

PRIMUS

SERVICE AND OPERATION MANUAL



WARNING

IMPORTANT HEALTH WARNING: PHOTOSENSITIVE SEIZURES - A very small percentage of people may experience a seizure when exposed to certain visual images, including flashing lights or patterns. Even people with no history of seizures or epilepsy may have an undiagnosed condition that can cause "photosensitive epileptic seizures" due to certain visual images, flashing lights or patterns. Symptoms can include lightheadedness, altered vision, eye or face twitching, jerking or shaking of arms or legs, disorientation, confusion, momentary loss of awareness, and loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.

IMMEDIATELY STOP PLAYING AND CONSULT A DOCTOR IF YOU EXPERIENCE ANY OF THESE SYMPTOMS.

Stern Pinball machines are assembled in Elk Grove Village, Illinois, USA; each pinball machine has unique characteristics that make it a one-of-a-kind American-made product. Each machine will have variations in appearance resulting from differences in the machine's particular wood parts, individual silk screened art and mechanical assemblies. Stern Pinball has inspected each game element to ensure it meets our quality standards.

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Games configured for North America operate on 60 cycle electricity only. These games will not operate in countries with 50 cycle electricity (Europe UK, Australia).



MANUAL #780-50N9-00
PRIMUS #500-55N9-01

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www.sternpinball.com - facebook.com/sternpinball

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SPIKE PINBALL SOFTWARE UPDATE INSTRUCTIONS

1. Obtain game software update file (filename ends in “.spk”) from www.sternpinball.com or from authorized Stern distributor.
2. Place game software update file (“.spk”) in root directory of a blank FAT32-formatted USB flash drive
3. Use backbox power switch to turn off game
4. Plug in USB flash drive to CPU board USB connector (CN20 or CN21). Refer to www.sternpinball.com
5. Turn on game
6. The game will automatically begin software update
7. Select the correct .spk update file from list.
8. Press Enter on the service switches to start update
9. When the display indicates “Update Complete”, turn off game
10. Remove USB flash drive from CPU board
11. Turn game on to complete the update and play pinball!
12. Detailed instructions and troubleshooting tips are available in the game manual, www.sternpinball.com and authorized Stern distributors.

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1. SETUP AND MOVING

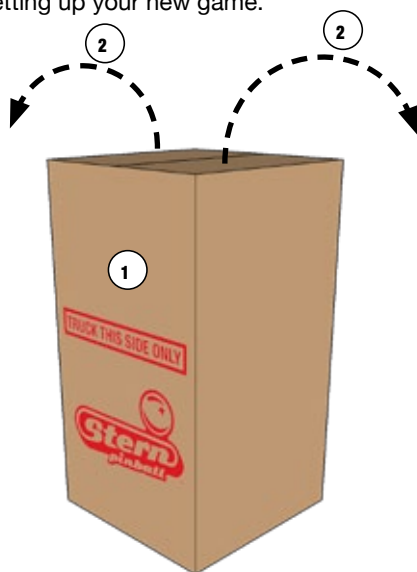
1.1 FIRST-TIME SETUP INSTRUCTIONS

Your brand new Stern Pinball Machine is carefully packed for safety and security. For your safety, exercise caution and use the correct tools and sufficient help when setting up your new game.

TOOLS REQUIRED

- 5/8" Socket Wrench
- 3/8" Nut driver or wrench
- Utility Knife
- Diagonal Cutters
- An Assistant

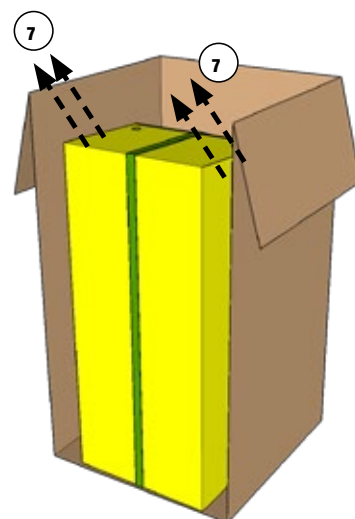
CAUTION: AT LEAST TWO (2) PEOPLE ARE REQUIRED TO MOVE AND MANEUVER THE GAME. USE PROPER MOVING EQUIPMENT AND EXTREME CARE WHILE HANDLING. STERN PINBALL MACHINES WEIGH OVER 250LBS BOXED.



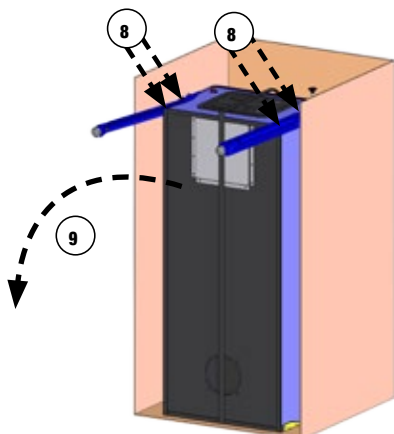
1. Locate the side labeled "TRUCK THIS SIDE ONLY". The bottom of the game faces this side.
2. Open the top box flaps by pulling hard in an upward motion on each flap. If the flaps are taped, cut the tape first, taking care to avoid the box staples.



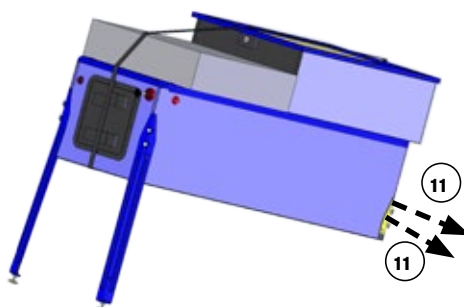
3. Remove the four (4) foam pieces and two (2) narrow box tubes which contain the four (4) identical legs with levelers.
4. DO NOT CUT STRAPPING YET. Keep backbox secured in the down position.
5. With the utility knife, carefully cut down the left and right corners of the box.



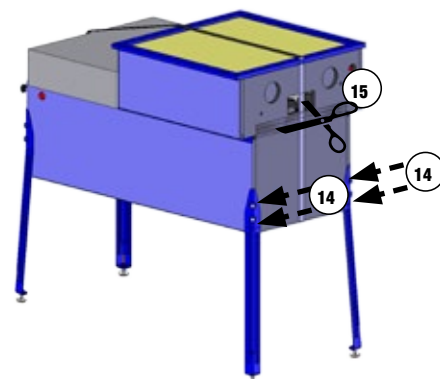
6. Let the face fall forward and remove the entire side by carefully cutting the bottom.
7. With the game still in its folded position, use a 5/8" wrench to loosen and remove the 2 leg bolts on each side of the front cabinet. Ensure the leg levelers are screwed all the way into the legs.



8. Install front legs using the bolts removed from the cabinet. Secure tightly.
9. Have someone help you carefully set the game down on the front legs.



10. Set aside the open box.
11. With the 5/8" socket wrench, loosen and remove the 2 leg bolts on each side of the rear cabinet, 4 total.



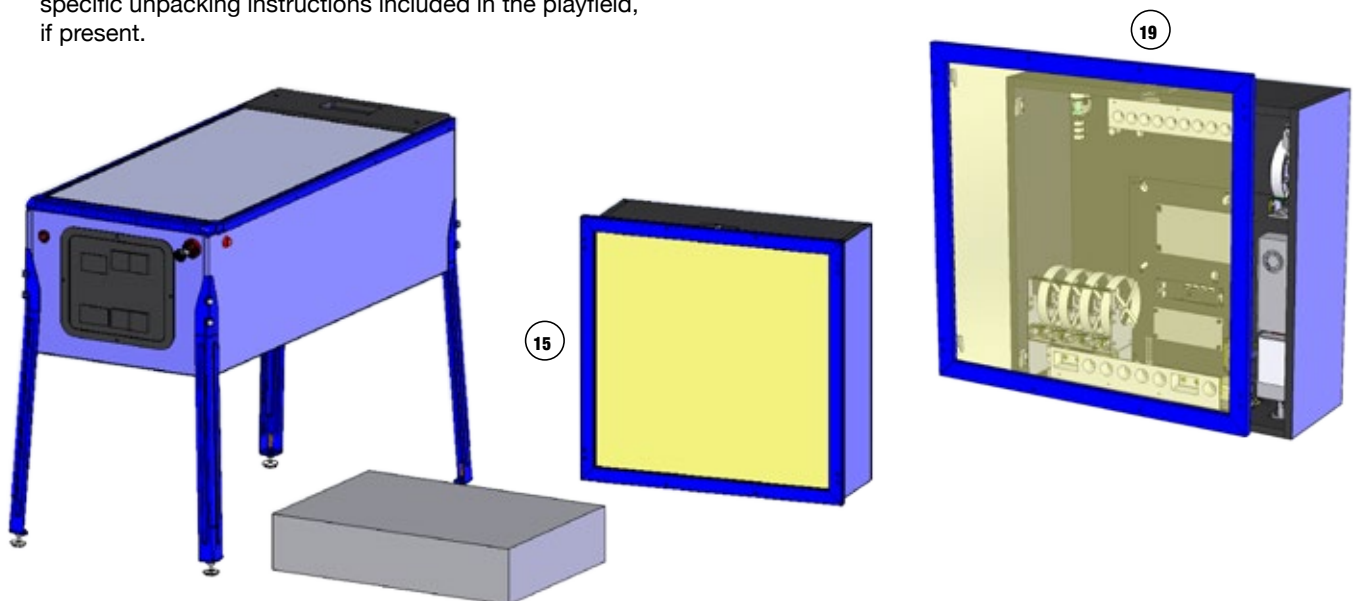
12. Using supports or two people, prop the rear of the cabinet up.
13. Ensure the rear leg levelers are screwed all the way into the legs.
14. Install the two rear legs using the 4 bolts previously removed from the cabinet.



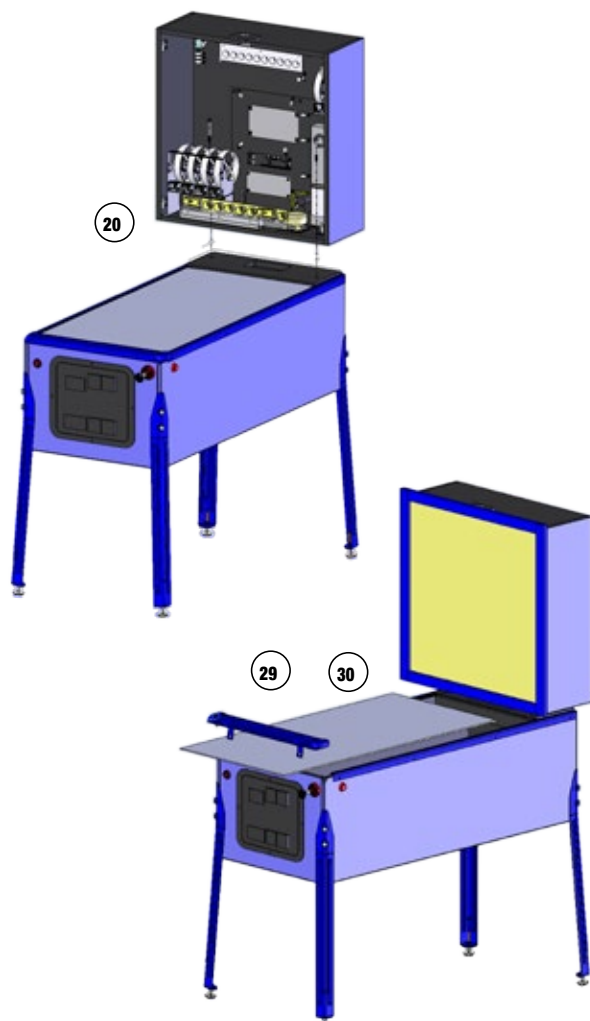
FIRST-TIME SETUP CONTINUED

15. Note that the backbox assembly is not attached to the game cabinet. While supporting the backbox, cut the strap holding the parts together and set the backbox aside.
16. Locate the factory keys, either on the shooter rod or taped to the playfield glass.
17. Using the diagonal cutters, cut the tie-wrap securing the keys if required. One set of keys is for the front coin door, the other set of keys is for accessing components in the backbox.
18. Using the backbox key, locate the backbox lock on top of the backbox and unlock the lock.
19. Gently remove the backglass frame assembly by lifting the backglass frame vertically and pulling away from the backbox.
20. Have someone help you position the backbox, with the glass removed, over the top of the cabinet and align the holes.
21. Install the two 3/8-16 x 3.00" bolts in the (2) backbox holes and tighten with the 3/8" wrench.
22. Open the front coin door.
23. Reach into the game and remove the retaining clip at the rear of the cash box.
24. Remove the cash box lid by sliding it toward you.
25. Locate and remove the pinball, plumb bob, and backbox bolts from the cash box.
26. Replace the cash box lid and retaining clip for future use.
27. Store the backbox keys on the metal hook located in the coin door.
28. Reach inside the cabinet and lift the two latches located on either side of the coin door.
29. Remove the front top molding.
30. Remove the playfield glass by sliding it toward you and carefully place it in a safe location.
Remove all playfield shipping tie downs, shipping blocks, and packing foam, and follow any game-specific unpacking instructions included in the playfield, if present.
31. Reach inside the cabinet and lift the two latches holding the playfield in place. If pinballs were already installed into the lower ball trough, remove them before lifting the playfield.
32. Grasp the lower arch between the flippers, and firmly but gently pull directly up to raise the playfield 8 to 12 inches.
33. While holding the playfield up, pull the playfield about one foot towards you.
34. Pivot the playfield vertically and rest it against the backbox.
35. Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.
36. Locate the plumb bob in the parts bag in the cash box.
37. Slide plumb bob onto the hanger wire. Note: the vertical position of the plumb bob affects tilt sensitivity - higher makes the game more sensitive to tilting.
38. Tighten the thumb screw finger-tight.
39. Install the correct number of pinballs. Refer to the decal on the lock down assembly for the correct number of pinballs.

CAUTION: PLAYFIELD GLASS IS MADE FROM HIGH-STRENGTH TEMPERED GLASS. TEMPERED GLASS IS SENSITIVE TO EXTREME TEMPERATURE SHIFTS AND CORNER NICKS, WHICH CAN CAUSE THE GLASS TO FAIL CATASTROPHICALLY. TAKE CARE TO STORE THE GLASS ON A SOFT, ROOM-TEMPERATURE SURFACE AND PREVENT THE CORNERS FROM BEING DAMAGED.



FIRST-TIME SETUP CONTINUED



LOCATING, LEVELING, AND FINAL SETUP

1. Select a location that is indoors, out of direct sunlight, and climate controlled. Excessive moisture/humidity can cause long-term damage to your game.
2. Use a pinball to roll down the center of the playfield for side-to-side leveling, or use an external bubble level, digital level, or smartphone level app.
3. Plug into a grounded outlet and check for proper operation through DIAGNOSTICS.
4. Check the coin door: With the door closed, insert coins to verify proper operation.
5. Play game: Check for satisfactory operation and adjust game volume (push the Red Buttons inside the Coin Door).
6. If desired, perform any game diagnostics, game adjustments, and pricing settings at this time.

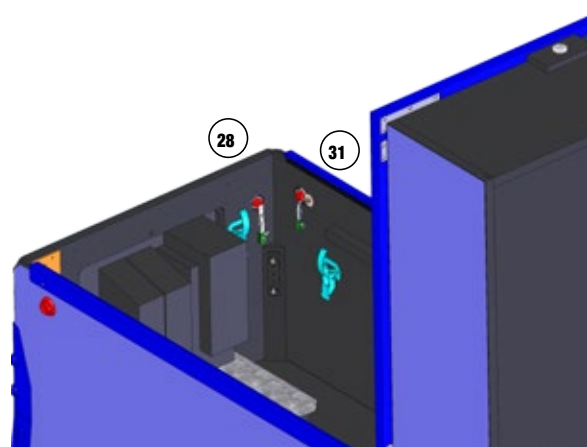
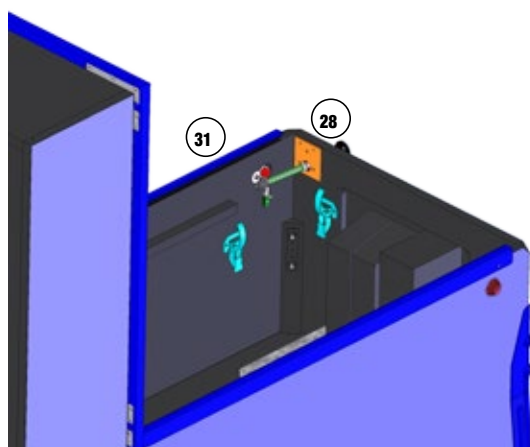
PLAYFIELD REMOVAL

The playfield is held in place by two basset clamps located on each side on the game.

1. Loosen the basset clamps by lifting them away from cabinet.
2. Lift the playfield and pull toward you.
3. Tilt up and rest the playfield against the backbox if necessary.

PLAYFIELD INSTALLATION

1. If the playfield has been completely removed, set the playfield on the wood rails in the base cabinet.
2. Ensure the cables are reconnected correctly.
3. Slide the playfield forward into the base cabinet until it stops.
4. Latch the basset clamps on each side of the base cabinet.



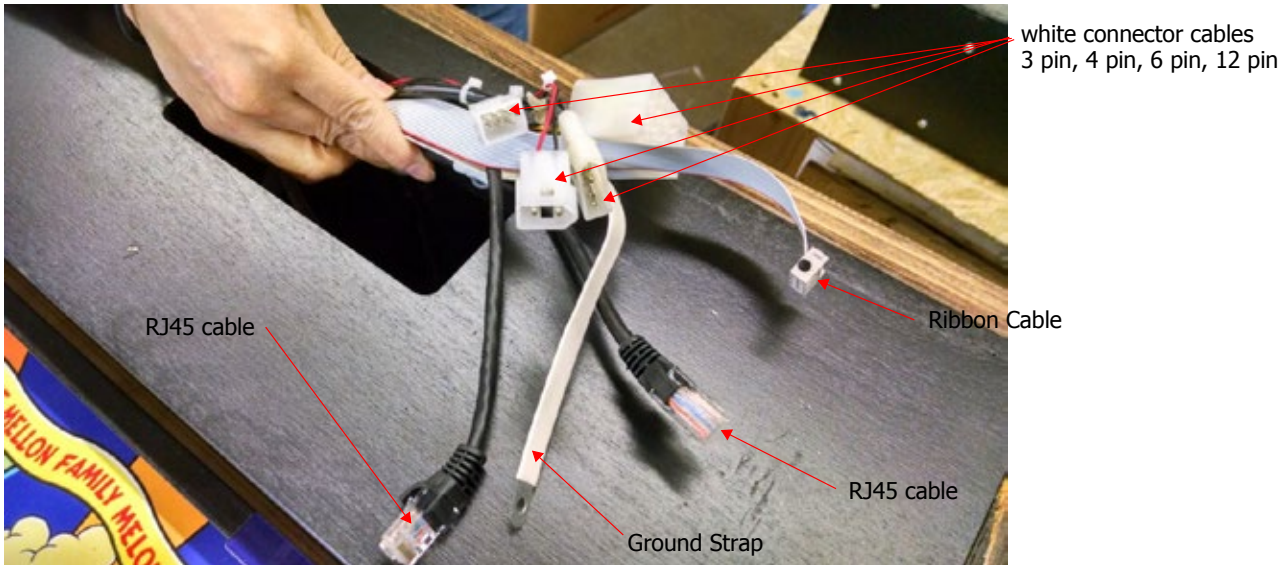
FIRST-TIME SETUP CONTINUED

1.2 USA CABLE CONNECTIONS

Making cable connection from base game to backbox

Make sure the backbox has been properly attached to the base game

Reach into the base cabinet through the large rectangular hole in the backbox and retrieve the bundle of cables. Pull the bundle into the back box

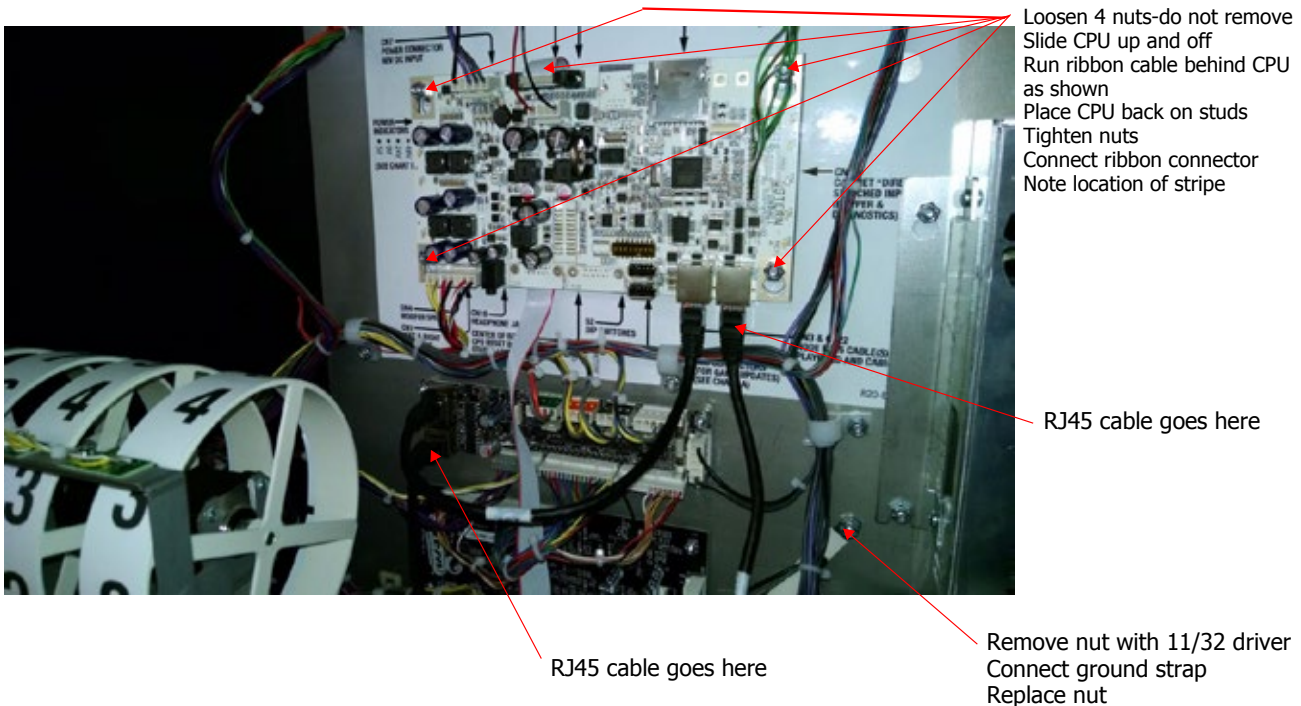


Connect the four cables from the base cabinet to the matching cables in the backbox, these are the white connectors. There is: a 3 pin plug, 4 pin plug, 6 pin plug, and 12 pin plug.

There are two black RJ 45 cables one gets connected to the CPU the other to the 4-coil driver circuit board.

The ribbon cable gets connected to the CPU

The ground strap to the stud as shown



1.3 MAINTENANCE

REGULAR MAINTENANCE - (MONTHLY/500 GAMES)

- Remove the playfield glass
- Enter the software diagnostics menu, start lamp test, then clean and wax the playfield.
- While cleaning the playfield, identify and repair malfunctioning lights, loose parts, cracked plastics and worn rubber parts.
- While in diagnostics, enter the switch test (Select the "SW" Icon, then "TEST" Icon).
- Use a pinball to actuate all switches and verify the correct switch registers with the switch test.
- The game will play a sound to confirm the switch functionality.
- Lift the playfield and inspect all assemblies for loose parts, broken wires or excessive wear. Look at the bottom of the cabinet for any parts that may have worked loose, then find the source.
- Check all coin door mechanisms and bill acceptor (if installed) for proper operation
- Play a game or two to ensure all coils and features are working
- Check the playfield to ensure it is level and set to the proper pitch using the bubble level on the right side wood rail.
- Check game audits: Replay % and Ball Time and note abnormal values which can indicate problems.
- Ensure game volume is set appropriately for the location.
- Clean both sides of the playfield glass and reinstall.
- Check and clean pinballs and replace if excessively worn or scuffed. Dirty pinballs accelerate game wear.

OVERHAUL MAINTENANCE - (5000 GAMES)

- Verify latest game software is installed
- Check flippers for excessive wear. Excessive flipper sloppiness (vertical or horizontal) or weakness indicates a flipper rebuild is required.
- Clean machine inside and out and check leg levelers for free operation.
- Visual check for loose or broken playfield and cabinet parts and repair as necessary.
- Electrical check: Plug into grounded outlet and check for proper operation through DIAGNOSTICS (enter the Service Menu).
- Clean playfield.
- Replace worn or dirty rubbers.
- Replace pinballs.
- Playfield switch adjustments: Check all playfield switches with a pinball.
- Check all settings (refer to manual for factory settings).
- Check coin door: With door closed, insert coins to verify proper operation.
- Check for proper adjustment of the plumb bob tilt.
- Play game: Check for satisfactory operation.

COMMON PINBALL TOOLS

- Common nut drivers (1/4", 5/16", 11/32", 3/8")
- Phillips screw driver
- Standard Allen wrench/Hex key set
- 5/8" Socket with ratchet
- Adjustable wrench (5/8" & 9/16")
- 6" Torpedo Level (or use a pinball)
- Flashlight or headlamp
- Soldering Iron (60w with flat tip), lead-free solder
- Wire cutter
- Wire stripper
- Long nose ("needle nose") pliers

1.4 MAINTENANCE KITS

Description	Part Number
Primus Standard Pinball Location Maintenance Kit	502-6002-N9
8 oz pinball playfield wax (Novus # 2) (675-0003-01)	
Standard Pinball (260-5000-00)	
Cleaning Cloth	
All Playfield Rubber Rings	
Spare Fuses	502-6003-N9
Primus Deluxe Pinball Location Maintenance Kit	
All standard kit items, plus:	
Flipper rebuild kits, Left and Right (500-6307-10,-00)	
Primus Playfield Plastics Kit	803-5000-N9
Primus Cabinet Decals Kit	802-5000-N9

1.5 COMMON MAINTENANCE PARTS

Description	Part Number
8 oz Pinball Playfield wax (Novus # 2)	675-0003-01
Standard Pinball, 1-1/16 in	260-5000-00
Flipper Rebuild Kit Left (Standard)	500-6307-10
Flipper Base Plate Kit Left	515-6617-01
Flipper Rebuild Kit Right	500-6307-00
Flipper Base Plate Kit Right	515-6617-00

2. SPIKE SYSTEM AND NODE GUIDE

2.1 SPIKE SYSTEM OVERVIEW

The SPIKE Pinball system is a rugged, distributed, and embedded platform custom-designed for the rigors of the pinball machine environment. SPIKE takes advantage of modern technologies to deliver an immersive pinball experience that supports modern features, reduces cabling, and increases serviceability and reliability.

A Stern Pinball machine based on the SPIKE system will have at least two nodes networked together with the SPIKE node bus, a custom industrial pinball control bus that is designed around industry standards and optimized for the pinball environment. The primary CPU node is networked to one or more input/output nodes over standard Category 5 UTP (unshielded twisted pair) ethernet cabling.

There are five primary types of nodes that are found in the game.

- CPU node (Node 0) - The primary node that controls other nodes in the system. Contains the primary game software for the system and provides SPIKE node bus power for other nodes.
- Cabinet 48V node (Node 1) - Specialized node with specific inputs and outputs for coin doors, tilt mechanisms, and other bottom-cabinet devices.
- 48V playfield node - Controls high power devices such as coils and flashers, and also supports a few switch and low-power outputs. Powered by the system 48V power supply.
- Light and switch node - High-density switch and low-power LED outputs, bus-powered from the node bus. These boards contain as many as 32 switch inputs and light outputs.
- Node extensions - These sub-nodes add additional low-power input and outputs to a specific Power or I/O node and are connected with simple serial bus.

2.2 NODE BUS CABLING

The SPIKE node bus utilizes standard Ethernet-style RJ45 8-pin modular jacks, and off-the-shelf Category 5e or better ethernet cabling. The node bus is electrically different from Ethernet and does not utilize Ethernet or TCP/IP protocols or signaling standards. SPIKE nodes are not compatible with standard computer networking equipment.

CAUTION: Plugging a SPIKE Node or CPU board into a standard Ethernet port may damage one or both devices and void your warranty.

2.3 SYSTEM POWER

The SPIKE System is powered from an 48V DC power supply bus. Each SPIKE node converts this voltage to lower voltages required by the node and its specific components. A SPIKE 48V node typically controls high-power outputs such as game coil mechanisms and high-brightness LEDs. These powered nodes are supplied directly with 48V system power. SPIKE standard I/O nodes are low-power nodes that read switch inputs and output

to standard-brightness LEDs. Standard I/O nodes use the node bus power, which is supplied by the main CPU node over the node bus modular jack connectors.

COIN-DOOR SAFETY INTERLOCK

To protect the system and for user safety, power to the playfield is disabled when the front coin door is opened. 48V system power and 9V node bus power is disabled to all playfield components until the switch is closed.

2.4 SPIKE NODE ADDRESSES

Each SPIKE node has a unique address ranging from 0 to 15. Not all addresses are used in all games. Nodes can be of the same part number, so the address is specified on the DIP switches on each node. When replacing a node, be certain that the correct address is set. Nodes can have 3-position and 4-position DIP switches. Refer to the appropriate table to set the address for each type of Node. The correct address for a node can be found in the SPIKE node reference section of the manual or in the game diagnostic software. Address 0 is reserved for the backbox CPU node, where the game software resides. Address 1 is reserved for the cabinet node, located inside the coin door. These two nodes do not have DIP switches as their address is not configurable.

Address	1	2	3
8	OFF	OFF	OFF
9	OFF	OFF	ON
10	OFF	ON	OFF
11	OFF	ON	ON
12	ON	OFF	OFF
13	ON	OFF	ON
14	ON	ON	OFF
15	ON	ON	ON

Figure 2.4.1. SPIKE node addresses for nodes with 3-position DIP switches. Addresses 0-7 are not used by SPIKE nodes with 3-position DIP switches.

Address	1	2	3	4
8	OFF	OFF	OFF	OFF
9	OFF	OFF	ON	OFF
10	OFF	ON	OFF	OFF
11	OFF	ON	ON	OFF
12	ON	OFF	OFF	OFF
13	ON	OFF	ON	OFF
14	ON	ON	OFF	OFF
15	ON	ON	ON	OFF

Figure 2.4.2. SPIKE node addresses for nodes with 4-position DIP switches. Addresses 0-7 are reserved for fixed-function nodes and do not require configuration.

SPIKE SYSTEM AND NODE GUIDE CONTINUED

2.5 SPIKE NODE PROGRAMMING

The SPIKE nodes are smart nodes that have on-board processors and run embedded code. The nodes are programmed automatically by the CPU node whenever software updates are installed to the CPU. When replacing a node, the CPU node will detect and update the node to the latest software with no user intervention. Always replace nodes with the power to the game turned OFF.

2.6 SPIKE SYSTEM TERMINOLOGY

MULTI GENERAL ILLUMINATION LIGHTING

General Illumination Lighting is two or more lights powered by one control source. These are often a number of LEDs connected in parallel and the system controls these as one large LED. A missing LED will not affect these circuits, however a shorted LED can cause the entire string of LEDs to turn off.

SINGLE LIGHTS

Single lights and LEDs are direct-controlled from SPIKE node boards. A common power source is grounded by individual transistors to turn individual LEDs on and off. Groups of LEDs, usually by node connector, share a common power source, so if a group of LEDs is out, check the wiring for the power source.

FLASHERS

SPIKE games treat flashers the same as single LEDs that draw more power. Flashers are controlled from the same circuits that power regular lights.

DRIVERS

A driver is a circuit that controls a high power-device such as a coil, magnet, or motor. Each device has a common 48V power source that is then connected to ground by a dedicated control transistor. Each driver is protected against shorting, static electricity, and over-current conditions. Take caution as 48V is always present on a device even when it is not energized.

OPTOS

Certain types of optical switches ("optos") require external signal conditioning. For these optos, they will interface to a SPIKE node via an opto signal conditioning board. Other optical switches connect directly to the Spike node board.

System Protections

CAUTION: Unless explicitly directed by an Authorized Stern Repair technician, perform ALL work on your pinball machine with the power disabled!

INPUT/OUTPUT PROTECTIONS

SPIKE features built-in short-circuit, static electricity, and other protections to maximize reliability. If an LED, coil or other device shorts, it will be disabled but will not shut down the entire system in most circumstances. Groups of LEDs, coils, and switches often share common power supplies or other circuits, so it is possible that a bad device will affect the group of related devices and require removal or repair to fix the group. The system diagnostics will inform the technician of shorted or otherwise malfunctioning devices whenever possible. While the system is protected against permanent damage, it is strongly recommended to repair or replace these bad components as soon as possible to minimize downtime and maximize game earnings.

FUSES

Nodes that have 48 V power are fused individually. Fuse voltage ratings are a safety rating and always must be higher than the circuit the fuse is protecting. Never replace a fuse with a lower voltage-rated fuse. Fuse current ratings must be replaced with the same current value. A higher current value fuse could cause catastrophic failures, and a lower-value fuse will cause premature fuse failures.

Common fuses

Fuse Rating (Amps)	Type	Part Number
3 A	Slow Blow MDL	200-5000-08
4 A	Slow Blow MDL	200-5000-06
5 A	Slow Blow MDL	200-5000-01
7 A	Slow Blow MDL	200-5000-03
8 A	Slow Blow MDL	200-5000-05

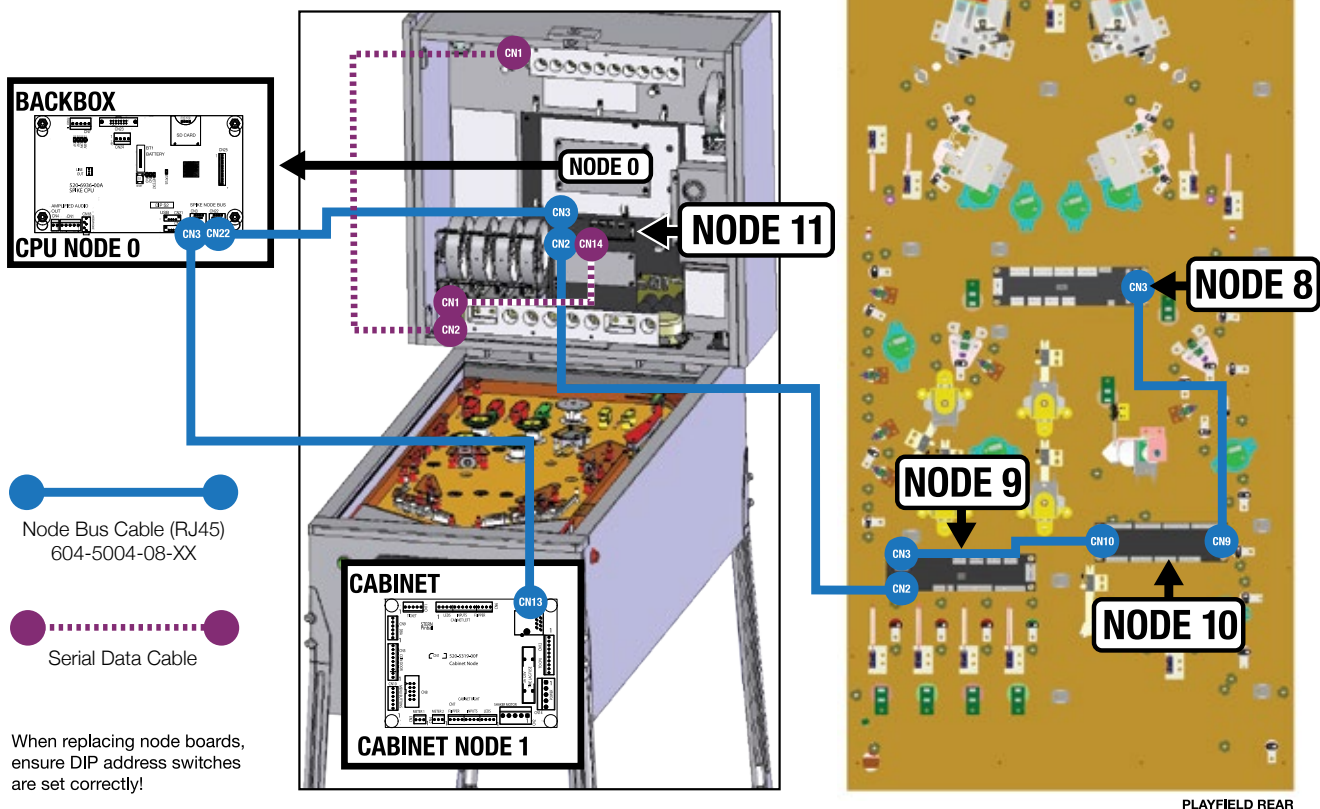
CAUTION: Always replace fuses with the exact current specifications.

2.7 COMMON SPIKE NODE BOARDS

Description	Type	Part Number
SPIKE CPU Node	Node	520-6936-01
SPIKE CPU Node w/ Video Out Support (Backward compatible with -00)	Node	520-6936-10
Cabinet Node	Node	520-5319-10
48V 8-Driver Node	Node	520-6935-10
48V 4-Driver Node	Node	520-5329-10
48V Core Node	Node	520-6985-72
SPIKE 32 Light and Switch Node	Node	520-5322-30
Trough Serial Opto Receiver Extension	Extension	520-5345-01

3. LIGHT, SWITCH, AND DRIVER REFERENCE

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3.1 SPIKE NODE BOARDS

ID	DIP Address	Description	Location	Part Number
Node 0	n/a	SPIKE CPU Node	Backbox	520-6936-01
Node 1	n/a	Cabinet Node	Cabinet	520-5319-10
Node 8	OFF-OFF-OFF-OFF	Lower Playfield 48V 8-Driver Node	Lower playfield	520-6935-10
Node 9	OFF-OFF-ON	Mid Left Playfield 48V 4-Driver Node	Mid left playfield	520-5329-10
Node 10	OFF-ON-OFF	Mid Right Playfield 32 Lighting and Switch	Mid left playfield	520-5322-72
Node 11	OFF-ON-ON	Back Box 48V 4-Driver Node	Backbox	520-5329-10
11a	n/a	9 Lamp Bottom Extension	Backbox	520-6963-00
11b	n/a	10 Lamp Top Extension	Backbox	520-6962-00
	n/a	Stepper Controller Driver Board	Backbox	520-6961-00
	n/a	Power Supply	Backbox	011-5003-00
	n/a	Power Distribution Board	Backbox	520-8096-00
	n/a	Stepper Motor Opto	Backbox	520-6960-00
	n/a	Diagnostic Display	Playfield	520-6964-00

3.2 DRIVER REFERENCE

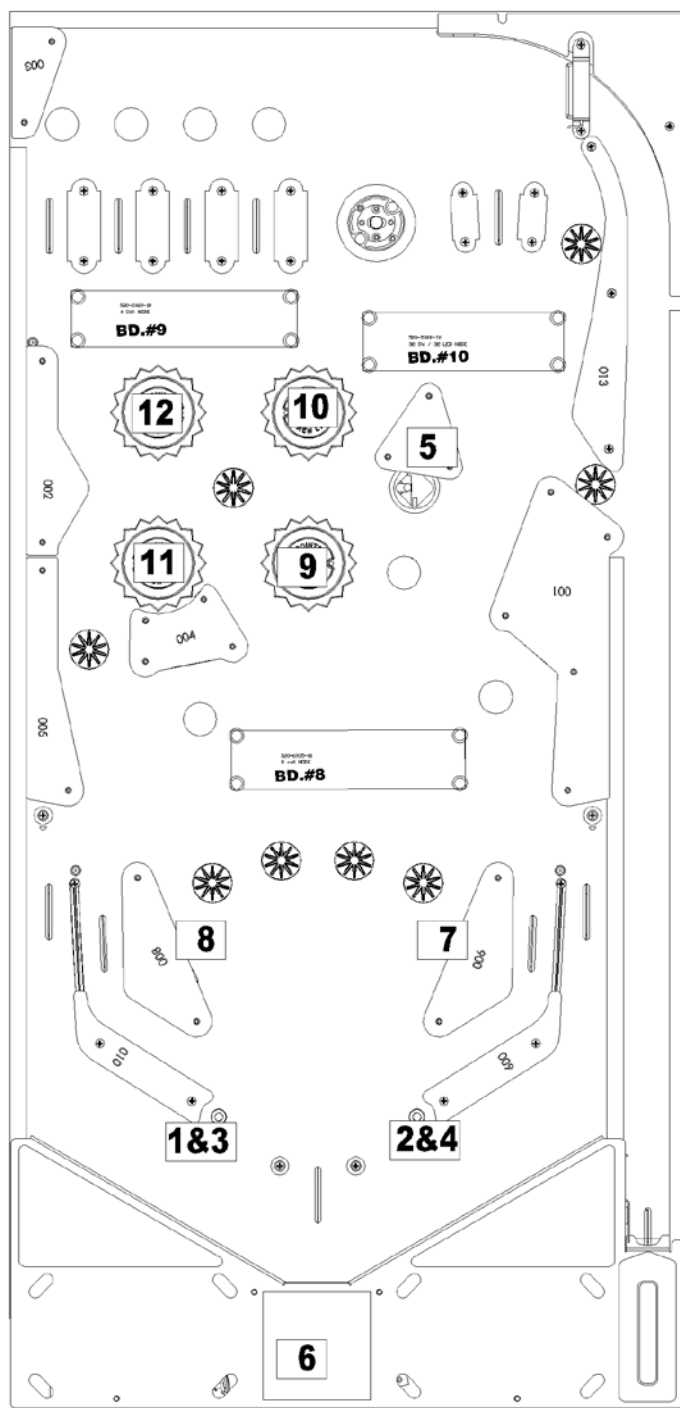


Figure 3.2.1. Playfield top component view.

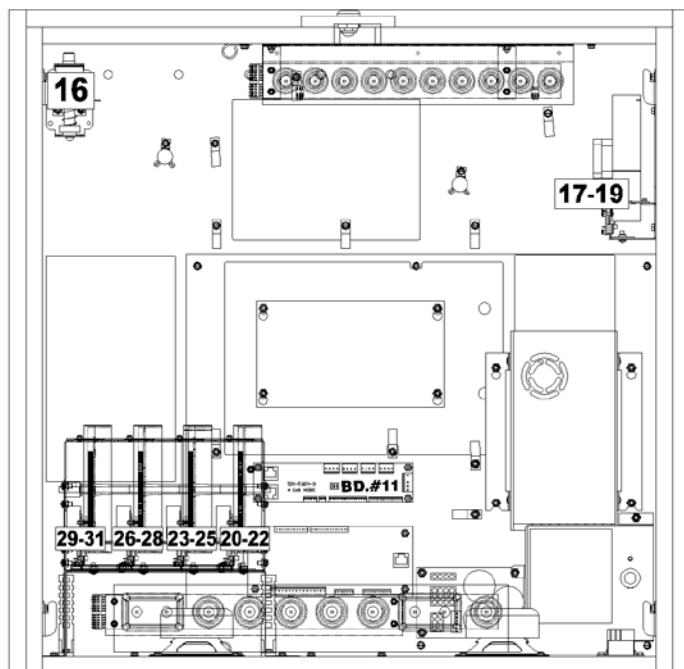


Figure 3.2.2. Backbox driver locations.

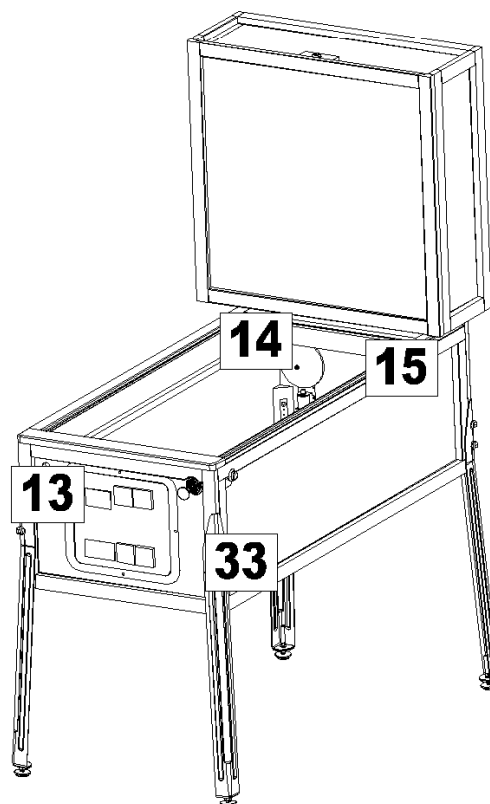


Figure 3.2.3. Cabinet driver locations.

DRIVER REFERENCE

ID	Name	Node	Connector	Ret. Pin	Ret. Wire	Voltage	V+ Pin	V+ Color	Location	Type	Address	Part Number
1	Left Flipper	8	CN5	3	ORG-YEL	48V	4	GRY-ORG	Playfield	Coil - 25-1000	8-DR-0	090-5083-00-ND
2	Right Flipper	8	CN7	3	ORG-GRN	48V	4	GRY-ORG	Playfield	Coil - 25-1000	8-DR-1	090-5083-00-ND
3	Left Flipper Hold	8	CN9	3	YEL-ORG	48V	4	GRY-ORG	Playfield	Coil - 31-4000	8-DR-2	090-5083-00-ND
4	Right Flipper Hold	8	CN11	3	YEL-GRN	48V	4	GRY-ORG	Playfield	Coil - 31-4000	8-DR-3	090-5083-00-ND
5	Top Eject	8	CN6	5	ORG-WHT	48V	6	GRY-ORG	Playfield	Coil - 26-1200	8-DR-4	090-5044-ND
6	Trough	8	CN8	5	ORG-GRY	48V	6	GRY-ORG	Playfield	Coil - 26-1200	8-DR-5	090-5044-ND
7	Right Slingshot	8	CN10	5	ORG-VIO	48V	6	GRY-ORG	Playfield	Coil - 26-1200	8-DR-6	090-5044-ND
8	Left Slingshot	8	CN12	5	ORG-BLU	48V	6	GRY-ORG	Playfield	Coil - 26-1200	8-DR-7	090-5044-ND
9	Bot RT Pop Bumper	9	CN5	3	YEL-BLK	48V	4	GRY-BRN	Playfield	Coil - 26-1200	9-DR-0	090-5044-ND
10	Top RT Pop Bumper	9	CN7	3	YEL-BRN	48V	4	GRY-BRN	Playfield	Coil - 26-1200	9-DR-1	090-5044-ND
11	Bot LT Pop Bumper	9	CN9	3	BRN-ORG	48V	4	GRY-BRN	Playfield	Coil - 26-1200	9-DR-2	090-5044-ND
12	Top LT Pop Bumper	9	CN11	3	YEL-RED	48V	4	GRY-BRN	Playfield	Coil - 26-1200	9-DR-3	090-5044-ND
13	Bell 1 point (opt)	11	CN5	3	YEL-BLU	48V	4	GRY-BLK	Cabinet	Coil - 26-1200	11-DR-0	090-5044-ND
14	Bell 10 point(opt)	11	CN7	3	YEL-GRY	48V	4	GRY-BLK	Cabinet	Coil - 26-1200	11-DR-1	090-5044-ND
15	Bell 100 point(opt)	11	CN9	3	YEL-VIO	48V	4	GRY-BLK	Cabinet	Coil - 26-1200	11-DR-2	090-5044-ND
16	Free Game knocker	11	CN11	3	ORG-RED	48V	4	GRY-BLK	Backbox	Coil - 26-1200	11-DR-3	090-5044-ND
17	Credit Reel Enable	11	CN16	16	BLK-VIO	5V	1	YEL	Backbox	Motor	11-LP-15	041-5105-00
18	Credit Reel Phase 1	11	CN16	15	BLU-GRY	5V	1	YEL	Backbox	Motor	11-LP-14	041-5105-00
19	Credit Reel Phase 2	11	CN16	14	RED-GRY	5V	1	YEL	Backbox	Motor	11-LP-13	041-5105-00
20	1s Reel Enable	11	CN16	13	RED-VIO	5V	1	YEL	Backbox	Motor	11-LP-12	041-5105-00
21	1s Reel Phase 1	11	CN16	12	GRN-VIO	5V	1	YEL	Backbox	Motor	11-LP-11	041-5105-00
22	1s Reel Phase 2	11	CN16	11	BLU-VIO	5V	1	YEL	Backbox	Motor	11-LP-10	041-5105-00
23	10s Reel Enable	11	CN16	10	BLU-YEL	5V	1	YEL	Backbox	Motor	11-LP-9	041-5105-00
24	10s Reel Phase 1	11	CN16	9	GRN-YEL	5V	1	YEL	Backbox	Motor	11-LP-8	041-5105-00
25	10s Reel Phase 2	11	CN16	8	RED-YEL	5V	1	YEL	Backbox	Motor	11-LP-7	041-5105-00
26	100s Reel Enable	11	CN16	7	GRN-ORG	5V	1	YEL	Backbox	Motor	11-LP-6	041-5105-00
27	100s Reel Phase 1	11	CN16	6	BLU-ORG	5V	1	YEL	Backbox	Motor	11-LP-5	041-5105-00
28	100s Reel Phase 2	11	CN16	5	RED-ORG	5V	1	YEL	Backbox	Motor	11-LP-4	041-5105-00
29	1000s Reel Enable	11	CN16	4	BLK-WHT	5V	1	YEL	Backbox	Motor	11-LP-3	041-5105-00
30	1000s Reel Phase 1	11	CN16	3	GRN-BLK	5V	1	YEL	Backbox	Motor	11-LP-2	041-5105-00
31	1000s Reel Phase 2	11	CN16	2	BLU-BLK	5V	1	YEL	Backbox	Motor	11-LP-1	041-5105-00
33	Shaker motor(opt)	1	CN2	1	BLU	48V	5	RED	Cabinet	Motor	1-DR-0	041-5029-04
38	Meter 1	1	CN3	2	BLK	12V	1	RED	Cabinet	Digital Out	1-DR-2	500-9946-00
39	Meter 2	1	CN4	2	BLK	12V	1	RED	Cabinet	Digital Out	1-DR-3	500-9946-00
40	Ticket Dispenser	1	CN11	3		12V	1		Cabinet	Digital Out	1-DR-4	

3.3 SWITCH REFERENCE

ID	Name	Node	Node Ext	Conn.	Input Pin	Input Wire	GND Pin	Ground Wire	Location	Type	Address	Part Number
1	Left Flipper EOS	8	-	CN5	2	GRY-YEL	1	BLK-GRN	Playfield	Leaf	8-SW-0	180-5149-00
2	Right Flipper EOS	8	-	CN7	2	GRY-GRN	1	BLK-GRN	Playfield	Leaf	8-SW-1	180-5149-00
3	Left Flipper	8	-	CN9	2	GRY-BRN	1	BLK-GRN	Cabinet	Leaf	8-SW-2	180-5164-01
4	Right Flipper	8	-	CN11	2	GRY-RED	1	BLK-GRN	Cabinet	Leaf	8-SW-3	180-5164-01
5	Shooter Lane	8	-	CN6	4	GRY-WHT	3	BLK-GRN	Playfield	Rollover	8-SW-4	180-5157-00
6	Right Return lane	8	-	CN8	4	LGN-BLK	3	BLK-GRN	Playfield	Rollover	8-SW-5	500-9935-03
7	Right Slingshot	8	-	CN7	4	GRY-VIO	3	BLK-GRN	Playfield	Leaf	8-SW-6	180-5231-00
8	Left Slingshot	8	-	CN12	4	GRY-BLU	3	BLK-GRN	Playfield	Leaf	8-SW-7	180-5231-00
9	Bot RT Pop bumper	9	-	CN5	2	TAN-BLK	1	BLK-BRN	Playfield	Leaf	9-SW-0	180-5232-00
10	Top RT Pop bumper	9	-	CN7	2	TAN-GRY	1	BLK-BRN	Playfield	Leaf	9-SW-1	180-5232-00
11	Bot LT Pop bumper	9	-	CN9	2	TAN-ORG	1	BLK-BRN	Playfield	Leaf	9-SW-2	180-5232-00

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SWITCH REFERENCE CONTINUED

ID	Name	Node	Node Ext	Conn.	Input Pin	Input Wire	GND Pin	Ground Wire	Location	Type	Address	Part Number
12	Top LT Pop bumper	9	-	CN11	2	TAN-RED	1	BLK-BRN	Playfield	Leaf	9-SW-3	180-5232-00
13	Top Lane 2	10	-	CN7	2	TAN-BLK	10	BLK-BRN	Playfield	Rollover	10-SW-0	500-9935-04
14	Top Lane 1 (left)	10	-	CN7	3	TAN-RED	10	BLK-BRN	Playfield	Rollover	10-SW-1	500-9935-04
16	Center Drain	10	-	CN7	4	TAN-ORG	10	BLK-BRN	Playfield	Rollover	10-SW-2	500-9935-04
17	Trough Opto	10	-	CN7	5	TAN-YEL	10	BLK-BRN	Playfield	Opto	10-SW-3	515-0215-00 tx 515-0215-01 rx
18	Left Return Lane	10	-	CN7	6	TAN-GRN	10	BLK-BRN	Playfield	Rollover	10-SW-4	500-9935-04
19	Right Outlane	10	-	CN7	7	TAN-BLU	10	BLK-BRN	Playfield	Rollover	10-SW-5	500-9935-04
20	Top Eject	10	-	CN7	8	TAN-VIO	10	BLK-BRN	Playfield	Micro	10-SW-6	180-5186-01
21	Bot Rt Standup 1pt	10	-	CN5	2	LGN-BLK	10	BLK-GRY	Playfield	Leaf	10-SW-8	180-5231-00
22	Right target outer	10	-	CN5	3	LGN-BRN	10	BLK-GRY	Playfield	Leaf	10-SW-9	511-7581-00
23	Right target inner	10	-	CN5	4	LGN-RED	10	BLK-GRY	Playfield	Leaf	10-SW-10	511-7581-00
24	Top Rt Standup 1pt	10	-	CN5	5	LGN-ORG	10	BLK-GRY	Playfield	Leaf	10-SW-11	180-5231-00
25	Skill Shot	10	-	CN5	6	LGN-YEL	10	BLK-GRY	Playfield	Rollover	10-SW-12	500-9935-04
26	Top Pop Single	10	-	CN5	7	LGN-BLU	10	BLK-GRY	Playfield	Leaf	10-SW-13	180-5232-00
27	Top Lane 4	10	-	CN5	8	LGN-VIO	10	BLK-GRY	Playfield	Rollover	10-SW-14	500-9935-04
28	Top Lane 3	10	-	CN5	9	LGN-GRY	10	BLK-GRY	Playfield	Rollover	10-SW-15	500-9935-04
29	Star Rollover 1 LT	10	-	CN3	2	PNK-BLK	10	BLK-VIO	Playfield	Opto	10-SW-16	520-6824-0x
30	Star Rollover 2	10	-	CN3	3	PNK-BRN	10	BLK-VIO	Playfield	Opto	10-SW-17	520-6824-0x
31	Star Rollover 3	10	-	CN3	4	PNK-RED	10	BLK-VIO	Playfield	Opto	10-SW-18	520-6824-0x
32	Star Rollover 4 RT	10	-	CN3	5	PNK-ORG	10	BLK-VIO	Playfield	Opto	10-SW-19	520-6824-0x
33	Star Rollover Left	10	-	CN3	6	PNK-YEL	10	BLK-VIO	Playfield	Opto	10-SW-20	520-6824-0x
34	Star Rollover Pops	10	-	CN3	7	PNK-GRN	10	BLK-VIO	Playfield	Opto	10-SW-21	520-6824-0x
35	Star Rollover Rtn	10	-	CN3	8	PNK-BLU	10	BLK-VIO	Playfield	Opto	10-SW-22	520-6824-0x
36	Star Rollover Top RT	10	-	CN3	9	PNK-VIO	10	BLK-VIO	Playfield	Opto	10-SW-23	520-6824-0x
37	Left Outlane	10	-	CN1	2	WHT-BLK	10	BLK-RED	Playfield	Leaf	10-SW-24	500-9935-03
38	Lt Standup 1pt #1	10	-	CN1	3	WHT-BRN	10	BLK-RED	Playfield	Leaf	10-SW-25	180-5231-00
39	Lt Standup 1pt #5	10	-	CN1	4	WHT-RED	10	BLK-RED	Playfield	Leaf	10-SW-26	180-5231-00
40	Left Target Outer	10	-	CN1	5	WHT-ORG	10	BLK-RED	Playfield	Leaf	10-SW-27	511-7581-00
41	Left Target Inner	10	-	CN1	6	WHT-YEL	10	BLK-RED	Playfield	Leaf	10-SW-28	511-7581-00
42	Lt Standup 1pt #2	10	-	CN1	7	WHT-GRN	10	BLK-RED	Playfield	Leaf	10-SW-29	180-5231-00
43	Lt Standup 1pt #3	10	-	CN1	8	WHT-BLU	10	BLK-RED	Playfield	Leaf	10-SW-30	180-5231-00
44	Lt Standup 1pt #4	10	-	CN1	9	WHT-VIO	10	BLK-RED	Playfield	Leaf	10-SW-31	180-5231-00
46	Credit Reel Home	11	-	CN15	6	TAN-WHT	14	BLK	Backbox	Opto	11-SW-8	520-6960-00
47	1s Reel Home	11	-	CN15	5	TAN-VIO	14	BLK	Backbox	Opto	11-SW-7	520-6960-00
48	10s Reel Home	11	-	CN15	4	TAN-YEL	14	BLK	Backbox	Opto	11-SW-6	520-6960-00
49	100s Reel Home	11	-	CN15	3	TAN-ORG	14	BLK	Backbox	Opto	11-SW-5	520-6960-00
50	1000s Reel Home	11	-	CN15	2	TAN-BLK	14	BLK	Backbox	Opto	11-SW-4	520-6960-00
52	Start Button	1	-	CN6	10	GRY	5	BLK-WHT	Cabinet	Micro	1-SW-11	500-6388-44-LED
53	Left Coin	1	-	CN5	9	PNK-BRN	3	BLK	Cabinet	Micro	1-SW-16	
54	Right Coin	1	-	CN5	7	PNK ORG	3	BLK	Cabinet	Micro	1-SW-18	
55	Center Coin	1	-	CN5	8	PNK RED	3	BLK	Cabinet	Micro	1-SW-17	
56	Fourth Coin	1	-	CN5	6	-	-	-	Cabinet	-	1-SW-19	
57	Fifth Coin	1	-	CN5	5	-	-	-	Cabinet	-	1-SW-20	
58	Tilt Pendulum	1	-	CN6	5	WHT	7	BLK-WHT	Cabinet	Plumb Bob	1-SW-14	516-0007-00
59	Ticket Notch	1	-	CN11	5	-	-	-	Cabinet	-	1-SW-8	
60	Slam Tilt	1	-	CN5	4	LGN-RED	3	BLK	Cabinet	-	1-SW-22	
61	Sixth Coin	1	-	CN9	5	-	-	-	Cabinet	-	1-SW-21	
C1	DIP 1	0	-	-	-	-	-	-	CPU Node		0-SW-0	-
C2	DIP 2	0	-	-	-	-	-	-	CPU Node		0-SW-2	-
C3	DIP 3	0	-	-	-	-	-	-	CPU Node		0-SW-3	-

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SWITCH REFERENCE CONTINUED

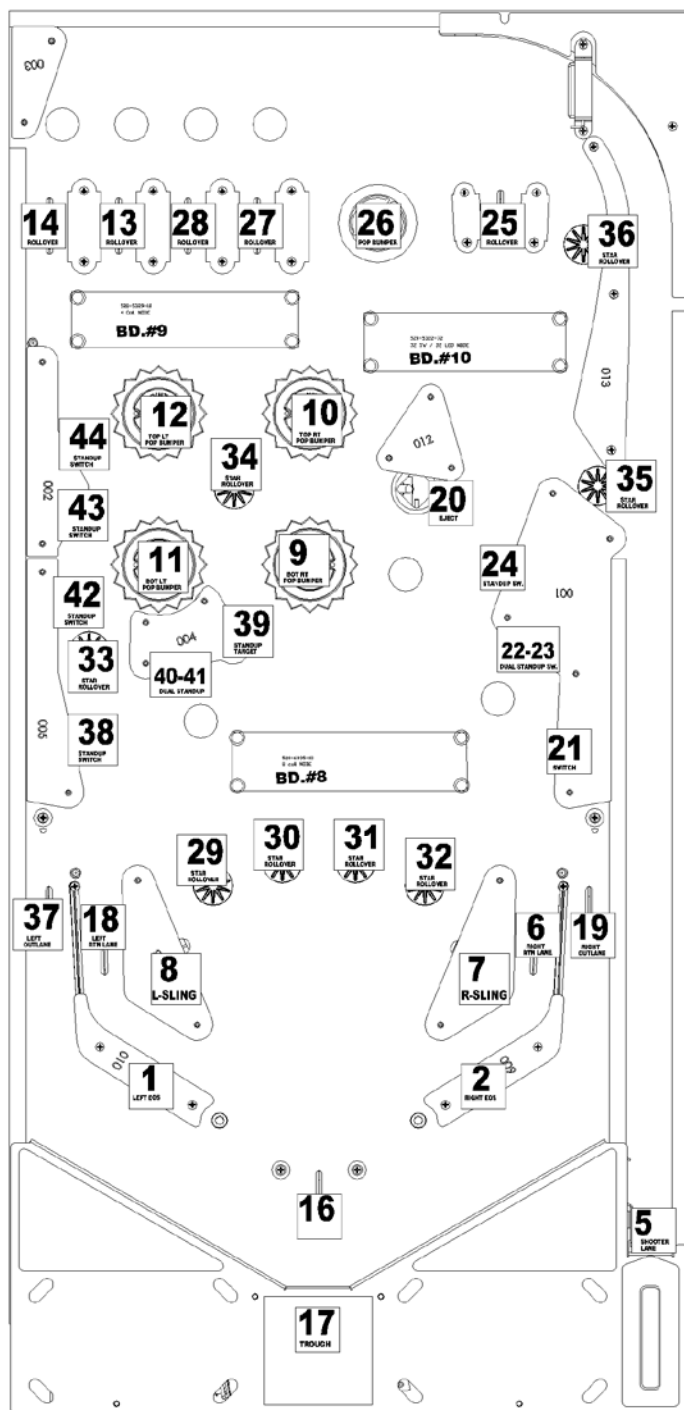


Figure 3.3.1. Switch locations, playfield top view.

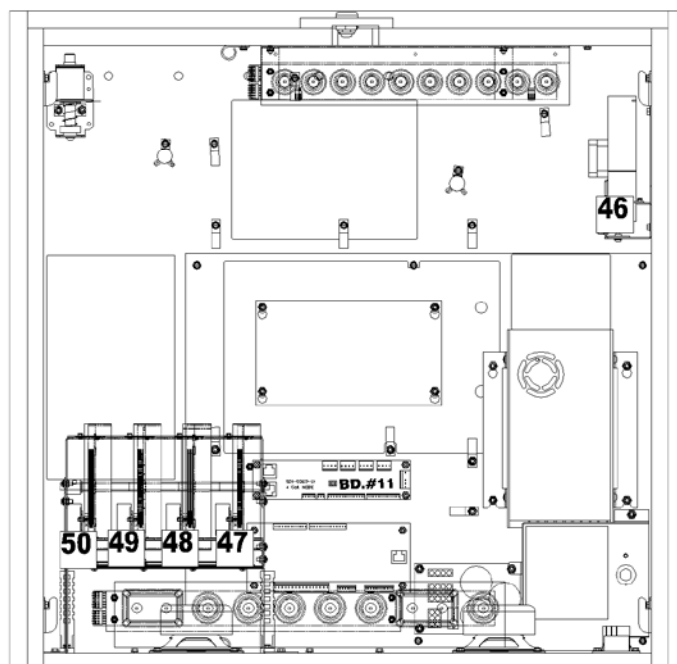


Figure 3.3.2. Backbox switch locations.

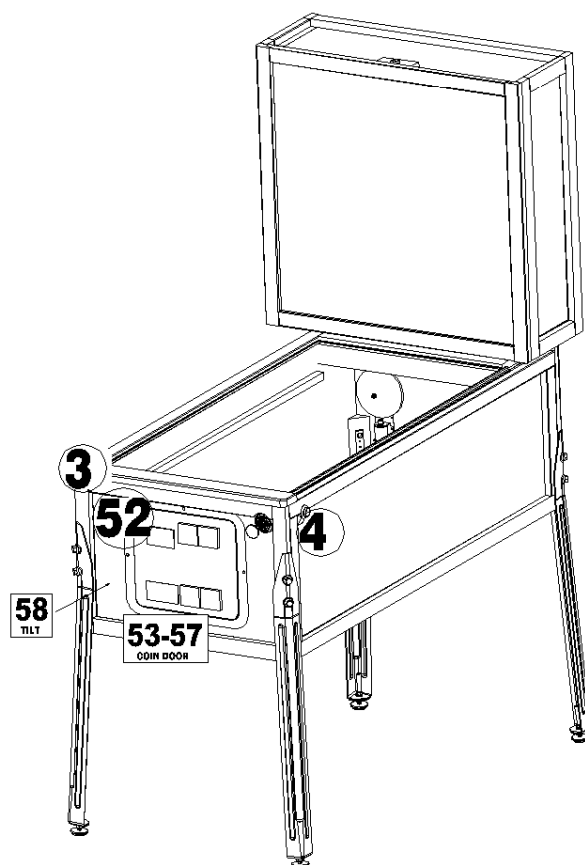


Figure 3.3.3. Cabinet switch locations.

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SWITCH REFERENCE CONTINUED

ID	Name	Node	Node Ext	Conn.	Input Pin	Input Wire	GND Pin	Ground Wire	Location	Type	Address	Part Number
C4	DIP 4	0	-	-	-	-	-	-	CPU Node		0-SW-4	-
C5	DIP 5	0	-	-	-	-	-	-	CPU Node		0-SW-5	-
C6	DIP 6	0	-	-	-	-	-	-	CPU Node		0-SW-6	-
C7	DIP 7	0	-	-	-	-	-	-	CPU Node		0-SW-7	-
C8	DIP 8	0	-	-	-	-	-	-	CPU Node		0-SW-8	-
C9	Service Select	0	-	CN25	4	LGN-GRY	6	BLK	Coin Door		0-SW-9	180-5192-04
C10	Service Plus	0	-	CN25	3	LGN-VIO	6	BLK	Coin Door		0-SW-10	180-5192-02
C11	Service Minus	0	-	CN25	2	LGN-BLU	6	BLK	Coin Door		0-SW-11	180-5192-02
C12	Service Back	0	-	CN25	1	LGN-BLK	6	BLK	Coin Door		0-SW-12	180-5192-00
C16	Power Interlock	0	-	CN7	4	GRY	5	GRY-RED	Cabinet	Interlock	0-SW-16	180-5136-00

3.4 LIGHT REFERENCE

ID	Name	Node	Node Ext.	Conn.	Ret. Pin	Ret. Wire	Src. Pin	Src. Wire	Location	Type	Light Color	Address	Part Number
1	Start Button	1	-	CN6	3	YEL-BRN	1	RED	Cabinet	Feature	White	1-LP-2	112-5033-08
2	Lt Flipper (x2)	8	-	CN6	1	BRN-WHT	2	YEL	Playfield	G.I.	White	8-LP-0	112-5034-08
3	Rt Flipper (x2)	8	-	CN8	1	BRN-GRN	2	YEL	Playfield	G.I.	White	8-LP-1	112-5034-08
4	Rt Slingshot (Bot)	8	-	CN10	1	BRN-VIO	2	YEL	Playfield	G.I.	White	8-LP-2	112-5034-08
5	Lt Slingshot (Bot)	8	-	CN12	1	BRN-BLU	2	YEL	Playfield	G.I.	White	8-LP-3	112-5034-08
6	Lt Slingshot(Top)	10	-	CN4	4	ORG-BLK	2	RED	Playfield	G.I.	White	10-LP-8	112-5034-08
7	Rt Slingshot(Top)	9	-	CN16	15	YEL-WHT	1	YEL	Playfield	G.I.	White	9-LP-14	112-5034-08
8	Right GI #1	9	-	CN16	14	ORG-WHT	1	YEL	Playfield	G.I.	White	9-LP-13	112-5033-08
9	Right GI #2	9	-	CN16	13	BLU-GRN	1	YEL	Playfield	G.I.	White	9-LP-12	112-5033-08
10	Right GI #3	9	-	CN16	12	GRN	1	YEL	Playfield	G.I.	White	9-LP-11	112-5033-08
11	Right GI #4	9	-	CN16	11	RED-GRN	1	YEL	Playfield	G.I.	White	9-LP-10	112-5033-08
12	Right GI #5	9	-	CN16	10	BLU-YEL	1	YEL	Playfield	G.I.	White	9-LP-9	112-5033-08
13	Right GI #6	9	-	CN16	9	GRN-YEL	1	YEL	Playfield	G.I.	White	9-LP-8	112-5033-08
14	Right GI #7	9	-	CN16	8	RED-YEL	1	YEL	Playfield	G.I.	White	9-LP-7	112-5033-08
15	Right GI #8	9	-	CN16	7	BLU-ORG	1	YEL	Playfield	G.I.	White	9-LP-6	112-5033-08
16	Right GI #9	9	-	CN16	6	GRN-ORG	1	YEL	Playfield	G.I.	White	9-LP-5	112-5033-08
17	Right GI #10	9	-	CN16	5	RED-ORG	1	YEL	Playfield	G.I.	White	9-LP-4	112-5033-08
18	Right GI #11	9	-	CN16	4	BLU-BRN	1	YEL	Playfield	G.I.	White	9-LP-3	112-5033-08
19	Right GI #12	9	-	CN16	3	GRN-BRN	1	YEL	Playfield	G.I.	White	9-LP-2	112-5033-08
20	Skillshot GI 2	9	-	CN16	2	RED-BRN	1	YEL	Playfield	Feature	White	9-LP-1	112-5033-08
21	Star Rollover 1	10	-	CN2	4	YEL-BLK	2	RED	Playfield	Feature	Green	10-LP-0	520-6824-0X
22	Star Rollover 2	10	-	CN2	5	YEL-BRN	2	RED	Playfield	Feature	Yellow	10-LP-1	520-6824-0X
23	Star Rollover 3	10	-	CN2	6	YEL-RED	2	RED	Playfield	Feature	Green	10-LP-2	520-6824-0X
24	Star Rollover 4	10	-	CN2	7	YEL-ORG	2	RED	Playfield	Feature	Yellow	10-LP-3	520-6824-0X
25	Left Star	10	-	CN2	8	YEL-GRN	2	RED	Playfield	Feature	Yellow	10-LP-4	520-6824-0X
26	Pop Bumper Star	10	-	CN2	9	YEL-BLU	3	RED	Playfield	Feature	Green	10-LP-5	520-6824-0X
27	Shooter Ret. Star	10	-	CN2	10	YEL-VIO	3	RED	Playfield	Feature	Yellow	10-LP-6	520-6824-0X
28	Top Right Star	10	-	CN2	11	YEL-GRY	3	RED	Playfield	Feature	Green	10-LP-7	520-6824-0X
29	Left GI #1	10	-	CN4	5	ORG-BRN	2	RED	Playfield	G.I.	White	10-LP-9	112-5033-08
30	Left GI #2	10	-	CN4	6	ORG-RED	2	RED	Playfield	G.I.	White	10-LP-10	112-5033-08
31	Left GI #3	10	-	CN4	7	ORG-YEL	2	RED	Playfield	G.I.	White	10-LP-11	112-5033-08
32	Left GI #4	10	-	CN4	8	ORG-GRN	2	RED	Playfield	G.I.	White	10-LP-12	112-5033-08
33	Left GI #5	10	-	CN4	9	ORG-BLU	2	RED	Playfield	G.I.	White	10-LP-13	112-5033-08
34	Skillshot GI 1	10	-	CN4	10	ORG-VIO	3	RED	Playfield	Feature	White	10-LP-14	112-5033-08
35	Left GI #6	10	-	CN4	11	ORG-GRY	3	RED	Playfield	G.I.	White	10-LP-15	520-5307-00
36	Top lane #4	10	-	CN6	4	RED-VIO	2	RED	Playfield	Feature	White	10-LP-16	520-5307-00

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LIGHT REFERENCE CONTINUED

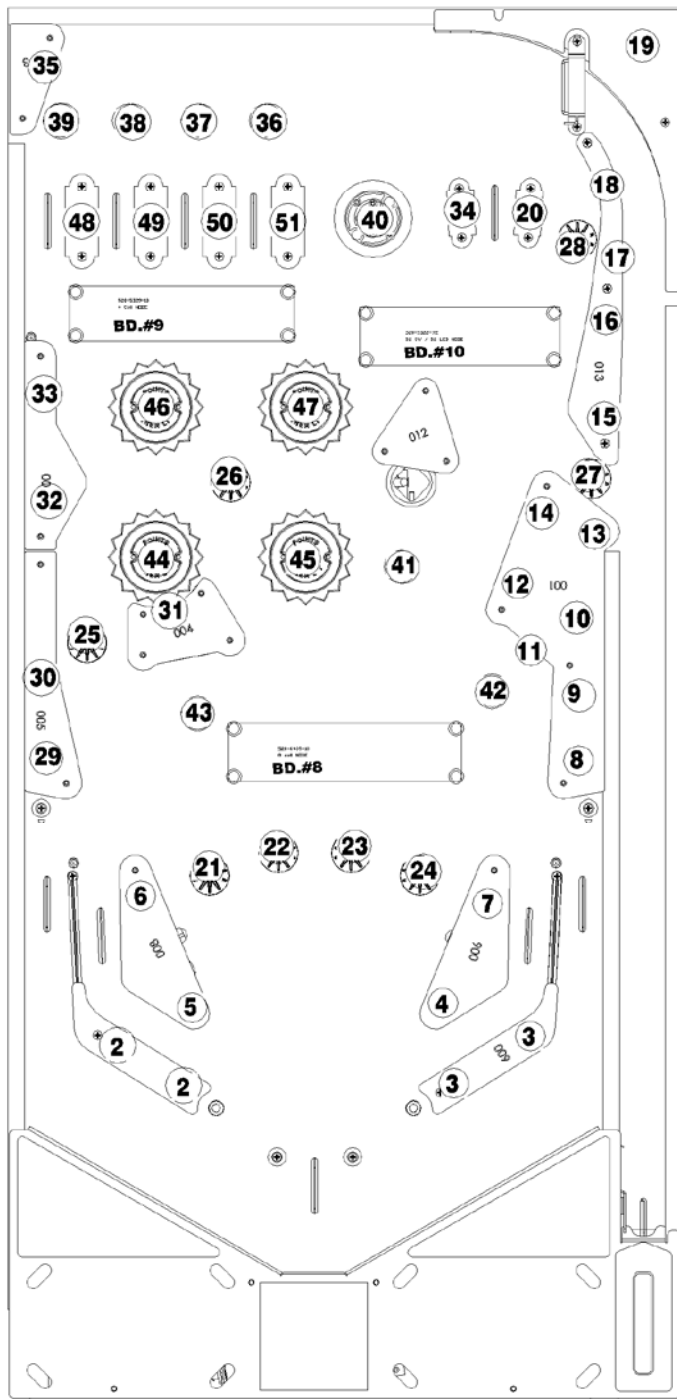


Figure 3.4.1. Playfield light locations (top view).

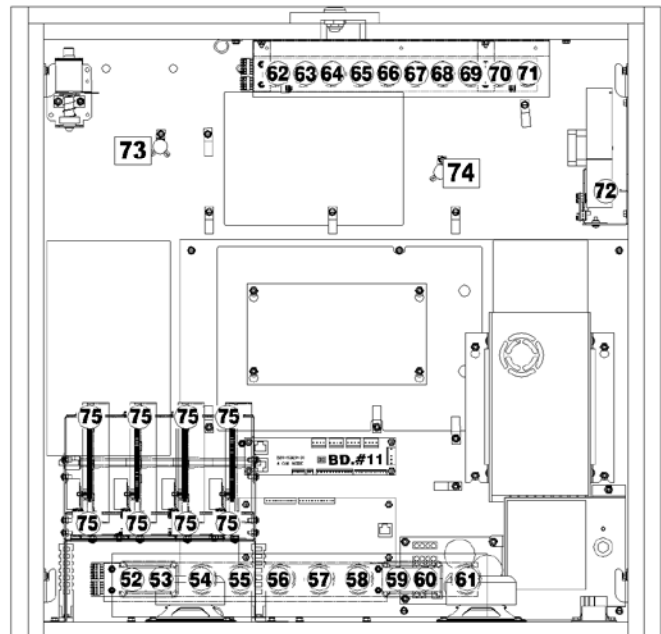


Figure 3.4.2. Backbox light locations.

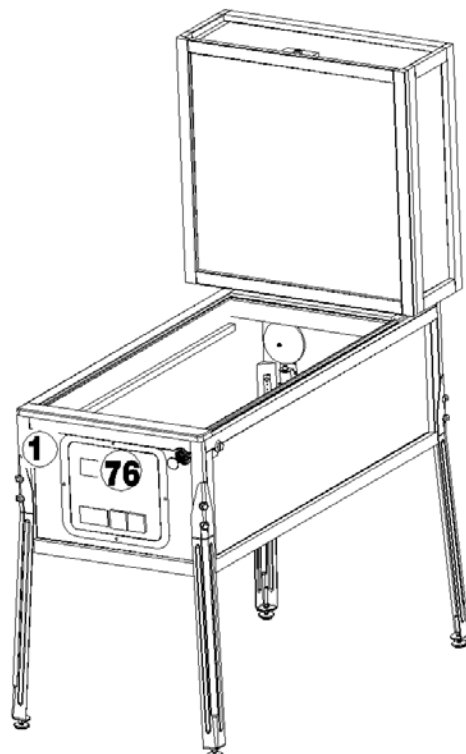


Figure 3.4.3. Cabinet light locations.

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LIGHT REFERENCE CONTINUED

ID	Name	Node	Node Ext.	Conn.	Ret. Pin	Ret. Wire	Src. Pin	Src. Wire	Location	Type	Light Color	Address	Part Number
37	Top lane #3	10	-	CN6	5	GRN-VIO	2	RED	Playfield	Feature	White	10-LP-17	520-5307-00
38	Top lane #2	10	-	CN6	6	BLU-VIO	2	RED	Playfield	Feature	White	10-LP-18	520-5307-00
39	Top lane #1 (Left)	10	-	CN6	7	RED-GRY	2	RED	Playfield	Feature	White	10-LP-19	520-5307-00
40	5 Point Bumper	10	-	CN6	8	GRN-GRY	2	RED	Playfield	Feature	White	10-LP-20	520-8059-00
41	Eject Lamp	10	-	CN6	9	BLU-GRY	3	RED	Playfield	Feature	White	10-LP-21	520-5307-00
42	Right Target	10	-	CN6	10	BLU-BRN	3	RED	Playfield	Feature	White	10-LP-22	520-5307-00
43	Left Target	10	-	CN6	11	BLU-GRN	3	RED	Playfield	Feature	White	10-LP-23	520-5307-00
44	Bot Lt Pop Bumper	10	-	CN8	4	RED-ORG	3	RED	Playfield	Feature	White	10-LP-24	520-8059-00
45	Bot Rt Pop Bumper	10	-	CN8	5	GRN-ORG	2	RED	Playfield	Feature	White	10-LP-25	520-8059-00
46	Top Lt Pop Bumper	10	-	CN8	6	BLU-ORG	2	RED	Playfield	Feature	White	10-LP-26	520-8059-00
47	Top Rt Pop Bumper	10	-	CN8	7	RED-YEL	1	RED	Playfield	Feature	White	10-LP-27	520-8059-00
48	Top Lane GI 1 (LT)	10	-	CN8	8	GRN-YEL	1	RED	Playfield	G.I.	White	10-LP-28	112-5033-08
49	Top Lane GI 2	10	-	CN8	9	BLU-YEL	1	RED	Playfield	G.I.	White	10-LP-29	112-5033-08
50	Top Lane GI 3	10	-	CN8	10	BLU-RED	1	RED	Playfield	G.I.	White	10-LP-30	112-5033-08
51	Top Lane GI 4	10	-	CN8	11	BLU-BLK	1	RED	Playfield	G.I.	White	10-LP-31	112-5033-08
52	High Score 1	11	11a	CN14	D1	-	-	-	Backbox	Feature	White	11-LP-16	520-6963-00
53	High Score 2	11	11a	CN14	D2	-	-	-	Backbox	Feature	White	11-LP-17	520-6963-00
54	Ball in Play 1	11	11a	CN14	D3	-	-	-	Backbox	Feature	White	11-LP-18	520-6963-00
55	Ball in Play 2	11	11a	CN14	D4	-	-	-	Backbox	Feature	White	11-LP-19	520-6963-00
56	Ball in Play 3	11	11a	CN14	D5	-	-	-	Backbox	Feature	White	11-LP-20	520-6963-00
57	Ball in Play 4	11	11a	CN14	D6	-	-	-	Backbox	Feature	White	11-LP-21	520-6963-00
58	Ball in Play 5	11	11a	CN14	D7	-	-	-	Backbox	Feature	White	11-LP-22	520-6963-00
59	Game Over 1	11	11a	CN14	D8	-	-	-	Backbox	Feature	White	11-LP-23	520-6963-00
60	Game Over 2	11	11a	CN14	D9	-	-	-	Backbox	Feature	White	11-LP-24	520-6963-00
61	Tilt Light	11	11a	CN14	D10	-	-	-	Backbox	Feature	White	11-LP-25	520-6963-00
62	Match 0 Left	11	11b	CN14	D1	-	-	-	Backbox	Feature	White	11-LP-32	520-6962-00
63	Match 1	11	11b	CN14	D2	-	-	-	Backbox	Feature	White	11-LP-33	520-6962-00
64	Match 2	11	11b	CN14	D3	-	-	-	Backbox	Feature	White	11-LP-34	520-6962-00
65	Match 3	11	11b	CN14	D4	-	-	-	Backbox	Feature	White	11-LP-35	520-6962-00
66	Match 4	11	11b	CN14	D5	-	-	-	Backbox	Feature	White	11-LP-36	520-6962-00
67	Match 5	11	11b	CN14	D6	-	-	-	Backbox	Feature	White	11-LP-37	520-6962-00
68	Match 6	11	11b	CN14	D7	-	-	-	Backbox	Feature	White	11-LP-38	520-6962-00
69	Match 7	11	11b	CN14	D8	-	-	-	Backbox	Feature	White	11-LP-39	520-6962-00
70	Match 8	11	11b	CN14	D9	-	-	-	Backbox	Feature	White	11-LP-40	520-6962-00
71	Match 9	11	11b	CN14	D10	-	-	-	Backbox	Feature	White	11-LP-41	520-6962-00
72	Credit reel	11	11b	CN3	3	ORG-GRN	1	RED	Backbox	G.I.	White	11-LP-42	520-5307-00
73	Flasher left	11	11b	CN4	2	ORG-RED	1	RED	Backbox	Flash	White	11-LP-44	113-5045-08
74	Flasher Right	11	11b	CN4	3	ORG-YEL	1	RED	Backbox	Flash	White	11-LP-43	113-5045-08
75	GI Reels (x8)	11	-	CN13	1	WHT-BLK	3	YEL	Backbox	G.I.	White	11-LP-0	520-5307-00
76	Coin Door GI (x2)	1	-	CN5	2	YEL	1	YEL-WHT	Coin Door	G.I.	White	1-LP-1	112-5033-08
77													
78													

3.5 MOTOR REFERENCE

ID	Name	Node	Node Ext.	Conn.	Ret. Pin	Ret. Wire	Src. Pin	Src. Wire	Location	Type	Light Color	Address	Part Number
17	Credit Reel Enable	11		CN16	16	BLK-VIO	1	YEL	Backbox	Stepper		11-LP-15	041-5105-00
18	Credit Reel Phase 1	11		CN16	15	BLU-GRY	1	YEL	Backbox	Stepper		11-LP-14	041-5105-00
19	Credit Reel Phase 2	11		CN16	14	RED-GRY	1	YEL	Backbox	Stepper		11-LP-13	041-5105-00
20	1s Reel Enable	11		CN16	13	RED-VIO	1	YEL	Backbox	Stepper		11-LP-12	041-5105-00
21	1s Reel Phase 1	11		CN16	12	GRN-VIO	1	YEL	Backbox	Stepper		11-LP-11	041-5105-00
22	1s Reel Phase 2	11		CN16	11	BLU-VIO	1	YEL	Backbox	Stepper		11-LP-10	041-5105-00
23	10s Reel Enable	11		CN16	10	BLU-YEL	1	YEL	Backbox	Stepper		11-LP-9	041-5105-00
24	10s Reel Phase 1	11		CN16	9	GRN-YEL	1	YEL	Backbox	Stepper		11-LP-8	041-5105-00
25	10s Reel Phase 2	11		CN16	8	RED-YEL	1	YEL	Backbox	Stepper		11-LP-7	041-5105-00
26	100s Reel Enable	11		CN16	7	GRN-ORG	1	YEL	Backbox	Stepper		11-LP-6	041-5105-00
27	100s Reel Phase 1	11		CN16	6	BLU-ORG	1	YEL	Backbox	Stepper		11-LP-5	041-5105-00
28	100s Reel Phase 2	11		CN16	5	RED-ORG	1	YEL	Backbox	Stepper		11-LP-4	041-5105-00
29	1000s Reel Enable	11		CN16	4	BLK-WHT	1	YEL	Backbox	Stepper		11-LP-3	041-5105-00
30	1000s Reel Phase 1	11		CN16	3	GRN-BLK	1	YEL	Backbox	Stepper		11-LP-2	041-5105-00
31	1000s Reel Phase 2	11		CN16	2	BLU-BLK	1	YEL	Backbox	Stepper		11-LP-1	041-5105-00

4. ELECTRONIC PINOUTS AND SCHEMATICS

4.1 SPIKE CPU NODE 0

520-6936-01

DIRECT SWITCH MAPPING (CN25)

The coin-door diagnostic switches are connected directly to the CPU node via the Cabinet Node. Note that both the CPU and Cabinet nodes are required for diagnostic switch operation.

ID	Name	Conn.	Input Pin	Input Wire	GND Pin	Ground Wire	Location	Type	Address	Part Number
C1	DIP 1	-	-	-	-	-	CPU Node		0-SW-0	-
C2	DIP 2	-	-	-	-	-	CPU Node		0-SW-2	-
C3	DIP 3	-	-	-	-	-	CPU Node		0-SW-3	-
C4	DIP 4	-	-	-	-	-	CPU Node		0-SW-4	-
C5	DIP 5	-	-	-	-	-	CPU Node		0-SW-5	-
C6	DIP 6	-	-	-	-	-	CPU Node		0-SW-6	-
C7	DIP 7	-	-	-	-	-	CPU Node		0-SW-7	-
C8	DIP 8	-	-	-	-	-	CPU Node		0-SW-8	-
C9	Service Select	CN25	4	LGN-GRY	6	BLK	Coin Door		0-SW-9	180-5192-04
C10	Service Plus	CN25	3	LGN-VIO	6	BLK	Coin Door		0-SW-10	180-5192-02
C11	Service Minus	CN25	2	LGN-BLU	6	BLK	Coin Door		0-SW-11	180-5192-02
C12	Service Back	CN25	1	LGN-BLK	6	BLK	Coin Door		0-SW-12	180-5192-00
C16	Playfield Power Interlock	CN7	4	GRY	5	GRY-RED	Cabinet	Interlock	0-SW-16	180-5136-00

CONNECTORS

ID	Connector Type	Description
CN1	5-Pin .156" Header	Backbox 2-channel amplified speaker out
CN3	RJ45	SPIKE node bus - to cabinet node N1
CN4	2-Pin .156"	Cabinet 1-channel amplified speaker out
CN7	5-Pin .156" Header	48V supply from main power supply
CN18	3.5mm Stereo TRS jack	Headphone Jack
CN20	USB	USB connector - for software updates, audit dumps, and expansion modules
CN21	USB	USB connector - for software updates, audit dumps, and expansion modules
CN22	RJ45	SPIKE node bus - to playfield node, N8
CN23	14-Pin .100" Header	Dot matrix display connector
CN24	4-Pin .156" Header	5V DC and ground out to the LED display
CN25	12-Pin .100" Header	Dedicated switch inputs - service, volume switches

COMPONENTS

ID	Name
S1	Reset Switch
S2	DIP Switches
SD CARD	For system SD card. Note: only to be removed if instructed to by Stern Service.
BT1	CR232 3V Lithium battery for game clock between power cycles

STATUS LEDS

LED ID	Name	Color	Description
48V	+48V Supply In	Red	ON: Main system power is connected, OFF: No 48V system power. Check power supply connections, cables, and fuses.
24V	+24V Audio Power	Red	ON: Audio power supply is good, OFF: Audio power supply off, call tech support.
9V	+9V Node Bus Power	Red	ON: Node bus power supply is good, OFF: Node bus power supply bad, call tech support.
5V		Red	ON: Logic power supply is good. OFF: Logic power supply bad, call tech support.
TxD	Node bus transmit	Red	Node bus transmit activity
RxD	Node bus receive	Red	Node bus receive activity
Status	System status	Red	Constant double blink - game software running
Netstat	Network status	Red	Communication bridge activity

SPIKE CPU NODE 0 CONTINUED

AUDIO PINOUTS

ID	Type	Pin	Description	Minimum Impedance	Max Power (RMS)
CN18	TRS 3.5mm Headphone Jack	Tip	Headphone Left	8 Ohms	200mW
		Ring	Headphone Right	8 Ohms	200mW
		Sleeve	Audio Ground	-	-
CN1	.156" 5-pin Header	1	Speaker Right Ground (-)	4 Ohms	-
		2	Speaker Right (+)	4 Ohms	20W
		3	n/c	-	-
		4	Speaker Left Ground (-)	4 Ohms	-
		5	Speaker Left (+)	4 Ohms	20W
CN4	.156" 2-pin Header	1	Woofer Ground (-)	8 Ohms	-
		2	Woofer Out (+)	8 Ohms	40W
CN27	.100" 3-pin header	1	Line Out Left (+)	600 Ohms	-
		2	Line Out Ground	-	-
		3	Line Out Right (-)	600 Ohms	-

COUNTRY CODES (DIP S2)

	DIP S2							
Country	1	2	3	4	5	6	7	8
USA	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Austria	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Australia	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
Belgium	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Canada 1	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Canada 2	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
Croatia	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
Denmark	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
Finland	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
France	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
Germany	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Greece	ON	ON	ON	ON	OFF	OFF	OFF	OFF
Italy	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
Japan	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
Middle East	ON	ON	ON	OFF	ON	OFF	OFF	OFF
Netherlands	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
New Zealand	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
Norway	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Portugal	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF
Russia	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
S. Africa	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
Spain	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
Sweden	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
Switzerland	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
Taiwan	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
United Kingdom	OFF	ON	ON	ON	OFF	OFF	OFF	OFF

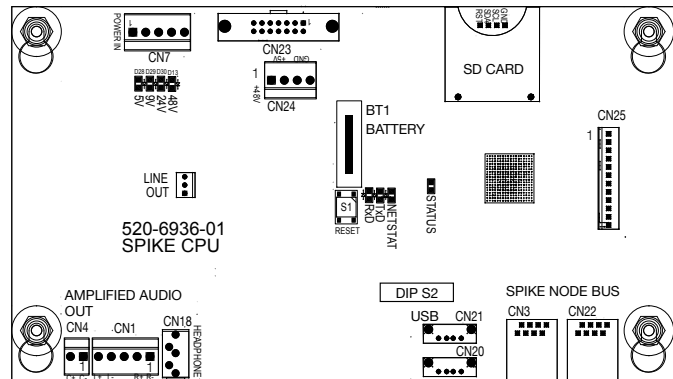


Figure 4.1.1. SPIKE CPU Node connector detail.

COIN DOOR SERVICE SWITCH WIRING

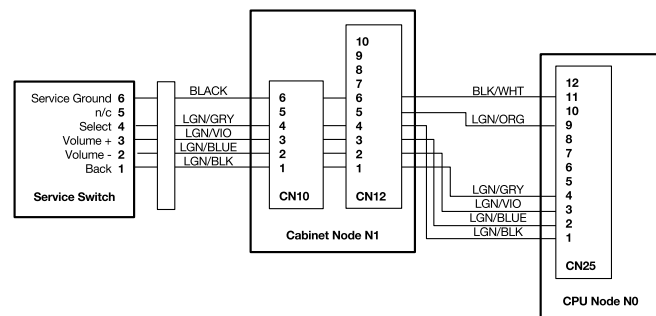
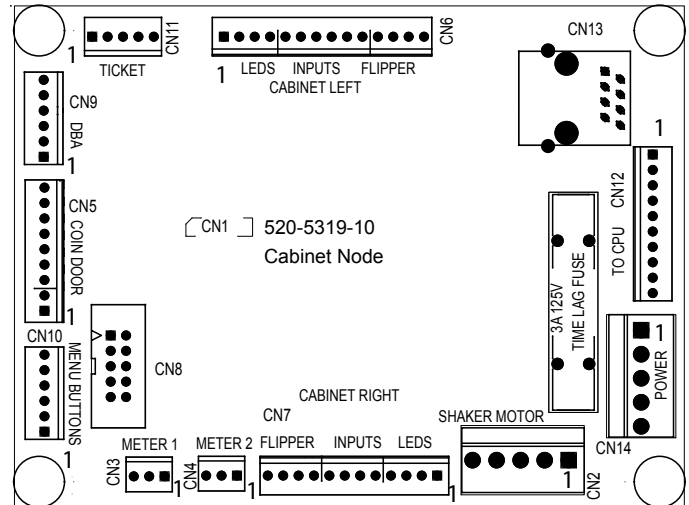


Figure 4.1.2. Service switch wiring. Note that the Cabinet Node must be present and CN10 and CN12 connected for the Coin Door Service Switches to function correctly.

4.2 NODE 1 CABINET

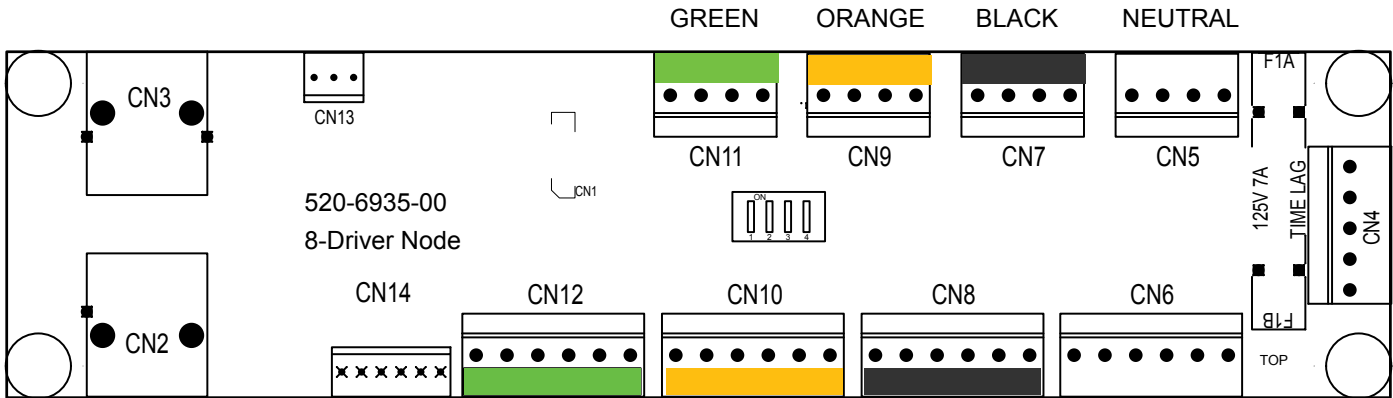
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ID	Type	Pin	Description	Wire Color
CN2	.156" 5-Pin Header Shaker Motor	1	Shaker Motor (-)	BLU
		2	Shaker Motor (-)	-
		3	Shaker Motor (+)	-
		4	Key	-
		5	Shaker Motor (+)	RED
CN3	.100" 3-Pin Header Meter 1	1	Meter 12V (+)	RED
		2	Meter (-)	BLK
		3	N/C	-
CN4	.100" 3-Pin Header Meter 2	1	Meter 12V (+)	RED
		2	Meter (-)	BLK
		3	N/C	-
CN5	.100" 9-Pin Header	1	5V Out	YEL/WHT
		2	Coin LED Out	YEL
		3	Ground	BLK
		4	Slam Tilt In	LGN/RED
		5	Coin 5	PNK/GRN*
		6	Coin 4	PNK/YEL*
		7	Coin 3	PNK/ORN*
		8	Coin 2	PNK/RED*
		9	Coin 1	PNK/BRN*
CN6	.100" 14-Pin Header Cabinet Left	1	5V LED Power	RED
		2	Start 2 LED	YEL/RED
		3	Start 1 LED	YEL/BRN
		4	Spare LED	YEL/ORG
		5	Ground	BLK/WHT
		6	Spare Left	-
		7	Tilt Input	WHT
		8	Door Open	-
		9	Start 2 Switch	-
		10	Start 1 Switch	GRY
		11	N/C	
		12	N/C	
		13	N/C	
		14	N/C	
CN7	.100" 12-Pin Header Cabinet Right	1	5V LED Power	-
		2	Plunge 2 LED	-
		3	Plunge 1 LED	-
		4	Spare LED 2	-
		5	Ground	-
		6	Spare Right In	-
		7	Plunge 2 Switch	-
		8	Plunge 1 Switch	-
		9	N/C	
		10	N/C	
		11	N/C	
		12	N/C	
CN9	.100" 6-Pin Header Dollar Bill Acceptor	1	Coin Enable/DBA Inhibit (-)	-
		2	Coin Enable/DBA Inhibit (+)	-
		3	Key	
		4	DBA 12V	-
		5	Coin 6 / DBA Credit	-
		6	Ground	-



CN10	.100" 6-Pin Header Service Switch In	1	Service Back (To Coin-door)	LGN/BLK
		2	Service Down (To Coin-door)	LGN/BLU
		3	Service Up (To Coindoor)	LGN/VIO
		4	Service Select (To Coindoor)	LGN/GRY
		5	Key	
		6	Service Ground (To Coindoor)	BLK
CN11	.100" 5-Pin Header Ticket Dispenser	1	12V	RED
		2	N/C	
		3	Ticket Dispenser Enable	WHT
		4	Ground	BLK
		5	Ticket Dispenser Notch	BLU
CN12	.100" 10-Pin Header CPU Direct Switches	1	Service Back (To CPU)	GRN/BLK
		2	Service Down (To CPU)	GRN/BLU
		3	Service Up (To CPU)	GRN/VIO
		4	Service Select (To CPU)	GRN/GRY
		5	Power Present	GRN/ORG
		6	Service Ground (To CPU)	BLK/WHT
		7	N/C	-
		8	N/C	-
		9	N/C	-
		10	N/C	-
CN14	.156" 5-Pin Header Power Input	1	Ground	BLK
		2	Key	-
		3	N/C	-
		4	N/C	-
		5	48VDC In	GRY-YEL
			*Varies by country model	

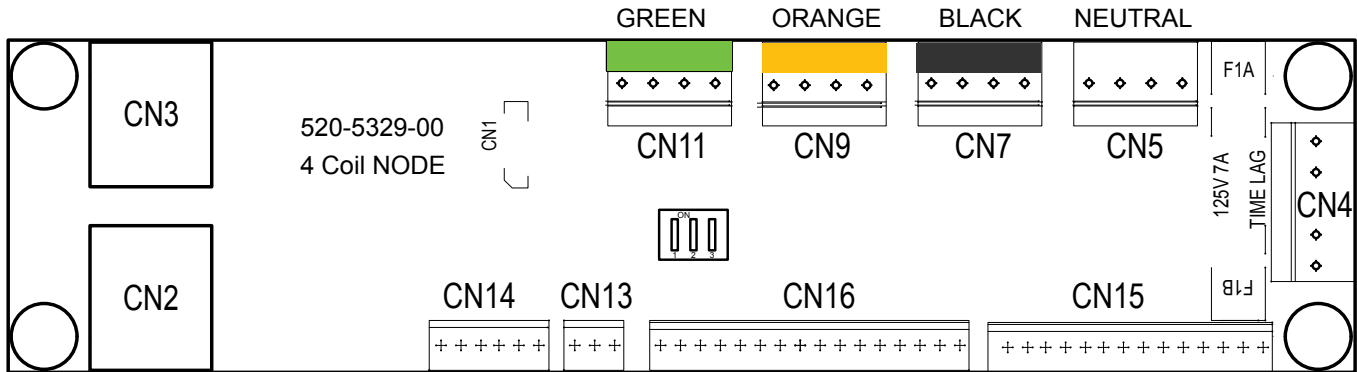
4.3 LOWER PLAYFIELD 48V 8-DRIVER PINOUT NODE 8

520-6935-10


					GREEN	ORANGE	BLACK	NEUTRAL
ID	Type	Pin	Description	Wire Color				
SW1	Address DIP	-	Node 8 - OFF-OFF-OFF-OFF					
CN2	RJ45	-	SPIKE Node Bus	n/a				
CN3	RJ45	-	SPIKE Node Bus	Multi				
CN4	.156" 5-Pin Header Node Power	1	Ground	BLK				
		2	Key	n/c				
		3	N/C	n/c				
		4	N/C	n/c				
		5	48VDC In	GRY				
CN5	.156" 4-Pin Header (White)	1	Switch Ground	BLK-GRN				
		2	8-SW-0 Switch Return	GRY-YEL				
		3	8-DR-0 Driver Return	ORG-YEL				
		4	48V Driver Power	GRY-ORG				
CN6	.156 6-Pin Header (White)	1	8-LP-0 Light Return	BRN-WHT				
		2	LED V+	YEL				
		3	Switch Ground	BLK-GRN				
		4	8-SW-4 Switch Return	GRY-WHT				
		5	8-DR-4 Driver Return	ORG-WHT				
		6	48V Driver Power	GRY-ORG				
CN7	.156" 4-Pin Header (Black)	1	Switch Ground	BLK-GRN				
		2	8-SW-1 Switch	GRY-GRN				
		3	8-DR-1 Driver Return	ORG-GRN				
		4	48V Driver Power	GRY-ORG				
CN8	.156 6-Pin Header (Black)	1	8-LP-1 Light Return	BRN-GRN				
		2	LED V+	YEL				
		3	Switch Ground	BLK-GRN				
		4	8-SW-5	LGN-BLK				
		5	8-DR-5 Driver Return	ORG-GRY				
		6	48V Driver Power	GRY-ORG				
CN9	.156" 4-Pin Header (Orange)	1	Switch Ground	BLK-GRN				
		2	8-SW-2 Switch	GRY-BRN				
		3	8-DR-2 Driver Return	YEL-ORG				
		4	48V Driver Power	n/c				
CN10	.156" 6-Pin Header (Orange)	1	8-LP-2 Light Return	BRN-VIO				
		2	LED V+	YEL				
		3	Switch Ground	BLK-GRN				
		4	8-SW-6 Switch Return	GRY-VIO				
		5	8-DR-6 Driver Return	ORG-VIO				
		6	48V Driver Power	GRY-ORG				
CN11	.156" 4-Pin Header (Green)	1	Switch Ground	BLK-GRN				
		2	8-SW-3 Switch	GRY-RED				
		3	8-DR-3 Driver Return	YEL-GRN				
		4	48V Driver Power	n/c				
CN12	.156" 6-Pin Header (Green)	1	8-LP-3 Light Return	BRN-BLU				
		2	LED V+	YEL				
		3	Switch Ground	BLK-GRN				
		4	8-SW-7 Switch Return	GRY-BLU				
		5	8-DR-7 Driver Return	ORG-BLU				
		6	48V Driver Power	GRY-ORG				
CN13	.100" 3-Pin Header	1	8-LP-4 GI Return (1A Max)	n/c				
		2	GI Ground	n/c				
		3	LED V+	n/c				
CN14	.100" 6-Pin Header, Node Extension Bus	1	Ground	n/c				
		2	DIN	n/c				
		3	DOUT	n/c				
		4	SCK	n/c				
		5	RCK	n/c				
		6	V+	n/c				
F1	Fuse	-	7A SB, 125V	n/a				
					* Refer to Light, Switch, and Driver Node Reference for Wire Colors			

4.4 MID PLAYFIELD 48V 4-DRIVER PINOUT NODE 9

520-5329-10

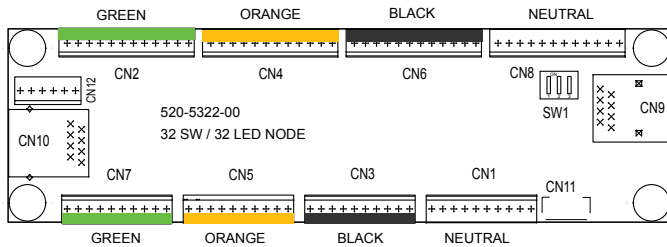


ID	Type	Pin	Description	Wire Color
SW1	Address DIP	-	Node 9 - OFF-OFF-ON	
CN1	-	-	Not Used	n/a
CN2	RJ45	-	SPIKE Node Bus	Multi
CN3	RJ45	-	SPIKE Node Bus	Multi
CN4	.156" 5-Pin Header Node Power	1	Ground	BLK
		2	Key	n/c
		3	N/C	n/c
		4	N/C	n/c
		5	48VDC In	GRY
CN5	.156" 4-Pin Header (White)	1	Switch Ground	BLK-BRN
		2	9-SW-0 Switch Return	TAN-BLK
		3	9-DR-0 Driver Return	YEL-BLK
		4	48V Driver Power	GRY-BRN
CN7	.156" 4-Pin Header (Black)	1	Switch Ground	BLK-BRN
		2	9-SW-1 Switch Return	TAN-WHT
		3	9-DR-1 Driver Return	YEL-BRN
		4	48V Driver Power	GRY-BRN
CN9	.156" 4-Pin Header (Orange)	1	Switch Ground	BLK-BRN
		2	9-SW-2 Switch Return	TAN-ORG
		3	9-DR-2 Driver Return	BRN-ORG
		4	48V Driver Power	GRY-BRN
CN11	.156" 4-Pin Header (Green)	1	Switch Ground	BLK-BRN
		2	9-SW-3 Switch Return	TAN-RED
		3	9-DR-3 Driver Return	YEL-RED
		4	48V Driver Power	GRY-BRN
CN13	.100" 3-Pin Header	1	9-LP-0 GI Return (1A Max)	n/c
		2	GI Ground	n/c
		3	LED V+	n/c
CN14	.100" 6-Pin Header	1	Ground	n/c
		2	DIN	n/c
		3	DOUT	n/c
		4	SCK	n/c
		5	RCK	n/c
		6	V+	n/c

CN15	.100" 14-Pin Header	1	+5V	n/c
		2	9-SW-4 Switch Return	n/c
		3	9-SW-5 Switch Return	n/c
		4	9-SW-6 Switch Return	n/c
		5	9-SW-7 Switch Return	n/c
		6	9-SW-8 Switch Return	n/c
		7	9-SW-9 Switch Return	n/c
		8	9-SW-10 Switch Return	n/c
		9	9-SW-11 Switch Return	n/c
		10	9-SW-12 Switch Return	n/c
		11	9-SW-13 Switch Return	n/c
		12	9-SW-14 Switch Return	n/c
		13	9-SW-15 Switch Return	n/c
		14	Switch Ground	n/c
CN16	.100" 16-Pin Header	1	+6V	YEL
		2	9-LP-1 Light Return	RED-BRN
		3	9-LP-2 Light Return	GRN-BRN
		4	9-LP-3 Light Return	BLU-BRN
		5	9-LP-4 Light Return	RED-ORG
		6	9-LP-5 Light Return	GRN-ORG
		7	9-LP-6 Light Return	BLU-ORG
		8	9-LP-7 Light Return	RED-YEL
		9	9-LP-8 Light Return	GRN-YEL
		10	9-LP-9 Light Return	BLU-YEL
		11	9-LP-10 Light Return	RED-GRN
		12	9-LP-11 Light Return	GRN
		13	9-LP-12 Light Return	BLU-GRN
		14	9-LP-13 Light Return	ORG-WHT
		15	9-LP-14 Light Return	YEL-WHT
		16	9-LP-15 Light Return	n/c
F1	Fuse		7A SB, 125V	n/a

4.5 MID PLAYFIELD PINOUT NODE 10

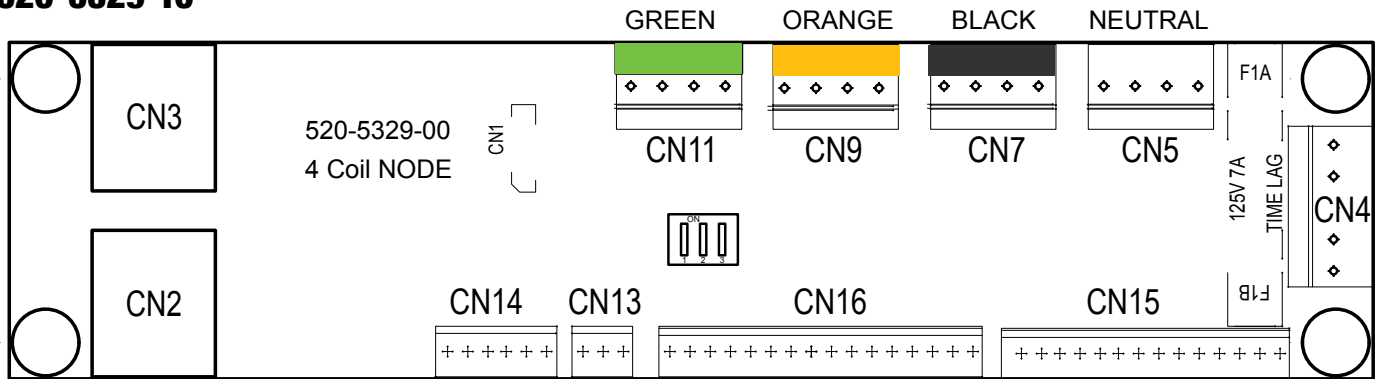
520-5322-72



ID	Type	Pin	Description	Wire Color
SW1	Address DIP		Node 10- OFF-ON-OFF	-
CN1	.100" 10-Pin Header (White)	1	+5V	n/c
		2	11-SW-24 Switch Return	WHT-BLK
		3	11-SW-25 Switch Return	WHT-BRN
		4	11-SW-26 Switch Return	WHT-RED
		5	11-SW-27 Switch Return	WHT-ORG
		6	11-SW-28 Switch Return	WHT-YEL
		7	11-SW-29 Switch Return	WHT-GRN
		8	11-SW-30 Switch Return	WHT-BLU
		9	11-SW-31 Switch Return	WHT-VIO
		10	Switch Ground	BLK-RED
CN2	.100" 12-Pin Header (Green)	1	+8V	n/c
		2	+5V	RED
		3	+5V	RED
		4	11-LP-0 Light Return	YEL-BLK
		5	11-LP-1 Light Return	YEL-BRN
		6	11-LP-2 Light Return	YEL-RED
		7	11-LP-3 Light Return	YEL-ORG
		8	11-LP-4 Light Return	YEL-GRN
		9	11-LP-5 Light Return	YEL-BLU
		10	11-LP-6 Light Return	YEL-VIO
		11	11-LP-7 Light Return	YEL-GRY
		12	Ground	n/c
CN3	.100" 10-Pin Header (Black)	1	+5V	n/c
		2	11-SW-16 Switch Return	PNK-BLK
		3	11-SW-17 Switch Return	PNK-BRN
		4	11-SW-18 Switch Return	PNK-RED
		5	11-SW-19 Switch Return	PNK-ORG
		6	11-SW-20 Switch Return	PNK-YEL
		7	11-SW-21 Switch Return	PNK-GRN
		8	11-SW-22 Switch Return	PNK-BLU
		9	11-SW-23 Switch Return	PNK-VIO
		10	Switch Ground	BLK-VIO
CN4	.100" 12-Pin Header (Orange)	1	+8V	n/c
		2	+5V	RED
		3	+5V	RED
		4	11-LP-8 Light Return	ORG-BLK
		5	11-LP-9 Light Return	ORG-BRN
		6	11-LP-10 Light Return	ORG-RED
		7	11-LP-11 Light Return	ORG-YEL
		8	11-LP-12 Light Return	ORG-GRN
		9	11-LP-13 Light Return	ORG-BLU
		10	11-LP-14 Light Return	ORG-VIO
		11	11-LP-15 Light Return	ORG-GRY
		12	Ground	n/c

CN5	.100" 10-Pin Header (Orange)	1	+5V	n/c
		2	11-SW-8 Switch Return	LGN-BLK
		3	11-SW-9 Switch Return	LGN-BRN
		4	11-SW-10 Switch Return	LGN-RED
		5	11-SW-11 Switch Return	LGN-ORG
		6	11-SW-12 Switch Return	LGN-YEL
		7	11-SW-13 Switch Return	LGN-BLU
		8	11-SW-14 Switch Return	LGN-VIO
		9	11-SW-15 Switch Return	LGN-GRY
		10	Switch Ground	BLK-GRY
CN6	.100" 12-Pin Header (Black)	1	+8V	n/c
		2	+5V	RED
		3	+5V	RED
		4	11-LP-16 Light Return	RED-VIO
		5	11-LP-17 Light Return	GRN-VIO
		6	11-LP-18 Light Return	BLU-VIO
		7	11-LP-19 Light Return	RED-GRY
		8	11-LP-20 Light Return	GRN-GRY
		9	11-LP-21 Light Return	BLU-GRY
		10	11-LP-22 Light Return	BLU-BRN
		11	11-LP-23 Light Return	BLU-GRN
		12	Ground	n/c
CN7	.100" 10-Pin Header (Green)	1	+5V	RED
		2	11-SW-0 Switch Return	TAN-BLK
		3	11-SW-1 Switch Return	TAN-RED
		4	11-SW-2 Switch Return	TAN-ORG
		5	11-SW-3 Switch Return	TAN-YEL
		6	11-SW-4 Switch Return	TAN-GRN
		7	11-SW-5 Switch Return	TAN-BLU
		8	11-SW-6 Switch Return	TAN-VIO
		9	11-SW-7 Switch Return	n/c
		10	Switch Ground	BLK-BRN
CN8	.100" 12-Pin Header (White)	1	+8V	n/c
		2	+5V	RED
		3	+5V	RED
		4	11-LP-24 Light Return	RED-ORG
		5	11-LP-25 Light Return	GRN-ORG
		6	11-LP-26 Light Return	BLU-ORG
		7	11-LP-27 Light Return	RED-YEL
		8	11-LP-28 Light Return	GRN-YEL
		9	11-LP-29 Light Return	BLU-YEL
		10	11-LP-30 Light Return	BLU-RED
		11	11-LP-31 Light Return	BLU-BLK
		12	Ground	n/c
CN9	RJ45	-	SPIKE Node Bus	Multi
CN10	RJ45	-	SPIKE Node Bus	Multi
CN11	-	-	Not Used	n/c
CN12	.100" 6-Pin Header, Node Extension Bus	1	Ground	*
		2	DIN	*
		3	DOUT	*
		4	SCK	*
		5	RCK	*
		6	V+	*

4.6 BACKBOX 48V 4-DRIVER PINOUT NODE 11

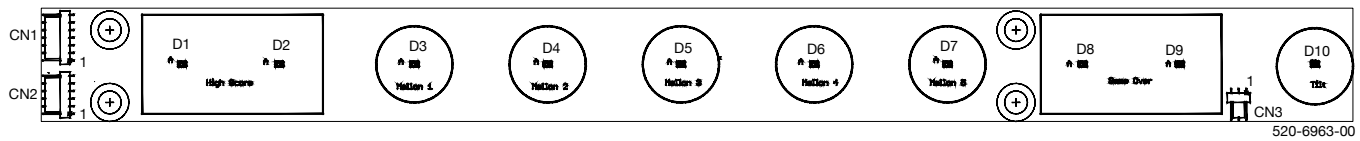
520-5329-10


ID	Type	Pin	Description	Wire Color
SW1	Address DIP		Node 11 - OFF-ON-ON	
CN1	-	-	Not Used	n/a
CN2	RJ45	-	SPIKE Node Bus	Multi
CN3	RJ45	-	SPIKE Node Bus	Multi
CN4	.156" 5-Pin Header Node Power	1	Ground	BLK
		2	Key	n/c
		3	N/C	n/c
		4	N/C	n/c
		5	48VDC In	GRY
CN5	.156" 4-Pin Header (White)	1	Switch Ground	n/c
		2	10-SW-0 Switch Return	n/c
		3	10-DR-0 Driver Return	YEL-BLU
		4	48V Driver Power	GRY-BLK
CN7	.156" 4-Pin Header (Black)	1	Switch Ground	n/c
		2	10-SW-1 Switch Return	n/c
		3	10-DR-1 Driver Return	YEL-GRY
		4	48V Driver Power	GRY-BLK
CN9	.156" 4-Pin Header (Orange)	1	Switch Ground	n/c
		2	10-SW-2 Switch Return	n/c
		3	10-DR-2 Driver Return	YEL-VIO
		4	48V Driver Power	GRY-BLK
CN11	.156" 4-Pin Header (Green)	1	Switch Ground	n/c
		2	10-SW-3 Switch Return	n/c
		3	10-DR-3 Driver Return	ORG-RED
		4	48V Driver Power	GRY-BLK
CN13	.100" 3-Pin Header	1	10-LP-0 GI Return (1A Max)	WHT-BLK
		2	GI Ground	n/c
		3	LED V+	YEL
CN14	.100" 6-Pin Header	1	Ground	BLK
		2	DIN	VIO-BLK
		3	DOUT	VIO-BRN
		4	SCK	VIO-RED
		5	RCK	VIO-ORG
		6	V+	RED
CN15	.100" 14-Pin Header	1	+5V	RED
		2	10-SW-4 Switch Return	TAN-BLK
		3	10-SW-5 Switch Return	TAN-ORG
		4	10-SW-6 Switch Return	TAN-YEL
		5	10-SW-7 Switch Return	TAN-VIO
		6	10-SW-8 Switch Return	TAN-WHT
		7	10-SW-9 Switch Return	WHT-RED
		8	10-SW-10 Switch Return	n/c
		9	10-SW-11 Switch Return	n/c
		10	10-SW-12 Switch Return	n/c
		11	10-SW-13 Switch Return	n/c
		12	10-SW-14 Switch Return	n/c
		13	10-SW-15 Switch Return	n/c
		14	Switch Ground	BLK
CN16	.100" 16-Pin Header	1	+6V	YEL
		2	10-LP-1 Light Return	BLU-BLK
		3	10-LP-2 Light Return	GRN-BLK
		4	10-LP-3 Light Return	BLK-WHT
		5	10-LP-4 Light Return	RED-ORG
		6	10-LP-5 Light Return	BLU-ORG
		7	10-LP-6 Light Return	GRN-ORG
		8	10-LP-7 Light Return	RED-YEL
		9	10-LP-8 Light Return	GRN-YEL
		10	10-LP-9 Light Return	BLU-YEL
		11	10-LP-10 Light Return	BLU-VIO
		12	10-LP-11 Light Return	GRN-VIO
		13	10-LP-12 Light Return	RED-VIO
		14	10-LP-13 Light Return	RED-GRY
		15	10-LP-14 Light Return	BLU-GRY
		16	10-LP-15 Light Return	BLK-VIO
F1	Fuse		7A SB, 125V	n/a

* Refer to Light, Switch, and Driver Node Reference for Wire Colors

4.7 9-LAMP BOTTOM EXTENSION PINOUT NODE 11A

520-6963-00



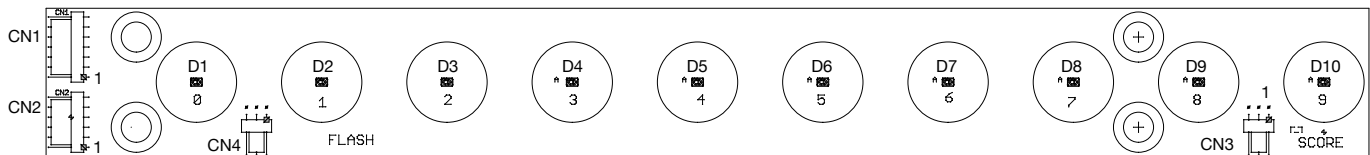
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ID	Type	Pin	Description	Wire Color
CN1	.100" 7-Pin Header, Node Extension Bus	1	Ground	BLK
		2	MISO	VIO-BLK
		3	MISI	VIO-BRN
		4	SCK	VIO-RED
		5	RCK	VIO-ORG
		6	n/c	n/c
		7	V+	RED

CN2	.100" 6-Pin Header, Node Extension Bus	1	Ground	BLK
		2	MISO	VIO-BLK
		3	MISI	VIO-BRN
		4	SCK	VIO-RED
		5	RCK	VIO-ORG
		6	V+	RED
CN3	.100" 3-Pin Header	1	LED1	n/c
		2	Ground	n/c
		3	V+	n/c

4.8 10-LAMP TOP EXTENSION PINOUT NODE 11B

520-6962-00



520-6962-00

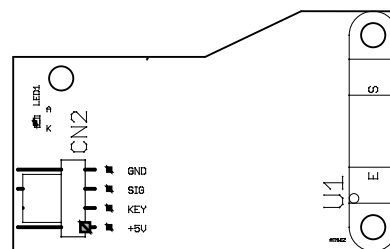
ID	Type	Pin	Description	Wire Color
CN1	.100" 7-Pin Header, Node Extension Bus	1	Ground	BLK
		2	MISO	VIO-BLK
		3	MISI	VIO-BRN
		4	SCK	VIO-RED
		5	RCK	VIO-ORG
		6	n/c	n/c
		7	V+	RED

CN2	.100" 6-Pin Header, Node Extension Bus	1	Ground	n/c
		2	MISO	n/c
		3	MISI	n/c
		4	SCK	n/c
		5	RCK	n/c
		6	V+	n/c
CN3	.100" 3-Pin Header	1	V+	RED
		2	Ground	n/c
		3	Score LED	ORG-GRN
CN4	.100" 3-Pin Header	1	V+	RED
		2	LED1	ORG-RED
		3	LED2	ORG-YEL

4.9 STEPPER MOTOR OPTO

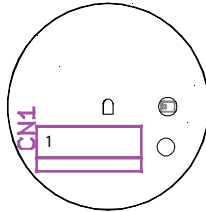
520-6960-00

ID	Type	Pin	Description	Wire Color
CN2	Molex 4pin KK100	1	5V	Red
		2	Key	n/c
		3	Signal	Tan
		4	Ground	Black



4.11 STAR ROLLOVER RGB

520-6824-0X

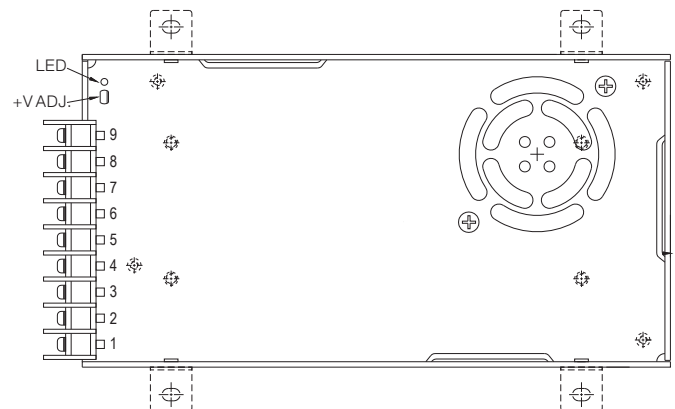


ID	Type	Pin	Description	Wire Color
Star Rollover 1				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-BLK
		3	Blue	n/c
		4	Green	YEL-BLK
		5	Red	n/c
		6	5V	RED
Star Rollover 2				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-BRN
		3	Blue	n/c
		4	Green	YEL-BRN
		5	Red	YEL-BRN
		6	5V	RED
Star Rollover 3				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-RED
		3	Blue	n/c
		4	Green	YEL-RED
		5	Red	n/c
		6	5V	RED
Star Rollover 4				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-ORG
		3	Blue	n/c
		4	Green	YEL-ORG
		5	Red	YEL-ORG
		6	5V	RED
Top Right Star				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-VIO
		3	Blue	n/c
		4	Green	YEL-GRY
		5	Red	n/c
		6	5V	RED
Shooter ret Star				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-BLU
		3	Blue	n/c
		4	Green	YEL-VIO
		5	Red	YEL-VIO
		6	5V	RED
Pop Bumper Star				

CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PINK-GRN
		3	Blue	n/c
		4	Green	YEL-BLU
		5	Red	n/c
		6	5V	RED
Left star				
CN1	.100" 6-Pin Header	1	Ground	BLK-VIO
		2	Switch Out	PNK-YEL
		3	Blue	n/c
		4	Green	YEL-GRN
		5	Red	YEL-GRN
		6	5V	RED

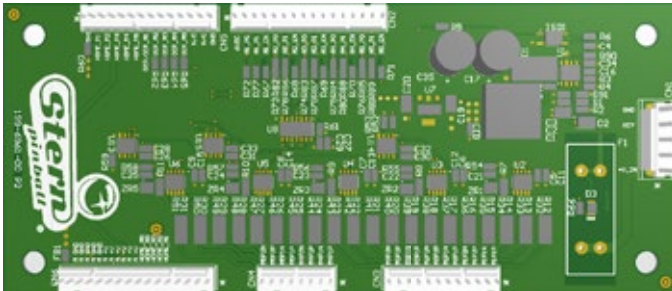
4.10 MAIN POWER SUPPLY

011-5003-00



ID	Type	Pin	Description	Wire Color
CN1	Screw Terminal	1	AC Line Hot In	BLK
		2	AC Line Neutral In	WHT
		3	Earth Ground In	GRN
		4	DC Ground	BLK
		5	DC Ground	BLK
		6	DC Ground	BLK
		7	+48 V System Power	GRY
		8	+48 V System Power	GRY
		9	+48 V System Power	GRY

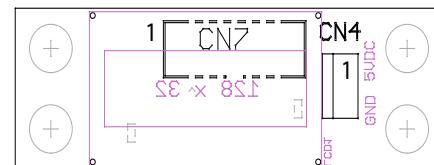
4.12 STEPPER MOTOR CONTROLLER

520-6961-00


ID	Type	Pin	Description	Wire Color
CN1	.156" 5-Pin Header Node Power	1	Ground	BLK
		2	Key	n/c
		3	N/C	n/c
		4	N/C	n/c
		5	48VDC In	GRY
CN2	.100" 16-Pin Header	1	+6V	YEL
		2	LED1/M1 P0	BLU-BLK
		3	LED2/M1 P1	GRN-BLK
		4	LED3/M1 EN	BLK-WHT
		5	LED4/M2 P0	RED-ORG
		6	LED5/M2 P1	BLU-ORG
		7	LED6/M2 EN	GRN-ORG
		8	LED7/M3 P0	RED-YEL
		9	LED8/M3 P1	GRN-YEL
		10	LED9/M3 EN	BLU-YEL
		11	LED10/M4 P0	BLU-VIO
		12	LED11/M4 P1	GRN-VIO
		13	LED12/M4 EN	RED-VIO
		14	LED13/M5 P0	RED-GRY
		15	LED14/M5 P1	BLU-GRY
		16	LED15/M5 EN	BLK-VIO
CN3	.100" 12-Pin Header	1	M1 P1 positive	RED-BLK
		2	M1 P1 negative	BLU-BLK
		3	M1 P2 positive	GRN-BLK
		4	M1 P2 negative	BLK-WHT
		5	M2 P1 positive	RED-ORG
		6	M2 P1 negative	BLU-ORG
		7	M2 P2 positive	GRN-ORG
		8	M2 P2 negative	BLK-ORG
		9	M3 P1 positive	RED-YEL
		10	M3 P1 negative	BLU-YEL
		11	M3 P2 positive	GRN-YEL
		12	M3 P2 negative	BLK-YEL
CN4	.100" 8-Pin Header	1	M4 P1 positive	RED-VIO
		2	M4 P1 negative	BLU-VIO
		3	M4 P2 positive	GRN-VIO
		4	M4 P2 negative	BLK-VIO
		5	M5 P1 positive	RED-GRY
		6	M5 P1 negative	BLU-GRY
		7	M5 P2 positive	GRN-GRY
		8	M5 P2 negative	BLK-GRY

CN5	.100" 14-Pin Header	1	+5V	RED
		2	Home M1 out	TAN-BLK
		3	Home M2 out	TAN-ORG
		4	Home M3 out	TAN-YEL
		5	Home M4 out	TAN-VIO
		6	Home M5 out	TAN-WHT
		7	M1 OCP/OCP out	WHT-RED
		8	M2 OCP out	n/c
		9	M3 OCP out	n/c
		10	M4 OCP out	n/c
		11	M5 OCP out	n/c
		12	n/c	n/c
		13	n/c	n/c
		14	Ground	BLK
CN6	.100" 16-Pin Header	1	Home M1 in	TAN-BLK
		2	Home M2 in	TAN-ORG
		3	Home M3 in	TAN-YEL
		4	Home M4 in	TAN-VIO
		5	Home M5 in	TAN-WHT
		6	Key	n/c
		7	Home +V	RED
		8	Home +V	RED
		9	Home +V	RED
		10	Home +V	RED
		11	Home +V	RED
		12	Home GND	BLK
		13	Home GND	BLK
		14	Home GND	BLK
		15	Home GND	BLK
		16	Home GND	BLK
F1	Fuse	-	7A SB, 125V	n/a

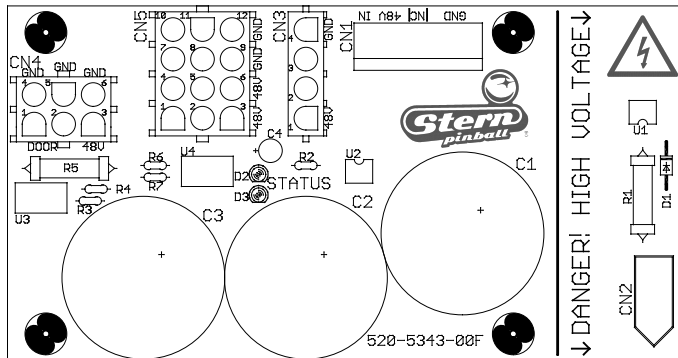
4.13 MINI DIAGNOSTICS DISPLAY

520-6964-00


ID	Type	Pin	Description	Wire Color
CN4	Power	1	Display Power +5V	Red
		4	Display Ground	Black
CN7	14-Pin Ribbon 11 ft 036-8045-132	-	Display Data (Red = Pin 1)	Ribbon

4.14 POWER DISTRIBUTION BOARD

520-8096-00



ID	Type	Pin	Description	Wire Color
CN1	.156 in 7-Pin Housing Plug: 045-5259-07 Pin: 055-5331-00 Key: 060-5013-00	1	+48 VDC IN	GRY
		2	+48 VDC IN	GRY
		3	+48 VDC IN	GRY
		4	Key (n/c)	-
		5	Ground	BLK
		6	Ground	BLK
		7	Ground	BLK
CN2	.093 in 3-Pos Plug Plug: 045-5003-03 Pin: 055-5013-09	1	Line In (100-240 VAC)	BLK
		2	Neutral	WHT
		3	Earth Ground	GRN
CN3	0.084 in 4-Pos Plug Plug: 045-5200-04 Pin: 055-5033-08	1	+48 VDC to CPU Node	GRY
		2	Door Interlock Switch Status	GRY/RED
		3	Line Voltage Status	VIO
		4	Ground	BLK
CN4	0.084 in 6-Pos Plug Plug: 045-5200-06 Pin: 055-5033-08	1	Door Interlock Switch +48V	GRY
		2	Door Interlock Switch +48V	GRY
		3	Switched 48V Out (to Node 1)	GRY/YEL
		4	Door Interlock Return Ground	GRY/RED
		5	Door Interlock Return Ground	GRY/RED
		6	Ground (to Node 1)	BLK
CN5	0.084 in 12-Pos Plug Plug: 045-5200-12 Pin: 055-5033-08	1	Switched 48V Node Power	GRY
		2	Switched 48V Node Power	GRY
		3	Switched 48V Node Power	GRY
		4	Switched 48V Node Power	GRY
		5	Switched 48V Node Power	GRY
		6	Switched 48V Node Power	GRY
		7	Node Ground	BLK
		8	Node Ground	BLK
		9	Node Ground	BLK
		10	Node Ground	BLK
		11	Node Ground	BLK
		12	Node Ground	BLK

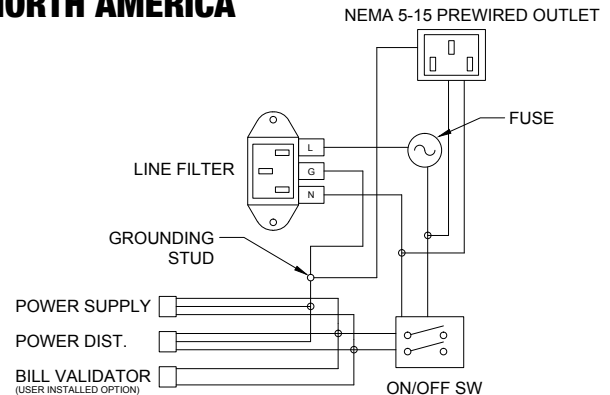
4.15 POWER PLUG WIRING

CAUTION

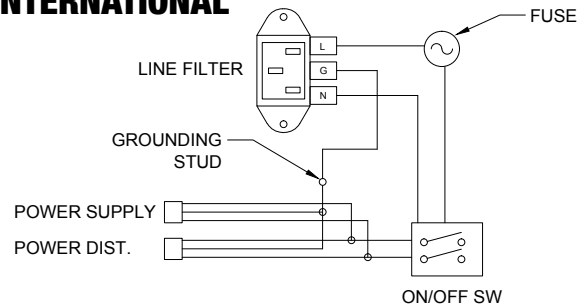
TO MAINTAIN SAFETY, GROUND WIRE FROM LINE FILTER IS TO BE MOUNTED FIRST ON GROUNDING STUD AND SECURED WITH NUT. ALL OTHER GROUNDS MAY THEN BE ATTACHED TO GROUNDING STUD.

REPLACE ALL FUSES WITH CORRECT CURRENT RATINGS!

NORTH AMERICA



INTERNATIONAL



LINE CORDS

Part Number	Description
034-6012-00	Line Cord, 3m, 5-15P USA
034-6012-01	Line Cord, 3m, CEE77P EUROPE
034-6012-02	Line Cord, 3m, BS1363P United Kingdom
034-6012-03	Line Cord, 3m, AS-NZS4417P Australia
034-6012-04	Line Cord, 3m, CEI23-16P Italy
034-6012-05	Line Cord, 3m, SEV1011P Switzerland
034-6012-06	Line Cord, 3m, JIS8303P Japan
034-6012-07	Line Cord, 3m, SI32P Israel
034-6012-08	Line Cord, 3m, BS546P S Africa, India
034-6012-09	Line Cord, 3m, IS6538P S. India

LINE FUSES

Line Voltage (Region)	Fuse Current	Type	Part Number
120V (North America)	8 A	Slow Blow MDL	200-5000-05
220/240v (Europe, Australia, UK)	5 A	Slow Blow MDL	200-5000-01

5. PARTS REFERENCE

5.1 PLAYFIELD RUBBER PARTS

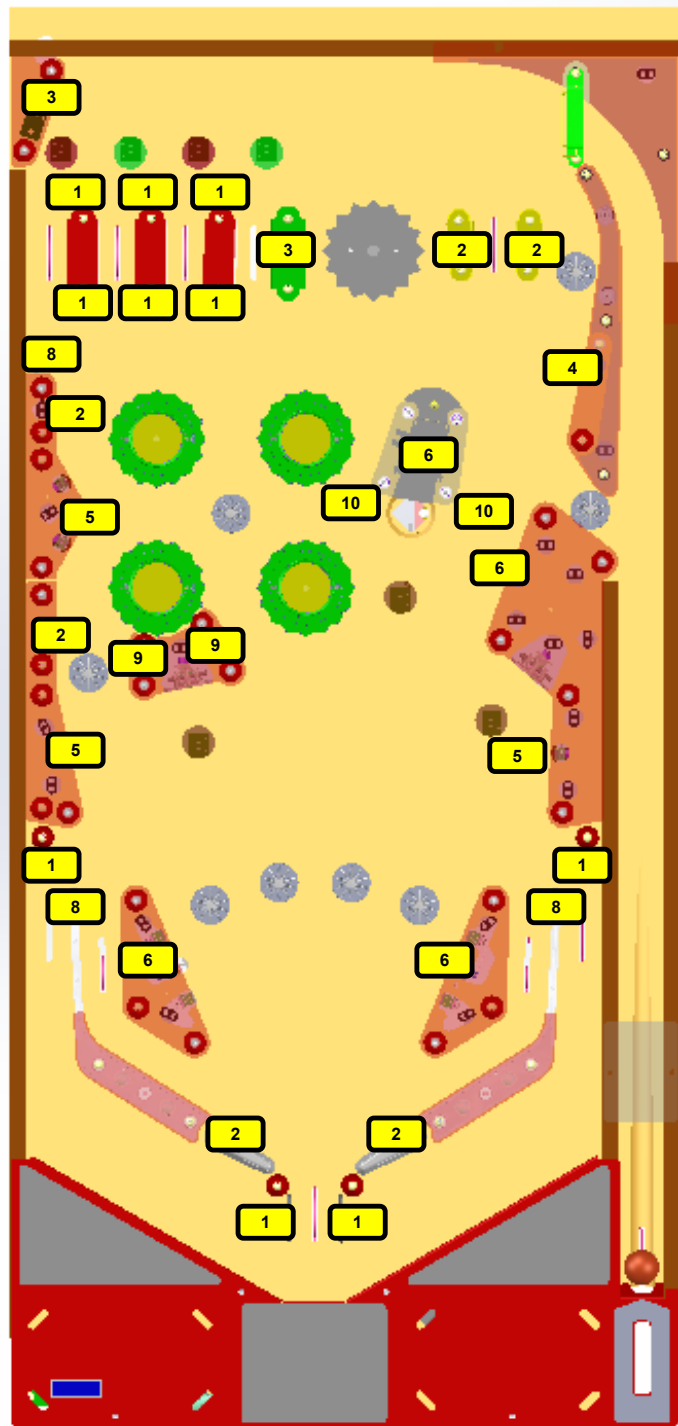


Figure 5.1.1. Rubber o-ring part locations.

RUBBER O-RINGS

ID	Qty	Size (ID)	Size (OD)	Durometer	Color	Part Number
1	10	5/16"		40	White	545-5348-52
2	6	1"		40	White	545-5348-55
3	2	1-1/4"		40	White	545-5348-56
4	1	1-1/2"		40	White	545-5348-57
5	3	2"		40	White	545-5348-58
6	4	2-1/2"		40	White	545-5248-59
8	3		7/16"	40	White	545-5348-67
9	2	1"		50	Black	545-5348-05
10	2	3/16"		50	Black	545-5348-01

Figure 5.1.2. Rubber o-ring part numbers and usage. ID: Inner Diameter, OD: Outer Diameter, Durometer: Higher number is firmer, less bounce, and more durable.

ID	Qty	Description	Color	Part Number
11	1	Plunger Tip	Black	545-5276-00
12	2	Bumper Pad (Sub assemblies)	Black	545-5105-00

Figure 5.1.3. Other rubber part numbers and usage

5.2 RUBBER SIZE CHART

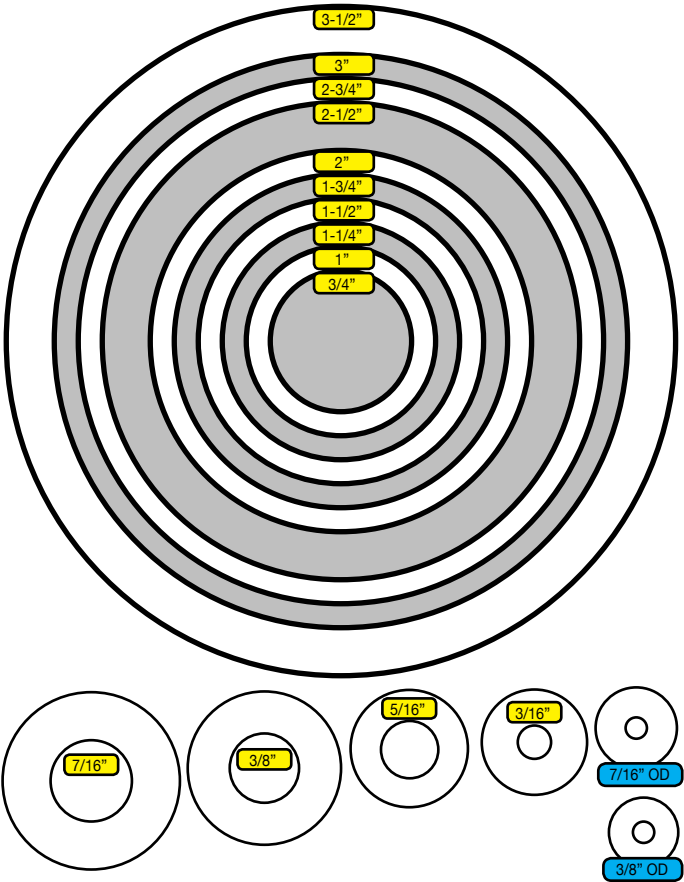
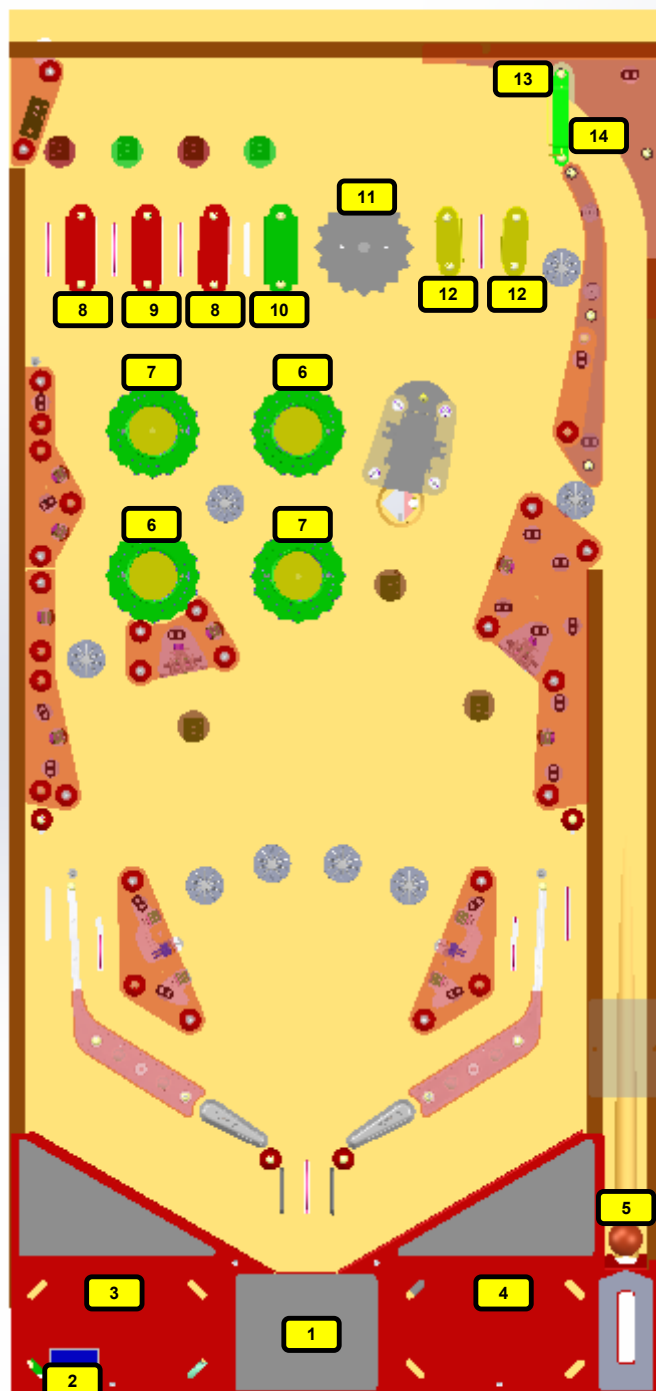


Figure 5.2.1. Rubber ring inner diameter sizing tool. Hold ring up to chart and read largest size on inside of ring. Dimensions are Inner Diameter (ID) unless otherwise noted as Outer Diameter (OD).



5.3 PLAYFIELD ASSEMBLIES, TOP



ID	Part Number	Description	Qty
1	535-0790-29	BOTTOM ARCH	1
2	520-6964-00	DISPLAY	1
3	820-1086-00	CD MINI-DISPLAY BOTTOM ARCH	1
4	755-5420-12-Y	COIN CARD	1
5	260-5000-00	PINBALL (STEEL) 1-1/16"	1
6	545-0651-06	DAISY POP CAP (YELLOW)	2
7	545-0651-04	DAISY POP CAP (GREEN)	2
8	550-5102-04	LANE HOOD (GREEN)	2
9	550-5102-06	LANE HOOD (YELLOW)	1
10	550-5103-06	LANE HOOD (YELLOW)	1
11	516-0033-18	POP TOP ASSY. W/ LED	1
12	550-5035-13	LANE HOOD (BLUE)	2
13	535-5269-02	ONE WAY GATE BRACKET	1
14	535-5307-07	WIRE FORM GATE	1

Figure 5.3.1. Major playfield assemblies, Top locations.

5.4 PLAYFIELD ASSEMBLIES, BOTTOM

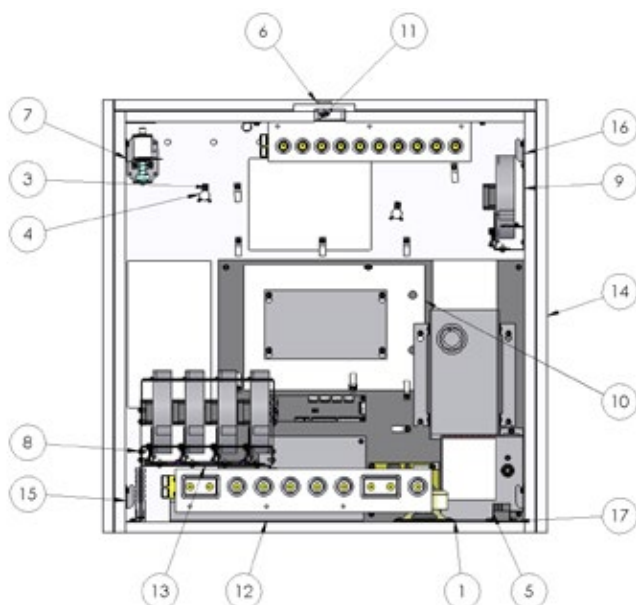


ID	Part Number	Description	Qty
1	511-1013-01	TROUGH COIL ASSEMBLY	1
2	511-7647-00	LONG RANGE OPTO ASSEMBLY	1
3	500-6543-84-ND	LEFT FLIPPER ASSEMBLY	1
4	500-6543-85-ND	RIGHT FLIPPER ASSEMBLY	1
5	500-9920-01-D7	SLINGSHOT ASSEMBLY	2
6	511-7544-0X	RGB STAR ROLLOVER ASSEMBLY	8
7	520-6935-10	48V 8-DRIVER NODE BOARD	1
8	511-7581-00	BULLSEYE TARGET ASSEMBLY	2
9	515-6459-04-ND	POP BUMPER (BOTTOM) ASSEMBLY	4
10	500-6511-03-ND	30 DEGREE EJECT ASSEMBLY	1
11	520-5322-72	32 SW / 32 LED NODE BOARD	1
12	520-5329-10	48V 4-DRIVER NODE BOARD	1

Figure 5.4.1. Major playfield assemblies, Bottom locations.

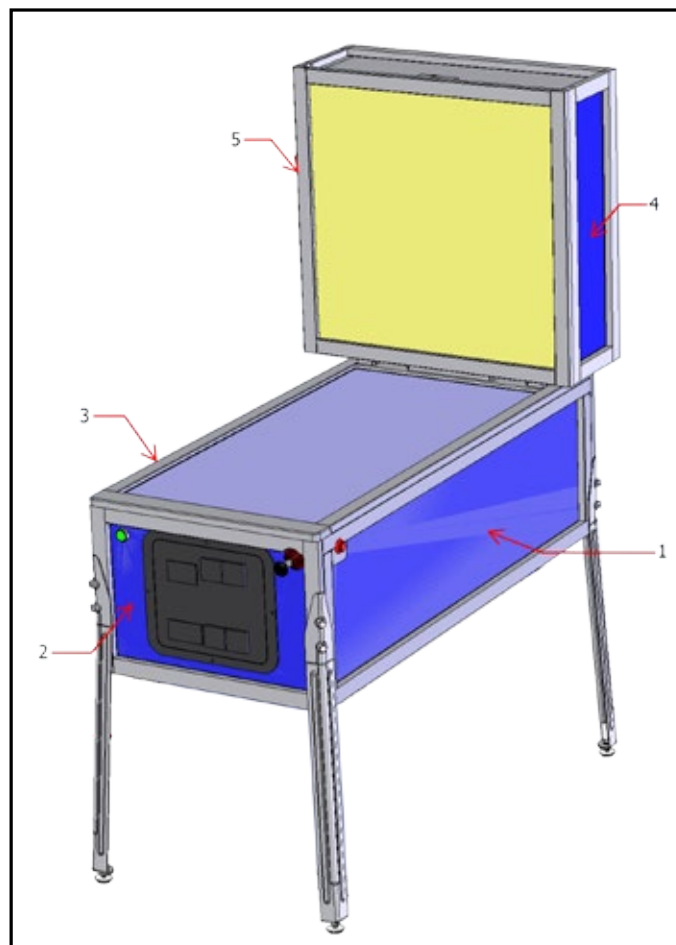


5.5 BACKBOX PARTS



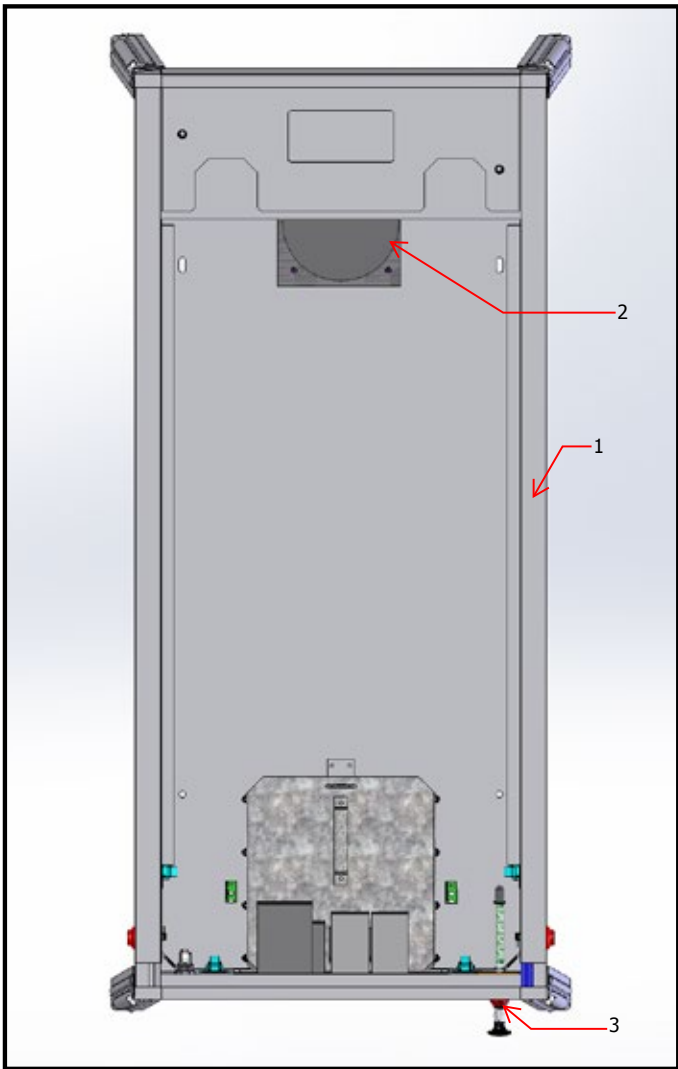
ID	Part Number	Description	Qty
1	031-5013-00	SPEAKER 21W 40OHM 4"	2
3	077-5106-00	2-LUG STAND-UP REV. MOUNT SHORT SOCKET	2
4	113-5045-08	LAMP - #89: WHITE LED	2
5	180-5001-03	POWER SWITCH	1
6	355-5170-00	BB LOCK	1
7	511-1027-00	KNOCKER ASSY	1
8	511-7614-00	4 BANK, REEL ASSEMBLY	1
9	511-7615-00	REEL MECH ASSY	1
10	511-7628-N9	CPU ASSEMBLY	1
11	511-7644-00	LAMP ASSEMBLY, TOP, BB	1
12	511-7645-00	LAMP ASSY: BOTTOM, BB	1
13	515-1055-00	REEL MECH MTG BRKT	1
14	525-6010-00	BACK BOX ASSEMBLY	1
15	535-1108-00	CORNER BRKT, BOTTOM, GLASS ASSY	2
16	535-1108-01	CORNER BRKT, BOTTOM, GLASS ASSY	2
17	535-8318-00	CABINET ON/OFF SWITCH PLATE	1
18	511-7825-43	GLASS FRAME, BB	1

5.6 CABINET DECALS

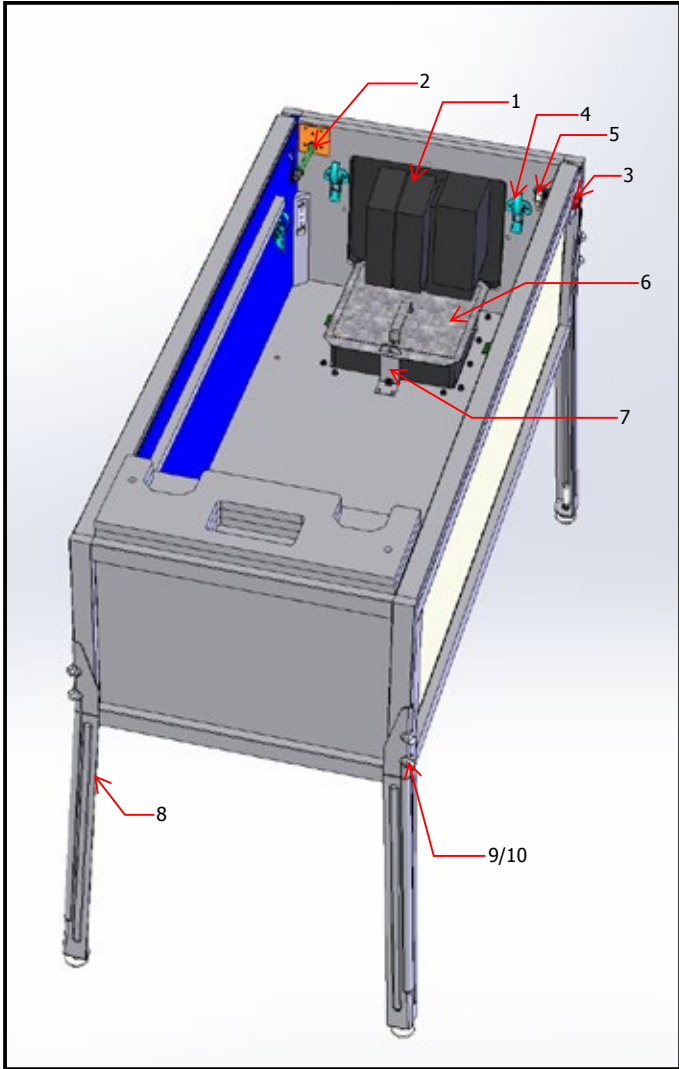


ID	Part Number	Description	Qty
1	820-91N9-04	DECAL CABINET - RIGHT	1
2	820-91N9-05	DECAL CABINET - FRONT	1
3	820-91N9-03	DECAL CABINET - LEFT	1
4	820-91N9-02	DECAL BACKBOX - RIGHT	1
5	820-91N9-01	DECAL BACKBOX - LEFT	1

5.7 CABINET PARTS



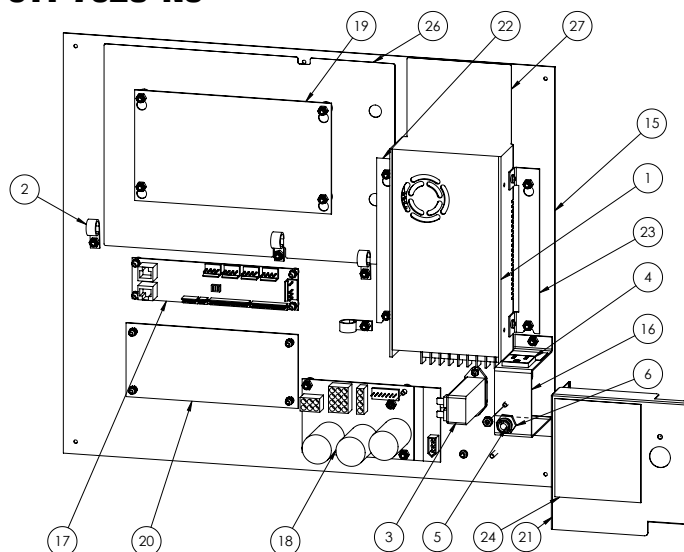
ID	Part Number	Description	Qty
1	525-6009-00	CABINET	1
2	031-5007-01	SPEAKER 8" ROUND, 4 OHM	1
3	511-0009-07-04	BEE HIVE PLUNGER	1



ID	Part Number	Description	Qty
1	501-5018-173	COIN DOOR ASSEMBLY (USA)	1
2	180-5160-01	FLIPPER SWITCH	2
3	500-5026-37	FLIPPER BUTTON, LONG	2
4	355-5038-00	BASSET CLAMP - LOCK BAR / PLAYFIELD	4
5	500-6388-44-LED	START BUTTON	1
6	545-5090-00	CASH BOX - PLASTIC	1
	535-5013-03	CASH BOX - COVER	1
	535-7772-00	HAIR PIN CLIP	1
7	535-1204-00	CASBOX - LOCKING TAB	1
8	500-5921-43	LEG ASSEMBLY	4
9	231-5001-01	LEG BOLT ZINC	8
10	242-5624-01	LEG WASHER 13/32 ID x 13/16 OD	8

5.8 BACKBOX ELECTRONICS

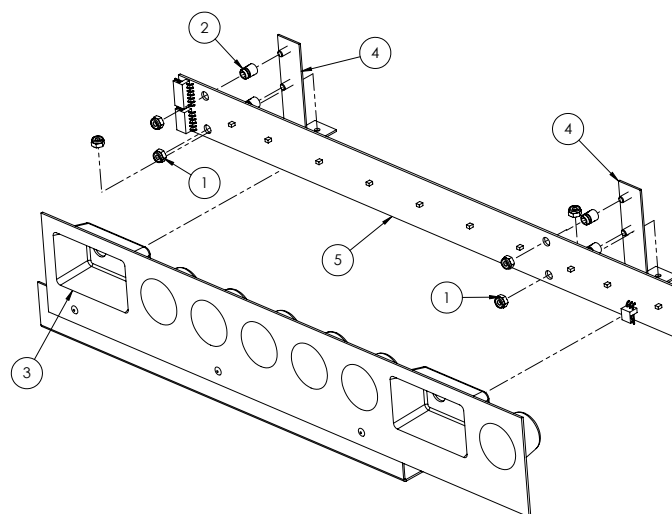
511-7628-N9



ID	Part Number	Description	Qty
1	011-5003-00	SWITCHING POWER SUPPLY, 48VDC, 500W	1
2	040-5000-06	1/2" CABLE CLAMP	5
3	150-5015-00	EMI FILTER: 06SEEG3V	1
4	180-5008-01	SERVICE OUTLET-US	1
5	200-5000-05	FUSE, 8 AMP S/B 250V	1
6	205-5001-00	FUSE HOLDER, SCREW IN, 3453LF7	1
7	232-5301-01	# 8-32 X 3/8" PPH MS SEMS SCREW - BLACK	1
8	237-5813-00	SCREW, 4-40 X 1/2" PPH SEMS	2
9	237-6296-06	M4 x 6mm PAN PHILL	4
10	240-5005-00	6-32 NYLOK STOP NUT	8
11	240-5102-00	8-32 NYLON LOCK NUT	26
12	240-5104-00	8-32 KEPS NUT	1
13	240-5318-00	4-40 KEPS NUT	2
14	254-5000-19	NYLON SPACER - BLACK - 3/8 OD X .175 ID X 1/8"	8
15	515-0206-00	CPU PLATE	1
16	515-9769-00	MTG BRKT: FUSE & OUTLET, SPIKE BACK-BOX	1
17	520-5329-10	PCB: MOTOR DRIVER	1
18	520-8096-00	PCB: POWER DISTRIBUTION BD, SPIKE	1
19	520-6936-01	CPU	1
20	520-6961-00	PCB: MOTOR DRIVER	1
21	535-1130-00	AC COVER, SPIKE BACKBOX	1
22	535-1129-00	MTG BRKT: 48V POWER SUPPLY	1
23	535-1129-01	MTG BRKT: 48V POWER SUPPLY	1
24	820-8351-00	LABEL: FUSE & WARNING	1
25	820-8352-00	LABEL: AC OUTLET	1
26	820-8373-01	DECAL: BACKBOX	1
27	820-8373-05	DECAL: BACK BOX	1

5.9 BACKBOX LED BOTTOM

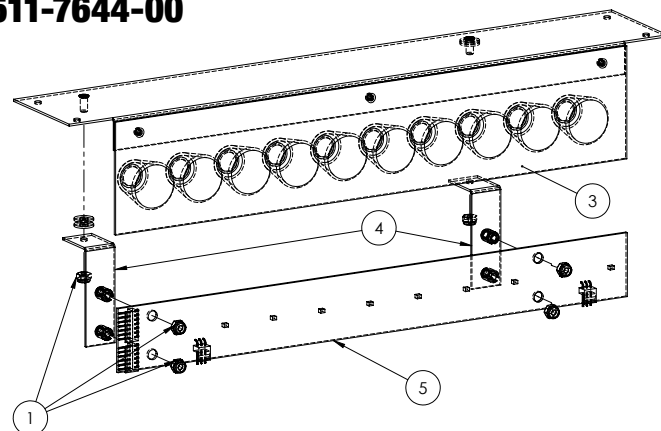
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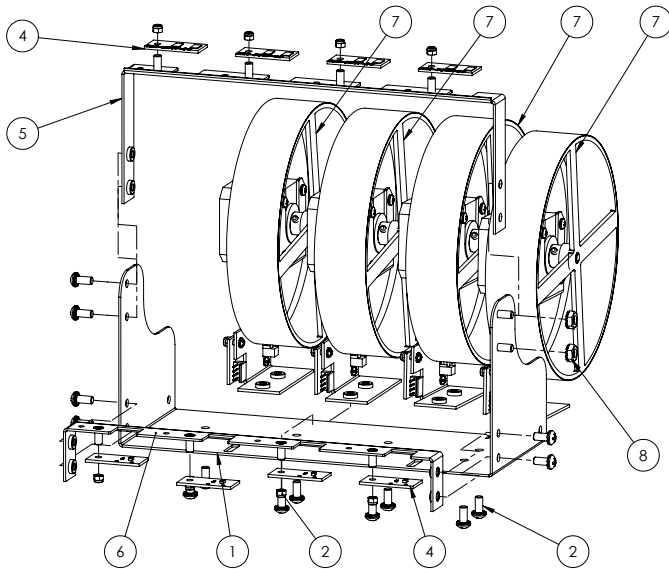
ID	Part Number	Description	Qty
1	240-5005-00	6-32 NYLOK STOP NUT	6
2	254-5007-02	1/4" SELF RETAINING SPACER	4
3	510-7531-00	RIVET: BOTTOM LIGHT CUPS	1
4	515-1053-00	PCB, MTG, BRKT #2	2
5	520-6963-00	PCB: LAMP BRD, BOTTOM	1

5.10 BACKBOX LED TOP

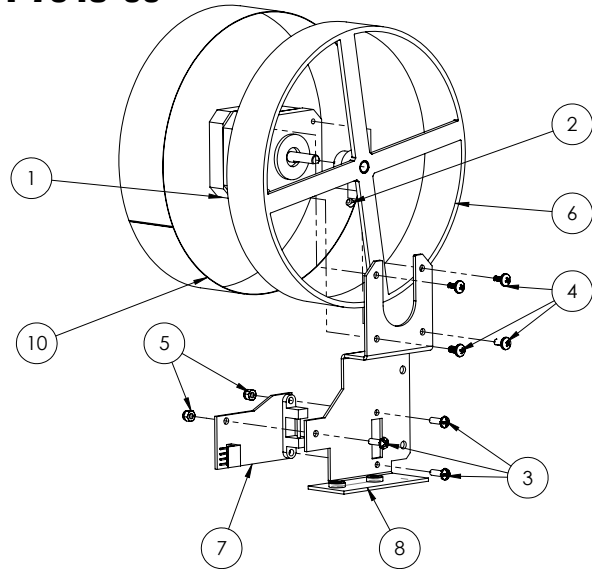
511-7644-00



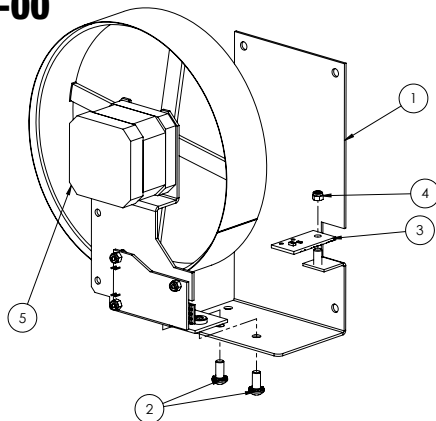
ID	Part Number	Description	Qty
1	240-5005-00	6-32 NYLOK STOP NUT	6
2	254-5007-02	1/4" SELF RETAINING SPACER	4
3	510-7530-00	RIVET: UPPER LIGHT CUPS	1
4	515-1052-00	PCB MTG BRKT #1	2
5	520-6962-00	PCB: LAMP BRD, SCORE	1
6	242-5005-00	#8 WASHER	4

5.11 SCORE REEL ASSEMBLY**511-7614-00**

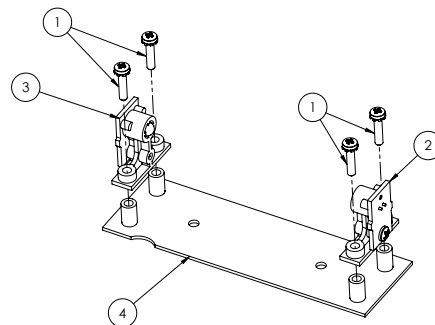
ID	Part Number	Description	Qty
1	515-0200-00	BRKT: 4 BANK REEL	1
2	232-5301-00	SCREW, 8-32 X 3/8" PPH SEMS	14
3	240-5303-00	4-40 NYLON LOCK NUT	8
4	520-5307-00	WHITE LED BOARD	8
5	515-1057-00	LAMP BRKT, REEL MECH	1
6	515-0207-00	LAMP BRKT, REEL MECH #2	1
7	511-7648-00	REEL ASSY - SCORE	4
8	240-5104-00	8-32 KEPS NUT	2

5.13 SCORE REEL ASSEMBLY**511-7648-00**

ID	Part Number	Description	Qty
1	041-5105-00	UNIPOLAR STEPPER MOTOR	1
2	237-5838-03	SET SCREW 6-32 X 1/8"	1
3	237-5909-01	SCREW, 4-40 X 3/8" PPH SEMS	3
4	237-6188-01	M3 x 6mm PPH	4
5	240-5303-00	4-40 NYLON LOCK NUT	3
6	515-9819-00	REEL ASSEMBLY	1
7	520-6960-00	PCB: OPTO SENSOR, REEL	1
8	535-1131-00	REEL MOTOR BRKT	1
9	820-8382-00	DECAL: SCORE	1
10	820-8382-01	DECAL: CREDITS REEL	1

5.12 CREDIT REEL ASSEMBLY**511-7615-00**

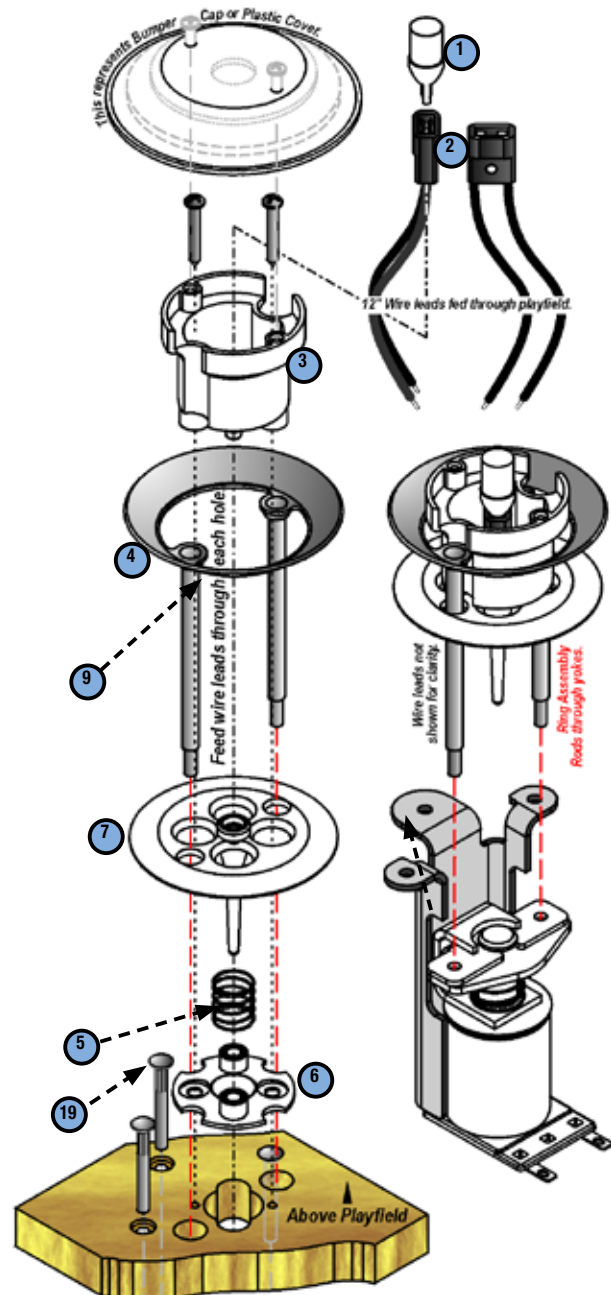
ID	Part Number	Description	Qty
1	515-1049-00	BRKT: REEL MECH	1
2	232-5301-00	SCREW, 8-32 X 3/8" PPH SEMS	2
3	520-5307-00	WHITE LED BOARD	1
4	240-5303-00	4-40 NYLON LOCK NUT	1
5	511-7648-01	REEL ASSY - CREDIT	1

5.14 LONG RANGE OPTO ASSEMBLY**511-7647-00**

ID	Part Number	Description	Qty
1	237-5813-00	SCREW, 4-40 X 1/2" PPH SEMS	4
2	500-0215-00	LR OPTO EMITTER ASSEMBLY	1
3	500-0215-01	LR OPTO RECIEVER ASSEMBLY	1
4	515-0199-00	BRKT: TROUGH WIDE OPTO	1

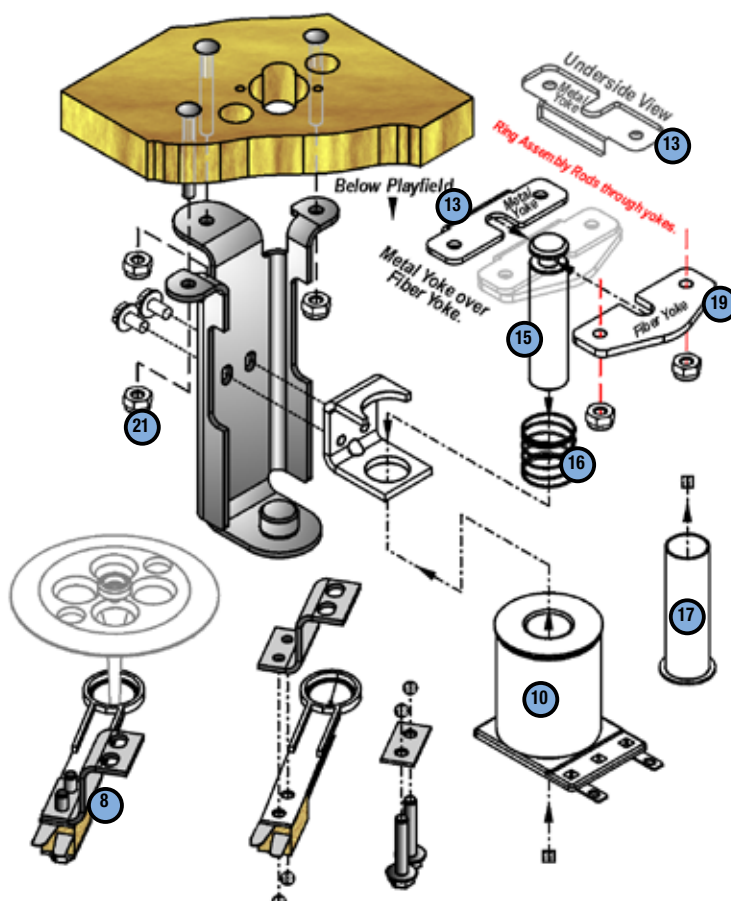
5.15 POP BUMPER ASSEMBLY

515-6784-XX



ID	Part Number	Description	Qty
1	520-5307-03	POP BUMPER LED MODULE	1
2	545-5197-00	BUMPER BODY	1
3	515-5085-00	RING AND ROD ASSY	1
4	545-5607-00	BUMPER SKIRT	1
5	266-5048-00	BUMPER SKIRT COMP SPRING	1
6	545-5195-00	BUMPER BASE	1

Figure 5.15.1. 515-6459-XX Pop bumper assembly top bill of materials.

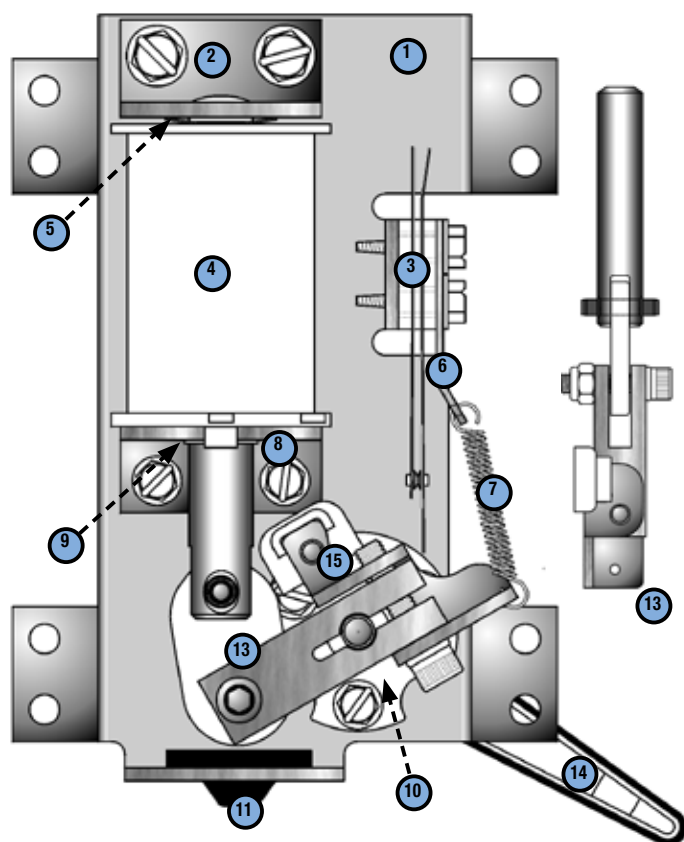


Part Number	Description	Qty
515-6459-01L	BUMPER/RING TOP ASSY, W/ LED 1	1
515-6459-04-ND	BUMPER BOTTOM ASSY, NO DIODE	1

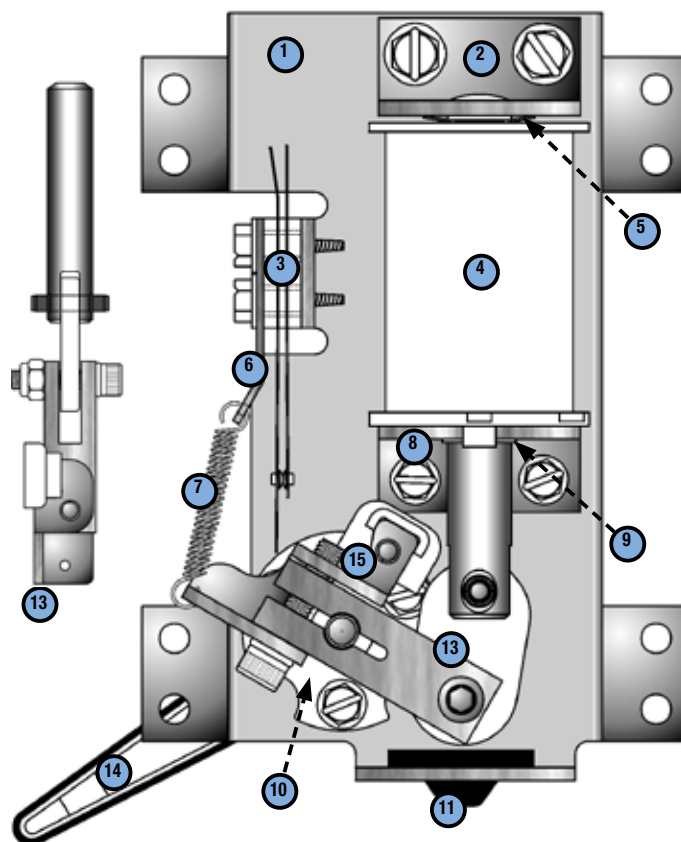
Figure 5.15.2. 516-6784-XX Pop bumper major subassemblies.

ID	Part Number	Description	Qty
7	500-9934-01	POP BUMPER SWITCH ASSY-2 - LUG-LEFT	1
8	240-5005-00	6-32 NYLON STOP NUT	3
9	090-5044-ND	COIL - 26-1200	1
10	237-5976-01	#6-32 X 1/4" SHWH SWAGE ZN	2
11	240-5005-00	#6-32 NYLON STOP NUT	2
12	535-7347-00	METAL YOKE STOP	1
13	234-5101-00	* 8 X 1/2 SLT	6
14	530-5348-00	PLUNGER, POP BUMPER	1
15	266-5047-00	COMPRESSION SPRING, POP BUMPER	1
16	545-5031-00	COIL SLEEVE	1
17	515-5939-00	COIL BRACKET POP BUMPER ASSY	1
18	545-5609-00	FIBER YOKE	1
19	535-7346-00	METAL YOKE	1
20	237-5957-00	#6-32 x 1-3/16" SPIRAL FIN SHANK SCREW	3

Figure 5.15.3. 515-6549-04-ND Pop bumper assembly bottom bill of materials.

5.16 FLIPPER ASSY, LEFT CLASSIC**500-6543-84-ND**

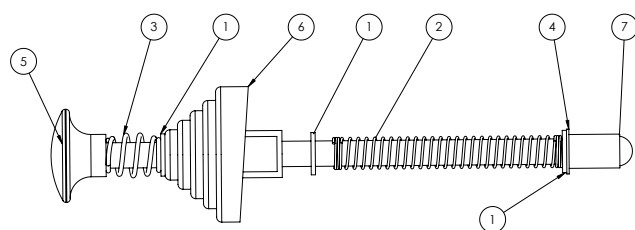
ID	Part Number	Description	Qty
1	515-6617-01	FLIPPER BASE PLATE LEFT KIT W/ BRACKET MOUNT HARDWARE	1
2	515-6308-01	COIL STOP BRACKET	1
3	180-5149-00	SWITCH - END OF STROKE N/C	1
4	090-5083-03-ND	COIL-DUAL WINDING	1
5	269-5002-00	SPRING WASHER	1
6	535-7354-00	SWITCH RETURN SPRING BRACKET	1
7	265-5035-00	SPRING FLIPPER RETURN	1
8	535-7356-00	COIL SUPPORT BRACKET	1
9	545-5388-00	COIL SLEEVE, FLIPPER	1
10	545-5070-00	FLIPPER BAT BUSHING	1
11	545-5428-00	FLIPPER BUMPER PAD	1
12	237-6144-00	SET SCREW #10-32 x 3/4" SOCKET	1
13	515-7203-01	PLUNGER/CRANK ASSEMBLY, LEFT	1
14	500-7287-00	FLIPPER BAT AND SHAFT*	1
15	515-7257-01	SWITCH ACTUATOR (LEFT) SUB-ASSY.	1
	500-6307-10	FLIPPER REBUILD KIT, LEFT	
		* Refer to game rubber chart for flipper rubber color and part number.	

5.17 FLIPPER ASSY, RIGHT CLASSIC**500-6543-85-ND**

ID	Part Number	Description	Qty
1	515-6617-00	FLIPPER BASE PLATE RIGHT KIT W/ BRACKET MOUNTING HARDWARE	1
2	515-6308-01	COIL STOP BRACKET	1
3	180-5149-00	SWITCH - END OF STROKE N/C	1
4	090-5083-03-ND	COIL-DUAL WINDING	1
5	269-5002-00	SPRING WASHER	1
6	535-7354-00	SWITCH RETURN SPRING BRACKET	1
7	265-5035-00	SPRING FLIPPER RETURN	1
8	535-7356-00	COIL SUPPORT BRACKET	1
9	545-5388-00	COIL SLEEVE, FLIPPER	1
10	545-5070-00	FLIPPER BAT BUSHING	1
11	545-5428-00	FLIPPER BUMPER PAD	1
12	237-6144-00	SET SCREW #10-32 x 3/4" SOCKET	1
13	515-7203-00	PLUNGER/CRANK ASSEMBLY	1
14	500-7287-01	FLIPPER BAT AND SHAFT*	1
15	515-7257-00	SWITCH ACTUATOR (RIGHT) SUB-ASSY.	1
	500-6307-00	FLIPPER REBUILD KIT, RIGHT	
		* Refer to game rubber chart for flipper rubber color and part number.	

5.18 BEEHIVE BALL SHOOTER ASSEMBLY

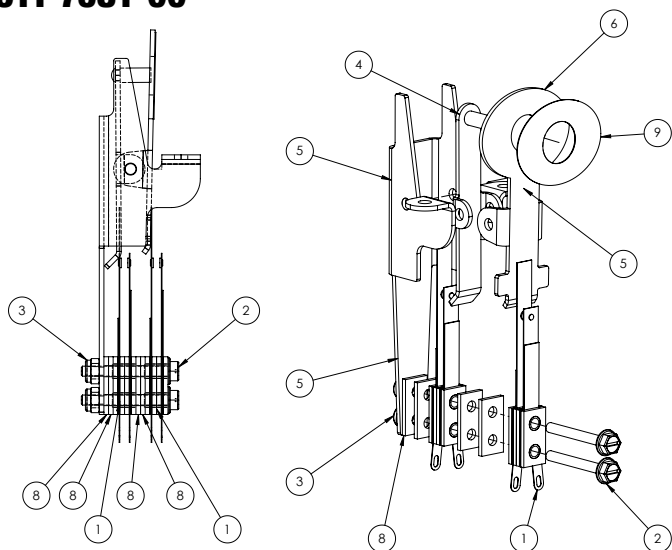
511-0009-07-04



ID	Part Number	Description	Qty
1	242-5014-00	WASHER, 3/8" ID X 5/8" OD X 1/16" THK	3
2	266-5001-04	BALL SHOOTER SPRING	1
3	266-5010-00	COMPRESSION SPRING, SHORT PLUNGER	1
4	270-5012-00	RETAINING RING, 3/8 DIA. SHAFT	1
5	515-6557-00	SHOOTER ROD ASSEMBLY	1
6	545-0902-07	BEEHIVE - ORANGE	1
7	545-5276-00	PLUNGER TIP	1

5.19 BULLSEYE TARGET

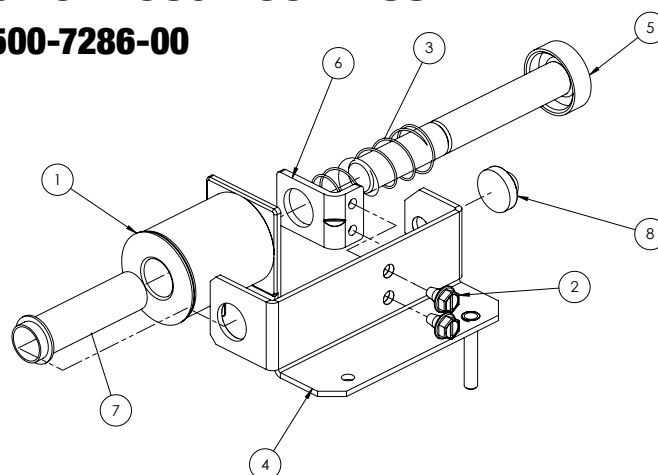
511-7581-00



ID	Part Number	Description	Qty
1	180-5231-00	SLING SHOT SWITCH - STANDARD LUGS	2
2	237-5976-07	# 6-32 X 1 1/8" HWH SER SCREW BLACK	2
3	240-5005-00	6-32 NYLOK STOP NUT	2
4	515-0212-00	BULLSEYE INNER BRKT	1
5	535-1123-00	BULLSEYE MTG BRKT	1
6	535-1124-00	BULLSEYE OUTER BRKT	1
7	535-1125-00	PIVOT, BULLSEYE TARGET	1
8	535-5045-00	SWITCH PLATE	4
9	820-1005-00	DECAL: CC	1

5.20 TROUGH COIL ASSEMBLY

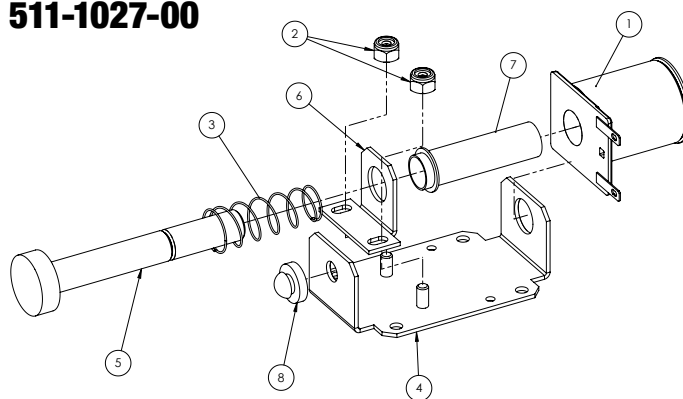
500-7286-00



ID	Part Number	Description	Qty
1	090-5044-ND	COIL 26-1200 - NO DIODE	1
2	237-5975-04	SCREW, 8-32 X 1/4 HWH SWAGE SERR	2
3	266-5020-00	COMPRESSION SPRING-CONICAL	1
4	515-1021-01	COIL BRKT, BT	1
5	515-7309-01	PLUNGER ASSEMBLY	1
6	535-5203-03	COIL RETAINING BRACKET	1
7	545-5076-01	COIL SLEEVE	1
8	545-5105-00	RUBBER BUMPER	1

5.21 KNOCKER ASSY

511-1027-00



ID	Part Number	Description	Qty
1	090-5044-ND	COIL 26-1200 - NO DIODE	1
2	240-5102-00	8-32 NYLON LOCK NUT	2
3	266-5020-00	COMPRESSION SPRING-CONICAL	1
4	515-0202-00	BRKT: KNOCKER	1
5	515-7318-00	PLUNGER ASSEMBLY	1
6	535-1016-00	BRKT: COIL	1
7	545-5076-01	COIL SLEEVE	1
8	545-5105-00	RUBBER BUMPER	1

5.22 SLING SHOT ASSEMBLIES

500-9920-01-D7

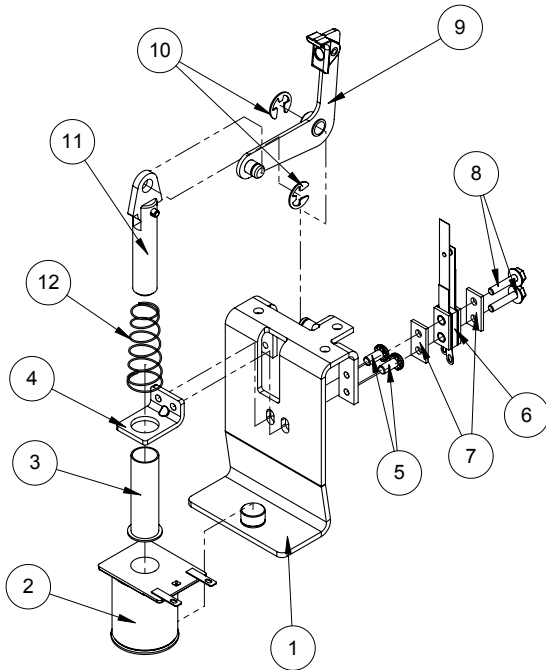


Figure 5.24.1. Sling shot core assembly explosion.

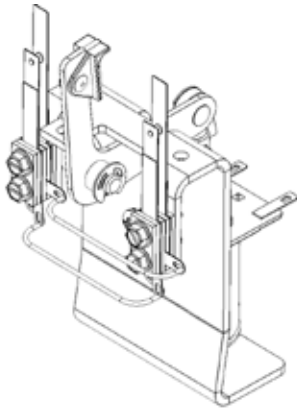
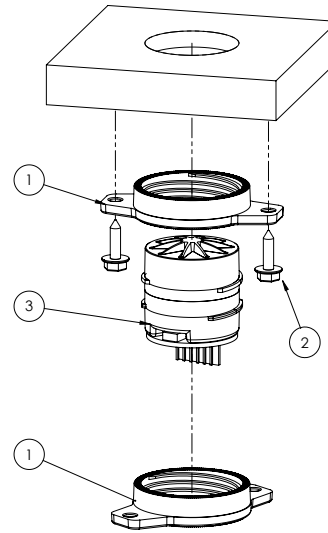


Figure 5.24.2. 500-9920-01-D7 sling shot assembly.

ID	Part Number	Description	Qty
1	515-5339-01-D7	SLING SHOT BRKT ASSY	1
2	090-5044-ND	COIL - 26-1200, NO DIODE	1
3	545-5031-00	COIL SLEEVE	1
4	535-5203-03	COIL RETAINING BRACKET	1
5	232-5301-00	SCREW, 8-32 X 3/8" PPH SEMS	2
6	180-5231-00	SLING SHOT SWITCH - 2 LUG - STANDARD LUGS	1
7	535-5045-00	SWITCH PLATE	2
8	237-5976-04	SCREW, 6-32 X 5/8" HWH SWAGE	2
9	515-5340-01	ARM & TIP ASSY	1
10	270-5002-00	RETAINING RING - 1/4"	2
11	515-5338-00	PLUNGER & LINK ASSEMBLY	1
12	266-5020-00	COMPRESSION SPRING-CONICAL	1

5.23 STAR ROLLOVER

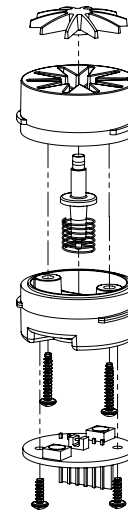
520-6824-0X



ID	Part Number	Description	Qty
1	545-0895-00	NUT: STAR ROLLOVER - 2 FLANGES	2
2	234-5001-02	SCREW, #6 X 1/2" HWH	2
3	511-7544-XX	STAR ROLLOVER	1

5.24 STAR ROLLOVER SWITCH

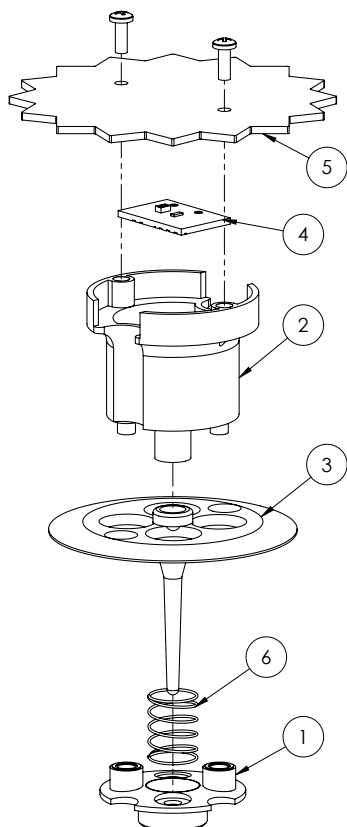
511-7544-0X



ID	Part Number	Description	Qty
1	237-6312-04	PPH #2-28 x 1/4" PLASTIC CUTTING	2
2	237-6312-08	PPH #2-28 X 1/2" PLASTIC CUTTING	2
3	265-5076-00	SPRING: STAR ROLLOVER	1
4	520-6824-0X	WHITE LED: SAM SYSTEM	1
5	545-0896-00	BOTTOM: STAR ROLLOVER	1
6	545-0897-01	TOP: STAR ROLLOVER	1
7	545-0897-02	PIN: STAR ROLLOVER	1
8	545-0897-03	STAR: STAR ROLLOVER	1

5.25 BUMPER ASSEMBLY

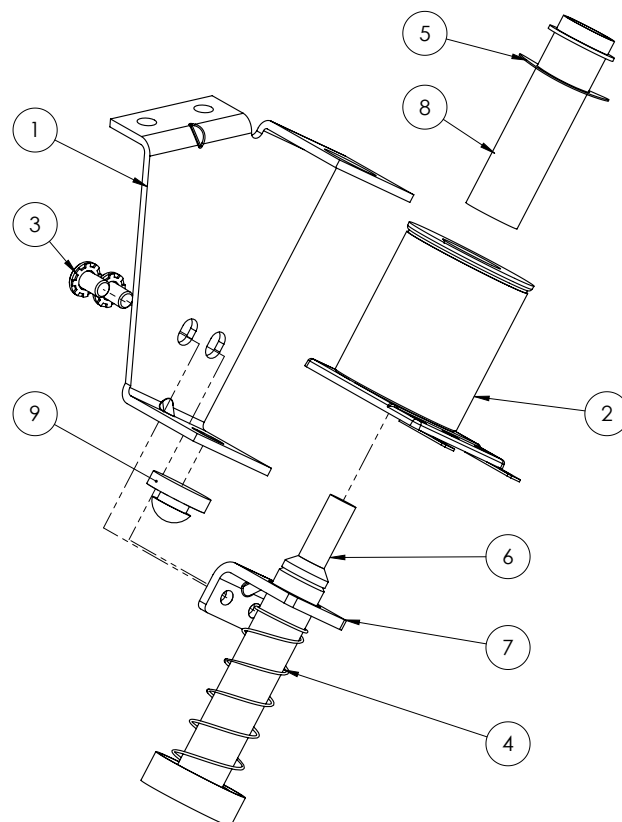
516-0033-88



ID	Part Number	Description	Qty
1	545-5195-00	BUMPER BASE	1
2	545-5197-00	BUMPER BODY	1
3	545-5607-00	BUMPER SKIRT	1
4	520-5307-03	WHITE LED BOARD, POP	1
5	830-8381-XX	POP PLASTIC	1
6	266-5048-00	COMPRESSION SPRING, POP BUMPER BODY	1

5.26 30-DEGREE EJECT

500-6511-03-ND



ID	Part Number	Description	Qty
1	535-8932-03	BRACKET - 30° EJECT - R	1
2	090-5044-ND	COIL 26-1200 - NO DIODE	1
3	232-5300-00	SCREW, 8-32 X 1/4" PPH SEMS	2
4	266-5020-00	COMPRESSION SPRING-CONICAL	1
5	269-5002-00	SPRING WASHER	1
6	515-7197-00	30° EJECT PLUNGER ASSEMBLY	1
7	535-5203-03	COIL RETAINING BRACKET	1
8	545-5076-01	COIL SLEEVE	1
9	545-5105-00	RUBBER BUMPER	1

6. SPECIFICATIONS

500-55N9-01

SPECIFICATIONS, MECHANICAL, GAME SETUP

Specification	Imperial	Metric
Weight	210 lbs	96 kg
Max dimensions, leg levers extended (h, w, d)	78 x 27.75 x 57 in	198 x 70.5 x 145 cm
Minimum game dimensions (h, w, d)	76 x 27.75 x 57 in	193 x 70.5 x 145 cm
Minimum room dimensions per game (h, w, d)	80 x 36 x 84 in	203 x 91 cm x 214 cm

- (h, w, d) = height, width, depth.

SPECIFICATIONS, MECHANICAL, BOXED

Specification	Imperial	Metric
Weight, boxed (without pallet)	230 lbs	105 kg
Box dimensions (h, w, d)	56.5 x 31 x 31 in	144 x 79 x 79 cm
Minimum dimensions (h, w, d)	76 x 26 x 57 in	193 x 66 x 145 cm

- (h, w, d) = height, width, depth.

SPECIFICATIONS, ELECTRICAL

Specification	North America - 120VAC	International - 240VAC
Line Voltage, Nominal	120 VAC	240 VAC
Line Voltage Range	90 VAC - 250 VAC	90 VAC - 250 VAC
Line Frequency *	60 Hz	50 Hz, 60 Hz
Line Power, Current - attract mode	70 W, 0.6 A @ 120 VAC	70 W, 0.3 A @ 240 VAC
Line Power, Current - nominal	360 W, 3 A @ 120 VAC	360 W, 1.5 A @ 240 VAC
Line Power, Current - peak, <100 ms	540 W, 4.5 A @ 120 VAC	540 W, 2.25 A @ 240 VAC

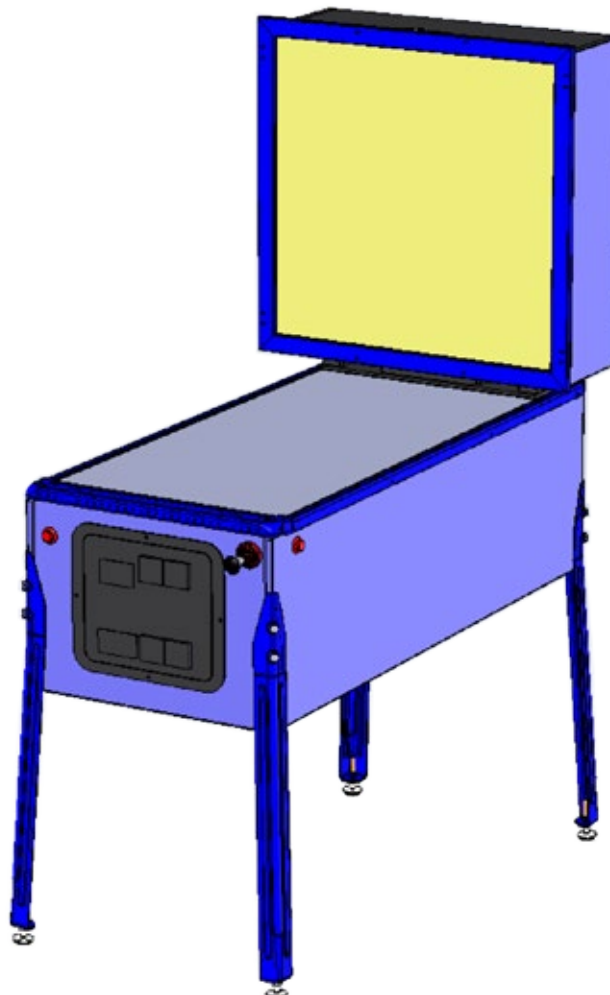
* NOTE: Games designed for 60hz operation (e.g. North America games) will not function correctly on 50hz power and vice versa.

WARNING: Overloading electrical supply circuits is dangerous. Do not overload circuits. To calculate the maximum number of games for a circuit, check circuit amperage rating and divide by the game Nominal Line Power Current rating for your line voltage. For example, a 15A 120V household circuit, $15/3 \text{ A}$ (nominal current) = 5 games maximum.

SPECIFICATIONS, ENVIRONMENT

	Minimum	Maximum
Temperature, Operating	32 °F / 0 °C	104°F / 40 °C
Temperature, Storage	32 °F / 0 °C	104°F / 40 °C
Relative Humidity, Operating	5%	95% non-condensing
Relative Humidity, Storage	5%	95% non-condensing

- (a) "The appliance has to be placed in a horizontal position."
- (b) "This appliance is not to be cleaned by a Water Jet."
- (i) "Do not locate this appliance in an area where a Water Jet is used."
- (ii) "Do not clean this appliance with a Water Jet."
- (b) If the supply cord is damaged, it must be replaced in order to avoid a hazard.



6.1 WARRANTY

500-55N9-01

Stern Pinball machines are assembled in Elk Grove Village, Illinois, USA; each pinball machine has unique characteristics that make it a one-of-a-kind American-made product. Each machine will have variations in appearance resulting from differences in the machine's particular wood parts, individual silk screened art and mechanical assemblies. Stern Pinball has inspected each game element to insure it meets stringent quality and playability standards.

STERN PINBALL INC LIMITED WARRANTY

Stern Pinball Inc ("SELLER") warrants only to the initial purchaser of its products that the items listed below are free from defects in material and workmanship under normal use and service for the warranty period specified:

- Printed circuit boards (game logic): 2 months
- Dot Matrix Display boards: 9 months

No other parts of seller's product are warranted.

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

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

1. Seller is notified promptly upon discovery by purchaser that stated products are defective.
2. Such products are properly packaged and then re-turned freight prepaid, to seller's plant.

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

WARRANTY DISCLAIMER

Except as specifically provided in a written contract between seller and purchaser, there are no other warranties, express or implied, including any implied warranties of merchantability or fitness for a particular purpose.

6.2 WARNINGS, COMPLIANCE, AND LEGAL NOTICES

500-55N9-01

PHOTOSENSITIVE SEIZURES HEALTH WARNING



A very small percentage of people may experience a seizure when exposed to certain visual images, including flashing lights or patterns. Even people with no history of seizures of epilepsy may have an undiagnosed condition that can cause "photosensitive epileptic seizures" due to certain visual images, flashing lights or patterns.

Symptoms can include light-headedness, altered vision, eye or face twitching, jerking or shaking of arms or legs, disorientation, confusion, momentary loss of awareness, and loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.

IMMEDIATELY STOP PLAYING AND CONSULT A DOCTOR IF YOU EXPERIENCE ANY OF THESE SYMPTOMS.

PARTS SUBSTITUTIONS



For safety and reliability, substitute parts and equipment modifications are not recommended and may void any and all warranties. Use of Non-Stern Pinball Inc Parts or Modifications of game circuitry may adversely affect game play or game safety. Transport pinball machines with hinged backbox in the down position only!

Always take great care when servicing any game. Always ready the service manual before replacing or servicing components. Substitutions of parts or equipment modifications may void FCC type acceptance.

Always disconnect the line voltage before servicing. Some parts may remain energized when unplugged. Take great caution when serving any electrical components.

FCC CLASS A SUBPART J COMPLIANCE

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



RF INTERFERENCE NOTICE

The cable harness placements, ground strap routing, and other shielding have been designed to keep RF radiation and conduction within levels accepted by FCC rules. To maintain these levels, factory harness position, shielding, and ground straps must be installed in their factory locations should they become disconnected during maintenance.

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MANUAL #780-50N9-00

