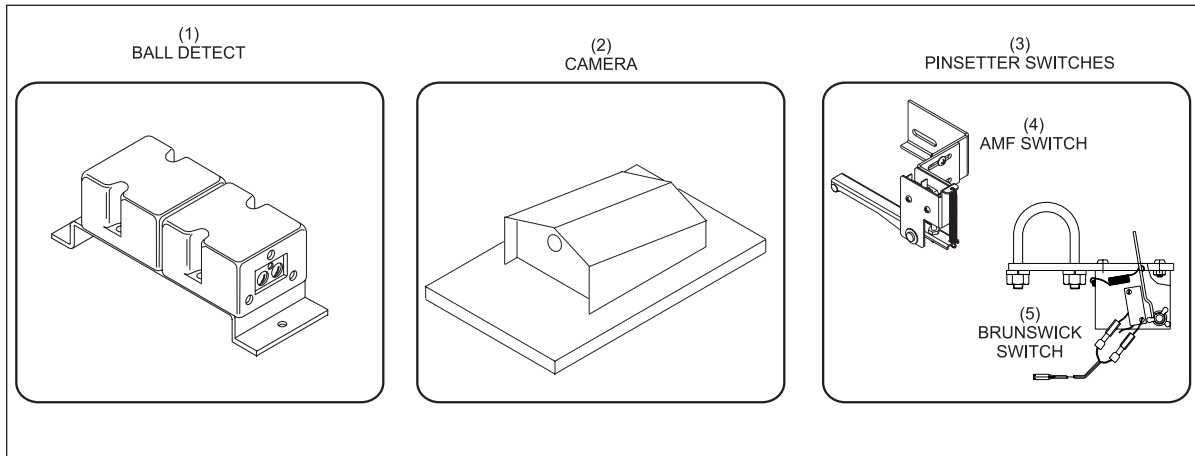

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GENERAL DESCRIPTION

The Sync camera assembly is an electrical/optical device used with non-GS series pinsetters to count standing pins, control on/off and machine reset for a pair of pinsetters, and interface the foul units to the scoring system. The system uses a camera, ball detect assemblies, and special pinsetter modifications to accomplish this. These components connect to the Peripheral Controller which uses the signals to determine pincount. Refer to figure titled *Sync Camera Scoring Components*.



Sync Components

(1) BALL DETECT
(4) AMF SWITCH

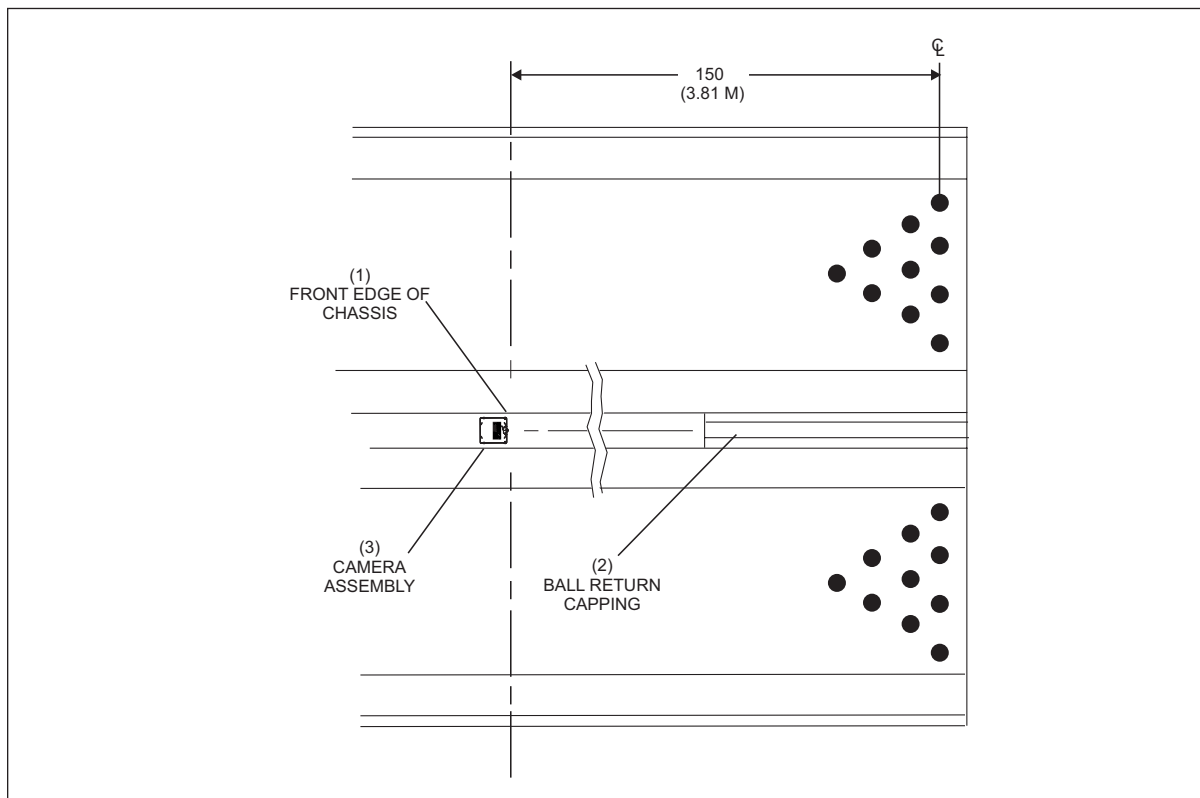
(2) SYNC CAMERA
(5) BRUNSWICK SWITCH

(3) PINSETTER SWITCHES

The Sync camera chassis is mounted on the ball return capping of a lane pair so that the front edge of the unit is approximately 150" (3.81 m) from the center of the last row of pins. Refer to figure titled *Camera Position*. The assembly uses a single camera to take a picture of the pit area of both pinsetters. The picture is sent by the Camera Adapter Board to the Peripheral Controller where it is analyzed. During the analysis, a portion of the picture is searched for bright reflections and shapes resembling pins. This is compared to a stored calibration to determine if the reflection level for the pins is above a reference brightness level set by the user through the control desk. Any reflection level that is above the set level is counted as a standing pin.

An infrared ball detect is mounted near the pinsetter and a switch is mounted on the pinsetter to monitor the rake (sweep) drop are used to ensure that the unit scores only after a ball has been thrown and the pinsetter has triggered. (A ball detect signal will not be accepted unless the switch is actuated.) Scoring occurs after a the rake (sweep) switch contacts have closed and a user determined time delay has passed. In the event that the pinsetter does not cycle on its own, the system will score then cycle the pinsetter using the machines reset circuit.

Centers upgrading from a Vector scoring system can use their Vector camera and related components to supply pin images to the Peripheral Controller. In these situations, the Distribution board is removed from the camera inclosure and replaced by the Camera Adapter Board.



Camera Position

(1) FRONT EDGE OF CHASSIS (2) BALL RETURN CAPPING (3) CAMERA ASSEMBLY

The Sync camera consists of the following components:

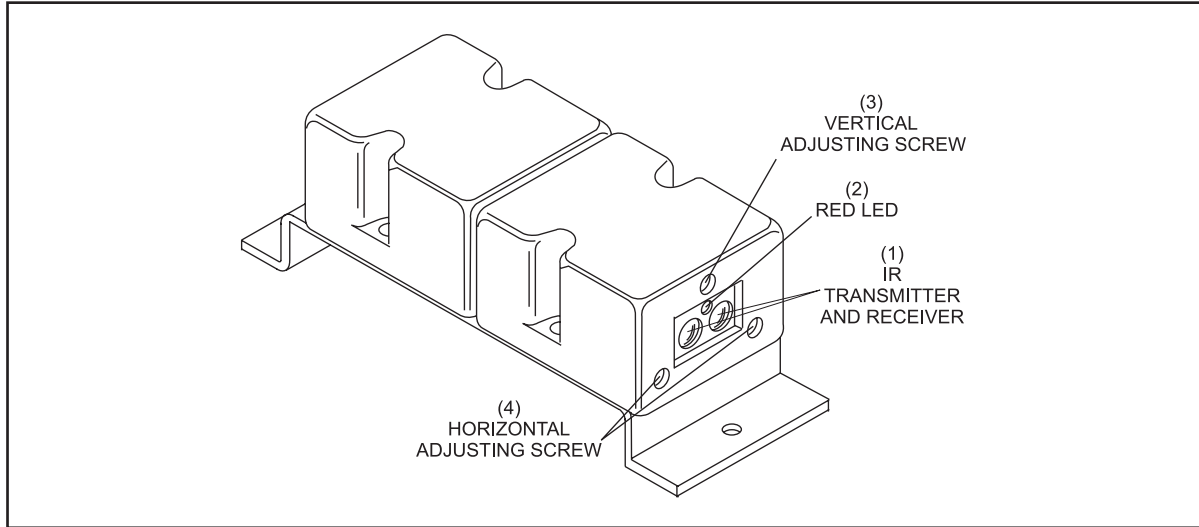
Ball Detect - The ball detect is an infrared device that senses when a ball has been thrown. The signal from the ball detect tells the system when to begin the scoring cycle for a lane.

Pinsetter Modifications - A sweep (rake) switch is added to the pinsetter to make sure the camera takes the picture at the proper time during the pinsetter cycle. Also connections into the pinsetters circuits allows auto triggering of the pinsetter, special pinsetter cycles for No Tap or 3rd ball-10th frame situations, and AMF short cycle.

Camera Assembly - The Camera Assembly contains the pin camera and the Camera Adapter Board. It connects to the Peripheral Controller via a power cable and a video coax cable.

BALL DETECTOR

The Sync system uses a ball detector that is an infrared sensing device. The ball detector unit is made up of two infrared transmitters and receivers, one for each lane. LEDs on the unit indicate power, signal stability and level. The provided adjustment allow the user to adjust the ball detection sensitivity. Refer to figure titled *Ball Detector*.



Ball Detector

- (1) IR TRANSMITTER AND RECEIVER
- (4) HORIZONTAL ADJUSTING SCREW

- (2) RED LED

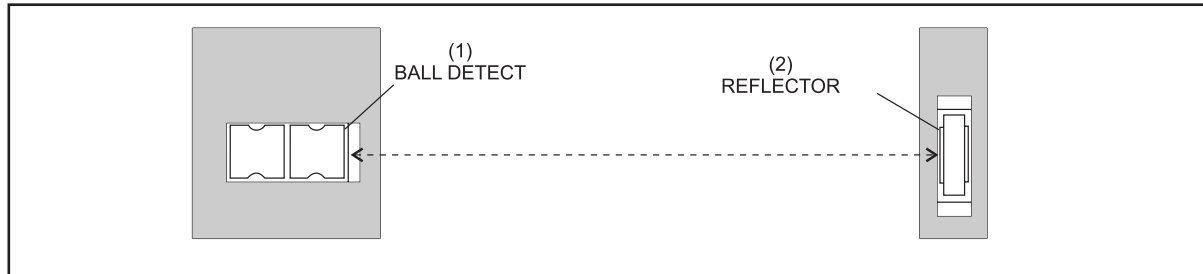
- (3) VERTICAL ADJUSTING SCREW

Ball Detect Calibration Instructions



WARNING: Before adjusting the ball detect, turn the stop/run switches on the pinsetter to the stop position. Failure to do this may result in personal injury caused by pinsetter cycling when the ball detect's beam is interrupted or the pinsetter is turned on at the Control Desk.

The ball detect adjustment contains three screws that are used to align the units infrared beam with a reflector opposite side of the lane. Refer to the figure titled *Ball Detect and Reflector*.

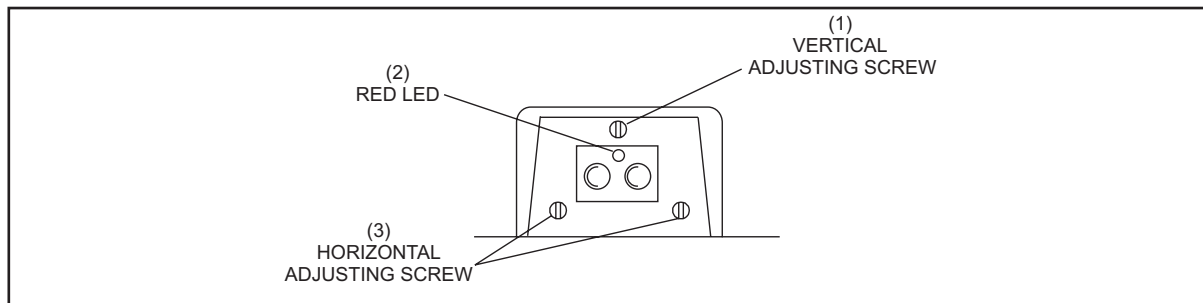


Ball Detect and Reflector

(1) BALL DETECT

(2) REFLECTOR

The red LED (Light Emitting Diode) mounted on the ball detect is “on” when the beam is not being received back from the reflector. This indicates a ball or some object is in the beam’s path or there is an alignment problem. Refer to the figure titled *Ball Detect Adjusting*



Ball Detect Adjusting.

(1) VERTICAL ADJUSTING SCREW (2) RED LED

(3) HORIZONTAL ADJUSTING SCREW

1. 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 before and after adjusting.
2. Cover the reflector with a dark non-reflective object. The red LED should be lit indicating the beam is not being received.
3. Hold an unmounted reflector in your hand and move it above, below and around the mounted reflector until the red LED goes “off.” This will indicate the position of the beam and guide you in your adjustment.
4. Using the vertical and horizontal adjusting screws (refer to the figure titled *Ball Detect Adjusting*) move the beam until it is aimed exactly on the center of the mounted reflector.

PINSETTER MODIFICATIONS

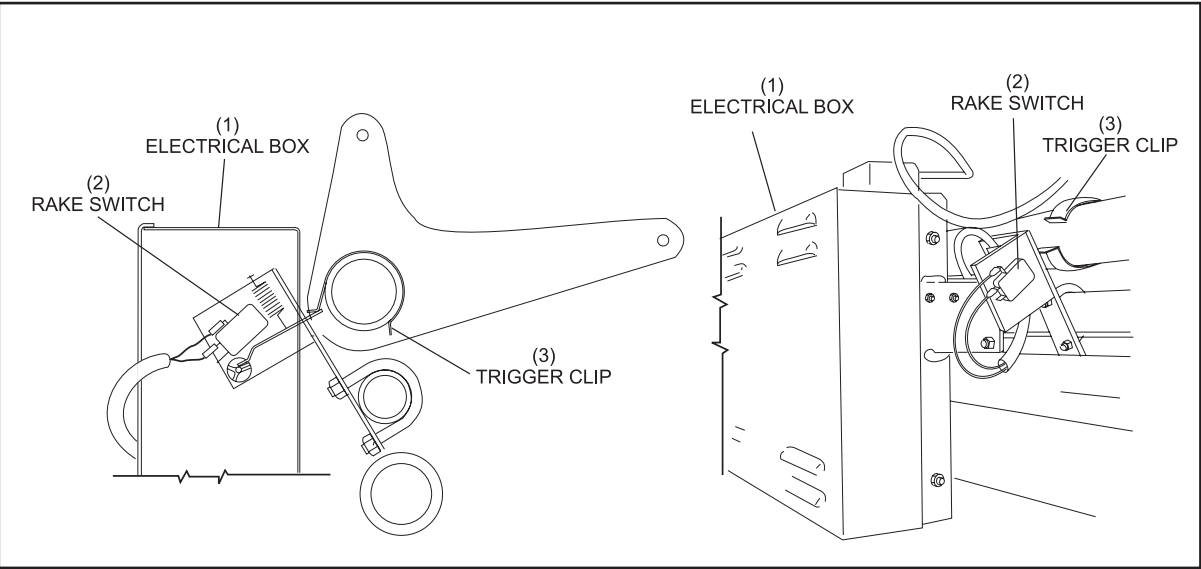
Sweep (Rake) Switch

The sweep (rake) switch ensures that the camera takes the picture only after the pinsetter triggers. If a ball detection has occurred, the opening of sweep switch, causes the camera to take a picture after a preset delay. Additional ball detect signals will be ignored when the switch is opened. Refer to figures titled *Switch Wiring Chart*, *Brunswick Rake Switch* and *AMF Sweep Switch*.

Sweep (Rake) Switch Wiring

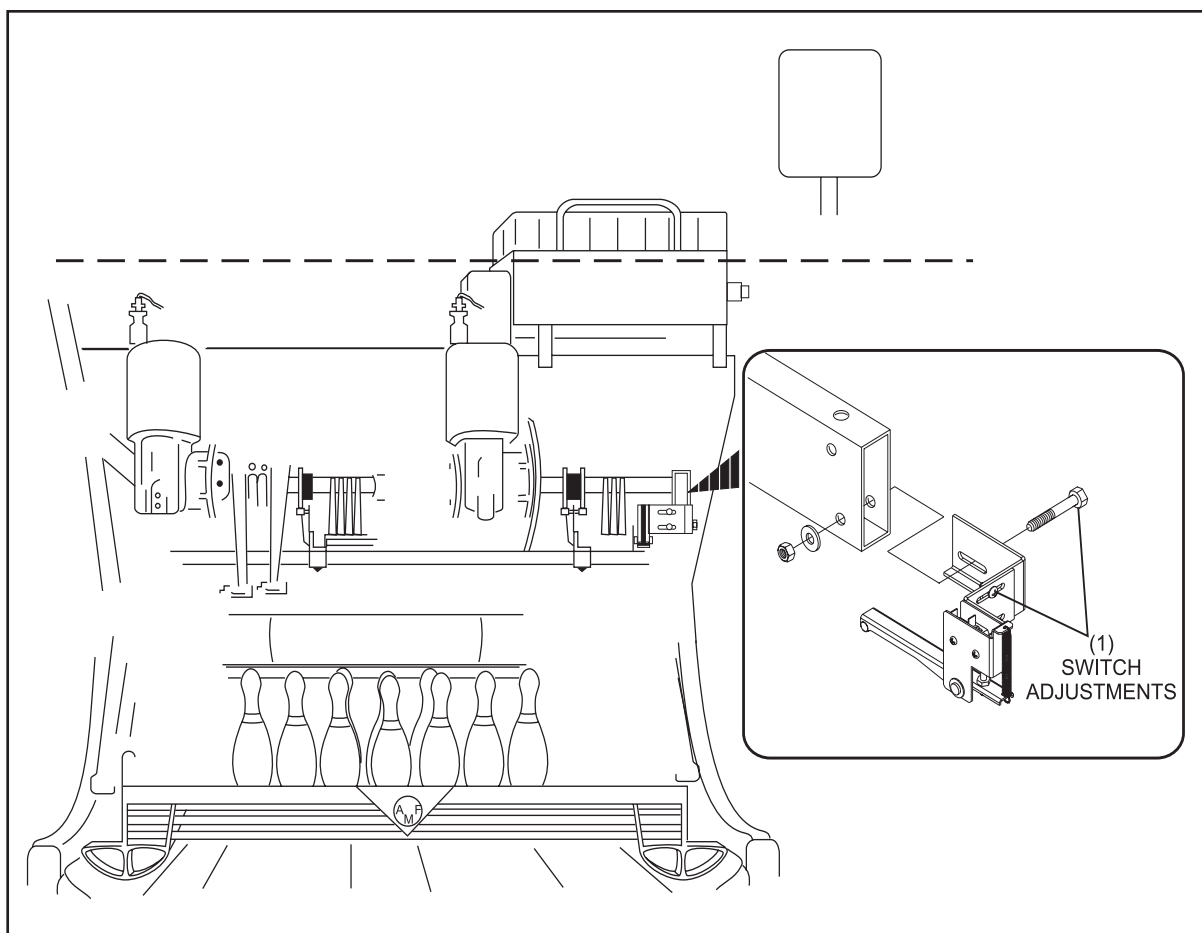
INSTALLATION	WIRING
Brunswick Pinsetters - Rake Switch	Common (COM), Normally Closed (NC)
AMF Pinspotters - Sweep Switch	Common (COM), Normally Closed (NC)

Switch Wiring Chart



Brunswick Rake Switch

- (1) ELECTRICAL BOX
- (2) RAKE SWITCH
- (3) TRIGGER CLIP



AMF Sweep Switch

(1) SWITCH ADJUSTMENTS

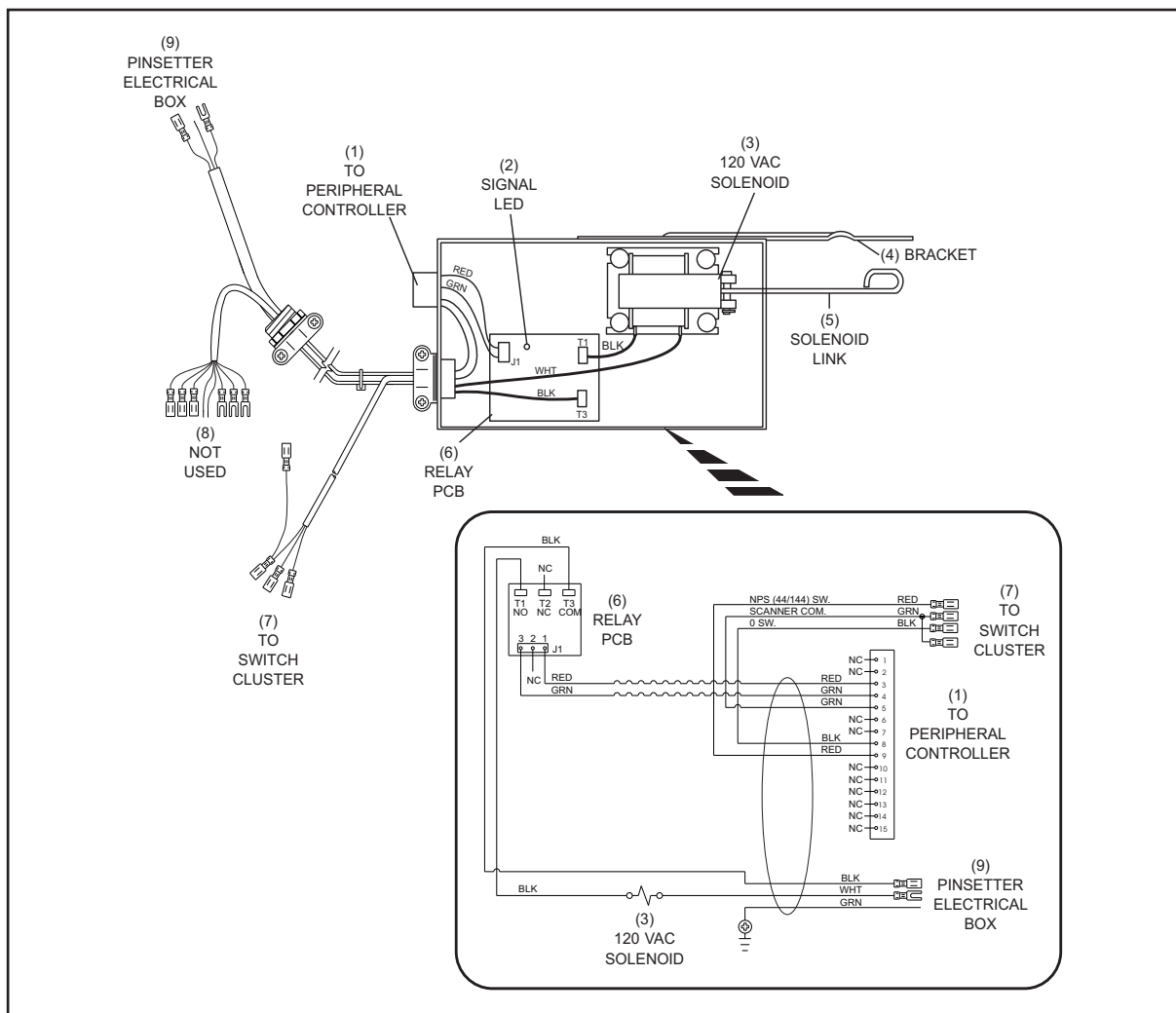
OPTIONAL BRUNSWICK A-2 PINSETTER MODIFICATIONS

Centers that want proactive cycling for foul, no tap, and 3rd ball 10th frame situations, can purchase the New Pins Solenoid kit. The kit includes the following:

1. New Pins Solenoid
2. Cycle Link
3. Switch Cluster
4. Associated wiring and cables

New Pins Solenoid and Cycle Link

The New Pins Solenoid is used to switch the pinsetter to second ball in the event of a first ball foul, third ball, tenth frame or a No Tap strike to eliminate the bowler's need to push the reset button. Refer to the figure titled *New Pins Solenoid*.



New Pins Solenoid

- | | | |
|------------------------------|-------------------|------------------------------|
| (1) TO PERIPHERAL CONTROLLER | (2) SIGNAL LED | (3) 120 VAC SOLENOID |
| (4) BRACKET | (5) SOLENOID LINK | (6) RELAY PCB |
| (7) TO SWITCH CLUSTER | (8) NOT USED | (9) PINSETTER ELECTRICAL BOX |

To make the New Pins Solenoid actuate on a foul, the following conditions must occur:

1. Pinsetter is on first ball.
2. A foul signal occurs.
3. A ball detect signal occurs.

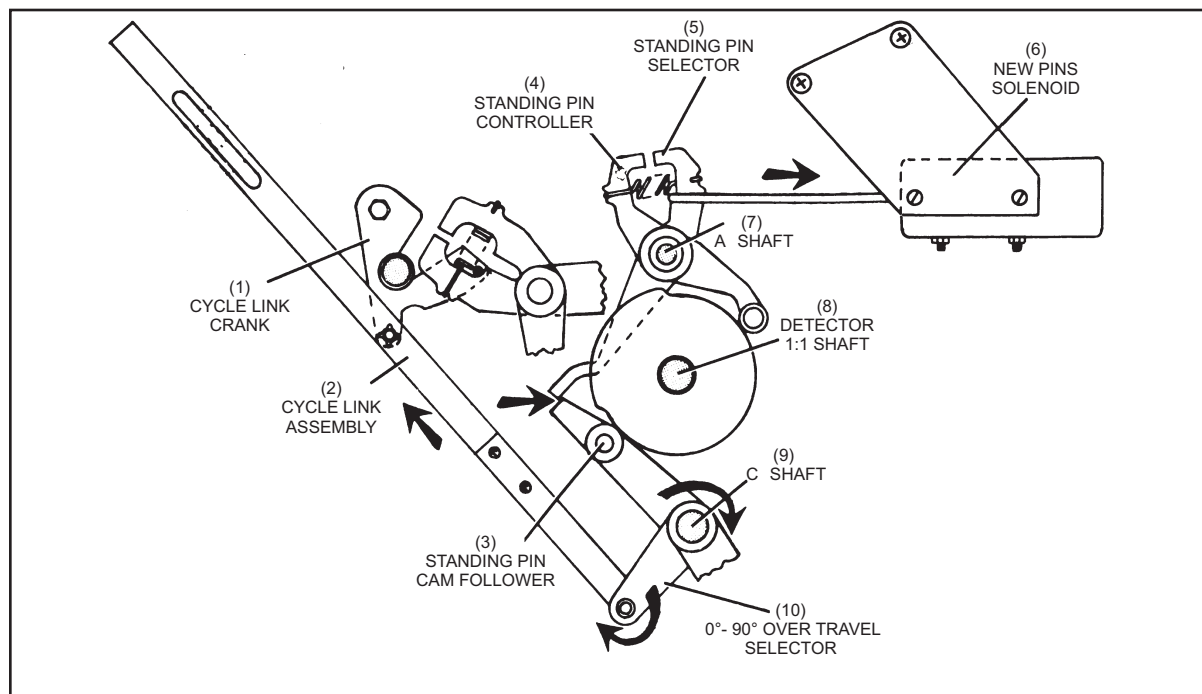
If the signals are present, the New Pins Solenoid will be energized two times during the pinsetter cycle. After the time delay for scoring the New Pins Solenoid will energize causing the pinsetter to switch to second ball and sweep all standing pins. It energizes again when the zero degree switch on the switch cluster is engaged when the pinsetter completes its cycle.

For third ball, tenth frame, the New Pins Solenoid will energize when the zero degree switch on the switch cluster is engaged at the end of the pinsetter cycle, when the bowler scores a spare or a double in the tenth frame. This will automatically put the pinsetter in a second ball mode for the final ball of the game.

For No Tap situations, the New Pins Solenoid energizes after the time delay for scoring to cause the pinsetter to switch to second ball, sweep all pins from the pin deck, and reset to a full rack first ball for the next bowler.

Cycle Link Operation

The New Pins Solenoid signal is received from the Peripheral Controller for 1st ball foul, third ball tenth frame and no tap cycles. When the New Pins Solenoid is energized, it pulls the standing pins selector clockwise, unblocking the standing pins cam follower. The standing pins cam follower goes into the low of the cam causing the "C" shaft to turn clockwise. The first/second ball switch lever, attached to the "C" shaft, rotates clockwise to switch the ball light to second ball. Refer to the figure titled *New Pins Solenoid Activated - Cycle Link Raised*.

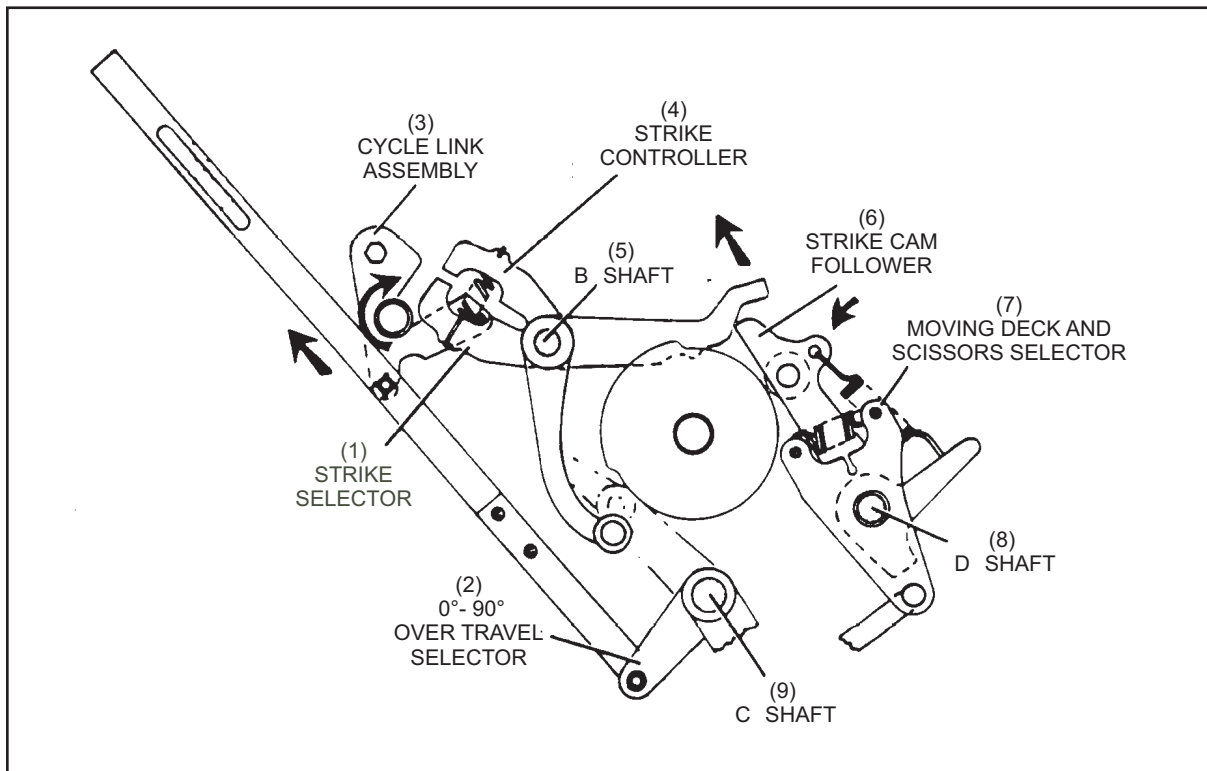


New Pins Solenoid Activated - Cycle Link Raised

- | | | |
|---------------------------------|---------------------------|-------------------------------|
| (1) CYCLE LINK CRANK | (2) CYCLE LINK ASSEMBLY | (3) STANDING PIN CAM FOLLOWER |
| (4) STANDING PIN CONTROLLER | (5) STANDING PIN SELECTOR | (6) NEW PINS SOLENOID |
| (7) "A" SHAFT | (8) DETECTOR 1:1 SHAFT | (9) "C" SHAFT |
| (10) 0°-90° OVERTRAVEL SELECTOR | | |

The 90° overtravel hook selector is also attached to the “C” shaft, and as it turns clockwise, it forces the cycle link up. The upward motion of the cycle link turns the cycle crank clockwise around the “E” shaft. A pin in the cycle crank turns the strike selector in a counterclockwise direction unblocking the strike cam follower. The strike cam follower goes into the low of the timing cam rotating the “D” shaft counterclockwise. The moving deck/scissors selector rotates counterclockwise pulling the adjustable scissors link forward, rotating the moving deck/scissors latch counterclockwise to block the cam follower, and freeing the moving deck cam follower.

This prevents the deck from picking up any pins standing on the pin deck during the detection stroke. The rake sweeps all the pins and the deck will then set ten new pins on the lane surface. The New Pins Solenoid will fire once more at 360° to place the pinsetter in second ball. Refer to the figure titled *New Pins Solenoid Activated - Strike Selected*.

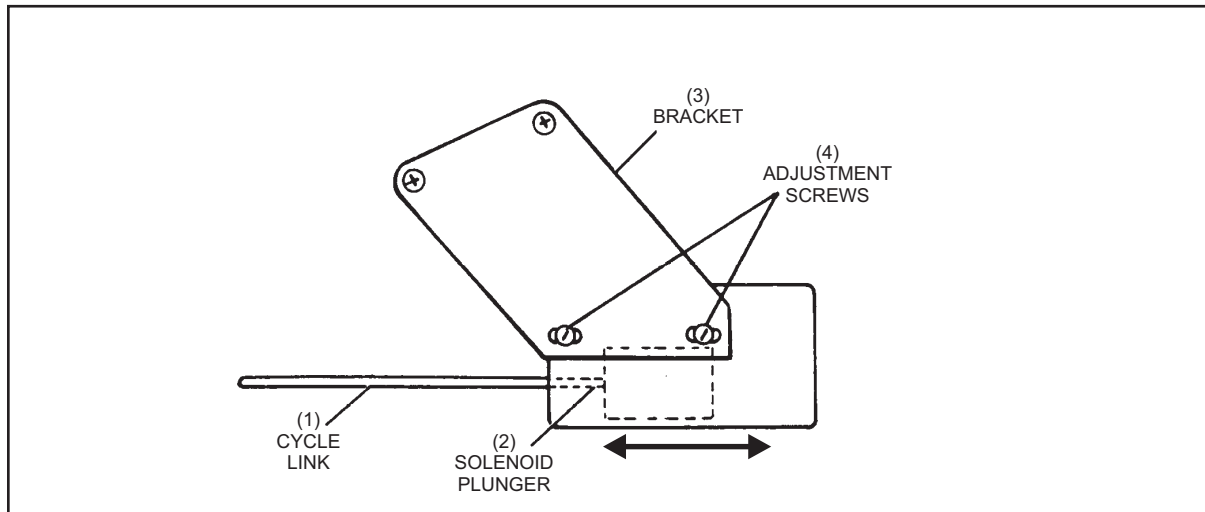


New Pins Solenoid Activated - Strike Selected

- | | | |
|---------------------------------------|--------------------------------|--------------------------|
| (1) STRIKE SELECTOR | (2) 0°-90° OVERTRAVEL SELECTOR | (3) CYCLE CRANK ASSEMBLY |
| (4) STRIKE CONTROLLER | (5) "B" SHAFT | (6) STRIKE CAM FOLLOWER |
| (7) MOVING DECK AND SCISSORS SELECTOR | (8) "D" SHAFT | (9) "C" SHAFT |

Adjustments

The New Pins Solenoid (NPS) is adjusted by moving the NPS box toward or away from the pinsetter detector. This is made possible by two elongated holes drilled into the mounting bracket to which the box is attached. Refer to the figure titled *New Pins Solenoid Mounting Bracket*.



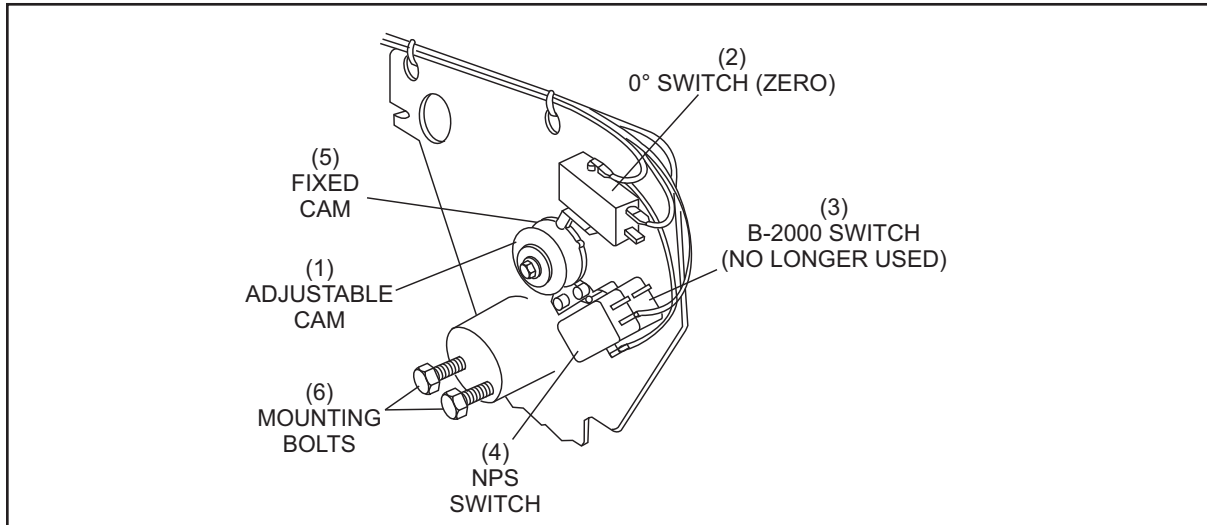
New Pins Solenoid Mounting Bracket

- (1) CYCLE LINK (2) SOLENOID PLUNGER (3) BRACKET
(4) ADJUSTMENT SCREWS

1. Cycle the pinsetter to first ball.
2. Loosen the screws that mount the NPS box to the bracket.
3. Hold in the plunger solenoid and move the NPS box away from the pinsetter until the pinsetter switches to second ball.
4. Tighten the NPS box mounting screws.
5. Cycle the pinsetter back to first ball.
6. Verify the cycle link is free of any binds and has plenty of “play.”
7. Verify the New Pins Solenoid operation by creating a first ball foul, third ball tenth frame, or No Tap situation.

Switch Cluster

The Switch Cluster is a metal plate containing switches and cams mounted on the pinsetter's detector so that its nylon gear engages with the detector's 1:1 gear. The nylon gear turns the cams which are timed to close the switches at proper times during the pinsetter cycle. Refer to the figure titled *Brunswick A-2 Pinsetter Switch Cluster*.



Brunswick A-2 Pinsetter Switch Cluster

- | | | |
|--------------------|----------------------|------------------------------------|
| (1) ADJUSTABLE CAM | (2) 0° SWITCH (ZERO) | (3) B-2000 SWITCH (NO LONGER USED) |
| (4) NPS SWITCH | (5) ADJUSTABLE CAM | (6) MOUNTING BOLTS |

NPS Switch

Although the NPS switch closes twice per pinsetter cycle, only the first closure is needed and used in the Sync scoring system. The first switch closure informs the scoring system that the pinsetter has cycled to a point where the new pin solenoid should not be energized. The cam that actuates the switch is positioned so that it closes the switch at approximately 66° into the pinsetter cycle or at a point where the deck is at the top of the pins.

0° Switch

The 0° switch closes when the pinsetter completes its pinsetter cycle. The switch closure is used during foul and third ball, tenth frame cycles to put the pinsetter on 2nd ball.

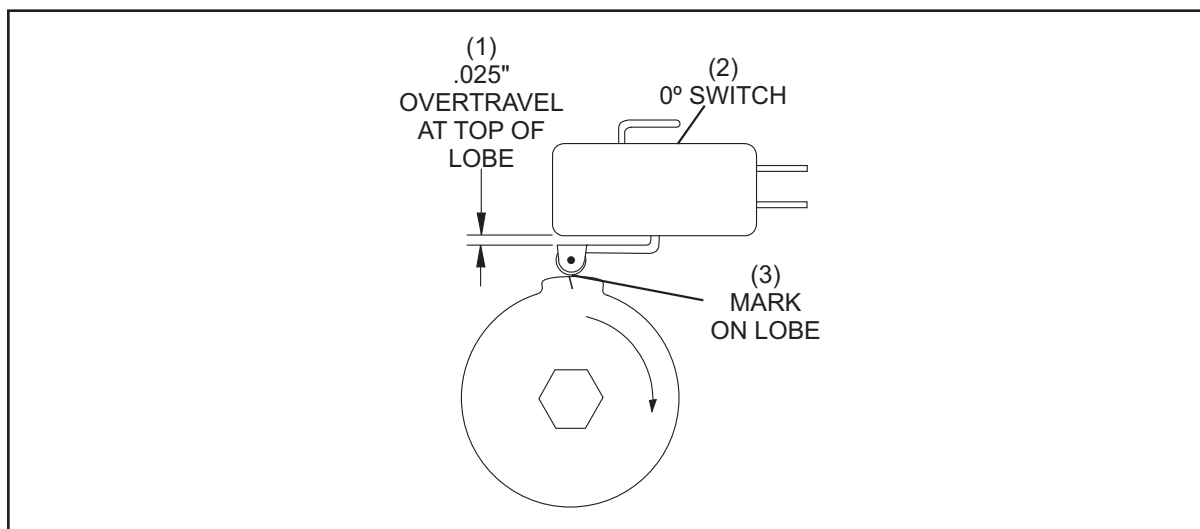
Switch Cluster Adjustments

The Switch Cluster contains three switches. Two of these switches, the 0° and the NPS switch are used with the Sync scoring system to provide timing for the New Pins Solenoid. The third switch was used only for timing of the ball director on the Systems 2000 Ball Rack.

Correct adjustment of the NPS switch is necessary to ensure the solenoid does not energize too late into the pinsetter cycle while proper adjustment of the 0° ensures that the pinsetter will switch to second ball at the end of the pinsetter cycle. Both switch adjustments should be checked after clutch adjustment, detector repair, or any other change to the timing of the pinsetter.

0° Switch

The lobe of the inside cam on the Switch Cluster must actuate the 0° switch when the pinsetter completes its cycle and is at 0°. Refer to the figure titled 0° Switch Adjustment.



0° Switch Adjustment

- (1) .025" OVERTRAVEL AT TOP OF LOBE (2) 0° SWITCH (3) MARK ON LOBE

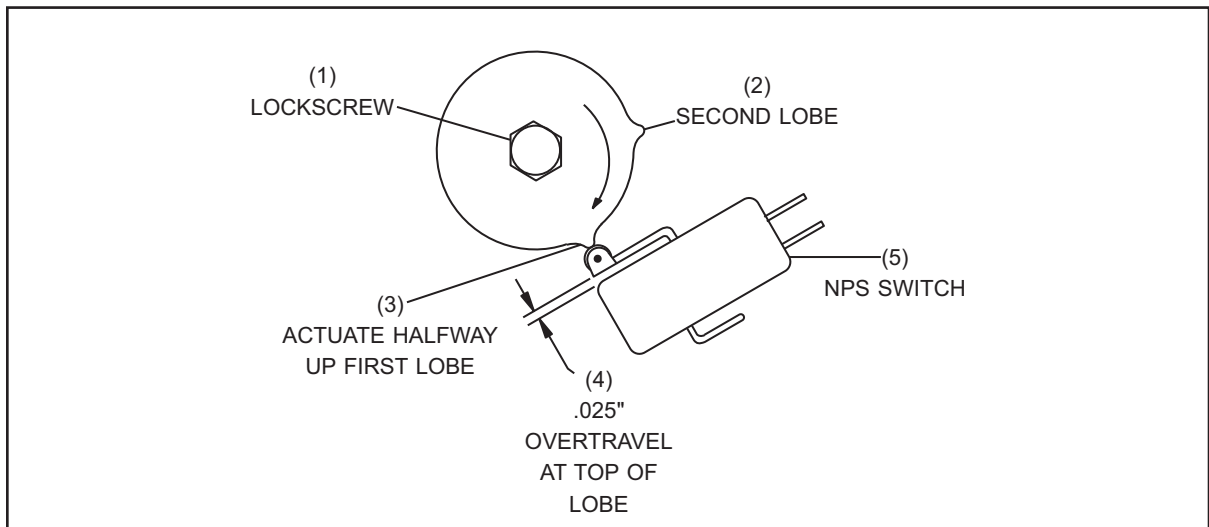
Adjusting the 0° cam is done by removing the Switch Cluster Assembly from the detector's 1:1 gear and repositioning the cam to actuate the 0° switch. (The pinsetter must be at 0°.) To adjust the switch perform the following steps:

1. Remove the switch cluster from the detector.
2. Position the cam and switch so the switch is activated at the scribe mark located near the middle of the lobe. Reference the figure titled 0° Switch Adjustment. An overtravel dimension of .025" is necessary at the top of the lobe to prevent damage to the switch.
3. Replace the cluster on the detector making sure that the cam does not change position.

NPS Switch

To adjust the NPS switch, perform the following steps. Refer to the figure titled *NPS Switch Adjustment*.

1. Cycle the pinsetter to a full rack first ball.
2. Lower the pinsetter deck until it is approximately 15" above the pindeck (at standing pin height).
3. Loosen the lockcrew holding to outer cam to the shaft.
4. Rotate the outer cam clockwise until the roller of the switch lever is positioned halfway up the front edge of the outer cam.
5. Tighten the cam lockcrew.
6. Cycle the pinsetter so that the switch is at the top of the lobe.
7. Loosen the NPS switch mounting screws.
8. Adjust the switch so that it activates and there is approximately .025" gap between the switch and the switch lever to prevent switch damage.
9. Tighten the switch mounting screws.



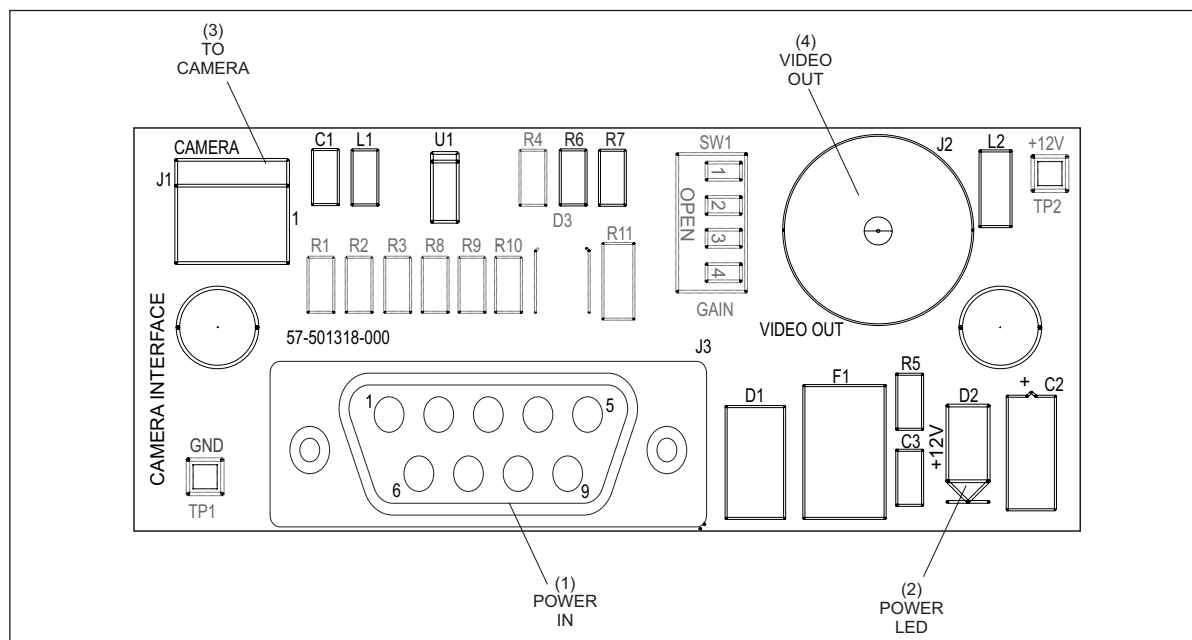
NPS Switch Adjustment

- | | | |
|-------------------------------------|-----------------|-----------------------------------|
| (1) LOCKSCREW | (2) SECOND LOBE | (3) ACTUATE HALFWAY UP FIRST LOBE |
| (4) .025" OVERTRAVEL AT TOP OF LOBE | (5) NPS SWITCH | |

CAMERA ASSEMBLIES

The camera assembly consists of a camera and Camera Adapter Board. The adapter board provides the connections needed to power the camera and send the pin images from the camera to the Peripheral Controller via a coaxial cable.

Centers upgrading from a Vector scoring system can use their Vector camera assemblies to supply pin images to the Peripheral Controller. In these situations, the Distribution board is removed from the camera inclosure and replaced by the Camera Adapter Board. Refer to the figure titled *Camera Adapter Board*.



Camera Adapter Board

The function of the connections on the Camera Adapter Board are:

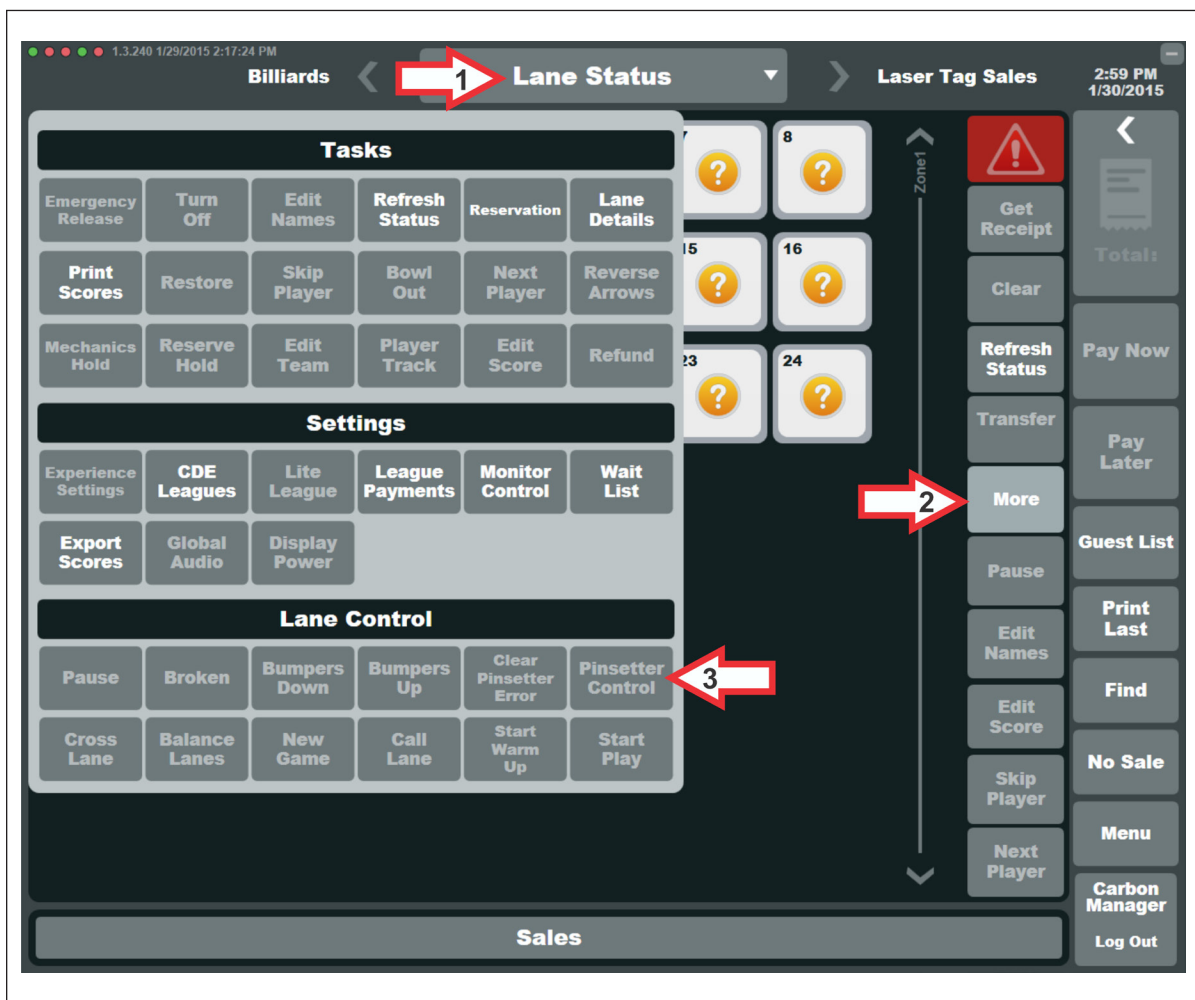
- (1) **Power In - (J3)** RS232 serial port that provides power used by the board and the camera.
- (2) **Power LED - (D2)** This LED illuminates to indicate the board has power.
- (3) **To Camera - (J1)** Connection to the camera. This connection provides power to the camera and receives video from the camera.
- (4) **Video Out - (J2)** Connection used to send the camera video to the Peripheral Controller.

Camera Set-up and Calibration

The Camera Calibration functions are used to control the operation of the Pinfall Camera. The Pinfall Camera takes a picture of the standing pins that is used to calculate the score. The camera settings are very important for proper operation of the scoring system. The score for each ball is determined by comparing the light level within a target with a threshold value. If the light level inside the target is higher than the threshold value, the scorer will determine the pin is standing. If the light level inside the target is lower than the threshold value, the scorer will determine the pin has fallen and score it as pinfall. The system has two light thresholds. One that is set up for use during normal operating conditions (Day Level) and one that is set up for operation in low light conditions such as black lights, or times when lights over the bowling lanes are turned off (Night Level). Refer to the figures titled *Accessing Camera Calibration*, *Pinsetter Control Window* and *Camera Calibration Window*.

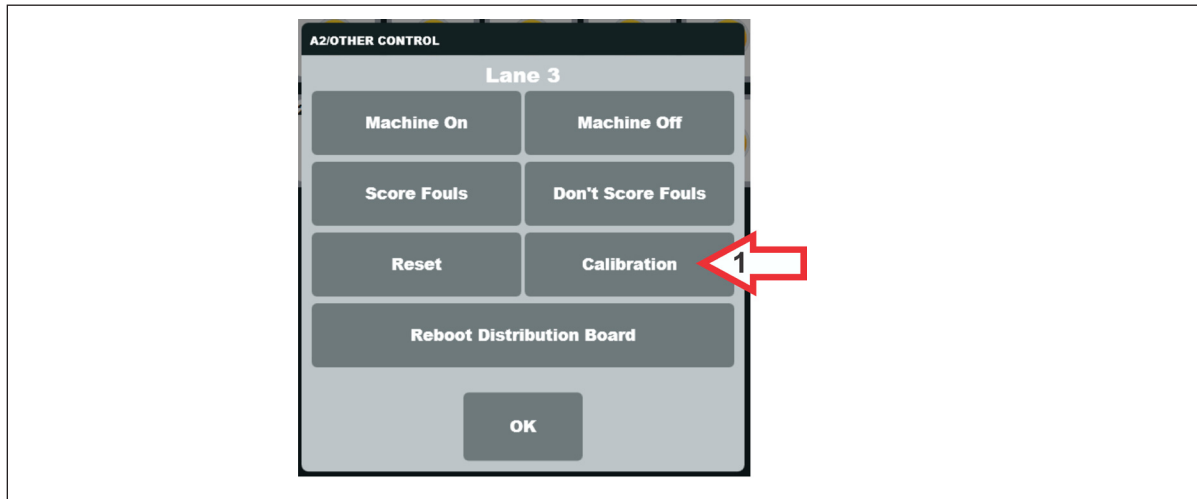
Use the following sequence to access the camera calibration screen:

1. Navigate to the “Lane Status” or “Lane Sales” screen and select the desired lane.
2. Select “More” to display the Lane Control selections.
3. Select “Pinsetter Control” to open the pinsetter control window.

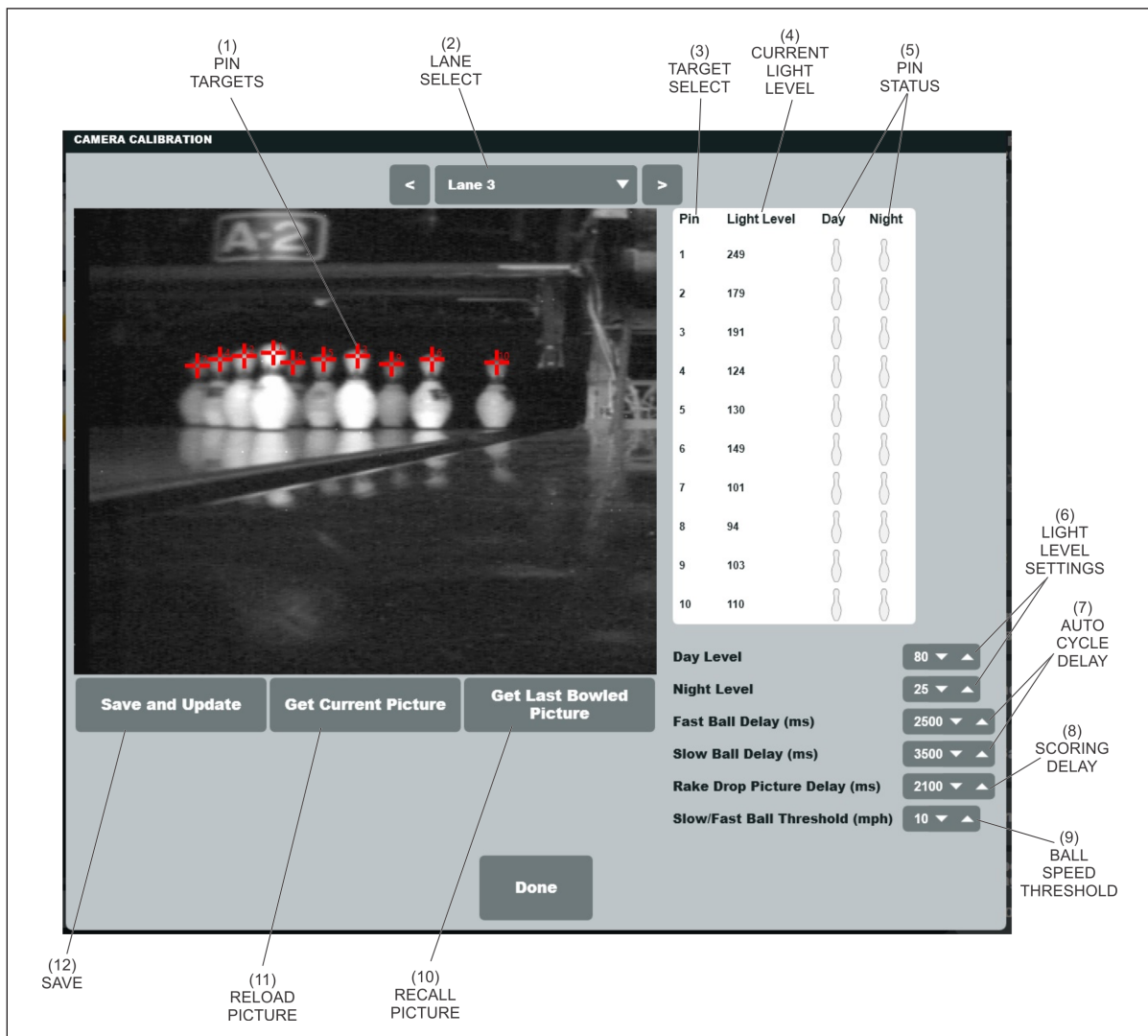


Accessing Camera Calibration

4. Select “Calibration” on the pinsetter control screen to open the calibrate camera window.



Pinsetter Control Window



Camera Calibration Window

- (1) **Pin Targets** - The spots where the camera is looking to determine if a pin is standing. A target is positioned by selecting a pin from the “*Pin*” column, then selecting a desired location on the pin image picture for the target. The light level (0 - 255) coming from the target’s location will appear in the “*Light Level*” column and the graphical representation of whether the pin is determined to be standing, based on the light level settings, will be shown in the “*Pin Status*” column.
- (2) **Lane Select** - Drop down box used to select a lane for calibration.
- (3) **Target Select** - Select a desired pin number to activate the corresponding target shown on the pin image picture, then touch a spot on the pin image to move the active target to that location.
- (4) **Current Light Level** - The light levels (0 - 255) coming from the targeted locations.
- (5) **Pin Status** - A graphical representation of the status of the pins based on the values set in the light level settings fields. If the light level value coming from a target is lower than the value set in the Day Level or Night Level field, a fallen pin image will display for that pin. If the light value is equal to or above the values, a standing pin will display.
- (6) **Light Level Settings (Day Level, Night Level)** - Settings used to determine the minimum light level needed to determine a pin as standing. The system allows settings for two light conditions. The Day Level setting is typically used for a bowling center’s normal bowling conditions. The Night Level setting is used for situations, such as Cosmic bowling, where an alternative light condition is used that changes the amount of light being reflected off the pins.

A good rule of thumb when determining a light level value is to use a number midpoint between the lowest number shown in the current light level column when viewing a picture with all pins standing on the pindeck and the highest number displayed in the current light level column when viewing a picture with all pins removed from pin deck.

Typically the level setting will be in the 80 to 100 range, but if the lighting is dimmer or brighter than normal, it may fall outside these values.

Also due to the nature of lighting, two camera pictures from the same lane, taken immediately after each other, can have different light levels. For this reason it is a good idea to look at several pictures in order to see how much the light can vary. Also remember that, during bowling, the camera pictures are taken when the rake/sweep is down and the deck/table is shadowing the pins. This results in pictures that are somewhat darker than the pictures used during setup. It is important to allow for this when setting the levels.

- (7) **Auto Cycle Delay** - The length of time the Peripheral Controller will wait, after a ball detection, for the pinsetter to cycle on its own. If the rake/sweep switch circuit does not open prior to the time set in the delay field, it is assumed that the pinsetter was unable to cycle on its own and the Peripheral Controller will automatically triggering the pinsetter.

The system determines if a ball is moving fast or slow based on the value set in the “Slow/Fast Ball Threshold” field. If the calculated ball speed is above the value set in the “Speed Limit” field, the system uses the “Fast Ball Trigg” value. When the ball speed is higher than the value set in the threshold field, the system uses the time specified in the “Fast Ball Delay” field. Otherwise it uses the time specified in the “Slow Ball Delay” field. The values in these fields should be high enough to allow for the machine to trigger on its own but not so high that the bowler has to wait for the machine to trigger.



NOTE: *Good starting values are 2000 ms for the “Fast Ball Delay” and 4500 ms for the “Slow Ball Delay”.*

- (8) **Scoring Delay** - The “Delay” time, in milliseconds, controls when the scoring picture is taken. The time starts once the rake/sweep has left its home position and the sweep switch circuit has opened. This value should long enough to allow the rake/sweep to drop fully to the guard but short enough so that the deck/table cannot interfere with scoring. If the delay is too short, the score may include pins just about to fall or the sweep board may block the camera from seeing the pins. If the delay is too long, the pinsetter’s deck or table may block the pins.



NOTE: *1500-3000 milliseconds is a typical setting for most pinsetters.*

- (9) **Ball Speed Threshold** - The “Slow/Fast Ball Threshold” field is used to set the ball speed that determines whether a ball is considered to be moving “Slow” or “Fast”. This is used in conjunction with the “Fast Ball Delay” or “Slow Ball Delay” values to determine how long the Peripheral Controller will wait before it forcing an automatic trigger of the pinsetter.
- (10) **Recall Picture** - The “Get Last Bowled Picture” button allows the user to see the last image used for scoring. This is useful in troubleshooting scoring errors.
- (11) **Reload Picture** - The “Get Current Picture” button replaces the picture shown display with a new image.
- (12) **Save** - The “Save and Update” button forces the program to save the camera calibration settings.

Camera Calibration Procedure

To calibrate the camera, the pinsetter associated with the camera must be turned “on” and have 10 pins standing on the pindeck illuminated with the desired light source. Perform the following steps to calibrate the camera to the pins:

1. Select the lane to be calibrated.
2. Using the mouse, click the number “1” listed in the “Pin” column. This will activate the 1 pin target.
3. Using the mouse, click on the pin image picture at the desired position where you wish to place the target for pin 1.
4. Repeat the steps 2 and 3 for pins 2 -10 .



NOTE: *It is important to place the correct pin target on its corresponding pin; if not, incorrect scoring may occur.*

5. Set the *initial* Day Level light value:
 - a. Set the bowling center’s lighting up as it would be used during normal bowling situations.
 - b. Record the light value for all ten pins.
 - c. At the pinsetter remove all ten pins from the pindeck.
 - d. Click the “Get Current Picture” button to refresh the pin image picture. Record the light value for each pin location.
 - e. Select the “Day Level” field and enter a value midway between the lowest light level value recorded in *step b* and the light highest level recorded in *step d*.
6. Set the *initial* Night Level light value:
 - a. Set the bowling center’s lighting up as it would be used during night bowling events such as cosmic bowling, black light bowling or other reduced lighting conditions.
 - b. Record the light value for all ten pins.
 - c. At the pinsetter remove all ten pins from the pindeck.
 - d. Click the “Get Current Picture” button to refresh the pin image picture. Record the light value for each pin location.
 - e. Select the “Night Level” field and enter a value midway between the lowest light level value recorded in *step b* and the light highest level recorded in *step d*.



NOTE: *The initial light level settings described are good starting points for camera calibration. The actual light level used may be varied from this setting to accommodate different lighting and pin conditions, such as colored pins.*

7. Set the “Rake Drop Picture Delay” value:
 - a. Select the “Rake Drop Picture Delay” field.
 - b. Enter the amount of delay from the time that the rake or sweep is triggered and when the camera should take the picture for scoring. This value should long enough to allow the rake/sweep to drop fully to the guard but short enough so that the deck/table cannot interfere with scoring.



NOTE: 1500-3000 milliseconds is a typical setting for most pinsetters.

8. Set the “Fast Ball Delay” and Slow Ball Delay” values:
 - a. Select the “Fast Ball Delay” field.
 - b. Enter the desired time that the Peripheral Controller should wait, after ball detection, to allow the pinsetter to cycle on its own when the ball is moving fast.
 - c. Select the “Slow Ball Delay” field.
 - d. Enter the desired time that the Peripheral Controller should wait, after ball detection, to allow the pinsetter to cycle on its own when the ball is moving slow.



NOTE: These settings determine how long the system will wait before executing a back up machine trigger in the event the pinsetter did not cycle on its own. Enough time should be allocated to allow for the machine to cycle on its own. Good starting values are 2000 ms for the “Fast Ball Delay” and 4500 ms for the “Slow Ball Delay”

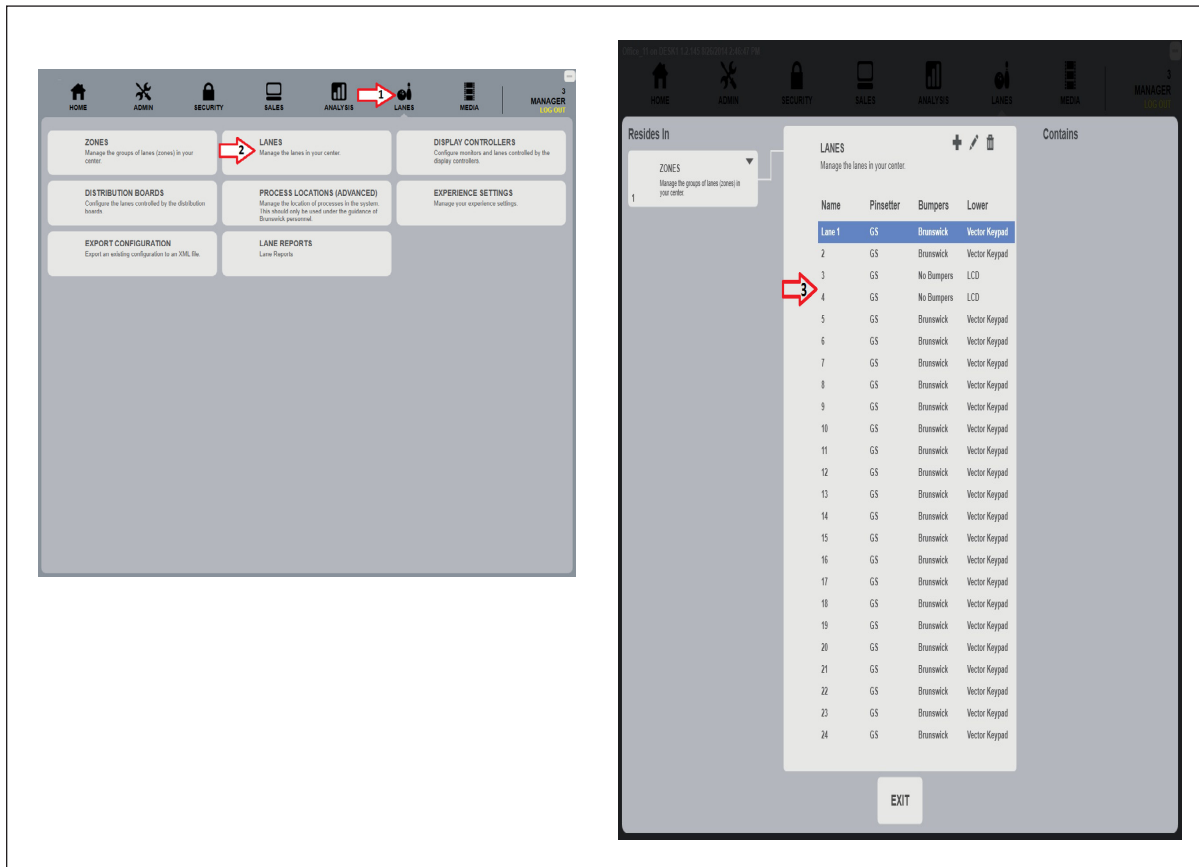
9. Set the “Fast/Slow Ball Threshold” value:
 - a. Select the “Fast/Slow Ball Threshold” field.
 - b. Enter ball speed value that will be used to determine whether a ball is considered to be moving “Slow” or “Fast”.
10. When all camera settings have been made for this lane, select the “Save and Update” button.

Ball Speed Adjustment

It is important that the ball speed is calculated properly so that the back up trigger system for the pinsetters is executed properly and the speed shown on the overhead displays for the bowler is as accurate as possible. Because the ball speed is determining by the length of time a ball is blocking the ball detector beam, the location of the beam on the ball is needed to calculate the speed properly.

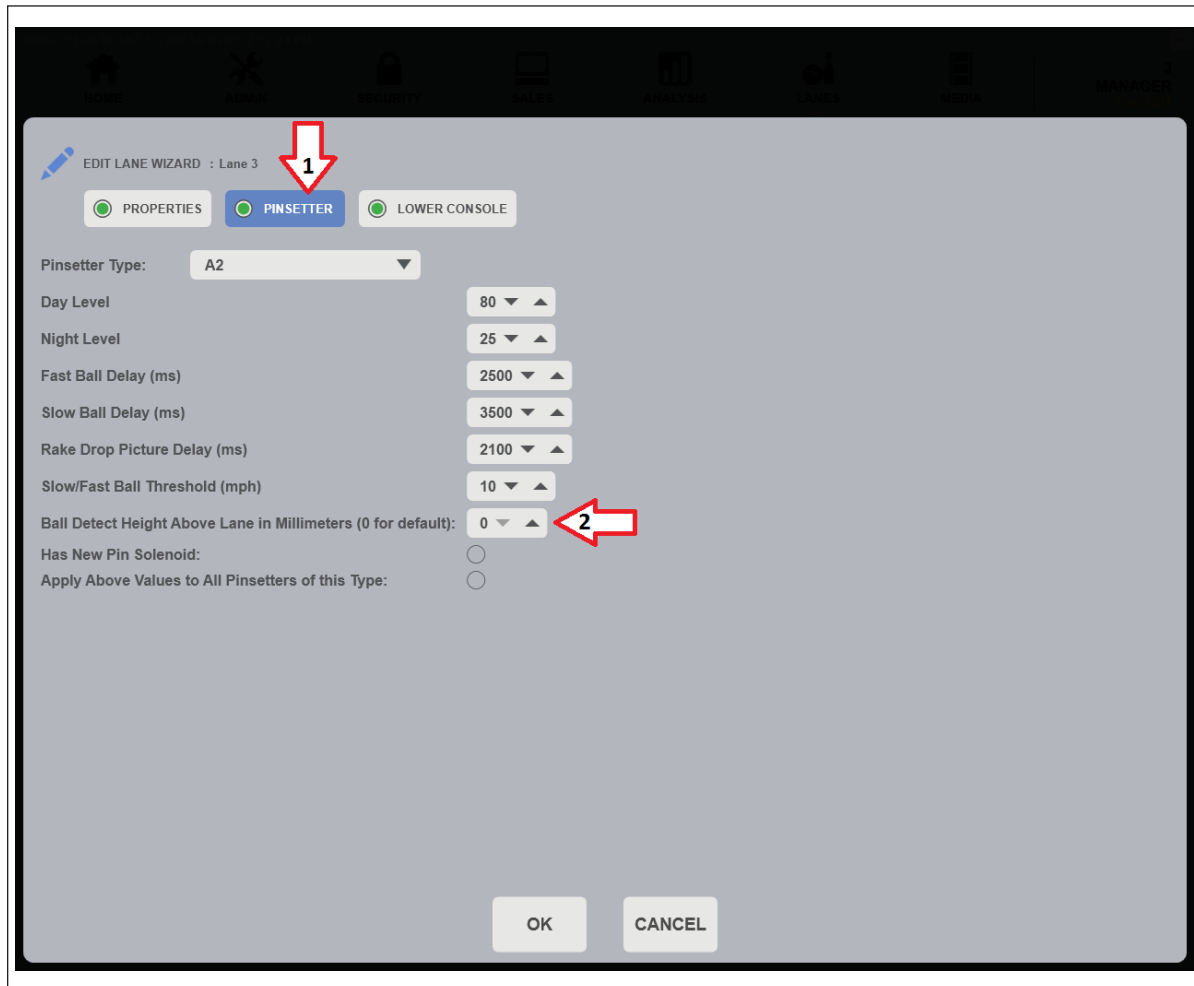
Use the following steps to record the ball detector's height:

1. From the Sync Office program's "Lanes" tab, select the "Lanes" button then select the desired lane from the "Lanes" screen. Refer to the figures titled *Accessing Lanes Settings*.



Accessing Lanes Settings

2. On the Lane Wizard screen, select the pinsetter tab.
3. Select the Ball Detect Height field and enter the measured distance, in millimeters, from lane surface to the middle of the ball detector lens.



Ball Detect Height Setting

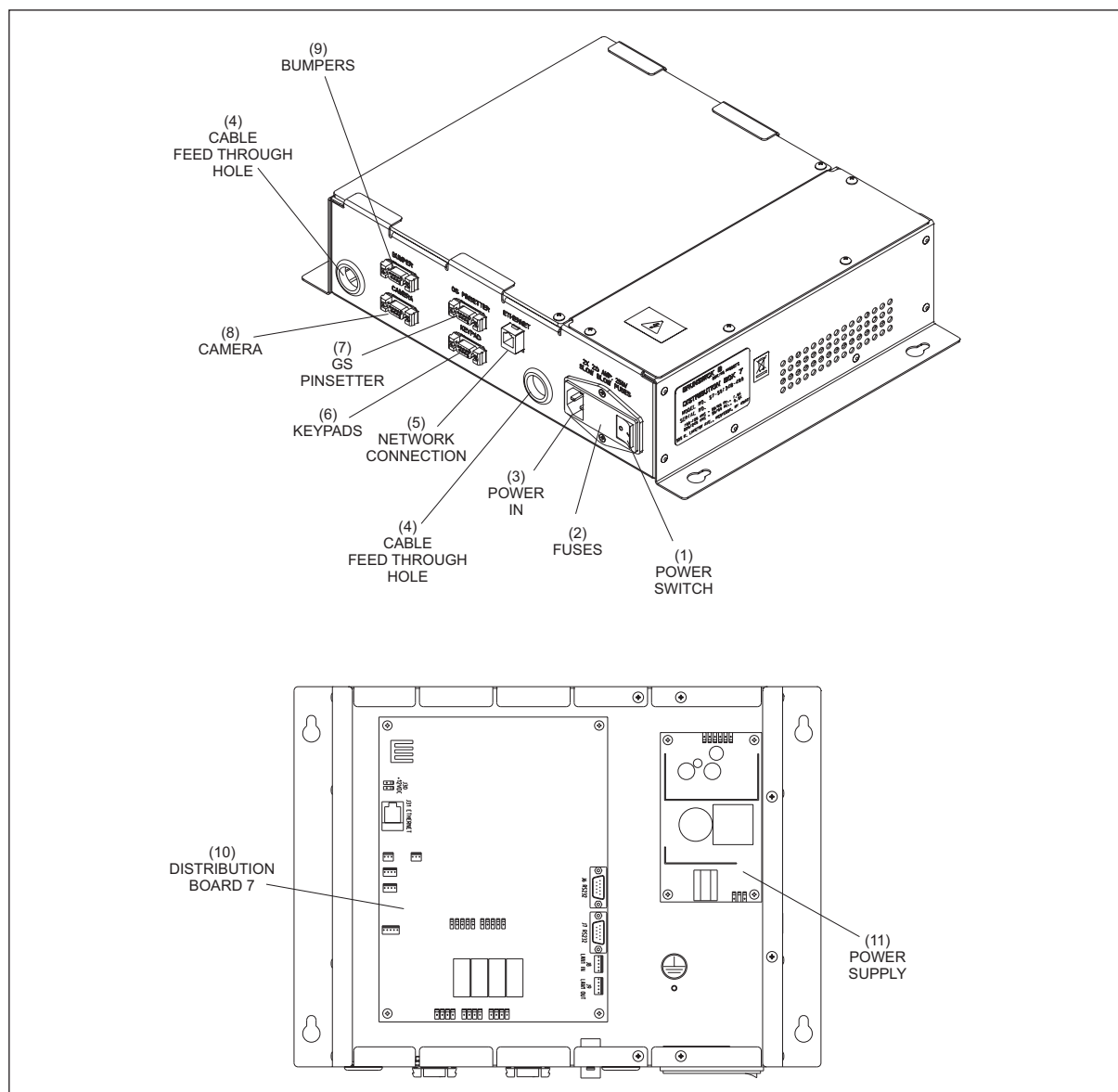
PERIPHERAL CONTROLLER

The Peripheral Controller provides multiple functions for a lane pair dependent on the pinsetter in use and optional devices that may be installed on the lane pair.

The board contains circuits to allow communication to GS series pinsetters, Brunswick automated bumpers and optional Vector keyboard.

For non GS pinsetter installations it supplies power to the pin camera and processes the camera's video, turns the pinsetters on/off, cycles the pinsetters as needed, interfaces the ball detectors and foul unit to the scoring system.

The board also has the capability to control AMF automated bumpers and provide signals for AMF pinspotters chassis equipped with the short cycle functionality. Version 7 also contains circuitry and connectors on the circuit board to expand functionality in the future. Refer to figure titled *Peripheral Controller Box, Distribution Board 7 Connectors and Components, Distribution Board 7 LEDs, and Distribution Board 7 Jumpers*.



Peripheral Controller Box

The function of the circuit boards, and external connections for the Peripheral Controller include:

- (1) **Power Switch** - Power switch for the Peripheral Controller box. Pressing this button turns the Peripheral Controller On/Off .
- (2) **Fuses** - Protection for the main input power. Rating = 2.0Amp 250V, Slow Blow.
- (3) **Power In** - 120VAC or 240VAC main input power for the Interface box.
- (4) **Cable Feed Through Hole** - Access holes for the cables that connect directly to the Distribution board. For non-GS pinsetters the cables that typically route through these holes include those for the pin camera's video and ball detector signals, AMF bumper control, and switches and controls for the pinsetters. For GS pinsetters the ball detector signal used to determine ball speed is routed through the holes.
- (5) **Network Connection** - The connection point for the Cat5e cable from the Ethernet Switch located on the curtain wall.
- (6) **Keypads** - Connection that provides +12VDC power and RS-232 communication for Sync Touchpads and Vector Keypads.
- (7) **GS Pinsetter** - Connection that provides RS-485 communication for GS Series pinsetters.
- (8) **Camera** - Connection that provides +12VDC power to the pin camera used for non-GS pinsetter installations.
- (9) **Bumpers** - Connection that provides RS-485 communication for Brunswick automated bumpers.
- (10) **Distribution Board 7** - The main circuit board inside the Peripheral Controller.
- (11) **Power Supply** - This board converts the incoming A/C power to supply 12 VDC. This voltage is used to generate additional voltage levels used by the Distribution PCBs, Pin Camera and Sync Touchpads or optional Vector Keypads. Input to the power supply can be 120 VAC or 240 VAC.

The function of the connectors and components on the Distribution Board 7 are:

- (1) **Power In - (J30)** Board power connector. Input for +12VDC originating at the power supply.
- (2) **Ethernet - (J31)** Internal connection point for the Cat5e cable that attaches to the external “Ethernet” connector located on the bottom of the Peripheral Controller. The Distribution board communicates with the Sync control system, Display Controllers, and Sync Touchscreen consoles through this connection.

- (3) **Ball Detect - (J27,J32)** Connections for the ball detector signals. When used in a system with pin cameras, these connections provide power for the ball detectors and an input for the signal that starts the scoring process and is used to determine ball speed. They are also used in GS pinsetters to monitor the GS pinsetter's ball detectors so that ball speed can be calculated. Also refer to *Ball Detect Jumper (JP17) and Ball Detect LEDs (D73,D102)*.

J27 - Odd (left) lane
J32 - Even (right) lane

- (4) **Sweep / Throw Switch - (J33,J34)** Connections for the signal from the sweep/rake switch installed on the pinsetter when pin cameras are used for scoring. These connections are not used with GS pinsetter installations. Also refer to *Sweep Switch / Throw LEDs (D61,D62, D75,D84)*.

J33 - Odd (left) lane
J34 - Even (right) lane

- (5) **Switch Cluster / New Pins Solenoid - (J22,J24)** Connections for the signals from the 0 degree and 44 degree switches and the New Pin Solenoids (NPS) that may be installed as an option for A-2 pinsetters. Also refer to *Switch Cluster LEDs (D46-D49) and NPS LEDs (D50,D58)*.

J22 - Odd (left) lane
J24 - Even (right) lane

- (6) **Foul - (J35)** Input for the signals from the foul units for both the left and right lanes. Also refer to *Foul Jumper (JP18) and Foul LEDs (D69,D94)*.

- (7) **AMF Short Cycle - (J36,J37)** Connection to the AMF 8270MP pinspotter to allow the machines to perform a short cycle when needed. Also refer to *AMF Short Cycle LEDs (D59,D64)*.

J36 - Odd (left) lane
J37 - Even (right) lane

- (8) **Spare Input - (J28)** Reserved for future use.

- (9) **Spare Output - (J29)** Reserved for future use.

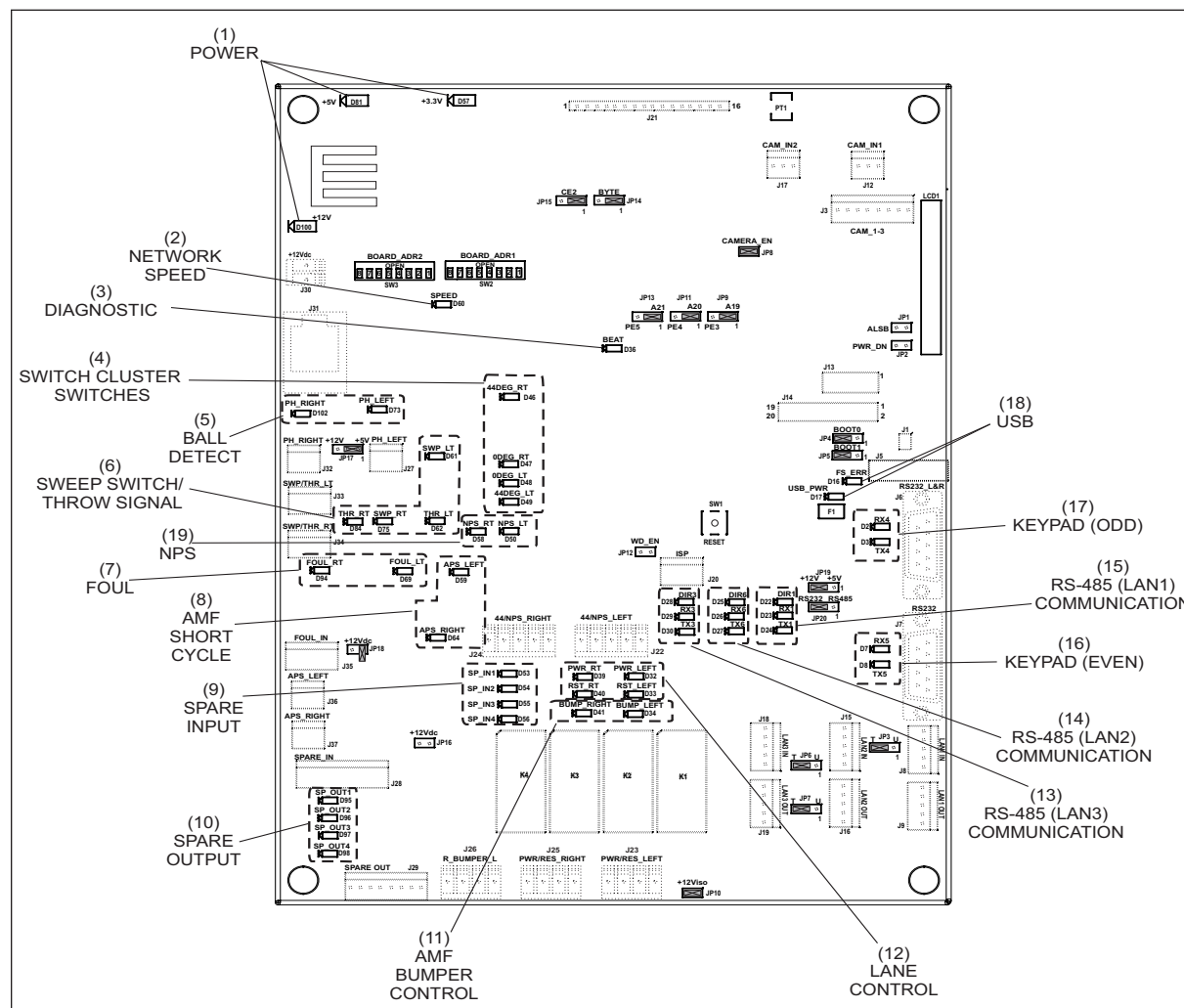
- (10) **AMF Bumper Control - (J26)** Connection to AMF automated bumpers. Also refer to *AMF Bumper Control LEDs (D34,D41)*.

- (11) **Even Lane Control - (J25)** Connection to the even (right) lane pinsetter. The distribution PCB turns the even lane pinsetter on/off by energizing relay K3 and resets (cycle) the pinsetter by energizing relay K4. LED D19 turns "on" when the pinsetter power relay (K1) energizes. LED D23 turns "on" when the pinsetter reset relay (K2) energizes. This connector is not used for installations with GS Series pinsetters.

- (12) **Odd Lane Control - (J23)** Connection to the odd (left) lane pinsetter. The distribution PCB turns the even lane pinsetter on/off by energizing relay K1 and resets (cycle) the pinsetter by energizing relay K2. LED D27 turns "on" when the pinsetter power relay (K1) energizes. LED D33 turns "on" when the pinsetter reset relay (K4) energizes. This connector is not used for installations with GS Series pinsetters.

- (13) **ISP - (J20)** In system programming connector for manufacturer's use only.
- (14) **Spare Communication Connectors - (J18,J19)** Normally these connection are not used. For centers equipped with an Intellishield ball lift safety device, J18 is used for communication to the Intellishield Controller. Jumper JP20 is used to select RS-232 or RS-485 communication.
- (15) **Brunswick Bumper Communication - (J15,J16)** Internal connection point for the cable that attaches to the external "Bumper" connector located on the bottom of the Peripheral Controller. This connector is used to communicate to optional Brunswick automated bumpers. The output connection (J16) is not used.
- (16) **GS Pinsetter Communication - (J8,J9)** Internal connection point for the cable that attaches to the external "GS Pinsetter" connector located on the bottom of the Peripheral Controller. Connection that provides RS-485 communication for GS series Pinsetters. The output connection (J9) is not used.
- (17) **RS-485 Connections - (J8,J9,J15,J16,J18,J19)** Connections that provides RS-485 communication for GS series Pinsetters (J8) and optional Brunswick automated bumpers (J15). Connection J18 can be switched between RS-232 and RS-485 using jumper JP20. For centers equipped with an Intellishield ball lift safety device, the connection is used to communicate with the Intellishield Controller using RS-485. Output connections (J9,J16 and J19) are not used.
- (18) **Pin Camera RS-232 - (J7)** Internal connection point for the cable that attaches to the external "Camera" connector located on the bottom of the Peripheral Controller. This connection provides +12VDC power for the pin camera.
- (19) **Keypads - (J6)** Internal connection point for the cable that attaches to the external "Keypad" connector located on the bottom of the Peripheral Controller. This connection provides +12VDC power and RS-232 communication for the Sync Touchpad and Vector Keypads.
- (20) **USB Connectors - (J1,J5)** Not Used. For manufacturer's use only.
- (21) **Programming Ports - (J13,J14)** For factory use only.
- (22) **Video Out - (LCDI)** For factory use only.
- (23) **Pin Camera Video - (J3)** Connection for the video originating at the pin camera.
- (24) **LCD Contrast Control - (PTI)** For factory use only.
- (25) **LCD Display - (J21)** For factory use only.

Status LEDs



Distribution Board 7 LEDs

The function of the LEDs on the Distribution Board 7 are:

(1) Power - (D57,D81,D100) Power indicator LEDs

D57 (red) - +3.3VDC
D81 (red) - +5VDC
D100 (green) - +12VDC

(2) Network Speed - (D60) LED D60 (green) indicates the status of the Ethernet network connections.

ON - Network cable is connected
FLASHING - Network activity

(3) Diagnostics - (D36) LED D36 (green) flashes when the Distribution PCB is working properly.

- (4) **Switch Cluster Switches - (D46 - D49)** These LEDs light to indicate when the zero degree and 44 degree switches that are available as an option on A-2 pinsetters are “closed”.

D46 (red) - Right Lane 44 degree switch
D47 (red) - Right Lane 0 degree switch
D48 (green) - Left Lane 0 degree switch
D49 (green) - Left Lane 44 degree switch

- (5) **Ball Detect - (D73,D102)** These LEDs turn “ON” when a ball detect signal occurs.

D73 (green) - Left lane ball detect
D102 (red) - Right lane ball detect

- (6) **Sweep Switch / Throw - (D61,D62,D75,D84)** These LEDs turn “ON” when the sweep switch on the pinsetter is actuated and when the pinsetter is on first ball. These LEDs are only used for installations equipped with pin cameras.

D61 (green) - Left lane sweep switch
D62 (green) - Left lane 1st ball
D75 (red) - Right lane sweep switch
D84 (red) - Left lane 1st ball

- (7) **Foul - (D69,D94)** These LED turn “ON” when the board is receiving a foul signal. These LEDs are not used for GS Series pinsetters installations.

D69 (green) - Left lane foul signal
D94 (red) - Right lane foul signal

- (8) **AMF Short Cycle - (D59,D64)** These LED turn “ON” when the short cycle signal is sent to the AMF pinspotter.

D59 (green) - Left lane short cycle
D64 (red) - Right lane short cycle

- (9) **Spare Input - (D53-D56)** Not Used.

- (10) **Spare Output - (D95-D98)** Not Used.

- (11) **AMF Bumper - (D34, D41)** These LEDs turn “ON” when a signal (voltage) is sent to the AMF automated bumpers.

D34 (green) - Left lane bumpers
D41 (red) - Right lane bumpers

- (12) **Lane Control - (D32,D33,D39,D40)** These LEDs turn “ON” when the relays to turn on or reset the pinsetters are energized. These LEDs are not used for GS Series pinsetters installations.

D32 (green) - Left lane power (K1 energized)
D33 (green) - Left lane reset (K2 energized)
D39 (red) - Right lane power (K3 energized)
D40 (red) - Right lane reset (K4 energized)

(13) RS-485 (LAN3) Communication - (D28-D30) Not Used.

LED D28 (blue) - Direction
LED D29 (red) - Receive
LED D30 (green) - Transmit

(14) RS-485 (LAN2) Communication - (D25-D27) These LEDs turn “ON” when information is being transmitted or received from the Brunswick bumpers.

LED D25 (blue) - Direction
LED D26 (red) - Receive
LED D27 (green) - Transmit

(15) RS-485 (LAN1) Communication - (D22-D24) These LEDs turn “ON” when information is being transmitted or received from the GS Series pinsetter.

LED D22 (blue) - Direction
LED D23 (red) - Receive
LED D24 (green) - Transmit

(16) Keypad Even - (D7,D8) These LEDs turn “ON” when information is being transmitted or received from the even (right) lane Sync Touchpad or Vector Keypad.

LED D7 (red) - Receive
LED D8 (green) - Transmit

(17) Keypad Odd - (D2,D3) These LEDs turn “ON” when information is being transmitted or received from the odd (left) lane Sync Touchpad or Vector Keypad.

LED D2 (red) - Receive
LED D3 (green) - Transmit

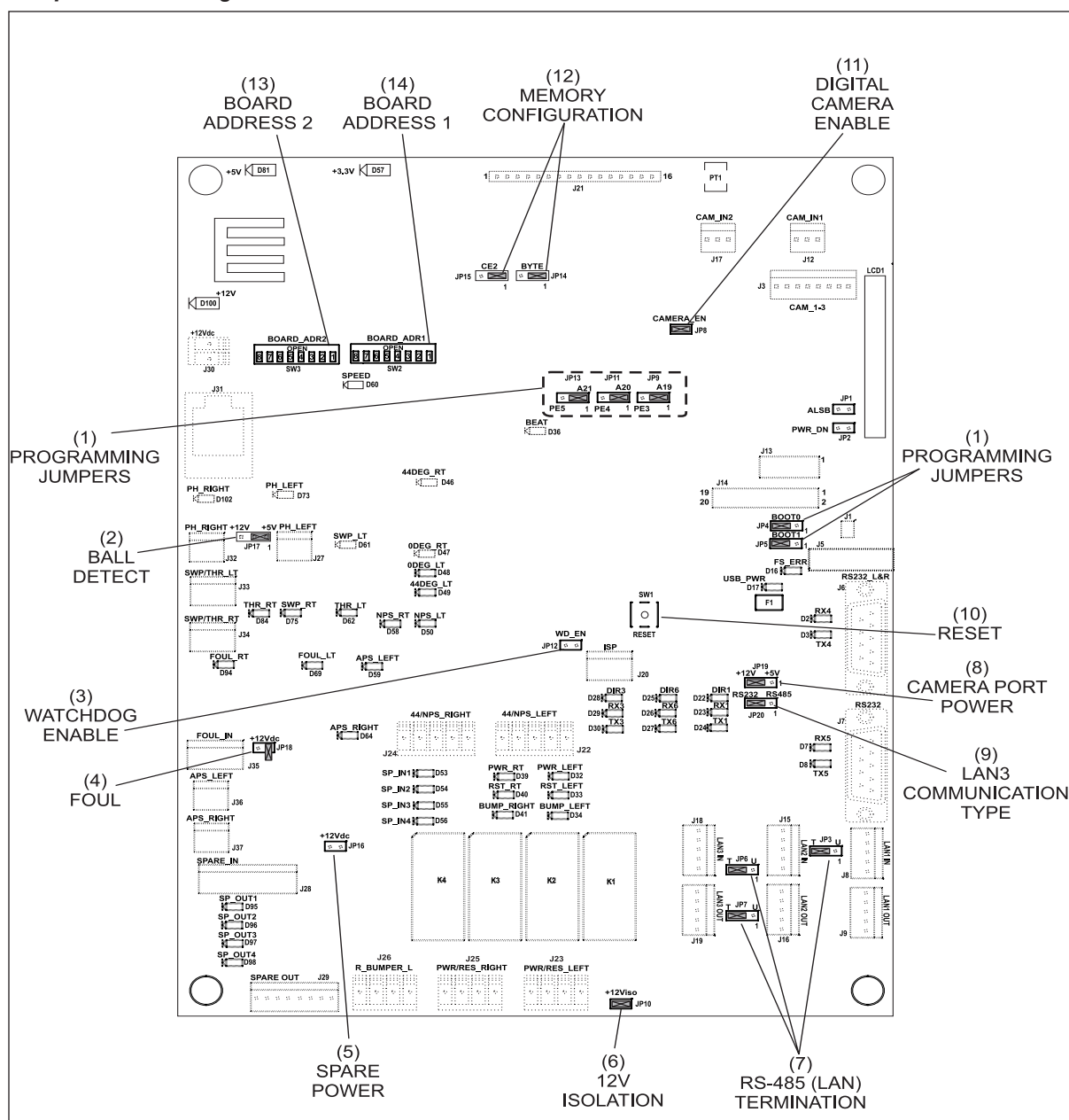
(18) USB - (D16, D17) Not Used.

LED D16 (red) - USB error
LED D17 (green) - USB power

(19) NPS - (D50,D58) These LED turn “ON” when a 12VDC signal is sent to the New Pin Solenoid that is available as an option on A-2 pinsetters.

LED D50 (green) - Left lane NPS
LED D58 (red) - Right lane NPS

Jumpers and Settings



Distribution Board 7 Jumpers

The function of the jumpers on the Distribution Board 7 are:

(1) Programming Jumpers - (JP4,JP5,JP9,JP11,JP13) For factory use only

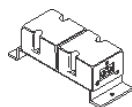
JP4,JP5 - Install jumper at pins 2-3 (Gnd) (Default)

JP9,JP11,JP13 - Install jumper at pins 1-2 (Default)

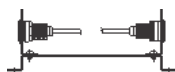
(2) Ball Detect - (JP17) Jumper used to configure the Distribution PCB to power the ball detectors used in installations equipped with pin camera with 5VDC or 12VDC. This setting is only impacts installations that use cameras for scoring (Centers without GS-Series pinsetters and StringPin pinsetters). For square type ball detectors, set the jumper to 5VDC. For the round ball detectors, set the jumper to 12VDC.



CAUTION! The ball detect jumper on the Distribution board **MUST** be set to the proper voltage. Failure to do so can cause permanent damage to the ball detector.



Square Ball Detector - Install jumper at pins 1-2 (5V)



Round Ball Detector - Install jumper at pins 2-3 (12V)

(3) Watchdog Enable - (JP12) For factory use only.

JP12 - Remove jumper (Default)

(4) Foul - (JP18) Jumper used to configure the distribution so that it can properly handle the foul input signal. When using Brunswick foul units or foul units that use a relay type (switch) output, install a jumper to short the pins. If using a foul unit that supplies +12VDC as an output (AMF) remove the jumper.

Brunswick Foul Unit - Install jumper (Default)

AMF Foul Unit - Remove Jumper

(5) Spare Power - (JP16) Reserved for future use.

JP16 - Remove Jumper (Default)

(6) +12V Isolation - (JP10) Factory use only.

JP10 - Install Jumper (Default)

(7) RS-485 (LAN) Termination - (JP3,JP6,JP7) Jumpers used to terminate the RS-485 communication.

JP3 - GS pinsetter communication. Install jumper at pins 2-3 (Terminate) (Default)

JP6 - Brunswick automated bumpers. Install jumper at pins 2-3 (Terminate) (Default)

JP7 - Spare. Install jumper at pins 2-3 (Terminate) (Default)

(8) Camera Port Power (JP19) - Selects voltage level used for the cameras.

Install jumpers at pins 2-3 (+12V).

(9) LAN3 Communication Type (JP20) - Determines the communication protocol used for LAN3 (J18).

Default - Install jumper at pins 2-3 (RS232)

Intellishield controller connected to LAN3 - Install jumper at pins 1-2 (RS485)

(10) Reset - (SW1) Push button used to restart the Distribution board.

(11) Digital Camera Enable - (JP8) Factory use only.

JP8 - Install Jumper (Default)

(12) Memory Configuration - (JP14,JP15) Factory use only.

JP14 - Install jumper at pins 1-2 (Default)

JP15 - Install jumper at pins 1-2 (Default)

- (13) **Board Address 2** - Factory use only. **Always set switch 8 to the ON position.** Setting the switch to the OFF position will place the board into a factory test mode and cause diagnostics LED, D36 to flash rapidly.

- (14) **Board Address 1** - Bank of 8 switches used to assign the lane ID. Refer to figure titled *Distribution Board Lane Assignment (Board Address 1)*.

Lane No.	SW 1 Value = 1	SW 2 Value = 2	SW 3 Value = 4	SW 4 Value = 8	SW 5 Value = 16	SW 6 Value = 32	SW 7 Value = 64	SW 8 Value = 128
1-2	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3-4	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
5-6	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
7-8	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
9-10	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
11-12	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
13-14	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
15-16	ON	ON	ON	ON	OFF	OFF	OFF	OFF
17-18	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
19-20	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
21-22	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
23-24	ON	ON	ON	OFF	ON	OFF	OFF	OFF
25-26	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
27-28	ON	ON	OFF	ON	ON	OFF	OFF	OFF
29-30	ON	OFF	ON	ON	ON	OFF	OFF	OFF
31-32	ON	ON	ON	ON	ON	OFF	OFF	OFF
33-34	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF
35-36	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
37-38	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
39-40	ON	ON	ON	OFF	OFF	ON	OFF	OFF
41-42	ON	OFF	OFF	ON	OFF	ON	OFF	OFF
43-44	ON	ON	OFF	ON	OFF	ON	OFF	OFF
45-46	ON	OFF	ON	ON	OFF	ON	OFF	OFF
47-48	ON	ON	ON	ON	OFF	ON	OFF	OFF
49-50	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
51-52	ON	ON	OFF	OFF	ON	ON	OFF	OFF
53-54	ON	OFF	ON	OFF	ON	ON	OFF	OFF
55-56	ON	ON	ON	OFF	ON	ON	OFF	OFF
57-58	ON	OFF	OFF	ON	ON	ON	OFF	OFF
59-60	ON	ON	OFF	ON	ON	ON	OFF	OFF
61-62	ON	OFF	ON	ON	ON	ON	OFF	OFF
63-64	ON	ON	ON	ON	ON	ON	OFF	OFF
65-66	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
67-68	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
69-70	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
71-72	ON	ON	ON	OFF	OFF	OFF	ON	OFF
73-74	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
75-76	ON	ON	OFF	ON	OFF	OFF	ON	OFF
77-78	ON	OFF	ON	ON	OFF	OFF	ON	OFF
79-80	ON	ON	ON	ON	OFF	OFF	ON	OFF

Distribution Board Lane Assignment (Board Address 1)

SCORING SEQUENCE OF EVENTS

First Ball, Second Ball

The following describes the events necessary for the first and second ball scoring sequences.



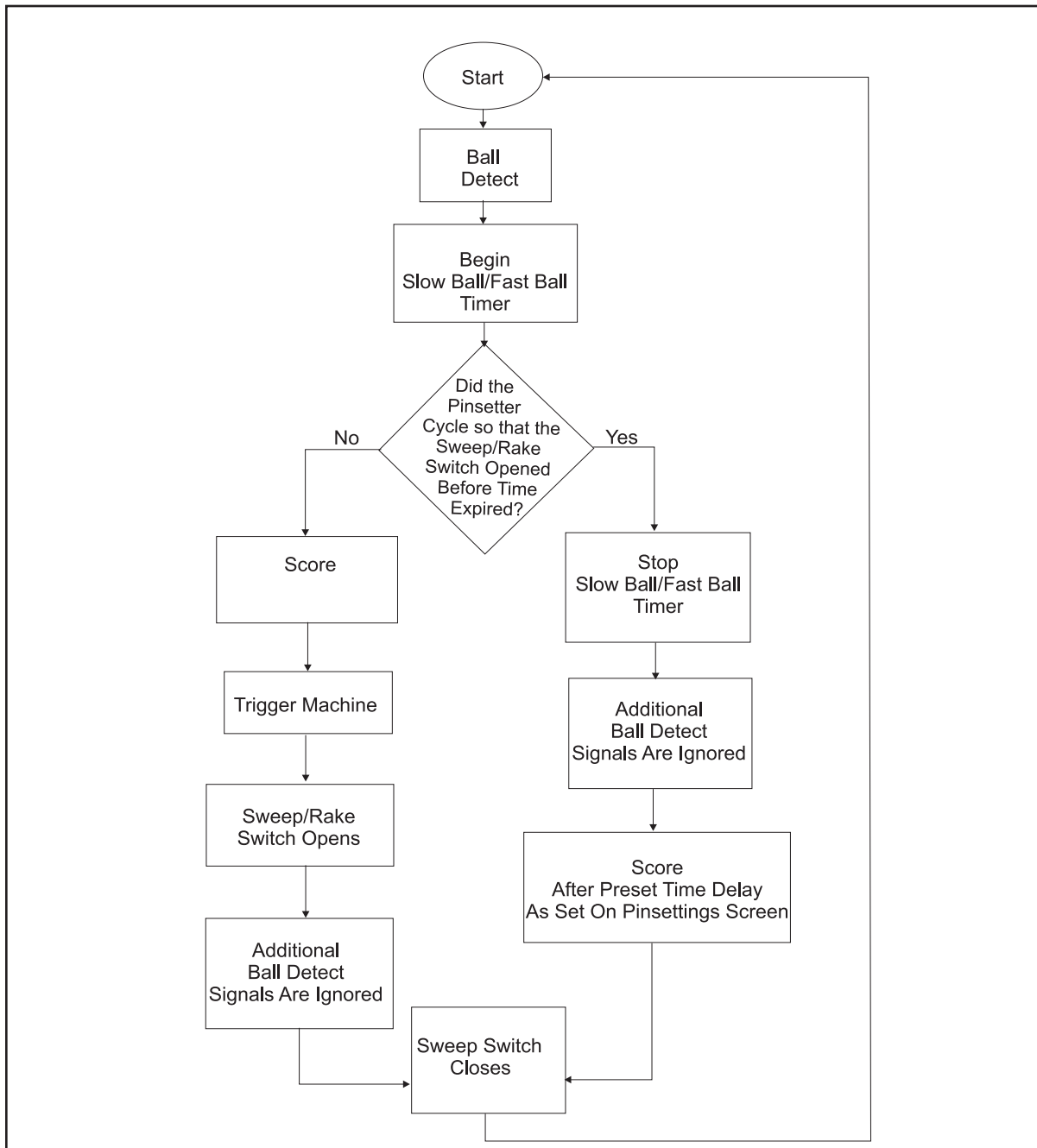
NOTE: *The scorer console must be turned on, and a bowler's name entered.*

1. The bowler delivers the first ball. The ball breaks the ball detect's light path and sends a signal to the Distribution Board.
2. The scoring process starts.
3. The pinsetter is triggered by the ball.



NOTE: *If the pinsetter does not trigger on its own, the Distribution Board will automatically take a picture and trigger the machine after a time delay that is calculated based on the fast ball/slow ball settings as set on the scorer settings screen and continues from step 6.*

4. The sweep falls downward causing the sweep switch to open - sending signal to the Distribution Board.
5. After the time delay entered on the pinsettings screen at the control desk, the camera takes a picture and sends it to the Distribution Board.
6. The picture is analyzed.
7. Score is displayed.
8. The sweep/rake switch closes to reset scoring cycle.



First Ball, Second Ball Scoring Sequence

No Tap

The following describes the events for the no tap scoring sequence.

This cycle occurs when a bowler throws a no tap strike and the scorer is set to No Tap scoring. At the end of the regular cycle, the pinsetter will automatically cycle a second time so the next bowler does not have to press the reset button to get a full rack of pins.

1. The bowler delivers the first ball. The ball breaks the ball detect's light path and sends a signal to the Distribution Board.
2. The scoring process starts.
3. The pinsetter is triggered by the ball or if the pinsetter does not trigger on its own, the a reset signal is sent from the Distribution Board to trigger the machine.



NOTE: *If the pinsetter does not trigger on its own, the Distribution Board will automatically take a picture and trigger the machine after a time delay that is calculated based on the fast ball/slow ball settings as set on the scorer settings screen and continues from step 6.*

4. The sweep falls downward causing the sweep switch to open - sending signal to the Distribution Board.
5. After the time delay entered on the pinsettings screen at the control desk, the camera takes a picture and sends it to the Distribution Board.
6. The picture is analyzed.
7. The “No Tap Strike” icon is displayed on screen when the appropriate amount of pins are knocked down by the bowler.



No Tap Strike Icon

8. The sweep switch closes to reset scoring cycle.
9. The Distribution Board sends a reset signal to the machine causing it to cycle a second time.

3rd Ball 10th Frame

The following describes the events necessary for the third ball tenth frame scoring sequence.

This cycle occurs at the end of the tenth frame for a bowler that received a “bonus” ball after a spare or a double. If the bowler does not strike on the “bonus” ball, the pinspotter will cycle a second time so the next bowler is not required to push the Reset button to get a full rack, first ball.



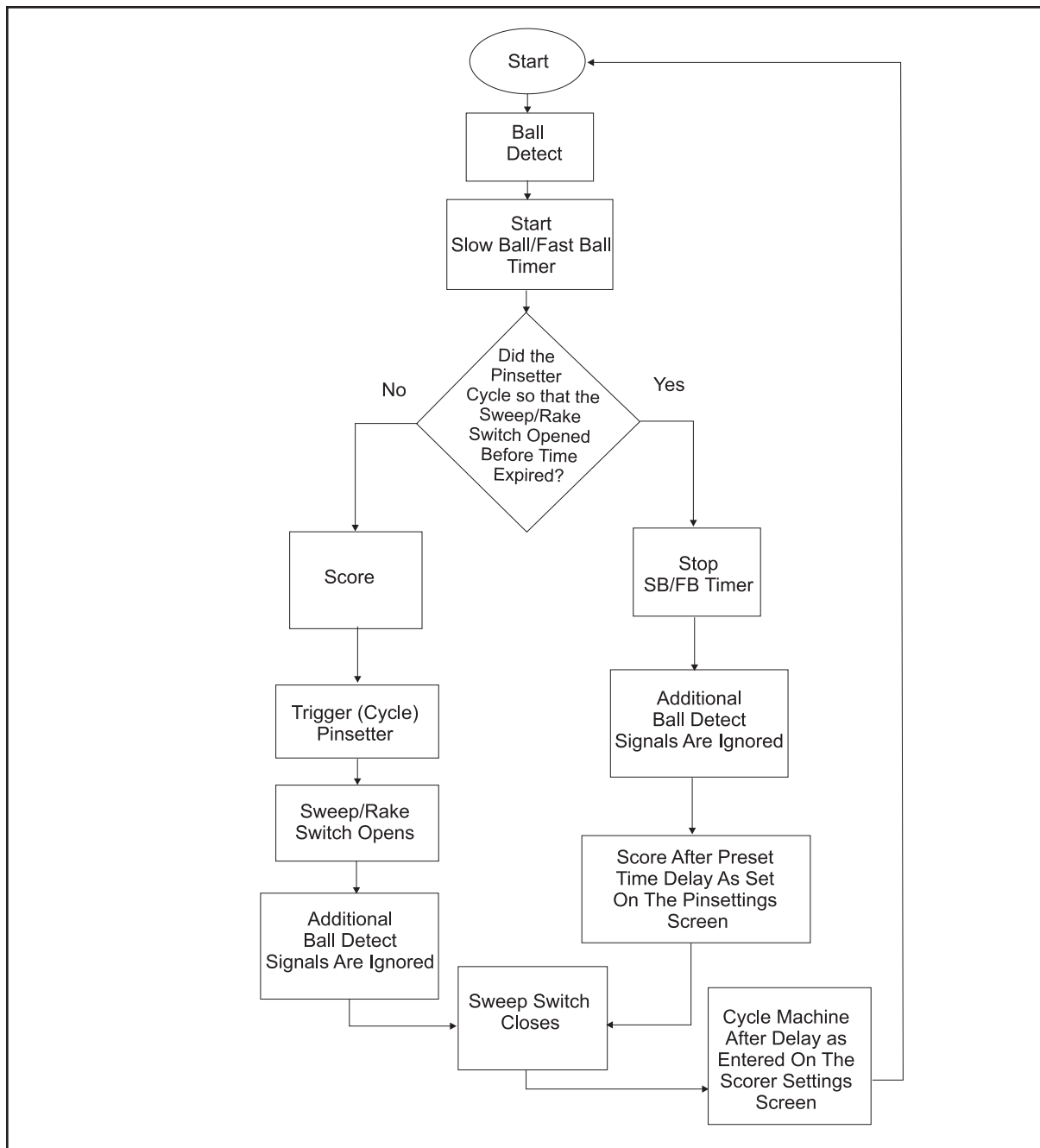
NOTE: *The scorer console must be turned on, a bowler's name entered, and the sequencing arrows on a bowler's name.*

1. The bowler delivers the first ball. The ball breaks the ball detect's light path and sends a signal to the Distribution Board.
2. The scoring process starts.
3. The pinsetter is triggered by the ball or if the pinsetter does not trigger on its own, the a reset signal is sent from the Distribution Board to trigger the machine.



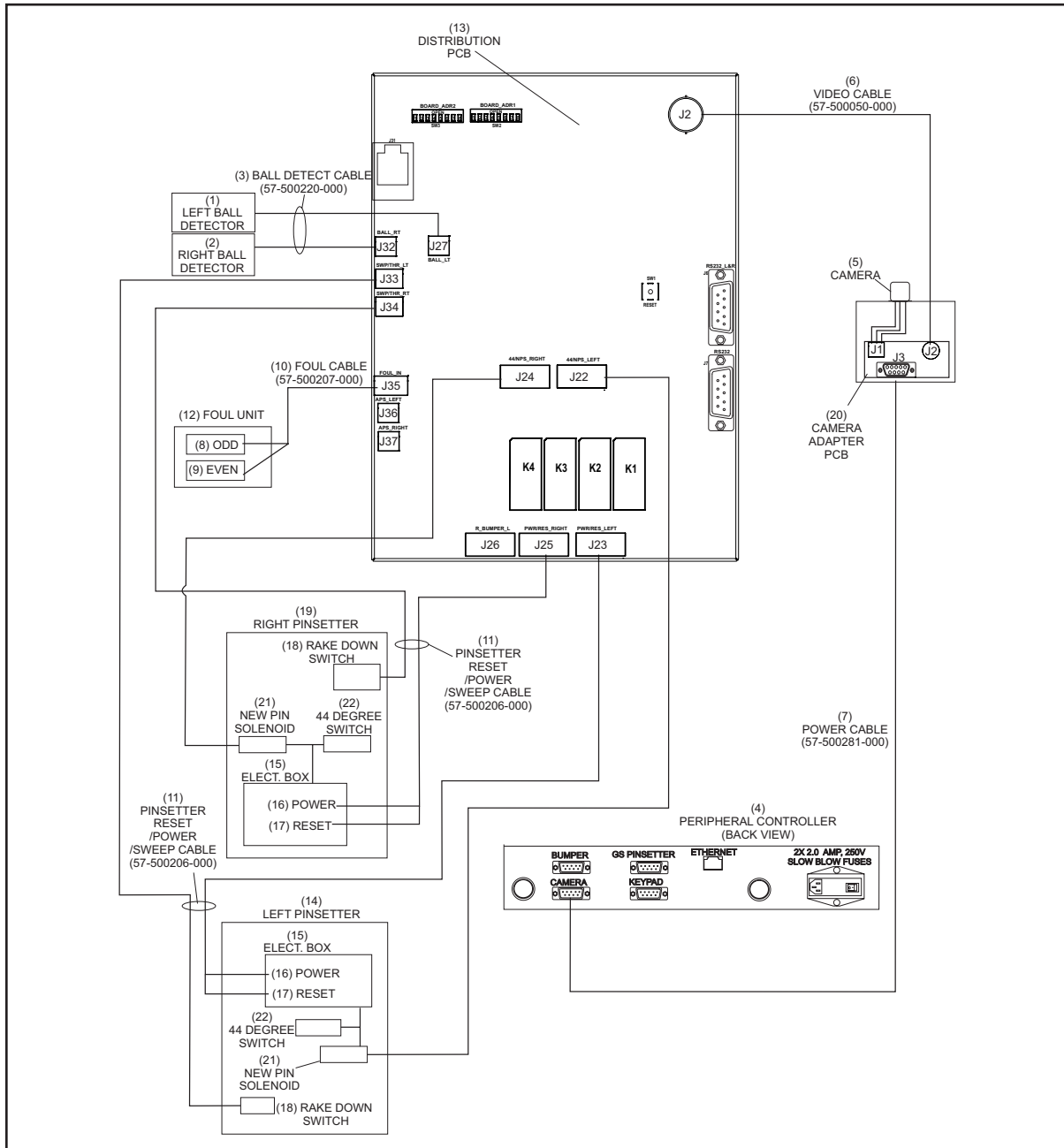
NOTE: *If the pinsetter does not trigger on its own, the Distribution Board will automatically take a picture and trigger the machine after a time delay that is calculated based on the fast ball/slow ball settings as set on the scorer settings screen and continues from step 6.*

4. The sweep falls downward causing the sweep switch to open - sending signal to the Distribution Board.
5. After the time delay entered on the pinsettings screen at the control desk, the camera takes a picture and sends it to the Distribution Board.
6. The picture is analyzed and it is determined a strike has not occurred.
7. The score is displayed.
8. The sweep switch closes to reset scoring cycle.
9. The Distribution Board sends a reset signal to the machine causing it to cycle a second time.



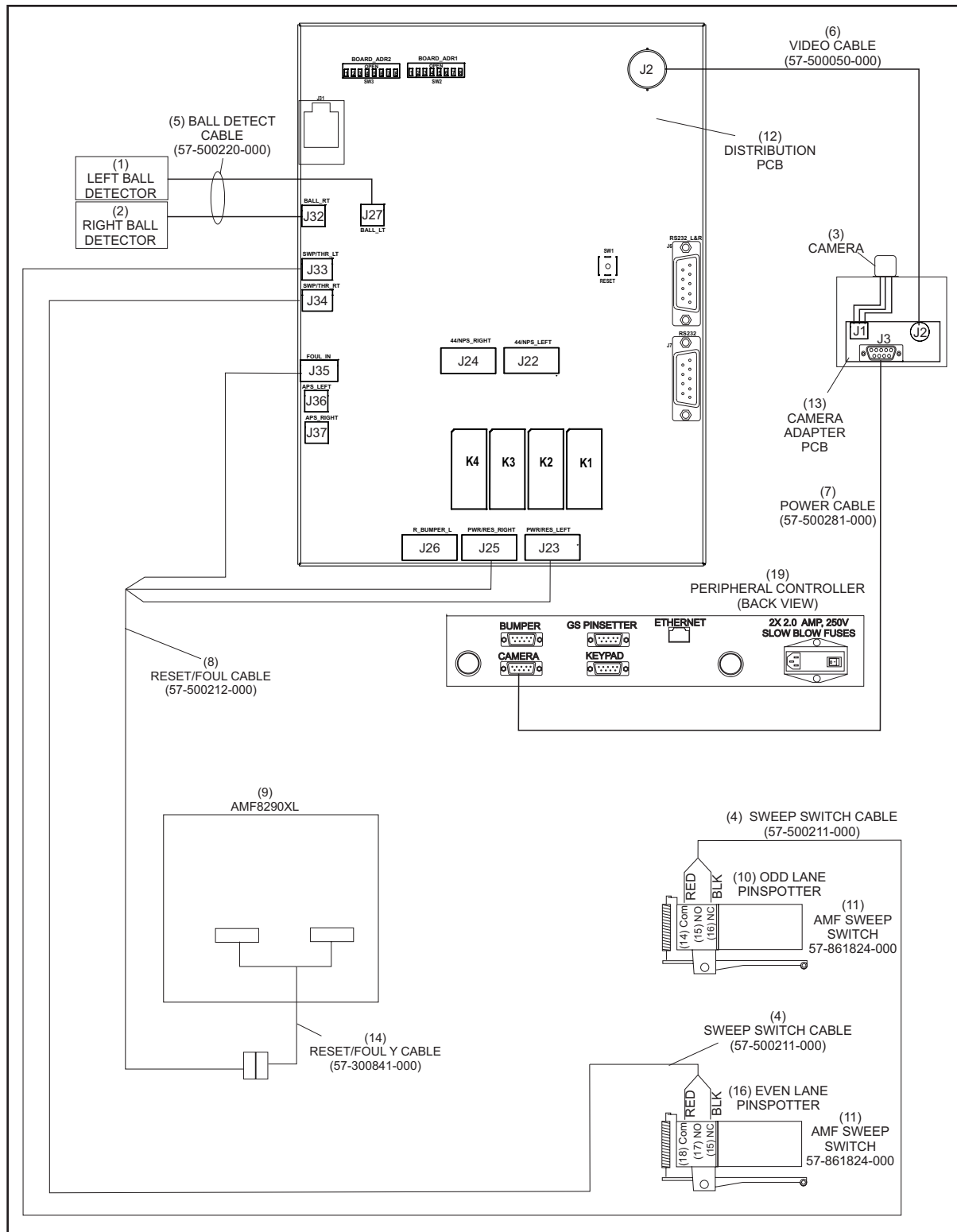
No Tap, Third Ball 10th Frame Scoring Sequence

CABLE DIAGRAMS



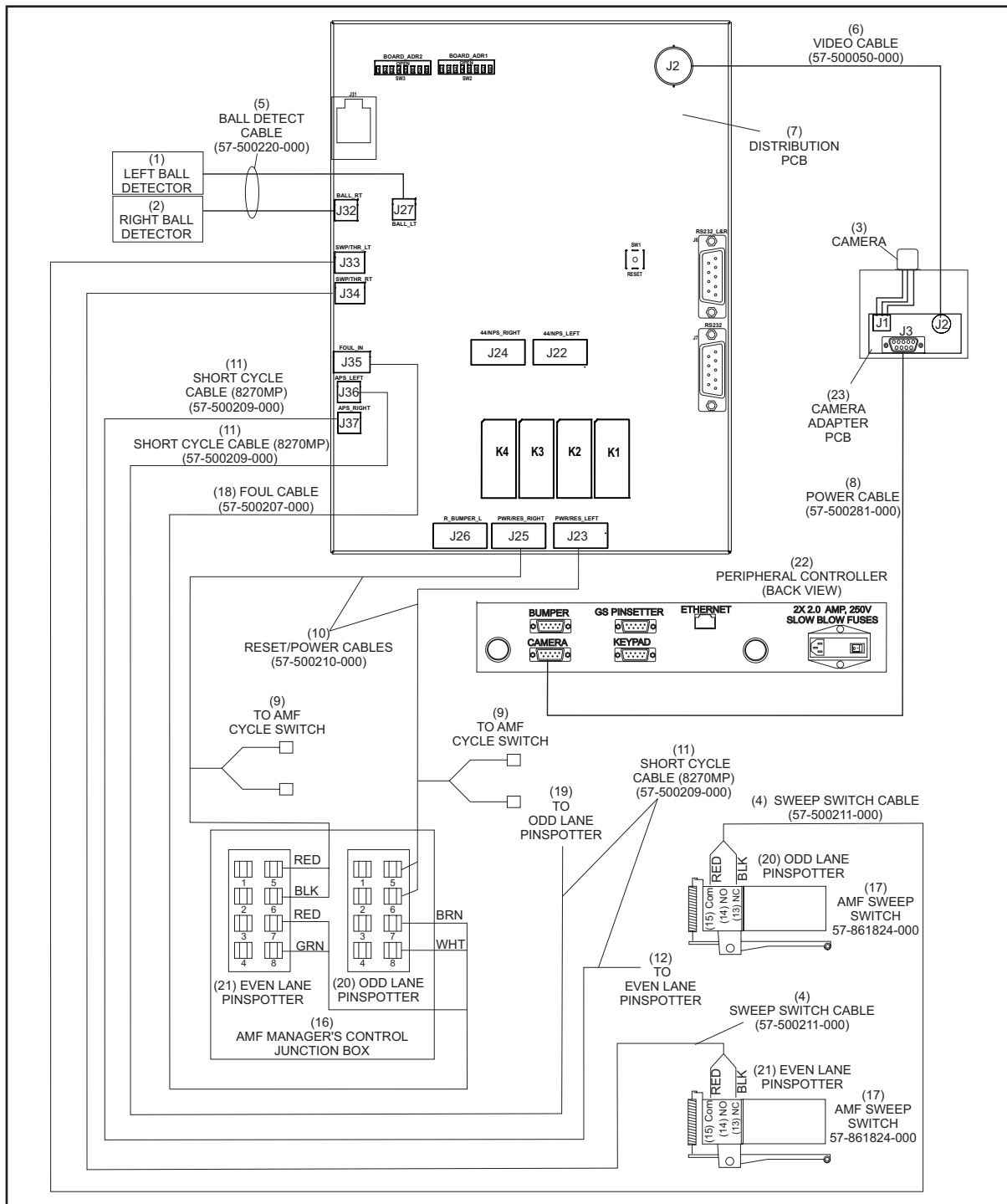
A, A2 Pinsetter Sync Wiring

- | | | |
|---------------------------------------|---|---------------------------------------|
| (1) LEFT BALL DETECTOR | (2) RIGHT BALL DETECTOR | (3) BALL DETECT CABLE (57-500220-000) |
| (4) PERIPHERAL CONTROLLER (BACK VIEW) | (5) CAMERA | (6) VIDEO CABLE (57-500050-000) |
| (7) POWER CABLE (57-500281-000) | (8) ODD | (9) EVEN |
| (10) FOUL CABLE (57-500207-000) | (11) PINSETTER RESET/POWER/ SWEEP CABLE (57-500206-000) | (12) FOUL UNIT |
| (13) DISTRIBUTOR PCB | (14) LEFT PINSETTER | (15) ELECT. BOX |
| (16) POWER | (17) RESET | (18) RAKE DOWN SWITCH |
| (19) RIGHT PINSETTER | (20) CAMERA ADAPTER PCB | (21) NEW PIN SOLENOID |
| (22) 44 DEGREE SWITCH | | |



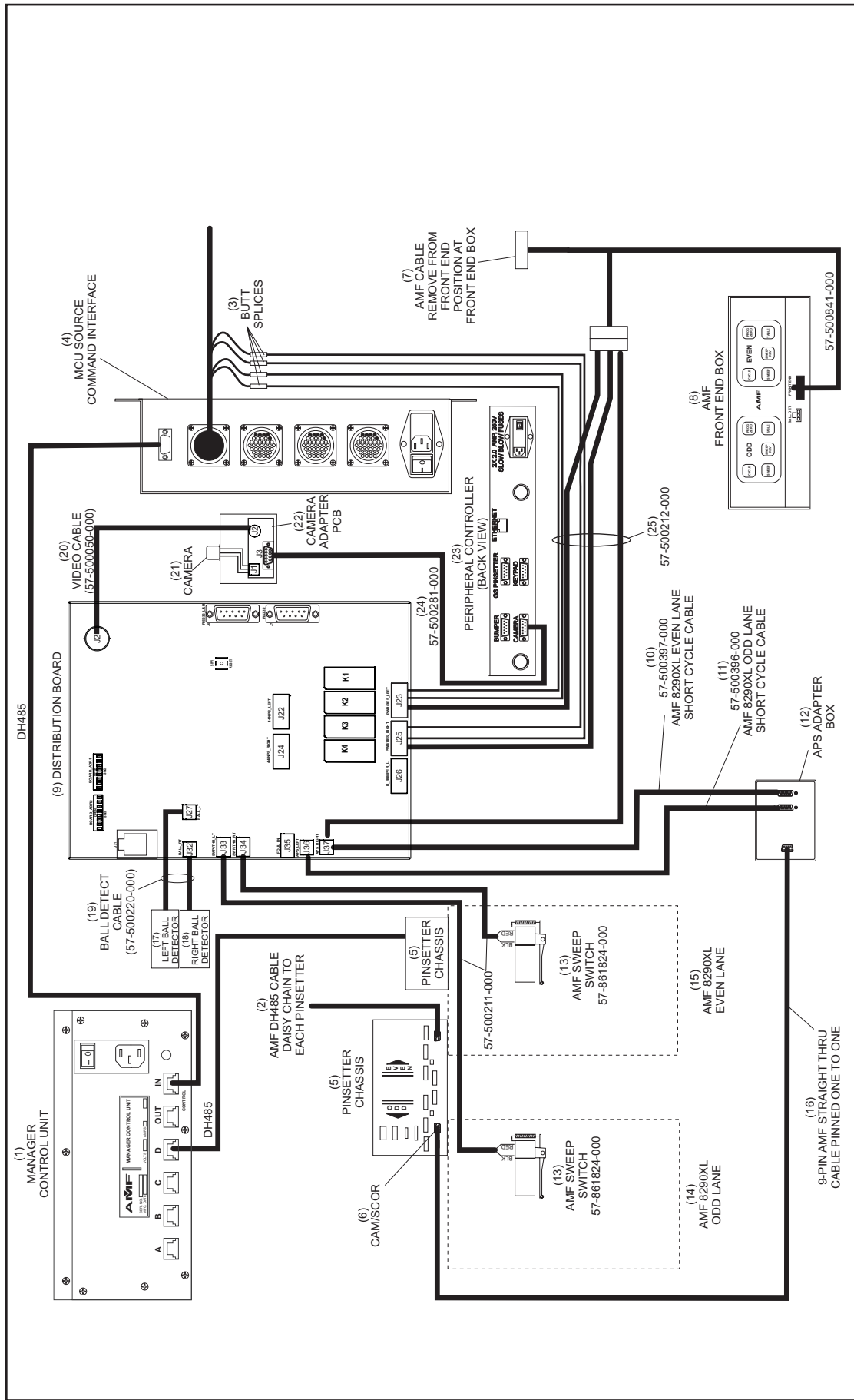
AMF 8230 Wiring

- | | | |
|--|---|---------------------------------|
| (1) LEFT BALL DETECTOR | (2) RIGHT BALL DETECTOR | (3) CAMERA |
| (4) SWEEP SWITCH CABLE (57-500211-000) | (5) BALL DETECT CABLE (57-500220-000) | (6) VIDEO CABLE (57-500050-000) |
| (7) POWER CABLE (57-500281-000) | (8) RESET FOUL CABLE (57-500212-000) | (9) AMF 8290XL |
| (10) ODD LANE PINSPOTTER | (11) AMF SWEEP SWITCH (57-861824-000) | (12) DISTRIBUTOR PCB |
| (13) CAMERA ADAPTER PCB | (14) RESET/FOUL "Y" CABLE (57-300841-000) | (15) NORMALLY CLOSED |
| (16) EVEN LANE PINSPOTTER | (17) NORMALLY OPEN | (18) COM |
| (19) PERIPHERAL CONTROLLER (BACK VIEW) | | |



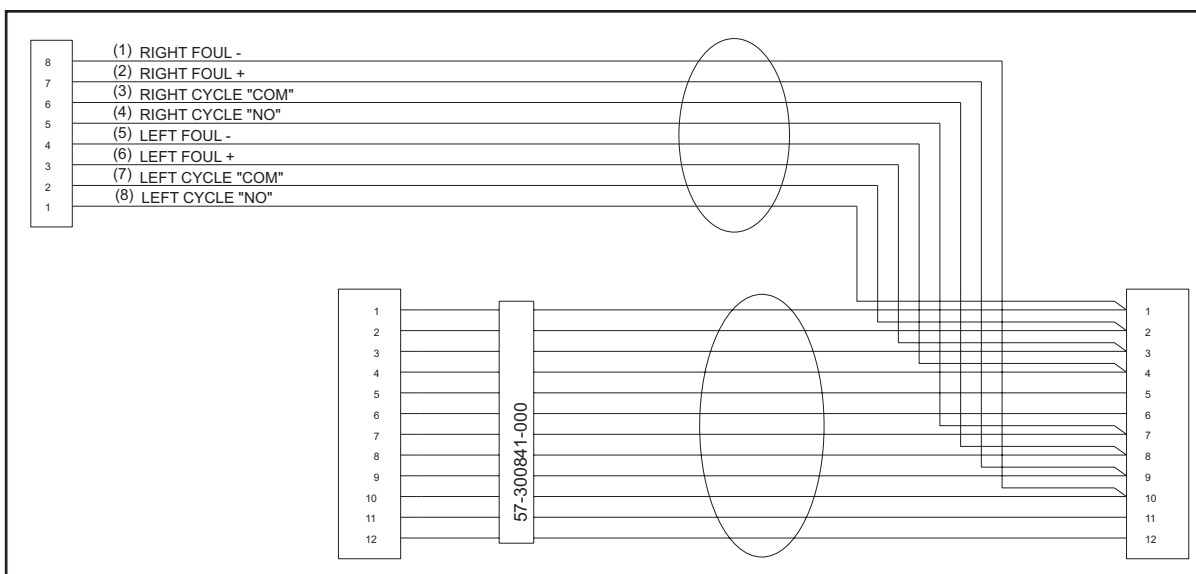
AMF 8270 Wiring

- | | | |
|--|--|------------------------------------|
| (1) LEFT BALL DETECTOR | (2) RIGHT BALL DETECTOR | (3) CAMERA |
| (4) SWEEP SWITCH CABLE
(57-500211-000) | (5) BALL DETECT CABLE
(57-500220-000) | (6) VIDEO CABLE
(57-500050-000) |
| (7) DISTRIBUTION PCB | (8) POWER CABLE (57-500281-000) | (9) TO AMF CYCLE SWITCH |
| (10) RESET/POWER CABLE
(57-500210-000) | (11) SHORT CYCLE CABLE 8270MP
(57-500209-000) | (12) TO EVEN LANE
PINSPOTTER |
| (13) NORMALLY CLOSED | (14) NORMALLY OPEN | (15) COM |
| (16) AMF MANAGER'S CONTROL
JUNCTION BOX | (17) AMF SWEEP SWITCH
(57-861824-000) | (18) FOUL CABLE
(57-500207-000) |
| (19) TO ODD LANE PINSPOTTER | (20) ODD LANE PINSPOTTER | (21) EVEN LANE PINSPOTTER |
| (22) PERIPHERAL CONTROLLER
(BACK VIEW) | (23) CAMERA ADAPTER PCB | |



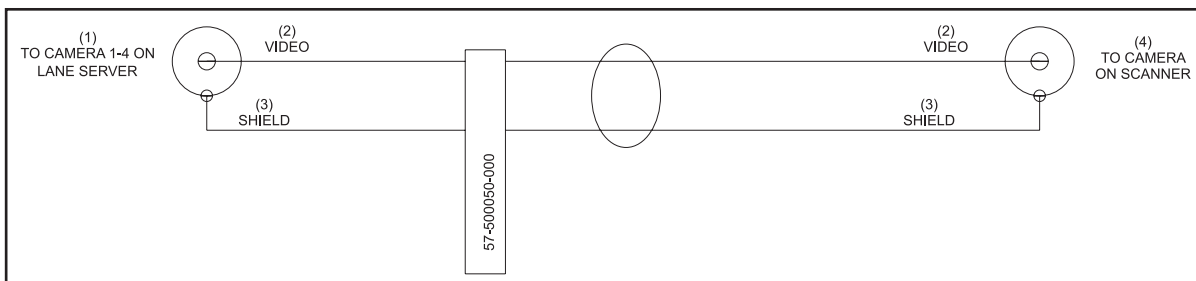
AMF 8290XL Interface Overview

- | | | | |
|-------------------------------|---|---|--|
| (1) MANAGER CONTROL UNIT | (2) CAM/SCOR | (3) BUTT SPLICES | (4) MCU SOURCE COMMAND INTERFACE |
| (5) PINSETTER CHASSIS | (6) AMF DH485 CABLE DAISY CHAIN TO EACH PINSETTER | (7) AMF CABLE REMOVE FROM "FRONT END" POSITION AT FRONT END BOX | (8) AMF FRONT END BOX |
| (9) DISTRIBUTION BOARD | (10) 57-500397-000 AMF 8290XL EVEN LANE SHORT CYCLE CABLE | (11) 57-500396-000 AMF 8290XL ODD LANE SHORT CYCLE CABLE | (12) APS ADAPTER BOX |
| (13) AMF SWITCH 57-861824-000 | (14) AMF 8290XL ODD LANE | (15) AMF 8290XL EVEN LANE | (16) 9-PIN AMF STRAIGHT THRU CABLE PINNED ONE TO ONE |
| (17) LEFT BALL DETECTOR | (18) RIGHT BALL DETECTOR | (19) BALL DETECT CABLE (57-500220-000) | (20) VIDEO CABLE (57-500050-000) |
| (21) CAMERA | (22) PERIPHERAL CONTROLLER | (23) CAMERA ADAPTER PCB | (24) 57-500281-000 |
| (25) 57-5002212-000 | | | |



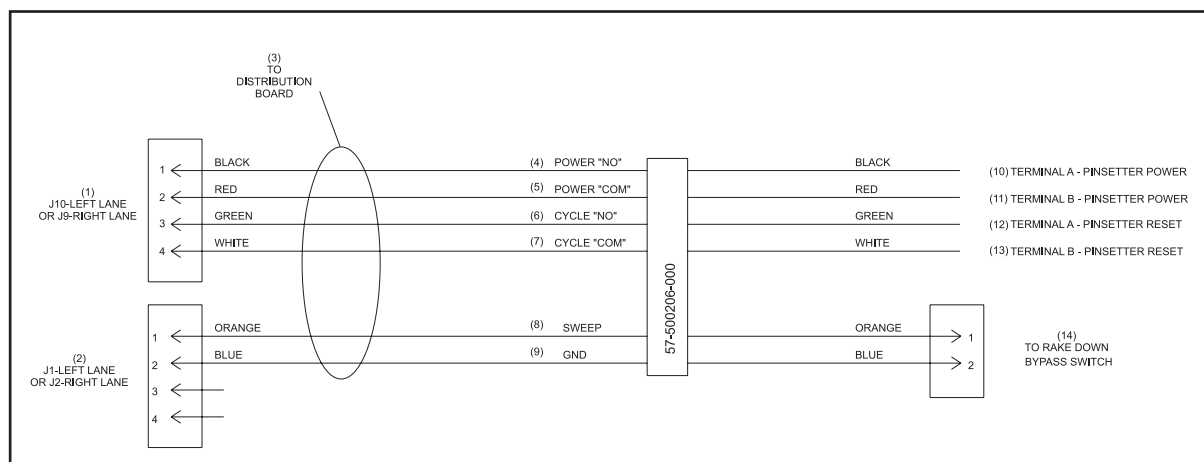
AMF 8290XL Foul/Reset "Y" Cable (Part No. 57-300841-000)

- | | | |
|----------------------|---------------------|-----------------------|
| (1) RIGHT FOUL - | (2) RIGHT FOUL + | (3) RIGHT CYCLE "COM" |
| (4) RIGHT CYCLE "NO" | (5) LEFT FOUL- | (6) LEFT FOUL+ |
| (7) LEFT CYCLE "COM" | (8) LEFT CYCLE "NO" | |



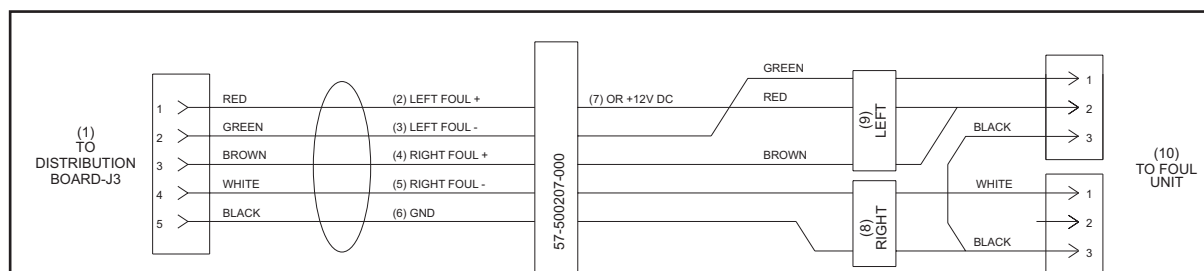
Camera Video Cable (Part No. 57-500050-000)

- | | | |
|----------------------------------|-----------|------------|
| (1) TO CAMERA 1-4 ON LANE SERVER | (2) VIDEO | (3) SHIELD |
| (4) TO CAMERA ON SCANNER | | |



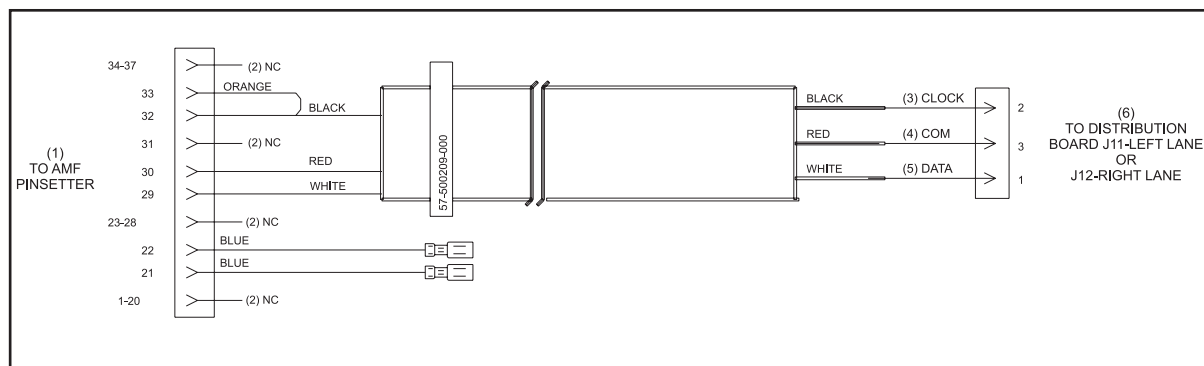
A, A-2 Reset/Power/Sweep Cable (Part No. 57-500206-000)

- | | | |
|------------------------------------|-----------------------------------|-----------------------------------|
| (1) J10 LEFT LANE OR J9 RIGHT LANE | (2) J1-LEFT LANE OR J2-RIGHT LANE | (3) TO DISTRIBUTION BOARD |
| (4) POWER "NO" | (5) POWER "COM" | (6) CYCLE "NO" |
| (7) CYCLE "COM" | (8) SWEEP | (9) GROUND |
| (10) TERMINAL A - PINSETTER POWER | (11) TERMINAL B - PINSETTER POWER | (12) TERMINAL A - PINSETTER RESET |
| (13) TERMINAL B - PINSETTER RESET | | |



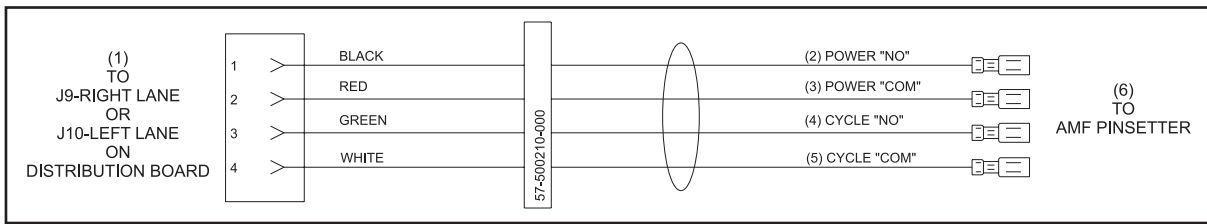
Foul Cable (Part No. 57-500207-000)

- | | | |
|------------------------------|-----------------|-----------------|
| (1) TO DISTRIBUTION BOARD-J3 | (2) LEFT FOUL + | (3) LEFT FOUL - |
| (4) RIGHT FOUL + | (5) RIGHT FOUL- | (6) GROUND |
| (7) OR +12VDC | (8) RIGHT | (9) LEFT |
| (10) TO FOUL UNIT | | |



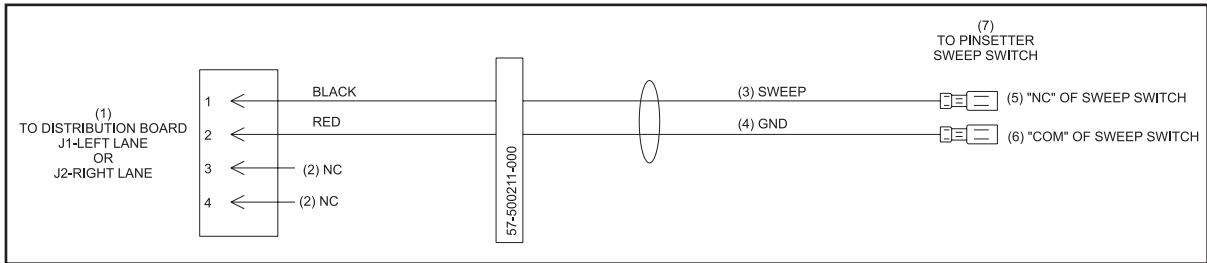
AMF 8270MP Short Cycle Cable (Part No. 57-500209-000)

- | | | |
|----------------------|-------------------|---|
| (1) TO AMF PINSETTER | (2) NO CONNECTION | (3) CLOCK |
| (4) COM | (5) DATA | (6) TO DISTRIBUTION BOARD J11-LEFT LANE OR J12-RIGHT LANE |



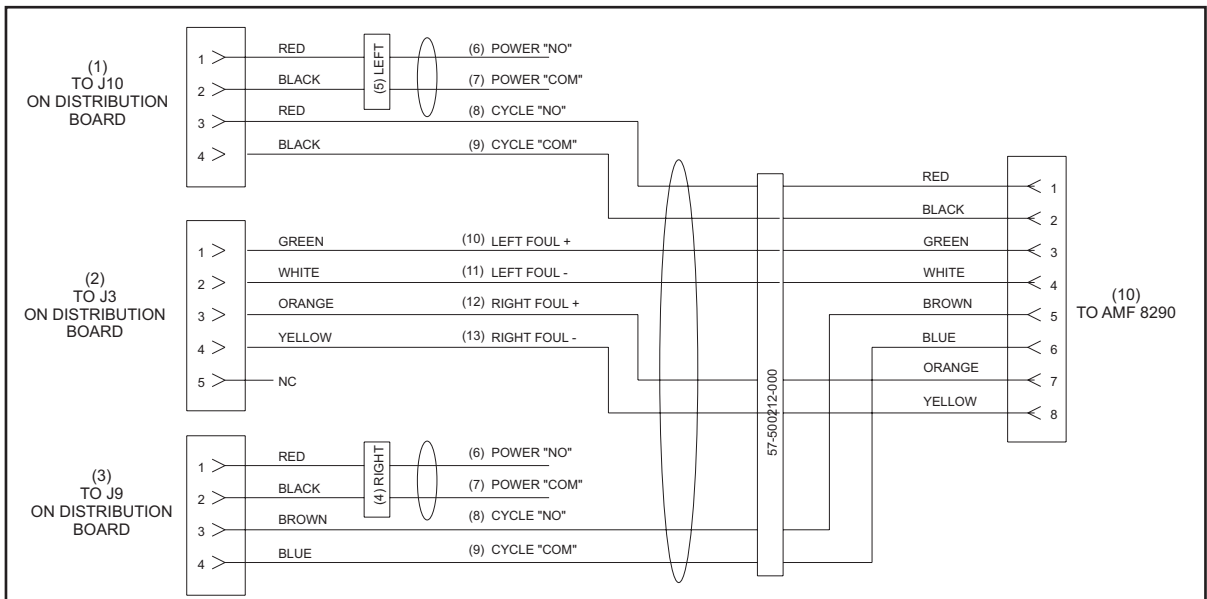
AMF 8230 /8270 Power/Reset Cable (Part No. 57-500210-000)

- | | | |
|--|-----------------|----------------------|
| (1) TO J9-RIGHT LANE OR J10
ON DISTRIBUTION BOARD | (2) POWER "NO" | (3) POWER "COM" |
| (4) CYCLE "NO" | (5) CYCLE "COM" | (6) TO AMF PINSETTER |



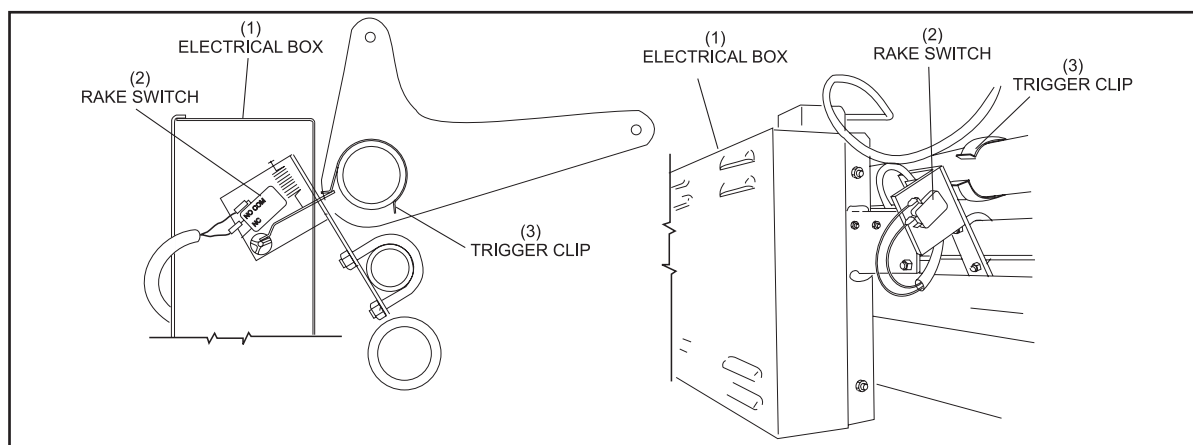
AMF Sweep Switch Cable (Part No. 57-500211-000)

- | | | |
|---|---------------------------------|----------------------------|
| (1) TO DISTRIBUTION BOARD
J1-LEFT LANE OR J2-RIGHT
LANE | (2) NO CONNECTION | (3) SWEEP |
| (4) GROUND | (5) NORMALLY CLOSED OF
SWEEP | (6) COMMON OF SWEEP SWITCH |
| (7) TO PINSETTER SWEEP SWITCH | | |



AMF 8290XL Foul/Reset Cable (Part No. 57-500212-000)

- | | | |
|-------------------------------------|------------------------------------|---------------------------------|
| (1) TO J10 ON DISTRIBUTION
BOARD | (2) TO J3 ON DISTRIBUTION
BOARD | (3) TO J9 ON DISTRIBUTION BOARD |
| (4) RIGHT | (5) LEFT | (6) POWER "NO" |
| (7) POWER "COM" | (8) CYCLE "NO" | (9) CYCLE "COM" |
| (10) TO AMF 8290 | | |

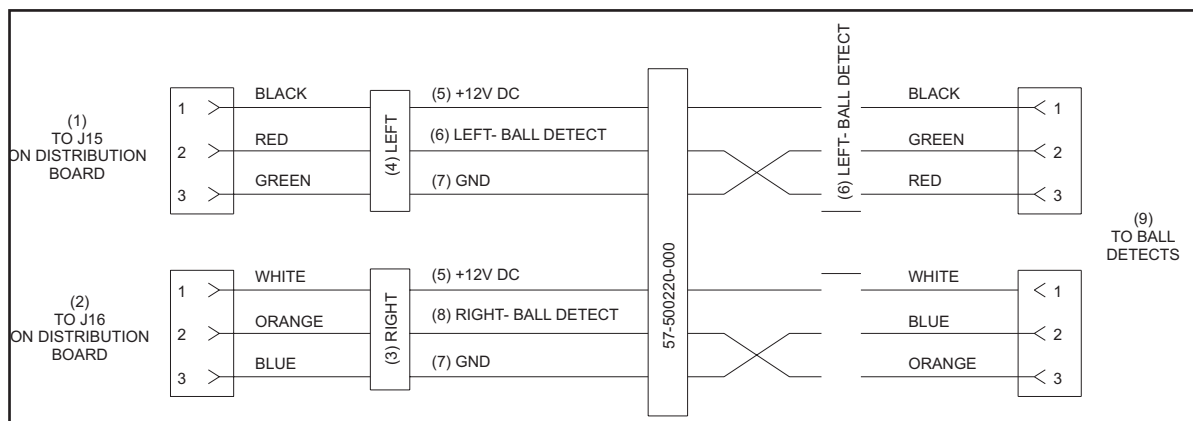


Brunswick A Pinsetter Sweep Switch Cable (Part No. 57-500213-000)

(1) ELECTRICAL BOX

(2) RAKE SWITCH

(3) TRIGGER CLIP



Ball Detect Cable (Part No. 57-500220-000)

(1) TO J15 ON DISTRIBUTION BOARD

(4) LEFT

(7) GROUND

(2) TO J16 ON DISTRIBUTION BOARD

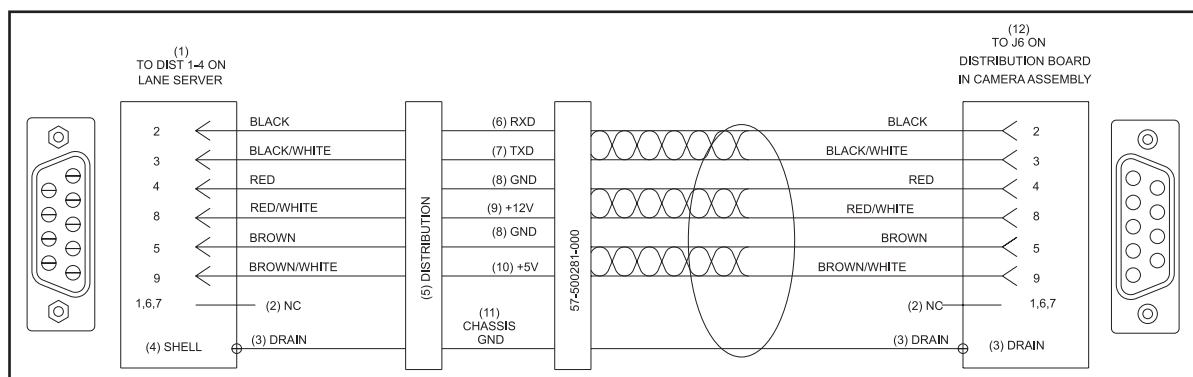
(5) +12 VOLTS DIRECT CURRENT

(8) RIGHT BALL DETECT

(3) RIGHT

(6) LEFT BALL DETECT

(9) TO BALL DETECTS



Distributor PCB to Scorer Computer Data Cable (Part No. 57-500281-000)

(1) TO DIST 1-4 ON LANE SERVER

(4) SHELL

(7) TXD

(10) +5V

(2) NO CONNECTION

(5) DISTRIBUTION

(8) GROUND

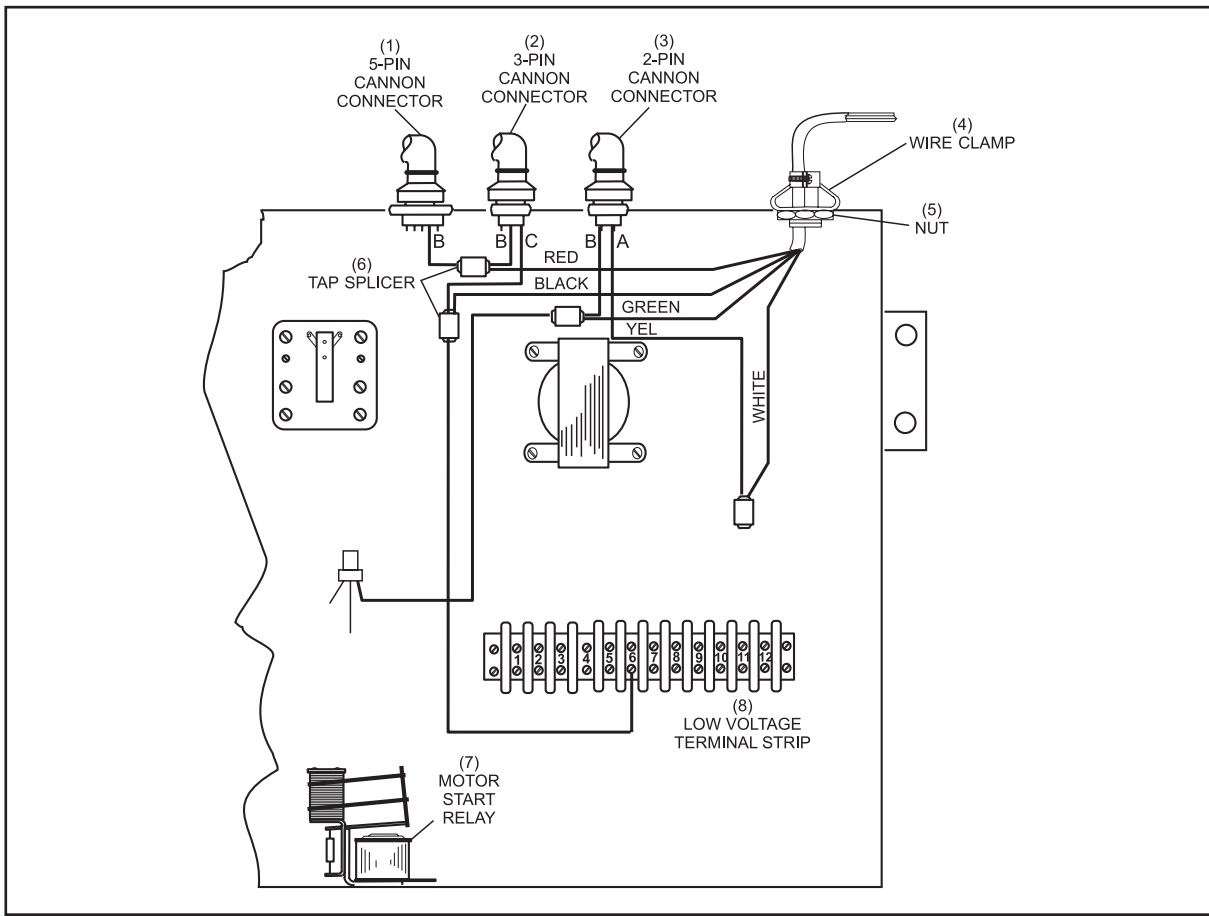
(11) CHASSIS GROUND

(3) DRAIN

(6) RXD

(9) +12V

(12) TO J6 ON DISTRIBUTION BOARD IN CAMERA ASSEMBLY



A-2 Pinsetter Wiring

- | | | |
|----------------------------|--------------------------------|----------------------------|
| (1) 5-PIN CANNON CONNECTOR | (2) 3-PIN CANNON CONNECTOR | (3) 2-PIN CANNON CONNECTOR |
| (4) WIRE CLAMP | (5) NUT | (6) TAP SPLICER |
| (7) MOTOR START RELAY | (8) LOW VOLTAGE TERMINAL STRIP | |

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