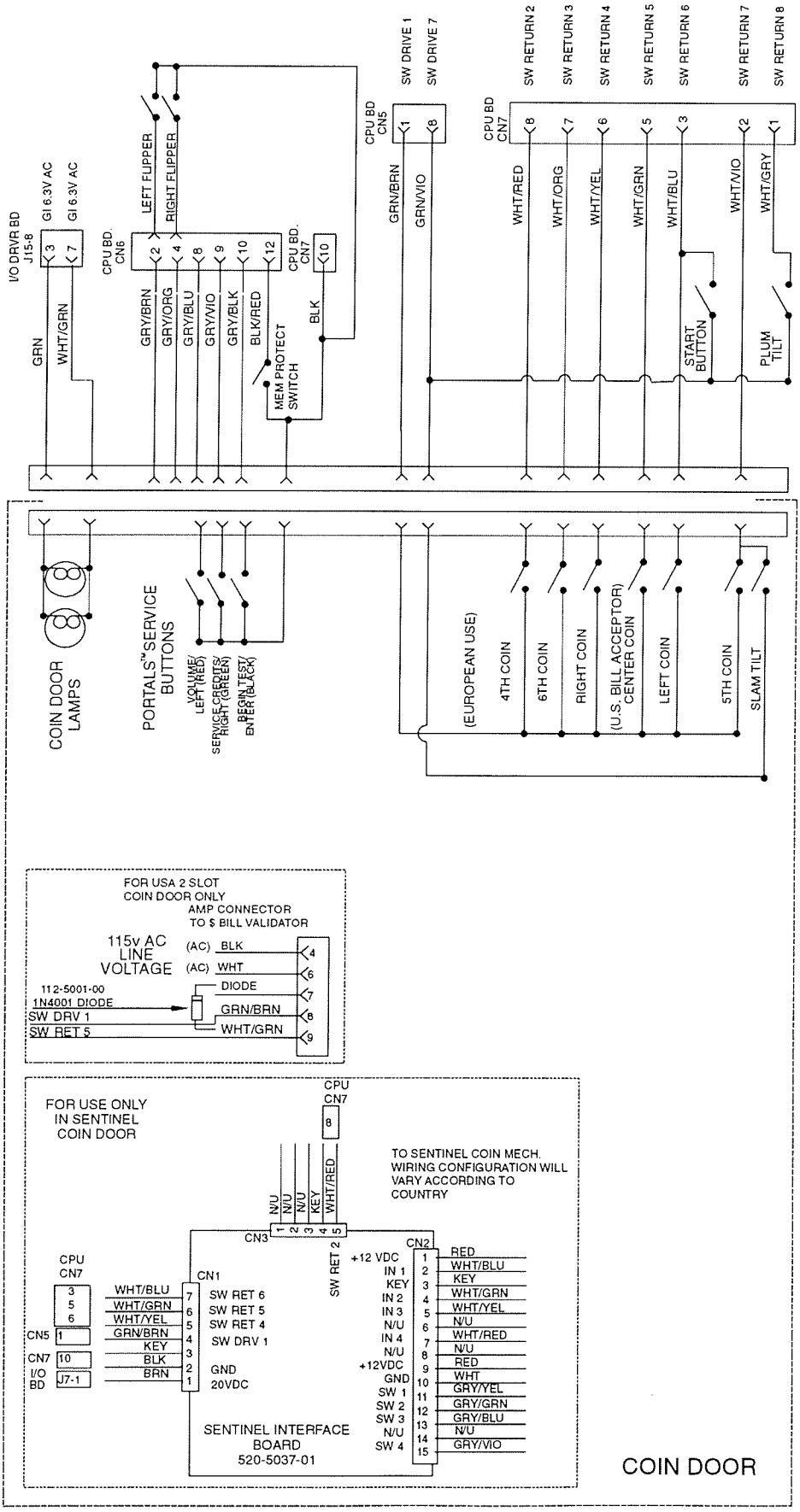
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	4	121-5003-00	R1, R2, R3, R4	120 Ω, 1/4 W Resistor
2	4	121-5016-00	R5, R6, R7, R8	47 Ω, 1/4 W Resistor
3	4	165-5102-00	LED 1, LED 2, LED 3, LED 4	Sm. Red LED, SSB-LX02SRC
4	4	112-5001-00	D1, D2, D3, D4	Diode, 1N4001

Cabinet Wiring

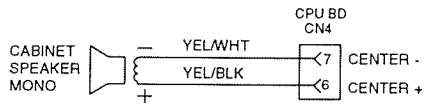
Transformer Power Wiring Diagram



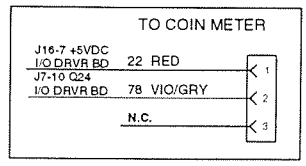
Cabinet/Coin Door Wiring Diagram

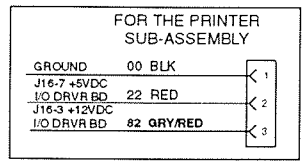


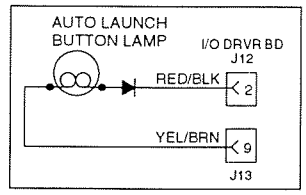
CABINET HARNESSES:



COIN DOOR CONNECTOR

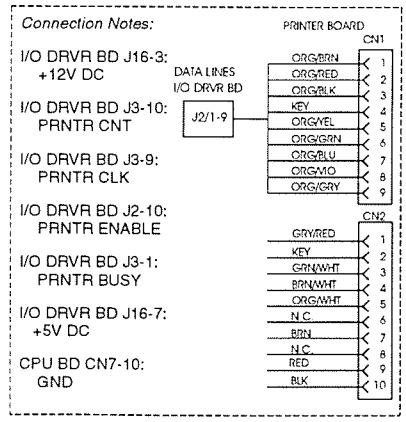






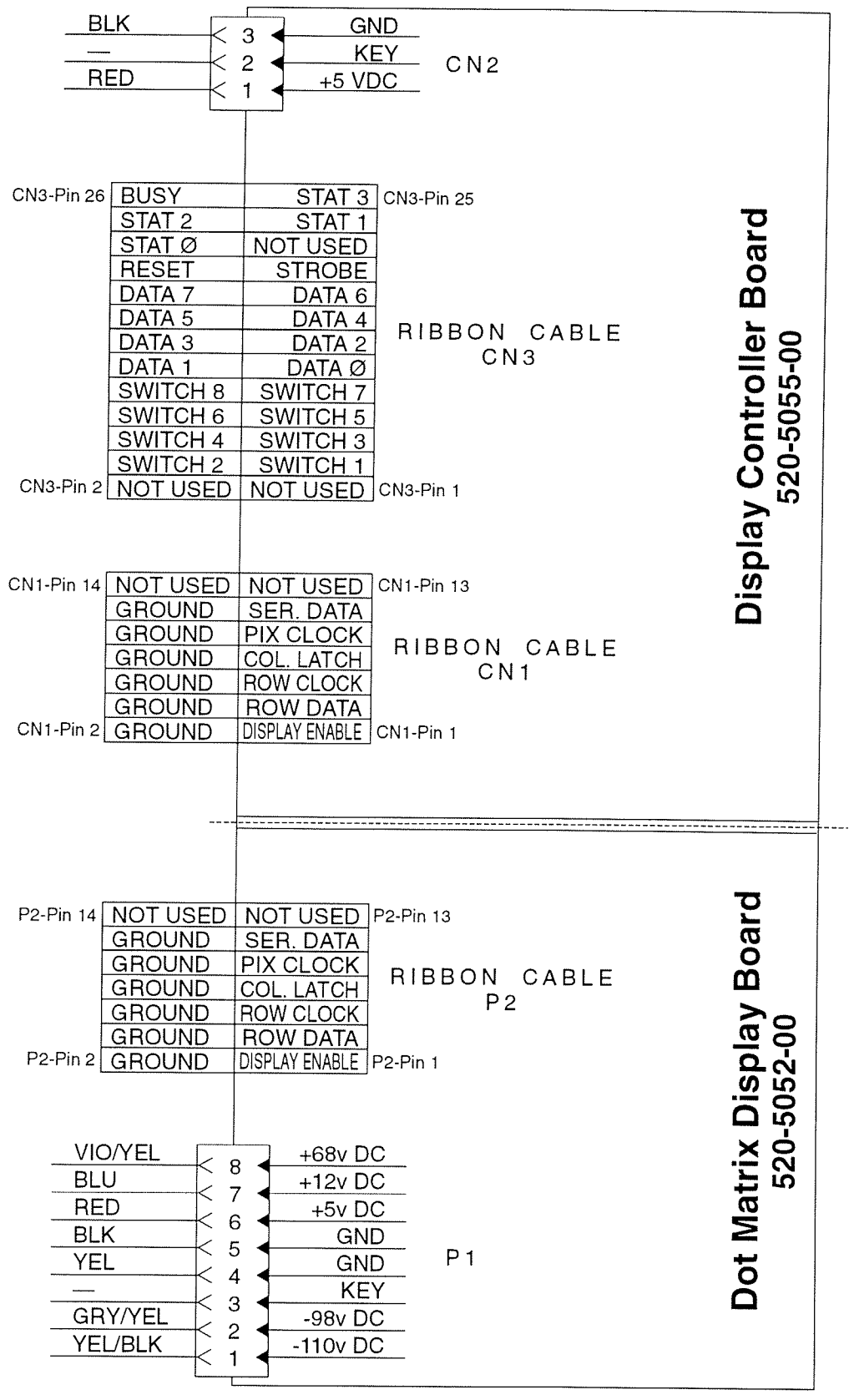
PRINTER INTERFACE OPTIONAL

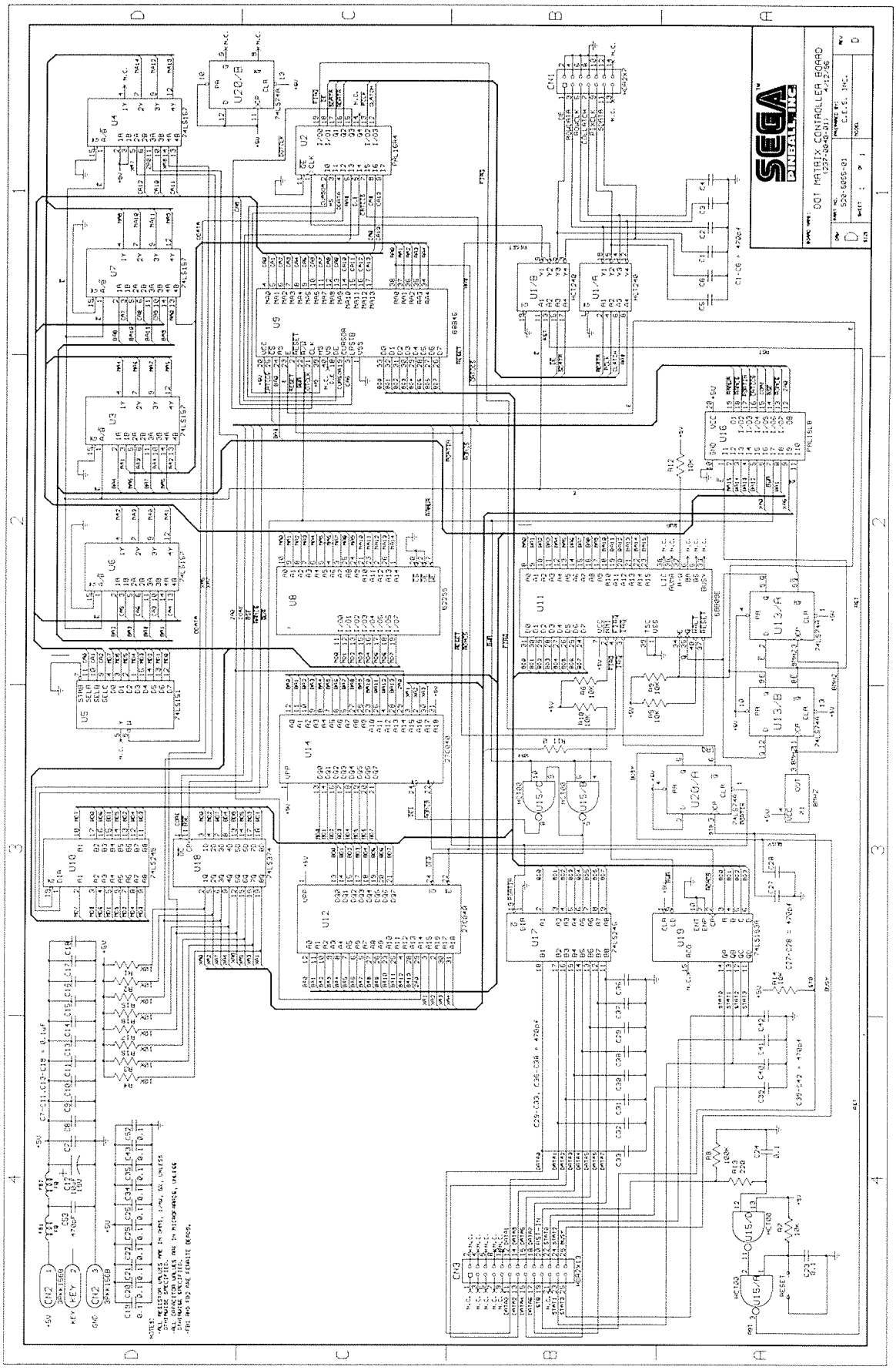
Cable Wiring Harness Part Nº:
036-5408-00
RS-232 Printer Interface Board Part Nº:
520-5069-00

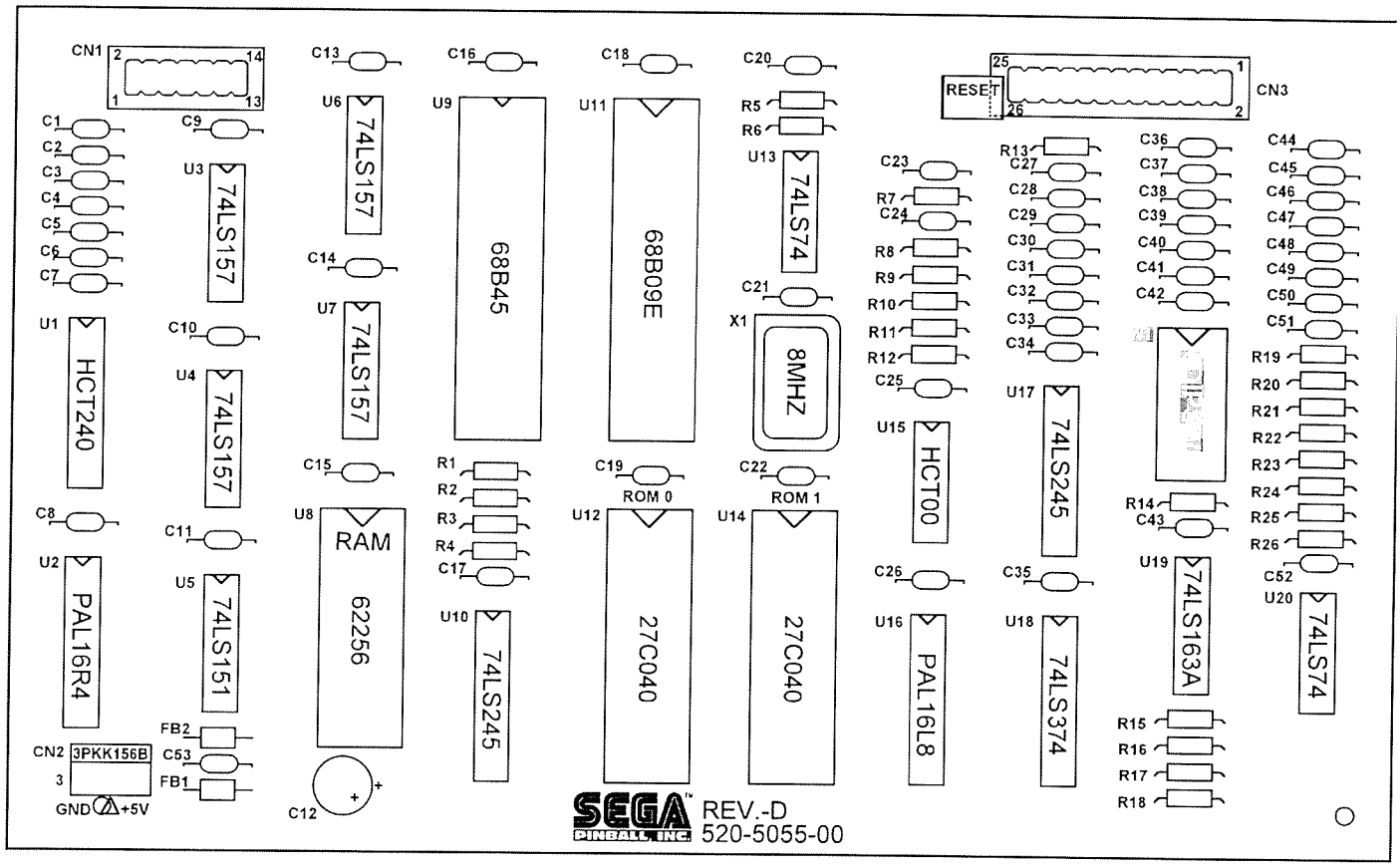


Printed Circuit Boards (PCBs)

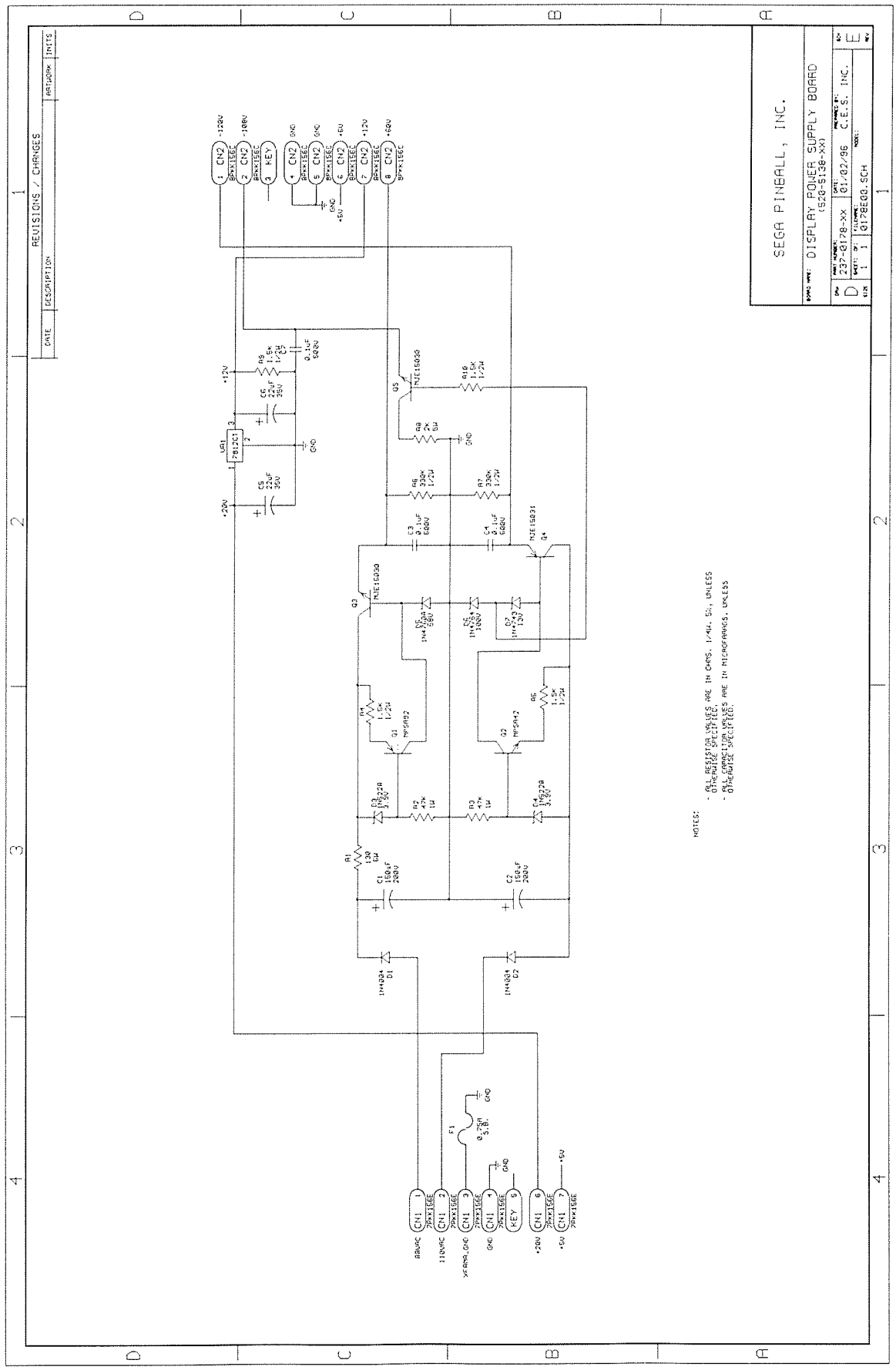
Dot Matrix Display/Display Controller Bd. Combined Display Connections



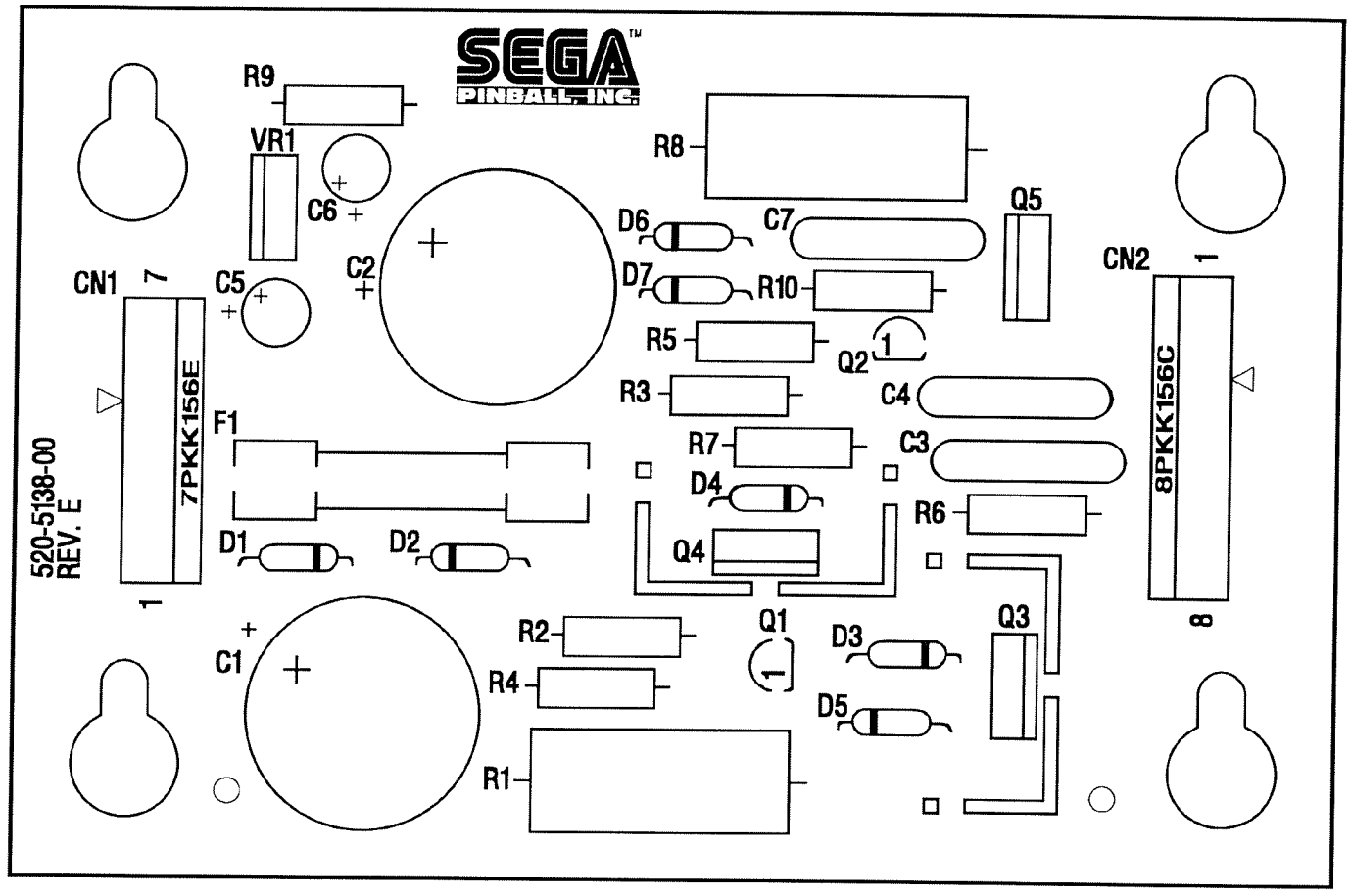

SEGA
PINBALL INC.
001 MATRIX CONTROLLER BOARD



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	2	077-5216-00	U12 U14	32-PIN SOCKET
2	1	100-0397-00	U8	32K X 8 STATIC RAM (62256L-10PC)
3	1	100-0189-01	U11	68B09E
4	1	100-0233-00	U9	68B45
5	1	100-0351-00	U15	74HCT00
6	1	100-5001-00	U1	74HCT240
7	1	100-5000-00	U5	74LS151
8	4	100-0046-00	U3 U4 U6 U7	74LS157
9	1	100-0049-00	U19	74LS163A
10	2	100-0058-00	U7, U10	74LS245
11	1	100-0064-00	U18	74LS374
12	2	100-0037-00	U13 U20	74LS74
13	1	965-0107-00	**U16 - ORANGE DOT** (Note the type of PAL)	PAL16L8 (15CN) (Programmed) **- ORANGE DOT**
14	1	965-0108-00	**U2 - ORANGE DOT** (Note the type of PAL)	PAL16R4 (25CN) (Programmed) **- ORANGE DOT**
15	23	125-5031-00	C7 C8 C9 C10 C11 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C34 C35 C43 C52	.1 mF (104) AXIAL CER. CAP
16	1	121-5051-00	R8	100K OHM 1/4 W C.F. RES. 5%
17	15	121-5011-00	R1 R2 R3 R4 R5 R6 R7 R9 R10 R12 R14 R15 R16 R17 R18	
18	1	121-5014-00	R13	220 OHM 1/4 W C.F. RES. 5%
19	0	Not Used	R19 R20 R21 R22 R23 R24 R25 R26	NOT STUFFED
20	21	125-5028-00	C1 C2 C3 C4 C5 C6 C27 C28 C29 C30 C31 C32 C33 C36 C37 C38 C39 C40 C41 C42 C44 C45 C46 C47 C48 C49 C50 C51 C53	470 pF (471) AXIAL CER. CAP (C44—C51 NOT STUFFED)
21	2	n/a	FB1 FB2	FERRITE BEAD (2743001182)
22	1	125-5015-00	C12	100uF 25V CAP (RADIAL ELEC)
23	1	045-5015-26	CN3	13-PIN DUAL ROW .1" HDR CONN.
24	1	045-5015-03	CN2	3-PIN KK-156 CONN. (540445-3)
25	1	045-5015-02	CN1	7-PIN DUAL ROW .1" HDR. CONN.
26	1	140-0013-00	X1	8Mhz CLOCK OSCILLATOR
27	0	Not Used	SW1	NOT STUFFED
28	1	See Page iii Table	U12 U14 (ROM 0)	4MB ROM (U14 NOT STUFFED)


SEGA PINBALL, INC.
DISPLAY POWER SUPPLY BOARD
(520-5138-XX)
REVISIONS / CHANGES
DATE
DESCRIPTION
APPROV
INITS
NOTES:
- ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.

Display Power Supply Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	200-5000-10	F1	S.B. 0.75A
2	2	535-5000-11	Q3 Q4	HEATSINKS - AAVID #563002
3	2	125-5041-00	C2 C1	200V 150uF RADIAL LYTIC
4	4	121-5038-00	R10 R9 R5 R4	1/2W 1.5K
5	2	121-5059-00	R7 R6	1/2W 330K
6	2	121-5060-00	R2 R3	1W 47K
7	1	121-5061-00	R1	5W 130
8	1	121-5062-00	R8	5W 2K
9	2	112-0053-00	D3 D4	3.9V 5228
10	1	112-0062-00	D5	68V 4760A
11	1	112-0049-00	D6	100V 4764
12	1	112-0061-00	D7	13V 4743
13	1	110-0100-00	Q1	MPSA92
14	1	110-0082-00	Q2	MPSA42
15	3	125-5035-00	C3 C4 C7	500V 0.1uF CERAMIC DISK
16	1	110-0103-00	Q4	MJE15031
17	2	110-0101-00	Q3 Q5	MJE15030
18	2	125-5003-00	C5 C6	25V 22uF RADIAL LYTIC
19	1	124-5003-00	VR1	7812CT
20	1	045-5015-08	CN2	8pkk156 (PIN3=KEY)
21	2	112-5003-00	D1 D2	1N4004
22	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
23	2	n/a	Q3 Q4	6/32 KEY NUT
24	2	n/a	Q3 Q4	6/32 X 3/8 SCREW
25	2	205-0004-00	F1	FUSECLIPS

I/O Power Driver Board Theory of Operation

5V Supply:
An AC voltage of approximately 9V comes into the board at [J17-(1-4)] this AC voltage is then full-wave rectified by bridge BRDG 21 and filtered by capacitor C203. The resulting voltage is 11VDC which is inserted into a linear voltage regulator for the output of 5VDC. This 5V regulated voltage can be adjusted by potentiometer R116 the voltage should be set to 5.00V. Besides powering the I/O Board the regulated 5 volts supplies power to the CPU & Sound Board Gas Plasma Display and Plasma Controller Board. Power for these devices comes off the I/O Board on [J16-(4-8)].

+5 +12 +50V +18V +20V LED Indicators:
These DC voltages are derived on the I/O board by rectification and filtering. Each has a LED indicating that power is being supplied to each of these voltage sources. The -12V supply comes from the same transformer winding as the +12V thus it does not have a led indicator. ** Note that the +50V &+20V power sources are turned off by the interlock switches when the coin door is open.

LED	Supply Voltage	LED	Supply Voltage
L2	+5	L200	+20V
L201	+50V	L202	+18V
L203	+12V		

Reset Circuitry:
The I/O will reset in three cases:
1. The CPU is in reset. The CPU's reset signal is fed into the I/O through connector J1 and forces the I/O into reset.
2. The 5V supply has fallen below 4.75V.
3. The watchdog is not being fed by the scanning of the light matrix. More specifically pin 19 of U6 must be toggling once every 50ms to prevent the watchdog from resetting. The scanning of the light matrix is controlled by the CPU through J1.

LED L204 shows the reset state of the I/O board. If this LED is not lit either the 5VDC is below 4.75V or the CPU board is holding the I/O in reset. If the LED is flashing this means that the watchdog is not being feed by the CPU board and the I/O is oscillating into and out of reset. If the LED is continuously on the board is out of reset and communication from the CPU to the lamp matrix is confirmed. Testpoint Blanking is the actual reset signal on the I/O Board. A low voltage indicates that it is in reset this will turn off all Solenoid drivers Flash Lamps Lamp Matrix Drivers Auxiliary Outputs and Flipper Outputs. A high voltage indicates that it is out of reset and normal operation can take place.

Address Decoding:
All Address decoding is done by two 74LS138 (3 of 8 decoder). Both of these must be in operation for the I/O Board to function properly.

Solenoid Drivers & Flash Lamps:
J8 & J9 are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. J8 & J9 consist of MOSFET drivers 20N10L which can easily & safely be tested by clipping one end of a clip-lead to test point FET TPL1 and then the other to the corresponding gate resistor R1-R16 (see note 1). This will apply 3.4V to the gate of the MOSFET transistor thus switching it on. J7 & J6 each are a bank of 8 low side driver for driving lamps or other lower current solenoids. They use a bipolar power transistor TIP122 which can also be tested by using test point TIP TPL3 and the corresponding resistors R17-R32 (see note 1).

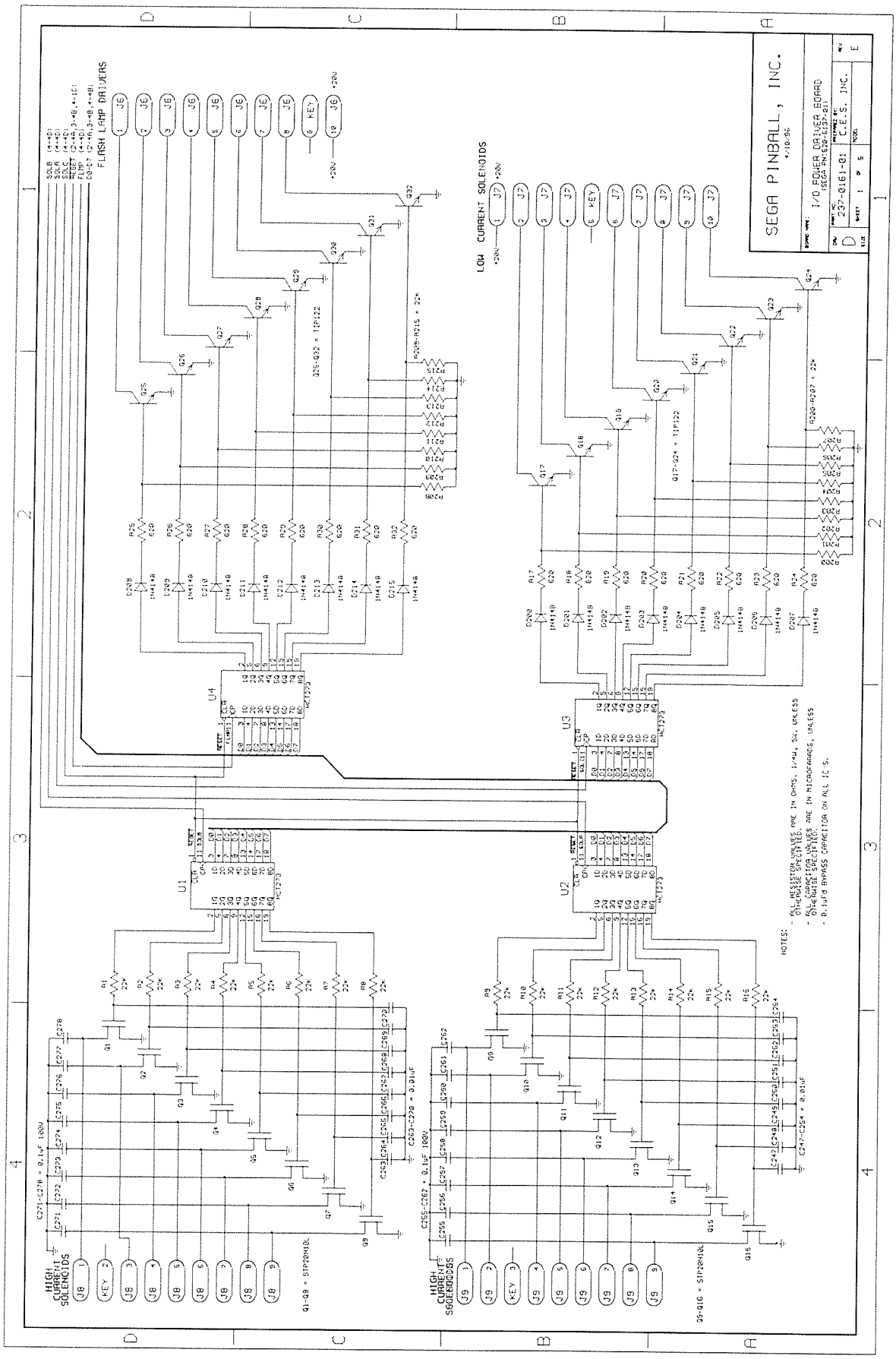
Note 1 * Clip on the resistor side with the white stripe.
** R1 controls Q1 and R2 controls Q etc...

Auxiliary In & Out:
J2 8 CMOS Outputs sometimes used for a printer interface.
J3 8 CMOS Inputs general purpose inputs.

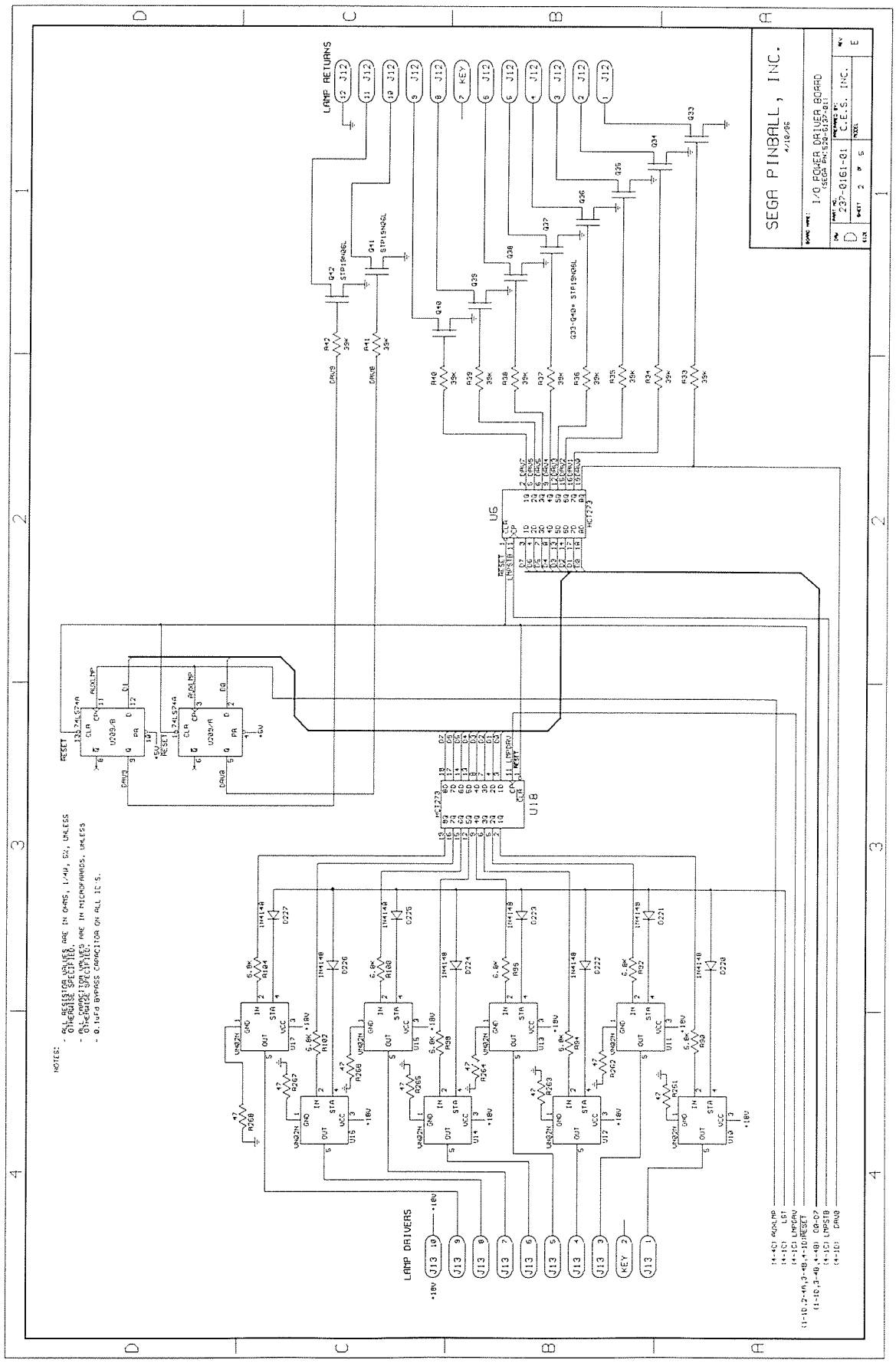
Lamp Matrix:
J12 has 10 low side drivers for the lamp strobes which consist of 19N06L MOSFETS. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. J13 has 8 high side drivers with each having a status indicator. All the status indicators are logically 'OR'ed together and fed back to the CPU. The status can identify open loads (for example open lamp filaments or intermittent connections) and short circuits. These drivers are also short-circuit protected.

General Illumination (G.I.) Lights:
J15 has 6VAC switched on and off by a relay on the I/O Board. The relay is controlled by Q200 which supplies power to the 24V coil winding to activate the relay. There are 4 taps on J15 each fused at 5A for this 6VAC source.

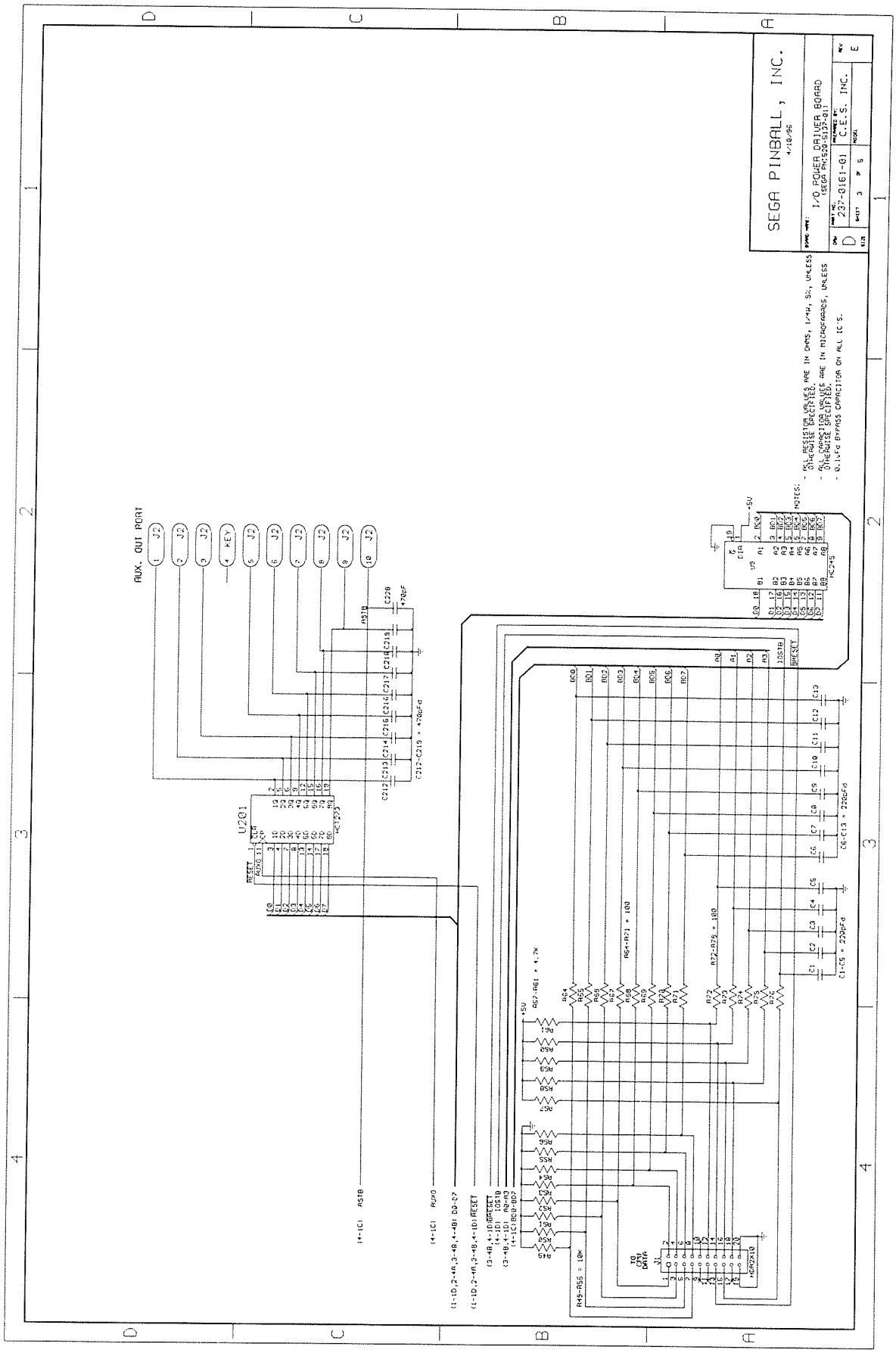
I/O Power Driver Board Schematic (Sheet 1 of 5)



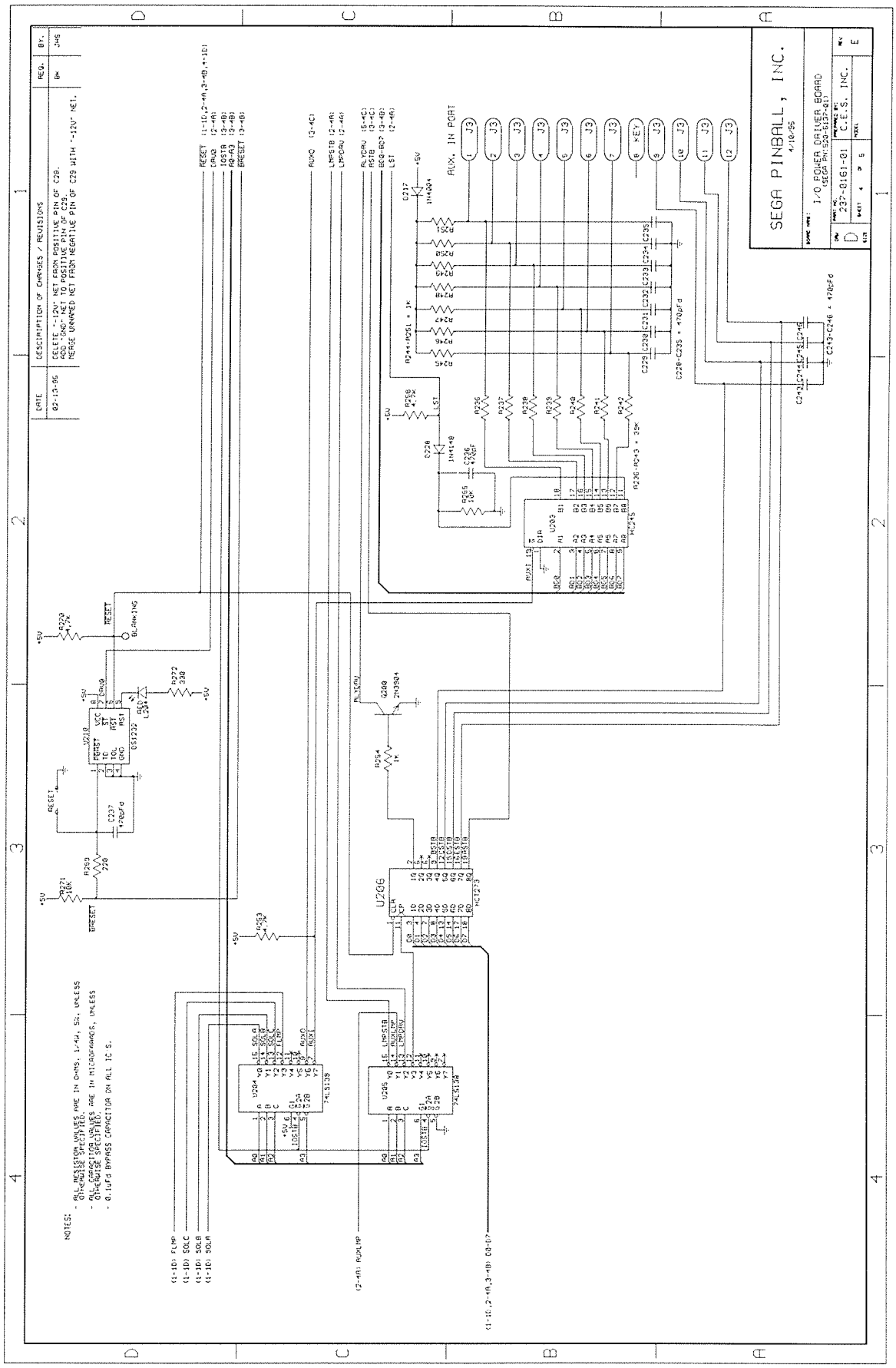
I/O Power Driver Board Schematic (Sheet 2 of 5)

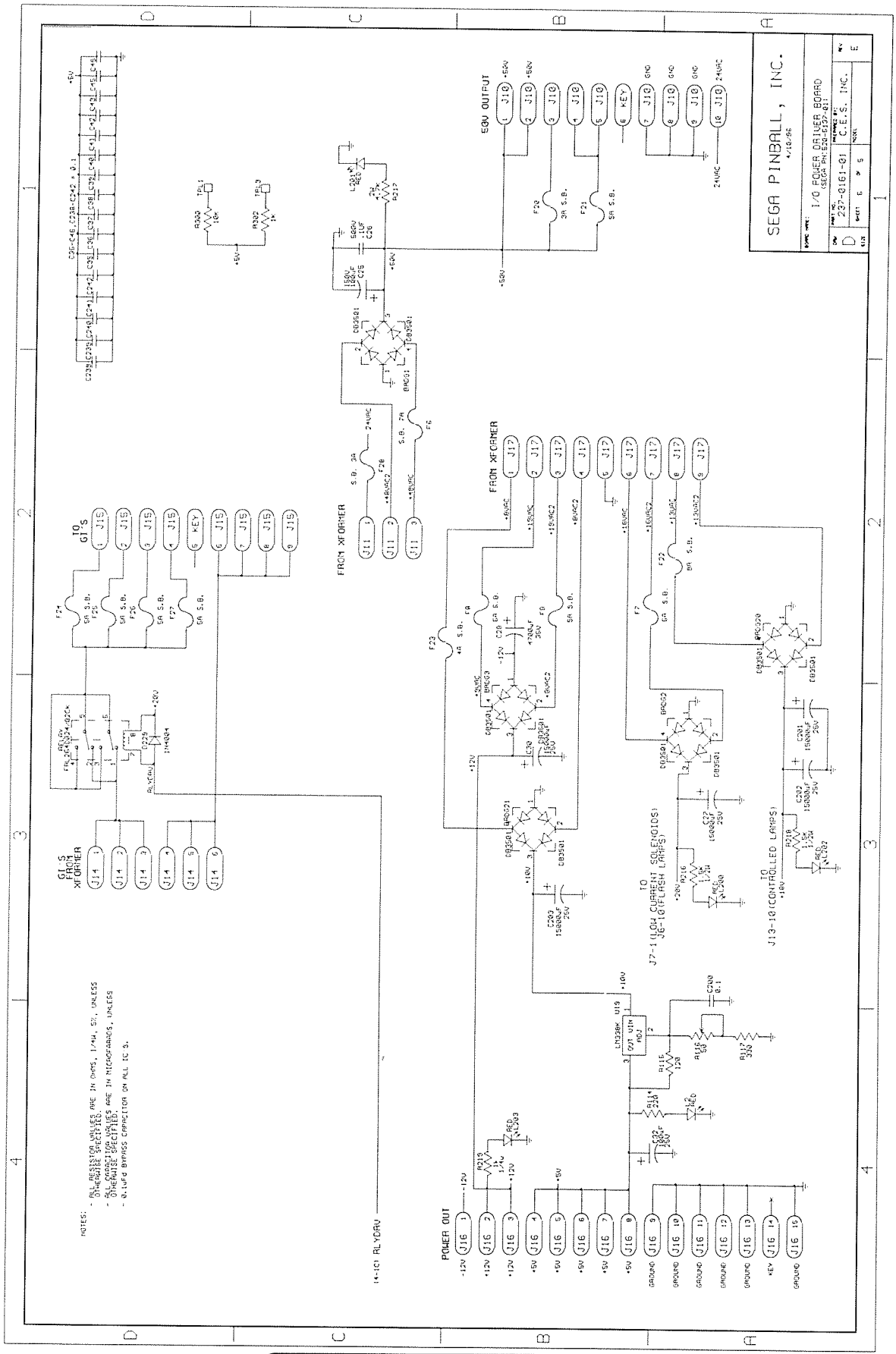


I/O Power Driver Board Schematic (Sheet 3 of 5)

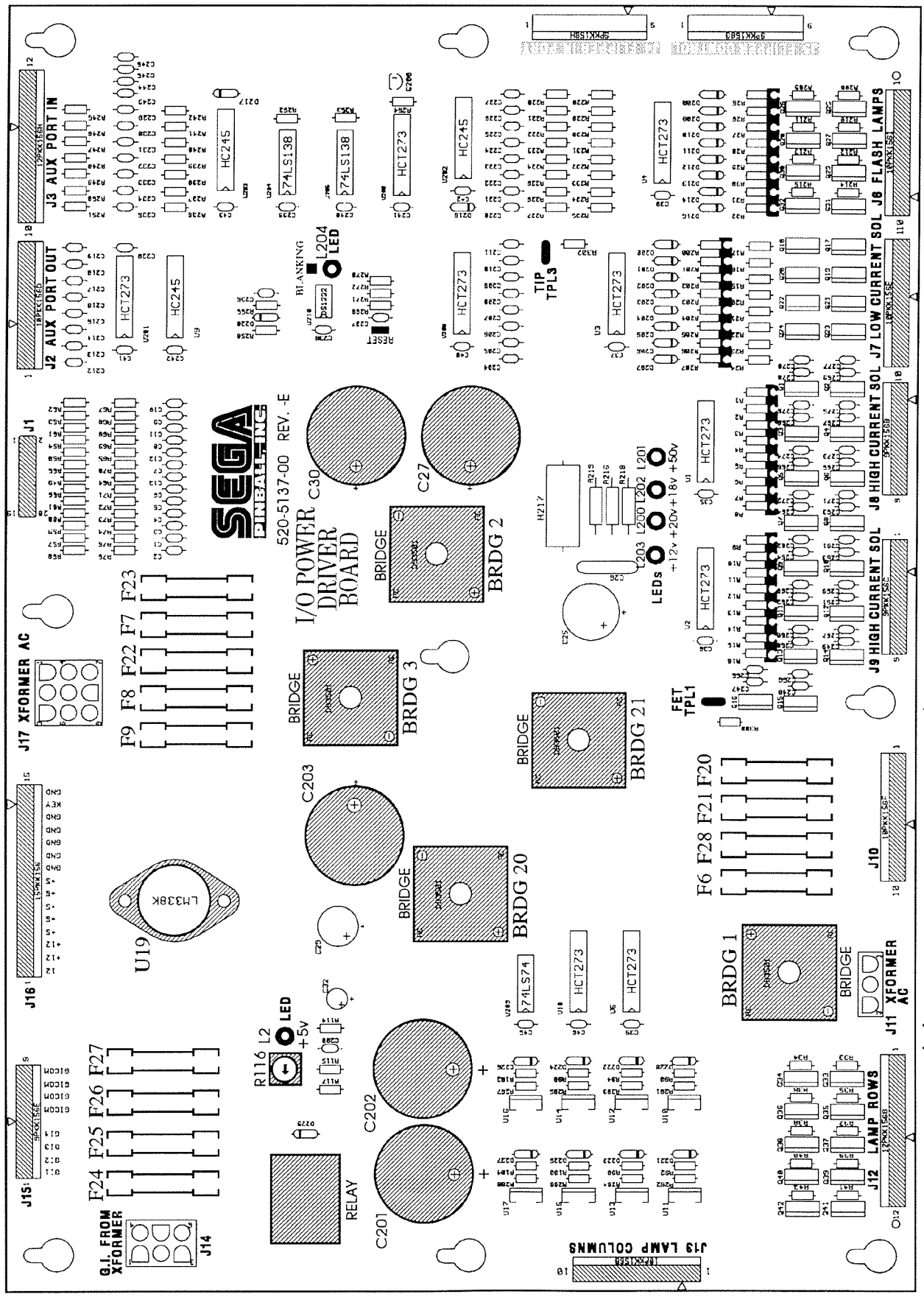


I/O Power Driver Board Schematic (Sheet 4 of 5)




SEGA PINBALL, INC.
I/O POWER DRIVER BOARD
SEGA PN:520-5137-01
237-0161-01
C.E.S. INC.
50V OUTPUT
FROM XFORMER
I/O GI'S
GI'S FROM XFORMER
J7-1(HIGH CURRENT SOLENOIDS) J6-10(FLASH LAMPS)
J13-10(CONTROLLED LAMPS)
POWER OUT
14-101 RLYDRV
NOTES:
- ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
- 0.1uFd BYPASS CAPACITOR ON ALL IC'S.

I/O Power Driver Board Component Layout



I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	16	125-5027-00	C260 C259 C258 C257 C256 C278 C271 C255 C261 C262 C277 C276 C275 C274 C273 C272	100V 104 (0.1uF)
2	22	125-5028-00	C204 C206 C207 C208 C209 C210 C211 C235 C234 C228 C229 C230 C231 C232 C233 C219 C217 C216 C215 C214 C212 C213 C237 C218 C236 C205 C243 C245 C246 C244	471 (470pF) AXIAL CAP (C204—C11 Not Stuffed)
3	16	125-5029-00	C263 C264 C265 C270 C269 C268 C267 C266 C247 C254 C253 C252 C251 C250 C249 C248	103 (0.01uF)
4	13	125-5030-00	C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	221 (220pF)
5	0	Not Used	C227 C226 C220 C221 C222 C223 C224 C225	Not Stuffed
6	17	125-5031-00	C35 C36 C37 C38 C39 C40 C41 C42 C43 C45 C46 C200 C239 C238 C240 C241 C242	104 (0.1uF)
7	16	110-0106-00	Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q16 Q15 Q14 Q13 Q12 Q11 Q10 Q9	20N10L STP
8	32	121-5042-00	R2 R3 R4 R5 R6 R7 R8 R16 R15 R14 R13 R12 R11 R10 R9 R200 R201R202 R203 R204 R205 R206 R207 R215 R214 R213 R212 R211 R210 R209 R208 R1	22K
9	16	121-5003-00	R17 R32 R18 R19 R20 R21 R22 R23 R24 R31 R30 R29 R28 R27 R26 R25	620
10	17	121-5045-00	R237 R236 R40 R39 R38 R37 R36 R35 R34 R33 R238 R239 R240 R241 R242 R42 R41	39K
11	13	121-5007-00	R64 R72 R73 R74 R75 R76 R71 R70 R69 R68 R67 R66 R65	100
12	8	121-5029-00	R90 R92 R94 R96 R98 R100 R102 R104	6.8K
13	1	121-5030-00	R115	120
14	0	Not Used	R221 R220 R222 R223 R224 R225 R226 R227	Not Stuffed
15	9	121-5009-00	R254 R248 R249 R250 R251 R232 R246 R247 R245 R233 R234 R235 R230 R231 R228 R229 R302	1K 1/4 W REST. (R228—R235 Not Stuffed)
16	8	121-5032-00	R262 R261 R263 R264 R265 R266 R267 R268	47K 1/4W RESISTOR
17	2	121-5033-00	R269 R114	220K 1/4W RESISTOR
18	8	121-5021-00	R57 R58 R59 R60 R61R252 R253 R256 R270 R49	4.7K 1/4W RES. (R252 Not Stuffed)
19	11	121-5011-00	R271 R56 R55 R54 R53 R52 R51 R50 R255 R300	10K
20	2	121-5036-00	R117 R272	330
21	8	100-5019-00	U6 U4 U18 U2 U1 U200 U3 U201 U206	74HCT273 (U200 Not Stuffed)
22	1	Not Used	RESET	Not Stuffed
23	1	121-5009-00	R219	1/4W 1K
24	2	121-5038-00	R218 R216	1/2W 1.5K
25	7	200-5000-01	F24 F25 F26 F27 F8 F9 F7	S.B. 5A
26	1	200-5000-03	F6	S.B. 7A
27	1	200-5000-06	F23	S.B. 4A
28	1	200-5000-07	F22	S.B. 8A
29	3	200-5000-08	F20 F21 F28	S.B. 3A
30	1	045-5013-00	J15	9PKK156 (PIN 5=KEY)
31	1	045-5016-00	J16	15PKK156
32	1	100-5023-00	U210	DS1232
33	1	110-0069-00	Q200	2N3904
34	1	125-5032-00	C32	25V 100uF RADIAL LYTIC
35	1	045-5015-01	J1	20 PIN 0.1 DUAL ROW HEADER
36	1	100-0338-00	U202 U203	74HC245 (U202 Not Stuffed)
37	10	110-0088-00	Q41 Q33 Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q42	19N06L STP
38	6	165-5099-00	L203 L202 L204 L200 L2 L201	RED LED
39	1	045-5014-01	J2	10PKK156 (PIN 4=KEY)
40	1	121-5039-00	R116	50 OHM POT
41	16	110-0067-00	Q23 Q22 Q21 Q20 Q19 Q18 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q17 Q25 Q24	TIP122
42	1	125-5033-00	C25	150V 100uF RADIAL LYTIC
43	1	110-0058-00	U9	74LS245
44	1	125-5034-00	C29	35V 4700uF RADIAL LYTIC
45	1	190-5002-00	RELAY	FRL264D024/02CK RELAY
46	0	Not Used	J5	Not Stuffed
47	1	100-0037-00	U209	74LS74
48	0	Not Used	J4	Not Stuffed
49	2	100-0148-00	U204 U205	74LS138
50	1	125-5035-00	C26	500V .1UF CERAMIC DISK
51	1	100-0356-00	U19	LM338K
52	5	124-5000-00	BRDG20 BRDG3 BRDG1 BRDG2 BRDG21	DB3501
53	5	125-5036-00	C202 C203 C201 C30 C27	25V 15000uF RADIAL LYTIC
54	25	112-0054-00	D208 D225 D226 D221D220 D223 D227 D224 D222 D200 D201 D202 D203 D204 D205 D206 D207 D209 D210 D211 D212 D213 D214 D215 D228	1N4148
55	2	112-5003-00	D217 D216 D229	1N4004 (D216 Not Stuffed)
56	2	n/a	TPL3 TPL1	TEST POINT WIRE (24ga.) LOOPS
57	1	045-5014-01	J7	10PKK156 (PIN 5=KEY)
58	1	045-5014-01	J6	10PKK156 (PIN 9=KEY)
59	8	110-0089-00	U17 U16 U15 U14 U13 U12 U11 U10	VN02N
60	1	045-0014-03	J11	10-84-4030 (3 PIN MOLEX)
61	1	045-5015-00	J12	12PKK156 (PIN 7=KEY)
62	1	045-0014-09	J17	10-84-4090 (9 PIN MOLEX)
63	1	Not Used	BLANKING	TEST POINT - DO NOT STUFF
64	1	121-5050-00	R217	2W 4.7K SANDBAR
65	1	045-5014-01	J13	10PKK156 (PIN 2=KEY)
66	1	045-0014-06	J14	10-84-4060 (6 PIN MOLEX)
67	1	045-5014-01	J10	10PKK156 (PIN 6=KEY)
68	1	045-5015-00	J3	12PKK156 (PIN 8=KEY)
69	1	045-5013-00	J9	9PKK156 (PIN 3=KEY)
70	1	045-5013-00	J8	9PKK156 (PIN 2=KEY)
71	26	205-0004-00	-->	FUSECLIPS
72	1	n/a	U19	HEATSINK (5v Reg.)

CPU/Sound Board Theory of Operation

CPU Section:

The CPU is a 68B09E (U209) with up to 8Mbytes of CPU code space (U210). The CPU code is bank selected by the use of U211and each bank consists of 16Kbytes. 8Kbytes of RAM (U212) is available to the CPU. The RAM is battery backed and has a write protected area. Battery back up is accomplished by 3-AA Cells which have a test point VB to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of RAM can only be written to when the coin door is open. The coin door switch comes into the CPU on CN6-12 and is fed into the address decoding PAL U213. When this memory protect signal is low writes to the protected RAM area are prohibited. Address decoding for the system is accomplished by one PAL U213 and one 1-of-8 decoder U214.

A watchdog is used to monitor the CPU and the 5V supply. If the 5V supply is below 4.75 the watchdog will hold the CPU Board & I/O Board in reset. The watchdog must be fed at a rate of 250ms or faster. The signal used to feed the watchdog comes from the EPROM Bank select signal used to load U211. The CPU has a timer interrupt used as a heartbeat for the system this signal comes from counter U2. The clock for this counter is the CPU Q clock. Clearing the timer interrupt is done by reading the DIP Switch. The timer interrupt can be observed at test point FIRQ. In normal operation "FIRQ" should be toggling at a rate of 976Hz.

The I/O interface CN1 is buffered by 2 HC245 chips. The CPU's reset line is buffered by Q10 and fed over to the I/O through CN1. An I/O strobe signal is feed through CN1-15 and is used to notify the I/O that a valid address is being sent.

Switches:

The Switch Matrix consists of 8 2N3904 Transistors which pull one of 8 strobes 'low' to *activate* a Single Column of switches. The *Switch Return Signals* are fed into CN7 [SWITCH ROWS] and are highly filtered and compared to a 2.5v *reference voltage*. The *Switch Return Voltage* must be below 2.5v to make a *Valid Switch Closure*. If *false switches* are appearing, check that none of the 2N3904 Transistors are permanently pulling the *strobe line low*. Only one strobe from CN5 [SWITCH COLUMNS] should be *low at any time*. CN6 [DEDICATED SWITCH IN] is a *Dedicated Bank of Input Switches*. Switches connected to CN6 are connected to ground instead of a strobe and may be read at any time.

Plasma Interface:

The data path for communication to and from the Plasma Controller Board is 8 bits wide. There are separate *Input* and *Output Busses*. The *Input Bus* from the Plasma Controller to the CPU/Sound Board comes in on CN8 [PLASMA CONTROL]-Pins 3-10 and is fed into **U200** for input to the CPU's *Data Bus*. Data going out to the controller comes from the CPU's *Data Bus* through **U201** and onto CN8-Pins 11-18. Status back from the Plasma Controller comes in on CN8-Pins 22-26 and is fed into **U202** for input to the CPU's *Data Bus*. Two control signals that go out to the Plasma Controller are **PRES** [PLASMA RESET] and CN8-Pin 19 [**PSTB** - *Plasma Strobe*]. The Plasma Reset is software controllable through **U216/B** and also has a test point "Plasma Reset". The *Plasma Strobe Signal* to the controller is generated from **U216/A** and is *used to latch data* into the Plasma Controller.

Sound Section:

The audio section consists of a BSMT sound chip U9 Sound EPROMs (U17 U21 U36 U37) 68B09E U6 and Sound Code EPROM U7. The BSMT latches sound EPROM addresses in U13 & U12 for output to the Sound EPROMs. Sound Data from the EPROMs is read through U19 to the BSMT. The EPROMs are bank selected by U22. When the BSMT has sound data to be played out to the speakers it loads 16 bits into a 16 bit shift register made up of U24 & U23. The data stream from the shift register is serially shifted into a stereo 16 bit Digital to Analog Converter (DAC). When the system is operating properly the ws(word select) input of the DAC will be toggling. The ws input is used to latch the right and left channel sound data into the DAC. If the ws line is not oscillating no analog signal will come out of the DAC. The DAC outputs are a controlled current source. These outputs are converted to a voltage by an operational amplifier U30 to form the analog signal. Test points AOR and AOL are the outputs of the operational amplifier. These outputs are then fed directly into three power amplifiers (TDA2030A) or optionally into an analog volume control chip U35 for a potentiometer volume control. The analog section has its own +5V & -5V derived from VR1 & VR2. These separate supply voltages are for the DAC U26 Operational Amplifier U30 and analog volume control U35.

Sound calls are made from the CPU's 68B09E U200 to the sound section by latching data into U5. The sound section's CPU 68BO9E (U6) reads in this data and handles the interfacing to the BSMT.

Other Test Points:

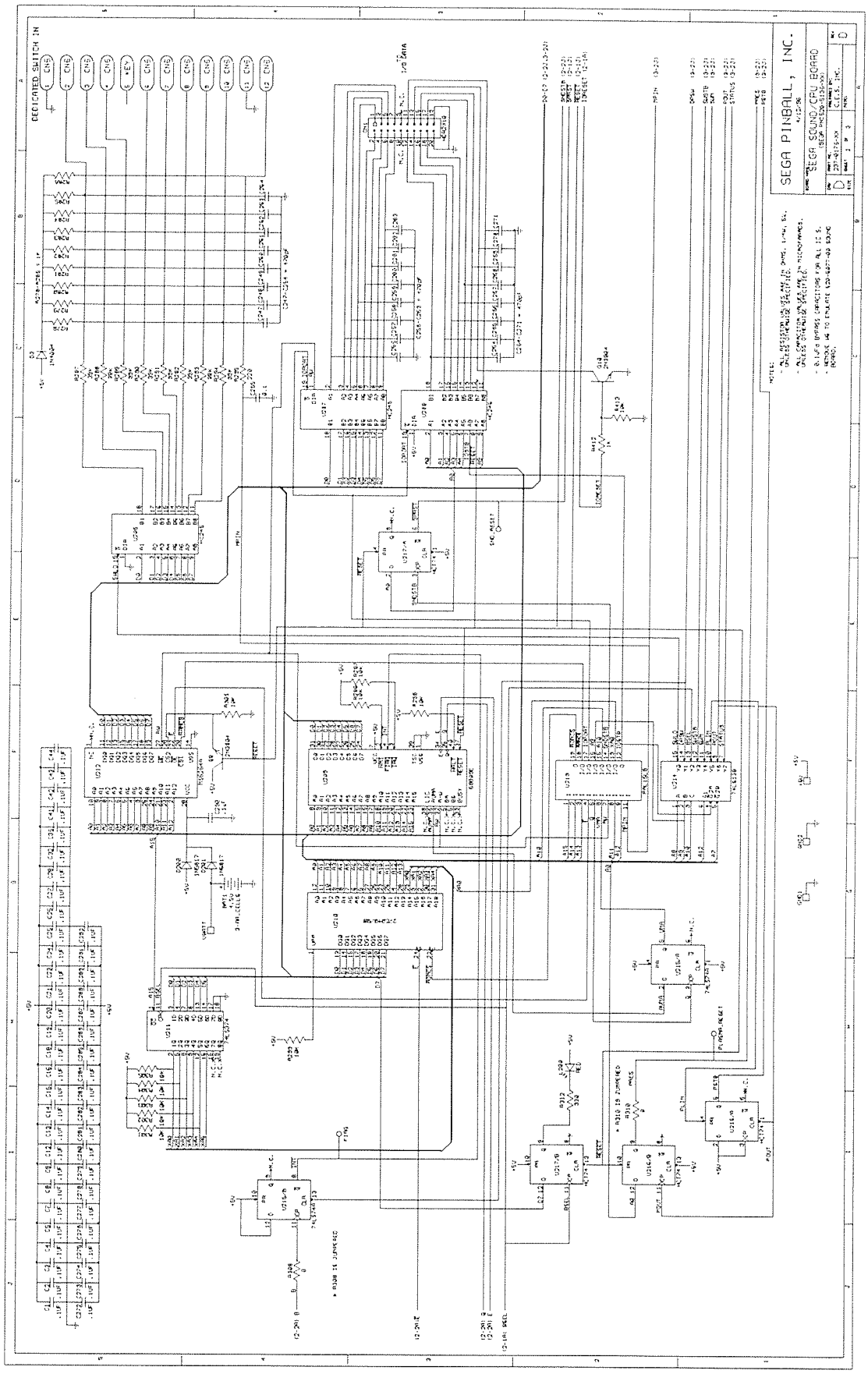
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

24Mhz - The oscillator used for the BSMT & derivation of E & Q.

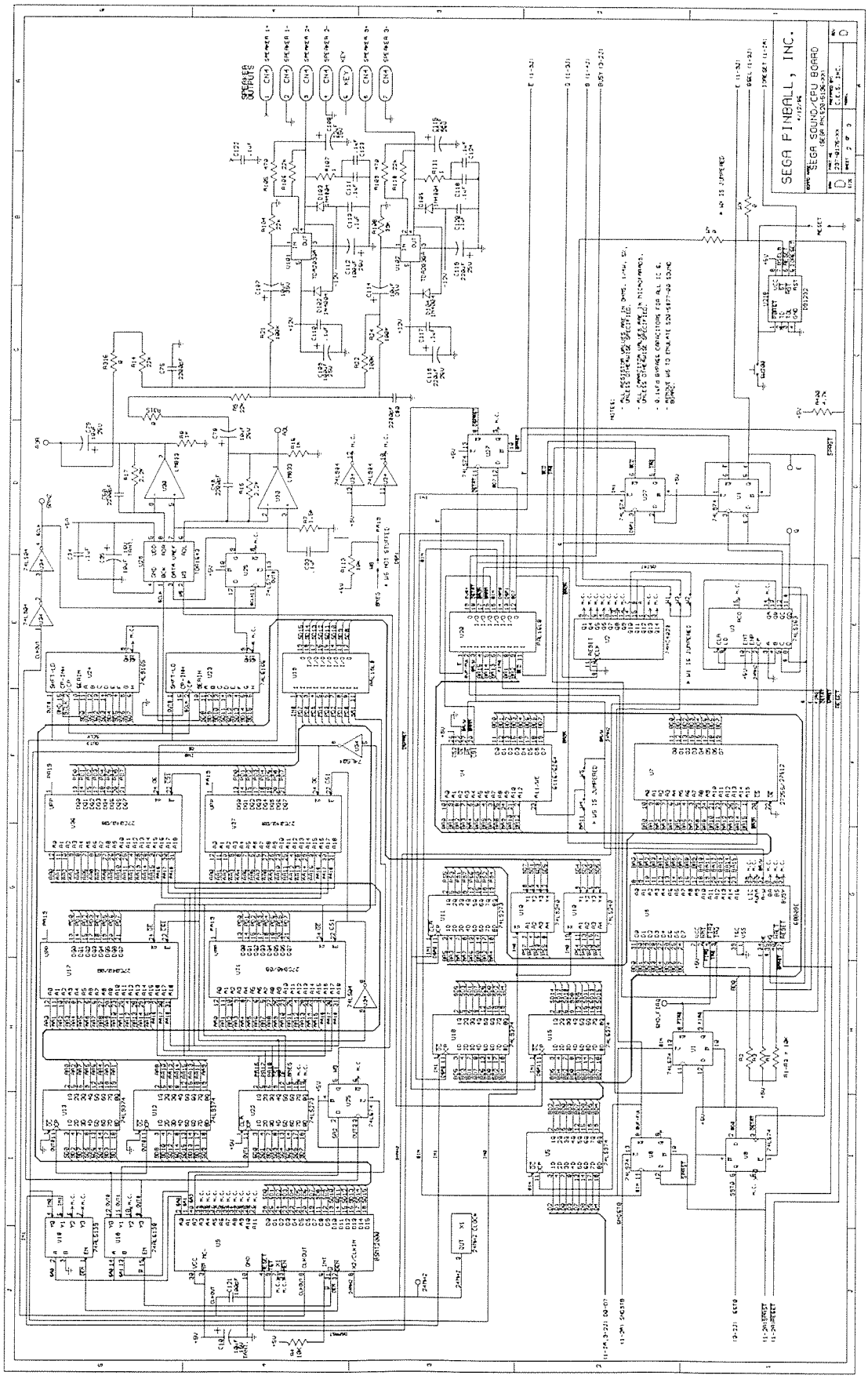
SND-FIRQ - The sound sections CPU interupt.

6Mhz - This clock is generated internally on the BSMT and is used for shifting the data samples into th DAC.

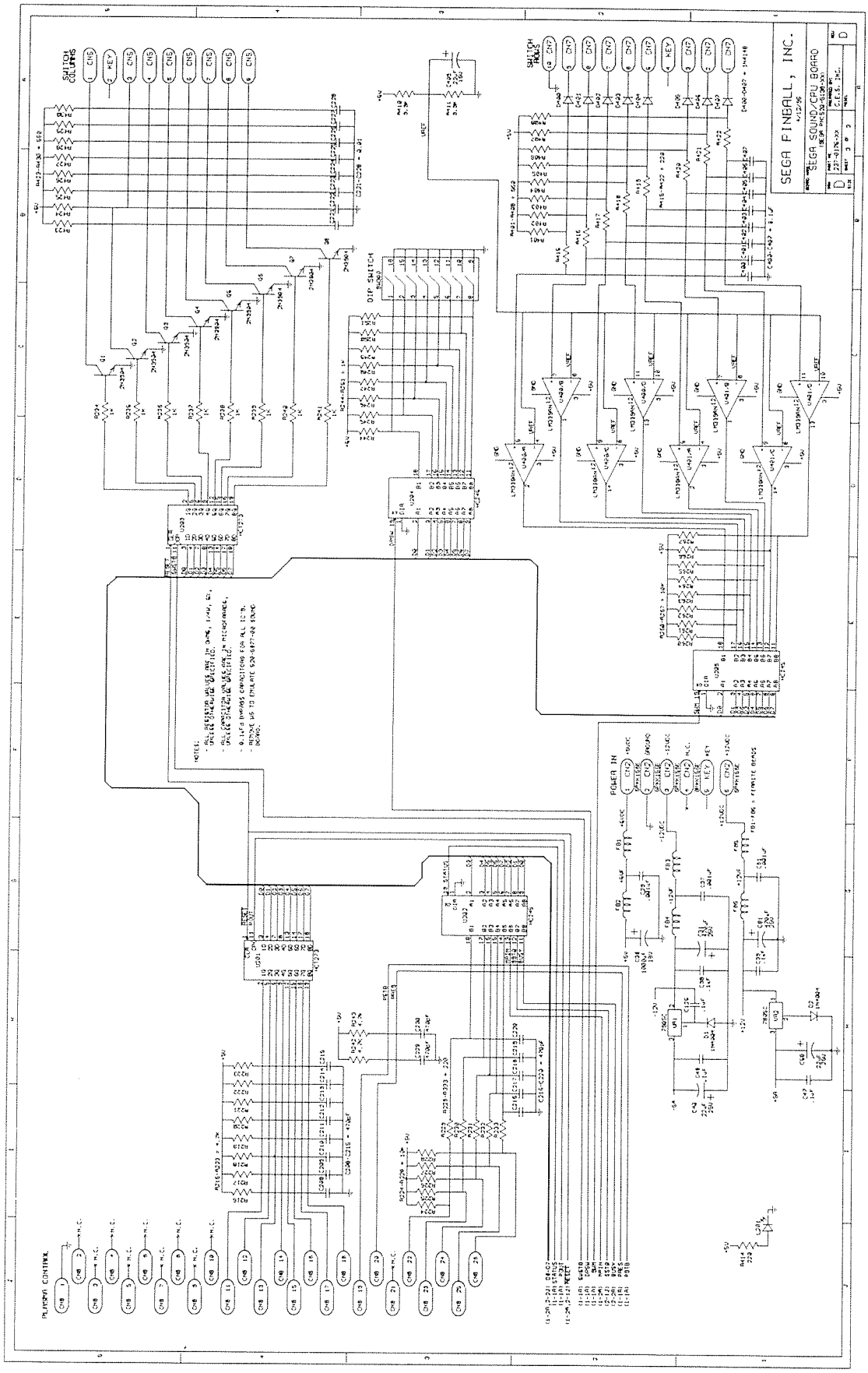
CPU/Sound Board Schematic (Sheet 1 of 3)



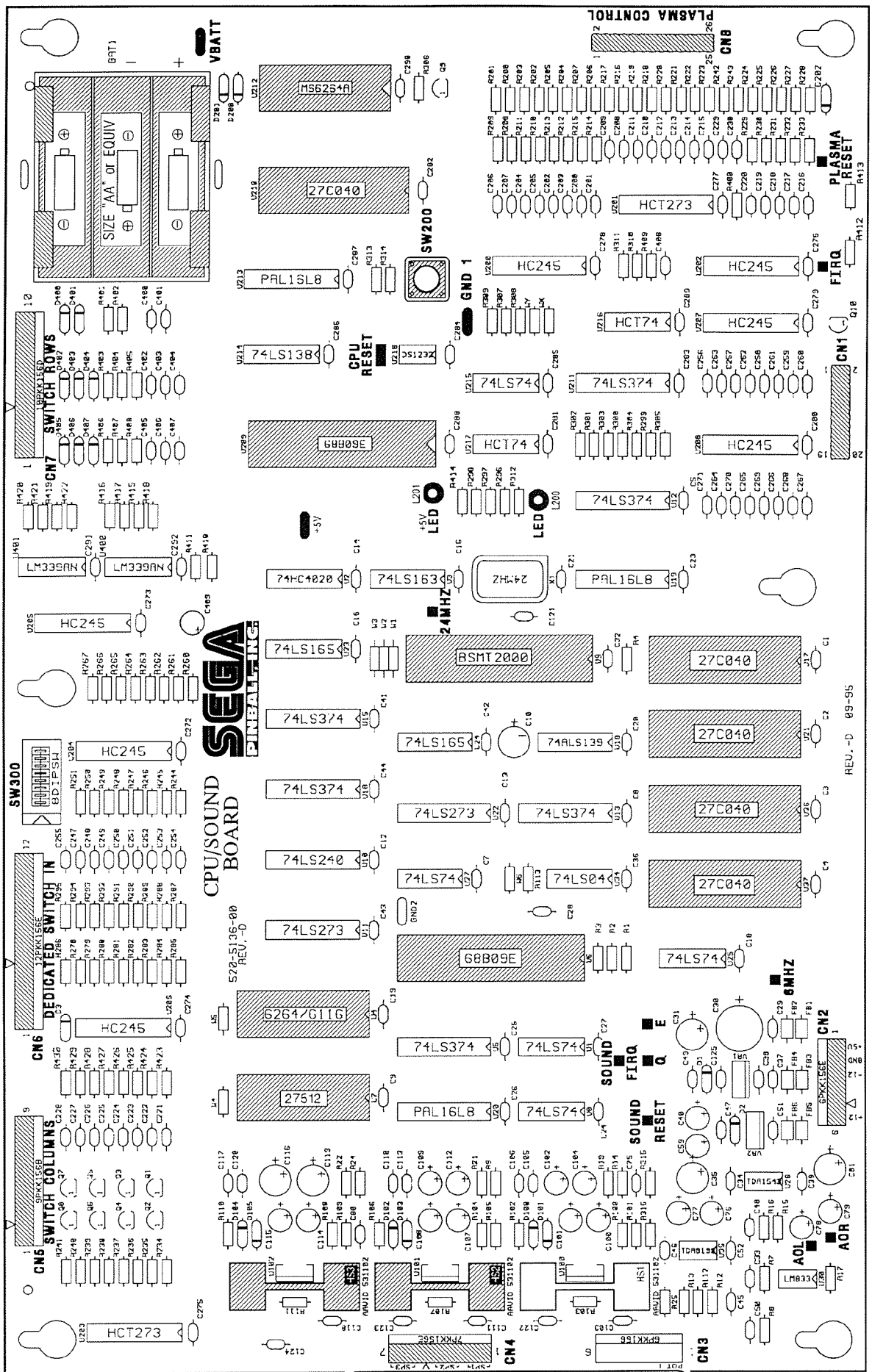
CPU/Sound Board Schematic (Sheet 2 of 3)



CPU/Sound Board Schematic (Sheet 3 of 3)



CPU/Sound Board Component Layout



TEST POINTS:

- << VBATT
- << PLASMA RESET
- << FIRQ
- << SW200
- << GROUND 1
- << CPU RESET
- << L201 LED+5v
- << L200 LED
- << +5v
- << 24 Mhz
- << 6 Mhz
- << E
- << SOUND FIRQ
- << Q
- << SOUND RESET
- << AOR
- << AOL

CPU/Sound Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	124-5001-00	VR2	7805
2	5	121-5051-00	R13 R24 R21 R12 R19 R22	100K 1/4W RES. (R19 Not Stuffed)
3	2	121-5009-00	R111 R103 R107	1K 1/4W RES. (R103 Not Stuffed)
4	38	121-5011-00	R4 R3 R2 R1 R113 R306 R301 R302 R303 R305 R304 R299 R296 R298 R297 R247 R248 R249 R251 R250 R246 R245 R244 R266 R267 R265 R264 R263 R228 R227 R226 R225 R224 R200 R201 R202 R203 R204 R205 R206 R207 R262 R261 R260 R409 R413	10K1/4W RES. (R200-R207 R409 R413 Not Stuffed)
5	5	121-5023-00	R14 R104 R110 R102 R100 R106 R9	22K1/4W RES. (R100 R102 Not Stuffed)
6	20	121-5009-00	R15 R8 R241 R240 R239 R238 R237 R236 R235 R234 R278 R279 R280 R281 R282 R283 R285 R286 R284 R412	1K 1/4W RES.
7	4	121-5043-00	R25 R17 R16 R112	2.2K
8	1	121-5018-00	R7	1.5K
9	2	121-5046-00	R105 R101 R109	470K 1/4W RES. (R101 Not Stuffed)
10	9	121-5045-00	R108 R294 R293 R292 R291 R290 R289 R288 R287	39K
11	1	121-5036-00	R312	330
12	12	n/a	R311 R310 R307 R309 R308 R300 R313 R316 R315 R314 WX WY	0Ω (Jumper Wire 24ga.)
13	15	121-5033-00	R295 R229 R230 R231 R232 R233 R215 R214 R213 R212 R211 R210 R209 R208 R414 R422 R421 R420 R419 R418 R417 R416 R415	220K 1/4W RES. (R208—R215 Not Stuffed)
14	11	121-5021-00	R223 R222 R221 R220 R219 R218 R217 R216 R243 R242 R400	4.7K 1/4W RES.
15	16	121-5047-00	R408 R407 R406 R405 R404 R403 R402 R401 R430 R429 R428 R427 R426 R425 R424 R423	560
16	2	121-5048-00	R411 R410	3.3K 1/4W RES.
17	1	100-0049-00	U3	74LS163
18	1	See Page iii Table	U7	27512 EPROM
19	1	045-5015-07	CN4	7PKK156 (PIN5=KEY)
20	1	Not Used	RESET	DO NOT STUFF
21	5	See Page iii Table	U37 U36 U21 U17 U210	27C040 EPROM
22	2	100-5008-00	U24 U23	74LS165
23	4	125-5017-00	C76 C78 C79 C77	25V 10uF RADIAL LYTIC
24	4	125-5020-00	C59 C101 C108 C115 C40	25V 22uF RADIAL LYTIC (C101 Not Stuffe
25	2	125-5017-00	C100 C107 C114	35V 10uF RADIAL LYTIC (C100 Not Stuffe
26	2	125-5015-00	C102 C104 C109 C112	25V 100uF RADIAL LYTIC (C102/104 N.St
27	1	125-5014-00	C409	16V 22uF RADILA LYTIC
28	1	100-5016-00	U35	TDA1899
29	1	125-5037-00	C30	16V 1000uF RADIAL LYTIC
30	1	100-0027-00	U34	74LS04
31	1	100-0043-00	U18	74ALS139
32	6	100-0064-00	U16 U12 U13 U15 U211U5	74LS374
33	1	100-0249-00	U2	74HC4020
34	1	100-0149-00	U10	74LS240
35	6	n/a	W2 W3 W1 W4 W5 W6	0Ω (Jumper Wire 24ga.)
36	2	125-5012-00	C81 C31	25V 470uF RADIAL LYTIC
37	2	125-5017-00	C10 C35	16V 10uF RADIAL TANT.
38	2	125-5019-00	C116 C119	25V 220uF RADIAL LYTIC
39	1	045-5015-06	CN2	6PKK156 (PIN 5=KEY)
40	1	140-0011-00	X1	24MHZ
41	1	105-0116-00	U9	BSMT2000
42a	1	965-0136-00	**U19 - YELLOW DOT**	PAL16L8 (Programmed) - **YELLOW DOT**
42b	1	965-0137-00	**U20 - WHITE DOT**	PAL16L8 (Programmed) - **WHITE DOT**
42c	1	965-6504-00	**U213- BLUE DOT**	PAL16L8 (Programmed) - **BLUE DOT**
43	5	100-0037-00	U27 U1 U25 U8 U215	74LS74
44	3	125-5043-00	C29 C37 C51	102 (0.001uF)
45	79	125-5031-00	C2 C12 C13 C14 C15 C20 C1 C42 C24 C32 C28 C43 C16 C103 C23 C27 C52 C36 C21 C26 C39 C47 C105 C120 C44 C46 C34 C25 C4 C19 C8 C41 C49 C3 C33 C9 C38 C18 C106 C45 C7 C118 C110 C122 C124 C113 C123 C5 C117 C111 C125 C290 C289 C288 C287 C286 C285 C284 C283 C282 C281 C280 C279 C278 C277 C276 C275 C273 C272 C255 C274 C292 C291 C407 C406 C405 C404 C400 C403 C401 C402 C102 C103	104 (0.1uF) AXIAL CER. CAP. (C102 C103 C105 C106 Not Stuffed)
46	1	125-5038-00	C121	101 (100pF)
47	4	125-5039-00	C48 C50 C75 C80	222 (0.0022uF)
48	41	125-5028-00	C270 C269 C268 C267 C271 C265 C266 C262 C261 C260 C259 C263 C256 C257 C258 C249 C248 C247 C254 C250 C251 C252 C220 C219 C218 C217 C216 C215 C213 C212 C211 C210 C209 C208 C200 C201 C202 C203 C205 C206 C207 C230 C229 C253 C214 C204 C264 C408	471 (470pF) CER. CAP (C200—C107, C408 Not Stuffed)
49	8	125-5029-00	C221 C222 C223 C225 C226 C227 C228 C224 C408	103 (0.01uF)
50	1	045-5015-06	CN3	6PKK156
51	1	100-0375-00	U30	LM833
52	2	100-0022-00	U22 U11	74LS273
53	7	112-5003-00	D1 D100 D2 D103 D104 D101 D105 D102 D3	1N4004 (D100 D101 Not Stuffed)
54	2	112-5008-00	D201 D200	1N5817
55	8	112-0054-00	D407 D406 D405 D404 D403 D402 D401 D400 D202	1N4148 (D202 Not Stuffed)
56	6	n/a	FB6 FB4 FB5 FB2 FB1 FB3	FB
57	1	124-5002-00	VR1	7905
58	2	100-5016-20	U102 U100 U101	TDA2030V (U100 Not Stuffed)

THIS PARTS LIST IS CONTINUED ON THE NEXT PAGE.

CPU/Sound Board Parts Continued

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
59	1	100-5018-00	U26	TDA1543
60	1	n/a	SW200	B3F4000
61	1	165-5099-00	L200	RED LED
62	1	165-5099-00	L201	RED LED
63	2	100-5015-00	U217 U216	HCT74
64	1	100-0148-00	U214	74LS138
65	1	105-0046-00	U212	MS6264A
66	1	100-0189-01	U209 U6	68B09E
67	1	545-5685-00	BAT1 BATTERY HOLDER	3-AA CELLS 4.5V
68	1	045-5015-01	CN1	20 PIN 0.1 HEADER
69	10	n/a	6MHZ AOR Q AOL 24MHZ	TEST POINTS - Not Stuffed
70	10	110-0069-00	Q9 Q3 Q4 Q5 Q6 Q7 Q8 Q1 Q2 Q10	2N3904
71	1	045-5013-00	CN5	9PKK156 (PIN 2=KEY)
72	2	100-5019-00	U201 U203	74HCT273
73	6	100-0338-00	U207 U206 U202 U200 U205 U208 U204	74HC245 (U200 Not Stuffed)
74	1	100-5023-00	U218	DS1232
75	1	045-5015-26	CN8	26 PIN 0.1 HEADER
76	1	045-5014-01	CN7	10PKK156 (PIN 4=KEY)
77	4	n/a	VBATT +5V GND2 GND1	TEST POINT WIRE (24ga.) LOOPS
78	1	045-5015-00	CN6	12PKK156 (PIN 5=KEY)
79	1	181-5002-00	SW300	8 PIN DIPSWITCH
80	2	100-0377-00	U401 U400	LM339AN
81	1	105-0052-05	U4	6116 RAM
82	3	535-5000-10	U100 U101 U102	AAVID 531102

Your Notes

Appendixes A through H

Appendix
Table of Contents

APPENDIX D
Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit
Laser War	2-Flipper Board Not Required	*initial:* 520-5002-00 *replaced with:* 520-5002-02 520-5002-01 was not used.	520-5000-00	Master: 520-5004-00 plus: 7 Digit Alpha/Numeric 520-5005-00 (Qty. 2) 7 Digit Numeric 520-5006-00 (Qty. 2) 4 Digit Numeric 520-5007-00
Secret Service	3-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Torpedo Alley	3-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Time Machine	2-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Playboy 35th Anniversary	520-5033-00 2-Flip. (for 100 games)	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
ABC Monday Night Football	520-5033-00 2-Flip. (for 100 games)	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Robocop	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Phantom of the Opera	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Back to the Future	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
The Simpsons	520-5033-00 2-Flipper	520-5002-03	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Checkpoint	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Batman	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Star Trek 25th Anniversary	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Hook	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Lethal Weapon 3	520-5033-00 2-Flipper	520-5050-01	520-5047-01	520-5052-00 128 X 32	520-5055-00
Star Wars	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Rocky & Bullwinkle & Friends	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Jurassic Park	520-5076-00 3-Flipper	520-5050-02	520-5047-02	520-5052-00 128 X 32	520-5055-00
Last Action Hero	520-5070-00 2-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-00
Tales from the Crypt	520-5076-00 3-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-01
The Who's Tommy	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
WWF Royal Rumble	520-5070-00 (Qty. 2) 4-Flipper (2X2)	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01

Table continued on the next page.

APPENDIX D
Board Type Table

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Guns N' Roses	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
Maverick	520-5076-00 3-Flipper	520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01
Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00	520-5047-03	520-5075-00 192 X 64	520-5092-01
Baywatch	520-5080-00 (Qty. 2) 4-Flipper (2X2)	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01
Batman Forever	520-5076-00 3-Flipper	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01

Games hereon use the White Star Board System™ :

Game Name	Flipper	I/O Power Driver	CPU / Sound †	Display Power Supply	Dot Matrix Display	Display Controller
Apollo 13	520-5070-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01
Golden Eye	520-5070-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01
Twister	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-f5055-01
ID4: Indepen-dence Day	3-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
Space Jam	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
The Star Wars Trilolgy - S.E.	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01

† ***Note:*** To order Game Specific CPU/Sound Board please specify Game Name; -00 = Stereo; -10 = Mono.

Music Credits

"STAR WARS" THEME

(John Williams)

"THE EMPIRE STRIKES BACK" THEME

(John Williams)

"PRINCESS LEIA'S" THEME

(John Williams)

"CANTINA BAND" THEME

(John Williams)

"VICTORY" THEME, (MEDAL CEREMONY)
a.k.a. "THE THRONE ROOM AND END TITLE"

(John Williams)

"YODA'S" THEME
from the Main Title, "THE EMPIRE STRIKES BACK"

(John Williams)

"RETURN OF THE JEDI" THEME, (ALTERNATE)

(John Williams)

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Notices

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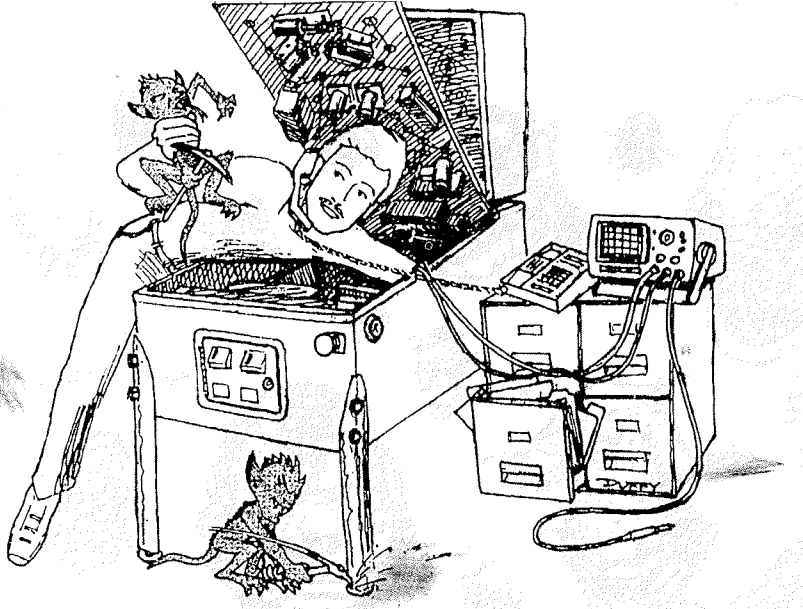

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