Auto Racing Display
Model CH-1624V

Installation & Service Manual

DAKTRONICS, INC.
Setting New Standards Worldwide
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Section 1 : Introduction

1.1 How To Use This Manual

This manual explains the installation and maintenance of the CH-1624V Auto Racing Display. Setup of other control equipment or operation of the CHTS-300 timing console are not covered in this manual. For questions regarding the safety, installation, operation or service of this system, please refer to the telephone numbers listed on the cover page of this manual.

Important Safeguards:

1. Read and understand these instructions before installing.
2. Do not drop the control console or allow it to get wet.
3. Be sure the display is properly grounded with a ground rod at the display location.
4. Disconnect power to the display when it is not in use.
5. Disconnect power when servicing the display.
6. Do not modify the display structure or attach any panels or coverings to the display without the written consent of Daktronics, Inc.

The box below illustrates Daktronics drawing numbering system. The drawing number “7087-P08A-69945” is how Daktronics identifies individual drawings. This number is located in the lower-right corner of the drawing. This manual refers to drawings by listing the last set of digits and the letter preceding them. In the example below, the drawing would be referred to as Drawing A-69945. Referenced drawings are inserted at the end of the first section which references them.

1.2 Display Overview

Reference Drawing: Display, CH-1624V ......................................[Drawing A-46744]

Drawing A-46744 shows a Daktronics CH-1624V display. The CH-1624V along with the use of the Daktronics CHTS-300 timing console will display the car positions on the display.
OVERALL DIMENSIONS: 289" H x 62" W x 6" D

WEIGHT: 575 LBS.

POWER REQUIREMENTS: 120/240 VAC, 40 AMPS PER LINE

MAXIMUM POWER DEMAND: 8000 WATTS WITH 25W LAMPS,
9500 WATTS WITH 30W LAMPS.

DIGITS ARE 24" HIGH, 4 x 7 MATRICES, WITH 25W FROSTED MED. BASE OR 30W FROSTED, 30R20 REFLECTOR LAMPS.
Section 2 : Installation

2.1 General System

Reference Drawings:
- Pwr/Sig Entrance, 1 Driver Display ................. Drawing A-46755
- Component Locations, CH-1624V .................. Drawing A-46756
- System Layout, CH-1624V .......................... Drawing A-46757
- Display Mounting, CH-1624V ....................... Drawing A-46774
- Footing & Beam, CH-1624V ........................ Drawing A-46784
- Color Code, 25 Pin J-Box ............................ Drawing A-47207
- Electrical Installation, CH-1624V .................. Drawing A-47270

Refer to Drawing A-46757 for a general system layout.

The general procedure for installing the CH-1624V display is as follows:

1. Select beam and footing recommendations from the table below.
2. Dig the footing holes and install beams and footings. Refer to the table in Section 2.2 for the correct beam and footing selections.
3. Route power and signal cables to the display and control locations.
4. Mount the displays to the beams as described in Drawings A-46774 and A-46784 and in Section 2.3.
5. Route power and signal wires into the displays as described in Drawings A-46755, A-46756, A-47207 and A-47270 and in Section 2.4.

2.2 Beam and Footing Selection

Reference Drawing: Footing & Beam, CH-1624V .................. Drawing A-46784

The table below contains recommendations for W-shape beams and footings to support the display as shown in Drawing A-46784. The first column is wind velocity in miles per hour. The distance in the second column is from the ground to the bottom of the display. The choices from these columns depend upon the display location.

The beams listed below are beams which provide maximum wind load strength for the weight and cost of the beams.

<table>
<thead>
<tr>
<th>Wind Speed</th>
<th>Height (ft)</th>
<th>Beam Section</th>
<th>Footing Depth x Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH 70</td>
<td>10</td>
<td>W 10x19</td>
<td>7 ½ ft x 3 ft</td>
</tr>
<tr>
<td>MPH 80</td>
<td>15</td>
<td>W 10x25</td>
<td>8 ¼ ft x 3 ft</td>
</tr>
<tr>
<td>MPH 90</td>
<td>10</td>
<td>W 10x29</td>
<td>9 ¾ ft x 3 ft</td>
</tr>
<tr>
<td>MPH 10</td>
<td>15</td>
<td>W 14x26</td>
<td>10 ½ ft x 3 ft</td>
</tr>
</tbody>
</table>

The calculations for footing diameters and depths are based on the assumption that footings are in undisturbed soils, not fill soils. Lateral bearing capacity of 300 psf per foot of depth in natural grade was used to derive these figures.
The footings recommendations are based on the allowable soil bearing pressure of 3000 psf vertically and 300 psf/ft of depth horizontally. However, these recommendations are suggestions only and soil bearing pressure at the site must be determined by a sample test prior to specifying actual footings. Be sure that the installation complies with local codes and is suitable for particular soil and wind conditions. Daktronics assumes no responsibility for structures installed by others. Daktronics recommends that W-sections of grade 36 steel be used for beams, and that 28-day (strength 3000 psi) concrete be used for footings.

**A note about beam nomenclature:** For a typical beam, W8x28 for example, "W" stands for "Wide-Flange Beam". The first number (8) is the approximate front to rear dimension of the beam in inches. The second number (28) is the weight per foot in pounds. This numbering is a standard in the steel industry. Widths are from 10.125 to 13.87 inches in the chart above.

**Note:** Recommendations for a single rectangular structural steel tube and footing to support the display as shown in **Drawing A-46784** must be determined by a qualified structural engineer using data from a soil sample test at the site.

### 2.3 Display Mounting

**Reference Drawing:** Display Mounting, CH-1624V ..........................[Drawing A-46774]
Footing and Beam, CH-1624V ..........................[Drawing A-46784]

**Drawings A-46774** and A-46784 show the typical mounting for the display.

**Note:** The bolts that secure the display to the beam(s) do not go through the beam(s), but run along both sides of the beam, clamping the display to the beam(s).

A mounting kit consisting of mounting angles and 1/2" hardware are provided to mount the display.

1. Position the display against the mounting beam(s) and secure the bottom of the display to the beam(s) as shown.
2. Secure the top of the display and then the middle of the display. Once mounting angles are attached, the display may be slid up or down to the desired height. Once the display is positioned as desired, tighten all bolts.
2.4 Electrical Installation

2.4.1 Control Signal Cable

Reference Drawings: Pwr/Sig Entrance, 1 Driver Display... [Drawing A-46755]
Component Locations, CH-1624V... [Drawing A-46756]
Color Code, 25 Pin J-Box................. [Drawing A-47207]

For the display, two conductors of 24 AWG are needed. For distances up to 600 ft. or 22 AWG, up to 1000 ft. are required. Daktronics has 24 AWG direct burial cable, Daktronics part no. W-1105 with 6 conductors, and 22 AWG cable that must be pulled through the conduit before burial, Daktronics part no. W-1077 with 2 conductors.

At the control location, mount the signal J-box to a convenient location. Route the cables and connect to the wires leading from the connector in the cover according to the table below and [Drawing A-47207].

At the display, open the bottom hinged panel covering the entrance enclosure as shown in [Drawing A-46756]. Remove the cover from the entrance enclosure. Refer to [Drawing A-46755] for an illustration of the components inside the entrance enclosure. Connect the signal wires to TB31 as indicated in the table below.

<table>
<thead>
<tr>
<th>Control End</th>
<th>Display End</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-box Terminal No.</td>
<td>Wire Color</td>
</tr>
<tr>
<td>14</td>
<td>Red/Wht</td>
</tr>
<tr>
<td>15</td>
<td>Grn/Wht</td>
</tr>
</tbody>
</table>

*Auxiliary display(s) require(s) a different output number(s). Consult the CHTS-300 console manual.

2.4.2 Power Wiring

Reference Drawing: Pwr/Sig Entrance, 1 Driver Display... [Drawing A-46755]

The CH-1624V display requires a 120/240 VAC, 40 amp circuit per line. When equipped with 25W lamps, the maximum current draw is 66.67 amps. When equipped with 30W, 30R20 reflector lamps, the maximum current draw is 80 amps.

Route power wires into the display and connect to TB41 in the entrance enclosure, as shown in [Drawing A-46755].

Connect the ground wire to E41 and to a ground rod near the display, according to local codes.
NOTE
TWO HINGED ACCESS PANELS REMOVED TO SHOW LAMP DRIVER AND ENTRANCE ENCLOSURE.

A1 IS THE ENCLOSED LAMP DRIVER, (COVER REMOVED TO SHOW LAMP DRIVER)

POWER & SIGNAL ENTRANCE

KNOCKOUTS FOR 1/2" CONDUIT

REMOVE THESE (4) SCREWS TO REMOVE SCREEN FOR LAMP ACCESS (TYPICAL)

LAMP DRIVER NO. DRIVER OUTPUT CONNECTOR NO. = LAMP DRIVER CONNECTOR NO. WIRED TO THAT DIGIT.

Daktronics, Inc. Brookings, SD 57006

Proj: Chronodex Displays
Title: Component Locations, CH-1624V

Rev. Date Description By Approv.

Revision Apprv. By:

Scale: 1=35

1081-R04A-46756
DISPLAY LOCATION

EARTH GND

120/240 VAC, 40 AMPS PER LINE

LOCKABLE DISCONNECT SWITCH (BY OTHERS)

CONTROL SIGNAL CABLE,
1 PAIR, 24 AWG OR 22 AWG
24 AWG, UP TO 600 FT.
22 AWG, UP TO 1000 FT.
IN CONDUIT BY OTHERS OR
DIRECT BURIAL.

CONTROL LOCATION

120 VAC

SIGNAL 4-BOX

SIGNAL CABLE

CHTS-300 TIMING CONSOLE

Daktronics, Inc. Brookings, SD 57006

Proj: Chrondek Displays
Title: System Layout, CH-1624V
Des. By: CF
Drawn By: CF
Date: 27 Mar 91
Rev. Date Description By Appr.
1 30 Apr 91 Changed Signal Cable Spec's. CF

Scale: 1 = 1

1081-R04A-46757
MOUNTING PROCEDURE:

1.) LOCATE WHERE CENTER OF THE BEAMS WILL BE ON BACK OF THE DISPLAY.

2.) DRILL 9/16” HOLES IN THE MTC CHANNELS ON THE BACK OF THE DISPLAY AT A DISTANCE OF ± 3.50” OR 4.50” FROM CENTER OF EACH BEAM.

3.) LIFT DISPLAY IN PLACE.

4.) ATTACH MOUNTING ANGLES AND 1/2” HARDWARE AS SHOWN ABOVE.

5.) DISPLAY CAN BE SLID UP OR DOWN TO HEIGHT REQUIRED.

6.) TIGHTEN ALL MOUNTING HARDWARE SECURELY.
1. Strip wire ends 1/4".
2. Insert wire into connector.
3. Squeeze connector securely onto wire end with pliers or crimping tool.

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>WIRE COLOR</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BLACK</td>
<td>PHOTO 1-N</td>
</tr>
<tr>
<td>2</td>
<td>WHITE</td>
<td>PWR 1-P</td>
</tr>
<tr>
<td>3</td>
<td>RED</td>
<td>GND 1-N</td>
</tr>
<tr>
<td>4</td>
<td>GREEN</td>
<td>PHOTO 2-N</td>
</tr>
<tr>
<td>5</td>
<td>ORANGE</td>
<td>PWR 2-P</td>
</tr>
<tr>
<td>6</td>
<td>BLUE</td>
<td>GND 2-N</td>
</tr>
<tr>
<td>7</td>
<td>WHITE/BLACK</td>
<td>PHOTO 3-N</td>
</tr>
<tr>
<td>8</td>
<td>RED/BLACK</td>
<td>PWR 3-P</td>
</tr>
<tr>
<td>9</td>
<td>GREEN/BLACK</td>
<td>GND 3-N</td>
</tr>
<tr>
<td>10</td>
<td>ORANGE/BLACK</td>
<td>PHOTO 4-N</td>
</tr>
<tr>
<td>11</td>
<td>BLUE/BLACK</td>
<td>PWR 4-P</td>
</tr>
<tr>
<td>12</td>
<td>BLACK/WHITE</td>
<td>GND 4-N</td>
</tr>
<tr>
<td>13</td>
<td>RED/WHITE</td>
<td>1 SIG-P</td>
</tr>
<tr>
<td>14</td>
<td>GREEN/WHITE</td>
<td>1 SIG-N</td>
</tr>
<tr>
<td>15</td>
<td>BLUE/WHITE</td>
<td>2 SIG-P</td>
</tr>
<tr>
<td>16</td>
<td>BLACK/RED</td>
<td>2 SIG-N</td>
</tr>
<tr>
<td>17</td>
<td>WHITE/RED</td>
<td>3 SIG-P</td>
</tr>
<tr>
<td>18</td>
<td>ORANGE/RED</td>
<td>3 SIG-N</td>
</tr>
<tr>
<td>19</td>
<td>BLUE/RED</td>
<td>4 SIG-P</td>
</tr>
<tr>
<td>20</td>
<td>RED/GREEN</td>
<td>4 SIG-N</td>
</tr>
<tr>
<td>21</td>
<td>ORANGE/GREEN</td>
<td>NOT USED</td>
</tr>
<tr>
<td>22</td>
<td>BLK/WHT/RED</td>
<td>NOT USED</td>
</tr>
<tr>
<td>23</td>
<td>WHT/BLK/RED</td>
<td>NOT USED</td>
</tr>
<tr>
<td>24</td>
<td>RED/GLK/WHT</td>
<td>12 VAC</td>
</tr>
<tr>
<td>25</td>
<td>GRN/GLK/WHT</td>
<td>12 VAC</td>
</tr>
</tbody>
</table>

**Photocell Power Inputs**

**Scoreboard Signal Outputs**

These pins typically not used by chts timer.
Scoreboard must be connected to a ground rod at scoreboard location.
Section 3 : Maintenance & Troubleshooting

IMPORTANT NOTES:
1. Disconnect power 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. Disconnect power when the display is not in use.

3.1 Lamp Replacement

Reference Drawing: Digit Service .................................................. [Drawing A-27674]

The primary service required by the CH-1624V display is to replace burned-out lamps. Refer to [Drawing A-27674] for an illustration of lamp changing. Replacement lamps are 120V, 25W frosted, medium base, available at your local store or directly from Daktronics, part number DS-1029. Some displays may be equipped with 120V, 30W reflector type 30R20 lamps, Daktronics part number DS-1126.

Do not use lamps larger than those originally installed in the display. Using higher powered lamps will likely cause fuse failures in the display and could exceed the current levels that the display's circuits can safely handle.

3.2 Lamp Driver

Reference Drawings: Lamp Driver,16 Col. w/ Fan.......................... [Drawing A-37070]
Component Locations,CH-1624V .......................... [Drawing A-46756]

In the display, the task of switching lamps on and off is performed by the lamp driver. [Drawing A-46756] in Section 2 shows the location of the lamp driver in the display. [Drawing A-37070] shows an illustration of the lamp driver and the fuses located in it. The lamp driver has 21 connectors with power and signal inputs and outputs to the digits. The functions of these connectors are as follows:

<table>
<thead>
<tr>
<th>Connector Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-16</td>
<td>Outputs to digits</td>
</tr>
<tr>
<td>17</td>
<td>Signal Input</td>
</tr>
<tr>
<td>18</td>
<td>Power input for outputs 1-8 (120 V)</td>
</tr>
<tr>
<td>19</td>
<td>Power input for driver logic and fan (120V)</td>
</tr>
<tr>
<td>20</td>
<td>Power input for outputs 9-16 (120V)</td>
</tr>
<tr>
<td>24</td>
<td>Dim option selector</td>
</tr>
</tbody>
</table>

In [Drawing A-46756] the numbers on the digits refer to the lamp driver output connector wired to each digit.
3.3 Digit Segmentation

Reference Drawing: Segments, 4x7 Lamp Matrix Digit..................Drawing A-37685

In a digit certain lamp always go on and off together. These groupings of lamps are known as "segments". Each digit has eight segments, referred to by letters A through H. Drawing A-37685 illustrates these segments and shows which connector pin and wire color is wired to each segment.

3.4 Schematic

Reference Drawings: Schematic, 1 Driver Display ..................Drawing A-46754
Pwr/Sig Entrance, 1 Driver Display ..........Drawing A-46755
Component Locations, CH-1624V ..........Drawing A-46756

The schematic diagram in Drawing A-46754 shows the power and signal inputs into the display and to the lamp driver. The component numbers correspond to those shown in Drawings A-46756 and A-46755.

3.5 Troubleshooting

This is a list of possible problems that may occur and their possible solutions.

<table>
<thead>
<tr>
<th>Observed Problem</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>One lamp won't light</td>
<td>• Burned-out lamp</td>
</tr>
<tr>
<td></td>
<td>• Broken wire behind digit</td>
</tr>
<tr>
<td>Digit segment won't light</td>
<td>• Broken wire</td>
</tr>
<tr>
<td></td>
<td>• Poor contact at driver connector</td>
</tr>
<tr>
<td></td>
<td>• Internal driver malfunction</td>
</tr>
<tr>
<td>Entire digit won't light</td>
<td>• Broken wire (black)</td>
</tr>
<tr>
<td></td>
<td>• Poor contact at connector, pin 7</td>
</tr>
<tr>
<td></td>
<td>• Fuse blown in driver</td>
</tr>
<tr>
<td>Half the display won't light</td>
<td>• Service breaker tripped</td>
</tr>
<tr>
<td></td>
<td>• Main fuse blown</td>
</tr>
<tr>
<td></td>
<td>• Poor contact at main power connection</td>
</tr>
<tr>
<td></td>
<td>• P18 disconnected</td>
</tr>
<tr>
<td>Entire display won't light</td>
<td>• Power disruption</td>
</tr>
<tr>
<td></td>
<td>• Poor signal connection</td>
</tr>
<tr>
<td></td>
<td>• Driver logic fuse blown</td>
</tr>
<tr>
<td></td>
<td>• Control not connected to display</td>
</tr>
<tr>
<td></td>
<td>• P20 disconnected</td>
</tr>
<tr>
<td>Segment stays lit</td>
<td>• Broken wire behind digit</td>
</tr>
<tr>
<td></td>
<td>• Internal driver malfunction</td>
</tr>
<tr>
<td>Garbled display</td>
<td>• Control malfunction</td>
</tr>
<tr>
<td></td>
<td>• Internal driver malfunction</td>
</tr>
</tbody>
</table>

If a problem is observed in one digit, the cause may be isolated by swapping plugs on the driver (connect the plug from the digit into a different jack). If the same digit shows the same
problem, the cause may be in the digit or the wiring. If the problem moves to another digit, then the cause is probably an internal driver problem.

Use a volt meter at driver inputs to determine if power is being supplied to the driver. An ohmmeter can be helpful in finding broken wires and bad connections. Internal electronic problems must be corrected by Daktronics or an authorized service center.

### 3.6 Replacement Parts

<table>
<thead>
<tr>
<th>Part Name or Description</th>
<th>Type</th>
<th>Daktronics Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Driver</td>
<td></td>
<td>0A-1033-00122</td>
</tr>
<tr>
<td>J-Box, CHTS-300 Timer</td>
<td></td>
<td>0A-1067-0056</td>
</tr>
<tr>
<td>Fuse, Main Power, 20A</td>
<td>FNW-20</td>
<td>F-1016</td>
</tr>
<tr>
<td>Fuse, Lamp Driver, 10A</td>
<td>AGC-10</td>
<td>F-1006</td>
</tr>
<tr>
<td>Fuse, Driver Logic, ½ A</td>
<td>AGC-1/2</td>
<td>F-1000</td>
</tr>
<tr>
<td>Digit Lampbank, 24” 4x7</td>
<td></td>
<td>0A-1027-0071</td>
</tr>
<tr>
<td>Digit Screen, 24” 4x7</td>
<td></td>
<td>OS-1064-0002</td>
</tr>
<tr>
<td>Socket, Med. Base</td>
<td></td>
<td>X-1046</td>
</tr>
<tr>
<td>Lamp, 25W Frosted</td>
<td></td>
<td>DS-1029</td>
</tr>
<tr>
<td>Lamp, 30W Reflector Type</td>
<td>30R20</td>
<td>DS-1126</td>
</tr>
</tbody>
</table>

### 3.7 Unit Exchange/Replacement Procedure

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

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

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

2. **Driver Packaging Instructions:** Drivers should be placed in a static-free enclosure for return shipping. An anti-static convoluted foam packing is available from Daktronics (part number PK-1135). The shipping box (Daktronics part number PK-1006) should be used along with the foam.

3. **Where to Send:** Contact your local representative prior to shipment to acquire a Return Material Authorization Number (RMA#). This will speed up the repair of your unit.

   When returning defective items under the exchange program, please use the UPS Blue Return Tags found in the package containing the exchange unit sent from Daktronics. This will speed up the transaction and help avoid 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
F1 THRU F16 ARE TYPE AGC-10, DAKTRONICS PART NUMBER F-1006.
F17 IS TYPE AGC-1/2, DAKTRONICS PART NUMBER F-1000.

DAKTRONICS, INC. BROOKINGS, SD 57006
PROJ: MULTIPLEX CONTROLLERS
TITLE: LAMP DRIVER, 16 COL., W/FAN
DES. BY: JLH DRAWN BY: JLH DATE: 20 FEB 89
REV. DATE DESCRIPTION APPR. REVISION APPRO. SCALE 1=5 1033-R04A-37070