



Installation & Operation Manual

**Electronic Pinsetter
Trigger/Control
System**

September 2005 / 12-902262-000

Brunswick® 

CUSTOMER SERVICE

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Electronic Pinsetter Trigger/Control System Installation & Operation Manual

U.S. Patent No. 5,429,554

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Past Revisions: August 1995

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Reorder Part No. 12-902262-000

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Notice: If available, updates to this manual can be found on-line at www.brunswickbowling.com

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SAFETY

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 a mechanical or nonelectrical alert which could potentially cause product damage.



Will designate grounding alerts.

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 products 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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Introduction

The new Brunswick Electronic Trigger/Control System, U.S. Patent No. 5,429,554, controls the cycle functions of the Brunswick A-2 and A-2 converted (must have electrical time delay module and A-2 style pit cushion with quick rake drop [shotgun]) pinsetting machines. Its primary function is to cause the pinsetter to cycle after a bowling ball is delivered and enters the pit end. The need for this new system arises from the increase of slowly delivered balls (bumper bowl) and worn or misadjusted parts which do not allow a consistent mechanical triggering of the pinsetter. It accomplishes this function along with some key safety features with the three included components described as follows:



NOTE:

This system does not work on any automatic scorer except Brunswick. For additional parts and instructions for installing this system onto a Model A Pinsetter (pinsetters with no electrical time delay module and no A-2 style pit cushion with quick rake drop [shotgun]), order supplement package part no. 12-860811-000. For additional parts and instructions for installing this system onto a cable triggered, Jet Back pinsetter system (pinsetters with no electrical time delay module, but already have the A-2 style pit cushion with a quick rake drop [shotgun]), order supplemental package part no. 12-862898-000.

Electronic Ball Detect

This reliable, dual output, infrared ball detect module is mounted ahead of the kickback, below the dropsweep, and sends a signal to the new control board.

Microprocessor Control Board

The new microprocessor control board replaces the existing time delay module in the electrical control box of the pinsetter. It functions as the “brain” of the new Electronic Pinsetter Trigger/Control System by accepting input from the electronic ball detect module and rake position switches, and adjusting the time delays, cycle, and scoring functions to match the ABC approved, original Brunswick designed systems. It also offers some enhanced features such as an automatic switch back to mechanical triggering of the pinsetter in the absence of an electronic ball detect signal. Once the cycle has started, the reset button is locked out to prevent “banana stops.” Another important feature of the microprocessor control board is the safety shut-off system which shuts off the pinsetter motor if the rake drop is blocked.

Rake Down Microswitch Assembly

The Rake Down Microswitch Assembly is attached to the center cross brace with a trigger clip on the rake lift shaft. It senses when the rake has dropped completely and connects to the microprocessor control board to complete the safety shut-off system.

Preparation

Make sure all parts listed below are included in the supplied kit. This kit (part no. 12-862584-400) contains the necessary parts to equip one lane pair of two pinsetters with the Electronic Pinsetter Trigger/Control System.

Qty.	Part Number	Description
2	12-862918-400	Microprocessor Control Board
1	57-214921-091	Electronic Ball Detect Assembly (Includes 2 ball detects mounted on a bracket.)
2	12-752396-000	Rake Down Microswitch Assembly (Includes U-bolt, trigger clip, and wire harness.)
2	12-752401-000	Safety Lockout Wire Harness (18 in. long with ring terminal and butt splice.)
2	12-752402-000	Ball Detect Cable (12 ft. long.)
2	12-752403-000	Scorer Wire Harness (Red single wire.)
1	12-862895-000	Hardware Package
1	17-600702-000	Dual Reflector (3 in. diameter, reference NOTE below.)
1	12-902262-000	Installation and Operation Manual



NOTE:

For each installation, the first lane pair installed and any post row or aisle way will require an additional reflector not supplied with this kit. (Contact your Brunswick service parts supplier for additional reflector assemblies, part no. 17-600702-000. Use only Brunswick reflectors, as other types are not designed for this application and will not perform as well.)

Tools Required

1. Screw Driver - Phillips (For Electrical Box Cover Removal)
2. Socket (7/16") and Drive Ratchet (3/8") or Nut Driver (7/16")
3. Screw Starter (Holder) - Slotted
4. Screw Driver - Small #1 Phillips
5. Crimpers
6. Wire Stripper
7. Safety Glasses
8. Tape Measure
9. Electric Drill
10. Drill Bit (7/64" or 3/32" dia.)
11. Drill Bit (3/16" dia.)
12. Drill Bit (3/4" or 7/8" dia.) or Greenlee Knockout Punch
(Available from Electrician Supply)
13. Magnet
14. Clean Dry Cloth

Installation of the Control Board



WARNING!

Be sure the circuit breaker is off and disconnect the high voltage input power cord before removing the cover of the pinsetter electrical control box. Lethal voltages are present!

1. Turn off the main circuit breaker and disconnect the high voltage input power cord. Also remove cannon plug CP3 from the top of the pinsetter electrical control box.
2. Remove the cover from the pinsetter electrical control box.
3. A hole will need to be drilled in the top of the pinsetter electrical control box for routing wires to the ball detect, rake down microswitch, etc. Locate an area on top of the electrical box above the motor contactor with proper clearance. Reference the figure titled *Control Board Mounting Diagram*. Center punch this location. Place a cloth inside the box to keep the metal drilling shavings off the electrical components. Drill the 3/4" or 7/8" diameter hole or use a Greenlee knockout punch and fasten the supplied cable (Romex) clamp through the hole.



NOTE:

If sufficient space is available in existing cable clamp, installing a new cable clamp may not be necessary. Check cable clamp for sharp edges which can cut through wire insulation and remove sharp edges and/or wrap cable with protective layer of electrical tape where it passes through cable clamp.

4. Without disconnecting the wires, unscrew the existing time delay module from the bottom of the box.



CAUTION!

To reduce the risk of static discharge damage to the control board, leave the board in its protective bag until installed and always touch a grounded surface before handling the control board.

5. If the new control board mounting spacers do not match the holes in the control box where the old time delay module was removed, it may be necessary to move the one mounting spacer to the other hole in the control board. If this does not match, drill a new 3/16" diameter hole in the control box.

6. Brush or use a magnet to remove the drilling shavings from the bottom of the box.
7. Screw the new control board to the electrical box with supplied hardware as shown in the figure titled *Control Board Mounting Diagram*.

i **NOTE:**

The flat washers are used to sandwich the slots in the electrical box with a lockwasher under the screw head. If your electrical box has holes instead of slots, the flat washers are not necessary.

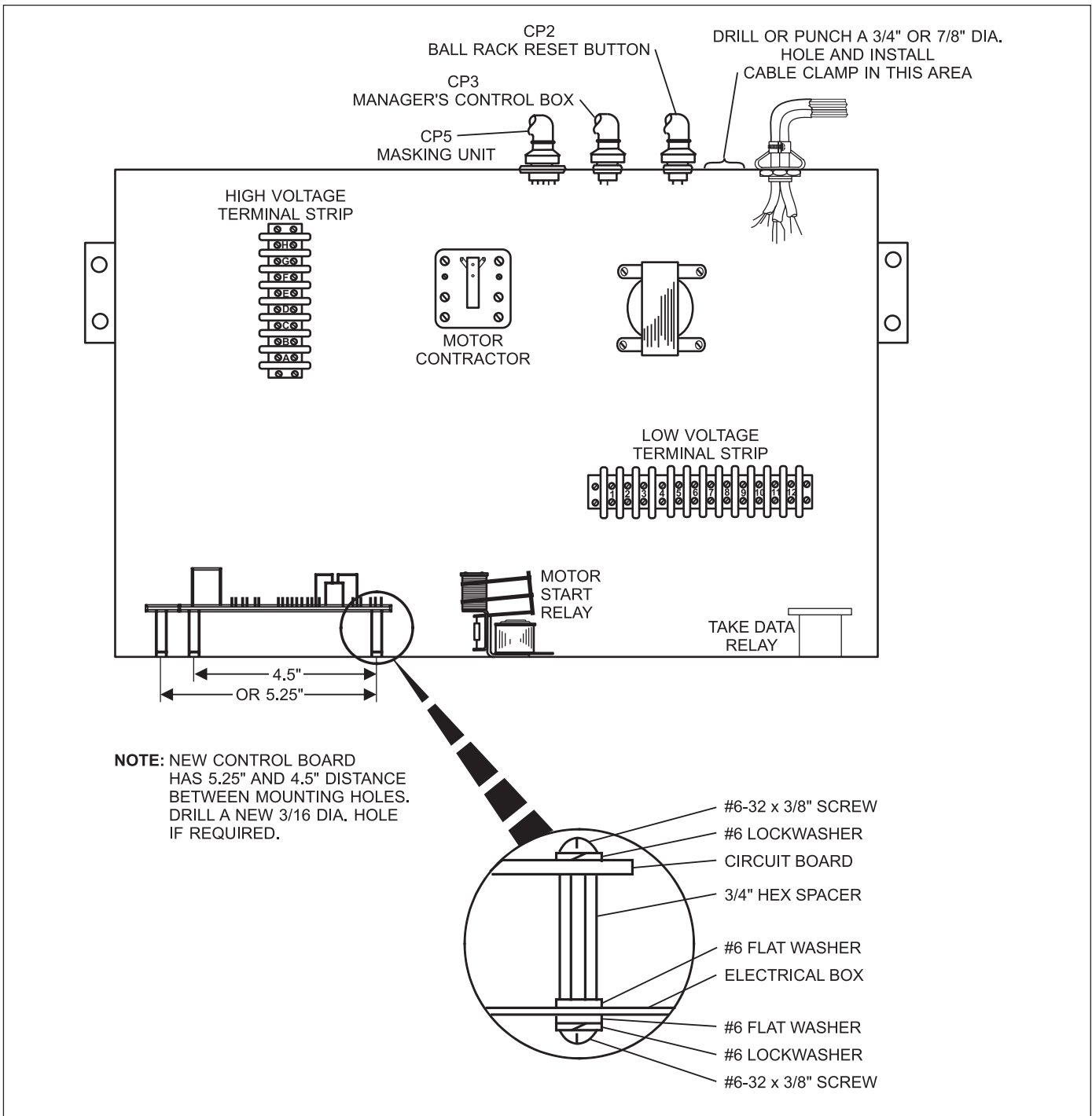
8. Transfer the wires from the old time delay module in the same positions onto the new control board. Transfer the wires one by one until you have transferred the wires from all eight terminals (#13 to #20).

i **NOTE:**

If there are multiple wires on one terminal, transfer them just as if they were a single wire. Terminal #15 (second ball signal) may be empty on some pinsetters.

i **NOTE:**

If your old time delay modules had screw terminals, it will be necessary to remove and discard the spade terminals from the screw terminals and attach the wires directly onto the screw terminals.



Control Board Mounting Diagram

Installation of the Safety Shut-off Connections

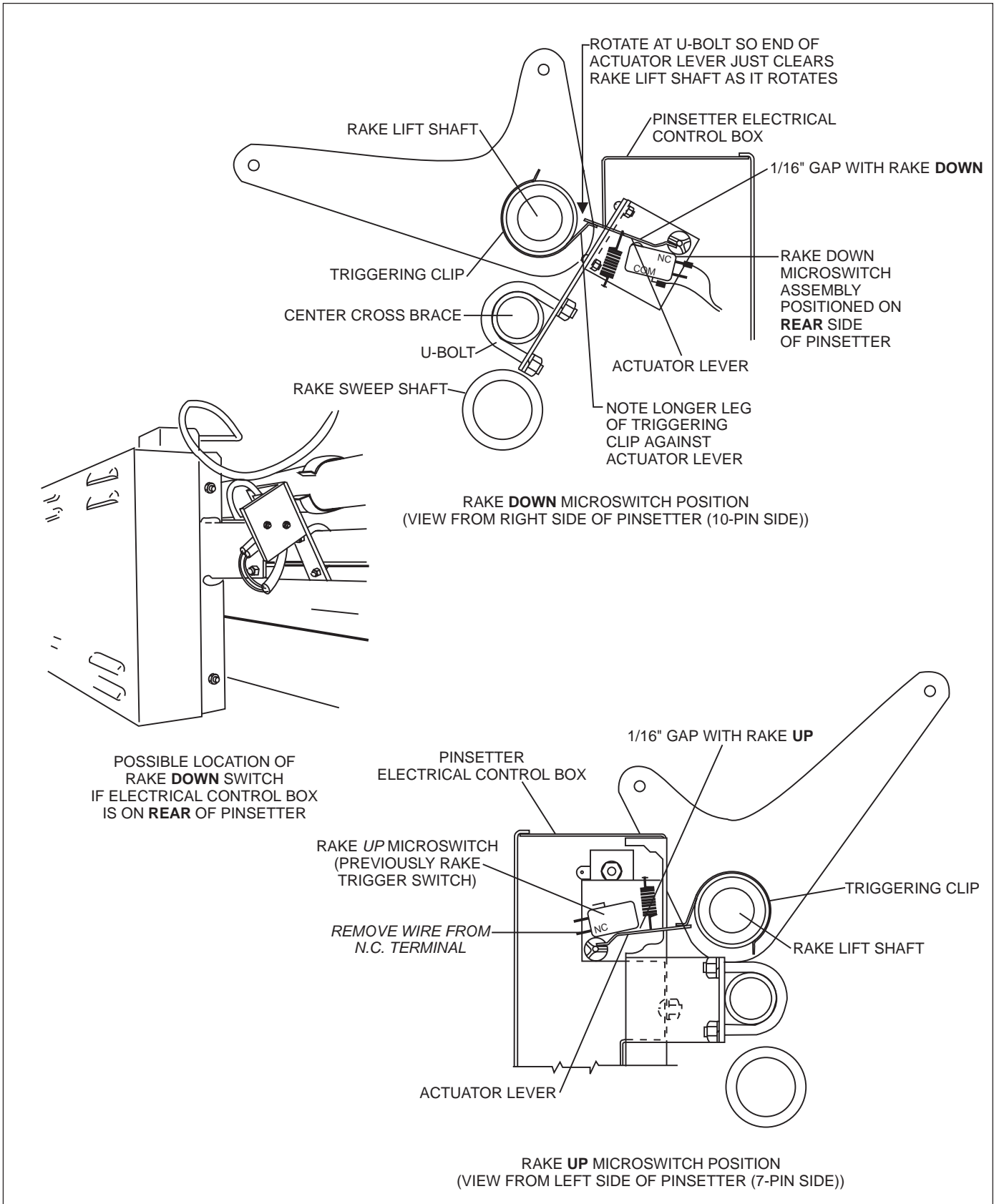
1. The new Electronic Trigger/Control System uses the existing rake trigger microswitch as a “rake up” switch. It is important that this switch be adjusted for a 1/16" gap between the microswitch plunger and the actuator lever when the rake is in the raised position. Reference the figure titled *Rake Position Safety Switch Locations and Adjustments* and *Adjustment #6* in the *Pinsetter Service Manual*, part no. 12-752828-000. Adjust to a 1/16" gap rather than a 1/16" gap minimum as noted in the service manual. ***Remove the normally closed terminal from the existing rake trigger microswitch and tape it out of the way.*** Reference the figure titled *Rake Position Safety Switch Locations and Adjustments*. The N.C. wire is usually the bottom terminal on the switch. If there are two microswitches, remove the N.C. wire from the outside or right-most switch.
2. Install the Rake Down Microswitch Assembly with the U-bolt clamped around the center cross brace. The Rake Down Microswitch Assembly can be installed on either side of the electrical control box, but make sure the switch is positioned on the ***rear*** side of the pinsetter. Reference the figure titled *Rake Position Safety Switch Locations and Adjustments*. Rotate the switch assembly so the end of the actuator lever just clears the rake lift shaft by 1/16". Tighten the U-bolt nuts.
3. Manually trip the rake trip-latch to lower the rake. Wear your safety glasses and ***install the clip onto the rake lift shaft so its longer leg just contacts the actuator lever.*** Rotate the clip until it raises the actuator lever far enough to open the switch (an audible click can be heard when the switch opens). Then rotate the clip slightly farther until the actuator lever just clears the switch plunger (not more than a 1/16" gap). Reference the figure titled *Rake Position Safety Switch Locations and Adjustments*.



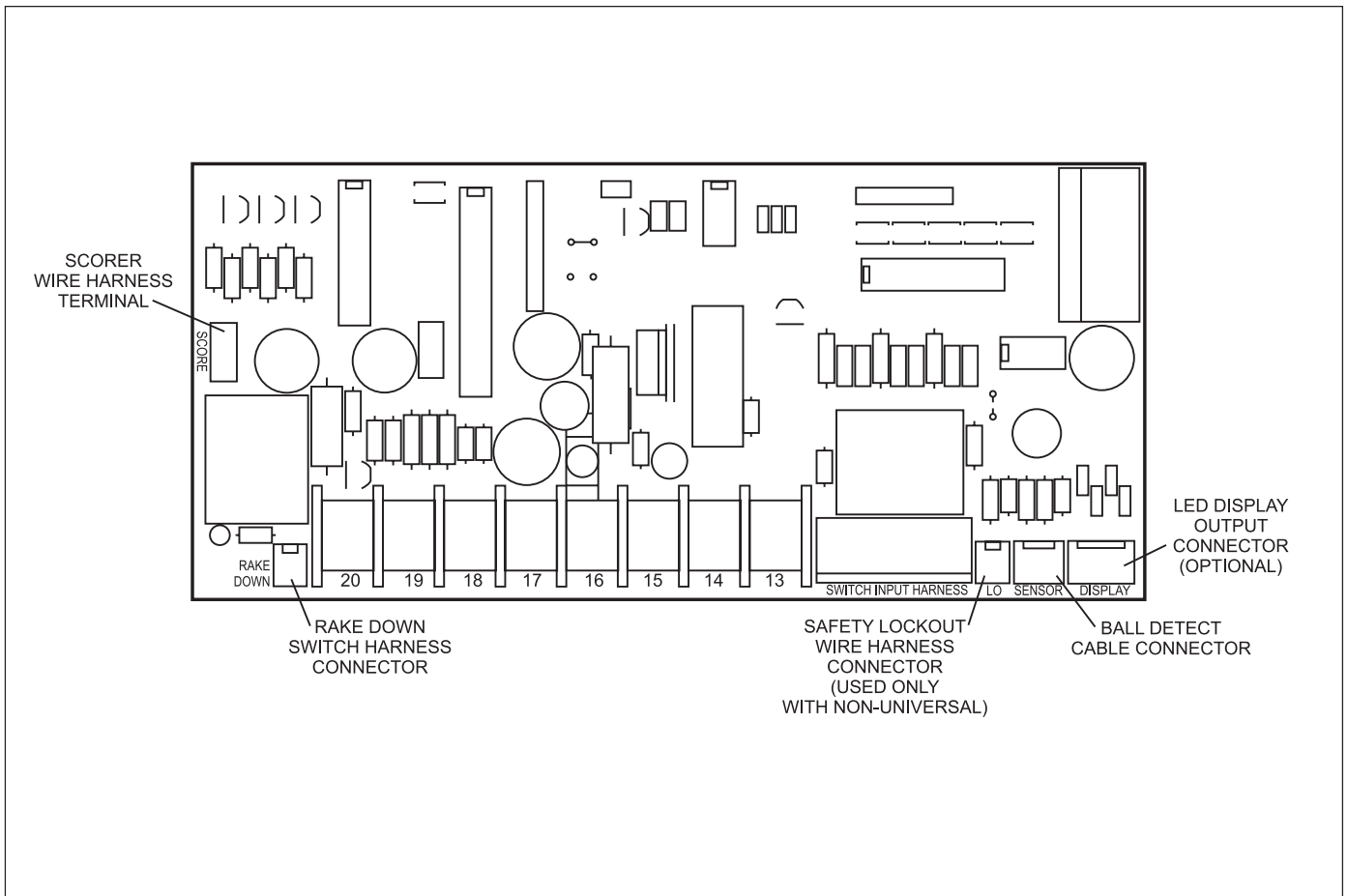
NOTE:

This gap will increase as the rake starts to sweep.

4. The rake down switch wire harness (with two spade receptacles) should be connected to the N.C. and “Com” terminals of the new microswitch. Route the wire harness through the cable clamp on top of the electrical control box and connect to the new control board. Reference the figure titled *Control Board Location Diagram* for proper connecting location. Secure wire harness away from moving parts as required.



Rake Position Safety Switch Locations and Adjustments



Control Board Location Diagram

5. Remove wire #20 from terminal #5 of the low voltage terminal strip that is routed from the wire channel.

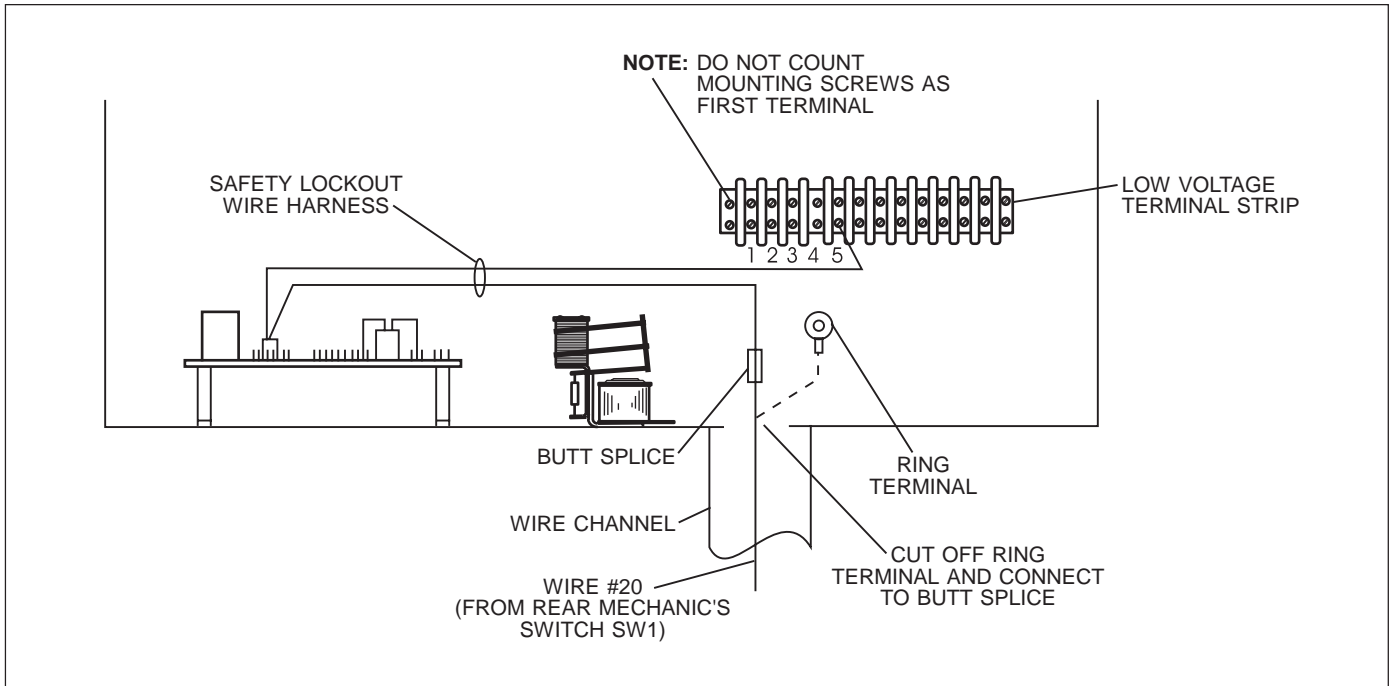
i **NOTE:**

Reference Pinsetter Service Manual, part no. 12-752828-000, pages 1-84 through 1-91 for wiring diagrams. Wire #20 is connected to the rear mechanic's switch SW1. Make sure not to connect to the wires from any bypass switch. Do not count the mounting screws as the first terminal.

Cut off the ring terminal, strip 1/4" of insulation from the wire, and crimp the butt splice from the Safety Lockout Wire Harness (18 in. long harness) to the existing stripped wire. Reference the figure titled *Connection of Safety Lockout Wire Harness*.

6. The remaining wire from the Safety Lockout Wire Harness has a #6 ring terminal on it. Connect this ring terminal back onto terminal #5 of the low voltage terminal strip in place of the wire removed in the previous step. Reference the figure titled *Connection of Safety Lockout Wire Harness*.

7. Route the connector end of the Safety Lockout Wire Harness to the new control board and connect to location shown in the figure titled *Control Board Location Diagram*.
8. Reconnect cannon plug CP3 onto the top of the pinsetter electrical control box.



Connection of Safety Lockout Wire Harness

Installation of Electronic Ball Detect Assembly

1. Connect the 12 ft. ball detect cable to the location indicated on the new control board. Reference the figure titled *Control Board Location Diagram*. Route the cable along the walkway side of the pinsetter, down to the front edge of the kickback plate. Make sure the cable will not interfere with any moving parts of the ball return or rake.
2. Install the ball detect bracket, with the two mounted ball detects just ahead of the kickback, below the dropsweep. Drill 7/64" or 3/32" diameter pilot holes and attach using the wood screws provided. Reference the figure titled *Ball Detect Installation and Adjustment*. The assembly should be mounted level across the lane and square with the end of the lane. The ideal location for the detector beam is 8" to 20" in front of the head pin. The sweep of the rake does not cause problems when it breaks the detector beam. Check that the mounting site (fill block) is not loose and secure as required.



NOTE:

If scorer ball detect is mounted in same area, allow 4" between detectors.

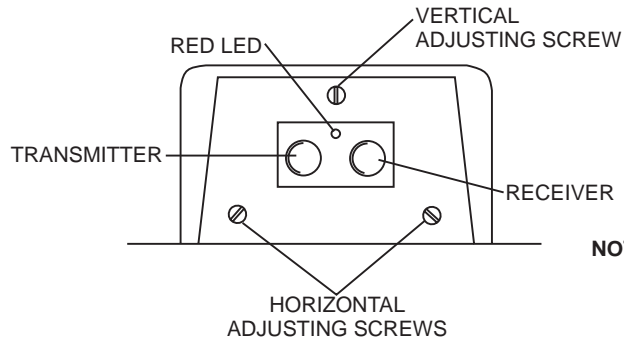
3. Install the safety decals in visible locations just below the ball detects. Reference the figure titled *Ball Detect Installation and Adjustment*. If safety decals become lost or damaged, reorder part no. 47-082592-000.
4. Mount the reflector opposite the ball detect assembly. Drill 7/64" or 3/32" diameter pilot holes and attach using the wood screws provided. The end of the gutter is a good reference to insure that the detector and reflector are mounted squarely to the lane. Reference the figure titled *Ball Detect Installation and Adjustment*. Make sure that the top of the reflector is not above the height of the ball as it passes in the gutters.



NOTE:

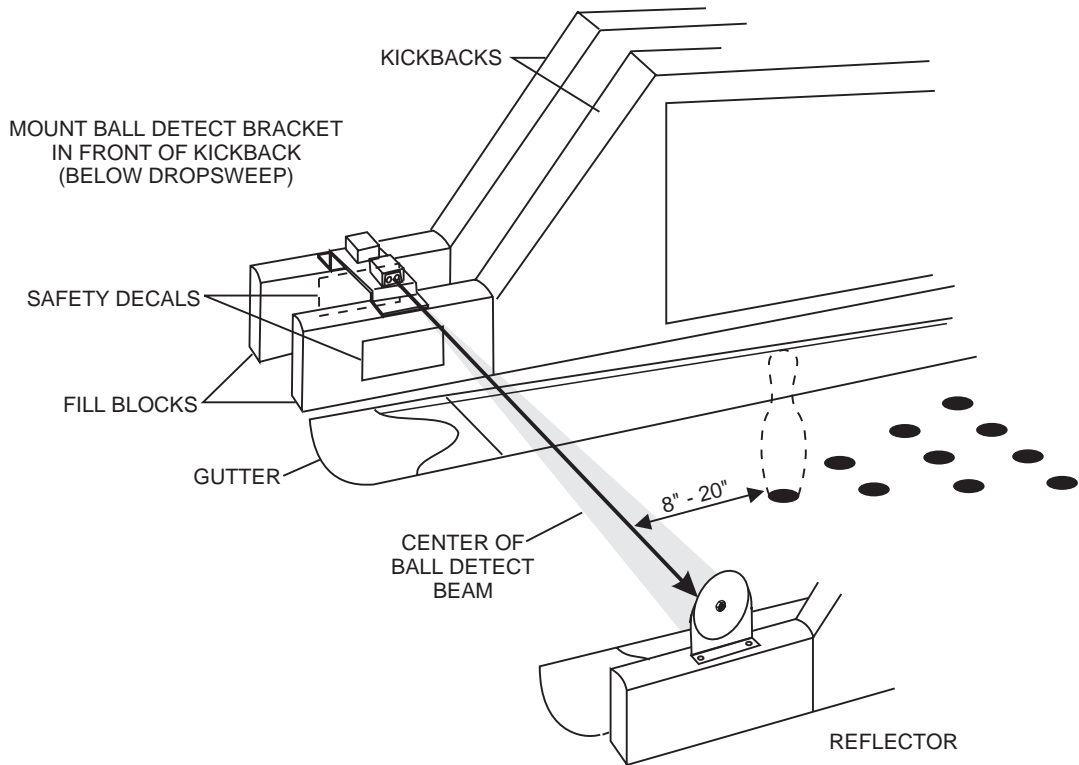
For each installation, the first lane pair installed and any post row or aisle way will require an additional reflector not supplied with this kit. (Contact your Brunswick service parts supplier for additional reflector assemblies, part no. 17-600702-000. Use only Brunswick reflectors as other types are not designed for this application and will not perform as well.)

5. Connect the ball detect cable into the module. Again, make sure the cable is not going to interfere with the ball return or rake as it sweeps. Secure the cable with tie wraps.
6. The ball detect and reflectors will be aligned after power is turned back on, as described in the *Ball Detect Alignment and System Check* section of this manual.



NOTE: KEEP ADJUSTING SCREWS TIGHT ENOUGH TO PULL SENSOR CLOSE TO HOUSING OPENING, WHICH KEEPS INTERNAL SPRINGS TENSIONED.

FRONT VIEW OF BALL DETECT



Ball Detect Installation and Adjustment

Special Installation Instructions for Pinsetters with Brunswick Automatic Scoring and Standard Take Data Relay Kit

i **NOTE:**

The following steps do not apply if you do not have the Take Data Relay Kit installed (normally located in the lower right corner of the electrical control box as facing the rear of the machine). You may consider adding the Take Data Relay Kit (part no. 57-860109-000) if you experience problems with scoring accuracy.

i **NOTE:**

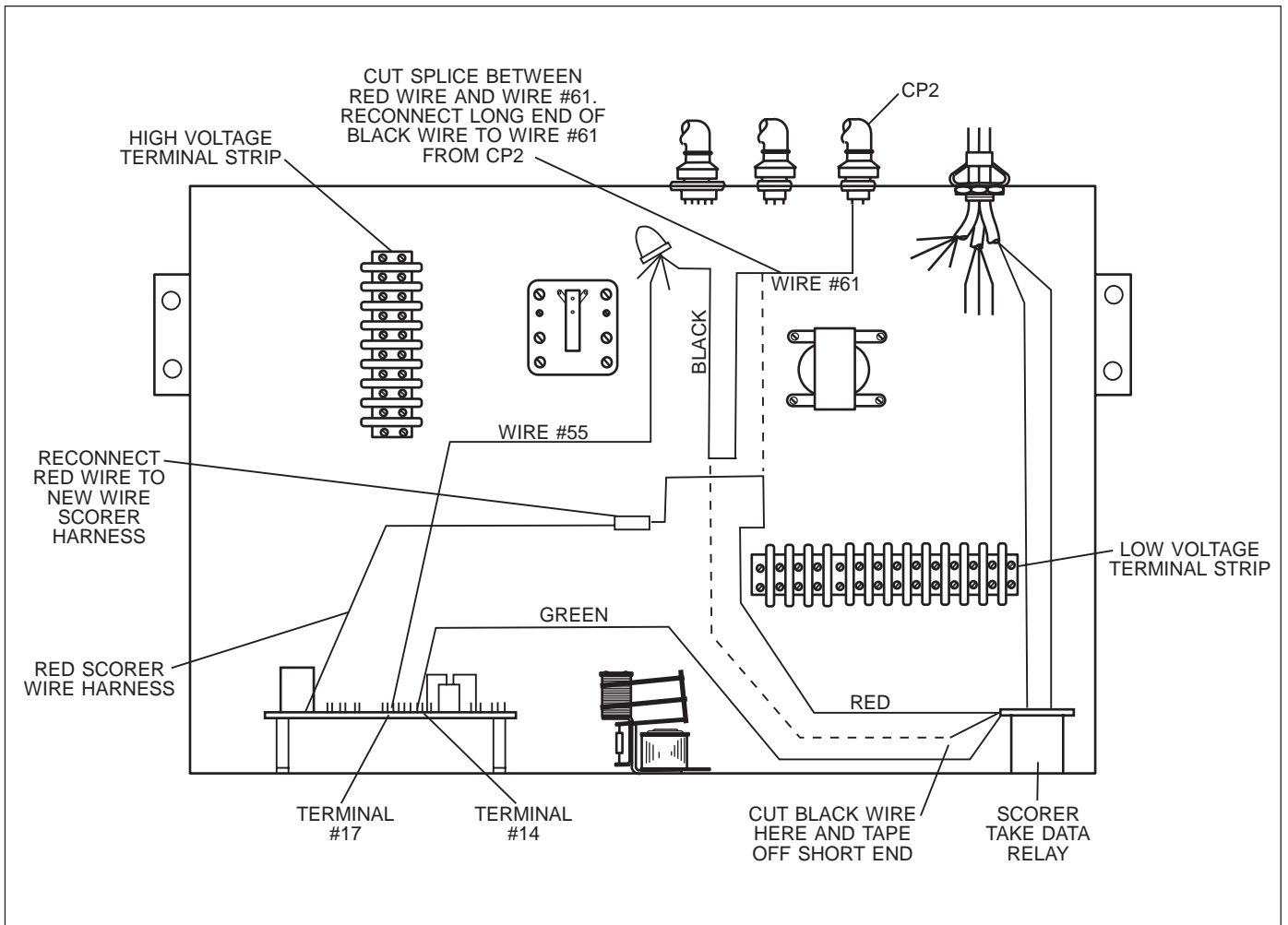
If you are installing the Take Data Relay Kit at the same time as the new Electronic Trigger/Control System, modify the instructions as follows:

- *Do not cut wire #61 as stated in step 7 of the separate Take Data Relay Kit instructions.*
 - *Connect the red wire from the Take Data Relay Kit to the scorer wire harness as in step 1 below.*
 - *Tape the black wire from the Take Data Relay Kit to the inside of the electrical box as it is unused.*
1. Find the heavy red wire from the Take Data Relay Kit that is spliced into wire #61 from CP2. Cut the splice off and strip 1/4" of insulation off both the red wire and wire #61. Crimp the red wire from the Take Data Relay Kit, to the provided red wire of the scorer harness, using the butt splice on the harness. Reference the figure titled *Connection of Scorer and Standard Take Data Relay Kit Wires*.
 2. Cut the heavy black wire approximately 3" from the Take Data Relay Kit. Tape the 3" end to the inside of the electrical box (not used). Strip 1/4" of insulation off the long end of the black wire. Reference the figure titled *Connection of Scorer and Standard Take Data Relay Kit Wires*.
 3. Connect the black wire that was stripped in step 2 and wire #61 in step 1 together with the provided butt splice.

i **NOTE:**

This effectively reconnects wire #61 that connects the ball rack cycle button from the cannon plug (CP2) to Y2. (Reference the Pinsetter Service Manual, part no. 12-752828-000, pages 1-69 through 1-74.)

4. Route the red scorer wire harness to the new control board and connect to the location indicated in the figure titled *Control Board Location Diagram*.



Connection of Scorer and Standard Take Data Relay Kit Wires

Special Installation Instructions for Pinsetters with Automatic Scoring and Japanese Take Data Relay Kit

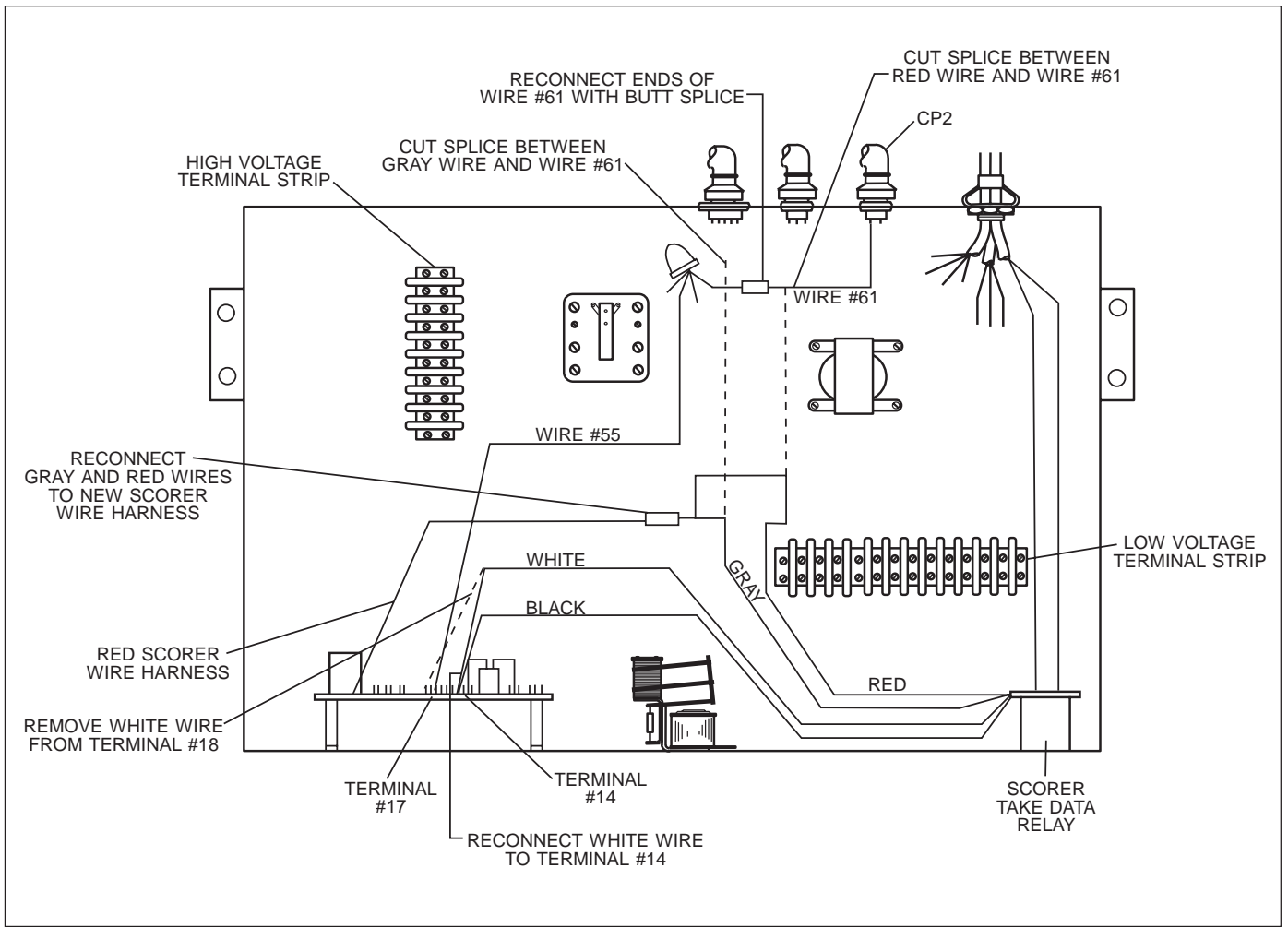
For the following steps, reference the figure titled *Connection of Scorer and Japanese Take Data Relay Kit Wires*.

1. Find the red wire from the Take Data Relay Kit that is spliced into wire #61 from the ball rack reset switch. Cut the splice off and strip 1/4" of insulation off both the red wire and wire #61.
2. Find the gray wire from the Take Data Relay Kit that is spliced into wire #61 right next to the wire nut which connects wires #52, #55, and #60. Cut the splice off and strip 1/4" of insulation off both the gray wire and wire #61.

i **NOTE:**

Wire #52 should already be disconnected from the trigger switch.

3. Reconnect both ends of wire #61 together with the provided butt splice.
4. Find the provided red scorer wire harness and insert the red and gray wires from the Take Data Relay Kit into the butt splice on the scorer harness. Crimp the butt splice securely. Connect the spade terminal of the red scorer wire harness to the control board location labeled "Score" as indicated in the figure titled *Control Board Location Diagram*.
5. Remove the white wire from the Take Data Relay Kit where it is attached to terminal #18 of the control board. Connect this white wire together with the black wire from the Take Data Relay on terminal #14 of the control board.



Connection of Scorer and Japanese Take Data Relay Kit Wires

Ball Detect Alignment and System Check

1. Reconnect the high voltage input power cord and turn the circuit breaker on. The motor should start; if not, check the rake down microswitch to see that the actuator lever just clears the switch plunger when the rake is down. Check that there is a 1/16" gap between the rake triggering microswitch and the actuator lever when the rake is up. Reference the figure titled *Rake Position Safety Switch Locations and Adjustments*.
2. Check the ball detect to make sure it is aligned with the reflector as follows:



WARNING!

The motor must be disconnected while making any adjustments to the ball detect, because the ball detect can trigger the pinsetter.

- a. Check the face of the ball detect and make sure it is parallel with the face of the ball detect's housing. Check the reflector to see if it is mounted securely and parallel to the ball detect. Clean the transmitter, receiver, and reflector with a clean dry cloth before and after adjusting.
 - b. Cover the reflector with a dark, nonreflective object. The red LED should be lit indicating the beam is not reflecting.
 - c. Hold an unmounted reflector in your hand and move it above, below, and around the beam zone to find the edges of the zone where the LED just goes out.
 - d. Using the vertical and horizontal adjusting screws (reference the figure titled *Ball Detect Installation and Adjustment*), move the beam zone until it is centered around the mounted reflector.
 - e. To verify that the beam is centered, cover one half of the reflector with a dark card. The red LED should not light until more than one half of the reflector is covered. Repeat this procedure by covering the top half, the bottom half, the left half, and the right half. The beam is centered only when the red LED stays off while covering an equal amount of the reflector from all four positions.
 - f. Turn the circuit breaker off. Plug in the motor. Turn the circuit breaker on.
3. Roll a ball past the ball detect to verify correct operation. (It is suggested trying both gutters and center of lane.)

4. Manually trip the rake at the rake trip-latch (shotgun) so it lowers without an electronic ball detect signal to verify that the automatic backup system operates.
5. Press the cycle buttons on the ball return rack and the rear of the pinsetter to verify correct operation.
6. Check the safety shut-off system by placing a box or other object under the rake to prevent it from dropping completely. Block the rake in a way that it can slide off the object easily if the rake starts to sweep. Trip the rake mechanically at the rake trip-latch (shotgun) without triggering the ball detect. (If the ball detect beam is interrupted for a long period of time, as with the object blocking the rake, the pinsetter will not be cycled by the ball detect until the beam is again reflected back to the ball detect.) The motor should shut off before the start of the cycle. If the motor does not shut off, check the adjustment of the rake up and rake down microswitches.

 **NOTE:**

When the safety system shuts off the pinsetter motor, it turns on the indicator light on the control board until the system is reset. Reference the figure titled Control Board Location Diagram. You can only reset the system by turning off the main breaker, waiting ten seconds, and then turning it back on.



WARNING!




Do not cycle the pinsetter by manually lifting the clutch cycle solenoid plunger or pushing the stop arm out from under the clutch lever, as this is not a normal condition and this bypasses the safety shut-off system.

7. After the pinsetter is ready for a new cycle, block the rake as in step 6 above. Check the other part of the safety shut-off system by pressing the reset button or break the ball detect beam so the pinsetter starts to cycle before the rake is tripped and lowers the rake with the rake lift cam. The motor should shut off before the rake starts sweeping.
8. If all checks are **ok**, turn the circuit breaker off, make sure the correct wires are routed correctly, and replace the electrical box cover. If all checks are **not ok**, recheck the installation instructions and refer to the following *Troubleshooting* section.
9. Attach the supplied adhesive-backed instructional label onto the outside of the electrical control box cover to indicate that the pinsetter is now controlled by the Electronic Pinsetter Trigger/Control System. Basic troubleshooting steps are also indicated on this label.

Troubleshooting

Proper troubleshooting of any system requires a clear understanding of the operating sequence of the system. A functional flow chart is provided in the figure titled *Functional Flow Chart*, along with a description of the Electronic Pinsetter Trigger/Control System operation. It is helpful to understand that this system checks the position of the rake at different times, and may either add extra time delays or shut off the pinsetter motor if the rake is not completely down at proper times.

The following troubleshooting guide gives the most common problems and solutions:

Solution No.	Problem 1: Pinsetter Will Not Cycle
1	Press the reset button. If it still does not cycle, turn off the circuit breaker, wait ten seconds, then turn it back on to reset the microprocessor.
 NOTE: <i>The reset button will not cycle the pinsetter if the rake is not up. The only exception to this occurs when the rake is dropped while the pinsetter is turned off. The reset button will recycle the pinsetter in this situation, but there will be a 30 second delay from the time the rake is dropped, to when the pinsetter will recycle. Before respotting pins, it is suggested to shut off the circuit breaker instead of the mechanic's switch so the pinsetter will recycle without delay when the circuit breaker is turned back on.</i>	
2	Check that the ball detect is adjusted correctly. If the ball detect LED is on when nothing is blocking the beam, it needs to be readjusted.
 NOTE: <i>If the ball detect beam is interrupted for a long period of time or if it is misaligned so the LED is constantly on, the pinsetter will not cycle until the beam is again reflected back to the ball detect. If there is no time to realign the ball detect or you suspect that it is damaged, temporarily disconnect the detector cable. The control board will then function as a normal time delay module triggered by the rake drop until the ball detect problem can be corrected.</i>	
 WARNING! <i>The motor must be disconnected while making <u>any</u> adjustments to the ball detect, because the ball detect can trigger the pinsetter.</i>	
3	Check that the safety shut-off indicator on the on the control board is not on. If this indicator is on and the pinsetter motor was not shut off, reference Problem 2.
4	Check that the fuse on the control board is not blown. If it is, check for a short in the 24 volt system (reset button, trigger switch, mechanic's switch, etc.) and repair. Replace fuse with part no. 11-685053-000, 1 amp, fast blow, 5 mm x 20 mm fuse.

**Solution
No.**

**Problem 1: Pinsetter Will Not Cycle
(continued)**

- 5 Check for damaged ball detect, damaged cable, or poor connection at either end of cable. Problems may not be obvious. Best check is to disconnect ball detect cable at control board and reset the system by turning the circuit breaker off, then on again. If system then cycles with reset button or rake drop, you have verified the main control board is working properly. Check and replace ball detect or cable as necessary.



WARNING!

Turn off the circuit breaker and disconnect the high voltage input power cord before touching anything inside electrical control box. Lethal voltages are present!



NOTE:

If spare control board is not available, a standard time delay module can be installed as a temporary solution. A jumper (solid 22 gauge wire stripped 1/4" at both ends) will need to be installed in the safety lockout wire harness connector and taped off until a replacement control board is installed.

**Solution
No.**

**Problem 2: Safety Shut-off System Does Not Shut Off the
Pinsetter Motor When the Rake is Blocked**

- 1 Check for a 1/16" gap between rake triggering microswitch and the actuator lever when rake is in the raised position.
- 2 Check that the rake down microswitch actuator lever just clears the switch plunger when the rake is completely lowered, but has not started sweeping.
- 3 Make sure the safety lockout wire harness is hooked in series with the rear mechanic's switch SW1. This should be wire #20. Do not connect to any bypass switch. If the safety shut-off indicator is on but the pinsetter motor is not off, pull the safety lockout wire harness connection off the control board. If this shuts off the motor, the wiring is correct and the microprocessor control board may be faulty. If this does not shut off the motor, the lockout wire is still not connected in series with the rear mechanic's switch SW1. Reconnect the safety lockout wire harness to the control board and trace the rear mechanic's switch SW1 wire with a continuity tester.
- 4 If the pinsetter motor cycles on and off when the rake is blocked, check that the control board has power (24 volts A/C) across terminals #13 and #14 when the circuit breaker is on and the mechanic's switch is off. Make sure wire #54 is wired correctly on the motor start relay terminals.

**Solution
No.**

Problem 3: Pinsetter Motor Shuts Off

- 1 Check for anything blocking the rake from dropping and correct as necessary.



NOTE:

If the rake is held between the fully raised and lowered position by the rake lift cam (such as after clearing a deck jam), it will be necessary to rotate the gear box drive pulley to move the rake to the fully raised or lowered position before turning on the circuit breaker. Or trip the rake trip-latch (shotgun) to lower the rake.

- 2 Check that there is a 1/16" gap between the rake triggering microswitch and the actuator lever when the rake is in the raised position (especially on Model A units).
- 3 Check that the rake down microswitch actuator lever clears the switch plunger when the rake is completely lowered, but has not started sweeping.
- 4 Check for any loose wire connections or faulty microswitches.
- 5 If the pinsetter locks-out when the reset or cycle button is pressed, make sure the N.C. wire of the microswitch on the rake shaft is disconnected and taped off. It is usually the bottom wire on the switch.



NOTE:

To reset the system after any safety shut-off, turn off the main circuit breaker, correct the problem that caused the shut-off, and turn the circuit breaker back on.

- 6 Check for a deck or turret jam, or some other problem beyond the Electronic Pinsetter Trigger/Control System.

**Solution
No.**

Problem 4: Pinsetter Cycles Continuously or Unexpectedly

- 1 Check that the ball detect is aligned correctly. Also, check that nearby detectors are aligned and scorer detectors are spaced at least 4" from trigger detector. If the ball detect LED is on when nothing is blocking the beam, it needs to be readjusted. Make sure adjusting screws are tight enough to pull sensor close to opening, which keeps internal springs tensioned. Also, check for loose sensor or reflector mounting and tighten as required. Disconnect the ball detect cable until the problem can be solved.

- 1 Test operation of the Take Data Relay by actuating the scorer ball detect and then pressing the reset button on the ball rack. The scorer should display the score immediately and not wait until the pinsetter reaches 44° or 144°. If this test is failed, recheck the Take Data Relay for proper wiring, proper diode function, etc., and repair or replace as required. If constant scanning of the Take Data Relay is a problem, disconnect the red scorer wire from the control board.

Functional Description of the Electronic Pinsetter Trigger/Control System

i **NOTE:**

Reference the figure titled Functional Flow Chart for the functional flow diagram.

The Electronic Pinsetter Trigger/Control System operation starts with a safety shut-off check after the main circuit breaker is turned on. If the rake is caught between the raised and lowered positions, the 24 volts to the motor start relay coil is shut off. This disables the motor start relay and the motor contactor, which shuts off the pinsetter motor immediately. When the safety system shuts off the pinsetter motor, it turns on the indicator light on the control board until it is reset.

i **NOTE:**

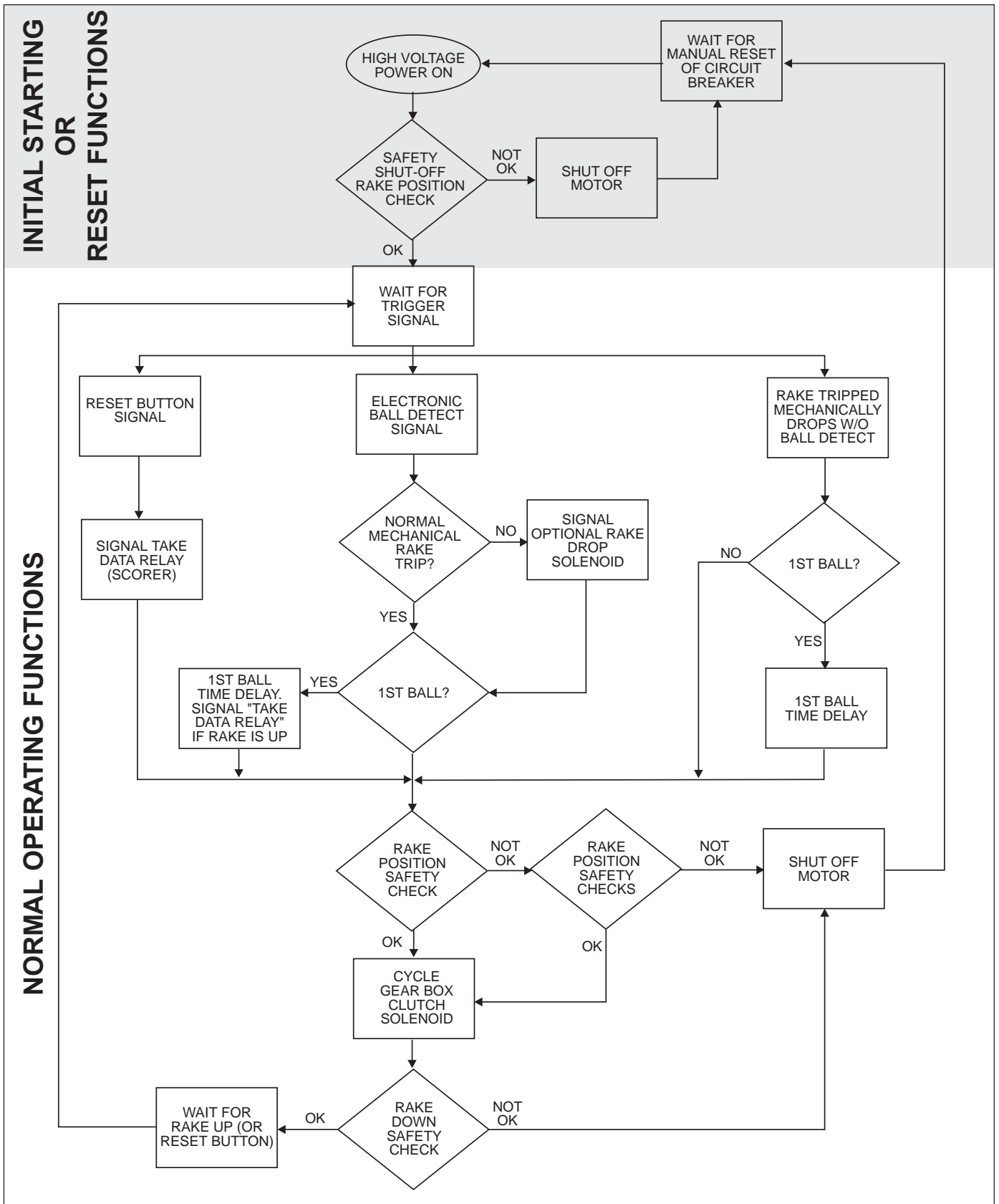
To reset the system after any safety shut-off, turn off the main circuit breaker, correct the problem that caused the shut-off, and turn the circuit breaker back on. The circuit breaker should remain off for at least five seconds to allow the electrical components to discharge and properly reset.

The system next waits to be triggered in one of three different ways. Normally, the system first receives a signal from the ball detect as a ball is delivered down the lane. The system can also be triggered by the reset button or by the rake being tripped mechanically without a ball detect signal. As you can see in the figure titled *Functional Flow Chart*, the system follows different paths depending on the first type of trigger it receives. After the system receives the first trigger signal, it ignores any additional trigger signal until the current cycle has been completed. We will follow a normal situation where the system is triggered by the ball detect signal first.

After the ball triggers the ball detect, it normally has enough momentum to mechanically trip the rake. If the rake drop is not tripped mechanically, a signal is sent to the optional rake drop solenoid (if installed).

If the ball is on the first ball cycle, the system delays per ABC regulation. Then, if the rake is still up, a signal is sent to the scorer Take Data Relay Kit (if installed).

If the ball is on the second ball cycle, the electrical time delay is shorter because the deck doesn't lower on the standing pins.



Functional Flow Chart

Next, the system checks to make sure the rake drop has not been blocked before the gear box clutch solenoid is triggered to start the pinsetter cycle. (The clutch is cycled if the rake is either fully raised or lowered.) If the rake is blocked between the raised and lowered positions, the system delays slightly as it checks the rake position a few more times. If the rake drops completely within three seconds, the clutch will be cycled. If not, the motor will be shut off.

After the cycle has started, the system again checks if the rake is completely down. (If the rake did not get tripped mechanically or with the optional rake drop solenoid, the rake is lowered after the start of the cycle via the rake lift cam.) If the rake does not lower completely via the cam, the motor is shut off before the rake starts to sweep. After the rake is down, the pinsetter completes the cycle, waits for the rake to return to the raised position, and then is ready for a signal to start a new cycle.

When the system receives a signal from someone pressing the reset button, it signals the Take Data Relay and then checks to see that the rake is not blocked before cycling the gear box clutch cycle solenoid. A second safety check occurs after the start of the cycle to assure that nothing blocks the rake if it is lowered by the rake lift cam. To prevent “banana stops,” the reset button will not cycle the pinsetter if the rake is not up. The only exception to this occurs when the rake is dropped while the pinsetter is turned off. The reset button will recycle the pinsetter in this situation, but there is a 30 second delay from the time the rake is dropped to when the pinsetter will recycle. (Normally there is at least a 30 second period between the rake dropping and the pinsetter being turned back on, so there is no delay noticed by the bowler.)

When the system senses that the rake has been tripped mechanically without a ball detect signal, the system checks that the rake drops completely before signaling the gear box cycle solenoid and proceeding with the normal function. If the ball detect is disconnected from the system (or if the system is configured without the electronic ball detect), the new control board will continue to function from the rake trigger switch or reset button signals with all the added safety features provided by the rake down microswitch.