Adaptive DISPLAY SOLUTIONS

# Sign Operation and Maintenance Manual

# AlphaXpress 2020 Front Access 20mm RGB Full Matrix Displays

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Adaptive DISPLAY SOLUTIONS

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# 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 16 x 16 LED modules with a 20mm pitch configured in a full matrix. These boards can be arranged to form different configurations. 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, Ethernet communication (standard), and three light sensor connections; all connected to the back of the sign.

## 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 2020 signs is full matrix, which allows for the display of any alphanumeric character, including punctuation marks, as well as simple graphics characters.

## NTCIP compliant error codes

The NTCIP compliant controllers used in AlphaXpress 2020 signs return information on sign health in the form of a binary number. This number, or code, is received in the form of a short error status when the sign is queried using IDI Intelligent Controls or other software. Adaptive provides the Short Error Code Status Translator program that quickly translates the returned value into individual error codes that the sign is reporting.

**Short Error Status**

| | | | |
|---|---|---|---|
| Bit 0: | Reserved | Bit 8: | Controller error |
| Bit 1: | Communications error | Bit 9: | Temperature warning |
| Bit 2: | Power error | Bit 10: | Fan error |
| Bit 3: | Attached device error | Bit 11: | Critical temperature error |
| Bit 4: | Lamp error | Bit 12: | Drum sign rotor error (not applicable to LED signs) |
| Bit 5: | Pixel error | Bit 13: | Open cabinet door error |
| Bit 6: | Photocell error | Bit 14: | Humidity warning |
| Bit 7: | Message error | | |

## Over temperature protection

VMS control systems are designed to protect LED signs from overheating. The VMS control system monitors the temperature at the display adapters, NTCIP controller plate, and the power supply plates. The following information describes the conditions in which protective measures are triggered and the actions the system takes. For information about converting Short Error Status Error Codes in Intelligent Controls, over-temperature conditions, and status definitions information, refer to “Short error status conversion” on page A-1.

### Condition 1: Measured at the display adapters

If the temperature measured at the display adapters exceeds 60° C (140° F):

- The sign controller reduces light output to 90% of the current brightness level setting.
- The sign controller keeps the light output at 90% of the current brightness level setting until the temperature falls below 56° C (133° F). The NTCIP controller will report a Temperature Warning by raising bit 9 of the short error status.
- Additional dimming will result if the temperature continues to increase. Every 4° C increase results in dimming by an additional 10%.

### Condition 2: Measured at the display adapters

If the temperature measured at the display adapters exceeds 80°C (176°F):

- The sign controller reduces the light output to 0%.
- The sign controller keeps the light output at 0% until the temperature falls below 76° C (133° F). At this point the sign will be allowed to display at 50% brightness.
- The NTCIP controller will report a Temperature Warning by raising bit 9 of the short error status.
- The NTCIP controller will report a Critical Temperature Error by raising bit 11of the short error status.

### Condition 3: Measured at the controller plate or power supply housings

If the temperature at the NTCIP controller plate or at the power supply plates exceeds 71° C:

- The NTCIP controller will report a Temperature Warning by raising bit 9 of the short error status.

### Condition 4: Measured at the controller plate and power supply housings

If the temperature at the NTCIP controller plate and at the power supply plates exceeds 71° C:

- The NTCIP controller will report a Temperature Warning by raising bit 9 of the short error status.
- The NTCIP controller will report a Critical Temperature Error by raising bit 11 of the short error status.

### Condition 5: Thermal shutdown

If the temperature at the NTCIP controller plate exceeds 71° C and the temperature at the power supply plates exceeds 71° C for approximately an hour:

- The NTCIP controller blanks the display and keeps the display blanked until this condition is resolved.
- The NTCIP controller will report a Temperature Warning by raising bit 9 of the short error status.
- The NTCIP controller will report a Critical Temperature Error by raising bit 11 of the short error status.
- The NTCIP controller will report a Message Error by raising bit 7 of the short error status.

## VMS control system

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

- NTCIP compliant controller
- LED display board/driver board
- Sign controller
- Display adapter

### General operation

The NTCIP controller interfaces with the “Host” computer system, and communicates with the Host through a CAT5 Ethernet cable (standard) or an RS422 connection (option). Using this network connection or I/O port, the Host issues commands to, and requests status information from, the NTCIP controller. The controller monitors and controls the entire LED VMS system. Communication by the NTCIP controller to and from the Host is accomplished using industry standard 10/100 Ethernet communications circuitry and NTCIP protocol.

### Placement of controllers

The controllers are located in the lower left modular case of all AlphaXpress 2020 sign configurations. Single row signs have a remote mounted controller.

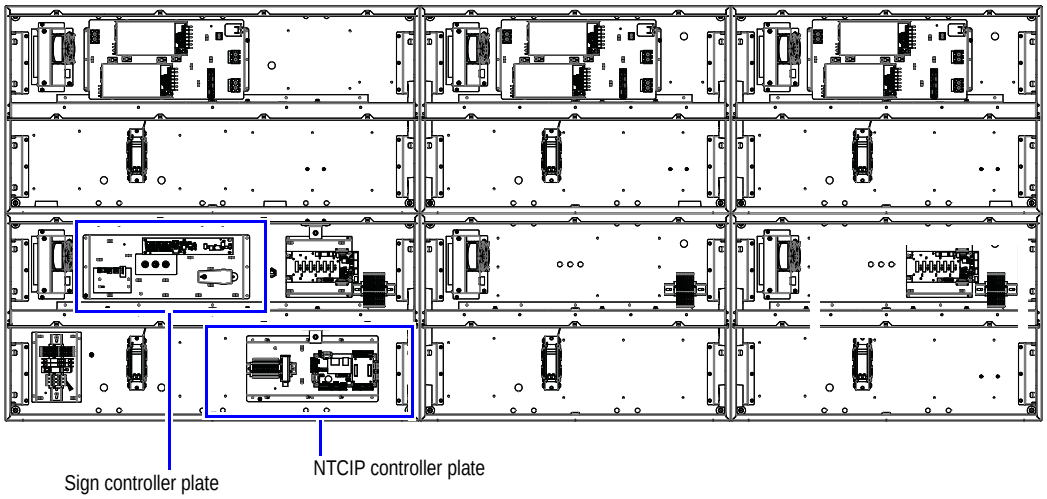


Figure 1-1. Controller plate on model typical AX-2020 64 x 160.

## 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 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:

- Sign Controller
- Light sensor assembly

### General operation

The photocells are enclosed in an assembly designed to protect them from the environment. The photocells continuously monitor the ambient light conditions and the controller constantly polls the photocells for this information. The controller determines exactly how much ambient light is detected through the light-sensing photocells and sets the light output of 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 light output will be at 50%; if the on time of the duty cycle is 75%, then the light output will be at 75%, and so on.)

### Light sensor assembly mounting

Because the function of the photocells depends on ambient lighting, the light sensor assembly 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 assembly, make sure the assembly can receive ambient light on the front.

## Environmental control system

To protect the sign components from overheating, two or three fans are mounted in each of the sign's modular cases. A thermostat dedicated to each fan controls the operation of each fan independently.

- Internal circulating fan - The internal circulating fan(s) turns on when the internal temperature of the sign reaches 43°C (+/- 4.5°C) 110°F), and turns off when the internal temperature falls below 27°C (+/- 5C°) 80°F).
- External air ventilation housing fan - The external air ventilation housing fan turns on when the internal temperature of the sign reaches 54°C (+/- 4°C) 130°F), and turns off when the internal temperature falls below 38°C (+/- 5°C) 100°F).

## 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:

- DC power supply
- Thermostat controlled AC fans

### Electrical distribution (DC)

Attached to the back panels in the sign housings are the power supply plates containing two 24VDC switching redundant power sharing supplies. 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 single power supply will not impact sign performance. The controller monitors the status of the power supplies.

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

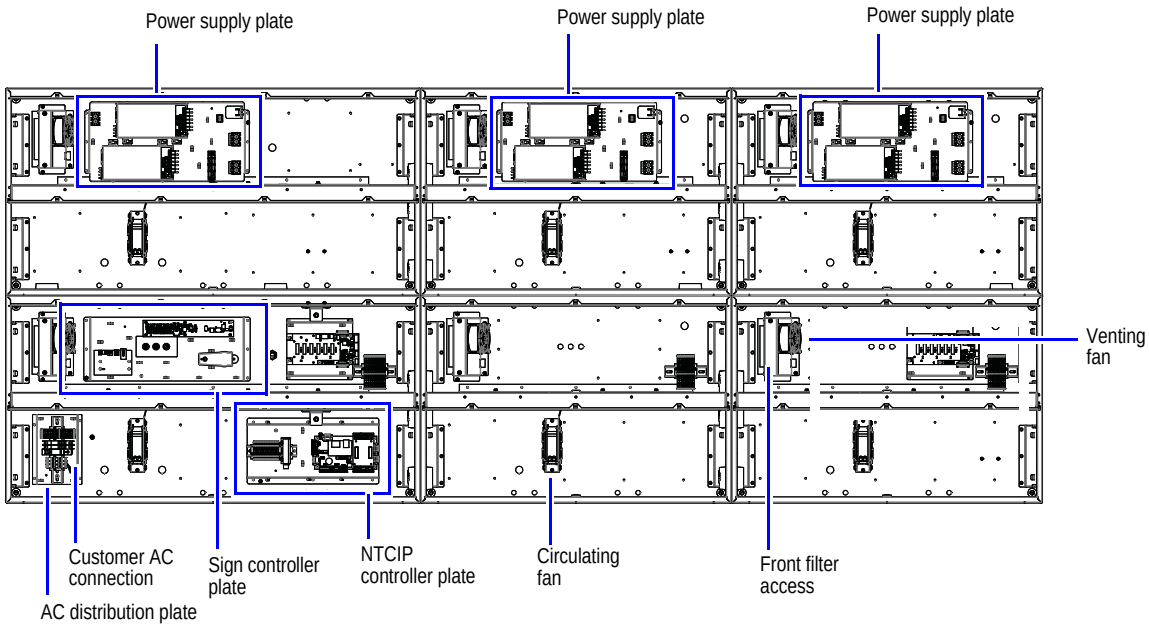


Figure 1-2. Typical AlphaExpress 2020 64 x 160 sign

### Electrical distribution (AC)

The AC input to the sign system consists of 120VAC (see the sales drawings) single-phase service wired to the input AC terminal block located on the controller plate. AC is internally wired to the DC power supplies and fans. AC power to the power supplies and fans is controlled by 20 Amp circuit breakers. The quantity of breakers is dependent on the size of the sign.

Depending on the sign size there may be more than one AC power entry. Reference the sales drawing for specifics. Contact Adaptive support if required.

## General description

- Serviceability: Front access
- Pitch (distance between each LED pixel): 20mm
- Reference sales drawings for sign specifications

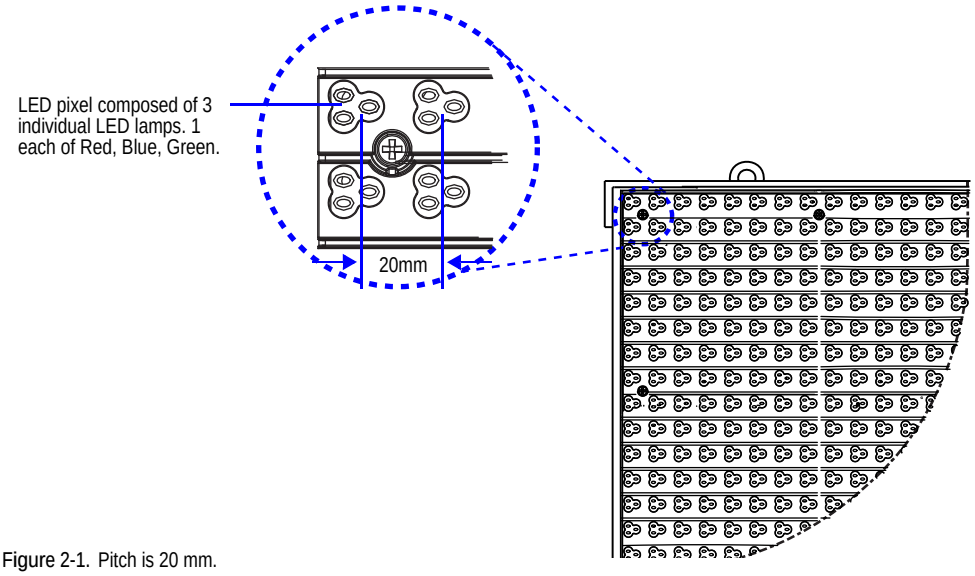


Figure 2-1. Pitch is 20 mm.

# Exterior views

## Top and side views

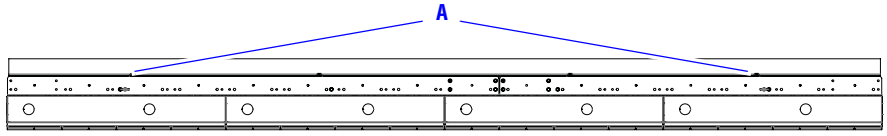


Figure 2-2. Top view of a sign.

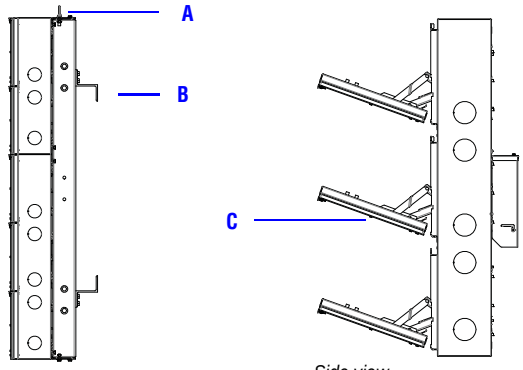


Figure 2-3. Side view of a sign. All sizes are similar.

| Item | Name | Description |
|---|---|---|
| A | LIFTING EYEBOLTS | Used to lift the sign into position. Can be removed after the sign has been mounted. Location varies by sign size. Removal does not impact the integrity of the housing. |
| B | SIGN MOUNTING STRUCTURE | Used to mount display cases. Horizontal Z-bar entire length of sign for mounting to customer supplied structure (vertical I-beams are not supplied). Varies depending on sign dimensions. |
| C | LED MODULE | Used to display content. |

## Front view

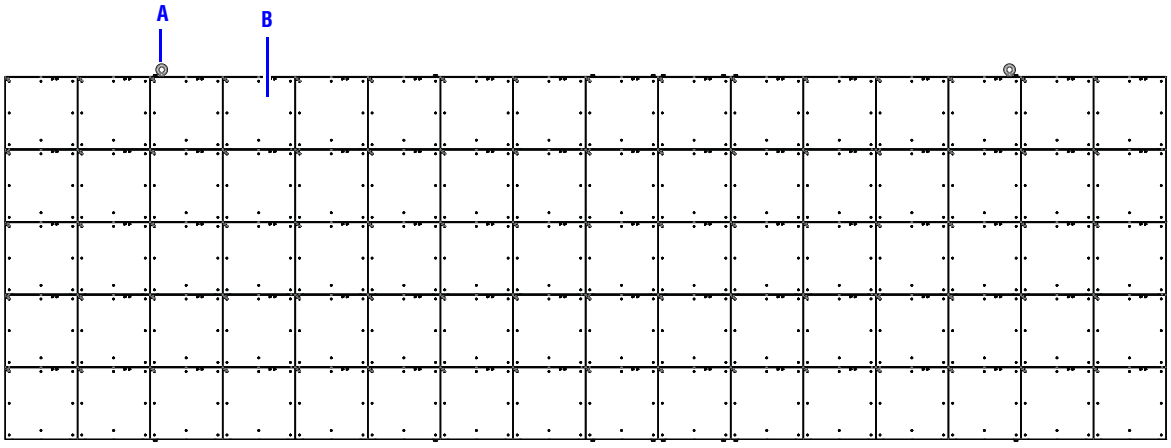


Figure 2-4. Front view of a sign; all sizes are similar.

| Item | Name | Description |
|---|---|---|
| A | LIFTING EYEBOLTS | Used to lift the sign into position. Can be removed after the sign has been mounted. Location varies by sign size. |
| B | LED MODULE | Used to display messages |

## Rear view

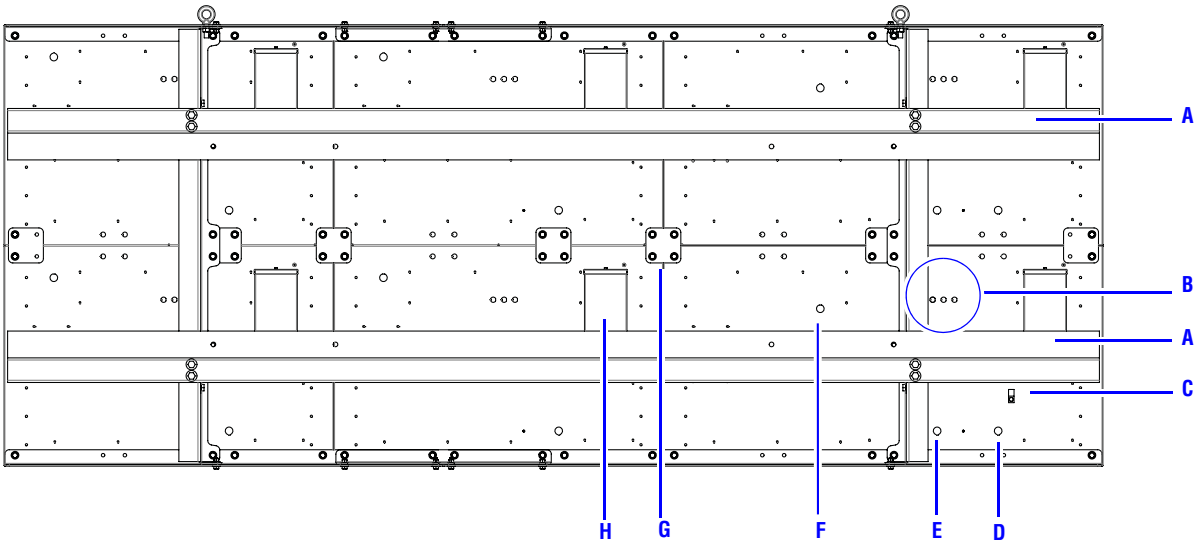


Figure 2-5. Rear view of a sign. All sizes are similar.

| Item | Name | Description |
|---|---|---|
| A | SIGN MOUNTING STRUCTURE | Used to mount display cases. Horizontal Z-bar entire length of sign for mounting to customer supplied structure (vertical I-beans are not acceptable). Varies depending on sign dimensions. |
| B | LIGHT SENSOR CONNECTION | Used to connect the light sensor. Front, top and rear connection. |
| C | GROUND LUG | Use to connect to an earth-ground rod. Sign must be grounded per NEC 250 and local electrical codes. Never use the sign's ground lug to ground welding or any other installation equipment or the warranty will be void. |
| D | PRIMARY POWER ENTRY | |
| E | SECONDARY POWER ENTRY | Used when required. |
| F | ETHERNET COMMUNICATION ENTRY | Water-tight connection external to sign. |
| G | TIE PLATE | Used to secure display mountings together vertically. |
| H | FILTER HOUSING (OPTION) | Front access filter is standard. Rear access is customer installed option. |

## Sign interior

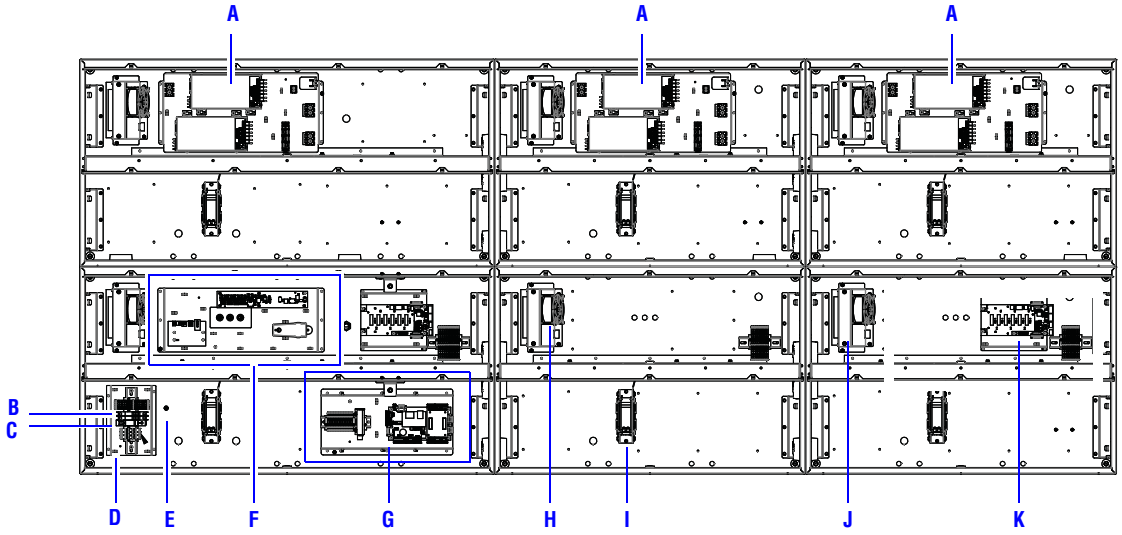


Figure 2-6. Component locations

| Item | Name | Description |
|---|---|---|
| A | POWER SUPPLY | Provides power to all the components in the sign. Number and location will vary depending on the size of the sign. |
| B | CIRCUIT BREAKERS | Routes line voltage to the sign. There may be more than one circuit breaker in the sign. |
| C | SURGE SUPPRESSOR | There is one surge suppressor at each power entry in the sign. |
| D | CUSTOMER AC CONNECTION | Customer AC connection. |
| E | AC ENTRY | Customer AC power connection when viewed from the front door. |
| F | SIGN CONTROLLER PLATE | Sign controller location. |
| G | NTCIP CONTROLLER PLATE | NTCIP controller location. |
| H | VENTING FAN | Prevent overheating of sign components. |
| I | CIRCULATING FAN | Internal recirculation fan used to mix air and help cool sign. |
| J | FRONT ACCESS FILTER | Standard front access for filter replacement. |
| K | DISPLAY ADAPTER | Used to communicate to LED modules from sign controller. |

## Components

### Sign controller plate

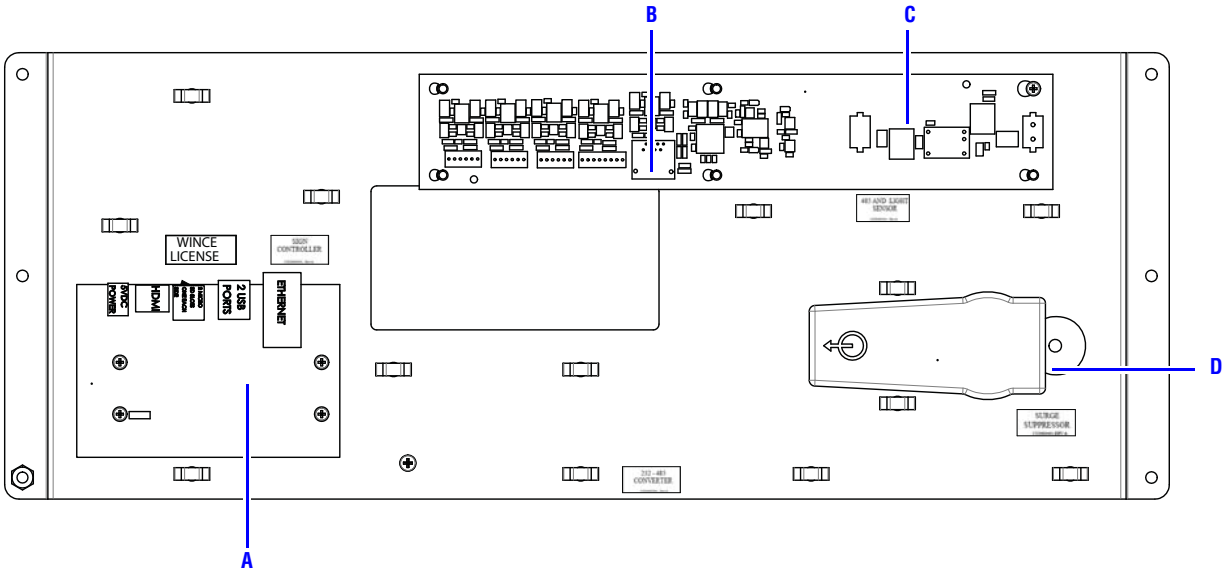


Figure 2-7. Sign controller plate

| Item | Name | Description |
|---|---|---|
| A | SIGN CONTROLLER | Controls display and communicates status information to central communications. |
| B | I/O COM TERMINAL BLOCK | Serial I/O to display adapter. |
| C | 485 HUB | Serial communications distribution and 5V DC power to the sign controller. |
| D | ETHERNET SURGE PROTECTOR | Ethernet cable (customer supplied) plugs in to this location. |

## NTCIP controller plate

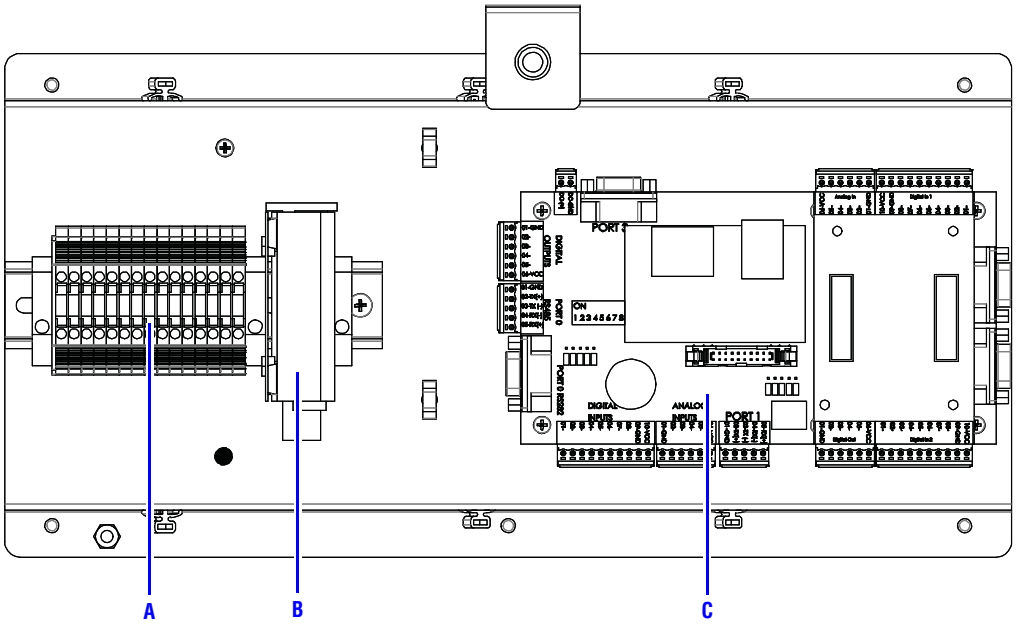


Figure 2-8. NTCIP controller

| Item | Name | Description |
|---|---|---|
| A | TERMINAL BLOCKS FOR I/O | |
| B | NETWORK SWITCH | |
| C | NTCIP CONTROLLER | |

## NTCIP controller board

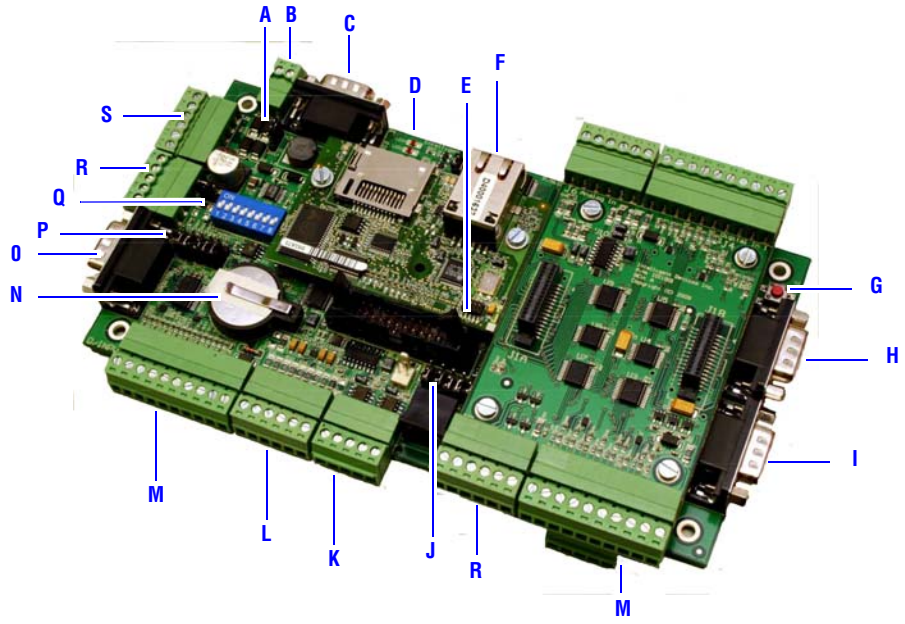


Figure 2-9. Controller components identification.

| Item | PCB Label | Name | Description |
|---|---|---|---|
| A | JMP12 | | Configures controllers for DC power. |
| B | J1 | POWER CONNECTOR | Connects to 24VDC power. |
| C | P4 | SENSORS PORT | |
| D | LED1 TO LED4 | LED 4 | Indicates communication to display |
| E | J1 | PROGRAMMING PORT | |
| F | J2 | ETHERNET PORT | Communication option available on 15029101 only. |
| G | S2 RESET | CONTROLLER RESET SWITCH | Initiates reset on controller board |
| H | P3 | RS232 PORT | Local NTCIP interface |
| I | P2 | RS232 PORT | RS232 sensors port. Cannot be used if K is in use. |
| J | JMP1 TO JMP5 | N/A | Configures controller for RS4485 on J6 or RS232 on P2 for sensors |
| K | J6 | RS485 PORT 1 | RS485 sensors port. Cannot be used if I is in use. |
| L | J5 A/INPUT | ANALOG INPUTS | Not used. |
| M | J4 D/INPUT | DIGITAL INPUTS | Connects to power supply fail signals, door status, and thermostat for power supplies. |
| N | BAT1 | CONTROLLER BATTERY | 3V lithium battery (Panasonic CR2032 or equivalent). |
| O | P1 | RS232 PORT | RS232 central port. |
| P | JMP2 TO JMP6 | N/A | Configures controller for RS422 on J3 or RS232 on P1. |
| Q | S1 | DIP SWITCHES | Serial addressing and sign controller configuration. |
| R | J2 | RS422 PORT | RS422 central communications port. |
| S | J3 | DIGITAL OUTPUTS | Used to control beacons (when installed |

## Power panel and power supplies

The size of the sign determines the number of power panels in the sign. Refer to the sales drawings for locations in each sign size.

There are no user connections to the power supply panels.

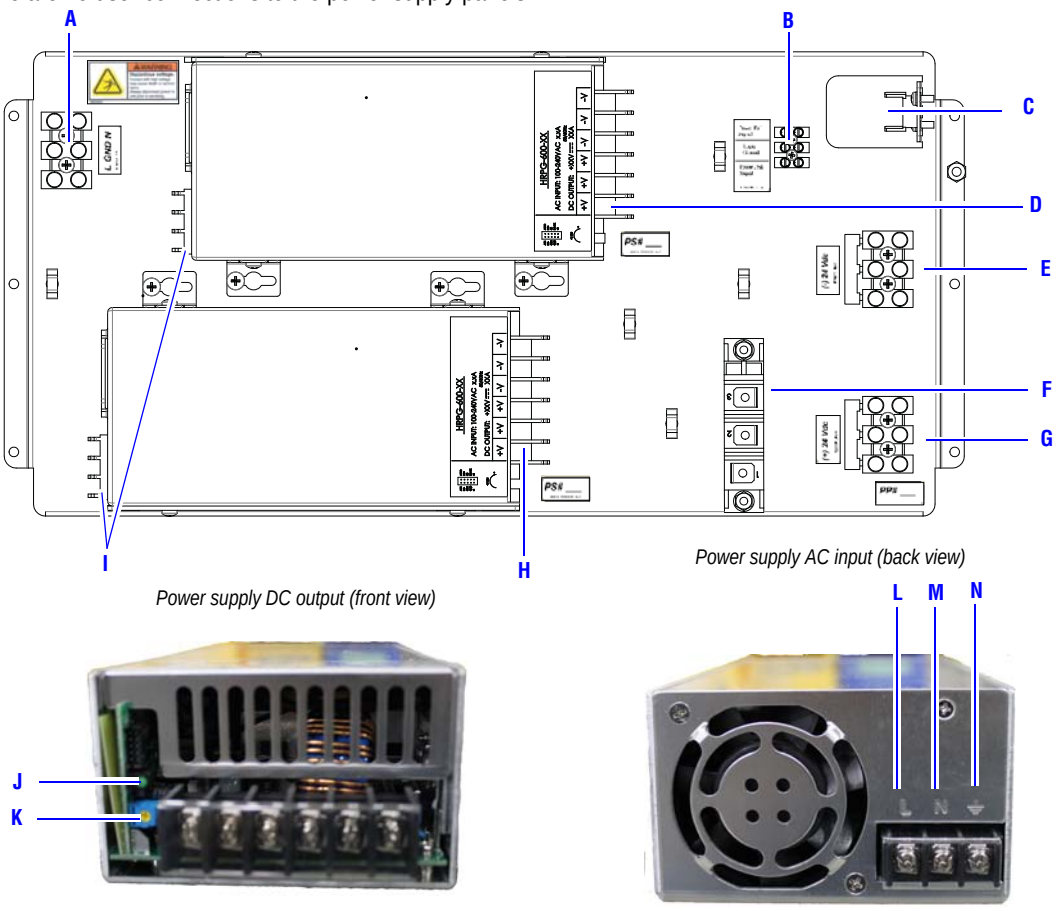


Figure 2-10. Power panel and power supply

| Item | Power supply label | Name | Description |
|---|---|---|---|
| A | N/A | POWER PANEL AC INPUT | AC Power connection to the power supply plate. |
| B | | DC POWER FAIL TERMINAL BLOCK | Power fail signal to controller. |
| C | | HI-LIMIT TEMPERATURE SENSOR | Hi Limit temperature warning for controller. |
| D | | DC SUPPLY OUTPUT | |
| E | V- | 24VDC - | |
| F | N/A | DIODE MODULE | Part number 30300003LFSP. See “Diode replacement” on page 5-9. |
| G | V+ | 24VDC + | DC output. |
| H | | DC SUPPLY OUTPUT | |
| I | | AC INPUT | |
| J | N/A | SIGNAL CONNECTOR | Used for remote control, remote sense, and power good signal. |
| K | N/A | DC VOLTAGE ADJUSTMENT | Used to fine tune the DC output of power supply. Factory set for optimal power |
| L | AC/L | AC INPUT LINE | |
| M | AC/N | AC INPUT NEUTRAL | |
| N | ⏚ | AC INPUT GROUND | AC input (90-264VAC, 47-63Hz). |

## Display adapter

The number of display adapters in a sign and their locations depends on the size of the sign. Refer to the sales drawings for locations in each sign size.

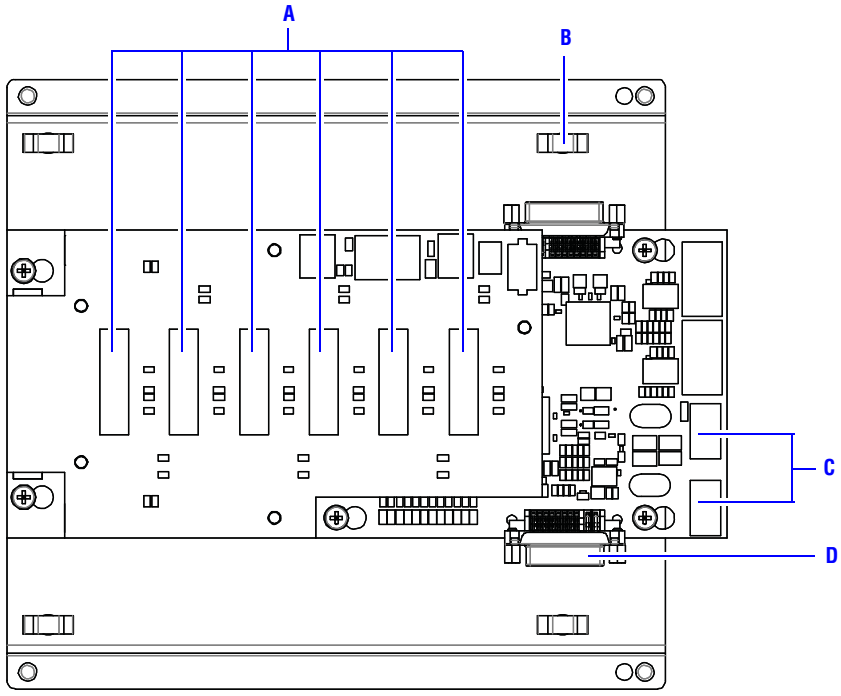


Figure 2-11. Display adapter

| Item | Name | Description |
|---|---|---|
| A | DRIVER COMMUNICATION | Each of the 6 outputs corresponds to a row of 9 LED modules |
| B | DVI OUT | DVI signal routes to next display adapter in chain. |
| C | 485 COMMUNICATION | RS485 I/O from sign controller and or next display adapter in chain. |
| D | DVI IN | DVI Signal from sign controller or from prior display adapter in chain. |

## 20mm LED module

The size of the sign determines the number of driver boards. Each board is 6 x 9 pixels, and each pixel is composed of 3 LED lamps, 1 red, 1 green and 1 blue.

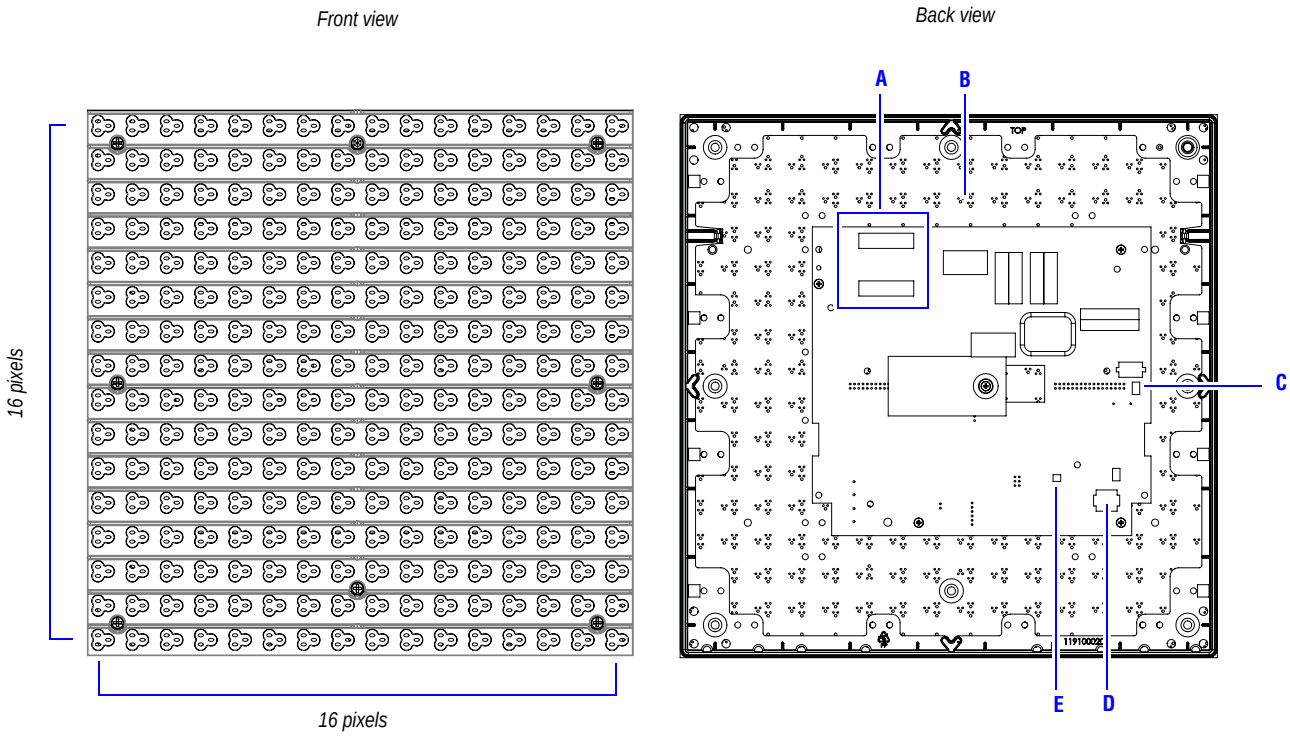


Figure 2-12. LED driver board, front and back views.

| Item | PCB label | Name | Description |
|---|---|---|---|
| A | P1 P2 | DATA | Connects to Controller #1 via a ribbon cable. |
| B | | BIN LABEL | Information on the intensity and wavelength of the LED lamps. |
| C | P4 | +V1 | Supplies power to the LED driver board. |
| D | P6 | | Programming port for the LED driver board processor. |
| E | STATUS 1 | POWER | On = 24V supplied to LED driver board. |
| | STATUS 2 | FAULT | On = one or more bad LED lamps on the LED driver board (if in normal operating mode). |
| | STATUS 3 | COMM | On = There is NO communication from sign controller.<br>Off = There is communication from the sign controller. |
| | STATUS 4 | RUN | Flashing = LED driver board processor operating. |

## Mechanical installation

### Lifting the sign

| | |
|---|---|
| WARNING | **Crush hazard.** Improperly lifting of a sign can create a crush hazard causing personal injury and damage the sign. Only use the sign's lifting eyebolts to lift the sign.<br>Lift the sign evenly and level, with no more than a 15 degree tilt. |

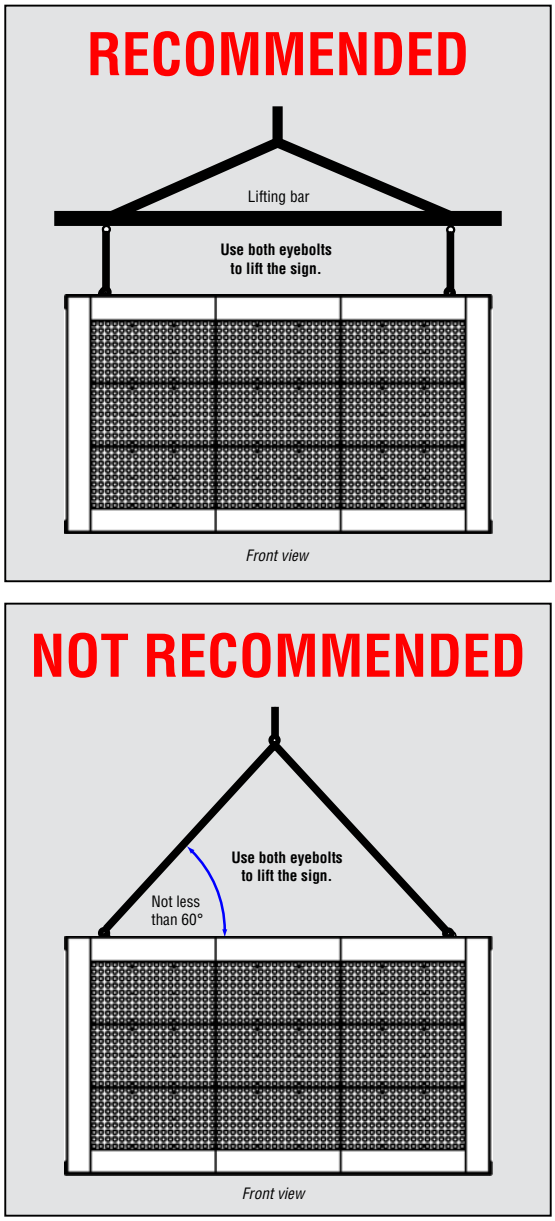


Figure 3-1. Lifting the sign.

# Electrical installation

## AC wiring

| WARNING | **Hazardous voltage**. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

AC wiring for typical AlphaXpress 2020

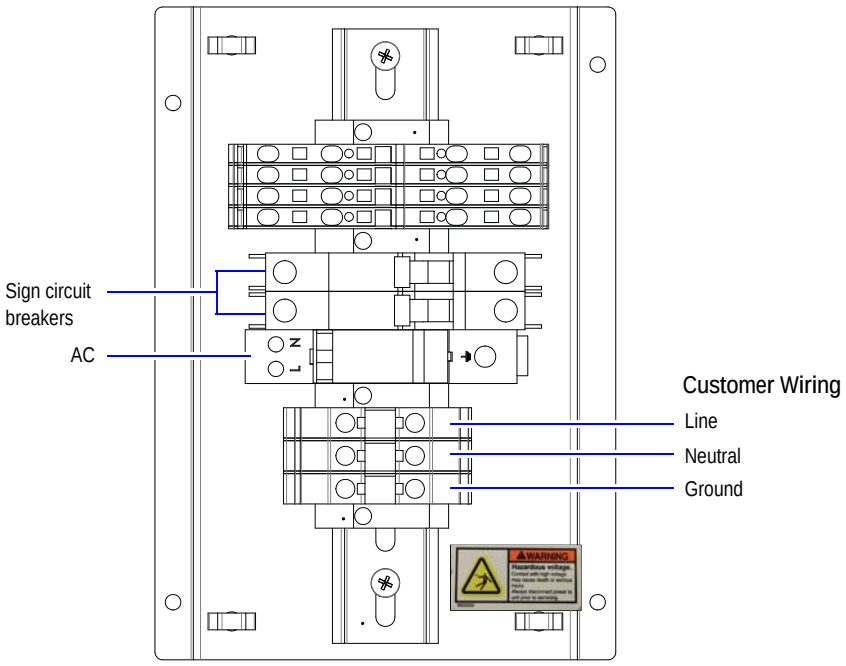


Figure 3-2. Typical AC power wiring AlphaXpress 2020.

## Light sensor

Plug the three light sensor cables into the light sensor ports on the back of the sign.

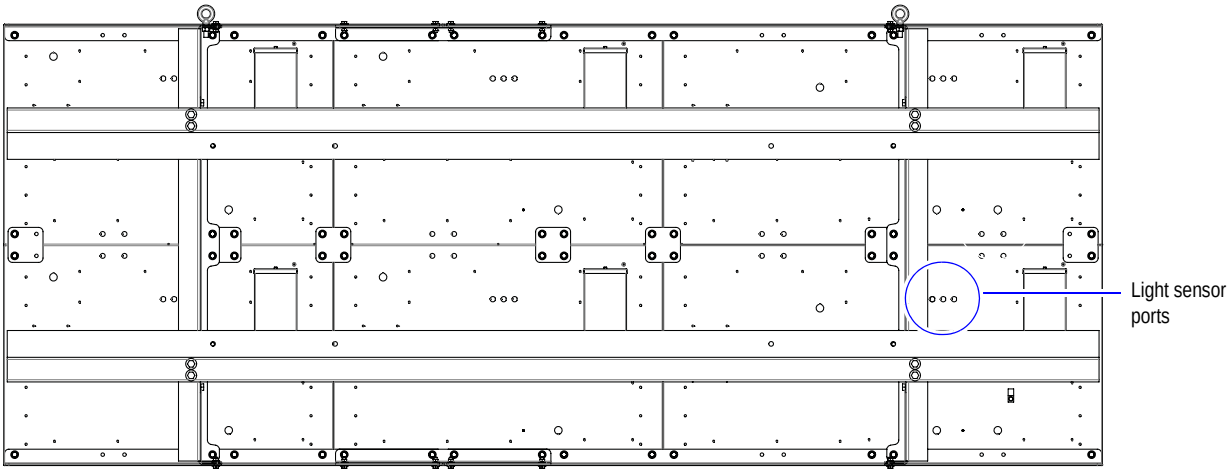


Figure 3-3. Light sensor port location.

## Network connection

Plug the Ethernet cable into the external waterproof port on the back of the sign.

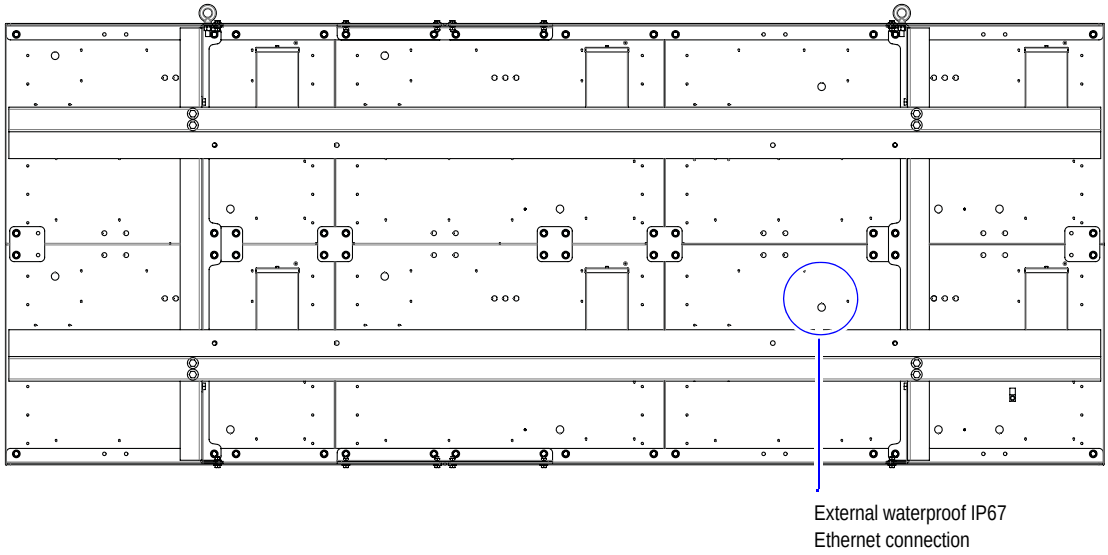


Figure 3-4. Ethernet communication port location.

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## 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 "Install a replacement venting fan" on page 5-14 for details on testing fan operation).
- Make sure the sign's drain holes are not plugged.

## Front lens cleaning (outside of sign)

### Required materials

- Mild, nonabrasive liquid detergent (liquid glass cleaner).
- 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.
2. Wipe the face of the display using the mild soap solution and a non-abrasive cloth.

## Filter cleaning

### Required materials

- Mild, nonabrasive liquid detergent.

Note: Do not use solvents. Use of solvents will damage the filter media.

### Cleaning procedure

1. Remove filter from ventilation housing and gently knock it against a hard surface to remove loose dust and dirt particles. For removal instructions, see "Filter replacement" on page 5-15.
2. Wash thoroughly with soapy water and rinse with clean water.
3. Shake water from filter and allow to dry.
4. Replace filter in the ventilation housing.

## Controller memory battery backup

In the event of a power loss, a lithium battery provides power to memory on the sign controller board(s). The battery only maintains the RAM, it does not allow any communication with the controller. In addition, it maintains any manually entered controller settings during a power outage.

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). For optimal operation, it is recommended to replace this battery annually.

| 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. |
|---|---|

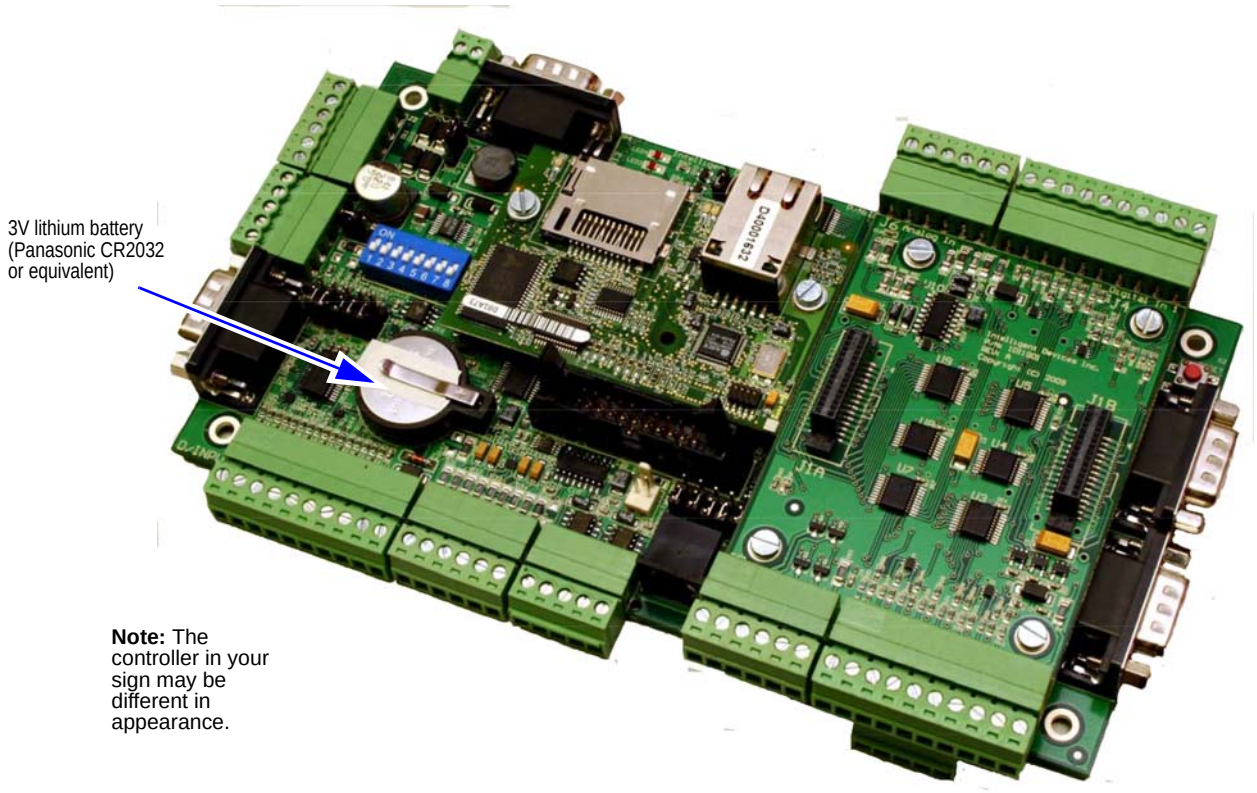



Figure 4-1. Representative controller showing the 3V lithium battery location.

## List of field-replaceable parts



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 service. |
|---|---|

### To open a sign

1. Remove power from the sign. Note there may be more than one power source present.
2. Using the hex tool (PN 68117076, supplied), turn the three or four 5/32 hex screw (circled) to open the front face frame.

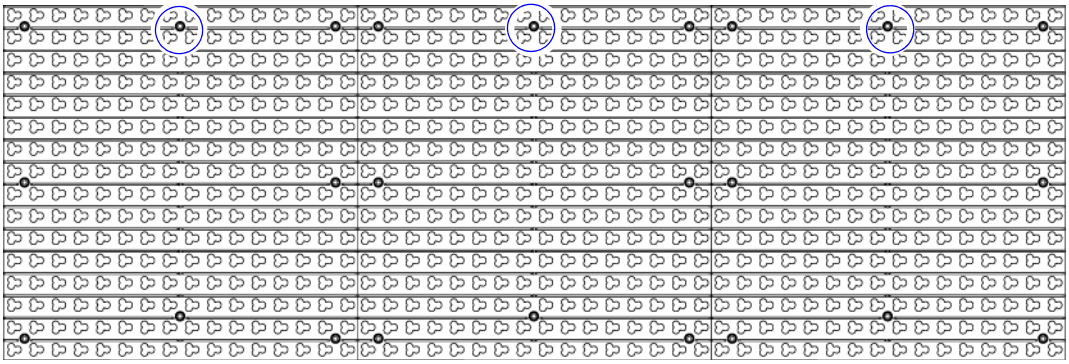


Figure 5-1. Hex screw location on the front face frame of a 3-wide door sign. 4-wide doors signs are similar.

# NTCIP controller replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove the NTCIP controller board

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the controller board to be replaced.
5. Set the DIP switches and jumpers on the replacement board to match the DIP switches and jumpers on the board being replaced.

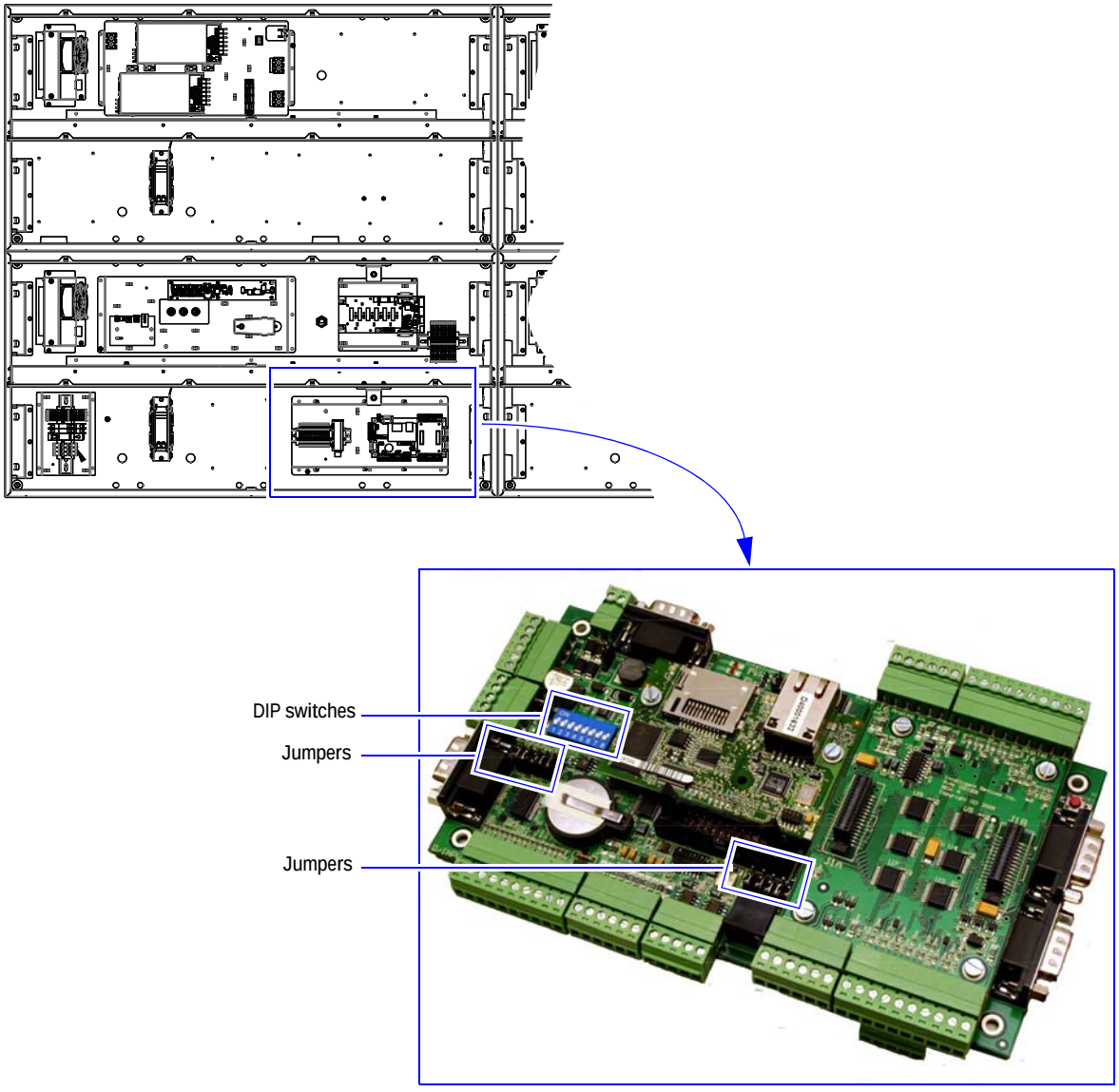
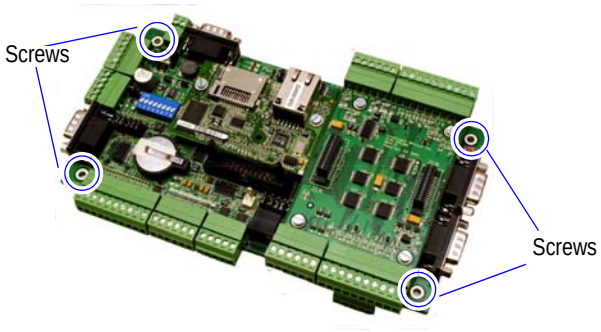



**Figure 5-2.** Typical view of controller plate.

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

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




Note: This view is representative, your controller may be different in appearance and have a different orientation.

**Figure 5-3.** Screw locations on the controller board.

## Install the replacement controller board

1. Fasten the new controller board to the sign.
2. Reconnect all the cables to the new controller board.
3. Close the sign.
4. Return power to the sign.
5. If Controller #1 is Ethernet controller (pn15029101), go to “To set the IP address for the replacement NTCIP controller” on page 5-4.

## To set the IP address for the replacement NTCIP controller

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 “NTCIP controller board” on page 2-7 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 5-4.

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

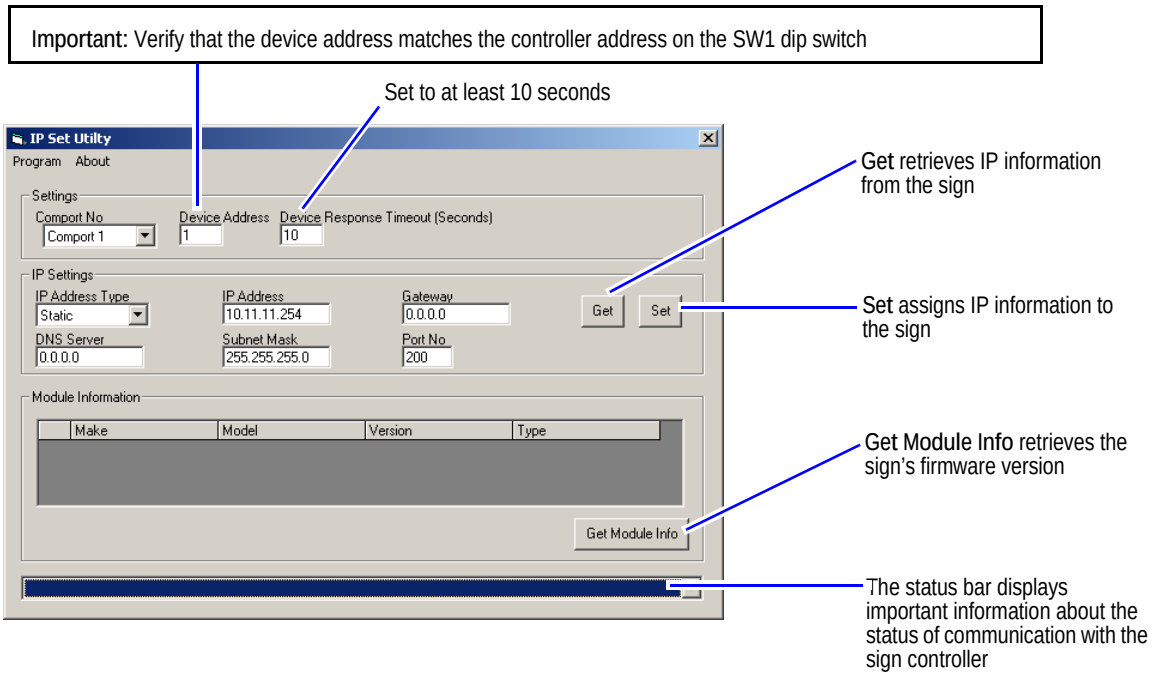



**Figure 5-4.** Setting the IP address for the controller.

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 perform a soft reset the controller.
6. Verify communications and ensure proper operation.

# Sign controller replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove the sign controller

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the controller board to be replaced.

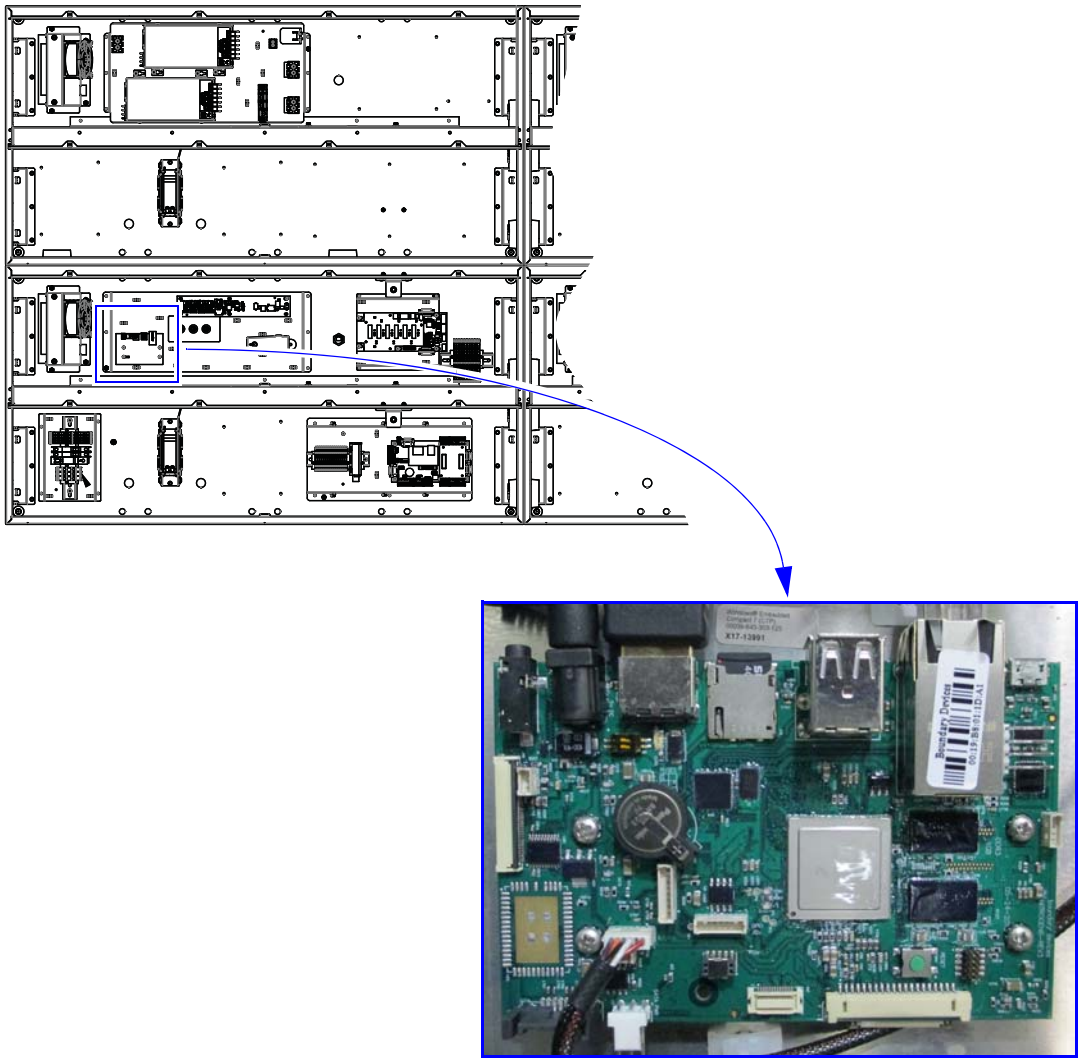
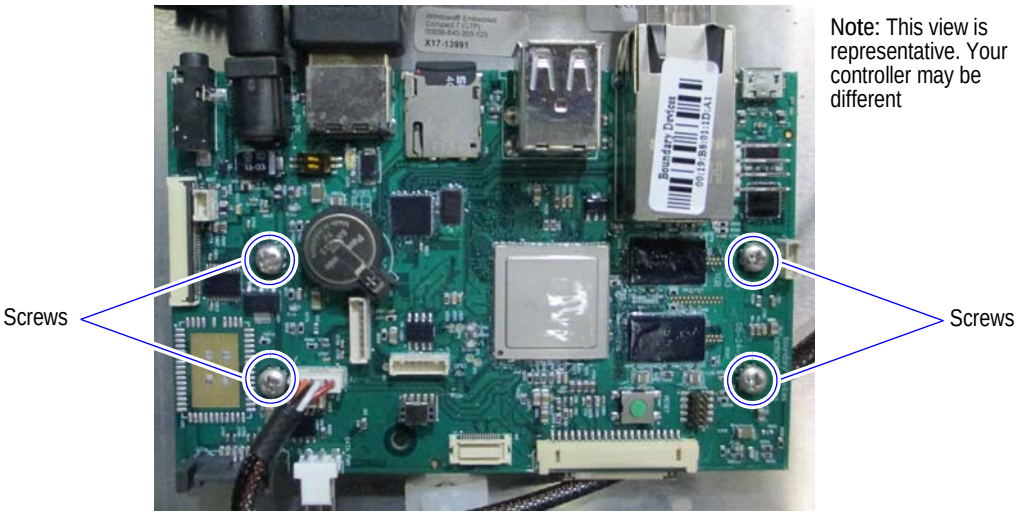


**Figure 5-5.** Typical view of NTCIP controller plate.

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

6. Remove the four screws.




Note: This view is representative. Your controller may be different

## Install the replacement controller board

1. Fasten the new controller board to the sign.
2. Reconnect all the cables to the new controller board.
3. Close the sign.
4. Return power to the sign.

# Power supply replacement

The number and location of power supplies varies depending on the size of the sign. See the sales drawings for locations in each sign size.

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove a power supply

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the power supply to be replaced.

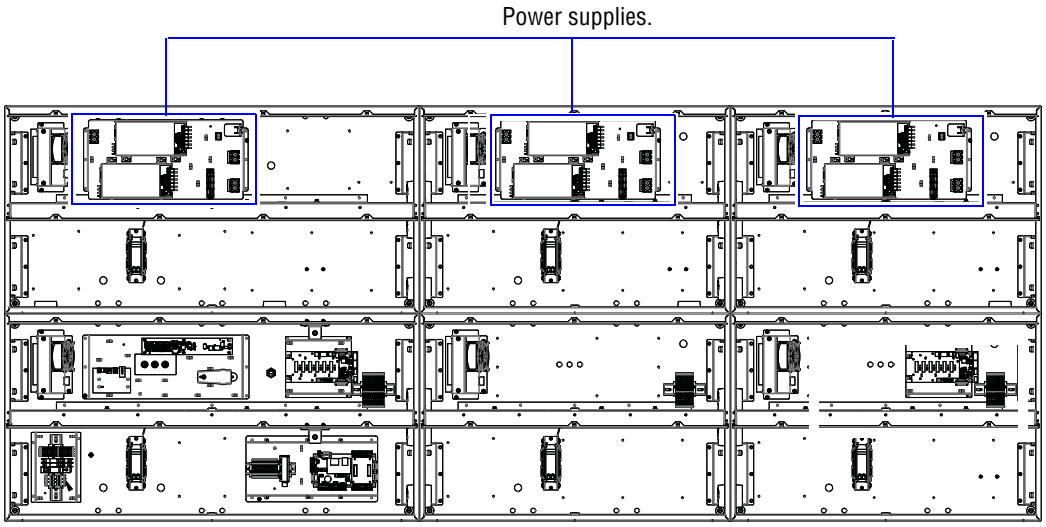



**Figure 5-6.** Power supply locations in a 64 x 160 sign.

5. Remove all wires from the power supply to be replaced.

   DC connections:

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

   AC connections:

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

6. Loosen the two screws, slide to the left or right, and lift the power supply off of the plate.

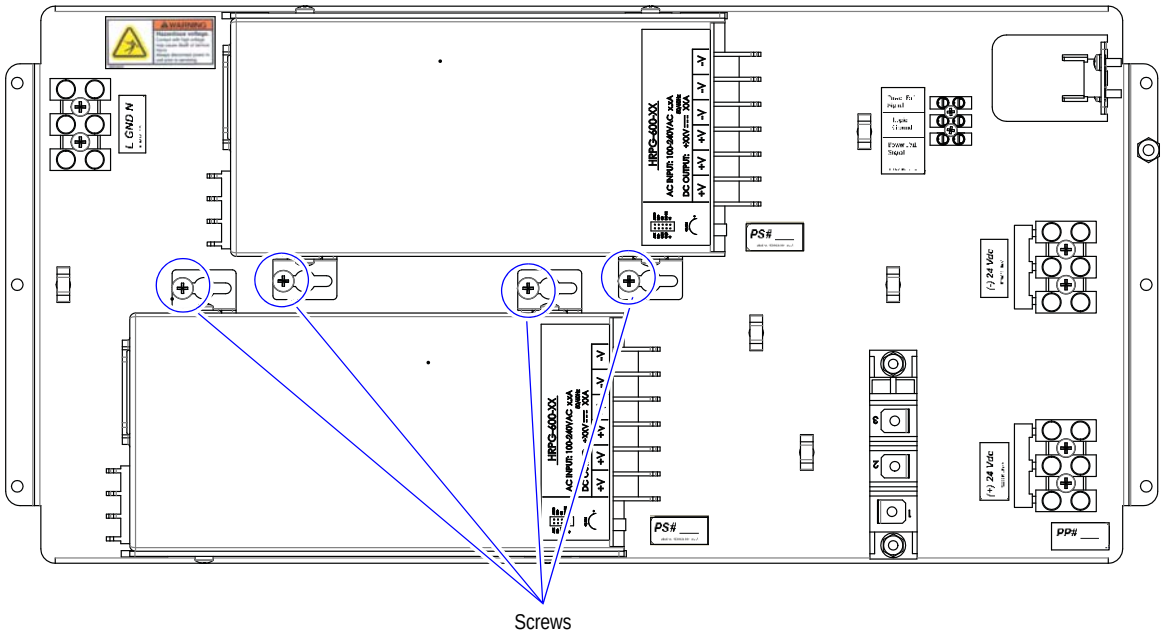



**Figure 5-7.** Screw locations on the power supply.

## Install a replacement power supply

1. Fasten the new power supply to the sign.
2. Reconnect all the wires to the replacement power supply.
3. Apply power and verify that the new power supply operates correctly.
4. Close the sign.
5. Return power to the sign.

# Diode replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove the diode module

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Remove the power panel cover.
5. Loosen the screws to disconnect the wiring from the diode module.
6. Remove the nuts (circled in Figure 5-8) securing the diode module to the power panel plate.

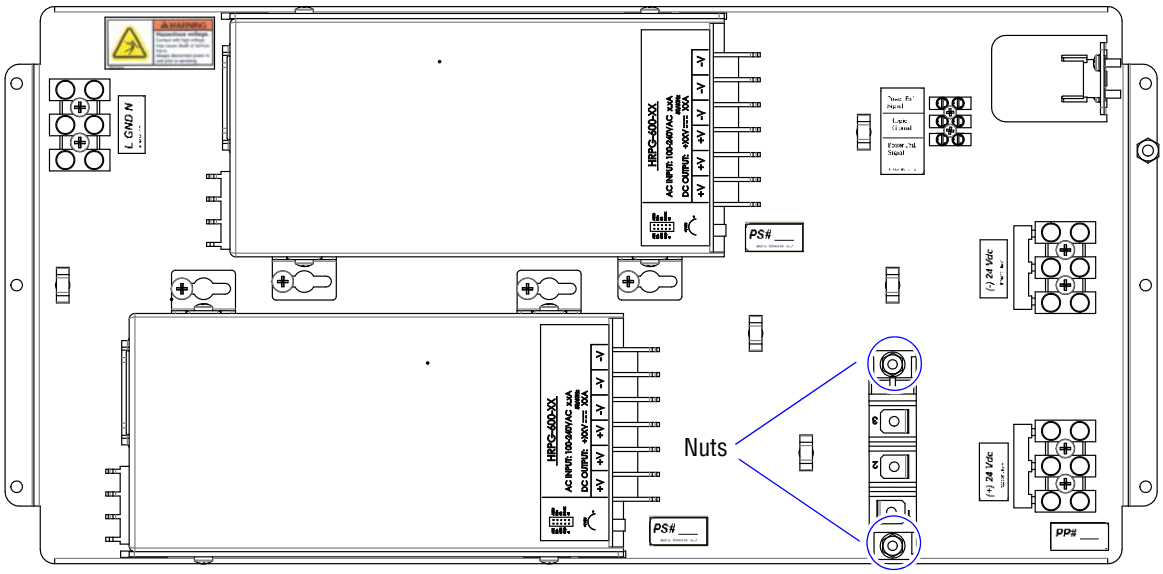



**Figure 5-8.** Nuts securing the diode module to the power plate.

## Install the replacement diode module

1. Apply thermal joint compound (pn 67004105) to the bottom of the replacement diode module (pn 30300003LFSP).
2. Bolt the replacement diode module to the power panel plate.
   Module 30300003LFSP will mount to 8-32x1” screws.
3. Reconnect wiring to the diode module and tighten the screws.

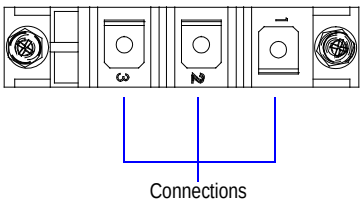



**Figure 5-9.** Diode module part number: 30300003LFSP.

4. Close the sign.
5. Return power to the sign.

# Display adapter replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove the display adapter

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Disconnect, in this order, the DVI cables, serial communication cables, the driver communication cables and power supply.

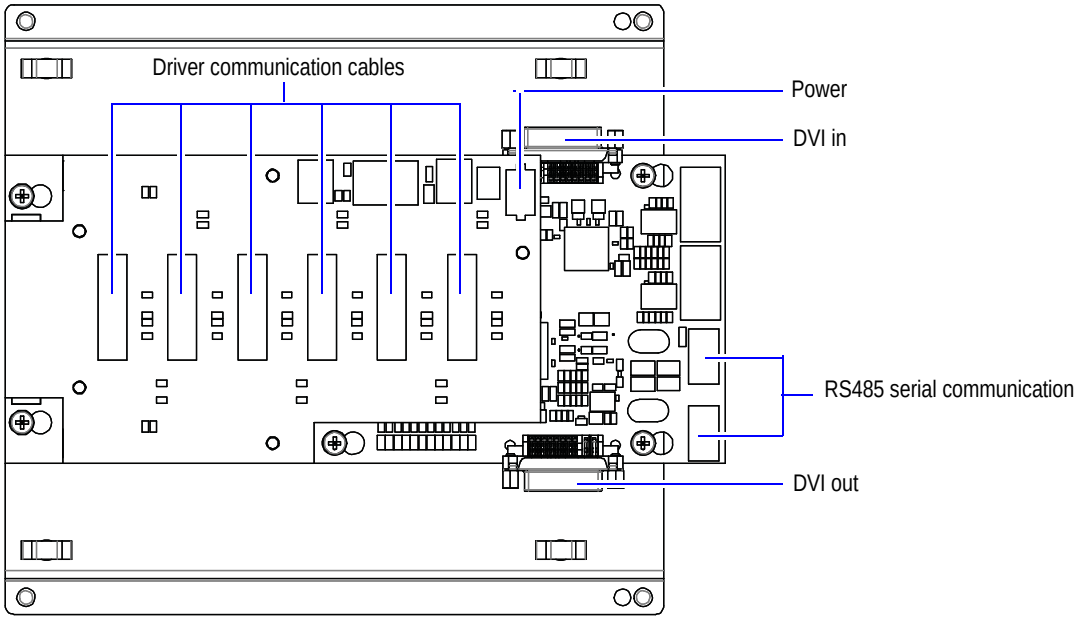



**Figure 5-10.** Disconnect cables.

5. Loosen but do not remove the five mounting screws.

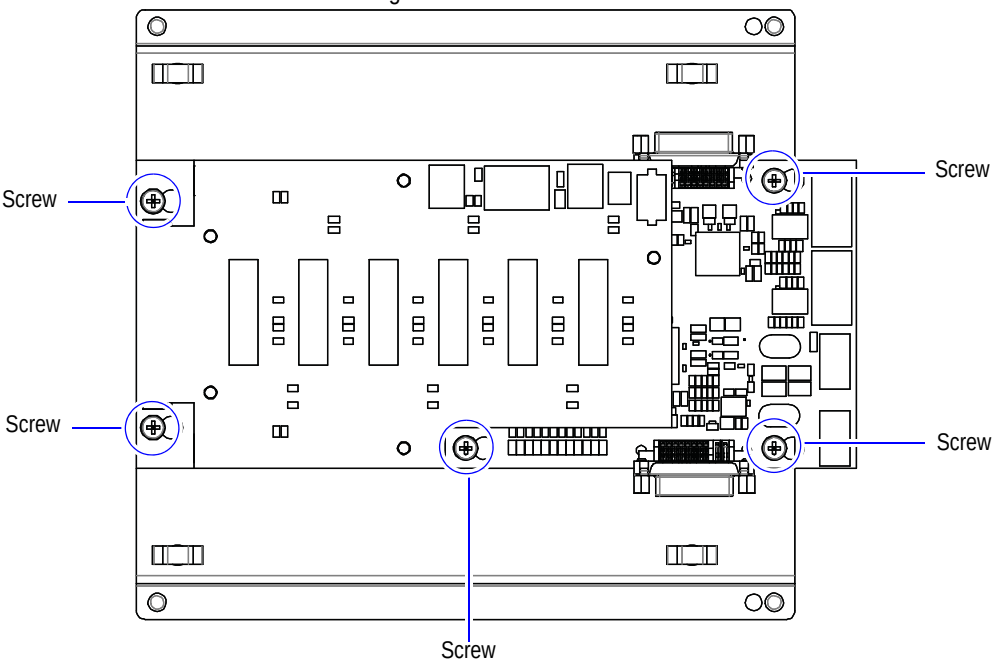



**Figure 5-11.** Loosen mounting screws.

6. Note the DIP switch settings.

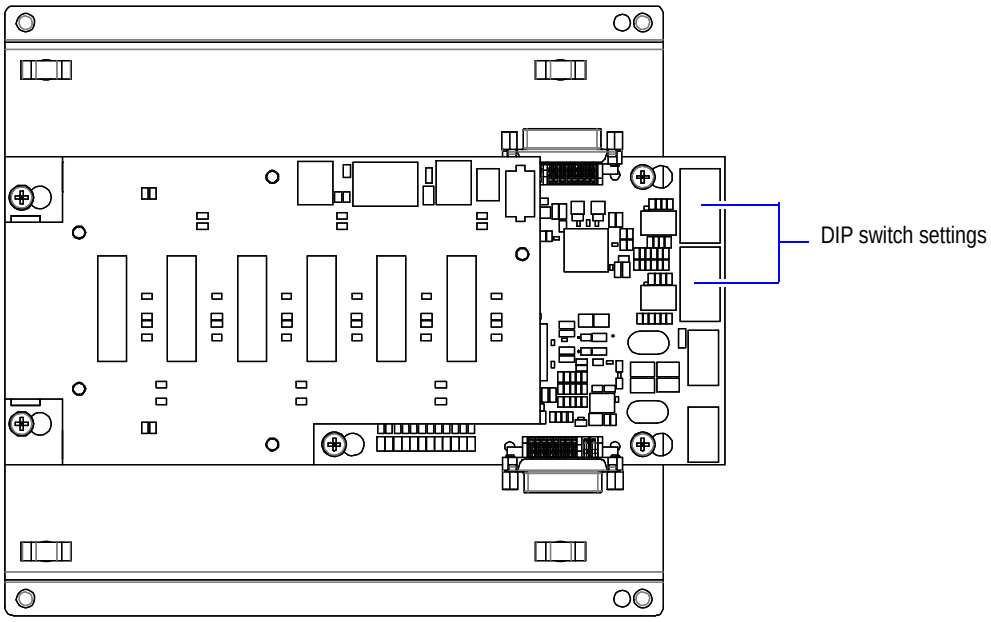



**Figure 5-12.** DIP switch settings.

## Install the replacement display adapter

1. Set the DIP switch setting to match those of the old display adapter. One display adapter can control up to 54 display boards. Each display adapter has unique DIP switch settings. Settings vary depending location in the sign. Hang the display adapter on the mounting screws. Tighten the screws to secure the display adapter.
2. Reconnect, in this order, the power cables, DVI cables, RS485 communication cables and the driver communication cables.
3. Connect the power cables and then the communication cables.
4. Close the sign.
5. Return power to the sign.

# LED driver board replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove the LED driver board

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Remove the driver assembly screws on the defective driver assembly.
5. Disconnect the cables from the power interface board.

   Note: Disconnect the cables in the order shown or damage to sign components may result.


**Figure 5-13.** Cable disconnect sequence on the power interface board.

6. Remove the driver assembly and align the new driver assembly:
   - Make sure the new driver assembly has the same orientation as the original one.
   - Leave enough room to connect the cables in the next step.

## Install the replacement LED driver board

1. Connect the cables to the power interface board.

   Note: Connect the cables in the order shown or damage to sign components may result.

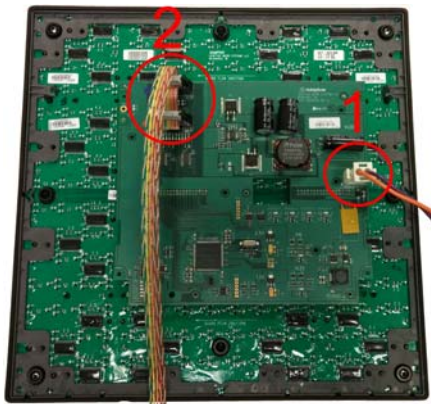



**Figure 5-14.** Cable connect sequence on the power interface board.

2. Push in the driver assembly until it is fully seated.
3. Close the sign.
4. Return power to the sign.

# Circulating fan replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Remove a circulating fan

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the fan to be replaced.
5. Disconnect the wire harness from the failed fan.
6. Loosen the two screw on the right side of the fan.

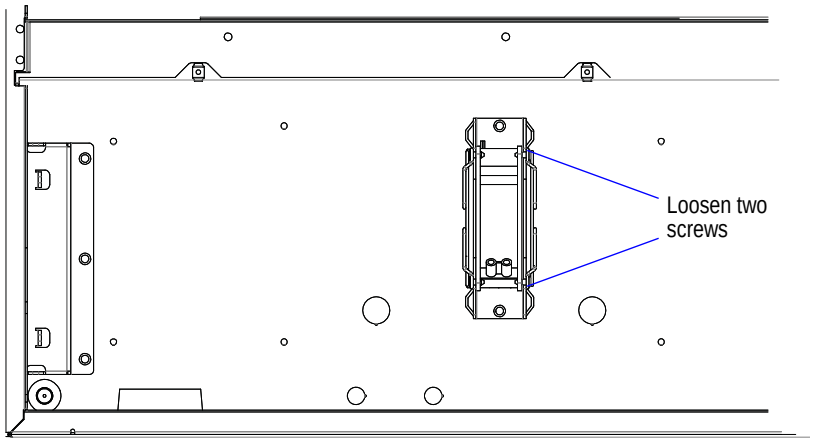



**Figure 5-15.** Screws securing the fan assembly to the sign.

7. Remove the fan.
8. Remove the fan wire carefully.

## Install a replacement circulating fan

1. Replace fan wire taking care not to bend the pins.
2. Place replacement fan in the bracket.
3. Tighten the nuts to secure the fan.
4. Return power to the sign. Do not close the sign.
5. Test the fan.
   Use a heat gun directed at the fan thermostat to verify fan operation. The thermostat must be heated to 85ºF (29.4ºC) to initiate fan operation.Verify the fan is blowing in the correct direction (upper fan right, lower fan left).

   Note: Move the heat gun around to prevent the wiring from burning.
6. Close the sign.

.

# Venting fan replacement

## Remove a venting fan

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the fan to be replaced.
5. Disconnect the wire harness from the failed fan.
6. Loosen the four screws holding the fan in place.

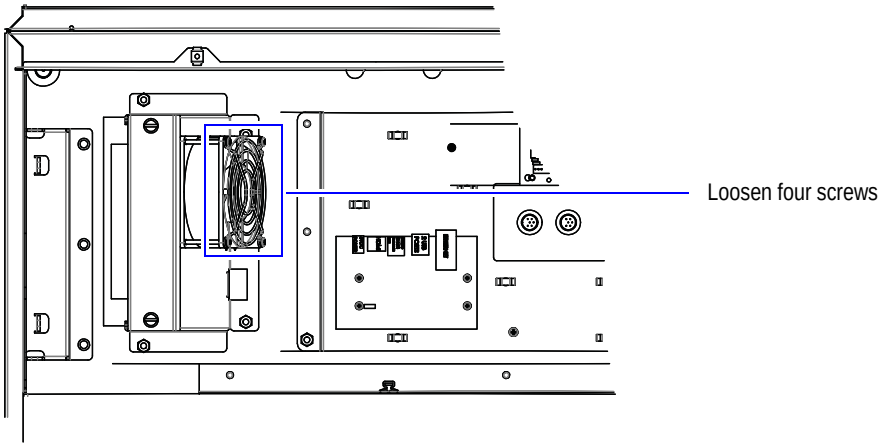



**Figure 5-16.** Screws securing the fan assembly to the sign.

7. Remove the fan.

## Install a replacement venting fan

1. Reattach the fan wire to new fan taking care not to bend pins on fan.
2. Reattach the fan to the bracket with four screws.
3. Return power to the sign. Do not close the sign.
4. Test the fan.
   Use a heat gun directed at the fan thermostat to verify fan operation. The thermostat must be heated to 85ºF (29.4ºC) to initiate fan operation.Verify the fan is blowing in the correct direction (upper fan right, lower fan left).

   Note: Move the heat gun around to prevent the wiring from burning.
5. Return power to the sign.

# Filter replacement

| WARNING | **Hazardous voltage.** Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## To replace a filter/access the rear serviceable filter

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. At the back of the sign, use the hex key (for opening the front display doors) to loosen the screw on the ventilation housing.

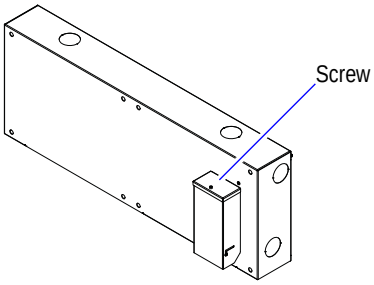



**Figure 5-17.** Hex screw location on back of case.

5. Rotate cover down as shown.

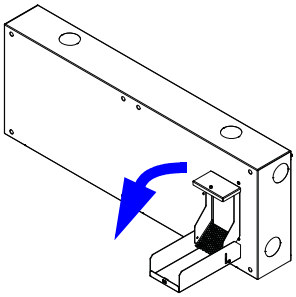


**Figure 5-18.** Exterior filter cover.

6. Remove filter from hook and loop fastener.

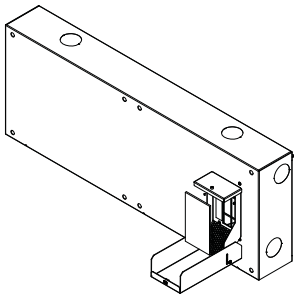


**Figure 5-19.** Filter.

7. Insert new or cleaned filter, close the ventilation housing, and then secure with the hex key.
8. Return power to the sign.

## To replace a filter/access the front serviceable filter

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. Locate the front access filter cover as shown below.

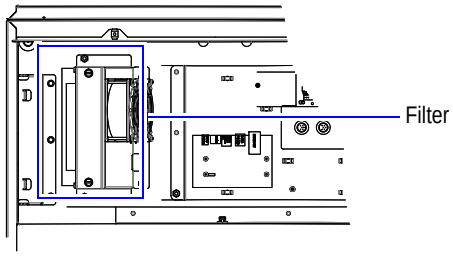



**Figure 5-20.** Filter location inside of sign.

5. Remove the filter cover by loosening two thumb screws.

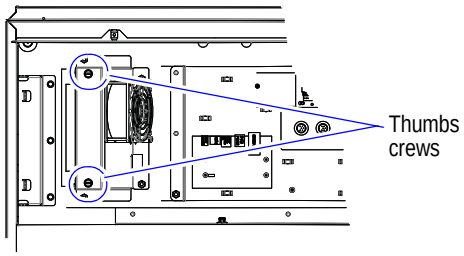



**Figure 5-21.** Removing the filter cover.

6. Reach in and remove filter.
7. Insert new or cleaned filter.
8. Replace the filter cover and tighten the thumb screws.
9. Close the sign.
10. Return power to the sign.

# Circuit breaker replacement

## Remove the circuit breaker

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. The circuit breaker is located next to the surge suppressor.

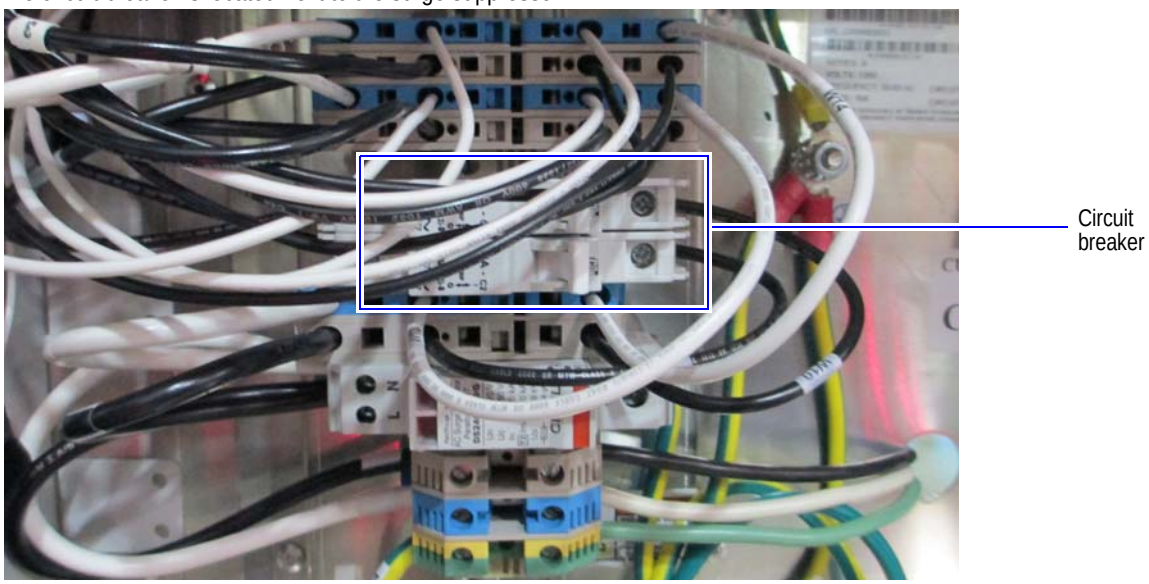



**Figure 5-22.** Location of circuit breaker

5. Loose the screws at the top and bottom of the circuit breaker. Disconnect the wires.

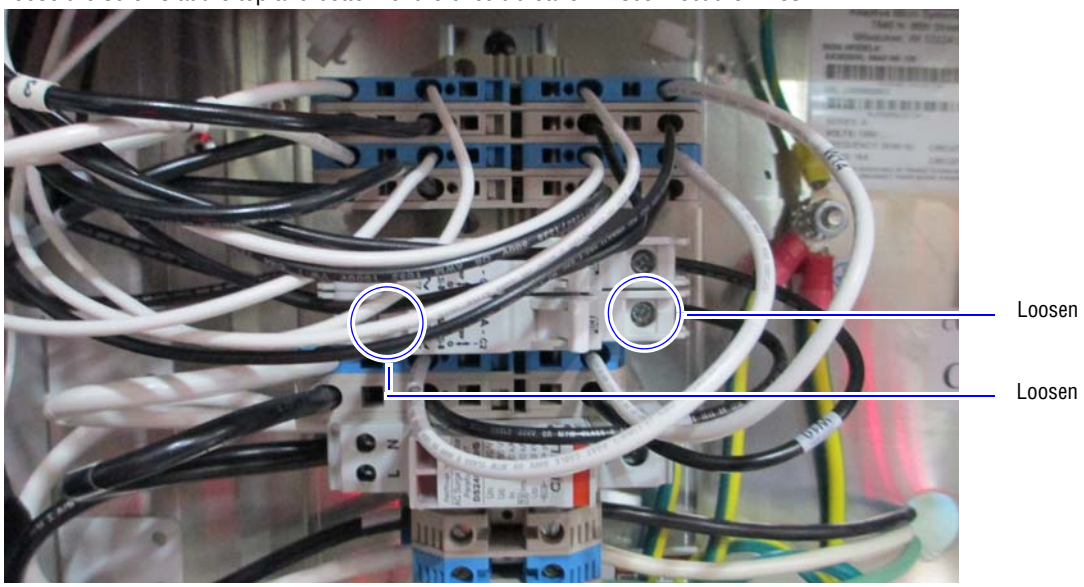



**Figure 5-23.** Loosen the screws.

6. Release the circuit breaker from the mounting rail by using a 1/8" flat head screw driver to press in and down on the yellow release tab under the circuit breaker. Note: yellow tab is not visible when circuit breaker is installed.

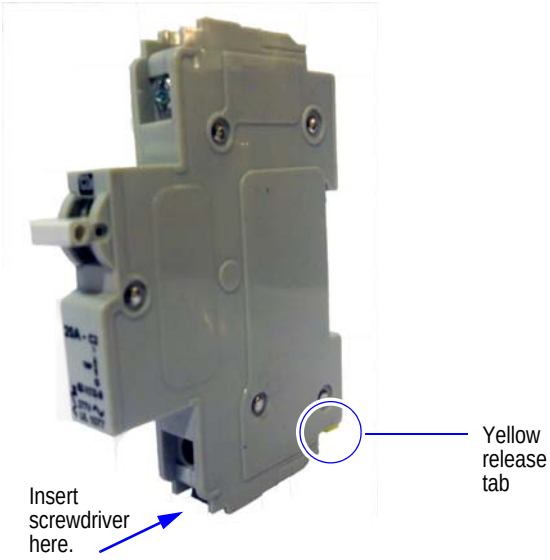



**Figure 5-24.** Location of release tab.

## Install the replacement circuit breaker

1. Snap the replacement circuit breaker onto the mounting rail.
2. Lock the circuit breaker to the rail by using a flathead screwdriver. Push in and up.
3. Reconnect the wires.
4. Tighten the screws.
5. Re-install the display board. Connect the power cables and then the communication cables.
6. Connect power to the sign.

# Surge suppressor replacement

## Remove the surge suppressor

1. Remove power from the sign. Note there may be more than one power source present.
2. Open the sign. See “Opening a sign” on page 5-1.
3. Turn the sign breaker to the OFF position. Note there may be more than one breaker in a sign.
4. No tools are necessary to remove the surge suppressor.

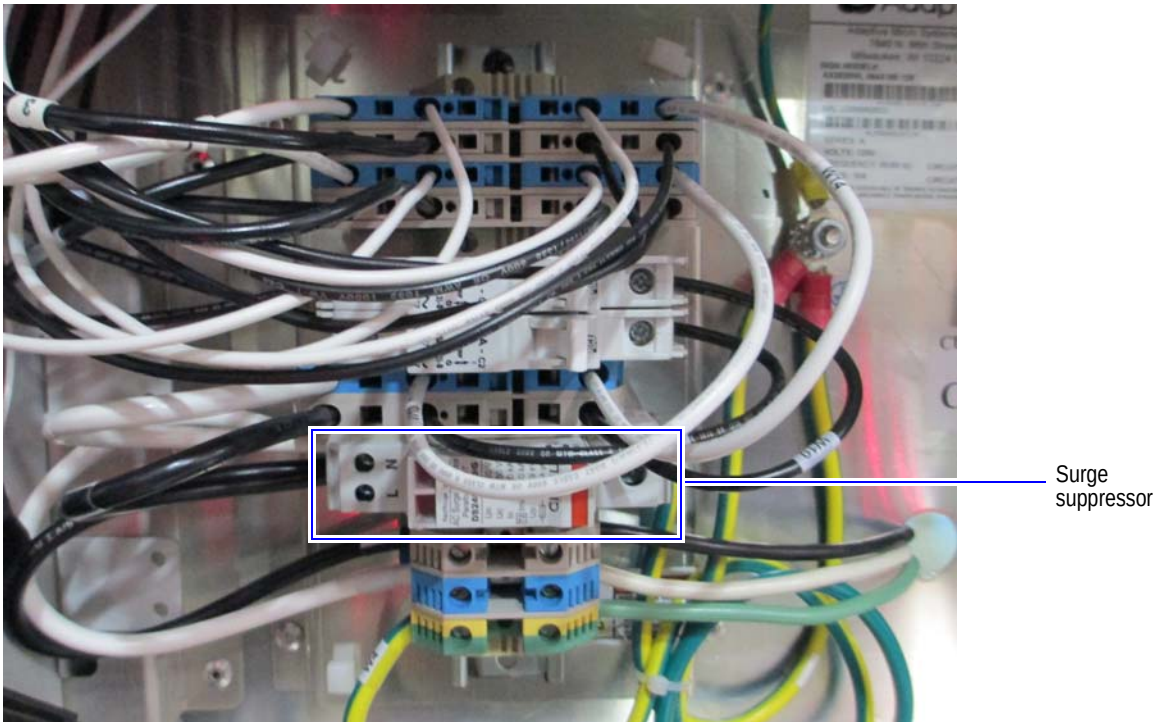



**Figure 5-25.** Location of surge suppressor.

5. Using one hand firmly grip the top and bottom or the surge suppressor.
6. Pull straight back to release the surge suppressor.

## Install the replacement surge suppressor

1. Snap the new surge suppressor into place.
2. Re-install the display board.
3. Connect power to the sign.

# Light sensor replacement

| WARNING | Hazardous voltage. Contact with high voltage may cause death or serious injury. Always disconnect power to unit prior to service. |
|---|---|

## Guidelines for mounting the light sensor

- The light sensor must be mounted facing in the same direction the front of the sign is facing.
- Make sure the light sensor is NOT in the shade because this may make it difficult to read your sign during brighter periods of the day.
- You can strap the light sensor to a pole, but make sure it is facing the same direction as the front of the sign.
- Do NOT mount light sensor directly to the sign; however it is okay to mount to the sign's sub–structure.
- The light sensor plug connection must be connected properly for a weather–tight seal.

## Installing the light sensor assembly

1. Mount the light sensor.
   Use one of the following methods to mount the light sensor:

   Traditional wall mount

   - Position the light sensor on a flat vertical surface in close proximity to the sign and make sure it is facing the same direction as the front of the sign.
   - Insert six screws (not supplied) into the mounting holes (three on each side) and tighten.

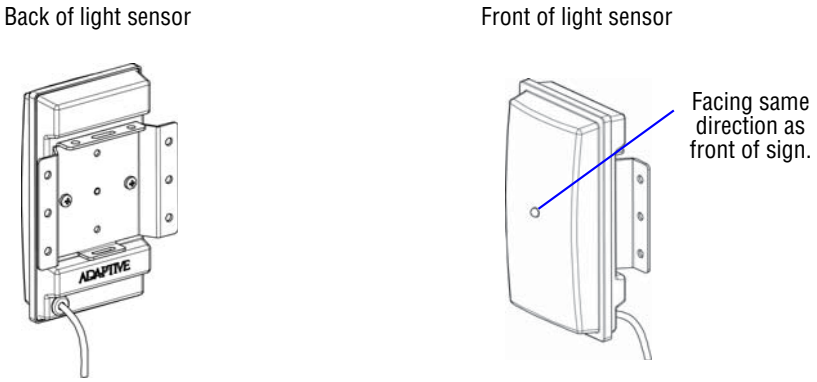



**Figure 5-26.** Traditional wall mount

Perpendicular wall mount

- Unscrew the two bracket screws and rotate the bracket 90 degrees.
- Tighten the bracket into position with the two screws.
- Position the side of the light sensor on a flat vertical surface in close proximity to the sign, making sure it is facing the same direction as the sign.
- Insert two screws (not supplied) into the mounting holes and tighten.

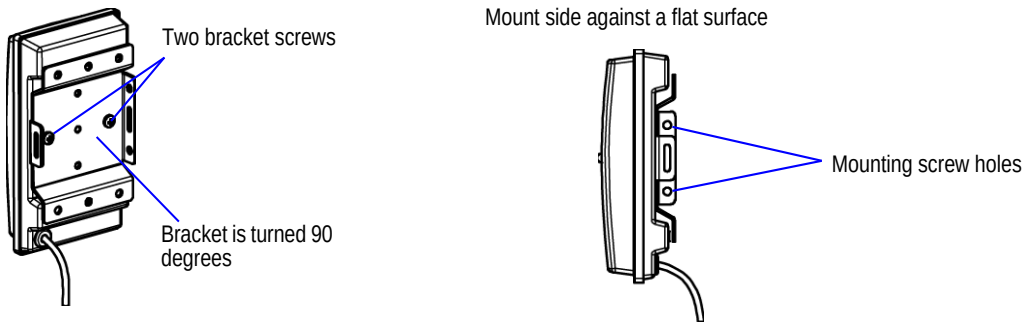



**Figure 5-27.** Perpendicular wall mount

Cable tie wrap installation

- If applicable, unscrew the two bracket screws, rotate the bracket 90 degrees, and tighten the bracket into position with the two screws.
- In close proximity to the sign, route the cable tie wrap through the slots in the light sensor bracket and around the pole. Make sure it is facing the same direction as the front of the sign before tightening.

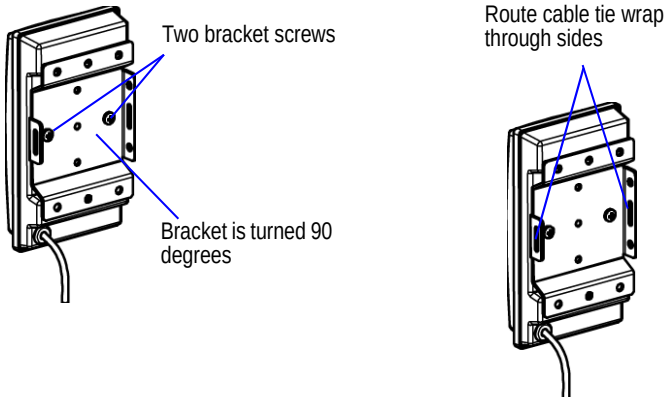



**Figure 5-28.** Cable tie wrap installation

2. Connect the light sensor to the sign
   Adaptive Micro Systems recommends that you turn off power to the sign prior to connecting the light sensor. The sign will only recognize the presence of the light sensor when it first starts. So, if you connect the light sensor while the sign is powered up, you will have to cycle power to the sign in order for it to acknowledge the presence of the light sensor.
3. Route the light sensor cable to the customer interface panel on the back of the sign's controller case.
4. Plug the light sensor cable into the port on the back of the sign. Leave a sufficient amount of slack to create a "Service Loop".

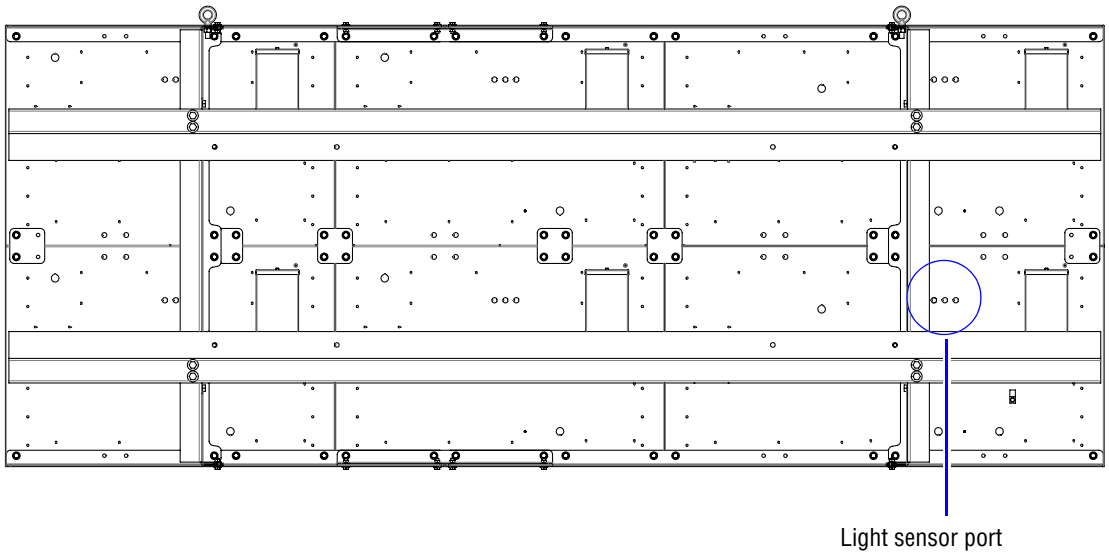



**Figure 5-29.** Light sensor port on the back of the sign.

Note: The sign will not acknowledge the presence of the light sensor(s) until power is cycled.

## Short error status conversion

The following steps explain how to convert the error status bits to error codes using Windows Calculator.

### Convert short error status to error codes in Intelligent Controls

1. Open Windows Calculator (Start > Programs > Accessories > Calculator).

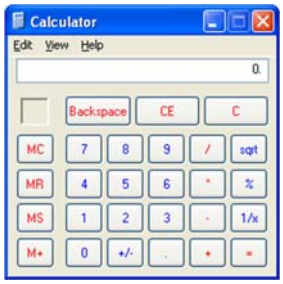



Figure A-1. Default view of Windows Calculator.

2. Switch to Scientific view (View > Scientific).


Figure A-2. Selecting Scientific view.

3. Click Dec.

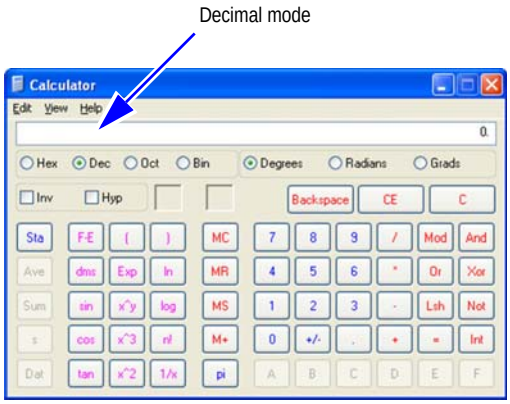



Figure A-3. Calculator mode.

4. Enter the Short Error Status decimal number from Intelligent Control.

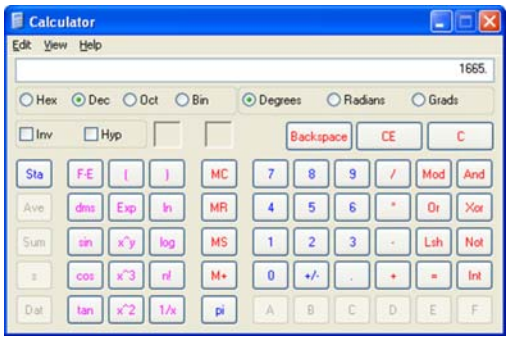



Figure A-4. Sample Short Error Status decimal number entered into the Calculator.

5. Click Bin.

   This converts the decimal value to the binary equivalent.

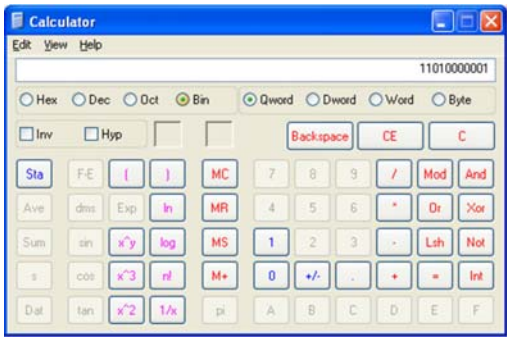



Figure A-5. Binary equivalent of the decimal value entered in the previous step.

   Each digit in the resulting binary equivalent is always a zero or a one. One indicates an error. Starting with zero, and counting from the right you can use the position of each error to determine the meaning.

Example:

1. Start with 1665 as the Decimal Short Error Status number.
2. Convert it to binary. The binary number equivalent = 11010000001.
3. Determine the Short Error Status position.

| Decimal Short Error Status number | 1665 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Binary number equivalent | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Short Error Status position | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

   Starting with zero on the right, log the position of each 1. In this case, the positions are 0, 7, 9, and 10.

4. Look up each position in the “Error status definitions” table on page 3.

   In this case:

   0 = Reserved
   7 = Message error
   9 = Temperature warning
   10 = Fan error

## Error status definitions

| (Bit) Position | Error | (Bit) Position | Error |
|---|---|---|---|
| 0 | Other error | 8 | Controller error |
| 1 | Communications error | 9 | Temperature warning |
| 2 | Power error | 10 | Fan error |
| 3 | Attached device error | 11 | Critical temperature error |
| 4 | Lamp error | 12 | Drum sign rotor error (not applicable to LED signs) |
| 5 | Pixel error | 13 | Open cabinet door error |
| 6 | Photocell error | 14 | Humidity warning |
| 7 | Message error | 15 | Undefined |

## Over-temperature conditions reference

| Condition | Location | Temperature | Light output %* | (Bit) Position | Warning |
|---|---|---|---|---|---|
| 1 | Measured at the display adapters | >59° C | 90 | 9 | Temperature warning |
| | | >63° C | 80 | 9 | Temperature warning |
| | | >67° C | 70 | 9 | Temperature warning |
| | | >71° C | 60 | 9 | Temperature warning |
| | | >75° C | 50 | 9 | Temperature warning |
| 2 | Measured at the display adapters | >79°C | 0 | 7, 9 and 11 | • Message error<br>• Temperature warning<br>• Critical temperature error |
| 3 | Measured at the NTCIP controller plate and power supply plates | One location >71°C | N/A | 9 | Temperature warning |
| 4 | Measured at the NTCIP controller plate and power supply plates | Both locations >71°C | N/A | 9 and 11 | • Temperature warming<br>• Critical temperature error |
| 5 | Measured at the NTCIP controller plate and power supply plates | Both locations >71°C for over 1 hour | Message blanked | 7, 9 and 11 | • Message error<br>• Temperature warning<br>• Critical temperature error |

*Light output as percentage of brightness level setting

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