



**1600 Series, 2.5 Inch  
Large Matrix Displays**  
(230 Volt – Front/Rear Access)

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**Installation, Maintenance &  
Troubleshooting Manual**

ED 11943

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Display Serial # \_\_\_\_\_

Display Model # \_\_\_\_\_

Date Installed \_\_\_\_\_



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# Section 1 : Introduction

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## 1.1 How to Use This Manual

---

This manual explains the installation, maintenance and troubleshooting of the Daktronics 1600 series SunSpot<sup>®</sup>, 2.5-inch large matrix display system. For additional questions regarding the safety, installation, operation or service of this system, please refer to the telephone numbers listed on the cover page of this manual.

The manual is divided into four sections: **Introduction, Mechanical Installation, Electrical Installation and Maintenance & Troubleshooting.**

- **Introduction** covers the basic information needed to make the most of the rest of this manual. Take time to read the entire introduction as it defines terms and explains concepts used throughout the manual.
- **Mechanical Installation** provides general guidance on display mounting.
- **Electrical Installation** provides general guidance on terminating power and signal cable at the display.
- **Maintenance & Troubleshooting** addresses such things as removing basic display components, troubleshooting the display, performing general maintenance and exchanging display components.

At the end of this manual are three appendices: **Appendix A: Project Specific Information, Appendix B: General Drawings, and Appendix C: Forms & Reports.** Drawings in each appendix are arranged in alphanumeric order unless otherwise specified.

- **Appendix A** contains any drawings specific to this display. Daktronics will often alter a display's original design to better meet the needs of the customer. These drawings are the primary source for specific display information.
- **Appendix B** contains standard drawings and general information relevant to this display.
- **Appendix C** contains any checklists and forms that may be used during installation or maintenance of the display.

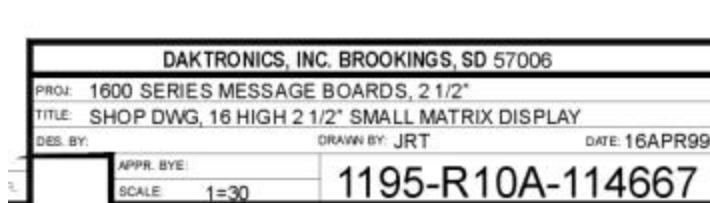
**Drawings in Appendix A always supersede any similar drawings found after any section of this manual.**

Listed below are a number of drawing types commonly used by Daktronics, along with the information that each is likely to provide.

- **System Riser Diagrams:** overall system layout from control room to display, power and phase requirements.
- **Shop Drawings:** fan locations, transformer locations, mounting information, power and signal entrance points and access method (front or rear).
- **Schematics:** power wiring, signal wiring, panelboard or power termination panel assignments, signal termination panel assignments and transformer assignments.

The box below, **Figure 1**, is an illustration of a Daktronics drawing label. The drawing number is located in the lower-right corner of the drawing. This manual refers to drawings by listing the last set

of digits and the letter preceding them. In the example below, the drawing would be referred to as **Drawing A-114667**.



**Figure 1:** Drawing Label

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

“Refer to **Drawing A-114667** in **Appendix B** for the location of the Venus 1500 controller.”

In addition, any drawings referenced within a particular sub-section are listed at the beginning of that sub-section in the following manner:

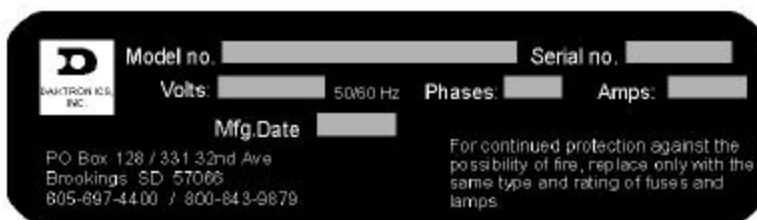
**Reference Drawing:**

Shop Drawing, 16 High 2 ½” Small Matrix .....**Drawing A-114667**

Referenced drawings are found in **Appendix B**.

Daktronics identifies manuals by the ED number located on the cover page of each manual. For example, this manual would be referred to as **ED-11943**.

Please list the model number, display serial number and the date this display became operational in the blanks provided on the front page of this manual. The serial number and model numbers can be found on the ID label, located on the front of the display on the right end. This label will look similar to the one shown in **Figure 2**. When calling Daktronics Customer Service, please have this information



**Figure 2:** Display ID Label

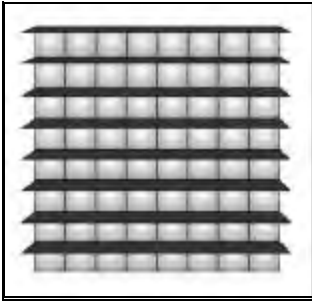
available to ensure that your request is serviced as quickly as possible.

Daktronics builds displays for long life and require little maintenance. However, from time to time, certain display components will need replacing. The Replacement Parts Lists in **Sections 4.21** and **4.22** provide the names and part numbers of components that may need to be ordered during the life of this display.

Following the Replacement Parts List in **Section 4** is the Exchange/Replacement Procedure in **Section 4.23**. Refer to these instructions if any display component needs to be replaced or repaired.

## 1.2 Display Overview

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**Figure 3:** 1600 Series 8 x 8 Lens/Reflector Assembly

Daktronics 1600 series 2.5" large matrix incandescent displays utilize a proprietary lens/reflector assembly, **Figure 3**, making them the brightest, sharpest color display systems available. They have been designed and manufactured for performance, reliability, easy maintenance and long life.

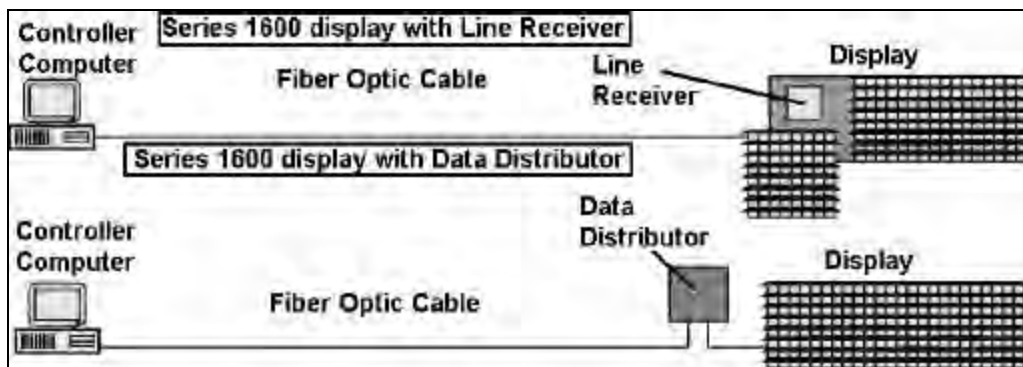
1600 series large matrix displays are controlled by Venus<sup>®</sup> 7000 software installed on a controller computer. The controller computer, in turn, connects to the display controller. The display has one of two types of display controllers, a **Line Receiver** or **Data Distributor**.

It will be helpful to know if the display has a data distributor or a line receiver while reading this manual. If the display has a **Super Line Receiver**, refer to **ED-11441** in **Appendix C** for specific information regarding super line receivers.

A display with a **Line Receiver** is capable of producing 16 color or monochrome images.

A display with a **Data Distributor** is capable of producing 16.7 million color or 64 shades of gray images.

**Notice:** A line receiver is housed inside a display, while a data distributor is found outside, somewhere near the display. **Figure 4** illustrates this difference between a line receiver and a data distributor. Information specific to each type of display controller is contained in this manual.



**Figure 4:** 1600 series displays have either a line receiver or a data distributor.

## 1.3 Definitions

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The following list of definitions is divided into three sections: **General Display Definitions**, **Line Receiver Definitions** and **Data Distributor Definitions**. Since the display has either a line receiver or a data distributor, not all definitions will apply. Definitions that apply to displays with both types of display controllers are found under **General Display Definitions**.

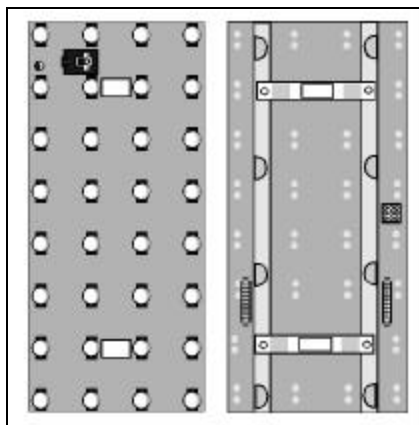
## General Display Definitions

**Controller Computer:** The computer that controls what you see on the display. Information is sent from the controller computer to the display controller through fiber optic cable.

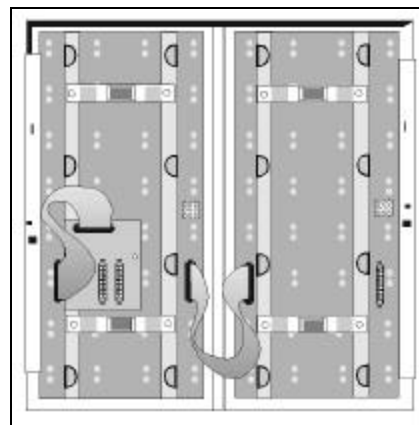
**Display Controller:** A general term used to describe the device housed either inside or outside the display that receives signal from the controller computer. This display will use either a line receiver or a data distributor as a display controller.

**Fan Controller Enclosure:** An assembly found within the display that receives information from the cooling fans. The fan controller card within the enclosure provides power to the fans and monitors the fans for proper operation. If a fan failure is detected, the fan control circuit sends a signal to the data distributor telling it to blank the display. This prevents the display from overheating. If the display remains blanked for 30 minutes, the data distributor or line receiver sends a signal to the fan control circuits, turning the fans off. This extends the life of the fans and filters.

**Lampbank:** A circuit board consisting of an array of lamps eight pixels high by four pixels wide. Two lampbanks mount to the rear of each lens/reflector assembly as seen in **Figure 5**. A single lampbank, front and back, is illustrated in **Figure 6**. If necessary, a lampbank can be easily removed from the lens/reflector assembly.



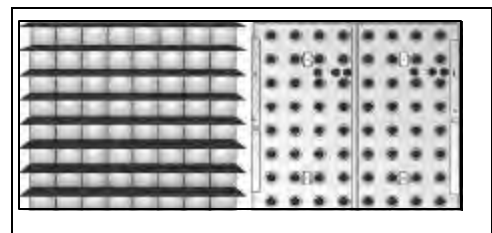
**Figure 5:** Two lampbanks on the back of a lens/reflector assembly



**Figure 6:** Lampbank, Front and Back

**Lampbank Test Fixture:** An optional unit designed to test a single lampbank separately from the display.

**Lens/Reflector Assembly:** Consists of reflectors, lenses and louvers. A lens/reflector assembly is eight lenses high by eight lenses wide and is easily removable for maintenance. **Figure 7** illustrates the front and back of a lens/reflector assembly. Two lampbanks mount on the rear of this assembly.

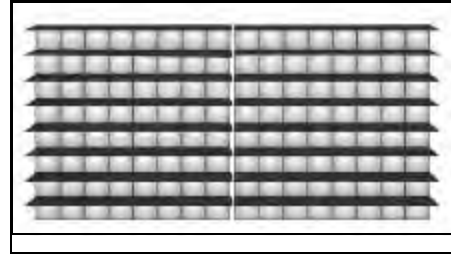


**Figure 7:** Lens/reflector Assembly, Front and Back

**Light Detector:** The light detector is a device that senses ambient light levels. The light detector and the controller operate together to dim the display when maximum lamp brightness is not required. This saves energy and extends lamp life. Refer to **ED-9490** and **Drawing A-79768** in **Appendix C** for light detector installation information.

**Louver:** A piece of aluminum, eight pixels long, positioned above each row of lamps to provide contrast and help direct light.

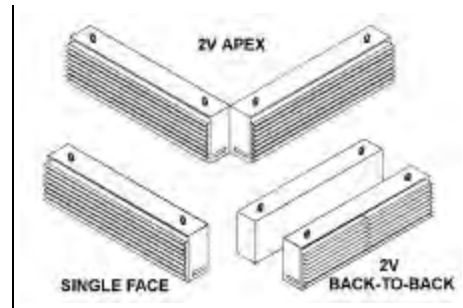
**Module:** A module consists of four lampbanks mounted to the backs of two lens/reflector assemblies. A module, **Figure 8**, is eight pixels high by 16 pixels wide.



**Figure 8:** Module

**Multiple-Face Display:** Consists of two or more independent displays, as seen in **Figure 9**.

**Pixel:** In the case of a Starburst display, a pixel is the smallest point on a display capable of producing red, green, blue, or white light. On a Sunspot display, a pixel is a single point of white light or a single lamp. A group of pixels can be arranged to form a letter, word or image.



**Figure 9:** Multiple/Single-Face Displays

**Single-Face Display:** A single-sided, independent display, as seen in **Figure 9**.

**Starburst<sup>®</sup> Display:** Refers to one of the two types of displays available (SunSpot is the other). Starburst color displays use blue, red, green and white lenses. These lenses, combined with the proper display controller, can create 16 color or 16.7 million color images on a display. Starburst is a registered trademark of Daktronics.

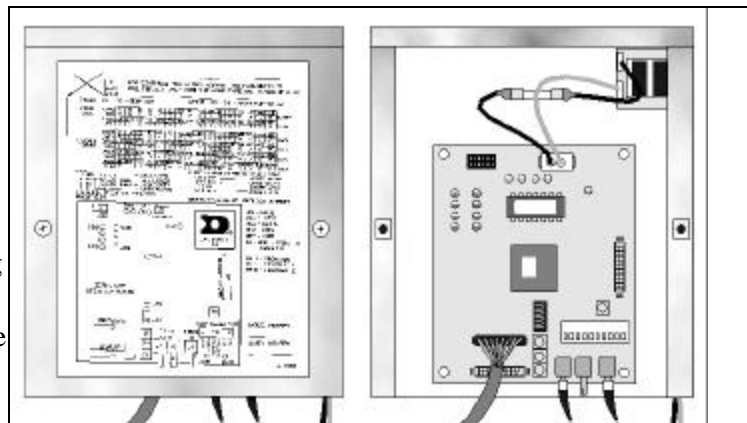
**Sunspot<sup>®</sup> Display:** A monochrome display capable of 64 shades of gray when used with the proper display controller. Sunspot is a registered trademark of Daktronics.

**Temperature Sensor:** A device mounted separately from the display that reports temperature information to a controller for processing and display. Refer to **ED-9489** and **Drawing A-79767** in **Appendix C** for temperature sensor installation information.

### **Line Receiver Definitions**

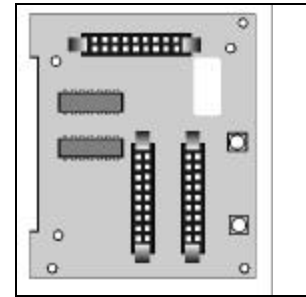
The following definitions are specific to displays with line receivers.

**Line Receiver:** Sometimes called a serial line interface, a line receiver receives signal from the controller computer through fiber optic cable and routes it to the display through vertical shift boards. A line receiver is capable of producing monochrome or 16 color images. **Figure 10** shows a line receiver.



**Figure 10:** Line Receiver

**Vertical Shift Board:** The vertical shift board is a circuit board mounted to the back of the left-most (front view) lampbank in each row of modules. It routes data from the line receiver both down the row and to the vertical shift board below it. A vertical shift board is seen in **Figure 11**.

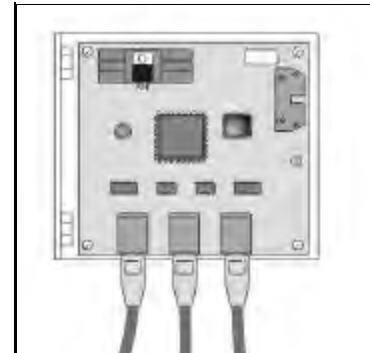


**Figure 11:** Vertical Shift

### **Data Distributor Definitions**

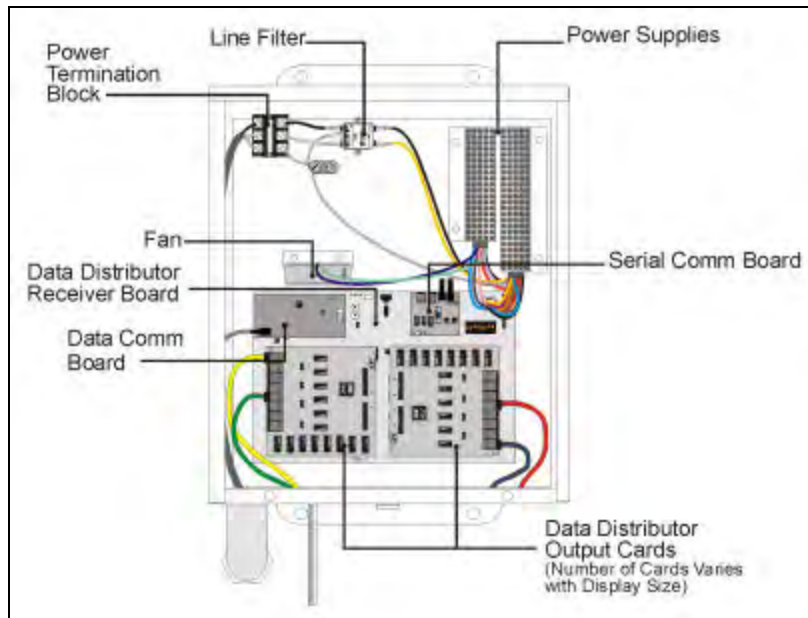
The following definitions are specific to displays with data distributors.

**Column Director:** This circuit board directs the flow of data coming from the data distributor to the proper line controller(s) through Cat-5 cable. It is part of the interface for 16.7 million-color and 64 shades of gray technology.



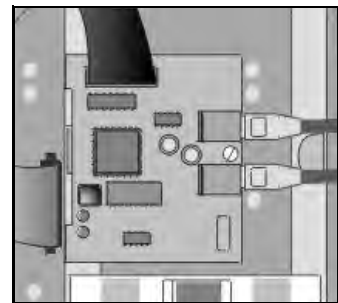
**Figure 12:** Column Director

**Data Distributor:** The data distributor is a display controller that consists of a receiver board and output cards. The number of output cards can range from 2 to 10, depending on the size of the display. The receiver board receives signal from the controller computer through fiber optic cable and distributes it to the output cards. The output cards send the signal to the display through the column directors and line controllers. A data distributor is capable of 16.7 million-color and 64 shades of gray display images.



**Figure 13:** Data Distributor

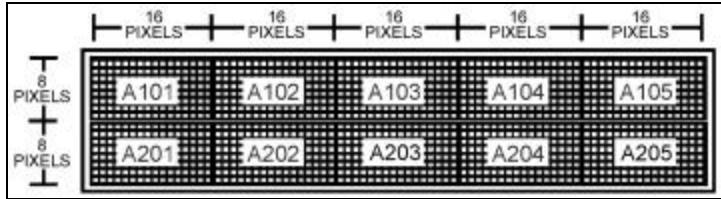
**Line Controller:** A circuit board that receives signal from a column director and distributes it to the modules in a row. **Figure 14** shows an illustration of a line controller. The line controller is mounted to the back of the left-most (front view) lampbank in each row of modules. It routes data from the column director both down the row and to the line controller below it.



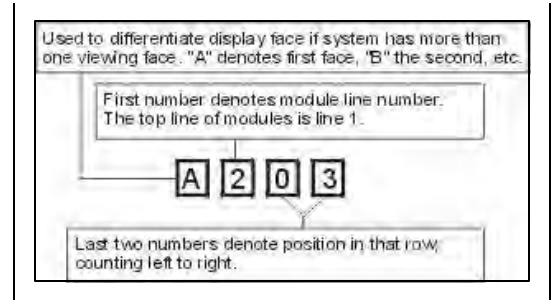
**Figure 14:** Line Controller

## 1.4 Daktronics Nomenclature

The Daktronics module numbering system assigns numbers to modules to aid in wiring and troubleshooting. Remember, a module is two, side-by-side lens/reflector assemblies. **Figure 15** illustrates how the top two rows of a large matrix display would be numbered starting from the left. **Figure 16** explains the meaning of the module numbering.

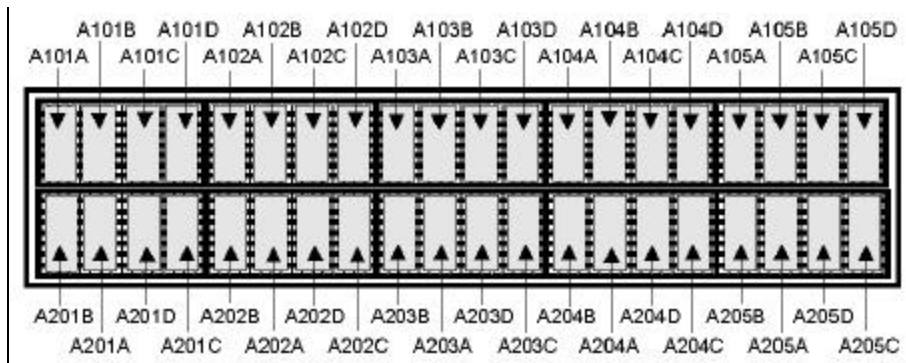


**Figure 15:** Module Numbering (16x80 display) – Front View



**Figure 16:** Module Numbering Detail

Lampbanks also have a numbering system. There are two lampbanks mounted on the back of each lens/reflector assembly. Therefore, there are four lampbanks per module. **Figure 17** illustrates this lampbank numbering. It uses the same first four digits as the module numbering system, but with an A, B, C or D at the end to indicate whether it is the first, second, third or fourth lampbank on that module.



**Figure 17:** Numbering (16x80) - Front View

In addition, when using Daktronics drawings it may also be helpful to know the following.

“**F**” denotes a fuse (F1, F2, F3...)

“**T**” denotes a transformer (T1, T2, T3)

“**TB**” denotes a termination block – power or signal.

“**A**” denotes an assembly. These are divided according to power or signal.





# Section 2 : Mechanical Installation

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The Daktronics product manager's engineering staff must approve any changes that may affect the weather tightness of the display. This includes, but is not limited to, the border shrouding, back sheets, cooling fans, fan filters and filler panels. *Before making ANY modifications to the weather tightness of the display, submit detailed drawings of the changes to our engineering staff for evaluation and approval or the warranty will be null and void.*

*Appendix C contains two copies of the Installation Quality Checklist. Keep one copy and send the other to Daktronics at the address listed on the form.*

**CAUTION:** *Fully attach backsheets to the display cabinet, with all of the screws, prior to lifting the display with the eyebolts. The backsheets provide structural support to the cabinet. Lifting the display with the backsheets removed may cause the cabinet members to twist, compromising the structural integrity and/or squareness of the display frame. If the display frame is not square, normal waterproofing measures may prove inadequate, leading to moisture related problems for the electronics.*

## 2.1 Mechanical Installation Overview

---

Because every installation site is unique, there is no single Daktronics-approved procedure for mounting Series 1600 large matrix displays. The information contained in this section is general information only and may or may not be appropriate for this particular installation.

**All decisions regarding the mounting of this display must conform to the specifications and guidelines in this section.**

**Read both the mechanical and electrical installation sections of this manual before beginning any installation procedures.**

Series 1600 large matrix displays are built as **Sectional Displays** or **Full Cabinet Displays**.

**Sectional Displays:** Larger displays built and shipped in sections, which are assembled at the installation location. The display sections are bolted to a mounting structure and to each other. Display sections must be bolted to each other horizontally and vertically to ensure uniform module spacing. The display border shroud may or may not be installed at the factory.

**Full Cabinet Displays:** Shipped in one piece as a complete unit.

## 2.2 Support Structure Selection/Design

---

An adequate support structure must be present if this display is to be mounted in a safe and stable manner. Support structure design may be dependent on mounting method, display size and weight as well as the size and weight of any additional signs attached to the display or mounting structure. Display height and wind loading are also critical factors. **The bottom of the display needs to be continuously supported.**

It is the installer's responsibility to ensure the mounting structure and mounting hardware is capable of supporting the display.

**Daktronics is not responsible for the mounting decisions made by others.**

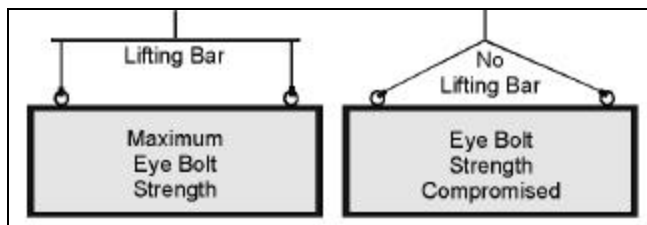
## 2.3 Lifting the Display or Display Section

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The top of the display (or display sections) will be equipped with eyebolts to lift the unit. Take special care not to exceed the rated load of the eyebolts. Refer to the information in **Appendix C** labeled **Eye Bolts** to determine the allowable load of the eyebolts shipped with the display.

**Figure 17** illustrates both the correct (left example) and the incorrect (right example) method of lifting a display. Lift the display as shown on the left, with the lifting bar.

Stress on the eye bolts increase as the angle between the cable and the display top decreases.



**Figure 18:** Display Lifting

Use every lifting point provided!

*Do not attempt to permanently support the display by the eyebolts.*

If mounting this display outside, make sure water or moisture doesn't get into the display.

1. Inspect the top and sides of the display for any holes that may allow moisture to enter the display. If the eyebolts were removed, plug the holes with bolts and the rubber sealing washer that came with the eyebolt.
2. Plug and seal the eyebolt holes and any other openings that may allow water to enter the display with silicone or another waterproof sealant.

**CAUTION:** Fully attach backsheets to the display cabinet, with all of the screws, prior to lifting the display with the eyebolts. The backsheets provide structural support to the cabinet. Lifting the display with the backsheets removed may cause the cabinet members to twist, compromising the structural integrity and/or squareness of the display frame. If the display frame is not square, normal waterproofing measures may prove inadequate, leading to moisture related problems for the electronics.

## 2.4 Display Mounting

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### Reference Drawing:

Sectional Display Assembly Example .....Drawing A-116653

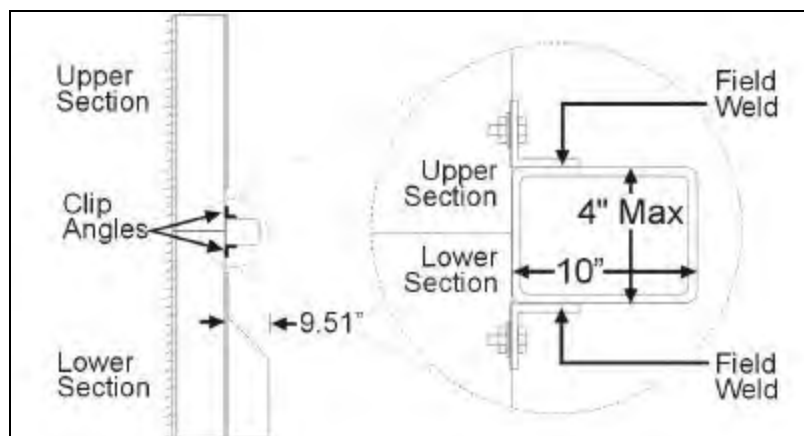
**It is the responsibility of the installer to ensure the installation will adequately meet local codes and standards. The mounting hardware and method is also the responsibility of the installer.**

**Before beginning the installation process, verify the following items.**

- The mounting structure will provide a straight and square frame for mounting the display. **Height variation in any four-foot (122 cm) horizontal section may not exceed ¼ inch (6.4 mm).**
- The mounting structure will not give way at any unsupported points after the display is mounted.

**In addition, keep the following critical points in mind.**

- The bottom of the display must be continuously supported along its length. The bottom display attachment must support the weight of the display and any additional weight caused by ice, snow, etc., plus half the wind load.
- The top of the display must resist overturning and half the wind load.
- If the display was shipped in sections, and the sections must be removed from the trailer prior to installation, do not sit the sections directly on the ground. Place them on spacers at least two inches high to prevent module damage.
- Ensure the drain holes in the bottom of the display or the bottom angle of the display is not obstructed by the mounting structure. If this is the case,  $\frac{3}{8}$ -inch (9.5mm) drain holes must be drilled through the mounting structure in the same location as the original holes. Be sure to maintain a minimum of ½-inch (13 mm) clearance between all bottom drain openings in the base of the sign and the mounting structure.
- Depending on display design, it may be necessary to jump ribbon cable from the last driver board in one section row to the first driver board in the section beside it. If this is the case, do not crush the

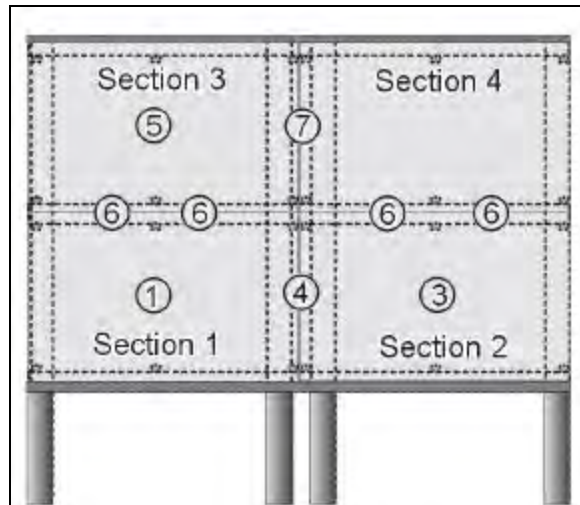


**Figure 19:** Outdoor Mounting Method Example (Horizontal Tubing)  
ribbon cables between the display sections.

**Figure 19** illustrates one possible mounting method for a large matrix display. Refer to **Drawing A-116653** in **Appendix B** for details. **Figure 19** shows two display sections being welded to a piece of horizontal tubing that was attached to a support structure by the customer/subcontractor. A cabinet display could be attached in a similar manner.

**Figure 20** and the steps below provide an example of how a sectional display might be mounted using the horizontal tubing method illustrated in **Figure 19**. The number of sections in a display may vary. The purpose of the following information is to provide general guidance in mounting the individual sections to a support structure. Refer to **Drawing A-116653** in **Appendix B** for details. The numbered areas in **Figure 20** correspond to the numbers of the following steps.

1. Bring the first lower section, **Section 1**, of the display into position and weld the upper and lower clip angles to the upper and lower horizontal tubing. Pay close attention to this first display section. Ensure it is both vertically and horizontally straight, as all other sections will be based on this section's position.
2. If an additional section is to be placed beside the first section, apply a  $\frac{3}{16}$ -inch (5 mm) bead of silicone around all interconnect holes and around the entire perimeter of the side of the section frames.
3. Lift the next section on the lower section row, **Section 2**, into position beside the first section mounted. All lower display sections should be installed first.
4. Bolt the lower display sections together vertically. A detailed illustration of section bolting is found in **Drawing A-116653** in **Appendix B**. Adjust the section's clip angles, if needed, and weld to the upper and lower horizontal tubing.
5. If mounting additional sections to the top of the bottom sections, remove the lift eyebolts from the bottom sections and fill these holes completely with silicone. Apply a  $\frac{3}{16}$ -inch (5 mm) bead of silicone around all interconnect holes and around the entire perimeter of the top of the bottom section frames. Bring the first top section, **Section 3**, into position.
6. Bolt the upper section to the lower section. Adjust the upper section clip angles, if needed, and weld to the upper and lower horizontal tubing. Apply a  $\frac{3}{16}$ -inch (5 mm) bead of silicone around all interconnect holes and around the entire perimeter of the side of the section frame. Stack the next upper display section (**Section 4**) onto the next lower section and bolt them together horizontally.
7. Bolt the top sections together vertically. Adjust the section's clip angles, if needed, and weld to the upper and lower horizontal tubing.



**Figure 20:** Sectional Mounting Method

**Height variation for any four-foot horizontal section (1219 mm) must not exceed  $\frac{1}{4}$ -inch (6.4 mm).**

**Bolt display sections together vertically *and* horizontally.**

After completing installation, carefully inspect the display for any holes that may allow water to seep into the display. Seal the any holes with silicone sealant.

If the eye bolts on the upper most sections (or the top of the display cabinet) have been removed from the display, plug the holes with bolts and the rubber-sealing washer that was removed with the eyebolt.

## 2.5 Full Cabinet Display Mounting

### Reference Drawing:

MTG Example, Full Matrix .....Drawing A-123964

The mounting procedure for a full cabinet display (also called a full matrix) varies from the procedure used for a sectional display in a number of ways. The following is a general overview of the steps to use while mounting a full cabinet display.

1. Inspect the display mounting structure before beginning the installation process.
2. Ensure that the structure provides a level and plumb frame for mounting the display. Height variation in any 4-foot horizontal section must not exceed ¼ inch.
3. In addition, check to see that the mounting frame will not give way at unsupported points after the display mounts. If any problems are noted, take corrective action before mounting the display.
4. Bring the display cabinet into position and weld the upper and lower clip angles to the upper and lower horizontal tubing as seen in **Drawing A-123964** in **Appendix A**. Make sure the cabinet is vertically plumb and horizontally level.

When applicable, project specific mounting details will be included in **Appendix A**. Call Daktronics for additional mounting details and specifications. *It is the responsibility of the installer to ensure the installation will adequately meet local codes and standards.* The mounting hardware and method is also the responsibility of the installer. Be sure to maintain a minimum of ½-inch clearance between all drain openings in the base of the sign and the mounting surface.

Refer to **Drawing A-123964** in **Appendix A** for a detailed illustration of a full-cabinet mounting example.

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## 2.6 Light Detector and Temperature Sensor Installation

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Refer to **ED-9490** and **Drawing A-79768** in **Appendix C** for light detector installation and **ED-9489** and **Drawing A-79767** in **Appendix C** for temperature sensor installation information.

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## 2.7 Data Distributor Mounting

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### Reference Drawings:

Standard Data Distributor .....	<b>Drawing A-117702</b>
Standard Data Distributor Details .....	<b>Drawing A-118499</b>
Detail, ISO View of DD.....	<b>Drawing A-119584</b>

Whenever possible, Daktronics mounts the data distributor enclosure to the rear of the display or display section. However, structural variables sometimes require the shipping the data distributor independently and mounting it on site, either to the display itself or to a nearby structure.

**Drawing A-118499** in **Appendix A** illustrates a data distributor mounted to the back of a display section. **Drawing A-119584** in **Appendix A** shows a data distributor mounted to a support structure.

Attached to the rear of the data distributor are two mounting plates – one on the top and one on the bottom. The data distributor can mount by running bolts through the holes in these mounting plates. Refer to **Drawing A-117702** in **Appendix A** for a detailed drawing of the mounting plates on a data distributor.

In displays with a data distributor (refer to *Error! Reference source not found.* in **Section Error! Reference source not found.** for data distributor description) data travels to column directors within the

display through RJ45 cables. Be sure not to mount the data distributor enclosure so far away from the display that the RJ45 cables cannot reach between the two. Daktronics usually cuts RJ45 cables to length.

Signal and power cable into the data distributor enclosure should both be run through separate, rigid, metal conduit, as opposed to flexible conduit (metal or PVC). Section 3 addresses power and signal connection.

## 2.8 Display Ventilation Requirements

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**L** *Any new plans for filtering air in an enclosed display must be submitted to Daktronics engineering staff for evaluation and approval or the warranty will be null and void. If the Daktronics air filtration system is modified in any way, these changes must first be approved by Daktronics engineering staff.*

In enclosed displays, 12 square inches (77.4 square centimeters) of unobstructed opening per module is required to ensure adequate display cooling. Allowances must be made to compensate for the percentage of screen in the material covering the openings in the enclosed structure. If air must be forced into the enclosed area, 110 cubic feet per minute (187 cubic meters per hour) must be provided per module (one module = 20" x 40" (508 mm x 1016 mm) display active area, or eight rows by 16 columns of lamps).

**For example**, a 24x80 double-face display with an enclosed center cabinet would require 360 square inches (2.3 square meters) of unobstructed opening in the bottom of the center cabinet.

$$[2(24 \times 80)] / 128 = 30 \text{ modules} \qquad 30 \text{ modules} \times 77.4 \text{ cm}^2 = 2322 \text{ cm}^2 \text{ or } 2.3 \text{ m}^2$$

## 2.9 Verifying Correct Lens and Module Position

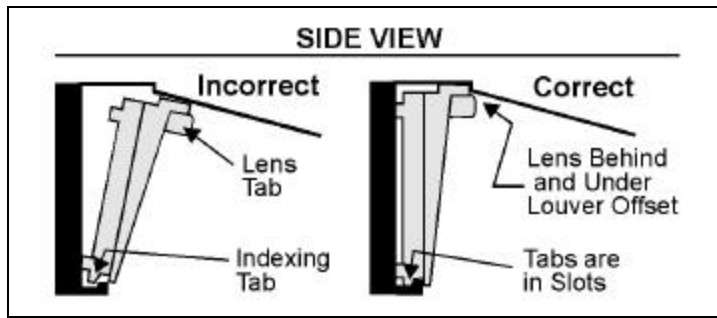
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The final steps of mechanical installation involve verifying that all lens are positioned properly upon their respective lens/reflector assemblies and that all modules are fully engaged into the cabinet.

Look down the rows of louvers from either end of the display and ensure that all lenses are secured properly. Lenses not secured properly are easily noticeable as the lens removal tab, or the lens itself, will not be in alignment with the other lenses or lens removal tabs of that row.

Refer to **Figure 21** and the following steps to return a lens to its correct position.

1. First, insert the bottom indexing tabs into the slots. There is one indexing tab on each bottom corner of the lens.
2. While gently pushing the above louver upward, grab the lens tab and push the top of the lens behind and under the louver offset. Only push the louver upward enough to allow the lens to snap into position behind the offset.
3. Release the louver and verify the lens is aligned with others in the row.



**Figure 21:** Correct Lens Position

Ensure that the rows of louvers align properly. If any rows seem out of position this may indicate that one, or both, sides of the lens/reflector assembly are not fully engaged into the cabinet. If this is the case, a firm push to both sides of the module at the same time should snap the module into place.





# Section 3 : Electrical Installation

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**Appendix C** contains two copies of the Installation Quality Checklist. It covers both mechanical and electrical installation. This form is intended to assist in display installation and assure dependable operation. Be sure to complete every item on the checklist. Following installation, return one copy to Daktronics Customer Service to receive a free set of replacement air filters. Contact Daktronics Customer Service if any product quality questions or concerns should arise.

## 3.1 Common Connectors

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Many different types of connectors are used for power and signal termination in this display. Take special care when disengaging any connector so as not to damage the connector, the cable or the circuit board.

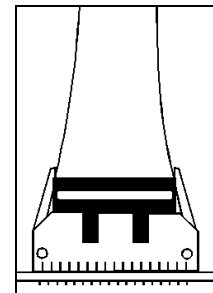
**When pulling a connector plug from a jack, do not pull on the wire or cable; pull on the jack itself. Pulling on the wires may damage the connector.**

The following information presents some common connectors encountered during display maintenance. These include, ribbon cable connectors, Mate-n-Lok™ connectors, Phoenix™-style connectors, fiber optic connectors, termination panels and termination blocks, and tab connectors. Not all of these connectors are found in every display.

### 1. Ribbon Cable Connectors:

Daktronics uses a variety of ribbon cables and ribbon cable connectors as seen in **Figure 22**.

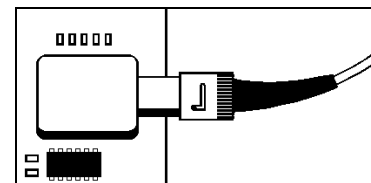
Before replacing a ribbon cable connector, spray it with **DeoxIT™** contact cleaner to remove any foreign matter that may cause signal problems. In addition, a generous amount of **CaiLube™** protector paste should be applied to the plug before it is inserted into the jack. This paste will protect both the plug and the jack from corrosion. Both the DeoxIT and the CaiLube are in the tool kit accessories package included with this display. Refer to the **Replacement Parts Lists** in **Sections 4.19** and **4.20** if needing additional supplies of either.



**Figure 22:** Ribbon Cable Connector

### 2. Fiber Optic Connectors:

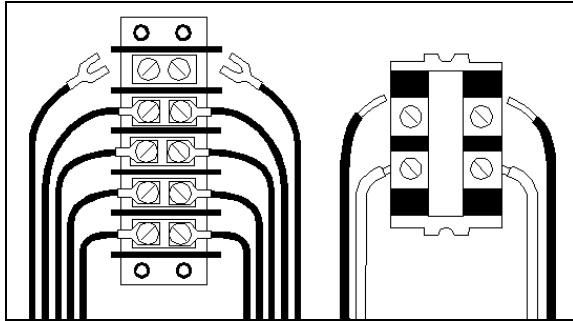
At each end of a fiber optic cable is a “twist-on” connector. To remove the fiber plug from its jack, push it toward the jack and twist it counter-clockwise until the plug can be pulled free. A common type of fiber optic connector is illustrated in **Figure 23**.



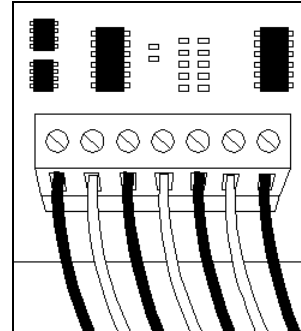
**Figure 23:** Fiber Optic Connector

### 3. Termination Panels & Termination Blocks:

Termination panels and termination blocks are most often used to connect internal power and signal wires to wires of the same type coming into the display from an external source. Most signal wire will come with forked connectors crimped to the ends of the wire. Power wires need to have one-half inch of insulation stripped from the end of the wire prior to termination. Tighten all screws firmly to ensure a good electrical connection. Refer to **Figure 24**.



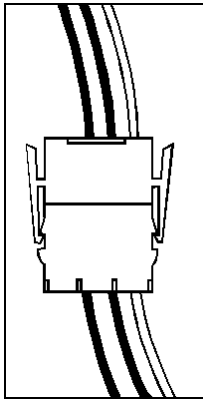
**Figure 25:** Termination Panel (Left) and Termination Block (Right)



**Figure 24:** Phoenix Connector

### 4. Phoenix™-Style Connectors:

Phoenix-style connectors, which are usually green, are often used for signal termination on circuit boards. Refer to **Figure 25**. One-quarter inch of insulation must be stripped from the wire prior to termination. To remove a wire, turn the above screw counter-clockwise to loose the connectors grip on the wire. To insert a wire, push the bare wire into the connector and turn the above screw clockwise to lock the wire into place.



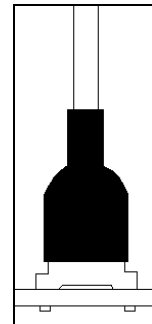
**Figure 26:** Mate-n-Lok Connector

### 5. Mate-n-Lok™ Connectors:

The Mate-n-Lok connectors found in this display are white and come in a variety of sizes. **Figure 26** illustrates a four-pin Mate-n-Lok connector. To remove the plug from the jack, squeeze the plastics locking clasps of the side of the plug and pull it from the jack.

### 6. Tab Connectors:

The tab connector, illustrated in **Figure 27**, is found in most Daktronics displays. Grab the connector on the plastic terminal cover when removing. Do NOT pull it off the tab by pulling on the wire.



**Figure 27:** Tab Connector

### 3.2 Display Power Requirements

The following table summarizes the power requirements for the various 1600 Series, 2.5-inch large matrix displays. **Power is stated per display face.**

Display Size	102/208 3 Phase 4 Wire Plus Ground (In Amps)	120/240 Single Phase 3 Wire Plus Ground (In Amps)	Total Watts
24 x 48	33	41	8813
24 x 64	33	49	11750
24 x 80	49	66	14688
24 x 96	49	82	17626
24 x 112	66	90	20563
24 x 128	66	98	23501
24 x 144	82	114	26438
32 x 80	58	82	19584
32 x 96	66	98	23501
32 x 112	82	115	27418
32 x 128	98	131	31334
32 x 144	98	147	35251
40 x 80	74	106	24480
40 x 96	82	131	29376
40 x 112	98	147	34272
40 x 128	115	164	39168
40 x 144	131	188	44064
48 x 80	82	131	29376
48 x 96	98	147	35251
48 x 112	115	180	41126
48 x 128	131	196	47002
48 x 144	147	229	52877
56 x 80	98	147	34272
56 x 96	115	180	41126
56 x 112	139	204	47981
56 x 128	164	229	54835
56 x 144	180	262	61690
64 x 80	115	164	39168
64 x 96	131	196	47002
64 x 112	164	229	54825
64 x 128	180	262	62669
64 x 144	196	294	70502
72 x 80	131	188	44064
72 x 96	147	229	52877
72 x 112	164	262	61690
72 x 128	204	294	70502
72 x 144	229	335	79315

### 3.3 Checking Line Voltage & 24-Hour Voltage Monitoring

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Prior to display installation a two-part voltage check should be performed. This is a necessary step taken to maximize lamp life. By looking-up the line voltage on the table in this sub-section, estimated lamp life may be calculated and, if necessary, steps can be taken to extend it.

In **Appendix C** are two forms titled “Display Power Report.” Three different voltage readings are recorded on this form.

1. Line voltage, which is addressed in this sub-section.
2. 24-hour monitoring, which also is addressed in this sub-section
3. Lamp voltage, which is checked after the display is powered-up for the first time.

When complete, one of the “Display Power Report” forms must be sent to Daktronics Customer Service. The other form is for the customer’s records.

To complete the line voltage check, take a line reading of each phase and record the results on each of the power reports in **Appendix C**. Then place a voltage monitor on the phase with the highest reading for 24 hours. The maximum and minimum voltages recorded should also be recorded on each of the power reports.

If lacking the proper equipment to accurately monitor line voltage consider the following options.

- Have the local power company take the readings.
- Rent the equipment from a local service company.
- Have Daktronics Customer Service recommend the proper equipment.
- Rent the equipment from Daktronics.

If there is any reason to suspect large voltage fluctuations, place a recorder on the line for on at least one phase of the power for one week while the display is being operated normally. Contact Daktronics Customer Service with respect to this recording.

Display brightness and lamp life are generally determined assuming an average incoming line voltage of 230 volts AC at 60 hertz. If the line voltage varies from that value, both lamp life and brightness will be affected. Lamp life results will also vary with programming style and use of dimming mode.

*⌚ Lamp life predictions are for lamps operating in a laboratory with continuous operation in a stable temperature and mechanical environment. Actual values will differ from predicted life because of switched operation, varying temperature, mechanical vibrations due to wind, traffic and sign service and actual hours of operation. Data is that of the manufacturer.*

**T-1110 Transformer 230 Volt Application  
1600 Series 2 1/2 Inch Displays**

**Xenon Lamp Voltage/Life/Candle Power with 24VAC Secondary  
(Lamp life/candle power values are estimates based on laboratory conditions.)**

Line Volts	230V Only			10V Buck			10V Boost			20V Buck		
	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power
200	20.27	24786	3.76	19.40	42879	3.23	21.22	13993	4.42	18.60	72586	2.79
210	21.31	13234	4.49	20.40	22876	3.85	22.31	7477	5.27	19.56	38695	3.32
212	21.52	11716	4.64	20.60	20250	3.98	22.53	6621	5.45	19.75	34247	3.44
214	21.73	10385	4.80	20.80	17946	4.12	22.75	5869	5.64	19.94	30346	3.56
216	21.94	9216	4.97	21.00	15923	4.26	22.96	5209	5.83	20.14	26921	3.68
218	22.15	8187	5.13	21.20	14144	4.40	23.18	4628	6.02	20.33	23910	3.80
220	22.36	7281	5.30	21.40	12577	4.55	23.40	4117	6.22	20.52	21259	3.93
222	22.57	6483	5.48	21.60	11197	4.70	23.62	3666	6.43	20.71	18923	4.06
224	22.77	5778	5.66	21.80	9978	4.86	23.84	3268	6.64	20.90	16861	4.19
226	22.98	5155	5.84	22.00	8902	5.01	24.05	2916	6.85	21.10	15040	4.33
228	23.19	4605	6.03	22.20	7950	5.18	24.27	2605	7.07	21.29	13430	4.47
230	23.40	4117	6.22	22.40	7107	5.34	24.49	2329	7.30	21.48	12004	4.61
232	23.61	3684	6.42	22.60	6359	5.51	24.71	2085	7.53	21.67	10740	4.76
234	23.82	3301	6.62	22.80	5696	5.68	24.93	1868	7.76	21.86	9619	4.91
236	24.03	2960	6.83	23.00	5107	5.86	25.15	1675	8.01	22.06	8623	5.06
238	24.23	2656	7.04	23.20	4583	6.04	25.36	1504	8.25	22.25	7738	5.22
240	24.44	2386	7.25	23.40	4117	6.22	25.58	1351	8.50	22.44	6950	5.37
242	24.65	2146	7.47	23.60	3701	6.41	25.80	1215	8.76	22.63	6248	5.54
244	24.86	1931	7.69	23.80	3331	6.60	26.02	1093	9.02	22.82	5622	5.70
246	25.07	1740	7.92	24.00	3000	6.80	26.24	985	9.29	23.02	5063	5.87
248	25.28	1568	8.15	24.20	2704	7.00	26.45	888	9.56	23.21	4563	6.05
250	25.49	1415	8.39	24.40	2440	7.20	26.67	802	9.84	23.40	4117	6.22





If the line voltage is above the rated voltage, changing the transformer configuration will increase the lamp life. Refer to the lamp life chart in this sub-section to determine the estimated lamp life based on the line voltage check.

If the measured input line voltage is over the particular transformer's rated input voltage, increased voltage will be delivered to the lamp. This will greatly reduce lamp life. Reconfiguring the transformer output may reduce lamp voltage and increase lamp life.

Contact a local electrician or the local power company if line voltage is substantially above or below normal.

### 3.4 Power to the Display

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**Only qualified individuals should perform power routing and termination to the display. It is the responsibility of the installer to ensure the installation will comply with local codes and standards.**

- ▶ **Run power** through conduit according to National and local electrical codes.
- ▶ **Power cannot** route through the display. Do not use the support conduit, located inside the display, for power routing.

The following subsections address the routing of incoming power through a power disconnect switch and the termination of incoming power at the display's power termination panel. Daktronics completes all power routing and connection within the display past the power termination panel prior to shipment.

When terminating the incoming power to the term panel, balance the individual power phases as evenly as possible. Current draw per line, as noted on the sales literature or schematic is the **high** leg current draw.

For a 2V display, bring power into both faces. The termination panel for the echo face is located in the right end of the display. Connect power as stated above. The display has built-in surge protection. However, for this to be effective the display must be properly earth-grounded.

#### **Grounding**

▶ **Ground displays according to the provisions outlined in Article 250 of the National Electrical Code 7. Daktronics recommends a resistance to ground of 10 ohms or less.**

The display system *must* be connected to earth-ground. Proper grounding is necessary for reliable equipment operation. It also protects the equipment from damaging electrical disturbances and lightning. **The display must ground properly or the warranty will be void.**

The material of an earth-ground electrode differs from region to region and from conditions present at the site. Consult the National Electrical Code and any local electrical codes that may apply. The support structure of the display cannot be used as an earth-ground electrode. The support is generally embedded in concrete, and if in earth, the steel is either primed or it corrodes, making it a poor ground.



## Branch Circuit Grounding

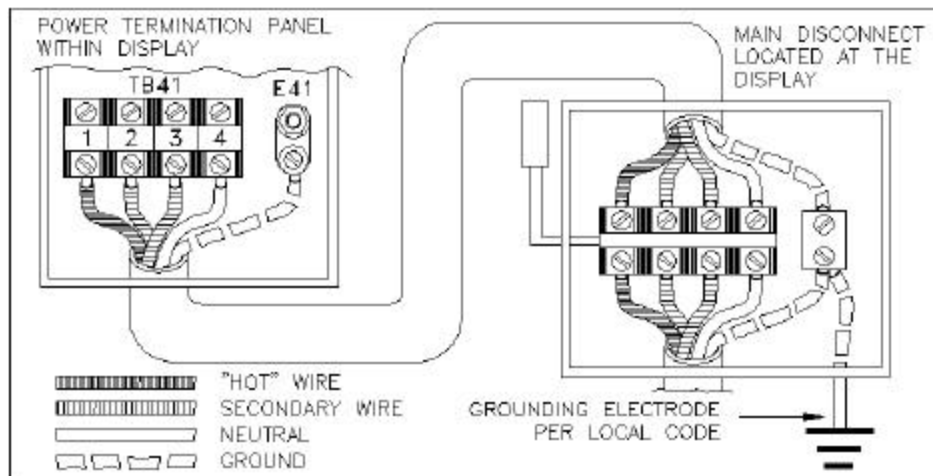
A grounding electrode at separate structures/displays shall not be required where only one branch circuit supplies the structure and the branch circuit includes an equipment-grounding conductor for grounding the non-current-carrying parts of all equipment.

### Power Installation

There are two considerations for power installation; installation with ground and neutral conductors provided and installation with only a neutral conductor provided. These two power installations differ slightly, as described in the following paragraphs:

#### Installation with Ground and Neutral Conductors Provided

For this type of installation, the power cable *must* contain an isolated earth-ground conductor. Under this circumstance, *do not* connect neutral to ground at the disconnect or at the display. This would violate electrical codes and void the warranty. Use a disconnect so that all hot lines and neutral can be disconnected. Refer to **Figure 28** for installation details. The National Electrical Code requires the use of a lockable power disconnect within sight of or at the display.



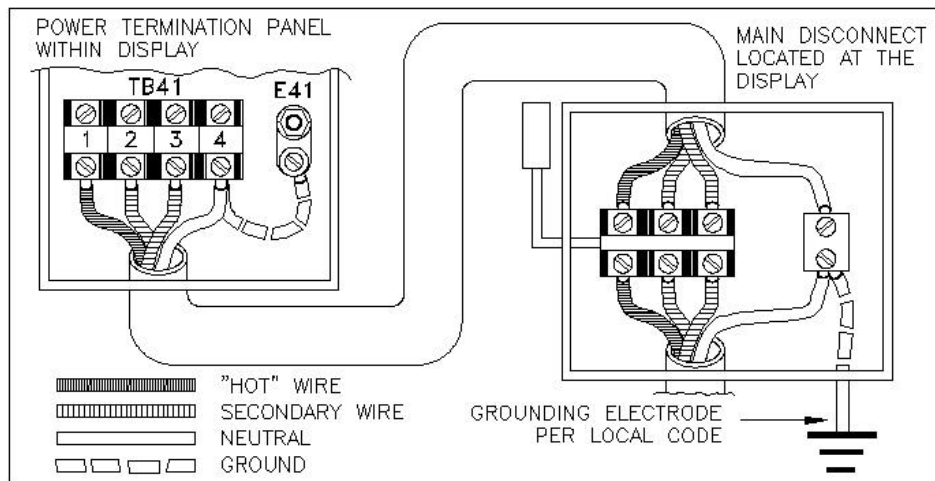
**Figure 28:** Installation with Ground and Neutral Conductor Provided

#### Installation with Only a Neutral Conductor Provided

**Installations where no grounding conductor is provided must comply with article 250-32 of the National Electrical Code. If the installation in question meets all of the requirements of article 250-32, the following guidelines must be observed:**

- Connect the grounding electrode cable at the local disconnect, never at the display power termination panel.
- A disconnect that opens all of the ungrounded phase conductors should be used.
- The neutral and the ground conductors should be bonded in the display power termination panel.

Refer to **Figure 29** for installation details.



**Figure 29:** Installation with only Neutral Conductor provided

### 3.5 Power Disconnect Switch

Route power to the display through a fused disconnect switch capable of opening all ungrounded power conductors. Locate this disconnect within the line of sight of any personnel performing maintenance on the display. If locating the disconnect out of sight of the display, it must be able to lock in the open position.

*Due to the inrush current (momentary surge) created by the display on start-up, Daktronics recommends using oversized current devices, high magnetic breakers or time delay fuses to handle the momentary surge.*

*The Over Current Protection Device needs to match the fault current available in the power delivery circuit. To determine the available fault current of circuit, have qualified personnel perform an onsite fault current survey at the site.*

*The National Electrical Code requires the Amp Inrush Current (AIC) rating of the electrical equipment in a circuit match the available fault current in the electrical circuit.*

*Because each installation is unique, Daktronics offers these instructions as guidelines only. Daktronics assumes no liability if installation steps have been omitted or other necessary procedures are not included in this manual.*

*Daktronics is not responsible for the quality of the power delivery system to the display. It is the customer's responsibility to ensure the undertaking of proper safety measures. Power and signal wiring in the display must comply with local, state and national electrical codes, with the correct cabling procedures for the installation determined and followed.*

### 3.6 Panelboard Assignments (Full Matrix Displays)

#### Reference Drawing:

Surge Suppressor Wiring .....Drawing A-81039

A panelboard encompasses the electrical service point, circuit protection, and switching of the display

power. A Daktronics supplied panelboard will be equipped with hi-magnetic trip breakers. If the customer supplies the panelboard, hi-magnetic breakers should be used. The customer is to supply a fused main disconnect(s) and wire for power distribution to the multiple breaker boxes. This customer supplied fused main disconnect is considered the service entrance point.

Due to the inrush current required by the transformers on start-up, the main disconnect may have to be oversized or use hi-magnetic trip breakers to handle this momentary inrush current requirement. An alternative is to shut down the individual breakers on the panelboard before turning on the main disconnect and then turn on the panelboard breakers individually.

The following table illustrates a typical panelboard wiring list. A list similar to this is located inside the panelboard door. The Square D 30 amp QA breaker is UL listed for 1 or 2 #10 AWG wire(s).

Breaker	Wire	Wire	Breaker
1	Main	W101P & W201P (T1)	2
3		W102P & W202P (T2)	4
5		W103P & W203P (T3)	6
7	W104P & W204P (T4)	Not Used	8
9	Spare	Not Used	10
11	Not Used	Not Used	12

Included with the panelboard is a surge suppresser that is *not* wired at the factory. Refer to **Drawing A-81039** for the wiring of the surge suppresser.

### 3.7 Configuring the Display Transformers

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The transformer used in this display has a 24V output. Refer to drawings as listed in **Sections 3.8** and **3.9** for information on configuring the transformer for variable incoming voltage.

### 3.8 Line Receiver Electrical Installation

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**Reference Drawings:**

- Schematic, Power & Wiring 220V .....**Drawing A-127375**
- Schematic, Power & Wiring 230V .....**Drawing A-127376**
- Schematic, Power & Wiring 240V .....**Drawing A-127377**

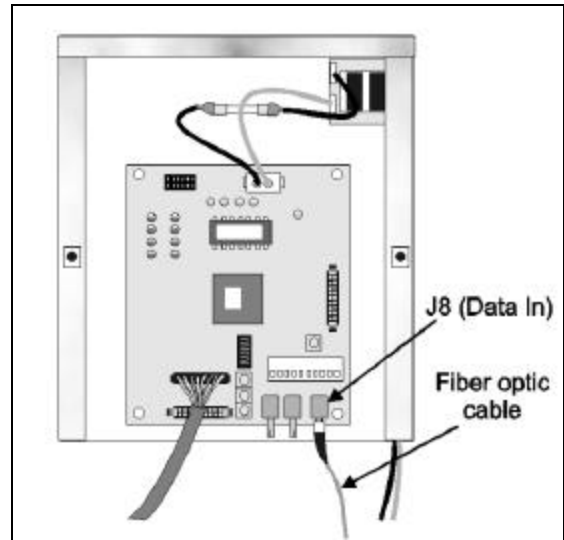
If the display has a line receiver, the data signal connection to the display is illustrated in **Figure 31**. If the display has a data distributor, skip to the sub-section titled Data Distributor Electrical Installation. For a description of the difference between a display with a line receiver and a data distributor refer to **Section 1.2 Display Overview**.

**Note:** Refer to the Shop Drawings in Appendix B for the location of the line receiver in the display. To access the inside of the display, refer to **Section 4.1**.

The data signal to the line receiver is sent through fiber optic cable from the controller computer. The fiber optic cable connects to the line receiver at the J8 (Data In) jack, as seen in **Figure 30**. This cable should be run through rigid, metal conduit, as opposed to flexible conduit (metal or PVC).

Once the signal reaches the line receiver, it is sent to vertical shift boards within the display. The vertical shift boards distribute the signal to all of the display modules.

Internal connections for power and the temperature monitoring system are completed at the factory. From the serial line interface board, display information is routed to the vertical shift board behind the upper-left-most lampbank (front view). A 20-pin ribbon cable connects J4 on the serial line interface to J2 (Input) on the vertical shift board.



**Figure 30:** J8 (Data In) connection on the line receiver

The vertical shift board then sends the display information to the lampbank on which it is mounted. A 20-pin ribbon cable connects J1 (Data Out) on the vertical shift board to J2 (Input) on the lampbank. On 16 and 24-high displays, J3 (Output) on each vertical shift board connects to J2 (Input) on the vertical shift board below it. Each display row has one vertical shift board behind the left-most lampbank (front view).

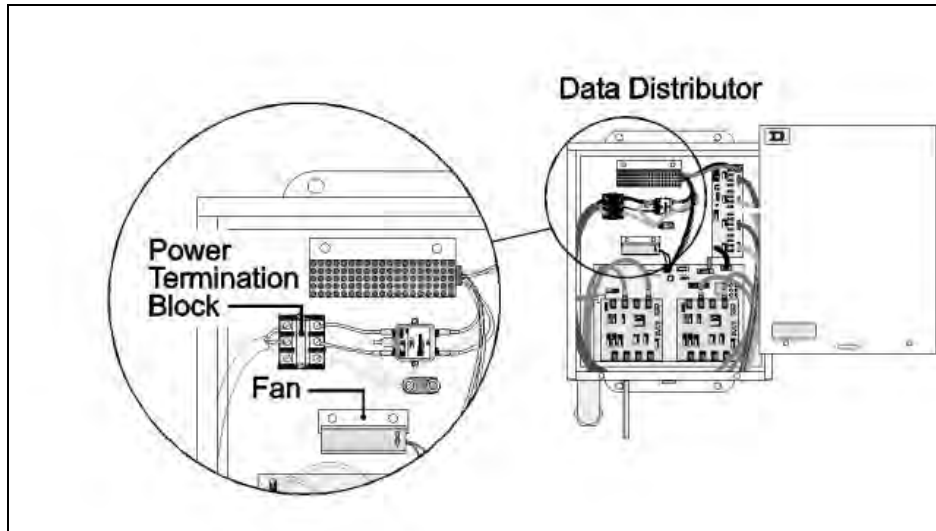
The display data then cascades down the row as it is passed from J3 (Output) on each lampbank to J2 (Input) on the next lampbank over 20-pin ribbon cable.

### 3.9 Data Distributor Electrical Installation

---

#### Reference Drawings:

Schematic, Power & Wiring 220V .....	Drawing A-127543
Schematic, Power & Wiring 230V .....	Drawing A-127544
Schematic, Power & Wiring 240V .....	Drawing A-127545



**Figure 31:** Close-up view of the power termination block in the data distributor

If the display has a data distributor, follow these steps to complete **power, signal and internal temperature monitoring system** connections. For a description of the difference between a display with a line receiver and a data distributor, refer to sub-section **1.2 Display Overview**.

#### ***Connecting Power to the Data Distributor***

Whenever possible, Daktronics runs power from the display or section panelboard to the data distributor prior to shipment. However, certain situations may require this power be run in the field.

Power should be run in conduit to the base of the data distributor enclosure. On the bottom of the enclosure are knockouts for conduit attachment. Conduit and labor to pull the power cable is the responsibility of the customer or contractor unless otherwise stated.

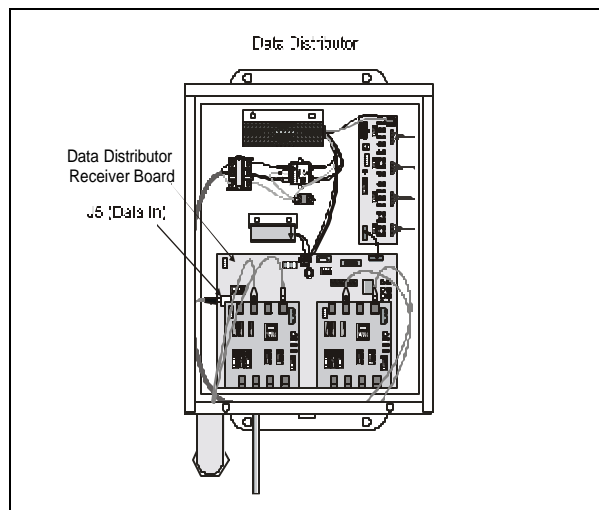
Having removed the front cover of the data distributor, the power cable can be pulled to the power termination block in the upper-left hand corner of the enclosure. The upper-left hand corner of the data distributor is illustrated in **Figure 31**.

This termination block has a protective plate that must be removed to connect the hot, neutral and ground wires. Strip and connect the incoming wires in agreement with the labels beside the termination block.

### **Connecting Signal to the Data Distributor**

Signal from the controller computer must first be routed to the data distributor and then to the column directors in the display. This signal is routed through fiber optic cable, which should be run through rigid, metal conduit, as opposed to flexible conduit.

Fiber optic cable from the controller computer connects to the data distributor receiver board at the J5 (data in) jack. The data distributor and the location of the J5 jack on the receiver board are illustrated in **Figure 32**.



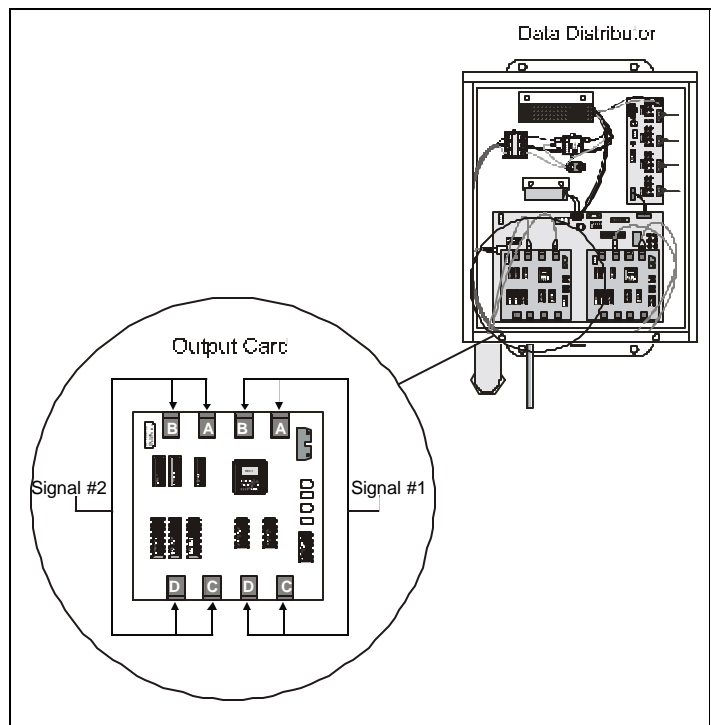
**Figure 32:** J5 (Data In) jack on the data distributor receiver board

### **Sending Signal from the Data Distributor to the Display**

Cat-5 cable from the data distributor must be connected to the column directors in a display. Route the Cat-5 cable through rigid metal conduit.

Output cards in the data distributor, **Figure 33**, are responsible for sending the data signal to the column directors through the Cat-5 cable. There can be anywhere between two and ten output cards in the data distributor – it depends on sign size. They are stacked on top of each other in pairs.

Each output card has two signal outputs, as shown in **Figure 33**. Signal #1 would be sent to one of the display's column directors, **Figure 35**, while signal #2 would be sent to another. The number of signals a data distributor can send depends on the number of output cards.

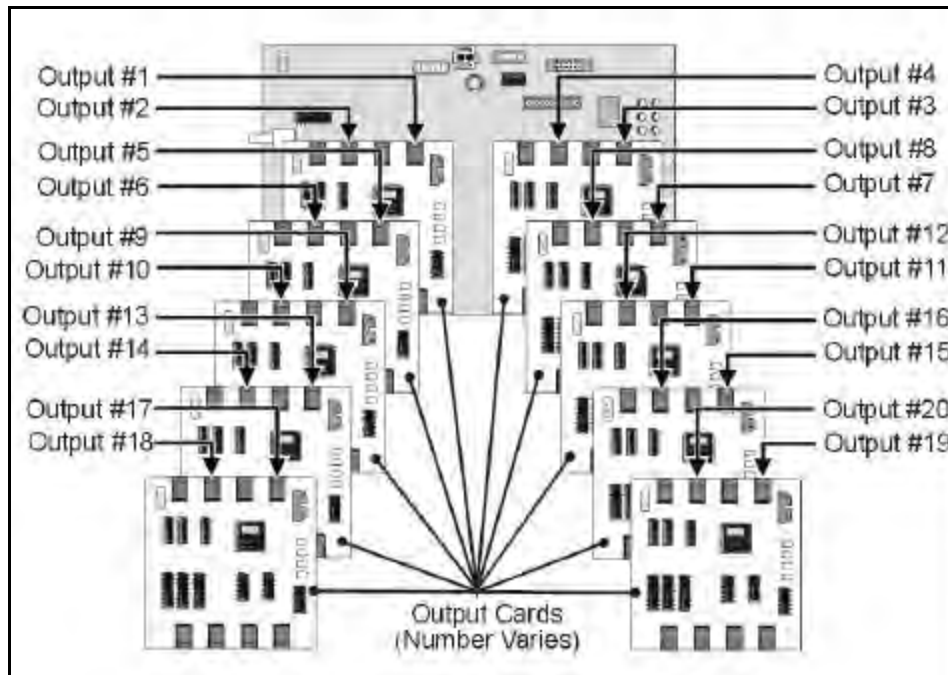


**Figure 33:** Output Card

Each signal is sent to four jacks in case there is the need to send the same signal to multiple displays. If sending data to a single display, only one of the four jacks on each signal output will be used.

In **Figure 33**, the jacks on each signal output (signal #1 and signal #2) are labeled A, B, C or D. The column directors within a display should all receive data from the same jack on both signal outputs on every output card. For instance, if only one display were present, one column director would be connected via Cat-5 cable to A on signal #1 and another would be connected via another Cat-5 cable to A on signal #2. This would be true of every output card in the data distributor.

The **System Riser Diagram** and/or schematics found in either **Appendix B** of this manual or in the **System Overview** manual, if present, will illustrate which column directors within the display receive signal from which data distributor outputs. Remember, each output card has two outputs. **Figure 34** labels the A outputs of a 10 output card data distributor. Ten is the maximum number of output cards the data distributor can accommodate. This display may have two, four, six, eight or ten output cards.



**Figure 34:** Data Distributor Output Numbering

Column directors within the display receive signal from the output cards in the data distributor. The signal is then routed from the column directors to the line controllers.

**Figure 35** shows the input and output jacks on a column director.

Line controllers receive signal from the column directors and send it to the modules in a given row and to the line controller in the next row below it. **Figure 36** shows the input and output jacks on a line controller.

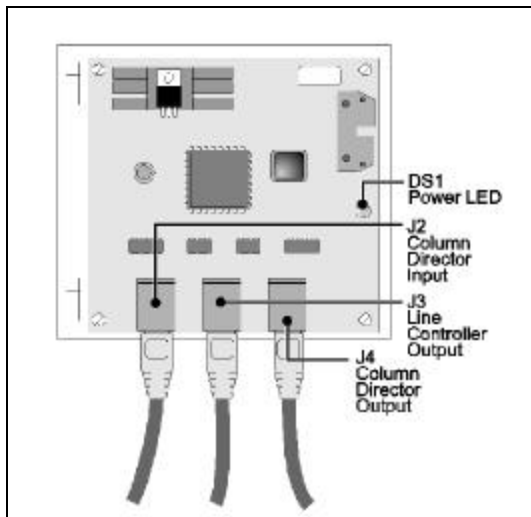


Figure 36: Column Director

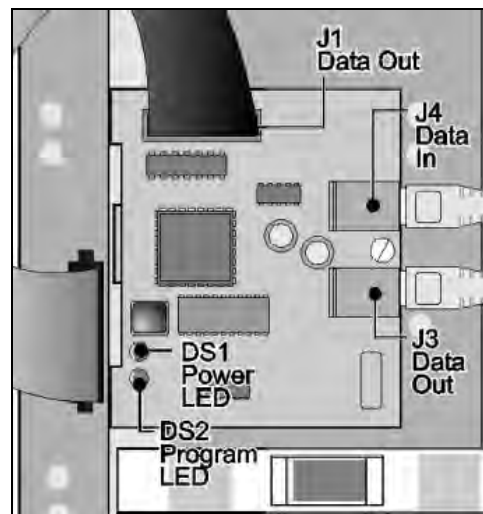


Figure 35: Line Controller

### 3.10 Connecting the Internal Temperature Monitoring System

Figure 37 shows an illustration of the inside of a fan control enclosure. Displays with line receivers and data distributors both have fan controller enclosures. The components in this enclosure are responsible for monitoring the cooling fans and sending information about the fan status to the display controller.

Refer to **Section 4.10** for details and a close-up view of the connections in the fan controller enclosure.

#### ***Connecting the Line Receiver to the Fan Controller Enclosure***

In displays with a line receiver, the connection from the line receiver to the fan controller enclosure is completed at the factory. Multiple fan controllers can be interconnected together. Refer to the **System Riser Diagram** in **Appendix B** or the **System Overview Manual**, if present, for details.

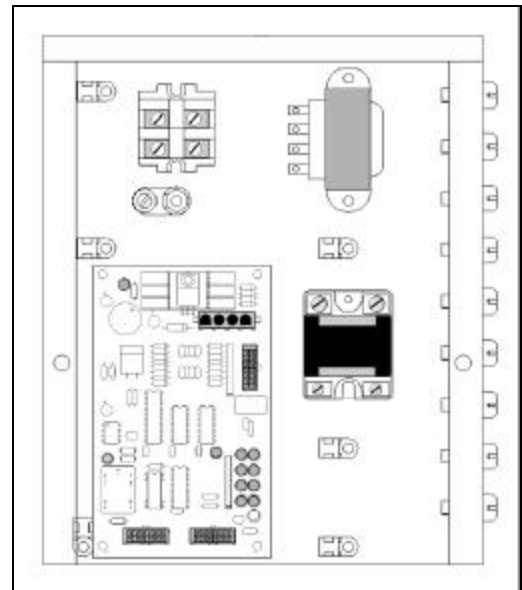
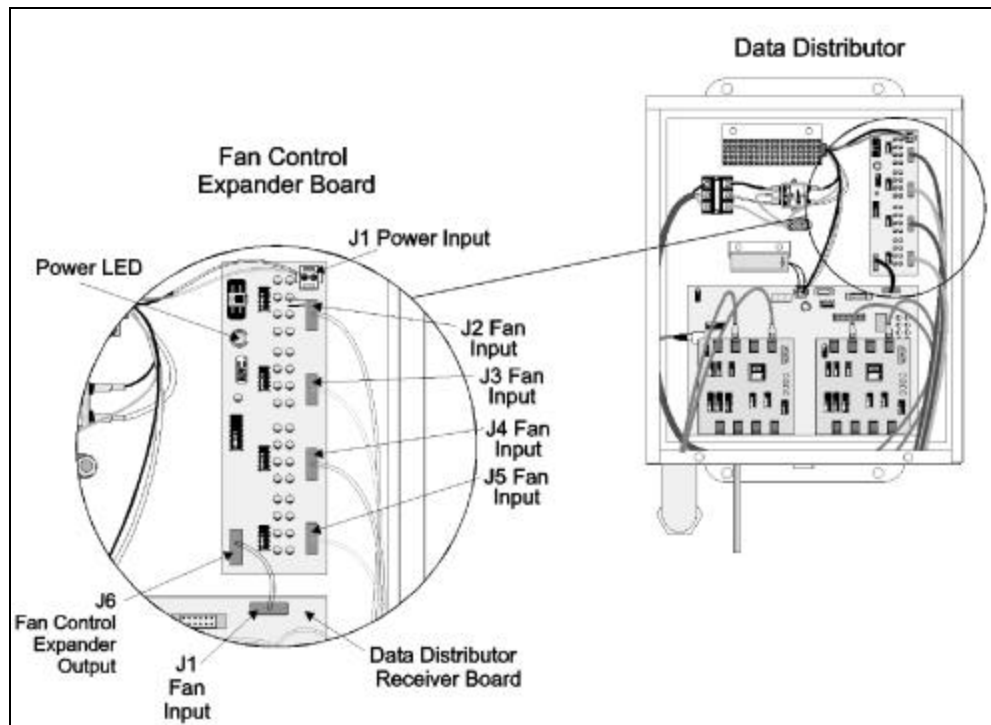


Figure 37: Fan Controller Enclosure

#### ***Connecting the Data Distributor to the Fan Controller Enclosure***

In displays with a data distributor, the fan control enclosure must be connected to the fan controller expander card in the data distributor. Figure 38 shows a close-up view of a fan controller expander card in the data distributor. Multiple fan controllers can be interconnected together. Refer to the **System Riser Diagram** in **Appendix B** or the **System Overview Manual**, if present, for details.





**Figure 38:** Close-up of the Fan Controller Expander Card in the Data Distributor.

### 3.11 Display Continuity Check

Prior to turning on the power to the display, a continuity check should be done to ensure that no short circuits have occurred due to shipping vibration.

**Caution: Before performing the following steps, be sure all the breakers are off!**

1. Remove the cover from the panelboard.
2. Using an ohmmeter, place one probe on the neutral terminal and one probe to each of the taps on the breaker wire terminal. Repeat the same test for each of the breakers.
3. Place one probe to earth ground and one to each of the breaker wire terminals and repeat for each of the breakers.

All tests should result in a reading of infinity or indicate an open circuit.

### 3.12 First Time Power Up

After all connections are made, turn on the display for a first-time field test.

1. Set all breakers to the OFF position.
2. Turn power ON to the display at the main disconnect.
3. Carefully check the voltage between the hot lines and neutral. Normal voltage range is between 230VAC and 125VAC.
4. If there are problems with voltage, check with your local electrician or power company.
5. Reset the breakers to the ON position.
6. Turn power ON to the display at the main disconnect (if it was turned off).

If the controller is not running, the display will blank after it has run through the power up test pattern. If the controller is running, the graphics or video will appear when power is restored.

### 3.13 Lamp Voltage Check

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The final step in display installation is the checking of lamp voltages. Excessive voltage to the lamps will cause premature burnout while insufficient voltage will hinder the display's effectiveness. Make sure the sign is on bright

Although a line voltage check was completed prior to installation, the lamp voltage test should still be done. This test will bring to light any internal problems, such as a transformer damaged during shipping that could result in excessive voltage being sent to the lamps.

Complete the following steps to test lamp voltages.

1. Turn on the power to the display and configure the display to have 50% of the lamps on per module. This can be done by either:
  - creating a static sequence with alternate columns on, or
  - selecting the sequence from the appropriate controller manual under the diagnostics section.

Refer to the Controller Manual for more information on setting up and running sequences.

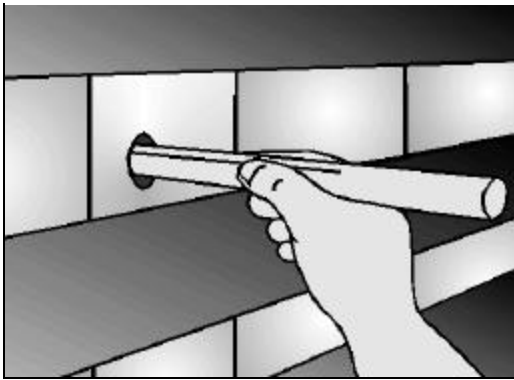
2. Locate two modules powered by the same transformer.
3. Remove a lens and an ON lamp from any column from one of the above modules. Lens removal and replacement is addressed in **Section 4.4**. **Figure 39** illustrates the use of the lamp removal tool.
4. Insert the lamp voltage tester into the empty lamp socket.
5. Place the probes of the voltage tester leads into the holes of the lamp voltage tester (**Figure 40**). Record the lamp voltage reading on each of the "1600 Series Display Power Report" forms found in **Appendix B**. The table in **Section 3.3** lists expected lamp life based on line and lamp voltages.

#### **L USE EXTREME CAUTION!**

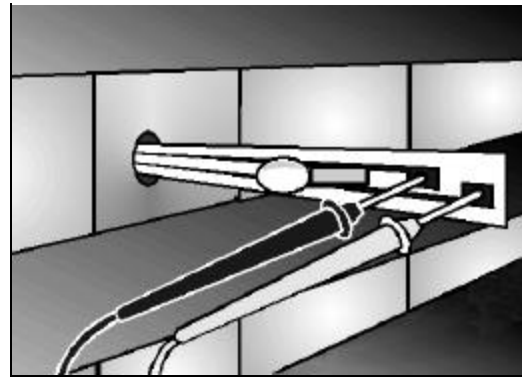
**Do not short across the terminals of the voltage tester. Doing so will damage the module electronics.**

6. Repeat the above steps for at least two more modules.
7. Carefully replace the lamps and lenses.

**Remember to record the lamp voltage readings on each "Display Power Report" found in Appendix B. Return one of the forms to Daktronics Customer Service.**



**Figure 39:** Removing an ON Lamp



**Figure 40:** Lamp Voltage Tester

### 3.13 Dimming

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For outdoor Starburst technologies, the display can dim and brighten manually. This happens under the BRIGHTNESS menu through the Automatic option (if there is a light detector with the display).

At a certain level of ambient lighting, the lamps will dim. During the day, the lamps should be brightest because they are competing with sunlight. In the evening and at night, they should be dimmer because they are not competing with sunlight. If a light detector is not present, make sure the controller is set to have manual brightness during daylight hours or control the dimming level through scheduling.



# Section 4 : Maintenance & Troubleshooting

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## IMPORTANT NOTES:

1. **Power must be turned off before any repair or maintenance work is done on the display!**
2. **Any access to internal display electronics must be made by qualified service personnel.**
3. **Do not operate the display with the back sheets removed!** The cabinet is positively pressurized, directing adequate airflow around the lamps and out through the lenses. Display operation without the back sheets in place and fans running could cause damage to the display and will void the warranty.

*Make certain the back sheets are fastened securely into place.*

4. **Dirt and contaminants may enter the display if it is operated without the fan filters in place or with dirty fan filters.** These contaminants may cause premature failure of the electronic components. *Operating the display with dirty fan filters or without fan filters will void the warranty.*
5. **The Daktronics product managers engineering staff must approve any changes that may affect the weather-tightness of the display.** This is to include, but is not limited to, border shrouding, back sheets, cooling fans, fan filters and filler panels. *Before making ANY modifications to the weather tightness of the display, submit detailed drawings to our engineering staff for evaluation and approval or the warranty will be null and void.*

**Sub-sections 4.3- 0of Maintenance & Troubleshooting applies to the servicing of *all Series 1600 large matrix displays.***

**Sub-section 4.11 is dedicated to servicing displays with *line receivers.***

**Sub-section 4.12 is dedicated to servicing displays with *data distributors.***

## 4.1 Maintenance & Troubleshooting Overview

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Series 1600 large matrix displays are either front or rear accessible, depending on site requirements and customer preference.

Information in **Section 4** is grouped as listed below. The information found within each group is also provided.

- **Operational Summary:** outlines the power and signal routing of the display, as well as operation of the ventilation system.
- **Servicing of Display Components:** explains how to remove various display components and provides operational and diagnostic information on each item.
- **Maintenance:** addresses the steps that must be taken to keep the display in safe, operational condition.
- **Troubleshooting:** lists the causes of a number of possible display malfunctions.
- **Replacement Parts List:** provides the descriptions and part numbers of selected display components.
- **Exchange/Replacement Procedure:** explains the process for returning a display component to Daktronics for repair or replacement.

## 4.2 Operational Summary

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### Reference Drawings:

Schematic, Power & Wiring220V LR.....	<b>Drawing A-127375</b>
Schematic, Power & Wiring230V LR.....	<b>Drawing A-127376</b>
Schematic, Power & Wiring240 LR.....	<b>Drawing A-127377</b>
Schematic, Power & Wiring220V DD.....	<b>Drawing A-127543</b>
Schematic, Power & Wiring230V DD.....	<b>Drawing A-127544</b>
Schematic, Power & Wiring240V DD.....	<b>Drawing A-127545</b>

This overview summarizes the power and signal functioning of the typical 1600 series, 2.5-inch large matrix display. Refer to the display schematics in **Appendix B** or any project specific drawings included in **Appendix A** for detailed power and signal information.

There are a number of schematics in **Appendix B**. Use the following table as a guide in choosing the one appropriate for this display.

In addition, the locations of the panelboards, display controller and fan control enclosure are shown in shop drawings in **Appendix B**, assuming no project specific drawings are in **Appendix A**.

Use the following table to choose the correct shop drawing.

<b>If the display being installed is...</b>	<b>Consult Section 3 shop drawing...</b>
24 high display (all lengths)	Drawing B-114883
32 high display (all lengths)	Drawing B-114884
40 high display (all lengths)	Drawing B-114885

### **Power Summary**

As addressed in **Power Installation**, incoming power terminates at the panelboard. The panelboard is typically mounted within 20 feet of the display but may be mounted to the display itself in special circumstances. Display grounding is the responsibility of the installer and should be done in agreement with both Article 250 of the National Electrical Code and all local codes and standards.

From the panelboard, power is routed to the transformers, the number of which is determined by display size. Each transformer is individually protected by a 20-amp breaker on the primary side.

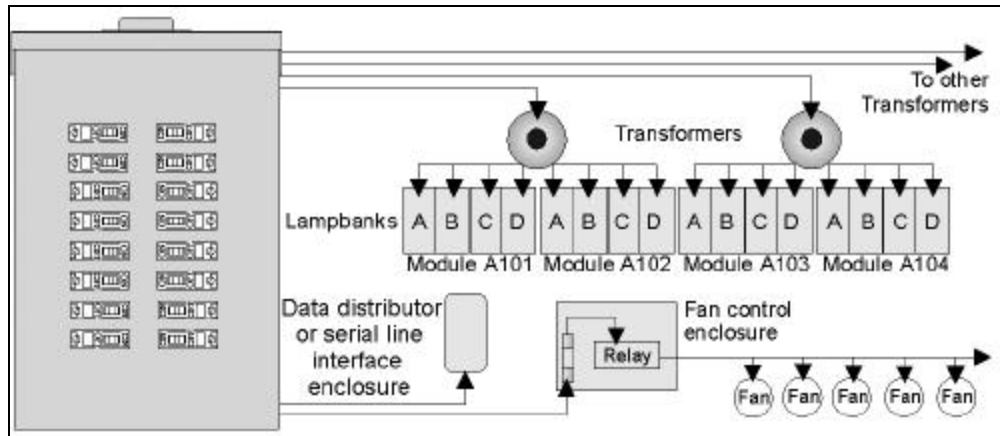
From the transformers, power is routed to the individual lampbanks on the backsides of the lens/reflector assemblies. Each transformer is capable of powering a maximum of two modules (eight lampbanks).

In addition, the panelboard also houses the breaker for the display controller (serial line interface).

**Replace this breaker with only another of equal value.**

Power to the fans is routed through the fan controller from the panelboard. If the display is blank for 30 minutes, the display controller can flip a relay, turning off the fans and extending the life of both the fans and the filters.

**Figure 41** provides a general summary of the power routing of the 1600 series large matrix line receiver displays. Neutral and ground wires are not illustrated. The illustration is for conceptual purposes only.



**Figure 41:** Power Routing Example

For detailed power and signal information, refer to the appropriate general schematic in **Appendix B**, or the project specific schematic in **Appendix A**, if one was included. Refer to **Section 4.2** if unsure which schematic to use.

### ***Line Receiver Signal Summary***

Signal routing for Venus 4600 systems starts at the controller computer. This computer, running Venus 4600 software, sends data to the Venus A/B transmitter interface over serial cable. The DB15 male-to-male cable connects to the A/B transmitter at J1.

The data is then sent to the serial line interface board within the display over fiber optic cable. The cable runs from the J5 fiber transmit jack within the A/B interface to the J6 fiber input jack on the serial line interface board. If an echo display is present, the data is shared with the displays by running a fiber optic cable between J6 or J7 (TX) on the master display's serial line interface to J8 (RX) on the echo display's serial line interface.

### ***Data Distributor Signal Summary***

Refer to **Section 3.9** for a detailed explanation of the data distributor signal summary.

### ***Ventilation & Temperature Sensing Summary***

Daktronics 1600 series large matrix displays depend on a ventilation system and internal temperature sensing equipment to prevent and monitor heat buildup within the cabinet. Excessive heat shortens the life of all electrical components, including lamps.

The three critical parts of the ventilation system are the filters, the fans and the lenses. On the back of the cabinet are a number of air filters, and in front of each air filter, within the cabinet, is a fan. The fans draw cooler air from outside the display through the filters and into the display. This incoming air forces warm air already in the cabinet to exit through the lenses on the face of the display. Each lens has an exhaust port near the top to allow for airflow. Before the air exists through the lenses, it passes past the lamps, cooling them in the process. This maximizes the life of the lamps.

Refer to **Section 4.10** for troubleshooting information for the internal temperature monitoring system.

### 4.3 Accessing the Inside of the Display

#### Reference Drawing:

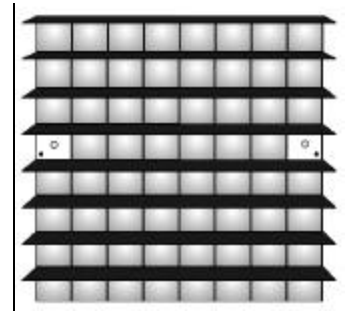
Front Module Access, 8x8 Lens/Ref. Assy.....**Drawing A-122363**

Series 1600 large matrix displays are designed to be either front or rear accessible, depending on site requirements and customer preference.

#### **Front Accessible Displays – Removing Lens Reflector Assemblies**

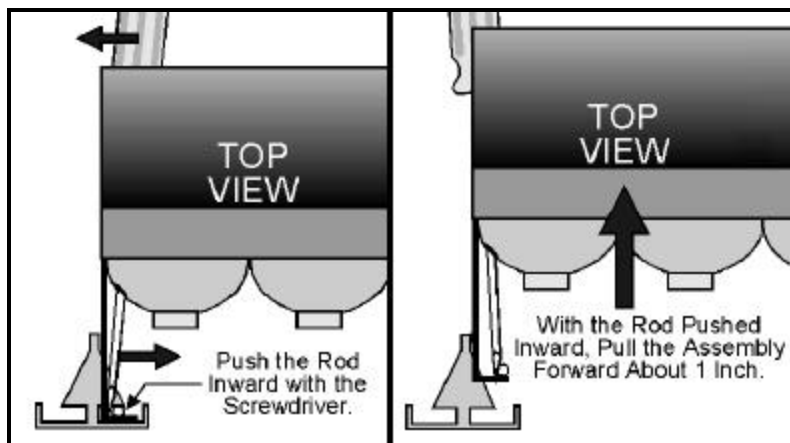
Front accessible displays require lens/reflector assemblies to be removed in order to reach the components within the display. If the display is rear accessible, refer to **Rear Accessible Displays – Removing Back Sheets**.

**Complete the following steps and refer to Drawing A-122363 in Appendix B to remove a lens/reflector assembly from the front of the display.**



**Figure 42:** Latching Mechanism Access Holes

1. Remove the lenses from the fourth row of columns one and eight as seen in **Figure 42** (lens removal is covered in **Section 4.4**).
2. Insert a 10 in. (254mm) flathead screwdriver into either of the latching mechanism access holes that were covered by the lenses. Keep the screwdriver edge vertical while pushing it into the access hole.
3. Refer to the **Drawing A-122363 in Appendix B** for a detailed illustration of the correct screwdriver position to use while unlatching a lens/reflector assembly from the front. Be careful not to angle the screwdriver too sharply while inserting it into the access hole—it may become stuck behind the EMI shield as seen in **Drawing A-122363**.
4. Use the handle of the screwdriver as a lever to disengage the latching mechanism on this side of the assembly. Pushing the screwdriver handle sideways, away from the assembly, will free this side of the assembly. **Figure 43** illustrates this procedure.



**Figure 43:** Assembly Latching Mechanism

**Note:** It takes only mild pressure on the screwdriver handle to free each side of the lens/reflector assembly. Excessive force can bend the rod.



5. While holding the screwdriver handle to the side, pull this side of the assembly out about an inch. This will pull it free of the latch and prevent it from snapping back into a locked position.
6. Perform steps 2-4 to free the opposite the opposite side of the assembly.

**CAUTION: The lens/reflector assembly is now held in place by only a few ribbon cables. Do not let the assembly fall from the cabinet.**

7. Pull the assembly out of the display far enough to disconnect all ribbon cables and power connectors from the lampbanks mounted on the assembly's backside. The assembly is now completely free of the cabinet.

**Complete the following steps to replace or install a lens/reflector assembly in a front accessible display.**

1. Reconnect all ribbon cables and power connectors to the lampbanks on the back of the assembly.
2. Slide the lens/reflector assembly back into position in the cabinet. A firm push should be all that is needed to lock the assembly into position. Give a tug to the assembly to verify that it is firmly locked in place.
3. If necessary, replace any lenses as explained in **Section 4.3**.

If one or both sides of the lens/reflector assembly fail to lock into position after repeated attempts take the following steps.

1. Hold a section of 2x4 board vertically against the louvers on the stubborn side of the assembly.
2. With the heel of the other hand strike the board
3. Give a tug to the assembly to verify the assembly is locked in place.

**Do not pound on the board with a hammer or similar device. This will damage the louvers.**

### ***Rear Accessible Displays – Removing Back Sheets***

Rear accessible displays require back sheets be removed from the rear of the display in order to reach the internal display components.

**To remove a back sheet from a rear accessible display, complete the following steps.**

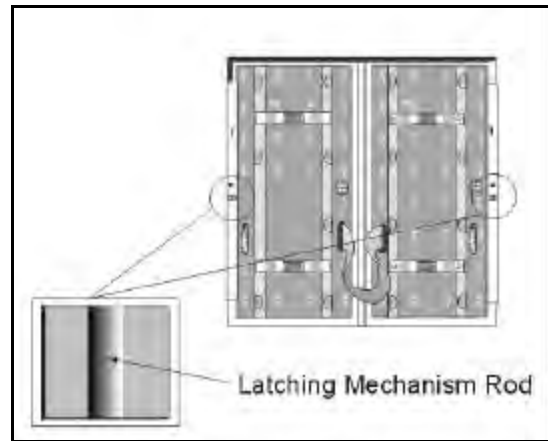
1. Remove all back sheet screws with a battery powered screwdriver using a  $\frac{5}{16}$ " hex bit
2. Lift the back sheet up and *slightly* away from the display.
3. Reach behind the back sheet and unplug the fan power wires if present.
4. Pull the back sheet entirely away from the display.

**If a lens/reflector assembly needs to be removed from a rear accessible display, complete the following steps while referring to Figure 44 and Figure 45.**

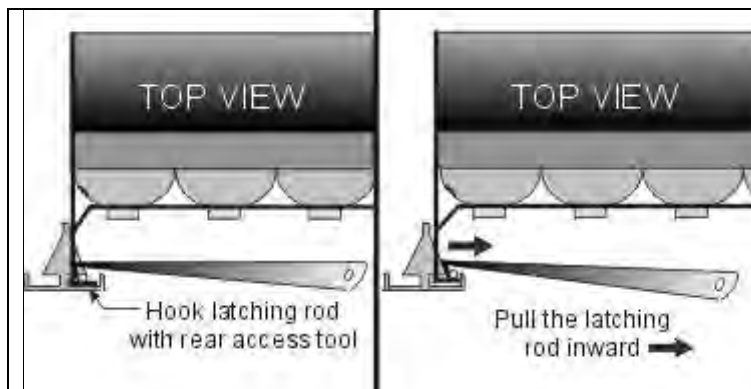
**Note: A lens/reflector assembly may not need to be removed in order to replace a lamp or lamp bank in a rear accessible display; refer to Section 4.6.**

**CAUTION: Make sure to use a lanyard when removing a lens/reflector assembly from the rear of the display. This will prevent the lens/reflector from falling forward out of the display.**

1. After removing the back sheet from the rear of the display, find the two latching mechanisms on either side of the back of the lens/reflector assembly as seen in **Figure 44**.
2. Attach the safety lanyard. Refer to **Appendix C** for additional information.
3. Use the rear access tool (found in display tool kit) to hook and pull the latching mechanism rod in toward the center of the lens/reflector assembly, as seen in **Figure 45**.



**Figure 44:** Lens/Reflector Latching Mechanisms (Rear-View)



**Figure 45:** Unlatching a lens/reflector assembly with the rear access tool

4. Repeat **Step 2** to unlatch the mechanism on the other side of the lens/reflector assembly.
5. The lens/reflector assembly can now be removed. The safety lanyard should be in place to prevent the assembly from suddenly falling forward. Disconnect all ribbon cables and power connectors from the lamp banks mounted on the assembly's backside. The assembly is now completely free of the cabinet.

**Note:** It takes only mild pressure to free each side of the lens/reflector assembly. Excessive force can bend the rod.

**Complete the following steps to replace or install a lens/reflector assembly in a rear accessible display.**

1. With the safety lanyard in place, the lens assembly must be passed through the opening, rotated right side up and then pulled back into place.
2. When pulling the lens assembly into place, it should be tilted about 30 degrees so the bottom goes in first.
3. Pull the lens assembly firmly back into place until the latches, one on each side of the frame verticals snap into place.

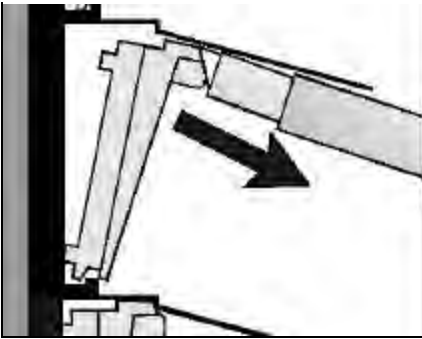
There are some areas on the display where components prevent the lens assembly from passing through the opening in the display. In this case, a second lens assembly above or below the first one must be removed, creating an opening large enough for the lens assembly to pass through.

Lens assemblies must fit together tight so the weather stripping forms a good seal and prevents water from leaking between the lens assemblies and into the display. Check the seal between the assemblies with a 0.032" feeler gauge. Refer to **Section 4.13**.

## 4.4 Lenses

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A lens is positioned in front of each lamp in the lens/reflector assembly. The lenses, along with the reflectors, direct the light from the display. Sixty-four lenses are found in each lens/reflector assembly.



**Figure 46:** Removing a lens

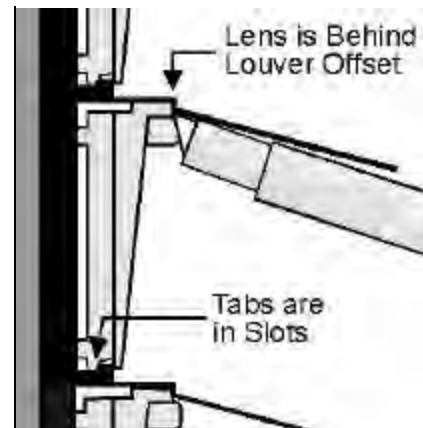
**\*Complete the following steps to remove a lens from a lens/reflector assembly.**

- Carefully pry out the lens tab using the lens/lamp extractor found in the tool kit. The lens tab is found on the top center of the lens. Refer to **Figure 46**.
- If necessary, gently press up on the louver above the lens to aid in removal. Applying excessive force to the louver may cause it to become deformed.

Complete the following steps and refer to **Figure 47** to insert a lens into the lens/reflector assembly.

Insert the lens' indexing tabs into their respective slots on the lens/reflector assembly. There is one indexing tab on the bottom-left and bottom-right corners of the lens.

1. Push the lens into position behind the louver offset. If necessary, gently press up on the louver above the lens to aid in insertion. Applying excessive force to the louver may cause it to become deformed.
2. Verify the lens position and placement is consistent with others in that row. If a lens looks out of position there is likely an indexing tab not in its slot.



**Figure 47:** Inserting a lens

## 4.5 Lamp Testing & Replacement

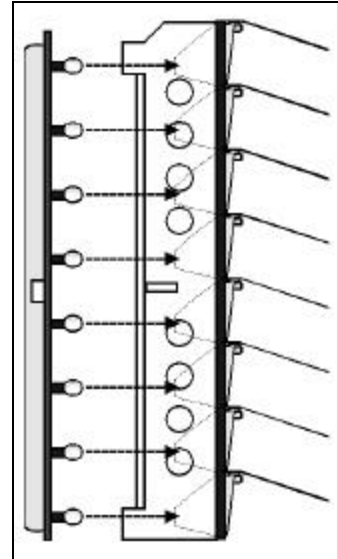
### Reference Drawing:

Jack Designation & Layout, Test Fixture .....Drawing A-96449

Daktronics designed this display for easy lamp replacement with front access. Always replace non-functioning lamps prior to scheduled events, or as soon as possible, for best viewing.

A 3.58-watt lamp is behind each lens. Use the controller lamp test to locate bad lamps. Use the lamp test form located in **Appendix C** to mark the location of bad lamps. Refer to **Section 4.21** and **Section 4.22** for the part numbers of replacement lamps and lenses.

- Daktronics-approved 3.58-watt lamps have an estimated life of 17,000 hours if operated at 11.0 volts. **Always use Daktronics approved lamps.** Lamps purchased from Daktronics have tighter specifications than similar lamps built in standard production. The recommended lamps give the sufficient intensity and beam spread to match the display design. Lamps not built to Daktronics specifications will not perform as well, will not give the intended results, and will adversely affect the beauty of the display.



**Figure 48:** Lampbank and Lens/Reflector Assembly

- A qualified individual who is capable of operating the controller equipment should do lamp testing.
- *Display power must be OFF for lamp replacement.*

The life rating of a lamp is the average value in hours within which 50% of a test quantity is expected **not** to fail and within 70% of the rated life, 90% of a test quantity is expected **not** to fail. Lamp life will increase if the average intensity of the lamp is less than the maximum intensity.

🕒 *Predicted lamp life is for lamps operating in a laboratory with continuous operation in a stable temperature and mechanical environment. Actual lamp life will differ from predicted life due to switched operation, varying temperature, mechanical vibrations due to wind, traffic and display service, and actual hours of operation.*

Typically, lamp failure rates for the 17,000 hour 11.0 volt lamp in the 1-20 displays is as follows.

- 3% of the lamps normally fail upon reaching 35% of rated life (5,950 hours).
- 10% of the lamps normally fail upon reaching 70% of rated life (11,900 hours).
- 50% of the lamps normally fail upon reaching 100% of rated life (17,000 hours).

The balance of 50% of the lamps last longer than the rated life of 17,000 hours.

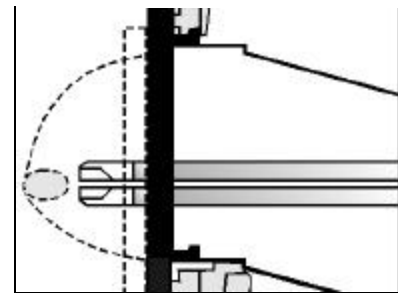
**Example:** The following chart shows predicted lamp failure for various displays based on a lamp voltage of 11.0 volts, assuming the display is in operation for 18 hours a day. *This chart is based on the manufacturers' test data and on laboratory conditions.*

% Failure	# Of Hours In Operation	# Of Days In Service	# Of Lamps Predicted To Fail For Selected Display Sizes					
			24x96 2,304 lamps	40x112 4,480 lamps	48x128 6,144 lamps	64x128 8,192 lamps	96x224 23,424 lamps	128x256 32,768 lamps
3	5,950	250	69	134	184	246	703	984
10	11,900	500	230	448	614	819	2,342	3,277
50	17,000	722	1,152	2,240	3,072	4,096	11,712	16,384

Lamps in this display are accessed either by removing the lampbank to which the lamps are attached or by removing the lens in front to the lamp. If just a few lamps here and there need replacing it is easier to remove the lenses in front of them. If there are many lamps that need replacing on a single lampbank (five or more) it is easier to remove the lampbank from the lens assembly. Both methods of lamp removal/lamp replacement are addressed in this sub-section.

Complete the following steps to access and service lamps by removing a lens:

1. Remove the necessary lenses as explained in **Section 4.4**.
2. As illustrated in **Figure 49**, remove the bad lamps with the lens/lamp extractor tool found in the tool kit.
3. Replace the necessary lamps. Use the lens/lamp extractor if the lamps are hot. **Use only Daktronics-approved lamps of the same wattage.**
4. Replace the lenses as explained in **Section 4.4**.



**Figure 49: Lamp Removal**

### ***The Diagnostics Method of Lamp Testing & Replacement***

A qualified individual who is capable of operating the controller equipment should do lamp testing.

The Venus 7000 *Diagnostics* program provides two ways to check for bad lamps. If the display is *not* visible from the controller, you must use the *Pattern Test* method. If the display is visible from the controller, you can use the *Pixel Locator* method that allows you to locate bad lamps without leaving the controller.

**Pattern Test Method** The *Pattern Test* method turns on the lamps in a pattern that makes it easy to spot bad lamps and record their location. When using the Pattern Test function, make photocopies of the test form in **Appendix C**. (Keep the original copy in **Appendix C**.) Complete one of these forms each time you test and replace lamps. Lamp test forms for your display size are available upon request.

To run the Test Pattern:

1. From the Venus 7000 Shell, open the *Monitor* program.
2. Open the *Diagnostics* program.
3. In the **Diagnostics** text box, select **Lamp Test**.
4. Be sure to select the sign you are testing in both the *Diagnostics* and the *Monitor* programs.
5. Under **Lamp Test Type**, select **Pattern Test**.
6. Click on **Start Test**. This will light up every other column, making it easy to spot any bad lamps. The monitor screen will indicate this pattern. To change to the alternate columns press

<F5>.

7. Check your display and record the location of any bad lamps on the test form.

**Note:** A test pattern can also run from the data distributor. Refer to the data distributor manual for instructions on starting these test patterns.

**The Pixel Locator Method:** The pixel locator method checks for bad lamps without leaving the controller. To run the Pixel Locator:

1. From the Venus 7000 Shell, open the *Monitor* program.
2. Open the *Diagnostics* program.
3. In the **Diagnostic** text box, select **Pixel Locator**.
4. Select the driver size of your display, (8 by 16).
5. Click on **Start**. This will light the entire top row and the entire left column of lamps. You'll be able to see if any of the lamps in the top row are bad.
  - a) If you spot a bad lamp, arrow to the right until the lighted column is on the bad lamp, i.e., the intersection of the lighted row and the lighted column is on the bad lamp.
  - b) To record the location of the bad lamp, press the **Stuck Off** button. If you have a lamp that is stuck on, follow the same procedure but press the **Stuck-On** button instead of the **Stuck Off** button.
6. Arrow down one row at a time to check each row for bad lamps, recording each bad lamp in the same way.
7. After marking the location of all the bad lamps, turn the display power off at the main power disconnect.

**Note:** For more information about lamp testing and replacement, refer to the Venus 7000 controller manual or contact the Daktronics Animation Department.

### ***Optional Lampbank Driver Test Table***

The purpose of the test table is to check the lampbank input and output and to determine if all lamps are working within that lampbank. Use the following steps as a guide when using the test table. Refer to **Drawing A-96449** for the location of jacks.

1. Remove the lampbank from the lens/reflector assembly or from the display.
2. Plug the test table into a standard 230-volt outlet. A standard IEC outlet is on the test table. Make sure the power switch is OFF.
3. Place the 4-pin jumper plug into J42 for the 2-<sup>1</sup>/<sub>2</sub>0, <sup>1</sup>/<sub>4</sub>0 lampbank.

**CAUTION: Never insert jumpers into both J42 and J43 at the same time.**

4. Attach power cable from J45 to the power plug of the lampbank.
5. Attach signal cables to the lampbank. The cable from J34 attaches to the input jack of the lampbank and the cable from J38 attaches to the output jack of the lampbank. For lampbanks with piggyback boards, connect the signal wire from the test fixture directly to the lampbank input.
6. Turn power switch ON and mark all bad lamps with a piece of masking tape.

**Note: Do not remove or replace lamps with the power ON as this may damage the lampbank.**

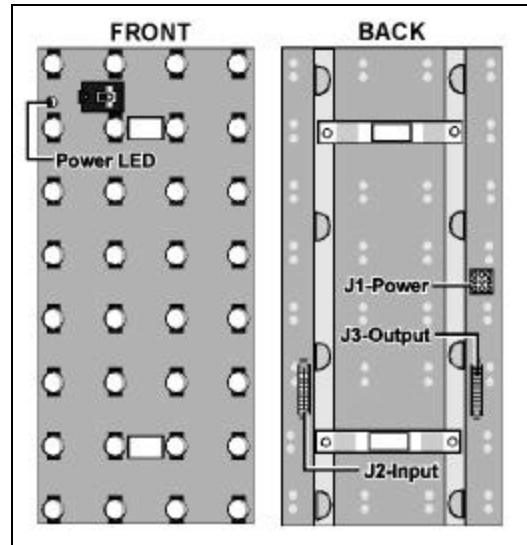
7. Turn fixture power OFF.
8. Replace all lamps with Daktronics approved lamps of the same wattage.
9. Turn test fixture power on and check if all lamps light up. If lamps don't light properly, check the troubleshooting section of the maintenance manual.
10. Test the lampbank output.
11. Unplug the lampbank and return it to the display.

## 4.6 Lampbanks

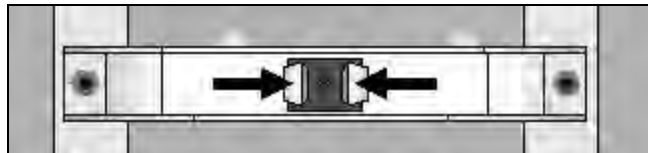
Note that different 8x4 lampbank part numbers are used within data distributor controlled displays. Refer to **Sections 4.21** and **4.22** for the correct replacement parts.

### Complete the following steps to remove a lampbank from a lens/reflector assembly.

1. If the display is front accessible only, remove the appropriate lens/reflector assembly as explained in **Section 4.3**. If the display is rear accessible, the lens/reflector assembly may not need to be removed in order to remove a lampbank.
2. Disconnect the ribbon cable connecting the two lampbanks.
3. Each lampbank is held to the lens/reflector assembly by two plastic latches. One latch at a time, squeeze the latch arms together and pull that end of the lampbank up past the latch. Refer to **Figure 51**.
4. Pull the lampbank from the lens/reflector assembly.



**Figure 50:** Lampbank Components



**Figure 51:** Lampbank Latch

The functions of the labeled lampbank components in **Figure 50** are explained in the following table.

Component	Function
Power LED	A lit LED indicates the lampbank is receiving its operational voltage of 5 VDC.
J1-Power	Power from a transformer enters the lampbank at this connector.
J2-Input	Signal enters the lampbank at this connector from any of the following sources: <ul style="list-style-type: none"> <li>• From a vertical shift board if it is the left-most lampbank in any row (front view).</li> <li>• From the previous lampbank in that row.</li> </ul>
J3-Output	Signal exits the lampbank at this connector and is passed to the next lampbank in that row. This connector is not used on the last lampbank in any row.

Complete the following steps to replace a lampbank.

1. Place the lampbank on the lens/reflector assembly. The white power connector (J1) should be to the right side (rear view).
2. Press down upon each latch bracket until both the latch arms on each latch snap into position.
3. Reconnect the two lampbanks on the lens/reflector assembly with the ribbon cable.
4. Put the lens/reflector back into the display cabinet as explained in 4.6.

In the event a lamp socket needs to be replaced on a lampbank, complete the following steps in a static-free environment.

1. Unsolder the two contacts of the socket.
2. Carefully pull the socket from the lampbank. Take care not to damage the pad or lift the trace.
3. Insert the new socket and solder in place.  
Clean the area of solder residue and apply conformal coating to the circuit board to protect against moisture damage. Use PC-101 protective coating for circuit boards (or equivalent). SE-1003 is the Daktronics part number for such coating.

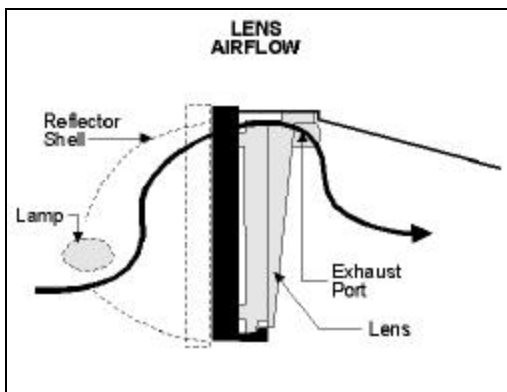
## 4.7 Display Ventilation Summary

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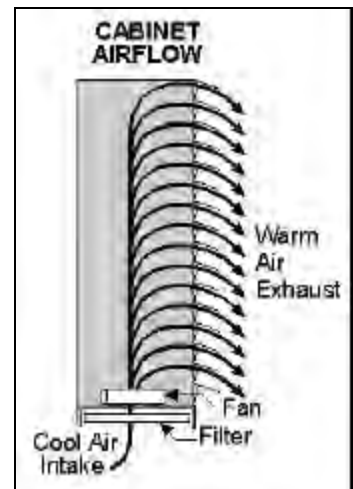
Excessive heat shortens the life of all electrical components, including lamps. Daktronics 1600 series large matrix displays depend on a three-part ventilation system to prevent heat buildup within the cabinet.

The three critical parts of the ventilation system are the filters, fans and lenses. The fans draw cooler air from outside the display through the filters and into the display. This incoming air forces warm air already in the cabinet to exit through the lenses on the face of the display, as illustrated in **Figure 52**. Each lens has an exhaust port near the top to allow for airflow. Before the air exits through the lenses, it passes past the lamps, cooling them in the process. This maximizes the life of the lamps.

**Figure 53** illustrates this lens airflow process.



**Figure 53:** Lens Airflow



**Figure 52:** Cabinet Airflow

In addition, the display controllers in 1600 series large matrix displays will turn off power to the fans if they sense the display has been blank for 30 minutes. This action is completed through the relay in the fan control enclosure. This extends the life of both the fans and the filters. The display controller will start the fans automatically when the display is put into use.

## 4.8 Fan Filters

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Shrouds are provided on the rear of the display to house the fan filters and shed rain. Filters must be



checked every 1500 hours of operation for accumulation of debris that could restrict airflow.

Check filters after the display has been in operation for 1500 hours—and every 1500 hours after that—to ensure that the display is being cooled properly. Filters should be checked more often if the display is located in a dusty or harsh weather environment (i.e. along a gravel road with dust-laden air).

1500 hours is equivalent to 83 days if the display is operated for 18 hours a day and the power to the display is turned off when not in use to ensure that the fans are not operating when the display is not running. 1500 hours is equivalent to 62 days if the display is on running non-stop, 24 hours a day.

The filter may be cleaned with a portable canister-type vacuum cleaner by gently vacuuming or by blowing compressed air through the filter media. When using compressed air to clean the filter, the air should be directed through the filter in the same direction that it flows during normal operation. The direction of the airflow during normal operation is indicated by the arrow stamped on the outside of the filter frame. *Hold the air nozzle at least six inches (152.4mm) from the filter to avoid damaging the filter material.*

The filter may also be cleaned with water. A garden hose nozzle set to direct the water as a fine mist works well. Hold the water nozzle back a few inches from the filter to prevent damage to the filter media and direct the water flow in the same direction that the air normally flows. The filter media should be allowed to dry completely before reusing. A mild detergent, like household dish washing soap, may be used to assist in cleaning the filter media. *Do not use any acid type cleaner or harsh cleaning solvents.*

It is recommended that spare filters be kept on hand at all times. Ideally, all filters could be replaced during routine maintenance. The dirty filters could then be brought back to the shop, cleaned and inspected, and would be available for use at the next job site.

The filter assembly has a 2-inch (50.8mm) wide piece of masking tape applied across the filter frame and holder to provide extra security during shipping. The masking tape may have to be removed to allow the filter to be removed the first time it is serviced using rear access.

If a filter media shows evidence of damage or wear, replace the filter with a Daktronics Filter (Daktronics part no. 0A-1195-0029).

**If a filter other than a standard Daktronics filter is used, make sure it meets the following criteria.**

- The filter media must have an average arrestance of 83% and resistance = 0.06 (in inches of water) or (1.52 mm) at 310 fpm or (94.5m/min).
- The filter media must be cleanable, permanent 1/2" or 12.7mm thick, 25 PPI (25 pores per inch) [3.88 pores per cm<sup>3</sup>] open cell polyurethane foam.
- The filter frame size must be 15.62" by 19.62" by 1.88" (420mm by 498mm by 47.75mm) with an effective filter area of no less than 3.4 square feet (2,194mm<sup>2</sup>)
- The filter must be rated UL 900 Class 2.

In order to access the air filters from the rear of the display, 8 inches (203mm) of clearance are required between the bottom of the air inlet hoods and catwalk level. 8 inches (203mm) is required to allow the air filter to be removed and replaced without damage to the filter.

### **Filter Removal (Rear Access)**

Filters are easy to remove if your display provides rear access.

Using the tab on the lower edge of the filter frame, lift the bottom edge of the filter up about an inch and out until it is free from the filter holder and remove.

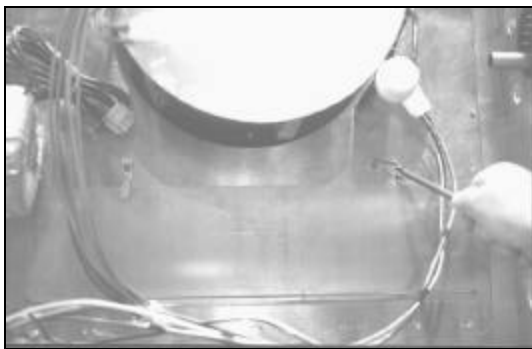


**Figure 54:** Filter Removal - Rear Access

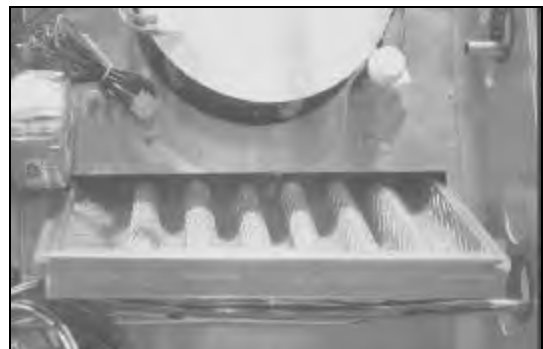
### **Filter Removal (Front Access)**

Turn the two latches to the horizontal position and remove the filter cover plate (refer to **Figure 56**).

Lift the filter up and out of the filter holder and pull it out through the access slot (refer to **Figure 57**).



**Figure 56:** Loosening the filter cover plate



**Figure 55:** Removal of the Filter

## **4.9 Fans**

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Fans are provided to control the heat buildup generated by the electronic components. One cooling fan will provide ventilation for eight to twelve 8 x 16 display modules (depending on display configuration).

Fans should be checked after the display has been in operation for 1500 hours and every 1500 hours after that to ensure that the display is being cooled properly. Fans should be checked more often if the display is located in a dusty or harsh weather environment (i.e. along a gravel road with dust laden air).

1500 hours is equivalent to 83 days if the display is operated for 18 hours a day and the power to the display is turned off when not in use to ensure that the fans are not operating when the display is not running. 1500 hours is equivalent to 62 days if the display is on running non-stop, 24 hours a day.

The fan operation can be easily checked on rear access displays.

- Once the filters have been removed (refer to **Section 4.8**), turn the power back on.
- Look up inside the rain shield and note if the fans are turning properly.

**CAUTION:** The fan blades are exposed during this step. **Turn the power off when finished checking the fans.**

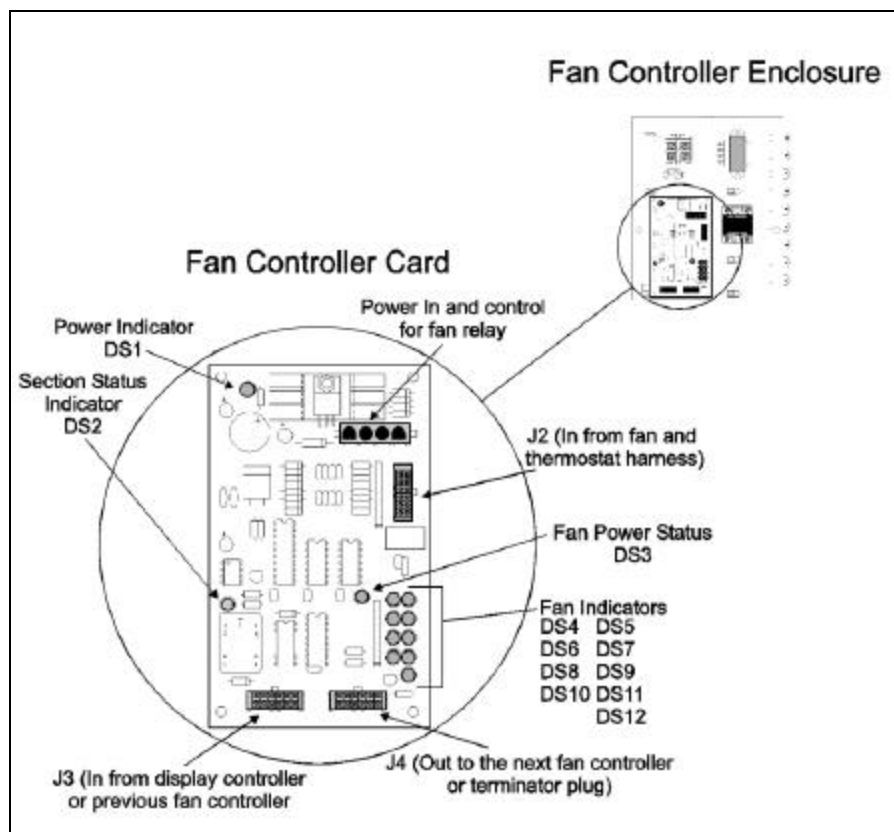
Each time a module is removed, take a minute to inspect the fans.

- Check the fan blades for dirt and debris. If the fan blades have a large accumulation of dirt and debris, this indicates that the filters need to be changed more often. Fan blades must be kept clean to maintain fan efficiency and ensure proper cooling.
- Spin the fan blades with a pen or pencil to ensure that the bearings are free and the fan is still in balance.

After replacing 10% of the fans, Daktronics recommends replacing all cooling fans to reduce associated maintenance costs that may incur with increased heat buildup from fan failure.

#### 4.10 Troubleshooting the Internal Temperature Monitoring System

The fan controller enclosure, found within the display, contains various components for monitoring and controlling the fans in the display. Twelve LED indicators on the fan controller card report the status of the temperature monitoring system, as illustrated below.



**Figure 57:** Fan Controller Card

The fan controller card, found in the fan controller enclosure, **Figure 57**, accepts signal from a maximum of eight fans.

If the RPM of any fan goes below a certain rate, the fan controller will send a signal to the display controller to blank the display. Bad fan bearings may cause a fan to run slowly. Use a pen or pencil to spin the fan. If the fan bearings are bad, the fan will not spin freely—refer to **Section 0** for more information regarding fans. A slow fan can also be caused by a plugged filter—refer to **Section 4.8** for filter maintenance information.

The following table describes the function of each LED indicator on the fan controller card.

LED indicator	LED – On	LED – Off	LED – Blinking
DS 1 Power	Power on	Power off	–
DS 2 Section Status	Section good	Section failure	–
DS 3 Fan Power	Fan power on	Fan power off	–
DS 4 Fan 1 Status	Fan good	Fan not present	Fan failure
DS 5 Fan 2 Status	Fan good	Fan not present	Fan failure
DS 6 Fan 3 Status	Fan good	Fan not present	Fan failure
DS 7 Fan 4 Status	Fan good	Fan not present	Fan failure
DS 8 Fan 5 Status	Fan good	Fan not present	Fan failure
DS 9 Fan 6 Status	Fan good	Fan not present	Fan failure
DS 10 Fan 7 Status	Fan good	Fan not present	Fan failure
DS 11 Fan 8 Status	Fan good	Fan not present	Fan failure
DS 12 Thermostat input	Thermostat input good	Thermostat input failure	–

To remove the fan controller card, remove all cables from jacks J2, J3 and J4, along with the white power-in connector. After removing the four corner nuts, you should be able to remove the fan controller card from its enclosure.

#### 4.11 Troubleshooting the Line Receiver

##### Reference Drawings:

- Line Receiver Settings, 32 & 40 High .....Drawing A-109450
- Line Receiver Settings, 64 & 72 High .....Drawing A-109648
- Line Receiver Settings, 48 & 56 High .....Drawing A-110166

Remember, the display will have either a line receiver or a data distributor. For a general description of both, refer to **Section 1.2 Display Overview**.

To access the line receiver, refer to **Section 4.3**. Refer to drawings in **Appendix A** for the location of the line receiver in your display.

On the following page is a description of each LED indicator on the line receiver board.

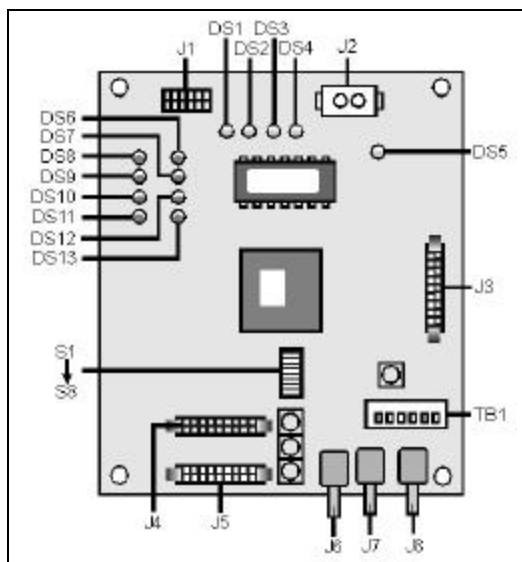


Figure 58: Line Receiver Board

**DS1 - Line Fault:** This indicates if the controller and data cable are connected correctly. With the controller turned on, and a good fiber optic connection, it should be OFF (it may flash ON occasionally). If DS1 stays ON there is probably a break in the fiber optic cable, a bad termination or something wrong with the controller computer.

**DS2 - Test Mode :** This indicates when the line receiver is in test mode. If it is ON, a test pattern will appear on the display.

**DS3 - Data:** This indicates when line receiver is receiving data from the controller. It will flash ON when data is being received.

**DS4 - Bright:** This indicator will be ON when the photocell is detecting a full bright light level and OFF for other light levels. If no photocell is connected to line receiver, it will flash.

**DS5 - Power:** This indicates when the power on the line receiver is working. It should ALWAYS be ON.

**DS6 - DS13 - Thermostat Inputs:** These indicate proper cooling of the display. These should ALL be ON. An OFF LED indicates a failed fan. When this occurs, the line receiver will automatically blank the display to prevent heat damage to the electrical components.

**DS14 - Program:** This indicates the line receiver powered-up OK. It should be ON.

**DS15 and/or DS16 -Transmit:** Indicate(s) signal transmission out of the fiber optic transmitter(s) (possibly to another display).

#### **Line Receiver Connections**

- J1:** In from the fan controller enclosure
- J2:** Power in
- J3:** Echo display dimming.
- J4:** Display 2 out
- J5:** Display 1 out
- J6:** Fiber optic cable out
- J7:** Fiber optic cable out
- J8:** Fiber optic cable in

Switch settings (S1-S12) are configured at the factory. If the need arises to verify switch settings, use the label on the cover of the line receiver as a guide or refer to **Drawings A-109450, A-109648 and A-110166 in Appendix B.**

#### **Complete the following steps to remove a line receiver board from its enclosure.**

1. To access the enclosure housing the serial line interface, remove the necessary lens/reflector assemblies as explained in **Section 4.3.**
2. Remove the cover form the enclosure.
3. Disconnect all signal cables from the circuit board. It may be helpful to label the cables to ensure correct placement when installing another serial line interface board.
4. Remove the nuts holding the board in place and remove the board from the enclosure.

### Vertical Shift Boards

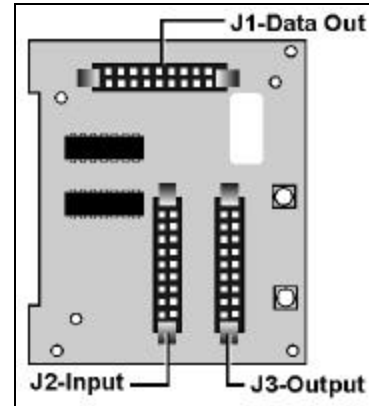
A vertical shift board is found on the back on the left-most lampbank in each row. It routes signal from the line receiver down each row of lampbanks.

A vertical shift board is illustrated in **Figure 59**. The following is a description of the connections on the vertical shift board.

**J1 – Data Out:** Signal is sent from this connector to the next lampbank in a row.

**J2 – Input:** This connector receives signal from the line receiver or the vertical shift board above it.

**J3 – Output:** Signal is sent from this connector to the vertical shift board below.



**Figure 59:** Vertical Shift Board

### Complete the following steps to remove a vertical shift board.

1. Remove the appropriate lens/reflector assembly as explained in **Section 4.3**.
2. Disconnect any remaining signal cables from the vertical shift board.
3. Remove the nut holding the board in place.
4. The board is now free to be removed from the lampbank.

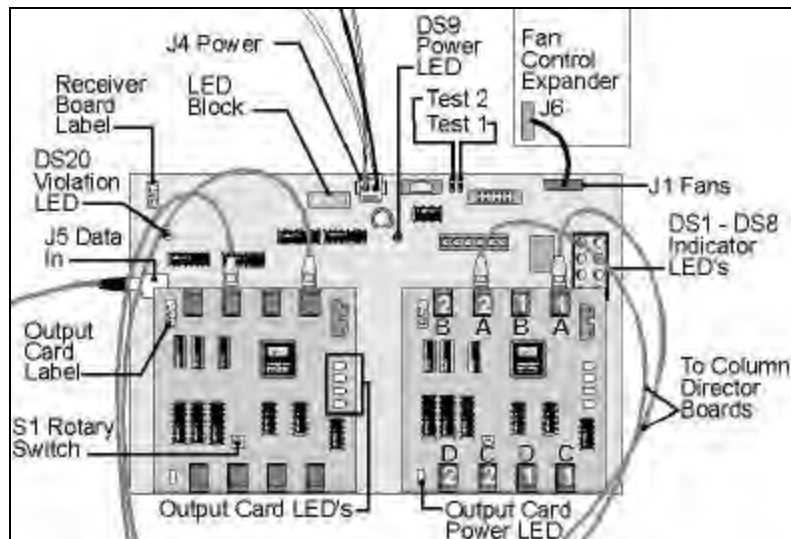
## 4.12 Troubleshooting the Data Distributor

### Reference Drawing:

Schematic; Col. Dir. Pwr. Supply .....**Drawing A-119453**

If the display has a data distributor, this sub-section describes the functions of various components within it. If the display has a line receiver, refer to **Section 4.11**. For a description of data distributors and line receivers, refer to **Section 1.2**.

The receiver board and output cards in a data distributor work together to route display data from the controller computer to the column director boards within the display. **Figure 60** illustrates the receiver board and outputs cards as they might appear in the data distributor.



**Figure 60:** Data Distributor – Receiver Board and Output Cards

The DS1-DS8 indicator LEDs on the receiver board must all be ON if a fan control expander is used with this display. This indicates the fan control expander board is receiving no fan failure notices from the fan controllers.

If a fan controller expander is not used each LED corresponds to a fan controller within the display. All must be ON for the display to operate.

If the display is out of use for 30 minutes, the receiver board sends a signal, either directly or through the fan control expander board, to the fan controllers to turn off the fans. This is designed to extend the life of the fans/cooling system and electronics of the display. The fans will automatically turn back on when the display is put back in use.

The following tables list the functions of some of the connectors on the receiver board and output cards, as well as the meanings of the diagnostic LEDs.

<b>Receiver Board Connectors</b>	
<b>Connector</b>	<b>Function</b>
J1 (Fans)	Input from either fan controllers or fan control expander bd.
J4 (Power)	Power input from power supply
J5 (Data In)	Fiber Optic Input from controller or other equipment

<b>Receiver Board DS1-DS8 LEDs WITHOUT Fan Control Expander Board</b>	
<b>LED</b>	<b>Function</b>
DS1	ON if fan controller number 1 reports all fans good
DS2	ON if fan controller number 2 reports all fans good
DS3	ON if fan controller number 3 reports all fans good
DS4	ON if fan controller number 4 reports all fans good
DS5	ON if fan controller number 5 reports all fans good
DS6	ON if fan controller number 6 reports all fans good
DS7	ON if fan controller number 7 reports all fans good
DS8	ON if fan controller number 8 reports all fans good

<b>Receiver Board DS1-DS8 LEDs WITH Fan Control Expander Board</b>	
<b>LED</b>	<b>Function</b>
DS1 & DS2	ON if fan controller expander board input J2 reports all fan controllers good.
DS3 & DS4	ON if fan controller expander board input J3 reports all fan controllers good.
DS5 & DS6	ON if fan controller expander board input J4 reports all fan controllers good.
DS7 & DS8	ON if fan controller expander board input J5 reports all fan controllers good.

<b>Receiver Board DS10-DS19 LED Block</b>	
<b>LED</b>	<b>Function</b>
DS10	N.C.
DS11	Processor Initialization Complete
DS12	EPLD Configuration Complete

DS13	Test Mode
DS14	Taxi Command Received (Will Flash with Data Received)
DS15	Sign is Blank
DS16	Sign Forced Blank – Signal Loss or Fan Failure
DS17	On=Fans On, Blinking=Fan Failure, Off=Fans Off
DS18	Heartbeat
DS19	N.C.

Receiver Board Miscellaneous LEDs and Jumpers	
DS9	Power LED should be ON
DS20	Violation LED – If ON indicates a problem with signal format or configuration
W1	Jumper – Test Pattern, Bottom=ON / Top=OFF
W2	Jumper – Fan Sensing, Top=Enable / Bottom=Disable

Output Card Connectors	
Connector	Function
J2, J3, J6, J7	Data 1 Output – All connectors XMIT same data
J4, J5, J8, J9	Data 2 Output – All connectors XMIT same data

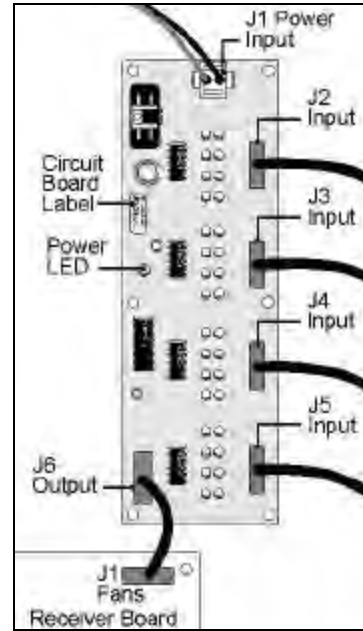
Output Card DS1-DS4 Indicator LEDs	
LED	Function
DS1	Should blink when data is received from Venus 7000
DS2	Should blink when data is received from Venus 7000
DS3	Should blink when data is received from Venus 7000
DS4	All DS4 LEDs in data distributor will light and then count sequentially through card addresses from 0 to 15.

Output Card Miscellaneous LEDs and Switches	
DS5	Power LED should be ON
S1	Board Address – Set in sequential order starting at 0. Four output cards would be set 0, 1, 2, 3. <b>Not</b> 1, 2, 3, 4.



The fan controller expander board, **Figure 61** is part of the data distributor. Each of the LEDs on the fan control expander board corresponds to a fan controller in the display. All the LEDs must be ON for the display to operate. An OFF LED indicates a fan controller is reporting a bad fan. At that point, check that fan controller to determine which fan is failing.

The table below lists the connectors of the fan control expander board along with their functions.



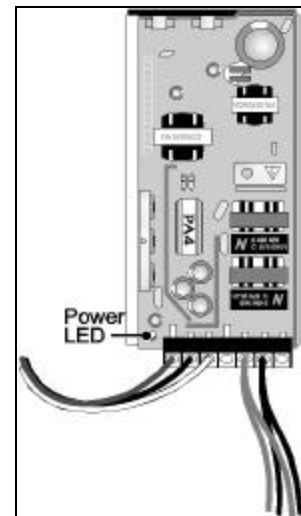
**Figure 61:** Fan Controller Expander Board

Connector	Function	
J1	Power input from power supply	
J2	Input from fan controllers 1-8	NOT ALL INPUTS (J2-J5) ARE USED ON EVERY DISPLAY. ANY UNUSED INPUTS MUST HAVE A TERMINATOR PLUG.
J3	Input from fan controllers 9-16	
J4	Input from fan controllers 17-24	
J5	Input from fan controllers 25-32	
J6	Output fan controller reports to J1 on receiver board	

**Column Director Power Supply**

There is one column director power supply per display section. These power supplies are found mounted on brackets within the display.

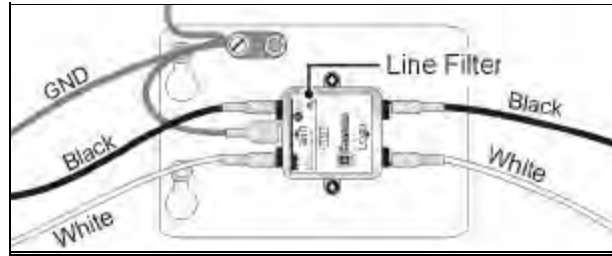
Each column director power supply has a power indicator LED, **Figure 62**. If this LED is on, the unit is working. Refer to **Drawing A-119453** in **Appendix B**.



**Figure 62:** Column Director Power Supply

### Line Filters

Line filters, as illustrated in **Figure 63**, are used to remove electromagnetic noise from the power system that might otherwise interfere with local communications channels. Line filters are sometimes mounted on brackets or power supplies. Generally, each line from the panelboard will pass through a line filter.



**Figure 63:** Line Filter

The white, black and green wires from the panelboard connect to the filter on the “LINE” end. Notice how the green ground wires is first routed to the ground lug before connecting to the line filter. The white and black wires to the display electronics connect on the “LOAD” end.

On Daktronics drawings, line filters are indicated by a “Z” followed by the filter number.

To remove a line filter disconnect the power wires from the filter and remove the two nuts that hold the unit to its bracket.

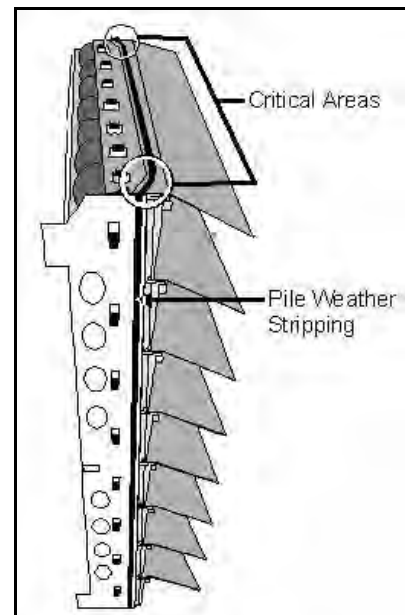
## 4.13 Weather Stripping Maintenance

Often, difficulty in sliding a lens/reflector assembly back into the cabinet can be attributed to worn or deteriorating weather stripping. If this is the case, the adhesive on the underside of the tape has likely failed, causing the weather stripping to buckle when pushed into the cabinet.

Weather stripping is essential for keeping moisture out of the display and for maintaining proper display ventilation. Bad weather stripping should be replaced immediately.

Take note of the following before attempting to replace the pile weather stripping on a lens/reflector assembly:

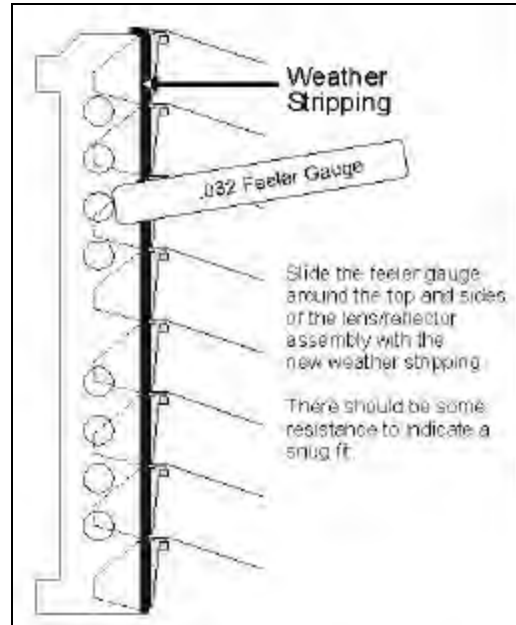
- Once the old weather stripping has been peeled away, clean the lens/reflector assembly with an adhesive remover so the new weather stripping will adhere.
- Precut the necessary amount of weather stripping needed to wrap up one side, across the top and down the other side of the lens/reflector assembly (plus a little extra).
- During application, only peel enough protective paper off the weather stripping to do one side at a time. Nothing, especially hands, should touch the adhesive side of the weather stripping once the protective tape is removed.
- During the entire application process, keep the weather stripping taut. Even the slightest buckle or wrinkle will cause problems when trying to put the assembly back into the display cabinet.
- Take note of the critical areas shown in **Figure 64**. The weather stripping must be stretched tighter in these areas to prevent buckling.



**Figure 64:** Weather Stripping Application

**Having read the previous notes, complete the following steps to replace bad weather stripping:**

1. Starting at the bottom of one side, apply the weather stripping up the side of the assembly as close to the front edge of the metal side plate as possible.
2. Continue the weather stripping onto the top of the assembly. Pull the weather stripping firmly to produce a tight corner and then, while still pulling it tightly, apply it around the raised curve on the top of the louver. Stay on the raised portion of the louver, but stay as close as possible to the ledge.
3. Apply the weather stripping across the top of the assembly (across the top of the louver) and again pull it firmly to follow the raised curve of the louver and to wrap it over the corner of the assembly.
4. Continue the application down the side of the metal side plate as done in step 1.
5. Clip the weather stripping flush at the bottom of both sides of the assembly.
6. After putting the lens/reflector assembly back into the cabinet, check the spacing between this assembly and the assemblies and/or display cabinet around it with the .032-inch feeler gauge found in the tool kit. The feeler gauge should not move freely. There should be some resistance along the entire length of all sides of the assembly. Refer to **Figure 65**.



**Figure 65:** Weather Stripping Feeler Gauge

#### **4.14 Louver Maintenance**

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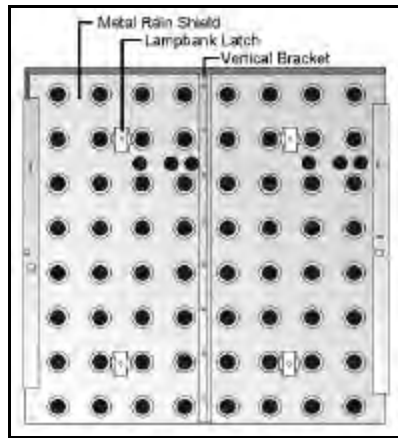
The louvers play an important role in making this large matrix display an effective communication device. The louvers cast a dark shadow on the display face that contrasts sharply with the brightly lit pixels. The louvers also help direct light from the pixels.

The louvers require no maintenance. However, louvers that are severely bent or damaged should be replaced to maximize display effectiveness.

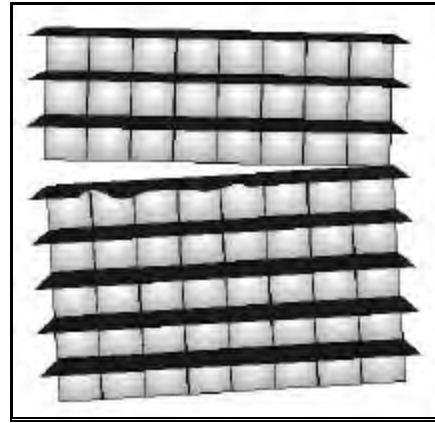
**Complete the following steps to replace a louver.**

1. Remove the lens/reflector assembly from the cabinet as explained in **Section 4.3**.
2. Remove both the lampbanks from the back of the lens/reflector assembly as explained in **Section 4.6**.
3. Remove the lampbank latches by removing the single screw that holds each one in place.

- Remove the vertical bracket by removing the eight screws that hold it in place.

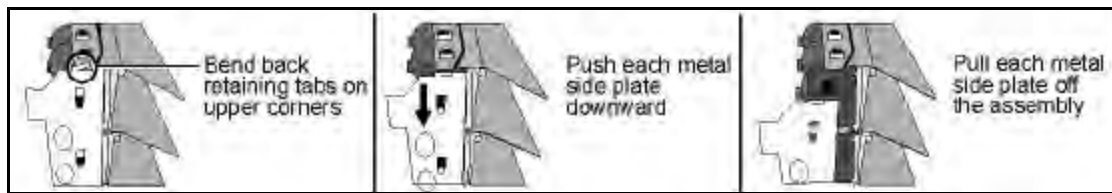


**Figure 66:** Lens Assembly Components



**Figure 67:** Separating rows above a damaged louver

- The metal rain shield is now free to be slide upward and off the lens/reflector assembly.
- On both top corners of the assembly is a retaining tab bent over the top louver. With pliers, bend each of these tabs back in alignment with the metal side plates. The method used to position the



**Figure 68:** Removing a metal side plate

side plates for louver replacement is illustrated in **Figure 68**.

- Push each metal side plate downward until it is free to be pulled away from the assembly. Replacing only the top louver does not require the removal of the side metal plates.
- Having removed the side plates, the only thing holding the rows of louvers/reflector together is the tape weather stripping between them. The damaged louver can be accessed by pulling the rows above this louver off in an intact group, as illustrated in **Figure 67**. There are now two groups of row/reflector assemblies.
- In the same manner as done with the metal side brackets, slide the damaged louver to the side and remove it from the row of reflectors beneath it. Discard it unless it is to be returned to Daktronics.
- Place the new louver onto the reflector row and slide it to the side until it is secured in place beneath the top reflector tabs.
- Remove the protective tape from the tape weather stripping to expose the adhesive surface. Nothing, especially hands, should touch the exposed adhesive surface of the weather stripping. The top louver of an assembly does not have tape weather stripping.
- With both groups of reflector rows lying on their backsides, carefully join them together by pressing the adhesive face of the tape against the underside of the above reflector row. Line up the reflector rows as accurately as possible. Leave the reflector/louvers laying down for the next step.
- Place the metal side plates on each side of the reflector/louver rows and slide them into position beneath the side reflector tabs.
- With pliers, bend the two top retainer tabs back over the upper louver.
- Slide the rain shield back into position on the rear of the lens/reflector assembly then reattach the vertical bracket and the lampbank latches. The longer screws are used for the latches. The top

edge of the rain shield should not extend beyond the top of the assembly.

16. Apply new weather stripping to lens/reflector assembly as explained in **Section 4.13**.
17. Reattach both the lampbanks to the back of the lens/reflector assembly as explained in **Section 4.6**.
18. Remount the lens/reflector assembly in the cabinet as explained in **Section 4.3**.

#### **4.15 Interior Maintenance**

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Do not allow dust and/or dirt to accumulate within the display cabinet. The debris can be picked up and deposited behind the lenses. This may restrict airflow out of the display and cause overheating problems. Use an air hose and vacuum to keep the inside of the cabinet clean.

Occasionally, it is wise to check the airflow through the lenses using the “smoke test.” This is especially true if the display controller is blanking the display but the cause of overheating is not apparent.

The smoke test is performed in the following manner.

1. Light a smoke ball or similar smoke-producing device beneath a fan inlet.
2. Observe where the smoke exits the display. It should only exit through the lens exhaust ports. If smoke exits from between two or more lens/reflector assemblies the weather stripping likely needs replacing.
3. If smoke does not exit a particular group of lenses, remove the lenses to clean out any debris, replace the lenses and retest. A failed fan may create an effect similar to that of clogged lens exhaust ports.

#### **4.16 Structural Maintenance & Inspection**

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A yearly inspection should be completed to maintain safe and dependable display operation. This inspection should address the following issues.

- **Corrosion**  
Check the paint and look for corrosion, especially at footing, structural tie points and ground rods.
- **Loosened Hardware**  
Verify fasteners, such as bolts and rivets, have not come loose. Fasteners should be checked and tightened or replaced as required.
- **Water Stains**  
Check the inside of the cabinet for any signs of water intrusion. Pay special attention to the area around the eyebolt holes
- **Electrical Components**  
Check all electrical components closely for signs of corrosion.

If noticing any of the above conditions, take action to correct the situation.

## 4.17 Cleaning the Signal Connectors

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If it becomes necessary to remove or replace a signal cable, clean the plugs and the circuit board jacks with DeoxIT (Daktronics part number CH-1015). Inspect and clean the jacks and plugs thoroughly to ensure the absence of any foreign matter. The presence of dirt or water may cause signal interconnect problems.

After the parts are cleaned, push the plug into a jar of CaiLube (Daktronics part number CH-1019), ensuring the paste wets the plug to a depth of at least  $\frac{1}{8}$ " on all four sides. Also, check to make sure all of the pinholes of the plug are filled with paste and that sufficient paste is present to form a "V" on the end of the plug. There should be enough paste on the end of the plug to form a weatherproof seal (from the paste pushed out around the jack) when the plug is inserted into the circuit board jack.

DeoxIT is the electrical contact cleaner in an aerosol can and CaiLube is the electrical contact lubricant and protector paste in a 1 oz jar. Both can be found in the *Tool Kit Accessories* package. CaiLube also comes in an 8 oz jar (Daktronics part number CH-1021). If additional supplies are needed, contact Customer Service for ordering information.

## 4.18 FCC Modem Notice

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The modem on the Venus interface complies with Part 68 of the FCC rules and regulations. With each device shipped, a label contains, among other information, the FCC Registration number and Ringer Equivalence Number (REN) for this product. Upon request, the customer must provide this information to the telephone company.

The REN is useful to determine the number of devices that may be connected to a telephone line and still have all of these devices ring when the number is called. In most, but not all areas, the sum of the RENs of all of these devices connected to one line should not exceed five. To be certain of the number of devices that may connect to the line, as determined by the REN, the customer should contact the local telephone company to determine the maximum REN for the calling area.

If the system causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, they will notify the customer in advance. If advance notification is not practical, the customer will be notified as soon as possible. The telephone company may make changes in its facilities, equipment, operations or procedures that could affect proper functioning of the equipment. If this is done, the customer will be notified in advance to give enough time to maintain uninterrupted telephone service.

If trouble is experienced with this device, please contact Daktronics customer service for information on obtaining service or repairs. The telephone company may ask to disconnect this device from the network until the problem has been corrected or until it is certain the device is not malfunctioning.

The device may not be used on coin service lines provided by the telephone company (this does not apply to private coin telephone applications which use standard telephone lines). Connection to party lines is subject to state tariffs.

## 4.19 Troubleshooting Checklist – Line Receiver Displays

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If the display has a line receiver, the following table covers a few problems that might be encountered while operating the display, along with a cause/remedy. While this list does not cover every possible problem, it does list those that are most likely to occur.

Problem	Possible Cause/Solution
One or more lamps will not light.	<ul style="list-style-type: none"> <li>• Replace the lamp.</li> <li>• Replace the socket.</li> <li>• Replace the lampbank.</li> </ul>
One or more lamps will not turn off.	<ul style="list-style-type: none"> <li>• Check for metallic foreign objects on the lampbank causing a short.</li> <li>• Replace the lampbank.</li> </ul>
Not all of one row of modules or part of one row of modules is working.	<ul style="list-style-type: none"> <li>• Check for a bad vertical shift board (VSB) by swapping in a known good vertical shift board.</li> <li>• Replace the ribbon cable from the VSB to the underlying lampbank.</li> <li>• Check appropriate breaker in panelboard.</li> <li>• Check for 230 VAC incoming display power.</li> <li>• Replace the last working lampbank in that row.</li> </ul>
Garbled display or shifted sequence.	<ul style="list-style-type: none"> <li>• Set computer and line receiver to high line feed.</li> <li>• Double check line receiver is set for correct display size.</li> <li>• Replace line receiver.</li> </ul>
Group of 2 modules does not work.	<ul style="list-style-type: none"> <li>• Check appropriate breaker in panelboard.</li> <li>• Check transformer for correct output (24 VAC).</li> </ul>
Entire display does not work	<ul style="list-style-type: none"> <li>• Check for 230 VAC incoming display power.</li> <li>• Check fuse in fan control enclosure.</li> <li>• Check line receiver indicator LEDs.</li> <li>• Check all signal connections.</li> </ul>
Single module does not work	<ul style="list-style-type: none"> <li>• Check signal connection.</li> <li>• Check power connections.</li> <li>• Check appropriate breaker in panelboard.</li> <li>• Replace lampbank.</li> </ul>
Display works for a short time and then blanks.	<ul style="list-style-type: none"> <li>• Check that all fans are operational and running at full RPM.</li> <li>• Check that filters are not plugged and limiting airflow.</li> </ul>



## 4.20 Troubleshooting Checklist – Data Distributor Displays

If the display has a data distributor, the following table covers a few possible problems that might be encountered while operating the display, along with a cause/solution. While this list does not cover every possible problem, it does list those that are most likely to occur.

Problem	Possible Cause/Solution
One or more lamps will not light.	<ul style="list-style-type: none"> <li>• Replace the lamp.</li> <li>• Replace the socket.</li> <li>• Replace the lampbank</li> </ul>
One or more lamps will not turn off.	<ul style="list-style-type: none"> <li>• Check for metallic foreign objects on the lampbank causing a short.</li> <li>• Check for foreign objects on PC board.</li> <li>• Replace the lampbank</li> </ul>
None of one row of modules across the entire display is working.	<ul style="list-style-type: none"> <li>• Check output card at data distributor.</li> <li>• Replace output card at data distributor.</li> <li>• Check signal cables to the first column director in that row.</li> <li>• Replace column director.</li> </ul>
A section of the display is not working (multiple rows in a group up to 4 modules long.)	<ul style="list-style-type: none"> <li>• Check signal cables to the column director for that section.</li> <li>• Replace the column director.</li> </ul>
A row of modules up to 4 modules long is not working.	<ul style="list-style-type: none"> <li>• Check the signal cable to the line controller in that row.</li> <li>• Replace the line controller.</li> </ul>
Garbled display or shifted sequence.	<ul style="list-style-type: none"> <li>• Check Cat-5 network cable</li> <li>• Check output on data distributor output card</li> <li>• Set computer and line receiver to high line feed.</li> </ul>
Single module does not work	<ul style="list-style-type: none"> <li>• Check signal connection (ribbon cable).</li> <li>• Check power connections.</li> <li>• Check appropriate breaker in panelboard.</li> <li>• Replace lampbank.</li> </ul>
Group of 2 modules does not work.	<ul style="list-style-type: none"> <li>• Check appropriate breaker in panelboard.</li> <li>• Check transformer for correct output (24 VAC).</li> </ul>
Entire display does not respond to any source of data.	<ul style="list-style-type: none"> <li>• Check clear LED on receiver board (if red, data distributor is not getting signal)</li> <li>• Controller may be off</li> <li>• Fiber optic connection may be bad or broken</li> </ul>
Display works for a short time and then blanks.	<ul style="list-style-type: none"> <li>• Check that all fans are operational and running at full RPM.</li> <li>• Check that filters are not plugged and limiting airflow.</li> </ul>

## 4.21 Replacement Parts List – Line Receiver Displays

Part Description	Daktronics Part Number
8x8 Lens Reflector Assembly; Starburst	0A-1195-1015
8x8 Lens Reflector Assembly; SunSpot	0A-1195-1007
Bench Test Fixture, 1 1/2 or 2 1/2 Lampbank, 230 V	0A-1176-0067
Electrical Contact Lubricant & Protector, 8 oz. Jar	CH-1021
Fan, 230 Volt, 1060 CFM w/ Capacitor	0A-1176-0052
Fan Filter, 19.62" x 15.62"	0A-1195-0029
Fan Controller Card	0P-1176-0003
Fuse, Line Receiver, MDL- 2 ½, 2 ½ A	F-1002
Lamp, 24V, T-3 ¼, Wedge Base	DS-1388
Lampbank, 8 x 4 Pixels, Shift	0P-1195-0001
Lampbank Latch, Arms	MP-1085
Lens; Blue - StadiaView	DS-1285
Lens; Green - StadiaView	DS-1287
Lens; Red - StadiaView	DS-1286
Lens; Starburst White - StadiaView	DS-1284
Lens; Monochrome White - StadiaView	DS-1288
Line Receiver Interface Board	0P-1176-0008
Line Receiver Spare Signal Cable <ul style="list-style-type: none"> <li>• 20-position cable from LR to VSR; 3M</li> <li>• 20-position cable from VSR to VSR; 2M</li> <li>• 20-position cable from 8x16 module to 8x16 module; 180</li> <li>• 20-position cable from VSR to module; 50</li> <li>• 20-position cable from 8x4 to 8x4 (2 1/20); 120</li> <li>• 20-position cable from 8x8 to 8x8 (2 1/20); 180</li> </ul>	<ul style="list-style-type: none"> <li>• 0A-1000-0018</li> <li>• 0A-1000-0016</li> <li>• W-1387</li> <li>• W-1356</li> <li>• W-1357</li> <li>• W-1387</li> </ul>
Louver, Top, 10 Degree, 1 x 8	0M-124912
Louver with Tape, 10 Degree, 1 x 8	0M-124913
Safety Lanyard	0A-1112-0036
Socket, Mini-Wedge Base	X-1209
Transformer (220V), T-1110	0A-1195-0053
Transformer 230V, T1110	0A-1195-0054
Transformer 240V, T1110	0A-1195-0055
Transformer, 230V Line Receiver	T-1106
Weather Stripping, Pile	HS-1149
Vertical Shift Board	0P-1176-0009
Tool Kit – Front Access (includes the following items)	0A-1195-0037
Screwdriver	TH-1050
Lamp Voltage Tester	0P-1195-0003
Lamp/Lens Extractor	0A-1195-0038
Electrical Contact Cleaner & Lubricant, 1 oz. Jar	CH-1019
Electrical Contact Cleaner, Spray Can	CH-1015
0.032 Feeler Gauge	0M-69133

Tool Kit – Rear Access (includes the following items)	0A-1195-0045
Rear Access Tool	0M-117093
Lamp Voltage Tester	0P-1195-0003
Lamp/Lens Extractor	0A-1195-0038
Electrical Contact Cleaner & Lubricant, 1 oz. Jar	CH-1019
Electrical Contact Cleaner, Spray Can	CH-1015
0.032 Feeler Gauge	0M-69133

## 4.22 Replacement Parts List – Data Distributor Displays

Part Description	Daktronics Part No.
8x8 Lens Reflector Assembly; Starburst	0A-1195-1015
8x8 Lens Reflector Assembly; SunSpot	0A-1195-1007
Bench Test Fixture; 1 ½ & 2 ½ Lampbank, 230V	0A-1176-0067
Column Director Card	0P-1145-0064
Data Distributor Output Card	0P-1145-0078
Data Distributor Receiver Board	0P-1145-0050
Data Distributor Spare Cables <ul style="list-style-type: none"> <li>• 20-position cable from LC to module; 50</li> <li>• 20-position cable from 8x16 to 8x16 &amp; 8x8 to 8x8; 180</li> <li>• 20-position cable from 8x4 to 8x4; 120</li> <li>• Cat-5 cable from CD to LC &amp; LC to LC; 3M</li> <li>• Cat-5 cable from CD to CD; 10M</li> <li>• Cat-5 cable from DD to CD (length will vary)</li> </ul>	<ul style="list-style-type: none"> <li>• W-1356</li> <li>• W-1387</li> <li>• W-1357</li> <li>• W-1382</li> <li>• W-1383</li> <li>• W-1383 (10M)</li> <li>• W-1406 (20M)</li> <li>• W-1446 (30M)</li> <li>• 0A-1000-0101 (40M)</li> </ul>
Electrical Contact Lubricant & Protector (paste) 8oz jar	CH-1021
EMI filter	Z-1008
Fan, 230 Volt, 1060 CFM w/ Capacitor	0A-1176-0052
Fan Filter, 19.62" x 15.62"	0A-1195-0029
Fan Controller Card	0P-1176-0003
Fan Control Expander Card	0P-1176-0010
Lamp, 24V, T-3 ¼, Wedge Base	DS-1388
Lampbank, 8x4 Pixels, Shift	0P-1195-0001
Lampbank, 8 x 4 Pixels for LC	0P-1195-0004
Lampbank Latch, Arms	MP-1085
Lens; Blue - StadiaView	DS-1285
Lens; Green - StadiaView	DS-1287
Lens; Red - StadiaView	DS-1286
Lens; Starburst White - StadiaView	DS-1284
Lens; Monochrome White - StadiaView	DS-1288
Line Controller Card	0P-1145-0068
Louver, Top, 10 Degree, 1 x 18	0M-124912
Louver with Tape, 10 Degree, 1 x 8	0M-124913
Safety Lanyard	0A-1112-0036
Socket, Mini-Wedge Base	X-1209

Transformer (220V), T-1110	0A-1195-0053
Transformer 230V, T1110	0A-1195-0054
Transformer 240V,T1110	0A-1195-0055
Weather Stripping, Pile	HS-1149
Tool Kit – Front Access (includes the following items)	0A-1195-0037
Screwdriver	TH-1050
Lamp Voltage Tester	0P-1195-0003
Lamp/Lens Extractor	0A-1195-0038
Electrical Contact Cleaner & Lubricant, 1 oz. Jar	CH-1019
Electrical Contact Cleaner, Spray Can	CH-1015
0.032 Feeler Gauge	0M-69133
Tool Kit – Rear Access (includes the following items)	0A-1195-0045
Rear Access Tool	0M-117093
Lamp Voltage Tester	0P-1195-0003
Lamp/Lens Extractor	0A-1195-0038
Electrical Contact Cleaner & Lubricant, 1 oz. Jar	CH-1019
Electrical Contact Cleaner, Spray Can	CH-1015
0.032 Feeler Gauge	0M-69133
2-foot, 20-position cable (from VSR to VSR)	0A-1000-0016
3-foot, 20-position cable (from LR to VSR)	0A-1000-0018
5-inch, 20-position cable (module to VSR)	W-1356
18-inch, 20-position cable (module to module)	W-1387

### 4.23 Daktronics Exchange/Repair & Return Programs

To serve customers' repair and maintenance needs, Daktronics offers both an exchange and a repair and return program. The exchange program reduces down time by providing timely replacement of key components. This service is provided to qualified customers who follow the program guidelines explained below. It is our pleasure to provide this service to ensure you get the most from your Daktronics products. Please call our Help Desk (1-877 / 605-1114) if you have any questions regarding the exchange program or any other Daktronics service.

When you call the Daktronics Help Desk, a trained service technician will work with you to solve the equipment problem. You will work together to diagnose the problem and determine which exchange replacement part to ship. If, after you make the exchange, the equipment still causes problems, please contact our Help Desk immediately.

If the replacement part fixes the problem, package the defective part in the same packaging the replacement part arrived in, fill out and attach the enclosed UPS shipping document and **RETURN THE PART TO DAKTRONICS**. (You may use the same box and packing the exchange part was sent in.) This will speed up the transaction and alleviate confusion when the failed component arrives at Daktronics. (Daktronics expects immediate return of the exchange part if it does not solve the problem.) For most equipment, you will be invoiced for the replacement part at the time it is shipped. This invoice is due when you receive it.

Daktronics reserves the right to refuse equipment that has been damaged due to acts of nature or causes other than normal wear and tear.

*If the defective equipment is not shipped to Daktronics within 30 working days from the invoice date, it is assumed you are purchasing the replacement part and you will be invoiced for it. This second invoice represents the difference between the exchange price and the purchase price of the equipment. This amount is due when you receive the second invoice. If you return the exchange equipment after 30 working days from invoice date, you will be credited for the amount on the second invoice minus a restocking fee.*

@ To avoid a restocking charge, please return the defective equipment within 30 days from the invoice date.

Daktronics also offers a Repair and Return program for items not subject to exchange.

**Where to Send:** To return parts for service, contact your local representative prior to shipment to acquire a Return Material Authorization Number (RMA#). If you have no local representative, call the Daktronics Help Desk for the RMA#. This will expedite the receiving process.

**Packaging for Return:** Package and pad the item well so that it will not be damaged in shipment. Electronic components such as printed circuit boards either should be installed in an enclosure or should be put in an anti-static bag before boxing. Please enclose your name, address, phone number and a clear description of symptoms.

**Mail:** Daktronics, Inc., Customer Service  
PO Box 5128  
331 32nd Avenue  
Brookings, SD 57006

**Phone:** Daktronics Help Desk: 1-877 / 605-1114 (toll free)  
or 1-605 / 697-4035

**Customer Service Fax:** 1-605 / 697-4444

**E-mail:** [helpdesk@daktronics.com](mailto:helpdesk@daktronics.com)



# Appendix B: General Drawings

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Surge Suppressor Wiring .....	Drawing A-81039
Line Receiver Settings, 3264-32192, 4064-40192.....	Drawing A-109450
Line Receiver Settings, 6464-64192, 7264-72192.....	Drawing A-109648
Line Receiver Settings, 4864-48192, 5664-56192.....	Drawing A-110166
Schematic; Pwr Wiring, Marquee/Sports .....	Drawing A-113564
Sectional Display Assembly Example, 120x160.....	Drawing A-116653
Schematic, Power Wiring 230V (DD).....	Drawing A-118779
Schematic; Column Director Power Supply.....	Drawing A-119453
Front Module Access, 8x8 Lens/Reflector Assy.....	Drawing A-122363
Shop DWG, 24YYY-18 Displays, S1600 .....	Drawing B-114883
Shop DWG, 32YYY-18 Displays, S1600 .....	Drawing B-114884
Shop DWG, 40YYY-18 Displays, S1600 .....	Drawing B-114885

## 32 HIGH

3264 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	3

3280 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	4

3296 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	5

32112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	6

32128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	7

32144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	8

32160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	9

32176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	A

32192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	3
ROTARY S10	0
ROTARY S11	B

## 40 HIGH

4064 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	3

4080 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	4

4096 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	5

40112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	6

40128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	7

40144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	8

40160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	9

40176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	A

40192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	4
ROTARY S10	0
ROTARY S11	B

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARD

TITLE: LINE RECEIVER SETTINGS, 3264-32192, 4064-40192

DES. BY: TWOODARD

DRAWN BY: RLONG

DATE: 12NOV98

REVISION

APPR. BY:

SCALE: 1=1

1176-R01A-109450

REV.	DATE	DESCRIPTION	BY	APPR.
2	29DEC99	CHANGED S3, S4, S7	RLONG	
1	11DEC98	CHANGED DIP S3 ON ALL SWITCH SETTING TO OFF. CHANGED 40 HIGH DIP S6 TO OFF	RLONG	



## 64 HIGH

6464 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	3

6480 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	4

6496 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	5

64112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	6

64128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	7

64144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	8

64160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	9

64176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	A

64192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	7
ROTARY S10	0
ROTARY S11	B

## 72 HIGH

7264 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	3

7280 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	4

7296 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	5

72112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	6

72128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	7

72144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	8

72160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	9

72176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	A

72192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	OFF
DIP S6	ON
DIP S7	OFF
DIP S8	OFF
ROTARY S9	8
ROTARY S10	0
ROTARY S11	B

REV.	DATE	DESCRIPTION	BY	APPR.
4	28DEC99	CHANGED S3, S4, S7	RLONG	
3	17MAR99	CHANGED S5 TO OFF AND S6 TO ON FOR 72 HIGH DISPLAYS.	RLONG	
2	14JAN99	CHANGED S5 TO ON AND S6 TO OFF ON 64 HIGH DISPLAYS.	RLONG	
1	11DEC98	CHANGED DIP S3 TO OFF ON ALL SETTINGS. CHANGED DIP S6 TO OFF ON 64 HIGH SETTINGS. CHANGED DIP S5 TO OFF ON 72 HIGH	RLONG	

<b>DAKTRONICS, INC. BROOKINGS, SD 57006</b>	
PROJ: 1600 SERIES MESSAGE BOARD	
TITLE: LINE RECEIVER SETTINGS, 6464-64192, 7264-72192	
DES. BY: TWOODARD	DRAWN BY: RLONG
	DATE: 18NOV98
REVISION	APPR. BY:
	SCALE: 1=1
<b>1176-R01A-109648</b>	

## 48 HIGH

4864 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	3

4880 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	4

4896 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	5

48112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	6

48128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	7

48144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	8

48160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	9

48176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	A

48192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	5
ROTARY S10	0
ROTARY S11	B

## 56 HIGH

5664 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	3

5680 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	4

5696 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	5

56112 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	6

56128 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	7

56144 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	8

56160 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	9

56176 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	A

56192 SWITCH SETTINGS	
DIP S1	ON
DIP S2	OFF
DIP S3 N.U.	OFF
DIP S4 N.U.	OFF
DIP S5	ON
DIP S6	OFF
DIP S7	OFF
DIP S8	OFF
ROTARY S9	6
ROTARY S10	0
ROTARY S11	B

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARD

TITLE: LINE RECEIVER SETTINGS, 4864-48192, 5664-56192

DES. BY: TWOODARD

DRAWN BY: RLONG

DATE: 08DEC98

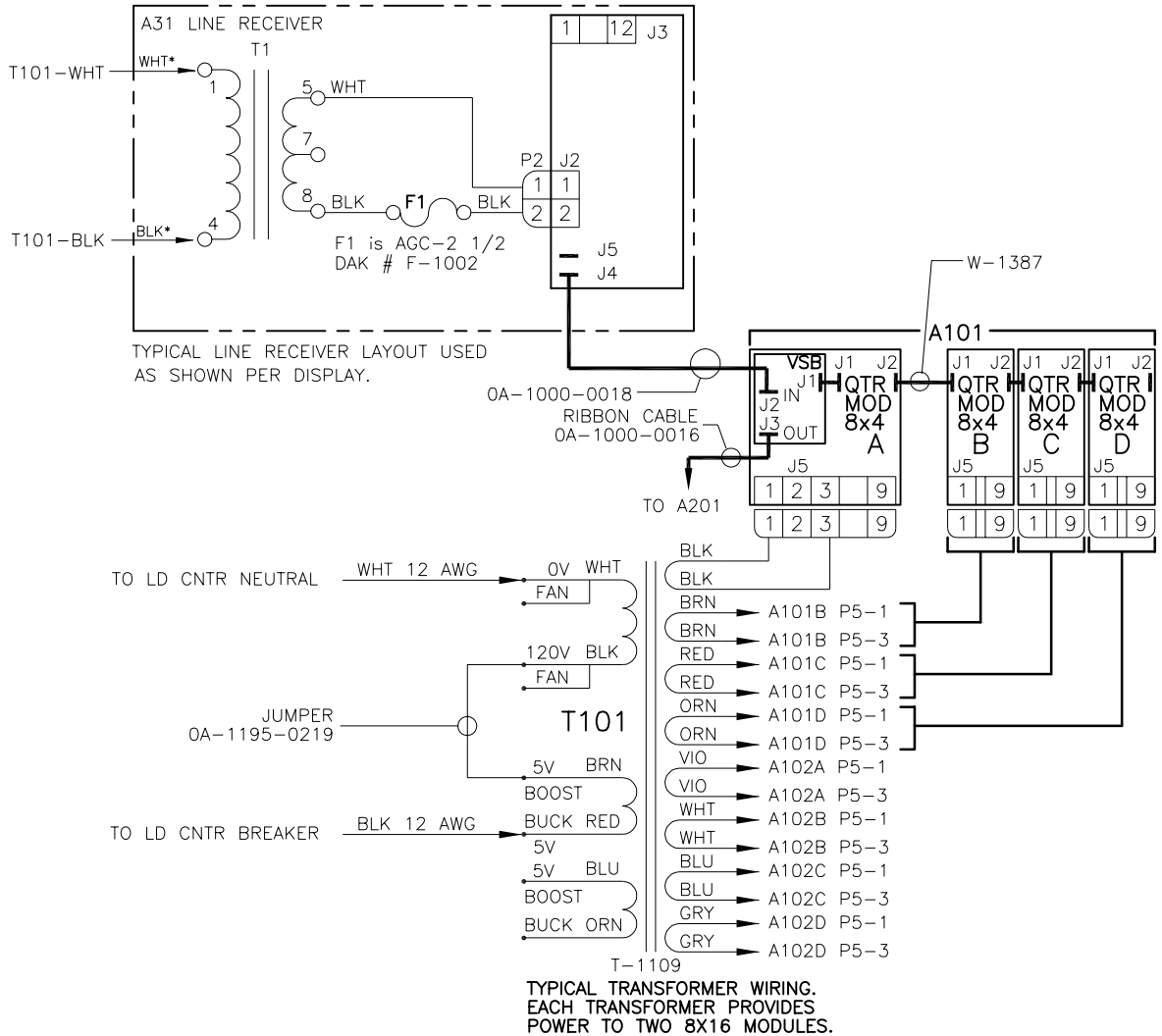
REVISION

APPR. BY:

SCALE: 1=1

1176-R01A-110166

REV.	DATE	DESCRIPTION	BY	APPR.
2	28DEC99	CHANGED S3, S4, S7 TO OFF	RLONG	
1	11DEC98	CHANGED DIP S3 & S6 TO OFF	RLONG	



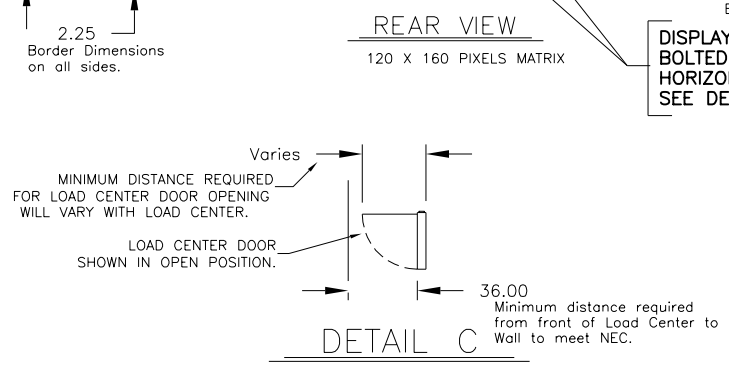
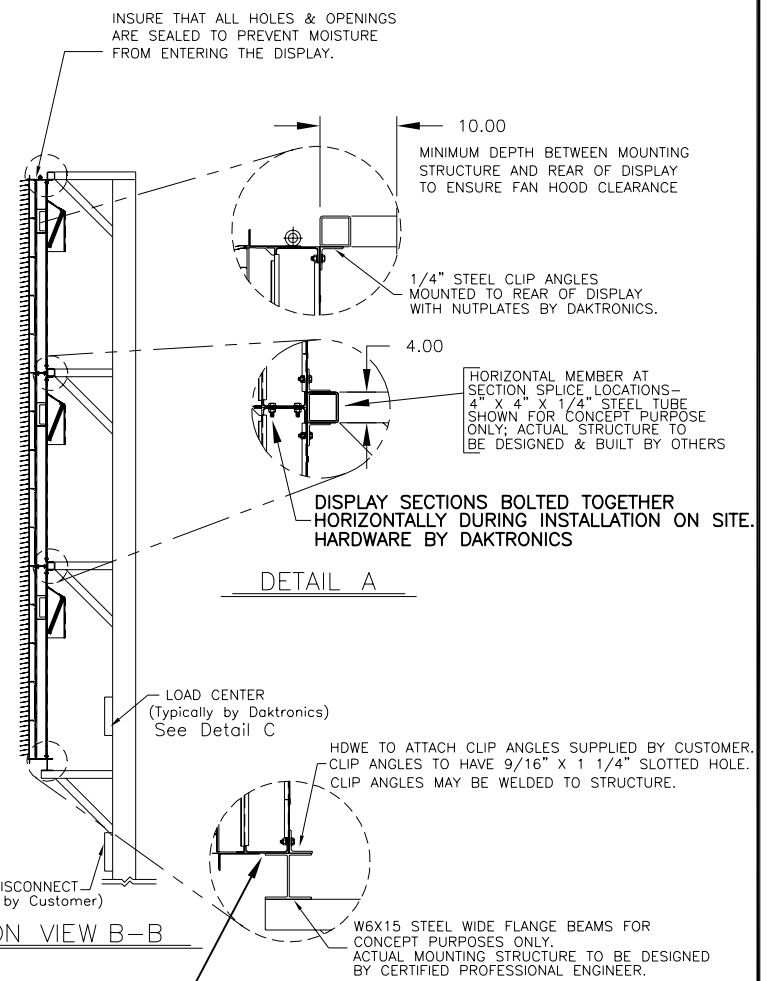
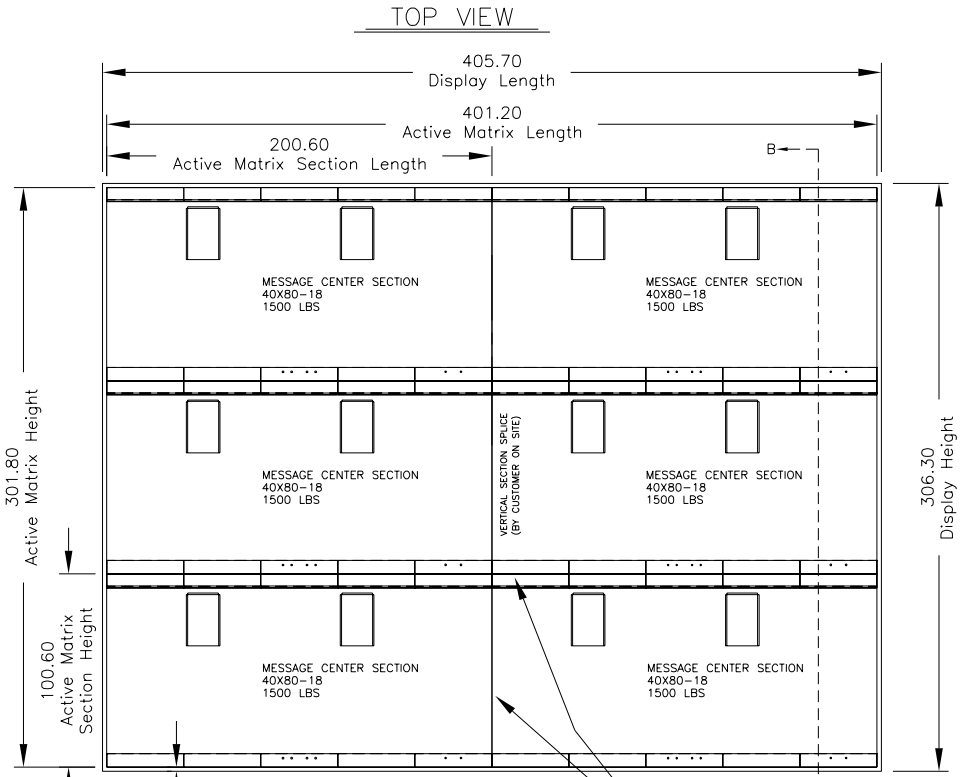
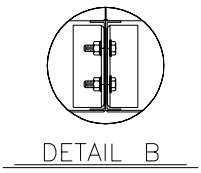
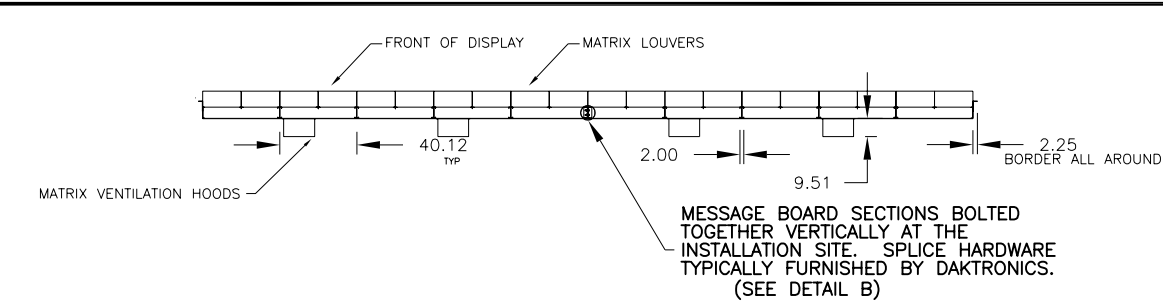
NOTES: ALL WIRING IS 12 AWG EXCEPT \* IS 14 AWG UNLESS OTHERWISE NOTED. REFER TO STANDARD OR CONTRACT LAYOUT DRAWING FOR LOAD CENTER BREAKER ASSIGNMENTS, MODULE DESIGNATIONS, SECTION LAYOUT AND TRANSFORMER LOCATIONS.

REV.	DATE	DESCRIPTION	BY	APPR.
1	06DEC99	ADDED SPORTS TO TITLE	RLONG	
2	16FEB00	MOVED JUMPER BETWEEN BLK AND BRN WIRE JUMPER PROVIDES 5V BUCK	RLONG	
3	26NOV01	ADDED JUMPER BETWEEN BLK AND BRN WIRES CHANGED BLK 12 AWG POWER IN TO RED WIRE JUMPER PROVIDES 5V BUCK	JSO	

DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ: 2 1/2" LENS PRODUCT	
TITLE: SCHEMATIC, POWER WIRING, LR, MARQUEE/SPORTS	
DES. BY: TWOODARD	DRAWN BY: RLONG
APPR. BY:	DATE: 16MAR99
REVISION	SCALE: 1=1
1195-R03A-113564	

REV.	1
DATE	13DEC99
DESCRIPTION	ADDED NOTE "BOTTOM OF DISPLAY TO BE CONTINUOUSLY SUPPORTED."
BY	JRT
APPR.	

REVISION	APPR. BY:	DATE:
SCALE:	1=100	02JUN99
1195-R10A-116653		



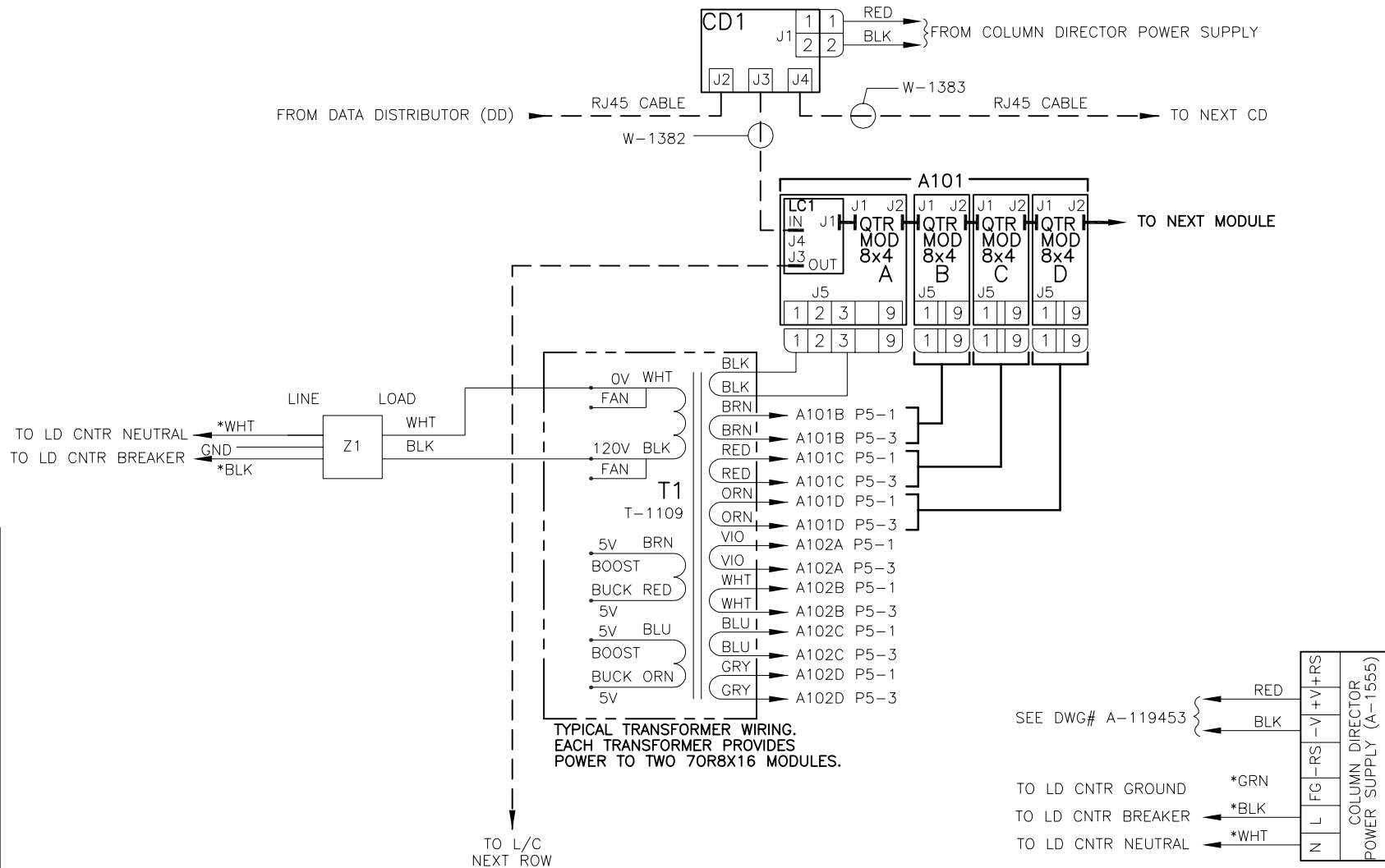
DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 2 1/2 IN  
 TITLE: SECTIONAL DISPLAY ASSEMBLY EXAMPLE, 120 X 160  
 DES. BY: JRT  
 DRAWN BY: JRT

BOTTOM OF DISPLAY TO BE CONTINUOUSLY SUPPORTED.

REV.	DATE	DESCRIPTION	BY	APPR.
1	23SEP99	ADDED FILTER BETWEEN TRANSFORMER AND LOAD CENTER	RLONG	
2	16FEB00	REMOVED JUMPER BETWEEN BLK AND BRN WIRE. MOVED INCOMING 120V TO BLK ON TRANSFORMER.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ.:	1600 SERIES MESSAGE BOARDS, 2 1/2"
TITLE:	SCHEMATIC, POWER WIRING 120V (DD)
DES. BY:	TWOODARD
DRWN BY:	JOLLYER
DATE:	21JUL99
REVISION	APPR. BY:
SCALE:	NONE
1195-R03A-118779	

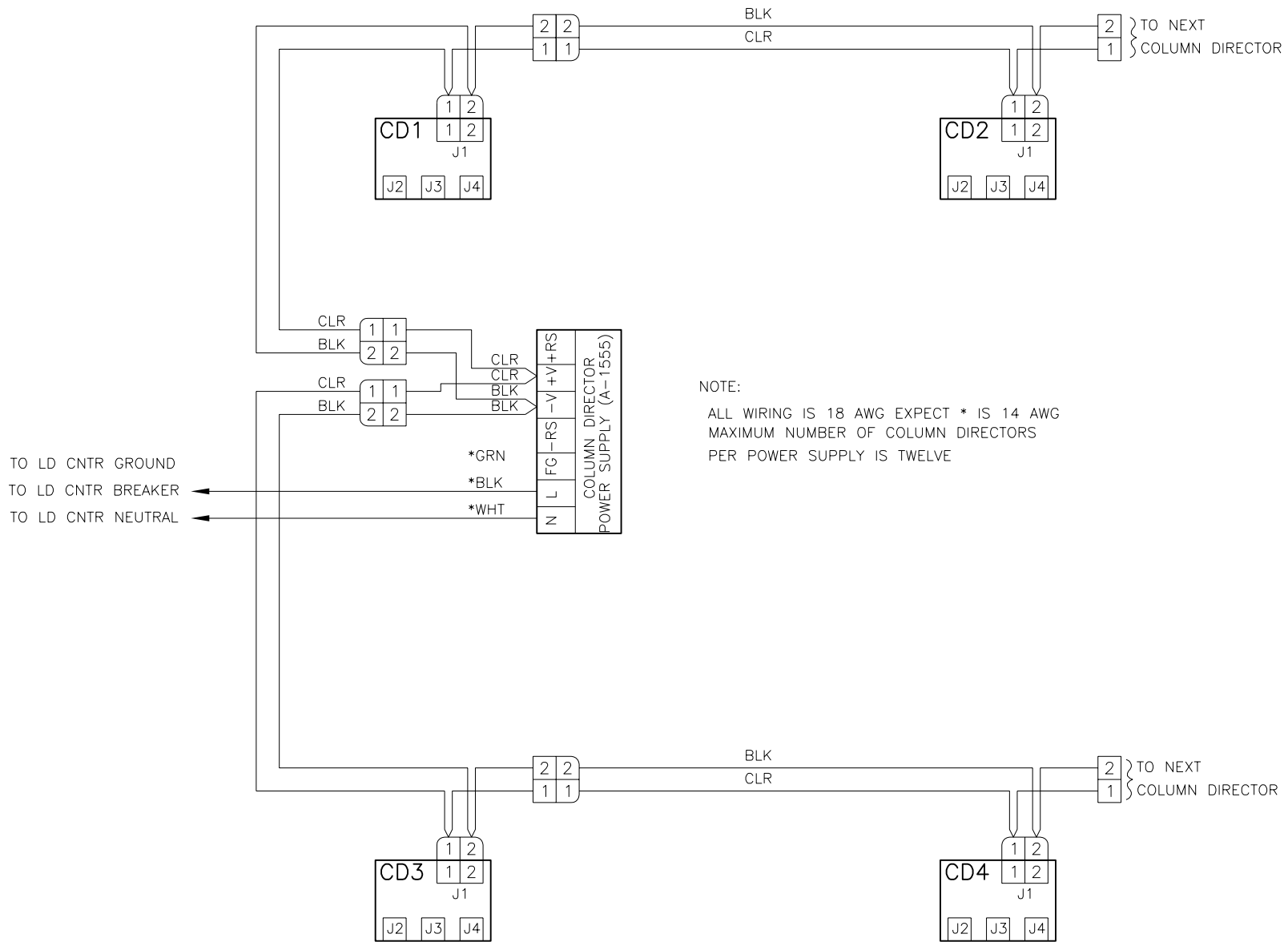


NOTES: ALL WIRING IS 18 AWG EXCEPT \* IS 12 AWG UNLESS OTHERWISE NOTED.

REFER TO STANDARD OR CONTRACT LAYOUT DRAWING FOR LOAD CENTER BREAKER ASSIGNMENTS, MODULE DESIGNATIONS, SECTION LAYOUT AND TRANSFORMER LOCATIONS.

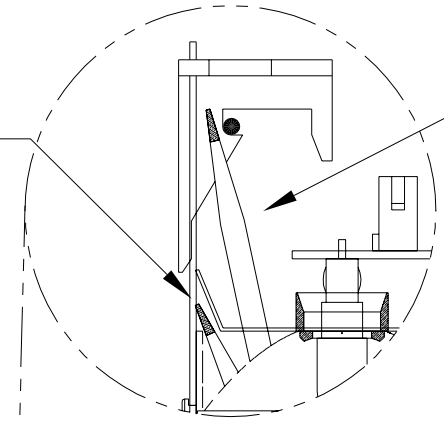
REV.	1	DATE	12NOV99	ADDED ADDITIONAL NOTE REFERENCING COLUMN DIRECTORS	DESCRIPTION	BY	RLONG	APPR.
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DAKTRONICS, INC. BROOKINGS, SD 57006	
Proj.:	2 1/2" 1600 SERIES
TITLE: SCHEMATIC: COLUMN DIRECTOR POWER SUPPLY	
DES. BY:	TWOODARD
DRAWN BY:	JOLIVER
DATE:	29JUL99
REVISION	APPR. BY:
SCALE:	NONE
1195-R03A-119453	



REV.	DATE	DESCRIPTION	BY	APPR.

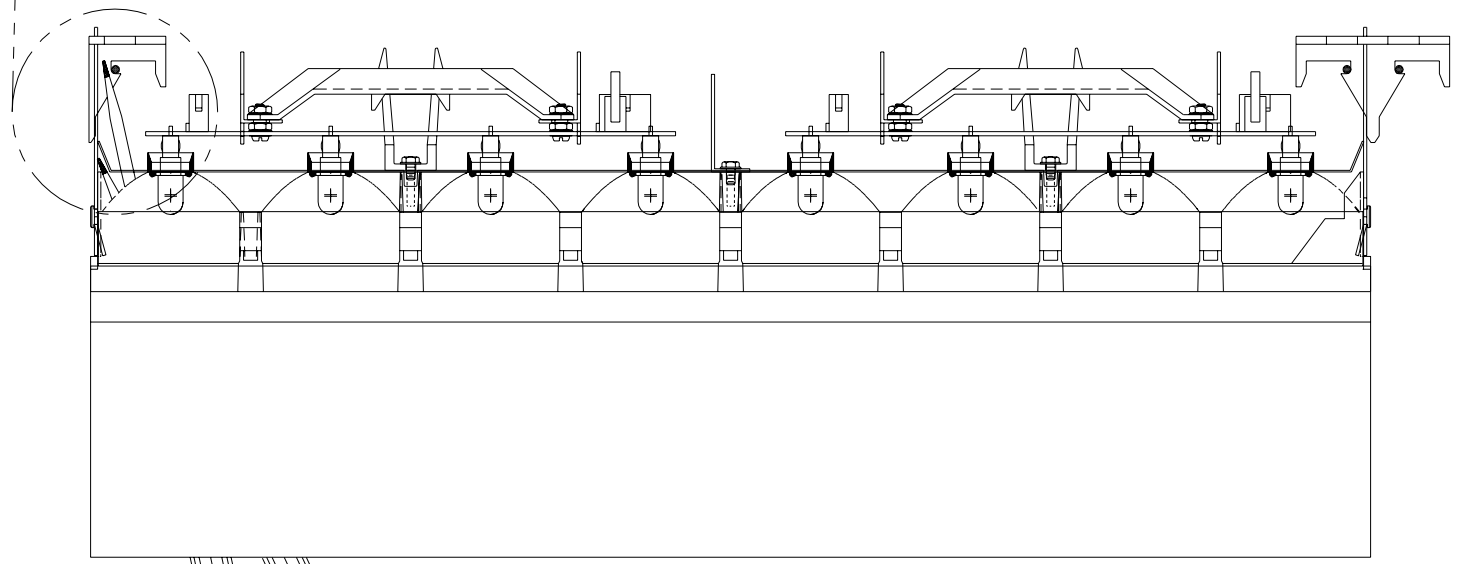
INCORRECT SCREWDRIVER POSITION



CORRECT SCREWDRIVER POSITION

PUSH SCREWDRIVER IN AT A SLIGHT ANGLE UNTIL YOU FEEL AN OBSTRUCTION, PULL SLIGHTLY BACK AND THEN ENGAGE THE LATCH.

DETAIL: A  
( SCALE 1=2)

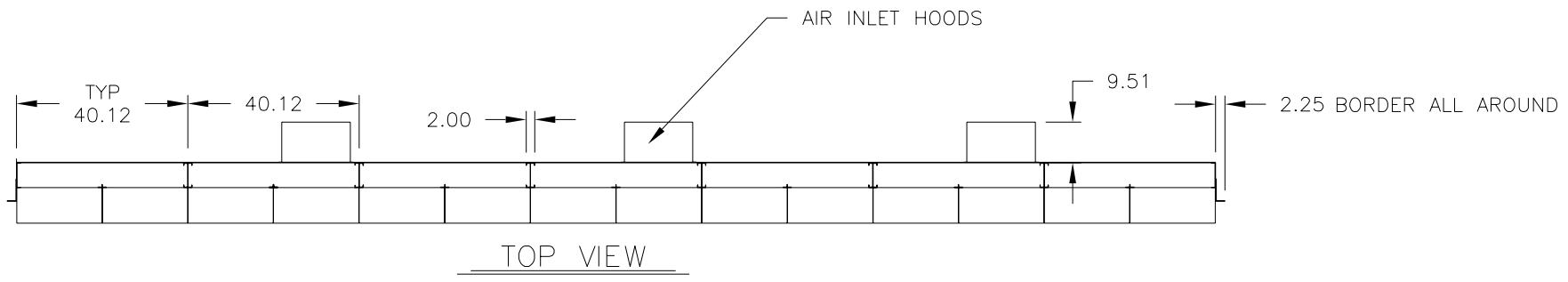


IF SCREWDRIVER IS INSERTED AT A SHARP ANGLE, IT MAY GET STUCK BEHIND THE EMI SHIELD.

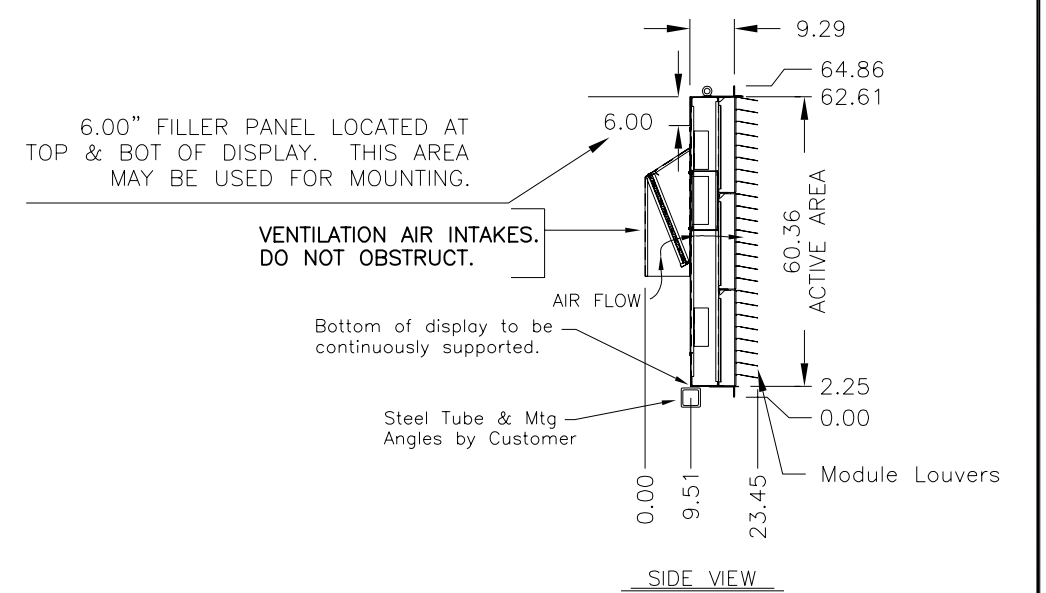
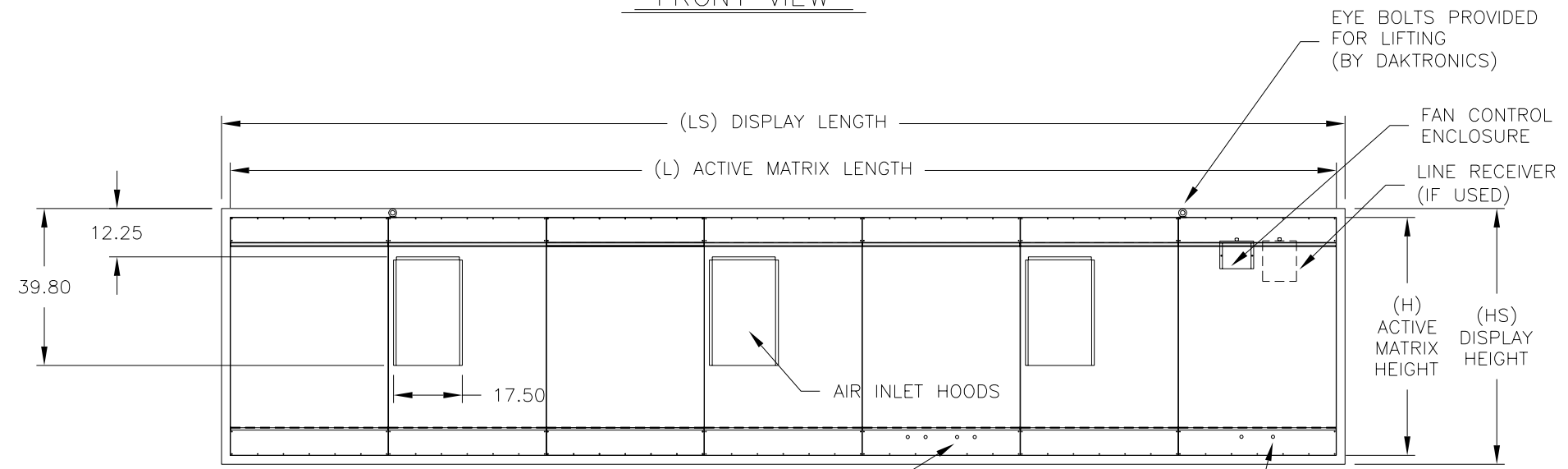
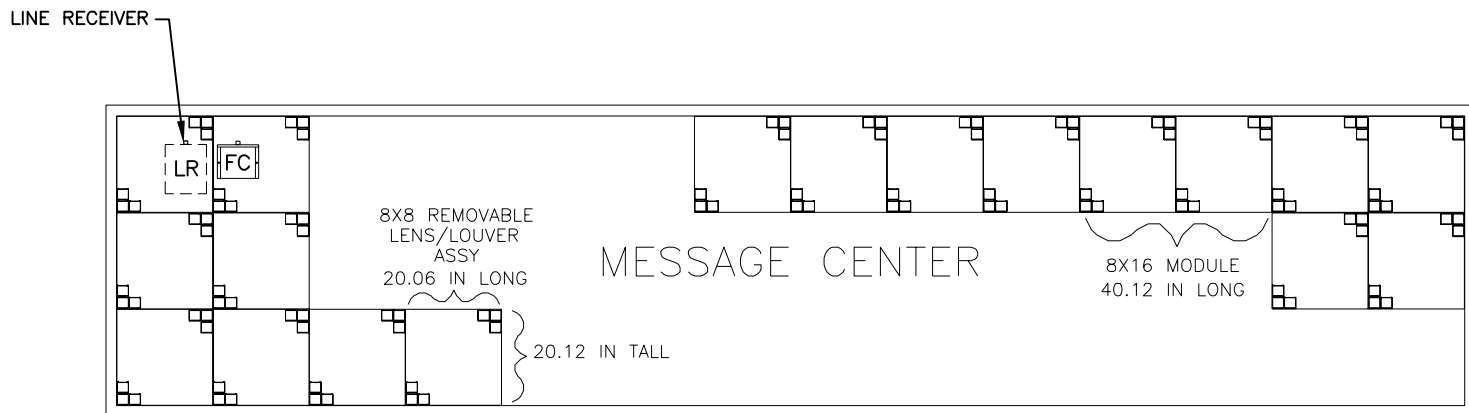
TOP VIEW

DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ: S1600 MESSAGE BOARDS, 2 1/2"	
TITLE: FRONT MODULE ACCESS, 8X8 LENS/REFLECTOR ASSY	
DES. BY: VERN V	DRAWN BY: JRT
	DATE: 30SEP99
REVISION	APPR. BY:
SCALE: 1=4	
1195-R10A-122363	

MODEL	NO. OF 8 X 16 MODULES	DISPLAY ACTIVE AREA (LENGTH) DIM "L"	DISPLAY LENGTH WITH 2.25 INCH BORDER ON ALL SIDES DIM "LS"	DISPLAY ACTIVE AREA (HEIGHT) DIM "H"	DISPLAY HEIGHT WITH 2.25 INCH BORDER ON ALL SIDES DIM "HS"	WEIGHT (SF)
2464	12	160.48 IN	164.98 IN	60.36 IN	64.86 IN	720 LBS
2480	15	200.60 IN	205.10 IN	60.36 IN	64.86 IN	900 LBS
2496	18	240.72 IN	245.22 IN	60.36 IN	64.86 IN	1080 LBS
24112	21	280.84 IN	285.34 IN	60.36 IN	64.86 IN	1200 LBS
24128	24	320.96 IN	325.46 IN	60.36 IN	64.86 IN	1440 LBS



- NOTES:**
1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
  2. DISPLAY CAN BE DESIGNED FOR FRONT OR REAR ACCESS, BUT FROM THE DISPLAY STANDPOINT ONLY. FRONT ACCESS MAY BE MORE EFFICIENT.
  3. LOAD CENTER IS TO BE MOUNTED EXTERNAL TO MOUNTING STRUCTURE.
  4. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
  5. AIR INLET HOODS, ON REAR OF DISPLAY, CAN NOT BE OBSTRUCTED.
  6. ALL DIMENSIONS ARE IN INCHES.
  7. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (20" X 40" ACTIVE AREA).
  8. DISPLAY WILL BE EQUIPPED WITH EITHER A LINE RECEIVER INTERFACE OR A DATA DISTRIBUTOR.
  9. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.
  10. REFER TO DWG 1195-R10B-113898 FOR POWER REQUIREMENTS.
  11. ANY OBJECTS IN THE VICINITY OF THE REAR OF THE DISPLAY MUST ALLOW FOR REMOVAL OF THE BACKSHEETS WHEN NECESSARY FOR MAINTENANCE & SERVICE. THIS IS TO INCLUDE POWER & SIGNAL CONDUIT.



POWER HARNESS LOCATED BEHIND THIS PANEL. FOUR KNOCKOUTS PROVIDED FOR POWER CONDUIT ENTRANCE. STANDARD POWER HARNESS LENGTH OF 20 FEET (MEASURED FROM THE BOTTOM CENTERLINE OF THE DISPLAY) IS FURNISHED.

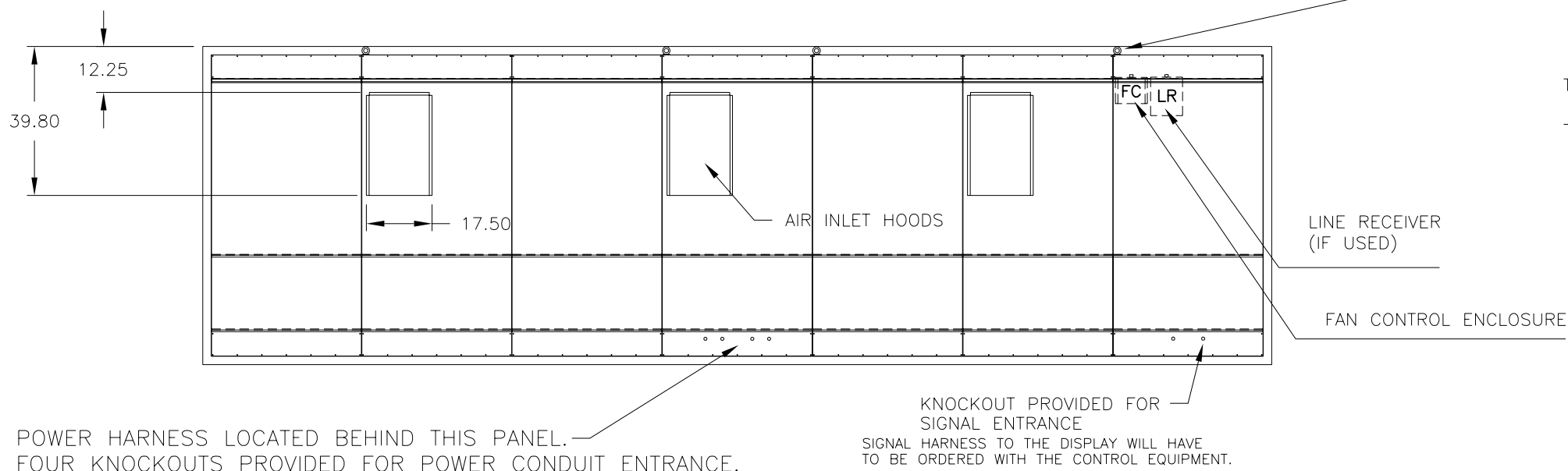
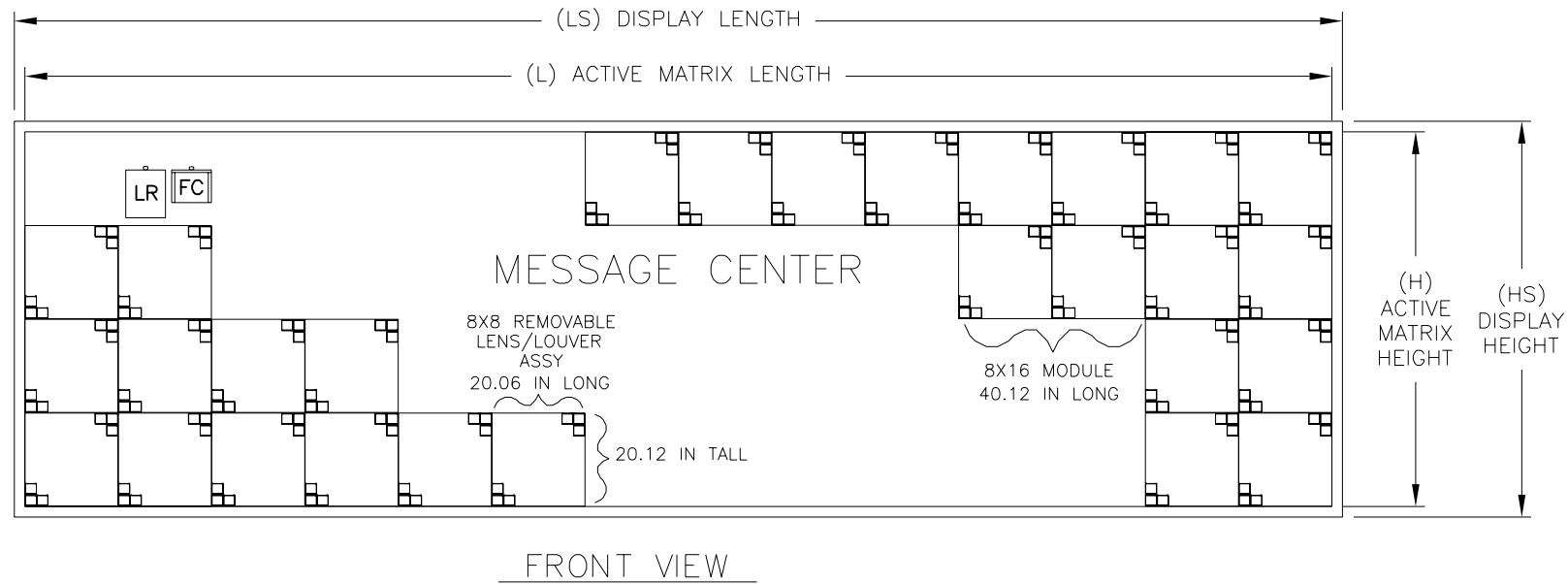
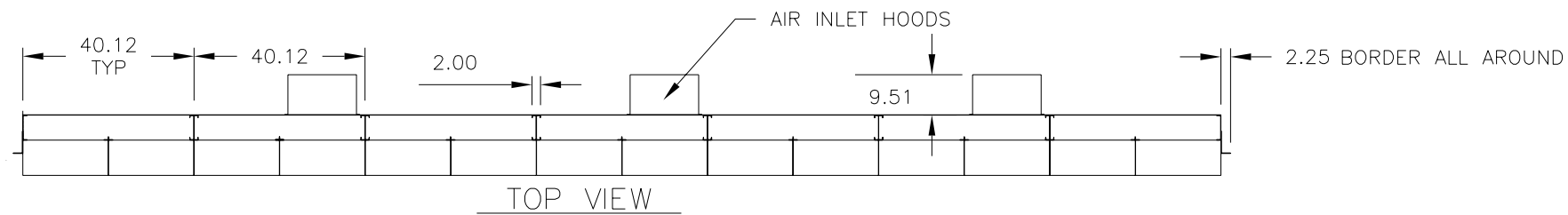
KNOCKOUT PROVIDED FOR SIGNAL ENTRANCE. SIGNAL HARNESS TO THE DISPLAY WILL HAVE TO BE ORDERED WITH THE CONTROL EQUIPMENT.

REAR VIEW  
24X112 MATRIX SHOWN

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1600 SERIES MESSAGE BOARDS, 2 1/2"			
TITLE: SHOP DWG, 24YYY-18 DISPLAYS, S1600			
DES. BY:	DRAWN BY: JRT		DATE: 22APR99
REVISION	APPR. BY:	1195-R10B-114883	
	SCALE: 1=40		

REV.	DATE	DESCRIPTION	BY	APPR.
1	07FEB01	MIRRORED AIR INLET HOODS IN TOP VIEW.	JRT	

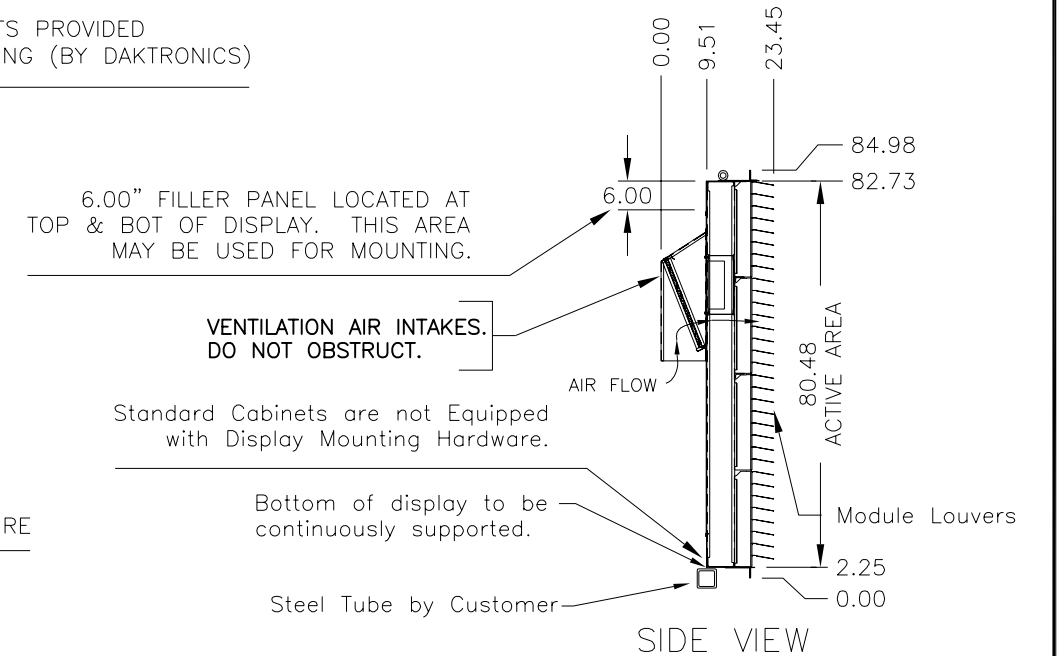




REAR VIEW  
32X112 MATRIX SHOWN

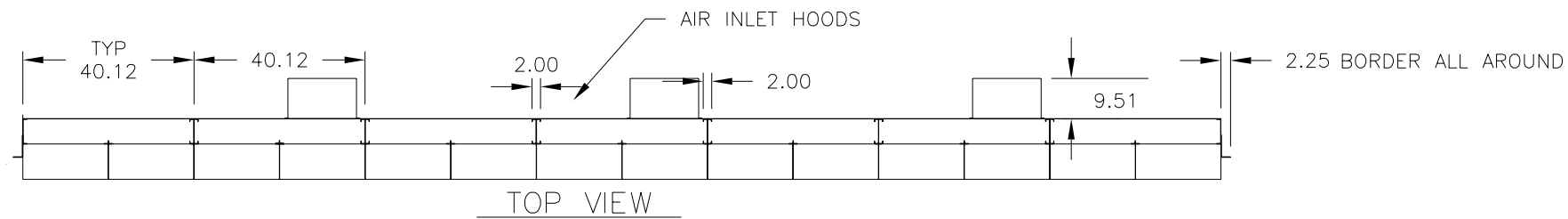
MODEL	NO. OF 8 X 16 MODULES	DISPLAY ACTIVE AREA (LENGTH) DIM "L"	DISPLAY LENGTH WITH 2.25 INCH BORDER ON ALL SIDES DIM "LS"	DISPLAY ACTIVE AREA (HEIGHT) DIM "H"	DISPLAY HEIGHT WITH 2.25 INCH BORDER ON ALL SIDES DIM "HS"	WEIGHT (SF)
3264	16	160.48 IN	164.98 IN	80.48 IN	84.98 IN	960 LBS
3280	20	200.60 IN	205.10 IN	80.48 IN	84.98 IN	1200 LBS
3296	24	240.72 IN	245.22 IN	80.48 IN	84.98 IN	1440 LBS
32112	28	280.84 IN	285.34 IN	80.48 IN	84.98 IN	1680 LBS
32128	32	320.96 IN	325.46 IN	80.48 IN	84.98 IN	1920 LBS

- NOTES:
1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
  2. DISPLAY CAN BE DESIGNED FOR FRONT OR REAR ACCESS, BUT FROM THE DISPLAY STANDPOINT ONLY. FRONT ACCESS MAY BE MORE EFFICIENT.
  3. LOAD CENTER IS TO BE MOUNTED EXTERNAL TO MOUNTING STRUCTURE.
  4. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
  5. AIR INLET HOODS, ON REAR OF DISPLAY, CAN NOT BE OBSTRUCTED.
  6. ALL DIMENSIONS ARE IN INCHES.
  7. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (20" X 40" ACTIVE AREA).
  8. DISPLAY WILL BE EQUIPPED WITH EITHER A LINE RECEIVER INTERFACE OR A DATA DISTRIBUTOR.
  9. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.
  10. REFER TO DWG 1195-R10B-113898 FOR POWER REQUIREMENTS.
  11. ANY OBJECTS IN THE VICINITY OF THE REAR OF THE DISPLAY MUST ALLOW FOR REMOVAL OF THE BACKSHEETS WHEN NECESSARY FOR MAINTENANCE & SERVICE. THIS IS TO INCLUDE POWER & SIGNAL CONDUIT.



DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ: 1600 SERIES MESSAGE BOARDS, 2 1/2"	
TITLE: SHOP DWG, 32YYY-18 DISPLAYS, S1600	
DES. BY:	DATE: 01JUN99
DRAWN BY: JRT	
REVISION	APPR. BY:
	SCALE: 1=40
1195-E10B-114884	

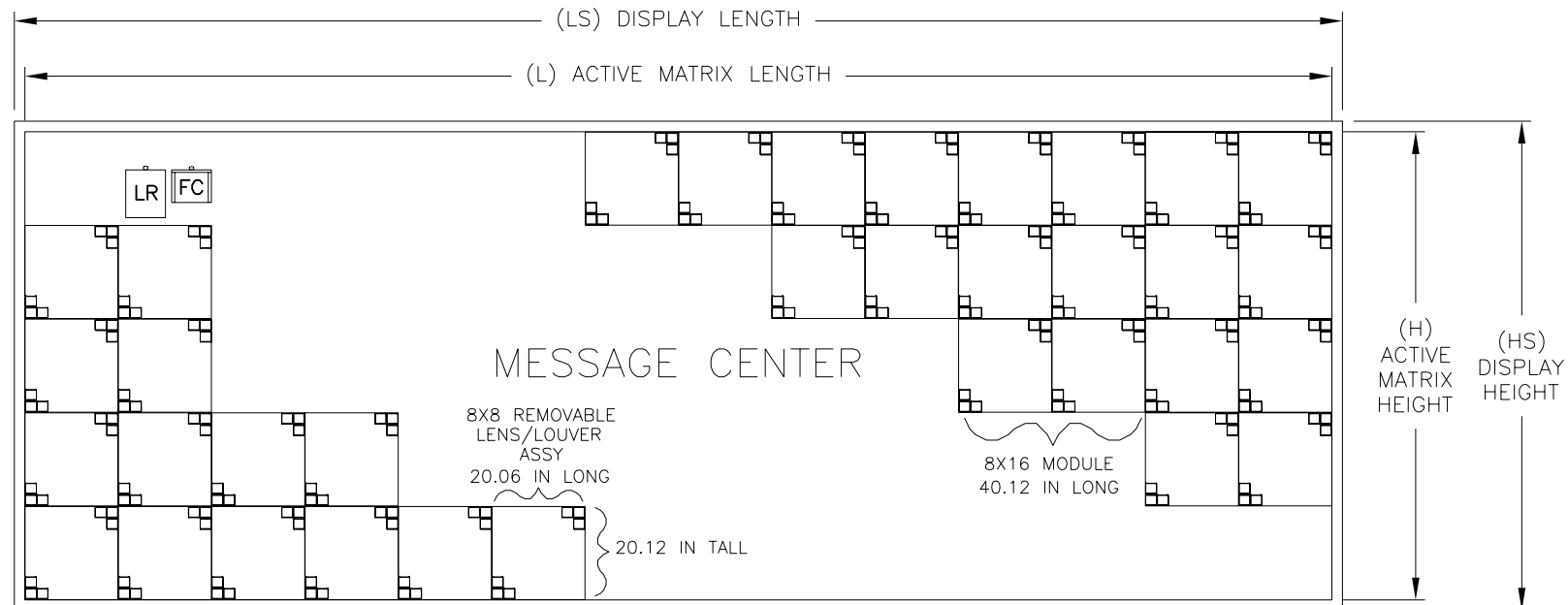
REV.	DATE	DESCRIPTION	BY	APPR.
1	07FEB01	MIRRORED AIR INLET HOODS IN TOP VIEW.	JRT	



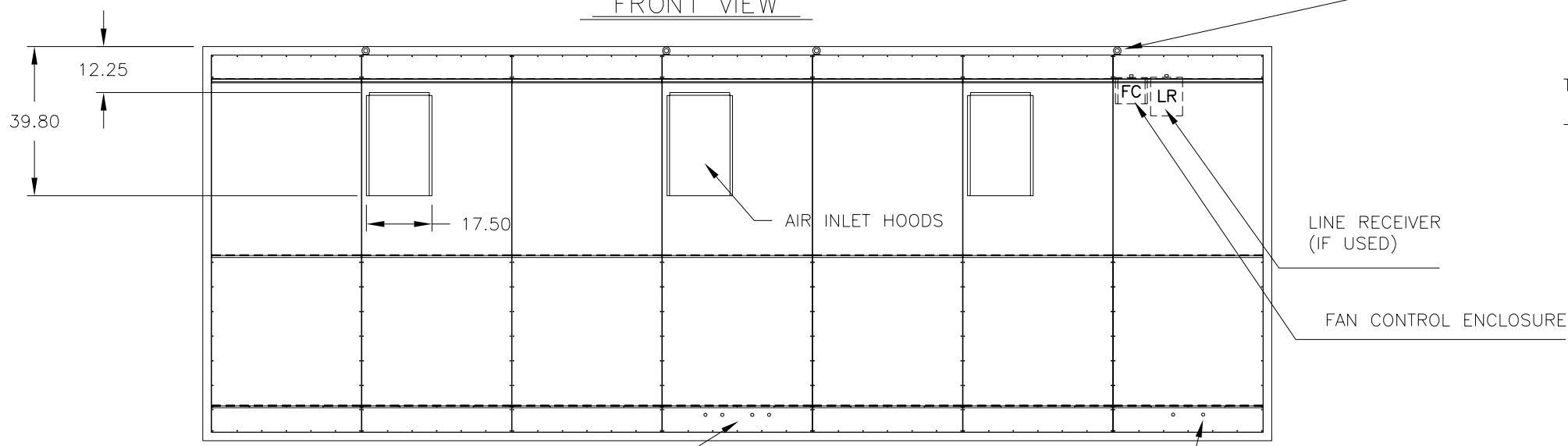
MODEL	NO. OF 8 X 16 MODULES	DISPLAY ACTIVE AREA (LENGTH) DIM "L"	DISPLAY LENGTH WITH 2.25 INCH BORDER ON ALL SIDES DIM "LS"	DISPLAY ACTIVE AREA (HEIGHT) DIM "H"	DISPLAY HEIGHT WITH 2.25 INCH BORDER ON ALL SIDES DIM "HS"	WEIGHT (SF)
4064	20	160.48 IN	164.98 IN	100.60 IN	105.10 IN	1200 LBS
4080	25	200.60 IN	205.10 IN	100.60 IN	105.10 IN	1500 LBS
4096	30	240.72 IN	245.22 IN	100.60 IN	105.10 IN	1800 LBS
40112	35	280.84 IN	285.34 IN	100.60 IN	105.10 IN	2100 LBS
40128	40	320.96 IN	325.46 IN	100.60 IN	105.10 IN	2400 LBS

**NOTES:**

1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
2. DISPLAY CAN BE DESIGNED FOR FRONT OR REAR ACCESS, BUT FROM THE DISPLAY STANDPOINT ONLY. FRONT ACCESS MAY BE MORE EFFICIENT.
3. LOAD CENTER IS TO BE MOUNTED EXTERNAL TO MOUNTING STRUCTURE.
4. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
5. AIR INLET HOODS, ON REAR OF DISPLAY, CAN NOT BE OBSTRUCTED.
6. ALL DIMENSIONS ARE IN INCHES.
7. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (20" X 40" ACTIVE AREA).
8. DISPLAY WILL BE EQUIPPED WITH EITHER A LINE RECEIVER INTERFACE OR A DATA DISTRIBUTOR.
9. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.
10. REFER TO DWG 1195-R10B-113898 FOR POWER REQUIREMENTS.
11. ANY OBJECTS IN THE VICINITY OF THE REAR OF THE DISPLAY MUST ALLOW FOR REMOVAL OF THE BACKSHEETS WHEN NECESSARY FOR MAINTENANCE & SERVICE. THIS IS TO INCLUDE POWER & SIGNAL CONDUIT.



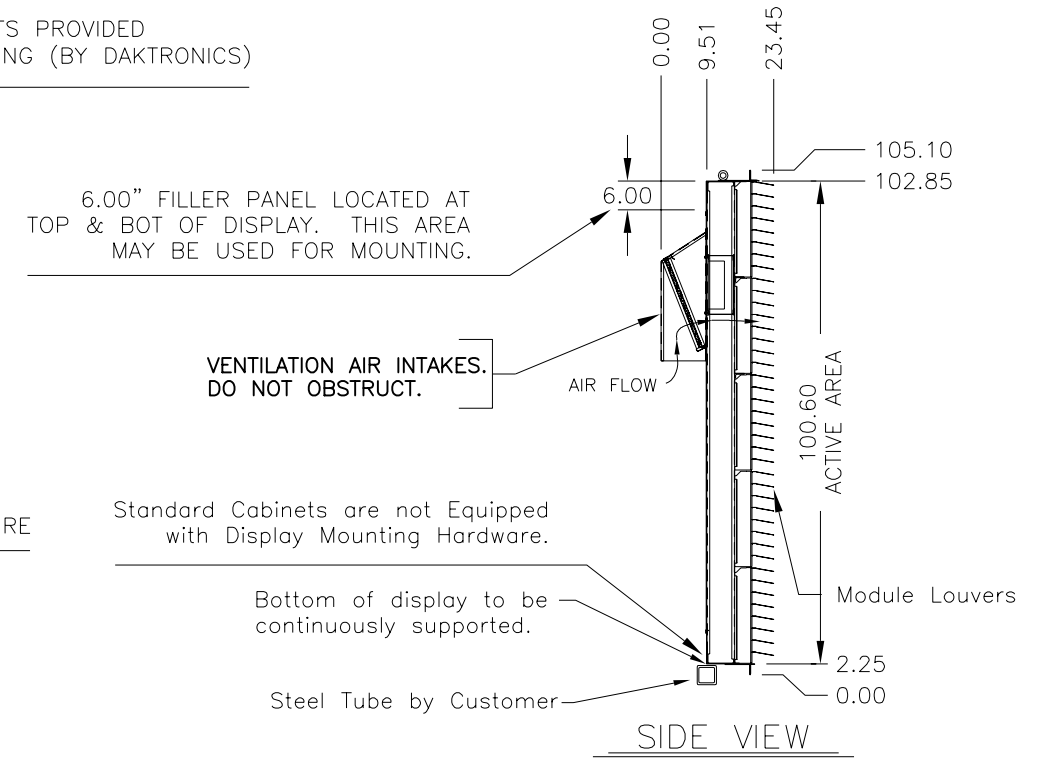
EYE BOLTS PROVIDED FOR LIFTING (BY DAKTRONICS)



POWER HARNESS LOCATED BEHIND THIS PANEL. FOUR KNOCKOUTS PROVIDED FOR POWER CONDUIT ENTRANCE.

KNOCKOUT PROVIDED FOR SIGNAL ENTRANCE. SIGNAL HARNESS TO THE DISPLAY WILL HAVE TO BE ORDERED WITH THE CONTROL EQUIPMENT.

40X112 MATRIX SHOWN



6.00" FILLER PANEL LOCATED AT TOP & BOT OF DISPLAY. THIS AREA MAY BE USED FOR MOUNTING.

VENTILATION AIR INTAKES. DO NOT OBSTRUCT.

Standard Cabinets are not Equipped with Display Mounting Hardware.

Bottom of display to be continuously supported.

Steel Tube by Customer

REV.	DATE	DESCRIPTION	BY	APPR.
1	07FEB01	MIRRORED AIR INLET HOODS IN TOP VIEW.	JRT	

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1600 SERIES MESSAGE BOARDS, 2 1/2"			
TITLE: SHOP DWG, 40YYY-18 DISPLAYS, S1600			
DES. BY:	DRAWN BY: JRT		DATE: 01JUN99
REVISION	APPR. BY:	1195-E10B-114885	
	SCALE: 1=40		