



1500 Series
Small Matrix Display
 (18" Character - 120/208 Volt)

**Installation, Maintenance &
 Troubleshooting Manual**

ED-11119

1500 Series displays are available in SunSpot® monochrome models.
 SunSpot® and Venus® are registered trademarks of Daktronics, Inc.
 Mate-N-Lok™, Deoxit™ and Cailube™ are trademarks of their respective companies.

ED#11119
Product #1112
Rev. 0 - 01Oct98

Display Serial # _____

Display Model # _____

Date Installed _____

Copyright © 1998 Daktronics, Inc.

All rights reserved. While every precaution has been taken in the preparation of this manual, the publisher assumes no responsibility for errors or omissions. No part of this book covered by the copyrights hereon may be reproduced or copied in any form or by any means - graphic, electronic, or mechanical, including photocopying, taping, or information storage and retrieval systems - without written permission of the publisher.



DAKTRONICS, INC.

Setting New Standards Worldwide

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605)697-4400 or (800)843-9879 Fax 697-4444

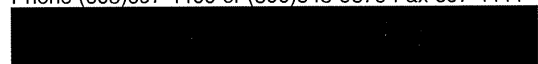


Table Of Contents

1.	Introduction	1-1
1.1	How To Use This Manual	1-1
1.2	Display Overview	1-2
1.3	Definitions	1-3
2.	Mechanical Installation	2-1
2.1	Display Definitions	2-1
2.2	Support Column Selection	2-1
2.3	Cabinet Display Mounting	2-2
2.4	Eye Bolts	2-2
2.5	Display Ventilation Requirements	2-3
2.6	8x8 Lens Assembly Removal and Installation	2-3
2.7	Properly Securing The Lens And Lens Assembly	2-3
3.	Electrical Installation	3-1
3.1	Grounding	3-1
3.1.1.	New Power Installation	3-1
3.1.2	Existing Power Installation	3-2
3.2	Driver/Module Numbering Convention	3-2
3.3	Power Terminations	3-3
3.4	Signal Terminations	3-4
3.5	Control Cable Requirements	3-4
3.5.1	RS/232 (Venus 1500 System)	3-5
3.5.2	RS/422 (Venus 1500 System)	3-5
3.5.3	Modem (Venus 1500 System)	3-5
3.5.4	Fiber (Venus 1500/Venus 4600 System)	3-5
3.6	Signal Terminations From Computer To Display	3-5
3.6.1	RS/232 (Venus 1500 System)	3-5
3.6.2	RS/422 (Venus 1500 System)	3-6
3.6.3	Modem (Venus 1500 System)	3-7
3.6.4	Fiber	3-7
3.6.4.1	Venus 1500 System	3-7
3.6.4.2	Venus 4600 System	3-7
3.7	Interconnect of 2V Displays	3-7
3.7.1	Venus 1500-Controlled Displays	3-8
3.7.2	Serial Line Interface-Controlled Displays	3-8
3.8	Module Connections	3-9
3.9	Dimming	3-9
3.9.1	Light Sensor - Venus 1500	3-9
3.9.2	Light Sensor - Venus 4600	3-10

3.10	Temperature Sensors	3-10
3.10.1	Temperature Sensor - Venus 1500	3-10
3.10.2	Temperature Sensor - Venus 4600	3-10
3.11	First Time Turn On	3-10
3.12	Main Disconnect	3-11
4.	Maintenance & Troubleshooting	4-1
4.1	Service Procedures	4-1
4.2	Lamp Testing And Replacement	4-2
4.2.1	Lamp Life	4-3
4.2.2	Controller Lamp Testing	4-3
4.2.2.1	Venus 1500 System	4-3
4.2.2.2	Venus 4600 System	4-4
4.2.3	Optional Lampbank Driver Test Table	4-5
4.2.4	Individual Lamp Replacement - Front Access	4-5
4.2.5	Complete 8x4 Lampbank Replacement - Front Access	4-5
4.3	Lens Position	4-6
4.4	8x8 Lens Assembly Weather Stripping	4-6
4.5	Lens Assembly Spacing	4-7
4.6	Louver Replacement	4-7
4.7	Lamp Driver Display Board	4-8
4.8	Vertical Shift Board (VSB)	4-8
4.9	Venus 1500 Controller/Serial Line Interface	4-9
4.9.1	Display Controller Box	4-9
4.9.1.1	Controller	4-9
4.9.1.2	Modem Board	4-11
4.9.1.3	Fiber Board	4-12
4.9.2	Serial Line Interface	4-12
4.9.2.1	Removing the Serial Line Interface for Service	4-14
4.9.2.2	Line Receiver Interconnect For 2V Displays	4-14
4.10	Socket Replacement	4-14
4.11	Fans	4-14
4.12	Fan Filters	4-15
4.13	Structural Inspection	4-17
4.14	Cleaning the Cables	4-17
4.15	Modem/FCC Regulations	4-17
4.16	Troubleshooting	4-19
4.17	Replacement Parts List	4-20
4.18	Unit Exchange/Replacement Procedure	4-21
Appendix A:	Light & Temperature Sensors	A-1
Appendix B:	Supplementary Information	B-1
Appendix C:	Forms & Reports	C-1
Appendix D:	Project Specific Information	D-1

List Of Figures

Figure 1	Sample Display Configurations	2-1
Figure 2	New Power Installation	3-1
Figure 3	Existing Power Installation	3-2
Figure 4	Typical 1/4-Module Configuration - Vertical Shift Board (VSB)	3-4
Figure 5	Screw Fasteners Exposed	4-1
Figure 6	Releasing the 8x8 Lens Assembly	4-2
Figure 7	Power and Signal Harnesses	4-2
Figure 8	8x8 Lens Assembly Weather Stripping	4-6
Figure 9	Use of Feeler Gauge	4-7
Figure 10	Weather Stripping & Replacement Louvers	4-7
Figure 11	Lamp Driver Display Board	4-8
Figure 12	Vertical Shift Board (VSB)	4-8
Figure 13	Controller Board with MDC	4-9
Figure 14	MDC DIP Switch	4-10
Figure 15	Modem Board	4-11
Figure 16	Fiber Board	4-12
Figure 17	Serial Line Interface	4-12
Figure 18	View of Cooling Fan and Filter	4-15
Figure 19	Fan Mounting and Filter Assembly	4-15
Figure 20	Display Cooling System	4-16

Section 1: Introduction

1.1 How To Use This Manual

This manual is designed to explain the installation and maintenance of Daktronics 1500 Series Outdoor Incandescent Displays - 18 inch character displays with 2.5" lenses. It specifies details and gives guidance for mounting and wiring these displays. The manual is broadly divided into mechanical, electrical and maintenance sections.

Important Safeguards:

1. Read and understand these instructions before installing the display.
2. Do not drop the control console or allow it to get wet.
3. Be sure that the display is properly grounded with a ground rod at the display location.
4. **Disconnect power to the display when it is not in use.**
5. **Disconnect power when servicing the display.**
6. Do not modify the display structure or attach any panels or coverings to the scoreboard without the express written consent of Daktronics, Inc.
5. If the display is not in operation, turn the display power off to conserve energy and extend the life of the fans. Turning off the power will also reduce the amount of debris that can accumulate in the filters thereby decreasing the amount of maintenance required on the electronics, fuses and filters.

Daktronics identifies manuals by an ED number located on the cover page of each manual. Any reference manuals called out in this manual will be identified by its ED number. For example, this manual would be referred to as **ED-9931**.

The box below illustrates Daktronics drawing numbering system. The drawing number "7087-P08A-69945" is how Daktronics identifies individual drawings. This number is located in the bottom right corner of the drawing. The manual will refer to drawings by the last set of digits and the letter preceding them. In the example, the drawing would be referred to as **Drawing A-69945**. All drawings referred to as such will be inserted at the *end of the first section which references them* unless otherwise specified.

DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ:	
TITLE:	
DES. BY:	DRAWN BY: DATE:
APPR. BY:	7087-P08A-69945
SCALE:	

Note: The front of this manual contains blank spaces where some important information should be noted. Fill in the date on which the display became operational. Also fill in the model number and serial number of the display. (This information is found on the ID label, located on the front of the display on the right end.) Please have this information available when calling Daktronics Customer Service; it will ensure that your request is serviced in the fastest manner possible.

1.2 Display Overview

The 1500 Series displays utilize a proprietary lens system making them the brightest and sharpest monochrome display system available. They have been designed and manufactured for performance, reliability, easy maintenance and long life.

Daktronics displays are furnished with air filters to filter the air prior to the air passing through the cooling fans. If the filters are removed or modified in any way, the changes must be submitted to the Daktronics engineering staff for evaluation and approval or the warranty will be null and void.

In enclosed displays, if ventilation air to the cabinet is to be pre-filtered, the effective filter area is to be no less than 2.3 square feet per 1.0 square feet of filter face area and the filter media is to have an average arrestance (resistance to debris) of 90-92%. Initial resistance should not exceed 0.48 w.g. (water gauge) at 500 fpm (feet per meter). It is required that any plans for filtering air in an enclosed display be submitted to the Daktronics engineering staff for evaluation and approval or the warranty will be null and void.

Note that two copies of the Installation Quality Checklist are located in **Appendix C**. Complete these forms and mail one back to Daktronics customer service to receive a free set of replacement air filters. This checklist is intended to assure the display's dependable operation after installation. Ensure that each item listed on the checklist was acted upon. If product quality concerns are noted during the checkoff, please note them on the back of the form or call Daktronics customer service. **Note:** Checked items may not necessarily be in the order in which they should be performed.

Ten copies of the Maintenance Checklist are located in **Appendix C**. Refer to the maintenance schedule items listed on this form to assist in determining which maintenance items to address on a periodic basis. A checklist is located at the bottom of the form in order to provide a personal record of the dates. As each operational year is completed, file the completed form in a personal maintenance record and begin a new form for the next year.

1.3 Definitions

Term	Definition
8x4 Lampbank	A circuit board consisting of an array of lamps 8 pixels high by 4 pixels wide.
8x8 lens Reflector Assembly	Consists of reflectors, lenses and louvers. It is 8 pixels high by 8 pixels wide. A lens reflector assembly can be easily removed for maintenance.
Column	A vertical group of pixels.
Com Port	A <i>Com Port</i> is a connector on the back of the controller PC. The Com Port is used to control the sign network through either a 9 or 25 pin serial connector.
Controller	The means by which the device is programmed to show various graphics.
Display Configuration	<i>Display configuration</i> refers to a display's size, address, etc. This information will be automatically displayed when the display is powered up, if Venus 1500 controlled.
Display Controller	The display controller is located inside the display and, in conjunction with Venus 1500 software, controls the messages on the display.
Fiber Optic	A standard communication method using light (signal) transmitted through a glass fiber. Fiber optic cable has a maximum length of 4,000 feet. A signal connector may be required. This communication method is used in both Venus 1500 and Venus 4600 Systems.
Louver	A piece of reflective aluminum, eight pixels long, positioned above each row of lamps to provide contrast and help direct light.
Marquee Display	Marquee type displays have an estimated lamp life of 13,000 hours with a line voltage of 129 volts at the 120 volt tap on the transformer.
Module	Consists of four lampbank and two 8x8 lens assemblies. A module is eight pixels high and 16 pixels wide. Two modules (265 lamps) are powered by one transformer.
Modem	A standard communication method that utilizes standard phone transmission lines, and is an option with the Venus 1500 System.
Pixel	A single point of light. Pixels can be arranged to form letters, numbers or images.
RS232	A standard PC communication type with a maximum cable length of 25 feet (8 meters).
RS422	A standard differential communication type with a maximum cable length of 4,000 feet (1.2 kilometers).
Row	A horizontal group of pixels.

Term	Definition
RX LED	An LED on the signal converter which indicates if the display is sending data back to the signal converter.
Scoreboard Display	Scoreboard type displays have an estimated lamp life of 4,000 hours with a line voltage of 120 volts at the 120 volt tap on the transformer.
Serial Line Interface	Similar to a display controller, but used in conjunction with the Venus 4600 controller.
Sign Address	The <i>sign address</i> is an identification number assigned to each sign of a network. The control software uses the address to locate and communicate with each display. Displays which are on the same network cannot have the same address.
Signal Converter	The <i>signal converter</i> is a Daktronics supplied unit which converts the data from RS232 to RS422. The signal converter is used in RS422 systems.
SunSpot	SunSpot displays, also called monochrome displays, use only one color lens - usually white.
TX LED	An LED on the signal converter which indicates the control PC is sending data to the display.
Venus 1500	Daktronics Windows-based software used to create, edit, and run messages for displays.
Venus 4600	Daktronics PC that uses Venus 4600 software to create, edit, and run messages for displays.

Section 2: Mechanical Installation

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

2.1 Display Definitions

Line displays are offered in single and multiple face displays. **Figure 1** illustrates a single face display and two 2V display configurations. The single face display is a single-sided, independent display. The multiple face display may consist of two independent displays or, if Venus 1500 controlled, an independent (master) and a dependent (slave) display. On 2V displays, regardless of the controller type, signal interconnection is required between the multiple faces.

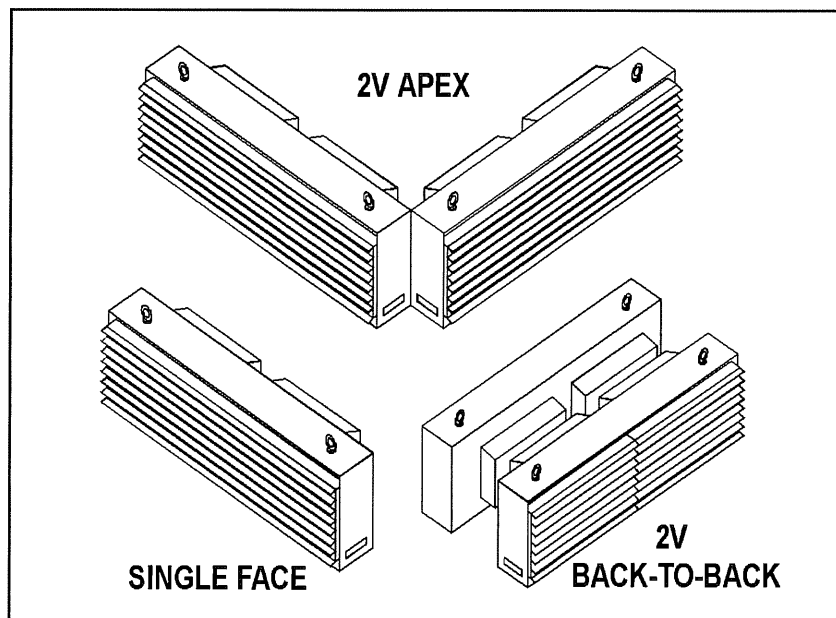


Figure 1: Sample Display Configurations

2.2 Support Column Selection


Support column size is dependent on the height and total wind loading of the message center and any other signage that make up the entire display. Column selection is critical and should be done only by a qualified individual. It is the installer's responsibility to specify the exact type of column and number of columns to be used. Using more columns generally allows smaller columns.

2.3 Cabinet Display Mounting

Reference Drawing: Mounting Example, Small Matrix Drawing A-106062

Check the display mounting structure before beginning the installation process. Ensure that the structure will provide a straight and square mounting frame for the display. Height variation in any 4-foot horizontal section *must not* exceed $\pm 1/16$ -inch. Also note if the mounting frame will possibly yield at unsupported points after the display is mounted. If any problems are noted, take corrective action before mounting the display.

All small matrix displays must be supported every eight feet with a maximum three foot overhang on each end of the display. The distribution of these supports is to be symmetrical, with a minimum of two supports.

 **Note:** These specifications are only accurate for cabinets made with Daktronics channel, part number HEX-319.

Drawing A-106062 shows an *example method* of mounting a cabinet display to columns. **Contact Daktronics for additional mounting details and specifications.**

It is the responsibility of the installer to ensure the installation will adequately meet local standards. The mounting hardware and method is also the responsibility of the installer. Be sure to maintain a minimum of 1/2-inch clearance between all drain openings in the base of the sign and the mounting surface.

Refer to **Drawing A-106062**. Remove the four pieces of bar stock from the display. These pieces of bar stock are used to reinforce the cabinet channel when mounting the display to the columns. Drill holes in the bar stock and cabinet frame where needed.

Power and signal termination requires access to the inside of the display. Refer to **Section 3** for further instructions.

Any modifications of the Daktronics air filtration system must first be approved by the Daktronics engineering staff.

Electrical installation requires access to the inside of the display (refer to **Section 3**).

2.4 Eye Bolts

The top of the display will be equipped with eye bolts which can be used to lift the display. Special precautions must be taken to ensure that the rated load of the eye bolts is not exceeded. Refer to the section in **Appendix B** labeled **Eye Bolts** to determine the allowable load of the eye bolts shipped with the display.

Inspect the top and sides of the display for any holes which may allow moisture to enter the display. If the lift eye bolts were removed, plug the holes with bolts and the rubber sealing washer which was removed with the eye bolt. Plug and silicone around any hole or opening which will allow moisture to enter the display.

2.5 Display Ventilation Requirements

In enclosed display situations, twelve square inches (.084 ft²) of unobstructed opening per module must be provided for 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 must be provided per module (one module = 20" x 40" display active area or 8 rows x 16 columns of lamps).

For example, a 16x80 double face display enclosed with an enclosed center cabinet would require 240 square inches, or 1.7 feet, of unobstructed opening in the bottom of the center cabinet.

$$(2(16 \times 80))/128 = 20 \text{ modules} \quad 20 \text{ modules} \times 12 \text{ square inches} = 240 \text{ in}^2 \text{ or } 1.7 \text{ feet}^2$$

In enclosed display, if ventilation air to the cabinet is to be *pre-filtered*, the effective filter area is to be *no less* than 2.3 square feet per 1.0 square feet of filter face area and the filter media is to have an average arrestance of 90-92%. Initial resistance should not exceed 0.48 w.g. at 500 fpm.

Any plans for filtering air in an enclosed display must be submitted to the Daktronics engineering staff for evaluation and approval or the warranty will be null and void.

2.6 8x8 Lens Assembly Removal and Installation

Refer to **Section 4.1** for information on removing and installing lens assemblies.

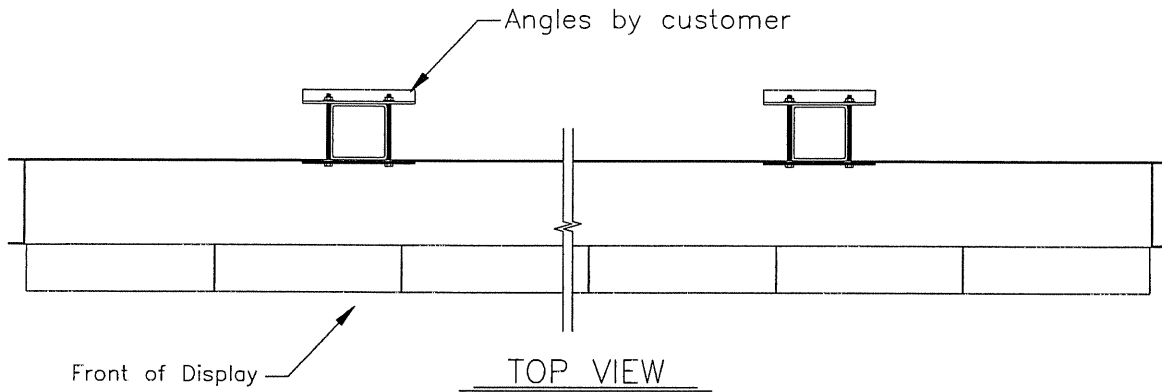
2.7 Properly Securing the Lens and Lens Assembly

Reference Drawing: Correct Lens Position **Drawing A-75204**

Look down the rows of louvers from either end of the display and ensure that all lenses are secured properly (refer to **Section 4.3**). Lenses that are not secured will be easily noticed 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. Also ensure that the rows of louvers are in proper alignment. Refer to **Drawing A-75204** for more information.

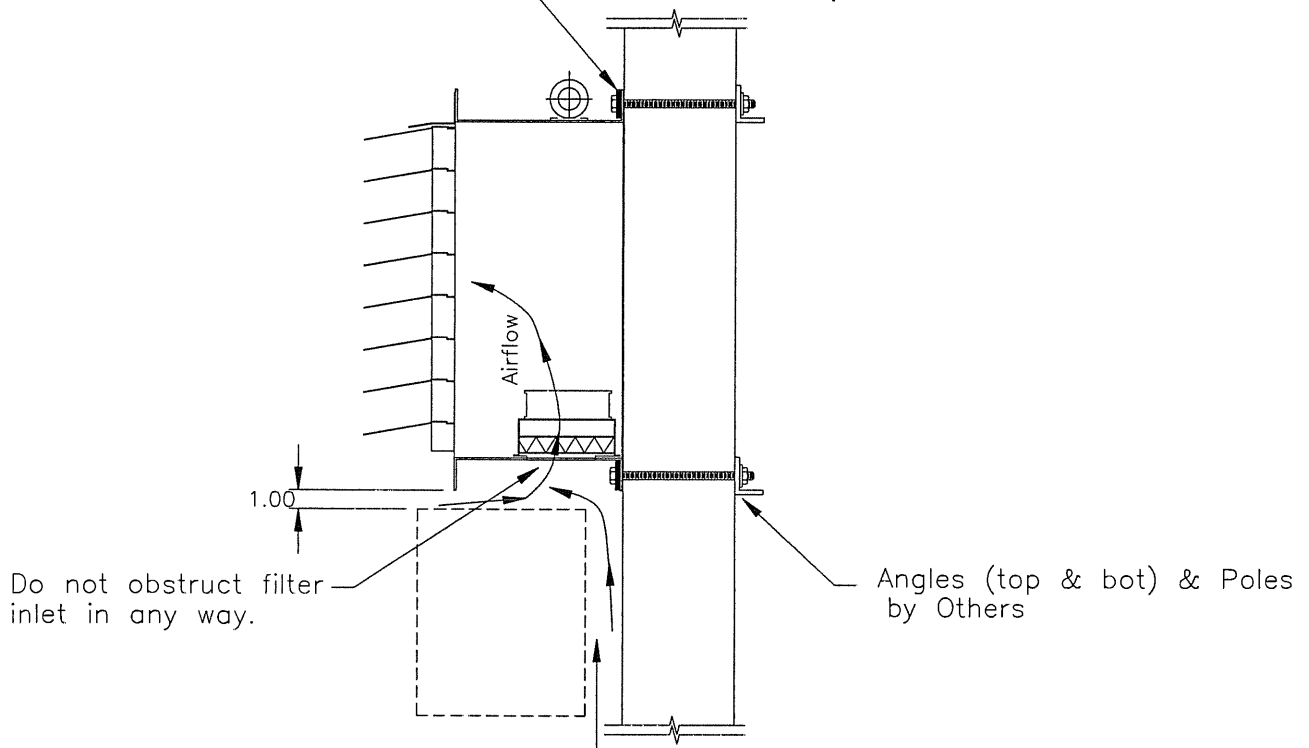
Be sure the seal between the lens assembly and the top of the display is waterproof. This seal should be checked in the following manner using the 0.032" feeler gauge provided.

1. Insert the feeler gauge between the module and the top of the display.
2. As the feeler gauge is slid along the top of the display, there should be considerable resistance. This indicates that the weather stripping (HS-1149) is providing a good, tight seal against moisture.
3. If the feeler gauge move freely or with little resistance, the cause *must* be found.
 - It may be that the weather stripping on either the module or the border is damaged and must be replaced.
 - If the weather stripping is not damaged, then the perimeter border must be adjusted so that a good, tight seal is obtained between it and the perimeter border.



TOP VIEW

Front of Display
Bar Stock to Reinforce
Cabinet Channel by Daktronics



SIDE VIEW

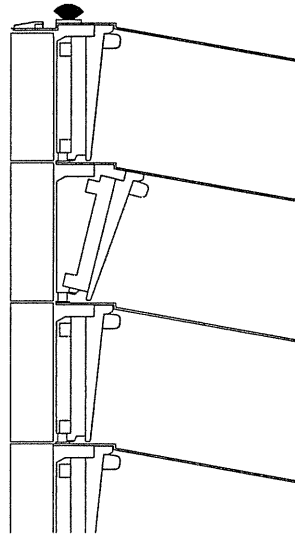
Scale: 1=10

Notes:

1. 1" of clearance between the bottom of the display & any other display/obstruction below is required for air intake.
2. The gap between displays may be shrouded if air is allowed to enter from the rear.
3. Filter can be accessed only from the front of the display.

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES MESSAGE BOARDS, 2 1/2"			
TITLE: MOUNTING EXAMPLE, SMALL MATRIX DISPLAYS			
DES. BY:	DRAWN BY: JRT	DATE: 4AUG98	
REVISION	APPR. BY:	1112-R10A-106062	
	SCALE: 1=20		

REV.	DATE	DESCRIPTION	BY	APPR.



TILT LENS, SET BEHIND LOUVER OFFSET, AND SNAP UP INTO THE VERTICAL POSITION. LENS MUST BE SNAPPED UP IN AND BEHIND UPPER LOUVER OFFSET.

SIDE VIEW

1	8DEC97	CORRECTED DWG TO CORRECT SCALE	JRT	
REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES MESSAGE CENTERS, 1 1/2"			
TITLE: CORRECT LENS POSITION, 1 1/2"			
DES. BY:		DRAWN BY: MMEISS	
		DATE: 09-26-95	
REVISION	APPR. BY:	7000-P08A-75204	
	SCALE: 1=2		

Section 3: Electrical Installation

3.1 Grounding

Proper grounding is necessary for reliable equipment operation. It also provides some protection to the equipment from damaging electrical disturbances and lightning. If the following grounding methods are not followed, the warranty will be void.

⇒ *Displays MUST be grounded according to the provisions outlined in Article 250 of the National Electrical Code.*

The steel support structure for the display cannot be used as grounding. The support is generally imbedded in concrete, and if in earth, the steel is either primed or it corrodes making it a poor ground.

The two considerations for power installations, New Power Installations and Existing Power Installations, differ slightly. They are explained in detail below.

3.1.1 New Power Installation

The display has built-in surge protection. However, for this to be effective, the display must be properly earth grounded. **Figure 2** illustrates the proper power and grounding installation showing an earth ground conductor from the power source.

This method should be used whenever a new installation needs to be done for a display.

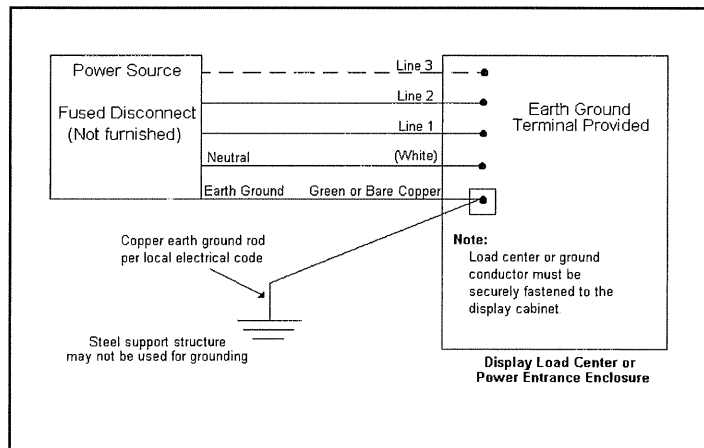


Figure 2: New Power Installation

Please note that this installation shows an earth ground conductor from the first point of disconnect or power source to the display location. The earth ground conductor must then be tied securely to the display cabinet via the load center or in some cases directly to the cabinet.

Another conductor is then run from this termination to a copper earth ground rod making certain that the termination to the ground rod is secure. This termination should be made with a brass or copper connection. The earth ground rod should be the diameter and length appropriate for the local electrical code. The earth ground conductor should be of the same size as the line and neutral conductors or no less than one size under these conductors.

3.1.2 Existing Power Installation

In many cases, displays will be installed where it is advantageous to use an existing power installation. These existing power installations may not have an earth ground conductor. If this is the situation, the earth grounding should be done as outlined in **Figure 3**.

Please note, if new power is being pulled to the display, the New Power Installation method (**Figure 2**) using an earth ground conductor from the source is recommended. The Existing Power Installation method used in **Figure 3** is not as effective in protecting equipment as the method in **Figure 2**.

In **Figure 3**, the neutral conductor must be tied to the ground terminal provided in the load center in the power entrance enclosure. A conductor size equal to the neutral needs to be run from the terminal to an earth ground rod in accordance with local codes.

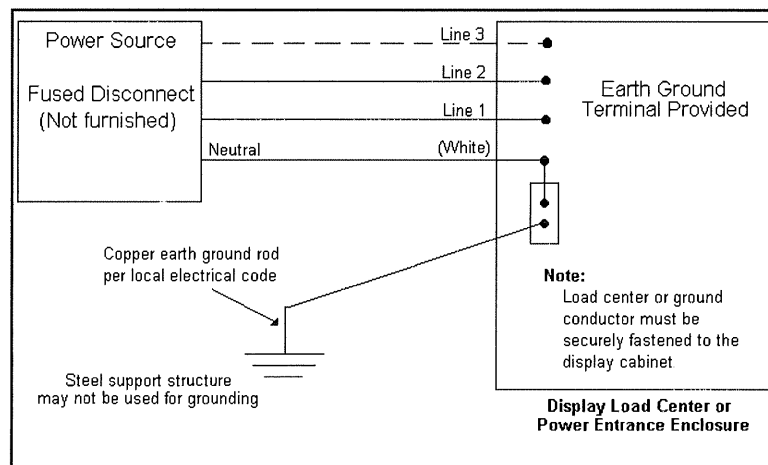


Figure 3: Existing Power Installations

3.2 Driver/Module Numbering Convention

The following table shows the typical driver/module numbering convention.

A display module is 8 lamps high by 16 lamps wide. Power and signal wires, and signal junction terminal blocks are labeled with the number of the driver to which they are connected, preceded by the identifier prefix "A," "B," "C," etc. (where A, B and C designate module drivers for each face on a multiple face display).

16x96 Matrix Display - Front View

A101	A102	A103	A104	A105	A106
A201	A202	A203	A204	A205	A206

- Labeling reference begins with the upper left driver/module and increments to the right and down from that point, independent of display size.
- Module drivers are designated by the prefix “A.” A101 represents the upper left display driver.
- The hundreds digit indicates the display *line* number. A101 through A106 make up the first display line, A201 through A206 make up the second display line, and so forth.

3.3 Power Terminations

Reference Drawings: Assy, Term Panel **Drawing A-106142**
Power Specifications **Drawing A-107173**

The power termination panel is located in the left end of the display (front view). Follow the instructions in **Section 4.1** to remove the far left module to access the termination panel. **Drawing A-106142** shows a typical power termination panel for either the master or the slave face. For a 2V display, power needs to be brought into both faces. The termination panels are located in the left end (front view) of each display. Connect power as follows.

The conduit for power should enter the display face near the termination panel. Knockouts are provided in the back sheets for power cable conduit attachment. Refer to the reference drawing schematic for your model in **Section 3.6** and to **Drawing A-107173** for power requirements (note: power stated is per display face). The maximum power requirements are also given on the Daktronics serial tag. The power is connected to TB41, located at the bottom of the termination panel.

Refer to the schematic in the **Appendix D** for the display wiring details. The maximum power requirements are given on the Daktronics serial tag. The power is connected to TB41, at the bottom of the termination panel.

Connect TB41 as follows:

1. Route power through conduit into the display and over to the termination panel.
2. Connect the white, neutral wire(s) to the position labeled NEUT on TB41.
3. Connect the hot wires to the positions labeled L1 and L2 (120 VAC) on TB41, or L1, L2, L3 if 120/208 3-phase.
4. Connect the ground wire to E41 (Earth Ground). Refer to **Section 3.1** for special grounding instructions.

The customer is to supply a fused main disconnect(s) for power distribution to the termination panel. This customer supplied fused main disconnect is considered the service entrance point. The main disconnect should be mounted at or near the point of power supply connection to the display. A main disconnect should be provided for each supply circuit to the display. The means of disconnecting must be located in a *direct line of sight* from the display or outline lighting that it controls. This requirement provides protection by enabling a worker to keep the disconnecting means within view while working on the display.

Exception: Means of disconnection which are capable of being *locked in the open position* may be located other than in direct line of sight.

Due to the inrush current required by the transformers on start-up, the main disconnect may have to be over sized (or use high-magnetic trip [HID] breakers) to handle this momentary inrush current requirement.

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

For a 2V display, power needs to be brought into both faces. The termination panel for the slave face is located in the right end of the display. Connect power as stated above.

3.4 Signal Terminations

Figure 4 illustrates a typical 1/4 module configuration using either a serial line interface or a Venus 1500.

If the display is 2-sided, the customer has the option of sending separate signal to each face from the controller or sending signal to one face and then parallel connecting to the second face.

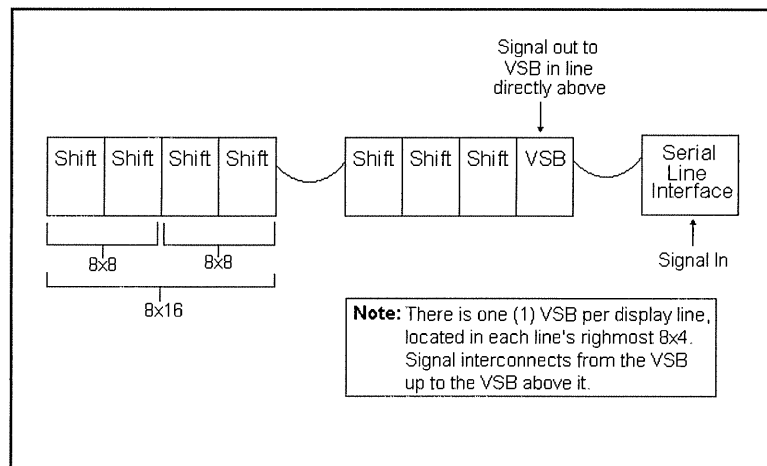


Figure 4: Typical 1/4 - Module Configuration
Vertical Shift Board (VSB)

3.5 Control Cable Requirements

On 2V displays, regardless of the controller type used, signal interconnection will be required between multiple faces. The Venus 1500 based controller, or line receiver (**Figure 13** in **Section 4.9.1.1**), is built into the left end (front view) of the master display face. The controller enclosure is accessed by removing the far left module (front view). Refer to **Section 4.1.1**.

3.5.1 RS/232(Venus 1500 System)

This cable is a 2-conductor shielded cable used to transmit a RS/232 signal (Daktronics part number W-1117). This shielded cable should not be subjected to mechanical flexing after installation. This cable is not for direct burial and should be routed in a dedicated, grounded metallic conduit at the base of the display structure. This cable has a maximum length of 25 feet.

3.5.2 RS/422 (Venus 1500 System)

This cable is a 6-conductor unshielded cable used to transmit a RS/422 signal (Daktronics part number W-1210). This unshielded cable consists of paired wires. They should not be subjected to mechanical flexing after installation.

Note: This cable is not for direct burial and should be routed in dedicated metallic conduit.

3.5.3 Modem (Venus 1500 System)

The modem option will use standard telephone cable routed through conduit. The local telephone company will need to assist in this installation. Ask the phone company which colors are used by the TIP, and the RING for signal hook up.

Note: The telephone lines must be standard, direct dial lines and not run through a switchboard/ communications system.

3.5.4 Fiber (Venus 1500/Venus 4600 System)

This cable is a 2-fiber cable (Daktronics part number W-1242). This cable may be either direct burial or routed in conduit, but should not be subjected to mechanical flexing.

3.6 Signal Termination From Computer To Display

The method used to route and terminate signal at the display differs according to the type of control cable used. The following sets of instructions cover the various control cables listed in **Section 3.5**. Refer to the procedure that is appropriate for your display.

3.6.1 RS/232 (Venus 1500 System)

Reference Drawings: V1500 Signal Termination . **Drawing A-103727**
Sys. Riser Diag. (232) **Drawing A-107194**

Mount RS232 J-box at the base of the display (within 25 feet). Route conduit and cable from the J-box to the left end of the master face. Continue cable into the controller box fitting labeled "Signal In."

One end of the signal cable should be terminated to the 6 position terminal block on the controller in the display labeled “RS232 IN” (TB1). **Drawing A-103727** is an example of the termination block. The other end is terminated at a J-box at the display structure (as shown below). The laptop PC connects to the J-box through the serial cable (refer to **Drawing A-107194**).

J-Box	Field Cabling	Terminal Block (RS232 In)
		Pin 1 (N.C.)
		Pin 2 (N.C.)
TB41-2	Clear	Pin 3 (TX-P)
TB41-3	Shield	Pin 4 (GRD)
TB41-1	Black	Pin 5 (RX-P)
		Pin 6 (N.C.)

3.6.2 RS/422 (Venus 1500 System)

Reference Drawing: Sys. Riser Diag. (422) **Drawing A-107195**

Route conduit and cable from the PC running Venus 1500 to the left end of the master display. Continue cable into the controller box fitting labeled “Signal In.” One end of the signal cable should be terminated to the 6 position terminal block in the display labeled “RS422 IN” (TB2). **Drawing A-103727** is an example of the termination block. The other end is terminated at the signal converter (Daktronics part number 0A-1127-0237) in the control room (as seen in the following table). Refer to **Drawing A-107195**.

Signal Converter	Field Cabling	Terminal Block (RS422 In)
Pin 1 (GND)	Red	Pin 1 (GND)
Pin 2 (RX-P)	Black	Pin 2 (TX-P)
Pin 3 (RX-N)	Brown	Pin 3 (TX-n)
Pin 4 (TX-P)	White	Pin 4 (RX-P)
Pin 5 (TX-N)	Blue	Pin 5 (RX-N)
Pin 6 (GND)	Green	Pin 6 (GND)

3.6.3 Modem (Venus 1500 System)

Reference Drawing: Sys. Riser Diag. (Modem) **Drawing A-107197**

Route conduit and telephone cable to the left end of the master display. Continue the cable onto the controller box fitting labeled "Signal In." Remove the telephone terminal block cover and connect the wire using standard telephone wire colors. Replace the cover. Plug the short telephone RJ-11 cable into the block and into the phone in the RJ-11 jack of the modem board.

3.6.4 Fiber

Reference Drawings: Sys. Riser Diag. (Fiber) **Drawing A-107198**
Sys. Riser Diag. (SLI) **Drawing A-107196**
S.L.I. Signal Terminations **Drawing A-107209**

Route conduit and fiber cable from the PC to the left end of the master display. Continue fiber to the controller box. Refer to the proper section below for signal terminations.

3.6.4.1 Venus 1500 System

Route fiber into controller box fitting labeled Signal In. Terminate the fiber and plug the ends onto RX In and TX In as shown in Drawing A-103727. Terminate fiber at PC and plug the corresponding colors into the signal converter as follows:

PC Fiber Converter	Field Fiber	Display Controller
RX-OUT TX-OUT	----- -----	TX-IN RX-IN

3.6.4.2 Venus 4600 System

Route fiber into the serial line interface box and terminate it. Plug the fiber into J8 (RX). Refer to **Drawings A-107196** and **A-107209**.

3.7 Interconnect of 2V Displays

The procedure for interconnecting 2V displays differs for Venus 1500 and Venus 4600 controlled displays. Information on both types is contained in this sub-section. Refer to the instructions appropriate to your display.

3.7.1 Venus 1500 Controlled Display

Reference Drawing: Interconnect, 2V Drawing A-107188

Signal is directed from the computer running the Venus 1500 software to the Venus 1500 based controller which is located in the independent (master) display only. The signals to the slave display are connected to the master display by means of one each of 25 foot long 12 & 20 pin interconnect cables which are located in the slave display. The cables are to be routed out through the back sheet of the slave display and into the master display. The interconnect cable location is labeled on the back sheet. Knockouts are provided in the back sheets to provide for easy installation of the 2.0 conduit for routing the interconnect cables through. When placed back-to-back, the displays can have a maximum separation of 5 feet if the displays are 144 pixels long. For every 16 columns less in length, the displays can be 2 feet further apart.

To interconnect the displays:

1. The 20 pin interconnect cable is plugged into the input jack of the vertical shift board located at the upper-left end (front view) of the slave display (module 101).
2. Plug the other end of the 20 pin interconnect cable into the output jack (J5) of the master/slave board (refer to **Drawing A-107188**) in the fan control enclosure (A42) of the master display.
3. The 12 pin interconnect cable is attached to the 12 position terminal block (TB31) in the fan control enclosure of the slave display.
4. Plug the other end of the 12 pin interconnect cable into the output jack (J3) of the master/slave board in the fan control enclosure (A42) of the master display. The fan control enclosure location is labeled on the back sheet.

3.7.2 Serial Line Interface Controlled Display (Venus 4600)

Signal is directed from the Venus 4600 computer to a serial line interface in one of the two displays. This display will then be considered the master. A fiber optic interconnect harness is then required to route the signal from the master display serial line interface to the serial line interface in the remaining display (slave). 50 feet of fiber optic interconnect cable is provided in the slave display. The interconnect cable location is labeled on the back sheet. Knockouts are provided in the back sheets to provide for easy installation of conduit of the interconnect cable. When placed back-to-back, the displays can have a maximum separation of 25 feet if the displays are 144 pixels long. For every 16 columns less in length the displays can be 2 feet further apart.

To interconnect the displays:

1. The fiber optic interconnect cable is connected to the J8 (RX) plug of the serial line interface on the slave display.
2. Plug the other end of the interconnect harness to the J6 or J7 (TX) plug of the serial line interface in the master display.

3.8 Module Connections

Reference Drawings: Schematic, 7&8 High 48-96-18M/SOC . . **Drawing B-106616**
Schematic, 1648-1696-18M/SOC **Drawing B-106617**

The displays are shipped with signal and power harness connections attached to the modules. Refer to the above-listed drawing that pertains to your display size.

To remove a module, unplug the 9 pin mate-n-lok power plug and the signal connections on the back of the module.

3.9 Dimming

For Starburst technologies, the display can be dimmed and brightened manually. This can also be done 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 time, the lamps outdoor 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 that the controller is set to have manual brightness during daylight hours or control the dimming level through scheduling.

To change the dimming, refer to the software operator's manual (Venus 1500, ED 9067; Venus 4600, ED 4602).

3.9.1 Light Detector Installation - Venus 1500

A light detector can be easily connected to the display controller as follows:

1. Route the light sensor cable (Daktronics part number W-1234) through conduit and into the display.
2. Continue the cable into the controller box fitting labeled "LIGHT."
3. Strip the insulation and terminate wires to TB7 as shown below. Refer to **Section 4.9.1.1** for the location on TB7.

Light Detector	Field Cabling	Controller Terminal Block (TB7)
+V	Red	Pin 1 (+5V)
GND	Black	Pin 2 (GND)
P	Green	Pin 3 (Light - P)
N	White	Pin 4 (Light - N)

Warning: Do not connect +5V and GND!

Refer to **Appendix A** for sensor mounting and connecting wire information.

3.9.2 Light Sensor Installation - Venus 4600

Refer to Venus 4600 Installation/Operation Manual (**ED-4602**) for Light Sensor Installation.

3.10 Temperature Sensor System

3.10.1 Temperature Sensor - Venus 1500

A temperature sensor can be connected to the display controller as follows:

1. Route the temperature sensor cable (Daktronics part number W-1234) through conduit and into the display.
2. Continue the cable into the controller box fitting labeled “TEMP.”
3. Strip the insulation and terminate wires to TB7 as shown in the following table. Refer to **Section 4.9.1.1** for the location on TB7.

Temperature Sensor	Field Cabling	Controller Terminal Block (TB7)
+V	Red	Pin 7 (+5V)
GND	Black	Pin 8 (GND)
P	Green	Pin 5 (Temp - P)
N	White	Pin 6 (Temp - N)

Warning: Do not connect +5V and GND!

If using the same temperature sensor to control multiple displays, connect the signal wire (P & N) to additional displays.

Refer to **Appendix A** for additional mounting and wiring information.

3.10.2 Temperature Sensor - Venus 4600

Refer to Venus 4600 Installation/Operation Manual (**ED-4602**) for Temperature Sensor Installation.

3.11 First Time Turn On

After all connections are made, it is time to turn on the display for the first time field test.

1. Remove the fuses from the power termination panel.
2. Turn power ON to the display.
3. Carefully check the voltage between the hot lines and neutral. The normal voltage range is between 120VAC and 125VAC.
4. If there are problems with voltage, check with your local electrician or power company.

5. Turn the power OFF and replace the fuses and covers of the termination panels. Fasten the display modules back in place.
6. Turn power ON to the display.
7. The controller will do a power up test, displaying the following:

Venus 1500 System:

1. Output Test (DDD's)
2. Product Name
3. Display Size (Row x Column)
4. Firmware Number (ED-10134)
5. Firmware Revision (Rev X.XX)
6. COM1 Configuration (C1: V15/RTD)
7. COM2 Configuration (C2: None)
8. Line Frequency (60 Hz)
9. Hardware Address (HW: XX)
10. Software Address (SW: XX)
11. Display Name
12. Modem if present (Modem)

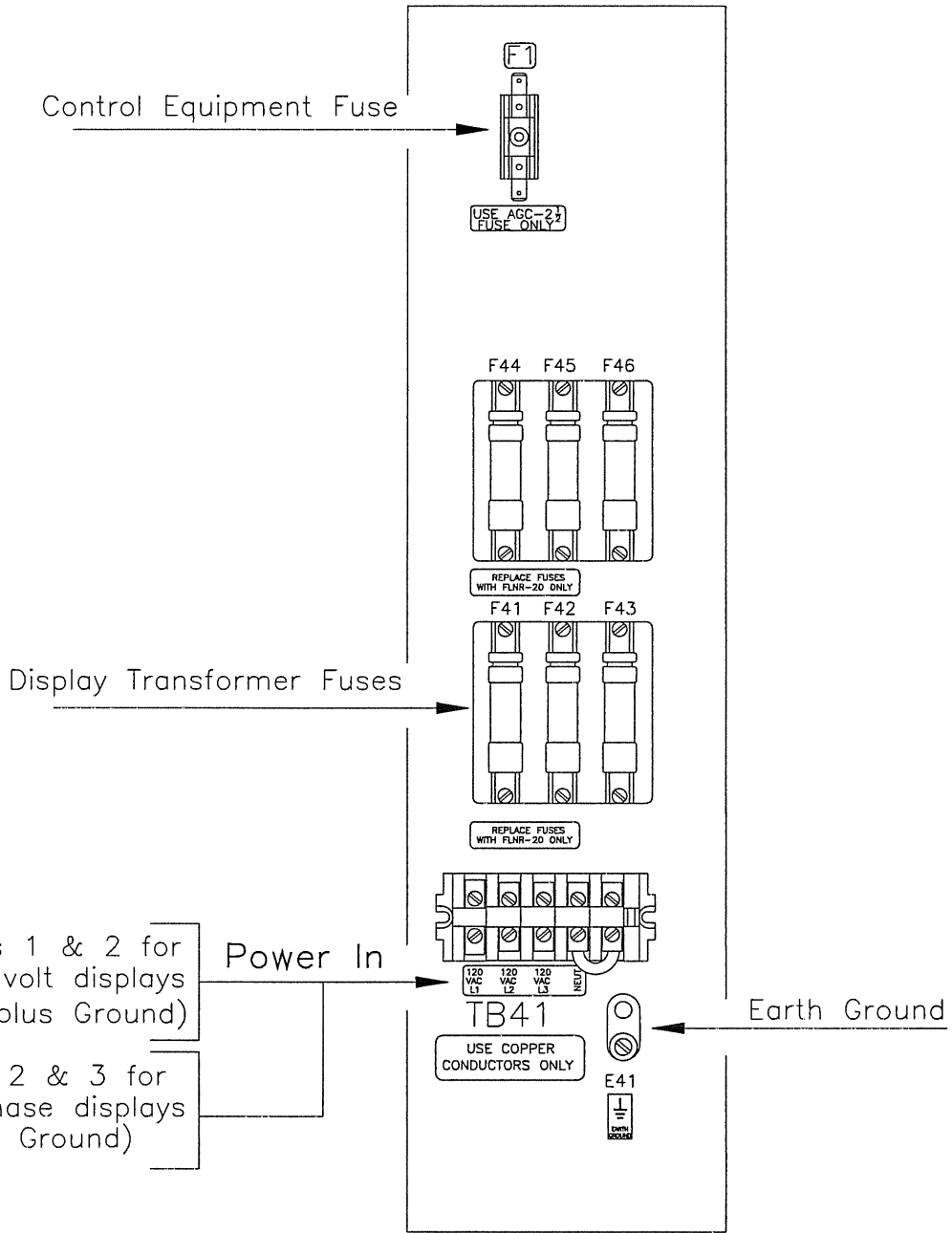
Venus 4600 System:

The display will blank until a sequence is run on the controller.

8. When the test patterns are done the Venus 1500 controller will run messages stored in the battery backup memory. These messages will continue to run until the power is turned off or the messages are changed using the programmer's console.

3.12 Main Disconnect

If a main disconnect is furnished with the display, it must be mounted at or near the point of supply connection to the display.



POWER TERMINATION PANEL LAYOUT

NOTE:

When terminating incoming power to the term panel, the individual power phases are to be balanced as evenly as possible.

This example represent the fuse label designation for a 16 x 96 pixel display. Other matrix sizes will differ in the number of Display Transformer Fuses.

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES MESSAGE BOARDS, 2 1/2"			
TITLE: ASSY, TERM PANEL FOR MANUAL USE			
DES. BY:	DRAWN BY: JRT	DATE: 5AUG98	
REVISION	APPR. BY:	1112-R10A-106142	
	SCALE: 1=3		

REV.	DATE	DESCRIPTION	BY	APPR.

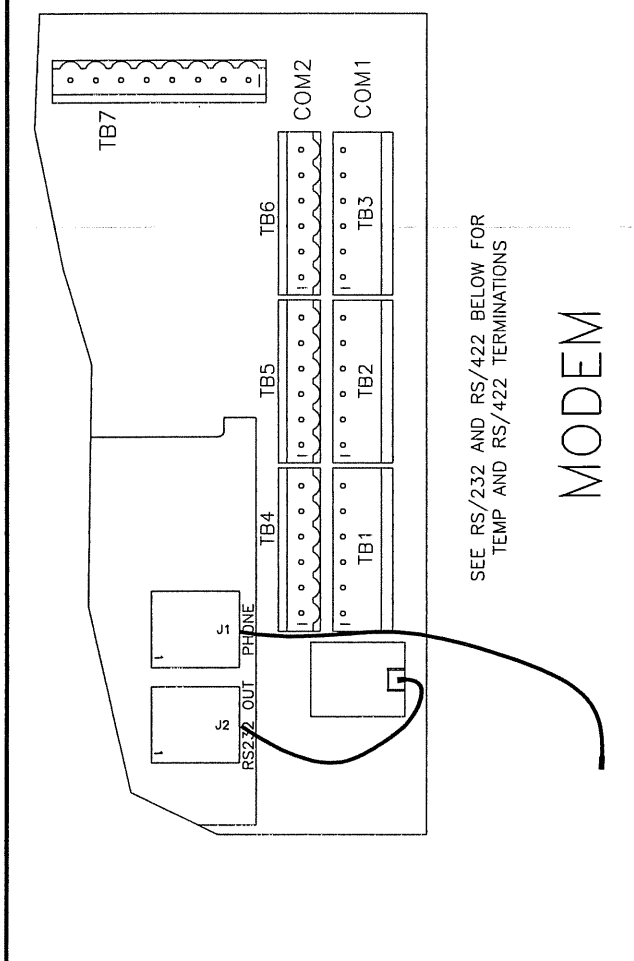
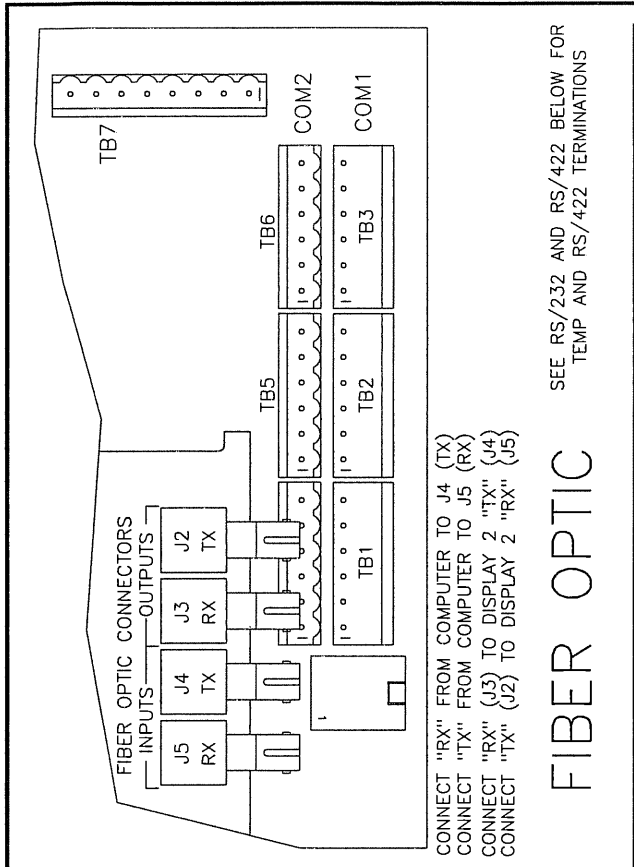
SINGLE FACE MESSAGE CENTER DISPLAYS

MATRIX SIZE	120/208 3 PHASE 4 WIRE PLUS GROUND (IN AMPS)		120/240 SINGLE PHASE 3 WIRE PLUS GROUND (IN AMPS)		TOTAL WATTS	
	MARQUEE	SPORTS	MARQUEE	SPORTS	MARQUEE	SPORTS
7 X 48	14	16	14	16	2436	2772
7 X 64	14	16	14	16	3248	3696
7 X 80	14	16	20	23	4064	4620
7 X 96	14	16	20	23	4872	5544
8 X 48	15	18	15	18	2784	3168
8 X 64	15	18	15	18	3712	4224
8 X 80	15	18	23	26	4640	5280
8 X 96	15	18	23	26	5568	6336
16 X 48	15	18	23	26	5568	6336
16 X 64	23	26	31	35	7424	8448
16 X 80	31	35	39	44	9280	10560
16 X 96	31	35	46	53	11136	12672

ABOVE CHART IS FOR SINGLE FACE DISPLAY. FOR DOUBLE FACE OR 2V DISPLAYS, EACH DISPLAY FACE WILL REQUIRE POWER AS IF IT WERE A SINGLE FACE DISPLAY.

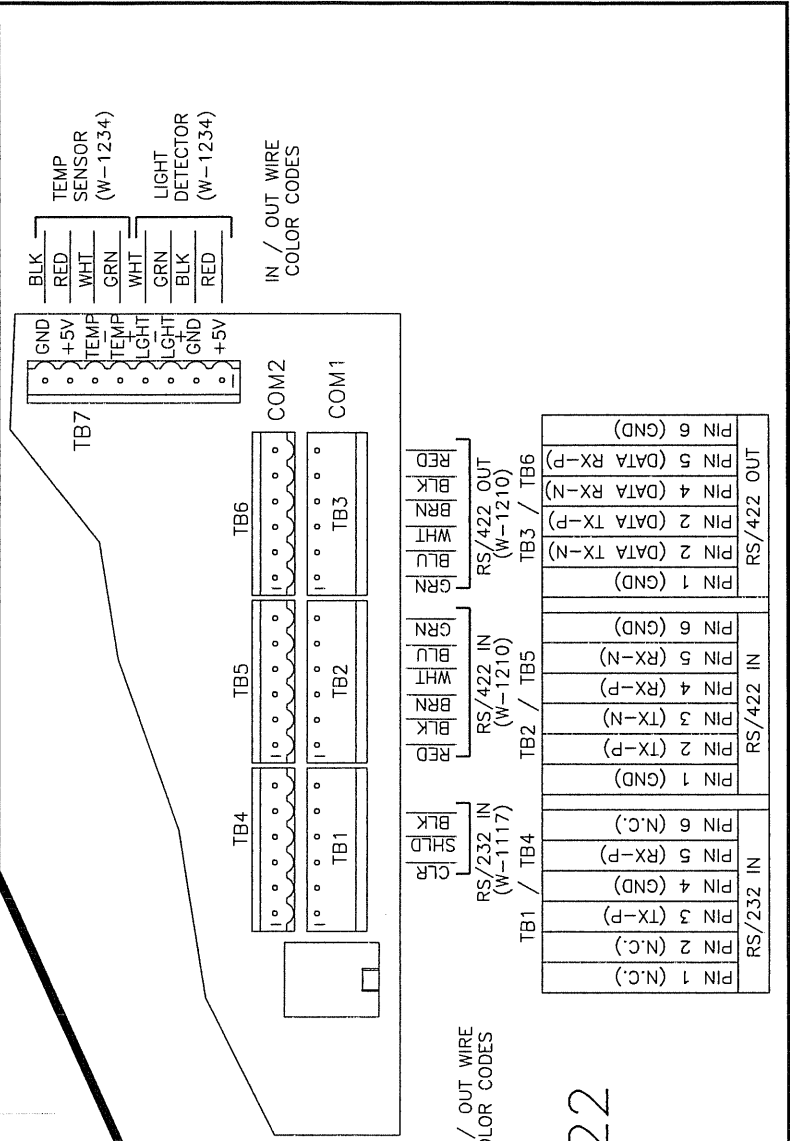
1	22SEP98	CHANGED PROJ: TO INCLUE 1500. CHANGED 1195 TO 1112.	RLONG	
REV.	DATE	DESCRIPTION	BY	APPR

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES MESSAGE BOARDS, 2 1/2"			
TITLE: PWR SPEC'S: 7, 8, & 16 HIGH LINE DISPLAYS			
DES. BY: TWOODARD		DRAWN BY: TWOODARD	
DATE: 01SEP98			
REVISION	APPR. BY:	1112-R01A-107173	
	SCALE: 1=1		



FIBER OPTIC

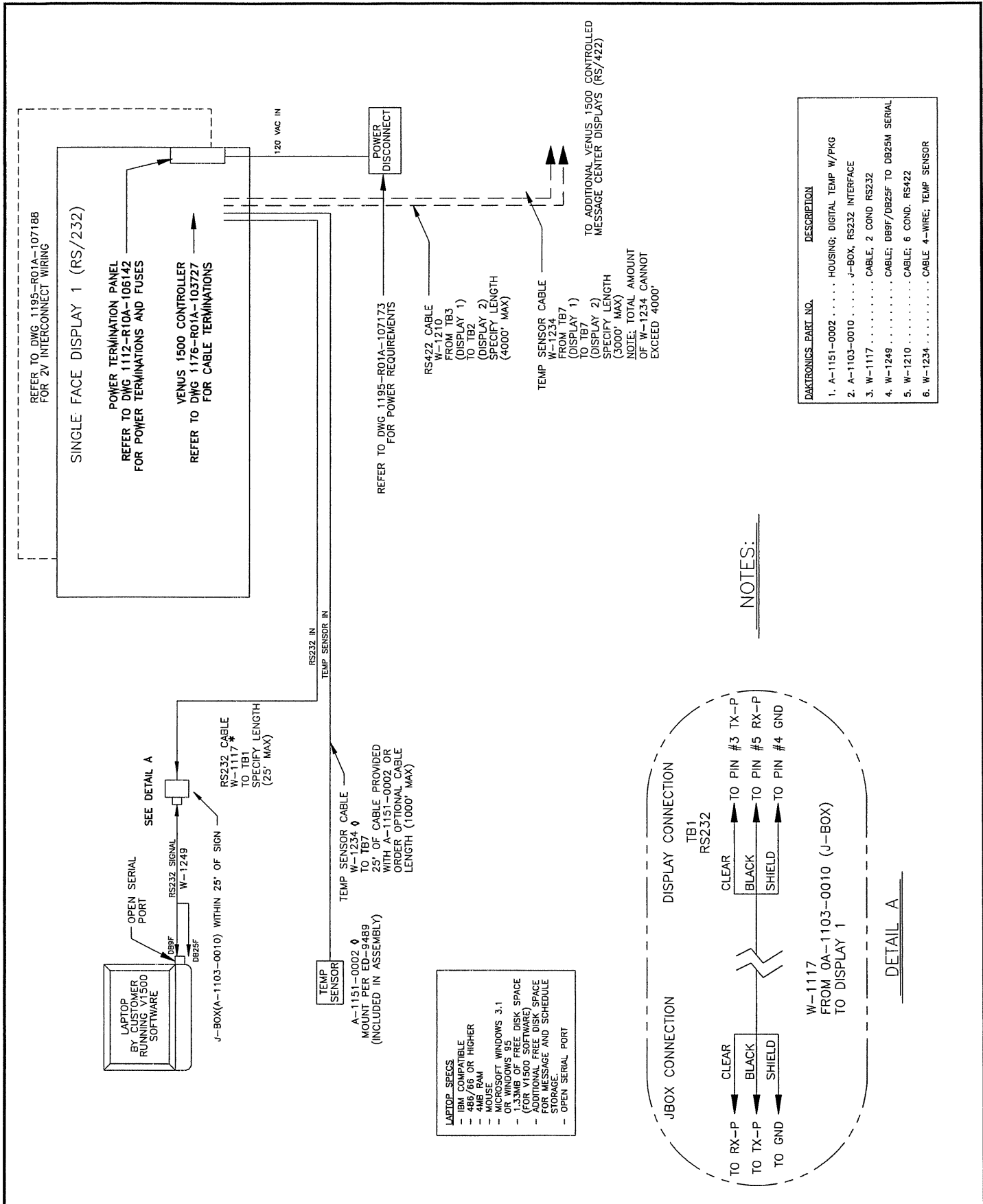
MODEM



RS/232 AND RS/422

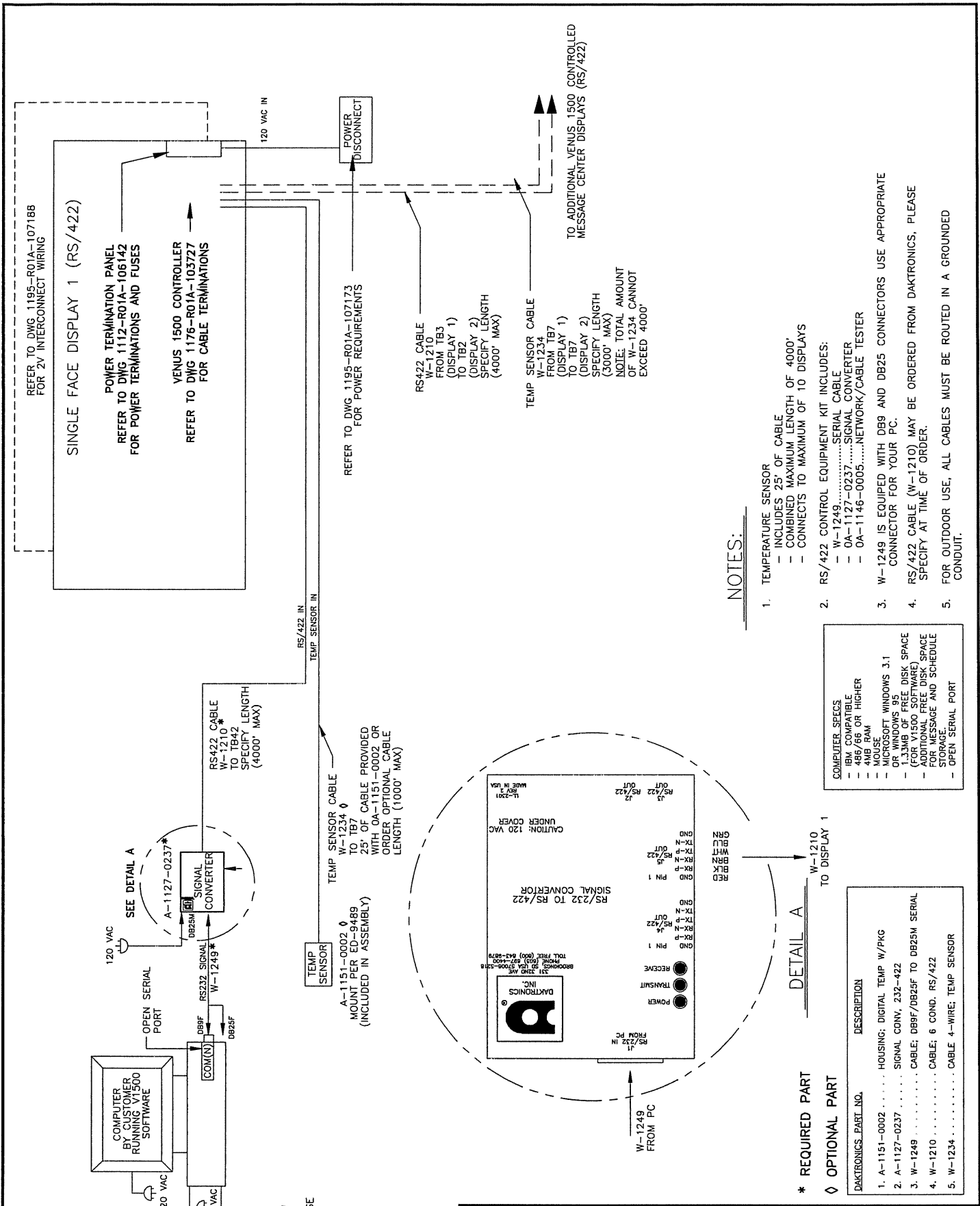
REV.	DATE	DESCRIPTION	BY	APPR.
1	28AUG98	ADDED LIGHT DETECTOR WIRING CORRECTED RS/232 COLOR CODES ENLARGED TEXT TITLES	TGW	

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1600 SERIES			
TITLE: V1500 SIGNAL TERMINATIONS			
DES. BY:	DRAWN BY:	DATE:	
	TWOODARD	10JUN98	
REVISION	APPR. BY:	SCALE: NONE	
		1176-R01A-103727	



DAKTRONICS PART NO.	DESCRIPTION
1. A-1151-0002	HOUSING, DIGITAL TEMP W/PKG
2. A-1103-0010	J-BOX, RS232 INTERFACE
3. W-1117	CABLE, 2 COND RS232
4. W-1249	CABLE, DB9F/DB25F TO DB25M SERIAL
5. W-1210	CABLE, 6 COND, RS422
6. W-1234	CABLE 4-WIRE, TEMP SENSOR

DAKTRONICS, INC. BROOKINGS, SD 57006				
PROJ: 1500 SERIES 2 1/2"				
TITLE: SYSTEM RISER DIAGRAM; RS/232 DISPLAYS				
DES. BY: TWOODARD		DRAWN BY: TWOODARD		DATE: 02SEP98
REVISION	APPR. BY:	1112-R01A-107194		
	SCALE: 1 = 1			
2	10AUG99	CHANGED W-1363 TO W-1249.	RLONG	
1	22SEP98	CHANGED PROJ: FROM 1600 TO 1500. CHANGED 1195 TO 1112.	RLONG	
REV	DATE	DESCRIPTION	BY	APPR.



NOTES:

1. TEMPERATURE SENSOR
 - INCLUDES 25' OF CABLE
 - COMBINED MAXIMUM LENGTH OF 4000'
 - CONNECTS TO MAXIMUM OF 10 DISPLAYS
2. RS/422 CONTROL EQUIPMENT KIT INCLUDES:
 - W-1249.....SERIAL CABLE
 - 0A-1127-0237.....SIGNAL CONVERTER
 - 0A-1146-0005.....NETWORK/CABLE TESTER
3. W-1249 IS EQUIPPED WITH DB9 AND DB25 CONNECTORS USE APPROPRIATE CONNECTOR FOR YOUR PC.
4. RS/422 CABLE (W-1210) MAY BE ORDERED FROM DAKTRONICS, PLEASE SPECIFY AT TIME OF ORDER.
5. FOR OUTDOOR USE, ALL CABLES MUST BE ROUTED IN A GROUNDED CONDUIT.

COMPUTER SPECS

- IBM COMPATIBLE
- 486/66 OR HIGHER
- MS-DOS
- MICROSOFT WINDOWS 3.1 OR WINDOWS 95
- 1.3MB OF FREE DISK SPACE (FOR V1500 SOFTWARE)
- ADDITIONAL FREE DISK SPACE FOR MESSAGE AND SCHEDULE
- OPEN SERIAL PORT

DETAIL A

- * REQUIRED PART
- ◇ OPTIONAL PART

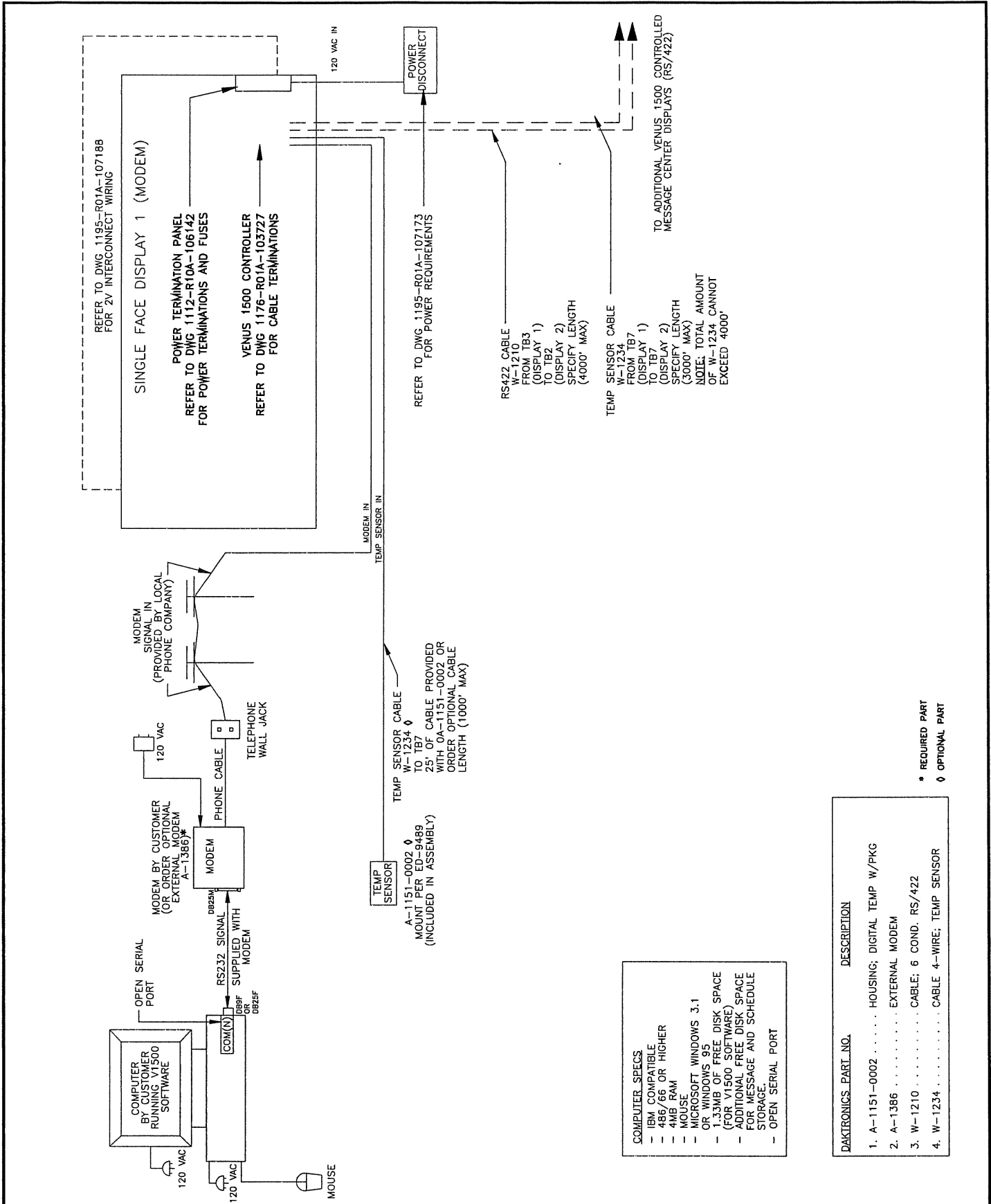
DAKTRONICS PART NO.	DESCRIPTION
1. A-1151-0002	HOUSING; DIGITAL TEMP W/PKG
2. A-1127-0237	SIGNAL CONVY, 232-422
3. W-1249	CABLE; DB9F/DB25F TO DB25M SERIAL
4. W-1210	CABLE; 6 COND. RS/422
5. W-1234	CABLE 4-WIRE, TEMP SENSOR

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1500 SERIES 2 1/2"	
TITLE: SYSTEM RISER DIAGRAM; RS/422	
DES. BY: TWOODARD	DRAWN BY: TWOODARD
DATE: 02SEP98	
REVISION	APPR. BY:
SCALE: 1 = 1	

1112-R01A-107195

REV.	DATE	DESCRIPTION	BY	APPR.
2	10AUG99	CHANGED W-1363 TO W-1249	RLONG	
1	22SEP98	CHANGED PROJ: 1600 TO 1500. CHANGED 1195 TO 1112.	RLONG	



COMPUTER SPECS

- IBM COMPATIBLE
- 486/66 OR HIGHER
- 4MB RAM
- MOUSE
- MICROSOFT WINDOWS 3.1
- OR WINDOWS 95
- 1.3MB OF FREE DISK SPACE (FOR V1500 SOFTWARE)
- ADDITIONAL FREE DISK SPACE FOR MESSAGE AND SCHEDULE STORAGE.
- OPEN SERIAL PORT

DAKTRONICS PART NO.	DESCRIPTION
1. A-1151-0002	HOUSING; DIGITAL TEMP W/PKG
2. A-1386	EXTERNAL MODEM
3. W-1210	CABLE; 6 COND. RS/422
4. W-1234	CABLE 4-WIRE; TEMP SENSOR

* REQUIRED PART
 ◊ OPTIONAL PART

REV.	DATE	DESCRIPTION	BY	APPR.
1	22SEP98	CHANGE PROJ. FROM 1600 TO 1500. CHANGED 1195 TO 1112.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

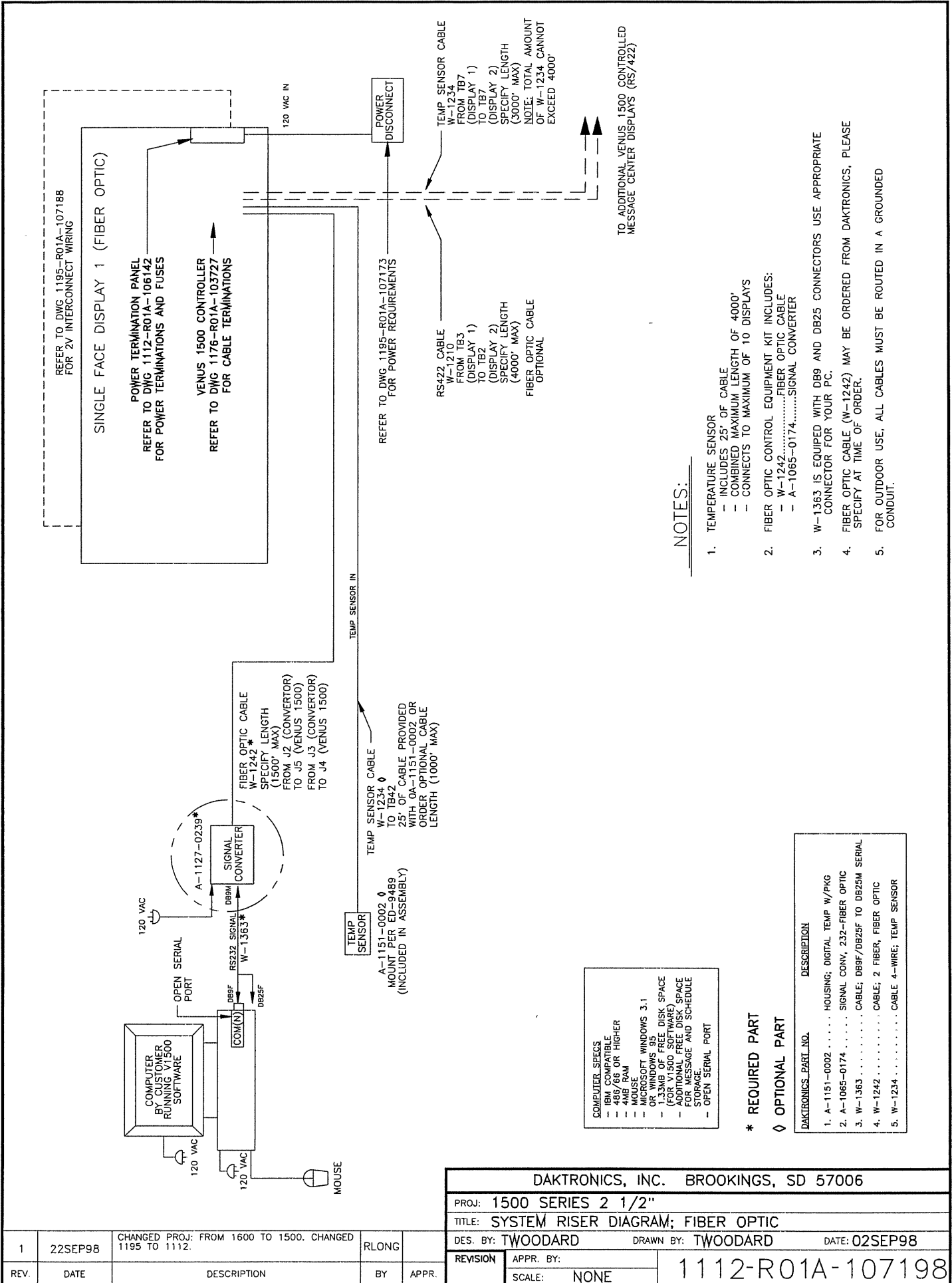
PROJ: 1500 SERIES 2 1/2"

TITLE: SYSTEM RISER DIAGRAM; MODEM DISPLAYS

DES. BY: TWOODARD DRAWN BY: TWOODARD DATE: 02SEP98

REVISION APPR. BY: SCALE: 1 = 1

1112-R01A-107197



REFER TO DWG 1195-R01A-107188 FOR 2V INTERCONNECT WIRING

POWER TERMINATION PANEL REFER TO DWG 1112-R01A-106142 FOR POWER TERMINATIONS AND FUSES

VENUS 1500 CONTROLLER REFER TO DWG 1176-R01A-103727 FOR CABLE TERMINATIONS

REFER TO DWG 1195-R01A-107173 FOR POWER REQUIREMENTS

TEMP SENSOR CABLE W-1234 FROM TB7 (DISPLAY 1) TO TB7 (DISPLAY 2) SPECIFY LENGTH (3000" MAX) NOTE: TOTAL AMOUNT OF W-1234 CANNOT EXCEED 4000'

TO ADDITIONAL VENUS 1500 CONTROLLED MESSAGE CENTER DISPLAYS (RS/422)

NOTES:

- TEMPERATURE SENSOR
 - INCLUDES 25' OF CABLE
 - COMBINED MAXIMUM LENGTH OF 4000'
 - CONNECTS TO MAXIMUM OF 10 DISPLAYS
- FIBER OPTIC CONTROL EQUIPMENT KIT INCLUDES:
 - W-1242.....FIBER OPTIC CABLE
 - A-1065-0174.....SIGNAL CONVERTER
- W-1363 IS EQUIPPED WITH DB9 AND DB25 CONNECTORS USE APPROPRIATE CONNECTOR FOR YOUR PC.
- FIBER OPTIC CABLE (W-1242) MAY BE ORDERED FROM DAKTRONICS, PLEASE SPECIFY AT TIME OF ORDER.
- FOR OUTDOOR USE, ALL CABLES MUST BE ROUTED IN A GROUNDED CONDUIT.

TEMP SENSOR CABLE W-1234 TO TB42 25' OF CABLE PROVIDED WITH OA-1151-0002 OR ORDER OPTIONAL CABLE LENGTH (1000" MAX)

A-1151-0002 MOUNT PER ED-9489 (INCLUDED IN ASSEMBLY)

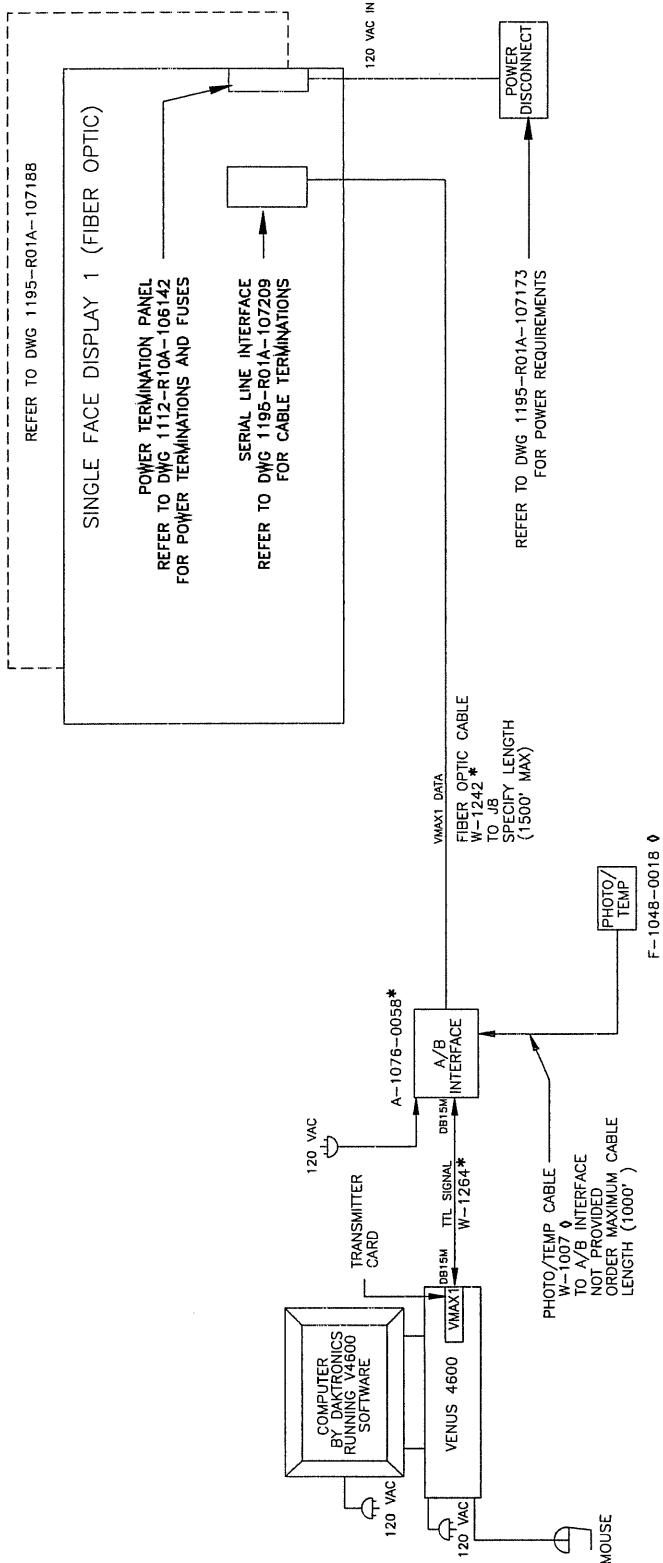
- COMPUTER SPECS
- IBM COMPATIBLE
 - 486/66 OR HIGHER
 - 4MB RAM
 - WINDOWS 3.1
 - MICROSOFT WINDOWS 3.1
 - OR WINDOWS 95
 - 1.33MB OF FREE DISK SPACE (FOR V1500 SOFTWARE)
 - ADDITIONAL FREE DISK SPACE FOR MESSAGE AND SCHEDULE SAVING
 - OPEN SERIAL PORT

* REQUIRED PART
◇ OPTIONAL PART

DAKTRONICS PART NO.	DESCRIPTION
1. A-1151-0002	HOUSING, DIGITAL TEMP W/PKG
2. A-1065-0174	SIGNAL CONV, 232-FIBER OPTIC
3. W-1363	CABLE, DB9F/DB25F TO DB25M SERIAL
4. W-1242	CABLE; 2 FIBER, FIBER OPTIC
5. W-1234	CABLE 4-WIRE; TEMP SENSOR

1	22SEP98	CHANGED PROJ: FROM 1600 TO 1500. CHANGED 1195 TO 1112.	RLONG
REV.	DATE	DESCRIPTION	BY APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES 2 1/2"			
TITLE: SYSTEM RISER DIAGRAM; FIBER OPTIC			
DES. BY: TWOODARD		DRAWN BY: TWOODARD	
DATE: 02SEP98			
REVISION	APPR. BY:	1112-R01A-107198	
SCALE: NONE			



* REQUIRED PART
 ◊ OPTIONAL PART

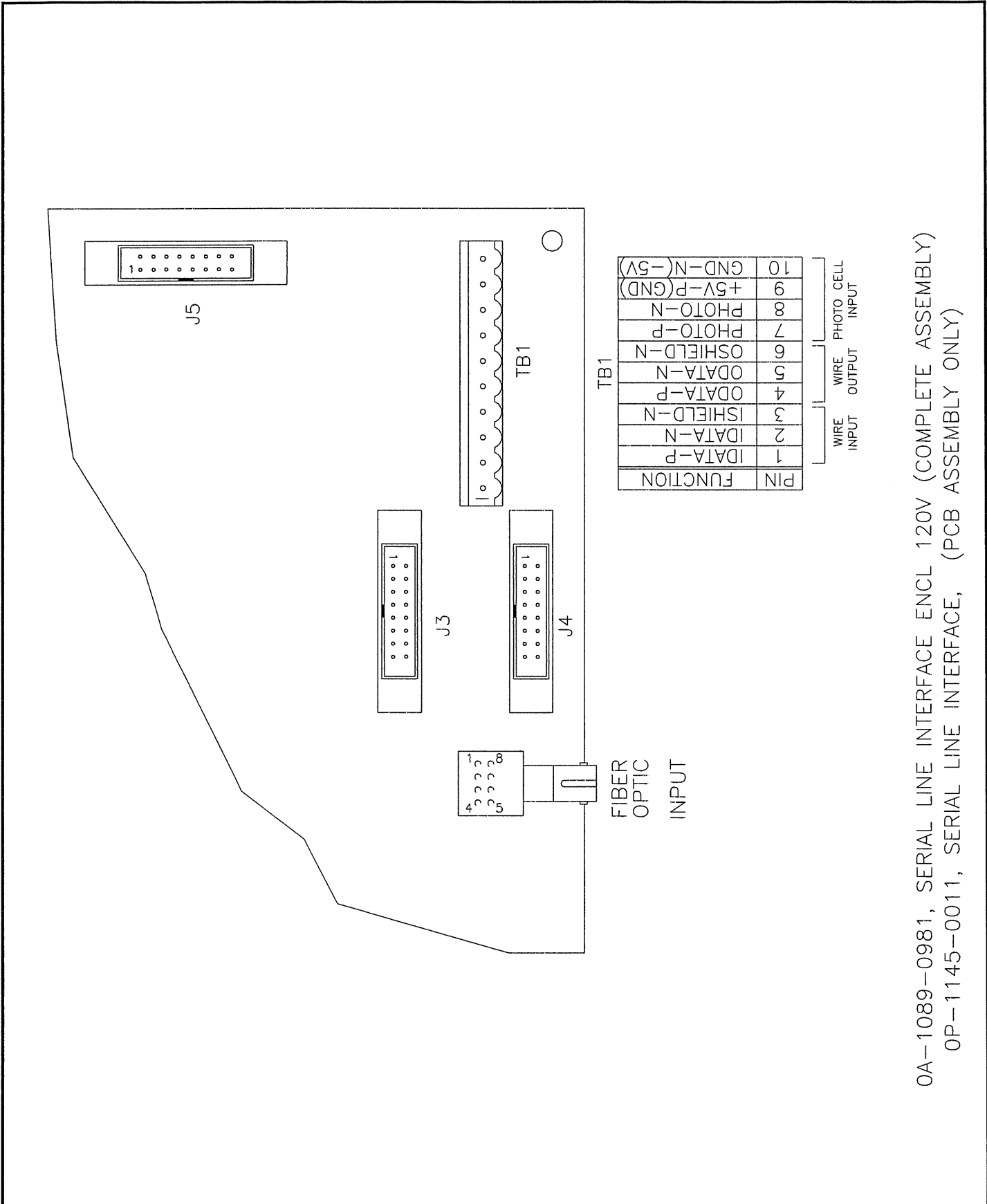
DAKTRONICS PART NO.	DESCRIPTION
F-1048-0018	TSI-EM EAVE MOUNT PHOTO/TEMP SENSOR
A-1127-0237	A/B TRANSMITTER INTERFACE
W-1264	CABLE; DB15M TO DB15M
W-1242	CABLE; 2 FIBER, FIBER OPTIC
W-1007	CABLE 5 COND. 18 AWG, PHOTO/TEMP SENSOR

NOTES:

- TEMPERATURE SENSOR PHOTO/TEMP CABLE (W-1007 NOT INCLUDED) MAY BE ORDERED FROM DAKTRONICS, PLEASE SPECIFY AT TIME OF ORDER.
 - MAXIMUM LENGTH OF 1000'
- FIBER OPTIC CABLE (W-1242) MAY BE ORDERED FROM DAKTRONICS, PLEASE SPECIFY AT TIME OF ORDER.
- FOR OUTDOOR USE, ALL CABLES MUST BE ROUTED IN A GROUNDED CONDUIT.

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1600 SERIES 2 1/2"			
TITLE: SYSTEM RISER DIAGRAM; SERIAL LINE INTERFACE			
DES. BY: TWOODARD		DRAWN BY: TWOODARD	
		DATE: 02SEP98	
REVISION	APPR. BY:	1195-R01A-107196	
	SCALE: 1=1		

REV	DATE	DESCRIPTION	BY	APPR.

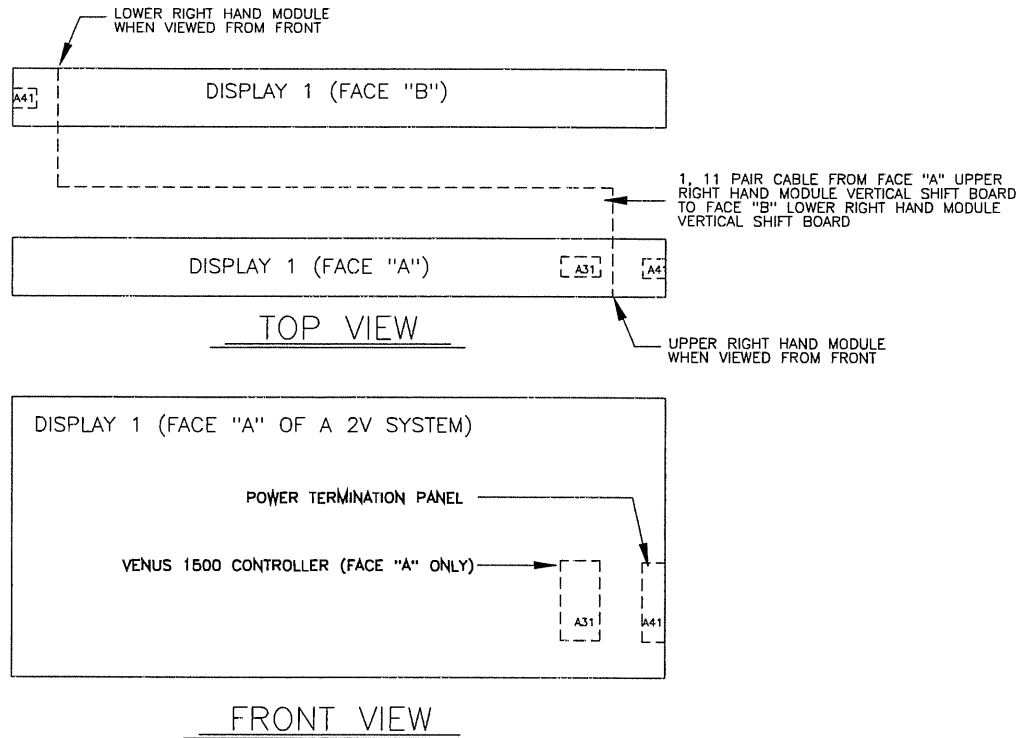


OA-1089-0981, SERIAL LINE INTERFACE ENCL 120V (COMPLETE ASSEMBLY)
 OP-1145-0011, SERIAL LINE INTERFACE, (PCB ASSEMBLY ONLY)

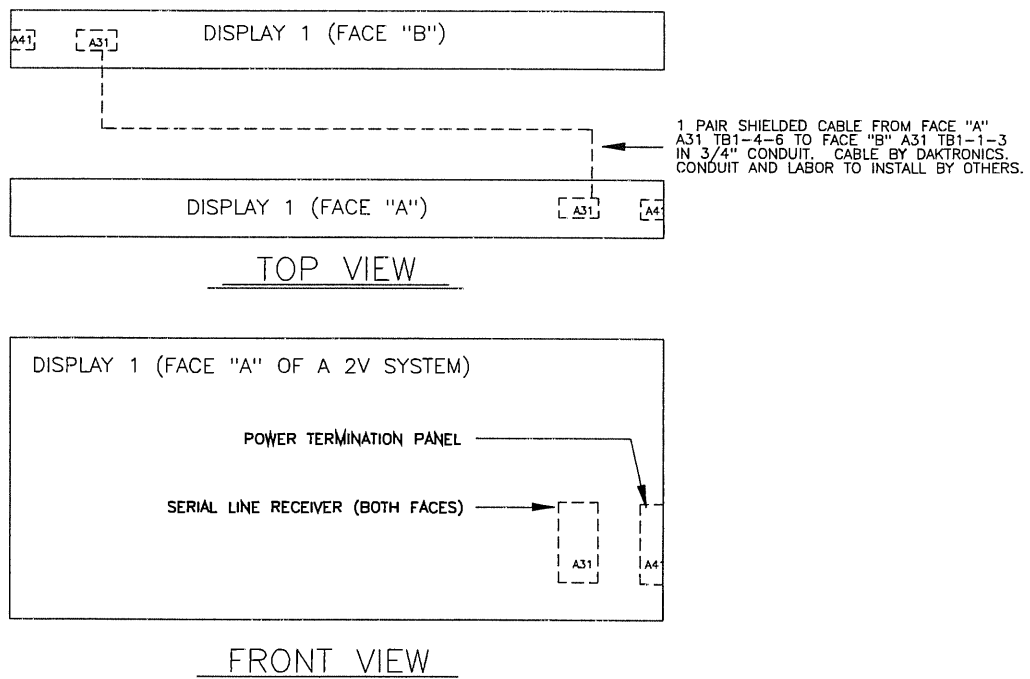
REV.	DATE	DESCRIPTION	BY	APPR.
1	22SEP98	CHANGED PROJ: FROM 1600 TO 1500. CHANGED 1195 TO 1112.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES 2 1/2"			
TITLE: SERIAL LINE INTERFACE SIGNAL TERMINATIONS			
DES. BY:	TWOODARD	DRAWN BY:	TWOODARD
DATE:	02SEP98	APPR. BY:	
REVISION	SCALE: NONE	1112-R01A-107209	

VENUS 1500



VENUS 4600



DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1500 SERIES, 2 1/2" LINE DISPLAYS

TITLE: INTERCONNECT, 2V WIRING

DES. BY: TWOODARD

DRAWN BY: TWOODARD

DATE: 02SEPT98

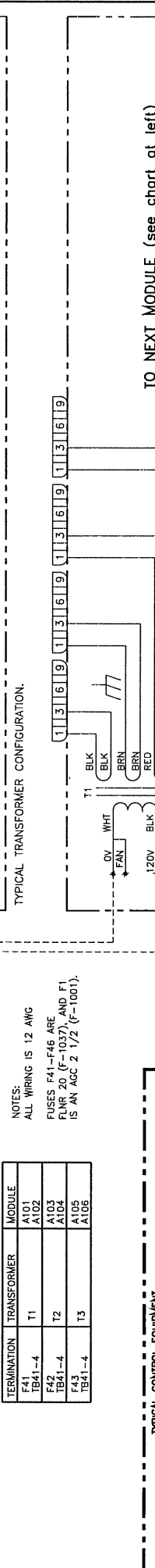
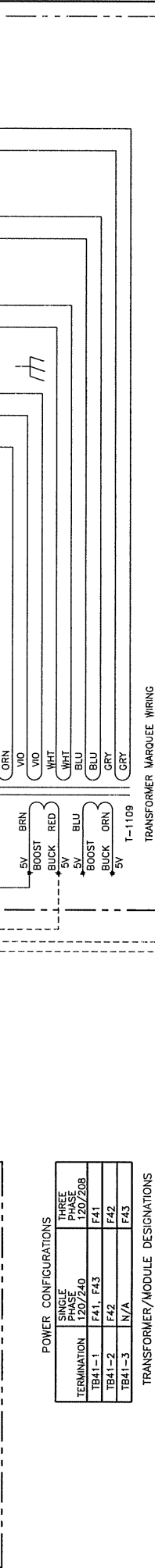
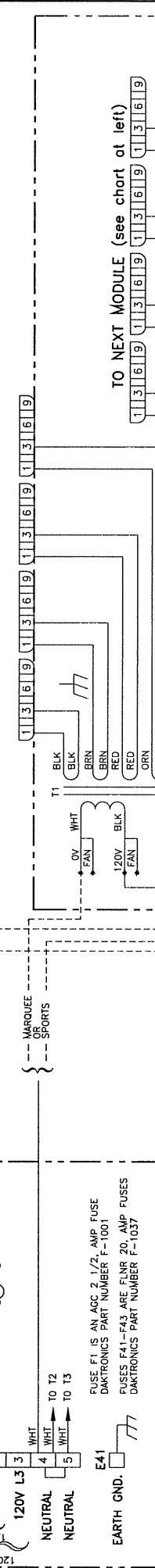
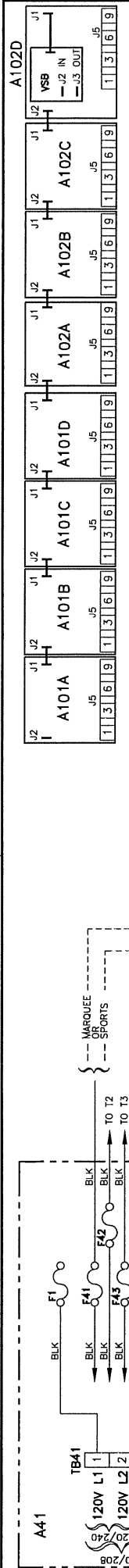
REV.	DATE	DESCRIPTION	BY	APPR.
1	22SEP98	CHANGED PROJ: TO 1500 NOT 1600. CHANGED 1195 TO 1112.	RLONG	

REVISION

APPR. BY:

SCALE: 1 = 1

1112-R01A-107188



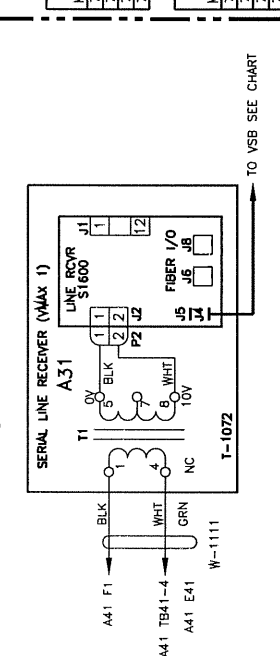
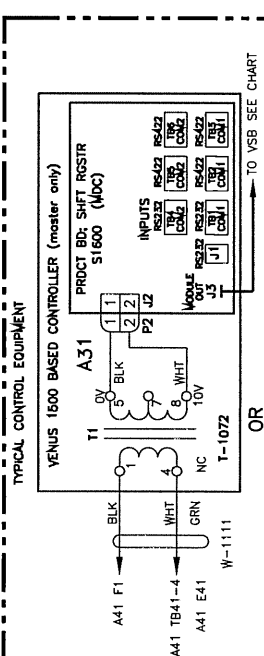
NOTES:
ALL WIRING IS 12 AWG
FUSES F41-F46 ARE FLNMR 20 (F-1037), AND F1 IS AN AGC 2 1/2 (F-1001).

POWER CONFIGURATIONS

TERMINATION	SINGLE	THREE
TB41-1	F41, F43	F41
TB41-2	F42	F42
TB41-3	N/A	F43

TRANSFORMER/MODULE DESIGNATIONS

TERMINATION	TRANSFORMER	MODULE
F41	T1	A101
TB41-4	T2	A103
F42	T3	A104
F43	TB41-4	A105
TB41-4		A106



VSIB LOCATIONS

VSIB SIZE	Vertical Shift Location
7 or Bx48	0
7 or Bx64	0
7 or Bx80	4
7 or Bx96	5

LINE RECEIVER SWITCH SETTINGS

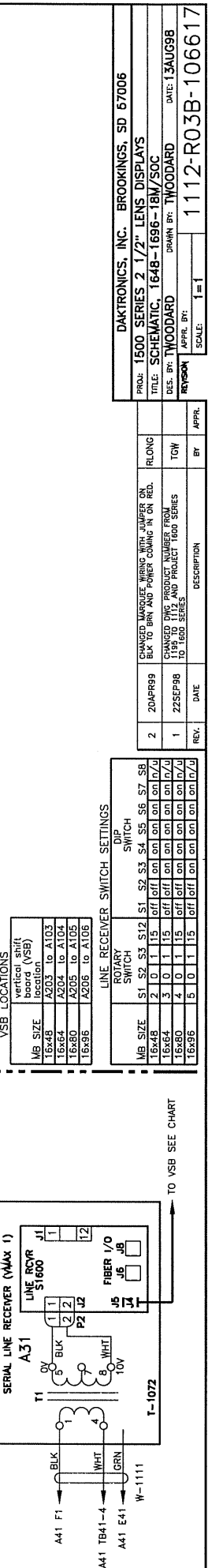
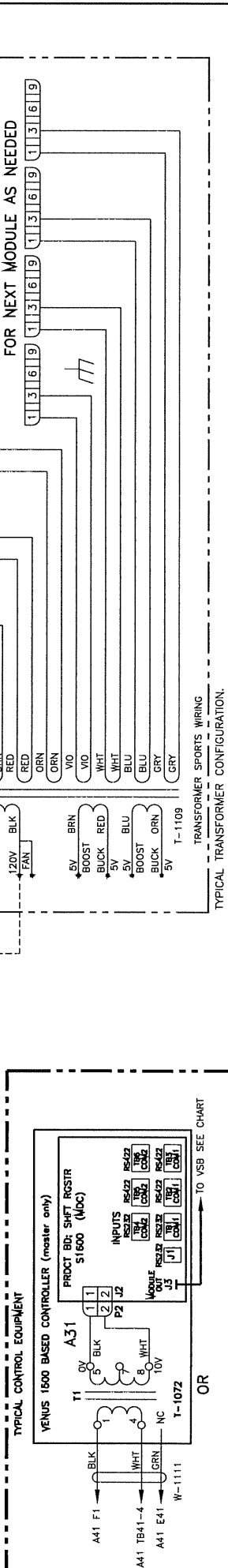
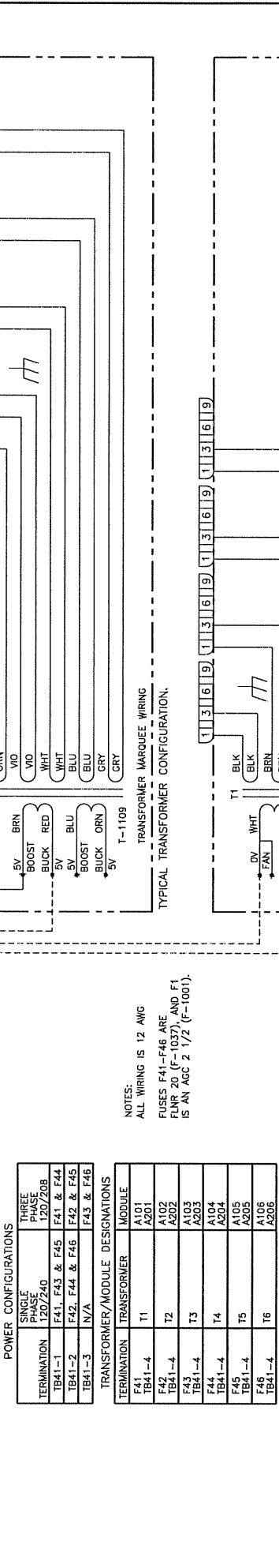
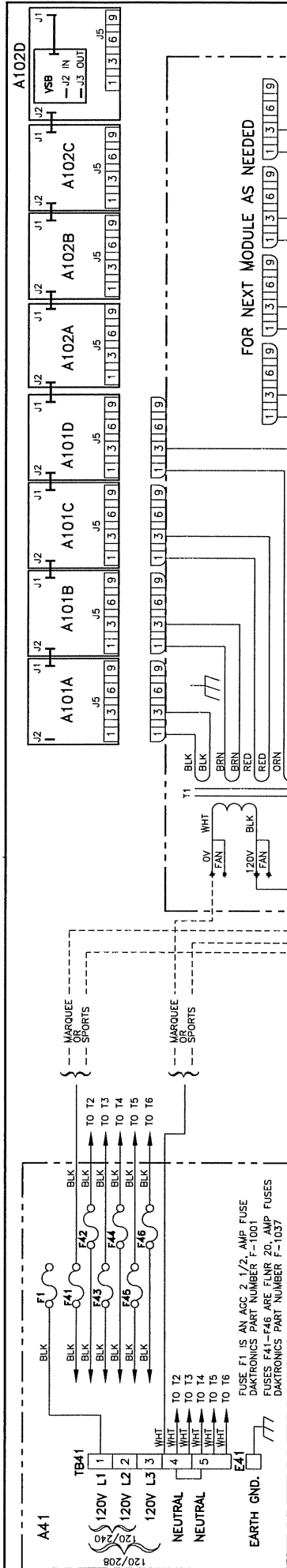
MB SIZE	ROTARY SWITCH	DIP SWITCH
S1	S2	S3
S4	S5	S6
S7	S8	S9

DAKTRONICS, INC. BROOKINGS, SD 57006
 PROJ: 1600 SERIES 2 1/2" LENS DISPLAY
 TITLE: SCHEMATIC, 7&8 HIGH 48-96-TBM/SOC
 DES. BY: TWOODARD
 DRAWN BY: TWOODARD
 DATE: 13AUG98
 APPROV. BY: TWOODARD
 SCALE: 1=1

REV.	DATE	DESCRIPTION	BY	APPR.
1	22SEP98	CHANGED PROJ: TO INCLUDE 1600 - CHANGED VSIB TO 1112.	RLONG	RLONG
2	20APR99	CHANGED MARQUEE WIRING WITH JUMPER ON BLK TO BRN AND POWER COMING IN ON RED.	RLONG	RLONG

REV.	DATE	DESCRIPTION	BY	APPR.
1	22SEP98	CHANGED PROJ: TO INCLUDE 1600 - CHANGED VSIB TO 1112.	RLONG	RLONG
2	20APR99	CHANGED MARQUEE WIRING WITH JUMPER ON BLK TO BRN AND POWER COMING IN ON RED.	RLONG	RLONG

1112-R03B-106616



REV.	DATE	DESCRIPTION	APPR.	BR.
2	20APR99	CHANGED MARQUEE WIRING WITH JUMPER ON BLK TO BRN AND POWER COMING IN ON RED.		RLONG
1	22SEF98	CHANGED PNG PRODUCT NUMBER FROM 1195 TO 1112 AND PRODUCT 1600 SERIES TO 1500 SERIES.		TOW

MB SIZE	vertical shift board location	ROTARY SWITCH	DIP SWITCH
16x48	A203 to A103	S1 S2 S3 S12	S1 S2 S3 S4 S5 S6 S7 S8
16x64	A204 to A104	0 1 15	off off on on on on on on
16x80	A205 to A105	0 1 15	off off on on on on on on
16x96	A206 to A106	0 1 15	off off on on on on on on

LINE RECEIVER SWITCH SETTINGS

DATE: 13AUG98
 DRAWN BY: THOODARD
 REVISION: 1=1
 SCALE: 1=1
 1112-R03B-106617

DAKTRONICS, INC. BROOKINGS, SD 57006
 PROD: 1500 SERIES 2 1/2" LENS DISPLAYS
 TITLE: SCHEMATIC. 1648-1696-18M/SOC
 DES. BY: THOODARD
 APRR. BY: REYSON

Section 4: Maintenance & Troubleshooting



IMPORTANT NOTES:

1. Power must be turned off before any repair or maintenance work is done on the sign!
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 positive 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 will void the warranty.
5. The Daktronics product manager's engineering staff must approve any changes that may affect the weather tightness of the display. This is to include, but is not limited to, the border shrouding, back sheets, cooling fans, fan filters and filler panels. If ANY modifications are made to the weather tightness of the display, detailed drawings of the changes **MUST** be submitted to the Daktronics engineering staff for evaluation and approval or the warranty will be null and void.

4.1 Service Procedures

Reference Drawing: Lens Assy, Manual Drawing A-75028

Refer to the following steps to remove an *8 x 8 lens assembly* and an *8x4 lampbank* from the front of the display:

8x8 Lens Assembly Removal: Refer to **Figures 8 and 9** and **Drawing A-75028**.

1. Remove the lenses from (row 4, column 1) and (row 4, column 8) to expose the two screw fasteners that hold the 8 x 8 lens assembly onto the cabinet frame.
2. Turn the screw fasteners counter clockwise (using a #2 Phillips head, 10" screwdriver) and pull the lens assembly straight off of the display.
3. Disconnect power and signal harness (refer to **Figure 7**).

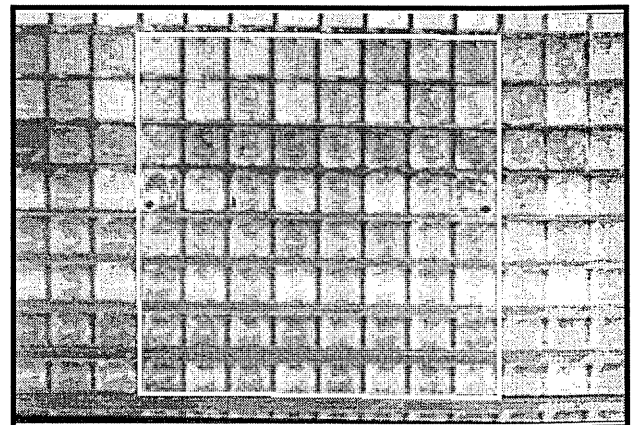


Figure 5: Screw Fasteners Exposed

8 x 4 Lampbank Removal:

1. Use a 1/4" nut driver or socket wrench to remove the screw on each of the two horizontal brackets on the rear of the lampbank to remove it from the 8x8 lens assembly. These two screws can be recognized by the nylon strapping that holds them onto the lampbank. Use pliers to secure the spacer connected to the reflector.
2. Disconnect the 8x4 signal interconnect harness and remove the 8x4 lampbank.
3. Reverse steps to replace a lampbank and an 8x8 lens assembly.

Note: When replacing a 8 x 8 lens assembly, it must be fastened securely with a tight sealing fit. It may be difficult to notice at a glance if the lens assembly is secured properly. After refastening the 8 x 8 lens assembly, grasp the louver near each 1/4-turn fastener and give the 8 x 8 lens assembly a short, firm tug to insure that the 1/4-turn fasteners are secured properly.

4. Noting proper lens orientation, snap the lenses back into the face plate.

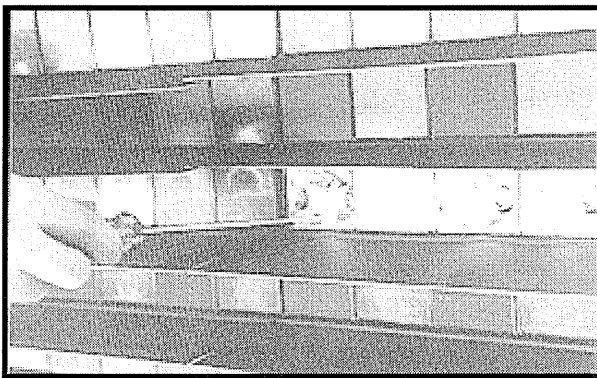


Figure 6: Releasing the 8x8 Lens Assembly

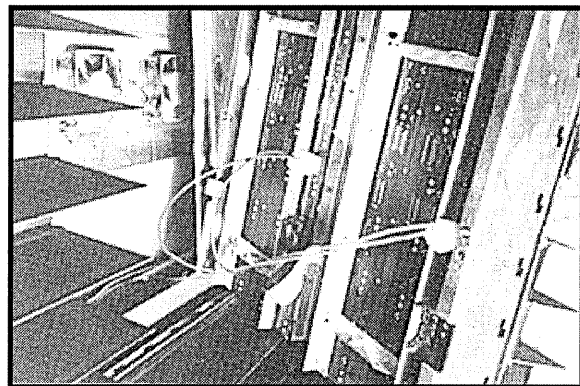


Figure 7: Power and Signal Harnesses

4.2 Lamp Testing And Replacement

This display has been designed for easy lamp replacement from the front. It is recommended to replace non-functioning lamps prior to scheduled events or as soon as possible for best viewing.

Notes:

1. Daktronics approved 6.2 watt lamps have an estimated life of 13,000 hours if operated at 21 volts. *Always use Daktronics approved lamps.* Lamps purchased from Daktronics are built to tighter specifications than similar lamps built on standard production. The recommended lamps give the sufficient intensity and spread to match the display design. Lamps not built to Daktronics specifications will not perform as well, and will not give the intended results and will adversely effect the beauty of the display.
2. Lamp testing should be done by a qualified individual who is capable of operating the controller equipment.
3. *Display power must be off for lamp replacement.*

4.2.1 Lamp Life

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.

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

Typically, lamp failures for the 13,000 hour 21 volt lamp in the 2-1/2" displays can be expected as follows.

- ▶ 3% of the lamps will normally fail upon reaching 35% of rated life (4,550 hours).
- ▶ 10% of the lamps will normally fail upon reaching 70% of rated life (9,100 hours).
- ▶ 50% of the lamps will normally fail upon reaching 100% of rated life (13,000 hours).

The balance of 50% of the lamps last longer than the rated life of 13,000 hours.

Example: The following chart will show predicted lamp failure for various displays based on a lamp voltage of 21 volts and assuming the display is in operation for 18 hours a day. This chart is based on the manufacturer's test data and is based on laboratory conditions.

% Failure	# of hours in operation	# of days in service	# of lamps predicted to have failed for selected display sizes					
			8x64 (512 lamps)	8x96 (768 lamps)	16x64 (1024 lamps)	16x96 (1536 lamps)	7x64 (448 lamps)	7x96 (672 lamps)
3	4,550	253	15	23	30	46	13	20
10	9,100	505	51	77	102	154	45	67
50	13,000	722	256	384	512	768	224	336

4.2.2 Controller Lamp Testing

Lamp testing should be done by a qualified individual who is capable of operating the controller equipment. Whenever you test lamps, make photo copies of the lamp 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 also available upon request.

4.2.2.1 Venus 1500 System

A lamp test can be run by putting the display controller in test mode. (Refer to **Section 4.9.1.1** to set the display controller to test mode.) Set to address zero and power up the display. The display will run several patterns which allow you to spot bad lamps.

4.2.2.2 Venus 4600 System

The Venus *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, which 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.

To run the Test Pattern:

1. From the Venus 4600 Shell, open the *Monitor* program.
2. Open the *Diagnostics* program.
3. In the **Diagnostics** text box, select **Lamp Test**.
4. Be sure the sign is in both the *Diagnostics* and the *Monitor* programs.
5. Under **Lamp Test Type**, select **Pattern Test**.
6. Select **Start Test**. This lights up every other column, making it easy to spot any bad lamps. This pattern will be indicated on the monitor screen. To change to the alternate columns press <F5>.
7. Check your display and record the location of any bad lamps on the test form.

The Pixel Locator Method: The pixel locator method checks for bad lamps without the operator having to leave the controller.

To run the Pixel Locator:

1. From the Venus 4600 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 lights the entire top row and the entire left column of lamps, exposing any lamps which have gone bad.
 - 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.
 - 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.

4.2.3 Optional Lampbank Driver Test Table

The purpose of the test table is to check a driver to determine if all lamps are working within a given 8x4 lampbank. When an 8x4 lampbank with bad lamps is spotted and removed from the display, use the test table to determine which lamps need replacing. Once the bad lamps have been replaced, the test table can then be used to retest the 8x4 lampbank to ensure that all of the lamps are working.

Use the following steps as a guide when using the test table for lamp replacement:

1. Plug test table into a standard 120 volt outlet. Make sure the **power is OFF**.
2. Remove the 8x4 lampbank from the display.
3. Attach power and signal cables to the driver.
4. Turn the power switch on and mark all bad lamps with a piece of masking tape.
Note: Lamps should *not* be removed or replaced with power on as this may damage the driver.
5. Turn display power off.
6. Replace all lamps with Daktronics *approved* lamps of the *same* wattage. Refer to **Section 4.17** for the correct replacement lamps.
7. Turn display power on and check if all lamps light up. If lamps do not light properly, check the troubleshooting charts in **Section 4.16**.
8. Return the 8x4 lampbank to the display.

4.2.4 Individual Lamp Replacement - Front Access

Reference Drawings: Lamp and Lens Removal **Drawing A-74242**

Refer to the following steps for individual lamp replacements from the front of the display. Refer to **Drawing A-74242** to remove and replace lenses and lamps.

1. Insert the *lens extractor* directly above the lens tab and use as a lever to remove a lens.
2. Remove the defective lamp using the *lamp extractor*.
3. Replace defective lamp with a Daktronics *approved* lamp of the *same* wattage. Refer to **Section 4.17** for the correct replacement lamps.
4. Noting proper lens orientation, snap the lens back into the faceplate.
5. Repeat the previous steps until all bad lamps have been replaced.

4.2.5 Complete 8x4 Lampbank Lamp Replacement - Front Access

Refer to **Section 4.1** to remove the 8x4 and 8x8 assemblies. Then remove all lamps from the lampbank and replace them with Daktronics approved lamps of the same wattage. Refer to **Section 4.17** for the correct replacement lamps.

4.3 Lens Position

The slots in the bottom of the reflector hold the lens indexing tabs. To insert a lens, grasp the lens tab, set the indexing tabs into the reflector slots, and snap the lens up into the vertical position. *Make sure that the lens is snapped in and behind the upper louver offset.* Refer to **Drawing A-75204** in **Section 2** for correct lens position.

Inspect the profile of the lenses to ensure that all lenses are secured properly. If the lenses are not properly secured, the lens tab or the lens itself will not be in alignment with the other lens tabs or lenses of that row.

4.4 8x8 Lens Assembly Weather Stripping

The perimeter of each 8 x 8 lens assembly has a strip of pile weather stripping (Daktronics part number HS-1149). There is tape weather stripping between each 1x8 louver assembly (Daktronics part number HS-1051). The weather stripping helps to keep moisture out of the display. It also maintains the positive air pressure necessary for proper display cooling. When doing routine display maintenance which involves removing an 8x8 lens assembly, check to make sure the weather stripping is in tack and is not damaged in any way. If any weather stripping appears damaged, replace it. Refer to the following instructions and **Figure 8**.

1. Once the old weather stripping has been removed, the sides and top of the 8x8 must be cleaned to ensure that the new weather stripping will stick.
2. The weather stripping should be applied in one continuous strip on both sides and the top of the 8x8. At the corners, it should be pulled tight so that it does not buckle.
3. When finished, the stripping should be flush at the bottom and pliers should be used to ensure that the corners are at a 90 degree angle. If the weather stripping is not tight and buckles anywhere on the 8x8, it will be difficult to reinstall in the display and will allow water to enter the display and cause damage to the electrical components.

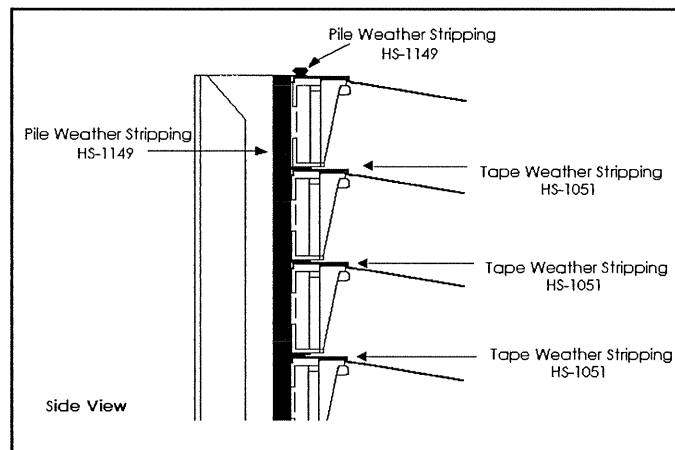


Figure 8: 8x8 Lens Assembly Weather Stripping

4.5 Lens Assembly Spacing

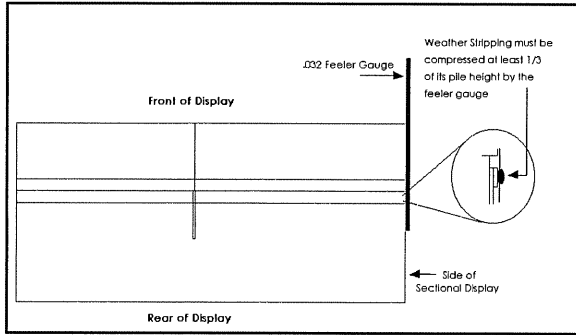


Figure 9: Use Of Feeler Gauge

Check ease of removal of the 8x8 lens assemblies and also ensure that the seal between the lens assembly and the shroud mounting channels is waterproof. Check the module spacing and weather stripping tightness with the 0.032 inch feeler gauge (Daktronics part number OM-69133). Refer to **Figure 9**.

4.6 Louver Replacement

There may be an occasion when a display louver becomes bent or damaged and needs to be replaced.

To replace a louver, use the following steps and refer to Figure 10:

1. Remove the 8x8 lens assembly that the defective louver is attached to.
2. Remove the pile weather stripping from the 8x8 lens assembly.
3. Bend the retaining tabs located on top of the right and left reflector brackets so that the louver/reflector assemblies can be removed.
4. Pull up on each louver/reflector assembly and remove one at a time until the defective louver/reflector assembly has been removed.
5. Grasp the lens reflector assembly and slide the defective louver off the louver retaining tabs.
6. Peel the protective plastic off the replacement louver reflective side and attach onto the lens assembly. Do *not* remove the paper from the louver weather stripping.
7. Reassemble the 8x8 lens assembly. Make sure that all the lenses are snapped in properly.
8. Bend the retaining tabs located on top of the right and left reflector brackets back in 15 degrees.
9. Replace the pile weather stripping (refer to **Section 4.4**) for replacement procedure. Ensure that weather stripping is taut and undamaged.

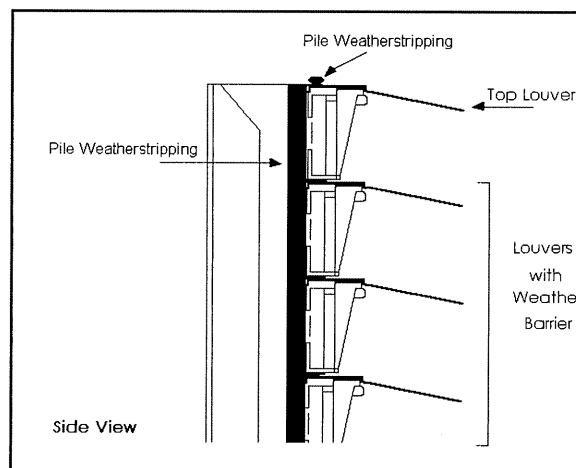


Figure 10: Weather Stripping & Replacement Louvers

4.7 Lamp Driver Display Board

Lamps are mounted to and controlled by a self-contained lamp driver display board (referred to as a *shift*). This unit receives display information from the controller and converts it to drive signals, which switch the lamps ON and OFF. The lamp driver display board has all the drive components integrated onto the same circuit board as the lamp socket. One 8x16 module contains four interconnected 8x4 lampbanks. Refer to **Figure 11** for the layout of this unit.

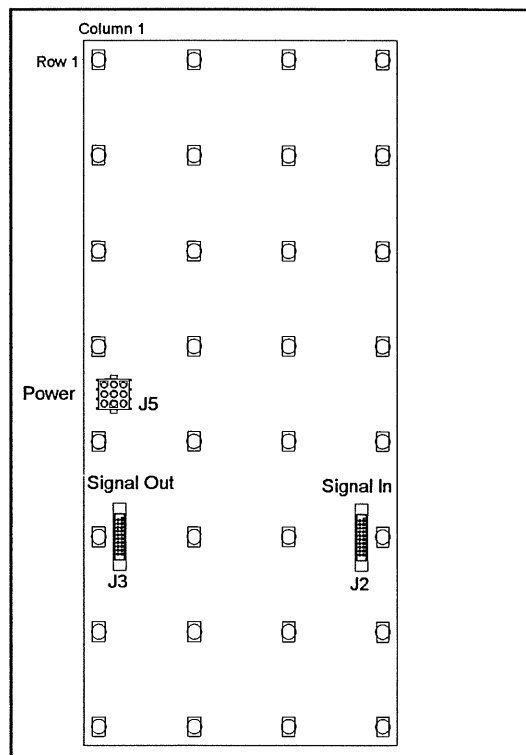


Figure 11: Lamp Driver Display Board
Ref. Dwg C-62613

4.8 Vertical Shift Board (VSB)

The vertical shift board (refer to **Figure 12**) may be used with the Venus 1500 controller (refer to **Section 4.9.1.1** and **Figure 13**) or Serial Line Interface (refer to **Figure 17** in **Section 4.9.2**).

There is one vertical shift board per line (a line is 8 pixels high). It is attached to the back of the rightmost lamp driver display board in each line, near the signal input jack of the lampbank (front view) (refer to **Figure 11**). Each vertical shift board interconnects to the vertical shift board above it. Signal is interconnected between each lampbank to the left of the vertical shift board with a ribbon cable.

Note: On 2V, Venus 1500-controlled displays the end of the signal interconnect harness will be inside of the rear of the slave display. This harness will require termination to the vertical shift register of the master display. The vertical shift register boards will always be located in the right end of the displays (front view). The back sheets will be labeled “Signal Interconnect Located Behind This Panel.”

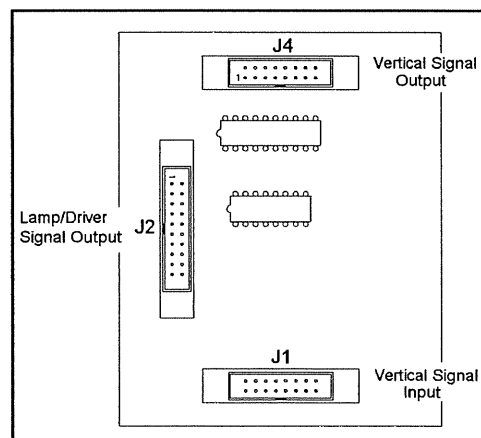


Figure 12: Vertical Shift Board (VSB)
Ref. Dwg C-48651

4.9 Venus 1500 Based Controller/Serial Line Interface

The Venus 1500 based controller/serial line interface sends data to the lampbanks in the display and is located inside the master display cabinet (refer to **Appendix D** for the appropriate shop drawing). To access the controller box, remove the modules in the left column (front view). There are five different controller boxes, as follows:

4.9.1 Display Controller Box (Venus 1500 System)

There are four different control boxes available: RS232, RS422, Modem and Fiber. Each box has a controller board. In addition, the modem box has a modem card and the fiber box has a fiber card.

4.9.1.1 Controller

The controller consists of two circuit boards: the product board and the MDC board. The controller should be replaced as a single unit. **Figure 13** shows the controller. Connections and functions are as follows.

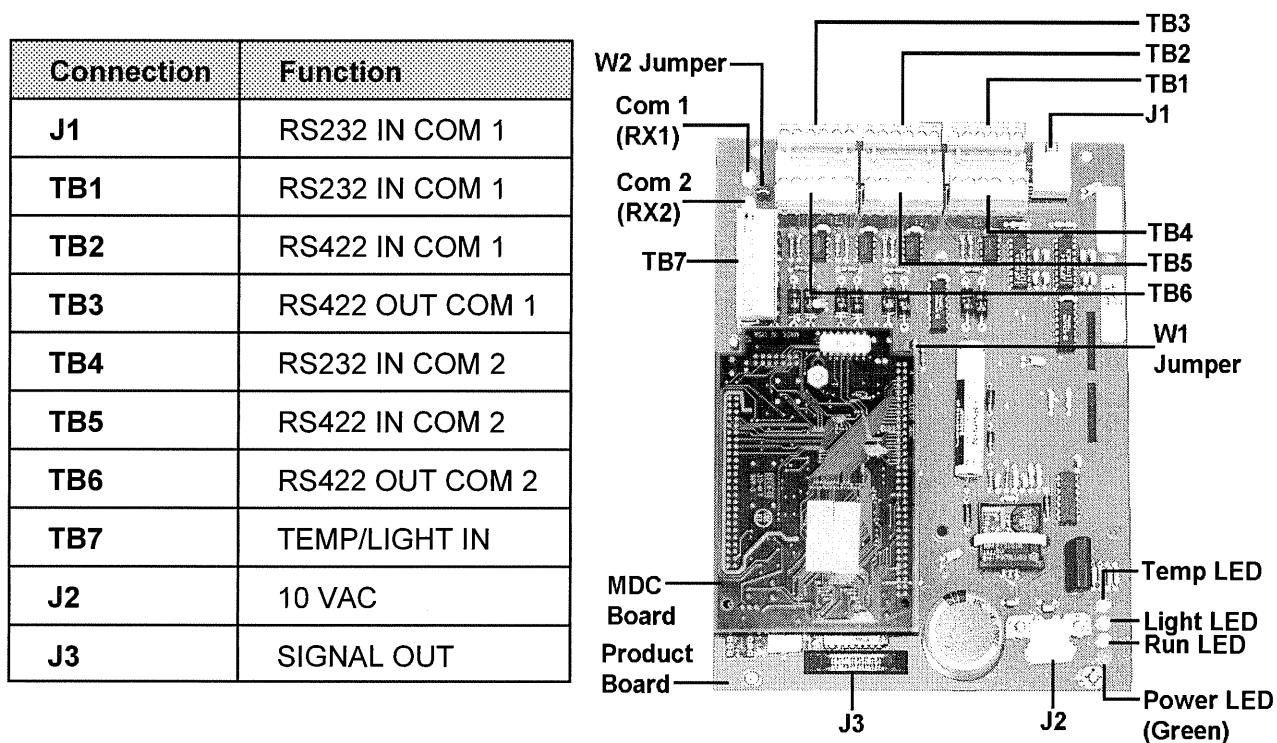


Figure 13: Controller Board with MDC

LED Function and Operation:

Within the controller box you will find a series of diagnostic LED's. The LED's are listed below, along with their respective function and operation.

Name	Function	Operation
PWR	Controller has power	Always on
RUN	Controller is running	Flashes
LGHT	Light Detector Input	Flash rate dependent on light level
EMP	Temperature Sensor Input	Flash rate dependent on temperature
RX1	Data in Com 1	On during data
RX2	Data in Com 2	On during data

Jumper Settings:

Jumpers W1 and W2 must be ON for modem system and OFF for others.

Controller Address and Test Mode:

Before a display can be run in a sign network, it must have an "address." The display address can be set by the use of "DIP" switches located on a PC board known as the MDC. The MDC is the circuit card mounted in the corner of the product board (as seen in **Figure 13**).

Locate the DIP switches on the MDC. They should be on the bottom end of the card (if it is oriented as shown in **Figure 13**). Refer to **Figure 14** for a picture of the DIP switches.

When replacing a controller, be sure to set the DIP switches in the same address configuration as the defective controller.

A test mode can be activated using the following procedure:

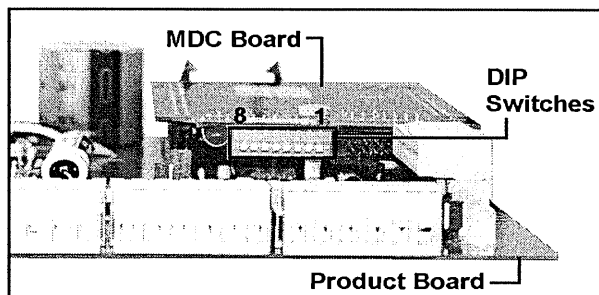


Figure 14: Product Board with MDC Board

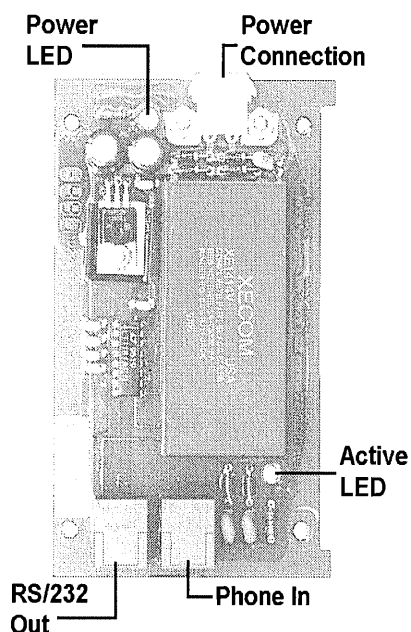
1. Turn off power to the display.
2. Set the DIP switches to address 0 (flip all the switches toward the numbers on the circuit board).
3. Restore power to run test mode.

To exit test mode:

1. Cut power to the display.
2. Set address back to original setting.
3. Restore power to display

Address	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
...
127	ON	ON	ON	ON	ON	ON	ON	OFF

4.9.1.2 Modem Board



The modem module has two (2) LED's (refer to **Figure 18**). The power LED should remain lit while power is applied to the module. The Active LED will light when the modem is being initialized and when it is in the process of communicating. The modem phone input connects to the telephone terminal block with a small, straight RJ11 cable. The modem RS232 Out connects to the controller board J1 RS232 In with a small, straight RJ11 cable.

A modem system requires jumpers to be set on the controller board. Refer to **Section 4.9.1.1** for jumper settings.

To replace a modem:

1. Disconnect the power and signal connections. Refer to **Figure 15** for signal disconnection.
2. Remove the four nuts on top of the modem board.
3. Install the new fiber board, replace the nuts and reconnect the power and signal cables.

Figure 15: Modem Board

4.9.1.3 Fiber Board

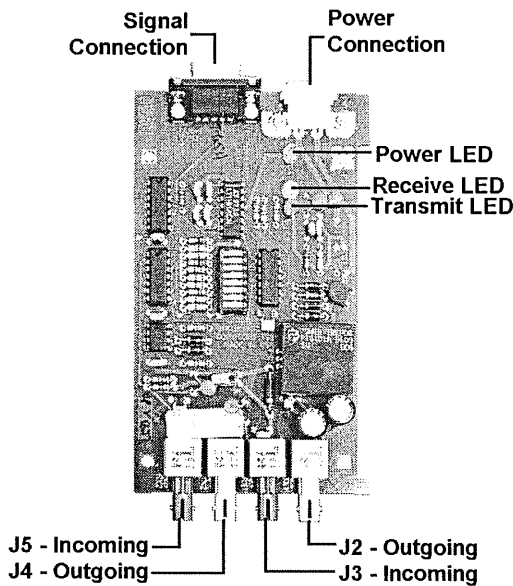


Figure 16: Fiber Board

The fiber module has three (3) LED's (refer to **Figure 16**). The Power LED (DS1) should remain lit while power is applied to the module. The Receive LED (DS2) will light when the display fiber board is accepting signal from the computer fiber board. The Transmit LED (DS3) will light when the display fiber board is sending signal to the computer fiber board. In addition, the fiber module has two (2) incoming fiber connectors and two (2) outgoing fiber connectors. The fiber module connects to the controller board with a small DB9 to RS11 cable.

To replace a fiber optic board:

1. Disconnect the power and signal connections (refer to **Figure 16** for disconnection of power).
2. Remove the four nuts holding down the fiber optic board.
3. Install the new fiber board, replace the nuts and reconnect power and signal cables.

4.9.2 Serial Line Interface

The serial line interface is used in systems with controllers that provide signal with a single, high speed data line (Venus controller - either wire or fiber optic cable). Display outputs connect to the vertical shift board in the lower right hand corner of the display (front view). **Figure 17** illustrates the serial line interface, which is also located in the lower right hand corner of the display (front view). Remove the enclosure cover to see the diagnostic LED's. The following is a list of LED's and their functions:

DS1 - Data Power (green): This indicates when there is power to the isolated data input circuit on the line receiver. It should ALWAYS be ON.

DS2 - Power (green): This indicates when the main power on the line receiver is working. It should ALWAYS be ON.

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

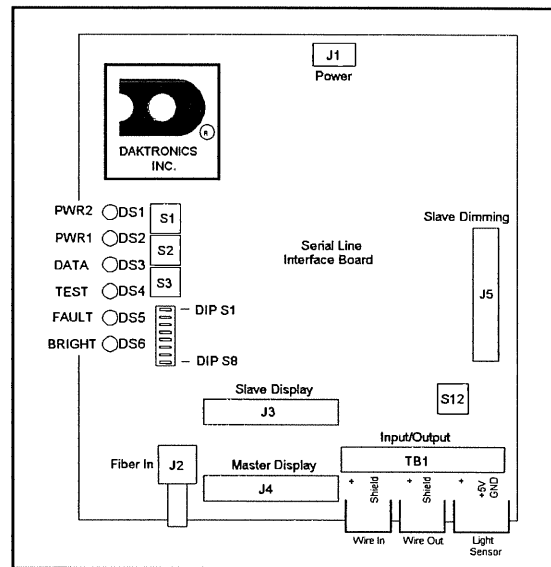


Figure 17: Serial Line Interface Ref. Dwg B-82027

DS4 - Test Mode (red): This indicates when the line receiver is in test mode. If it is ON, a test pattern will be put on the display.

DS5 - Line Fault (red): This indicates if the controller and data cable are connected correctly. With the controller on a good connection, it should be OFF (it will flash ON at the beginning of each sequence). If this light stays ON, there is probably a break in the data cable somewhere or the data lines are swapped.

DS6 - Bright (red): 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, it will flash.

Switch	Function
S1 Rotary	Size setting: columns $COLS \leq 256: S1 = (\frac{COLS}{16}) - 1, S2 = 0$ $256 < COLS \leq 512: S1 = (\frac{COLS - 256}{16}) - 1, S2 = 1$
S2 Rotary	$512 < COLS \leq 768: S1 = (\frac{COLS - 512}{16}) - 1, S2 = 2$ $768 < COLS \leq 1024: S1 = (\frac{COLS - 768}{16}) - 1, S2 = 3$
S3 Rotary	Size setting: rows $ROWS \leq 128: S3 = (\frac{ROWS}{8}) - 1, S4(1) = OFF$ $128 < ROWS \leq 256: S3 = (\frac{ROWS - 128}{8}) - 1, S4(1) = ON$
S4 DIP S1	
S5 DIP S2	Test Mode. ON=Test, OFF=Normal Operation
S6 DIP S3	Test Pattern Selection 1-page sign: S6(3)=ON, S7(4)=ON (16 color/monochrome) 2-page sign: S6(3)=ON, S7(4)=OFF (256 color) 4-page sign: S6(3)=OFF, S7(4)=ON (65,536 color) 8-page sign: S6(3)=OFF, S7(4)=OFF (LED only)
S7 DIP S4	
S8 DIP S5	Buffer Configuration. Used only on Venus 6500 version. 256x128: S8(5) = OFF, S9(6) = OFF 128x256: S8(5) = OFF, S9(6) = ON 64x512: S8(5) = ON, S9(6) = OFF 32x1024: S8(5) = ON, S9(6) = ON
S9 DIP S6	
S10 DIP S7	Dimming mode selection. OFF=8-level, ON=2-level (use 2-level - choice of Bright or 1/2 Dim)
S11 DIP S8	Unused
S12 Rotary	Full bright level setting.

Note: Shaded area is the 8-position DIP switch. Others are 16-position rotary switches.

4.9.2.1 Removing the Serial Line Interface for Service

Disconnect the signal input wires before removing the Serial Line Interface from the holder to prevent damage to the incoming wires. **Front access displays:** Remove the Serial Line Interface prior to servicing the air filter behind it.

4.9.2.2 Serial Line Interface Interconnect For 2V Displays

For 2V display, the slave face gets its signal from the master face. A 3-conductor cable (W-1117) is routed between the line receivers in each face. Signal from the controller comes into either the fiber or wire input of the serial line interface in the master face (the serial line interface automatically switches between fiber or wire input). Signal for the slave face is connected to the wire output of the line receiver in the master face. This signal cable is connected to the wire input of the line receiver in the slave face.

4.10 Socket Replacement

To replace a faulty socket, remove the appropriate 8 x 4 lampbank and proceed with the following steps: **Note:** All work must be done in a static free environment

1. Unsolder the two contacts of the bad socket.
2. Pull the socket out front side of lampbank.
3. Insert a new socket and resolder the two contacts.
4. Thoroughly clean and inspect the area around the socket for solder residue. After ensuring that the worked area is clean and dry, re-coat the area around the socket with conformal coating (Daktronics part number SE-1021).

4.11 Fans

Note: To locate the module to remove to access the fan and filters, refer to the shop drawing located in **Appendix D**. Refer to Section **4.12** concerning the fan filters. There is one cooling fan per 8x16 display module. Fans should be checked after the display has been in operation for 1,500 hours, and every 1,500 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).

1,500 hours is equivalent to 62 days if the display is on running non-stop for 24 hours a day. Keep blades clean to maintain their efficiency and to ensure proper cooling. If a fan is not operating properly, check the fuse for that fan first. If the fuse is not the problem, check the wiring. If fans are wired correctly but still don't work, replace the fan.

A fan testing power cord is available for checking fan operation. Plug the test cord into the problem fan and plug the other end into a 110 volt outlet. If the fan does not turn on or does not operate smoothly, replace it. **Use extreme caution during this testing since the fan blades are exposed!**

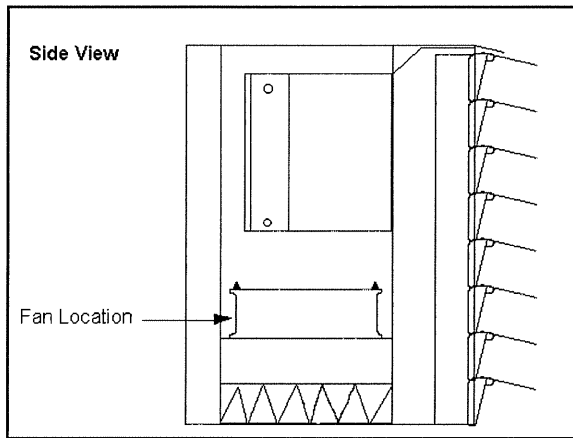


Figure 18: View of Cooling Fan and Filter

4.12 Fan Filters

Note: If the display is not in operation, turn display power off to conserve energy and extend the life of the fans.

Note: To locate the module to remove to access the fan and filters, refer to the shop drawing located in **Appendix D**. Filters should be checked after the display has been in operation for 1,500 hours, and every 1,500 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).

1,500 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.

Each time a module is removed, for whatever reason, take a minute to inspect the fans. First, check the fan blades for dirt and debris. A large accumulation of dirt and debris indicates that the filters need to be changed more often. Fan blades must be kept clean to maintain fan efficiency and ensure proper cooling. Second, spin the fan blades with a pen or pencil to ensure that the bearings are free and the fan is still in balance.

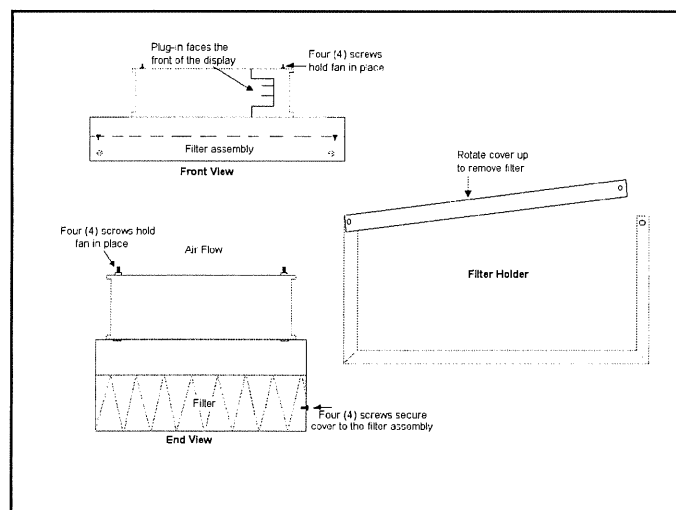


Figure 19: Fan Mounting and Filter Assembly

Replace filters as needed using Figure 19 and the following steps:

Note: Figure 19 illustrates a one fan filter assembly. In some displays, a two fan filter assembly will be used.

1. Remove the nut securing the fan mounting and filter assembly.
2. Lift up on the assembly and pull the entire fan mounting and filter assembly out.
3. Remove the four screws securing the cover to the filter assembly and lift up on the cover to find the filter assembly.
4. Remove the filter holder.
5. Remove a screw from one end of the filter holder assembly and rotate cover up to remove the filter.
6. Stretch the replacement filter to a width of six inches. Keep the pleats in the filter evenly spaced.
7. Insert new filter into the filter holder.
8. Rotate filter holder cover down. Make sure the filter stays inside the channel of the cover. Fasten the end of the cover with the screw from **Step 5**.
9. Inspect the filter assembly. Make certain that the filter is touching the inside perimeter of the frame throughout its entire length and that no air gaps exist.
10. Reattach filter assembly to the fan mounting cover. Insert fan mounting and filter assembly into the slot in the bottom channel and refasten. Filter *must* be inserted wire side *up*.

If a filter other than the Daktronics standard filter is used, follow this criteria:

- effective filter area to be no less than 2.3 square feet per 1.0 square feet of filter face
- filter media to have an average arrestance of 90-92%.
- Initial resistance should not exceed 0.48 w.g. at 500 fpm.

Standard Daktronics displays are equipped with 0.80 square feet of effective filter area for each fan.

Periodically check airflow through the lenses to ensure that there are no obstructions in the lens exhaust holes. Airflow is necessary to cool the lenses and lamps adequately (refer to **Figure 20**). The interior of the module should be kept clean to prevent a buildup of dust on the lenses. Use an air hose and a vacuum cleaner to keep the display clean.

Inspect the cabinet seal periodically to make certain it is sealing properly. If leaks are detected, repair or replace the pile weather stripping seal around the edges of the cover.

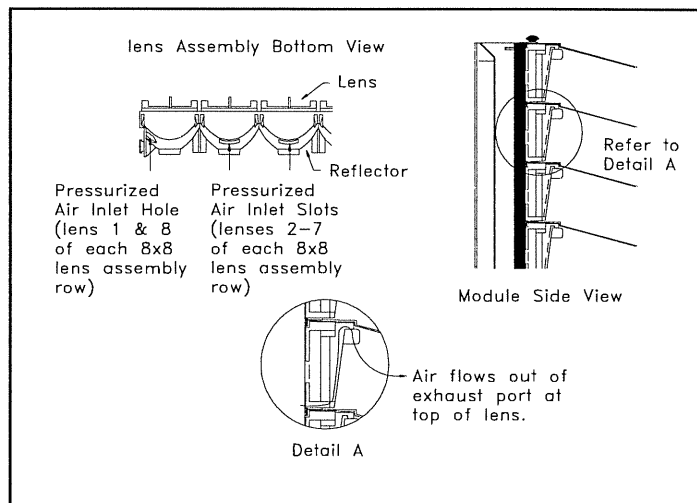


Figure 20: Display Cooling System

4.13 Structural Inspection

Visual inspection should be done annually to check paint and possible corrosion, especially at footings, structural tie points, and ground rods. Fasteners should be checked and tightened or replaced as required.

At least once a year, check the inside of the display for signs of water intrusion, i.e.-water stain marks. Water can enter a display where weather stripping has come loose or deteriorated, where fasteners have come loose, allowing gaps in the panels, or where moisture may be entering around hardware which is in the top of the display. Check electronic components for signs of corrosion.

4.14 Cleaning the Cables

During routine maintenance if it becomes necessary to remove or replace a 16 or 20 pin ribbon cable, clean the ribbon cable plugs and the circuit board jacks with Deoxit™ (CH-1015). Inspect and clean the jacks and plugs thoroughly to ensure the absence of any foreign matter, as the presence of dirt or water may cause signal interconnect problems.

After the parts are cleaned, push the ribbon cable plug into the jar of Cailube™ (CH-1019), ensuring that the paste wets the plug to a depth of at least 1/8" on all four sides. Also check to make sure that all of the pin holes of the plug are filled with paste and that sufficient paste is present on the end of the plug to form a "V."

There should be enough paste present on the end of the plug so that when it is inserted into the circuit board jack, the paste is pushed out around the jack and forms a weather-proof seal.

CH-1015 is the electrical contact cleaner in an aerosol can and **CH-1019** is the electrical contact lubricant and protector paste in a 1oz. jar. Both can be found in the **Tool Kit Accessories** package. Cailube is also available in an 8oz. jar (**CH-1021**). If additional supplies are needed, contact Daktronics customer service for ordering information.

4.15 Modem/FCC Regulations

The modem on the Venus 1500 interface PCB complies with Part 68 of the FCC rules and regulations. With each device shipped, there is a label which contains, among other information, the FCC Registration number and Ringer Equivalence Number (REN) for this product. The customer must, upon request, 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. On most, but not all areas, the sum of the REN's 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 discontinue service temporarily. 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 ample opportunity 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 that 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.

4.16 Troubleshooting

This section contains some symptoms that may be encountered in a 1500 Series display. For these symptoms, possible causes and corrective actions are given. This list is not inclusive of every possible problem, but does represent some of the more common situations that may occur.

Symptom / Condition	Possible Cause / Remedy
One or more lamps on display will not light.	<ul style="list-style-type: none"> • Replace lamp. • Replace socket. • Replace lampbank.
One or more lamps will not turn off.	<ul style="list-style-type: none"> • Check for foreign objects on PC board. • Replace lampbank.
Section of display is not working. Section not less than eight (8) rows high and extends all the way to the left of the display.	<ul style="list-style-type: none"> • Replace ribbon cable. • Replace the first driver not working. • Replace the last driver working. • Check fuse termination panel. • Check for 120 VAC input power. • Check for a bad shift register.
Garbled display or shifted sequence.	<ul style="list-style-type: none"> • Set computer and serial line interface to high line feed. • Set serial line interface to correct size. • Replace serial line interface. • Replace Venus transmitter card.
Section of display does not work.	<ul style="list-style-type: none"> • Check appropriate main fuse or breaker.
A group of (2) modules does not work.	<ul style="list-style-type: none"> • Check termination panel or load center. • Check transformer for correct output (26 VAC).
Entire display does not work.	<ul style="list-style-type: none"> • Check 120 VAC input power to sign. • Check serial line interface. • Check all signal connections. • Check Venus 1500 Output
Controller not operating properly.	<ul style="list-style-type: none"> • Refer to Venus controller installation manual.
Entire module does not work.	<ul style="list-style-type: none"> • Check signal connection (ribbon cable). • Check power connections. • Check transformer fuse on panel. • Replace lampbank.

4.17 Replacement Parts List

Part Description	Daktronics Part No.
Conformal Coating	SE-1021
Driver; Vertical Shift Register	OP-1089-0003
Electrical Contact Lubricant and Protector, 8oz. jar	CH-1021
Fan Filter, Two Fan, 20" Long	OL-58207
Fan Filter, One Fan, 10" Long	OL-58208
Fan Filter, One Fan, with AL Frame	OS-1089-0090
Fan Filter, Two Fan, with AL Frame	OS-1089-0091
Fan Finger Guard	HS-1036
Fan Power Cord	W-1246
Fan; 120 Volt	B-1006
Fuse, AGC, 2 ½ (Control Equipment)	F-1001
Fuse; FLNR-20	F-1037
Lamp; T-5, Wedge Base, Xenon Filled	DS-1303
Lampbank with Driver; Shift (8x4) 1/4 Module	OP-1112-0001
Lens; white monochrome - Stadia View	DS-1288
Louver with Weather Barrier; 10 Degree Bend	OM-62964
Louver; Top 10 Degree Bend	OM-62963
Power Cord, Fan Testing	OA-1089-0192
Reflector; 8 x 1	MP-1054
Socket; T-5, Wedge	X-1209
Test Fixture, Desk Type	OA-1112-0025
Test Fixture, Portable	OA-1089-0775
Transformer; Sports Application, 120 Volt, T-1109	OA-1112-0020
Transformer; Marquee Application, 120 Volt, T-1109	OA-1112-0022
Weather Stripping; Pile	HS-1149
Weather Stripping; Tape	HS-1051
Tool Kit (includes the following)	OA-1112-0035
-Screw driver; #2 Phillips, 10" Shank	TH-1040
-Lamp Voltage Tester	OP-1112-0002
-1/4" Nut Driver	TH-1042
-Stubby Screwdriver	TH-1043
-Lamps/Lens Extractor	OA-1112-0019
-Electrical Contact Cleaner & Lubricant 8 oz. jar	CH-1019
-Electrical Contact Cleaner (spray can)	CH-1015
-0.032 Feeler Gauge, Weather Stripping	OM-69133

4.18 Unit Exchange/Replacement Procedure

Daktronics unique exchange program offers our clients the quickest, most economical way of receiving product repairs. If a component has failed, Daktronics will send the customer a replacement. The customer, in turn, sends the failed components to Daktronics. This not only saves money but also decreases the time the display is inoperable. Daktronics offers repair and return on a timely basis; in urgent situations, every attempt is made to ship by the fastest transit method available.

1. **Packaging for Return:** Package and pad the item well to prevent damage during shipment. Electronic components such as printed circuit boards should either be installed in an enclosure or placed in an anti-static bag before boxing.

Please enclose your name and address along with a list of all the symptoms. Please be as specific as possible.

2. **Lampbank and Driver Packaging Instructions:** Lampbanks and drivers should be placed in a static-free enclosure for return shipping. An anti-static convoluted foam packing is available from Daktronics, part number PK-1135 for your use if needed. The shipping box (Daktronics part number PK-1006) should be used in conjunction with the foam.
3. **Where to Send:** To return parts for service, contact your local representative prior to shipment to acquire a Return Material Authorization Number (RMA#). This will speed up the repair of your unit.

When returning defective items under the exchange program, please utilize the UPS Blue Return Tags found in the package containing the exchange unit sent from Daktronics. This will speed up the transaction and help avoid any confusion when the part is returned to Daktronics. The defective item must be returned within 15 days of receiving a replacement part. Using the UPS Blue Return tag immediately will eliminate the possibility of late charges being assessed against your account.

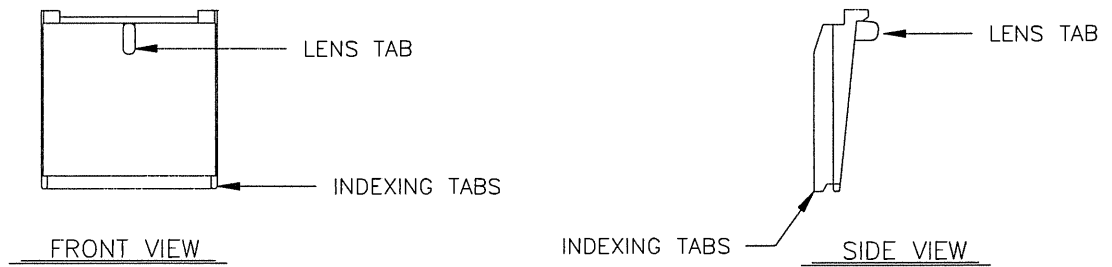
Mail: Daktronics, Inc., Customer Service
PO Box 5128
331 32nd Avenue
Brookings, SD 57006

Phone: Toll Free: 1-800-843-9879
or 1-605-697-4400

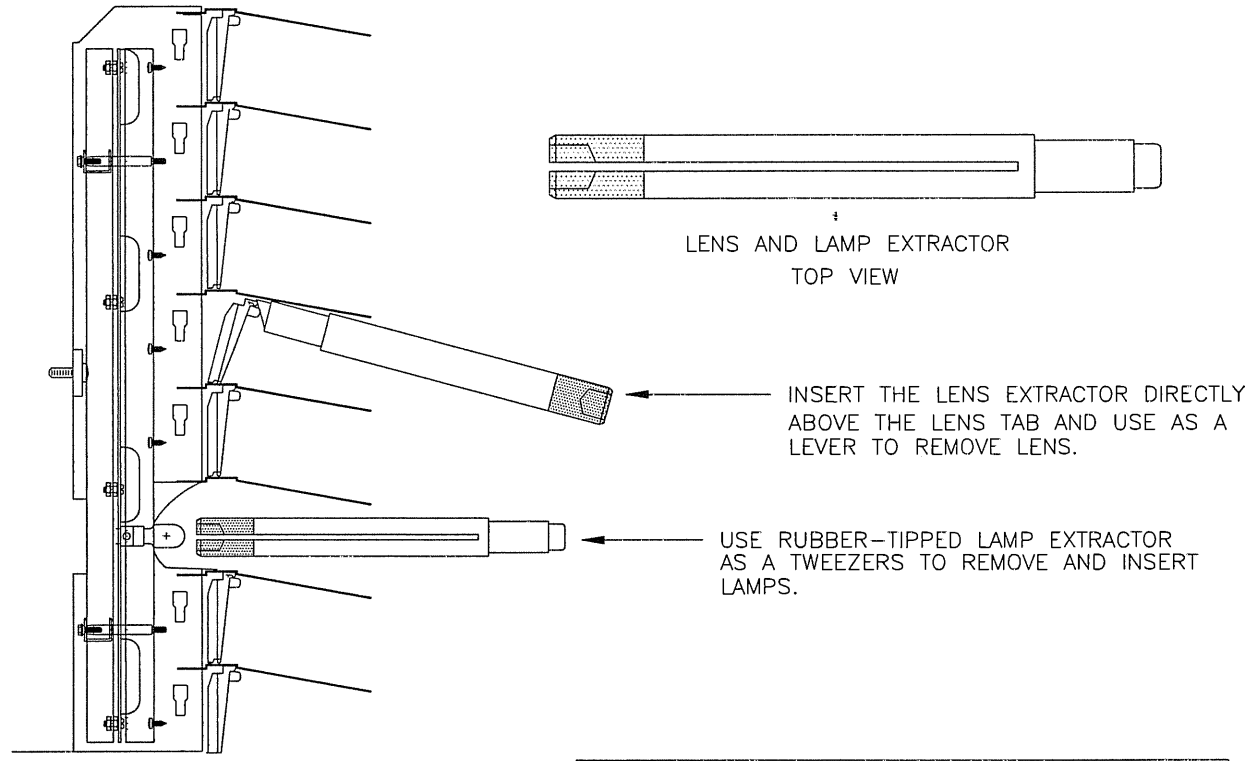
Customer Service Fax: 1-605-697-4444

E-Mail: helpdesk@daktronics.com

LENS DETAIL



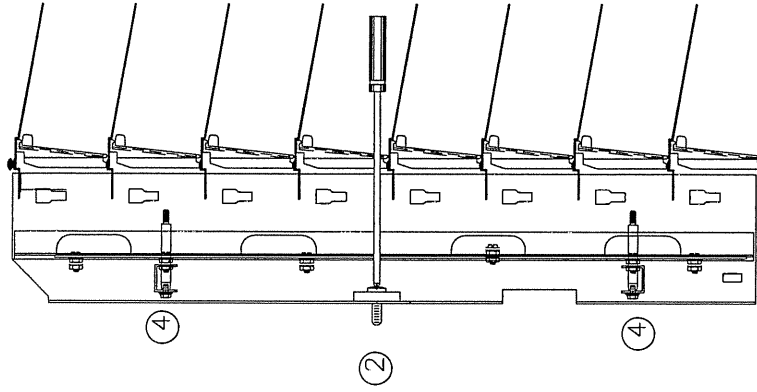
LENS TAB: USE THE LENS TAB TO GRASP ONTO THE LENS
INDEXING TABS: THE SLOTS IN THE BOTTOM OF THE REFLECTOR ACCOMMODATE THE LENS INDEXING TABS. TO INSERT A LENS, SET THE LENS TABS INTO THE REFLECTOR SLOTS AND SNAP THE LENS UP INTO THE VERTICAL POSITION.



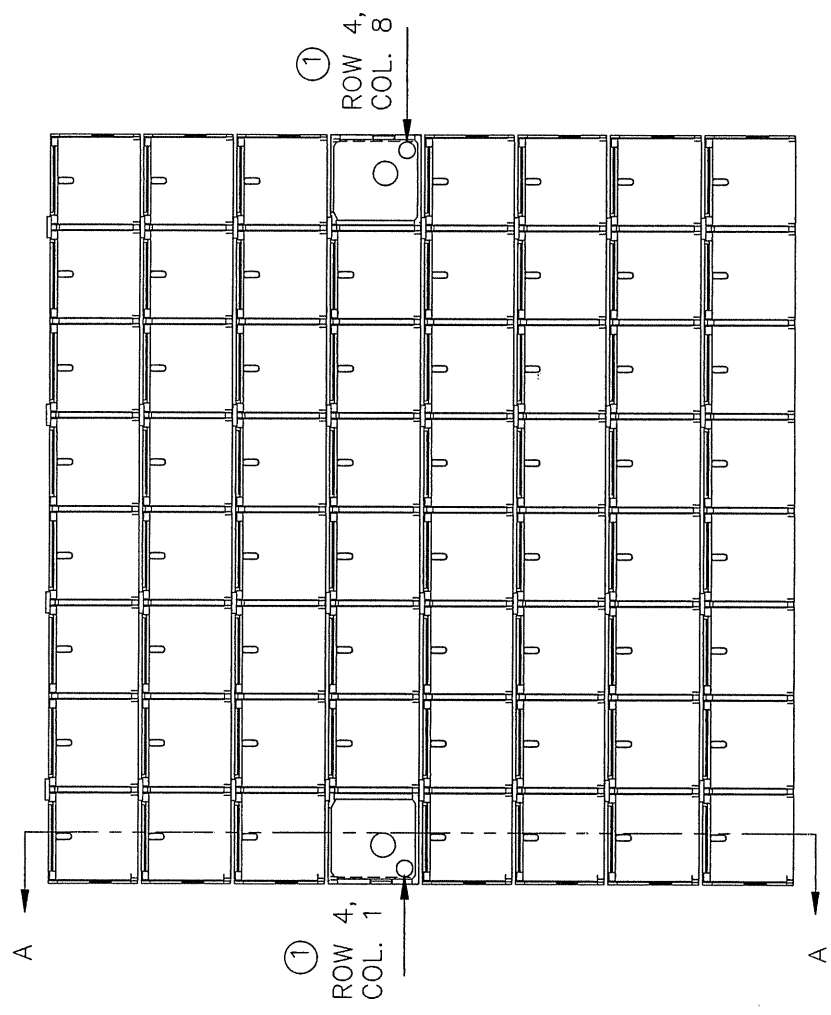
8 x 8 LENS ASSEMBLY—SIDE VIEW

NOTE:
 LIFT UP ON THE LOUVER DIRECTLY ABOVE THE LENS IF NECESSARY FOR LENS REMOVAL. DO NOT PRESS UP ON THE LOUVER ANY FURTHER THAN NECESSARY OR THE LOUVER MAY BECOME DEFORMED.

DAKTRONICS, INC. BROOKINGS, SD 57006				
PROJ: (1500) SERIES				
TITLE: LENS AND LAMP REMOVAL				
DES. BY:	DRAWN BY: MMEISS		DATE: 08-18-95	
REVISION	APPR. BY:	1112-P08A-74242		
	SCALE: NONE			
1	26JUN96	CHGD 1/4 TURN TO 1/4" SCREW.	JRT	
REV.	DATE	DESCRIPTION	BY	APPR.



SECTION VIEW A-A



8 x 8 LENS ASSEMBLY-FRONT VIEW

DAKTRONICS, INC. BROOKINGS, SD 57006			
PROJ: 1500 SERIES MESSAGE BOARDS, 18"			
TITLE: LENS ASSEMBLY, MANUAL			
DES. BY:		DRAWN BY: MMEISS	
DATE: 19SEP95		DATE: 19SEP95	
REVISION	APPR. BY:	1112-P08A-75028	
	SCALE: 1=5		

1	28JUN96	CHGD 1/4 TURN TO 1/4" SCREW.	JRT	
REV.	DATE	DESCRIPTION	BY	APPR.

Appendix A: Light & Temperature Sensors

Optional Temperature/Light Sensors

This appendix contains:

1. Light Detector Mounting Procedure (**ED-9490**)
2. Temperature Sensor Mounting Procedure (**ED-9489**)

Use this appendix for mounting and connecting wire to both the light detector and temperature sensor.

A.1 Light Detector

The light detector must be mounted near the display and so that the light detector is facing downward. A four-conductor cable is used to connect this light detector to the display. Refer to **ED-9490**.

A.2 Temperature Sensor

To connect sensor wires to the controller refer to **Sections 3.9** and 3.120. Refer to **ED-9489** for more installation information.

Temperature Sensor Mounting

The Temperature Sensor is mounted separately and requires a location away from the influence of chimneys, air conditioners, vents, tar roofs, concrete, and parking lots which can cause abnormal temperature fluctuations. Usually a separation of at least 20-30 feet horizontally and 8 feet vertically is required to achieve this. Locations where air movement is restricted are also unsatisfactory.

A first-choice sensor location is a north eave or northern exposure away from direct sun light and above grass. This location gives extra stability and accuracy to the sensor because of the added shading usually obtained on a northern exposure.

The second choice for locating a temperature sensor is on the display itself, or somewhere on the display structure. A light-colored display is preferred in this application. Location of the sensor should be above, below, or on a northern edge of the display to try to keep the sensor shaded. If mounting above the display, a minimum height above of 6 feet is required. If mounting below the display, a minimum of 8 feet above ground and a minimum of 1 foot between sensor and display is required. Greater accuracy is obtained if there is grass below the sign rather than concrete or some other material.

A 2 pair, individually shielded cable (Belden 5594, Dak. P.N. W-1234) is used to connect the sensor to the display controller. Maximum length is 1000 feet.

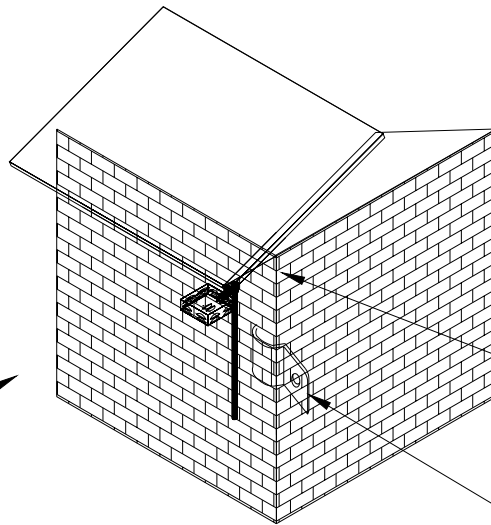
Directions

1. Run ½" conduit from the sensor location to the controller where the sensor cable is to be attached. The cable must be routed thru ½" metal conduit which should be earth grounded to help protect the sensor and controller from lightning damage.
2. Power down the controller where the sensor cable is to be attached.
3. Connect the cable to the temperature sensor terminal block as follows:

RED = V+	BLK = GND
GRN = P	WHT = N
4. Install the mesh screen with the four screws enclosed.
5. Connect the cable to the display controller as described in the controller installation manual.
6. Power up the controller.

THERE SHOULD BE AT LEAST 1 FT BETWEEN THE BOTTOM OF THE EAVE AND THE TOP OF THE TEMP SENSOR HOUSING FOR ACCURATE READINGS.

TEMP SENSOR HOUSING
(SUPPLIED BY DAKTRONICS)



CONDUIT OUTLET BODY
(SUPPLIED BY DAKTRONICS)

INSURE THAT CONDUIT IS SUPPORTED AT TOP END NEAR SENSOR.

1/2" CONDUIT
(SUPPLIED BY CUSTOMER)

EAVE/WALL MOUNT

BOTTOM OF DISPLAY

1 FT OF 1/2" CONDUIT
(SUPPLIED BY CUSTOMER)

MOUNTING TO THE TOP OF THE DISPLAY IS DONE IN THE SAME MANNER EXCEPT THE CONDUIT HAS TO BE 6 FT LONG.

TEMP SENSOR HOUSING
(SUPPLIED BY DAKTRONICS)

CONDUIT OUTLET BODY
(SUPPLIED BY DAKTRONICS)

MOUNTING TO BOTTOM OF DISPLAY

THE CONCEPTS EXPRESSED AND DETAILS SHOWN ON THIS DRAWING ARE CONFIDENTIAL AND PROPRIETARY. DO NOT REPRODUCE BY ANY MEANS, INCLUDING ELECTRONICALLY WITHOUT THE EXPRESSED WRITTEN CONSENT OF DAKTRONICS, INC. COPYRIGHT 2003 DAKTRONICS, INC.

DAKTRONICS, INC. BROOKINGS, SD 57006

2	27DEC99	CLEANED UP DRAWING.	NJA	
1	19AUG98	ADDED CONDUIT CLAMP FOR EAVE/WALL MOUNT	JRT	
REV.	DATE	DESCRIPTION	BY	APPR.

PROJ:			
TITLE:	TEMP SENSOR MOUNTING		
DES. BY:	DRAWN BY: NJA	DATE: 20 MAR 96	
REVISION	APPR. BY:	1151-R11A-79767	
	SCALE: NONE		

Light Detector Mounting

Tools needed:

- Small standard screwdriver
- Medium standard screwdriver
- Drill
- 13/16" drill bit
- Ratchet

Directions

1. Turn off the power to the display and to the controller.
2. Drill a 13/16" hole in cabinet where sensor is to be located, either bottom or side.
3. Disassemble the sensor.
4. Place threaded nipple in hole from inside of the display, attach the conduit outlet body to the nipple. If bottom mount, use the hole in back of conduit body, (Figure C). If side mount use the hole in the side of the conduit body, (Figure D). **Make sure the opening of the conduit outlet body faces the ground.**

☞ **EXCEPTION!** If LED display, use side hole of conduit body only (Figures E & F). **Make sure the opening of the conduit outlet body faces in the direction that the display faces.**
5. Route the cable from the controller thru the conduit body and cut the cable to the desired length. Leave approximately 2 feet extra cable to work with.
6. Attach wires to sensor as shown in figure A.

Red = + V	Blk = Gnd
Grn = P	Wht = N
7. Attach the lens to the sensor and then to the conduit body and push the excess cable thru the conduit body and back into the display.
8. Use the ratchet to put the plug into the hole not used.
9. Attach the cable to the display/controller per display/controller instructions.
10. Restore all power.

☞ **NOTE:** If locating the sensor somewhere other than attached to the display, the conduit outlet body is made to attach to 1/2" conduit. The specified cable is a 2 pair, individually shielded cable (Belden 5594, Dak. P.N. W-1234) and the maximum cable length is 1000 feet. The cable should be run in 1/2" conduit and the conduit should be earth grounded to help protect the sensor from lightning damage.

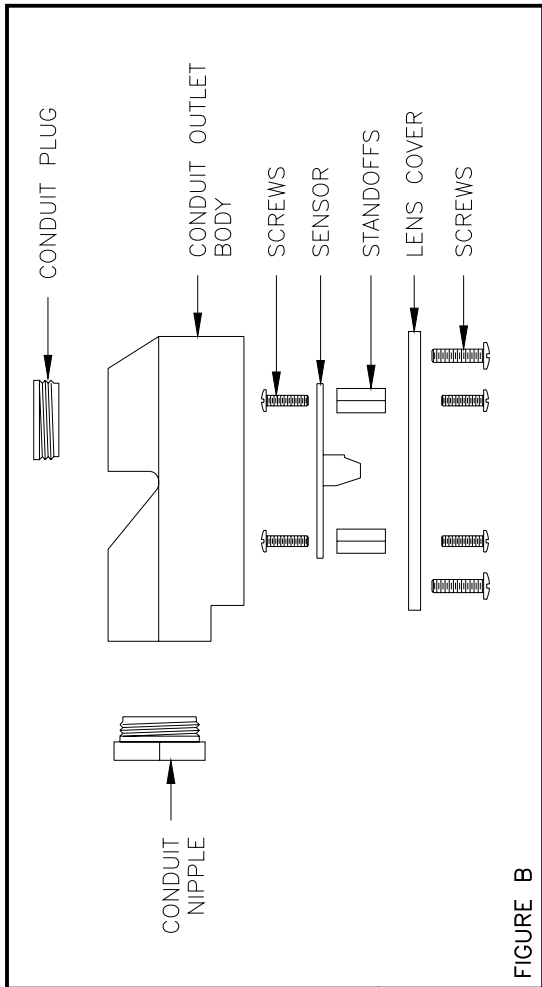


FIGURE B

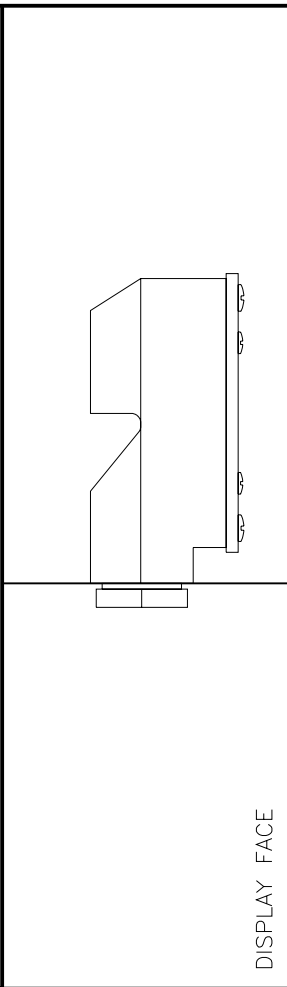


FIGURE D

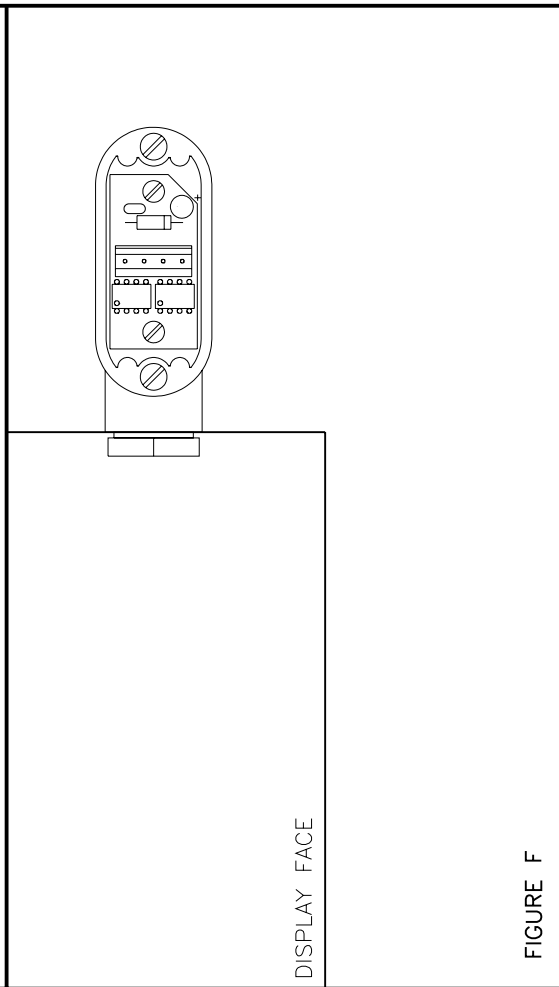


FIGURE F

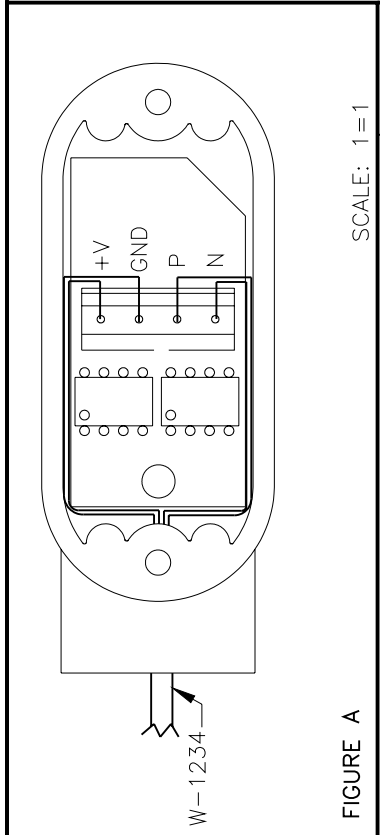


FIGURE A

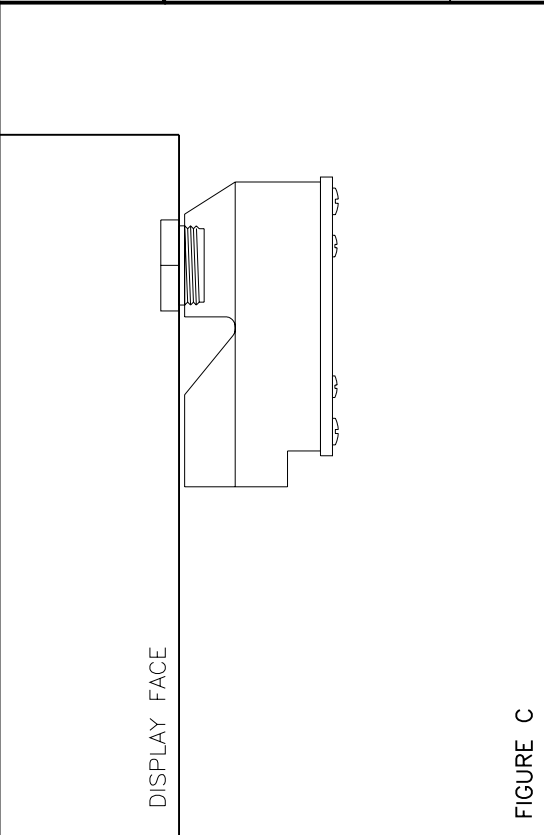


FIGURE C

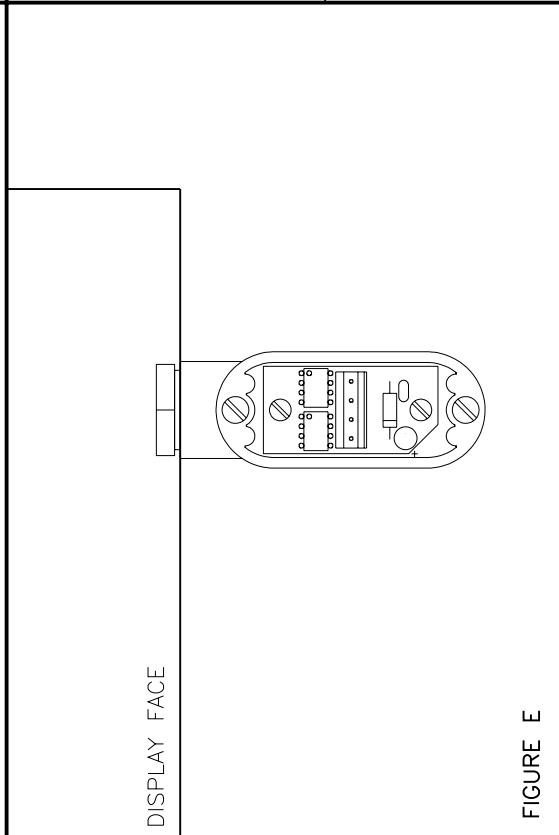


FIGURE E

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ:

TITLE: LIGHT DETECTOR MOUNTING

DES. BY:

DRAWN BY: CIVERSEN

DATE: 7 MAR 96

REVISION

APPR. BY:

SCALE: 1=1

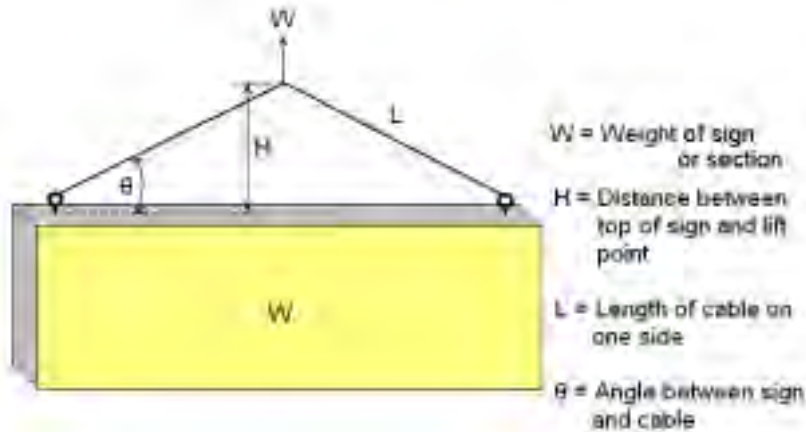
1151-R11A-79768

REV.	DATE	DESCRIPTION	BY	APPR.
1	06MAY97	ADDED W-1234 CABLE AND WIRING TO FIGURE A FOR INSTALLATION PURPOSES	RLONG	

Eyebolts

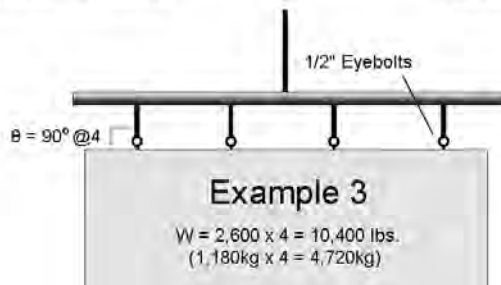
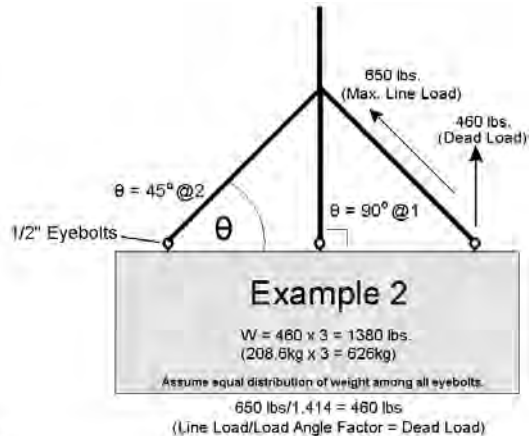
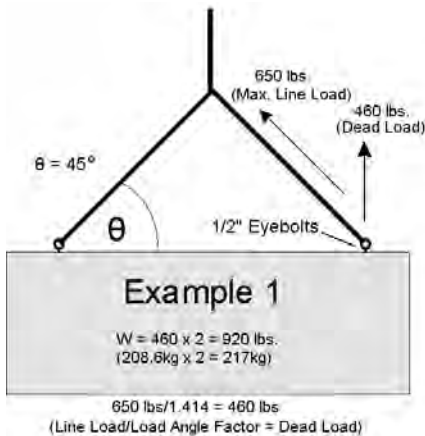
Almost every display that leaves Daktronics is equipped with eyebolts for lifting the display. There are two standard sizes of eyebolts: 1/2" and 5/8".

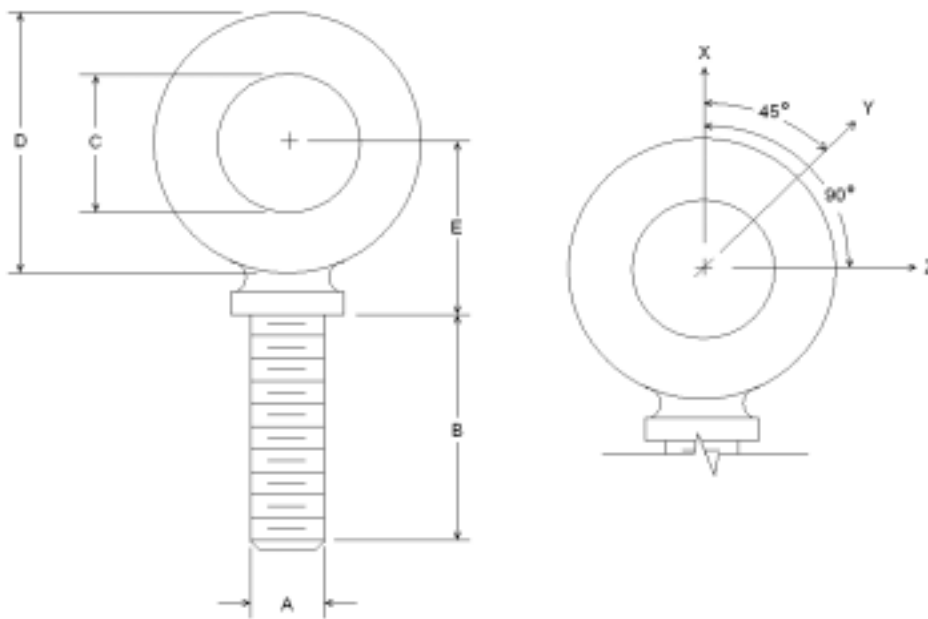
Load Increase Factor: The load increases as the lift angle (θ) decreases. The allowable load on the eyebolts also decreases with the lift angle due the bending stress on the eyebolts. In sum, the smaller the angle between the cable and the top of the display, the lighter the sign must be to safely lift it. *Do NOT attempt to lift the display when the lift angle is less than 30 degrees.*



Horizontal Angle	Load Angle Factor (L/H)
90	1.00
60	1.155
50	1.305
45	1.414
30	2.00

θ	1/2"		5/8"	
	Line Load	Weight/Anchor	Line Load	Weight/Anchor
90	2600	2600	4000	4000
60	1500	1299	3300	2858
45	650	460	1000	707
30	520	260	800	400





A	B	C	D	E	No.	Min. Proof Load (lbs.)	Min. Break Load (lbs.)	Stocked	Min. Eff. Thrd. Length	Line Loads		
										Wx	Wy	Wz
1/4	1	3/4	1-3/16	25/32	21	600	2,000	Blank 1/4-20	7/8	400	100	80
3/8	1-1/4	1	1-21/32	1-3/16	23	2,100	5,000	Blank 3/8-16	1-1/8	1,400	350	250
1/2	1-1/2	1-3/16	2-1/16	1-13/32	25	3,900	9,200	Blank 1/2-13	1-11/32	2,600	650	520
9/16	1-5/8	1-9/32	2-13/16	1-17/32	26	4,500	11,830	Blank 9/16-12	1-3/8	3,000	750	600
5/8	1-3/4	1-3/8	2-1/2	1-11/16	27	6,000	14,700	Blank 5/8-11	1-9/16	4,000	1,000	800
3/4	2	1-1/2	2-13/16	1-13/16	28	9,000	21,700	Blank 3/4-10	1-5/8	6,000	1,500	1,200
7/8	2-1/4	1-11/16	3-1/4	2-1/16	29	10,000	30,000	Blank 7/8-9	1-13/16	6,600	1,670	1,330
1	2-1/2	1-13/16	3-9/16	2-5/16	30	12,000	39,400	Blank 1-8	2-1/16	8,000	2,000	1,600
1-1/2	3-1/2	2-9/16	5-1/2	3-5/32	34	27,000	91,300	Blank 1-1/2-6	3	17,800	4,500	3,600

- A. Do not use eyebolts on angular lifts unless absolutely necessary. For angular lifts, the shoulder pattern eyebolt is preferred.
- B. Load should always be applied to eyebolts in the plane of the eye, not at some angle to this plane.
- C. Shoulder eyebolts must be properly seated (should bear firmly against the mating part), otherwise the working loads must be reduced to those indicated for regular eyebolts. A washer or spacer may be required to put the plane of the eye in the direction of the load when the shoulder is seated.
- D. No load greater than the safe working load listed in the data table should be used.
- E. To obtain the greatest strength from the eyebolt, it must fit reasonably tight in its mounting hole to prevent accidental unscrewing due to twist of cable.
- F. Eyebolts should never be painted or otherwise coated when used for lifting. Such coatings may cover potential flaws in the eyebolt.
- G. To attain the safe working loads listed for regular eyebolts, 90% of the thread length must be engaged.

Appendix C: Forms & Reports

Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

* Assuming the display is operated 18 hours per day and is turned off when not in use.

** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Maintenance Checklist

1½ Inch and 2½ Inch Displays

This form can be used as both as a maintenance guide and a record of maintenance performed. Store these forms in maintenance file as they are completed. Each form is designed to cover one year of maintenance.

Circle the operational year to which this form applies	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Maintenance Procedures

1. Check fans at 1,500 hour intervals to ensure proper operation. With display power off, clean dust from blades and spin the blades with a pen or pencil to make sure the bearings are free and the fan is still 'in balance.
2. Check the filters at 1,500 hour intervals. Check the filter for excessive dust/dirt buildup and for damage, such as holes, which may allow unfiltered air into the display.
3. Check line and lamp voltage every 4,500 hours or whenever a significant change occurs in the area that could affect line voltage. Refer to the Electrical Installation section of the Installation and Maintenance Manual for more information.
4. At least once each 9,000 operational hours check the inside of the display, including the circuit boards, for signs of water intrusion such as water stains. Water may enter the display due to any of the following:
 - Loose or deteriorating weather stripping.
 - Loosened fasteners which allow gaps to open between panels.
 - Weak seals around hardware, such as eye bolts, on the top of the display.
5. At least once each 9,00 operational hours inspect the paint and check for signs of corrosion on the structure. Pay special attention to footings, structural tie points and ground rods. Fasteners should be tightened or replaced as required.

Operation Hours	Perform Above Steps Numbered	Date Performed	Checked By
1,500 Hrs * Day 83 * Day 62	1,2		
3,000 Hrs * Day 166 ** Day 125	1,2		
4,500 Hrs * Day 249 ** Day 187	1,2,3		
6,000 Hrs * Day 332 ** Day 250	1,2		
7,500 Hrs * Day 415 ** Day 312	1,2		
9,500 Hrs * Day 498 ** Day 365	1,2,3,4,5		

- * Assuming the display is operated 18 hours per day and is turned off when not in use.
- ** Assuming the display is operated 24 hours per day.

Consult the Installation and Maintenance Manual for additional Maintenance Details.



DAKTRONICS, INC.

P.O. Box 5128 331 32nd Ave. Brookings, SD 57006
 Phone (605) 697-4035 or (877) 605-1114 Fax (605) 697-4444
 www.daktronics.com e-mail helpdesk@daktronics.com



Installation Quality Checklist

1½ Inch and 2½ Inch Displays

Send 1 Copy (Front and Back of this Installation Quality Checklist to the Daktronics Address below.

Daktronics Customer Service
P.O. Box 5128
Brookings, SD 57006-51285

This checklist is intended to serve as a general guide during display installation. If this display is to operate in a dependable manner it must be installed properly. Date and initial each of the following tasks as they are completed. Because each installation site is unique, the tasks below may not necessarily be in the order in which they should be performed. If product quality concerns arise during check off, please note them on the back of this form or contact Daktronics Customer Service.

Contract/Work
 Order Number: _____

Display
 Serial Number: _____

Display
 Description: _____

✓ OK box if acceptable. ✓ Rej box if a deficiency is noted & correction is required.

OK	Rej	Initial	Date	
<input type="checkbox"/>	<input type="checkbox"/>			Inspect the display & all crates & boxes for any damage as they are unloaded at the site. Note any shipping damage on this form or notify Daktronics
<input type="checkbox"/>	<input type="checkbox"/>			Review the installation manual & installation procedures with the installation crew prior to beginning the installation work. Stress the importance of water tightness at all points.
<input type="checkbox"/>	<input type="checkbox"/>			Check the display mounting structure to ensure a straight & square mounting frame for the display. The height variation in any 4 foot horizontal should not exceed ¼ inch. This check should be done well in advance of the scheduled installation to allow for repairs if necessary.
<input type="checkbox"/>	<input type="checkbox"/>			Mount the display as per the engineering plan & shop drawing. If the display is shipped in sections, ensure that the sections were bolted together vertically & horizontally.
<input type="checkbox"/>	<input type="checkbox"/>			If eyebolts are removed, plug the holes with bolts & the rubber water sealing washer which was removed with the eyebolt. Plug & silicone around any hole or openings in the top of the display.
<input type="checkbox"/>	<input type="checkbox"/>			Inspect the top & side front shrouds for weather tightness. If the shrouding has been field attached, ensure it was done per the engineering drawing. All shroud overlaps must be siliconed.
<input type="checkbox"/>	<input type="checkbox"/>			Note that there are drain holes in the bottom on the display. There should be a minimum of ½ inch clearance between these holes & any mounting surface.
<input type="checkbox"/>	<input type="checkbox"/>			Check the spacing between modules of sectional displays with the 0.032 feeler gauge. Also check the weather stripping tightness with the feeler gauge (OM-69133).
<input type="checkbox"/>	<input type="checkbox"/>			Check the lens to see if they are secured properly & that the rows of louvers are in proper alignment with each other. Ensure that all lampbanks are secured properly & all lamps are the focal point of the reflector.
<input type="checkbox"/>	<input type="checkbox"/>			During assembly of sectional displays, check the interconnect ribbon cables at the splice locations to ensure they are not pinched.
<input type="checkbox"/>	<input type="checkbox"/>			Use electrical contact cleaner (Daktronics part number CH-1015) to clean the 16 & 20 pin connectors any time a ribbon cable is removed during installation. Use electrical contact lubricant & protector (CH-1019) to protect the connector from moisture.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that all electrical entrance connections are watertight.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that each load center is properly earth grounded as per National Electrical Code. Refer to the grounding information in the Electrical Installation section of the manual.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that the supply voltage rating matches the voltage rating of the display.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that all cooling fans are operational after the initial fire up of the display.

OK	Rej	Initial	Date
<input type="checkbox"/>	<input type="checkbox"/>		Monitor display voltage per the Line Voltage and 24-Hour Monitoring instructions in the Electrical Installation section of the manual. Fill out and complete both copies of DF-1796 (Display Power Report). Send one copy of the form to Daktronics customer service & keep one copy of the report for your records.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that the display controller is set to have the lamp level on bright during the daylight hours.
<input type="checkbox"/>	<input type="checkbox"/>		If any modifications have been made to the Daktronics air filtration system, ensure that these changes have been approved by the Daktronics Engineering Staff.
<input type="checkbox"/>	<input type="checkbox"/>		If displays are mounted back to back inside a center cabinet, adequate clearance must be provided between the rain shields to provide for proper air flow to all ventilation fans. Ensure that this clearance has been approved by the Daktronics Engineering staff.
<input type="checkbox"/>	<input type="checkbox"/>		In enclosed display situations, ensure that 12 square inches of unobstructed opening is provided for each module. Allowances must be made to compensate for the percentage of screen or any other material covering the ventilation opening in the enclosed structure.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that all wiring clears the bottom of the display by a minimum of 1/2" and is not in contact with any sharp edges.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that the backsheets of rear access displays are removable and are not obstructed by conduit or support structure members.
<input type="checkbox"/>	<input type="checkbox"/>		On displays with bottom ventilation, 2 1/2" of clearance between the bottom of the display & any other display/obstruction is required for air intake & filter maintenance.

I certify that all items listed above have been checked and approved.

Signature of Installer

Date

Signature of Owner/Owner Rep

Date

Owner's signature signifies they have been shown the installation checklist and the periodic maintenance located in the manuals. The owner also understands the importance of air filter and fan maintenance. When customer service receives this completed form, they will send the first set of replacement air filters to the customer at no charge.

Comments

Items rejected and later corrected, and the person making the correction

Return one copy of the installation checklist to Daktronics at the address listed on the front of this form!

Customer Service will Route Copies to the Following:

1 Copy – Customer Service File

1 Copy – Project Manager File

1 Copy – Product Manager

Installation Quality Checklist

1½ Inch and 2½ Inch Displays

Send 1 Copy (Front and Back of this Installation Quality Checklist to the Daktronics Address below.

Daktronics Customer Service
P.O. Box 5128
Brookings, SD 57006-51285

This checklist is intended to serve as a general guide during display installation. If this display is to operate in a dependable manner it must be installed properly. Date and initial each of the following tasks as they are completed. Because each installation site is unique, the tasks below may not necessarily be in the order in which they should be performed. If product quality concerns arise during check off, please note them on the back of this form or contact Daktronics Customer Service.

Contract/Work
 Order Number: _____

Display
 Serial Number: _____

Display
 Description: _____

✓ OK box if acceptable. ✓ Rej box if a deficiency is noted & correction is required.

OK	Rej	Initial	Date	
<input type="checkbox"/>	<input type="checkbox"/>			Inspect the display & all crates & boxes for any damage as they are unloaded at the site. Note any shipping damage on this form or notify Daktronics
<input type="checkbox"/>	<input type="checkbox"/>			Review the installation manual & installation procedures with the installation crew prior to beginning the installation work. Stress the importance of water tightness at all points.
<input type="checkbox"/>	<input type="checkbox"/>			Check the display mounting structure to ensure a straight & square mounting frame for the display. The height variation in any 4 foot horizontal should not exceed ¼ inch. This check should be done well in advance of the scheduled installation to allow for repairs if necessary.
<input type="checkbox"/>	<input type="checkbox"/>			Mount the display as per the engineering plan & shop drawing. If the display is shipped in sections, ensure that the sections were bolted together vertically & horizontally.
<input type="checkbox"/>	<input type="checkbox"/>			If eyebolts are removed, plug the holes with bolts & the rubber water sealing washer which was removed with the eyebolt. Plug & silicone around any hole or openings in the top of the display.
<input type="checkbox"/>	<input type="checkbox"/>			Inspect the top & side front shrouds for weather tightness. If the shrouding has been field attached, ensure it was done per the engineering drawing. All shroud overlaps must be siliconed.
<input type="checkbox"/>	<input type="checkbox"/>			Note that there are drain holes in the bottom on the display. There should be a minimum of ½ inch clearance between these holes & any mounting surface.
<input type="checkbox"/>	<input type="checkbox"/>			Check the spacing between modules of sectional displays with the 0.032 feeler gauge. Also check the weather stripping tightness with the feeler gauge (OM-69133).
<input type="checkbox"/>	<input type="checkbox"/>			Check the lens to see if they are secured properly & that the rows of louvers are in proper alignment with each other. Ensure that all lampbanks are secured properly & all lamps are the focal point of the reflector.
<input type="checkbox"/>	<input type="checkbox"/>			During assembly of sectional displays, check the interconnect ribbon cables at the splice locations to ensure they are not pinched.
<input type="checkbox"/>	<input type="checkbox"/>			Use electrical contact cleaner (Daktronics part number CH-1015) to clean the 16 & 20 pin connectors any time a ribbon cable is removed during installation. Use electrical contact lubricant & protector (CH-1019) to protect the connector from moisture.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that all electrical entrance connections are watertight.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that each load center is properly earth grounded as per National Electrical Code. Refer to the grounding information in the Electrical Installation section of the manual.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that the supply voltage rating matches the voltage rating of the display.
<input type="checkbox"/>	<input type="checkbox"/>			Ensure that all cooling fans are operational after the initial fire up of the display.

OK	Rej	Initial	Date
<input type="checkbox"/>	<input type="checkbox"/>		Monitor display voltage per the Line Voltage and 24-Hour Monitoring instructions in the Electrical Installation section of the manual. Fill out and complete both copies of DF-1796 (Display Power Report). Send one copy of the form to Daktronics customer service & keep one copy of the report for your records.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that the display controller is set to have the lamp level on bright during the daylight hours.
<input type="checkbox"/>	<input type="checkbox"/>		If any modifications have been made to the Daktronics air filtration system, ensure that these changes have been approved by the Daktronics Engineering Staff.
<input type="checkbox"/>	<input type="checkbox"/>		If displays are mounted back to back inside a center cabinet, adequate clearance must be provided between the rain shields to provide for proper air flow to all ventilation fans. Ensure that this clearance has been approved by the Daktronics Engineering staff.
<input type="checkbox"/>	<input type="checkbox"/>		In enclosed display situations, ensure that 12 square inches of unobstructed opening is provided for each module. Allowances must be made to compensate for the percentage of screen or any other material covering the ventilation opening in the enclosed structure.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that all wiring clears the bottom of the display by a minimum of 1/2" and is not in contact with any sharp edges.
<input type="checkbox"/>	<input type="checkbox"/>		Ensure that the backsheets of rear access displays are removable and are not obstructed by conduit or support structure members.
<input type="checkbox"/>	<input type="checkbox"/>		On displays with bottom ventilation, 2 1/2" of clearance between the bottom of the display & any other display/obstruction is required for air intake & filter maintenance.

I certify that all items listed above have been checked and approved.

Signature of Installer

Date

Signature of Owner/Owner Rep

Date

Owner's signature signifies they have been shown the installation checklist and the periodic maintenance located in the manuals. The owner also understands the importance of air filter and fan maintenance. When customer service receives this completed form, they will send the first set of replacement air filters to the customer at no charge.

Comments

Items rejected and later corrected, and the person making the correction

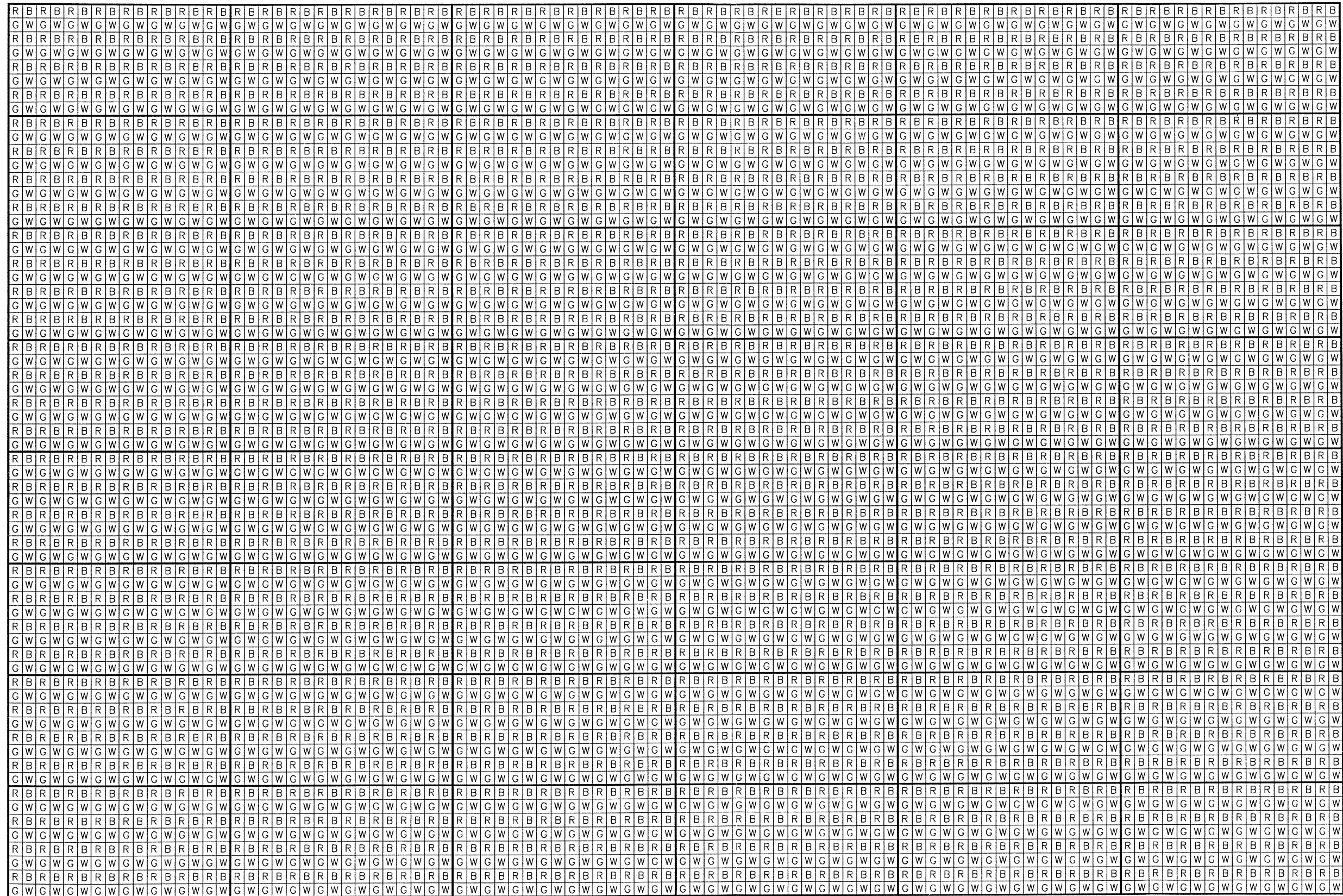
Return one copy of the installation checklist to Daktronics at the address listed on the front of this form!

Customer Service will Route Copies to the Following:

1 Copy – Customer Service File

1 Copy – Project Manager File

1 Copy – Product Manager



DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: DIGAL, 5.A. de C.V.

TITLE: FORM, ALL LENS LAMP TEST

DES. BY: WOELZKE

DRAWN BY: JRT

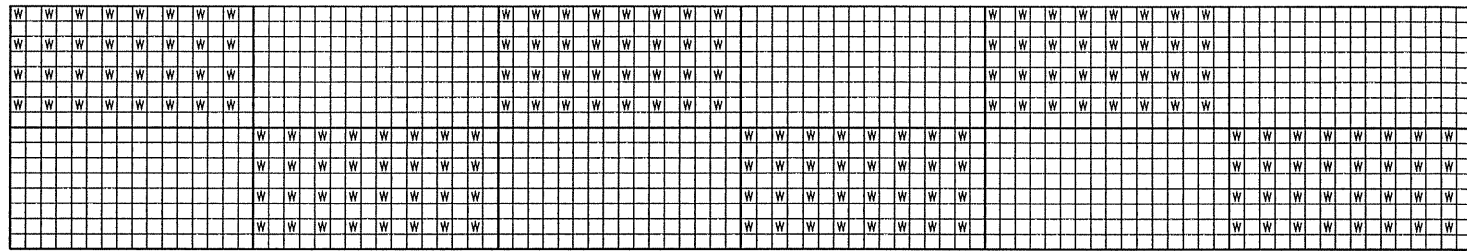
DATE: 04FEB91

APPR. BY:

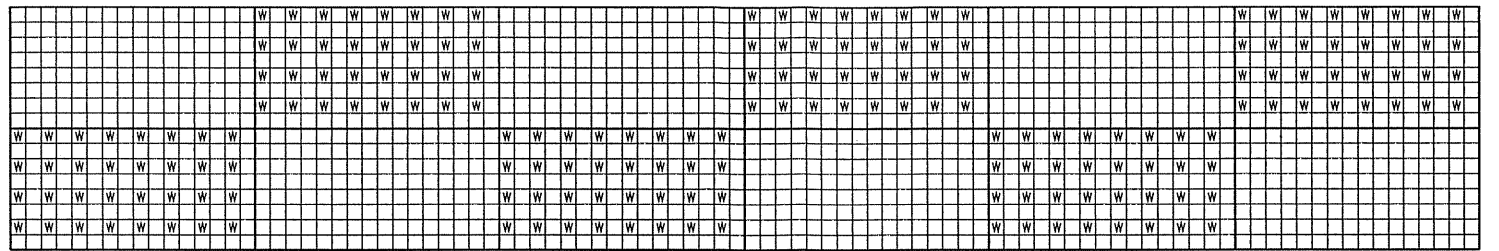
SCALE: 1=1.5

4457-R11B-46049

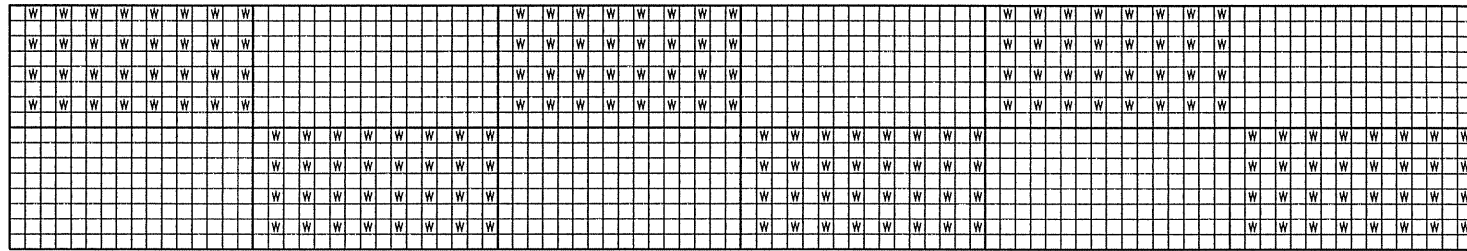
REV.	DATE	DESCRIPTION	BY	APPR.
1	14 APRIL 99	RESCALED DWG, UPDATED BORDER	JEM	JEM



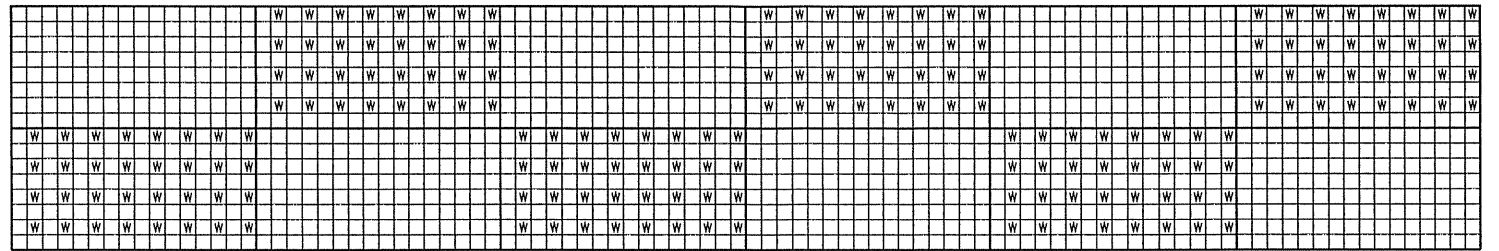
FRAME 1



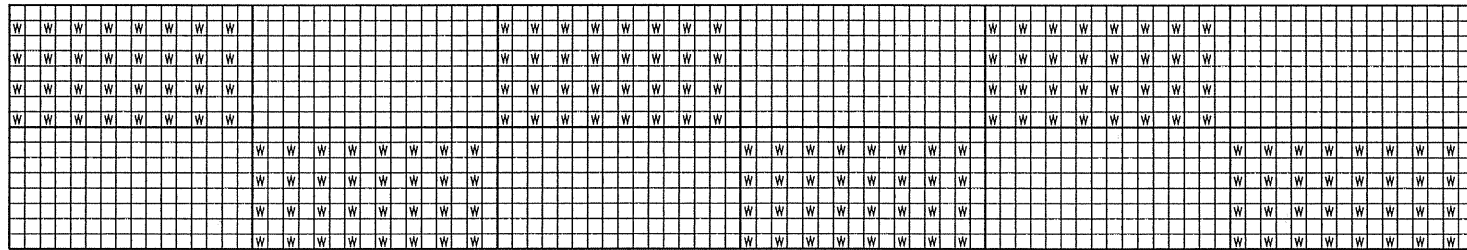
FRAME 2



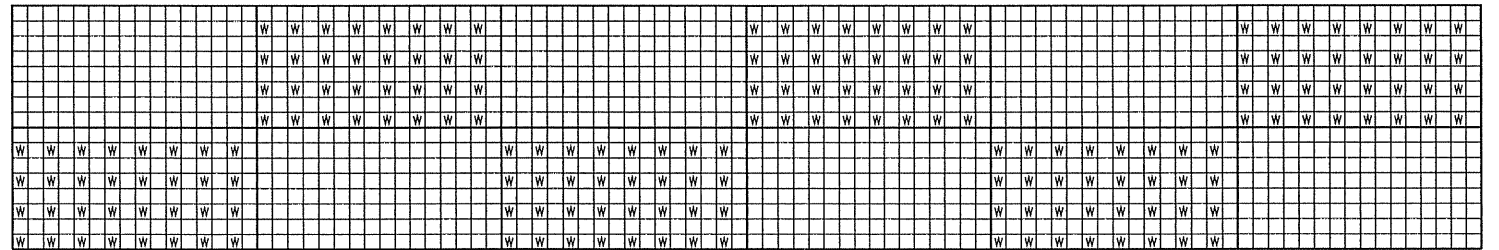
FRAME 3



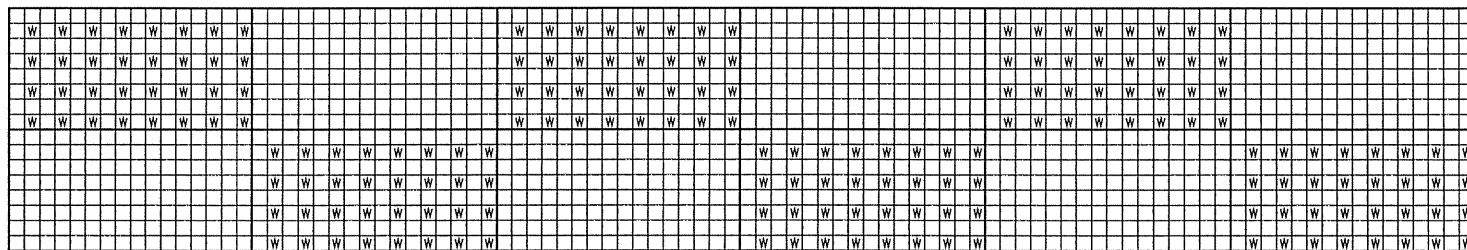
FRAME 4



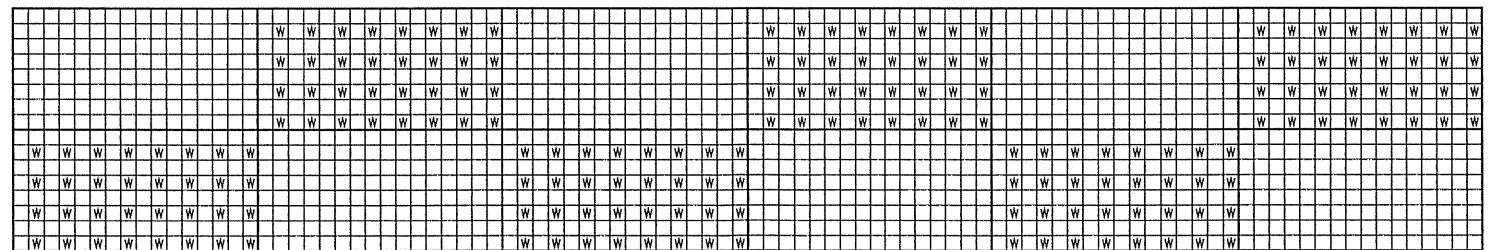
FRAME 5



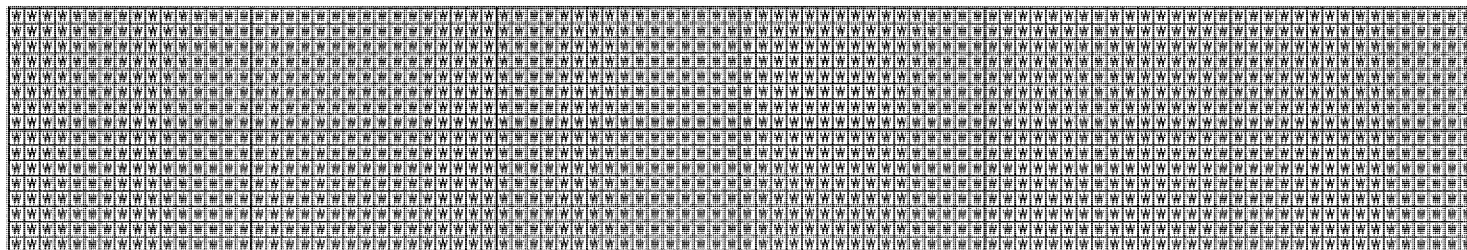
FRAME 6



FRAME 7



FRAME 8



ALL LENS LAMP TEST

NOTES:

1. REFER TO THE LAMP TESTING SECTION OF THE MAINTENANCE MANUAL FOR COMPLETE INSTRUCTIONS IN THE USE OF THIS FORM.
2. PICK "LAMP TEST" FROM THE CONTROLLER MENU.
3. THE FRAME NUMBER WILL CHANGE AUTOMATICALLY EVERY 20 SECONDS.
4. THE FRAME CAN BE PAUSED BY SELECTING "SINGLE STEP". REFER TO YOUR CONTROLLER MANUAL FOR SPECIFIC INSTRUCTIONS.

DAKTRONICS, INC. BROOKINGS, SD 57006	
PROJ: 1500 SERIES OUTDOOR MESSAGE BOARDS	
TITLE: 16X96 MONOCHROME LAMP TEST FORM	
DES. BY:	DRAWN BY: JRT DATE: 19JUN95
REVISION	APPR. BY: 1089-R11B-71877
SCALE: 1=3	

REV.	DATE	DESCRIPTION	BY	APPR.
1	07-06-95	SCALED FRAMES UP	MM	