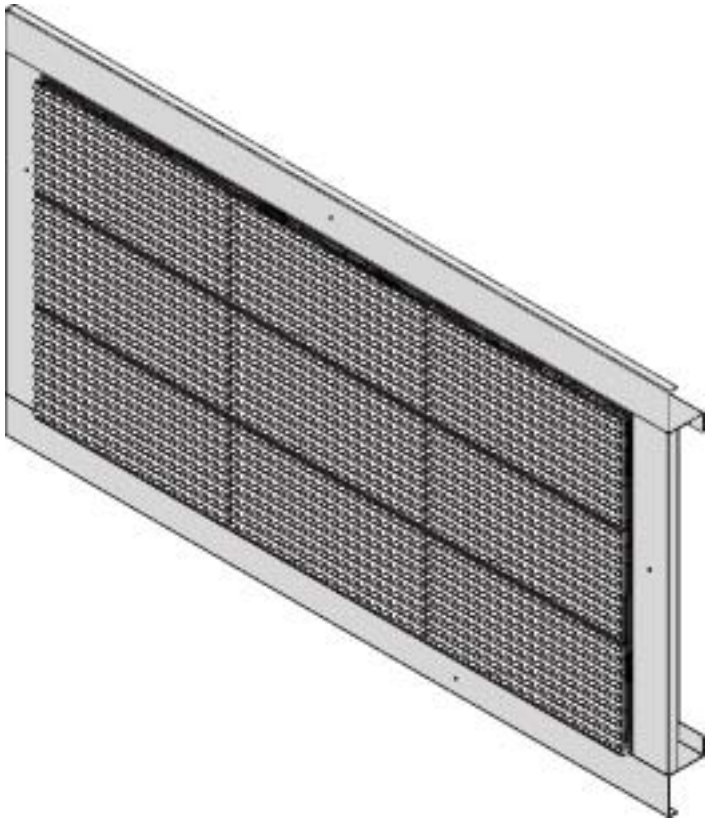
AlphaXpress 8700

Front Access Full-Matrix Displays Sign Maintenance Manual

Revision date: May 1, 2008



Manual Part Number 1508610101 rev. B

ADAPTIVE®
Connecting people, places and ideas

Adaptive Micro Systems
7840 North 86th Street
Milwaukee, WI 53224 USA
414-357-2020
414-357-2029 (fax)
http://www.adaptivedisplays.com

Due to continuing product innovation, specifications in this manual are subject to change without notice.

Quick Start Guide

- Mount the sign, see “Mechanical Installation” on page 13.
- Connect 30A AC service to input terminal blocks, see “Electrical installation” on page 15.
- Connect light sensor to controller #2, see “Light sensor wiring diagram” on page 17.
- Connect communications to the controller:
  - See “Network connection directly to sign” on page 19 for two controller configuration.
  - See “Sign to ground controller network connection” on page 18 for three controller configuration.
- If required, set the controller’s IP address:
  - See “To set the IP address for the new Controller #1 board” on page 36 for two controller configurations.
  - See “To set the IP address for the new Ground Controller #3 board” on page 39 for three controller configurations.

Contents

Introduction 5

Purpose 5
Revision history 5
Related documentation 5
Safety information 5
Equipment symbols 5
Warnings and cautions 5
Controller memory battery backup 6
3V lithium backup battery 6
System overview 7
Introduction 7
General system 9
What is an LED? 9
VMS control system 10
LED brightness control system 11
Environmental control system 11
Electrical system 11

Installation 13

Mechanical Installation 13
Setting the OPTIONAL tilting brackets (before mounting sign) 13
Lifting the sign 14
Electrical installation 15
AC wiring 15
Beacon option 16
Light sensor wiring diagram 17
Sign to ground controller network connection 18
Network connection directly to sign 19

Equipment 21

General description 21
Outside views 22
Inside view 23
General view 23
Controller plate 24
Controller plate for 27 x 126 signs 25
Ground controller panel (option) 26
Controller #1 and #2 27
Power panel and power supplies 29
LED driver board 30

Maintenance 31
Physical inspection 31
Exterior inspection 31
Interior inspection 31
Front lens cleaning (outside of sign) 32
Required materials 32
Cleaning procedure 32

Part replacement 33
List of field-replaceable parts 33
Opening a sign 34
Controller board replacement 35
Ground controller (Controller #3) board replacement 38
Power supply replacement 41
Diode replacement 44
LED driver board replacement 45
Fan replacement 46
Light sensor replacement 47

Appendix 49

Introduction

Purpose

This manual is intended as a guide for maintenance and repairs considered field serviceable on all Adaptive AlphaXpress 8700 signs.

This field service manual supplies technical information for service and technical personnel so that they can maintain the equipment at the assembly but not the component level.

Revision history

Rev	Date	Description
A	October 6, 2006	First release.
B	April 25, 2008	Updated the format of the manual, added sign options (controller battery back-up, ground controller, beacons, and tilting brackets), updated AC wiring information for 27x126 size sign, and single row sign configurations.

Related documentation

Document Number	Title	Description
TechMemo #00-0005	Preventing Electrostatic Discharge (ESD) Damage	Describes the precautions to take to protect electronic components from ESD damage.

Safety information

Equipment symbols


Chassis ground

Warnings and cautions

Warnings and cautions are posted in appropriate locations throughout this manual.

Controller memory battery backup

In the event of a power loss, a lithium battery provides power to the sign controller board(s).

Note: The backup battery provides only enough power to operate the sign's controller memory, not the sign's LED displays.

3V lithium backup battery

One 3V lithium battery is located on the sign controller board(s).

WARNING! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

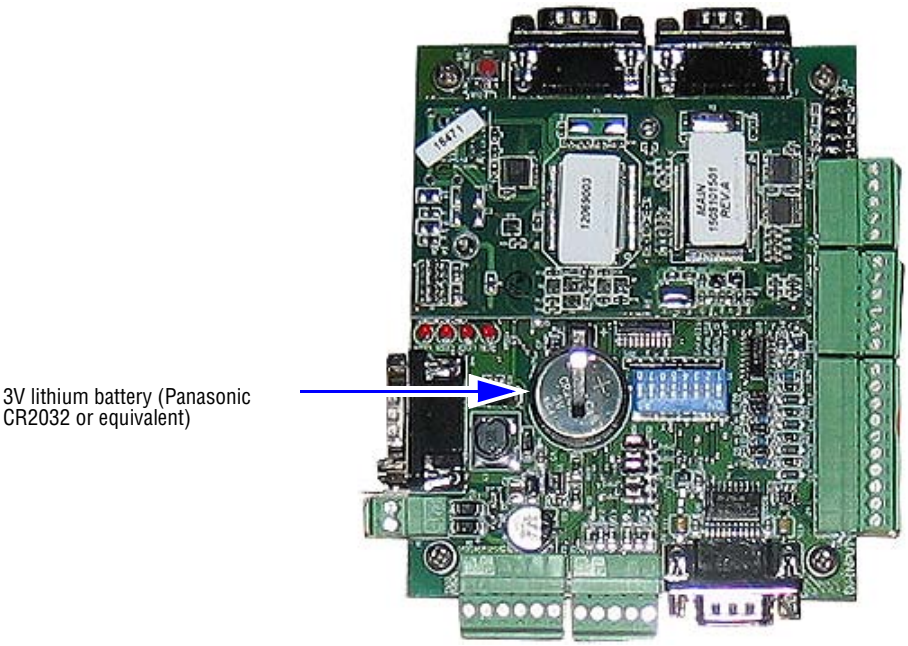


Figure 1. A 3V lithium battery is located on the sign controller.

System overview

This section contains the LED Variable Message Sign (VMS) systems description and a general explanation of how each system operates.

Introduction

The Adaptive LED family of Variable Message Signs is considered to be one of the highest visibility sign systems available. Utilizing the latest generation of light emitting diode (LED) technology has allowed us to construct a high-reliability, variable message sign display system.

The LED Variable Message Signs discussed in this manual are built with a combination of 9 x 18 pixel modular cases, each with three 6 x 9 pixel display boards at 2.6-inch pitch configured in a full matrix. The signs are designed to be used as outdoor highway information signs. The signs utilize a corrosion-resistant front-access housing with control circuitry enclosed within. The only connections necessary are AC power and Communications Input/Output between the sign housing and ground cabinet.

AlphaXpress 8700 models (three row models)

This manual applies to the following AlphaXpress models:

AlphaXpress 8700	Height* (feet)	Width* (feet)	Depth* (feet)	Lines	Char/line	Weight** (lbs)	Typical Power** (watts)	Max Power** (watts)	Number of 30A*** circuits Req.
AX-8700-27X54-18A	7.5	13.5	1	3	11	1300	660	1700	1
AX-8700-27X72-18A	7.5	17.5	1	3	14	1800	880	2200	1
AX-8700-27X90-18A	7.5	21.5	1	3	18	2300	1100	2800	1
AX-8700-27X108-18A	7.5	25	1	3	21	3000	1350	3300	1
AX-8700-27X126-18A	7.5	29	1	3	25	3600	1550	3850	2

Pixel center-to-center spacing is 2.6” (66 mm) horizontally and vertically. Character count is based on a 7 x 4 single stroke font with single-column spacing. A 7-pixel high character is 18” (460 mm) tall. Line count based on a 7 x 4 font with two-pixel row spacing.
*Approximate cabinet dimensions (feet).
**All weight and power specifications are approximations. Consult factory for more details.
***Circuits to be sized for 30A breaker(s) in the controller modular case.

For AlphaXpress models other than three row configurations see the “Appendix” on page 49 for more details.

27 x 54 dimensions

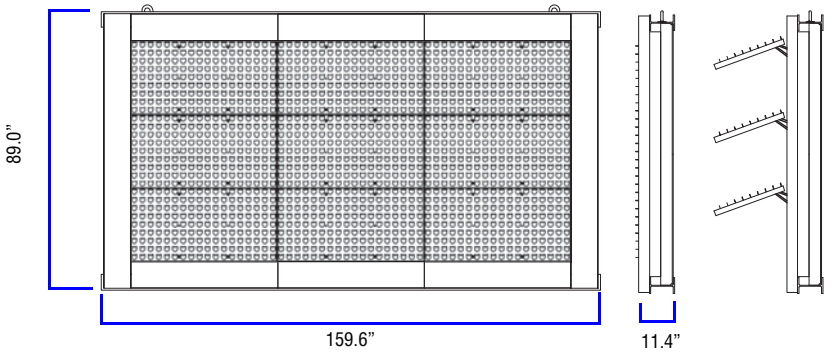


Figure 2: AX-8700-27x54-18A

27 x 72 dimensions

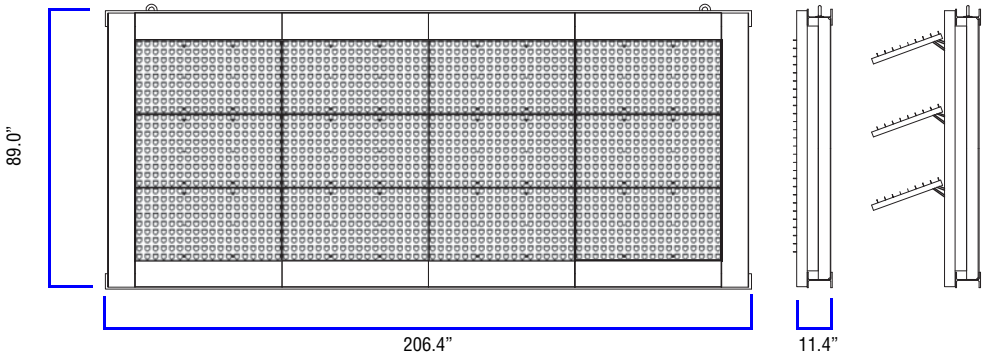


Figure 3: AX-8700-27x72-18A

27 x 90 dimensions

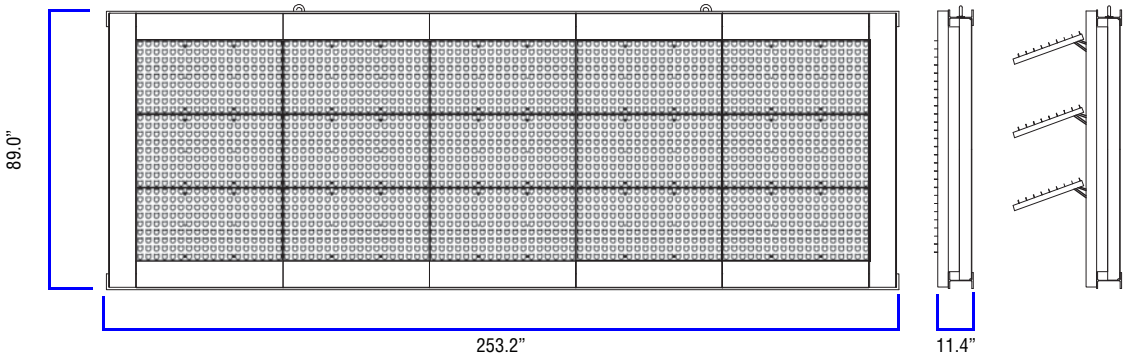


Figure 4: AX-8700-27x90-18A

27 x 108 dimensions

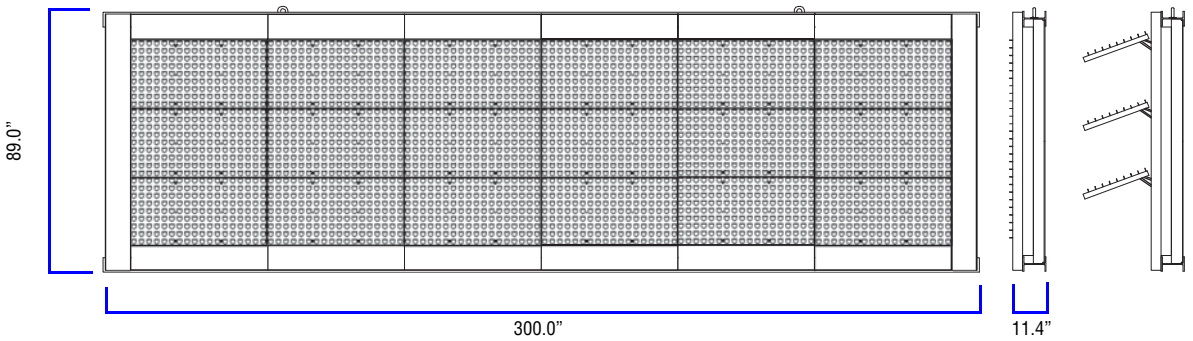


Figure 5: AX-8700-27x108-18A

27 x 126 dimensions

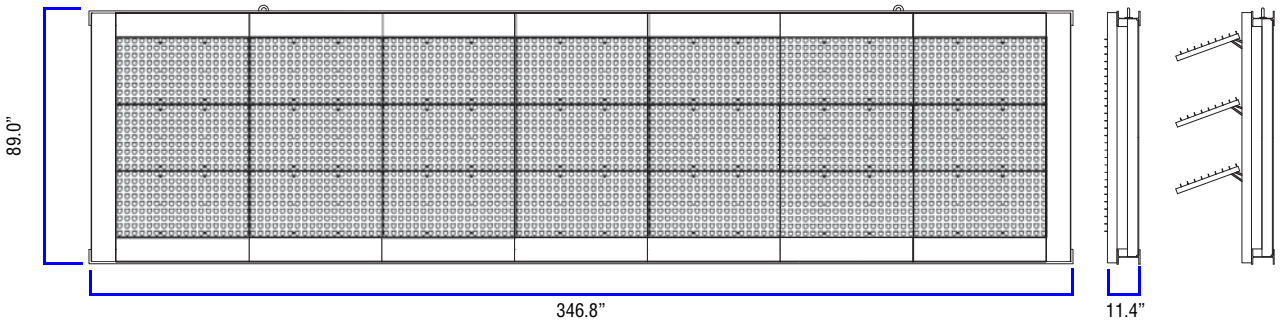


Figure 6: AX-8700-27x126-18A

For views and dimensions other than three row configurations see the “Appendix” on page 49 for more details.

General system

The entire sign system may be broken down into four basic subsystems:

- VMS control system
- LED brightness control system
- Environmental control system
- Electrical system

In the following sections, we explain each of the above-mentioned systems in general terms for ease of understanding. Referring to the drawings throughout this manual should help you to gain a general understanding of the LED Variable Message Sign system.

What is an LED?

LED-based signs are one of the most versatile and visible display systems available. We use a cluster of small LEDs to form a pixel. The pixels are arranged in various matrices to form alphanumeric characters. These characters are then linked together to form an LED display line. The display line format used in AlphaXpress 8700 signs is full matrix, which allows for the display of any alphanumeric character, including punctuation marks, as well as simple graphics characters.

VMS control system

The VMS control system used in the Variable Message Sign consists of the following components:

- IDI 1320 controller
- IDI 1321 controller
- LED display board/driver board

General operation

The controllers interface with the “Host” computer system, and communicate with the Host through a CAT5 Ethernet cable (customer-ordered) or an RS232 Input/Output (I/O) port (standard). Using this network connection or I/O port, the Host issues commands to, and requests status information from, the LED VMS equipment. The controllers monitor and control the entire LED VMS system. Communication by the controllers to and from the Host and the VMS is accomplished using industry standard 10/100 Ethernet or RS232 communications circuitry and NTCIP protocol. Ethernet does not come standard on AlphaXpress 8700 signs; the option is available, however, at the customer’s request.

Placement of controllers

The controllers are located in the lower right modular case of all AlphaXpress 8700 sign configurations.

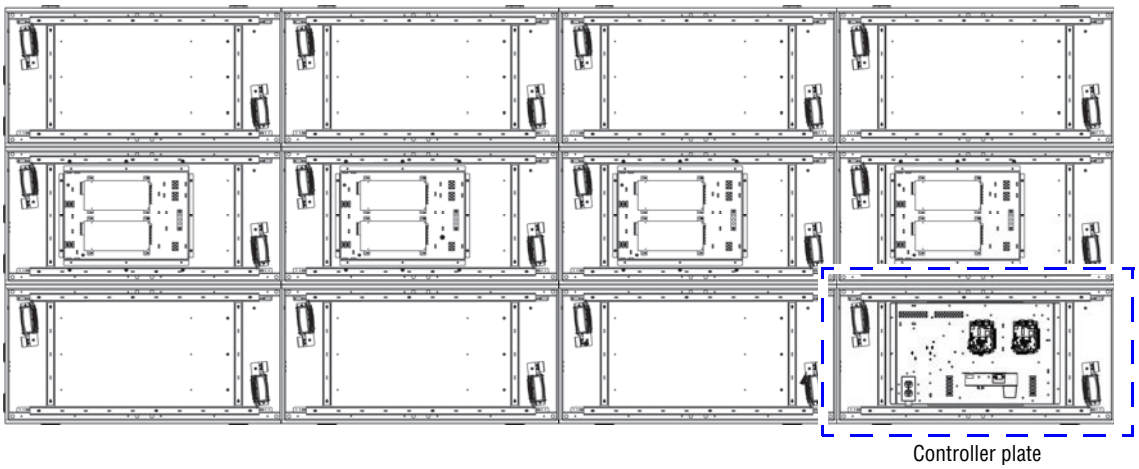


Figure 7: Controller plate on model AX-8700-27x72-18A.

LED brightness control system

The VMS is equipped with a brightness control system for the LEDs. The brightness control system ensures that the display is readable in all lighting conditions.

The photocells are enclosed in the light sensor globe to protect them from the environment. Three photocells continually monitor the ambient light conditions. The photocell assembly is constructed in such a manner that adverse weather conditions (such as heavy snow) should have no effect on its performance. The main components of the brightness control system are the following:

- IDI 1320 controller
- Light sensor globe

General operation

The photocells are enclosed in a globe to protect them from the environment. The photocells continuously monitor the ambient light conditions and send the information directly to the controller. The controller assembly determines exactly how much ambient light is present through the light-sensing photocells and sends the proper command to the display module for it to adjust duty cycle of the LED current drive, thus dimming or brightening the LED modules according to the ambient light. (If the on time of the duty cycle is 50%, then the brightness will be at 50%; if the on time of the duty cycle is 75%, then the brightness will be at 75%, and so on.) The photocell assembly is constructed in such a manner that adverse weather conditions should have no effect on its performance.

Light sensor globe mounting

Because the function of the photocells depends on ambient lighting, the light sensor globe should be mounted in a location where it will receive maximum light exposure throughout the day. When choosing a mounting location for the light sensor globe, make sure the globe can receive ambient light on all sides of the globe.

Environmental control system

To protect the sign components from overheating, two fans are mounted in each of the sign's modular cases. The operation of each fan is controlled independently by a thermostat dedicated to each fan. The fans turn on when the internal temperature of the sign reaches 122ºF (50ºC), and turn off when the internal temperature is below 90ºF (32ºC).

Electrical system

The electrical supply system is responsible for supplying the necessary power to operate the LED sign system. The sign housing AC and DC electrical system consists of the following components:

- GFCI outlet
- DC power supply

Electrical distribution (AC)

The AC input to the sign system consists of 120VAC 30A single-phase service wired to the input AC terminal block located on the controller plate. See "AlphaXpress 8700 models (three row models)" on page 7 or the "Appendix" on page 49 for the number of circuits required for your sign. AC is internally wired to the DC power supplies.

Electrical distribution (DC)

Attached to the back panels in the sign housings are the power supply boxes containing 12VDC switching power supplies. The power supplies are located in the second (center) row on three row AlphaXpress 8700 sign configurations. The electronic power supplies convert the 120VAC to the required DC voltage to power all of the electronics in the sign. DC power to the electronics is redundant and has a primary and secondary source of DC power. Therefore, failure of a power supply will not impact sign performance. The controller monitors the status of the power supplies.

See the “Appendix” on page 49 for power panel locations on sign configurations other than three row models.

WARNING! Hazardous voltage. Multiple power sources may be present. Risk of electrical shock. Disconnect all power sources before servicing.

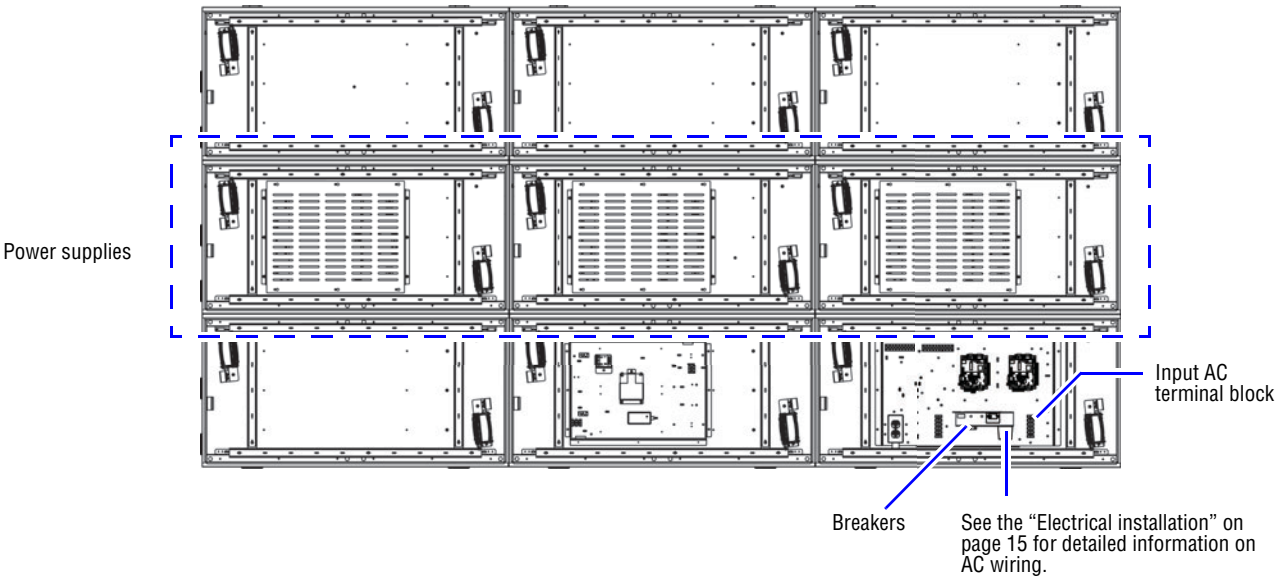


Figure 8: Model AX-8700-27x54-18A

Installation

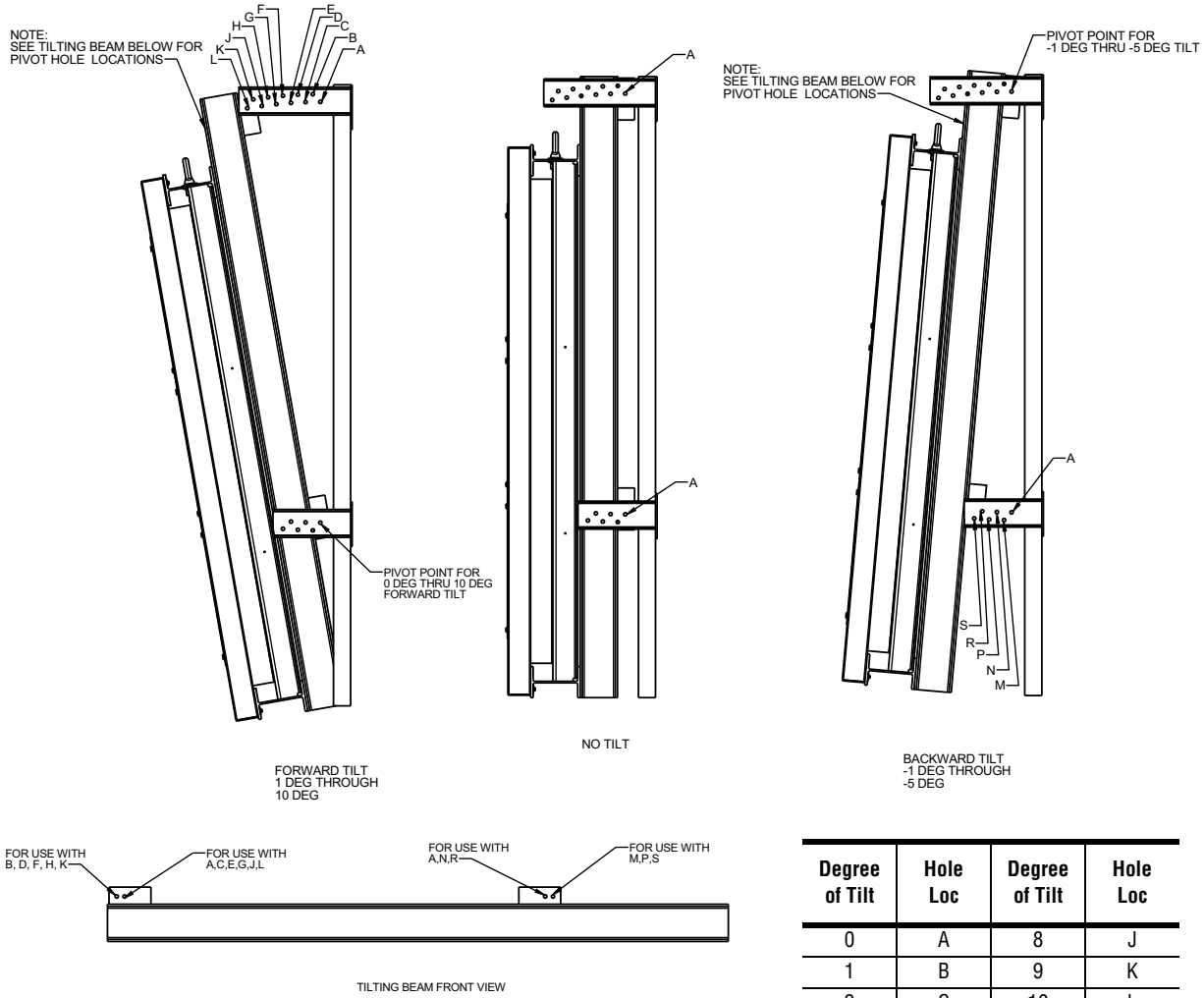
Mechanical Installation

Setting the OPTIONAL tilting brackets (before mounting sign)

WARNING! When installing the tilt assembly, make sure the correct hole(s) for the degree of forward or backward tilt are used. If the tilt assembly is improperly installed, the brackets could malfunction and the sign could fall potentially resulting in death.

Note: Tilting brackets are optional equipment, not all signs are shipped with them.

Torque to 45 FT LBS per bolt



Degree of Tilt	Hole Loc	Degree of Tilt	Hole Loc
0	A	8	J
1	B	9	K
2	C	10	L
3	D	-1	M
4	E	-2	N
5	F	-3	P
6	G	-4	T
7	H	-5	S

Figure 9. Tilt assembly illustrations and degree settings for the optional tilting brackets.

Lifting the sign

WARNING! Crush hazard! Do not lift sign with more than a 15 degree tilt.

Always use lifting bar to lift sign. Otherwise eyebolts may fail and sign may fall, causing serious injury or death.

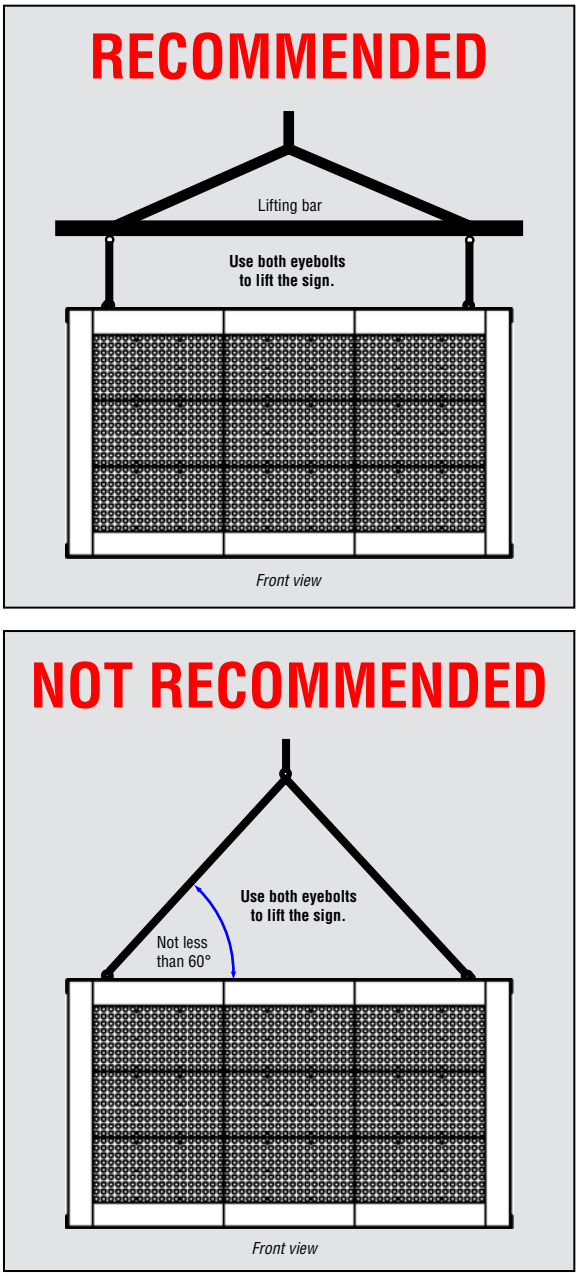


Figure 10. Sign lifting guidelines.

Electrical installation

AC wiring

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

AC wiring for 27 x 126

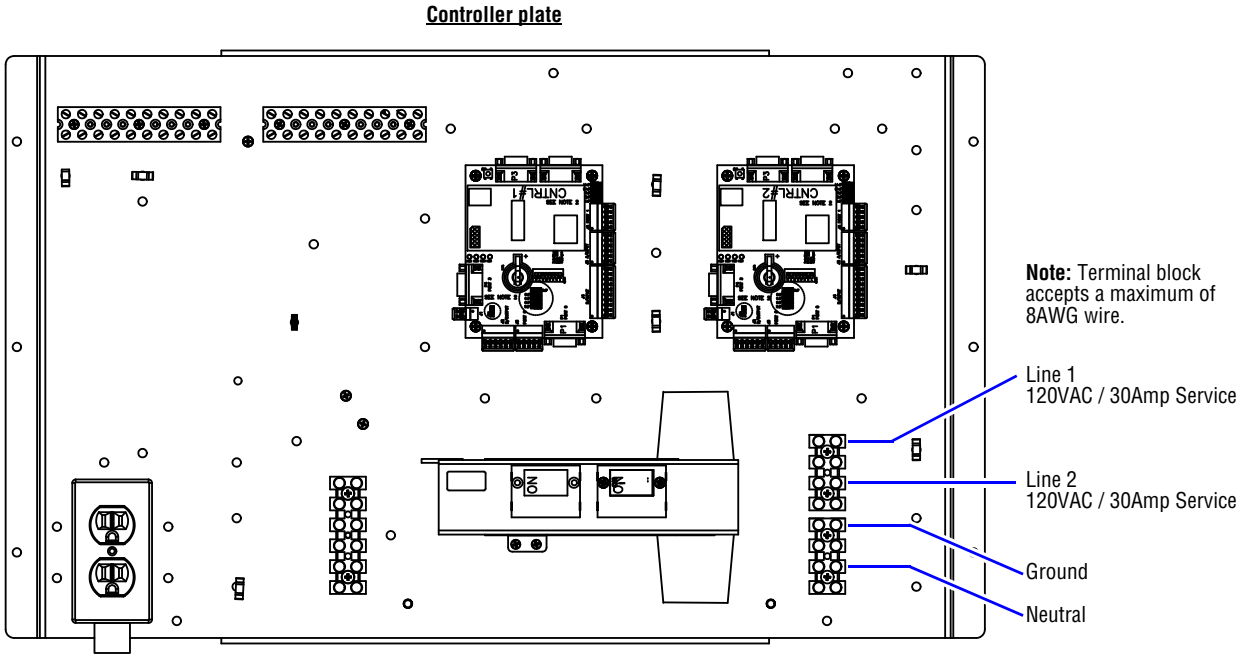


Figure 11. When installing the 27x126 sign, a two-service power entry is required.

AC wiring for all other sizes

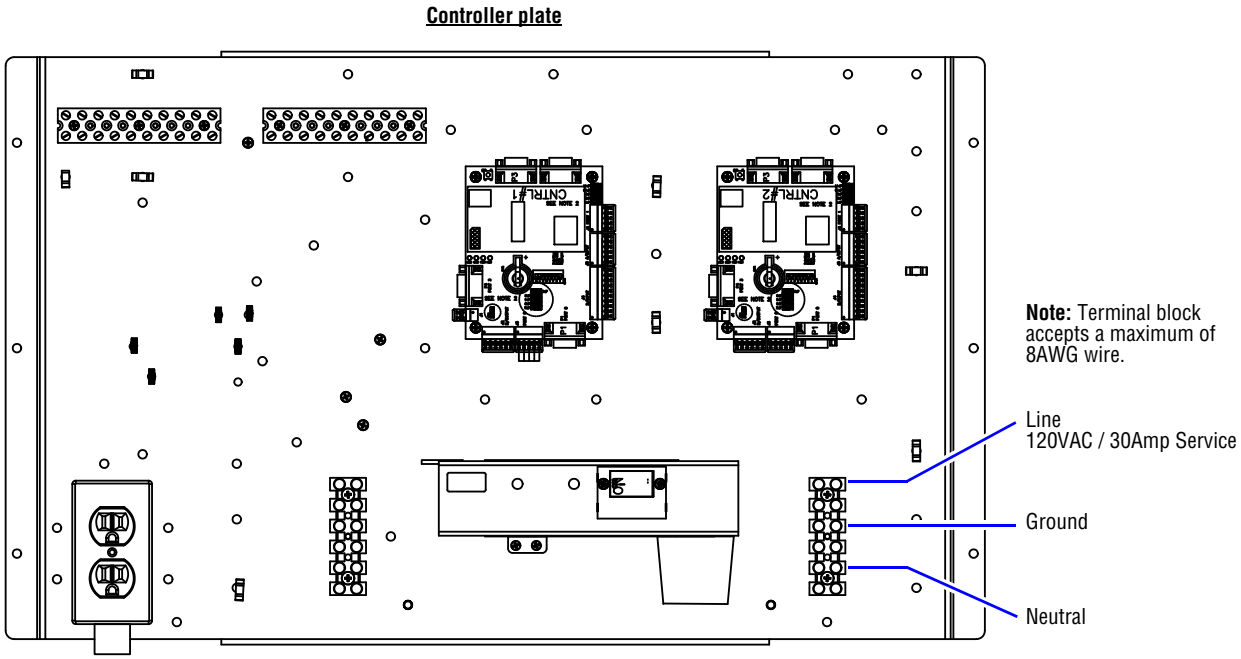


Figure 12. Terminal block on controller plate for all signs except 27x126.

Beacon option

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

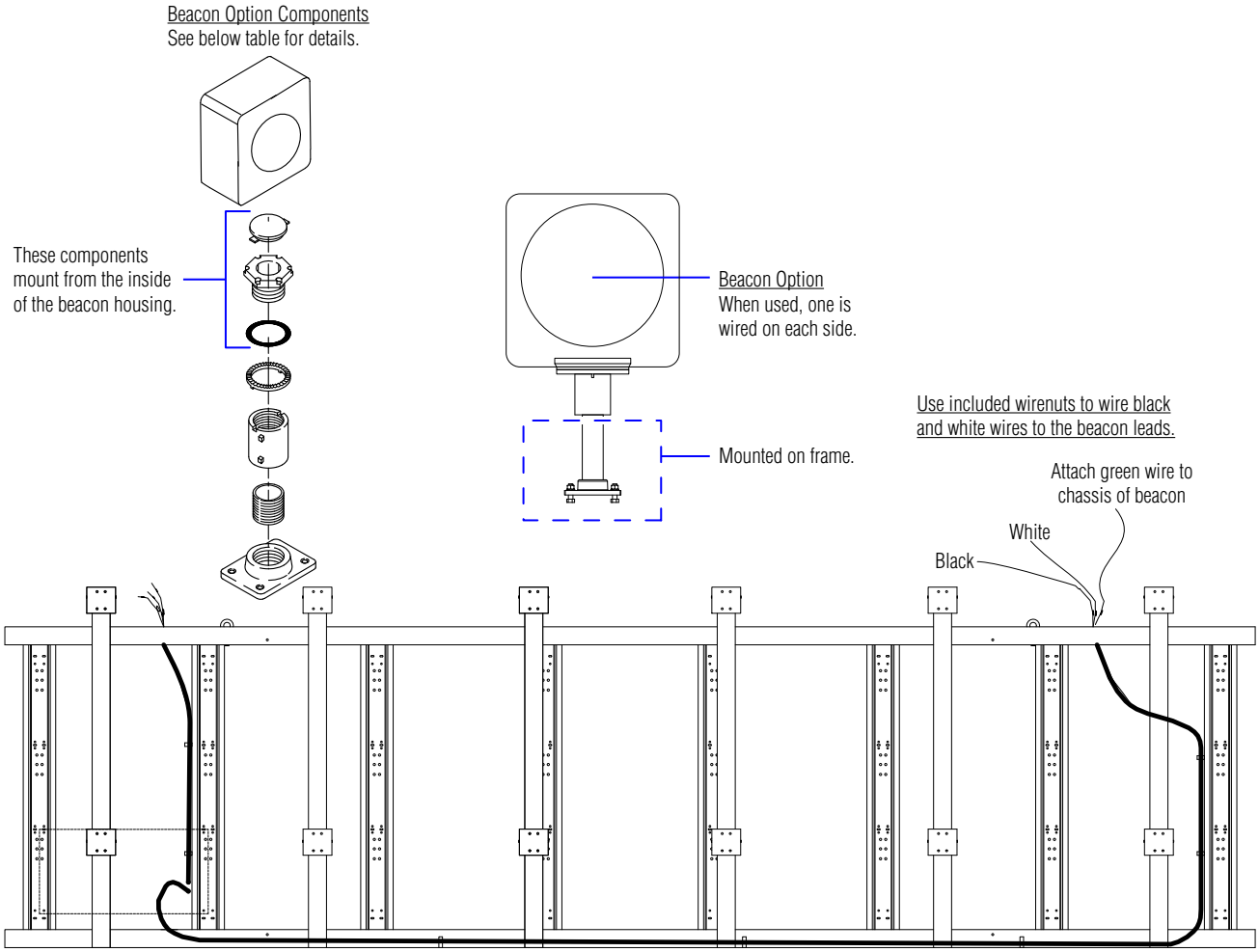
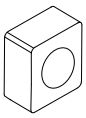
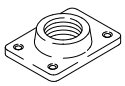


Figure 13. Rear view of sign showing where to connect the beacon option.

Beacon option assembly

Part	PN	Description	Field Installed	Part	PN	Description	Field Installed
	1508230201	SIGNAL CLOSURE KIT	Yes		61910044	SERRATED LOCK RING	Yes
	64000029	1.5-INCH HEX NIPPLE	Yes		64000030	1.5-INCH NOTCHED COUPLING	Yes
	63320022	NEOPRENE GASKET	Yes		64000028	6-INCH THREADED NIPPLE	No
	634008901	12-INCH BEACON HOUSING WITH LED	Yes		64000031	HUB PLATE	No

Light sensor wiring diagram

Note: The light sensor power is protected by a 3AG, 1.5A SLO-BLO fuse.

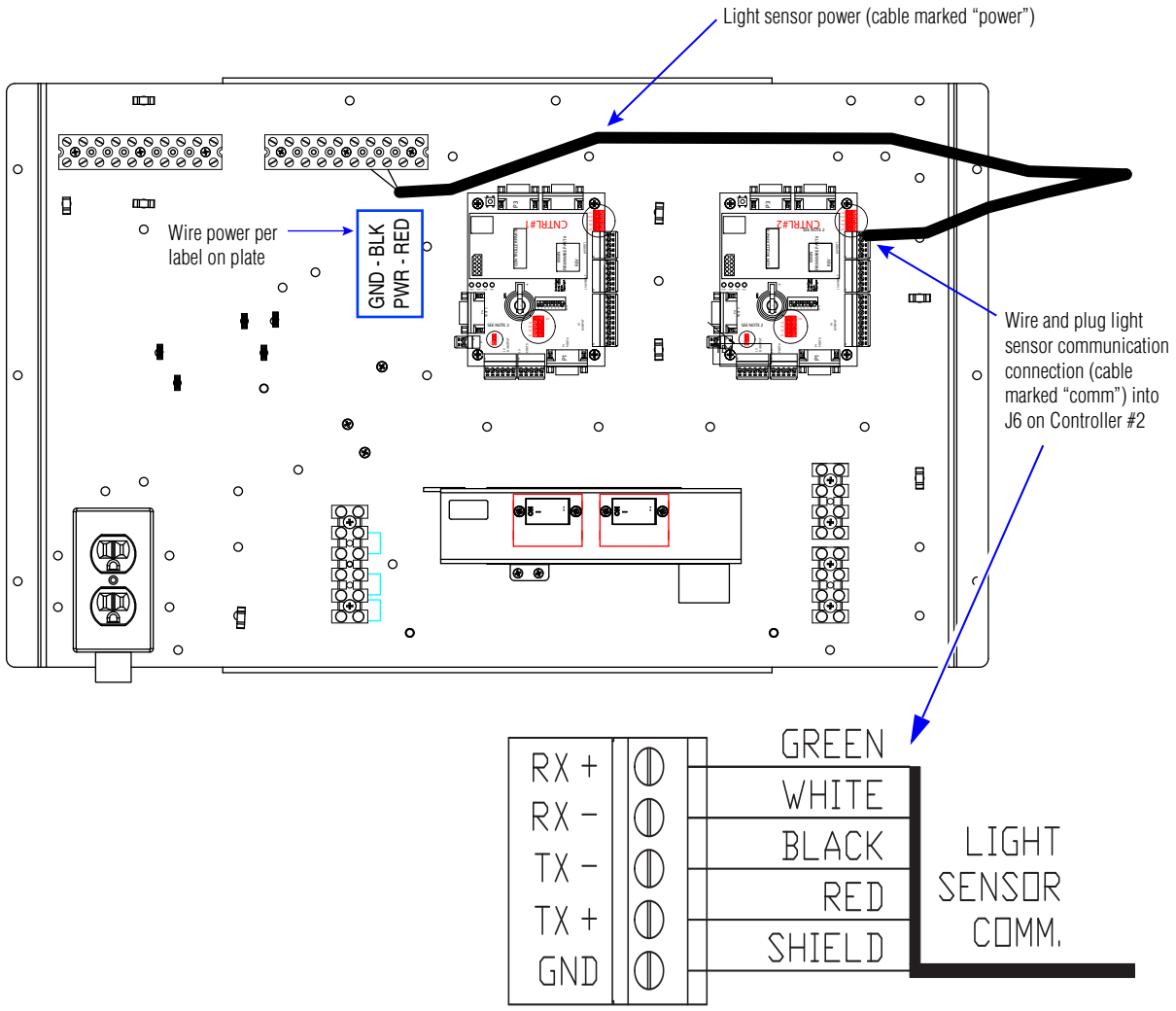


Figure 14. Light sensor wiring.

Sign to ground controller network connection

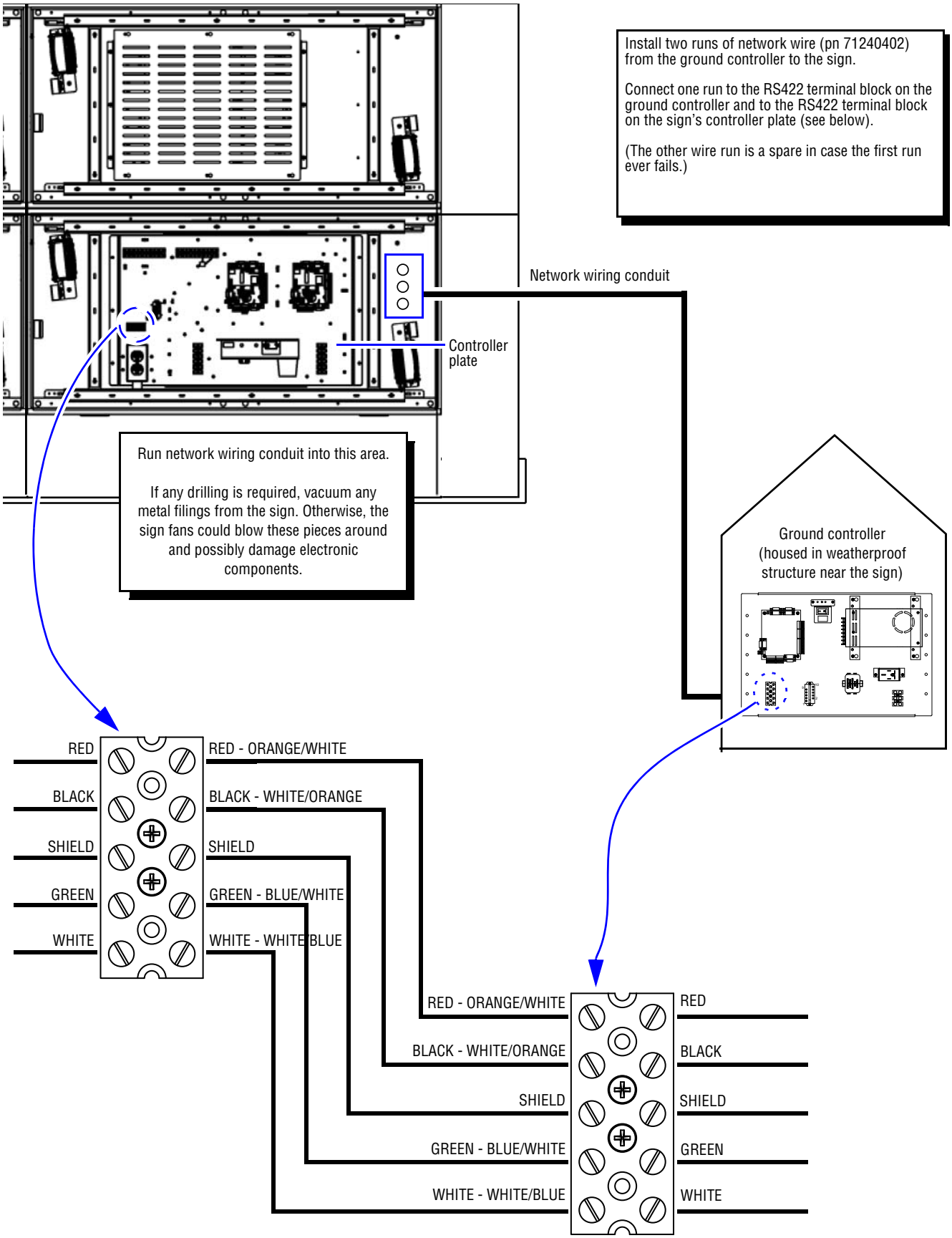


Figure 15. Ground controller communications wiring.

Network connection directly to sign

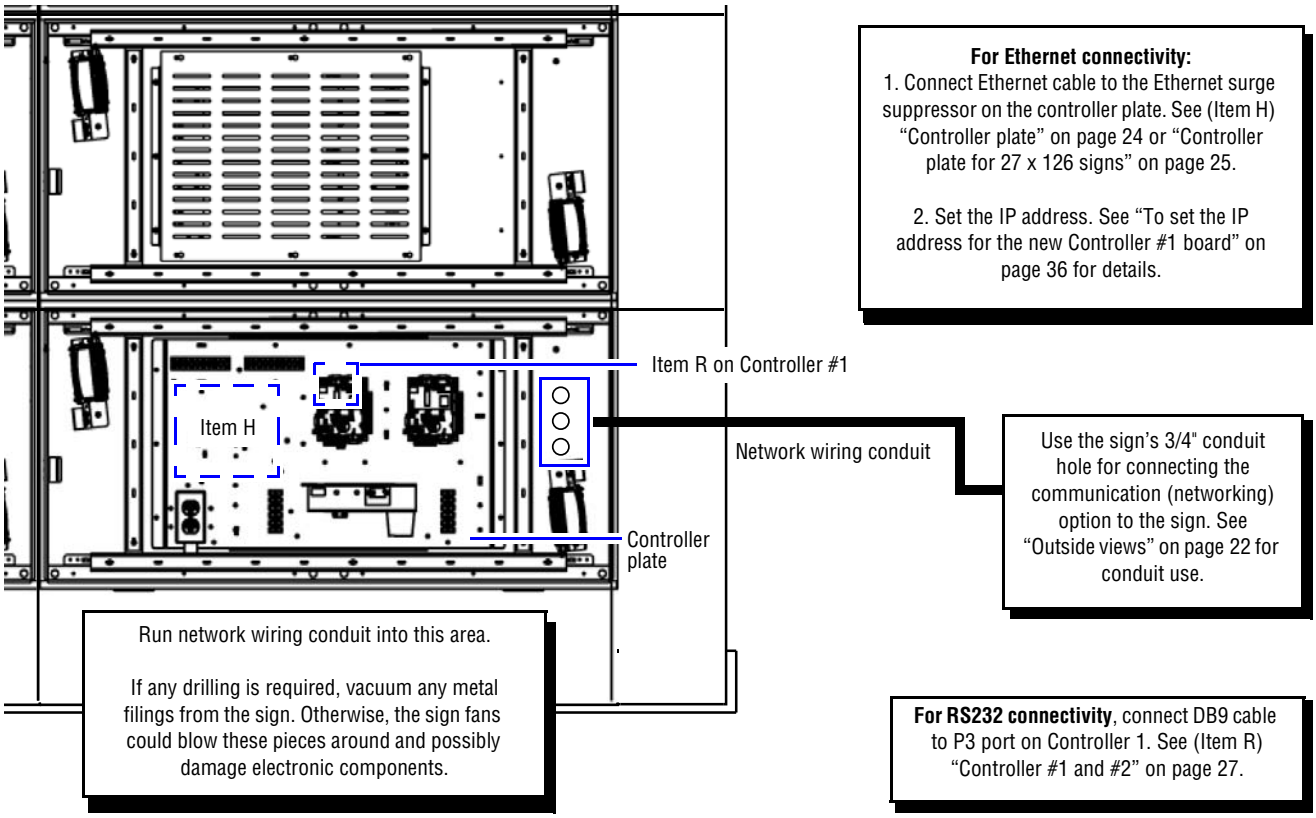


Figure 16. Communication wiring directly to sign.

THIS PAGE INTENTIONALLY BLANK

Equipment

General description

- Serviceability: Front access.
- Weight: see “AlphaXpress 8700 models (three row models)” on page 7 or the “Appendix” on page 49.
- Electrical: 120VAC, 50/60Hz, 30A; see “AlphaXpress 8700 models (three row models)” on page 7 or the “Appendix” on page 49.
- Display size: see “AlphaXpress 8700 models (three row models)” on page 7 or the “Appendix” on page 49.
- Character height: 18.2 inches, nominal.
- Character width: 10.4 inches, nominal.

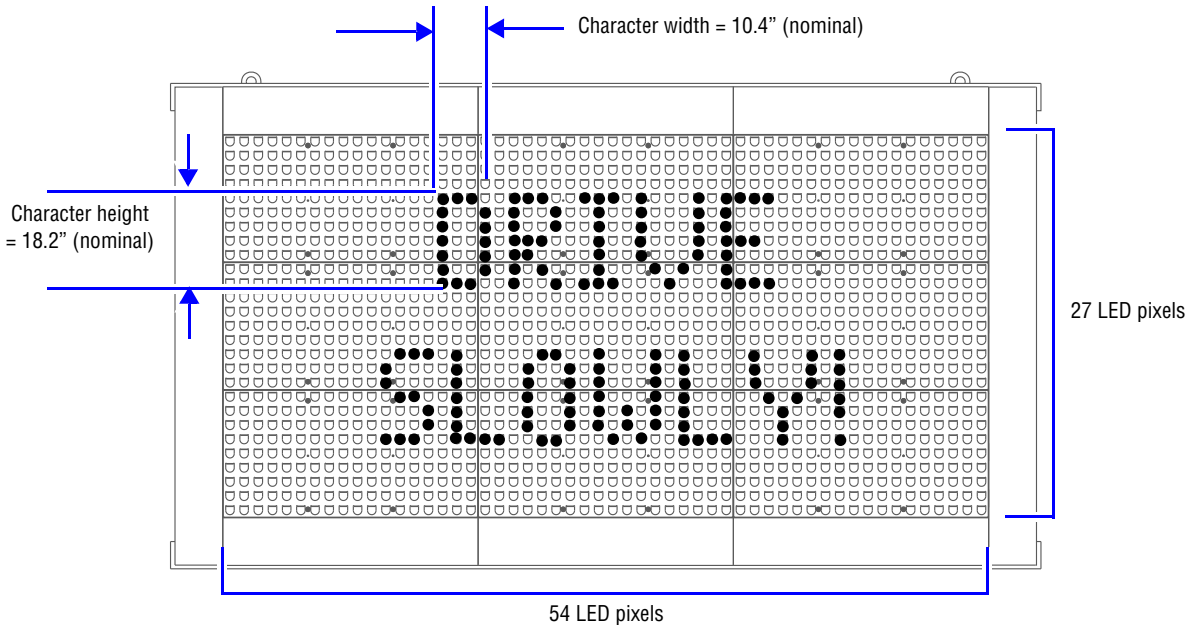


Figure 17. Nominal character heights for model AX-8700-27x54-18A.

- Pitch (distance between each LED pixel): 2.6 inches.

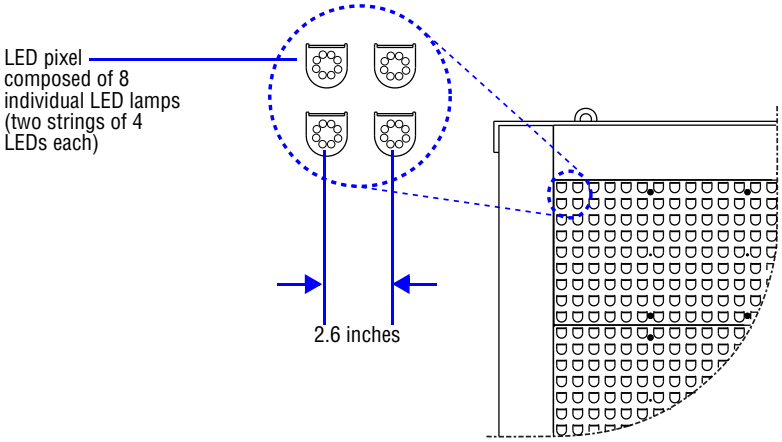


Figure 18. Pitch is 2.6 inches.

Outside views

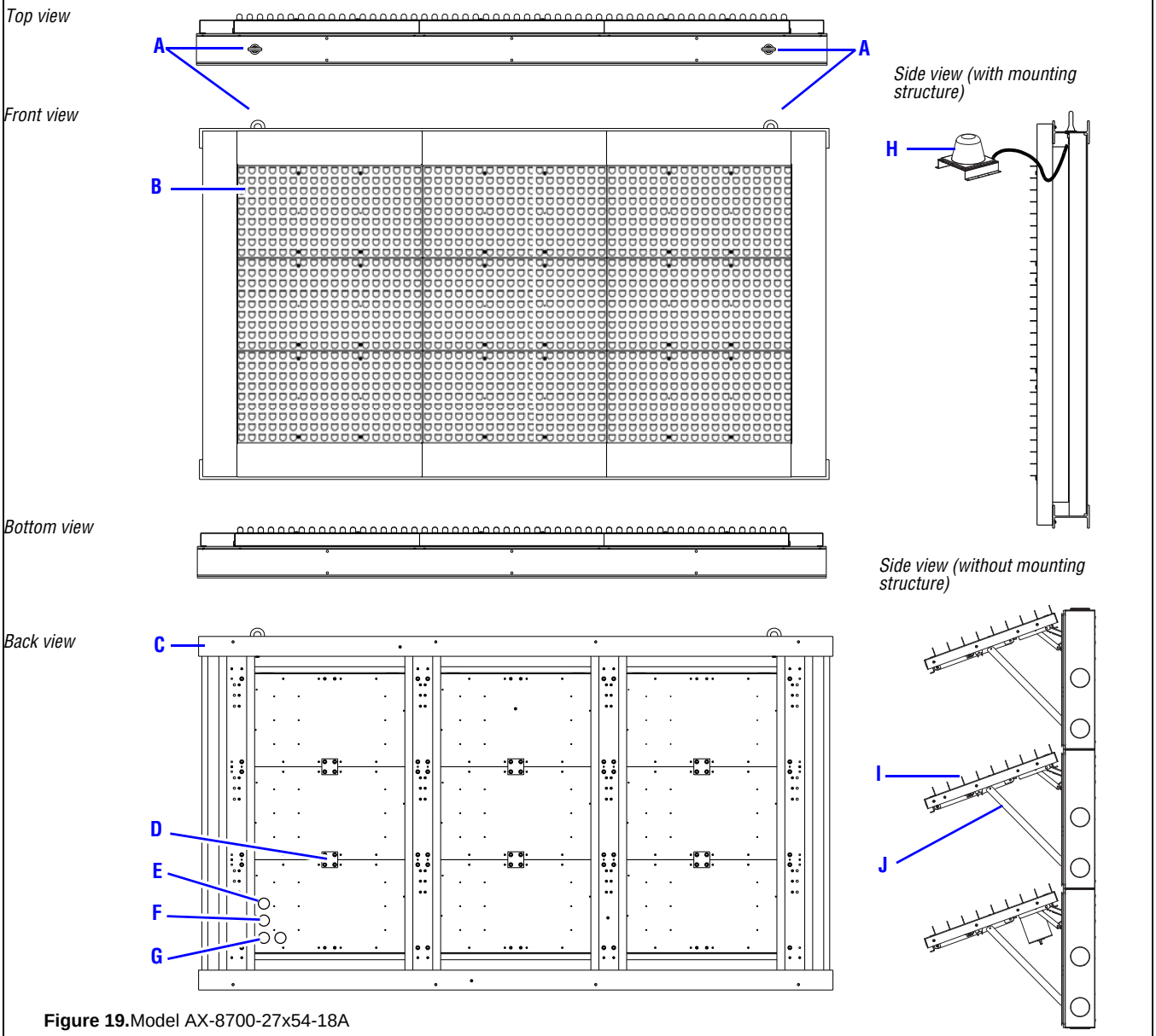


Figure 19. Model AX-8700-27x54-18A

Item	Name	Description
A	LIFTING EYEBOLTS	Used to lift sign. These should NOT be used to mount the sign.
B	LEDS	Used to display messages.
C	SIGN MOUNTING STRUCTURE	Used to mount display cases. Varies depending on sign dimensions; see “AlphaXpress 8700 models (three row models)” on page 7.
D	TIE PLATE	Used to secure display mountings together vertically.
E	LIGHT SENSOR CONDUIT	3/4" conduit light sensor opening.
F	COMMUNICATION	3/4" conduit communication opening.
G	AC POWER	3/4" conduit AC power #1 opening.
H	LIGHT SENSOR GLOBE	See “Light sensor globe mounting” on page 11 and “Light sensor replacement” on page 47.
I	PIXEL LOUVER	Used to improve LED contrast.
J	DOOR PROP	Used to secure door in open position. NOTE: On older sign models, a screw was used for securing the door open. For newer models, automatic engaging prop rods are used.

Inside view

General view

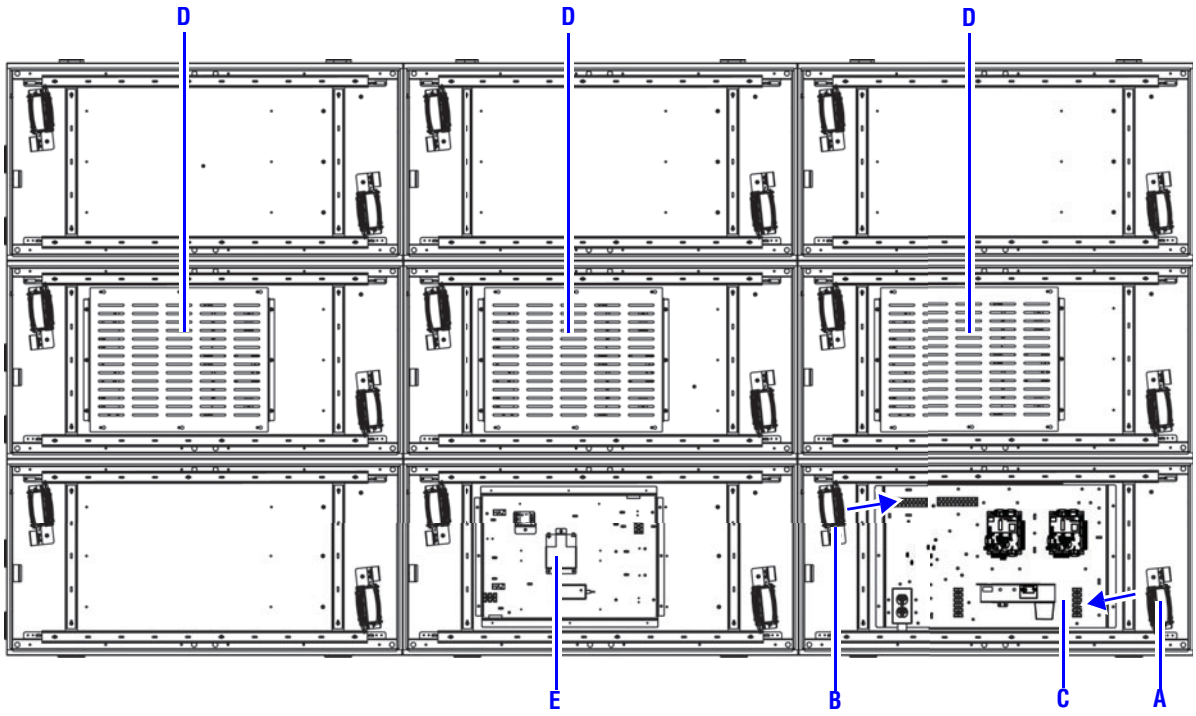


Figure 20. Model AX-8700-27x54-18A inside view.

Item	Name	Description
A	FAN (ARROW - AIR FLOW LEFT)	Prevent overheating of sign components. There are two fans in each modular case.
B	FAN (ARROW - AIR FLOW RIGHT)	
C	CONTROLLER PLATE	Contains sign controller #1 and #2.
D	POWER PANELS	Provides DC power to the display and controller. Located in middle row across the width of the sign on three row sign configurations. See “Appendix” on page 49 for single row sign configurations.
E	OPTIONAL CONTROLLER BATTERY BACKUP	12V controller battery backup keeps the controllers operating, does not power or backup the sign. For all three row sign configurations, the battery backup plate is in the cube directly to the left of the controller cube. **Note:** For AlphaXpress models other than three row configurations see the “Appendix” on page 49 for more details.

Controller plate

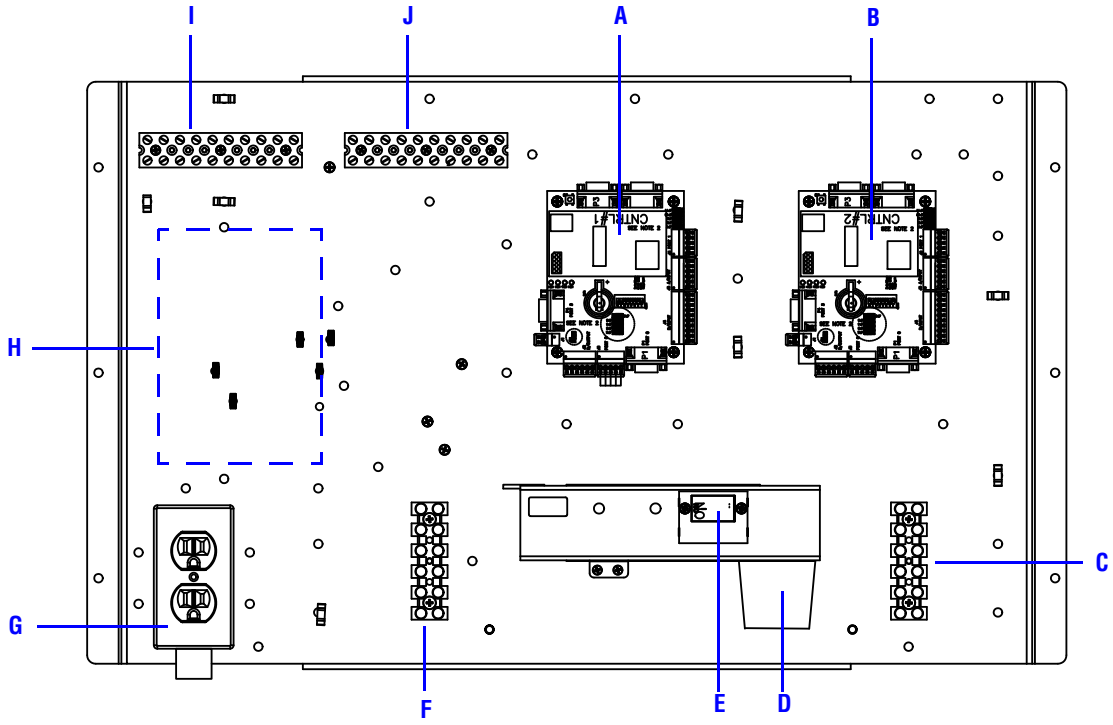


Figure 21. Typical view of controller plate used for 27x54, 27x72, 27x90, 27x108, and one line sign configurations.

Item	Name	Part #	Description
A	CONTROLLER #1	15029101	■ In two controller sign configurations - controls display and communicates status information to central communications. ■ With three controller sign configurations - Item B (12069003) controls display and communicates status information to central communications.
B	CONTROLLER #2	12069003	Auxiliary controller for extra input/output.
C	AC TERMINAL BLOCK	43201058	12-position terminal block.
D	120/240VAC SURGE ARRESTOR	30352001	Transient voltage suppression.
E	30A BREAKER	48100013	A single breaker is used for the sizes shown in Figure 21.
F	AC TO SIGN	43201051	Distributes power to the sign (12-position terminal block).
G	120V OUTLET	1507500101	Outlet (GFCI).
H	COMM OPTION LOCATION	N/A	Communication option location.
I	I/O COM TERMINAL BLOCK	43201054	I/O for controller connections (e.g., power fail signals, power for controllers, light sensor power, etc.).
J			

Controller plate for 27 x 126 signs

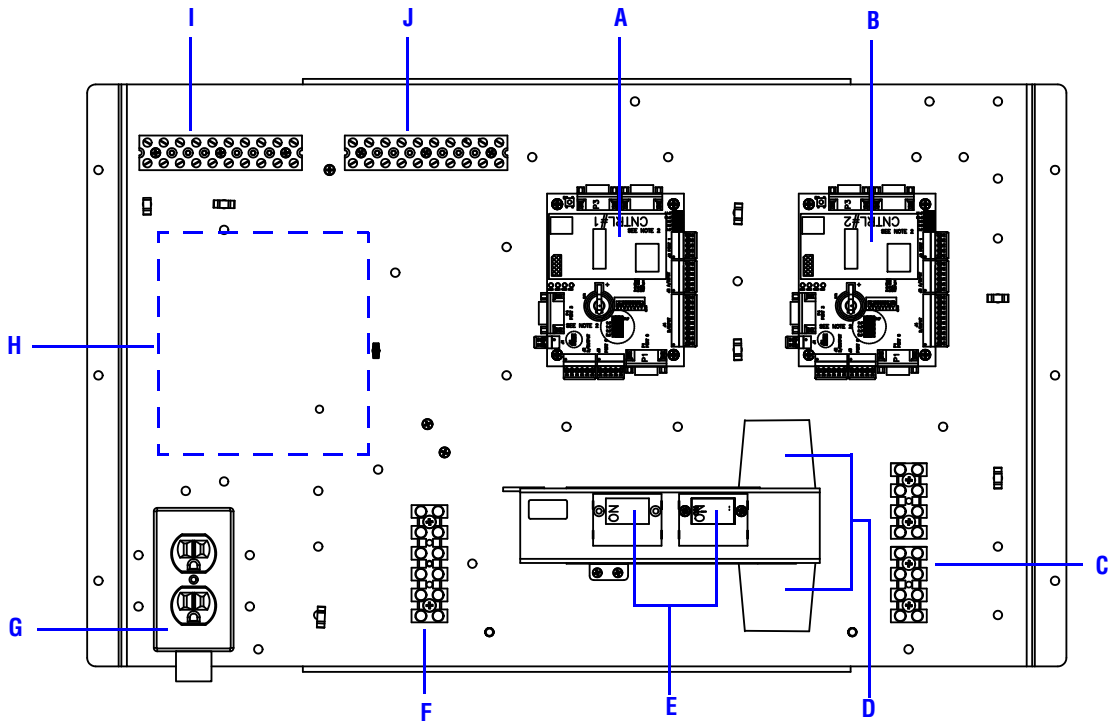


Figure 22. Typical view of controller plate used for 27x126 signs.

Item	Name	Part #	Description
A	CONTROLLER #1	15029101	■ In two controller sign configurations - controls display and communicates status information to central communications. ■ With three controller sign configurations - Item B (12069003) controls display and communicates status information to central communications.
B	CONTROLLER #2	12069003	Auxiliary controller for extra input/output.
C	AC TERMINAL BLOCK	43201047	Two 8-position terminal blocks.
D	120/240VAC SURGE ARRESTOR	30352001	Transient voltage suppression.
E	30A BREAKERS	48100013	Two 30Amp breakers are used for 27x126 signs.
F	AC TO SIGN	43201051	Distributes power to the sign (12-position terminal block).
G	120V OUTLET	1507500101	Service outlet (GFCI).
H	COMM OPTION LOCATION	N/A	Communication option location.
I	I/O COM TERMINAL BLOCK	43201054	I/O for controller connections (e.g., power fail signals, power for controllers, light sensor power, etc.).
J			

Ground controller panel (option)

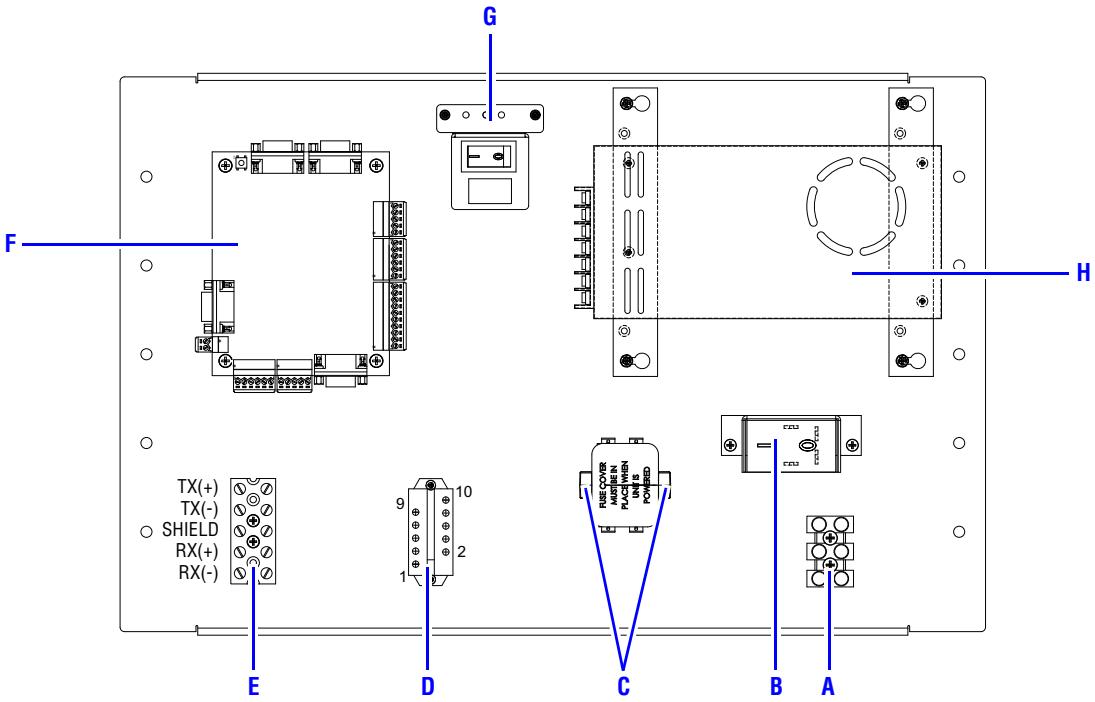
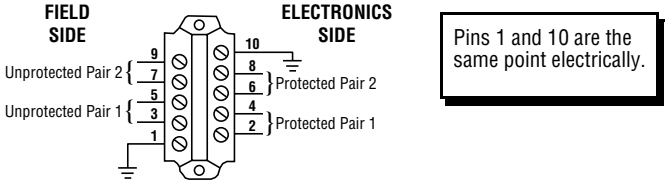
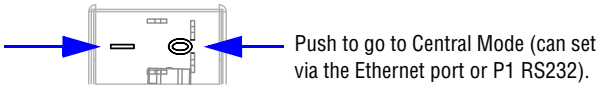
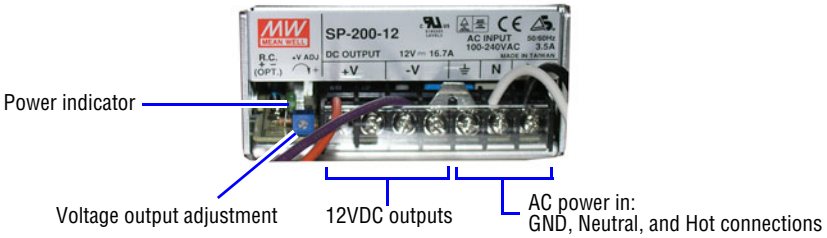


Figure 23. Ground controller.

Item	Name	Part #	Description
A	TERMINAL BLOCK	43201036	AC power terminal. 3 position x 2, 15mm, 50A.
B	SWITCH	41000233	AC power switch. DPDT, 20A.
C	FUSES	48020003	Two, 1.5A, 250V, 3AG, SLO-BLO.
D	RS422 SURGE PROTECTOR TERMINAL BLOCK BASE (OPTIONAL BASED ON CONFIGURATION)	30350019 30350018	Protects the RS422 transmit/receive connection from a peak surge current of 10kA. There are two surge protectors: one in the sign and the other in the ground controller cabinet:  Pins 1 and 10 are the same point electrically.
E	TERMINAL BLOCK	43201044	RS422 connection to sign controller. 5 position x 2, 8-24AWG, 600V, 50A.
F	GROUND CONTROLLER	15029101	This board is connected to an NTCIP network and works in conjunction with the two sign controller boards to control sign operation.
G	LOCAL REMOTE SWITCH (OPTIONAL)	41000233	DPDT, 20A  Set = activate diagnostics and messages.
H	POWER SUPPLY	40656304	Meanwell SP-200-12 switching power supply, 12VDC output: 

Controller #1 and #2

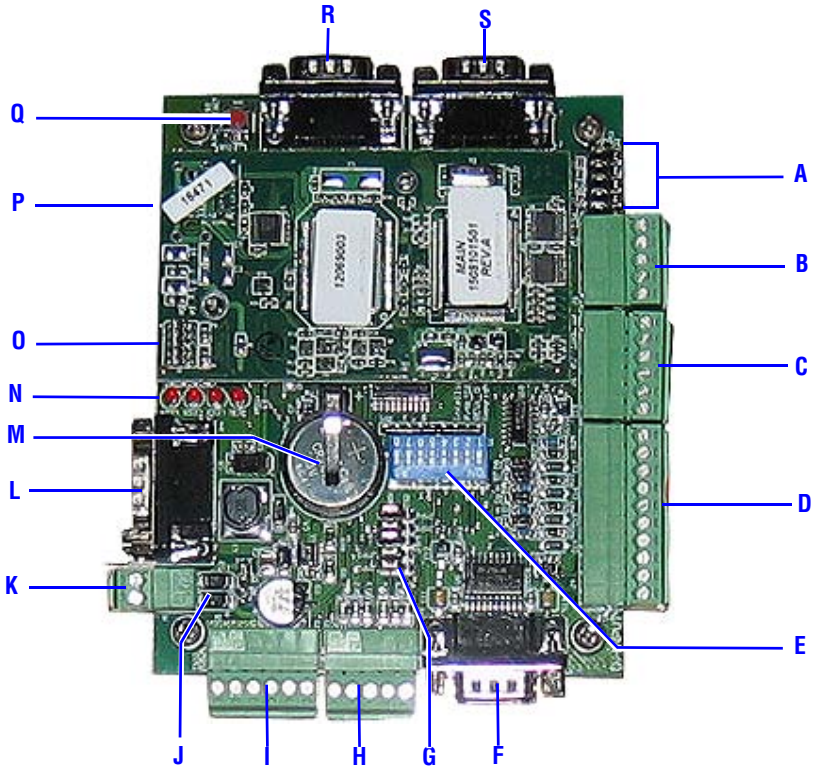


Figure 24. Controller components identification.

Item	PCB label	Name	Description
A	JP7 TO JP11		Configures controller for RS422 on J6 for display modules (115.2 kbaud).
B	J6	RS485 PORT 1	■ Controller #1 — connects to LED displays. ■ Controller #2 — connects to light sensors #0, #1, and #2.
C	J5 A/INPUT	ANALOG INPUTS	Depends on application; see wiring diagram included with sign.
D	J4 D/INPUT	DIGITAL INPUTS	■ Controller #1 — connects to power supply fail signals, and door status. ■ Controller #2 — connects to power fail signals of power supplies.
E	S1	DIP SWITCHES	Serial addressing and sign controller configuration.
F	P1	RS232 PORT	RS232 COMM PORT 0 — not used because J3 is used.
G	JMP2 TO JMP6		Configures controller for RS422 on J3 for communication between controllers.
H	J3	RS422 PORT	Used to interface both sign controllers together.
I	J2	DIGITAL OUTPUTS	Used to control beacons (when installed).
J	JMP1		Configures controllers for DC power.
K	J1	POWER CONNECTOR	Connects to 12VDC power.
L	P4	RS232 PORT	Not used.
M	BAT1	CONTROLLER BATTERY	3V lithium battery (Panasonic CR2032 or equivalent).

N	LED1 TO LED4	DIAGNOSTIC LEDS	■ LED1: ■ Controller #1—Heartbeat. ■ Controller #2—Heartbeat. ■ LED2: ■ Controller #1—Communications from P3 or the ground controller. ■ Controller #2—Communications from Controller #1 or the ground controller depending on the configuration. ■ LED3: ■ Controller #1—Not used in all applications. ■ Controller #2—Not used in all applications. ■ LED4: ■ Controller #1—Communications to and from LED display boards. ■ Controller #2—Communications to and from light sensors #0, #1, and #2.
O	J5	PROGRAMMING PORT	
P	J4	ETHERNET PORT	Communication option available on 15029101 only.
Q	S2 RESET	CONTROLLER RESET SWITCH	Initiates soft reset on controller board.
R	P3	RS232 PORT	■ Two-controller configuration—used to interface RS232 to device. ■ Three-controller configuration—not used. ■ Controller #2 P3—not used.
S	P2	RS232 PORT	RS232 COMM PORT 1—not used.

Power panel and power supplies

The size of the sign determines the number of power panels in the sign (for example, a 27 x 54 sign would have 3 power panels; a 27 x 72 sign would have 4). Each power panel contains two 12VDC output power supplies. Power panels are located in the center row as shown in “Electrical system” on page 11 for three row sign configurations.

Note: Both power supplies may not turn on at the same time if there is not enough display load.

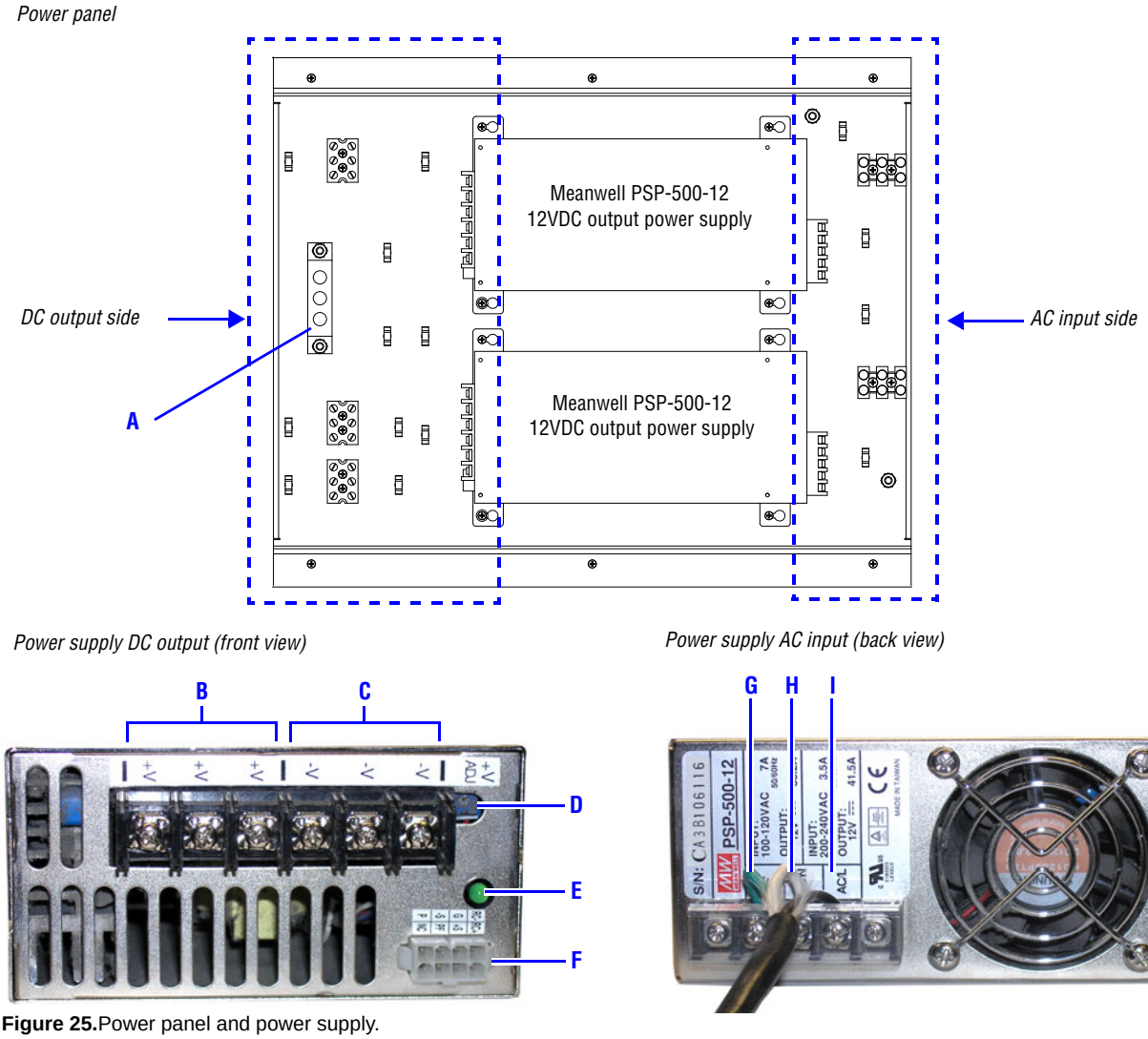


Figure 25. Power panel and power supply.

Item	Power supply label	Name	Description
A		DIODE MODULE	Part number 30300003LFSP or 30300002SP. See “Diode replacement” on page 44..
B	V+	12VDC +	DC output.
C	V-	12VDC -	
D		DC OUTPUT VOLTAGE ADJUST	Adjustment range. Output should be set to 12VDC prior to installation in power panel.
E		INPUT POWER INDICATOR	Green = AC voltage supplied to power supply.
F		SIGNAL CONNECTOR	Used for remote control, remote sense, and power good signal.
G	⏚	AC IN GROUND	AC input (90-264VAC, 47-63Hz).
H	AC/N	AC IN NEUTRAL	
I	AC/L	AC IN NEUTRAL	

LED driver board

The size of the sign determines the number of driver boards in the sign (for example, a 27 x 54 sign would have 27 driver boards; a 27 x 72 sign would have 36). Each board is 6 x 9 pixels, and each pixel is composed of 8 LED lamps.

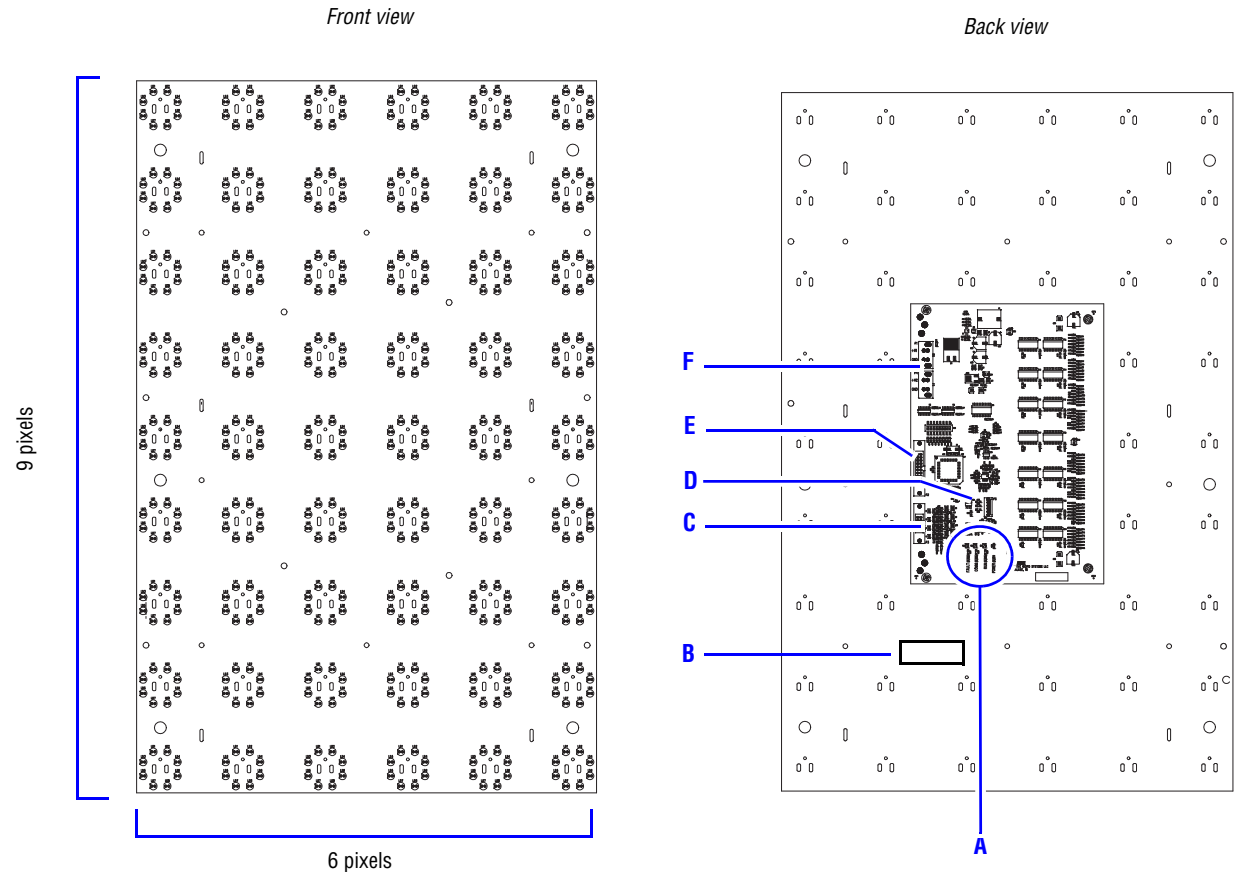
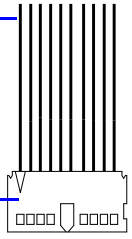


Figure 26.LED driver board, front and back views.

Item	PCB label	Name	Description
A	LD1	POWER	On = 12V supplied to LED driver board.
	LD2	FAULT	On = one or more bad LED lamps on the LED driver board (if in normal operating mode).
	LD3	COMM	On = There is NO communication from sign controller. Off = There is communication from the sign controller.
	LD4	RUN	Flashing = LED driver board processor operating.
B		BIN LABEL	Information on the intensity and wavelength of the LED lamps.
C	P3	DATA	Connects to Controller #1 via a ribbon cable.
D	P5		Programming port for the LED driver board processor.
E	P2	LED DRIVER BOARD ADDRESS	This address is set using an address plug (pn 1509100701). **Jumper wires** Refer to the appropriate wiring diagram for your sign model. These are preset from the factory with the correct settings. Plugs into P2 
F	P1	+V1	Supplies power to the LED driver board.

Maintenance

Physical inspection

A physical inspection of the sign's exterior and interior should be performed every 6 months.

Exterior inspection

- Check for any physical damage to the exterior of the sign.
- Check for loose nuts, bolts, hinges, doors, and so on.
- Check the exterior electronics for foreign debris and general cleanliness.
- Check the exterior of the sign for general cleanliness.
- Check the LEDs of the sign for general cleanliness and visibility.

Interior inspection

- Check for any physical damage to the interior of the sign.
- Check for loose nuts, bolts, hinges, doors, and so on.
- Check the interior electronics for foreign debris and general cleanliness.
- Check the interior of the sign for general cleanliness.
- Make sure all fans are operational (see "Fan test" on page 46 for details on testing fan operation).
- Make sure the sign's drain holes are not plugged.

Front lens cleaning (outside of sign)

Required materials

- Cleaning brush with very long and soft bristles.
- Mild, nonabrasive liquid detergent (liquid glass cleaner).
  Note: Do not use solvents. Use of solvents will damage the lens UV stabilizer.
- Soft cloth or soft paper towels.

Cleaning procedure

1. Mix the detergent with water in a large bucket. The solution may be put in a spray bottle for spot cleaning.
   Note: Do not clean the lens with a pressure washer. Damage to the sign resulting from the use of a pressure washer is not covered by the manufacturer's warranty.
2. Saturate the cleaning brush with the cleaning solution in the bucket or with the spray bottle.
3. Clean the sign's lens and louvers in a horizontal motion, starting from the top and progressing toward the bottom.

Part replacement

List of field-replaceable parts

Part name	Page
Sign controllers #1 and #2	page 35
Ground controller	page 38
Power supplies	page 41
Diode module	page 44
LED driver board	page 45
Fans	page 46
Light sensors	page 47

Notice: This equipment contains components that may be damaged by “static electricity”, or electrostatic discharge. To prevent this from happening, be sure to follow the guidelines in Adaptive Tech Memo 00-0005, *“Guidelines for Controlling Electrostatic Discharge Damage”*, available at Adaptive’s web site at http://www.adaptivedisplays.com.

Opening a sign

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

➔ **To open a sign**

1. Remove power from the sign.
2. Using the hex tool (PN 68117076, supplied), turn the four 5/32 hex screws (circled) to open the front face frame.

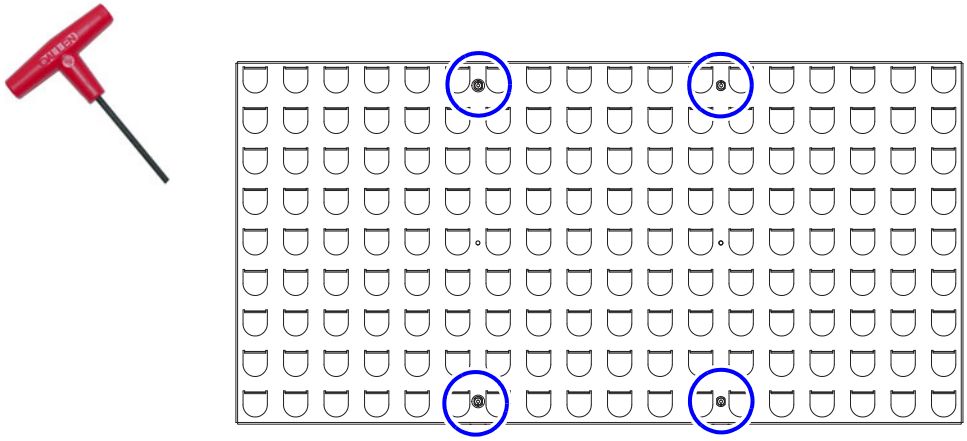


Figure 27. Hex screw locations on the front face frame.

3. Lift up the front face frame and fully engage both prop rods until they lock into position.

   Note: On older sign models, a screw was used for securing the door open. For newer models, automatic engaging prop rods are used.

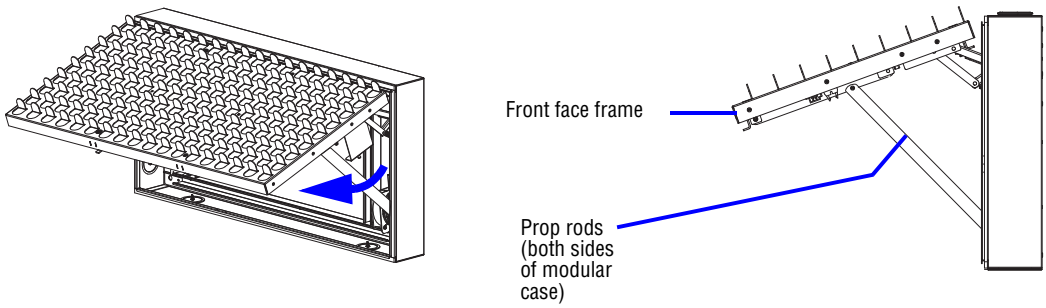


Figure 28. Prop rods on the front face frame.

Controller board replacement

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

➔ **To replace the new controller board**

1. Open the sign. See See “Opening a sign” on page 34.
2. Locate the controller board to be replaced (either Controller #1 or #2, see “Controller plate” on page 24.
3. Set the DIP switches and jumpers on the replacement board to match the DIP switches and jumpers on the board being replaced.

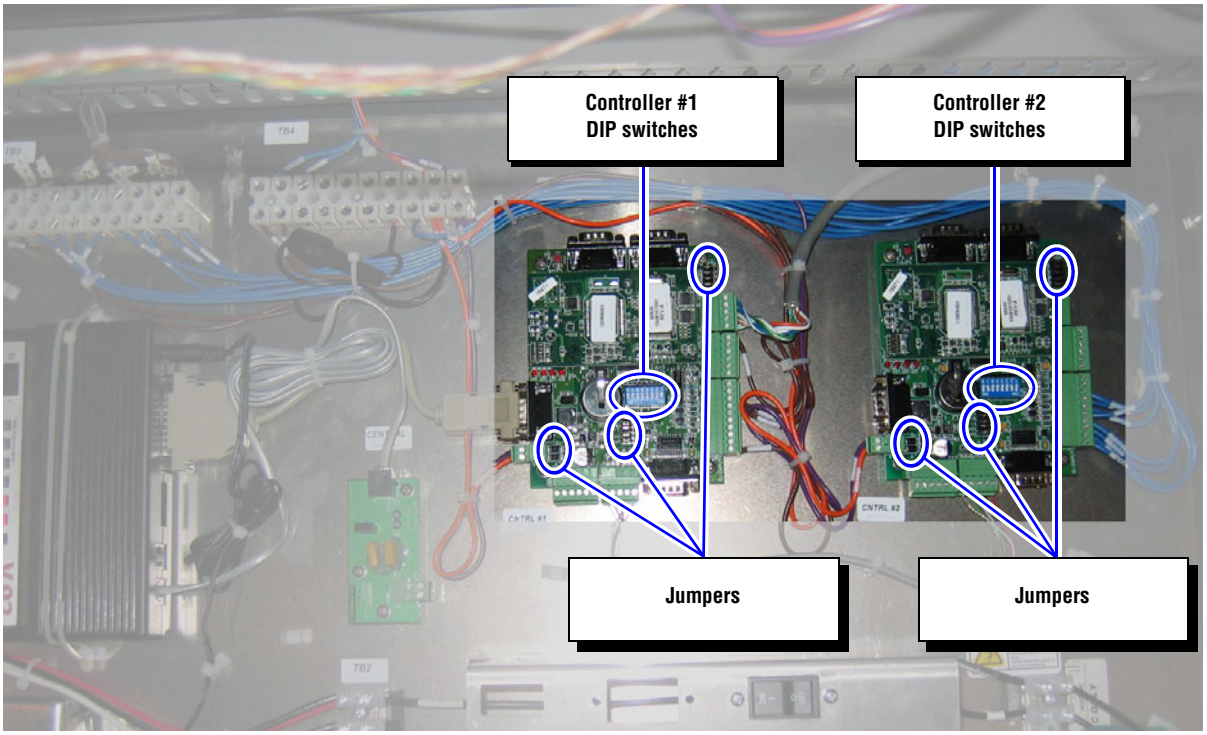


Figure 29. Typical view of controller plate.

4. Disconnect all cables from the controller board to be replaced.

5. Remove the four screws (circled) and remove the controller board from the sign.

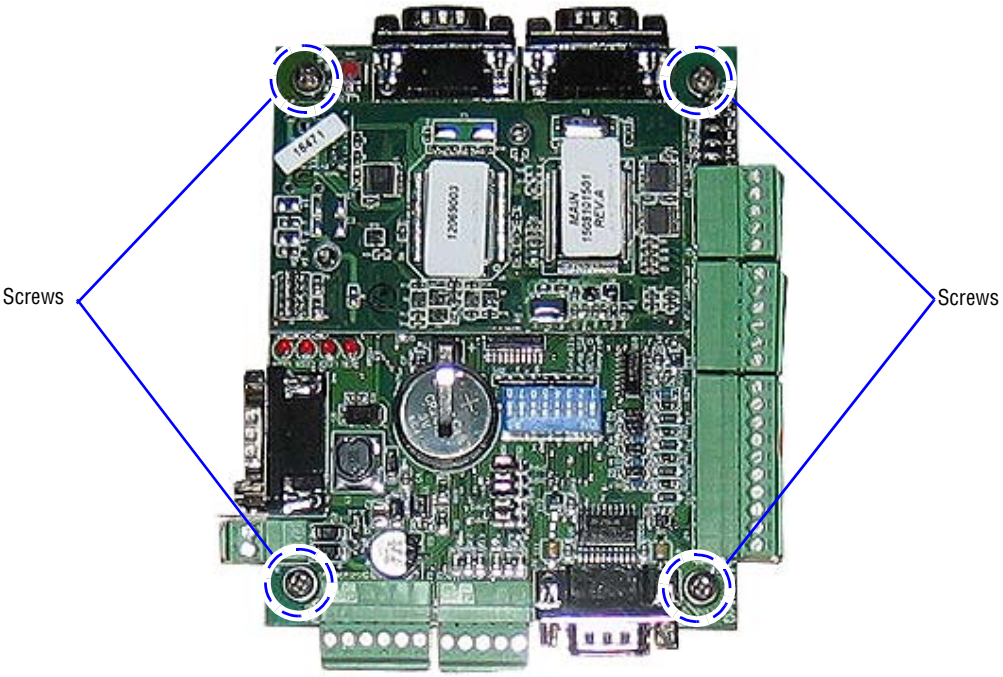


Figure 30. Screw locations on the controller board.

6. Fasten the new controller board to the sign.
7. Reconnect all the cables to the new controller board.
8. If Controller #1 is Ethernet controller (pn15029101), go to “To set the IP address for the new Controller #1 board” on page 36. If Controller #1 is non-Ethernet (pn 12069003), set dip switch 1 to the ON position.
9. If Controller #2 was replaced, set dip switch 2 to the ON position.

➔ To set the IP address for the new Controller #1 board

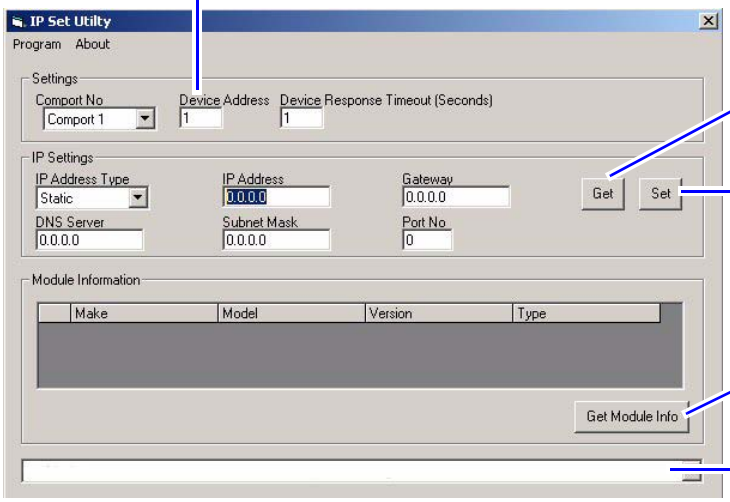
Note: To assign an IP address, the IP Set Utility program must be installed on the computer that will be communicating to the sign. Contact Adaptive Technical Services at (800) 558-7022 or (414) 357-2020 if you do not have this program.

1. Using a null modem cable, connect a laptop computer to the controller #1 at P3 (next to the Reset button). See “Controller #1 and #2” on page 27 for the P3 location.
2. Open the IP Set Utility program — select **Start > Programs > IPSetUtility > IP Set Utility.**

3. Enter the appropriate information in the *IP Set Utility* window See Figure 34.

Note: If the controller is operational (LED 1 is normally flashing), use *Get* to verify if the sign's IP address can be retrieved.

Important: Verify that the device address matches the controller address on the SW1 dip switch



Get retrieves IP information from the sign

Set assigns IP information to the sign

Get Module Info retrieves information about the sign

The status bar displays important information about the status of the information being assigned to or retrieved from the sign

DIP switch positions	Equivalent decimal values
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	*

Example: if SW1 has positions 1 and 4 on, then it is set to serial/device address 9.

* For two controller sign configuration, then position #8 is always **ON** for controller #1 (firmware is the same in both controller #1 and #2).

See "Ground controller (Controller #3) board replacement" on page 38 for controller #3 settings.

Figure 31. Setting the IP address for the controller.

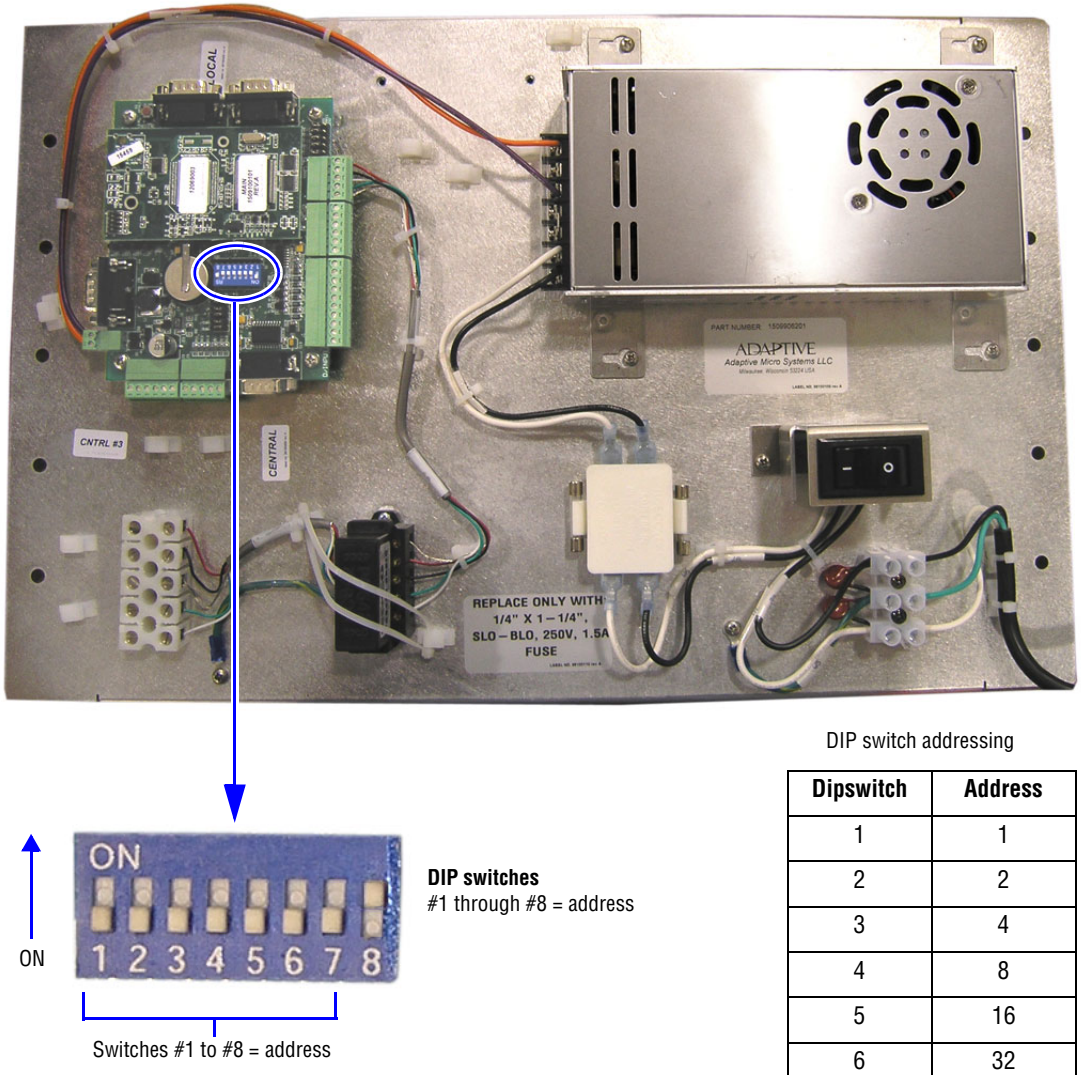
4. Click **Set** to set the IP address (each sign must have a unique IP address).
5. After the IP address is set, detach the computer from the controller board and reset the controller.
6. Verify communications and ensure proper operation.

Ground controller (Controller #3) board replacement

WARNING! Hazardous voltage. Contact with high voltage may cause serious injury or death. Always disconnect power to unit prior to servicing.

➔ **To replace the ground controller #3 board**

1. Remove power from the ground controller panel.
2. Locate the controller board to be replaced.
3. Set the DIP switches and jumpers on the replacement board to match the DIP switches and jumpers on the board being replaced. At least one dip switch must be on for the controller to function. See Figure 32.



DIP switch addressing

Dipswitch	Address
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Figure 32.DIP switch settings for the ground controller.

4. Disconnect all the cables from the ground controller board.

5. Remove the four screws (circled below) that hold the ground controller board to the panel. Remove the controller board from the sign.

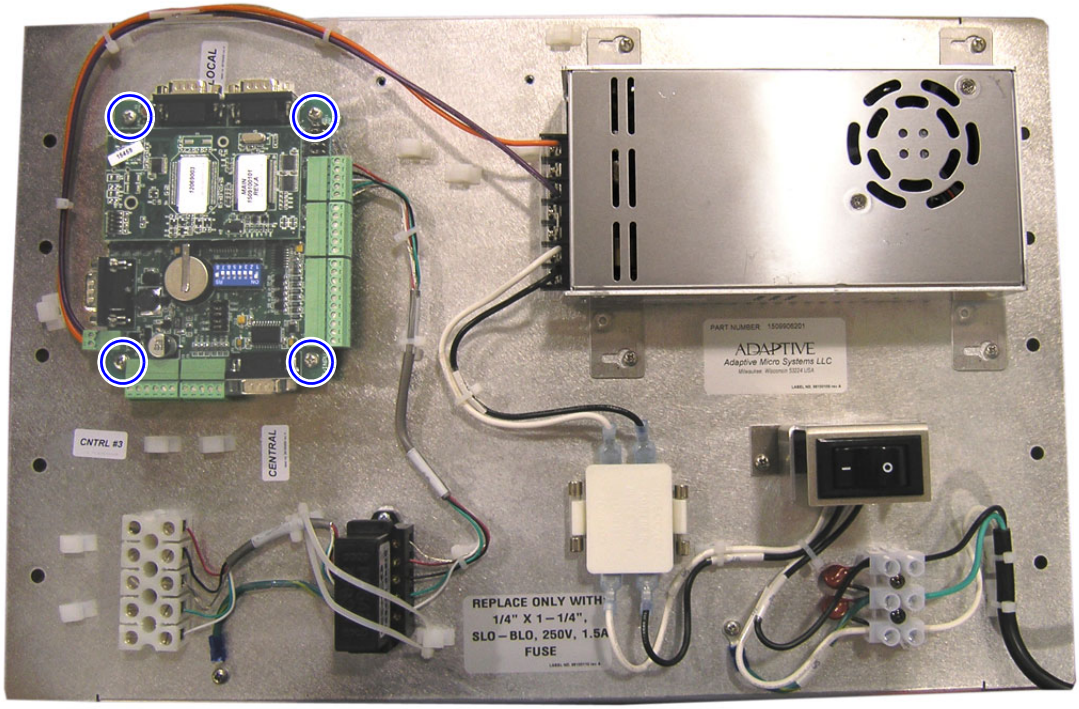


Figure 33. Ground controller screw locations.

6. Fasten the new ground controller board to the sign and reconnect all the cables to the new board.
7. Apply power to the ground controller plate.

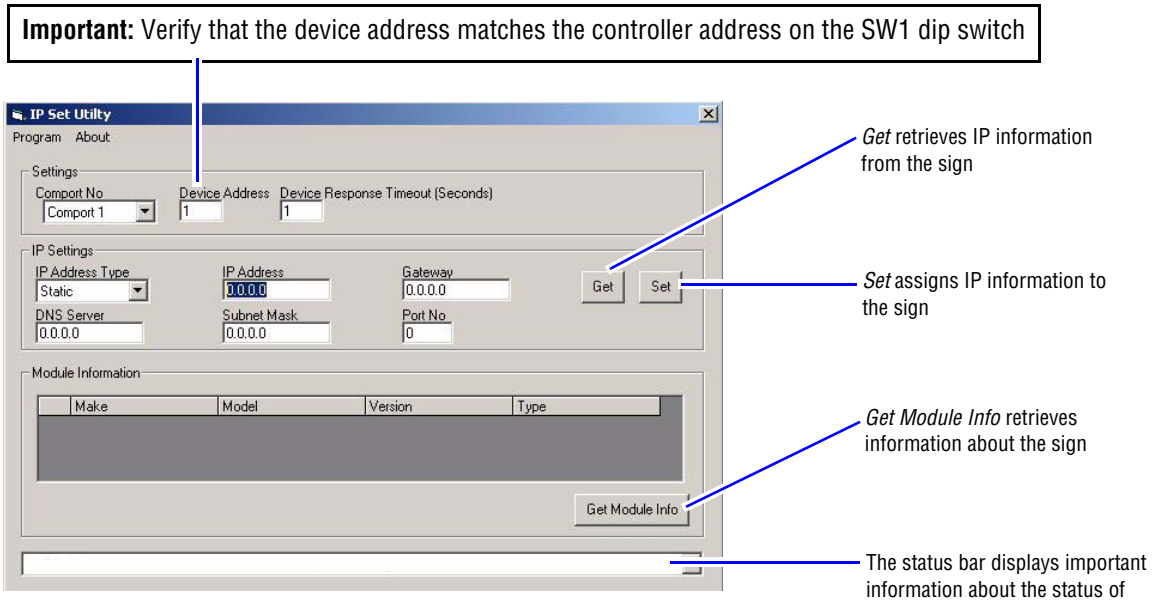
➔ **To set the IP address for the new Ground Controller #3 board**

Note: To assign an IP address, the IP Set Utility program must be installed on the computer that will be communicating to the sign. Contact Adaptive Technical Services at (800) 558-7022 or (414) 357-2020 if you do not have this program.

1. Using a null modem cable, connect a laptop computer to the controller board at P3 (next to the Reset button). See “Controller #1 and #2” on page 27 for the P3 location.
2. Open the IP Set Utility program — select **Start > Programs > IPSetUtility > IP Set Utility.**

3. Enter the appropriate information in the *IP Set Utility* window See Figure 34.

   Note: If the controller is operational (LED 1 is normally flashing), use *Get* to verify if the sign's IP address can be retrieved.



DIP switch positions	Equivalent decimal values
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Example: if SW1 has positions 1 and 4 on, then it is set to serial/device address 9.

Figure 34. Setting the IP address for the controller.

4. Click **Set** to set the IP address (each sign must have a unique IP address).
5. After the IP address is set, detach the computer from the controller board.
6. Reset the controller and verify operation of controller.

   Note: If battery is low the IP address can be lost. Replace as required.

Power supply replacement

Two types of power supplies are used:

- Meanwell PSP-500-12 (see “To replace a sign power supply” on page 41) — This 12VDC output power supply is used *inside* the sign.
- Meanwell SP-200-12 (“To replace the ground controller #3 power supply” on page 42) — This is the 12VDC output power supply used *on the ground controller panel*.

WARNING! Hazardous voltage. Contact with high voltage may cause serious injury or death. Always disconnect power to unit prior to servicing.

➔ To replace a sign power supply

1. Open the sign. See See “Opening a sign” on page 34.
2. Remove the power panel cover.
3. Remove all wires from the power supply to be replaced.

   DC connections:

   - V+ (orange-colored wire)
   - V- (violet-colored wire)
   - Signal harness

   AC connections:

   - Hot (black wire)
   - Neutral (white wire)
   - Ground (green wire)

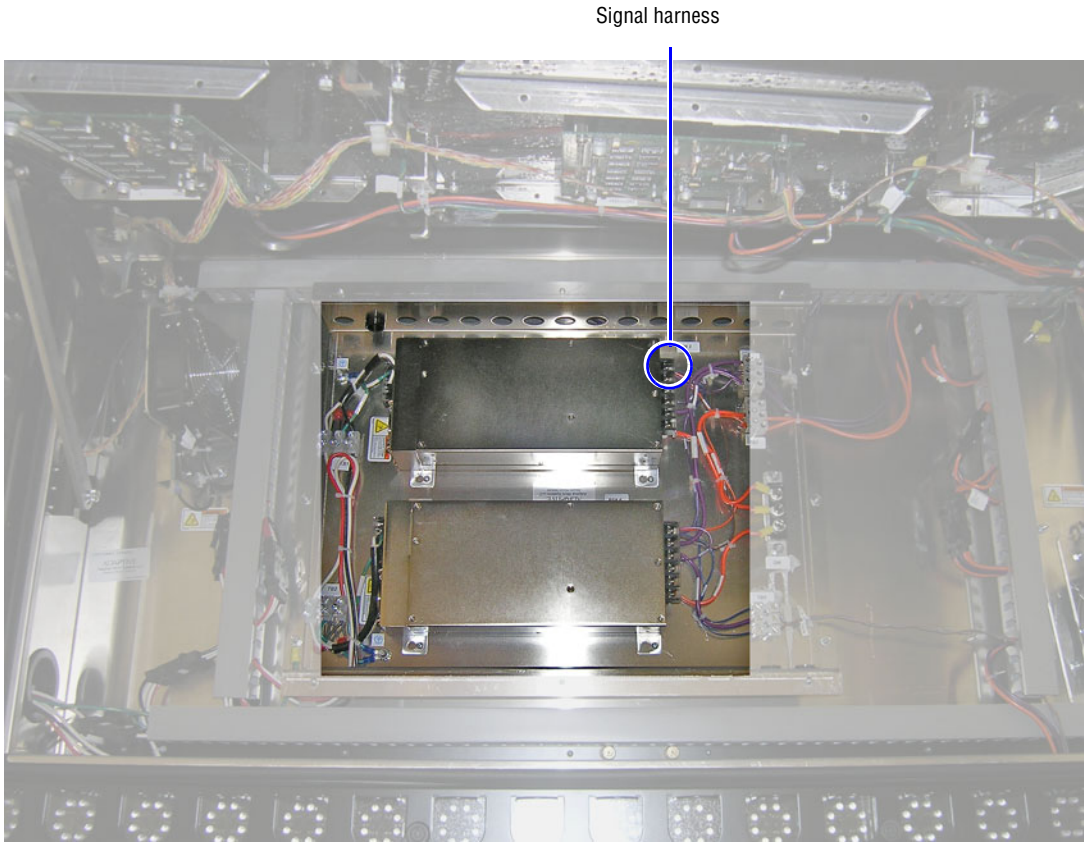


Figure 35. Signal harness location.

4. Loosen the four screws (circled) and remove the power supply from the sign.

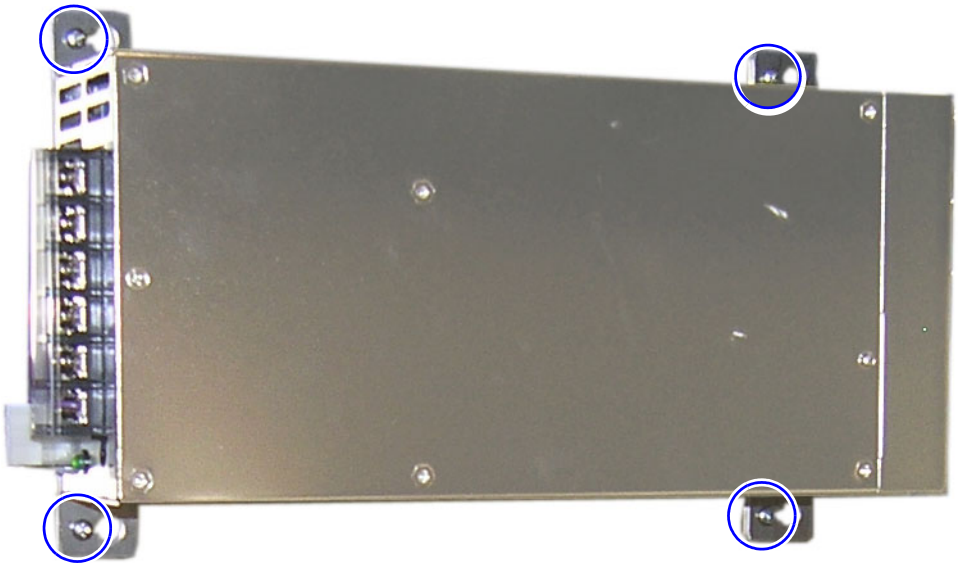


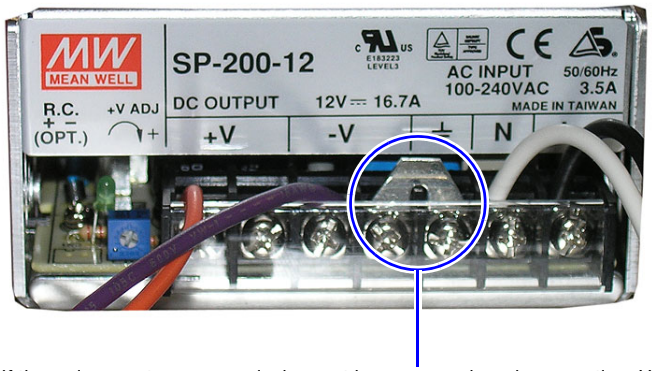
Figure 36. Screw locations on the power supply.

5. Fasten the new power supply to the sign.
6. Reconnect all the wires to the new power supply.

   Note: Refer to the wiring diagram located on the power panel cover for power supply settings.
7. Apply power and verify that the new power supply operates correctly.
8. Reattach power panel cover.

➔ To replace the ground controller #3 power supply

1. Remove power from the ground control panel.
2. Remove all wires from the power supply:



If the replacement power supply does not have a ground spade connecting -V and ⏚ .

Then transfer this ground spade to the replacement power supply.

Figure 37. Ground spade connector.

3. Loosen, but do not remove, the 4 screws that hold the power supply to the ground controller plate. Then remove the power supply:

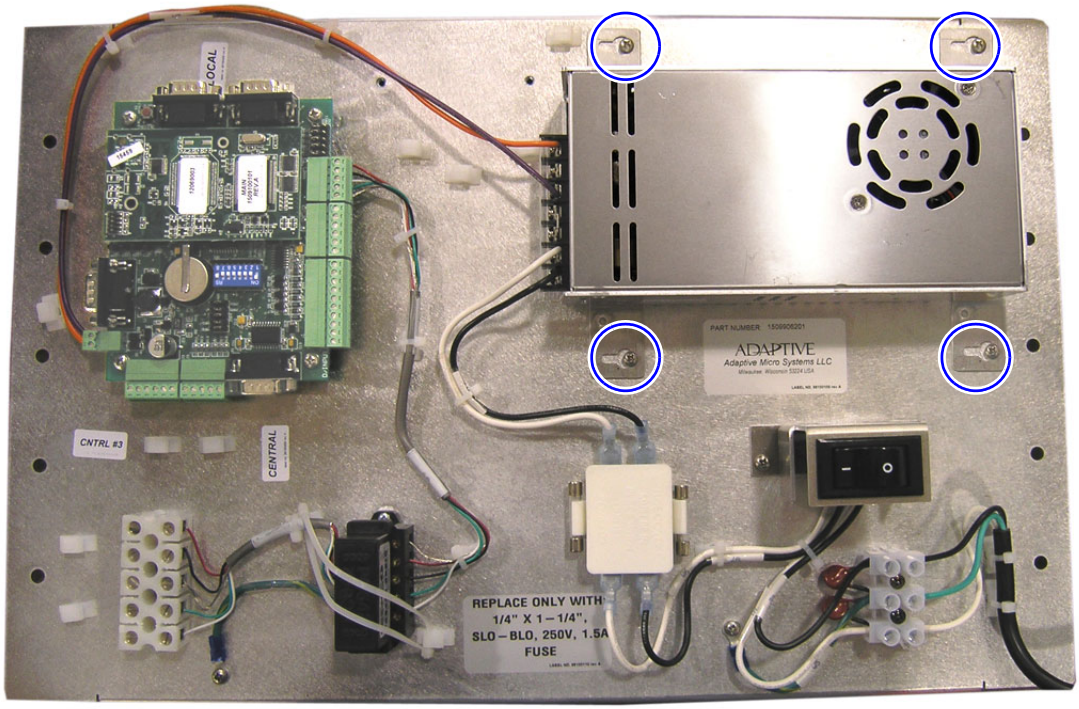


Figure 38. Screw locations on the power supply.

4. Fasten the new power supply to the sign and then reconnect all the wires to the new power supply.
5. Close the sign and then apply power to the sign.

Diode replacement

WARNING! Hazardous voltage. Contact with high voltage may cause serious injury or death. Always disconnect power to unit prior to servicing.

➔ To replace the diode module

1. Open the sign. See “Opening a sign” on page 34.
2. Turn the sign breaker to the OFF position.
3. Remove the power panel cover.
4. Loosen the screws to disconnect the wiring from the diode module.
5. Remove the nuts (circled in Figure 39) securing the diode module to the power panel plate.

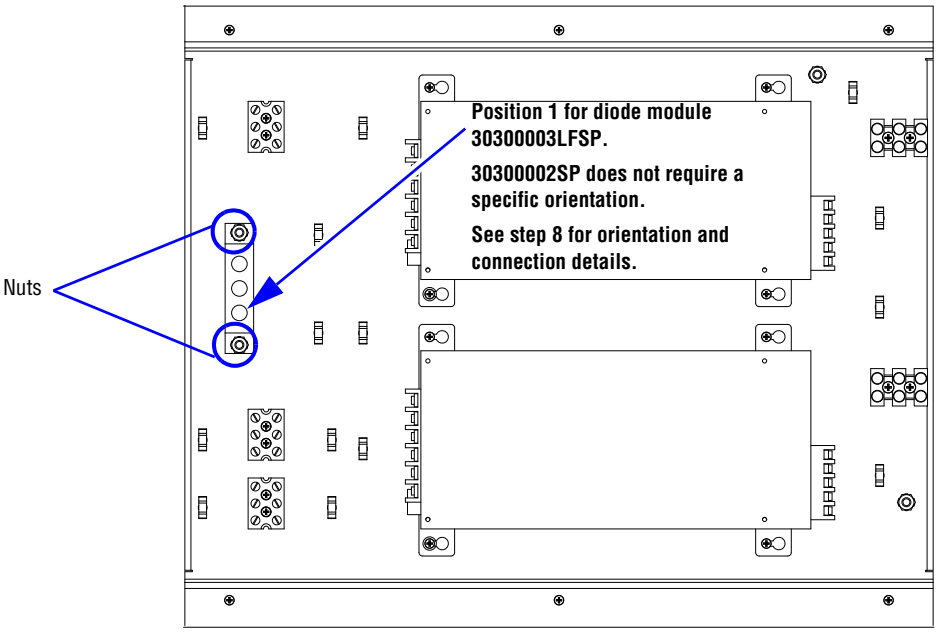


Figure 39. Nuts securing the diode module to the power plate.

6. Apply thermal joint compound (pn 67004105) to the bottom of the replacement diode module (pn 30300003LFSP or 30300002SP).
7. Bolt the replacement diode module to the power panel plate.
   - Module 30300002SP will mount to 1/4-20 x 3/4” PEM studs.
   - Module 30300003LFSP will mount to 8-32x1” screws.
8. Reconnect wiring to the diode module and tighten the screws.

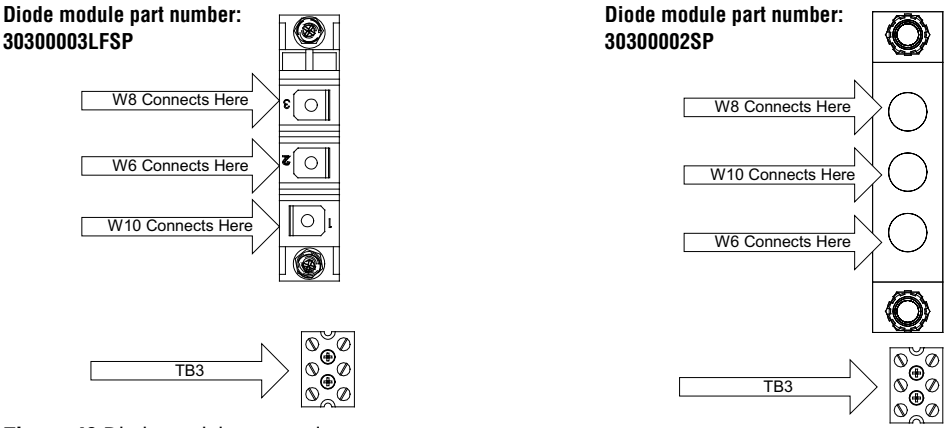


Figure 40. Diode module connections.

LED driver board replacement

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

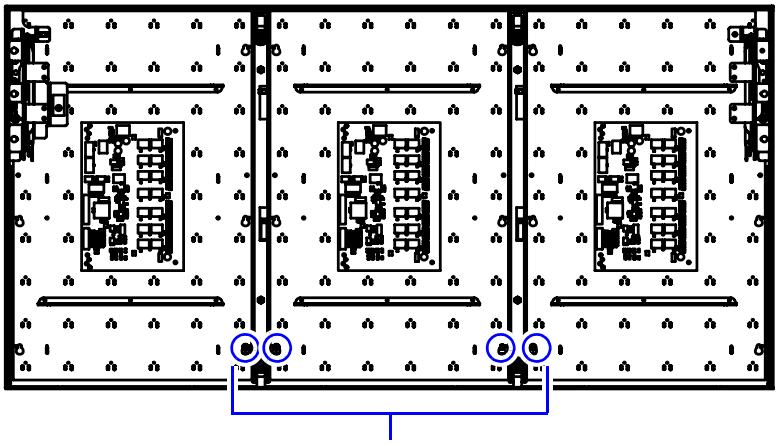
➔ **To replace a driver board**

1. Open the sign. See See “Opening a sign” on page 34.
2. Locate the driver board to be replaced.
3. Remove all cables from the back of the driver board (“LED driver board” on page 30).

Notice: Driver boards are electrostatic sensitive devices. Observe precautions when handling.

- Power cable (P1)
- Communications cable (P3)

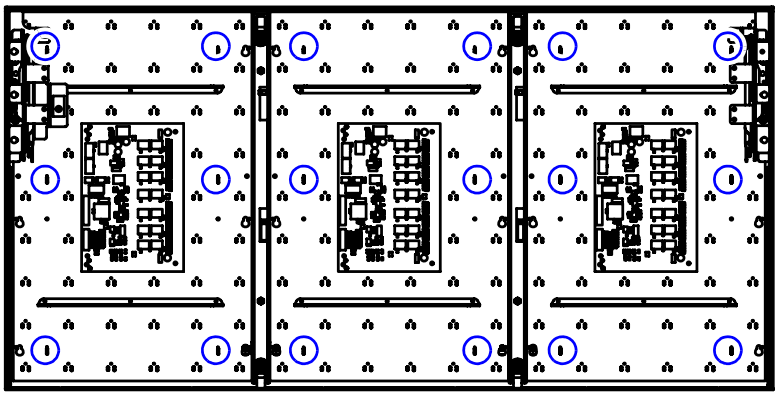
4. From the front of the LED panel, remove the anchor screw holding the LED driver board to the LED mounting panel.



Each driver board has an anchor screw securing it to the LED mounting panel. The middle driver board may have a screw on either the left or the right side.

Figure 41.LED driver board anchor screw and hook locations.

5. Push the driver board up and slide off to remove.



Six (6) hooks are on each driver board.

Figure 42.hook locations on driver boards.

6. Attach the new LED driver board to the LED mounting panel.
   - Slide the driver board on the hooks, ensuring they are all fully engaged, and then push down.
   - Reattach the anchor screw.
7. Reconnect the cables to the LED driver boards (P1, P2, and P3).
8. Reapply power to the sign, close the door and verify operation.

Fan replacement

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

➔ **To replace a fan**

1. Open the sign. See See “Opening a sign” on page 34.
2. Locate the fan to be replaced.
3. Disconnect the wire harness from the failed fan.
4. Remove the two 10-32 nuts securing the fan assembly to the sign.

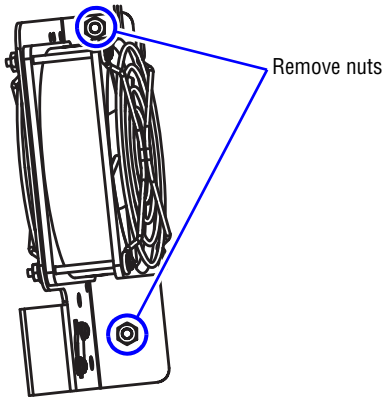


Figure 43. Nuts securing the fan assembly to the sign.

5. Remove the four 6-32 screws and nuts securing the fan guards and remove the guards.
6. Remove the fan and slide the new fan into the frame pointing in the correct direction.

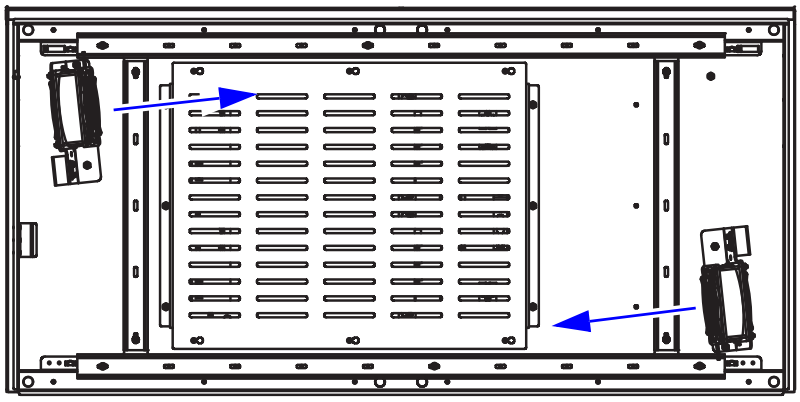


Figure 44. Fan air flow.

7. Reattach the fan guards with the 6-32 screws and nuts.
8. Secure the fan to the fan mounting and tighten the two 10-32 nuts.
9. Connect the fan wire harness.
10. Apply AC power to the sign.

Fan test

Use a heat gun directed at the fan thermostat to verify fan operation. The thermostat must be heated to 122ºF (50ºC) to initiate fan operation.Verify the fan is blowing in the correct direction (upper fan right, lower fan left).

WARNING! Move the heat gun around to prevent the wiring from burning.

Light sensor replacement

WARNING! Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to servicing.

➔ **To replace a light sensor**

1. Turn all sign breakers to the OFF position.
2. Remove the 12 screws at the base of the light sensor globe. Remove the attachment bracket and glove to access the light sensor boards.

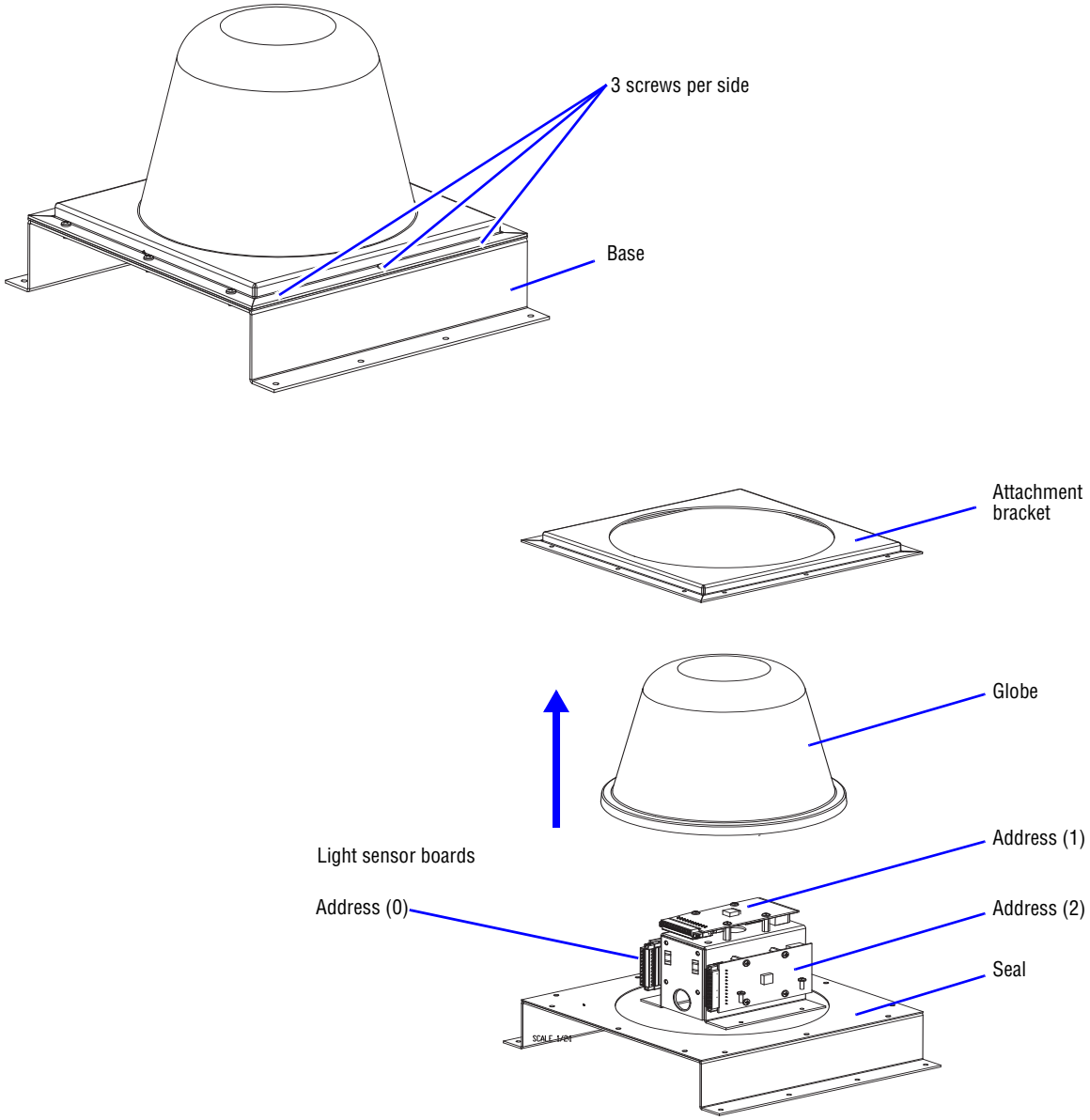


Figure 45. Light sensor screws, base, bracket, globe, and addressing.

3. Locate the light sensor board to be replaced.
4. Set the address switch on the replacement light sensor board to the setting on the board that will be replaced.

   Note: If the light sensors are not properly addressed the photocell assembly will not operate properly.

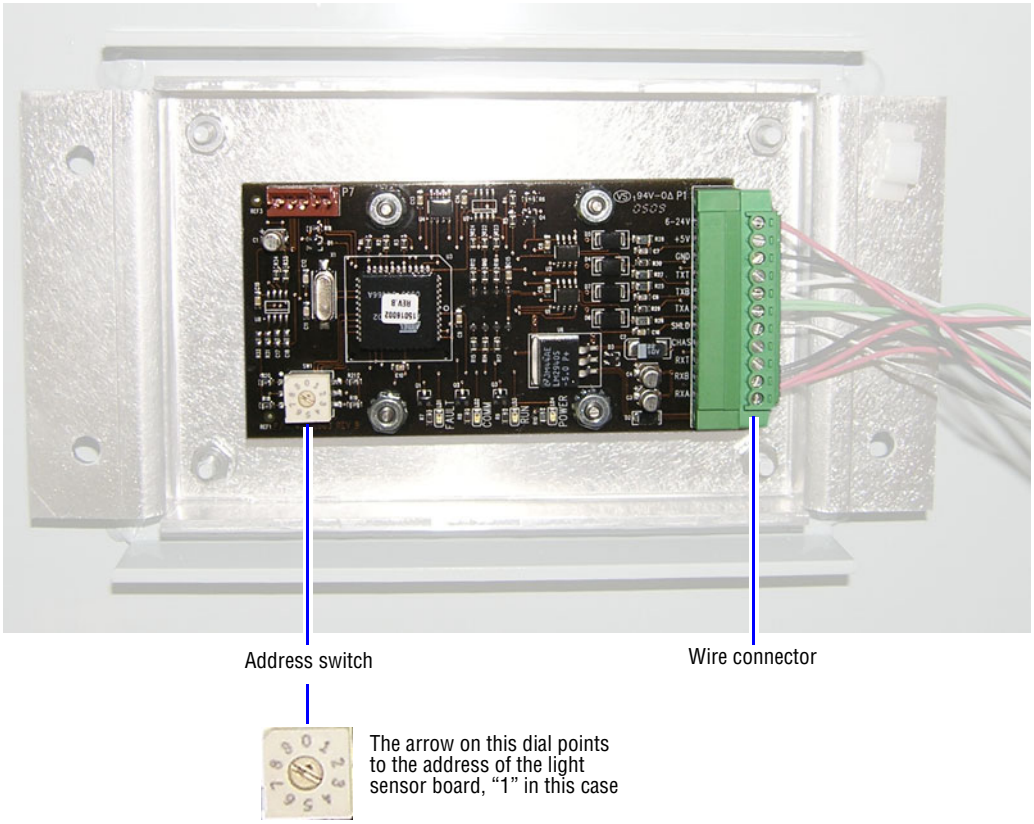


Figure 46. Light sensor (representative view).

5. Use a small, flat blade screwdriver to remove the wire connector form the light sensor that is being replaced. Then remove the four screws (circled) that hold the board to the base of the light sensor globe.

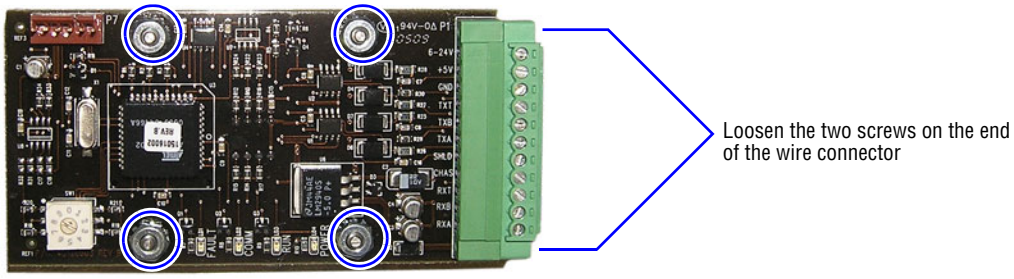


Figure 47. Light sensor board (representative view).

6. Attach the replacement light sensor board and screw down the wire connector.
7. Reattach the attachment bracket and globe to the base with the 12 screws (see Figure 45 on page 47).

Appendix

AlphaXpress 8700 models (single row models):

AlphaXpress 8700	Height* (feet)	Width* (feet)	Depth* (feet)	Lines	Char/line	Weight** (lbs)	Typical Power** (watts)	Max Power** (watts)	Number of 30A circuits Req.
AX-8700-9x36	3.6	9.5	1	1	6	450	232	500	1
AX-8700-9x54	3.6	13.5	1	1	11	650	266	667	1
AX-8700-9x72	3.6	17.5	1	1	14	800	299	835	1
AX-8700-9x90	3.6	21.5	1	1	18	1050	333	1002	1
AX-8700-9x108	3.6	25	1	1	21	1250	366	1169	1
AX-8700-9x126	3.6	29	1	1	25	1450	400	1337	1

Pixel center-to-center spacing is 2.6" (66 mm) horizontally and vertically. Character count is based on a 7 x 4 single stroke font with single-column spacing. A 7-pixel high character is 18" (460 mm) tall. Line count based on a 7 x 4 font with two-pixel row spacing.
*Approximate cabinet dimensions (feet).
**All weight and power specifications are approximations. Consult factory for more details.
***Circuits to be sized for 30A breaker(s) in the controller modular case.

9 x 36 dimensions

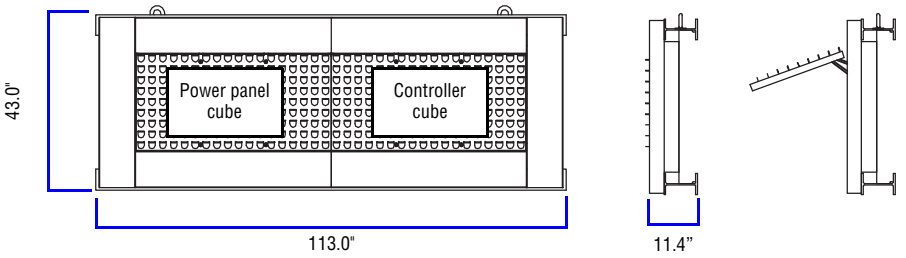


Figure 48: AX-8700-9x36

9 x 54 dimensions

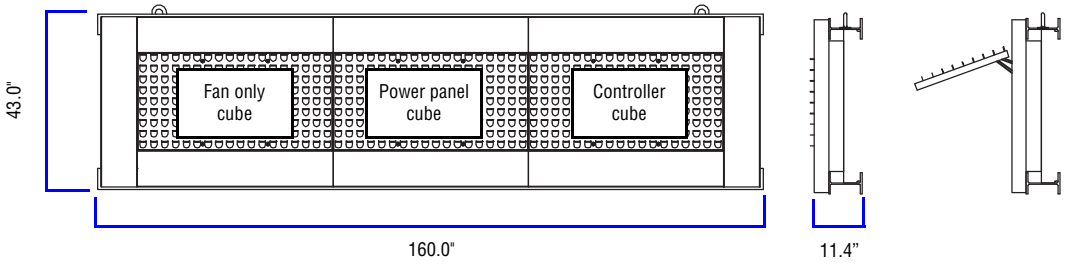


Figure 49: AX-8700-9x54

9 x 72 dimensions

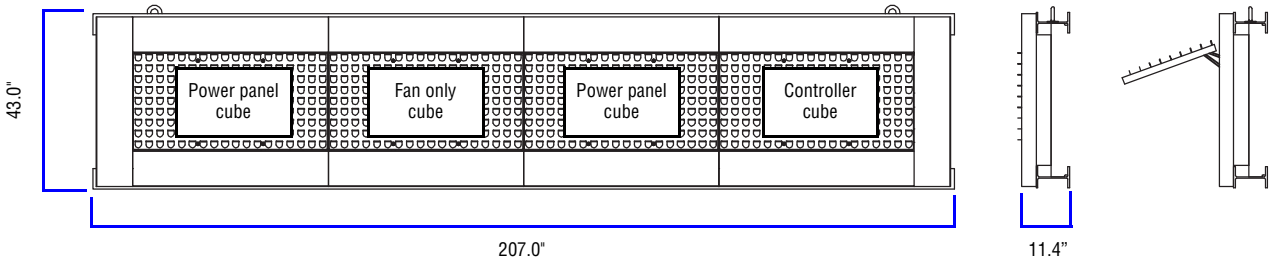


Figure 50: AX-8700-9x72

9 x 90 dimensions

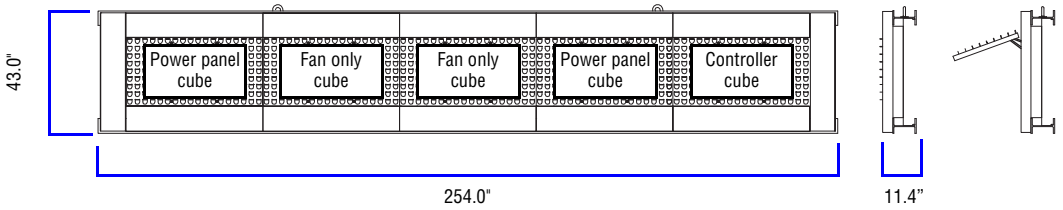


Figure 51: AX-8700-9x90

9 x 108 dimensions

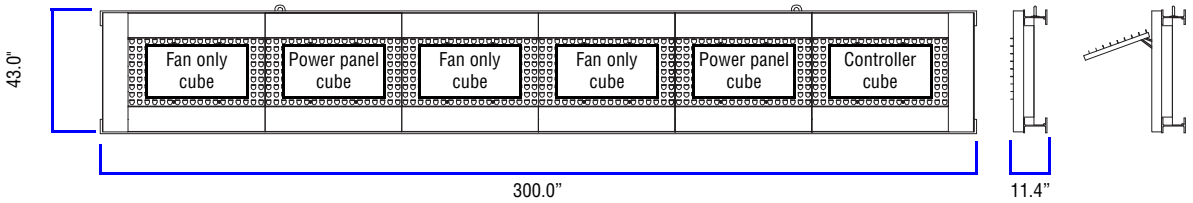


Figure 52: AX-8700-9x108

9 x 126 dimensions

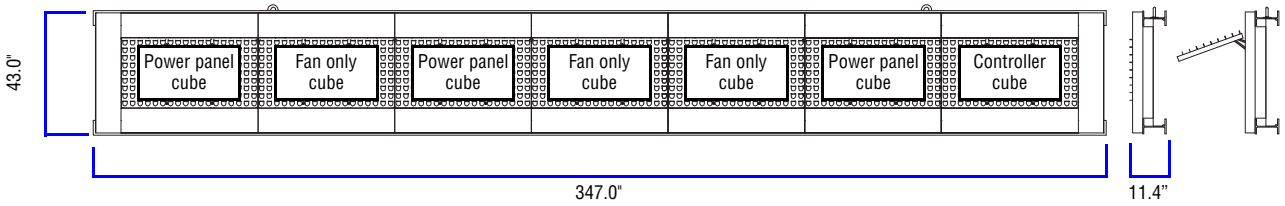


Figure 53: AX-8700-9x126

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK