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Section 1: Introduction

This manual guides Project Managers, Authorized Service Contractors, and installers in the installation of 4000 Series Daktronics digital billboard displays and display components. Before performing any work, read and understand all of the steps in this manual.

1.1 Using this Manual

Important Safeguards:

- Read and understand installation instructions in this manual before beginning the installation process.
- Turn off display power before servicing.

This manual is divided into five sections:

1. Introduction: explains the basic information needed to use this manual. Take time to read the entire introduction as it explains concepts used throughout this manual.

2. Display Installation: covers required tools, site preparation, display assembly, and display hanging.

3. Control Enclosure Installation: covers steps for moving and connecting power to the control enclosure.

4. Spare Parts Box Installation: covers spare parts box installation information.

5. First-time Power Up: covers display startup procedure as well as display troubleshooting. It also covers test patterns, diagnostics, and calibration.

At the end of this manual are a glossary and three appendices: Appendix A: Drawings, Appendix B: Supplementary Manuals, and Appendix C: Daktronics Warranty and Limitation of Liability. The Glossary defines terms used in this manual. Appendix A contains generic display drawings. Appendix B contains manuals that contain useful information about installing your display and connecting the controller to the internet. Appendix C explains Daktronics standard warranty and liability limitations.

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. In the example, the drawing would be referred to as Drawing A-69945.
It is important to note the drawing title since this manual may refer to drawings in an appendix by title rather than drawing number. All references to drawing numbers, appendices, figures, or other manuals are presented in bold typeface, as shown above.

1.2 Installation Component Overview

Figure 2 shows typical installation component locations for a Valo® 4000 series billboard.
Section 2: Display Installation

2.1 Before Starting

- Review all drawings in Appendix A.
- Review the System Riser with the electrician.
- Review the Daktronics Warranty and Limitation of Liability in Appendix C.
- Review installation plans with the installer.

2.2 Required Tools

The following bullets list the minimum tool requirements Daktronics recommends having on-site for each installation. The customer is responsible for providing these tools.

- Allen wrenches: Various sizes
- Bucket truck (customer must supply until the final proof of performance from the Daktronics NOC)
- Caulk gun
- Crane
- Cordless drill
- Drill bits
- Hammers
- Ladders: 6', 8', or 10' (step or A-frame)
- Laptop computer
- Pry bar
- Ratchet tie-downs/come along
- Screw drivers: Phillips and flat head
- Socket and open end wrench: \( \frac{11}{16}'' \)
- Socket extension: 3''
- Socket set, \( \frac{1}{2}'' \) drive (\( \frac{3}{4}'' \) socket head)
- Splice wrench
  - Refer to DD1473819 in Appendix B for directions on using the splice wrench (located in spare parts box)
- T-handle wrench: \( \frac{1}{8}'' \)
- Tape measure
- Torque Allen wrench: \( \frac{3}{16}'' \)
- Torque stick: 75 ft-lb
  - Refer to DD1473819 in Appendix B for directions on using the torque stick located in spare parts box.
- Utility knife
2.3 Site Preparation

1. Inspect the work area for potential hazards and installation issues.

2. Verify that the catwalks were mounted in the proper location. Refer to the pixel pitch specific bracing and catwalk drawing in Appendix A or the Shop Drawing for catwalk mounting locations.

3. Once the truck arrives, remove all tarp, wood, and shipping materials from the trailer.

4. Inspect the display for damage. Photograph any damage and send the images to the Project Manager.

5. Ensure all the following parts are with the display. If missing display parts call the Project Manager or the Project Materials Manager immediately to verify the parts were shipped with the display.
   - Attachment clamps
   - Hardware for section splice (if applicable)
   - Photocell
   - Remote enclosure
   - Spare parts box
   - Square splice plates (if applicable)
   - Trim and border T-bolts
   - Webcam
   - Webcam arm

6. If the display requires a splice, ensure splice key is installed before lifting the display.

7. Remove bracing between display sections.

2.4 Before Display Installation

Before the display arrives on site for installation:

- Verify the ledger brackets are mounted to the structure. These support the display after installation.

- Verify the electrician has installed power according to the requirements outlined in the System Riser.

- Verify there is internet service to the site. Display start up and uploading content to the display is easier when it is connected to the internet.
2.5 Display Installation

1. Identify and separate all of the border pieces. Refer to **ED-18429** in **Appendix B** for generic border installation instructions and illustrations.

**Upper Border Installation**

2. Place the top border to the display top section. Refer to **Drawing 100110** in **Appendix A** for additional border details.

3. Push the border T-bolts through the border T-bolt notch. Turn the bolt 90° to lock the bolt into the channel. Refer to **Figure 3**.

4. Slide the border bolt to one of the narrow ends of the border bolt notch.

5. Attach a 1/2" flat washer and 1/2" nut on the border bolt.

6. Ensure the bottom of the border aligns with bottom of the display.

7. Tighten the border T-bolts. Refer to **Figure 3**.

8. Install the side borders on the display top section before lifting the display.

   a. Place the side borders on the side of the display top section.

9. Push the border bolt through the border bolt notch.

10. Turn the bolt 90° to lock the bolt into the channel.

11. Slide the border bolt to one of the narrow ends of the border bolt notch.

12. Place a 3/8" flat washer and 1/2" nut on the border bolt.

13. Ensure the bottom of the border aligns with bottom of the display.

14. Tighten the border T-bolts.

**Removing the Display from Truck**

15. Connect the crane to the lift eyes. Refer to **ED16454** in **Appendix B** for spreader beam specifications or to **DD1886109** in **Appendix B** for lifting the display without using a spreader beam (if applicable).
16. Lift the display enough to apply some tension from the crane.

17. Unbolt the display from the shipping braces. Leave the hardware in the display from the shipping braces. This may be used during display splicing or installation.

   **Note:** Some displays do not require a section splice on-site. If a section splice is not required proceed to Step 29. If a splice is required, leave the lower section end shipping braces bolted to the truck. Refer to ED-18400 in Appendix B.

**Display Splicing**

18. Ensure the channel key is in the splice channel.

19. Lift the display top section off the truck.

   **Note:** Displays with multiple sections are numbered starting with 100 in the lower left corner of the display when looking at the face. Refer to Figure 5. If splicing a display, follow the display specific Shop Drawing to identify display sections and section locations.

20. Guide and align the sections together until the top section is resting on the bottom section. Refer to Drawing B-308570 in Appendix A for more vertical section splice details.

21. Ensure the U-channel brackets in the display sections align with the slots in the Valo®Mount bracket.

22. Ensure the display sections align front to back. Refer to the ED-18400 in Appendix B.

   **Note:** Use the splice wrench in the spare parts box to align the display sections.

23. Verify the LEDs on the display face are aligned in all directions.

24. Slide the U-channel into the Valo®Mount channel on the display back.

25. Attach and secure all mounting plates along the section splice. Refer to Figure 5. To secure the mounting plate:

   a. Slide the four bolt assemblies into the notches on the plate. Ensure all washers and nuts...
are over the mounting plate.

b. Tighten all bolts using the torque stick and impact wrench.

26. Connect the signal cables between display sections. These are located on the back of the display. Refer to Figure 11.

**Lower Border Installation**

27. Place the lower vertical borders against the side of the display.

28. Push the border bolt through the lower border bolt notch.

29. Turn the bolt 90° to lock the bolt into the channel.

30. Slide the border bolt to one of the narrow ends of the border bolt notch.

31. Place a 3/8" flat washer and 1/2" nut on the border bolt.

32. Ensure the bottom of the border aligns with bottom of the display.

33. Tighten nuts on the border T-bolts.

34. Insert and fasten border T-bolts in the remaining bolt notch locations.

35. If applicable, attach the second vertical border. Ensure the top of the second vertical border is flush with the top of the display.

36. Splice the vertical border sections together with border splice plates. Splice plates attach to the rear of the border with four Tek screws from the front of the border.

   - Do not drill holes out to make the border fit.
   - Adjust the border if needed.

37. Repeat **Steps 29-38** to attach the vertical border on the other end of the display.

38. Place the corner splice plate behind the vertical and horizontal borders.
39. Place the front corner splice plate over the corner splice plate, vertical, and horizontal borders. Refer to Figure 6.

40. Attach the front corner splice to the vertical and horizontal borders and the corner splice plate.

41. Repeat Steps 4-5 for the bottom borders.

Aligning Mounting Brackets
42. Measure out the mounting bracket location based on the structure upright spacing. Position the brackets in these locations.

Webcam Arm Installation
43. Refer to DD1463448 in Appendix B for webcam arm installation instructions.

Photocell Installation
44. Before installing a photocell, verify that all of the mounting components were shipped. If you are missing any of the parts, immediately contact the project manager. There should be:

- 1 photocell with 25' cable attached
- 2 Tek screws
- 30' or 100' cable (located in the spare parts box)
45. After the borders are installed on the display, determine the best location to mount the photocell. Select an area not shaded by trees, buildings, or other structures that may affect the readings. This would typically be the side of the display closest to traffic. Ideally, the photocell is exposed to the exact same lighting conditions as the display face.

**Note:** The photocell comes preassembled to mount to the right side display. If needed, loosen the attachment bolts and flip the photocell assembly on the photocell mounting arm. Refer to Figure 7, Figure 9, and Drawing 1000019 for mounting and assembly details.

46. Using Tek screws, fasten the photocell mounting arm to the side of the display border.

**Note:** Mount the arm as close to the bottom of the display as possible without interfering with the movement of the webcam arm.

47. Route the 25’ cable from the photocell assembly to the connection in the remote enclosure. If needed, attach the extension cable from the spare parts box.

48. Using zip ties, attach cable to the zip tie anchor points along the back of the display.

49. After the display is running, test the photocell by covering it with a heavy piece of fabric to dim the display. It may take a minute or two for the display to dim appropriately.

**Removing Display from Truck**

50. Remove the shipping braces from the bottom display section.

51. Tie tag lines to mounting brackets on each bottom corner of the display. Ensure the tag lines do not prevent the upright from sliding into the mounting bracket.

52. Lift the display off the truck.

**Hanging the Display**

53. Slowly lift the display to the structure while guiding the display into place with tag lines. Refer to ED-18487 in Appendix B for further installation instructions and illustrations.

54. Align the offset extrusion with the uprights. Refer to Figure 9.
55. Lower the display along the upright until it rests on the support ledger. The support ledger is provided by the customer. Verify the display is resting on all support ledgers before continuing.

56. On each end of the display, slide the pre-assembled offset extrusion and the rocker clamps over until they engage the upright flanges.

57. Tighten the nut on the Rocker Clamp Bolt to 75 ft-lb with the torque stick. This will pull the display firmly against the upright.

   Note: If the U-Channel mounted to the offset extrusion bolt aligns with an opening in the mounting channel, shift the entire display left of right until the U-channel is at least 1” from the opening.

58. Slide the right side rocker mount in the end of the intermediate extrusion.

59. Tighten the nut on the rocker clamp Bolt to 75 ft-lb with the torque stick. This will pull the display firmly against the upright.

60. Tighten all of the nuts on the offset extrusion bolts to 75 ft-lb with the torque stick.

61. Remove crane support.

62. Remove the tag lines.

63. Secure all remaining mounting assemblies.

**Power and Signal Connection**

64. If applicable, connect signal cables between display sections.
a. Connect the signal out to signal in quick connects provided on the display back. Refer to Figure 10.

65. Run signal cables to the display. Refer to the System Riser for signal cable specifications and connection locations.

66. Locate display power entrances. These are located in the middle of the lower and upper halves of the display.

67. Run power from the junction box to each display section. Refer to the System Riser for electrical requirements.

68. Strip 1/2” of each the insulation off each power wire.

69. Insert the power (L1 and L2), Neutral and Ground wires into the multi-tap connector according to the System Riser. Refer to Figure 11.

Figure 11: Multi-Tap Connector

70. Tighten all multi-tap set screws to 41 ft-lbs.

Note: Ensure all set screws that hold the wires into place are tight. If they are not tight, the connection will loosen over time and cause the display to malfunction.

71. Set wire and multi-tap connector inside the display.

72. Replace the power entrance door.

73. Test the display ground. It must be at least 10 Ohms or less before powering up the display.

Daktronics does not recommend using the support structure as an earth-ground electrode; concrete, primer, corrosion, and other factors make the support structure a poor ground.
**Note:** The support structure may be used as earth-ground electrode only if designed to do so. A qualified inspector must approve the support structure and earth grounding methods.
Section 3: Control Enclosure Installation

This section provides basic installation requirements for the 4000 Series digital billboard remote enclosure. Any information in the display specific drawings takes precedence over the information included in this section. This section contains information for the remote enclosure attached to the remote enclosure. For information on relocating a control enclosure embedded in a rear access door, refer to DD1895077 in Appendix B.

3.1 Physical Installation

The control enclosure comes attached to the back of the display. If this location is suitable, there is no need to move, remove, or tighten bolts. If, before hanging the display, it is determined the control enclosure needs to be moved. Refer to Figure 12 while following these steps.

1. Attach the crane to the lift eyes on the control enclosure and apply tension.
2. Remove the screws that secure the lid of the enclosure power entrance.
3. Disconnect the power, ground, and neutral wires inside the enclosure power entrance.
4. Starting at the bottom of the enclosure, remove the four attachment bolts.
5. Using the crane, carefully move the remote enclosure to the other end of the display.

Note: Also move all attachments bolts and mounting hardware at this time.
6. Slide the mounting hardware into the desired location.
7. Carefully guide the control enclosure into place.

8. Slide the attachment bolts into place.

9. Place the washer and nut over the attachment bolts.

10. Using the provide torque stick and an impact wrench, secure the control enclosure in place.

11. Remove the cover for the alternate enclosure power box.

12. Feed the control enclosure power cable into the alternate enclosure power entrance box.

13. Connect the control enclosure power, ground, and neutral wires.

14. Replace the alternate enclosure power entrance cover.

15. Replace the enclosure power entrance cover.

### 3.2 Modem Installation

The customer or customer’s Internet Service Provider (ISP) is responsible for providing the modem. Refer to the display schematics for display specific signal and power connections.

1. Connect an Ethernet cable from the modem Internet port to the Internet port on the router.

2. Route the ISP cable into the remote enclosure through the signal port 1 the bottom of the remote enclosure.

3. Connect the ISP cable to the modem.

4. Plug the modem power cable into port 2 on the iBoot bar.

### 3.3 Electrical Installation

As long as the control enclosure is not moved during the installation process the all required electrical connections to the display are complete.

### 3.4 Laptop Connection

During the installation it is the installer’s responsibility to provide a laptop for fire up. To connect the laptop for power up:

1. In the remote enclosure, locate the red cable plugged into the router with an “Unplug Cable & Use For Laptop Access” tag. Refer to **Figure 13**.

2. Disconnect the laptop access cable from the router.
3. Connect the cable into an Ethernet port on the laptop.

*Figure 13: Laptop Access Cable*
Section 4:  Spare Parts Box Installation

4.1 Spare Parts Box Installation

To properly install a spare parts box:

- do not mount the box in a location that inhibits maintenance personnel from accessing the display.
- ensure the lid is on top.
- ensure the latch is easily accessible.
- ensure the lid opens completely.
- mount the spare parts box by welding or bolting the spare parts box feet to a catwalk. Refer to Figure 14.
- always lock the spare parts box when leaving the display site.

Figure 14: Spare Parts Box
Section 5: First-Time Power Up

5.1 First-time Power Up

1. Install the router according to the System Riser.

2. Turn on the Uninterruptible Power Supply (UPS).

3. Ensure the equipment in the remote enclosure powers up properly. Make sure the connections did not loosen during shipping.

4. After a successful boot, ensure the VIP-4060 starts.

5. Call the NOC at 1-877-DAK-HELP to verify connectivity to the display and to perform a diagnostics check.

Identify Controller

1. Enter http://dakfiles.daktronics.com into the address browser bar.

2. Select Video Products.

3. Click Tools > DisplayFind.exe to download application. A popup window will appear.

4. Click Run > Run.

5. Click Find Displays.

6. Select your controller from the list. If you are unsure of the controller name, look at the back of the VIP4060. There is a sticker with the DHCP name which is an “M” followed by a five digit number.

User Log In

1. After identifying and selecting the controller, the User log in window will open.

2. Verify the Username is Dak (case sensitive) and the Password field is blank.

3. Click Log In.

Dimming Settings

1. Locate the Dimming area on the Display Control tab. Verify the Auto radial button is checked.

2. Test the dimming by covering the photocell with a heavy cloth. The display should noticeably dim within a few minutes.

Running Test Patterns

1. Under the Display Control tab, navigate to the Display Mode area.
2. Select **Test Pattern** from the drop down.

3. In the drop down to the right of Display Mode, select **Cycle All**.

4. In the drop down next to monitor, select **Output**.

5. The test pattern will be visible in the window.

6. Verify the display and the controller are showing the same content. Also inspect the display for modules out, LEDs stuck on, or other visual issues.

### 5.2 Advanced Setup (Not Recommended)

The steps in this section are only intended for users that need to modify their display settings. Do not perform these steps without assistance from Daktronics NOC.

1. After identifying the controller, open Internet Explorer.

2. In the address bar, type `http://mXXXXX/?admin`.

   **Note:** The XXXXX is the digits from the controller name.

3. Press **Enter**. This will take you to the Admin mode login screen.

4. Verify **Dak** is the **Username** and the **Password** is blank.

5. Click **Log In**.

**Obtaining the IP Address**

1. When logged in as administrator, click the **Configuration** tab.

2. Under Port configuration, verify the **Obtain an IP address automatically** radial button is selected.

**Verify Translation Table**

1. When logged in as administrator, click the **Configuration** tab.

2. Select **Display**. A window will open that shows display dimensions (in pixels), description, and other display information. If the information in the window is not correct or blank, click the Upload button next to Translation Table. A popup will open.

3. From the **Files of Type** drop down, select **All Files**.

4. Navigate to the correct translation table.

5. Select and open the file.

6. After a successful upload, click **OK** in the popup window.
Checking Firmware Revision
1. When logged in as the administrator, select the Configuration tab.

2. Click Firmware. This will open a window showing the latest firmware revision for the controller and the display.
**Glossary**

**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:** device that removes electromagnetic noise that might interfere with local communication channels from the power system. Line filters sometimes mount on brackets with power supplies. Other times they are mounted alone.

**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. Part number varies by pixel pitch.

**Module:** consists of a display board with LEDs, a driver board or logic card, a black plastic housing, a module latch assembly, and a louver. Each module is individually removable from either the front or back of the display. Part number varies by pixel pitch.

**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 converts AC line voltage from the panel board to low DC voltage for driver boards. One power supply may power multiple modules.

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

**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.

**Video Image Processor (VIP):** for digital billboards, the VIP takes still images and sends them to the digital billboard.
Appendix A: Reference Drawings

Appendix A contains drawings that are not project specific. Refer to the Project Installation Packet for project-specific drawings. Any project specific drawings take precedence over the drawings listed in Appendix A. The Daktronics drawing number is located in the bottom right corner of the drawings. Refer to Section 1.1 for information regarding how to read the drawing number. The drawings in Appendix A are listed in alpha-numeric order.

Valo Cabinet Splice/Mount Limitations ......................................................... Drawing A-545358
Double Offset Universal Mount ................................................................. Drawing A-584532
3.0 Enclosure Mounting & Rotation .......................................................... Drawing A-851765
Ledger Assembly ....................................................................................... Drawing A-988359

Horizontal/Field Splice Detail ................................................................. Drawing B-308570
Universal Mount Assembly; Valo ............................................................ Drawing B-400792
Universal Mount Installation ..................................................................... Drawing B-400802
Double Offset Adjustable Ledger ............................................................ Drawing B-566679
Control System Riser ................................................................................ Drawing B-799215
Multi-Dir Light Sensor; Valo Mtg Assy .................................................. Drawing B-1000019
DB-4000 Generic Border Attachment ...................................................... Drawing B-100010
Valo Generic Border Cover Attachment ................................................ Drawing B-1000114
Appendix B: Supplementary Manuals

The Daktronics manual number is located on the front of the manual, or in the lower left corner of quick guides.

Quick Guide: Valo® Digital Billboard Retractable Webcam Arm Mounting and Use................DD1463448
Quick Guide: Valo® Digital Billboard Installation Tool Use................................................DD1473819
Quick Guide: Valo® Digital Billboard Catwalk Mounted Webcam Arm Installation........DD1583763
Service Manual: 4000 Series Valo® Billboard ..................................................................DD1783793
Daktronics Digital Billboard Photocell Installation.........................................................DD1795637
Checklist: Daktronics Digital Billboard Installation.......................................................DD1799678
Daktronics Digital Billboard Lifting Guidelines ...............................................................DD1886109
Relocating an Embedded Digital Billboard Control Enclosure Prior to Installation........DD1895077
Spreader Beam Specifications Quick Start Guide ........................................................ED-16454
Quick Guide: 2008 Series Digital Billboard Section Splice..........................................ED-18400
Quick Guide: 2008 Series Digital Billboard Border Installation......................................ED-18429