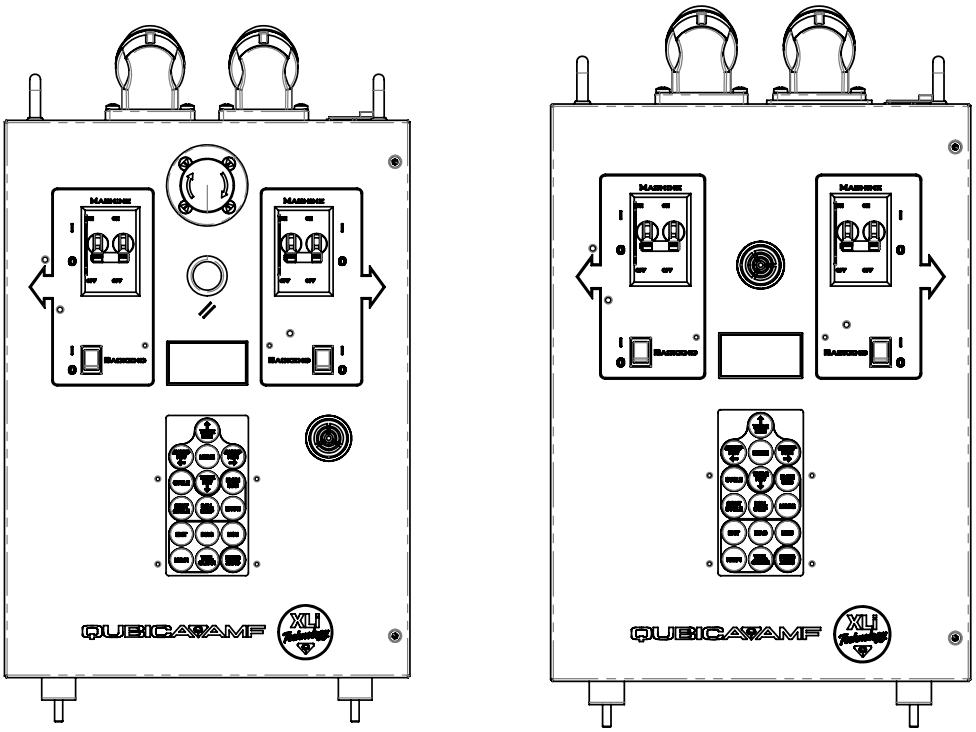
SYSTEM CONTROLLER

EDGE FREE FALL Pinspotter Manual Supplement
Appendix D



These Original Instructions were written in English.

400-088-009-03 Rev. A
November 2022

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DOCUMENT UPDATES

This manual supersedes all previous versions of the System Controller Owner's Manual. QubicaAMF Worldwide, LLC. reserves the right to revise and/or update this manual at any time without obligation to notify any person or entity of such revision. The document number, revision level, and date below indicate the edition of this manual.

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Pinspotter System Controller

Installation & Operating Guide

400-088-009-03 Rev. A

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Appendix D. System Controller Manual

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1. **INTRODUCTION**

1.1. How to Use This Manual

The Installation and Operating Guide is divided into six sections:

1.0 INTRODUCTION
2.0 SAFETY PRECAUTIONS
3.0 EDGE Free Fall SYSTEM CONTROLLER INSTALLATION
4.0 EDGE Free Fall SYSTEM CONTROLLER CONTROL PANEL OPERATING PROCEDURES
5.0 TROUBLESHOOTING
6.0 WIRING DIAGRAMS AND DRAWINGS

1.2. Conventions Used

Whenever a switch or keypad pushbutton is mentioned, its name will appear in brackets **[ ]** as shown below.

[SWEEP REV]

Items in italics are references to menu items that will be seen on the display or is a state that the system controller screen is in. An example is shown below.

Auto Backend Shutoff

1.3. Abbreviations Used

CONT	Continuous
MCU	Manager's Control Unit
PROG	Program
REV	Reverse
TRBL	Trouble
DIAG	Diagnostic
AC	Alternating Current
E-Stop	Emergency Stop
LOTO	Lock out/Tag out

1.4. System Controller Description

This manual is written specifically for the EDGE Free Fall system controller, p/n 088-401-000-03 & 088-401-001, containing software versions 5.08 or higher. The 088-401-000 system controller is used in standard pinspotter installations, while the 088-401-000 system controller is used in installations that include the SmartGuard™ Safety System. Other EDGE Free Fall system controllers and software are likely to have many of the same features and functions, but differences will exist. Refer to the system controller manual that was provided with your equipment for details of the features of those system controllers.

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The EDGE FREE FALL pinspotter system controller is a multifunction control system designed to operate a pair of pinspotters as well as communicate with and carry out functions from the Manager's Control Unit (MCU) and the Technician's Handheld Unit (THU). The system controller consists of a metal box with a swing-open front cover. There are no internal components that need to be replaced by the center mechanic. All fuses are now accessed from the top of the unit. **Opening the system controller during the warranty period will void the warranty.**

The front of the system controller contains circuit breakers, switches, and a keypad for performing various functions. A lighted display indicates the state of pinspotter and system components as described in Section 4.0. The rear of the system controller contains connectors for the various pinspotter power and control cables as well as for cables from supporting equipment, such as the scoring camera and handheld unit extension (which replaces the front end box on older systems). Power supply connections are located at the top of the system controller. Section 6.0 contains system controller drawings and a cable identification and wiring connection diagram.

1.5. Key Features

Some key system controller features are listed below.

KEY FEATURES

- Circuit breakers and back end motor switches are on the operating panel.
- Battery backup allows the system controller to maintain key operational data when normal power is removed.
- A keypad that allows manual operation of the odd or even lane's pinspotter.
- Lighted display that indicates the state of pinspotter and system components.
- Links to the pit lights, ball detector, camera, mask switch, MCU, foul detector, and ball return.
- Audible warning on startup.
- Built-in time delay for back end shutdown to allow the bowler's ball to be returned.
- Access to fuses without opening the system controller.
- Handheld unit that plugs in at the front of the pinspotters near the camera.
- Emergency Stop (E-Stop) switch that can be used to rapidly shutdown both pinspotters. A reset switch is also provided (not applicable to the 088-401-001 system controller).
- A pair of remote light towers that signal the status of the pinspotters as well as functioning as a mechanic call system.

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2. SAFETY PRECAUTIONS

- **When you see this symbol associated with instructions, a possible hazard is indicated. Follow these instructions carefully!**

- **Before installing, removing, or replacing a system controller, be certain that the circuit breakers on the front of the system controller are turned off and all power supplies are unplugged.**

- **Before applying power to a system controller, be sure that all cables have been connected properly – especially the power cables.**

WARNING! Read this <u>BEFORE</u> Proceeding.

TO AVOID INJURY:

Read these safety precautions before attempting to install or modify any QubicaAMF equipment.

Failure to follow these procedures may result in severe personal injury, fire, or permanent damage to equipment or property.

- **Disconnect the power before working on any pinspotter equipment and before entering any operating portion of a pinspotter.**

- **Before operating a system controller or pinspotter, make sure that all GUARDS are in place.**

- **High Voltage is present within the system controller. Never open the system controller with the main power or logic power plugs plugged in.**

Note: The system controller contains tamper indicating seals. <u>Opening the system controller will void the warranty.</u>

- **Wait a minimum of 60 seconds after the power is disconnected from a system controller before touching or removing any system controller components.**

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2.1. Warning Labels

Risk of electric shock! This is the *Electrical Hazard* Symbol. It indicates that there are dangerous high voltages present. Electrical panels contain lethal voltage. Do not perform any work unless you are qualified and authorized to do so.

To reduce the risk of fire or electric shock, do not attempt to gain access to areas where you are not instructed to do so. Use safety consciousness when testing circuits or using test equipment with high voltage potential output.

This is the *Caution* Symbol. It indicates a condition where damage to the equipment or non-fatal injury to the installer could occur if operational procedures are not followed. To reduce the risk of damage or injury, follow all procedures as directed.

This is the *safety glasses* required symbol. It indicates that damage to eyesight could occur while performing a task or operation. To reduce the risk of eye injury, use approved safety glasses or goggles prior to beginning the task denoted with this symbol.

This is the *hearing protection required* symbol. It indicates that damage to hearing could occur while performing a task or operation. To reduce the risk of hearing injury, use approved hearing protection prior to beginning the task denoted with this symbol. During bowling activities, the sound pressure level (A-weighted) in the system controller operating area is greater than 80 dBA. Hearing protection is recommended.

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3. EDGE Free Fall SYSTEM CONTROLLER INSTALLATION

Before installing the EDGE Free Fall System controller, ensure that all power to the pinspotters is switched off at the main breaker box.

Verify that the power supply matches that required by the system controller. (The EDGE Free Fall system controller accepts single phase, 208-250 Volt, 50/60 Hertz power only – DO NOT supply an EDGE Free Fall system controller with 115-Volt power!)

Refer to the wiring diagram on Page 45 for cable identification.

3.1. Tools Needed

7/16-inch Wrench
Small Flat-Blade Screwdriver

3.2. Power Supply Requirements

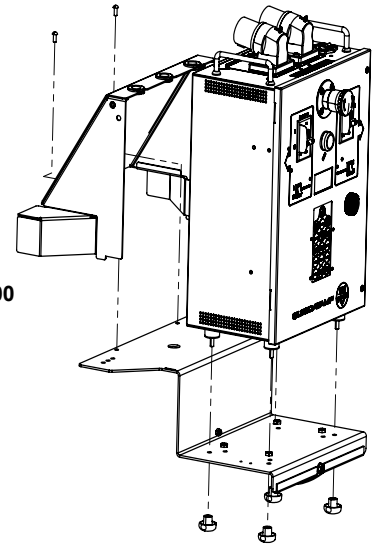
- Two 20-Amp, 208-250 Volt, 50 or 60 Hertz circuits (1 per pinspotter).
- System controller logic power can have a drop from one of the 20-Amp pinspotter circuits.

3.3. Installation

1. For the 088-401-000 system controller installation, mount the EDGE Free Fall system controller to the system controller mounting bracket (P/N 088-501-772) located between the odd and even lane pinspotters.

   a. Insert the four studs of the vibration mounts on the bottom of the system controller through the holes in the mounting bracket and secure using four knobs.

088-401-000



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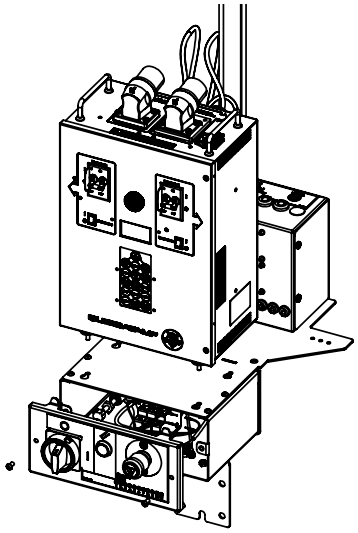

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2. For the 088-400-001-01 system controller installation,
   a. Place the disconnect switch on the Safety E-Stop Panel in the OFF position.
   b. Remove the front panel of the Safety E-Stop Panel Assembly by removing the two screws that secure it to the box.
   c. Insert the four studs of the vibration mounts on the bottom of the system controller through the holes in the Safety E-Stop Panel Assembly and secure using four knobs.
   d. Reinstall the Safety E-Stop front panel. The tabs on the cover prevent front to back system controller movement.

3. Attach the connectors of the odd machine's power cable (088-500-239-01) and the signal cable (088-000-243) to the corresponding connectors on the back of the EDGE Free Fall system controller. Take care to only connect to the odd side connectors.

4. Repeat this process for the even machine's power cable (088-500-238-01) and the signal cable (088-000-242) for the even side of the system controller connectors.

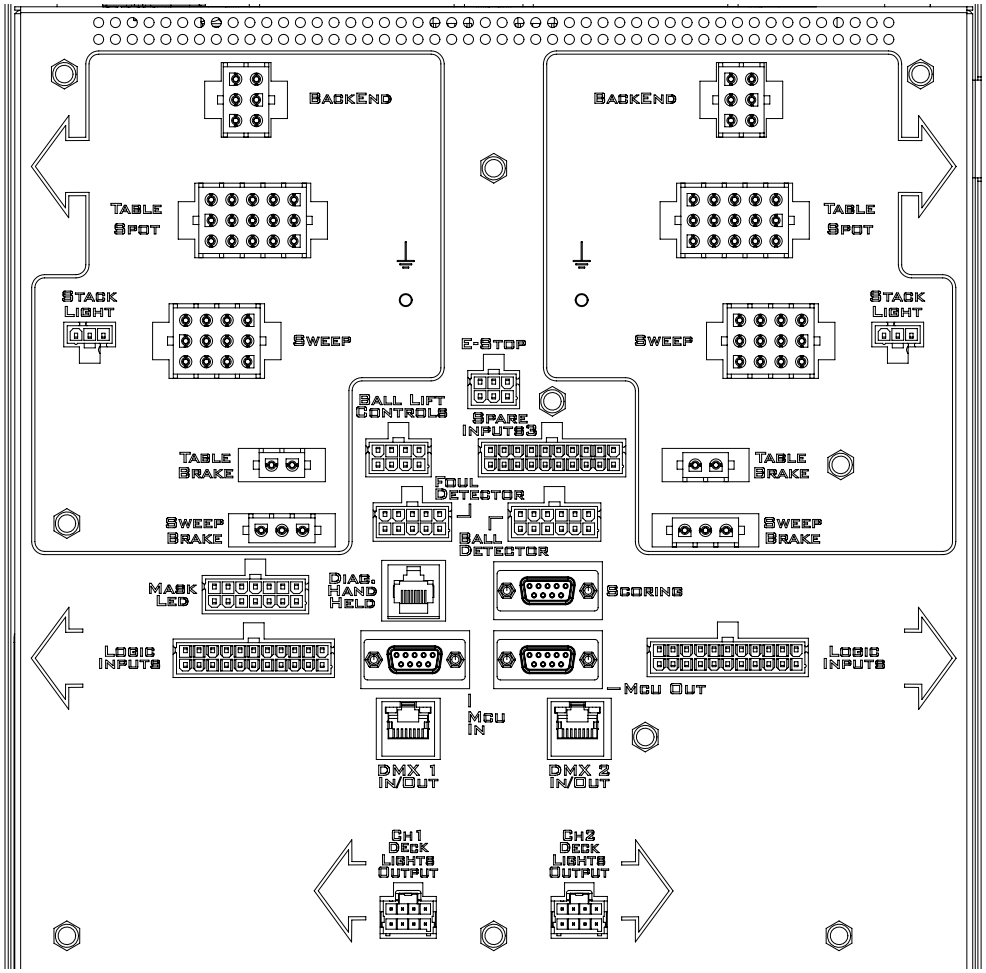

Figure 2, EDGE Free Fall System Controller, connection layout

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5. Connect the handheld relocation cable (070-007-056) to the RJ45 connector located on the back of the system controller. Route the handheld relocation cable to the front of the pinspotter then down under the lane to the camera's location. Attach the cables RJ45 connector to the ethernet receptacle (746-024-506).

6. For installations with QubicaAMF QVision camera:

   a. Connect the scoring cable (286-003-303) to the scoring port (DB9) on the back of the system controller.

   b. Route the scoring cable to the front of the pinspotter, then down under the lane to the camera's location. Attach the cable's RJ45 connector to the corresponding connector on the QVision board.

7. For installations with the QubicaAMF QV3000 camera:
   a. Connect the scoring cable (286-003-303) to the scoring port (DB9) on the back of the system controller.
   b. Mount the camera power port assembly (088-200-526) near an electrical outlet on the curtain wall, centered between the pair of pinspotters.
   c. Verify the camera power port's voltage selector switch is set to the correct voltage supplied at the outlet (120v/220v).
   d. Connect the camera power cable (232-008-734) to the pigtail cable attached to the camera power port assembly.
   e. Route the camera power and scoring cables to the front of the pinspotter, then down under the lane to the cameras position. Attach the cable connectors to the corresponding connectors on the QV3000 boards.
   f. Connect the power cable from the camera power port to the electrical outlet on the curtain wall.

Refer to MCU installation instruction sheet 400-088-158 for connecting the home run cable to the MCU USB Converter and loading the MCU software.

8. Connect the Mask cable (051-010-007), the Ball Detector cable (088-000-508-01, if installing Ball Detector), the Ball Lift cable (088-000-016), the EDGE Lift E-stop cable (088-201-184), the Guarding & Bin Switch power cable (088-000-246-01) and the Foul Detector cable (088-000-015) to the back of the system controller. The cable numbers given here are for current production products. Legacy products may have cables with different part numbers.

*If installing the 088-401-001 system controller into a system containing the SmartGuard™ Safety System electrical configuration, connect the EDGE Free Fall System Controller E-Stop Cable (088-200-639), which is included with the Safety Control System, to the CE Safety Control Box and to the EDGE Free Fall System controller.

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3.4. Manager's Control Unit (MCU) and Daisy Chain Links

One MCU USB Converter is required for each chain of system controller. Each chain can consist of up to 32 lanes through 16 system controllers that are connected together using daisy chain cables. The first system controller in a chain is linked to the MCU via a home run cable, and the last system controller in the chain ends the chain using a terminator cable.

1. Connect the home run cable (088-000-510) coming from the MCU to the "MCU IN" connector on the back of the first EDGE Free Fall system controller in the chain.

2. Connect one end of the daisy chain cable (090-005-749) to the "MCU OUT" connector on the back of the first EDGE Free Fall system controller in the chain.

3. Route the free end of the daisy chain cable along the even machine's wireway and within the crossbeam weldment to the next lane pair in the series. Continue to route the cable in a similar manner within the lane pair's even machine wireway and connect the free end of the daisy chain cable to the "MCU IN" connector on the back of the next EDGE Free Fall system controller in the chain.

4. Repeat Steps 2 and 3 for the remaining system controllers in the chain. There can be no more than 16 system controllers in a chain.

5. Connect a terminator cable (090-005-794) to the "MCU OUT" connector on the back of the last EDGE Free Fall system controller in the chain.

Verify that all power switches and breakers on the system controller are in the OFF position.

1. Connect the AC power cables to the connectors located on the top of the system controller. Note: for 088-401-001 System controller installation, connect the AC power and Logic power cables (in brackets below) coming from the CE Safety Control Box to the system controller.

   a. Connect the odd pinspotter's AC power cable, 090-005-855, [088-200-632] coming from the power source to the system controller's odd machine power connector.

   b. Connect the even pinspotter's AC power cable, 090-005-855, [088-200-631] coming from the power source to the system controller's even machine power connector.

   c. Connect the system controller logic AC power cable, 090-005-706, [088-200-637] to the system controller logic power connector.

2. Install the wiring hood cover over the wires at the back of the system controller. Ensure any cables routed through the cover are protected by grommets.

3. Install the wireway covers and secure them with the screws provided.

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4. EDGE Free Fall SYSTEM CONTROLLER CONTROL PANEL OPERATING PROCEDURES

Before Operating This Equipment:

- **Ensure that all guards are in place and that there are no loose or frayed wires.**
- **Keep clear of all moving parts.**
- **Advise the MCU operator that you are working on the equipment.**

The EDGE Free Fall system controller has a safety beeper that beeps for 10 seconds when the logic power is turned on and when a pinspotter is placed in any mode except "Standby" at the MCU. The pinspotter will not operate while the safety beeper is beeping.

Whenever the Table or Sweep Motor is cranked by hand, the encoders will not keep the correct count. Because of this, it is very important that you either crank the Table and/or Sweep to the HOME position so that the LED on the Home Sensor comes on and stays on, or place the system controller in the Mechanics Mode and use the Table and Sweep [RUN] or [REV] buttons and drive the Table and/or Sweep slightly past the HOME position, and then use the [HOME] button to return them to the HOME position. If this is not done, you could possibly receive Interlock and Sweep errors, or the Table and Sweep could collide causing damage to the pinspotter.

4.1. System controller components

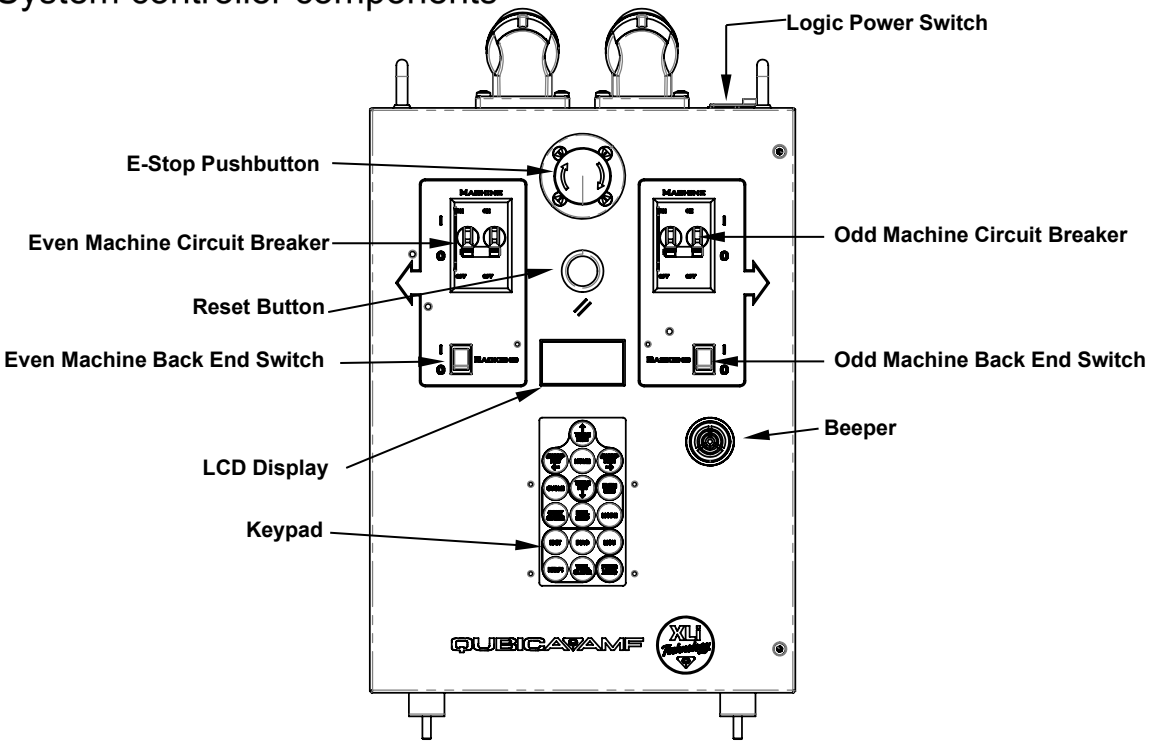

Figure 3, System Controller component identification

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- **Logic Power Switch** — Turns control power to the system controller on and off. Switch is located on top of the system controller.
- **Odd Machine Circuit Breaker** — Controls all AC power to the odd pinspotter.
- **Even Machine Circuit Breaker** — Controls all AC power to the even pinspotter.
- **Odd Machine Back End Switch** — Turns the odd pinspotter's back end motor on or off. **This switch interrupts the control voltage to the back end motor relay, NOT the motor AC power! THIS IS NOT FAIL-SAFE! When working in the back end, follow LOTO procedures.**
- **Even Machine Back End Switch** — Turns the even pinspotter's back end motor on or off. **This switch interrupts the control voltage to the back end motor relay, NOT the motor's AC power! THIS IS NOT FAIL-SAFE! When working in the back end, follow LOTO procedures.**
- **E-Stop Pushbutton** (088-401-000 System controller Only) — Red button used to stop both pinspotters in an emergency. Once the problem has been solved, twist the E-Stop button clockwise to disengage it. An error message will be on the display. To clear it, press the blue reset button and then the **[TRBL CLEAR]** button on the keypad.
- **Reset Button** — **Blue** button directly below the E-Stop that clears the system controller (088-401-000 System controller Only) and allows the **[TRBL CLEAR]** to clear the E-Stop error message.

4.2. LCD Display

The *Main Screen* (see Figure 4) is shown on the LCD Display when the system controller is turned on and has completed its startup. The state of both of the lanes is displayed. A considerable amount of information is shown by the various icons and numbers, which is explained in detail on the following pages.

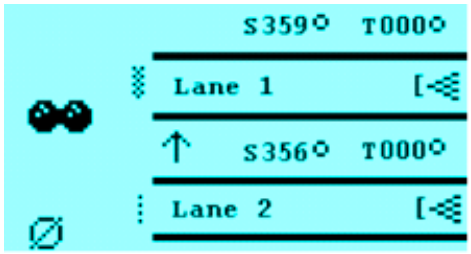

Figure 4, Main Screen

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4.3. Keypad

The Keypad is located directly below the display and allows the user to change basic attributes about the machine environment. It is identical to the keypad on the Handheld Unit. The Keypad is shown below in Figure 5.

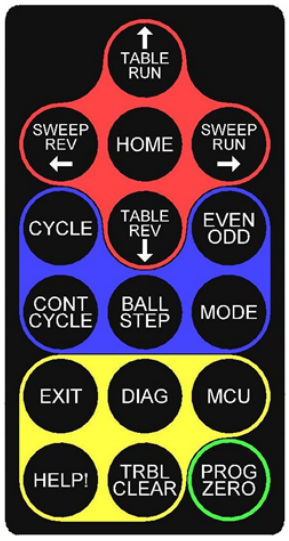

Figure 5, System controller and Handheld Keypad

4.3.1. Keypad Description

Note - The table and sweep **[RUN]** and **[REV]** buttons are active only in the Mechanic Mode; otherwise, they function as the arrows. Holding down the table or sweep **[RUN]** or **[REV]** button will move the table or sweep a significant amount. The **[HOME]** button is active in any mode except Continuous Cycle. See Sections 4.6 and 4.7 for a description of all the modes.

[TABLE RUN] [↑] - Runs the table manually forward through the normal cycle. The up arrow is used to scroll up through a menu list.

To spot pins remotely from the system controller or the Technician's Handheld Unit (THU), press **[BALL STEP]**, followed by **[HELP!]**, then press and hold **[TABLE RUN]**. This engages the spotting solenoid and runs the table down and spots pins. Must repeat for each spotting cycle.

[TABLE REV] [↓] - Runs the table manually backward through the normal cycle. The down arrow is used to scroll down through a menu list.

[SWEEP RUN] [→] - Runs the sweep manually forward through the normal cycle. The right arrow is sometimes used to scroll to the right when more than one setting option is available. It is also used for selection of menu items in the *MCU Functions* menu.

[SWEEP REV] [←] - Runs the sweep manually backward through the normal cycle. The left arrow is sometimes used to scroll to the left when more than one setting option is available.

[HOME] - Returns the table and sweep to their HOME positions.

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[CYCLE] - Will cause the selected lane to cycle (sweep and set pins), and will not send a signal to the scoring system that a cycle has occurred.

[CONT CYCLE] - Causes the selected pinspotter to go into Continuous Cycle (uses a longer than normal time delay).

[BALL STEP] - Changes the system controller from first ball to second ball and vice versa. This will be seen on the *Main Screen* display next to the selected lane as well as on the masking 1st or 2nd ball lights.

[MODE] - Pressing this button will make the selected lane go into Mechanic Mode and pressing it a second time will cause the system controller to return to the previous mode it was in. See *Mode Indicators* (Section 4.6) for more information about modes in general.

[EVEN ODD] - Pressing this button changes the focus of the system controller controls from the even lane to the odd lane and vice versa. See *Lane Selection* (Section 4.5) for more information.

[EXIT] - Takes you to the previous menu. If there is no previous menu then the *Main Screen* will be displayed.

[DIAG] - Pressing this button opens up a menu list on the display that allows basic monitoring of the machine and system controller. These items are not present on the *Main Screen* as icons. See *DIAG Button* (Section 4.12) for more information.

[MCU] - Pressing this button opens a menu list with submenus all related to settings and functions. They also can be selected through the Manager's Control Unit. See *MCU Button* (Section 4.11) for more information.

[HELP!] - Press and hold this button. If there is help available for the item that is being displayed, then it will come up on the screen. If no help is available, the display reads, "No help available for this item". Release the button to go back to the last screen displayed.

[PROG ZERO] - Used to reset software or to stop a cycle from continuing. Following an *Interlock* Trip, pressing **[PROG ZERO]** stops the cycle from continuing when the **[TRBL CLEAR]** button is pressed.

[TRBL CLEAR] - Clears the error from the system controller display. This will only work if the error itself has been corrected. For instance, if a breaker is open or has tripped, the error can only be cleared once the breaker is closed.

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4.4. Setting the System Controller Address

The Manager's Control Unit must be able to recognize each individual system controller so that each lane can be individually controlled. To accomplish this, a different address is input into each system controller. The lowest lane number of the pair needs to be input into the system controller. If a single lane is installed and it is an even lane, then it's lane number needs to be input into the system controller.

To set the system controller address:

1. Press the **[MCU]** button on the system controller keypad.
2. The flashing arrow should be next to the *Settings Menu*. Press the **[→]** button to select *Settings Menu*.
3. Press **[↓]** repeatedly until the flashing arrow is next to *Odd Lane ID:*
4. Use the **[→]** button to make the low lane number increase and the **[←]** button to make it decrease. The lane number will display just below the menu option for *Low Lane ID:*
5. Once the correct odd lane has been selected, press the **[EXIT]** button a few times until the display is back to the *Main Screen*.

4.5. Lane Selection

Pressing the **[EVEN/ODD]** button on the system controller keypad changes the focus of the system controller controls from the even lane to the odd lane and vice versa. The way to tell which lane has the focus is by viewing the *Lane Indicator Arrow* (Figure 6). When the arrow is pointing up, the odd lane has the focus, and when the arrow is pointing down, the even lane has it. It is important to note that whichever lane the arrow is pointing to, that is the lane that will receive the commands entered from the keypad.

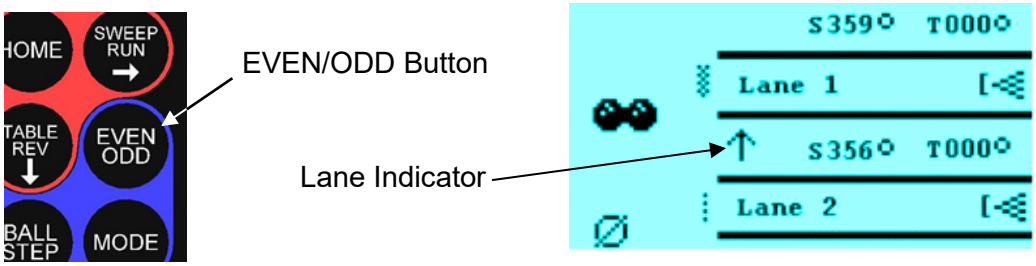

Figure 6, Lane Indication

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4.6. Mode Indicators

On the system controller *Main Screen*, several different icons will appear based on what mode the system controller is in (see Section 4.7 for a complete list of mode indicators). When there is only one icon visible, as on Lane 2 (Figure 7), the pinspotter is in the first ball cycle. However, when two icons are visible, as on Lane 1, the pinspotter is in the second ball cycle.

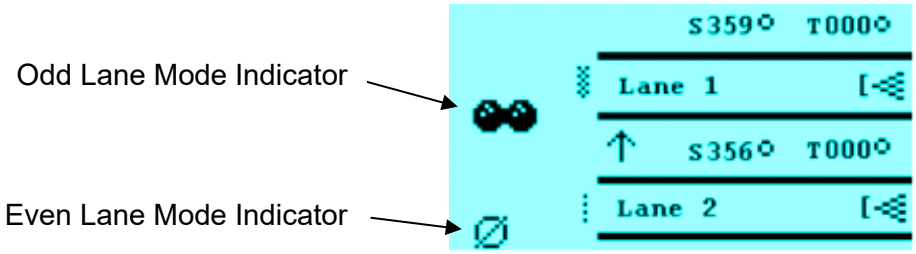

Figure 7, Mode Indication

When the **[DIAG]** or **[MCU]** button is pressed, the Mode Indicator for the selected lane is still visible but it is in the upper right corner of the display (Figure 8). There will only be one icon displayed on this screen even if the pinspotter is in the second ball cycle.

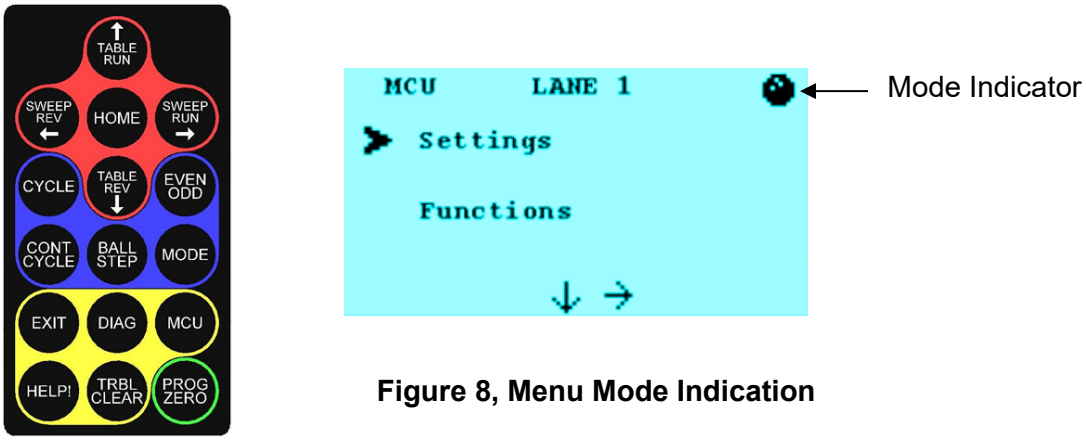

Figure 8, Menu Mode Indication

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4.7. List of Modes

The icons in the following list represent the different modes that a system controller can be in. All the modes except the Mechanic Mode and the Continuous Cycle Mode can be entered manually from the MCU or the scoring control system. Changing to the Mechanic or Continuous Cycle Modes and back can only be done from the system controller or handheld unit.

Bowl Mode - The selected pinspotter will go into this mode when turned on for open play or when practice is complete for a league or a tournament. This can be done manually from the MCU or through a scoring control system.

Mechanic Mode - Activated by pressing the **[MODE]** button on the system controller keypad, this mode gives the mechanic control of the table, sweep, and home buttons (located in the red section of the keypad). The arrows will not be functional again until the **[MODE]** button is pressed and the previous mode is restored.

Continuous Cycle Mode – Activated by pressing the **[CONT CYCLE]** button and will exit this mode by pressing it again. The Continuous Cycle Mode uses a longer than normal time delay.

Standby Mode – In this mode, the pinspotter is inactive and the system controller is awaiting instruction from the MCU.

Practice With Pins - This mode allows the pinspotter to function in a normal fashion (setting pins and going through normal cycling). The scoring system does not reflect frames being bowled nor does the score get marked. The two practice modes are usually only seen when a league or tournament has started warm-up.

Practice Without Pins - In this mode, the pinspotter will not cycle when a ball is rolled. Also, the **[CYCLE]** button and the tenth frame switch on the ball return are not functional in this mode. Just as with Practice With Pins, there is no scoring information being recorded. There will always be two of these icons on the display regardless of whether the bowler is throwing the first or second ball.

4.8. Sweep and Table Drive Shaft Positions

The display has two sets of numbers that indicate the position of the sweep and table as measured in degrees (000 - 360). The letter “S” preceding the degree amount indicates a sweep measurement and the “T” indicates the table. Figure 9 shows the location of these numbers on the *Main Screen* display.

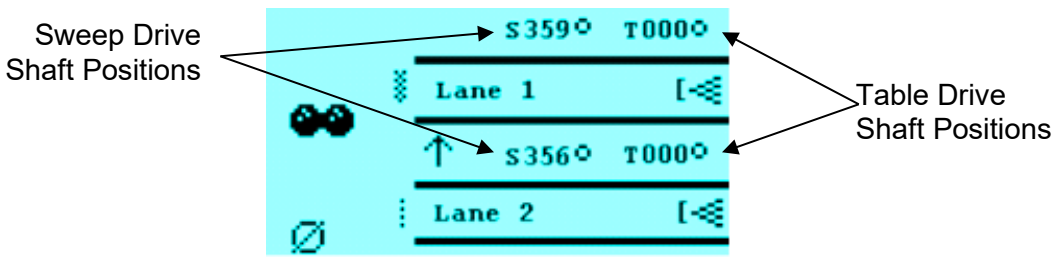

Figure 9, Sweep and Table Drive Shaft Positions

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4.9. Pin Indication

The two icons pointed out below are a graphic representation of the pins still standing on their respective lanes. After a ball is thrown, the pins that are left will appear on the display as dashes (Figure 10). Looking at a full Pin Indication display, the left-most dash of the icon represents the #1 pin, the upper right is the #7 pin, and the lower right is the #10 pin.

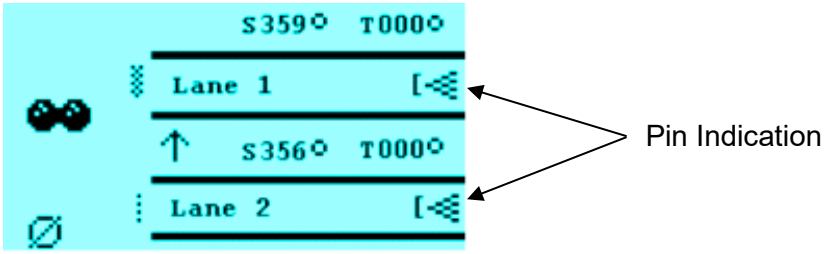

Figure 10, Pin Indication Icons

There is a menu option for the **[MCU]** button that will also display the numbers for the pins still standing on the selected lane. The numbers are shown in a triangle grid corresponding to the pin numbers they represent (See Figure 11 below). This number grid can be viewed on the system controller display by using the following steps.

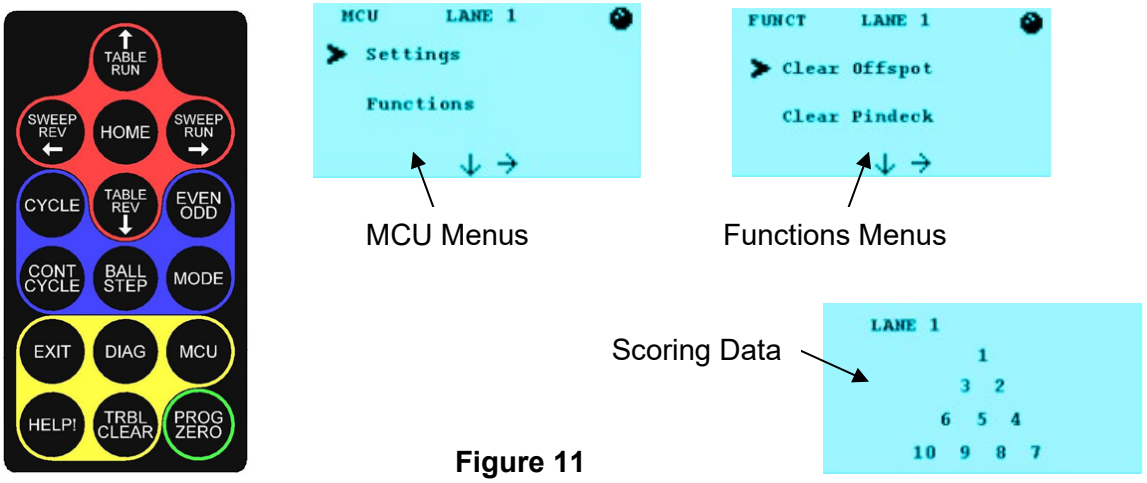

Figure 11

1. Press the **[MCU]** button to go into the *MCU Menus*.
2. Press the **[↓]** button to make *Functions* appear next to the cursor.
3. Press the **[→]** button to select the *Functions Menus*.
4. Scroll down by using the **[↓]** button until the cursor is next to *Scoring Data* menu item.
5. Press the **[→]** button and the screen will display the pin indication by number.

Once you have finished viewing the *Scoring Data* screen, press **[EXIT]** three (3) times to return to the *Main Screen*.

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4.10. Foul Detectors

The system controller is capable of showing when a lane has the foul detector on or in warning mode. On the Main Screen, you will see symbols just to the left of the lane numbers that tell you what mode the foul detectors are in (shown in Figure 12). If there is no foul icon on the display, the foul detector is off.

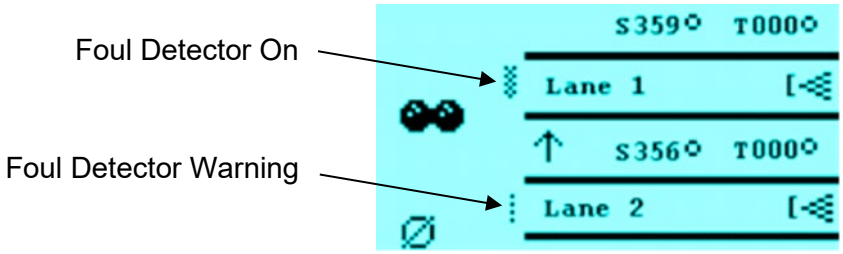

Figure 12, Foul Detector Icons

Foul Detector On – When a foul occurs, the foul lights come on, a buzzer sounds, the foul will register on scoring, and the pinspotter will perform a foul cycle as applicable.

Foul Detector Warning – When a foul occurs, the foul lights come on and the buzzer sounds, but the foul will not affect scoring or pinspotter operation.

The foul detector modes and foul detector type can be changed through the **[MCU]** button on the system controller using the following steps (see Figure 13).

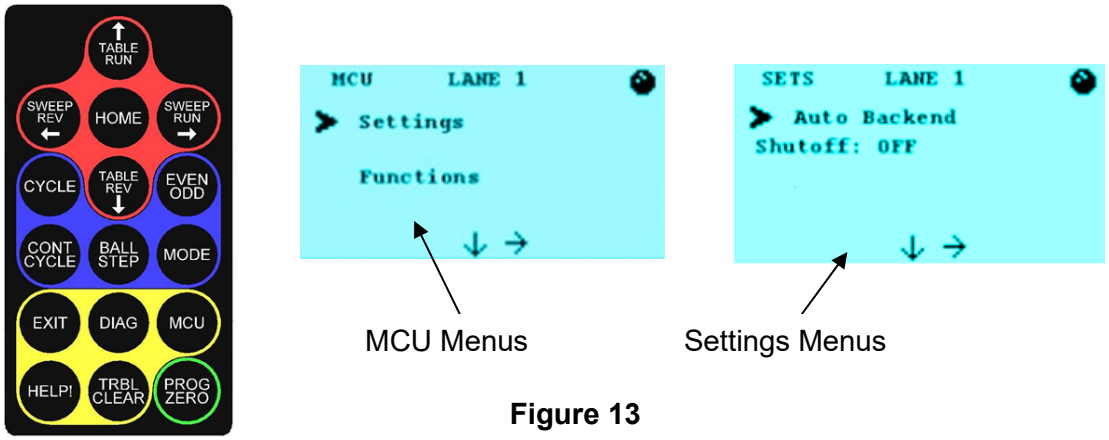

Figure 13

1. Press the **[MCU]** button to go into the *MCU Menus*.
2. Press the **[→]** button to select the *Settings Menus*.
3. Scroll down by using the **[↓]** button until the cursor is next to *Foul Detector* or *Foul Type*.
4. Pressing the **[→]** button will cycle through the possible choices for the foul detector.

Once you have finished selecting the appropriate setting for the foul detectors, press the **[EXIT]** button twice to return to the *Main Screen*.

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4.11. MCU Button

The list of menu items available when the **[MCU]** button is pressed is discussed in the following sections. Pressing the down arrow **[↓]** will scroll down through each list and the right arrow **[→]** will select the Menu Item. The initial MCU Menu is shown in Figure 14.

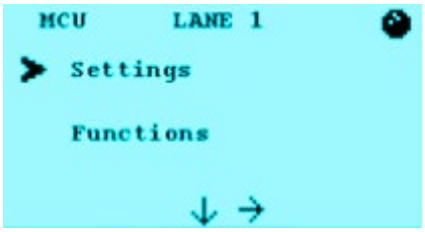

Figure 14, MCU Menu

4.11.1. Settings Menu

The following list contains the options available when the *Settings* menu is selected using the **[→]** button. Pressing **[↓]** after selecting *Settings* will scroll down through this list and the **[→]** button will select the menu item for adjustment. The **[Exit]** button should be used once changes have been made in order to return to the previous menu. The factory default settings are in **Bold**. The 5.08 software version handle the following *Settings* 'per pair.' Changing the setting on one lane changes the other lane to the same setting.

- *Auto Offspot Cycle* - **On** / Off
  - When ON, the Table and Sweep will return to HOME and the pinspotter will change to a *2nd Ball* condition during an *Offspot* cycle. **The USBC recommends that this setting be OFF during league play**.
- *Ball Det Cycle* – **On** / Off / N/A (0) (see page 21.)
  - Determines if the Ball Detector is providing the System controller with the "start cycle" signal. ON = Yes, OFF = No. The safety feature is enabled in both settings. Safety feature: Pinspotter shuts down if ball detector is tripped *during* a machine cycle.
  - OFF allows for disabling the Ball Detector. Use when the scoring system is supplying the "start cycle" signal and the *Pin Data* setting is NOT set to *SCORING*.
  - If the *Pin Data* setting is set to *SCORING*, then the *Ball Det Cycle* setting will show *N/A (0)* indicating that the Ball Detector is being used by the scoring system to provide the "start cycle" signal and that the safety feature is enabled. When *N/A (0)* is displayed, the *Ball Det Cycle* setting cannot be changed.
- *Ball Detector* (*when installed*) - Front of Sweep / **Behind Sweep**
  - *Behind Sweep* setting is used when the single beam ball detector (088-000-500) is installed. This is the preferred location.
  - The *Front of Sweep* setting is used with legacy ball detectors (four sensors).
- *Ball Lift Sleep* – **On** / Off
  - When ON, shuts off the ball lift 30 seconds after both back end motors of the pinspotter pair turn off. Requires *Auto Backend Shutoff* setting for BOTH pinspotters to be set to ON.

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- *Ball Lift Type* – **QAMF** / Other
  - When connected to QAMF front end lift, system controller automatically detects QAMF type and will show N/A (QAMF).
  - Select Other for non-QAMF front end lift. Bumper outputs become switch closures. Power source (24v) must be provided.

- *Bumpers* - **Down** / Up / Auto - (This setting is not used.)

- *Foul Sweep Reverse* - **On** / Off
  - When ON, the pinspotter performs a *Smart Cycle* for gutter balls if the foul detector is ON and a foul is committed.

- *Foul Type* – **XLi** / XL
  - Select *XLi* when used with the Radaray EDGE Free Fall foul detector or the Radaray Plus foul detector (requires cable).
  - Select *XL* when a Radaray XL foul unit is installed (requires interface box and cabling). This selection allows the foul detector to be turned off when not needed and causes the red foul indicator on the Xl foul cover to function correctly (light turns off when the foul detector is in the ON or WARNING mode and no foul exists).

- *Low Lane ID* - 1-127
  - Used to set the lane address for communication with the MCU, Front Desk and Scoring.

- *Pin Data* - Camera / Brunswick / BOSS / **Scoring** / QV Scoring
  - *Camera* is used with QubicaAMF Scoring using T-Vision cameras and Six, F or H-Boxes.
  - *Brunswick* is used with Frameworx® / Vector® Scoring. Simulates the 44 / 144 switches normally used with this scoring.
  - *BOSS* is used with all AMF scoring systems.
  - *Scoring* is used with QubicaAMF scoring using M-Vision cameras and ALLXL boxes or Q-Vision cameras with ball detectors installed.
  - *QV Scoring* is used with QubicaAMF Scoring having Qvision cameras and no ball detector installed. System controller software version must be at 16.14 and 4.02 or higher.

- *Pin Data Delay* - 0 / .75 / 1.25 / 1.75 / **2.25** / 2.75
  - For QubicaAMF scoring using T-Vision cameras, ***1.75*** is the recommended setting.
  - For QAMF scoring using M-Vision or Q-Vision cameras, ***2.25*** is the recommended setting.
  - For AMF scoring systems, ***1.75*** is the recommended setting.

Note – If scoring is missing late falling pins, increase the *Pin Data Delay* setting.

- *Pit Light Control* – **Auto** / ON
  - When the setting is ON, the Pit Light will be lit until the pinspotter is placed in Standby Mode. At that time, the Pit Light turns off for two minutes, and then turns back on.
  - When in AUTO, the Pit Light is on until the pinspotter is placed in the Standby Mode at which time the Pit Light turns off and remains off until the pinspotter is placed in another mode.

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- *Second Guard Timeout* – 10 to 40 seconds / default is **30** seconds
  - Time, in seconds, during which the sweep will stay at the 2nd Guard position waiting for the bin to fill before giving a *2nd Guard* Warning Error. This could indicate a pin jam.
  - If the system controller is connected to a Q-Vision camera / 5HD-Hub / Conqueror/X, Conqueror will be enabled to adjust the setting. **The setting will not be adjustable from the system controller except** in Mechanic Mode, where the value will be adjustable for testing purposes, **but will revert to the Conqueror setting** upon leaving the Mechanic Mode.
  - The warning error shuts down the pinspotter. After the jam has been cleared, press the [**TRBL CLEAR]** pushbutton to clear the warning message and to restart the pinspotter. The pinspotter will run normally unless the bin again fails to fill within the timeout setting.

- *Start Signal Delay* - **Auto** / 0.0 to 3.1 Seconds (also, see below)
  - Auto is the recommended setting for all camera types of interfaces.
  - Increasing the setting increases the time the sweep will wait before moving after a ball has passed the ball detector. Adjustable in 0.1 second increments. A 0.0 setting can cause scoring errors. Use only with legacy ball detectors (4 sensors)

- *Sweep Reverse Mode* - **On** / Off
  - When ON, Smart Cycle is active. Smart Cycle – on the first ball when a gutter ball is thrown, or when only the 7 pin or 10 pin is picked off, the sweep lowers and then returns home. The table does not run, and the pinspotter goes to 2nd ball. This speeds up play by eliminating unnecessary pinspotter operation.

- *Tenth Frame Reset* - **On** / Off
  - When set to OFF, disables Tenth Frame buttons on front end ball return.
  - Select *ON* when the EDGE Free Fall pinspotter is connected to scoring via a 6-box, F-box or H-box; otherwise, pinspotters will not cycle when a ball is thrown.

The following *Settings* are handled 'per lane.'

- *Auto Backend Shutoff* – **On** / Off
  - When ON, the backend motor will shut off if the pinspotter hasn't cycled in approximately two minutes *and* the bin switch is activated. Cycling the pinspotter by any method will restart the back end motor.

- *Foul Detector* – **Off** / On / Warning
  - When ON and a foul is committed, the foul detector will light a red LED and its buzzer will sound an alarm. *"F"* will be displayed by scoring and the pinspotter performs a *Foul Cycle*.
  - When in WARNING and a foul is committed, the foul detector's red LED will light and its buzzer will sound an alarm. No other action will occur.
  - This setting is controlled by Conqueror (if installed) and can be overridden at the system controller.
  - When used with Radaray Plus, separate power must be supplied to the Radaray Plus unit for the foul detector to function.

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- *Guard Set Menu* – 1st Guard **72** / 2nd Guard **272**

CAUTION: Selecting this setting places the pinspotter in Mechanic Mode and turns the pinspotter ON!

- Used to set the 1st Guard and 2nd Guard stopping positions of the Sweep.

- *Pit Light* – **White** / Black
  - Used to switch between normal lighting and color lighting for glow effects.

088-401-001 System Controller specific settings

- *Ball Det Cycle* – **On** / Off / N/A (0) / N/A (1)
  - Determines if the Ball Detector is providing the System controller with the "start cycle" signal. ON = Yes, OFF = No. The safety feature is enabled in both settings. Safety feature: Pinspotter shuts down if ball detector is tripped *during* a machine cycle.
  - OFF allows for disabling the Ball Detector. Use when the scoring system is supplying the "start cycle" signal and the *Pin Data* setting is NOT set to *SCORING*.
  - If *Pin Data* is set to *SCORING* and the *Remote Ball Detector* indication is *NO*, then the *Ball Det Cycle* setting will show *N/A (0)* indicating that the Ball Detector is being used by the scoring system to provide the "start cycle" signal and that the safety feature is enabled.
  - If the *Pin Data* setting is set to *SCORING* and the *Remote Ball Detector* indication is *YES*, then the *Ball Det Cycle* setting will show *N/A (1)* indicating that the Ball Detector is disabled and a remote ball detector is being used by the scoring system to provide the "start cycle" signal and that the safety feature is disabled.

***Remote Ball Detector / Ball Det Cycle* Matrix**

Remote Ball Detector

SAFETY FEATURE		NO		YES
		Ball Detector Cycle Setting		
	ON	**ON** (Pin Data≠Scoring)	**OFF** (Pin Data≠Scoring)	
	ON	**N/A(0)** (Pin Data=Scoring)		
	OFF			**N/A(1)** (088-400-001-01 system controller only) (Pin Data=Scoring)

The matrix shows that when the ball detector is active (a *Remote Ball Detector* indication of NO), an ON or N/A (0) setting for the *Ball Det Cycle* indicates that the ball detector is

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supplying the Cycle Start signal and the safety feature is enabled. An OFF *Ball Det Cycle* setting indicates the ball detector is inactive, but the safety feature is still enabled.

On the 088-401-001 system controller only, when a scoring system camera is being used for ball detection (a *Remote Ball Detector* indication of YES), the *Ball Det Cycle* setting will indicate N/A (1), and both the safety feature and ball detector will be disabled.

4.11.2. Functions Menu

The following list contains the options available when the *Functions* menu is selected using the **[→]** button. Pressing **[↓]** after selecting *Functions* will scroll down through this list and the **[→]** button will select the function to be done. The **[Exit]** button should be used once changes have been made in order to return to the previous menu.

- *Clear Offspot* - Returns the sweep to home position after an offspot. Pinspotter cannot be in Standby Mode. Pressing **[HOME]** (in any Mode) will perform the same function.
- *Clear Pindeck* - Runs only the sweep through a complete cycle. Doesn't function in Standby Mode.
- *Counts (Ball)* - Keeps track of the number of balls bowled in Bowl Mode as well as in Mechanic Mode (see Figure 15). There are resettable and non-resettable totals.

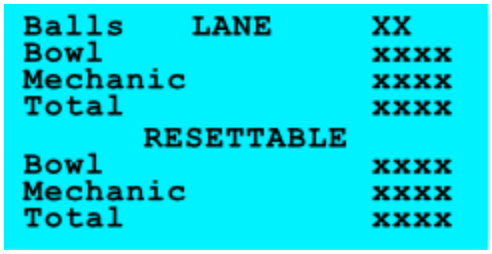

Figure 15, Ball Counter

- *Counts (Frame)* - Keeps track of the number of frames bowled in Bowl Mode as well as in Mechanic Mode. There are resettable and non-resettable totals.
- *Reset Bowling Ball Counter* – Resets the resettable Bowling Mode ball counts to zero.
- *Reset Bowling Frame Counter* – Resets the resettable Bowling Mode frame counts to zero.
- *Reset Mechanic Ball Counter* – Resets the resettable Mechanic Mode ball counts to zero.
- *Reset Mechanic Frame Counter* – Resets the resettable Mechanic Mode frame counts to zero.

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- *Reset To Factory Settings* - Restores most settings to the manufacturer's defaults. Customer should keep a record of custom settings. The following settings do not change when *Reset to Factory Settings* is actuated:
  Low Lane ID
  Pin Data
  Pin Data Delay

- *Scoring Data* - Gives a visual account of the pins that should be standing according to the information sent from the camera or scoring.

- *Set New Pins* – The pin deck is swept and a new rack of pins are set and the pinspotter is placed in a 1st ball condition.

4.11.3. Remote Menu

The *Remote* feature no longer allows the viewing and changing of settings on one system controller from another system controller.

4.12. DIAG Button

The **[DIAG]** button is used to open a menu that displays the current state of different components of the machine and associated parameters. The EDGE Free Fall is constantly being monitored by the system controller for potential problems in performance. The following list details all of the menu items for this button and their potential status.

- *Backend Motor* - On / Off / Asleep / Overload
- *Backend Switch* - On / Off
- *Ball Detector 1* - Ball / No Ball
- *Ball Detector 2* - Ball / No Ball
- *Ball Lift* - On / Off / Asleep
- *Bin Switch* - Pin Present / Pin Absent
- *Breaker* - On / Off
- *E-Stop Loop* - Open / Closed
- *Foul Detector* - Foul / No Foul
- *Mask Safety Sensor* – YES indicates the system controller was designed for use with the CE SmartGuard™ Safety System. NO is for all other system controllers. System controller and systems are not interchangeable.
- *Mask Switch* - On / Off
- *Mechanic Called* - Yes / No
- *Offspot Switch* - On / Off
- *Pinspotter State* - Bowl / Mechanic / Standby / Continuous Cycle / (Errors)
- *Power Frequency* - 50 Hz / 60 Hz
- *Remote Ball Detector* – No / Yes
- *Scoring Input* - Bowl Mode OFF / Bowl Mode ON

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- *Scoring Input* - Practice OFF / Practice ON
- *Software* – V5.08
- *Sweep Encoder* - 0 - 360 degrees
- *Sweep Home* - Home / Not Home
- *Table Encoder* - 0 - 360 degrees
- *Table Home* - Home / Not Home
- *Tenth Frame* - On / Off

4.13. Shutdown Errors

If your bowling center is equipped with the Tech Wizard or Trouble Call System (TCS), use the [MODE] button to place the pinspotter in the Mechanics Mode (lets the scoring know that you are working on a problem) when responding to a Shutdown Error. Press [MODE] again to return the pinspotter to the Bowl Mode when the error has been cleared. This is necessary in order to clear the Tech Wizard and/or TCS error message from the scoring monitor.

The EDGE Free Fall has the ability to diagnose when problems occur, and in many cases will display an error on the system controller screen. For instance, when the mask switch is turned off, the main screen will display an error like what is seen in Figure 17. These machine errors will cause one or both of the pinspotters to shut down.

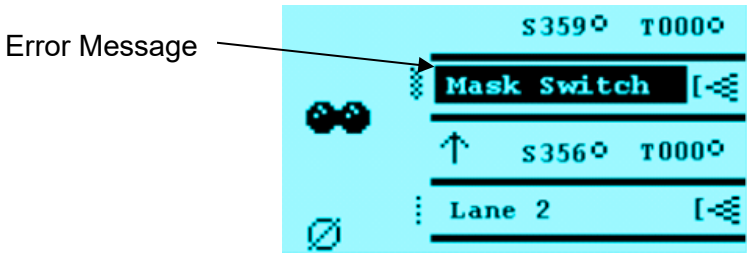

Figure 17, Error Message

The following list shows all of the possible errors and the reason they would be displayed on the system controller screen. Basic fixes for the errors will be listed with each error. The troubleshooting section (Section 5.0) should be used as a reference for other possible problems. If the error still exists and everything from this section and the Troubleshooting Section 5.0 have been tried, please call technical support for further assistance.

Breaker – System controller circuit breaker is turned off or tripped.

- Turn the breaker on and press **[TRBL CLEAR]** on the keypad.

Sweep Encoder - Sweep jam or sweep motor encoder sensor error.

- There are several possible reasons for this error. See the Troubleshooting Section 5.0 for more information.

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Table Encoder - Table jam or table motor encoder sensor error.

- ❖ Check to see if it is caused by a pin binding the table or linkage. There are several other possible reasons for this error. See the Troubleshooting Section 5.0 for more information.

Ball Detector - Ball Detector beam is interrupted during sweep or table motor operation.

- ❖ A ball thrown while the pinspotter is cycling will cause this error message.
- ❖ If the beam is still being broken, clear the object and press **[TRBL CLEAR]** on the keypad.

Note: This shutdown error is only displayed if the *Ball Detector* menu item in the *Settings Menu* is set to **Front of Sweep**. When it is set to **Behind Sweep**, regardless of the ball detector position, the shutdown safety feature is disabled.

Mask Switch - Mask Switch is turned off or not working properly.

- ❖ Turn on the switch for that mask unit.

Table Home - Home sensor not detected for 3 revolutions of the drive shaft.

- ❖ Make sure that the sensor is plugged in and press **[TRBL CLEAR]** on the keypad. If the error remains, the sensor might be faulty or dirty or the HOME disc slot could be filled with debris. Try cleaning or replacing the unit and pressing **[TRBL CLEAR]** on the keypad.

Sweep Home - Home sensor not detected for 3 revolutions of the drive shaft.

- ❖ Make sure that the sensor is plugged in and press **[TRBL CLEAR]** on the keypad. If the error remains, the sensor might be faulty or dirty or the HOME disc slot could be filled with debris. Try cleaning or replacing the unit and pressing **[TRBL CLEAR]** on the keypad.

Overload - A jam or overload is causing the back end motor to draw excessive current.

- ❖ The jam could be in the ball lift, carpet, pin elevator, or distributor drive. Clear the jam and press **[TRBL CLEAR]** on the keypad.
- ❖ If the motor trips, determine and correct the cause, allow the motor to cool, and press the reset button on the motor.

E-Stop - E-Stop circuit is opened.

- ❖ Twist the E-Stop button to make it pop out, then press the reset button followed by the **[TRBL CLEAR]** button on the keypad.
- ❖ Properly install center guard(s) on EDGE lift, then press RESET button followed by **[TRBL CLEAR]** button on keypad.
- ❖ IR Barrier Beam tripped. Climb into even lane crow's nest and check that no one is within the mask to the front of the pinspotter area for the pair. Press the blue reset button located on the e-stop/reset button box located on the even lane hand rail. The green LED indicator should light. At the system controller press the blue E-stop RESET button. Press **[TRBL CLEAR]** button.

Interlock - Table and Sweep are interlocked.

- ❖ Press **[PROG ZERO],** then **[TRBL CLEAR],** and finally **[HOME]** on the keypad.

2nd Guard – Pins have not filled the bin within the allotted time.

- ❖ Can indicate a pin jam. With a pin in the 9-pin bin pocket, press **[TRBL CLEAR]** on the keypad.

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- ❖ Pit light will remain lit.

Ball Lift – Indicates that the ball return on the approach is not running.

- ❖ Back end motors for both pinspotters stop running.
- ❖ Pinspotter stops at Second Guard waiting to spot pins until front ball lift is running.
  - ❖ Software version 5.08 and higher.
  - ❖ Prevents bowling balls from accumulating in back end.
- ❖ Reference your ball return manual to troubleshoot/clear the error.

Offspot – Offspot switch is activated and waiting for the *Clear Offspot* command.

- ❖ Table made contact with an out-of-position pin or with one standing in the gutter.
- ❖ Press the **[HOME]** button.

Note: If the *Auto Offspot Cycle* in the *Settings* menu is set to ON, the error message clears and the Sweep returns to the HOME position without operator action.

Note - Be sure that when you are trying to clear an error that the lane indicator is pointing to the appropriate lane. A single lane that has an error will not allow the **[TRBL CLEAR]** button to clear it if the correct lane is not selected.

Note - If the error does not clear out and you know everything is corrected for the error, try turning off the logic power to the system controller and turning it back on again.

4.14. Warning Errors

There are several machine errors that show up on the display that can inform you of a potential problem but will not cause the pinspotter to shut down. They can all be cleared by pressing **[TRBL CLEAR]** on the keypad. See the Troubleshooting Section 5.0 for other possible causes of these warnings. If the warning still exists and you have tried everything in the troubleshooting section, please call technical support for further assistance.

1st Guard adj - Sweep adjusted out of range for 1st guard.
Default setting is 72°.
Adjustable from 45° and 85°.
Error displays when set at 55° or less.

2nd Guard adj - Sweep adjusted out of range for 2nd guard.
Default is 272°.
Adjustable from 250° and 320°.
Error displays when set to 260° or less.

Check and correct home position adjustment and readjust 1st and 2nd Guard positions as needed.

Sweep hm adj - Sweep adjusted out of range for home position.

Sweep rev adj - Sweep adjusted out of range for sweep reverse home stop position.

Table B1 adj - Table adjusted out of range for ball 1 home stop position.

Table B2 adj - Table adjusted out of range for ball 2 home stop position.

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Mechanic's call - Mechanic's call button is pressed. Stack lights flash red and green.

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4.15. Stack Light Warnings

On the EDGE Free Fall system controller there are outputs to control remote stack lights: one for the odd lane and one for the even lane. Each stack of lights consists of a red and a green light. The lights are LEDs that should provide many years of illumination. The remote stack light recommended location will be on top of the EDGE Performance Lift. Below is a list of the light combinations and what each one means.

Solid Green Only - Machine is in Bowl Mode.

Solid Red and Solid Green - Machine is in Mechanic Mode.

Solid Red Only - Machine is in Shutdown Mode.

Flashing Green (with or without **Solid Red**) - Extended period of time that bin switch sees no pins (possible distributor or pin jam).

Flashing Red (with or without **Solid Green**) - Mask switch is turned off.

Alternating Flashing Red and Green - Mechanic's Call button is pressed.

4.16. Technicians Handheld Unit

The EDGE Free Fall is equipped with a handheld unit that can be taken from pinspotter pair to pinspotter pair. It plugs into a port located on the coverboard near the camera. The unit's keypad is identical to the system controller keypad and once plugged in will have complete control of the system controller. Every function that can be performed from the system controller keypad is available to you with the handheld unit. Figure 18 shows the icon that is displayed on the system controller screen as well as the handheld unit. Seeing this icon lets you know that the handheld unit is plugged in.

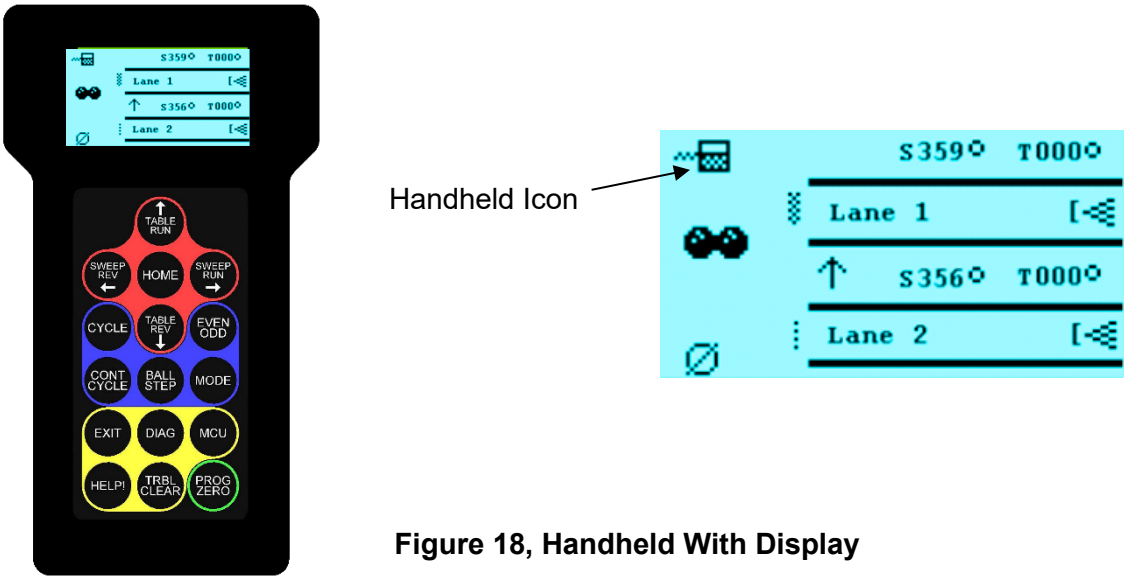

Figure 18, Handheld With Display

Note - When the handheld is plugged in, the system controller keypad will not function, and the system controller is locked out from remote changes from the MCU and scoring. At this point, the handheld has complete control.

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4.17. Fuse Protection

Various system controller and load components are provided with overload protection through the use of fuses or self-resetting circuit breakers. Figure 19 shows the locations of the fuses.

If a fuse requires replacement:

- **Always replace a fuse with one of the same type, voltage, current, and time delay rating only!**

WARNING! **Dangerous voltages can exist inside the system controller. Remove all three sources of power from the system controller before attempting fuse replacement.**

- **Wait at least 60 seconds after removing power from the system controller before changing fuses to allow voltage stored in the capacitors to dissipate.**

Spot Solenoid Fuses

The spot solenoids for the even and odd machines are protected by 1-Amp, 250-Volt, 5 x 20 mm slo-blo fuses (F1 and F2, P/N 748-901-111) located on top of the system controller.

These fuses are designed to protect sensitive components. Because of this, switching a pinspotter or a fused component on and off several times in rapid succession could cause a fuse to blow. This does not indicate a problem in the circuitry, and this practice should be avoided.

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Below is a diagram that shows the locations of the fuses and the part numbers for replacement fuses.

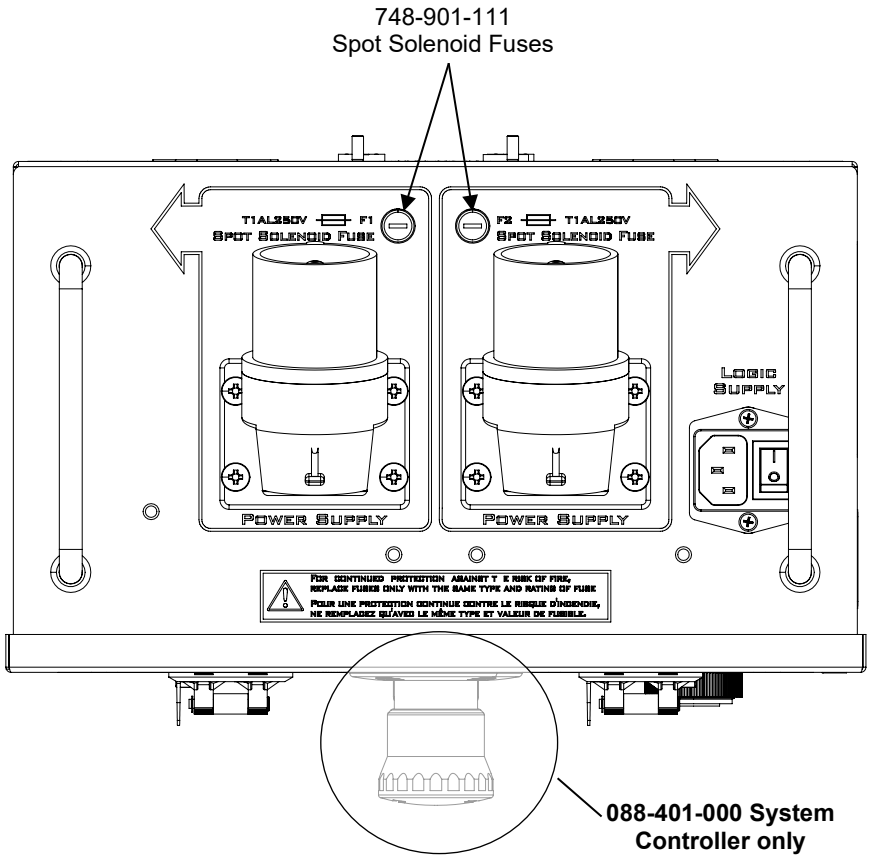

Figure 19, Fuse Locations

4.18. Nameplate

Each system controller nameplate contains the system controller part number and a serial number that includes the date of manufacture. The voltage and frequency ratings, the logic power requirements, and the full load machine current are also listed.

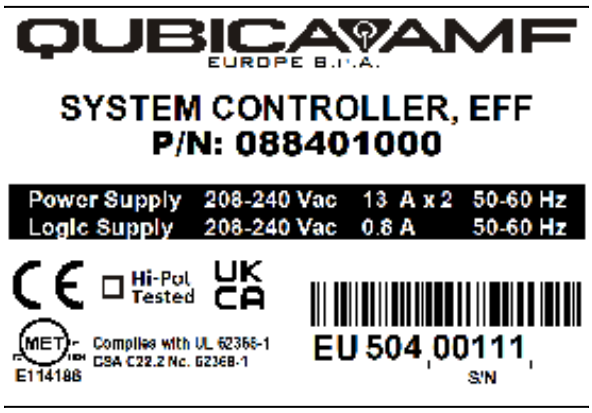

Figure 20, System Controller Nameplate

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5. TROUBLESHOOTING

The EDGE Free Fall system controller is capable of giving error messages on the display when something is not working correctly. This section outlines troubleshooting the possible problems that cause errors to occur. The solutions are in the order of the most likely and easiest to check to the least likely or more difficult to perform. If the problem is not resolved after using the suggestions below, try replacing the system controller or call Technical Support.

Note - Use the following procedure to activate the pinspotter pair from a power OFF condition:
1. Switch system controller main power switch to ON.
2. Press RESET E-STOP button.

5.1. Shutdown Errors

Breaker - Circuit breaker is turned off.

- Turn the breaker on and press **[TRBL CLEAR]** on the keypad.
- Call Technical Support and/or replace the system controller.

Sweep Encoder - Sweep jam or encoder sensor error. Once the problem has been resolved, press **[TRBL CLEAR]** on the keypad.

- Make sure that the main power for the specified pinspotter is plugged into the system controller.
- Make sure the circuit breaker is on.
- Ensure that the motor and encoder sensor are both plugged in.
- Faulty or dirty encoder or encoder disc. Clean or replace the encoder and/or disc.
- Make sure the sweep mechanism is not blocked by a broken part, pin, or anything else.
- Make sure the wire harness is completely plugged into the back of the system controller and there are no damaged pins or wires.
- Make sure the brake is plugged in and functioning properly. If the brake is not working, check the brake fuse (a blown fuse would affect all four front end motor brakes on a pair of pinspotters). If blown, replace it. If the fuse is good, replace the brake.
- The start switch in the motor could be faulty. Replace the start switch.

Table Encoder -Table jam or encoder sensor error. Once the problem has been resolved, press **[TRBL CLEAR]** on the keypad.

- Make sure that the main power for the specified pinspotter is plugged into the system controller.
- Make sure the circuit breaker is on.
- Ensure that the motor and encoder sensor are both plugged in.
- Faulty or dirty encoder or disc. Clean or replace the encoder and/or disc.
- Make sure the table mechanism is not blocked by a broken part, pin, or anything else.
- Make sure the wire harness is completely plugged into the back of the system controller and there are no damaged pins or wires.
- Make sure brake is plugged in and functioning properly. If the brake is not working, check the brake fuse (a blown fuse would affect all four front end motor brakes on a pair of pinspotters). If blown, replace it. If the fuse is good, replace the brake.

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- ❖ The start switch in the motor could be faulty. Replace the start switch.

Ball Detector - Ball Detector beam is broken during sweep or table motor operation. Once the problem has been fixed, press **[TRBL CLEAR]** on the keypad.

- ❖ If the beam is still being broken, clear the object.
- ❖ If the detector is mounted in the path of the sweep, ensure that the *Ball Detector* setting is not *Front of Sweep*.
- ❖ The ball detector sensor might also be out of alignment. Readjust as needed.
- ❖ The reflector might be damaged, bent, etc. Check the reflector and replace if needed.
- ❖ If bumpers are installed, ensure the bumper does not cross the ball detector's beam when raising and lowering. It is sometimes necessary to trim a few inches off the end of the plastic bumper rail to prevent interference.
- ❖ The sensor might be faulty. Replace the unit.

Mask Switch - Mask Switch is turned off or not working properly. This is a self-clearing error. It is not necessary to press **[TRBL CLEAR]** on the keypad for this error.

- ❖ Turn on the switch for that mask unit.
- ❖ Check the switch and the wiring to ensure that everything is plugged in at the mask as well as the back of the system controller.
- ❖ Replace the switch and/or the wiring to solve the problem.

Offspot - Offspot switch is activated and waiting for Clear Offspot command.

- ❖ Press the **[HOME]** button.

  Note: This only works if the *Auto Offspot Cycle* in the *Settings* menu is set to *Off*.
- ❖ The Off-spot switch could be loose or misadjusted. Secure the switch mounting hardware or adjust as necessary.
- ❖ The Off-spot lever spring could be loose, weak, or broken. Repair or replace.

Table Home - Home switch not found after 3 revolutions of drive shaft.

- ❖ Make sure that the Home sensor is plugged in and press **[TRBL CLEAR]** on the keypad. If the error remains, the sensor or home disc might be dirty or the sensor faulty. Try cleaning the sensor and home disc or replacing the sensor and pressing **[TRBL CLEAR]** on the keypad.

Sweep Home - Home switch not found after 3 revolutions of drive shaft.

- ❖ Make sure that the Home sensor is plugged in and press **[TRBL CLEAR]** on the keypad. If the error remains, the sensor or home disc might be dirty or the sensor faulty. Try cleaning the sensor and home disc or replacing the sensor and pressing **[TRBL CLEAR]** on the keypad.

Overload - Backend Motor has jammed or overloaded.

- ❖ The jam could be in the ball lift, pit conveyor, pin lift, or distributor drive. Clear the jam and press **[TRBL CLEAR]** on the keypad. Check that belt pulleys rotate freely. Lubricate or replace bushings or bearings as needed.
- ❖ Check for gearbox problems such as noise, low oil, or binding. Repair or replace the gearbox.

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E-Stop - E-Stop circuit is opened.

- Twist the E-Stop button to make it pop out, then press the reset button followed by the **[TRBL CLEAR]** button on the keypad.
- Properly install center guard(s) on EDGE lift, then press RESET button followed by **[TRBL CLEAR]** button on keypad.
- IR Barrier Beam tripped. Climb into even lane crow's nest and check that no one is within the mask to the front of the pinspotter area for the pair. Press the blue reset button located on the e-stop/reset button box located on the even lane hand rail. The green LED indicator should light. At the system controller press the blue E-stop RESET button. Press **[TRBL CLEAR]** button.
- Check to ensure that all external E-Stops are not pressed in. Pull the E-Stop button to make it pop out, then press the reset button followed by **[TRBL CLEAR]** on the keypad. For the 088-401-001 System controller, follow the CE Safety System shutdown recovery procedure in the *EDGE Free Fall EDGE SmartGuard Safety System Manual, 400-088-092-01*.
- An external E-Stop could be faulty and needs to be replaced. If it is the E-Stop that is part of the 088-401-000 system controller that has failed, the system controller should be replaced.
- The wiring for an external E-Stop could be damaged and should be replaced.

Interlock - Table and Sweep are interlocked.

- Press **[PROG ZERO*]**, then **[TRBL CLEAR]**, and finally **[HOME]** on the keypad.
- Faulty or dirty encoder for the sweep or table. Clean or replace the encoder.
- Faulty or dirty encoder disc for the sweep or table. Clean or replace the disc.
- Faulty home sensor for the sweep or table. Replace the home sensor.
- Table or sweep home discs are out of adjustment.
- Faulty sweep or table brake. Replace the brake.
- Physical obstruction stopping the table or sweep. Clear obstruction.

* When an Interlock occurs, pressing **[PROG ZERO]** stops the cycle which would otherwise automatically resume if the **[TRBL CLEAR]** button is pressed first thereby causing another interlock and possibly damaging the pinspotter. Always look for the cause of the interlock as specified above, before returning the pinspotter to service.

ALSO, if a **PIN JAM** occurs on the table while the pinspotter is in the middle of a cycle, placing the system controller in the Mechanics Mode will not enable the **[TABLE RUN]**, **[TABLE REV]**, **[SWEEP RUN]**, and **[SWEEP REV]** functions of the keypad. This is because the table, although stopped by the pin jam, is still in the middle of a cycle. To be able to remove the pin without causing damage to the pinspotter and without having to manually crank the table, perform the following:

1. Press **[MODE]** to place the machine in the Mechanics Mode.
2. Turn the machine circuit breaker for that pinspotter on the front of the system controller to OFF.
3. Press **[PROG ZERO]** to stop the cycle.
4. Turn the machine circuit breaker back ON.

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5. Press **[TRBL CLEAR]** which turns the pinspotter back on.
6. Press **[TABL REV]** and lower the table to allow access to the jammed pin.
7. Turn the machine circuit breakers for that pinspotter pair on the front of the system controller to OFF.
8. Implement Lockout/Tagout (LOTO).
9. Remove the pin (use a pin hook [p/n 088-500-518], if possible).
10. Remove LOTO.
11. Turn the machine circuit breaker back ON. (as applicable, reset the SmartGuard™ Safety system).
12. Press **[TRBL CLEAR]** and then press **[HOME]**.
13. Press **[MODE]** to return the machine to the Bowl Mode.

Ball Lift - Problem with the Ball Return in Bowler's Area.

- Safety switch activated or has a problem.
- Ball Return Control Board faulty. Replace.
- Wiring between the system controller and Ball Return Control board may have a problem. Check terminal connections, replace cable

5.2. Warning Errors

Note: All warning errors are cleared by pressing **[TRBL CLEAR]** on the keypad.

1st guard adj - Sweep adjusted out of range for 1st guard.

- Check the sweep links for wear and replace as needed.
- The sweep might be poorly adjusted mechanically*.

2nd guard adj - Sweep adjusted out of range for 2nd guard.

- Check the sweep links for wear and replace as needed.
- The sweep might be poorly adjusted mechanically*.

Sweep hm adj - Sweep adjusted out of range for home position.

- There could be brake or encoder failure. Check and replace as needed.

Sweep rev adj - Sweep adjusted out of range for sweep reverse home stop position.

- There could be brake or encoder failure. Check and replace as needed.

Table B1 adj - Table adjust out of range for ball 1 home stop position.

- There could be brake or encoder failure. Check and replace as needed.

Table B2 adj - Table adjust out of range for ball 2 home stop position.

- There could be brake or encoder failure. Check and replace as needed.

Mechanic's Call - Mechanic's Call button pressed.

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- ❖ Just press **[TRBL CLEAR]** on the keypad. If this doesn't clear the error, the Mechanic's Call button isn't working properly.

* Check the 1st and 2nd Guard positions (in degrees) on the system controller display. If too high or low, check the physical position of the sweep at the HOME position. The connecting rod assembly (090-005-255) should bisect the crank arm (000-023-139) that is attached to the sweep drive shaft (this corresponds to the highest point of sweep travel). If necessary, manually crank the sweep motor until the connecting rod bisects the crank arm and then reset the home disc so that the LED on the sweep home sensor lights. Readjust the 1st and 2nd guard position settings on the system controller as necessary.

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6. DRAWINGS AND WIRING DIAGRAMS

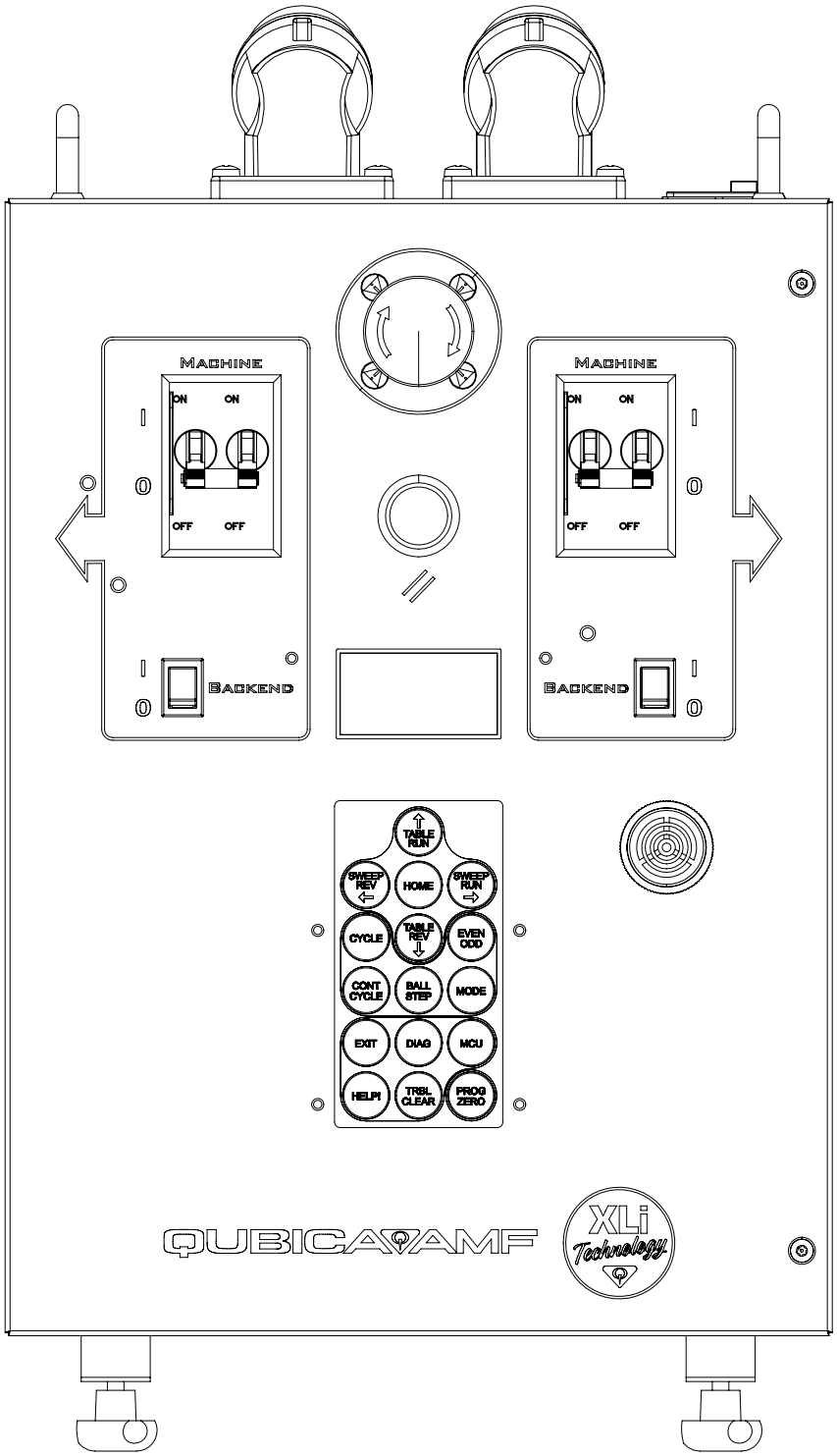

Figure 21, 088-401-000 system controller, front view

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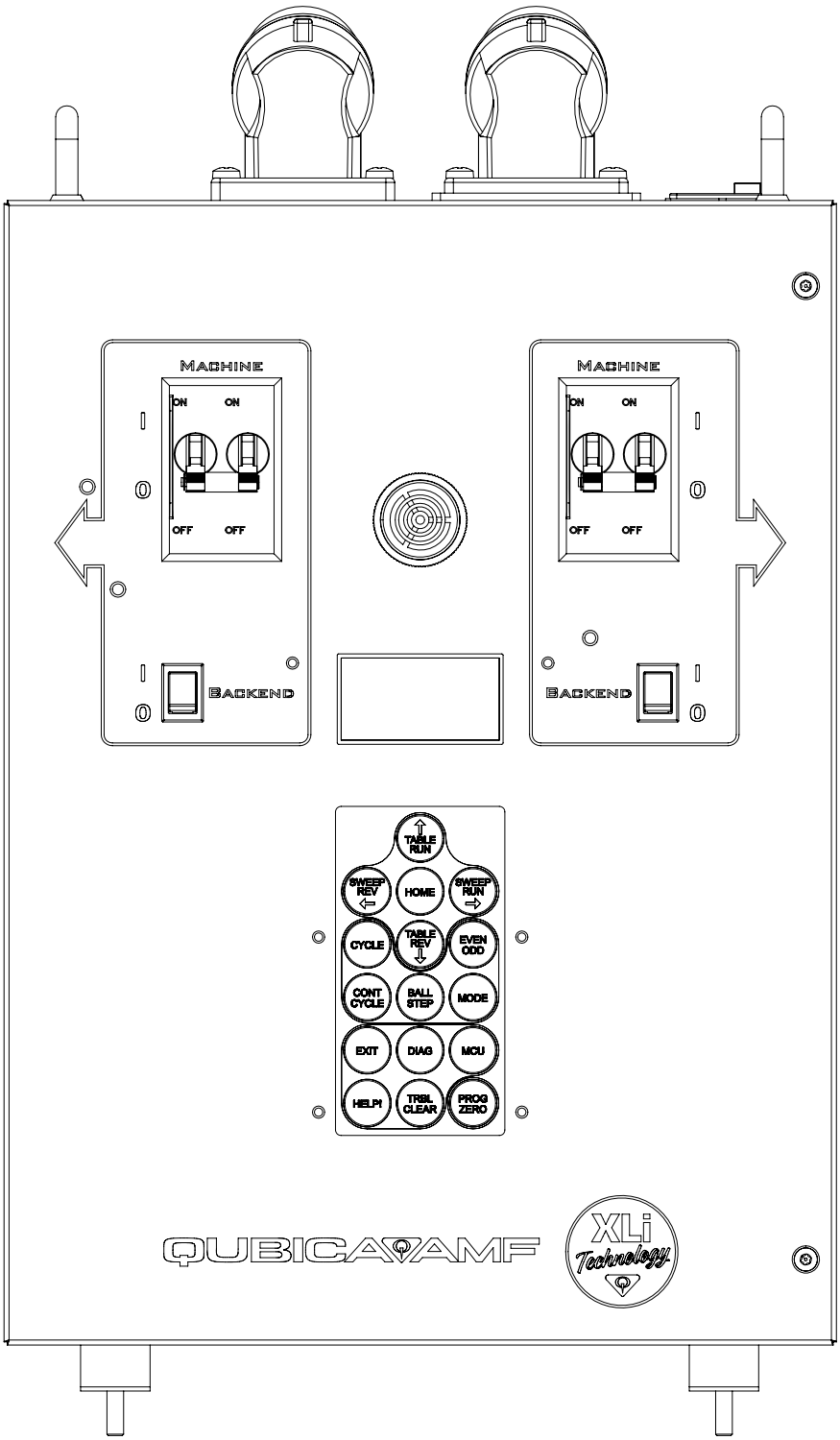

Figure 22, 088-401-001 system controller, front view

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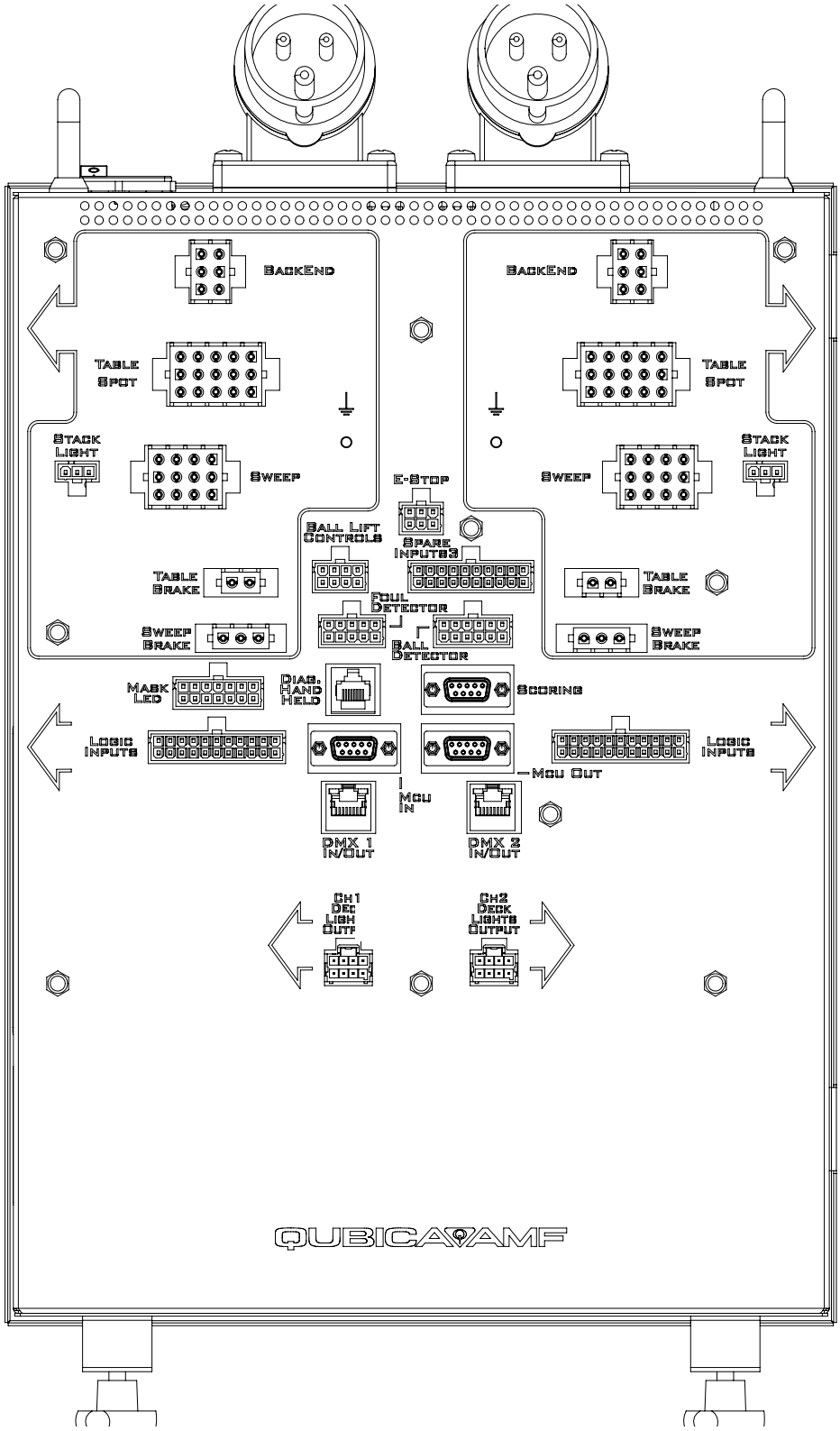

Figure 23, 088-401-000, & 088-401-001 system controllers, rear view

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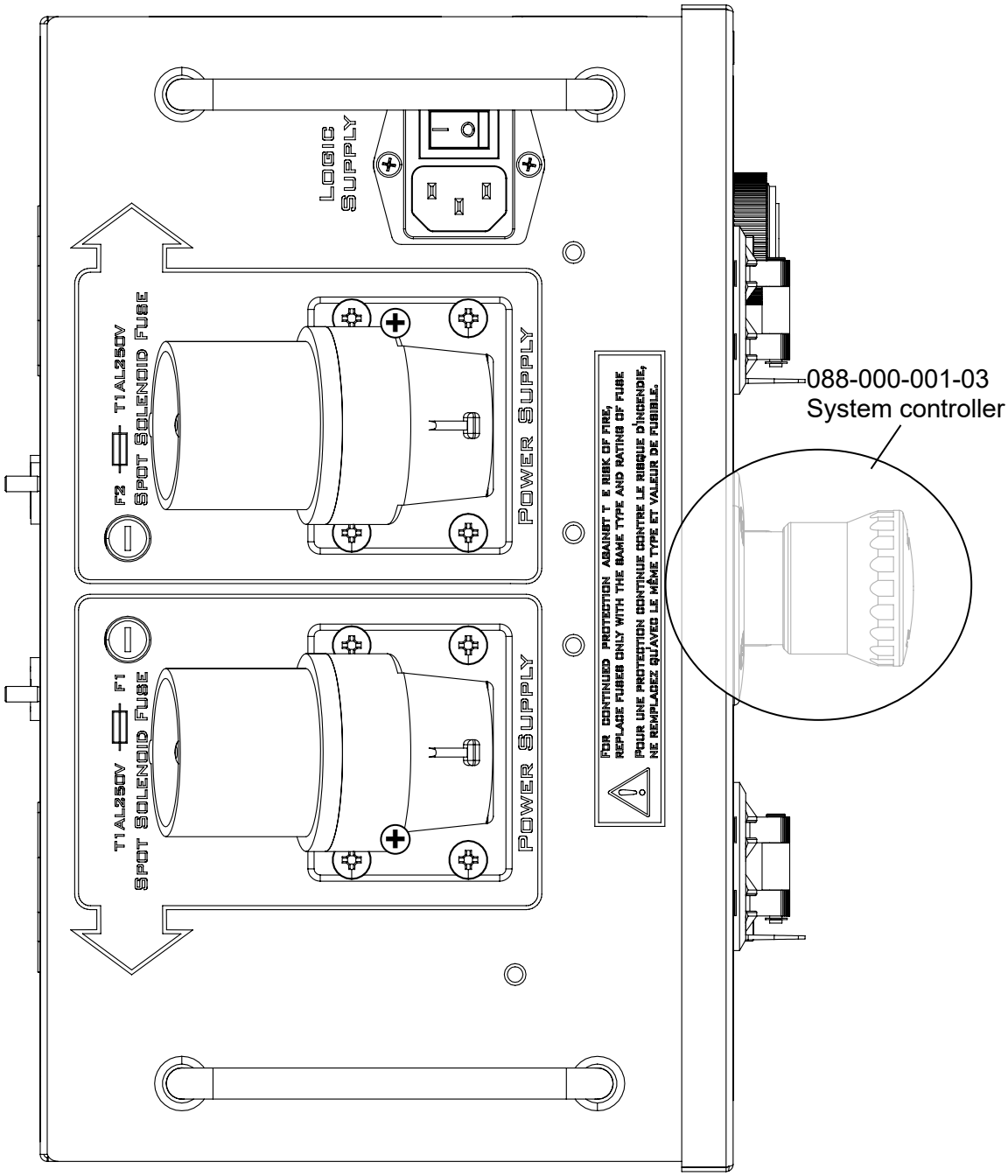

Figure 24, system controller, top view

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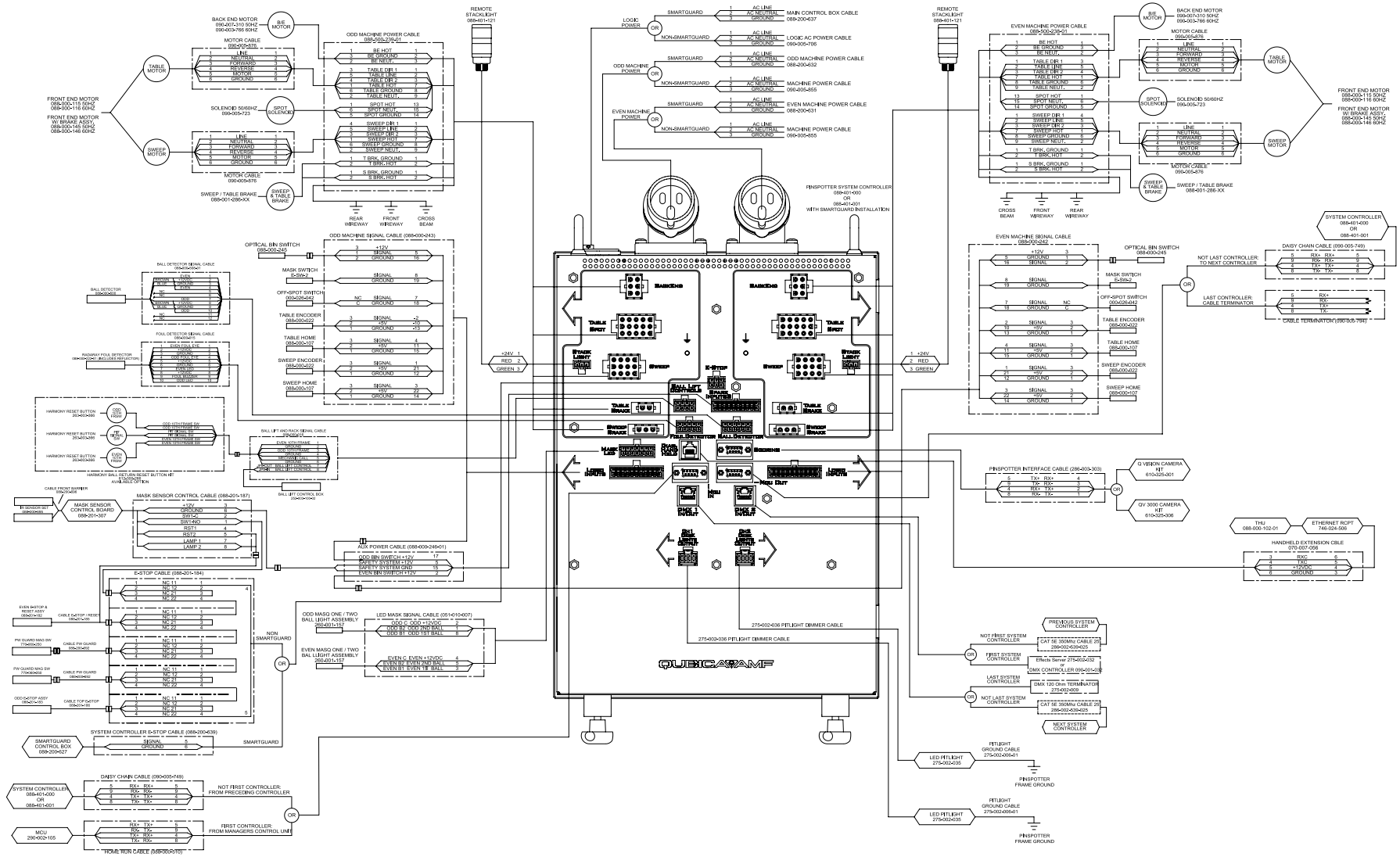

Figure 25, Pinspotter Wiring Diagram

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