Ground Control Cabinet

Service Manual

P1507-12/336

Manual part number: 1507610801

Revision date: December 3, 2009

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Contents

Introduction

Purpose

This manual is intended as a guide for maintenance and repairs considered field serviceable.

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 internal component level.

Revision history

Revision	Date	Notes
1507610801 rev A	November 12, 2009	Initial Release

Related documentation

Technical documentation can be found at Adaptive's web site — www.adaptivedisplays.com/manuals/:

Part #	Manual title	Description
1507610701	28x72 Front Access Full Matrix LED Sign Maintenance Manual	This manual explains how to maintain and service a 28x72 Front Access LED sign.
15075051DR	Control Cabinet Wiring Diagram	Wiring details for control cabinet.
15075052DR	Sign Wiring Diagram	Wiring details for sign.
15075053DR	LCD Pass Through Diagram	Wiring details for ground controller.
00-0005	Preventing Electrostatic Discharge Damage	Tech memo.

Safety information

Preventing electrostatic discharge (ESD)

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, *"Preventing Electrostatic Discharge (ESD) Damage,"* available on our Web site at http://www.adaptivedisplays.com.

Equipment symbols

Chassis ground

Warnings, cautions, and notices

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

Lightning strike protection

A control cabinet bonded to an earth ground has a means of dissipating the high voltage and current from a lightning strike. The resistance of the grounding electrode must be as low as possible. However, damage can still occur to the cabinet's electronic equipment from lightning voltage transients.

Though some surge protection is incorporated into the control cabinet, to protect a cabinet from high-voltage lightning transients, surge protectors need to be installed in accordance with NEC Articles 280 and 285.

EMI compliance

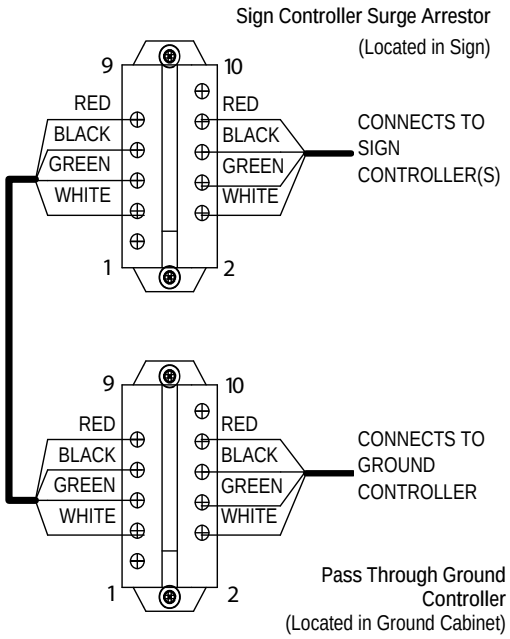
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with installation guidelines, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Cabinet components

Quick Start Guide

- **Mounting the Ground Cabinet:** Mount cabinet to the pole using straps (third-party supplied part) to the three mounting brackets provided.
- **Electrical Connection:** Connect Control Center load center to 120/240V single phase 40A service. Connect sign to dual pole 30A breaker.
- **Communications Connection**: Connect communications cabling between ground controller to sign controller surge arrestors per diagram at right. Ground controller dipswitches should be set the same as the dipswitches on the sign controller for proper operation.



Overview

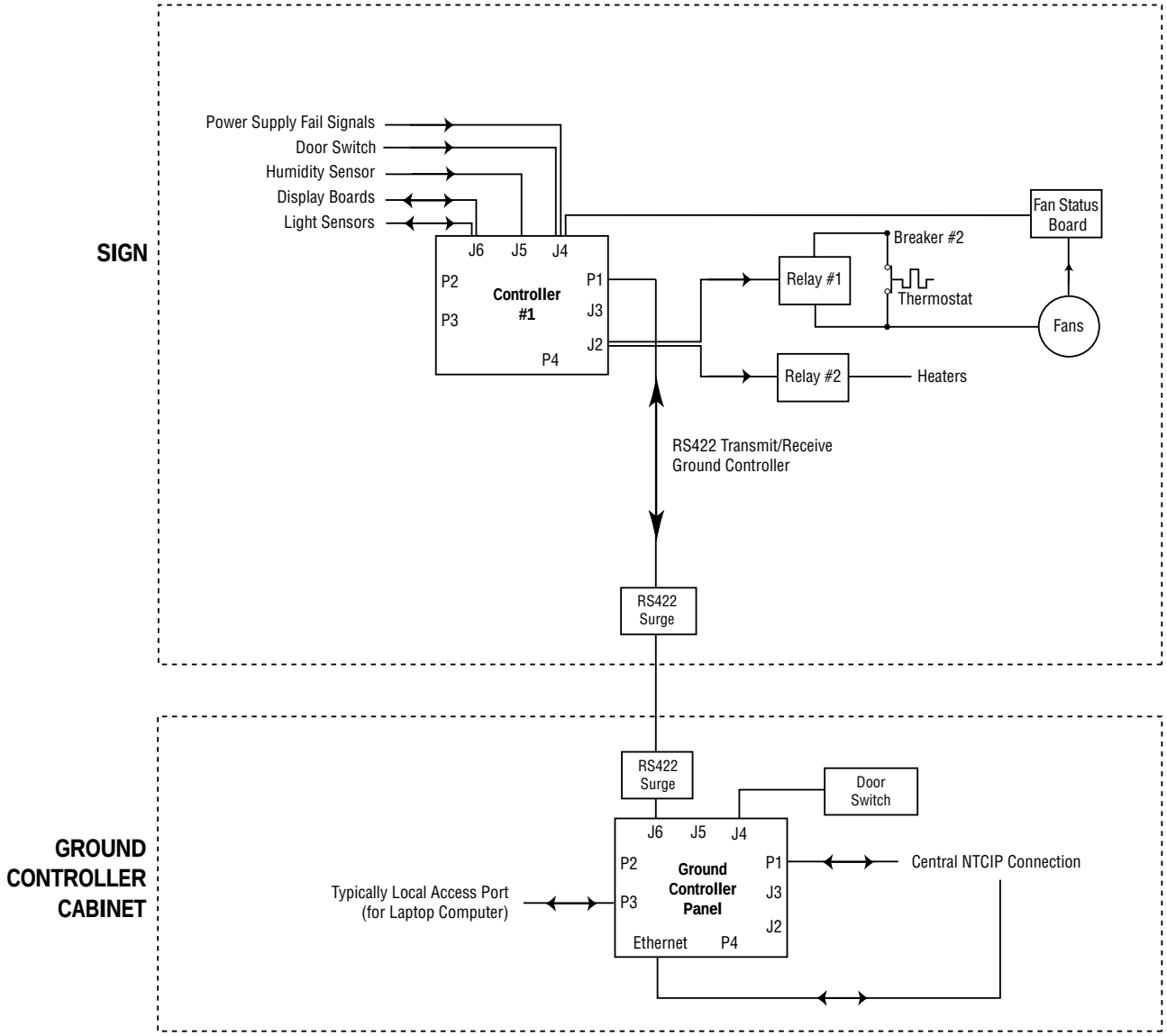
The control cabinet creates a secured on-site centralized location for service personnel to easily access the sign's networking and operating equipment. This section gives a brief description on each individual component in the control cabinet and how to field replace each item.

Note: Adaptive recommends all equipment documentation/manuals associated with the contents of the control cabinet is kept inside the cabinet. Record all service/maintenance performed on the control cabinet into the service log typically located in the document drawer.

WARNING! Hazardous voltage may be present in cabinet. Contact with high voltage may cause death or serious injury. Always disconnect power to equipment prior to servicing.

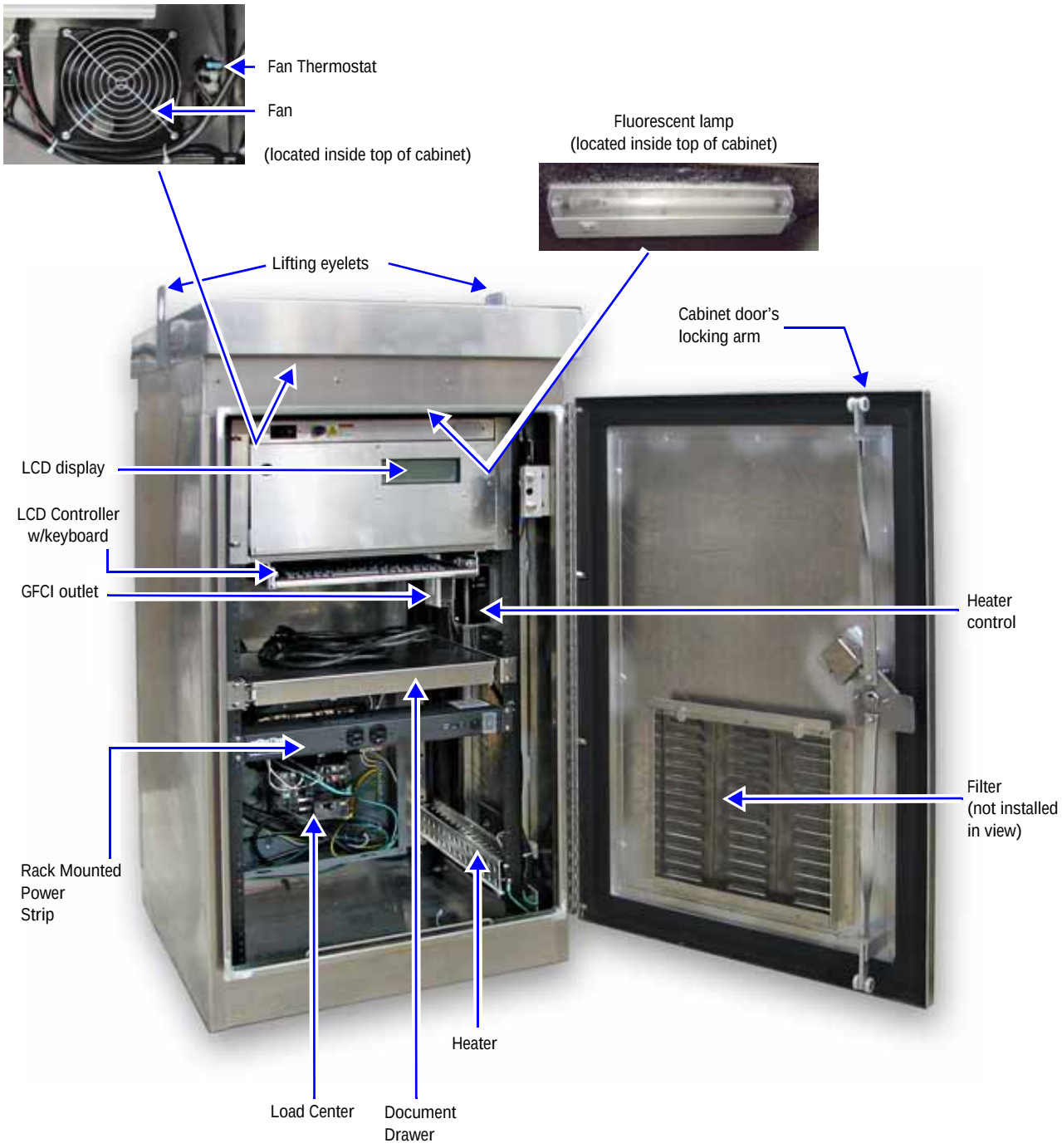
Notice: Ensure the cabinet door is completely closed and secured.

Controller Block Diagram

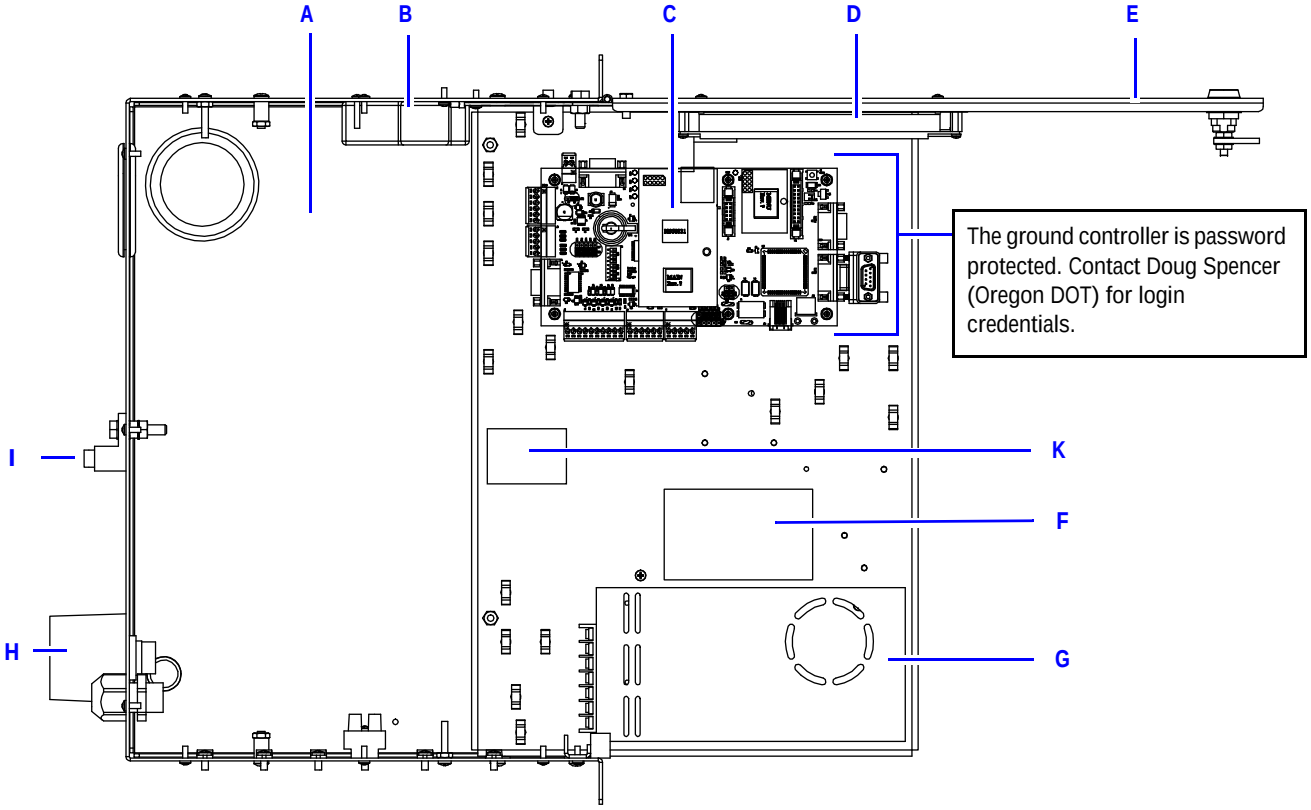


Control cabinet

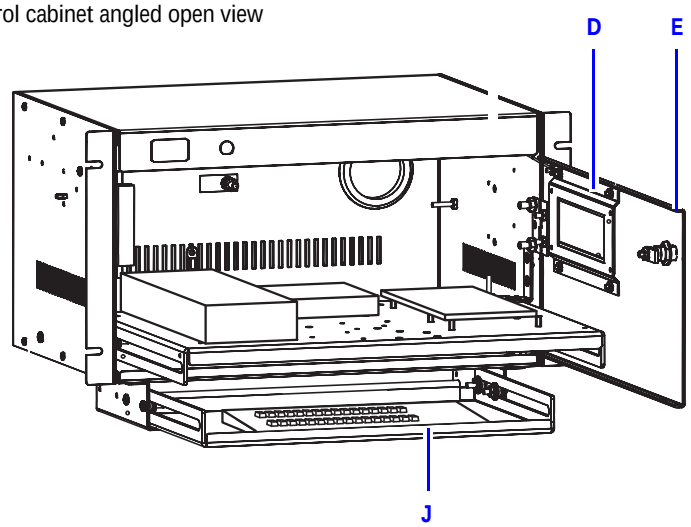
The NEMA 3R rated cabinet enclosure is equipped with fan and heater controls to maintain environmental conditions. Located inside the cabinet is a GFCI receptacle, fluorescent lamp, surge arrestor, and LCD controller with terminal.



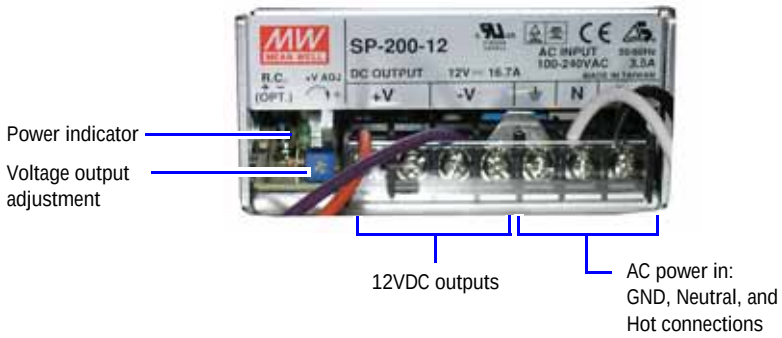
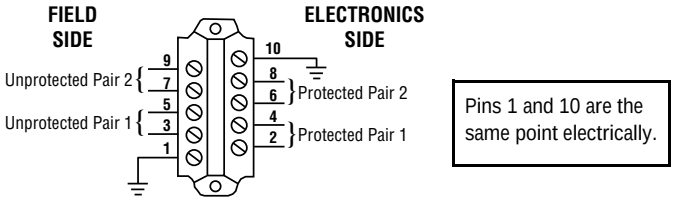
LCD Ground Controller Detailed View



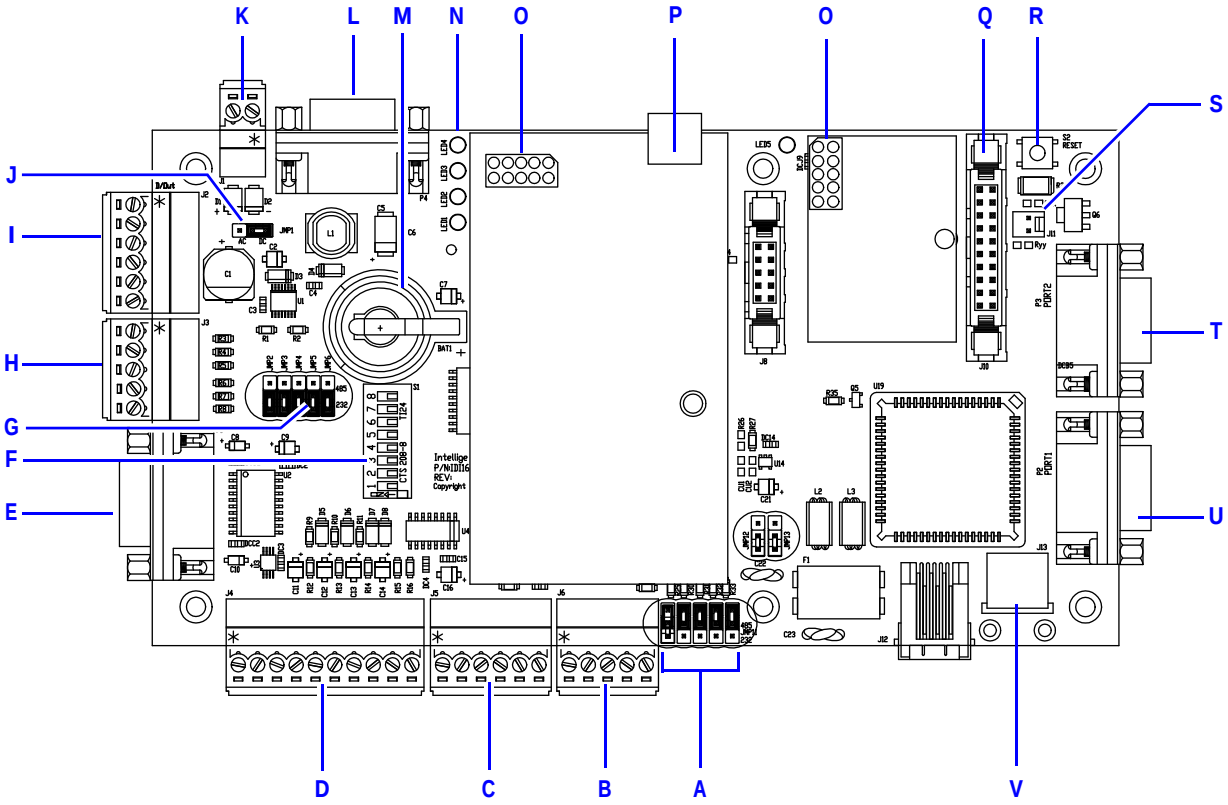
Ground control cabinet angled open view



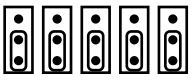
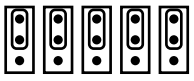
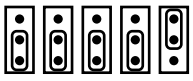
Item	Name	Part #	Description
A	GROUND CONTROL CABINET	—	19" rack mounted ground controller cabinet.
B	ETHERNET SURGE SUPPRESSOR	1507101201	Protects an Ethernet data port from damaging surges.
C	GROUND CONTROLLER	10950221	The ground controller is connected to the NTCIP network and works in conjunction with the sign controller board to control sign operation. Refer to wiring diagram for the proper firmware part number to be loaded into this assembly.
D	LCD MODULE SCREEN	15009308	240 x 64 pixel LCD display.

E	CABINET DOOR	—	Cabinet door with lock. 5/32 Hex tool required to open the cabinet.
F	MODEM	10519024	Modem is configured for 9600 baud from the factory. It is used to interface via PN 43312001 (Telephone Surge Arrestor) to the DOT-supplied telephone line for control of the ground controller.
G	POWER SUPPLY	40656304	Meanwell SP-200-12 switching power supply, 12VDC output: 
H	SURGE ARRESTOR	30352001	Protect systems against transient surge events.
I	GROUND LUG	—	Connects to a customer supplied ground.
J	KEYBOARD	10729911	The keyboard is used to type commands into the ground controller.
K	SURGE PROTECTOR	30350018 30350019	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: 

Ground Controller PCB Assembly (PN 10950221)



Item A and G jumpers must match for proper operation and communication between the controllers.

Item	PCB label	Name	Description
A	JP7 TO JP11	COMM PORT SELECTION JUMPERS FOR J6 AND P2	Set to RS485 with termination. Jumper settings must match Item G jumpers. RS232  RS485 with termination  RS485 without termination 
B	J6	COMM PORT	Jumper configured for RS422. This port used for the communications to sign controller.
C	J5 A/INPUT	ANALOG INPUTS	
D	J4 D/INPUT	DIGITAL INPUTS	
E	P1	RS232 PORT	Central control port.
F	S1	DIP SWITCHES	Dipswitch for addressing the ground controller.
G	JMP2 TO JMP6		Refer to jumper termination settings for Item A; these settings must match on the ground controller for proper operation and communication between the controllers.
H	J3	COMM PORT	Not used.
I	J2	DIGITAL OUTPUTS	
J	JMP1		Set to DC.
K	J1	POWER CONNECTOR	Connects to Power Panel for DC Power.
L	P4	COMM PORT	Connects to a local laptop or debug port.

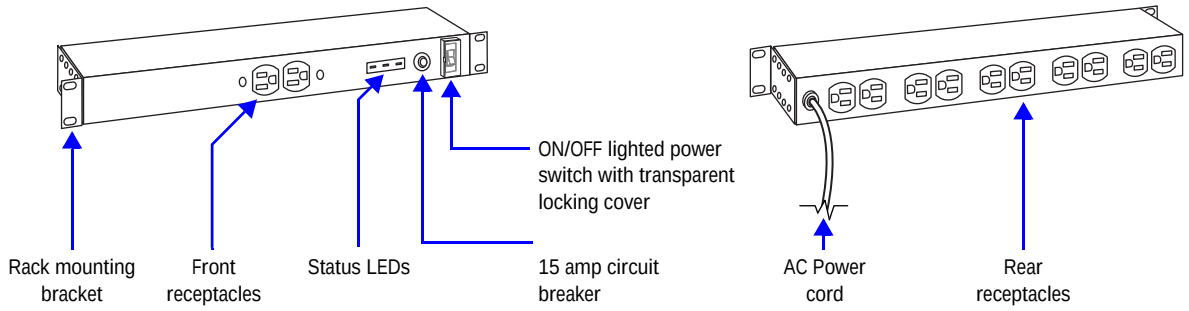
M	BAT1	MEMORY BACKUP	3V lithium battery (Panasonic CR2032 or equivalent).
N	LED1 TO LED4	DIAGNOSTIC LEDS	• LED1—Controller Heartbeat. • LED2—Flashes when receiving communications from Central/Local port P1 or P3. • LED3—Flashes when receiving communications from menu processor. • LED4—Flashes with communications to and from sign controller #3.
O	J5	PROGRAMMING PORT	Used to program the controller with a rabbit programming cable.
P		ETHERNET PORT	Ethernet 10-BASE T connection
Q	J10	LCD HEADER	
R	S2 RESET	CONTROLLER RESET SWITCH	Used to do a soft reset on the controller.
S	J11	LCD BACKLIGHT	
T	P3	COMM PORT	Typically used for a local laptop top connection.
U	P2	COMM PORT	Not used.
V	J13	PS/2 KEYBOARD	Connects to the keyboard.

LCD Ground Controller

The function of this assembly is to provide an LCD interface for service personnel. The ground controller is used in a passthrough mode to communicate to the sign controller; i.e., all data that is sent to ethernet and RS232 is passed to the sign controller. All responses from the sign controller are directed back to the appropriate port. The ground controller communicates to the sign controller via NTCIP protocol. The communications use the J6 port on the ground controller and the J3 port on the sign controller, because these support RS422. Both sign and ground controller must be set to the same serial address. See the table labelled“DIP switch addressing” on page 14 for the proper settings.

Rack mounted power strip (PN 46000032)

The rack mounted power strip with 12 NEMA 5-15R receptacles (2 front and 10 rear) provides additional electrical outlets and surge protection for the addition of electrical components contained inside the control cabinet. The power strip features front panel LED status indicators, lighted ON/OFF switch, and a 15 amp circuit breaker.



Maintenance and Service

Overview

The following parts can be serviced and maintained as needed.

Part	Suggested Interval	Page
Ground Controller	6 months	13
Fan	6 months	15
Heater	6 months	15
Fan Thermostat	6 months	16
Heater Thermostat	6 months	17
Fan Filter	6 months	18
Fluorescent Light	6 months	19
Transient Voltage Suppressors (TVS)	6 months	20
Rack Mounted Power Strip	6 months	21

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

WARNING! Failure to properly ground the control cabinet could result in elevated voltage from lightning entering the cabinet seeking a path to earth. The high voltage can result in electric shock, fires, and the destruction of the cabinet from lightning.

Physical Inspection

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

Exterior inspection

- Check for any physical damage to the exterior of the cabinet.
- 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 cabinet for general cleanliness.

Interior inspection

- Check for any physical damage to the interior of the cabinet.
- 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.
- Check that the cabinet's filters and vents are clear of debris.

Ground Controller Board Replacement

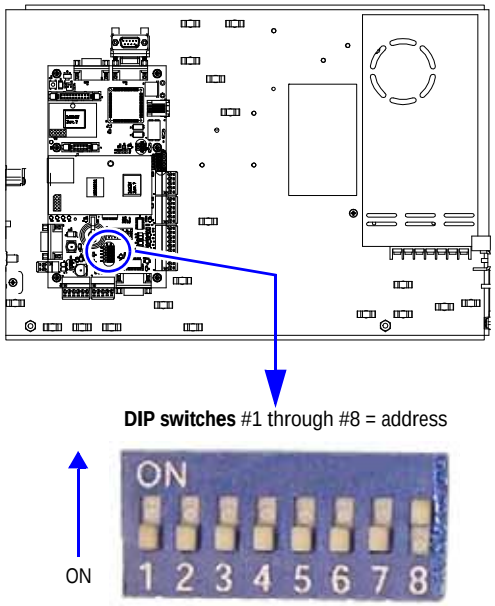
WARNING! Hazardous voltage. Contact with high voltage may cause serious injury or death. Always disconnect power to unit prior to servicing.

⇨ To replace the ground controller board

1. Switch all control cabinet breakers to the OFF position, except the breaker for the lights.
2. Locate ground controller; see “Inside views” on page 18 for the location.
3. Set the DIP switches and jumpers (JMP2-6 and JP7-11) on the replacement board to match the settings on the board being replaced. At least one dip switch must be on for the controller to function properly.

   Note: The sign controller’s and the ground controller’s dip switch addresses must match for them to communicate.

Figure 1. Ground Controller panel DIP switch settings.



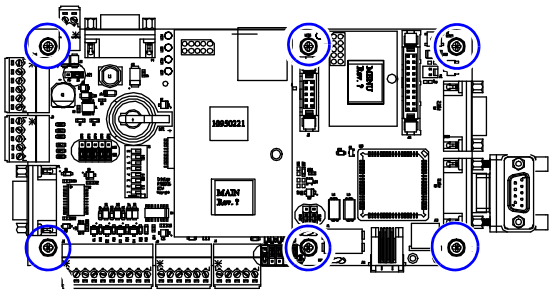
Notice: Turning all dip switches off will cause the controller to lose its IP, Subnet mask, and Ethernet routing information.

DIP switch addressing

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

4. Disconnect all the cables from the controller board to be replaced.
5. Remove the six screws (see Figure 2) that hold the controller board to the panel. Remove the controller board from the sign.

Figure 2. Locations of the screws securing the controller board to the panel.



6. Fasten the new controller board to the ground controller plate.
7. Reconnect all the cables to the new controller board.
8. Apply power to the controller plate.

⇨ If applicable, change the IP address for the new ground controller board

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.

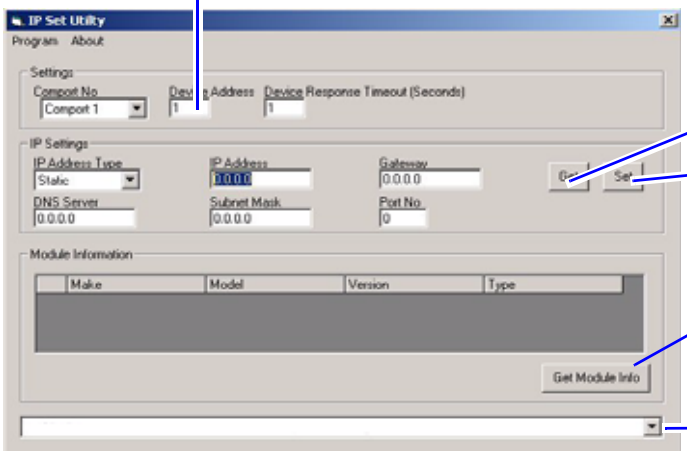
Note: If the IP address on the ground controller is changed, the ground controller IP address must be changed to match the new address.

1. Using a null modem cable, connect a laptop computer to the controller board at P3 (next to the Reset button). See “Ground Controller PCB Assembly (PN 10950221)” on page 9 for the P3 location.
2. Open IP Set Utility program — select **Start > Programs > IPSetUtility > IP Set Utility.**
3. Enter the appropriate information in the *IP Set Utility* window (See Figure 3).

   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 3. Setting the IP address for the controller.

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 addressing

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 position 1 and position 4 on, then it is set to address 9

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.

Fan Replacement (PN 46008028SP)

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

Fans are operated via a thermostat switch. This is located on the top above the rear door.

The thermostat is adjustable from 80°F to 170°F. The factory default is set at 120°F.

To remove failed fan

1. Disconnect AC to control center.
2. Open the doors to the control center.
3. Disconnect AC cord to fan.
4. Remove the four 6/32 X 2.0" screws and fan guard securing fan on top of enclosure.
5. Discard old fan per manufacturers recommendations.

To install replacement fan

1. Place fan guard on replacement fan.
2. Install the fan and fan guard with the four previously removed 6/32 X 2.0" screws. Do not over tighten - 10-15inlbs.
3. Reinstall the AC cord to fan.
4. Close control center.
5. Re-apply AC to control center.
6. Verify function of fans.

Heater Replacement (PN 30676014SP)

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

⇨ **To replace a heater**

1. Disconnect AC to control cabinet.
2. Open the doors to the control cabinet.
3. Remove the cover from the heater using a phillips screw driver.

   WARNING! Do not touch the heater. The surface is hot and may result in injury.

4. Remove the 1/4-20 bolts securing the heater to the mounting bracket.
5. Disconnect the two 10-32 screws connecting the heater to AC power.
6. Attach wiring to the new heater and secure the heater to the heating bracket with the 1/4-20 bolts.

   Note: Make sure the wiring does not come in contact with the heater or cover. Wiring can be connected to any post on heater (no polarization).
7. Reinstall cover with 6-32 screw previously removed.
8. Re-apply AC to heater and verify operation.

Fan Thermostat Replacement (PN 41009072)

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

Fans are operated via a thermostat switch. This is located on the top above the rear door.

The thermostat is adjustable from 80°F to 170°F. Factory default is 120°F.

To remove a failed fan thermostat

1. Disconnect AC to control center.
2. Open the rear door to the control center.
3. Disconnect AC connections to fan thermostat.
4. Remove the two 6/32 X 0.5” screws securing the thermostat to the mounting plate at the top of the control center.
5. Discard old fan thermostat per manufacturers recommendations.

To install a replacement fan thermostat

1. Install the fan thermostat with the two previously removed 6/32 X 0.5" screws. Do not over tighten - 10 to 15inlbs.
2. Reinstall the fan thermostat AC connections. There is no polarization to the thermostat connections. Do not over tighten - 8 to 10inlbs.
3. Set thermostat to 120°F.
4. Close control center.
5. Re-apply AC to control center.
6. Verify function of fans.

Heater Thermostat Replacement (PN 41009071)

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

Heaters are operated via a thermostat switch. This is located on the side wall of the control cabinet.

The thermostat is adjustable from -10°F to 100°F. Factory default is -10°F.

This switch is Grainger 2E816 or equivalent.

To remove a failed heater thermostat

1. Disconnect AC to control center.
2. Open the door to the control center.
3. Open heater thermostat.
4. Disconnect AC connections to heater thermostat. Red and black are connected. Blue is capped with a wire nut.
5. Remove the four 6/32 X 0.5” screws securing the thermostat to the mounting plate.
6. Discard old heater thermostat per manufacturers recommendations.

To install a replacement heater thermostat

1. Install the heater thermostat with the four previously removed 6/32 X 0.5" screws. Do not over tighten - 10 to 15inlbs.
2. Reinstall the heater thermostat AC connections with the wire nuts provided with the replacement heater thermostat. Verify the wire nut is installed on the blue wire. Verify the black and red are installed as before.
3. Reinstall the cover on the thermostat.
4. Set thermostat to -10°F.
5. Close control center.
6. Re-apply AC to control center.
7. Verify function of heater.

Checking and Replacing the Fan Filter

The first indication of excessively clogged fan filters is usually a gradual increase of temperature within the cabinet. It is generally recommended to check and, if filters are clogged, replace filters every 6-12 months.

The fan filter is located in the door. Measurements of the filter are 12” X 12” X 1” and can be replaced with Grainger #6B831 or equivalent.

To access and remove the fan filter:

1. Disconnect AC to control center.
2. Open the doors to the control center.
3. The filter holder is located on the bottom of the door.
4. Turn the holding latches so they are out of the way of the filter.
5. Pull the filter out and up to remove.

To install the replacement filter:

1. Install the filter into the holder by inserting the bottom end first.
2. Insert the filter fully into the holder, and turn the filter holders down to secure it in place.
3. Close control center.
4. Re-apply AC to control center.

Fluorescent Lamp Replacement

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

The fluorescent lighting tube is AMS #50600013SP, Grainger #2V429 or equivalent.

The light fixture is AMS #50600012, Grainger 3GA54, or equivalent.

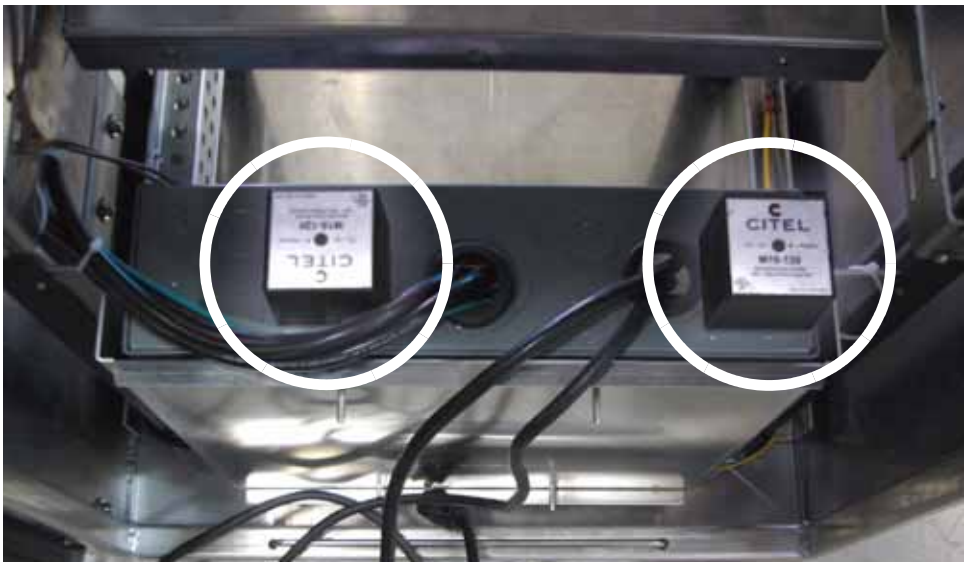
To remove the fluorescent lighting tube:

1. Disconnect AC to control center
2. Open the rear door (the door that hinges on the **left**) to the control center.
3. The lighting tube is located at top of control center. Twist and remove the failed tube.
4. Install the replacement tube by sliding in contact and twisting.
5. Pull gently on tube to verify that it is securely installed.
6. Re-apply AC to control center.
7. Verify function of replacement lighting tube.

Transient Voltage Suppressors (TVS) (PN 30352001SP2)

The TVS devices that are installed on the load center in the control cabinet are used to suppress voltage spikes and surges.

These TVS's have an LED indicator on them which indicates if they are operating or not. If the LED is green and lit, the TVS's are functioning as required. If it is out, the device has failed and should be replaced.



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

To remove the TVS devices:

1. Disconnect AC to control cabinet prior to servicing the TVS's. Remove load center cover.
2. Disconnect the two black and white wires from load center.
3. Remove the TVS from load center by loosening nut.
4. Dispose of per manufacturers recommendations.

To install a replacement TVS:

1. Remove the nut from the replacement TVS.
2. Install replacement TVS into the failed location on load center.
3. Tighten nut 1/4" turn past flush.
4. Label white wire with the "GND" label provided with replacement TVS.
5. Label one black wire with the "NEUT" label provided with replacement TVS.
6. Label one black wire with the "HOT" label provided with replacement TVS.
7. Install the white wire in ground bar in load center.
8. Strip wire 1.5". Install the HOT black wire onto the main lug of the load center.
9. Install the NEUT black wire into neutral bar of load center.
10. Re-Install the load center cover.
11. Reapply AC power to the control cabinet.
12. Verify that the green LED is lit on the TVS that was replaced.

Rack Mounted Power Strip Replacement (PN 46000032)

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

To remove the rack mounted power strip:

1. All components that are plugged into the power strip must be turned off before the components are unplugged from the power strip.
2. Disconnect all cables connected to the rack mounted power strip.
3. Disconnect AC to ground cabinet.
4. Disconnect from breaker.
5. Dispose of the defective power strip according to the manufacturer's guidelines.

To install the replacement rack mounted power strip:

1. Mount replacement power strip in location of failed strip.
2. Plug in all component power cords that were previously unplugged from the power strip.
3. Strip 12 inches of jacket and remove power cable connector.
4. Wire into breaker as shown in wiring diagram for ground cabinet.