Series 1600
Small Matrix Displays
(120 Volt / 1.5 Inch)

Installation, Maintenance & Troubleshooting Manual

ED-10941

ED-10941
Product#1176
Rev. 3 – 3 April 2001

Display Serial #_____

Display Model #_____

Date Installed _____

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

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Section 1 : Introduction

1.1 How To Use This Manual

This manual explains the installation and maintenance of Daktronics 1.5″ Lens 1600 Series Outdoor Incandescent Matrix Displays. It also provides guidance for mounting, wiring and maintaining these displays. The manual is broadly divided into mechanical, electrical and maintenance sections.

☞ Important Safeguards:

1. Read and understand the installation instructions before beginning the installation process.
2. Do not drop the control equipment or allow it to get wet.
3. Do not disassemble the control console or the electronic controls of the display. Failure to follow this safeguard will void the warranty.
4. Disconnect display power when not in use or when servicing.

The box below is an illustration of 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 title box in the lower right corner of the drawing. This manual will refer to drawings by calling out the last set of digits and the letter preceding them. In the example below, the drawing would be referred to as **Drawing A-69945**. **Reference drawings will be inserted at the end of the section in which they are first referenced.**

✎ **Note**: On the cover of this manual, fill in the date which the display was installed, the model number and serial number of the display. (This information is found on the specifications label, located on the front of the display at the left end.) Have this information available when calling Daktronics Customer Service; it will ensure that your request is serviced in a timely manner.

1.2 Display Overview

The Series 1600 displays utilize a proprietary lens system, making them the brightest, sharpest color display systems available. They have been designed and manufactured for performance, reliability, easy maintenance and long life.

Daktronics displays are furnished with filters to clean the air before it passes 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.
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 assist with the display installation and assure its dependable operation. Make sure each item listed on the checklist is acted upon. If product quality concerns are noticed during the check-off, please note them on the back of the form or call Daktronics Customer Service. Listed items may not necessarily be in the order in which they should be performed.

Two copies of the Series 1600 Display Power Report are in **Appendix C**. Complete these forms and return one copy to Daktronics Customer Service. Keep the other copy with the maintenance manual for a permanent record.

There are ten copies of the Maintenance Checklist in **Appendix C**. Perform all the maintenance procedures on this checklist. A list at the bottom of the form provides 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
8x16 Lens Reflector Assembly	The 8x16 lens reflector assembly consists of reflectors, lenses and louvers. The entire assembly can easily be removed for maintenance.
Column	A vertical group of pixels.
Com Port	A *Com Port* is a connector on the back of the controller PC. The Com Port is used to communicate to the sign network through either a 9 or 25 pin serial connector.
Display Configuration	*Display configuration* 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.
Fan Control Circuit	The fan control circuits provide power to the fans. The thermostats monitor fan operation and are connected through the control enclosure to the controller. If the display is blanked from the controller for one-half hour, the controller switches a relay which turns off the fans.
Fiber Optic	A standard communication method using light (signal) transmitted through a glass fiber. Fiber optic cable has a maximum length of 2,000 feet. A signal converter may be required. This communication method is used in both Venus 1500 and Venus 4600 Systems.
Lampbank	A lampbank is a circuit board containing an array of lamps, 8 pixels high by 16 pixels wide with electronics to drive the lamps and turn them on and off.
Louver	Black aluminum louvers are positioned above each row of lamps to provide contrast and help direct light.
Marquee Display	Marquee type displays have an estimated lamp life of 17,000 hours with a line voltage of 120 volts at the 120 volt tap on the transformer.

Modem	A standard communication method that utilizes standard phone transmission lines, and is an option with the Venus 1500 System.
Module	A module consists of a lampbank, 8 pixels high by 16 pixels wide, with an 8x16 removable lens/reflector assembly attached to the front of the lampbank with latches. One module is powered by one transformer
Pixel	A pixel is a single point of light produced by a single lamp. Groups of pixels can be arranged to form words, 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.
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 5,466 hours with a line voltage of 120 volts at the 120 volt tap in conjunction with the 10 volt boost windings.
Serial Line Interface	Similar to a display controller, but used in conjunction with the Venus 4600 controller.
Sign Address	The *sign address* 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 *signal converter* is a Daktronics supplied unit which converts the data from RS232 to RS422. The signal converter is used in RS422 systems.
Starburst®	Starburst color displays use blue, red, green and white lenses. These lenses, combined with the proper interface, create 16.7 million shades of color.
SunSpot®	SunSpot displays use only one color lens - white. This display is capable of 64 shades of gray, if using a Venus 4600, or 1 monochrome gray if Venus 1500.
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

☞ Daktronics engineering staff must approve any changes that may affect the weather tightness of the display. This includes, but is not limited to the border shrouding, back sheets, cooling fans, fan filters and filler panels. *If ANY modifications are made to the weather tightness of the display, detailed drawings of the changes MUST BE submitted to our 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, of an independent (master) and a dependent (slave) display. On 2V displays, regardless of the controller type, signal interconnection will be required between multiple faces.

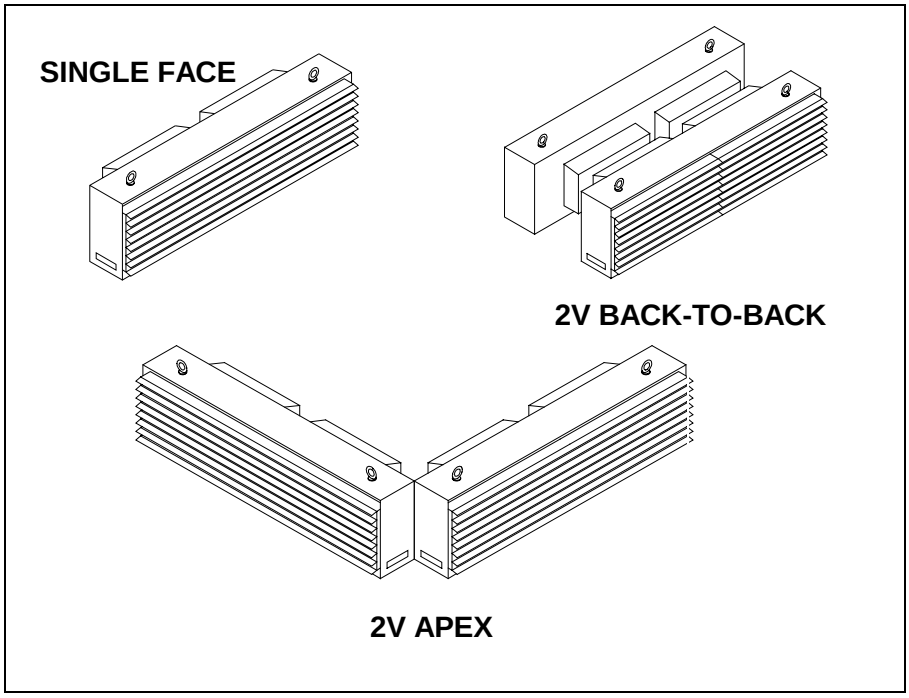


Figure 1: Sample Display Configurations

2.2 Eye Bolts

The top of the display will be equipped with eye bolts which are used to lift the display into position. 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 that may allow moisture to enter the display. If the lift eye bolts are 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 that may allow moisture to enter the display.

2.3 Cabinet Display Mounting

Reference Drawing: Mounting Example; Small Line Displays .... **Drawing A-101424**

Visually 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 1/32-inch. Also, inspect the mounting frame for areas that might yield once the display is in place. 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-101424 shows an example method of mounting cabinet displays to columns. Specific project mounting details will be included in **Appendix D** if applicable. Please contact Daktronics for additional mounting details and specifications.

It is the responsibility of the installer to ensure the installation will adequately meet local codes and standards. The mounting hardware and method is also the responsibility of the installer. Be sure to maintain a minimum of ½-inch clearance between all drain openings in the base of the sign and the mounting surface.

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

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

2.4 Display Ventilation Requirements (For Enclosed Displays)

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

In this display, 12 square inches of unobstructed opening per module is required to ensure adequate display cooling. Allowances must be made to compensate for the percentage of screen in the material covering the openings in the enclosed structure. If air must be forced into the enclosed area, 110 cubic feet per minute must be provided per module (one module = 12" x 24" display active area, or 8 rows x 16 columns of lamps).

For example, an 8x80 double face display enclosed with an enclosed center cabinet would require 120 square inches, or 0.83 square feet, of unobstructed opening in the bottom of the center cabinet.

2(8x80)/128=10 modules 10 modules x 12 square inches = 120 in^2 or .83 $feet^2$

In an 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 0.41 wg at 500 fpm.

2.5 Removing An 8x16 Module

Refer to **Section 4.1** for instructions regarding module removal and replacement.

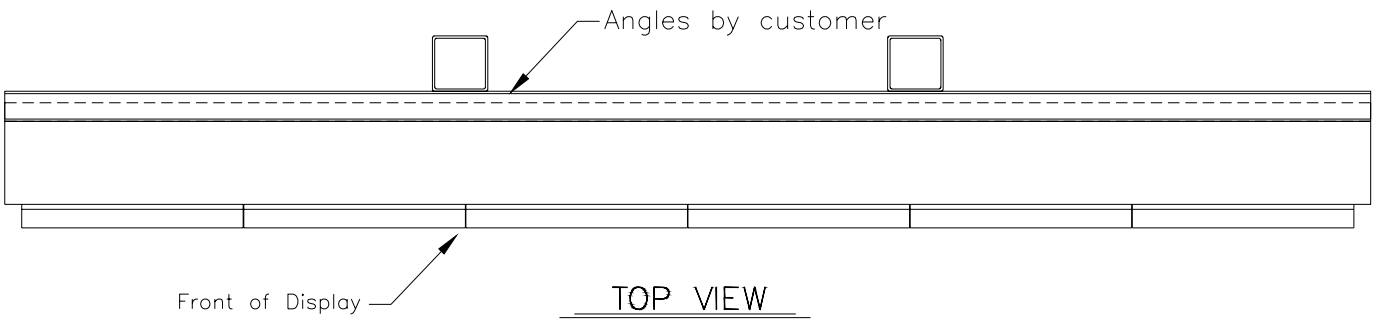
2.6 Properly Securing The Lens And Lens Assembly

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

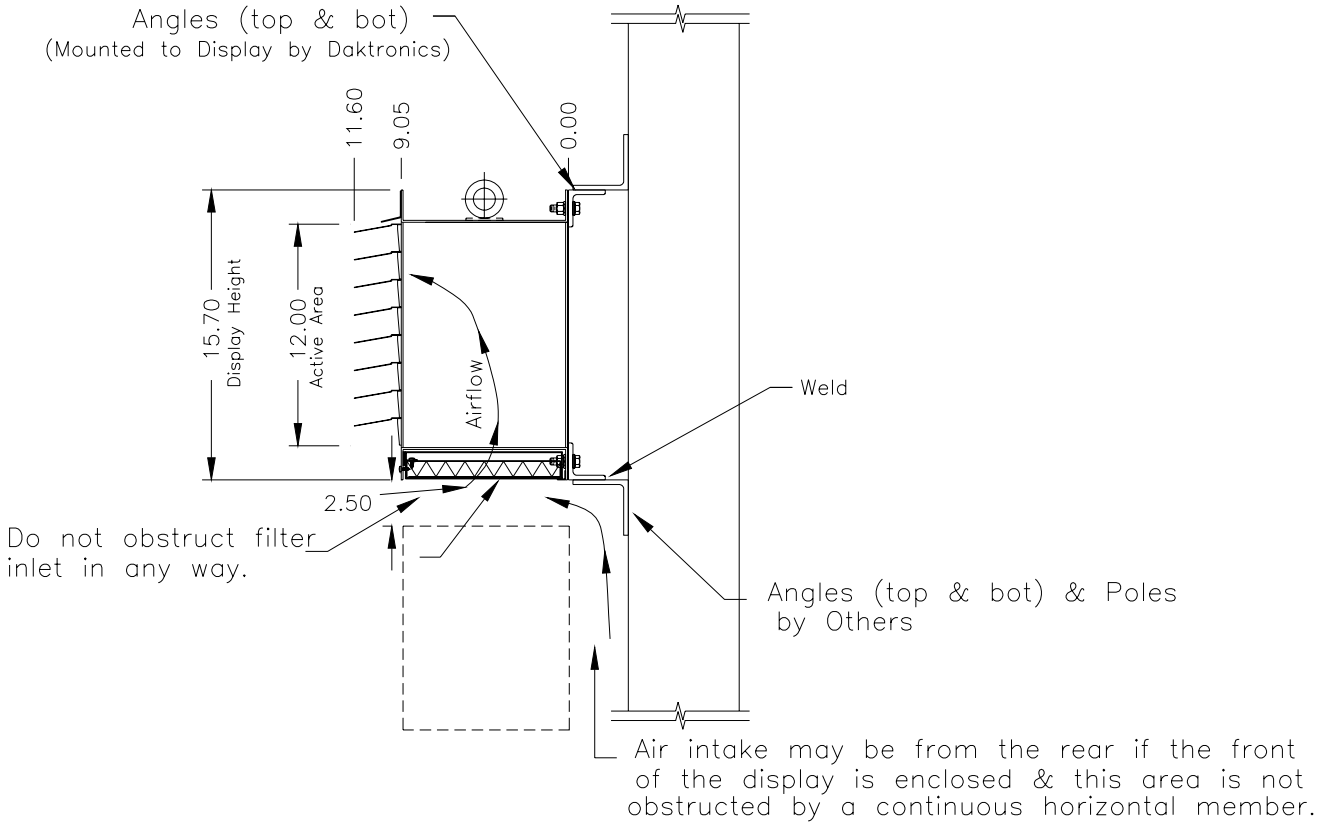
Look down the rows of louvers from either end of the display and ensure that all lenses are secured properly (refer to **Section 4.3**). Lenses that are not secured will be easily noticed as the lens removal tab or the lens itself will not be in alignment with the other lenses or lens removal tabs of 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 with the 0.032" feeler gauge provided. Insert the feeler gauge between the module and the top of the display.

1. 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.
2. If the feeler gauge moves freely or with very 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 the weather stripping of the module and the perimeter border.



TOP VIEW



SIDE VIEW
Scale: 1=10

Notes:

1. 2 1/2" of clearance between the bottom of the display & any other display/obstruction below is required for filter access & 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.

REV.	DATE	DESCRIPTION	BY	APPR.
3	29SEP99	CORRECTED 2.25 TO 2.50 FILTER CLEARANCE.	JRT	
2	27Jul98	ADDED NOTES.	JRT	
1	15APR98	ADD ACTIVE AREA & DISPLAY HEIGHT	JRT	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

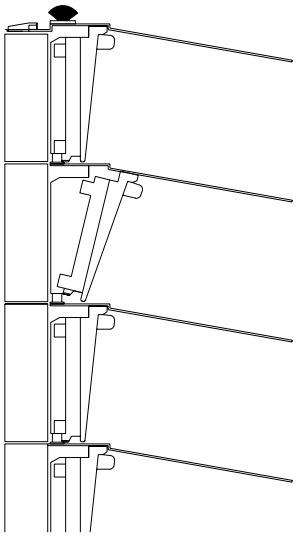
TITLE: MOUNTING EXAMPLE, SMALL LINE DISPLAYS

DES. BY: DRAWN BY: JRT DATE: 9APR98

REVISION APPR. BY:

SCALE: 1=20

1176-R10A-101424



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

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

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:

SCALE: 1=2

7000-P08A-75204

Section 3 : Electrical Installation

3.1 Grounding

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

➪ ***Displays MUST be grounded according to the provisions 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 it is 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.

☞ **Note: Requirements for surge protection are the sole responsibility of the customer!**

3.1.1. New Power Installations

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.

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.

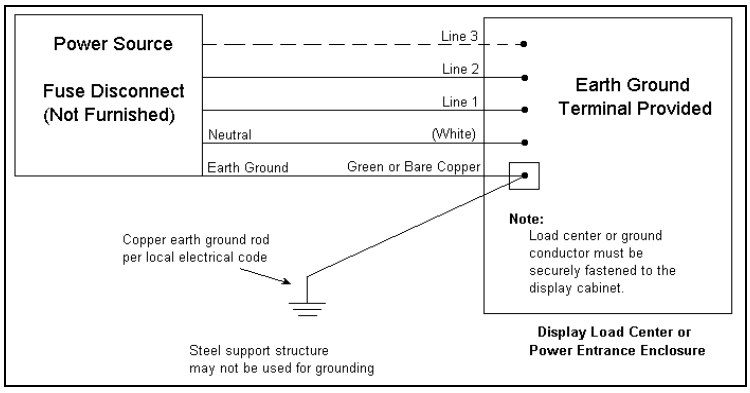


Figure 2: New Power Installation

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.**

Note that 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 must be ran from the terminal to an earth ground rod in accordance with local codes.

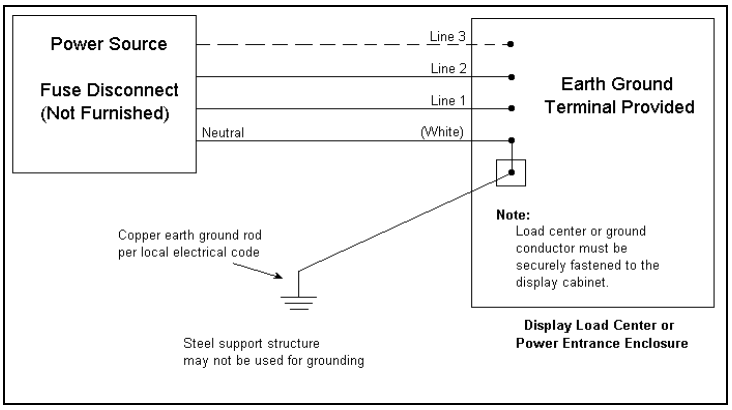


Figure 3: Existing Power Installation

3.2 Driver/ Module Numbering System

Displays are shipped with the internal signal and power harness connections completed. Each wire harness is labeled with a number that corresponds to the identification number of the module(s) to which it is connected. The following table shows an example of the module numbering system.

A101	A102	A103	A104	A105	A106
A201	A202	A203	A204	A205	A206
A301	A302	A303	A304	A305	A306

- The labeling reference begins with the left module and increments to the right.
- Some signs are multiple-faced. The letter **A** indicates that module is for sign face "A." The letter **B** would indicate sign face "B," etc.
- The hundreds digit indicates the display line number. A101 through A106 make up the first line of the display. A201 through A206 make up the second display line and so on.

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Reference Drawings: Power Term Panel Layout.....**Drawing A-103140**
Power Specifications.....**Drawing A-103186**

The power termination panel is located in the left end of the display (front view). Follow the instructions in **Section 4.1.1** to remove the far left module to access the termination panel. **Drawing A-103140** shows a typical power termination panels for either the master or the slave faces. 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 face. Connect power as stated below.

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-103186** 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. Connect 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 of TB41 for 120/240 single phase power and to L1, L2 and L3 of TB41 for 120/208 three phase power.
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.

3.4 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 8** in **Section 4.6.1.1**), 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**.

3.4.1 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.

3.4.2 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.

3.4.3 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.

3.4.4 Fiber (Venus 1500/Venus 4600 System)

This cable is a 4-fiber cable (Daktronics part number W-1376). Two of the fibers are used for display communications, and the other two are saved as spare fibers. This cable may be either direct burial or routed in conduit, but should not be subjected to mechanical flexing.

3.5 Signal Termination From Computer To Display

Reference Drawing: V1500 Signal Termination ..... **Drawing A-103727**

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 3.4**. Refer to the procedure that is appropriate for your display. **Drawing A-103727** illustrates Venus 1500 signal terminations for RS/232, RS/422, modem and fiber optic control cables.

3.5.1 RS/232 (Venus 1500 System)

Reference Drawing: Sys. Riser Diag. (232) ..... **Drawing A-103729**

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-103729**).

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 (GND)
TB41-1	Black	Pin 5 (RX-P)
		Pin 6 (N.C.)

3.5.2 RS/422 (Venus 1500 System)

Reference Drawing: Sys. Riser Diag. (422) ..... **Drawing A-103728**

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-103728**.

Signal Converter (J4/J5)	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)
	Shield (Bare)	N.C.

3.5.3 Modem (Venus 1500 System)

Reference Drawing: Sys. Riser Diag. (Modem) .... **Drawing A-103725**

Route conduit and telephone cable to the left end of the master display. Continue cable into controller box fitting labeled "Signal In." Remove the telephone terminal block cover and connect wire using standard telephone wire colors. Replace the cover. Plug the short telephone RJ-11 cable into the block and into the phone in RJ-11 jack of the modem board (refer to **Drawing A-103727** and **A-103725**).

3.5.4 Fiber

Reference Drawing: Sys. Riser Diag. (Fiber) ..... **Drawing A-103730**
Sys. Riser Diag. (S.L.I.) ..... **Drawing A-103731**
S.L.I. Signal Terminations .... **Drawing A-103740**

Route conduit and fiber cable from the PC to the left end of the master display. Continue fiber to the controller box. Refer to proper section below. Maximum fiber optic cable run should not exceed 2000 feet.

3.5.4.1 Venus 1500 System

Route fiber into controller box fitting labeled signal in. Terminate fiber. Plug fiber ends into RX In and TX IN as shown in **Drawing A-103727** in **Section 3.5.1**. Terminate fiber at PC and plug corresponding colors into signal converter (Daktronics Part Number 0A-1127-0239) as shown below:

PC Fiber Converter	Field Fiber	Display Controller
J3(RX-OUT)	----------	J4(TX2-IN)
J2(TX-OUT)	----------	J5(RX2-IN)

3.5.4.2 Venus 4600 System

Route fiber into serial line interface box and terminate fiber. Plug fiber into J8 (RX). Refer to **Drawings A-103731** and **A-103740.**

3.6 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 section. Refer to the instructions appropriate to your display.

3.6.1 Venus 1500 Controlled Display

Reference Drawing: Interconnect, 2V ..... **Drawing A-104023**

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. Signal is then relayed to the slave display through one 25 foot long 12 pin and one 25 foot long 25 pin interconnect cable. The cables 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-104023**) 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 (A42).
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.

3.6.2 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 for routing the interconnect cable through. 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 harness is connected to the J8 (RX) plug of the serial line interface in 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.

3.7 Module Connections

Reference Drawings:
Schem., 24112 to 24114 - 10 S1600.....**Drawing B-76996**
Schem., 2448 to 2496 - 10 S1600.....**Drawing B-76997**
Schem., 1680 to 16144 - 10 S1600.....**Drawing B-76998**
Schem., 1648 to 1664 - 10 S1600.....**Drawing B-76999**
Schem., 848 to 8144 - 10 S1600.....**Drawing B-77000**

The displays are shipped with signal and power harness connections to the modules. Refer to **Appendix D** for the appropriate drawing that pertains to your display size.

To remove a module, unplug the 9 pin mate-n-lok power plug on the back of the module and the signal connections and refer to **Section 4.1.1**.

3.8 Power Line Voltage Considerations

Display brightness and lamp life are generally determined assuming an average incoming line voltage of 120 volts AC at 60 hertz. If the line voltage varies from that value, both lamp life and brightness will be affected. Refer to the following table. *The following chart is based on the manufacturers' test data and on laboratory conditions.*

A voltage check should be done prior to display installation. This voltage monitoring is necessary to maximize lamp longevity.

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

T-1107 Transformer
1600 Series 1 1/2 Inch Displays

	Marquee Application									Scoreboard Application		
	Xenon Lamp Voltage/Life/Candle Power with 24VAC Secondary (Lamp life/candle power values are estimates based on laboratory conditions.)											
	120V Only			7V Buck			7V Boost			10V Boost		
Line Volts	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power	Lamp Volts	Lamp Life Hours	Candle Power
106	9.60	87078	1.21	9.02	184986	0.97	10.26	39364	1.53	10.56	27631	1.70
108	9.80	67990	1.30	9.20	144222	1.05	10.47	30781	1.64	10.78	21620	1.82
110	10.00	53353	1.40	9.39	113011	1.12	10.68	24189	1.76	11.00	17000	1.95
112	10.20	42069	1.50	9.58	88985	1.21	10.89	19099	1.89	11.22	13430	2.09
113	10.30	37421	1.55	9.68	79101	1.25	11.00	17000	1.95	11.33	11958	2.16
114	10.40	33324	1.61	9.77	70395	1.29	11.11	15149	2.02	11.44	10659	2.24
115	10.50	29709	1.66	9.87	62718	1.33	11.21	13514	2.09	11.55	9511	2.31
116	10.60	26515	1.72	9.96	55940	1.38	11.32	12069	2.16	11.65	8496	2.39
117	10.70	23689	1.77	10.06	49948	1.43	11.42	10789	2.23	11.76	7597	2.47
118	10.80	21187	1.83	10.15	44645	1.47	11.53	9655	2.30	11.87	6801	2.55
119	10.90	18969	1.89	10.24	39946	1.52	11.64	8650	2.38	11.98	9064	2.63
120	11.00	17000	1.95	10.34	35779	1.57	11.74	7756	2.46	12.09	5466	2.72
121	11.10	15251	2.02	10.43	32079	1.62	11.85	6962	2.53	12.20	4907	2.81
122	11.20	13694	2.08	10.53	28789	1.68	11.96	6255	2.61	12.31	4410	2.90
123	11.30	12309	2.15	10.62	25862	1.73	12.06	5625	2.70	12.42	3967	2.99
124	11.40	11074	2.21	10.72	23255	1.78	12.17	5064	2.78	12.53	3572	3.08
125	11.50	9972	2.28	10.81	20930	1.84	12.27	4562	2.87	12.64	3219	3.17
126	11.60	8988	2.35	10.91	18854	1.90	12.38	4114	2.85	12.75	2903	3.27
127	11.70	8108	2.42	11.00	17000	1.95	12.49	3713	3.04	12.85	2621	3.37
128	11.80	7321	2.50	11.09	15342	2.01	12.59	3355	3.14	12.96	2368	3.47
129	11.90	6616	2.57	11.19	13857	2.07	12.70	3033	3.23	13.07	2142	3.57
130	12.00	5984	2.65	11.28	12527	2.14	12.81	2745	3.32	13.18	1938	3.68

3.9 Display Voltage Monitoring

Turn on the power to the display and configure the display to have 50% of the lamps on per module. This can be done by either:

1. creating a static sequence with alternate columns on, or
2. selecting the sequence from the appropriate controller manual under the diagnostics section.

Record the readings on both power reports provided in **Appendix C**. Send one of the completed power report forms to Daktronics Customer Service and keep one report form for your own records.

Line and lamp voltage should be monitored every six months or whenever a significant change occurs in the area which could affect line voltage (e.g., additional business moves into the area or perhaps the power company installs a new transformer). To alter lamp brightness and/or lamp life, refer to **Section 4.2**.

3.9.1 Line Voltage

Take a line voltage reading of all phases with the display running and record the results. For the phase with the highest reading, record line voltage over a period of 24 hours (minimum).

If there are any reasons to suspect large voltage fluctuations, a recorder should be put on at least one phase of the power for a period of one week while the display is being operated normally. Contact Daktronics Customer Service department with respect to this recording.

If you don't have the proper equipment to accurately monitor the line voltage, you may:

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

If the line voltage is above 120 volts, changing the transformer configuration will increase lamp life. Refer to the lamp life chart in **Section 3.7** to determine the estimated lamp life after determining the lamp voltage from the above voltage monitoring test.

If the measured input line voltage is over the particular transformer rated input voltage, increased voltage will be delivered to the lamp which in turn will greatly reduce lamp life. Connecting the 7V buck winding will reduce lamp voltage and increase lamp life.

Lamp life of a Marquee-type display is estimated to be 17,000 hours with a line voltage of 120 volts at the 120 volt tap on the transformer. Lamp life of a Sports-type display is estimated to be 5,466 hours with a line voltage of 120 volts connected to the 10V Boost tap on the transformer. Lamp life results will also vary with programming style and use of dimming mode.

3.9.2 Lamp Voltage

To test the lamp voltage:

1. Locate two modules which are powered by the same transformer.
2. Remove the lens and an ON lamp from any column numbered 6-10 from one of the above modules (**Figure 4**).
3. Place a lamp in the lamp socket of the lamp voltage tester and insert the probe of the tester into the lamp socket (**Figure 5**).
4. Place the probes of the voltage tester leads into the holes of the lamp voltage tester (**Figure 6**). Record the lamp voltage reading on the forms provided.

☞ **USE EXTREME CAUTION! Do not short across the terminals of the voltage tester. Doing so will damage the module electronics.**

Figure 4: Removing An ON Lamp

5. The above steps should be repeated for at least two more modules.

=

Figure 5: Lamp Voltage Tester

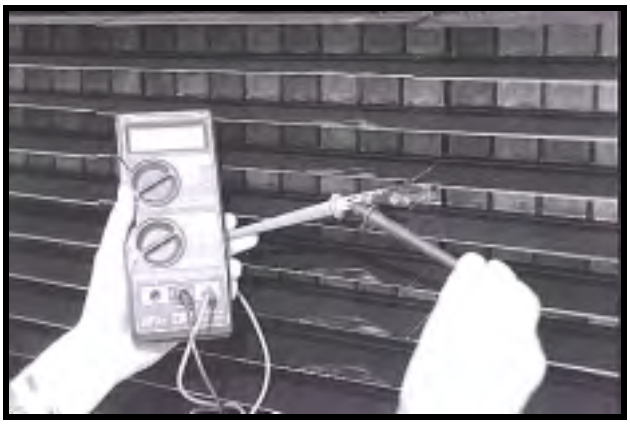


Figure 6: Lamp Voltage Test With Volt Meter

=

3.10 Dimming

For outdoor 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 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).

3.10.1 Light Detector Installation - Venus 1500

Refer to **Appendix A** for light detector mounting instructions.

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

1. Route the light detector 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 4.6.1** 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)

3.10.2 Photo/Temp Sensor Installation - Venus 4600

Refer to Venus 4600 Installation/Operation Manual (**ED-4602**) for photo/temp sensor installation.

3.11 Temperature Sensor

3.11.1 Venus 1500 System

Refer to **Appendix A** for sensor mounting instructions.

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 4.6.1** 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)

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

☞**Warning: Do not connect +5V and GND to additional displays!**

3.11.2 Venus 4600 System

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

3.12 First Time Turn On

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

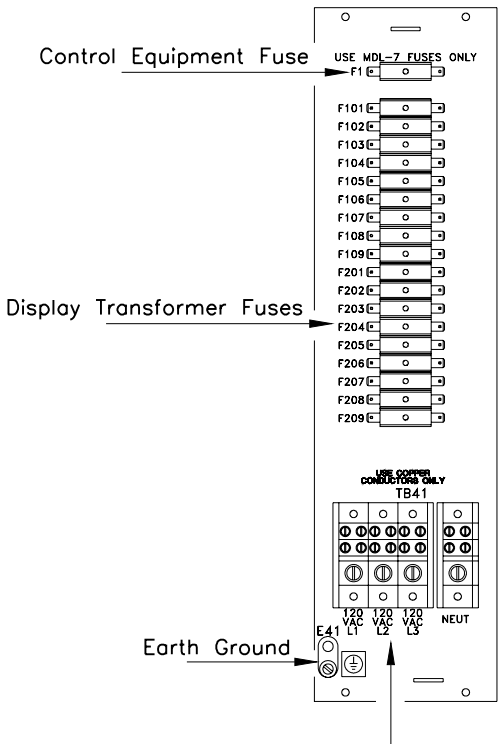
1. Remove the fuses from the power termination panel.
2. Turn power ON to the display.
3. Carefully check the voltage between the hot lines and neutral. The normal voltage range is between 120VAC and 125VAC. Refer to **Section 3.8** for voltage considerations.
4. If there are problems with voltage, check with your local electrician or power company. Refer to **Section 3.9.1**.
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 (Galaxy)
   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.



[Use Lines 1&2 for
120/240 volt Displays
(3 Wire plus Ground)]

[Use Lines 1,2&3 for
120/208 volt
3-phase Displays
(4 Wire plus Ground)]

POWER TERMINATION PANEL LAYOUT

THIS EXAMPLE REPRESENTS THE FUSE LABEL DESIGNATION FOR A 16 PIXEL HIGH DISPLAY. 8 & 24 PIXEL HIGH DISPLAY TERM PANELS WILL DIFFER SLIGHTLY.

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

TITLE: POWER TERM PANEL LAYOUT

DES. BY: DRAWN BY: JRT DATE: 26MAY98

REVISION APPR. BY:

SCALE: 1=10

1176-R07A-103140

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
8 X 48	5	6	11	12	1920	2235
8 X 64	11	12	11	12	2560	2980
8 X 80	11	12	16	19	3200	3725
8 X 96	11	12	16	19	3840	4470
8 X 112	16	19	21	25	4480	5215
8 X 128	16	19	21	25	5120	5960
8 X 144	16	19	27	31	5760	6705
16 X 48	11	12	16	19	3840	4470
16 X 64	19	19	21	25	5120	5960
16 X 80	21	25	27	31	6400	7450
16 X 96	21	25	32	37	7680	8940
16 X 112	27	31	37	43	8960	10429
16 X 128	32	37	43	50	10240	11919
16 X 144	32	37	48	56	11520	13409
24 X 48	16	19	27	31	5760	6705
24 X 64	21	25	32	37	7680	8940
24 X 80	27	31	43	50	9600	11174
24 X 96	32	37	48	56	11520	13409
24 X 112	37	43	59	68	13440	15644
24 X 128	43	50	64	74	15360	17879
24 X 144	48	56	75	87	17280	20114
32 X 80	43	50	64	74	13182	15282
32 X 96	46	53	67	78	15742	18262
32 X 112	64	75	85	99	18493	21433
32 X 132	64	75	90	104	21053	24413
32 X 144	70	81	107	124	23804	27584
40 X 80	51	59	72	83	16381	18901
40 X 96	64	74	85	99	19772	22924
40 X 112	64	74	107	121	22972	26332
40 X 128	85	99	111	129	26172	30372
40 X 144	85	99	128	149	29563	34289
48 X 80	64	74	85	99	19964	22904
48 X 96	69	79	107	124	23612	27392
48 X 112	85	99	117	137	27451	31862
48 X 128	92	106	134	155	31483	36523
48 X 144	107	124	149	174	35322	40993
56 X 80	64	74	107	121	22972	26332
56 X 96	85	99	119	137	27643	32054
56 X 112	97	111	140	161	32123	37163
56 X 128	107	124	156	180	36602	42482
56 X 144	123	143	179	207	41273	47888
64 X 80	85	99	111	129	26172	30372
64 X 96	92	106	134	155	31483	36523
64 X 112	107	124	157	182	36794	42674
64 X 128	128	149	180	208	42106	48826
64 X 144	138	159	202	233	47225	54785
72 X 80	85	99	128	149	29563	34289
72 X 96	107	124	149	174	35322	40993
72 X 112	123	143	179	207	41273	47888
72 X 128	138	159	202	233	47225	54785
72 X 144	149	174	226	261	53368	61873

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.

REV.	DATE	DESCRIPTION	BY	APPR.
3	14JAN00	CHGD 2496 MARQUEE TOTAL WATTS FROM 1150 TO 11520.	JRT	
2	10JUL98	CHANGED SPORTS 8X48 120/208 FROM 3 TO 6.	RLONG	
1	30JUN98	ADDED PWR SPECS FOR 32, 40, 48, 56, 64, AND 72 MATRIX.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS

TITLE: PWR SPEC'S: 8, 16, 24,32,40,48,56,64,72 HIGH DISPLAYS

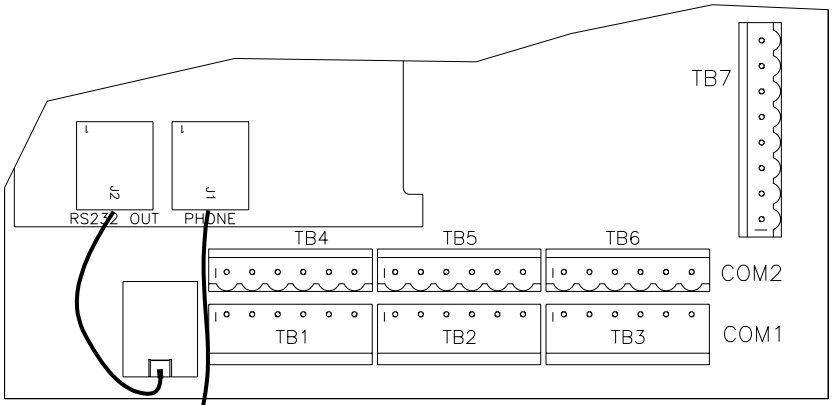
DES. BY: TWOODARD DRAWN BY: RLONG DATE: 05JUN98

REVISION APPR. BY:

SCALE: 1=1

1176-R01A-103186

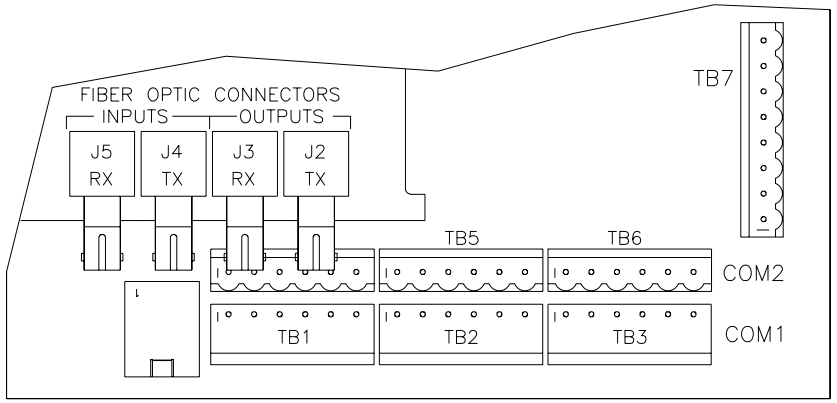
REV.	DATE	DESCRIPTION	BY	APPR.
1	28AUG98	ADDED LIGHT DETECTOR WIRING CORRECTED RS/232 COLOR CODES ENLARGED TEXT TITLES	TGW	



SEE RS/232 AND RS/422 BELOW FOR TEMP AND RS/422 TERMINATIONS

MODEM

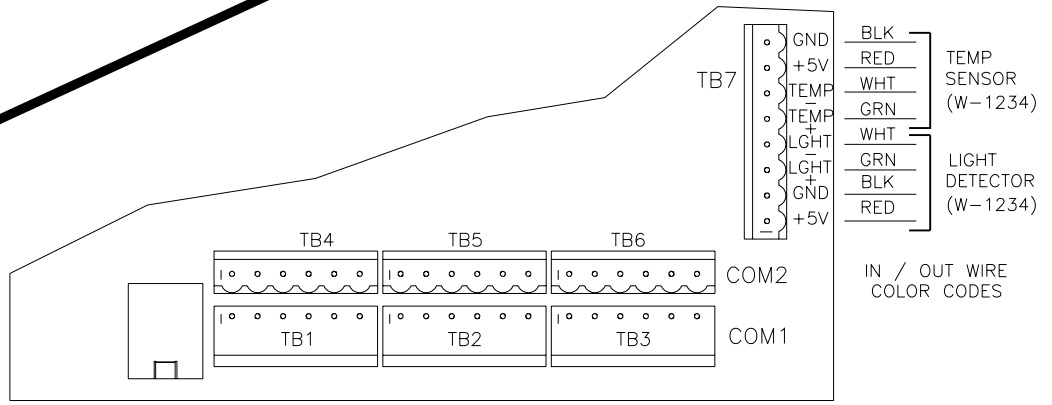
STANDARD PHONE TERMINATIONS (TIP & RING) MATCH COLORS



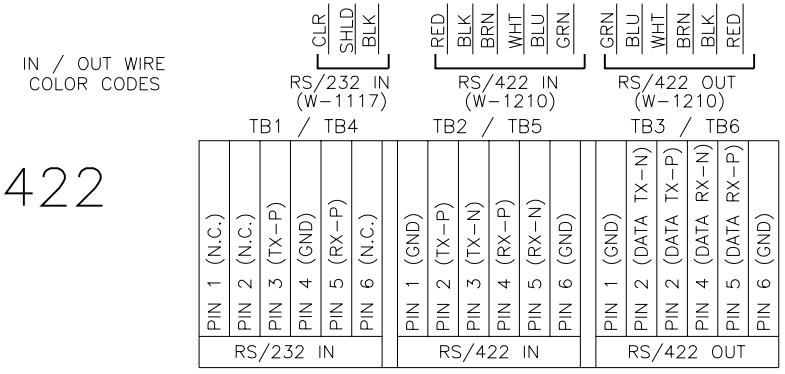
CONNECT "RX" FROM COMPUTER TO J4 (TX)
CONNECT "TX" FROM COMPUTER TO J5 (RX)
CONNECT "RX" (J3) TO DISPLAY 2 "TX" (J4)
CONNECT "TX" (J2) TO DISPLAY 2 "RX" (J5)

FIBER OPTIC

SEE RS/232 AND RS/422 BELOW FOR TEMP AND RS/422 TERMINATIONS



IN / OUT WIRE COLOR CODES



RS/232 AND RS/422

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

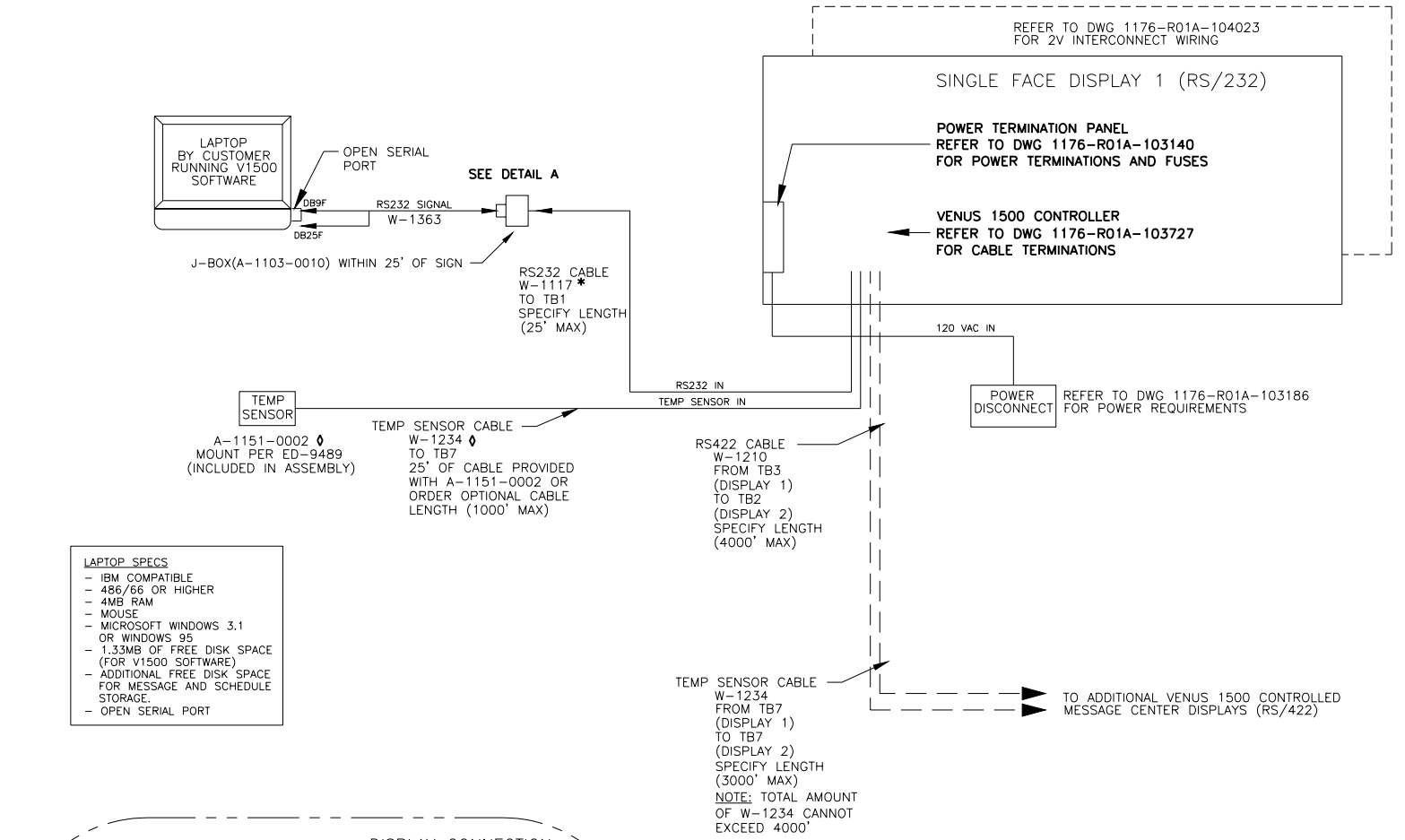
TITLE: V1500 SIGNAL TERMINATIONS

DES. BY: DRAWN BY: TWOODARD DATE: 10JUN98

REVISION

SCALE: NONE APPR. BY:

1176-R01A-103727



NOTES:

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-1363	CABLE; DB9F/DB25F TO DB25M SERIAL
5. W-1210	CABLE; 6 COND. RS422
6. W-1234	CABLE 4-WIRE; TEMP SENSOR

REV.	DATE	DESCRIPTION	BY	APPR.

REVISION

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

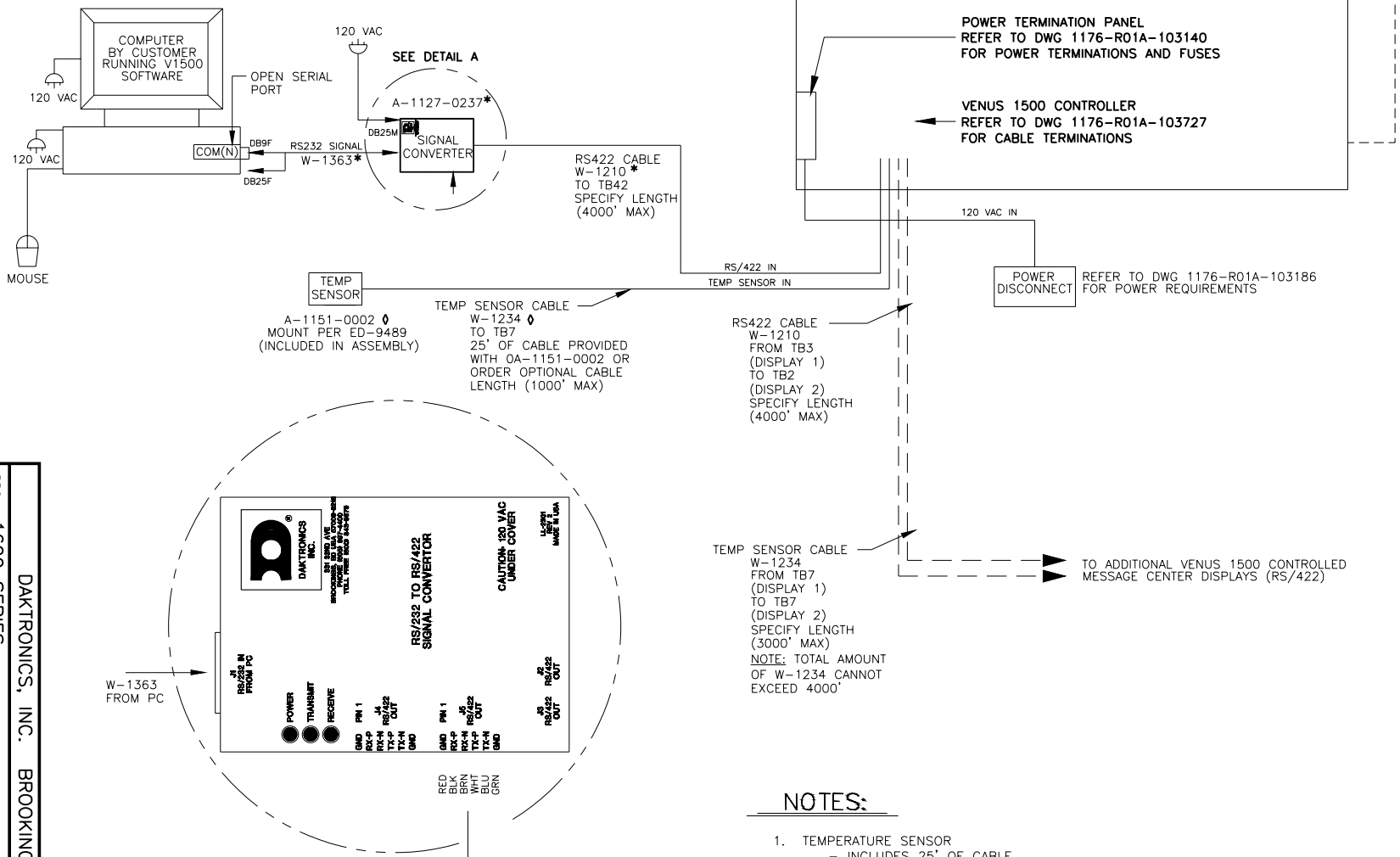
TITLE: SYSTEM RISER DIAGRAM; RS/232 DISPLAYS

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 10JUN98

APPR. BY:

SCALE: 1=1

1176-R01A-103729



DETAIL A

* REQUIRED PART

◊ OPTIONAL PART

DAKTRONICS PART NO.	DESCRIPTION
1. A-1151-0002	HOUSING; DIGITAL TEMP W/PKG
2. A-1127-0237	SIGNAL CONV, 232-422
3. W-1363	CABLE; DB9F/DB25F TO DB25M SERIAL
4. W-1210	CABLE; 6 COND. RS/422
5. W-1234	CABLE 4-WIRE; TEMP SENSOR

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

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-1363.....SERIAL CABLE
   - 0A-1127-0237.....SIGNAL CONVERTER
   - 0A-1146-0005.....NETWORK/CABLE TESTER
3. W-1363 IS EQUIPED 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.

REV. | DATE | DESCRIPTION | BY | APPR.

REVISION

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

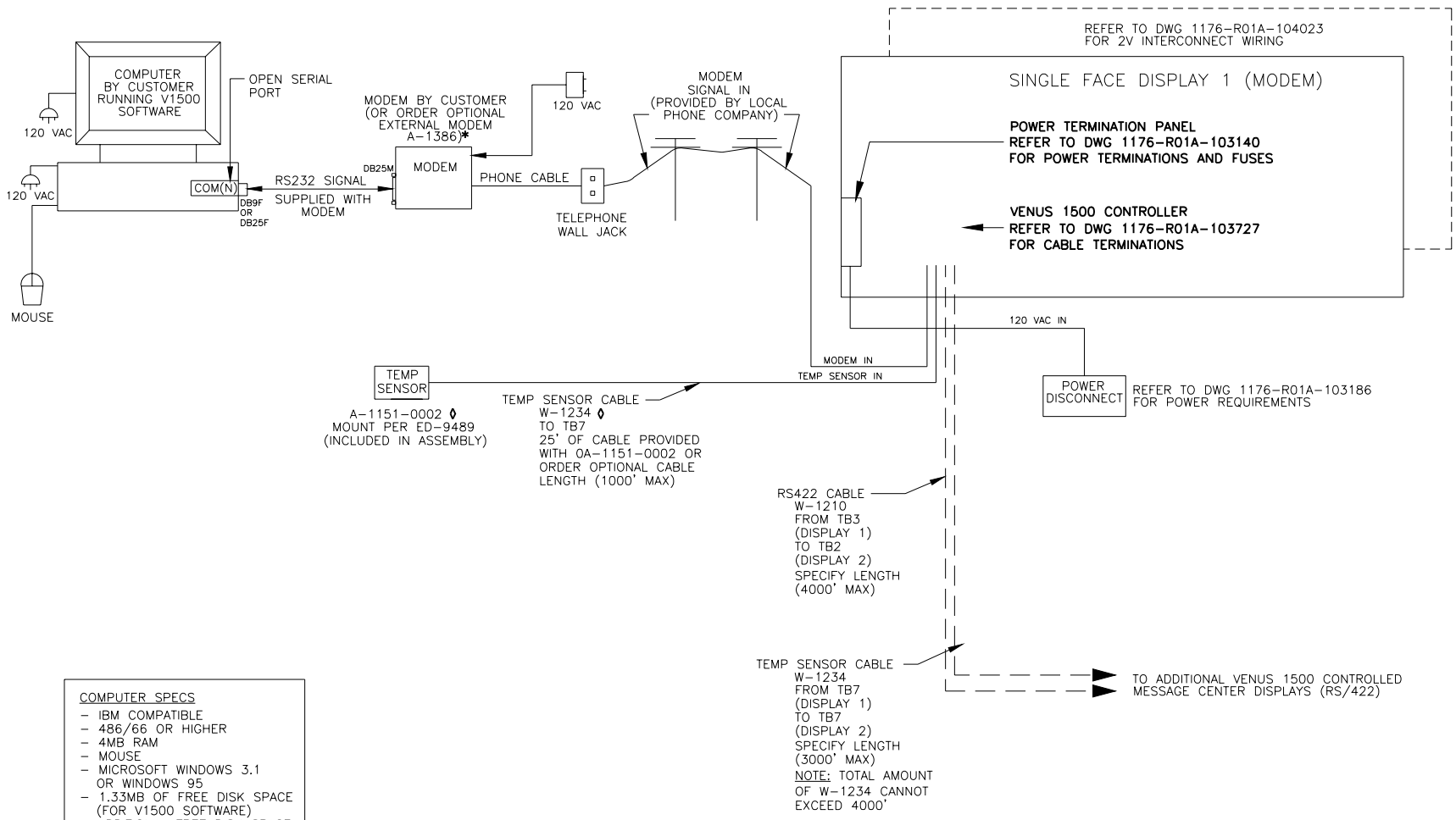
TITLE: SYSTEM RISER DIAGRAM; RS/422

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 10JUN98

APPR. BY:

SCALE: 1=1

1176-R01A-103728



COMPUTER SPECS
- IBM COMPATIBLE
- 486/66 OR HIGHER
- 4MB RAM
- MOUSE
- MICROSOFT WINDOWS 3.1 OR WINDOWS 95
- 1.33MB 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.

REVISION

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

TITLE: SYSTEM RISER DIAGRAM; MODEM DISPLAYS

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 10JUN98

APPR. BY:

SCALE: 1=1

1176-R01A-103725

REV.	DATE	DESCRIPTION	BY	APPR.
2	7JUL99	ADDED DETAIL "A". CHANGED FIBER CABLE FROM 1500' TO 2000'. CORRECTED PART NUMBERS.	LLK	
1	28AUG98	CHANGED SIGNAL CONVERTORS FROM A-1065-0174 TO A-1127-0239 & ADDED TERMINATIONS	TGW	

REFER TO DWG 1176-R01A-104023
FOR 2V INTERCONNECT WIRING

SINGLE FACE DISPLAY 1 (FIBER OPTIC)

POWER TERMINATION PANEL
REFER TO DWG 1176-R01A-103140
FOR POWER TERMINATIONS AND FUSES

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

COMPUTER BY CUSTOMER RUNNING V1500 SOFTWARE

120 VAC

120 VAC

COM(N)

OPEN SERIAL PORT

SERIAL ADAPTER
SEE NOTE 3
DB25F DB9M

DB9F

SERIAL CABLE

120 VAC

SEE DETAIL A

A-1127-0239*

DB25M

SIGNAL CONVERTER

FIBER OPTIC CABLE
W-1376 *
SPECIFY LENGTH
(2000' MAX)
FROM J2 (CONVERTOR)
TO J5 (VENUS 1500)
FROM J3 (CONVERTOR)
TO J4 (VENUS 1500)

MOUSE

120 VAC IN

POWER DISCONNECT

REFER TO DWG 1176-R01A-103186
FOR POWER REQUIREMENTS

TEMP SENSOR

TEMP SENSOR IN

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

TEMP SENSOR CABLE
W-1234 ◊
TO TB42
25' OF CABLE PROVIDED
WITH 0A-1151-0002 OR
ORDER OPTIONAL CABLE
LENGTH (1000' MAX)

RS422 CABLE
W-1210
FROM TB3
(DISPLAY 1)
TO TB2
(DISPLAY 2)
SPECIFY LENGTH
(4000' MAX)

FIBER OPTIC CABLE
OPTIONAL

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)

CABLE
FROM PC

RS/232 TO FIBER
SIGNAL CONVERTOR

POWER

RECEIVE

TRANSMIT

CAUTION: 120 VAC
UNDER COVER

OUTPUT PAIR 1 — TO DISPLAY A

OUTPUT PAIR 2 — TO DISPLAY X

NOTE:
*EITHER OUTPUT PAIR CAN BE USED
*DISPLAYS MUST BE DIFFERENT ADDRESSES

DETAIL A

* REQUIRED PART

◊ OPTIONAL PART

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

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
   - A-1603.....DB9 TO DB25 ADAPTER
   - 0A-1127-0239.....SIGNAL CONVERTER
   - 0A-1146-0005.....NETWORK/CABLE TESTER
3. USE APPROPRIATE DB9 OR DB25 CONNECTORS DEPENDING ON PC.
4. 4 CONDUCTOR FIBER OPTIC CABLE (W-1376) MAY BE ORDERED FROM DAKTRONICS. PLEASE SPECIFY AT TIME OF ORDER. (2 FIBERS FOR SIGNAL, 2 FIBERS FOR SPARES)
5. FOR OUTDOOR USE, ALL CABLES MUST BE ROUTED IN A GROUNDED CONDUIT.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

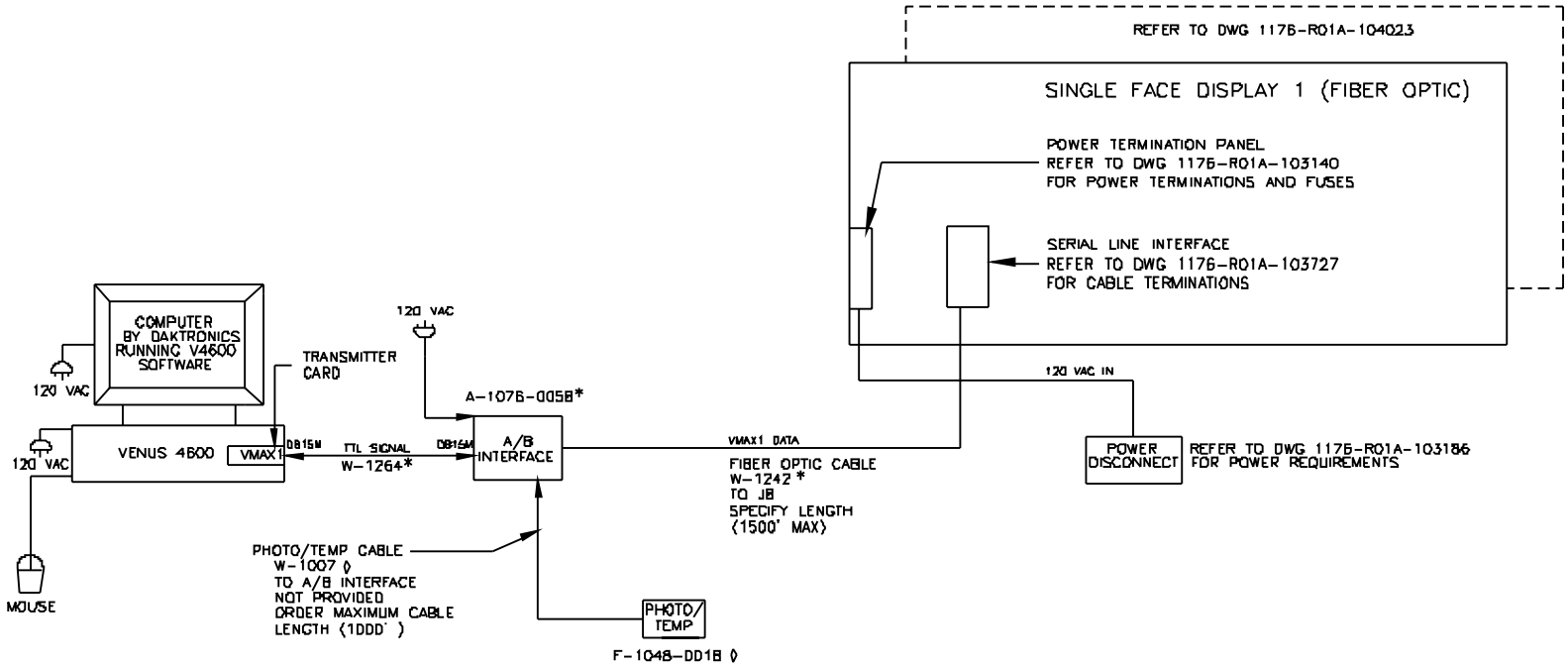
TITLE: SYSTEM RISER DIAGRAM; FIBER OPTIC

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 10JUN98

SCALE: NONE APPR. BY:

REVISION

1176-R01A-103730



* REQUIRED PART

◊ OPTIONAL PART

DAKTRONICS PART NO.	DESCRIPTION
1 F-1048-0018	TSI-EM EAVE MOUNT PHOTO/TEMP SENSOR
2 A-1127-0237	A/B TRANSMITTER INTERFACE
3 W-1264	CABLE: DB15NF TO DB15M
4. W-1242	CABLE; 2 FIBER, FIBER OPTIC
5 W-1007	CABLE 5 COND. 18 AWG, PHOTO/TEMP SENSOR

NOTES:

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

REV. | DATE | DESCRIPTION | BY | APPR.

REVISION

DES. BY: TWOODARD
DRAWN BY: RLONG
DATE: 10JUN98

APPR. BY:

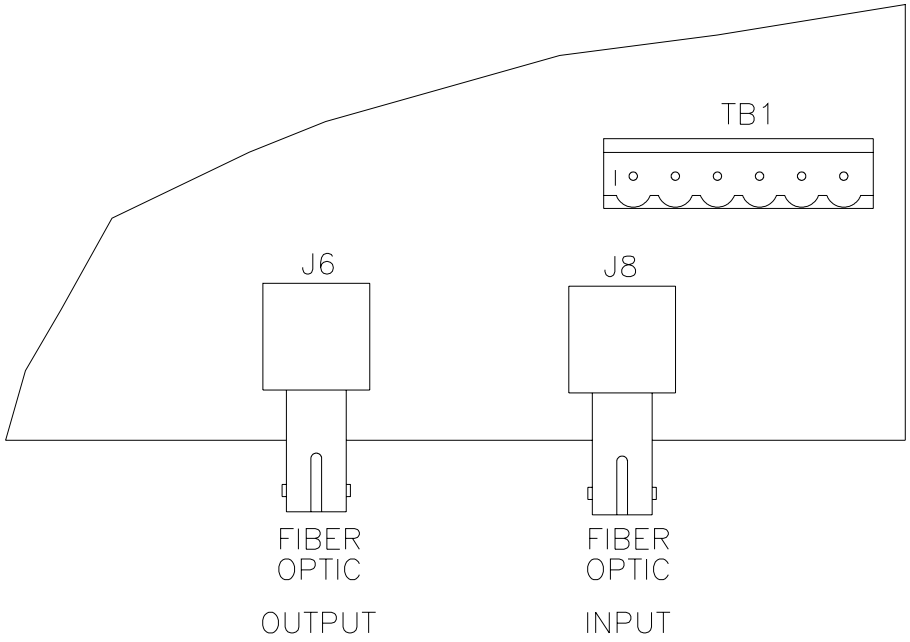
SCALE: 1=1

TITLE: SYSTEM RISER DIAGRAM; SERIAL LINE INTERFACE

PROJ: 1600 SERIES

DAKTRONICS, INC. BROOKINGS, SD 57006

1176-R01A-103731



TB1

PIN	FUNCTION
1	+5V–P
2	GND–N
3	PHOTO–P
4	PHOTO–N
5	N.C.
6	N.C.

0A–1176–0023, SERIAL LINE INTERFACE ENCL 120V (COMPLETE ASSEMBLY)
0P–1176–0008, SERIAL LINE INTERFACE, S1600 (PCB ASSEMBLY ONLY)

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

TITLE: SERIAL LINE INTERFACE SIGNAL TERMINATIONS

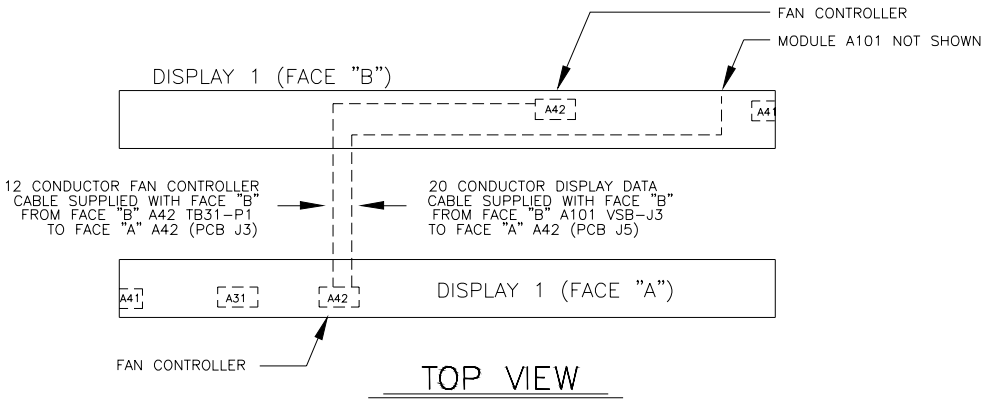
DES. BY: TWOODARD DRAWN BY: RLONG DATE: 10JUN98

REVISION APPR. BY:

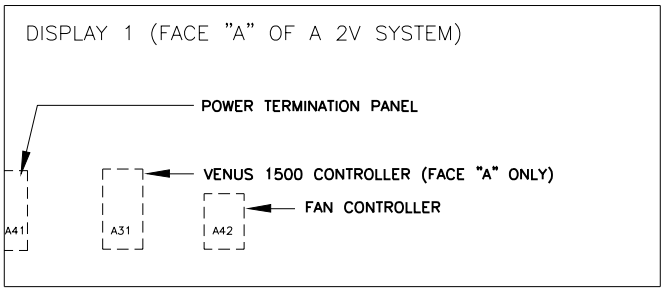
SCALE: NONE

1176-R01A-103740

VENUS 1500

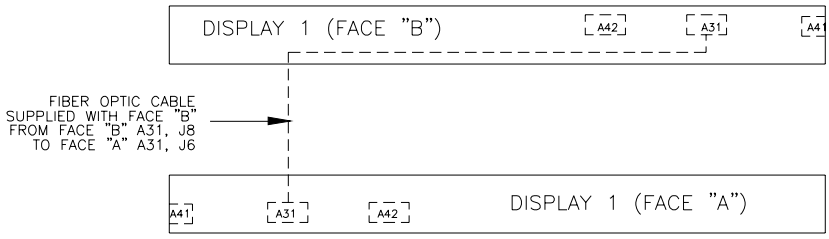


TOP VIEW

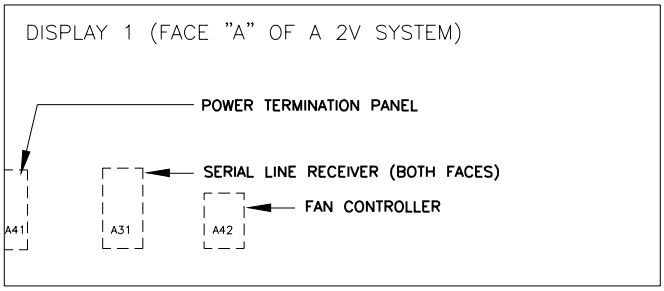


FRONT VIEW

VENUS 4600



TOP VIEW



FRONT VIEW

REV.	DATE	DESCRIPTION	BY	APPR.
1	28AUG98	ADDED TB31 TO 12 CONDUCTOR FAN NOTE ENLARGED VENUS 1500 & 4600 TITLES	TGW	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES

TITLE: INTERCONNECT, 2V WIRING

DES. BY: TWOODARD DRAWN BY: TWOODARD DATE: 10JUN98

REVISION APPR. BY:

SCALE: 1=1

1176-R01A-104023

Section 4 : Maintenance & Troubleshooting

Important Notes:

1. **Power must be turned off before any repair or maintenance work is done on the display!**

2. **Any access to internal display electronics must be made by qualified service personnel.**

3. **Do not operate the display with the back sheets removed! The cabinet is positively pressurized, directing adequate airflow around the lamps and out through the lenses. Display operation without the back sheets in place and fans running could cause damage to the display and will void the warranty. *Make certain the back sheets are fastened securely into place.***

4. **Dirt and contaminants may enter the display if it is operated without the fan filters in place or with dirty fan filters. These contaminants may cause premature failure of the electronic components. *Operating the display with dirty fan filters or without fan filters will void the warranty.***

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

4.1 Service Procedures

This display is designed to be serviced from the front (*front access*).

4.1.1 Removing a Module

Reference Drawings: Lens Removal, Front Access..... **Drawing A-99898**
Lens Assy Removal, Front ..... **Drawing A-99899**

For many maintenance or repair procedures, the first step is to remove a module. Each 8x16 lens assembly is secured to the frame by two spring-loaded latches, one on each side. Follow these instructions for access to these latches:

1. Remove the lens from row 4, column 1, and the lens from row 4, column 16 of the lens assembly. Refer to **Drawing A-99898**.
2. Place the front access tool, 0M-95442, into the latch access hole. The angled edge of the tool should be down so it wedges the latch pin down as it is pushed further into the access hole.

3. When the front access tool is fully inserted, the module latches should be released. Refer to **Figure 7**, below.

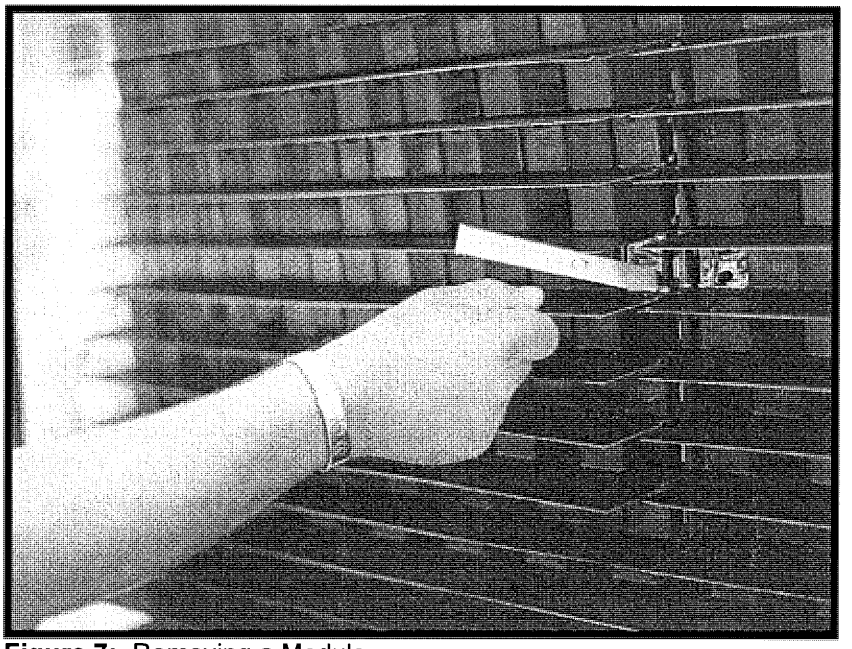


Figure 7: Removing a Module

4. With the latch released, pull the module slightly away (about a half-inch) from the display. This will prevent it from re-latching. Refer to **Drawing A-99899**. *Use care to avoid bending the louvers.*
5. Repeat this procedure on the other side of the module.
6. With both sides unlatched, the module should pull away from the display far enough so the signal and power harness can be disconnected from the lampbank. When the signal and power harnesses are removed, the module can be removed from the display.

☞**Note**: A 3/16″ slotted screwdriver may be used in place of the access tool (Daktronics part number 0M-95442).

4.1.2 Removing a Lampbank

The lampbank, also called the lamp driver display board, is attached to the lens assembly with a metal tab at each corner. The lampbank is illustrated in **Figure 12** in **Section 4.8**. To remove the lampbank:

1. Push the clips in with your thumb while gently pulling the lampbank out.
2. Repeat this step for the three remaining corners. Lampbanks should be serviced in a static-free area to prevent static electricity from damaging the components.

4.1.3 Replacing a Lampbank

When lampbanks are re-attached to the lens assemblies, be sure the lamp sockets are seated tightly against the reflectors. All four tabs, one in each corner, must be snapped securely onto the lampbank. If the lampbank is not secured properly to the lens assembly, the lamp filament will not be at the focal point of the reflector and parts of that lens assembly will appear dim.

4.1.4 Replacing the Module

To re-install a module in the display refer to the following list of instructions:

1. Reconnect power and signal connections to the lampbank.
2. Tilt the module about 30 degrees and place the bottom corners of the side brackets to the inside of the frame verticals.
3. Push the module firmly back into place until the latches snap into place and the lens assembly is secured to the display. It may be necessary to use a solid object, such as a short length of two-by-four, to properly seat the assembly. Place the two-by-four across the louvers so the pressure on them is evenly distributed and strike the board with the heel of your hand. This should drive the assembly in place.
4. Pull firmly on the assembly to ensure that it is fully in place and secured to the display. The lens assemblies must fit together tightly enough so the weather stripping forms a seal and prevents water from leaking between the lens assemblies and into the display. The seal between the modules should be checked with a 0.032" feeler gauge. Refer to **Section 2.5**.
5. Snap the lenses back into the face plate of the lens assembly. If a lens is not replaced properly, it is easily noticed. The lens removal tab or the lens itself will not be in alignment with the other lenses or lens tabs.
6. Ensure that the rows of louvers on the lens assembly are in proper alignment.

4.2 Lamp Testing And Replacement

This display is designed for easy lamp replacement with front access. Non-functioning lamps should always be replaced prior to scheduled events, or as soon as possible, for best viewing.

A 3.58 watt lamp is positioned behind each lens. Use the controller lamp test to locate bad lamps. Use the lamp test form located in **Appendix C** to mark the location of bad lamps. Refer to **Section 4.19** for the part numbers of replacement lamps and lenses.

- Daktronics-approved 3.58 watt lamps have an estimated life of 17,000 hours if operated at 11.0 volts. **Always use Daktronics approved lamps.** Lamps purchased from Daktronics are built to tighter specifications than similar lamps built in standard production. The recommended lamps give the sufficient intensity and beam spread to match the display design. Lamps not built to Daktronics specifications will not perform as well, will not give the intended results, and will adversely effect the beauty of the display.
- Lamp testing should be done by a qualified individual who is capable of operating the controller equipment.
- *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.

Lamp life will be increased if the average intensity of the lamp is less than maximum.

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

Typically, lamp failures for the 17,000 hour 11.0 volt lamp in the 1-½" displays may be expected as follows.

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

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

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

% Failure	# Of Hours In Operation	# Of Days In Service	# Of Lamps Predicted To Have Failed For Selected Display Sizes					
			8x48 (348 lamps)	8x64 (512 lamps)	8x80 (640 lamps)	8x96 (768 lamps)	8x112 (896 lamps)	16x112 (1792 lamps)
3	5,950	250	12	16	19	23	27	54
10	11,900	500	38	51	64	77	90	179
50	17,000	722	192	256	320	384	448	896

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 4.6** 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.
   a) If you spot a bad lamp, arrow to the right until the lighted column is on the bad lamp, i.e., the intersection of the lighted row and the lighted column is on the bad lamp.
   b) To record the location of the bad lamp, press the **Stuck Off** button. If you have a lamp that is stuck on, follow the same procedure but press the **Stuck On** button instead of the **Stuck Off** button.
6. Arrow down one row at a time to check each row for bad lamps, recording each bad lamp in the same way.
7. After marking the location of all the bad lamps, turn the display power off at the main power disconnect.

4.2.3 Optional Lampbank Driver Test Table

The purpose of the test table is to check a driver to find failed lamps on a module lampbank removed from the display. This test can be used as an alternative to the testing outlined in **Section 4.2.2**. A Lampbank Driver Test Table (Daktronics Part Number 0A-1089-0075) can be purchased by contacting Daktronics Customer Service.

When a module 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 re-test the module 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 the test table into a standard 120 volt outlet. *Make sure the power switch is OFF.*
2. Remove the module from the display (refer to **Section 4.1**).
3. Attach the power and signal cables of the test table to the driver.
4. Turn the power switch ON and mark all bad lamps with a piece of masking tape. *Lamps should not be removed or replaced with power ON, since this may damage the driver.*
5. Turn the power OFF.
6. *Replace all lamps with Daktronics approved lamps of the same wattage.* Refer to **Section 4.19** for the correct replacement lamps.
7. Turn display power ON and check if all lamps light up. If the lamps don't light properly, refer to the troubleshooting guide in **Section 4.18**.
8. Turn the power OFF, unplug the lampbank and return it to the display.

4.2.4 Individual Lamp Replacement

1. Grasp the tab on the top center of the lens with the lamp extracting tool (refer to **Drawing A-99898**).
2. Pull out and down on the tab, while using your other hand to *lightly* press up on the louver *directly above* the lens to be removed. *Do not press up on the louver any further than necessary or the louver may become deformed.*
3. Remove the defective lamp using the lamp extracting tool.
4. *Replace defective lamps with Daktronics approved lamps of the same wattage.* Refer to **Section 4.18** for the correct replacement lamps.
5. Noting proper lens orientation, snap the lens back into the lens/reflector assembly (refer to **Section 4.3**).

4.3 Lens Position And Sequence

The slot in the bottom of the reflector accommodates 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. *Make sure that the lens is snapped in and behind the upper louver offset.*

Inspect the profile of the lenses to ensure that all lenses are secured properly. Lenses that are not secured properly can be easily noticed, as the lens removal tab or the lens itself will not be in alignment with the other lenses or lens tabs in that row.

Refer to **Drawing A-99898** for more information.

4.4 The 8x16 Lens Assembly Weather Stripping

Reference Drawing: Lens Assy, Weather Stripping ..... **Drawing A-91100**

The top and bottom of each 8x16 lens assembly has a strip of pile weather stripping (Daktronics part number HS-1149). There is tape weather stripping between each louver assembly (Daktronics part number HS-1051). The weather stripping helps keep moisture out of the display and maintains the positive air pressure necessary for proper display cooling. When doing routine display maintenance, which involves removing the 8x16 lens assemblies, make sure the weather stripping is intact. If any weather stripping appears damaged, replace it. Refer to the following instructions and **Drawing A-91100**.

1. Once the old weather stripping has been removed, clean the top and bottom of the lens assembly with an adhesive remover so the new weather stripping will adhere.
2. The weather stripping should be applied in one continuous strip on both the top and bottom of the lens assembly.
3. When finished, the stripping should be flush at the bottom. If the weather stripping is not tight or buckles anywhere on the lens assembly, it will be difficult to reinstall it in the display, and it will allow water to enter the display and damage the electrical components.
4. Check the module spacing and weather stripping tightness with the 0.032" feeler gauge (refer to **Section 2.5**).

4.5 Louver Replacement

If display louvers become bent or damaged, they must be replaced. The lens/reflector assembly containing the damaged louvers should be returned to Daktronics for repair or replacement.

4.6 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:

4.6.1 Display Controller Box (Venus 1500 System)

There are three different control boxes available for the Venus 1500 system: 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.

4.6.1.1 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 8** shows the controller. Connections and functions are as follows.

Connection	Function
J1	RS232 IN COM1
TB1	RS232 IN COM1
TB2	RS422 IN COM1
TB3	RS422 OUT COM1
TB4	RS232 IN COM2
TB5	RS422 IN COM2
TB6	RS422 OUT COM2
TB7	TEMP/LIGHT IN
J2	10 VAC
J3	SIGNAL OUT

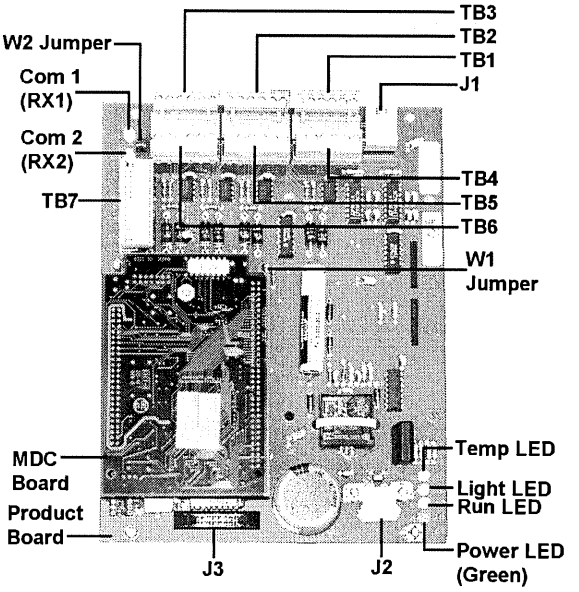


Figure 8: Controller

LED Function and Operation:

On the controller board 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 Com1	On during data communication
RX2	Data In Com2	On during data communication

Jumper Settings:

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

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 on the corner of the product board (as seen in **Figure 8**).

Locate the DIP switches on the MDC. They should be near TB 7. Refer to **Figure 9** for a picture of the DIP switches.

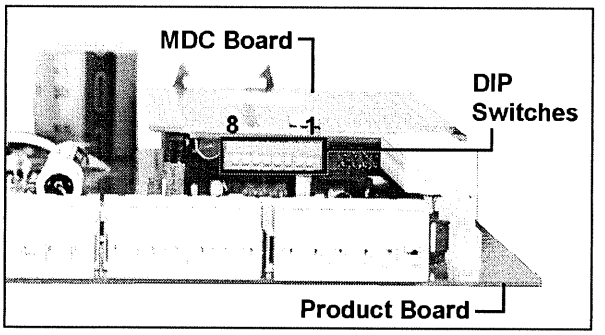


Figure 9: MDC DIP Switch

When replacing a controller board, 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:

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

☞**Note:** Be sure to record the original DIP switch settings.

To exit test mode:

1. Turn off display power.
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

To Replace the Controller:

1. Turn off display power.
2. Disconnect power and signal connections.
3. Remove nuts holding controller in box.
4. Write down MDC address setting.
5. Remove modem/fiber board and mounting hardware (if applicable).
6. Attach modem/fiber board and mounting hardware to new controller board (if applicable).
7. Insert controller and replace nuts.

4.6.1.2 Modem Board

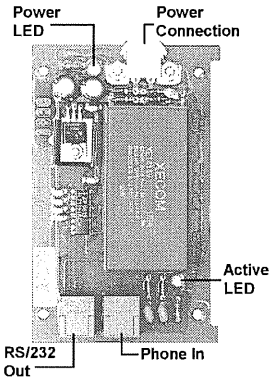


Figure 10: Modem

The modem board has two (2) LED's. The Power LED should remain lit while power is applied to the modem board. 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 4.6.1.1** for jumper settings.

To replace a modem:

1. Turn off display power.
2. Disconnect the power and signal connections (refer to **Figure 10** for disconnection of power).
3. Remove the four nuts on top of the modem board.
4. Insert the new modem, replace the screws and reconnect the power and signal connections.

4.6.1.3 Fiber Optic Board

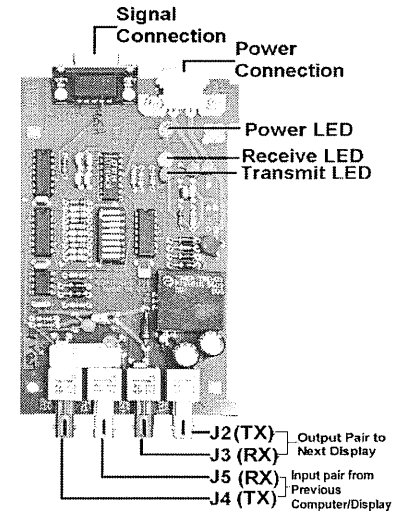


Figure 11: Fiber Optic Cable

The fiber board has three (3) LED's. The Power LED (DS1) should remain lit while power is applied to the fiber board. 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) input fiber connectors, that the computer or previous display connect to, and two (2) output fiber connectors, that connect to the next display. The fiber board connects to the controller board with a small DB9 to RJ11 cable.

To replace a fiber optic board:

1. Turn off display power.
2. Disconnect the power and signal connections.
3. The fiber optic board is held in place with four nuts. Carefully remove them.
4. Install the new fiber board, replace the nuts and reconnect power and signal cables.

4.6.2 Serial Line Interface (Venus 4600 System)

Reference Drawings: Serial Line Interface ..... **Drawing A-101843**

The serial line interface is used in monochrome or 16 color systems with Venus 4600 or Venus 7000 controllers that provide signal with a fiber optic cable. Display outputs connect to the vertical shift board in the upper left hand corner of the display (front view). **Drawing A-101843** illustrates the serial line interface which is located in the left end of the display (front view).

Locate the serial line interface and remove the enclosure cover to see the diagnostic LED's. Following is a list of LED's and their functions:

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

DS2 - Test Mode (red) This indicates when the serial line interface is in test mode. If it is ON, a test pattern will appear on the display.

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

DS4 - 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 to the serial line interface, it will flash.

DS5 - Power (green): This indicates when the power on the serial line interface is working. It should ALWAYS be ON.

DS6 - DS13 - Thermostat Inputs (all red): These indicate proper cooling of the display. These should ALL be ON. When a fan control input (& LED) turns off, the serial line interface will blank the display. If the cabinet temperature gets too high (due to fan failure/blocked filters) one the thermostats will open. When the thermostat opens the associated LED will go off and the serial line interface will blank the display to prevent damage or the possibility of fire. It will be necessary to locate and fix the problem to get the display running again.

DS14 - Program (red): This indicates the serial line interface powered-up OK. It should be ON.

DS15 and/or DS16 -Transmit (both red): Indicate(s) signal transmission out of the fiber optic transmitter(s) (to the slave face).

☞ **Note:** Refer to **Drawing A-101843** to check or change the switch settings for configuration.

4.7 Vertical Shift Board

Reference Drawing: Vertical Shift Board ..... **Drawing A-101842**

The vertical shift board, illustrated in **Drawing A-101842**, is used only with the serial line interface. There is one vertical shift board per line (eight rows). It is attached to the back of the left-most lamp driver display board in a line (front view) near the signal input jack of the lampbank (refer to **Figure 12**). Each vertical shift board is connected to the vertical shift board below it. Signal is interconnected between each lampbank to the right of the vertical shift board with a ribbon cable.

4.8 Lamp Driver Display Board

The lamps of the displays are mounted to, and controlled by, a self-contained lamp driver display board (**Figure 12**). This unit receives display information from the controller and converts it to drive signals, which switch the lamps. The lamp driver display board has all the drive components integrated onto the same circuit board as the lamp sockets.

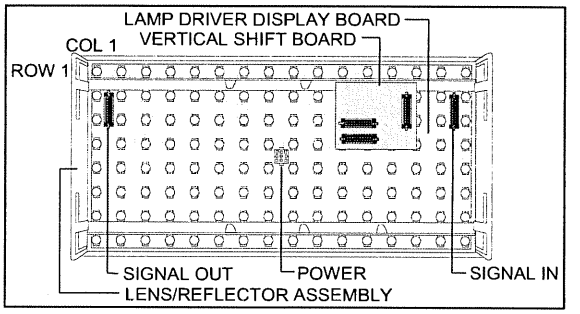


Figure 12: Lamp Driver Display Board

4.9 Master/Slave Board (Venus 1500 Series)

The Master/Slave Board (**Figure 13**) located in the master display fan control box, distributes data to both the master and the slave faces and monitors the thermostats.

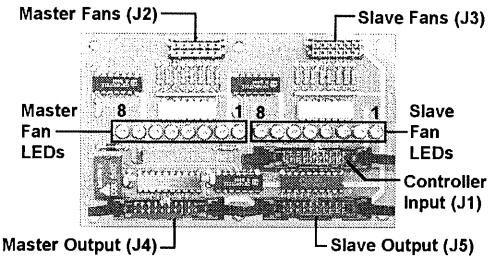


Figure 13: Master/Slave Board

There are 16 LED's (8 for the master face and 8 for the slave face) that indicate thermostat status (see **Section 4.14**). The master face LED's are labeled as such on the circuit board and are numbered 1-8 (right to left). The same is true of the slave face LED's. The LED numbers correspond to the display thermostats, which are numbered 1-8, left to right, when viewed from the front.

An ON LED indicates normal operation. If one of the LED's is OFF, the corresponding thermostat has opened due to excessive heat. The thermostat will also have signaled the controller board to blank the display to prevent heat damage. The appropriate thermostat and fan will have to be checked to determine the cause of overheating. If the display is blank unexpectedly, check these LED's if there doesn't appear to be a problem with the controller.

☞**Note:** 24x144 displays have nine thermostats and fans. Thermostats 8 and 9 are connected to LED 8 on both the master and slave faces. If a failure is indicated by LED number 8 it will be necessary to check both thermostat/fan 8 and 9 on the corresponding display.

To remove the Master/Slave board, unplug the cables and remove the four nuts.

4.10 Lamp Module Transformer

Marquee display applications are shipped with transformers which, when wired to the 120 volt tap with a line voltage of 120 volts, will deliver 11.0 volts to the lamp. Lamp life is estimated to be 17,000 hours with this transformer. The replacement Daktronics part number for this transformer is T-1107.

Due to input line voltage variations from site to site, the resultant lamp voltages may vary, which may greatly alter lamp life.

If the measured input line voltage is over the particular transformer rated input voltage, increased voltage will be delivered to the lamp, which will greatly reduce lamp life.

The transformer is capable of adjustment both up and down if line voltage varies enough to greatly alter lamp life/lamp brightness. Refer to the chart in **Section 3.8** to determine lamp voltage as related to input line voltage.

If adjustments to the transformer are required, contact Daktronics Customer Service.

4.11 Fan Filters

Filters are provided on the bottom of the display to provide clean, cooling air to the display. Filters must be checked every 1,500 hours of operation for accumulation of debris that could restrict airflow.

Check filters 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. 1,500 hours is equivalent to 62 days if the display is on running non-stop, 24 hours a day.

It is recommended that spare filters be kept on hand at all times. Ideally, filters can be replaced during routine maintenance. If a filter media shows evidence of damage or wear, replace the filter with a Daktronics Filter (part number L-98614). If a filter other than the Daktronics standard filter is used, follow these criteria:

1. effective filter area to be no less than 2.3 square feet per 1.0 square feet of face area and
2. filter media to have an average arrestance of 90-92%.

Once the filters have been removed, turn power back on. Note if the fans are turning properly.

☞ **Turn the power OFF when finished checking the fans.**

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 14**). 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.

A method for checking both the airflow through the lenses and the cabinet seal is as follows: Direct smoke toward the fan inlet and note where the smoke exits. Check all around the cabinet and the lenses. If smoke does not exit a particular group of lenses, remove the lenses to clean out any debris, replace the lenses and retest.

4.12 Filter Removal

Reference Drawing: Filter Access, Line Displays ..... **Drawing A-103235**

1. Remove the screws which secure the filter assembly to the display cabinet. Refer to view 1 in **Drawing A-103235**.
2. Rotate the filter assembly down and remove from the display. Refer to view 2 in **Drawing A-103235**.
3. Inspect the filter assembly perimeter gasket for evidence of deterioration or air leaking around or through the gasket. If any part of the gasket material is damaged or needs to be replaced, the gasket material can be obtained from Daktronics. Refer to Side View in **Drawing A-103235**.
4. Inspect the filter assembly. Make certain that the filter is touching the inside of the frame throughout its entire length and that no air gaps exist. Ensure that the filter assembly is set inside the channel on the top side and is resting in the filter holder. Make sure that the filter wire side is up.
5. Inspect the filter material and determine if it should be replaced. If so, remove the screws securing the holder assembly to the filter frame and replace the filter material.
6. To replace the filter remove a screw from one end of the filter holder assembly and rotate the cover up. Stretch the replacement filter to a length of 8.25 inches while keeping the filter pleats evenly spaced. Insert the replacement filter into the filter holder. Rotate the filter holder cover down, making sure the filter stays inside the channel of the cover. Replace the screw to secure the cover to the filter cover.
7. Repeat step 4.
8. Return the filter holder to the filter holder tray assembly.
9. Return the filter holder tray assembly to the display cabinet.

If a filter other than the Daktronics standard filter is used, follow the criteria in **Section 4.11**.

4.13 Fans

Reference Drawing: Filter Access, Line Displays. ..... **Drawing A-103235**

Fans are provided to control the heat buildup generated by the electronic components. One cooling fan is provided for three modules (8x16 display modules).

Check fans after the display has been in operation for 1,500 hours--and every 1,500 hours thereafter--to ensure the display is being cooled properly. Fans should be checked more often if the display is located in a dusty or harsh 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. 1,500 hours is equivalent to 62 days if the display is on running non-stop, 24 hours a day.

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

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

Refer to view 1 in **Drawing A-103235** to remove fans. After 10% of the fans have been replaced, we recommend replacing all fans to reduce associated maintenance costs which may incur with increased heat buildup from fan failure.

A fan testing power cord is available for checking fan operation. Plug the test cord into the questionable fan and plug the other end into a 110 volt outlet. If the fan does not turn or does not operate smoothly, replace it.

- **Use extreme caution during this testing! The fan blades are exposed!**

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

4.14 Cabinet Temperature Sensing & Fan Control

This display has the ability to sense the proper operation of the cooling fans. The display is equipped with thermostats inside the cabinet to sense overheating in the display. The thermostats are found near each fan, mounted on a transformer mounting bolt. When the thermostats sense an overheated condition inside the cabinet they will open. When a thermostat opens, the master/slave board will sense this and send a *bad* status report back to the Venus 1500 based controller. If there is a serial line interface, it will sense the open thermostat. The Venus 1500 based controller or the serial line interface will, in turn, blank the display to prevent overheating. The display will cool with the lamps off and the thermostats will then close when a safe cabinet temperature is reached. The Venus 1500 based controller or the serial line interface will sense this and restore signal to the lampbanks and the display will become operational.

If this blanking condition persists, determine the cause of the overheating and take immediate corrective action to prevent possible damage to the display. The two most common causes of overheating are (1) a dirty air filter (refer to **Section 4.11** for maintenance) or (2) fan failure (refer to **Section 4.15** for maintenance). If you determine that neither of these two conditions exist, contact Daktronics Customer Service for assistance in troubleshooting. Temperature sensing can by bypassed to get the display running for testing purposes. This is for troubleshooting only.

☞ *If the temperature sensor/fan control is altered in any way over the long term, the warranty will be null and void.*

The Venus 1500 based controller or the serial line interface can also turn the fan power off. When the Venus 1500 based controller or the serial line interface senses the display has been blank for more than ½ hour they will turn power off to the fans (with the relay). This prolongs the life of the fans and filters.

4.15 Lens Airflow

Check airflow through the lenses periodically to ensure there are no obstructions in the lens exhaust holes. Airflow is necessary to cool the lenses and lamps adequately (refer to **Figure 14**). 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.

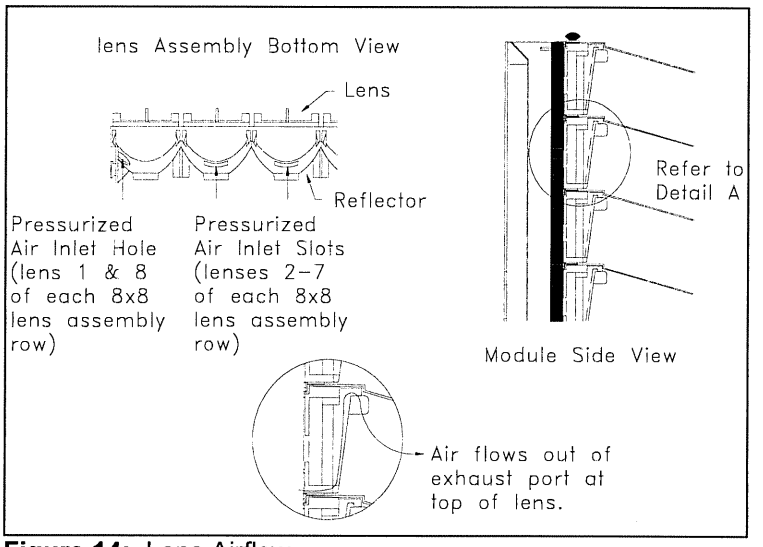


Figure 14: Lens Airflow

Inspect the cabinet seal periodically to make certain it is sealing properly. If leaks are detected, repair or replace the pile weather stripping seal in the area where the leak occurred.

Use the following method to check both the airflow through the lenses and the cabinet seal:

1. Direct smoke toward the fan inlet and observe where the smoke exits.
2. Check all around the cabinet and the lenses.
3. If smoke does not exit a particular group of lenses, remove the lenses to clean out any debris, replace the lenses and retest.

4.16 Structural Inspection

Visual inspection should be done annually to check the paint and look for 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 (e.g., water stain marks). Water can enter a display where weather stripping has come loose or deteriorated. Fasteners may have come loose, allowing moisture to enter through seams in the display. Also check the top of the display around the eye bolts to insure that no moisture may enter through loosened fixtures. Check electronic components closely for signs of corrosion.

4.17 Cleaning the Signal Connectors

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

After the parts are cleaned, push the plug into a jar of Cailube™ (Daktronics part number CH-1019), ensuring that the paste wets the plug to a depth of at least ⅛" 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 to form a V on the end of the plug. There should be enough paste on the end of the plug to form a weather-proof seal (from paste pushed out around the jack) when the plug is inserted into the circuit board jack.

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

4.18 FCC Modem Notice

The modem on the Venus 1000 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 RENs of all of these devices connected to one line should not exceed five. To be certain of the number of devices that may connect to the line, as determined by the REN, the customer should contact the local telephone company to determine the maximum REN for the calling area.

If the system causes harm to the telephone network, the telephone company may 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 modem problems occur, please contact Daktronics customer service for information on obtaining service or repairs. The telephone company may request the device be disconnected 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.

4.19 Troubleshooting

This section contains some symptoms that may be encountered in a display. For these symptoms, possible causes and corrective actions are given. This list does not include 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.	• Replace lamp. • Replace socket. • Replace lampbank.
One or more lamps will not turn off.	• Check for foreign objects on PC board. • Replace lampbank.
Entire module does not work.	• Check signal connection (ribbon cable). • Check power connections. • Check transformer fuse on panel. • Check display size configuration. • Replace lampbank.
Section of display does not work.	• Check appropriate main fuse or breaker. • Check previous module. • Check first bad module power and signal.
Entire display does not work.	• Check 120 VAC input power to sign. • Check thermostat status LED's on serial line interface or master/slave board. • Check all signal connections. • Verify message is running. • Verify serial line interface is receiving data. • Power down/up the display to verify Venus 1500 boot-up. • Check controller LED's.
Cannot communicate with display (Venus 1500 controlled)	• Verify Venus 1500 sign setup communication settings. • Verify signal converter (422, modem, fiber) is working (TX LED). • Verify controller is receiving communication commands (RX LED). • Verify address of display and Venus 1500 sign.
Master/Slave board or Serial Line Interface has fan LED(s) off.	• Determine LED number. • Ensure cable is in place on fan inputs (J2/J3) • Check corresponding fan (LED 1=Fan 1, LED 8=Fan 8 and 9)

4.20 Replacement Parts List

Part Description	Daktronics Part No.
8x16 Lens Reflector Assembly; Starburst	0A-1176-0001
8x16 Lens Reflector Assembly; Monochrome	0A-1176-0002
Controller Board, Venus 1500 Based, R232/242	0A-1146-0007
DB9/RJ11 Flipped Connector	0A-1146-0029
Electrical Contact Lubricant & Protector (paste) 8oz jar	CH-1021
Fan, 120 Volt, 250 CFM	B-1019
Fan Controller Card	0P-1176-0003
Fan Filter	L-98614
Fan Thermostat Assy.	0A-1176-0024
Fiber Optic Board, Signal Conv.	0P-1127-0024
Fuse, MDL-7, ¼" by 1 ¼", Slow-Blo	F-1031
Lamp; T-3 ¼, Wedge Base, Xenon Filled	DS-1241
Lampbank; 816-10 w/xenon lamps	0P-1176-0002
Lens, Blue - StadiaView	DS-1232
Lens, Green - StadiaView	DS-1234
Lens, Red - StadiaView	DS-1233
Lens; Starburst White - StadiaView	DS-1231
Lens, Mono White	DS-1235
Serial Line Interface Board	0P-1176-0008
Master/Slave Board, Fan Control Enclosure	0P-1146-0018
Modem Board	0P-1146-0003
PC Signal Converter; Fiber	0A-1127-0239
PC Signal Converter; RS422	0A-1127-0237
Portable Test Fixture	0A-1176-0007
Fan Testing Power Cord	0A-1089-0192
Serial Cable	W-1363
Socket; T-3 1/4 Wedge	X-1209
Tool Kit Accessories (includes the following)	0A-1176-0008
Electrical Contact Cleaner (spray can)	CH-1015
Electrical Contact Lubricant and Protector (paste) 1oz jar	CH-1019
Front Access Module Remover Tool	0M-95442
Lamp Extractor	TH-1032
Lamp Voltage Tester	0P-1089-0010
Rear Access Module Remover Tool	0M-95441
0.032 Feeler Gauge, Weather Stripping	OM-69133
Transformer, 120 Volt	T-1107
Vertical Shift Register	P-1176-0009
Weather Stripping, Pile, Filter Assembly	HS-1149
Weather Stripping, Open Cell, Filter Assembly	HS-1039

4.21 Exchange/Replacement Procedure

Daktronics unique exchange program was designed with the client's needs in mind. This is the quickest and most economical way available for product repair. If a component has failed, Daktronics sends the customer a replacement. The customer, in turn, sends the failed components to Daktronics. This not only saves money but also decreases the amount of time that 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 available method.

1. **Packaging for Return:** Package and pad the item well so it will not be damaged in shipment. Electronic components, such as printed circuit boards, should either be installed in an enclosure or put in an anti-static bag before boxing. Please enclose your name and address and describe all the symptoms as clearly 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 (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.

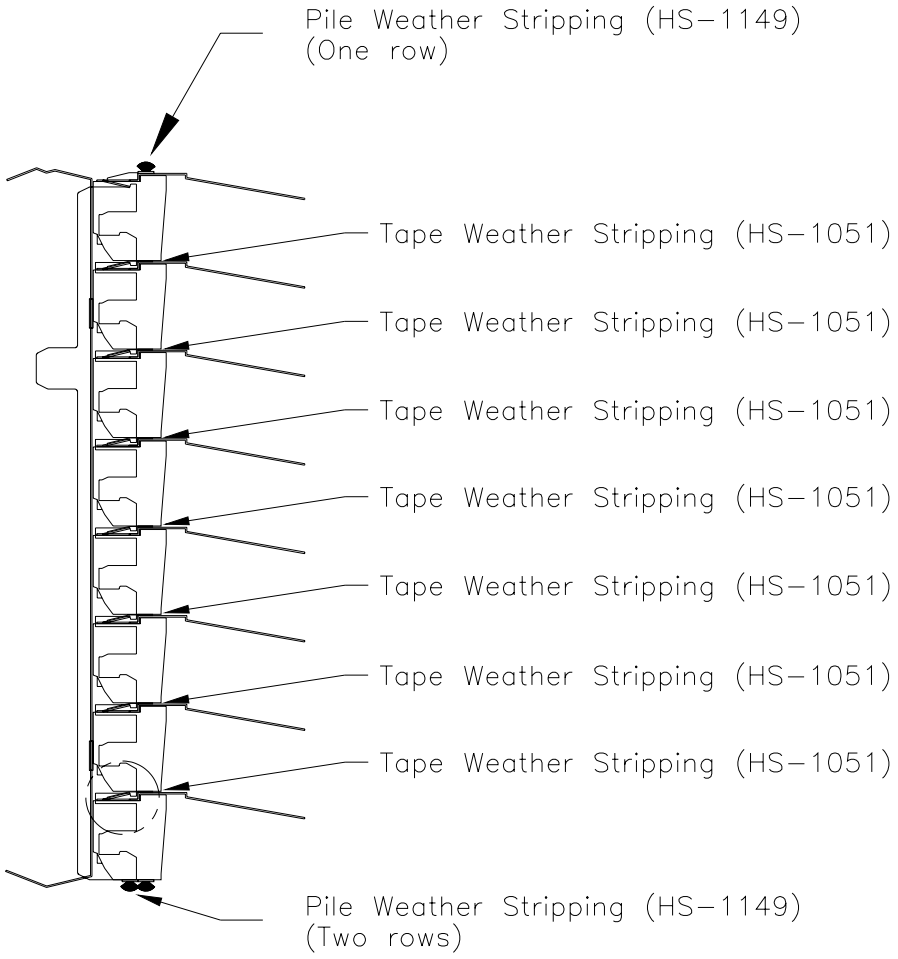
4. For return of defective items under the exchange program, please utilize the UPS Blue Return Tags found in the package containing the exchange unit sent from Daktronics. This will speed up the transaction and will also avoid any confusion when the part is returned to Daktronics. **The defective item 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



SIDE VIEW OF LENS/REFLECTOR ASSY

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

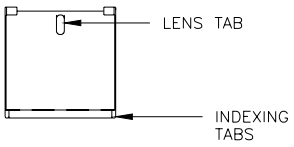
TITLE: LENS ASSY, WEATHERSTRIPPING LOCATION, FOR MANUAL

DES. BY: DRAWN BY: JRT DATE: 15JAN98

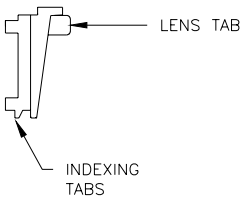
REVISION APPR. BY:

SCALE: 1=3

1176-R10A-91100

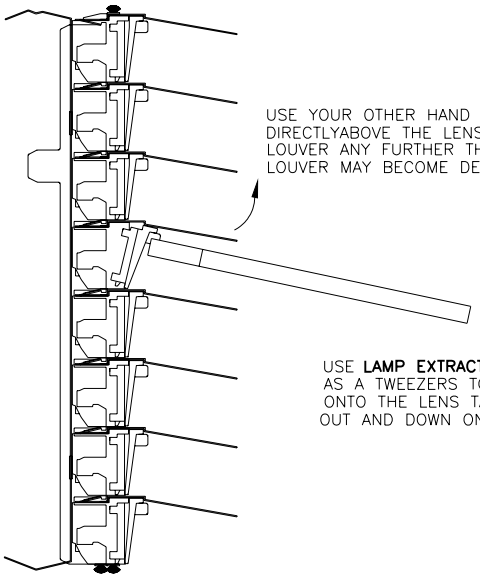


FRONT VIEW



SIDE VIEW

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



SIDE VIEW OF LENS/REFLECTOR ASSY

RUBBER-TIPPED LAMP EXTRACTING TOOL

DAK PART No. TH-1032

REV.	DATE	DESCRIPTION	BY	APPR.
1	27APR98	CORRECTED DWG TITLE FROM "LENS ASSY REMOVAL" TO "LENS REMOVAL".	JRT	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

TITLE: LENS REMOVAL, FRONT ACCESS, FOR MANUAL USE

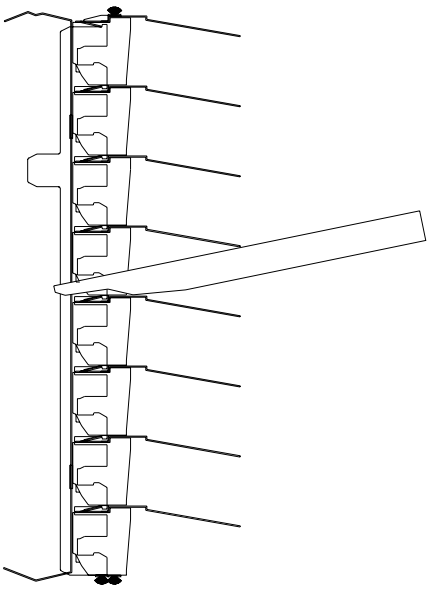
DES. BY: DRAWN BY: JRT DATE: 15JAN98

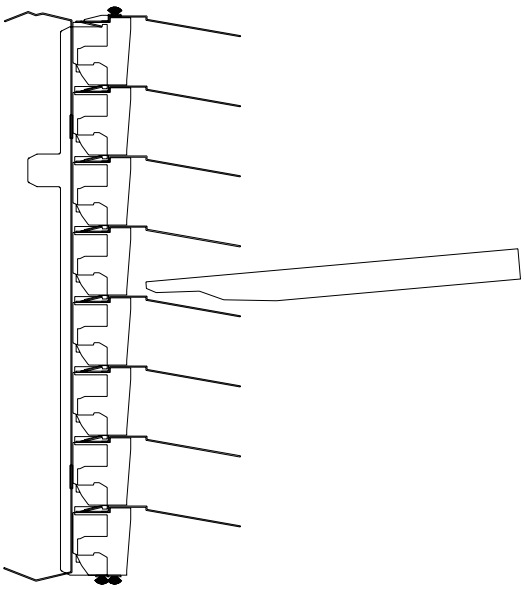
REVISION APPR. BY:

SCALE: 1=4

1176-R19A-99898

FRONT ACCESS REMOVAL TOOL
DAK PART No. 0M-95442





SIDE VIEW OF LENS/REFLECTOR ASSY

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

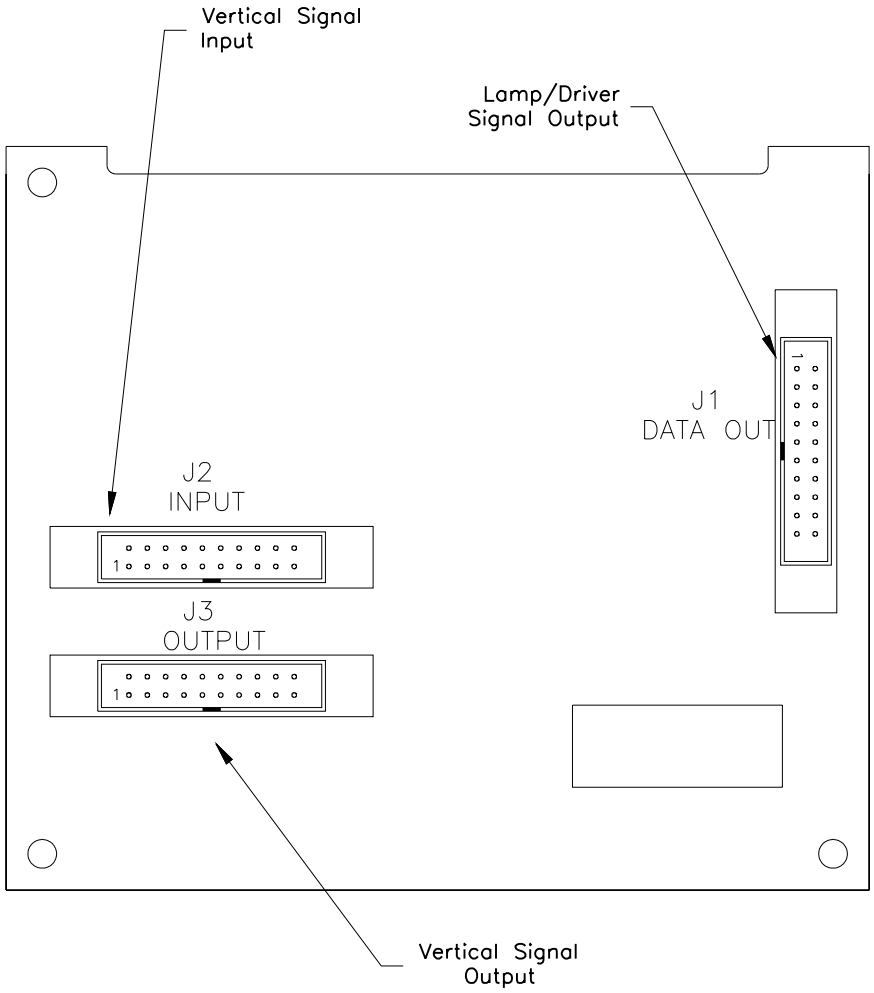
TITLE: LENS ASSY REMOVAL, FRONT ACCESS, FOR MANUAL USE

DES. BY: DRAWN BY: JRT DATE: 15JAN98

REVISION APPR. BY:

SCALE: 1=4

1176-R10A-99899



LAYOUT VIEW

NOTES:

Refer to dwg B-99184 to insure current revision level.

REV.	DATE	DESCRIPTION	BY	APPR.
1	30JUL98	CORRECTED DESCRIPTION OF OUTPUTS.	JRT	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS

TITLE: VERTICAL SHIFT BOARD, MANUAL USE

DES. BY: JRT DRAWN BY: JRT DATE: 17APR98

REVISION APPR. BY:

SCALE: 1=1

1176-R08A-101842

WARNING

F1 AGC 2-1/2 — FOR CONTINUED PROTECTION AGAINST THE POSSIBILITY OF FIRE, REPLACE ONLY WITH THE SAME TYPE AND RATING OF FUSE.

V4600: S8 - S11 = SIGN SIZE — **V7000: S8 - S11 = FIXED BUFFER SIZE**

ROWS S8,S9

ROWS	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	
S9=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S8=OFF
ROWS	136	144	152	160	168	176	184	192	200	208	216	224	232	240	248	256	
S9=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S8=ON

COLUMNS S10,S11

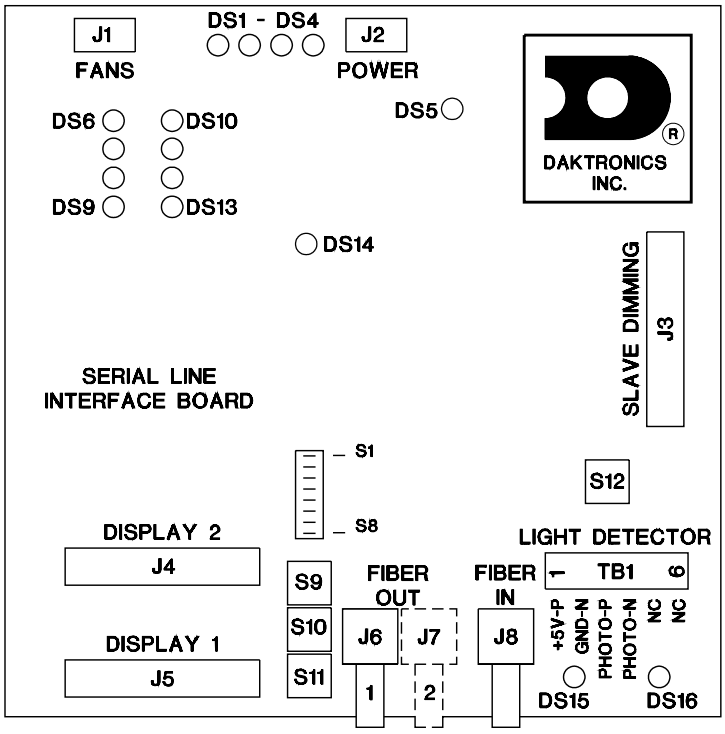
COLS	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	
S11=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S10=0
COLS	272	288	304	320	336	352	368	384	400	416	432	448	464	480	496	512	
S11=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S10=1
COLS	528	544	560	576	592	608	624	640	656	672	688	704	720	736	752	768	
S11=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S10=2
COLS	784	800	816	832	848	864	880	896	912	928	944	960	976	992	1008	1024	
S11=	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	S10=3

MODE:
1. LEFT TO RIGHT ——— S1=ON, S2=ON
2. RIGHT TO LEFT V4600 — S1=OFF, S2=ON
3. RIGHT TO LEFT V6500 — S1=ON, S2=OFF
4. NOT USED ——— S1=OFF, S2=OFF

TEST MODE: S7 ON=TEST, OFF=NORMAL
UNUSED: S3,S4

BUFFER CONFIG: S5 AND S6 (MODE 3 ONLY)
256 X 128 ——— S5=OFF, S6=OFF
128 X 256 ——— S5=ON, S6=OFF
64 X 512 ——— S5=OFF, S6=ON
32 X 1024 ——— S5=ON, S6=ON

BRIGHTNESS LEVEL: S12 LOWER SETTING=DIMMER



DS1 - FAULT
DS2 - TEST
DS3 - DATA
DS4 - BRIGHT
DS5 - PWR
DS6-DS13 - FANS 1-8 ON=GOOD
DS14 - PROGRAM
DS15 - TRANSMIT 1
DS16 - TRANSMIT 2

MODEL NUMBER _____

SERIAL NUMBER _____

LL-2358
REV 2

NOTES:

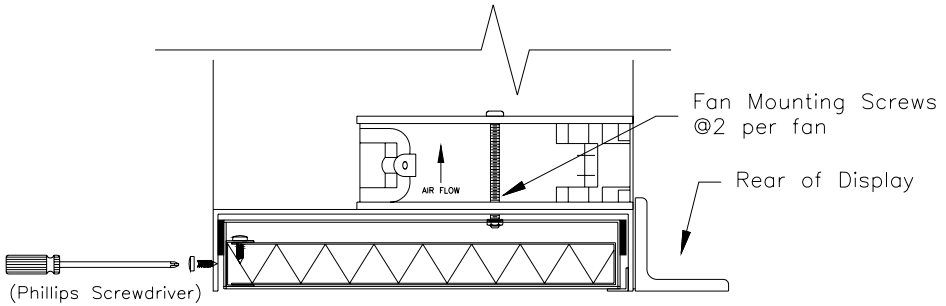
Refer to dwg B-99636 to ensure current revision level.

REV.	DATE	DESCRIPTION	BY	APPR.
2	23JUN98	CHGD LABEL OF TB1 FROM "INPUT/OUTPUT" TO "LIGHT DETECTOR".	GDT	DAN S.
1	05JUN98	ADDED NOTE CONCERNING SIGN SIZE FOR V4600 OR V7000. CHGD UNUSED SWITCHES FROM S4,S7 TO S3,S4. MADE S7 TEST SWITCH INSTEAD OF S3.	GDT	DAN S.

DAKTRONICS, INC. BROOKINGS, SD 57006

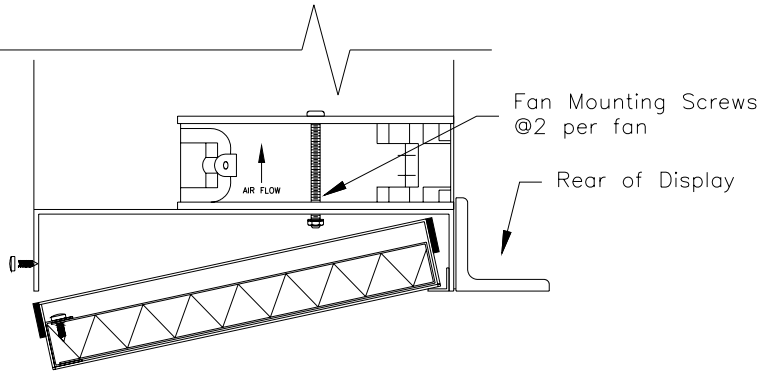
PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"
TITLE: LABEL, SERIAL LINE INTERFACE, MANUAL USE, LL2358
DES. BY: DRAWN BY: JRT DATE: 17APR98
REVISION APPR. BY:
SCALE: 1=1.25

1176-R08A-101843



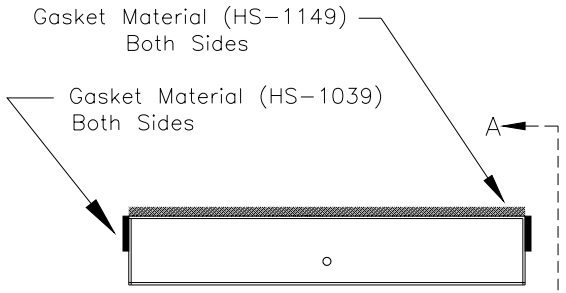
SECTION VIEW 1

of Bottom of Display



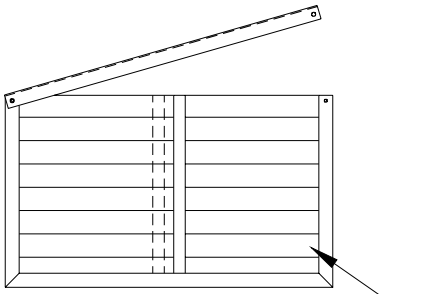
SECTION VIEW 2

of Bottom of Display



SIDE VIEW

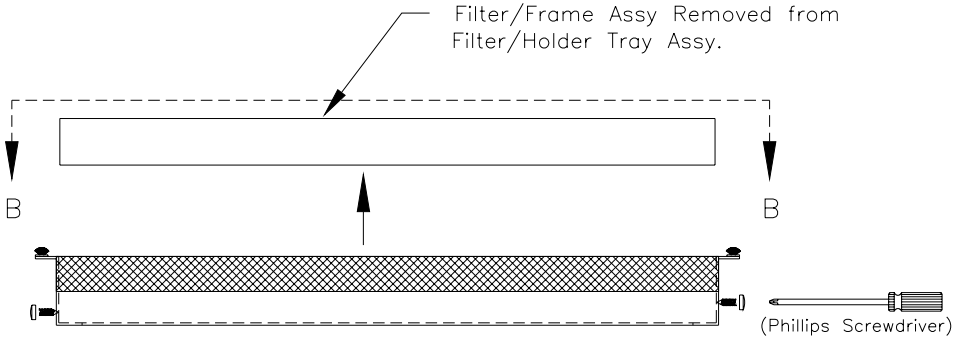
Of Filter Holder Tray Assy
Removed from Display Cabinet



SECTION VIEW B-B

Scale: 1=8

Wire Side Must always
Face up Into the Display.



SECTION VIEW A-A

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

TITLE: FILTER ACCESS, SMALL LINE DISPLAYS, 250 CFM FAN

DES. BY: DRAWN BY: JRT DATE: 28MAY98

REVISION APPR. BY:

SCALE: 1=4

1176-R08A-103235

Appendix A: Light Detector & Temperature Sensor

This appendix contains:

- Light Detector Mounting Procedure (**ED-9490**)
- 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 the light detector to the display. Refer to **ED-9490** for further installation instructions. To connect the light detector to the controller refer to **Section 3.10**.

A.2 Temperature Sensor

To connect the temperature sensor wires to the controller refer to **Section 3.11**. Refer to **ED-9489** or more installation information.

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 ½" 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 ½" conduit and the conduit should be earth grounded to help protect the sensor from lightning damage.

FIGURE B

FIGURE D

FIGURE F

SCALE: 1=1

FIGURE A

FIGURE C

FIGURE E

REV.	DATE	DESCRIPTION	BY	APPR.
02	02 dec 04	CORRECTED WIRING PINOUT OF PCB TERMINAL BLOCK	EB	
1	06MAY97	ADDED W-1234 CABLE AND WIRING TO FIGURE A FOR INSTALLATION PURPOSES	RLONG	

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

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.

Appendix B: Supplementary Information

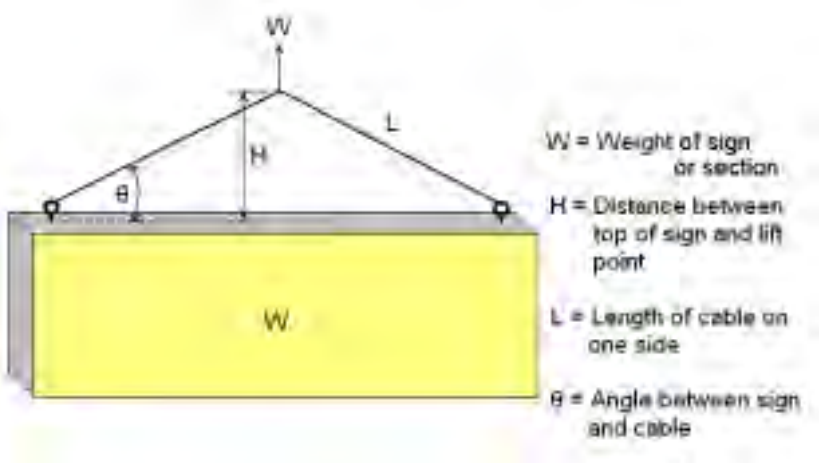
This appendix contains, but is not limited to:

- Eye bolt Information (**ED-7244**)

Eyebolts

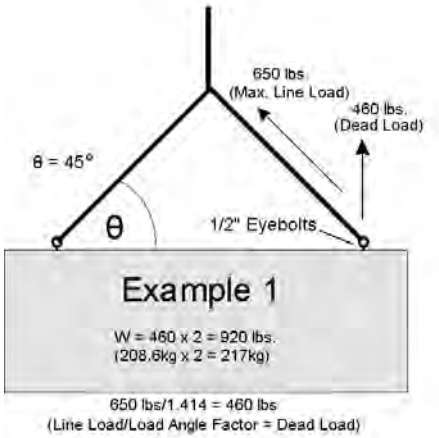
Almost every display that leaves Daktronics is equipped with eyebolts for lifting the display. There are two standard sizes of eyebolts: ½″ and ⅝″.

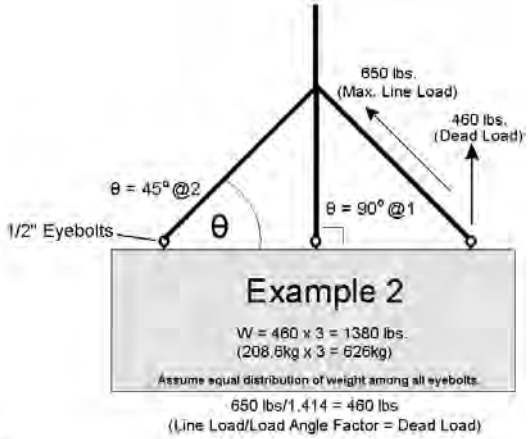
Load Increase Factor: The load increases as the lift angle (θ) decreases. The allowable load on the eyebolts also decreases with the lift angle due the bending stress on the eyebolts. In sum, the smaller the angle between the cable and the top of the display, the lighter the sign must be to safely lift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

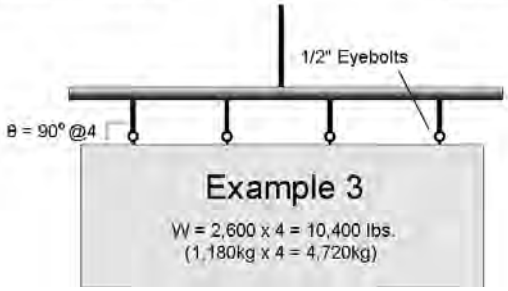


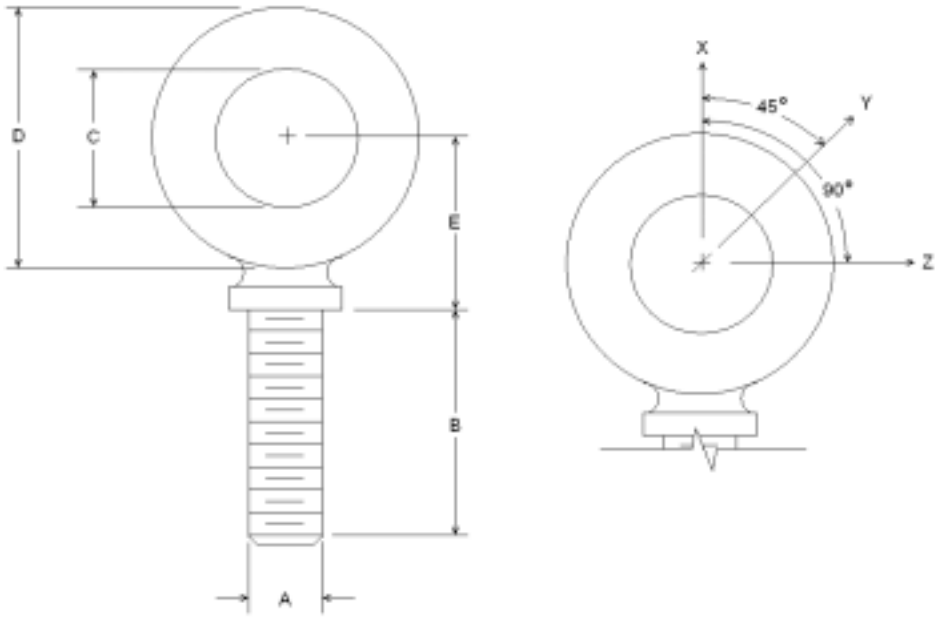
Horizontal Angle	Load Angle Factor (L/H)
90	1.00
60	1.155
50	1.305
45	1.414
30	2.00

	½"		⅝"	
θ	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

This appendix contains, but is not limited to:

- 1600 Series Display Power Report
- Installation Quality Checklist
- Maintenance Checklist
- Checkerboard Lamp Test Forms

DAKTRONICS, INC.
1600 SERIES DISPLAY POWER REPORT

SITE: _____

LINE VOLTAGE

PHASE A VOLTAGE _____
PHASE B VOLTAGE _____
PHASE C VOLTAGE _____

LINE RECORDER ON PHASE: _____

EXPECTED HOURS PER DAY DISPLAY WILL BE OPERATED ON DIM: ____ HRS

DRIVER MODULE #	ROW #	COLUMN #	VOLTAGE

Customer Service to Distribute Copies To:
1 Copy - Customer Service File
1 Copy - Mechanical Design (Dept. 370)
1 Copy - Project Manager File
1 Copy - Sales Person

Send Form To:
Daktronics Customer Service
P.O. Box 5128
Brookings, SD 57006-5128
Phone: 800/843-9879

DAKTRONICS, INC. PO BOX 5128 331 32ND AVENUE BROOKINGS, SD 57006
PHONE: (605)697-4000 FAX: (605)697-4700

DAKTRONICS, INC.
1600 SERIES DISPLAY POWER REPORT

SITE: _____

LINE VOLTAGE

PHASE A VOLTAGE _____
PHASE B VOLTAGE _____
PHASE C VOLTAGE _____

LINE RECORDER ON PHASE: _____

EXPECTED HOURS PER DAY DISPLAY WILL BE OPERATED ON DIM: ____ HRS

DRIVER MODULE #	ROW #	COLUMN #	VOLTAGE

Customer Service to Distribute Copies To:

1 Copy - Customer Service File
1 Copy - Mechanical Design (Dept. 370)
1 Copy - Project Manager File
1 Copy - Sales Person

Send Form To:

Daktronics Customer Service
P.O. Box 5128
Brookings, SD 57006-5128
Phone: 800/843-9879

DAKTRONICS, INC. PO BOX 5128 331 32ND AVENUE BROOKINGS, SD 57006
PHONE: (605)697-4000 FAX: (605)697-4700

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	
☐	☐			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
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			Check the spacing between modules of sectional displays with the 0.032 feeler gauge. Also check the weather stripping tightness with the feeler gauge (0M-69133).
☐	☐			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.
☐	☐			During assembly of sectional displays, check the interconnect ribbon cables at the splice locations to ensure they are not pinched.
☐	☐			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.
☐	☐			Ensure that all electrical entrance connections are watertight.
☐	☐			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.
☐	☐			Ensure that the supply voltage rating matches the voltage rating of the display.
☐	☐			Ensure that all cooling fans are operational after the initial fire up of the display.

OK	Rej	Initial	Date	
☐	☐			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.
☐	☐			Ensure that the display controller is set to have the lamp level on bright during the daylight hours.
☐	☐			If any modifications have been made to the Daktronics air filtration system, ensure that these changes have been approved by the Daktronics Engineering Staff.
☐	☐			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.
☐	☐			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.
☐	☐			Ensure that all wiring clears the bottom of the display by a minimum of ½" and is not in contact with any sharp edges.
☐	☐			Ensure that the backsheets of rear access displays are removable and are not obstructed by conduit or support structure members.
☐	☐			On displays with bottom ventilation, 2 ½" of clearance between the bottom of the display & any other display/obstruction is required for air intake & filter mainenance.

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 or 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.

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P.O. Box 5128
Brookings, SD 57006-51285

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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	
☐	☐			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
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			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.
☐	☐			Check the spacing between modules of sectional displays with the 0.032 feeler gauge. Also check the weather stripping tightness with the feeler gauge (0M-69133).
☐	☐			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.
☐	☐			During assembly of sectional displays, check the interconnect ribbon cables at the splice locations to ensure they are not pinched.
☐	☐			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.
☐	☐			Ensure that all electrical entrance connections are watertight.
☐	☐			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.
☐	☐			Ensure that the supply voltage rating matches the voltage rating of the display.
☐	☐			Ensure that all cooling fans are operational after the initial fire up of the display.

OK	Rej	Initial	Date	
☐	☐			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.
☐	☐			Ensure that the display controller is set to have the lamp level on bright during the daylight hours.
☐	☐			If any modifications have been made to the Daktronics air filtration system, ensure that these changes have been approved by the Daktronics Engineering Staff.
☐	☐			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.
☐	☐			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.
☐	☐			Ensure that all wiring clears the bottom of the display by a minimum of ½" and is not in contact with any sharp edges.
☐	☐			Ensure that the backsheets of rear access displays are removable and are not obstructed by conduit or support structure members.
☐	☐			On displays with bottom ventilation, 2 ½" of clearance between the bottom of the display & any other display/obstruction is required for air intake & filter mainenance.

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 or 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

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.

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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.

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DF-1866
Rev. 3 – 24 October 2001

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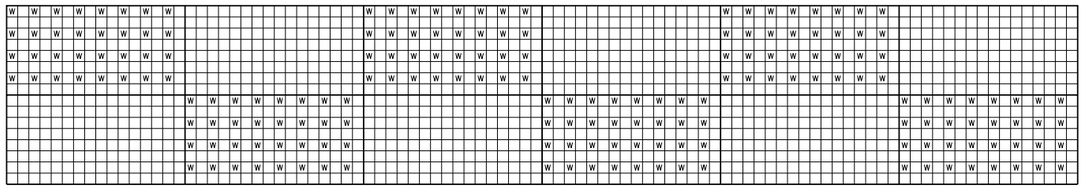

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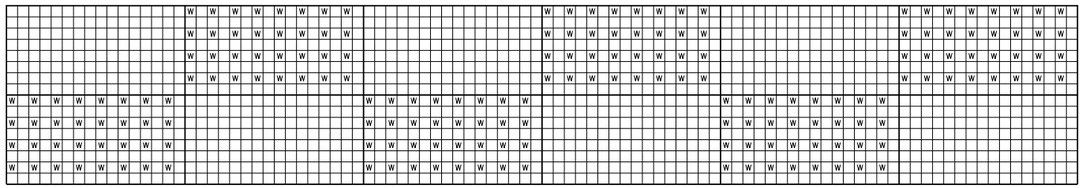

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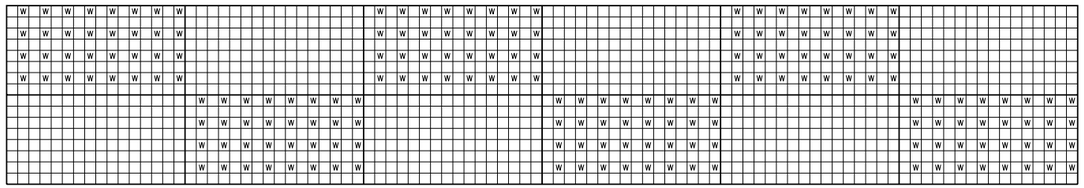

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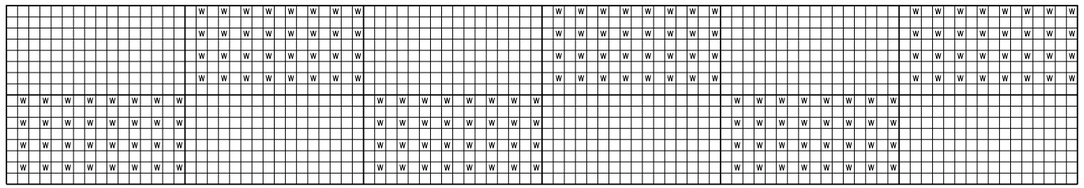

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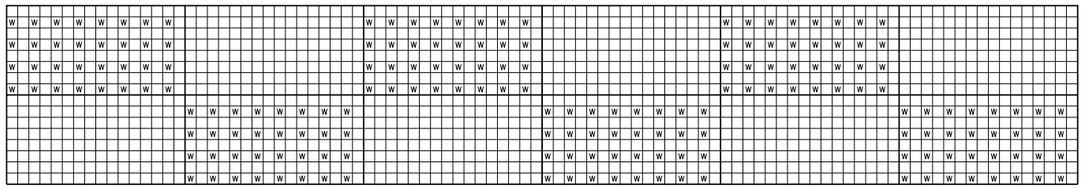

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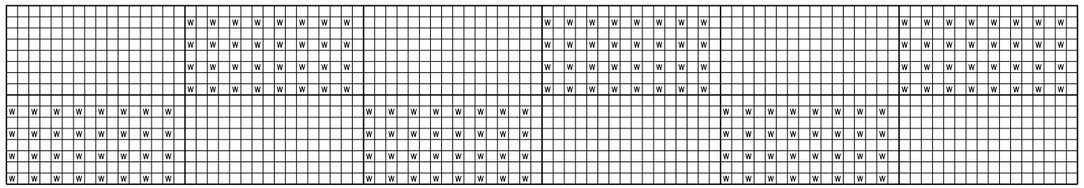

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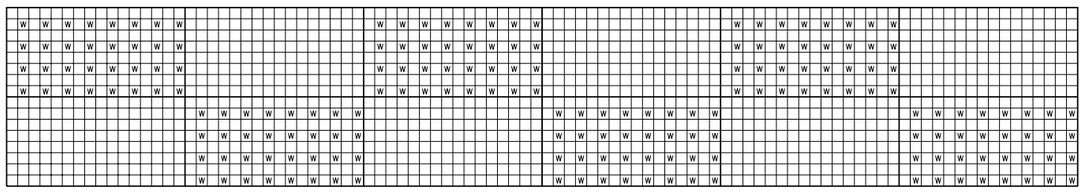
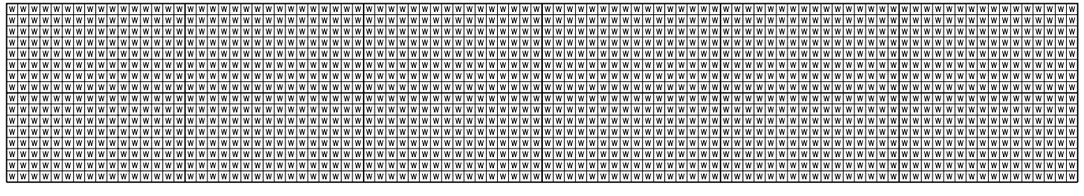


FRAME 7



ALL LENS LAMP TEST

FRAME 8

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.

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

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:

SCALE: 1=3

1089-R11B-71877

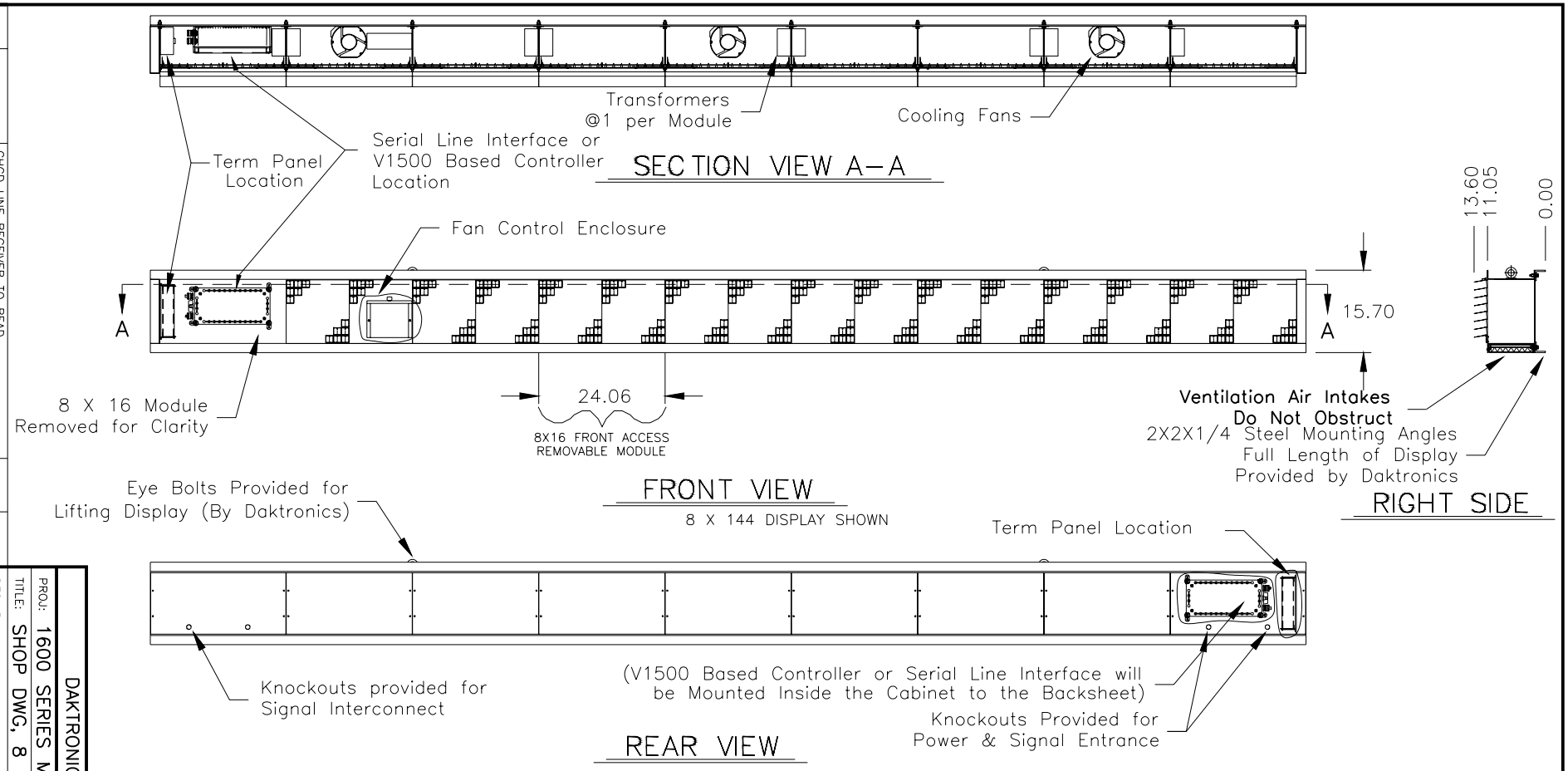
Appendix D: Project Specific Information

This **Appendix** contains project specific information compiled for installations that require further documentation.

This section may include (but not restricted to):

- System Riser Diagram
- Schematic
- Shop Drawing
- Mounting Attachment Details

REV.	DATE	DESCRIPTION	BY	APPR.
1	19MAY98	CHGD LINE RECEIVER TO READ SERIAL LINE INTERFACE	JRT	



NOTES:

1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
2. DISPLAY IS DESIGNED FOR FRONT ACCESS ONLY.
3. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
4. AIR INLETS AT BOTTOM OF DISPLAY CAN NOT BE OBSTRUCTED.
5. ALL DIMENSIONS ARE IN INCHES.
6. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (12" X 24" ACTIVE AREA)
7. DISPLAY WILL BE EQUIPPED WITH EITHER A SERIAL LINE INTERFACE OR A VENUS 1500 BASED CONTROLLER.
8. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.

MODEL	TOTAL DISPLAY LENGTH	TOTAL DISPLAY HEIGHT	ACTIVE AREA LENGTH	ACTIVE AREA HEIGHT	WEIGHT (SF)	# OF MODULES
848	75.78	15.70	72.18	12.12	105	3
864	99.84	15.70	96.24	12.12	140	4
880	123.90	15.70	120.30	12.12	175	5
896	147.96	15.70	144.36	12.12	210	6
8112	172.02	15.70	168.42	12.12	245	7
8128	196.08	15.70	192.48	12.12	280	8
8144	220.14	15.70	216.54	12.12	315	9

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

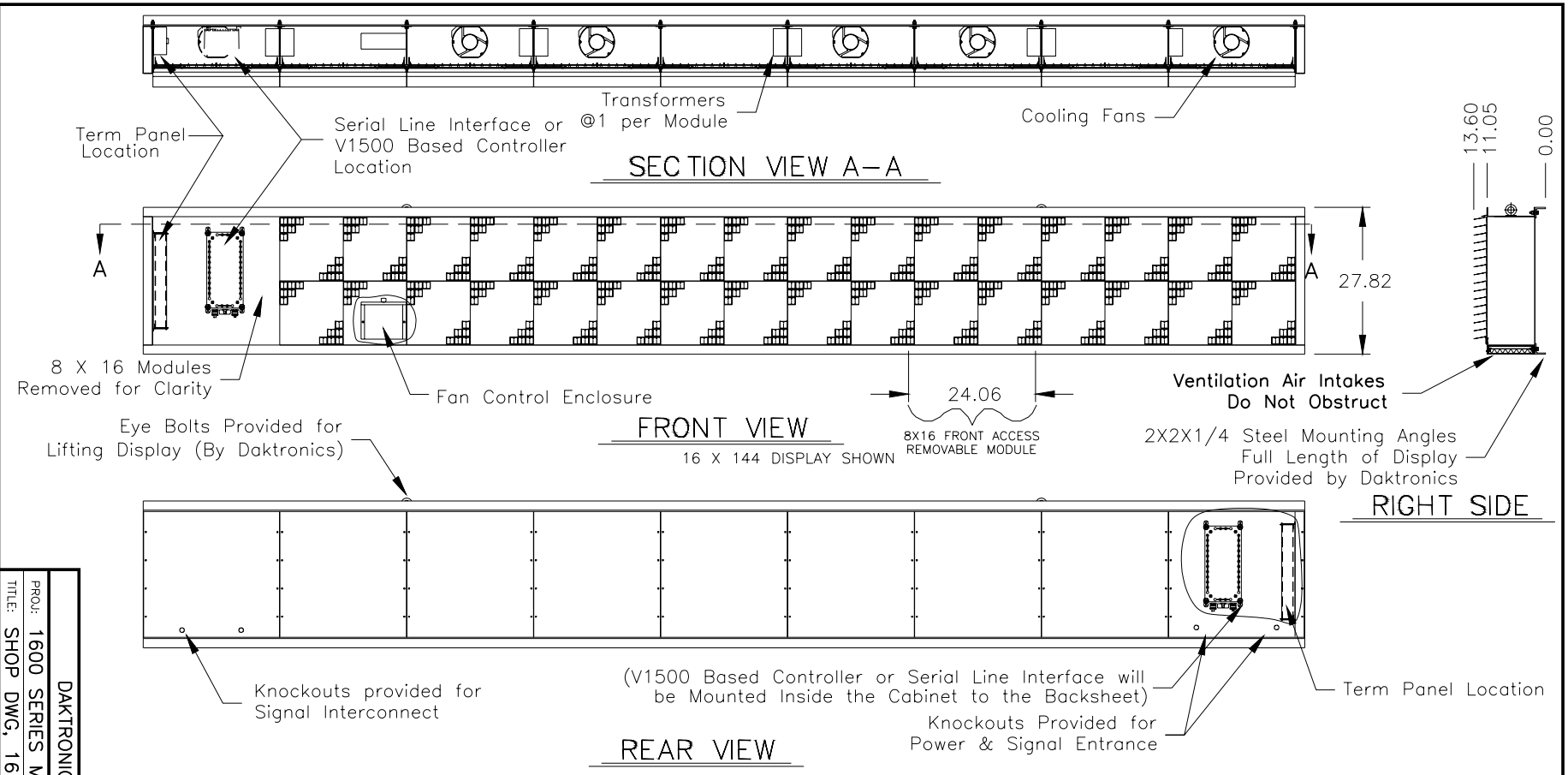
TITLE: SHOP DWG, 8 HIGH S1600 DISPLAYS

DES. BY: DRAWN BY: JRT DATE: 1MAY98

REVISION APPR. BY:

SCALE: 1=30

1176-R08A-102325



NOTES:

1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
2. DISPLAY IS DESIGNED FOR FRONT ACCESS ONLY.
3. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
4. AIR INLETS AT BOTTOM OF DISPLAY CAN NOT BE OBSTRUCTED.
5. ALL DIMENSIONS ARE IN INCHES.
6. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (12" X 24" ACTIVE AREA)
7. DISPLAY WILL BE EQUIPPED WITH EITHER A SERIAL LINE INTERFACE OR A VENUS 1500 BASED CONTROLLER.
8. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.

MODEL	TOTAL DISPLAY LENGTH	TOTAL DISPLAY HEIGHT	ACTIVE AREA LENGTH	ACTIVE AREA HEIGHT	WEIGHT (SF)	# OF MODULES
1648	75.78	27.82	72.18	24.24	210	6
1664	99.84	27.82	96.24	24.24	280	8
1680	123.90	27.82	120.30	24.24	350	10
1696	147.96	27.82	144.36	24.24	420	12
16112	172.02	27.82	168.42	24.24	490	14
16128	196.08	27.82	192.48	24.24	560	16
16144	220.14	27.82	216.54	24.24	630	18

REV.	DATE	DESCRIPTION	BY	APPR.
1	19MAY98	CHGD. LINE RECEIVER TO READ SERIAL LINE INTERFACE.	JRT	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

TITLE: SHOP DWG, 16 HIGH S1600 DISPLAYS

DES. BY:

DRAWN BY: JRT

DATE: 1MAY98

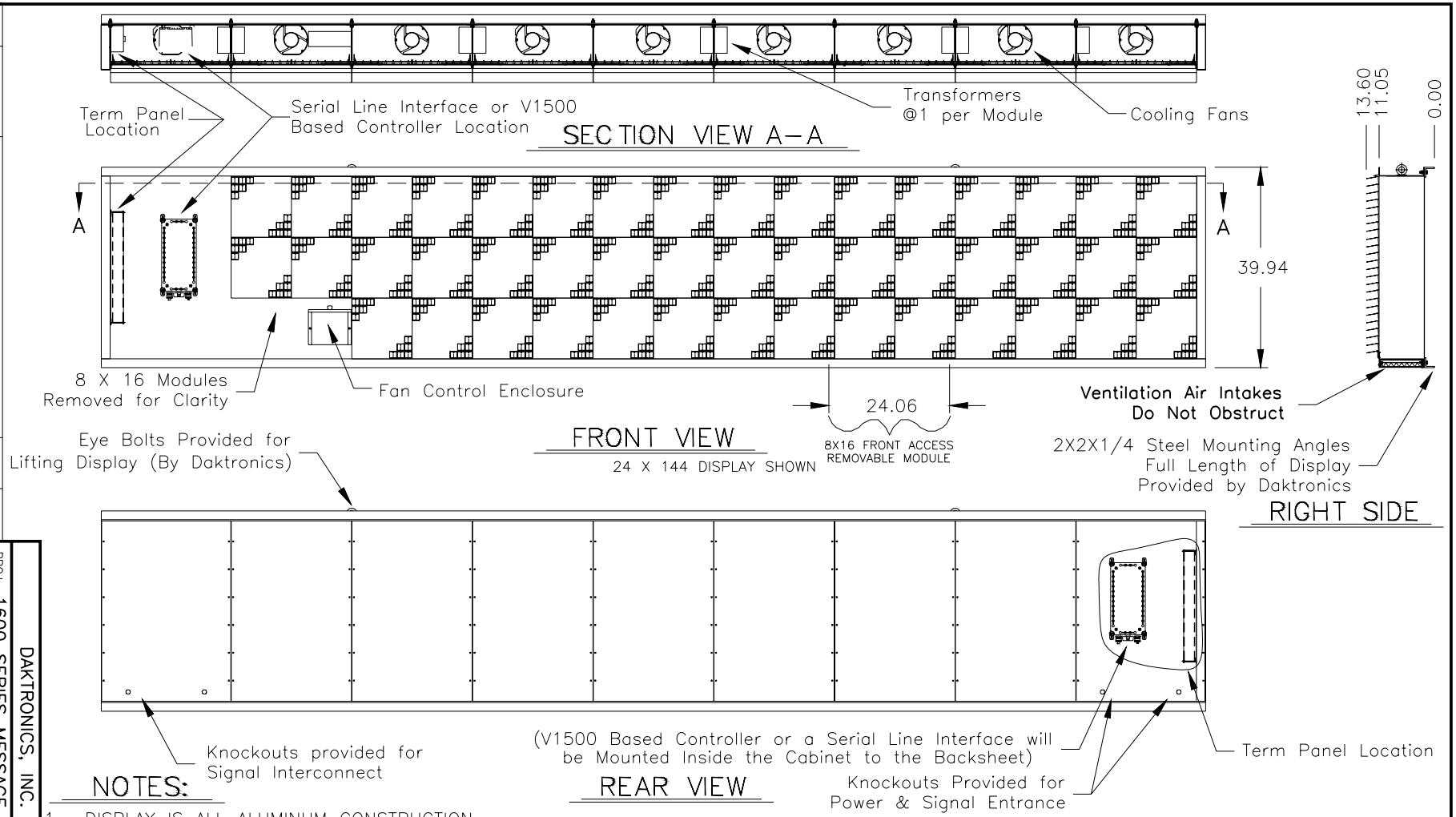
APPR. BY:

SCALE: 1=30

REVISION

1176-R08A-102326

REV.	DATE	DESCRIPTION	BY	APPR.
2	11JUN98	CORRECTED SIDE VIEW FROM 2 TO 3 MODULES HIGH. MOVED FAN CONTROL.	JRT	
1	19MAY98	CHGD LINE RECEIVER TO READ SERIAL LINE INTERFACE.	JRT	



NOTES:

1. DISPLAY IS ALL ALUMINUM CONSTRUCTION
2. DISPLAY IS DESIGNED FOR FRONT ACCESS ONLY.
3. MAIN ELECTRICAL DISCONNECT TO BE FURNISHED BY CUSTOMER
4. AIR INLETS AT BOTTOM OF DISPLAY CAN NOT BE OBSTRUCTED.
5. ALL DIMENSIONS ARE IN INCHES.
6. VENTILATION: IN ENCLOSED CABINET SITUATIONS, TWELVE SQ INCHES OF UNOBSTRUCTED OPENING PER MODULE MUST BE PROVIDED TO INSURE ADEQUATE DISPLAY COOLING. ALLOWANCES MUST BE MADE TO COMPENSATE FOR THE PERCENTAGE OF SCREEN IN THE MATERIAL COVERING THE OPENINGS IN THE STRUCTURE. IF AIR MUST BE FORCED INTO THE ENCLOSED CABINET, 120 CUBIC FEET PER MINUTE MUST BE PROVIDED PER MODULE (12" X 24" ACTIVE AREA)
7. DISPLAY WILL BE EQUIPPED WITH EITHER A SERIAL LINE INTERFACE OR A VENUS 1500 BASED CONTROLLER.
8. CUSTOMER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE STRUCTURE THAT THE DISPLAY IS MOUNTED TO.

MODEL	TOTAL DISPLAY LENGTH	TOTAL DISPLAY HEIGHT	ACTIVE AREA LENGTH	ACTIVE AREA HEIGHT	WEIGHT (SF)	# OF MODULES
2448	75.78	39.94	72.18	36.36	315	9
2464	99.84	39.94	96.24	36.36	420	12
2480	123.90	39.94	120.30	36.36	525	15
2496	147.96	39.94	144.36	36.36	630	18
24112	172.02	39.94	168.42	36.36	735	21
24128	196.08	39.94	192.48	36.36	840	24
24144	220.14	39.94	216.54	36.36	945	27

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE BOARDS, 1 1/2"

TITLE: SHOP DWG, 24 HIGH S1600 DISPLAYS

DES. BY:

DRAWN BY: JRT

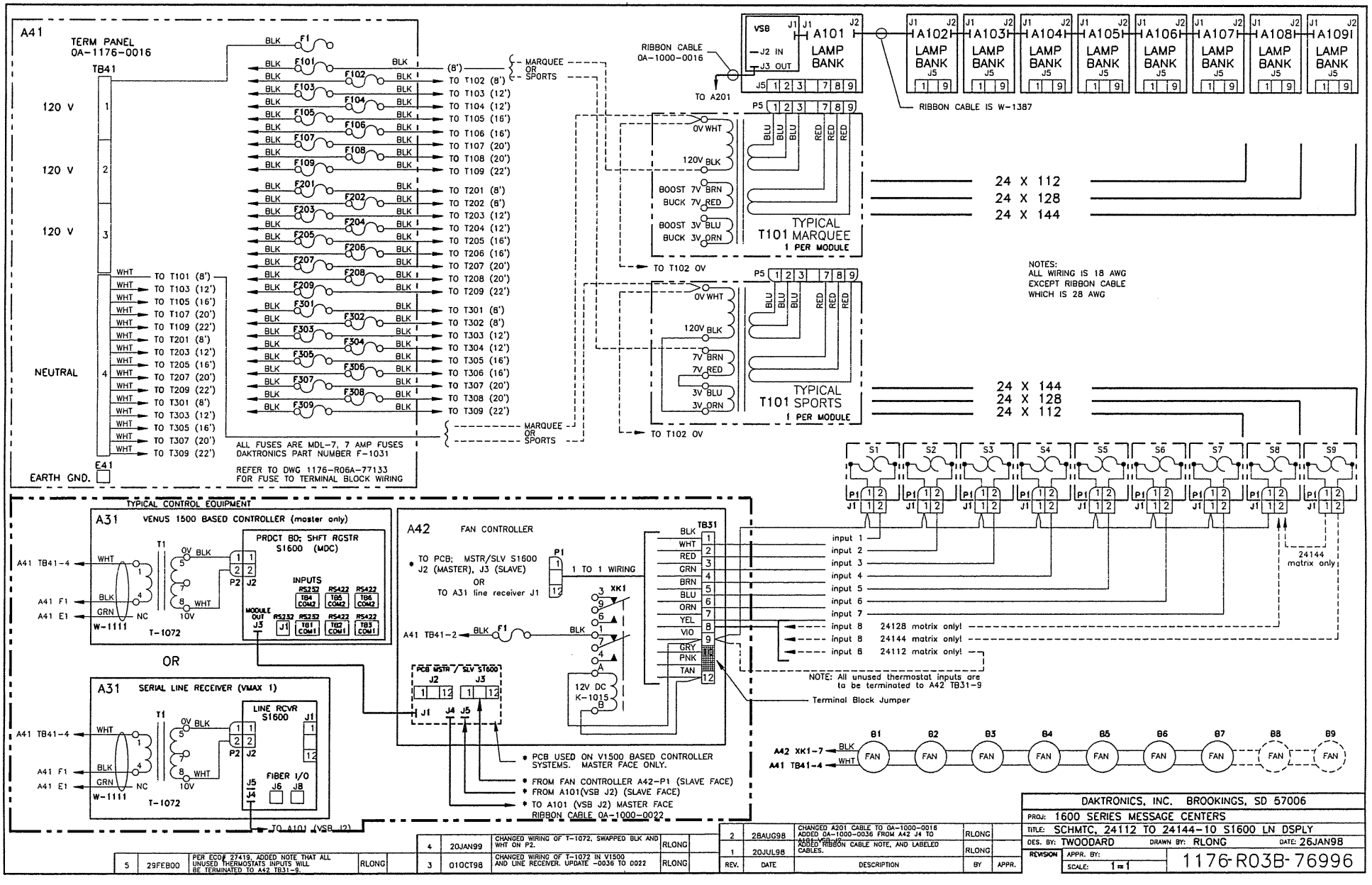
DATE: 1MAY98

APPR. BY:

SCALE: 1=30

REVISION

1176-R08A-102327



REV.	DATE	DESCRIPTION	BY	APPR.
5	29FEB00	PER ECO# 27419, ADDED NOTE THAT ALL UNUSED THERMOSTATS INPUTS WILL BE TERMINATED TO A42 TB31-9.	RLONG	
4	20JAN99	CHANGED WIRING OF T-1072, SWAPPED BLK AND WHT ON P2.	RLONG	
3	010CT98	CHANGED WIRING OF T-1072 IN V1500 AND LINE RECEIVER. UPDATE -0036 TO 0022	RLONG	
2	28AUG98	CHANGED A201 CABLE TO 0A-1000-0016 ADDED 0A-1000-0036 FROM A42 J4 TO A201 (VSB J2)	RLONG	
1	20JUL98	ADDED RIBBON CABLE NOTE, AND LABELED CABLES.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE CENTERS

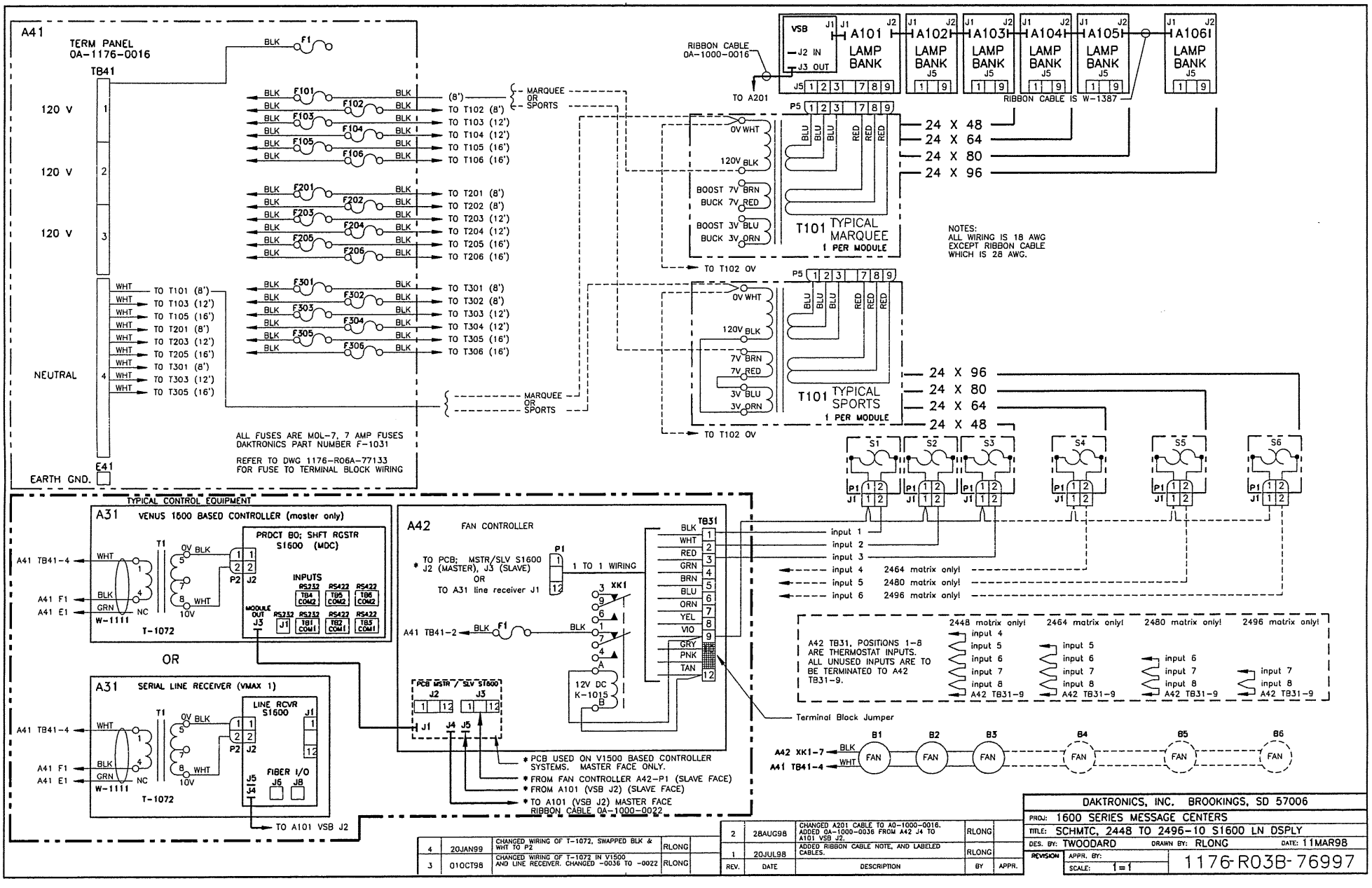
TITLE: SCHMTC, 24112 TO 24144-10 S1600 LN DSPLY

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 26JAN98

REVISION APPR. BY:

SCALE: 1=1

1176-R03B-76996



REV.	DATE	DESCRIPTION	BY	APPR.
4	20JAN99	CHANGED WIRING OF T-1072, SWAPPED BLK & WHT TO P2	RLONG	
3	010CT98	CHANGED WIRING OF T-1072 IN V1500 AND LINE RECEIVER. CHANGED -0036 TO -0022	RLONG	
2	28AUG98	CHANGED A201 CABLE TO A0-1000-0016. ADDED 0A-1000-0036 FROM A42 J4 TO A101 VSB J2.	RLONG	
1	20JUL98	ADDED RIBBON CABLE NOTE, AND LABELED CABLES.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE CENTERS

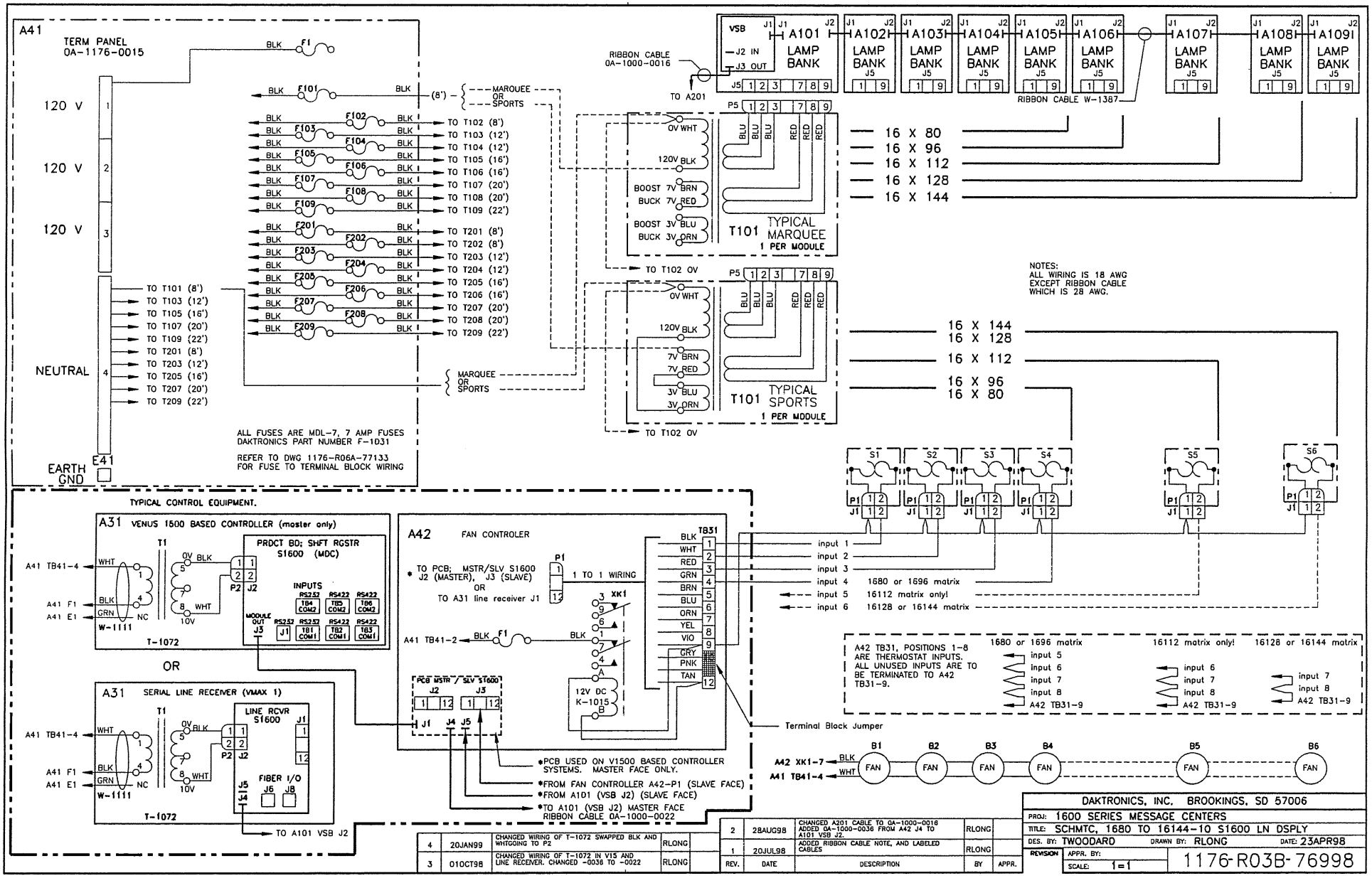
TITLE: SCHMTC, 2448 TO 2496-10 S1600 LN DSPLY

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 11MAR98

REVISION APPR. BY:

SCALE: 1=1

1176-R03B-76997



REV.	DATE	DESCRIPTION	BY	APPR.
4	20JAN99	CHANGED WIRING OF T-1072 SWAPPED BLK AND WHTGOING TO P2	RLONG	
3	010CT98	CHANGED WIRING OF T-1072 IN V15 AND LINE RECEIVER. CHANGED -0038 TO -0022	RLONG	
2	28AUG98	CHANGED A201 CABLE TO 0A-1000-0016 ADDED 0A-1000-0036 FROM A42 J4 TO A101 VSB J2.	RLONG	
1	20JUL98	ADDED RIBBON CABLE NOTE, AND LABELED CABLES	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE CENTERS

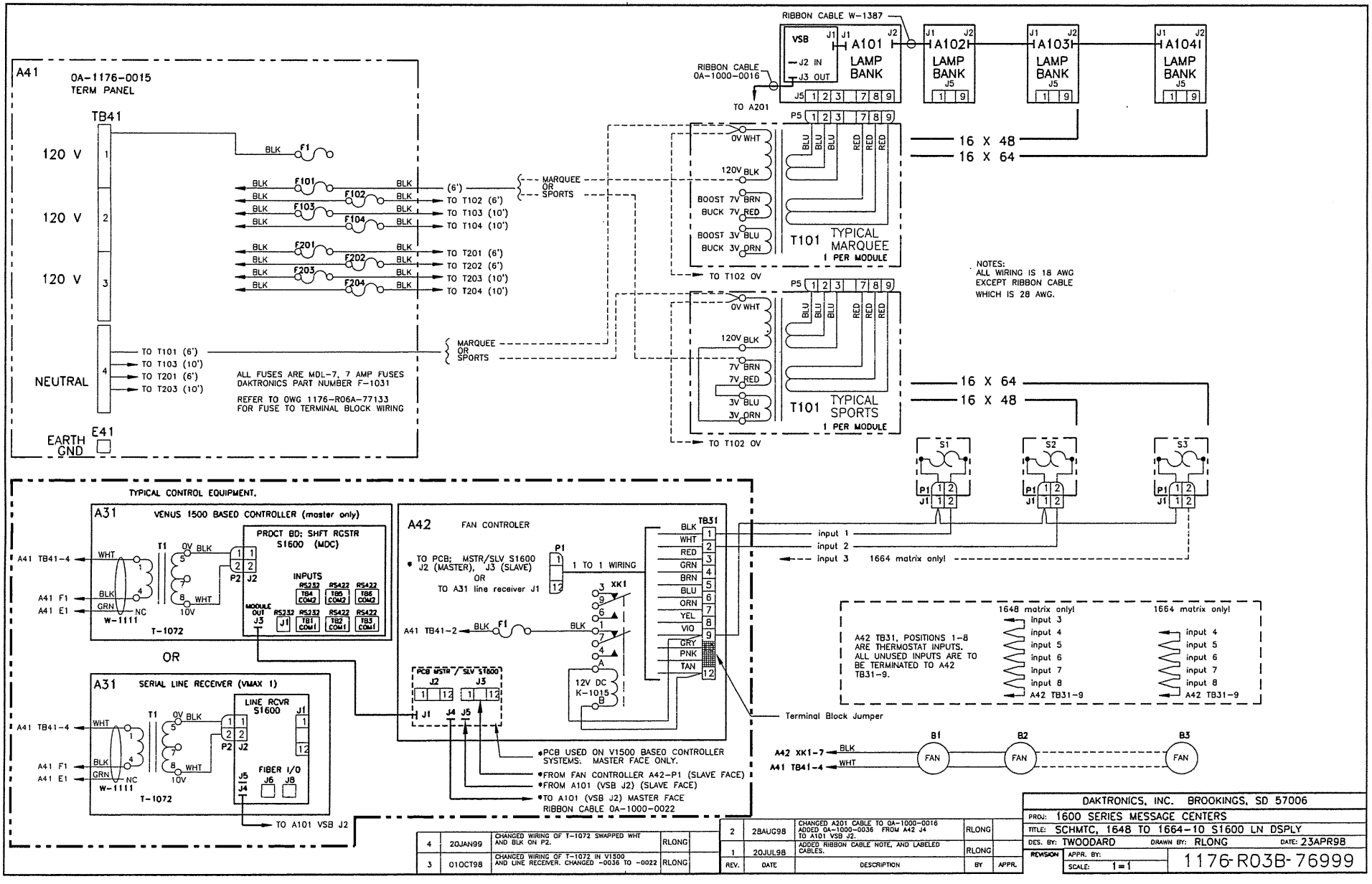
TITLE: SCHMTC, 1680 TO 16144-10 S1600 LN DSPLY

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 23APR98

REVISION APPR. BY:

SCALE: 1=1

1176-R03B-76998



REV.	DATE	DESCRIPTION	BY	APPR.
4	20JAN99	CHANGED WIRING OF T-1072 SWAPPED WHT AND BLK ON P2.	RLONG	
3	010CT98	CHANGED WIRING OF T-1072 IN V1500 AND LINE RECEIVER. CHANGED -0036 TO -0022	RLONG	
2	28AUG98	CHANGED A201 CABLE TO 0A-1000-0016 ADDED 0A-1000-0036 FROM A42 J4 TO A101 VSB J2.	RLONG	
1	20JUL98	ADDED RIBBON CABLE NOTE, AND LABELED CABLES.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE CENTERS

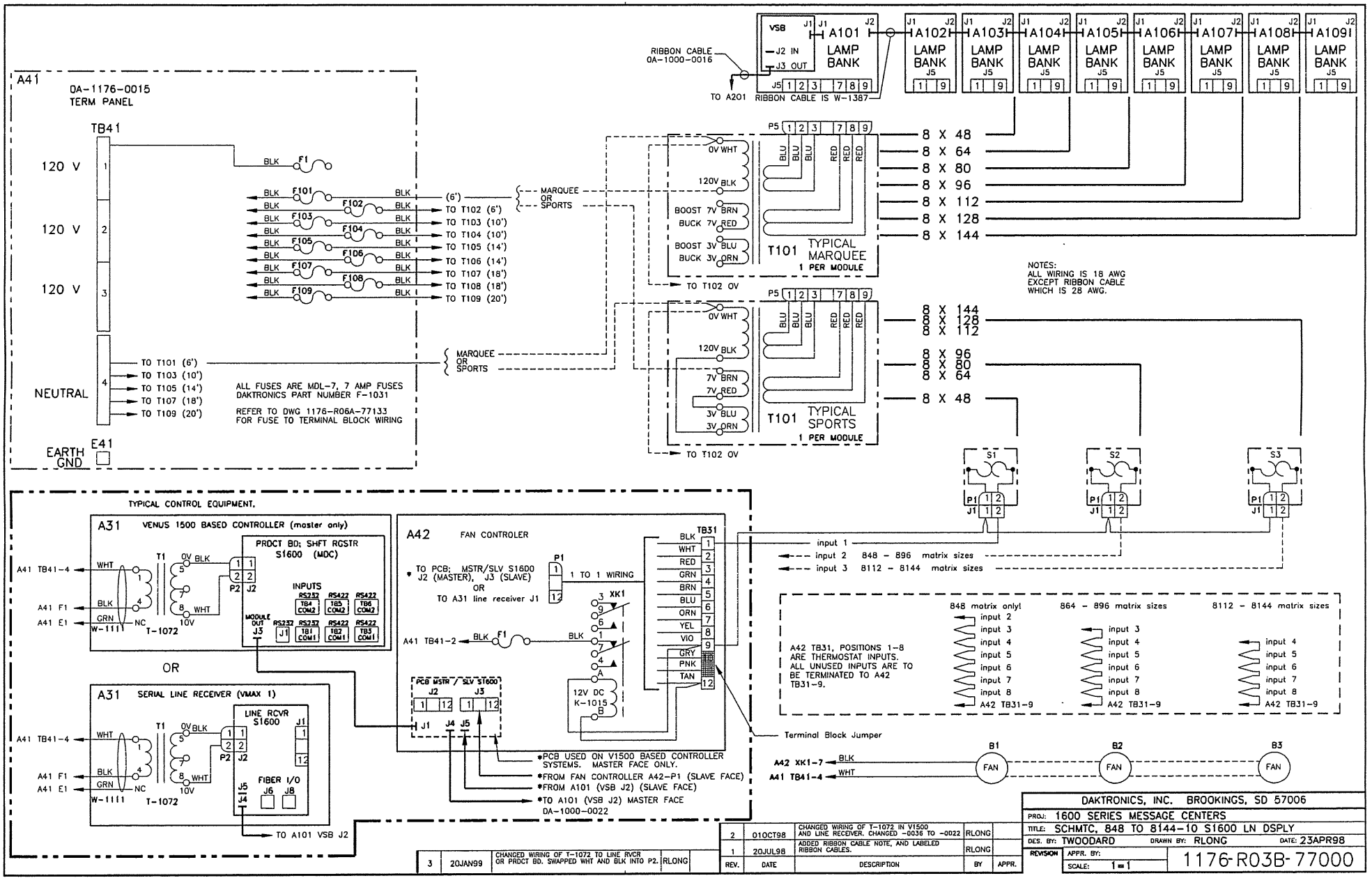
TITLE: SCHMTC, 1648 TO 1664-10 S1600 LN DSPLY

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 23APR98

REVISION APPR. BY:

SCALE: 1=1

1176-R03B-76999



REV.	DATE	DESCRIPTION	BY	APPR.
3	20JAN99	CHANGED WIRING OF T-1072 TO LINE RVCR OR PRDCT BD. SWAPPED WHT AND BLK INTO P2.	RLONG	
2	01OCT98	CHANGED WIRING OF T-1072 IN V1500 AND LINE RECEIVER. CHANGED -0036 TO -0022	RLONG	
1	20JUL98	ADDED RIBBON CABLE NOTE, AND LABELED RIBBON CABLES.	RLONG	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: 1600 SERIES MESSAGE CENTERS

TITLE: SCHMTC, 848 TO 8144-10 S1600 LN DSPLY

DES. BY: TWOODARD DRAWN BY: RLONG DATE: 23APR98

REVISION APPR. BY:

SCALE: 1=1

1176-R03B-77000