

**4000 Series  
Digital Billboard**

Service Manual

*DD1783793*

*Rev 7 – 3 August 2017*

**DAKTRONICS**

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**Project 1604**  
**Rev 7 –3 August 2017**

## **DAKTRONICS, INC.**

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# Section 1: Introduction

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This manual provides service and maintenance information for the 4000 Series Digital Billboards. To ensure optimal display life, take time to read and understand the information in this manual.

## 1.1 About this Manual

This manual is divided into ten sections:

- **Introduction:** Explains basic information needed to use this manual.
- **Display Troubleshooting:** Explains basic troubleshooting steps.
- **Removing Modules from the Display:** Explains the various ways of removing modules from a display.
- **Replacing Display Components:** Explains how to replace display components.
- **Routine Maintenance:** Explains recommended guidelines for routine maintenance.
- **Service Call:** Explains the recommended guidelines for service calls.
- **Annual Maintenance Checks:** Explains the recommended guidelines for annual maintenance checks.
- **Remote Enclosure Parts List:** Provides a list of part names and part numbers for the remote enclosure
- **Signal Routing:** Explains the signal routing in the 4000 series displays.
- **Testing the Display Ground:** Explains how to test power and signal.

At the end of this manual are a glossary and appendix:

- **Glossary:** Defines various terms used in the manual.
- **Appendix A: Daktronics Warranty and Limitation Liability:** Provides information on warranty and liability.

**Figure 1** illustrates a Daktronics drawing label. The drawing number is located in the lower-right corner of a drawing. This manual refers to drawings by listing the last set of digits and the letter preceding them.

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DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: DIGITAL BILLBOARDS			
TITLE: PLATFORM 3.0 ENCLOSURE MOUNTING & ROTATION			
DES. BY: DBAKKER		DRAWN BY: DBAKKER	
		DATE: 05 JUN 09	
REVISION	SHEET 1 OF DWG 851765	1520-E10A-851765	
00	SCALE: 1=50		

**Figure 1: Daktronics Drawing Label**

In the example in **Figure 1**, the drawing would be referred to as Drawing **A-69945**.

All references to drawing numbers, appendices, figures, or other manuals are presented in bold typeface, as shown above.

## 1.2 4000 Series Digital Billboard Overview

### What has Changed

- Hinged doors, capable of being lifted off the hinge
- Cabinet-mounted fans, which can be removed without tools
- Completely sealed modules
- SATA cables replace ribbon cables
- ProLink Routers replace Multi-Line Controllers
- VIP-4060 in remote enclosure

### What Stayed the Same

- Cabinet is the same as 2000 and 3000 series
- Mounting plates, splice key, pick points (for lifting the display), power entry point, and the remote enclosure are the same as the 3000 series.

### Display Label

Hinged doors are easily identifiable features of the 4000 series. Another way to identify the 4000 series is to check the label on the back of the display, next to the power entrance. It should read “DB4K.” Refer to **Figure 2**.



**Figure 2: Display Label**

### 1.3 Spare Parts List

The following table is a generic list of spare parts found in the spare parts box. Spare parts requirements vary for each display. For a project-specific spare parts list, refer to the spare parts list on the inside of the spare parts box lid.

<b>Part number</b>	<b>Description</b>
0A-1487-6000	Assy, PLR 6050 W/ Hook Mount, 0P-1525-0001
0A-1604-4001	Assy; Mod PS, HK, Posi-lock, A-2021R, 0P-1273-0063
W-2094	Cable; SATA Plug To SATA Plug, 2', Crossover
W-2210	Harn; 142", 4 pin m mnl sealed-2pin






## Section 2: Display Troubleshooting

---

The following table lists some problems that may occur while operating a display. The left column contains a list of display problems. The right column contains a list of troubleshooting steps to help resolve the issue. While this table does not cover all possible problems that may occur, it does cover those that may occur most often.

4000 Series Display Problem	Troubleshooting Steps
Entire display is blank	<ul style="list-style-type: none"><li>• Check that the display is receiving power and all internal and external breakers are turned on. When power is applied to the display, power supply LEDs should turn on.</li><li>• Make sure the fiber-optic signal cable is connected to the ProLink Router (PLR).</li></ul>
Module is blank 	<ul style="list-style-type: none"><li>• Make sure the module status indicators and power supply in the blank section are all on.</li><li>• Measure the voltage on the module power connector to ensure a 12-volt output.</li><li>• Make sure fiber connections to the ProLink Router in the blank section are secure. Change the connections with one another to test.</li><li>• Check the power status LEDs on the power supply connected to the module. If a power indicator LED is off, ensure the fuse on the power supply output is intact.</li><li>• Check that the SATA cables to the module are secure.</li></ul>



## Section 3: Removing Modules from the Display

### 3.1 Important Note on Signal and Power Cables

The signal and power cables connected to the modules are not designed to be used as lanyards to hold the modules in place when unlatched from the display face.

When performing maintenance on the display face, Daktronics recommends removing the modules completely from the display face to avoid possible damage.

If module removal is not possible, use the safety lanyards – provided in the spare parts box or installation kit – to hang modules from the display face. Refer to **Figure 3** for an example of module damage caused by using a SATA cable as a lanyard.



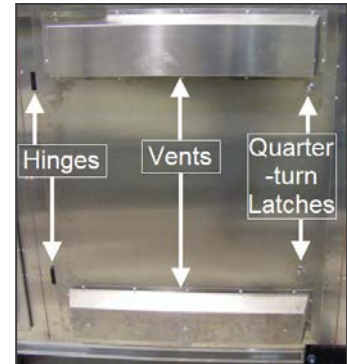
**Figure 3:** Broken SATA Jack

### 3.2 Proper Seating of SATA and Power Cables

#### SATA Cables

To install a SATA cable and ensure it is seated properly:

1. Align the SATA cable jack over the SATA jack on the module.
2. Insert one end of the SATA cable jack into the SATA jack on the module with a slight forward force..
3. Rotate the other end of the SATA cable jack into the SATA jack on the module and press firmly until the cable jack clicks into place and the gasket is not visible.



**Figure 4:** Rear Access Door



**Figure 5:** Door Lanyard Ring

#### Power Cables

To install a Power jack cable and ensure it is seated properly:

1. Align the power cable jack over the power jack on the module.
2. Insert one end of the power cable jack into the power jack on the module.

**Note:** Do not squeeze the clips on the end of the cable jack when connecting.

3. Rotate the other end of the power cable jack into the power jack on the module and press firmly until the cable jack clicks into place and the gasket is compressed.

### 3.3 Rear Access Doors

Required tools: Flat head screwdriver

The 4000 series digital billboards have hinged doors that are secured with two quarter-turn latches. If the doors are obstructed, they can be lifted off the hinges for easy access. Refer to **Figure 4**.

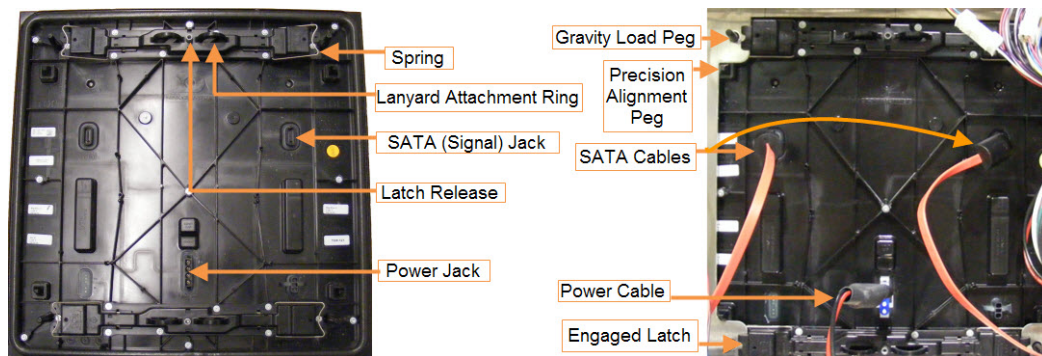
**Note:** If you remove a door and find there is no safe place to put it, use a safety lanyard to keep the door from falling. Attach the lanyard to the door lanyard ring, and attach the other end to a secure part of the display. Refer to **Figure 5**.

To access the back of the display:

1. With a flat head screwdriver, turn the quarter-turn latches counterclockwise.
2. If the door is obstructed, lift the door off the hinges.
  - a. Attach the safety lanyard to the door lanyard hook to prevent damage.
  - b. Pull the bottom of the display door away from the back of the display.
  - c. Carefully place the access door out of the way.

### 3.4 Remove and Reinstall a Module from the Rear of the Display

Required tools:  $\frac{1}{8}$ " hex wrench



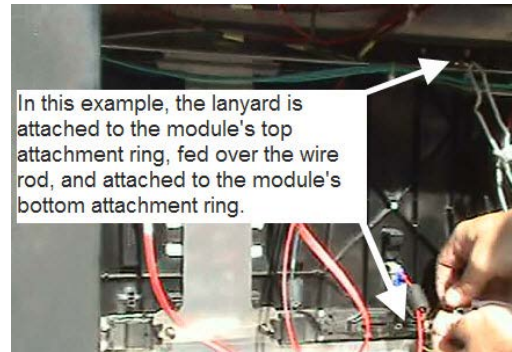
**Figure 6:** Module and Installed Module

If the module is unobstructed by display components, follow the procedures below. If a display component is obstructing access to a module, refer to the display-specific manual for procedures on removing display components to access modules.

Refer to **Figure 6** for module terminology used in this section.

1. Use a safety lanyard. Refer to **Figure 7** when performing **steps 1a-1c**.

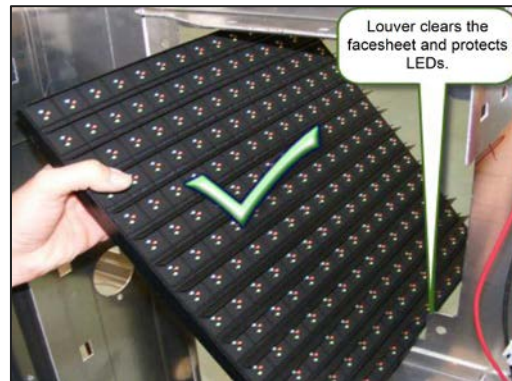
- a. Attach one end of the safety lanyard to a lanyard attachment ring on the top of the module.
- b. Feed the lanyard over a wire rod, or through a nearby upright. Do not anchor the lanyard to another module.
- c. Attach the other end of the safety lanyard to the lanyard attachment ring on the bottom of the module.



**Figure 7: Attach Safety Lanyard to Module**

2. Disconnect the signal cables and power cable.
3. With a 1/8" hex wrench, turn the top and bottom latch releases approximately a quarter turn clockwise to disengage the module latches.

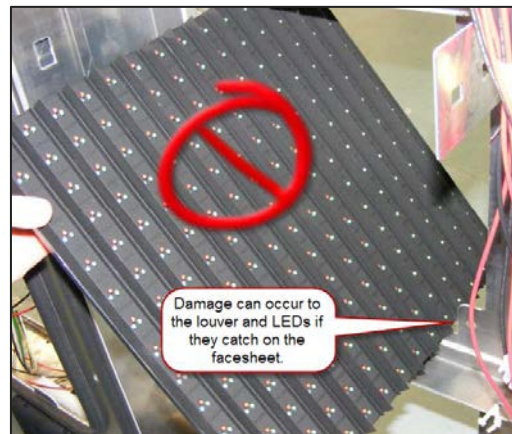
**Note:** Always maintain a firm grip on the module as you carefully remove the module from the face sheet of the display.



**Figure 8: Proper Module Removal**

4. Rotate the module in a way that allows you to guide it through the frame opening without catching the louvers or LEDs on the cabinet. Refer to **Figure 8** and **Figure 9** for examples of proper and improper removal of modules.
5. To reinstall a module, rotate and carefully guide the module through the opening.

**Note:** To ensure proper alignment, the word "top" is printed on the back of the module, in the upper-left and upper-right corners. In addition, if the module is upside down, the precision alignment pegs will bind on the facesheet.



**Figure 9: Improper Module Removal**

6. Once the module is through the opening, align the module with the facesheet so the gravity load pegs fit in the gravity load peg holes. Refer to **Figure 10**. Ensure the lanyard or cables are not pinched between the module and the display.



- Once the module is in place, use the bottom module lanyard rings or the lanyard to pull the module tight against the facesheet. This is to ensure the module latches clear the facesheet when engaging the latches.

**Note:** Use care when engaging the module latches. It is possible to damage the module latches if they do not clear the facesheet.

- With the  $\frac{1}{8}$ " hex wrench, turn the bottom latch release approximately a quarter turn counter-clockwise to engage the bottom latch. Verify the latches clear the facesheet.
- Repeat **Step 8** to secure the top latch.
- Connect signal cables and the power cable. Verify the cables are properly seated.
- Remove the module safety lanyard and return it to the parts box/installation kit.

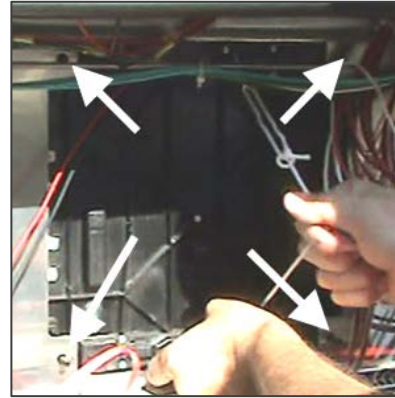
**Note:** Sometimes it may be necessary to remove the module beside, above, or below in order to access the target module. For example, you may need to remove a module from the top-most section of the display. In this case, you may need to remove the module directly below the top-most module, and pull the top-most module through the lower opening.

### Remove a Module behind a Power Supply

Required tools: Phillips screwdriver,  $\frac{5}{16}$ " nut driver

Refer to **Figure 13** for an example of the power supply.

- Turn off power to the display.
- With a Phillips screwdriver, remove the two screws that hold the cover to the power supply.
- Disconnect all power and signal cables from the power supply.
- With a  $\frac{5}{16}$ " nut driver, remove the Tek screw below the finger tab. Refer to **Figure 13** for Tek screw and finger tab location.

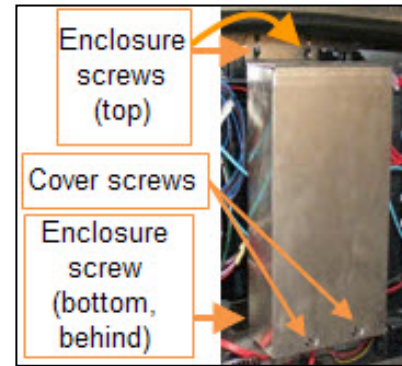


**Figure 10:** Gravity Load Pegs



**Figure 11:** Power Supply

5. Pull the finger tab to disengage the power supply from the upright, and then lift the power supply up and away from the hook mounts.
6. Gently set the power supply assembly down.
7. Follow the **Module Removal** procedure above to remove and replace a module.
8. Once the module is replaced, reverse **Steps 1-5** of this section to reinstall the power supply.
9. Turn on power to the display.



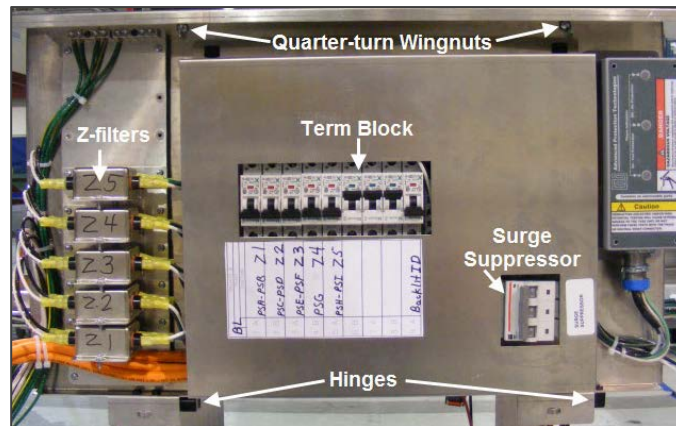
**Figure 12:** PLR Enclosure

### Remove a Module behind a ProLink Router (PLR)

Required tools: Phillips screwdriver, <sup>5</sup>/<sub>16</sub>" nut driver

Refer to **Figure 14** for an example of the PLR.

1. Use a Phillips screwdriver to remove the PLR enclosure cover.
2. Disconnect all power, signal, and fiber cables from the PLR.
3. Use a Phillips screwdriver to remove the top two screws of the PLR enclosure.



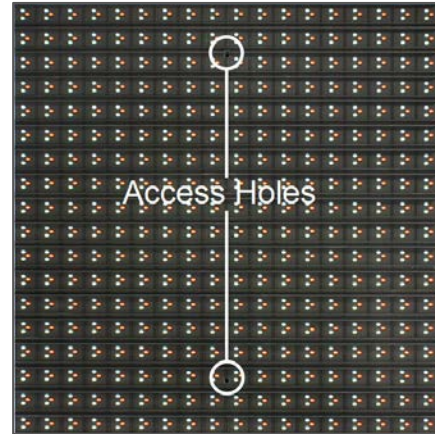
**Figure 13:** Term Panel

4. Use the nut driver to remove the bottom Tek screw (behind the enclosure).
5. Gently set the PLR enclosure assembly down.
6. Follow the **Module Removal** procedure above to remove and replace a module.
7. Once the module is replaced, reverse **Steps 1-4** of this section to reinstall the PLR enclosure assembly.

### Remove a Module behind a Termination Panel

1. Turn off power to the display.

2. Turn the two wing nuts at the top of the panel to unlatch the term panel. Refer to **Figure 15**
3. Pull back on the top of the term panel. If necessary, you can pull the term panel off the lower hinges, similar to the hinged doors.
4. Follow the **Module Removal** procedure above to remove and replace a module.
5. Once the module is replaced, return the term panel to its upright position and tighten the quarter-turn wing nuts.
6. Turn on power to the display.



**Figure 14:** Front Access

### 3.5 Remove and Reinstall a Module from the Front of the Display

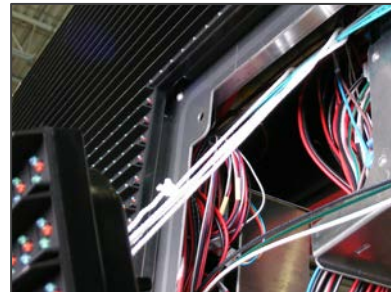
Required tools:  $\frac{1}{8}$ " hex wrench, safety lanyard (if necessary)

4000 series digital billboards are designed to be accessed from the rear. However, some situations may require removal of modules or components from the front. If this is the case, a lift or bucket truck will be needed to access the display from the front.



**Figure 15:** Safety Lanyard Attached to Module Lanyard Attachment Rings

1. With one hand on the module face, insert the  $\frac{1}{8}$ " hex wrench in the access holes. Refer to **Figure 16** for the location of the access holes.
2. Turn the top and bottom latch releases approximately a quarter turn counter-clockwise.
3. Pull the module from the display just far enough to reach around to the back of the module. Disconnect the power and signal cables from the back of the module.
4. Gently set the module down on a clean and dry surface.
  - a. If there is no place to set the module down, use a safety lanyard to hang the module from the display. Attach the safety lanyard in a way that takes up slack on the lanyard. Refer to **Figure 17**, **Figure 18**, and **Figure 19** for examples.



**Figure 16:** Safety Lanyard Secured to nearby Wire Rod in Display



**Note:** When resting the module against the display face, ensure the gravity load pegs do not damage LEDs on the display face.

5. To reinstall the module, ensure the module is properly aligned with its location in the display.
6. Reattach signal and power cables. Ensure no cables are hanging between the display and the module.
7. Insert the module. Place your hand on the module to keep it in place.
8. Firmly push in the lower half of the module to ensure the module latches clear the face sheet. With the  $\frac{1}{8}$ " hex wrench, turn the bottom latch release approximately a quarter turn clockwise.
9. Repeat **Step 8** to secure the top latches.
10. Gently pull the module to verify that it is properly seated.

**Note:** If the module is not latched properly, the springs on the back of the module will force the module out.



**Figure 17:** Module Safety Lanyard Prevents Module from Falling

### 3.6 Module Status Indicators

The 4000 series module has two status indicators that can be seen from the back of the module, one above each SATA jack. Refer to **Figure 20**.

#### **Operation Modes**

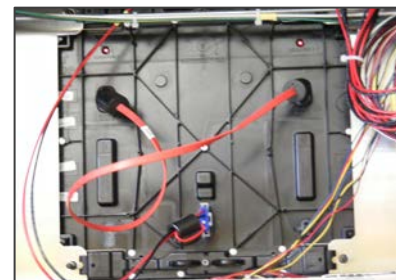
Under normal operation, module indicator LEDs (one on each side on the back of the module) should flash once every two seconds. The table below lists situations in which the status indicators will change.

**Note:** When troubleshooting, it is important to know that it will take up to eight seconds to change modes.

Status Indicators	Problem
Both status indicators are on continuously, not blinking	Critical hardware problem, input power good
Both status indicators are off	No power, power hardware problem, or micro will not program
Ten pulses per second	Bootstrap active and bad signal being received by jack – Both ports bad signal
Five pulses per second	Bootstrap active and good signal being received by jack – Both ports good signal
One pulse per second	User program active and bad signal being received by jack – Both ports bad signal
One pulse per four seconds	User program active and good signal being received by jack – Both ports good signal

### 3.7 Self Test a Module

1. If a module is blank and it has power supplied to it, you can connect it for a self-test. Attach a working SATA cable to Ports A and B, power cycle the module to run the self-test.
2. Observe the module test. The module should play red, green, blue, white, and then a double-digit number. It will continue to cycle through this pattern until you stop it either by disconnecting power or the SATA cable.
3. If the module does not display this pattern, check the power indicator lights to verify it is receiving the proper power (12 volts). If the power is correct, try a known SATA cable to be sure, it is not a SATA cable problem. If the problem persists, replace the module.



**Figure 18:** Self Test

## Section 4: Replacing Display Components

This section provides information on removing and replacing display components.

### 4.1 Photocell

Required tools: Wrench, utility knife, cable ties

A 25' cable is attached to the replacement photocell.

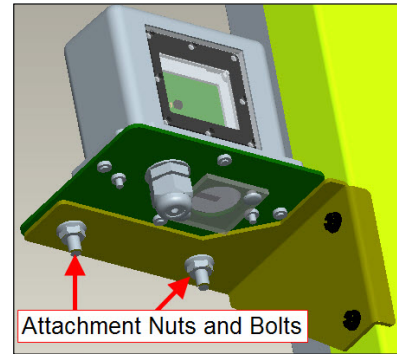
1. Unplug the old photocell cable from the remote enclosure.
2. Cut any cable ties that hold the photocell cable in place along the back of the display.
3. Use a wrench to remove the two attachment nuts and bolts that hold the old photocell to the mounting bracket. Refer to **Figure 21**.
4. Use the two attachment nuts and bolts to install the new photocell in place of the old photocell. Refer to **Figure 20** and **Figure 21** for mounting method reference. Ensure the arrow on top of the photocell is pointing the same direction as the display face.

**Note:** The photocell must be installed right side up on the mounting bracket. If installed upside down or sideways, the ambient light readings will be inaccurate, thus causing display brightness to be inaccurate.

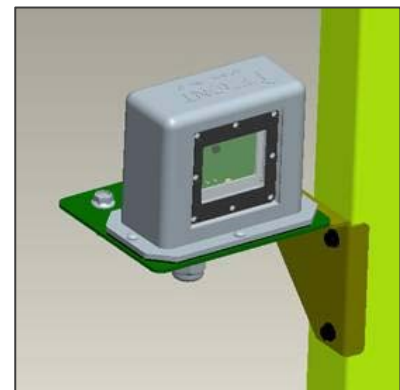
5. Route the 25' cable from the photocell assembly to the connection in the remote enclosure. If needed, attach the extension cable (located in the spare parts box).
6. Using cable ties, attach the photocell cable to the cable tie anchor points along the back of the display.

#### Test

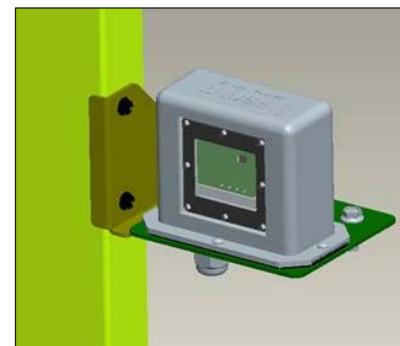
1. Test the photocell by covering all sensor windows (front, back, and bottom) with a heavy piece of fabric to dim the display. It may take a minute or two for the display to dim.



**Figure 19:** Attachment Nuts and Bolts



**Figure 20:** Left Side Mounting



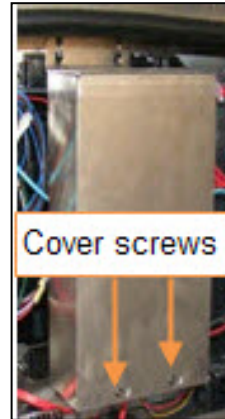
**Figure 21:** Right Side Mounting

## 4.2 ProLink Router (PLR)

Required tools: Phillips screwdriver

Refer to **Figure 24** for an example of the PLR.

1. Access the interior of the display. Refer to **Section 3.2**.
2. With a Phillips screwdriver, loosen the two screws on the PLR enclosure cover.
3. Slide the cover to the right to remove the PLR enclosure cover.
4. Disconnect all power and signal cables from the PLR. Refer to **Figure 25**.
5. Use a Phillips screwdriver to remove the old PLR from the PLR enclosure.
6. Install the new PLR.
7. Connect the cables to the new PLR. Verify the cables are properly seated.
8. Reinstall the PLR enclosure cover.



**Figure 22:** PLR Enclosure



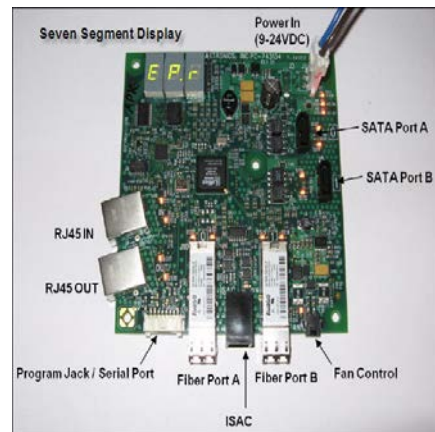
**Figure 23:** PLR

### Self Test

1. Connect a duplex fiber cable to Fiber Ports A and B. Refer to **Figure 26** and **Figure 27**.
2. Connect a SATA cable to SATA ports A and B.
3. Connect the power cable to the PLR to start the self-test.

This test may take up to 90 seconds to complete. When the PLR has successfully sent and received data through each of the connected ports, the letters “P.A.S.” will appear on the seven-segment display.

- If the PLR detects a problem, the letters “E.r.r.” will appear on the seven-segment display and then it will show the two ports that it detected the problem from (e.g. F01, F02 for the fiber ports or F05, F06 for the SATA ports).



**Figure 24:** PLR Components

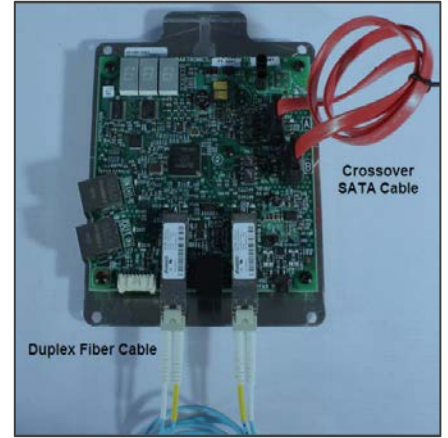
- If an error is displayed, use a known good cable on those ports and run the test a second time to see if it was the cable causing the error.
- If it continues to show an error, replace the PLR.

### 4.3 Power Supply

Required tools: Phillips screwdriver,  $\frac{5}{16}$ " nut driver

Refer to **Figure 28** for an example of the power supply.

1. Turn off power to the display.
2. Access the interior of the display.  
Refer to **Section 3.2**.
3. Use a Phillips screwdriver to remove the shroud that covers the power supply cables and fuses.
4. Disconnect all power and signal cables from the power supply.
5. Use a  $\frac{5}{16}$ " nut driver to remove the Tek screw below the finger tab.
6. Pull the finger tab to disengage the power supply, and then lift the power supply off the hook mount.
7. Reverse **Steps 1-5** to replace the power supply.
8. Turn on power to the display.



**Figure 25:** PLR Self Test



**Figure 26:** Power Supply

### 4.4 Filter

Filters should be checked yearly, except for sites that have been designated to be checked every six months. Refer to the table below for filter quantities by display size.

Display Size	Filter Quantity
20' x 60'	32
14' x 48'	26
12' x 48'	26
14' x 28'	16
21' x 21'	18
11' x 22'	12
10'6" x 36"	10
10' x 30'	8
10' x 20'	6



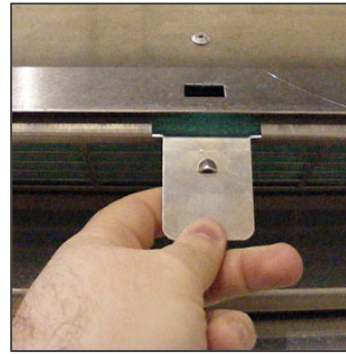
To replace a filter in the display:

1. Depress the filter release to lower the filter door. Refer to **Figure 27**.
2. Remove the filter.
3. Install the new filter.
4. Close the filter tray. Verify the filter release is in place.

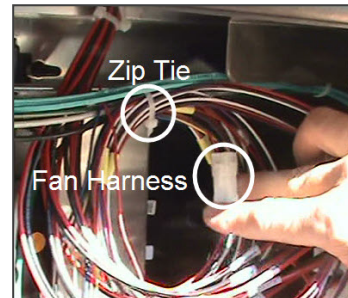
## 4.5 Fan

Required tools: Utility knife, cable tie

1. Access the interior of the display. Refer to **Section 3.2**.
2. To remove a fan, first locate its 4-pin to 6-pin fan harness. It should be zip-tied to the wire rod with other cables. Refer to **Figure 28**.
3. Disconnect the fan harness.
4. To remove the fan power cable, cut the cable tie from the wire rod. Take care not to cut through any cables.
5. Once power is removed from the fan, compress and hold the finger guard against the fan body. Refer to **Figure 31**.
6. Rotate the fan until the hook can be lifted up. Remove the fan from the display.
7. Install the new fan.
8. Connect the fan to the fan harness. Verify the fan works.
9. Use a new cable tie to reattach the cables to the wire rod.



**Figure 27:** Filter Release



**Figure 28:** Cable tie and Fan Harness



**Figure 29:** Fan

## 4.6 Webcam

Required tools: 1-1/16" socket wrench

### Retract the Webcam Arm

1. Disconnect webcam power and signal cables from the

display.

2. Use a 1-1/16" socket wrench to remove the three short bolts from the top of the elbow assembly. Refer to **Figure 32**.

**Note:** Do not remove the long bolts.

3. Use the handle to pivot the webcam arm to the catwalk.

**Note:** Ensure that the power and signal cables do not get pinched when pivoting the webcam arm.

### Remove and Replace the Webcam

1. Loosen the four saddle bolts. Lift the webcam and tube saddle from the arm. Refer to **Figure 31**.

2. Pull the cables through the webcam arm.

3. Route the new cables through the webcam arm.

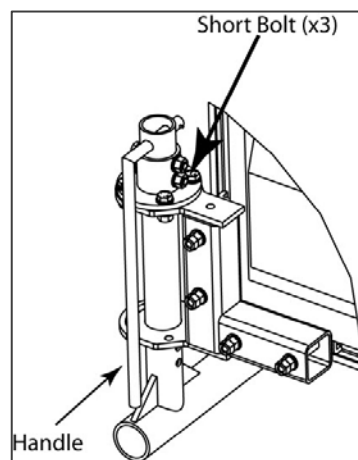
**Note:** Ensure there is enough excess cable to allow the webcam to pivot if needed.

4. Use the four saddle bolts to mount the new webcam and tube saddle on the arm.

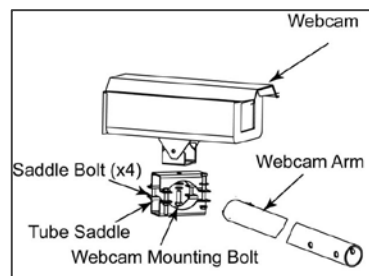
5. Return the webcam arm to the original position when done servicing the webcam.

6. Reinsert and tighten the three short bolts on the elbow assembly.

7. Work with the NOC to verify the webcam is functioning and focused properly.



**Figure 30:** Webcam Arm



**Figure 31:** Webcam





## Section 5: Routine Maintenance

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### 5.1 Inspecting a Display

When performing maintenance on a display, check for the following items:

- Inspect for modules protruding from the display face. If a module is protruding from the display, press the module in and latch the module. If the module will not latch, the module may need replacement.
- Inspect for dirty filters in the display and the control enclosure.
- Inspect for water in the display. If water is found, attempt to locate the source of water intrusion.
- Ensure the fans are working properly.
- Ensure there is not standing water in the spare parts box.
- Ensure the gasket is on the spare parts box.
- Call the NOC at 1-877-325-4357 if any of the issues are found.

### 5.2 Restarting a Display

Occasionally, it may be necessary to restart a display. To restart a display:

1. Shut down all control equipment in the remote enclosure.
2. Turn off the Uninterruptible Power Supply (UPS). Not turning off the UPS will delay sign restart.
3. Turn off all breakers in the main distribution panel inside the display. Refer to the display-specific system riser to locate the distribution panel. Typically, there is one breaker panel per display section.
4. Turn off site power.
5. Turn on site power.
6. Turn on all breakers in the main distribution panel inside the display.
7. Restart the UPS.
8. Restart all of the control equipment in the remote enclosure.

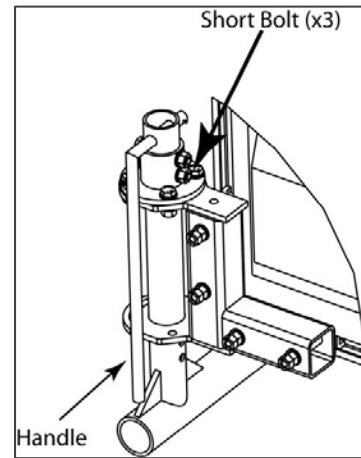
## 5.3 Cleaning the Webcam Lens

Clean the camera lens on every visit. Use the retractable webcam arm to pull the webcam close enough to clean the lens.

1. To move the retractable arm, use a 1-<sup>1</sup>/<sub>16</sub>" socket wrench to remove the three short bolts from the top of the elbow assembly. Refer to **Figure 34**.

**Note:** Do not remove the long bolts.

2. Use the handle to pivot the webcam arm to the catwalk.
3. Verify the power and signal cables do not get pinched when pivoting the webcam arm.
4. Carefully clean the webcam lens with a lens-cleaning wipe or with a clean rag and a glass cleaner.



**Figure 32:** Webcam Arm Pivot

5. Return the webcam arm to the original position when done servicing the webcam.
6. Replace and tighten the three short bolts.

**Note:** If you think the lens may be out of focus after the cleaning, call the NOC at 1-877-325-4357 to ensure the webcam is focused and the image is clear.

## 5.4 Fan Operation

1. Regularly check fan function. To do so, hold your hand or a piece of light paper above the fan to detect air movement.
2. Check connections to the power supply. Make sure the fuse is not blown. If the fuse is not blown, replace the fan. If the fuse is blown, replace it and check fans again.
3. If the fan does not turn or does not operate smoothly, replace it. After replacing 10 percent of the fans, Daktronics recommends replacing all cooling fans to reduce associated maintenance costs that may incur with increased heat buildup from fan failure.

## Section 6: Service Call

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At every service call, perform the following service and maintenance checks.

Required tools: Digital camera, to provide Daktronics with evidence of display damage, water intrusion, or other issues.

### 6.1 Service Instructions

When arriving on site, contact Daktronics Dispatch at 1-866-325-8425 and selecting #1 before service to announce you are on site. If immediate technical assistance is needed, ask to be transferred to the technical help desk. If no assistance is needed, proceed with display service.

#### Service Issue

1. Correct the service issue.

#### Structure

1. Inspect the structure, ladder, and catwalks for structural integrity.

#### Display Cabinet

1. Check the entire display cabinet for holes, gaps, and other issues. Fill any gaps or holes with silicone approved for use on aluminum.
2. Ensure the doors are latched.

#### Water Intrusion Inspection

1. Check section splices for water trails. Follow the water trail to its source and silicone as needed.
2. Check the inside of the display at several locations for evidence of water intrusion, corrosion, or water stains. Include the cabinet, modules, power supplies, and PLRs in the inspection. Photograph any evidence of water intrusion.

## **Modules**

1. Ensure all modules are seated properly. Work with the NOC to run a red test pattern. View the display from one end and look down the face of the display to inspect for modules that are sticking out.
2. Check for stuck pixels, bent LEDs, broken louvers, and other issues that may affect the display image quality.
3. Remove any loose modules and inspect them for stripped gears, broken latches, etc.

## **Remote Enclosure**

1. Inspect the remote enclosure for overall integrity.
2. Check the remote enclosure for signs of water intrusion, especially at entry locations.
3. If the remote enclosure is equipped with a/c, check the filter. Remove and wash the filter if it is dirty. Allow the filter to dry before reinserting it.
4. Visually inspect the electronics and cabling in the remote enclosure. Look for worn cables, connectors, dust in the computer or VIP-4060 fans, corrosion, etc.
5. Verify the key to the spare parts box is in the remote enclosure.

## **Spare Parts Box**

1. Inspect the spare parts box for signs of water intrusion.
2. Inventory all spare parts in the box. Lock the spare parts box and place the keys in the remote enclosure.

## **Display Visual Inspection**

1. Visually inspect the display from ground level for module discoloration or other visual issues. If you find any issues, contact a NOC technician by calling 1-866-325-8425 and selecting #2 to recalibrate the display remotely to restore uniformity.

## **Completing the Inspection**

1. Contact the NOC technician to ensure diagnostics are clear.

## Section 7: Annual Maintenance Checks

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For annual maintenance checks, perform the following service and maintenance procedures.

Required tools: Digital camera, silicone approved for use on aluminum, utility knife, Alcohol or Lens Cleaning wipes

### 7.1 Service Instructions

When arriving on site, contact Daktronics Dispatch at 1-866-325-8425 and selecting #1 before service to announce you are on site. If immediate technical assistance is needed, ask to be transferred to the technical help desk. If no assistance is needed, proceed with display service.

#### Structural Inspection

Perform annual visual inspections of the display structure to facilitate repair and lengthen display life.

- Inspect the structure, ladder, and catwalks for structural integrity.
- Check for possible corrosion, especially at structural tie points and ground rods.
- Check, tighten, and replace fasteners as required.
- Check electronic components for corrosion.
- At least once a year check the inside of the display for signs of water intrusion. Water can enter the display where weather stripping has deteriorated or where fasteners have loosened.

#### Webcam

1. If a lift truck is on site, clean the webcam lens with alcohol or lens cleaning wipes. Refocus the camera as necessary. Refer to **Section 5.3**.

#### Display Cabinet

1. Check the entire display cabinet for holes from missing nutserts, and other gaps on or along the edges of back sheets. Check the rear of the display for holes or gouges. Fill any gaps or holes with silicone. For gaps larger than 6", insert Tek screws into the display to shorten the gap length. Apply silicone along the seam and over the Tek screw heads.
2. Ensure the doors are locked and on their hinges.

## **Water Intrusion Inspection**

1. Check section splices for water trails. Follow the water trail and silicone as needed.
2. Check the inside of the display at several locations for evidence of water intrusion, corrosion, or water stains. Include the cabinet, modules, power supplies, and PLRs in the inspection. Photograph any evidence of water intrusion.

## **Modules**

1. Ensure all modules are seated properly. View the display from one end and look down the face of the display to inspect for modules that are sticking out.
2. Inspect the gaskets on the back of a few modules and ensure they are in good condition.
3. Check modules for pixels out, stuck pixels, bent LEDs, broken louvers, and other issues that may affect the display image quality.
4. Remove any loose modules and inspect them for stripped gears, broken latches, unlatched modules, etc. If a module has a broken module latch, replace the module and send the other module to Daktronics for repair.

## **Remote Enclosure**

1. Inspect the remote enclosure for overall integrity.
2. Check the remote enclosure for signs of water intrusion, especially at entry locations.
3. If the remote enclosure is equipped with a/c, check the filter. Remove and wash the filter if it is dirty. Allow the filter to dry before reinserting it.
4. Visually inspect the electronics and cabling in the remote enclosure. Look for worn cables, connectors, dust in the computer or VIP-4060 fans, corrosion, etc.
5. Check the battery level of the UPS in the remote enclosure.
6. Verify that the key to the spare parts box is in the remote enclosure.

## **Spare Parts Box**

1. Inspect the spare parts box for signs of water intrusion.
2. Inventory all spare parts in the box.
3. Lock the spare parts box and place the keys in the remote enclosure.

## Display Visual Inspection

1. Visually inspect the display from ground level for module discoloration or other visual issues. If you find any issues, contact a NOC technician by calling 1-866-325-8425 and selecting #2 to recalibrate the display remotely to restore uniformity.

## Display Power

1. Verify the display is properly grounded. Measure the display grounding. It should measure 10 Ohms or less. If display grounding reads more than 10 Ohms, improve display grounding until it reads 10 Ohms or less.
2. Verify the voltage on each leg. If the voltage reading is not equal to 120V AC  $\pm$  5 V AC on each leg, check the amperage in the displays breaker panels. Call a NOC technician to discuss potential actions or solutions.
3. Verify breaker panels, termination panels and cable connections are secure.

## Completing the Inspection

1. Upon completing the inspection, call 1-877-325-4357 to speak with a Billboard Technician who will request the findings, enter them into the system, and check for non-visual diagnostic errors that need resolution.

## 7.2 Cleaning a Display Face

Typically, it is not necessary to clean the display face. If the need arises, use one of the methods below.

Required tools:

- Five-gallon bucket with cold water.
- Non-abrasive, non-petroleum based detergent.
- 4' – 8' telescoping, soft automotive brush. Daktronics recommends a 10"  $\times$  4" brush head and a brush of light to medium stiffness.
- Soft terry cloth towels.

### Wet Cleaning Method

1. Turn off power to the display.
2. Mix mild detergent and cold water in the five-gallon bucket at a ratio of one ounce of detergent to one gallon of cold water.

3. Clean only a section of modules that are safely within reach of the lift or stage, and then move to the next section of modules.
4. Working from top to bottom, use horizontal brush strokes to loosen dirt and grime. Use light pressure as not to damage LEDs. When finished washing the display face, rinse it with generous amounts of cold water under low pressure. A spot-free agent, such as Jet Dry<sup>®</sup>, can be used to reduce water spots.
5. Use a soft, dry terry cloth to dry and remove any excess water. Take care not to damage LEDs by catching the cloth on them.
6. Allow the display to air-dry for one to two hours before applying power to the display.
7. Dispose of any leftover soapy water in an environmentally safe manner.

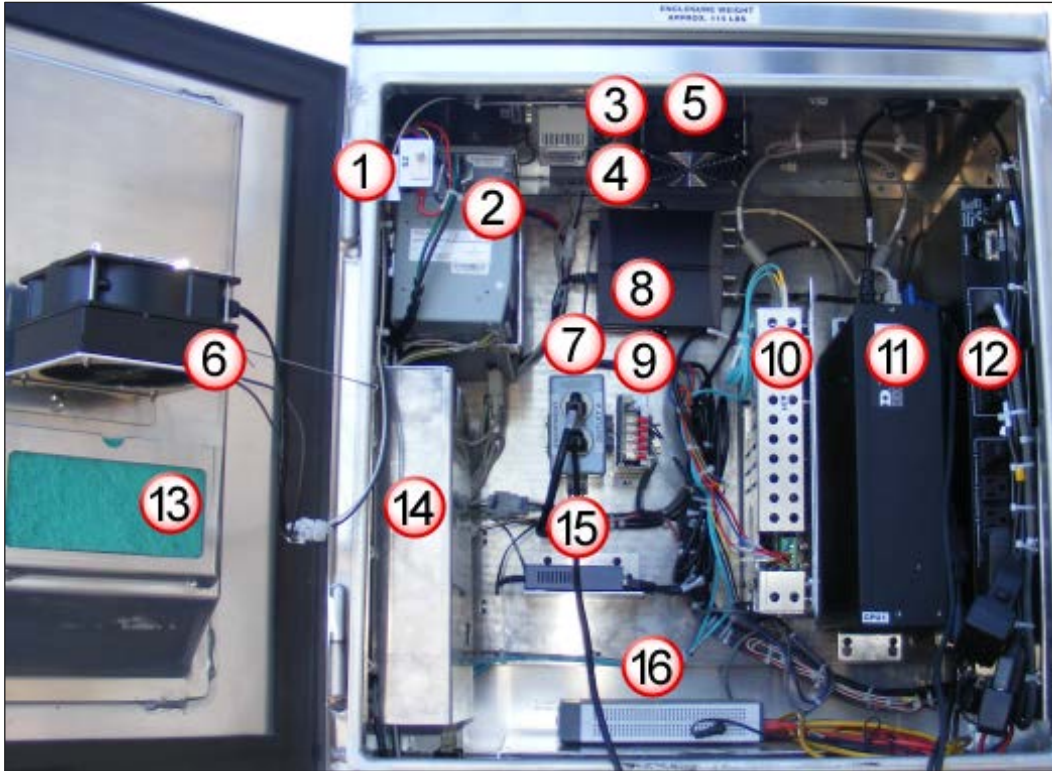
### **Dry Cleaning Method**

1. Clean only a section of modules that are safely within reach of the lift or stage, and then move on to the next section of modules.
2. Working from top to bottom, rub a dry, soft terry cloth towel horizontally across each row of LEDs. Make four passes per row of LEDs before moving to the next row of LEDs.
3. Take care not to damage LEDs or the plastic louvers by catching them with the cloth.



## Section 8: Remote Enclosure Parts List

The numbers in **Figure 35** correspond to the numbers in the table.



**Figure 33:** Remote Enclosure Components

	Part Name	Part Number
1	Door Switch	S-1170
2	Power Protection Kit	0A-1520-3000
3	Dual Thermostat	S-1225
4	Term Block	TB-1069
5	Axial Fan	B-1053
6	500W Axial Fan Heater	A-1819
7	Power Outlet	TB-1128
8	Video Server	A-2138
9	Power Supply	A-2454
10	VIP-4060	0A-1578-0050
11	Computer	0A-1520-1000
12	iBoot	A-2270
13	Air Filter	EN-2242
14	Term Panel: <ul style="list-style-type: none"> <li>• Term Block; 3-pos</li> <li>• Term Block; L-N-G</li> <li>• Z-filter</li> <li>• Transformer</li> </ul>	 TB-1069 TB-1130 Z-1007 T-1043

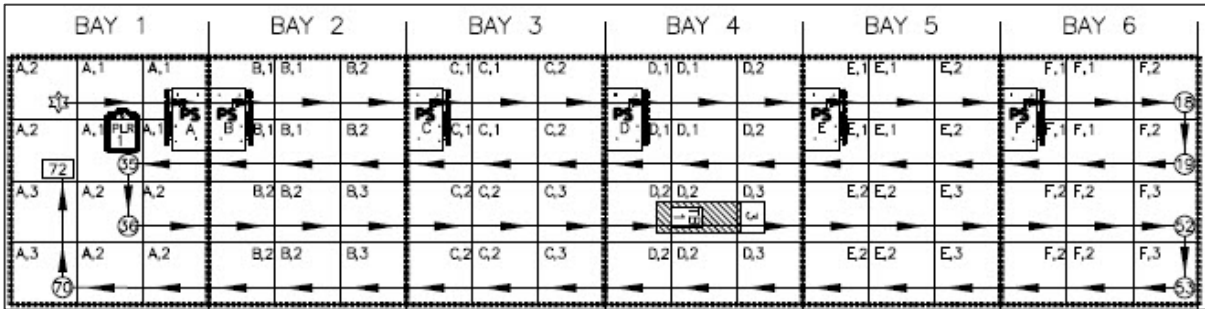
	• Breaker	S-1187
15	Ethernet Switch	A-1815
16	Router	A-2520

# Section 9: Signal Routing

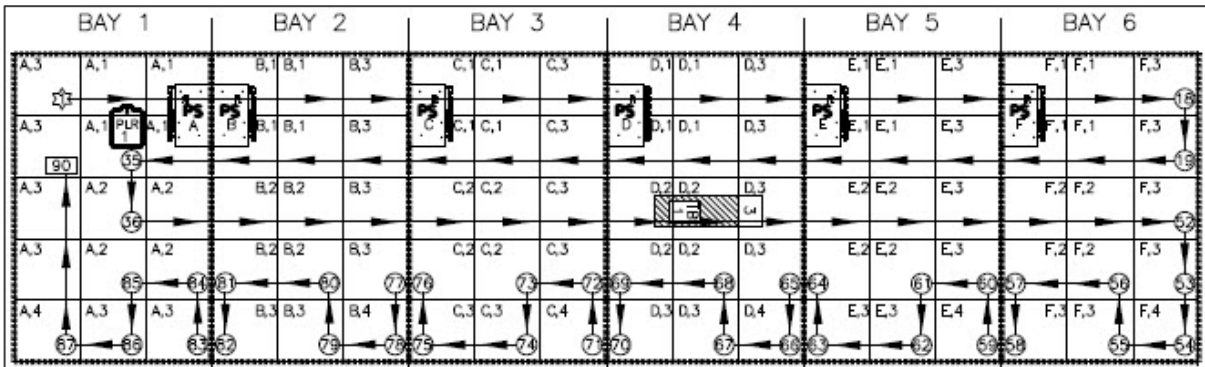
This section illustrates a general routing of power and signal in the 4000 series digital billboards. Refer to project-specific drawings for more details.

Signal starts at the PLR. The arrows in the examples below represent the signal path.

**Note:** Signal routing in odd tall displays have a slightly different signal routing than even tall displays. Refer to **Figure 36** and **Figure 37**.



**Figure 34:** Even Tall Signal Routing



**Figure 35:** Odd Tall Signal Routing



## Section 10: Testing the Display Ground

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### 10.1 Testing with a Ground Meter

1. Remove any molding covering the ground connection and provide sufficient room for the jaws of the ground tester to close around the conductor.
2. Open the jaws of the ground tester and make certain that the jaws' mating surface is clean and free of dust, dirt, and other foreign matter.
3. Open and close the jaws a few times to allow the jaws to sit on the best mating position.
4. Set the rotary meter to  $\Omega$ .
5. When powering on the ground tester, the tester will calibrate itself to ensure accuracy. Wait for the self-calibration to complete. During the process, the LCD will read, "CAL7, CAL6,..., CAL2, CAL1." Do not clamp to a conductor or open the jaws during calibration. The tester will beep when the calibration finishes and is ready for use.
6. Test resistance by clamping the meter on the testing strip provided in the ground meter kit. The testing strip simulates grounding rings and circuits. Once the reading is attained from the test strip, remove the meter.
7. Clamp the meter to the electrode or the ground rod-bonding conductor that you are measuring. Open and close the jaws a few times for better accuracy.
8. The LCD will read the ground resistance measurement. The meter will beep if the resistance is less than 40  $\Omega$ . The measurement should read under 25  $\Omega$ . Record the measurement.

### 10.2 Testing with a Multimeter

1. Remove any molding covering the ground conduction and provide sufficient surface to contact the probes on the multimeter.
2. Turn the dial on the multimeter to the  $\Omega$  symbol.
3. Place the red positive probe of the multimeter on the ground wire in the term panel.
4. Place the black ground probe against the main distribution case.
5. The LCD will read the ground resistance measurement. The measurement should read under 25  $\Omega$ . Record the measurement.



# Glossary

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**Lanyard Attachment Ring:** a ring found on the back of each module near the latch release on the back of the module. The lanyard attaches to the ring and prevents the module from falling.

**Latch Release:** device that holds the module firmly to the display frame. There are two per module, one on the top and one on the bottom.

**Light Emitting Diode (LED):** low energy, high intensity lighting unit.

**Line Filter (Z-Filter):** device that removes electromagnetic noise that might interfere with local communication channels from the power system. In the 4000 series digital billboards, line filters are mounted next to the termination panel.

**Louver:** a black plastic shade positioned horizontally above each pixel row. Louvers increase the contrast level on the display face and direct LED light for easier viewing.

**Module:** consists of a display panel with LEDs, a driver board or logic card, a black plastic housing, module latch assemblies, and a louver. Each module is individually removable either from the front or back of the display.

**Module Latch:** an assembly using a rotating retainer bar to hold the module firmly to the display frame. There are two per module, one near the top and one near the bottom.

**ProLink Router (PLR):** the PLR takes data in and then routes that data to other areas in the sign. There is typically one PLR per display section.

**Power Supply:** device that receives AC line voltage at its power distribution board, and then supplies DC voltage to modules and other internal components. One power supply may power several modules and internal components.

**SATA Cable:** Serial Advanced Technology Attachment (SATA) allows high-speed signal from module to module.

**Termination Block:** an electrical connection point, usually used to connect internal power and signal wires to wires of the same type coming into the display from an external source.





# **Appendix A: Daktronics Warranty Information**

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Daktronics Warranty and Limitation of Liability ..... SL-02374