

Part Number 775-7640-00

Release 2



spikeTM

system

Manual

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1. SPIKE SYSTEM OVERVIEW

SPIKE™ System Overview

The SPIKE™ system brings distributed processing to pinball. This modular system gives designers the ability to produce first-rate games that thrill players. Modules allow the incorporation of the latest features while maintaining flexibility.

SPIKE™ Feature	Benefit
• Standard parts. The same node boards work in many SPIKE™ machines.	Interchangeable parts and greater availability.
• Reliability. Parts that prove themselves in one machine are carried across into new machines.	Greater uptime. Less maintenance expenses.
• Built-in safeguards. Overcurrent, output, and static protection.	Increased reliability. Saves PCBs from potential damage.
• LED lighting. Bright and more colorful than incandescent lamps. Produces little heat. Long life. Low maintenance.	Attracts more plays. Reduces upkeep costs. Increases location lifetime.
• Serviceability. Less heat in the backbox. Easy module replacement. Fewer cables to get in the way when servicing under the playfield. Enhanced diagnostic software. 48V switching power supply.	Faster game service and less potential downtime.
• Gameplay intelligence. Lightning fast response time. Quickly reactions to game conditions. More lighting effects. State-of-the-art video and stereo sound.	New features attract plays.

The Ins and Outs of Nodes

A SPIKE™ pinball machine interacts with the player through intelligent nodes. SPIKE™ nodes perform input and output (I/O) operations. Typical inputs are switches. Typical outputs are coils and lamps. The CPU, Node 0, controls the game logic as well as the operation of the display and sound.

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 one node networked together with the SPIKE node bus. The primary CPU is networked to one or more input/output nodes over standard Category 5 UTP (unshielded twisted pair) ethernet cabling.

There are five types of nodes.

- CPU node (Node 0) - The primary node that controls other nodes in the system. Contains the game software for the system and provides SPIKE node bus power for other nodes.
- Cabinet node (Node 1) - Specialized node with specific inputs and outputs for coin doors, tilt mechanisms, and other cabinet devices.
- 48V playfield node - Controls high power devices such as coils and flashers, and also supports a few switch and low-power outputs.
- Light and switch node (32 Switch + LED Node) - Switch and low-power LED outputs. Contains as many 32 switch inputs and light outputs.
- Node extensions - These LED boards 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 ethernet cabling. 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 switching power supply. Each SPIKE node converts this voltage to lower voltages required by the node and its specific components. A SPIKE node controls high-power outputs such as game coils and some LEDs. These nodes are supplied directly with 48V system power. Other nodes are low-power boards that read switch inputs and output to standard-brightness LEDs.

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 or 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 CPU node, where the game software resides. Address 1 is reserved for the cabinet node. These two nodes do not have DIP switches as their address is not configurable.

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
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

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

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

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 COMPONENTS

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 share a common power source by node connector. If a group of LEDs is out, check the wiring for the power source.

FLASHERS

SPIKE games treat flashers 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. Some optos will interface to a SPIKE node via an opto signal conditioning board. Other optical switches connect directly to the SPIKE node board.

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

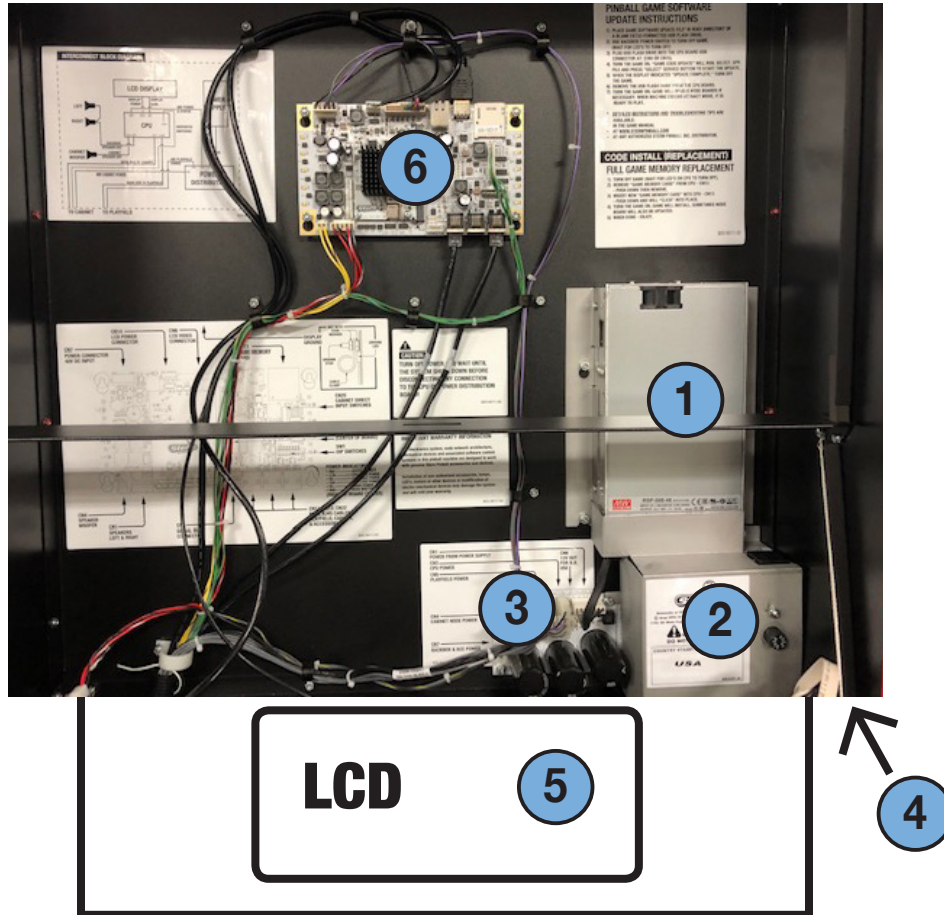
INPUT/OUTPUT PROTECTIONS

SPIKE features built-in short-circuit, static electricity, and other protections for greater reliability. If an LED, coil, or other device shorts, it will be disabled rather than shutting down the entire system. Groups of LEDs, coils, and switches often share common power supplies or other circuits. 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. While the system is protected against permanent damage, it is strongly recommended to repair or replace these bad components as soon as possible.

2.7 COMMON SPIKE NODE BOARDS

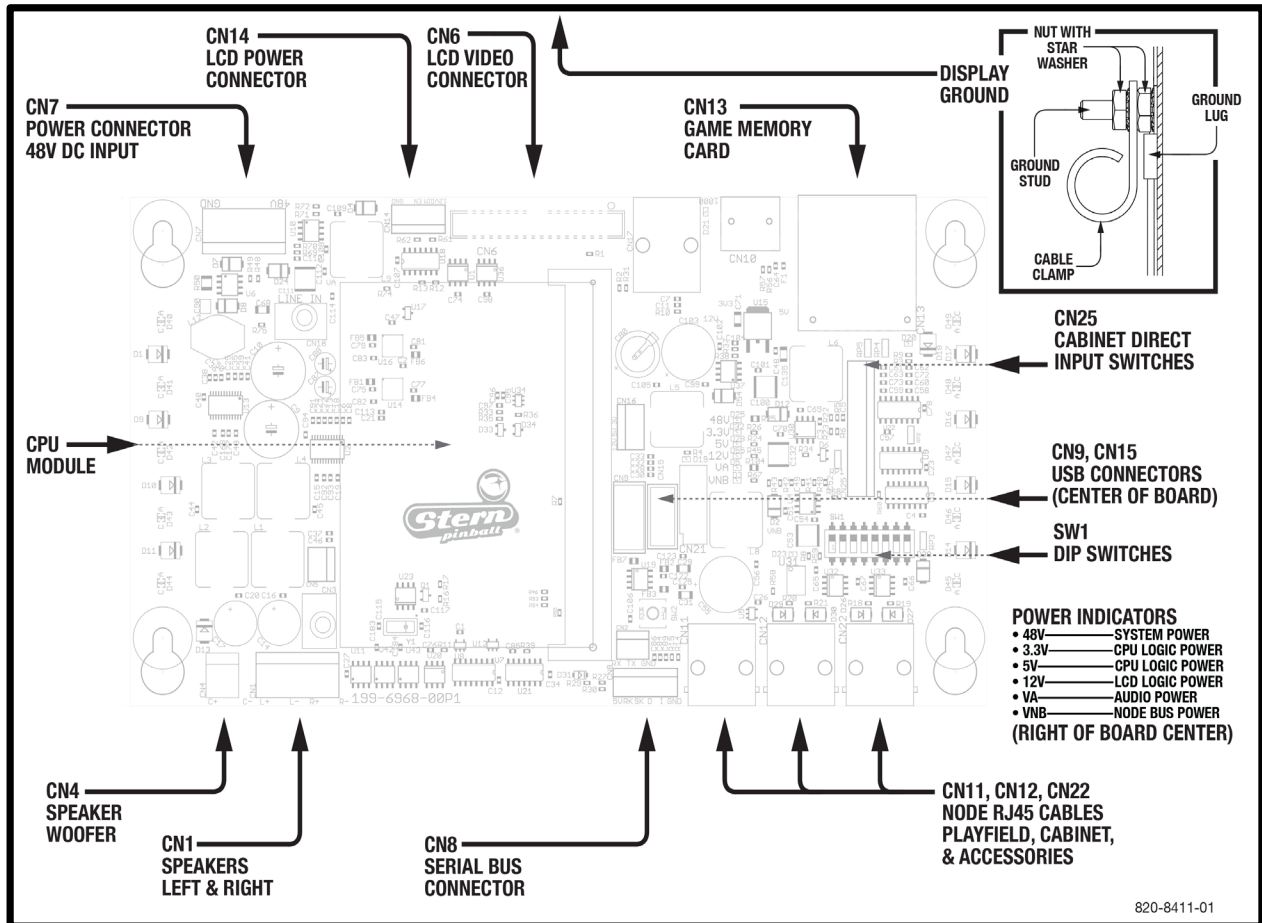
Description	Type	Part Number
SPIKE CPU Node	Node	509-1003-01
Cabinet Node	Node	520-6967-72
Playfield 48V Core-Driver Node	Node	520-7017-72
Trough Serial Opto Receiver Extension	Extension	520-7001-00

3. BACKBOX IDENTIFICATION



1. **Power Supply** – 48V switching P/S (48V at 10.5A, 500W)
2. **Service Box** – Main power fuse location – 8A S/B fuse. Location of the AC service outlet – domestic games only.
3. **Power Distribution Board** – Distributes 48V and ground to the CPU, cabinet and playfield. Coin door switch (if present) activates distribution of power to cabinet and playfield.
4. **Power Switch**
5. **15.6 Inch LCD Display**
6. **CPU Board Node 0**

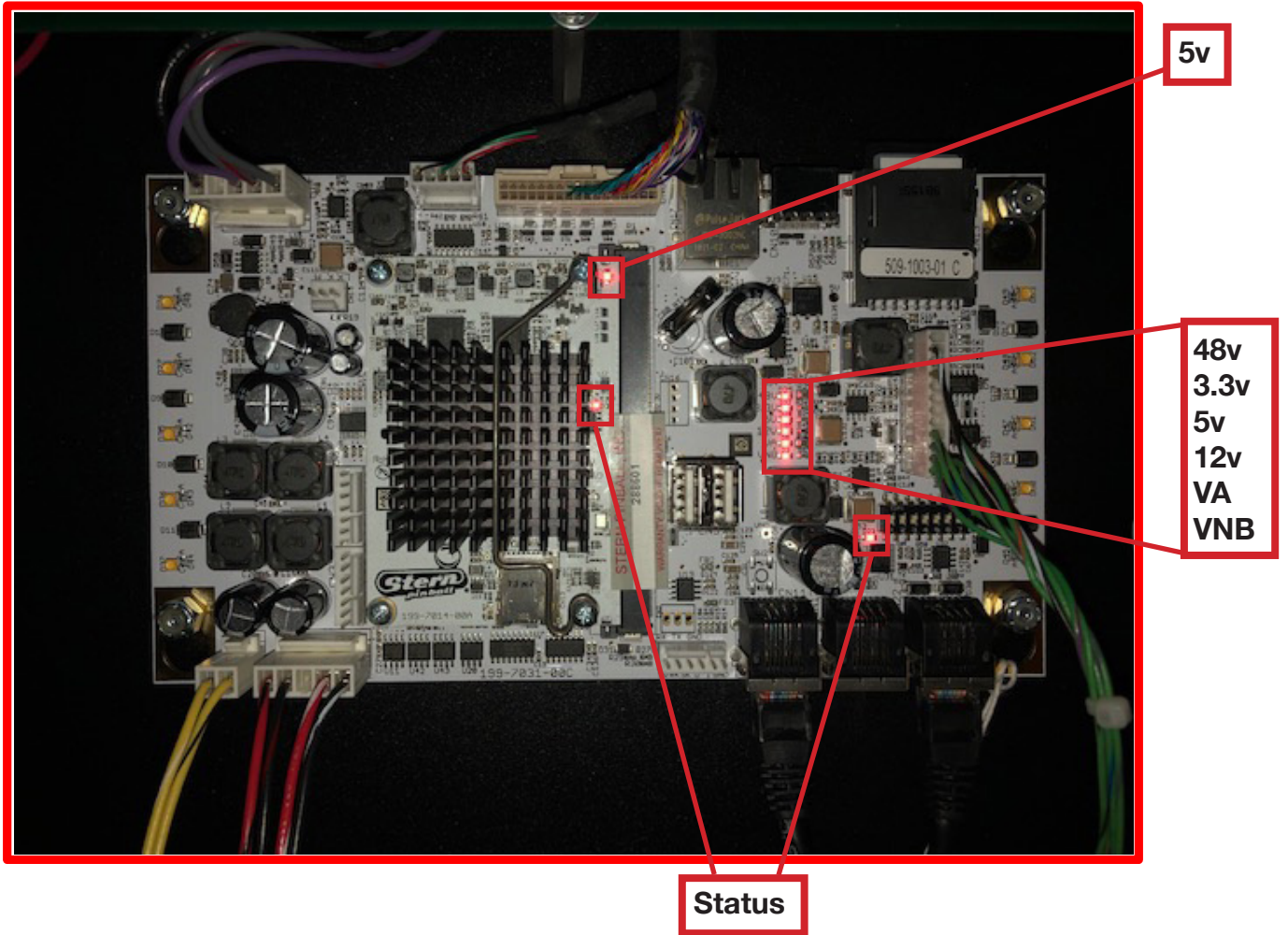
4. IDENTIFYING CONNECTORS AND PARTS OF THE CPU BOARD



- CN7 – 48V in from the power supply.
- CN14 – LCD power connector.
- CN6 – LCD video connector.
- CN13 – Game memory card.
- CN25 – Cabinet direct input switches (diagnostics).
- CN9, CN15 – USB ports – for software updates, audit dumps and expansion modules.
- BT1 – Battery for the real time clock.
- SW1 – 8 bank dip switch for setting the country codes.
- CN11, CN12, CN22 – Node RJ45 cables, Playfield, Cabinet, & Accessories.
- CN8 – (Not used)
- CN1 – Speaker panel left and right.
- CN4 – Speaker cabinet woofer.
- CN3 – Headphone kit connection.
- CN5 – Audio line in/out.

5. LED INDICATORS

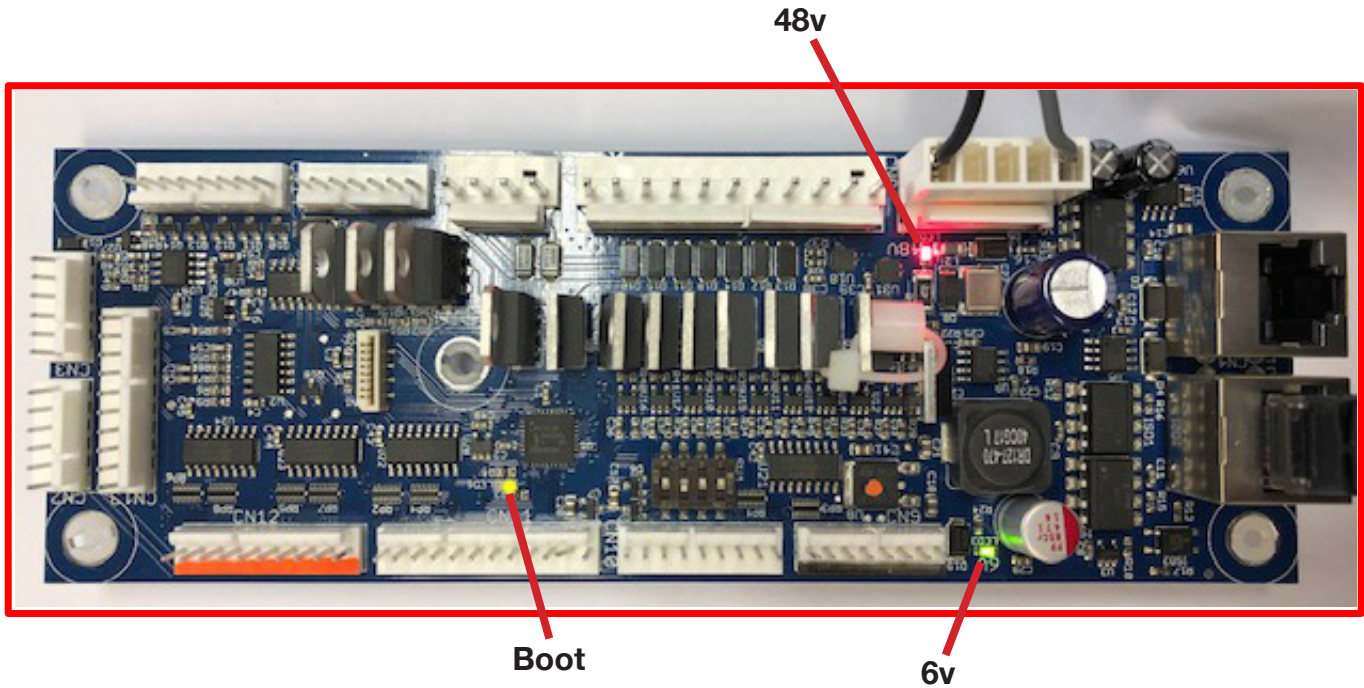
5.1 CPU LED INDICATORS



- 48V ----- System Power
- 3.3V ----- CPU Logic Power
- 5V ----- CPU Logic Power – two locations
- 12V ----- LCD Logic Power
- VA ----- Audio Power
- VNB ----- Node Bus Power

2 Status LEDs - One on the carrier board D23 and the other on the CPU. These LEDs will flicker when the system is running.

5.2 PLAYFIELD NODE BOARD LED INDICATORS

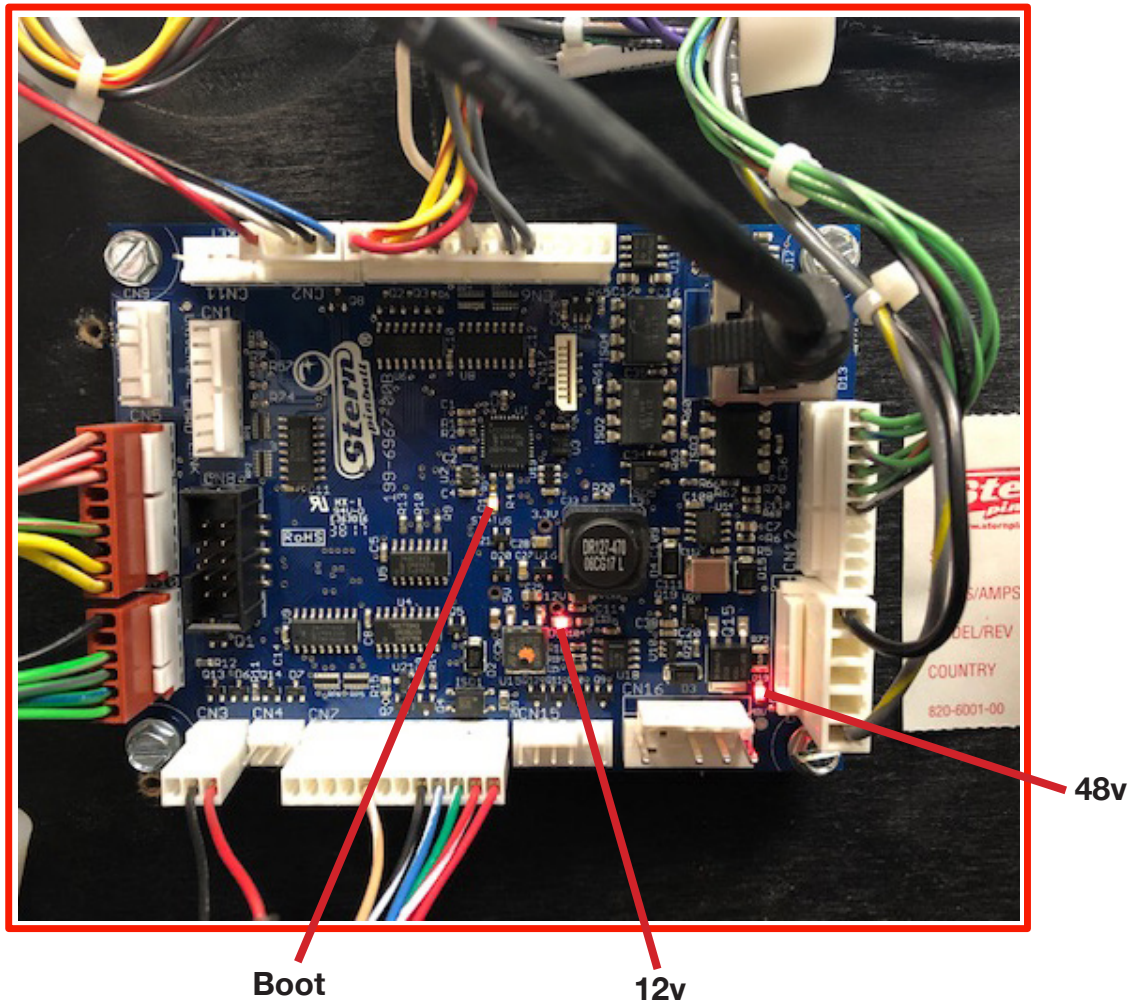


Red LED – 48V present

Yellow Boot LED – System is running – constant flicker

Green LED – 6V is present

5.3 CABINET NODE BOARD LED INDICATORS

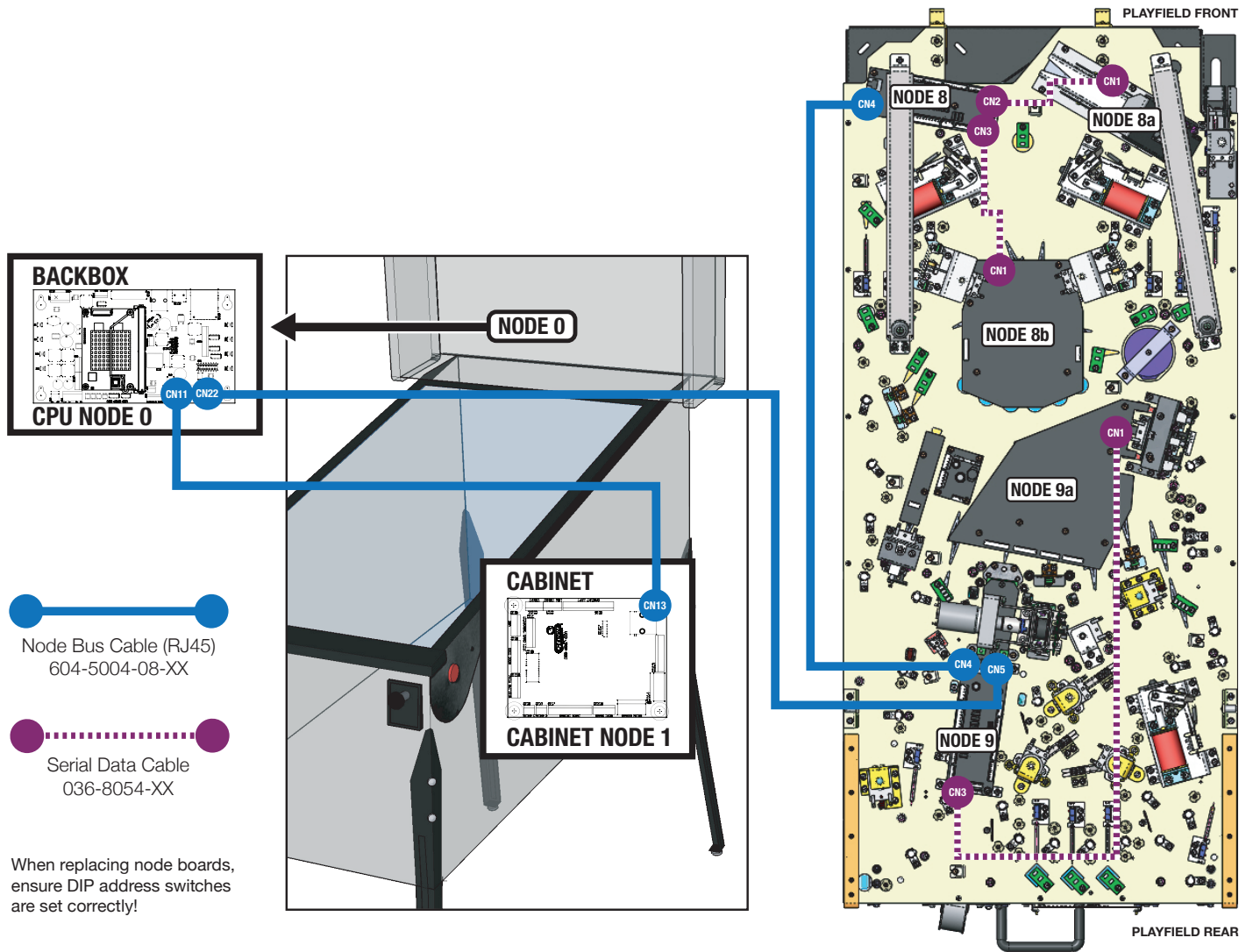


Red LED – 48V present

Yellow Boot LED – System is running – constant flicker

Red LED – 12V is present

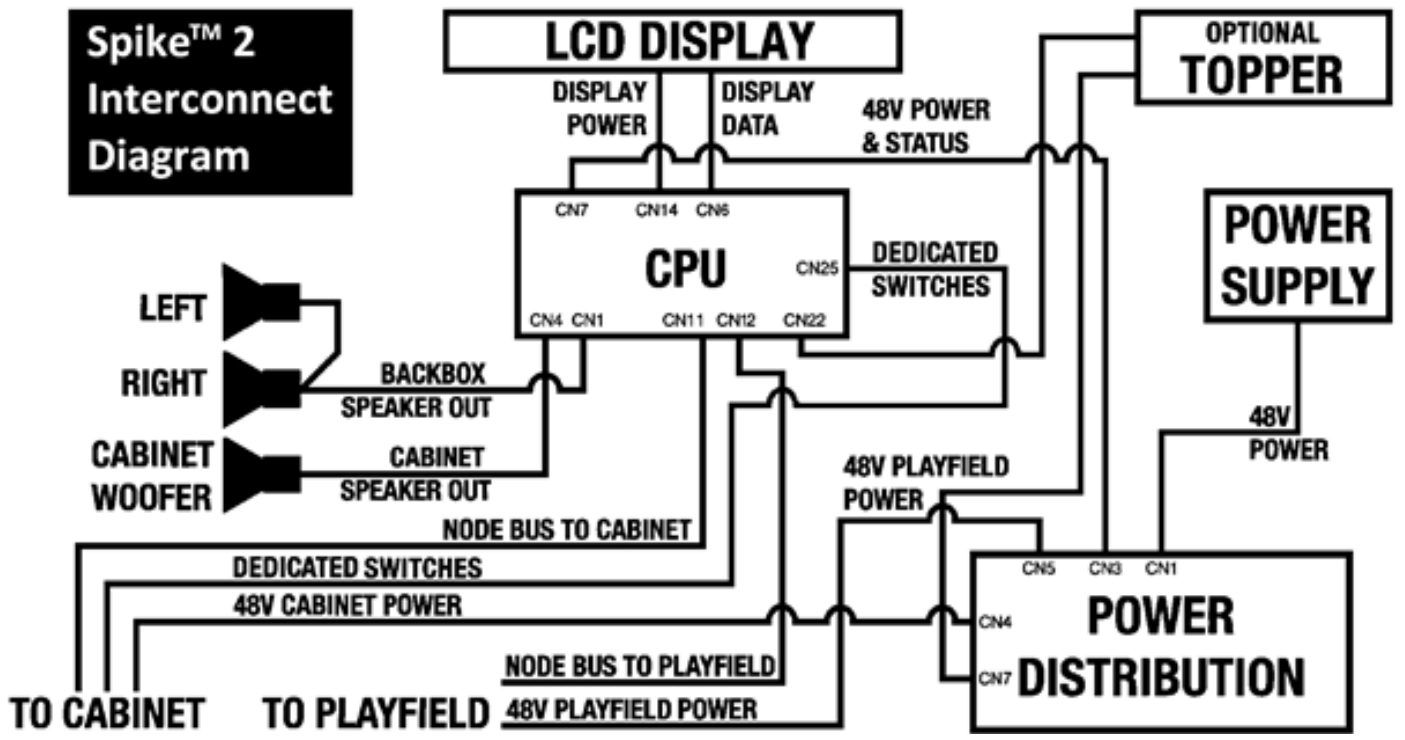
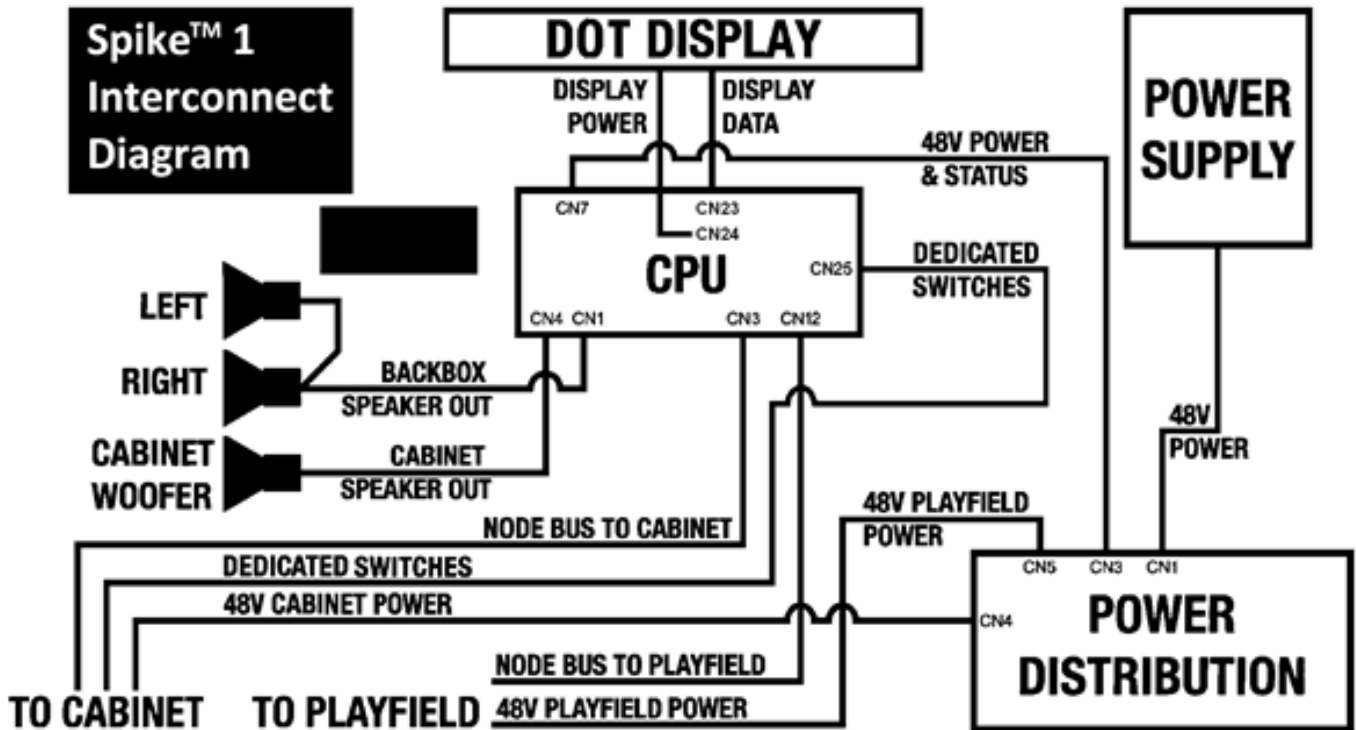
6. EXAMPLE NODE BOARD BACKBOX, CABINET, & PLAYFIELD MAP



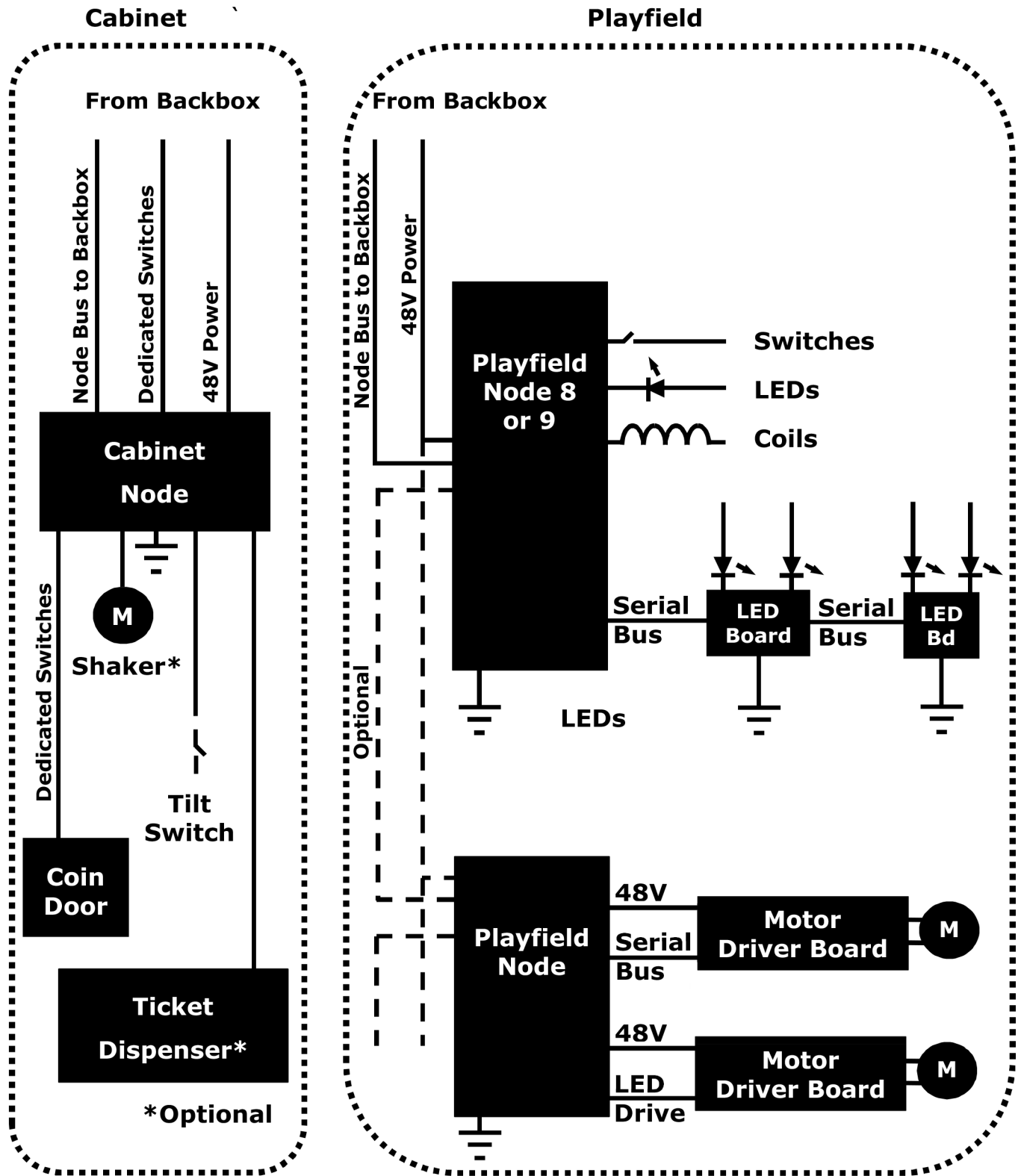
Exact location of components on playfield varies from game to game.

7. INTERCONNECT DIAGRAMS

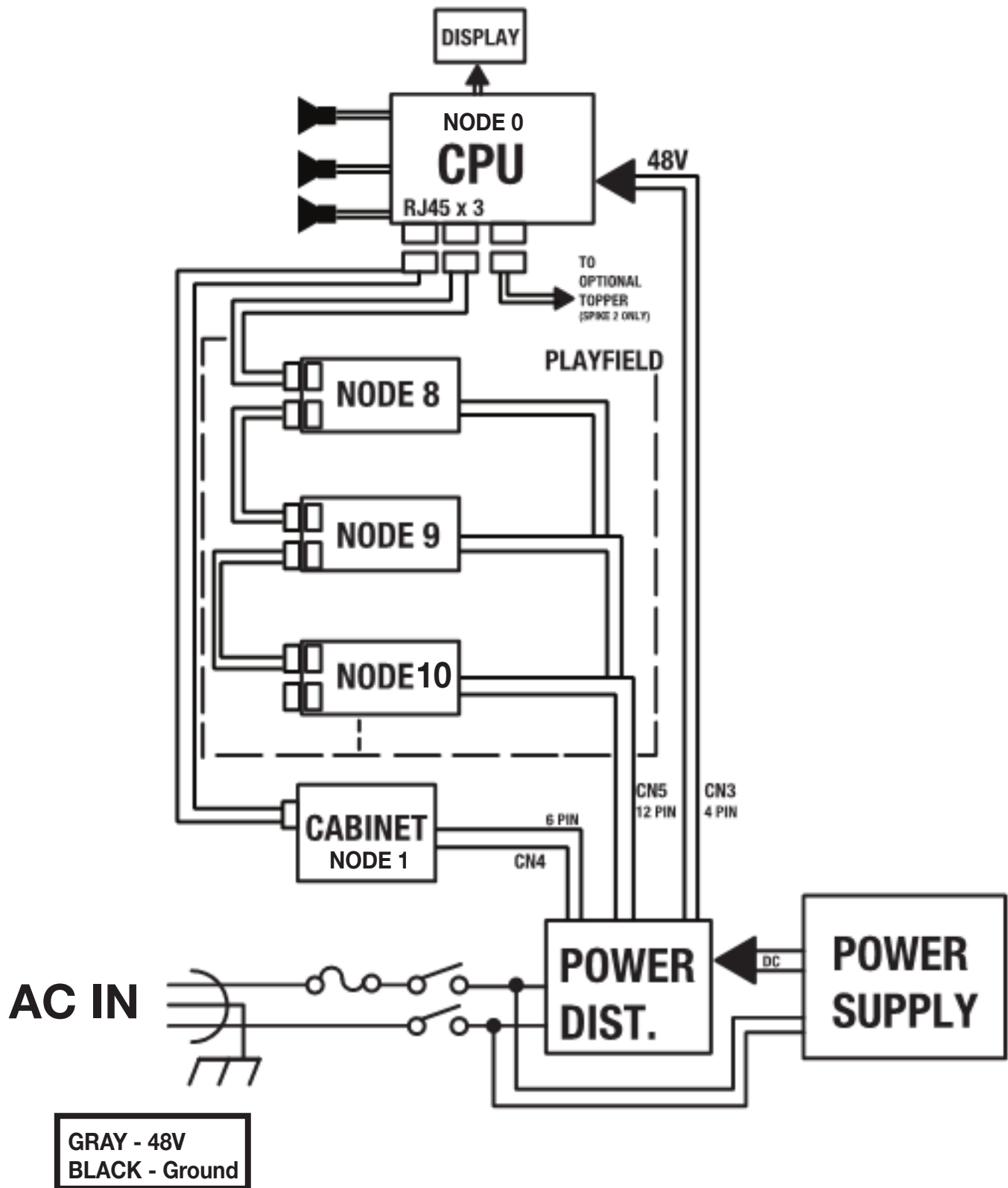
7.1 SPIKE 1 & SPIKE 2



7.2 INTERCONNECT DIAGRAM - PLAYFIELD & CABINET



7.3 INTERCONNECT DIAGRAM - BACKBOX, CABINET, & PLAYFIELD

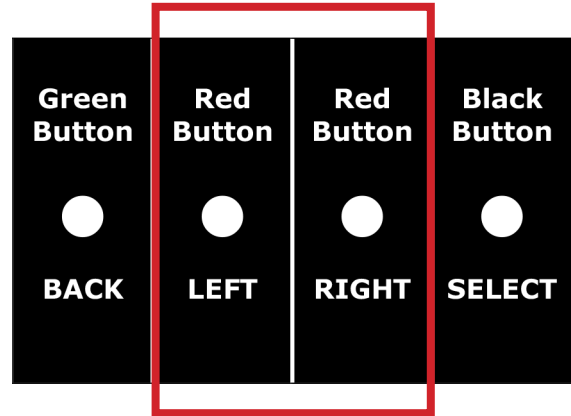


8. NAVIGATING THE DIAGNOSTICS MENU

8.1 ADJUSTING VOLUME

Change the Game Volume

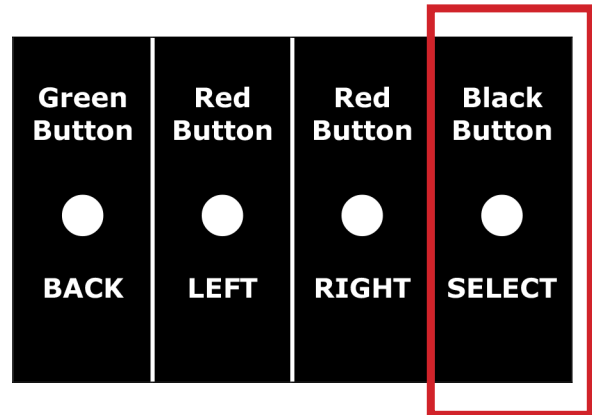
Use the two red middle buttons on the backside of the coindoor to change the main volume of the game. The left red button will decrease volume, the right red button will increase volume.



8.2 USING DIAGNOSTIC MENUS

Access the Diagnostic Menu System

From the four switches on the back of the coin door, you can open menus of tests. Press the black button on the far right to enter the service menu. Test prompts appear on the machine's backbox display.



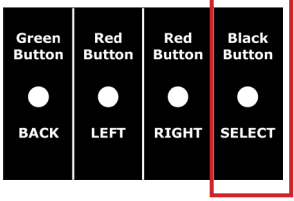
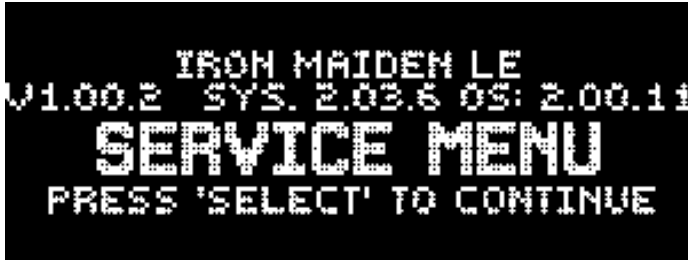


Selecting Tests

After entering the Service Menu with the black button, use the left and right red buttons to highlight the different menu items. Press the black button to select the currently highlighted menu item. As you test, the machine's display will indicate results and prompt further actions. Press the green button at any time to back out of or exit any of the menus.

• **NOTICE: Diagnostic Switch on Coin Door**

Press...	To...
• Black Button	Select test or setting. Also opens Service Menu (“Diagnostics”).
• Either Red Button	Move across display to desired function or value.
• Green Button	Exit to previous menu.

8.3 ENTERING DIAGNOSTICS

Screen	Instructions
<p>1. Turn on pinball machine.</p> <p>2. Open coin door.</p> <p>3. On back of coin door, press black button. Service Menu appears on backbox display.</p> 	
<p>4. On Service Menu, pick “DIAG” (“Go to Diagnostics Menu”) by pushing black button.</p> <p>5. Diagnostic Menu appears on display. There are several options: •SW, •COIL, •LAMP, •GAME, •NODE, & •MORE. Using right red button, move across display to desired test.</p>	
<p>6. To open selected (highlighted) test menu, press black button. For specific information on switch, coil, lamp, and flash lamp tests, see procedures that follow.</p>	

• **WARNING: Servicing devices**

Prevent shocks and injuries! Except when using diagnostics, do not service the game under power. Before servicing switches, coils, lamps or device wiring, turn off pinball machine power. Also disconnect the line cord from the power receptacle.

• **WARNING: Avoid shocks!**

Potentially lethal voltages are present in the backbox. When power is on, avoid contact with the power supply and power distribution board. These components are in the lower-right corner of the backbox. Exercise caution to avoid shocks.

8.4 SWITCH TESTS

To find stuck or open switches, use the pinball machine's diagnostic software. Follow prompts on the main display. An outline of the process is below.



1. Turn on the pinball machine.
2. Open the coin door. (Pull coin door interlock switch to allow playfield to function)

• **NOTICE: 48V Power Interlock Switch**

This notice affects some SPIKE™ 1 & 2 pinball machines. These machines may include a 48V power interlock switch. The switch is inside the coin door, on the left side. This switch shuts off 48V power to the playfield. For all tests 48v power voltage must be present on the playfield. Pull the interlock switch out, restoring playfield power.

3. On the back of the coin door, press the black button. The Service Menu appears on the backbox display.
4. On the Service Menu, pick “DIAG” (“Go to Diagnostics Menu”) by pressing the black button. The Diagnostic Menu appears on the display. There are six options...



5. To open the Switch Test Menu (“SW”), press the black button.



6. On the Switch Test Menu, select “SW” (Regular Switch Test). “SW” is the first test on the left side of the menu. (For now, avoid the other two switch tests, “Active Switch” and “SW Alert.”)
7. Use a ball to test a switch. (For instance, let the ball pass beneath a rollunder switch.)

• NOTICE: Test with a ball

Only the pressure of a real ball can test the switch correctly. (A finger might apply too much pressure, invalidating the test result.)

• WARNING: Fingers

When testing switches, keep your fingers away from switch-triggered coils. (Example: Kickers, bumpers and out holes.)

8. As you activate a switch, watch the display and listen for a tone. On the display, one of the boxes should light up. Whenever you activate a switch, you should hear the tone.



Switch Test screen (Small squares indicate closed switches.) When you open the test, closed ball trough switches are normal.

9. If the display doesn't change and the tone doesn't sound, you've found a malfunctioning switch. Unplug the pinball machine from the power outlet.

10. Repair the switch wiring or replace the switch as necessary.

11. Plug the pinball machine back in.

12. Re-enter the Regular Switch ("SW") Test.

13. Repeat Steps 8 through 11, checking every switch on the playfield: Rollovers, slingshots, rollunders, pop bumpers, and optic switches, etc.

14. Leave the switch test by pressing the green button on the coin door.

8.5 COIL TESTS

1. Turn on the pinball machine.

2. Open the coin door. (Pull interlock switch out)

3. On the back of the coin door, press the black button. The Service Menu appears on the backbox display.

4. On the Service Menu, pick "DIAG" ("Go to Diagnostics Menu") by pressing the black button. The Diagnostic Menu appears on the display. There are six options...



5. By pressing the right red button, move across the display to Coil Test. (Coil Test is the second test.)

6. To open the Coil Test Menu (“COIL”), press the black button.

7. There are two coil tests. Pick the first test, Single Coil, by pressing the black button. The name of the coil appears on the screen. (In our example above, the coil name is Auto Plunger.)



8. The name of a coil appears on the display. Activate the coil by pressing the black button.

9. The coil will fire if working properly. If the coil is not responding, unplug the pinball machine.

10. Repair the coil wiring. Or replace the MOSFET or coil as necessary.

11. Plug in the pinball machine.

12. Re-enter the Single Coil Test.

13. Continue testing any additional coils as necessary.

14. To exit the test, press the green button.

8.6 LAMP TESTS

1. Turn on the pinball machine.

2. Open the coin door. (Pull interlock switch out)

3. On the back of the coin door, press the black button. The Service Menu appears on the backbox display.



4. On the Service Menu, pick “DIAG” (“Go to Diagnostics Menu”) by pressing the black button. The Diagnostic Menu appears on the display. There are six options...



5. By pressing the right red button, move across the display to Lamp Test. (Lamp Test is the third test.)
6. To open the Lamp Test Menu (“LAMP”), press the black button.
7. There are various lamp tests. Move across the display to the second one, All Lamps Test (“ALL”). Do this by pressing the right red button.
8. By pressing the black button, pick the “ALL” Test. All lamps will flash continuously.
9. Inspect each lamp on the game.
10. If a lamp is working, it will light brightly and not flicker. If a lamp is not functioning, unplug the pinball machine.

• **NOTICE: Controlled lamp specs**

SPIKE™ pinball machines use three types of controlled lamps. The first two types are socketed LED bulbs. They’re LED versions of standard bayonet (left, below) and wedge-base (right, below) lamps. (Standard bulb outlines: LED bayonet= T3¼. LED wedge= T1¾.) The third type of LED lamp is an LED on a printed circuit board (PCB). The wiring harness connects directly to the PCB’s solder pads.



• **CAUTION: Only use LED bulbs**

Never substitute incandescent bulbs for LED bulbs! LED lamps draw far less current than incandescent bulbs do. Engineers designed your pinball machine exclusively for LED bulbs and LED flash lamps. If you substitute incandescent bulbs, the bulbs will draw excessive current. To protect your pinball machine, the node will shut down the improper device.

11. Replace the lamp or repair the lamp wiring as necessary.
12. Plug in the pinball machine.
13. Re-enter the All Lamps Test (“ALL”).
14. Check your work by repeating Steps 9 through 12. (Node tests might also help you to diagnose lamp problems.)
15. To exit the test, press the green button.

8.7 FLASH LAMP TESTS

1. Turn on the pinball machine.
2. Open the coin door. (Pull interlock switch out)
3. On the back of the coin door, press the black button. The Service Menu appears on the backbox display.
4. On the Service Menu, pick “DIAG” (“Go to Diagnostics Menu”) by pressing the black button. The Diagnostic Menu appears on the display. There are six options...



5. By pressing the right red button, move across the display to Lamp Test. (Lamp Test is the third test.)
6. To open the Lamp Test Menu (“LAMP”), press the black button.
7. There are various lamp tests. Move across the display to the Flash Lamps Test (“FLASH”): Do this by pressing the right red button.
8. By pressing the black button, pick the “FLASH” Test.
9. There are two flash lamp tests. Move across the display to the second one, Cycling (“CYC”). Do this by pressing the right red button.

10. By pressing the black button, pick the Cycling (“CYC”) Test. Following a sequence, each flash lamp will flash.
11. Inspect each lamp on the game, looking for a flickering, weak, or non-working lamp.
12. If a lamp works, it will light brightly and not flicker. If a lamp is not functioning correctly, unplug the pinball machine.

• **NOTICE: Flash lamp specs**

SPIKE™ pinball machines use three types of flash lamps. The first two types are socketed LED bulbs. They’re LED versions of standard large bayonet (left, below) and wedge-base (right, below) lamps. (Standard bulb outlines: LED bayonet= S8. LED wedge= T5.) The third type of LED lamp is an LED on a printed circuit board (PCB). The wiring harness connects directly to the PCB’s solder pads.



• **CAUTION: Only use LED bulbs**

Never substitute incandescent bulbs for LED bulbs! LED lamps draw far less current than incandescent bulbs do. Engineers designed your pinball machine exclusively for LED bulbs and LED flash lamps. If you substitute incandescent bulbs, the bulb will draw excessive current. To protect your pinball machine, the node will shut down the improper device.

13. Replace the flash lamp or repair the lamp wiring as necessary.
14. Plug in the pinball machine.
15. Re-enter the Cycling Test (“CYC”).
16. Check your work by repeating Steps 10 through 14. (Node tests might also help you to diagnose lamp problems.)
17. To exit the test, press the green button.

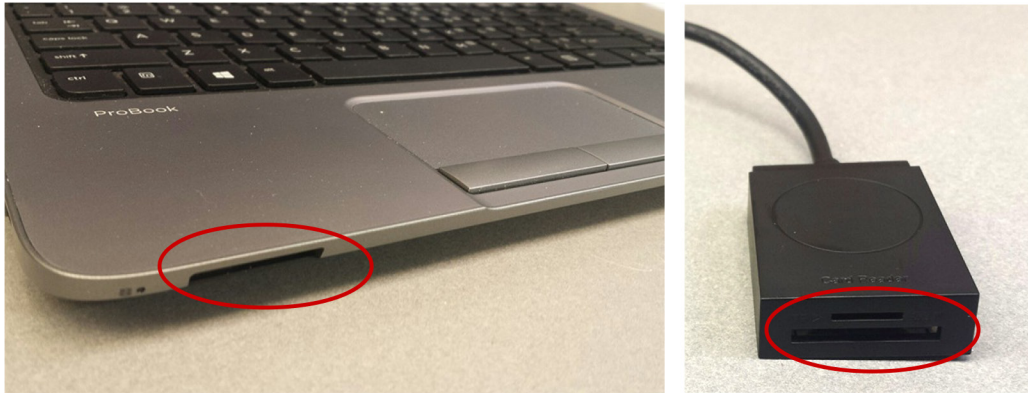
9. UPDATING GAME SOFTWARE

1. Obtain game software update file (filename ends in “.spk”) from www.sternpinball.com or from an 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”, power off the 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.

10. CREATING A COMPLETE SD CARD

Requirements:

- A built-in or external SD Card reader/writer – external USB based devices are available at local electronics stores and online resellers



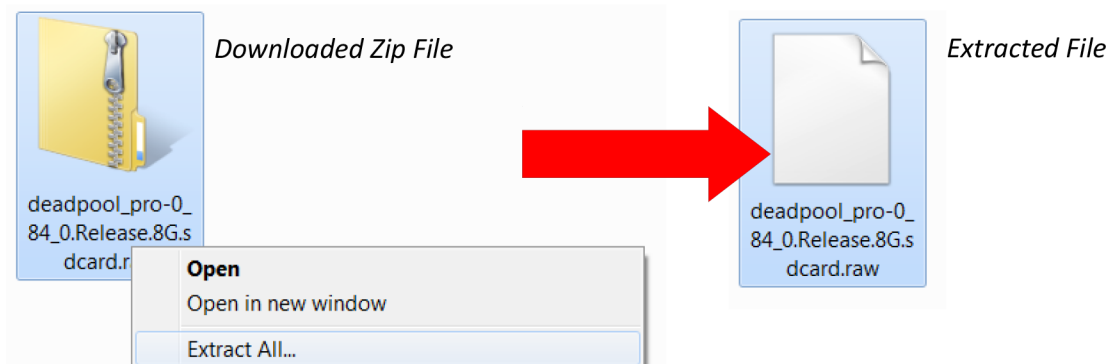
- Etcher software – available for Windows, macOS, and Linux at <https://etcher.io/>
- SD Card Image file – available on the Stern Pinball website: <https://sternpinball.com/support/sd-cards/>
- SD Card – it is recommended you use the same SD Card brand, size, and part number that was provided with your pinball machine. SPIKE pinball machines require a **“Class 10” rated SD Card** of appropriate size for proper operation.

Instructions:

Download and install Etcher on your computer. Etcher is a free and easy to use application that enables you to write (also referred to as burn or flash) complete game OS (operating system) images to an SD Card.

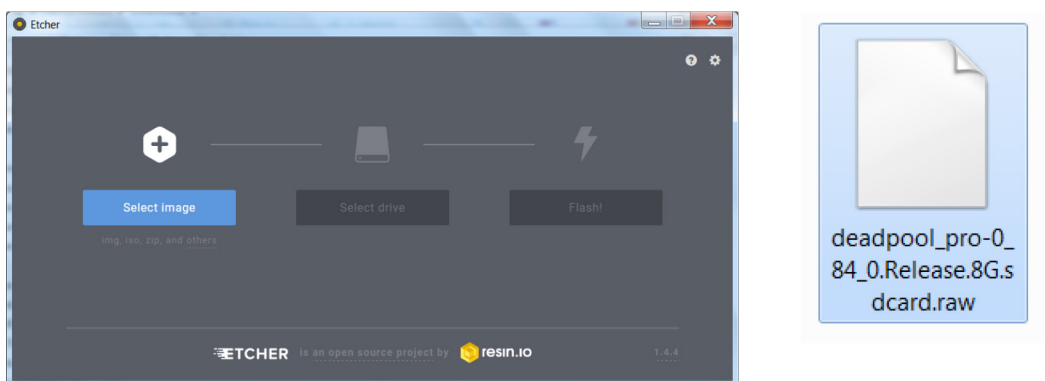
Download and unzip the appropriate game SD Card image file from the Game Code section on the Stern website (Default method in Windows – right click the zip file and select “Extract All”).

NOTE: The extraction process can take several minutes to complete. Wait until the file is fully extracted before proceeding.

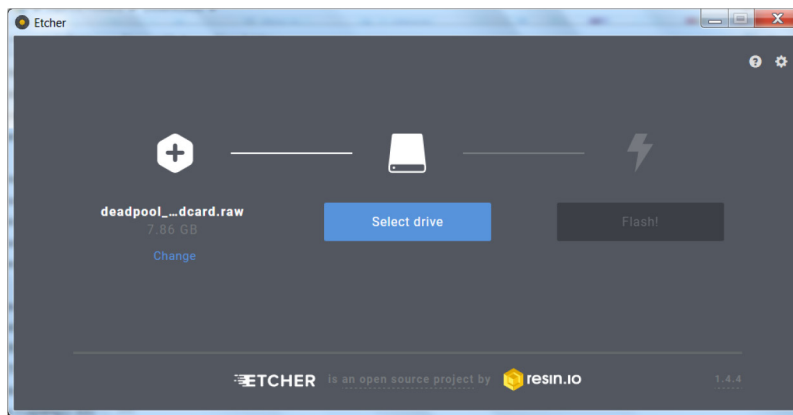


Run Etcher:

1. Click “Select image” – select the extracted game SD card image from earlier.



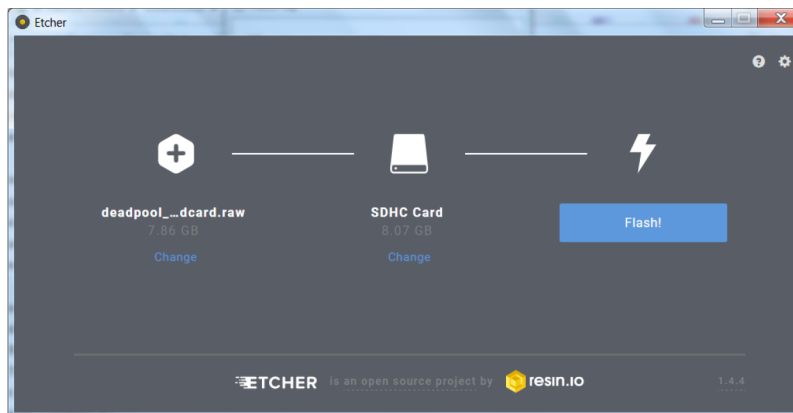
2. Insert the SD Card into the SD Card reader/writer.



No SD Card Inserted

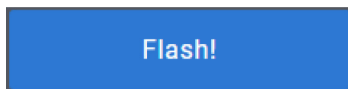
The SD Card should automatically be selected.

CAUTION - Verify this is the correct device! Ensure this is not one of your computer's hard drives as this would overwrite computer system files and may render it inoperable.



SD Card Inserted

3. Click "Flash!"

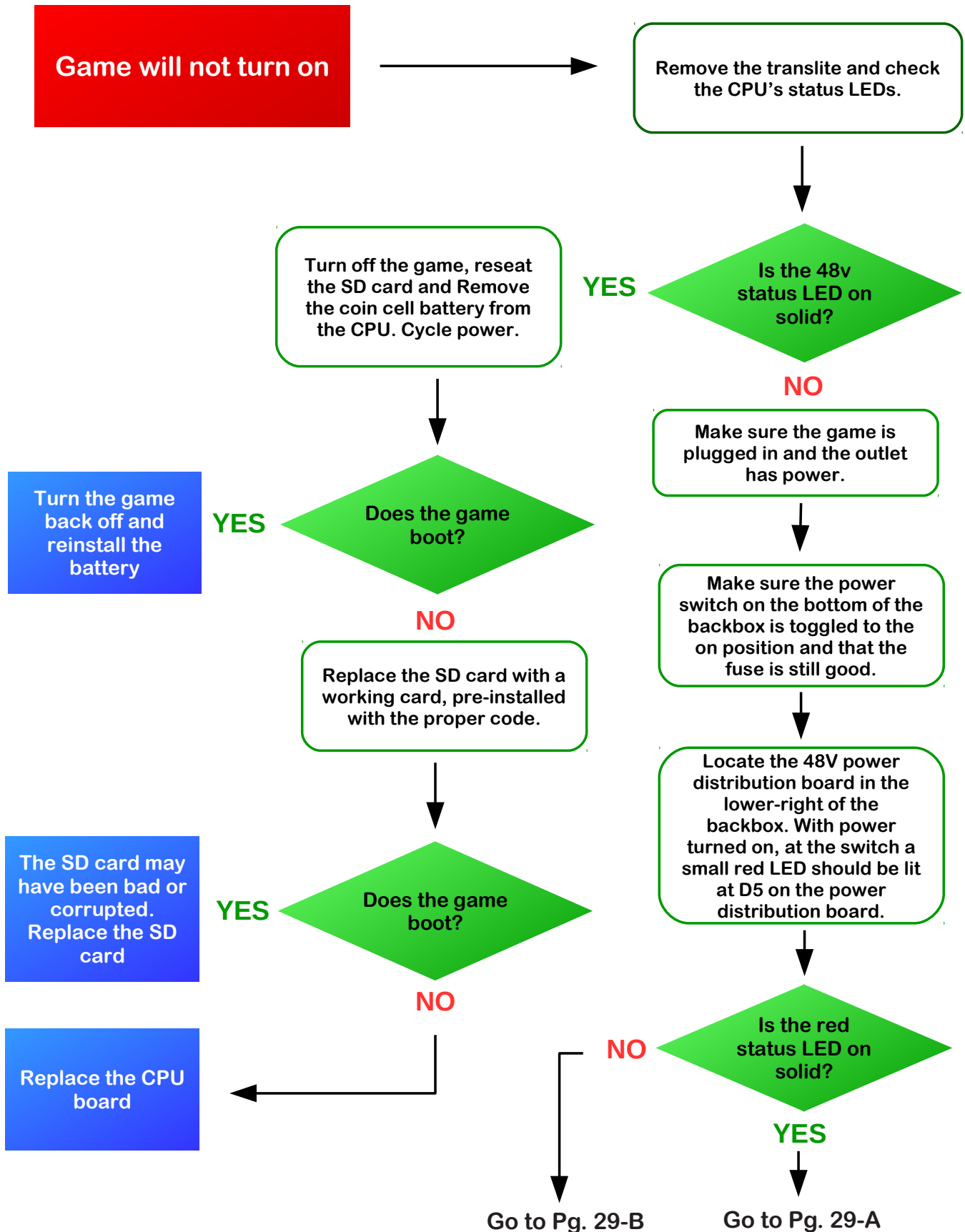


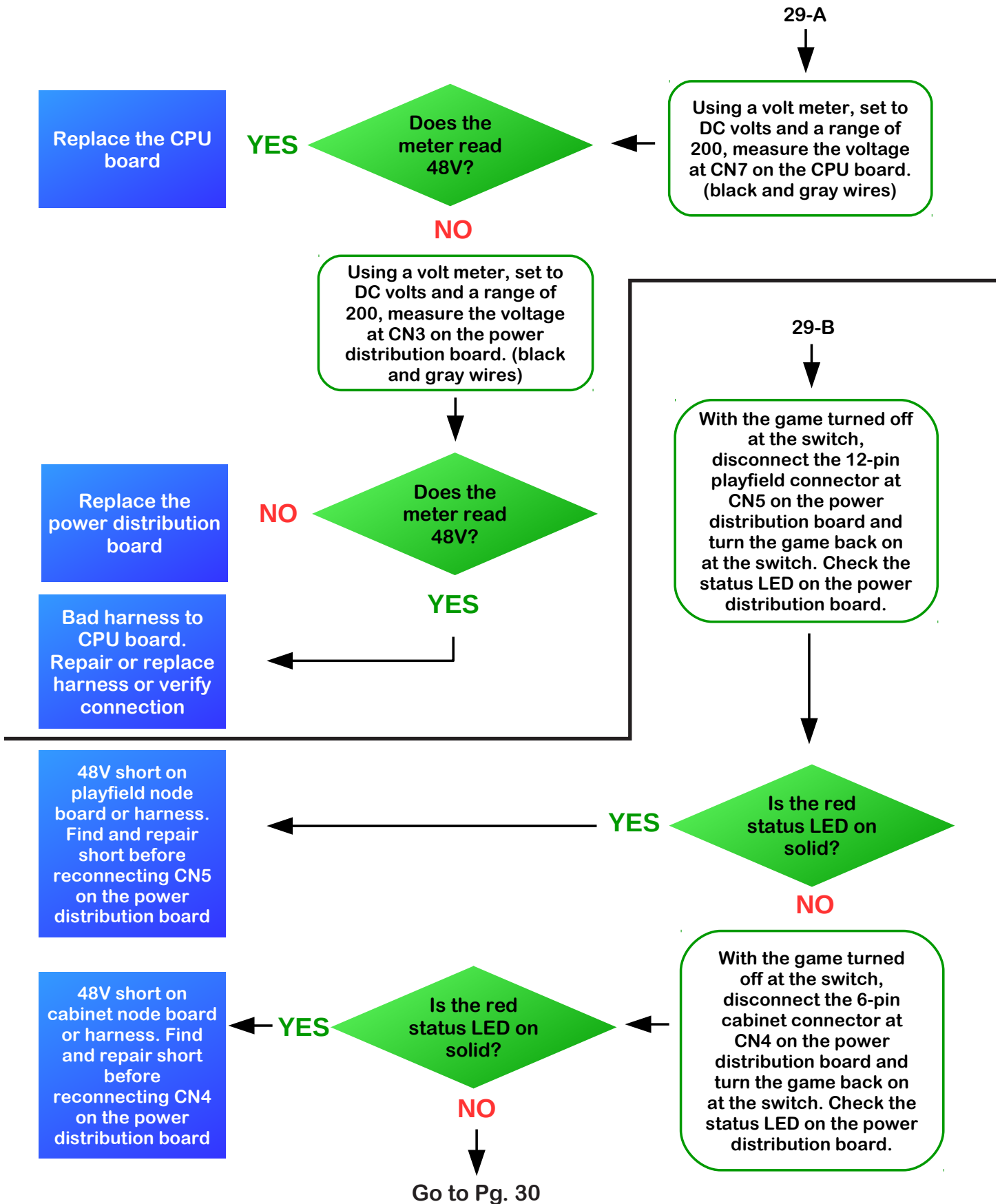
4. Wait for the SD Card to be written and verified. NOTE: The complete process to write and verify the card can take up to 45 minutes.

5. Remove the SD Card from the reader/writer device. With the pinball machine turned off, insert the SD Card into the pinball machine's SD Card slot (CN13) and turn on game.

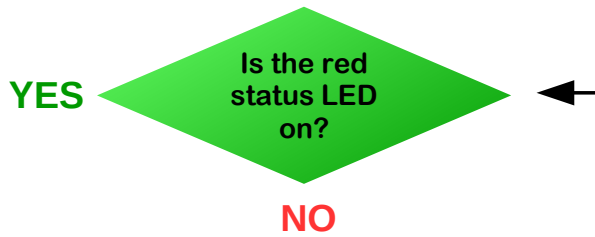
11. TROUBLESHOOTING FLOWCHARTS

11.1 GAME POWER TROUBLESHOOTING



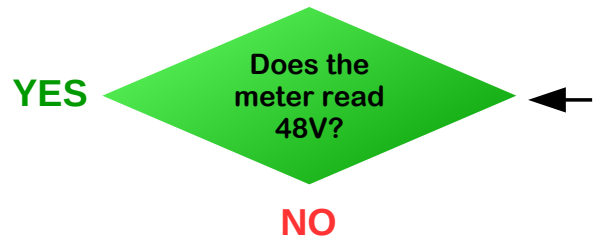


48V short in CPU board or harness. Find and repair short before reconnecting CN3 on the power distribution board



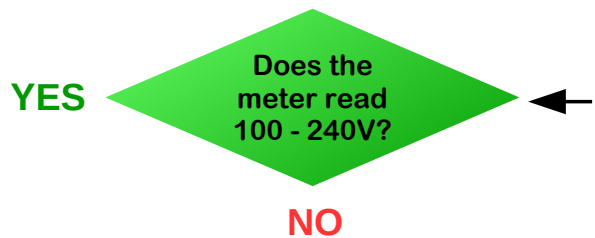
With the game turned off at the switch, disconnect the 4-pin CPU connector at CN3 on the power distribution board and turn the game back on at the switch. Check the status LED on the power distribution board.

Replace power distribution board



With the game turned off at the switch, disconnect the 6-pin P/S input connector at CN1 on the power distribution board, and remove the cover from the 48V power supply to view the screw terminals. Turn the game back on at the switch. Using a volt meter set to DC volts and a range of 200, measure the voltage at the output of the supply (black and gray wires labeled V+, V-).

Replace 48V power supply

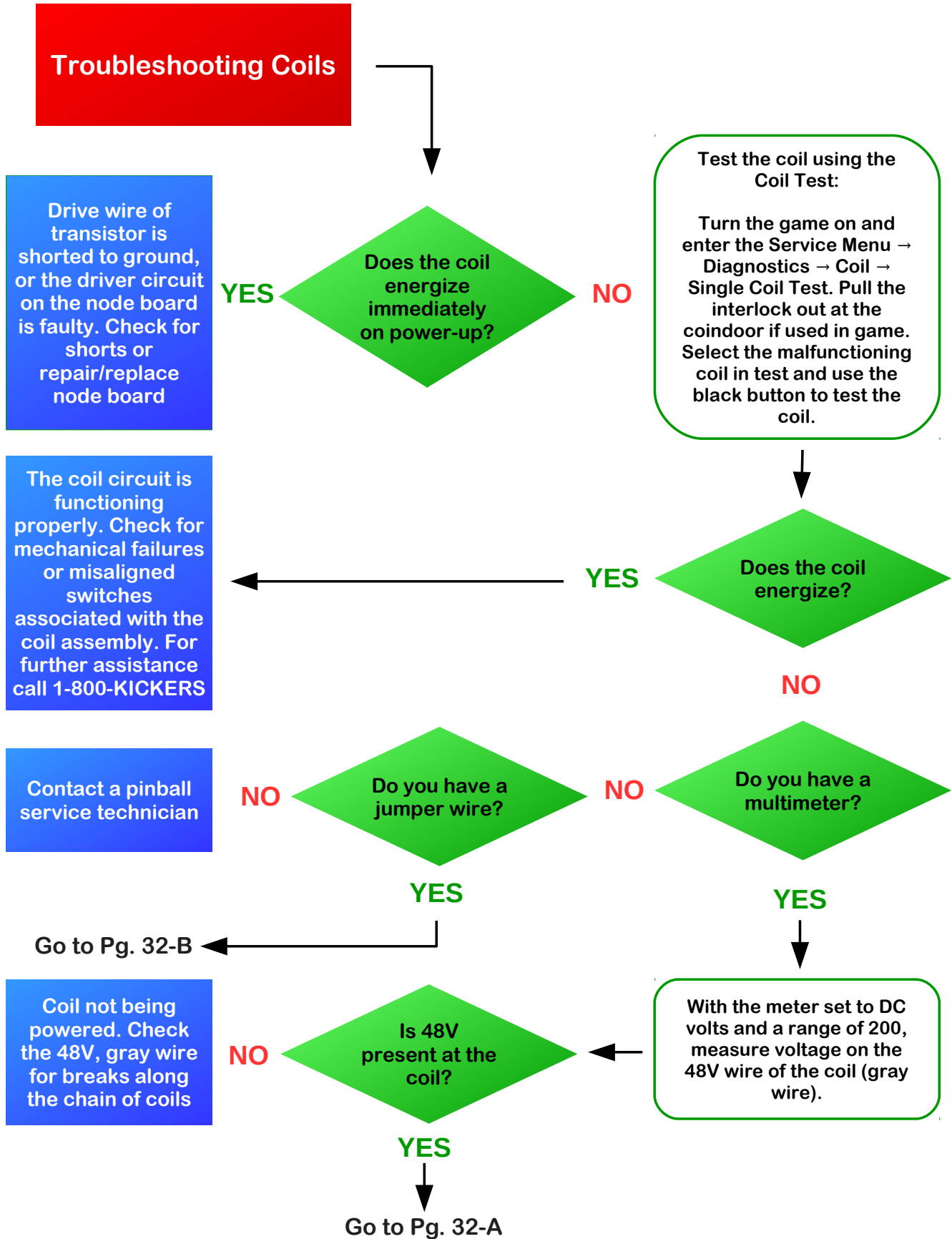


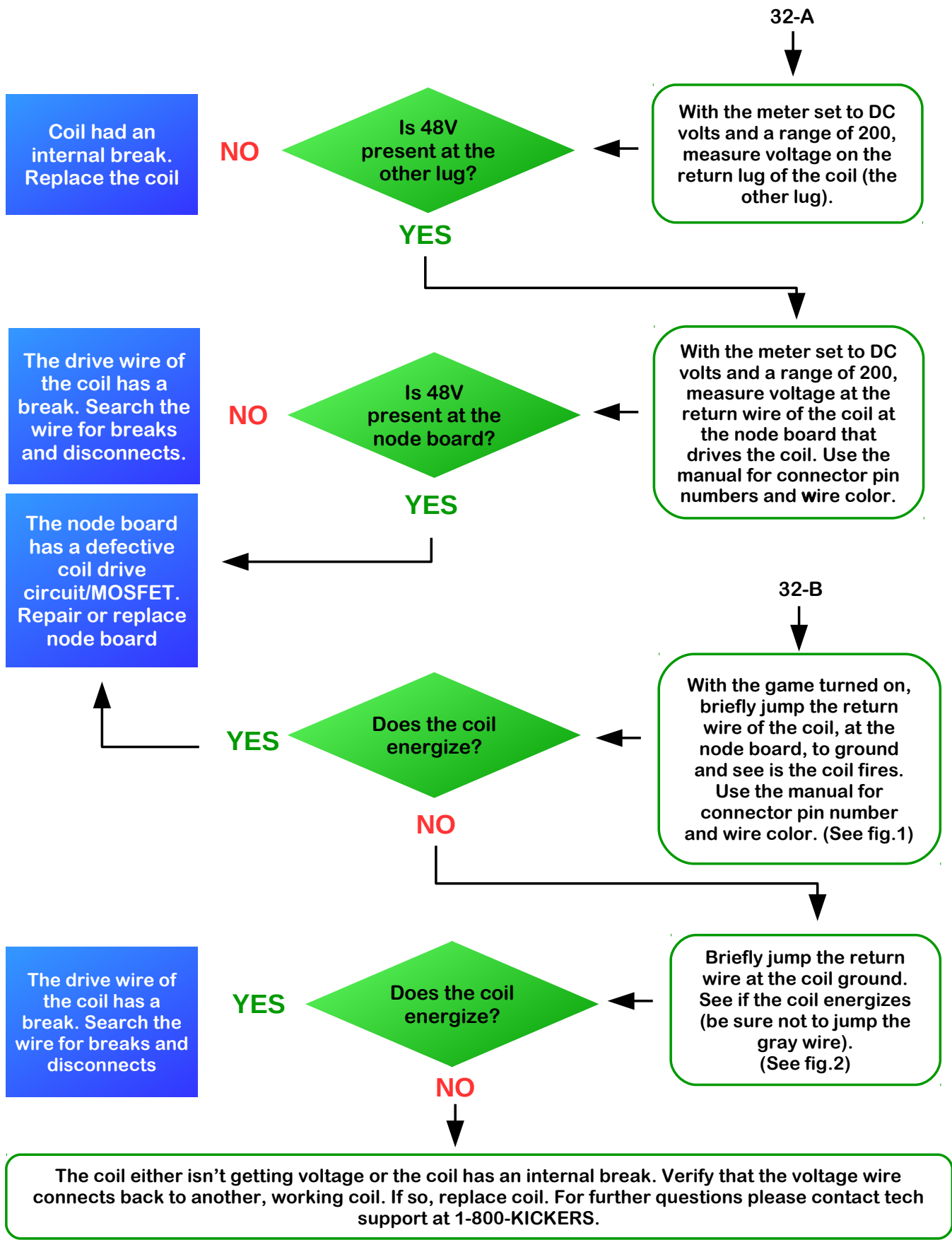
Set your meter to AC volts and a range of 2000, measure the voltage to the input of the power supply (black and white wires labeled N, L)

Unplug the machine and check the continuity of the AC harness that runs between the receptacle, service outlet, fuse, power supply, and power distribution board. Also, double check that the game has AC voltage getting to the game, the fuse is still good, and the power switch is in the on position.

If this chart did not help you locate the source of the issue, please contact tech support at 1-800-KICKERS

11.2 TROUBLESHOOTING COILS





Coil Circuit

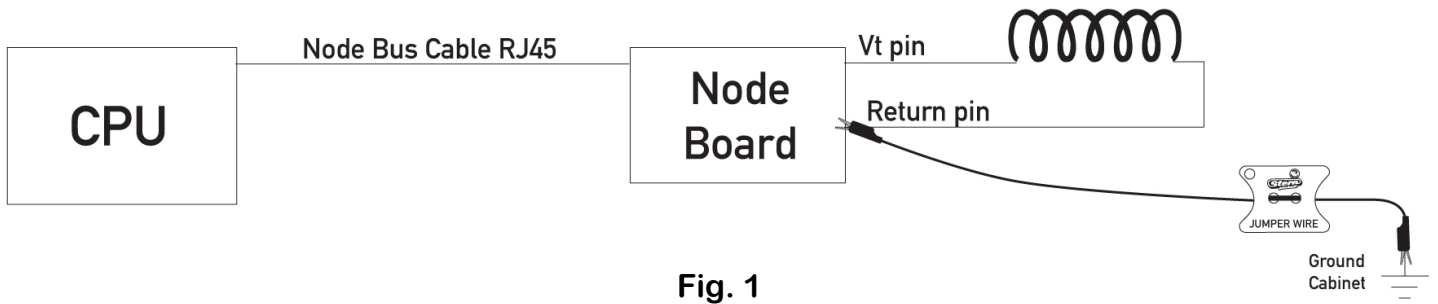


Fig. 1

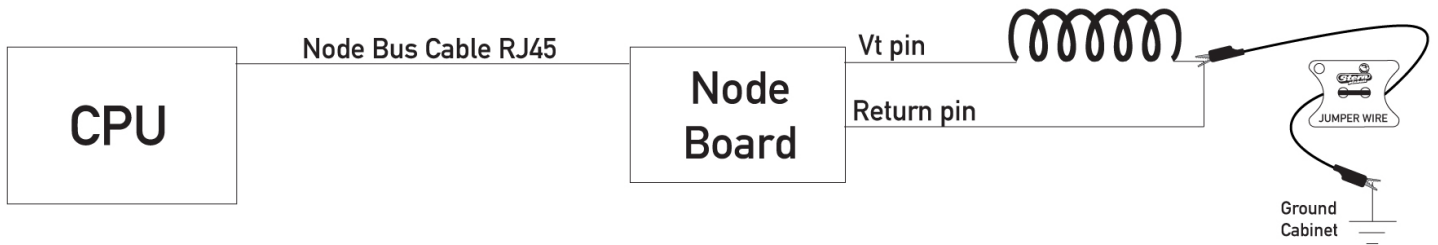
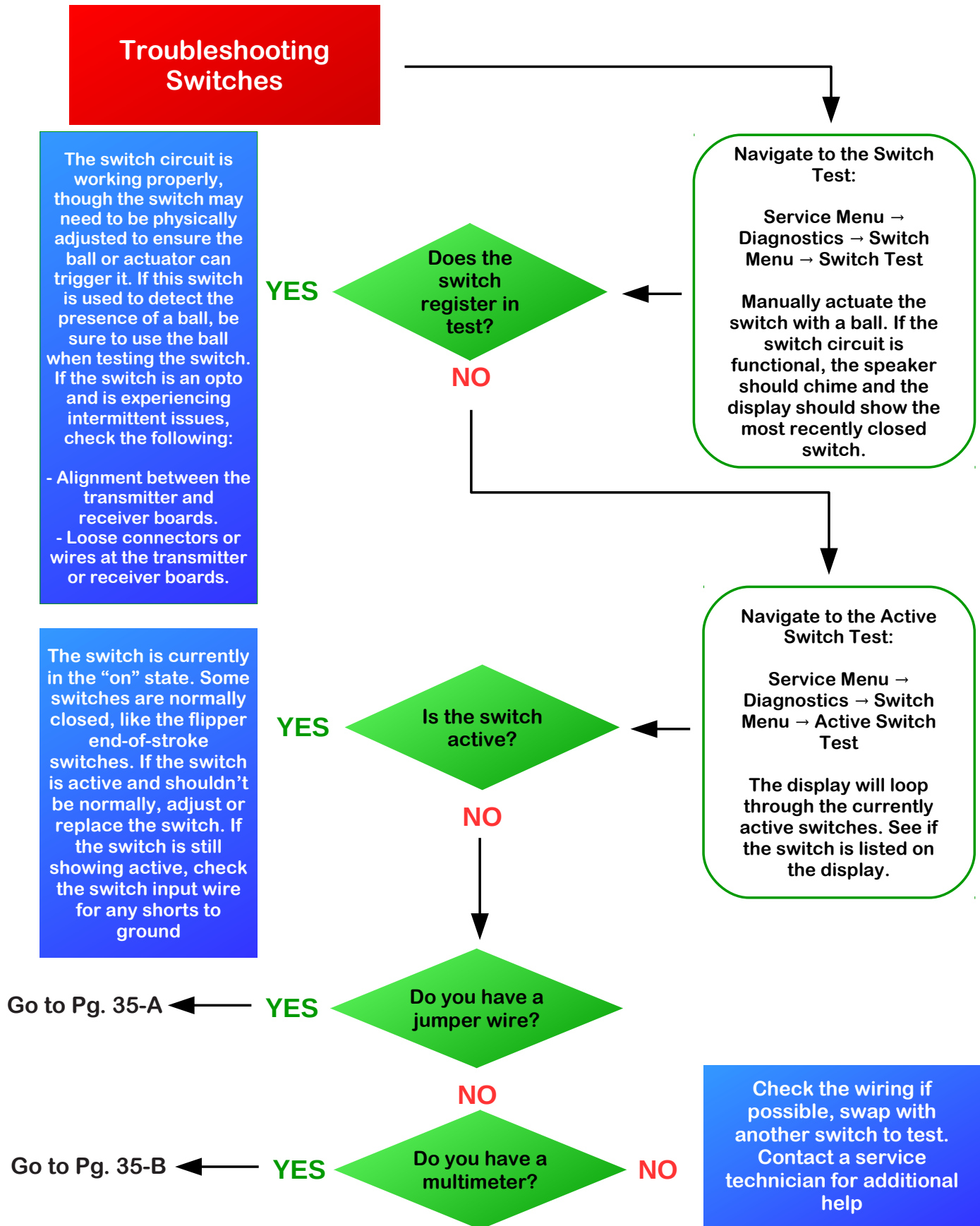
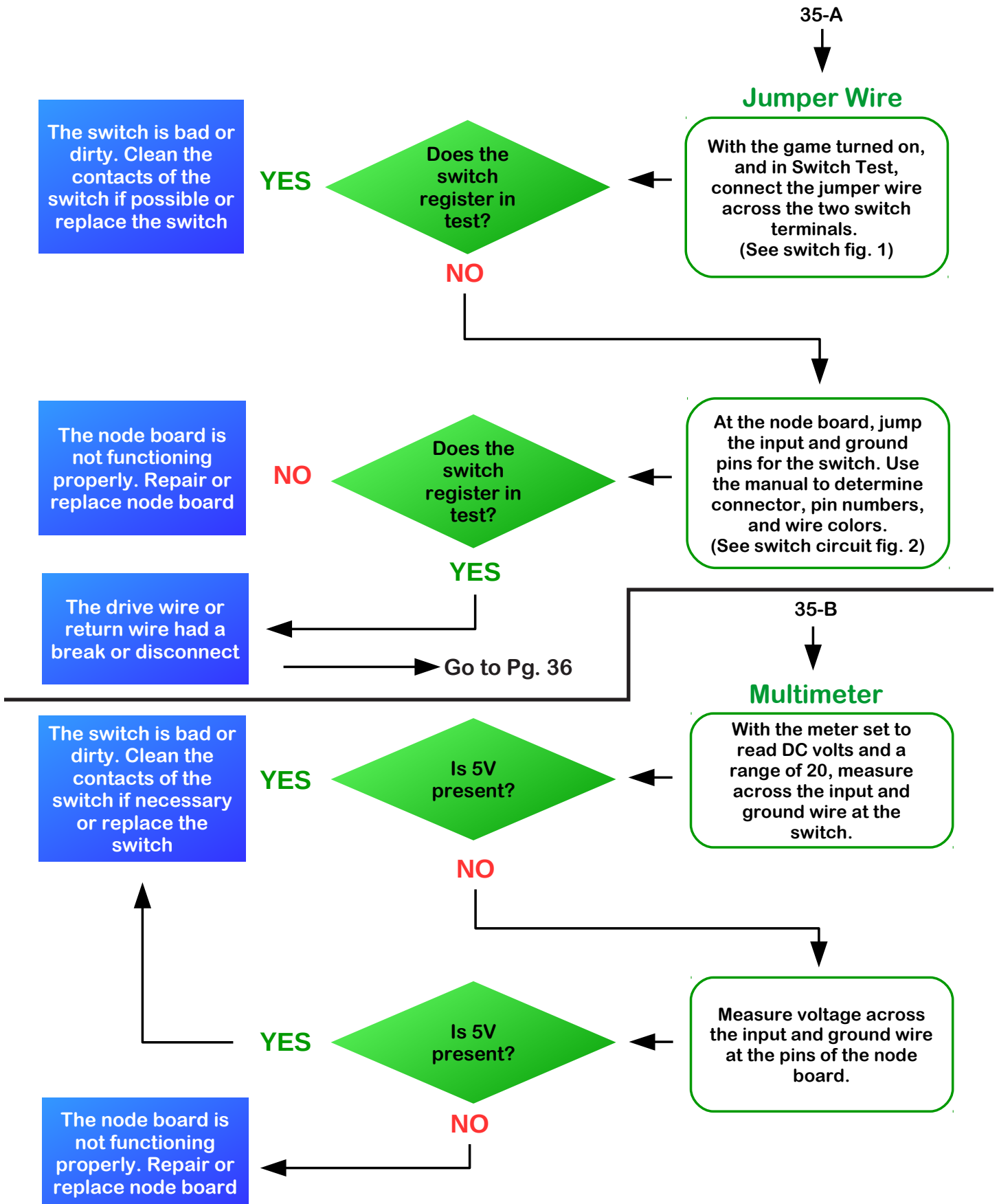


Fig. 2

11.3 TROUBLESHOOTING SWITCHES





The switch input wire has a break or disconnect



With the switch actuated with your finger, connect the jumper wire across the switch input wire that goes between the node board and the switch. Use the manual to determine connector, pin number, and wire color. (See fig. 3)

The switch ground wire has a break or disconnect



With the switch actuated with your finger, connect the jumper wire across the switch ground wire that goes between the node board and switch. Use the manual to determine connector, pin number, and wire color. (See fig. 4)

Contact tech support at 1-800-KICKERS or Parts.Service@sternpinball.com

SW Circuit

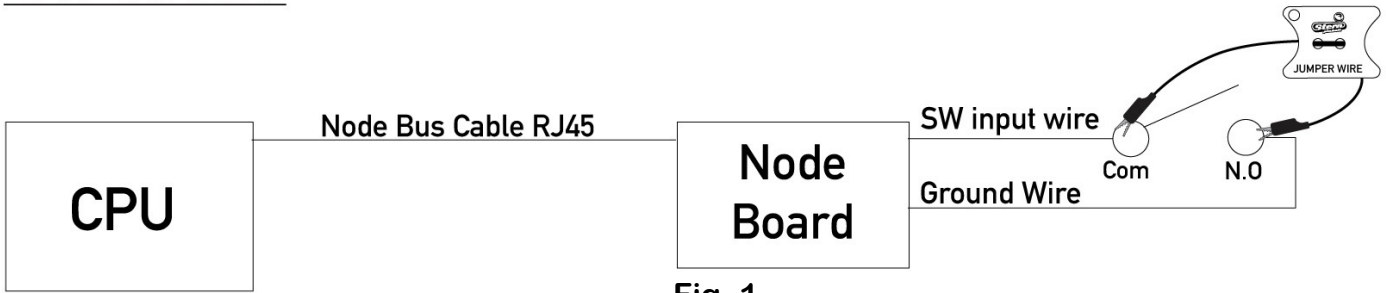


Fig. 1

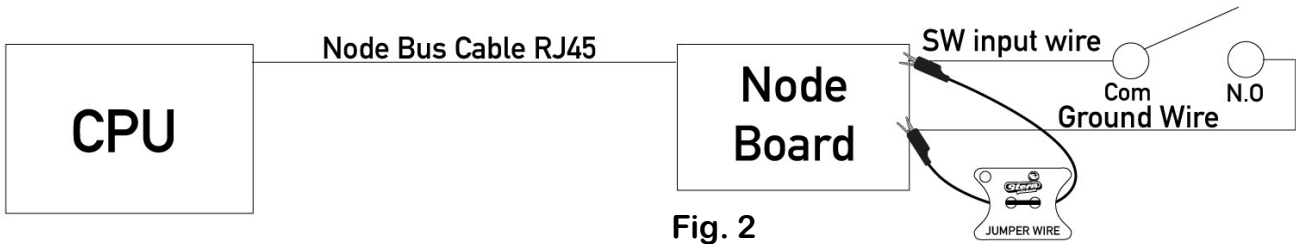


Fig. 2

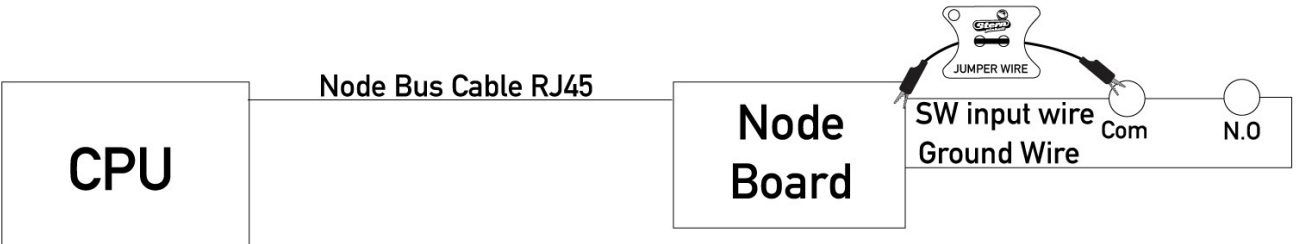


Fig. 3

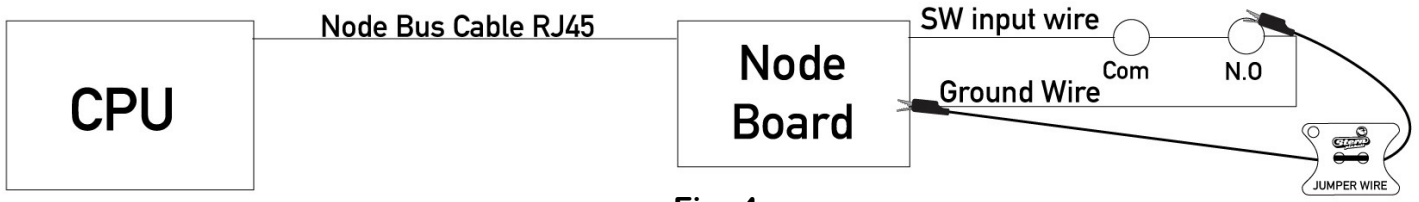
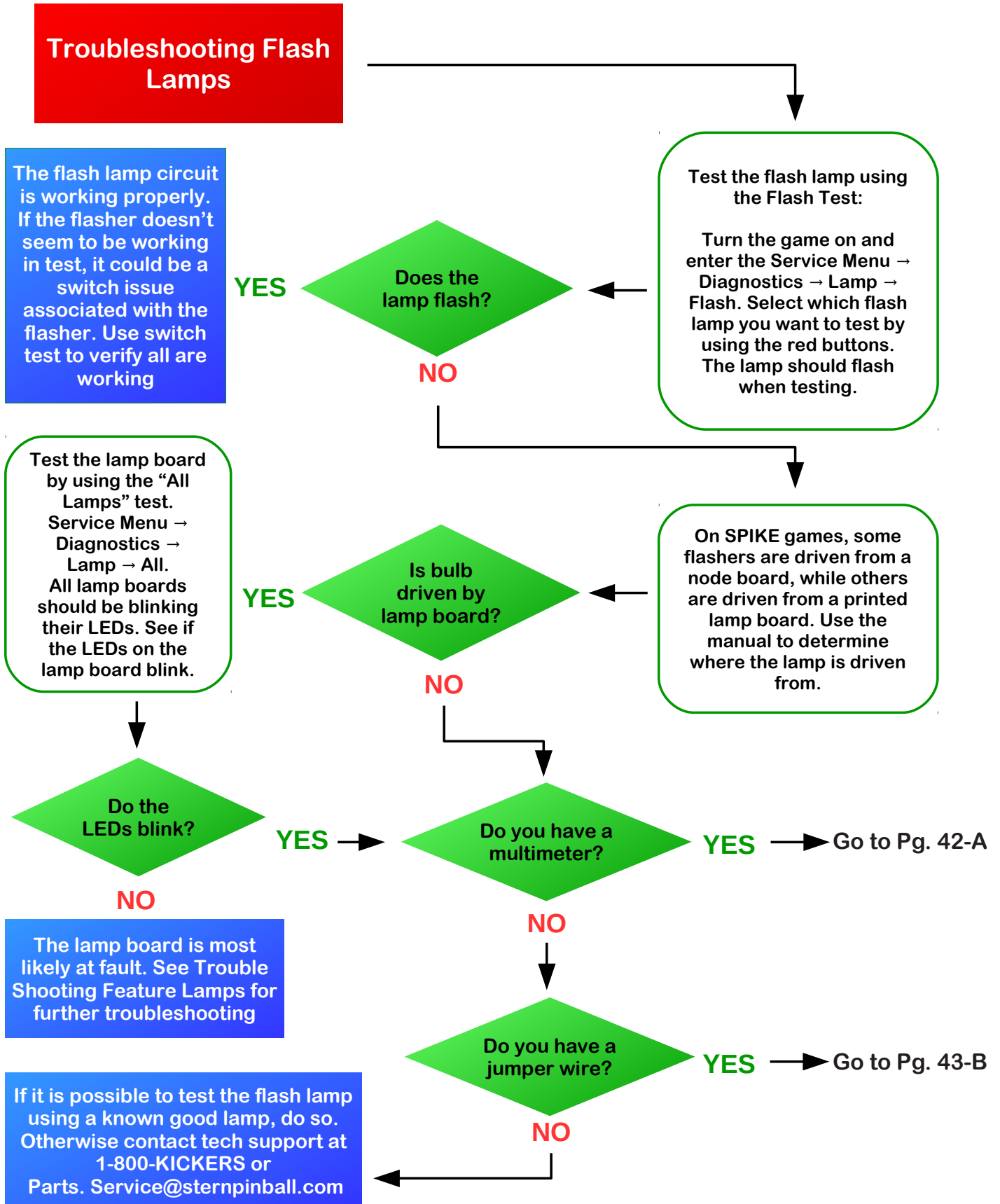
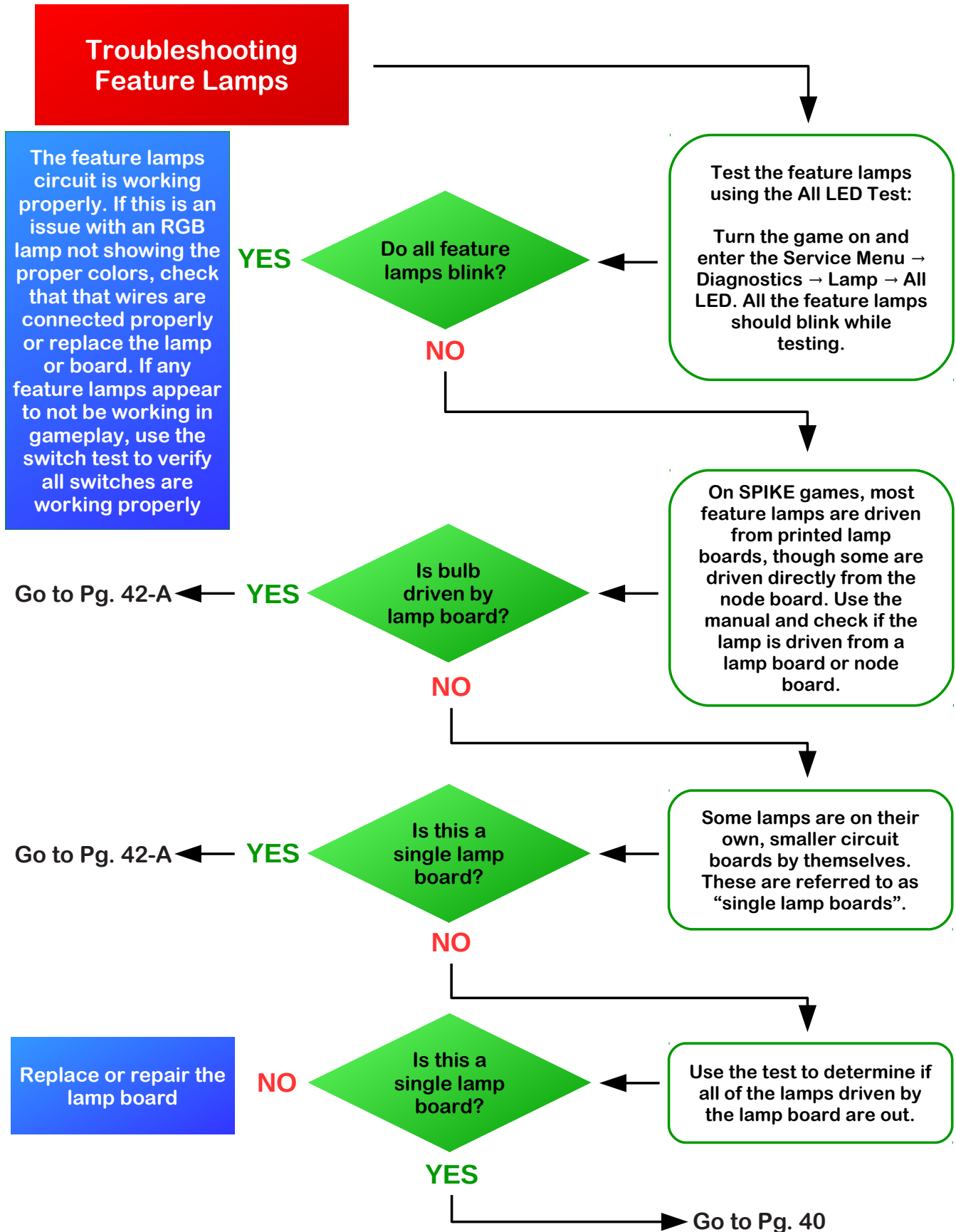


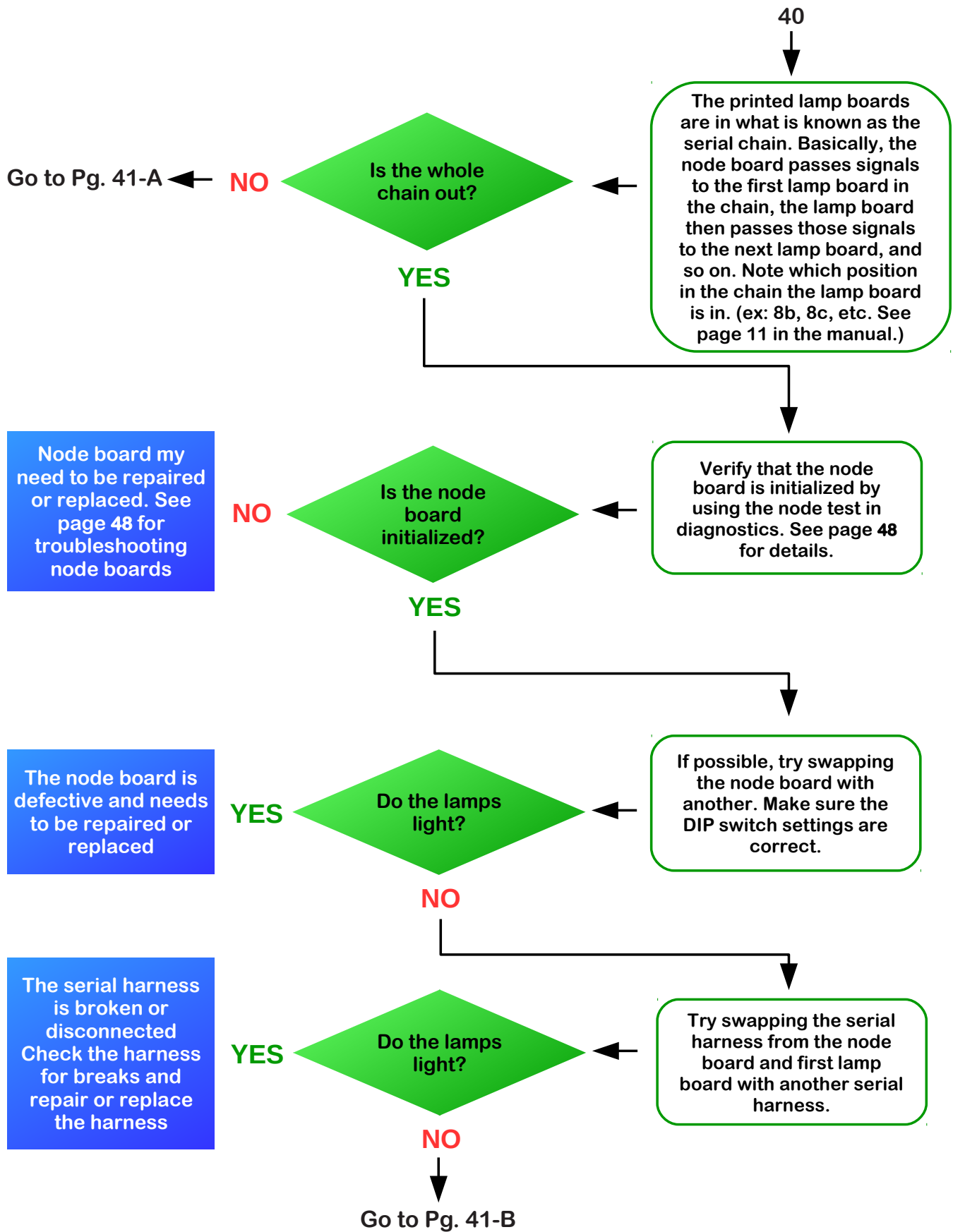
Fig. 4

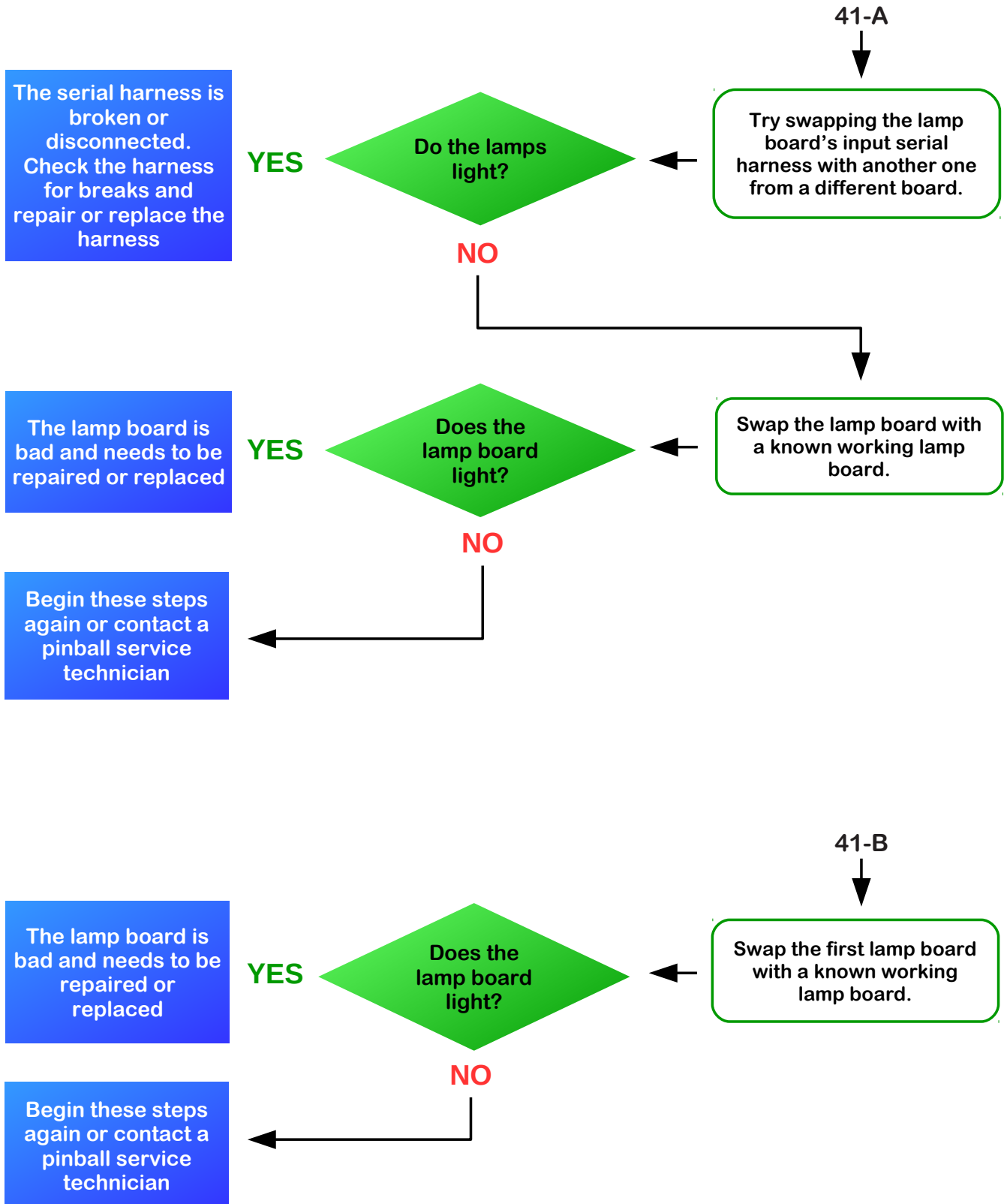
11.4 TROUBLESHOOTING FLASH LAMPS

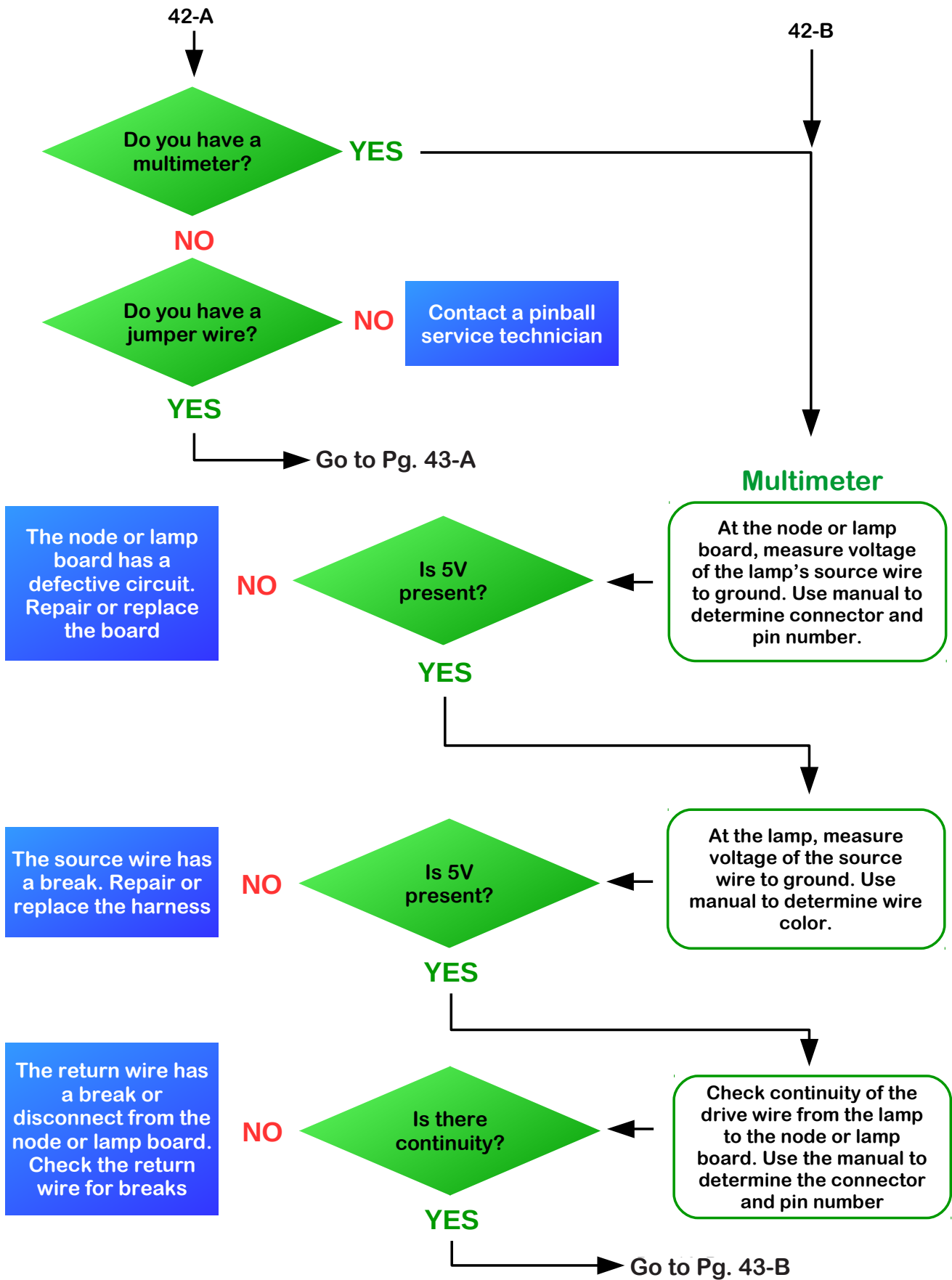


11.5 TROUBLESHOOTING FEATURE LAMPS







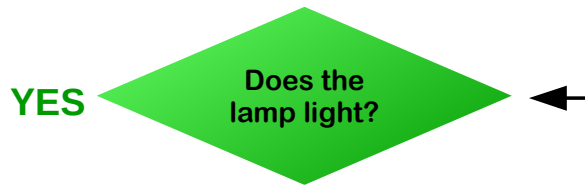


43-A



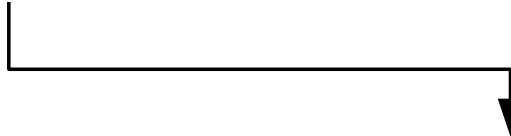
Jumper Wire

At the node or lamp board, jump the drive side of the lamp to ground. Use the manual to determine connector and pin number.

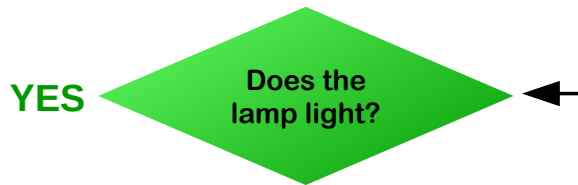


The node or lamp board that drives this lamp is faulty. Repair or replace the board

NO

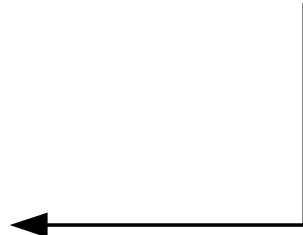


At lamp, jump the drive side of the lamp to ground. Use the manual to determine wire color.

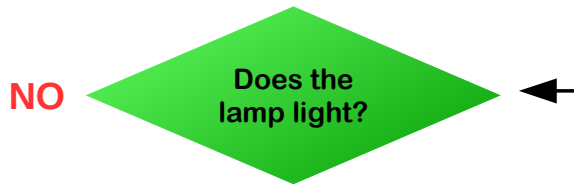


Return wire is not connected to the node or lamp board. Check the wire for breaks and disconnects

NO

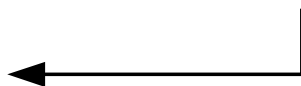


Determine if the lamp is good by using a jumper wire to jump the drive side of the lamp to ground. Use the manual to determine connector and pin number.



The lamp is bad and needs to be replaced

YES

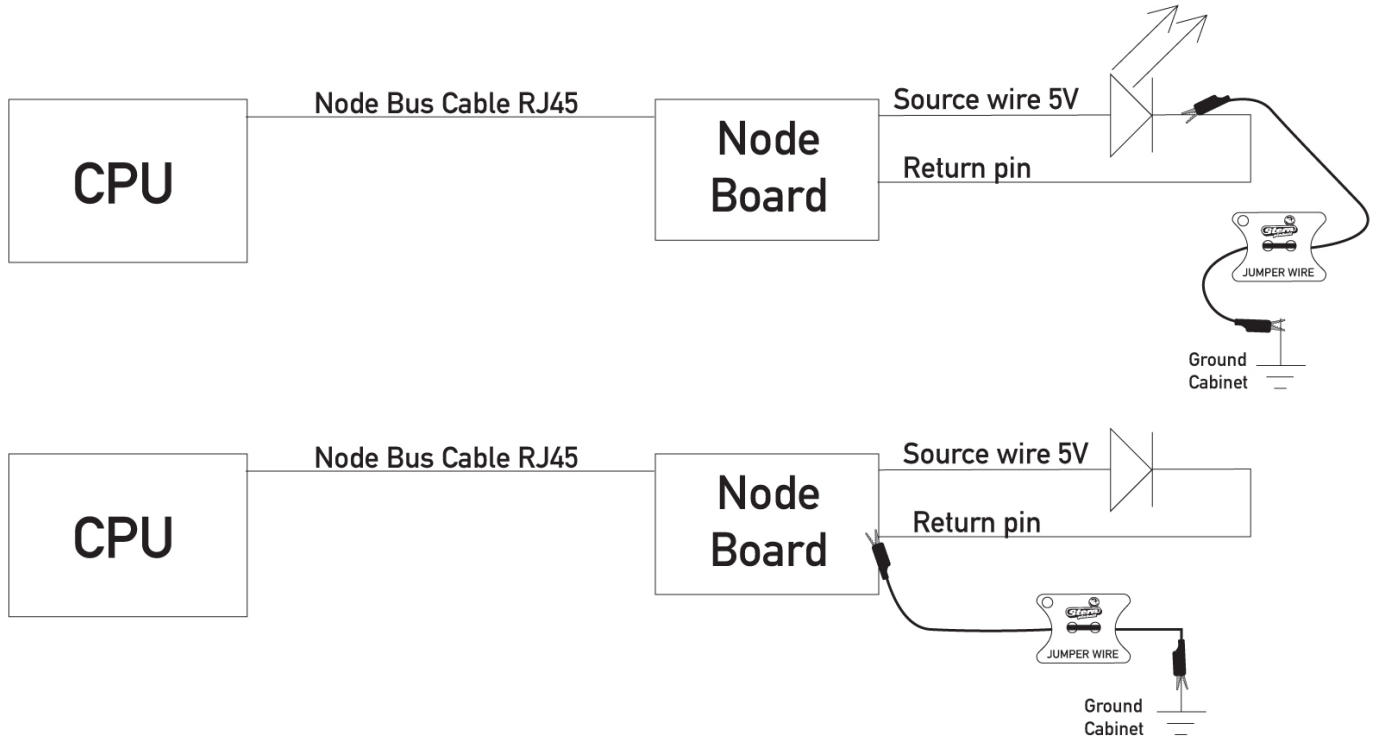


The node or lamp board has a faulty circuit. Repair or replace board

43-B



LED Circuit



11.6 TROUBLESHOOTING GENERAL ILLUMINATION

Troubleshooting General Illumination Lamps

The G.I. string circuit is working properly. If your problem is with the GI flickering, you may have a loose socket. Slightly pinching the socket with the bulb removed may help with this.

Test the G.I. string using the G.I. Test:
Turn the game on and enter the Service Menu → Diagnostics → Lamp → G.I. Test. Select which string of GI you want to test by using the red buttons. The string of GI should blink if working properly.

YES
Does the whole G.I. string blink?

NO

Is the whole string out? YES

NO

Try swapping the LED with another, working LED from a different socket.

Spike games have overcurrent protection. It's possible the game detected an overcurrent and shut off the G.I. string. Use the node test to determine if the game detected an overcurrent.

The LED is bad and needs to be replaced. Check the manual for the correct part number

YES
Does the LED light?

NO

Go to Pg. 46

YES
Do you have a multimeter?

NO

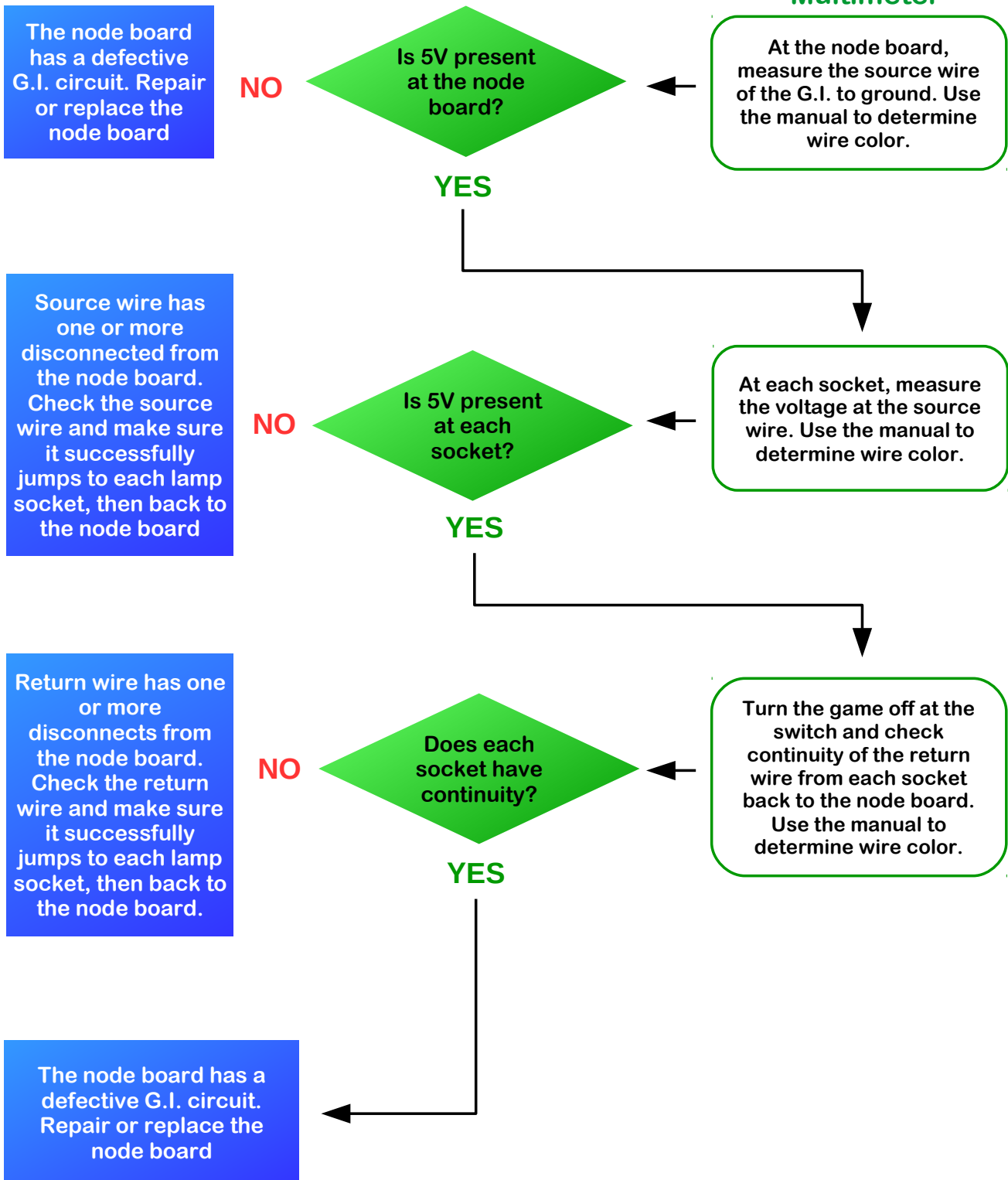
Check for breaks in the wiring chain for the G.I. string. The source wire or drive wire may be disconnected somewhere in the chain. Otherwise there may be an issue with the node board

Go to Pg. 47

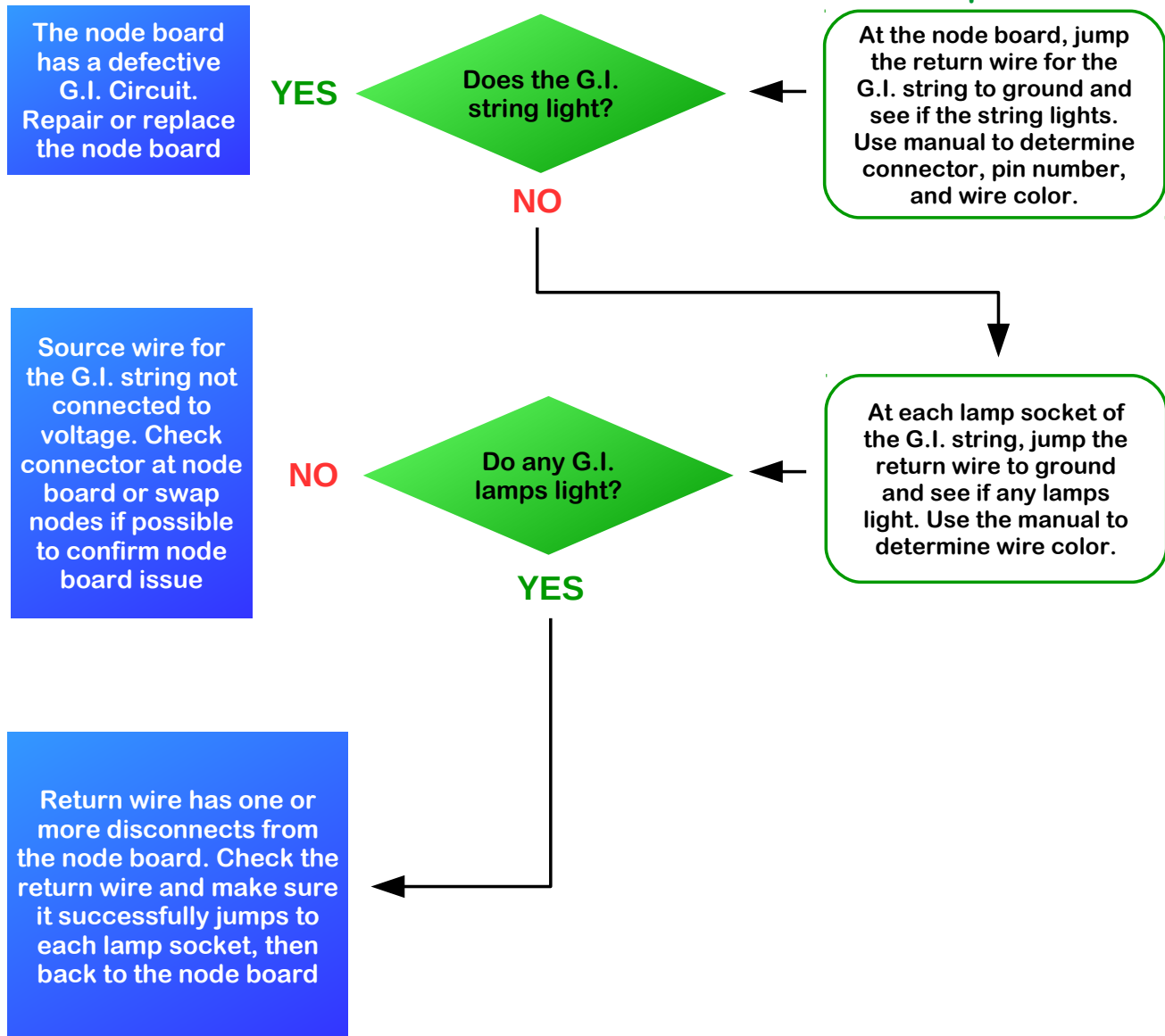
YES
Do you have a jumper wire?

NO

Multimeter

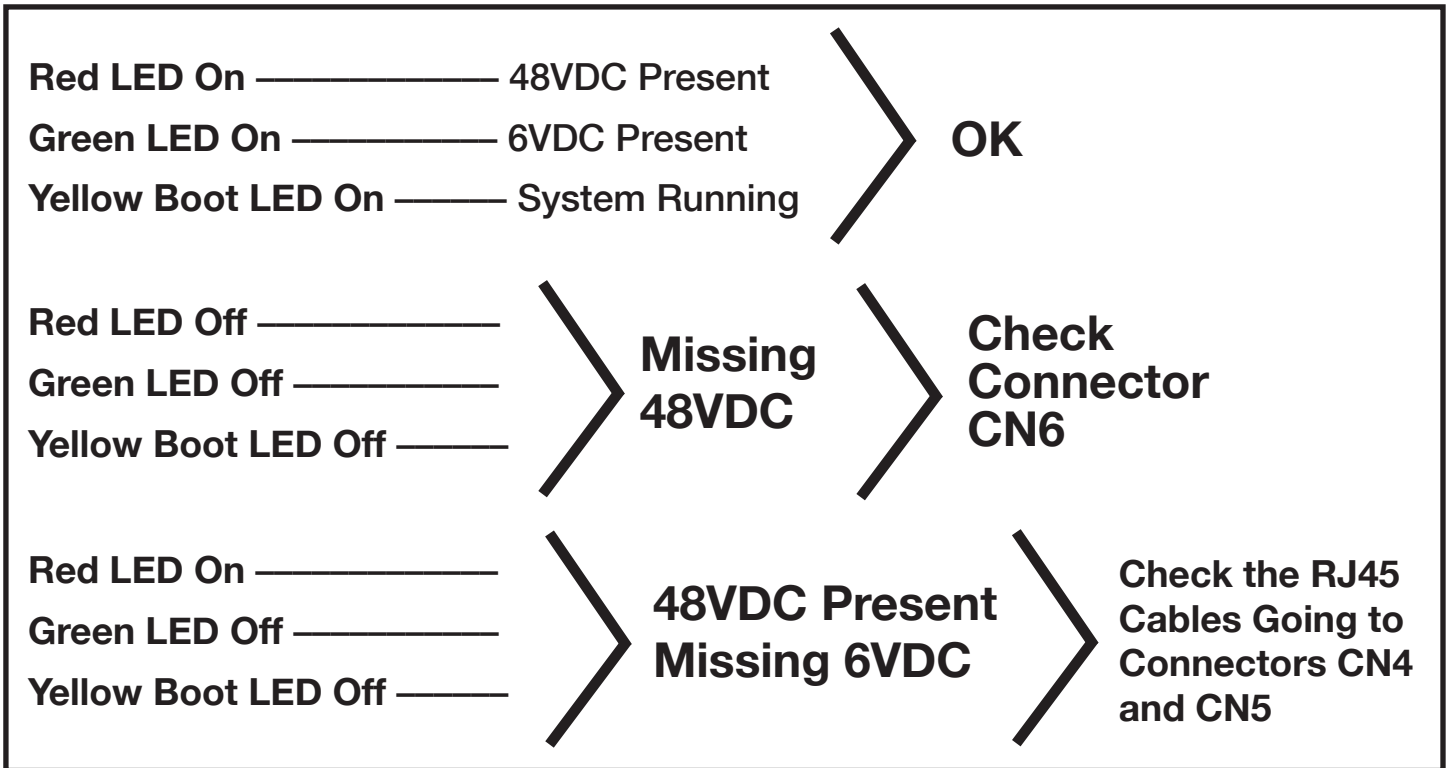


Jumper Wire

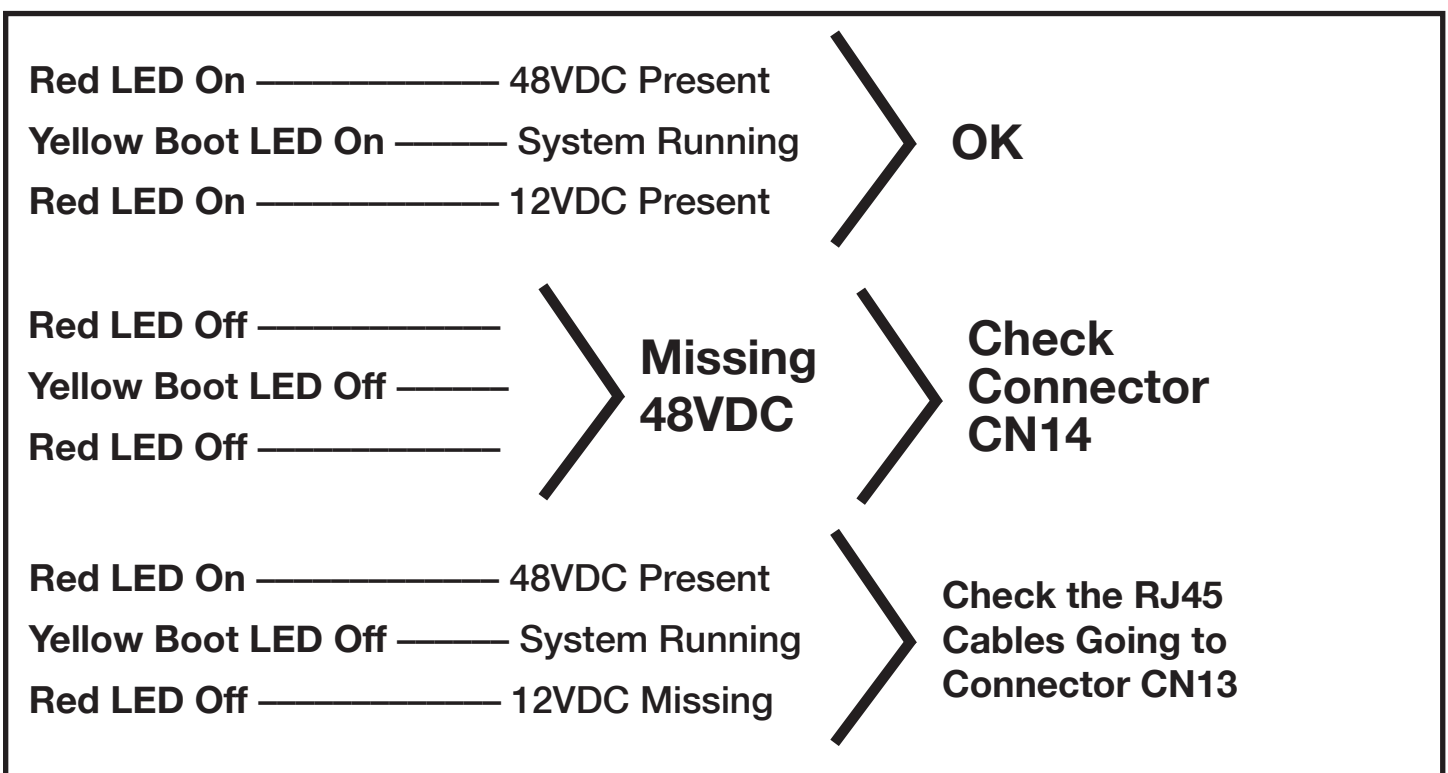


12. NODE BOARD STATUS LED TABLE / NODE BOARD AND BUS TEST

12.1 NODE BOARD STATUS LEDS



12.2 CABINET NODE BOARD STATUS LEDS



12.3 NODE BOARD TEST

Enter the Service Menu by opening the coin door and pressing the black button. On the Service Menu, pick “DIAG” by pressing the black button. Use the red buttons to select the Node Test and press the black button once more to enter the testing screen.



During the Node Board Test, the expected and discovered node addresses are displayed. The node address is the large digit inside the box and the number below the box is the number of the firmware revision on the node board. The dots in the upper right hand corner of the box indicate the DIP switch setting for each Node. Note: Node 0, the CPU, and Node 1, the Cabinet Node board, do not have DIP switch settings because there can only be one CPU and one cabinet node board in a game. The arrow on the display during Node Board Test indicates that there are more node addresses off screen to the left or right. A blinking arrow during Node Board Test indicates a problem with an off screen node address. A blinking box around the node address indicates a problem with that particular node board.

What to check for when the box around the node address is flashing during Node Test:

1. **Symptom:** Node address not found or unexpected node address found.
Check the following - Correct node address (DIP switch settings), the 48V power source and the RJ45 node bus cable going to the node board.
2. **Symptom:** Overcurrent condition has been detected and the overcurrent protection circuit disabled the device (coil or G/I lamp circuit)
Check the following - the information on the display during Node Test will direct you to the faulty coil or G/I lamp circuit. Look for any shorts in the circuit.

12.4 NODE BUS TEST

During the Node Bus Test the CPU confirms with which node addresses it's communicating with. The message “No Errors” will be displayed under the node address box if all communications between the CPU and node boards are good. If the CPU detects a problem communicating with a node board you will see one of three 3 error messages appear under the node address box (**Not Responding, Unexpected Node Address or Node Collision**).

Node bus errors and what to check:

1. **Symptom / Not Responding:** The CPU cannot communicate with an expected node.
Check the following - Node address (DIP switch settings on the node board), the 48V power source, and the RJ45 Node Bus cable going to the Node board.
2. **Symptom / Unexpected Node Address:** The CPU detects an unknown node address.
Check the node address (DIP switch settings on the node board).
3. **Symptom / Node Collision:** Two or more node boards have the same node address.
Check the node address (DIP switch settings on the node board).

