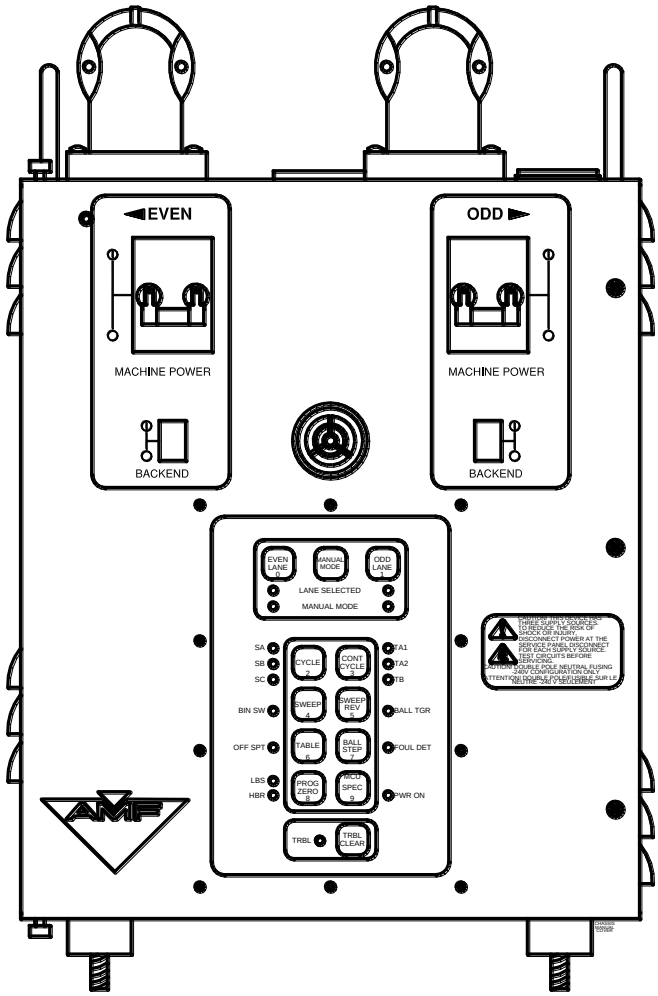
90XL PINSPOTTER CONTROL CHASSIS

Installation & Operating Guide



400-090-005

Revision A

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Rev. A

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I. INTRODUCTION

HOW TO USE THIS MANUAL

The Installation Guide is divided into five sections:

I. Introduction

II. Safety Precautions

III. Step-by-step instructions for installing and wiring the 90XL chassis.

IV. Control Panel Operating Instructions.

V. Wiring Diagrams and Drawings.

CONVENTIONS USED

Whenever a pushbutton or switch on the chassis is to be pushed or operated, the name of the pushbutton or switch will appear in brackets [ ] as shown below.

[SWEEP REV]

If a pushbutton or switch on the chassis is mentioned, but is not to be pushed or operated, the name of the pushbutton or switch will appear in quotation marks **“ ”**. Whenever a cable connection must be made, the name of the connection will also appear in quotation marks as shown below.

“CABLE CONNECTOR DESCRIPTION”, for example, “MCU IN”

ABBREVIATIONS USED

CAM	Camera	**PROG**	Program
CONT	Continuous	**PWR**	Power
DET	Detector	**REV**	Reverse
FEB	Front End Box	**S/F**	Strike/Foul
HBR	Horizontal Ball Return	**SPEC**	Special Function
LBS	Light Ball Sensor	**SPT**	Spot
LED	Light Emitting Diode	**TRG**	Trigger
MCU	Manager’s Control Unit		

CHASSIS DESCRIPTION

The 90XL pinspotter chassis 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. The unit consists of a steel box with a swing-open front cover to allow access to internal components.

Note: The only internal components that are designed to be serviced by the bowling center mechanic are the various fuses contained within the chassis. Fuse replacement is described in Section IV.

The front of the chassis contains circuit breakers, switches, keypads, and lights for performing various functions and for indicating machine status as described in Section IV. The rear of the chassis contains connectors for the various pinspotter power and control cables as well as for cables from supporting equipment, such as the scoring camera and the front end box. Power supply connections are made at the top of the chassis. Section V contains chassis drawings and a cable identification and wiring diagram.

Some key chassis features are listed below.

KEY FEATURES

- Circuit breakers and back end motor switches are on the operating panel.
- Battery backup allows the chassis 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.
- LEDs that indicate the state of pinspotter microswitches and system components.
- Links to the pit lights, bumpers, ball detector, camera, mask switch, MCU, and front end box as well as the mask, foul detector, and ball return via the front end box.
- Audible warning on startup.
- Built-in time delay for back end shutdown to allow bowler's ball to be returned.

II. SAFETY PRECAUTIONS

WARNING!
Read this BEFORE 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.

- **When you see this symbol**

associated with instructions, a possible hazard is indicated. Follow these instructions carefully!

- **Before installing, removing, or replacing a chassis, be certain that the circuit breakers are turned OFF.**
- **Before applying power to a chassis, be sure that all cables have been connected properly – especially the power cables.**
- **Disconnect the power plug before working on any pinspotter equipment and before entering any operating portion of a pinspotter.**
- **Before operating a chassis or pinspotter, make sure that all GUARDS are in place.**
- **Wait a minimum of 60 seconds after the power is disconnected from a chassis before touching or removing any chassis components.**

III. 90XL CHASSIS INSTALLATION

Before installing the 90XL Chassis, 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 chassis. (The 90XL chassis accepts single phase, 208-250 Volt, 50/60 Hertz power only – DO NOT supply a 90XL chassis with 115-Volt power!)

Refer to the wiring diagram on Page 18 for cable identification.

Tools Needed

7/16-inch Wrench

Small Flat-Blade Screwdriver

Power Supply Requirements

- Two 13-Amp, 208-250 Volt, 50 or 60 Hertz circuits (1 per pinspotter).
- One 10-Amp 208-250 Volt, 50 or 60 Hertz circuit to serve up to 8 chassis. Must be from the same line (mains) phase as the pinspotter's AC power.

See QubicaAMF preinstallation drawings P/N 610-903-686 through 610-903-689 for details pertaining to pinspotter electrical requirements.

Installation

1. Mount the 90XL chassis to the chassis mounting bracket located between pin elevator wheel covers of the odd and even lane pinspotters.

    a. Align the four studs of the vibration mounts on the bottom of the chassis with the holes in the mounting bracket, and secure in place using four 1/4 - 20 nuts.

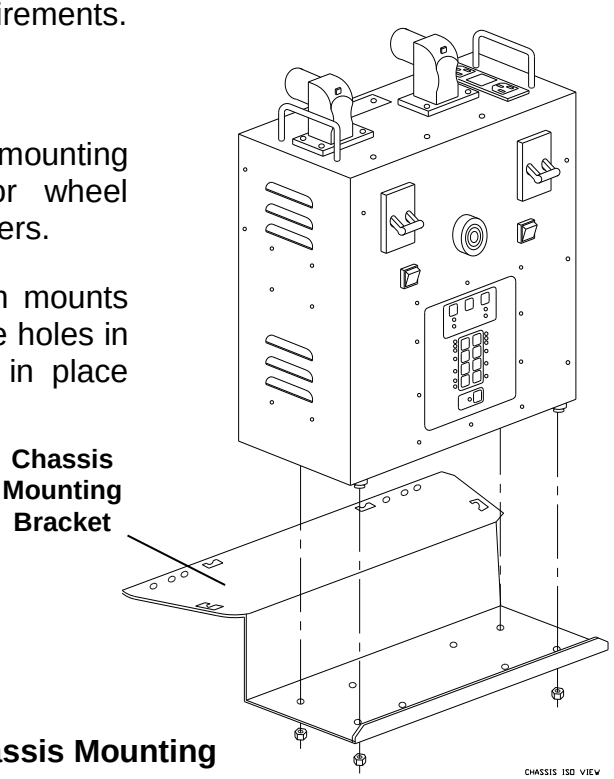

Figure 1, Chassis Mounting

2. Attach the connectors of the odd machine's power cable (090-008-914) to the connectors on the back of the 90XL chassis as follows (refer to Figures 2, 3, & 4):

   a. Connect the odd pinspotter's sweep and table power cables (090-005-876) to the "SWEEP" and "TABLE/SPOT" connectors on the back of the chassis.

   b. Connecting the back end motor is a two-step process:

      1. Connect the odd pinspotter's back end motor cable connector to the "BACKEND" connector on the rear of the chassis.

      2. Connect the odd back end motor's factory wiring connector to the corresponding connector on the odd machine's power cable.

   c. Connect the odd pinspotter's pit light power cable (090-003-703) to the "PIT LIGHTS" connector on the back of the chassis.

   d. Connect the odd pinspotter's machine signal cable (090-008-916) to the "MACHINE INPUTS" connector on the back of the chassis.

3. Repeat Steps 2a. through 2d. for the even pinspotter's power cable (090-008-913) and signal cable (090-008-915).

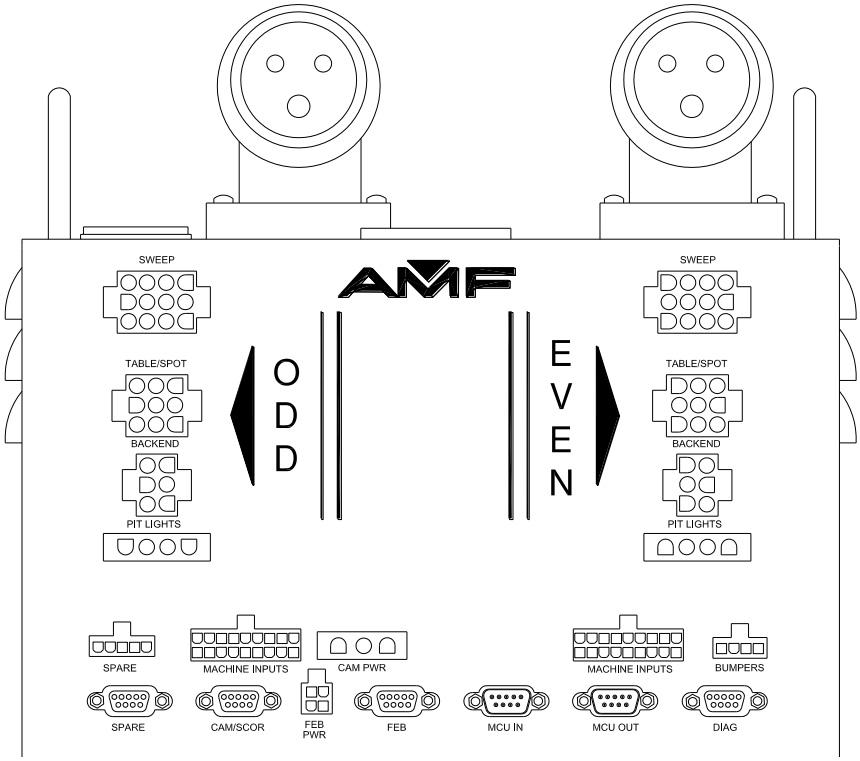

Figure 2, 90XL Chassis, Connection Layout

4. Verify that the front end box (090-005-827) has been installed (new installations).

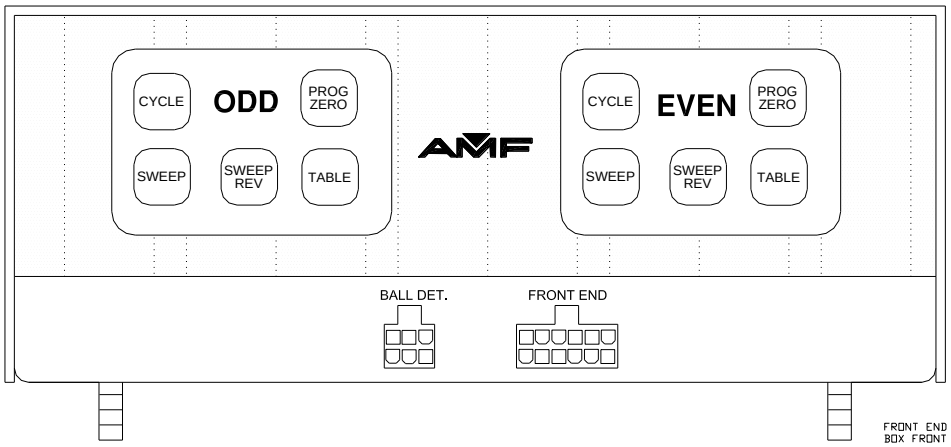

Figure 3, Front End Box, Front View

5. Install the communication and power cables between the front end box and the chassis as described below. All of the cables must be routed through the wiring channels of the respective even or odd pinspotter. If the wiring channels have not yet been installed, install them and remove their covers before performing this step.

   a. Connect the DB-9 front end communications cable (090-005-733) between the "BACKEND" connector on the front end box and the "FEB" connector on the back of the 90XL chassis.

   b. Connect the Molex power cable (090-005-714) between the "POWER" connector on the front end box and the "FEB PWR" connector on the back of the 90XL chassis.

   c. Verify that the odd and even machine's Strike/Foul cables (090-005-734) are connected between the mask and the front end box.

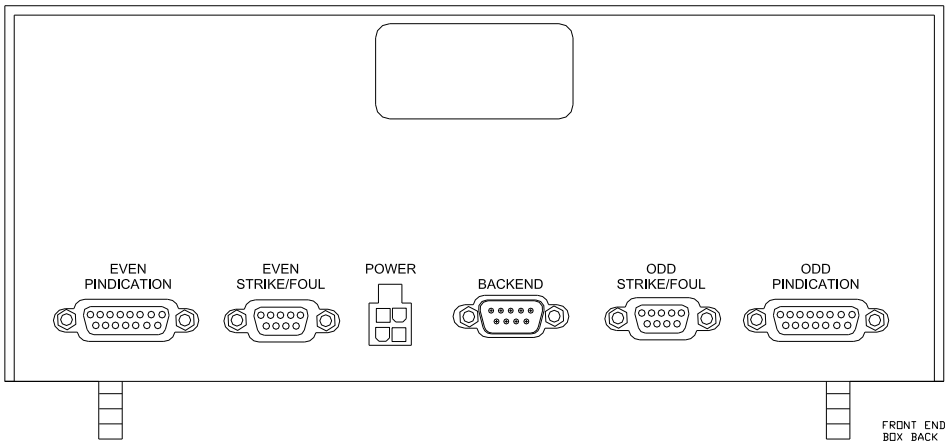

Figure 4, Front End Box, Rear View

6. For installations with or without QubicaAMF scoring:

   a. Verify that the camera has been installed on the capping between the odd and even lanes.

   b. Connect the DB-9 scoring cable (286-003-303) between the “CAM/SCOR” connector on the back of the 90XL chassis and the camera.

   c. If the camera came with a camera power transformer (232-009-116), connect the camera power cable as follows:

      1. Verify the transformer’s voltage selector switch is selected to the 220-volt position. (The transformer should be located on the top level of the chassis mounting bracket near the rear of the chassis.
      2. Insert the transformer’s three-pronged plug into the “AC OUT” connection on top of the chassis.
      3. Connect the camera power cable (232-008-748) to the three connections on the transformer. The cable’s slide-on connector (ground/earth) attaches to the center terminal (terminal 2) and the remaining wires connect to terminals 1 and 3.
      4. Route the camera power cable to the front of the pinspotter, then down under the lane to the camera’s location. Attach the cable’s connector to the corresponding connector on the camera.

   d. If the camera came with camera power cable P/N 090-008-140 only, connect one end of the cable to the “CAM PWR” connector on the rear of the 90XL chassis. Route the other end of the cable to the front of the pinspotter, then down under the lane to the camera’s location, and connect it to the camera.

7. Verify that the ball detector cable (090-003-915) and ball return cable (090-005-774) are connected to the front of the front end box.

Manager’s Control Unit (MCU) And Daisy Chain Links

Each MCU has four ports, labeled A through D, and each port can control one chain of chassis. Each chain can link up to 64 lanes through 32 chassis that are connected together using a daisy chain cable. The first chassis in a chain is linked to the MCU via a home run cable, and the last chassis in the chain ends the chain using a termination cable.

1. Connect the home run cable (090-005-748) coming from the MCU to the “MCU IN” connector on the back of the first 90XL chassis 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 90XL chassis 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 90XL chassis in the chain.

4. Repeat Steps 2 and 3 for the remaining chassis in the chain. There can be no more than 32 chassis in a chain.

5. Connect a termination cable (090-005-794) to the "MCU OUT" connector on the back of the last 90XL chassis in the chain.

6. **Verify that all power switches and breakers on the chassis are in the OFF position.**

7. Connect the AC power cables to the connectors located on the top of the chassis.

   a. Connect the odd pinspotter's AC power cable (090-005-855) coming from the power source to the chassis' odd machine power connector (see Figure 5).

   b. Connect the even pinspotter's AC power cable (090-005-855) coming from the power source to the chassis' even machine power connector.

   c. Connect the chassis logic AC power cable (090-005-706) to the chassis logic power connector.

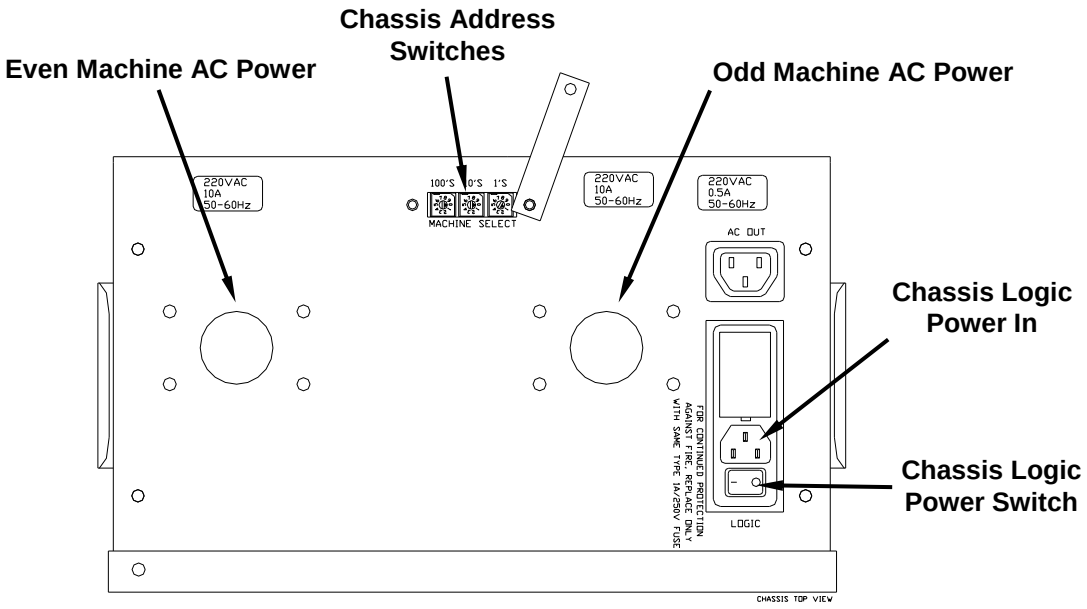

Figure 5, 90XL Chassis, Top View

8. Install the wiring hood cover (090-004-707) over the wires at the back of the chassis. The hood has two tabs that fit into slots in the chassis mounting bracket.

9. Reinstall the wireway covers and secure them with the screws provided.

Setting the Chassis Address

The Manager's Control Unit must be able to recognize each individual chassis so that the chassis can be individually controlled. To accomplish this, a different address is dialed into each chassis.

To set the chassis address:

1. Verify that the logic power cable is not connected to the top of the chassis.

2. Remove one of the two screws that secures the chassis address cover plate to the top of the chassis, loosen the other screw, and rotate the cover plate out of the way.

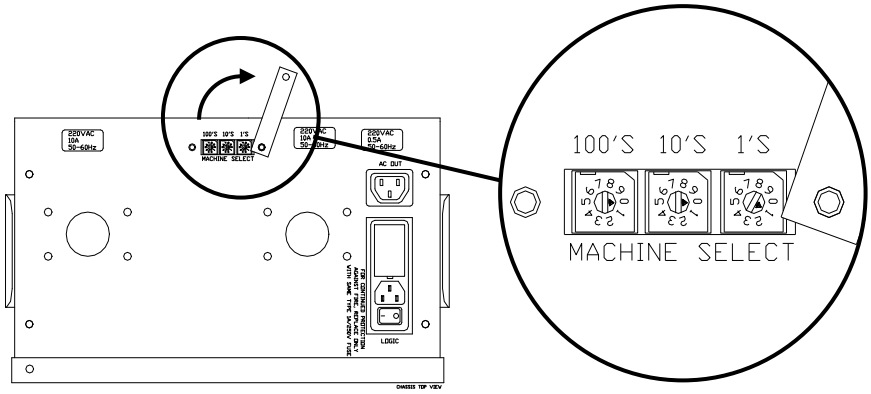

Figure 6, Setting the Chassis Address

3. Set the three dials to the number that corresponds to the ODD lane of the lane pair that the chassis controls. The dials represent a three-digit number, and are labeled 100's, 10's, and 1's. There is a small pointer near the center of each dial that shows its setting. The factory setting is 100. So, for example, to set the first chassis in the series, which in this example controls lanes 1 and 2, set the 100's dial to [0], the 10's dial to [0], and the 1's dial to [1]. The next chassis in the series (controlling lanes 3 and 4) would be set to [0], [0], [3], and so on resulting in a chassis address series of 1, 3, 5, 7, 9, etc. These chassis addresses are actually the odd lane's address. The even lane's address is automatically determined by the chassis to be one number higher than the chassis address setting.

4. Reposition the address cover plate, and secure it in place with its two screws.

5. Set the following chassis operating parameters from the MCU in accordance with the MCU Operating Manual (610-005-700). Additional parameters can be set as needed.

   - LIU Mode (SPECs 10 or 11)
   - Ball Delay (SPEC 12)
   - Pin Data Interface (SPECs 14 or 15)
   - Scoring Timing (SPECs 16, 17, 18, or 19)
   - Beginning and Ending Lane Numbers (SPEC 99)

IV. 90XL CHASSIS CONTROL PANEL OPERATING PROCEDURES

Before Operating This Equipment:

- **Be sure 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.**

To operate the chassis control panel, first push either the [ODD LANE] or [EVEN LANE] pushbutton, observe that the corresponding LED turns on. Press the [MANUAL MODE] button, another LED should light, and then choose the function that you need. Keypad entries will apply to the selected lane's pinspotter only.

The 90XL chassis has a safety beeper that beeps for 10 seconds when the logic power is turned on and when a pinspotter is placed in the "Bowl" mode at the MCU. The pinspotter will not operate while the safety beeper is beeping.

Switches and Circuit Breakers

There are two circuit breakers and three switches on the chassis. Their functions are:

- **Logic Power Switch** — Turns control power to the chassis on and off. Switch is located on top of the chassis.
- **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 when the pinspotter is in the MANUAL or BOWL mode. **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, disconnect the motor's AC power cord.**
- **Even Machine Back End Switch** — Turns the even pinspotter's back end motor on or off when the pinspotter is in the MANUAL or BOWL mode. **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, disconnect the motor's AC power cord.**

Manual Mode

1. To select a lane and place it in the manual mode, press the keypad pushbuttons in the order indicated below:

[EVEN LANE] or **[ODD LANE]** pushbuttons select the desired lane. The LED indicates the selected lane. An LED that is blinking indicates that the chassis is on a 2nd ball cycle. A steady light indicates the 1st ball cycle.

[MANUAL MODE] pushbutton turns on the pinspotter for maintenance or adjustment. Also, activates the keypad for the selected lane. The LED indicates that the manual mode is selected.

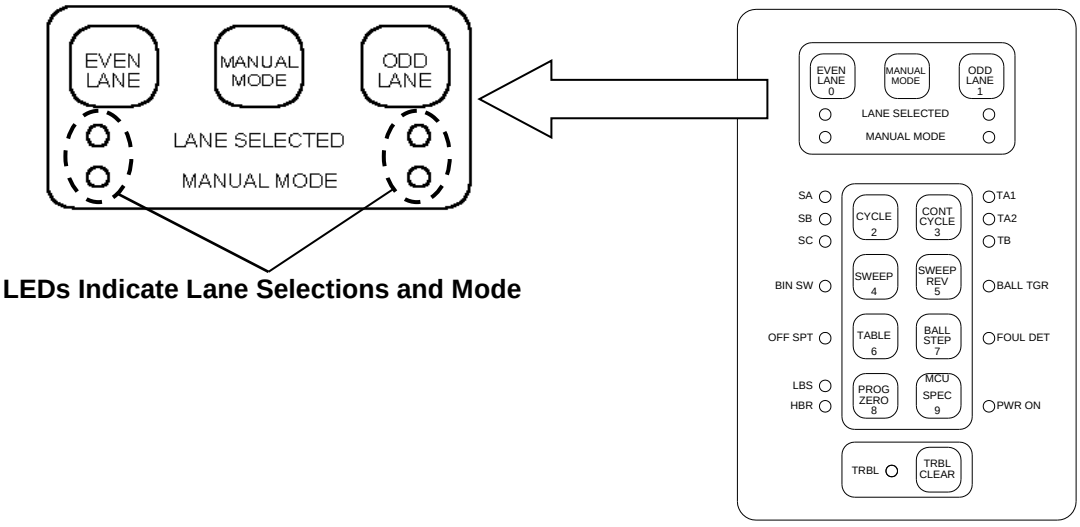

Figure 7, Chassis Control Panel

Light Emitting Diodes (LEDs)

The illuminated LEDs are for with the selected lane only.

- **SA** Illuminates when the sweep bar is between the second guard and home positions, which is between 270 degrees and 360 degrees of the sweep drive shaft rotation.
- **SB** Illuminates when the sweep bar is between 66 degrees and 186 degrees of the sweep drive shaft rotation.
- **SC** Illuminates when the sweep bar is between 85 degrees and 243 degrees of the sweep drive shaft rotation.
- **TA1** Illuminates when the table is between 185 degrees and 355 degrees of the table drive shaft rotation.
- **TA2** Illuminates when the table is between 260 degrees and 350 degrees of the table drive shaft rotation.

- **TB** Illuminates when the table is in the interference zone of the sweep arm (between 105 degrees and 255 degrees of the table drive shaft rotation.
- **BIN SW** Illuminates when a pin has been deposited in the #9 bin position. Signifies that the machine is ready to spot a set of pins.
- **BALL TRG** Illuminates when a ball interrupts the photo eye beam of the ball detector. Remains on until the completion of the cycle.
- **OFF SPT** Illuminates to indicate that a pin has moved from its normal position and is causing interference with table operation. This light remains on until the sweep is returned to up and the machine is cycled.
- **FOUL DET** Illuminates to indicate that someone has tripped the foul detector at the foul line. This information is used by scoring to score zero pins for that part of the frame.
- **LBS** This LED is for future use.
- **HBR** This LED is for future use.
- **PWR ON** Illuminates when logic power is ON.
- **TRBL** This LED is for future use.

Keypad Pushbutton Functions

The chassis contains a number of pushbuttons that are provided for the mechanic to use when performing maintenance, troubleshooting, or when recovering from an off-normal condition. The chassis must be in the Manual Mode for the selected lane for most keypad functions to be available.

"CYCLE" Causes the selected machine to cycle (uses a longer than normal time delay between reaching 1st guard and continuing the cycle).

"CONT CYCLE" Causes the selected machine to go into continuous cycle (uses a longer than normal time delay).

"SWEEP" Runs the sweep motor as long as the key is depressed. Once the sweep starts up from the 2nd guard position, you can remove your finger from the button.

"SWEEP REV" Runs the sweep motor to run in the reverse direction. You would use this function to return the sweep to the home position without completing a sweep-through of the pin deck, such as when recovering from an off-spot condition.

"TABLE" Runs the table motor for as long as the key is depressed. Once the table starts up from the respot position, you can remove your finger

from the button. Because the table operates independently from the sweep when using this function, exercise caution to prevent the table from being exposed to a thrown bowling ball.

"BALL STEP" Changes the machine state from 1st ball to 2nd ball and vise versa without cycling the machine.

"PROG ZERO" This function resets the chassis to its saved default settings.

"MCU SPEC" This function allows entering special function settings into the chassis memory locally instead of from the Manager's Control Unit (MCU). Many of the keypad's pushbuttons also contain numbers that can be used for entering the SPEC Codes.

Entering Chassis Special Function (SPEC) Codes

Many 90XL chassis Spec Codes can be set directly from the chassis operating panel using the "MCU SPEC" pushbutton and the numbered keys that were mentioned above. To enter Spec Codes from the chassis control panel, proceed as follows:

1. Select a lane using the [ODD LANE] or [EVEN LANE] pushbuttons.
2. Push and hold the [SPEC] button until all the LEDs turn on, then release the button.
3. Within 10 seconds, press the [SPEC] button once.
4. Within 10 seconds, enter the first digit of the Spec Code. (The Spec Codes that can be entered from the chassis are listed at the end of this procedure.)
5. Within 10 seconds, enter the second digit of the Spec Code.
6. When the code is received or 10 seconds elapses, the LEDs turn off.

List of Chassis Special Function Codes

The following spec codes can be entered directly from the chassis control panel. For a more detailed description of the function of each code, refer to the MCU Operations and Maintenance Manual (610-005-700).

Code	Action
14	Use Scoring Interface for Pin Data.
15	Use Camera Interface for Pin Data.
16	Start Signal Delay = 0.00 seconds.
17	Start Signal Delay = 0.75 seconds.
18	Start Signal Delay = 1.25 seconds.
19	Start Signal Delay = 1.75 seconds.

22 – Chassis Reset (keeps current settings).
25 – Enable Auto Off-Spot Release.
26 – Disable Auto Off-Spot Release.
27 – Enable Auto Back End Shutoff.
28 – Disable Auto Back End Shutoff.
29 – Radaray ON.
30 – Radaray OFF.
31 – Radaray Warning Mode.
32 – Enable Sweep Reverse.
33 – Disable Sweep Reverse.
36 – Enable Pindication.
37 – Disable Pindication.
38 – Enable Auto Cycle on 2nd Ball (10th Frame).
39 – Disable Auto Cycle on 2nd Ball (10th Frame).
51 – Select Pit Light #1 (White)
52 – Select Pit Light #2. (Black Light)
53 – Bumpers Down.
54 – Bumpers Up.
55 – Bumpers Auto Controlled by Scoring.
88 – Reset EEPROM to Factory Settings:

- Mask Switch Monitor : ENABLED
- Pindication Mode: ENABLED
- B/E Auto Shutoff: ENABLED
- Radaray Power: ON
- Sweep Reverse: ENABLED
- Off-Spot Release: MANUAL
- Scoring Source: SCORING
- Start Delay: 1.75 seconds

FUSE PROTECTION

Various chassis and load components are provided with overload protection through the use of fuses. Figure 8a and 8b show the locations of the various 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 chassis. Remove all three sources of power from the chassis before attempting fuse replacement.**

- **Wait at least 60 seconds after removing power from the chassis before opening the access door to allow voltage stored in the capacitors to dissipate.**

Logic Power Fuse

Chassis logic circuitry is protected by a 1-Amp, 250-Volt, 5 x 20 mm fuse (P/N 090-002-776). This fuse is located inside the removable fuse holder on top of the chassis between the “Logic Power In” and “AC Out” receptacles, as shown if Figure 8a.

Power Supply Fuse

The power supply circuit board contains a 2-Amp, 250-Volt, 5 x 20 mm fuse (P/N 294-002-252) at the location shown in Figure 8a.

Spot Solenoid Fuses

The spot solenoids for the even and odd machines are protected by 1-Amp, 250-Volt microfuses (F309 and F310, P/N 090-002-775) located on the Power I/O circuit board as shown In Figure 8b. These fuses are similar to the illustration shown at the right.

Microfuse

Pit Light Fuses

The pit lights for the even and odd machines are protected by 1-Amp, 250-Volt microfuses (F307 and F308, P/N 090-002-775) located on the Power I/O circuit board as shown in Figure 8b. These fuses are identical to the fuses for the spot solenoids.

Some of these fuses are designed to be fast acting in order 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.

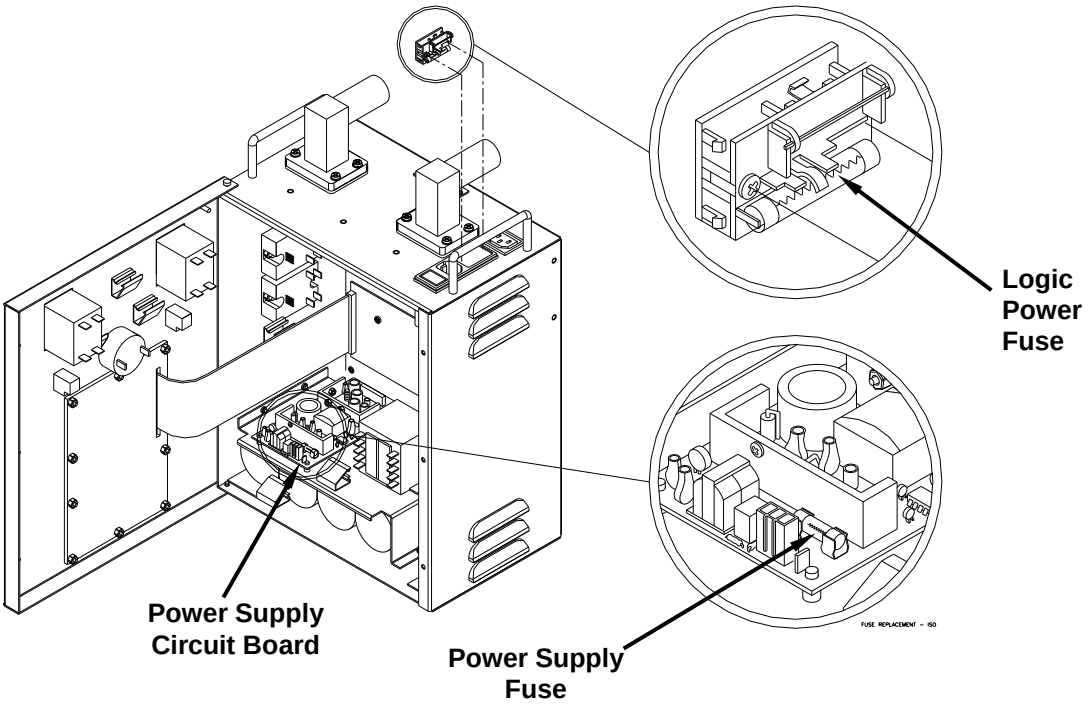

Figure 8a, Fuse Locations

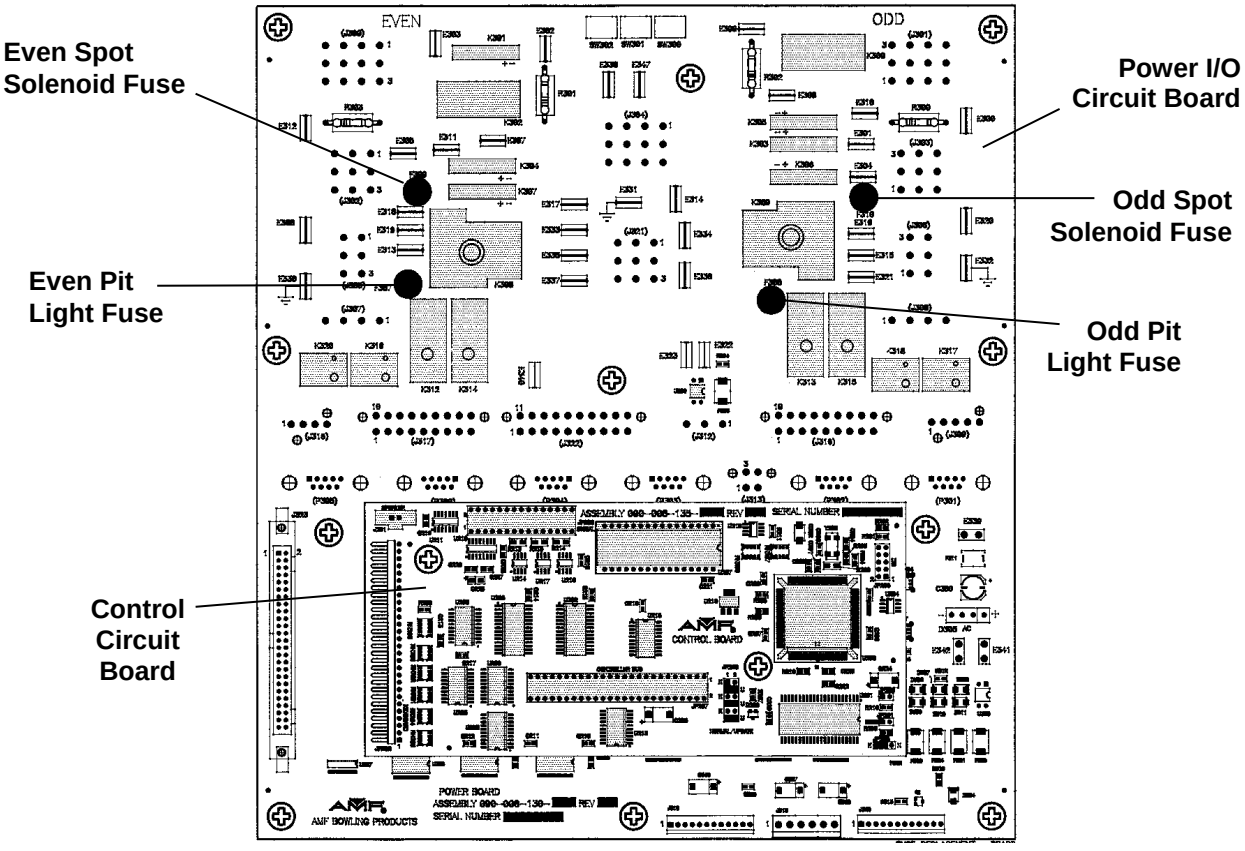

Figure 8b, Fuse Locations

SECTION V

WIRING DIAGRAMS AND DRAWINGS

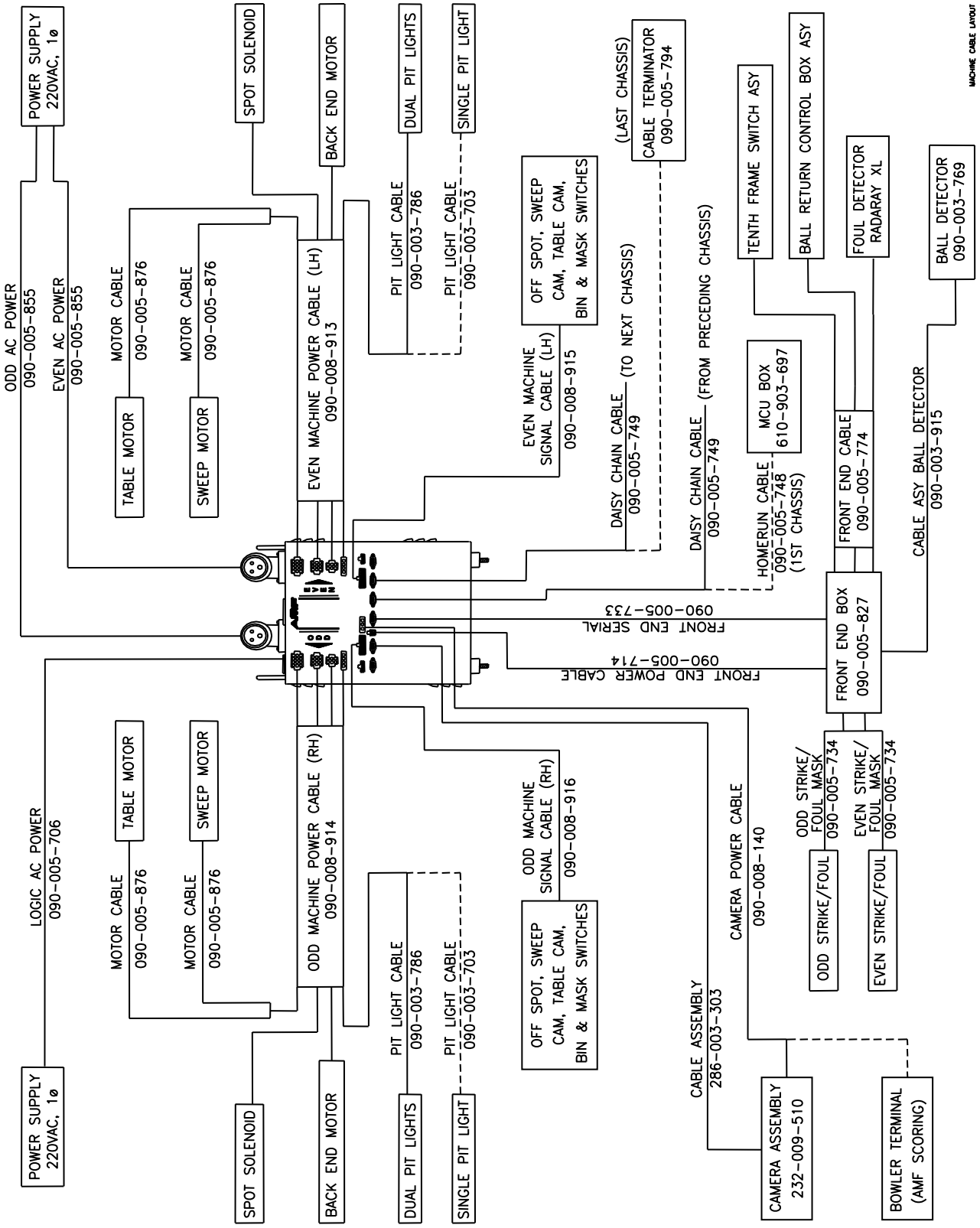

Figure 9, 90XL Chassis Cable Numbers and Connections

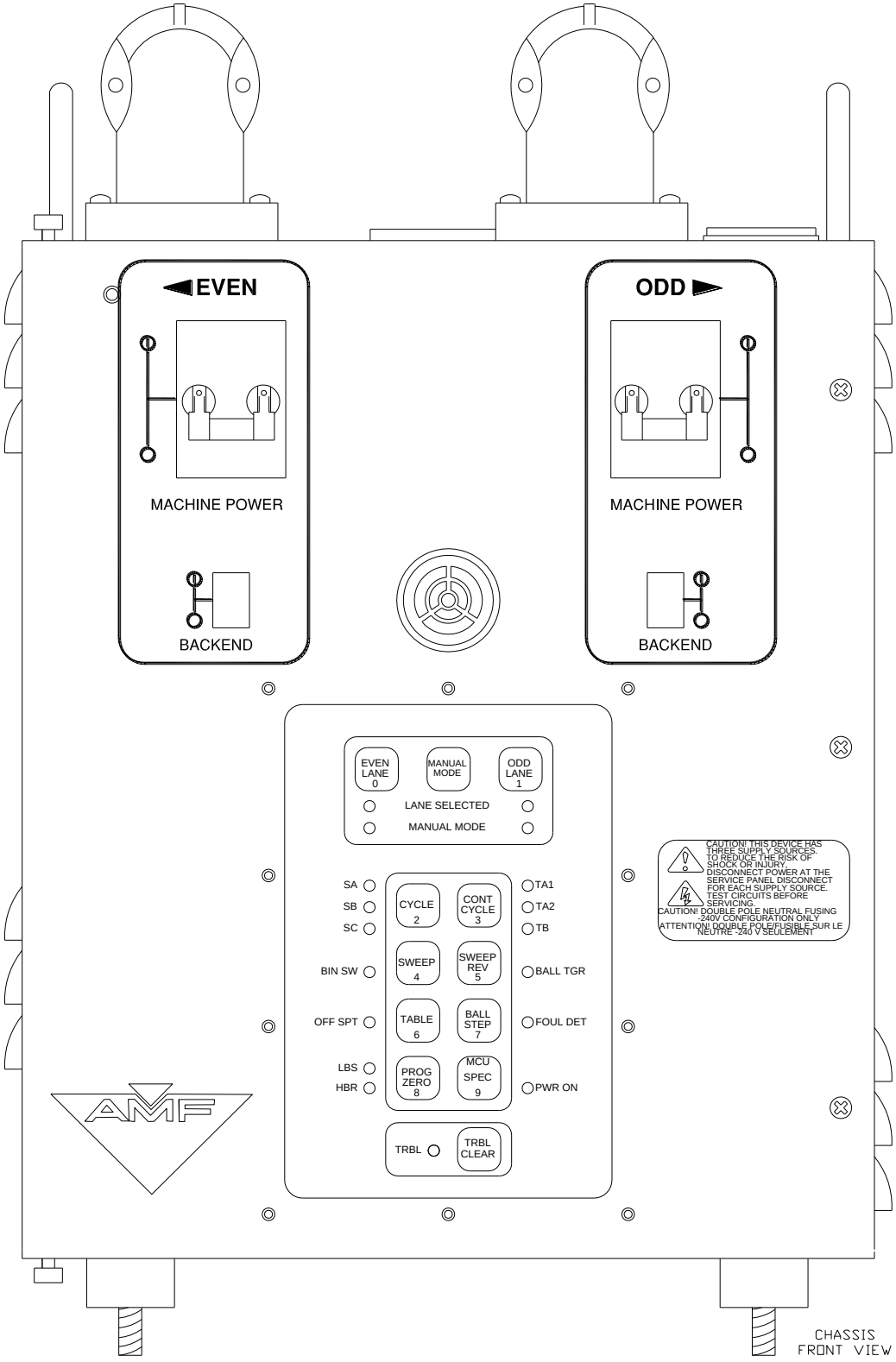

Figure 10, Chassis, Front View

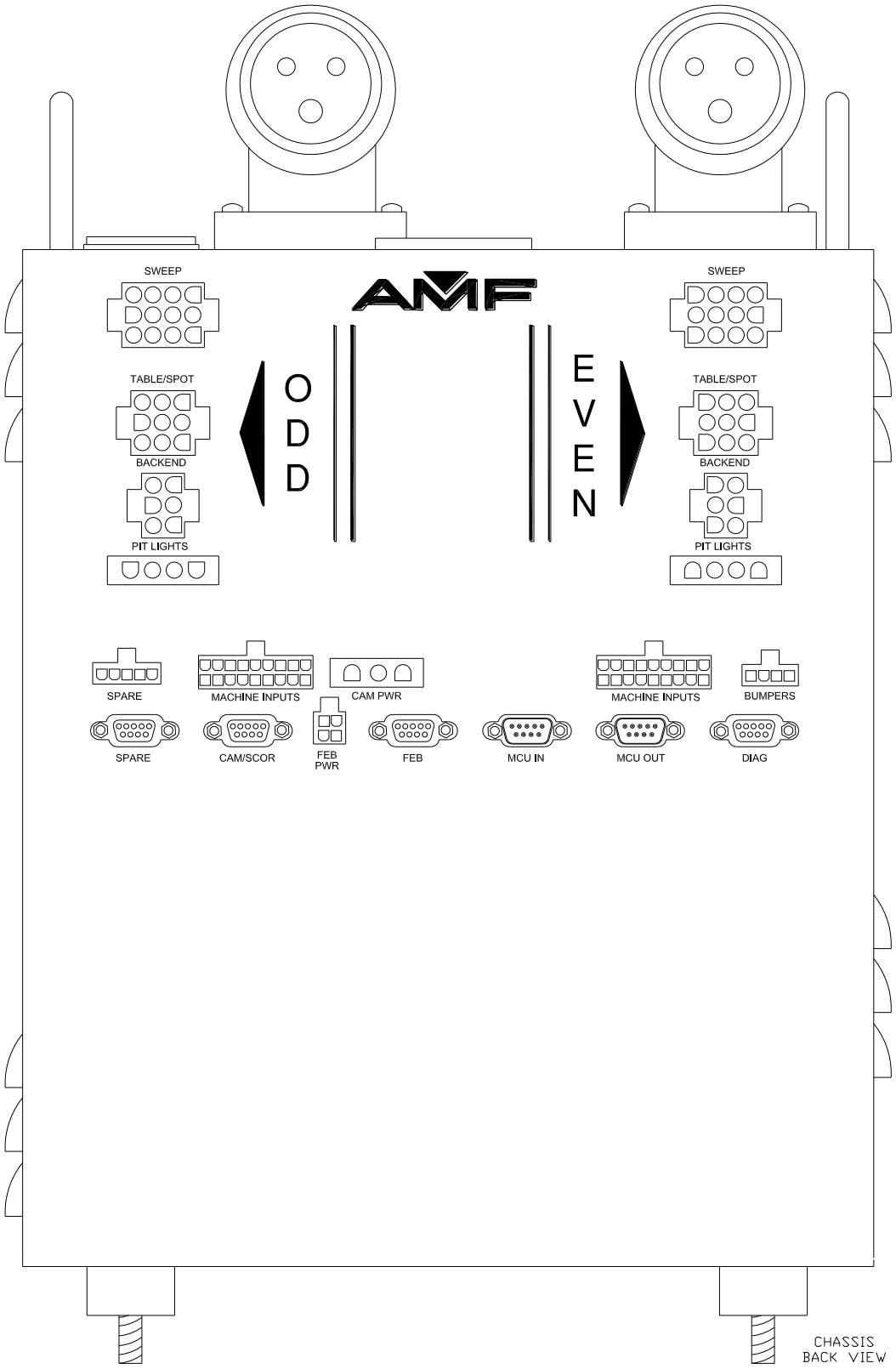

Figure 11, Chassis, Rear View

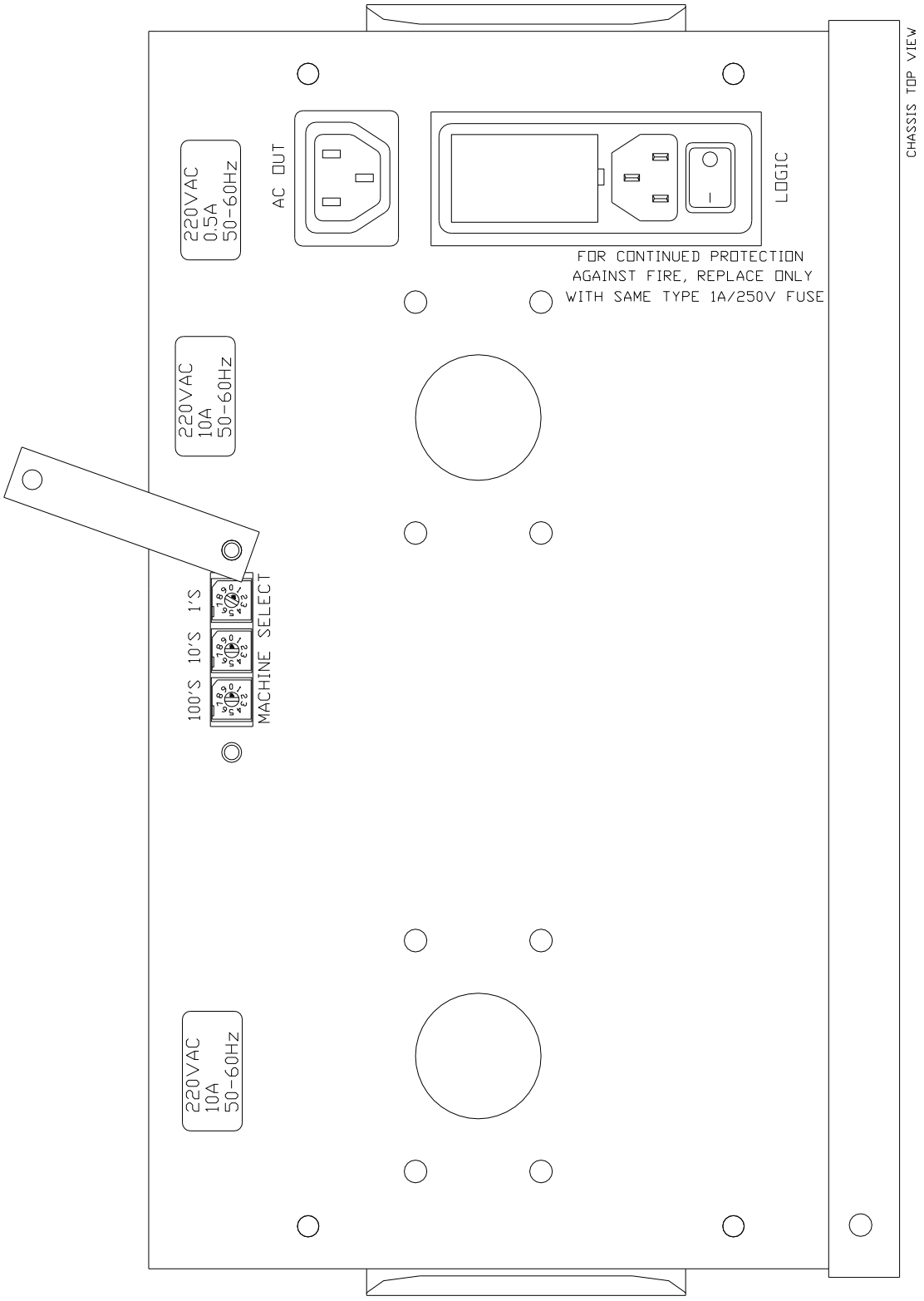

Figure 12, Chassis, Top View