



*Operations & Service Manual*

# Pinball Wizard

June 2011 84-900032-000

***Brunswick***®   
CUSTOMER SERVICE  
A tradition in excellence.

## **Pinball Wizard Service & Operations Manual**

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### **Reorder Part No. 84-900032-000**

Notice: If available, updates to this manual can be found on-line at [www.brunswickbowling.com](http://www.brunswickbowling.com).

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## NOTES & WARNINGS

Throughout this publication, “Warnings”, and “Cautions” (accompanied by one of the International HAZARD Symbols) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. They are defined below. OBSERVE AND READ THEM CAREFULLY!

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus training and “Common Sense” operation are major accident prevention measures.



*NOTE or IMPORTANT!: Will designate significant informational notes.*



**WARNING!** Will designate a mechanical or nonelectrical alert which could potentially cause personal injury or death.



**WARNING!** Will designate electrical alerts which could potentially cause personal injury or death.



**CAUTION!** Will designate an alert which could potentially cause product damage.



*Will designate grounding alerts.*

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## **SAFETY NOTICE TO USERS OF THIS MANUAL**

This manual has been written and published by the Service Department of Brunswick Bowling and Billiards to aid the reader when servicing or installing the products described.

It is assumed that these personnel are familiar with, and have been trained in, the servicing or installation procedures of these products, which includes the use of common mechanic's hand tools and any special Brunswick or recommended tools from other suppliers.

We could not possibly know of and advise the reader of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not attempted any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by Brunswick, must first completely satisfy himself that neither his nor the product's safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

It should be kept in mind, while working on the product, that the electrical system is capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the power to the product should be disconnected prior to servicing and remain disconnected until servicing is complete.

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# CONTENTS

<b>Section 1: General Information .....</b>	<b>8</b>
Federal Communications Commission Class B Equipment.....	8
Product Information Sheet.....	10
Products Not Harmful to Pinball Wizard Gutters.....	10
Products Harmful to Pinball Wizard Gutters.....	11
<b>Section 2: Safety .....</b>	<b>12</b>
Safety Precautions .....	12
Safety During Normal Operations.....	12
Safety During Non-Operational Service or Preventive Maintenance .....	12
Operational Checks .....	13
Disconnecting Power .....	13
Manually Raising and Lowering the Bumpers.....	14
Recommendations for Safe Bumper Bowling.....	16
Supervision .....	16
Advise.....	16
Use Foul lights and Buzzers.....	16
Prevent Unnecessary Closings of the Bumpers.....	16
<b>Section 3: Product Detail.....</b>	<b>17</b>
System Overview.....	17
Automated Bumper Controller .....	19
System Controller (Stand-Alone Systems).....	27
System Controller - System Setup .....	28
Lane Configuration Mode .....	29
Confirm Lane Configuration .....	29
<b>Section 4: Operations and Diagnostics.....</b>	<b>30</b>
Operations.....	30
Operations for Stand-Alone Systems .....	30
Operations with Command Network.....	32
Operations - Vector Control Desk .....	35
Operations - Vector Plus Control Desk .....	38
Diagnostics .....	41
Stand-Alone Systems .....	41
Frameworkx Scoring.....	42
Remote Control Box.....	43
Checking Bumper Rail Position.....	45
<b>Section 5: Service, Maintenance and Troubleshooting.....</b>	<b>46</b>
Service and Maintenance.....	46
Periodic Inspections .....	46
Motor Replacement.....	47

<b>Section 6: Troubleshooting .....</b>	<b>52</b>
The Bumper Rails Keep Going Into Emergency Up .....	53
Front Desk Indicates Bumpers Are Offline .....	54
Frameworkx Scorers.....	54
Front Desk Indicates Bumpers Are Offline .....	55
Vector Scorers.....	55
Rails Will Not Raise or Lower On One Lane Pair .....	56
Stand Alone Systems .....	56
Rails Will Not Raise or Lower On One Lane Pair .....	57
Vector Scoring .....	57
Rails Will Not Raise or Lower On One Lane Pair .....	58
Frameworkx Scoring .....	58
The Rails Will Not Raise Or Lower On One Lane .....	59
Only One Bumper Rail Opens/Closes .....	60

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## **PURPOSE OF THIS MANUAL**

This manual is designed to provide instructions and guidelines to qualified bowling center operators and maintenance personnel regarding the automated Pinball Wizard system. Operations, servicing, scheduled maintenance and basic troubleshooting procedures are listed to provide center personnel with the necessary instructions for maintaining the automated Pinball Wizard system in the best possible operating condition.

Equipment problems or issues that are not directly addressed within this manual should be brought to the attention of Brunswick Technical Support at 1-800-323-8141.

# **Section 1: General Information**

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## **FEDERAL COMMUNICATIONS COMMISSION CLASS B EQUIPMENT**

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.





## Declaration of Conformity

We,

**Brunswick Bowling & Billiards Corporation**

**1 North Field Court, Lake Forest, IL, USA 60045**

declare under our sole responsibility that the product:

**Brunswick Automated Bumper System:  
Model Pinball Wizard and Accessories**

is in conformity with the following Directives at date of this declaration:

**Low Voltage Directive 73/23/EEC and its amendment 93/68/EEC**

**Standards:** EN 60950 Safety of Information Technology Equipment

**EMC Directive 89/336/EEC**

**Standards:** EN 55022, EN 50082-1

**Machinery Directive 98/37/EC**

These conclusions were based on the following test reports:

EMC Directive;

TUV, EMC Emission, Report B950901

TUV, EMC Immunity, Report B950902

Machinery Directive;

Product evaluation according to Annex I

place and date of issue

Muskegon, MI, USA – 07/15/2008

last 2 digits of the year the ce marking was affixed the first time

**0 1**

**David M. Sella, Vice President, Engineering and R&D**

*Name and signature of company authorized person and company's stamp*

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## PRODUCT INFORMATION SHEET

Laboratory tests have been conducted to develop a list of cleaning materials which are approved for use in the maintenance of your Pinball Wizard gutters. Also developed was a list of products commonly used in bowling center maintenance *that must NOT be used on your Pinball Wizard gutters.*



**IMPORTANT:** *The use of any unapproved material on your PinBall Wizard gutters will void the warranty.*

---

### Products Not Harmful to Pinball Wizard Gutters

Absolute HV	62-860106-005
Absolute Control	62-860143-005
Authority22® W22 Lane Conditioner	62-860205-005
Connect Lane Conditioner™	62-860160-005
Control® Lane Conditioner	62-860046-005
Control® LV Lane Conditioner	62-860141-005
Logic™ Lane Conditioner	62-860162-005
Authority22® Lane Cleaner	62-860206-005
Intense™ Concentrated Cleaner	62-860139-012
Invincible® Lane Cleaner	62-860055-005
Judge™ Lane Cleaner	62-860066-005
MAX20™ Concentrated Lane Cleaner	62-860239-000
Squeaky LD Lane Cleaner	62-860054-005
IPA 99 Synthetic Approach Cleaner	61-860254-000
Approach Spot Cleaner	62-860034-000
Armor Slide	62-860024-000
Approach Restorer	62-860033-000

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## Products Harmful to Pinball Wizard Gutters

Pinsetter Cleaner	62-860032-000
Approach Treatment	62-860078-001
All Purpose Cleaner (APC)	62-860085-000
CV88 All Purpose Cleaner	62-860188-005
CV98 All Purpose Cleaner	62-860198-005
White Glove™ Multi-Purpose Cleaner	DBA #1375915

### Obsolete DBA Products

Solvent Lane Stripper #007  
Detergent Pin Cleaner #555  
Lane Cleaner & Polish #80014P  
Kwik Kleen Cleaner #7579  
N/C Machine Cleaner #6040  
Formula “C” Approach Conditioner  
Chlorinite Solvent #008  
Lane Stripper #7555  
Pin Cleaner #522  
G/P Machine Cleaner #088  
Pin Deck Treatment #7585  
White Glove Cleaner  
Detergent Lane Cleaner #7583

### Obsolete Perry-Austen Products

Approach Spot Cleaner #2D 4013  
Solvent Lane Cleaner #4096  
Guardian Lane Cleaner #2D 0880  
CV88 All Purpose Cleaner #2D 0850



***IMPORTANT: Toulene, Methyl Ethyl Ketone and Chlorinated Solvents will also cause damage to Pinball Wizard gutters.***

# Section 2: Safety

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## SAFETY PRECAUTIONS

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Like most devices that have pivoting arms or moving assemblies, Pinball Wizard contains areas that may create pinch points. These pinch points exist both when the bumpers are raising up and when they lower to their down position.

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### Safety During Normal Operations

When possible every effort has been made to protect the user (bowler) from these points. For original installations of Pinball Wizard an emergency up switch located on the ball return capping near the foul line allows the user to quickly return the bumpers to their up position in the event of an emergency. For newer installations the emergency up switch is integrated into the bumper drive assembly for automatic operation. Bumpers may also be equipped with “break away” rails. With this feature the rails will disengage from the motor drive when there is an obstruction under the rail that prevents it from lowering .

---

### Safety During Non-Operational Service or Preventive Maintenance

Servicing the bumpers can create unique situations that do not occur during normal operation. Extra care must be taken during service to ensure maintenance and repairs are done in a safe manner.

1. Service to the bumper system should only be carried out by trained personnel.
2. Power to the Automated Bumper Controller box must be disconnected prior to servicing the bumper system. Refer to *Figure 1*.
3. Your hands or fingers must never come into direct contact with the bumper rails while they are moving.
4. Never use your hands or feet to manually raise or lower the bumper rails. Use an appropriate tool such as the Brunswick bumper deployment tool (Brunswick part number 84-8601000-000) when manually lifting (or lowering) the bumpers. Refer to *Figure 2*.

During non-operational service of the bumper system additional precautions need to be taken as integrated safety features may be unexpectedly triggered or may have been temporarily disabled during service. To prevent unexpected operation, all non-operational work must be done with the power turned off and the power cord unplugged from the bumper controller PCB. Additionally, the power cord must be secured so that it cannot be used to power the bumpers until they are ready to be put back into service. Refer to *Figure 1*.

The Pinball Wizard automatic bumpers are not intended for manual operation. **Never** raise or lower the bumpers by pushing or pulling the rails as injury to or loss of fingers or toes can occur. To raise or lower the bumper manually disconnect power to the Automated Bumper Controller and then use an appropriate tool such as the Brunswick bumper deployment tool (84-860100-000). Refer to *Figure 2*.

---

## Operational Checks

Most operational checks require electrical power to be on. Extreme care must be exercised to avoid contacting electrical components or power sources. Simple steps such as reinstalling covers, proper static grounding, etc. will prevent injury to personnel and/or equipment damage.

Operational checks should only be performed if :

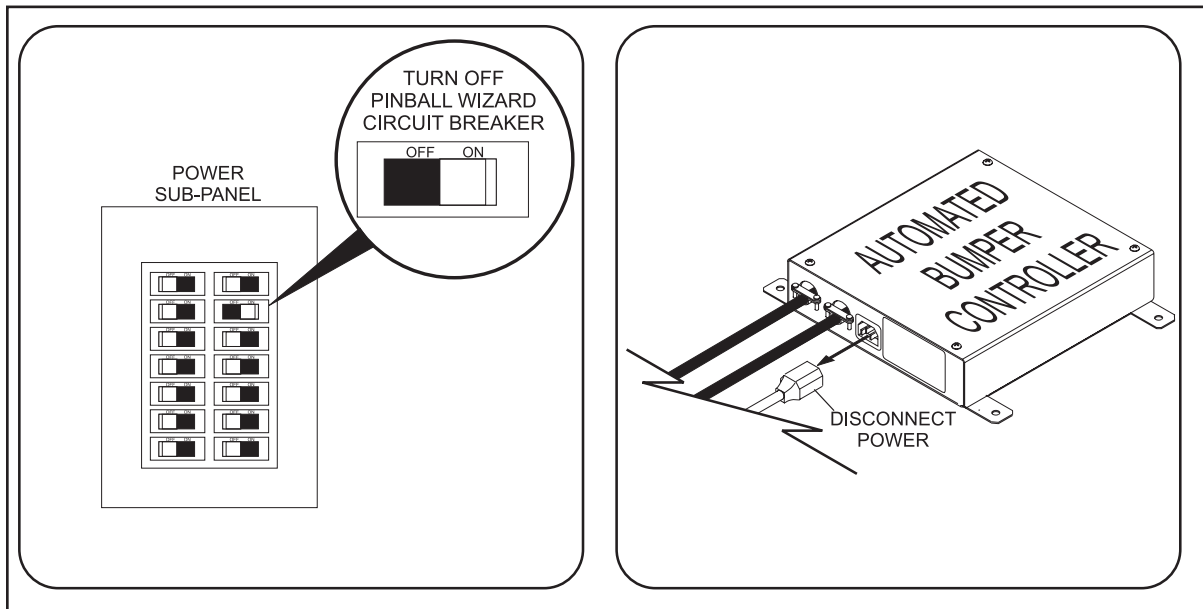
- The center personnel are aware the installation or service of the bumpers is in process.
- The lane(s) being worked on are placed in an “out of service” or hold status. This prevents personnel from inadvertently activating the pinsetter and issuing a lane.

---

## Disconnecting Power

Power to the Automated Bumper Controller box must be removed prior to servicing the bumper system. It is suggested that the circuit breaker that supplies power to the Bumper Controller be turned off AND the power cord connected to the side of the Bumper Controller Box be disconnected. Refer to *Figure 1*.

Once power is removed , additional steps must be taken to ensure that the power cannot be restored until servicing is complete. This can be accomplished by attaching an approved lockout device to the circuit breaker and/or securing the power cord so that it cannot be used.



*Figure 1. Disconnect Power*

---

## Manually Raising and Lowering the Bumpers

The Pinball Wizard bumper system is designed for automatic operation and under normal conditions should not be operated manually. During servicing, however, it may be necessary to raise or lower the bumper rails manually. When operating the bumpers manually the following safety precautions must be taken to prevent injury.

1. Service to the bumper system should only be carried out by trained personnel.
2. Power to the Automated Bumper Controller box must be removed prior to servicing the bumper system or raising or lowering the rails. Refer to *Figure 1*.
3. Your hands, fingers, or feet must never come into direct contact with the bumper rails to raise or lower them. Refer to *Figure 2*.
4. Use an appropriate tool such as the Brunswick bumper deployment tool (Brunswick part number 84-8601000-000) when manually lifting or lowering the bumpers. Refer to *Figure 2*.
5. To further prevent injury when servicing bumpers that are in the up position, place a wedge between the bumper rail and the bumper channel to prevent the rails from accidentally lowering.



***WARNING! Manually raising or lower the bumper rails should only be done if it is necessary for servicing the bumpers. It should not be used as an alternative operating method for inoperative bumpers.***

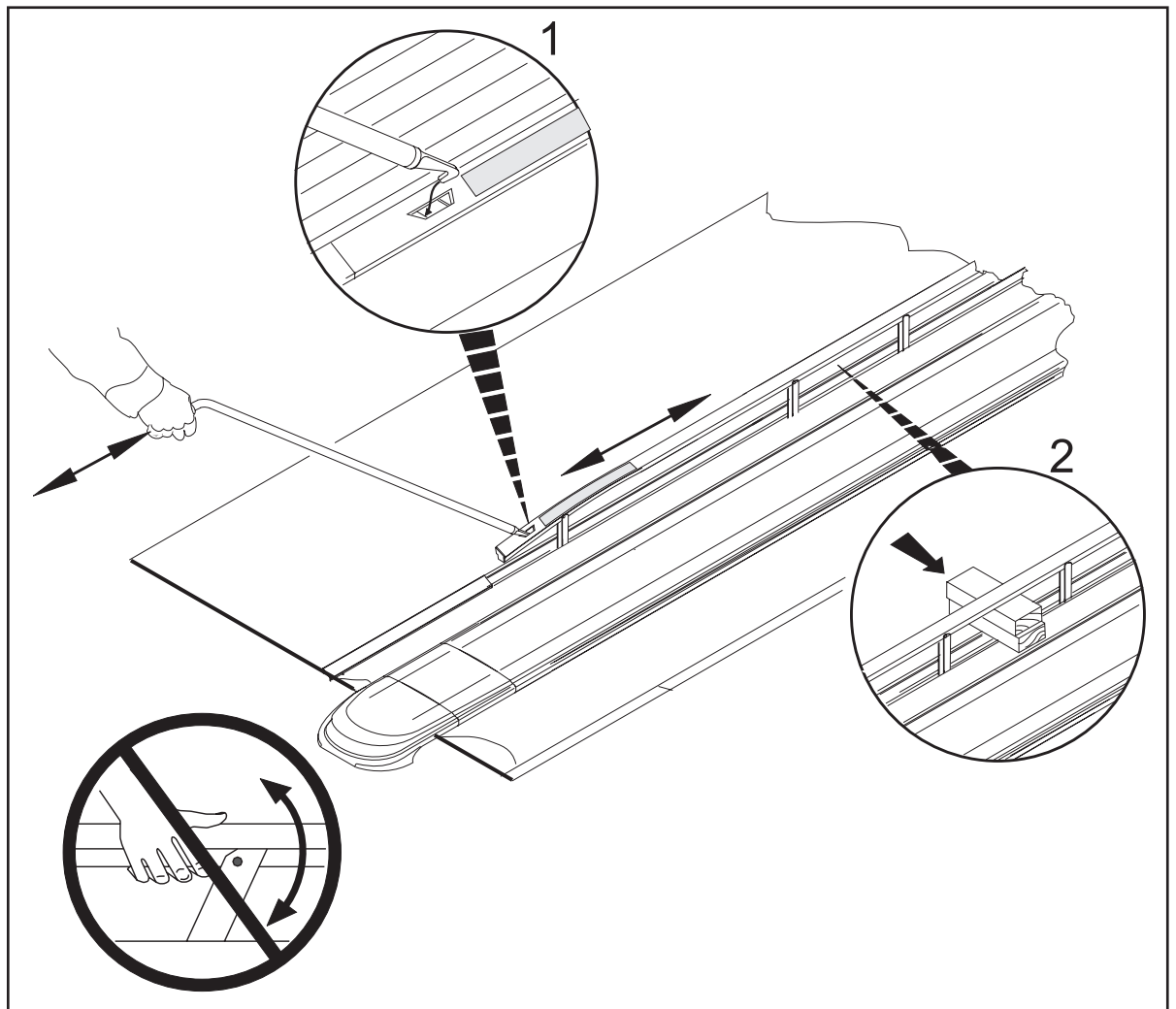


Figure 2. Raising/Lowering the Bumpers



**WARNING!** To prevent serious injury, your hands or feet should never come in contact with the bumpers while they are being raised or lowered. **DO NOT** use your hands to raise or lower the bumper rails.

---

## **RECOMMENDATIONS FOR SAFE BUMPER BOWLING**

Automated Bumper Bowling presents a risk of injury to young children who attempt to walk on the lane surface where they could slip and fall while the automated bumpers are closing. The following “Operating Guidelines” are provided for bowling center proprietors, managers and their employees in an effort to minimize this risk to the greatest extent possible while providing an enjoyable bowling experience for young bowlers.

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### **Supervision**

Always make sure that parents, youth group supervisors, and/or bowling center instructors supervise children bowlers.

---

### **Advise**

1. Advise the children and the children’s supervisors, of the risk of slipping or falling if the bowler crosses the foul line and walks on the lane surface.
2. Advise parents of children’s desires to chase balls that have stopped on the lane.
3. Advise supervisors and children to call a center employee to retrieve a ball.
4. “Bumper Up Switch” - If you have the original Pinball Wizard, advise parents, supervisors and employees of its location and its use. The newer Pinball Wizard incorporates an automatic Bumper Up Switch.

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### **Use Foul lights and Buzzers**

Keep them on. Advise children and parents of the presence and significance of the foul line and foul lights. Children are wary of the sound of the buzzers. They are also sensitive to the loss of score should they create a foul.

---

### **Prevent Unnecessary Closings of the Bumpers**

1. Leave the bumpers permanently in the up position when only young children are bowling.
2. Assign younger children together in the lineup (bowling) order when parents and older siblings are also bowling to reduce the up/down cycling of the bumpers.



## Section 3: Product Detail

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### SYSTEM OVERVIEW

The automated bumper system is an electromechanical system that allows the user to conveniently raise and lower the gutter bumpers on a lane from a remote location. When used with a Brunswick scoring system, the bumpers can be controlled automatically for each bowler through the scoring system. When installed as a Stand-Alone system (no scorers), a system controller is placed at the control desk and allows the user to raise and lower the bumpers on selected lanes.

The system consists of a drive motor, pivot assemblies and an automated bumper controller mounted approximately 30' from the foul line in the ball return area. Older installations have an emergency up switch, mounted on the ball return capping next to the foul line to provide a means of raising the gutters in the event of an emergency. Newer installations have an automatic emergency up switch incorporated into the drive assembly. Refer to *Figure 3*.

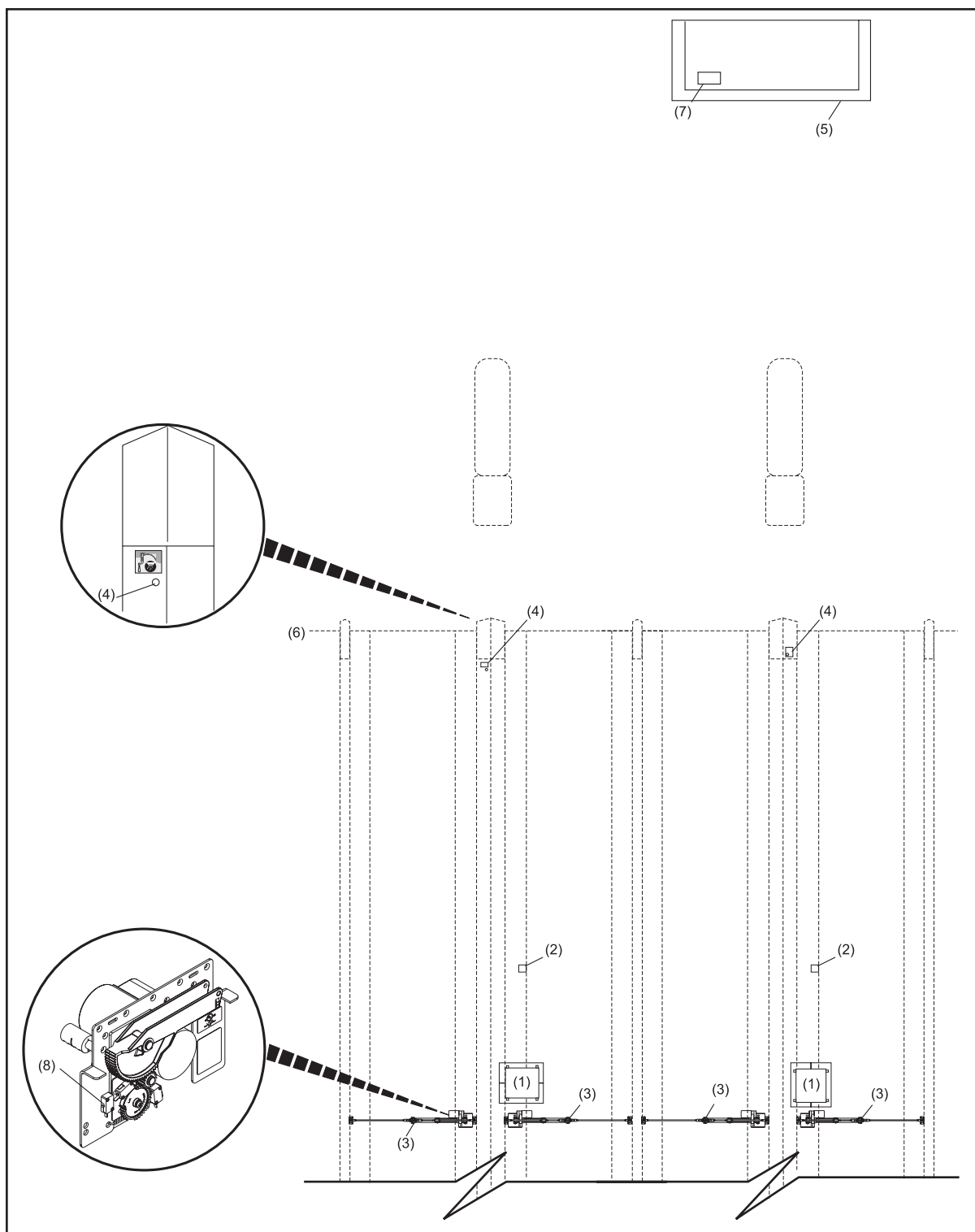


Figure 3. Overview - Component Location

- |   |   |                                   |
|---|---|-----------------------------------|
| (1) AUTOMATED BUMPER<br>CONTROLLER                    | (2) RECEPTACLE  | (3) DRIVE & DRIVEN PIVOT ASSEMBLY |
| (4) EMERGENCY UP SWITCH<br>(OLDER INSTALLATIONS ONLY) | (5) CONTROL DESK                                      | (6) FOUL LINE                     |
| (7) SYSTEM CONTROLLER                                 | (8) EMERGENCY UP SWITCH<br>(NEWER) INSTALLATIONS ONLY |                                   |

## AUTOMATED BUMPER CONTROLLER

The automated bumper controller assembly contains a single printed circuit board (PCB). The main function of this PCB is to supply and control power to the actuator motors of the lane pair. Refer to *Figure 4*.

The PCB determines when to raise or lower the bumpers based on information it receives from the control desk's System Controller (Stand-Alone installations) or from the scoring system.

The emergency up switch mounted on the ball return capping, for older installations or on the drive assembly pivot plate for newer installations, overrides the signals received from the System Controller or scoring system causing the automated bumper controller to raise the bumpers.

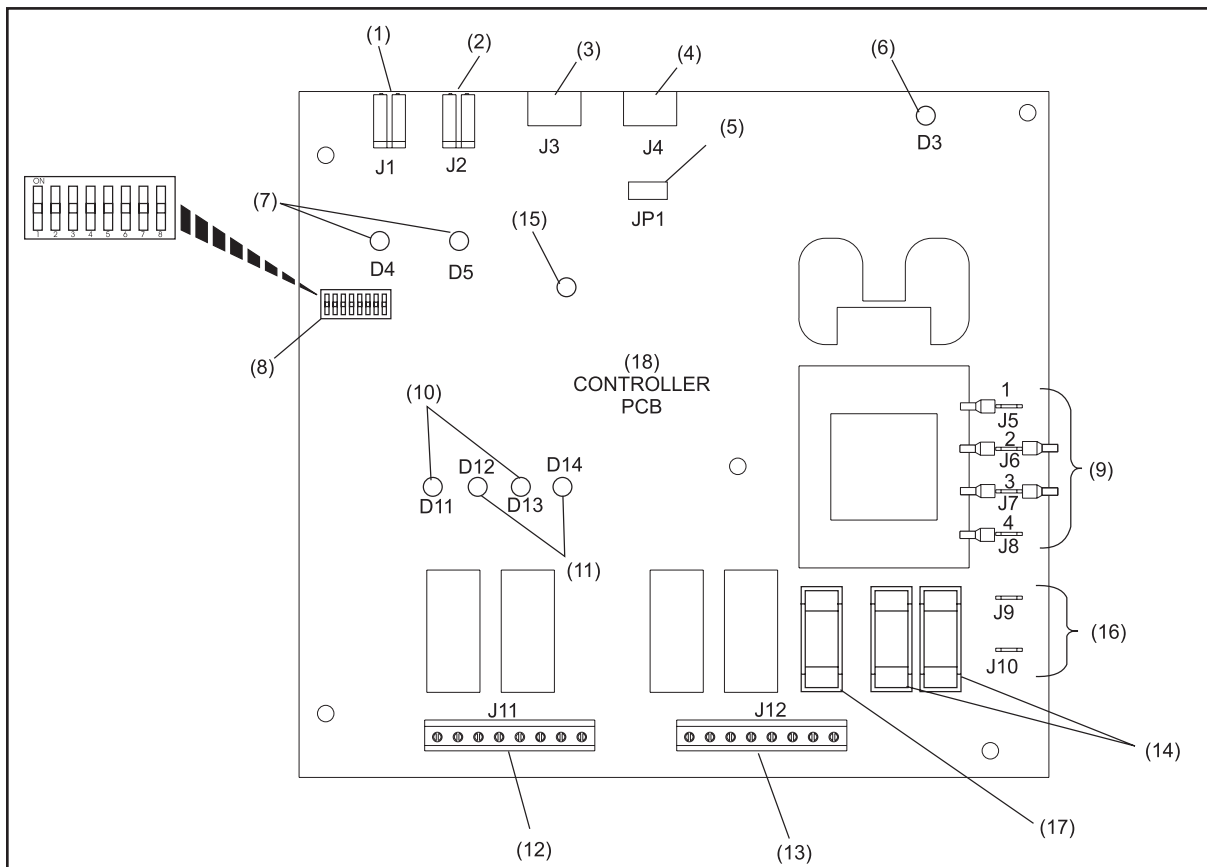


Figure 4. Automated Bumper Controller PCB

- |   |  |  |
|---|--|--|
| (1) LEFT LANE EMERGENCY UP SWITCH INPUT | (2) RIGHT LANE EMERGENCY UP SWITCH INPUT                     | (3) COMMUNICATION IN                   |
| (4) COMMUNICATION OUT                   | (5) TERMINATION JUMPER                                       | (6) POWER LED                          |
| (7) EMERGENCY UP LED                    | (8) CONFIGURATION SWITCHES                                   | (9) POWER TRANSFORMER JUMPERS          |
| (10) GUTTER UP LEDS                     | (11) GUTTER DOWN LEDS  | (12) ACTUATOR MOTOR OUTPUT (LEFT LANE) |
| (13) ACTUATOR MOTOR OUTPUT (RIGHT LANE) | (14) MOTOR FUSES - (1.6A SB FOR 115VAC) (0.8A SB FOR 230VAC) | (15) HEARTBEAT LED                     |
| (16) MAIN POWER INPUT                   | (17) MAIN POWER FUSE (.25A)                                  | (18) CONTROLLER PCB                    |

The functions of the automated bumper controller PCB's connections and components are:

**Actuator Motor Output, Left Lane (J11)** - Terminal block used to supply voltage to the left lane actuator motor. The motor should be wired according to the color-coded label located next to the terminal block.

**Actuator Motor Output, Right Lane (J12)** - Terminal block used to supply voltage to the right lane actuator motor. The motor should be wired according to the color-coded label located next to the terminal block.

**Communication In (J3)** - Communication input for the PCB.

#### Stand Alone Systems

For the first lane pair in a Stand-Alone configuration, this information comes from the System Controller located at the control desk. Refer to *Figure 5*. For additional lane pairs in a Stand-Alone system, the cable attached to this terminal comes from the prior lane pair bumper controller. Refer to *Communications Out (J4)*.

#### Vector Scoring Systems

In Vector scoring systems, each scorer computer can control up to 8 lanes of bumpers. The communication originates at the Com2 port on the Scorer Computer and connects to J3 at the first lane pair that the computer controls. For additional lane pairs, the cable attached to J3 comes from the prior lane pair bumper controller. Refer to *Figure 5*.

**i** **NOTE:** An RS232 Converter box connected to the Com2 port on the scorer computer changes the communication protocol to RS-485.

#### Frameworkx Scoring Systems

For installations with Frameworkx scorers, the input data to J3 originates from the I/O PCB - J2. Refer to *Figure 6*.

**i** **NOTE:** A LLAN Breakout PCB is mounted in either the lane group processor, or Frameworkx scorer console, and allows easy cabling to the existing Frameworkx local LAN.

**Communication Out (J4)** - This connection allows the communication entering the PCB at J3 to continue out of the PCB. Refer to *Figures 2 - 4*. When the communication signal is not needed by additional devices (J4 not used), a jumper (terminator) must be installed on pins 2 and 3 of JP1. Refer to *Figure 7*.



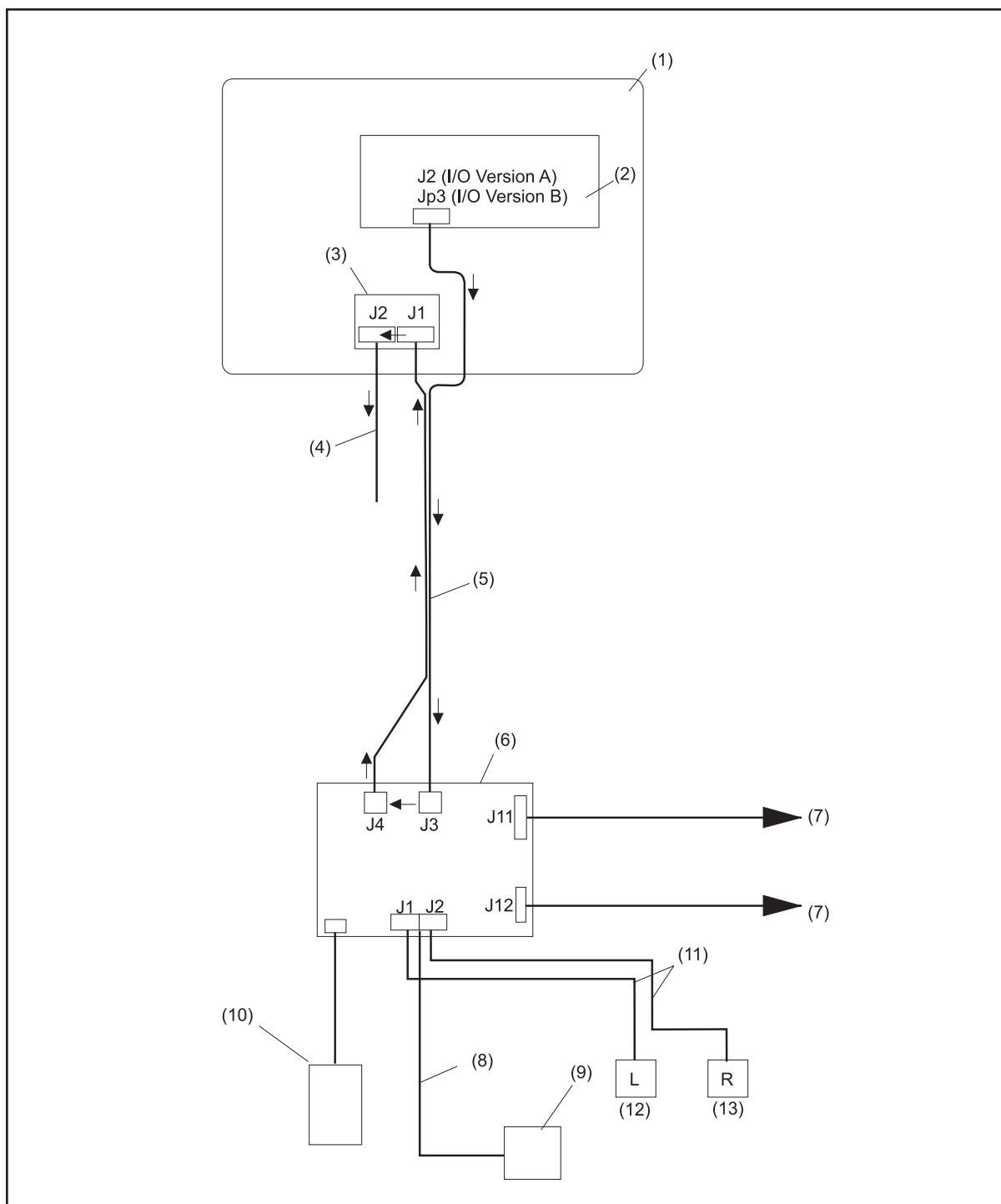
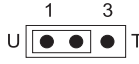
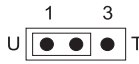
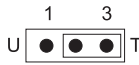
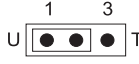
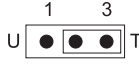


Figure 6. Frameworkx Cable Routing and Connections

- |   |  |                                       |
|---|--|---------------------------------------|
| (1) FRAMEWORX LGP OR SCORER             | (2) I/O PCB  | (3) LLAN BREAKOUT PCB                 |
| (4) EXISTING LAN CABLE                  | (5) 17-300256-000 AUTOMATED BUMPER LANE CABLE ASSEMBLY                     | (6) AUTOMATED BUMPER CONTROLLER       |
| (7) TO MOTOR                            | (8) 17-300284-000 EMERGENCY UP SWITCH CABLE ASSEMBLY                       | (9) EMERGENCY UP SWITCH               |
| (10) POWER RECEPTACLE                   | (11) 84-200589-000 CABLE (FOR INSTALLATION WITH AUTOMATIC SAFETY SWITCHES) | (12) LEFT LANE INTERNAL SAFETY SWITCH |
| (13) RAIGHT LANE INTERNAL SAFETY SWITCH |  |                                       |

**Emergency Up Switch Connectors (J1 and J2)** - The emergency up switches causes the controller PCB to immediately raise the bumpers on the lane. J1 connector is for left lane switch and J2 is for the right lane.

**Termination Jumper (JP1)** - The termination jumper is used to terminate the communications line when the bumper controller PCB is that last circuit board attached to the communication line. Set the jumpers as shown in *Figure 7*.

INSTALLATION LOCATION	SETTINGS
Frameworkx Scorers	
Stand-Alone (all but last lane pair)	
Stand-Alone (last lane pair only)	
Vector Scoring (all but last lane pair controlled by scorer computer)	
Vector Scoring (Last lane pair controlled by Scorer Computer)	

*Figure 7. Termination Jumper (JP1).*

**DIP Switch Configuration** - The 8 two-position ON-OFF switches are used to configure the controller. Switches 1-7 provide lane address (identification) for the controller PCB. Dip Switch 8 determines the type of motor connected to the controller. The position of the switches (On/Off) is also dependent on the firmware version installed on the Controller's EPROM. Refer to *Figure 8*.

#### SW 8 - Motor Type

SW8			
Software Version 13 or Prior		Software Version 15 or Later	
Square Motor	Round Motor	Square Motor	Round Motor
OFF	Not Compatible*	ON	OFF

*Figure 8. Motor Type Switch Setting*

\* The round Pinball Wizard II motor requires software version 15 or later.

**i** **Important:** Setting DIP Switch # 8 to the wrong position will cause the motor to run backwards.

#### SW 1-7 - Lane Assignment

##### *Frameworkx Scoring:*

For Frameworkx scoring systems, set switches 1-7 to the OFF position

##### *Vector Scoring or Stand-Alone Systems:*

For Vector Scoring or stand-alone systems, set switches 1-7 as shown in *Figure 9*.

Lane No.	SW1 (Value 1)	SW2 (Value 2)	SW3 (Value 4)	SW4 (Value 8)	SW5 (Value 16)	SW6 (Value 32)	SW7 (Value 64)
1-2	ON	OFF	OFF	OFF	OFF	OFF	OFF
3-4	ON	ON	OFF	OFF	OFF	OFF	OFF
5-6	ON	OFF	ON	OFF	OFF	OFF	OFF
7-8	ON	ON	ON	OFF	OFF	OFF	OFF
9-10	ON	OFF	OFF	ON	OFF	OFF	OFF
11-12	ON	ON	OFF	ON	OFF	OFF	OFF
13-14	ON	OFF	ON	ON	OFF	OFF	OFF
15-16	ON	ON	ON	ON	OFF	OFF	OFF
17-18	ON	OFF	OFF	OFF	ON	OFF	OFF
19-20	ON	ON	OFF	OFF	ON	OFF	OFF
21-22	ON	OFF	ON	OFF	ON	OFF	OFF
23-24	ON	ON	ON	OFF	ON	OFF	OFF
25-26	ON	OFF	OFF	ON	ON	OFF	OFF
27-28	ON	ON	OFF	ON	ON	OFF	OFF
29-30	ON	OFF	ON	ON	ON	OFF	OFF
31-32	ON	ON	ON	ON	ON	OFF	OFF
33-34	ON	OFF	OFF	OFF	OFF	ON	OFF
35-36	ON	ON	OFF	OFF	OFF	ON	OFF
37-38	ON	OFF	ON	OFF	OFF	ON	OFF
39-40	ON	ON	ON	OFF	OFF	ON	OFF
41-42	ON	OFF	OFF	ON	OFF	ON	OFF
43-44	ON	ON	OFF	ON	OFF	ON	OFF
45-46	ON	OF	ON	ON	OFF	ON	OFF
47-48	ON	ON	ON	ON	OFF	ON	OFF
49-50	ON	OFF	OFF	OFF	ON	ON	OFF
51-52	ON	ON	OFF	OFF	ON	ON	OFF
53-54	ON	OFF	ON	OFF	ON	ON	OFF
55-56	ON	ON	ON	OFF	ON	ON	OFF
57-58	ON	OFF	OFF	ON	ON	ON	OFF
59-60	ON	ON	OFF	ON	ON	ON	OFF
61-62	ON	OFF	ON	ON	ON	ON	OFF
63-64	ON	ON	ON	ON	ON	ON	OFF
65-66	ON	OFF	OFF	OFF	OFF	OFF	ON
67-68	ON	ON	OFF	OFF	OFF	OFF	ON
69-70	ON	OFF	ON	OFF	ON	ON	ON
71-72	ON	ON	ON	OFF	OFF	OFF	ON
73-74	ON	OFF	OFF	ON	OFF	OFF	ON
75-76	ON	ON	OFF	ON	OFF	OFF	ON
77-78	ON	OFF	ON	ON	OFF	OFF	ON
79-80	ON	ON	ON	ON	OFF	OFF	ON

Figure 9 - Switch Settings for Vector Scoring and Stand Alone system



## LEDs

Several LEDs are located on the controller PCB to indicate various operating functions and conditions. Refer to *Figure 2* for LED locations on the controller PCB. The LED functions are:

- **Bumper Up LEDs (D11, D13)** - These LEDs light to indicate that the bumpers are in the UP position. LED D11 is for left lane and D13 is for right lane bumper.
- **Bumper Down LEDs (D12, D14)** - These LEDs light to indicate that the bumpers are in the DOWN position. LED D12 is the indicator for left lane bumpers and D14 is for right lane.
- **Emergency UP LEDs (D4, D5)** - These LEDs light whenever the emergency up switch has been used to raise the bumpers.
- **Power LED (D3)** - This LED lights to indicate the presence of 12VDC power.
- **Heartbeat LED (D10)** - This LED flashes to indicate the status of communication to an automatic scorer or the system controller (stand alone systems). When communication is present, the LED will light in a FLASH, FLASH, PAUSE sequence.

## Fuses

There are three fuses located on the controller PCB. Refer to *Figure 4*.

- **Power Fuse (F1)** - A .25 amp main power fuse.
- **Motor Fuses(F2,F3)** - Fuses for the actuator motors. The ratings for these fuses are determined by the input voltage to the board.

115VAC = 1.6 amp

230VAC= .8 amp



**NOTE:** Fuse F2 protects the right lane actuator motor and F3 protects the left lane actuator motor.

## Power Transformer Jumpers (J5 through J8)

These jumper terminals allow the user to setup the controller to accept either an 115VAC or 230VAC input. Refer to *Figure 10* for jumper locations when using a 115VAC power source and *Figure 11* for a 230VAC power source.

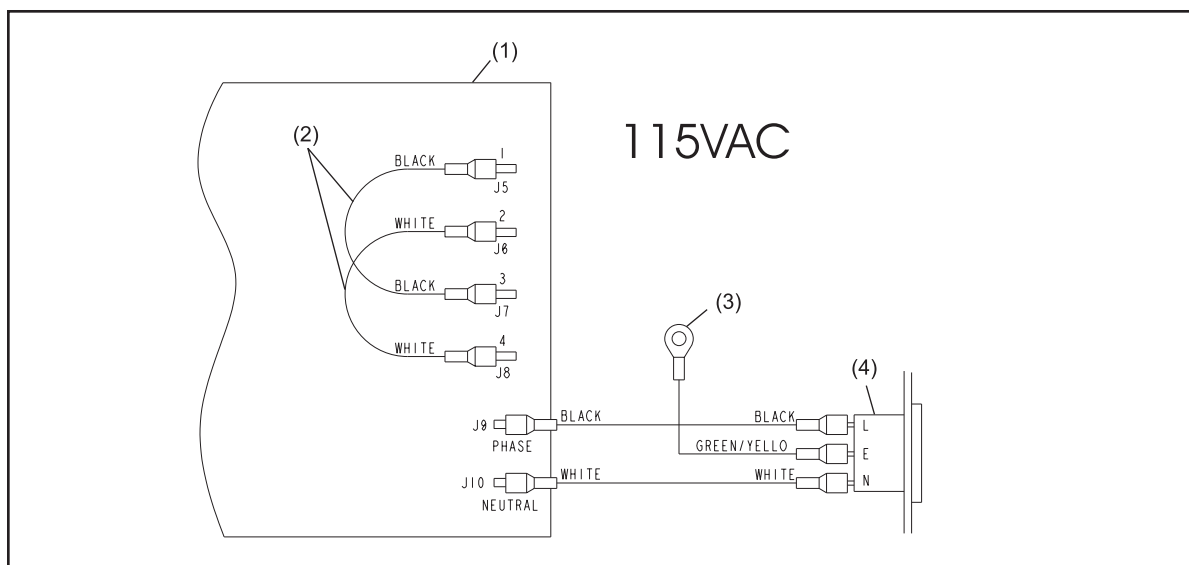


Figure 10. Power Jumper Settings - 115VAC Power Source

- (1) CONTROLLER PCB      (2) 115V JUMPER CONFIGURATION      (3) ATTACH TO ENCLOSURE  
(4) RECEPTACLE

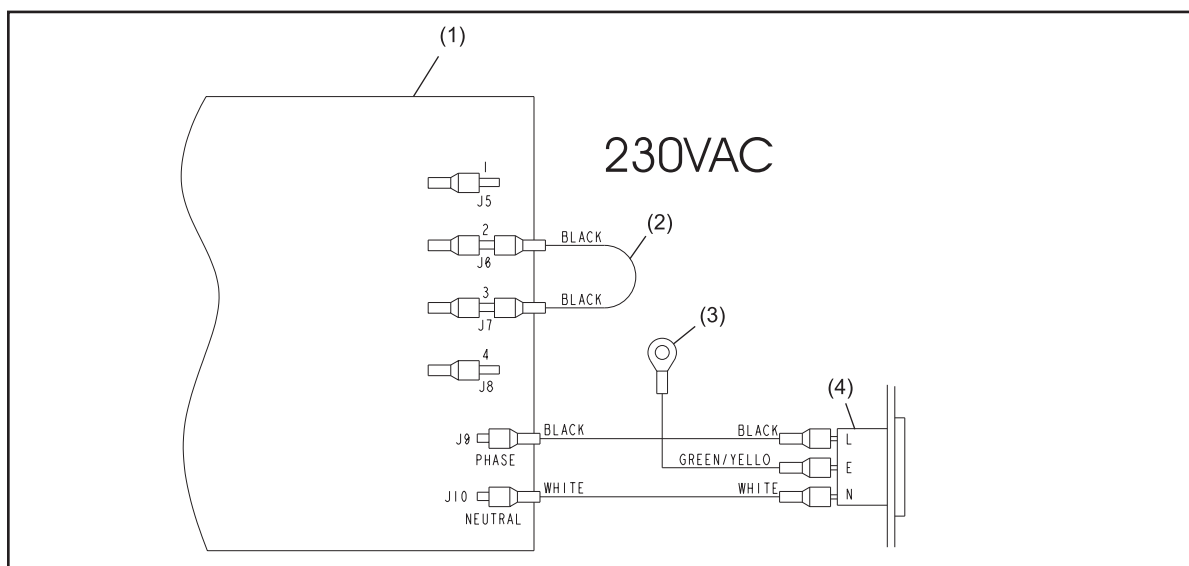


Figure 11. Power Jumper Settings - 230 VAC Power Source

- (1) CONTROLLER PCB      (2) 230V JUMPER CONFIGURATION      (3) ATTACH TO ENCLOSURE  
(4) RECEPTACLE

## SYSTEM CONTROLLER (STAND-ALONE SYSTEMS)

When installed with an automatic scoring system capable communicating to the bumpers, all Pinball Wizard bumper functions are controlled by the scoring system. In centers not equipped with a compatible scoring system, a System Controller located at the Control Desk to allow the desk operator to raise or lower the bumpers on a lane(s).

The System Controller allows the desk operator to raise or lower the bumpers on a single lane or group of lanes. Refer to *Figure 12*.

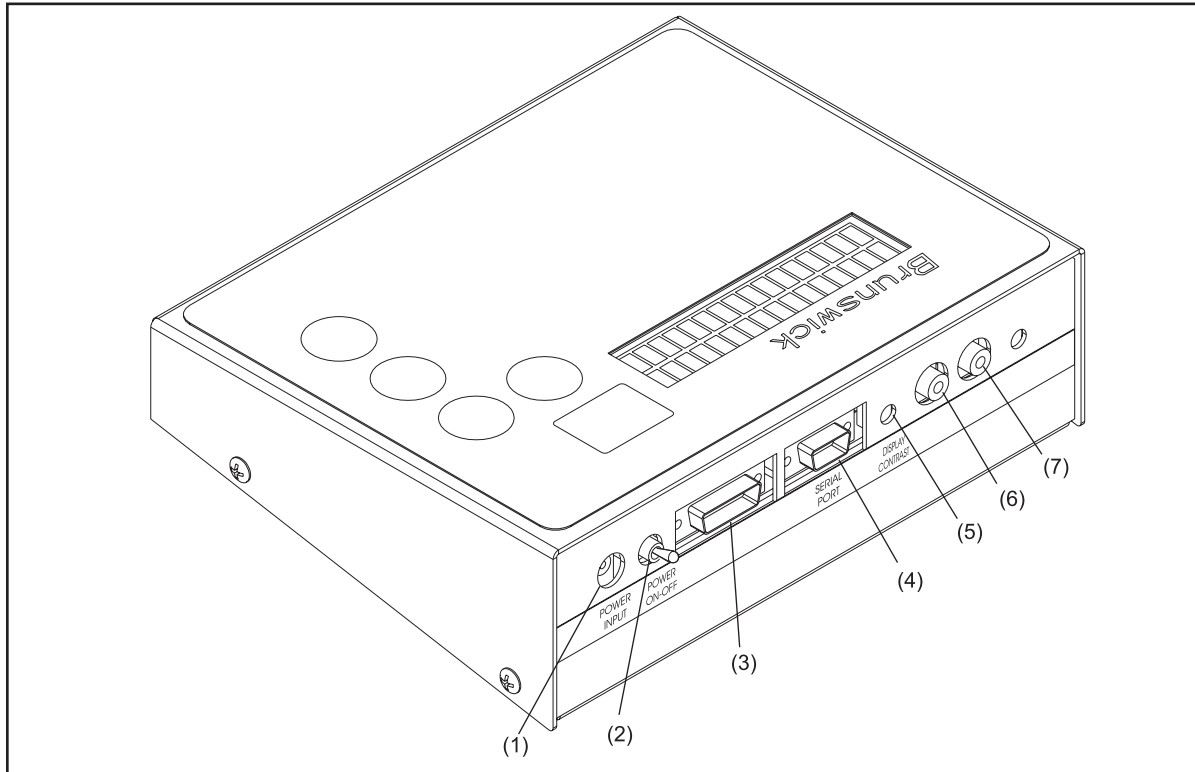


Figure 12. System Controller - Rear Connector Ports and Controls

- |                          |                  |                         |
|--------------------------|------------------|-------------------------|
| (1) POWER IN             | (2) POWER SWITCH | (3) SHIFT DATA PORT     |
| (4) SERIAL PORT          | (5) CONTRAST     | (6) AUDIO IN (NOT USED) |
| (7) AUDIO OUT (NOT USED) |                  |                         |

The controller functions/features are:

- **Power In** - Connection for the main power for the controller.
- **Power Switch** - Main Power, On/Off toggle switch.
- **Shift Data Port** - Not used.
- **Serial Port** - Connection for communication cable going to the automated bumper controller located on the first lane pair.
- **Display Contrast** - Rotate this control to adjust the LCD screen for best visibility.
- **Audio** - Not used.

## System Setup

Before first use, the system controller must be programmed to specify which and how many lanes within the center have automated bumpers.

Perform the following steps to set the configuration of the system Controller:

1. Place toggle switch on rear of unit up (ON) position. Refer to *Figure 13* for switch/button locations.

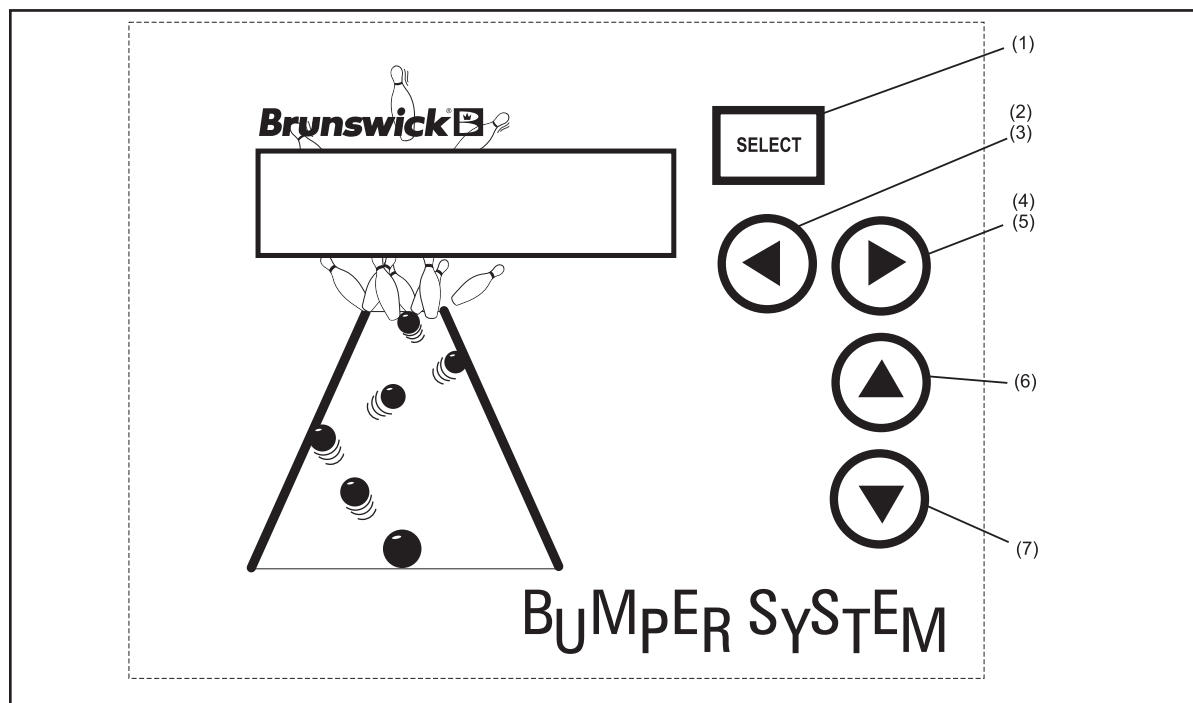


Figure 13. System Controller Keypad

- |                               |  |   |
|-------------------------------|--|---|
| (1) SELECT "ENTER" KEY        | (2) LANE NUMBER SCROLL DOWN KEY              | (3) "NO" KEY (AUTOMATED BUMPERS INSTALLED?) |
| (4) LANE NUMBER SCROLL UP KEY | (5) "YES" KEY (AUTOMATED BUMPERS INSTALLED?) | (6) RAISE CHANNEL KEY                       |
| (7) LOWER CHANNEL KEY         |  |   |

2. On the LCD display, the prompt, "ENTER FIRST LANE WITH AUTOMATED BUMPERS: 01" will appear.

**i** **NOTE:** If the lane numbers are already configured but need to be changed, turn the toggle switch to the off position then press and hold the up arrow button while turning the toggle switch on. Wait 10 seconds before releasing the up arrow button to allow all data to clear.

3. Use the **▲** (up) arrow key to identify the first lane number with automated bumpers installed.
4. Press **SELECT** key. The last lane prompt is now displayed.
5. Use the **▲** (up) and **▼** (down) arrow keys to identify the *last* lane number with automated bumpers installed.
6. Press **SELECT** to accept the lane number data.

---

## Lane Configuration Mode

**i** **NOTE:** *It is initially assumed that all lanes from the start to the end lane will have the automated bumpers installed - all lanes will be set to “Y” (YES - automated bumpers installed). If this is the case, pressing SELECT will end the lane configuration mode immediately.*

Those lanes that do NOT have automated bumpers must be identified as follows:

1. With the prompt “ AUTOMATED BUMPERS LN 00? -Y PRESS SELECT TO END” displayed,
  - a. Use the **▶**(up) and **◀**(down) arrow keys to scroll through the lane numbers.
  - b. Press **SELECT** when desired lane appears.
  - c. Press **▶**(yes) or **◀**(no) key to identify each specific lane.
  - d. To change from a “no automated bumpers installed” status back to “yes automated bumpers installed”, press the **▶** key.
  - e. Press **SELECT** to end the lane configuration mode.

---

## Confirm Lane Configuration

To verify that the lane configuration data has been entered correctly, the following prompt will appear:

“SETUP COMPLETE? UP = YES DOWN=NO”

1. Press **▶**(YES) key to confirm that the setup is complete; the normal (default) mode is then displayed on the LCD.
2. If **◀**(NO) is pressed, ALL setup data is cleared, and the setup will start over again with the prompt ‘ENTER FIRST LANE WITH AUTOMATED BUMPERS: 01.’

**i** **NOTE:** *If the setup data is corrupted or lost, it will be cleared and the initial setup prompts will be displayed again. The operator MUST perform the steps listed under “System Controller - Initial System Setup” again. In addition, the operator may change current configuration of lane (i.e. add/remove bumper mode) using same steps.*

# Section 4: Operations and Diagnostics

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## OPERATIONS

---

### Stand-Alone Systems

The display default will show the first lane in the center that has automated bumpers installed:

*“AUTOMATED BUMPERS LANE 01”*

#### Individual Lane Selection

1. Press **▶** key to scroll up or **◀** to scroll down until desired lane number is displayed.
2. Press **▲** arrow key to raise bumpers for selected lane. Press **▼** key to lower bumpers for selected lane.

#### Selecting Lane Range

1. With prompt *“AUTOMATED BUMPERS OI”* displayed, press **SELECT** key. Two up arrows are shown on LCD display beneath starting lane number.
2. Use **▶** key to scroll up until desired starting lane is displayed.
3. Press **SELECT** key again so the two arrows are displayed beneath the current (ending) lane number.
4. Press **▶** or **◀** keys to scroll up or down until desired ending lane is displayed.
5. Press **▲** key to raise bumpers for selected lane range. Press **▼** key to lower bumpers for selected lane range.



**NOTE:** Starting lane range may never be less than the first lane in the center that has automated bumpers installed and ending lane range not greater than last lane with automated bumpers. Pressing and holding either the **▲▼** keys for more than 0.5 seconds will scroll the starting lane number at a rate of 1 lane every 0.5 seconds until the maximum or minimum lane has been reached. Pressing the **SELECT** key a third time will return to the default prompt allowing the operator to select one lane at a time. Lanes that do **NOT** have automated bumpers installed are automatically skipped over when selecting lane range. If a selected range of lanes includes lanes with bumpers that are not all in the same state (up or down), pressing the **▲** key will raise all bumpers that are not currently up. Pressing the **▼** key will lower all bumpers that are not currently down.

## Error Messages

There are five error messages that may appear on the LCD display;

- Could not open channel (Could not raise bumper rails)
- Could not close channel (Could not lower bumper rails)
- Communication error (No communication to the Bumper Controller PCB)
- Invalid Switch State (Could not verify position of the bumper motor switches)
- COM LINE DOWN - (All communication with ALL automated bumper controllers has been lost)

These messages appear to alert the operator of the displayed condition. Refer to “*Troubleshooting*” section at the end of this manual for error descriptions and corrective action.

## Resetting Emergency UP Switch Conditions

When the emergency UP switch is actuated on any of the lanes, it overrides any commands from the system controller and immediately raises the bumpers on the affected lane. The following prompt appears on the controller LCD display:

“EMERGENCY UP ## (## = Lane Number)  
PRESS SEL TO CLR”

1. Determine the cause of the emergency up and correct the issue found.



**Caution: Step 2 should only be performed after the cause of the emergency up has been corrected.**

2. Press **SELECT** key to reset an emergency UP condition. Normal automated bumper operation is restored on the affected lane.

---

## Operations with Command Network

### Turn On Automated Bumpers While Issuing a Lane from the Control Desk

**i** **NOTE:** Perform the following steps at the Control Desk CMS terminal:

1. Select LANE NUMBER(S) for automated bumper system.
2. Press **LANE ON** key.
3. While “check in” screen is displayed, press the **↑** key. The automated bumper system is now available to the bowlers on that lane. Press the **↑** a second time to disable automated bumpers.

**i** **NOTE:** The status of the automated bumpers is displayed by a “W” in the RATE box while the “check in” screen is displayed. When the letter “W” is present, automated bumpers are available to the bowlers on the selected lane or lane range. Automated bumpers will need to be enabled for the appropriate bowlers as names are entered at the automatic scorer. Names that were previously entered, entered via the Waiting List, entered via “Download Open Party” or entered via “View/Correct Scores” will have to be edited at the automatic scorer to activate for the appropriate bowler(s).

### Enable Automated Bumpers from the Waiting List Screen

1. Press “A” to add a party to the waiting list.
2. Type the party name and press **ENTER**.
3. Type the number of bowlers in the party and press **ENTER**.
4. Use the arrow keys to highlight the scoring unit available and press **ENTER**.
5. Use the arrow keys to highlight “Bumpers” on the Centers Services List. Press **ENTER** to select bumpers. (An asterisk will display when bumpers are selected.) Pressing **ENTER** a second time deselects bumpers. Press **ENTER SCREEN** when all of the desired Center Services have been selected to continue to the *Bowler Entry* screen.
6. Enter the bowlers names and special game information as needed. For additional information regarding waiting lists refer to the *Control Desk Operations Guide 57-900355-000*, pages 3-1 through 3-3.



## **Turn On Automated Bumpers After Lane Has Been Issued**

**i** ***NOTE:** Operators can choose one of two methods to turn on the automated bumpers after a lane has been issued.*

### **Method One**

1. Press **SCORER STATUS** key.
2. Enter the lane number and/or lane range and press the **↑** key.
3. The prompt “Lift bumpers for everyone? Y/N” will appear.
4. If **Y** (yes) is selected, ALL bowler names for that lane number/lane range will have automated bumpers activated.
5. If **N** (no) is selected, the appropriate bowler name(s) will have to be edited at the scorer.

### **Method Two**

1. Enter lane number(s) and press **ADJUST** key.
2. With “ADJUST” screen displayed, press **↑** key. Bumpers are now available for bowler(s) on this lane.
3. Press **ADJUST** key again to exit.

## **Turn Off Automated Bumpers While a Lane is in Use**

**i** ***NOTE:** Operators can choose one of two methods to turn off the automated bumpers while a lane is in use.*

### **Method One**

1. To disable the automated bumper system:
  - a. Enter the lane number or lane range.
  - b. Press **U** key and then the **↑** key. Automated bumpers are no longer available for that lane/ lane range.

### **Method Two**

1. Enter lane number(s) and press “ADJUST” key.
2. With adjust screen displayed, press the **↑** key. Bumpers are no longer available for bowler(s) on this lane.
3. Press adjust key again to exit.

### ***Raising/Resetting Bumpers from the Control Desk During an Emergency***

1. EMERGENCY UP - Enter lane number or lane range and press **↑** key.
2. To reset bumpers after an Emergency UP command has been given OR the Emergency UP switch has been actuated:
  - a. Enter lane number or lane range and press **↑** key.
  - b. At the prompt, “Bumpers are in emergency up. Do you want to turn off emergency up? Y/N”. Enter **Y** to lower bumpers and return to normal operation. If **N** is entered, bumpers will remain in the emergency UP position.

### ***Enable/Disable bumpers for Bowlers at the Scorer***

1. Press **BOWLER** and then **EDIT**.
2. Use the **↑** and **↓** keys to highlight bowler name to be edited and press OK.
3. Press the **↑** or **↓** key to highlight AUTOMATED BUMPERS mode.
4. Use **←** or **→** key to turn bumper on or off for that bowler. Press OK when finished.

### ***Adding New Bowler with Automated Bumpers at the Scorer***

1. Press **BOWLER** and then **ADD**.
2. Enter bowler name and press **↓** key.
3. Use **←** or **→** to select left or right-handed coach display and then press **↓** key.
4. Use **←** or **→** key to select (turn on) automated bumpers for specified bowler name.
5. Press **DONE** or **NEXT** to add another bowler with automated bumpers.

## Operations - Vector Control Desk

### Initial Set-up

Before using the bumpers for the 1st time with Vector Scoring, they must be activated within the Scorer Computer. This one time setup is necessary upon initial installation of a scorer computer or whenever the hard drive in the scorer computer is replaced. To active the bumpers for a scorer computer perform the following steps:

1. At the Windows desktop screen of the server computer, Double-click the “Config” icon. If the “Config” icon is missing from the desktop screen it can be found in the C:\Brunswick\Utilities directory of the server computer.
2. Select the Score Computer button. *Refer to Figure 14*

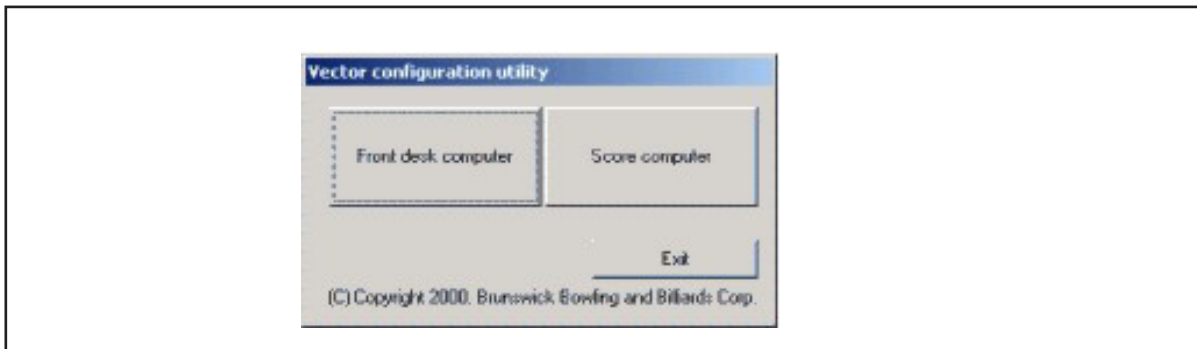


Figure 14. Config.exe screen

3. You will see a message, “Is DATOR a scoring computer?” Click No.
4. Select the appropriate SCORING COMPUTER from the drop-down list on the top-right of the window. *Refer to Figure 15.*

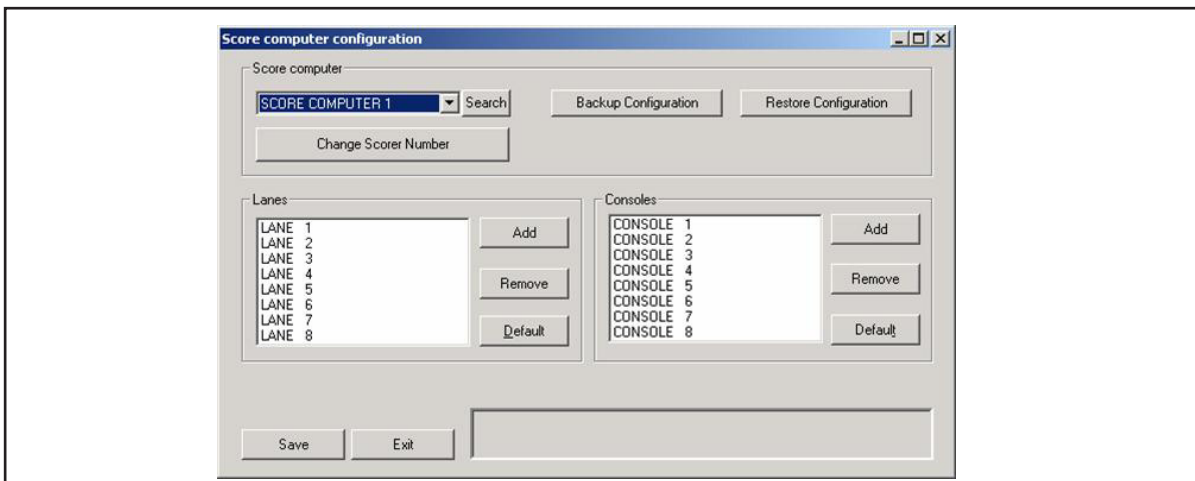


Figure 15. Scorer Configuration Screen

5. Under the lane column, double-click on the first lane that has bumpers installed, and assign the bumper type “Brunswick” to the lane. *Refer to Figure 15.*
6. Repeat this step for each lane that has automatic bumpers.
7. Click Save to finish.
8. Repeat steps 4 through 7 for each scoring computer that has automatic bumpers installed.
9. Then click Exit.
10. Finish by clicking Merge, then clicking Exit.

### **Enabling bumpers for the bowler**

In order for the bowlers to select the bumper feature at the lane it will be necessary to enable the bumpers for the bowler.

1. At the control desk terminal make sure Vector desk program (Reception) is running. From the *Settings* menu select *Setup*.
2. On the *Front Desk* tab, be sure there is a check mark in the box next to *Bumpers Available*. Refer to *Figure 16*.

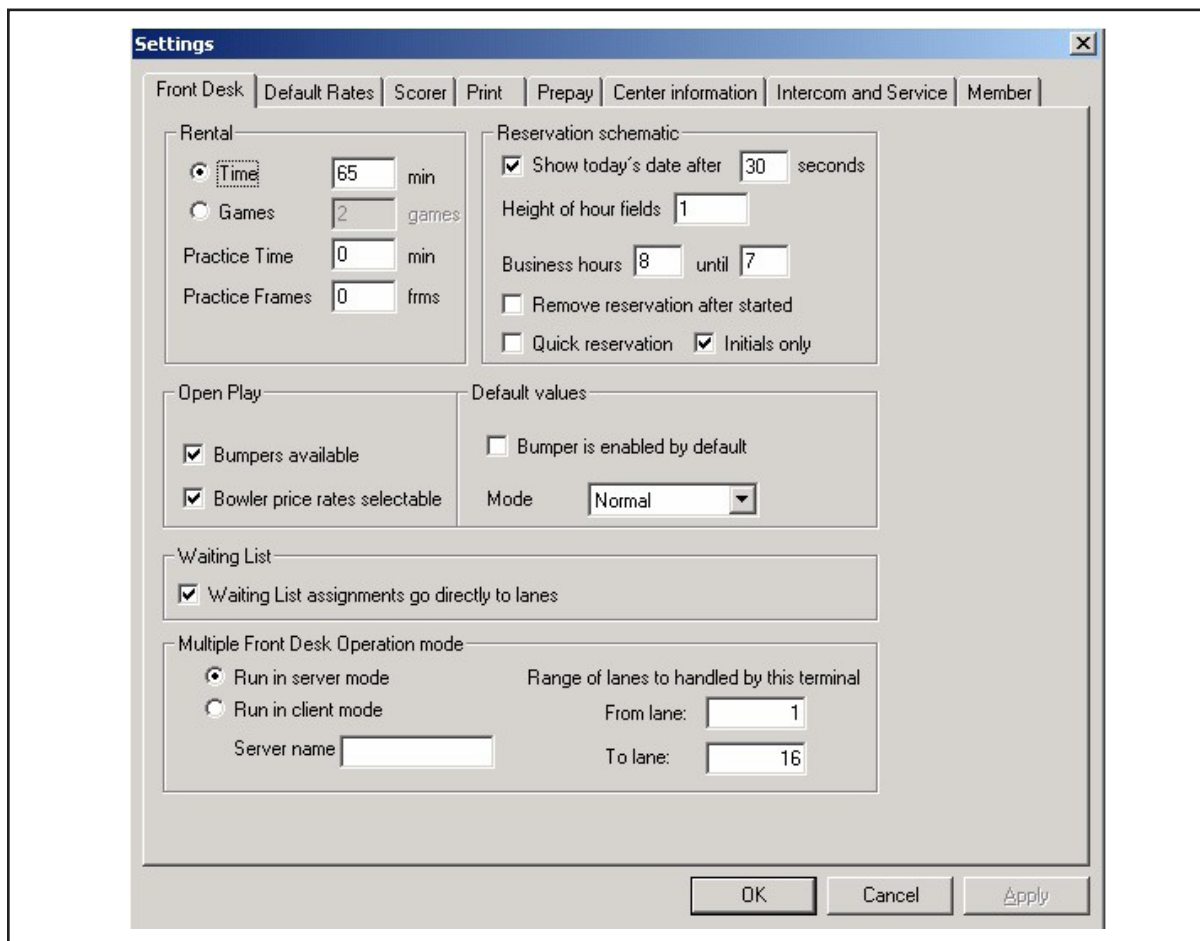


Figure 16. Vector Settings - Front Desk Tab

3. Click OK for your change to take effect.
4. You can now assign the bumpers at the *Open Play* (F2) screen or the *Score Correction* (F11) screen. Refer to *Figure 17*.

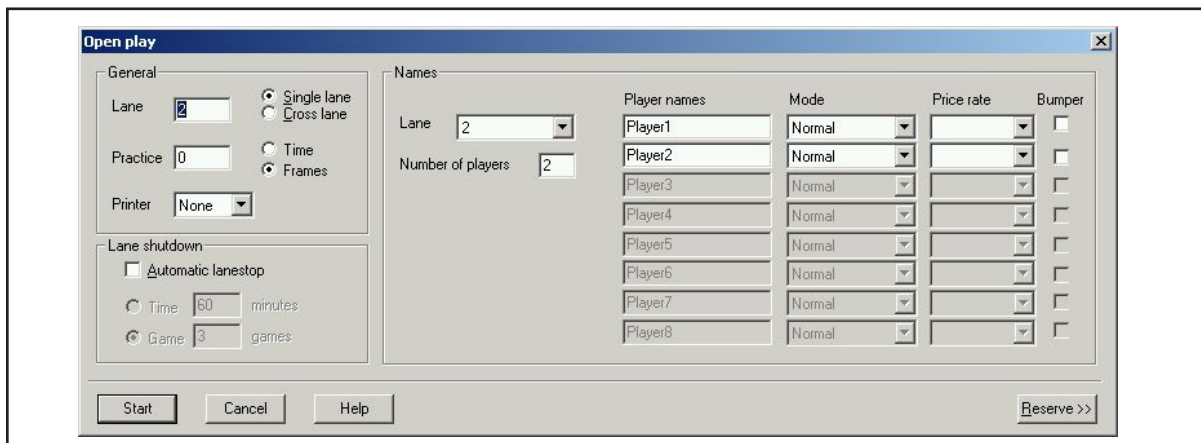


Figure 17. Open Play Menu

## Operations - Vector Plus Control Desk

### Initial Set-up ( For Vector Scorers)

Before using the bumpers for the 1st time with Vector Scoring, they must be activated within the Scorer Computer. This one time setup is necessary upon initial installation of a scorer computer or whenever the hard drive in the scorer computer is replaced. To active the bumpers for a scorer computer perform the following steps:

1. At the Windows desktop screen of the server computer, Double-click the “Config” icon. If the “Config” icon is missing from the desktop screen it can be found in the C:\Brunswick\Utilities directory of the server computer.
2. Select the Score Computer button. *Refer to Figure 18.*

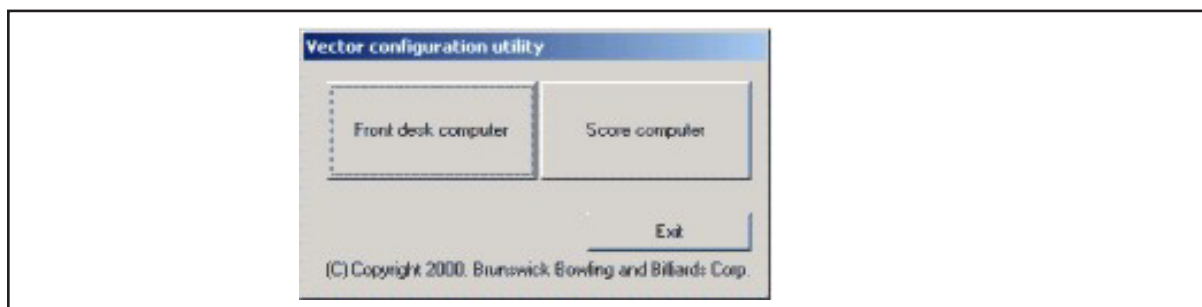


Figure 18. Config.exe screen

3. You will see a message, “Is CMSERVER a scoring computer?” Click No.
4. Select the appropriate SCORING COMPUTER from the drop-down list on the top-left of the window. *Refer to Figure 19.*

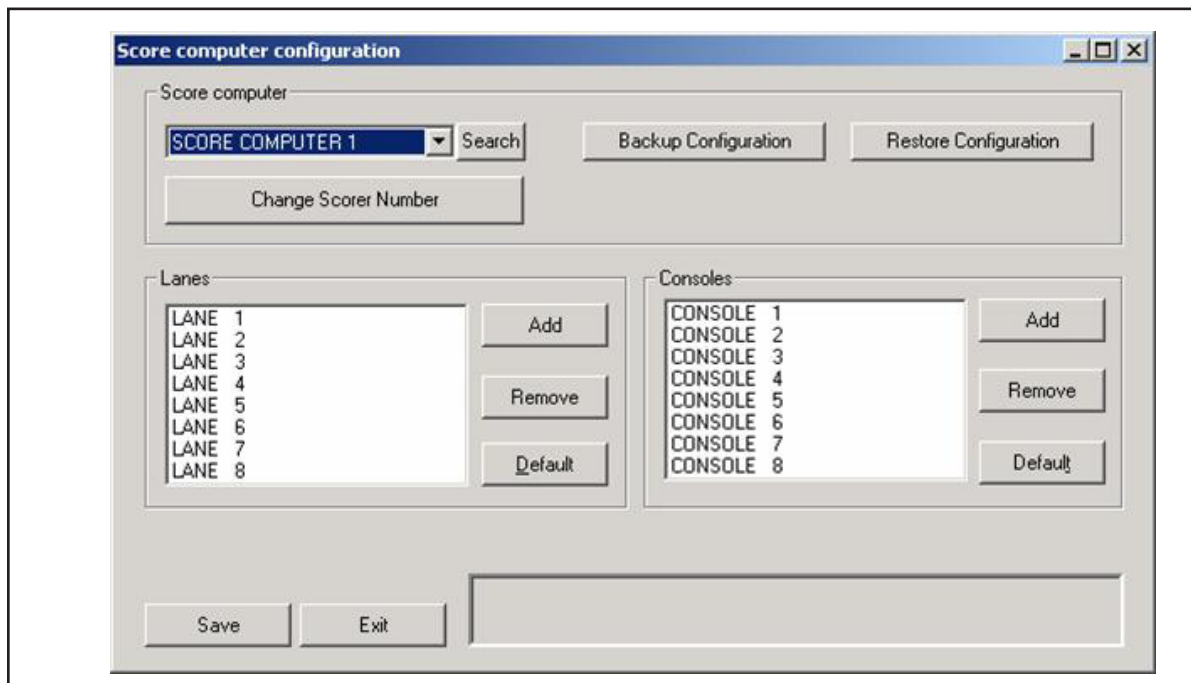


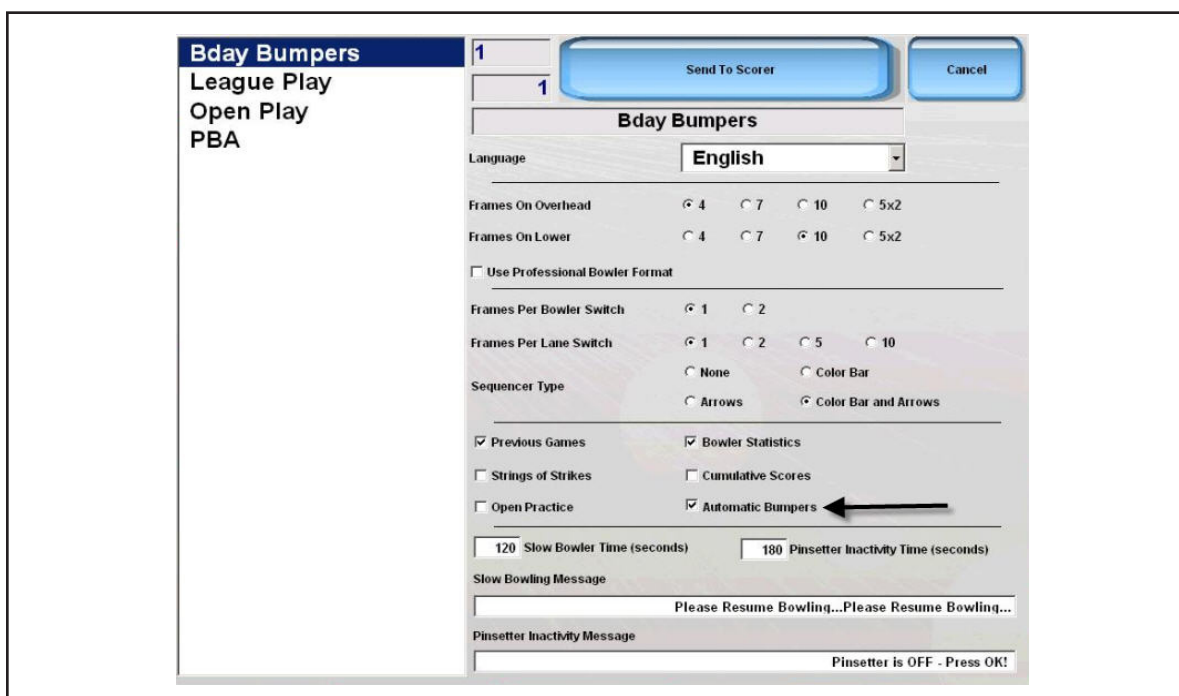
Figure 19. Scorer Configuration Screen

5. Under the “Lanes” column, double-click on the first lane that has bumpers installed, and assign the bumper type “Brunswick” to the lane. *Refer to Figure 19.*
6. Repeat this step for each lane that has automatic bumpers.
7. Click “Save” to finish.
8. Repeat steps 4 through 7 for each scoring computer that has automatic bumpers installed.
9. Then click “Exit”.
10. Finish by clicking “Merge”, then clicking “Exit”.

### ***Enabling bumpers for the bowler***

In order for the bowlers to have bumper selection at the scorer, the bumpers must be enabled at the control desk.

The default setting is determined when the lane is assigned. For centers with Frameworkx scorers, the default bumper setting can be found on Frameworkx Settings - Scoresheet page. *Refer to Figure 20.* For centers with Vector scorers the settings are on the Vector Settings - Lane Settings page. *Refer to Figure 21*



*Figure 20. Frameworkx Settings - Scoresheet Screen*

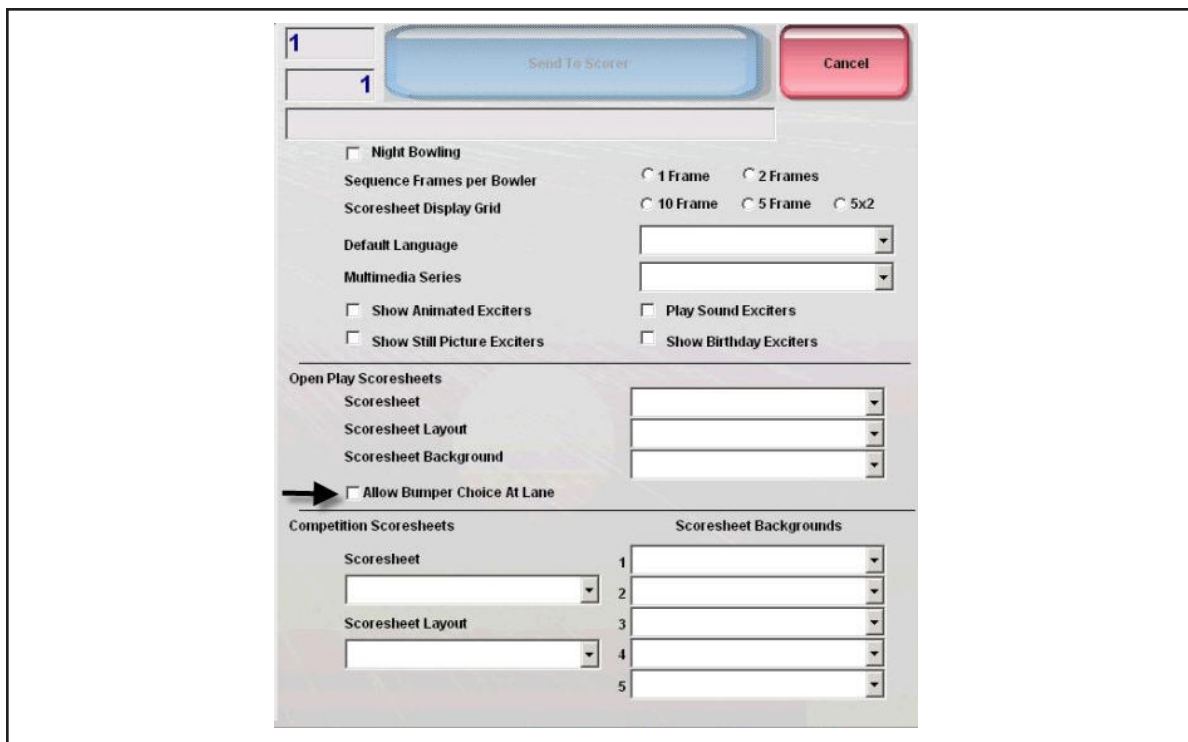


Figure 21 Vector Settings - Lane Settings Screen

The control desk operator can change the default status of the bumpers as follows:

1. Select “Lane Status”
2. Select the “Tasks”
3. Choose the desired lane or lane range
4. Select “Bumpers”
5. At the bumper screen, choose the desired function *Refer to figure 22.*



Figure 22 Bumper Screen



---

# DIAGNOSTICS

---

## Stand-Alone Systems

The diagnostics mode is designed to allow automated bumpers system installers, field service personnel, or center mechanic to make adjustments and check status of switch on the drive pivot assembly. Only one lane at a time is affected under the diagnostics mode.

1. Press and hold **SELECT** key for five seconds to access the diagnostics mode. Refer to *Figure 13*.
2. The currently selected lane is displayed:  
  
“DIAG LN01 COARSE  
\*OPEN = 0 CLOSE = 1”
3. Press **▶** key to scroll lane number up or **◀** key to scroll lane number down. Lane numbers without automated bumpers installed are automatically skipped.
4. Press **SELECT** key to toggle between full open/close, coarse and fine adjustment modes.
5. Press **▲** arrow key and continue to press and release to move the bumper rail UP in the selected increments.
6. Press **▼** key and press repeatedly to move the bumper rail DOWN in the selected increments.

**i** **NOTE:** While in diagnostics mode, the opening and closing status messages are not displayed.

7. When finished running diagnostics, press and hold the **SELECT** key for five seconds to disable and exit the diagnostics mode.

---

## Frameworkx Scoring

**i** **NOTE:** *The following steps are performed at the Frameworkx scorer and require Frameworkx Scorer software version 4.0 or higher. They are basic commands and/or status messages used to verify system operation after installation or during system troubleshooting.*

1. At the Frameworkx Scorer, access the maintenance menu by entering the appropriate password.
2. Choose the “*Select Diagnostics Function*” menu and enter the appropriate password to access the diagnostics menu.
2. Select “*Bumpers Configuration*” from the diagnostics menu.
3. Choose “*Left Lane or Right Lane Configuration*” as desired.
4. Select “*Enable Bumpers*” to establish bumper communication.
5. Select the “*Close Channels*” option to force the bumpers to close.

**i** **NOTE:** *Reset switch status before each check.*

6. Select the “*Open Channels*” option to force the bumpers open.
7. Repeat steps 3-6 for other lane pair.
8. Press “*Cancel*” to return to Frameworkx scorer screen.

## Remote Control Box

If a System Controller or Frameworkx scoring is not installed, raising/lowering of the rails is possible through the use of an “automated bumper remote control box” (part number 17-300271-000) hereafter referred to as the “remote box”. The remote box plugs into the automated bumper controller and through visual checks of actual rail physical position and the LED indicators on the automated bumper controller PCB, the rail positions and motor cycling can be tested. Only one lane at a time can be operated using remote box.

**i** **NOTE:** To use remote box, firmware version (V.15 or later) must be installed within automated bumper controller.

**i** **IMPORTANT:** After using the remote control box to raise/lower the rails, make sure the lane address settings (DIP switches) inside automated bumper controller are returned to their original settings.

Perform the following to verify that the drive assembly operates correctly and rails open and close properly.

1. Disconnect power from the automated bumper controller.
2. Set DIP switches inside automated bumper controller as listed in *Figure 23*.

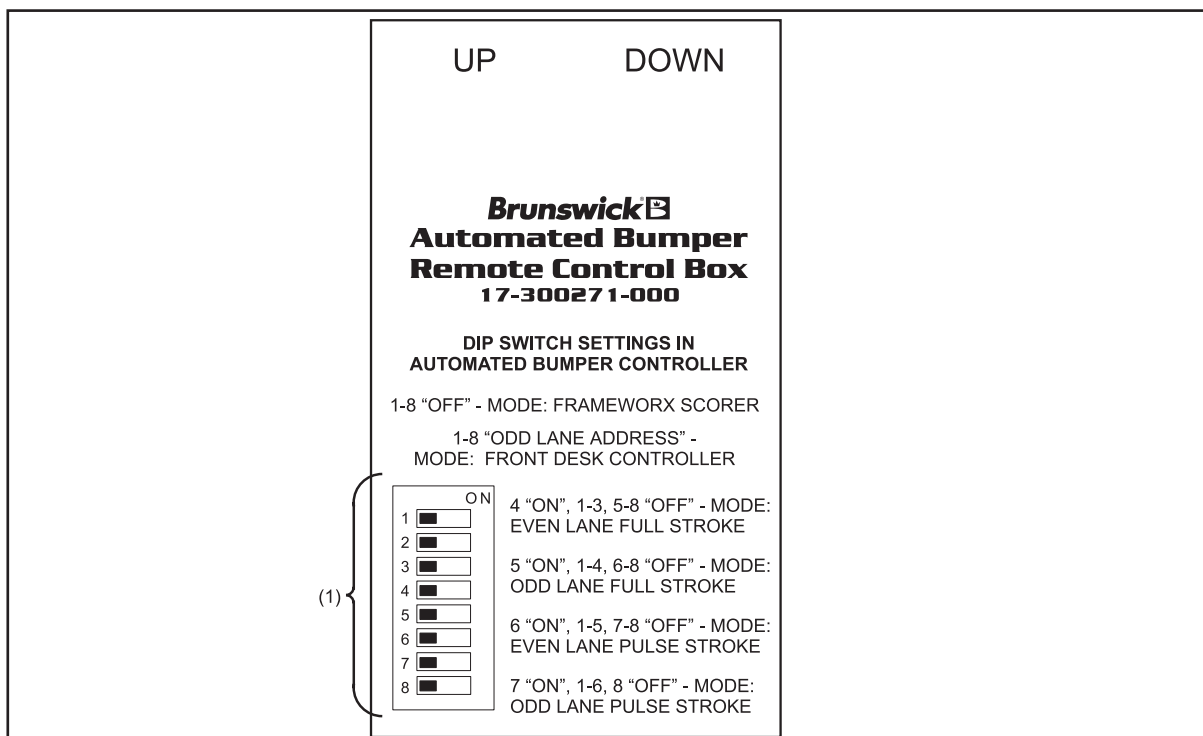


Figure 23. Automated Bumper Remote Control Box

(1) DIP SWITCH SETTING

**i** **NOTE:** DIP switch settings as listed in Figure 23 are for raising/lowering rails for visual check and/or performing adjustments to the system only! After diagnostics, All DIP switch settings within automated bumper controller **MUST** be returned to the appropriate settings as indicated on pages 22 and 23 prior to using the bumpers for normal operation.

3. Plug the remote box connector marked “UP” into the J1 port of the automated bumper controller (left lane). Plug the connector marked “DOWN” into the J2 port of the automated bumper controller (right lane).

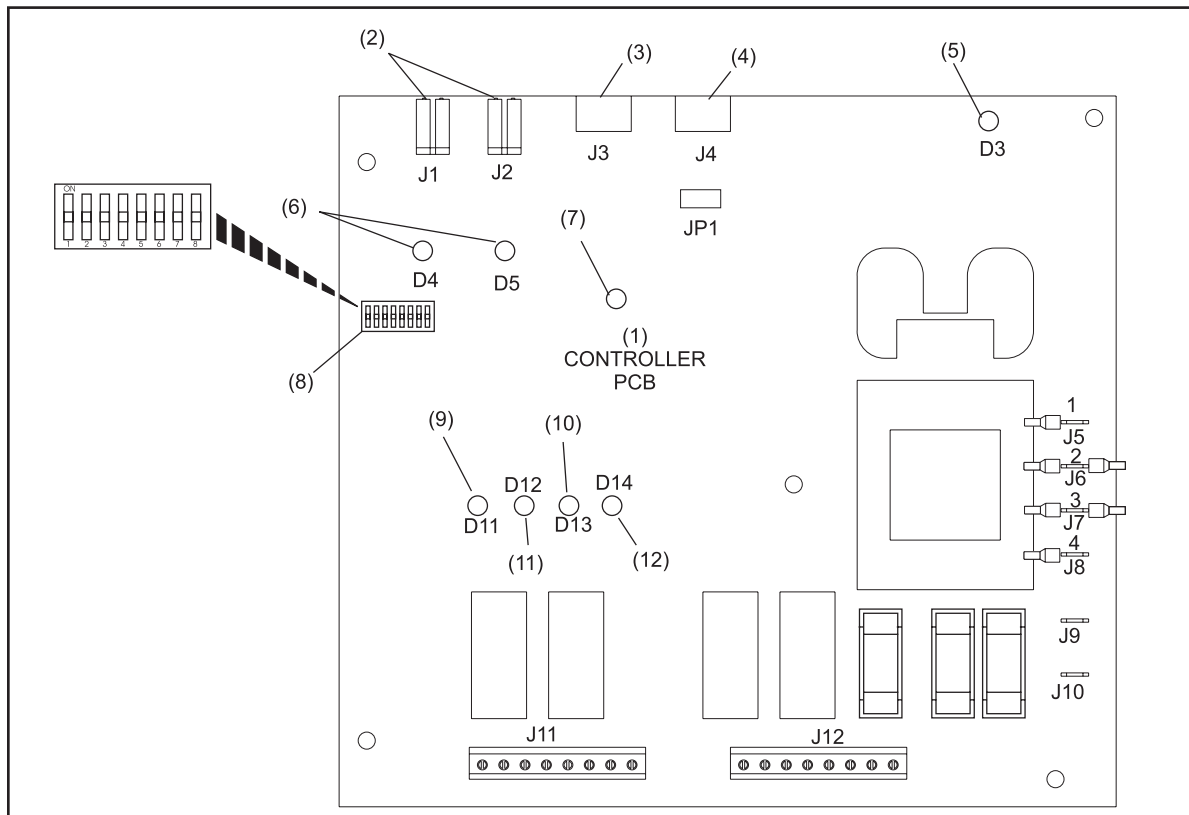


Figure 24. Bumper Position LEDs

- |                          |                                |                        |
|--------------------------|--------------------------------|------------------------|
| (1) CONTROLLER PCB       | (2) EMERGENCY UP SWITCH INPUT  | (3) COMMUNICATION IN   |
| (4) COMMUNICATION OUT    | (5) POWER LED                  | (6) EMERGENCY UP LED   |
| (7) HEARTBEAT LED        | (8) CONFIGURATION DIP SWITCHES | (9) LEFT LANE DOWN LED |
| (10) RIGHT LANE DOWN LED | (11) LEFT LANE UP LED          | (12) RIGHT LANE UP LED |

4. Turn on the automated bumper controller.
5. Press the “UP” button on the front of the remote box to raise the bumpers or “DOWN” to lower the bumpers as desired.

---

## Checking Bumper Rail Position

Use the diagnostics features of your system to verify that the drive assembly operates correctly and the rails open and close properly.

1. Raise the bumpers. Listen for smooth cycling of drive pivot motor assembly. Visually verify that rails raise fully.
2. Lower the bumpers. Listen for smooth cycling of drive pivot motor assembly. Visually verify that rails fully lower into the gutter.

If motor cycles but fails to reach “full up” or “full down” position:

- a. Visually inspect the rails for evidence of binding, obstructions, etc.
- b. If no obstructions/binding condition is apparent, contact Brunswick Technical Support at 1-800-323-8141.

# Section 5: Service, Maintenance and Troubleshooting

---

## SERVICE AND MAINTENANCE

**i** **IMPORTANT!** *It is absolutely critical that the bumper rail positions (Opened & Closed) be verified after replacement of drive/driven pivot assemblies. Failure to verify proper rail position may result in damage to mechanical or electrical components of the system!*

The Pinball Wizard system was designed to simplify the required scheduled maintenance or servicing done by the customer. The only lubrication needed is to lubricate the gear teeth on the actuator arm once a year using Pinball Wizard lubricant, part number 11-676308-000. This lubricant is safe for the plastic components.

**i** **NOTE:** *The Troubleshooting section at the end of this manual contains corrective actions for system faults. The items listed here are NOT recommended procedures for troubleshooting the system.*

---

## Periodic Inspections



**WARNING:** *The lane(s) being serviced should be placed out of service at the control desk until servicing/inspections are finished. Failure to deactivate lane(s) may cause injury to personnel!*

1. Disconnect power from the Automated Bumper Controller.
2. At recommended intervals of 20,000 cycles or six months of operation, visually inspect the set screws on the drive and driven pivot assembly crank arms for security. Tighten set screws as needed.
3. Visually inspect the jam nuts on the connecting link turnbuckles for evidence of wear, looseness, or damage; correct turnbuckles as needed. The required length of assembled turnbuckles is 4.31 to 4.38”.
4. Inspect the bushings on the rail upright and correct any conditions that may exist.
5. Visually inspect ALL mechanical linkages (i.e. cross lane links, crank arms, rail couplers) for evidence of excessive wear. Replace worn components as needed.

**i** **NOTE:** *If replacement of drive/driven pivot assemblies is required, a bumper rail position check MUST be performed afterward. Refer to “Bumper Rail Position Check” paragraph in this manual.*

## Motor Replacement



**WARNING:** The lane(s) being serviced should be placed out of service at the control desk until servicing/inspections are finished. Failure to deactivate lane(s) may cause injury to personnel!

### Motors with internal limit switches

1. Disconnect power from the Automated Bumper Controller.
2. Loosen the two screws on the shaft coupler at the cross lane shaft and remove the drive assembly and shaft coupler from the lane.
3. Remove the actuator arm to gain access to all motor attachment screws.
4. Remove the pinion gear and key.
5. Remove the old motor.
6. Remove the plastic cover on new motor. Position the motor and cams as shown in *Figure 25*.

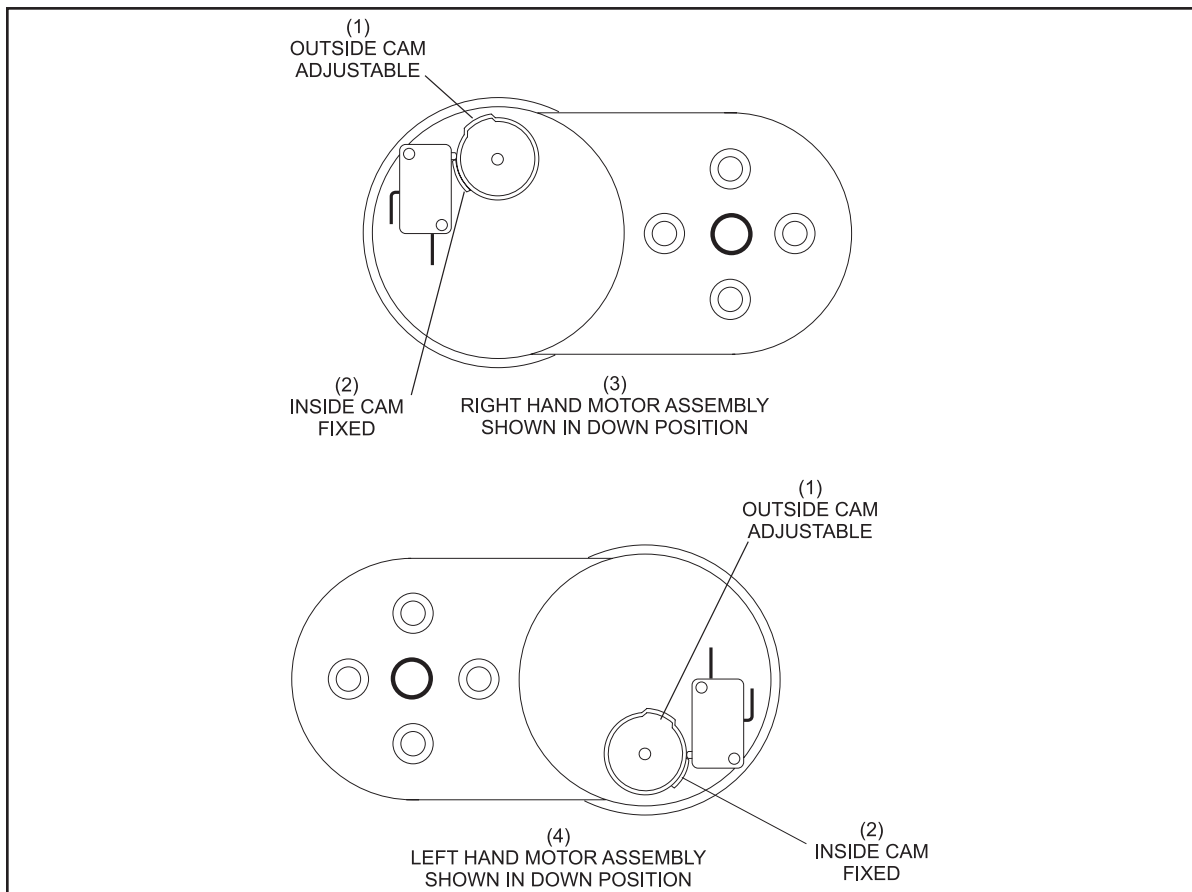


Figure 25. Cam Adjustment

- |   |                      |  |
|---|----------------------|--|
| (1) OUTSIDE CAM ADJUSTABLE                          | (2) INSIDE CAM FIXED | (3) RIGHT HAND MOTOR ASSEMBLY SHOWN IN DOWN POSITION |
| (4) LEFT HAND MOTOR ASSEMBLY SHOWN IN DOWN POSITION |                      |  |



**NOTE:** *The inside switch is the bumper down switch. The cam touching this switch is not adjustable. The outside switch is the bumper up switch. The cam touching this switch is adjustable.*

7. Install the new motor and loosely install the screws.
8. Install the key and pinion gear.
9. Temporarily install the actuator arm. Position the actuator arm so that the inside limit switch clicks when lowering the actuator arm. Rotate the motor within slots so that a click occurs when the top of actuator arm is  $3/8'' \pm 1/8''$  below the top edge of the side plate.
10. Tighten the motor screws to 100 inch pounds (11nm). (Slide the actuator out slightly to gain access to the hidden motor screw.)
11. Push the actuator back on and then install washer and retaining ring.
12. Rotate the actuator arm up and adjust the outer switch cam so that the arm is between  $90^\circ$  and  $100^\circ$  from horizontal when outer switch clicks.
13. Verify both the up and down adjustments by rotating the actuator up and down, listening for limit switch clicks at the appropriate locations.
14. Reinstall the plastic switch cover.
15. With the actuator in the down position, install the shaft coupler from the old motor so that the screws on the coupler point away from the motor allowing access to them when installed on the lane. Tighten the two screws on coupler to secure it to the motor shaft.
16. Install drive assembly onto the lane while inserting the cross lane shaft into the coupler.
17. Rotate the cross lane shaft within the coupler until both actuator arms are horizontal.
18. Tighten the two screws on the coupler to secure the coupler to the cross lane shaft.



## Motors with External Limit Switches

1. Disconnect power from the Automated Bumper Controller.
2. Loosen the two screws on the shaft coupler at the cross lane shaft and remove the drive assembly and shaft coupler from the lane.
3. Remove the actuator arm to gain access to the top motor attachment screw.
4. Remove the screw, 2 washers, spacer and cam gear from the external timing switch assembly to gain access to the lower motor attachment screw.
5. Remove the pinion gear and key.
6. Remove the 4 screws holding the old motor and external timing switch plate.
7. Install the new motor and external timing switch plate. Make sure that the edges of the switch plate are aligned with the edges of the pivot plate and secure with the 4 attachment screws. Torque the screws to 100 inch pounds (11nm).
8. Install the key and pinion gear.
9. Install the actuator arm in the fully down horizontal position and secure it with the washer and retaining ring.
10. With the actuator arm in the fully down horizontal position, install the cam gear, washers and spacer. Position the 1/16" (1.5mm) alignment hole in the cam gear with the "Down Switch" plunger. Refer to *Figures 26 and 27*.
11. Torque the cam screw to 15 inch pounds (1.7 nm).

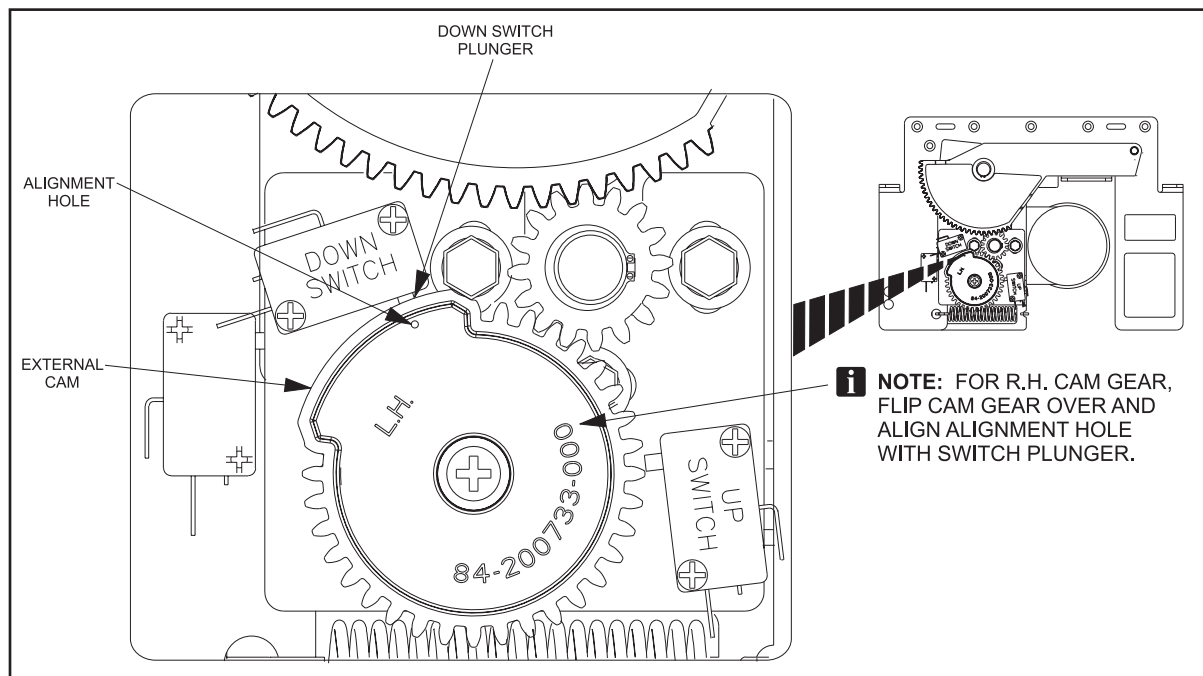


Figure 26. Motor with External Limit Switches

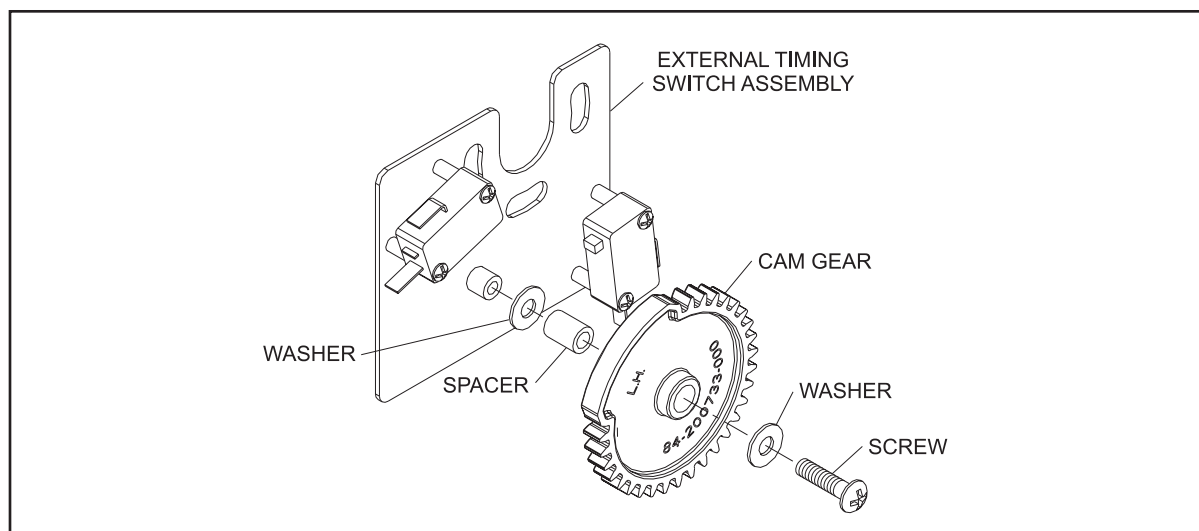


Figure 27. Timing Switch Assembly

## Switch Cam Adjustment



**WARNING:** *The lane(s) being serviced should be placed out of service at the control desk until servicing/inspections are finished. Failure to deactivate lane(s) may cause injury to personnel!*

### **Motors with Internal Limit Switches**

1. Disconnect power from the Automated Bumper Controller.
2. Remove the plastic switch cover.
3. Remove the actuator arm to gain access to the motor attachment screws.
4. Loosen the motor attachment screws.
5. Temporarily install the actuator arm. Position the arm so that the inside limit switch clicks when lowering the actuator arm. Rotate the motor so that the switch click occurs when the top of the actuator arm is  $3/8'' \pm 1/8''$  below the top edge of the side plate.
6. Temporarily install the actuator arm. Position the actuator arm so that the inside limit switch clicks when lowering the actuator arm. Rotate the motor within slots so that a click occurs when the top of actuator arm is  $3/8'' \pm 1/8''$  below the top edge of the side plate.
7. Tighten the motor screws to 100 inch pounds (11nm). (Slide the actuator out slightly to gain access to the hidden motor screw.)
8. Push the actuator back on and the install washer and retaining ring.
9. Rotate actuator arm up and adjust the outer switch cam so that the arm is between  $90^\circ$  and  $100^\circ$  from horizontal when outer switch clicks.
10. Verify both the up and down adjustments by rotating the actuator up and down, listening for limit switch clicks at the appropriate locations.
11. Reinstall the plastic switch cover.

### **Motors with External Limit Switches**

1. Disconnect power from the Automated Bumper Controller.
2. Place the actuator arm in the fully down horizontal position.
3. Loosen the screw holding the cam gear .
4. Position the  $1/16''$  (1.5mm) alignment hole in the cam gear with the “Down Switch” plunger. Refer to *figure 27*.
5. Torque the cam screw to 15 inch pounds (1.7nm)

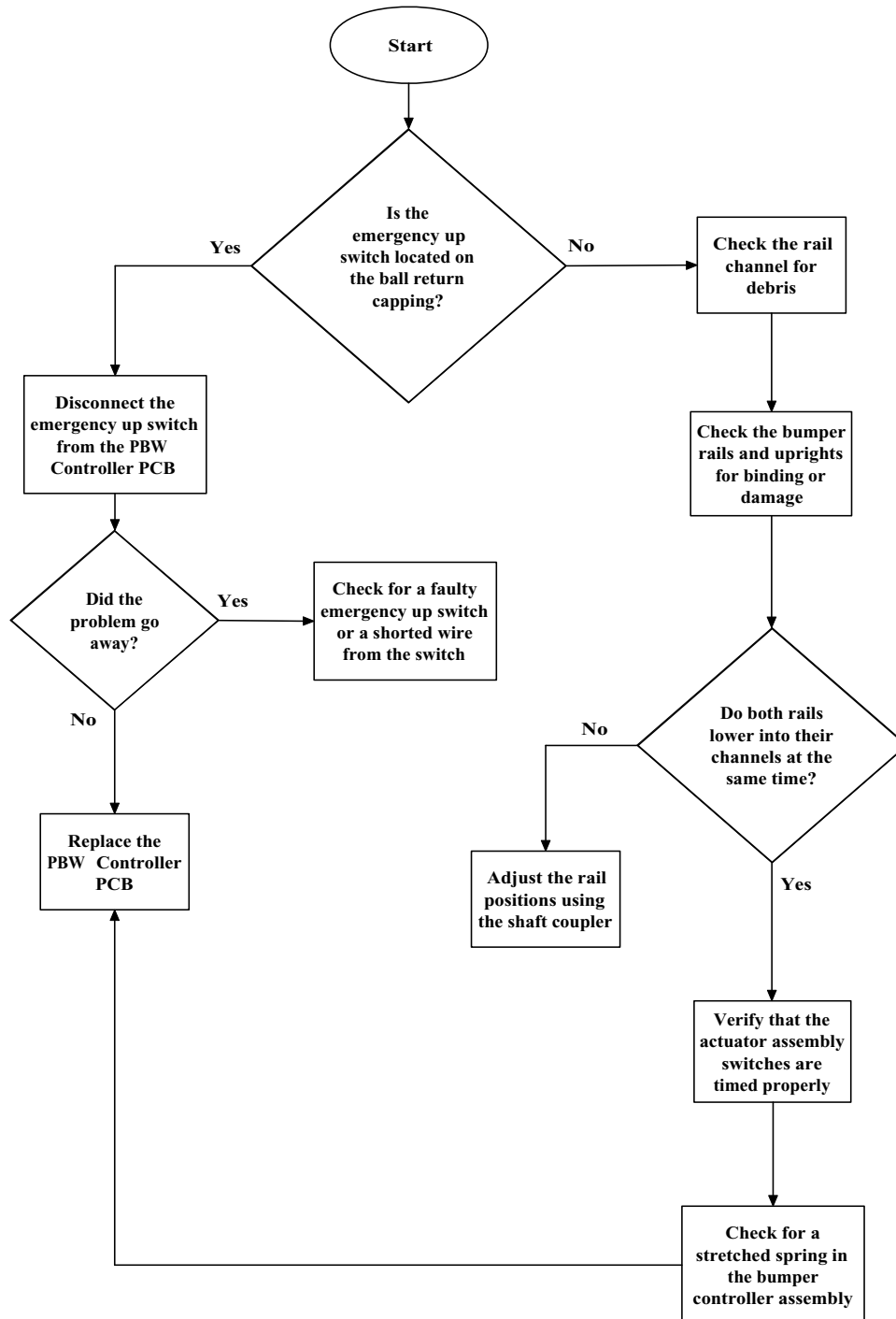
## Section 6: Troubleshooting

**i** ***IMPORTANT:** All non-operational checks should be done with the lane placed in an “out of service” status. Operational checks must be performed by trained, experienced personnel. Refer to the safety section of this manual before servicing the bumpers.*

Servicing or troubleshooting the Pinball Wizard bumpers can create unique situations that do not occur during normal operation. Extra care must be taken during service to ensure maintenance and repairs are done in a safe manner. Before any service or troubleshooting is performed on the bumpers the following safety precautions must be taken to prevent injury.

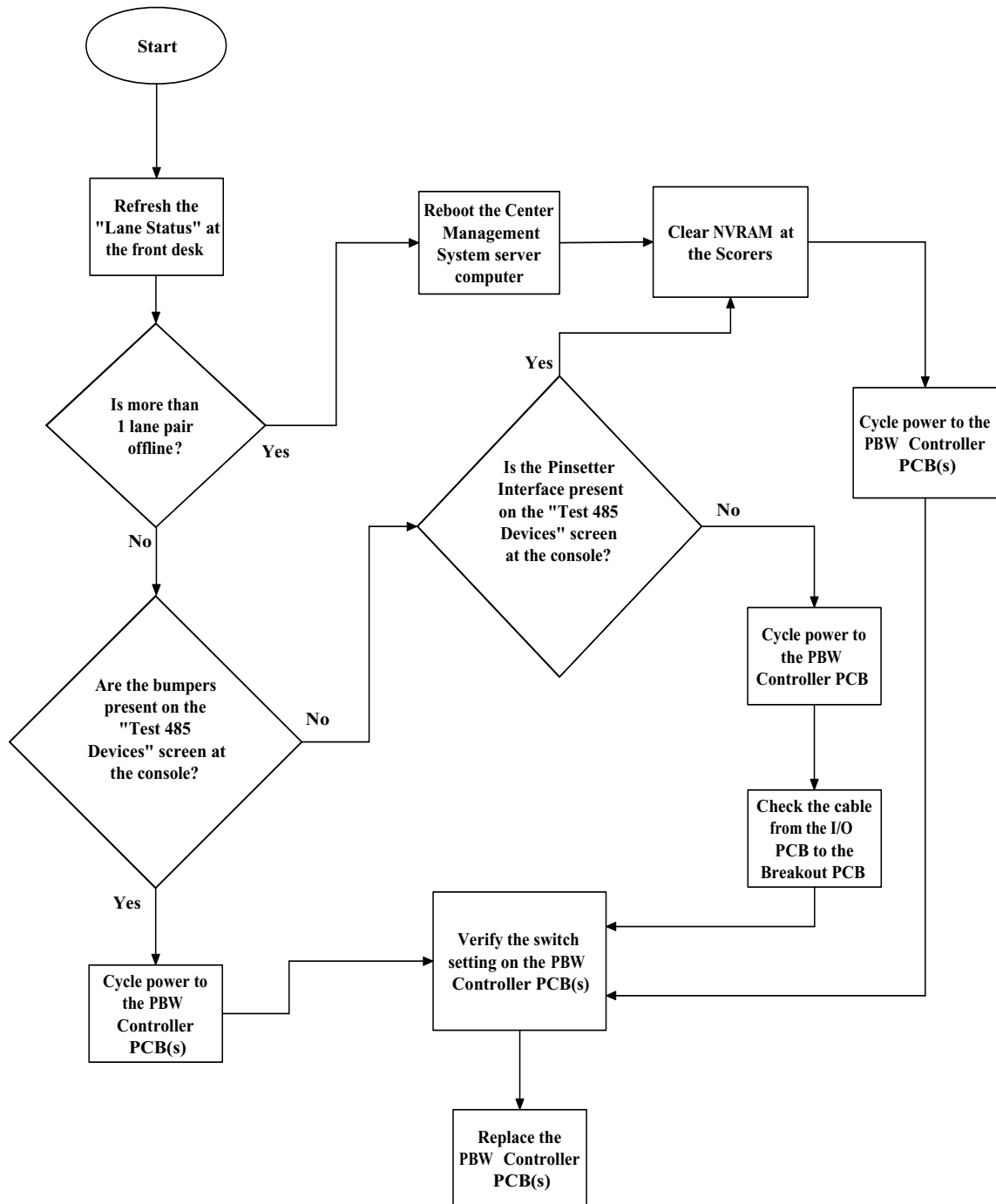
1. Service to the bumper system should only be carried out by trained personnel.
2. Read and understand the safety section of this manual.
3. Power to the Automated Bumper Controller box must be disconnected prior to servicing the bumper system.
4. Your hands or fingers must never come into direct contact with the bumper rails to raise or lower them.
5. Use an appropriate tool such as the Brunswick bumper deployment tool (84-8601000-000) when manually lifting (or lowering) the bumpers.
5. To further prevent injury when servicing bumpers that are in the up position, place a wedge between the bumper rail and the bumper channel to prohibit the rails from accidentally lowering.

# THE BUMPER RAILS KEEP GOING INTO EMERGENCY UP



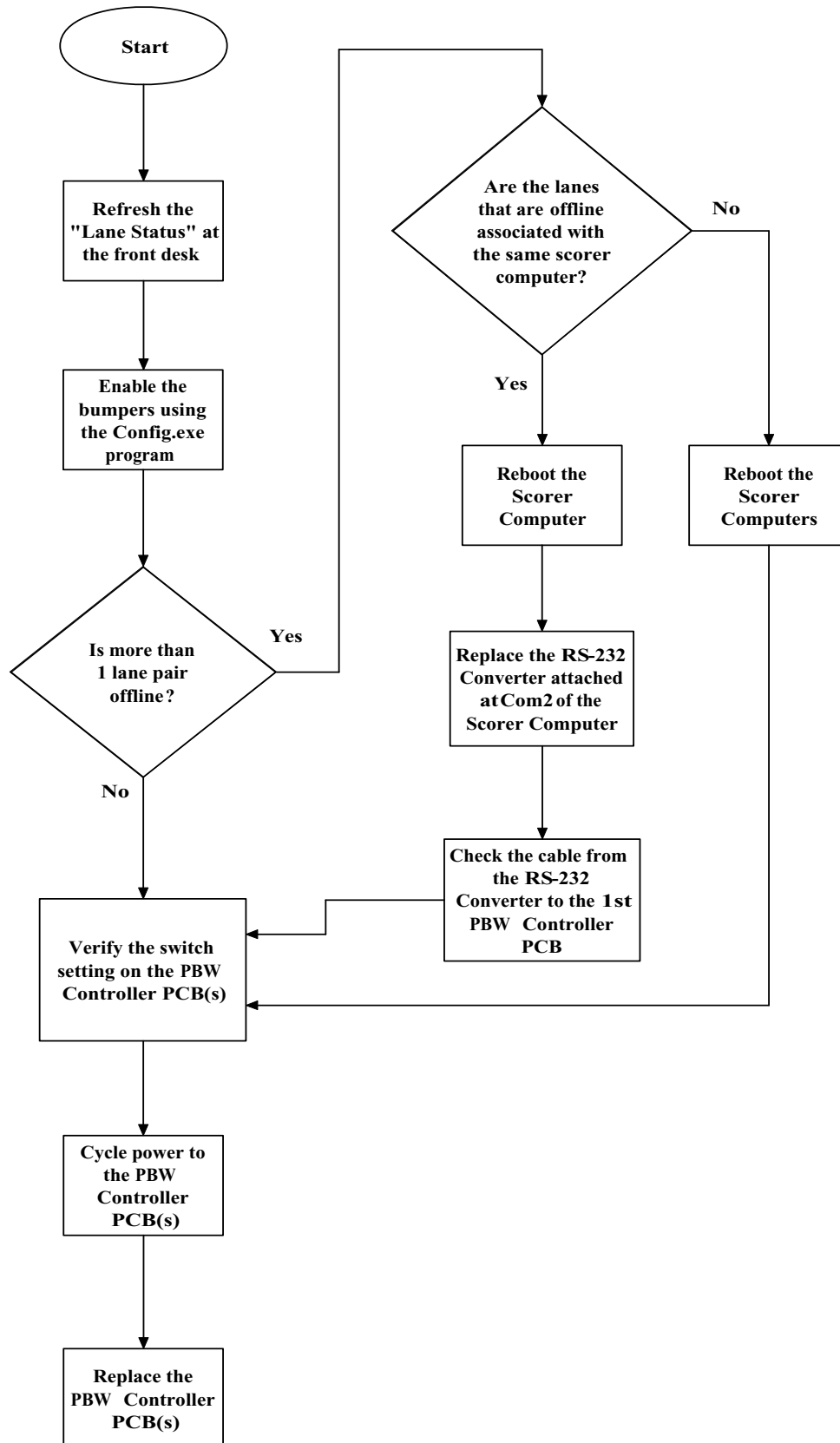
# FRONT DESK INDICATES BUMPERS ARE OFFLINE

## Frameworkx Scorers



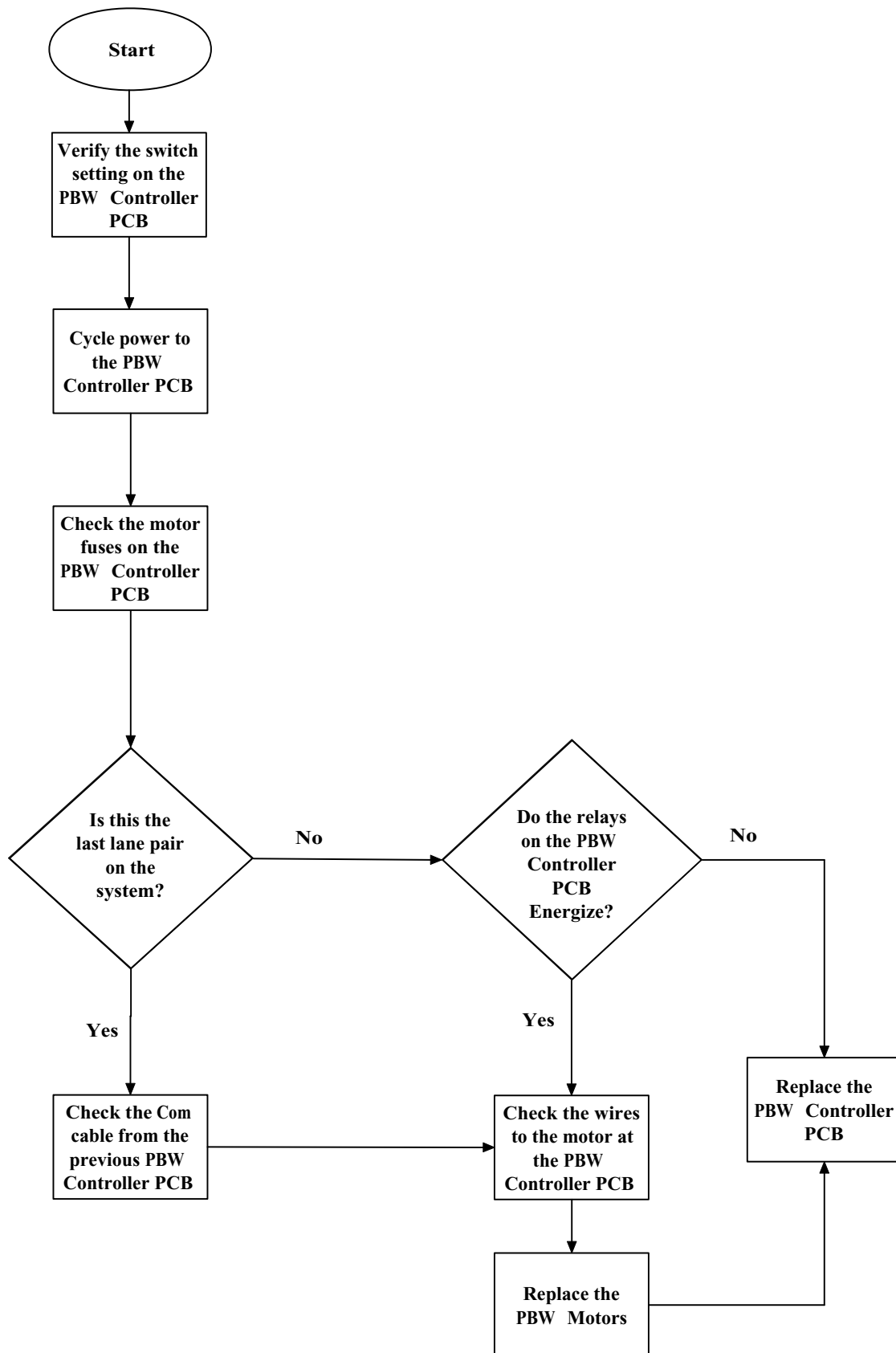
# FRONT DESK INDICATES BUMPERS ARE OFFLINE

## Vector Scorers



# RAILS WILL NOT RAISE OR LOWER ON ONE LANE PAIR

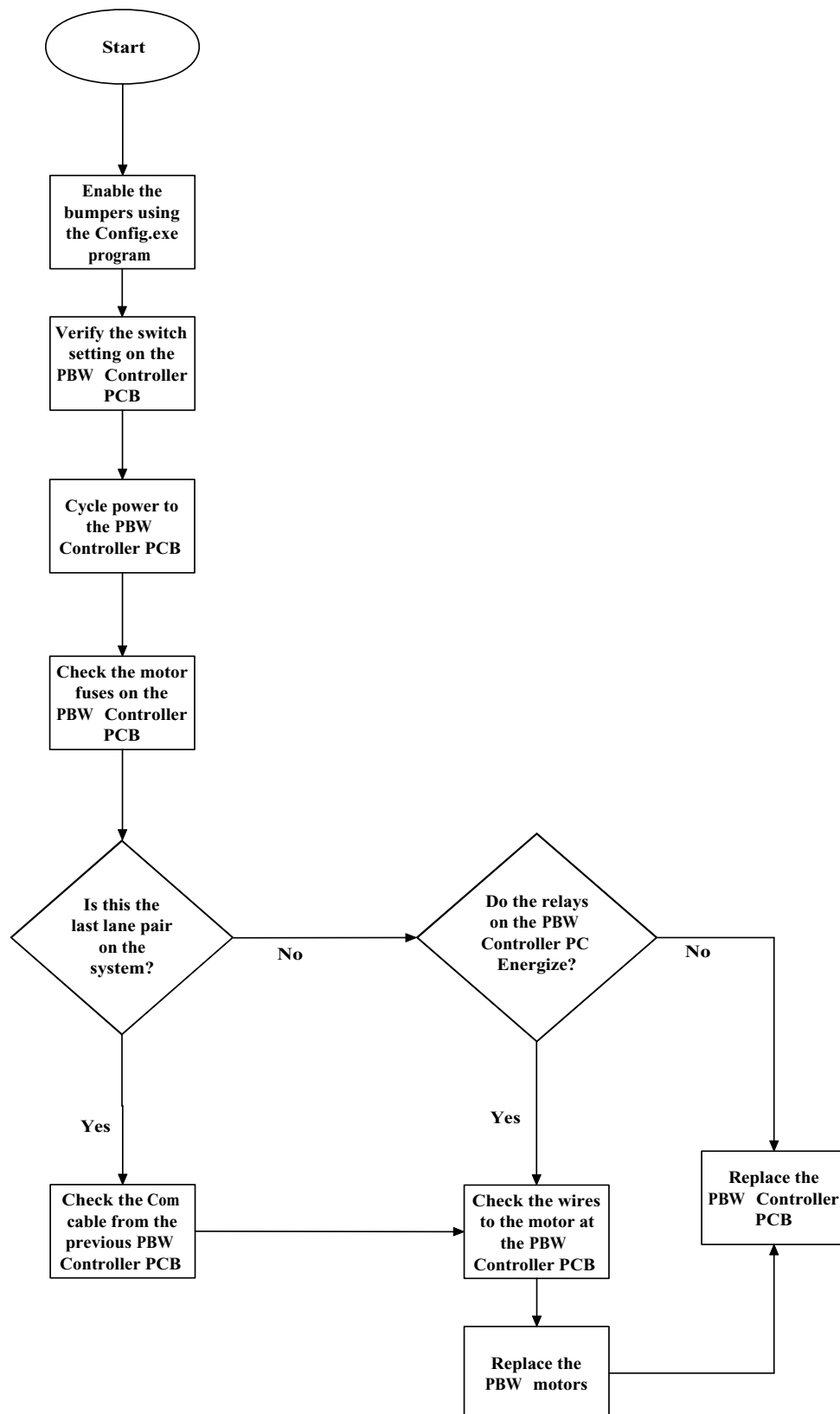
## Stand Alone Systems





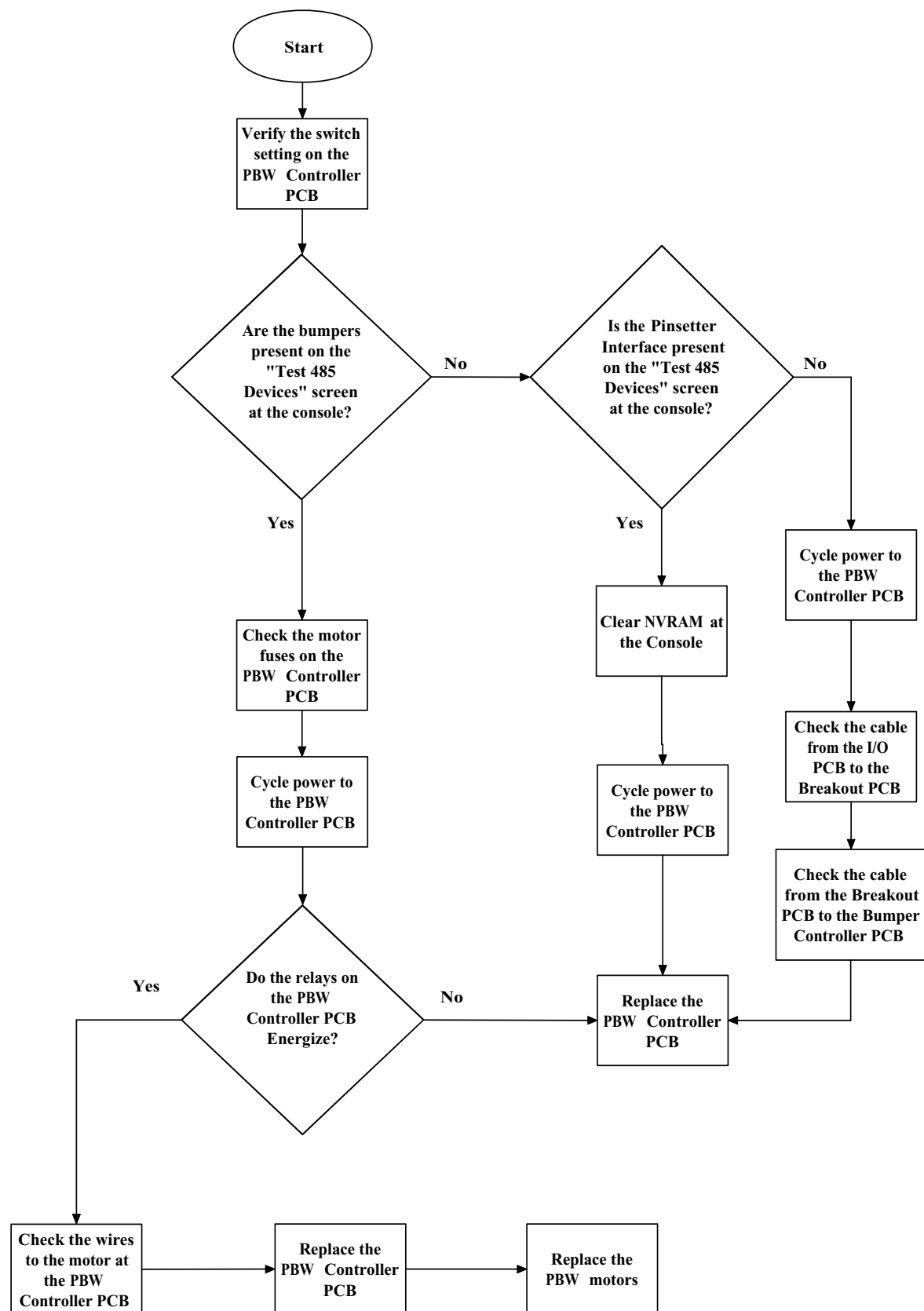
# RAILS WILL NOT RAISE OR LOWER ON ONE LANE PAIR

## Vector Scoring



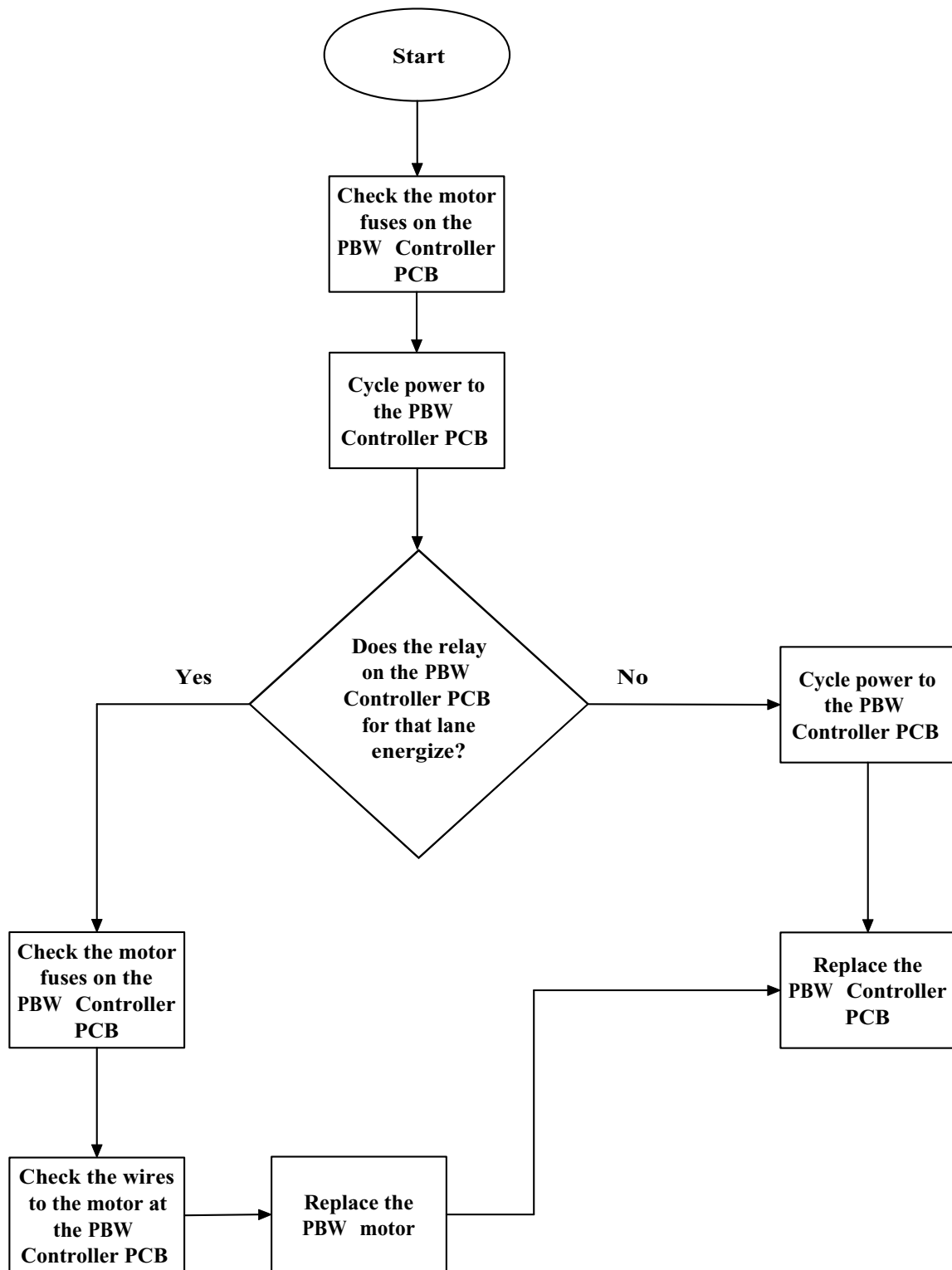
# RAILS WILL NOT RAISE OR LOWER ON ONE LANE PAIR

## Frameworkx Scoring



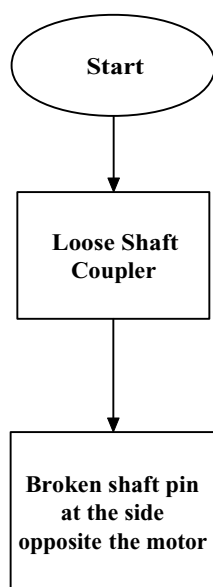
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## THE RAILS WILL NOT RAISE OR LOWER ON ONE LANE

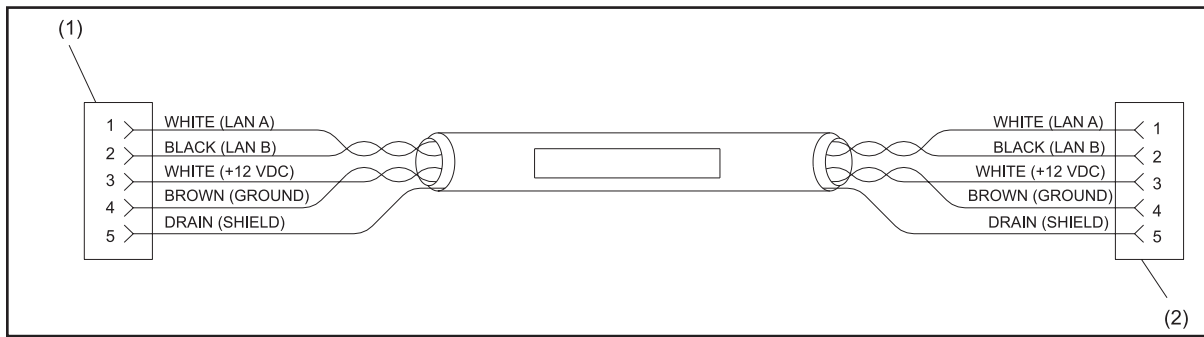


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## ONLY ONE BUMPER RAIL OPENS/CLOSES

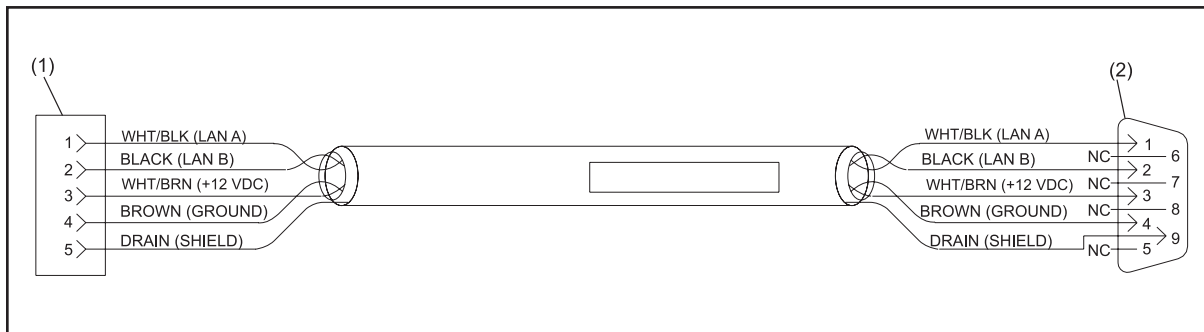


# Appendix A - Cables



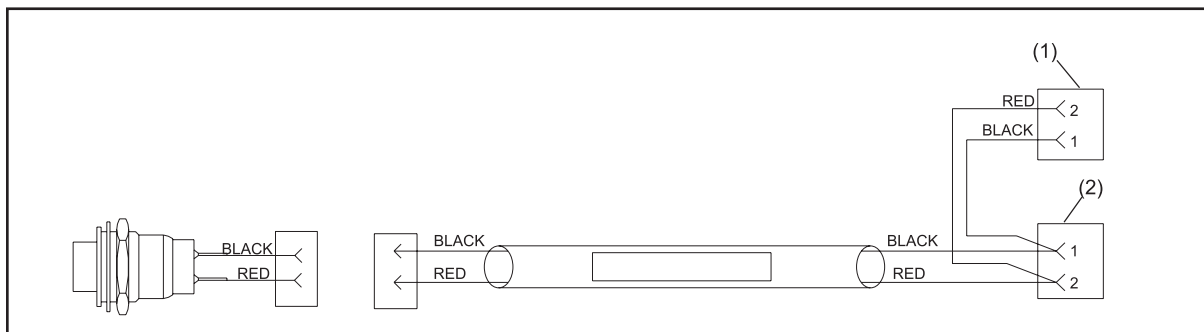
*Control Box to Control Box Daisy Chain - Stand Alone Systems & Vector Scorers Cable (17-300234-000)*

- (1) TO LLAN IN J3 ON AUTOMATED CONTROLLER PCB      (2) TO OUT J4 ON AUTOMATED CONTROLLER PCB



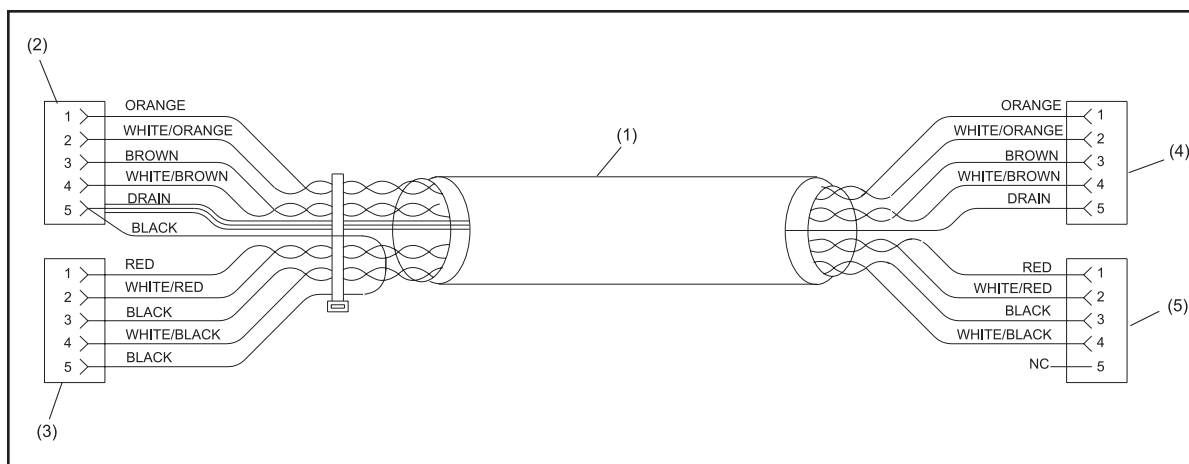
*Front Desk Controller to Controller Cable (17-300235-000)*

- (1) TO J3 ON FIRST AUTOMATED CONTROLLER PCB      (2) TO SERIAL PORT ON SYSTEM CONTROLLER AT DESK



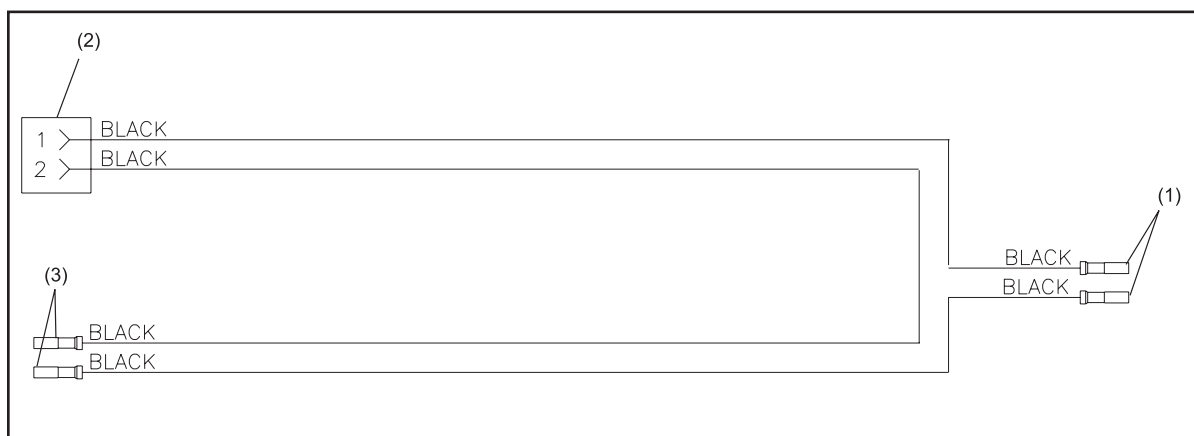
*Automated Bumpers Emergency Up Switch Cable - External Switches (17-300284-000)*

- (1) TO J2 ON AUTOMATED BUMPER CONTROLLER PCB      (2) TO J1 ON AUTOMATED BUMPER CONTROLLER PCB



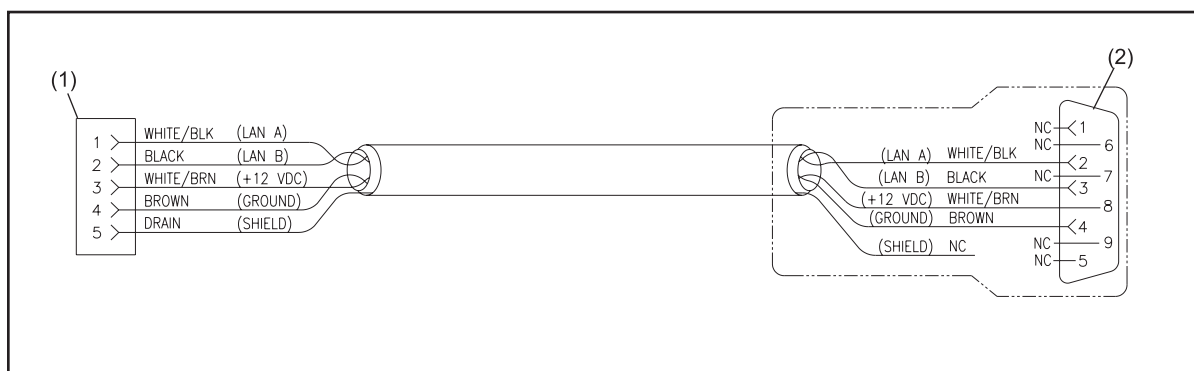
*Automated Bumper System Lane Cable - Frameworkx Scorers (17-300256-000)*

- (1) TO J4 AUTOMATED BUMPER CONTROLLER  
 (2) TO J1 BREAKOUT BOX  
 (3) TO J2 ON FWX I/O PCB (A) OR JP4/JP5 ON FWX I/O PCB (B)  
 (4) TO J3 AUTOMATED BUMPER CONTROLLER



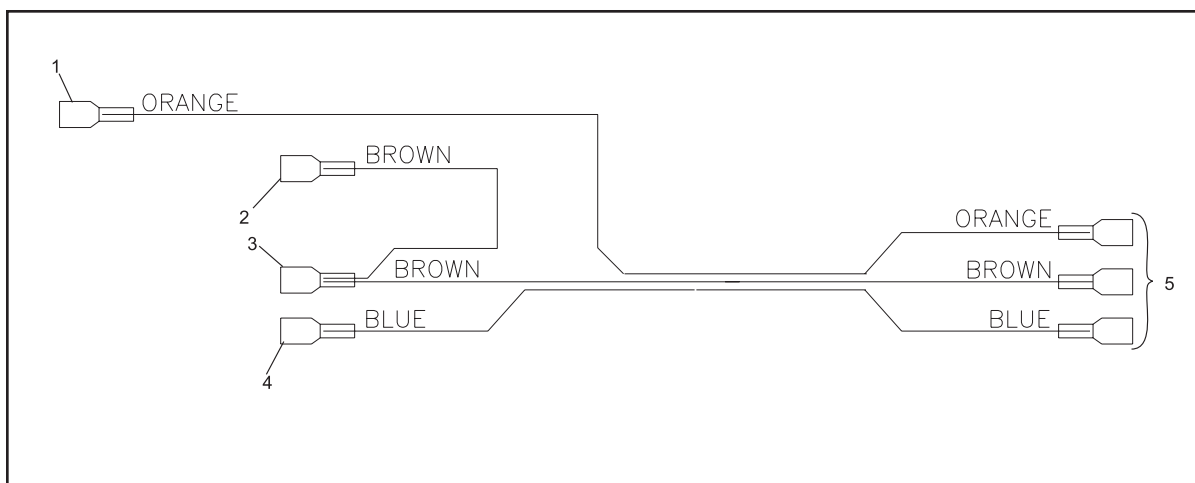
*Pinball Wizard Safety Switch Cable (84-900589-000)*

- (1) TO EMERGENCY UP SWITCH ON ACUTUATOR ARM ASSEMBLY (MOTOR SIDE)  
 (2) TO J1 OR J2 ON AUTOMATED BUMPER CONTROLLER  
 (3) TO EMERGENCY UP SWITCH ON ACTUATOR ARM ASSEMBLY (DRIVEN SIDE)



*Scoring Computer to Bumper Controller Cable (17-300287-000)*

- (1) TO LLAN IN ON AUTOMATED CONTROLLER PCB  
 (2) TO SERIAL PORT ADAPTER



*Emergency Up Switch Cable - Integrated Switches (84-200600-000)*

- |                    |   |                                       |
|--------------------|---|---------------------------------------|
| (1) TO DOWN SWITCH | (2) TO DOWN SWITCH<br>(COMMON TERMINAL)         | (3) TO UP SWITCH<br>(COMMON TERMINAL) |
| (4) TO UP SWITCH   | (5) TO ORANGE, BROWN AND<br>BLUE WIRES ON MOTOR |                                       |